

they may be produced on the spot from chemicals of known purity, or purchased in large quantities in special liquid containers, pipelines, rail, road or tanker ships. Eleven cryogenics are discussed ranging from very light (hydrogen and helium) to xenon.

Chapter 1 presents general safety requirements in making, using, and disposal of cryogenics. Four of the eleven have serious fire/explosion potential (namely, hydrogen, methane, ethane and ethylene), a reality which must be carefully controlled. All eleven have the ability to introduce serious contact hazards of skin and eyes. Safety control procedures for all include treatment of cryogenic burns, anoxia, precautions when working in confined spaces (including rescue and first-aid), appropriate warning signs, toxicity (low except in the case of carbon monoxide), thermal burns from the substances which are flammable, hypothermia, safety devices and instruments, with emergency control, toughness of materials which may be considerably reduced, overpressure and safety work permits.

Chapter 2 covers oxygen, nitrogen and argon. Oxygen is especially critical with respect to ignition or adding intensity to fire, and information such as the list which is provided deserves special attention in this regard. Oil-lubricated compressors in nitrogen or oxygen-service should not be switched to compressing air without a thorough cleaning. It is also noted that ambient air will condense into liquid nitrogen, producing an unexpected hazard.

In Chapter 3, similar detailed treatment is given to natural gas, ethylene and ethane.

Chapter 4 deals with the high energy fuel, hydrogen, which when mixed with air or other oxidizers produces large amounts of energy. Small leaks have been known to ignite spontaneously (reverse of Joule-Thompson).

Chapter 5 on helium and other relatively rare gases, notes the specific properties of these cryogenics in detail.

This is an excellent volume, with many pictures, charts and tables. A well-organized index concludes the work. It is recommended to anyone making, using, shipping or storing any cryogen.

HOWARD H. FAWCETT

Principles of Environmental Toxicology, by S.F. Zakrzewski, American Chemical Society, Washington, D.C., 1991, 240 pp. (hard cover), ISBN 0-8412-2125-1, \$59.95; (paperback) ISBN 0-8412-2170-7, \$44.95.

As the title indicates, this book is slanted toward the environment. None the less, the first five chapters do provide the essentials for an elementary course in toxicology. Various pharmacological concepts are reviewed, while metabo-

lism of xenobiotics, factors that influence toxicity, and chemical carcinogenesis and mutagenesis are also covered. Over half of the book is devoted to environmental concerns, including different types of pollution and corresponding controls.

A chapter on occupational toxicology reviews the most frequent types of toxicity noted in working populations. The final chapter discusses the regulatory agencies, with emphasis on the role of the EPA and mention of OSHA. Three appendices are added, two of which really should have been included with the main chapters. The index is fairly comprehensive.

Overall, this appears to be useful, both for a first exposure to toxicology and for study of the interactions between the environment and various types of pollutants.

ELIZABETH K. WEISBURGER

Environmental Risk: Identification and Management, by A.R. Wilson, Lewis Publishers, Chelsea, MI, 1991, ISBN 0-87371-388-5, 400 pp., plus index, \$69.95.

The author states in the Introduction that this book will attempt to provide uniform methodology for the identification, measurement and reporting of environmental risks, and furnish definitions of various types of environmental risk assessments, in addition to a management program for control of such risks.

In Part I, The Context of Environmental Risk Management, the topics covered include: basic concepts and terminology; environmental regulations; professional liability and response; risk management policy; an inventory system for environmental risks; control mechanisms; analysis of potential targets and risk sources; cost models and estimation; and management decision-making. Sample worksheets for many situations are given; as well as tables on persistence of various organic compounds, toxicity ratings and checklists for environmental compliance.

Part II, Environmental Risk Investigation, treats the numerous factors that must be examined, including historic land use, sampling and the statistical concepts, geography, topography, hydrology, laboratory selection and certification, and finally, how to combine all these into a risk assessment.

The coverage of all topics is very thorough. Most enlightening is the chapter on regulatory aspects; after reading this volume, one may be reluctant to purchase any piece of land, for the problems go with the purchaser. Overall, this appears to be a valuable addition to the literature of risk assessment.

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