'nt. J. Heat Mass Transfer. Vol. 26, No. 1, p. 317, 1983
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BOOK REVIEWS

D. B. SPALDING and N. AFGAN, Heat and Mass Transfer in Metallurgical Systems. Hemisphere, 1981, 758 pp.

THIS book contains papers presented at the seminar of the International Center for Heat and Mass Transfer held in Dubrovnik, Yugoslavia. The papers were presented in ten sessions with the titles: (a) blast furnaces; (b) other iron and steel processes; (c) non-ferrous processes; (d) metallurgical and fluid dynamic processes; (e) heat and mass transfer during crystallization; (f) heat and diffusion treatment; (g) nuclear reactors; (h) turbine and combustors, and (i) corrosion. The papers are varied both in approach and level of sophistication. An extensive amount of information has been brought together in the book with contributions from both theoreticians and practitioners from all over the world.

Sophisticated multi-dimensional mathematical models are presented; they solve conservation equations for mass, momentum, enthalpy and electrical potential in metallurgical processes involving turbulent fluid flow with heat and mass transfer. Such flows are often subjected to significant body forces by gravity and electro-magnetic fields. Advanced numerical methods and two-equation models of turbulence have been employed to study processes such as the reduction of aluminum oxide in the Hall-Heroult cell, transport processes in agitated ladels, and submerged gas jets. Significant progress has been reported in these areas.

New experimental techniques, such as use of infra-red thermography for industrial heat balance calculation, are also described. There are several papers on blast furnaces which provide a critical review of the chemical reaction model and describe simplified flow and heat transfer models and mathematical simulations of the dynamic behavior of blast furnace operation. The volume also contains a number of informative papers on heat and mass transfer during crystallization.

A. K. MAJUMDAR

D. K. EDWARDS, Radiation Heat Transfer Notes. Hemisphere, 1981, xiv + 370 pp. $19.95.

THIS paperback presents a wide-ranging treatise of the concepts and techniques used in the formal specification of radiative heat transfer. The text is based on Notes, intended for a 40 lecture-hour course, and places the emphasis clearly on developing the information and skills to formulate and solve engineering heat-transfer problems. The layout in the text is discussed by the author in the Preface of the book, where he provides a particularly useful indication of the topics covered in the various chapters.

The contents are in two main parts: the first part develops the subject of surface-to-surface radiative heat transfer; the second is concerned with radiative transfer in a participating medium.

The text consists of 8 Chapters, with the following headings:

1. Introduction
2. Surface Radiation Characteristics
3. Radiation Transfer between perfectly Diffuse Surfaces
4. Radiation Transfer between Nondiffuse Walls
5. Gas Radiation Properties
6. Radiation Transfer with an Isothermal Gas
7. Nonisothermal Gas Radiation
8. Radiation Acting with Conduction or Convection

References and Exercises follow each chapter. The book is well organised for reference purposes, and includes frequent exercises (at the end of each chapter), which both illustrate and extend the text. The various subjects of the presented material are treated with commendable mathematical and physical rigour, and as such the reader is assumed to have a general knowledge of calculus, matrix algebra and thermodynamics.

The strong point of this book is in that it draws together in one place information on, and examples of, a wide variety of radiation aspects normally found scattered in heat transfer books and papers. The style of presentation is, however, rather heavy, making this book not so easy to read. This is obviously due to the need of keeping within the confines of a 40 hour course; and, after all, the text is intended to be used as notes.

The text design quality is moderate and the book is modestly printed and illustrated. The general presentation is therefore of an average standard, but with reasonably clear diagrams and neatly laid out mathematical expressions. It is, however, a pity that diagrams (particularly in Chapters 3 and 5) are laid sideways, thus obliging the reader to turn the book in order to read them; and labelling chapter subsections by letters (some in brackets) rather than numerals does not serve any particular purpose, but may lead to confusion. Fortunately, the modest presentation is reflected in the modest price of the book.

The present reviewer appreciated particularly the author's effort to emphasise the importance of the subject to practicing engineers, by developing various levels of problem-solving skills. In this context, the powerful Monte Carlo algorithm is described and a sample Monte Carlo program listing is given. Furthermore, the concepts of finite-element thermal system analysis and differential-element analysis are presented and discussed in detail. The material is very suitable for teaching courses at various levels; and will appeal to lecturers, students and researchers in Science and Engineering, who will find a generous stock of material to select, to suit the needs of their students. The book should also appeal to any practitioner (including beginners) who wish to gain further experience of heat transfer. In short, I recommend the book to anyone interested in a concentrated technical text on radiation heat transfer. Its low price, $19.95, makes this paperback good value.

NIKOS G. MARKATOS