existence of footnotes (at the bottom of the page), endnotes (at the end of every chapter), and a separate citation of references. The distinction between material suitable for footnotes and that for endnotes was not clear to me. In the chapter on coal compositions, a discussion of the results of modern techniques would have been most useful, but there are basically three references dated after 1985 and none dated after 1990. Chapter 5 on chemical properties contains a good description of the chemistry, including some NMR and FTIR work. Chapter 6 is particularly strong on caking, coking, and pyrolysis. Unfortunately, Chapter 7 on the effects of solvents contains little on the effect of aprotic solvents ("supersolvents").

Part II, chapters 8-14, is likely to be of more direct interest to chemical engineers. Surprisingly, Chapter 8 on coal cleaning makes no explicit mention of the technologies proposed and used in the massive "clean coal" program in the U.S. The treatment of transportation and storage contains a section on fluid mechanics which is unlikely to be useful to chemical engineers, but is strong on history. Some upgrading processes (used for coal storage) are also discussed here. While on Chapter 10 on Combustion, readers will have to go back to refresh their memory on some of the materials dealing with pyrolysis and volatile matter, a brief review (or even a mention of section numbers) would not have been out of place here. In the following chapter, the qualitative treatment of combustors is good, but more details on design would have been preferred to citing reviews in the literature. Chapter 11 deals with low- and high-temperature carbonization, and coal-tar processes. There is a good overall assessment, but the treatment of individual processes is uneven. Modern research and demonstration projects in this area are not treated. The chapter on gasification deals well with the distinction between producer gas, water gas, and synthesis gas, and with the processes used to obtain each of these. Only about one page, however, deals with catalyzed gasification, and the treatment of hot-gas desulfurization is relatively sparse. Chapter 13 on liquefaction appears to be a historical treatment. Exxon Donor Solvent (EDS) and Solvent-Refined Coal (SRC) processes are dealt with. Early work carried out in the Wilsonville Advanced Coal Treatment Facility (ACTF) is mentioned, but not the more interesting results with close coupling, nor the fact that the ATCF has recently been abandoned. Again, catalysis in liquefaction is dealt with in a page. Coprocessing (of coal with other fuels) is dealt with only in terms of the HRI scheme. The final chapter on environmental aspects of coal utilization deals extensively with electrostatic precipitators, venturi scrubbers, and the like. Selective Catalytic Reduction and similar schemes are relatively quickly described.

In summary, the book fulfills the mission that the author prescribed. The historical treatment is excellent, as is the description of technology in commercial use, either currently or historically. Treatment of modern research advances and descriptions of demonstration technology would appear to be lacking. Discussion of advances in solvent dissolution, clean coal technologies, disposable catalysts, coprocessing, and stationary source emission control would have made the book more useful to researchers and practitioners. Japanese and French contributions to the (English-language) literature could also perhaps have been dealt with in greater depth. The book is suitable for in-depth background and for a good broadbrush description of the technology of coal processing.

Dady B. Dadyburjor
Dept. of Chemical Engineering
West Virginia University
Morgantown, WV 26506

Multicomponent Mass Transfer

by Ross Taylor and R. Krishna, Wiley, New York, 1993, 579 pp.

This is an important book on multicomponent mass transfer, written by two leading investigators in the field. It is meant for readers already acquainted with the theory of mass transfer and the fundamentals of transport phenomena at the undergraduate level. The book is notable for its wealth of examples, including real data and useful comparisons of alternate models and methods for multicomponent problems. It is attractively printed and illustrated, with numerous graphs and schematic drawings.

Part I, entitled Molecular Diffusion, contains the following chapters:

1. Preliminary Concepts
2. The Maxwell-Stefan Relations
3. Fick's Law
4. Estimation of Diffusion Coefficients
5. Solution of Multicomponent Diffusion Problems: The Linearized Theory
6. Solution of Multicomponent Diffusion Problems: Effective Diffusivity Methods

Chapters 2-6 are very useful and well done. Nonideal mixtures and electrolytes are treated in the latter part of Chapter 2. The relative merits of the Maxwell-Stefan and generalized Fick diffusion coefficients are well treated in Chapters 3 and 4. Chapter 4 is a useful survey of diffusivity estimation methods for gases and liquids. Chapters 5 and 6 compare two popular approaches for solving multicomponent diffusion problems and should be required reading for workers in this field. The pitfalls of effective diffusivity approaches are thoroughly demonstrated in Chapter 6.

Part II, entitled Interphase Transfer, contains the following chapters:

7. Mass-Transfer Coefficients
8. Film Theory
9. Unsteady-State Mass-Transfer Models
10. Mass Transfer in Turbulent Flow
11. Simultaneous Mass and Energy Transfer

These chapters review selected mass-transfer models for binary systems and develop analogous methods for multicomponent systems. Chapter 7 deals with definitions, starting from a binary mass-transfer coefficient and generalizing the definition to multicomponent systems. Chapter 8 is a thorough treatment of the authors' multicomponent film model, with many examples. Chapters 9 and 10 are less complete; the surface-renewal model and laminar sublayer model given there are historically important, but more realistic models are available. Chapter 11 is extensive and well done, including detailed numerical examples on distillation and stripping in binary and ternary systems.

Part III, entitled Design, contains the following chapters:

12. Multicomponent Distillation: Mass-Transfer Models
13. Multicomponent Distillation: Efficiency Models
14. Multicomponent Distillation: A Nonequilibrium Stage Model
15. Condensation of Vapor Mixtures

Chapters 12 and 14 treat selected nonequilibrium models, and Chapter 13 treats equilibrium-stage models modified by stage efficiencies. Each chapter has extensive examples, and the last two include design studies and comparisons with experiments.

Appendices are provided on matrix algebra, equation-solving and estimation of the thermodynamic derivative matrix $\Gamma = [\partial \ln a / \partial \ln x]_{T,P}$.

A computer diskette is provided with the book; the examples in Chapters 1–13 are solvable using this diskette and the commercial package Mathcad which the user must obtain. A separate software package, *Chemsep*, is needed for some of the exercises in Chapter 14; information on it is available from Ross Taylor. With these computational aids and the extensive examples provided, this book is a very useful resource for chemical engineers in academia and industry.

Warren E. Stewart
Dept. of Chemical Engineering
University of Wisconsin
Madison, WI 53706