

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  $\text{NO}_x$  removal.

Regarding the last topic ( $\text{NO}_x$  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  $\text{SO}_2$  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  $\text{SO}_2$  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

of agents that typically would be involved in a terrorist attack. These agents include nerve agents, blister agents, blood agents, choking agents, and irritants. Data also are given for examples of war agents and the record number, examples of industrial chemicals and record number, a brief summary of physical properties, early symptoms of exposure, and field detection using both M8 paper and the M256-A1 Chemical Agent Detection Kit.

The author refers (in the Appendix) to emergency response guidelines published by the U.S. Department of Transportation. The author refers to the appropriate guide-

line in the above noted publication for each chemical. Finally, I note that the Appendix contains a list of synonyms and trade names.

In my opinion, the book is an excellent source of information on chemicals, their hazards and safe response thereto. It would be a valuable addition to the reference section of industrial laboratories and engineering departments as well as fire departments.

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