

**Functional Condensation Polymers.** By C. E. Carraher Jr., G. G. Swift. Kluwer: New York, 2002; hardback, \$145, ISBN 0-306-47245-7, pp 342.

Based on their structure and composition, polymers can be divided into condensation polymers and addition polymers. Traditionally, condensation polymers are classified as those that are obtained by reacting two different functional groups, which usually originate from different monomers. Often, the condensation reaction is accompanied by the elimination of a small molecule. Addition polymers are defined as polymers that are obtained from monomers without the loss of a small molecule. The repeating unit of an addition polymer has the same composition as the monomer.

On a bulk basis, addition polymers surpass condensation polymers two to three times. Also, much of the industrial and academic research has focussed on addition polymers, in particular since the development of various 'living' and 'controlled' polymerisation techniques, which have enabled the preparation of polymers with predictable molecular weights and controlled architecture. Most natural polymers, in contrast, can be classified as condensation polymers. The objective of the book is to illustrate the broadness and versatility of condensation polymers as functional materials. The book concentrates on four areas, viz. nanomaterials, light and energy, bioactivity and biomaterials and enhanced physical properties. Many of the contributions are based on papers presented at a symposium organized by the editors at the 221<sup>st</sup> ACS National Meeting, which was held from April 1-5, 2001 in San Diego, California (USA).

The first part focuses on nanomaterials and contains four contributions that discuss the synthesis and properties of organic-inorganic composites. The other two chapters describe the preparation and characterisation of novel cross-linkable polyesters for applications in non-linear optics and discuss the immune response to polyamidoamine (PAMAM) dendrimers. In this last contribution, it is shown how conjugation of helper T-cell epitopes to PAMAM dendrimers can be used to generate anti-dendrimer antibodies, which are not only highly interesting for therapeutic purposes but also for manipulation and processing of dendritic macromolecules.

The contributions in the second cluster, light and energy, concentrate on the use of condensation polymers as membrane materials for fuel cell applications and describe the design and synthesis of materials for the development of

polymeric light-emitting diodes. Two of the chapters report on condensation polymers that exhibit blue electroluminescence.

Part 3 of the book comprises five chapters that discuss the bioactivity of condensation polymers and explore possible (bio)medical applications. This part starts with a brief review of the different types of natural condensation polymers. In a subsequent chapter, hydrogels are described that are obtained by photocrosslinking of mixtures of itaconic anhydride modified poly(caprolactone) or poly(ethylene glycol). The properties of the gels could be manipulated by variations in the molecular weight of the macromonomers and by changing the relative amounts of the hydrophilic and hydrophobic components. The remaining three chapters report on organometallic condensation polymers and their potential as anti-cancer drugs or as controlled release agents for agricultural applications.

In Part 4, three different strategies to modify and enhance physical properties are presented. In two chapters, it is demonstrated how the incorporation of polycyclic aromatic hydrocarbon moieties can be used to improve thermal stability and/or enhance glass transition temperatures and melting points. Another chapter describes the synthesis of amorphous polyesters that contain ionic end-groups. These end-groups can induce ionic association, which influences both bulk rheological properties as well as solution viscosities. The final chapter of the book illustrates how optimisation of processing conditions can be used to obtain poly(p-phenylene-pyromellitimide) films of reduced brittleness. The chapter reports a new processing method that involves biaxial gel-drawing of a poly(isoimide) precursor.

Unfortunately, the technical quality of the contributions presented in the book varies considerably, with a number of chapters certainly being unacceptable for publication in peer-reviewed scientific journals. Nevertheless, the editors have succeeded in compiling a number of interesting contributions that illustrate the potential and versatility of condensation polymers in four areas that are currently active fields of research.

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