Preface

Advanced energy technologies have been and will continue to be one of the most explored fields across the multidisciplines of: materials science, chemistry, applied physics and engineering. The rapid progress of portable electronic devices and electric vehicles in recent years has aroused tremendous research interests and technological challenges for the development of higher energy and/or power density electrochemical power management devices such as fuel cells, supercapacitors, and Li batteries.

Nanostructured carbon materials have traditionally been deemed as the most suitable electrode materials in almost all above-mentioned energy technologies due to their low price, high specific surface area, and chemical stability. However, recent researches have revealed that dealloyed nanoporous metals can also function as an alternative type of electrode materials that exhibit some very unique structural properties not commonly expected from carbon-based electrodes. Amongst various unique features of dealloyed nanoporous metals, the most appreciable ones are (i) bicontinuous open framework structures tunable across the wide dimension scale; (ii) clean surfaces with well-defined and tailorable interfacial structures; (iii) superior electric conductivity; (iv) simple processing scalable for mass production.

This book aims to provide a comprehensive discussion of research in this new field to date. Chapters 1 and 2 provide a general introduction of nanoporous metals, in particular on how a historically unwanted process of alloy corrosion can be tailored to generate functional nanoporous metals and composites with tunable structural properties. Chapters 3–5 discuss the respective research advances of dealloyed nanoporous metals for applications in fuel cells, supercapacitors, and Li batteries. And finally Chap. 6 summarizes the current research activities and also proposes future prospects of employing this new class of electrode materials for other energy-related technologies.

Tianjin Yi Ding
Jinan Zhonghua Zhang
2016
Nanoporous Metals for Advanced Energy Technologies
Ding, Y.; Zhang, Z.
2016, XIV, 223 p. 151 illus., 123 illus. in color.,
Hardcover
ISBN: 978-3-319-29747-7