Chapter Seven presents information on liquid-liquid dispersions, and one example in the chapter is given to show the discrepancy between various correlations. An ingenious technique is suggested for inverting the dispersion in an immiscible liquid dispersion. Gas liquid contacting is discussed in Chapter Eight. A notable omission from this chapter is information on surface aeration in waste treating systems. Chapter Nine discusses a few detailed studies of heterogeneous reactions and gives several examples of typical processes.

Professor Nagata asked me to prepare Chapter Ten and to relate previous chapters to some actual examples of mixing processes. This chapter is, therefore, written in a different style, and, unfortunately, Professor Nagata was not able to review this section in detail before his untimely death. It summarizes concepts that are important in mixing applications in practical situations.

All in all, the book contains information which will be helpful to those concerned with mixing processes. By choosing selective sections, one could use the book to present some basic concepts of fluid mixing in undergraduate and graduate courses.

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Mixing Equipment Company

Fluid-Bed Heat Transfer, J. S. M. Botterill, Academic Press, New York, New York (1975). 299 pages, $23.75.

Heat transfer correlations for practical fluidized-bed reactors must currently be regarded as highly empirical and specific to the equipment in use. This situation is recognized in the book, and therefore it emphasizes the mechanisms of fluidized-bed heat transfer as the necessary basis for data interpretation and application. The book primarily treats gas-solids fluidization with some reference to liquid-fluidized systems. All aspects of the subject which have been reported in the literature are covered. Particle-to-gas heat transfer, heat transfer from the bed to various types of surfaces, and radiant heat transfer are among the topics treated. Empirical heat transfer correlations for specific systems are also presented.

While heat transfer is the primary subject of this book, the dynamics of fluidized-bed behavior is in addition discussed to establish a basis for interpreting heat transfer phenomena. A chapter is also devoted to solids transport.

The extensive literature on this subject is well covered, providing a valuable reference on the current state of knowledge of heat transfer as well as bed behavior. The author thoroughly understands the subject of fluidized-bed heat transfer and has organized the material very well. While the book provides an excellent technical description, additional editorial assistance would have been advised for removing frequent typographical errors and making the sentences read easier.

The book is quite timely, particularly for those interested in fluidized-bed coal conversion processes and should be of exceptional value to the researcher and design engineer.

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Handbook of Plastics and Elastomers, Charles A. Harper, Editor-in-Chief, 1024 pages, 525 illustrations, McGraw-Hill Book Company, $39.50.

The Handbook of Plastics and Elastomers, Charles A. Harper, ed., is intended as a "comprehensive sourcebook for those who want to capitalize on product improvement and cost advantages made possible by plastics and elastomers." The more than 1000 pages and 500 tables and figures contain a massive array of useful technological data and commercial product information; the accompanying text will be especially helpful to the polymer technologist with little or no formal background in polymer science. It is disappointing, however, that the extensive bibliographies at the end of each chapter merely document sources of data and do not lead the reader to a broader perspective by referring to any of the more basic literature in the polymer field.

The overall organization of the Handbook is excellent with clearly marked chapter contents and an extensive index. The size of the print in the text and in the tables and figures is surprisingly comfortable for the reader, and the figures are generally clear and large enough to use in a quantitative manner. A weak point is the absence of any reference to the page location of the various tables and figures which rarely appear on, or even near, the page on which they are discussed in the text. The twelve chapters, prepared by a panel of industrial scientists, are organized as follows: Chapter 1 outlines background information but falls short of its claim of covering the "fundamentals" of plastics and elastomers. The following three chapters cover electrical, mechanical and environmental properties. Chapters 5-10 deal with particular polymer systems —composites, fibers, foams, resins, coating and adhesives—and it is these chapters which will likely be the most heavily used. Chapter 11, whose presence provides an interesting commentary on today's technological bureaucracy, details current commercial and government agency standards for plastics and elastomers. Finally Chapter 12 outlines design and fabrication techniques.

In deciding whether or not to purchase this handbook one should consider the $39.50 price tag as well as the major emphasis on polymer technology rather than polymer science. One must also consider the reliability of the data and the text material. In perusing the tables and figures this reviewer found mostly accurate information although such errors as pentavalent carbon in the structure of polypropylene (p. 4-30) and the reference to the pioneering work of "Corothers and Florey" (p. 1-107) appear with disconcerting regularity.

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Air Pollution Control and Industrial Energy Production, K. E. Noll, W. T. Davis, and J. R. Duncan, ed., Ann Arbor, Michigan (1975). 367 pages. $22.50.

A better title for this book might be "Air Pollution Control in Industrial Processes," since over a dozen industrial processes are described, ranging from the control of odors from rendering plants to emission control of TVA electric generating plants. Each of the 21 chapters has been written by a different author or group of authors. This multitude of authors benefits the reader since each expert can describe those pollution problems encountered in the industry which he is intimately familiar with, but it does tend to give the book some lack of continuity.

When I first received this book, my first impression was skepticism, since I couldn't imagine that any book by three civil engineers could be of interest to a chemical engineer; however, the excellent descriptions of various industrial processes, the sources of pollution from these processes, and the method of abatement maintained my interest throughout the book. As expected, the emphasis is in physical removal of particulates and secondary combustion techniques rather than the removal of chemical pollutants by chemical means.

The major topics include pollution sources, performance standards, sam-

pling and analytical techniques and elimination of pollutants. Obviously, it is not possible in 367 pages to cover every subject in great depth; however, because of the breadth of coverage, this book could make an excellent text for an introductory survey course in *pollution control*. It could also serve as a starting point for someone just becoming involved in pollution control, although in that respect it is lacking in many of the basic literature references. Six chapters contained no bibliography whatsoever.

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Rheometry, K. Walters, Wiley, New York (1975) 278 pages $32.00.

This is a timely occasion for a book on rheometry: the three decades of serious activity which we have observed since the advent of the modern subject by Weissenberg, Reiner and Rivlin might be described as one of toying with infinitesimal deformations, one of development of adequate instrumentation and now one of vigorous analytic and experimental work. Professor Walters' book brings all this together in a conservative and careful manner: conservative in that the only experimental tools which are discussed and recommended are those which have been proven useful; careful in that the notation is very clear, the derivations are complete and lucid and errors of fact and of typography appear to have been eliminated with a substantial devotion to detail.

The book is not a text for teaching rheology nor a development of molecular constitutive equations as the jacket flap might imply but it is a valuable reference for both students and practitioners of rheology. The important rotational shearing flow geometries are thoroughly analyzed with careful attention to assumptions in the derivations and to such error sources as inertial, edge and end effects. The many years of productive experience which the author has enjoyed with the Weissenberg rheogoniometer assert themselves with dignified authority and clarity. Both steady state and oscillatory sinusoidal test methods are described in detail and the treatment of instrumental resonance effects is lucid. There is no other compilation of all of this which is of comparable quality.

The reader also deserves to know the important limitations of the book and there are several. The experimental difficulty of resolving the phase angle during forced oscillations is barely mentioned. There is no discussion of transient tests other than sinusoidal —such as the "start-up" or "stress relaxation" modes. The fact that the cone-and-plate geometry cannot satisfy the stress equations of motion for nonlinear fluids when a steady shearing motion is assumed is noted on p. 46 but, for inexplicable reasons, this geometry is later concluded to be superior to the parallel plate geometry which is entirely free of this conceptual defect. An excellent analysis of secondary flows in the cone-and-plate device, published by Turian in 1972, has also been omitted with reference given instead to an earlier analysis which is really much less satisfactory.

The use of capillary instruments to infer material properties is discussed much more superficially than are the rotational devices. Capillary measurements generally extend the attainable range of experimental results by more than two orders of magnitude and so their use is of very great pragmatic importance. That this is so is clear from the figure reproduced from the work of Meister and Biggs but the significance of this fact is not noted in the text. In the case of extrudate swell the excellent papers by Graessley and Tanner are really not considered in sufficient detail for the reader to appreciate their utility. The capillary tube is the most widely used rheometer in industry and its real strength is lost, in the view of these reviewers, in an exhaustive discussion of pathological results which are not of very great importance.

On the subject of extensional flows Professor Walters' conservative stance is to emphasize steady-state results perceptively and in detail. This is good but also needed is a lucid discussion of what can be done at much higher deformation rates in unsteady state experiments. These are mentioned briefly and sensitively but the reader is not exhorted to proceed as vigorously with such studies as may be desirable if we are to understand industrial operations such as film blowing and fiber spinning.

Omitted are a large variety of empirical procedures for inferring material properties as well as any mention of work of thixotropic systems.

Professor Walter's subtle Welsh humor is present, though not as frequently as we might have preferred. Both of us must admit to failing Professor Walters' rheological Rorschach test: the pictures in Figure 3.3 remain as much of a mystery after a month as when the book was first received. After the usual exhortations concerning material indifference he notes (p. 42) with less than profound insight that the standard "broomstick" experiment (stretching of a cylindrical rod) is an extensional flow regardless of whether the whole apparatus is fixed in the laboratory or rotating on a giant turntable. This is followed by "it is not immediately clear how such a flow can be realized in the laboratory." Nor, might one add, why! Surely Equation 3.79 was inserted merely to determine whether or not the reader was awake.

In summary, this book may contain a number of omissions but very few errors. It is by far the best book available on the subject.

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CHRISTOPHER W. MACOSKO
University of Minnesota

(Continued from page 398)

ERRATA

The paper, "A Coordinate-Transformation Method for the Numerical Solution of Nonlinear Minimum-Time Control Problems," by Young D. Kwon and Lawrence B. Evans, *AIChE Journal* (**21** No. 6, 1158-1164, November, 1975) has errors in Figures 4 and 5. The label for each abscissa should read Chain Length instead of Molecular Weight. Also, the sentences immediately following Equations (48) and (49) should read $\gamma_k = 10^4$ instead of $\alpha = 10^4$.

In "A Model for Predicting Flow Regime Transitions in Horizontal and Near Horizontal Gas-Liquid Flow," *AIChE Journal*, **22**, 47 (1976) and in the Table of Contents of that issue the authors' names should read Yehuda Taitel and A. E. Dukler.