BOOKS

Flow of Fluids Through Porous Materials, R. E. Collins, Reinhold Publishing Co., New York (1961). 270 pages. $12.50.

The problem of flow of liquids and gases through, around, and in-between solids arises in most chemical engineering applications. This book is a successful attempt by a physicist to put the mathematical analysis of laminar flow through porous rocks and the like in a well-organized textbook form. Within this prescribed area the content is detailed and comprehensive. Complex multidimensional flow problems involving transients, two fluid phases, and moving boundaries are described with fundamental relationships and appropriate models. The peculiar characteristics of porous materials are concisely and quantitatively presented. In addition some important problems arising in petroleum production, such as viscous fingering, are explained, and important research methods, such as scaling models, are described. The author is also to be commended for use of consistent, simple units in an area of application where unusual combinations of units are frequently found. Although symbols are defined where they are introduced, a table of notation would have been useful.

Although the book is mostly concerned with petroleum problems, the content is obviously applicable to many soil mechanics problems, such as those of ground water flow and dispersal of radioactive wastes.

This book is no ordinary qualitative discussion of a particular application. It is a quantitative, advanced text about general phenomena and is of considerable value for describing and explaining complex mechanisms and also, thereby, very useful for design purposes.

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Progress in Very High Pressure Research, F. P. Bundy, W. R. Hibbard, Jr., and H. M. Strong, ed., John Wiley & Sons, Inc., New York (1961). 314 pages. $12.00.

This book consists of the papers and discussions presented at an International Conference held at Bolton Landing, Lake George, New York, June 13-14, 1960. The conference was sponsored jointly by the Materials Central, Wright Air Development Division of the United States Air Force, and the Research Laboratory of the General Electric Company.

The twenty-seven papers are mainly concerned with equipment and technique, structure of materials formed under high pressure, and behavior of matter at high pressure. High pressure is a purely relative term, but in this book it refers mainly to the range between 10,000 and 100,000 atm. Some of the papers report research in the range of 1,000 to 10,000 atm., and at least one paper reports pressures up to 400,000 atm. (The last paper of the

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INFORMATION RETRIEVAL*

Key Words: Catalysis-I, Conditions-I, Surfaces-I, Temperature-I, Pressure-I, Partial-, Heterogeneous-H, Reactions-H, Particles-H, Pellets-H, Reaction Mechanics-H, Methods-J, Numerical-, Graphs-, Techniques-J, Models-J.

Abstract: Numerical and graphical methods are presented for estimating the temperatures and partial pressures at the surfaces of catalyst particles for gaseous reactions in flow systems. The errors resulting in the interpretation of catalytic reaction rate data where surface conditions are assumed to be those of the ambient gas stream are presented. A numerical method of evaluating the reaction model using nonisothermal surface conditions is indicated.

Reference: Yoshida, Fumitake, D. Ramaswami, and O. A. Hougen, **A.I.Ch.E. Journal, 8,** No. 1, p. 5 (March, 1962).

Key Words: Transferring-I, Heat Transfer-I, Radiating-I, Fluxes-H, Thermal-H, Radiations-H, Heat Transfer-H, Local-, Transport-H, Surfaces-H, Temperature-F, Emissivity-F, Heat Transfer-G.

Abstract: An analysis of radiant interchange is made which takes account of possible surface variations in incident radiation flux, heat transfer, and leaving radiant flux. This represents a generalization of standard calculation methods which postulate that the radiant fluxes and heat transfer are uniformly distributed on a surface. Consideration is given to pairs of simply arranged surfaces having different emissivities and arbitrarily different surface temperatures. Local and overall heat transfer results are compared with those predictd by standard calculation procedures.

Reference: Sparrow, E. M., **A.I.Ch.E. Journal, 8,** No. 1, p. 12 (March, 1962).

Key Words: Flow-I, Fluid Flow-I, Pressure Drop-I, Predicting-I, Forecasting-I, Fluids-H, Gases-H, Liquids-H, Phases-H, Heat Transfer-H, Trichlorofluoromethane-A, Chlorinated Hydrocarbons-A, Fluorinated Hydrocarbons-A, Halogenated Hydrocarbons-A, Hydrogen-A, Tubes-J, Pipes-J.

Abstract: Data on pressure drop in two-phase, single-component fluid flow, both with and without heat transfer, are presented in terms of the Lockhart and Martinelli correlation parameters. The fluids used were trichloromonofluoromethane and hydrogen. The results are compared with the correlation curve recommended by Martinelli and Nelson, and reasons for deviations are discussed. A method is proposed for predicting roughly the total pressure drop in tubes containing steady state, two-phase, single-component fluid flow with appreciable vaporization.

Reference: Hatch, M. R., and R. B. Jacobs, **A.I.Ch.E. Journal, 8,** No. 1, p. 18 (March, 1962).

Key Words: Fluid Flow-I, Flow-I, Velocity-I, Profiles-I, Annular-I, Friction-H, Factors-H, Correlations-H, Pressure Drop-H, Reynolds Number-H, Drag-H, Boundaries-H, Water-A, Liquids-A, Fluids-A, Tubes-J, Pipes-J, Cylinders-J, Concentric-J.

Abstract: Main stream velocity profiles have been obtained by means of impact probes for the steady, isothermal flow of water in three smooth, concentric annuli having widely different diameter ratios. The point of maximum local velocity has been determined, thus permitting the ratio of skin frictions of the inner and outer boundaries to be calculated. Previously published data on pressure drop have been used to obtain separate friction factor correlations for the two surfaces. Attention has been centered on the transition range, where the position of maximum velocity is a function of both the diameter ratio and the Reynolds number.

Reference: Rothfus, R. R., and E. J. Croop, **A.I.Ch.E. Journal, 8,** No. 1, p. 26 (March, 1962).

* For details on the use of these key words and the A.I.Ch.E. Information Retrieval Program, see **Chem. Eng. Progr., 57,** No. 5, p. 55 (May, 1961), No. 6, p. 73 (June, 1961).

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conference deals with units and recommends that all future publications use the units bar and kilobar for pressure. One atm. = 0.987 bars).

Of special note is the paper by Professor Vereshchagin of the Institute for High Pressure Research of the Union of Soviet Socialist Republics which reviews the progress made in this area in the Union of Soviet Socialist Republics.

In order to give a better idea of the content of the various papers presented at this conference the following list of titles is given: High Pressure Apparatus, Diamond Cells for X-Ray Diffraction Studies under High Pressure, Optical Studies at High Pressure, The Upper Three-Phase Region in the System SiO_2-H_2O, Mobility of Vacancies and Interstitials at High Pressures, Some Observations on the Morphology and Physical Characteristics of Synthetic Diamond, The Thermodynamics of Activated Processes at High Pressures, The Synthesis of the Cubic Form of Boron Nitride, The Effect of Hydrostatic Pressure on the F.C.C. $\rightleftarrows$ B.C.C. Reactions in Iron-Base Alloys, The Effect of High Pressures on Transformation Rates, Research and Development on the Effects of High Pressure and Temperature on Various Elements and Binary Alloys, State of Matter at High Pressure, Resistance and Thermal Gap Measurements to 400,000 Atmospheres, Recent Geochemical Research at High Pressures, Melting and Other Phase Transformations at High Pressure, Some Experiments at High Pressures and Low Temperatures, The Pressure Variation of the Elastic Constants of Sodium, Properties of Semiconductors at High Pressures, An Accurate Determination of the Equation of State by Ultrasonic Measurements, Effect of Pressure on EMF of Thermocouples, Effect of Hydrostatic Pressure up to 8,000 Atm. on the Self-Diffusion Rate in Silver Single Crystals, Effects of Pressure on Magnetic Interactions in Metals, The Volume Dependence of the Cohesive Energy from Shock Wave Compression Measurements in Solids, Nuclear Magnetic Resonance in Solids and Liquids Under Pressure, Investigations (In U.S.S.R.) in the Area of the Physics of High Pressures, Some Fixed Points on the High Pressure Scale, and Large Pressure Units.

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The Optimal Design of Chemical Reactors: A Study in Dynamic Programming, Rutherford Aris, Academic Press, Inc., New York (1961). 191 pages. $7.00.

Problems associated with optimization and optimal design of chemical reactor systems have been receiving increasing attention in recent literature. Quite often the results have been somewhat disappointing in that only relatively restricted systems are considered, and the inclusion of more general situations results in mathematical formulations of appalling complexity.