BOOKS

Mass Transfer and Absorbers, T. Hobler, Pergamon Press, New York (1966). English translation, 525 pages, $18.50.

Professor Hobler is head of the faculty of chemical engineering and chemical plant at the Silesian Technical University, Gliwice, Poland. This book was originally written in Polish and published in 1962. The English translation has beeen prepared by Dr. Jan Bandrowski and edited by S. Hartland.

Most of the book is devoted to the design and analysis of industrial scale gas-liquid contacting equipment. The author states that the book is "mainly intended for practicing engineers" and that "theoretical considerations are reduced to the necessary minimum." To some extent this may be misleading; Hobler does stress an understanding of many basic mass transfer concepts.

The text begins with a comprehensive analysis of phase equilibrium and proceeds to an exploration of the classical Maxwell equations for diffusion. A discussion of the solutions of these equations for steady state diffusion leads to the definition of a generalized driving force for all mass transfer processes. The driving force is selected so as to produce a mass transfer coefficient which should be more constant than others commonly employed. For binary systems the resulting coefficient is equivalent to the k_x defined by Bird, Stewart, and Lightfoot; however, Hobler also endeavors to cover multicomponent systems with his selection of the generalized driving force.

An extensive chapter is devoted to the prediction of single-phase mass transfer coefficients for flow through pipes and packed beds, for liquid flow down a wall and over packing, for natural convection, and for rising bubbles and falling drops. This material is largely intended to be utilitarian. The approach involves dimensional analysis and correlation, and there are few specific solutions of basic transport equations in flow situations.

The chapters on the design of gas-liquid mass transfer equipment cover two hundred fifty pages. They are comprehensive with respect to packed and plate column heights and bubble-cap tray efficiencies. Although most of the material on column heights is standard, the author does make a laudable effort to provide simple ways of handling his generalized driving force approach in such calculations. There is also a presentation of design factors not strictly connected with mass transfer rate analyses. This coverage is valuable and complete with regard to pressure drops, limiting and economic vapor velocities, bubble hydraulics and

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COMMUNICATIONS TO THE EDITOR

INFORMATION RETRIEVAL*

Application of the Wohl equation to ternary liquid-vapor equilibria, Adler, Stanley B., Leo Friend, and Robert L. Pigford, **A.I.Ch.E. Journal, 12,** No. 4, p. 629, (July, 1966).

Key Words: A. Testing-8, Utility-9, Feasibility-9, Wohl Equation-9, 8, 10, Calculating-4, 8, Predicting-4, 8, Activity Coefficients-2, Composition-1, 2, Phase Equilibria-1, 2, 7, Ternary Constant-1, Binary Constants-1, 7, Ternary Systems-9, Nonideal-0, Vapor-Liquid-0, Pressure-6, Temperature-6, Statistical Analysis-10.

Abstract: The use of the Wohl equation for calculating activity coefficients is tested for twenty-five nonideal ternary systems. Both the three-suffix form (seven constants) and the four-suffix form (ten constants) of the Wohl equation are tested. All of the constants except one, C*, for each form are derived from phase equilibrium data on the constituent binaries. The ternary constant, C*, is determined by a trial and error method. Predictions of vapor composition are made for each experimental ternary liquid composition, temperature, and pressure, and the results are analyzed statistically.

Skin friction of power law fluids in turbulent flow over a flat plate, McDonald, A. T., and Harry Brandt, **A.I.Ch.E. Journal, 12,** No. 4, p. 637 (July, 1966).

Key Words: A. Calculating-8, 4, Derivation-8, Equations-2, Curves-2, Drag 2, 7, 8, Skin Friction-2, 7, 8, Velocity Profiles-1, Momentum Balance-1, Fluids-9, Non-Newtonian Fluids-9, Power Law Fluids-9, Carbopol-9, Flat Plate-9, Turbulent Flow-9, Reynolds Number-6, Viscosity-6, Power Law Exponent-6.

Abstract: A mathematical analysis is presented for skin friction of power law fluids in turbulent flow over a flat plate. A momentum balance is combined with a logarithmic velocity profile and the resulting equation is integrated. Skin friction is shown to be a function of non-Newtonian Reynolds number and power law shear rate exponent. Closed-form solutions for viscous drag are obtained for some values of shear rate exponent, but in general a numerical integration is necessary. For an example the results are applied to a power law fluid consisting of Carbopol in water.

Simultaneous heat and mass transfer in free convection with opposing body forces, Adams, J. A., and P. W. McFadden, **A.I.Ch.E. Journal, 12,** No. 4, p. 642 (July, 1966).

Key Words: A. Heat Transfer-8, Mass Transfer-8, Simultaneous-0, Measuring-8, 4, Density Changes-9, 1, Temperature Profiles-9, 1, Partial Pressure Profiles-9, 1, Calculating-4, 8, Heat Transfer Coefficients-2, 6, 7, 8, Mass Transfer Coefficients-2, 6, 7, 8, Local-0, Nusselt Number-2, Sherwood Number-2, Thermocouple Probe-10, Mach-Zehnder Interferometer-10, 8, Interferometer-10, 8, Sublimation-8, 6, *p*-Dichlorobenzene-1 9, Air-5.

Abstract: An experimental technique which utilized a Mach-Zehnder interferometer was used to measure local heat and mass transfer coefficients during simultaneous heat and mass transfer. The experimental model was a vertical, subliming surface of *p*-dichlorobenzene. The system was designed so that the body force due to the temperature difference was approximately the same as the body force caused by the mass transfer from the subliming surface. Of particular interest was the behavior of the free convection boundary layer under the influence of opposing body forces.

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* For details on the use of these Key Words and the A.I.Ch.E. Information Retrieval Program, see **Chem. Eng. Progr.,** Vol. 60, No. 8, p. 88 (August, 1964). A free copy of this article may be obtained by sending a post card, with the words "Key Word Article" and your name and address (please print) to Publications Department, A.I.Ch.E., 345 East 47 St., N. Y., N. Y., 10017. Price quotations for volume quantities on request.

Free tear sheets of the information retrieval entries in this issue may be obtained by writing to the New York office.

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drop-size distributions in spray towers. The bubble-cap tray design methods developed by Bolles are considered extensively.

The design oriented material is restricted to absorption, stripping, and distillation towers. Unfortunately, this limits the scope of the book, since the early chapters would lend themselves readily to further treatment of simultaneous heat and mass transfer, liquid extraction, and mass transfer to fixed beds.

One shortcoming of the book is the lack of sufficient coverage of some of the more recent data and methods, even if one makes allowances for the original publication date of 1962. For example, there is no mention of the Chapman-Enskog approach to gas diffusivities, of the various mass-heat-momentum transfer analogies, of the applications or predictions of boundary-layer theory, of the effect of high flux rates on mass transfer coefficients, or of much of the existing work on mass transfer to drops and bubbles. The chapter on absorption with chemical reaction is mainly devoted to the early film theory solutions of Hatta and of Van Krevelen and Hoftijzer. The extension of these results to tower design is not considered in any detail.

As might be anticipated, a major value of the book is the inclusion of much information developed in Russia and Poland. For the most part this takes the form of mass transfer data and correlations rather than new computational approaches. There are extensive tabulations of mass transfer coefficients measured for specific situations. There is also a forty-page supplement of data on solubilities, diffusivities (mostly older values), and properties of packings. Many of the solubility data are not otherwise readily available to those in English-speaking countries.

The book is well organized and is quite clear even though it is a translation. It should definitely be made available to all who perform design and analyses of gas-liquid contacting devices. It may also find some use as a text in more applied mass transfer courses.

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Fuel Cells. Their Electrochemical Kinetics, V. S. Bagotskii and Yu. B. Vasil'ev, editors, Consultants Bureau, New York (1966). 121 pages, $15.00.

This is one of a series of paper-bound books of interest to chemical engineers which was recently translated from the Russian by Consultants Bureau. As stated in the Preface it is a collection of ten articles presented at