Int. J. Heat Mass Transfer. Vol. 16, pp. 1967–1968. Pergamon Press 1973. Printed in Great Britain

BOOK REVIEW

L. P. FILIPPOV. **Study of Liquid Thermal Conductivity.** Moscow, Moscow University (1970).

THE MONOGRAPH is devoted both to methodological problems of a thermophysical experiment on liquid and liquid metal thermal conductivities and to discussion of the experimental data obtained. The greater part of the monograph deals with the author's results in this field of science.

The monograph treats the following basic subjects:

(1) thermal conductivity of non-metallic liquids and that as a temperature dependence;
(2) thermal conductivity of supercooled liquids;
(3) thermal conductivity of solutions;
(4) thermal properties of liquid metals.

A study of liquid thermal conductivity is of great theoretical and practical importance. The theoretical significance is connected with research efforts to clear up the nature of liquid heat motion, while the practical importance is stipulated by utilization of liquids as fuel oxidants, heat-transfer agents, etc. in various branches of chemical engineering.

The monograph under review is composed of two parts divided into six chapters. The first part entitled "Experimental Investigation Methods" consists of three chapters. In the first chapter "General practical problems of thermal conductivity measurement" the author considers the main information necessary for the further exposition of the material, namely, the Fourier law, heat conduction, convective and radiative heat transfer and discusses peculiarities of experimental procedures at high temperatures. In particular, dealing with radiative heat transfer the author notes that G. Poltz's results on radiative heat transfer in liquids are not reliable in respect of their quantitative data.

In the second chapter "Measurement of non-metallic liquid thermal conductivities" the author makes a review of the main experimental data (steady- and unsteady-state). The author gives no design peculiarities of experimental installations but offers a systematization of experimental methods. The author notes that "nowadays there is no method or group of methods that may be definitely preferable among the others". Next, the necessity is emphasized of developing unsteady-state methods which allow more information to be gained in experiment compared to steady-state methods.

As for relative methods, their simplicity in design of experimental installation and in the very measuring procedure make them preferable compared to the absolute ones. However, these methods are not properly applied to thermophysical experiments.

The next sections deal with experience in applying the relative plane layer method, its new variant, relative varieties of the concentric cylinder and hot wire methods and those of measuring thermal diffusivity and thermal activity of liquids.

The third chapter "Measuring methods of liquid metal thermal conductivity" gives a review of the main methods and procedure for measuring thermal properties simultaneously by means of radial temperature waves. The author emphasizes that the methods based on application of periodic processes (the methods of regular thermal regime of the 3rd kind) may be of particular interest since they permit all thermal properties to be investigated within a single run. The relative methods appear to be promising also as in the case of non-metallic liquids.

The second part of the monograph entitled "Results" comprises Chapters 4–6. The fourth chapter "Brief review of present knowledge of the liquid nature" deals with a number of problems on the liquid state and the existing theories of liquid heat conduction. Special attention is paid to discussion of theoretical papers by A. S. Predvoditelev on heat conduction of liquids.

The author notes that to get insight into the mechanism of heat transfer in liquids it is necessary to run experimental series on thermal conductivities of various liquids, to find the relation between thermal conductivity and other properties of liquids, to investigate temperature dependence of thermal conductivity in a wide temperature range, to study concentration dependence of thermal conductivities of solutions, to compare thermal conductivities of the same materials in solid and liquid states. The next material of the book also contributes much to these problems. The author gives his experimental results. Based on an analysis of the experimental data, the mechanism of liquid thermal conductivities is reported to be connected with heat transfer by hyperacoustic waves. The results obtained on the same basis explain the correlation between thermal conductivity and ultrasound speed, etc.

The formulas are proposed describing thermal conductivity of non-associated liquids.

Consideration of the mechanism of liquid viscosity reveals that here a transfer by transverse hyperacoustic oscillations is a controlling factor, and the formula is proposed, which describes well viscosity of liquified gases and organic liquids up to the boiling temperature.

The fifth chapter "Thermal conductivity of solutions" presents the results obtained by the author on concentration dependence of thermal conductivity of a number of solutions. For non-aqueous solutions of organic liquids with non-associated and associated components the formulas are recommended for calculation of thermal conductivity from the known thermal conductivities of pure components. For calculation of concentration dependence of aqueous solutions a single value of thermal conductivity should be known. The formulas are suggested for calculation of temperature dependence of thermal conductivity.

The sixth chapter "Thermal conductivity of liquid metals" presents the author's experimental results that allowed the

author to find the temperature relation of the Lorentz number for a large group of liquid metals.

To sum up, the monograph by L. P. Filippov is the first experience in presentation of liquid thermal conductivities on the basis of the experimental results, in establishment of a number of important relationships that clear up the nature of liquid state and the mechanism of heat motion of molecules in liquid.

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ANNOUNCEMENT

SEVENTH U.S. NATIONAL CONGRESS OF APPLIED MECHANICS

UNIVERSITY OF COLORADO, BOULDER, COLORADO 80302, U.S.A.

Monday, 3 June–Friday, 7 June 1974

Call for papers

Subjects: The First International Congress for Theoretical and Applied Mechanics held at Delft, Holland, in 1924, was devoted to high quality papers in three general areas: Rational Mechanics, Theory of Elasticity, and Hydro and Aerodynamics. The Seventh U.S. National Congress of Applied Mechanics will continue in the same tradition by seeking papers in the many special areas that have come to be part of Applied Mechanics during the intervening fifty years.

How to submit

A similar procedure for the selection of papers to be presented at the Seventh Congress will be followed as was adopted for the Sixth Congress. A prospective author should:

(1) Submit his manuscript to an appropriate journal of his choice, stating clearly to the editor that the paper is to be considered for presentation at the Seventh U.S. National Congress of Applied Mechanics, as well as for publication in the journal.

(2) Send a copy of the journal transmittal letter and one extra copy of his manuscript to:
Professor S. K. Datta, Chairman, Editorial Committee
Seventh U.S. National Congress of Applied Mechanics
Department of Mechanical Engineering
University of Colorado
Boulder, Colorado 80302, U.S.A.

The decision on publication of the paper will be made in accordance with the usual procedure of the journal and the author will be notified of that decision in the usual way. The decision on acceptance for the Congress will be made by the Congress Editorial Committee, and the prospective author will be notified of that decision by its chairman.

Submission deadline

In arriving at its decision, the Editorial Committee will give substantial credence to the opinions of the journal referees. Since the review procedures and time periods for the review process vary among the participating journals, the date of submission should allow sufficient time for the referees' opinions to reach the Editorial Committee prior to 1 April 1974. In any case a paper must be submitted by 1 January 1974.