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# Macromolecular Architectures

Volume Editor: J.G. Hilborn

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## Preface

Thanks to recent advances in the chemistry of preparing polymers, an increasing number of tools are at our disposal for the design of polymer materials. The design level ranges from monomer synthesis, controlled stepwise or chainwise polymerization, block copolymer synthesis, over branching to crosslinking reactions. Depending on the structure of the individual polymer chains formed these will be organized in the bulk to give specific properties. Hence, this gives us two architectural levels: *The structure of individual macromolecules and the microstructure of the material produced*. While both of these organization levels may contribute to the design of materials properties we would ultimately like to be able to tailor our material to suit desired applications in which surface properties, mechanical or thermal behavior, processability, optical or electrical characteristics etc. are crucial. The next decades should see an enormous advance in nanoscopic and supramolecular chemistry leading to novel predetermined properties. Molecular manipulation of nano and microstructures paves the way to organic polymer materials by design. Such architectures comprise both the synthesis and the kinetic and thermodynamics of macromolecular organization and is the theme of this volume.

The book consists of four articles reviewing the literature based on the authors own experiences over the last decade in this field. It does not claim to be exhaustive nor to provide complete coverage of the very extensive literature in this field. Instead, it focuses on the currently intense areas of research namely living polymerization, block copolymer synthesis, synthesis of dendrimers and finally macroporous thermosets. Hopefully, this volume will not only serve as a book on the design of macromolecular architectures but also as a source of inspiration to produce polymers combining several functional properties.

In the first chapter by P. Dubois and D. Mecerreyes, living polymerization to produce precisely defined linear polyesters is outlined and also compared to other living polymerization techniques. In chapter two, C. Hawker describes the synthesis of polymeric dendrimers which are organic globular-like nanoscopic entities of exact molecular mass and functionality synthesized either by the convergent or divergent approach. How block copolymers are produced to define micromorphology in high performance polymers and thereby tailoring their thermal, chemical, mechanical and dielectrical properties is the content of chapter three by J. Hedrick. The book concludes with a fourth chapter by J. Kiefer on the importance of kinetic and thermodynamics for microstructural organization in thermosets.

The editor would also like to acknowledge the valuable input from Professor Stanislaw Penczek, Professor Bernard Sillion, Professor Anders Hult, and Professor Vipin Kumar who served as referees for the above contributions.

Lausanne,  
November 1998

Jöns G. Hilborn



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