

Macromolecular Physics

Bernhard Wunderlich

Volume I

Crystal Structure,
Morphology,
Defects



Macromolecular Physics Volume I Crystal Structure

Morphology Defects

A.L. Kovarskii



Macromolecular Physics Volume I Crystal Structure Morphology Defects:

Macromolecular Physics V1 Bernhard Wunderlich, 1973-01-01 Macromolecular Physics Volume 1 Crystal Structure Morphology Defects provides a unified treatment of crystals of linear macromolecules This book is organized into four chapters structure of macromolecules microscopic structure of crystals crystal morphology and defect crystal This publication specifically discusses the macromolecular hypothesis molecular conformation and synthesis of macromolecules The discovery and proof of the lattice theory structures of minimum free energy and crystal structures of macromolecules are also deliberated This publication likewise covers the macromolecular crystals macroscopic recognition of defects and deformation of polymer crystals This volume is a good reference for physicists scientists and specialists concerned with research on crystals of linear macromolecules Macromolecular Physics, Volume 1: Crystal Structure, Morphology, Defects B. Wunderlich, 1973

Macromolecular physics. vol. 1 Bernhard Wunderlich, 1973 **Thermal Analysis of Polymeric Materials** Bernhard Wunderlich, 2005-04-04 Table of Contents Table of Contents 1 Atoms small and large molecules 2 Basics of thermal analysis 3 Dynamics of chemical and phase changes 4 Thermal analysis tools 5 Structure and properties of materials 6 Single component materials 7 Multiple component materials App A 1 Table of thermal properties of linear macromolecules and related small molecules the ATHAS data bank App A 2 Radiation scattering App A 3 Derivation of the Rayleigh ratio App A 4 Neural network predictions App A 5 Legendre transformations Maxwell relations linking of entropy and probability and derivation of dS dT App A 6 Boltzmann distribution harmonic vibration complex numbers and normal modes App A 7 Summary of the basic kinetics of chemical reactions App A 8 The ITS 1990 and the Krypton 86 length standard App A 9 Development of classical DTA to DSC App A 10 Examples of DTA and DSC under extreme conditions App A 11 Description of an online correction of the heat flow rate App A 12 Derivation of the heat flow equations App A 13 Description of sawtooth modulation response App A 14 An introduction to group theory definitions of configurations and conformations and a summary of rational and irrational numbers App A 15 Summary of birefringence and polarizing microscopy App A 16 Summary of X ray diffraction and interference effects App A 17 Optical analog of electron double diffraction to produce Moire patterns **Crystallography and Crystal Defects** Anthony Kelly, Kevin M.

Knowles, 2020-06-02 The classic book that presents a unified approach to crystallography and the defects found within crystals revised and updated This new edition of Crystallography and Crystal Defects explains the modern concepts of crystallography in a clear succinct manner and shows how to apply these concepts in the analyses of point line and planar defects in crystalline materials Fully revised and updated this book now includes Original source references to key crystallographic terms familiar to materials scientists Expanded discussion on the elasticity of cubic materials New content on texture that contains more detail on Euler angles orientation distribution functions and an expanded discussion on examples of textures in engineering materials Additional content on dislocations in materials of symmetry lower than cubic

An expanded discussion of twinning which includes the description and classification of growth twins The inclusion and explanation of results from atomistic modelling of twin boundaries Problem sets with new questions detailed worked solutions supplementary lecture material and online computer programs for crystallographic calculations Written by authors with extensive lecturing experience at undergraduate level Crystallography and Crystal Defects Third Edition continues to take its place as the core text on the topic and provides the essential resource for students and researchers in metallurgy materials science physics chemistry electrical civil and mechanical engineering Macromolecular Physics V2 Bernhard Wunderlich, 2012-12-02 Macromolecular Physics Volume 2 Crystal Nucleation Growth Annealing continues the discussion of crystals of linear macromolecules The text also gives conclusion about the description and formation of crystals The book covers topics such as the primary secondary and tertiary nucleation of crystals the general growth of crystals solution and melt crystallization of macromolecules and the general annealing of crystals For those who wish to do further reading the table of contents of Volume 1 is included in the book The text is recommended for macromolecular physicists especially those whose focus is on the study of crystals and its different properties Polymer Morphology Qipeng Guo, 2016-03-21 With a focus on structure property relationships this book describes how polymer morphology affects properties and how scientists can modify them The book covers structure development theory simulation and processing and discusses a broad range of techniques and methods Provides an up to date comprehensive introduction to the principles and practices of polymer morphology Illustrates major structure types such as semicrystalline morphology surface induced polymer crystallization phase separation self assembly deformation and surface topography Covers a variety of polymers such as homopolymers block copolymers polymer thin films polymer blends and polymer nanocomposites Discusses a broad range of advanced and novel techniques and methods like x ray diffraction thermal analysis and electron microscopy and their applications in the morphology of polymer materials *Inorganic Polymers* James E. Mark, Harry R. Allcock, Robert West, 2005-04-21 Polymer chemistry and technology form one of the major areas of molecular and materials science This field impinges on nearly every aspect of modern life from electronics technology to medicine to the wide range of fibers films elastomers and structural materials on which everyone depends Although most of these polymers are organic materials attention is being focused increasingly toward polymers that contain inorganic elements as well as organic components The goal of *Inorganic Polymers* is to provide a broad overview of inorganic polymers in a way that will be useful to both the uninitiated and those already working in this field There are numerous reasons for being interested in inorganic polymers One is the simple need to know how structure affects the properties of a polymer particularly outside the well plowed area of organic materials Another is the bridge that inorganic polymers provide between polymer science and ceramics More and more chemistry is being used in the preparation of ceramics of carefully controlled structure and inorganic polymers are increasingly important precursor materials in such approaches This new edition begins with a brief introductory chapter That is followed with a discussion of

the characteristics and characterization of polymers with examples taken from the field Other chapters in the book detail the synthesis reaction chemistry molecular structure and uses of polyphosphazenes polysiloxanes and polysilanes The coverage in the second edition has been updated and expanded significantly to cover advances and interesting trends since the first edition appeared Three new chapters have been added focusing on ferrocene based polymers other phosphorous containing polymers and boron containing polymers inorganic organic hybrid composites and preceramic inorganic polymers

Supramolecular Materials and Technologies David N. Reinhoudt, 2008-04-30 Perspectives in Supramolecular Chemistry relates recent developments and new exciting approaches in supramolecular chemistry The series covers all areas from theoretical and modelling aspects through organic and inorganic chemistry and biochemistry to materials solid state and polymer sciences reflecting the many and varied applications of supramolecular structures in modern chemistry From the early days of supramolecular chemistry the field has been associated with possible applications This is not surprising as the design of new molecules and later of assemblies of molecules is often function driven Now after three decades of supramolecular chemistry David Reinhoudt has brought together a collection of reviews to reflect on the applications that have actually been achieved The first applications in molecular recognition are now established technologies in analytical chemistry separation science and medicine More recently developments have taken place in material design and these concepts are also discussed here Contents Self Assembling Systems on Scales from Nanometers to Millimeters Design and Discovery Dendritic Architectures Supramolecular Structures with Macromolecules Chemosensors Synthetic Receptors in Analytical Sensing Applications Selective Ion Recognition with Durable Sensors Ion Separations in Membrane and Solid Phase Extraction Systems Porphyrin and Expanded Porphyrin Based Diagnostic and Therapeutic Agents Supramolecular Materials and Technologies illustrates the achievements and advances that supramolecular chemistry has made in many fields from organic chemistry to materials science and from analytical chemistry to molecular biology

Fracture micromechanics of polymer materials V.S. Kuksenko, Vitauts P. Tamusz, 2013-04-17 Within the last two decades fracture theory has been one of the most rapidly advancing fields of continuous media mechanics Noteworthy success has been achieved in linear fracture mechanics where the propagation of the macrocrack in elastic materials is under study However fracture of materials is by no means a simple process since it involves fracture of structural elements ranging from atomic sizes to macrocracks To obtain all information about how and why materials fail all stages of the process must be studied For a long time both mechanical engineers and physicists have been concerned with the problem of the fracture of solids Unfortunately most of their work has been independent of the others To solve the problem not only requires the minds and work of mechanical engineers and physicists but chemists and other specialists must be consulted as well In this book we will consider some conclusions of the physical and mechanical schools acquired by the A F Joffe Physics Technical Institute of the USSR Academy of Sciences in Leningrad and the Institute of Polymer Mechanics of Latvian SSR Academy of Sciences in Riga

The methods for studying the phenomena of fracture applied at both Institutes are different yet complimentary to one another the materials tested are also sometimes different

Low-Temperature Behaviour of Elastomers

Bukhina,Kurlyand,2007-11-01 This book focuses on the effect the composition of rubbers and the conditions of their processing have on low temperature resistance It considers the nature and development of two physical processes glass transition and crystallization determining low temperature behavior of elastomers The book addresses the effects of deformation pressure an

Fundamental Principles of Polymeric Materials Christopher S. Brazel,Stephen L.

Rosen,2012-05-22 New edition brings classic text up to date with the latest science techniques and applications With its balanced presentation of polymer chemistry physics and engineering applications the Third Edition of this classic text continues to instill readers with a solid understanding of the core concepts underlying polymeric materials Both students and instructors have praised the text for its clear explanations and logical organization It begins with molecular level considerations and then progressively builds the reader s knowledge with discussions of bulk properties mechanical behavior and processing methods Following a brief introduction Fundamental Principles of Polymeric Materials is divided into four parts Part 1 Polymer Fundamentals Part 2 Polymer Synthesis Part 3 Polymer Properties Part 4 Polymer Processing and Performance Thoroughly Updated and Revised Readers familiar with the previous edition of this text will find that the organization and style have been updated with new material to help them grasp key concepts and discover the latest science techniques and applications For example there are new introductory sections on organic functional groups focusing on the structures found in condensation polymerizations The text also features new techniques for polymer analysis processing and microencapsulation as well as emerging techniques such as atom transfer radical polymerization At the end of each chapter are problems including many that are new to this edition to test the reader s grasp of core concepts as they advance through the text There are also references leading to the primary literature for further investigation of individual topics A classic in its field this text enables students in chemistry chemical engineering materials science and mechanical engineering to fully grasp and apply the fundamentals of polymeric materials preparing them for more advanced coursework

High-Pressure

Chemistry and Physics of Polymers A.L. Kovarskii,1994-02-03 High Pressure Chemistry and Physics of Polymers is devoted to covering all areas of high pressure polymer materials science Topics addressed include the synthesis of polymers changes in reactivity structural transformations molecular dynamics relaxation processes deformational properties chemical modification and the effect of shock waves and shear stresses The authors contributions reflect over 60 years of Soviet study in the field of physico chemistry conducted at the major former Soviet Institutes of Chemical Physics Organic Chemistry Polymer Chemistry and Physical Chemistry Fundamental topics such as compressibility of polymers polymerization under pressure viscoelastic deformational properties and polymer modification are discussed with an eye toward materials development for improving physical models and methods of calculating the changing parameters of materials under pressure

The book is a valuable reference to data on mechanisms of physical and chemical processes in addition to new experimental data for improving physical models and methods of calculating changes in material characteristics under compression loads High Pressure Chemistry and Physics of Polymers will be an important reference for graduate students and practicing professionals in polymer chemistry and polymeric materials Handbook of Thermal Analysis and Calorimetry ,2018-03-12 Handbook of Thermal Analysis and Calorimetry Recent Advances Techniques and Applications Volume Six Second Edition presents the latest in a series that has been well received by the thermal analysis and calorimetry community This volume covers recent advances in techniques and applications that complement the earlier volumes There has been tremendous progress in the field in recent years and this book puts together the most high impact topics selected for their popularity by new editors Sergey Vyazovkin Nobuyoshi Koga and Christoph Schick all editors of Thermochemica Acta Among the important new techniques covered are biomass conversion sustainable polymers polymer nanocomposites nonmetallic glasses phase change materials propellants and explosives applications to pharmaceuticals processes in ceramics metals and alloys ionic liquids fast scanning calorimetry and more Features 19 all new chapters to bring readers up to date on the current status of the field Provides a broad overview of recent progress in the most popular techniques and applications Includes chapters authored by a recognized leader in each field and compiled by a new team of editors each with at least 20 years of experience in the field of thermal analysis and calorimetry Enables applications across a wide range of modern materials including polymers metals alloys ceramics energetics and pharmaceuticals Overviews the current status of the field and summarizes recent progress in the most popular techniques and applications **Interphases and Mesophases in Polymer Crystallization III** Giuseppe Allegra,2005-12-02 With contributions by numerous experts **Principles of Nucleic Acid Structure** Wolfram Saenger,2013-12-01 New textbooks at all levels of chemistry appear with great regularity Some fields like basic biochemistry organic reaction mechanisms and chemical thermodynamics are well represented by many excellent texts and new or revised editions are published sufficiently often to keep up with progress in research However some areas of chemistry especially many of those taught at the graduate level suffer from a real lack of up to date textbooks The most serious needs occur in fields that are rapidly changing Textbooks in these subjects usually have to be written by scientists actually involved in the research which is advancing the field It is not often easy to persuade such individuals to set time aside to help spread the knowledge they have accumulated Our goal in this series is to pinpoint areas of chemistry where recent progress has outpaced what is covered in any available textbooks and then seek out and persuade experts in these fields to produce relatively concise but instructive introductions to their fields These should serve the needs of one semester or one quarter graduate courses in chemistry and biochemistry In some cases the availability of texts in active research areas should help stimulate the creation of new courses CHARLES R CANTOR New York Preface This monograph is based on a review on polynucleotide structures written for a book series in 1976 **Crystals and**

Crystallinity in Polymers Claudio De Rosa, Finizia Auriemma, 2013-08-26 Provides the tools needed to master and apply the fundamentals of polymer crystallography Using core concepts in physics chemistry polymer science and engineering this book sheds new light on the complex field of polymer crystallography enabling readers to evaluate polymer crystallization data and determine the best methods to use for their investigations The authors set forth a variety of tested and proven methods for analyzing ordered and disordered structures in polymer crystals including X ray diffraction electron diffraction and microscopy In addition to the basics the book explores several advanced and emerging topics in the field such as symmetry breaking frustration and the principle of density driven phase formation Crystals and Crystallinity in Polymers introduces two new concepts in crystallinity and crystals in synthetic polymers First crystallinity in polymeric materials is compatible with the absence of true three dimensional long range order Second the disorder may be described as a structural feature using the methods of X ray scattering and electron diffraction analysis The book begins by introducing the basic principles and methods for building structural models for the conformation of polymer crystal chains Next it covers Packing of macromolecules in polymer crystals Methods for extracting structural parameters from diffraction data Defects and disorder in polymer crystals Analytical methods for diffuse scattering from disordered polymer structures Crystal habit Influence of crystal defects and structural disorder on the physical and mechanical properties of polymeric materials Crystals and Crystallinity in Polymers examines all the possible types of structural disorder generally present in polymer crystals and describes the influence of each kind of disorder on X ray and electron diffraction patterns Its comprehensive expert coverage makes it possible for readers to learn and apply the fundamentals of polymer crystallography to solve a broad range of problems

Industrial Polysaccharides Salvatore S. Stivala, Vittorio Crescenzi, Iain C. M. Dea, 1987 This book highlights recent developments in polysaccharides spurred by advances in biotechnology Experts in the field describe the new biomass polysaccharides and their medicinal food and industrial applications

Macromolecular Physics Bernhard Wunderlich, 1980-07 This third volume completes the first part of the project Macromolecular Physics The first volume dealt with the description of macromolecular crystals the second volume dealt with crystal growth and the third volume summarizes our knowledge of the melting of linear flexible macromolecules The discussion in the three volumes goes from reasonably well established topics such as the structure morphology and defects in crystals to topics still in flux such as crystal nucleation detailed growth mechanisms and annealing processes to arrive at the present topics of equilibrium nonequilibrium and copolymer melting Our knowledge is quite limited on many aspects of these latter topics

Polymer Microscopy Linda Sawyer, David T. Grubb, Gregory F. Meyers, 2008-12-24 Polymer Microscopy Third Edition is a comprehensive and practical guide to the study of the microstructure of polymers and is the result of the authors many years of academic and industrial experience To address the needs of students and professionals from a variety of backgrounds introductory chapters deal with the basic concepts of both polymer morphology and processing and microscopy and imaging

theory The core of the book is more applied with many examples of specimen preparation and image interpretation leading to materials characterization Microscopy is applied to the characterization of a wide range of polymer systems including fibers films engineering resins and plastics composites nanocomposites polymer blends emulsions and liquid crystalline polymers Light microscopy atomic force microscopy and scanning and transmission electron microscopy techniques are all considered as are emerging techniques such as compositional mapping in which microscopy is combined with spectroscopy This extensively updated and revised Third Edition closes with a problem solving guide which gives a systematic framework for deciding on suitable approaches to the characterization of polymer microstructure Key Features Revised and updated this Third Edition remains the gold standard for information on the characterization of polymer microstructure Presents a wide variety of polymer systems and characterization techniques Covers the major advances in microscopy and polymers since the publication of the Second Edition in 1996 Describes new methods for use with the SPM and related to advances in cryo TEM as well as new polymer materials such as nanocomposites Includes both basic and applied topics making this book ideal as a professional reference and as a teaching text

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