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BOOK REVIEWS

Environmental Catalysis. Edited by Vicki H. Grassian (University of Iowa). CRC Press (an imprint of Taylor and Francis Group): Boca Raton, FL. 2005. xx + 702 pp. $169.95. ISBN 1-57444-462-X.

This is a comprehensive and up-to-date book on various aspects of environmental catalysis. Environmental catalysis is defined as the study of catalysts and catalytic reactions that impact the environment. The book brings together leading experts from numerous disciplines involved in the research of environmental catalysis and emphasizes a molecular and electronic level approach to this timely topic. This fundamental approach necessitates employing numerous state-of-the-art molecular- and electronic-level characterization techniques (Raman, IR, SFG, SHG, UV−vis DRS, XAS (XANES and EXAFS), EPR, NMR, etc.) with complementary theoretical and computational methods. Emphasis is also placed on in situ studies under actual environmental conditions, which makes the information presented very relevant to the science of environmental catalysis.

The book is divided into three sections: (1) environmental catalysis in natural systems (air, water, and soil), (2) environmental remediation, and (3) green chemical processing. The section on environmental catalysis in natural systems nicely surveys catalytic processes taking place at liquid−mineral interfaces, air−mineral dust aerosol nanoparticle surfaces, and air−ice interfaces, as well as characterization methodologies that have been developed to study such interfacial phenomena.

The largest section of this book is devoted to the catalysis employed in environmental remediation. Fuel combustion from stationary and mobile sources has resulted in high levels of NO_x emissions that are related to smog (NO, NO_2), acid rain (NO, NO_2), and global warming (N_2O) gases. This section extensively covers the steps occurring at a molecular level during the heterogeneous catalytic reduction of gaseous NO_x to environmentally benign N_2, employing both experimental and theoretical approaches. Similarly, the topics of photocatalysis for the destructive oxidation of toxic hydrocarbon contaminants in water and air as well as bioengineering for remediation, where a catalytic enzyme is involved, are covered in great detail. In addition, environmental nanocatalysis and nonphotocatalytic applications of semiconductors for solar energy conversion, disinfection, sensors, and self-cleaning surfaces are discussed. The third section of the book focuses on catalysis—biocatalysis, homogeneous, and heterogeneous—as a foundational pillar of green chemical processing in environmentally benign solvents such as H_2O and supercritical CO_2 to reduce energy consumption and the formation of waste byproducts through completely selective reactions.

The book is well organized, and the chapters are well laid out and well written, with their contents being relatively easy to follow. The topics covered are rather extensive, and the book would make an excellent text for an undergraduate senior-level or graduate-level course on environmental catalysis. The text is also indispensable for anyone engaged in research in environmental catalysis because of the breadth of the topics covered. In summary, this book is a fresh addition to the study of this topic.

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Combinatorial Chemistry and Technologies: Methods and Applications, 2nd Edition. Edited by Giorgio Fassina (XEPTAGEN S.p.A., Pozzuoli, Italy) and Stanislav Miertus (University of Trieste, Italy). CRC Press (an imprint of Taylor and Francis). 2005. xvi + 598 pp. $169.95. ISBN 0-8247-5837-4.

Since the initial release of this book in 1999, impressive advances have been made in the field of combinatorial chemistry; consequently, Fassina and Miertus have revised the text and released a second edition, which is organized into 24 chapters covering many of the primary topics in combinatorial chemistry. The flow of the text from the synthesis of combinatorial libraries to analytical considerations in combinatorial chemistry to the biological preparation of combinatorial libraries provides the chemist with an easy transition from the more familiar synthetic chemistry to molecular biological aspects of combinatorial chemistry. Many of the chapters from the previous edition have been updated with more recent literature citations, and a number of new chapters also have been included. In particular, chapters devoted to recent technologies, such as oligonucleotide aptamers and DNA microarrays, have been added to this edition and provide the novice with a good summary of these emerging areas.

The intent of this book is to serve as a reference guide for scientists without prior knowledge of the field of combinatorial chemistry. While the authors generally succeed in this goal, a word of caution should be given to the reader. Many of the chapters are clearly biased toward the authors' own work, with several significant omissions of the complementary research of others in the same area. Furthermore, many of the references to the primary literature are relatively dated, with most citations from prior to 1999 and very few cited articles from the past four years. Thus, considering the nature of a rapidly evolving field such as combinatorial chemistry, there are key innovations that are noticeably absent from this volume. For example, the chapters on phage display libraries are sorely out-of-date with no mention of recently developed systems that expand beyond pIII or pVIII display. Also, some discussion should have been given to the in silico screening of virtual combinatorial libraries. This technology has become critical to many combinatorial endeavors, and phenomenal leaps have been made in this field

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in the past five years, making this discussion a necessary addition in order to gain perspective of the entire field.

In total, while this book provides a reasonable introduction to the field of combinatorial chemistry for early-stage graduate students or researchers new to the field, it unfortunately falls short in its aim of providing a thorough summary of many of the current techniques practiced by those working in combinatorial chemistry today.

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