

state with respect to arbitrary disturbances and, to some extent, the evolution conditions. The practical use of analyzing this term is determination of the dissipative heat generation for nonisothermal flow.

Even without this, the book provides deep insight into the physics underlying the constitutive equations for polymeric melts and solutions. It can serve as a guidebook for the broad range of specialists in polymer science and technology and could be useful as a textbook for a lecture course in advanced polymer rheology.

A. I. Leonov

Department of Polymer Engineering
The University of Akron
Akron, OH 44325

Thermo- and Laser Anemometry

Edited by A. F. Polyakov, Hemisphere Publishing Corp., New York, 1988, 173 pp.

For the reader who is an expert in the use of hot-wire or laser Doppler anemometers, this compilation of papers in English from a workshop held by the Division of Heat Transfer of the Institute for High Temperatures, USSR Academy of Sciences, and the Danish company, Dantec Elektronik, has a few papers of interest. This is not a book for the beginner in these experimental tools for turbulent-flow measurement. These techniques, however, are becoming more common as we need to know more details about turbulent mixing.

The first three articles deal with thermo anemometers for the measurement of velocity and temperature. Petukhov et al. discuss the relationship between

velocity fluctuations in the flow-to-voltage fluctuations in a single hot-wire probe. This relation between the instrument and the property to be measured is important in any method. In the case of hot-wire anemometers, we must look at the frequency response of the wire, the filtering effect of the holder which has a large mass compared to the wire, and the length of the wire compared to the smallest fluctuations in the flow. These are all treated mathematically, and an experimental method to correct for the last effect is verified. The second article in this section treats the calibration of a triple-split probe that can be used in two-dimensional reversing flows. The last article presents measurements in a boundary layer over a porous plate with injection.

There are seven laser Doppler articles, all concerned with equipment design. The first Dantec article discusses optical fibers suitable for use with a laser Doppler anemometer (LDA) system. Transmitting and receiving light through fiber optics can make positioning easier than for a conventional lens system. The next Dantec paper reviews the optical calculations for typical one- and three-dimensional arrangements. A major objective here is to obtain a sufficiently large number of fringes in the direction of the velocity component to be measured. A third paper from Dantec contains a derivation of the equations for the fluctuations due to refractive index variations in the optical path. The Dantec papers are available in Dantec publications in more detail.

The last two papers by Soviet authors are merely lists of equipment, but the other two are the highlights of the vol-

ume. They give keys to the Russian literature and, perhaps, some new ideas for the improvements to LDA systems. The disadvantage is that significant details may only be available in Russian. One paper on the "Spectral Method of Measuring the Structure of Turbulence," gives results of a comparison of a counter and a "spectral method" signal processor. The "spectral method" is a homemade unit to directly measure the energy spectrum of the photocurrent from the photodetector of the LDA. The Russian authors claim that their spectral method is inexpensive, but commercial photon correlators using fast Fourier transforms are now promoted at much higher costs. Another article, "Techniques of LDA Measurements in Cylindrical or Conical Models," presents several optical arrangements of three or four beams to measure two components of velocity. Problems associated with the refraction at solid fluid interfaces are discussed. This article should be of particular interest to students using LDA in cylindrical tubes.

Most of the articles were translated from Russian and although the text is generally understandable, the translation is only fair. Many of the figures and handwritten equations are not readable. The Russian articles are good introductions to experimental design for the researcher who knows the fundamentals of the hot-wire and laser Doppler anemometry. The book is appropriate for a research library but not for an individual.

Neil S. Berman
Dept. of Chemical, Bio, and
Materials Engineering
Arizona State University
Tempe, AZ 85287