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rate Behaviour of Polymers Using Blast-wave and Impact Loading Methods Wear of Polymers and Composites The Effects of Post-immersion on the ESC Behaviour of Polymers Pressure/volume/temperature Behaviour of Polymers During Rapid Cooling Elastic Behavior of Polymer Melts Polymer Viscoelasticity Modeling of Extensional Behaviour of Polymers Application of fracture mechanics to the impact behaviour of polymers Dynamic Mechanical Behaviour of Polymer Materials Mechanical Behaviour of Polymers Used for Tooth Positioners Molecular Structure and Interfacial Behaviour of Polymers Time-dependent Behaviour of Polymers and Unidirectional Polymeric Composites The Dielectric Behaviour of Polymers An Introduction to the Mechanical Properties of Solid Polymers Modelling the Long-term Deformation Behaviour of Polymers for Finite Element Analysis The Non-linear Viscoelastic Behaviour of Polymers On the Behaviour of Polymer Solutions in a Porous Medium Models of the non-linear creep behaviour of polymers

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In the field of tribology, the wear behaviour of polymers and

composite materials is considered a highly non-linear phenomenon. Wear of Polymers and Composites introduces fundamentals of polymers and composites tribology. The book suggests a new approach to explore the effect of applied load and surface defects on the fatigue wear behaviour of polymers, using a new tribometer and thorough experiments. It discusses effects of surface cracks, under different static and cyclic loading parameters on wear, and presents an intelligent algorithm, in the form of a neural network, to map the relationship between wear rate and relevant factors. Using the aforementioned method leads to more accurate and cost effective prediction of surface fatigue wear rates, under different service conditions. The first three chapters of the book introduce polymers and composite materials tribology, followed by three chapters that cover testing in wear, applied load and contact pressure and surface defects. The remaining chapter moves on to predicting wear of polymers, and concludes by discussing questions and problems. Prepares senior undergraduates as well as postgraduate students Focuses on the factors influencing wear of polymers and composites Contains detailed design of Tribometer, wear test procedures and detailed dataset of more than 50 experimental wear tests Introduces an artificial neural network approach as one of the recently developed wear prediction models. This book covers the most recent advances in the deformation and fracture behaviour of polymer material. It provides deeper insight into related morphology–property correlations of thermoplastics, elastomers and polymer resins. Each

chapter of this book gives a comprehensive review of state-of-the-art methods of materials testing and diagnostics, tailored for plastic pipes, films and adhesive systems as well as elastomeric components and others. The investigation of deformation and fracture behaviour using the experimental methods of fracture mechanics has been the subject of intense research during the last decade. In a systematic manner, modern aspects of fracture mechanics in the industrial application of polymers for bridging basic research and industrial development are illustrated by multifarious examples of innovative materials usage. This book will be of value to scientists, engineers and in polymer materials science. Over recent years there has been a tremendous upsurge in interest in the fracture behaviour of polymers. One reason for this is the increas ing use of polymers in structural engineering applications, since in such circumstances it is essential to have as complete an understanding as possible of the polymer's fracture behaviour. This book is designed to meet the requirements of those who need to be informed of the latest developments in the field of polymer fracture. It is written particularly for research workers but it should also prove invaluable for advanced students taking final-year undergraduate or postgraduate courses. The main emphasis is upon the use of fracture mechanics in the study of polymer fracture but this approach is then developed to cover the micromechanisms of the fracture process. Particular prominence is given to the relationship between structure, mechanical properties and the mechanics and mechanisms

*of fracture. The first chapter is a brief introduction which has several aims. One is to introduce polymers to the reader who does not have a strong background in the subject and another is to provide background material that will be used at later stages. The book is then split into two main parts: the first deals with the mechanics and mechanisms whilst the second is concerned with materials. In Part I phenomena such as molecular fracture, fracture mechanics, shear yielding and crazing are covered from a general viewpoint. Provides a comprehensive introduction to the mechanical behaviour of solid polymers. Extensively revised and updated throughout, the second edition now includes new material on mechanical relaxations and anisotropy, composites modelling, non-linear viscoelasticity, yield behaviour and fracture of tough polymers. The accessible approach of the book has been retained with each chapter designed to be self contained and the theory and applications of the subject carefully introduced where appropriate. The latest developments in the field are included alongside worked examples, mathematical appendices and an extensive reference. * Fully revised and updated throughout to include all the latest developments in the field * Worked examples at the end of the chapter * An invaluable resource for students of materials science, chemistry, physics or engineering studying polymer science Providing an updated and comprehensive account of the propertiesof solid polymers, the book covers all aspects of mechanicalbehaviour. This includes finite elastic behavior, linearviscoelasticity and mechanical relaxations, mechanical*

anisotropy,non-linear viscoelasicity, yield behavior and fracture. New to thisedition is coverage of polymer nanocomposites, and molecularinterpretations of yield, e.g. Bowden, Young, and Argon. The book begins by focusing on the structure of polymers,including their chemical composition and physical structure. It goes on to discuss the mechanical properties and behaviour ofpolymers, the statistical molecular theories of the rubber-likestate and describes aspects of linear viscoelastic behaviour, itsmeasurement, and experimental studies. Later chapters cover composites and experimental behaviour,relaxation transitions, stress and yielding. The book concludeswith a discussion of breaking phenomena. In this chapter, we present the current research program of dynamic mechanical behaviour of polymer materials. Polymers typically have low strength, stiffness and wave impedance, making it challenging to obtain accurate stress-strain relations at high strain rates. The challenges in split Hopkinson bar testing technique modified for characterizing the mechanical response of polymers under high-rate loading are introduced first. Then, various representative polymers are reviewed for illustrating the strain-rate dependencies of mechanical data and their constitutive modellings. Explores the nature of relaxation phenomena in polymers on the basis of time-temperature equivalence. Its role in the physical and mechanical behavior of polymers materials and fundamentals of thermoplastics processing are discussed. Four appendixes detail thermo-mechanical methods to study relaxation in polymers, structure of both

amorphous and semi-crystalline polymers, and unified approach to describe deformation of polymeric materials. Applied Mechanics of Polymers: Properties, Processing, and Behavior provides readers with an overview of the properties, mechanical behaviors and modeling techniques for accurately predicting the behaviors of polymeric materials. The book starts with an introduction to polymers, covering their history, chemistry, physics, and various types and applications. In addition, it covers the general properties of polymers and the common processing and manufacturing processes involved with them. Subsequent chapters delve into specific mechanical behaviors of polymers such as linear elasticity, hyperelasticity, creep, viscoelasticity, failure, and fracture. The book concludes with chapters discussing electroactive polymers, hydrogels, and the mechanical characterization of polymers. This is a useful reference text that will benefit graduate students, postdocs, researchers, and engineers in the mechanics of materials, polymer science, mechanical engineering and material science. Additional resources related to the book can be found at polymersmechanics.com. Provides examples of real-world applications that demonstrate the use of models in designing polymer-based components Includes access to a companion site from where readers can download FEA and MATLAB code, FEA simulation files, videos and other supplemental material Features end-of-chapter summaries with design and analysis guidelines, practice problem sets based on real-life situations, and both analytical and computational examples to bridge academic and industrial

applications A concise, self-contained introduction to solid polymers, the mechanics of their behavior and molecular and structural interpretations. This updated edition provides extended coverage of recent developments in rubber elasticity, relaxation transitions, non-linear viscoelastic behavior, anisotropic mechanical behavior, yield behavior of polymers, breaking phenomena, and other fields. Surface Phenomena in the Structural and Mechanical Behaviour of Solid Polymers explores the role of various surface phenomena in the structural and mechanical behaviour of amorphous and semicrystalline polymers. This book: Discusses the development of the interfacial surface in the deformation of polymers Examines the healing of interfacial surfaces in polymers Inspects the structure and properties of polymers in thin films and surface layers Evaluates the mechanism of inelastic deformation in glassy amorphous polymers Investigates strain softening and the phenomena taking place upon deformation of polymers in active liquid media Covers the Rehbinder effect, or the adsorption reduction of the strength of solids Describes the properties of polymers in environmental or solvent crazing Analyses the interaction of the highly developed surface of crazed polymers with diverse low- and high-molecular mass components Addresses the instability and self-organisation of surface layers in polymers and diverse polymer systems Presents theoretical speculations concerning the structurally mechanical behaviour of 'a rigid coating on a soft substratum' (RCSS) systems Assesses the stress–strain properties of the thin surface layers of polymers and the

nanometric coatings deposited on their surfaces Highlights the efficacy of the approaches developed for RCSS systems for the analysis and description of natural phenomena Details the applied aspects of surface phenomena in the structurally mechanical behaviour of polymers Thus, Surface Phenomena in the Structural and Mechanical Behaviour of Solid Polymers provides a useful framework for the development of new and innovative polymer-based materials. Showcasing vital engineering applications to transient and dynamic pertubations of macromolecular materials, structural recovery's role in mechanical responses in the glassy state, and viscoelastic parameters that condition the non-Newtonian behaviour of polymers, this work presents a systematic account of the responses of macromolecular materials to mechanical force fields. It focuses on the most important features of the linear stress-strain relationships for ideal solids and liquids. Surface Phenomena in the Structural and Mechanical Behaviour of Solid Polymers explores the role of various surface phenomena in the structural and mechanical behaviour of amorphous and semicrystalline polymers. This book: Discusses the development of the interfacial surface in the deformation of polymers Examines the healing of interfacial surfaces in polymers Inspects the structure and properties of polymers in thin films and surface layers Evaluates the mechanism of inelastic deformation in glassy amorphous polymers Investigates strain softening and the phenomena taking place upon deformation of polymers in active liquid media Covers the Rehbinder effect, or the adsorption

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appendices and an extensive reference. Fully revised and updated throughout to include all the latest developments in the field Worked examples at the end of the chapter An invaluable resource for students of materials science, chemistry, physics or engineering studying polymer science As the title suggests, this monograph features the physicochemical behavior and supramolecular organization of polymers. The book consists of four chapters dealing with solution properties, viscoelastic behavior, physicochemical aspects at interfaces and supramolecular structures of polymeric systems. The classical treatment of the physicochemical behavior of polymers is presented in such a way that the book will meet the requirements of a beginner in the study of polymeric systems in solution and in some aspects of the solid state, as well as those of the experienced researcher in other types of materials. Physicochemical behavior and Supramolecular Organization of Polymers is ultimately, a contribution to the chemistry of materials; it is a powerful reference tool for students and scientists working both in polymer chemistry, polymer physics and materials science. This book gives an overview of recent advances in the fracture mechanics of polymers, morphology property correlations, hybrid methods for polymer testing and polymer diagnostics, and biocompatible materials and medical prostheses, as well as application examples and limits. This volume explores the mechanics of the behaviour of solid polymers, discussing molecular and structural interpretations and emphasizing the physical rather than the engineering approach. Readers are provided

with a set of elementary problems and their solutions. Viscoelastic behavior reflects the combined viscous and elastic responses, under mechanical stress, of materials which are intermediate between liquids and solids in character. Polymers the basic materials of the rubber and plastic industries and important to the textile, petroleum, automobile, paper, and pharmaceutical industries as well exhibit viscoelasticity to a pronounced degree. Their viscoelastic properties determine the mechanical performance of the final products of these industries, and also the success of processing methods at intermediate stages of production. Viscoelastic Properties of Polymers examines, in detail, the effects of the many variables on which the basic viscoelastic properties depend. These include temperature, pressure, and time; polymer chemical composition, molecular weight and weight distribution, branching and crystallinity; dilution with solvents or plasticizers; and mixture with other materials to form composite systems. With guidance by molecular theory, the dependence of viscoelastic properties on these variables can be simplified by introducing certain ancillary concepts such as the fractional free volume, the monomeric friction coefficient, and the spacing between entanglement loci, to provide a qualitative understanding and in many cases a quantitative prediction of how to achieve desired results. The phenomenological theory of viscoelasticity which permits interrelation of the results of different types of experiments is presented first, with many useful approximation procedures for calculations given. A wide

variety of experimental methods is then described, with critical evaluation of their applicability to polymeric materials of different consistencies and in different regions of the time scale (or, for oscillating deformations, the frequency scale). A review of the present state of molecular theory follows, so that viscoelasticity can be related to the motions of flexible polymer molecules and their entanglements and network junctions. The dependence of viscoestic properties on temperature and pressure, and its descriptions using reduced variables, are discussed in detail. Several chapters are then devoted to the dependence of viscoelastic properties on chemical composition, molecular weight, presence of diluents, and other features, for several characteristic classes of polymer materials. Finally, a few examples are given to illustrate the many potential applications of these principles to practical problems in the processing and use of rubbers, plastics, and fibers, and in the control of vibration and noise. The third edition has been brought up to date to reflect the important developments, in a decade of exceptionally active research, which have led to a wider use of polymers, and a wider recognition of the importance and range of application of viscoelastic properties. Additional data have been incorporated, and the book s chapters on dilute solutions, theory of undiluted polymers, plateau and terminal zones, cross-linked polymers, and concentrated solutions have been extensively rewritten to take into account new theories and new experimental results. Technical managers and research workers in the wide range of industries in which polymers

play an important role will find that the book provides basic information for practical applications, and graduate students in chemistry and engineering will find, in its illustrations with real data and real numbers, an accessible introduction to the principles of viscoelasticity. This book provides a unified mechanics and materials perspective on polymers: both the mathematics of viscoelasticity theory as well as the physical mechanisms behind polymer deformation processes. Introductory material on fundamental mechanics is included to provide a continuous baseline for readers from all disciplines. Introductory material on the chemical and molecular basis of polymers is also included, which is essential to the understanding of the thermomechanical response. This self-contained text covers the viscoelastic characterization of polymers including constitutive modeling, experimental methods, thermal response, and stress and failure analysis. Example problems are provided within the text as well as at the end of each chapter. New to this edition: · One new chapter on the use of nano-material inclusions for structural polymer applications and applications such as fiber-reinforced polymers and adhesively bonded structures · Brings up-to-date polymer production and sales data and equipment and procedures for evaluating polymer characterization and classification · The work serves as a comprehensive reference for advanced seniors seeking graduate level courses, first and second year graduate students, and practicing engineers Understanding the elastic properties of polymer melts is necessary for ensuring successful polymer processing and

thus producing high-quality plastic parts. This unique book is the first to focus on this important topic. Starting with the molecular origin of elastic behavior and an explanation of the physical quantities involved, experimental methods and the dependence of elastic behavior on experimental parameters are then presented. Elastic properties of filled and unfilled systems are compared directly, and polymer blends are also considered. Elastic effects in various applications are included, such as in extrudate swell, internal stresses, and shrink films, to illustrate the importance of this field in the plastics processing industry. This text, now in its second edition, offers an up-to-date, expanded treatment of the behaviour of polymers with regard to material variables and test and use conditions. It highlights general principles, useful empirical rules and practical equations.;Detailing the specific behaviour of many common polymers, the text: places emphasis on time and frequency dependence over temperature dependence; uses contemporary molecular mechanisms to explain creep, stress relaxation, constant strain rate responses and crazing; provides explicit equations to predict responses; supplies a discussion of large deformation multiaxial responses; compares statistical and continuum theories on the same data set; and updates stress-strain behaviour and particulate filled systems. How do engineering materials deform when bearing mechanical loads? To answer this crucial question, the book bridges the gap between continuum mechanics and materials science. The different kinds of material deformation are explained in detail. The

book also discusses the physical processes occurring during the deformation of all classes of engineering materials and shows how these materials can be strengthened to meet the design requirements. It provides the knowledge needed in selecting the appropriate engineering material for a certain design problem. This book is both a valuable textbook and a useful reference for graduate students and practising engineers. Over recent years there has been a tremendous upsurge in interest in the fracture behaviour of polymers. One reason for this is the increas ing use of polymers in structural engineering applications, since in such circumstances it is essential to have as complete an understanding as possible of the polymer's fracture behaviour. This book is designed to meet the requirements of those who need to be informed of the latest developments in the field of polymer fracture. It is written particularly for research workers but it should also prove invaluable for advanced students taking final-year undergraduate or postgraduate courses. The main emphasis is upon the use of fracture mechanics in the study of polymer fracture but this approach is then developed to cover the micromechanisms of the fracture process. Particular prominence is given to the relationship between structure, mechanical properties and the mechanics and mechanisms of fracture. The first chapter is a brief introduction which has several aims. One is to introduce polymers to the reader who does not have a strong background in the subject and another is to provide background material that will be used at later stages. The

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