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Shallow Crack Fracture Mechanics

Toughness Tests and Applications
Springer Science & Business Media
Fracture Mechanics: Fundamentals and Applications, Fourth Edition is the most useful and comprehensive guide to fracture mechanics available. It has been adopted by more than 150 universities worldwide and used by thousands of engineers and researchers. This new edition reflects the latest research, industry practices, applications, and computational analysis and modeling. It encompasses theory and applications, linear and nonlinear fracture mechanics, solid mechanics, and materials science with a unified, balanced, and in-depth approach. Numerous chapter problems have been added or revised, and additional resources are available for those teaching college courses or training sessions. Dr. Anderson's own website can be accessed at www.FractureMechanics.com.

Modern Applied Fracture Mechanics
ASTM International
The book offers detailed treatment on fundamental concepts of fracture mechanics. The text is useful for undergraduate students, graduate students and researchers.

Fundamentals of Fracture Mechanics
Wiley
Within the last decade there has been an increasing awareness that use of standards deeply notched fracture mechanics test specimens can result in substantial over-or-under-assessments of the real fracture toughness associated with shallow surface cracks.

Weight Functions and Stress Intensity

Factor Solutions CRC Press
This textbook consists primarily of notes by Iain Finnie who taught a popular course on fracture mechanics at the University of California at Berkeley. It presents a comprehensive and detailed exposition of fracture, the fundamentals of fracture mechanics and procedures for the safe design of engineering components made from metal alloys, brittle materials like glasses and ceramics, and composites. Interesting and practical problems are listed at the end of most chapters to give the student practice in applying the theory. A solutions manual is provided to the instructor. The text presents a unified perspective of fracture with a strong fundamental foundation and practical applications. In addition to its role as a text, this reference would be invaluable for the practicing engineer who is involved in the design and evaluation of components that are fracture critical. This book also: Presents details of derivations of the basic equations of fracture mechanics and the historical context of the development of fracture theory and methodology Treats linear and nonlinear fracture mechanics methodologies beginning with a review of the basic equations of solid mechanics followed by solutions useful in fracture prediction Illustrates the basis of linear elastic fracture mechanics (LEFM), practical applications of LEFM in the design of fracture-tolerant structural components Offers interesting, practical, classroom proven problems at the end of most chapters Includes instructor's

solutions manual

Dynamic Fracture Springer Science & Business Media

This paper presents a numerical procedure for the computation of stress intensity factors, which are used in linear fracture mechanics. The procedure is based on a conventional finite element stress analysis and thus can be carried out with any of the many standard programs that are available. A particular feature of this method is that orthotropic materials and non-zero angle notches present no extra difficulties. Computed results are presented in the paper for: (i) Centre, edge and double edge cracks in a rectangular plate; (ii) multiple cracks in a rectangular plate; (iii) right angle notched plates. The accuracy of these results is expected to be better than +5%.

Fracture Mechanics ASTM International

This book deals with the mechanics and physics of fractures at various scales. Based on advanced continuum mechanics of heterogeneous media, it develops a rigorous mathematical framework for single macrocrack problems as well as for the effective properties of microcracked materials. In both cases, two geometrical models of cracks are examined and discussed: the idealized representation of the crack as two parallel faces (the Griffith crack model), and the representation of a crack as a flat elliptic or ellipsoidal cavity (the Eshelby inhomogeneity problem). The book is composed of two parts: The first part deals with solutions to 2D and 3D problems involving a single crack in

linear elasticity. Elementary solutions of cracks problems in the different modes are fully worked. Various mathematical techniques are presented, including Neuber-Papkovitch displacement potentials, complex analysis with conformal mapping and Eshelby-based solutions. The second part is devoted to continuum micromechanics approaches of microcracked materials in relation to methods and results presented in the first part. Various estimates and bounds of the effective elastic properties are presented. They are considered for the formulation and application of continuum micromechanics-based damage models.

Fracture Mechanics CRC Press

The proceedings of the 23rd National Symposium on Fracture Mechanics, held in College Station, Texas, June 1991, present a broad overview of the current state of the art in fracture mechanics research. Following the Swerdlow Lecture (Structural Problems in Search of Fracture Mechanics Solutions by

Deformation and Fracture Mechanics of Engineering Materials Woodhead Publishing

This bestselling text/reference provides a comprehensive treatment of the fundamentals of fracture mechanics. It presents theoretical background as well as practical applications, and it integrates materials science with solid mechanics. In the Second Edition, about 30% of the material has been updated and expanded; new technology is discussed, and feedback from users of the first edition has been incorporated.

Fracture Mechanics Springer Science

& Business Media
This book presents, in a unified manner, a variety of topics in Continuum and Fracture Mechanics: energy methods, conservation laws, mathematical methods to solve two-dimensional and three-dimensional crack problems. Moreover, a series of new subjects is presented in a straightforward manner, accessible to under-graduate students. Emphasizing physical or experimental back-grounds, then analysis and theoretical results, this monograph is intended for use by students and researchers in solid mechanics, mechanical engineering and applied mathematics.
Fracture Mechanics Springer
This book is about the use of fracture mechanics for the solution of practical problems; academic rigor is not at issue and dealt with only in as far as it improves insight and understanding; it often concerns secondary errors in engineering. Knowledge of (ignorance of) such basic input as loads and stresses in practical cases may cause errors far overshadowing those introduced by shortcomings of fracture mechanics and necessary approximations; this is amply demonstrated in the text. I have presented more than three dozen 40-hour courses on fracture mechanics and damage tolerance analysis, so that I have probably more experience in teaching the subject than anyone else. I learned more than the students, and became cognizant of difficulties and of the real concerns in applications. In particular I found, how a subject should

be explained to appeal to the practicing engineer to demonstrate that his practical problem can indeed be solved with engineering methods. This experience is reflected in the presenta tions in this book. Sufficient background is provided for an understanding of the issues, but pragamatism prevails. Mathematics cannot be avoided, but they are presented in a way that appeals to insight and intuition, in lieu of formal derivations which would show but the mathematical skill of the writer.

Fracture Mechanics CRC Press

The International Conference on Fracture Mechanics Technology Applied to Material Evaluation and Structure Design was held in Melbourne, Australia, from August 10 to 13, 1982. It was sponsored jointly by the Australian Fracture Group and Institute of Fracture and Solid Mechanics at Lehigh University. Pro fessor G. C. Sih of Lehigh University, Drs. N. E. Ryan and R. Jones of Aeronau tical Research Laboratories served as Co-Chairmen. They initiated the organiza tion of this international event to provide an opportunity for the practitioners, engineers and interested individuals to present and discuss recent advances in the evaluation of material and structure damage originating from defects or cracks. Particular emphases were placed on applying the fracture mechanics tech nology for assessing interactions between material properties, design and opera tional requirements. It is timely to hold such a Conference in Australia as she embarks on technology extensive industries where safeguarding structures

from pre mature and unexpected failure is essential from both the technical and economical points. view The application of system-type approach to failure control owes much of its success to fracture mechanics. It is now generally accepted that the discipline, when properly implemented, provides a sound engineering basis for accounting in teractions between material properties, design, fabrication, inspection and op erational requirements. The approach offers effective solutions for design and maintenance of large-scale energy generation plants, mining machineries, oil ex ploration and retrieval equipments, land, sea and air transport vehicles.

Fracture Mechanics Springer Science & Business Media

This book is aimed at those in both industry and academic institutions who require a grounding not only in the basic principles of this important field but also in the practical aspects of evaluating fracture mechanics parameters.

Fatigue and Fracture Mechanics of High Risk Parts CRC Press

On Fracture Mechanics A major objective of engineering design is the determination of the geometry and dimensions of machine or structural elements and the selection of material in such a way that the elements perform their operating function in an efficient, safe and economic manner. For this reason the results of stress analysis are coupled with an appropriate failure criterion. Traditional failure criteria based on maximum stress, strain or energy density cannot adequately

explain many structural failures that occurred at stress levels considerably lower than the ultimate strength of the material. On the other hand, experiments performed by Griffith in 1921 on glass fibers led to the conclusion that the strength of real materials is much smaller, typically by two orders of magnitude, than the theoretical strength. The discipline of fracture mechanics has been created in an effort to explain these phenomena. It is based on the realistic assumption that all materials contain crack-like defects from which failure initiates. Defects can exist in a material due to its composition, as second-phase particles, debonds in composites, etc. , they can be introduced into a structure during fabrication, as welds, or can be created during the service life of a component like fatigue, environment-assisted or creep cracks. Fracture mechanics studies the loading-bearing capacity of structures in the presence of initial defects. A dominant crack is usually assumed to exist.

Solutions Manual for Fracture Mechanics
Springer Science & Business Media

In the preliminary stage of designing new structural hardware that must perform a given mission in a fluctuating load environment, there are several factors the designers should consider. Trade studies for different design configurations should be performed and, based on strength and weight considerations, among others, an optimum configuration selected. The selected design must be able to

withstand the environment in question without failure. Therefore, a comprehen sive structural analysis that consists of static, dynamic, fatigue, and fracture is necessary to ensure the integrity of the structure. During the past few decades, fracture mechanics has become a necessary discipline for the solution of many structural problems. These problems include the prevention of failures resulting from preexisting cracks in the parent material, welds or that develop under cyclic loading environment during the life of the structure. The importance of fatigue and fracture in nuclear, pressure vessel, aircraft, and aerospace structural hardware cannot be overemphasized where safety is of utmost concern. This book is written for the designer and strength analyst, as well as for the material and process engineer who is concerned with the integrity of the structural hardware under load-varying environments in which fatigue and frac ture must be given special attention. The book is a result of years of both acade mic and industrial experiences that the principal author and co-authors have accumulated through their work with aircraft and aerospace structures.

Micromechanics of Fracture and Damage Springer Nature

Fracture mechanics is an indispensible tool in the design and safe operation of damage tolerant structures. One of the essential elements in fracture mechanics based analysis is the stress intensity factor. This book provides a powerful theoretical background to the weight

function method in fracture mechanics and numerous stress intensity factors. Part I gives a theoretical background and overview of the weight function method. Part II provides further details of the weight functions for various geometries and a large number of stress intensity factor solutions. Part II deals with the determination of crack opening displacements, Dugdale model solutions and crack opening areas.

Fundamentals of Fracture Mechanics - Solutions Manual Springer Science & Business Media

In the preliminary stage of designing new structural hardware to perform a given mission in a fluctuating load environment, there are several factors that the designer should consider. Trade studies for different design configurations should be performed and, based on strength and weight considerations, among others, an optimum configuration selected. The selected design must withstand the environment in question without failure. Therefore, a comprehensive structural analysis that consists of static, dynamic, fatigue, and fracture is necessary to ensure the integrity of the structure. Engineers must also consider the feasibility of fabricating the structural hardware in the material selection process. During the past few decades, fracture mechanics has become a necessary discipline for the solution of many structural problems in which the survivability of structure containing pre-existing flaws is of great interest. These problems include structural failures

resulting from cracks that are inherent in the material, or defects that are introduced in the part due to improper handling or rough machining, that must be assessed through fracture mechanics concepts.

Fracture Mechanics of Metals, Composites, Welds, and Bolted Joints

ASTM International

"Analytical Fracture Mechanics should prove to be a valuable resource to both the new student and the experienced researcher in fracture mechanics. It is recommended." — Applied Mechanics Review One of the central concerns of engineering is the failure of materials. Addressing this concern, fracture mechanics — an interdisciplinary subject spanning mechanical, civil, and materials engineering, applied mathematics, and physics — predicts the conditions under which such failure will occur due to crack growth. This valuable self-contained text by an expert in the field supplements standard fracture mechanics texts by focusing on analytical methods for determining crack-tip stress and strain fields. Following a comprehensive 120-page introduction — which provides all the background necessary for understanding the remaining chapters — the book is organized around a series of elastoplastic and hydrogen-assisted crack-tip problems and their solutions. The first chapter presents the only proven solution technique for the second order nonlinear partial differential equation governing a mode I elastoplastic crack problem. Other

chapters deal with plastic zone transitions, environmental cracking, and small-scale yielding versus exact linear elastic solutions. One of the excellent features of this book is the clarity with which groups of problems are presented and related to each other. Another is the careful attention it gives to the various modes of fracture (I, II, and III) and to showing the circumstances under which information from a solution for one mode may be used to infer information in another mode. For this edition, the author has added a new appendix, "Stress Across an Elastoplastic Boundary of a Mode I Crack: Parabolic to Hyperbolic Plasticity Transition."

Fracture Mechanics ASTM International

From a leading expert in fracture mechanics, this text provides new approaches and new applications to advance the understanding of crack formation and propagation.

Fracture Mechanics Cambridge University Press

Modern Applied Fracture Mechanics presents a practical, accessible guide to understanding and applying basic linear elastic fracture mechanics (LEFM) techniques to problems commonly seen in industry, including fatigue analysis, failure analysis, and damage tolerance. Including applications for several software programs, AFGROW, MATLAB®, ABAQUS, and a web-based FM calculator, the book discusses appropriate models, assumptions, and typical input/output parameters. It provides a framework that will enable readers to quickly learn and use fracture mechanics (FM) software

packages and/or write their own code to solve unique or standard FM problems. The book covers the fundamental concepts needed to successfully execute routine applications or conduct experimental investigations. End-of-chapter problems are included, along with real-world examples to enhance student understanding. The textbook is appropriate for undergraduate students, preparing them for the industry, and for advanced studies in fracture mechanics at the graduate level. Industry professionals and researchers will find this book a valuable resource for understanding basic fracture mechanics principles and methods. Features include: Provides broad, accessible coverage of common fracture mechanics concepts and applications. Focuses on applications, real-world examples, and numerical methods in fracture analysis. Integrates and explains current end-user software coverage for fracture mechanics. Includes numerous sample problems, software examples, and end-of-chapter problems. Includes a Solutions Manual for adopting instructors.

Analytical Fracture Mechanics Pergamon

Dynamic fracture in solids has attracted much attention for over a century from engineers as well as physicists due both to its technological interest and to inherent scientific curiosity. Rapidly applied loads are encountered in a number of technical applications. In some cases such loads might be applied deliberately, as for example in problems of blasting, mining, and comminution or

fragmentation; in other cases, such dynamic loads might arise from accidental conditions. Regardless of the origin of the rapid loading, it is necessary to understand the mechanisms and mechanics of fracture under dynamic loading conditions in order to design suitable procedures for assessing the susceptibility to fracture. Quite apart from its repercussions in the area of structural integrity, fundamental scientific curiosity has continued to play a large role in engendering interest in dynamic fracture problems In-depth coverage of the mechanics, experimental methods, practical applications Summary of material response of different materials Discussion of unresolved issues in dynamic fracture