Oxide Scale Behavior In High Temperature Metal Processing

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Influence of Black Annealing Oxide Scale on the Anodic Behavior of Alloy 22
Advances in Plastic Forming of Metals
High Temperature Corrosion
Springer Handbook of Metrology and Testing
High-Entropy Alloys
Oxide Dispersion Strengthened Refractory Alloys
Self-Organization During Friction
High Temperature Oxidation and Ignition Behaviour of Magnesium Alloys Containing Stronium (Sr) and Neodymium (Nd)
High Temperature Coatings
High Performance Structural Materials
High Temperature Corrosion of Advanced Materials and Protective Coatings
High Temperature Corrosion and Materials Chemistry 7
Fourth volume

Advanced Surface-Engineered Materials and Systems Design
High-temperature Oxidation of Metals
High Temperature Corrosion and Materials Chemistry
Non-Destructive Evaluation of Corrosion and Corrosion-assisted Cracking
High-Temperature Oxidation and Corrosion 2005
Materials for High-Temperature Fuel Cells
Nickel Base Single Crystals Across Length Scales
Hot Stamping Advanced Manufacturing Technology of Lightweight Car Body
High Temperature Mechanical Behaviour of Ceramic Composites
Fundamentals and Engineering
Proceedings of Chinese Materials Conference 2017
High Temperature Corrosion
Tribology in Manufacturing Technology
High Temperature Oxidation Behavior of Gamma-Ni+gamma'-Ni3Al Alloys and Coatings Modified with Pt and Reactive Elements
Aerospace Materials Handbook
High-Temperature Oxidation and Corrosion 2010
High Temperature Corrosion and Materials Chemistry III
Advances and Real-Life Applications
The Effect of Surface-applied Reactive Elements on the High Temperature Oxidation

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Wear of Materials
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Waste Production and Utilization in the Metal Extraction Industry
Proceedings of the Per Kofstad Memorial Symposium

GIDEON ADELAIDE

Study of Grain Boundary Character CRC Press
In our present era of nanoscience and nanotechnology, new materials are poised to take center stage in dramatically improving friction and wear behavior under extreme conditions. Compiled by two eminent experts, Self-Organization During Friction: Advanced Surface-Engineered Materials and Systems Design details the latest advances and developments i
Influence of Black Annealing Oxide Scale on the Anodic Behavior of Alloy 22 Wiley-American Ceramic Society
This book brings together the experience

of specialists on High Temperature Corrosion. The 43 papers discuss topics related to the high temperature corrosion of engineering alloys, ceramics and protective coatings. The papers will be a useful and dynamic tool for those wishing to increase their knowledge of High Temperature Corrosion, as well as providing a guide to recent literature in this field.

Advances in Plastic Forming of Metals ASM International

Oxide Scale Behavior in High Temperature Metal ProcessingJohn Wiley & Sons

High Temperature Corrosion Elsevier

Proceedings from: EPRI’s 9th International Conference on Advances in Materials Technology for Fossil Power Plants and the 2nd International 123HiMAT Conference on High-Temperature Materials

Springer Handbook of Metrology and Testing John Wiley & Sons

The world's ever-growing demand for power has created an urgent need for new efficient and sustainable sources of energy and electricity. Today's consumers of portable electronics also demand devices that not only deliver more power but are also environmentally friendly. Fuel cells are an important alternative energy source, with promise in military, commercial and industrial applications, for example power vehicles and portable devices. A fuel cell is an electrochemical device that directly converts the chemical energy of a fuel into electrical energy. Fuel cells represent the most efficient energy

conversion technologies to-date and are an integral part in the new and renewable energy chain (e.g., solar, wind and hydropower). Fuel cells can be classified as either high-temperature or lowtemperature, depending on their operating temperature, and have different materials requirements. This book is dedicated to the study of high temperature fuel cells. In hightemperature fuel cells, the electrolyte materials are ceramic or molten carbonate, while the electrode materials are ceramic or metal (but not precious metal). High operation temperature fuel cells allow internal reforming, promote rapid kinetics with non-precious materials and offer high flexibilities in fuel choice, and are potential and viable candidate to moderate the fast increase in power requirements and to minimize the impact of the increased power consumption on the environment. 'Materials for High Temperature Fuel Cells' is part of the series on Materials for Sustainable Energy and Development edited by Prof. Max Q. Lu. The series covers advances in materials science and innovation for renewable energy, clean use of fossil energy, and greenhouse gas mitigation and associated environmental technologies. *High-Entropy Alloys* John Wiley & Sons Nanotechnology: Advances and Real-Life Applications offers a comprehensive reference text about advanced concepts and applications in the field of nanotechnology. The text – written by researchers practicing in the field –

presents a detailed discussion of key concepts including nanomaterials and their synthesis, fabrication and characterization of nanomaterials, carbon-based nanomaterials, nano-bio interface, and nanoelectronics. The applications of nanotechnology in the fields of renewable energy, medicine and agriculture are each covered in a dedicated chapter. The text will be invaluable for senior undergraduate and graduate students in the fields of electrical engineering, electronics engineering, nanotechnology and nanoscience. Dr. Cherry Bhargava is an Associate Professor and Head, VLSI domain, at the School of Electrical and Electronics Engineering of Lovely Professional University, Jalandhar, India. Dr. Amit Sachdeva is an Associate Professor at Lovely Professional University, Jalandhar, India.

Oxide Dispersion Strengthened Refractory Alloys ASTM International

This book aims to show how tribological concepts can be applied in order to improve manufacturing technology in modern industry. It can be used as a guide book for engineering students or a reference useful for academics in the fields of tribology, manufacturing, materials and mechanical engineering.

Self-Organization During Friction Trans Tech Publications Ltd

This book is a printed edition of the Special Issue "Advances in Plastic Forming of Metals" that was published in Metals

High Temperature Oxidation and Ignition Behaviour of Magnesium Alloys

Containing Stronium (Sr) and Neodymium (Nd) Springer Science & Business Media
This proceedings volume gathers selected papers presented at the Chinese Materials Conference 2017 (CMC2017), held in Yinchuan City, Ningxia, China, on July 06-12, 2017. This book covers a wide range of powder metallurgy, high performance aluminum alloys, high performance titanium & titanium alloys, superalloys, metal matrix composite, space materials science and technology, rare metals, refractory metals and their applications, advanced ceramics materials, nanostructured metals and alloys. The Chinese Materials Conference (CMC) is the most important serial conference of the Chinese Materials Research Society (C-MRS) and has been held each year since the early 1990s. The 2017 installment included 37 Symposia covering four fields: Advances in energy and environmental materials; High performance structural materials; Fundamental research on materials; and Advanced functional materials. More than 5500 participants attended the congress, and the organizers received more than 700 technical papers. Based on the recommendations of symposium organizers and after peer reviewing, 490 papers have been included in the present proceedings, which showcase the latest original research results in the field of materials, achieved by more than 300 research groups at various universities and research institutes.

High Temperature Coatings

Butterworth-Heinemann
This book summarizes the advanced manufacturing technology of original innovations in hot stamping of lightweight car body. A detailed description of the technical system and basic knowledge of sheet metal forming is given, which helps readers quickly understand the relevant knowledge in the field. Emphasis has been placed on the independently developed hot stamping process and equipment, which help describe the theoretical and experimental research on key problems involving stress field, thermal field and phase transformation field in hot stamping process. Also, a description of the formability at elevated temperature and the numerical simulation algorithms for high strength steel hot stamping is given in combination with the experiments. Finally, the book presents some application cases of hot stamping technology such as the lightweight car body design using hot stamping components and gradient hardness components, and the cooling design of the stamping tool. This book is intended for researchers, engineers and graduate students in vehicle engineering, mechanical engineering, especially in the field of advanced manufacturing technology. The book also provides a useful reference for other new technology related temperature and phase transformation, such as aluminum-magnesium alloy hot stamping.

High Performance Structural Materials Elsevier

High Temperature Mechanical Behavior of Ceramic Composites provides an up-to-date comprehensive coverage of the mechanical behavior of ceramic matrix composites at elevated temperatures. Topics include both short-term behavior (strength, fracture toughness and R-curve behavior) and long-term behavior (creep, creep-fatigue, delayed failure and lifetime). Emphasis is on a review of fundamentals and on the mechanics and mechanisms underlying properties. This is the first time that complete information of elevated temperature behavior of ceramic composites has ever been compacted together in a single volume. Of particular importance is that each chapter, written by internationally recognized experts, includes a substantial review component enabling the new material to be put in proper perspective. Shanti Nair is Associate Professor at the Department of Mechanical Engineering at the University of Massachusetts at Amherst. Karl Jakus is Professor at the University of Massachusetts at Amherst.

High Temperature Corrosion of Advanced Materials and Protective Coatings CRC Press

High-Entropy Alloys, Second Edition provides a complete review of the current state of the field of high entropy alloys (HEA). Building upon the first edition, this fully updated release includes new theoretical understandings of these materials, highlighting recent developments on modeling and new classes of HEAs, such as Eutectic HEAs and Dual phase HEAs. Due to their

unique properties, high entropy alloys have attracted considerable attention from both academics and technologists. This book presents the fundamental knowledge, the spectrum of various alloy systems and their characteristics, key focus areas, and the future scope of the field in terms of research and technological applications. Provides an up-to-date, comprehensive understanding on the current status of HEAs in terms of theoretical understanding and modeling efforts Gives a complete idea on alloy design criteria of various classes of HEAs developed so far Discusses the microstructure property correlations in HEAs in terms of structural and functional properties Presents a comparison of HEAs with other multicomponent systems, like intermetallics and bulk metallic glasses **High Temperature Corrosion and Materials Chemistry 7** Nova Publishers Materials for high-pressure turbine blades must be able to operate in the high-temperature gases (above 1000 C) emerging from the combustion chamber. Accordingly, the development of nickel-based superalloys has been constantly motivated by the need to have improved engine efficiency, reliability and service lifetime under the harsh conditions imposed by the turbine environment. However, the melting point of nickel (1455 C) provides a natural ceiling for the temperature capability of nickel-based superalloys. Thus, surface-engineered turbine components with modified diffusion coatings and overlay

coatings are used. Theses coatings are capable of forming a compact and adherent oxide scale, which greatly impedes the further transport of reactants between the high-temperature gases and the underlying metal and thus reducing attack by the atmosphere. Typically, these coatings contain ?-NiAl as a principal constituent phase in order to have sufficient aluminum content to form an Al2O3 scale at elevated temperatures. The drawbacks to the currently-used ?-based coatings, such as phase instabilities, associated stresses induced by such phase instabilities, and extensive coating/substrate interdiffusion, are major motivations in this study to seek next-generation coatings. The high-temperature oxidation resistance of novel Pt + Hf-modified ?-Ni + ?-Ni3Al-based alloys and coatings were investigated in this study. Both early-stage and 4-days isothermal oxidation behavior of single-phase ?-Ni and ?'-Ni3Al alloys were assessed by examining the weight changes, oxide-scale structures, and elemental concentration profiles through the scales and subsurface alloy regions. It was found that Pt promotes Al2O3 formation by suppressing the NiO growth on both ?-Ni and ?'Ni3Al single-phase alloys. This effect increases with increasing Pt content. Moreover, Pt exhibits this effect even at lower temperatures (õ970 C) in the very early stage of oxidation. It was also inferred that Pt enhances the diffusive flux of aluminum from the substrate to the scale/alloy interface. Relatively low levels of hafnium addition

to Pt-free ?'-Ni3Al increased the extent of external NiO formation due to non-protective HfO2 formation. Accordingly, this effect intensified with increasing Hf content from 0.2 to 0.5 at.%.

ASTM International

The resistance of Alloy 22 (N06022) to localized corrosion, mainly crevice corrosion, has been extensively investigated in the last few years. The effect of influencing variables such as temperature, applied potential, chloride concentration and nitrate inhibitor concentration have been addressed previously. At this time, it was important to address the effect an oxide film or scale that forms during the high temperature annealing process or solution heat treatment (SHT) and its subsequent water quenching. Electrochemical tests such as cyclic potentiodynamic polarization (CPP) have been carried out to determine the repassivation potential for localized corrosion and to assess the mode of attack on the specimens. Tests have been carried out in parallel using mill annealed (MA) specimens free from oxide on the surface. The comparative testing was carried out in six different electrolyte solutions at temperatures ranging from 60 to 100 C. Results show that the repassivation potential of the specimens containing the black anneal oxide film on the surface was practically the same as the repassivation potential for oxide-free specimens.

Fourth volume Springer Science & Business Media

This book contains eight chapters with

original and innovative research studies in the field of grain boundaries. The results presented in the chapters of this book are very interesting and inspiring. This book will be very valuable to all researchers who are interested in the influence of grain boundaries on the structure and different kinds of properties of engineering materials. This book is also addressed to students and professional engineers working in the industry as well as to specialists who pay attention to all aspects related to grain boundaries and their impact on the various properties of innovative materials. The chapters of this book were developed by respected and well-known researchers from different countries.

Advanced Surface-Engineered Materials and Systems Design The Electrochemical Society

Refractory metals such as W, Mo, Ta, Nb, and Re have immense potential for application in plasma-facing materials in nuclear reactors, defense materials, aviation counterweights, heating elements in furnaces, and so forth. This book presents a wide perspective of oxide dispersion strengthened refractory alloys fabrication and critical properties. It provides a comprehensive road map for an appropriate basis for alloy design, process parameter selection, fabrication route, and deformation behavior for oxide dispersion strengthened refractory alloys. It further covers achievement of application-oriented properties and critical process-regulating parameters for development of sustainable

materials. Features: Covers development of oxide dispersion strengthened sustainable material to withstand high-temperature environments Describes stimulating application-oriented final mechanical properties Illustrates fabrication of alloys through effective route to achieve desired properties Presents in-depth explanation of deformation behavior at ambient and high temperatures Explores critical applications of the alloys in nuclear reactors, defense, and aviation sectors Oxide Dispersion Strengthened Refractory Alloys will be of interest to graduate students and researchers in high-temperature materials, mechanics, metallurgy, powder metallurgy, and physical metallurgy.

High-temperature Oxidation of Metals CRC Press

Volume is indexed by Thomson Reuters CPCI-S (WoS). This volume contains 80 selected peer-reviewed papers, divided into the sections: Fundamentals of High-Temperature Oxidation and Corrosion, Steam Oxidation and Influence of Hydrogen, Protective Coatings and Surface Treatments, Mechanical and Chemical Aspects of Scale Adhesion, Corrosion in Incinerators and Metal Dusting and Oxidation of Ceramics and Intermetallics.

High Temperature Corrosion and Materials Chemistry CRC Press

Selected, peer reviewed papers from the 3rd International Symposium on High-Temperature Oxidation and Corrosion, (ISHOC), November 8-11, 2010, Zushi, Japan

Non-Destructive Evaluation of Corrosion and Corrosion-assisted Cracking The Electrochemical Society "The high temperature oxidation and ignition of magnesium (Mg) and its alloys have restricted their use in many applications, such as civilian aircraft and other aerospace components. Recent research activities have aimed at increasing the resistance of Mg alloys to oxidation and ignition by modifying the MgO surface scale to a more protective barrier oxide between the metal and the gas environment. Alloying is one of the techniques to alter the surface oxide structure. In this thesis, two different alloying elements, namely an alkaline earth element strontium (Sr) and a rare earth element neodymium (Nd), are studied over a range of compositions with respect to their effects on high temperature oxidation behavior and ignition temperature. Mg-Nd Alloys: In the range of 0-6 wt% Nd, the effect of Nd was composition dependent. The Ti increased from 640 °C of pure Mg to 770 oC at 0.5 wt% Nd. The beneficial effect saturated at 0.5 wt% Nd with no further significant increase in Ti as Nd increased to 6 wt% Nd (Ti is 780 °C). The oxidation behavior was investigated first on dilute Mg-Nd alloys (Nd up to 0.5 wt%) and secondly on Mg-Nd alloys richer in Nd (up to 6 wt%). Dilute Mg-Nd alloys having a near single-phase structure ([alpha]-Mg) formed a composite Nd2O3/MgO oxide scale of homogeneous morphology. The oxidation kinetics of the dilute alloys showed slower kinetics compared to pure Mg: the parabolic rate

constant decreased from 8x10-7 of pure Mg to ~2x10-7 mg2 cm-4 s-1 and the linear rate decreased from 8x10-4 to 3x10-4 mg cm-2 s-1. The oxidation behavior of these alloys was largely governed by the oxidation of the [alpha]-Mg phase. Electron probe microanalysis (EPMA) indicated Nd2O3 ingrowth at the metal/oxide surface and Nd enrichment of the subsurface, which supported the formation of the Nd2O3 at the metal/oxide interface. An oxidation model was proposed wherein the formation of an initial oxide scale led a two-directional transport of the species through the oxide scale based on their diffusion coefficients. MgO formed at the oxide/gas interface via outward diffusion of Mg2+ ions through the oxide scale, while Nd2O3 created fast diffusion paths for oxygen causing inward oxide growth and slowed down MgO formation at the gas/oxide interface. The two-phase alloys also formed an MgO + Nd2O3 composite oxide structure with an Nd2O3 rich subscale but with dual-oxide morphology that mimics the two-phase structure. An Nd-depleted zone beneath the subscale was seen and attributed to the rapid Nd consumption at the metal/oxide interface through oxidation. The formation of an Nd-depleted zone lowered the protective ability of the oxide scale and adversely affected the ignition resistance. Kinetic studies showed that the parabolic oxidation kinetics controls the oxide growth on Mg-(0.5-6 wt%) Nd alloys. Mg-Sr Alloys: The oxidation and ignition of Mg-Sr alloys were investigated over the range 0-6

wt% Sr. Ti increased gradually with increased Sr from 640 °C to 860 °C (at 6 wt% Sr). The formation of a dense SrO-containing scale delayed the ignition of the alloys. The interrupted tests showed that the presence of surface active Sr at the metal/oxide interface prevented MgO formation and Mg vaporization through the cracks, which delayed the rapid temperature increase seen on the pure Mg surface and explained the continued beneficial effect of Sr on ignition resistance as Sr increased towards 6 wt% Sr. The oxidation tests at 500 °C revealed extensive SrO formation on the solid solution region on Mg-6%Sr alloy surface; since Sr has a negligible solid solubility of in Mg, this is associated with the Sr-enrichment of the surface due to the surface activity of Sr. The oxidation kinetics slowed down with Sr additions: the parabolic rate constant decreased to ~3x10-7 mg2 cm-4 s-1, and the linear rate constants decreased to 2x10-4 mg cm-2 s-1." --

High-Temperature Oxidation and Corrosion 2005 CRC Press

Reviews the science and engineering of high-temperature corrosion and provides guidelines for selecting the best materials for an array of system processes High-temperature corrosion (HTC) is a widespread problem in an array of industries, including power generation, aerospace, automotive, and mineral and chemical processing, to name a few. This book provides engineers, physicists, and chemists with a balanced presentation of all relevant basic science and engineering aspects of

high-temperature corrosion. It covers most HTC types, including oxidation, sulfidation, nitridation, molten salts, fuel-ash corrosion, H2S/H2 corrosion, molten fluoride/HF corrosion, and carburization. It also provides corrosion data essential for making the appropriate choices of candidate materials for high-temperature service in process conditions. A form of corrosion that does not require the presence of liquids, high-temperature corrosion occurs due to the interaction at high temperatures of gases, liquids, or solids with materials. HTC is a subject is of increasing importance in many areas of science and engineering, and students, researchers, and engineers need to be aware of the nature of the processes that occur in high-temperature materials and equipment in common use today, especially in the chemical, gas, petroleum, electric power, metal manufacturing, automotive, and nuclear industries. Provides engineers and scientists with the essential data needed to make the most informed decisions on materials selection Includes up-to-date information accompanied by more than 1,000 references, 80% of which from within the past fifteen years Includes details on systems of critical engineering importance, especially the corrosion induced by low-energy radionuclides Includes practical guidelines for testing and research in HTC, along with both the European and International Standards for high-temperature corrosion engineering Offering balanced, in-depth coverage of the fundamental science

behind and engineering of HTC, High Temperature Corrosion: Fundamentals and Engineering is a valuable resource for academic researchers, students, and professionals in the material sciences, solid state physics, solid state chemistry, electrochemistry, metallurgy, and mechanical, chemical, and structural engineers.

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