BOOKS

Chemical Reactor Theory, edited by Leon Lapidus and Neal R. Amundson, Prentice Hall Inc., 1977, 856 + viii pages, $28.00.

Like the Great Books of the Western World this handsomely bound volume is filled with the wisdom of profound thinkers and could occupy a prominent place in one's library. Also like the Great Books, only small portions are likely to be read by the individual owner. In fact, one wonders if anyone will read this book from cover to cover.

The book is a collection of independent papers, as illustrated in the accompanying table. There is no index such as one would expect to find in a more coherent text. On the other hand, much more effort has gone into coordination among chapters than is common in volumes of collected papers. The authors are clearly aware of each others efforts, and there is even some similarity in writing styles. This latter probably results from the very evident Minnesota-Princeton axis (9 authors with Minnesota connections, 4 with Princeton connections and 10 others). With the exception of one or two chapters, the writing and proofreading are superb. The book was conceived for earlier publication and most of the chapters were written in 1974. While it is slightly less up to date than originally intended there is nevertheless much thought which will endure.

The authors are clearly a collection of superstars, consistent with the stature of the editors and Richard H. Wilhelm, to whose memory the book is dedicated. Few individuals could be expert enough to judge the quality of each article, and this reviewer is not one of them. A few of my impressions however may convey the overall character of the book. The first thought is that any given chapter is most appropriate for reading by a specialist interested in that particular area. Several (1, 2, 12, 13) are so demanding mathematically as to be very difficult for the uninitiated. Others (4, 6, 7, 11) are so loaded with equations that at times the physical meaning is hard to retain. On the other hand very powerful efforts have been made in some cases (1, 6, 12) to maintain contact between the mathematics and the physical reality. Several chapters (3, 5, 7, 8, 9, 10) can be read easily by any research oriented, chemical reaction engineer. For balance among historical, theoretical, and experimental aspects, chapters 4, 9, 12 seem to stand out. Typical of the gems which may be found throughout the book, chapter 3 gives a most complete treatment of why Langmuir-Hinshelwood, Hougen-Watson catalytic kinetics are so often successful. Chapter 6 treats the seldom described radial flow reactors and includes a guide to the solution of the equations which arise for fixed bed reactors.

Certain chapters are complementary. Chapter 8 relates to Chapter 7 as chemical reaction engineering relates to kinetics. Chapters 10 and 11 both deal with fluidized beds. Chapter 10 is a marvelous treatment of the subject, offering much comparison of theory and experiment. It is most enjoyable to read, but it ends abruptly leaving this reader eager for an overview. Chapter 11 is much more difficult reading, with many models and little data, but does give some perspective. The concluding chapter (13) missed an opportunity to establish a strong connection between theory and application, however this seems to be a characteristic weakness of the control literature.

While acknowledging with enthusiasm the excellence which pervades this book, one might ask what is missing. The major emphasis is clearly on the mathematics, physics, and physical chemistry with very little attention given to the reaction chemistry. This is an accurate reflection of chemical reactor theory, and indeed chemical engineering, in the last 25 years. Thus, it is perhaps symbolic, that gas-liquid reactions, where detailed consideration of

Chapter	Authors	Titles	Pages
1	Feinberg	Mathematical Aspects of Mass Action Kinetics	78
2	Varma & Aris	Stirred Pots and Empty Tubes	77
3	Carberry	Catalysis and Catalytic Kinetics —An Introduction	35
4	Luss	Steady-State and Dynamic Behavior of a Single Catalytic Pellet	78
5	Szekely	Reactions Between Porous Solids and Gases	45
6	Hlavacek & Vortruba	Steady-State Operation of Fixed-Bed Reactors and Monolithic Structures	91
7	Fredrickson & Tsuchiya	Microbial Kinetics and Dynamics	79
8	Ollis	Biological Reactor Systems	48
9	Ray & Laurence	Polymerization Reaction Engineering	51
10	Davidson, Harrison, Darton & LaNauze	The Two-Phase Theory of Fluidization and Its Application to Chemical Reactors	103
11	Bukur, Caram & Amundson	Some Model Studies of Fluidized Bed Reactors	72
12	Bailey	Periodic Phenomena	56
13	Padmanabhan & Lapidus	Control of Chemical Reactors	43

the chemistry is usually required, is omitted from consideration. Another area of considerable importance is mixing which received no in depth consideration. To practitioners it would surely be worthy of a chapter and there have been 25 years of sophisticated theoretical attention to residence time distribution and its ramifications. Finally, with all the attention given to temperature and concentration and to heat and mass transfer, the important effects of pressure have been largely overlooked. Actually Professor Wilhelm was exploring the dynamic use (parametric pumping) of this variable at the time of his death. Pressure effects are usually dealt with in the realm of thermodynamics, but this too is a part of chemical reactor theory.

To read only the chapters of this book which interests one directly, is to be amply rewarded. The reader of the entire book should be congratulated.

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Authors