

interesting process for waste fixation based on the use of sodium zirconate which has been prepared from zircaloy fuel cladding thereby solving two problems simultaneously.

Of those chapters which deal with the radionuclide sorption on geological media, two depart from conventional study of equilibrium distribution coefficients and are concerned with the kinetics of adsorption and desorption which are shown to be of importance in assessing activity migration. One of these two papers attempts to simulate sorption in a fissure. This is a most welcome development which points the way for future studies of waste disposal in fractured media. A final comment concerns the inclusion of a paper describing the sorption characteristics of the abyssal red clays. These are in the form of sediments, saturated with seawater, and are relevant to studies of radioactive waste disposal to the ocean-bed. Insofar as geological and deep ocean disposal are complementary disposal routes, this paper will be of interest to the reader, but there is no introductory discussion of the unique problems of the latter route. For this reason the paper is somewhat misplaced in an otherwise valuable contribution to the literature on geological disposal of radioactive waste.

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Highly Hazardous Material Spills and Engineering Emergency Plans by J.E. Zajic and W.A. Himmelman, Marcel Dekker, New York (1978) \$24.50.

This book can lay claim to two important firsts: (1) It is the first book in Dekker's new series on "Hazardous and Toxic Substances", and (2) it is the first book to be published dealing solely with hazardous materials spills. This in itself, makes the book an important contribution to the field.

The book encompasses seven chapters and five appendices covering 225 pages of very useful material. Being Canadian, the authors have used examples and data from Canada and, in appendix 6, report in detail on the laws governing spills in Canada. Unfortunately, for readers in the U.S. and other countries, the same cannot be said since U.S. Public Law 92-500, the Federal Water Quality Act Amendments of 1972 are not even discussed and so we miss out in all aspects of the important section 311 of that Act that governs U.S. spill regulations.

Perhaps the most useful section of the book is Chapter 1 with its detailed classification of hazardous chemicals. Several excellent tables are given to allow the reader to quantify risk. The extensive tables covering 18 pages report the hazards (health, flammability, reactivity) of many chemicals as well as toxicity physical-chemical properties (detection limits and water solubility).

The second chapter reports on the environmental effects of spills. Included, is a discussion of spills that cause air pollution problems with appropriate equations supplied, so that one can calculate the downwind concentration of volatile compounds. One table gives precalculated data on safe initial evacu-

ation distance for highly hazardous volatile materials, i.e. 0.6 km downwind of an ammonia spill. The authors also report on the impact, migration and fate of spills on water and land. The chapter ends with brief descriptions of 13 different spills of a wide variety of chemicals: endrin, cyanide, H_2S , Cl_2 , H_2SO_4 , acrylonitrile, etc.

Short chapters are devoted to contingency plans and laws governing spills. Both industrial and governmental response plans are covered for the U.S. and Canada. Information systems available to spill response personnel are listed, but too briefly to be of real use. The authors could well have amplified this section.

Containment and treatment are discussed in the 20-page chapter 6. What is written is good, but the authors stop far short of reporting significant developments in the field. With regard to cleanup, the major references are to the 1974 National Conference on Control of Hazardous Material Spills, in San Francisco, which this reviewer chaired — but the technology has long since surpassed what was then reported. Unfortunately, writing of the book seems to have ceased before the 1976 National Conference in New Orleans, by which time the state of the art had made significant progress. The reader who desires more complete information on spill cleanup experience would be well advised to consult the 1976 and 1978 Conference proceedings.

Nuclear terms are defined in the last appendix and along with the unique properties and problems of radioisotopes are discussed in Chapter 7. Rather than focusing on spills however, the chapter discusses chronic emissions.

At this point the book breaks into "Part 2" which is really one long chapter devoted to a rating system for communities exposed to hazardous materials. The authors propose a methodology for calculating a population and environmental hazard rating scheme and a maximum disaster potential for a community through which hazardous materials are transported. However, when one is done with the calculation, one has a number, the significance of which is lost to the reviewer. The rating system is intriguing, the calculation interesting academically, but the results appear not to be very useful in real life.

As stated before there are several appendices, some of which have been referred to already. Table A-1 contains reports of recent (?) spill statistics in Ontario — the question mark is because recent refers to July 1971 to 1973 and for a book that has been photo-reproduced (not typeset), it seems later data could have been utilized.

Appendix B cites emergency data and action systems. The appendix has great but unrealized potential because each citation is too brief to be useful. In the case of one-line systems, the authors could have given telephone numbers; for written data, titles and descriptions of the available material would have been useful.

In summary, those engineers and scientists dealing with hazardous materials will want to have this book in their library. It is not a classic but it is the first and an important beginning to the literature of the unique aspects of hazardous materials spills.