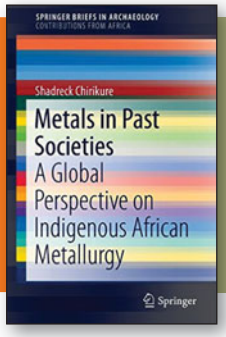


Metals in Past Societies: A Global Perspective on Indigenous African Metallurgy

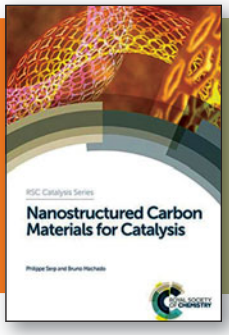
Shadreck Chirikure

Springer, 2015
166 pages, $54.99 (e-book $39.99)
ISBN 978-3-319-11640-2

This slim book shines a spotlight on pre-industrial African metallurgy, its global connections, and anthropological implications. It integrates seemingly disparate disciplines, such as history, geology, ethnography, archeology, and metallurgy, to illustrate the diversity and innovation in metallurgy across Africa and the role of metals in the rise of socioeconomic inequalities and political power. The book has seven chapters, and the focus on metals, mainly iron, copper, gold, silver, lead, and tin, catering to human needs and wants is evident in each chapter. The sources of information are adequately cited, and the long list of references at the end of each chapter will be a boon to researchers in this field.

The first chapter presents the context of the work and data sources. The second chapter focuses on the origin and development of mining and metallurgy in pre-industrial Africa. Chapter 3 is dedicated to the interaction of nature and culture in the process of mining. African mining practices were similar to underground mining practices elsewhere not because of the diffusion of ideas, but due to common limitations imposed on humans by geology. Chapter 4 deals with the transformation of ores into copper or iron by smelting and the sociocultural aspects of this process. Chapter 5 explores the social and cultural roles acquired by iron, copper, and gold as a result of fabrication into objects. Chapter 6 examines the social role of metals, trade in metals, cultural contact, proto-globalization, and technology transfer. African gold paid for commodities from India, Persia, and China, such as porcelain and gunpowder. This trade took place without significant technology transfer to Africa, because cultural barriers, differences in value systems, and a lower population density in Africa impeded the adoption of foreign metallurgical processes. Finally, chapter 7 draws lessons for global anthropology from the African experience. One needs to understand the evolution of materials technology to fully appreciate the development of social institutions, accumulation of wealth, and concentration of political power. At the same time, local beliefs, rituals, and value systems influence the arc of technology. The author highlights the cultural aspects and social context of the adoption of metallurgy in Africa while drawing parallels between practices in pre-industrial Africa and those in other parts of the world. The book is peppered with delightful vignettes that offer insights into the process of transforming nature into culturally significant objects. For instance, African miners, like their counterparts in Nepal and Latin America, called upon deities, spirits, and ancestors to mediate between nature and humans. Women had distinct roles in this process, but there were variations in these roles and in the caste status of metalworkers across Africa. Taboos, rituals, and magic were very much a part of the development of metallurgical technology. The smelting of metal was considered analogous to conception, gestation, and child birth. Power, fertility, and metallurgy were intertwined, as shown by the decoration of furnaces with female anatomical features. The book concludes with a warning against broad generalizations and stereotypes about African practices. This volume is well written and illustrated with photos, micrographs, colorful maps, and drawings that enliven this challenging topic.

Reviewer: Ram Devanathan *is Technical Group Manager of Reactor Materials and Mechanical Design, Pacific Northwest National Laboratory, USA.*



Nanostructured Carbon Materials for Catalysis

Philippe Serp and Bruno Machado

Royal Society of Chemistry, 2015
570 pages, $226.45
ISBN 978-1-84973-909-2

This book is an excellent introduction to the field of carbon nanomaterials for catalysis application for researchers and students in the field of chemistry. It will not be outdated for a long time, as it is written from the point of view of the basics and applications. It covers molecular structure and surface chemistry aspects and comprises 10 chapters.

The first two chapters cover the fundamentals of different types of carbon nanomaterial, molecular structure, classifications, and its bulk properties as a catalyst. The third chapter introduces a molecular point of view of the adsorption process on the surface of nanostructured carbon materials by physisorption and chemisorption, and explains its specific adsorption sites for the chemical reactions. The next three chapters explain in detail the preparation processes and properties of different types of nanocarbon catalysts such as nanocarbon supported

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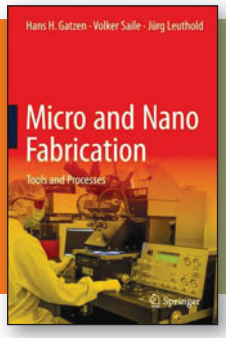
catalysts, nanostructured carbon materials, and doped nanostructured materials. Chapters 7 and 8 give interesting examples of the chemical reactions on the surface of nanostructured carbon material supported catalysts, such as heterogeneous and photocatalytic reactions. Chapter 9 introduces applications of carbon nanostructured materials for energy conversion and storage such as its applications in fuel cells, solar cells, super capacitors, and lithium batteries. The authors end the book with an interesting chapter regarding the use of carbon nanomaterials on the industrial scale as in micro- and large-scale reactors and environmental and safety considerations, such as short-term inhalation, cytotoxicity, bioactivity, and possible enzymatic degradation of nanostructured materials. The authors support the textbook with recent and up-to-date references and useful figures.

In conclusion, the authors have succeeded in explaining the fundamentals of different types of carbon nanomaterials and their properties and applications in the field of surface chemistry and catalysis. This approach will make the book useful for many years.

I can recommend without hesitation this book to all who are interested in nanomaterials, and particularly to those entering the fields of surface chemistry and catalysis. It is written at a level appropriate to someone with a chemistry, molecular structure, and materials background.

Reviewer: Walid M. Daoush *of Helwan University, Egypt.*



Micro and Nano Fabrication: Tools and Processes
Hans H. Gatzen, Volker Saile, and Jürg Leuthold

Springer, 2015
519 pages, $99.00 (e-book $69.99)
ISBN 978-3-662-44394-1

Used to make pressure sensors, microphones, accelerometers, and gyroscopes, microelectromechanical systems (MEMS) reached a global market of USD$12 billion in 2014, with an expected growth of 20% in the next four years. Future MEMS challenges will be strong price reduction coupled to system size shrinkage, thus the field heads toward the development of nanoelectromechanical (NEMS) systems. With these characteristics, it is easy to understand why MEMS are currently one of the most exciting topics on which to learn.

Current MEMS fabrication technologies rely on somewhat standard semiconductor device processing, although new technological prospects are envisaged to overcome the current limitations. This book is designed to give an overview of all these technologies.

The first chapter is a historical background of these systems taking a broad look at some of the milestones that have contributed to the development of MEMS as we know them today. The second chapter, after an overview on gas properties and gas-flow basics, reviews several vacuum systems presently used and issues related to vacuum measurements and leak detection. Chapter 3 is dedicated to deposition technologies, such as physical and chemical vapor deposition, thermal and plasma-based, and hybrid processes. Alternative cost-effective methods from liquid and sol-gel phases are also treated. The fourth chapter is a compact exposition of the etching methods required to define the structures inside the devices, basically divided into wet and dry processes. Chapter 5 deals with the doping of silicon, the main material discussed in the book, explaining the different approaches used so far, such as solid, liquid, and gas sources, together with the theoretical background on atomic diffusion. As highlighted by the authors, doping is used in MEMS on a smaller scale than in the semiconductor industry. A paragraph on thermal oxidation as a protection from contamination is also inserted. Lithography is the subject of chapter 6, covering the standard optical technology to the most innovative and spatially resolved techniques. Techniques used to fabricate high-aspect-ratio structures based on lithography are discussed in chapter 8. Innovative approaches for nanolithography based on self-assembling mechanisms are reviewed in chapter 9. Planarization, wafer bonding, and contaminant reduction are presented as enabling technologies, while an example of MEMS fabrication is described in the last chapter.

The book is clearly written and easy to read. The various topics are balanced and well organized. For each of the approaches, the technology is presented together with the theoretical background. The numerous figures and schematics are the most useful tools of the book. At the end of each chapter, a list of exercises is offered. The references are adequate. It is useful to students and newcomers, but also experts may find it a good reference because there are some useful aspects not easily found in other books, such as the leak detection in the vacuum technology chapter, the liquid-phase deposition in the third chapter, photoresist and ink characteristics explained in the lithography chapter, and equipment and consumables suggested for the planarization processes. Even if the reader does not plan to work on this topic, the book offers a good opportunity to go through the basic semiconductor fabrication technologies.

Reviewer: Rosaria A. Puglisi *of the Institute for Microelectronics and Microsystems, National Research Council, Italy.*

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