70 μm are: 10 μm—1 min 22 s, and 1 μm—11 min 38 s. In the final paper of this section the use of a computer-controlled scanning electron microscope to give approximate analysis of Fe, S, Ca, Si and Al in coal particles in the range 10 to 100 μm is described.

In the final section some recent developments in particulate standard references are presented. From 1977 to 1980 a new American Society of Testing and Materials Coordinating Committe (S-21) was formed with the purpose of obtaining cooperation between industry and the National Bureau of Standards in the certification of Standard Reference Materials for particle size metrology. These SRM's are used in the calibration of particle sizing equipment. Three methods for measuring size distribution of microscopic spherical particles—light scattering, electron microscopy and flow counting—form a complementary set of techniques used at the National Bureau of Standards for calibration purposes. Precision of reproducibility of particle counters is improved through the use of high quality calibration standards which need to be selected, manufactured and labelled with great care. Although particle counters are capable of generating data rapidly and reproducibly, the data reported are sometimes questionable due to the lack of clearly defined methods and calibration materials. ASTM Standard F-50 specifies the use of spherical particles of known size and physical properties whereas ISO 4402 requires the use of an ill-defined non-spherical 'Arizona road dust'. Both materials are widely used for instrumentation calibration but yield vastly different calibration data.

The Fine Particle Society meeting was most interesting and the selected papers presented in this book are very useful.

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Heat Conduction

S. Kakac and Y. Yener

The level at which this book is written varies from elementary to esoteric. For example, Fourier's Law is stated first at school-textbook level as a formula for the heat transfer by conduction through a plane slab. Then a page or two later an expression for the thermal conductivity tensor for an anisotropic medium is written down, though not followed up. Steady one-dimensional heat conduction withoug heat source through plane, cylindrical and spherical walls, and through such walls in series, is dealt with at length, as it might be in a rather pedestrian introductory undergraduate course; and is followed by chapters on the various sophisticated (but well-known) mathematical methods for obtaining analytical solutions to multi-dimensional and unsteady-state problems. In the early pages, there is a short account of the principles of thermodynamics, but it is superfluous to those familiar with the subject and too condensed for those who are not. What readers then do the authors have in mind? In their own words, 'the material presented has evolved from a series of lecture notes developed by the authors when teaching a graduate course in heat conduction over a period of years': there is a looseness of wording here that does not inspire confidence in the outcome of this evolutionary process of development. They continue, 'this book is written for both engineering students and engineers practicing (sic) in areas involving the applications of heat diffusion problems': many readers would prefer the proposed form of contract between the authors and themselves to be shorn of this woolliness.

The concept of thermal resistance is introduced and applied in simple terms, but the scope and limitations of the concept are not made clear. The solution of Laplace's equation for steady two-dimensional heat conduction is discussed solely in analytical terms, while the practically useful concepts of curvilinear squares (and their sketching) and of shape factor seem to be ignored (they are certainly not indexed). The chapter on unsteady-state conduction makes no reference to the excellent book of 'Temperature response charts' by P. J. Schneider. But perhaps the most unsatisfactory part of the book is the chapter on numerical solutions. The finite-difference method presented for disecretizing the partial-differential equations is inferior to the finite-domain method (described for example in S. V. Patankar's book 'Numerical Heat Transfer and Fluid Flow'). The use of matrix inversion for solving the resulting linear algebraic equations is presented as though it were an acceptable alternative to Gaussian elimination, which it is not, and the statement that the 'Crank–Nicolson method is stable... and converges' is misleading, since in some cases it may converge to a false solution, and the fully-implicit method is more generally reliable and economical and is easier to program.

As there are several other books which deal with heat conduction thoroughly from an analytical point of view, and others which present it in the practical context of heat transfer as a whole, and as computer methods have become dominant in meeting the needs of engineers in this field, there seems little reason for the present book. The type-face is bleak without serifs, perhaps reproduced from a type-script, and is unpleasing to the eye.

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