

1. Record Nr.	UNINA9910789345903321
Autore	Chen Xiaohong
Titolo	Fracture mechanics of electromagnetic materials [[electronic resource]] : nonlinear field theory and applications / / Xiaohong Chen, Yiu-Wing Mai
Pubbl/distr/stampa	London, : Imperial College Press Singapore ; ; Hackensack, NJ, : Distributed by World Scientific, c2013
ISBN	1-283-85062-1 1-84816-664-8
Descrizione fisica	1 online resource (326 p.)
Altri autori (Persone)	MaiY. W. <1946->
Disciplina	620.1/126 620.1126
Soggetti	Fracture mechanics - Mathematics Nonlinear theories Magnetic materials - Fracture
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references (p. 276-298) and index.
Nota di contenuto	Foreword; Preface; Contents; List of Tables; List of Figures; Chapter 1: Fundamentals of Fracture Mechanics; 1.1 Historical Perspective; 1.2 Stress Intensity Factors (SIF); 1.3 Energy Release Rate (ERR); 1.4 J-Integral; 1.5 Dynamic Fracture; 1.6 Viscoelastic Fracture; 1.7 Essential Work of Fracture (EWF); 1.8 Configuration Force (Material Force) Method; 1.9 Cohesive Zone and Virtual Internal Bond Models; Chapter 2 : Elements of Electrodynamics of Continua; 2.1 Notations; 2.1.1 Eulerian and Lagrangian descriptions; 2.1.2 Electromagnetic field; 2.1.3 Electromagnetic body force and couple 2.1.4 Electromagnetic stress tensor and momentum vector 2.1.5 Electromagnetic power; 2.1.6 Poynting theorem; 2.2 Maxwell Equations; 2.3 Balance Equations of Mass, Momentum, Moment of Momentum, and Energy; 2.4 Constitutive Relations; 2.5 Linearized Theory; Chapter 3 : Introduction to Thermoviscoelasticity; 3.1 Thermoelasticity; 3.2 Viscoelasticity; 3.3 Coupled Theory of Thermoviscoelasticity; 3.3.1 Fundamental principles of thermodynamics; 3.3.2 Formulation based on Helmholtz free energy functional; 3.3.3 Formulation based on Gibbs

free energy functional

3.4 Thermoviscoelastic Boundary-Initial Value Problems
Chapter 4 : Overview on Fracture of Electromagnetic Materials; 4.1 Introduction; 4.2 Basic Field Equations; 4.3 General Solution Procedures; 4.4 Debates on Crack-Face Boundary Conditions; 4.5 Fracture Criteria; 4.5.1 Field intensity factors; 4.5.2 Path-independent integral; 4.5.3 Mechanical strain energy release rate; 4.5.4 Global and local energy release rates; 4.6 Experimental Observations; 4.6.1 Indentation test; 4.6.2 Compact tension test; 4.6.3 Bending test; 4.7 Nonlinear Studies; 4.7.1 Electrostriction/magnetostriction
4.7.2 Polarization/magnetization saturation
4.7.3 Domain switching; 4.7.4 Domain wall motion; 4.8 Status and Prospects; Chapter 5 : Crack Driving Force in Electro-Thermo-Elastodynamic Fracture; 5.1 Introduction; 5.2 Fundamental Principles of Thermodynamics; 5.3 Energy Flux and Dynamic Contour Integral; 5.4 Dynamic Energy Release Rate Serving as Crack Driving Force; 5.5 Configuration Force and Energy-Momentum Tensor; 5.6 Coupled Electromechanical Jump/Boundary Conditions; 5.7 Asymptotic Near-Tip Field Solution; 5.8 Remarks
Chapter 6 : Dynamic Fracture Mechanics of Magneto-Electro-Thermo-Elastic Solids
6.1 Introduction; 6.2 Thermodynamic Formulation of Fully Coupled Dynamic Framework; 6.2.1 Field equations and jump conditions; 6.2.2 Dynamic energy release rate; 6.2.3 Invariant integral; 6.3 Stroh-Type Formalism for Steady-State Crack Propagation under Coupled Magneto-Electro-Mechanical Jump/Boundary Conditions; 6.3.1 Generalized plane crack problem; 6.3.2 Steady-state solution; 6.3.3 Path-independent integral for steady crack growth; 6.4 Magneto-Electro-Elastostatic Crack Problem as a Special Case; 6.5 Summary
Chapter 7 : Dynamic Crack Propagation in Magneto-Electro-Elastic Solids

Sommario/riassunto

Fracture Mechanics of Electromagnetic Materials provides a comprehensive overview of fracture mechanics of conservative and dissipative materials, as well as a general formulation of nonlinear field theory of fracture mechanics and a rigorous treatment of dynamic crack problems involving coupled magnetic, electric, thermal and mechanical field quantities. Thorough emphasis is placed on the physical interpretation of fundamental concepts, development of theoretical models and exploration of their applications to fracture characterization in the presence of magneto-electro-thermo-mechanical coupl
