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Fracture mechanics is the study of the influence of loading, crack size, and structural geometry on the fracture resistance of materials containing natural flaws and cracks.

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The topic is first introduced based on the concept of... | Find, read and cite all the research you need on ResearchGate. Chapter. Fracture Mechanics. January 2016; DOI: 10.1007/978-981-287-865-6_5.

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Abstract Most design engineers are tasked to design against failure, and one of the biggest causes of product failure is failure of the material due to fatigue/fracture. From leading experts in...

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The two fracture mechanics parameters were compared and there was good agreement between the J-integral fracture initiation toughness, JIC, and the specific essential fracture work, W_{le} .

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This fracture mechanism forms the basis of an analysis of experimental data on the deformational response of concrete under various states of triaxial stress, and has led to a comprehensive...

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The development of the singularity approach of fracture mechanics is at its dead end because it is not possible to describe real failure at the crack boundary and to replace the real failure criteria by general energy conditions and the method remains empirical. Therefore the theoretical approach based on the elliptical flat crack has to be followed, leading to the possibility to derive and explain the empirical mixed mode I-II interaction equation. Because it is shown that the singularity approach does not apply for wood, the theory is based on the flat elliptical crack. This new book examines a new fracture mechanics theory of wood. Further discussed: the derivation of the power-law; the energy method of notched beams and of joints loaded perpendicular to the grain; the necessary rejection of the applied crack growth models and fictitious crack models and the Weibull size effect in fracture mechanics.

As the shift from the Metal Age progresses, materials engineers and materials scientists seek new analytical and design methods to create stronger and more reliable materials. Based on extensive research and developmental work done at the author's multi-disciplinary material laboratory, this graduate-level and professional reference addresses the relationship between fracture mechanisms (macroscale) and the microscopic, with the goal of explaining macroscopic fracture behavior based on a microscopic fracture mechanism. A careful fusion of mechanics and materials science, this text and monograph systematically considers an array of materials, from metals through ceramics and polymers, and demonstrates lab-tested

strategies to develop desirable high-temperature materials for technological applications.

Application of Fracture Mechanics to Polymers, Adhesives and Composites

Critical distance methods are extremely useful for predicting fracture and fatigue in engineering components. They also represent an important development in the theory of fracture mechanics. Despite being in use for over fifty years in some fields, there has never been a book about these methods – until now. So why now? Because the increasing use of computer-aided stress analysis (by FEA and other techniques) has made these methods extremely easy to use in practical situations. This in turn has prompted researchers to re-examine the underlying theory with renewed interest. The Theory of Critical Distances begins with a general introduction to the phenomena of mechanical failure in materials: a basic understanding of solid mechanics and materials engineering is assumed, though appropriate introductory references are provided where necessary. After a simple explanation of how to use critical distance methods, and a more detailed exposition of the methods including their history and classification, the book continues by showing examples of how critical distance approaches can be applied to predict fracture and fatigue in different classes of materials. Subsequent chapters include some more complex theoretical areas, such as multiaxial loading and contact problems, and a range of practical examples using case studies of real engineering components taken from the author's own consultancy work. The Theory of Critical Distances will be of interest to a range of readers, from academic researchers concerned with the theoretical basis of the subject, to industrial engineers who wish to

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incorporate the method into modern computer-aided design and analysis. Comprehensive collection of published data, plus new data from the author's own laboratories A simple 'how-to-do-it' exposition of the method, plus examples and case studies Detailed theoretical treatment Covers all classes of materials: metals, polymers, ceramics and composites Includes fracture, fatigue, fretting, size effects and multiaxial loading

This multiauthor volume provides a useful summary of current knowledge on the application of fracture mechanics to composite materials. It has been written to fill the gap between the literature on fundamental principles of fracture mechanics and the special publications on the fracture properties of conventional materials, such as metals, polymers and ceramics. The data are represented in the form of about 420 figures (including diagrams, schematics and photographs) and 80 tables. The author index covers more than 500 references, and the subject index more than 1000 key words.

Portland cement concrete is a relatively brittle material. As a result, mechanical behavior of concrete, conventionally reinforced concrete, prestressed concrete, and fiber reinforced concrete is critically influenced by crack propagation. It is, thus, not surprising that attempts are being made to apply the concepts of fracture mechanics to quantify the resistance to cracking in cementitious composites. The field of fracture mechanics originated in the 1920's with A. A. Griffith's work on fracture of brittle materials such as glass. Its most significant applications, however, have been for controlling brittle fracture and fatigue failure of metallic structures such as pressure vessels, airplanes, ships and pipe lines. Considerable development

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has occurred in the last twenty years in modifying Griffith's ideas or in proposing new concepts to account for the ductility typical of metals. As a result of these efforts, standard testing techniques have been available to obtain fracture parameters for metals, and design based on these parameters are included in relevant specifications. Many attempts have been made, in the last two decades or so, to apply the fracture mechanics concepts to cement, mortar, con crete and reinforced concrete. So far, these attempts have not led to a unique set of material parameters which can quantify the resistance of these cementitious composites to fracture. No standard testing methods and a generally accepted theoretical analysis are established for concrete as they are for metals.

Presenting original results from both theoretical and numerical viewpoints, this text offers a detailed discussion of the variational approach to brittle fracture. This approach views crack growth as the result of a competition between bulk and surface energy, treating crack evolution from its initiation all the way to the failure of a sample. The authors model crack initiation, crack path, and crack extension for arbitrary geometries and loads.

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