

# Preface

This book contains eight chapters on the progress made in recent years in the fabrication, processing, and performance of organic nanophotonic materials and devices. To the best of my knowledge, it is the first monograph in this field.

Nanophotonics deals with the generation, transfer, modulation, and detection of photons in a confined system, which provides an effective solution to the current obstacles that seriously limit the further improvement of modern electronics. Chemists and material scientists have contributed enormously to the achievement of novel optical properties with inorganic materials, such as ZnO, CdSe as well as noble metal nanostructures.

While their inorganic counterparts have flourished, organic materials and devices are gradually becoming a good alternative choice due to their numerous advantages. Organic compounds possess high photoluminescence quantum yields, tunable optical properties, and rapid photoresponses. The excellent flexibility and processability are also big pluses in the construction and assembling of functional photonic devices. Overall, there is no doubt that organic molecular materials would bring great innovation in the design and fabrication of functional elements toward photonic integrated circuits.

Nowadays, research on *Organic Nanophotonics* is growing rapidly. The editor and authors attempted to give a fairly comprehensive introduction to the fabrication, properties, and functionalities of organic nanophotonic materials and devices. The book is useful for scientists and engineers who want to get deeper insights into the novel applications of nanophotonics that will be of key importance in our lives and for wider society, both today and in the future.

Chapter 1 (Duan et al.) discusses photonic nanofabrications and microscopy imaging based on multiphoton processes. Chapters 2 (La Rocca et al.), 3 (Ma et al.), and 4 (Pei et al.) present nanoscale light sources for integrated nanophotonic circuits, including organic nano/microcavities, organic laser materials, and polymer light-emitting electrochemical cells (LECs). All these chapters are related to light emission, but it should be remarked that they present distinct nanoscale light sources and microscopic processes. Chapters 5 (Takazawa et al.), 6 (Inoue et al.), and 7 (Barillé et al.) are based on the interactions between light and matter,

including the propagation of light in organic nanostructures, photoswitches based on nonlinear optical polymer photonic crystals, and photoresponsive molecules, respectively. Chapter 8 (Zhao et al.) discusses the integration of miniaturized photonic devices and circuits with various organic nanophotonic elements.

The editor hopes that this book will be a valuable reference source for scientists, graduate students, engineers, industrial researchers, and other professionals working at the interfaces of chemistry, physics, materials, optics, information, etc. This book is a must-have reference for university libraries, research establishments, government libraries, and high-tech companies engaged in research and development of photonics and nanotechnology.

Finally, I would like to express my gratitude to all the authors for contributing comprehensive chapters. I also thank colleagues who offered invaluable advice to ensure the quality of this book, and the editorial staff of Springer, especially June Tang, for their guidance and suggestions throughout the preparation of this book. I expect that this book will attract students' attention and stimulate their interests and innovative ideas in this promising and fascinating field.

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Organic Nanophotonics

Fundamentals and Applications

Zhao, Y.S. (Ed.)

2015, X, 208 p. 116 illus., 47 illus. in color., Hardcover

ISBN: 978-3-662-45081-9