The useful appendices contain elements of vector analysis, heat and mass diffusion in anisotropic materials, elements of non-Newtonian fluids, the conservation equations in Cartesian and cylindrical coordinates, similarity transformation by separation of variables and Taylor and Helmholtz instability criteria, which are important in problems concerning an interface between two phases.

The above material is presented in a conventional but clear manner, and the strong point of this book is the extensive number of well-thought-out and practically interesting problems that follow each chapter, assisting the reader to digest the material and link it to practical applications. The literature cited is adequate but could be more extensive and up-to-date. Some more emphasis could also have been placed on the numerical computations feasible today, because of their current dramatic impact on the field.

The text design quality is good and the book is very well printed and illustrated. The material is particularly suitable for teaching courses at advanced undergraduate/graduate levels; and will appeal to lecturers 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 of heat transfer as a reference test.

The book can be thoroughly recommended to both students and lecturers of courses in heat transfer.

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N. Wakao and S. Kaguei, **Heat and Mass Transfer in Packed Beds.** Gordon & Breach, London, 1982, xxii + 364 pp.

This book is part of a series of monographs and texts edited by R. Hughes, under the general title of *Topics in Chemical Engineering.* This series is planned as a number of books covering areas of chemical engineering which, although important, are not treated at any length in standard texts. This is certainly the case with the problem of heat and mass transfer in packed beds, which because of their heterogeneity and complexity have not lent themselves to the application of exact hydrodynamic theory. The authors hope that this book will help graduate students and researchers in chemical engineering understand the relevant phenomena; and, in my opinion, they have done a commendable effort towards that purpose.

The text is arranged in eight chapters, with the following headings:

1. Parameter Estimation from Tracer Response Measurements.
2. Fluid Dispersion Coefficients.
3. Diffusion and Reaction in a Porous Catalyst.
4. Particle-to-Fluid Mass Transfer Coefficients.
5. Steady-state Heat Transfer.
6. Thermal Response Measurements.
7. Unsteady-state Heat Transfer Models.
8. Particle-to-Fluid Heat Transfer Coefficients.

Three appendices, and author and subject indices close the book.

In Chap. 1 the techniques of parameter estimation from the measurements of tracer input and response signals are discussed. These techniques include moment and weighted-moment methods, curve fitting in the time domain, transfer-function fitting, Fourier analysis, etc.

It is recognized that conversion in a chemical reactor depends largely on the degree of fluid dispersion in the reactor. With this in mind, the authors devote Chap. 2 to the effect of dispersion on chemical conversion, the significance of fluid dispersion coefficients and their evaluation in reactive, non-reactive and adsorption-packed bed systems. The importance of the catalyst effectiveness factor, the mechanisms of pore diffusion, the measurement and prediction of effective diffusivities in porous solids and multicomponent systems are discussed in Chap. 3.

Chapter 4 presents a critical review of the published particle-to-fluid mass transfer coefficient data and their correction for axial dispersion effect. Chapter 5 is devoted to packed beds used as heat exchangers, under steady-state conditions. Analytical solutions for temperature profiles are presented, together with various empirical formulae for the prediction of effective thermal conductivities and wall heat transfer coefficients.

Chapter 6 outlines the techniques for parameter measurement by thermal response, and the prediction of fluid thermal dispersion coefficients from axial effective thermal conductivity by model comparison. The last two chapters (7 and 8) are devoted, respectively, to describing models of unsteady-state heat transfer and to reviewing the published particle-to-fluid heat transfer coefficient data.

Appendix A contains physical property data and units conversion factors. Appendix B lists computer programs, in FORTRAN 77, for predicting a response signal and calculating the RMS errors for construction of a two-dimensional error map.

Finally, Appendix C presents a computer program for deriving the moment equations for infinite adsorption beds, and for adsorption/dead volume system.

The above material is presented in a conventional, clear, manner; but I would have preferred a somewhat different chapter organisation (such as 1–2–4–6–8–3–5–7 or 3–5–7–1–2–4–6–8), although the interspersion of 'theory' and 'measurement' chapters is not at all disturbing.

The literature cited is adequate but could have been more extensive; and inclusion of some discussion on the mathematical modelling and computation of packed beds which is feasible today, should also be considered in a future edition.

The book is well printed and illustrated and comes bound in an attractive red and black cover.

The material is very suitable for teaching courses at graduate level, and also as reference for any chemical engineer. The book can, therefore, be recommended to both students and lecturers of relevant courses, and to any practitioner of heat and mass transfer.

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