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Book reviews

Quantitative Environmental Risk Analysis for Human Health, Robert A. Fjeld, Norman A. Eisenberg, Keith L. Compton (Eds.). John Wiley & Sons, Inc., Hoboken, NJ (2007). 403 pp., US$ 99.95, ISBN: 0-471-72243-X

The back cover of this text notes that it is "A comprehensive textbook and reference for quantitative environmental risk analysis for both chemical and radioactive contaminants." In my opinion, it certainly is-comprehensive, well written and authoritative. Abstracting further from the book jacket is the following statement: "Environmental risk analysis is complex and interdisciplinary." I quote further from the preface:

> "Environmental risk analysis for human health is the systematic analytical process of assessing, managing, and communicating the risk to human health from contaminants released to or contained in the environment in which humans live. It is a discipline central to the development of environmental regulations and the demonstration of compliance with those regulations. The goal of the book is to provide both the methods that are commonly used in environmental risks analysis and the underlying scientific basis for these methods. Although the text covers all three of the activities involved in environmental risk analysis (risk assessment, risk management, and risk communication), the focus is on environmental risk assessment, especially the computational aspects."

The authors continue in the preface with the following statement:

> "Development of a textbook on environmental risk analysis is a challenging undertaking. Environmental risk analysis encompasses a variety of diverse technical disciplines, including surface water hydrology, groundwater hydrology, air dispersion meteorology, chemical process engineering, toxicology, health physics, decision analysis, and risk communication, to name a few. Each of these disciplines is a separate field of technical study, often with individual academic curricula and professional certification. A significant challenge in developing the book has been choosing the appropriate degree of depth and detail for each of these many technical disciplines. Our approach is to provide enough information for each discipline so that the reader can develop an understanding of its role in the overall analysis, its methods, and significant uncertainties. Because the treatment of each specialty is limited, practitioners are likely to seek more focused texts for their particular specialty."

The book is an outgrowth of notes for a course at Clemson University's Department of Environmental Engineering and Science.

> "The overall organization of the book is as follows: Chapter 1 is an overview of environmental risk analysis and environmental risk assessment, Chapter 2 describes the modeling process and fundamentals of environmental models, Chapters 3 through 11 are concerned with environmental risk assessment, Chapter 12 deals with uncertainty and sensitivity analysis, Chapter 13 covers risk communication, Chapter 14 describes methods of risk management, and Chapter 15 presents environmental laws and regulations. Since a four-step paradigm is used for the risk assessment calculation, the risk assessment chapters are organized as follows: Chapter 3, release assessment; Chapter 4, generic transport; Chapters 5 to 8, surface water, groundwater, atmospheric, and food chain transport, respectively; Chapter 9, exposure assessment; and Chapters 10 and 11, basic human toxicology and dose-response, respectively . . .. For historical, pedagogical, and practical reasons, probabilistic methods are not described substantially until Chapter 12."

The beginning paragraph of the book beautifully illustrates the meaning and utility of this topic.

> "Environmental risk analysis for human health is a systematic analytical process for assessing, managing, and communicating the risk to human health from contaminants released to or contained in the environment in which humans live. Environmental risk analysis encompasses a broad variety of disciplines and endeavors, including natural sciences such as geology, meteorology, hydrology, and ecology, which describe the natural environment in which contaminants migrate; biological sciences such as physiology, toxicology, anatomy, and cell biology, which describe the interaction and response of humans to environmental toxins; physical sciences such as physics and chemistry, which describe how contaminants migrate in natural systems; and decision and social sciences, which provide methods for making rational decisions and for communicating with stakeholders throughout the risk analysis process."

Risk is defined by the Society of Risk Analysis as: ". . . a detailed examination including risk assessment, risk evaluation,

and risk management alternatives, performed to understand the nature of unwanted, negative consequences to human life, health, property, or the environment . . .”

Risk is portrayed in the first table of the book which lists the impacts of contaminant releases that resulted in adverse human health or ecological impacts. Shown are the results of releases of SO_2 at Donora, Pennsylvania, of methyl mercury at Minimata, Japan, of dioxin at Seveso, Italy and of (deadly) methyl isocyanate at Bhopal, India.

In Chapter 3, the authors discuss the impacts of common environmental contaminants emitted in the United States. They begin with aflatoxin B1 and list several pages of other compounds that include chlorine, creosote, lead, sulfur dioxide, and radionuclides.

Written primarily as a textbook, the authors have included worked mathematical examples and numerous problems for student use at the end of each chapter. This is a book that I would enthusiastically adopt for a risk analysis course if I were to teach one. It is good.

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Organic chemistry of explosives, J.P. Agrawal, R.D. Hodgson. John Wiley & Sons, Ltd., Chichester, West Sussex, England (2007). 414 pp., Price: US$ 165.00, ISBN: 0-470-02967-6 [Hardcover], 978-0-470-05935-7 [e-book format]

> “Explosives have attracted a lot of unwanted publicity over the years for their misuse in the taking of life and destruction of property. Explosives are perceived by most as materials of fear and at no time is this more prevalent than in times of war. . . [However,] more explosives have been used in times of peace than in all of the wars and conflicts put together. . . Explosives are in fact no more than a tool and remain some of the most fascinating products of chemistry.”

The authors state that they have attempted to fill a void in the literature by authoring a reference text that provides detailed information on the synthetic routes to a wide variety of energetic materials. In my opinion, they have done that well.

The book is divided into nine chapters, which are based on the observation that explosive properties are imparted.

> “Chapters 1, 3, 4 and 5 discuss the methods which can be used to introduce C-nitro, O-nitro, and N-nitro functionality into organic compounds; the advantages and disadvantages of each synthetic method or route is discussed together with the scope and limitations, aided with numerous examples in the form of text, reaction diagrams and tables. Chapters 2, 6 and 7 discuss the synthesis of energetic compounds in the form of polynitropolycycloalkanes, caged and strained nitromines, and N-heterocycles respectively. Chapter 8 discusses the synthesis of explosives containing functionality less widely encountered, including: organic azides, peroxides, diazophenols, and energetic compounds derived from guanidine and its derivatives. In the end, Chapter 9 gives an account of nitration with dinitrogen pentoxide and its likely significance for the futuristic synthesis of energetic materials.”

> “In simplest terms, an explosive is defined as a substance, which on initiation by friction, impact, shock, spark, flame, heating, or any simple application of an energy pulse, undergoes a rapid chemical reaction evolving a large amount of heat and so exerting a high pressure on its surroundings.”

> “Most organic explosives contain nitrate ester, nitramine, or aliphatic or aromatic C-nitro functionality.”

Hence, this book is organized into the following sections:

- Aliphatic C-nitro groups.
- Nitrate ester groups.
- Aeromatic C-nitro groups.
- Nitramine, nitramide, and nitrimine groups.
- Nitrogen heterocycles.
- Other groups, including: azide, peroxide, diazophenols, and nitrogen-rich compounds derived from guanidine derivatives.

The book has the following chapters containing the information noted above:

1. Synthetic routes to aliphatic C-nitro functionality.
2. Energetic compounds 1: polynitropolycycloalkanes.
3. Synthetic routes to nitrate esters.
4. Synthetic routes to aromatic C-nitro compounds.
5. Synthetic routes to N-nitro functionality.
6. Energetic compounds 2: nitramines and their derivatives.
7. Energetic compounds 3: N-heterocycles.
8. Miscellaneous explosive compounds.
9. Dinitrogen pentoxide—an eco-friendly nitrating agent.

Without going into a deeper discussion of what is contained in the book, I note that the chapter titles clearly convey its contents and emphasize that this material relates to the underlying chemical structure of explosives. Clearly and in depth, the chemical routes to the synthesis of explosives are detailed.

The authors have referenced their material, citing almost 1500 papers with most of the citation to the *Journal of the American Chemical Society* and the *Journal of Organic Chemistry* including one reference to an article published in 1877.

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