The Chemistry of

Nanostructured Materials

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Volume II

The Chemistry of

Nanostructured Materials

Editor

Peidong Yang

University of California, Berkeley, USA

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PREFACE

Nanostructures have attracted steadily growing interest due to their fascinating properties, as well as their unique applications relative to their bulk counterparts. The ability to generate such structures is now central to the advance of many areas in modern science and technology. In the past decades, significant progress has already been made in the field of low-dimensional nanostructures. With these nanostructures as the functional components, a variety of nanoscale devices have been fabricated as prototypes by many research groups around the world, with notable examples including nanoscopic lasers and transistors, logic and memory units, light-emitting diodes, as well as energy generation and storage devices.

Among many of the potential applications for nanomaterials, energy generation and storage become increasingly important. For the next few decades, the annual global consumption of energy is estimated to rise significantly. Assuming current policies and practices remain in place, most of the increased energy production is expected to come from the combustion of liquid fuels, such as oil, natural gas, and coal. A commensurate increase in CO₂ (a prominent greenhouse gas) emissions is anticipated, much of which is due to burning coal – the fastest growing source of energy globally. In order to moderate global reliance on exhaustible natural resources and their environmentally hazardous combustion, more scientific efforts should be directed towards reducing the cost of energy production from renewable sources.

There exist many potential renewable energy technologies in the form of solid state devices, such as, for example, solar cells, which convert solar energy in the form of light to the more practical form of an electricity. In addition, a large collection of condensed matter phenomena involve the conversion of energy from one form to another, and some

proceed with efficiency near unity. Consequently, the study of energy conversion in nanomaterials is a field full of opportunities for practical and socially significant applications.

This book, as a sequel to the 2003 book “Chemistry of Nanostructured Materials”, focuses on the energy applications of nanomaterials. The individual chapters, written by experts within the field, will review ways in which nanostructured materials can enable advanced solid state energy conversion and storage devices. More importantly, all of these studies reflect beautifully the central theme of the nanomaterials research — *rational synthesis with a purpose*.

I would like to thank all the authors for their time and efforts to put together these comprehensive review articles, Dr. Frank Tsung for assistance in editing and formatting final version of the individual chapters. I personally hope that researchers at different levels will find this book useful and interesting. Enjoy reading and see you at sequel III.

Peidong Yang @ Berkeley
Spring 2010

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