BOOKS

Computational Analysis of Polymer Processing

Edited by JRA Pearson and S.M. Richardson, Elsevier Science Publishing Co., 1983, 343 pp., $66.75.

This book presents an outstanding collection of review papers, authored in almost every case by experts I would have recommended as the most active and knowledgeable in the specific topic area. It will appeal to engineers and scientists actively attempting to apply computational methods to analysis of polymer melt processing.

In the shortest chapter, JRA Pearson presents a concise introduction to "Polymer Melt Mechanics," as an aid to the subsequent detailed and specific reviews. This is followed by a general review of finite difference and finite element methods of Crochet and Walters, and aimed specifically at "Viscoelastic Fluid Flow," as opposed to the simpler problem of non-Newtonian but purely viscous flows.

Subsequent chapters deal with a variety of challenging and important problems that occur in melt processing. Tanner discusses computations of "Extrudate Swell," a free boundary problem. Fenner then describes methods of computing confined flows that occur in "Extrusion," including the melting problem. Purely viscous models are used—a reasonable assumption in this class of flow. Richardson then presents a discussion of nonisothermal "Injection Molding," with schemes for simulation of various stages of that process. Again, the discussion is restricted to purely viscous fluids. Denn presents a careful and detailed discussion of "Fiber Spinning," including both steady behavior as well as stability to infinitesimal and finite disturbances. C.J.S. Petrie follows with a discussion of models of "Film Blowing," "Blow Molding," and "Thermoforming," which includes nonisothermal and non-Newtonian effects.

In the longest chapter in this collection, Kistler and Scriven describe the remarkable progress, primarily by Scriven's own research group, toward the development of finite element methods for treatment of "Coating Flows." This is a class of flow that is especially complex because of the presence of free surfaces that are *a priori* unknown. In the final chapter, J. Wortberg describes a range of applications of microcomputers to "Process Control" of systems of hardware engaged in extrusion, injection molding, etc. The emphasis is on monitoring of various signals from a process and the use of such measurements to maintain or optimize the performance of a process.

In summary, this excellent collection will encourage those who are serious about solving the kinds of problems that arise in viscous flows subject to complex boundary conditions. It is not a "how to" book; many of the writers seem to have committed substantial portions of their careers to this topic during the past ten years. The reader is fortunate to have access to this history of their successes and their optimistic plans for continuation.

STANLEY MIDDLEMAN
Dept. of Applied Mechanics and
Engineering Sciences
University of California, San Diego
La Jolla, CA 92093

The Chemistry and Technology of Coal

By James G. Speight, Marcel Dekker, 1983, 528 pp., $69.75.

This volume is a useful addition to a rapidly growing body of literature dealing with coal science and technology, since it provides a general introduction and overview of the field. Various chapters deal with the basic nature, composition, structure, and properties (physical and chemical) of coal; methods of testing and analysis; classification systems; chemical reactions and solvent extraction; and the technology of coal mining, conversion, and utilization. Because of the broad coverage, most topics are not covered in great depth. On the other hand, a bibliography at the end of each chapter provides a useful entry into the coal literature. Numerous illustrations serve to clarify meaning and add interest.

An important feature of the volume is a description of different coal utilization and conversion systems and processes. Flowsheets, equipment diagrams, and important operating conditions are presented for a large number of carbonization, liquefaction, and gasification processes. However, engineering and economic details are limited, and little indication of development status is provided. In many cases, there is no indication as to whether a process has reached the commercial stage or pilot-plant stage, or has even advanced beyond the laboratory stage.

The volume is a useful reference for most scientists and engineers who require a broad overview of coal science and technology. It could also serve as a text for an introductory course on this subject for college students with some background in chemistry and physics.

THOMAS D. WHEELOCK
Dept. of Chemical Engineering
Iowa State University
Ames, IA 50011

Modeling and Identification of Dynamic Systems

By N.K. Sinha and B. Kuszta, Van Nostrand Reinhold, 1983, 334 pp., $32.50.

System identification ordinarily involves the determination of structure and parameter values of linear models. Such models can describe linear or nonlinear systems within a narrow operating range and are useful primarily for control purposes. System identification has evolved as an important component of control theory. Although