Stress Corrosion Cracking Theory And Practice Woodhead Publishing Series In Metals And Surface Engineering

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Stress Corrosion Cracking John Wiley & Sons
This report deals with the stress-corrosion cracking of aluminum alloys, and it represents an effort by DMIC to expand on the information contained in DMIC Memorandum 202, 'Stress-Corrosion Cracking of Aluminum Alloys', dated February 15, 1965. DMIC Report 228 begins by presenting a comprehensive definition of stress-corrosion cracking. This is followed by sections dealing with (1) the historical development and growth in awareness of the problem, (2) the mechanisms involved, and (3) the theory of stress-corrosion cracking. A section on experimental techniques is presented. These techniques include test methods used to determine the susceptibility of alloys to stress-corrosion cracking, as well as more refined methods of studying the fundamental mechanisms of the problem. Different evaluation methods, applicable to obtaining the different objectives of stress-corrosion testing, are also presented. All of the foregoing serve as background to the sections on stress-corrosion-cracking behavior of aluminum alloys and preventive measures. (Author).
Theory manual for the copper corrosion model for stress corrosion cracking of used fuel disposal containers CCM-SCC.0 Woodhead Publishing
Explains why pipeline stress corrosion cracking happens and how it can be prevented Pipelines sit at the heart of the global economy. When they are in good working order, they deliver fuel to meet the ever-growing demand for energy around the world. When they fail due to stress corrosion cracking, they can wreak environmental havoc. This book skillfully explains the fundamental science and engineering of pipeline stress corrosion cracking based on the latest research findings and actual case histories. The author explains how and why pipelines fall prey to stress corrosion cracking and then offers tested and proven strategies for preventing, detecting, and monitoring it in order to prevent pipeline failure. Stress Corrosion Cracking of Pipelines begins with a brief introduction and then explores general principals of stress corrosion cracking, including two detailed case studies of pipeline failure. Next, the author covers: Near-neutral pH stress corrosion cracking of pipelines High pH stress corrosion cracking of pipelines Stress corrosion cracking of pipelines in acidic soil environments Stress corrosion cracking at pipeline welds Stress corrosion cracking of high-strength pipeline steels The final chapter is dedicated to effective management and mitigation of pipeline stress corrosion cracking. Throughout the book, the author develops a number of theoretical models and concepts based on advanced microscopic electrochemical measurements to help readers better understand the occurrence of stress corrosion cracking. By examining all aspects of pipeline stress corrosion cracking—the causes, mechanisms, and management strategies—this book enables engineers to construct better pipelines and then maintain and monitor them to ensure safe, reliable energy supplies for the world.
Atomistics of Fracture CRC Press
The susceptibility of six stainless steels to stress corrosion has been determined by exposing self-stressed specimens indoors and outdoors at ambient temperatures and also at 550 F (56l K). The salt-coated stainless steels were resistant to stress corrosion cracking at 550 F (56l K) for exposures from 4000 to 10,000 hours. Specimens of AM-350 DA and AM-367 stainless steel were found to be very susceptible to stress-corrosion cracking with exposures less than 5000 hours in both the indoor (with a salt coating) and outdoor (with and without a salt coating) environments, while the AM-350 CRT, AISI 501, PH l5-7 Mo, and PH 14-8 Mo displayed excellent resistance. In general, the stainless steels with higher austenite contents appeared to have better resistance to the corrosive effects of salt, both at rooni temperature and at 550 F (56l K).
Stress Corrosion Cracking of Pipelines Woodhead Publishing
Stress corrosion cracking is a major problem in light water nuclear reactors, whether pressurised water reactors (PWRs) or boiling water reactors (BWRs). The nuclear industry needs to be able to predict the service life of these power plants and develop appropriate maintenance and repair practices to ensure safe long term operation. This important book sums up key recent research on corrosion in light water reactors and its practical applications. The book is divided into four parts. It begins with an overview of materials degradation due to stress corrosion, corrosion potential monitoring and passivation. Part two summarises research on susceptibility of materials to stress corrosion cracking and the ways it can be initiated. The third part of the book considers stress corrosion crack propagation processes whilst the final part includes practical case studies of corrosion in particular plants. The book reviews corrosion in a range of materials such as low alloy steels, stainless steels and nickel-based alloys. With its distinguished editor and team of contributors, Corrosion issues in light water reactors is a standard work for the nuclear industry. Summarises key recent research on corrosion in light water reactors Includes practical case studies
Stress, Corrosion Cracking and Embrittlement Trans Tech Publications Ltd
It is now more than 100 years since certain detrimental effects on the ductility of iron were first associated with the presence of hydrogen. Not only is hydrogen embrittlement still a major industri al problem, but it is safe to say that in a mechanistic sense we still do not know what hydrogen (but not nitrogen or oxygen, for example) does on an atomic scale to induce this degradation. The same applies to other examples of environmentally-induced fracture: what is it about the ubiquitous chloride ion that induces premature catastrophic fracture (stress corrosion cracking) of ordinarily ductile austenitic stainless steels? Why, moreover, are halide ions troublesome but the nitrate or sulfate anions not deleterious to such stainless steels? Likewise, why are some solid metals embrit tled catastrophically by same liquid metals (liquid metal embrit tlement) - copper and aluminum, for example, are embrittled by liquid mercury. In short, despite all that we may know about the materials science and mechanics of fracture on a macroscopic scale, we know little about the atomistics of fracture in the absence of environmental interactions and even less when embrittlement phe nomena such as those described above are involved. On the other hand, it is interesting to note that physical chemists and surface chemists also have interests in the same kinds of interactions that occur on an atomic scale when metals such as nickel or platinum are used, for example, as catalysts for chemical reactions.
Environmental and Metallurgical Factors of Stress-corrosion Cracking in High-strength Steels Elsevier
The second edition serves as a go-to reference on the complex subject of stress corrosion cracking (SCC), offering information to help metallurgists, materials scientists, and designers determine whether SCC will be an issue for their design or applications; and for the failure analyst to help determine if SCC played a role in a failure under investigation. Research conducted over the last 20 years warranted new coverage on crack tip chemistry analysis and modeling, SCC of low strength steels in alcohol, SCC in new high strength steels, new data in SCC of stainless steels and nickel-based alloys, SCC of copper alloys in potable water, and hydrogen induced cracking of aluminium alloys. Additional case studies and a section on high strength low alloy steels were added. An appendix of relevant standards pertaining to SCC is also included. The book details the many conditions under which SCC can occur, the parameters which control SCC, and methodologies for mitigating and testing for SCC, plus information on the mechanism of SCC with experimental data on

a variety of materials. It contains information about the environmental, mechanical, microstructural and chemical aspects of SCC to help predict and prevent component failure. Chapters include coverage of SCC in these materials: carbon, and low-alloy steels; high-strength steels; stainless steels; nickle-base alloys; copper alloys; magnesium alloys; titanium alloys; zirconium alloys; uranium alloys; amorphous alloys; and glasses and ceramics.

Stress-corrosion Cracking, Materials Performance and Evaluation Springer Science & Business Media

The problem of stress corrosion cracking (SCC), which causes sudden failure of metals and other materials subjected to stress in corrosive environment(s), has a significant impact on a number of sectors including the oil and gas industries and nuclear power production. Stress corrosion cracking reviews the fundamentals of the phenomenon as well as examining stress corrosion behaviour in specific materials and particular industries. The book is divided into four parts. Part one covers the mechanisms of SCC and hydrogen embrittlement, while the focus of part two is on methods of testing for SCC in metals. Chapters in part three each review the phenomenon with reference to a specific material, with a variety of metals, alloys and composites discussed, including steels, titanium alloys and polymer composites. In part four, the effect of SCC in various industries is examined, with chapters covering subjects such as aerospace engineering, nuclear reactors, utilities and pipelines. With its distinguished editors and international team of contributors, Stress corrosion cracking is an essential reference for engineers and designers working with metals, alloys and polymers, and will be an invaluable tool for any industries in which metallic components are exposed to tension, corrosive environments at ambient and high temperatures.

Stress-corrosion Cracking ASM International(OH)

Details the many conditions under which stress-corrosion cracking (SCC) can occur, the parameters which control SCC, and the methodologies for mitigating and testing for SCC, plus information on mechanisms of SCC with experimental data on a variety of materials. Contains information about environmen

Stress-corrosion Cracking in High Strength Steels and in Titanium and Aluminum Alloys ASTM International

For more then one century it has been observed that stress corrosion cracking (SCC) and corrosion fatigue (CF) corresponds to synergetic effects between corrosion and mechanics. Researchers and engineers have tried to translate such effects through empirical damage laws, in particular to predict crack velocities in metallic materials for the nuclear, aeronautical and chemical industries. Nevertheless the precise nature of these synergetic effects is still difficult to determine and quantify, mainly because of the localization of the damage events. One of the objective of the current publication is to review in details what is known about these deleterious synergetic effects which lead to SCC and CF. The matter of the book clearly corresponds to an interdisciplinary field. Bases in materials science, corrosion, theory of dislocations and chemistry of surfaces are supposed to be known, even if some elements will be briefly introduced.

Some Electrochemical Considerations in Stress Corrosion Cracking Woodhead Publishing

Called "a useful contribution to the current litereture on corrosion science, engineering, and technology" by Corrosion Review, this book offers real-world applications and problem-solving techniques to reduce the occurrence of pits, cracks, and deterioration in industrial, automotive, marine, and electronic structures. It details the electrochemic

Guidelines for Preventing Stress Corrosion Cracking in the Chemical Process Industries Woodhead Publishing

Stress Corrosion Cracking of Nickel Based Alloys in Water-Cooled Nuclear Reactors: The Coriou Effect presents the latest information on brittle failure of metals in corrosive chemical environments under the influence of tensile stresses. Nickel alloys are more resistant to SCC as well as high temperatures and have been widely used in more challenging environments such as nuclear power plants. However, these alloys can suffer SCC under certain conditions, resulting in component failure. A key figure in understanding the mechanisms of SCC in nickel alloys in water-cooled nuclear reactors is Henri Coriou of the CEA, France’s leading center for nuclear research. This book assesses his work in the context of the latest research on SCC in nickel alloys in nuclear power plants. Up-to-date reviews of recent research findings from leading experts in the field Authoritative and comprehensively reviewed by the Working Party 4 on Nuclear Corrosion Showcases the excellent quality and technical accomplishments of Henri Coriou and CEA

Stress Corrosion Cracking of Metals-A State of the Art Butterworth-Heinemann

This new second edition serves as a go-to reference on the complex subject of stress corrosion cracking (SCC), offering information to help metallurgists, materials scientists, and designers determine whether SCC will be an issue for their design or application; and for the failure analyst to help determine if SCC played a role in a failure under investigation.

Hydrogen Embrittlement and Stress Corrosion Cracking John Wiley & Sons

Steel Corrosion Induced Concrete Cracking presents the latest advances in the origin, mechanism and development of corrosion-induced cracking in concrete. It investigates topics including expansion coefficient and elastic modulus of steel corrosion, rust layer and rust distribution, spatial distribution of corrosion products, the shape of corrosion-induced cracks and so on. This book concludes by proposing an improved corrosion-induced cracking model, which considers the phenomena of the simultaneous occurrence of corrosion layer accumulation and corrosion filling in concrete. This book will be a valuable reference book for researchers and graduate students in the field of concrete durability and concrete structure, and industry engineers who are concerned with the deterioration mechanisms and the life cycle of reinforced concrete structures. Proposes a new corrosion-induced concrete cracking model, which takes into account the phenomenon of the simultaneous occurrence of corrosion layer accumulation and corrosion filling paste. Investigates the parameters and values of expansion coefficients and elastic modulus of steel corrosion, which enables a more rational prediction of concrete surface cracking Introduces the use of the Gaussian function to describe the non-uniform spatial distribution of corrosion products.

Stress Corrosion Cracking of Pipelines ASTM International

Explains why pipeline stress corrosion cracking happens and how it can be prevented Pipelines sit at the heart of the global economy. When they are in good working order, they deliver fuel to meet the ever-growing demand for energy around the world. When they fail due to stress corrosion cracking, they can wreak environmental havoc. This book skillfully explains the fundamental science and engineering of pipeline stress corrosion cracking based on the latest research findings and actual case histories. The author explains how and why pipelines fall prey to stress corrosion cracking and then offers tested and proven strategies for preventing, detecting, and monitoring it in order to prevent pipeline failure. Stress Corrosion Cracking of Pipelines begins with a brief introduction and then explores general principals of stress corrosion cracking, including two detailed case studies of pipeline failure. Next, the author covers: Near-neutral pH stress corrosion cracking of pipelines High pH stress corrosion cracking of pipelines Stress corrosion cracking of pipelines in acidic soil environments Stress corrosion cracking at pipeline welds Stress corrosion cracking of high-strength pipeline steels The final chapter is dedicated to effective management and mitigation of pipeline stress corrosion cracking. Throughout the book, the author develops a number of theoretical models and concepts based on advanced microscopic electrochemical measurements to help readers better understand the occurrence of stress corrosion cracking. By examining all aspects of pipeline stress corrosion cracking—the causes, mechanisms, and management strategies—this book enables engineers to construct better pipelines and then maintain and monitor them to ensure safe, reliable energy supplies for the world.

Steel Corrosion-Induced Concrete Cracking ASTM International

The problem of stress corrosion cracking (SCC), which causes sudden failure of metals and other materials subjected to stress in corrosive environment(s), has a significant impact on a number of sectors including the oil and gas industries and nuclear power production. Stress corrosion cracking reviews the fundamentals of the phenomenon as well as examining stress corrosion behaviour in specific materials and particular industries. The book is divided into four parts. Part one covers the mechanisms of SCC and hydrogen embrittlement, while the focus of part two is on methods of testing for SCC in metals. Chapters in part three each review the phenomenon with reference to a specific material, with a variety of metals, alloys and composites discussed, including steels, titanium alloys and polymer composites. In part four, the effect of SCC in various industries is examined, with chapters covering subjects such as aerospace engineering, nuclear reactors, utilities and pipelines. With its distinguished editors and international team of contributors, Stress corrosion cracking is an essential reference for engineers and designers working with metals, alloys and polymers, and will be an invaluable tool for any industries in which metallic components are exposed to tension, corrosive environments at ambient and high temperatures. Examines the mechanisms of stress corrosion cracking (SCC) presenting recognising testing methods and materials resistant to SCC Assesses the effect of SCC on particular metals featuring steel, stainless steel, nickel-based alloys, magnesium alloys, copper-based alloys and welds in steels Reviews the monitoring and management of SCC and the affect of SCC in different industries such as petrochemical and aerospace

Stress-corrosion Cracking of High-strength Stainless Steels in Atmospheric Environments ASM International

High-strength steels are susceptible to delayed cracking under suitable conditions. Frequently such a brittle failure occurs at a stress that is only a fraction of the nominal yield strength. Considerable controversy exists over whether such failures result from two separate and distinct phenomena or whether there is but one mechanism called by two different names. Stress-corrosion cracking is the process in which a crack propagates, at least partially, by the stress induced corrosion of a susceptible metal at the advancing tip of the stress-corrosion crack. There is considerable evidence that this cracking results from the electrtrochemical corrosion of a metal subjected to tensile stresses, either residual or externally applied. Hydrogen-stress cracking is cracking which occurs as the result of hydrogen in the metal lattice in combination with tensile stresses. Hydrogen-stress cracking cannot occur if hydrogen is prevented from entering the steel, or if hydrogen that has entered during processing or service is removed before permanent damage has occurred. It is generally agreed that corrosion plays no part in the actual fracture mechanism. This report was prepared to point out wherein the two fracture mechanisms under consideration are similar and wherein they differ. From the evidence available today, the present authors have concluded that there are two distinct mechansims of delayed failure. (Author).

The Stress Corrosion of Metals

Stress Corrosion Cracking: Theory and Practice

The Susceptibility of Six Stainless Steels to Stress Corrosion at Ambient and Elevated Temperatures

Stress Corrosion Cracking-the Slow Strain-rate Technique