BOOKS

Water Quality and Treatment, A Handbook of Public Water Supplies, 3rd Ed., McGraw-Hill Book Company, New York. 654 pages. $19.50.

The subtitle "A Handbook of Public Water Supplies" aptly describes this book's contents. It is a comprehensive and well-arranged coverage of the field of water treatment as we know it today. The information presented is vitally necessary to those directly associated with water treatment and responsible for the safety of our water supplies; aside from this primary benefit, however, the book should be of interest and value to those engineers and scientists only casually involved with our overall ecological problems but whose specific responsibilities deal with the solution of the waste control problems of industry.

Perhaps of far greater importance is the book's potential value to the layman —for it chronicles man's dedication to insuring a safe and pure water supply for a great proportion of the world's population. It vividly shows that this didn't just happen but occurred only as a result of the cooperative searching, experimentation, and labor of diverse disciplines from all over the earth. Man will rest a little more secure knowing that such thoroughness and dedication stand behind his potable water supply and realizing that what has been accomplished by technological expertise there can also be achieved with relation to the current ecological problems facing man.

The technical coverage is excellent. The 28 contributors to the third edition of this auspicious work provide a wealth of theoretical and practical competence concerning the unit operations prevalent in the water treatment area. The information should also be of value to those using these operations in other fields.

The plan of the Handbook is to cover in more or less detail all of the unit operations and other procedures commonly employed in water treatment. The list of chapter headings is diverse —ranging from water quality, aeration, coagulation and flocculation, filtration, corrosion phenomena, chemical treatment, radioactivity, fluorides in water, and plant control to the ultimate disposal of water-treatment plant residues. Each discussion contains numerable descriptions of successful operating plants and extensive bibliographies.

The chapters on coagulation and flocculation, filtration, chemicals and chemical handling, and management of water-treatment plant residues should be of particular interest to those engaged in chemical engineering operations. The broad aspects of coagulation and flocculation are covered with a comprehensive bibliography for further elaboration. However, for those wishing only a broad review or for those interested in refreshing their knowledge of the field, this chapter is excellent. It covers the history of sedimentation, the nature and physical chemistry of particles, the theories of coagulation-flocculation, the factors affecting coagulation, the control of coagulation, and the coagulants commonly used in this operation. From a technical standpoint, this is perhaps the most useful chapter that expounds basic chemical engineering principles.

The discussion of filtration is restricted primarily to single- and dual-media rapid-sand filters which are commonly used in water treatment. Identification and cure of the common malfunctions of sand filter operation is described; this information should be useful to anyone interested in this type of filtration.

The ultimate disposal of treatment plant residues is a severe problem which is disproportionately increasing not only in water-treatment operations but also in the general field of pollution control. While it is encouraging that this problem is being recognized, it is unfortunate that the Third Edition treats this subject rather superficially and does not provide much information of a specific nature.

All in all, however, even if the chemical engineer is not directly engaged in water treatment or pollution control, he will find the Third Edition valuable reading. It will provide him with an excellent appreciation of how so many familiar techniques are necessary to produce and protect our pure water supply.

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Elements of Polymer Degradation, Leo Reich and Salvatore S. Stivala, McGraw-Hill Book Company, New York (1971) 361 pages. $18.50.

As stated by the authors, this book is primarily intended for those entering the general field of polymer degradation but should also be of value as a reference for anyone already working in the area. The title is appropriate, since the authors examine thoroughly the fundamentals of various types of degradation, experimental degradation methods, kinetic mechanisms, and factors affecting polymer instability. Although the book was developed for a special topics graduate course, most areas examined are particularly suitable for industry.

The book is divided into the four general areas mentioned above. In the first section, thermal and oxidative degradation are introduced briefly, with a discussion of chemical mechanisms and fundamental kinetic rate derivations. Ample references are cited for each case. The chapter then moves into the various types of radiative degradation, citing specific cases for various types of polymers. Mechanochemical and chemical processes of degradation are discussed in depth, again with a fundamental kinetic treatment and references. A brief discussion of biological degradation concludes the chapter. Considering the current attitude toward environmental problems, this topic is only superficially covered, although references are provided for greater detail.

Most beneficial to both industrial polymer chemists/engineers and students is the discussion of experimental Dynamic Thermogravimetric Analysis (TGA) and Differential Thermal Analysis (DTA). The authors skillfully de-

scribe the experimental procedure, as well as factors affecting accuracy and estimation of kinetic parameters. Enough information with examples is given to make both TGA and DTA very powerful and quantitative tools. Additional analytical methods, including Gel Permeation Chromatography (GPC), Infrared Spectroscopy (IR), and Gas Chromatography (GC) are presented in less detail.

A good description of the kinetics of thermal and oxidative degradation comprises the third section. Sufficient detail and rigor are employed in order that a complete academic study could be undertaken in conjunction with the mechanisms set forth in the first section.

Factors which affect polymer stability, including the effects of various pollutants on the stability of commercial polymers, are examined in the last section. The industrial polymer chemist/engineer will find the chapter valuable in either product application work (new product areas) or environmental studies.

In conclusion, this work is an excellent single source, well-suited to industrial chemists/engineers and students or as a reference to the whole area of polymer degradation. Since each major section is essentially independent, an investigator may effectively use one without resorting to another. Both qualitative and quantitative aspects of polymer degradation are described well enough to be a useful tool.

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Thermal Radiation Heat Transfer, Robert Siegel and John R. Howell, McGraw-Hill Book Company, New York (1972). 814 pages. $18.50.

This book originated from the notes prepared by the authors for a course in thermal radiation given to a group of practicing engineers. Its primary intention was to cover the field of thermal radiation at first-year graduate level. Because some of the topics are treated in considerable detail, however, the book can also serve as a reference for engineers working in the thermal radiation field. The text is organized in three sections, each representing a separate area of thermal radiation. The areas are thermal properties of opaque materials, radiative interchange in enclosures, and radiation in partially transmitting media.

In the first section the authors introduce the subject of thermal properties of opaque materials by reviewing basic concepts in thermal radiation, including black body radiation and the radiation from nonblack surfaces. The basic treatment of the subject constitutes a good introduction for readers needing a review of fundamentals. One whole chapter deals with the predictions of radiative properties of surfaces from a classical electromagnetic theory. Although these predictions apply only to idealized surfaces, they can be used in practical engineering calculations to extrapolate experimental data to other ranges.

Of interest to engineers is a chapter describing the properties of real surfaces encountered in engineering practice. Although the description is limited to only a few types of surfaces, references to literature sources with more information are given. Some of the radiative properties of common engineering materials are also tabulated in accompanying appendices—a welcome addition to the book.

The second section is concerned with the radiative interchanges in enclosures, with and without other heat transfer modes present. In the opinion of this reviewer, this part of the book constitutes a valuable contribution to the literature of radiative heat transfer and is also of great interest to a chemical engineer. Starting with a brief introduction to the mechanism of radiative energy transfer in enclosures, the authors proceed to discuss radiant energy interchange between black isothermal surfaces, outlining several methods for determining geometrical configuration factors. The discussion is then extended into two areas: enclosures composed of diffuse-gray surfaces, and enclosures having some specularly reflective surfaces. In both cases methods for determining radiant energy transfer rates are described. The authors then consider radiation interchange between nondiffuse, nongray surfaces, which probably approximates most closely the true situations encountered in engineering. The difficulties in obtaining exact solutions to this type of problems are indicated.

The next chapter describes Monte Carlo methods as applied to the solutions of complex radiation problems. One of the authors has made extensive personal contributions to the development of this technique and is therefore especially well qualified to discuss the subject.

The second section concludes with a description of radiant energy interchange in the presence of conduction and/or convection. This discussion is somewhat limited in scope, but a comprehensive list of references will permit the interested reader to find more information.

The last section treats the problem of radiation in partially transmitting media, including several areas of interest to chemical engineers. The authors discuss engineering approaches to the solution of gas radiation in enclosures including several, by now, classical methods. They also describe how to apply the Monte Carlo technique to the solution of problems in absorbing-emitting media. It is pointed out that this method is especially suitable for this application and can yield solutions to otherwise intractable problems.

One chapter covers energy transfer in emitting and absorbing media in the presence of other heat transfer mechanisms. The authors conclude that in most cases the problems become very complicated and the analytical solutions extremely difficult to obtain. In the concluding portion of this section several special topics are discussed, including the radiation from nonluminous and luminous flames. This subject may be of some interest to a chemical engineer. References at the end of the chapter provide the reader with additional sources to supplement this brief and somewhat sketchy treatment.

The material presented in the book covers a very wide scope and it is difficult to expect that all areas could be treated with the same degree of thoroughness. The reviewer finds, for example, that the text fails to mention the solutions of radiation interchange problems by means of such devices as mechanical integrator or electrical network analogue simulator. Although with the advent of digital computers these techniques became less important, they still offer a valuable tool in solving certain types of problems. The material is presented clearly and logically and can be easily followed even by a reader with limited previous knowledge of thermal radiation heat transfer. The worked-out examples in the text as well as the problems given at the end of each chapter are very useful, especially to those studying without an instructor.

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