

## Polymeric Multicomponent Materials An Introduction By L H Sperling 1997 09 24

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Multicomponent polymeric materials consist of polymer blends, composites, or combinations of both. The term polymer blends includes mechanical blends, block, graft, star, starblock, AB-crosslinked polymers, and interpenetrating polymer networks. A polymer composite contains a polymer and a nonpolymer.

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The only comprehensive review of multicomponent polymer theory and applications Polymeric Multicomponent Materials is the first comprehensive review of the field to appear since the author's 1976 classic, Polymer Blends and Composites. As such, it is an indispensable resource for professionals and graduate students alike in polymer science and engineering, chemistry, chemical engineering, materials science and engineering, physics, and mechanical engineering. The book begins with a review of essential terms, concepts, theories, and experimental facts and procedures concerning polymer-polymer and polymer-nonpolymer combinations. This material is followed by a series of chapters focusing on the relatively new subfield that has developed around polymer surfaces and interfaces. In the final section, the author covers a wide range of engineering polymer materials and systems. Emphasizing synthesis and mechanical behavior throughout, Professor Sperling treats all relevant chemical and physical aspects of both thermoplastics and thermosets. He provides in-depth coverage of most polymeric multicomponent materials currently being synthesized, including toughened plastics, reinforced elastomers, polymer blends, interpenetrating polymer networks, graft and block copolymers, and reinforcing and filling agents. He also explores a broad array of specific applications, including those for impact-resistant plastics, structural composites, coatings, carbon black reinforced elastomers, and fiber reinforced plastics. Polymeric Multicomponent Materials is certain to be the standard text/reference in the field well into the next century.

Through a balanced combination of theory and experiments, this book provides a detailed overview of the main and most up-to-date advances in the area of polymeric materials. Because the subject is essentially interdisciplinary and brings together scientists and engineers with different educational backgrounds, the book offers a research-oriented exposition of the fundamentals as well. The book is based on the editors' and authors' extensive experience in research, development, and education in the field of materials science, and especially polymer testing, polymer diagnostics, and failure analysis. A comprehensive coverage of the methods of polymer testing is provided along with the results of the authors' work on deformation and fracture behavior of polymers. This book will be useful to faculty as well as advanced-level students in materials science, materials technology, plastic technology, mechanical engineering, process engineering, and chemical engineering.

The book offers an in-depth review of the materials design and manufacturing processes employed in the development of multi-component or multiphase polymer material systems. This field has seen rapid growth in both academic and industrial research, as multiphase materials are increasingly replacing traditional single-component materials in commercial applications. Many obstacles can be overcome by processing and using multiphase materials in automobile, construction, aerospace, food processing, and other chemical industry applications. The comprehensive description of the processing, characterization, and application of multiphase materials presented in this book offers a world of new ideas and potential technological advantages for academics, researchers, students, and industrial manufacturers from diverse fields including rubber engineering, polymer chemistry, materials processing and chemical science. From the commercial point of view it will be of great value to those involved in processing, optimizing and manufacturing new materials for novel end-use applications. The book takes a detailed approach to the description of process parameters, process optimization, mold design, and other core manufacturing information. Details of injection, extrusion, and compression molding processes have been provided based on the most recent advances in the field. Over two comprehensive sections the book covers the entire field of multiphase polymer materials, from a detailed description of material design and processing to the cutting-edge applications of such multiphase materials. It provides both precise guidelines and general concepts for the present and future leaders in academic and industrial sectors.

In August, 1996, the ACS Division of Polymeric Materials: Science and Engineering hosted a symposium on Interfacial Aspects of Multicomponent Polymer Materials at the Orlando, Florida, American Chemical Society meeting. Over 50 papers and posters were presented. The symposium proper was preceded by a one-day workshop, where the basics of this relatively new field were developed. This edited book is a direct outcome of the symposium and workshop. Every object in the universe has surfaces and interfaces. A surface is defined as that part of a material in contact with either a gas or a vacuum. An interface is defined as that part of a material in contact with a condensed phase, be it liquid or solid. Surfaces of any substance are different from their interior. The appearance of surface or interfacial tension is one simple manifestation. Polymer blends and composites usually contain very finely divided phases, which are literally full of interfaces. Because interfaces are frequently weak mechanically, they pose special problems in the manufacture of strong, tough plastics, adhesives, elastomers, coatings, and fibers. This book provides a series of papers addressing this issue. Some papers delineate the nature of the interface both chemically and physically. The use of newer instrumental methods and new theories are described. Concepts of interdiffusion and entanglement are developed. Other papers describe state-of-the-art approaches to improving the interface, via graft and block copolymers, direct covalent bonding, hydrogen bonding, and more.

An Updated Edition of the Classic Text Polymers constitute the basis for the plastics, rubber, adhesives, fiber, and coating industries. The Fourth Edition of Introduction to Physical Polymer Science acknowledges the industrial success of polymers and the advancements made in the field while continuing to deliver the comprehensive introduction to polymer science that made its predecessors classic texts. The Fourth Edition continues its coverage of amorphous and crystalline materials, glass transitions, rubber elasticity, and mechanical behavior, and offers updated discussions of polymer blends, composites, and interfaces, as well as such basics as molecular weight determination. Thus, interrelationships among molecular structure, morphology, and mechanical behavior of polymers continue to provide much of the value of the book. Newly introduced topics include: \* Nanocomposites, including carbon nanotubes and exfoliated montmorillonite clays \* The structure, motions, and functions of DNA and proteins, as well as the interfaces of polymeric biomaterials with living organisms \* The glass transition behavior of nano-thin plastic films In addition, new sections have been included on fire retardancy, friction and wear, optical tweezers, and more. Introduction to Physical Polymer Science, Fourth Edition provides both an essential introduction to the field as well as an entry point to the latest research and developments in polymer science and engineering, making it an indispensable text for chemistry, chemical engineering, materials science and engineering, and polymer science and engineering students and professionals.

Publisher Description

This book offers in-depth insights into the photochemical behavior of multicomponent polymeric-based materials, with a particular emphasis on the photodegradation and photostabilization of these materials. Studying various classes of materials bases such as polysaccharides, wood, synthetic polymers, rubber blends, and nanocomposites, it offers a valuable reference source for graduate and postgraduate students, engineering students, research scholars and polymer engineers working in industry.

In recent years, multicomponent polymers have generated much interest due to their excellent properties, unique morphology and high-end applications. Book focusses on thermal, thermo-mechanical and dielectric analysis of polymers and multicomponent polymeric systems like blends, interpenetrating polymeric networks (IPNs), gels, polymer composites, nanocomposites. Through these analyses, it provides an insight into the stability of polymer systems as a function of time, processing and usage. Aimed at polymer chemists, physicists and engineers, it also covers ASTM /ISO and other standards of various measurement techniques for systematic analysis in materials science.

Well-structured and adopting a pedagogical approach, this self-contained monograph covers the fundamentals of scanning probe microscopy, showing how to use the techniques for investigating physical and chemical properties on the nanoscale and how they can be used for a wide range of soft materials. It concludes with a section on the latest techniques in nanomanipulation and patterning. This first book to focus on the applications is a must-have for both newcomers and established researchers using scanning probe microscopy in soft matter research. From the contents: \* Atomic Force Microscopy and Other Advanced Imaging Modes \* Probing of Mechanical, Thermal Chemical and Electrical Properties \* Amorphous, Poorly Ordered and Organized Polymeric Materials \* Langmuir-Blodgett and Layer-by-Layer Structures \* Multi-Component Polymer Systems and Fibers \* Colloids and Microcapsules \* Biomaterials and Biological Structures \* Nanolithography with Intrusive AFM Tip-and Dip-Pen Nanolithography \* Microcantilever-Based Sensors

Carraher's Polymer Chemistry, Tenth Edition integrates the core areas of polymer science. Along with updating of each chapter, newly added content reflects the growing applications in Biochemistry, Biomaterials, and Sustainable Industries. Providing a user-friendly approach to the world of polymeric materials, the book allows students to integrate their chemical knowledge and establish a connection between fundamental and applied chemical information. It contains all of the elements of an introductory text with synthesis, property, application, and characterization. Special sections in each chapter contain definitions, learning objectives, questions, case studies and additional reading.

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