

### Graphene: Preparations, Properties, Applications, and Prospects

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620 pages, \$193 (eBook \$200)

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This book is unique in that it discusses in a more detailed manner the graphene literature from the perspective of crystalline or defective layers. The focus is on graphene foams, films, horns, doping with foreign atoms, and electrical, thermal, chemical, mechanical, and biomedical aspects. The collective goal of the authors was to review the literature in an unprecedented way.

Chapter 1 provides an introduction to graphene, followed by a discussion on carbon materials, including highly oriented graphite materials, synthetic graphite materials, fibrous carbon materials, nanoporous carbon, spherical carbon materials, and glass-like carbon. The structure of graphite intercalation compounds is well covered.

Chapter 2 reviews the making of graphene by chemical vapor deposition (CVD), mechanical exfoliation, and chemical exfoliation. The materials produced by CVD using organic precursors

have been compared with those arising from graphite exfoliation.

Chapter 3 discusses the electrical properties of graphene, carbon allotropes, carbon nanofibers, and graphite, with illustrations of graphene-based transistors, spintronics, sensor devices, and photon detectors. This chapter also presents the concept of “zero gap” semiconductors, Bernal stacking, pi electron band structures, spin injection efficiency, and the performance of graphene sensors in doped and undoped states.

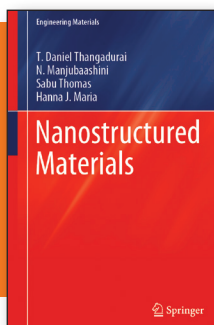
The chemical properties of graphene-based materials relevant for a variety of applications is the basis of chapter 4. This chapter also includes discussions on energy-storage aspects and environment remediation relevant to batteries and capacitors. Chapter 5 elaborates on the mechanical properties of graphene, with illustrations of nanolubricants and mechanical sensors. The thermal properties of graphene, thermal interface materials, nanofluids, and

thermal energy storage are reviewed in chapter 6. Chapter 7 includes discussions on biomedical properties, biocompatibility, cell management, drug delivery aspects, and biosensors. This chapter compares the performance of graphene with carbon nanotubes in their biocompatibility.

Chapter 8 is especially interesting, as it introduces materials derived from graphene (known as graphene derivatives) such as fluorographene, graphene oxide, graphyne, and also single-layer compounds such as boron nitride nanotubes and transition-metal sulfides. The concluding chapter 9 summarizes new knowledge added to materials science from the studies of graphene and future prospects.

This book is a solid contribution to materials science and engineering, as it reviews published research in the literature up until 2018. The book features an index for the easy selection of topics and is well illustrated. Graduate students could use the book for advanced research on graphene, and it serves as a good source on graphene developments viewed as a material derived from a CVD process, contrasting it with mechanical or chemical exfoliation. But it is not a textbook and does not include problems or worked examples.

*Reviewer: K.S.V. Santhanam, School of Chemistry and Materials Science, Rochester Institute of Technology, USA.*



### Nanostructured Materials

T. Daniel Thangadurai, N. Manjubaashini, Sabu Thomas, and Hanna J. Maria

Springer, 2020

221 pages, \$106 (eBook \$101)

ISBN 9783030261443

Nanotechnology and materials are among the most important fields in R&D of new products and technologies. Consequently, recent developments in design, synthesis, and application of different nanostructured materials have been the focus of much attention. This book covers a wide range of topics in nanostructured

materials, which are organized into 18 chapters and written in clear language. Figures and references suitably complement the text, allowing the reader to gain a detailed understanding of each chapter. However, there are no exercises in this book.

Although there are books published with similar themes, this book offers an

updated, comprehensive overview of different aspects related to the fundamentals, properties, synthesis, characterization, processing, and applications of nanostructured materials. Its readability, simplified presentations of key concepts and formulas, and solid number of topics and applications distinguish it from other books devoted to this subject. It can be used as a reference for researchers and professionals who are interested in this topic, or as a textbook for undergraduate studies in nanotechnology, nanoscience, and materials science. This book not only describes basic concepts and fundamentals of nanostructured materials, but it also summarizes their diverse applications in different areas such as



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