International Journal of Thermophysics, Vol. 11, No. 2, 1990

PREFACE

The First Japan–United States Joint Seminar on Thermophysical Properties was held in Tokyo, Japan, in October 1983. Because of its success, it was decided to organize a second seminar, this time in the United States.

The Second United States–Japan Joint Seminar on Thermophysical Properties was held at the National Bureau of Standards (now National Institute of Standards and Technology) in Gaithersburg, Maryland, on June 23, 1988, in conjunction with the Tenth Symposium on Thermophysical Properties. This arrangement exposed the seminar to a wider international audience. The seminar brought together experts in thermophysical-properties research from the two countries for the purpose of exchanging information, understanding research approaches and thrusts, and enhancing future cooperation in research and applications. The organizing committee of the seminar consisted of A. Cezairliyan (National Institute of Standards and Technology), A. Nagashima (Keio University), and J. V. Sengers (University of Maryland).

The one-day seminar featured 11 invited review papers on current topics on thermophysical properties of both solid and fluid substances. They are summarized below.

1. *Thermal Diffusivity Measurements of Thin Films and Multilayered Composites, by I. Hatta (Nagoya University).* Thin films show interesting behavior which differs from that of bulk materials. Also, interactions between the thin film and the substrate is an important problem in semiconductor technologies. Various new techniques for measuring the thermal diffusivity of thin films in the micrometer range are reviewed.

2. *Issues in Steady-State Versus Transient Thermophysical Measurements, by D. L. McElroy (Oak Ridge National Laboratory).* Thermal conductivity can be measured directly with the aid of steady-state techniques or deduced from thermal-diffusivity data obtained with transient techniques. The extent of the agreement between directly measured thermal conductivities and those deduced from thermal

0195-928X/90/0300-0289$06.00/0

diffusivities is discussed and is shown to depend on the properties of the specimen material.

3. *Possibility of High-Temperature Heat Capacity Measurements with Differential Scanning Calorimetry, by M. Kamimoto (Electrotechnical Laboratory).* There exists an increasing need for reliable information on the heat capacity of materials at high temperatures such as for latent thermal storage materials. The possibility of using differential scanning calorimetry for precise measurements of the specific heat at high temperatures is discussed.

4. *Measurements of Thermal Insulation Performance: The Challenge of the Next Decade, by R. P. Tye (Holometrix, Inc.).* The past two decades have witnessed a significant growth in thermal-insulation materials. A challenge for the next decade is development of new or modified techniques for accurate measurements of the performance of present and new insulation materials. Various examples of current measurement technologies applicable to new materials are discussed.

5. *Effect of Thermal Radiation on Thermal Diffusivity Measurements, by N. Araki (Shizuoka University).* In the measurement of thermal diffusivity of semitransparent materials at high temperatures, the most difficult problem is the estimation of the effect of thermal radiation. This problem is studied and a correction method is proposed; some practical examples are given.

6. *Present Research on Thermal Radiation Properties and Characteristics of Materials, by T. Makino (Kyoto University).* As in the subject covered by the previous paper, one of the most difficult problems in high-temperature technologies is the precise estimation of the effect of thermal radiation. The demand for information on radiation characteristics of actual solid surfaces and of scattering-absorbing media is very strong. The review discusses recent advances in research of the radiation properties of materials.

7. *Thermophysical Properties of Ice, Snow, and Sea Ice, by S. Fukusako (Hokkaido University).* Thermophysical properties of ice, sea ice, and snow are relevant to environmental science, oceanographic technologies, and energy engineering. Available information on the thermophysical properties of ice and snow as a function of temperature is reviewed.

8. *Mixture Equations of State: Composition Dependence, by M. A. Khan et al. (University of Oklahoma).* An outstanding problem in chemical engineering is the prediction of the properties of fluid mixtures

from those of the pure-fluid components. Theoretical models for the composition dependence of equations of state are discussed and the quality of the predictions is compared with some experimental data.

9. *Non-Newtonian Molecular Dynamics and Thermophysical Properties, by H. J. M. Hanley and D. J. Evans (National Institute of Standards and Technology).* Computer simulation has become an important tool in understanding fluid behavior. Recent molecular dynamics techniques that incorporate non-Newtonian equations of motion yield interesting information about the structure of dense liquids and about the rheological behavior of liquids.

10. *Thermodynamic Properties of Aqueous Solutions at High Temperatures; Needs, Methods, and Challenges, by J. M. H. Levelt Sengers (National Institute of Standards and Technology).* The need for thermophysical property data on aqueous solutions at high temperatures and pressures exists in many areas of industrial activity such as the power industry, geothermal engineering, and wherever chemical processes employ water and steam as solvents. Aspects and drawbacks of current formulations for the thermodynamic properties are discussed, which are usually extensions to high temperatures of methods developed for aqueous systems below 100°C. The need for new theoretical developments and understanding is specified.

11. *Viscosity, Thermal Conductivity, and Surface Tension of High-Temperature Melts, by A. Nagashima (Keio University).* High-temperature melts are substances which are solids at room temperature and liquids at high temperature. They include liquid metals, molten salts, and molten semiconductor materials. They often show strong chemical activity and therefore are corrosive to materials of containers and sensors so that it is difficult to obtain accurate thermophysical-property information. The present status of available data for the viscosity, thermal conductivity, and surface tension of high-temperature melts is reviewed.

After the formal presentations, a general discussion took place dealing with possible research cooperation between the two countries and future plans. In addition to immediate technical benefits, the Seminar stimulated a closer relationship between researchers from the United States and Japan and enhanced the establishment of channels for future contacts and cooperation between the two countries.

This Special Issue of the *International Journal of Thermophysics* contains 10 of the 11 papers presented at the second United States–Japan Joint Seminar on Thermophysical Properties. In addition, this issue contains a paper on Current Thermophysical-Properties Research on

Refrigerant Mixtures in Japan by K. Watanabe. This paper was presented as an invited paper at a special session on refrigerants of the Tenth Symposium on Thermophysical Properties.

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