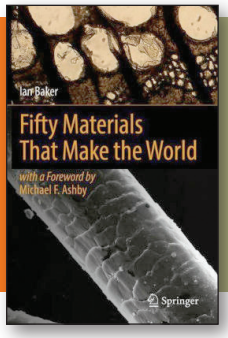


Fifty Materials That Make the World

Ian Baker

Springer, 2018
271 pages, $49.99 (e-book $39.99)
ISBN 978–3-319–78766–4

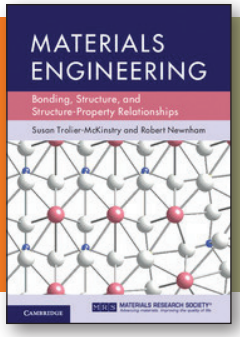
This book could be considered a "materials science crash course"—a concise, semi-technical review of 50 materials of significance to mankind. A combination of metals, plastics, and various naturally occurring materials such as stone and wood are included, and the decision on what to include must have been a difficult one for the author. Surprisingly, materials such as water, air, and soil are left out. The pre-set limit of 50 materials and perhaps the historical context spanning many centuries are the two factors that likely precluded the inclusion of many more recently developed modern materials such as high-temperature superconductors, high-entropy alloys, semiconductors, nanomaterials, and various energy-storage materials, which already greatly influence our lives.

The book contains numerous references for those wanting to dig deeper, including many Internet links as footnotes. The coverage focuses on applications and the practical impact of various materials on our lives, including tidbits of descriptive information and interesting historical context, uncovering little-known background information about the discovery and development of various materials. Also included are basic economics information (production scale by country) and geography data on the occurrence of specific material resources. The reader will learn facts that are often less known yet significant (e.g., that most of the gold is found in seawater or that platinum is about 10 times more common in the earth's crust than gold).

The technical value of the book would be enhanced if, in the case of elements, the description included more details on the atomic structure and known isotopes. On the other hand, the text can be useful in designing thematic travel itineraries, such as a visit to the subterranean London Silver Vaults, to learn about and purchase the largest variety of silver goods not found anywhere else.

The book briefly touches on the subject of "rapid prototyping" (additive manufacturing, AM) in connection with polymers. As materials play a key role in this emerging technology, more detailed coverage of this topic (especially that of metal AM) would further enhance the next edition of this book.

***Reviewer: Vlad Paserin**, Research associate, Faculty of Mechanical and Mechatronics Engineering, University of Waterloo, Canada.*



Materials Engineering: Bonding, Structure, and Structure-Property Relationships

Susan Trolier-McKinstry and Robert E. Newnham

Cambridge University Press
and Materials Research Society, 2018
630 pages, $85.61 (e-book $75.09)
ISBN 978–1-107–10378–8

The book *Materials Engineering* has a crystal structure approach to bonding, structure, and how they relate to the properties of materials. However, it does not describe materials processing and microstructure or materials characterization. The subject is covered in 30 chapters (630 pages). The authors use common raw and industrial materials to explain the symmetry relationships in crystals and molecules.

After the introductory chapter, the next three chapters describe the primary raw materials on earth: minerals, water, atmospheric air, and fossil fuels. The bonding between different atoms and ions is discussed in the third chapter and is immediately related to hardness, melting points, and boiling point topics in the fourth chapter. Chapters 5 and 6 discuss the geometry and morphology of crystals, crystal systems, and the theoretical density of crystalline solids. The connecting line of thought is always the crystal structure, or its absence in amorphous materials.

There are several figures in these introductory chapters describing different crystal structures and molecules and pointing to the importance of symmetry before its formal definition in Chapter 7. The text is fluent and resembles a teacher in a classroom who brings examples related to raw and synthetic materials to pinpoint the theory. Many tables and figures are used to provide hints for the behavior of materials. Whenever possible, the authors include "rules of thumb" related to materials properties.

Chapters 8–12 present covalent, ionic, metallic, molecular, and polymeric materials before going back to the fundamental theory, Pauling's rules, bond valence, structure-field maps, and crystal field theory in Chapters 13 and 14. Since the text is an introduction to materials engineering, advanced details are not included, but the related physics and chemistry are substituted by figures and tables that provide excellent insight.

Chapters 15 and 16 introduce solid solutions and defects in crystals, with a brief presentation of the Kröger–Vink notation for ionic point defects. The authors finish the general introduction to materials by discussing amorphous

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