reflects their breadth of expertise. A large number of literature citations is given at the end of each section so that the reader can follow up on material.All practicing control engineers should have this handbook in their library; it is a real bargain. On the other hand, the Borer text can easily be omitted from one's library without a significant loss.

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The Chemistry of Coal

By N. Berkowitz, Elsevier, 1985, 513 pp.

This book covers a broad range of coal chemistry topics at a level of detail and degree of advancement that should serve as an introduction for engineers, scientists or graduate students not familiar with coal or as an overview and review for those already knowledgeable about some of the topics. The author of the book has long been a productive researcher in many areas of coal chemistry, and he describes authoritatively the well established information as well as the knowledge gaps.

The book is divided into four parts. The first part consists of three chapters on the history of coal chemistry, the diversity of coal in terms of its organic and mineral heterogeneities, and the methods used to measure chemical and physical properties of coal.

Part II begins with a chapter on coal as an undefined organic compound, including a presentation of physical properties and a discussion of the implications of elemental composition and evidence from function group determinations. Four other chapters discuss chemical reactions at electron-rich centers, including nitration, halogenation, oxidation and dehydrogenation, as well as acid- and base-catalyzed reactions, pyrolysis, and the action of solvents on coal.

Practical applications of coal chemistry are covered in Part III, with chapters on chemical aspects of direct combustion, carbonization, gasification, and liquefaction. A separate chapter on the environmental chemistry of coal discusses the nature of solid, liquid and gaseous pollutants and techniques for their control.

Part IV is presented as a postscript on the chemical structure of coal. Representations of coal structure are given along with a discussion of the significance of structural models and anomalous rank effects.

The main strength of the book is its coverage of coal chemistry from a scientific point of view. Thus the chemical characterization of coal and its reactions are extensively described in detail. The underlying experimental evidence for conclusions and remaining ambiguities are carefully given and identified.

A possible weakness of the book is the treatment of engineering aspects of coal chemistry. More often than not the chemical reactions of coal are coupled with transport processes that can significantly affect the behavior, be it softening and swelling or product yields, distributions, and overall reaction kinetics. While the book does offer valuable discussion of these physical influences, the treatment is not as quantitative as chemical engineers usually prefer. However, this possible weakness is more than offset by the many strengths of the book.

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Synthetic Polymeric Membranes: A Structural Perspective, Second Edition

By R. E. Kesting, John Wiley & Sons, 1985, 348 pp.

The membrane field has grown significantly over the past fifteen years since publication of the first edition of R. E. Kesting's book that focused on membrane types and formation techniques. His recently published second edition includes updates on advances in membrane formation, material selection and membrane processes. The title to the new edition has been lengthened to include the words "A Structural Perspective," reflecting an expansion in the scope compared to the first edition. The substantially rewritten book seeks to make a direct connection between primary polymer structure and functional properties of membranes. Relationships between polymer molecular weight, molecular weight distribution, crystallizability and mechanical properties are integrated into discussions of membrane properties in Chapter 4. A discussion of polymer solutions has also been added in Chapter 5. This latter chapter has a strong practical tone with little quantitative theory; nevertheless, it contains many useful observations and rules to guide one in the art of successful membrane formation.

As in the first edition, there are no formal illustrative examples or problems, so it is not appropriate as a conventional text for academic instruction. The information covered, however, suits it well as a reference for researchers in advanced membrane materials or membrane formation development. Only a very short discussion of module configurations and packaging is offered in the introductory chapter of the second edition, and while such topics are not the primary focus, a bit more information here would have been nice. Also, more discussion of adsorptive fouling of membranes and how polymer structural features suppress or promote this problem would have been useful and well within the scope of the topic area. Overall, however, this book is highly recommended as an easily readable means of obtaining a deeper understanding of characteristics of membrane formation processes and of the types of materials currently available.

The point of view expressed by Kesting emphasizes the need for chemical engineers to understand polymer science in order to participate effectively in the evolving field of membrane science. Unlike traditional unit operations such as distillation and extraction, the detailed material properties of the medium from which the separation device is made enters *directly* into the separation process itself. Both polymer/penetrant thermodynamic interactions and polymer-controlled diffusion of the permeating species, governed by the membrane composition, determine the effectiveness of the unit operation.

Chapter three, dealing with miscellaneous membrane applications, is a nice addition to this expanded edition. This chapter treats cases falling outside the normal separation realm typically associated with membranes. Examples of such applications include: selective membrane electrodes, collector membranes for sampling, controlled release devices, membrane reactors, and solid state electrolytes. These new areas are based largely on the same fundamental principles as in conventional membrane separation situations. Such miscellaneous uses constitute a rapid growth segment of the