criticize his communication. He also works collaboratively with students on some assignments, demonstrating how to take, as well as to give, criticism. Above all, the teacher demystifies communication. Lucidity becomes not a magical property given to some and withheld from others, but the end result of a process, subject to human frailty yet responsive to effort. □

ChE book reviews

PHASE EQUILIBRIA IN CHEMICAL ENGINEERING

by Stanley M. Walas
Butterworth Publishers, Boston,
671 pages, $49.95 (1985)

Reviewed by
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Hundreds of thermodynamics textbooks have been written, and new volumes appear every month. So why do we need another one? Certainly it is because chemical engineers (and others) need to understand thermodynamics, especially for use in determining phase equilibria, and because thermodynamics is a difficult subject to explain. Dr. Walas avoids the pitfalls common to other thermodynamics texts by limiting the scope of his book; he does not attempt to explain the basis of phase equilibria in terms of the First and Second Laws, but rather he assumes that the reader has studied (and learned) these concepts and is ready for the design calculations for phase equilibria. This is not a book that could be considered as the sole text for the traditional one or two required courses in thermodynamics that are common in BSChe curricula in the U.S. Rather it is a textbook for an advanced undergraduate or graduate course specifically for design calculations in phase equilibria. However, it lacks the theoretical rigor common in textbooks aimed at this audience—this could be seen as either an advantage or a disadvantage, depending on one's point of view. Perhaps the best audience for this book is the practicing chemical engineer who remembers some thermodynamics and needs to come up to speed quickly in phase equilibria.

Besides extensive coverage of the standard phase-equilibrium topics, Walas has included many topics of importance to chemical engineers that are often lacking in similar texts. For example, there are sections on gas hydrates, liquid crystals, critical phenomena, supercritical equilibria, solid/liquid equilibria, and, perhaps most important, a section on recommendations as to which of the many available correlations one should use for a specific system. His description of the relevant literature (especially the review literature) is a very good feature.

Several computer programs in BASIC are given in an appendix and in worked-out examples in the text. These can be used directly by the reader for simple phase-equilibrium calculations.

The many homework problems are good, as are the example problems worked out in the text. The solutions manual seems to be complete and is a valuable companion to the book. The examples and problems in each chapter are related to real chemical engineering situations, not just idealized problems as in most texts. This distinction is especially important if the book is to be used by practicing engineers.

Numerous phase diagrams and tabular data for real systems are given, and a good (although quite abbreviated) section on experimental techniques is presented. Again, these are extremely important features, as is the subject index, which can be used to find these data quickly.

Although the book does contain several unique and important sections, they tend to be too short. For example, the section on experimental techniques is only twelve pages long. Other weaknesses include a complete lack of discussion about local-composition mixing rules (or other mixing rules except the original 1890 van der Waals rules) or about continuous thermodynamics. In fact, not even a full page is devoted to ill-defined mixtures, even though they are extremely important in the chemical processing industries. And although the chemical/physical model for predicting fluid-phase equilibria for multicomponent polar systems has been used extensively by industry for several years, it is not mentioned. Perhaps the most misleading part of the book is in the first chapter where it is implied that the solution of a cubic equation of state for its volumes is inherently iterative. In fact, one of the advantages of a cubic equation of state in industrial practice is that its roots can always be found with a straightforward technique involving no iteration.

Overall, *Phase Equilibria in Chemical Engineering* is a fine self-study and reference text for readers who already understand the basic thermodynamics which underlies the calculation of phase equilibria. It proves a rapid introduction into the use of phase-equilibrium models for chemical process design. The many worked-out examples and the computer programs make it a worthwhile text for what seems to be its targeted audience: practicing chemical engineers who need to use thermodynamic models for phase-equilibrium calculations immediately. □