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BOOK REVIEWS

Electrochemistry of Functional Supramolecular Systems. Edited by Paola Ceroni, Alberto Credi, and Margherita Venturi (all at Università di Bologna Italy). John Wiley & Sons, Inc.: Hoboken, NJ. 2010. xvi + 598pp. $149.95. ISBN 978-0-470-255557-5.

Complex supramolecular constructs are important platforms in areas as diverse as catalysis, sensors, biomimicry, and energy harvesting. For many of these applications, a solid foundation of electrochemical methods is required to characterize electronic properties and extract function. This edited book provides a timely survey of these important electrochemical considerations as applied to a range of contemporary research areas. Although more specialized texts have appeared over the past few years dealing with specific subfields of supramolecular science, this monograph does a fine job of collecting in one volume a broad treatment of the electrochemical aspects of small molecules, dendrimers, nanomaterials, biomolecules, and their subsequent use in electronic devices.

This book has a nice organization and flow, with several complementary but not entirely overlapping discussions from multiple authors on related topics. The first two chapters deal primarily with interactions among small molecular systems, using redox reactions to influence hydrogen bonding and translocation of ions, respectively. Discussion of the complexity of the molecular materials systems is increased in the subsequent chapters dealing with various aspects of noncovalent encapsulation of redox-active guests (Chapter 3) and covalent immobilization within dendrimers (Chapters 4, 5) and on their periphery (Chapter 6). Chapter 5 focuses on metal polypyridyl-type dendrimers, but Chapters 4 and 6 also briefly touch upon these materials, in some cases duplicating the same schematics.

Chapter 8 addresses the electrochemistry of empty and endohedral fullerenes and of carbon nanotubes. The segment on nanotubes here seemed like an afterthought and would have been better served with a separate chapter. Chapter 9 then continues discussion of functionalized fullerenes and carbon nanotubes but without the electrochemical rigor of the preceding chapter. Although ostensibly about "devices," this chapter focuses exclusively on molecules studied in solution. Chapter 10 is a description of the intrinsic electroactivity of protein and nucleic acid biomolecules and of their metallocene-functionalized counterparts. A broader discussion of other nonorganometallic electroactive biomolecules would have been a welcome addition.

Another theme is based around less well-defined materials systems derived from the passivation of reactive surfaces. Chapter 7 is a brief but solid introduction to the electrochemical characterization of self-assembled monolayers that presents a couple illustrative case studies. This is continued in a discussion of nanoparticles functionalized with mixed monolayers (Chapter 11), addressing electrochemical issues of both surface-active reporter groups and core-based responses. Chapter 12 goes into more depth on device aspects of monolayers and nanoparticles as active sensor materials and addresses critical issues such as wiring the redox active biomolecules to electrical devices.

Chapters 13 and 14 deal with molecular motions controlled by the redox chemistry of rotaxanes and catenanes and their associated metal ions. Although informative, I felt these two chapters could have been better integrated into one story, perhaps merged with the ion translocation discussion of Chapter 2. Unlike other topically connected chapters, it felt like more of a repetition of previously discussed topics. Finally, Chapter 15 presents a broad structural survey of other types of shape-changing molecular switch events dictated by photochemical reactions of dithienyl ethene photochromes and altered coordination spheres induced by changes in metal redox states. This chapter, while illustrative, could have been better served by the inclusion of more actual data indicating the observables present or possible with the discussed switches.

The two final chapters on electrochemiluminescence (Chapter 16) and dye-sensitized solar cells (Chapter 17) are very timely and encompass important issues where electrochemistry plays a major role, but I felt they were very much out of place in the general supramolecular theme of this text. A more general chapter that reflected these and other tangible issues associated with device operation would have been a more appropriate contribution, in my opinion.

This book in many respects could be viewed as complementary to Kaifer and Gómez-Kaifer's *Supramolecular Electrochemistry* published over a decade ago. Although not as pedagogical, this new book offers a detailed update of the supramolecular electrochemical research that has transpired in the decade since and does a great job of reinforcing and demonstrating the usefulness of electrochemical measurements. This book will have very strong appeal to graduate students and other researchers active in the area of supramolecular materials. The individual contributions were typically framed with brief introductions to the relevant electrochemical phenomena before jumping into the application of specific techniques or interpretation of data.

Given that *Supramolecular Electrochemistry* is now out of print, a chapter or two devoted purely to the electrochemical principles would have made this book much more approachable to those encountering supramolecular electrochemical measurements for the first time. However, there is a strong combination here of structural considerations, redox schemes, and experimental data that should allow researchers in allied areas to make new connections with unfamiliar electrochemical techniques and strategies that may prove useful in their own work.

John D. Tovar, *Johns Hopkins University*

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