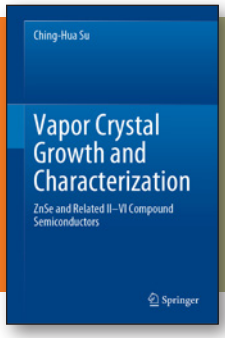


Vapor Crystal Growth and Characterization: ZnSe and Related II–VI Compound Semiconductors

Ching-Hua Su

Springer, 2020
215 pages, $139.99
ISBN 978-3-030-39654-1

This book focuses on the crystal growth of II–VI compound semiconductors by the vapor-transport method in sealed quartz ampules. Although confined to just a few II–VI compounds related to ZnSe, its topics are general and applicable to many crystal-growth processes.

The book is divided into eight self-contained chapters that can be read independently. Chapter 1 introduces and explains the properties of the compounds discussed, including ZnSe, ZnS, ZnTe, CdS, and CdTe. Their applications include light-emitting diodes and laser diodes in the blue and ultraviolet spectral regions. The advantages of vapor crystal growth are discussed, including its ability to produce crystals at temperatures below the compound's melting point, with controlled stoichiometry, and with high purity.

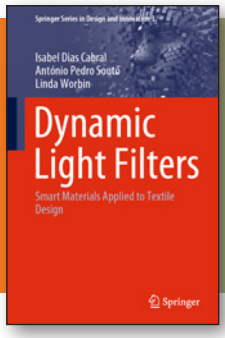
This crystal-growth process consists of the creation of vapor at the source material (sublimation), transport of species to the crystal-growth zone, and their condensation to form the crystal (chapters 2 and 3). Sublimation is controlled by the vapor pressures of the individual elements in the compound. The thermodynamics governing the partial pressures as functions of temperature are described. The transport of elements is driven by diffusion because of concentration gradients and convection due to differences in temperatures along the tube length.

The practical steps to implementing this crystal-growth method include treating the silica tube to minimize the release of oxygen and water vapor, considering the advantages and disadvantages of horizontal and vertical configurations, and setting up an appropriate temperature profile (chapter 4). Techniques to evaluate the crystals are considered in chapter 5. The crystals are optically examined to determine their size, shape, and morphology. Crystal surface kinetics can be applied to explain the detailed surface structure.

Methods of characterizing the crystalline structure, extended defects, compound stoichiometry, and concentrations of impurities in the crystals are explained in chapter 6. Measuring the crystal's charge-transport properties and the thermal properties before and after post-growth thermal annealing provides further insights into their fundamental properties (chapter 7). Modeling and simulation with mass and energy balances are used to estimate the spatial distributions of species, fluid velocities, and temperature (chapter 8). These can be helpful for understanding the properties of crystals.

The book's text is clearly written, well organized, and easily understood. It is abundantly illustrated with informative graphs, schematics, and photographs. The technology described is well established; only 12 of the 329 references are more recent than 2010. Still, this is a useful book, as it draws together much information into a single source. This is a valuable resource for researchers involved in, and interested in, understanding and improving any type of crystal growth.

***Reviewer: James Edgar**, Distinguished Professor, Kansas State University, USA.*



Dynamic Light Filters: Smart Materials Applied to Textile Design

Isabel Dias Cabral, António Pedro Souto, and Linda Worbin

Springer, 2020
219 pages, $149.99
ISBN 978-3-030-39528-5

The book is a modern and challenging approach to smart textile materials and their design specifically applied in dynamic light filters. Even though such materials are typically associated with passive functionalities, now the emphasis is on the dynamic dimensions that appear in time and movement during the interaction of light with matter under the action of thermal and electrical fields.

The work is structured into three parts and seven chapters, and is finalized with conclusions and reference lists. In Part I, basic concepts in dynamic color in textiles are presented, for a deeper understanding of thermochromic mechanisms in connection with light transmittance and electrical activation of thermo-responsive textiles. These theoretical notions are strongly supported in Part II by a large palette of experimental works to highlight dynamic form in textiles, with special emphasis placed on origami surfaces in order to demonstrate shape memory in materials and textiles. Although an ancient Japanese art of folding paper, in the last decades, origami has captured increased interest among practitioners in the arts, design, engineering, and science, providing new possibilities to fabricate, assemble, store, and morph structures.

Part III is devoted to design research based on the revolutionary concept of dynamic light filters, illustrated by three case studies as prototypes that explored the expressive possibilities of color, shape, and light performance through different intensity levels of change. These prototypes have been designed for artistic interior environments, which demonstrate

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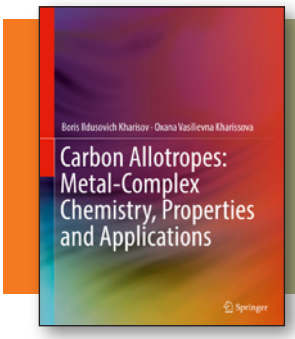
the distinctive role of such smart textiles as interactive surfaces of our everyday life.

The highly interdisciplinary nature of the book should be stressed, as fundamental aspects and knowledge on light and color physics are examined in detail. This provides a basis for further developments on how smart materials are integrated in textile substrates to acquire dynamic qualities to interactively change their color and shape in response to sensed stimuli. Even more impressive is the ability of the textile for sensing, reacting, and adapting under the influence of the electric field, resulting in textile-based conductive materials that can combine data processing, communication, and power supply functions, thus imparting these very smart textiles with capabilities for computation, electronics, and device miniaturization.

This book might be of interest to both academia and industry specialists who are able to exploit the versatile features of smart textiles related to various scientific and application fields, such as materials science and engineering, biomaterials used in therapies, electronics and computing, design, architecture, and the arts. The book is illustrated with relevant figures able to support the interpretation of experimental data, while details on materials and methods used are included to allow for the reproduction of experiments. These could be useful and recommended as supplementary information for MSc and PhD students, and researchers involved in highly innovative projects.

***Reviewer: Aurelia Meghea**, Emeritus Professor, University Politehnica of Bucharest, Romania.*



Carbon Allotropes: Metal-Complex Chemistry, Properties and Applications

Boris I. Kharisov and Oxana V. Kharissova

Springer, 2019
790 pages, $299.99
ISBN 978-3-030-03504-4

This book is an outstanding addition to existing carbon literature. It includes comprehensive details (properties, synthesis, and applications) about various existing forms of carbon, both natural and man-made. The vast compilation of properties of carbon in different forms makes it unique, whereas most existing books are restricted to a few carbon forms. This book discusses a variety of carbon allotropes varying from common (graphite, coal) to rare (nanoplates or nanocups), to well-developed industrially (carbon black), or intensely studied on the nanolevel (carbon nanotubes or graphene), or doped with metals and functionalized with organic and organometallic groups.

Each chapter contains a large number of high-quality figures and tables, which will help the reader understand the concepts, properties, and behavior of carbon materials. Appropriate comparisons among different carbon materials are used wherever possible to provide a better insight into the evolution of properties as carbon changes its forms. References for further reading are also provided. A small collection of problems with their solutions is included at the end of chapter 11.

Chapter 1 briefly presents classification of various carbon allotropes according to dimensionality and hybridization and also discusses their properties. The properties of conventional carbon allotropes (graphite, diamond, and amorphous carbon) and their applications are discussed in chapter 2.

Chapter 3 covers details about the structure, properties, synthesis, and applications of classic carbon nanostructures and provides insight into the salient features of these materials, such as reactivity and electron-transport mechanisms.

The text provides an in-depth understanding of lesser-known carbon forms (such as nano–New York, nano-paper, nano-volcanoes, nano-sponges) along with discussions in chapter 4. Chapter 5 presents details about synthesis, properties, and applications of lonsdaleite, glassy carbon, carbon black, and xerogels, while chapter 6 includes applications of computational methods to predict new carbon forms, which have not been observed experimentally (e.g., novamene, protomene).

Chapters 7 and 8 are dedicated to coordination/organometallic compounds and composites of carbon allotropes and their solubilization. Detailed synthesis procedures for these materials are presented. Chapter 9 discusses carbon allotropes in the environment and emphasizes their toxicity. It sheds light on health risks such as rheumatoid arthritis, significant DNA damage, and autoimmune diseases. Apart from health risks, it also describes the soil and environmental pollution caused by these materials.

Chapter 10 is dedicated to applications and cost perspectives of various carbon allotropes, such as graphite, carbon black, natural coal, and glassy carbon. It also describes how the price and applications of these materials varies with their quality.

Chapter 11 provides a detailed discussion about synthesis and characterization techniques, metal complex chemistry of nanocarbons, laboratory hazards, and safety precautions. This chapter contains simple problems and solutions for students. Inclusion of more complex problems would have been helpful.

This book is an extensive portrait of carbon allotropes, with emphasis placed on properties and applications. It could serve a broad audience, including students, researchers, teachers, and others interested in the science of carbon. It is written at a level appropriate for someone with a chemistry, physics, or materials background. The book is suitable for graduate and undergraduate students.

***Reviewer: Geeta Sharma**, DST Woman Scientist, Physical and Materials Chemistry Division, CSIR-National Chemical Laboratory, India.*

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