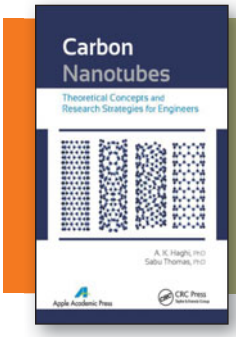
from x-ray diffraction techniques and electron microscopy. This book is thoroughly referenced, with 398 citations that range in date from 1783 to 2013; more than 20% are studies published since 2000.

The book is divided into four chapters. Chapter 1 covers crystal lattices, concepts of symmetry, Bravais lattices, the reciprocal lattice, crystal structures, polymorphism and polytypism, and selected examples of molecular crystals. Chapter 2 explains the fundamental processes that take place during crystal growth, including homogeneous and heterogeneous nucleation, the equilibrium shape of crystals, interfaces and the roughening of surfaces, the vapor–liquid–solid growth mechanism, phase diagrams, constitutional supercooling, and mass transfer by convection. Chapter 3 briefly describes the major bulk crystal growth and epitaxy methods divided into two groups: those driven by phase changes and those driven by chemical reactions. The former includes growth from melts (such as the Czochralski and Bridgman methods) and solutions, sublimation and condensation, and liquid-phase epitaxy. The latter includes chemical vapor deposition and vapor-phase epitaxy. Examples from specific material systems (primarily semiconductors) are also presented. Chapter 4 recounts the wide variety of defects that occur in crystals and how they are detected and quantified. Defects discussed include zero-, one-, two- and three-dimensional defects, dislocations, stacking faults, antiphase boundaries, twins, inclusions, precipitates, and voids. X-ray topography, scanning and transmission electron microscopy, and defect-sensitive etching are introduced as methods for detecting and quantifying these defects.

This book is an excellent introduction to the field of crystal growth and characterization. It clearly defines important terms, and fundamental concepts (e.g., crystallography, thermodynamics, and transport phenomena) are well-explained, making it valuable for learning the subject. With the addition of appropriate problems, it is suitable for graduate studies and provides a firm background for understanding contemporary issues and challenges in crystal growth.

***Reviewer: James H. Edgar** of the Department of Chemical Engineering, Kansas State University, USA.*



Carbon Nanotubes: Theoretical Concepts and Research Strategies for Engineers
A.K. Haghi and Sabu Thomas

Apple Academic Press, 2015
364 pages
ISBN 978-1-77188-052-7

Carbon nanotubes are a hot topic because of their potential technological utility and economic importance. Performing experiments can be expensive and sometimes difficult; therefore, modeling and simulation are of increasing value. Combining these two topics in one book should be very useful.

This book first gives an overview on the properties of carbon nanotubes and of composites incorporating carbon nanotubes. These topics are clearly written and can be understood by any engineer with a background in materials. The authors avoid discussing the theories of all these properties and applications in detail. This makes the book accessible to readers who are not physicists. On the other hand, a physicist expecting a helping hand to learn details of theory in the field will be disappointed. Thus, this book is written for engineers and not for physicists.

In the Properties section, the book describes electrical properties, structural and thermal properties, and methods for synthesis. The differences between three-dimensional and one-dimensional electrical conductors are explained, as well as the differences between single- and multiple-wall nanotubes. In addition, structure and thermal properties are discussed in context of the thermodynamic properties. However, the very special mechanical properties of carbon nanotubes are not discussed.

The main part of the book is devoted to modeling and simulation. All the established methods are described, ranging from quantum mechanical *ab initio* methods to rather experience-based methods. The authors explain in detail the differences between deterministic and probabilistic (Monte Carlo) methods. As it is a common problem often not realized by scientists doing Monte Carlo calculations, the authors give a program code to calculate random numbers and to test existing codes. This is of great importance, as random number generators often do not have a sufficient period length (pseudo random numbers).

This is a book on simulation and modeling applied to problems connected to carbon nanotubes. The selected mathematical notation is very clear to engineers and physicists. Additionally, the authors give a list of mathematical symbols, and the 37 illustrations in the book are quite instructive. At the end of the book, there is a list of 192 references connected to nearly all aspects of the topic. As modeling depends too specifically on the problem in question, the book does not give instructions on how to perform these calculations. This book is recommended to everyone who wants an introduction to modeling and simulation.

***Reviewer: Dieter Vollath** is CEO of NanoConsulting, Stutensee, Germany.*

https://doi.org/10.1557/mrs.2015.190 Published online by Cambridge University Press

MRS OnDemand® WEBINAR SERIES

Presented by MRS Bulletin

Perovskite Photovoltaics

Wednesday, August 26 | 12:00 – 1:30 pm (ET)

Perovskite solar cells, especially those based on methylammonium lead triiodide, have seen unprecedented progress in recent years. The August issue of *MRS Bulletin* overviews perovskite photovoltaics, with articles focused on various deposition methods of perovskite absorbers, vapor-assisted solution process techniques, as well as hole-transporting material-free perovskite solar cells. The talks featured in the Perovskite Photovoltaics Webinar are representative examples of research detailed in the *MRS Bulletin* issue.

Attendance for this and all MRS OnDemand Webinars is FREE, but advance registration is required.

Visit www.mrs.org/webinars today for more information.

SPONSORSHIP OPPORTUNITIES

The MRS OnDemand Webinar Series features free, live monthly Webinars and event re-broadcasts that provide valuable educational information on timely, interdisciplinary topics. This design format provides a great opportunity to learn while networking with other researchers from around the world.

Create your own Webinar using the content and speakers of your choice, or sponsor an existing event from our Webinar Calendar.

Benefits Include:

- Reaching new customers by providing an educational resource to targeted audiences
- Benefiting from MRS OnDemand Webinar Series marketing—print and online advertising; targeted email marketing; inclusion in the *Materials360*® e-newsletter; and social media
- Generating quality leads using the detailed registration information provided by each of the registrants
- Gaining long-term exposure—your Webinar lives on long after the broadcast with library archiving

Visit **www.mrs.org/webinars** for more details and proposal form or contact Mary E. Kaufold at kaufold@mrs.org | 724-779-2755.

JOIN US ON WEBINAR WEDNESDAYS

September 23	Functional Nanocomposites
October 21	Engineered Nanomaterials in Aerospace Applications
November 4	Materials & Engineering: Propelling Innovation
November 18	Mesoscale Materials, Phenomena and Functionality

VIEW PAST WEBINARS IN THE SERIES

Past Webinars are archived and available to watch OnDemand at **www.mrs.org/webinars.**

- **2D Transition Metal Dichalcogenides**
- **Biomineralization**
- **Beyond Topography: New Advances in AFM Characterization of Polymers**
- **Power Electronics with Wide Bandgap Materials**
- **Essentials of Getting Your Work Published**
- **Multiscale Mechanics of Biological, Biomedical and Biologically-Inspired Materials**
- **3D Integrated Circuits: Materials Challenges**
- **3D Printing of Biomaterials**
- ***In Situ* Transmission Electron Microscopy**
- **Nanodiamond and Diamond Electronics**
- **Surface Characterization of Mechanical & Chemical Properties of Energy Storage Devices**
- **Elastic Strain Engineering**
- **Nanoindentation: Fundamentals and Frontiers**

www.mrs.org/webinars

https://doi.org/10.1557/mrs.2015.190 Published online by Cambridge University Press