

fighters the basic science of hazardous materials. The early chapters deal with basic theory, though the author never uses SI units, perhaps due to the book's American origin. More information on cryogenic materials, in the heat section, would have been desirable. The student is introduced very quickly to the concepts of atoms and molecules, which is rapidly followed by the Lewis theory of valency. In my experience many students will find this confusing and some material would be better left till the student understands acids, bases and salts.

Oxidation-reduction can be understood at different levels; a rapid treatment of the electron theory will again create difficulties for some students. On the other hand Change of State is very important to fire-fighters and could merit a more extended treatment.

The chapters on various types of dangerous materials are useful and well written, especially the chapter on water reactions. I could find no authority for a reaction quoted where lithium displaces sodium from sodium chloride!

The chapter on toxicity is useful. It is not made very clear that carbamates work by an anti-cholinesterase mechanism, also a short account of breathing apparatus is not very useful to fire-fighters who must know much more on this topic than is found in the chapter.

On organic chemistry it needs to be stated clearly that there is a traditional naming system and also the IUPAC system, which run parallel. Fire-fighters (and even organic chemists) can readily be confused by synonyms for the same material. In the chapter on plastics, polyurethanes get very superficial treatment in view of the amount of research on this topic. More information on plastics in fire and less on synthesis of the materials would have been preferable.

In the Radiation section the units are defined in non-SI terms and the old Relative Biological Effectiveness terminology is used instead of Dose Equivalent. Whether we like it or not, greys and becquerels should be mentioned at least!

The book is a useful one on dangerous materials in many ways, but often goes rapidly into theory and even indulges in theory not really necessary to fire-fighters; this theoretical treatment could cause non-chemist students some difficulty.

D. A. SMITH

*Hydrogen Technology for Energy* by David A. Mathis, Noyes Data Corporation, Park Ridge, NJ, 1976.

*Hydrogen Technology for Energy* is the ninth volume in a series of technology reviews published by Noyes Data Corporation. This volume is intended to be an up to date statement of the technologies available and associated problems involved with the use of hydrogen as an energy carrier. All the data

used to support the text is drawn from reports of work sponsored by the U.S. government.

The book begins with a chapter briefly describing the hydrogen economy concept, indicating the major potential uses of hydrogen. In this short exposition the applications of hydrogen are put in context and the scene is set for the remainder of the text to examine each of these in more detail. As the book is mainly concerned with the usage of hydrogen, only passing mention is made of the various techniques for its production which have been the concern of many studies in the past.

Chapters two, three and four are concerned respectively with the handling and storage of hydrogen as a gas, liquid and in solid form as metal hydrides. Transmission of hydrogen by pipeline and compressed gas storage are considered in some detail together with the problems associated with the deleterious metallurgical effects of gaseous hydrogen. The technology for hydrogen liquefaction, cryogenic storage and transfer receives considerable attention. This chapter is quite enlightening on the technical difficulties presented on transference of the low temperature liquid from dewar to insulated pipeline and vice versa, especially when the receiving container is initially at ambient temperature. The book has been able to draw on a wealth of experience with liquid hydrogen in aerospace applications, and this appears invaluable in considerations of various safety aspects including fire and explosion hazard. Storage in combined form as metal hydrides is of course a less well developed technology. However the potential is explored for hydrides in fixed and mobile storage applications and as a chemical compressor for power cycles.

The book goes on to consider the use of hydrogen as a fuel, and for energy storage in utility peak shaving applications. Many investigations are reviewed of the suitability of hydrogen for use in existing devices such as various types of internal combustion engine, flame burners, fuel cells and others. The concluding chapter of the book is an unusual, but valuable list of US experts in various fields of hydrogen related technology together with a brief statement of each individual's expertise.

A creditable feature, lacking in many texts concerned with the hydrogen economy, is that throughout the economics of hydrogen technologies are carefully considered. In many potential applications the projected costs are prohibitively high and present more of an obstacle to the use of hydrogen than any problems of a technical nature. The estimates presented in this book do therefore help to keep the potential advantages of hydrogen in perspective.

The style of presentation could be criticised, short separated paragraphs tending to break the flow of the text and on the whole make the book rather difficult to read. However the objective in this kind of review of drawing together up to date information in several related areas of technology and bringing it quickly to the attention of the reader is extremely worthwhile, even if it does imply some slight compromise on the polish of the presentation. This volume admirably achieves this objective and forms an excellent

starting point for anyone wishing to keep abreast of advances in the technology of hydrogen utilization.

G. McHUGH

*Fire Research, Vol. 1. No. 1, March 1977*, published by Elsevier Sequoia, Lausanne, Switzerland.

“Fire Research” is a journal which “aims to promote an integrated approach to fire and flammability research by providing an international forum for the presentation of original papers, interpretative reviews and discussion of the latest developments in research, testing and legislation”. The Editor states that social, as well as scientific and technical, aspects will be discussed under Letters to the Editor. The present state of literature in science is such that the thought of yet another journal may create as much enthusiasm as the prospect of another plate of lampreys to the English king who died from over-eating them. Nevertheless, in fire science there are many journals on the practical side, with an engineering bias, but not many providing a forum for more fundamental studies on problems of pressing interest, such as, for example, polyurethane foams. “Combustion and Flame” contains academic papers, and “Fire Research” fills a gap between this and the more practical journals.

We are promised by the Editor that there will be papers and discussions on toxicology and physiology. I hope this will come about. Many important papers on these and other topics are found in journals not well known to fire scientists and engineers, written in medical language which creates problems for non-medical people. Fire science contains many different disciplines from toxicology to hydraulics. I believe any forum which propogates a better understanding can only be welcome.

D.A. SMITH

*Particulates and Fine Dust Removal: Processes and Equipment* by Marshall Sittig, Noyes Data Corporation, Park Ridge, NJ, 1977, \$48.

This book provides a detailed reference work for those concerned with reducing particulate and fine dust emissions at source, and the choice of control processes and equipment. It is based on reports of federally financed air pollution studies and the recent U.S. patent literature.

The introductory chapter presents a concise discussion on the nature of airborne particulates and their effects on health in relation to particle size, the ranking of air pollutants and major pollution sources, and the evaluation of particle size distribution and fractional efficiency data for control equipment.

Successive chapters deal with emission control technology as applied in