

Book reviews

Chemical Analysis of Contaminated Land

K. Clive Thompson, C. Paul Nathanail (Eds.), Blackwell Publishing/CRC Press, Oxford, UK, 2003, £89.50, 305 pp., ISBN: 1-84127-334-1

In the United States, the EPA's Brownfield Program addresses the problem of abandoned, contaminated industrial sites. Most of those sites are in industrial cities and, if allowed to remain vacant, represent a terrible waste of urban land. Therefore, much effort is being devoted to their cleanup. But before that cleanup can begin (or end), chemical analysis of the soil and material on the site is needed both for risk assessment and for planning the cleanup process. Needed for that determination is an understanding of the initial concentration of site contaminants and a final goal of their concentration at the end of the remediation process.

The editors write in the preface that this book sets out to provide a description of the chemical analysis of potentially contaminated land for all those involved in risk assessment. This book contains 10 chapters, which the editors note, distill the expertise and experience of their contributors in the analysis of contaminated land. The book's contents are well-described by the editors in the preface. Chapter 1 is an introductory chapter written by the editors. It focuses on "the risk assessor as a customer". Chapter 2 highlights the difficulty in developing robust methods of analysis that cover all the soil matrices likely to be encountered. . . Chapter 3 tackles the problem of preparing submitted samples for analysis. . . The following five chapters cover the analysis of metals, including a brief discussion on speciation analysis (Chapter 4), the analysis of inorganic parameters such as cyanide, pyrites, total sulphur and asbestos. . . (Chapter 5), petroleum hydrocarbons, including polyaromatic hydrocarbons (Chapter 6), volatile organic compounds (Chapter 7) and non-halogenated organic compounds, including semi-volatile organic compounds. . . (Chapter 8). Chapter 9 deals with leaching tests [while]. Chapter 10 describes the use of toxicity tests in ecological assessment and toxicity screening of potentially contaminated land.

I found the last chapter entitled "Ecological assessment in toxicity screening in contaminated land analysis" particularly interesting as ecotoxic assessment is based on biological methods in contrast to chemical determination of the concentration of chemicals. This new concept can be used to evaluate the effects of toxic chemicals on humans and the environment. The authors describe the process this way: "Toxicity testing comprises the evaluation of effects of

known chemicals on ecological receptors (ecotoxicity tests), and the measurement of effects exhibited by contaminated media (bioassays). For ecotoxicity testing, key test organisms are exposed to a range of concentrations of a series of potentially toxic agents and the resulting adverse effects are measured".

Bioassay tests conducted with solid samples include: invertebrate tests, plant tests, and microbial tests with single species. The use of bioassays for toxicity screening is advantageous because of the short test periods and rapid access to sufficient test organisms. Bioassays provide information that may not be obtained through chemical analysis. This chapter ends with a description of the bioassay tests conducted with earthworms (acute toxicity test and reproduction test), Collembola, Enchytreid, plant tests, microbial tests, and invertebrate tests.

This is a very well written book with a comprehensive review of the numerous tests that may be used to evaluate contaminated land. It should be extremely useful both to the bench chemist as well to the engineer who has responsibility of understanding safe site cleanup and a desirable end point for that process.

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Adsorbents: Fundamentals and Applications

Ralph T. Yang, John Wiley & Sons, Hoboken, NJ, 2003, US\$ 94.95, 422 pp., ISBN: 0-471-29741-0

Most of the environmental papers I have received for publication in the Journal that deal with adsorption have involved the adsorption of organics on activated carbon, while several others have reported on the adsorption of heavy metals on a variety of natural substrates. These topics are discussed in Yang's book, but not until Chapter 5 where Yang also notes the popularity of activated carbon: "Activated carbon is the most widely used sorbent. Its manufacture and use date back to the 19th century. Its usefulness derives mainly from its large micropore and mesopore volumes and the resulting high surface area". Yang does discuss, albeit briefly, the details of carbon adsorption in the above noted chapter. Section topics in this chapter are: (1) formation and manufacture of activated carbon, (2) pore structure and standard tests for activated carbon, (3) general adsorption properties, (4) surface chemistry and its effects on adsorption, (5) ad-

sorption from solution and effects of surface functionalities, (6) activated carbon fibers, and (7) carbon molecular sieves.

Fast forwarding through the book to Chapter 9, one finds a discussion of carbon nanotubes, pillared clays, and polymeric resins. Of these three materials, only the latter has been used commercially. However, all are reported “to have interesting and unique adsorption properties and are subjects of active research”. I was particularly interested in the discussion of nanotubes. Yang introduces the topic thusly: “The discovery of fullerenes and carbon nanotubes has opened a new chapter in carbon chemistry. Carbon nanotubes, in particular, hold tremendous potential for applications because of their unique properties, such as high thermal and electrical conductivities, high strengths, and stiffness. Potential applications include: electron microscope tips, field and light emitters, microelectronic devices, nanopores and nanosensors, high Li capacitors for rechargeable Li batteries, composite materials, and replacing Si as the smallest computer chips”.

Prior to the above discussion, the book has the following chapters: fundamental factors for designing adsorbent; sorbent selection: equilibrium isotherms, diffusion, cyclic processes, and sorbent selection criteria; and pore size distribution.

But this book discusses many more adsorption substrates than carbon. Chapters 6–8 are entitled silica gel, MCM and activated alumina; zeolites and molecular sieves; and complexation sorbents and applications.

I was particularly interested in the final chapter in the book, sorbents for applications. Discussed are air separation, hydrogen purification and storage (here the author has placed his book in the forefront of current research, i.e., the use of hydrogen for vehicle propulsion). Also discussed are methane storage, olefin/paraffin separation, nitrogen/methane separation, desulfurization of transportation fuels, the removal of aromatics from fuels and NO_x removal.

Regarding the last topic (NO_x removal), Yang writes: “Adsorption has been playing an increasingly important role in environmental control. The sorbents being used in common industrial adsorption systems for the removals of SO_2 and volatile organic compounds (VOCs) are quite well-established. The VOC removal systems often use activated carbon, polymeric resins, and hydrophobic zeolites, for both gas and aqueous systems. Activated carbon (and alkalinized forms) and hydrophobic zeolites are used for SO_2 removal”.

This is a long review of a very good book on a very important topic. Well-written, resplendent with figures and tables, and well-referenced are some of my observations. Included in the references are many of the author’s own from his extensive list of publications. This book, I am sure, will be used and cited often in the adsorption literature.

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HazMat Data For First Response, Transportation, Storage and Security, 2nd ed.

Richard P. Pohanish, John Wiley & Sons, Hoboken, NJ, 2004, US\$ 250.00, 1309 pp., ISBN: 0-471-27328-7

Hazardous chemicals are a ubiquitous component of modern society. Thousands of different chemicals are manufactured, stored, shipped, and used daily. Accidents involving these chemicals are inevitable and occur routinely. Normally, the first responders to chemical incidents are fire department personnel who, when arriving on-scene, need clear, concise, and accurate data regarding the chemicals, the danger they pose to first responders and the environment, and methods that should be taken to ameliorate the dangers posed by the chemical release. This book provides that information on 1450 chemicals (200 of which are new in this edition).

Pohanish notes “The objectives of this book are (1) to provide critical data for those who must initially respond to fixed facility, transportation, and terrorist incidents and to help them limit the consequences of these incidents and (2) to present data on heavily used and widely transported chemicals in a portable package”. He further notes that this book is “. . . directed at the responders trained at the Awareness and/or Operational levels as defined by the (US) Occupational Safety and Health Administration (OSHA 1910–120) and the National Fire Protection Association (NFPA 472,19992)”.

For each of the chemicals in the book, the following data are given:

- Name—including synonyms and Spanish language synonyms.
- Identification—chemical abstract service (CAS) registry number, formula, U.S. Department of Transportation ID number, proper shipping name, and reportable quantity (RQ).
- Description—characteristics and hazard classification.
- Physical and chemical properties.
- Emergency response guidelines.
- Exposure effects—short-term observable effects, treatments, and additional medical notes.
- Health hazards and recommended personal protective equipment.
- Fire data (behavior in fire).
- Chemical reactivity (especially with water).
- Environmental data—food chain concentration potential and water pollution potential.
- Shipping information.
- Physical and chemical properties.
- National Academy of Sciences (NAS) hazard classification for bulk water transportation.

The introduction includes a detailed section on how to use the book in which the above noted sections are discussed.

A new feature of this book is a chart entitled “Chemicals Likely Involved in Terrorist Incidents”. This chart is on the inside of the front cover of the book and it lists kind