x = mole fraction
z = compressibility factor

Greek Letters

ϵ = minimum of potential function
μ = Joule-Thomson coefficient
ρ = density
ρ^* = defined by Equation (11)
σ = intermolecular distance at minimum potential

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BOOKS

Fluid Phase Equilibria, edited by H. Renon, Elsevier Scientific Publishing Company, Amsterdam and New York, $57.75 for Volume I (in four issues).

There are a number of important characteristics of Fluid Phase Equilibria to justify the appearance of this new journal. First, is that it (unlike Industrial and Engineering Chemistry Fundamentals or the AIChE Journal) is devoted solely to applied thermodynamics, statistical mechanics and phase equilibria. This whole area is one of renewed engineering interest due to the need for physical properties and phase equilibrium data and prediction methods as a result of more stringent pollution standards, tighter design requirements necessary for energy conservation, and the development of synthetic fuels processing and other new technologies. It is also an area in which rapid progress is being made. Second, the editorial policy of this new journal, unlike that of the Journal of Chemical Thermodynamics, is such as to encourage a juxtaposition of the results of experimental and theoretical research, which may lead to more theorists reading about experiments, and more experimentalists reading theory. Next, Fluid Phase Equilibria, unlike Molecular Physics and the Journal of Physical Chemistry, publishes review articles, which should be of interest and value to those concerned with physical properties. The first two such articles, on statistical thermodynamics by T. Boublik and the start of a series on high pressure phase equilibria by I. Wichterle, indicate the diversity of subjects that the editorial policy of this journal permits. Finally, the two issues of Fluid Phase Equilibria which have appeared suggest that it will be a truly international journal, with authors from many countries.

Fluid Phase Equilibria is likely to attract readers and authors from all of the other journals mentioned above, and promises to be a necessary addition to the reading list of physical properties practitioners in industry and at universities. It is unfortunate that the subscription price of Fluid Phase Equilibria will also make it a rather expensive addition.

STANLEY I. SANDLER
Professor of Chemical Engineering
University of Delaware

Vapor-Liquid Equilibria using UNIFAC, Aage Fredenslund, Jurgen Gmehling and Peter Rasmussen, Elsevier Scientific Publishing Company, Amsterdam and New York, 1977. 380 pages. $59.75.

This monograph treats thoroughly the application of a method for prediction of activity coefficients in multicomponent liquid mixtures of nonelectrolytes at low to moderate pressures. Word of the success of the UNIFAC method has spread rapidly through the chemical-engineering community, and prospective users will find here complete descriptions which readily allow its implementation. All available parameters are given, detailed computer programs are listed, and many examples are presented. The book should indeed, as the authors intend, serve as a manual for the design engineer concerned with distillation and other separation processes.

The authors also carefully call attention to the present limitations of the method, for example, illustrating in a separate chapter that while qualitatively useful predictions of excess enthalpies and phase splitting may be made, the results should not be taken as quantitatively valid.

Since I was a visitor at the Technical University of Denmark during the time of greatest activity in the preparation of the manuscript for this book, I can attest to the painstaking care that went into all matters of accuracy and detail. The parameter tables inevitably contain gaps owing to the lack of data; however, the availability to the authors of the Dortmund data bank allowed their completion to the fullest extent possible.

This book is a large contribution to the fulfillment of a long-standing need.

HENDRICK C. VAN NESS
Department of Chemical Engineering
Rensselaer Polytechnic Institute

Multicomponent Diffusion, E. L. Cussler, Elsevier Scientific Publishing Company, New York and Amsterdam, 1976. 176 pp. $24.95.

This third volume in the Elsevier chemical engineering monograph series is a highly personal guided tour through the frequently bewildering area of multicomponent diffusion. While not a definitive fundamental reference it will prove a useful introduction, and a continuing challenge to the reader to do something with this material. This is clearly a book meant to be used, and it reflects both the energy and the entrepreneurial instincts of the author.

The first three chapters, which are devoted largely to phenomenology, should be very helpful to the beginner trying to orient himself, and to relate the many different kinds of diffusional formulations in the literature.

Chapter four is an excellent introduction to the measurement of multicomponent diffusion coefficients and reflects the hard-won experience of the author. It is a compact summary of material not well organized elsewhere to my knowledge.

Chapters five through seven are a praiseworthy attempt to summarize the behavior of frequently encountered systems. They are particularly useful for answering the key questions of when to use the formidable multicomponent formalisms and when to be on the lookout for major surprises. Much remains to be accomplished here, however, and accurate reliable predictions are not yet often possible.

Chapter eight describes carrier transport in membranes, an area in which the author has made particularly important contributions.

Chapter nine shows how one may apply multicomponent formalism in convective mass transport, a subject of particular importance to engineers working on kinetic and separation problems.

This book is generally clearly written in an informal style and imparts atmosphere as well as facts. The author has, for example, a "fast, eager, proton forever tugging on the leash, pulling the slow, stodgy chloride along behind." This occasionally breezy approach has pedagogical value for the receptive reader. A few unfortunate typographical omissions occur in key equations, and an erratum list should be requested of the author.

E. N. LIGHTFOOT
Chemical Engineeering Department
University of Wisconsin-Madison

LETTERS TO THE EDITOR

To the Editor:

Funk and Prausnitz [*AIChE J.*, 17, 254 (1971)] have discussed application of thermodynamic analysis to correlations of propane-propylene vapor-liquid equilibria and consequences affecting design of propane-propylene distillation columns (C_3 splitters). Related studies which I have made lead to the conclusion that it may be advantageous to operate C_3 splitters at pressures below 300 psia (2068 kPa) especially when methyl acetylene is present. I have made computer correlations similar to those reported by Funk and Prausnitz which produce propane-propylene relative volatilities essentially in agreement with those given in their paper. They stated that the relative volatility of propylene to propane was relatively unaffected by system pressure for high propylene concentrations and that little advantage would be gained by operating separation equipment at lower pressures for production of pure propylene. I agree that the relative volatility of propylene to propane is only slightly affected by system pressure for the high (95-99+ mole percent) propylene purities, but I would like to suggest modification of their latter conclusion for at least some cases.

The C_3 splitters employed in olefin plants generally contain in excess of 100 trays. Feed to these distillation columns contains methyl acetylene (propyne) and propadiene (allene) as well as propane and propylene if these former compounds are not removed by prior selective hydrogenation. It is desirable to produce a bottoms product as free of propylene as feasible and to reduce methyl acetylene concentration in overhead product to meet very low specifications in most cases.

In order to determine the effect of pressure on separations in a C_3 splitter on as simple a basis as possible I have set up computer simulations of such a column operating at total reflux with constant molal overflow. I have utilized equilibrium data for methyl acetylene and propadiene in C_3 hydrocarbon mixtures presented by Hill *et al.* [*AIChE J.*, 8, 681 (1962)] along with other selected propane-propylene data as listed in Funk and Prausnitz' paper. I would like to present two results which should be considered relative to C_3 splitter design. First, due to the fact that the C_3 splitter contains a very wide range of propylene concentrations from bottom to top, the theoretical tray requirement for production of polymer-grade (99+%) propylene is increased by about 7% by increasing tower pressure from 280 psia (1931 kPa) to 320 psia (2206 kPa). In a tower containing over 100 trays this extra 7 to 10 trays can be appreciable, especially if height restrictions are limiting. As could be deducted from Funk and Prausnitz' report, pressure has extremely little effect on propane-propylene separation in the upper portion of the tower (above the 95% propylene