

Book reviews

Physicochemical Treatment of Hazardous Wastes

Walter Z. Tang (Ed.), Lewis Publishers, Boca Raton, FL, 2004, 603 pp., Price \$149.95 ISBN 1-56676-927-2

The treatment and disposal of hazardous wastes, as well as the remediation of contaminated sites, present scientists and engineers with many technical problems, as well as many opportunities. Among these opportunities are the treatment potential of several emerging biological and physical treatment processes. This book examines many of these processes based on a concept new to me—QSARs, which is the acronym for Quantitative Structural–Activity Relationships.

The author had five goals in writing this book. They are:

1. To utilize the fundamental theories of thermokinetics such as transition state theory to integrate research findings in the Advanced Oxidation Process (AOP) research.
2. To explain reaction kinetics and mechanism for each AOP in terms of elementary reactions and reactive center.
3. To introduce the term QSARs as methodologies to assess the treatability of organic compounds.
4. To use computational molecular descriptors such as E_{HOMO} and E_{LUMO} .
5. To compare the kinetics of various AOPs so that the most effective process can be selected for a given class or organic pollutants.

In my opinion, he has done the above well. Tang has generated a comprehensive treatise on the chemistry and kinetics underlying AOPs, processes which are being actively studied in research institutions as well as being utilized in the field in a few instances to treat hazardous organic wastes.

The author writes in the preface: “This book is divided into five parts. Chapters 1–4, define the hazardous waste problems and physicochemical approaches to solve these problems. Chapter 5, explains QSAR theory and its applications to predicting molecular descriptors and hydroxyl radical reactions. Chapters 6–12 focus on each of the eight most important AOPs. Chapter 13 presents a major reductive treatment technology, zero-valence iron, and Chapter 14 compares each AOP according to its oxidation kinetics for specific classes of organic compounds.”

Personally, I was most interested in the AOP process chapters. Discussed in detail were: Fenton’s reagent, ultraviolet/hydrogen peroxide, ultraviolet/ozone, ultraviolet/titanium dioxide, supercritical water oxidation, sonolysis, high-energy electron beam, and zero-valence iron. some

of these processes still are relegated to laboratory experimentation while others have been used in the “real” world.

The author notes “Each chapter begins with an introduction of the process and its historical development”. The intention is to demonstrate how fundamental sciences guide the search for these innovative technologies. Also, such introductions provide the information necessary for readers to delve into the literature for current research topics. Then, the principles of the process and the degradation kinetics, along with mechanisms of organic pollutants are explained in terms of elementary reactions. These elementary reactions not only are important in assessing the treatability of organic pollutants using QSAR but are also critical in properly designing AOP processes. Finally, QSAR models are discussed to demonstrate the effect of molecular structure on their degradation kinetics and to rank the treatability of each organic compound.

The unique aspect of this book (for me, at least) is a new concept—QSAR Theory. The book is not simply a discussion of various treatment processes and their results. Rather, it is based on a thorough recitation of reaction kinetics. I fully expect, this book will be adopted in many university graduate environmental courses as well as being of interest to researchers and consultants.

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Riegel’s Handbook of Industrial Chemistry

James A. Kent, (Ed.), 10th ed., Kluwer Academic/Plenum Publishers, Dordrecht, The Netherlands, 2003, 1383 pp., Price \$595.00 (€ 607; £ 381) ISBN 0-306-47411-5

Few books have presented a greater challenge for me to review than this one. The size and broad coverage in the book preclude a comprehensive review, not the least due to my unfamiliarity with many of the topics presented in its 31 chapters written by 48 subject matter experts. Kent, the Editor, notes that he is “. . . in awe of the breadth and depth of the knowledge that the contributing authors (brought) to this work”. I join him in this observation.

Kent also wrote in his preface that “The central aim of this book is to present in a single volume an up-to-date account