INFORMATION RETRIEVAL

Mass transfer from large single bubbles at high Reynolds numbers, Nate, Takayuki, and D. M. Himmelblau, **AIChE Journal, 13,** No. 4, p. 697 (July, 1967).

Key Words: A. Mass Transfer-8, 7, Diffusion-8, 7, Absorption-8, 7, Bubbles-9, Carbon Dioxide-9, Water-5, Mass Transfer Coefficient-8, 7, Flow Rate-6, Reynolds Number-6.

Abstract: Measurements of interphase transfer of carbon dioxide into single bubbles at average film Reynolds numbers of 40 to 300 were made.

Diffusion coefficients of hydrogen and helium in water, Ferrell, R. T., and D. M. Himmelblau, **AIChE Journal, 13,** No. 4, p. 702 (July, 1967).

Key Words: A. Diffusivity-8, 7, Diffusion Coefficient-8, 7, Mass Transfer-8, Hydrogen-9, Helium-9, Water-5, Transport Properties-8, Temperature-6, Absolute Rate Theory-10.

Abstract: Measurements of laminar dispersion in a capillary were used to determine the molecular diffusion coefficients of hydrogen and helium dissolved in water over the temperature range of 10° to 55°C. A statistical analysis of the experimental diffusion coefficients indicated that they could be related to the absolute temperature by a semiempirical correlation. The relation was based on the absolute reaction rate model of liquids.

A new apparatus for liquid phase thermal diffusion, Von Halle, Edward, and S. H. Jury, **AIChE Journal, 13,** No. 4, p. 709 (July, 1967).

Key Words: A. Thermal Diffusion-8, 7, Composition-7, Column-10, Horizontal-0, Forgotten Effect-6, Remixing-6, Efficiency-7, Temperature-6. B. Separation-8, Water-1, 2, Ethyl Alcohol-1, 2, Column-10, Horizontal-10.

Abstract: A horizontal thermal diffusion column is described in which the inefficiencies caused by the forgotten effect and parasitic remixing are avoided. Experimental results obtained on the separation of water-ethyl alcohol mixtures are presented.

The phase and volumetric relations in the helium-*n*-butane system: Part II. Second virial coefficients for helium-*n*-butane mixtures, Jones, Allen E., and Webster B. Kay, **AIChE Journal, 13,** No. 4, p. 720 (July, 1967).

Key Words: A. Second Virial Coefficients-8, *n*-Butane-9, Helium-9, Gas-Gas Equilibrium-8, Phase Equilibrium-8, Binary System-9, Compressibility-10, Isothermal-0.

Abstract: The second virial coefficients of pure *n*-butane and of two mixtures of helium and *n*-butane were determined from isothermal compressibility measurements. The occurrence of the gas-gas equilibrium observed in the helium-*n*-butane system can be qualitatively ascribed to the large differences in the molecular sizes and energies of the two components.

The phase and volumetric relations in the helium-*n*-butane system: Part I. Phase and volumetric behavior of mixtures of low helium concentration, Jones, Allan E., and Webster B. Kay, **AIChE Journal, 13,** No. 4, p. 717 (July, 1967).

Key Words: A. P-V-T Relationships-8, Helium-9, *n*-Butane-9, Gas-Gas Equilibrium-8, Phase Equilibrium-8, Binary System-9, Critical Temperature-8, Critical Pressure-8, Critical Volume-8, Critical Constants-8, Isothermal Retrograde Condensation-8.

Abstract: The P-V-T-x phase relations of helium-*n*-butane system were measured in the region of low helium content. The system exhibits the gas-gas equilibrium. The term gas-gas equilibrium is applied because the critical temperatures of the mixtures are higher than the critical temperature of either component.

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a survey of the physical concepts, experimental findings, and elementary theory of the subject. The topics covered include hydrostatics, integral conservation equations (macroscopic balances), differential conservation equations, and empirical methods of flow analysis, all for pure fluids. There are numerous examples, as well as review questions and problems at the end of each chapter.

The novelty claimed for the text is the provision of conservation equations for deformable control volumes (systems) with accelerating reference frames. These techniques have actually been demonstrated in other fluid mechanics texts; however the formal presentation given by Hansen will encourage their use.

The reviewer could find no mention of the mechanical energy balance. This important equation is included only in special forms obtained from the total energy balance, or from the Euler equation of inviscid flow. Thus, the student is not made aware of the availability of two separate and independent energy balances, both of which are needed to solve the majority of nonisothermal design problems.

The first section of the book contains a number of errors, such as the statement that stress is a vector (page 10), the use of inexact differential signs in differentiating state functions (page 30), the inappropriate use of a classical-mechanical expression for C_p/C_v (page 34), and the suggestion that the internal energy becomes a path function in the presence of electric fields, magnetic fields, or surface energy effects (page 28). In subsequent printings these errors will undoubtedly be corrected.

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Geometric Programming, Duffin, R. J., Peterson, E. L., and Zener, C., John Wiley, New York (1967). 278 pages.

So closely is the technique of *Geometric Programming* associated with the names of Duffin, Peterson, and Zener that had the authors not coined such an apt title, there is a fair chance that it would be called the DPZ method (or something equivalent). In view of this, it comes not at all as a surprise that this team has written a fine book on the subject.

The treatment starts from scratch so far as geometric programming is concerned, but does assume an acquaintance on the part of the reader with the arguments associated with linear (matrix) algebra, Lagrange functions, and linear programming. In fact a good review of the latter is presented in Chap-

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Kinetics of the aluminum-chlorine reaction, Cozewith, Charles, and Kun Li, **AIChE Journal, 13,** No. 4, p. 726 (July, 1967).

Key Words: A. Reaction Kinetics-8, Kinetics-8, Reaction Rate-8, 7, Reaction-8, *Aluminum-1, Chlorine-1,* Aluminum Chloride-2, Mass Transfer-6.

Abstract: The reaction between aluminum and chlorine to produce gaseous aluminum chloride was investigated at 500° to 650°F. The reaction rates were influenced by mass transport.

Sorption and diffusion of hydrocarbons in synthetic mordenite, Satterfield, Charles N., and Alton J. Frabetti, Jr., **AIChE Journal, 13,** No. 4, p. 731 (July, 1967).

Key Words: A. Diffusion Coefficients-8, Diffusion-8, Methane-1, Ethane-1, Propane-1, Butane-1, Benzene-1, Zeolite-5, Sodium Mordenite-5, Sorption-10, Desorption-10.

Abstract: Diffusion coefficients for the C_1 to C_4 paraffin hydrocarbon gases in single crystals of the synthetic zeolite sodium mordenite were determined from transient sorption rate and desorption rate measurements.

Normal freezing of eutectic forming organic mixtures, Cheng, C. S., David A. Irvin, and B. G. Kyle, **AIChE Journal, 13,** No. 4, p. 739 (July, 1967).

Key Words: A. Freezing-8, 7, Heat Transfer-8, Mass Transfer-8, Stability-8, 7, Interface-9, Distribution Coefficients-8, Eutectic Systems-9, Constitutional Subcooling-6, Trapping-7, Solute-9, Concentration-7, Solid Phase-9, Boundary-Layer Model-10, Diffusion Model-10, Benzene-9, Cyclohexane-9, *n*-Heptane-9, Hexadecane-9, Hydrocarbons-9.

Abstract: Normal freezing of several organic systems exhibiting simple eutectic behavior was studied experimentally and the occurrence of constitutional subcooling was clearly established. This phenomenon results in the instability of a planar solid/liquid interface and leads to solute trapping.

A gravity corrected theory for cylinder withdrawal, White, David A., and John A. Tallmadge, **AIChE Journal, 13,** No. 4, p. 745 (July, 1967).

Key Words: A. Entrainment-8, 7, Flux-8, 7, Withdrawal-9, Removal-9, Cylinders-9, Liquids-9, Films-9, Oils-9, Radius-6 Viscosity-6, Surface Tension-6, Goucher Number-6, Capillary Number-6, Speed-6, Thickness-6.

Abstract: A gravity corrected theory for cylinder withdrawal is developed and experimentally verified. It extends the speed range of valid theory by a factor of ten.

A study of interstitial liquid flow in foam: Part III. Test of theory, Shih, Fang-Shung, and Robert Lemlich, **AIChE Journal, 13,** No. 4, p. 751 (July, 1967).

Key Words: A. Foams-8, 9, Drainage-8, 6, Overflow-8, Fractionation-4, Separation-4, Interstitial Flow-8, Mathematical Model-8, Rate-6, Feed-9, Density-7, Theoretical-0, Experimental-0.

Abstract: The theory for foam drainage and overflow is tested with extensive experimental data gathered from foam fractionation columns and also from stationary foams at steady state. The experimental results support the theory.

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ter 2 with considerable detail and examples, but it will probably seem sketchy to a reader who has not encountered the subject before. Such a consideration is not a significant drawback, except for the occasional reader who first encounters the subject of optimization through geometric programming. For him the authors provide a handy reference list.

Through the heart of their book—Chapters 3, 4, and 5 will probably be those that most readers work over in detail—the authors skillfully build a lattice of mutually supporting examples and proofs. This will be most appreciated by the engineering reader who, as the authors point out, learns a new approach more readily from examples than from theorems. Nevertheless it should be noted here that the book's "primary purpose . . . is to explain the mathematical theory of geometric programming and to illustrate its application . . . ." In keeping with the first part of this focus, emphasis shifts increasingly in the later chapters to abstract formulations, until in the last two chapters, 6 and 7, problems with an engineering flavor have disappeared, leaving a mathematical structure that is strictly for the specialist. In a sense this sequence of material is a biography of a new field that arises from practical engineering needs, but matures into a mathematical framework for rigor and elaboration.

The strength of this book is above all in its deft synthesis of material that is essentially of two kinds: it offers an excellent introduction to engineering problem solving by geometric programming, yet finds place for analysis of its more significant abstract implications. For this reason an audience of quite diverse backgrounds will find use for the book. Because of this feature, however, the authors have chosen not to elaborate on some subjects that may be particularly troublesome to a beginning student. If he wonders, for example, how geometric programming can be adapted to *maximization* problems, he will find a hint supplied in an exercise problem at the end of Chapter 1, but might wish for more details on the treatment of posynomials in general.

But no book can be all things to all men, and this last point is meant to guide the reader's expectations, rather than to criticize an excellent, clearly written book. The authors have certainly achieved admirably the task they set for themselves. In so doing they have for the first time made available much of geometric programming in a single place, and the book will surely be a major reference for a long time to come.

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