

# BOOKS

**Essential Fiber Chemistry** (Fiber Science Series), Mary E. Carter, Marcel Dekker, Inc., New York, N. Y. (1970). 216 pages. \$19.75.

This is a general review of major fiber varieties, giving an overview of fiber chemistry with emphasis on applications in the textile industry. Of particular interest are the discussions of fiber structure and properties and the chemical modification of both natural and synthetic fibers to impart properties that achieve permanent press, wrinkle resistance, etc.

Chapters are devoted to cotton, rayon, cellulose acetate, wool, polyamide, acrylic, polyethylene terephthalate, polyolefins, spandex, and glass. While discussions of fiber chemical and physical structure and the steps of processing and manufacturing are treated but briefly, extensive bibliographies appear at the end of each chapter.

Because of the brief, and even superficial, treatment of some topics, the book should be considered as a general review whose primary merit may lie in the bibliographical listings.

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**Optimal Control Theory—An Introduction**, Donald E. Kirk, Prentice Hall, Inc., New York (1971), 452 pages. \$13.50.

This excellent book is to be highly recommended for use as a first-year graduate textbook and also for self-study by engineers and scientists. The reader's background should include matrix algebra and basic concepts of control. One of the strengths of this book is its wide use of illustrative examples, answers to selected problems, and footnotes that help the reader to quickly recall or learn mathematical symbolism and jargon. Half of the problems and most of the examples are suitable for nonelectrical engineers; chemical engineers, in particular, will feel at home with the examples relating to the optimal control of a continuous stirred-tank reactor.

After starting with a concise, but excellent, review of state variable representation and an introduction to optimal control problem formulation, the book discusses dynamic programming and its use in optimal control. This discussion is followed by the calculus of variations and Pontryagin's minimum

principle and its application. The book ends with a discussion of iterative numerical techniques for finding optimal controls and trajectories.

For a mathematically complex subject, the book is made easier to read because of the many examples worked out and because of the description of computational procedures, including tables which summarize the salient features of the methods being discussed. In particular, Table 4-1 summarizes the boundary conditions for the several possible cases in which the calculus of variations is employed; the table contains also pertinent remarks on the number of equations and the number of unknown variables to be solved. Table 6-4 provides a comparison of features of three of the iterative numerical techniques for finding optimal controls and trajectories. The dynamic programming approach is compared with the calculus of variations approach to optimal control problems and the text points out how the techniques may be combined so as to minimize computational problems. The final chapter gives a feeling for what it is possible to do and what is probably impossible to do with the current theory and calculational technology.

The text material should be directly useful to the chemical engineer who can develop a mathematical model of his process in finite state vector form. One of the weaker points of Chapter 2 is that, while it does a commendable job of illustrating the types of performance measures, it provides inadequate insight into the selection of the "weighting factors" used in them. The text takes special pains to use nomenclature and mathematical symbols that precisely state what the equations are about, which is a real help to readers using it for self-study. For the formal classroom situation, the book is suitable for a one-semester graduate course.

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**Chemical Engineering Journal**, An International Journal of Research and Development, published quarterly by Elsevier Publishing Co., Ltd., London (1970). Volume 1, \$18.00.

*Chemical Engineering Journal* is a welcome addition to the publication ranks in the effort to keep up with the

increasing volume of papers in the chemical engineering field. This new journal is a quarterly, the first having appeared in January, 1970, and the editors are Professor D. C. Freshwater and Dr. B. A. Buffham of the Loughborough University of Technology. The need for an additional publication for chemical engineering is indicated by the backlog of material for the established journals. Justification for the new periodical will rest with the economic test as it is produced by a commercial publisher.

The editors indicate interest in a range of papers to include fringe areas of chemical engineering that may be of future importance. Particular interest is also stated for papers which relate recent theoretical work to design applications and for review papers which survey new fields and explain the relevance of these developments in chemical engineering. In this respect, the editors recognize the complaint of a majority of chemical engineers in that many published research papers are too "far out" and have no apparent application in applied chemical engineering. The journal's subtitle emphasizes the application interest.

Review of the first volume shows an international scope of authors with a large proportion of research papers. The editors have been successful in obtaining publication from three to six months after acceptance of papers. It will be a challenge to maintain this short publication period and to represent the applications area so as to maintain the word "Development" in the subtitle.

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