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Corrosion - L L Shreir 2013-10-22

Corrosion, Volume 1: Metal/Environment Reactions is concerned with the subject of corrosion, with emphasis on the control of the environmental interactions of metals and alloys used as materials of construction. Corrosion is treated as a synthesis of corrosion science and corrosion engineering. This volume is comprised of nine chapters; the first of which provides an overview of the principles of corrosion and oxidation, with emphasis on the electrochemical mechanism of corrosion and how the kinetics of cathodic and anodic partial reactions control the rate of overall corrosion reaction. Attention then turns to the effects of environmental factors such as concentration, velocity, and temperature based on the assumption that either the anodic or cathodic reaction, but not both, is rate-controlling. The corrosion of ferrous and non-ferrous metals and alloys, as well as rarer and noble metals, is considered. The reader is also introduced to high-temperature corrosion and mechanical factors that affect corrosion. This book concludes with topics of electrochemistry and metallurgy relevant to corrosion, including the nature of the electrified interface between the metal and the solution; charge transfer across the interface under equilibrium and non-equilibrium conditions; overpotential and the rate of an electrode reaction; and the hydrogen evolution reaction and hydrogen absorption by ferrous alloys. This book will be of value to students as well as workers and engineers in the field of corrosion.

Tribocorrosion - Arpith Siddaiah 2021-04-27

Tribocorrosion: Fundamentals, Methods, and Materials provides a balanced coverage of recent advancements in both experimental and computational areas of tribocorrosion, covering the basic concepts of tribology and electrochemistry, as well as testing set-ups, protocols, electrochemical methods, and more. It outlines experimental methods, demonstrating the different effects of material loss due to mechanical and electrochemical actions and looks at their effects in applied automotive, aerospace and biomedical settings. Standard testing protocols, tribocorrosion mechanisms in sliding contacts, and modeling and simulation techniques are all covered at length, as is bio-tribocorrosion and the best ways to prevent it. Provides a complete overview of tribocorrosion testing, experimentation and modeling methods that in turn empower safer, environmentally-friendlier and cost-saving applications Balances experimental and computational methods, thus encouraging readers to define and develop experimental and investigative techniques specific to their tribo-system of interest Covers tribocorrosion behavior in passive and non-passive metals and alloys, coatings, modified surfaces, metal matrix composites, and more

Polymeric Materials in Corrosion Inhibition - Saviour A. Umoren 2022-06-14

Polymeric Materials in Corrosion Inhibition: Fundamentals and Applications brings together the very latest information and techniques in the preparation and application of a broad range of polymeric materials as corrosion inhibitors in diverse corrosive environments. Sections introduce the fundamentals of polymeric materials, corrosion and corrosion inhibitors and include methodical coverage of polymers as corrosion inhibitors, with separate sections for natural and synthetic polymers. Each chapter guides the reader through the synthesis, properties and application of a specific polymer for corrosion inhibition, including an analysis of advantages and disadvantages and guidance on methods for improved performance. Final chapter cover other important aspects and developments, including adsorption mechanisms, quantum chemical calculations, molecular dynamics and simulations. This is a valuable reference for researchers and advanced students across a range of disciplines, including polymer science, corrosion, electrochemistry,

materials science, chemical engineering, and petroleum engineering. Introduces the fundamentals of polymeric materials, applications of polymers, corrosion and corrosion inhibition Provides thorough, systematic coverage of their synthesis, characterization and application, all organized by polymer category Explores advantages and disadvantages of polymers in corrosion inhibition, along with methods to improve performance

Nuclear Corrosion Science and Engineering - Damien FERON 2012-02-21

Corrosion of nuclear materials, i.e. the interaction between these materials and their environments, is a major issue for plant safety as well as for operation and economic competitiveness. Understanding these corrosion mechanisms, the systems and materials they affect, and the methods to accurately measure their incidence is of critical importance to the nuclear industry. Combining assessment techniques and analytical models into this understanding allows operators to predict the service life of corrosion-affected nuclear plant materials, and to apply the most appropriate maintenance and mitigation options to ensure safe long term operation. This book critically reviews the fundamental corrosion mechanisms that affect nuclear power plants and facilities. Initial sections introduce the complex field of nuclear corrosion science, with detailed chapters on the different types of both aqueous and non aqueous corrosion mechanisms and the nuclear materials susceptible to attack from them. This is complemented by reviews of monitoring and control methodologies, as well as modelling and lifetime prediction approaches. Given that corrosion is an applied science, the final sections review corrosion issues across the range of current and next-generation nuclear reactors, and across such nuclear applications as fuel reprocessing facilities, radioactive waste storage and geological disposal systems. With its distinguished editor and international team of expert contributors, Nuclear corrosion science and engineering is an invaluable reference for nuclear metallurgists, materials scientists and engineers, as well as nuclear facility operators, regulators and consultants, and researchers and academics in this field. Comprehensively reviews the fundamental corrosion mechanisms that affect nuclear power plants and facilities Chapters assess different types of both aqueous and non aqueous corrosion mechanisms and the nuclear materials susceptible to attack from them Considers monitoring and control methodologies, as well as modelling and lifetime prediction approaches

Corrosion and Surface Chemistry of Metals - Dieter Landolt 2007-05-02

Providing a carefully developed and comprehensive overview of the corrosion chemistry of metallic materials, this book covers the principal methods of corrosion prevention. It includes a systematic study of the physical chemistry of the surface supported by state-of-the-art analysis methods. The author builds a scientific foundation by developing thermodynamics and kinetics of electrode-electrolyte interaction and other surface processes. This allows him to analyze and derive the models that are used in the study of corrosion for metals and their alloys, including electrochemical attack, high-temperature oxidation, passivity, atmospheric corrosion, as well as the roles of wear and strain.

Materials Characterisation Five - Andrea Alberto Mammoli 2011

Until recently, engineering materials could be characterized successfully using relatively simple testing procedures. However, advanced materials technology has led to the development of materials with complex meso-, micro- and nano-structures that can no longer be characterised with simple testing procedures. Materials modelling and characterisation have become ever more closely intertwined. Characterisation, in essence, connects the abstract material model with the real-world behaviour of the material in question.

Characterisation of complex materials often requires a combination of experimental and computational techniques. This book contains papers to be presented at the Fifth International Conference, convened to facilitate the sharing of recent work between researchers who use computational methods, those who perform experiments, and those who do both, in all areas of materials characterisation. The papers cover such topics as: Advances in composites; Thermal analysis; Nano-materials; Damage mechanics; Computational models and experiments; Mechanical characterisation and testing; Nano-composites; Energy materials; Chemo-mechanical problems; Innovative experiments; Recycled materials; and Corrosion problems.

Graphene to Polymer/Graphene Nanocomposites - Ayesha Kausar 2021-09-23

Graphene to Polymer/Graphene Nanocomposites: Emerging Research and Opportunities brings together the latest advances and cutting-edge methods in polymer/graphene nanocomposites that offer attractive properties and features, leading to a broad range of valuable applications. The initial chapters of this book explain preparation, properties, modification, and applications of graphene and graphene-based multifunctional polymeric nanocomposites. Later, the state-of-the-art potential of polymer/graphene nanocomposites for hierarchical nanofoams, graphene quantum dots, graphene nanoplatelets, graphene nanoribbons, etc., has been elucidated. The subsequent chapters focus on specific innovations and applications including stimuli-responsive graphene-based materials, anticorrosive coatings, applications in electronics and energy devices, gas separation and filtration membrane applications, aerospace applications, and biomedical applications. Throughout the book, challenges, and future opportunities in the field of polymer/graphene nanocomposites are discussed and analyzed. This is an important resource for researchers, scientists, and students/academics working with graphene and across the fields of polymer composites, nanomaterials, polymer science, chemistry, chemical engineering, biomedical engineering, materials science, and engineering, as well those in an industrial setting who are interested in graphene or innovative materials. Explores the fundamentals, preparation, properties, processing, and applications of graphene and multifunctional polymer-graphene nanocomposites. Focuses on the state of the art including topics such as nano-foam architectures, graphene quantum dots, graphene nanoplatelets, graphene nanoribbons, and other graphene nanostructures. Provides advanced applications including shape memory materials, anticorrosion materials, electronics and energy devices, gas separation and filtration membranes, aerospace relevance, and biomedical applications.

Chemical Engineering Design Gavin Towler 2012-01-25

Chemical Engineering Design, Second Edition, deals with the application of chemical engineering principles to the design of chemical processes and equipment. Revised throughout, this edition has been specifically developed for the U.S. market. It provides the latest US codes and standards, including API, ASME and ISA design codes and ANSI standards. It contains new discussions of conceptual plant design, flowsheet development, and revamp design; extended coverage of capital cost estimation, process costing, and economics; and new chapters on equipment selection, reactor design, and solids handling processes. A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data, and Excel spreadsheet calculations, plus over 150 Patent References for downloading from the companion website. Extensive instructor resources, including 1170 lecture slides and a fully worked solutions manual are available to adopting instructors. This text is designed for chemical and biochemical engineering students (senior undergraduate year, plus appropriate for capstone design courses where taken, plus graduates) and lecturers/tutors, and professionals in industry (chemical process, biochemical, pharmaceutical, petrochemical sectors). New to this edition: Revised organization into Part I: Process Design, and Part II: Plant Design. The broad themes of Part I are flowsheet development, economic analysis, safety and environmental impact and optimization. Part II contains chapters on equipment design and selection that can be used as supplements to a lecture course or as essential references for students or practicing engineers working on design projects. New discussion of conceptual plant design, flowsheet development and revamp design Significantly increased coverage of capital cost estimation, process costing and economics New chapters on equipment selection, reactor design and solids handling processes New sections on fermentation, adsorption, membrane separations, ion exchange and chromatography Increased coverage of batch processing, food, pharmaceutical and biological processes All equipment chapters in Part

II revised and updated with current information Updated throughout for latest US codes and standards, including API, ASME and ISA design codes and ANSI standards Additional worked examples and homework problems The most complete and up to date coverage of equipment selection 108 realistic commercial design projects from diverse industries A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data and Excel spreadsheet calculations plus over 150 Patent References, for downloading from the companion website Extensive instructor resources: 1170 lecture slides plus fully worked solutions manual available to adopting instructors

Modern Physical Metallurgy - R. E. Smallman 2016-06-24

Modern Physical Metallurgy, Fourth Edition discusses the fundamentals and applications of physical metallurgy. The book is comprised of 15 chapters that cover the experimental background of a metallurgical phenomenon. The text first talks about the structure of atoms and crystals, and then proceeds to dealing with the physical examination of metals and alloys. The third chapter tackles the phase diagrams and solidifications, while the fourth chapter covers the thermodynamics of crystals. Next, the book discusses the structure of alloys. The next four chapters deal with the deformations and defects of crystals, metals, and alloys. Chapter 10 discusses work hardening and annealing, while Chapters 11 and 12 cover phase transformations. The succeeding two chapters talk about creep, fatigue, and fracture, while the last chapter covers oxidation and corrosion. The text will be of great use to undergraduate students of materials engineering and other degrees that deal with metallurgical properties.

Mechanics - Microstructure - Corrosion Coupling - Christine Blanc 2019-02-19

Mechanics - Microstructure - Corrosion Coupling: Concepts, Experiments, Modeling and Cases presents the state-of-the-art on scientific and technological developments relating to the durability of materials and structures subjected to mechanical and environmental stress in industries such as energy, aeronautics, chemistry and oil. Experimental, theoretical and numerical aspects are tackled at different scales, providing readers with the most advanced tools and scientific approaches to apprehend coupling phenomena by understanding associated mechanisms, identifying variables of the first order, and proposing strategies to control and/or extend the lifespan of structures in a multi-process coupling situation. In addition, the book presents the latest advances in research in these areas (hydrogen embrittlement, stress corrosion, fatigue, etc.), especially in the consideration of the multi-scale aspect of the phenomena in the implementation of dedicated experiments. Reviews the status of scientific and technological developments related to the durability of materials Addresses experimental, theoretical and numerical aspects at different scales Provides the most advanced tools and scientific approaches Focuses on the latest advances, such as hydrogen embrittlement, stress corrosion, fatigue, and more

Corrosion L L Shreir 2013-10-22

Corrosion, Volume 2: Corrosion Control deals with corrosion and corrosion control. Topics covered range from the design and economic aspects of corrosion to cathodic and anodic protection; pretreatment and design for metal finishing; protective action of metallic coatings; and methods of applying metallic coatings. Corrosion testing, monitoring, and inspection are also considered. This volume is comprised of 13 chapters; the first of which provides an overview of corrosion control, with emphasis on the classification of practical methods of corrosion control. Attention then turns to the economic aspects of corrosion; how corrosion control is implemented in chemical and petrochemical plants; and design considerations to prevent corrosion in buildings and structures. Design in marine engineering and in relation to welding and joining is also discussed. The chapters that follow focus on the principles and practical applications of cathodic and anodic protection; chemical and mechanical pretreatments for metal finishing; and design for corrosion protection by electroplated and paint coatings. Chemical conversion coatings and miscellaneous coatings such as vitreous enamel coatings are also considered. Finally, this book describes the conditioning of the atmosphere to reduce corrosion. Tables and specifications as well as terms and abbreviations are included. This book will be of value to students as well as workers and engineers involved in corrosion and corrosion control.

Corrosion of Magnesium Alloys - G L Song 2011-03-25

The use of magnesium alloys is increasing in a range of applications, and their popularity is growing wherever lightweight materials are needed. This book provides a comprehensive account of the corrosion of

magnesium alloys. It covers not only the corrosion performances and mechanisms of Mg alloys in conventional environments, such as sodium chloride solutions, but also looks at their corrosion behaviours in special media, like engine coolants and simulated body fluids. Part one covers fundamentals such as the corrosion electrochemistry, activity and passivity of magnesium and its alloys. Part two then considers the metallurgical effect in relation to the corrosion of magnesium alloys, including the role of micro-structure and earth-rare elements, the corrosion behaviour of magnesium-based bulk metallic glasses, and the corrosion of innovative magnesium alloys. Part three goes on to describe environmental influences on the corrosion of magnesium alloys, such as atmospheric corrosion, stress corrosion cracking, creep and fatigue behaviour, and galvanic corrosion. Finally, part four is concerned with various means of protecting magnesium alloys against corrosion through the use of aluminium electrodeposition, conversion and electrophoretic coatings, and anodisation. With its distinguished editor and team of contributors, this book is an invaluable resource for metallurgists, engineers and designers working with magnesium and its alloys, as well as professionals in the aerospace and automotive industries. Provides a comprehensive account of the corrosion of magnesium alloys covering fundamentals such as the corrosion electrochemistry, activity and passivity Reviews the metallurgical effect in relation to the corrosion of magnesium alloys, including the role of micro-structure and earth-rare elements Assesses environmental influences such as atmospheric corrosion, stress corrosion cracking, creep and fatigue behaviour, and galvanic corrosion

Underground Pipeline Corrosion - Mark Orazem 2014-02-17

Underground pipelines transporting liquid petroleum products and natural gas are critical components of civil infrastructure, making corrosion prevention an essential part of asset-protection strategy. Underground Pipeline Corrosion provides a basic understanding of the problems associated with corrosion detection and mitigation, and of the state of the art in corrosion prevention. The topics covered in part one include: basic principles for corrosion in underground pipelines, AC-induced corrosion of underground pipelines, significance of corrosion in onshore oil and gas pipelines, numerical simulations for cathodic protection of pipelines, and use of corrosion inhibitors in managing corrosion in underground pipelines. The methods described in part two for detecting corrosion in underground pipelines include: magnetic flux leakage, close interval potential surveys (CIS/CIPS), Pearson surveys, in-line inspection, and use of both electrochemical and optical probes. While the emphasis is on pipelines transporting fossil fuels, the concepts apply as well to metallic pipes for delivery of water and other liquids. Underground Pipeline Corrosion is a comprehensive resource for corrosion, materials, chemical, petroleum, and civil engineers constructing or managing both onshore and offshore pipeline assets; professionals in steel and coating companies; and academic researchers and professors with an interest in corrosion and pipeline engineering. Reviews the causes and considers the detection and prevention of corrosion to underground pipes Addresses a lack of current, readily available information on the subject Case studies demonstrate how corrosion is managed in the underground pipeline industry

Understanding Biocorrosion - T Liengen 2014-11-14

Biocorrosion refers to corrosion influenced by bacteria adhering to surfaces in biofilms. Biocorrosion is a major problem in areas such as cooling systems and marine structures where biofilms can develop. This book summarises key recent research in this subject. Part one looks at theories of biocorrosion and measurement techniques. Part two discusses how bacteria and biofilms result in biocorrosion. The final part of the book includes case studies of biocorrosion in areas as diverse as buildings, fuels, marine environments and cooling systems. Provides a detailed overview of biocorrosion and the different scientific and/or industrial problems related to microbially induced corrosion Introduces a variety of investigative techniques and methodologies that are employed in diagnosing and evaluating microbially induced corrosion Includes case studies on: biodeterioration of building materials; biocorrosion issues associated with diesel and biofuels; marine biocorrosion; corrosion of open recirculating cooling water systems and cooling system components; the effect of H₂S on steel corrosion

High Temperature Oxidation and Corrosion of Metals - David John Young 2008-08-06

This book is concerned with providing a fundamental basis for understanding the alloy-gas oxidation and corrosion reactions observed in practice and in the laboratory. Starting with a review of the enabling thermodynamic and kinetic theory, it analyzes reacting systems of increasing complexity. It considers in

turn corrosion of a pure metal by a single oxidant and by multi-oxidant gases, followed by corrosion of alloys producing a single oxide then multiple reaction products. The concept of "diffusion paths is used in describing the distribution of products in reacting systems, and diffusion data is used to predict reaction rates whenever possible. * Provides a logical and expert treatment of the subject for use as a guide for advanced-level academics, researchers and practitioners * Text is well supported by numerous micrographs, phase diagrams and tabulations of relevant thermodynamic and kinetic data * Combines physical chemistry and materials science methodologies

Smart Coatings - Vaibhav Sanjay Kathavate 2022-09-02

This book focuses on fundamentals, technology, synthesis, and characterizations and applied techniques from a practical point of view of coatings. The first three chapters offer a rigorous review of the application of these coatings to corrosion protection in various aerospace and oil and gas industries, and the subsequent chapters present a quick critical review of the state-of-the-art protection techniques of these coatings to novel biomedical applications such as clinical translations and tissue-engineered materials. Environmental, ergonomics, and aesthetic aspects and future perspectives are also explained at the end. Features: Explores the synthesis and application techniques of novel smart coatings in various research areas Presents a concise, critical, and state-of-the-art review of existing research on various types of smart coatings Ascertain the different mechanisms associated with the stimuli response of smart coatings Includes an exclusive chapter on real-time applications in the biomedical field Covers self-healing, self-cleaning, pH balance, early corrosion detection, and triggering mechanisms This book is aimed at researchers and graduate students specifically in smart coatings and thin films and corrosion, including chemical, materials science engineering, industrial and manufacturing engineering, and nanotechnology.

Encyclopedia of Electrochemical Power Sources - Jurgen Garche 2013-05-20

The Encyclopedia of Electrochemical Power Sources is a truly interdisciplinary reference for those working with batteries, fuel cells, electrolyzers, supercapacitors, and photo-electrochemical cells. With a focus on the environmental and economic impact of electrochemical power sources, this five-volume work consolidates coverage of the field and serves as an entry point to the literature for professionals and students alike. Covers the main types of power sources, including their operating principles, systems, materials, and applications Serves as a primary source of information for electrochemists, materials scientists, energy technologists, and engineers Incorporates nearly 350 articles, with timely coverage of such topics as environmental and sustainability considerations

Humidity and Electronics - Rajan Ambat 2021-12-10

Humidity and Electronics: Corrosion Reliability Issues and Preventive Measures provides comprehensive information on humidity related corrosion reliability issues surrounding electronics and how to tackle potential issues from a pro-active-design-prevention perspective. The book contains a mix of academic and industrial relevance, making it suitable for a detailed understanding on humidity issues on electronics, both for materials and corrosion experts and electronics and electrical experts. It will be useful for researchers, academics, and industrial persons involved in materials, corrosion, and electronics reliability aspects. Provides basic and applied knowledge surrounding corrosion in electronics Combines electronics/electrical and electrochemical aspects related to failure modes and mechanisms Presents knowledge on influencing factors and how they can be used as preventive measures at the material, component, device and system level

Shreir's Corrosion - 2009-02-27

This four-volume reference work builds upon the success of past editions of Elsevier's Corrosion title (by Shreir, Jarman, and Burstein), covering the range of innovations and applications that have emerged in the years since its publication. Developed in partnership with experts from the Corrosion and Protection Centre at the University of Manchester, Shreir's Corrosion meets the research and productivity needs of engineers, consultants, and researchers alike. Incorporates coverage of all aspects of the corrosion phenomenon, from the science behind corrosion of metallic and non-metallic materials in liquids and gases to the management of corrosion in specific industries and applications Features cutting-edge topics such as medical applications, metal matrix composites, and corrosion modeling Covers the benefits and limitations of techniques from scanning probes to electrochemical noise and impedance spectroscopy

Stress Corrosion Cracking S Raja 2011-09-22

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

Materials Science and Metallurgical Technology III - Andrey A. Radionov 2022-02-03

Selected peer-reviewed full text papers from the 4th International Russian Conference on Materials Science and Metallurgical Technology (RusMetalCon 2021)

Advances in Materials Technology for Fossil Power Plants - D. Gandy and J. Shingledecker 2014-01-01
Conference proceedings covering the latest technology developments for fossil fuel power plants, including nickel-based alloys for advanced ultrasupercritical power plants, materials for turbines, oxidation and corrosion, welding and weld performance, new alloys concepts, and creep and general topics.

Tribocorrosion of Passive Metals and Coatings - D Landolt 2011-10-12

Tribocorrosion causes the degradation or alteration of materials through the combined action of corrosion and wear. It limits the performance and life-time of installations, machines and devices with moving parts, and controls certain manufacturing processes such as chemical-mechanical polishing. The effects of tribocorrosion are most pronounced on passive metals which owe their corrosion resistance to a thin protecting oxide film. Most corrosion-resistant engineering alloys belong to this category. This book provides an introduction to the developing field of tribocorrosion and an overview of the latest research. Part one reviews basic notions of corrosion and tribology, before presenting the most recent results on the growth and structure of passive oxide films. Tribocorrosion mechanisms under fretting, sliding and erosion conditions, respectively, are then discussed. Part two focuses on methods for measuring and preventing tribocorrosion. It includes chapters on electrochemical techniques, the design of tribocorrosion test equipment, data evaluation and the optimisation of materials' properties for tribocorrosion systems. Part three presents a selection of tribocorrosion problems in engineering and medicine. Three chapters address the tribocorrosion of medical implants including test methods and clinical implications. Other chapters examine tribocorrosion issues in nuclear power plants, marine environments, automotive cooling circuits, elevated-temperature metal working and chemical-mechanical polishing. With its distinguished editors and international team of expert contributors Tribocorrosion of passive metals and coatings is an invaluable reference tool for engineers and researchers in industry and academia confronted with tribocorrosion problems. Comprehensively reviews current research on the tribocorrosion of passive metals and coatings, with particular reference to the design of tribocorrosion test equipment, data evaluation and the optimisation of materials' properties for tribocorrosion systems Chapters discuss tribocorrosion mechanisms under fretting, sliding and erosion conditions before focussing on methods for measuring and preventing tribocorrosion Includes a comprehensive selection of tribocorrosion problems in engineering and medicine, such as the tribocorrosion of medical implants, and tribocorrosion issues in nuclear power plants, marine environments, automotive cooling circuits and elevated-temperature metal working

Reverse Engineering of Ancient Metals - Patricia Silvana Carrizo 2022-01-01

This book examines archaeometallurgy and the preservation of ancient materials for cultural heritage. Through understanding the internal structures of relevant ancient materials, their chemical composition, resistance, hardness, etc., their conservation can be more effectively addressed. Preserving cultural artifacts, such as those from border sites, funerary contexts (burials), railway lines, ceremonial sites and road infrastructure, is necessary to provide perspective to a culture's trajectory. This book addresses how Reverse Engineering can disseminate knowledge of a culture's heritage by offering technology that can help restore artifacts so they may be displayed and utilized as educational objects.

Conducting Polymer-Based Nanocomposites - Ayesha Kausar 2021-04-22

Conducting Polymer-Based Nanocomposites: Fundamentals and Applications delivers an up-to-date overview on cutting-edge advancements in the field of nanocomposites derived from conjugated polymeric matrices. Design of conducting polymers and resultant nanocomposites has instigated significant addition in the field of modern nanoscience and technology. Recently, conducting polymer-based nanocomposites have attracted considerable academic and industrial research interest. The conductivity and physical properties of conjugated polymers have shown dramatic improvement with nanofiller addition. Appropriate fabrication strategies and the choice of a nanoreinforcement, along with a conducting matrix, may lead to enhanced physicochemical features and material performance. Substantial electrical conductivity, optical features, thermal stability, thermal conductivity, mechanical strength, and other physical properties of the conducting polymer-based nanocomposites have led to high-performance materials and high-tech devices and applications. This book begins with a widespread impression of state-of-the-art knowledge in indispensable features and processing of conducting polymer-based nanocomposites. It then discusses essential categories of conducting polymer-based nanocomposites such as polyaniline, polypyrrole, polythiophene, and derived nanomaterials. Subsequent sections of this book are related to the potential impact of conducting polymer-based nanocomposites in various technical fields. Significant application areas have been identified for anti-corrosion, EMI shielding, sensing, and energy device relevance. Finally, the book covers predictable challenges and future opportunities in the field of conjugated nanocomposites. Integrates the fundamentals of conducting polymers and a range of multifunctional applications Describes categories of essential conducting polymer-based nanocomposites for polyaniline, polypyrrole, polythiophene, and derivative materials Assimilates the significance of multifunctional nanostructured materials of nanocomposite nanofibers Portrays current and future demanding technological applications of conjugated polymer-based nanocomposites, including anti-corrosion coatings, EMI shielding, sensors, and energy production and storage devices

Handbook of Environmental Degradation of Materials - Myer Kutz 2012-12-31

Nothing stays the same for ever. The environmental degradation and corrosion of materials is inevitable and affects most aspects of life. In industrial settings, this inescapable fact has very significant financial, safety and environmental implications. The Handbook of Environmental Degradation of Materials explains how to measure, analyse, and control environmental degradation for a wide range of industrial materials including metals, polymers, ceramics, concrete, wood and textiles exposed to environmental factors such as weather, seawater, and fire. Divided into sections which deal with analysis, types of degradation, protection and surface engineering respectively, the reader is introduced to the wide variety of environmental effects and what can be done to control them. The expert contributors to this book provide a wealth of insider knowledge and engineering knowhow, complementing their explanations and advice with Case Studies from areas such as pipelines, tankers, packaging and chemical processing equipment ensures that the reader understands the practical measures that can be put in place to save money, lives and the environment. The Handbook's broad scope introduces the reader to the effects of environmental degradation on a wide range of materials, including metals, plastics, concrete, wood and textiles For each type of material, the book describes the kind of degradation that effects it and how best to protect it Case Studies show how organizations from small consulting firms to corporate giants design and manufacture products that are more resistant to environmental effects

Nuclear Corrosion - Stefan Ritter 2020-08-14

Nuclear Corrosion: Research, Progress and Challenges, part of the "Green Book series of the EFC, builds upon the foundations of the very first book published in this series in 1989 ("Number 1 - Corrosion in the

Nuclear Industry). This newest volume provides an overview on state-of-the-art research in some of the most important areas of nuclear corrosion. Chapters covered include aging phenomena in light water reactors, reprocessing plants, nuclear waste disposal, and supercritical water and liquid metal systems. This book will be a vital resource for both researchers and engineers working within the nuclear field in both academic and industrial environments. Discusses industry related aspects of materials in nuclear power generation and how these materials react with the environment Provides comprehensive coverage of the topic as written by noted experts in the field Includes coverage of nuclear waste corrosion

Corrosion - S. Syngellakis 2017-05-23

Corrosion is a degrading material process frequently encountered in engineering structures and components, which may lead to costly and catastrophic failures if not properly and timely addressed. This volume describes a wide spectrum of experimental and analytical studies, which provide a fairly comprehensive account of corrosion manifestations and methodologies for addressing them in structural and industrial design. As such, it is expected to make a valuable reference publication for engineers and scientists interested in the protection of structures and components from harmful and potentially ruinous corrosive action. The collected articles comprising this volume address issues which can be categorised into two main areas. The first is concerned with material science approaches to corrosion, that is, visual or instrumental means of assessing existing behaviour or effectiveness of corrective measures and techniques. The second part of the volume comprises boundary element simulations of cathodic protection schemes for the purpose of predicting and optimising their performance. A number of practical problems are analysed such as: the coating condition on a ballast tank wall; the impressed current cathodic protection of an offshore platform and minimizing a ship's electric and magnetic signature. Topics covered include: Elemental identification; Material loss; Strain fields; Stress corrosion cracking; Corrosion resistance; Fretting corrosion; Contact surface damage; Electrochemical testing; Coating conditions; Cathodic protection; Current density distribution; Pipelines and deep well casings; Electric and magnetic signatures; Coating damage effects; Galvanic corrosion.

Principles of Corrosion Engineering and Corrosion Control - Zaki Ahmad 2006-09-18

Corrosion is a huge issue for materials, mechanical, civil and petrochemical engineers. With comprehensive coverage of the principles of corrosion engineering, this book is a one-stop text and reference for students and practicing corrosion engineers. Highly illustrated, with worked examples and definitions, it covers basic corrosion principles, and more advanced information for postgraduate students and professionals. Basic principles of electrochemistry and chemical thermodynamics are incorporated to make the book accessible for students and engineers who do not have prior knowledge of this area. Each form of corrosion covered in the book has a definition, description, mechanism, examples and preventative methods. Case histories of failure are cited for each form. End of chapter questions are accompanied by an online solutions manual. * Comprehensively covers the principles of corrosion engineering, methods of corrosion protection and corrosion processes and control in selected engineering environments * Structured for corrosion science and engineering classes at senior undergraduate and graduate level, and is an ideal reference that readers will want to use in their professional work * Worked examples, extensive end of chapter exercises and accompanying online solutions and written by an expert from a key petrochemical university

Introduction to Corrosion Science - E. McCafferty 2010-01-04

This textbook is intended for a one-semester course in corrosion science at the graduate or advanced undergraduate level. The approach is that of a physical chemist or materials scientist, and the text is geared toward students of chemistry, materials science, and engineering. This textbook should also be useful to practicing corrosion engineers or materials engineers who wish to enhance their understanding of the fundamental principles of corrosion science. It is assumed that the student or reader does not have a background in electrochemistry. However, the student or reader should have taken at least an undergraduate course in materials science or physical chemistry. More material is presented in the textbook than can be covered in a one-semester course, so the book is intended for both the classroom and as a source book for further use. This book grew out of classroom lectures which the author presented between 1982 and the present while a professorial lecturer at George Washington University, Washington, DC, where he organized and taught a graduate course on "Environmental Effects on Materials." Additional

material has been provided by over 30 years of experience in corrosion research, largely at the Naval Research Laboratory, Washington, DC and also at the Bethlehem Steel Company, Bethlehem, PA and as a Robert A. Welch Postdoctoral Fellow at the University of Texas. The text emphasizes basic principles of corrosion science which underpin extensions to practice.

Trends in Oil and Gas Corrosion Research and Technologies - A. M. El-Sherik 2017-06-09

Trends in Oil and Gas Corrosion Research and Technologies: Production and Transmission delivers the most up-to-date and highly multidisciplinary reference available to identify emerging developments, fundamental mechanisms and the technologies necessary in one unified source. Starting with a brief explanation on corrosion management that also addresses today's most challenging issues for oil and gas production and transmission operations, the book dives into the latest advances in microbiology-influenced corrosion and other corrosion threats, such as stress corrosion cracking and hydrogen damage just to name a few. In addition, it covers testing and monitoring techniques, such as molecular microbiology and online monitoring for surface and subsurface facilities, mitigation tools, including coatings, nano-packaged biocides, modeling and prediction, cathodic protection and new steels and non-metallics. Rounding out with an extensive glossary and list of abbreviations, the book equips upstream and midstream corrosion professionals in the oil and gas industry with the most advanced collection of topics and solutions to responsibly help solve today's oil and gas corrosion challenges. Covers the latest in corrosion mitigation techniques, such as corrosion inhibitors, biocides, non-metallics, coatings, and modeling and prediction Solves knowledge gaps with the most current technology and discoveries on specific corrosion mechanisms, highlighting where future research and industry efforts should be concentrated Achieves practical and balanced understanding with a full spectrum of subjects presented from multiple academic and world-renowned contributors in the industry

High Temperature Coatings - Sudhangshu Bose 2017-11-27

High Temperature Coatings, Second Edition, demonstrates how to counteract the thermal effects of rapid corrosion and degradation of exposed materials and equipment that can occur under high operating temperatures. This is the first true practical guide on the use of thermally protective coatings for high-temperature applications, including the latest developments in materials used for protective coatings. It covers the make-up and behavior of such materials under thermal stress and the methods used for applying them to specific types of substrates, as well as invaluable advice on inspection and repair of existing thermal coatings. With his long experience in the aerospace gas turbine industry, the author has compiled the very latest in coating materials and coating technologies, as well as hard-to-find guidance on maintaining and repairing thermal coatings, including appropriate inspection protocols. The book is supplemented with the latest reference information and additional support to help readers find more application- and industry-type coatings specifications and uses. Offers an overview of the underlying fundamental concepts of thermally-protective coatings, including thermodynamics, energy kinetics, crystallography and equilibrium phases Covers essential chemistry and physics of underlying substrates, including steels, nickel-iron alloys, nickel-cobalt alloys and titanium alloys Provides detailed guidance on a wide variety of coating types, including those used against high temperature corrosion and oxidative degradation and thermal barrier coatings

Developments in High Temperature Corrosion and Protection of Materials - W Gao 2008-04-09

High temperature corrosion is a phenomenon that occurs in components that operate at very high temperatures, such as gas turbines, jet engines and industrial plants. Engineers are constantly striving to understand and prevent this type of corrosion. This book examines the latest developments in the understanding of high temperature corrosion processes and protective oxide scales and coatings. Part one looks at high temperature corrosion. Chapters cover diffusion and solid state reactions, external and internal oxidation of alloys, metal dusting corrosion, tribological degradation, hot corrosion, and oxide scales on hot-rolled steel strips. Modern techniques for analysing high temperature oxidation and corrosion are also discussed. Part two discusses methods of protection using ceramics, composites, protective oxide scales and coatings. Chapters focus on layered ternary ceramics, alumina scales, Ti-Al intermetallic compounds, metal matrix composites, chemical vapour deposited silicon carbide, nanocrystalline coatings and thermal barrier coatings. Part three provides case studies illustrating some of the challenges of high

temperature corrosion to industry and how they can be overcome. Case studies include the petrochemical industry, modern incinerators and oxidation processing of electronic materials. This book is a valuable reference tool for engineers who develop heat resistant materials, mechanical engineers who design and maintain high temperature equipment and plant, and research scientists and students who study high temperature corrosion and protection of materials. Describes the latest developments in understanding high temperature corrosion Presents the latest research by the leading innovators from around the globe Case studies are provided to illustrate key points

Elsevier's Dictionary of Technical Abbreviations - S. Bobryakov 2005-03-23

The English-Russian dictionary of technical abbreviations contains nearly 65,000 entries covering various fields and subfields of engineering and technology. Abbreviations are widely used in technical literature and, as a rule, they create difficulties for the reader. Numerous abbreviations are used in technical literature dealing with space, agriculture, electronics, computer science, chemistry, thermodynamics, nuclear engineering, refrigeration, cryogenics, machinery, aviation, business, accounting, optics, radio electronics, and military fields, including abbreviations used on a wide scale by the Navy, Airforce and the Army. In many instances the same abbreviation is used in most different fields of engineering and technology though depicting different notions. There are cases when the same abbreviation may have dozen of meanings, depending on the specific field of engineering. The entries are arranged in alphabetical order. A wide range of literature has been explored for the selection and translation of the abbreviations. The dictionary has been compiled by comparing parallel texts in both languages, and by consultation with experts. This publication will be invaluable to the personnel of designing bureaus and research institutions, and also to translators, scientists, researchers, designers and university personnel dealing with various fields of engineering and technology. approx. 125,000 terms

Corrosion and Materials in the Oil and Gas Industries - Reza Javaherdashti 2016-04-19

The advancement of methods and technologies in the oil and gas industries calls for new insight into the corrosion problems these industries face daily. With the application of more precise instruments and laboratory techniques as well as the development of new scientific paradigms, corrosion professionals are also witnessing a new era in the way d

Corrosion Protection at the Nanoscale - Susai Rajendran 2020-03-10

Corrosion Protection at the Nanoscale explores fundamental concepts on how metals can be protected at the nanoscale by using both nanomaterials-based solutions, including nanoalloys, noninhibitors and nanocoatings. It is an important reference resource for both materials scientists and engineers wanting to find ways to create an efficient corrosion prevention strategy. Nanostructure materials have been widely used in many products, such as print electronics, contact, interconnection, implant, nanosensors and display units to lessen the impact of corrosion. Traditional methods for protection of metals include various techniques, such as coatings, inhibitors, electrochemical methods (anodic and cathodic protections), metallurgical design are covered in this book. Nanomaterials-based protective methods can offer many advantages over their traditional counterparts, such as protection for early-stage, higher corrosion resistance, better corrosion control. This book also outlines these advantages and discusses the challenges of implementing nanomaterials as corrosion protection agents on a wide scale. Explains the main methods of detection, monitoring, testing, measurement and simulation of corrosion at the nanoscale Explores how metals can be protected at the nanoscale using nanotechnology and nanomaterials Discusses the major

challenges of detecting and preventing corrosion at the nanoscale

Materials Science and Engineering: Concepts, Methodologies, Tools, and Applications -

Management Association, Information Resources 2017-01-11

The design and study of materials is a pivotal component to new discoveries in the various fields of science and technology. By better understanding the components and structures of materials, researchers can increase its applications across different industries. Materials Science and Engineering: Concepts, Methodologies, Tools, and Applications is a compendium of the latest academic material on investigations, technologies, and techniques pertaining to analyzing the synthesis and design of new materials. Through its broad and extensive coverage on a variety of crucial topics, such as nanomaterials, biomaterials, and relevant computational methods, this multi-volume work is an essential reference source for engineers, academics, researchers, students, professionals, and practitioners seeking innovative perspectives in the field of materials science and engineering.

Oxidation Mechanisms of Materials for Heat Exchanging Components in CO₂/H₂O-containing Gases Relevant to Oxy-fuel Environments - Tomasz Olszewski 2012

Nanomaterials for Direct Alcohol Fuel Cells - Fatih Sen 2021-08-25

Nanomaterials for Direct Alcohol Fuel Cells explains nanomaterials and nanocomposites as well as the characterization, manufacturing, and design of alcohol fuel cell applications. The advantages of direct alcohol fuel cells (DAFCs) are significant for reliable and long-lasting portable power sources used in devices such as mobile phones and computers. Even though substantial improvements have been made in DAFC systems over the last decade, more effort is needed to commercialize DAFCs by producing durable, low-cost, and smaller-sized devices. Nanomaterials have an important role to play in achieving this aim. The use of nanotechnology in DAFCs is vital due to their role in the synthesis of nanocatalysts within the manufacturing process. Lately, nanocatalysts containing carbon such as graphene, carbon nanotubes, and carbon nanocoils have also attracted much attention. When compared to traditional materials, carbon-based materials have unique advantages, such as high corrosion resistance, better electrical conductivity, and less catalyst poisoning. This book also covers different aspects of nanocomposites fabrication, including their preparation, design, and characterization techniques for their fuel cell applications. This book is an important reference source for materials scientists, engineers, energy scientists, and electrochemists who are seeking to improve their understanding of how nanomaterials are being used to enhance the efficiency and lower the cost of DAFCs. Shows how nanomaterials are being used for the design and manufacture of DAFCs Explores how nanotechnology is being used to enhance the synthesis and catalysis processes to create the next generation of fuel cells Assesses the major challenges of producing nanomaterial-based DAFCs on an industrial scale

Surface Engineering of Modern Materials - Kapil Gupta 2020-03-20

This book focuses on surface engineering of a wide range of modern materials such as smart alloys, light metals, polymers, and composites etc. for their improved manufacturability. It discusses the effect of surface engineering processes namely friction stir processing, forming, spark erosion, welding, laser heating, and coating etc. on various properties of modern materials. The book aims to facilitate researchers and engineers for manufacturing modern materials for numerous commercial, precision and scientific applications.