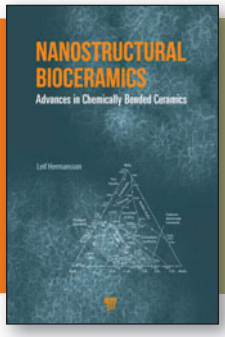
concluding chapter 19 predicts an unstable situation until 2020, with one country dominating production, but holds out hope for new mines and substitutions for rare earths so that we are less dependent on them. The substitutes are often less green. An exception is the light-emitting diode, which has higher energy efficiency and is a replacement for fluorescent lighting containing rare-earth phosphors.

Each chapter starts with a list of objectives and ends with a summary. The book is well illustrated with 6–18 figures per chapter and has a 10-page section containing color photographs. The references (49) and suggested readings (50) are current up to 2014 and adequate, but not extensive, considering the information explosion in this topic. The book is recommended for graduate students with a background in condensed-matter physics, chemistry, and metallurgy; scientists; researchers in materials industries; and the wider audience interested in strategic materials.

China gave up the quota system this year and the hybrid electric car—the poster boy of rare earths—uses less of them in its recent versions. However, efforts to develop new sources, more efficient processes, recycling technologies, and substitutes are not expected to slow down. The outcome of these efforts will hopefully be covered in future editions. This readable book takes you through mines, extraction plants, research labs, pilot plants, factories, and recycling plants, on four continents. Enjoy the journey!

Reviewer: N. Balasubramanian *is an independent research scholar working in Bangalore, India.*



Nanostructural Bioceramics: Advances in Chemically Bonded Ceramics
Leif Hermansson

Pan Stanford, 2014
158 pages, $129.95
ISBN 9789814463430

This book is an excellent introduction to the field of bionanomaterials for the researcher as well as the newcomer to the field. It introduces readers to the structure and characteristics of new bioceramics, chemically bonded nanobioceramics, and their interaction with tissues *in vivo* and *in vitro*, posing the question: What determines the biocompatibility and the toxicity of such new inserts in human bodies? The book thoroughly explains chemically bonded bioceramics from a chemical composition and mineralogy point of view and early tissue response, providing researchers with comprehensive knowledge about nanobioceramics for practical applications. It is written from a combined materials chemistry, mineralogy, and medical perspective, and comprises 14 chapters and 158 pages.

The first chapter is an introduction to classifications of ceramics, stable and resorbable chemically bonded bioceramics, and their relationship with other biomaterials. Chapter 2 goes through the structure of hard tissue, and how chemically bonded bioceramics interact *in vivo* through the contact zone with hard tissues. In chapter 3, several types of mechanisms and chemical reactions describe how the chemically bonded bioceramics are processed, including a discussion of the proper time for curing. Chapter 4 details the different types of additives that comprise active complementary binders, processing agents, and fillers. Chapter 5 covers the necessary characterizations and investigations of different types of chemically bonded bioceramics. Chapter 6 explains the formation mechanisms and the solubility products of some of the nanostructure phases developed in some chemically bonded bioceramics. Chapter 7 describes how nanostructures influence properties and mechanical strength, including crystal size and porosity structure. Chapter 8 introduces an overview of the importance of nanostructures, including nanocrystals and nanoporosity in relation to bioactivity, anti-bacterial properties, microleakage, hemocompatability, and controlled drug delivery. Chapter 9 details using chemically bonded bioceramics in dental applications, such as dental cements, endodontic therapy, dental fillings, and dental implant coatings. Chapter 10 focuses on orthopedic applications of chemically bonded bioceramics such as calcium aluminate-based orthopedic materials and their coatings. Chapter 11 introduces the possibility of using chemically bonded bioceramics as carriers for drug delivery and the carrier for controlling drug release. Chapter 12 explains the clinical studies and evaluations of the orthopedic biomaterials, including diagnosis, indications, surgical procedure, symptoms, case studies, and testing on patient groups. Chapters 13 and 14 serve as a summary and overview of the classifications, applications, and some general properties of biomaterials. Hermansson includes a potential evolution of nanostructural chemically bonded ceramics as biomaterials in the coming decades.

Areas for improvement are to use high-resolution images for several of the figures and to include reference numbers for all figures and tables. Also, Hermansson repeats the same acknowledgments after each chapter, while it may make more sense to include one detailed acknowledgments section. Overall, this book will serve as an important addition to the libraries of those interested in materials processing and will stimulate new applications of bioceramics.

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

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