The Phenomenological Theory Of Linear Viscoelastic Behavior An Introduction

Levinas and James
Fundamentals of Equilibrium and Steady-State Thermodynamics
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GLASS ANTON

Levinas and James
Walter de Gruyter GmbH & Co KG
Excited States, Volume 5 consists of three concise and detailed chapters. These chapters cover the topics of excited-state potential surfaces of polyatomic molecules; vibronic spectroscopy of benzene; and quantum statistical mechanical (QSM) theory for molecular relaxation processes. Chapter 1 discusses excited-state potential surfaces with focus on ab initio calculations. Simple methods of computational schemes are also presented in this chapter. Chapter 2 reviews the excited electronic states of benzene. This chapter also includes the basic

theory of benzene electronic excitations and the various types of spectroscopy (absorption, vibrational Raman, and electron-impact). Lastly, Chapter 3 presents a unified QSM theory, phenomenological theory of irreversible thermodynamics, and kinetics. The focus of QSM theory is on the nonlinear domain and is used to construct a nonlinear theory for the relaxation of excited molecules that are electric, vibrating, and rotating. This volume is a good reference for students and researchers studying in the field of chemistry and physics.

Fundamentals of Equilibrium and Steady-State Thermodynamics

Elsevier

This book offers a comprehensive introduction to polymer rheology with a focus on the viscoelastic characterization of polymeric materials. It contains various numerical algorithms for the processing of viscoelastic data, from basic principles to advanced examples which are hard to find in the existing literature. The book takes a multidisciplinary approach to the study of the viscoelasticity of polymers, and is self-contained, including the essential mathematics, continuum mechanics, polymer science and statistical mechanics needed to understand the theories of polymer viscoelasticity. It covers recent achievements in polymer rheology, such as theoretical and experimental aspects of large amplitude

oscillatory shear (LAOS), and numerical methods for linear viscoelasticity, as well as new insights into the interpretation of experimental data. Although the book is balanced between the theoretical and experimental aspects of polymer rheology, the author's particular interest in the theoretical side will not remain hidden. Aimed at readers familiar with the mathematics and physics of engineering at an undergraduate level, the multidisciplinary approach employed enables researchers with various scientific backgrounds to expand their knowledge of polymer rheology in a systematic way.

The Phenomenological Theory of Linear Viscoelastic Behavior

Elsevier

Theoretical and experimental work on solids with low-dimensi℗Ư onal cooperative phenomena has been rather explosively expanded in the last few years, and it seems to be quite fashionable to con℗Ư tribute to this field, especially to the problem of one-dimensional metals. On the whole, one could divide the huge amount of recent investigations into two parts although there is much overlap bet℗Ư ween these regimes, namely investigations on magnetic exchange interactions constrained to mainly one or two dimensions and, secondly, work done on Id metallic solids or linear chain compounds with Id delocalized electrons. There is, of course,

overlap from one extreme case to the other with these solids and in some rare cases both phenomena are studied on one and the same crystal. In fact, however, most of the scientific groups in this area could be associated roughly with one of these categories and, in addition, a separation between theoreticians and experimentalists in each of these groups leads to a further splitting of interests although many theories about these solids have been tested by experimenta®U˙ lists. Nevertheless, more cooperation and understanding between scientists working on low-dimensional cooperative phenomena should appreciably stimulate further development. With a better inderdis®U˙ ciplinary understanding, new ideas could possibly help chemists in synthesizing tailor-cut solids. This would in return give experi®U˙ mentalists new phenomena to examine and finally would stimulate new theoretical work.

Thermodynamic Approaches in Engineering Systems John Wiley & Sons

The Springer Handbook of Experimental Solid Mechanics documents both the traditional techniques as well as the new methods for experimental studies of materials, components, and structures. The emergence of new materials and new disciplines, together with the escalating use of on- and off-line computers for rapid data processing and

the combined use of experimental and numerical techniques have greatly expanded the capabilities of experimental mechanics. New exciting topics are included on biological materials, MEMS and NEMS, nanoindentation, digital photomechanics, photoacoustic characterization, and atomic force microscopy in experimental solid mechanics. Presenting complete instructions to various areas of experimental solid mechanics, guidance to detailed expositions in important references, and a description of state-of-the-art applications in important technical areas, this thoroughly revised and updated edition is an excellent reference to a widespread academic, industrial, and professional engineering audience.

Low-Dimensional Cooperative Phenomena

Springer

The theory of linear poroelasticity describes the interaction between mechanical effects and adding or removing fluid from rock. It is critical to the study of such geological phenomena as earthquakes and landslides and is important for numerous engineering projects, including dams, groundwater withdrawal, and petroleum extraction. Now an advanced text synthesizes in one place, with one notation, numerous classical solutions and applications of this highly useful theory. The introductory chapter recounts parallel developments in geomechanics,

hydrogeology, and reservoir engineering that are unified by the tenets of poroelasticity. Next, the theory's constitutive and governing equations and their associated material parameters are described. These equations are then specialized for different simplifying geometries: unbounded problem domains, uniaxial strain, plane strain, radial symmetry, and axisymmetry. Example problems from geomechanics, hydrogeology, and petroleum engineering are incorporated throughout to illustrate poroelastic behavior and solution methods for a wide variety of real-world scenarios. The final chapter provides outlines for finite-element and boundary-element formulations of the field's governing equations. Whether read as a course of study or consulted as a reference by researchers and professionals, this volume's user-friendly presentation makes accessible one of geophysics' most important subjects and will do much to reduce poroelasticity's reputation as difficult to master. *Dynamic Mechanical Analysis* Indiana University Press 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.

The Phenomenological Theory of Linear Viscoelastic Behavior

Springer Science & Business Media

Femtosecond optics involves the study of ultra-short pulses of light. Understanding the behaviour of these light pulses makes it possible to develop ultra-fast lasers with a wide range of applications in such areas as medical imaging, chemical analysis and micro-machining. Written by two leading experts in the field, this book reviews the theory of the interaction of femtosecond light pulses with matter, femtosecond lasers and laser systems, and the principles of femtosecond coherent spectroscopy of impurity amorphous media. - reviews the theory of the interaction of femtosecond light pulses with matter - Discusses femtosecond lasers and laser systems - Considers the principles of femtosecond coherent spectroscopy of impurity amorphous media

Photoelastic and

Electro-Optic Properties of Crystals
Springer Nature
Rheology: Concepts, Methods, and Applications, Fourth Edition provides a thorough historical and theoretical grounding in the field and introduces rheology as the method for solving many practical problems in materials science and engineering. This new edition has been updated to include new evidence-based methods and applications, coverage of non-Newtonian properties and their effect on material processing, heterogeneity in flow, rheology of highly concentrated emulsions and suspensions, viscosity and viscoelastic behavior of nanocomposites, the behavior of supramolecular solutions, rheology of gels, deformation-induced anisotropy, conformation changes during flow and molecular orientation. The book is practical and relevant for industry, but also consistent with rheology courses in academia, making it relevant to both academics and accomplished rheologists in industry. - Includes updates on non-Newtonian properties and their effect on material processing, heterogeneity in flow, rheology of concentrated emulsions, suspensions, and more - Discusses viscosity and viscoelastic behavior of nanocomposites, the behavior of supramolecular solutions, rheology of gels, deformation-induced anisotropy, conformation changes during flow, and molecular orientation -

Covers theory backed by practical examples, methods of measurement and raw data treatment, and various applications

Engineering and Food for the 21st Century Pergamon

Engineering and Food for the 21st Century presents important reviews and up-to-date discussions of major topics relating to engineering and food. Internationally renowned contributors discuss a broad base of food engineering and related subjects, including research and prospective industrial applications. The first part begins with recent trends in

An Introduction to the Phenomenological Theory of Ferroelectricity Elsevier

This work sets out to provide an up-to-date account of the physical properties and structure of polymers in the glassy state. Properties measured above the glass transition temperature are therefore included only in so far as is necessary for the treatment of the glass transition process. This approach to the subject therefore excludes any detailed account of rubber elasticity or melt rheology or of the structure and conformation of the long chain molecule in solution, although knowledge derived from this field is assumed where required. Major emphasis is placed on structural and mechanical properties, although a number of other physical properties are included. Naturally the different authors contributing to the book write mainly from their own particular points of view and where

there are several widely accepted theoretical approaches to a subject, these are sometimes provided in different chapters which will necessarily overlap to a significant extent. For example, the main theoretical presentation on the subject of glass transition is given in Chapter 1. This is supplemented by accounts of the free volume theory in Chapter 3 and in the Introduction, and a short account of the work of Gibbs and DiMarzio, also in Chapter 3. Similarly, there is material on solvent cracking in Chapters 7 and 9, though the two workers approach the subject from opposite directions. Every effort has therefore been made to encourage cross-referencing between different chapters.

Physics and Chance

CRC Press

The areas of suspension mechanics, stability and computational rheology have exploded in scope and substance in the last decade. The present book is one of the first of a comprehensive nature to treat these topics in detail. The aim of the authors has been to highlight the major discoveries and to present a number of them in sufficient breadth and depth so that the novice can learn from the examples chosen, and the expert can use them as a reference when necessary.The first two chapters, grouped under the category General Principles, deal with the kinematics of continuous media and the balance laws of mechanics,

including the existence of the stress tensor and extensions of the laws of vector analysis to domains bounded by fractal curves or surfaces. The third and fourth chapters, under the heading Constitutive Modelling, present the tools necessary to formulate constitutive equations from the continuum or the microstructural approach. The last three chapters, under the caption Analytical and Numerical Techniques, contain most of the important results in the domain of the fluid mechanics of viscoelasticity, and form the core of the book.A number of topics of interest have not yet been developed to a theoretical level from which applications can be made in a routine manner. However, the authors have included these topics to make the reader aware of the state of affairs so that research into these matters can be carried out. For example, the sections which deal with domains bounded by fractal curves or surfaces show that the existence of a stress tensor in such regions is still open to question. Similarly, the constitutive modelling of suspensions, especially at high volume concentrations, with the corresponding particle migration from high to low shear regions is still very sketchy.

Diffusion in Materials

Springer

Beyond Equilibrium Thermodynamics fills a niche in the market by providing a comprehensive introduction to a new,

emerging topic in the field. The importance of non-equilibrium thermodynamics is addressed in order to fully understand how a system works, whether it is in a biological system like the brain or a system that develops plastic. In order to fully grasp the subject, the book clearly explains the physical concepts and mathematics involved, as well as presenting problems and solutions; over 200 exercises and answers are included. Engineers, scientists, and applied mathematicians can all use the book to address their problems in modelling, calculating, and understanding dynamic responses of materials.

Principles of Linear Systems Cambridge University Press

An Introduction to the Phenomenological Theory of Ferroelectricity covers topics about the basis and derivation of the macroscopic or phenomenological theory of the elastic, dielectric and thermal properties of crystals as applied in the field of ferroelectricity. The monograph discusses the elastic, dielectric, and thermal properties of ferroelectric crystals; the standard linear time-dependent electroelastic theory; the non-linear static properties of an elastic dielectric on a variational principle; and the phenomenological theory of the static thermal, elastic, and dielectric properties o ...

Geophysical Journal Springer Science & Business Media

Statistical mechanics has been proven to be successful at describing

physical systems at thermodynamic equilibrium. Since most natural phenomena occur in nonequilibrium conditions, the present challenge is to find suitable physical approaches for such conditions: this book provides a pedagogical pathway that explores various perspectives. The use of clear language, and explanatory figures and diagrams to describe models, simulations and experimental findings makes the book a valuable resource for undergraduate and graduate students, and also for lecturers organizing teaching at varying levels of experience in the field. Written in three parts, it covers basic and traditional concepts of nonequilibrium physics, modern aspects concerning nonequilibrium phase transitions, and application-orientated topics from a modern perspective. A broad range of topics is covered, including Langevin equations, Levy processes, directed percolation, kinetic roughening and pattern formation.

Fluid Mechanics of Viscoelasticity Springer

No detailed description available for "The dynamics of sorptions processes / Dinamika sorbcionnych processov".

The dynamics of sorptions processes / Dinamika sorbcionnych processov Springer

Lawrence Sklar offers a comprehensive, non-technical introduction to statistical mechanics and attempts to understand

its foundational elements.

Quantum Statistics of Charged Particle Systems
Cambridge University Press
This book offers a radical new interpretation of Georg Lukács's History and Class Consciousness, showing for the first time how the philosophical framework for his analysis of society was laid in the drafts of a philosophy of art that he planned but never completed before he converted to Marxism. Reading Lukács's work through the so-called "Heidelberg Aesthetics" reveals for the first time a range of unsuspected influences on his thought, such as Edmund Husserl, Emil Lask, and Alois Riegl; it also offers a theory of subjectivity within social relations that avoids many of the problems of earlier readings of his text. At a time when Lukács's reputation is once more on the rise, this bold new reading helps revitalize his thought in ways that help it speak to contemporary concerns.

Electrets and Related Electrostatic Charge Storage Phenomena
Springer Science & Business Media
The classical theories of Linear Elasticity and Newtonian Fluids, though trium phantly elegant as mathematical structures, do not adequately describe the defor mation and flow of most real materials. Attempts to characterize the behaviour of real materials under the action of external forces gave rise to the science of Rheology. Early rheological studies isolated the phenomena

now labelled as viscoelastic. Weber (1835, 1841), researching the behaviour of silk threats under load, noted an instantaneous extension, followed by a further extension over a long period of time. On removal of the load, the original length was eventually recovered. He also deduced that the phenomena of stress relaxation and damping of vibrations should occur. Later investigators showed that similar effects may be observed in other materials. The German school referred to these as "Elastische Nachwirkung" or "the elastic aftereffect" while the British school, including Lord Kelvin, spoke ofthe "viscosityofsolids". The universal adoption of the term "Viscoelasticity", intended to convey behaviour combining proper ties both of a viscous liquid and an elastic solid, is of recent origin, not being used for example by Love (1934), though Alfrey (1948) uses it in the context of polymers. The earliest attempts at mathematically modelling viscoelastic behaviour were those of Maxwell (1867) (actually in the context of his work on gases; he used this model for calculating the viscosity of a gas) and Meyer (1874).

State of the Art and Future Trends in Material Modeling

Cambridge University Press

This special anniversary book celebrates the success of this Springer book series highlighting materials modeling as the

key to developing new engineering products and applications. In this 100th volume of “Advanced Structured Materials”, international experts showcase the current state of the art and future trends in materials modeling, which is essential in order to fulfill the demanding requirements of next-generation engineering tasks.

Beyond Equilibrium Thermodynamics

Springer Science & Business Media

Thermodynamic Approaches in Engineering Systems responds to the need for a synthesizing volume that throws light upon the extensive field of thermodynamics from a chemical engineering perspective that applies basic ideas and key results from the field to chemical engineering problems. This book outlines and interprets the most valuable achievements in applied non-equilibrium thermodynamics obtained within the recent fifty years. It synthesizes nontrivial achievements of thermodynamics in important branches of chemical and biochemical engineering. Readers will gain an update on what has been achieved, what new research problems could be stated, and what kind of further studies should be developed within specialized research. - Presents clearly structured chapters beginning with an introduction, elaboration of the process, and results summarized in a conclusion - Written by a

first-class expert in the field of advanced methods in thermodynamics - Provides a synthesis of recent thermodynamic developments in practical systems - Presents very elaborate literature discussions from the past fifty years

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