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Book reviews

K. Clive Thompson, Kirit Wakhia, Andreas P. Loibner (Eds.), Environmental Toxicity Testing, CRC Press/ Blackwell Publishing Ltd., Oxford, UK, 2005, 408 pp., £129.95, ISBN: 1-4051-1819-9.

Environmental toxicity testing is evolving as an important component of environmental control going beyond simple chemical analysis of toxic compounds. This book does that by examining new issues regarding environmental toxicity tests such as identification of pertinent tests including and evaluation of their reproducibility, robustness and cost. Also examined are the advantages, benefits and drawbacks of the strategies and methods proposed.

The editors succinctly describe the book's contents in the preface thusly:

"A historical perspective on effective management of the environment is presented in Chapter 1, which provides a comprehensive overview of the subject. This is followed by a chapter on effective monitoring of environmental toxicity, including aspects of quality control. Quality control is of fundamental importance in environmental toxicity testing, but it fails to achieve a prominence comparable with routine chemical analysis parameters. In Chapter 3, the fundamental concepts of ecotoxicological testing and evaluation are described, with explanations of the relevant methodology and systems. The extent of variability and standardisation of testing are clarified.

The rationale for the utilisation of toxicity tests and the inference of data employing different techniques is discussed in Chapter 4. Monitoring of the quality of water and soil ecotoxicological techniques are likely to assume greater importance with the implementation of the EU Water Framework Directive and the EU soil assessment strategy. Aspects relevant to the aquatic environment are conveyed in Chapter 5, and biological methods available for the assessment of the terrestrial environment are described in Chapter 6.

Chapters 7 and 8 on biomarkers and genotoxic substances clarify these two controversial areas of increasing importance.

Chapter 9 examines legislation in a global context, with examples from the UK, the Netherlands, Germany and the USA. It is evident that the strategies adopted are country-dependent. The penultimate chapter is an illustrative case study from the petroleum industry, which illustrates the use of a robust, pragmatic approach to a complex problem.

The final chapter provides an insight into the future, highlighting likely new developments that should improve environmental toxicity testing in respect of relevance of tests, improvements in efficiency and, ultimately, reductions in costs."

Contributors, numbering 31 (in addition to the editors), represent a wide variety of researchers from Europe and North America. The book is well written and contains numerous references to the scientific literature. As such, it represents a significant resource to those interested in environmental preservation.

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Suthan S. Suthersan, Fred C. Payne, In Situ Remediation Engineering, CRC Press, Boca Raton, FL, 2005, 531 pp., US$ 129.95, ISBN 1-56670-653-X.

In the introduction to this book, the authors succinctly outline the application of this technology utilized to treat contaminated sites: "The realization that mass removal efficiencies can be significantly enhanced using air as an extractive media instead of or in addition to water led to the development and application of in situ extractive technologies such as soil vapor extraction and in situ air sparging."

The next major development, in situ remediation, was the utilization of in situ non-extractive technologies such as fun-

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nel and gate systems and in situ reactive zones. These systems are superior technically and cost effective. The technology is based on the creation of a subsurface zone where migrating contaminants are intercepted and permanently immobilized or degraded into harmless end products.

The authors cite an impressive list of contaminants susceptible to in situ treatment, among which are: chlorinated hydrocarbons, petroleum hydrocarbons, ethers, explosives, and dissolved metals.

Among the advantages or benefits of using this technology are: non-transfer of contaminants to other media; no ex situ waste generated; flexibility, etc. (14 separate benefits are noted in the text).

The second chapter deals with all aspects of Microbial Reactive Zones including enhanced reductive dechlorination, in situ precipitation of heavy metals (Ni, Cr, As, Cd), and in situ denitrification. Also discussed are the decontamination of sites containing perchlorates, dioxane, explosives, radionuclides and *N*-nitrosodimethylamine.

Chapter 3 is entitled "Chemical Reactive Zones". The authors note that "The popularity of chemical reactive zones for treatment of aquifer contamination increased dramatically in the mid-1990s. Although there is no central base of statistics on reactive zone applications, from publication of field applications in conference proceedings, it appears that oxidation has become the dominant chemical reactive zone strategy, with permanganate and Fenton's reagent methods leading the way. Of the chemical reducing zone strategies, zero-valent iron appears to be the most popular."

Chemical oxidation zones are discussed in the above chapter. The authors note, however, the cost of using this technology is often much higher than alternative solutions. Consequently, the decision to utilize this technique rather than a biological or natural attenuation system is most often driven by a requirement to achieve significant mass reduction in a short time interval. Remediation topics discussed in this chapter include, as noted, the use of Fenton's reagent, potassium permanganate, ozone and persulfate-based systems.

Chapters 4 and 5 deal with the implementation of the technologies discussed in the preceding paragraphs. Discussed (in Chapter 4) are site screening, site conceptual models, performance measures (process monitoring and groundwater sampling and analysis), system design, reagents, delivery system design and pilot testing.

In the final chapter, the authors discuss Building Reactive Zone Strategies:

"In this chapter, reactive zone structures are defined according to the physical, chemical, and biological processes that occur within, and downgradient from, the locations at which the managed reactions occur. Each of the identified zones – injection, reaction, desorption, and recovery – is a working component of an IRZ strategy. Reactive zones are deployed in several possible patterns including source zone, barrier, and whole-plume treatments, according to the project scope and timing objectives.

The chapter concludes with discussions of limitations on reactive zone effectiveness in contaminated aquifers. The fundamental problems of reactive zone design and operation include the challenge of achieving contact between reagents and target compounds, the variable distribution of reagent concentrations, and the associated impacts of reaction kinetics and by-product formation. Contaminant distribution factors such as the presence of nonaqueous-phase liquids DNAPLs and large-scale sorbed mass add further to the difficulty of reactive zone design and operation."

Through my association with US-EPA Hazardous Substance Research Centers, I have been exposed to many of the topics discussed in this book. Indeed, some cited references have been to these research center projects. To the extent that I have acquired knowledge of remediation problems and solutions, I can state that book is well written, well researched and well worth acquiring.

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Roger D. Spence, Caijun Shi (Eds.), Stabilization and Solidification of Hazardous, Radioactive, and Mixed Wastes, CRC Press, Boca Raton, FL, 2004, ISBN 1-56670-444-8, p. 390 (USD 189.95).

Stabilization, the authors note "...refers to techniques that chemically reduce the hazard potential of a waste by converting the contamination into less soluble, mobile, or toxic forms." They then define solidification as "...techniques that encapsulate the waste, forming a solid material, and does not necessarily involve a chemical interaction between the contaminants and the solidifying additives."

In their introduction, Spence and Shi state:

"Stabilization/solidification is typically a process that involves the mixing of a waste with a binder to reduce the contaminant leachability by both physical and chemical means and to convert the hazardous waste into an environmentally acceptable form for land disposal or construction use." Wastes treated by this process include low-level radioactive wastes, hazardous and mixed wastes. This process has numerous advantages (19 specific advantages are cited by the