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Heat transfer – a review of 2000 literature

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1. Introduction

Heat transfer continues to be a major field of interest to engineering and scientific researchers, as well as designers, developers, and manufacturers. The wealth of applications includes a wide variety of components and systems for energy devices, including general power systems, heat exchangers, high performance gas turbines and other power conversion devices. Other areas of interest include chemical processing, general manufacturing, bio-heat transfer, electronic cooling, comfort heating and cooling, and a number of natural phenomena from upwelling currents in the oceans to heat transport in stellar atmospheres.

The present review is intended to encompass the English language heat transfer papers published in 2000. While being exhaustive, some selection is necessary. Many papers reviewed herein relate to the science of heat transfer, including numerical, analytical and experimental works. Others relate to applications where heat transfer plays a major role in not only virtually all man-made devices, but natural systems as well. The papers are grouped into categories and then into subfields within these categories. We restrict ourselves to papers published in reviewed archival journals.

Besides reviewing the journal articles in the body of this paper, we also mention important conferences and meetings on heat transfer and related fields, major awards presented in 2000, and books on heat transfer published during the year.

The 34th National Heat Transfer Conference on 20–22 August in Pittsburgh, USA had sessions on enhanced heat transfer in heat exchangers, microscale transport phenomena, heat transfer in electronic systems, inverse problems and porous media. The ASME International Mechanical Engineering Congress and Exposition (IMECE-2000) was held in Orlando, USA on 15–20 October. The Heat Transfer Division of the ASME organized sessions on heat transfer in turbomachinery, heat transfer enhancement in multiphase flow, CFD in multidimensional two-phase flows, transport phenomena in materials processing, and radiative heat transfer. The ASME Turbo Expo 'Land, Sea and Air-2000' held in Munich, Germany had sessions on film cooling and blade internal and external heat transfer.

A Symposium on Energy Engineering was conducted in 9–12 January in Hong Kong; sessions covered forced convection, air-conditioning and refrigeration, boiling and condensation, and clean combustion technology. The Fourth ISHMT/ASME Heat and Mass Transfer Conference was held on 12–14 January in Girinagar, India. The 5th International Workshop on Advanced Plasma Tools and Process Engineering was held on 10–11 February in Santa Clara, USA. The Eighth International Seminar on Numerical Combustion was held on 5–8 March in Amelia Island, USA. The Third International Symposium on Turbulence Heat and Mass Transfer was organized on 3–7 April in Nagoya, Japan. The 4th Minsk International Heat and Mass Transfer Forum on 22–26 May discussed issues in heat and mass transfer in disperse and rheological systems and capillary-porous bodies. An ASME–ZSIT International Thermal Science Seminar was held on 11–14 June in Bled, Slovenia. The Eurotherm Seminar N64 held on 18–21 June in Reims, France covered advances in quantitative infrared thermography. The 14th Symposium on Thermophysical Properties was held on 25–30 June in Boulder, USA. The Sixth International Conference on Advanced Computational Methods in Heat

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Transfer was held in Madrid, Spain on 26–28 June. Papers were presented on natural and forced convection, porous media and composites, inverse problems, coupling of different numerical methods, and heat transfer in manufacturing.

The 7th Australasian Heat and Mass Transfer Conference was held on 3–6 July in Townsville, Australia; topics covered, among others, were combustion, conduction, multiphase flow and computational methods. An International Symposium on Heat Transfer in Gas Turbine Systems was held on 13–18 August in Cesme, Turkey; sessions covered disk cavity and blade heat transfer, combustor liner cooling, film cooling and internal cooling. The 4th ASME–JSME Thermal Engineering Conference was held in Kobe, Japan on 1–6 October; topics covered included phase change, flow in microgravity, and microscale heat transfer. The International Symposium on Multiphase Flow and Transport Phenomena (MFTP-2000) held on 5–10 November in Antalya, Turkey covered bio-aerosols and biosystems, surface and interfacial phenomena, pollution control and cleanroom technology, and scaling laws for two-phase phenomena.

In 2000, the 1999 Max Jakob Award was bestowed on Adrian Bejan for his pioneering work on entropy generation minimization and exergy analysis and his lifelong contributions to the areas of natural convection, porous media, and combined heat and mass transfer. The Donnald Q. Kerd award was given to V.K. Dhir for his outstanding applied research contributions to phase change and thermal hydraulics of nuclear systems, and basic and applied research contributions in heat and mass transport. At IMECE-2000, the Heat Transfer Memorial Awards were presented to Ramesh Shah (Art) for his significant contributions to the design theories of compact heat exchangers and education worldwide through lectures, Dr. Ashley Emery (General) for demonstrating the importance of heat transfer fundamentals in a wide spectrum of research and engineering applications, and Dr. Ta-Shen Chen (Science) for outstanding pioneering contributions to the understanding of mixed convective heat transfer, instability mechanisms, and transport processes in such flows.

Books published during the year on heat transfer include:

Advances in Enhanced Heat Transfer
ASME Press

Advanced Computational Methods in Heat Transfer
B. Sunden, C. Brebbia

Advances in Heat Transfer, Vol. 34
J.P. Harnett, T.F. Irvine, G.A. Greene
Academic Press, Inc.

Advances in Numerical Heat Transfer
W.J. Minkowycz, E. M. Sparrow (editors)
Taylor & Francis

Condensation Heat Transfer Enhancement
V.G.G. Rifert, H.F. Smirnov

Computational Analysis of Convection Heat Transfer
G. Comini, B.Sunden (editors)
Computational Mechanics, Inc.

Dynamics of Regenerative Heat Transfer
J.A. Wilmott
Taylor & Francis

Extended Surface Heat Transfer
A.D. Kraus, A. Aziz
John Wiley and Sons

The Finite Element Method in Heat Transfer and Fluid Dynamics
J.N. Reddy, D.K. Gartling
CRC Press

The Finite Analytic Method in Flows and Heat Transfer
C.J. Chen, R.A. Bernatz, W. Lin, K. Carlson
Computational Mechanics, Inc.

Fundamentals of Momentum, Mass and Heat Transfer
J.R. Welty, R.E. Wilson, C.E. Wicks, G.L. Rorrer
John Wiley and Sons

Fundamentals of Heat and Mass Transfer
F. Incropera and D.P. DeWitt
John Wiley and Sons

Heat Transfer
V.P. Isachenko, S. Semyonov, A. Sukomel
University Press of the Pacific

Heat and Mass Transfer Under Plasma Conditions
P. Fauchais, J. Heberlein, J. van der Mullen (editors)
New York Academy of Sciences

Proceedings of the International Conference on Heat Transfer and Transport Phenomena in Microscale
G.P. Celata, V. P. Carey (editors)
Begell House Publishers, Inc.

Heat Transfer in Industrial Combustion
C. Baukal
CRC Press

Heat Transfer
L.C. Thomas
Capstone Publishing Corporation

Introduction to Heat Transfer
V. Arpaci, A. Selamet, S.-H. Kao
Prentice-Hall

Introduction to Heat Transfer
F. Incropera and D.P. DeWitt
John Wiley and Sons

Modelling of Transport Phenomena in Crystal Growth
J.S. Szmyd, K. Suzuki (editors)
Computational Mechanics, Inc.

Microgravity Fluid Physics and Heat Transfer
International Conference on Microgravity Fluid Physics and Heat Transfer
Begell House Publishers, Inc.

National Heat Transfer Conference Proceedings
American Nuclear Society

Principles of Heat Transfer
F. Kreith, M. Bohn
Brooks/Cole Publishing Company

Radiation Heat Transfer
H.R.N. Jones
Oxford University Press

2. Conduction

The category related to Heat Conduction always enjoys widespread research activity in various sub-topics to include: Contact conduction and contact resistance; Composites and Heterogeneous media; Heat conduction in solids of arbitrary geometries; Thermal waves and micro/nanoscale heat transfer; Conduction with convection and flow effects; Thermomechanical problems; Materials and modeling; Analytical, Numerical and Experimental Studies; and Miscellaneous studies in heat conduction. The various efforts in each of the sub-categories are highlighted next.

2.1. Contact conduction and contact resistance

Contact conductance measurements under high temperature across a cylindrical joint by a periodic method [1A]; metal polymer joints [2A]; enhancement of contact conductance and effect of metallic coating [3A]; analysis of heat transfer in film covered composite–steel surfaces [4A] and gap conductance due to contact heat transfer [5A] have appeared in this sub-category.

2.2. Composites and heterogeneous media

Specific studies dealt with experimental investigations of resistance welding in thermoplastic-composites [6A]; axisymmetric transient solutions in layered composites [7A]; experimental/numerical studies of residual stresses [8A]; macro/micro periodic layered solids [9A]; transient analysis in 1-D slab [10A]; thermal diffusivity measurements in composites with thick fillers and rubbers [11A]; thermal resistance on heat transfer in composite medium using thermal wave model [12A]; and thermo-hygro-mechanical tailoring of composites accounting for second sound [13A].

2.3. Heat conduction in arbitrary geometries

The various issues dealing with pin fins [14A], T-shaped fins [15A], heat-pipe fin [16A], extended heat transfer fins [17A], binary mixtures of granular materials [18A], irregularly spaced plane strip contact [19A], and modeling of transient conduction in plane slabs employing a rational method for distribution of nodes [20A] appear in this sub-category.

2.4. Thermal waves, micro/nanoscale effects, and laser heating

This sub-category is receiving widespread research interest and an increased emphasis in various issues dealing with thermal waves and hyperbolic nature of heat transport, prediction of thermophysical properties in micro/nanoscale sizes, analytical and numerical analysis of thermal propagation and distribution appear in various indepth studies in [21A–35A].

2.5. Conduction with convection and flow effects

The transient analysis of a 2-D cylindrical pin with constant base heat flux and tip convective effects appeared in [36A].

2.6. Thermomechanical problems and applications

The thermoelastic stress analysis to fully reversed bending fatigue [37A], composites under local intense heating by irradiation [38A], continuous casting processes [39A], an efficient approach to computing residual stresses in welded joints [40A], and residual stresses in aluminum alloy forgings [41A] appeared in this sub-category.

2.7. Materials and modeling

The process of cure during repair of a broken thermoset piece by heating with a new uncured resin [42A], finite gap effects on modeling thermal contact conductance at polymer–mold wall interface [43A], distortion induced by electron beam welding [44A] for a nickel-based superalloy, and a model for conduction through oxide layer of steel during hot rolling [45A] appeared in this sub-category.

2.8. Analytical, numerical and experimental studies

Various issues ranging from developing new analytical tools and numerical simulations for a broad range of heat conduction applications appeared in the literature. In certain applications experimental studies were either additionally undertaken or results of experiments were provided for selected applications. The numerical simulations either employed new and novel techniques and/or use of existing tools for varied applications. All these appeared in [46A–65A].

2.9. Miscellaneous studies

As always, numerous studies appeared in the literature for problem specific and selected applications that addressed the aspects of heat conduction. The various details of these miscellaneous topics appeared in [66A–80A].

3. Boundary layers and external flows

Papers on boundary layers and external flows for 2000 have been categorized as follows: flows influenced externally, flows with special geometric effects, compressible and high-speed flows, analysis and modeling techniques, unsteady flow effects, flows with film and interfacial effects, flows with special fluid types and property effects and flows with reactions.

3.1. External effects

Papers which focus on external effects document the influence of blowing or suction through the wall [1B–3B,5B,9B,11B], adverse pressure gradients [6B], free-stream turbulence [8B], electric fields [7B], magnetic fields [4B,10B] and viscosity's dependence on temperature [12B].

Several papers include studies of injection or suction through porous walls. In one, heat transfer is enhanced by injection-induced turbulence effects [5B], another applies suction to a stretching sheet of variable conductivity [1B], a third is similar, but with a visco-elastic fluid [2B], the fourth is with another non-Newtonian fluid [11B], the fifth investigates the effects of nearness to the exit of the extrusion slot on the local heat transfer characteristics [3B] and the final is with a compressible laminar flow on a wall [9B]. In [9B], injection through multiple slots is shown to move the point of separation downstream. Separation moves upstream when suction is applied. The effects of adverse pressure gradient over a 2-D boundary layer on mass transfer in compressible flow are presented as a means of control [6B]. The effects of free stream turbulence level on turbulent boundary layers are discussed in [8B]; substantial augmentation of heat transfer with elevated turbulence is computed. The effects of an electric field on mass transfer from a liquid drop are discussed in [7B]; mass transfer enhancement is strong when operating at an optimum frequency. The influence of a magnetic field on mass transfer from a stretching sheet is described in [10B] where it is noted that the skin friction is strongly increased while the heat transfer is only slightly reduced. Another paper describes the effects of a magnetic field on heat transfer from a plate cooled by a non-Newtonian fluid [4B]. Finally, the sensitivity of viscosity to changes in temperature is capitalized upon in a strategy for active control of fluctuations in surface heat flux [12B].

3.2. Geometric effects

Papers in this category address heat transfer in several geometries; a moving surface [15B,29B,33B], spheres, wedges and geometrically similar objects [19B, 20B,23B, 27B,28B], wavy, rough and ribbed surfaces [16B,17B, 21B,25B,26B,30B,31B,34B], airfoils [18B,32B], stagnation flows [13B,14B], flows in a room [35B] and flows with strong shear [22B,24B].

Several papers dealt with moving surfaces. One [15B] simulates casting or rolling processes and another, with Newtonian fluids and pseudo-plastics, discusses heat transfer in extrusions [29B]. On a larger scale, a paper is presented which deals with the energy, mass and momentum transfer in moving viscous mantle-solid systems representing continents [33B]. Heat transfer from geometrically similar objects is analyzed in [27B] and heat transfer from wedges in [19B,20B,23B]. In the latter two, the wedge surface is permeable. Wavy surfaces with micro-polar fluids are treated in two similar papers [16B,17B]. Three papers deal with roughness; in one [34B], curvature effects are included; in another, the wall is permeable and the Reynolds analogy is addressed [31B] and, in a third [25B], variational methods are used to estimate aerodynamic roughness length. The effects of ribs mounted on a surface are discussed in [26B], based on results from RANS modeling techniques; while in another [21B], heat transfer performance with detached and attached ribs is compared. Another similar paper shows computed heat transfer from surfaces with protruding bodies [30B]. It notes the importance of activating the unsteady term in the equations. Two airfoil studies are included; in one [32B], an unsteady compressible code is applied to compute conjugate heat transfer in a turbine blade. In another [18B], the geometries of iced airfoils are used, noting the differences between rime and glazed ice behavior. Two flows with stagnation heat transfer are presented, one at the stagnation point on a wall [13B] and another in a jet impingement geometry [14B]. In the latter, the effects of inlet chamfering of the delivery hole are addressed. Other papers in this category include large eddy simulation of natural and forced convection heat transfer in a room [35B], the turbulent thermal boundary layer of the entry flow to a channel [24B] and transfer of a passive species in a shear flow [22B].

3.3. Compressibility and high-speed flow effects

Papers in this category include two on blunt leading edges [39B–41B], two on non-equilibrium effects [36B, 42B], one on slip velocity effects [43B] and two on modeling [37B,38B].

An artificially blunted leading edge is shown to have reduced drag [39B]. The effects on heat transfer of such leading edge changes are documented. Non-equilibrium effects on a blunt body in hypersonic flows are discussed [41B] where the effects of vibrational temperatures on heat flux and shock standoff distance are described. Experiments in transonic and supersonic flows with plasma and hot gas injection document the drag reduction effect [36B]. The effects of thermochemical non-equilibrium on shock standoff distance for high-speed flow around a sphere are measured [42B]. Another paper presents an analysis of the effects of slip velocity on heat transfer and condensed phase momentum flux of a supersonic nozzle flow [43B]. The application is industrial cleaning. Direct numerical simulation is applied to supersonic turbulent boundary layers [38B]. The modeling choices are discussed. Finally, a research group reported over-prediction of heat transfer in hypersonic flows [37B]. They attribute it to shortcomings in turbulence modeling.

3.4. Analysis and modeling

Papers in this category include some on modeling of turbulence in Reynolds-averaged equations [44B–46B,48B,54B,56B,57B,59B], some focus on near-wall modeling, others present DNS and LES simulation techniques [49B,52B,53B], two are on transition [47B, 51B], one is on the Reynolds analogy factor [50B] and two present modeling of atmospheric flows [55B,58B].

A turbulent heat flux transport model is proposed and tested against DNS and experimental results in homogeneous turbulence [46B]. A homogeneous turbulent shear flow is used to discuss the evolution of passive scalar fields [57B]. Anisotropic RANS modeling of the k–ε–A, three-equation eddy viscosity type is shown to be encouraging in capturing anisotropic behavior in thermal fields [45B]. A survey of various RANS models applied to heat transfer in wood heaters is presented [48B]. Near-wall turbulence modeling is addressed as applied to Reynolds-averaged energy equation modeling [44B]. A low-Reynolds number model is applied to pipe entry flow where three variations on turbulent Prandtl number modeling are employed [54B]. Near-wall modeling is addressed in a two-equation RANS model leading to the suggestion that the temperature-field model must be at least one level lower in order than the velocity-field model [56B]. A wall function is discussed for application to computing with variable-property fluids and permeable surfaces [59B]. Near-wall modeling using DNS is discussed for fluids of various Prandtl numbers. A new dynamic subgrid-scale turbulence model is presented for use in LES computation of turbulent stress and heat flux fields [49B]. Subgrid-scale modeling of atmospheric boundary layers is discussed in terms of stability and filter dimensions [53B]. Transition to turbulence in high-speed flows is computed by assuming that non-turbulent fluctuations behave in a turbulent-like manner [51B]. Time-dependent calculations of wake-affected flows which use an intermittency function to effect transition are shown to be superior to computations made with quasi-steady assumptions. The Reynolds analogy factor, St/Cf, is used to discuss thermal convection driven by non-isothermal stretching surfaces [50B]. A model is presented for including sensible and latent heat fluxes in atmospheric boundary layers [58B]. It is used to compute vapor transport from the surface of the Bay of Bengal. Also, for atmospheric flow, a dissipation integral is applied to compute surface fluxes [55B].

3.5. Unsteady effects

Flows in this category include one which tests a quasi-static hypothesis [62B], two for flat-plate boundary layers [61B,69B], one which compares timescales [66B], one on drag reduction strategies [70B], four on heat transfer to spheres [60B,64B,65B,68B], one for wake effects [63B] and two on flow stability [67B,71B].

A numerical study of transient cooling with variable fluid viscosity is presented [62B], showing that a convective onset time can be scaled on a viscous temperature scale. Conjugate heat transfer is applied to a flat-plate flow to evaluate surface temperature evolution [61B]. An analysis is applied to an impulsively started flat plate [69B]. The results of limiting cases are compared to exact solution results. Measurements are made of the turbulent concentration variance and its dissipation [66B] in support of experimentally evaluating the scalar-to-velocity timescale ratio. Coherent structures are computed with DNS to discuss strategies for drag reduction [70B]. Transient heat transfer to particles is computed for various Reynolds and Peclet number values [64B]. Results show a strong sensitivity to Re when Pe values are above unity. The effects of flow pulsation on particle heat transfer are described experimentally [68B]. Heating of liquid droplets in immiscible fluids is computed and the effects of Reynolds number and the effects of the ratio of external to internal viscosity are quantified [60B]. The effects of acoustic excitation on heat transfer from a bubble are evaluated and the results are compared to magnetic excitation effects [65B]. Transient heat transfer to airfoils, as affected by passing wakes, is described [63B]. Transitional spot spreading and propagation rates are documented experimentally by using liquid crystal thermometry [71B]. Finally, the development of compression and gravity waves, their growth and decay, in convective storms is described [67B].

3.6. Films and interfacial effects

Papers in this category address droplet evaporation [76B], direct contact heat exchangers [77B], falling films [72B–74B,79B], co-current and counter-current flows [75B] and instability [78B].

A paper on droplet evaporation numerically investigates the interaction among droplets. Groups of droplets behave differently than single droplets [76B]. The direct contact heat exchange between perfluorocarbons and hot water is experimentally evaluated [77B], describing the effects of size distribution and flow behavior. The effects of humidity on the thermocapillarity of a falling film are addressed [79B]. Liquid film heat transfer for heat exchangers operating under various Peclet number conditions is analyzed [73B]. A mathematical model is presented for an ammonia–water falling film to describe the effects of subcooling and initial film thickness [74B]. A similarity transformation is employed to analyze a laminar liquid film on a horizontal stretching sheet [72B]. In the limit of high Pr, the film surface temperature is shown to approach that of the sheet. A similarity variable method is employed to describe mass transfer across the interface in co-current and counter-current flows [75B]. The advantages of using co-current flows are presented. Finally, the Rayleigh–Taylor stability of vapor–liquid interfaces is studied [78B] by use of a multiple-timescale expansion method.

3.7. Effects of fluid type or fluid properties

Papers in this category include one with a heat generating fluid [80B], one in the Knudsen transition range [82B], two with particles in a gas [83B,85B] and one on the earth's mantle [81B].

A theoretical study describes the solidification of a heat-generating fluid [80B]. Correlation with a modified Rayleigh number is given. Non-continuum heat transfer between isolated, motionless, highly overheated spherical particles and the cooler surrounding gas is studied by a Monte Carlo simulation [82B]. Equations for accurate estimates of the heat transfer coefficients with temperature-dependent heat capacities are given. Direct numerical simulation is used to compute fluid and particle temperature decay in isotropic turbulence [83B]. A Lagrangian random-walk simulation is used to compute thermophoretic transport in a particle-laden flow [85B]. The relative importance of the various mechanisms is discussed and results for mass deposition rates are compared with experiments. Stagnation point flow of dissociated carbon dioxide is measured [84B]. The effectiveness values of various catalysts of the process are evaluated, showing silver to be the best catalyst. Flow dynamics and heat transfer of 3-D mantle convection are computed [81B]. Variable thermal conductivity is found to stabilize the flow greatly. The authors suggest that plume-like structures observed by others may be manifestations of this nonlinearity in the conductivity.

3.8. Flows with reactions

Papers in this category include one on reacting jets [88B], one with a flame on a cooled wall [87B], two on wall deposition rates [89B,90B] and another dealing with high-speed flow [86B].

The effects of dispersion characteristics on particle temperatures in a non-premixed reacting jet are evaluated [88B]. This is done by a parametric study using a Lagrangian simulation, where the continuous phase is computed with DNS. It is found that the particle temperature behavior is a strong function of spatial dispersion. The effects of wall boundary conditions are evaluated for hydrogen flames over various surfaces [87B]. Boundary conditions described are: a cooled wall, a catalytic surface and an inert surface. A mathematical model is formulated for computing the growth of a product layer of a bimolecular reaction on a reactor wall [89B]. The role of the reactor design is discussed. The growth rate of a diamond layer is predicted with a 2-D model written to describe the hydrodynamics and chemistry of the process [90B]. Though some experimental results are computed accurately, some discrepancies were noted and a tie is made to the use of the Miller–Melius mechanism model for rich oxy-acetylene flames. Numerical simulations of high-speed flow of a high-temperature, non-equilibrium reacting gas mixture over a flat plate are made [86B]. With a kinetic scheme, which allows partial recombination in the boundary layer, good agreement with experiments is found.

4. Channel flows

4.1. Straight-walled ducts

Straight-walled ducts with a variety of cross-sectional geometries are reviewed in this section. Heat and mass transfer for turbulent flow in circular tubes with uniform wall temperature was addressed using a resistance-in-series model [2C]. The forced-convection of slug flow was examined in a rectangular duct [3C]; rectangular ducts were also studied with constant axial heat flux [15C,16C]. Experiments investigated the laminar mixed convection of an inclined duct; buoyancy assisted and opposed conditions were considered [5C]. Mixed convection was also studied using linear stability of purely convective Poiseuille flow [17C], and to address Prandtl number effects in vertical pipes [22C]. The modeling of turbulence and relaminarization of forced gas flows at high-heat flux was undertaken [18C]. A low-Reynolds number algebraic stress model was examined for turbulent flow under fully developed conditions [19C]. Strong heating was also modeled for the laminarization of gas flows in circular tubes [21C]. Flow and heat transfer in annular-sectored ducts was studied both experimentally [23C] and numerically [12C]. Thermal stresses were investigated in fully developed laminar flow conditions [1C]. A large number of low Reynolds number k–ε models were compared for turbulent pipe flows [24C]. Heat transfer in triangular ducts was studied for different apex angles using the SIMPLE method [6C]. The optimum cross-sectional geometry for maximum heat transfer for a given pressure loss was evaluated at constant wall temperature [25C]. Buoyancy-assisted flow separation was modeled using a modified FLARE procedure [7C]. Inclined cooling ducts were examined for determining the heat transfer characteristics for the design of PV cooling ducts [4C]. Buoyancy-assisted flow was studied in the entrance region of a vertical rectangular duct [8C]. The Integral Transform Technique was used to study the turbulent heat transfer characteristics of drag-reducing fluids [13C]. The influence of rarefaction on heat transfer in circular tubes was studied [11C] as well as the thermomechanical coupling in Couette flow [9C]. An analytical study was undertaken to understand the entropy generation in turbulent liquid flows in smooth ducts with constant wall temperature [20C]; an entropy production theorem was used to investigate the performance of enhanced heat transfer surfaces in ducts with constant wall temperature [26C]. The heat transfer to liquid lithium was examined when exposed to a transverse magnetic field [14C]. The effect of Lorenz force in the flow of conducting turbulent fluids was also studied [10C].

4.2. Microchannel heat transfer

Recent attention to micro-scale phenomena has led to an increase in papers devoted to microchannel heat transfer. Heat transfer in a silicon substrate containing rectangular microchannels was investigated numerically [27C]. The 3-D conjugate heat transfer was studied in the microchannel heat sink [29C]. Wall effects on the heat transfer behavior was examined in laminar gas flows [30C]. Irregular cross-sections were considered for low Reynolds number microchannel flows [32C]. Scale effects were used to study differences in microchannel and large-scale channel heat transfer [33C]. The heat transfer of water flow in trapezoidal microchannels was studied experimentally [31C]. Vapor–liquid flow was studied in a micro-heat pipe; the phase change process was examined numerically [34C]. Heat transfer characteristics were investigated in the microchannels of thermal conductivity detectors; boundary conditions, channel size and property effects were considered [28C]. Surface radiation in an annular enclosure was studied numerically for meniscus-driven convection [36C]. Experiments were conducted to evaluate the importance of Brinkman number in microchannel heat transfer [35C].

4.3. Irregular geometries

Forced-convective heat transfer was investigated in curved channels for laminar conjugate conditions [40C]. Local heat transfer measurements were made near a 180° turn in a rectangular channel [37C]. A numerical study considered the laminar to transitional range of Reynolds numbers in corrugated ducts; both heat transfer and pressure drop results are presented [39C]. Flow visualization using liquid crystals was used to examine the local heat transfer characteristics near a 180° bend of a two-pass square duct [44C]. A reduced equation is presented to assist in the calculation of the heat transfer and temperature distribution on the surfaces of square and non-square internal turbine blade cooling channels [51C]. Flow and heat transfer in helically coiled pipes was examined to determine the roles of curvature and torsion [43C] as well as the conjugate problem of a coil immersed in a chilled water container [46C]. The effect of inlet conditions on the flow and heat transfer in endwall secondary flows was computed and compared to experiment [41C]. The cooling of a volume experiencing heat generation at all locations was studied for parallel-plate channels and round tubes [38C]. The inverse force convection problem was investigated in a 3-D irregular duct; the effects of duct height, inlet fluid velocity and measurement errors were considered [42C]. The thermal hydraulic analysis of cable-in-conduit-conductors was modeled numerically [53C]. The slow flow of liquid in conical annular channels was solved by separation of variables [50C]. Experiments were used to obtain instantaneous heat fluxes in cylinder heads and exhaust manifolds [47C]; load and speed effects were also considered [48C]. A heat-pipe cooled piston crown was studied experimentally to provide effect means for piston temperature control [52C]. Heat sources modeled as Dirac delta functions used to investigate the performance of flat-plate heat pipes [49C]. Experiments were used to study the thermal behavior of an asymmetrical flat-plate heat pipe [54C]. Mixed convection was modeled in the windings of a disc-power transformer [45C].

4.4. Finned and profiled ducts

Extended surfaces, protrusions, twisted elements and other surface enhancements in channel flows are considered in this section. Turbulent heat transfer was studied in a wavy channel having twisted tape elements and interrupted ribs; averaged heat transfer distributions and friction factors were obtained [80C]. The 3-D hydrodynamically and thermally developing laminar flow and conjugate heat transfer in oval tubes were calculated [55C]. The effects of property variations and buoyancy were considered for laminar flow in tubes with twisted tape inserts [57C]. The heat transfer of laminar flow in channels with corrugated walls was studied using a numerical model [59C]. The performance of asymmetrical longitudinal fins in annular ducts was optimized for laminar flow conditions [60C]. The heat transfer on the annulus side of a spirally fluted tube was studies to examine the effect of fluid property variations [62C]. Slots were used to enhance the heat transfer in channels with surface mounted blocks [64C]. The laminar flow in vertical pipes with twisted tape inserts was investigated experimentally; the flow of water in air-cooled copper pipes was considered [65C]. Experiments were used to study the flow of water, ethylene glycol and turbine oil through tubes with internal extended surfaces and continuous and segmented twisted-tape elements [69C,70C]. Heat transfer enhancement in a circular duct with circumferential fins and circular disks was studied experimentally for fully developed turbulent flow [74C]. Periodic ribs were used to enhance the turbulent heat transfer in a channel and were modeled numerically [76C]. A numerical method was also used to study the laminar flow in an air-cooled horizontal printed circuit board [67C]; heat transfer from multiple protruding heat sources simulating electronic components was addressed in the laboratory [75C]. An experimental investigation was undertaken to study the forced convection in air-cooled, horizontal, equilateral-triangular ducts [68C]. Heat transfer measurements were made inside straight and tapered two-pass channels with rib turbulators to model the characteristics in gas turbine blade passages [58C]. Spirally corrugated tubes and inlet axial vane swirlers were used to enhance heat transfer in channels; experimental results are presented [79C]. A square ribbed duct was examined numerically using a low Reynolds number turbulence model together with a simple eddy viscosity model and an explicit algebraic stress model [72C]. Multilobe vortex generators were used to enhance heat transfer in a circular tube; a finite volume method was used [77C]. Solid and perforated blocks attached to the flat plates in ducts were compared to the plate performance without the enhancement [73C]. The cooling of turbine blades with ribs was studied numerically [71C]. Internal twisted-tape elements were used in enhance the performance of highly subcooled water in smooth pipes [66C]. Subcritical and supercritical flows in periodic 2-D corrugated channels was studied numerically using the spectral method [61C]. A ribbed coolant passage experiencing a 180° turn was studied experimentally [56C]. The heat transfer and pressure loss characteristics in turbulent channel flows with surfaces roughnesses was presented [63C]; a channel with a square bar detached from the wall was also examined numerically [78C].

4.5. Ducts with periodic and unsteady motion

Transient heat transfer measurements were made in an unsteady turbulent and relaminarizing pipe flow [81C]. A single-channel modeling approach was taken to examine the warm up characteristics of an automotive catalyst substrate subjected to pulsatile flow [83C]. The problem of unsteady laminar flow and heat transfer of a particulate suspension in an electrically conducting fluid was studied in the presence of a uniform transverse magnetic field [84C]. The zero-mean oscillatory flow in short channels was examined; the results differ from those in long ducts [87C]. Bundles of circular, triangular, square and hexagonal pipes were subjected to pulsatile flow; longitudinal heat transfer was investigated [86C]. A low Reynolds number k–ε model was used to incorporate the role of turbulence on oscillating pipe flow [88C]. A theoretical study was undertaken of the periodic laminar flow developing between parallel plates [85C]. Sinusoidally varying wall heat flux was imposed on laminar flow in a circular duct [82C].

4.6. Multiphase and non-Newtonian flows in channels

An Eulerian–Lagrangian numerical scheme is used to examine the wall heat transfer in a gas–solid particle flow [91C]. A mathematical model was also developed to study the influence of heat transfer and friction between a dilute gas–particle flow and a constant area lance [93C]. One paper considered the drag reduction characteristics and heat transfer of a water suspension flow mixed with fine fibers in a circular pipe [94C]. An electro-resistance sensor and infrared imaging was used to obtain the heat transfer coefficient between a solid–liquid mixture and a circular pipe [98C]. Turbulent gas–liquid flow in vertical pipes was studied to obtain a robust heat transfer correlation [95C]; the forced-convection heat transfer to phase change material slurries was also studied in circular ducts [89C]. An experimental study of mixed convection in vertical annular ducts was conducted for power-law fluids [90C]. The viscoelastic fluid obeying the Phan-Thien–Tanner constitutive equations was studied for laminar pipe and plane channel flow [97C]. The non-Newtonian two-phase flow in conventional and helical-holding tubes was undertaken using a finite-difference approach [99C]. A combined experimental and numerical study examined the laminar mixed convection in a horizontal annular duct for thermo-dependent non-Newtonian fluids [96C]. The behavior of a Bingham non-Newtonian fluid was investigated for laminar flow conditions through a sudden expansion pipe flow [92C].

5. Separated flows

The majority of papers in the archival literature addressing flow separation and heat transfer focused on bluff body geometries. The fluid flow and heat transfer were examined around a cylindrical protuberance to model the situation encountered when oil tanks are stored in cold environments [25D]. The vortex shedding behind bluff bodies can be stabilized by heating the cylinder in air; heating in water creates an unstable situation [11D]. A Lagrangian–Eulerian description was used to examine the heat transfer changes created by a body moving in the same direction as a fluid in a channel [3D]. The role of struts on the performance of a diffuser was studied experimentally [26D]. The heat transfer characteristics for flow over a tube bank was calculated for laminar and turbulent conditions [27D]. A numerical approach was used to study the turbulent flow past an array of blunt plates; a modified k–ε model is used with preferential dissipation [28D]. The complex flow and heat transfer were examined experimentally in flow past two and three cylinders placed side-by-side [30D]. The inverse problem of laminar flow past a heat cylinder was addressed using a finite difference method [12D]. Non-Newtonian flow past an electrically heated cylinder and the associated heat transfer was measured [18D]. An experimental study was undertaken of the pulsatile flow past a heated cylinder; the effect of Strouhal number was documented [9D]. Buoyancy-assisted and opposed flow past isolated and tandem circular cylinders was simulated using a velocity correction method [17D]; unsteady laminar flow past a single and tandem pair of square cylinders was also studied in a channel [21D]. The high-speed flow over a spiked body was examined [14D]; peak heating for the purpose of reattachment was also simulated [15D]. Viscous and thermal contributions to entropy generation were investigated for steady 2-D flow past a parabolic cylinder [4D,5D]. Experiments examined the angle dependence on the heat transfer coefficient for a circular 180° bend in cross-flow [2D]. A low Reynolds number turbulence model was applied to the separation and reattachment phenomena [20D]. Constant wall temperature and constant wall heat flux are imposed on a separation bubble created by mass injection on the opposing wall; DNS calculations are used to examine the flow [24D]. A numerical study was also undertaken to document the turbulent heat transfer of hot flow over a sudden expansion with base mass injection [29D]. A numerical approach was used to investigate the turbulent separated flow and reattachment by local forcing [19D]. Flow past heated curved surfaces having convex and concave shapes was examined under mixed convection conditions [16D]. The maximum heat transfer rate was increased when supersonic channel-airfoils were employed [22D]. A 2-D finite difference model accurately captured the observed temperature histories of an injection molding process with conformal cooling channels [23D]. Heat transfer is computed and compared to experiment for the crossing- shock-wave/turbulent-boundary-layer interaction [10D]. The mixed convection over a backward-facing step was simulated in three dimensions; both adiabatic and constant heat flux conditions were considered [7D,8D]. The instantaneous heat transfer occurring during compression and expansion in a piston-cylinder geometry is addressed in a numerical study [1D]. Flow and heat transfer past a seven-rod horizontal tube bundle is reported [6D]. A computation study of the heat transfer over a spiked blunt body at Mach 6.8 was presented [13D].

6. Porous media

6.1. Synopsis/highlights

Heat and mass transfer in porous media was the focus of a great deal of applied and fundamental research. Basic studies of the effective thermophysical properties of a fluid-saturated matrix, fundamental questions on the formation of the governing equations, and the effects of a deformable matrix all received attention. Imbedded surface problems have begun to be treated via conjugate formulations. Packed and fluidized beds remain a challenging technology from the viewpoint of prediction and control of flow fields and transport, and a good deal of modeling and experimental work is underway worldwide. Applied areas that appeared as local activities of porous media research included porous gas-phase and catalytic burners, membrane pumping, cryogenic liquefaction systems, drying of organic materials, assessing growth of forest fires, and geothermal energy production.

6.2. Fundamental advances

Several fundamental advances have appeared in the expanding literature on transport in porous media. At the level of review and codification, a major review of non-aqueous liquid dissolution in porous media was published; it summarizes areas where understanding of fundamentals is strong and where additional experiments and analysis are needed [7DP]. Fundamental work on two-phase flows has resulted in criteria for micro-scale equilibrium [4DP] and the development of conditions for mass and energy jumps at a vapor–liquid boundary within a porous medium [5DP]. Similarity solutions for laminar boundary layer flow of a micropolar fluid were obtained for a wide range of permeability [15DP].

Entropy generation in natural convection in a porous enclosure was analyzed numerically [1DP] and in an annular packed bed [2DP]. A 1-D model for thermal dispersion was developed from volume averages and multiple scale expansions [11DP]. A macroscopic description of turbulent flow via a two-equation model was developed and shows the need for higher order closure schemes, much the same as for single phase turbulent flow [3DP].

For particulate flows in which the suspended solid comprises nano-particles, the altered mechanism of heat transfer and a prediction of bulk transport properties have been investigated [16DP]. The primary result is that a nano-fluid behaves more like a fluid than a fluid–solid mixture.

Fundamental research concerning coupled heat and mass transfer has addressed the effect of moisture content on transport properties [10DP], molecular level models of hydration and mechanical deformation, [12DP], and saturated versus unsaturated system effects on macro-deformation [13DP]. The effect of mass diffusion in a spherical micro-porous particle was analytically determined, and three limiting regimes of transport were determined [14DP]. Mass transfer in capillary porous bodies was considered via surface and volume-averaged potentials for concentration, heat and filtration [8DP]. Experimental data obtained in rock salt was presented that determine the permeability, the binary diffusion coefficient and the Knudsen coefficients [6DP]. A generalized theory of dependent variable transformation of dispersive transport was developed and extended to include heterogeneous systems with diffusive transport between the fracture and matrix phases and thus develop solutions for the medium overall that conform to conditions encountered experimentally [9DP].

6.3. Property determination

The prediction of the effective stagnant properties and radiative transport within a porous medium continued to be major areas of focus of research. Modeling efforts were largely directed at predicting effective thermal conductivity based on the geometry and packing parameters of the matrix, including contact area [17DP, 23DP,29DP], thermal constriction resistance at the matrix level [25DP,26DP], large solid–fluid conductivity ratio [27DP], and the orientation of a fibrous solid phase [20DP]. Two studies included models of effective permeability and thermal conductivity in the computation of overall heat transfer in free and forced convection [22DP,24DP]. For combined conduction and radiative transport, model studies involved computation of the phonon scattering [21DP] and pore-network simulations [18DP].

Measurements of overall thermal conductivity of compressed graphite and silica gel powder were reported over a range of preparation parameters and mean temperatures [19DP]. A transient measurement technique was used to determine the effective thermal conductivity of red pine sapwood for several degrees of saturation as function of direction and temperature [28DP].

6.4. External flow and heat transfer

Evaporative heat transfer from a partially saturated porous surface was simulated and measured with a liquid 2-D meniscus attaching two adjacent cylinders [37DP]. Models of several types of porous silicon were used in assessing heat transfer in integrated sensors [45DP]. A general formulation was presented for convection in a double porosity deformable material under the assumption of local thermal equilibrium [41DP]. The variation of permeability and porosity on free convection from a vertical solid surface was shown to produce greater effects on the local heat transfer coefficient near the leading edge where the thermal boundary layer is thin [51DP].

Heat and mass transfer under the influence of non-zero velocity and time-dependent thermal boundary conditions were determined for a continuously moving plate imbedded in a non-Darcian medium [32DP], oscillatory fluid motion past a visco-elastic boundary [48DP], and time-dependent surface temperatures in free convection from a vertical plate [34DP,42DP]. Heat and mass transfer coefficients in a simple free convection transient on vertical plate was found to depend strongly on heat capacity and porosity ratios [31DP].

Steady free convection from a vertical surface was predicted via a local non-equilibrium model was shown to produce two asymptotic regions near the leading edge that disappear down stream where thermal equilibrium is approached [52DP]. Asymptotic and numerical solutions for the steady buoyant boundary layer and heat transfer above a heated horizontal plate were obtained for fixed and conjugated thermal boundary conditions [39DP]. Free convection from an imbedded inclined permeable plate was computed for a range of wall mass flux and porosity and conductivity variation in the medium [49DP]. Predicted locations of the onset of vortex instability on an inclined imbedded, impermeable plate compared well with measurements and new heat and mass transfer correlations were presented [38DP]. Heat and mass transfer predictions from a wavy imbedded cone were also reported [30DP]. Measurements of mass transfer in natural convection showed that a Brinkman–Darcy flow model is the best predictor of overall mass transfer coefficients when the medium comprises a bed of packed spheres [50DP].

Mixed convection on an imbedded vertical wall was computed for the full range of Peclet, Rayleigh and Gebhart numbers include the effects of viscous dissipation [53DP], surface mass transfer [35DP], a non-isothermal wall [40DP]. The effect of variable surface heat flux and variable permeability for wedge flows were also reported [33DP,36DP].

Conjugated free convection on a vertical thin-walled cylinder and a fin surface was predicted via non-similarity and numerical methods [46DP,47DP]. The combined effects of thermal dispersion and thermal radiation on non-Darcy free convection forma vertical plate were determined using the Rosseland and an ad hoc representation of total diffusivity [44DP]. Laminar, hydromagnetic heat and mass transfer in free convection over a vertical cone in a uniform porous medium were predicted via non-similarity methods [43DP].

6.5. Packed beds

The analysis of flow and heat transfer in partially filled channels was reported for Couette flow in which the fixed surface bounds the porous matrix [67DP], and the effect of thermal dispersion on forced convection in a partly filled circular duct was predicted numerically via the Darcy–Brinkman–Forcheimer model [68DP,89DP]. A heat transfer model for enhancing forced convection via a porous substrate in the entrance region was shown to produce an optimum in the enhanced Nusselt number based on the depth of the porous layer [63DP]. The design of a porous heat flux sensor was described wherein fluid flows through the sensor to produce a measure of convective heat flux [73DP]. Numerical solutions were developed for porous inserts in otherwise forced flow in a channel [91DP].

Heat transport in fully packed beds was modeled via a quasi-homogeneous model for the laterally uneven distributions of porosity, fluid velocity and effective thermal conductivity, and a comparison with existing measurements suggested that such a model works well for coupled heat and mass transfer [86DP]. Overall effective bed properties were the focus of two related studies [59DP,60DP], and another treated the chemical reaction as a disturbance in the overall energy balance [61DP]. Stochastic methods were applied to describe interparticle heat transfer in a fixed bed [76DP]. A reevaluation of existing data on temperature and concentration profiles without chemical reaction led to new set of model coefficients [87DP]. Some new results were reported on non-Darcy mixed convection in vertical channel flow [55DP] and in a horizontal channel with a cavity in the lower wall [70DP].

Heat transfer and thermal dispersion in thermally developing forced convection in a sintered metal matrix in channel flow were analyzed, and Nusselt numbers in terms of Peclet number and the thermal conductivity ratio were reported [64DP]. The effects of solids loading on bed porosity and gas flux distribution were determined via analysis of transient temperature response [74DP]. Heat transfer in oscillating channel flow of a viscous compressible fluid was analyzed via capillary tube and resonance models [71DP]. Volume averaging techniques and a numerical solution of the closure problem were used to establish a volumetric heat transfer coefficient, and results were applied to large Peclet number channel flow [92DP].

Packed beds with inserts designed to improve heat transfer were analyzed for 2-D flow and heat transfer and a range of geometrical parameters pertaining to the inserts [77DP]. Statistical analysis of experimental data on heat transfer in a bed of glass spheres with air as the working fluid established the effects of a variation of inlet conditions on the effective thermal conductivity and the wall heat transfer coefficient [85DP]. Measurements on channel flow containing a pin–fin matrix were analyzed with overall matrix porosity as a factor, and the protrusion of the pin fins through the viscous sub-layer was found to be a major factor in determining heat transfer coefficients and friction factors [90DP]. Measurements of laminar free convection in an open-ended vertical rod bundle was compared to and analyzed via a porous medium approximation, and several key geometrical parameters were identified [62DP]. A multiple ray tracing scheme for the computation on radiative transfer in a packed bed was developed and shown to be computationally faster than probabilistic methods [88DP].

Experiments were reported for a packed bed in both single- and two-phase flow with the aim being to determine the influence of coalescence, inhibition, and effective thermal conductivity on heat transfer coefficients [57DP]. Flow and heat transfer for immiscible conducting and heat generating fluids in a vertical packed channel was analyzed to determined the influence of fluid properties and physical parameters [54DP]. Two-phase turbulent flow through a porous plug was analyzed using a standard k–ε model, existing interphase friction coefficients and a turbulent dispersion Prandtl number; a favorable comparison with mean flow data was reported [56DP]. Volume-averaged transport equations were applied to data on gas–liquid counter-current flow with good agreement when model parameters were estimated by extending the model of saturated single-phase flow [69DP]. Correlations for phase holdup in concurrent gas liquid flows were developed from existing data via a drift-flux model with velocity slip [66DP]. Wall channeling in a moving bed was found to decrease gas-to-solid heat transfer coefficients by an order of magnitude below those given by correlations for fixed beds [58DP].

Velocity and temperature distributions in large porosity channel flow showed that outlet flows were nearly homogeneous even though the inlet velocity profile was nearly parabolic over the inlet area [81DP]. Analysis of the effects of heterogeneity in the porous matrix indicated that the effect of a variation of thermal conductivity introduces two opposing effects and thus makes the Nusselt number a non-monotonic function of the conductivity variation [78DP].

Details of the flow field and fluidization regimes in a fluidized bed were determined by frequency and state-space analysis of pressure measurements in a circulating bed [65DP]. Quantitative flow visualization and determination of the void fraction in a fluidized bed were obtained via neutron radiography [82DP]. Cold flow studies were also carried out via laser phase Doppler anemometry to measure mean and fluctuating velocity, as well as the solids concentration and diameter [75DP]. A limiting case model was developed to determine the drag on falling particle clusters that are observed near the walls of fluid beds [79DP], and experiments were reported on measurements of instantaneous local solids concentration that yielded the parametric effects of particle size and superficial gas velocity on descriptors of particle clusters [84DP]. Numerical predictions of heat transfer in dense gas–solid bubbling fluid beds were carried out via a kinetic theory of granular flow that takes into account particle interactions [83DP].

The effect of bed diameter on near-wall flow bed was determined by measurements of the wall coverage due to clusters of particles in two laboratory scale beds [80DP]. Measurement of suspension-to-membrane wall heat transfer in a circulating bed was deduced from experiments and 1-D fin type models for the exposed surfaces [72DP].

6.6. Porous layers and enclosures

Fundamental work continued on solution methods for steady and transient natural convection in a variety of systems. The lower order Lorenz equations applied to a bottom-heated layer were solved via a decomposition method that yields convergent power series solutions that are applicable to a wide class of problems [116DP]. Non-Darcy, convection in an anisotropic medium was computed via a semi-implicit Galerkin procedure [109DP]. Analytical solutions for free convection in porous layers, along with solutions for several channel and rotating flows, were presented [94DP]. It was demonstrated that convective instability in inclined saturated layers exists at a critical Rayleigh number of zero when an adverse temperature gradient exists parallel to the plates [95DP]. A duel-reciprocity boundary element method for the solution of 2-D cavity flow and heat transfer [110DP].

Steady natural convection in porous cavities was determined for a variety of 2- and 3-D flows: in superposed fluid and porous layers [100DP,102DP], in Maragoni convection in power-law fluids [108DP], in hydromagnetic convection in tilted enclosures [103DP], and in open ended cylinders with spatially varying heat flux boundary conditions [98DP]. Cavity flow and heat transfer were determined numerically when one of the vertical walls is wavy [105DP]. The case of an arbitrary non-rectangular cavity was treated with a body fitted coordinate transformation [112DP], and the problem of flow and heat transfer between concentric elliptical cylinders was solved numerically [107DP]. An interesting study of a cavity filled with capsules containing phase-change material in a rigid matrix demonstrated that a maximum capsule density exists that limits disperse diffusion over the entire system [104DP].

Transient natural convection inside porous cavities was determined via hybrid numerical and analytical methods employed integral transforms so as to produce a system of coupled, nonlinear ordinary differential equations [96DP]. Three-dimensional fluctuating flow and heat transfer with variable permeability and a transpired boundary exhibits a reduction of velocity amplitudes with an increase of permeability or the frequency of permeability variation in the matrix [113DP]. A Nusselt number correlation for lid-driven cavity flows with a vertical temperature gradient were determined numerically for laminar convection [93DP].

Double diffusive convection induced by horizontal gradients of temperature and concentration exhibited two types of solutions at steady state according to whether the heat and mass gradients were aiding or opposing [97DP]. In slender anisotropic enclosures, analytical solutions are shown to exist for aspect ratios greater than three and to exhibit great sensitivity to parameters that characterize anisotropy [99DP]. The onset of double-diffusive convection in a rectangular cavity was shown to depend on the aspect ratio of the cavity and to exhibit a supercritical Rayleigh number and an over stability [106DP]. Finite frequency modulation of double-diffusive convection in a square cavity was demonstrated via linear harmonic oscillations in the vertical direction [114DP].

The filling of fiber reinforced molds was predicted numerically based on mixed Eulerian–Lagrangian approach under a two-temperature model [101DP]. A related study for a non-reactive fluid shows analytically and experimentally that boundary effects are important for Reynolds numbers on the order of unity or greater; below this value, Darcy flow is applicable, and boundary effects are not important [118DP].

Geophysical heat transfer problems were modeled in the context of porous-cavity heat transfer. The onset of free convection in fracture zones was modeled to test prior work that indicated that critical Rayleigh number greatly exceeded that for the horizontal layer [115DP]. The development of layered structures due to magma intrusions in the evolution of the Earth's mantle was numerically simulated as a transient double-diffusive problem in an initially stable layer; when a density interface develops that is strong enough to arrest ascending plumes, the layering process ends [111DP]. A 2-D steady solution for buoyant flows induced from a nuclear waste repository in unfractured and fractured crystalline rock demonstrated that fluid discharge at the boundary is a possibility in the fracture flow case [117DP].

6.7. Coupled heat and mass transfer

Several analytical solutions for coupled heat and mass transfer have appeared for systems of general applicability. Similarity and non-similarity solutions were obtained for a cone imbedded in a porous medium [133DP,177DP], magneto-natural convection in Hiemenz flow [132DP], mixed magneto-convection from a vertical plate in a porous medium [130DP], hydromagnetic mixed convection with a temperature-dependent heat source on a flat place with suction/injection [128DP], and hydromagnetic convection from imbedded permeable surfaces [129DP,131DP]. Laplace transforms and a subsequent transform function were used to reduce the coupled heat and mass transfer problem to a single fourth order, ordinary differential equation [134DP]. Nusselt numbers on a buried cable in either dry or saturated soil were determined from the numerical solution of the governing equations [124DP]. The interface between and non-wetting phases in the absence of mass transfer for 3-D porous materials was determined via an image analysis, which was shown to be superior to the use of percolation networks [160DP].

Experimental data were presented for enhanced condensation on a fluted tube surface with a thin porous coating [175DP]. Heat and moisture transfer with sorption and condensation in clothing assemblies were determined via a dynamic numerical model that takes into account the effect of water content on the effective thermal conductivity [147DP]. Permeability effects on condensation heat transfer coefficients, film thickness and velocity profiles were determined for a vertical plate imbedded in a porous medium via a Brinkman–Darcy formulation that included local macroscopic inertia [163DP].

A review of the role of fire and heating on water repellency in soil includes effects of vaporization and soil chemistry, such as occur in wildland environments [139DP]. Gas phase growth via pressure reduction in 2-D porous media was successfully modeled using an etched micro-network and an analysis taking into account supersaturation, wettability and gravity [144DP]. Liquefaction of cryogenic gases in a two-stage magnetic particle bed refrigerator was modeled to determine the effects of key parameter and the optimal operating point [178DP].

A numerical model of heat and mass transfer in turbulent channel flow over a saturated hygroscopic porous layer shows that moisture migration takes place from the warm interior to the relatively cool periphery [167DP]. Transient drying of a metal hydride bed was analyzed numerically taking into account the kinetics, the significance of assuming local thermal equilibrium, and the neglect of convective energy transport [164DP]. An analysis of moisture transport driven by thermal gradients in a porous membrane was reported with application to membrane-based humidity pumps [179DP].

Combined thawing and mass transfer at 0 °C, such as occurs in cold immersion storage, was found to exhibit a sharp thawing front that separates a frozen inner layer from a thawed non-impregnated outer layer [158DP]. Experiments to simulate coupled heat and mass transfer at the product–freezant interface showed that a non-frozen surface layer forms in the product and that thawing follows a classical diffusion timescale [157DP].

A variety of drying processes in wood and foodstuffs received analytical and experimental attention. Vacuum-contact drying was analyzed using the water potential formulation [141DP]. A new experimental method for determining heat/mass transfer coefficients was developed by indirect measurement of the water potential over time [173DP]. A multi-component, multi-temperature model for forced convective drying was developed using data from the various drying regime [140DP]. A phenomenological, 2-D multi-component model was developed where capillarity, bulk diffusion and diffusion of bound water due to the gradient of the chemical potential are the simultaneous transport mechanisms [172DP]. A finite-volume finite time-domain algorithm to solve Maxwell's equations was developed to determine the steady state power distribution in micro-wave heating of wood with low moisture content [182DP]. A 1-D analysis was of high-temperature drying of softwoods, where the permeability is relatively large and moisture transport occurs in the fibers and in bulk form, was presented and favorably compared to measured moisture content profiles [165DP]. Batch fluid bed drying for apples was analyzed to reveal the importance of internal heat transfer and state of the gas along the height of the bed [174DP].

Combustion of a moving gas in a semi-infinite porous medium was analyzed to determine the effects of heat transfer to the matrix and the conditions under which combustion does not take place at the external surface [125DP]. Experiments and numerical were also reported on the low- to high-velocity regimes of gas-phase and catalyzed combustion in such a system [126DP,143DP, 145DP,161DP]. Thermal radiation and the transparency of the matrix were shown to have measurable effects on combustion efficiency and the matrix temperature [184DP]. Experiments on flammability limits for hydrocarbon–air mixtures show that matrix geometry, matrix heat transfer and flow effects must be taken into account to predict flamability data and in modeling extinction mechanisms [142DP]. Numerical analysis and experiments on 2-D porous burners for premixed methane–air combustion produced similar results with good agreement with experiments [123DP].

Transient heat and mass transfer in a reacting packed bed was shown to have oxidant-limited and reaction-limited modes, which were verified experimentally [170DP]. Experiments on bulk phase water vapor diffusion in a silica gel packed bed were reported [176DP]. Packed beds for methanol steam reforming were compared to a novel use of a coated heat exchanger to improve conversion efficiency and transient operation [138DP]. Variations in overall reaction kinetics in a catalytic packed bed were attributed to interparticle heat transfer [171DP]. A convection–dispersion model and an effective thermal diffusivity were used to describe the variation in solids temperature in a reacting packed bed [135DP], and a 1-D model successfully modeled combustion of char particles in an overfed packed bed [137DP]. Experiments on overall mass transfer in an absorbing bed using an insert to prevent solution carry over was reported [136DP].

Fluidization regimes in packed bed via injection of carbon dioxide were experimentally mapped for a sub-critical to super-critical conditions [162DP]. A transverse magnetic field was used to alter the heat transfer and flow in a fluidized bed of ferro-magnetic particles [119DP]. Circulating fluid-beds with an without reaction were the focus of analytical and experimental studies aimed at species concentrations, temperature profiles and local velocities [120DP–122DP,152DP, 156DP, 168DP,169DP]. Measurements were reported of heat transfer coefficients on an immersed surface in a gas–solid fluid bed [159DP]. Particle tracking was used to determine overall bed properties in a transient reacting gas–solid bed [149DP].

Structural change of the porous medium due to reaction, such a might take place in forest fires and pyrolysis in packed beds, was the objective of both numerical and analytical work [146DP,148DP,153DP, 154DP]. Double-diffusive convection in a deformable, saturated medium with temperature-dependent reaction was computed using a fully couple model for temperature, species, and pore flow [181DP]. Sintering of the porous medium with reaction as shown to be sensitive to heat transfer at the flame front [155DP]. The equations governing the physico-chemical convective dynamics of heterogeneous gas–solid reactions were reviewed with respect to pore obstruction [166DP] and the material synthesis [127DP].

Geophysical heat and mass transfer where the host rock is present were the subject of several theoretical and experimental studies. Layered hydrothermal systems with upward through flow and mineralization were numerically investigated to determine the most probable precipitation regions [180DP]. Fractured hydrothermal systems that have suddenly dilated were analyzed to determine heat transfer and fluid withdraw from an initial state close to vapor saturation [150DP]. A negative feedback between flow and heat transfer was shown to exist in large-scale density-driven circulation in structures of the type seen in marine carbonate platforms [151DP]. Buoyancy driven flow with phase change in a symmetrically heated vertical channel was analyzed to include capillary effects [183DP].

7. Experimental methods

Experimental methods play a key role in heat transfer studies, not only in fundamental research, but also in a number of important applications and engineering systems including energy conversion, transportation, heat exchangers, and many others. Valid and accurate data are required to improve classical heat transfer techniques, as well as in the development of new and important methods. Although, some measurement techniques and systems are included in other sections of this review where they are used in specific applications, the present section considers developments of a more general nature.

7.1. Heat flux measurement

An overview [6E] describes the National Institute of the Standards and Technology high-temperature black bodies used in calibration of heat flux sensors. A heat flux gage using a sputtered thin film thermometer on one side of an insulating layer and a thermocouple in a metal arm on the other side has been developed [8E] for studying rapid fluctuations in heat transfer. Corrections have been applied in the use of button gages that determine heat transfer to a metal wall suddenly exposed to a hot flow [5E]. A "sandwich hologram" can determine the heat transfer coefficient in transparent fluids [10E]. Heat transfer measurement techniques have been developed for solidification problems [7E] thermodynamic and kinetics analysis [2E] heat transport between the atmosphere and an ocean surface [4E] fluid-to-particle heat transfer [9E] non-intrusive studies of a dense suspension of gas and fine solids [3E] and use in pulsed excimer laser calorimeters [1E].

7.2. Temperature measurement

A number of techniques have been reported for measuring temperature. Some of these are optical and can be non-intrusive in nature. Other reports have presented improvements of widely used systems such as liquid crystal temperature measurement. Rayleigh scattering has been used to measure temperatures in air [25E]. Laser-induced fluorescence was used for temperature measurement in a model combustor [17E] and in the flow field in a high-enthalpy arc jet facility [11E]. Other optical techniques include nuclear magnetic resonance spectroscopy to monitor electrolyte temperature in capillary electrophoresis [14E] and laser-based thermo-reflectance to measure temperature at a transparent solid–liquid interface [12E]. Particle image velocimetry techniques have been used in combination with a shadowgraph to measure temperature in a reacting flow [18E]. Reviews describe applications of infrared thermography in gas turbine film cooling measurements [23E] and calibration techniques for liquid crystal temperature measurement [15E,21E]. Systematic errors in temperature measurement due to presence of a temperature sensor have been described [20E]. Techniques presented for temperature measurement include a differential scanning calorimeter [22E], metaloxide fibers for calibration of high-temperature gas measurements [13E], algorithms for use in passive thermo-acoustic tomography [19E], a system to determine wafer temperature during integrated circuit processing [24E] and gallium arsenide crystals for temperature measurement in low-pressure plasmas [16E].

7.3. Velocity and flow measurements

Calibration systems have been developed for hot wire anemometers at low flow velocity [27E]. Ultrasound scattering has been used to study the transition to turbulence in a thermal plume [26E]. Other reports describe the use of liquid crystals for measuring both heat transfer and surface shear stress [28E], combined particle image velocimeter (PIV) and planar laser-induced fluorescence for studying turbulent mass transport mixing [29E], and a thermal system for measuring water flow in soil [30E].

7.4. Miscellaneous measurements techniques

Recent probe developments include a double sensor probe [32E] to determine local interfacial variables in two-phase gas–liquid bubbly flows, and a four-sensor conductivity probe for time average local two-phase flow measurement [34E]. Techniques were developed to measure thermal conductivity of re-melted volcanic rock materials [31E] and thermal diffusivity at room temperature using laser pulsed heating [36E]. An inverse solution method for estimating both thermal conductivity and contact resistance in heat transfer systems [33E] has been described. A two-wire in-core instrument can measure energy deposition in a nuclear reactor [35E], and a laser focus displacement meter has been developed and applied to measure waves flowing on films in vertical tubes [38E] and on flat vertical walls [37E].

8. Natural convection-internal flows

8.1. Fundamental studies

One of the classical issues in the Rayleigh–Benard (R–B) problem, the relationship between Nusselt number and Rayleigh number, has been addressed by considering the effect of the flow Reynolds number [1F]. A unifying theory is presented in which the heat transfer is correlated with the *Ra Pr* product over a wide range of Rayleigh number.

8.2. Heat generating fluids

The onset of thermal convection caused by microwave heating in a bounded vertical cylinder was predicted using linear stability analysis [5F]. Results of convection of liquid in a square enclosure [3F] and of liquid metal in a rectangular enclosure [2F] were presented. More practical investigations include the simulation of convection in a microwave cavity [6F] and measurements in a hemispherical cavity [4F] that simulates a nuclear reactor lower head geometry.

8.3. Thermocapillary flows

Rayleigh–Benard–Marangoni convection continues to receive interest. Tomita and Abe [14F] have shown that hexagonal convection occurs when the surface tension effect is stronger than the buoyancy effect. A type of mixed roll and hexagonal convection is found when both effects are of comparable magnitude. Flow of liquid metal in a square cavity with a uniform vertical magnetic field was investigated [11F]. A novel numerical method based on the stream function – vorticity formulation was used to simulate flows in a rectangular cavity with a free surface [8F]. Oscillatory Marangoni flow in liquid bridges was reported by Lappa et al. [10F].

Studies of Marangoni convection within electrostatically levitated droplets have been reported [12F,13F]. Results show that the combined effects of surface tension and the electromagnetic field cause the drop to deform into an ellipsoidal shape. Balasubramaniam [7F]analyzed the motion of a spherical drop within a uniform temperature gradient when the Marangoni number is large. A theoretical study was presented in which the flow of liquid that has been sprayed onto a moving fiber was simulated [9F].

8.4. Enclosure heat transfer

Heat transfer in a vertical square or rectangular cavities continues to receive considerable interest with most of the work being numerical rather than experimental. Several different combinations of thermal boundary conditions and flow properties have been studied. Secondary flows [32F] and optimum thickness for window applications [16F] were reported for cavities with high-aspect ratio. Ishihara et al. [27F] considered localized heat sources on one vertical wall and Leal et al. [33F] included variable fluid density in the body force term. Numerical simulations were conducted on the classical geometry with opposed heated and cooled vertical walls using a pseudo-spectral Chebyshev algorithm [46F]. Finite element solutions compared favorably with the benchmark results published by de Vahl Davis [29F]. Experimental work on the flow and heat transfer in a vertical air filled cavity was conducted by Tian and co-workers [44F,45F] and Betts and Bokhari [18F]. A 1-D turbulence model was shown to reproduce available direct numerical simulation results for natural convection in a vertical rectangular slot [23F]. Aydin and Yang [17F] simulated the heat transfer in a cavity with localized heating on the bottom surface and cooling from both sides. Two numerical studies were presented in which the fluid had a density maximum such as water near 4 °C [28F,34F].

Rayleigh–Benard convection in horizontal layers has been studied using a RANS model [30F] to investigate transient effects. The route to chaos in a fluid layer was studied using a Galerkin representation of the governing equations [47F]. Experiments using water reached a Rayleigh number of 2×10^{10} [43F] and tests using cryogenic helium gas attained a Rayleigh number of 2×10^{15} [38F], considered to be the highest ever achieved in a controlled laboratory setting. Sezai considered the effects of different thermal boundary conditions, heated from a patch on the bottom [39F] and cooled from the sides in addition to the top surface [40F]. The heat transfer was reported to have increased by more than 76% when the upper and lower surfaces were roughened [24F]. Numerical simulations were performed to study the effect of strongly temperature-dependent viscosity [22F] and an electrochemical technique was used to develop a correlation between the Sherwood number and the thermal and solutal Rayleigh numbers [31F].

Double-diffusive natural convection was investigated numerically in a cavity with conductive and diffusive walls [26F] and in a square cavity in the neighborhood of the maximum density of the fluid [42F]. Siginer and Valenzuela-Rendon [41F] studied the flow and instability of natural convection in an inclined slot containing a grade fluid. Numerical studies of flow in a vertical cylinder heated from below [20F,37F] and having azimuthally varying wall temperature [21F] were presented. Investigations of contained bodies includes the study of heat transfer in a conducting cubic heat-generating body centered within a larger cubic enclosure [25F]. Natural convection in pitched roof attic spaces has been simulated [15F,36F]. A numerical analysis of heat transfer through a shallow rectangular cavity was presented [19F] and a parametric study of heat loss from heat sources placed into an enclosure was reported [35F].

8.5. Vertical ducts and annuli

Experimental results and numerical solutions were presented for heat transfer from a heated tube centered between two vertical walls of lower temperature [49F]. The heat transfer decreased then increased unexpectedly as the Rayleigh number increased. Heat transfer in a vertical concentric cylindrical annulus with radial temperature gradient was studied by Bahloul et al. [48F].

8.6. Horizontal cylinders and annuli

Thermal and hydrodynamic instabilities were reported in air-filled annuli of small aspect ratio [50F].

The effect of eccentricity on the heat transfer in a horizontal annulus was studied by Yeh and Chang [51F,52F] where the annulus opens into a larger cavity.

8.7. Mixed convection

The majority of publications in the area of mixed convection considered flow through channels and pipes. Numerical [65F] and experimental [66F] investigations were made of mixed convection in a fluid injected between two horizontal circular plates. Flow in a low aspect ratio channel was studied to predict the behavior caused by small accelerations encountered in spacecraft [63F]. The effect of mixed convection on visco-elastic fluids in a horizontal pipe was reported [58F]. Brinkworth [56F] presented a procedure for calculating the flow rate and heat transfer for laminar free and mixed convection in inclined ducts.

Mixed convection in rotating systems were studied by Enger et al. [57F] and Auernhammer and Brand [54F]. A numerical study was conducted on the effects of moving sidewalls on the flow and heat transfer in a cavity heated from below [55F].

Several numerical studies have been conducted on natural convection in a vented cavity with the primary application being the cooling of electronic equipment [53F,59F–61F,64F]. The heat transfer in a marine reactor core subject to rolling was found to be well correlated with the Richardson number for the rolling motion [62F].

8.8. Complex geometries

Several unusual geometries and thermal boundary conditions have been investigated this year. Heat transfer from two vertical plates or a centrally located heating block were studied in a larger 2-D enclosure [67F]. Heat transfer from a conducting block located in a cavity [71F] and between two coaxial square containers inclined by 45° [70F] were investigated. The effects of spacing between vertically mounted heating strips in a vertical cavity [69F] and time varying heated strips placed on the bottom of a horizontal channel [68F] were reported. Yu and Joshi [72F] studied the cooling of partially open horizontal enclosures containing discrete flush mounted heat sources.

8.9. Fires

A fire growth and smoke movement model developed for multi-compartment buildings by the National Research Council of Canada was presented [75F]. Experimental studies include investigation of the effect of ventilation airflow in tunnel fires [77F] and the ignition signatures that describe the onset of self-sustained downward smolder [73F]. Theoretical studies include the influence of flame heat transfer on the flame spread on solid surfaces [74F] and the modeling of confined jet fires using three different combustion models [76F].

8.10. Miscellaneous

Thermal convection models have been developed to explain the differences in geologic histories in various regions of North America [79F]. Free convection has been found to increase the heat flux to semiconductor wafers in CVD reactors [81F]. Measurements of SF6 during quenching in low gravity environment show a striking observation that the gas temperature exceeds that of the heating walls by a considerable amount [82F]. Two papers report the effect of transport between two liquid layers of different density [78F,80F].

9. Natural convection-external flows

9.1. Vertical plate

Studies of laminar buoyancy-driven convection of heat from a vertical plate include the use of a similarity transformation and heat functions for isothermal or constant heat flux boundary conditions [5FF]. Variations in fluid conditions that were considered include heat transfer to a stratified fluid with time varying boundary conditions [3FF], variable viscosity and thermal diffusivity [6FF] and partly dissociated gases [7FF]. Experiments in water, direct numerical simulation and linear stability analysis were used to study convective instability near a suddenly heated vertical wall [4FF]. Conjugate conduction–natural convection near a thin vertical strip with internal heat generation was investigated [9FF] and the effect of an attached or adjacent square solid element was reported [8FF]. The effects of wall suction, magnetic field and Prandtl number have been studied numerically [10FF] and a series expansion method was used to determine the limiting diffusion current for a thermal perturbation under conditions of simultaneous heat and mass transfer to the vertical electrode [1FF]. Measurements and predictions have been presented for turbulent natural convection adjacent to an isothermal vertical wall containing an adiabatic backward-facing step [2FF].

9.2. Horizontal and inclined plates

Studies of heat transfer above heated horizontal plates include rectangular plates of different aspect ratios [14FF,17FF], the effect of surface roughness [16FF] and mixed thermal boundary conditions in a micro-polar fluid [15FF]. Experiments and numerical solutions were presented for heat transfer from a downward-facing heated plate with rectangular grooves [13FF].

Liquid crystal thermography was used to provide full field measurements of the influence of longitudinal vortices on an inclined heated plate [12FF]. Numerical results were obtained for turbulent flow [18FF] and transient 3-D laminar flow [11FF] over inclined plates.

9.3. Channels

Experimental results were obtained for heat transfer from a vertical plate mounted within a ventilated cabinet [23FF]. Numerical methods were used to study the appropriate boundary conditions to use for a partially open cavity [22FF], the cooling of heated objects mounted in a vertical channel [20FF,21FF] and fin geometry and temperature difference for air cooling of fin arrays [19FF].

9.4. Cylinders

A correlation for predicting the extent of electrohydrodynamic enhancement of natural convection from horizontal cylinders was presented [28FF]. Heat transfer measurements were obtained for natural convection from a vertical array of two horizontal cylinders [24FF] and a finite element method was used to predict the cooling of two open-ended seven-rod bundles of horizontal cylinders [27FF]. Heat transfer from a vertical cylinder with variable surface temperature [26FF] and with combined heat and mass transfer [25FF] were presented.

9.5. Buoyant plumes

Two numerical studies [29FF,32FF] considered plumes in an enclosure such as in a room. Comments regarding the use of experimental balances in the study of thermal plumes were given [33FF]. Theoretical results have been presented for very weak plumes or fountains in large containers [30FF,31FF].

9.6. Mixed convection

Several studies have been reported that consider mixed convection adjacent to a heated vertical flat plate [38FF,39FF,41FF,42FF] or cylinder [44FF]. Measurements have been made on surfaces in a ventilated building [35FF] and in a horizontal converging channel heated from below [37FF]. Numerical results have been presented for mixed convection in a micro-polar fluid on a horizontal flat plate [40FF] and in a water model of continuous casting Tundish [43FF]. Two investigations were conducted on heat transfer from a continuously stretching surface [34FF,36FF].

10. Heat transfer in rotating systems

10.1. Synopsis/highlights

Moderate activity on rotating flows in 2000. Rotating disks yet attract a good deal of attention, with prediction of 3-D flow and heat transfer yielding fundamental advance; rotating disks in a confined geometry occur in many applications and several related studies on heat and mass transfer are reported. Materials processing technologies and geophysical heat transfer motivated research on rotational effects on convective heat transfer in a annular systems. Some interesting and important experimental data were reported. The prediction of flow and heat transfer in multi-pass rotating channels continues to received a good deal of attention, and research is motivated largely by gas turbine blade cooling technology.

10.2. Rotating disks

Fundamental measurements on convection due to normal jet impingement on a rotating disc were obtained using liquid crystals to estimate local temperature differences over a range of rotational speeds and jet Reynolds numbers [6G]. The influence of the Coriolis force on convection on a rotating transitional boundary layer was also experimentally was shown to enhance heat transfer coefficients when the forces act toward the wall [1G]. Three-dimensional flow and heat transfer a stagnation flow CVD reactor was shown to main its symmetry with relatively low inlet Reynolds numbers and/or rotation rate of the working surface. [9G]. Similarity solutions for time-dependent heat and mass transfer, with phase change, from a rotating disk were obtained where the angular velocity varies inversely with time [8G].

Rotating disks in ventilated passages, or enclosures, were the subject of experimental and numerical work. Heating by viscous dissipation between two disks, one of which is rotating, was investigated experimentally and shown to be predictable by simple theoretical models [2G]. An extensive numerical study was carried out on a ventilated disk for which inlet Reynolds number, rotational speed, shroud clearance and wall temperature were varied in the determination of Nusselt numbers and skin friction coefficients [5G].

Heat transfer from rotating finned tubes was the subject of experimental study. Measurements of heat transfer coefficients on rotating fins have been obtained using infrared thermography and the relative influences of rotational forced and natural convection have been estimated via correlations [10G]. These same researchers have also reported measurements of flow fields between two fins where a superposed external flow exists [11G]. A novel rotating-disk evaporative cooler with parallel airflow was developed, and bench scale tests coupled with numerical analysis demonstrated higher cooling capacity and greater coefficients of performance [4G]. A numerical study motivated by disk brake cooling reported the influence of convective heat transfer from a rotating solid or heat pipe disk with a superposed parallel airflow [12G]. A related study reports turbulent heat transfer to a disk for both the constant wall temperature and constant wall heat flux boundary conditions [7G], and extensive 3-D numerical work was completed for film-cooling effectiveness for a turbine blade with 172 cooling holes in eight rows [3G].

10.3. Rotating channels

Several aspects of convective heat transfer in rotating channels were investigated largely via numerical means. Strong curvature effects on laminar flow in square and circular ducts were shown to give rise to non-symmetric secondary flows at low Reynolds and Rossby numbers [21G]. Reynolds stress budgets were computed via DNS for a pipe where near-wall regions are altered due to high-rotation rates [20G]. Large eddy simulation models were developed for a channel with transverse rib turbulators [19G]. Relaminarization of turbulent flow in entrance region flows was computed and successfully compared with experiments [17G].

Convection and flow in rotating multi-pass channels was investigated to determine pressure drop and heat transfer characteristics. Heat transfer in a two-pass square channel was shown to be strongly affected by Reynolds stress anisotropy and the 180° flow turn [15G,16G]. Pressure drop in a smooth square channel with a sharp 180° bend was measured and shown to be strongly affected by rotation and less so on Reynolds number [22G]. The combined effects of rotation and skew angle in a two-pass duct were also investigated numerically [14G]. Active control of reversed flow and mixed convection via transpiration in a two-pass duct was analyzed numerically and shown to have different effects for the radial-outward and radial-inward flows [18G].

In somewhat specialized studies, measurements of discharge coefficients on a rotating shaft, such as would exist in a gas turbine, were reported as a function of the rotation of the surface [13G], and the numerical predictions of flow through a helical pipe rotating about the center of curvature show a sharp peak when rotation is opposite to the pressure-driven flow [23G].

10.4. Enclosures

Three-dimensional natural convection in rotating cylinders was investigated numerically and experimentally for a range of Reynolds and Richardson numbers, as well as rotational parameters, stratification effects, and thermal boundary conditions. A variety of effects of rotation were observed on boundary layer regions [32G], vortical interactions in geophysical flows [27G], and heat transfer coefficients [24G,35G]. Coriolis forces were shown to completely suppress convection in water near the density maximum point [40G]. A similar result was observed for solutal convection in shallow rotating electrochemical cells for certain Schimdt and Ekman numbers [43G].

Rotational effects on buoyant flows encountered in materials processing technologies were investigated numerically for time-dependent high pressure vertical Bridgman growth [44G]. Similar simulations were carried out but with flow induced by rotating magnetic field [42G]. In both studies, fluid rotation was seen to induce mixing and promote secondary flow.

Direct numerical simulation (DNS) of turbulence and compressed swirl flow in a rotating flat cylinder was compared with prior work based on the Reynolds-averaged Navier–Stokes equations, and the latter were shown to reproduce the results of DNS, as well as existing experiments [29G].

Flow and heat transfer in a rotating annulus were investigated numerically and experimentally generally for lateral heating but under different conditions on rotation and internal stratification. Flow in a multi-layered double-diffusive regime under uniform rotation shows that temperature fields develop continuous shapes but that concentration profiles can develop jumps at the Taylor number increases [34G]. Measurements on Couette–Taylor flows using electro-diffusion probes at the walls and internal to the flow indicated the existence of the Ekman vortices at rotation rates smaller than the critical rate for the onset of Taylor vortices [38G]. Centrifugal forced convection in a short annulus containing a Carreau-fluid shows shear thinning effects, higher heat transfer coefficients and the possibility of oscillatory flow [30G].

Analytic and numerical solutions for centrifugal forced flow in a gas-filled annulus were obtained for the free molecule and hydrodynamic limits [25G]. Flow in an eccentric annulus containing a pseudo-plastic fluid and an axial pressure gradient was analyzed to determine axial discharge rate under various rotational rates of the inner cylinder [28G], and both experiments and numerical analysis were reported for a similar system but with a Newtonian fluid [26G].

Measurements of high Rayleigh number thermal convection in a rotating hemispherical shell were reported where centrifugal forces and gravity successfully simulate gravity in the Earth's core; major results include the identification of three major Raleigh regimes of flow, the existence of geostrophic turbulence, and so-called dual convection driven by cold and warm plume flow [39G]. Flow bifurcation and heat transfer at each mode of flow in a spherical gap with an inner rotating surface was numerically predicted for low to moderate Reynolds numbers [36G].

An experimentally validated model for the mixing of solids in a rotating drum was developed based on correlations for mixing rate and material contact [41G]. Mixing of granular materials due to an embedded rotating blade was measured using positron emission tracking to produce maps of the velocity field and hence circulation patterns [33G]. Heat and mass transfer measurements in a centrifugal fluid bed dryer were reported for various superficial gas velocities, particle size, bed thickness and rotational speed [37G].

A model was developed for heat transfer and flow in co-rotating twin screw extruder during the fluid-filling phase, and viscous heating effects on the screw were determined [31G].

10.5. Cylinders, spheres, and bodies of revolution

Similarity solutions for unsteady flow in the stagnation region of a rotating sphere with a magnetic field show that heat transfer increases with acceleration and the magnetic parameter [46G]. Forced convection from steadily rotating and oscillating cylinders were obtained for Newtonian and non-Newtonian fluids [45G,47G].

Flow and heat transfer calculations in a pipe containing a coaxially rotating disk were reported for laminar pipe flow and large disk-to-pipe diameter; rotation is shown to substantially affect the heat transfer rates, primarily by introduction of swirl flow [48G].

11. Combined heat and mass transfer

11.1. Ablation

A number of studies consider the thermal response of ablating materials. Researchers considered the onset of ablation in the hypersonic (Mach 5) flow regime [4H]. The study extended previous investigations by considering the effects of the cavity on ablation onset times using both experimental and computational methods. Picosecond laser ablation was investigated using joint computational/experimental studies [2H,3H]. These studies captured the formation and evolution of the plasma during early stages of the ablation process. Another hybrid experimental/computational investigation studied crater properties during nanosecond laser ablation of silicon [6H]. In considering the ablation of metal/polymer composite materials, researchers studied the energy transfer between the metal and the polymer which results in the ejection of the metal powder [5H]. Researchers also modeled ablation using an effective inverse Stefan number. The model was used to perform a parametric study of the proposed inverse Stefan model in simulations of 2-D abalation [1H].

11.2. Film cooling

Film cooling is an effective method of heat transfer and very useful in protecting surfaces from the effects of thermal stress. Several studies considered the film cooling of turbine blades. These include use of the heat transfer ñ mass transfer analogy [14H], and the utilization of multi-disciplinary optimization methods in turbine blade design [21H]. A survey of past accomplishments as well as work which needs to be done was also performed [19H]. Researchers also considered the angle of coolant injection [16H], and the shape of the injection holes [7H,9H,12H]. The effect of the orientation angle on the boundary layer temperature was also considered [13H]. Flow visualization and numerical simulations were utilized in investigating heat transfer in short length-to-diameter injection holes [10H]. Computational studies were used to investigate the effect of flow ratios, hole spacings, and injection angles on secondary vortices and the ensuing heat transfer [18H]. The film cooling of cylindrical [17H] and other convex surfaces were also investigated [8H]; these too considered both cylindrical and shaped holes [15H]. The cooling of films was also investigated. Researchers considered the cooling of a blown film due to the impingement of turbulent air [20H], and the cooling of visco-elastic films during extrusion [11H].

11.3. Jet impingement heat transfer – submerged jets

A number of studies involving the heat transfer in submerged jets (air issuing into air, liquid issuing into liquid) impinging on solid surfaces have been performed. Researchers investigated the heat transfer due to multiple jet impingement by considering the spacing between nozzles, the jet Reynolds number, and the spacing between nozzle exit and the surface of impingement [24H]. Another study considered the shape of the nozzle – from circular to elliptical ñ in enhancing heat transfer [29H]. Three studies considered the effect of jet inclination on heat transfer [22H,33H,35H]. The effect of jet nozzle contouring was investigated by considering a slot jet impinging on a circular cylinders [30H]. A study of flow pulsation on the characteristics of planar jet impinging on a heated surface was performed [31H]. the enhancement of heat transfer from a discrete heat source using multiple jet impingement of air in a confined arrangement was investigated [26H]. Researchers studied cooling of alumina disks using a high-velocity air jet [34H]. The effect jet Reynolds number was investigated under a variety of pin–fin heat sinks under air impingement [27H]. Experiments were performed to study slot air jet impinging on a triangular rib-roughened wall [28H]. Additionally, several numerical simulations were performed. Researchers utilized a nonlinear eddy-viscosity model in performing Reynolds-averaged Navier–Stokes simulations of separating and impinging flows [25H]. Surface pressure distributions and streamlines were computed for different impinging jet configurations [32H], and the conjugate heat transfer due to the impingement of a high Prandtl number fluid was studied [23H].

11.4. Jet impingement heat transfer – liquid jets

A jet in which the issuing stream has a density significantly higher than that of the ambient fluid is said to be a liquid jet. Because of their relatively high-thermal conductivity liquid jets are often used for jet impingement heat transfer. The interaction of propagating premixed flames with obstructing bodies was considered [43H]. A water-cooled, cylindrical combustion chamber was used to investigate the effect of injection location and percentage of liquid fuel during gaseous combustion [36H]. The surface temperature of a layer of liquid in the process of combined heat and mass transfer was predicted [41H]. Jets of high Prandtl number fluid impinging on a substrate with heat sources were modeled as a conjugate problem [38H,44H]. Heat transfer measurements were made of jets impinging on a dimpled surface using a transient liquid crystal technique [37H]. Simulations utilizing a volume-of-fluid method were used to study the break-up of liquid jets upon impaction with a liquid pool [45H]. A combined experimental and computational study of a high Schmidt number slot jet was performed [40H]. Gas absorption from a rising gas plug was studied [42H]. It was found that the mass transfer rate decreased when the dimensionless heat of absorption was increased. The effect of nozzle shape on heat transfer enhancement was investigated in a steam-jet refrigeration system [39H].

11.5. Transpiration

Several studies involving transpiration were performed. A simulation model was developed to predict the effects of heating system location on transpiration in a greenhouse crop [48H]. Another study analytically investigated the effect of evaporation from a wetted wall on convective heat transfer [46H]. Researchers considered the effect of thermal properties of lysimeters in measuring the evaporation of water from soil [49H]. The cooling of ultrasound applicators for interstitial therapy was investigated [47H].

11.6. Drying

Heat and mass transfer are integral to drying. A wide variety of studies utilizing computational methods were performed. These include the drying of foodstuff [51H, 68H,70H,75H,86H], polymer solutions [58H,77H], fibers [76H], wood [83H], shale [55H], and clay [56H]. The studies utilized models which predicted integral quantities such drying time [86H], as well as finite-element methods which provided spatial temperature distributions [70H]. Researchers also consider the modeling of dryers [57H,62H,78H,81H]. A control-volume method was used to reduce six partial differential equations in time and space to six ordinary differential equations in time. The approach was validated using a counter-current flow rotary dryer [57H]. Reynolds-averaged Navier–Stokes simulations were used to perform studies of turbulent flows in an impingement dryer [78H]. Researchers developed a time-dependent computational fluid dynamics model of the combustion processes in bagasse-fired furnaces [90H]. Finite-element methods were used to simulate the drying of ceramics which include volume change and hydrothermal stress [71H]. Neural network mapping was used to predict heat transfer coefficients in a fluidized bed [91H]. Finite-volume methods were utilized in performing simulations of grain drying in a cylindrical bed with evaporation boundary conditions [73H]. The effect of forced convective heat and mass transfer coefficients was investigated [59H]. A moving boundary model was developed to describe the frying of essentially 2-D objects [82H]. A mathematical model was developed for fluidized bed drying with microwave heating [88H]. The applicability of the infinite slab condition was assessed under a range of Biot and Fourier numbers [79H]. Stochastic modeling approaches were used in simulating heat and mass transfer in drying [61H]. Researchers also developed, and validated, a model of a single droplet in a two-phase flow inside a spray dryer [69H]. Additionally, a number of experimental investigations were also performed. In the drying of wood, temperature and weight measurements were used to calculate the position of the evaporation front beneath the surface [89H]. Several investigators considered the drying of foodstuff using different techniques [50H,52H,53H,60H,64H–66H]. These include fluidized beds [52H,65H,66H], and fryers [60H,64H]. Researchers studied the design and performance of rotary dryers [67H,87H], convective drying [63H,84H], a combination of micro-wave and convective drying [74H], vacuum drying [80H], drying under turbulent flow conditions [54H], the performance of a mechanically spouted bed dryer [85H]. Researchers also measured gas velocities and moisture content in a convective vacuum kiln in hopes of providing more uniform conditions [72H].

11.7. Miscellaneous

A variety of studies in which heat and mass transfer occurs in combination have been performed. These included the cooking of foods [112H,113H,132H,136H, 138H], the modeling and analysis of wood pyrolysis [109H,110H,115H], combined heat and mass transfer and material surface characterization [97H,98H], chemically reacting flows and combustion [99H,100H, 103H, 111H], prediction of wood moisture content and subsequent combustion [117H,119H,140H,141H], the removal of moisture from soils under various thermal conditions [102H,104H,108H], and multiphase transport [93H–96H]. Researchers also considered heat transfer mechanisms such as sublimation [116H], evaporation [130H], diffusion [139H]as well as both forced and natural convection [92H,137H,114H]. The coupling of the hydrodynamic and thermal fields was studied using both analytical and computational techniques [107H,120H, 123H,125H–128H]. Laser Doppler anemometry was used to measure temperature and velocity measurements in a heated jet interacting with a cold wire [124H]. Models were developed to predict erosion and moisture removal rates from soils [121H,122H, 129H]. The transfer efficiency of oligomer ions in monocomponent systems of polymer mixtures from solution phase to gas phase was examined [118H]. A non-equilibrium phenomenological theory of mass and heat transfer was developed and applied to ammonia synthesis [133H–135H]. Other studies include the development of a liquid crystal thermography for gas turbine heat transfer measurements [106H], estimation of the heat and mass transfer rates during the adsorption of volatile organic compounds [101H], modeling of water absorption in polymide based composites [131H], and mass transport in a partially covered fluid-filled cavity [105H].

12. Bio-heat transfer

The bioheat transfer section of this review continues to evolve. The present review is still only a small portion of the overall literature in the area. This represents work presented in engineering journals with occasional basic science and biomedical journals such as Cryobiology and Am. J. of Physiology. This is a very dynamic and cross-disciplinary area of research, and thus, this review should be taken as more of an overview, particularly from an engineering point of view, rather than an exhaustive list of all work in this area for 2000. Subsections include work in Cryobiology, hyperthermia, thermoregulation and miscellaneous studies.

12.1. Cryobiology

Work in cryobiology can be broken in cryopreservation, crystallization/vitrification, and cryosurgery.

Cryopreservation work focused on CPA loading, freezing and thawing, and post freeze transplantation and use of biomaterials. In CPA loading, the precise quantification of CPA penetration in tissues as a function of time has been difficult, and a new MR approach to the characterization of cryopreservation permeation in an engineered dermal replacement was presented to address this need [3I]. Work in the area of freezing and thawing included characterization of a cryopreservation technique of precision-cut rat liver slices [10I] a cultured cartilage analog [12I]; assessment of ice morphology and recovery of chondrocytes in articular cartilage [11I] and the effect of temperature-dependent thermal conductivity in heat transfer simulations of frozen biomaterials [15I]. Rapid thawing of cryopreserved tissues by electromagnetic and conductive means was also studied [6I,9I]. Lastly, one study assessed vascular injury after transplantation of previously frozen mammalian livers [7I].

Work in the area of crystallization and vitrification (glass formation) included assessment of both intracellular and extracellular freezing events. One study assessed the effect of cell–cell contact on membrane integrity after intracellular freezing [1I]. Other studies assessed the recrystallization inhibitor activity in plant and lichen species [5I] and the effects and mechanisms of antifreeze proteins during low-temperature preservation [Review] [16I]. Finally, vitrification studies showed enhancement by synthetic ice blocking agents [17I] and the tendency of a glass to form in the system water–dimethyl sulfoxide was also assessed [2I]. The phase diagram, including glass forming information for trehalose–water binary mixture was also presented [4I].

In cryosurgery, the use of freezing in situ was used to control hemorrhage from liver injury [8I] and as an experimental treatment for thyroid [13I]. Cryosurgical probe characterization studies were also performed for general freeze/thaw processes around a probe [19I] and in porcine and human liver tissue and human colorectal liver metastases in vitro [14I]. Finally, an in vitro monitoring system for simulated thermal processes in cryosurgery and ensuing damage was also presented [18I].

12.2. Hyperthermia

Work in this area can be broken into thermal therapies, adjuvants, heat death mechanisms and kinetics, and bioheat transfer modeling.

Thermal therapy continues to be an area of active work due to the minimally and at times non-invasive nature of high-temperature tissue destruction afforded by new equipment. Several studies using micro-wave, Radio-Frequency RF, High Intensity Ultrasound (HFU) and Laser have been reported. Micro-wave and radiofrequency studies report a new 434 MHz interstitial hyperthermia system monitored by micro-wave radiometry [22I] and a dielectric-loaded coaxial-slot antenna for interstitial micro-wave hyperthermia [30I]. Further characterization studies show that the position, size and distance of the opposite applicator changes the SAR and thermal distributions in some RF applications [31I,32I]; and resonance effects in applicator water boluses can also affect the SAR [28I]. Characterization work in HIFU assessed cylindrical ultrasound transducers for intracavitary hyperthermia [35I] and temperature elevation at the muscle/bone interface [36I]. Further ultrasound work investigated the treatable domain and optimal frequency for brain tumors [37I]. Several characterization studies looked at the effects of cavitation bubbles on US lesions [23I] and the directional power deposition from direct-coupled versus catheter-cooled interstitial US applicators [40I]. In the laser area, an analysis of cryogen spray cooling during laser treatment of port wine stains was presented by [43I] and [52I] and the temperature change in teeth at the dentin/pulpal interface was assessed [25I]. Lastly, one study reports the use of hyperthermia and radiotherapy for inoperable squamous cell carcinoma [20I].

Adjuvants to heat destruction were also studied. Potential adjuvants included local anaesthetics [49I]; granulocyte-colony stimulating factor [50I]; paclitaxel–epirubicin chemotherapy [24I]; and heat with cancer cell cytosol immunization [41I]. Heat-inducible vectors for use in gene therapy were also investigated by Gerner et al. [29I].

The mechanism of heat death and/or kinetics were studied by several groups in various systems. Studies included: supraphysiological thermal injury in Dunning AT-1 prostate tumor cells [21I]; thermal death kinetics of insect pests [33I] and apoptosis induced by hyperthermia in Dunn osteosarcoma cell line [48I]. It was also found that fever-range hyperthermia stimulates alpha4beta7 integrin-dependent lymphocyte-endothelial adhesion [27I]. The injury outcome of hyperthermia on tissue was assessed after interstitial therapy on normal rat brain by histology [34I] and after whole body by assessment of murine leukocyte populations [42I]. Lastly, one study showed that thermotolerance (and rapid cold hardening) ameliorate the negative effects of brief exposures to high (or low) temperatures on fecundity in the flesh fly, Sarcophaga crassipalpis [46I].

Modelling of temperature excursion in the body, particularly during hyperthermia with blood flow, continues to be an area of intense activity using the bioheat equation. Modelling included assessment of perturbations in hyperthermia temperature distributions associated with counter-current flow [26I]; temperature profiles in an isolated perfused bovine tongue [44I]; use of a discrete vessel model in thermal simulations [45I]; temperature simulations in tissue with a computer generated vessel network [51I]; an energy equation based automated meshing technique for analysis of blood vessels and tissues [53I] and heat transfer to the periodontal ligament during root obturation [47I]. Other work investigated the morphometry of the canine prostate vasculature to assist in the blood flow term of the bioheat equation [54I] and boundary information based diagnostics on the thermal states of biological bodies [39I]. Additionally, the controversial subject of whether heat transfer in living tissues exhibits wave-like behavior was reviewed by Liu [38I].

12.3. Thermoregulation

Work in this subarea included heating, cooling and general studies as well as studies related to clinical operations. Heating work included discussion of effects of whole body heating on dynamic baroreflex regulation of heart rate in humans [58I] and heat production in human skeletal muscle at the onset of intense dynamic exercise [59I]. It was also shown that pre-treatment with mild whole body heating prevents gastric ulcer induced by restraint and water-immersion by stress [61I]. Other work modeled heat mat operation for piglet creep heating [74I] and the effect of acute heat exposure on skin blood flow in persons with paralysis [72I].

Cooling work included the integrated response of the upper and lower respiratory tract of asthmatic subjects to frigid air [62I]; a new approach to calculation of wind chill [63I] and the effects of phase control materials on hand skin temperature within gloves of soccer goalkeepers [64I]. Additional studies investigated hemorrhage-induced hypothermia and the accompanying reduced metabolic rate in rats [60I] and skeletal muscle properties in cadaveric test specimens after freezing [71I].

General work included the evaluation of cutaneous heat flux model limitations for metabolic rate studies of marine mammals [56I]; thermal analysis and design of an advanced space suit [57I]; generation of an anatomically based 3-D model of the conducting airways [66I]; parametric studies of human thermal mechanisms and measurements [67I]; thermal balance of livestock [70I]; heat transfer in the micro-vascular network in reptiles [65I] and steady and pulsatile flow studies in Abdominal Aortic Aneurysm models [73I].

Studies relevant to clinical thermoregulation included the implications of packed cell volume on specific heat measurements for heat exchange in extracorporeal circuits during anesthesia [55I]. Additional work assessed thermal and hemodynamic responses to postoperative rewarming with a sub-atmospheric pressure device [68I]; measurement of porcine heart temperatures [69I]; conceptual design of a combined device for normothermia and venous compression [75I]; and a theoretical evaluation of contributions of heat conduction and countercurrent heat exchange in selective brain cooling in humans [76I].

13. Change of phase – boiling

Thermal transport phenomena associated with liquid-to-vapor phase change are addressed in the publications reviewed in this section and classified into five major categories: droplet, film, and explosive evaporation (23 papers), bubble characteristics (15 papers), pool boiling (44 papers), flow boiling (32 papers), and two-phase thermohydraulics (12 papers). In addition to these 126 papers, the interested reader will find reference to studies of evaporative and ebullient heat transfer among the papers included in: change of phase – condensation (JJ), heat transfer applications – heat pipes and heat exchangers (Q), and heat transfer applications – general (S).

13.1. Droplet and film evaporation

The 2000 archival literature provides several fundamental studies of droplet evaporation, including the effects of a vortex and acoustic fields, respectively, [12J,19J], evaporation of binary liquid droplets [8J,14J], droplet evaporation in a supercritical environment [3J,23J], and the impact dynamics and heat transfer for a saturated drop impinging on a heated surface in the non-wetting regime [9J].

Evaporation of liquid films is described in [16J] – dealing with a liquid fuel evaporating from a metal substrate, in [15J] – presenting the development of a phenomenological model for an evaporating meniscus, in [1J] – emphasizing the development of expressions for eddy diffusivity in turbulent falling films, in [21J] – offering a new, computationally efficient model for multi-component evaporation, and in [17J] – providing accurate approximations for intensive evaporation. The effects of surfactants on evaporation from an open water surface are described in [18J], evaporation from the wetted floor of an open cylinder in [13J], the evaporation of refrigerant films in a vapor compression cycle in [2J], and the experimental heat transfer characteristics of refrigerant–oil mixtures in evaporator tubes in [6J].

Evaporation during vapor explosions is described in [4J] – providing two distinct models for this phenomenon, in [5J,7J] – dealing with flashing in tubes, and in [22J] – with explosive vaporization on a micro-heater. The development of a new spray/wall interaction model [10J], along with the use of water sprays to cool glass fibers [20J] and die-cast steel rods [11J], is also described in the 2000 literature.

13.2. Bubble characteristics

Single bubble characteristics underpin much of the modeling and understanding of ebullient heat transfer. Heat transfer and fluid flow in a non-isothermal constrained vapor bubble is studied in [29J], parametric effects on bubble coverage on electrodes in [26J], characteristics of bubbles generated on micro-heaters in [37J], bubble dynamics during pool boiling in [35J,36J], bubble dynamics in high-frequency acoustic fields in [27J], bubble behavior in a uniform electric field in [38J] and heat and mass transfer during the rise of superheated bubbles in [24J,25J], velocity of long bubbles in oscillating pipes [30J], and numerical simulation of bubble rise at elevated pressures in [32J]. The characteristics of collapsing bubbles attracted the attention of [28J] – exploring the effects of non-uniform flow, of [34J] – dealing with binary mixtures, of [33J] – describing molecular dynamics computer simulations, and of [31J] – studying collapse driven micro-bubble emission boiling.

13.3. Pool boiling

Fundamental studies of pool boiling behavior continued to attract the attention of the heat transfer community, with a notable focus on the characterization of the active nucleation sites [62J] and the interaction among neighboring nucleation sites [41J–43J,65J], as well as the effect of surface roughness [52J]. The results of an exploration of multiple solutions for boiling on a wire are reported in [80J] and the influence of heat conduction in the wall in [66J].

Several of the pool boiling heat transfer studies in the 2000 literature deal with important extensions of the ebullient transport knowledgebase to include the correlation of pool boiling of halocarbon refrigerants [73J], effects of heater orientation and confinement [68J], boiling from a downward facing surface [51J], transient heat transfer [64J], cyclic heating [47J], effects of microgravity on micro-scale boiling [76J], and the influence of mass transport during the boiling of multi-component mixtures [55J].

The thermal design and optimization of pool boiling fins was explored in several studies, notably in [60J] – addressing both the stable and metastable regimes, in [46J,61J] – examining boiling of dielectric liquids from single fins, and in [39J] – exploring issues in the design of boiling heat sinks for immersion cooling of electronics. The literature also provides results for the augmented boiling of refrigerants on the Turbo-BII-HP tube [77J] and grooved tubes [71J], as well as for the addition of hydrocarbons [53J].

Fundamental aspects of pool boiling on porous surfaces are described in [59J] and [82J], while the effects of oil on the boiling of refrigerants and the boiling of mixtures in [81J] and [72J], respectively. Pool boiling of distilled water on a PTFE-coated tube is described in [78J]. Enhancement of pool boiling with electric fields is addressed in [44J] – exploring EHD effects on finned tubes, in [57J] – visualizing the benefits of non-uniform dc electric fields, in [69J] – comparing the behavior of several fluids, and in [75J] – investigating the effectiveness of an electric field in microgravity.

In boiling heat transfer, the Critical Heat Flux (CHF), or "boiling crisis", represents the heat flux value at which vapor blankets the heater surface and the heat transfer coefficient deteriorates. The 2000 literature includes an experimental study of dryout in a falling film [79J], CHF in an open thermosyphon [67J], and CHF on a laser heated thin plate [48J], as well as a theoretical derivation of the critical heat load [56J] and of a dry-spot based model of CHF [49J].

A broad review of theoretical models and the experimental literature on the transition from CHF to film boiling, along with recent experimental results on the temperature distribution adjacent to the film boiling boundary is provided in [63J,74J], respectively. Trans-CHF behavior, as encountered in quenching of samples in water [58J], freezing of biological samples and food [50J], and under severe reactor accident conditions [40J] is also described. Models of film boiling in superfluid helium under microgravity conditions are examined in [45J,54J]. An extensive development of thin-film asymptotics is used to provide the theoretical foundation for horizontal film boiling in [70J].

13.4. Flow boiling

The broad range of interactions between a pumped flow of liquid and vapor bubbles generated and released on a heated surface provides a large number of flow boiling heat transfer mechanisms and a diverse flow boiling literature. Several of the studies contained in the 2000 archival literature deal with the onset of nucleate flow boiling in horizontal tubes [114J], minichannels [92J], microchannels [102J], and in finned, annular channels [108J]. Others, expand the use of the available correlations to unconventional fluids, such as kerosene [87J], HFC refrigerants [86J], and wide-boiling binary and ternary mixtures [112J]. The influence of the flow boiling flow regime on the temperature distribution of a heated wall is investigated in [93J].

During 2000, the literature has been enriched by studies of the thermohydrodynamic characteristics of flow boiling in various channel geometries, including microchannels [85J,100J,101J], narrow refrigerant passages [84J], annular ducts [113J], hot-rolled wires [99J], channels in a die for pressure die-casting [88J], and a horizontal geologic fracture [111J]. Flow boiling in enhanced surface tubing was examined in [103J–106J], while enhancement due to a screen sheet suspended in the flow was the subject of [94J].

The archival literature of 2000 provides evidence of further progress in the understanding and enhancement of the flow boiling "crisis", including both critical heat flux and dryout. Hall and Mudawar [90J,91J] provide a comprehensive review of CHF for water flowing in tubes. A CHF model for subcooled flow boiling, which is extendable to non-uniform heating, twisted tape inserts and other fluids, is presented in [97J], while a modeling approach for square rod bundles is articulated in [95J] and experimental data for CHF on protruding and flush-mounted simulated chips is presented in [110J]. The influence of subcooling on the relative stability of nucleate boiling and film boiling on an inclined surface is explored in [96J].

The correlation and modeling of post-CHF, dispersed-flow film boiling in tubes [107J] and in the core of a nuclear reactor [83J], convection-controlled film boiling along fast moving wires [98J] and along a vertical cylinder [109J], as well as a detailed examination of the liquid–wall contact characteristics adjacent to a quench front [89J] are also reported.

13.5. Two-phase thermohydraulics

The design of flow boiling systems must include attention to the thermohydraulic aspects of two phase flow. The accurate prediction of pressure drop in two-phase flow continues to occupy many researchers and led to the publication of a review of phenomenological models for the pressure gradient in horizontal gas–liquid flows [124J], horizontal pipe pressure gradient and hold-up data for low liquid loadings [116J], experimentally determined two-phase flow patterns and pressure drop in micro-rod bundles [121J], and pressure drop measurements for refrigerants in small channels [123J].

The transition from slug to annular flow in microgravity was the subject of [126J], while [120J] described the measurement of void fraction in magnetic two-phase fluids, and [117J] presented a methodology for the prediction of slug liquid hold up in vertical flows. The prediction of acoustic wave velocities in two-phase flows was described in [125J].

Droplet characteristics are central to the understanding of thermal transport in annular and wispy annular flow. Several distinct droplet models are used in [115J] to underpin the numerical prediction of depressurization of highly pressurized propane, while [118J] provide evidence for the existence of core structures in high-mass flux annular flows, [119J] provide a correlation for the droplet entrainment rate, and [122J] discuss the use of an isokinetic probe for establishing droplet flow parameters.

14. Change of phase – condensation

Papers on condensation published during 2000 are separated into those which deal with surface geometry effects; those on the effects of global geometry, thermal boundary conditions and external influences; papers presenting techniques for modeling and analysis; papers predominately on free-surface condensation; papers on unsteady effects and papers dealing with mixtures.

14.1. Surface geometry and material effects

Papers on the importance of surface geometry to condensation include one on the effects of coiled wires inserted into horizontal tubes [1JJ]. It shows a 100% improvement in heat transfer coefficient over smooth tube performance. Five papers discuss micro-finned tube performance [2JJ,3JJ,5JJ,7JJ,8JJ]. Micro-fins of axial, helical and cross-hatch geometries are evaluated [7JJ, 8JJ] to learn that the cross-hatched geometry performs best with several refrigerants. Another study, presented in two similar papers, compares condensation with smooth and micro-finned tubes using R22 [2JJ,3JJ]. The importance of surface tension forces when the vapor quality is high is discussed. A study of condensation with two refrigerant types in smooth and herringbone-type, mico-finned tubes is presented [5JJ] in which it is noted that the herringbone-type geometry provides higher heat transfer coefficients, and pressure drops. The effects of surface waviness on a disk facing upward is discussed with respect to laminar film condensation [4JJ]. The wavelength and amplitude of the surface waviness, and suction through the surface, play important roles in determining film thickness. Finally, mass transfer from the surface of the sea is measured [6JJ] and analyzed. The assumption that the roughness length is the same for modeling both heat and moisture transport is assessed.

14.2. Global geometry, thermal boundary condition and external influence effects

Papers which describe the effects of global geometry include three with vertical tubes and surfaces [16JJ,18JJ,25JJ], eight with horizontal and inclined tubes and surfaces [9JJ], and [11JJ,17JJ,20JJ–24JJ], a helical tube, [15JJ] and several system or device-oriented papers [10JJ,12JJ–14JJ,19JJ]. Experiments are conducted to assess the effects of non-condensables in passive cooling systems of nuclear reactor containments using a vertically mounted, smooth tube [18JJ]. The gas stratification phenomenon is clearly observed when the gas mole fraction exceeds 60%. For the same application, a study develops a new turbulent annular film condensation model for steam in a vertical tube [16JJ]. Pure saturated vapor condensation with downward flow over a horizontal cylinder or cylinder bank is numerically studied where particular attention is given to the effects of surface tension [9JJ]. A model is developed for forced convection condensation in the annular flow region between horizontal tubes [17JJ]. Comparisons within 30% on mass flux with the data are achieved. A similar study is with an adiabatic inner tube [23JJ]. The analysis shows that the effects of surface tension cannot be neglected when the tube is small. A similar study, but with inclined tubes, is presented [24JJ]. Condensation in horizontal tubes with several HFC refrigerants is experimentally assessed and the results are compared with correlations [11JJ]. One correlation is noted to give the best comparison. Condensation of pure and azeotropic fluids in smooth horizontal tubes is documented, including the flow pattern changes with flow conditions and fluid type [21JJ]. Zeotropic (or non-azeotropic) refrigerant mixtures are investigated in a similar geometry [22JJ]. A prediction method for pressure drop and heat transfer rates in the same geometry is presented [20JJ]. Standard design models are tested. Helicoidal tubes are tested with R134a inside [15JJ]. The data are compared to those with a horizontal straight pipe. Condensation in gas-fired boilers of water from the products of combustion is documented [14JJ]. The models predict fin efficiencies below those obtained using an assumption of constant heat transfer coefficient and temperature. Droplet condensation of metal vapor on the under side of a stainless steel plate is studied [19JJ]. Scanning electron microscopy of the droplets formed is the recommended visualization method. Two papers are on steam-driven jet pumps. In one, a mathematical model is presented [10JJ]. Key to the analysis is the modeling of the nozzle. Visualization in jet pumps is carried out [13JJ]. The intent is to better understand the physical laws driving the flow. A prototype of an adsorption refrigerator which uses a carbon–aluminum laminate absorber surface is tested with emphasis on assessing the intensification of heat transfer within the bed [12JJ].

14.3. Modeling and analysis techniques

Conjugate condensation-heat conduction analysis is applied to a vertical fin geometry and the equations are written in terms of Prandtl and Jakob numbers, a non-dimensional fin thermal conductivity ratio and the aspect ratio [29JJ]. The Graetz problem, but applied to condensation, and with wall conduction, is applied to analyze condensation on the external surfaces of two vertical thin plates [26JJ]. In addition to the parameters of the previous paper, the ratio of thermal conductance of the condensed layer to the thermal conductance of the forced cooling flow is added. A numerical method is applied to condensing steam flow within a compressible boundary layer [32JJ]. Viscous dissipation and reduced expansion rates within the boundary layer are shown to influence nucleation and growth of the droplets relative to those predicted with inviscid flow. Droplet size distributions are modeled for condensing steam using the moments of the size distribution [33JJ]. Two papers deal with nuclear reactor modeling using RELAP5. In one, the code is interrogated regarding the models for thermal stratification, condensation and natural circulation flow with the small driving forces present in the small break accident [31JJ]. Another paper investigates numerical diffusion [30JJ] in the code. The authors note that automatic halving of the time-step can lead to failure of the accuracy of simulation. An automobile air conditioner is simulated as a system and the effects of condenser size and refrigerant charge on the performance are discussed [28JJ]. A new theory is developed for adsorption chiller units to describe why surfactants in the fluid, added for boiling improvement, also improve condensation [27JJ]. The conclusion is that the surfactants generate intense Marangoni secondary flow circulation due to surface tension gradients.

14.4. Free-surface condensation

Two papers specifically focus on free-surface condensation. In one, condensing bubbles make uniformly sized liquid droplets. The bubbles form by injecting vapor in an immiscible liquid [35JJ]. A model is developed to estimate direct contact condensation of steam bubbles [34JJ]. Measurements are made by using holographic interferometry. Maps of the results show that the boundary between chugging flow and subsonic jetting is shifted to larger steam mass flux values when the pipe size is increased.

14.5. Unsteady effects in condensation

One paper on unsteady effects analyzes experimental data on the formation of aromatic species from sooting flames [39JJ]. Measurements of pyrolysis, partial oxidation and combustion of acetylenes as well as allene and ketene in turbulent flow reactors, jet-stirred reactors and shock tube experiments are used in the analysis. Nucleation of aerosols in laminar tube flow is analyzed with approximate methods in terms of the Lewis number and a parameter which describes the temperature variation of the equilibrium vapor concentration [37JJ]. The predictions are shown to agree with numerical results. Condensation-induced water hammer is addressed experimentally and analytically [38JJ]. The analysis uses an improved criterion for transition from stratified flow to slug flow. The effects of non-condensables on the unsteady flow by natural circulation inside horizontal tubes are assessed experimentally [36JJ]. The results show a blockage of heat transfer area by the gas which leads to increased primary pressure, followed by compression of the gas and re-entry of the steam, hence the dynamics.

14.6. Binary mixtures

Papers which deal with mixtures include one which shows the effects of additives to R123 on condensation [41JJ]. A 0.5% by mass isopentane addition improves pool boiling. Previously the effect on condensation had not been assessed. On average, a 4% reduction in performance was experimentally found. The degradation was presumed to be by the zeotropic behavior of the mixture, which leads to a loss of available driving temperature difference for heat transfer across the film. In three similar papers, a method for prediction of condensation of azeotropic mixtures in horizontal, enhanced-surface tubes is employed [44JJ–46JJ]. Both pressure drop and heat transfer are included. The papers differ in the fluid used for testing. Analysis of the trapping of impurity molecules in material deposition from mixtures of gases is investigated [42JJ]. Trapping is correlated with the condensation. Condensation in boundary layers, as affected by non-condensable gases, is discussed [40JJ]. Fog forms within the steam-nitrogen boundary layer and steam condenses at the water droplets' surfaces; then the fog layer no longer reaches the cooling water interface and condensation is reduced. Condensation of potassium salts in straw-fired boilers is experimentally investigated [43JJ]. A novel probe is designed for this investigation.

15. Change of phase – freezing and melting

This is the change of phase (freezing and melting) section of the review. It is broken into several subsections including: melting and freezing of sphere, cylinders and slabs; Stefan problems; ice formation/melting; contact melting; melting and melt flows; powders, films, emulsions and particles in a melt; crucible melts; glass technology; welding; enclosures; nuclear technology; energy storage – PCMs; casting, moulding, and extrusion; mushy zone – dendritic growth; solidification; crystal growth; droplets, spray and splat cooling; oceanic and geological phase change and miscellaneous.

15.1. Melting and freezing of sphere, cylinders and slabs

In this section, work on freezing in several geometries was pursued. In slab geometry, freezing during quenching was investigated [4JM]. In cylindrical geometry water freezing in a horizontal circular cylinder [5JM], and high-pressure freezing in a cylinder [3JM] were investigated. In addition, freezing with flow in both parallel-plate laminar conditions [2JM] and Couette cylinder flow in an annulus were reported [1JM].

15.2. Stefan problems

Stefan problem work was reported by several groups. Numerical solution of one-phase Stefan problems by the heat balance integral method in cylindrical and spherical geometries was reported [6JM]. In addition, electron-beam autocrucible melting was studied by means of the steady-state Stefan problem [7JM]. Analytical modeling of transient phase-change problems was reported [8JM], and with a generalized Stefan problem approach to fluvio-deltaic sedimentation was reported by [9JM].

15.3. Ice formation/melting

Ice formation and melting was studied in or on food, soil, wastewater, aircraft applications and general solid surfaces as well as in several miscellaneous systems. In foods, freezing and thawing was studied by a modified fictitious heat flow method [12JM], and a neural network technique [18JM]. Convection and solidification in food freezing was also studied in a plate shaped food [19JM] and in food within a freezing chamber [20JM]. In soil, heat and mass transfer in columns during freezing/thawing was studied [22JM]. In wastewater, treatment using an in situ freezing–melting process was studied by Hirata et al. [11JM], and the freezing temperatures of freely falling industrial wastewater droplets was studied by Gao et al. [13JM]. In aircraft applications, glaze or ice growth on airfoils was studied by Politovich [23JM] and anti-icing was studied by Morency et al. [21JM]. Other studies of ice formation on solid surfaces included: time to the onset of ice formation at metal surface [10JM] and the effect of concentration gradient on the melting of a horizontal ice plate from above [24JM]. Further studies report on ice formation and removal on cooled horizontal solid surfaces [14JM,15JM]. Miscellaneous studies report on the sublimation and vaporization of an ice aerosol by laser radiation [17JM] and solid–liquid equilibria of organic binary mixtures [16JM].

15.4. Contact melting

Contact melting of a pure metal on a vertical wall was numerically simulated by Stella and Giangi [26JM]. Analytical solutions to unsteady close-contact melting on a flat plate were also presented [27JM]. In addition, melting from heat sources flush mounted on a conducting vertical wall was analyzed [25JM].

15.5. Melting and melt flows

The work in this category can be subdivided into steel and metal melt, laser processing, magnetic field effects, and general melt flow modeling. Steel and metal melt work included modeling of steel flow in a Tundish heated by plasma [28JM]; effects of buoyancy and flow control of liquid steel in a Tundish [38JM]; kinetics of steel scrap melting in molten Fe–C bath [31JM]; effect of molten steel flow on the solidification shell [44JM]; melting and dissolution of low-density ferro-molybdenum in steel melts [41JM]; inclusion removal and microstructure in electron beam button melting [32JM] and modeling of a molten zinc pot of a continuous hot-dip galvanizing line [36JM]. Melt studies in laser processing included shape changes of colloidal gold nano-rods using femtosecond and nanosecond laser pulses [37JM] and delayed melting at the substrate interface of amorphous Ge films [43JM]. Magnetic field effects were studied in the dynamics of semi-levitation melting [30JM] and in an oxide melt [34JM]. General melt flow work included: thermocapillary flow in a jet of liquid (melt) film painted on a moving boundary [33JM]; study of slipping fluids by a unified transient network model [35JM]; modeling of molten material–vapor–liquid mixtures in thermal non-equilibrium [42JM]; and thermofluid analysis of the entrance section of a continuous pressure infiltration process for fiber–metal matrix composites [40JM]. Additional studies on the melt behavior of float zones in micro- and low- gravity environments [29JM] and for thermal management of high-power electronics with phase-change cooling [39JM] were presented.

15.6. Powders, films, emulsions and particles in a melt

Studies in this section were dominated by particle-laden melt work. These included convective stability of a particle-laden fluid system in the presence of solidification [45JM]; lattice–Boltzmann simulations of fluidization of rectangular particles [46JM]; and modeling of the iron ore sintering process including the agglomeration phenomenon of granules in the packed bed [47JM]. In addition, investigation of coatings and SiCf/SiC composites under thermal shock were reported [48JM].

15.7. Crucible melts

See work described in Section 2 by [7JM].

15.8. Glass technology

Glass melting work included modeling of an industrial glass-melting furnace [49JM]; melting using an IGBT full bridge resonant converter [50JM] and investigation of means of increasing the energy efficiency and intensity of glass melting [51JM,52JM].

15.9. Welding

Welding work included analysis of single-pass arc welds [53JM]; fusion welding [54JM]; resistance spot welding in aluminum [55JM]; and micro- and macro-modeling of titanium arc welding [56JM].

15.10. Enclosures

See studies in Section 12.

15.11. Nuclear technology

Phase-change work in nuclear technology included an implicit enthalpy formulation for oxidation of nuclear reactor fuel cladding by steam [57JM], and investigation of heat removal from a liquid–salt target irradiated with high-energy protons [58JM].

15.12. Energy storage – PCM

Studies in this section investigated the storage and release of energy during a phase-change process. This included the investigations included the investigation of thermal characteristics of paraffin in a spherical capsule during freezing and melting processes [59JM]; solidification of phase-change material (PCM) inside a spherical capsule [60JM]; and melting of a phase-change material in a concentric horizontal annuli [61JM].

15.13. Casting, moulding, and extrusion

Work in this section was dominated by casting with some moulding and extrusion reports. The casting work included thermal analysis during continuous casting using an effective heat capacity method [62JM]; modeling of defects in shape castings based on various effects [63JM]; modeling microporosity formation in aluminum alloys due to various effects [66JM]; speed disturbance compensation in continuous casting [64JM]; and analysis of microstructural characteristics in sand cast Al–Si alloys [69JM]. Modeling work in steel and alloy casting analyzed grain selection during the solidification of single crystal superalloy castings [65JM]; fluid flow phenomena during Tundish filling and casting [68JM]; fluid flow, heat transfer, and solidification in two-roll melt drag thin strip casting of steel [70JM]; thermally induced stresses in two-roll melt drag thin strip casting of steel [71JM]; and instantaneous heat fluxes from solidifying steels to the surfaces of twin-roll casters [72JM]. Further modeling work in casting included simulation of coupled turbulent flow and heat transfer in the wedge-shaped pool of a twin-roll strip casting process [74JM]; application of the boundary element method for the modeling of cylindrical and spherical castings [77JM]; an asymptotic approach to the mathematical modeling of Ohno continuous casting of cored rods [78JM]; and numerical analysis of fluid flow and heat transfer in the funnel type mold of a thin slab caster [79JM]. Other work in the area included investigations into the effects of processing parameters on the microstructure and mechanical properties of alloy in direct squeeze casting [76JM] and the mechanisms of initial melt/substrate heat transfer pertinent to strip casting [80JM]. Finally, one study focused on finding appropriate boundary conditions for the modeling of metal casting [83JM].

Work in the moulding area included modeling of phase change and material performance in blow moulding and thermoforming [67JM]; predicting stereolithography injection mould tool behavior [73JM] and modeling temperature distributions in cooling chocolate moulds [82JM].

Modeling to predict the plasticating [75JM] and non-isothermal flow of polymer melts [81JM] in single screw extruders were also presented.

15.14. Mushy zone – dendritic growth

Investigations into the behavior of the mushy zone or dendritic growth processes in impure material phase-change processes included modeling of interdendritic strain and macrosegregation [84JM]; a model of micro-segregation during binary alloy solidification [85JM]; and the effect of free-floating dendrites and convection on macrosegregation in cast aluminum [86JM,87JM].

15.15. Solidification

Solidification work, predominantly in metals, involved a considerable number of studies on interfacial heat transfer, rapid solidification as well as general phenomena surrounding phase change in metals.

Interfacial work included studies on heat transfer and heat transfer coefficients. Interfacial heat transfer was studied during nucleation of steel-on metallic substrate [89JM] and for design and control of interfacial temperature gradients in solidification [92JM]. Interfacial heat transfer coefficient determination was carried out during unidirectional solidification of an aluminum alloy [90JM]; unidirectional Al–7 wt%Si alloy solidification with special geometry [91JM]; on the solid–fluid boundary with the phase change in a fluid [93JM]; at the metal–mould interface in the unidirectional solidification of Cu–8%Sn alloys [96JM] and also with a thermal stress model [94JM].

Work primarily concerned with the effects of rapid solidification included studies on multi-stage rapid solidification [95JM]; micro-scale heat and mass transfer during non-equilibrium phase change [97JM]; a model of dendritic and planar interface growth and morphology [98JM]; shape of a pore trapped in solid [99JM] and non-equilibrium planar interfaces during solidification of radiating materials [100JM].

Studies of generalized phenomena during solidification reported an algorithm for modeling phase change problems in materials processing [88JM]; multi-dimensional solidification with internal radiation and temperature-dependent properties [101JM]; the effect of viscous plane stagnation flow on the freezing of fluid [102JM]; and a model of solidifcation in inviscid stagnation flow [103JM].

15.16. Crystal growth

Investigations in this area can be divided into vertical zone, polymer and melt spinning, Czochralski, Bridgman and general crystal growth studies.

Work on vertical zone crystal growth reported on the effects of axial vibration on melt processing [115JM]; 3-D simulation of crystal growth with symmetry [116JM]; weak transverse magnetic field and crystal rotation [120JM] and dopant distribution in Ge single crystals grown aboard spacecrafts [113JM].

Polymer solidification and crystal growth work included directional solidification of isotactic and atactic polypropylene blends [112JM]; simulation of crystallization in high-density polyethylene [124JM]; modeling of the melt spinning of polyethylene terephthalate [123JM] and simulation of melt spinning including flow-induced crystallization [106JM].

Czochralski crystal growth work included modeling of a CZ melt using a block-structured finite-volume method [104JM]; influence of Marangoni convection on the flow pattern in the melt during growth of $Y_3Al_5O_{12}$ single crystals [109JM]; crystal–melt interface shape in the growth of oxide single crystals [111JM]; effect of internal radiative heat transfer on CZ oxide melt [114JM]; a hybrid finite-volume/finite-element simulation of heat transfer and melt turbulence in growth of silicon [118JM] and numerical simulation for silicon crystal growth of up to 400 mm [127JM].

Bridgman crystal growth work included investigation of vibrational control of convective flows in melt growth configurations [107JM]; simulation of growth in a material with anisotropic solid-phase thermal conductivity (i.e. benzene) [117JM]; boundary element modeling of the growth process of semi-transparent crystals [119JM]; the influence of gravity levels on the horizontal Bridgman crystal growth of an alloy [126JM] and a computational study of transient plane front solidification of alloys under micro-gravity conditions [128JM].

General crystal growth work included in situ visualization of $Cd_{1-x}Zn_xTe$ nucleation and crystal growth [105JM] and X-ray visualization of silicon carbide vapor transport [130JM]. Additional work on the solidification of Ga–Mg–Zn in a gas-filled drop [108JM]; mold surface wavelength effect on gap nucleation [110JM]; silicon carbide crystal growth by physical vapor transport method [121JM]; void engulfment in shaped sapphire crystals [122JM]; impurity distribution in semiconductor crystals [129JM]; edge-defined film-fed growth process [131JM] and the influence of electromagnetic field on resistivity variations in Si single crystals [125JM] were presented.

15.17. Droplets, spray and splat cooling

Work on molten droplet and sprays included a number of studies on solidification of droplets along with other liquid-phase analysis. These included simulation of metal droplet deposition with solidification [133JM]; liquid droplet solidification on substrates [136JM]; spreading and solidification of a molten metal droplet on a cooled substrate [138JM]; liquid metal particles impacting onto solid [140JM]; and droplet-based deposition [141JM]. Additional work included the analysis of impact, recoil and splashing of molten metal droplets [132JM]; interaction of a molten droplet with a liquid weld pool surface [134JM]; iron drop ejection into slags by bursting gas bubbles [135JM]; effects of thermocapillary convection on melting within droplets [137JM]. In addition, in situ temperature measurement during spray forming of A2-tool steel and axisymmetric 2-D analysis was presented [139JM].

15.18. Oceanic and geological phase change

Predominantly magma studies were presented in this section including deformation and freezing of enclaves during magma mixing [142JM]; extended-Boussinesq thermal–chemical convection with moving heat sources and variable viscosity [143JM]; simultaneous crystallization and melting at both the roof and floor of crustal magma chambers using NH_4Cl–H_2O binary eutectic system as a model [144JM].

15.19. Miscellaneous

Variational methodology using the enthalpy of the system to model heat flow and phase change within a structure of random material properties was also presented [145JM].

16. Radiative heat transfer

The papers below are divided into subcategories, which focus on the different impacts of radiation. Most of the papers report the results of modeling studies. Papers describing the development of new numerical methods themselves are reviewed in the numerical methods section under the subcategory radiation.

16.1. Influence of the geometry

The most striking observation in this section is the decrease of papers dealing with the determination of view factors. Katte and Venkateshan [3K] derive view factors in axisymmetric enclosures containing shadowing bodies.

One-dimensional sphere packings for sintering are considered in [12K]. Two-dimensional irregular enclosures are considered in [1K,9K]. Three-dimensional radiation problems are studied in [4K,7K,10K]. An unstructured radiation model for 2- and 3-D problems is proposed by Liu et al. [5K].

Monte Carlo radiation models are used to model thermal radiation in semiconductor processing [6K]. Circular infrared lamps used in rapid thermal processing are studied in [2K]. The influence of radiation on the meteorological conditions in urban canyons is studied in [8K,11K].

16.2. Radiation and combustion

Combustion problems involve radiative heat transfer as well as participating media, and other heat transfer modes. The increase in the number of publications over the last years justifies grouping these papers in a separate section.

A number of papers consider radiation in flames. Diffusion flames are studied by Liakos et al. [24K], Morvan et al. [28K], and Olson and Tíen [29K]. The inverse radiation problem of axisymmetric free flames is studied by Liu et al. [26K]. Radiation extinction of stretched premixed flames is studied by Ju et al. [18K].

Radiation in fires is studied by several authors. Turbulent burning between vertical walls with fire-induced flow is considered in [33K]. The spectral formulation for radiative transfer in 1-D fires is studied by Dembele and Wen [16K]. Soares and Teixeira [31K] report probabilistic modeling of offshore fires. Lilley [25K] investigates the minimum safe distance from pool fires. Ray effect mitigation in jet fire modeling is studied in [15K].

Radiation is also important in the study of furnaces. Fluidized bed-like furnaces are considered in [13K], coal-fired furnaces are investigated in [27K,32K], and natural gas fired furnaces are the subject of [20K,21K]. Radiative transfer in controlled-atmosphere furnaces is studied by Ratts [30K]. Radiation in a 0.3 Mwt Atmospheric Fluidized Bed Combustor test rig is studied by Kozan and Selcuk [23K].

Kayakol et al. [19K] simulate gas turbine combustors. Chen et al. [14K] perform multi-dimensional simulations of direct injection Diesel engines. Radiation properties of combustion products are reported in [22K]. Ewald et al. [17K] investigate the combustion of zirconium in oxygen. Coal combustion as well as reacting gas-particle flow is simulated in [34K].

16.3. Radiation and small particles

An increasing number of publications consider radiative heat transfer in systems involving small particles.

Hiers points out the importance of radiation in small particle combustion [41K]. Sazhin et al. [44K] study radiative exchange between a gas and fuel droplets. Dombrovsky [39K] models the radiative transfer from a small particle to ambient water through a vapor layer and the thermal radiation from non-isothermal particles of semi-transparent material [40K]. The influence of optical constants and particle size on the radiative properties and heat transfer involving ash clouds and deposits is considered in [36K]. Unsteady heat transfer in dilute suspensions of small particles is studied by Coimbra and Rangel [38K].

Lee et al. [42K] point out the importance of radiative transfer in thermophoretic particle deposition. Radiative and convective transfer through pneumatic transport of particles is studied in [35K]. Radiation and fluid-particle flow past a surface in the presence of gravity is studied in [37K]. Two-phase mixtures of non-gray gases with particles are considered in [45K]. The effect of thermal radiation on the sound wave propagation in gas–particle media is investigated by Park and Baek [43K].

16.4. Participating media

Papers in this category focus on emission and absorption properties, as well as scattering properties of the participating medium.

Several papers deal with the molecular emission and absorption properties. Vitkin et al. [62K] present an engineering procedure for calculating the transfer in molecular gases geared towards combustion of hydrocarbon fuels. Liu et al. [56K] present a statistical narrow-band correlated-k method to study 1- and 3-D enclosures containing CO_2–H_2O–N_2 mixtures. The same authors consider band lumping strategies in [55K]. Kanne et al. [51K] study thermochemical relaxation through collisions and radiation.

Anisotropic scattering is involved in the radiative transfer in non-gray CO_2 containing carbon particles, as is discussed in [50K]. A model to evaluate the total emissivity of an isothermal, gray, anisotropically scattering particle–gas mixture is presented in [58K]. The influence of anisotropically scattering media is also subject of the studies by Nunes et al. [57K] of arbitrarily shaped, axisymmetric enclosures, and by Krishnaprakas et al. [53K] of boundary layer flow of a fluid. An integral equation formulation for transient transfer is reported in [64K], a new angular discretization scheme for 3-D radiative transfer with anisotropic scattering in [52K]. Media with isotropic scattering are considered in the study of Byun et al. [47K], and Zhou et al. [66K]. The YIX method and pseudoadaptive angular quadrature is used for ray effect mitigation in scattering media by Tan et al. [60K].

Le Dez et al. [54K] and Anteby and Arbel [46K] study radiative-conduction coupling in semi-transparent media. Viskanta and co-workers discuss transient radiative heating of opaque and semi-transparent materials in [61K], and radiative transfer in semi-transparent glass foam blankets in [48K,49K]. Coupled radiation and conduction in absorbing and scattering composite layers is considered by Tan and co-workers in [59K,63K]. Yamada and Kurosaki [65K] investigate the radiative characteristics of fibers with a large size parameter.

16.5. Combined heat transfer

Papers in this subcategory consider the combined effect of radiation with conduction and/or convection. This year only few papers focus on combinations of conduction and radiation. Similarity solutions for collapsing cylindrical shock waves in radiating and conducting gas are presented by Hirschler and Gretler [73K]. Kiwan and Al-Nimr [75K] investigate the effect of radiative losses on a two-step parabolic conduction model. Shiff simulate radiation and conduction in a cylindrical volume [88K]. A spherically inhomogeneous medium is studied in [69K]. Conduction and radiation also dominate the operation of electric IR heaters studied by Petterson and Stenstrom [80K,81K]. Conduction/radiation in high-porosity fiber insulation is investigated in [76K].

A considerable number of papers discuss radiation combined with convection. Combined radiative heat transfer and natural convection are considered for an L-shaped corner [82K], for staggered and aligned arrays of nuclear fuel rods in rectangular enclosures [90K], for an air channel of LMR decay heat removal [89K], and for longitudinal fins [83K]. Han and Baek consider natural convection and radiation in rectangular enclosures divided by two partitions [72K]. Monnier uses finite element analysis to study free convection and radiation of gray bodies [77K]. Cheng et al. [68K] investigate the contaminant cooling by natural convection–radiation after severe nuclear accidents. Airflow, radiation and moisture transport also play an important role in heat release from the human body [78K]. Effects of radiation and thermal buoyancy on hydromagnetic flow are considered by Chamkha [67K]. Combined radiation and forced convection are studied for helical pipes [92K] and for flow of micro-polar fluids over a horizontal plate [70K]. The combination of radiation and forced convection also plays a role in low-pressure chemical vapor deposition [79K], and physical vapor deposition [87K]. Convection/radiation is also dominant in arc heaters [74K], and the X-33 linear aerospike plume-induced base heating [91K].

All three heat transfer modes are studied by Roy et al. [86K] in a silicon tube growth system, and by Ergin [71K] in surface radiation in two-floor enclosures. Rousse and co-workers [84K,85K] present a control volume finite element method to study 2-D problems involving all three heat transfer modes.

16.6. Intensely irradiated materials

Several papers deal with materials intensely irradiated by laser radiation or microwaves. Energy transfer and plasma formation under laser irradiation were studied by Gusíkov et al. [94K]. Stable and critical regimes in the laser heating of carbon particles are discussed in [96K]. Pfefer et al. [98K] use a YAG laser to investigate photocoagulation of albumen. The temperature response of an absorbing and scattering medium to laser irradiation is investigated by Tan et al. [100K]. Guo et al. [93K] report Monte Carlo simulations of short-pulse laser transport. Micro-wave sintering is studied in [97K]. A simulation of micro-wave and conventional ovens as well as hybrid ovens is reported by Haala and Wiesbeck [95K]. Samaras et al. [99K] present heat transfer computations for non-ionizing radiation in biological tissue.

16.7. Experimental methods

Only few studies of experimental methods are reported this year. Bertrand et al. [101K] report pyrometry applications in thermal plasma processing. Surface brightness measurements from satellites offer the possibility of mapping surface heat fluxes. Norman et al. [104K] present a dual temperature-difference method to minimize measurement errors. The transient temperature behavior of multistage cryogenic radiators is studied in [102K]. Hatchard et al. [103K] study the importance of radiative heat transfer in Li-ion batteries during thermal abuse.

17. Numerical methods

Simulation of fluid flow and heat transfer by numerical techniques has by now become a significant part of fundamental research and practical applications. Research continues in the development of improved techniques for heat conduction, convection and diffusion, phase change, radiation, and fluid flow. In this review, the papers that primarily describe the *application* of numerical techniques to specific physical problems are included in the appropriate application category. The papers that describe the development of numerical methods are reviewed in this section.

17.1. Heat conduction

A domain decomposition technique is used for solving 3-D finite-difference equations for heat conduction [3N]. The technique is further extended to a hybrid method involving finite-element and finite-difference formulations [4N]. Cheng and Wu [2N] describes a combination of grid-generation and conjugate-gradient methods for shape design.

Inverse heat conduction problems have received considerable attention. An approximate inverse has been applied to a 1-D problem [6N]. Two-dimensional nonlinear inverse problems have been solved by finite-element techniques [7N]. The inverse method is used to estimate fluid temperatures within an instrumented probe [1N]. Maciag and Al-Khatib [8N] investigates the stability of over-determined inverse problems. Laplace transforms are used to solve an inverse problem [9N]. A novel inverse methodology is used to estimate time-dependent heat flux [10N]. A 2-D inverse problem is solved to determine the unknown thermal conductivity [5N].

17.2. Convection and diffusion

A 2-D scheme is developed for convection and diffusion with linear production [11N]. A higher-order characteristics upwind method is described for unstructured grids [12N].

17.3. Phase change

A formulation based on the Second Law is applied for solid–liquid phase change [16N]. A fast and accurate way for solving phase-change problems is described [17N]. A network approach is proposed for modeling solidification in complex geometries [18N]. A moving-boundary method is used for the calculation of droplet spreading and solidification [19N]. Domain decomposition methods are applied to the aluminum casting process [15N]. A fixed grid finite-difference method is described for phase-change problems [14N]. An adaptive scheme is proposed for situations involving solid–liquid phase change [13N].

17.4. Radiation

An inverse radiation problem is solved using a conjugate-gradient method [22N]. A finite-volume scheme is presented for radiative heat transfer in semi-transparent media [21N]. Chai and Moder [20N] describes an angular-multiblock procedure for radiation.

17.5. Fluid flow

The SIMPLE algorithm and its variants for the solution of flow equations were originally introduced for a staggered grid. A number of papers describe extensions of the method for non-staggered or colocated grids. A method is presented for curvilinear non-staggered grid [33N]. An improved SIMPLE algorithm is described for a colocated grid [32N]. A pressure-based algorithm for non-staggered grids is applied to incompressible flows

[24N]. A colocated-grid, fully coupled algorithm is used for large eddy simulation of incompressible and compressible flows [23N]. A non-staggered, curvilinear-coordinate method is developed for free-surface flows [30N].

A unified formulation is described for SIMPLE-like segregated algorithms [29N]. A method is proposed for an automatic determination of relaxation factors for the SIMPLE algorithm [28N]. A SIMPLE-like conservative method is used for a transient flow [31N]. A new block-implicit method is reported for flow in rectangular enclosures [25N]. A numerical scheme based on Fourier expansions is presented for a 3-D flow [36N]. A treatment is described for flow problems with specified pressure boundary conditions [27N]. A 3-D *diagonal* Cartesian method is applied to complex geometries [26N]. A vorticity-stream function formulation is used for natural convection [35N]. A meshless method for laminar natural convection is evaluated [34N].

17.6. Other studies

The Second Law is used to impose a time-step constraint in transient calculations [37N]. A procedure is described for maintaining the heat-flux continuity in conjugate heat transfer problems [38N]. A boundary-domain integral method is used for conjugate heat transfer [40N].

A conservative flux-splitting technique is applied to multi-component flows [42N]. The volume of fluid (VOF) technique is extended to spherical coordinates [41N]. A higher-order upwind scheme is used to calculate wave propagation based on a hyperbolic two-fluid model [39N].

18. Properties

Experimental measurements of thermal conductivity for a host of systems, simple and complex, by a wide variety of methods distinguished the research in this section.

18.1. Thermal conductivity and diffusivity

For simple systems, results of experiments are reported for; Binary beryllium beds used in next generation fusion reactors, isotope effects on boron carbide diffusivity; monolithic carbon thermophysical properties; heat transport in He-3 below and above convection onset in a Rayleigh–Benard cell; parahydrogen–orthodeuterium solid solutions with varying concentrations (0.01–100%) of the latter; CH_4–Kr solid solutions with varying concentrations of the former (0.2–5%) at temperatures 1.8–40 K; NbTi superconducting wire and the influence of wire coatings; solid SF6 in the high-temperature phase; for tetragonal zirconia ceramic hemispherical total emissivity determinations from spectral analysis yields thermal conductivity data [3P,7P–9P,15P,18P,25P,31P,33P]. For more complex and practical systems further experiments provide data on: coal ash and synthetic ash samples: the relationship between effective conductivity of an evacuated powder and bulk conductivity of the same material; insulating properties for perpendicular-laid versus cross-laid lofty non-woven fabrics; rigid polyurethane foams blown with different hydrocarbons: nanosystems electron dynamics, suspension of nanophase powders in a base liquid and a novel temperature jump apparatus for observing transient temperature; Kapton HN between 0.5 and 5 K [4P,13P, 17P,22P,24P,26P,37P,38P,40P]. Suspensions in shear flow fields are studied, Bi-2223/Ag/barrier/Ag tapes with various oxide barrier materials evaluated, and the coupled heat and mass transfer in soils and mulches considered [11P,16P,29P,30P,36P]. With emphasis upon the experimental technique results are given for: Diffusivity in disk-shaped samples (graphite and boron nitride); hemispherical total emissivity (Vycor and fused silica glasses); emission spectroscopy (soot particle determination in ethane diffusion flames); in situ high-temperature conductivity measurement (impurity concentration on boiling surface crevice or a steam-generator element); flash method (effect of thin layer on diffusivity measurement) [14P,21P,23P,28P,32P].

Models are devised for a number of heat and mass transfer phenomena: The drying process of an anisotropic biological product (sweet potato); the period of crystal growth during frost formation; predicting the thermal performance of complex aerospace structures; cooling systems designed for optimum conditions including energy savings and quality of product; predictive models tested against conductivity data for soil samples at high temperatures (30, 50 and 70 °C); conductance of thin layers with randomly oriented composites using percolation theory [1P,5P,10P,19P,27P,34P]. Other analytical approaches are taken to study a number of problems: the conductivity, cellular structure and matrix polymer morphology of an assembly of chemically crosslinked, low density, closed cell polyolefin foams; spatially dependent conductivity (K_x) of heterogeneous materials; soil conductivity at very low moisture content and moderate temperatures; transient thermal behavior of composite material; determining temperature dependent properties from temperature responses measured at medium's boundaries; using an artificial neural network to determine conductivity detection response factors; conductivity of I-D Fibonacci quasi-crystals [2P,6P,12P, 20P,35P,39P,41P].

18.2. Diffusion

The few papers in this area are concerned with: the determination of the diffusion coefficient–vapor pressure product for 11 liquids from hanging drop evaporation measurements; irreversible thermal–diffusional coupling in local equilibrium; estimating the diffusion coefficient of tungsten and carbon introduced in liquid cobalt through the dissolution of tungsten carbide; the classical diffusion model of vibrational predissociation of van der Waals complexes [42P–45P].

18.3. Viscosity

Limited work in this area observe: the influence of fluid properties on electrohydrodynamic heat transfer in liquids under viscous and electrically dominated flow conditions; apparent molar volumes and viscosities of DL-α-alanine in water–ethanol mixtures; the crystallization fraction under shear using the shear flow rheometer (SFTR); the break temperatures of mould fluxes in continuous casting for steady-state and dynamic measurement of the viscosity. Viscosities for solutions of glycine, alanine, butyric acid, valine, leugine and serine aqueous urea have been calculated at four temperatures about 300 K [46P–50P].

18.4. Transport properties

A pulse method is used to measure thermal conductivity, specific heat capacity and thermal diffusivity of polycrystalline $ZnIn_2Se_4$ in the 300–600 K range. Analytical works describe: an improved dynamic molecular collision (DMC) model particularly suited for calculating viscosity and thermal conductivity values in rarefied gas flow; transport coefficient in non-equilibrium diatomic gas flow; simple methods for estimating diffusion, viscosity and thermal diffusion from collision integrals for a gas composed of carbon and nitrogen atoms [51P–54P].

18.5. Specific heat

Experimental works consider the role of system thermal conductivity when temperature modulate differential scanning calorimeter (DSC) is applied to measure specific heats of materials; a micro-calorimeter is employed to measure partial molar heat capacities of some saccharides in aqueous ura solutions; adiabatic vacuum calorimetry yields temperature-dependent heat capacities for hydrofullerene, $C_{60}H_{36}$; a calorimeter and densimeter are combined to measure heat capacities and densities of liquids and liquids with dissolved gas; optical dump probe spectroscopy measurements show the influence of the magnetic specific heat; for copper–tin (Cu–Sn) alloys rapid solidification experiments and cooling curves permit specific heats to be evaluated. An analysis indicates the impact of variable fluid heat capacities upon the performance of adsorption refrigeration cycles [55P–62P].

18.6. Thermodynamic properties

Differential scanning calorimetry is used to study isothermal curing of a thermosetting system, yielding data on reaction rate and heat transfer. Analytical investigations examine enthalpy, temperature and quality of non-azeotropic refrigerant mixtures in the phase-change region; the behavior of unsaturated moist air as given by the systems thermodynamic functions and their derivatives; a model of liquid crystalline polymer (LCP) fibers material during the manufacturing process; the influence of multipolar and induction interactions on the speed of sound; a mathematical model for computing thermodynamic properties in the liquid, gas, and two-phase domains using statistical thermodynamics; the thermodynamic properties of alternative fluid pairs for absorption thermal systems [63P–69P].

18.7. Miscellaneous

Experimental property data are reported for the following systems: soot-optical properties when produced from acetylene and ethene flames; a new segregated fluoroether with a global warming potential $< 3\%$ of comparable perfluorocarbon fluids and superior heat transfer performance; cubic majorite (one of the primary components of earth's transition zone) – bulk modulus; Inconel 718 – total hemispherical emissivities; metal and composite structural materials in aerospace applications – effect of surface heating on reflectance. A numerical heat transfer model predicts temperature profiles during high-pressure thawing [70P–74P].

19. Heat transfer applications – heat exchangers and heat pipes

Efforts center on enhancing heat transfer, fouling and other aspects of exchanger surfaces, mathematical modeling and analysis and factors affecting performance.

19.1. Compact heat exchangers

A group of papers gives the results of experiments for: an absorption heat transformer using the mixture TFE-E181, louvered fin-and-tube exchangers in wet conditions, evaporative heat transfer for R-22 and R-407C-oil mixture in a microfin tube with U-bend, heat transfer and pressure drop of R-22 in smooth/micro-fin tubes and heat exchange for compact plate exchangers used as evaporators and condensers in refrigeration loops [1Q–5Q].

19.2. Design

Heat exchangers can play a crucial role in avoiding pollution worldwide by an industrial design process which incorporates their use at the outset. Two shell-and-tube exchangers, physically alike in every respect, are compared for different flow configurations (regular versus chaotic advection flow) at Reynolds numbers from 30 to 30 000. Charts are derived to determine approximate area requirements for exchangers using plain and low-finned tube bundles. Other works show that: the main architecture of counterflow exchangers can be determined by thermodynamic optimization with volume constraint; computational fluid dynamics (CFD) numerical models are useful in the design or refit of pulverized coal – fired boilers; design of heat exchangers can strongly affect final heat exchanger network (HEN) synthesis; exchanger design influences system performance of silica gel absorption refrigeration systems and the heat transfer and flow characteristics of slit fin exchangers [6Q–14Q].

19.3. Enhancement

A host of papers describes the efficacy of various means of enhancing heat transfer. Thus thirty-six exchanger (12 plate-fin, 12 wavy-fin and 12 louvered-fin) geometries were tested for heat transfer and pressure drop characteristics. The carbon steel spirally fluted tube in investigated as a replacement for the smooth copper tube normally used in high-pressure preheaters of power plants. Airside performance of fin (and superslit fin)-and-tube exchangers with plain fin configurations is determined by testing 18 samples. Other investigations consider the use of acoustic resonant standing wave fields, an anionic surfacant, the effect of a single oblique pin fin on endwall heat transfer, and a new tube – the inside and outside spirally triangle finned tube (10STF Tube). Experiments also include work on special systems or conditions: wavy fin-and-tube exchangers under dehumidifying conditions, finned water wall tube in fluidized bed boiler, inserts for a recuperator, annular finned pyrolyser, spray towers with and without fin coils, and condensate carryover in dehumidifying, finned tube exchangers [15Q,16Q,19Q,20Q,22Q–25Q,27Q,30Q,33Q–35Q,37Q].

Analytical efforts include correlations, visualization and numerical computation, comparisons of mathematical models and the assessment of specific enhancement designs. Correlations are given for heat transfer and friction characteristics of plain fin-and-tube exchangers, generalized friction effects for lovuer fin geometry, and airside data for plain fin-and-tube exchangers in wet conditions. Flow visualization and numerical computation examine the influence of fin spacing on the over-tube side of a single row fin tube exchanger. Three different mathematical modes are compared for their ability to account for the augmented heat transfer of in-tube flows in the presence of an array of equally spaced plate fins attached at the outer surface. Other efforts consider vortex generators (delta winglet pairs) for plate-fin heat transfer enhancement, a model for condensation heat transfer on a horizontal finned tube with non-condensible gases present, enhancement and heat exchanger network retrofit, performance assessment, and a survey of recent fin-and-tube exchanger patents [17Q,18Q,21Q,26Q,28Q,29Q,31Q,32Q,36Q,38Q].

19.4. Fouling and surface effects

Efforts continue to understand, control and prevent the fouling of heat transfer surfaces. These efforts include: the influence of surface energy and surface roughness on calcium sulphate deposition, the use of paint protection to control corrosion and fouling of thermosyphon economizer tubes, long-term fouling tests of cooling tower water flowing in enhanced tubes to determine the mechanism of fouling, and the effect or operating parameters on the deposition of calcium sulphate and calcium carbonate mixtures – the most common constituents of heat transfer surface scale. Other works treat: thermal resistance measurement of porous deposits under single-phase forced convection and flow-boiling conditions, the fouling of two types of copper-modified surfaces of low surface energy, the fouling of alloy-800 surfaces by magnetic particles, and the use of an organic monolayer coating to promote dropwise condensation. Preventive and cleaning approaches involve novel biological inhibitors developed by protein and genetic engineering, the use of the antiscalant polyphosphonate, relative merits of four scale-removal methods, and enhanced cleaning of whey protein soils using pulsed flows [39Q–42Q,47Q–50Q,52Q,59Q,61Q–63Q].

A comparable analytical and mathematical modeling effort addresses fouling and related matters of economics, optimal cleaning programs and thermodynamic performance. A new composite model is proposed for $CaSO_4$ fouling which accounts for both crystallization and particulate fouling and predicts fouling resistance during cleaning and fouling cycles. A mathematical model for initial chemical reaction fouling is tested and a new strategy described for mitigating exchanger fouling by modifying molecular interactions at the interface between heat transfer surface and the/adjacent deposit. A cost model is proposed linking maintenance and thermal performance of exchangers, a related work uses entropy generation to represent the effect of fouling and a third effort gives a probabilistic approach to represent fouling models in common use. Heat exchanger networks (HENs) are involved with scheduling short-term cleaning, retrofitted using pinch analysis, and a dynamic neural network control models predictive control strategy. Concluding works describe a fault diagnosis method for early detection of fouling and review composite fouling of aqueous exchangers [43Q–46Q,51Q,53Q–58Q,60Q, 64Q].

19.5. Mathematical modeling/analysis

The scope of work in this section embraces condensers, evaporators, a variety of heat exchangers, exchanger networks, control, and regenerators. The emergency condenser of an innovative boiling water reactor (BWR) is simulated; the divided condenser of a molecular evaporator modeled and the geometrical and operating parameters for evaporative coolers optimized. Parallel-plate, double flow and counterflow double-pass exchangers, created by inserting an insulated or impermeable sheet, are analyzed. Other works consider: a lumped parameter model of operating limits of a one-well geothermal plant exchanger; parallel-flow exchangers with ambient interaction; heat and mass transfer for parallel air flow and falling desiccant film; comparison of 1- and 2-D models for wet-surface fin efficiency in a plate-fin-tube exchanger; a "gray box" model for exchanger fault detection and diagnosis; and the modeling of the controlled atmosphere brazing (CAB) process for automotive aluminum radiation manufacturing. A new nonlinear model for exchanger network refit considers the distribution of heat transfer area and pressure drop and the robustness of fuzzy control as applied to a thermal plant is described. Regenerators are the focus of works: solving the set of partial differential equations which physically model blast furnace stoves, using Second Law exergy analysis, linking heat transfer to pressure drop, to assess performance, and analyzing transient behavior of a regenerator bed using a hyperbolic dispersion model [65Q–80Q].

19.6. Performance-factors affecting

A number of works approaches exchanger performance from the Second Law of thermodynamics. A cross-flow plate heat exchanger with unmixed fluids, analyzed for balanced flow, identifies the exchanger characteristics which determine the minimum entropy generation number. A wet cross-flow exchanger operating at various weather conditions is examined from Second Law principles and the concept of an isentropic heat exchanger with regenerative work transfer is developed. Following a review of various second law approaches, a rational method is presented which satisfies physical requirements. Low temperature condensation data are given for hydrogen with various exchanger geometries and the energy transfer mechanisms at the solid/liquid interface between liquid He-3 and Ag sinter heat exchangers. Disuniformities of fluid properties and maldistributions are considered for their effect on condenser and evaporator performance. Experimental data for a single circuit, multi-pass heat exchanger, typical of an element of a packaged air conditioning unit, validates a cross-flow exchanger program (ACOL5) for air conditioning applications. A standard methodology is recommenced for data reduction, when obtaining air-side performance of fin-and-tube exchangers, which should improve the development of correlations or performance comparisons [81Q–93Q].

19.7. Power and reversed cycles

Experimental results are reported for several systems: low- and high-temperature performance of a single stage superfluid stirling refrigerator (SSR) using a plastic recuperator; performance of a heat pump system using hydrocarbon refrigerants (single component – propane, isobutane, butane and propylene and binary mixtures – propane/isobutane and propane/butane); and existing data utilized to correlate performance impacts attributable to liquid – suction exchangers of refrigeration systems. Analytical and numerical works range over a number of systems as well: the rotary system for continuous cooling by solid–gas sorption is modeled by counter-flow heat exchangers in series; a numerical model proposed to investigate the performance of air-cooled condensed coils; the effect of oscillating flow of gap fluid on shuttle heat transfer in reciprocating expanders analyzed; the generator performance of a lithium bromide – water vapor absorption chiller estimated; the performance of liquid desiccant cooling systems simulated to facilitate the development of energy efficient alternatives to conventional air conditioning practices; and the orifice pulse tube refrigeration modeled, showing an association of refrigeration load and entropy flow [94Q–102Q].

19.8. Shell and tube/plate heat exchangers

For shell-and-tube exchangers an algorithm provides a cost comparison between an optimized, enhanced tube heat exchanger and one with optimized plain tubes. A physically based model is developed to predict void fractions for upward cross-flow through horizontal tube bundles in good agreement with measurements for R-11 and air–water mixtures. Turbulence-induced tube vibrations due to baffle plates with flow hole nozzles is reported and an editorial promise that "real-world experiences" will be regularly published for practicing heat transfer engineers. For plate exchangers, observations of nucleate and convective boiling (of CFC114) in plate fin units are reported and heat and fluid flow in corrugated-undulated plate devices investigated. Analytical efforts consider: the hydrodynamical and thermal character of corrugated channels using computational fluid dynamics; the transient response of multi-pass exchangers based on axial heat dispersion with deviation from ideal plug flow accounted for; the numerical investigation of

2-D forced convection heat transfer over a plate with protruded transverse groove fins; a general calculation method which allows a determination of temperature profiles simulation of wall heat flux and dispersion in exchanger passages; and the investigation of falling film and bubble types of the ammonia–water absorption process [103Q–113Q].

19.9. Thermosyphons/heat pipes

Micro and miniature heat pipes and the novel application of heat pipes distinguish the papers of this section. Three coupled models (for the micro-region, 2-D wall conduction and longitudinal capillary two-phase flow) predict 3-D steady-state in a micro-heat pipe array. Thermosyphons employing enhanced structures offer an alternative to liquid immersion and are suitable for point cooling applications as very compact evaporators. The radially rotating, miniature, high-temperature heat pipe is wickless; its performance is analyzed by appropriate flow and heat transfer models and experimentally tested. Flat miniature heat pipes are optimized using existing and new data and quasi-Newton algorithms.

The performance of conventional gravity assisted heat pipes and modified heat pipes with a separator in the adiabatic section is investigated experimentally, as is the performance of a flat-plate heat pipe. Analytical studies consider: thermal transients in a capillary evaporator prior to boiling initiation; transient characterization of flat-plate heat pipes during startup and shutdown phases; the effect of dimensionless parameters on heat transfer characteristics of an inclined, closed, two-phase thermosyphon at normal operating conditions; and a unique thermosyphon condenser designed to utilize drainage disks in the condenser to improve heat transfer. Several papers report special recent application of heat pipes: the capillary pumped loop (CPL) for cooling spacecraft and telecommunication devices, incorporation of heat pipes in a latent heat storage unit used in the low energy cooling of buildings, waste heat recovery using heat-pipe heat exchanger (HPHE) in hospital surgery rooms, and the application of miniature heat pipes for mobile PC cooling systems [114Q–127Q].

19.10. Miscellaneous

Scraped surface heat exchangers are investigated for electrodiffusional wall shear rate, temperature heterogeneities at exchanger outlet and residence time distribution modeling (RTD) of food product by a neuro-computing approach. The rapid cooling of hot foods is studied using various high-heat transfer rate devices. Evaporation rate of an electron-beam evaporator is modeled allowing for interaction effects between the beam and the evaporant. In an industrial environment an adaptive, nonlinear control method is successfully applied. A series of papers describes efforts to improve the energy efficiency and environmental quality of industrial and commercial processes: energy saving and pollution control in ultra high-power electric-arc furnaces, recirculating fluidized bed (RCFB) incineration of solid, liquid, gaseous wastes – energy equations and performance, desiccant air conditioning systems incorporating rotary heat and mass exchangers, thermal behavior of closed wet cooling towers used with wet ceilings. Downflow tube-reactors have attracted attention for their ability to promote heat and mass transfer and accelerate high-temperature gas–solid reactions for fine powders. A brief review presents research progress on dropwise condensation heat transfer in China for the past decade [128Q–139Q].

20. Heat transfer – general applications

20.1. Buildings

Computers have become an indispensable tool for engineers having to predict energy histories of buildings and similar structures. Many contributions in the literature propose and describe how to perform energy balances by computer analysis for structures to be heated or cooled through ventilation or climatisation. Paper [11S] suggests how to plan a heat transfer analysis effectively for multi-zone buildings. The prediction of velocities and temperatures in naturally ventilated buildings is discussed in [12S]. An experimental technique to determine heat transfer functions is based on a neural network [4S]. Turbulent flow is simulated [13S]. Paper [14S] presents a mathematical model that simulates local velocities and temperatures in 3-D building models for given meteorological conditions. Experiments and computer simulations are performed [10S] in residential applications for different insulation levels. The temperature rise in concrete nuts was measured under adiabatic conditions [9S]. The finite element formulation and the numerical strategy for the analysis of a telescope building is developed [6S]. The measured temperatures in a ground floor slab were simulated in [2S] and compared [1S]. The optimal distribution of thermal insulation of underground structures is minimized [5S]. Giaconia and Orioli [7S] describes how to calculate transfer function coefficients. The paper [3S] calculates fire growth in industrial cable arrays. The dispersion of vapor from an accidental fire is calculated [8S] for a building.

20.2. Meteorology

The energy budget of the ground surface and the air boundary layer above was measured [21S] in the wet savanna. A paper [22S] explores the need for a more complex formulation of the vegetative energy balance. Sensible heat flux radiometric surface temperature measurement is discussed [24S]. An urban surface temperature model with turbulent heat fluxes is presented [27S]. The sensitivity of a regional climate model is improved by a reflective upper boundary condition [26S]. A numerical model of the hydrodynamic structure of an artificial lake was designed [16S]. Temperature anomalies and the decay of wave induced turbulence near the ocean surface was interpreted as a consequence of wave breaking. A paper [18S] discusses the mantle convection process. The temperature observations in the near surface layer of the ocean reveal brief fluctuations due to wave traveling [23S]. Simulation with the Miami Ocean Model (MICOM) explored its accuracy [29S]. The atmospheric response to spatial variations of the concentration in the Southern Ocean is discussed [20S]. The paper [17S] describes the thermal regime of retrogressive thaw in the Yukon Territory. A method to identify changes in the structure of a solid is based on heat transfer studies [31S] in Argentina. A 2-D model [30S] studies heat transport during the evolution of the Baikal rift. The sensible heat flux is estimated [28S] from the radiometric temperature over a crop canopy. Numerical models of transient fluid flow and heat transport are compared with and without buffering in basement rocks [25S] in the Arcoma foreland. Numerical simulation of coupled, thermal, hydraulic and mechanical behavior is validated [19S] by experiments and numerical simulation. A critical injection rate [15S] determines simulation of effectiveness parameters for laboratory scale simulation of steam injection in oil recovery.

20.3. Thermodynamics

The optimum thermodynamic match between two streams at different temperatures is determined by maximising the power generation associated solely with the stream to stream interaction [38S]. Three problems are considered in [37S]: (a) maximal work produced in a thermodynamic system in finite time; (b) minimal work to be done in order to transform an equilibrium system into a number of subsystems and (c) maximal power obtained in a finite time. Cogeneration of various energy forms in a single equipment depends on the thermodynamic parameters of the system [36S]. In a Lenoir cycle with regenerative heating, the entire positive work is available for external consumption [35S] since the negative work is supplied by the atmosphere. The optimal heating and cooling rates for the reversed Ericsson cycle with ideal regeneration is determined [33S] for heat pump operation. Ref. [34S] fluid dynamic analysis provides useful insight into heat transfer processes in electronic systems [32S].

20.4. Engines

A numerical simulation analyses the transient in a solid rocket ignition process [40S]. The k–ε model with a wall function describes wall turbulence. Transient heat transfer and water condensation in the engine exhaust system influence the conversion of carbon monoxide, hydrocarbons, and nitrogen oxides in the convertor of an engine in cold start [39S]. Local convective heat transfer is started from a coaxial rotor to the crown shaped stator experimentally [41S]. The results of flow visualisation in turbomachinery are discussed [42S]. A new turbulent flow system consisting of a cruciform burner with two cylindrical vessels is proposed [43S]. A 3-D finite element heat conduction code was developed to calculate the temperature distribution in the three piston head and cylinder liner of a heavy duty diesel engine [44S].

20.5. Nuclear reactors

A thermal mockup of a simulated CANDU 3T bundle within a fuel basket was studied experimentally [45S] to obtain fuel rod temperatures. An analytical model computed the two 2-D velocity profile of the hot fuel elements of a pressurized water reactor core [51S] following a break and loss of coolant. The pyrolysis of n-butane initiated by methyl radicals was studied in the temperature range 750–1000 K in a quasi-wall-free reactor [46S]. Corrosion products in the secondary system of a pressurized water reactor accumulated in the steam generator in regions of stagnant flow. The paper [50S] describes such a sludge collector. Experimental information was obtained [49S] on the temperature of fuel elements in the transcritical region. Sodium experiments on a scram transient experiment [47S] clarified flow and heat transfer in a fast reactor core under natural circulation conditions. The use of large scale storage systems for spent fuel is considered in Japan. The present experiment [48S] studies the heat removal from the vault storage system with passive cooling in a 1/5 scale model. The Richardson number appears to be the most representative parameter.

20.6. Chemical reactors

Radial velocities due to temperature gradients are calculated [53S] inside a continuous annular Chromatograph Simulation software. Modern hydrocarbon absorbers are promising candidates [64S] for cold start emission control of gasoline engines. A model of a charring heat shielding material is used [66S] to investigate heat and mass transfer at high temperature. A paper considers the extraction of power from a stream of hot gas [77S]. The vapor deposition process of silicon is modeled [55S] numerically. A 3-D model [76S] predicts the temperature distribution in a proton membrane fuel cell. Data are presented on hydride storage for a fuel cell [67S]. The integration of a steam reformer in a fuel cell is examined. Closed form expressions are derived [58S] for the bulk mean and the catalyst temperature of a catalytic converter. The velocity vectors and the strain rate distribution were measured [71S] for the first time in a baffled column. The film blowing process was numerically simulated [74S]. The heat transfer coefficient in a helical agitator was calculated [75S] based on experimental data. Chemical vapor deposition of crystalline diamond films is studied [59S]. Chemical deposition of a thin film on a moving surface is numerically investigated [54S]. The Maxwell–Stefan method with proper approximations was used to model mass transfer in distillation columns [52S]. Another model for the design of distillation columns is imported [81S]. The vapor deposition in a horizontal chemical reactor is analyzed based on the basic 3D flow, heat, mass transfer equations [72S]. The same equations are used [56S] to optimise a vapor deposition reactor. Chemical deposition in free molecular gas flow through cylindrical channels is analyzed [62S]. Fast drying can reduce granulation time by half [69S]. An increased utilization of biomass for heat and power production can reduce emissions of CO_2 [78S]. The heat transfer coefficient is found experimentally to increase in a cyclone separator with circulation rate and as velocity [60S]. The operating parameters of tubular coking heaters can be predicted by mathematical modeling [79S]. A reformer model for a molten carbonate fuel cell [61S]. A mathematical model simulates the temperature in molten carbonate fuel cells [63S]. A novel moving and stirred bed reactor achieves thermal decomposition of tyre particles in vacuum [80S]. A general model simulates a sludge reactor operational for dispersive flow [68S]. The hot blast stoves at the Ispatt steel facility in Chicago are controlled based on a dynamic model [70S]. The pyrolysis of coal in a furnace is modeled [73S]. Numerical methods describing combustion kinetics in coal fixed boilers is described [57S]. Frontiers in refrigeration and cooling at very low temperatures are discussed [65S].

20.7. Manufacturing and processing

The thermal storage characteristics of aluminium plates are discussed under heating in electrical and natural gas furnaces [112S]. A method for the simulation of temperature stabilisation in tools during multi-cycle cold-forging operations combines thermo-mechanical plastic simulation and heat transfer [109S]. A model calculates interphase pressure in order to predict the heat transfer in spot welding [95S]. A model [100S] calculates heat transfer in down grinding. The transient slab temperature distribution in the reheating furnace for rolling of steel slabs is predicted [97S]. Calculations and local temperature measurements determine [89S] thermal crowning in work rolls left in air to cool. The effect of scaling and emulsion delivery on heat transfer during hot rolling of steel strips is examined [111S]. The surface heat transfer coefficient and the appearance of the surface of the strip depend on process variables [103S]. Rapid thermal processing has become a key technology in the fabrication of advanced semiconductor devices [104S]. A paper [92S] describes the computer simulation of the deep narrow extrusion of a thin-walled cup. Deformation and temperature are simulated for hot backward extrusion by an elastic and rigid-plastic finite element method [91S]. Steady state 3-D analysis studies [102S] 3-D extrusion using automatic mesh generation.

The simulation of heat transfer and cure in pultrusion predicts these processes well [105S]. A heat transfer model coupled with an optimization scheme is presented in [84S]. A finite element analysis [110S] is supported by temperature measurements with embedded thermocouples. A computational scheme determines optimal conditions and geometry for a continuous quenching process [85S]. The internal structure of steel bars after treatment with the Temcore method are predicted mathematically [83S]. Minimills are introducing mould powder as lubricant for the continuous casting of steel billets. An experimental study [108S] investigates this. The location of the phase-change interface and the temperature field are calculated for a continuous casting process [88S]. Experiments study hot dip coating of steel with Al–Zn–Si alloy [87S]. The Kirchoff transformation is used to simplify the equation describing the heat transfer in continuous casting of steel [90S]. A 3-D model simulates the die-casting process [94S].

Heat transfer in the weld pool and work piece are studied in arc and beam welding [106S]. Analysis describes heat flux in multiple pass welding [113S]. The methods described above are also used for the study of manufacturing processes of polymers [82S,86S,93S,96S, 98S,99S,101S,107S,114S].

20.8. Food processing

Baking conditions were observed for two multi-zone industrial ovens temperatures, air velocities, and humidity were measured [115S]. The coupling between electromagnetics and heat transfer were studied through changes in dielectric processes during heat transfer [125S]. Application of process engineering methods have recently improved the understanding of the principles in deep-fat frying. The heat transfer coefficient in steam retort processing was measured [124S].

A neural network was used to predict temperature, moisture, and fat transfer in foods coated with edible films [123S]. A neural network was developed to predict temperature and moisture during thermal processing of frankfurters [119S]. Temperatures predicted by a 2-D model were in good agreement with measured values [118S]. The numerical model provided a useful tool to evaluate batch high-pressure processes of foods [117S].

Heat and mass transfer processes in cold storage of food and vegetables are studied [116S] and natural losses are measured [121S,122S]. The temperature rise in packaged frozen food is modelled numerically in the distribution chain [120S].

21. Solar energy

Papers are broadly divided into solar radiation, low-temperature solar applications, building applications, and high-temperature solar applications. Papers on solar energy or energy conservation that do not focus on heat transfer, for example, papers on photovoltaics (except for those that deal with building integrated components), wind energy, architectual aspects of building design, and control of space heating or cooling systems are not included.

Papers that do not fit into one of the technology areas include an overview of the US Department of Energy ís Office of Solar Energy Technologies [2T], an analysis of solar energy technologies from an environmental standpoint [3T], and an evaluation of renewable options to generate electricity [1T].

21.1. Radiation

The purpose and status of the US SURFace RADiation budget observing network (SURFRAD) established in 1995 to support satellite retrieval validation, and climate, hydrology and weather research is described in [4T].

Several papers analyze and interpret data for specific sites. Craggs et al. [5T] look at the effect of the duration over which averages of solar irradiance are computed on the short-term prediction of solar irradiance of an urban site in the UK. Jacovides et al. [8T] use spectroradiometric measurements taken in Athens in 1995 to investigate the influence of gaseous pollutant and aerosols on the spectral radiant energy distribution. Utrialls et al. [19T] compare spectral values of the aerosol optical thickness measured in Valencia, Spain from 1993 to 1997 to boundary layer aerosol models in ZD-LOA and LOWTRAN7. Udo [18T] uses clearness index and relative sunshine to characterize sky conditions in Nigeria. He recommends an empirical expression relating monthly maximum clearness index and monthly average clearness index for tropical locations. Soler [16T] expresses zenith luminance for cloudless skies in Madrid as a function of solar elevation. Pereira et al. [10T] show that models based on clear skies overestimate incoming solar radiation in Brazil by as much as 44%. The discrepancy is attributed to burning of biomass. The aerosol radiative forcing and stratospheric temperature response of the Mount Pinatubo volcanic eruption are evaluated using updated spectral optical property data in [11T]. Global and diffuse radiation pyranometer measurements in a Mediterranean location are used to investigate the diurnal and seasonal variations of atmospheric turbidity using Linke's factor [12T]. Ianetz et al. [7T] present a statistical analysis of global and beam radiation to compare the suitability of sites in Israel for utilization of solar energy.

Many papers present new or modified modeling approaches to evaluate measured data. [6T] discusses two new models to predict monthly average hourly global irradiation distribution from daily values. A quadratic in the sine of solar elevation is found to fit measured data well at 135 locations. A clear sky model developed in the framework of the new digital European Solar Radiation Altas (ESRA) is compared favorably to other models and ground measurements [13T]. Sfetsos and Coonick [15T] introduce a new artificial intelligence based method for forecasting mean hourly global solar radiation on a horizontal surface. Mohandes et al. [9T] use radial basis functions to estimate monthly mean daily radiation on horizontal surfaces. Sen [14T] presents a solar irradiance polygon concept for evaluating variations of monthly, seasonal and annual global irradiation. Suehrcke [17T] presents a relationship between the duration of sunshine and solar radiation on the earth surface. The relationship is derived from monthly average values of daily beam radiation which are used as a measure of the fraction of clear sky. The relationship is validated for sites in Australia and is suggested to be universally applicable.

21.2. Low-temperature applications

Low-temperature solar applications include domestic water heating, space heating and cooling, desalination of water, cooking, waste treatment and solar ponds. Within this category, papers on non-concentrating solar thermal collectors and thermal storage are discussed.

21.3. Flat-plate and low-concentrating collectors

A special issue of Solar Energy includes papers on new concepts and testing methodologies for flat-plate solar collectors. Low-cost antireflective covers made with porous media and by subwavelength surface relief structures embossed in sol–gel materials improve solar transmittance by 6% [23T]. Several papers address improved absorbers. Colored absorbers intended to better integrate with buildings were evaluated in [33T]. The behavior of selective surfaces is the subject of [20T,26T, 32T]. A procedure for accelerated life testing of absorber surfaces developed by the International Energy Agency is presented in [21T].

A critical review and comparison of nine dynamic test methods for flat-plate collectors is given by [29T]. [30T,31T] model the effects of various environmental and geometrical parameters on the performance of unglazed water film collectors. Kumar and Prasad [27T] investigate heat transfer enhancement due to the use of twisted tape inserts in traditional water flat-plate collector tubes. Experimental results include heat transfer rates and pressure drop. The effect of dust on transmittance of low-density polyethylene glazing is measured by [28T]. Tsilingiris [35T] proposes a polymer absorber concept for solar water heating. Vieira et al. [37T] present a semi-empirical approach to determine the void fraction in boiling collectors. Two prototype CPC collectors with flat bifacial absorbers were tested by Tripanagnostopoulos [34T]. Maximum efficiency was 0.71 with a stagnation temperature of 180 °C.

Collectors for heating air are discussed by Gao et al. [22T], Hegazy [24T,25T], and Verma and Prasad [36T]. Based on a numerical model, Gao et al. [22T] present geometric arrangements that most effectively suppress natural convection heat loss from a cross-corrugated absorber. Hegazy [24T] estimates the optimum channel geometry for collectors with flow over the absorber and on both sides of it. In a separate paper [25T], he extends the analysis to collectors that combine photovoltaic cells and air heating. Heat transfer and pressure drop characteristics of roughened absorbers are expressed in terms of a dimensionless roughness Reynolds number by Verma and Prasad [36T].

21.4. Water heating

The use of polymeric materials in solar water heating systems is considered in [39T,41T,43T]. Raman [43T] and Liu [41T] evaluate polymers for possible use as heat exchangers and analyze their effect of overall heat transfer rates. Janjai [39T] models a plastic solar collector installed on a hotel in Almeria, Spain.

Kalogirou [40T] uses an artificial neural network to model the long-term performance of 30 water heating systems in Greece. A successful project to provide hot water to a correctional facility in Arizona is discussed by May et al. [42T]. Wang [44T] tests a new hybrid water heater and adsorption icemaker.

Water heating for maintaining the temperature of a biogas reactor is evaluated in [38T].

21.5. Space heating and cooling

Papers that address solar air collectors are presented in the section on flat-plate collectors (see the discussion of [22T,24T,25T,36T]). This section presents papers on heat pump and refrigeration systems.

Ground source heat pumps systems are the subject of [47T] and [50T]. Chiasson et al. [47T] describe the development and use of a model of a hydronic pavement heating system which is a supplemental heat rejector for a commercial building heat pump system. Kaygusuz [50T] presents limited data and a model of a specific system operated over one heating system.

Gordon and Ng [49T] discuss the performance improvements in absorption cooling made possible by recent advances in solar fiber-optic mini concentrator systems and solar-fired gas micro-turbines. Alizadeh [45T] models two regenerative chillers and compares COPs. Boubakri et al. [46T] predict ice production in an adsorptive icemaker as a function of component size. Enibe Iloeje [48T] analyse heat and mass transfer in a $CaCl_2$ pellet – NH_3 system. Measured heat transfer data obtained for saturated nucleate boiling of water/ammonia, ammonia/lithium nitrate, and water/lithium bromide indicate that average heat transfer is greatest in the ammonia/water mixture [51T]. The use of metal wire gauze coated with zeolite to improve heat and mass transfer in the solar collector is proposed to increase COPs in solar adsorption heat pumps [52T]. Wijeysundera [53T] models a solar adsorption system with an idealized three heat reservoir cycle and suggests that this method provides realistic limits and trends for cooling capacity and COP. Zhang [54T] presents a 3-D non-equilibrium model of heat and mass transfer in the absorbent. With some modification the model can be used for system optimization.

21.6. Storage

Most papers in this section address latent heat storage. Storage in building components (e.g. walls and floors) is discussed in Buildings. Models of solid–liquid phase change are presented by [55T] for a paraffin wax–air spiral unit, [57T] for a horizontal elliptic cylinder, and [56T] and [60T] in cylindrical tubes. Kiatsiriroat et al. [61T] develop an empirical expression to evaluate the volumetric heat transfer coefficient for solidification of thiosulphate pentahydrate. Experimental data and a model of temperature and void distributions in thermal storage canisters for heat receivers of solar power systems are presented in [59T] and [62T].

The sole sensible heat storage paper discusses soils up to 90 °C [58T].

21.7. Solar desalination

Papers in this section are restricted to solar distillation. Most present models and optimization of specific solar still designs based on traditional concepts [63T,65T,68T–70T]. Mandani et al. [66T] model an evaporation process combined with a lithium bromide water absorption heat pump. Experimental data are presented in [64T] and [67T].

21.8. Cooking

The international standard for testing solar cookers is presented in [71T].

21.9. Waste treatment

Although only two papers appear in this review, there is increasing interest is the use of solar energy to treat waste. One method is photocatalytic destruction. Ajona [72T] report on the on-going efforts to commercialize the technology and provide an economic analysis of a one-sun compound parabolic concentrator (CPC) system. Nakamura [73T] considers a different technology to remove non-aqueous phase liquids, hazardous metals and radionuclides from the ground. Concentrated solar energy is transmitted to the contaminated site by optical fibers. Wastes are removed by soil vapor extraction.

21.10. Solar ponds

The archival literature contains increasingly fewer papers in this area. In 2000, two papers appeared. [75T] gives a critical review of the empirical and theoretical equations describing evaporation rates from large free water surfaces. Rivera [74T] conducted experiments to simulate the heat input of a solar pond to an absorption heat transformer.

21.11. Buildings

This section includes papers on characterization of energy consumption, and heat transfer in walls, roofs, floors, and glazings.

Models to estimate building heat and cooling loads continue to be refined. Rees [97T] presents a qualitative comparison of the ASHRAE heat balance method to the radiant time-series method and the admittance method used in the UK. Anderson [78T] describes a dynamic building stochastic model and uses it to model a residential building. Li [93T] describes a procedure for calculating hourly solar gain factors for horizontal and vertical surfaces. The method is used for the City University of Hong Kong and compared to the ASHRAE clear sky approach.

Other modeling efforts address specific building components. A 3-D transient model of a lattice solar heating wall is used to analyze the sensitivity of performance to structural parameters and to compare performance to that of a Trombe wall [87T]. The thermal dynamics of a phase change material wallboard subject to diurnal temperature variations is examined in [95T]. Studies of floors consider steady periodic conduction in slab floors [85T] and the influence of solar radiation and floor covering on floor temperature and energy consumption in floor heating systems [79T]. A parametric study of the effects of shingle absorptivity, radiant barrier emissivity, ventilation flow rate and roof slope on the performance of radiant barriers is based on a heat balance model [94T]. Experimental study of heat transfer processes in passive finned wall is presented by Bilgen [81T].

There is growing interest in integrating photovoltaics (PV) into building design. Brinkworth [83T] presents a simplified method to estimate mass flow rates in naturally ventilated PV cladding. Yang [100T] examines heat transfer across a PV wall and predicts cooling loads contributed by such walls. An optical analysis of concentrating covers for building integrated PV is used to determine optimum tilt angles and to compare performance to flat PV covers [101T]. Multi-functional facades consisting of a transparent glazing and an opaque PV section are modeled and optimized for European locations [99T].

Many papers in the building area address coatings for glazing and other window treatments. New developments in films and coating used in switchable windows are reported in [89T–91T]. Alvarez [76T] considers transient 2-D heat transfer in a cavity with one wall with a solar control coating. Measured optical properties of a thin holographic optical element indicate that the visible light is split from the infrared, thus providing a means of separately controlling daylighting and solar gain [82T]. The angular dependence of total solar transmittance is modeled for multiple pane and coated windows [88T]. An apparatus and methodology to evaluate thermal performance of glazing are presented in [77T]. Leftheriotis [92T] also presents a method of measurement of overall heat transfer characteristics of building components. The overall heat transfer coefficients of single and double paned windows fitted with a long wave high reflectivity venetian blind are measured [86T]. Baker [80T] measured heat exchange of a double paned window used to preheat room air. Total reflectance and transmittance of glass coated with a paint made of silica particles coated by titania and then dispersed in polymeric binder were measured [98T]. The authors suggest the pigments be useful for sunscreens or foils for daylighting and radiative cooling.

Daylighting with light pipes is modeled by Chirarattananon [84T]. Performance of six light pipes was measured in three building areas [96T].

21.12. High-temperature applications

High-temperature solar thermal applications require use of concentrated solar energy. Uses include electricity generation, thermochemical reactors and industrial process heat. Papers address processes as well as system components such as heliostats, concentrators, and receivers/reactors.

Studies of concentrators include presentation of a design method for a two stage ultra flat non-imaging compact 2-D device [104T]; accelerated measurement of the long-term optical properties of aluminized reflector materials; and testing of a new rectangular cross-section secondary concentrator at the Weizmann Institute in Israel [106T] [114T]. Mills [110T] evaluates Fresnel reflectors for large-scale tower-based solar thermal electricity plants and by Larbi [108T] for operation in fixed aperture mode for medium temperature processes (200–300 °C). An approach to optimize reflector shapes for non-tracking cylindrical absorbers and reflectors is presented in [111T]. Kribus and co-workers at the Weizmann Institute consider several approaches to using optical fibers for power generation systems [107T]. Heat losses from two dish-type receivers at the Korea Institute of Energy Research are analyzed in [112T].

Theoretical papers on heat engines address factors affecting optimum power and efficiency of a Stirling cycle [103T] and the upper limit on efficiency of cyclic heat engines [113T].

Solar thermochemical processes continue to gain attention. Coal gasification is the topic of [102T] and [109T]. Belghit [102T] models heat and mass transfer in a moving chemical bed reactor. Matsunami [109T] conducted experiments to evaluate bubbling carbon dioxide through a molten salt storage medium.

Other topics related to high-temperature solar applications include solar thermal propulsion for satellites, orbit-to-orbit transfer systems and launch vehicles [105T] and solar power plant chimneys [115T]. For space applications, solar concentrators are used to achieve temperatures greater than 2200 K in compact absorbers. The heat is transferred to flowing hydrogen to produce high-energy thrust or to thermionic or alkali metal thermoelectric converters to generate electricity. The paper on solar chimney power plants models compressible flow through chimneys as tall as 1500 m [115T].

22. Plasma heat transfer and magnetohydrodynamics

22.1. Fundamental investigations on plasma heat transfer

Two publications deal with determination of plasma properties. Capitelli et al. [3U] present a model for collision integrals for species in air over a wide temperature range, to be used for calculations of transport properties. Murphy [6U] presents a review of eight different methods to calculate diffusion in thermal plasmas, and concludes that the self-consistent effective binary diffusion coefficient approach is the most accurate. The effect of inserting solid or porous material into an electrical discharge has been modeled by Sawicki and Krouchinin [9U], and relations between the electrical characteristics and the fluid dynamics and the geometries of the discharge are presented. A model of a turbulent plasma jet is presented by Liu et al. [4U], and the results are shown as dimensionless temperature and velocity distributions. Another model considers the flow of a plasma over an array of particles [10U], and the effect of varying lateral and longitudinal spacing of the particles on the heat transfer is shown.

A model of the cathode region of a dc glow discharge is presented by Arslanbekov [1U] and the results show that a non-local treatment is necessary for prediction of the power dissipation. Another model of a glow discharge uses a Monte Carlo method to describe the energy transfer between the different species, and the effect on the heating of the neutral gas atoms is presented [2U]. A model of a 'Glidarc', a discharge traveling between diverging electrode rails, uses a simplified approach in which the arc is modeled as a hot wire cooled by a cross-flow of air [8U]. A couple of papers consider the effects of a corona discharge on the heat transfer [5U] and on the pressure drop in a tube flow [7U]. The heat transfer enhancement was determined theoretically using a large eddy simulation approach, and experimentally, and Nusselt number enhancements of up to a factor of 3.4 have been found [5U]. The study of the tube flow concentrated on experimentally determining the effect of different electrode geometries (wire and concentric tube, two parallel wires) [7U].

22.2. Specific applications

Modeling of plasmas and plasma reactor configurations as they appear in specific applications continue to find much interest. A chart which could be used for control of a plasma spray process has been developed by Ang et al. [14U] who used a commercial fluid dynamics code to compute the state of spray particles in the jet. In another paper related to plasma spraying, plasma sprayed boron carbide coatings were evaluated for their ability to withstand periodic high-heat loads [15U], and good survival rates have been found for films with a thickness of less than 150 μm which were exposed to 1000 cycles of 7.5 MW/m^2. Two papers from the same group deal with models of the fluid flow and heat transfer in a dc electric arc furnace [13U] including the magnetic stirring effects in molten material [12U]. For a similar reactor arrangement but with silica as the material serving as the anode for the transferred arc, Addona et al. [11U] model the temperature and flow fields and the silica evaporation rates, with the objective to identify an efficient route to produce fumed silica. The different transfer modes in gas metal arc welding have been mapped by Scotti [19U] as function of gas flow, weld current and arc length using high-speed videography.

Several papers deal with space related applications. Herdrich et al. [16U] describe an inductively coupled plasma torch operating at 180 kW with argon which is used for reentry simulation. A model description of this torch is presented by Lenzner et al. [18U] giving the energy fluxes at low pressure. A characterization of a pulsed plasma thruster where the discharge takes place in a Teflon cavity is reported by Keidar et al. [17U].

22.3. Magnetohydrodynamics

Effects of magnetic fields on fluid dynamics and heat transfer continue to be an inexhaustible source of topics for modeling approaches. Three papers deal with MHD flows along a vertical, semi-infinite flat plate, with Abo-Eldahab and El-Aziz [20U] concentrating on free convection under strong magnetic field conditions, Kim [27U] describing the unsteady flow in the boundary layer of a moving porous plate with variable suction, and Singh and Singh [29U] giving an analytical solution for the laminar boundary layer of a steadily moving porous plate. Two further papers treating the boundary layers of semi-infinite plates are describing the effect of varying surface temperature [31U], and the effects of chemical reactions and species concentration gradients [22U]. Flow past a cylinder is described in several papers, with Yih [32U] investigating the effect of blowing or suction on natural convection over a horizontal cylinder, Ganesan and Rani [25U] describing the unsteady free convection for flows past a vertical cylinder, and Mansour et al. [28U] looking at the heat and mass transfer in the boundary layer of a circular cylinder when a micropolar fluid is used. Vempaty et al. [30U] describe the flow in a rotating annulus with a radial temperature gradient, and Ghosh and Bhattacharjee [26U] present solutions for a rotating flow in a parallel plate channel and a Hall current for an inclined applied magnetic field.

A 3-D model presented by Fujisaki et al. [24U] describes the liquid metal flow under the influence of magnetic stirring and include solidification of the material, and the model has been applied to describe the continuous casting process. Eckert et al. [23U] give experimental results of the liquid metal flows under the influence of different applied magnetic fields, obtained through injection of gas bubbles and measuring the local void fraction using resistivity probes. In another experimental effort, free convection effects in the presence of magnetic fields are used for thermophoretic separation of ultrafine particles in a ferrofluid, and the Soret effect has been investigated by measuring the particle separation on a thermodiffusion column [21U].

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References

Contact conduction and contact resistance

[1A] P. Benigni, C. Marchionni, J. Rogez, High temperature contact conductance measurement across cylindrical joint by the periodic method: feasibility and first results, Int. J. Heat Mass Transfer 43 (23) (2000) 4217.

[2A] J.J. Fuller, E.E. Marotta, Thermal contact conductance of metal/polymer joints, J. Thermophys. Heat Transfer 14 (2) (2000) 283.

[3A] Y.Z. Li, C.V. Madhusudana, E. Leonardi, Enhancement of thermal contact conductance: effect of metallic coating, J. Thermophys. Heat Transfer 14 (4) (2000) 540.

[4A] K. Varadi, Z. Neder, K. Friedrich, J. Flock, Contact and thermal analysis of transfer film covered real composite–steel surfaces in sliding contact, Tribol. Int. 33 (11) (2000) 789.

[5A] S.M.S. Wahid, C.V. Madhusudana, Gap conductance in contact heat transfer, Int. J. Heat Mass Transfer 43 (24) (2000) 4483.

Composites and heterogeneous media

[6A] C. Ageorges, L. Ye, M. Hou, Experimental investigation of the resistance welding for thermoplastic–matrix composites. Part I: heating element and heat transfer, Compos. Sci. Technol. 60 (7) (2000) 1027.

[7A] M.F.A. Azeez, A.F. Vakakis, Axisymmetric transient solutions of the heat diffusion problem in layered composite media, Int. J. Heat Mass Transfer 43 (20) (2000) 3883.

[8A] M. Buchmann, R. Gadow, J. Tabellion, Experimental and numerical residual stress analysis of layer coated composites, Mater. Sci. Eng. A 288 (2) (2000) 154.

[9A] H. Bufler, Stationary heat conduction in a macro- and microperiodically layered solid, Arch. Appl. Mech. 70 (1) (2000).

[10A] F. de Monte, Transient heat conduction in one-dimensional composite slab. A 'natural' analytic approach, Int. J. Heat Mass Transfer 43 (19) (2000) 3607.

[11A] M. Juma, M. Bafrnec, Method of measuring thermal diffusivity of composites with thick fillers and reinforced rubbers, J. Reinf. Plast. Compos. 19 (13) (2000) 1024.

[12A] W.B. Lor, H.S. Chu, Effect of interface thermal resistance on heat transfer in a composite medium using the thermal wave model, Int. J. Heat Mass Transfer 43 (5) (2000) 653.

[13A] A. Szekeres, Analogy between heat and moisture – thermo-hygro-mechanical tailoring of composites by taking into account the second sound phenomenon, Comput. Struct. 76 (1) (2000) 145.

Heat conduction in arbitrary geometries

[14A] M. Almogbel, A. Bejan, Cylindrical trees of pin fins, Int. J. Heat Mass Transfer 43 (23) (2000) 4285.
[15A] A. Bejan, M. Almogbel, Constructal T-shaped fins, Int. J. Heat Mass Transfer 43 (12) (2000) 2101.
[16A] W.J. Bowman, T.W. Moss, D. Maynes, K.A. Paulson, Efficiency of a constant-area, adiabatic tip, heat pipe fin, J. Thermophys. Heat Transfer 14 (1) (2000) 112.
[17A] P.J. Heggs, Overview of extended surface heat transfer-fins, Recent Adv. Anal. Heat Transfer Fin Type Surf. 5 (2000) 1.
[18A] S.S. Hsiau, Effective thermal conductivities of a single species and a binary mixture of granular materials, Int. J. Multiphase Flow 26 (1) (2000) 83.
[19A] W. Manners, Heat conduction through irregularly spaced plane strip contacts, Proc. Inst. Mech. Eng. Part C 214 (8) (2000) 1049.
[20A] P. Tuomaala, K. Piira, M. Vuolle, A rational method for the distribution of nodes in modelling of transient heat conduction in plane slabs, Build. Environ. 35 (5) (2000) 397.

Thermal waves, micro/nanoscale effects, and laser heating

[21A] M.A. Al-Nimr, V.S. Arpaci, The thermal behavior of thin metal films in the hyperbolic two-step model, Int. J. Heat Mass Transfer 43 (11) (2000) 2021.
[22A] A.H. Ali, Non-Fourier heat-flux law for diatomic gases, J. Thermophys. Heat Transfer 14 (2) (2000) 281.
[23A] P.J. Antaki, Effect of dual-phase-lag heat conduction on ignition of a solid, J. Thermophys. Heat Transfer 14 (2) (2000) 276.
[24A] G. Chen, Phonon heat conduction in nanostructures, Int. J. Thermal Sci. 39 (4) (2000) 471.
[25A] G. Gutierrez, T.C. Jen, Numerical simulation of non-linear heat conduction subjected to a laser source: the effects of variable thermal properties, Int. J. Heat Mass Transfer 43 (12) (2000) 2177.
[26A] M.A. Karam, A thermal wave approach for heat transfer in a nonuniform soil, Soil Sci. Soc. Am. J. 64 (4) (2000) 1219.
[27A] S. Lin, H.S. Chu, Using inverse modeling to estimate the incident heat flux required to achieve temperature uniformity across a circular disk, Microscale Thermophys. Eng. 4 (4) (2000) 245.
[28A] A.G. Merzhanov, A.S. Rogachev, Discrete heat waves in active heterogeneous media: basic principles and introduction to the theory, Russ. J. Phys. Chem. 74 (Suppl. 1) (2000) S20.
[29A] T. Ohara, D. Suzuki, Intermolecular energy transfer at a solid–liquid interface, Microscale Thermophys. Eng. 4 (3) (2000) 189.
[30A] A.I. Sharkov, T.I. Galkina, A.Y. Klokov, R.A. Khmelnitskii, V.A. Dravin, A.A. Gippius, V.G. Ralchenko, A.V. Karabutov, Non-equilibrium acoustic phonon propagation in CVD diamond films, Diamond Relat. Mater. 9 (3) (2000) 1100.
[31A] Y. Shibayama, H. Sato, T. Enoki, X.X. Bi, M.S. Dresselhaus, M. Endo, Novel electronic properties of a nano-graphite disordered network and their iodine doping effects, J. Phys. Soc. Japan 69 (3) (2000) 754.
[32A] L.Q. Wang, Solution structure of hyperbolic heat-conduction equation, Int. J. Heat Mass Transfer 43 (3) (2000) 365.
[33A] B.S. Yilbas, Laser short pulse heating with convective boundary condition, Numer. Heat Transfer Part A 38 (4) (2000) 423.
[34A] T.F. Zeng, G. Chen, Energy conversion in heterostructures for thermionic cooling, Microscale Thermophys. Eng. 4 (1) (2000) 39.
[35A] Y.W. Zhang, A. Faghri, Thermal modeling of selective area laser deposition of titanium nitride on a finite slab with stationary and moving laser beams, Int. J. Heat Mass Transfer 43 (20) (2000) 3835.

Conduction with convection and flow effect

[36A] J.J. Hwang, R.J. Su, B.J. Tsai, Transient analysis of 2-D cylindrical pin with constant base heat flux and tip convective effects, J. Enhanced Heat Transfer 7 (3) (2000) 201.

Thermomechanical problems and applications

[37A] L.W. Byrd, M.A. Haney, Thermoelastic stress analysis applied to fully reversed bending fatigue, Exp. Mech. 40 (1) (2000) 10.
[38A] Y.I. Dimitrienko, Thermomechanical behaviour of composites under local intense heating by irradiation, Composites – Part A 31 (6) (2000) 591.
[39A] A.E. Huespe, A. Cardona, V. Fachinotti, Thermomechanical model of a continuous casting process, Comput. Meth. Appl. Mech. Eng. 182 (3) (2000) 439.
[40A] S. Sarkani, V. Tritchkov, G. Michaelov, An efficient approach for computing residual stresses in welded joints, Finite Elements Anal. Des. 35 (3) (2000) 247.
[41A] D.A. Tanner, J.S. Robinson, Residual stress prediction and determination in 7010 aluminum alloy forgings, Exp. Mech. 40 (1) (2000) 75.

Materials and modeling

[42A] J. Ben Abdelouahab, A. El Bouardi, J.M. Vergnaud, Process of cure during repair of an old broken thermoset piece by heating it with a new uncured resin, Polym. Polym. Compos. 8 (1) (2000) 31.
[43A] L. Sridhar, K.A. Narh, Finite size gap effects on the modeling of thermal contact conductance at

polymer–mold wall interface in injection molding, J. Appl. Polym. Sci. 75 (14) (2000) 1776.
[44A] H.J. Stone, S.M. Roberts, R.C. Reed, A process model for the distortion induced by the electron-beam welding of a nickel-based superalloy, Metall. Mater. Trans. A 31 (9) (2000) 2261.
[45A] M. Torres, R. Colas, A model for heat conduction through the oxide layer of steel during hot rolling, J. Mater. Process. Technol. 105 (3) (2000) 258.

Analytical, numerical and experimental studies

[46A] C. Ageorges, L. Ye, M. Hou, Experimental investigation of the resistance welding of thermoplastic–matrix composites. Part II: optimum processing window and mechanical performance, Compos. Sci. Technol. 60 (8) (2000) 1191.
[47A] V.T. Borukhov, P.N. Vabishchevich, Numerical solution of the inverse problem of reconstructing a distributed right-hand side of a parabolic equation, Comput. Phys. Commun. 126 (1) (2000) 32.
[48A] R.N. de Carvalho, H.R.B. Orlande, M.N. Ozisik, Estimation of the boundary heat flux in grinding via the conjugate gradient method, Heat Transfer Eng. 21 (4) (2000) 71.
[49A] I.Y. Gedzhadze, V.P. Shutyaev, On a method for solving the observation problem for a nonstationary temperature field, J. Comput. Syst. Sci. Int. 39 (1) (2000) 21.
[50A] A. Haji-Sheikh, J.V. Beck, An efficient method of computing eigenvalues in heat conduction, Numer. Heat Transfer Part B 38 (2) (2000) 133.
[51A] M.T. Ibanez, H. Power, An efficient direct BEM numerical scheme for heat transfer problems using Fourier series, Int. J. Numer. Meth. Heat Fluid Flow 10 (7) (2000) 687.
[52A] A.R. Kacimov, Y.V. Obnosov, Conduction through a grooved surface and Sierpinsky fractals, Int. J. Heat Mass Transfer 43 (4) (2000) 623.
[53A] C. Le Niliot, F. Rigollet, D. Petit, An experimental identification of line heat sources in a diffusive system using the boundary element method, Int. J. Heat Mass Transfer 43 (12) (2000) 2205.
[54A] D. Nortershauser, P. Millan, Resolution of a three-dimensional unsteady inverse problem by sequential method using parameter reduction and infrared thermography measurements, Numer. Heat Transfer Part A 37 (6) (2000) 587.
[55A] G.S. Prakash, S.S. Reddy, S.K. Das, T. Sundararajan, K.N. Seetharamu, Numerical modelling of microscale effects in conduction for different thermal boundary conditions, Numer. Heat Transfer Part A 38 (5) (2000) 513.
[56A] Y. Rabin, D. Rittel, Infrared temperature sensing of mechanically loaded specimens: thermal analysis, Exp. Mech. 40 (2) (2000) 197.
[57A] C.P. Rahaim, A.J. Kassab, R.J. Cavalleri, Coupled dual reciprocity boundary element/finite volume method for transient conjugate heat transfer, J. Thermophys. Heat Transfer 14 (1) (2000) 27.
[58A] J.C. Rozzi, F.P. Incropera, Y.C. Shin, Transient, three-dimensional heat transfer model for the laser assisted machining of silicon nitride: II. Assessment of parametric effects, Int. J. Heat Mass Transfer 43 (8) (2000) 1425.
[59A] J.C. Rozzi, F.E. Pfefferkorn, F.P. Incropera, Y.C. Shin, Transient, three-dimensional heat transfer model for the laser assisted machining of silicon nitride: I. Comparison of predictions with measured surface temperature histories, Int. J. Heat Mass Transfer 43 (8) (2000) 1409.
[60A] A.K. Satapathy, P.K. Kar, Rewetting of an infinite slab with boundary heat flux, Numer. Heat Transfer Part A 37 (1) (2000) 87.
[61A] M.R. Siddique, R.E. Khayat, A low-dimensional approach for linear and nonlinear heat conduction in periodic domains, Numer. Heat Transfer Part A 38 (7) (2000) 719.
[62A] S. Sieniutycz, Dynamic programming approach to a Fermat type principle for heat flow, Int. J. Heat Mass Transfer 43 (18) (2000) 3453.
[63A] T. Telejko, Investigation of sensitivity of the inverse method applied to determination of the thermal conductivity of steels, Arch. Metall. 45 (2) (2000) 197.
[64A] D.G. Walker, E.P. Scott, R.J. Nowak, Estimation methods for two-dimensional conduction effects of shock–shock heat fluxes, J. Thermophys. Heat Transfer 14 (4) (2000) 533.
[65A] X. Zhang, S. Fujiwara, M. Fujii, Measurements of thermal conductivity and electrical conductivity of a single carbon fiber, Int. J. Thermophys. 21 (4) (2000) 965.

Miscellaneous studies

[66A] T.A. Ameel, I. Papautsky, R.O. Warrington, R.S. Wegeng, M.K. Drost, Miniaturization technologies for advanced energy conversion and transfer systems, J. Propulsion Power 16 (4) (2000) 577.
[67A] J.L. Battaglia, J.C. Batsale, Estimation of heat flux and temperature in a tool during turning, Inverse Probl. Eng. 8 (5) (2000) 435.
[68A] T. Boeck, U. Bahr, Temperature distribution in an array of moving cracks acting as heat sinks, J. Eng. Math. 37 (4) (2000) 289.
[69A] G. Groppi, G. Airoldi, C. Cristiani, E. Tronconi, Characteristics of metallic structured catalysts with high thermal conductivity, Catal. Today 60 (1) (2000) 57.
[70A] C.S. Jeon, M.K. Yoon, S.K. Kauh, Heat transfer enhancement in the unfinned frame of an externally cooled induction motor, Heat Transfer Eng. 21 (1) (2000) 25.
[71A] Z.F. Jin, Y. Asako, Y. Yamaguchi, M. Harada, Fire resistance test for fire protection materials with high water content, Int. J. Heat Mass Transfer 43 (24) (2000) 4395.
[72A] Z.F. Jin, Y. Asako, Y. Yamaguchi, H. Yoshida, Thermal and water storage characteristics of super-absorbent polymer gel which absorbed aqueous solu-

tion of calcium chloride, Int. J. Heat Mass Transfer 43 (18) (2000) 3407.

[73A] A. Paul, N. Pradhan, A.K. Ray, P.K. Bhor, S. Mazumdar, J.M. Korath, Assessment of heat extraction through slab caster mould, Scand. J. Metall. 29 (4) (2000) 139.

[74A] D. Polisevski, Optimal quasiperiodic design for a heat transfer problem, Int. J. Eng. Sci. 38 (3) (2000) 267.

[75A] F. Pompei, Increasing production speeds via IR control of product internal temperature, Measure. Control (202) (2000) 74.

[76A] E.B. Postnikov, S.V. Sobolev, Cerenkov-type magnetoacoustic oscillations in a viscoelastic cylinder, Acoust. Phys. 46 (2) (2000) 191.

[77A] R. Vance, I.S. Wichman, Heat transfer analysis of a diffusion flame leading edge near a cold, chemically inert surface, Int. J. Heat 43 (6) (2000) 921.

[78A] S. Varga, J.C. Oliveira, F.A.R. Oliveira, Influence of the variability of processing factors on the *F*-value distribution in batch retorts, J. Food Eng. 44 (3) (2000) 155.

[79A] J.S. Walder, Pyroclast/snow interactions and thermally driven slurry formation. Part 1: theory for monodisperse grain beds, Bull. Volcanol. 62 (2) (2000) 105.

[80A] L.G. Zhao, T.J. Lu, N.A. Fleck, Crack channelling and spalling in a plate due to thermal shock loading, J. Mech. Phys. Solids 48 (5) (2000) 867.

Boundary layers and external flows: *External effects*

[1B] N. Ahmad, N. Khan, Boundary layer flow past a stretching plate with suction and heat transfer with variable conductivity, Indian J. Eng. Mater. Sci. 7 (1) (2000) 51.

[2B] N. Ahmad, K. Marwah, Visco-elastic boundary layer flow past a stretching plate with suction and heat transfer with variable conductivity, Indian J. Eng. Mater. Sci. 7 (1) (2000) 54.

[3B] S.A. Al-Sanea, M.E. Ali, The effect of extrusion slit on the flow and heat-transfer characteristics from a continuously moving material with suction or injection, Int. J. Heat Fluid Flow 21 (1) (2000) 84.

[4B] H.A. Attia, Hiemenz magnetic flow of a non-Newtonian fluid of second grade with heat transfer, Can. J. Phys. 78 (9) (2000) 875.

[5B] Y. Izawa, K. Sawada, Calculation of surface heat transfer for a sphere with wall injection, J. Thermophys. Heat Transfer 14 (2) (2000) 230.

[6B] N.G. Kafoussias, M.A. Xenos, Numerical investigation of two-dimensional turbulent boundary-layer compressible flow with adverse pressure gradient and heat and mass transfer, Acta Mech. 141 (3) (2000) 201.

[7B] S.M. Lee, D.J. Im, I.S. Kang, Circulating flows inside a drop under time-periodic nonuniform electric fields, Phys. Fluids 12 (8) (2000) 1899.

[8B] F. Peneau, H.C. Boisson, N. Djilali, Large eddy simulation of the influence of high free-stream turbulence on a spatially evolving boundary layer, Int. J. Heat Fluid Flow 21 (5) (2000) 640.

[9B] S. Roy, Nonuniform multiple slot injection (suction) or wall enthalphy into a steady compressible laminar boundary layer, Acta Mech. 143 (1) (2000) 113.

[10B] H.S. Takhar, A.J. Chamkha, G. Nath, Flow and mass transfer on a stretching sheet with a magnetic field and chemically reactive species, Int. J. Eng. Sci. 38 (12) (2000) 1303.

[11B] B. Tashtoush, Z. Kodah, A. Al-Ghasem, Heat transfer analysis of a non-Newtonian fluid on a power-law stretched surface with suction or injection for uniform and cooled surface temperature, Int. J. Numer. Meth. Heat Fluid Flow 10 (4) (2000) 385.

[12B] X.Y. You, X. Xiao, Active control of laminar stability by feedback control strategy, Int. J. Heat Mass Transfer 43 (19) (2000) 3529.

Geometric effects

[13B] R. Bhargava, H.S. Takhar, Numerical study of heat transfer characteristics of the micropolar boundary layer near a stagnation point on a moving wall, Int. J. Eng. Sci. 38 (4) (2000) 383.

[14B] L.A. Brignoni, S.V. Garimella, Effects of nozzle-inlet chamfering on pressure drop and heat transfer in confined air jet impingement, Int. J. Heat Mass Transfer 43 (7) (2000) 1133.

[15B] C.H. Chen, Heat transfer characteristics of a non-isothermal surface moving parallel to a free stream, Acta Mech. 142 (1) (2000) 195.

[16B] C.K. Chen, C.C. Wang, Transient analysis of forced convection along a wavy surface in micropolar fluids, J. Thermophys. Heat Transfer 14 (3) (2000) 340.

[17B] C.Y. Cheng, C.C. Wang, Forced convection in micropolar fluid flow over a wavy surface, Numer. Heat Transfer Part A 37 (3) (2000) 271.

[18B] R.C. Henry, D. Guffond, F. Garnier, A. Bouveret, Heat transfer coefficient measurement on iced airfoil in small icing wind tunnel, J. Thermophys. Heat Transfer 14 (3) (2000) 348.

[19B] A. Hossain, S. Munir, D.A.S. Rees, Flow of viscous incompressible fluid with temperature dependent viscosity and thermal conductivity past a permeable wedge with uniform surface heat flux, Int. J. Thermal Sci. 39 (6) (2000) 635.

[20B] M.A. Hossain, M.S. Munir, M.Z. Hafiz, H.S. Takhar, Flow of a viscous incompressible fluid of temperature dependent viscosity past a permeable wedge with uniform surface heat flux, Heat Mass Transfer 36 (4) (2000) 333.

[21B] J.J. Hwang, C.H. Chao, Passive control of convective transport phenomena utilizing an attached–detached rib-array, J. Thermophys. Heat Transfer 14 (4) (2000) 579.

[22B] F.G. Jacobitz, Scalar transport and mixing in turbulent stratified shear flow, Int. J. Heat Fluid Flow 21 (5) (2000) 535.

[23B] Y.J. Kim, Behaviors of anisotropic fluids in the vicinity of a wedge, KSME J. 14 (6) (2000) 690.

[24B] H. Kong, H. Choi, J.S. Lee, Direct numerical simulation of turbulent thermal boundary layers, Phys. Fluids 12 (10) (2000) 2555.

[25B] J.M. Ma, S.M. Daggupaty, Using all observed information in a variational approach to measuring $z(0m)$ and $z(0t)$, J. Appl. Meteorol. 39 (8) (2000) 1391.

[26B] R. Manceau, S. Parneix, D. Laurence, Turbulent heat transfer predictions using the $v^2 - f$ model on unstructured meshes, Int. J. Heat Fluid Flow 21 (3) (2000) 320.

[27B] O. Molerus, Fluid mechanics in terms of eigenparameters part I: Fundamentals, Chem. Eng. Sci. 55 (6) (2000) 11–71.

[28B] W.R. Paterson, A.N. Hayhurst, Mass or heat transfer from a sphere to a flowing fluid, Chem. Eng. Sci. 55 (10) (2000) 1925.

[29B] A.K. Sahu, M.N. Mathur, P. Chaturani, S.S. Bharatiya, Momentum and heat transfer from a continuous moving surface to a power-law fluid, Acta Mech. 142 (1) (2000) 119.

[30B] S.Z. Shuja, B.S. Yilbas, M.O. Iqbal, Heat transfer characteristics of flow past a rectangular protruding body, Numer. Heat Transfer Part A 7 (3) (2000) 307.

[31B] G.F. Sivykh, Turbulent transfer coefficients model for flows over permeable rough surfaces, J. Enhanced Heat Transfer 7 (1) (2000) 11.

[32B] D.L. Sondak, D.J. Dorney, Simulation of coupled unsteady flow and heat conduction in turbine stage, J. Propulsion Power 16 (6) (2000) 1141.

[33B] V.P. Trubitsyn, Principles of the tectonics of floating continents, Izv. Phys. Solid Earth 36 (9) (2000) 708.

[34B] A.B. Turner, S.E. Hubbe-Walker, F.J. Bayley, Fluid flow and heat transfer over straight and curved rough surfaces, Int. J. Heat Mass Transfer 43 (2) (2000) 251.

[35B] W. Zhang, Q.Y. Chen, Large eddy simulation of indoor airflow with a filtered dynamic subgrid scale model, Int. J. Heat Mass Transfer 43 (17) (2000) 3219.

Compressibility and high-speed flow effects

[36B] Y.C. Ganiev, V.P. Gordeev, A.V. Krasilnikov, V.I. Lagutin, V.N. Otmennikov, A.V. Panasenko, Aerodynamic drag reduction by plasma and hot-gas injection, J. Thermophys. Heat Transfer 14 (1) (2000) 10.

[37B] U. Goldberg, P. Batten, S. Palaniswamy, S. Chakravarthy, O. Peroomian, Hypersonic flow predictions using linear and nonlinear turbulence closures, J. Aircraft 37 (4) (2000) 671.

[38B] S.E. Guarini, R.D. Moser, K. Shariff, A. Wray, Direct numerical simulation of a supersonic turbulent boundary layer at Mach 2.5, J. Fluid Mech. 414 (2000) 1.

[39B] A. Gupta, S.M. Ruffin, M.E. Newfield, L. Yates, Aerothermodynamic performance enhancement of sphere–cones using the artificially blunted leading-edge concept, J. Spacecraft Rockets 37 (2) (2000) 235.

[40B] G. Jagadeesh, N.M. Reddy, K. Nagashetty, K.P.J. Reddy, Forebody convective hypersonic heat transfer measurements over large-angle blunt cones, J. Spacecraft Rockets 37 (1) (2000) 137.

[41B] E. Josyula, Computational study of vibrationally relaxing gas past blunt body in hypersonic flows, J. Thermophys. Heat Transfer 14 (1) (2000) 18.

[42B] S. Nonaka, H. Mizuno, K. Takayama, C. Park, Measurement of shock standoff distance for sphere in ballistic range, J. Thermophys. Heat Transfer 14 (2) (2000) 225.

[43B] S.A. Sherif, W.E. Lear, N.S. Winowich, Effect of slip velocity and heat transfer on the condensed phase momentum flux of supersonic nozzle flows, J. Fluids Eng. Trans. ASME 122 (1) (2000) 14.

Analysis and modeling

[44B] K.C. Chang, M.J. Shyu, Revisiting the Reynolds-averaged energy equation in near-wall turbulence models, Int. J. Heat Mass Transfer 43 (5) (2000) 665.

[45B] M. Gonzalez, Asymptotic evolution of a passive scalar field advected by an homogeneous turbulent shear flow, Int. J. Heat Mass Transfer 43 (3) (2000) 387.

[46B] H. Kawamura, Y. Kurihara, Modelling of turbulent scalar transport in homogeneous turbulence, Int. J. Heat Mass Transfer 43 (11) (2000) 1935.

[47B] K. Kim, M.E. Crawford, Prediction of transitional heat transfer characteristics of wake-affected boundary layers, J. Turbomach. Trans. ASME 122 (1) (2000) 78.

[48B] H. Knaus, S. Richter, S. Unterberger, U. Schnell, H. Maier, K.R.G. Hein, On the application of different turbulence models for the computation of fluid flow and combustion processes in small scale wood heaters, Exp. Thermal Fluid Sci. 21 (1) (2000) 99.

[49B] N.Y. Liu, X.Y. Lu, L.X. Zhuang, A dynamic subgrid-scale model for the large eddy simulation of stratified flow, Sci. China Ser. (Mathematics, Physics, Astronomy) 43 (4) (2000) 391.

[50B] E. Magyari, B. Keller, Reynolds' analogy for the thermal convection driven by nonisothermal stretching surfaces, Heat Mass Transfer 36 (5) (2000) 393.

[51B] R.D. McDaniel, R.P. Nance, H.A. Hassan, Transition onset prediction for high-speed flow, J. Spacecraft Rockets 37 (3) (2000) 304.

[52B] Y. Na, T.J. Hanratty, Limiting behavior of turbulent scaler transport close to a wall, Int. J. Heat Mass Transfer 43 (10) (2000) 1749.

[53B] F. Porte-Agel, M.B. Parlange, C. Meneveau, W.E. Eichinger, M. Pahlow, Subgrid-scale dissipation in the atmospheric surface layer: effects of stability and filter dimension, J. Hydrometeorol. 1 (1) (2000) 75.

[54B] K. Rup, M. Soczowka, An improved low Reynolds number k–ε model for heat transfer calculations, Forsch. Ingenieurwes. Eng. Res. 65 (8) (2000) 225.

[55B] E.K. Schneider, U.S. Bhatt, A dissipation integral with application to ocean diffusivities and structure, J. Phys. Oceanogr. 30 (6) (2000) 1158.

[56B] R.M.C. So, T.P. Sommer, C.Y. Zhao, Effects of near-wall Reynolds-stress modeling on the calculation of the turbulent thermal field, Int. J. Heat Fluid Flow 21 (2) (2000) 164.

[57B] K. Suga, K. Abe, Nonlinear eddy viscosity modelling for turbulence and heat transfer near wall and shear-free boundaries, Int. J. Heat Fluid Flow 21 (1) (2000) 37.

[58B] M. Venkataramana, K. Sengupta, G.S. Bhat, S. Ameenulla, J.V.S. Raju, Inertial-dissipation flux measurements over south Bay of Bengal during BOBMEX-Pilot experiment, Proc. Indian Acad. Sci. Earth Planet. Sci. 109 (2) (2000) 239.

[59B] L.I. Zaichik, A.I. Leont'ev, The use of the limiting laws of turbulent friction and heat transfer to construct wall functions on permeable surfaces, High Temperature – USSR 38 (4) (2000) 585.

Unsteady effects

[60B] M.A. Antar, A.A. Al-Farayedhi, M.A.J. El-Shaarawi, Steady and transient liquid sphere heating in a convective gas stream, Heat Mass Transfer 36 (2) (2000) 147.

[61B] K. Chida, Surface temperature of a flat plate of finite thickness under conjugate laminar forced convection heat transfer condition, Int. J. Heat Mass Transfer 43 (4) (2000) 639.

[62B] G. Choblet, C. Sotin, 3D thermal convection with variable viscosity: can transient cooling be described by a quasi-static scaling law?, Phys. Earth Planet. Interiors 119 (3) (2000) 321.

[63B] X. de Saint Victor, R. Houdeville, Influence of periodic wakes on the development of a boundary layer, Recherche Aerosp. 4 (6) (2000) 371.

[64B] Z.G. Feng, E.E. Michaelides, A numerical study on the transient heat transfer from a sphere at high Reynolds and Peclet numbers, Int. J. Heat Mass Transfer 43 (2) (2000) 219.

[65B] A. Larraza, E. Tucholski, Acoustic Einstein–Hopf drag on a bubble, Phys. Rev. Lett. 84 (11) (2000) 2378.

[66B] F. Lemoine, Y. Antoine, M. Wolff, M. Lebouche, Some experimental investigations on the concentration variance and its dissipation rate in a grid generated turbulent flow, Int. J. Heat Mass Transfer 43 (7) (2000) 1187.

[67B] M.E. Nicholls, R.A. Pielke, Thermally induced compression waves and gravity waves generated by convective storms, J. Atmos. Sci. 57 (19) (2000) 3251.

[68B] M. Ohta, M. Nakamura, M. Akiyoshi, E. Obata, Characteristics of heat transfer from a spherical solid body under pulsating forced convection, Chem. Eng. Commun. 182 (2000) 81.

[69B] A. Pozzi, R. Tognaccini, Coupling of conduction and convection past an impulsively started semi-infinite flat plate, Int. J. Heat Mass Transfer 43 (7) (2000) 1121.

[70B] W. Schoppa, F. Hussain, Generation of near-wall coherent structures in a turbulent boundary layer, Current Sci. 79 (6) (2000) 849.

[71B] S. Zhong, C. Kittichaikan, H.P. Hodson, P.T. Ireland, Visualisation of turbulent spots under the influence of adverse pressure gradients, Exp. Fluids 28 (5) (2000) 385.

Films and interfacial effects

[72B] H.I. Andersson, J.B. Aarseth, B.S. Dandapat, Heat transfer in a liquid film on an unsteady stretching surface, Int. J. Heat Mass Transfer 43 (1) (2000) 69.

[73B] V.N. Babak, T.B. Babak, L.P. Kholpanov, Heat and momentum transfer in liquid films with temperature-dependent viscosity, Theoret. Found. Chem. Eng. (English Transl.: Teoreticheskie Osnovy Khimicheskoi Tekhnologii) 34 (4) (2000) 373.

[74B] W.B. Chen, R.N. Christensen, Inlet subcooling effect on heat and mass transfer characteristics in a laminar film flow, Int. J. Heat Mass Transfer 43 (2) (2000) 167.

[75B] M. Doichinova, C. Boyadjiev, Opposite-current flows in gas–liquid boundary layers – II. Mass transfer kinetics, Int. J. Heat Mass Transfer 43 (15) (2000) 2707.

[76B] H.A. Dwyer, P. Stapf, R. Maly, Unsteady vaporization and ignition of a three-dimensional droplet array, Combust. Flame 121 (1) (2000) 181.

[77B] H. Inaba, A. Horibe, K. Ozaki, N. Yokoyama, Liquid-liquid direct contact heat exchange using a perfluorocarbon liquid for waste heat recovery, JSME Int. J. Ser. B 43 (1) (2000) 52.

[78B] D.S. Lee, Nonlinear stability of a cylindrical interface with mass and heat transfer, Z. Naturforsch. Section A 55 (9) (2000) 837.

[79B] J.T. Zhang, B.X. Wang, X.F. Peng, On the effect of thermocapillarity for falling liquid film flow with consideration of humidity condition, Int. J. Heat Mass Transfer 43 (23) (2000) 4365.

Effects of fluid type or properties

[80B] L.A. Bolshov, P.S. Kondratenko, Limiting angular dependencies of heat transfer and stratification in a heat-generating fluid, Int. J. Heat Mass Transfer 43 (20) (2000) 3897.

[81B] F. Dubuffet, D.A. Yuen, A thick pipe-like heat-transfer mechanism in the mantle: nonlinear coupling between 3-D convection and variable thermal conductivity, Geophys. Res. Lett. 27 (1) (2000) 17.

[82B] A.V. Filippov, D.E. Rosner, Energy transfer between an aerosol particle and gas at high temperature ratios in the Knudsen transition regime, Int. J. Heat Mass Transfer 43 (1) (2000) 127.

[83B] F.A. Jaberi, F. Mashayek, Temperature decay in two-phase turbulent flows, Int. J. Heat Mass Transfer 43 (6) (2000) 993.

[84B] A.F. Kolesnikov, I.S. Pershin, S.A. Vasil'evskii, M.I. Yakushin, Study of quartz surface catalycity in dissociated carbon dioxide subsonic flows, J. Spacecraft Rockets 37 (5) (2000) 573.

[85B] C. Kroger, Y. Drossinos, A random-walk simulation of thermophoretic particle deposition in a turbulent boundary layer, Int. J. Multiphase Flow 26 (8) (2000) 1325.

Flows with reactions

[86B] S.R. Amaratunga, O.R. Tutty, G.T. Roberts, High-speed flow with discontinuous surface catalysis, J. Fluid Mech. 420 (2000) 325.

[87B] J.C.G. Andrae, P.H. Bjornbom, Wall effects of laminar hydrogen flames over platinum and inert surfaces, AICHE J. 46 (7) (2000) 1454.

[88B] D.J. Glaze, S.H. Frankel, Effect of dispersion characteristics on particle temperature in an idealized non-premixed reacting jet, Int. J. Multiphase Flow 26 (4) (2000) 609.

[89B] A.M. Kutepov, I.V. Melikhov, A.Y. Gorbachevskii, A.G. Churbanov, Deposit growth on chemical reactor walls and the associated heat and mass transfer, Theoret. Found. Chem. Eng. (English Transl.: Teoreticheskie Osnovy Khimicheskoi Tekhnologii) 34 (6) (2000) 537.

[90B] M. Okkerse, C.R. Kleijn, H.E.A. van den Akker, M. de Croon, G.B. Marin, Two-dimensional simulation of an oxy-acetylene torch diamond reactor with a detailed gas-phase and surface mechanism, J. Appl. Phys. 88 (7) (2000) 4417.

Channel flows: *Straight-walled ducts*

[1C] I.T. Al-Zaharnah, B.S. Yilbas, M.S.J. Hashmi, Conjugate heat transfer in fully developed laminar pipe flow and thermally induced stresses, Comput. Meth. Appl. Mech. Eng. 190 (8) (2000) 1091.

[2C] S. Aravinth, Prediction of heat and mass transfer for fully developed turbulent fluid flow through tubes, Int. J. Heat Mass Transfer 43 (8) (2000) 1399.

[3C] A. Barletta, B. Pulvirenti, Forced convection with slug flow and viscous dissipation in a rectangular duct, Int. J. Heat Mass Transfer 43 (5) (2000) 725.

[4C] B.J. Brinkworth, Estimation of flow and heat transfer for the design of PV cooling ducts, Solar Energy 69 (5) (2000) 413.

[5C] A.A. Busedra, H.M. Soliman, Experimental investigation of laminar mixed convection in an inclined semicircular duct under buoyancy assisted and opposed conditions, Int. J. Heat Mass Transfer 43 (7) (2000) 1103.

[6C] S. Chen, T.L. Chan, C.W. Leung, Numerical prediction of laminar forced convection in triangular ducts with unstructured triangular grid method, Numer. Heat Transfer Part A 38 (2) (2000) 209.

[7C] C.H. Cheng, C.Y. Lin, W. Aung, Predictions of developing flow with buoyancy-assisted flow separation in a vertical rectangular duct: parabolic model versus elliptic model, Numer. Heat Transfer Part A 37 (6) (2000) 567.

[8C] C.H. Cheng, C.J. Weng, W. Aung, Buoyancy-assisted flow reversal and convective heat transfer in entrance region of a vertical rectangular duct, Int. J. Heat Fluid Flow 21 (4) (2000) 403.

[9C] Y. Demirel, Thermodynamic analysis of thermomechanical coupling in Couette flow, Int. J. Heat Mass Transfer 43 (22) (2000) 4205.

[10C] S. Kenjeres, K. Hanjalic, On the implementation of effects of Lorenz force in turbulence closure models, Int. J. Heat Fluid Flow 21 (3) (2000) 329.

[11C] F.E. Larrode, C. Housiadas, Y. Drossinos, Slip-flow heat transfer in circular tubes, Int. J. Heat Mass Transfer 43 (15) (2000) 2669.

[12C] M.J. Lin, Q.W. Wang, W.Q. Tao, Developing laminar flow and heat transfer in annular-sector ducts, Heat Transfer Eng. 21 (2) (2000) 53.

[13C] E.N. Macedo, C.E. Maneschy, J.N.N. Quaresma, Forced convection in thermally developing turbulent flow of drag-reducing fluids within circular tubes, Int. J. Heat Mass Transfer 43 (20) (2000) 3785.

[14C] A. Majid, Heat transfer to liquid lithium in a straight duct in the presence of a transverse magnetic field and a gravity field, Fus. Technol. 37 (2) (2000) 103.

[15C] G.L. Morini, Analytical determination of the temperature distribution and Nusselt numbers in rectangular ducts with constant axial heat flux, Int. J. Heat Mass Transfer 43 (5) (2000) 741.

[16C] G.L. Morini, Analytical determination of the temperature distribution and Nusselt numbers in rectangular ducts with constant axial heat flux (vol. 43, p. 741, 2000), Int. J. Heat Mass Transfer 43 (17) (2000) 3259.

[17C] X. Nicolas, J.M. Luijkx, J.K. Platten, Linear stability of mixed convection flows in horizontal rectangular channels of finite transversal extension heated from below, Int. J. Heat Mass Transfer 43 (4) (2000) 589.

[18C] M. Nishimura, S. Fujii, A.M. Shehata, T. Kunugi, D.M. McEligot, Prediction of forced gas flows in circular tubes at high heat fluxes accompanied by laminarization, J. Nucl. Sci. Technol. 37 (7) (2000) 581.

[19C] M. Rokni, A new low-Reynolds version of an explicit algebraic stress model for turbulent convective heat transfer in ducts, Numer. Heat Transfer Part B 37 (3) (2000) 331.

[20C] A.Z. Sahin, Entropy generation in turbulent liquid flow through a smooth duct subjected to constant wall temperature, Int. J. Heat Mass Transfer 43 (8) (2000) 1469.

[21C] S. Satake, T. Kunugi, A.M. Shehata, D.M. McEligot, Direct numerical simulation for laminarization of turbulent forced gas flows in circular tubes with strong heating, Int. J. Heat Fluid Flow 21 (5) (2000) 526.

[22C] Y.C. Su, J.N. Chung, Linear stability analysis of mixed-convection flow in a vertical pipe, J. Fluid Mech. 422 (2000) 141.

[23C] W.Q. Tao, S.S. Lu, H.J. Kang, M.J. Lin, Experimental study on developing and fully developed fluid flow and heat transfer in annular-sector ducts, J. Enhanced Heat Transfer 7 (1) (2000) 51.

[24C] S.S. Thakre, J.B. Joshi, CFD modeling of heat transfer in turbulent pipe flows, AICHE J. 46 (9) (2000) 1798.

[25C] A. Yilmaz, O. Buyukalaca, T. Yilmaz, Optimum shape and dimensions of ducts for convective heat transfer in laminar flow at constant wall temperature, Int. J. Heat Mass Transfer 43 (5) (2000) 767.

[26C] V. Zimparov, Extended performance evaluation criteria for enhanced heat transfer surfaces: heat transfer through ducts with constant wall temperature, Int. J. Heat Mass Transfer 43 (17) (2000) 3137.

Microchannel heat transfer

[27C] K.K. Ambatipudi, M.M. Rahman, Analysis of conjugate heat transfer in microchannel heat sinks, Numer. Heat Transfer Part A 37 (7) (2000) 711.
[28C] K. Chen, Y.E. Wu, Thermal analysis and simulation of the microchannel flow in miniature thermal conductivity detectors, Sensors Actuat. A 79 (3) (2000) 211.
[29C] A.G. Fedorov, R. Viskanta, Three-dimensional conjugate heat transfer in the microchannel heat sink for electronic packaging, Int. J. Heat Mass Transfer 43 (3) (2000) 399.
[30C] J.M. Li, B.X. Wang, X.F. Peng, 'Wall-adjacent layer' analysis for developed-flow laminar heat transfer of gases in microchannels, Int. J. Heat Mass Transfer 43 (5) (2000) 839.
[31C] W.L. Qu, G.M. Mala, D.Q. Li, Heat transfer for water flow in trapezoidal silicon microchannels, Int. J. Heat Mass Transfer 43 (21) (2000) 3925.
[32C] D.H. Richardson, D.P. Sekulic, A. Campo, Low Reynolds number flow inside straight micro channels with irregular cross sections, Heat Mass Transfer 36 (3) (2000) 187.
[33C] M.N. Sabry, Scale effects on fluid flow and heat transfer in microchannels, IEEE Trans. Components Packaging Technol. 23 (3) (2000) 562.
[34C] C.B. Sobhan, X.Y. Huang, L.C. Yu, Investigations on transient and steady-state performance of a micro heat pipe, J. Thermophys. Heat Transfer 14 (2) (2000) 161.
[35C] C.P. Tso, S.P. Mahulikar, Combined evaporating meniscus-driven convection and radiation in annular microchannels for electronics cooling application, Int. J. Heat Mass Transfer 43 (6) (2000) 1007.
[36C] C.P. Tso, S.P. Mahulikar, Experimental verification of the role of Brinkman number in microchannels using local parameters, Int. J. Heat Mass Transfer 43 (10) (2000) 1837.

Irregular geometries

[37C] T. Astarita, G. Cardone, Thermofluidynamic analysis of the flow in a sharp 180° turn channel, Exp. Thermal Fluid Sci. 20 (3) (2000) 188.
[38C] A. Bejan, M.R. Errera, Convective trees of fluid channels for volumetric cooling, Int. J. Heat Mass Transfer 43 (17) (2000) 3105.
[39C] H. Blomerius, N.K. Mitra, Numerical investigation of convective heat transfer and pressure drop in wavy ducts, Numer. Heat Transfer Part A 37 (1) (2000) 37.
[40C] T.W. Gyves, T.F. Irvine, Laminar conjugated forced convection heat transfer in curved rectangular channels, Int. J. Heat Mass Transfer 43 (21) (2000) 3953.
[41C] K.S. Hermanson, K.A. Thole, Effect of inlet conditions on endwall secondary flows, J. Propulsion Power 16 (2) (2000) 286.
[42C] C.H. Huang, W.C. Chen, A three-dimensional inverse forced convection problem in estimating surface heat flux by conjugate gradient method, Int. J. Heat Mass Transfer 43 (17) (2000) 3171.
[43C] T.J. Huttl, R. Friedrich, Influence of curvature and torsion on turbulent flow in helically coiled pipes, Int. J. Heat Fluid Flow 21 (3) (2000) 345.
[44C] T.M. Liou, C.C. Chen, Y.Y. Tzeng, T.W. Tsai, Non-intrusive measurements of near-wall fluid flow and surface heat transfer in a serpentine passage, Int. J. Heat Mass Transfer 43 (17) (2000) 3233.
[45C] J.M. Mufuta, E. van den Bulck, Modelling of the mixed convection in the windings of a disc-type power transformer, Appl. Thermal Eng. 20 (5) (2000) 417.
[46C] A. Nakayama, N. Kokubo, T. Ishida, F. Kuwahara, Conjugate numerical model for cooling a fluid flowing through a spiral coil immersed in a chilled water container, Numer. Heat Transfer Part A 37 (2) (2000) 155.
[47C] C.D. Rakopoulos, G.C. Mavropoulos, Experimental instantaneous heat fluxes in the cylinder head and exhaust manifold of an air-cooled diesel engine, Energy Conversion Manage. 41 (12) (2000) 1265.
[48C] C.D. Rakopoulos, G.C. Mavropoulos, D.T. Hountalas, Measurements and analysis of load and speed effects on the instantaneous wall heat fluxes in a direct injection air-cooled diesel engine, Int. J. Energy Res. 24 (7) (2000) 587.
[49C] B.K. Tan, X.Y. Huang, T.N. Wong, K.T. Ooi, A study of multiple heat sources on a flat plate heat pipe using a point source approach, Int. J. Heat Mass Transfer 43 (20) (2000) 3755.
[50C] L.M. Ul'ev, Heat exchange during a slow flow of a liquid between coaxial conical surfaces, Theoret. Found. Chem. Eng. (English Transl.: Teoreticheskie Osnovy Khimicheskoi Tekhnologii) 34 (1) (2000) 13.
[51C] J.A. Visser, A simplified equation to predict heat transfer in an internal duct of a gas turbine nozzle guide vane, Commun. Numer. Meth. Eng. 16 (9) (2000) 637.
[52C] Q. Wang, Y. Cao, R. Wang, F. Mignano, G. Chen, Studies of a heat-pipe cooled piston crown, J. Eng. Gas Turbines Power – Trans. ASME 122 (1) (2000) 99.
[53C] Q.L. Wang, K. Kim, C.S. Yoon, Numerical model for thermal hydraulic analysis in cable-in-conduit-conductors, KSME J. 14 (9) (2000) 985.
[54C] Y. Wang, K. Vafai, An experimental investigation of the thermal performance of an asymmetrical flat plate heat pipe, Int. J. Heat Mass Transfer 43 (19) (2000) 3753.

Finned and profiled ducts

[55C] Y. Chen, M. Fiebig, N.K. Mitra, Heat transfer enhancement of finned oval tubes with staggered punched longitudinal vortex generators, Int. J. Heat Mass Transfer 43 (3) (2000) 417.
[56C] Y. Chen, D.E. Nikitopoulos, R. Hibbs, S. Acharya, T.A. Myrum, Detailed mass transfer distribution in a

ribbed coolant passage with a 180° bend, Int. J. Heat Mass Transfer 43 (8) (2000) 1479.
[57C] A.W. Date, Numerical prediction of laminar flow and heat transfer in a tube with twisted-tape insert: effects of property variations and buoyancy, J. Enhanced Heat Transfer 7 (4) (2000) 217.
[58C] S.V. Ekkad, G. Pamula, A. Shantiniketanam, Detailed heat transfer measurements inside straight and tapered two-pass channels with rib turbulators, Exp. Thermal Fluid Sci. 22 (3) (2000) 155.
[59C] G. Fabbri, Heat transfer optimization in corrugated wall channels, Int. J. Heat Mass Transfer 43 (23) (2000) 4299.
[60C] G. Fabbri, Optimum profiles for asymmetrical longitudinal fins in annular ducts, Heat Transfer Eng. 21 (2) (2000) 40.
[61C] N. Ghaddar, A. El-Hajj, Numerical study of heat transfer augmentation of viscous flow in corrugated channels, Heat Transfer Eng. 21 (5) (2000) 35.
[62C] Y.T. Kang, R.N. Christensen, The effect of fluid property variations on heat transfer in annulus side of a spirally fluted tube, J. Enhanced Heat Transfer 7 (1) (2000) 1.
[63C] K. Katoh, K.S. Choi, T. Azuma, Heat-transfer enhancement and pressure loss by surface roughness in turbulent channel flows, Int. J. Heat Mass Transfer 43 (21) (2000) 4009.
[64C] S.H. Kim, N.K. Anand, Use of slots to enhance forced convective cooling between channels with surface-mounted heat sources, Numer. Heat Transfer Part A 38 (1) (2000) 1.
[65C] A. Klaczak, Heat transfer by laminar flow in a vertical pipe with twisted-tape inserts, Heat Mass Transfer 36 (3) (2000) 195.
[66C] A.T. Komov, A.S. Barashkov, A.N. Varava, A.V. Dedov, A.S. Shcheglov, Heat transfer in a pipe under asymmetric heating under conditions of forced motion of subcooled liquid, High Temperature – USSR 38 (1) (2000) 57.
[67C] C.W. Leung, S. Chen, T.L. Chan, Numerical simulation of laminar forced convection in an air-cooled horizontal printed circuit board assembly, Numer. Heat Transfer Part A 37 (4) (2000) 373.
[68C] C.W. Leung, S. Chen, T.T. Wong, S.D. Probert, Forced convection and pressure drop in a horizontal triangular-section with V-grooved (i.e. orthogonal to the mean flow) inner surfaces, Appl. Energy 66 (3) (2000) 199.
[69C] Q. Liao, M.D. Xin, Augmentation of convective heat transfer inside tubes with three-dimensional internal extended surfaces and twisted-tape inserts, Chem. Eng. J. 78 (2) (2000) 95.
[70C] Q. Liao, X. Zhu, M.D. Xin, Augmentation of turbulent convective heat transfer in tubes with three-dimensional internal extended surfaces, J. Enhanced Heat Transfer 7 (3) (2000) 139.
[71C] M.J. Noot, R.M.M. Mattheij, Numerical analysis of turbine blade cooling ducts, Math. Comput. Model. 31 (1) (2000) 77.
[72C] A. Saidi, B. Sunden, Numerical simulation of turbulent convective heat transfer in square ribbed ducts, Numer. Heat Transfer Part A 38 (1) (2000) 67.
[73C] O.N. Sara, T. Pekdemir, S. Yapici, H. Ersahan, Thermal performance analysis for solid and perforated blocks attached on a fiat surface in duct flow, Energy Conversion Manage. 41 (10) (2000) 1019.
[74C] T. Seo, S.W. Byun, M.R. Jung, Experimental investigation of heat transfer enhancement in a circular duct with circumferential fins and circular disks, KSME J. 14 (12) (2000) 1421.
[75C] G.I. Sultan, Enhancing forced convection heat transfer from multiple protruding heat sources simulating electronic components in a horizontal channel by passive cooling, Microelectronics J. 31 (9) (2000) 773.
[76C] W.B. Tsai, W.W. Lin, C.C. Chieng, Computation of enhanced turbulent heat transfer in a channel with periodic ribs, Int. J. Numer. Meth. Heat Fluid Flow 10 (1) (2000) 47.
[77C] Y.Y. Tsui, S.W. Leu, C.C. Lin, P.W. Wu, Heat transfer enhancement by multilobe vortex generators: effects of lore parameters, Numer. Heat Transfer Part A 37 (6) (2000) 653.
[78C] A. Valencia, Turbulent flow and heat transfer in a channel with a square bar detached from the wall, Numer. Heat Transfer Part A 37 (3) (2000) 289.
[79C] H.Y. Wu, H. Cheng, Q.T. Zhou, Compound enhanced heat transfer inside tubes by combined use of spirally corrugated tubes and inlet axial vane swirlers, J. Enhanced Heat Transfer 7 (4) (2000) 247.
[80C] Y.M. Zhang, G.M. Azad, J.C. Han, C.P. Lee, Turbulent heat transfer enhancement and surface heating effect in square channels with wavy, and twisted tape inserts with interrupted ribs, J. Enhanced Heat Transfer 7 (1) (2000) 35.

Ducts with periodic and unsteady motion

[81C] A.R. Barker, J.E.F. Williams, Transient measurements of the heat transfer coefficient in unsteady, turbulent pipe flow, Int. J. Heat Mass Transfer 43 (17) (2000) 3197.
[82C] A. Barletta, E.R. di Schio, Periodic forced convection with axial heat conduction in a circular duct, Int. J. Heat Mass Transfer 43 (16) (2000) 2949.
[83C] S.F. Benjamin, C.A. Roberts, Warm up of an automotive catalyst substrate by pulsating flow: a single channel modelling approach, Int. J. Heat Fluid Flow 21 (6) (2000) 717.
[84C] A.J. Chamkha, Unsteady laminar hydromagnetic fluid-particle flow and heat transfer in channels and circular pipes, Int. J. Heat Fluid Flow 21 (6) (2000) 740.
[85C] S. Cheroto, J.S.P. Guerrero, C.A.C. Santos, S. Kakac, Integral transform for periodic laminar forced convection in simultaneously developing flow, Numer. Heat Transfer Part A 38 (6) (2000) 653.

[86C] T. Inaba, M. Tahara, K. Saitoh, Longitudinal heat transfer in oscillatory flows in pipe bundles of various cross sections, JSME Int. J. Ser. B 43 (3) (2000) 460.
[87C] P. Li, K.T. Yang, Mechanisms for the heat transfer enhancement in zero-mean oscillatory flows in short channels, Int. J. Heat Mass Transfer 43 (19) (2000) 3551.
[88C] C. Walther, H.D. Kuhl, S. Schulz, Numerical investigations on the heat transfer in turbulent oscillating pipe flow, Heat Mass Transfer 36 (2) (2000) 135.

Multiphase and non-Newtonian flows in channels

[89C] E.L. Alisetti, S.K. Roy, Forced convection heat transfer to phase change material slurries in circular ducts, J. Thermophys. Heat Transfer 14 (1) (2000) 115.
[90C] A. Barletta, Combined forced and free flow of a power-law fluid in a vertical annular duct, Int. J. Heat Mass Transfer 43 (19) (2000) 3673.
[91C] P. Boulet, S. Moissette, R. Andreux, B. Oesterle, Test of an Eulerian–Lagrangian simulation of wall heat transfer in a gas–solid pipe flow, Int. J. Heat Fluid Flow 21 (3) (2000) 381.
[92C] K.J. Hammad, The effect of hydrodynamic conditions on heat transfer in a complex viscoplastic flow field, Int. J. Heat Mass Transfer 43 (6) (2000) 945.
[93C] T. Han, A. Levy, H. Kalman, Y. Peng, Model for dilute gas–particle flow in constant-area lance with heating and friction, Powder Technol. (2000) 283 (special issue).
[94C] H. Inaba, N. Haruki, A. Horibe, Flow drag and heat transfer reduction of flowing water containing fibrous material in a straight pipe, Int. J. Thermal Sci. 39 (1) (2000) 18.
[95C] D. Kim, A.J. Ghajar, R.L. Dougherty, Robust heat transfer correlation for turbulent gas–liquid flow in vertical pipes, J. Thermophys. Heat Transfer 14 (4) (2000) 574.
[96C] C. Nouar, B. Benaouda-Zouaoui, C. Desaubry, Laminar mixed convection in a horizontal annular duct. Case of thermodependent non-Newtonian fluid, Eur. J. Mech. B 19 (3) (2000) 423.
[97C] F.T. Pinho, P.J. Oliveira, Analysis of forced convection in pipes and channels with the simplified Phan-Thien–Tanner fluid, Int. J. Heat Mass Transfer 43 (13) (2000) 2273.
[98C] R. Rozenblit, M. Simkhis, G. Hetsroni, D. Barnea, Y. Taitel, Heat transfer in horizontal solid–liquid pipe flow, Int. J. Multiphase Flow 26 (8) (2000) 1235.
[99C] K.P. Sandeep, C.A. Zuritz, V.M. Puri, Modelling non-Newtonian two-phase flow in conventional and helical-holding tubes, Int. J. Food Sci. Technol. 35 (5) (2000) 511.

Separated flows

[1D] A.G. Catto, A.T. Prata, A numerical study of instantaneous heat transfer during compression and expansion in piston-cylinder geometry, Numer. Heat Transfer Part A 38 (3) (2000) 281.
[2D] L. Fang, D.K. Harris, V.W. Goldschmidt, Heat transfer of a U-bend in a cross flow of air at different angles of incidence, Int. J. Heat Mass Transfer 43 (17) (2000) 3053.
[3D] W.S. Fu, S.J. Yang, Numerical simulation of heat transfer induced by a body moving in the same direction as flowing fluids, Heat Mass Transfer 36 (3) (2000) 257.
[4D] O.M. Haddad, M. Abu-Qudais, B.A.K. Abu-Hijleh, A.M. Maqableh, Entropy generation due to laminar forced convection flow past a parabolic cylinder, Int. J. Numer. Meth. Heat Fluid Flow 10 (7) (2000) 770.
[5D] O.M. Haddad, M. Abu-Qudais, A.M. Maqableh, Numerical solutions of the Navier–Stokes and energy equations for laminar incompressible flow past parabolic bodies, Int. J. Numer. Meth. Heat Fluid Flow 10 (1) (2000) 80.
[6D] S.C. Haldar, Fully developed combined convection in a seven-rod horizontal bundle, Int. J. Heat Mass Transfer 43 (19) (2000) 3735.
[7D] H. Iwai, K. Nakabe, K. Suzuki, Flow and heat transfer characteristics of backward-facing step laminar flow in a rectangular duct, Int. J. Heat Mass Transfer 43 (3) (2000) 457.
[8D] H. Iwai, K. Nakabe, K. Suzuki, K. Matsubara, The effects of duct inclination angle on laminar mixed convective flows over a backward-facing step, Int. J. Heat Mass Transfer 43 (3) (2000) 473.
[9D] Y. Kikuchi, H. Suzuki, M. Kitagawa, K. Ikeya, Effect of pulsating strouhal number on heat transfer around a heated cylinder in pulsating cross-flow, JSME Int. J. Ser. B 43 (2) (2000) 250.
[10D] D. Knight, M. Gnedin, R. Becht, A. Zheltovodov, Numerical simulation of crossing-shock-wave/turbulent-boundary-layer interaction using a two-equation model of turbulence, J. Fluid Mech. 409 (2000) 121.
[11D] J.C. Lecordier, L.W.B. Browne, S. Le Masson, F. Dumouchel, P. Paranthoen, Control of vortex shedding by thermal effect at low Reynolds numbers, Exp. Thermal Fluid Sci. 21 (4) (2000) 227.
[12D] J.H. Lin, C.K. Chen, Y.T. Yang, The inverse estimation of the thermal boundary behavior of a heated cylinder normal to a laminar air stream, Int. J. Heat Mass Transfer 43 (21) (2000) 3991.
[13D] R.C. Mehta, Heat transfer study of high speed flow over a spiked blunt body, Int. J. Numer. Meth. Heat Fluid Flow 10 (7) (2000) 750.
[14D] R.C. Mehta, Numerical heat transfer study over spiked blunt bodies at Mach 6.8, J. Spacecraft Rockets 37 (5) (2000) 700.
[15D] R.C. Mehta, Peak heating for reattachment of separated flow on a spiked blunt-body, Heat Mass Transfer 36 (4) (2000) 277.
[16D] F. Moukalled, A. Doughan, S. Acharya, Parametric study of mixed convection in channels with concave and convex surfaces, Int. J. Heat Mass Transfer 43 (11) (2000) 1947.

[17D] B.S.V. Patnaik, P.A.A. Narayana, K.N. Seetharamu, Finite element simulation of transient laminar flow past a circular cylinder and two cylinders in tandem – Influence of buoyancy, Int. J. Numer. Meth. Heat Fluid Flow 10 (6) (2000) 560.

[18D] B.K. Rao, Heat transfer to non-Newtonian flows over a cylinder in cross flow, Int. J. Heat Fluid Flow 21 (6) (2000) 693.

[19D] G.H. Rhee, H.J. Sung, Enhancement of heat transfer in turbulent separated and reattaching flow by local forcing, Numer. Heat Transfer Part A 37 (7) (2000) 733.

[20D] G.H. Rhee, H.J. Sung, A nonlinear low-Reynolds number heat transfer model for turbulent separated and reattaching flows, Int. J. Heat Mass Transfer 43 (8) (2000) 1439.

[21D] J.L. Rosales, A. Ortega, J.A.C. Humphrey, A numerical investigation of the convective heat transfer in unsteady laminar flow past a single and tandem pair of square cylinders in a channel, Numer. Heat Transfer Part A 38 (5) (2000) 443.

[22D] S.M. Ruffin, A. Gupta, D. Marshall, Supersonic channel airfoils for reduced drag, AIAA J. 38 (3) (2000) 480.

[23D] E. Sachs, E. Wylonis, S. Allen, M. Cima, H.L. Guo, Production of injection molding tooling with conformal cooling channels using the three-dimensional printing process, Polym. Eng. Sci. 40 (5) (2000) 1232.

[24D] P.R. Spalart, M.K. Strelets, Mechanisms of transition and heat transfer in a separation bubble, J. Fluid Mech. 403 (2000) 329.

[25D] T. Tsutsui, T. Igarashi, H. Nakamura, Fluid flow and heat transfer around a cylindrical protuberance mounted on a flat plate boundary layer, JSME Int. J. Ser. B 43 (2) (2000) 279.

[26D] S. Ubertini, U. Desideri, Experimental performance analysis of an annular diffuser with and without struts, Exp. Thermal Fluid Sci. 22 (3) (2000) 183.

[27D] A.S. Wilson, M.K. Bassiouny, Modeling of heat transfer for flow across tube banks, Chem. Eng. Process. 39 (1) (2000) 1.

[28D] M. Yaghoubi, M. Rahnema, Numerical study of turbulent flow and heat transfer from an array of thick plates, Int. J. Thermal Sci. 39 (2) (2000) 213.

[29D] Y.J. Yang, Z.S. Yan, C.K. Chen, Numerical study of turbulent heat transfer and flow characteristics of hot flow over a sudden-expansion with base mass injection, Acta Mech. 144 (1) (2000) 57.

[30D] Y. Zhou, R.M.C. So, M.H. Liu, H.J. Zhang, Complex turbulent wakes generated by two and three side-by-side cylinders, Int. J. Heat Fluid Flow 21 (2) (2000) 125.

Porous media: Fundamental advances

[1DP] A.C. Baytas, Entropy generation for natural convection in an inclined porous cavity, Int. J. Heat Mass Transfer 43 (12) (2000) 2089.

[2DP] Y. Demirel, R. Kahraman, Thermodynamic analysis of convective heat transfer in an annular packed bed, Int. J. Heat Fluid Flow 21 (4) (2000) 442.

[3DP] D. Getachew, W.J. Minkowycz, J.L. Lage, A modified form of the k–ε model for turbulent flows of an incompressible fluid in porous media, Int. J. Heat Mass Transfer 43 (16) (2000) 2909.

[4DP] W.G. Gray, Macroscale equilibrium conditions for two-phase flow in porous media, Int. J. Multiphase Flow 26 (3) (2000) 467.

[5DP] J. Hager, S. Whitaker, Vapor–liquid jump conditions within a porous medium: results for mass and energy, Transport Porous Media 40 (1) (2000) 73.

[6DP] W. Kast, C.R. Hohenthanner, Mass transfer within the gas-phase of porous media, Int. J. Heat Mass Transfer 43 (5) (2000) 807.

[7DP] C. Khachikian, T.C. Harmon, Nonaqueous phase liquid dissolution in porous media: current state of knowledge and research needs, Transport Porous Media 38 (1) (2000) 3.

[8DP] V.M. Kharin, G.V. Agafonov, A.A. Goryainov, Internal water and heat transfer in capillary porous bodies, Theoret. Found. Chem. Eng. (English Transl.: Teoreticheskie Osnovy Khimicheskoi Tekhnologii) 34 (5) (2000) 469.

[9DP] I. Kocabas, M.R. Islam, Concentration and temperature transients in heterogeneous porous media. Part I: linear transport, J. Petrol. Sci. Eng. 26 (1) (2000) 211.

[10DP] A.F. Miguel, Contribution to flow characterisation through porous media, Int. J. Heat Mass Transfer 43 (13) (2000) 2267.

[11DP] C. Moyne, S. Didierjean, H.P.A. Souto, O.T. da Silveira, Thermal dispersion in porous media: one-equation model, Int. J. Heat Mass Transfer 43 (20) (2000) 3853.

[12DP] M.A. Murad, J.H. Cushman, Thermomechanical theories for swelling porous media with microstructure, Int. J. Eng. Sci. 38 (5) (2000) 517.

[13DP] V. Navarro, E.E. Alonso, Modeling swelling soils for disposal barriers, Comput. Geotech. 27 (1) (2000) 19.

[14DP] C.C. Ni, J.Y. San, Mass diffusion in a spherical microporous particle with thermal effect and gas-side mass transfer resistance, Int. J. Heat Mass Transfer 43 (12) (2000) 2129.

[15DP] A. Raptis, Boundary layer flow of a micropolar fluid through a porous medium, J. Porous Media 3 (1) (2000) 95.

[16DP] Y.M. Xuan, W. Roetzel, Conceptions for heat transfer correlation of nanofluids, Int. J. Heat Mass Transfer 43 (19) (2000) 3701.

Property determination

[17DP] G. Buonanno, A. Carotenuto, The effective thermal conductivity of packed beds of spheres for a finite contact area, Numer. Heat Transfer Part A 37 (4) (2000) 343.

[18DP] J.D. Chung, M. Kaviany, Effects of phonon pore scattering and pore randomness on effective conductivity of porous silicon, Int. J. Heat Mass Transfer 43 (4) (2000) 521.

[19DP] T.H. Eun, H.K. Song, J.H. Han, K.H. Lee, J.N. Kim, Enhancement of heat and mass transfer in silica-expanded graphite composite blocks for adsorption heat pumps: Part I. Characterization of the composite blocks, Int. J. Refrig. 23 (1) (2000) 64.

[20DP] J. Fukai, M. Kanou, Y. Kodama, O. Miyatake, Thermal conductivity enhancement of energy storage media using carbon fibers, Energy Conversion Manage. 41 (14) (2000) 1543.

[21DP] K. Kamiuto, K. Combined, conductive and radiative heat transfer through open-cellular porous plates, JSME Int. J. Ser. B 43 (2) (2000) 273.

[22DP] S.J. Kim, D. Kim, D.Y. Lee, On the local thermal equilibrium in microchannel heat sinks, Int. J. Heat Mass Transfer 43 (10) (2000) 1735.

[23DP] R.E. Martinez-Gomez, A. Soria, Effective conductivity for porous media: a Maxwellian approach, J. Porous Media 3 (3) (2000) 237.

[24DP] C.C. Ngo, F.C. Lai, Effective permeability for natural convection in a layered porous annulus, J. Thermophys. Heat Transfer 14 (3) (2000) 363.

[25DP] W.W.M. Siu, S.H.K. Lee, Effective conductivity computation of a packed bed using constriction resistance and contact angle effects, Int. J. Heat Mass Transfer 43 (21) (2000) 3917.

[26DP] W.W.M. Siu, S.H.K. Lee, Transient effect on the constriction resistance between spheres, Comput. Mech. 25 (1) (2000) 59.

[27DP] A.J. Slavin, F.A. Londry, J. Harrison, A new model for the effective thermal conductivity of packed beds of solid spheroids: alumina in helium between 100 and 500 °C, Int. J. Heat Mass Transfer 43 (12) (2000) 2059.

[28DP] C. Tremblay, A. Cloutier, Y. Fortin, Determination of the effective water conductivity of red pine sapwood, Wood Sci. Technol. 34 (2) (2000) 109.

[29DP] A.K.C. Wu, S.H.K. Lee, Sphere packing algorithm for heat transfer studies, Numer. Heat Transfer Part A 37 (6) (2000) 631.

External flow and heat transfer

[30DP] C.Y. Cheng, C.Y. Natural, convection heat and mass transfer near a wavy cone with constant wall temperature and concentration in a porous medium, Mech. Res. Commun. 27 (5) (2000) 613.

[31DP] C.Y. Cheng, Transient heat and mass transfer by natural convection from vertical surfaces in porous media, J. Phys. D 33 (12) (2000) 1425.

[32DP] E.M.A. Elbashbeshy, M.A.A. Bazid, Heat transfer over a continuously moving plate embedded in non-Darcian porous medium, Int. J. Heat Mass Transfer 43 (17) (2000) 3087.

[33DP] R.S.R. Gorla, M. Kumari, Nonsimilar solutions for mixed convection in non-Newtonian fluids along a wedge with variable surface heat flux in a porous medium, J. Porous Media 3 (2) (2000) 181.

[34DP] M.A. Hossain, I. Pop, D.A.S. Rees, The effect of time-periodic surface temperature oscillations on free convection from a vertical surface in a porous medium, Transport Porous Media 39 (1) (2000) 119.

[35DP] F.S. Ibrahim, S.M. Abdel-Gaid, R.S.R. Gorla, Non-Darcy mixed convection flow along a vertical plate embedded in a non-Newtonian fluid saturated porous medium with surface mass transfer, Int. J. Numer. Meth. Heat Fluid Flow 10 (4) (2000) 397.

[36DP] F.S. Ibrahim, I.A. Hassanien, Influence of variable permeability on combined convection along a nonisothermal wedge in a saturated porous medium, Transport Porous Media 39 (1) (2000) 57.

[37DP] J. Jiang, Y.X. Tao, L. Byrd, Evaporative heat transfer from thin liquid film on a heated cylinder, Int. J. Heat Mass Transfer 43 (1) (2000) 85.

[38DP] D.H. Lee, D.Y. Yoon, C.K. Choi, The onset of vortex instability in laminar natural convection flow over an inclined plate embedded in a porous medium, Int. J. Heat Mass Transfer 43 (16) (2000) 2895.

[39DP] D. Lesnic, D.B. Ingham, I. Pop, Free convection from a horizontal surface in a porous medium with Newtonian heating, J. Porous Media 3 (3) (2000) 227.

[40DP] M.A. Mansour, R.S.R. Gorla, Combined convection in non-Newtonian fluids along a nonisothermal vertical plate in a porous medium, Int. J. Numer. Meth. Heat Fluid Flow 10 (2) (2000) 163.

[41DP] I. Masters, W.K.S. Pao, R.W. Lewis, Coupling temperature to a double-porosity model of deformable porous media, Int. J. Numer. Meth. Eng. 49 (3) (2000) 421.

[42DP] J.H. Merkin, I. Pop, Free convection near a stagnation point in a porous medium resulting from an oscillatory wall temperature, Int. J. Heat Mass Transfer 43 (4) (2000) 611.

[43DP] A.A. Merrikh, A.A. Mohamad, Transient natural convection in differentially heated porous enclosures, J. Porous Media 3 (2) (2000) 165.

[44DP] A.A. Mohammadien, M.F. El-Amin, Thermal dispersion-radiation effects on non-Darcy natural convection in a fluid saturated porous medium, Transport Porous Media 40 (2) (2000) 153.

[45DP] A.G. Nassiopoulou, G. Kaltsas, Porous silicon as an effective material for thermal isolation on bulk crystalline silicon, Phys. Status Solidi A 182 (1) (2000) 307.

[46DP] I. Pop, T.Y. Na, Conjugate free convection over a vertical slender hollow cylinder embedded in a porous medium, Heat Mass Transfer 36 (5) (2000) 375.

[47DP] I. Pop, A. Nakayama, Conjugate free and mixed convection heat transfer from a vertical fin embedded in a porous medium, Recent Adv. Anal. Heat Transfer Fin Type Surf. 5 (2000) 67.

[48DP] K.V. Prasad, M.S. Abel, A. Joshi, Oscillatory motion of a viscoelastic fluid over a stretching sheet in porous media, J. Porous Media 3 (1) (2000) 61.

[49DP] N.J. Rabadi, E.M. Hamdan, Free convection from inclined permeable walls embedded in variable permeability porous media with lateral mass flux, J. Petrol. Sci. Eng. 26 (1) (2000).

[50DP] S.U. Rahman, M.A. Al-Saleh, R.N. Sharma, An experimental study on natural convection from vertical surfaces embedded in porous media, Ind. Eng. Chem. Res. 39 (1) (2000) 214.

[51DP] D.A.S. Rees, I. Pop, Vertical free convection in a porous medium with variable permeability effects, Int. J. Heat Mass Transfer 43 (14) (2000) 2565.
[52DP] D.A.S. Rees, I. Pop, Vertical free convective boundary-layer flow in a porous medium using a thermal nonequilibrium model, J. Porous Media 3 (1) (2000) 31.
[53DP] B. Tashtoush, Analytical solution for the effect of viscous dissipation on mixed convection in saturated porous media, Transport Porous Media 41 (2) (2000) 197.

Packed beds

[54DP] A.J. Chamkha, Flow of two-immiscible fluids in porous and nonporous channels, J. Fluids Eng. Trans. ASME 122 (1) (2000) 117.
[55DP] Y.C. Chen, J.N. Chung, C.S. Wu, Y.F. Lue, Non-Darcy mixed convection in a vertical channel filled with a porous medium, Int. J. Heat Mass Transfer 43 (13) (2000) 2421.
[56DP] C.R. Choi, C.N. Kim, Numerical analysis of plume characteristics and liquid circulation in gas injection through a porous plug, KSME J. 14 (12) (2000) 1365.
[57DP] M.T. Colli-Serrano, N. Midoux, Hydrodynamics and heat transfer in packed bed with co current up flow for coalescing and non-coalescing liquids. A simple model, Chem. Eng. Sci. 55 (19) (2000) 4149.
[58DP] J.P. Crawshaw, W.R. Paterson, D.M. Scott, Gas channelling and heat transfer in moving beds of spherical particles, Chem. Eng. Res. Des. 78 (A3) (2000) 465.
[59DP] Y. Demirel, R.N. Sharma, H.H. Al-Ali, On the effective heat transfer parameters in a packed bed, Int. J. Heat Mass Transfer 43 (2) (2000) 327.
[60DP] M.D. Donne, A. Goraieb, G. Piazza, F. Scaffidi-Argentina, Experimental investigations on the thermal and mechanical behaviour of single size beryllium pebble beds, Fus. Technol. 38 (3) (2000) 290.
[61DP] E. Elisante, M. Yoshida, S. Matsumoto, Application of mu-interaction measures for decentralized temperature control of packed-bed chemical reactor, J. Chem. Eng. Japan 33 (1) (2000) 120.
[62DP] S.C. Haldar, A.K. Mohanty, M.R. Dubey, Laminar free convection in open-ended vertical 7-rod bundles: experiments and porous model, Nucl. Eng. Des. 198 (3) (2000) 295.
[63DP] M.O. Hamdan, M.A. Al-Nimr, M.K. Alkam, Enhancing forced convection by inserting porous substrate in the core of a parallel-plate channel, Int. J. Numer. Meth. Heat Fluid Flow 10 (5) (2000) 502.
[64DP] W.H. Hsieh, S.F. Lu, Heat-transfer analysis and thermal dispersion in thermally-developing region of a sintered porous metal channel, Int. J. Heat Mass Transfer 43 (16) (2000) 3001.
[65DP] F. Johnsson, R.C. Zijerveld, J.C. Schouten, C.M. van den Bleek, B. Leckner, Characterization of fluidization regimes by time-series analysis of pressure fluctuations [Review], Int. J. Multiphase Flow 26 (4) (2000) 663.
[66DP] A. Khan, A.A. Khan, Y.B.G. Varma, An analysis of phase holdup in concurrent gas liquid upflow through packed beds using (I) drift-flux model, and (II) slip ratio, Bioprocess Eng. 22 (2) (2000) 165.
[67DP] A.V. Kuznetsov, Fluid flow and heat transfer analysis of Couette flow in a composite duct, Acta Mech. 140 (3) (2000) 163.
[68DP] A.V. Kuznetsov, M. Xiong, Numerical simulation of the effect of thermal dispersion on forced convection in a circular duct partly filled with a Brinkman–Forchheimer porous medium, Int. J. Numer. Meth. Heat Fluid Flow 10 (5) (2000) 488.
[69DP] S.J. Liu, J. Long, Gas–liquid countercurrent flows through packed towers, J. Porous Media 3 (2) (2000) 99.
[70DP] J. Llagostera, J.R. Figueiredo, Application of the UNIFAES discretization scheme to mixed convection in a porous layer with a cavity, using the Darcy model, J. Porous Media 3 (2) (2000) 139.
[71DP] G.Q. Lu, P. Cheng, Friction factor and Nusselt number for thermoacoustic transport phenomena in a tube, J. Thermophys. Heat Transfer 14 (4) (2000) 566.
[72DP] W. Luan, B.D. Bowen, C.J. Lim, C.M.H. Brereton, J.R. Grace, Suspension-to-membrane-wall heat transfer in a circulating fluidized bed combustor, Int. J. Heat Mass Transfer 43 (7) (2000) 1173.
[73DP] N. Martins, M.G. Carvalho, N. Afgan, A.I. Leontiev, A radiation and convection fluxmeter for high temperature applications, Exp. Thermal Fluid Sci. 22 (3) (2000) 165.
[74DP] M.F. Mathias, G.P. Muldowney, Effect of solids loading method on bed porosity and gas flux distribution in a fixed-bed reactor, Chem. Eng. Sci. 55 (21) (2000) 4981.
[75DP] V. Mathiesen, T. Solberg, B.H. Hjertager, An experimental and computational study of multiphase flow behavior in a circulating fluidized bed, Int. J. Multiphase Flow 26 (3) (2000) 387.
[76DP] C. Mihalyko, B.G. Lakatos, T. Blickle, Modelling heat transfer between solid particles, Math. Comput. Simul. 53 (4) (2000) 305.
[77DP] D.A. Mitchell, O.F. von Meien, Mathematical modeling as a tool to investigate the design and operation of the zymotis packed-bed bioreactor for solid-state fermentation, Biotechnol. Bioeng. 68 (2) (2000) 127.
[78DP] D.A. Nield, A.V. Kuznetsov, Effects of heterogeneity in forced convection in a porous medium: parallel plate channel or circular duct, Int. J. Heat Mass Transfer 43 (22) (2000) 4119.
[79DP] P.D. Noymer, L.R. Glicksman, Descent velocities of particle clusters at the wall of a circulating fluidized bed, Chem. Eng. Sci. 55 (22) (2000) 5283.
[80DP] P.D. Noymer, M.R. Hyre, L.R. Glicksman, The effect of bed diameter on near-wall hydrodynamics in scale-model circulating fluidized beds, Int. J. Heat Mass Transfer 43 (19) (2000) 3641.
[81DP] M. Okuyama, Y. Abe, Measurement of velocity and temperature distributions in a highly porous medium, J. Porous Media 3 (3) (2000) 193.
[82DP] M. Ozawa, H. Umekawa, N. Takenaka, M. Matsubayashi, Quantitative flow visualization of fluidized-

bed under normal- and down-flow-mode operations by neutron radiography, Exp. Fluids 28 (5) (2000) 413.
[83DP] A. Schmidt, U. Renz, Numerical prediction of heat transfer in fluidized beds by a kinetic theory of granular flows, Int. J. Thermal Sci. 39 (9) (2000) 871.
[84DP] A.K. Sharma, K. Tuzla, J. Matsen, J.C. Chen, Parametric effects of particle size and gas velocity on cluster characteristics in fast fluidized beds, Powder Technol. 111 (1) (2000) 114.
[85DP] J.C. Thomeo, J.T. Freire, Heat transfer in fixed bed: a model non-linearity approach, Chem. Eng. Sci. 55 (12) (2000) 2329.
[86DP] M. Winterberg, E. Tsotsas, Modelling of heat transport in beds packed with spherical particles for various bed geometries and/or thermal boundary conditions, Int. J. Thermal Sci. 39 (5) (2000) 556.
[87DP] M. Winterberg, E. Tsotsas, A. Krischke, D. Vortmeyer, A simple and coherent set of coefficients for modelling of heat and mass transport with and without chemical reaction in tubes filled with spheres, Chem. Eng. Sci. 55 (5) (2000) 967.
[88DP] A.K.C. Wu, S.H.K. Lee, Multiple-rays tracing technique for radiative exchange within packed beds, Numer. Heat Transfer Part B 37 (4) (2000) 469.
[89DP] M. Xiong, A.V. Kuznetsov, Forced convection in a Couette flow in a composite duct: an analysis of thermal dispersion and non-Darcian effects, J. Porous Media 3 (3) (2000) 245.
[90DP] H.I. You, C.H. Chang, Experimental study on heat transfer and friction in pin fin channel flow, Chung-Kuo Kung Ch'Eng Hsueh K'An 23 (1) (2000) 117.
[91DP] B.L. Zhang, Y. Zhao, A numerical method for simulation of forced convection in a composite porous/fluid system, Int. J. Heat Fluid Flow 21 (4) (2000) 432.
[92DP] H.Y. Zhang, X.Y. Huang, Volumetric heat transfer coefficients in solid–fluid porous media: closure problem, thermal analysis and model improvement with fluid flow, Int. J. Heat Mass Transfer 43 (18) (2000) 3417.

Porous layers and enclosures

[93DP] A.M. Al-Amiri, Analysis of momentum and energy transfer in a lid-driven cavity filled with a porous medium, Int. J. Heat Mass Transfer 43 (19) (2000) 3513.
[94DP] M.A. Al-Nimr, M.K. Alkam, Basic fluid flow problems in porous media, J. Porous Media 3 (1) (2000) 45.
[95DP] S.M. Alex, P.R. Patil, Thermal instability in an inclined isotropic porous medium, J. Porous Media 3 (3) (2000) 207.
[96DP] L.S.D. Alves, R.M. Cotta, Transient natural convection inside porous cavities: hybrid numerical–analytical solution and mixed symbolic-numerical computation, Numer. Heat Transfer Part A 38 (1) (2000) 89.
[97DP] A. Amahmid, M. Hasnaoui, M. Mamou, P. Vasseur, On the transition between aiding and opposing double-diffusive flows in a vertical porous cavity, J. Porous Media 3 (2) (2000) 123.
[98DP] T. Amara, K. Slimi, S. BenNasrallah, Free convection in a vertical cylindrical enclosure, Int. J. Thermal Sci. 39 (5) (2000) 616.
[99DP] P. Bera, V. Eswaran, P. Singh, Double-diffusive convection in slender anisotropic porous enclosures, J. Porous Media 3 (1) (2000) 11.
[100DP] A. Chatterjee, V. Prasad, D. Sun, A full 3-dimensional adaptive finite volume scheme for transport and phase-change processes, part II: application to crystal growth, Numer. Heat Transfer Part A 37 (8) (2000) 823.
[101DP] H.T. Chiu, B.M. Yu, S.C. Chen, L.J. Lee, Heat transfer during flow and resin reaction through fiber reinforcement, Chem. Eng. Sci. 55 (17) (2000) 3365.
[102DP] T.C. Jue, Analysis of heat and fluid flow in partially divided fluid saturated porous cavities, Heat Mass Transfer 36 (4) (2000) 285.
[103DP] K.M. Khanafer, N.M. Al-Najem, M.M. El-Refaee, Natural convection in tilted porous enclosures in the presence of a transverse magnetic field, J. Porous Media 3 (1) (2000) 79.
[104DP] V.V. Kulish, J.L. Lage, Diffusion within a porous medium with randomly distributed heat sinks, Int. J. Heat Mass Transfer 43 (18) (2000) 3481.
[105DP] B.V.R. Kumar, A study of free convection induced by a vertical wavy surface with heat flux in a porous enclosure, Numer. Heat Transfer Part A 37 (5) (2000) 493.
[106DP] A. Mahidjiba, M. Mamou, P. Vasseur, Onset of double-diffusive convection in a rectangular porous cavity subject to mixed boundary conditions, Int. J. Heat Mass Transfer 43 (9) (2000) 1505.
[107DP] J.P.B. Mota, I. Esteves, C.A.M. Portugal, J. Esperanca, E. Saatdjian, Natural convection heat transfer in horizontal eccentric elliptic annuli containing saturated porous media, Int. J. Heat Mass Transfer 43 (24) (2000) 4367.
[108DP] M. Naimi, M. Hasnaoui, J.K. Platten, Marangoni convection of non-Newtonian power law fluids in a shallow rectangular cavity, Eng. Comput. (Swansea, Wales) 17 (6) (2000) 638.
[109DP] P. Nithiarasu, K.S. Sujatha, K. Ravindran, T. Sundararajan, K.N. Seetharamu, Non-Darcy natural convection in a hydrodynamically and thermally anisotropic porous medium, Comput. Meth. Appl. Mech. Eng. 188 (1) (2000) 413.
[110DP] B. Sarler, D. Gobin, B. Goyeau, J. Perko, H. Power, Natural convection in porous media – dual reciprocity boundary element method solution of the Darcy model, Int. J. Numer. Meth. Fluids 33 (2) (2000) 279.
[111DP] S. Schoofs, R.A. Trompert, U. Hansen, The formation and evolution of layered structures in porous media: effects of porosity and mechanical dispersion, Phys. Earth Planet. Interiors 118 (3) (2000) 205.
[112DP] A.K. Singh, T. Paul, G.R. Thorpe, Natural convection in a non-rectangular porous enclosure, Forsch. Ingenieurwes. – Eng. Res. 65 (10) (2000) 301.
[113DP] K.D. Singh, R. Sharma, K. Chand, Three dimensional fluctuating flow and heat transfer through a porous

medium with variable permeability, Z. Angew. Math. Mech. 80 (7) (2000) 473.
[114DP] O. Sovran, G. Bardan, A. Mojatbi, M.C. Charrier-Mojtabi, Finite frequency external modulation in doubly diffusive convection, Numer. Heat Transfer Part A 37 (8) (2000) 877.
[115DP] C. Tournier, P. Genthon, M. Rabinowicz, The onset of natural convection in vertical fault planes: consequences for the thermal regime in crystalline basements and for heat recovery experiments, Geophys. J. Int. 140 (3) (2000) 500.
[116DP] P. Vadasz, S. Olek, Convergence and accuracy of Adomian's decomposition method for the solution of Lorenz equations, Int. J. Heat Mass Transfer 43 (10) (2000) 1715.
[117DP] J.W. Yang, R.N. Edwards, Predicted groundwater circulation in fractured and unfractured anisotropic porous media driven by nuclear fuel waste heat generation, Can. J. Earth Sci. 37 (9) (2000) 1301.
[118DP] B. Yu, H.T. Chiu, Z. Ding, L.J. Lee, Analysis of flow and heat transfer in liquid composite molding, Int. Polym. Process. 15 (3) (2000) 273.

Coupled heat and mass transfer

[119DP] Z. Al-Qodah, M. Al-Hassan, M. Al-Busoul, Hydrodynamic and heat transfer characteristics of an air fluidized bed utilizing a transverse magnetic field, J. Chin. Inst. Chem. Eng. 31 (3) (2000) 211.
[120DP] Y.H. Bai, Heat transfer in the circulating fluidized bed of a commercial catalyst cooler, Powder Technol. 111 (1) (2000) 83.
[121DP] Y. Bando, R. Suzuki, Y. Tanaka, H. Sugita, K. Yasuda, Y. Sakurai, M. Nakamura, Flow and heat transfer characteristics in liquid–solid swirl fluidized bed using centrifugal force, J. Chem. Eng. Japan 33 (2) (2000) 296.
[122DP] D.J. Bremford, H. Muller-Steinhagen, G.G. Duffy, Heat transfer to kraft black liquor in a liquid–solid fluidized bed, Heat Transfer Eng. 21 (6) (2000) 57.
[123DP] G. Brenner, K. Pickenacker, O. Pickenacker, D. Trimis, K. Wawrzinek, T. Weber, Numerical and experimental investigation of matrix-stabilized methane/air combustion in porous inert media, Combust. Flame 123 (1) (2000) 201.
[124DP] G. Buonanno, A. Carotenuto, A comparison of thermal performances of underground power cables in dry and saturated soils, J. Porous Media 3 (1) (2000) 1.
[125DP] R.S. Burkina, R.S. Filtration, combustion of a gas in a semiinfinite porous medium, Combust. Explos. Shock Waves 36 (4) (2000) 417.
[126DP] I. Cerri, G. Saracco, V. Specchia, Methane combustion over low-emission catalytic foam burners, Catal. Today 60 (1) (2000) 21.
[127DP] S.W. Chae, C.H. Son, Y.S. Kim, Finite element analysis on the effect of Si phase melting in combustion synthesis of $MoSi_2$, Mater. Sci. Eng. A 279 (1) (2000) 111.
[128DP] A.J. Chamkha, Non-similar solutions for heat and mass transfer by hydromagnetic mixed convection flow over a plate in porous media with surface suction or injection, Int. J. Numer. Meth. Heat Fluid Flow 10 (2) (2000) 142.
[129DP] A.J. Chamkha, A.R.A. Khaled, Hydromagnetic combined heat and mass transfer by natural convection from a permeable surface embedded in a fluid-saturated porous medium, Int. J. Numer. Meth. Heat Fluid Flow 10 (5) (2000) 455.
[130DP] A.J. Chamkha, A.R.A. Khaled, Hydromagnetic coupled heat and mass transfer by natural convection from a permeable constant heat flux surface in porous media, J. Porous Media 3 (3) (2000) 259.
[131DP] A.J. Chamkha, A.R.A. Khaled, Hydromagnetic simultaneous heat and mass transfer by mixed convection from a vertical plate embedded in a stratified porous medium with thermal dispersion effects, Heat Mass Transfer 36 (1) (2000) 63.
[132DP] A.J. Chamkha, A.R.A. Khaled, Similarity solutions for hydromagnetic mixed convection heat and mass transfer for Hiemenz flow through porous media, Int. J. Numer. Meth. Heat Fluid Flow 10 (1) (2000) 94.
[133DP] A.J. Chamkha, A.R.A. Khaled, O. Al-Hawaj, Simultaneous heat and mass transfer by natural convection from a cone and a wedge in porous media, J. Porous Media 3 (2) (2000) 155.
[134DP] W.J. Chang, C.I. Weng, An analytical solution to coupled heat and moisture diffusion transfer in porous materials, Int. J. Heat Mass Transfer 43 (19) (2000) 3621.
[135DP] M.S. Chou, W.H. Cheng, B.J. Huang, Heat transfer model for regenerative beds, J. Environ. Eng. – ASCE 126 (10) (2000) 912.
[136DP] T.W. Chung, H. Wu, Mass transfer correlation for dehumidification of air in a packed absorber with an inverse U-shaped tunnel, Separation Sci. Technol. 35 (10) (2000) 1502.
[137DP] J. Cooper, W.L.H. Hallett, A numerical model for packed-bed combustion of char particles, Chem. Eng. Sci. 55 (20) (2000) 4451.
[138DP] P.J. de Wild, M. Verhaak, Catalytic production of hydrogen from methanol, Catal. Today 60 (1) (2000) 3.
[139DP] L.F. De Bano, L.F. The, role of fire and soil heating on water repellency in wildland environments: a review, J. Hydrol. 231 (2000) 195.
[140DP] A. Dedic, A. Simplifying, convective heat and mass transfer in moisture desorption of beech wood by introducing characteristic transfer coefficients, Holz. Roh. Werkst. 58 (1) (2000) 96.
[141DP] M. Defo, A. Cloutier, Y. Fortin, Modeling vacuum-contact drying of wood: the water potential approach, Drying Technol. 18 (8) (2000) 1737.
[142DP] L. di Mare, T.A. Mihalik, G. Continillo, J.H.S. Lee, Experimental and numerical study of flammability limits of gaseous mixtures in porous media, Exp. Thermal Fluid Sci. 21 (1) (2000) 117.
[143DP] K.V. Dobrego, S.A. Zhdanok, E.I. Khanevich, Analytical and experimental investigation of the transition from low-velocity to high-velocity regime of filtration combustion, Exp. Thermal Fluid Sci. 21 (1) (2000) 9.

[144DP] A. Dominguez, S. Bories, M. Prat, Gas cluster growth by solute diffusion in porous media. Experiments and automaton simulation on pore network, Int. J. Multiphase Flow 26 (12) (2000) 1951.
[145DP] V. Dupont, F. Moallemi, A. Williams, S.H. Zhang, Combustion of methane in catalytic honeycomb monolith burners, Int. J. Energy Res. 24 (13) (2000) 1181.
[146DP] J.L. Dupuy, Testing two radiative physical models for fire spread through porous forest fuel beds, Combust. Sci. Technol. 155 (2000) 149.
[147DP] J.T. Fan, Z.X. Luo, Y. Li, Heat and moisture transfer with sorption and condensation in porous clothing assemblies and numerical simulation, Int. J. Heat Mass Transfer 43 (16) (2000) 2989.
[148DP] M.G. Gronli, M.C. Melaaen, Mathematical model for wood pyrolysis – comparison of experimental measurements with model predictions, Energy Fuels 14 (4) (2000) 791.
[149DP] M.A. Hastaoglu, N. Hilal, M. Abdulkarim, M. El-Naas, Transient multi gas–solid reactions in a bubbling fluidized bed, Can. J. Chem. Eng. 78 (3) (2000) 433.
[150DP] R.W. Henley, G.O. Hughes, Underground fumaroles: "Excess heat" effects in vein formation, Econom. Geol. Bull. Soc. Econom. Geol. 95 (3) (2000) 453.
[151DP] P. Jean-Baptiste, A.M. Leclerc, Self-limiting geothermal convection in marine carbonate platforms, Geophys. Res. Lett. 27 (6) (2000) 743.
[152DP] H.S. Ji, H. Ohara, K. Kuramoto, A. Tsutsumi, K. Yoshida, T. Hirama, Nonlinear dynamics of gas–solid circulating fluidized-bed system, Chem. Eng. Sci. 55 (2) (2000) 403 (special issue).
[153DP] J. Larfeldt, B. Leckner, M.C. Melaaen, Modelling and measurements of heat transfer in charcoal from pyrolysis of large wood particles, Biomass Bioenergy 18 (6) (2000) 507.
[154DP] J. Larfeldt, B. Leckner, M.C. Melaaen, Modelling and measurements of the pyrolysis of large wood particles, Fuel 79 (13) (2000) 1637.
[155DP] Loo, C.E. Changes, in heat transfer when sintering porous goethitic iron ores, Trans. Inst. Mining Metall. Section C 109 (2000) C11.
[156DP] H.L. Lu, R.S. Bie, W.T. Liu, B.X. Li, L.D. Yang, Computations of a circulating fluidized-bed boiler with wide particle size distributions, Ind. Eng. Chem. Res. 39 (9) (2000) 3212.
[157DP] T. Lucas, C. Favier, J.M. Chourot, J. Guilpart, A.L. Raoult-Wack Aim, R. B. Immersion chilling and freezing of a porous medium, Int. J. Food Sci. Technol. 35 (6) (2000) 583.
[158DP] T. Lucas, D. Flick, J.M. Chourot, A.L. Raoult-Wack, Modeling and control of thawing phenomena in solute-impregnated frozen foods, J. Food Eng. 45 (4) (2000) 209.
[159DP] Y. Ma, J.X. Zhu, Heat transfer between gas–solids suspension and immersed surface in an upflow fluidized bed (riser), Chem. Eng. Sci. 55 (5) (2000) 981.
[160DP] F.S. Magnani, P.C. Philippi, Z.R. Liang, C.P. Fernandes, Modelling two-phase equilibrium in three-dimensional porous microstructures, Int. J. Multiphase Flow 26 (1) (2000) 99.
[161DP] I. Malico, X.Y. Zhou, J.C.F. Pereira, Two-dimensional numerical study of combustion and pollutants formation in porous burners, Combust. Sci. Technol. 152 (2000) 57.
[162DP] A. Marzocchella, P. Salatino, Fluidization of solids with CO_2 at pressures from ambient to supercritical, AICHE J. 46 (5) (2000) 901.
[163DP] S.A. Masoud, M.A. Al-Nimr, M.K. Alkam, Transient film condensation on a vertical plate imbedded in porous medium, Transport Porous Media 40 (3) (2000) 345.
[164DP] T. Nakagawa, A. Inomata, H. Aoki, T. Miura, Numerical analysis of heat and mass transfer characteristics in the metal hydride bed, Int. J. Hydrogen Energy 25 (4) (2000) 339.
[165DP] J.J. Nijdam, T.A.G. Langrish, R.B. Keey, A high-temperature drying model for softwood timber, Chem. Eng. Sci. 55 (18) (2000) 3585.
[166DP] F. Patisson, D. Ablitzer, Modeling of gas–solid reactions: kinetics, mass and heat transfer, and evolution of the pore structure, Chem. Eng. Technol. 23 (1) (2000) 75.
[167DP] M. Prakash, O.F. Turan, Y. Li, G.R. Thorpe, CFD modelling of natural convection heat and mass transfer in hygroscopic porous media, Drying Technol. 18 (10) (2000) 2175.
[168DP] D.P. Ross, C.A. Heidenreich, D.K. Zhang, Devolatilisation times of coal particles in a fluidised-bed, Fuel 79 (8) (2000) 873.
[169DP] P. Schlichthaerle, J. Werther, Influence of the particle size and superficial gas velocity on the sublimation of pure substances in fluidized beds of different sizes, Drying Technol. 18 (10) (2000) 2217.
[170DP] D. Shin, S. Choi, The combustion of simulated waste particles in a fixed bed, Combust. Flame 121 (1) (2000) 167.
[171DP] S. Smeds, T. Salmi, D.Y. Murzin, Gas-phase hydrogenation of ethylbenzene over Ni. Comparison of different laboratory fixed bed reactors, Appl. Catal. A 201 (1) (2000) 55.
[172DP] M.E.D. Souza, S.A. Nebra, Heat and mass transfer model in wood chip drying, Wood Fiber Sci. 32 (2) (2000) 153.
[173DP] C. Tremblay, A. Cloutier, Y. Fortin, Experimental determination of the convective heat and mass transfer coefficients for wood drying, Wood Sci. Technol. 34 (3) (2000) 253.
[174DP] Z.H. Wang, G.H. Chen, Heat and mass transfer in batch fluidized-bed drying of porous particles, Chem. Eng. Sci. 55 (10) (2000) 1857.
[175DP] Z.Z. Wang, D. Wei, F.J. Dong, Experimental study of condensation heat transfer promotion on a fluted tube with thin porous coatings, Heat Transfer Eng. 21 (4) (2000) 46.
[176DP] E. Yamamoto, K. Katsurayama, F. Watanabe, H. Matsuda, M. Hasatani, Heat and mass transfer characteristics in adsorption of water vapor for silica gel packed bed adsorber, J. Chem. Eng. Japan 33 (1) (2000) 12.

[177DP] K.A. Yih, Combined heat and mass transfer in mixed convection adjacent to a VWT/VWC or VHF/VMF cone in a porous medium: the entire regime, J. Porous Media 3 (2) (2000) 185.

[178DP] L. Zhang, S.A. Sherif, A.J. De Gregoria, C.B. Zimm, T.N. Veziroglu, Design optimization of a 0.1 ton/day active magnetic regenerative hydrogen liquefier, Cryogenics 40 (4) (2000) 269.

[179DP] L.Z. Zhang, Y. Jiang, Y.P. Zhang, Membrane-based humidity pump: performance and limitations, J. Membrane Sci. 171 (2) (2000) 207.

[180DP] C.B. Zhao, B.E. Hobbs, H.B. Muhlhaus, Finite element analysis of heat transfer and mineralization in layered hydrothermal systems with upward through flow, Comput. Meth. Appl. Mech. Eng. 186 (1) (2000) 49.

[181DP] C.B. Zhao, B.E. Hobbs, H.B. Muhlhaus, A. Ord, G. Lin, Numerical modelling of double diffusion driven reactive flow transport in deformable fluid-saturated porous media with particular consideration of temperature-dependent chemical reaction rates, Eng. Comput. (Swansea, Wales) 17 (4) (2000) 367.

[182DP] H. Zhao, I.W. Turner, The use of a coupled computational model for studying the microwave heating of wood, Appl. Math. Model. 24 (3) (2000) 183.

[183DP] T.S. Zhao, P. Cheng, C.Y. Wang, Buoyancy-induced flows and phase-change heat transfer in a vertical capillary structure with symmetric heating, Chem. Eng. Sci. 55 (14) (2000) 2653.

[184DP] S.A. Zhdanok, K.V. Dobrego, S.I. Futko, Effect of porous media transparency on spherical and cylindrical filtrational combustion heaters performance, Int. J. Heat Mass Transfer 43 (18) (2000) 3469.

Experimental methods: *Heat flux measurement*

[1E] D.H. Chen, Z.M. Zhang, Thermal analysis of the volume absorber in pulsed excimer laser calorimeters, Int. J. Heat Mass Transfer 43 (17) (2000) 3061.

[2E] P. Dantzer, P. Millet, Advances in hydride phase growth: automatic high precision calorimeter–volumetric devices, for thermodynamic and kinetics analyses, Rev. Sci. Instrum. 71 (1) (2000) 142.

[3E] A.E. Griffith, M. Louge, J. Mohd-Yusof, Simultaneous, noninvasive measurements of convective heat transfer and solid volume fraction at the wall of an entrained gas–solid suspension, Rev. Sci. Instrum. 71 (7) (2000) 2922.

[4E] W. McKeown, Differential absorption techniques and radiometric satellite calibration for measuring air–sea interactions, IEEE Trans. Geosci. Remote Sensing (art 1) (2000) 2213.

[5E] R.J. Moffat, J.K. Eaton, D. Mukerji, A general method for calculating the heat island correction and uncertainties for button gauges, Measure. Sci. Technol. 11 (7) (2000) 920.

[6E] A.V. Murthy, B.K. Tsai, R.D. Saunders, Radiative calibration of heat-flux sensors at NIST: facilities and techniques, J. Res. Nat. Inst. Standards Technol. 105 (2) (2000) 293.

[7E] D. O'Mahoney, D.J. Browne, Use of experiment and an inverse method to study interface heat transfer during solidification in the investment casting process, Exp. Thermal Fluid Sci. 22 (3) (2000) 111.

[8E] E. Piccini, S.M. Guo, T.V. Jones, The development of a new direct-heat-flux gauge for heat-transfer facilities, Measure. Sci. Technol. 11 (4) (2000) 342.

[9E] H.S. Ramaswamy, M.R. Zareifard, Evaluation of factors influencing tube-flow fluid-to-particle heat transfer coefficient using a calorimetric technique, J. Food Eng. 45 (3) (2000) 127.

[10E] G.S. Spagnolo, D. Ambrosini, Sandwich holography for determining the convective heat transfer coefficient, J. Optics A 2 (1) (2000) 39.

Temperature measurement

[11E] A. Del Vecchio, G. Palumbo, U. Kochi, A. Gulhan, Temperature measurements by laser-induced fluorescence spectroscopy in nonequilibrium high-enthalpy flow, J. Thermophys. Heat Transfer 14 (2) (2000) 216.

[12E] C.H. Fan, J.P. Longtin, Laser-based measurement of liquid temperature or concentration at a solid–liquid interface, Exp. Thermal Fluid Sci. 23 (1) (2000) 1.

[13E] S.A. Gokoglu, D.F. Schultz, A precise calibration technique for measuring high gas temperatures, Combust. Sci. Technol. 153 (2000) 3.

[14E] M.E. Lacey, A.G. Webb, J.V. Sweedler, Monitoring temperature changes in capillary electrophoresis with nanoliter–volume NMR thermometry, Anal. Chem. 72 (20) (2000) 4991.

[15E] D.H. Lee, J.H. Chung, S.Y. Won, Y.T. Kim, K.S. Boo, A new liquid crystal color calibration technique using neural networks and median filtering, KSME J. 14 (1) (2000) 113.

[16E] A.N. Magunov, O.V. Lukin, Scanning calorimetry measurements of the gas temperature in an RF-discharge fluorine-containing plasma, Plasma Phys. Rep. 26 (4) (2000) 328.

[17E] U.E. Meier, D. Wolff-Gassmann, W. Stricker, LIF imaging and 2D temperature mapping in a model combustor at elevated pressure, Recherche Aerosp. 4 (6) (2000) 403.

[18E] G. Papadopoulos, Novel shadow image velocimetry technique for inferring temperature, J. Thermophys. Heat Transfer 14 (4) (2000) 593.

[19E] V.I. Passechnik, A.A. Anosov, K.M. Bograchev, Fundamentals and prospects of passive thermoacoustic tomography, Crit. Rev. Biomed. Eng. 28 (3) (2000) 603.

[20E] R. Pein, Treatment of systematic errors in intrusive concentration and temperature measurements, Combust. Explos. Shock Waves 36 (1) (2000) 21.

[21E] D.R. Sabatino, T.J. Praisner, C.R. Smith, A high-accuracy calibration technique for thermochromic liquid crystal temperature measurements, Exp. Fluids 28 (6) (2000) 497.

[22E] M. Schubnell, Temperature and heat flow calibration of a DSC-instrument in the temperature range between 100 and 160 °C, J. Thermal Anal. 61 (1) (2000) 91.

[23E] A. Schulz, Infrared thermography as applied to film cooling of gas turbine components, Measure. Sci. Technol. 11 (7) (2000) 948.
[24E] A.M. van Graven, R.A.M. Wolters, Wafer temperature measurement in PVD systems using the Co–Si reaction, Microelectronic Eng. 50 (1) (2000) 495.
[25E] A.P. Yalin, R.B. Miles, Temperature measurements by ultraviolet filtered Rayleigh scattering using a mercury filter, J. Thermophys. Heat Transfer 14 (2) (2000) 210.

Velocity and flow measurements

[26E] J.C. Elicer-Cortes, J. Fuentes, A. Valencia, C. Baudet, Experimental study of transition to turbulence of a round thermal plume by ultrasound scattering, Exp. Thermal Fluid Sci. 20 (3) (2000) 137.
[27E] C. Henselowsky, H.C. Kuhlmann, H.J. Rath, Experimental setup for low Reynolds number calibration of thermal anemometers, Z. Angew. Mat. Mech. (3) (2000) S685.
[28E] P.T. Ireland, T.V. Jones, Liquid crystal measurements of heat transfer and surface shear stress, Measure. Sci. Technol. 11 (7) (2000) 969.
[29E] A.W.K. Law, H.W. Wang, Measurement of mixing processes with combined digital particle image velocimetry and planar laser induced fluorescence, Exp. Thermal Fluid Sci. 22 (3) (2000) 213.
[30E] T. Ren, G.J. Kluitenberg, R. Horton, Determining soil water flux and pore water velocity by a heat pulse technique, Soil Sci. Soc. Am. J. 64 (2) (2000) 552.

Miscellaneous measurement techniques

[31E] R. Buttner, B. Zimanowski, C. Lenk, A. Koopmann, V. Lorenz, Determination of thermal conductivity of natural silicate melts, Appl. Phys. Lett. 77 (12) (2000) 1810.
[32E] S.G. Dias, F.A. Franca, E.S. Rosa, Statistical method to calculate local interfacial variables in two-phase bubbly flows using intrusive crossing probes, Int. J. Multiphase Flow 26 (11) (2000) 1797.
[33E] A.F. Emery, A.V. Nenarokomov, T.D. Fadale, Uncertainties in parameter estimation: the optimal experiment design, Int. J. Heat Mass Transfer 43 (18) (2000) 3331.
[34E] S. Kim, X.Y. Fu, X. Wang, M. Ishii, Development of the miniaturized four-sensor conductivity probe and the signal processing scheme, Int. J. Heat Mass Transfer 43 (22) (2000) 4101.
[35E] T.D. Radcliff, D.W. Miller, A.C. Kauffman, Constant-temperature calorimetry for in-core power measurement, Nucl. Technol. 132 (2) (2000) 240.
[36E] M.A. Sheikh, S.C. Taylor, D.R. Hayhurst, R. Taylor, Measurement of thermal diffusivity of isotropic materials using a laser flash method and its validation by finite element analysis, J. Phys. D 33 (12) (2000) 1536.
[37E] T. Takamasa, T. Hazuku, Measuring interfacial waves on film flowing down a vertical plate wall in the entry region using laser focus displacement meters, Int. J. Heat Mass Transfer 43 (15) (2000) 2807.
[38E] T. Takamasa, K. Kobayashi, Measuring interfacial waves on film flowing down tube inner wall using laser focus displacement meter, Int. J. Multiphase Flow 26 (9) (2000) 1493.

Natural convection-internal flows: *Fundamental studies*

[1F] S. Grossmann, D. Lohse, Scaling in thermal convection: a unifying theory, J. Fluid Mech. 407 (2000) 27.

Heat generating fluids

[2F] I. Di Piazza, M. Ciofalo, Low-Prandtl number natural convection in volumetrically heated rectangular enclosures I. Slender cavity, AR = 4, Int. J. Heat Mass Transfer 43 (17) (2000) 3027.
[3F] A. Liaqat, A.C. Baytas, Heat transfer characteristics of internally heated liquid pools at high Rayleigh numbers, Heat Mass Transfer 36 (5) (2000) 401.
[4F] T.G. Theofanous, S. Angelini, Natural convection for in-vessel retention at prototypic Rayleigh numbers, Nucl. Eng. Des. 200 (1) (2000) 1.
[5F] K.F. Wu, J.P. Brancher, Thermoconvective instability in a bounded vertical cylinder with internal heat generation, Int. J. Heat Mass Transfer 43 (20) (2000) 3775.
[6F] Q.O. Zhang, T.H. Jackson, A. Ungan, Numerical modeling of microwave induced natural convection, Int. J. Heat Mass Transfer 43 (12) (2000) 2141.

Thermocapillary flows

[7F] R. Balasubramaniam, R.S. Subramanian, The migration of a drop in a uniform temperature gradient at large Marangoni numbers, Phys. Fluids 12 (4) (2000) 733.
[8F] M.B. Davis, G.F. Carey, Parallel multilevel solution of Rayleigh–Benard–Marangoni problems, Int. J. Numer. Meth. Heat Fluid Flow 10 (2) (2000) 248.
[9F] W.R. Hu, N. Imaishi, Thermocapillary flow in an annular liquid layer painted on a moving fiber, Int. J. Heat Mass Transfer 43 (24) (2000) 4457.
[10F] M. Lappa, R. Savino, R. Monti, Influence of buoyancy forces on Marangoni flow instabilities in liquid bridges, Int. J. Numer. Meth. Heat Fluid Flow 10 (7) (2000) 721.
[11F] S. Saravanan, P. Kandaswamy, Low Prandtl number magnetoconvection in cavities: effect of variable thermal conductivity, Z. Angew. Mat. Mech. 80 (8) (2000) 570.
[12F] S.P. Song, P. Dailey, B.Q. Li, Effects of heat source arrangements on Marangoni convection in electrostatically levitated droplets, J. Thermophys. Heat Transfer 14 (3) (2000) 355.

[13F] S.P. Song, B.Q. Li, Free surface profiles and thermal convection in electrostatically levitated droplets, Int. J. Heat Mass Transfer 43 (19) (2000) 3589.
[14F] H. Tomita, K. Abe, Numerical simulation of pattern formation in the Benard–Marangoni convection, Phys. Fluids 12 (6) (2000) 1389.

Enclosure heat transfer

[15F] H. Asan, L. Namli, Laminar natural convection in a pitched roof of triangular cross-section: summer day boundary conditions, Energy Build. 33 (1) (2000) 69.
[16F] O. Aydin, Determination of optimum air-layer thickness in double-pane windows, Energy Build. 32 (3) (2000) 303.
[17F] O. Aydin, W.J. Yang, Natural convection in enclosures with localized heating from below and symmetrical cooling from sides, Int. J. Numer. Meth. Heat Fluid Flow 10 (5) (2000) 518.
[18F] P.L. Betts, I.H. Bokhari, Experiments on turbulent natural convection in an enclosed tall cavity, Int. J. Heat Fluid Flow 21 (6) (2000) 675.
[19F] E. Bucchignani, D. Mansutti, Horizontal thermal convection in a shallow cavity: oscillatory regimes and transition to chaos, Int. J. Numer. Meth. Heat Fluid Flow 10 (2) (2000) 179.
[20F] T.C. Cheng, Y.H. Li, T.F. Lin, Effects of thermal boundary condition on buoyancy driven transitional air flow in a vertical cylinder heated from below, Numer. Heat Transfer Part A 37 (8) (2000) 917.
[21F] K.H. Chung, J.M. Hyun, H. Ozoe, Buoyant convection in a vertical cylinder with azimuthally-varying sidewall temperature, Int. J. Heat Mass Transfer 43 (13) (2000) 2289.
[22F] F. Deschamps, C. Sotin, Inversion of two-dimensional numerical convection experiments for a fluid with a strongly temperature-dependent viscosity, Geophys. J. Int. 143 (1) (2000) 204.
[23F] T.D. Dreeben, A.R. Kerstein, Simulation of vertical slot convection using 'one-dimensional turbulence', Int. J. Heat Mass Transfer 43 (20) (2000) 3823.
[24F] Y.B. Du, P. Tong, Turbulent thermal convection in a cell with ordered rough boundaries, J. Fluid Mech. 407 (2000) 57.
[25F] M.Y. Ha, M.J. Jung, A numerical study on three-dimensional conjugate heat transfer of natural convection and conduction in a differentially heated cubic enclosure with a heat-generating cubic conducting body, Int. J. Heat Mass Transfer 43 (23) (2000) 4229.
[26F] M. Hribersek, L. Skerget, Numerical study of conjugate double diffusive natural convection in a closed cavity, Z. Angew. Mat. Mech. (3) (2000) S689.
[27F] I. Ishihara, R. Matsumoto, A. Senoo, Natural convection in a vertical rectangular enclosure with localized heating and cooling zones, Heat Mass Transfer 36 (6) (2000) 467.
[28F] M. Ishikawa, T. Hirata, S. Noda, Numerical simulation of natural convection with density inversion in a square cavity, Numer. Heat Transfer Part A 37 (4) (2000) 395.
[29F] K.A.R. Ismail, V.L. Scalon, A finite element free convection model for the side wall heated cavity, Int. J. Heat Mass Transfer 43 (8) (2000) 1373.
[30F] S. Kenjeres, K. Hanjalic, Transient analysis of Rayleigh–Benard convection with a RANS model (vol. 20, p. 329, 1999), Int. J. Heat Fluid Flow 21 (1) (2000) 122.
[31F] M.C. Kim, M.T. Hyun, D.Y. Yoon, Ionic mass transport correlation of double-diffusive convection in horizontal fluid layers, KSME J. 14 (12) (2000) 1396.
[32F] B. Lartigue, S. Lorente, B. Bourret, Multicellular natural convection in a high aspect ratio cavity: experimental and numerical results, Int. J. Heat Mass Transfer 43 (17) (2000) 3157.
[33F] M.A. Leal, H.A. Machado, R.M. Cotta, Integral transform solutions of transient natural convection in enclosures with variable fluid properties, Int. J. Heat Mass Transfer 43 (21) (2000) 3977.
[34F] C.H. Lee, J.M. Hyun, H.S. Kwak, Oscillatory enclosed buoyant convection of a fluid with the density maximum, Int. J. Heat Mass Transfer 43 (19) (2000) 3747.
[35F] P.N. Madhavan, V.M.K. Sastri, Conjugate natural convection cooling of protruding heat sources mounted on a substrate placed inside an enclosure: a parametric study, Comput. Meth. Appl. Mech. Eng. 188 (1) (2000) 187.
[36F] F. Moukalled, S. Acharya, Natural convection in trapezoidal cavities with baffles mounted on the upper inclined surfaces, Numer. Heat Transfer Part A 37 (6) (2000) 545.
[37F] A. Mrabti, K. Gueraoui, A. Hihi, O. Terhmina, Effects of microstructure on natural convection flow of micropolar fluids in a vertical cylinder heated from below, Int. J. Eng. Sci. 38 (7) (2000) 823.
[38F] J.J. Niemela, L. Skrbek, R.J. Donnelly, Ultra-high Rayleigh number convection in cryogenic helium gas, Phys. B 284 (11) (2000) 61.
[39F] I. Sezai, A.A. Mohamad, Natural convection from a discrete heat source on the bottom of a horizontal enclosure, Int. J. Heat Mass Transfer 43 (13) (2000) 2257.
[40F] I. Sezai, A.A. Mohamad, Natural convection in a rectangular cavity heated from below and cooled from top as well as the sides, Phys. Fluids 12 (2) (2000) 432.
[41F] D.A. Siginer, A. Valenzuela-Rendon, On the laminar free convection and instability of grade fluids in enclosures, Int. J. Heat Mass Transfer 43 (18) (2000) 3391.
[42F] K. Sundaravadivelu, P. Kandaswamy, Double diffusive nonlinear convection in a square cavity, Fluid Dyn. Res. 27 (5) (2000) 291.
[43F] S.A. Theerthan, J.H. Arakeri, Planform structure and heat transfer in turbulent free convection over horizontal surfaces, Phys. Fluids 12 (4) (2000) 884.
[44F] Y.S. Tian, T.G. Karayiannis, Low turbulence natural convection in an air cavity filled square cavity – Part I: the thermal and fluid flow fields, Int. J. Heat Mass Transfer 43 (6) (2000) 849.
[45F] Y.S. Tian, T.G. Karayiannis, Low turbulence natural convection in an air filled square cavity – Part II: the

turbulence quantities, Int. J. Heat Mass Transfer 43 (6) (2000) 867.
[46F] E. Tric, G. Labrosse, M. Betrouni, A first incursion into the 3D structure of natural convection of air in a differentially heated cubic cavity, from accurate numerical solutions, Int. J. Heat Mass Transfer 43 (21) (2000) 4043.
[47F] P. Vadasz, Subcritical transitions to chaos and hysteresis in a fluid layer heated from below, Int. J. Heat Mass Transfer 43 (5) (2000) 705.

Vertical ducts and annuli

[48F] A. Bahloul, I. Mutabazi, A. Ambari, Codimension 2 points in the flow inside a cylindrical annulus with a radial temperature gradient, Eur. Phys. J. 9 (3) (2000) 253.
[49F] W.T. Konka, Natural convection heat transfer around horizontal tube in vertical slot, Int. J. Heat Mass Transfer 43 (3) (2000) 447.

Horizontal ducts and annuli

[50F] G. Desrayaud, G. Lauriat, P. Cadiou, Thermoconvective instabilities in a narrow horizontal air-filled annulus, Int. J. Heat Fluid Flow 21 (1) (2000) 65.
[51F] C.L. Yeh, K.C. Chang, Enhancement of natural convection by eccentricity of power cable inside underground conduit, J. Thermophys. Heat Transfer 14 (4) (2000) 604.
[52F] C.L. Yeh, K.C. Chang, Natural convection simulation inside the underground conduit of an electrical power cable, J. Thermophys. Heat Transfer 14 (4) (2000) 557.

Mixed convection

[53F] D. Angirasa, Mixed convection in a vented enclosure with an isothermal vertical surface, Fluid Dyn. Res. 26 (4) (2000) 219.
[54F] G.K. Auernhammer, H.R. Brand, Thermal convection in a rotating layer of a magnetic fluid, Eur. Phys. J. B 16 (1) (2000) 157.
[55F] O. Aydin, W.J. Yang, Mixed convection in cavities with a locally heated lower wall and moving sidewalls, Numer. Heat Transfer Part A 37 (7) (2000) 695.
[56F] B.J. Brinkworth, A procedure for the routine calculation of laminar free and mixed convection in inclined ducts, Int. J. Heat Fluid Flow 21 (4) (2000) 456.
[57F] S. Enger, B. Basu, M. Breuer, F. Durst, Numerical study of three-dimensional mixed convection due to buoyancy and centrifugal force in an oxide melt for Czochralski growth, J. Cryst. Growth 219 (1) (2000) 144.
[58F] K. Gasljevic, G. Aguilar, E.F. Matthys, Buoyancy effects on heat transfer and temperature profiles in horizontal pipe flow of drag-reducing fluids, Int. J. Heat Mass Transfer 43 (23) (2000) 4267.
[59F] T.H. Hsu, S.G. Wang, Mixed convection in a rectangular enclosure with discrete heat sources, Numer. Heat Transfer Part A 38 (6) (2000) 627.
[60F] T.H. Hsu, S.G. Wang, Mixed convection of micropolar fluids in a cavity, Int. J. Heat Mass Transfer 43 (9) (2000) 1563.
[61F] Y. Liu, S. Chen, B.W. Shiu, An optimum spacing problem for four chips on a horizontal substrate–mixed convection, Comput. Mech. 26 (5) (2000) 470.
[62F] H. Murata, K. Sawada, M. Kobayashi, Experimental investigation of natural convection in a core of a marine reactor in rolling motion, J. Nucl. Sci. Technol. 37 (6) (2000) 509.
[63F] R.J. Naumann, An analytical model for transport from quasi-steady and periodic accelerations on spacecraft, Int. J. Heat Mass Transfer 43 (16) (2000) 2917.
[64F] A. Raji, M. Hasnaoui, Mixed convection heat transfer in ventilated cavities with opposing and assisting flows, Eng. Comput. (Swansea, Wales) 17 (5) (2000) 556.
[65F] H. Van Santen, C.R. Kleijn, H.E.A. Van Den Akker, Mixed convection in radial flow between horizontal plates – I. Numerical simulations, Int. J. Heat Mass Transfer 43 (9) (2000) 1523.
[66F] H. Van Santen, C.R. Kleijn, H.E.A. Van Den Akker, Mixed convection in radial flow between horizontal plates – II. Experiments, Int. J. Heat Mass Transfer 43 (9) (2000) 1537.

Complex geometries

[67F] G.S. Barozzi, M.A. Corticelli, Natural convection in cavities containing internal sources, Heat Mass Transfer 36 (6) (2000) 473.
[68F] S. Douamna, M. Hasnaoui, B. Abourida, Two-dimensional transient natural convection in a repetitive geometry submitted to variable heating from below: numerical identification of routes leading to chaos, Numer. Heat Transfer Part A 37 (7) (2000) 779.
[69F] Y. Liu, N. Phan-Thien, An optimum spacing problem for three chips mounted on a vertical substrate in an enclosure, Numer. Heat Transfer Part A 37 (6) (2000) 613.
[70F] T.M.S. Nakagawa, T. Suzuki, On thermal convection between two coaxial square containers inclined by 45°, Heat Mass Transfer 36 (5) (2000) 371.
[71F] S.Z. Shuja, B.S. Yilbas, M.O. Budair, Natural convection in a square cavity with a heat generating body: entropy consideration, Heat Mass Transfer 36 (4) (2000) 343.
[72F] E. Yu, Y.K. Joshi, Natural convection air cooling of electronic components in partially open compact horizontal enclosures, IEEE Trans. Components Packaging Technol. 23 (1) (2000) 14.

Fires

[73F] M.K. Anderson, R.T. Sleight, J.L. Torero, Ignition signatures of a downward smolder reaction, Exp. Thermal Fluid Sci. 21 (1) (2000) 33.

[74F] M.A. Azhakesan, T.J. Shields, G.W.H. Silcock, On the nature, influence and magnitudes of flame heat transfer during surface flame spread, Fire Safety J. 35 (3) (2000) 189.
[75F] Z.M. Fu, G. Hadjisophocleous, A two-zone fire growth and smoke movement model for multi-compartment buildings, Fire Safety J. 34 (3) (2000) 257.
[76F] J.X. Wen, L.Y. Huang, CFD modelling of confined jet fires under ventilation-controlled conditions, Fire Safety J. 34 (1) (2000) 1.
[77F] H. Xue, T.C. Chew, K.L. Tay, Y.M. Cheng, Control of ventilation airflow for tunnel fire safety, Combust. Sci. Technol. 152 (2000) 179.

Miscellaneous

[78F] M. Epstein, J.P. Burelbach, Transient vertical mixing by natural convection in a wide layer, Int. J. Heat Mass Transfer 43 (2) (2000) 321.
[79F] E. Kaminski, C. Jaupart, Lithosphere structure beneath the Phanerozoic intracratonic basins of North America, Earth Planet. Sci. Lett. 178 (1) (2000) 139.
[80F] Y.Y. Renardy, C.G. Stoltz, Time-dependent pattern formation for convection in two layers of immiscible liquids, Int. J. Multiphase Flow 26 (11) (2000) 1875.
[81F] H. Van Santen, C.R. Kleijn, H.E.A. Van den Akker, On turbulent flows in cold-wall CVD reactors, J. Cryst. Growth 212 (1) (2000) 299.
[82F] R. Wunenburger, Y. Garrabos, C. Lecoutre-Chabot, D. Beysens, J. Hegseth, Thermalization of a two-phase fluid in low gravity: heat transferred from cold to hot, Phys. Rev. Lett. 84 (18) (2000) 4100.

Natural convection-external flows: *Verticle plate*

[1FF] O. Aaboubi, I. Citti, J.P. Chopart, C. Gabrielli, A. Olivier, B. Tribollet, Thermoelectrochemical transfer function under thermal laminar free convection at a vertical electrode, J. Electrochem. Soc. 147 (10) (2000) 3808.
[2FF] B.F. Armaly, A. Li, H.I. Abu-Mulaweh, T.S. Chen, Measurements and predictions of turbulent natural convection adjacent to backward-facing step, J. Thermophys. Heat Transfer 14 (4) (2000) 584.
[3FF] Y.I. Babenko, A.I. Moshinskii, Asymptotic solution of the problem of unsteady heat transfer into a stratified medium, Theoret. Found. Chem. Eng. (English Transl.: Teoreticheskie Osnovy Khimicheskoi Tekhnologii) 34 (5) (2000) 416.
[4FF] A.M.H. Brooker, J.C. Patterson, T. Graham, W. Schopf, Convective instability in a time-dependent buoyancy driven boundary layer, Int. J. Heat Mass Transfer 43 (2) (2000) 297.
[5FF] V.A.F. Costa, Heatline and massline visualization of laminar natural convection boundary layers near a vertical wall, Int. J. Heat Mass Transfer 43 (20) (2000) 3765.
[6FF] E.M.A. Elbashbeshy, M.A.A. Bazid, The effect of temperature-dependent viscosity on heat transfer over a continuous moving surface, J. Phys. D 33 (21) (2000) 2716.
[7FF] D.M. Fontana, M. Corcione, A. Lo Monaco, L. Santarpia, Laminar free convection from a vertical plate in partly dissociated gases, Int. J. Heat Mass Transfer 43 (7) (2000) 1113.
[8FF] K. Ichimiya, Heat transfer enhancement or depression of natural convection by a single square solid element on or separated from a vertical heated plate, J. Enhanced Heat Transfer 7 (2) (2000) 125.
[9FF] F. Mendez, C. Trevino, The conjugate conduction-natural convection heat transfer along a thin vertical plate with non-uniform internal heat generation, Int. J. Heat Mass Transfer 43 (15) (2000) 2739.
[10FF] S.S. Tak, R.K. Gehlot, Effects of suction on heat and momentum transfer along a vertical plate in presence of transverse magnetic field, Indian J. Eng. Mater. Sci. 7 (3) (2000) 136.

Horizontal and inclined plates

[11FF] A.J. Chamkha, Transient hydromagnetic three-dimensional natural convection from an inclined stretching permeable surface, Chem. Eng. J. 76 (2) (2000) 159.
[12FF] P. Jeschke, R. Biertumpfel, H. Beer, Liquid-crystal thermography for heat-transfer measurements in the presence of longitudinal vortices in a natural convection flow, Measure. Sci. Technol. 11 (5) (2000) 447.
[13FF] C.E. Kwak, T.H. Song, Natural convection around horizontal downward-facing plate with rectangular grooves: experiments and numerical simulations, Int. J. Heat Mass Transfer 43 (5) (2000) 825.
[14FF] W.M. Lewandowski, E. Radziemska, M. Buzuk, H. Bieszk, Free convection heat transfer and fluid flow above horizontal rectangular plates, Appl. Energy 66 (2) (2000) 177.
[15FF] A.A. Mohammadein, Similarity analysis of axisymmetric free convection on a horizontal infinite plate subject to a mixed thermal boundary condition in a micropolar fluid, Heat Mass Transfer 36 (3) (2000) 209.
[16FF] S. Pretot, B. Zeghmati, P. Caminat, Influence of surface roughness on natural convection above a horizontal plate, Adv. Eng. Software 31 (10) (2000) 793.
[17FF] S. Pretot, B. Zeghmati, G. Le Palec, Theoretical and experimental study of natural convection on a horizontal plate, Appl. Thermal Eng. 20 (10) (2000) 873.
[18FF] L.I. Zaichik, V.M. Alipchenkov, High-Rayleigh-number turbulent natural convection on an inclined surface, High Temperature – USSR 38 (3) (2000) 421.

Channels

[19FF] S. Baskaya, M. Sivrioglu, M. Ozek, Parametric study of natural convection heat transfer from horizontal

rectangular fin arrays, Int. J. Thermal Sci. 39 (8) (2000) 797.
[20FF] R. Bessaih, M. Kadja, Numerical study of three-dimensional turbulent natural convection air cooling of heat sources simulating electronic components mounted in a vertical channel, J. Enhanced Heat Transfer 7 (3) (2000) 153.
[21FF] R. Bessaih, M. Kadja, Turbulent natural convection cooling of electronic components mounted on a vertical channel, Appl. Thermal Eng. 20 (2) (2000) 141.
[22FF] K. Khanafer, K. Vafai, Buoyancy-driven flow and heat transfer in open-ended enclosures: elimination of the extended boundaries, Int. J. Heat Mass Transfer 43 (22) (2000) 4087.
[23FF] G. Tanda, M. Misale, F. Devia, Experimental heat transfer from a vertical plate within a naturally ventilated cabinet, Heat Mass Transfer 36 (6) (2000) 511.

Cylinders

[24FF] R. Chouikh, A. Guizani, A. El Cafsi, M. Maalej, A. Belghith, Experimental study of the natural convection flow around an array of heated horizontal cylinders, Renewable Energy 21 (1) (2000) 65.
[25FF] P. Ganesan, H.P. Rani, On diffusion of chemically reactive species in convective flow along a vertical cylinder, Chem. Eng. Process. 39 (2) (2000) 93.
[26FF] P. Ganesan, H.P. Rani, Transient natural convection flow over vertical cylinder with variable surface temperatures, Forsch. Ingenieurw. – Eng. Res. 66 (1) (2000) 11.
[27FF] S.C. Haldar, Laminar free convection in open-ended vertical 7-rod bundles: numerical, Nucl. Eng. Des. 199 (3) (2000) 273.
[28FF] C.C. Pascual, J.H. Stromberger, S.M. Jeter, S.I. Abdel-Khalik, An empirical correlation for electrohydrodynamic enhancement of natural convection, Int. J. Heat Mass Transfer 43 (11) (2000) 1965.

Buoyant plumes

[29FF] R.J.M. Bastiaans, C.C.M. Rindt, F.T.M. Nieuwstadt, A.A. van Steenhoven, Direct and large-eddy simulation of the transition of two- and three-dimensional plane plumes in a confined enclosure, Int. J. Heat Mass Transfer 43 (13) (2000) 2375.
[30FF] W.X. Lin, S.W. Armfield, Direct simulation of weak laminar plane fountains in a homogeneous fluid, Int. J. Heat Mass Transfer 43 (17) (2000) 3013.
[31FF] W.X. Lin, S.W. Armfield, Very weak fountains in a homogeneous fluid, Numer. Heat Transfer Part A 38 (4) (2000) 377.
[32FF] S. Murakami, N. Ohira, S. Kato, CFD analysis of a thermal plume and the indoor air flow using k–ε models with buoyancy effects, Flow, Turbulence Combust. 63 (1) (2000) 113.
[33FF] A. Shabbir, D.B. Taulbee, Experimental balances for the second moments for a buoyant plume and their implication on turbulence modeling, Int. J. Heat Mass Transfer 43 (10) (2000) 1777.

Mixed convection

[34FF] E.M. Abo-Eldahab, M.S. El Gendy, Radiation effect on convective heat transfer in an electrically conducting fluid at a stretching surface with variable viscosity and uniform free stream, Phys. Scr. 62 (4) (2000) 321.
[35FF] H.B. Awbi, A. Hatton, Mixed convection from heated room surfaces, Energy Build. 32 (2) (2000) 153.
[36FF] C.H. Chen, Mixed convection cooling of a heated, continuously stretching surface, Heat Mass Transfer 36 (1) (2000) 79.
[37FF] W.K.S. Chiu, C.J. Richards, Y. Jaluria, Flow structure and heat transfer in a horizontal converging channel heated from below, Phys. Fluids 12 (8) (2000) 2128.
[38FF] Y. Hattori, T. Tsuji, Y. Nagano, N. Tanaka, Characteristics of turbulent combined-convection boundary layer along a vertical heated plate, Int. J. Heat Fluid Flow 21 (5) (2000) 520.
[39FF] M.A. Hossain, M.S. Munir, Mixed convection flow from a vertical flat plate with temperature dependent viscosity, Int. J. Thermal Sci. 39 (2) (2000) 173.
[40FF] F.S. Ibrahim, I.A. Hassanien, Mixed convection boundary layer flow of a micropolar fluid on a horizontal fiat plate with power law variation in surface temperature, Int. J. Thermal Sci. 39 (3) (2000) 360.
[41FF] R. Muthucumaraswamy, P. Ganesan, Flow past an impulsively started vertical plate with constant heat flux and mass transfer, Comput. Meth. Appl. Mech. Eng. 187 (1) (2000) 79.
[42FF] R. Muthucumaraswamy, P. Ganesan, On impulsive motion of a vertical plate with heat flux and diffusion of chemically reactive species, Forsch. Ingenieurw. – Eng. Res. 66 (1) (2000) 17.
[43FF] D.Y. Sheng, L. Jonsson, Two-fluid simulation on the mixed convection flow pattern in a nonisothermal water model of continuous casting Tundish, Metall. Mater. Trans. B 31 (4) (2000) 867.
[44FF] H.S. Takhar, A.J. Chamkha, G. Nath, Combined heat and mass transfer along a vertical moving cylinder with a free stream, Heat Mass Transfer 36 (3) (2000) 237.

Heat transfer in rotating systems: *Rotating disks*

[1G] Y. Edo, S. Obi, S. Masuda, Heat transfer experiments in rotating boundary layer flow, Int. J. Heat Fluid Flow 21 (6) (2000) 684.
[2G] C.M. Ellwood, W.J. Korchinsky, The heating, by viscous dissipation, of liquids flowing across an enclosed rotating disc, Int. J. Heat Mass Transfer 43 (6) (2000) 1035.
[3G] V.K. Garg, Heat transfer on a film-cooled rotating blade, Int. J. Heat Fluid Flow 21 (2) (2000) 134.

[4G] Y.H. Hwang, S.I. Haider, B. Markey, W. Kopko, R. Radermacher, Evaporatively-cooled condenser with rotating disks, J. Enhanced Heat Transfer 7 (4) (2000) 273.

[5G] E.Y.K. Ng, Z.Y. Liu, C.Y. Soong, Heat and flow evaluation in rotating circular disks passage with a CFD approach, Numer. Heat Transfer Part A 38 (6) (2000) 611.

[6G] N. Saniei, X.J. Yan, An experimental study of heat transfer from a disk rotating in an infinite environment including heat transfer enhancement by jet impingement cooling, J. Enhanced Heat Transfer 7 (4) (2000) 231.

[7G] I.V. Shevchuk, Turbulent heat transfer of rotating disk at constant temperature or density of heat flux to the wall, High Temperature – USSR 38 (3) (2000) 499.

[8G] H.S. Takhar, M. Kumari, G. Nath, Melting from a horizontal disk rotating with a time-dependent angular velocity, Commun. Numer. Meth. Eng. 16 (7) (2000) 485.

[9G] H. Van Santen, C.R. Kleijn, H.E.A. Van den Akker, Symmetry breaking in a stagnation-flow CVD reactor, J. Cryst. Growth 212 (1) (2000) 311.

[10G] B. Watel, S. Harmand, B. Desmet, Experimental study of convective heat transfer from a rotating finned tube in transverse air flow, Exp. Fluids 29 (1) (2000) 79.

[11G] B. Watel, S. Harmand, B. Desmet, Influence of convective heat exchange on a rotating disc in superimposed air flow – comparison between heat pipe and solid discs, J. Enhanced Heat Transfer 7 (4) (2000) 259.

[12G] B. Watel, S. Harmand, B. Desmet, Influence of fin spacing and rotational speed on the convective heat exchanges from a rotating finned tube, Int. J. Heat Fluid Flow 21 (2) (2000) 221.

Rotating channels

[13G] A. Alexiou, N.J. Hills, C.A. Long, A.B. Turner, L.S. Wong, J.A. Millward, Discharge coefficients for flow through holes normal to a rotating shaft, Int. J. Heat Fluid Flow 21 (6) (2000) 701.

[14G] Y. Asako, Y. Yamaguchi, K. Nabana, M.K. Chyu, Combined effects of rotation and skew angle on the convective heat transfer in a two-pass passage with a 180-degree turn, J. Enhanced Heat Transfer 7 (3) (2000) 185.

[15G] H.C. Chen, Y.J. Jang, J.C. Han, Computation of heat transfer in rotating two-pass square channels by a second-moment closure model, Int. J. Heat Mass Transfer 43 (9) (2000) 1603.

[16G] H.C. Chen, Y.J. Jang, J.C. Han, Near-wall second-moment closure for rotating multiple-pass cooling channels, J. Thermophys. Heat Transfer 14 (2) (2000) 201.

[17G] G.K. Dutzler, B.A. Pettersson-Reif, H.I. Andersson, Relaminarization of turbulent flow in the entrance region of a rapidly rotating channel, Int. J. Heat Fluid Flow 21 (1) (2000) 49.

[18G] J.J. Hwang, W.J. Wang, Active control of mixed convection in a rotating periodical two-pass duct by using trailing-wall transpiration, Int. J. Numer. Meth. Heat Fluid Flow 10 (5) (2000) 581.

[19G] A. Murata, S. Mochizuki, Large eddy simulation with a dynamic subgrid-scale model of turbulent heat transfer in an orthogonally rotating rectangular duct with transverse rib turbulators, Int. J. Heat Mass Transfer 43 (7) (2000) 1243.

[20G] P. Orlandi, D. Ebstein, Turbulent budgets in rotating pipes by DNS, Int. J. Heat Fluid Flow 21 (5) (2000) 499.

[21G] F. Papa, K. Vaidyanathan, T.G. Keith, K.J. DeWitt, Numerical computations of flow in rotating ducts with strong curvature, Int. J. Numer. Meth. Heat Fluid Flow 10 (5) (2000) 541.

[22G] S.V. Prabhu, R.P. Vedula, Pressure drop characteristics in a rotating smooth square channel with a sharp 180° bend, Exp. Thermal Fluid Sci. 21 (4) (2000) 198.

[23G] K. Yamamoto, M.M. Alam, J. Yasuhara, A. Aribowo, Flow through a rotating helical pipe with circular cross-section, Int. J. Heat Fluid Flow 21 (2) (2000) 213.

Enclosures

[24G] L.J. Cummings, J. Rubinstein, A fluid and heat flow problem arising in the soup-canning industry, Q. J. Mech. Appl. Math. 53 (4) (2000) 583.

[25G] L.M. de Socio, N. Ianiro, L. Marino, Effects of the centrifugal forces on a gas between rotating cylinders, J. Thermophys. Heat Transfer 14 (2) (2000) 269.

[26G] M.P. Escudier, I.W. Gouldson, P.J. Oliveira, F.T. Pinho, Effects of inner cylinder rotation on laminar flow of a Newtonian fluid through an eccentric annulus, Int. J. Heat Fluid Flow 21 (1) (2000) 92.

[27G] V.M. Gryanik, T.N. Doronina, D.J. Olbers, T.H. Warncke, The theory of three-dimensional hetons and vortex-dominated spreading in localized turbulent convection in a fast rotating stratified fluid, J. Fluid Mech. 423 (2000) 71.

[28G] Q.E. Hussain, M.A.R. Sharif, Numerical modeling of helical flow of pseudoplastic fluids, Numer. Heat Transfer Part A 38 (3) (2000) 225.

[29G] S. Jakirlic, J. Volkert, H. Pascal, K. Hanjalic, C. Tropea, DNS, experimental and modelling study of axially compressed in-cylinder swirling flow, Int. J. Heat Fluid Flow 21 (5) (2000) 627.

[30G] K. Khellaf, G. Lauriat, Numerical study of heat transfer in a non-Newtonian Carreau-fluid between rotating concentric vertical cylinders, J. Non-Newtonian Fluid Mech. 89 (1) (2000).

[31G] E.K. Kim, J.L. White, Non-isothermal transient startup of a starved flow modular co-rotating twin screw extruder, Int. Polym. Process. 15 (3) (2000) 233.

[32G] W.N. Kim, H.S. Kwak, J.M. Hyun, Buoyant heat transfer in a rotating cup-like cavity, Int. J. Heat Mass Transfer 43 (8) (2000) 1449.

[33G] B.F.C. Laurent, J. Bridgewater, D.J. Parker, Motion in a particle bed agitated by a single blade, AICHE J. 46 (9) (2000) 1723.
[34G] J. Lee, S.H. Kang, Y.S. Son, Numerical study of multilayered flow regime in double-diffusive convection in a rotating annulus with lateral heating, Numer. Heat Transfer Part A 38 (5) (2000) 467.
[35G] D. Lin, W.M. Yan, Experimental study of unsteady thermal convection in heated rotating inclined cylinders, Int. J. Heat Mass Transfer 43 (18) (2000) 3359.
[36G] W.J. Luo, R.J. Yang, Flow bifurcation and heat transfer in a spherical gap, Int. J. Heat Mass Transfer 43 (6) (2000) 885.
[37G] M.H. Shi, H. Wang, Y.L. Hao, Experimental investigation of the heat and mass transfer in a centrifugal fluidized bed dryer, Chem. Eng. J. 78 (2) (2000) 107.
[38G] V. Sobolik, B. Izrar, F. Lusseyran, S. Skali, Interaction between the Ekman layer and the Couette–Taylor instability, Int. J. Heat Mass Transfer 43 (24) (2000) 4381.
[39G] I. Sumita, P. Olson, Laboratory experiments on high Rayleigh number thermal convection in a rapidly rotating hemispherical shell, Phys. Earth Planet. Interiors 117 (1) (2000) 153.
[40G] K. Sundaravadivelu, P. Kandaswamy, Nonlinear convection in a rotating square cavity, Acta Mech. 144 (1) (2000) 119.
[41G] D.R. Van Puyvelde, B.R. Young, M.A. Wilson, S.J. Schmidt, Modelling transverse mixing in a rolling drum, Can. J. Chem. Eng. 78 (4) (2000) 635.
[42G] D. Vizman, B. Fischer, J. Friedrich, G. Muller, 3D numerical simulation of melt flow in the presence of a rotating magnetic field, Int. J. Numer. Meth. Heat Fluid Flow 10 (4) (2000) 366.
[43G] F.B. Weng, Y. Kamotani, S. Ostrach, Numerical analysis of solutal convection in rotating shallow electrochemical cells, Int. J. Heat Mass Transfer 43 (3) (2000) 341.
[44G] A. Yeckel, J.J. Derby, Effect of accelerated crucible rotation on melt composition in high-pressure vertical Bridgman growth of cadmium zinc telluride, J. Cryst. Growth 209 (4) (2000) 734.

Cylinders, spheres, and bodies of revolution

[45G] F.M. Mahfouz, H.M. Badr, Forced convection from a rotationally oscillating cylinder placed in a uniform stream, Int. J. Heat Mass Transfer 43 (17) (2000) 3093.
[46G] H.S. Takhar, G. Nath, Self-similar solution of the unsteady flow in the stagnation point region of a rotating sphere with a magnetic field, Heat Mass Transfer 36 (2) (2000) 89.
[47G] K. Vajravelu, J.R. Cannon, D. Rollins, Analytical and numerical solutions of nonlinear differential equations arising in non-Newtonian fluid flows, J. Math. Anal. Appl. 250 (1) (2000) 204.
[48G] J. Wojtkowiak, J.M. Hyun, Flow and heat transfer in a pipe containing a coaxially-rotating disk, Fluid Dyn. Res. 26 (6) (2000) 377.

Combined heat and mass transfer: *Ablation*

[1H] S.S. Katte, S.K. Das, S.P. Venkateshan, Two-dimensional ablation in cylindrical geometry, J. Thermophys. Heat Transfer 14 (4) (2000) 548.
[2H] S.S. Mao, X. Mao, R. Greif, R.E. Russo, Initiation of an early-stage plasma during picosecond laser ablation of solids, Appl. Phys. Lett. 77 (16) (2000) 2464.
[3H] S.S. Mao, X.L. Mao, R. Greif, R.E. Russo, Simulation of a picosecond laser ablation plasma, Appl. Phys. Lett. 76 (23) (2000) 3370.
[4H] S.I. Silton, D.B. Goldstein, Ablation onset in unsteady hypersonic flow about nose tip with cavity, J. Thermophys. Heat Transfer 14 (3) (2000) 421.
[5H] A. Slocombe, L. Li, Laser ablation machining of metal/polymer composite materials, Appl. Surf. Sci. 154 (2000) 617.
[6H] J.H. Yoo, S.H. Jeong, R. Greif, R.E. Russo, Explosive change in crater properties during high power nanosecond laser ablation of silicon, J. Appl. Phys. 88 (3) (2000) 1638.

Film cooling

[7H] R.A. Brittingham, J.H. Leylek, A detailed analysis of film cooling physics: Part IV – compound-angle injection with shaped holes, J. Turbomach. Trans. ASME 122 (1) (2000) 133.
[8H] S.V. Ekkad, J.C. Han, Film cooling measurements on cylindrical models with simulated thermal barrier coating spallation, J. Thermophys. Heat Transfer 14 (2) (2000) 194.
[9H] M. Gritsch, A. Schulz, S. Wittig, Film-cooling holes with expanded exits: near-hole heat transfer coefficients, Int. J. Heat Fluid Flow 21 (2) (2000) 146.
[10H] C.A. Hale, M.W. Plesniak, S. Ramadhyani, Structural features and surface heat transfer associated with a row of short-hole jets in crossflow, Int. J. Heat Fluid Flow 21 (5) (2000) 542.
[11H] K. Housiadas, J. Tsamopoulos, Cooling of a viscoelastic film during unsteady extrusion from an annular die, Rheol. Acta 39 (1) (2000) 44.
[12H] D.G. Hyams, J.H. Leylek, A detailed analysis of film cooling physics: Part III – streamwise injection with shaped holes, J. Turbomach. Trans. ASME 122 (1) (2000) 122.
[13H] I.S. Jung, J.S. Lee, Effects of orientation angles on film cooling over a flat plate: boundary layer temperature distributions and adiabatic film cooling effectiveness, J. Turbomach. Trans. ASME 122 (1) (2000) 153.
[14H] D. Lampard, N. Hay, The use of a mass transfer technique to infer heat transfer coefficients on film cooled turbine components, Measure. Sci. Technol. 11 (7) (2000) 933.
[15H] E. Lutum, J. von Wolfersdorf, B. Weigand, K. Semmler, Film cooling on a convex surface with zero pressure gradient flow, Int. J. Heat Mass Transfer 43 (16) (2000) 2973.
[16H] K.T. McGovern, J.H. Leylek, A detailed analysis of film cooling physics: Part II – compound-angle

injection with cylindrical holes, J. Turbomach. Trans. ASME 122 (1) (2000) 113.
[17H] H. Reiss, A. Bolcs, Experimental study of showerhead cooling on a cylinder comparing several configurations using cylindrical and shaped holes, J. Turbomach. Trans. ASME 122 (1) (2000) 161.
[18H] S. Roy, Numerical investigation of the blade cooling effect generated by multiple jets issuing at an angle into an incompressible horizontal crossflow, Numer. Heat Transfer Part A 38 (7) (2000) 701.
[19H] R. Schiele, S. Wittig, Gas turbine heat transfer: past and future challenges, J. Propulsion Power 16 (4) (2000) 583.
[20H] V. Sidiropoulos, J. Vlachopoulos, The effects of dual-orifice air-ring design on blown film cooling, Polym. Eng. Sci. 40 (7) (2000) 1161.
[21H] S.S. Talya, J.N. Rajadas, A. Chattopadhyay, Multidisciplinary optimization for gas turbine airfoil design, Inverse Probl. Eng. 8 (3) (2000) 283.

Jet impingement heat transfer – submerged jets

[22H] A.H. Beitelmal, M.A. Saad, C.D. Patel, The effect of inclination on the heat transfer between a flat surface and an impinging two-dimensional air jet, Int. J. Heat Fluid Flow 21 (2) (2000) 156.
[23H] A.J. Bula, M.M. Rahman, J.E. Leland, Numerical modeling of conjugate heat transfer during impingement of free liquid jet issuing from a slot nozzle, Numer. Heat Transfer Part A 38 (1) (2000) 45.
[24H] M.S. Choi, H.S. Yoo, G.Y. Yang, J.S. Lee, D.K. Sohn, Measurements of impinging jet flow and heat transfer on a semi-circular concave surface, Int. J. Heat Mass Transfer 43 (10) (2000) 1811.
[25H] T.J. Craft, H. Iacovides, J.H. Yoon, Progress in the use of non-linear two-equation models in the computation of convective heat-transfer in impinging and separated flows, Flow, Turbulence Combust. 63 (1) (2000) 59.
[26H] H.A. El-Sheikh, S.V. Garimella, Enhancement of air jet impingement heat transfer using pin–fin heat sinks, IEEE Trans. Components Packaging Technol. 23 (2) (2000) 300.
[27H] H.A. El-Sheikh, S.V. Garimella, Heat transfer from pin–fin heat sinks under multiple impinging jets, IEEE Trans. Adv. Packaging 23 (1) (2000) 113.
[28H] C. Gau, I.C. Lee, Flow and impingement cooling heat transfer along triangular rib-roughened walls, Int. J. Heat Mass Transfer 43 (24) (2000) 4405.
[29H] J. Lee, S.J. Lee, The effect of nozzle aspect ratio on stagnation region heat transfer characteristics of elliptic impinging jet, Int. J. Heat Mass Transfer 43 (4) (2000) 555.
[30H] C.S. McDaniel, B.W. Webb, Slot jet impingement heat transfer from circular cylinders, Int. J. Heat Mass Transfer 43 (11) (2000) 1975.
[31H] E.C. Mladin, D.A. Zumbrunnen, Alterations to coherent flow structures and heat transfer due to pulsations in an impinging air-jet, Int. J. Thermal Sci. 39 (2) (2000) 236.
[32H] D.J. Phares, G.T. Smedley, R.C. Flagan, The inviscid impingement of a jet with arbitrary velocity profile, Phys. Fluids 12 (8) (2000) 2046.
[33H] H.B. Song, S.H. Yoon, D.H. Lee, Flow and heat transfer characteristics of a two-dimensional oblique wall attaching offset jet, Int. J. Heat Mass Transfer 43 (13) (2000) 2395.
[34H] A.G. Tomba, A.L. Cavalieri, Evaluation of the heat transfer coefficient in thermal shock of alumina disks, Mater. Sci. Eng. A 276 (1) (2000) 76.
[35H] T. Wang, S. Chintalapati, R.S. Bunker, C.P. Lee, Jet mixing in a slot, Exp. Thermal Fluid Sci. 22 (1) (2000) 1.

Jet impingement heat transfer – liquid jets

[36H] A.M.E. Abdel-Latif, An experimental investigation of fluid flow and combustion characteristics of dual-fuel in a cylindrical combustion chamber, J. Loss Prevention Process Ind. 13 (6) (2000) 477.
[37H] G.S. Azad, Y.H. Huang, J.C. Han, Impingement heat transfer on dimpled surfaces using a transient liquid crystal technique, J. Thermophys. Heat Transfer 14 (2) (2000) 186.
[38H] A.J. Bula, M.M. Rahman, J.E. Leland, Axial steady free surface jet impinging over a flat disk with discrete heat sources, Int. J. Heat Fluid Flow 21 (1) (2000) 11.
[39H] Y.J. Chang, Y.M. Chen, Enhancement of a steam-jet refrigerator using a novel application of the petal nozzle, Exp. Thermal Fluid Sci. 22 (3) (2000) 203.
[40H] M. Chen, R. Chalupa, A.C. West, V. Modi, High Schmidt mass transfer in a laminar impinging slot jet flow, Int. J. Heat Mass Transfer 43 (21) (2000) 3907.
[41H] A.R. Dorokhov, V.S. Loginov, Calculation of the surface temperature of liquid under conditions of combined heat and mass transfer, Tech. Phys. Lett. 26 (2) (2000) 150.
[42H] T. Elperin, A. Fominykh, Effect of an absorbate concentration level on the coupled mass and heat transfer during short gas plugs dissolution, Int. J. Thermal Sci. 39 (7) (2000) 753.
[43H] A.R. Masri, S.S. Ibrahim, N. Nehzat, A.R. Green, Experimental study of premixed flame propagation over various solid obstructions, Exp. Thermal Fluid Sci. 21 (1) (2000) 109.
[44H] M.M. Rahman, A.J. Bula, J.E. Leland, Analysis of transient conjugate heat transfer to a free impinging jet, J. Thermophys. Heat Transfer 14 (3) (2000) 330.
[45H] G.J. Storr, M. Behnia, Comparisons between experiment and numerical simulation using a free surface technique of free-falling liquid jets, Exp. Thermal Fluid Sci. 22 (1) (2000) 79.

Transpiration

[46H] K. Boukrani, C. Carlier, A. Gonzalez, P. Suzanne, Analysis of heat and mass transfer in asymmetric system, Int. J. Thermal Sci. 39 (1) (2000) 130.

[47H] D.L. Deardorff, C.J. Diederich, Ultrasound applicators with internal water-cooling for high-powered interstitial thermal therapy, IEEE Trans. Biomed. Eng. 47 (10) (2000) 1356.
[48H] F.L.K. Kempkes, N.J. Van de Braak, J.C. Bakker, Effect of heating system position on vertical distribution of crop temperature and transpiration in greenhouse tomatoes, J. Agric. Eng. Res. 75 (1) (2000) 57.
[49H] R.W. Todd, S.R. Evett, T.A. Howell, N.L. Klocke, Soil temperature and water evaporation of small steel and plastic lysimeters replaced daily, Soil Science 165 (11) (2000) 890.

Drying

[50H] M. Abud-Archila, F. Courtois, C. Bonazzi, J.J. Bimbenet, A compartmental model of thin-layer drying kinetics of rough rice, Drying Technol. 18 (7) (2000) 1389.
[51H] T. Akiyama, K. Hayakawa, Heat and moisture transfer and hygrophysical changes in elastoplastic hollow cylinder-food during drying, J. Food Sci. 65 (2) (2000) 315.
[52H] N. Anantharaman, S. Sundaram, S.H. Ibrahim, Fluidised bed drying of agro products, Bioprocess Eng. 23 (4) (2000) 411.
[53H] P. Baldini, E. Cantoni, F. Colla, C. Diaferia, L. Gabba, E. Spotti, R. Marchelli, A. Dossena, E. Virgili, S. Sforza, P. Tenca, A. Mangia, R. Jordano, M.C. Lopez, L. Medina, S. Coudurier, S. Oddou, G. Solignat, Dry sausages ripening: influence of thermohygrometric conditions on microbiological, chemical and physico-chemical characteristics, Food Res. Int. 33 (3) (2000) 161.
[54H] C.G.A. Berg, Heat and mass transfer in turbulent drying processes – experimental and theoretical work, Drying Technol. 18 (3) (2000) 625.
[55H] A.J. Berkovich, J.H. Levy, B.R. Young, S.J. Schmidt, Predictive heat model for Australian oil shale drying and retorting, Ind. Eng. Chem. Res. 39 (7) (2000) 2592.
[56H] N. Boukadida, S. Ben Nasrallah, P. Perre, Mechanism of two-dimensional heat and mass transfer during convective drying of porous media under different drying conditions, Drying Technol. 18 (7) (2000) 1367.
[57H] W.F. Cao, T.A.G. Langrish, The development and validation of a system model for a countercurrent cascading rotary dryer, Drying Technol. 18 (1) (2000) 99.
[58H] J.J. Chen, J.D. Lin, Thermocapillary effect on drying of a polymer solution under non-uniform radiant heating, Int. J. Heat Mass Transfer 43 (12) (2000) 2155.
[59H] A. Dedic, Convective heat and mass transfer in moisture desorption of oak wood by introducing characteristic transfer coefficients, Drying Technol. 18 (7) (2000) 1617.
[60H] B.E. Farkas, L.J. Hubbard, Analysis of convective heat transfer during immersion frying, Drying Technol. 18 (6) (2000) 1269.
[61H] I. Farkas, C. Meszaros, A. Balint, Mathematical and physical foundations of drying theories, Drying Technol. 18 (3) (2000) 541.
[62H] M.A. Garcia, A. Ragazzo, Mathematical modeling of continuous dryers using the heat and mass transfer properties and product-air equilibrium relation, Drying Technol. 18 (1) (2000) 67.
[63H] J.K. Gigler, W.K.P. van Loon, M.M. Vissers, G.P.A. Bot, Forced convective drying of willow chips, Biomass Bioenergy 19 (4) (2000) 259.
[64H] P. Gupta, U.S. Shivhare, A.S. Bawa, Studies on frying kinetics and quality of French fries, Drying Technol. 18 (1) (2000) 311.
[65H] E. Hajidavalloo, F. Hamdullahpur, Thermal analysis of a fluidized bed drying process for crops. Part I: mathematical odeling, Int. J. Energy Res. 24 (9) (2000) 791.
[66H] E. Hajidavalloo, F. Hamdullahpur, Thermal analysis of a fluidized bed drying process for crops. Part II: experimental results and model verification, Int. J. Energy Res. 24 (9) (2000) 809.
[67H] K.S. Hatzilyberis, G.P. Androutsopoulos, C.E. Salmas, Indirect thermal drying of lignite: design aspects of a rotary dryer, Drying Technol. 18 (9) (2000) 2009.
[68H] J.A. Hernandez, G. Pavon, M.A. Garcia, Analytical solution of mass transfer equation considering shrinkage for modeling food-drying kinetics, J. Food Eng. 45 (1) (2000) 1.
[69H] F.F. Hill, J. Zank, Flue gas desulphurization by spray dry absorption, Chem. Eng. Process. 39 (1) (2000) 45.
[70H] C.C. Jia, D.W. Sun, C.W. Cao, Mathematical simulation of temperature and moisture fields within a grain kernel during drying, Drying Technol. 18 (6) (2000) 1305.
[71H] Y.T. Keum, J.H. Jeong, K.H. Auh, Finite-element simulation of ceramic drying processes, Model. Simulat. Mater. Sci. Eng. 8 (4) (2000) 541.
[72H] S.F. Ledig, K.E. Militzer, Measured gas velocity and moisture content distribution in a convective vacuum kiln, Drying Technol. 18 (8) (2000) 1817.
[73H] A. Mhimid, S. Ben Nasrallah, J.P. Fohr, Heat and mass transfer during drying of granular products – simulation with convective and conductive boundary conditions, Int. J. Heat Mass Transfer 43 (15) (2000) 2779.
[74H] J. Monzo-Cabrera, A. Diaz-Morcillo, J.M. Catala-Civera, E. De los Reyes, Kinetics of combined microwave and hot air drying of leather, J. Soc. Leather Technol. Chem. 84 (1) (2000) 38.
[75H] M. Nemenyi, I. Czaba, A. Kovbas, T. Jani, Investigation of simultaneous heat and mass transfer within the maize kernels during drying, Comput. Electron. Agric. 26 (2) (2000) 123.
[76H] S. Pang, Mathematical modelling of MDF fibre drying: drying optimisation, Drying Technol. 18 (7) (2000) 1433.
[77H] P.E. Price, R.A. Cairncross, Optimization of single-zone drying of polymer solution coatings using mathematical modeling, J. Appl. Polym. Sci. 78 (1) (2000) 149.

[78H] J.R. Quispe, E. Canales, R. Borquez, Simulation of turbulent flows in an impingement dryer by an extended k–ε model, Comput. Meth. Appl. Mech. Eng. 190 (5) (2000) 625.

[79H] C.O. Rovedo, P.E. Viollaz, Drying of solids: the infinite slab condition, Drying Technol. 18 (4) (2000) 1007.

[80H] R.A. Sadykov, Vacuum drying of dispersed materials from multicomponent liquid systems: verification of model, Drying Technol. 18 (3) (2000) 687.

[81H] S. Shahhosseini, I.T. Cameron, F.Y. Wang, A simple dynamic model for solid transport in rotary dryers, Drying Technol. 18 (4) (2000) 867.

[82H] C.R. Southern, M.M. Farid, X.D. Chen, B. Howard, L. Eyres, Thermal validation of a simple moving boundary model to determine the frying time of a thin potato crisp, Heat Mass Transfer 36 (5) (2000) 407.

[83H] Z.F. Sun, C.G. Carrington, P. Bannister, Dynamic modelling of the wood stack in a wood drying kiln, Chem. Eng. Res. Des. 78 (A1) (2000) 107.

[84H] S. Szentgyorgyi, L. Tomosy, O. Molnar, Convection heat transfer coefficients at convective drying of porous materials, Drying Technol. 18 (6) (2000) 1287.

[85H] T. Szentmarjay, E. Pallai, Drying experiments with AlO(OH) suspension of high purity and fine particulate size to design an industrial scale dryer, Drying Technol. 18 (3) (2000) 759.

[86H] W.P. Tu, M.L. Chen, Z.R. Yang, H.Q. Chen, A mathematical model for freeze-drying, Chinese J. Chem. Eng. 8 (2) (2000) 118.

[87H] R.E. Vega, P.I. Alvarez, E.R. Canales, Dimensionless correlation for the heat transfer coefficient in a batch-indirect rotary drier, Drying Technol. 18 (10) (2000) 2351.

[88H] Z.H. Wang, G.H. Chen, Theoretical study of fluidized-bed drying with microwave heating, Ind. Eng. Chem. Res. 39 (3) (2000) 775.

[89H] P. Wiberg, P.S. Sehlstedt, T.J. Moren, Heat and mass transfer during sapwood drying above the fibre saturation point, Drying Technol. 18 (8) (2000) 1647.

[90H] P.L. Woodfield, J.H. Kent, T.F. Dixon, Computational modelling of combustion instability in bagasse-fired furnaces, Exp. Thermal Fluid Sci. 21 (1) (2000) 17.

[91H] I. Zbicinski, K. Ciesielski, Extension of the neural networks operating range by the application of dimensionless numbers in prediction of heat transfer coefficients, Drying Technol. 18 (3) (2000) 649.

Miscellaneous

[92H] R.S. AbdulNour, K. Willenborg, J.J. McGrath, J.F. Foss, B.S. AbdulNour, Measurements of the convection heat transfer coefficient for a planar wall jet: uniform temperature and uniform heat flux boundary conditions, Exp. Thermal Fluid Sci. 22 (3) (2000) 123.

[93H] E.L. Andreas, E.C. Monahan, The role of whitecap bubbles in air–sea heat and moisture exchange, J. Phys. Oceanogr. 30 (2) (2000) 433.

[94H] A. Attou, L. Bolle, J.M. Seynhaeve, Experimental study of the critical flashing flow through a relief line: evidence of the double-choked flow phenomenon, Int. J. Multiphase Flow 26 (6) (2000) 921.

[95H] C. Boyadjiev, On the mechanism and kinetics of the transport processes in systems with intensive interphase mass transfer. 1. Heat arid mass transfer, Int. J. Heat Mass Transfer 43 (15) (2000) 2749.

[96H] C. Boyadjiev, On the mechanism and kinetics of the transport processes in systems with intensive interphase mass transfer. 2. Stability, Int. J. Heat Mass Transfer 43 (15) (2000) 2759.

[97H] J.A. Case, R.D. Tucker, J.B. Park, Defining the heating characteristics of ferromagnetic implants using calorimetry, J. Biomed. Mater. Res. 53 (6) (2000) 791.

[98H] P. Cauquot, S. Cavadias, J. Amouroux, Heat transfer from oxygen atoms recombination on silicon carbide. Chemical evolution of the material surface, High Temperature Mater. Processes 4 (3) (2000) 365.

[99H] A. Chikhaoui, J.P. Dudon, S. Genieys, E.V. Kustova, E.A. Nagnibeda, Multitemperature kinetic model for heat transfer in reacting gas mixture flows, Phys. Fluids 12 (1) (2000) 220.

[100H] G.M. Choi, M. Katsuki, D.J. Kim, The relationship between firing modes and nitric oxide emission in highly preheated air combustion, KSME J. 14 (4) (2000) 433.

[101H] F. Delage, P. Pre, P. Le Cloirec, Mass transfer and warming during adsorption of high concentrations of VOCs on an activated carbon bed: experimental and theoretical analysis, Environ. Sci. Technol. 34 (22) (2000) 4816.

[102H] P.K. Di, D.P.Y. Chang, H.A. Dwyer, Heat and mass transfer during microwave steam treatment of contaminated soils, J. Environ. Eng. – ASCE 126 (12) (2000) 1108.

[103H] Y.I. Dimitrienko, I.D. Dimitrienko, Effect of thermomechanical erosion on heterogeneous combustion of composite materials in high-speed flows, Combust. Flame 122 (3) (2000) 211.

[104H] P.A. Dirmeyer, F.J. Zeng, A. Ducharne, J.C. Morrill, R.D. Koster, The sensitivity of surface fluxes to soil water content in three land surface schemes, J. Hydrometeorol. 1 (2) (2000) 121.

[105H] E.H. Driesen, J.G.M. Kuerten, H.K. Kuiken, Mass transport in a partially covered fluid-filled cavity, Int. J. Heat Mass Transfer 43 (10) (2000) 1823.

[106H] S.V. Ekkad, J.C. Han, A transient liquid crystal thermography technique for gas turbine heat transfer measurements, Measure. Sci. Technol. 11 (7) (2000) 957.

[107H] Z.G. Feng, E.E. Michaelides, Mass and heat transfer from fluid spheres at low Reynolds numbers, Powder Technol. (2000) 63 (special issue).

[108H] N.I. Gamayunov, S.N. Gamayunov, Heat and mass transfer in freezing grounds, Eurasian Soil Sci. 33 (3) (2000) 257.

[109H] M.A. Hastaoglu, R. Kahraman, M.Q. Syed, Pellet breakup due to pressure generated during wood pyrolysis, Ind. Eng. Chem. Res. 39 (9) (2000) 3255.

[110H] L. Helsen, E. Van, den Bulck, Kinetics of the low-temperature pyrolysis of chromated copper arsenate-treated wood, J. Anal. Appl. Pyrolysis 53 (1) (2000) 51.
[111H] J. Hu, B. Rivin, E. Sher, The effect of an electric field on the shape of co-flowing and candle-type methane–air flames, Exp. Thermal Fluid Sci. 21 (1) (2000) 124.
[112H] Z.H. Hu, D.W. Sun, CFD simulation of heat and moisture transfer for predicting cooling rate and weight loss of cooked ham during air-blast chilling process, J. Food Eng. 46 (3) (2000) 189.
[113H] L.J. Hubbard, B.E. Farkas, Influence of oil temperature on convective heat transfer during immersion frying, J. Food Process. Preservation 24 (2) (2000) 143.
[114H] S. Hussain, M.A. Hossain, M. Wilson, Natural convection flow from a vertical permeable flat plate with variable surface temperature and species concentration, Eng. Comput. (Swansea, Wales) 17 (6) (2000) 789.
[115H] A.M.C. Janse, R.W.J. Westerhout, W. Prins, Modelling of flash pyrolysis of a single wood particle, Chem. Eng. Process. 39 (3) (2000) 239.
[116H] N. Kawahara, A.L. Yarin, G. Brenn, O. Kastner, F. Durst, Effect of acoustic streaming on the mass transfer from a sublimating sphere, Phys. Fluids 12 (4) (2000) 912.
[117H] S.V. Leach, G. Rein, J.L. Ellzey, O.A. Ezekoye, J.L. Torero, Kinetic and fuel property effects on forward smoldering combustion, Combust. Flame 120 (3) (2000) 346.
[118H] E.N. Macedo, R.M. Cotta, H.R.B. Orlande, A solution via generalised integral transform technique for the simultaneous transport processes during combustion of wood cylinders, Int. J. Numer. Meth. Eng. 49 (11) (2000) 1455.
[119H] E.P. Maziarz, G.A. Baker, J.V. Mure, T.D. Wood, A comparison of electrospray versus nanoelectrospray ionization Fourier transform mass spectrometry for the analysis of synthetic poly(dimethylsiloxane)/poly(ethylene glycol) oligomer blends, Int. J. Mass Spectrometry 202 (1) (2000) 241.
[120H] R.M. Nelson, Prediction of diurnal change in 10-h fuel stick moisture content, Can. J. Forest Res. 30 (7) (2000) 1071.
[121H] F. Nicoud, P. Bradshaw, A velocity transformation for heat and mass transfer, Phys. Fluids 12 (1) (2000) 237.
[122H] Y.Y. Niu, C.S. Tsai, Simulation of erosion by the dilute particulate flow impact, Numer. Heat Transfer Part A 37 (2) (2000) 167.
[123H] M.D. Novak, W.J. Chen, A.L. Orchansky, R. Ketler, Turbulent exchange processes within and above a straw mulch. Part II: thermal and moisture regimes, Agric. Forest Meteorol. 102 (2) (2000) 155.
[124H] C. Picard, J. Delville, Pressure velocity coupling in a subsonic round jet, Int. J. Heat Fluid Flow 21 (3) (2000) 359.
[125H] L. Pietri, M. Amielh, F. Anselmet, Simultaneous measurements of temperature and velocity fluctuations in a slightly heated jet combining a cold wire and Laser Doppler Anemometry, Int. J. Heat Fluid Flow 21 (1) (2000) 22.
[126H] A.D. Polyanin, A.I. Zhurov, A.V. Vyaz'min, Exact solutions of nonlinear heat- and mass-transfer equations, Theoret. Found. Chem. Eng. (English Transl.: Teoreticheskie Osnovy Khimicheskoi Tekhnologii) 34 (5) (2000) 403.
[127H] J.I. Ramos, Heat and mass transfer in annular liquid jets: I. Formulation, Appl. Math. Comput. 110 (2) (2000) 133.
[128H] J.I. Ramos, Heat and mass transfer in annular liquid jets: II. g-jitter, Appl. Math. Comput. 110 (2) (2000) 165.
[129H] J.I. Ramos, Heat and mass transfer in annular liquid jets: III. Combustion within the volume enclosed by the jet, Appl. Math. Comput. 110 (2) (2000) 185.
[130H] T. Saravanapavan, G.D. Salvucci, Analysis of rate-limiting processes in soil evaporation with implications for soil resistance models, Adv. Water Resour. 23 (5) (2000) 493.
[131H] J.P. Schwartze, S. Brocker, The evaporation of water into air of different humidities and the inversion temperature phenomenon, Int. J. Heat Mass Transfer 43 (10) (2000) 1791.
[132H] J.C. Seferis, K.M. Chung, F.U. Buehler, T. Takatoya, Heat and water mass transfer modeling in polyimide based advanced composites, Polym. Degradation Stability 68 (1) (2000) 43.
[133H] W. Senadeera, B.R. Bhandari, G. Young, B. Wijesinghe, Methods for effective fluidization of particulate food materials, Drying Technol. 18 (7) (2000) 1537.
[134H] M.D. Staicovici, A non-equilibrium phenomenological theory of the mass and heat transfer in physical and chemical interactions. Part I – application to NH_3/H_2O and other working systems, Int. J. Heat Mass Transfer 43 (22) (2000) 4153.
[135H] M.D. Staicovici, A non-equilibrium phenomenological theory of the mass and heat transfer in physical and chemical interactions. Part II – modeling of the NH_3/H_2O bubble absorption, analytical study of absorption and experiments, Int. J. Heat Mass Transfer 43 (22) (2000) 4175.
[136H] M.D. Staicovici, A phenomenological theory of polycomponent interactions in non-ideal mixtures. Application to NH_3/H_2O and other working pairs, Int. J. Refrig. 23 (2) (2000) 153.
[137H] D.W. Sun, L.J. Wang, Heat transfer characteristics of cooked meats using different cooling methods, Int. J. Refrig. 23 (7) (2000) 508.
[138H] P. Verboven, N. Scheerlinck, J. De Baerdemaeker, B.M. Nicolai, Computational fluid dynamics modelling and validation of the temperature distribution in a forced convection oven, J. Food Eng. 43 (2) (2000) 61.
[139H] Q.Z. Wang, N. Sakai, T. Hanzawa, Numerical analysis of heat transfer of canned liquid foods containing fibers or particles during sterilization, J. Chem. Eng. Japan 33 (5) (2000) 703.
[140H] Y.P. Xi, K. William, D.M. Frangopol, Multiscale modeling of interactive diffusion processes in concrete, J. Eng. Mech. – ASCE 126 (3) (2000) 258.
[141H] R. Yuen, G.D. Davis, E. Leonardi, G.H. Yeoh, The influence of moisture on the combustion of wood, Numer. Heat Transfer Part A 38 (3) (2000) 257.

Bioheat transfer: *Cryobiology*

[1I] J.P. Acker, L.E. McGann, Cell-cell contact affects membrane integrity after intracellular freezing, Cryobiology 40 (1) (2000) 54.

[2I] A. Baudot, L. Alger, P. Boutron, Glass-forming tendency in the system water–dimethyl sulfoxide, Cryobiology 40 (2) (2000) 151.

[3I] N.P. Bidault, B.E. Hammer, A. Hubel, Rapid MR imaging of cryoprotectant permeation in an engineered dermal replacement, Cryobiology 40 (1) (2000) 13.

[4I] T.N. Chen, A. Fowler, M. Toner, Literature review: supplemented phase diagram of the trehalose–water binary mixture, Cryobiology 40 (3) (2000) 277.

[5I] C.J. Doucet, L. Byass, L. Elias, D. Worrall, M. Smallwood, D.J. Bowles, Distribution and characterization of recrystallization inhibitor activity in plant and lichen species from the UK and maritime Antarctic, Cryobiology 40 (3) (2000) 218.

[6I] S. Evans, Electromagnetic rewarming: the effect of CPA concentration and radio source frequency on uniformity and efficiency of heating, Cryobiology 40 (2) (2000) 126.

[7I] N. Ishine, B. Rubinsky, C.Y. Lee, Transplantation of mammalian livers following freezing: vascular damage and functional recovery, Cryobiology 40 (1) (2000) 84.

[8I] D. Kopelman, Y. Klein, A. Zaretsky, O. Ben-Izhak, M. Michaelson, M. Hashmonai, Cryohemostasis of uncontrolled hemorrhage from liver injury, Cryobiology 40 (3) (2000) 210.

[9I] C.C. Lu, H.Z. Li, D.Y. Gao, Combined electromagnetic and heat-conduction analysis of rapid rewarminging of cryopreserved tissues, IEEE Trans. Microwave Theory Tech. Part 2 (2000) 2185.

[10I] W.J.M. Maas, I.A.M. de Graaf, E.D. Schoen, H.J. Koster, J.J.M. van de Sandt, J.P. Groten, Assessment of some critical factors in the freezing technique for the cryopreservation of precision-cut rat liver slices, Cryobiology 40 (3) (2000) 250.

[11I] K. Muldrew, K. Novak, H.Y. Yang, R. Zernicke, N.S. Schachar, L.E. McGann, Cryobiology of articular cartilage: ice morphology and recovery of chondrocytes, Cryobiology 40 (2) (2000) 102.

[12I] T.R. Oegema, L.B. Deloria, M.M. Fedewa, J.C. Bischof, J.L. Lewis, A simple cryopreservation method for the maintenance of cell viability and mechanical integrity of a cultured cartilage analog, Cryobiology 40 (4) (2000) 370.

[13I] L. Pomorski, M. Bartos, M. Amsolik, J. Cieplucha, K. Jozwik, J. Narebski, H. Pisarek, M. Kolodziejczyk, K. Kuzdak, Thyroid cryotherapy in an experimental rat model – topography of temperature during therapy and functional results, Cryobiology 41 (1) (2000) 51.

[14I] F. Popken, J.K. Seifert, R. Engelmann, P. Dutkowski, F. Nassir, T. Junginger, Comparison of iceball diameter and temperature distribution achieved with 3-mm Accuprobe cryoprobes in porcine and human liver tissue and human colorectal liver metastases in vitro, Cryobiology 40 (4) (2000) 302.

[15I] Y. Rabin, The effect of temperature-dependent thermal conductivity in heat transfer simulations of frozen biomaterials, Cryo-Letters 21 (3) (2000) 163.

[16I] J.H. Wang, A comprehensive evaluation of the effects and mechanisms of antifreeze proteins during low-temperature preservation [Review], Cryobiology 41 (1) (2000) 1.

[17I] B. Wowk, E. Leitl, C.M. Rasch, N. Mesbah-Karimi, S.B. Harris, G.M. Fahy, Vitrification enhancement by synthetic ice blocking agents, Cryobiology 40 (3) (2000) 228.

[18I] W.H. Yang, H.H. Peng, H.C. Chang, S.Y. Shen, C.L. Wu, C.H. Chang, An in vitro monitoring system for simulated thermal process in cryosurgery, Cryobiology 40 (2) (2000) 159.

[19I] J. Zhang, T.C. Hua, E.T. Chen, Experimental measurement and theoretical analyses of the freezing-thawing processes around a probe, Cryo-Letters 21 (4) (2000) 245.

Hyperthermia

[20I] M. Amichetti, M. Romano, L. Cristoforetti, R. Valdagni, Hyperthermia and radiotherapy for inoperable squamous cell carcinoma metastatic to cervical lymph nodes from an unknown primary site, Int. J. Hyperthermia 16 (1) (2000) 85.

[21I] S. Bhowmick, D.J. Swanlund, J.C. Bischof, Supraphysiological thermal injury in Dunning AT-1 prostate tumor cells, J. Biomech. Eng. 122 (1) (2000) 51.

[22I] J.C. Camart, D. Despretz, B. Prevost, J.P. Sozanski, M. Chive, J. Pribetich, New 434 MHz interstitial hyperthermia system monitored by microwave radiometry: theoretical and experimental results, Int. J. Hyperthermia 16 (2) (2000) 95.

[23I] F. Chavrier, J.Y. Chapelon, A. Gelet, D. Cathignol, Modeling of high-intensity focused ultrasound-induced lesions in the presence of cavitation bubbles, J. Acoust. Soc. Am. 108 (1) (2000) 432.

[24I] A. Cividalli, E. Livdi, F. Ceciarelli, M. Piscitelli, P. Pasqualetti, G. Cruciani, D.T. Danesi, Hyperthermia and paclitaxel–epirubicin chemotherapy: enhanced cytotoxic effect in a murine mammary adenocarcinoma, Int. J. Hyperthermia 16 (1) (2000) 61.

[25I] D.S. Cobb, D.N. Dederich, T.V. Gardner, In vitro temperature change at the dentin/pulpal interface by using conventional visible light versus argon laser, Lasers Surgery Med. 26 (4) (2000) 386.

[26I] O.I. Craciunescu, T.V. Samulski, J.R. MacFall, S.T. Clegg, Perturbations in hyperthermia temperature distributions associated with counter-current flow: numerical simulations and empirical verification, IEEE Trans. Biomed. Eng. 47 (4) (2000) 435.

[27I] S.S. Evans, M.D. Bain, W.C. Wang, Fever-range hyperthermia stimulates alpha4beta7 integrin-dependent lymphocyte-endothelial adhesion, Int. J. Hyperthermia 16 (1) (2000) 45.

[28I] E.A. Gelvich, V.N. Mazokhin, Resonance effects in applicator water boluses and their influence on SAR distribution patterns, Int. J. Hyperthermia 16 (2) (2000) 113.

[29I] E.W. Gerner, E.M. Hersh, M. Pennington, T.C. Tsang, D. Harris, F. Vasanwala, J. Brailey, Heat-inducible vectors for use in gene therapy, Int. J. Hyperthermia 16 (2) (2000) 171.

[30I] L. Hamada, K. Saito, H. Yoshimura, K. Ito, Dielectric-loaded coaxial-slot antenna for interstitial microwave hyperthermia: longitudinal control of heating patterns, Int. J. Hyperthermia 16 (3) (2000) 219.

[31I] Y. Hiraki, M. Nakajo, T. Takeshita, H. Churei, The position of the opposite flat applicator changes the SAR and thermal distributions of the RF capacitive intracavitary hyperthermia, Int. J. Hyperthermia 16 (3) (2000) 193.

[32I] Y. Hiraki, M. Nakajo, T. Takeshita, H. Churei, The size and distance of the opposite flat applicator change the SAR and thermal distributions of RF capacitive intracavitary hyperthermia, Int. J. Hyperthermia 16 (3) (2000) 205.

[33I] J.N. Ikediala, J. Tang, T. Wig, A heating block system for studying thermal death kinetics of insect pests, Trans. ASAE 43 (2) (2000) 351.

[34I] S.Y. Lee, S.H. Lee, K. Akuta, M. Uda, C.W. Song, Acute histological effects of interstitial hyperthermia on normal rat brain, Int. J. Hyperthermia 16 (1) (2000) 73.

[35I] W.L. Lin, W.C. Fan, J.Y. Yen, Y.Y. Chen, M.J. Shieh, A theoretical study of cylindrical ultrasound transducers for intracavitary hyperthermia, Int. J. Radiat. Oncol. Biol. Phys. 46 (5) (2000) 1329.

[36I] W.L. Lin, C.T. Liauh, Y.Y. Chen, H.C. Liu, M.J. Shieh, Theoretical study of temperature elevation at muscle/bone interface during ultrasound hyperthermia, Med. Phys. 27 (5) (2000) 1131.

[37I] W.L. Lin, C.T. Liauh, J.Y. Yen, Y.Y. Chen, M.J. Shieh, Treatable domain and optimal frequency for brain tumors during ultrasound hyperthermia, Int. J. Radiat. Oncol. Biol. Phys. 46 (1) (2000) 239.

[38I] J. Liu, Preliminary survey on the mechanisms of the wave-like behaviors of heat transfer in living tissues, Forsch. Ingenieurw. – Eng. Res. 66 (1) (2000) 1.

[39I] J. Liu, L.X. Xu, Boundary information based diagnostics on the thermal states of biological bodies, Int. J. Heat Mass Transfer 43 (16) (2000) 2827.

[40I] W.H. Nau, C.J. Diederich, P.R. Stauffer, Directional power deposition from direct-coupled and catheter-cooled interstitial ultrasound applicators, Int. J. Hyperthermia 16 (2) (2000) 129.

[41I] M. Okamoto, K. Tazawa, T. Kawagoshi, M. Maeda, T. Honda, T. Sakamoto, K. Tsukada, The combined effect against colon-26 cells of heat treatment and immunization with heat treated colon-26 tumour cell extract, Int. J. Hyperthermia 16 (3) (2000) 263.

[42I] J.R. Ostberg, E.A. Repasky, Comparison of the effects of two different whole body hyperthermia protocols on the distribution of murine leukocyte populations, Int. J. Hyperthermia 16 (1) (2000) 29.

[43I] T.J. Pfefer, D.J. Smithies, T.E. Milner, M.J.C. van Gemert, J.S. Nelson, A.J. Welch, Bioheat transfer analysis of cryogen spray cooling during laser treatment of port wine stains, Lasers Surgery Med. 26 (2) (2000) 145.

[44I] B.W. Raaymakers, J. Crezee, J.J.W. Lagendijk, Modelling individual temperature profiles from an isolated perfused bovine tongue, Phys. Med. Biol. 45 (3) (2000) 765.

[45I] B.W. Raaymakers, A. Kotte, J.J.W. Lagendijk, How to apply a discrete vessel model in thermal simulations when only incomplete vessel data are available, Phys. Medi. Biol. 45 (11) (2000) 3385.

[46I] J.P. Rinehart, G.D. Yocum, D.L. Denlinger, Thermotolerance and rapid cold hardening ameliorate the negative effects of brief exposures to high or low temperatures on fecundity in the flesh fly, Sarcophaga crassipalpis, Physiol. Entomol. 25 (4) (2000) 330.

[47I] A.D. Romero, D.B. Green, A.L. Wucherpfennig, Heat transfer to the periodontal ligament during root obturation procedures using an in vitro model, J. Endodontics 26 (2) (2000) 85.

[48I] Y. Rong, P. Mack, Apoptosis induced by hyperthermia in Dunn osteosarcoma cell line in vitro, Int. J. Hyperthermia 16 (1) (2000) 19.

[49I] G.A. Senisterra, J.R. Lepock, Thermal destabilization of transmembrane proteins by local anaesthetics, Int. J. Hyperthermia 16 (1) (2000) 1.

[50I] Y. Takada, E.F. Sato, T. Nakajima, M. Hosono, M. Tsumura, M. Inoue, R. Yamada, Granulocyte-colony stimulating factor enhances anti-tumour effect of hyperthermia, Int. J. Hyperthermia 16 (3) (2000) 275.

[51I] G.M.J. Van Leeuwen, A. Kotte, B.W. Raaymakers, J.J.W. Lagendijk, Temperature simulations in tissue with a realistic computer generated vessel network, Phys. Med. Biol. 45 (4) (2000) 1035.

[52I] W. Verkruysse, B. Majaron, B.S. Tanenbaum, J.S. Nelson, Optimal cryogen spray cooling parameters for pulsed laser treatment of port wine stains, Lasers Surgery Med. 27 (2) (2000) 165.

[53I] J.A. White, A.W. Dutton, J.A. Schmidt, R.B. Roemer, An accurate, convective energy equation based automated meshing technique for analysis of blood vessels and tissues, Int. J. Hyperthermia 16 (2) (2000) 145.

[54I] D.Y. Yuan, K.R. Holmes, J.W. Valvano, Morphometry of the canine prostate vasculature, Microvascular Res. 59 (1) (2000) 115.

Thermoregulation

[55I] A.S.T. Blake, G.W. Petley, C.D. Deakin, Effects of changes in packed cell volume on the specific heat capacity of blood: implications for studies measuring heat exchange in extracorporeal circuits, Br. J. Anaesth. 84 (1) (2000) 28.

[56I] P. Boily, P.H. Kvadsheim, L.P. Folkow, Cutaneous heat flux models do not reliably predict metabolic rates of marine mammals, J. Theoret. Biol. 207 (3) (2000) 317.

[57I] A.B. Campbell, J.D. French, S.S. Nair, J.B. Miles, C.H. Lin, Thermal analysis and design of an advanced space suit, J. Thermophys. Heat Transfer 14 (2) (2000) 151.

[58I] C.G. Crandall, R. Zhang, B.D. Levine, Effects of whole body heating on dynamic baroreflex regulation of heart rate in humans, Am. J. Physiol. 279 (5) (2000) H2486.

[59I] J. Gonzalez-Alonso, B. Quistorff, P. Krustrup, J. Bangsbo, B. Saltin, Heat production in human skeletal muscle at the onset of intense dynamic exercise, J. Physiol. London 524 (2) (2000) 603.

[60I] R.A. Henderson, M.E. Whitehurst, K.R. Morgan, R.G. Carroll, Reduced metabolic rate accompanies the hemorrhage-induced hypothermia in conscious rats, Resuscitation 44 (2) (2000) 129.

[61I] Y.H. Itoh, R. Noguchi, Pre-treatment with mild whole-body heating prevents gastric ulcer induced by restraint and water-immersion stress in rats, Int. J. Hyperthermia 16 (2) (2000) 183.

[62I] M.L. McLane, J.A. Nelson, K.A. Lenner, R. Hejal, C. Kotaru, M. Skowronski, A. Coreno, E. Lane, E.R. McFadden, Integrated response of the upper and lower respiratory tract of asthmatic subjects to frigid air, J. Appl. Physiol. 88 (3) (2000) 1043.

[63I] R.J. Osczevski, Windward cooling: an overlooked factor in the calculation of wind chill, Bull. Am. Meteorol. Soc. 81 (12) (2000) 2975.

[64I] A.J. Purvis, N.T. Cable, The effects of phase control materials on hand skin temperature within gloves of soccer goalkeepers, Ergonomics 43 (10) (2000) 1480.

[65I] F. Seebacher, Heat transfer in a microvascular network: the effect of heart rate on heating and cooling in reptiles (Pogona barbata and Varanus varius), J. Theoret. Biol. 203 (2) (2000) 97.

[66I] M.H. Tawhai, A.J. Pullan, P.J. Hunter, Generation of an anatomically based three-dimensional model of the conducting airways, Ann. Biomed. Eng. 28 (7) (2000) 793.

[67I] S.B. Thornton, S.S. Nair, Parametric studies of human thermal mechanisms and measurements, IEEE Trans. Biomed. Eng. 47 (4) (2000) 444.

[68I] K.M. Tran, S.M. Frank, H.K. El-Rahmany, N.S. Ghoneim, L.J. Kim, R.A. Barnes, Thermal and hemodynamic responses to postoperative rewarming with a sub-atmospheric pressure device, J. Thermal Biol. Part 2 (2000) 191 (special issue).

[69I] P. Trunk, R. Trobec, B. Gersak, Measurement of porcine heart temperatures, Pflugers Arch. (Suppl. S) (2000) R132.

[70I] J.R. Turnpenny, A.J. McArthur, J.A. Clark, C.M. Wathes, Thermal balance of livestock 1. A parsimonious model, Agric. Forest Meteorol. 101 (1) (2000) 15.

[71I] C.A. Van Ee, A.L. Chasse, B.S. Myers, Quantifying skeletal muscle properties in cadaveric test specimens: effects of mechanical loading, postmortem time, and freezer storage, J. Biomech. Eng. 122 (1) (2000) 9.

[72I] M. Yamasaki, M. Shiokawa, S.W. Choi, S. Muraki, Effect of acute heat exposure on skin blood flow of the paralyzed thigh in persons with spinal cord injury, Spinal Cord 38 (4) (2000) 224.

[73I] S.C.M. Yu, Steady and pulsatile flow studies in Abdominal Aortic Aneurysm models using particle image velocimetry, Int. J. Heat Fluid Flow 21 (1) (2000) 74.

[74I] Q. Zhang, H. Xin, Modeling heat mat operation for piglet creep heating, Trans. ASAE 43 (5) (2000) 1261.

[75I] Z.C. Zheng, W.F. Yost, Conceptual design of a combined device for normothermia and venous compression, Med. Eng. Phys. 22 (3) (2000) 235.

[76I] L. Zhu, Theoretical evaluation of contributions of heat conduction and countercurrent heat exchange in selective brain cooling in humans, Ann. Biomed. Eng. 28 (3) (2000) 269.

Change of phase – boiling: *Droplet and film evaporation*

[1J] A.A. Alhusseini, J.C. Chen, Transport phenomena in turbulent falling films, Ind. Eng. Chem. Res. 39 (6) (2000) 2091.

[2J] C. Aprea, F. de Rossi, A. Greco, Experimental evaluation of R22 and R407C evaporative heat transfer coefficients in a vapour compression plant, Int. J. Refrig. 23 (5) (2000) 366.

[3J] J. Bellan, Supercritical (and subcritical) fluid behavior and modeling: drops, streams, shear and mixing layers, jets and sprays, Progr. Energy Combust. Sci. 26 (4) (2000).

[4J] G. Berthoud, Heat transfer modeling during a vapor explosion, Nucl. Technol. 130 (1) (2000) 39.

[5J] E. Elias, P.L. Chambre, Bubble transport in flashing flow, Int. J. Multiphase Flow 26 (2) (2000) 191.

[6J] S. Ha, Some aspects of experimental in-tube evaporation, KSME J. 14 (5) (2000) 537.

[7J] E. Hahne, G. Barthau, Evaporation waves in flashing processes, Int. J. Multiphase Flow 26 (4) (2000) 531.

[8J] K. Harstad, J. Bellan, An all-pressure fluid drop model applied to a binary mixture: heptane in nitrogen, Int. J. Multiphase Flow 26 (10) (2000) 1675.

[9J] S. Inada, W.J. Yang, S. Uchiyama, J. Song, Heat transfer effectiveness of saturated drops in the nonwetting regime impinging on a heated surface, JSME Int. J. Ser. B 43 (3) (2000) 468.

[10J] S.H. Lee, H.S. Ryou, Development of a new spray/wall interaction model, Int. J. Multiphase Flow 26 (7) (2000) 1209.

[11J] G.W. Liu, Y.S. Morsi, B.R. Clayton, Characterisation of the spray cooling heat transfer involved in a high pressure die casting process, Int. J. Thermal Sci. 39 (5) (2000) 582.

[12J] M. Masoudi, W.A. Sirignano, Collision of a vortex with a vaporizing droplet, Int. J. Multiphase Flow 26 (12) (2000) 1925.

[13J] G.D. McBain, H. Suehrcke, J.A. Harris, Evaporation from an open cylinder, Int. J. Heat Mass Transfer 43 (12) (2000) 2117.

[14J] C. Morin, C. Chauveau, I. Gokalp, Droplet vaporisation characteristics of vegetable oil derived biofuels at high temperatures, Exp. Thermal Fluid Sci. 21 (1) (2000) 41.

[15J] S.J.S. Morris, A phenomenological model for the contact region of an evaporating meniscus on a superheated slab, J. Fluid Mech. (2000) 411–459.

[16J] I.G. Namyatov, S.S. Minaev, V.S. Babkin, V.A. Bunev, A.A. Korzhavin, Diffusion combustion of a liquid fuel film on a metal substrate, Combust. Explos. Shock Waves 36 (5) (2000) 562.

[17J] J.W. Rose, Accurate approximate equations for intensive sub-sonic evaporation, Int. J. Heat Mass Transfer 43 (20) (2000) 3869.

[18J] J.R. Saylor, G.B. Smith, K.A. Flack, The effect of a surfactant monolayer on the temperature field of a water surface undergoing evaporation, Int. J. Heat Mass Transfer 43 (17) (2000) 3073.

[19J] R.I. Sujith, G.A. Waldherr, J.I. Jagoda, B.T. Zinn, Experimental investigation of the evaporation of droplets in axial acoustic fields, J. Propulsion Power 16 (2) (2000) 278.

[20J] M. Sweetland, J.H. Lienhard, Evaporative cooling of continuously drawn glass fibers by water sprays, Int. J. Heat Mass Transfer 43 (5) (2000) 777.

[21J] Y.B. Zeng, C.F. Lee, Multicomponent-fuel film-vaporization model for multidimensional computations, J. Propulsion Power 16 (6) (2000) 964.

[22J] Z. Zhao, S. Glod, D. Poulikakos, Pressure and power generation during explosive vaporization on a thin-film microheater, Int. J. Heat Mass Transfer 43 (2) (2000) 281.

[23J] G.S. Zhu, S.K. Aggarwal, Transient supercritical droplet evaporation with emphasis on the effects of equation of state, Int. J. Heat Mass Transfer 43 (7) (2000) 1157.

Bubble characteristics

[24J] F.B. Campos, P.L.C. Lage, Large, Heat and mass transfer modeling during the formation and ascension of superheated bubbles, Int. J. Heat Mass Transfer 43 (16) (2000) 2883.

[25J] F.B. Campos, P.L.C. Lage, Simultaneous heat and mass transfer during the ascension of superheated bubbles, Int. J. Heat Mass Transfer 43 (2) (2000) 179.

[26J] J. Eigeldinger, H. Vogt, The bubble coverage of gas-evolving electrodes in a flowing electrolyte, Electrochim. Acta 45 (27) (2000) 4449.

[27J] N.A. Gumerov, Dynamics of vapor bubbles with nonequilibrium phase transitions in isotropic acoustic fields, Phys. Fluids 12 (1) (2000) 71.

[28J] Y. Hao, A. Prosperetti, The collapse of vapor bubbles in a spatially non-uniform flow, Int. J. Heat Mass Transfer 43 (19) (2000) 3539.

[29J] J. Huang, M. Karthikeyan, P.C. Wayner, J.L. Plawsky, Heat transfer and fluid flow in a nonisothermal constrained vapor bubble, Chem. Eng. Commun. (2000) 181–203.

[30J] J. Kubie, Velocity of long bubbles in horizontally oscillating vertical pipes, Int. J. Multiphase Flow 26 (2) (2000) 339.

[31J] S. Kumagai, K. Kawabata, H. Yoshikawa, R. Shimada, Pressure fluctuation associated with bubble motion in microbubble emission boiling from a vertical surface, JSME Int. J. Ser. B 43 (2) (2000) 206.

[32J] Y. Li, J.P. Zhang, L.S. Fan, Discrete-phase simulation of single bubble rise behavior at elevated pressures in a bubble column, Chem. Eng. Sci. 55 (20) (2000) 4597.

[33J] M. Matsumoto, K. Miyamoto, K. Ohguchi, T. Kinjo, Molecular dynamics simulation of a collapsing bubble, Progr. Theoret. Phys. Suppl. 138 (2000) 728.

[34J] T.L. Merrill, Thermally controlled bubble collapse in binary solutions, Int. J. Heat Mass Transfer 43 (18) (2000) 3287.

[35J] C.X. Yang, Y.T. Wu, X.G. Yuan, C.F. Ma, Study on bubble dynamics for pool nucleate (vol 43, pg 203, 2000), Int. J. Heat Mass Transfer 43 (18) (2000) 3511.

[36J] C.X. Yang, Y.T. Wu, X.G. Yuan, C.F. Ma, Study on bubble dynamics for pool nucleate boiling, Int. J. Heat Mass Transfer 43 (2) (2000) 203.

[37J] W.J. Yang, K. Tsutsui, Overview of boiling on microstructures – Macro bubbles from micro heaters, Microscale Thermophys. Eng. 4 (1) (2000) 7.

[38J] M.C. Zaghdoudi, M. Lallemand, Study of the behaviour of a bubble in an electric field: steady shape and local fluid motion, Int. J. Thermal Sci. 39 (1) (2000) 39.

Pool boiling

[39J] C.S. Baldwin, S.H. Bhavnani, R.C. Jaeger, Toward optimizing enhanced surfaces for passive immersion cooled heat sinks, IEEE Trans. Components Packaging Technol. 23 (1) (2000) 70.

[40J] S.V. Bechta, S.A. Vitol, E.V. Krushinov, V.S. Granovsky, A.A. Sulatsky, V.B. Khabensky, D.B. Lopukh, Y.B. Petrov, A.Y. Pechenkov, Water boiling on the corium melt surface under VVER severe accident conditions, Nucl. Eng. Des. 195 (1) (2000) 45.

[41J] J. Bonjour, M. Clausse, M. Lallemand, Experimental study of the coalescence phenomenon during nucleate pool boiling, Exp. Thermal Fluid Sci. 20 (3) (2000) 180.

[42J] L.H. Chai, X.F. Peng, B.X. Wang, Nonlinear aspects of boiling systems and a new method for predicting the pool nucleate boiling heat transfer, Int. J. Heat Mass Transfer 43 (1) (2000) 75.

[43J] L.H. Chai, X.F. Peng, B.X. Wang, Nucleation site interaction during boiling, Int. J. Heat Mass Transfer 43 (23) (2000) 4249.

[44J] J. Darabi, M.M. Ohadi, S.V. Dessiatoun, Compound augmentation of pool boiling on three selected commercial tubes, J. Enhanced Heat Transfer 7 (5) (2000) 347.

[45J] I.M. Dergunov, A.P. Kryukov, A.A. Gorbunov, The vapor film evolution at superfluid helium boiling in conditions of microgravity, J. Low Temperature Phys. 119 (3) (2000) 403.

[46J] F. Fantozzi, A. Franco, E.M. Latrofa, Analysis of the heat dissipation enhancement with finned surfaces in pool boiling of dielectric fluid, Heat Mass Transfer 36 (6) (2000) 487.

[47J] S. Fuchino, N. Tamada, I. Ishii, M. Okano, Heat transfer characteristics of liquid nitrogen for cyclic heating, IEEE Trans. Appl. Superconduct. 10 (1) (2000) 1526.

[48J] H. Gjerkes, I. Golobic, Pool boiling CHF on a laser heated thin plate, Int. J. Heat Mass Transfer 43 (11) (2000) 1999.

[49J] S.J. Ha, H.C. No, A dry-spot model of critical heat flux applicable to both pool boiling and subcooled forced convection boiling, Int. J. Heat Mass Transfer 43 (2) (2000) 241.

[50J] T.C. Hua, J.J. Xu, Quenching boiling in subcooled liquid nitrogen for solidification of aqueous materials, Mater. Sci. Eng. A 292 (2) (2000) 169.

[51J] K. Kamiuto, D. Walujastono, Improvement of one-equation boundary-layer integral method for pool film-boiling heat transfer from a downward-facing surface, Int. J. Heat Mass Transfer 43 (13) (2000) 2415.

[52J] M.G. Kang, Effect of surface roughness on pool boiling heat transfer, Int. J. Heat Mass Transfer 43 (22) (2000) 4073.

[53J] M.A. Kedzierski, Enhancement of R123 pool boiling by the addition of hydrocarbons, Int. J. Refrig. 23 (2) (2000) 89.

[54J] P.V. Khurtin, A.P. Kryukov, Some models of heat transfer at film boiling of superfluid helium near lambda-point in microgravity, J. Low Temperature Phys. 119 (3) (2000) 413.

[55J] R. Krupiczka, A. Rotkegel, Z. Ziobrowski, The influence of mass transport on the heat transfer coefficients during the boiling of multicomponent mixtures, Int. J. Thermal Sci. 39 (6) (2000) 667.

[56J] G.N. Kruzhilin, E.V. Lykov, Critical heat load upon pool liquid boiling, Tech. Phys. 45 (2) (2000) 157.

[57J] Y.C. Kweon, M.H. Kim, Experimental study on nucleate boiling enhancement and bubble dynamic behavior in saturated pool boiling using a nonuniform dc electric field, Int. J. Multiphase Flow 26 (8) (2000) 1351.

[58J] A.G. Lanin, A.L. Tkachev, Numerical method of thermal shock resistance estimation by quenching of samples in water, J. Mater. Sci. 35 (9) (2000) 2353.

[59J] Q. Liao, T.S. Zhao, A visual study of phase-change heat transfer in a two-dimensional porous structure with a partial heating boundary, Int. J. Heat Mass Transfer 43 (7) (2000) 1089.

[60J] W.W. Lin, J.C. Yang, D.J. Lee, Metastable pin fin boiling, Int. J. Heat Mass Transfer 43 (9) (2000) 1629.

[61J] Z.W. Liu, W.W. Lin, D.J. Lee, Boiling of HFE-7100 on straight pin fin, Exp. Thermal Fluid Sci. 23 (1) (2000) 35.

[62J] A. Luke, D. Gorenflo, Heat transfer and size distribution of active nucleation sites in boiling propane outside a tube, Int. J. Thermal Sci. 39 (9) (2000).

[63J] M.O. Lutset, Experimental study of temperature distribution in the vicinity of film boiling, High Temperature – USSR 38 (4) (2000) 599.

[64J] M.O. Lutset, S.V. Zhukov, V.Y. Chekhovich, A.D. Nazarov, A.N. Pavlenko, V.E. Zhukov, N.V. Zhukova, A study of transient heat transfer from the heater surface to a boiling liquid, Instrum. Exp. Tech. 43 (3) (2000) 419.

[65J] R. Mallozzi, R.L. Judd, N. Balakrishnan, Investigation of randomness, overlap and the interaction of bubbles forming at adjacent nucleation sites in pool boiling, Int. J. Heat Mass Transfer 43 (18) (2000) 3317.

[66J] M. Mann, K. Stephan, P. Stephan, Influence of heat conduction in the wall on nucleate boiling heat transfer, Int. J. Heat Mass Transfer 43 (12) (2000) 2193.

[67J] M. Monde, Y. Mitsutake, Enhancement of CHF in open thermosyphon with heated bottom chamber, Int. J. Heat Mass Transfer 43 (18) (2000) 3341.

[68J] D.N.T. Nguyen, R.H. Chen, L.C. Chow, C.B. Gu, Effects of heater orientation and confinement on liquid nitrogen pool boiling, J. Thermophys. Heat Transfer 14 (1) (2000) 109.

[69J] S.D. Oh, H.Y. Kwak, A study of bubble behavior and boiling heat transfer enhancement ender electric field, Heat Transfer Eng. 21 (4) (2000) 33.

[70J] C.H. Panzarella, S.H. Davis, S.G. Bankoff, Nonlinear dynamics in horizontal film boiling, J. Fluid Mech. 402 (2000) 163.

[71J] J.C. Passos, R.F. Reinaldo, Analysis of pool boiling within smooth and grooved tubes, Exp. Thermal Fluid Sci. 22 (1) (2000) 35.

[72J] V.M. Polyaev, B.V. Kichatov, Boiling of solutions on porous surfaces, Theoret. Found. Chem. Eng. (English Transl.: Teoreticheskie Osnovy Khimicheskoi Tekhnologii) 34 (1) (2000) 22.

[73J] G. Ribatski, J.M.S. Jabardo, Nucleate boiling of halocarbon refrigerants: heat transfer correlations, Hvac&R Res. 6 (4) (2000) 349.

[74J] A. Sakurai, Mechanisms of transitions to film boiling at CHFs in subcooled and pressurized liquids due to steady and increasing heat inputs, Nucl. Eng. Des. 197 (3) (2000) 301.

[75J] T.J. Snyder, J.N. Chung, Terrestrial and microgravity boiling heat transfer in a dielectrophoretic force field, Int. J. Heat Mass Transfer 43 (9) (2000) 1547.

[76J] J. Straub, Microscale boiling heat transfer under 0 g and 1 g conditions, Int. J. Thermal Sci. 39 (4) (2000) 490.

[77J] R.A. Tatara, P. Payvar, Pool boiling of pure R134a from a single Turbo-BII-HP tube, Int. J. Heat Mass Transfer 43 (12) (2000) 2233.

[78J] C.B.V. Vittala, S.C. Gupta, V.K. Agarwal, Pool boiling of distilled water an PTFE-coated heating tube, Heat Transfer Eng. 21 (6) (2000) 26.

[79J] B.X. Wang, J.T. Zhang, X.F. Peng, Experimental study on the dryout heat flux of falling liquid film, Int. J. Heat Mass Transfer 43 (11) (2000) 1897.

[80J] S.H. Wang, Existence and multiplicity of solutions of an equation from pool boiling on wires, Q. Appl. Math. 58 (2) (2000) 331.

[81J] V. Zarnescu, R.L. Webb, L.H. Chien, Effect of oil on the boiling performance of structured and porous surfaces, Hvac&R Res. 6 (1) (2000) 41.

[82J] T.S. Zhao, Q. Liao, On capillary-driven flow and phase-change heat transfer in a porous structure heated by a finned surface: measurements and modeling, Int. J. Heat Mass Transfer 43 (7) (2000) 1141.

Flow boiling

[83J] S.M. Bajorek, M.Y. Young, Direct-contact heat transfer model for dispersed-flow film boiling, Nucl. Technol. 132 (3) (2000) 375.
[84J] Z.Y. Bao, D.F. Fletcher, B.S. Haynes, An experimental study of gas–liquid flow in a narrow conduit, Int. J. Heat Mass Transfer 43 (13) (2000) 2313.
[85J] Z.Y. Bao, D.F. Fletcher, B.S. Haynes, Flow boiling heat transfer of Freon R11 and HCFC123 in narrow passages, Int. J. Heat Mass Transfer 43 (18) (2000) 3347.
[86J] X. Boissieux, M.R. Heikal, R.A. Johns, Two-phase heat transfer coefficients of three HFC refrigerants inside a horizontal smooth tube, part I: evaporation, Int. J. Refrig. 23 (4) (2000) 269.
[87J] L.X. Cheng, T.K. Chen, Comparison of six typical correlations for upward flow boiling heat transfer with kerosene in a vertical smooth tube, Heat Transfer Eng. 21 (5) (2000) 27.
[88J] L.D. Clark, I. Rosindale, K. Davey, S. Hinduja, P.J. Dooling, Predicting heat extraction due to boiling in the cooling channels during the pressure die casting process, Proc. Inst. Mech. Eng. Part C 214 (3) (2000) 465.
[89J] A.F. Cokmez-Tuzla, K. Tuzla, J.C. Chen, Characteristics of liquid-wall contact in post-CHF flow boiling, Int. J. Heat Mass Transfer 43 (11) (2000) 1925.
[90J] D.D. Hall, I. Mudawar, Critical heat flux (CHF) for water flow in tubes – I. Compilation and assessment of world CHF data [Review], Int. J. Heat Mass Transfer 43 (14) (2000) 2573.
[91J] D.D. Hall, I. Mudawar, Critical heat flux (CHF) for water flow in tubes – II. Subcooled CHF correlations [Review], Int. J. Heat Mass Transfer 43 (14) (2000) 2605.
[92J] I. Hapke, H. Boye, J. Schmidt, Onset of nucleate boiling in minichannels, Int. J. Thermal Sci. 39 (4) (2000) 505.
[93J] G. Hetsroni, R. Rozenblit, Thermal patterns on a heated wall in vertical air–water flow, Int. J. Multiphase Flow 26 (2) (2000) 147.
[94J] K. Kadoguchi, M. Tashiro, Heat transfer enhancement and pressure drop in the flow boiling field with the bubble movement restricted by a screen sheet, J. Enhanced Heat Transfer 7 (5) (2000) 327.
[95J] M. Lee, A critical heat flux approach for square rod bundles using the 1995 Groeneveld CHF table and bundle data of heat transfer research facility, Nucl. Eng. Des. 197 (3) (2000) 357.
[96J] W.W. Lin, J.C. Yang, D.J. Lee, Relative stability of subcooled flow boiling on non-uniformly heated, inclined flat surface, Int. J. Heat Mass Transfer 43 (7) (2000) 1201.
[97J] W. Liu, H. Nariai, F. Inasaka, Prediction of critical heat flux for subcooled flow boiling, Int. J. Heat Mass Transfer 43 (18) (2000) 3371.
[98J] G.H.D. Muhlenbruch, H. Boye, J. Schmidt, Modelling of heat transfer in the region of convection-controlled film boiling, Heat Mass Transfer 36 (3) (2000) 265.
[99J] G.H.D. Muhlenbruch, J. Schmidt, Boiling heat transfer region with independence of the wall temperature, Heat Mass Transfer 36 (2) (2000) 165.
[100J] Y.P. Peles, S. Haber, A steady state, one dimensional, model for boiling two phase flow in triangular microchannel, Int. J. Multiphase Flow 26 (7) (2000) 1095.
[101J] Y.P. Peles, L.P. Yarin, G. Hetsroni, Thermohydrodynamic characteristics of two-phase flow in a heated capillary, Int. J. Multiphase Flow 26 (7) (2000) 1063.
[102J] X.F. Peng, D. Liu, D.J. Lee, Y. Yan, B.X. Wang, Cluster dynamics and fictitious boiling in microchannels, Int. J. Heat Mass Transfer 43 (23) (2000) 4259.
[103J] S.M. Sami, D.E. Desjardins, Boiling characteristics of alternatives to R-502 inside air/refrigerant enhanced surface tubing, Int. J. Energy Res. 24 (1) (2000) 27.
[104J] S.M. Sami, D.E. Desjardins, Prediction of convective boiling characteristics of alternatives to R-502 inside air/refrigerant enhanced surface tubing, Appl. Thermal Eng. 20 (6) (2000) 579.
[105J] S.M. Sami, D.E. Desjardins, Two-phase flow boiling characteristics of alternatives to R-22 inside air/refrigerant enhanced surface tubing, Int. J. Energy Res. 24 (2) (2000) 109.
[106J] S.M. Sami, J. Grell, Heat transfer prediction of air-to-refrigerant two-phase flow boiling of alternatives to HCFC-22 inside air/refrigerant enhanced surface tubing, Int. J. Energy Res. 24 (4) (2000) 349.
[107J] M.M. Shah, M.A. Siddiqui, A general correlation for heat transfer during dispersed-flow film boiling in tubes, Heat Transfer Eng. 21 (4) (2000) 18.
[108J] S.Y. Shim, H.M. Soliman, G.E. Sims, Turbulent fluid flow, heat transfer and onset of nucleate boiling in annular finned passages, Int. J. Thermal Sci. 39 (7) (2000) 709.
[109J] M. Shiotsu, K. Hama, Film boiling heat transfer from a vertical cylinder in forced flow of liquids under saturated and subcooled conditions at pressures, Nucl. Eng. Des. 200 (1) (2000) 23.
[110J] C.P. Tso, K.W. Tou, G.P. Xu, Flow boiling critical heat flux of FC-72 from flush-mounted and protruded simulated chips in a vertical rectangular channel, Int. J. Multiphase Flow 26 (3) (2000) 351.
[111J] C.T. Wang, R.N. Horne, Boiling flow in a horizontal fracture, Geothermics 29 (6) (2000) 759.
[112J] M. Wettermann, D. Steiner, Flow boiling heat transfer characteristics of wide-boiling mixtures, Int. J. Thermal Sci. 39 (2) (2000) 225.
[113J] C.P. Yin, Y.Y. Yan, T.F. Lin, B.C. Yang, Subcooled flow boiling heat transfer of R-134a and bubble characteristics in a horizontal annular duct, Int. J. Heat Mass Transfer 43 (11) (2000) 1885.
[114J] O. Zurcher, J.R. Thome, D. Favrat, An onset of nucleate boiling criterion for horizontal flow boiling, Int. J. Thermal Sci. 39 (9) (2000) 909.

Two-phase thermohydraulics

[115J] M.A. Aamir, A.P. Watkins, Numerical analysis of depressurisation of highly pressurised liquid propane, Int. J. Heat Fluid Flow 21 (4) (2000) 420.

[116J] S. Badie, C.P. Hale, C.J. Lawrence, G.F. Hewitt, Pressure gradient and holdup in horizontal two-phase gas–liquid flows with low liquid loading, Int. J. Multiphase Flow 26 (9) (2000) 1525.
[117J] L.E. Gomez, O. Shoham, Y. Taitel, Prediction of slug liquid holdup: horizontal to upward vertical flow, Int. J. Multiphase Flow 26 (3) (2000) 517.
[118J] N.J. Hawkes, C.J. Lawrence, G.F. Hewitt, Studies of wispy-annular flow using transient pressure gradient and optical measurements, Int. J. Multiphase Flow 26 (10) (2000) 1565.
[119J] I. Kataoka, M. Ishii, A. Nakayama, Entrainment and desposition rates of droplets in annular two-phase flow, Int. J. Heat Mass Transfer 43 (9) (2000) 1573.
[120J] A.A. Kendoush, F.A. Awni, F.Z. Majeed, Measurement of void fraction in magnetic two-phase fluids, Exp. Thermal Fluid Sci. 22 (1) (2000) 71.
[121J] T.L. Narrow, S.M. Ghiaasiaan, S.I. Abdel-Khalik, D.L. Sadowski, Gas–liquid two-phase flow patterns and pressure drop in a horizontal micro-rod bundle, Int. J. Multiphase Flow 26 (8) (2000) 1281.
[122J] D. Tayebi, S. Nuland, P. Fuchs, Droplet transport in oil/gas and water/gas flow at high gas densities, Int. J. Multiphase Flow 26 (5) (2000) 741.
[123J] T.N. Tran, M.C. Chyu, M.W. Wambsganss, D.M. France, Two-phase pressure drop of refrigerants during flow boiling in small channels: an experimental investigation and correlation development, Int. J. Multiphase Flow 26 (11) (2000) 1739.
[124J] C. Tribbe, H.M. Muller-Steinhagen, An evaluation of the performance of phenomenological models for predicting pressure gradient during gas–liquid flow in horizontal pipelines, Int. J. Multiphase Flow 26 (6) (2000) 1019.
[125J] J.L. Xu, T.K. Chen, Acoustic wave prediction in flowing steam–water two-phase mixture, Int. J. Heat Mass Transfer 43 (7) (2000) 1079.
[126J] J.F. Zhao, W.R. Hu, Slug to annular flow transition of microgravity two-phase flow, Int. J. Multiphase Flow 26 (8) (2000) 1295.

Change of phase – condensation: *Surface geometry and material effects*

[1JJ] M.A. Akhavan-Behabadi, H.K. Varma, K.N. Agarwal, Enhancement of heat transfer rates by coiled wires during forced convective condensation of R-22 inside horizontal tubes, J. Enhanced Heat Transfer 7 (2) (2000) 69.
[2JJ] N.H. Kim, J.P. Cho, J.O. Kim, R-22 condensation in flat aluminum multi-channel tubes, J. Enhanced Heat Transfer 7 (6) (2000) 427.
[3JJ] J.T. Kwon, S.K. Park, M.H. Kim, Enhanced effect of a horizontal micro-fin tube for condensation heat transfer with R22 and R410A, J. Enhanced Heat Transfer 7 (2) (2000) 97.
[4JJ] T.Y. Li, P.T. Hsu, Laminar film condensation on a finite-size horizontal wavy disk with suction at the wall, Chem. Eng. Commun. 177 (2000) 87.
[5JJ] A. Miyara, K. Nonaka, M. Taniguchi, Condensation heat transfer and flow pattern inside a herringbone-type micro-fin tube, Int. J. Refrig. 23 (2) (2000) 141.
[6JJ] W.A. Oost, C.M.J. Jacobs, C. Van Oort, Stability effects on heat and moisture fluxes at sea, Bound. Layer Meteorol. 95 (2) (2000) 271.
[7JJ] L.Y. Tang, M.M. Ohadi, A.T. Johnson, Flow condensation in smooth and micro-fin tubes with HCFC-22, HFC-134a and HFC-410A refrigerants, part I: experimental results, J. Enhanced Heat Transfer 7 (5) (2000) 289.
[8JJ] L.Y. Tang, M.M. Ohadi, A.T. Johnson, Flow condensation in smooth and micro-fin tubes with HCFC-22, HFC-134a and HFC-410A refrigerants, part II: design equations, J. Enhanced Heat Transfer 7 (5) (2000) 311.

Global geometry, thermal boundary condition and external influence effects

[9JJ] M. Asbik, D.O. Hadda, A.I. Idrissi, B. Zeghmati, A. Khmou, Forced convection laminar film condensation of downward flowing vapor on a single horizontal elliptic cylinder or a bank of elliptical tubes, Numer. Heat Transfer Part A 37 (5) (2000) 511.
[10JJ] N. Beithou, H.S. Aybar, A mathematical model for steam-driven jet pump, Int. J. Multiphase Flow 26 (10) (2000) 1609.
[11JJ] X. Boissieux, M.R. Heikal, R.A. Johns, Two-phase heat transfer coefficients of three HFC refrigerants inside a horizontal smooth tube, part II: condensation, Int. J. Refrig. 23 (5) (2000) 345.
[12JJ] R.E. Critoph, Z. Tamainot-Telto, G.N.L. Davies, A prototype of a fast cycle adsorption refrigerator utilizing a novel carbon–aluminium laminate, Proc. Inst. Mech. Eng. Part A 214 (A5) (2000) 439.
[13JJ] N. Deberne, J.F. Leone, A. Lallemand, Local measurements in the flow of a steam injector and visualisation, Int. J. Thermal Sci. 39 (9) (2000) 1056.
[14JJ] S.A. Idem, A.M. Jacobi, V.W. Goldschmidt, Fin heat transfer modeling and its impact predictions of efficiency and condensation in gas-fired boilers, Heat Transfer Eng. 21 (6) (2000) 7.
[15JJ] H.J. Kang, C.X. Lin, M.A. Ebadian, Condensation of R134a flowing inside helicoidal pipe, Int. J. Heat Mass Transfer 43 (14) (2000) 2553.
[16JJ] S.J. Kim, H.C. No, Turbulent film condensation of high pressure steam in a vertical tube, Int. J. Heat Mass Transfer 43 (21) (2000) 4031.
[17JJ] P.W. Li, M. Chen, W.Q. Tao, Theoretical analysis and experimental investigation on local heat transfer characteristics of HFC-134a forced-convection condensation inside smooth horizontal tubes, Heat Transfer Eng. 21 (6) (2000) 34.
[18JJ] H. Liu, N.E. Todreas, M.J. Driscoll, An experimental investigation of a passive cooling unit for nuclear plant containment, Nucl. Eng. Des. 199 (3) (2000) 243.
[19JJ] N. Maiti, U.B. Desai, A.K. Ray, Application of mathematical morphology in measurement of droplet size distribution in dropwise condensation, Thin Solid Films 376 (1) (2000) 16.

[20JJ] P.K. Sarma, V.D. Rao, T. Subrahmanyam, S. Kakac, H.T. Liu, A method to predict two-phase pressure drop using condensation heat transfer data, Int. J. Thermal Sci. 39 (2) (2000) 184.

[21JJ] D.W. Shao, E.G. Granryd, Flow pattern, heat transfer and pressure drop in flow condensation part I: pure and azeotropic refrigerants, Hvac&R Res. 6 (2) (2000) 175.

[22JJ] D.W. Shao, E.G. Granryd, Flow pattern, heat transfer and pressure drop in flow condensation part II: zeotropic refrigerants mixtures (NARMs), Hvac&R Res. 6 (2) (2000) 197.

[23JJ] B.X. Wang, X.Z. Du, Condensation on the outside surface of a small/mini diameter tube for vapor flowing through a horizontal annulus surround by an adiabatic concentric tube, Int. J. Heat Mass Transfer 43 (8) (2000) 1391.

[24JJ] B.X. Wang, X.Z. Du, Study on laminar film-wise condensation for vapor flow in an inclined small/mini-diameter tube, Int. J. Heat Mass Transfer 43 (10) (2000) 1859.

[25JJ] C.M. Winkler, T.S. Chen, Mixed convection in film condensation from isothermal vertical surfaces – the entire regime, Int. J. Heat Mass Transfer 43 (17) (2000) 3245.

Modeling and analysis techniques

[26JJ] O. Bautista, F. Mendez, C. Trevino, Graetz problem for the conjugated conduction-film condensation process, J. Thermophys. Heat Transfer 14 (1) (2000) 96.

[27JJ] S. Kulankara, K.E. Herold, Theory of heat/mass transfer additives in absorption chillers, Hvac&R Res. 6 (4) (2000) 369.

[28JJ] G.H. Lee, J.Y. Yoo, Performance analysis and simulation of automobile air conditioning system, Int. J. Refrig. 23 (3) (2000) 243.

[29JJ] F. Mendez, J.J. Lizardi, C. Trevino, Laminar film condensation along a vertical fin, Int. J. Heat Mass Transfer 43 (16) (2000) 2859.

[30JJ] I. Tiselj, G. Cerne, Some comments on the behavior of the RELAP5 numerical scheme at very small time steps, Nucl. Sci. Eng. 134 (3) (2000) 306.

[31JJ] J. Tuunanen, J. Vihavainen, F. D'Auria, M. Frogheri, G.M. Galassi, G. Kimber, J. Lillington, E. Alien, T.G. Williams, Analyses of PACTEL passive safety injection experiments with APROS, CATHARE and RELAP5 codes, Nucl. Eng. Des. 198 (3) (2000) 261.

[32JJ] A.J. White, Numerical investigation of condensing steam flow in boundary layers, Int. J. Heat Fluid Flow 21 (6) (2000) 727.

[33JJ] A.J. White, M.J. Hounslow, Modelling droplet size distributions in polydispersed wet-steam flows, Int. J. Heat Mass Transfer 43 (11) (2000) 1873.

Free-surface condensation

[34JJ] S.H. Ju, H.C. No, F. Mayinger, Measurement of heat transfer coefficients for direct contact condensation in core makeup tanks using holographic interferometer, Nucl. Eng. Des. 199 (1) (2000) 75.

[35JJ] K. Terasaka, T. Prakoso, W.Y. Sun, H. Tsuge, Two-phase bubble formation with condensation at nozzle submerged in immiscible liquid, J. Chem. Eng. Japan 33 (1) (2000) 113.

Unsteady effects in condensation

[36JJ] S. Alt, W. Lischke, Heat transfer in horizontal tubes during two phase natural circulation with presence of noncondensing gas, Heat Mass Transfer 36 (6) (2000) 575.

[37JJ] J.C. Barrett, T.J. Baldwin, Aerosol nucleation and growth during laminar tube flow: maximum saturations and nucleation rates, J. Aerosol Sci. 31 (6) (2000) 633.

[38JJ] M.H. Chun, S.O. Yu, A parametric study and a guide chart to avoid condensation-induced water hammer in a horizontal pipe, Nucl. Eng. Des. 201 (2) (2000) 239.

[39JJ] E. Ranzi, T. Faravelli, A. Goldaniga, F. Ferrari, M. Lattuada, Pyrolysis and oxidation of unsaturated C-2 and C-3 species, Exp. Thermal Fluid Sci. 21 (1) (2000) 71.

Binary mixtures

[40JJ] J. Karl, Spontaneous condensation in boundary layers, Heat Mass Transfer 36 (1) (2000) 37.

[41JJ] M.A. Kedzierski, The effect of a boiling additive on R123 condensation on a vertical integral-fin surface, Int. J. Refrig. 23 (2) (2000) 101.

[42JJ] V.V. Levdansky, J. Smolik, P. Moravec, Trapping of impurity molecules in condensation from mixtures of gases, Int. J. Heat Mass Transfer 43 (4) (2000) 629.

[43JJ] H.P. Nielsen, L.L. Baxter, G. Sclippab, C. Morey, F.J. Frandsen, K. Dam-Johansen, Deposition of potassium salts on heat transfer surfaces in straw-fired boilers: a pilot-scale study, Fuel 79 (2) (2000) 131.

[44JJ] S.M. Sami, M. Fontaine, Prediction of condensation characteristics of alternatives to R-502 inside air–refrigerant enhanced surface tubing, Appl. Thermal Eng. 20 (2) (2000) 199.

[45JJ] S.M. Sami, J. Grell, Prediction of two-phase condensation characteristics of some alternatives to R-22 inside air/refrigerant enhanced surface tubing, Int. J. Energy Res. 24 (14) (2000) 1277.

[46JJ] S.M. Sami, H. Maltais, Experimental investigation of two phase flow condensation of alternatives to HCFC-22 inside enhanced surface tubing, Appl. Thermal Eng. 20 (12) (2000) 1113.

Change of phase – freezing and melting: *Melting and freezing of spheres, cylinders and slabs*

[1JM] C.A. Hall, C. Mackie, J.A. Perkins, Freezing Couette flow in an annulus with translating outer sleeve, J. Thermophys. Heat Transfer 14 (4) (2000) 609.

[2JM] A. Luer, H. Beer, Frost deposition in a parallel plate channel under laminar flow conditions, Int. J. Thermal Sci. 39 (1) (2000) 85.

[3JM] P.D. Sanz, L. Otero, High-pressure shift freezing. Part 2. Modeling of freezing times for a finite cylindrical model, Biotechnol. Progr. 16 (6) (2000) 1037.

[4JM] A.K. Satapathy, Thermal analysis of an infinite slab during quenching, Commun. Numer. Meth. Eng. 16 (8) (2000) 529.

[5JM] J.I. Yoon, O.K. Kwon, C.G. Moon, Y.S. Son, J.D. Kim, T. Kato, Numerical study on cooling phenomenon of water with supercooled region in a horizontal circular cylinder, Numer. Heat Transfer Part A 38 (4) (2000) 357.

Stefan problems

[6JM] J. Caldwell, C.K. Chiu, Numerical solution of one-phase Stefan problems by the heat balance integral method, Part I – cylindrical and spherical geometries, Commun. Numer. Meth. Eng. 16 (8) (2000) 569.

[7JM] Y.A. Mitropolsky, A.A. Berezovsky, Y.V. Zhernovyi, Mathematical modelling of heat transfer during electron-beam autocrucible melting by means of the steady-state Stefan problem, J. Eng. Math. 38 (2) (2000) 173.

[8JM] A.Z. Sahin, I. Dincer, Analytical modelling of transient phase-change problems, Int. J. Energy Res. 24 (12) (2000) 1029.

[9JM] J.B. Swenson, V.R. Voller, C. Paola, G. Parker, J.G. Marr, Fluvio-deltaic sedimentation: a generalized Stefan problem, Eur. J. Appl. Math. (5) (2000) 433.

Ice formation/melting

[10JM] X.D. Chen, P. Chen, K.W. Free, Experimental results of the time to the onset of ice formation at metal surface and a correlation based on a sub-layer reactor model, Int. J. Heat Mass Transfer 43 (4) (2000) 643.

[11JM] S.F. Chou, I.P. Tsern, Treatment of low level liquid waste by an in situ freezing–melting process, Chung-Kuo Kung Ch'Eng Hsueh K'An 23 (2) (2000) 161.

[12JM] K. Franke, A new approach for the numerical calculation of freezing and thawing processes of foods using a modified fictitious heat flow method, J. Food Eng. 44 (1) (2000) 23.

[13JM] W. Gao, D.W. Smith, D.C. Sego, Freezing temperatures of freely falling industrial wastewater droplets, J. Cold Regions Eng. 14 (3) (2000) 101.

[14JM] T. Hirata, M. Kato, K. Nagasaka, M. Ishikawa, Crystal ice formation of solution and its removal phenomena at cooled horizontal solid surface – part II: onset of ice removal condition, Int. J. Heat Mass Transfer 43 (5) (2000) 757.

[15JM] T. Hirata, K. Nagasaka, M. Ishikawa, Crystal ice formation of solution and its removal phenomena at cooled horizontal solid surface – part I: ice removal phenomena, Int. J. Heat Mass Transfer 43 (3) (2000) 333.

[16JM] C.C. Huang, Y.P. Chen, Measurements and model prediction of the solid–liquid equilibria of organic binary mixtures, Chem. Eng. Sci. 55 (16) (2000) 3175.

[17JM] A.N. Kucherov, Sublimation and vaporization of an ice aerosol particle in the form of thin cylinder by laser radiation, Int. J. Heat Mass Transfer 43 (15) (2000) 2793.

[18JM] G.S. Mittal, J.X. Zhang, Prediction of freezing time for food products using a neural network, Food Res. Int. 33 (7) (2000) 557.

[19JM] N.O. Moraga, E.E. Medina, Conjugate forced convection and heat conduction with freezing of water content in a plate shaped food, Int. J. Heat Mass Transfer 43 (1) (2000) 53.

[20JM] N.O. Moraga, C.H. Salinas, Numerical study of unsteady 2D natural convection and solidification of a food inside a freezing chamber, Numer. Heat Transfer Part A 37 (7) (2000) 755.

[21JM] F. Morency, F. Tezok, I. Paraschivoiu, Heat and mass transfer in the case of anti-icing system simulation, J.Aircraft 37 (2) (2000) 245.

[22JM] I.N. Nassar, R. Horton, G.N. Flerchinger, Simultaneous heat and mass transfer in soil columns exposed to freezing/thawing conditions, Soil Science 165 (3) (2000) 208.

[23JM] M.K. Politovich, Predicting glaze or rime ice growth on airfoils, J. Aircraft 37 (1) (2000) 117.

[24JM] M. Sugawara, T.F. Irvine, The effect of concentration gradient on the melting of a horizontal ice plate from above, Int. J. Heat Mass Transfer 43 (9) (2000) 1591.

Contact melting

[25JM] B. Binet, M. Lacroix, Melting from heat sources flush mounted on a conducting vertical wall, Int. J. Numer. Meth. Heat Fluid Flow 10 (2000) 286.

[26JM] F. Stella, M. Giangi, Melting of a pure metal on a vertical wall: numerical simulation, Numer. Heat Transfer Part A 38 (2) (2000) 193.

[27JM] H. Yoo, Analytical solutions to the unsteady close-contact melting on a flat plate, Int. J. Heat Mass Transfer 43 (8) (2000) 1457.

Melting and melt flows

[28JM] M.A. Barron-Meza, J.D. Barreto-Sandoval, R.D. Morales, Physical and mathematical models of steel flow and heat transfer in a tundish heated by plasma, Metall. Mater. Trans. B 31 (1) (2000) 63.

[29JM] H. Bazzi, G.T. Nguyen, N. Galanis, Transient behaviours of float zones in mu-g and 1-g environments, Int. J. Numer. Meth. Heat Fluid Flow 10 (2) (2000) 307.

[30JM] V. Bojarevics, K. Pericleous, M. Cross, Modeling the dynamics of magnetic semilevitation melting, Metall. Mater. Trans. B 31 (1) (2000) 179.

[31JM] L.C. Brabie, M. Kawakami, Kinetics of steel scrap melting in molten Fe–C bath, High Temperature Mater. Processes 19 (3) (2000) 241.

[32JM] M. Halali, M. McLean, D.R.F. West, Effects of flux additions on inclusion removal and microstructure in electron beam button melting of Udimet 720, Mater. Sci. Technol. 16 (4) (2000) 457.
[33JM] W.R. Hu, N. Imaishi, Thermocapillary flow in a jet of liquid film painted on a moving boundary, Langmuir 16 (10) (2000) 4632.
[34JM] C.J. Jing, N. Imaishi, S. Yasuhiro, T. Sato, Y. Miyazawa, Three-dimensional numerical simulation of rotating spoke pattern in an oxide melt under a magnetic field, Int. J. Heat Mass Transfer 43 (23) (2000) 4347.
[35JM] Y.M. Joshi, A.K. Lele, R.A. Mashelkar, Slipping fluids: a unified transient network model, J. Non-Newtonian Fluid Mech. 89 (3) (2000) 303.
[36JM] Y.H. Kim, Y.W. Cho, S.H. Chung, J.D. Shim, H.Y. Ra, Numerical analysis of fluid flow and heat transfer in molten zinc pot of continuous hot-dip galvanizing line, ISIJ Int. 40 (7) (2000) 706.
[37JM] S. Link, C. Burda, B. Nikoobakht, M.A. El-Sayed, Laser-induced shape changes of colloidal gold nanorods using femtosecond and nanosecond laser pulses, J. Phys. Chem. B 104 (26) (2000) 6152.
[38JM] S. Lopez-Ramirez, R.D. Morales, J.A.R. Serrano, Numerical simulation of the effects of buoyancy forces and flow control devices on fluid flow and heat transfer phenomena of liquid steel in a tundish, Numer. Heat Transfer Part A 37 (1) (2000) 69.
[39JM] T.J. Lu, Thermal management of high power electronics with phase change cooling, Int. J. Heat Mass Transfer 43 (13) (2000) 2245.
[40JM] U. Narusawa, J.T. Blucher, Thermofluid analysis of entrance section of a continuous pressure infiltration process for fiber–metal matrix composites, J. Porous Media 3 (1) (2000) 69.
[41JM] F. Oeters, L.Y. Zhang, C. Hauler, J. Leitner, Laboratory experiments and process modelling of the melting and dissolution of low-density ferro-molybdenum in steel melts, Steel Res. 71 (10) (2000) 381.
[42JM] I.K. Park, G.C. Park, K.H. Bang, Multiphase flow modeling of molten material–vapor–liquid mixtures in thermal nonequilibrium, KSME J. 14 (5) (2000) 553.
[43JM] F. Vega, J. Solis, J. Siegel, C.N. Afonso, Delayed melting at the substrate interface of amorphous Ge films partially melted with nanosecond laser pulses, J. Appl. Phys. 88 (11) (2000) 6321.
[44JM] H. Yamamura, Y. Mizukami, Y. Ueshima, K. Miyazawa, Effect of molten steel flow on nonuniformity of initially solidified shell, High Temperature Mater. Processes 19 (3) (2000).

Powders, films, emulsions and particles in a melt

[45JM] C. Mackie, Convective stability of a particle-laden fluid system in the presence of solidification, Int. J. Heat Mass Transfer 43 (9) (2000) 1617.
[46JM] D.W. Qi, Lattice–Boltzmann simulations of fluidization of rectangular particles, Int. J. Multiphase Flow 26 (3) (2000) 421.
[47JM] M.V. Ramos, E. Kasai, J. Kano, T. Nakamura, Numerical simulation model of the iron ore sintering process directly describing the agglomeration phenomenon of granules in the packed bed, ISIJ Int. 40 (5) (2000) 448.
[48JM] J.N. Yu, Z.W. Yao, G. Yu, F.M. Chu, X.Z. Tang, Y. Zeng, T. Noda, The behavior of coatings and SiCf/SiC composites under thermal shock, J. Nucl. Mater. (B) (2000) 1077.

Glass technology

[49JM] S.C. Hill, B.W. Webb, M.Q. McQuay, J. Newbold, Numerical modelling of an industrial glass-melting furnace, J. Inst. Energy 73 (494) (2000) 2.
[50JM] J.O. Pacheco-Sotelo, E. Gutierrez-Ocampo, J.S. Benitez-Read, J. Martinez-Valencia, R. Lopez-Callejas, Glass melting using an IGBT full bridge resonant converter, Glass Technol. 41 (2) (2000) 59.
[51JM] C.X. Sun, J. Le, Energy saving effect with honeycomb crown, Glass Technol. 41 (4) (2000) 140.
[52JM] S. Wagnerova, S. Kasa, P. Jandacek, F. Paur, Influence of intensifying means upon technological characteristic of glass melting furnaces, Ceramics Silikaty 44 (1) (2000) 20.

Welding

[53JM] E.A. Bonifaz, Finite element analysis of heat flow in single-pass arc welds, Welding J. 79 (5) (2000) 121–S4.
[54JM] O. Hunziker, D. Dye, R.C. Reed, On the formation of a centreline grain boundary during fusion welding, Acta Mater. 48 (17) (2000) 4191.
[55JM] J.A. Khan, K. Broach, A. Kabir, Numerical thermal model of resistance spot welding in aluminum, J. Thermophys. Heat Transfer 14 (1) (2000) 88.
[56JM] Z. Yang, J.W. Elmer, J. Wong, T. Debroy, Evolution of titanium arc weldment macro and microstructures – modeling and real time mapping of phases, Welding J. 79 (4) (2000) 97–S.

Nuclear technology

[57JM] J. Caldwell, C.C. Chan, S.K. Wong, An implicit enthalpy formulation for oxidation of nuclear reactor fuel cladding by steam, Commun. Numer. Meth. Eng. 16 (3) (2000) 205.
[58JM] A.G. Chukhlov, B.R. Bergel'son, Investigation of heat removal from a liquid-salt target irradiated with high-energy protons, Atomic Energy 88 (2) (2000) 111.

Energy storage – PCM

[59JM] K. Cho, S.H. Choi, Thermal characteristics of paraffin in a spherical capsule during freezing and melting processes, Int. J. Heat Mass Transfer 43 (17) (2000) 3183.

[60JM] K.A.R. Ismail, J.R. Henriquez, Solidification of pcm inside a spherical capsule, Energy Conversion Manage. 41 (2) (2000) 173.

[61JM] D.B. Khillarkar, Z.X. Gong, A.S. Mujumdar, Melting of a phase change material in concentric horizontal annuli of arbitrary cross-section, Appl. Thermal Eng. 20 (10) (2000) 893.

Casting, moulding and extrusion

[62JM] M.R. Amin, Thermal analysis during continuous casting process using effective heat capacity method, J. Thermophys. Heat Transfer 14 (2) (2000) 170.

[63JM] S. Bounds, G. Moran, K. Pericleous, M. Cross, T.N. Croft, A computational model for defect prediction in shape castings based on the interaction of free surface flow, heat transfer, and solidification phenomena, Metall. Mater. Trans. B 31 (3) (2000) 515.

[64JM] F.R. Camisani-Calzolari, I.K. Craig, P.C. Pistorius, Speed disturbance compensation in the secondary cooling zone in continuous casting, ISIJ Int. 40 (5) (2000) 469.

[65JM] P. Carter, D.C. Cox, C.A. Gandin, R.C. Reed, Process modelling of grain selection during the solidification of single crystal superalloy castings, Mater. Sci. Eng. A 280 (2) (2000) 233.

[66JM] J.G. Conley, J. Huang, J. Asada, K. Akiba, Modeling the effects of cooling rate, hydrogen content, grain refiner and modifier on microporosity formation in Al A356 alloys, Mater. Sci. Eng. A 285 (1) (2000) 49.

[67JM] R.W. DiRaddo, R. Aubert, Modelling of phase change and material performance in blow moulding and thermoforming, Plast. Rubber Compos. 29 (4) (2000) 168.

[68JM] C.M. Fan, W.S. Hwang, Mathematical modeling of fluid flow phenomena during tundish filling and subsequent initial casting operation in steel continuous casting process, ISIJ Int. 40 (11) (2000) 1105.

[69JM] C. Gonzalez-Rivera, B. Campillo, M. Castro, M. Herrera, J. Juarez-Islas, On the local microstructural characteristics observed in sand cast Al–Si alloys, Mater. Sci. Eng. A 279 (1) (2000) 149.

[70JM] M. Gupta, Y. Sahai, Mathematical modeling of fluid flow, heat transfer, and solidification in two-roll melt drag thin strip casting of steel, ISIJ Int. 40 (2) (2000) 144.

[71JM] M. Gupta, Y. Sahai, Mathematical modeling of thermally induced stresses in two-roll melt drag thin strip casting of steel, ISIJ Int. 40 (2) (2000) 137.

[72JM] R.I.L. Guthrie, M. Isac, J.S. Kim, R.P. Tavares, Measurements, simulations, and analyses of instantaneous heat fluxes from solidifying steels to the surfaces of twin roll casters and of aluminum to plasma-coated metal substrates, Metall. Mater. Trans. B 31 (5) (2000) 1031.

[73JM] N. Hopkinson, P. Dickens, Predicting stereolithography injection mould tool behaviour using models to predict ejection force and tool strength, Int. J. Production Res. 38 (16) (2000) 3747.

[74JM] W.S. Kim, D.S. Kim, A.V. Kuznetsov, Simulation of coupled turbulent flow and heat transfer in the wedge-shaped pool of a twin-roll strip casting process, Int. J. Heat Mass Transfer 43 (20) (2000) 3811.

[75JM] E. Lai, D.W. Yu, Modeling of the plasticating process in a single-screw extruder: a fast-track approach, Polym. Eng. Sci. 40 (5) (2000) 1074.

[76JM] D.Y. Maeng, J.H. Lee, C.W. Won, S.S. Cho, B.S. Chun, The effects of processing parameters on the microstructure and mechanical properties of modified B390 alloy in direct squeeze casting, J. Mater. Process. Technol. 105 (1) (2000) 196.

[77JM] E. Majchrzak, B. Mochnacki, R. Szopa, Application of the boundary element method for the numerical modelling of the solidification of cylindrical and spherical castings, J. Mater. Process. Technol. 106 (1) (2000) 99.

[78JM] S.A. Morman, G.W. Young, An asymptotic approach to the mathematical modeling of Ohno continuous casting of cored rods, J. Eng. Math. 38 (1) (2000) 51.

[79JM] H. Nam, H.S. Park, J.K. Yoon, Numerical analysis of fluid flow and heat transfer in the funnel type mold of a thin slab caster, ISIJ Int. 40 (9) (2000) 886.

[80JM] L. Strezov, J. Herbertson, G.R. Belton, Mechanisms of initial melt/substrate heat transfer pertinent to strip casting, Metall. Mater. Trans. B 31 (5) (2000) 1023.

[81JM] S. Syrjala, Numerical simulation of nonisothermal flow of polymer melt in a single-screw extruder: a validation study, Numer. Heat Transfer Part A 37 (8) (2000) 897.

[82JM] H. Tewkesbury, A.G.F. Stapley, P.J. Fryer, Modelling temperature distributions in cooling chocolate moulds, Chem. Eng. Sci. 55 (16) (2000) 3123.

[83JM] M. Trovant, S. Argyropoulos, Finding boundary conditions: a coupling strategy for the modeling of metal casting processes: Part I. Experimental study and correlation development, Metall. Mater. Trans. B 31 (1) (2000) 75.

Mushy zone – dendritic growth

[84JM] M. El-Bealy, Modeling of interdendritic strain and macrosegregation for dendritic solidification processes: Part II. Computation of interdendritic strain and segregation fields in steel ingots, Metall. Mater. Trans. B 31 (2) (2000) 345.

[85JM] V.R. Voller, A model of microsegregation during binary alloy solidification, Int. J. Heat Mass Transfer 43 (11) (2000) 2047.

[86JM] C.J. Vreeman, F.P. Incropera, The effect of free-floating dendrites and convection on macrosegregation in direct chill cast aluminum alloys Part II: predictions for Al–Cu and Al–Mg alloys, Int. J. Heat Mass Transfer 43 (5) (2000) 687.

[87JM] C.J. Vreeman, H.J.M. Krane, F.P. Incropera, The effect of free-floating dendrites and convection on macrosegregation in direct chill cast aluminum alloys Part I: model development, Int. J. Heat Mass Transfer 43 (5) (2000) 677.

Solidification

[88JM] S. Chakraborty, P. Dutta, A generalized algorithm for modelling phase change problems in materials processing, Current Sci. 78 (7) (2000) 887.

[89JM] T. Evans, L. Strezov, Interfacial heat transfer and nucleation of steel-on metallic substrates, Metall. Mater. Trans. B 31 (5) (2000) 1081.

[90JM] W.D. Griffiths, A model of the interfacial heat-transfer coefficient during unidirectional solidification of an aluminum alloy, Metall. Mater. Trans. B 31 (2) (2000) 285.

[91JM] W.D. Griffiths, Modelled heat transfer coefficients for Al-7 wt%Si alloy castings unidirectionally solidified horizontally and vertically downwards, Mater. Sci. Technol. 16 (3) (2000) 255.

[92JM] S.W. Hale, M. Keyhani, J.I. Frankel, Design and control of interfacial temperature gradients in solidification, Int. J. Heat Mass Transfer 43 (20) (2000) 3795.

[93JM] L. Hozejowski, L. Grysa, S. Piwowarski, M. Poniewski, Heat transfer coefficient identification on the solid–fluid boundary with the phase change in the fluid, Z. Angew. Mat. Mech. (3) (2000) S687.

[94JM] R.W. Lewis, R.S. Ransing, The optimal design of interfacial heat transfer coefficients via a thermal stress model, Finite Elements Anal. Des. 34 (2) (2000) 193.

[95JM] Y.Z. Liu, Z.H. Chen, J.N. Wang, Simulation study of heat transfer in multi-stage rapid solidification, Mater. Sci. Eng. A 280 (1) (2000) 229.

[96JM] M.A. Martorano, J.D.T. Capocchi, Heat transfer coefficient at the metal–mould interface in the unidirectional solidification of Cu–8%Sn alloys, Int. J. Heat Mass Transfer 43 (14) (2000) 2541.

[97JM] G.X. Wang, V. Prasad, Microscale heat and mass transfer and non-equilibrium phase change in rapid solidification, Mater. Sci. Eng. A 292 (2) (2000) 142.

[98JM] G.X. Wang, V. Prasad, S. Sampath, An integrated model for dendritic and planar interface growth and morphological transition in rapid solidification, Metall. Mater. Trans. A 31 (3) (2000) 735.

[99JM] P.S. Wei, Y.K. Kuo, S.H. Chiu, C.Y. Ho, Shape of a pore trapped in solid during solidification, Int. J. Heat Mass Transfer 43 (2) (2000) 263.

[100JM] C.C. Yao, G.X. Wang, B.T.F. Chung, Nonequilibrium planar interface model for solidification of semitransparent radiating materials, J. Thermophys. Heat Transfer 14 (3) (2000) 297.

[101JM] B. Yimer, Multi-dimensional solidification with internal radiation and temperature dependent properties, Energy Conversion Manage. 41 (4) (2000) 343.

[102JM] J.S. Yoo, Effect of viscous plane stagnation flow on the freezing of fluid, Int. J. Heat Fluid Flow 21 (6) (2000) 735.

[103JM] J.S. Yoo, Numerical investigation of the transient heat transfer in the inviscid stagnation flow with solidification, Int. J. Numer. Meth. Heat Fluid Flow 10 (1) (2000) 67.

Crystal growth

[104JM] B. Basu, S. Enger, M. Breuer, F. Durst, Three-dimensional simulation of flow and thermal field in a Czochralski melt using a block-structured finite-volume method, J. Cryst. Growth 219 (1) (2000) 123.

[105JM] B.W. Choi, H.N.G. Wadley, In situ studies of $Cd_{1-x}Zn_xTe$ nucleation and crystal growth, J. Cryst. Growth 208 (1) (2000) 219.

[106JM] A.K. Doufas, A.J. McHugh, C. Miller, Simulation of melt spinning including flow-induced crystallization – part I. Model development and predictions, J. Non-Newtonian Fluid Mech. 92 (1) (2000) 27.

[107JM] A.I. Fedoseyev, J.I.D. Alexander, Investigation of vibrational control of convective flows in Bridgman melt growth configurations, J. Cryst. Growth 211 (1) (2000) 34.

[108JM] J. Fransaer, A.V. Wagner, F. Spaepen, Solidification of Ga–Mg–Zn in a gas-filled drop tube: experiments and modeling, J. Appl. Phys. 87 (4) (2000) 1801.

[109JM] Z. Galazka, H. Wilke, Influence of Marangoni convection on the flow pattern in the melt during growth of $Y_3Al_5O_{12}$ single crystals by the Czochralski method, J. Cryst. Growth 216 (1) (2000) 389.

[110JM] L.G. Hector, J.A. Howarth, O. Richmond, W.S. Kim, Mold surface wavelength effect on gap nucleation in solidification, J. Appl. Mech. – Trans. ASME 67 (1) (2000) 155.

[111JM] J.H. Jeong, I.S. Kang, Analytical studies on the crystal-melt interface shape in the Czochralski process for oxide single crystals, J. Cryst. Growth 218 (2) (2000) 294.

[112JM] E.J. Kaiser, J.J. McGrath, A. Benard, Directional solidification of isotactic and atactic polypropylene blends, J. Appl. Polym. Sci. 76 (10) (2000) 1516.

[113JM] A.V. Kartavykh, E.S. Kopeliovich, M.G. Milvidskii, V.V. Rakov, Anomalous effects in dopant distribution in Ge single crystals grown by the floating zone technique aboard spacecrafts, Crystallogr. Rep. 45 (1) (2000) 161.

[114JM] M. Kobayashi, T. Tsukada, M. Hozawa, Effect of internal radiative heat transfer on transition of flow modes in CZ oxide melt, J. Cryst. Growth 208 (1) (2000) 459.

[115JM] C.W. Lan, Effects of axial vibration on vertical zone-melting processing, Int. J. Heat Mass Transfer 43 (11) (2000) 1987.

[116JM] C.W. Lan, M.C. Liang, Three-dimensional simulation of vertical zone-melting crystal growth: symmetry breaking to multiple states, J. Cryst. Growth 208 (1) (2000) 327.

[117JM] H. Lee, A.J. Pearlstein, Simulation of vertical Bridgman growth of benzene, a material with anisotropic solid-phase thermal conductivity, J. Cryst. Growth 209 (4) (2000) 934.

[118JM] A. Lipchin, R.A. Brown, Hybrid finite-volume/finite-element simulation of heat transfer and melt turbulence in Czochralski crystal growth of silicon, J. Cryst. Growth 216 (1) (2000) 192.

[119JM] W.Q. Lu, Boundary element analysis of the heat transfer in Bridgman growth process of semi-transparent crystals, Mater. Sci. Eng. A 292 (2) (2000) 219.
[120JM] N. Ma, J.S. Walker, A. Ludge, H. Riemann, Silicon float zone process with a weak transverse magnetic field and crystal rotation, J. Electrochem. Soc. 147 (9) (2000) 3529.
[121JM] R.H. Ma, Q.S. Chen, H. Zhang, V. Prasad, C.M. Balkas, N.K. Yushin, Modeling of silicon carbide crystal growth by physical vapor transport method, J. Cryst. Growth 211 (1) (2000) 352.
[122JM] I. Nicoara, D. Vizman, J. Friedrich, On void engulfment in shaped sapphire crystals using 3D modelling, J. Cryst. Growth 218 (1) (2000) 74.
[123JM] M.L. Ottone, J.A. Deiber, Modeling the melt spinning of polyethylene terephthalate, J. Elastomers Plast. 32 (2) (2000) 119.
[124JM] K.M. Pillai, S.G. Advani, A. Benard, K.I. Jacob, Numerical simulation of crystallization in high density polyethylene extrudates, Polym. Eng. Sci. 40 (11) (2000) 2356.
[125JM] G. Ratnieks, A. Muiznieks, L. Buligins, G. Raming, A. Muhlbauer, A. Ludge, H. Riemann, Influence of the three dimensionality of the HF electromagnetic field on resistivity variations in Si single crystals during FZ growth, J. Cryst. Growth 216 (1) (2000) 204.
[126JM] J.E. Simpson, S.V. Garimella, The influence of gravity levels on the horizontal Bridgman crystal growth of an alloy, Int. J. Heat Mass Transfer 43 (11) (2000) 1905.
[127JM] K. Takano, Y. Shiraishi, T. Iida, N. Takase, J. Matsubara, N. Machida, M. Kuramoto, H. Yamagishi, Numerical simulation for silicon crystal growth of up to 400 mm diameter in Czochralski furnaces, Mater. Sci. Eng. B 73 (1) (2000) 30.
[128JM] V. Timchenko, P.Y.P. Chen, E. Leonardi, G.D. Davis, R. Abbaschian, A computational study of transient plane front solidification of alloys in a Bridgman apparatus under microgravity conditions, Int. J. Heat Mass Transfer 43 (6) (2000) 963.
[129JM] P.K. Volkov, B.G. Zakharov, Y.A. Serebryakov, Convection in melts and impurity distribution in semiconductor crystals, Crystallogr. Rep. 45 (5) (2000) 862.
[130JM] P.J. Wellmann, M. Bickermann, D. Hofmann, L. Kadinski, M. Selder, T.L. Straubinger, A. Winnacker, In situ visualization and analysis of silicon carbide physical vapor transport growth using digital X-ray imaging, J. Cryst. Growth 216 (1) (2000) 263.
[131JM] G.W. Young, J.A. Heminger, A mathematical model of the edge-defined film-fed growth process, J. Eng. Math. 38 (4) (2000) 371.

Droplets, spray and splat cooling

[132JM] S.D. Aziz, S. Chandra, Impact, recoil and splashing of molten metal droplets, Int. J. Heat Mass Transfer 43 (16) (2000) 2841.
[133JM] M. Chung, R.H. Rangel, Simulation of metal droplet deposition with solidification including undercooling and contact resistance effects, Numer. Heat Transfer Part A 37 (3) (2000) 201.
[134JM] M.H. Davies, M. Wahab, M.J. Painter, An investigation of the interaction of a molten droplet with a liquid weld pool surface: a computational and experimental approach, Welding J. 79 (1) (2000) 18–S16.
[135JM] A. Feiterna, D. Huin, F. Oeters, P.V. Riboud, J.L. Roth, Iron drop ejection into slags by bursting gas bubbles, Steel Res. 71 (3) (2000) 61.
[136JM] J. Fukai, T. Ozaki, H. Asami, O. Miyatake, Numerical simulation of liquid droplet solidification on substrates, J. Chem. Eng. Japan 33 (4) (2000) 630.
[137JM] J.M. Khodadadi, Y. Zhang, Effects of thermocapillary convection on melting within droplets, Numer. Heat Transfer Part A 37 (2) (2000) 133.
[138JM] T. Loulou, J.P. Bardon, Heat transfer during the spreading and solidification of a molten metal droplet on a cooled substrate, High Temperature Mater. Processes 4 (1) (2000) 69.
[139JM] B.C. Moon, Z.H. Lee, D.R. White, E.J. Lavernia, In situ temperature measurement during spray forming of A2-tool steel and axisymmetric two-dimensional analysis, J. Mater. Res. 15 (8) (2000) 1669.
[140JM] S. Vincent, J.P. Caltagirone, E. Arquis, Numerical simulation of liquid metal particles impacting onto solid substrate: description of hydrodynamic processes and heat transfers, High Temperature Mater. Processes 4 (1) (2000) 79.
[141JM] Q. Xu, V.V. Gupta, E.J. Lavernia, Thermal behavior during droplet-based deposition, Acta Mater. 48 (4) (2000) 835.

Oceanic and geological phase change

[142JM] S. Blake, J.H. Fink, On the deformation and freezing of enclaves during magma mixing, J. Volcanol. Geothermal Res. 95 (1) (2000) 1.
[143JM] U. Hansen, D.A. Yuen, Extended-Boussinesq thermal–chemical convection with moving heat sources and variable viscosity, Earth Planet. Sci. Lett. 176 (3) (2000) 401.
[144JM] K. Kaneko, T. Koyaguchi, Simultaneous crystallization and melting at both the roof and floor of crustal magma chambers: experimental study using NH_4Cl–H_2O binary eutectic system, J. Volcanol. Geothermal Res. 96 (3) (2000) 161.

Miscellaneous

[145JM] A. Sluzalec, Random heat flow with phase change, Int. J. Heat Mass Transfer 43 (13) (2000) 2303.

Radiative heat transfer: *Influence of the geometry*

[1K] S.W. Baek, D.Y. Byun, S.J. Kang, The combined Monte-Carlo and finite-volume method for radiation in a two-dimensional irregular geometry, Int. J. Heat Mass Transfer 43 (13) (2000) 2337.

[2K] H. Habuka, M. Shimada, K. Okuyama, Thermal conditions in rapid thermal processing system using circular infrared lamp, J. Electrochem. Soc. 147 (12) (2000) 4660.

[3K] S.S. Katte, S.P. Venkateshan, Accurate determination of view factors in axisymmetric enclosures with shadowing bodies inside, J. Thermophys. Heat Transfer 14 (1) (2000) 68.

[4K] J.G. Kim, K.Y. Huh, I.T. Kim, Three-dimensional analysis of the walking-beam-type slab reheating furnace in hot strip mills, Numer. Heat Transfer Part A 38 (6) (2000) 589.

[5K] J. Liu, H.M. Shang, Y.S. Chen, Development of an unstructured radiation model applicable for two-dimensional planar, axisymmetric, and three-dimensional geometries, J. Quantitative Spectrosc. Radiat. Transfer 66 (1) (2000) 17.

[6K] S. Mazumder, A. Kersch, A fast Monte Carlo scheme for thermal radiation in semiconductor processing applications, Numer. Heat Transfer Part B 37 (2) (2000) 185.

[7K] T. Miyanaga, Y. Nakano, Radiation heat transfer in three-dimensional closed space including diffuse and specular surfaces – (Numerical calculation method using an improved ray-tracing method), JSME Int. J. Ser. B 43 (3) (2000) 449.

[8K] J.P. Montavez, J.I. Jimenez, A. Sarsa, A Monte Carlo model of the nocturnal surface temperatures in urban canyons, Bound. Layer Meteorol. 96 (3) (2000) 433.

[9K] M. Sakami, A. Charette, Application of a modified discrete ordinates method to two-dimensional enclosures of irregular geometry, J. Quantitative Spectrosc. Radiat. Transfer 64 (3) (2000) 275.

[10K] N. Selcuk, G. Kirbas, The method of lines solution of the discrete ordinates method for radiative heat transfer in enclosures, Numer. Heat Transfer Part B 37 (3) (2000) 379.

[11K] J.A. Voogt, C.S.B. Grimmond, Modeling surface sensible heat flux using surface radiative temperatures in a simple urban area, J. Appl. Meteorol. 39 (10) (2000) 1679.

[12K] A.K.C. Wu, S.H.K. Lee, Computation of radiative properties in one-dimensional sphere packings for sintering applications, Numer. Heat Transfer Part A 37 (5) (2000) 477.

Radiation and combustion

[13K] S.A.B. Al-Omari, K. Kawajiri, On the combustion and soot processes in a fluidized bed – like furnace, Combust. Sci. Technol. 154 (2000) 179.

[14K] S. Chen, T.L. Chan, C.W. Leung, M.A. Liu, K.Y. Pan, L.B. Zhou, Multidimensional numerical simulation of heat radiation in direct injection diesel engines, Proc. Inst. Mech. Eng. Part D, J. Autom. Eng. 214 (4) (2000) 453.

[15K] P.S. Cumber, Ray effect mitigation in jet fire radiation modelling, Int. J. Heat Mass Transfer 43 (6) (2000) 935.

[16K] S. Dembele, J.X. Wen, Investigation of a spectral formulation for radiative heat transfer in one-dimensional fires and combustion systems, Int. J. Heat Mass Transfer 43 (21) (2000) 4019.

[17K] K.H. Ewald, U. Anselmi-Tamburini, Z.A. Munir, A finite difference model for the combustion of zirconium in oxygen, J. Mater. Res. 15 (9) (2000) 1922.

[18K] Y. Ju, G. Masuya, F. Liu, Y. Hattori, D. Riechelmann, Asymptotic analysis of radiation extinction of stretched premixed flames, Int. J. Heat Mass Transfer 43 (2) (2000) 231.

[19K] N. Kayakol, N. Selcuk, I. Campbell, O.L. Gulder, Performance of discrete ordinates method in a gas turbine combustor simulator, Exp. Thermal Fluid Sci. 21 (1) (2000) 134.

[20K] E.P. Keramida, H.H. Liakos, M.A. Founti, A.G. Boudouvis, N.C. Markatos, The discrete transfer radiation model in a natural gas-fired furnace, Int. J. Numer. Meth. Fluids 34 (5) (2000) 449.

[21K] E.P. Keramida, H.H. Liakos, M.A. Founti, A.G. Boudouvis, N.C. Markatos, Radiative heat transfer in natural gas-fired furnaces, Int. J. Heat Mass Transfer 43 (10) (2000) 1801.

[22K] O.J. Kim, T.H. Song, Data base of WSGGM-based spectral model for radiation properties of combustion products, J. Quantitative Spectrosc. Radiat. Transfer 64 (4) (2000) 379.

[23K] M. Kozan, N. Selcuk, Investigation of radiative heat transfer in freeboard of a 0.3 MWt AFBC test rig, Combust. Sci. Technol. 153 (2000) 113.

[24K] H.H. Liakos, M.A. Founti, N.C. Markatos, Modelling of stretched natural gas diffusion flames, Appl. Math. Model. 24 (5) (2000) 419.

[25K] D.G. Lilley, Minimum safe distance from pool fires, J. Propulsion Power 16 (4) (2000) 649.

[26K] L.H. Liu, H.P. Tan, Q.Z. Yu, Inverse radiation problem in axisymmetric free flames, J. Thermophys. Heat Transfer 14 (3) (2000) 450.

[27K] J.G. Marakis, C. Papapavlou, E. Kakaras, A parametric study of radiative heat transfer in pulverised coal furnaces, Int. J. Heat Mass Transfer 43 (16) (2000) 2961.

[28K] D. Morvan, B. Porterie, J.C. Loraud, M. Larini, Numerical simulation of a methane/air radiating turbulent diffusion flame, Int. J. Numer. Meth. Heat Fluid Flow 10 (2) (2000) 196.

[29K] S.L. Olson, S. T'Ien J, Buoyant low-stretch diffusion flames beneath cylindrical PMMA samples, Combust. Flame 121 (3) (2000) 439.

[30K] E.B. Ratts, A study of the radiant heat exchange within a controlled-atmosphere furnace, Heat Transfer Eng. 21 (5) (2000) 55.

[31K] C.G. Soares, A.P. Teixeira, Probabilistic modelling of offshore fires, Fire Safety J. 34 (1) (2000) 25.

[32K] J. Strohle, H. Knaus, U. Schnell, K.R.G. Hein, A radiation model for the numerical simulation of coal-fired furnaces using body-fitted grids, Combust. Sci. Technol. 153 (2000) 127.

[33K] H.Y. Wang, P. Joulain, Numerical study of the turbulent burning between vertical parallel walls with a fire-induced flow, Combust. Sci. Technol. 154 (2000) 119.

[34K] L.X. Zhou, Y.C. Guo, W.Y. Lin, Two-fluid models for simulating reacting gas-particle flows, coal combustion and NOx formation, Combust. Sci. Technol. 150 (1) (2000) 161.

Radiation and small particles

[35K] S.L. Bertoli, Radiant and convective heat transfer on pneumatic transport of particles: an analytical study, Int. J. Heat Mass Transfer 43 (13) (2000) 2345.

[36K] S.P. Bhattacharya, A theoretical investigation of the influence of optical constants and particle size on the radiative properties and heat transfer involving ash clouds and deposits, Chem. Eng. Process. 39 (5) (2000) 471.

[37K] A.J. Chamkha, Effects of heat absorption and thermal radiation on heat transfer in a fluid-particle flow past a surface in the presence of a gravity field, Int. J. Thermal Sci. 39 (5) (2000) 605.

[38K] C.F.M. Coimbra, R.H. Rangel, Unsteady heat transfer in the harmonic heating of a dilute suspension of small particles, Int. J. Heat Mass Transfer 43 (18) (2000) 3305.

[39K] L.A. Dombrovsky, Heat transfer by radiation from a hot particle to ambient water through the vapor layer, Int. J. Heat Mass Transfer 43 (13) (2000) 2405.

[40K] L.A. Dombrovsky, Thermal radiation from non-isothermal spherical particles of a semitransparent material, Int. J. Heat Mass Transfer 43 (9) (2000) 1661.

[41K] R.S. Hiers, Critical behavior in small particle combustion, J. Thermophys. Heat Transfer 14 (1) (2000) 53.

[42K] K.H. Lee, M. Choi, J.S. Lee, Effect of radiative transfer on the thermophoretic particle deposition around a circular cylinder in a uniform cross flow, Numer. Heat Transfer Part A 37 (1) (2000) 19.

[43K] J.H. Park, S.W. Baek, Effects of thermal radiation on the sound wave propagation in a gas–particle two-phase medium, Numer. Heat Transfer Part A 38 (4) (2000) 341.

[44K] S.S. Sazhin, E.M. Sazhina, M.R. Heikal, Modelling of the gas to fuel droplets radiative exchange, Fuel 79 (14) (2000) 1843.

[45K] M.J. Yu, S.W. Baek, J.H. Park, An extension of the weighted sum of gray gases non-gray gas radiation model to a two phase mixture of non-gray gas with particles, Int. J. Heat Mass Transfer 43 (10) (2000) 1699.

Participation media

[46K] I. Anteby, I. Shai, A. Arbel, Numerical calculations for combined conduction and radiation transient heat transfer in a semitransparent medium, Numer. Heat Transfer Part A 37 (4) (2000) 359.

[47K] D.Y. Byun, S.W. Baek, M.Y. Kim, Thermal radiation in a discretely heated irregular geometry using the Monte-Carlo, finite volume, and modified discrete ordinates interpolation method, Numer. Heat Transfer Part A 37 (1) (2000) 1.

[48K] A.G. Fedorov, R. Viskanta, Radiation characteristics of glass foams, J. Am. Ceram. Soc. 83 (11) (2000) 2769.

[49K] A.G. Fedorov, R. Viskanta, Radiative transfer in a semitransparent glass foam blanket, Phys. Chem. Glasses 41 (3) (2000) 127.

[50K] Z.X. Guo, S. Maruyama, Radiative heat transfer in inhomogeneous, nongray, and anisotropically scattering media, Int. J. Heat Mass Transfer 43 (13) (2000) 2325.

[51K] S. Kanne, H.H. Fruhauf, E.W. Messerschmid, Thermochemical relaxation through collisions and radiation, J. Thermophys. Heat Transfer 14 (4) (2000) 464.

[52K] S.H. Kim, K.Y. Huh, A new angular discretization scheme of the finite volume method for 3-D radiative heat transfer in absorbing, emitting and anisotropically scattering media, Int. J. Heat Mass Transfer 43 (7) (2000) 1233.

[53K] C.K. Krishnaprakas, K.B. Narayana, P. Dutta, Radiation in boundary layer flow of an absorbing, emitting and anisotropically scattering fluid, Int. J. Numer. Meth. Heat Fluid Flow 10 (5) (2000) 530.

[54K] V. Le Dez, R. Vaillon, D. Lemonnier, M. Lallemand, Conductive–radiative coupling in an absorbing–emitting axisymmetric medium, J. Quantitative Spectrosc. Radiat. Transfer 65 (6) (2000) 787.

[55K] F.S. Liu, G.J. Smallwood, O.L. Gulder, Application of the statistical narrow-band correlated-k method to low-resolution spectral intensity and radiative heat transfer calculations – effects of the quadrature scheme, Int. J. Heat Mass Transfer 43 (17) (2000) 3119.

[56K] F.S. Liu, G.J. Smallwood, O.L. Gulder, Band lumping strategy for radiation heat transfer calculations using a narrowband model, J. Thermophys. Heat Transfer 14 (2) (2000) 278.

[57K] E.M. Nunes, V. Modi, M.H.N. Naraghi, Radiative transfer in arbitrarily-shaped axisymmetric enclosures with anisotropic scattering media, Int. J. Heat Mass Transfer 43 (18) (2000) 3275.

[58K] M. Schoenwetter, D. Vortmeyer, A new model for radiation heat transfer in emitting, absorbing and anisotropically scattering media based on the concept of mean beam length, Int. J. Thermal Sci. 39 (9) (2000) 983.

[59K] H.P. Tan, P.Y. Wang, X.L. Xia, Transient coupled radiation and conduction in an absorbing and scattering composite layer, J. Thermophys. Heat Transfer 14 (1) (2000) 77.

[60K] Z.M. Tan, P.F. Hsu, S.H. Wu, C.Y. Wu, Modified YIX method and pseudoadaptive angular quadrature for ray effects mitigation, J. Thermophys. Heat Transfer 14 (3) (2000) 289.

[61K] R. Viskanta, K.D. Jorgensen, Transient heating of opaque and semitransparent materials by radiation during processing, Heat Mass Transfer 36 (5) (2000) 413.

[62K] E.I. Vitkin, S.L. Shuralyov, V.V. Tamanovich, Engineering procedure for calculating the transfer of the

selective radiation of molecular gases, Int. J. Heat Mass Transfer 43 (11) (2000) 2029.
[63K] P.Y. Wang, H.P. Tan, L.H. Liu, T.W. Tong, Coupled radiation and conduction in a scattering composite layer with coatings, J. Thermophys. Heat Transfer 14 (4) (2000) 512.
[64K] C.Y. Wu, S.H. Wu, Integral equation formulation for transient radiative transfer in an anisotropically scattering medium, Int. J. Heat Mass Transfer 43 (11) (2000) 2009.
[65K] J. Yamada, Y. Kurosaki, Radiative characteristics of fibers with a large size parameter, Int. J. Heat Mass Transfer 43 (6) (2000) 981.
[66K] H.C. Zhou, F. Sheng, S.D. Han, C.G. Zheng, A fast algorithm for calculation of radiative energy distributions received by pinhole image-formation process from 20 rectangular enclosures, Numer. Heat Transfer Part A 38 (7) (2000) 757.

Combined heat transfer

[67K] A.J. Chamkha, Thermal radiation and buoyancy effects on hydromagnetic flow over an accelerating permeable surface with heat source or sink, Int. J. Eng. Sci. 38 (15) (2000) 1699.
[68K] X. Cheng, F.J. Erbacher, H.J. Neitzel, Passive containment cooling by natural air convection and thermal radiation after severe accidents, Nucl. Eng. Des. 202 (2) (2000) 219.
[69K] S.A. El-Wakil, E.M. Abulwafa, Variational-iterative method for conductive–radiative heat transfer in spherical inhomogeneous medium, J. Thermophys. Heat Transfer 14 (4) (2000) 612.
[70K] E.M.A. Elbashbeshy, M.A.A. Bazid, Effect of radiation on forced convection flow of a micropolar fluid over a horizontal plate, Can. J. Phys. 78 (10) (2000) 907.
[71K] S. Ergin, Surface radiation with conduction and natural convection in a two-floor enclosure, Energy Build. 32 (1) (2000) 57.
[72K] C.Y. Han, S.W. Baek, The effects of radiation on natural convection in a rectangular enclosure divided by two partitions, Numer. Heat Transfer Part A 37 (3) (2000) 249.
[73K] T. Hirschler, W. Gretler, Similarity solution of a collapsing cylindrical shock wave in a thermal radiating and conducting gas, Z. Angew. Mat. Mech. (3) (2000) S609.
[74K] K.H. Kim, O.H. Rho, C. Park, Navier–Stokes computation of flows in arc heaters, J. Thermophys. Heat Transfer 14 (2) (2000) 250.
[75K] S. Kiwan, M.A. Al-Nimr, Effect of radiative losses on the parabolic two-step heat conduction model, Japan. J. Appl. Phys. Part 1 39 (7A) (2000) 4245.
[76K] S.C. Lee, G.R. Cunnington, Conduction and radiation heat transfer in high-porosity fiber thermal insulation, J. Thermophys. Heat Transfer 14 (2) (2000) 121.
[77K] J. Monnier, Free convection with radiative thermal transfer of grey bodies. Analysis and approximation by finite element methods, Math. Models Meth. Appl. Sci. 10 (9) (2000) 1383.
[78K] S. Murakami, S. Kato, J. Zeng, Combined simulation of airflow, radiation and moisture transport for heat release from a human body, Build. Environ. 35 (6) (2000) 489.
[79K] K.S. Park, M. Choi, H.J. Cho, J.D. Chung, Analysis of radiative heat transfer and mass transfer during multiwafer low-pressure chemical vapor deposition, J. Electrochem. Soc. 147 (12) (2000) 4554.
[80K] M. Pettersson, S. Stenstrom, Modelling of an electric IR heater at transient and steady state conditions. Part I: model and validation, Int. J. Heat Mass Transfer 43 (7) (2000) 1209.
[81K] M. Pettersson, S. Stenstrom, Modelling of an electric IR heater at transient and steady state conditions. Part II: modelling a paper dryer, Int. J. Heat Mass Transfer 43 (7) (2000) 1223.
[82K] N. Ramesh, C. Balaji, S.P. Venkateshan, Effect of radiation on natural convection in an L-shaped corner, Exp. Fluids 28 (5) (2000) 448.
[83K] P. Razelos, X. Kakatsios, Optimum dimensions of convecting–radiating fins: Part I – longitudinal fins, Appl. Thermal Eng. 20 (13) (2000) 1161.
[84K] D.R. Rousse, Numerical predictions of two-dimensional conduction, convection, and radiation heat transfer. I. Formulation, Int. J. Thermal Sci. 39 (3) (2000) 315.
[85K] D.R. Rousse, G. Gautier, J.F. Sacadura, Numerical predictions of two-dimensional conduction, convection, and radiation heat transfer. II. Validation, Int. J. Thermal Sci. 39 (3) (2000) 332.
[86K] A. Roy, B. Mackintosh, J.P. Kalejs, Q.S. Chen, H. Zhang, V. Prasad, A numerical model for inductively heated cylindrical silicon tube growth system, J. Cryst. Growth 211 (1) (2000) 365.
[87K] M. Selder, L. Kadinski, Y. Makarov, F. Durst, P. Wellmann, T. Straubinger, D. Hofmann, S. Karpov, M. Ramm, Global numerical simulation of heat and mass transfer for SiC bulk crystal growth by PVT, J. Cryst. Growth 211 (1) (2000) 31.
[88K] V.K. Shiff, Mathematical simulation of radiative–conductive heat transfer in a cylindrical volume, J. Opt. Technol. 67 (6) (2000) 546.
[89K] Y.S. Sim, S.O. Kim, H.W. Myung, E.K. Kim, Heat transfer enhancement by radiation structures for an air channel of LMR decay heat removal, Nucl. Eng. Des. 199 (1) (2000) 167.
[90K] C.E. Triplett, R.E. Canaan, D.E. Klein, A comparison of natural convection heat transfer for a staggered versus an aligned array of horizontal spent nuclear fuel rods within a rectangular enclosure, Nucl. Technol. 130 (1) (2000) 99.
[91K] T.S. Wang, Effect of fence on linear aerospike plume-induced base-heating physics, J. Thermophys. Heat Transfer 14 (4) (2000) 457.
[92K] B. Zheng, C.X. Lin, M.A. Ebadian, Combined laminar forced convection and thermal radiation in a helical pipe, Int. J. Heat Mass Transfer 43 (7) (2000) 1067.

Intensely irradiated materials

[93K] Z. Guo, S. Kumar, K.C. San, Multidimensional Monte Carlo simulation of short-pulse laser transport in scattering media, J. Thermophys. Heat Transfer 14 (4) (2000) 504.
[94K] S.Y. Gus'kov, N.V. Zmitrenko, I.V. Popov, V.B. Rozanov, V.F. Tishkin, Two-dimensional energy transfer and plasma formation under laser beam irradiation of a subcritical-density material, Quant. Electron. 30 (7) (2000) 601.
[95K] J. Haala, W. Wiesbeck, Simulation of microwave, conventional and hybrid ovens using a new thermal modeling technique, J. Microwave Power Electromagnetic Energy 35 (1) (2000) 34.
[96K] V.V. Kalinchak, S.G. Orlovskaya, A.V. Mandel, Stable and critical regimes of heat and mass transfer of a carbon particle in a laser-radiation field, Combust. Explos. Shock Waves 36 (2) (2000) 181.
[97K] J. Lasri, P.D. Ramesh, L. Schachter, Energy conversion during microwave sintering of a multiphase ceramic surrounded by a susceptor, J. Am. Ceram. Soc. 83 (6) (2000) 1465.
[98K] T.J. Pfefer, K.F. Chan, D.X. Hammer, A.J. Welch, Dynamics of pulsed holmium:YAG laser photocoagulation of albumen, Phys. Med. Biol. 45 (5) (2000) 1099.
[99K] T. Samaras, P. Regli, N. Kuster, Electromagnetic and heat transfer computations for non-ionizing radiation dosimetry, Phys. Med. Biol. 45 (8) (2000) 2233.
[100K] H.P. Tan, L.M. Ruan, T.W. Tong, Temperature response in absorbing, isotropic scattering medium caused by laser pulse, Int. J. Heat Mass Transfer 43 (2) (2000) 311.

Experimental methods

[101K] P. Bertrand, M. Ignatiev, G. Flamant, I. Smurov, Pyrometry applications in thermal plasma processing, Vacuum 56 (1) (2000) 71.
[102K] P. Couto, M.B.H. Mantelli, Transient temperature behavior of multistage cryogenic radiators: model and experimental validation, J. Thermophys. Heat Transfer 14 (3) (2000) 313.
[103K] T.D. Hatchard, D.D. MacNeil, D.A. Stevens, L. Christensen, J.R. Dahn, Importance of heat transfer by radiation in Li-ion batteries during thermal abuse, Electrochem. Solid-State Lett. 3 (7) (2000) 305.
[104K] J.M. Norman, W.P. Kustas, J.H. Prueger, G.R. Diak, Surface flux estimation using radiometric temperature: a dual temperature-difference method to minimize measurement errors, Water Resour. Res. 36 (8) (2000) 2263.

Numerical methods: *Heat conduction*

[1N] R.S. Banim, M.J. Tierney, P.N. Brett, The estimation of fluid temperatures through an inverse heat conduction technique, Numer. Heat Transfer Part A 37 (5) (2000) 465.
[2N] C.H. Cheng, C.Y. Wu, An approach combining body-fitted grid generation and conjugate gradient methods for shape design in heat conduction problems, Numer. Heat Transfer Part B 37 (1) (2000) 69.
[3N] W. Dai, R. Nassar, A domain decomposition method for solving three-dimensional heat transport equations in a double-layered thin film with microscale thickness, Numer. Heat Transfer Part A 38 (3) (2000) 243.
[4N] W.Z. Dai, R. Nassar, A hybrid finite element-finite difference method for solving three-dimensional heat transport equations in a double-layered thin film with microscale thickness, Numer. Heat Transfer Part A 38 (6) (2000) 573.
[5N] C.H. Huang, S.C. Chin, A two-dimensional inverse problem in imaging the thermal conductivity of a non-homogeneous medium, Int. J. Heat Mass Transfer 43 (22) (2000) 4061.
[6N] P. Jonas, A.K. Louis, Approximate inverse for a one-dimensional inverse heat conduction problem, Inverse Problems 16 (1) (2000) 175.
[7N] R.A. Khachfe, Y. Jarny, Numerical solution of 2-D nonlinear inverse heat conduction problems using finite-element techniques, Numer. Heat Transfer Part B 37 (1) (2000) 45.
[8N] A. Maciag, M.J. Al-Khatib, Stability of solutions of the overdetermined inverse heat conduction problems when discretized with respect to time, Int. J. Numer. Meth. Heat Fluid Flow 10 (2) (2000) 228.
[9N] M. Monde, Analytical method in inverse heat transfer problem using Laplace transform technique, Int. J. Heat Mass Transfer 43 (21) (2000) 3965.
[10N] P.C. Tuan, M.C. Ju, The validation of the robust input estimation approach to two-dimensional inverse heat conduction problems, Numer. Heat Transfer Part B 37 (2) (2000) 247.

Convection and diffusion

[11N] Y.H. Chen, T.W.H. Sheu, Two-dimensional scheme for convection–diffusion with linear production, Numer. Heat Transfer Part B 37 (3) (2000) 365.
[12N] Y. Zhao, B.L. Zhang, A high-order characteristics upwind FV method for incompressible flow and heat transfer simulation on unstructured grids, Comput. Meth. Appl. Mech. Eng. 190 (5) (2000) 733.
[13N] A. Chatterjee, V. Prasad, A full 3-dimensional adaptive finite volume scheme for transport and phase-change processes, part I: formulation and validation, Numer. Heat Transfer Part A 37 (8) (2000) 801.
[14N] C.K. Chun, S.O. Park, A fixed-grid finite-difference method for phase-change problems, Numer. Heat Transfer Part B 38 (1) (2000) 59.
[15N] M.L.G Martin, S.D. Cuenca, J.L.F. Martinez, J.D. de la Lastra, Domain decomposition methods for the numerical resolution of the aluminium casting process, Finite Elements Anal. Des. 36 (2) (2000) 147.
[16N] G.F. Naterer, Predictive entropy based correction of phase change computations with fluid flow – Part 2: application problems, Numer. Heat Transfer Part B 37 (4) (2000) 415.

[17N] N. Nigro, A. Huespe, V. Fachinotti, Phasewise numerical integration of finite element method applied to solidification processes, Int. J. Heat Mass Transfer 43 (7) (2000) 1053.

[18N] J.A. Spim, A. Garcia, A modified network approach for modeling solidification of complex-shaped domains, Numer. Heat Transfer Part B 38 (1) (2000) 75.

[19N] L.L. Zheng, H. Zhang, An adaptive level set method for moving-boundary problems: application to droplet spreading and solidification, Numer. Heat Transfer Part B 37 (4) (2000) 437.

Radiation

[20N] J.C. Chai, J.P. Moder, Radiation heat transfer calculation using an angular-multiblock procedure, Numer. Heat Transfer Part B 38 (1) (2000) 1.

[21N] J.Y. Murthy, S.R. Mathur, A finite-volume scheme for radiative heat transfer in semitransparent media, Numer. Heat Transfer Part B 37 (1) (2000) 25.

[22N] H.M. Park, T.Y. Yoon, Solution of the inverse radiation problem using a conjugate gradient method, Int. J. Heat Mass Transfer 43 (10) (2000) 1767.

Fluid flow

[23N] N. Chidambaram, R.H. Pletcher, A colocated-grid, fully coupled algorithm for large eddy simulation of incompressible and compressible flows, Numer. Heat Transfer Part B 37 (1) (2000) 1.

[24N] G. Croce, G. Comini, W. Shyy, Incompressible flow and heat transfer computations using a continuous pressure equation and nonstaggered grids, Numer. Heat Transfer Part B 38 (3) (2000) 291.

[25N] M.J.S. de Lemos, Flow and heat transfer tn rectangular enclosures using a new block-implicit numerical method, Numer. Heat Transfer Part B 37 (4) (2000) 489.

[26N] H.W. Fang, C.J. Chen, W.L. Lin, Three-dimensional diagonal Cartesian method for incompressible flows involving complex boundaries, Numer. Heat Transfer Part B 38 (1) (2000) 37.

[27N] K.M. Kelkar, D. Choudhury, Numerical method for the prediction of incompressible flow and heat transfer in domains with specified pressure boundary conditions, Numer. Heat Transfer Part B 38 (1) (2000) 15.

[28N] T. Morii, K. Vierow, The SOAR method for automatically optimizing simple relaxation factors, Numer. Heat Transfer Part B 38 (3) (2000) 309.

[29N] F. Moukalled, M. Darwish, A unified formulation of the segregated class of algorithms for fluid flow at all speeds, Numer. Heat Transfer Part B 37 (1) (2000) 103.

[30N] J.R. Pacheco, R.E. Peck, Nonstaggered boundary-fitted coordinate method for free surface flows, Numer. Heat Transfer Part B 37 (3) (2000) 267.

[31N] A.N. Pavlov, S.S. Sazhin, R.P. Fedorenko, M.R. Heikal, A conservative finite difference method and its application for the analysis of a transient flow around a square prism, Int. J. Numer. Meth. Heat Fluid Flow 10 (1) (2000) 6.

[32N] M.M. Rahman, T. Siikonen, An improved simple method on a collocated grid, Numer. Heat Transfer Part B 38 (2) (2000) 177.

[33N] S. Ray, A.W. Date, A calculation procedure for solution of incompressible Navier–Stokes equations on curvilinear non staggered grids, Numer. Heat Transfer Part B 38 (1) (2000) 93.

[34N] H. Sadat, S. Couturier, Performance and accuracy of a meshless method for laminar natural convection, Numer. Heat Transfer Part B 37 (4) (2000) 455.

[35N] C. Shu, K.S. Yeo, Q. Yao, An efficient approach to simulate natural convection in arbitrarily eccentric annuli by vorticity-stream function formulation, Numer. Heat Transfer Part A 38 (7) (2000) 739.

[36N] Y.C. Su, C.S. Wang, J.N. Chung, S.T. Lee, An accurate method for the simulation of three-dimensional incompressible heated pipe flow, Numer. Heat Transfer Part B 37 (3) (2000) 293.

Other studies

[37N] J.A. Camberos, Nonlinear time-step constraints based on the second law of thermodynamics, J. Thermophys. Heat Transfer 14 (3) (2000) 435.

[38N] X. Chen, P. Han, A note on the solution of conjugate heat transfer problems using SIMPLE-like algorithms, Int. J. Heat Fluid Flow 21 (4) (2000) 463.

[39N] M.S. Chung, K.S. Chang, S.J. Lee, Wave propagation in two-phase flow based on a new hyperbolic two-fluid model, Numer. Heat Transfer Part A 38 (2) (2000) 169.

[40N] L. Hribersek, G. Kuhn, Conjugate heat transfer by boundary-domain integral method, Eng. Anal. Bound. Elements 24 (4) (2000) 297.

[41N] A.M.C. Janse, P.E. Dijk, J.A.M. Kuipers, The volume of fluid method in spherical coordinates, Int. J. Numer. Meth. Heat Fluid Flow 10 (7) (2000) 654.

[42N] Y.Y. Niu, Simple conservative flux splitting for multi-component flow calculations, Numer. Heat Transfer Part B 38 (2) (2000) 203.

Properties: *Thermal conductivity and diffusivity*

[1P] R. Abalone, A. Gaston, M.A. Lara, Determination of mass diffusivity coefficient of sweet potato, Drying Technol. 18 (10) (2000) 2273.

[2P] O.A. Almanza, M.A. Rodriguez-Perez, J.A. De Saja, Prediction of the radiation term in the thermal conductivity of crosslinked closed cell polyolefin foams, J. Polym. Sci. Part B 38 (7) (2000) 993.

[3P] Y. Arita, Y. Nishi, M. Amaya, T. Matsui, Isotope effects on thermal diffusivity of boron carbide, Thermochim. Acta 352 (2000) 39.

[4P] J.Y. Bigot, V. Halte, J.C. Merle, A. Daunois, Electron dynamics in metallic nanoparticles, Chem. Phys. 251 (1) (2000) 181.

[5P] I. Dincer, Heat transfer parameter models and correlations for cooling applications, Heat Mass Transfer 36 (1) (2000) 57.

[6P] E. Divo, A. Kassab, F. Rodriguez, Characterization of space dependent thermal conductivity with a BEM-based genetic algorithm, Numer. Heat Transfer Part A 37 (8) (2000) 845.

[7P] M.D. Donne, A. Goraieb, G. Piazza, F. Scaffidi-Argentina, Measurement of the heat transfer parameters in infiltrated binary beryllium beds. Comparison between the results with PEHTRA and SUPER-PEHTRA, Fus. Technol. 38 (3) (2000) 310.

[8P] V.V. Dudkin, B.Y. Gorodilov, A.I. Krivchikov, V.G. Manzhelii, Thermal conductivity of solid krypton with methane admixture, Low Temperature Phys. 26 (9) (2000) 762.

[9P] B.Y. Gorodilov, O.A. Korolyuk, A.I. Krivchikov, V.G. Manzhelii, Heat transfer in solid solutions hydrogen–deuterium, J. Low Temperature Phys. 119 (3) (2000) 497.

[10P] A.R. Hanuska, E.P. Scott, K. Daryabeigi, Thermal characterization of aerospace structures, J. Thermophys. Heat Transfer 14 (3) (2000) 322.

[11P] Y. Hiraiwa, T. Kasubuchi, Temperature dependence of thermal conductivity of soil over a wide range of temperature (5–75 °C), Eur. J. Soil Sci. 51 (2) (2000) 211.

[12P] M. Jalali-Heravi, M.H. Fatemi, Prediction of thermal conductivity detection response factors using an artificial neural network, J. Chromatography 897 (1) (2000) 227.

[13P] O. Jirsak, T.G. Sadikoglu, B. Ozipek, N. Pan, Thermo-insulating properties of perpendicular-laid versus cross-laid lofty nonwoven fabrics, Textile Res. J. 70 (2) (2000) 121.

[14P] H. Kawamura, H. Hirano, Estimating the impurity concentration factor on the boiling heat transfer surface of a simulated steam-generator tube-support-plate crevice using an in situ high-temperature conductivity measurement technique, Nucl. Technol. 129 (3) (2000) 398.

[15P] A.B. Kogan, D. Murphy, H. Meyer, Heat transfer in a pure near-critical fluid: diffusive and convective regimes in He-3, Phys. B 1 (2000) 208.

[16P] P. Kovac, I. Husek, F. Gomory, O.O. Oduleye, W. Pachla, R. Diduszko, N.M. Alford, Electrical and mechanical properties of Bi-2223/Ag/barrier/Ag composite tapes, Superconduct. Sci. Technol. 13 (4) (2000) 378.

[17P] J. Lawrence, A.B. Patel, J.G. Brisson, The thermal conductivity of Kapton HN between 0.5 and 5 K, Cryogenics 40 (3) (2000) 203.

[18P] Y.Z. Li, Thermal properties of NbTi superconductor wire and its heat release performance over quench, Mater. Sci. Eng. A 292 (2) (2000) 194.

[19P] X.G. Liang, X. Ji, Thermal conductance of randomly oriented composites of thin layers, Int. J. Heat Mass Transfer 43 (19) (2000) 3633.

[20P] E. Macia, Thermal conductivity of one-dimensional Fibonacci quasicrystals, Phys. Rev. B 61 (10) (2000) 6645.

[21P] D. Maillet, C. Moyne, B. Remy, Effect of a thin layer on the measurement of the thermal diffusivity of a material by a flash method, Int. J. Heat Mass Transfer 43 (21) (2000) 4057.

[22P] V.V. Murashov, M.A. White, Thermal conductivity of crystalline particulate materials, J. Mater. Sci. 35 (3) (2000) 649.

[23P] T.L. Pourpoint, R.M. Banish, F.C. Wessling, R.F. Sekerka, Real-time determination of thermal diffusivity in a disk-shaped sample: applications to graphite and boron nitride, Rev. Sci. Instrum. 71 (12) (2000) 4512.

[24P] A. Prociak, J. Pielichowski, T. Sterzynski, Thermal diffusivity of rigid polyurethane foams blown with different hydrocarbons, Polym. Testing 19 (6) (2000) 705.

[25P] O.I. Purskii, N.N. Zholonko, V.A. Konstantinov, Heat transfer in the orientationally disordered phase of SF6, Low Temperature Phys. 26 (4) (2000) 278.

[26P] H.R. Rezaei, R.P. Gupta, G.W. Bryant, J.T. Hart, G.S. Liu, C.W. Bailey, T.F. Wall, S. Miyamae, K. Makino, Y. Endo, Thermal conductivity of coal ash and slags and models used, Fuel 79 (13) (2000) 1697.

[27P] A.Z. Sahin, Effective thermal conductivity of frost during the crystal growth period, Int. J. Heat Mass Transfer 43 (4) (2000) 539.

[28P] S. Schraml, S. Dankers, K. Bader, S. Will, A. Leipertz, Soot temperature measurements and implications for time-resolved laser-induced incandescence (TIRE-LII), Combust. Flame 120 (4) (2000) 439.

[29P] S. Shin, S.H. Lee, Thermal conductivity of suspensions in shear flow fields, Int. J. Heat Mass Transfer 43 (23) (2000) 4275.

[30P] D.N. Singh, K. Devid, Generalized relationships for estimating soil thermal resistivity, Exp. Thermal Fluid Sci. 22 (3) (2000) 133.

[31P] Z. Tamainot-Telto, R.E. Critoph, Thermophysical properties of monolithic carbon, Int. J. Heat Mass Transfer 43 (11) (2000) 2053.

[32P] H. Tanaka, S. Sawai, K. Morimoto, K. Hisano, Evaluation of hemispherical total emissivity for thermal radiation calorimetry, Int. J. Thermophys. 21 (4) (2000) 927.

[33P] H. Tanaka, S. Sawai, K. Morimoto, K. Hisano, Measurements of IR spectra and thermophysical properties of tetragonal zirconia by thermal radiation calorimetry, Japan. J. Appl. Phys. Part 1 39 (11) (2000) 6465.

[34P] V.R. Tarnawski, F. Gori, B. Wagner, G.D. Buchan, Modelling approaches to predicting thermal conductivity of soils at high temperatures, Int. J. Energy Res. 24 (5) (2000) 403.

[35P] V.R. Tarnawski, W.H. Leong, Thermal conductivity of soils at very low moisture content and moderate temperatures, Transport Porous Media 41 (2) (2000) 137.

[36P] S.J. van Donk, E.W. Tollner, Apparent thermal conductivity of mulch materials exposed to forced convection, Trans. ASAE 43 (5) (2000) 1117.

[37P] Y.M. Xuan, Q. Li, Heat transfer enhancement of nanofluids, Int. J. Heat Fluid Flow 21 (1) (2000) 58.

[38P] K. Yamamoto, Y. Mizutani, T. Kitagawa, Construction of novel nanosecond temperature jump apparatuses applicable to Raman measurements and direct observation of transient temperature, Appl. Spectrosc. 54 (11) (2000) 1591.

[39P] C.Y. Yang, Determination of the temperature dependent thermophysical properties from temperature responses measured at medium's boundaries, Int. J. Heat Mass Transfer 43 (7) (2000) 1261.

[40P] H. Yokura, M. Niwa, Changes in disposable diaper properties caused by wetting, Textile Res. J. 70 (2) (2000) 135.

[41P] Y.P. Zhang, X.G. Liang, Y. Jiang, H.F. Di, Z.J. Nin, Simple method of calculating the transient thermal performance of composite material and its applicable condition, Sci. China Ser. E 43 (4) (2000) 344.

Diffusion

[42P] A.H. Ali, Irreversible thermal–diffusional coupling in local equilibrium, J. Thermophys. Heat Transfer 14 (4) (2000) 601.

[43P] C. Allibert, P. Marty, A. Gagnoud, Y. Fautrelle, Estimate of the diffusion coefficient in Co based liquids, Int. J. Heat Mass Transfer 43 (3) (2000) 437.

[44P] E.I. Dashevskaya, I. Litvin, E.E. Nikitin, I. Oref, J. Troe, Classical diffusion model of vibrational predissociation of van der Waals complexes: truncated mean first passage time approximation, Phys. Chem. Chem. Phys. 2 (10) (2000) 2251.

[45P] H.Y. Erbil, M. Dogan, Determination of diffusion coefficient-vapor pressure product of some liquids from hanging drop evaporation, Langmuir 16 (24) (2000) 9267.

Viscosity

[46P] W. Nagatake, T. Takahashi, Y. Masubuchi, J.I. Takimoto, K. Koyama, Development of sheer flow thermal rheometer for direct measurement of crystallization fraction of polymer melts under shear deformation, Polymer 41 (2) (2000) 523.

[47P] J.S. Paschkewitz, D.M. Pratt, The influence of fluid properties on electrohydrodynamic heat transfer enhancement in liquids under viscous and electrically dominated flow conditions, Exp. Thermal Fluid Sci. 21 (4) (2000) 187.

[48P] C.M. Romero, J.L. Rojas, Apparent molar volumes and viscosities of DL-α-alanine in water–ethanol mixtures, Phys. Chem. Liquids 38 (2) (2000) 237.

[49P] S. Sridhar, K.C. Mills, O.D.C. Afrange, H.P. Lorz, R. Carli, Break temperatures of mould fluxes and their relevance to continuous casting, Ironmaking Steelmaking 27 (3) (2000) 238.

[50P] J.J. Wang, Z.N. Yan, H.C. Zhang, J.S. Lu, Effect of temperature on viscosity properties of some α-amino acids in aqueous urea solutions, Biophys. Chem. 86 (1) (2000) 71.

Transport properties

[51P] V.V. Riabov, Gas dynamic equations,transport coefficients,and effects in nonequilibrium diatomic gas flows, J. Thermophys. Heat Transfer 14 (3) (2000) 404.

[52P] L.I. Soliman, M.H. Wasfi, T.A. Hendia, Thermal properties of polycrystalline $ZnIn_2Se_4$, J. Thermal Anal. 59 (3) (2000) 971.

[53P] J.R. Stallcop, H. Partridge, A. Pradhan, E. Levin, Potential energies and collision integrals for interactions of carbon and nitrogen atoms, J. Thermophys. Heat Transfer 14 (4) (2000) 480.

[54P] T. Tokumasu, Y. Matsumoto, Construction of collision model of diatomic molecules (Improvement of energy transfer model and its verification), JSME Int. J. Ser. B 43 (2) (2000) 288.

Specific heat

[55P] P.K. Banipal, T.S. Banipal, J.C. Ahluwalia, B.S. Lark, Partial molar heat capacities and volumes of transfer of some saccharides from water to aqueous urea solutions at $T = 298.15$ K, J. Chem. Thermodynamics 32 (10) (2000) 1409.

[56P] D. Bessieres, H. Saint-Guirons, J.L. Daridon, J.Y. Coxam, Apparatus for simultaneous determination of the densities and heat capacities of liquids and of liquids with dissolved gas under an extended range of pressure (0.1–100 MPa), Measure. Sci. Technol. 11 (5) (2000) N69.

[57P] B.V. Lebedev, T.A. Bykova, A.S. Lobach, Thermodynamic properties of hydrofullerene C60H36 from 5 to 340 K, J. Thermal Anal. 62 (1) (2000) 257.

[58P] A.I. Lobad, R.D. Averitt, C. Kwon, A.J. Taylor, Spin-lattice interaction in colossal magnetoresistance manganites, Appl. Phys. Lett. 77 (24) (2000) 4025.

[59P] J. Mahmoudi, H. Fredriksson, Thermal analysis of copper-tin alloys during rapid solidification, J. Mater. Sci. 35 (19) (2000) 4977.

[60P] R. Pons, S. Szarzynski, Accounting for the real properties of the heat transfer fluid in heat-regenerative adsorption cycles for refrigeration, Int. J. Refrig. 23 (4) (2000) 284.

[61P] S.X. Xu, Y. Li, Y.P. Feng, Some elements in specific heat capacity measurement and numerical simulation of temperature modulated DSC (TMDSC) with R/C network, Thermochim. Acta 360 (2) (2000) 157.

[62P] S.X. Xu, Y. Li, Y.P. Feng, Study of temperature profile and specific heat capacity in temperature modulated DSC with a low sample heat diffusivity, Thermochim. Acta 360 (2) (2000) 131.

Thermodynamic properties

[63P] J. Avsec, M. Marcic, Calculation of the speed of sound and other thermophysical properties, J. Thermophys. Heat Transfer 14 (1) (2000) 39.

[64P] J. Avsec, M. Marcic, Influence of multipolar and induction interactions on the speed of sound, J. Thermophys. Heat Transfer 14 (4) (2000) 496.

[65P] A.T. Bulgan, A. Koc, N.A. Ozturk, Investigation of thermodynamic properties of alternative fluid couples for absorption thermal systems, Energy Conversion Manage. 41 (10) (2000) 1029.

[66P] M. Chung, C. Bai, Thermodynamic property variation of nonazeotropic refrigerant mixtures (NARMs) in the temperature gliding zone, Chem. Eng. Commun. 180 (2000) 1.

[67P] P.W. Egolf, B. Frei, R. Furter, Thermodynamics of moist air: contribution to error estimates, Appl. Thermal Eng. 20 (1) (2000) 1.

[68P] M.G. Forest, H. Zhou, Q. Wang, Thermotropic liquid crystalline polymer fibers, SIAM J. Appl. Math. 60 (4) (2000) 1177.

[69P] J.E.K. Schawe, Investigation of isothermal curing of a thermosetting system by temperature-modulated differential scanning calorimetry: information derived from the phase shift and the determination of the complex heat capacity, Thermochim. Acta 361 (1) (2000) 97.

Miscellaneous

[70P] S. Denys, A.M. Van Loey, M.E. Hendrickx, Modeling conductive heat transfer during high-pressure thawing processes: Determination of latent heat as a function of pressure, Biotechnol. Progr. 16 (3) (2000) 447.

[71P] R.K. Freeman, F.A. Rigby, N. Morley, Temperature-dependent reflectance of plated metals and composite materials under laser irradiation, J. Thermophys. Heat Transfer 14 (3) (2000) 305.

[72P] G.A. Greene, C.C. Finfrock, T.F. Irvine, Total hemispherical emissivity of oxidized Inconel 718 in the temperature range 300–1000 °C, Exp. Thermal Fluid Sci. 22 (3) (2000) 145.

[73P] A. Kavner, S.V. Sinogeikin, R. Jeanloz, J.D. Bass, Equation of state and strength of natural majorite, J. Geophys. Res. 105 (B3) (2000) 5963.

[74P] P.E. Tuma, L. Tousignant, New "green" heat transfer fluids, Solid State Technol. 43 (6) (2000) 175.

Heat transfer applications – heat exchangers and heat pipes: *Compact heat exchangers*

[1Q] G. Boccardi, G.P. Celata, M. Cumo, A. Gerosa, A. Giuliani, A. Zorzin, The use of new refrigerants in compact heat exchangers for the refrigeration industry, Heat Transfer Eng. 21 (4) (2000) 53.

[2Q] K. Cho, S.J. Tae, Evaporation heat transfer for R-22 and R-407C refrigerant-oil mixture in a microfin tube with a U-bend, Int. J. Refrig. 23 (3) (2000) 219.

[3Q] A. Genssle, K. Stephan, Analysis of the process characteristics of an absorption heat transformer with compact heat exchangers and the mixture TFE-E181, Int. J. Thermal Sci. 39 (1) (2000) 30.

[4Q] K. Seo, Y. Kim, Evaporation heat transfer and pressure drop of R-22 in 7 and 9. 52 mm smooth/micro-fin tubes, Int. J. Heat Mass Transfer 43 (16) (2000) 2869.

[5Q] C.C. Wang, Y.T. Lin, C.J. Lee, Heat and momentum transfer for compact louvered fin-and-tube heat exchangers in wet conditions, Int. J. Heat Mass Transfer 43 (18) (2000) 3443.

Design

[6Q] K.C.A. Alam, B.B. Saha, Y.T. Kang, A. Akisawa, Heat exchanger design effect on the system performance of silica gel adsorption refrigeration systems, Int. J. Heat Mass Transfer 43 (24) (2000) 4419.

[7Q] C. Chagny, C. Castelain, H. Peerhossaini, Chaotic heat transfer for heat exchanger design and comparison with a regular regime for a large range of Reynolds numbers, Appl. Thermal Eng. 20 (17) (2000) 1615.

[8Q] F.S. Liporace, F.L.P. Pessoa, E.M. Queiroz, The influence of heat exchanger design on the synthesis of heat exchanger networks, Brazilian J. Chem. Eng. 17 (4) (2000) 735.

[9Q] M.R.J. Nasr, G.T. Polley, Derivation of charts for the approximate determination of the area requirements of heat exchangers using plain and low-pinned tube bundles (part A), Chem. Eng. Technol. 23 (1) (2000) 46.

[10Q] J.C. Ordonez, A. Bejan, Entropy generation minimization in parallel-plates counterflow heat exchangers, Int. J. Energy Res. 24 (10) (2000) 843.

[11Q] R.K. Shah, B. Thonon, D.M. Benforado, Opportunities for heat exchanger applications in environmental systems, Appl. Thermal Eng. 20 (7) (2000) 631.

[12Q] W.J. Xie, S.C. Tam, Y.L. Lam, H.R. Yang, J.G. Liu, J.H. Gu, W. Tan, Thermal and optical properties of diode side-pumped solid state laser rods, Opt. Laser Technol. 32 (3) (2000) 193.

[13Q] M.H. Xu, X.G. He, J.L.T. Azevedo, M.G. Carvalho, Flexibly using results of CFD and simplified heat transfer model for pulverized coal-fired boilers, Int. J. Energy Res. 24 (13) (2000) 1161.

[14Q] J.Y. Yun, K.S. Lee, Influence of design parameters on the heat transfer and flow friction characteristics of the heat exchanger with slit fins, Int. J. Heat Mass Transfer 43 (14) (2000) 2529.

Enhancement

[15Q] P. Basu, L.M. Cheng, An experimental and theoretical investigation into the heat transfer of a finned water wall tube in a circulating fluidized bed boiler, Int. J. Energy Res. 24 (4) (2000) 291.

[16Q] D. Batra, T.R. Rao, Analysis of an annular finned pyrolyser-II, Energy Conversion Manage. 41 (6) (2000) 573.
[17Q] A. Campo, Heat removal of in-tube viscous flows to air with the assistance of arrays of plate fins Part I: theoretical aspects involving 3-D, 2-D and 1-D models, Int. J. Numer. Meth. Heat Fluid Flow 10 (2) (2000) 334.
[18Q] Y.J. Chang, K.C. Hsu, Y.T. Lin, C.C. Wang, A generalized friction correlation for louver fin geometry, Int. J. Heat Mass Transfer 43 (12) (2000) 2237.
[19Q] T.W. Chung, H. Wu, Comparison between spray towers with and without fin coils for air dehumidification using triethylene glycol solutions and development of the mass-transfer correlations, Ind. Eng. Chem. Res. 39 (6) (2000) 2076.
[20Q] Y.J. Du, C.C. Wang, An experimental study of the airside performance of the superslit fin-and-tube heat exchangers, Int. J. Heat Mass Transfer 43 (24) (2000) 4475.
[21Q] L.E. Herranz, J.L. Munoz-Cobo, M.J. Palomo, Modeling condensation heat transfer on a horizontal finned tube in the presence of noncondensable gases, Nucl. Eng. Des. 201 (2) (2000) 273.
[22Q] R. Matsumoto, S. Kikkawa, M. Senda, M. Suzuki, Endwall heat transfer characteristics with a single oblique pin fin, J. Enhanced Heat Transfer 7 (3) (2000) 167.
[23Q] J.C. Min, R.L. Webb, Condensate carryover phenomena in dehumidifying, finned-tube heat exchangers, Exp. Thermal Fluid Sci. 22 (3) (2000) 175.
[24Q] Y. Park, J. Cha, M. Kim, Heat transfer augmentation characteristics of various inserts in a heat exchanger tube, J. Enhanced Heat Transfer 7 (1) (2000) 23.
[25Q] J.S. Paschkewitz, M.A. Smajdek, D.M. Pratt, "On-demand" electrohydrodynamic (EHD) heat transfer enhancement using an anionic surfactant, J. Enhanced Heat Transfer 7 (6) (2000) 385.
[26Q] R. Romero-Mendez, M. Sen, K.T. Yang, R. McCclain, Effect of fin spacing on convection in a plate fin and tube heat exchanger, Int. J. Heat Mass Transfer 43 (1) (2000) 39.
[27Q] V. Uhlenwinkel, R.X. Meng, K. Bauckhage, Investigation of heat transfer from circular cylinders in high power 10 and 20 kHz acoustic resonant fields, Int. J. Thermal Sci. 39 (8) (2000) 771.
[28Q] R. Vasudevan, V. Eswaran, G. Biswas, Winglet-type vortex generators for plate-fin heat exchangers using triangular fins, Numer. Heat Transfer Part A 38 (5) (2000) 533.
[29Q] C.C. Wang, Technology review – a survey of recent patents of fin-and-tube heat exchangers, J. Enhanced Heat Transfer 7 (5) (2000) 333.
[30Q] C.C. Wang, K.Y. Chi, Heat transfer and friction characteristics of plain fin-and-tube heat exchangers, part I: new experimental data, Int. J. Heat Mass Transfer 43 (15) (2000) 2681.
[31Q] C.C. Wang, K.Y. Chi, C.J. Chang, Heat transfer and friction characteristics of plain fin-and-tube heat exchangers, part II: correlation, Int. J. Heat Mass Transfer 43 (15) (2000) 2693.
[32Q] C.C. Wang, Y.T. Lin, C.J. Lee, An airside correlation for plain fin-and-tube heat exchangers in wet conditions, Int. J. Heat Mass Transfer 43 (10) (2000) 1869.
[33Q] C.C. Wang, W.H. Tao, Y.J. Du, Effect of waffle height on the air-side performance of wavy fin-and-tube heat exchangers under dehumidifying conditions, Heat Transfer Eng. 21 (5) (2000) 17.
[34Q] L.J. Wang, D.W. Sun, P. Liang, L.X. Zhuang, Y.K. Tan, Experimental studies on heat transfer enhancement of the inside and outside spirally triangle finned tube with small spiral angles for high-pressure preheaters, Int. J. Energy Res. 24 (4) (2000) 309.
[35Q] L.J. Wang, D.W. Sun, P. Liang, L.X. Zhuang, Y.K. Tan, Heat transfer characteristics of carbon steel spirally fluted tube for high pressure preheaters, Energy Conversion Manage. 41 (10) (2000) 993.
[36Q] A.S. Wood, G.E. Tupholme, P.J. Heggs, Steady-state heat transfer and performance assessment, Recent Adv. Anal. Heat Transfer Fin Type Surf. 5 (2000) 165.
[37Q] W.M. Yan, P.J. Sheen, Heat transfer and friction characteristics of fin-and-tube heat exchangers, Int. J. Heat Mass Transfer 43 (9) (2000) 1651.
[38Q] X.X. Zhu, M. Zanfir, J. Klemes, Heat transfer enhancement for heat exchanger network retrofit, Heat Transfer Eng. 21 (2) (2000) 7.

Fouling and surface effects

[39Q] M. Basset, J. McInerney, N. Arbeau, D.H. Lister, The fouling of alloy-800 heat exchange surfaces by magnetite particles, Can. J. Chem. Eng. 78 (1) (2000) 40.
[40Q] T.Y. Chen, S.H. Chan, Novel biological inhibitors of fouling and scale formation on heat transfer surfaces through genetic engineering, Microscale Thermophys. Eng. 4 (2) (2000) 103.
[41Q] Y.I. Cho, R. Liu, W.J. McFarland, L. Fusegni, Study of scale-removal methods in a double-pipe heat exchanger, Heat Transfer Eng. 21 (3) (2000) 50.
[42Q] A.K. Das, H.P. Kilty, P.J. Marto, A. Kumar, G.B. Andeen, Dropwise condensation of steam on horizontal corrugated tubes using an organic self-assembled monolayer coating, J. Enhanced Heat Transfer 7 (2) (2000) 109.
[43Q] P.E. Davis, M.R. Dorton, T.W. Evans, Why chemically clean thermal fluid systems?, Mater. Perform. 39 (9) (2000) 64.
[44Q] M. Forster, M. Bohnet, Modification of molecular interactions at the interface crystal/heat transfer surface to minimize heat exchanger fouling, Int. J. Thermal Sci. 39 (7) (2000) 697.
[45Q] M.C. Georgiadis, S. Macchietto, Dynamic modelling and simulation of plate heat exchangers under milk fouling, Chem. Eng. Sci. 55 (9) (2000) 1605.
[46Q] M.C. Georgiadis, L.G. Papageorgiou, S. Macchietto, Optimal cleaning policies in heat exchanger networks under rapid fouling, Ind. Eng. Chem. Res. 39 (2) (2000) 441.
[47Q] C.R. Gillham, P.J. Fryer, A.P.M. Hasting, D.I. Wilson, Enhanced cleaning of whey protein soils using pulsed flows, J. Food Eng. 46 (3) (2000) 199.

[48Q] O.A. Hamed, M.A.K. Al-Sofi, M. Imam, K.B. Mardouf, A.S. Al-Mobayed, A. Ehsan, Evaluation of polyphosphonate antiscalant at a low dose rate in the Al-Jubail Phase II MSF plant, Saudi Arabia, Desalination 128 (3) (2000) 275.
[49Q] A. Helalizadeh, H. Muller-Steinhagen, M. Jamialahmadi, Mixed salt crystallisation fouling, Chem. Eng. Process. 39 (1) (2000) 29.
[50Q] W. Li, R.L. Webb, Fouling in enhanced tubes using cooling tower water Part II: combined particulate and precipitation fouling, Int. J. Heat Mass Transfer 43 (19) (2000) 3579.
[51Q] M. Markowski, Reconstruction of a heat exchanger network under industrial constraints – the case of a crude distillation unit, Appl. Thermal Eng. 20 (15) (2000) 1535.
[52Q] H. Muller-Steinhagen, Q. Zhao, A. Helali-Zadeh, X.G. Ren, The effect of surface properties on $CaSO_4$ scale formation during convective heat transfer and subcooled flow boiling, Can. J. Chem. Eng. 78 (1) (2000) 12.
[53Q] M. Nikravesh, A.E. Farell, T.G. Stanford, Control of nonisothermal CSTR with time varying parameters via dynamic neural network control (DNNC), Chem. Eng. J. 76 (1) (2000) 1.
[54Q] I.C. Rose, A.P. Watkinson, N. Epstein, Testing a mathematical model for initial chemical reaction fouling using a dilute protein solution, Can. J. Chem. Eng. 78 (1) (2000) 5.
[55Q] A.Z. Sahin, S.M. Zubair, A.Z. Al-Garni, R. Kahraman, Effect of fouling on operational cost in pipe flow due to entropy generation, Energy Conversion Manage. 41 (14) (2000) 1485.
[56Q] A.K. Sheikh Zubair, S.M. Zubair, M. Younas, M.O. Budair, A risk based heat exchanger analysis subject to fouling Part II: economics of heat exchangers cleaning, Energy 25 (5) (2000) 445.
[57Q] R. Sheikholeslami, Calcium sulfate fouling-precipitation or particulate: a proposed composite model, Heat Transfer Eng. 21 (3) (2000) 24.
[58Q] R. Sheikholeslami, Composite fouling of heat transfer equipment in aqueous media – a review, Heat Transfer Eng. 21 (3) (2000) 34.
[59Q] P. Terdtoon, C. Coykaen, S. Tungkum, K. Kraitong, Corrosion and fouling of tubes used in a thermosyphon economizer: a case study of paint protection, Appl. Thermal Eng. 20 (9) (2000) 791.
[60Q] M. Thomson, P.M. Twigg, B.A. Majeed, N. Ruck, Statistical process control based fault detection of CHP units, Control Eng. Practice 8 (1) (2000) 13.
[61Q] C.W. Turner, S.J. Klimas, M.G. Brideau, Thermal resistance of steam-generator tube deposits under single-phase forced convection and flow-boiling heat transfer, Can. J. Chem. Eng. 78 (1) (2000) 53.
[62Q] R.L. Webb, W. Li, Fouling in enhanced tubes using cooling tower water. Part I: long-term fouling data, Int. J. Heat Mass Transfer 43 (19) (2000) 3567.
[63Q] Q.F. Yang, J. Ding, Z.Q. Shen, Investigation on fouling behaviors of low-energy surface and fouling fractal characteristics, Chem. Eng. Sci. 55 (4) (2000) 797.
[64Q] S.M. Zubair, A.K. Sheikh, M. Younas, M.O. Budair, A risk based heat exchanger analysis subject to fouling Part I: performance evaluation, Energy 25 (5) (2000) 427.

Mathematical modeling/analysis

[65Q] T.A. Ameel, Parallel-flow heat exchangers with ambient thermal interaction, Heat Transfer Eng. 21 (6) (2000) 18.
[66Q] A. Carotenuto, C. Casarosa, A lumped parameter model of the operating limits of one-well geothermal plant with down hole heat exchangers, Int. J. Heat Mass Transfer 43 (16) (2000) 2931.
[67Q] J. Cvengros, M. Micov, J. Lutisan, Modelling of fractionation in a molecular evaporator with divided condenser, Chem. Eng. Process. 39 (3) (2000) 191.
[68Q] S.K. Das, P. Nanda, Use of artificial neural network and leveque analogy for the exergy analysis of regenerator beds, Chem. Eng. Process. 39 (2) (2000) 113.
[69Q] C.D. Ho, An analytical study of laminar counterflow double-pass heat exchangers with external refluxes, Int. J. Heat Mass Transfer 43 (18) (2000) 3263.
[70Q] C.D. Ho, H.M. Yeh, C.H. Lu, S.C. Chiang, An analytical study of parallel-plate heat exchangers with insulation sheet inserted for double-flow operations, J. Chinese Inst. Chem. Eng. 31 (1) (2000) 33.
[71Q] J.W. Howse, G.A. Hansen, D.J. Cagliostro, K.R. Muske, Solving a thermal regenerator model using implicit Newton–Krylov methods, Numer. Heat Transfer Part A 38 (1) (2000) 23.
[72Q] E. Krepper, A. Schaffrath, A. Aszodi, Numerical simulation of the emergency condenser of the SWR-1000, Nucl. Sci. Eng. 135 (3) (2000) 267.
[73Q] S.Y. Liang, T.N. Wong, G.K. Nathan, Comparison of one-dimensional and two-dimensional models for wet-surface fin efficiency of a plate-fin-tube heat exchanger, Appl. Thermal Eng. 20 (10) (2000) 941.
[74Q] D. Matko, I. Skrjanc, G. Music, Robustness of fuzzy control and its application to a thermal plant, Math. Comput. Simulation 51 (3) (2000) 245.
[75Q] V.S. Prasad, S.K. Das, Temperature response of a single blow regenerator using axially dispersive thermal wave of finite propagation velocity – analysis and experiment, Int. J. Heat Fluid Flow 21 (2) (2000) 228.
[76Q] A.S. Rahmad, M.M. Elsayed, N.M. Al-Najem, A numerical investigation for the heat and mass transfer between parallel flow of air and desiccant falling film in a fin-tube arrangement, Hvac&R Res. 6 (4) (2000) 307.
[77Q] E.B. Ratts, Y.L. Murphey, Y.N. Zhou, Thermal modeling of controlled atmosphere brazing process using virtual reality technology, Appl. Thermal Eng. 20 (17) (2000) 1667.
[78Q] M.L. Silva, R.J. Zemp, Retrofit of pressure drop constrained heat exchanger networks, Appl. Thermal Eng. 20 (15) (2000) 1469.

[79Q] E. Weyer, G. Szederkenyi, K. Hangos, Grey box fault detection of hear exchangers, Control Eng. Practice 8 (2) (2000) 121.

[80Q] W. Zalewski, B. Niezgoda-Zelasko, M. Litwin, Optimization of evaporative fluid coolers, Int. J. Refrig. 23 (7) (2000) 553.

Performance-factors affecting

[81Q] A.A. Aganda, J.E.R. Coney, P.E. Farrant, C.G.W. Sheppard, T. Wongwuttanasatian, A comparison of the predicted and experimental heat transfer performance of a finned tube evaporator, Appl. Thermal Eng. 20 (6) (2000) 499.

[82Q] A.A. Aganda, J.E.R. Coney, C.G.W. Sheppard, Airflow maldistribution and the performance of a packaged air conditioning unit evaporator, Appl. Thermal Eng. 20 (6) (2000) 515.

[83Q] D.R.H. Beattie, Effect of disuniformities in vapor saturation pressure and coolant velocity on vapor back flow phenomena in single-pass air-cooled condensers – Comment, Int. J. Heat Mass Transfer 43 (1) (2000) 161.

[84Q] I. Cristescu, M. Zamfirache, Determination of heat transfer coefficients for hydrogen condensation in condensers of various geometries, Int. J. Thermal Sci. 39 (6) (2000) 659.

[85Q] G. Fabbri, Effect of disuniformities in vapor saturation pressure and coolant velocity on vapor back flow phenomena in single-pass air-cooled condensers, Int. J. Heat Mass Transfer 43 (1) (2000) 147.

[86Q] G. Fabbri, Effect of nonuniformities in vapor saturation pressure and coolant velocity on noncondensable contaminant accumulation in single-pass air-cooled condensers, Heat Transfer Eng. 21 (6) (2000) 44.

[87Q] A. Faghri, V.K. Dhir, Y. Jaluria, Effect of disuniformities in vapor saturation pressure and coolant velocity on vapor back flow phenomena in single-pass air-cooled condensers – Reply, Int. J. Heat Mass Transfer 43 (1) (2000) 162.

[88Q] J.E. Hesselgreaves, Rationalisation of second law analysis of heat exchangers, Int. J. Heat Mass Transfer 43 (22) (2000) 4189.

[89Q] R.T. Ogulata, F. Doba, T. Yilmaz, Irreversibility analysis of cross flow heat exchangers, Energy Conversion Manage. 41 (15) (2000) 1585.

[90Q] H.V. Rao, Isentropic recuperative heat exchanger with regenerative work transfer, Proc. Inst. Mech. Eng. Part C 214 (4) (2000) 609.

[91Q] J.Y. San, C.L. Jan, Second-law analysis of a wet crossflow heat exchanger, Energy 25 (10) (2000) 939.

[92Q] I. Usherov-Marshak, A. Schindler, R. Konig, Compacted Ag powder at very low temperatures: acoustic and magnetic properties and their influence on the thermal coupling to liquid He-3, Phys. B 284 (2) (2000) 202.

[93Q] C.C. Wang, R.L. Webb, K.Y. Chi, Data reduction for air-side performance of fin-and-tube heat exchangers, Exp. Thermal Fluid Sci. 21 (4) (2000) 218.

Power and reversed cycles

[94Q] M.B. Arun, M.P. Maiya, S.S. Murthy, Equilibrium low pressure generator temperatures for double-effect series flow absorption refrigeration systems, Appl. Thermal Eng. 20 (3) (2000) 227.

[95Q] H.M. Chang, D.J. Park, S. Jeong, Effect of gap flow on shuttle heat transfer, Cryogenics 40 (3) (2000) 159.

[96Q] Y.S. Chang, M.S. Kim, S.T. Ro, Performance and heat transfer characteristics of hydrocarbon refrigerants in a heat pump system, Int. J. Refrig. 23 (3) (2000) 232.

[97Q] S.A. Klein, D.T. Reindl, K. Brownell, Refrigeration system performance using liquid-suction heat exchangers, Int. J. Refrig. 23 (8) (2000) 588.

[98Q] S.Y. Liang, T.N. Wong, G.K. Nathan, Study on refrigerant circuitry of condenser coils with exergy destruction analysis, Appl. Thermal Eng. 20 (6) (2000) 559.

[99Q] J. Llobet, V. Goetz, Rotary system for the continuous production of cold by solid–gas sorption: modeling and analysis of energy performance, Int. J. Refrig. 23 (8) (2000) 609.

[100Q] V. Martin, D.Y. Goswami, Effectiveness of heat and mass transfer processes in a packed bed liquid desiccant dehumidifier/regenerator, Hvac&R Res. 6 (1) (2000) 21.

[101Q] P. Neveu, C. Babo, A simplified model for pulse tube refrigeration, Cryogenics 40 (3) (2000) 191.

[102Q] A.B. Patel, J.G. Brisson, Experimental evaluation of a single stage superfluid stirling refrigerator using a large plastic recuperator, J. Low Temperature Phys. 118 (3) (2000) 201.

Shell and tube/Plate heat exchangers

[103Q] J.I. Calvert, Troubleshooting shell-and-tube heat exchangers, Heat Transfer Eng. 21 (6) (2000) 3.

[104Q] M. Ciofalo, I. DiPiazza, J.A. Stasiek, Investigation of flow and heat transfer in corrugated–undulated plate heat exchangers, Heat Mass Transfer 36 (5) (2000) 449.

[105Q] S.K. Das, K. Murugesan, Transient response of multipass plate heat exchangers with axial thermal dispersion in fluid, Int. J. Heat Mass Transfer 43 (23) (2000) 4327.

[106Q] P.A. Feenstra, D.S. Weaver, R.L. Judd, An improved void fraction model for two-phase cross-flow in horizontal tube bundles, Int. J. Multiphase Flow 26 (11) (2000) 1851.

[107Q] A. Feldman, C. Marvillet, M. Lebouche, Nucleate and convective boiling in plate fin heat exchangers, Int. J. Heat Mass Transfer 43 (18) (2000) 3433.

[108Q] Y.T. Kang, A. Akisawa, T. Kashiwagi, Analytical investigation of two different absorption modes: falling film and bubble types, Int. J. Refrig. 23 (6) (2000) 430.

[109Q] K. Kawamura, A. Yasuo, Turbulence-induced tube vibration by parallel air–water two-phase jet flow, JSME Int. J. Ser. C 43 (1) (2000) 1.

[110Q] S.J. Lee, T.H. Song, Application of grooved fins to enhance forced convection to transverse flow, Numer. Heat Transfer Part A 38 (5) (2000) 491.
[111Q] M.A. Mehrabian, R. Poulter, Hydrodynamics and thermal haracteristics of corrugated channels: computational approach, Appl. Math. Model. 24 (5) (2000) 343.
[112Q] M.R.J. Nasr, G.T. Polley, An algorithm for cost comparison of optimized shell-and-tube west exchangers with tube inserts and plain tubes, Chem. Eng. Technol. 23 (3) (2000) 267.
[113Q] O. Strelow, A general calculation method for plate heat exchangers, Int. J. Thermal Sci. 39 (6) (2000) 645.

Thermosyphons

[114Q] M. Gao, Y. Cao, J.E. Beam, B. Donovan, Structural optimization of axially grooved flat miniature heat pipes, J. Enhanced Heat Transfer 7 (6) (2000) 361.
[115Q] K.A. Joudi, A.M. Witwit, Improvements of gravity assisted wickless heat pipes, Energy Conversion Manage. 41 (18) (2000) 2041.
[116Q] T.J. LaClair, I. Mudawar, Thermal transients in a capillary evaporator prior to the initiation of boiling, Int. J. Heat Mass Transfer 43 (21) (2000) 3937.
[117Q] J. Ling, Y.D. Cao, Closed-form analytical solutions for radially rotating miniature high-temperature heat pipes including non-condensable gas effects, Int. J. Heat Mass Transfer 43 (19) (2000) 3661.
[118Q] B. Mo, M.M. Ohadi, S.V. Dessiatoun, K.R. Wrenn, Capillary pumped-loop thermal performance improvement with electrohydrodynamic technique, J. Thermophys. Heat Transfer 14 (1) (2000) 103.
[119Q] T. Nguyen, M. Mochizuki, K. Mashiko, Y. Saito, I. Sauciuc, R. Boggs, Advanced cooling system using miniature heat pipes in mobile PC, IEEE Trans. Components Packaging Technol. 23 (1) (2000) 86.
[120Q] S.H. Noie-Baghban, G.R. Majideian, Waste heat recovery using heat pipe heat exchanger (HPHE) for surgery rooms in hospitals, Appl. Thermal Eng. 20 (14) (2000) 1271.
[121Q] T. Payakaruk, P. Terdtoon, S. Ritthidech, Correlations to predict heat transfer characteristics of an inclined closed two-phase thermosyphon at normal operating conditions, Appl. Thermal Eng. 20 (9) (2000) 781.
[122Q] C. Ramaswamy, Y.K. Joshi, W. Nakayama, W.B. Johnson, Combined effects of sub-cooling and operating pressure on the performance of a two-chamber thermosyphon, IEEE Trans. Components Packaging Technol. 23 (1) (2000) 61.
[123Q] V. Sartre, M.C. Zaghdoudi, M. Lallemand, Effect of interfacial phenomena on evaporative heat transfer in micro heat pipes, Int. J. Thermal Sci. 39 (4) (2000) 498.
[124Q] J.R. Turnpenny, D.W. Etheridge, D.A. Reay, Novel ventilation cooling system for reducing air conditioning in buildings. Part I: testing and theoretical modelling, Appl. Thermal Eng. 20 (11) (2000) 1019.
[125Q] Y. Wang, K. Vafai, An experimental investigation of the thermal performance of an asymmetrical flat plate heat pipe, Int. J. Heat Mass Transfer 43 (15) (2000) 2657.
[126Q] Y. Wang, K. Vafai, Transient characterization of flat plate heat pipes during startup and shutdown operations, Int. J. Heat Mass Transfer 43 (15) (2000) 2641.
[127Q] Z.J. Zuo, J.E. Fale, N.J. Gernert, Study of a drainage disk thermosyphon condenser design, J. Enhanced Heat Transfer 7 (3) (2000) 207.

Miscellaneous

[128Q] B.J. Alappat, V.C. Rane, Performance prediction of an RCFB incineration system, J. Energy Eng. – ASCE 126 (2) (2000) 53.
[129Q] G. Bisio, G. Rubatto, R. Martini, Heat transfer, energy saving and pollution control in UHP electric-arc furnaces, Energy 25 (11) (2000) 1047.
[130Q] C.R. Chen, H.S. Ramaswamy, A neuro-computing approach for modeling of residence time distribution (RTD) of carrot cubes in a vertical scraped surface heat exchanger (SSHE), Food Res. Int. 33 (7) (2000) 549.
[131Q] E. Dumont, D. Della Valle, F. Fayolle, Influence of flow regimes on temperature heterogeneities within a scraped surface heat exchanger, J. Food Process Eng. 23 (3) (2000) 207.
[132Q] E. Dumont, F. Fayolle, J. Legrand, Electrodiffusional wall shear rate analysis in scraped surface heat exchanger, AICHE J. 46 (6) (2000) 1138.
[133Q] J. Facao, A.C. Oliveira, Thermal behaviour of closed wet cooling towers for use with chilled ceilings, Appl. Thermal Eng. 20 (13) (2000) 1225.
[134Q] L. Ketteringham, S. James, The use of high thermal conductivity inserts to improve the cooling of cooked foods, J. Food Eng. 45 (1) (2000) 49.
[135Q] C.S. Kim, E.S. Putilin, Emission characteristics of electron-beam evaporators, J. Opt. Technol. 67 (4) (2000) 386.
[136Q] X.H. Ma, J.W. Rose, D.Q. Xu, J.F. Lin, B.X. Wang, Advances in dropwise condensation heat transfer: Chinese research, Chem. Eng. J. 78 (2) (2000) 87.
[137Q] S. Neti, E.I. Wolfe, Measurements of effectiveness in a silica gel rotary exchanger, Appl. Thermal Eng. 20 (4) (2000) 309.
[138Q] C. Riverol, V. Napolitano, Nonlinear control of an evaporator using an error trajectory technique, J. Chem. Technol. Biotechnol. 75 (11) (2000) 1047.
[139Q] F. Zenklusen, L. Reh, Homogeneous gas–solid suspensions for efficient downflow reactors, Chem. Eng. Commun. 181 (2000) 57.

Heat transfer – general applications: *Buildings*

[1S] M.H. Adjali, M. Davies, C. Ni Riain, J.G. Littler, In situ measurements and numerical simulation of heat transfer beneath a heated ground floor slab, Energy Build. 33 (1) (2000) 75.
[2S] M.H. Adjali, M. Davies, S.W. Rees, J. Littler, Temperatures in and under a slab-on-ground floor: two- and three-dimensional numerical simulations and

comparison with experimental data, Build. Environ. 35 (7) (2000) 655.
[3S] N. Alvares, A.C. Fernandez-Pello, Fire initiation and spread in overloaded communication system cable trays, Exp. Thermal Fluid Sci. 21 (1) (2000) 51.
[4S] Y.M. Chen, Z.K. Chen, A neural-network-based experimental technique for determining z-transfer function coefficients of a building envelope, Build. Environ. 35 (3) (2000) 181.
[5S] S. Choi, M. Krarti, Thermally optimal insulation distribution for underground structures, Energy Build. 32 (3) (2000) 251.
[6S] R. Codina, C. Morton, E. Onate, O. Soto, Numerical aerodynamic analysis of large buildings using a finite element model with application to a telescope building, Int. J. Numer. Meth. Heat Fluid Flow 10 (5) (2000) 616.
[7S] C. Giaconia, A. Orioli, On the reliability of ASHRAE conduction transfer function coefficients of walls, Appl. Thermal Eng. 20 (1) (2000) 21.
[8S] S. Gilham, D.M. Deaves, P. Woodburn, Mitigation of dense gas releases within buildings: validation of CFD modelling, J. Hazard. Mater. (2000) 193 (special issue).
[9S] H.R. Lu, S. Swaddiwudhipong, T.H. Wee, Evaluation of internal restrained strain in concrete members at early age, ACI Mater. J. 97 (5) (2000) 612.
[10S] M.A. Medina, On the performance of radiant barriers in combination with different attic insulation levels, Energy Build. 33 (1) (2000) 31.
[11S] C. Menezo, H. Bouia, J.J. Roux, J. Virgone, Adaptation of the balanced realization to the coupling of reduced order models for the modelling of the thermal behavior of buildings, Math. Comput. Simulation 53 (4) (2000) 395.
[12S] K.A. Papakonstantinou, C.T. Kiranoudis, N.C. Markatos, Computational analysis of thermal comfort: the case of the archaeological museum of Athens, Appl. Math. Model. 24 (7) (2000) 477.
[13S] K.A. Papakonstantinou, C.T. Kiranoudis, N.C. Markatos, Mathematical modeling of environmental conditions inside historical buildings. The case of the archaeological museum of Athens, Energy Build. 31 (3) (2000) 211.
[14S] K.A. Papakonstantinou, C.T. Kiranoudis, N.C. Markatos, Numerical simulation of air flow field in single-sided ventilated buildings, Energy Build. 33 (1) (2000) 41.

Meteorology

[15S] T. Babadagli, Optimum steam injection strategies for naturally fractured reservoirs, Petrol. Sci. Technol. 18 (3) (2000) 375.
[16S] M.P. Bonnet, M. Poulin, J. Devaux, Numerical modeling of thermal stratification in a lake reservoir. Methodology and case study, Aquatic Sci. 62 (2) (2000) 105.
[17S] C.R. Burn, The thermal regime of a retrogressive thaw slump near Mayo, Yukon Territory, Can. J. Earth Sci. 37 (7) (2000) 967.
[18S] S.L. Butler, W.R. Peltier, On scaling relations in time-dependent mantle convection and the heat transfer constraint on layering, J. Geophys. Res. 105 (B2) (2000) 3175.
[19S] M. Chijimatsu, T. Fujita, A. Kobayashi, M. Nakano, Experiment and validation of numerical simulation of coupled thermal, hydraulic and mechanical behaviour in the engineered buffer materials, Int. J. Numer. Anal. Meth. Geomech. 24 (4) (2000) 403.
[20S] R.A. Dare, B.W. Atkinson, Atmospheric response to spatial variations in concentration and size of polynyas in the Southern Ocean sea–ice zone, Bound. Layer Meteorol. 94 (1) (2000) 65.
[21S] C. Delon, A. Druilhet, R. Delmas, P. Durand, Dynamic and thermodynamic structure of the lower troposphere above rain forest and wet savanna during the EXPRESSO campaign, J. Geophys. Res. 105 (D11) (2000) 14823.
[22S] F. Domingo, L. Villagarcia, A.J. Brenner, J. Puigdefabregas, Measuring and modelling the radiation balance of a heterogeneous shrubland, Plant, Cell Environ. 23 (1) (2000) 27.
[23S] J.R. Gemmrich, Temperature anomalies beneath breaking waves and the decay of wave-induced turbulence, J. Geophys. Res. 105 (C4) (2000) 8727.
[24S] J.P. Lhomme, A. Chehbouni, B. Monteny, Sensible heat flux-radiometric surface temperature relationship over sparse vegetation: parameterizing B-1, Bound. Layer Meteorol. 97 (3) (2000) 431.
[25S] G.C. Lin, J.A. Nunn, D. Deming, Thermal buffeting of sedimentary basins by basement rocks: implications arising from numerical simulations, Petrol. Geosci. 6 (4) (2000) 299.
[26S] A.H. Lynch, R.I. Cullather, An investigation of boundary-forcing sensitivities in a regional climate model, J. Geophys. Res. 105 (D21) (2000) 26603.
[27S] V. Masson, A physically-based scheme for the urban energy budget in atmospheric models, Bound. Layer Meteorol. 94 (3) (2000) 357.
[28S] M. Mohan, Estimation of sensible heat flux from radiometric temperature over crop canopy, Indian J. Agric. Sci. 70 (1) (2000) 13.
[29S] A.M. Paiva, E.P. Chassignet, A.J. Mariano, Numerical simulations of the North Atlantic subtropical gyre: sensitivity to boundary conditions, Dyn. Atmos. Oceans 32 (3) (2000) 209.
[30S] O.P. Polyansky, J. Poort, 2D modelling of fluid flow and heat transport during the evolution of the Baikal rift, J. Geochem. Exploration (2000) 77 (special issue).
[31S] H.S. Silva, J.W. Romero, R.B. Venturini, J.E. Gonzalez, Heat transfer studies in natural carbonates from San Juan (Argentina), Thermochim. Acta 360 (2) (2000) 169.

Thermodynamics

[32S] A.E. Allahverdyan, T.M. Nieuwenhuizen, Steady adiabatic state: its thermodynamics, entropy production, energy dissipation, and violation of Onsager relations, Phys. Rev. E Part B (2000) 845.

[33S] D.A. Blank, C. Wu, Cooling and heating rate limits of a reversed reciprocating Ericsson cycle at steady state, Proc. Inst. Mech. Eng. Part A 214 (A1) (2000) 75.
[34S] V. Eveloy, J. Lohan, P. Rodgers, A benchmark study of computational fluid dynamics predictive accuracy for component-printed circuit board heat transfer, IEEE Trans. Components Packaging Technol. 23 (3) (2000) 568.
[35S] D.P. Georgiou, Useful work and the thermal efficiency in the ideal Lenolr cycle with regenerative preheating, J. Appl. Phys. 88 (10) (2000) 5981.
[36S] K. Lucas, On the thermodynamics of cogeneration, Int. J. Thermal Sci. 39 (9) (2000) 1039.
[37S] A.M. Tsirlin, V. Kazakov, Maximal work problem in finite-time thermodynamics, Phys. Rev. E Part A (2000) 307.
[38S] J.V.C. Vargas, A. Bejan, Thermodynamic optimization of the match between two streams with phase change, Energy 25 (1) (2000) 15.

Engines

[39S] S.H. Chan, D.L. Hoang, Chemical reactions in the exhaust system of a cold-start engine, Chem. Eng. Technol. 23 (8) (2000) 727.
[40S] I.H. Cho, S.W. Baek, Numerical analysis of ignition transient in an axisymmetric solid rocket motor equipped with rear ignition system, Combust. Sci. Technol. 152 (2000) 81.
[41S] S. Harmand, B. Watel, B. Desmet, Local convective heat exchanges from a rotor facing a stator, Int. J. Thermal Sci. 39 (3) (2000) 404.
[42S] P. Ligrani, Flow visualization and flow tracking as applied to turbine components in gas turbine engines, Measure. Sci. Technol. 11 (7) (2000) 992.
[43S] S.S. Shy, W.K. I, M.L. Lin, A new cruciform burner and its turbulence measurements for premixed turbulent combustion study, Exp. Thermal Fluid Sci. 20 (3) (2000) 105.
[44S] J.F. Wiedenhoefer, R.D. Reitz, Modeling the effect of EGR and multiple injection schemes on IC engine component temperatures, Numer. Heat Transfer Part A 37 (7) (2000) 673.

Nuclear reactors

[45S] M.H. Chun, Y.H. Ryu, Thermal analysis of a simulated CANDU 37-element spent fuel bundle with air backfill, Nucl. Eng. Des. 199 (1) (2000) 85.
[46S] E. Goos, H. Hippler, K. Hoyermann, B. Jurges, Laser powered homogeneous pyrolysis of butane initiated by methyl radicals in a quasi-wall-free reactor at 750–1000 K, Phys. Chem. Chem. Phys. 2 (22) (2000) 5127.
[47S] M. Nishimura, H. Kamide, K. Hayashi, K. Momoi, Transient experiments on fast reactor core thermal-hydraulics and its numerical analysis Inter-subassembly heat transfer and inter-wrapper flow under natural circulation conditions, Nucl. Eng. Des. 200 (1) (2000) 157.
[48S] K. Sakamoto, T. Koga, M. Wataru, Y. Hattori, Heat removal characteristics of vault storage system with cross flow for spent fuel, Nucl. Eng. Des. 195 (1) (2000) 57.
[49S] O.B. Samoilov, A.V. Kupriyanov, I.A. Nagaev, S.M. Dmitriev, Experimental investigations of transcritical heat transfer on an electrically heated model of a fuel assembly, Atomic Energy 88 (4) (2000) 263.
[50S] H. Takamatsu, T. Matsunaga, R.M. Wilson, T. Kusakabe, Sludge collector performance in steam generators of pressurized water reactor, Nucl. Eng. Des. 200 (1) (2000) 295.
[51S] L.W. Ward, Application of the two-dimensional Navier–Stokes equations to steam cooling in asymmetrically heated channels, Nucl. Technol. 131 (1) (2000) 69.

Chemical reactors

[52S] V. Alopaeus, J. Aittamaa, Appropriate simplifications in calculation of mass transfer in a multicomponent rate-based distillation tray model, Ind. Eng. Chem. Res. 39 (11) (2000) 4336.
[53S] J. Brozio, H.J. Bart, Heat transfer and hydrodynamics in preparative continuous annular chromatography (P-CAC), Chem. Eng. Technol. 23 (10) (2000) 893.
[54S] W.K.S. Chiu, Y. Jaluria, Continuous chemical vapor deposition processing with a moving finite thickness susceptor, J. Mater. Res. 15 (2) (2000) 317.
[55S] W.K.S. Chiu, Y. Jaluria, N.G. Glumac, Numerical simulation of chemical vapor deposition processes under variable and constant property approximations, Numer. Heat Transfer Part A 37 (2) (2000) 113.
[56S] W.K. Cho, D.H. Choi, Optimization of a horizontal MOCVD reactor for uniform epitaxial layer growth, Int. J. Heat Mass Transfer 43 (10) (2000) 1851.
[57S] B. Coda, L. Tognotti, The prediction of char combustion kinetics at high temperature, Exp. Thermal Fluid Sci. 21 (1) (2000) 79.
[58S] J. Cunha, J.L.T. Azevedo, Modelling the integration of a compact plate steam reformer in a fuel cell system, J. Power Sources 86 (1) (2000).
[59S] M. Grujicic, S.G. Lai, Multi-length scale modeling of CVD of diamond – Part I – A combined reactor-scale/atomic-scale analysis, J. Mater. Sci. 35 (21) (2000) 5359.
[60S] A. Gupta, P.K. Nag, Prediction of heat transfer coefficient in the cyclone separator of a CFB, Int. J. Energy Res. 24 (12) (2000) 1065.
[61S] W. He, K. Hemmes, Operating characteristics of a reformer for molten carbonate fuel-cell power-generation systems, Fuel Process. Technol. 67 (1) (2000) 61.
[62S] H.Y. Kim, H.C. Kim, V.V. Levdansky, V.G. Leitsina, J. Smolik, Chemical deposition of substance from gas phase in nonisothermal channels, Int. J. Heat Mass Transfer 43 (20) (2000) 3877.
[63S] J.H. Koh, B.S. Kang, H.C. Lim, Effect of various stack parameters on temperature rise in molten

carbonate fuel cell stack operation, J. Power Sources 91 (2) (2000) 161.
[64S] G.C. Koltsakis, A.M. Stamatelos, Thermal response of automotive hydrocarbon adsorber systems, J. Eng. Gas Turbines Power – Trans. ASME 122 (1) (2000) 112.
[65S] R. Konig, Frontiers in refrigeration and cooling: how to obtain and sustain ultralow temperatures beyond nature's ambience, Int. J. Refrig. 23 (8) (2000) 577.
[66S] G.V. Kuznetsov, V.P. Rudzinskii, High-temperature heat and mass transfer in a layer of coke of heat-shielding materials, High Temperature – USSR 38 (4) (2000) 629.
[67S] S. Levesque, M. Ciureanu, R. Roberge, T. Motyka, Hydrogen storage for fuel cell systems with stationary applications – I. Transient measurement technique for packed bed evaluation, Int. J. Hydrogen Energy 25 (11) (2000) 1095.
[68S] J. Makinia, S.A. Wells, A general model of the activated sludge reactor with dispersive flow – I. Model development and parameter estimation, Water Res. 34 (16) (2000) 3987.
[69S] K.R. Morris, J.G. Stowell, S.R. Byrn, A.W. Placette, T.D. Davis, G.E. Peck, Accelerated fluid bed drying using NIR monitoring and phenomenological modeling, Drug Develop. Ind. Pharmacy 26 (9) (2000) 985.
[70S] K.R. Muske, J.W. Howse, G.A. Hansen, D.J. Cagliostro, Model-based control of a thermal regenerator. Part 1. Dynamic model, Comput. Chem. Eng. 24 (11) (2000) 2519.
[71S] X. Ni, J.A. Cosgrove, A.D. Arnott, C.A. Greated, R.H. Cumming, On the measurement of strain rate in an oscillatory baffled column using particle image velocimetry, Chem. Eng. Sci. 55 (16) (2000) 3195.
[72S] K.W. Park, H.Y. Pak, Characteristics of three-dimensional flow, heat, and mass transfer in a chemical vapor deposition reactor, Numer. Heat Transfer Part A 37 (4) (2000) 407.
[73S] F. Patisson, E. Lebas, F. Hanrot, D. Ablitzer, J.L. Houzelot, Coal pyrolysis in a rotary kiln: part II. Overall model of the furnace, Metall. Mater. Trans. B 31 (2) (2000) 391.
[74S] J.P. Pontaza, J.N. Reddy, Numerical simulation of tubular blown film processing, Numer. Heat Transfer Part A 37 (3) (2000) 227.
[75S] C.L. Rai, I. Devotta, P.G. Rao, Heat transfer to viscous Newtonian and non-Newtonian fluids using helical ribbon agitator, Chem. Eng. J. 79 (1) (2000) 73.
[76S] S. Shimpalee, S. Dutta, Numerical prediction of temperature distribution in PEM fuel cells, Numer. Heat Transfer Part A 38 (2) (2000) 111.
[77S] J.V.C. Vargas, J.C. Ordonez, A. Bejan, Power extraction from a hot stream in the presence of phase change, Int. J. Heat Mass Transfer 43 (2) (2000) 191.
[78S] R. Wanker, M. Berg, H. Raupenstrauch, G. Staudinger, Numerical simulation of monolithic catalysts with a heterogeneous model and comparison with experimental results from a wood-fired domestic boiler, Chem. Eng. Technol. 23 (6) (2000) 535.
[79S] J.Z. Xiao, L.J. Wang, X.J. Wei, X.Y. Li, T.Q. Zhang, Process simulation for a tubular coking heater, Petrol. Sci. Technol. 18 (3) (2000) 319.
[80S] J. Yang, C. Malendoma, C. Roy, Determination of the overall heat transfer coefficient in a vacuum pyrolysis moving and stirred bed reactor, Chem. Eng. Res. Des. 78 (A4) (2000) 633.
[81S] L.D. Yang, K.T. Chuang, A new approach to simulation of distillation in packed columns, Comput. Chem. Eng. 24 (8) (2000) 1843.

Manufacturing and processing

[82S] M. Akermo, B.T. Astrom, Modeling compression molding of all-thermoplastic honeycomb core sandwich components. Part A: model development, Polym. Compos. 21 (2) (2000) 245.
[83S] H. Cetinel, M. Toparli, L. Ozsoyeller, A finite element based prediction of the microstructural evolution of steels subjected to the Tempcore process, Mech. Mater. 32 (6) (2000) 339.
[84S] N. Chakraborti, K. Deb, A. Jha, A genetic algorithm based heat transfer analysis of a bloom re-heating furnace, Steel Res. 71 (10) (2000) 396.
[85S] D.J. de Kock, K.J. Craig, J.A. Snyman, Using mathematical optimization in the CFD analysis of a continuous quenching process, Int. J. Numer. Meth. Eng. 47 (5) (2000) 985.
[86S] Z.M. Ding, S.J. Li, H. Yang, L.J. Lee, H. Engelen, P.M. Puckett, Numerical and experimental analysis of resin flow and cure in resin injection pultrusion (RIP), Polym. Compos. 21 (5) (2000) 762.
[87S] N. Ebrill, Y. Durandet, L. Strezov, Dynamic reactive wetting and its role in hot dip coating of steel sheet with an Al–Zn–Si alloy, Metall. Mater. Trans. B 31 (5) (2000) 1069.
[88S] A. Fic, A.J. Nowak, R. Bialecki, Heat transfer analysis of the continuous casting process by the front tracking BEM, Eng. Anal. Bound. Elements 24 (3) (2000) 215.
[89S] G. Garcia-Gil, R. Colas, Calculation of thermal crowning in work rolls from their cooling curves, Int. J. Mach. Tools Manuf. 40 (14) (2000) 1977.
[90S] B.Z. Guo, X.H. Xia, F.R. Camisani-Calzolari, I.K. Craig, A semi-discrete approach to modelling and control of the continuous casting process, Steel Res. 71 (6) (2000) 220.
[91S] Y.M. Guo, Y. Yokouchi, K. Nakanishi, Hot backward extrusion comparative analyses by a combined finite element method, Int. J. Mech. Sci. 42 (9) (2000) 1867.
[92S] Z. Hu, L.H. Zhu, B.Y. Wang, Z. Liu, Y.C. Miao, P.L. Xie, S.X. Gu, W. Sheng, Computer simulation of the deep extrusion of a thin-walled cup using the thermo-mechanically coupled elasto-plastic FEM, J. Mater. Process. Technol. 102 (1) (2000) 128.
[93S] S.S. Hur, J.R. Youn, Thermal deformation of a photo-cured polymer for the analysis of stereolithography, Polym. Plast. Technol. Eng. 39 (4) (2000) 651.
[94S] L.R. Jia, S.M. Xiong, B.C. Liu, Study on numerical simulation of mold filling and heat transfer in die

casting process, J. Mater. Sci. Technol. 16 (3) (2000) 269.

[95S] J.A. Khan, L.J. Xu, Y.J. Chao, K. Broach, Numerical simulation of resistance spot welding process, Numer. Heat Transfer Part A 37 (5) (2000) 425.

[96S] D.S. Kim, C.W. Macosko, Reaction injection molding process of glass fiber reinforced polyurethane composites, Polym. Eng. Sci. 40 (10) (2000) 2205.

[97S] J.G. Kim, K.Y. Huh, Prediction of transient slab temperature distribution in the re-heating furnace of a walking-beam type for rolling of steel slabs, ISIJ Int. 40 (11) (2000) 1115.

[98S] Y.C. Lam, S.C. Joshi, X.L. Liu, Numerical simulation of the mould-filling process in resin-transfer moulding, Compos. Sci. Technol. 60 (6) (2000) 845.

[99S] Y.C. Lam, Y. Shengjie, S.C.M. Yu, K.C. Tam, Simulation of polymer removal from a powder injection molding compact by thermal debinding, Metall. Mater. Trans. A 31 (10) (2000) 2597.

[100S] A.S. Lavine, An exact solution for surface temperature in down grinding, Int. J. Heat Mass Transfer 43 (24) (2000) 4447.

[101S] C.L. Lee, J.C. Ho, K.H. Wei, Resin transfer molding (RTM) process of a high performance epoxy resin. I: kinetic studies of cure reaction, Polym. Eng. Sci. 40 (4) (2000) 929.

[102S] C.M. Lee, D.Y. Yang, A three-dimensional steady-state finite element analysis of square die extrusion by using automatic mesh generation, Int. J. Mach. Tools Manuf. 40 (1) (2000) 33.

[103S] Z.C. Lin, T.G. Huang, Hot rolling of an aluminum–copper sandwich flat strip with the three-dimensional finite element method, J. Mater. Process. Technol. 99 (1) (2000) 154.

[104S] J. Liu, Y.S. Chen, Simulation of rapid thermal processing in a distributed computing environment, Numer. Heat Transfer Part A 38 (2) (2000) 129.

[105S] X.L. Liu, I.G. Crouch, Y.C. Lam, Simulation of heat transfer and cure in pultrusion with a general-purpose finite element package, Compos. Sci. Technol. 60 (6) (2000) 857.

[106S] A. Mahrle, J. Schmidt, D. Weiss, Simulation of temperature fields in arc and beam welding, Heat Mass Transfer 36 (2) (2000) 117.

[107S] L.G. Olson, R. Crawford, M. Kearns, N. Geiger, Rotational molding of plastics: comparison of simulation and experimental results for an axisymmetric mold, Polym. Eng. Sci. 40 (8) (2000) 1758.

[108S] C.A.M. Pinheiro, I.V. Samarasekera, J.K. Brimacombe, B.N. Walker, Mould heat transfer and continuously cast billet quality with mould flux lubrication – Part 1 – mould heat transfer, Ironmaking Steelmaking 27 (1) (2000) 37.

[109S] Y. Qin, R. Balendra, K. Chodnikiewicz, A method for the simulation of temperature stabilisation in the tools during multi-cycle cold-forging operations, J. Mater. Process. Technol. 107 (1) (2000) 252.

[110S] M. Sedighi, C.A. McMahon, The influence of quenchant agitation on the heat transfer coefficient and residual stress development in the quenching of steels, Proc. Inst. Mech. Eng. Part B 214 (7) (2000) 555.

[111S] A. Shirizly, J.G. Lenard, The effect of scaling and emulsion delivery on heat transfer during the hot rolling of steel strips, J. Mater. Process. Technol. 101 (1) (2000) 250.

[112S] P.M. Sobrinho, J.A. Carvalho, J.L. Silveira, P. Magalhaes, Analysis of aluminum plates under heating in electrical and natural gas furnaces, Energy 25 (10) (2000) 975.

[113S] R.N. Suzuki, R.E. Trevisan, O.V. Trevisan, Analytical solutions for heat flow in multiple pass welding, Sci. Technol. Welding Joining 5 (2) (2000) 63.

[114S] A.E. Varela, Self-tuning pressure control in an injection moulding cavity during filling, Chem. Eng. Res. Des. 78 (A1) (2000) 79.

Food processing

[115S] O.D. Baik, M. Marcotte, F. Castaigne, Cake baking in tunnel type multi-zone industrial ovens – Part I. Characterization of baking conditions, Food Res. Int. 33 (7) (2000) 587.

[116S] S. Denys, L.R. Ludikhuyze, A.M. Van Loey, M.E. Hendrickx, Modeling conductive heat transfer and process uniformity during batch high-pressure processing of foods, Biotechnol. Progr. 16 (1) (2000) 92.

[117S] C.C. Jia, D.W. Sun, C.W. Cao, Mathematical simulation of temperature fields in a stored grain bin due to internal heat generation, J. Food Eng. 43 (4) (2000) 227.

[118S] G.S. Mittal, J. Zhang, Prediction of temperature and moisture content of frankfurters during thermal processing using neural network, Meat Sci. 55 (1) (2000) 13.

[119S] G.S. Mittal, J. Zhang, Use of artificial neural network to predict temperature, moisture, and fat in slab-shaped foods with edible coatings during deep-fat frying, J. Food Sci. 65 (6) (2000) 978.

[120S] J. Moureh, E. Derens, Numerical modelling of the temperature increase in frozen food packaged in pallets in the distribution chain, Int. J. Refrig. 23 (7) (2000) 540.

[121S] B. Tashtoush, Heat-and-mass transfer analysis from vegetable and fruit products stored in cold conditions, Heat Mass Transfer 36 (3) (2000) 217.

[122S] B. Tashtoush, Natural losses from vegetable and fruit products in cold storage, Food Control 11 (6) (2000) 465.

[123S] S. Varga, J.C. Oliveira, Determination of the heat transfer coefficient between bulk medium and packed containers in a batch retort, J. Food Eng. 44 (4) (2000) 191.

[124S] O. Vitrac, G. Trystram, A.L. Raoult-Wack, Deep-fat frying of food: heat and mass transfer, transformations and reactions inside the frying material, Eur. J. Lipid Sci. Technol. 102 (8) (2000) 529.

[125S] H. Zhang, A.K. Datta, Coupled electromagnetic and termal modeling of microwave oven heating of foods, J. Microwave Power Electromagnetic Energy 35 (2) (2000) 71.

Solar energy

[1T] T. McVeigh, D. Burtraw, J. Darmstadter, K. Palmer, Winner, loser, or innocent victim? Has renewable energy performed as expected?, Solar Energy 68 (3) (2000) 237.

Radiation

[2T] J. Rannels, The DOE Office of Solar Energy Technologies' vision for advancing solar technologies in the new Millennium, Solar Energy 69 (5) (2000) 363.

[3T] Y. Tsur, A. Zemel, Long-term perspective on the development of solar energy, Solar Energy 68 (5) (2000) 379.

[4T] J.A. Augustine, J.J. DeLuisi, C.N. Long, SURFRAD – a national surface radiation budget network for atmospheric research, Bull. Am. Meteorol. Soc. 81 (10) (2000) 2341.

[5T] C. Craggs, E.M. Conway, N.M. Pearsall, Statistical investigation of the optimal averaging time for solar irra, Solar Energy 68 (2) (2000) 179.

[6T] C. Gueymard, Prediction and performance assessment of mean hourly global radiation, Solar Energy 68 (3) (2000) 285.

[7T] A. Ianetz, V. Lyubansky, I. Setter, E.G. Evseev, A.I. Kudish, A method for characterization and intercomparison of sites with regard to solar energy utilization by statistical analysis of their solar radiation data as performed for three sites in the Israel Negev region, Solar Energy 69 (4) (2000) 283.

[8T] C.P. Jacovides, M.D. Steven, D.N. Asimakopoulos, Spectral solar irradiance and some optical properties for various polluted atmospheres, Solar Energy 69 (3) (2000) 215.

[9T] M. Mohandes, A. Balghonaim, M. Kassas, S. Rehman, T.O. Halawani, Use of radial basis functions for estimating monthly mean daily solar radiation, Solar Energy 68 (2) (2000) 161.

[10T] E.B. Pereira, F.R. Martins, S.L. Abreu, P. Couto, R. Stuhlmann, S. Colle, Effects of burning of biomass on satellite estimations of solar irradiation in Brazil, Solar Energy 68 (1) (2000) 91.

[11T] S. Ramachandran, V. Ramaswamy, G.L. Stenchikov, A. Robock, Radiative impact of the Mount Pinatubo volcanic eruption: lower stratospheric response, J. Geophys. Res. 105 (D19) (2000) 24409.

[12T] A.S. Rapti, Atmospheric transparency, atmospheric turbidity and climatic parameters, Solar Energy 69 (2) (2000) 99.

[13T] C. Rigollier, O. Bauer, L. Wald, On the clear sky model of the ESRA – European Solar Radiation Atlas – With respect to the Heliosat method, Solar Energy 8 (1) (2000) 33.

[14T] Z. Sen, A.D. Sahin, Solar irradiation polygon concept and application in Turkey, Solar Energy 68 (1) (2000) 57.

[15T] A. Sfetsos, A.H. Coonick, Univariate and multivariate forecasting of hourly solar radiation with artificial intelligence techniques, Solar Energy 68 (2) (2000) 169.

[16T] A. Soler, K.K. Gopinathan, A study of zenith luminance on Madrid cloudless skies, Solar Energy 69 (5) (2000) 403.

[17T] H. Suehrcke, On the relationship between duration of sunshine and solar radiation on the earth's surface: Angstrom's equation revisited, Solar Energy 68 (5) (2000) 417.

[18T] S.O. Udo, Sky conditions at Ilorin as characterized by clearness index and relative sunshine, Solar Energy 69 (1) (2000) 45.

[19T] M.P. Utrillas, J.A. Martinez-Lozano, V.E. Cachorro, F. Tena, S. Hernandez, Comparison of aerosol optical thickness retrieval from spectroradiometer measurements and from two radiative transfer models, Solar Energy 68 (2) (2000) 197.

Flat-plate and low-concentrating collectors

[20T] M. Adsten, R. Joerger, K. Jarrendahl, E. Wackelgard, Optical characterization of industrially sputtered nickel–nickel oxide solar selective surface, Solar Energy (2000) 325 (Part A, special issue).

[21T] S. Brunold, U. Frei, B. Carlsson, K. Moller, M. Kohl, Accelerated life testing of solar absorber coatings: testing procedure and results, Solar Energy (2000) 313 (Part A, special issue).

[22T] W.F. Gao, W.X. Lin, E.R. Lu, Numerical study on natural convection inside the channel between the flat-plate cover and sine-wave absorber of a cross-corrugated solar air heater, Energy Conversion Manage. 41 (2) (2000) 145.

[23T] A. Gombert, W. Glaubitt, K. Rose, J. Dreibholz, B. Blasi, A. Heinzel, D. Sporn, W. Doll, V. Wittwer, Antireflective transparent covers for solar devices, Solar Energy (2000) 357 (Part A, special issue).

[24T] A.A. Hegazy, Comparative study of the performances of four photovoltaic/thermal solar air collectors, Energy Conversion Manage. 41 (8) (2000) 861.

[25T] A.A. Hegazy, Performance of flat plate solar air heaters with optimum channel geometry for constant/variable flow operation, Energy Conversion Manage. 41 (4) (2000) 401.

[26T] R. Karmhag, T. Tesfamichael, E. Wackelgard, A. Niklasson, M. Nygren, Oxidation kinetics of nickel particles: comparison between free particles and particles in an oxide matrix, Solar Energy (2000) 329 (Part A, special issue).

[27T] A. Kumar, B.N. Prasad, Investigation of twisted tape inserted solar water heaters–heat transfer, friction factor and thermal performance results, Renewable Energy 19 (3) (2000) 379.

[28T] G.A. Mastekbayeva, S. Kumar, Effect of dust on the transmittance of low density polyethylene glazing in a tropical climate, Solar Energy 68 (2) (2000) 135.

[29T] J.K. Nayak, E.H. Amer, Experimental and theoretical evaluation of dynamic test procedures for solar flat-plate collectors, Solar Energy 69 (5) (2000) 377.

[30T] B. Song, H. Inaba, A. Horibe, Numerical investigation of the effects of environmental parameters and geometry on energy absorption for an open-type

water-cooled flat-plate solar collector, J. Solar Energy Eng. – Trans. ASME 122 (2) (2000) 56.
[31T] B. Song, H. Inaba, A. Horibe, Numerical study on the limiting characteristics of an open-type water-cooled flat-plate solar collector, Numer. Heat Transfer Part A 37 (1) (2000) 55.
[32T] T. Tesfamichael, E. Wackelgard, Angular solar absorptance and incident angle modifier of selective absorbers for solar thermal collectors, Solar Energy (2000) 335 (Part A, special issue).
[33T] Y. Tripanagnostopoulos, M. Souliotis, T. Nousia, Solar collectors with colored absorbers, Solar Energy (2000) 343 (Part A, special issue).
[34T] Y. Tripanagnostopoulos, P. Yianoulis, S. Papaefthimiou, S. Zafeiratos, CPC solar collectors with flat bifacial absorbers, Solar Energy 69 (3) (2000) 191.
[35T] P.T. Tsilingiris, Heat transfer analysis of low thermal conductivity solar energy absorbers, Appl. Thermal Eng. 20 (14) (2000) 1297.
[36T] S.K. Verma, B.N. Prasad, Investigation for the optimal hermohydraulic performance of artificially roughened solar air heaters, Renewable Energy 20 (1) (2000) 19.
[37T] M.E. Vieira, P.O.O. Duarte, H.L.B. Buarque, Determination of the void fraction and drift velocity in a two-phase flow with a boiling solar collector, Solar Energy 69 (4) (2000) 315.

Water heating

[38T] T.M. Alkhamis, R. El-Khazali, M.M. Kablan, M.A. Alhusein, Heating of a biogas reactor using a solar energy system with temperature control unit, Solar Energy 69 (3) (2000) 239.
[39T] S. Janjai, A. Esper, W. Muhlbauer, Modelling the performance of a large area plastic solar collector, Renewable Energy 21 (3) (2000) 363.
[40T] S.A. Kalogirou, S. Panteliou, Thermosiphon solar domestic water heating systems: long-term performance prediction using artificial neural networks, Solar Energy 69 (2) (2000) 163.
[41T] W. Liu, J. Davidson, S. Mantell, Thermal analysis of polymer heat exchangers for solar water heating: a case study, J. Solar Energy Eng. – Trans. ASME 122 (2) (2000) 84.
[42T] K. May, G. Barker, E. Hancock, A. Walker, J. Dominick, B. Westby, Performance of a large parabolic trough solar water heating system at Phoenix Federal Correcyional Institution, J. Solar Energy Eng. – Trans. ASME 122 (4) (2000) 165.
[43T] R. Raman, S. Mantell, J. Davidson, C.H. Wu, G. Jorgensen, A review of polymer materials for solar water heating systems, J. Solar Energy Eng. – Trans. ASME 122 (2) (2000) 92.
[44T] R.Z. Wang, M. Li, Y.X. Xu, J.Y. Wu, An energy efficient hybrid system of solar powered water heater and adsorption ice maker, Solar Energy 68 (2) (2000) 189.

Space heating and cooling

[45T] S. Alizadeh, S. Multi-pressure, absorption cycles in solar refrigeration: a technical and economical study, Solar Energy 69 (1) (2000) 37.
[46T] A. Boubakri, J.J. Guilleminot, F. Meunier, Adsorptive solar powered ice maker: experiments and model, Solar Energy 69 (3) (2000) 249.
[47T] A.D. Chiasson, J.D. Spitler, S.J. Rees, M.D. Smith, A model for simulating the performance of a pavement heating system as a supplemental heat rejecter with closed-loop ground-source heat pump systems, J. Solar Energy Eng. – Trans. ASME 122 (4) (2000) 183.
[48T] S.O. Enibe, O.C. Iloeje, Heat and mass transfer in porous spherical pellets of $CaCl_2$ for solar refrigeration, Renewable Energy 20 (3) (2000) 305.
[49T] J.M. Gordon, K.C. Ng, High-efficiency solar cooling, Solar Energy 68 (1) (2000) 23.
[50T] K. Kaygusuz, Experimental and theoretical investigation of a solar heating system with heat pump, Renewable Energy 21 (1) (2000) 79.
[51T] W. Rivera, V. Velez, A. Xicale, Heat transfer coefficients in two-phase flow for mixtures used in solar absorption refrigeration systems, Solar Energy Mater. Solar Cells 63 (4) (2000) 401.
[52T] M. Tatlier, A. Erdem-Senatalar, The performance analysis of a solar adsorption heat pump utilizing zeolite coatings on metal supports, Chem. Eng. Commun. 180 (2000) 169.
[53T] N.E. Wijeysundera, An irreversible-thermodynamic model for solar-powered absorption cooling systems, Solar Energy 68 (1) (2000) 69.
[54T] L.Z. Zhang, L.Z. A, three-dimensional non-equilibrium model for an intermittent adsorption cooling system, Solar Energy 69 (1) (2000) 27.

Storage

[55T] J. Banaszek, R. Domanski, M. Rebow, F. El-Sagier, Numerical analysis of the paraffin wax-air spiral thermal energy storage unit, Appl. Thermal Eng. 20 (4) (2000) 323.
[56T] M. Esen, M. Thermal, performance of a solar-aided latent heat store used for space heating by heat pump, Solar Energy 69 (1) (2000) 15.
[57T] S.A. Fomin, A.V. Wilchinsky, T.S. Saitoh, Close-contact melting inside an elliptical cylinder, J. Solar Energy Eng. – Trans. ASME 122 (4) (2000) 192.
[58T] A. Gabrielsson, U. Bergdahl, L. Moritz, Thermal energy storage in soils at temperatures reaching 90°C, J. Solar Energy Eng. – Trans. ASME 122 (1) (2000) 3.
[59T] M. Ibrahim, P. Sokolov, T. Kerslake, C. Tolbert, Experimental and computational investigations of phase change thermal energy storage canisters, J. Solar Energy Eng. – Trans. ASME 122 (4) (2000) 176.
[60T] K.A.R Ismail, M.M. Abugderah, Performance of a thermal storage system of the vertical tube type, Energy Conversion Manag. 41 (11) (2000) 1165.

[61T] T. Kiatsiriroat, J. Tiansuwan, T. Suparos, K.N. Thalang, Performance analysis of a direct-contact thermal energy storage-solidification, Renewable Energy 20 (2) (2000) 195.
[62T] P. Sokolov, M. Ibrahim, T. Kerslake, Computational heat-transfer modeling of thermal energy storage canisters for space applications, J. Spacecraft Rockets 37 (2) (2000) 265.

Solar desalination

[63T] R.S. Adhikari, A. Kumar, H.P. Garg, Techno-economic analysis of a multi-stage stacked tray (MSST) solar still, Desalination 127 (1) (2000) 19.
[64T] Y.J. Dai, H.F. Zhang, Experimental investigation of a solar desalination unit with humidification and dehumidification, Desalination 130 (2) (2000) 169.
[65T] S. Kumar, G.N. Tiwari, H.N. Singh, Annual performance of an active solar distillation system, Desalination 127 (1) (2000) 79.
[66T] F. Mandani, H. Ettouney, H. El-Dessouky, LiBr–H_2O a heat pump for single-effect evaporation desalination process, Desalination 128 (2) (2000) 161.
[67T] E. Rubio, M.A. Porta, J.L. Fernandez, Cavity geometry influence on mass flow rate for single and double slope solar stills, Appl. Thermal Eng. 20 (12) (2000) 1105.
[68T] N.S.L. Srivastava, M. Din, G.N. Tiwari, Performance evaluation of distillation-cum-greenhouse for a warm and humid climate, Desalination 128 (1) (2000) 67.
[69T] R. Tchinda, E. Kaptouom, D. Njomo, Heat and mass transfer processes in a solar still with an indirect evaporator-condenser, Energy Conversion Manage. 41 (1) (2000) 93.
[70T] K. Voropoulos, E. Mathioulakis, V. Belessiotis, Transport phenomena and dynamic modeling in greenhouse-type solar stills, Desalination 129 (3) (2000) 273.

Cooking

[71T] P.A. Funk, P.A. Evaluating, the international standard procedure for testing solar cookers and reporting performance, Solar Energy 68 (1) (2000) 1.

Waste treatment

[72T] J.I. Ajona, A. Vidal, The use of CPC collectors for detoxification of contaminated water: design, construction and preliminary results, Solar Energy 68 (1) (2000) 109.
[73T] T. Nakamura, C.L. Senior, E.G. Burns, M.D. Bell, Solar-powered soil vapor extraction for removal of dense nonaqueous phase organics from soil, J. Environ. Sci. Health Part A 35 (6) (2000) 795.

Solar ponds

[74T] W. Rivera, Experimental evaluation of a single-stage heat transformer used to increase solar pond's temperature, Solar Energy 69 (5) (2000) 369.
[75T] E. Sartori, A critical review on equations employed for the calculation of the evaporation rate from free water surfaces, Solar Energy 68 (1) (2000) 77.

Buildings

[76T] G. Alvarez, C.A. Estrada, Numerical heat transfer in a cavity with a solar control coating deposited to a vertical semitransparent wall, Int. J. Numer. Meth. Fluids 34 (7) (2000) 585.
[77T] G. Alvarez, M.J. Palacios, J.J. Flores, A test method to evaluate the thermal performance of window glazings, Appl. Thermal Eng. 20 (9) (2000) 803.
[78T] K.K. Andersen, H. Madsen, L.H. Hansen, Modelling the heat dynamics of a building using stochastic differential equations, Energy Build. 31 (1) (2000) 13.
[79T] A.K. Athienitis, Y. Chen, The effect of solar radiation on dynamic thermal performance of floor heating systems, Solar Energy 69 (3) (2000) 229.
[80T] P.H. Baker, M. McEvoy, Test cell analysis of the use of a supply air window as a passive solar component, Solar Energy 69 (2) (2000) 113.
[81T] E. Bilgen, Passive solar massive wall systems with fins attached on the heated wall and without glazing, J. Solar Energy Eng. – Trans. ASME 122 (1) (2000) 30.
[82T] J. Breitenbach, J.L.J. Rosenfeld, Goniospectrometer measurements of the optical performance of a holographic optical element, Solar Energy 68 (5) (2000) 427.
[83T] B.J. Brinkworth, R.H. Marshall, Z. Ibarahim, A validated model of naturally ventilated PV cladding, Solar Energy 69 (1) (2000) 67.
[84T] S. Chirarattananon, S. Chedsiri, R.S. Liu, Daylighting through light pipes in the tropics, Solar Energy 69 (4) (2000) 331.
[85T] P. Chuangchid, M. Krarti, Steady-periodic three-dimensional foundation heat transfer from refrigerated structures, J. Solar Energy Eng. – Trans.fs ASME 122 (2) (2000) 69.
[86T] X.D. Fang, A study of the U-factor of the window with a high-reflectivity venetian blind, Solar Energy 68 (2) (2000) 207.
[87T] X.D. Fang, Y.Z. Li, Numerical simulation and sensitivity analysis of lattice passive solar heating walls, Solar Energy 69 (1) (2000) 55.
[88T] J. Karlsson, A. Roos, Angle-resolved optical characterisation of an electrochromic device, Solar Energy 68 (6) (2000) 493.
[89T] J. Karlsson, A. Roos, Modelling the angular behaviour of the total solar energy transmittance of windows, Solar Energy 69 (4) (2000) 321.
[90T] U.O. Krasovec, B. Orel, A. Georg, V. Wittwer, The gasochromic properties of sol–gel WO3 films with sputtered Pt catalyst, Solar Energy 68 (6) (2000) 541.

[91T] L. Kullman, A. Azens, G. Vaivars, C.G. Granqvist, Electrochromic devices incorporating Cr oxide and Ni oxide films: a comparison, Solar Energy 68 (6) (2000) 517.

[92T] G. Leftheriotis, P. Yianoulis, Thermal properties of building materials evaluated by a dynamic simulation of a test cell, Solar Energy 69 (4) (2000) 295.

[93T] D.H.W. Li, J.C. Lam, Solar heat gain factors and the implications to building designs in subtropical regions, Energy Build. 32 (1) (2000) 47.

[94T] M.A. Medina, Effects of shingle absorptivity, radiant barrier emissivity, attic ventilation flowrate, and roof slope on the performance of radiant barriers, Int. J. Energy Res. 24 (8) (2000) 665.

[95T] D.A. Neeper, Thermal dynamics of wallboard with latent heat storage, Solar Energy 68 (5) (2000) 393.

[96T] G. Oakley, S.B. Riffat, L. Shao, Daylight performance of lightpipes, Solar Energy 69 (2) (2000) 89.

[97T] S.J. Rees, J.D. Spitler, M.G. Davies, P. Haves, Qualitative comparison of North American and UK cooling load calculation methods, Hvac&R Res. 6 (1) (2000) 75.

[98T] W.E. Vargas, P. Greenwood, J.E. Otterstedt, G.A. Niklasson, Light scattering in pigmented coatings: experiments and theory, Solar Energy 68 (6) (2000) 553.

[99T] E. Vartiainen, K. Pieppo, P. Lund, Daylight optimization of multifunctional solar facades, Solar Energy 68 (3) (2000) 223.

[100T] H.X. Yang, J. Burnett, J. Ji, Simple approach to cooling load component calculation through PV walls, Energy Build. 31 (3) (2000) 285.

[101T] A. Zacharopoulos, P.C. Eames, D. McLarnon, B. Norton, Linear dielectric non-imaging concentrating covers for PV integrated building facades, Solar Energy 68 (5) (2000) 439.

High temperature applications

[102T] A. Belghit, M. Daguenet, A. Reddy, Heat and mass transfer in a high temperature packed moving bed subject to an external radiative source, Chem. Eng. Sci. 55 (18) (2000) 3967.

[103T] S. Bhattacharyya, D.A. Blank, Design considerations for a power optimized regenerative endoreversible Stirling cycle, Int. J. Energy Res. 24 (6) (2000) 539.

[104T] J. Chaves, M. Collares-Pereira, Ultra flat ideal concentrators of high concentration, Solar Energy 69 (4) (2000) 269.

[105T] T.L. Kessler, P. Frye, R. Partch, Solar thermal OTV – applications to reusable and expendable launch vehicles, Acta Astronaut. (2000) 215 (Part A, special issue).

[106T] A. Kribus, M. Huleihil, A. Timinger, R. Ben-Mair, Performance of a rectangular secondary concentrator with an asymmetric heliostat field, Solar Energy 69 (2) (2000) 139.

[107T] A. Kribus, O. Zik, J. Karni, Optical fibers and solar power generation, Solar Energy 68 (5) (2000) 405.

[108T] A.B. Larbi, M. Godin, J. Lucas, Analysis of two models of (3D) Fresnel collectors operating in the fixed-aperture mode with a tracking absorber, Solar Energy 69 (1) (2000) 1.

[109T] J. Matsunami, S. Yoshida, Y. Oku, O. Yokota, Y. Tamaura, M. Kitamura, Coal gasification by CO_2 gas bubbling in molten salt for solar/fossil energy hybridization, Solar Energy 68 (3) (2000) 257.

[110T] D.R. Mills, G.L. Morrison, Compact linear Fresnel reflector solar thermal powerplants, Solar Energy 68 (3) (2000) 263.

[111T] J. Muschaweck, W. Spirkl, A. Timinger, N. Benz, M. Dorfler, M. Gut, E. Kose, Optimized reflectors for non-tracking solar collectors with tubular absorbers, Solar Energy 68 (2) (2000) 151.

[112T] S. Ryu, T. Seo, Estimation of heat losses from the receivers for solar energy collecting system of Korea Institute of Energy Research, KSME J. 14 (12) (2000) 1403.

[113T] A.Z. Sahin, Optimum operating conditions of solar driven heat engines, Energy Conversion Manage. 41 (13) (2000) 1335.

[114T] A. Timinger, W. Spirkl, A. Kribus, H. Ries, Optimized secondary concentrators for a partitioned central receiver system, Solar Energy 69 (2) (2000) 153.

[115T] T.W. vonBackstrom, A.J. Gannon, Compressible flow through solar power plant chimneys, J. Solar Energy Eng. – Trans. ASME 122 (3) (2000) 138.

Plasma heat transfer and magnetohydrodynamics: *Fundamental Investigations*

[1U] R.R. Arslanbekov, Model of the cathode region and gas temperature of a dc glow discharge at high current density, J. Phys. D 33 (5) (2000) 524.

[2U] A. Bogaerts, R. Gijbels, V.V. Serikov, Calculation of gas heating in direct current argon glow discharges, J. Appl. Phys. 87 (12) (2000) 8334.

[3U] M. Capitelli, C. Gorse, S. Longo, D. Giordano, Collision integrals of high-temperature air species, J. Thermophys. Heat Transfer 14 (2) (2000) 259.

[4U] B. Liu, T. Zhang, D.T. Gawne, Computational analysis of the influence of process parameters on the flow field of a plasma jet, Surf. Coatings Technol. 132 (2) (2000) 202.

[5U] M. Molki, M.M. Ohadi, B. Baumgarten, M. Hasegawa, A. Yabe, Heat transfer enhancement of airflow in a channel using corona discharge, J. Enhanced Heat Transfer 7 (6) (2000) 411.

[6U] A.B. Murphy, Treatments of diffusion in thermal plasmas, High Temperature Mater. Processes 4 (1) (2000) 1.

[7U] D.A. Nelson, S. Zia, R.L. Whipple, M.M. Ohadi, Corona discharge effects on heat transfer and pressure drop in tube flows, J. Enhanced Heat Transfer 7 (2) (2000) 81.

[8U] S. Pellerin, F. Richard, J. Chapelle, J.M. Cormier, K. Musiol, Heat string model of bi-dimensional dc Glidarc, J. Phys. D 33 (19) (2000) 2407.

[9U] A. Sawicki, A.M. Krouchinin, Modeling of electrical and thermal processes in stream plasmatrons, IEEE Trans. Plasma Sci. 28 (1) (2000) 242.

[10U] A. Verma, M.A. Jog, Plasma flow over an array of particles, Int. J. Heat Mass Transfer 43 (1) (2000) 101.

Specific applications

[11U] T. Addona, P. Proulx, R.J. Munz, Mathematical modeling of silica anode decomposition, Plasma Chem. Plasma Process. 20 (4) (2000) 521.
[12U] J. Alexis, P. Jonsson, L. Jonsson, Heating and electromagnetic stirring in a ladle furnace – a simulation model, ISIJ Int. 40 (11) (2000) 1098.
[13U] J. Alexis, M. Ramirez, G. Trapaga, P. Jonsson, Modeling of a DC electric arc furnace – heat transfer from the arc, ISIJ Int. 40 (11) (2000) 1089.
[14U] C.B. Ang, H.W. Ng, S.C.M. Yu, Y.C. Lam, A proposed process control chart for DC plasma spraying process, Plasma Chem. Plasma Process. 20 (3) (2000) 325.
[15U] P. Chappuis, F. Escourbiac, M. Chantant, M. Febvre, M. Grattarola, M. Bet, M. Merola, B. Riccardi, Infrared characterization and high heat flux testing of plasma sprayed layers, J. Nucl. Mater. B (2000) 1081.
[16U] G. Herdrich, M. Auweter-Kurtz, H. Kurtz, New inductively heated plasma source for reentry simulations, J. Thermophys. Heat Transfer 14 (2) (2000) 244.
[17U] M. Keidar, I.D. Boyd, Beilis II, Electrical discharge in the Teflon cavity of a coaxial pulsed plasma thruster, IEEE Trans. Plasma Sci. 28 (2) (2000) 376.
[18U] S. Lenzner, M. Auweter-Kurtz, J. Heiermann, P.C. Sleziona, Energy partitions in inductively heated plasma sources for reentry simulations, J. Thermophys. Heat Transfer 14 (3) (2000) 388.
[19U] A. Scotti, Mapping transfer modes for stainless steel gas metal are welding, Sci. Technol. Welding Joining 5 (4) (2000) 227.

Magnetohydrodynamics

[20U] E.M. Abo-Eldahab, M.A. El Aziz, Hall and ion-slip effects on MHD free convective heat generating flow past a semi-infinite vertical flat plate, Phys. Scr. 61 (3) (2000) 344.
[21U] E. Blums, S. Odenbach, Thermophoretic separation of ultrafine particles in ferrofluids in thermal diffusion column under the effect of an MHD convection, Int. J. Heat Mass Transfer 43 (9) (2000) 1637.
[22U] S.P.A. Devi, R. Kandasamy, Effects of chemical reaction, heat and mass transfer on MHD flow past a semi infinite plate, Z. Angew. Mat. Mech. 80 (10) (2000) 697.
[23U] S. Eckert, G. Gerbeth, O. Lielausis, The behaviour of gas bubbles in a turbulent liquid metal magnetohydrodynamic flow – Part I: dispersion in quasi-two-dimensional magnetohydrodynamic turbulence, Int. J. Multiphase Flow 26 (1) (2000) 45.
[24U] K. Fujisaki, S. Satoh, T. Yamada, Consideration of heat transfer and solidification in 3-D MHD calculation, IEEE Trans. Magnetics art 1 (2000) 1300.
[25U] P.G. Ganesan, P.H. Rani, Unsteady free convection MHD flow past a vertical cylinder with heat and mass transfer, Int. J. Thermal Sci. 39 (2) (2000) 265.
[26U] S.K. Ghosh, P.K. Bhattacharjee, Hall effects on steady hydromagnetic flow in a rotating channel in the presence of an inclined magnetic field, Czechoslovak J. Phys. 50 (6) (2000) 759.
[27U] Y.J. Kim, Unsteady MHD convective heat transfer past a semi-infinite vertical porous moving plate with variable suction, Int. J. Eng. Sci. 38 (8) (2000) 833.
[28U] M.A. Mansour, M.A. El-Hakiem, S.M. El Kabeir, Heat and mass transfer in magnetohydrodynamic flow of micropolar fluid on a circular cylinder with uniform heat and mass flux, J. Magnet. Magnet. Mater. 220 (2) (2000) 259.
[29U] N.P. Singh, A.K. Singh, MHD effects on heat and mass transfer in flow of a viscous fluid with induced magnetic field, Indian J. Pure Appl. Phys. 38 (3) (2000) 182.
[30U] S. Vempaty, P. Satyamurty, R. Balasubramanian, Hydromagnetic flow in a wall heated rigid rotating annulus, Z. Angew. Mat. Mech. 80 (4) (2000) 273.
[31U] N.V. Vighnesam, V.M. Soundalgekar, Heat transfer in the MHD boundary layer flow past a semi-infinite flat plate with variable temperature, Indian J. Eng. Mater. Sci. 7 (2) (2000) 66.
[32U] K.A. Yih, Effect of uniform blowing/suction on MHD-natural convection over a horizontal cylinder: UWT or UHF, Acta Mech. 144 (1) (2000) 17.