BOOKS

Hydrodynamics and Heat Transfer in Fluidized Beds, S. S. Zabrodsky, Fizmatgiz, Moscow (1963). Translation Editor F. A. Zenz, Massachusetts Institute of Technology Press, Cambridge, Massachusetts.

This is an important book for those interested in the field of fluidized solids. For the first time it makes available in English the considerable amount of work that has been done by Russian investigators.

In the main the book is devoted to the flow characteristics of fluidized solids, covering onset of fluidization, homogeneous (particulate) and nonhomogeneous (bubble) fluidization, spouting beds, mixing in fluidized bed, entrainment, and heat and mass transfer.

The presentation tends to be of the review type, giving the results and relationships of the many investigations without any significant analysis or correlation of the current state of the art. Emphasis is on the Russian work and does not cover many of the studies that have been done in Europe and North America. This would be expected, and in the Foreword the author criticizes American investigators and authors for neglecting the U.S.S.R. work.

The U.S.S.R. work presented is very similar to that which has been done in the United States, Canada, and England, and tends to supplement and duplicate rather than open up new approaches or concepts. The Russian studies would appear to be somewhat behind those in this country, but this may be related to a lag time in publication.

The book does not indicate any significant effort by the Russians in the area of contacting, which is so important in the use of beds of fluidized solids as chemical reactors, particularly those involving high conversions of the feed compounds. There is a seven-page chapter on the "Means of Overcoming the Deficiencies of Fluidization as a Processing Technique" which gives a list of disadvantages of fluidization as a technological process, but it does mention contacting between the fluid and solid. This could lead to the conclusion that the Russians have not employed large beds of fluidized solids for many chemical operations, particularly those involving high conversion-heterogeneous catalysis.

The publisher indicates that the material was designed both as a graduate

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INFORMATION RETRIEVAL

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A fourth parameter for the vapor pressure and entropy of vaporization of polar fluids, Halm, R. L., and L. I. Stiel, **A.I.Ch.E. Journal, 13,** No. 2, p. 351 (March, 1967).

Key Words: A. Thermodynamic Properties-8, Vapor Pressure-8, Entropy of Vaporization-8, Polar Fluids-9, Saturated Fluids-9, Normal Fluids-9, Fluids-9, Acentric Factor-10, Polarity Factor-10, Boiling Point-10, Heat of Vaporization-10.

Abstract: Pitzer's acentric factor approach has been extended to the vapor pressure and entropy of vaporization of polar fluids. Normal fluid vapor pressure functions were determined. A polarity factor was defined, and polar correction terms established for the vapor pressure and for the entropy of vaporization. The polar correction terms enable the accurate calculation of the vapor pressure and entropy of vaporization of a polar fluid from its normal boiling point and normal latent heat of vaporization.

Turbulent flow of unstable liquid-liquid dispersions: drop sizes and velocity distributions, Ward, J. P., and J. G. Knudsen, **A.I.Ch.E. Journal, 13,** No. 2, p. 356 (March, 1967).

Key Words: A. Flow-8, Turbulent-0, Liquid-Liquid Dispersions-9, Dispersions-9, Unstable-0, Oil-9, Water-9, Size-8, Drops-9, Velocity Distribution-8, Velocity-8, Velocity Profiles-8, Friction-8, Friction Factors-8, Loss-8, Pressure-9, Determination-4, Viscosity-8, 9, Breakup-8, Coalescence-8.

Abstract: Friction losses, velocity profiles, and drop size distributions of liquid-liquid dispersions in turbulent flow were studied. The study of drop size distribution provided qualitative information concerning the breakup and coalescence processes in the flow system.

Penetration theory for diffusion accompanied by a reversible chemical reaction with generalized kinetics, Secor, R. M., and J. A. Beutler, **A.I.Ch.E. Journal, 13,** No. 2, p. 365 (March, 1967).

Key Words: A. Solution-8, Penetration Theory-9, 8, Finite-Difference Method-10, Reaction Kinetics-8, Diffusion-8, Mass Transfer-8, Computer-10, Film Theory-9, 8.

Abstract: The penetration theory equations representing diffusion with a generalized, reversible, chemical reaction are solved by a finite-difference method. Many solutions are presented in graphical form. Approximate solutions to several limiting cases are obtained analytically by means of a steady state representation, and are useful for estimating results of the solution to the penetration theory equations.

The frequency domain evaluation of mathematical models for dynamic systems, Hays, James R., William C. Clements, Jr., and Thomas R. Harris, **A.I.Ch.E. Journal, 13,** No. 2, p. 374 (March, 1967).

Key Words: A. Modeling-8, Mathematical Modeling-8, Frequency Domain-9, Intergral Squared Error-10, 9, Minimization-9, Parseval's Theorem-10, Fourier Transforms-10, Least Squares Method-10.

Abstract: In mathematical modeling applications, one of the simplest and most widely applicable comparison criterion for dynamic systems is the integral of the squared error between the observed and predicted results (ϕ). This paper discusses the advantages of the minimization of ϕ in the frequency domain.

Mass transfer with chemical reaction from single gas bubbles, Johnson, A. I., A. E. Hamielec, and W. T. Houghton, **A.I.Ch.E. Journal, 13,** No. 2, p. 379 (March, 1967).

Key Words: A. Solutions-8, Mass Transfer-8, 9, Mass Transfer Coefficients-8, 9, Steady State-0, Reactions-8, 9, Gas-9, Bubbles-9, Circulating-0, Noncirculating-0, Forced Convection-10, Velocity Profiles-10. B. Comparison-8, Solutions-9, Mass Transfer-9, Penetration Theory-9.

Abstract: Numerical solutions of the equations that describe steady state, forced-convection mass transfer around single circulating or noncirculating gas bubbles have been obtained for both first- and second-order chemical reaction conditions. The numerical results for circulating gas bubbles have been compared with penetration theory for both first- and second-order chemical reactions.

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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text and as a reference for the practicing engineer. It does not appear to be a satisfactory textbook and it is doubtful that many schools would be interested in a graduate subject in a field as specific as the fluidization of solids. The book can be a valuable reference source, and the review of the U.S.S.R. work in English and the extensive bibliography of Russian publications are important contributions.

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Nucleation Phenomena, A symposium sponsored by Industrial and Engineering Chemistry and the Division of Industrial and Engineering Chemistry of the American Society, Alan S. Michaels, Chairman, American Chemical Society Publications, Washington, D. C. (1966). 89 pages, $5.75.

This short, mighty volume is a collection of eight review papers, a preface, and an introduction. The review papers were presented at a symposium on nucleation in June, 1965, and thereupon published from September, 1965, to April, 1966, in *Industrial and Engineering Chemistry.*

The understanding of nucleation process (the mechanisms and kinetics of phase changes) is of considerable importance in a number of seemingly unrelated areas. Included among these areas, as indicated by the review papers, are alloy formations in metallurgy, nucleation in cloud chambers, nozzles, molecular beams and fogs, nucleation with boiling heat transfer, formation of crystals in polymeric melts, and nucleation in glasses. The contributors are all distinguished workers in this field and on the whole the caliber of their papers is quite high.

Nucleation research is a frontier area and the definitive text has yet to be written. These concise and readable articles offer the next best thing to a textbook and are capable of providing an introduction to, and a bibliography for, the field.

The two types of nucleation, namely, those changes which are of slight extent but extend over a large region and the converse are both treated. Whether these seemingly different phenomena will turn out to be special cases of a more general theory remains to be seen, but that is the stuff of research.

The format is quite attractive but some of the figures accompanying the text are deceiving. Figure 9 of page 10, which attempts to give a graphical