INFORMATION RETRIEVAL *

Diffusion and dispersion in porous media, Whitaker, Stephen, **A.I.Ch.E. Journal, 13,** No. 3, p. 420 (May, 1967).

Key Words: A. Diffusion-8, Dispersion-8, Dispersion Equation-8, Porous Media-9, Anisotropic-0, Dispersion Vector-8, Tortuosity Vector-8, Flow-9, Laminar-0, Incompressible-0, Differential Equations-10.

Abstract: The dispersion equation for a single, nonreacting, nonadsorbing species is derived for incompressible, laminar flow in anisotropic porous media.

The relationship between transport properties and rates of freeze-drying of poultry meat, Sandall, Orville C., C. Judson King, and C. R. Wilke, **A.I.Ch.E. Journal, 13,** No. 3, p. 428 (May, 1967).

Key Words: A. Transport Properties-6, Heat Transfer-6, Mass Transfer-6, Thermal Conductivity-6, Pressure-6, Nitrogen-6, Helium-6, Inert Gas-6, Freeze-Drying-8, 7, Drying-8, 7, Poultry-9, Turkey-9.

Abstract: This paper presents the results of an experimental study of freeze-drying under controlled and analyzable conditions. The major aim was to develop and confirm a model which relates the fundamental transport properties of the dried material to the observed drying rates.

Flow work exchanger, Cheng, Chen-yen, Sing-wang Cheng, and Liang-tseng Fan, **A.I.Ch.E. Journal, 13,** No. 3, p. 438 (May, 1967).

Key Words: A. Flow Work Exchanger-8, Pressurizing-8, 4, Feedstocks-9, Depressurizing-8, 4, Products-9, Pumps-10, Turbines-10, Desalination-4, Reverse Osmosis-10, Freezing-10, Hydrogenation-4, Synthesis-4, Phenol-2, Chlorobenzene-1.

Abstract: A flow work exchanger which offers an efficient and economical scheme for simultaneously pressurizing a fluid stream and depressurizing a substantially equivalent volume of another fluid stream is described. Several high-pressure processes are used to illustrate the application of a flow work exchanger.

The mechanics of a spray column, Letan, Ruth, and Ephraim Kehat, **A.I.Ch.E. Journal, 13,** No. 3, p. 443 (May, 1967).

Key Words: A. Holdup-8, 7, Drop Size Distribution-8, 7, Drop Size-8, 7, Flow Rate-6, Kerosene-9, Water-9, Spray Column-8, 9, 10, Flooding-8, Heat Exchanger-8, 10, Position-6, Column-9, Packing-6.

Abstract: Local and average holdup and drop size distribution as a function of low rates were measured for kerosene drops and water in a countercurrent spray column. At the same pairs of low rates of the dispersed and the continuous phases in spray columns, three modes of drop packings can be obtained. These are termed dispersed, restrained, and dense packings. For dispersed packing at low flow rates of the two phases, the holdup and the drop size are constant along the column. At high flow rates the drop size increases from bottom to top of the column and the holdup increases from top to bottom of the column.

Influence of resin selectivity on film diffusion-controlled ion exchange, Copeland, J. P., C. L. Henderson, and J. M. Marchello, **A.I.Ch.E. Journal, 13,** No. 3, p. 449 (May, 1967).

Key Words: A. Ion Exchange-8, 7, Selectivity-6, Resin-9, Ion Exchange Resin-6, 9, Nernst-Planck Equations-10, Diffusivity-6.

Abstract: An analytic solution of the Nernst-Planck equations is derived which applies to a selective resin when film diffusion controls. The selectivity has a marked effect on the rate of exchange for a wide range of diffusivities.

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

* 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.

marily boiling," and nineteen under "Miscellaneous papers, books, and reports."

With a view to the future, Professor Gouse writes "If useless repetition and lost time are to be minimized, then an effort of this kind must be continued and its results made widely available." This reviewer welcomes and recommends the services provided by Professor Gouse. The "Index" focuses on problems in coping with the literature, offers an assist, but still leaves for us to resolve our own problems of reporting and communication.

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State Space Analysis of Control Systems, K. Ogata, Prentice-Hall, Inc., Englewood Cliffs, New Jersey (1967). 596 pages, $13.95.

This book is an excellent one which should be of interest to chemical engineers who wish to understand the basic features of introductory modern control theory. The material is well written, the references are quite recent, and numerous short examples are located in each chapter. More detailed examples and problems are also presented at the end of each chapter.

To illustrate the material covered, the first six chapters (369 pages) contain a detailed description of matrix-vector manipulation, eigenvalue properties, the state space (differential and difference equation) representation of dynamical systems, and the solutions of these state equations. In Chapter 6, for example, four different procedures are detailed for evaluating the homogeneous matrix solution, exp $[At]$, and this is then used in solving the Riccati matrix equation.

Chapter 7 contains a detailed examination of the important concepts of controllability and observability and Chapter 8 is concerned with the stability of continuous and discrete systems via Liapunov's method. Among other items, Krasovskii's and the variable gradient method for generating Liapunov functions are examined. Chapter 9 introduces the concepts of dynamic programming and applies it to the optimal regulator problem.

This reviewer would have liked some material included on the maximum principle and further consideration given to the control of nonlinear systems via various computer algorithms. In any event this book will be a welcome addition to those who teach optimal control theory in graduate chemical engineering courses.

Princeton University
Leon Lapidus