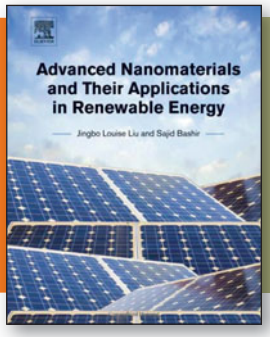
of electrochemistry. The pathways of a general electrode reaction and electrode processes are explained using Faraday's Laws of electrolysis, Nernst's equation, and Pourbaix diagrams.

Chapter 3 discusses the principle of materials removal in EMM. Appropriately, the author introduces the basic equivalent electrical circuit for a single electrode by using the metal-electrolyte interface as a capacitor. This is followed by a good picture of the inter-electrode gap, and its response to pulse cycle is discussed elegantly. Subsequent discussion of the material removal rate model illustrates the removal of micro-machined products through the Butler–Volmer equation.

Chapters 4–12 discuss several technological aspects of ECM, such as types of ECM (chapter 4); ECM setup (chapter 5); design and development of micro tools (chapter 6); influencing factors of EMM (chapter 7); improvements of machining accuracy (chapter 8); advantages, limitations, and applications of EMM (chapter 9); microdevice fabrication (chapter 10); electrochemical microsystem technology (chapter 11); and advancements in EMM of micro- and nanofabrication (chapter 12). The concluding chapter discusses nano features on metals and semiconductors for nanotechnological applications (chapter 13). There is an 11-page index that makes it easy to navigate topics.

The author orients the reader in a logical and systematic manner to power supply requirements, electrolyte feed, optimum factor levels, and process details with impressive illustrations. One drawback of the book is in formatting: the equations in some chapters are numbered, while in others they are not. The book will be very useful to professionals as well as nonprofessionals who are interested in electrochemical micromachining. I strongly recommend this book for scientists, engineers, and those who wish to teach this subject.

Reviewer: K.S.V. Santhanam *is a professor in the School of Chemistry and Materials Science at the Rochester Institute of Technology, USA.*



Advanced Nanomaterials and Their Applications in Renewable Energy

Jingbo Louise Liu and Sajid Bashir

Elsevier, 2015
436 pages, print and e-book $144.50
ISBN 9780128015285

This e-book linking nanotechnology to renewable energy applications is composed of 436 pages divided into nine chapters. The beginning includes a preface and a glossary of acronyms. Most of the chapters have been written by the main authors, with chapter 7 co-authored by Yeng-Pin Chen. Chapter 6 is exclusively authored by Daqiang Yuan. The book concludes with a summary/post-log.

The first chapter discusses generalities of nanomaterials in terms of their properties and applications. A brief historical perspective of nanotechnology is also provided, followed by a discussion on dimensionality of nanomaterials. The second chapter deals with what I consider the most important aspect: their synthesis via top-down (ball-milling and lithography processes) and bottom-up (sol-gel synthesis) approaches. Since synthesis itself is unable to define the nanoscale character of the materials, the third chapter therefore describes nanocharacterization methods. This chapter also describes indispensable techniques such as transmission electron microscopy (TEM), atomic force microscopy, x-ray diffraction, optical spectroscopy techniques, and x-ray photoelectron spectroscopy.

Chapters 4 and 5 deal with energy production. The fourth chapter briefly overviews important concepts in fuel cells, energy storage, and carbon capture and storage. It also imparts a lot of background knowledge on photovoltaic cells. Toward the end of the chapter, a special section is dedicated to nanocatalyst preparation and nanocharacterization. The fifth chapter on fuel cells examines proton-exchange-membrane fuel cells and the role of Pt-carbon nanotube cathodes in their performance.

Chapters 6 and 7 deal with energy storage and capture via porous materials such as metal–organic frameworks (MOFs). Chapter 6 delves into storage of gases such as CH_4, CO_2, and H_2 in covalent organic frameworks. Chapter 7 provides the implications of fossil fuels used for producing electricity in transportation and industry. It further provides statistics of CO_2 emission in various developed and developing countries. Methods of CO_2 capture and the use of MOFs for the same are examined.

Chapter 8 covers the toxicity of nanomaterials. Nanomaterials, even though a growing field of research and development, have their shortcomings. Environmental implications such as exposure to nanomaterials, their toxicology, and toxicity evaluation are discussed. The reader is made aware of the implications of nanomaterials in everyday life. The ninth chapter is the post-log, bringing forward points that were not discussed in detail in previous chapters.

A positive aspect of this book is the large number of TEM images that have been used to demonstrate the shape, size, morphology, and crystallization of the nanomaterials. This book gives the reader a good overview of nanomaterials in energy-related applications. However, the e-book version of the index could be made more reader friendly by adding sub-subsections and making them available at the click of a button. It would also be helpful to the reader if page numbers were provided in the index.

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https://doi.org/10.1557/mrs.2016.127 Published online by Cambridge University Press