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thalpy departure $\frac{(h_o-h)}{(T_c)}$, and the entropy departure ($S^o-S-R \ln p$) as functions of P_r, T_r, and Z_c. They have reduced all the values for a given property to a single chart by including on each diagram of the property vs. P_r with lines of constant T_r, 4 lines of constant Z_c. The property charts are based on $Z_c = 0.27$ and by using the lines for the other, Z_c's as a nomograph one quickly and easily corrects the property to another value of Z_c. The suggestion is made that these reduced correlations may also be used for mixtures by employing pseudo-critical values of the three parameters. An example of such use is given which involves an estimation of the isentropic work of compression of a mixture of methane and propane.

The critical properties, formula and molecular weight of 122 elements and compounds are tabulated. T_c is given in °C. °K. and °F., P_c in atm. and V_c in cc./g. mole and cu.ft./lb. mole. Another table gives the molar ideal-gas enthalpies of 96 elements and compounds at even intervals of temperature from 0 to 1,600°K. with some gaps where data are not available. In still another table molar ideal gas absolute entropies of the same substances are also tabulated at the same absolute temperatures and for $p=1$ atm.

Everyone who has occasion to make thermodynamic calculations will be grateful to the authors for producing this new and very useful compilation.

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The Flow of High Polymers, Stanley Middleman, New York (1968). 246 pages, $

Stanley Middleman's book deals with the rheology of high polymers: the carrying out of well defined viscometric measurements in the laboratory and the correlation of these measurements with each other and with molecular parameters. To place the book in the wider context of polymer flow mechanics, one might think of three broad areas: analysis of polymer processing flows, basic theoretical and phenomenological continuum mechanics, and moleuclar rheology. The focus of this book is on the second area with some attention to the third area where possible. One hopes, of course, for the comprehensive, three-

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INFORMATION RETRIEVAL

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Chromatographic study of surface diffusion, Schneider, P., and J. M. Smith, **AIChE Journal, 14,** No. 6, p. 886 (November, 1968).

Key Words: A. Diffusivity-8, Diffusion-8, Surface-9, Ethane-9, Propane-9, *n*-Butane-9, Silica Gel-5, Chromatography-10, Adsorption-8, Pores-9.

Abstract: A new method, based upon chromatography, was used to measure surface diffusion coefficients for ethane, propane, and *n*-butane on silica gel. An advantage of this method is that the average surface coverage is very low. Thus the surface diffusion coefficients so obtained are very close to limiting values.

Two phase friction factor for para-hydrogen between one atmosphere and the critical pressure, Rogers, John D., **AIChE Journal, 14,** No. 6, p. 895 (November, 1968).

Key Words: A. Pressure Drop-8, Two Phase-0, Flow-8, Friction Factor-8, Para-Hydrogen-9, Martinelli Model-10, Critical Pressure-9.

Abstract: The Martinelli model for pressure drop in flowing two phase systems has been examined in detail for para-hydrogen from one atmosphere to its critical pressure. A method for obtaining the Martinelli Φ term, two phase friction factor, at intermediate pressures is presented.

Free convective effects on stokes flow mass transfer, Pearson, R. S., and P. F. Dickson, **AIChE Journal, 14,** No. 6, p. 903 (November, 1968).

Key Words: A. Mass Transfer-7, 8, Stokes Flow-9, Convection-6, Drops-9, Methyl Acetate-9, 2-Ethoxyethyl Acetate-9, Water-5, Spheres-9, Flow Rate-6.

Abstract: Free convective effects on forced convective mass transfer in the Stokes Flow region were studied experimentally by using a single drop in a liquid-liquid system. Liquids used to form the drops were methyl acetate or 2-ethoxyethyl acetate with distilled water as the continuous medium.

Iterative techniques in optimization. I. Dynamic programming and quasilinearization, Lee, E. Stanley, **AIChE Journal, 14,** No. 6, p. 908 (November, 1968).

Key Words: A. Solution-8, Differential Equations-9, Optimization-8, Quasilinearization-6, 10, Programming-8, Dynamic-0, Dimensionality-7, Extraction-4, Iteration-10.

Abstract: The quasilinearization technique is used to overcome the dimensionality difficulties of dynamic programming. The approach is based on the fact that if the difference or differential equations are linear, their closed forms of solution can be obtained. This solution permits the separation of the effects due to the initial state from the effects due to the control variables. Using this separation combined with quasilinearization, the dimensionality of the functional equation of dynamic programming can be reduced to one in most cases.

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Transient diffusion from a well-stirred reservoir to a body of arbitrary shape, Ma, Yi Hua, and Lawrence B. Evans, **AIChE Journal, 14,** No. 6, p. 956 (November, 1968).

Key Words: A. Diffusion-8, Transient-0, Reservoir-9, Well-Stirred-0, Constant-Volume-0, Diffusivity-8, Measurement-4, Integral Equation-9, Digital Computer-10, Partial Differential Equation-9, Solid Body-9.

Abstract: A theoretical study was made of transient diffusion to a body immersed in a finite volume of well-stirred fluid. The major contribution of this work was the development of a technique for solving the problem for a three-dimensional body of arbitrary shape. The solutions are in a form that is useful for determining diffusion coefficients in solids by means of the constant-volume experimental technique. New solutions were computed for two three-dimensional geometries: the finite cylinder and the rectangular prism. A range of shape factors and ratios of the volume of the reservoir to that of the solid body were employed for each geometry. It was shown that by selecting the ratio of volume to external surface area as the characteristic length of each shape object, the solutions for all shapes were brought close together and were identical during the initial part of the transient.

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pronged treatment. But rheology is an enormous field and the appearance of any general treatment is welcome. Within the framework set out by the author, the book is well done; it is concisely written and calls attention to real material behavior.

The chapter on experimental techniques is logically laid out and covers the standard viscometric geometries, such as the capillary tube and the cone and plate. In addition there is a discussion of the jet expansion (die swell) experiment. The succeeding chapter on constitutive equations is as readable as one can hope to make this kind of material. Good descriptive passages accompany the mathematical developments.

The chapter on molecular theories is good so far as it goes. It is largely concerned with dilute solution theory and deals only in passing with concentrated solutions and bulk polymers, which are of most interest. In particular, the kinetic theory of rubber elasticity needs to be included. The Williams paper cited in Chapter 4 gives a concise discussion of the molecular framework, with intramolecular (dilute solution) theories on the one hand and intermolecular (network) theories on the other. The Williams paper itself, which undertakes a synthesis of these approaches, is discussed.

And finally the chapter on the correlation and interrelation of material functions discusses such topics as the Williams, Landel, and Ferry time-temperature superposition rules and the analogies between dynamic and steady shear experiments. In some sense, the author deals with a comparison of nonlinear effects as opposed to the linear effects discussed by molecular rheologists.

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Thermodynamics: An Advanced Course with Problems and Solutions, Ryogo Kubo in cooperation with Hiroshi Ichimura, Tsunemaru Usui, and Natsuki Hashitsume, North-Holland Publishing Co., distributed in the U. S. A. by John Wiley and Sons, Inc., New York, (1968). 293 pages, $16.00.

This is a thermodynamics book with a difference, and a different difference, than any other that has come to my attention. It bears the subtitle, "An advanced Course with Problems and Solutions," and the problems and solutions account for the difference. Altogether there are presented 188 problems with solutions. Indeed, no problem is included without its solution. The textual material is very concise, and is contained within 74 pages, whereas 219 pages are devoted to problems and their solutions.

There are but four chapters; however, a wide coverage of material is packed into them, all of it appropriate for a chemical engineer studying thermodynamics at the advanced level. The titles of the chapters are: "Thermodynamic State and the First Law of Thermodynamics." "The Second Law of Thermodynamics and Entropy," "Thermodynamic Functions and Equilibrium Conditions," and "Phase Equilibrium and Chemical Equilibrium." Although these chapter titles might be appropriate for a elementary text, one should not mistake the level of this book. The authors quite rightly call it an advanced course.

This book should be of considerable value to anyone with a thorough grounding in elementary thermodynamics and who through self-study wishes to pursue the subject further. It should also be most useful as a supplementary text to graduate students taking an advanced course in thermodynamics or studying for examinations.

The translation of the book from Japanese into English occasionally porduces a quaintness of phrase, but there is no ambiguity. Symbolism and terminology are sufficiently close to American practice so as to produce no great difficulty.

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