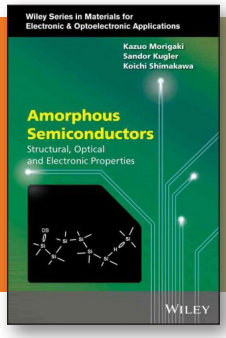


Amorphous Semiconductors: Structural, Optical, and Electronic Properties

Kazuo Morigaki, Sándor Kugler, and Koichi Shimakawa

Wiley, 2017
286 pages, $140.00 (e-book $112.99)
ISBN 978-1-118-75792-5

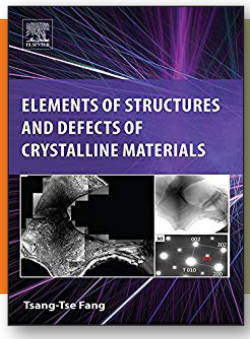
Amorphous solids are topologically disordered systems that have semiconducting behaviors. In contrast to crystalline semiconductors, the physical nature and theory of amorphous semiconductors are far from understood. Amorphous semiconductors are still a growing field and are in an early stage of development.

This book provides an introduction to amorphous semiconductors, including structural, electronic, and optical properties and their applications. The book comprises eight chapters and 286 pages. Chapter 1 introduces amorphous semiconductors. Chapter 2 illustrates techniques commonly used for growth of amorphous semiconductors, including *a*-Si:H films and amorphous chalcogenides. Chapter 3 is devoted to structural properties of *a*-Si:H films and amorphous chalcogenides, where both experimental measurements and computer simulations are involved. Chapter 4 discusses the electronic structure of several kinds of amorphous semiconductors. In chapters 5 and 6, the authors present the electronic and optical properties of amorphous silicon and amorphous chalcogenides, respectively. These two chapters are the main content of the book. The electronic and optical properties are related to the band structure, defects, and external actions, such as light irradiation, humidity, and temperature. Chapter 7 provides an overview of other amorphous materials, such as amorphous carbon and related materials, amorphous oxide semiconductors, and metal-containing amorphous chalcogenides. Chapter 8 discusses possible applications (e.g., displays and solar cells) of amorphous semiconductors, such as amorphous silicon and amorphous chalcogenides.

This book reflects the general current understanding of amorphous semiconductors and observations of the technological progress in the field. Several typical amorphous semiconductors are introduced. Amorphous oxide semiconductors (AOSs) have attracted more attention in recent years, with the potential for practical applications in transparent electronics and flexible electronics. The book would certainly be better if AOSs had been described in more detail.

The authors have put together a comprehensive set of structural, electronic, and optical properties of amorphous semiconductors. The contents have been organized and presented in a logical way. The figures and tables are useful to understand the materials, and the references are adequate and up to date. I recommend this book to postgraduate students, researchers, and technologists, especially those who are interested in microelectronics, photonics, and optoelectronics, as well as printed electronics, transparent electronics, and flexible electronics.

Reviewer: Jianguo Lu *is an associate professor at Zhejiang University, China.*



Elements of Structures and Defects of Crystalline Materials

Tsang-Tse Fang

Elsevier, 2018
230 pages, $126.00 (e-book $126.00)
ISBN 978-0-12-814268-4

Many properties such as mechanical strength, thermal conductivity, electrical resistivity, and the performance of materials are determined by defects. To understand defects, it is necessary to understand ideal structures.

This book lays the foundation for structures and defects at the most basic level, with treatments similar to those found in introductory materials science and engineering textbooks. These include electron configurations, chemical bond types, and basic structures of metallic, covalent, and ionic materials. The book builds from this foundation by covering topics in greater depth and employing more sophisticated tools for its explanations, such as vector calculus, chemical and phase thermodynamics, and statistical mechanics.

The book is divided into six chapters, starting with a chapter on the properties of electron orbitals and their relation to the periodic table. The rules applied to the order in which electron orbitals are filled are described.

Chapter 2 recounts various types of chemical bonds that form in solids—the familiar ionic, covalent, and metallic bonds. The nature of bonding forces between point charges (Coulombic), permanent dipoles, induced dipoles, and the sharing of electrons between atoms are described. The dependence between electronic energy levels and the elastic modulus, melting temperature, and thermal properties are shown.

Chapter 3 describes a wide variety of crystal structures that solids form, as well as the rules and geometric constraints governing the structures. The structures of metal oxide compounds are covered in-depth. Specific structures of metal oxide compounds of technological relevance

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