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Structural Alloys For Power Plants Operational Challenges And High Temperature Materials Woodhead Publishing Series In Energy

Ping Huai - Thorium Molten Salt Reactor (TMSR) Materials Challenge @ ThEC12 Geneva Trotter: Engineering New Alloys for Energy High-entropy alloys for nuclear applications Best Steel Design Books Used In The Structural (Civil) Engineering Industry Stainless Steel and Alloys for High Temperature Applications The Best Structural Design Books Precipitation trajectories in structural alloys mapped by small angle scattering Kelly Lecture Cambridge University 2021: Sustainable Metals for a Circular Economy Sustainability of metals \u0026 their role in a circular economy Novel high performance materials and components 3.371 Structural Materials Selection - Fall 2013 [1/14] Modern Steel Products 1 (2013) amazing welding method of Pakistani welder #welding #shorts Brian Wirth | Degradation in Harsh Nuclear Environments Recommended Structural engineering books for Concrete Steel and General ABCs of Structural Steel - Part 2: Beam | Metal Supermarkets Metallurgy Guru: Sustainable Metallurgy and Green Metals - A Green Metallurgy Introduction 3.371 Structural Materials Selection - Fall 2013 [11/14] Alloy: The Powerhouse for Iron Enrichment A high-quality alloy product used in strong acid environments

From Safe Design to Residual Life Assessments

Energy Research Abstracts

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Effects of Radiation on Structural Materials

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Structural Alloys For Power Plants Operational Challenges And High Temperature Materials Woodhead Publishing Series In Energy ***OMB No. 1676439458370 edited by***

CHAMBERS NATHANIEL

From Safe Design to Residual Life Assessments Elsevier
A program on fireside corrosion is being conducted at Argonne National Laboratory to evaluate the performance of several structural alloys in the presence of mixtures of synthetic coal ash, alkali sulfates, and alkali chlorides. Candidate alloys are also exposed in a small-scale coal-fired combustor at the National Energy Technology Laboratory in Pittsburgh. Experiments in the present program, which addresses the effects of deposit chemistry, temperature, and alloy chemistry on the corrosion response of alloys, were conducted at temperatures in the range of 575-800 C for time periods up to (almost equal to)1850 h. Alloys selected for the study included HR3C, 310TaN, HR120, SAVE 25, NF709, modified 800, 347HFG, and HCM12A. In addition, 800H clad with Alloy 671 was included in several of the exposures. Data were obtained on weight change, scale thickness, internal penetration, microstructural characteristics of corrosion products, mechanical integrity, and cracking of scales. Results showed that relationship of corrosion rates to temperature followed a bell-shaped curve, with peak rates at (almost equal to)725 C, but the rate itself was dependent on the alloy chemistry. Several alloys showed acceptable rates in the sulfate-containing coal-ash environment; but NaCl in the deposit led to catastrophic corrosion at 650 and 800 C.
Energy Research Abstracts Springer Science & Business Media
The increasing global demand for electricity is straining current resources of fossil fuels and placing increased pressure on the environment. The implementation of alternative sources of energy is paramount to satisfying global electricity demand while reducing reliance on fossil fuels and lessen the impact on the

environment. Concentrated solar power (CSP) plants have the ability to harness solar energy at an efficiency not yet achieved by other technologies designed to convert solar energy to electricity. The problem of intermittency in power production seen with other renewable technologies can be virtually eliminated with the use of molten salt as a heat transfer fluid in CSP plants. Commercial and economic success of CSP plants requires operating at maximum efficiency and capacity which requires high temperature and material reliability. This study investigates the corrosion behavior of structural alloys and electrochemical testing in molten nitrate salts at three temperatures common to CSP plants. Corrosion behavior was evaluated using gravimetric and inductively-coupled plasma optical emission spectroscopy (ICP-OES) analysis. Surface morphology was studied using scanning electron microscopy. Surface oxide structure and chemistry was characterized using X-ray diffraction, Raman spectroscopy, energy dispersive spectroscopy, and X-ray photoelectron spectroscopy. Electrochemical behavior of candidate structural alloys Alloy 4130, austenitic stainless steel 316, and super-austenitic Incoloy 800H was evaluated using potentiodynamic polarization characteristics. It was observed that electrochemical evaluation of these candidate materials correlates well with the corrosion behavior observed from gravimetric and ICP-OES analysis. This study identifies that all three alloys exhibited acceptable corrosion in 300°C molten salt while elevated salt temperatures require the more corrosion resistant alloys, stainless steel 316 and 800H. Characterization of the sample surfaces revealed the presence of spinels at lower temperatures, while Fe2O3 was the dominant iron oxide at higher temperatures for each alloy. It is recommended that accelerated corrosion testing be investigated further to evaluate alloys in other molten salt systems considered for utilization in concentrated solar power plants.

Elsevier

This book presents an up-to-date overview on the main classes of metallic materials currently used in aeronautical structures and propulsion engines and discusses other materials of potential interest for structural aerospace applications. The coverage encompasses light alloys such as aluminum-, magnesium-, and titanium-based alloys, including titanium aluminides; steels; superalloys; oxide dispersion strengthened alloys; refractory alloys; and related systems such as laminate composites. In each chapter, materials properties and relevant technological aspects, including processing, are presented. Individual chapters focus on coatings for gas turbine engines and hot corrosion of alloys and coatings. Readers will also find consideration of applications in aerospace-related fields. The book takes full account of the impact of energy saving and environmental issues on materials development, reflecting the major shifts that have occurred in the motivations guiding research efforts into the development of new materials systems. Aerospace Alloys will be a valuable reference for graduate students on materials science and engineering courses and will also provide useful information for engineers working in the aerospace, metallurgical, and energy production

industries.

Refractory Metal Alloys Metallurgy and Technology

CRC Press
After decades of research and development, concentrating solar thermal (CST) power plants (also known as concentrating solar power (CSP) and as Solar Thermal Electricity or STE systems) are now starting to be widely commercialized. Indeed, the IEA predicts that by 2050, with sufficient support over ten percent of global electricity could be produced by concentrating solar thermal power plants. However, CSP plants are just but one of the many possible applications of CST systems. Advances in Concentrating Solar Thermal Research and Technology provides detailed information on the latest advances in CST systems research and technology. It promotes a deep understanding of the challenges the different CST technologies are confronted with, of the research that is taking place worldwide to address those challenges, and of the impact that the innovation that this research is fostering could have on the emergence of new CST components and concepts. It is anticipated that these developments will substantially increase the cost-competiveness of commercial CST solutions and reshape the technological landscape of both CST technologies and the CST industry. After an introductory chapter, the next three parts of the book focus on key CST plant components, from mirrors and receivers to thermal storage. The final two parts of the book address operation and control and innovative CST system concepts. Contains authoritative reviews of CST research taking place around the world Discusses the impact this research is fostering on the emergence of new CST components and concepts that will substantially increase the cost-competitiveness of CST power Covers both major CST plant components and system-wide issues

Effects of Radiation on Structural Materials

Springer Science & Business Media
Laser peening is an emerging modern process that impresses a compressive stress into the surface of metals or alloys. This treatment can reduce the rate of intergranular stress corrosion cracking and fatigue cracking in structural metals or Alloy 600 needed for nuclear power plants.

Nuclear Corrosion

Elsevier
Due to their continuing role in electricity generation, it is important that coal power plants operate as efficiently and cleanly as possible. Coal Power Plant Materials and Life Assessment reviews the materials used in coal plants, and how they can be assessed and managed to optimize plant operation. Part I considers the structural alloys used in coal plants. Part II then reviews performance modelling and life assessment techniques, explains the inspection and life-management approaches that can be adopted to optimize long term plant operation, and considers the technical and economic issues involved in meeting variable energy demands. Summarizes key research on coal-fired power plant materials, their behavior under operational loads, and approaches to life assessment and defect management Details the range of structural alloys used in coal power plants, and the life assessment techniques applicable to defect-free components

under operational loads Reviews the life assessment techniques applicable to components containing defects and the approaches that can be adopted to optimize plant operation and new plant and component design

Radiation Damage of Structural Materials

Springer Science & Business Media
Current fleets of conventional and nuclear power plants face increasing hostile environmental conditions due to increasingly high temperature operation for improved capacity and efficiency, and the need for long term service. Additional challenges are presented by the requirement to cycle plants to meet peak-load operation. This book presents a comprehensive review of structural materials in conventional and nuclear energy applications. Opening chapters address operational challenges and structural alloy requirements in different types of power plants. The following sections review power plant structural alloys and methods to mitigate critical materials degradation in power plants.
Fundamental Aspects of Structural Alloy Design Elsevier
Failures or forced shutdowns in power plants are often due to boilers, and particularly failure of boiler tubes. This comprehensive resource deals with the subject of failure investigation of boiler tubes from basic fundamentals to practical applications. Coverage includes properties and selection of materials for boiler tubes from a metallurgical view point, damage mechanisms responsible for failure of boiler tubes, and characterization techniques employed for investigating failures of boiler tubes in thermal power plants and utility boilers of industrial/commercial/institutional (ICI) boilers. A large number of case studies based on the actual failures from the field are described, along with photographs and microstructures to allow for easy comprehension of the theory behind the failures. This book is geared to practicing engineers and for studies in the major area of power plant engineering. For non-metallurgists, a chapter has been devoted to the basics of material science, metallurgy of steels, heat treatment, and structure-property correlation. A chapter on materials for boiler tubes covers composition and application of different grades of steels and high temperature alloys currently in use as boiler tubes and future materials to be used in supercritical, ultra-supercritical and advanced ultra-supercritical thermal power plants. A comprehensive discussion on different mechanisms of boiler tube failure is the heart of the book. Additional chapters detailing the role of advanced material characterization techniques in failure investigation and the role of water chemistry in tube failures are key contributions to the book. The authors have long-standing experience in the field of metallurgy and materials technology, failure investigation, remaining life assessment (RLA) and fitness for service (FFS) for industrial plant and equipment, including power plants. They have conducted a large number of failure investigations of boiler tubes and have recommended effective remedial measures in problem solving for power and utility boilers.
Properties of Reactor Structural Alloys After Neutron Or Particle Irradiation Newnes
Calcium and Chemical Looping Technology

for Power Generation and Carbon Dioxide (CO2) Capture reviews the fundamental principles, systems, oxygen carriers, and carbon dioxide carriers relevant to chemical looping and combustion. Chapters review the market development, economics, and deployment of these systems, also providing detailed information on the variety of materials and processes that will help to shape the future of CO2 capture ready power plants. Reviews the fundamental principles, systems, oxygen carriers, and carbon dioxide carriers relevant to calcium and chemical looping Provides a lucid explanation of advanced concepts and developments in calcium and chemical looping, high pressure systems, and alternative CO2 carriers Presents information on the market development, economics, and deployment of these systems

Failure Investigation of Boiler Tubes: A Comprehensive Approach

ASTM International
The clamor for non-carbon dioxide emitting energy production has directly impacted on the development of nuclear energy. As new nuclear plants are built, plans and designs are continually being developed to manage the range of challenging requirement and problems that nuclear plants face especially when managing the greatly increased operating temperatures, irradiation doses and extended design life spans. Materials for Nuclear Plants: From Safe Design to Residual Life Assessments provides a comprehensive treatment of the structural materials for nuclear power plants with emphasis on advanced design concepts. Materials for Nuclear Plants: From Safe Design to Residual Life Assessments approaches structural materials with a systemic approach. Important components and materials currently in use as well as those which can be considered in future designs are detailed, whilst the damage mechanisms responsible for plant ageing are discussed and explained. Methodologies for materials characterization, materials modeling and advanced materials testing will be described including design code considerations and non-destructive evaluation concepts. Including models for simple system dynamic problems and knowledge of current nuclear power plants in operation, Materials for Nuclear Plants: From Safe Design to Residual Life Assessments is ideal for students studying postgraduate courses in Nuclear Engineering. Designers on courses for code development, such as ASME or ISO and nuclear authorities will also find this a useful reference.
Materials for Nuclear Plants Elsevier
Structural Alloys for Power PlantsOperational Challenges and High-Temperature MaterialsElsevier

Advances in Materials Technology for Fossil Power Plants

Woodhead Publishing
This publication documents Proceedings of the Symposium on Metal lurgy and Technology of Refractory Metal Alloys, held in Washington, D.C. at the Washington Hilton Hotel on April 25-26, 1968, under sponsorship of the Refractory Metals Committee, Institute of Metals Division, of the Metallurgical Society of AIME, and the National Aeronautics and Space Administration. The Symposium

presented critical reviews of selected topics in refractory metal alloys, thereby contributing to an in-depth understanding of the state-of-the-art, and establishing a base line for further research, development, and application. This Symposium is fifth in a series of conferences on refractory metals, sponsored by the Metallurgical Society of AIME. Publications issuing from the conferences are valuable technical and historical source books, tracing the evolution of refractory metals from early laboratory alloying studies to their present status as useful engineering materials. Refractory metals are arbitrarily defined by melting point. A 0 melting temperature of over 3500 F was selected as the minimum for this Symposium, thus excluding chromium and vanadium, which logically could be treated with other refractory metals in Groups VA and VIA of the periodic table. The Refractory Metals Committee is planning reviews of chromium and vanadium in subsequent conferences.

Laser Peening - A Processing Tool to Strengthen Metals Or Alloys ASM International

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

ERDA Energy Research Abstracts

Structural Alloys for Power PlantsOperational Challenges and High-Temperature Materials

In recent years the effort devoted to assuring both the safety and reliability of commercial nuclear fission power reactors has markedly increased. The incentives for performing this work are large since the resulting im provement in plant productivity translates into lower fuel costs and, more importantly, reduced reliance on imported oil. Reliability and availability of nuclear power plants, whether fission or fusion, demand that more attention be focused on the behavior of materials. Recent experiences with fission power indicate that the basic properties of materials, which categorize their reliable behavior under specified conditions, need reinforcement to assure trouble-free operation for the expected service life. The pursuit of additional information con tinues to demand a better understanding of some of the observed anom alous behavior, and of the margin of resistance of materials to unpre dictable service conditions. It is also apparent that, next to plasma heating and confinement, materials selection represents the most serious chal lenge to the introduction of fusion power. The recognition of the

importance of materials performance to nu clear plant performance has sustained a multimillion dollar worldwide research and development effort that has yielded significant results, both in quantification of the performance limits of materials in current use and the development and qualification of new materials. Most of this infor mation appears in the open literature in the form of research reports, journal articles, and conference proceedings.

Handbook of Membrane Reactors ASTM International

The 49 peer-reviewed papers collected here together offer a plenitude of up-to-date information on Advanced Fossil Fuel Energy Technologies, Hydrogen Production and Storage, Fuel Cells, Electrochemical Energy Storage Systems. The papers are conveniently arranged into MATERIALS FOR ADVANCED FOSSIL FUEL ENERGY TECHNOLOGIES, MATERIALS IN HYDROGEN PRODUCTION AND STORAGE, Hydrogen Production, Hydrogen Storage, FUEL CELLS: MATERIALS AND TECHNOLOGY CHALLENGES, MATERIALS IN ELECTROCHEMICAL ENERGY STORAGE SYSTEMS.

Coal-ash Corrosion of Alloys for Combustion Power Plants

Elsevier

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.

Fundamental Materials Science, Design and Optimisation

Elsevier

Membrane reactors are increasingly replacing conventional separation, process and conversion technologies across a wide range of applications. Exploiting advanced membrane materials, they offer enhanced efficiency, are very adaptable and have great economic potential. There has therefore been increasing interest in membrane reactors from both the scientific and industrial communities, stimulating research and development. The two volumes of the Handbook of membrane reactors draw on this research to provide an authoritative review of this important field. Volume 1 explores fundamental materials science, design and optimisation, beginning with a review of polymeric, dense metallic and composite membranes for membrane reactors in part one. Polymeric and nanocomposite membranes for membrane reactors, inorganic membrane reactors for hydrogen production, palladium-based composite membranes and alternatives to palladium-based membranes for hydrogen separation in membrane reactors are all discussed. Part two goes on to investigate zeolite, ceramic and carbon membranes and catalysts for membrane reactors in more depth. Finally, part three explores membrane reactor modelling, simulation and optimisation, including the use of mathematical modelling, computational fluid dynamics, artificial neural networks and non-equilibrium thermodynamics to analyse varied aspects of membrane reactor design and production enhancement. With its distinguished editor and international team of expert contributors, the two volumes of the Handbook of membrane reactors provide an authoritative guide for membrane

reactor researchers and materials scientists, chemical and biochemical manufacturers, industrial separations and process engineers, and academics in this field. Considers polymeric, dense metallic and composite membranes for membrane reactors Discusses cereamic and carbon for membrane reactors in detail Reactor modelling, simulation and optimisation is also discussed

Fusion Energy Update Springer

The utilisation of biomass is increasingly important for low- or zero-carbon power generation. Developments in conventional power plant fuel flexibility allow for both direct biomass combustion and co-firing with fossil fuels, while the integration of advanced technologies facilitates conversion of a wide range of biomass feedstocks into more readily combustible fuel. Biomass combustion science, technology and engineering reviews the science and technology of biomass combustion, conversion and utilisation. Part one provides an introduction to biomass supply chains and feedstocks, and outlines the principles of biomass combustion for power generation. Chapters also describe the categorisation and preparation of biomass feedstocks for combustion and gasification. Part two goes on to explore biomass combustion and co-firing, including direct combustion of biomass, biomass co-firing and gasification, fast pyrolysis of biomass for the production of liquids and intermediate pyrolysis technologies. Largescale biomass combustion and biorefineries are then the focus of part three. Following an overview of large-scale biomass combustion plants, key engineering issues and plant operation are discussed, before the book concludes with a chapter looking at the role of biorefineries in increasing the value of the end-products of biomass conversion. With its distinguished editor and international team of expert contributors, Biomass combustion science, technology and engineering provides a clear overview of this important area for all power plant operators, industrial engineers, biomass researchers, process chemists and academics working in this field. Reviews the science and technology of biomass combustion, conversion and utilisation Provides an introduction to biomass supply chains and feedstocks and outlines the principles of biomass combustion for power generation Describes the categorisation and preparation of biomass feedstocks for combustion and gasification

Operational Challenges and High-Temperature Materials

ASTM International

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

Structural Materials for Generation IV Nuclear Reactors Trans Tech Publications Ltd

This book addresses structural material corrosion in coolant circuits, simulation of erosion corrosion of carbon and low-alloy steels, and simulation of stress corrosion. It also discusses corrosion of copper alloys, zirconium corrosion, optimization of water chemistry at operating nuclear power plants, coolant tendency to deposit hardness salts on heat-transfer surfaces, and inspection of metallic components. In addition, there are two appendixes, the first showing the chemical composition of steels, the second discussing solubility of iron, cobalt, zinc and copper corrosion products under conditions simulating power unit water chemistry.