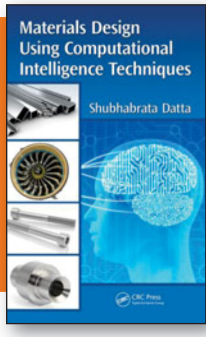


Materials Design Using Computational Intelligence Techniques

Shubhabrata Datta

CRC Press, 2016
184 pages, $139.95 (e-book $97.97)
ISBN 9781482238327

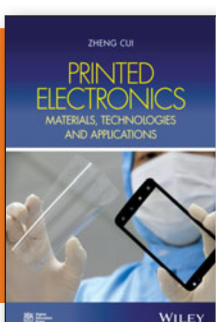
Given recent developments in artificial intelligence and materials design, computational tools are well positioned to realize an order of magnitude increase in available information throughput across multiple disciplines of materials science. This book is timely due to the increasing number of relevant updates in artificial intelligence and the desire for a data-information-knowledge-understanding-wisdom hierarchy using machine learning, neural networks, genetic evolutionary programming, fuzzy logic systems, and multi-objective optimization. This book helps to educate the inexperienced to well-informed scientist or engineer on computer intelligence for materials design.

Chapters 1–3 describe conventional approaches to materials design and data mining. Chapters 4–6 are full overviews of artificial shallow-to-deep neural networks, genetic programming, and fuzzy logic schemes. The relevance of these approaches is well grounded in desirable attributes to control and optimize material growth, composition, properties, and machining based on available data. At the conclusion of each chapter, applications, including figures and tables, are provided to assist the reader in understanding each method in the context of materials engineering and to form the foundation for later advanced chapters.

Building on the basis of computer intelligence, the final chapters extend the text to provide advice and insights on combining techniques in tandem. Each approach is well understood by this point in the book, and the author guides the reader to use and join each method effectively in order to realize optimization goals in materials processing and fabrication. Examples with up-to-date references to the literature include designing better shaped memory nitinol and polymer composites, where artificial neural networks or fuzzy models are implemented as objective functions within an evolutionary genetic or multi-optimization scheme.

At the conclusion, the author indicates that computer intelligence techniques are well positioned to be used for commercial and research purposes beyond the applications discussed throughout the text. Identified areas that stand to benefit from these computational tools include microstructure, microscopy, green design, and uncertainty analysis. This book is a vital resource that goes beyond standard textbook material for those working in materials design, metallurgy, processing, scientific computing, and related fields.

***Reviewer: Jeffery Aguiar** of the Idaho National Laboratory, USA.*



Printed Electronics: Materials, Technologies and Applications

Zheng Cui

Wiley and Higher Education Press, 2016
450 pages, $150.00 (e-book $120.99)
ISBN 978-1-118-92092-3

Printed electronics is based on conventional printing techniques as the means to manufacture electronic devices and systems. The aim of printed electronics is to make integrated electronic systems using printing technology instead of expensive and complex integrated circuit (IC) manufacturing technology. Printed electronics is still a growing field and in its early stage of development, but will certainly prosper in the future.

This book gives an excellent introduction to printed electronics, including materials, technologies, and applications. It is written by members of Zheng Cui's research team. They include not only the information and knowledge published by others, but also their research experience and results. This book reflects the authors' understanding of printed electronics and observations of the technological progress in the field.

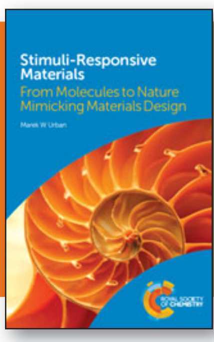
The book comprises nine chapters. Chapter 1 provides a historical introduction and an overview of printed electronics. Chapter 2 illustrates printed electronics based on organic materials, including conductive, semiconducting, and insulating polymers. Chapter 3 describes printed electronics based on inorganic materials with commonly used materials such as metallic ink, transparent oxides, carbon nanotubes, graphene, silicon, germanium, and metal chalcogenides. Chapter 4 is devoted to printing processes and equipment, where jet and replicate printing, including pre- and post-printing processes, are involved. Printing as an alternative manufacturing technology gives organic electronics and flexible electronics extra dimensions and new application possibilities. Chapters 5–7 provide the details of printed thin-film transistors, organic thin-film solar cells, and organic light emission and display, respectively, where the device structures and fabrication processes are discussed with various involved materials. Chapter 8 details encapsulation

https://doi.org/10.1557/mrs.2017.228 Published online by Cambridge University Press

technologies for organic electronic devices. Chapter 9 discusses applications and future prospects of printed electronics. Printing combined with organic and inorganic electronic materials and flexible substrates will create new applications, markets, and industries. References are listed at the end of each chapter, and an index is provided at the end of the book.

The authors have compiled a comprehensive set of information and knowledge in this book. Readers will gain a general understanding of printed electronics, from the materials and technologies involved to potential applications. The figures and tables are adequate, and there are worked examples in this book. Those who have a general knowledge of physics, chemistry, or electronics will be able to comprehend the contents of this book. It is a good monograph for researchers and can also be used as a textbook for graduate students. I recommend this book to anyone who is interested in printed electronics, as well as microelectronics, transparent electronics, and flexible electronics.

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



Stimuli-Responsive Materials: From Molecules to Nature Mimicking Materials Design
Marek W. Urban
Royal Society of Chemistry, 2016
488 pages, $112.00
ISBN 978-1-84973-656-5

This book focuses on designing stimuli-responsive materials by mimicking nature—an excellent source of inspiration for conceiving new products with tailored properties and desired functions. The book is structured into 12 chapters and covers a wide range of topics, from controlled synthesis of polymers to various aspects of stimuli responsiveness in macromolecular blocks, polymer brushes, surfaces, and interfaces, to nano- and micro-materials, and photochromic and photorefractive polymers.

The common essence of these stimuli-responsive materials resides in their heterogeneity at the nanoscale—the origin of energy excess able to be converted into other energy forms as a result of various external stimuli: temperature, solvent polarity, pH, ultraviolet/visible light, electrical potential, magnetic field, or combinations of these.

Starting from biologically responsive polymers, special attention is paid to stimuli-responsive materials applied in medical therapy, nanomedicine, enhancing imaging and target delivery, and self-healing and shape-memory materials, with a perspective for these materials to shape the future of human existence.

Most of the illustrations are appropriate and enable a deeper understanding of the scientific arguments.

Chapters are on topics such as tissue engineering, microfluidics, biosensors, molecular electronics, and photochromic devices. Each chapter starts with short definitions of terms or phenomena and provides clear explanations based on physicochemical proofs, combining structural characteristics given by molecular interactions with adequate thermodynamic and kinetics approaches. Each chapter ends with a reference list. The book is accessible to senior undergraduate and graduate students in materials chemistry and physics. At the same time, this monograph is also useful for specialists in materials science and engineering, providing stimulating ideas for further advances in materials design mostly needed in nanofabrication.

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

https://doi.org/10.1557/mrs.2017.228 Published online by Cambridge University Press