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to be ignorant to this field, since whether he wills or not, the past is rapidly becoming bygone and the methods of the computer age are with us.

Perhaps the most useful part of the book is the quite complete list of information sources, data centers, and specialized libraries. This information generally includes addresses. A useful coverage of the abstract sources is also helpful.

It is clear that modern information management is a far cry from the past role of the librarian as a caretaker.

R. H. NEWTON
COMMERCIAL SOLVENTS CORP.
TERRE HAUTE, INDIANA

Radiative Transfer, H. C. Hottel and A. F. Sarofim, McGraw-Hill Book Company, New York, 1967. 520 pages.

For many years in the past, engineers in the U.S. have obtained their knowledge on radiative heat transfer from Hottel's chapter in the consecutive editions of the book, *Heat Transmission*, by W. H. McAdams. It is the opinion of this reviewer that the new book by Hottel and Sarofim will play the same role for many years to come. It is the most comprehensive text available today and fulfills remarkably the stated aim to supply the student, practicing engineer, or scientist with a background adequate for attacking a radiative problem of almost any degree of complexity.

It is interesting to note that all engineering textbooks on radiative transfer, which are presently available, start the treatment with special and relatively simple situations and gradually add complexities as the discussion proceeds. This obviously stems from the feeling that a general statement of the process is too involved for absorption by a student or reader.

The present book which uses the same approach begins with a discussion of the basic definitions and geometric concepts used in radiative transfer and of the laws of black body radiation. In Chapter 2, it introduces the concept of the view factor and the exchange area and discusses the various methods by which these parameters can be calculated. With this preparation, the reader is now able to follow in Chapter 3 the method by which the radiative interchange among gray Lambertian surfaces with a nonabsorbing intervening medium can be analyzed. The radiative properties of real surfaces, however, deviate from the ones assumed

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Foaming and frothing related to system physical properties in a small perforated plate distillation column, Lowry, R. P., and Matthew Van Winkle, **AIChE Journal, 15,** No. 5, p. 665 (September, 1969).

Key Words: A. Frothing-7, 8, Foaming-7, 8, Height-8, Froth-9, Physical Properties-6, Distillation Columns-9, Perforated Plates-10, Laboratory Scale-0, Surface Tension-6, Heat Transfer-6, Density-6, Viscosity-6, Binary Systems-0.

Abstract: Experimental froth heights occurring on a perforated distillation tray were correlated with the determining system physical properties under distillation conditions. A photographic technique was used to measure accurately the foam and froth heights. Several data points were obtained over a range of composition for each of five binary systems which were selected to cover a reasonably broad range of system physical properties.

An experimental study of steady state multiplicity in a loop reactor, Root, R. B., and R. A. Schmitz, **AIChE Journal, 15,** No. 5, p. 670 (September, 1969).

Key Words: A. Multiplicity-8, Steady State-0, Loop Reactor-9, Adiabatic-0, Sodium Thiosulfate-1, Hydrogen Peroxide-1, Water-5, Disturbances-6, Stability-7.

Abstract: Steady state multiplicity in an adiabatic loop reactor was studied in experiments employing the reaction between sodium thiosulfate and hydrogen peroxide in aqueous solution. The steady state characteristics of the loop reactor were predicted by a method which utilized batch reactor data of temperature vs. time directly. Experimental results verify the existence of multiple steady states on ranges of feed flow rates and recycle ratios and demonstrate the capability of the simple model for predicting the qualitative and quantitative features of the reactor steady state.

Thermally induced solid state polycondensation of nylon 66, nylon 6-10, and polyethylene terephthalate, Chen, F. C., Richard G. Griskey, and G. H. Beyer, **AIChE Journal, 15,** No. 5, p. 680 (September, 1969).

Key Words: A. Polycondensation-8, Nylon 66-1, Nylon 6-10-1, Polyethylene Terephthalate-1, Molecular Weight-6, Rate Functions-7, Reaction Rate-6, Diffusion-6, 8, Temperature-6, Polymerization-7, 8, Solid State-0.

Abstract: The mechanism of solid state polycondensation has been subjected to a fundamental analysis. Equations were formulated for combined diffusion and chemical reaction for two separate situations. One was for solid state polycondensation in polymer flakes or chips. The other dealt with polymer powders. The resultant solutions related molecular weight changes to rate functions. A technique for deriving the rate functions from experimental data is described. Solid state polycondensations were then studied for nylon 66, nylon 6-10, and polyethylene terephthalate.

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On the structure of dissolving thin liquid films, Suciu, D. G., O. Smigelschi, and Eli Ruckenstein, **AIChE Journal, 15,** No. 5, p. 686 (September, 1969).

Key Words: A. Isobutanol-9, Water-5, 9, Liquid Film-9, Dissolving-8, Liquid Film Thickness-2, Liquid Film Velocity-2, Dynamic Contact Angle-2, Marangoni Effect-6, Dynamic Interfacial Tensions-6.

Abstract: The structure of thin circular films, formed over a flat water surface during the dissolving of isobutanol is examined by performing film thickness and surface velocity measurements. The thicknesses were obtained by light absorption determinations, and the velocities by a stroboscopic method. The film profile and the dynamic wetting angles obtained differ markedly from those corresponding to a static lens. This is explained by considering the equilibrium between dynamic surface tensions isstead of between static surface tensions.

Prediction of jet length in immiscible liquid systems, Meister, Bernard J., and George F. Scheele, **AIChE Journal, 15,** No. 5, p. 689 (September, 1969).

Key Words: A. Jet Length-8, Jet-9, Cylindrical-0, Liquids-9, Immiscible-0, Newtonian-0, Nozzle-10, Drop Size-4, Extraction-4, Density-6, Viscosity-6, Interfacial Tension-6, Nozzle Diameter-6, Velocity-6, Initial Disturbance-6, Mass Transfer-6, Velocity. Distribution-7, Disturbances-7, Wavelength-7, Growth Rate-7.

Abstract: Stability theory is used to predict jet length from jet inception to jet disruption for injection of one Newtonian liquid into a second immiscible Newtonian liquid. Knowledge of the length is essential for predicting the size of drops formed from jets. At low velocities jet length is controlled by the amplification of symmetrical waves which travel at the interfacial velocity of the jet. At higher velocities an abrupt lengthening of the jet may occur as a result of drop merging, and the jet length is then controlled by the growth rate of sinuous waves which are strongly velocity dependent. Jet disruption results from a geometrical limitation on the maximum amplitude of the sinuous waves. Predictions show good quantitative agreement with experimental data for thirteen mutually saturated systems over a wide range of variables and qualitative agreement with limited experimental data on the effects of initial disturbance level and mass transfer.

Drop formation from cylindrical jets in immiscible liquid systems, Meister, Bernard J., and George F. Scheele, **AIChE Journal, 15,** No. 5, p. 700 (September, 1969).

Key Words: A. Drop Volume-8, Jet-9, Cylindrical-0, Liquids-9, Immiscible-0, Newtonian-0, Nozzle-10, Interfacial Area-4, Extraction-4, Density-6, Viscosity-6, Interfacial Tension-6, Nozzle Diameter-6, Interfacial Velocity-7, Disturbances-7, Wavelength-7.

Abstract: A theoretical analysis is presented for predicting the size of drops formed from a laminar cylindrical jet when one Newtonian liquid is injected through a nozzle into a second immiscible Newtonian liquid. The analysis couples stability theory with the requirement that the disturbances travel at the same velocity as the jet interface. Comparison of the theory with experimental data for thirteen mutually saturated liquid-liquid systems covering a wide range of physical properties shows a mean error of 11.7% in prediction of the specific surface.

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in the preceding analysis by the fact that emissivity, absorptivity, and reflectivity usually depend on wavelength, on the direction in space, and are possibly polarized.

These properties are discussed in Chapter 4, presenting information based on electromagnetic theory as well on experiments. A very useful appendix to this chapter tabulates normal, total emissivities of various surfaces. Chapter 5 considers the analysis of radiative transfer in enclosures bounded by nonideal surfaces with radiation properties as discussed in the preceding chapter. The medium inside the enclosure is still considered as nonparticipating. An appendix to this chapter treats the effects of polarization in a few examples.

Chapter 6 prepares the reader for the analysis of enclosures with a participating medium by discussing gas emissivities and absorptivities. Following a short historical treatise, the basic laws applying to line and band emission and absorption, and the models for numerical calculations are discussed. The results of measurements and calculations are then presented for water vapor, carbon dioxide, sulfur dioxide, carbon monoxide, ammonia, hydrogen chloride, nitric oxide, nitrogen dioxide, air, methane, and glass. A discussion of radiation from clouds of particles concludes the chapter.

Geometrical parameters useful for gas radiative interchange are then introduced and discussed in Chapter 7 with tables listing mean beam lengths and interchange areas for various geometries. The reader is now prepared for the discussion of radiative exchange in enclosures with an isothermal gas in Chapter 8. Some new engineering applications encounter radiative energy transfer in comparably simple geometries. Consequently the newer literature has concentrated on the analysis of such processes when the local variation of the state and radiation parameters is taken into account. These analyses are discussed in Chapters 9 and 10 for one-dimensional problems and in Chapter 11 for three-dimensional situations. Chapter 12 discusses scatter by single particles and Chapter 13 now includes absorption and scattering in the medium filling the enclosure into the analysis. Chapter 14 finally applies it to the analysis of radiative exchange in furnaces. Sixty-nine problems conclude the treatise.

Radiative transfer analysis is important in various fields of engineering and science, and no agreement exists, unfortunately, on the nomenclature for

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this field. An extensive listing of nomenclature at the beginning of the book will therefore be found useful.

The coverage of the subject material is very thorough and complete. The only omission in the opinion of this reviewer is that the Monte Carlo method is just mentioned in passing. The book should be found on the shelf of every student who does his thesis in this field and of any practicing engineer who has to make radiative transfer analyses.

E. R. G. ECKERT
UNIVERSITY OF MINNESOTA
MINNEAPOLIS, MINNESOTA

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Physical effects in red blood cell trauma, Nevaril, C. G., and J. D. Hellums, C. P. Alfrey, Jr., and E. C. Lynch, **AIChE Journal, 15,** No. 5, p. 707 (September, 1969).

Key Words: A. Damage-8, Blood-7, 9, Cells-7, 9, Shear Stress-6, Pressure-6, Impact-6.

Abstract: Red blood cell damage and destruction are important problems in the use of artificial valves, heart-lung machines, and other devices which pump or process blood. An experimental study has been made on the mechanism of cell damage. Three types of physical forces which might be injurious to red cells were studied: shearing stress, pressure variations, and direct impact of solid surfaces.

Base film over which roll waves propagate, Woodmansee, Donald E., and Thomas J. Hanratty, **AIChE Journal,** 15, No. 5, p. 712 (September, 1969).

Key Words: A. Propagation-8, Roll Waves-7, 9, Flow-9, Gases-9, Liquids-9, Films-9, Flow Rate-6, Stresses-8, Annular-0, Flow-9, Heights-8.

Abstract: The liquid that moves along the duct walls in the annular regime observed in gas-liquid flows often consists of a series of flow surges (roll waves) moving over a thin liquid film (base film). This paper describes the results of a study of the base film in a horizontal enclosed rectangular channel. At a given gas velocity there is a critical flow rate of the liquid below which roll waves are not present. Measurements of the height and wall stresses are presented to support the notion that the conditions in the base film are close to those which exist at the critical liquid flow rate.

Temperature-separation factor relationships in gaseous diffusion, Tock, R. W., and Karl Kammermeyer, **AIChE Journal, 15,** No. 5, p. 715 (September, 1969).

Key Words: A. Diffusion-8, Temperature-6, Enrichment-7, 8, Separation-7, 8, Gases-9, Binary Systems-0, Equations-10, Porous Membranes-10. B. Separation-8, Helium-9, Nitrogen-9. C. Separation-8, Nitrogen-9, Hydrogen-9. D. Separation-8, Oxygen-9, Carbon Dioxide-9. E. Separation-8, Carbon Dioxide-9, Ethane-9. F. Separation-8, Propane-9, Nitrogen-9.

Abstract: A theoretical equation was developed to predict the enrichment produced by a single stage porous Vycor diffusion cell as a function of temperature. The separations of five binary gas mixtures were measured experimentally over a temperature range of 80° to 600°K. The agreement between theoretical predictions and experimental results was good over most of the temperature range. Overall, both separation and separative capacity were observed to increase with a decrease in temperature.

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