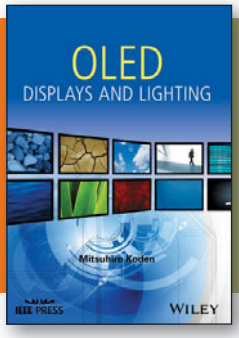


OLED Displays and Lighting

Mitsuhiro Koden

Wiley-IEEE Press, 2016
232 pages, $90.00 (e-book $72.99)
ISBN 978-1-119-04045-3

This book provides an elaborate description and presentation of the recent technological evolution of organic light-emitting diodes (OLEDs), starting from basic research to product development. Specific emphasis is given toward OLED application for displays and lighting. The book starts with the history of OLEDs from 1987 to 2015, and ends with information on new technologies involved in OLED fabrication.

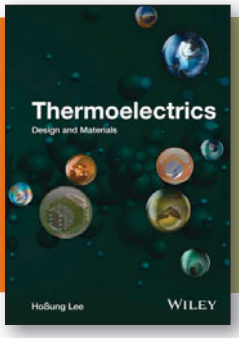
The first three chapters briefly introduce the history of OLEDs (chapter 1), the fundamentals (chapter 2), and light emission mechanisms (chapter 3) that are necessary to understand the underlying "basic physics of OLEDs." A systematic and in-depth presentation is made in the remaining eight chapters, giving specific details on materials, devices, fabrication, displays, lighting, and new technologies of flexible as well as quantum dot OLEDs. These make the book suitable for varied scientific communities (e.g., readers with a basic physics background, those working in interdisciplinary areas of research-technology, and those involved in technology development).

Chapters 4–7 are requisites of the field to understand and to undertake research work on applications of OLEDs. Accordingly, in-depth material aspects are clearly explained in chapter 4, whereas various types of OLED devices and their fabrication processes are explained in chapters 5 and 6, respectively. Chapter 7 includes information on performance-related parameters of OLEDs necessary to compare and grade them for commercial applications. This set of chapters prepares one to be well versed in OLED technology to an extent that can help a researcher in initiating research in this ever-growing area.

Chapters 8 and 9 describe the state of the art of OLED technology in the context of display and light applications. Aspects of OLED fabrication in the flexible configuration are included in chapter 10. This chapter especially indicates the promising future of flexible displays and light sources in the era to come. Present evolution and future aspects of OLED devices (e.g., electrodes, thin-film transistors, wet processability, and quantum dot utilization) are included in the final chapter.

The book clearly explains and demonstrates the evolutionary role of OLEDs with respect to their simple fabrication technology. It shows how an era of gas or fluorescent material lighting would come to an end by virtue of OLED technology development. The references included are up to date. The logical and systematic selection and progression of chapters is helpful. Each chapter is self-sufficient. Figures and tables are included at desirable points in the book and are highly informative. This book will be equally useful for research student scientists as well as technologists. The book does not contain any exercises, which may make it unsuitable as a course book, but good as a reference book.

***Reviewer: Pramod H. Borse**, International Advanced Research Centre for Powder Metallurgy and New Materials, India.*



Thermoelectrics: Design and Materials

HoSung Lee

Wiley, 2016
440 pages, $135.00 (e-book $108.99)
ISBN 978-1-118-84895-1

The text of this book is divided into two parts, with the first part comprising eight chapters that cover basic thermodynamic concepts and definitions, design of thermoelectric power-generation devices, and specific applications. The first chapter begins with a brief historical introduction to thermoelectrics, followed by an overview of thermoelectric phenomena. The next three chapters delve specifically into thermoelectric devices, with chapters on power generation, refrigeration, and optimization of design of thermoelectric devices, including heat dissipation. This is followed by an in-depth investigation of specific formalism of the thermodynamics with exact and numerical solutions to heat flow through a device. Thermal and electrical contact issues and modeling of thermoelectric devices are then covered. Finally, specific applications of thermoelectric power generation and refrigeration are provided. The content is nicely developed, considering the large amount of material presented. The author provides appropriate references for the material covered and for further exploration of the subject matter. References include up-to-date work as well as original work and the main reference books for the field.

The second part covers the last eight chapters, where the author develops the physics required to understand basic transport phenomena in materials, which is invaluable in understanding fundamental transport in thermoelectric materials. As is typically done in solid-state physics

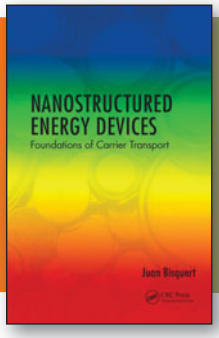
courses, the author begins with a chapter on crystal structure followed by chapters on electrons, band theory, and phonons. A chapter on quantum confinement is also included in this section, as well as a chapter on bulk and nanowire silicon, before ending with a chapter that begins with transport equations and finishes with the thermoelectric properties of specific materials that continue to be of interest as thermoelectric materials.

The text mostly takes a how-to approach throughout; the author introduces concepts that students can use in solving the examples. Many of the examples are essential for a proper understanding of the material. The exercises extend this approach and allow the student to more fully develop an understanding of the material. The figures and tables are useful.

The second part of the book does not provide much depth in any of its subjects because of its ambitious breadth. The basic features of solid-state physics are covered; however, there are a number of other excellent texts on solid-state and materials physics. It may have been best to shorten this part of the text while expanding the first part to include more derivations and examples.

This book is well written with up-to-date examples. It will be useful as a textbook for a course on thermoelectrics for advanced undergraduates and first-year graduate students in engineering. The text has been tested, as the author has taught the course several times and has compiled the material based on this experience. As someone who has been involved with research on new materials for thermoelectrics applications for more than two decades, as well as incorporated certain aspects of the field into undergraduate and graduate courses in materials physics, I found the text to be interesting. Thermoelectrics is a "field with comprehensive applications" involving "multiple interdisciplinary fields," as the author indicates.

***Reviewer: George S. Nolas**, Department of Physics, University of South Florida, USA.*



Nanostructured Energy Devices: Foundations of Carrier Transport

Juan Bisquert

CRC Press, 2017
180 pages, $179.95 (e-book $161.96)
ISBN 9781466587991

Nanostructure-based energy devices such as solar-cell devices provide a new alternative to traditional Si-based solar-cell devices. Understanding the transport processes, charge injection, and band bending in nanostructure-based energy devices is important in guiding their design and fabrication. This short book (volume II in a series) provides a concise yet adequate theoretical representation of carrier transport in nanostructured energy devices.

The book's seven chapters discuss different carrier transport models in energy devices: drift transport (chapter 1); diffusion transport (chapter 2); drift-diffusion transport (chapter 3); transport mechanisms in disordered media, such as hopping, single-level and two-level trapping, multiple trapping, and variable range hopping (chapter 4); configurations of thin-film transistors (chapter 5); space-charge-limited transport for insulator materials (chapter 6); and frequency-domain impedance spectroscopy characterization (chapter 7). Most discussions are independent of the nanomaterials in the nanostructured devices, but there are also discussions specific to organic materials, dye-sensitized solar-cell devices, and single-layer MoS_2 transistors.

This reference book should be of particular interest for researchers in related experimental fields who want to understand the theoretical framework needed for solar-cell devices. It is also a good reference for beginning researchers in device simulation and modeling. Anyone with knowledge of electrodynamics and quantum mechanics should be able to read the book without much effort. Step-by-step derivations are provided for readers. Plenty of figures, such as energy diagrams, schematics of devices, diagrams of density of states, and current–voltage (I–V) characterizations are provided throughout the book to help readers understand the theoretical narratives. At the end of each chapter, adequate and up-to-date references are listed. Overall, this book is very well written and definitely worth reading for students, researchers, and engineers in relevant fields. The unique aspect of this book is that it is short yet adequate, especially for experimentalists.

***Reviewer: Gen Long**, assistant professor of physics, St. John's University, USA.*