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# Polymer Chemistry

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Properties and Application

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Vorwort

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# Preface

This book provides a comprehensive introduction to the field of polymer science, covering all relevant topics in a single volume. It systematically develops the various branches of polymer science, starting from basic chemical structures, working through the scientific principles that describe polymer behavior and culminating with a description of their conversion to usable products. The final section of the book is devoted to case studies that discuss the most important classes of synthetic polymers. It is with regret that the authors decided to omit a discussion of elastomeric materials. It was felt that a single volume could not do justice to both plastics in the general sense and the wide ranging field of elastomers and rubbers.

The opening chapter of this book introduces the basic chemical features of synthetic polymers that set them apart from the majority of compounds encountered in classic organic and inorganic chemistry. The importance of the distribution of chemical structure is discussed in detail, with particular relevance to how this influences properties and end uses. Subsequent chapters enlarge upon this theme describing the relationships between molecular structure and molten and solid state properties. The principal polymerization processes are surveyed with respect to the range of molecular structures available therefrom. A chapter is devoted to the rheological behavior of polymer melts, particular as it pertains to non-Newtonian flow and how this affects processing. This theme continues with a discussion of the solidification of polymers from the molten state and the formation of the anisotropic structures that characterize most polymer articles. The physical attributes of polymers in their solid state are then described in terms of mechanical, thermal, optical, and electrical characteristics. Analytical methods for characterizing polymers are briefly outlined as appropriate. Chemical degradation and the importance of stabilization are briefly explored. Commercial processes for converting raw polymers to useful products are described and their application to various classes of polymer is discussed. The principle recycling processes as applied to polymers are outlined. The final section of this book is dedicated to a series of case studies that describe the most important classes of polymer. Each case study outlines the chemistry, properties and applications of a particular polymer type in its own right and compared to competing materials, both polymeric and non-polymeric. The book is illustrated throughout with figures and tables that serve to further explain the principles under discussion.

This work is intended to introduce the field of polymer science to undergraduates in the areas of physical sciences and engineering. It is also aimed at professionals who find themselves working with polymers for the first time and need to rapidly familiarize themselves with guiding principles. In keeping with its role as a comprehensive text, this book assumes no prior knowledge of the field of polymers. A bibliography is provided at the end of the book for those wishing to delve further into a particular topic.

*Andrew Peacock and Allison Calhoun*