

Polymer Synthesis: Theory and Practice. By D. Braun, H. Cherdrón, H. Ritter. Springer: Heidelberg, 2001, hardcover US \$ 59.95, ISBN 3-540-41697-8, 333 pp.

This book is an English translation of 'Praktikum der Makromolekularen Stoffe' published in 1999, which was based on three previous editions of 'Praktikum der Makromolekularen Organischen Chemie' (1966/1971/1979). The book consists of five chapters, each having a current list of references providing further reading. All basics, essential and important aspects of polymer chemistry are included in this book. The theoretical treatment in chapters 3, 4 and 5 are supplemented by 110 selected and detailed experiment.

Chapter 1 introduces the basic definitions, propositions, nomenclature and structure of macromolecular substances, their properties in solution, molten and solid state (both amorphous and crystalline). The properties of macromolecules in the elastomeric state and the peculiarities of liquid crystal polymers are discussed. General literature on macromolecules (textbooks, monographs and handbooks, laboratory manuals, nomenclature, journals and periodicals) are presented as a valuable source of information for further studying. In this chapter you can also find lists of abbreviations, relevant SI units and conversions.

Chapter 2 gives an introduction to the successive chapters – describes the fundamentals and the most common methods (chain polymerization, polycondensation and polyaddition) and techniques for synthesis, characterization, processing and modification of polymers. The processes for manufacturing macromolecular materials are divided into three categories: polyreactions in bulk, solution and dispersion. Some special particularities in the preparation of polymers are considered as well as general techniques for preparation of macromolecular substances in the laboratory (safety in the laboratory, reaction vessels, purification of monomers and polymers, control and termination of polymerization reactions and others). We can also find the description of basic principles of characterization of macromolecules, e. g. solvents and solubility, determination of molecular weight of polymers, fractionation of polymers, determination of glass transition temperature, melting range, melt index, crystallinity and density of polymers, degradation of polymers, mechanical measurements of polymers, etc. Some emphasis is devoted to processing of polymers on the laboratory scale.

Chapter 3 is a comprehensive overview of the synthesis of macromolecular substances by addition polymerization.

There are reviews on radical homopolymerization with initiators (peroxo or azo compounds and redox systems) and polymerization using photolabile compounds. The minor part of the chapter is devoted to very recently developed new method for polymerization of cyclodextrin host-guest complexes in water. This section of the book covers theoretical background of ionic homopolymerization via C=C and C=O bonds, ring opening polymerization, metal catalyzed polymerization (polymerization with Ziegler-Natta catalysts, metathesis polymerization, polymerization with metallocene catalysts) and copolymerization (random, alternating, block and graft). The detailed experiments are followed after each theoretical part.

Chapter 4 encompasses the theoretical and experimental parts of the synthesis of macromolecular substances by condensation polymerization (polyesters, polyamides, phenol-formaldehyde resins, urea- and melamine-formaldehyde condensation products, poly(alkylene sulfide)s, poly(arylene ether)s, polymers with heterocyclic rings in the main chain, polysiloxanes) and stepwise addition polymerization (polyurethanes, epoxy resins).

Chapter 5 is devoted to chemical and physical modifications. The chapter covers chemical conversion, crosslinking and degradation of macromolecular substances. Authors in the latter chapter have discussed the modification of polymers by additives with the aim to be converted into a processable form and to improve their mechanical properties (this is especially valid for solid polymers) and have sketched out the peculiarities of polymer blends and blending strategies as well as stretching and foaming of polymers.

It is safe to say that theory and practical application are well balanced in this book, which is a very useful source and reference for anyone amateurish or professionally interested in polymer chemistry.

In conclusion, the book 'Polymer Synthesis: Theory and Practice' is a necessary day-to-day manual, demonstrating the well pronounced interdependence between theory and practice, fundamental propositions and subtle nuances; it is one of those inimitable everyday research instruments in polymer chemistry for both academia and industry workers.

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