Dendrimers, Dendrons, and Dendritic Polymers

Dendrimer science has exploded onto the polymer science scene as the fourth major class of polymer architecture after the three traditional categories of: (I) linear, (II) crosslinked, and (III) branched types. Capturing the history of dendrimer discovery to the present day with a special focus on developments in the past decade, this book addresses all the essential information for a newcomer, as well as those experienced in the field. Special issues covered include:

- Fundamental theory, chemistry, and physics of the "dendritic state"
- Synthetic strategies for dendrons and dendrimers including click chemistry, self-assembly, etc.
- Dendron/dendrimer characterization techniques
- Architecturally driven "dendritic effects"
- Developments in scientific and commercial applications
- Convergence with nanotechnology – including dendrimer-based nanodevices, nanomaterials, nanotoxicology, and nanomedicine
- Dendrimers as a window to a systematic framework for unifying and defining nanoscience
- The emergence of dendrimer-based, Mendeleev-like nano-periodic property patterns
- The future of the "dendritic state"

This is the ideal book for researchers in both academia and industry who wish to gain a complete introduction to the "dendritic state" with a special focus on dendrimer and dendron polymer science.

Donald A. Tomalia is Director of the National Dendrimer & Nanotechnology Center and Founder/CEO of NanoSynthons, LLC. He is internationally recognized as a pioneer in dendrimers, dendritic polymers, dendrimer-based nanomedicine, and a new nano-periodic system for defining and unifying nanoscience. Active in both academia and industry, Tomalia is an Associate Editor of *Nanomedicine* (Elsevier), and the founder of several dendrimer-related companies including, most recently, NanoSynthons, LLC (2010) and Dendritic Nanotechnologies, Inc. (2001), a subsidiary of Starpharma, Melbourne, Australia.

Jørn B. Christensen is an Associate Professor in the Department of Chemistry at the University of Copenhagen. He has a background in organic chemistry and has worked in many different areas ranging from organic superconductors to non-antibiotics.

Ulrik Boas is an Associate Professor in the National Veterinary Institute at the Technical University of Denmark. He received his Ph.D. in Organic and Macromolecular Chemistry in 2002, prior to which he gained several years of experience working in the biotechnology industry.

"A brilliant and exciting book co-authored by the pioneer of the dendrimer field. With a focus on dendrons/dendrimers, it provides a unique perspective on the history, current status and anticipated future developments of these precise nanostructures. This book is packed with critical information for academic, governmental and private sector scientists with in-depth commentary on the theory, synthesis, characterization and applications of dendrimers. A 'must have' reference source for all students and scientists interested in this rapidly growing area of 'soft particle nanoscience.'"

Anil K. Patri, Frederick National Laboratory for Cancer Research, USA

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Discovery, Applications, and the Future

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Contents

Foreword

While scanning through this book, you can sense the leadership of the inventor of the word that defines this field: the visionary pioneer who bridged the discovery of dendrimers, their first technological applications, the early merger of the fields of medicine and nanoscience into nanomedicine, and the grand vision of a uniform classification of the chemical sciences on all levels and length scales, in a 'systematic nano-periodic framewok for unifying and defining nanoscience.'

In spite of numerous excellent books in this exciting field, bordering the interface between the most creative science of complex chemical synthesis by covalent and supramolecular bonds, and science fiction, a book like the current one could not have been written by anybody but Donald A. Tomalia, strongly aided and supported by two more recent practitioners in this field, Jørn B. Christensen and Ulrik Boas. Reading through this book, you can feel the dedication and imagination of D. A. Tomalia in the same way that you feel it in his lectures, trying to reach the minds and dreams of the young generation of scientists from the beginning of this new century.

This is not a book for those solely interested in having yet another updated and comprehensive list of publications from this field on their desk. This is a book which has been constructed based on almost a lifetime of dedication to the development of this field. This book provides an in-depth analysis of the state-of-the-art of the most advanced conceptual developments in the field, for those creative contributors or newcomers who want to master the field directly from one of its most creative inventors and visionaries, and who are interested in listening to the authors' views on its future, and its possible evolution into other new multidisciplinary fields.

In order to provide this transfer of unwavering intellectual belief in the scientific importance and utility of dendrimers, the authors have selected a range of topics, from the discovery and development of the dendritic architecture and dendritic state as a new macromolecular concepts, followed by the discussion of synthetic and characterization challenges, biopharmaceutical applications, toxicology issues, the dendritic effect, the concept of dendrimers as quantized building blocks leading to a new nano-periodic system, and concluding with discussion of the past, present and future of dendrimers and dendrons. This very enjoyable book is as a must for the desk of every chemist – including inorganic, organic, supramolecular, polymer and physical chemists – as well as nanoscientists, soft condensed matter scientists, and medical practitioners, regardless if they are in academia or industry.

Virgil Percec
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