Bioelectrochemistry. Fundamentals, Experimental Techniques and Applications

by Philip N. Bartlett (Ed.): Wiley, Chichester, UK, 2008, pp 494, ISBN: 978-0470-843642. Price: GBP 125.00, EUR 143.80

In the preface, Philip Bartlett defines bioelectrochemistry as the study and application of biological electron transfer processes. It is immediately seen that this sub-discipline is wide-ranging, incorporating principles of methods to study charge transfer, the nature of the biological species (molecules, assemblies, cells) involved and the useful applications of such processes in areas like health, energy and the environment. This multi-author book, edited by one of the leading bioelectrochemists and containing contributions from many world specialists in this area, sets out to give the reader a view of modern bioelectrochemistry. It is aimed at graduate students, final year undergraduates and researchers in various fields that impact on or are impacted by bioelectrochemistry.

The book is divided into thirteen chapters, which cover fundamentals,

principles and applications of biosensors and related bioanalytical approaches, and uses of bioelectrochemistry in synthesis and in fuel cells. Chapter 1, by the editor, deals with a general introduction to biological electron transfer processes, serving as a basis for the more advanced material presented in subsequent chapters. Chapter 2, by Rusling and colleagues, presents the electrochemistry of redox enzymes, covering both mediated electrochemistry, in which a redox-active molecule is employed to shuttle electrons between the enzyme and the electrode, and direct electrons between enzymes and electrodes. Hianik's chapter on biomembranes and membrane mimics covers membrane structure and composition, models of membrane structure, lipid bilayers, mechanical and electrical properties and transport through membranes. Gorton and Bartlett then present the following chapter on biosensors based on the electrochemistry of NAD(P)H, including direct electrochemical oxidation, mediated electrochemistry and biosensors based on NAD(P)H-dependent dehydrogenases. The chapter on glucose biosensors by Katakis and colleagues deals with the topic mainly from a device design and commercialization point of view. Chapter 6 by Wollenberger et al.

covers phenolic biosensors. Whole-cell biosensors are covered in Chapter 7 by Shiku et al. while Chapter 8 by Bartlett, Calvo and colleagues deals with the mathematical modeling of biosensor responses. The chapter by Pletcher on bioelectrosynthesis is a step away from the biosensor domination of the preceding chapters, presenting various strategies and examples of the synthesis of organic molecules through bioelectrochemical reactions. Palmore then presents the principles of bio-fuel cells, before we return, in the final three chapters, to the bioanalytical topics of electrochemical immunoassays, electrochemical DNA assays and in vivo applications of glucose sensing by Yakovleva and Emneus, Oliveira-Brett, and Vadgama and Schoenleber, respectively.

Overall, this book provides a comprehensive account of modern bioelectrochemistry and will be of wide interest for those with research activities in the areas covered. All chapters are readable and packed with information, all are well-referenced and up-to-date. The book is highly recommended to those with interests in bioelectrochemistry and its applications.

D. Arrigan