

Contents

Common abbreviations — VII

Preface — 1

Section 1: Overview of nanoscience and nanochemistry

Sajid Bashir, William Houf, Luis Villanueva, Jianhong Ren, Jingbo Louise Liu

Chapter 1

Nanochemistry: development of nanomaterials — 33

Section 2: Focus on synthesis methods

S. Bashir, C. Li, Y. Huang, S. Palakurthi, Z. Wang, Y. Olaseni, P. Villarreal,
W. Houf, M. Alexander, J. Ren, J. Liu

Chapter 2A

**Wet-chemistry-derived nanomaterials and their multidisciplinary
applications — 133**

Xuan Wang, Jingbo Louise Liu

Chapter 2B

Bottom-up synthesis of nanomaterials — 239

Telli Alia, Darem Sabrine, Sushesh Srivatsa Palakurthi, Jingbo Louise Liu

Chapter 2C

Green pathways to synthesize nanomaterials — 267

Saurabh Vyas, Vivek Anand, Roli Mishra

Chapter 2D

Synthesis and stabilization of metallic nanoparticles — 307

Section 3: Focus on characterization methods

Hao Zhang, Bingbao Mei, Zheng Jiang

Chapter 3A

**Advances in understanding electrochemical reaction mechanisms of highly
dispersed metal sites using X-ray absorption spectroscopy — 329**

Dan Kong

Chapter 3B

In situ spectroscopic studies of the electrochemistry — 357

Sohaib Mohammed, Hassnain Asgar, Greeshma Gadikota

Chapter 3C

Integrated X-ray scattering and molecular-scale simulation approaches to probe the behavior of confined fluids for a sustainable energy future — 437

Section 4: Focus on select example applications of nanoscience in energy, environment, and health

Yeshe Tan, Ivan P. Parkin, Guanjie He,

Chapter 4A

Electrocatalytic hydrogen production — 463

Wen Lei, Shaowei Zhang, Haijun Zhang

Chapter 4B

Nanostructured materials for electrocatalytic hydrogen evolution reaction — 489

Tanveer Ul Haq, Yousef Haik

Chapter 4C

Recent progress in cobalt-based nanosheets for electrochemical water oxidation — 537

Xuan Wang, Sajid Liu

Chapter 4D

Nanoapplication: carbon capture and conversions — 565

Robert S. Luckett Ed.D., MSW

Postface: social impact, consequences, and results of nanotechnology — 583

Biography of the editors — 593

Biography of the authors — 595

Author list — 603

Index — 607