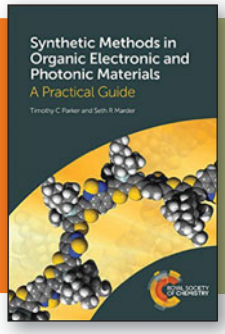


Synthetic Methods in Organic Electronic and Photonic Materials: A Practical Guide

Timothy C. Parker and Seth R. Marder

Royal Society of Chemistry, 2015
296 pages, $110.00
ISBN 978-1-84973-986-3

This book describes synthetic methods for organic chromophores used in optoelectronic applications. It emphasizes the design and synthesis of (electron donor)-(π-bridge)-(electron acceptor) systems, including improving processing and thermo-optical stability.

Chapter 1 includes a history of organic electronics and photonics, including light-emitting diodes, field-effect transistors, nonlinear optics, electro-optics, and photovoltaics. Chapter 2 discusses chromophore design. The authors correlate the optical gap, ionization energy, and electron affinity with descriptors, including Hammett-type parameters, aromaticity indices, and frontier orbital energies. They give strategies for improving processability, followed by a discussion of the relation of intermolecular interactions and charge-transport properties.

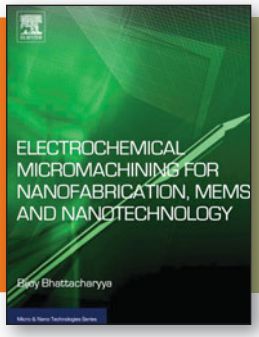
The remainder of the book discusses methods to synthesize the designed chromophores. All of the chapters explain underlying reaction mechanisms and give numerous examples. Chapter 3 includes methods for donor materials synthesis, specifically thiophenes and aryl amines. There is extensive discussion of the safe use of lithium reagents for preparation of various thiophenes. There is also discussion of Grignard reagents, alkylation reactions, thiophene rings, and heteroannulation synthesis.

Chapter 4 deals with the creation of π-conjugated bridges between aromatic intermediates. The reactions discussed include halogenation, Vilsmeier formylation, use of phosphorus reagents, and the Horner–Wadsworth–Emmons reaction. Chapter 5 describes organometallic coupling chemistry. The basic reactions of ligand exchange, oxidative addition, reductive elimination, migratory insertion, and β-hydride elimination are covered, followed by a discussion of the Stille, Kumada, Negishi, Sonogashira, and Heck coupling reactions.

Chapter 6 discusses synthesis of acceptors. There is a discussion of Knoevenagel condensation as well as the chemistry of polymethine dyes, including hemicyanines, merocyanines, and cyanines. Other types of acceptors presented are tetracyanoethylenes, heterocycles, thiadiazoles, pyrazines, diketopyrrolopyrroles, isoindigos, and imides. Chapter 7 focuses on main-chain π-conjugated polymers. There is a good discussion on how to prepare high number average molecular-weight polymers. Synthesis of poly(phenylene vinylene) polymers using the Wittig, Knoevenagel, and Heck methods are described. Formation of aryl-aryl polymers by Stille, Suzuki, and Kumada methods and direct arylation polymerization are also discussed.

This book is a very useful introduction to synthesis methods for optoelectronic materials that are also applicable to electronic materials. There are over 600 references, including all critical books and reviews, along with 19 tables and 137 schemes/figures that support the text well. There is an appendix describing related synthesis of functional materials and a good discussion of lab safety. A materials scientist or advanced student with a background in organic chemistry will be able to enter the organic optoelectronics research field after studying this book.

***Reviewer: Thomas M. Cooper** of the Air Force Research Laboratory, USA.*



Electrochemical MicroMachining for Nanofabrication, MEMS and Nanotechnology

Bijoy Bhattacharyya

Elsevier, 2015
296 pages, $170.00
ISBN 978-0-323-32737-4

This book falls into Elsevier's Micro & Nano Technologies Series. As a teacher who taught a course on microsensors and actuators for over 10 years, I always saw the need for having a book on electrochemical micromachining (EMM) techniques containing good illustrations. Classical books cover this topic in a few pages without emphasizing the principles. Electrochemical machining (ECM) is a topic that requires greater emphasis as a potential method by which devices can be fabricated. It provides continuous production schemes with ease. This book is an excellent addition to the nanotechnology literature.

In chapter 1, the author brings out the differences between conventional processing and nanofabrication. He also describes the different elements of microelectromechanical systems and microsystems. Micromachining processes are well illustrated and explained. The advantages and limitations of ECM and EMM are presented to orient the reader to top-down and bottom-up approaches in nanofabrication processes. Chapter 2 is directed toward electrochemical macro- to micromachining. It brings out the versatility of ECM techniques and introduces the reader to fundamentals

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