

Magnesium Magnesium Alloys And Magnesium Composites

Despite their tremendous potential, Mg and its alloys are not yet used in biomedical applications. This book aims to provide scientific insights into the challenges of the materials, and give an overview of the research regarding their mechanical properties, corrosion behaviour and biological performances. The authors intend to put the reader into the position to accurately discern the proper Mg-based material for his/her applications and to choose the proper improvement strategy to his/her cause. To this aim, the manuscript is structured as follows: in Section 2, the main challenges hampering the use of magnesium in biomedical applications and the common improvement strategies are listed. In Section 3, the most investigated Mg alloys are reported in separate sub-sections, detailing their mechanical properties, corrosion behaviour and biotoxicity. High-pure and ultra-high-pure Mg, Al-based Mg alloys, Zn-based Mg alloys, Ca-based alloys and RE-based Mg alloys have been considered. In Section 4, the alloys' performances with respect to the challenges is summarized providing the reader with useful information and suggestions on the potentially most suited choice. Finally, in Section 5, an authors' opinion of the field with a perspective is provided. This book will allow biomedical engineers, surface scientists, material scientists, implant manufacturers and companies working on implant approval an overview of the state-of-the-art technologies adopted so far to overcome the drawbacks of Mg for biomedical applications. Particular emphasis is put on explaining the link between mechanical, corrosion and biocompatible properties of Mg and its alloys as well as their pros and cons. In doing so, the authors intend to put the reader into the position to accurately discern the proper Mg-based material for his/her applications and to choose the proper improvement strategy to his/her cause.

This collection from the 12th International Conference on Magnesium Alloys and Their Applications (Mg 2021)—the longest running conference dedicated to the development of magnesium alloys—covers the breadth of magnesium research and development, from primary production to applications to end-of-life management. Authors from academia, government, and industry discuss new developments in magnesium alloys and share valuable insights. Topics in this volume include but are not limited to the following: Primary production Alloy development Solidification and casting processes Forming and thermo-mechanical processing Other manufacturing process development (including joining and additive manufacturing) Corrosion and protection Modeling and simulation Structural, functional, biomedical, and energy applications Advanced characterization and fundamental theories Recycling and environmental issues

Magnesium, Magnesium alloys, Ingots, Castings, Designations, Chemical composition, Mechanical properties of materials

The Magnesium Technology Symposium, the event on which this collection is based, is one of the largest yearly gatherings of magnesium specialists in the world. Papers represent all aspects of the field, ranging from primary production to applications to recycling. Moreover, papers explore everything from basic research findings to industrialization. Magnesium Technology 2021 is a definitive reference that covers a broad spectrum of current topics, including novel extraction techniques; primary production; alloys and their production; thermodynamics and kinetics; cast products and processing; wrought products and processing; forming, joining, and machining; corrosion and surface finishing; structural applications; degradation and biomedical applications; and several others.

Corrosion and Surface Treatments

Fundamentals of Magnesium Alloy Metallurgy

19. Control of biodegradation of magnesium (Mg) alloys for medical applications

Magnesium 2021

13. Electroless nickel-boron plating to improve the corrosion resistance of magnesium (Mg) alloys

Corrosion of Magnesium Alloys

This ASM Handbook is the most comprehensive collection of engineering information on this important structural material published in the last sixty years. Prepared with the cooperation of the International Magnesium Association, it presents the current industrial practices and provides information and data about the properties and performance of magnesium alloys. Materials science and engineering are covered, including processing, properties, and commercial uses.

Valuable information on corrosion fundamentals and applications of aluminum and magnesium Aluminum and magnesium alloys are receiving increased attention due to their light weight, abundance, and resistance to corrosion. In particular, when used in automobile manufacturing, these alloys promise reduced car weights, lower fuel consumption, and resulting environmental benefits. Meeting the need for a single source on this subject, Corrosion Resistance of Aluminum and Magnesium Alloys gives scientists, engineers, and students a one-stop reference for understanding both the corrosion fundamentals and applications relevant to these important light metals. Written by a world leader in the field, the text considers corrosion phenomena for the two metals in a systematic and parallel fashion. The coverage includes: The essentials of corrosion for aqueous, high temperature corrosion, and active-passive behavior of aluminum and magnesium alloys The performance and corrosion forms of aluminum alloys The performance and corrosion forms of magnesium alloys as coatings for aluminum and magnesium Electrochemical methods of corrosion investigation and their application to aluminum and magnesium alloys Offering case studies and detailed references, Corrosion Resistance of Aluminum and Magnesium Alloys provides an essential, up-to-date resource for graduate-level study, as well as a working reference for professionals using aluminum, magnesium, and their alloys.

Magnesium (Mg) alloys are receiving increasing attention due to their abundance, light weight, castability, formability, mechanical properties and corrosion performance. By selecting the appropriate combination of materials, coatings and surface modifications, their corrosion resistance can be greatly enhanced. Corrosion prevention of magnesium alloys is a comprehensive guide to the effective prevention of corrosion in these important light metals. Part one discusses alloying, inhibition and prevention strategies for magnesium alloys as well as corrosion and prevention principles. Part two reviews surface treatment and conversion. Beginning with an overview of surface cleaning and pre-conditioning, the book goes on to discuss the use of surface processing and alloying, laser treatments, chemical conversion and electrochemical anodization to improve the corrosion resistance of magnesium alloys. Coatings are then the focus of part three, including varied plating techniques, cold spray coatings, gel and electroless electrophoresis coatings. Finally, the book concludes in part four with a selection of case studies investigating the application of preventative techniques for both automotive and medical applications. With its distinguished editor and international team of expert contributors, Corrosion prevention of magnesium alloys is a key reference tool for all those working with magnesium and its alloys, including scientists, engineers, metallurgists, aerospace and automotive professionals, and academics interested in this field. Chapters provide an overview of surface cleaning and pre-conditioning Examines processes to improve the corrosion resistance of magnesium alloys, including laser treatments and chemical conversion and electrochemical anodization Discusses cold spray, sol-gel and electrophoretic coatings

This important book summarises the wealth of recent research on our understanding of process-property relationships in wrought magnesium alloys and the way this understanding can be used to develop a new generation of alloys for high-performance applications. After an introductory overview of current developments in wrought magnesium alloys, part one reviews fundamental aspects of deformation behaviour. These chapters are the building blocks for the optimisation of processing steps covered in part two, which discusses casting, extrusion, rolling and forging technologies. The concluding chapters cover applications of wrought magnesium alloys in automotive and biomedical engineering. With its distinguished editors, and drawing on the work of leading experts in the field, Advances in wrought magnesium alloys is a standard reference for those researching, manufacturing and using these alloys. Summaries recent research on our understanding of process-property relationships in wrought magnesium alloys Discusses the way this understanding can be used to develop a new generation of alloys for high-performance applications Reviews casting, extrusion, rolling and forging technologies, fundamental aspects of deformation behaviour, and applications of wrought magnesium alloys in automotive and biomedical engineering

Welding and Joining of Magnesium Alloys

Machining of Light Alloys

Conversion Coatings for Magnesium and Its Alloys

Magnesium and Magnesium Alloys

Advances in Wrought Magnesium Alloys

12. Plating techniques to protect magnesium (Mg) alloys from corrosion

Plating on Mg alloys has proved difficult due to their high susceptibility to the degradation reactions such as galvanic corrosion in the plating processes. In this chapter, surface conditioning, activation, electroless- or electroplating methods are discussed from viewpoints of corrosion engineering. Degradation reactions of the Mg substrate in each plating stage are considered to figure out how to suppress degradation of substrate and to achieve uniform deposition of a plating layer. Building up an interface between the substrate and the plating layer is also an important subject to establish enough adhesion strength of the plating layer and low defect density to prohibit corrosion progress of the substrate. Al coating plating on Mg alloys electrodeposited from an ionic liquid bath is also introduced to provide coatings with less-galvanic coupling property with a less-noble Mg substrate.

The Magnesium Technology Symposium at the TMS Annual Meeting & Exhibition is one of the largest yearly gatherings of magnesium specialists in the world. Papers represent all aspects of the field, ranging from primary production to applications and recycling. Moreover, papers explore everything from basic research findings to industrialization. Magnesium Technology 2022 is a definitive reference that covers a broad spectrum of current topics, including novel extraction techniques; primary production; alloys and their production; integrated computational materials engineering; thermodynamics and kinetics; plasticity mechanisms; cast products and processing; wrought products and processing; forming, joining, and machining; corrosion and surface finishing; fatigue and

fracture; dynamic response; structural applications; degradation and biomedical applications; emerging applications; additive manufacturing of powders; and recycling, ecological issues, and life cycle analysis.

This important book discusses corrosion with particular reference to how magnesium automotive components, exposed to the automotive corrosion environment, can be protected and provide durable function. The chapter introduces the four types of corrosion that occur with automotive magnesium alloy components. The major focus is on the galvanic events associated with manufacturing and fastening between magnesium components and the steel/aluminum structures used in automotive construction. Examples of new applications, taken from the literature, are discussed with details of the protective modalities that were developed to ensure long-term vehicle durability.

The Magnesium Technology Symposium, the event on which this collection is based, is one of the largest yearly gatherings of magnesium specialists in the world. Papers represent all aspects of the field, ranging from primary production to applications to recycling. Moreover, papers explore everything from basic research findings to industrialization. Magnesium Technology 2020 covers a broad spectrum of current topics, including alloys and their properties; cast products and processing; wrought products and processing; forming, joining, and machining; corrosion and surface finishing; and structural applications. In addition, there is coverage of new and emerging applications.

Magnesium Alloys as Degradable Biomaterials

Magnesium and Magnesium Alloys. Magnesium and Magnesium Alloy Anodes, Ingots and Castings. Designation System

Proceedings of the 6th International Conference - Magnesium Alloys and Their Applications

18. Magnesium (Mg) corrosion protection techniques in the automotive industry

Fundamentals of Processing, Properties and Applications

Engineering Properties of Magnesium Alloys

Anodizing is one of the most widely used surface treatments for magnesium and its alloys. In this electrolytic oxidation process, the surface of a metal is converted to an anodic oxide/hydroxide film with desirable protective, decorative or functional properties. This chapter describes the fundamentals of anodizing treatment, with an emphasis on the difference between magnesium anodizing and aluminum anodizing. The chapter then discusses the most widely used commercial anodic treatments and describes how the treatment conditions affect the corrosion resistance. This chapter also reviews the current state of the art in the anodizing of magnesium. After reviewing the literature, the chapter explains how surface treatment can lead to more widespread use of magnesium alloys in a range of industrial applications.

This chapter briefly reviews current electroless plating techniques for Mg alloys. Among them, a recently developed Ni-B plating is particularly selected for further discussion. Following that, the Ni-B plating methodology is presented and its electroless plating mechanism is proposed. The deposited Ni-B layer on AZ91D is then systematically characterized for its microstructure, porosity, thickness, adhesion and corrosion resistance. Based on the plating performance and characteristics, some possible applications and future developments of this new plating are presented.

In this book, the authors present the current state of both research and technological application of magnesium. In particular, casting and wrought alloys are presented in Chapter 5, followed by a large chapter dedicated to fabrication methods. Corrosion and Protection are treated in Chapter 7. Chapter 8 discusses Engineering Requirements, Strategies and Examples for automobiles in Europe, USA, Asia and Pacific and also for Aerospace and Consumer Articles. Chapter 10 is dedicated to recycling. The experience of authors from seven countries has been combined to provide a comprehensive overview of the current state of the art in the anodizing of magnesium. After reviewing the literature, the chapter explains how surface treatment can lead to more widespread use of magnesium alloys in a range of industrial applications.

Due to the wide application of magnesium alloys in metals manufacturing, it is very important to employ a reliable method of joining these reactive metals together and to other alloys. Welding and joining of magnesium alloys provides a detailed review of both established and new techniques for magnesium alloy welding and their characteristics, limitations and applications. Part one covers general issues in magnesium welding and joining, such as welding materials, metallurgy and the joining of magnesium alloys to other metals such as aluminum and steel. The joining techniques are reviewed, with chapters covering such topics as inert gas welding, metal inert gas welding and laser welding, as well as soldering, mechanical joining and adhesive bonding. The application of newer techniques to magnesium alloys, such as hybrid laser-arc welding, activating flux tungsten inert gas welding and friction stir, is also discussed. With its distinguished editor and expert team of contributors, Welding and joining of magnesium alloys is a comprehensive reference for producers of primary magnesium and those using magnesium alloys in a range of applications.

materials science. Provides a detailed review of both established and new techniques for magnesium alloys welding and their characteristics, limitations and applications Both the weldability of magnesium alloys and weldability to other metals is assessed as well as the preparation required for welding featuring surface treatment Particular welding and joining technologies are explored in detail with particular chapters examining hybrid laser-arc welding, laser welding and resistance spot welding

Corrosion Prevention of Magnesium Alloys

Latest Developments in the Field of Magnesium Alloys and their Applications

8. Anodization of magnesium (Mg) alloys to improve corrosion resistance

Corrosion, Mechanical and Biological Performances

Magnesium Technology 2022

Encyclopedia of Magnesium and Its Alloys (Print)

A resistance of magnesium alloys to surface degradation is paramount for their applications in automotive, aerospace, consumer electronics and general-purpose markets. An emphasis of this book is on oxidation, corrosion and surface modifications, designed to enhance the alloy surface stability. It covers a nature of oxides grown at elevated temperatures and oxidation characteristics of selected alloys along with elements of general and electrochemical corrosion. Medical applications are considered that explore bio-compatibility of magnesium alloys. Also techniques of surface modifications, designed to improve not only corrosion resistance but also corrosion fatigue, wear and other behaviors, are described. The book represents a valuable resource for scientists and engineers from academia and industry.

This book covers fundamentals and recent advancements on conversion coatings for magnesium and its alloys. The contents are presented in two sections, respectively dealing with chemical and electrochemical conversion coatings. The chemical conversion coating section is further subdivided into inorganic conversion coatings, organic conversion coatings and advanced approaches/coatings. The section on electrochemical conversion coatings spans from fundamentals to state-of-the-art progress on electrochemical anodization and plasma electrolytic oxidation of magnesium and its alloys. Collects a range of chapters covering all aspects of chemical and electrochemical conversion coatings for magnesium alloys to improve their corrosion resistance and biocompatibility Stands as the first book dedicated exclusively for conversion coatings on magnesium alloys Serves as a ready reference for graduate students, researchers, and practitioners in multiple industries.

Anodization is one of the most widely used surface pre-treatments for Mg alloys. This chapter systematically summarizes Mg alloy anodizing behavior, the compositions and microstructures of anodized films on Mg alloys and the anodization-influencing factors. Based on the anodizing voltage variation, gas evolution and sparking behavior in a typical anodizing process and the characteristic composition and microstructure of an anodized coating, a four-stage anodizing mechanism is postulated. Moreover, the corrosion performance of anodized Mg alloys is systematically reviewed and a corrosion model is proposed to explain the corrosion performance and electrochemical behavior. It is believed that some of the measured electrochemical features can be utilized to rapidly evaluate or compare the corrosion resistance of anodized Mg alloys.

Magnesium-based alloys containing rare-earth metals are important structural materials, as they combine low density with high-strength properties. This makes them particularly attractive for industry, especially in cases where the low weight of constructions is critical, as in aircraft and space apparatus construction. One of the remarkable features of alloys is the significant difference made by individual rare-earth metals when they are added to magnesium. This second edition of Magnesium Alloys Containing Rare-Earth Metals: Structure and Properties describes the constitution and properties of magnesium-based alloys containing rare-earth metals. It presents the dependence of their characteristics on their atomic number and place in the periodic table and discusses new ideas for rare-earth metals as alloying additives to magnesium. This volume consists mainly of research from Russian scientists but also contains western literature making it a valuable reference tool for students, researchers and professionals in materials science and metallurgy.

Magnesium Alloys

Magnesium and Magnesium Alloys. Magnesium Alloy Ingots and Castings

Understanding, Performance, and Testing

ASM Specialty Handbook

Magnesium and Its Alloys as Implant Materials

Aluminum, Titanium, and Magnesium

The need for light-weight materials, especially in the automobile industry, created renewed interest in innovative applications of magnesium materials. This demand has resulted in increased research and development activity in companies and research institutes in order to achieve an improved property profile and better choice of alloy systems. Here, development trends and application potential in different fields like the automotive industry and communication technology are discussed in an interdisciplinary framework.

Magnesium and Its Alloys: Technology and Applications covers a wide scope of topics related to magnesium science and engineering, from manufacturing and production to finishing and applications. This handbook contains thirteen chapters, each contributed by experts in their respective fields, and presents a broad spectrum of new information on pure magnesium, magnesium alloys, and magnesium matrix MgMnCs composites. It covers such topics as computational thermodynamics, modern Mg-alloys with enhanced creep or fatigue properties, cutting-edge approaches to melt treating (grain refinement, micro-alloying, and the resulting solidification and growth), coatings, surface engineering, environmental protection (recycling and green energy storage and production), as well as biomedical applications. Aimed at researchers, professionals, and graduate students, the book conveys comprehensive and cutting-edge knowledge on magnesium alloys. It is especially useful to those in the fields of materials engineering, mechanical engineering, manufacturing engineering, and metallurgy.

Magnesium, Magnesium alloys, Ingots, Anodes, Castings, Designations, Symbols, Numerical designations, Data layout

Classical magnesium alloys are a combination of aluminum, magnesium, manganese and zinc. Magnesium combined with lithium forms ultralight alloys that have many uses. Since it is a reasonable material, it offers great possibilities and is constantly tested at various angles of applications and properties. Magnesium, previously used for military purposes, seems to fit perfectly to the requirements of the currently prevailing technology. Low density with appropriate mechanical properties (strength, high operating temperature), good foundry properties (high castability and low shrinkage), vibration damping ability and cost-effectiveness of recycling seem to be an ideal response to market needs. All things considered, magnesium alloys are the perfect material used in various industries starting from the automotive industry, through sport, electronics up to the space industry and defence. This book is written by experts in various areas of magnesium science and technology. It gives a general idea of modern advancements in theory and practical purposes of magnesium alloys. The book reports fundamental aspects of corrosion types and details about magnesium alloys designed to work in elevated temperatures and superplastic behaviour. Fundamentals, broad experience, theory as well as complex technological aspects make this work helpful for engineers and scientists from all over the world.

Magnesium Alloys and Technologies

Magnesium Alloys and Their Applications

9. Anodization and corrosion of magnesium (Mg) alloys

Magnesium Technology

Technology and Applications

Magnesium

"Magnesium alloys are known for their light weight, high specific stiffness, and excellent castability and workability. The use of Mg alloys in general, and in the transportation industry in particular, has significantly increased over the last decades, and in-depth and broad knowledge is essential to meet the diverse mechanical, physical and environmental requirements. The Mg encyclopedia will cover a wide scope of topics related to Mg science and engineering, from manufacturing through production to finishing and applications. It will cover such topics as computational thermodynamics, modern Mg-alloys with enhanced creep or fatigue properties, cutting-edge approaches to melt treating (grain refinement, micro-alloying and the resulting solidification and growth), coatings, surface engineering, environmental protection (recycling and green energy storage and production), as well as biomedical applications"--

A look at the current and future uses of magnesium-based productsand their role in the world's environmental and technologicalrevolution The lightest of all structural metals, having one-fourth the density of steel and two-thirds that of aluminum, magnesium hasalready been adopted as an alternative construction material inapplications as far ranging as automotive and sports equipment,electronics, and space technology. In a world concerned withminimizing the environmental impact of products, the choice oflight-weight, energy-saving, and high-performance materials, likemagnesium, would seem a small, significant step towards improvinglife on this planet. Magnesium, Magnesium Alloys, and MagnesiumComposites introduces the science and current applications of thisimportant metal, shedding light on the magnesium-based compositesdeveloped over the last fifteen years. Chapters include in-depthdiscussion of: The characteristics of pure magnesium—including atomproperties and crystal structure as well as physical, electrical, and mechanical properties Magnesium alloys—and the effects of the alloying elements,such as aluminum, lithium, copper, nickel, and silicon The properties of magnesium-based composites—and theeffects of different types (metallic, ceramic, interconnected, andintermetallic) of reinforcements of varying length (from microscale to nanometric length) Corrosion aspects of magnesium-based materials Magnesium-based products in medicine, sports equipment, and theautomotive, aerospace, and electronics industries Bringing together, for the first time, the science, properties, and technologies relating to the current and future uses ofmagnesium, this important reference also offers readers a glimpseof a not-too-distant world in which environmental safety and soundengineering are a reality.

Addition of inhibitors in service environments is a practical corrosion protection approach for engineering materials in industry. This chapter provides an overview of corrosion inhibition of magnesium (Mg) alloys. After a summary of inhibitor inhibition mechanisms on Mg, a few case studies on inhibitor selection and inhibition efficiency evaluation for Mg and its alloys in various media are presented. Based on promising results, future work in this area is proposed.

Magnesium Alloys as Degradable Biomaterials provides a comprehensive review of the biomedical applications of biodegradable magnesium and its alloys. Magnesium has seen increasing use in orthopedic and cardiovascular applications over the last decade, particularly for coronary stents and bone implants.The book discusses the basic concepts of biodeg

Magnesium Technology 2021

Corrosion Resistance of Aluminum and Magnesium Alloys

Corrosion prevention of magnesium alloys

Structure and Properties

Magnesium, Magnesium Alloys, and Magnesium Composites

Magnesium Alloys Containing Rare Earth Metals

The escalation of ongoing research on the topic of conversion coatings for magnesium alloys confirms that the search continues for appropriate replacements to toxic chromate-based coatings. This chapter reviews the performance of the range of typical conversion coating technologies presently available. As a means to rationalise coating performance and characteristics more generally, thermodynamic analysis has been used to compare coating processes and coating pretreatment, the latter of which appears to be at least as significant as the choice of coating technology itself.

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 aluminum 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

Magnesium and magnesium alloys offer a wealth of valuable properties, making them of great interest for use across a wide range of fields. This has led to extensive research focused on understanding the properties of magnesium and how these can be controlled during processing. Fundamentals of magnesium alloy metallurgy presents an authoritative overview of all aspects of magnesium alloy metallurgy, including physical metallurgy, deformation, corrosion and applications. Beginning with an introduction to the primary production of magnesium, the book goes on to discuss physical metallurgy of magnesium and thermodynamic properties of magnesium alloys. Further chapters focus on understanding precipitation processes of magnesium alloys, alloying behaviour of magnesium, and alloy design. The formation, corrosion and surface finishing of magnesium and its alloys are reviewed, before Fundamentals of magnesium alloy metallurgy concludes by exploring applications across a range of fields. Aerospace, automotive and other structural applications of magnesium are considered, followed by magnesium-based metal matrix composites and the use of magnesium in medical applications. With its distinguished editors and international team of expert contributors, Fundamentals of magnesium alloy metallurgy is a comprehensive tool for all those involved in the production and application of magnesium and its alloys, including manufacturers, welders, heat-treatment and coating companies, engineers, metallurgists, researchers, designers and scientists working with these important materials. Overviews all aspects of magnesium alloy metallurgy Discusses physical metallurgy of magnesium and thermodynamic properties of magnesium alloys Reviews the formation, corrosion and surface finishing of magnesium and its alloys

In the recent years there has been a dramatic increase in research activity and also applications of magnesium alloys. The driving force is the growing demand by the automobile industry resulting from the pressure to reduce weight and hence to reduce the fuel consumption. The U.S. car industry incorporates the largest amount of magnesium at the present time. In Europe, Volkswagen had a history of using magnesium in the VW Beetle. Volkswagen, in common with other major car producers has initiated a major research and development programme for advanced magnesium materials. The main emphasis of this book is in the field of general physical metallurgy and alloy development reflecting the need to provide a wider range of alloys both casting and wrought alloys to meet the increasing demands of industry. Other topics are nevertheless well represented such as casting, recycling, joining, corrosion, and surface treatment.

3. Corrosion inhibition of magnesium (Mg) Alloys

Metallurgy, Design Data, Automotive Applications

Magnesium Technology 2020

Proceedings of the 12th International Conference on Magnesium Alloys and Their Applications

Selected Issue

Proceedings of the 7th International Conference on Magnesium Alloys and Their Applications

Magnesium-based metals, including pure magnesium and its alloys, are becoming increasingly popular in the medical industry due to the fact that they are biodegradable. This chapter briefly introduces the concept of biodegradable magnesium-based metals and their advantages as a new class of metallic biomaterials. Relevant research progress is summarized, especially the corrosion control of magnesium-based metals by appropriate surface modification, which is a key issue for clinical applications.

Aluminum, magnesium and titanium are alloys of special interest for engineering applications in a wide range of sectors such as aeronautics, automotive and medical. Their low density, along with sufficient mechanical properties, makes them especially adequate for sectors such as transportation allowing diminishing weight less fuel consumption and emissions to the atmosphere. Nowadays, machining is still one the most important manufacturing processes, not only for metal parts, but also for specially designed hybrid parts for more demanding new applications. A wide range of valuable research has been done on the machining of conventional engineering materials. However, when dealing with light alloys and hybrid materials containing them, they need to face new challenges. Particularly, it is important to analyse the suitability of the machining of these alloys in the current context of Industry 4.0, focusing on the development of cost-effective and sustainable processes. This book is a comprehensive source on the machining of light alloys, presenting a collection of both experimental and review studies. The work is arranged in eight chapters, presented by a group of international scholars, which analyse the main problems related to the machining of these alloys from different perspectives. Key Features A comprehensive state-of-the-art reference source on machining of light alloys Provides research on conventional and non-conventional machining process Offers current research topics on sustainable machining Presents research on the machining of hybrid materials using light alloys Includes applications for Industry 4.0 environments Machining of Light Alloys: Aluminum, Titanium, and Magnesium The aim of the book is to serve as a tool for helping researchers and practitioners to face machining challenges and facilitating the development of new industrial applications for light alloys.

Magnesium and magnesium alloys provide unique properties for engineering applications. Magnesium alloys are popular as a structural material because of their combination of light weight and strength. They are desirable for portable tools, appliances, electronic devices, airplanes, space vehicles, and land transportation. This book is written for engineers, scientists, teachers, and students engaged in the design process of material selection and material elimination. While focused on mechanical properties for structural design, the physical properties that are germane to corrosion behavior and electrical applications are represented. Two-thirds of the book is devoted to datasheets for individual alloys which provide a handy quick reference to specific properties and performance. The remainder of the book addresses topics common to all magnesium alloys such as the alloy designation system and product forms. Casting alloys and wrought alloys are compared. The alloy

performance at elevated temperature is presented, as are fatigue properties. Finally, a summary of the corrosion behavior of selected alloys is discussed along with how these corrosion mechanisms can be applied for beneficial results.

10. Corrosion-resistant coatings for magnesium (Mg) alloys

Magnesium Alloys - Properties in Solid and Liquid States

Magnesium and Its Alloys