
REVERSIBLE CRYSTAL PLASTICITY

Vladimir S. Boyko
Ruvim I. Garber
Arnold M. Kosseovich

Reversible Crystal Plasticity

G Psacharopoulos



Reversible Crystal Plasticity:

Reversible Crystal Plasticity Vladimir Boyko, Ruvin Garber, Arnold Kossevich, 1997-05-09 Market Research scientists and students in materials science physical metallurgy and solid state physics This detailed monograph presents the theory of reversible plasticity as a new direction of development in crystal physics It features a unique integration of traditional concepts and new studies of high temperature superconductors plus in depth analyses of various related phenomena Among the topics discussed are elastic twinning discovered by Dr Garber thermoelastic martensite transformation superelasticity shape memory effects the domain structure of ferroelastics and elastic aftereffect Partial Contents 1 Transformation of Dislocations Dislocation Description of a Phase Transformation Front 2 Dislocation Theory of Elastic Twinning Twinning of Crystals Principal Definitions 3 Statics and Dynamics of Elastic Twinning Discovery of Elastic Twinning Verification of the Validity of the Static Theory in a Description of the Macroscopic Behavior of an Elastic Twin 4 Thermoelastic Martensitic Transformation Martensitic Transformation a Diffusionless Process of Rebuilding the Crystal Lattice 5 Superelasticity and the Shape Memory Effect Main Characteristics of Superelasticity and Shape Memory Effects 6 Reversible Plasticity of Ferroelastics Ferroelastics Main Definitions 7 Investigation of Reversible Plasticity of Crystals by the Acoustic Emission Method Emission of Sound by Moving Dislocations and Their Pileups Methods Used in Experimental Investigations of the Acoustic Emission Generated by a Single Twin Acoustic Emission Associated with Elastic Twinning 8 Influence of Reversible Plasticity of Superconductors on Their Physical Properties Reversible Changes in the Parameters of Traditional Superconductors under the Action of Elastic Stresses Influence of Magnetic Fields on Reversible Changes in the Parameters

Crystal Plasticity Wojciech Polkowski, 2021-04-27 The book presents a collection of 25 original papers including one review paper on state of the art achievements in the theory and practice of crystals plasticity The articles cover a wide scope of research on materials behavior subjected to external loadings starting from atomic scale simulations and a new methodological aspect to experiments on a structure and mechanical response upon a large scale processing Thus a presented contribution of researchers from 18 different countries can be virtually divided into three groups namely i modelling and simulation ii methodological aspects and iii experiments on process structure properties relationship Furthermore a large variety of materials are investigated including more conventional steels copper titanium nickel aluminum and magnesium alloys and advanced ones composites or high entropy alloys The book should be interested for senior students researchers and engineers working within discipline of materials science and solid state physics of crystalline materials *Strengthening Mechanisms in Crystal Plasticity* Ali Argon, 2008 Technologically important metals and alloys have been strengthened throughout history by empirical means The scientific bases of the central mechanisms of such forms of strengthening developed over the past several decades are presented here through mechanistic models and associated experimental results **Applied Nanoindentation in Advanced Materials** Atul Tiwari, Sridhar Natarajan, 2017-10-30

Research in the area of nanoindentation has gained significant momentum in recent years but there are very few books currently available which can educate researchers on the application aspects of this technique in various areas of materials science. *Applied Nanoindentation in Advanced Materials* addresses this need and is a comprehensive self-contained reference covering applied aspects of nanoindentation in advanced materials. With contributions from leading researchers in the field, this book is divided into three parts. Part one covers innovations and analysis, and parts two and three examine the application and evaluation of soft and ceramic like materials respectively. Key features: A one stop solution for scholars and researchers to learn applied aspects of nanoindentation. Contains contributions from leading researchers in the field. Includes the analysis of key properties that can be studied using the nanoindentation technique. Covers recent innovations. Includes worked examples. *Applied Nanoindentation in Advanced Materials* is an ideal reference for researchers and practitioners working in the areas of nanotechnology and nanomechanics and is also a useful source of information for graduate students in mechanical and materials engineering and chemistry. This book also contains a wealth of information for scientists and engineers interested in mathematical modelling and simulations related to nanoindentation testing and analysis.

Introduction to Ferroic Materials Vinod Wadhawan, 2000-12-21. Ferroic materials are important not only because of the improved understanding of condensed matter but also because of their present and potential device applications. This book presents a unified description of ferroic materials at an introductory level with the unifying factor being the occurrence of nondisruptive phase transitions in crystals that alter point group symmetry. The book also aims to further systematize the subject of ferroic materials employing some formal carefully worded definitions and classification schemes. The basic physical principles leading to the wide ranging applications of ferroic materials are also explained while placing extra emphasis on the utilitarian role of symmetry in materials science. *Nonlinear Elastic and Inelastic Models for Shock Compression of Crystalline Solids* John D. Clayton, 2019-05-17. This book describes thermoelastic and inelastic deformation processes in crystalline solids undergoing loading by shock compression. Constitutive models with a basis in geometrically nonlinear continuum mechanics supply these descriptions. Large deformations such as finite strains and rotations are addressed. The book covers dominant mechanisms of nonlinear thermoelasticity, dislocation plasticity, deformation twinning, fracture, flow, and other structure changes. Rigorous derivations of theoretical results are provided with approximately 1300 numbered equations and an extensive bibliography of over 500 historical and modern references spanning from the 1920s to the present day. Case studies contain property data as well as analytical and numerical solutions to shock compression problems for different materials. Such materials are metals, ceramics, and minerals, single crystalline and polycrystalline. The intended audience of this book is practicing scientists, physicists, engineers, materials scientists, and applied mathematicians involved in advanced research on shock compression of solid materials. Some Developments in Crystal Plasticity Arun R. Srinivasa, 1991. Microstructure modeling and crystal plasticity parameter identification for predicting the cyclic

mechanical behavior of polycrystalline metals Kuhn, Jannick,2023-04-04 Computational homogenization permits to capture the influence of the microstructure on the cyclic mechanical behavior of polycrystalline metals In this work we investigate methods to compute Laguerre tessellations as computational cells of polycrystalline microstructures propose a new method to assign crystallographic orientations to the Laguerre cells and use Bayesian optimization to find suitable parameters for the underlying micromechanical model from macroscopic experiments Nuclear Science Abstracts ,1976-06

Micro-Macro-Interactions Albrecht Bertram,Jürgen Tomas,2008-10-23 Many materials or media in nature and technology possess a microstructure which determines their macroscopic behaviour The knowledge of the relevant mechanisms is often more comprehensive on the micro than on the macro scale On the other hand not all information on the micro level is relevant for the understanding of this macro behaviour Therefore averaging and homogenization methods are needed to select only the specific information from the micro scale which influences the macro scale These methods also open the possibility to design or to influence microstructures with the objective to optimize their macro behaviour This book presents the development of new methods in this interdisciplinary field of macro micro interactions of different engineering branches like mechanical and process engineering applied mathematics theoretical and computational physics In particular solids with microstructures and particle systems are considered **Nonlinear Mechanics of Crystals** John D. Clayton,2010-11-01 This book describes behavior of crystalline solids primarily via methods of modern continuum mechanics Emphasis is given to geometrically nonlinear descriptions i e finite deformations Primary topics include anisotropic crystal elasticity plasticity and methods for representing effects of defects in the solid on the material s mechanical response Defects include crystal dislocations point defects twins voids or pores and micro cracks Thermoelastic dielectric and piezoelectric behaviors are addressed Traditional and higher order gradient theories of mechanical behavior of crystalline solids are discussed Differential geometric representations of kinematics of finite deformations and lattice defect distributions are presented Multi scale modeling concepts are described in the context of elastic and plastic material behavior Representative substances towards which modeling techniques may be applied are single and poly crystalline metals and alloys ceramics and minerals This book is intended for use by scientists and engineers involved in advanced constitutive modeling of nonlinear mechanical behavior of solid crystalline materials Knowledge of fundamentals of continuum mechanics and tensor calculus is a prerequisite for accessing much of the text This book could be used as supplemental material for graduate courses on continuum mechanics elasticity plasticity micromechanics or dislocation mechanics for students in various disciplines of engineering materials science applied mathematics and condensed matter physics Smart Structures Vinod K. Wadhawan,2007-10-18 Smartness is often associated with living beings as they can adapt themselves to changing situations Artificial smart structures are designed to mimic biological structures to a small or large extent This book gives a comprehensive account of how this can be done It will be of interest to students and professionals in science and engineering

Collective Effects in Condensed Matter Physics Vladimir V. Kiselev, 2018-06-11 This monograph offers a concise overview of the theoretical description of various collective phenomena in condensed matter physics These effects include the basic electronic structure in solid state physics lattice vibrations superconductivity light matter interaction and more advanced topics such as martensitic transitions

Foundations of Elastoplasticity: Subloading Surface Model Koichi Hashiguchi, 2017-05-06 This book is the standard text book of elastoplasticity in which the elastoplasticity theory is comprehensively described from the conventional theory for the monotonic loading to the unconventional theory for the cyclic loading behavior Explanations of vector tensor analysis and continuum mechanics are provided first as a foundation for elastoplasticity theory covering various strain and stress measures and their rates with their objectivities Elastoplasticity has been highly developed by the creation and formulation of the subloading surface model which is the unified fundamental law for irreversible mechanical phenomena in solids The assumption that the interior of the yield surface is an elastic domain is excluded in order to describe the plastic strain rate due to the rate of stress inside the yield surface in this model aiming at the prediction of cyclic loading behavior although the yield surface enclosing the elastic domain is assumed in all the elastoplastic models other than the subloading surface model Then the plastic strain rate develops continuously as the stress approaches the yield surface providing the advantages 1 The tangent modulus changes continuously 2 The yield judgment whether the stress reaches the yield surface is not required 3 The stress is automatically attracted to the yield surface even when it goes out from the yield surface by large loading increments in numerical calculation and 4 The finite strain theory based on the multiplicative decomposition of deformation gradient tensor is formulated exactly Consequently the monotonic the cyclic the non proportional loading behaviors for wide classes of materials including soils rocks and concretes in addition to metals can be described rigorously by the subloading surface model Further the viscoplastic constitutive equations in a general rate from the quasi static to the impact loadings are described and constitutive equations of friction behavior and its application to the prediction of stick slip phenomena etc are also described in detail In addition the return mapping algorithm the consistent tangent modulus etc are explained for the numerical analyses Further the damage the phase transformation and the crystal plasticity models are also described in brief All of them are based on the subloading surface model The elastoplasticity analysis will be advanced steadily based on the subloading surface model

Strength of Metals and Alloys (ICSMA 8) P. O. Kettunen, T. K. Lepistö, M. E. Lehtonen, 2013-10-22 Containing almost 250 technical and review papers these proceedings form an authoritative state of the art review of this important multidisciplinary topic Emphasis is placed on the study of the strength of mechanical properties of materials and their dependence on the microstructure and defect arrangements Areas covered include dislocations dislocation arrangements plastic deformation strengthening mechanisms cyclic deformation and fatigue plastic deformation at high temperatures fracture modern strengthening methods in steels boundaries and interfaces

International Conference on Martensitic Transformations (ICOMAT) 2008 Gregory Olson, David

Lieberman, Avadh Saxena, 2013-10-09 During the week of June 29 July 5 2008 over 300 scientists and engineers from 30 countries spanning five continents converged at the historic La Fonda Hotel in the city of Santa Fe New Mexico USA to participate in the 12th International Conference on Martensitic Transformations ICOMAT 08 to fathom the peculiar world of certain crystalline materials that undergo structural change when cooled or stressed Many of these materials can restore their original shape when reheated thus the name Shape Memory Alloys In the spirit of Santa Fe a central theme of ICOMAT 08 was INTEGRATION across many dimensions

Pharmaceutical Crystals Tong Li, Alessandra Mattei, 2018-10-16 An important resource that puts the focus on understanding and handling of organic crystals in drug development Since a majority of pharmaceutical solid state materials are organic crystals their handling and processing are critical aspects of drug development Pharmaceutical Crystals Science and Engineering offers an introduction to and thorough coverage of organic crystals and explores the essential role they play in drug development and manufacturing Written contributions from leading researchers and practitioners in the field this vital resource provides the fundamental knowledge and explains the connection between pharmaceutically relevant properties and the structure of a crystal Comprehensive in scope the text covers a range of topics including crystallization molecular interactions polymorphism analytical methods processing and chemical stability The authors clearly show how to find solutions for pharmaceutical form selection and crystallization processes Designed to be an accessible guide this book represents a valuable resource for improving the drug development process of small drug molecules This important text Includes the most important aspects of solid state organic chemistry and its role in drug development Offers solutions for pharmaceutical form selection and crystallization processes Contains a balance between the scientific fundamental and pharmaceutical applications Presents coverage of crystallography molecular interactions polymorphism analytical methods processing and chemical stability Written for both practicing pharmaceutical scientists engineers and senior undergraduate and graduate students studying pharmaceutical solid state materials Pharmaceutical Crystals Science and Engineering is a reference and textbook for understanding producing analyzing and designing organic crystals which is an imperative skill to master for anyone working in the field

Physics Letters, 1998 General physics atomic physics molecular physics and solid state physics

Computational Design of Engineering Materials Yong Du, Rainer Schmid-Fetzer, Jincheng Wang, Shuhong Liu, Jianchuan Wang, Zhanpeng Jin, 2023-06-29 Introducing state of the art computational methods this book combines detailed explanations with real world case studies to give a full grounding in the design of engineering materials This book presents a wide spectrum of key computational methods such as CALPHAD method first principles calculations phase field simulation and finite element analysis covering the atomic meso macro scale range The reader will see these methods applied to case studies for steel light alloys superalloys cemented carbides hard coating and energy materials demonstrating in detail how real world materials are designed Online ancillary material includes input files for computational design software providing the reader with hands on

design experience Step by step instructions will allow you to perform and repeat the simulations discussed in the book Aimed at both graduate and undergraduate students as well as non specialist researchers in materials science and engineering including ceramics metallurgy and chemistry this is an ideal introductory and reference book **Hot Topics in Crystal Engineering** Kari Rissanen, 2021-08-24 Hot Topics in Crystal Engineering covers the design and synthesis of single crystalline solid state materials their properties and applications focusing on the understanding and use of intermolecular interactions that constitute single crystalline materials Many of the most modern materials such as metal organic frameworks MOFs capable of gas storage and separation and selective entrapment of harmful substances are the result of the rational use of crystal engineering Topics covered in this work highlight breakthroughs in this rapidly developing field This work offers a carefully chosen cross section of the latest developments some in their early infancy and some covered for the first time Provides comprehensive and authoritative articles giving readers access to a wealth of information to fully support their research and activities Covers the latest developments in crystal engineering including topics which are in their early infancy Written by leading international experts

Embracing the Tune of Expression: An Psychological Symphony within **Reversible Crystal Plasticity**

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