Tensile Fracturing In Rocks

Decoding **Tensile Fracturing In Rocks**: Revealing the Captivating Potential of Verbal Expression

In a time characterized by interconnectedness and an insatiable thirst for knowledge, the captivating potential of verbal expression has emerged as a formidable force. Its ability to evoke sentiments, stimulate introspection, and incite profound transformations is genuinely awe-inspiring. Within the pages of "**Tensile Fracturing In Rocks**," a mesmerizing literary creation penned with a celebrated wordsmith, readers embark on an enlightening odyssey, unraveling the intricate significance of language and its enduring effect on our lives. In this appraisal, we shall explore the book is central themes, evaluate its distinctive writing style, and gauge its pervasive influence on the hearts and minds of its readership.

Fundamentals of Rock Mechanics J. C. Jaeger 1979-11-29
Tensile Fracturing in Rocks Dov Bahat 2005-12-05 ‘Tensile Fracturing in Rocks’ presents field observations on fracturing of sedim- tary rocks and granite outcrops from various provinces in three continents. It also combines results of recent experiments conducted at different laboratories around the world with current theories on fracturing. In treating faults, this book limits itself to faults that are associated with joint sets produced by definable causes and occasi- ally to cases where

interaction between the two types of fracture – faults and joints – is not clear. The book's subject matter is divided over six chapters, which are briefly described below. Chapter 1 summarizes current key concepts in fracture physics. It starts with a pr- entation of the elastic theory of fracture, and concentrates on the results of linear el- tic fracture mechanics. The chapter touches also upon other fracture properties, e.g., crack nucleation, dynamic fracturing and slow fracturing processes. Nucleation is - dressed by statistical mechanics methods incorporating modern approaches of th- mal and fiber bundle processes. The analyses of dynamic fracturing and slow fract- ing focus on the differences, as compared to the linear elastic approach. The cont- versy in interpreting experimental dynamic results is highlighted, as are the surface morphology patterns that emerge in fracturing and the non-Griffith crack extension criterion in very slow fracturing processes.

Fracture of Concrete and Rock Surendra P. Shah 2012-12-06 The International Conference on Fracture of Concrete and Rock was organized by the Society for Experimental Mechanics (SEM) subdivision on Fracture of Concrete and Rock and RILEM Committee 89-FMT Fracture MechanicS of Concrete; Test Methods. The venue was Houston, Texas on June 17-19, 1987 and cooperation was provided by ACI 446, Fracture Mechanics and RILEM 90-FHA Fracture Mechanics of Concrete; Applications. The conference co-chai rmen were Professor S. P. Shah, Northwestern Uni versity and Professor S. E. Swartz, Kansas State University with the able assistance of Professor K. P. Chong, University of Wyoming. The conference theme was Fracture Mechanics Applications to Cracking and Fracture of Concrete (plain or reinforced) and Rock Subjected to Uniaxial or Complex Stress States with Static- or Dynamic-Loading Rates. This theme was chosen in recognition of parallel efforts between the rock

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mechanics community and researchers working in the application of fracture mechanics methods to the problem of cracking and fracture of concrete.

Studies in Rock Fracture John Handin 1969 The study is to evaluate the influence of residual elastic strain on the orientations of tensile and shear fractures in rock. As a first step the three-dimensional state of residual elastic strain was measured by X-ray diffractometry in each of three quartzose sandstones. A prediction was then made concerning the orientations of fractures that would be induced in each rock by loading normal to bedding. The prediction was based upon a knowledge of the prestrain, the applied loads, the maximum tensile stress and Coulomb-Mohr criteria. Each prediction was then tested by experimentally fracturing the rocks. (Author).

Size Effect in Tensile Fracture of Concrete and Rock M. R. A. Van Vliet 2000

Fracturing Processes and Induced Seismicity Due to the Hydraulic Fracturing of Rocks Bruno Miguel Gonçalves da Silva 2016 Hydraulic fracturing is a method used routinely in oil and gas exploitation and in engineered geothermal systems. While used frequently, there are aspects of hydraulic fracturing, such as the propagation of the newly-created fractures and interaction between natural and newly-created fractures, which are not well understood. Since data from field hydraulic stimulations may be difficult to obtain and interpret, laboratory testing and numerical modeling play a major role in understanding the hydraulically fracturing processes. A test setup was developed to simultaneously apply a vertical stress to rock specimens and a hydraulic pressure to pre-cut flaws with various geometries, leading to the initiation and propagation of new cracks. The test setup allowed one to obtain high-resolution and high-speed video images of the hydraulic fracturing processes and to monitor acoustic emissions in

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Barre granite specimens subjected to constant vertical stresses of 0 or 5 MPa. The imaging data were used to determine the mechanisms of development of the visible fractures produced during the tests. The acoustic emission data were used to estimate the mechanisms responsible for the development of micro-cracks. In order to understand the fracturing behavior of the hydraulically loaded rock specimens, particularly the effect of the ratio between the water pressure applied in the flaws (WP) and the vertical load applied to the specimen (VL), a finite element analysis was performed using the same loading conditions of the experiments. The experiments showed that most visible cracks observed were tensile and that the patterns of the hydraulic fractures produced were strongly dependent on the vertical load applied. They also showed that the water pressure necessary to propagate fractures is dependent on the vertical load and on the flaw geometry. The numerical analysis showed that the ratio WP/VL plays a crucial role in the magnitude and shape of the stress field around a flaw tip, and therefore in the location of tensile and shear fracture initiation. The study of micro-seismic events indicated that tensile and shear micro-cracks frequently developed before visible tensile cracks in the tests with no and 5 MPa of vertical load, respectively. The results presented improve the knowledge of the physical processes involved in the hydraulic fracturing of rocks.

Rock Mechanics Leopold Müller 2014-05-04 Much of the research on fracture of rocks or rock-like materials conducted over the past two decades may be considered as "academic studies" of the general phenomenon of fracture. Yet, the understanding of this phenomenon is fundamental if a material is used in any engineering design, whether the aim is to prevent failure of the structure or to promote it. Fracture theories existing are generally empirical and derived from experimental results of laboratory test with simple boundary

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conditions. Because of the basic weakness of rock intension and because in general the environmental stresses in rock mechanics are compressive most of these theories consider fracture under compressive stress conditions. The Coulomb-Navier-, the Mohr-, the Griffith and the McClintock and Walsh criteria are typical examples and will be considered in the following. In addition the tendency during the past was in making accurate experiments under conditions of homogeneous stresses. To obtain information about the fracture behaviour with unequal principal stresses systems have to be used which involve inhomogeneous stresses. This case is of particular interest, since in practical rock mechanics we may expect conditions of highly inhomogeneous stresses. However, a consideration of such situations involve additional assumptions like the applicability of the theory of elasticity for calculating the stress field, which may be open to question. A distinction has to be made between fracture initiation and fracture propagation, since a detailed observation of the total fracture process in rock was possible by means of "stiff" and "servo-controlled" loading systems.

Rock Fractures and Fluid Flow National Research Council 1996-08-27 Scientific understanding of fluid flow in rock fracturesâ€"a process underlying contemporary earth science problems from the search for petroleum to the controversy over nuclear waste storageâ€"has grown significantly in the past 20 years. This volume presents a comprehensive report on the state of the field, with an interdisciplinary viewpoint, case studies of fracture sites, illustrations, conclusions, and research recommendations. The book addresses these questions: How can fractures that are significant hydraulic conductors be identified, located, and characterized? How do flow and transport occur in fracture systems? How can changes in fracture systems be predicted and controlled?

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Among other topics, the committee provides a geomechanical understanding of fracture formation, reviews methods for detecting subsurface fractures, and looks at the use of hydraulic and tracer tests to investigate fluid flow. The volume examines the state of conceptual and mathematical modeling, and it provides a useful framework for understanding the complexity of fracture changes that occur during fluid pumping and other engineering practices. With a practical and multidisciplinary outlook, this volume will be welcomed by geologists, petroleum geologists, geoengineers, geophysicists, hydrologists, researchers, educators and students in these fields, and public officials involved in geological projects.

Progress Report : Fracturing of Heterogeneous Rocks. Topic A: Determining Tensile Strength and Tensile Elastic Moduli Under Confining Pressure with a Four-point Beam Device Zeev Reches 1993

Dynamic Tensile Fracture in Rock D. E. Grady 1978

A Laboratory Study of Fluid-driven Tensile Fracturing in Anisotropic Rocks Stephan Gehne 2018

Rock Joints Georg Mandl 2005-12-06 Rock Joints deals exclusively with the mechanical genesis of joints in rocks. It is aimed at a coherent, critical and comprehensible presentation of the underlying mechanical processes of various types of joints and joint systems. Special care is taken to elucidate and quantify the role of high fluid pressures in the formation of joints. The background is an offshoot of the author's courses on "Genesis of Rock Joints" in the Department of Rock Mechanics and Tunneling at the Technical University of Graz, Austria.

Rock Fractures in Geological Processes Agust Gudmundsson 2011-04-28 Rock fractures control many of Earth's dynamic processes, including plate-boundary development, tectonic earthquakes, volcanic eruptions, and fluid

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transport in the crust. An understanding of rock fractures is also essential for effective exploitation of natural resources such as ground water, geothermal water, and petroleum. This book combines results from fracture mechanics, materials science, rock mechanics, structural geology, hydrogeology, and fluid mechanics to explore and explain fracture processes and fluid transport in the crust. Basic concepts are developed from first principles and illustrated with worked examples linking models of geological processes to real field observations and measurements. Many additional examples and exercises are provided online, allowing readers to practise formulating and quantitative testing of models. Rock Fractures in Geological Processes is designed for courses at the advanced undergraduate and graduate level but also forms a vital resource for researchers and industry professionals concerned with fractures and fluid transport in the Earth's crust.

Experimental Rock Deformation - The Brittle Field M. S. Paterson 2013-03-09 This monograph deals with the part of the field of ex-' perimental rock deformation that is dominated by the phenomena of brittle fracture on one scale or another. Thus a distinction has been drawn between the fields of brittle und ductile behaviour in rock, corresponding more or less to a distinction between the phenomena of fracture and flow. It is hoped eventually to present a survey of the ductile field in a separate volume. The last chapter of this volume deals with the transition between the two fields. The scope of this survey has been limited to the mec.hanical properties of rock viewed as a material on the laboratory scale. Thus, the topic and approach is of a "materials science" kind rather than of a "structures" kind. We are dealing with only one part of the wider field of rock mechanics, which also includes structural or boundary value problems, for example, those of the stability of slopes, the collapse of mine openings, earth quakes, the folding of stratified rock, and the

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convec tive motion of the earth's mantle. One topic thus ex cluded is the role of jointing, which it is commonly necessary to take into account in applications in engi neering and mining, and probably often in geology too.

Brittle Failure of Rock Materials G.E. Andreev 1995-01-01 This text comprises different basic aspects of brittle failure for rocks. It considers classical and contemporary models, as well as failure patterns under different loading schemes.

Rock Fracture Mechanics H.P. Rossmanith 2014-05-04

Progress Report, Ze'ev Reches 1997

The Fracture of Rocks J. L. Bles 1986

Tectonofractography Dov Bahat 2012-12-06 " ... he who repeats a thing in the name of him who said it brings deliverance to the world ... " Mishnah, Sayings of the Fathers 6; 6 Main Objectives The present book intends to fulfill a number of purposes, which are arranged under the following scheme: 1. A topical review of main subjects in fractography, that branch of science which analyses fracture surface morphology and related features and their causes and mechanisms in technological materials. Among the materials that bear significant affinities to rock are in organic glass, ceramics, metals and polymer glass. 2. A historical review of the main studies published to date on rock fractography. In both these fields of review, one is confronted by the similarities between small-scale (micro metre) and large-scale (tens of metres) fracture surface morphologies. The similarities, on the one hand, and the differences on the other must surely promote further development of fractographical approaches in structural geology, where extrapola tion from microfractography to large-scale fractography is virtually a directive. As geologists become more familiar with the fractography of rocks, they undoubtedly will become aware of the great power of this descriptive discipline as a tool, in both qualitative and quantitative analysis. Rock

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fractography must yet be routinely applied in the structural analysis of rock formations in which fracture morphology is sufficiently prominent or extensive.

Physical Geology Steven Earle 2016-08-12 This is a discount Black and white version. Some images may be unclear, please see BCCampus website for the digital version.This book was born out of a 2014 meeting of earth science educators representing most of the universities and colleges in British Columbia, and nurtured by a widely shared frustration that many students are not thriving in courses because textbooks have become too expensive for them to buy. But the real inspiration comes from a fascination for the spectacular geology of western Canada and the many decades that the author spent exploring this region along with colleagues, students, family, and friends. My goal has been to provide an accessible and comprehensive guide to the important topics of geology, richly illustrated with examples from western Canada. Although this text is intended to complement a typical first-year course in physical geology, its contents could be applied to numerous other related courses.

Modelling Rock Fracturing Processes Baotang Shen 2013-10-07 This text book provides the theoretical background of rock fracture mechanics and displacement discontinuity methods used for the modelling of geomechanical problems. The computer program FRACOD is used to analyse the fracture problems, assessing fracture initiation and propagation in tension (Mode I), shear (Mode II) and mixed mode I and II of solid intact or jointed geomaterials. The book also presents the fundamentals of thermo-mechanical coupling and hydro-mechanical coupling. Formulations of multiple regional mechanical, thermal and hydraulic functions, which allow analyses of fracture mechanics problems for structures made of brittle, rock-like materials, are provided. In addition, instructive examples of

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code verification and applications are presented. Additional material: The 2-D version of the FRACOD program, a manual on the program and a wealth of verification examples of classical problems in physics, mechanics and hydromechanics are available at http://extras.springer.com. A large number of applications related to civil, mining, petroleum and environmental engineering are also included. - The first textbook available on modelling of rock fracture propagation - Introduces readers to the fundamentals of rock fracturing - Uses a modern style of teaching with theory, mathematical modelling and applications in one package - The basic version of the FRACOD software, manual, verification examples and applications are available as additional material - The FRACOD program and manual enable the readers to solve fracture propagation problems on their own ---------- Ki-Bok Min, Department of Energy Resources Engineering, College of Engineering, Seoul National University, Korea “Challenging rock engineering applications require extreme conditions of stress, temperature and hydraulic pressure resulting in rock fracturing to a various extent. The FRACOD is one of few computer codes available in engineering rock mechanics that can simulate the initiation and propagation of fractures often interacting with natural fractures. Its capability has been significantly enhanced to include the hydraulic and thermal fracturing with concerted interaction from multi-national research and industry partners. My experience with the FRACOD is very positive and I am certain that its already-excellent track record will expand further in the future."

Folds and Tensile Fractures in Stratified Rocks Günther Kampfer 2011-05 Folds and Tensile Fractures in Stratified Rocks This work tries to contribute to the development of quantitative tools for an objective interpretation, based on mechanical equilibrium and material strength of folds, which can be potential oil reservoirs.

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Furthermore, the objective is to improve the prediction of fracture distributions in layered sequences, which control the permeability. Experiments, analytical and numerical results are presented on the onset and evolution of folds and fractures, which happens at different scales. Analogue experiments, conducted in the Shell-Laboratory in Rijswijk, The Netherlands are discussed. The outcomes are compared with results obtained by a theoretical study. A geometrical imperfection and activation of bed parallel slip is shown to be essential for the creation of folds to be more likely compared to other failure modes (thrusting, compaction bands). Interfacial properties in a multilayered setting are also affecting the fracture spacing. Saturation is linked to the delamination of the interface between the layer and its foundation. At last, a new experimental device for the study of bending fractures is introduced.

Engineering Behaviour of Rocks I.W. Farmer 2012-12-06 The first edition of this book was received more kindly than it deserved by some, and with some scepticism by others. It set out to present a simple, concise and reasonably comprehensive introduction to some of the theoretical and empirical criteria which may be used to define rock as a structural material. The objectives - reinforced by the change in title - remain the same, but the approach has been changed considerably and only one or two sections have been retained from the first edition. The particular aim in this edition is to provide a description of the mechanical behaviour of rocks, based firmly upon experimental data, which can be used to explain how rocks deform, fracture and yield, and to show how this knowledge can be used in design. The major emphasis is on the behaviour of rocks as materials, although in the later chapters the behaviour of discontinuities in rocks, and the way in of rock masses, is considered. which this can affect the behaviour If this edition is an improvement on the first edition it reflects the

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debt lowe to numerous people who have attempted to explain the rudiments of the subject to me. I should like to thank Peter Attewell and Roy Scott in particular. I should also like to thank Tony Price and Mike Gilbert whose work at Newcastle I have used shamelessly.

Dynamic Tensile Fracture in Rock D. E. Grady 1978

Adaptive Analysis of Damage and Fracture in Rock with Multiphysical Fields Coupling Yongliang Wang 2020-08-31 This book mainly focuses on the adaptive analysis of damage and fracture in rock, taking into account multiphysical fields coupling (thermal, hydro, mechanical, and chemical fields). This type of coupling is a crucial aspect in practical engineering for e.g. coal mining, oil and gas exploration, and civil engineering. However, understanding the influencing mechanisms and preventing the disasters resulting from damage and fracture evolution in rocks require high-precision and reliable solutions. This book proposes adaptive numerical algorithms and simulation analysis methods that offer significant advantages in terms of accuracy and reliability. It helps readers understand these innovative methods quickly and easily. The content consists of: (1) a finite element algorithm for modeling the continuum damage evolution in rocks, (2) adaptive finite element analysis for continuum damage evolution and determining the wellbore stability of transversely isotropic rock, (3) an adaptive finite element algorithm for damage detection in non-uniform Euler–Bernoulli beams with multiple cracks, using natural frequencies, (4) adaptive finite element–discrete element analysis for determining multistage hydrofracturing in naturally fractured reservoirs, (5) adaptive finite element–discrete element analysis for multistage supercritical CO2 fracturing and microseismic modeling, and (6) an adaptive finite element–discrete element–finite volume

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algorithm for 3D multiscale propagation of hydraulic fracture networks, taking into account hydro-mechanical coupling. Given its scope, the book offers a valuable reference guide for researchers, postgraduates and undergraduates majoring in engineering mechanics, mining engineering, geotechnical engineering, and geological engineering.

Flow and Fracture of Rocks H. C. Heard 1972 Published by the American Geophysical Union as part of the Geophysical Monograph Series, Volume 16 (The Griggs Volume). David Tressel Griggs was born October 6, 1911, in Columbus, Ohio. His parents were Robert Fiske and Laura Amelia Tressel Griggs. His father was a widely known professor of botany and a leading ecologist and environmental conservationist at a time when these viewpoints were less familiar than they are today. David was an undergraduate at Ohio State University in 1930 when he participated in a National Geographic Society expedition, led by his father, to the Valley of Ten Thousand Smokes. This Alaskan experience and the encouragement he received from a gifted and enthusiastic teacher, Professor Edmund M. Spieker, led him to choose for his life work the application of physics to the problems of the earth. After a year of graduate studies in geology at Ohio State, David moved on in 1933 to Harvard, where a new progTam of high-pressure studies devoted to geophysical problems had just been initiated under the inspired guidance of Percy W. Bridgman, pre-eminent leader in the experimental exploration of the physics of very high pressures and in the philosophical analysis of the logical processes of scientific thinking.

Rock Stress and Its Measurement B. Amadei 2012-12-06 Rock masses are initially stressed in their current in situ state of stress and to a lesser natural state. Whether one is interested in the extent on the monitoring of stress change. formation of geological structures (folds, faults, The subject of paleostresses is only briefly

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intrusions, etc.), the stability of artificial struc discussed. tures (tunnels, caverns, mines, surface excava The last 30 years have seen a major advance our knowledge and understanding of rock tions, etc.), or the stability of boreholes, a in the in situ or virgin stress field, stress. A large body of data is now available on knowledge of along with other rock mass properties, is the state of stress in the near surface of the needed in order to predict the response of rock Earth's crust (upper 3-4km of the crust). masses to the disturbance associated with those Various theories have been proposed regarding structures. Stress in rock is usually described the origin of in situ stresses and how gravity, within the context of continuum mechanics. It is tectonics, erosion, lateral straining, rock fabric, defined at a point and is represented by a glaciation and deglaciation, topography, curva second-order Cartesian tensor with six compo ture of the Earth and other active geological nents. Because of its definition, rock stress is an features and processes contribute to the current enigmatic and fictitious quantity creating chal in situ stress field.

Fracture Mechanics of Rock Barry Kean Atkinson 2015-05-11 The analysis of crack problems through fracture mechanics has been applied to the study of materials such as glass, metals and ceramics because relatively simple fracture criteria describe the failure of these materials. The increased attention paid to experimental rock fracture mechanics has led to major contributions to the solving of geophysical problems. The text presents a concise treatment of the physics and mathematics of a representative selection of problems from areas such as earthquake mechanics and prediction, hydraulic fracturing, hot dry rock geothermal energy, fault mechanics, and dynamic fragmentation.

Characterization, Modeling, Monitoring, and Remediation of Fractured Rock National Academies of Sciences, Engineering, and

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Medicine 2020-12-29 Fractured rock is the host or foundation for innumerable engineered structures related to energy, water, waste, and transportation. Characterizing, modeling, and monitoring fractured rock sites is critical to the functioning of those infrastructure, as well as to optimizing resource recovery and contaminant management. Characterization, Modeling, Monitoring, and Remediation of Fractured Rock examines the state of practice and state of art in the characterization of fractured rock and the chemical and biological processes related to subsurface contaminant fate and transport. This report examines new developments, knowledge, and approaches to engineering at fractured rock sites since the publication of the 1996 National Research Council report Rock Fractures and Fluid Flow: Contemporary Understanding and Fluid Flow. Fundamental understanding of the physical nature of fractured rock has changed little since 1996, but many new characterization tools have been developed, and there is now greater appreciation for the importance of chemical and biological processes that can occur in the fractured rock environment. The findings of Characterization, Modeling, Monitoring, and Remediation of Fractured Rock can be applied to all types of engineered infrastructure, but especially to engineered repositories for buried or stored waste and to fractured rock sites that have been contaminated as a result of past disposal or other practices. The recommendations of this report are intended to help the practitioner, researcher, and decision maker take a more interdisciplinary approach to engineering in the fractured rock environment. This report describes how existing tools-some only recently developed-can be used to increase the accuracy and reliability of engineering design and management given the interacting forces of nature. With an interdisciplinary approach, it is possible to conceptualize and model the fractured rock environment with acceptable levels of uncertainty and reliability,

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and to design systems that maximize remediation and long-term performance. Better scientific understanding could inform regulations, policies, and implementation guidelines related to infrastructure development and operations. The recommendations for research and applications to enhance practice of this book make it a valuable resource for students and practitioners in this field.

Rock Failure Mechanisms Chun'An Tang 2010-08-06 When dealing with rock in civil engineering, mining engineering and other engineering, the process by which the rock fails under load should be understood, so that safe structures can be built on and in the rock. However, there are many ways for loading rock and rock can have a variety of idiosyncracies. This reference book provides engineers and researchers with the essential knowledge for a clear understanding of the process of rock failure under different conditions. It contains an introductory chapter explaining the role of rock failure in engineering projects plus a summary of the theories governing rock failure and an explanation of the computer simulation method. It subsquently deals in detail with explaining, simulating and illustrating rock failure in laboratory and field. The concluding chapter discusses coupled modelling and the anticipated future directions for this type of computer simulation. An appendix describing the RFPA numerical model (Rock Failure Process Analysis program) is also included. About the Authors Chun'an Tang has a PhD in Mining Engineering and is a Professor at the School of Civil & Hydraulic Engineering at Dalian University of Technology in China. He is an advisor for design and stablity problem modelling in mining and civil rock engineeringand and Chairman of the China National Group of the International Society for Rock Mechanics. John Hudson is emeritus professor at Imperial College, London and is active as an independant consultant for Rock Engineering Consultants. He has a PhD in

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Rock Mechanics and completed over a 130 rock engineering consulting assignments in mining and civil engineering. He is a fellow at the Royal Academy of Engineering in the UK and President of the International Society for Rock Mechanics.

Dynamic Tensile Fracture in Rock Vilem Petr 1996

Electrohydraulic Fracturing of Rocks Christian La Borderie 2016-02-10 This book presents a new fracturing technique that should be considered as a potential alternative, or a companion technique, to hydraulic fracturing of tight gas reservoirs and low permeability rock masses. As opposed to hydraulic fracturing which generates a few numbers of large cracks, electro-hydraulic fracturing induces diffuse micro-cracking and fragmentation of rocks. Laboratory tests demonstrate that increases of permeability by two orders of magnitude can be reached, without major cracking in tested specimens. This book discusses the principles of this new technique, reports experiments which have been developed is order to prove the concept and finally describes the numerical model from which the potentialities of this technique in representative reservoir conditions can be assessed.

Fracture Mechanics of Concrete Surendra P. Shah 1995-09-28 FRACTURE MECHANICS OF CONCRETE AND ROCK This book offers engineers a unique opportunity to learn, frominternationally recognized leaders in their field, about the latesttheoretical advances in fracture mechanics in concrete, reinforcedconcrete structures, and rock. At the same time, it functions as asuperb, graduate-level introduction to fracture mechanics conceptsand analytical techniques. Reviews, in depth, the basic theory behind fracture mechanics * Covers the application of fracture mechanics to compressionfailure, creep, fatigue, torsion, and other advanced topics * Extremely well researched, applies experimental evidence ofdamage to a wide range of design cases *

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Supplies all relevant formulas for stress intensity * Covers state-of-the-art linear elastic fracture mechanics (LEFM)techniques for analyzing deformations and cracking * Describes nonlinear fracture mechanics (NLFM) and the latestRILEM modeling techniques for testing nonlinear quasi-brittlematerials * And much more Over the past few years, researchers employing techniques borrowedfrom fracture mechanics have made many groundbreaking discoveriesconcerning the causes and effects of cracking, damage, andfractures of plain and reinforced concrete structures and rock.This, in turn, has resulted in the further development andrefinement of fracture mechanics concepts and tools. Yet, despitethe field's growth and the growing conviction that fracturemechanics is indispensable to an understanding of material andstructural failure, there continues to be a surprising shortage oftextbooks and professional references on the subject. Written by two of the foremost names in the field, FractureMechanics of Concrete fills that gap. The most comprehensive bookever written on the subject, it consolidates the latest theoreticalresearch from around the world in a single reference that can beused by students and professionals alike. Fracture Mechanics of Concrete is divided into two sections. In thefirst, the authors lay the necessary groundwork with an in-depthreview of fundamental principles. In the second section, theauthors vividly demonstrate how fracture mechanics has beensuccessfully applied to failures occurring in a wide array ofdesign cases. Key topics covered in these sections include: * State-of-the-art linear elastic fracture mechanics (LEFM)techniques for analyzing deformations and cracking * Nonlinear fracture mechanics (NLFM) and the latest RILEM modelingtechniques for testing nonlinear quasi-brittle materials * The use of R-Curves to describe cracking and fracture inquasi-brittle materials * The application of fracture mechanics to compression failure,creep, fatigue,

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torsion, and other advanced topics The most timely, comprehensive, and authoritative book on thesubject currently available, Fracture Mechanics of Concrete is botha complete instructional tool for academics and students instructural and geotechnical engineering courses, and anindispensable working resource for practicing engineers.

Porous Rock Fracture Mechanics Amir Shojaei 2017-05-05 Porous Rock Failure Mechanics: Hydraulic Fracturing, Drilling and Structural Engineering focuses on the fracture mechanics of porous rocks and modern simulation techniques for progressive quasi-static and dynamic fractures. The topics covered in this volume include a wide range of academic and industrial applications, including petroleum, mining, and civil engineering. Chapters focus on advanced topics in the field of rock's fracture mechanics and address theoretical concepts, experimental characterization, numerical simulation techniques, and their applications as appropriate. Each chapter reflects the current state-of-the-art in terms of the modern use of fracture simulation in industrial and academic sectors. Some of the major contributions in this volume include, but are not limited to: anisotropic elasto-plastic deformation mechanisms in fluid saturated porous rocks, dynamics of fluids transport in fractured rocks and simulation techniques, fracture mechanics and simulation techniques in porous rocks, fluid-structure interaction in hydraulic driven fractures, advanced numerical techniques for simulation of progressive fracture, including multiscale modeling, and micromechanical approaches for porous rocks, and quasi-static versus dynamic fractures in porous rocks. This book will serve as an important resource for petroleum, geomechanics, drilling and structural engineers, R&D managers in industry and academia. Includes a strong editorial team and quality experts as chapter authors Presents topics identified for individual chapters are

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current, relevant, and interesting Focuses on advanced topics, such as fluid coupled fractures, rock's continuum damage mechanics, and multiscale modeling Provides a 'one-stop' advanced-level reference for a graduate course focusing on rock's mechanics

Modelling Rock Fracturing Processes Baotang Shen 2020-05-06 This book is the second edition of the well-known textbook Modelling Rock Fracturing Processes. The new and extended edition provides the theoretical background of rock fracture mechanics used for modelling of 2-D and 3-D geomechanics problems and processes. Fundamentals of rock fracture mechanics integrated with experimental studies of rock fracturing processes are highlighted. The computer programs FRACOD 2D and 3D are used to analyse fracture initiation and propagation for the three fracture modes: Mode I, II and III. Coupled fracture modelling with other continuous and distinct element codes including FLAC, PFC, RFPA, TOUGH are also described. A series of applications of fracture modelling with importance for modern society is presented and discussed by distinguished rock fracture modelling experts.

A Study of Rock Fracture Induced by Dynamic Tensile Stress and Its Applications to Fracture Mechanics Somsakdi Sriruang 1972

Geologic Fracture Mechanics Richard A. Schultz 2019-08-08 Introduction to geologic fracture mechanics covering geologic structural discontinuities from theoretical and field-based perspectives.

Rock Fracture and Blasting Zong-Xian Zhang 2016-04-26 Rock Fracture and Blasting: Theory and Applications provides the latest on stress waves, shock waves, and rock fracture, all necessary components that must be critically analyzed to maximize results in rock blasting. The positioning of charges and their capacity and sequencing are covered in this book, and must be carefully modeled to minimize impact in the surrounding environment. Through an

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explanation of these topics, author Professor Zhang's experience in the field, and his theoretical knowledge, users will find a thorough guide that is not only up-to-date, but complete with a unique perspective on the field. Includes a rigorous exposition of Stress Waves and Shock Waves, as well as Rock Fracture and Fragmentation Provides both Empirical and Hybrid Stress Blasting Modeling tools and techniques for designing effective blast plans Offers advanced knowledge that enables users to choose better blast techniques Includes exercises for learning and training in each chapter

Hydraulic Fracturing and Rock Mechanics Yu Zhao 2023-06-21 This open access book is the first to consider the effect of non-uniform fluid pressure in hydraulic fractures. The book covers the key topics in the process of hydraulic fracture nucleation, growth, interaction and fracture network formation. Laboratory experiments and theoretical modeling are combined to elucidate the formation mechanism of complex fracture networks. This book is suitable for master's/Ph.D. students, scientists and engineers majoring in rock mechanics and petroleum engineering who need to use a more reliable model to predict fracture behavior.

Fundamentals of Rock Mechanics John Conrad Jaeger 2009-03-12 Widely regarded as the most authoritative and comprehensive book inits field, the fourth edition of Fundamentals of RockMechanics includes new and substantially updated chapters tothis highly praised text. Extensively updated throughout, this new edition containssubstantially expanded chapters on poroelasticity, wavepropogation, and subsurface stresses Features entirely new chapters on rock fractures andmicromechanical models of rock behaviour Discusses fundamental concepts such as stress and strain Offers a thorough introduction to the subject before expertlydelving into a fundamental, self-contained discussion of specifictopics

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