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REINA MYLA

Multiscale Materials Modeling for Nanomechanics Springer Science & Business Media
Self-Healing Polymer-Based Systems presents all aspects of self-healing polymeric materials, offering detailed information on fundamentals, preparation methods, technology, and applications, and drawing on the latest state-of-the-art research. The book begins by introducing self-healing polymeric systems, with a thorough explanation of underlying concepts, challenges, mechanisms, kinetic and thermodynamics, and types of chemistry involved. The second part of the book studies the main categories of self-healing polymeric material, examining elastomer-based, thermoplastic-based, and thermoset-based materials in turn. This is followed by a series of chapters that examine the very latest advances, including nanoparticles, coatings, shape memory, self-healing biomaterials, ionomers, supramolecular polymers, photoinduced and thermally induced self-healing, healing efficiency, life cycle analysis, and characterization. Finally, novel applications are presented and explained. This book serves as an essential resource for academic researchers, scientists, and graduate students in the areas of polymer properties, self-healing materials, polymer science, polymer chemistry, and materials science. In industry, this book contains highly valuable information for R&D professionals, designers, and engineers, who are looking to incorporate self-healing properties in their materials, products, or components. Provides comprehensive coverage of self-healing polymeric materials, covering principles, techniques, and applications Includes the very latest developments in the field, such as the role of nanofillers in healing, life cycle analysis of materials, and shape memory assisted healing Enables the reader to unlock the potential of self-healing polymeric materials for a range of advanced applications
Continuum Damage Mechanics of Materials and Structures Elsevier
The book is targeted at engineers, university lecturers, postgraduates, and final year undergraduate students involved in computational modelling and experimental and theoretical analysis of the high-temperature behavior of engineering structures. It will also be of interest to researchers developing the thermal strength theory as a branch of continuum mechanics. Thermal integrity is a multidisciplinary field combining the expertise of mechanical engineers, material scientists and applied mathematicians, each approaching the problem from their specific viewpoint. This monograph draws on the research of a broad scientific community including the author’s contribution. The scope of thermal strength analysis was considerably extended thanks to modern computers and the implementation of FEM codes. However, the author believes that some material models adopted in the advanced high-performance software, are not sufficiently justificated due to lack of easy-to-follow books on the theoretical and experimental aspects of thermal integrity. The author endeavors to provide a thorough yet sufficiently simple presentation of the underlying concepts, making the book compelling to a wide audience.
Elasto-Plastic Damage Behaviour of Concrete Elements Imperial College Press
This unique volume presents the state of the art in the field of multiscale modeling in solid mechanics, with particular emphasis on computational approaches. For the first time, contributions from both leading experts in the field and younger promising researchers are combined to give a comprehensive description of the recently proposed techniques and the engineering problems tackled using these techniques. The book begins with a detailed introduction to the theories on which different multiscale approaches are based, with regards to linear Homogenisation as well as various nonlinear approaches. It then presents advanced applications of multiscale approaches applied to nonlinear mechanical problems. Finally, the novel topic of materials with self-similar structure is discussed. Sample Chapter(s). Chapter 1: Computational Homogenisation for Non-Linear Heterogeneous Solids (808 KB). Contents: Computational Homogenisation for Non-Linear Heterogeneous Solids (V G Kouznetsova et al.); Two-Scale Asymptotic Homogenisation-Based Finite Element Analysis of Composite Materials (Q-Z Xiao & B L Karihaloo); Multi-Scale Boundary Element Modelling of Material Degradation and Fracture (G K Sfantos & M H Aliabadi); Non-Uniform Transformation Field Analysis: A Reduced Model for Multiscale Non-Linear Problems in Solid Mechanics (J-C Michel & P Suquet); Multiscale Approach for the Thermomechanical Analysis of Hierarchical Structures (M J Lefik et al.); Recent Advances in Masonry Modelling: Micro-Modelling and Homogenisation (P B Louren o); Mechanics of Materials with Self-Similar Hierarchical Microstructure (R C Picu & M A Soare). Readership: Researchers and academics in the field of heterogeneous materials and mechanical engineering; professionals in aeronautical engineering and materials science.
Non-Linear Fracture Academic Press
This book gives a unified presentation of the research performed in the field of multiscale modelling in sheet metal forming over the course of more than thirty years by the members of six teams from internationally acclaimed universities. The first chapter is devoted to the presentation of some recent phenomenological yield criteria (BBC 2005 and BBC 2008) developed at the CERTETA center from the Technical University of Cluj-Napoca. An overview on the crystallographic texture and plastic anisotropy is presented in Chapter 2. Chapter 3 is dedicated to multiscale modelling of plastic anisotropy. The authors describe a new hierarchical multi-scale framework that allows taking into account the evolution of plastic anisotropy during sheet forming processes. Chapter 4 is focused on modelling the evolution of voids in porous metals with applications to forming limit curves and ductile fracture.

The chapter details the steps needed for the development of dissipation functions and Gurson-type models for non-quadratic anisotropic plasticity criteria like BBC 2005 and those based on linear transformations. Chapter 5 describes advanced models for the prediction of forming limit curves developed by the authors. Chapter 6 is devoted to anisotropic damage in elasto-plastic materials with structural defects. Finally, Chapter 7 deals with modelling of the Portevin-Le Chatelier (PLC) effect. This volume contains contributions from leading researchers from the Technical University of Cluj-Napoca, Romania, the Catholic University of Leuven, Belgium, Clausthal University of Technology, Germany, Amirkabir University of Technology, Iran, the University of Bucharest, Romania, and the Institute of Mathematics of the Romanian Academy, Romania. It will prove useful to postgraduate students, researchers and engineers who are interested in the mechanical modeling and numerical simulation of sheet metal forming processes.

State of the Art and Future Trends in Material Modeling Springer

Constitutive Modeling of Engineering Materials provides an extensive theoretical overview of elastic, plastic, damage, and fracture models, giving readers the foundational knowledge needed to successfully apply them to and solve common engineering material problems. Particular attention is given to inverse analysis, parameter identification, and the numerical implementation of models with the finite element method. Application in practice is discussed in detail, showing examples of working computer programs for simple constitutive behaviors. Examples explore the important components of material modeling which form the building blocks of any complex constitutive behavior. Addresses complex behaviors in a wide range of materials, from polymers, to metals and shape memory alloys Covers constitutive models with both small and large deformations Provides detailed examples of computer implementations for material models

Advanced Materials Modelling for Structures Springer Science & Business Media

With its discussion of strategies for modeling complex materials using new numerical techniques, mainly those based on the finite element method, this monograph covers a range of topics including computational plasticity, multi-scale formulations, optimization and parameter identification, damage mechanics and nonlinear finite elements.

Constitutive Modeling of Engineering Materials Springer Science & Business Media

This book contains 14 invited contributions written by distinguished authors who participated in the VIII International Conference on Computational Plasticity held at CIMNE/UPC (www.cimne.com) from 5-8 September 2005, in Barcelona, Spain. The chapters present recent progress and future research directions in the field of computational plasticity.

Thermal Integrity in Mechanics and Engineering Elsevier

This book presents a liber amicorum dedicated to Wolfgang H. Müller, and highlights recent advances in Prof. Müller's major fields of research: continuum mechanics, generalized mechanics, thermodynamics, mechanochemistry, and geomechanics. Over 50 of Prof. Müller's friends and colleagues contributed to this book, which commemorates his 60th birthday and was published in recognition of his outstanding contributions.

Deformation and Failure in Metallic Materials Springer Science & Business Media

This volume presents the major outcome of the IUTAM symposium on "Advanced Materials Modeling for Structures". It discusses advances in high temperature materials research, and also to provides a discussion the new horizon of this fundamental field of applied mechanics. The topics cover a large domain of research but place a particular emphasis on multiscale approaches at several length scales applied to non linear and heterogeneous materials. Discussions of new approaches are emphasised from various related disciplines, including metal physics, micromechanics, mathematical and computational mechanics.

Inelastic Behaviour of Structures under Variable Repeated Loads Elsevier

Contains papers from the May 1996 Symposium on Applications of Continuum Damage Mechanics (CDM) to Fatigue and Fracture. Papers in Section I deal with various aspects of modeling damage in composite materials, such as high temperature environmental degradation, fatigue, and viscous damage in metal a

Metal Plasticity and Fatigue at High Temperature Springer Science & Business Media

This book presents the most important aspects of analysis of dynamical processes taking place on the human body surface. It provides an overview of the major devices that act as a prevention measure to boost a person's motivation for physical activity. A short overview of the most popular MEMS sensors for biomedical applications is given. The development and validation of a multi-level computational model that combines mathematical models of an accelerometer and reduced human body surface tissue is presented. Subsequently, results of finite element analysis are used together with experimental data to evaluate rheological properties of not only human skin but skeletal joints as well. Methodology of development of MOEMS displacement-pressure sensor and adaptation for real-time biological information monitoring, namely "ex vivo" and "in vitro" blood pulse type analysis, is described. Fundamental and conciliatory investigations, achieved knowledge and scientific experience about biologically adaptive multifunctional nanocomposite materials, their properties and synthesis compatibility, periodical microstructures, which may be used in various optical components for modern, productive sensors' formation technologies and their application in medicine, pharmacy industries and environmental monitoring, are presented and analyzed. This book also is aimed at research and development of vibrational energy harvester, which would convert ambient kinetic energy into electrical energy by means of the impact-type piezoelectric transducer. The book proposes possible prototypes of devices for non-invasive real-time artery pulse measurements and micro energy harvesting.

New Achievements in Continuum Mechanics and Thermodynamics Springer

Designed as a text for both the undergraduate and postgraduate students of civil, mechanical, aerospace, and marine engineering, this book provides an indepth analysis of the fundamental principles of mechanics of deformable solids based on the phenomenological approach. The book starts with linear and angular momentum principles for a body. It introduces the concepts of stress, strain and the constitutive relations using tensors. Then it goes on to give a description of the laws of thermodynamics as a restriction on constitutive relations and formulates the boundary value problem in elasticity. Besides, the text treats bar under axial, bending and torsional deformation as well as plane stress and plane strain idealizations. The book concludes with a discussion on variational mechanics and the theory of plasticity. DISTINGUISHING FEATURES l Elaborate treatment of constitutive relations for linear elasticity. l Consistent formulation of strength of materials approach and three-dimensional elasticity for bar under axial, bending and torsional

deformation. l Presentation of failure criteria and plasticity theory taking the modern developments into account. Large number of worked-out examples throughout the text and exercises at the end of each chapter.

Introduction to Unified Mechanics Theory with Applications Springer

This book is based on 40 years of research and teaching in the fields of fracture mechanics and plasticity. It will bring students and engineers from various disciplines up to date on key concepts that have become increasingly important in the design of safety-relevant engineering structures in general and in modern lightweight structures in the transportation industry in particular. Primarily intended for graduate students in the engineering sciences and practicing structural engineers, it employs a multidisciplinary approach that comprises theoretical concepts, numerical methods, and experimental techniques. In addition, it includes a wealth of analytical and numerical examples, used to illustrate the applications of the concepts discussed.

Anisotropic Behaviour of Damaged Materials MDPI

Elasto-Plastic Damage Behaviour of Concrete Elements presents the results of practical experiments with numerical analyses and case studies, along with a summary of basic theory, to provide an accessible explanation for young practising engineers on the performance evaluation of concrete structures. It shows how the mechanical phenomena of familiar concrete structures can be expressed using mathematical models and provides a solid basic understanding of the nonlinear behaviour of concrete structures. It applies elasto-plastic theory to damage mechanics and the modelling of cracks in concrete, drawing on the author’s 25 years of design and construction experience as a professional engineer, as well as recent research. Sets out the reality of damage mechanics in concrete Connects standard theory with good design and construction practice The book is suitable for structural design engineers and researchers.

Engineering Structures Under Extreme Conditions Cambridge University Press

This book presents various questions of continuum mechanical modeling in the context of experimental and numerical methods, in particular, multi-field problems that go beyond the standard models of continuum mechanics. In addition, it discusses dynamic problems and practical solutions in the field of numerical methods. It focuses on continuum mechanics, which is often overlooked in the traditional division of mechanics into statics, strength of materials and kinetics. The book is dedicated to Prof. Volker Ulbricht, who passed away on April 9, 2021.

Mechanics of Solid Materials ASTM International

This book deals with the safety assessment of structures and structural components, possibly operating beyond the elastic limits under variable repeated thermo-mechanical loads. Examples of such situations can be found both in mechanical and civil engineering (e.g. transportation technologies, pressure vessels, pipelines, offshore platforms, dams, pavements and buildings in seismic zones). So-called "direct” methods are focused, based on the shakedown theorems and their specialisation to limit theorems. These methods are receiving increased attention for the prediction of structural failure because they provide the information that is essential in practice (e.g. safety factor and collapse mechanisms) by more economical procedures than step-by-step inelastic analysis; also, they only need a minimum of information on the evolution of loads as functions of time. The addressed audience are primarily engineers and scientists active in Structural Engineering and Safety and Reliability Analysis.

Simulation of damage mechanisms in weave reinforced materials based on multiscale modeling John Wiley & Sons

This book presents a unique combination of chapters that together provide a practical introduction to multiscale modeling applied to nanoscale materials mechanics. The goal of this book is to present a balanced treatment of both the theory of the methodology, as well as some practical aspects of conducting the simulations and models. The first half of the book covers some fundamental modeling and simulation techniques ranging from ab-inito methods to the continuum scale. Included in this set of methods are several different concurrent multiscale methods for bridging time and length scales applicable to mechanics at the nanoscale regime. The second half of the book presents a range of case studies from a varied selection of research groups focusing either on a the application of multiscale modeling to a specific nanomaterial, or novel analysis techniques aimed at exploring nanomechanics. Readers are also directed to helpful sites and other resources throughout the book where the simulation codes and methodologies discussed herein can be accessed. Emphasis on the practicality of the detailed techniques is especially felt in the latter half of the book, which is dedicated to specific examples to study nanomechanics and multiscale materials behavior. An instructive avenue for learning how to effectively apply these simulation tools to solve nanomechanics problems is to study previous endeavors. Therefore, each chapter is written by a unique team of experts who have used multiscale materials modeling to solve a practical nanomechanics problem. These chapters provide an extensive picture of the multiscale materials landscape from problem statement through the final results and outlook, providing readers with a roadmap for incorporating these techniques into their own research.

Modeling High Temperature Materials Behavior for Structural Analysis Springer

This monograph presents approaches to characterize inelastic behavior of materials and structures at high temperature. Starting from experimental observations, it discusses basic features of inelastic phenomena including creep, plasticity, relaxation, low cycle and thermal fatigue. The authors formulate constitutive equations to describe the inelastic response for the given states of stress and microstructure. They introduce evolution equations to capture hardening, recovery, softening, ageing and damage processes. Principles of continuum mechanics and thermodynamics are presented to provide a framework for the modeling materials behavior with the aim of structural analysis of high-temperature engineering components.

Multiscale Modeling in Solid Mechanics Springer Nature

Provides a short survey of recent advances in the mathematical modelling of the mechanical behavior of anisotropic solids under creep conditions, including principles, methods, and applications of tensor functions. Some examples for practical use are discussed, as well as experiments by the author to test the validity of the modelling. The monograph offers an overview of other experimental investigations in creep mechanics. Rules for specifying irreducible sets of tensor invariants, scalar coefficients in constitutive and evolutional equations, and tensorial interpolation methods are also explained

Multiscale Modelling in Sheet Metal Forming PHI Learning Pvt. Ltd.

This book deals with the most recent numerical modeling of adhesive joints. Advances in damage mechanics and extended finite element method are described in the context of the Finite Element method with examples of

application. The book also introduces the classical continuum mechanics and fracture mechanics approach and discusses the boundary element method and the finite difference method with indication of the cases they are most adapted to. At the moment there a no numerical technique that can solve any problem and the analyst needs to be aware of the limitations involved in each case.