

Corrosion And Conservation Of Cultural Heritage Metallic Artefacts

26 Corrosion Inhibitors For The Preservation Of Metallic Heritage Artefacts European Federation Of Corrosion Efc Series

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Science, Technology and Cultural Heritage M.A. Rogerio-Candelera
2014-12-01

The Second International Congress on Science and Technology for the Conservation of Cultural Heritage was held in Seville, Spain, June 24-27, 2014, under the umbrella of the TechnoHeritage network.

TechnoHeritage is an initiative funded by the Spanish Ministry of Economy and Competitivity dedicated to the creation of a network which integrates CSIC and University groups, private companies and end users such as foundations, museums or institutions. The network's purpose is to foster the creation of transdisciplinary (and not only multidisciplinary) initiatives focused on the study of all assets, movable or immovable, that make up Cultural Heritage. The congress was dedicated to six topics, namely (1) Environmental assessment and monitoring (pollution, climate change, natural events, etc.) of Cultural Heritage; (2) New products and materials for conservation and maintenance of Cultural Heritage; (3) Agents and mechanisms of deterioration of Cultural Heritage (physical,

chemical, biological), including deterioration of modern materials used in Contemporary Art and information storage; (4) Development of new instruments, non invasive technologies and innovative solutions for analysis, protection and conservation of Cultural Heritage; (5) Security technologies, remote sensing and G.I.S. for the protection and management of Cultural Heritage; and (6) Significance, social value and policies for the conservation of Cultural Heritage. This volume publishes a total of seventy-two contributions which reflect some of the most recent responses to the challenge of cultural assets conservation and the application of different scientific approaches to the common goal of the conservation of Cultural Heritage.

Corrosion and conservation of cultural heritage metallic artefacts
- S. Grassini 2013-07-31

Electrochemical impedance spectroscopy (EIS) is a powerful tool in developing the most appropriate methodology for ensuring long-lasting artefact preservation. EIS consists in the measurement of amplitude and

phase of the surface impedance of coated metallic objects at different frequencies in order to highlight either the protective effectiveness of a coating or the stability of a corrosion product layer grown onto the metallic surface. Two in-situ EIS measuring campaigns are described together with the description of the portable instrument and the measuring probes specifically designed and developed for cultural heritage applications.

Mechanical and Electro-chemical Interactions under

Tribocorrosion - Pierre Ponthiaux 2021-08-22

Mechanical and Electro-chemical Interactions under Tribocorrosion: From Measurements to Modelling for Building a Relevant Monitoring Approach looks at progress in the field of tribocorrosion. The work is a result of the efforts of the European tribocorrosion community gathered under the auspices of the European Corrosion Federation (EFC) within WP18 Tribocorrosion. In addition to the handbook, Testing Tribocorrosion of Passivating Materials Supporting Research and industrial Innovation published in 2012, this release describes the latest scientific approaches recognized and validated experimentally to address tribocorrosion. Sections look at the phenomena of coupling through an understanding of the associated mechanisms and how to identify variables. Final sections cover strategies to control and/or extend the life of structures in a multi-process coupling situation and an in-depth description of the current state-of-the-art on modeling approaches of tribocorrosion. Reviews the multidisciplinary basics of tribocorrosion Includes insights into novel experimental approaches Provides insights into advanced modeling techniques of tribocorrosion Looks at the implication of results in the development of the monitoring of tribocorrosion

10th International Symposium on the Conservation of Monuments in the Mediterranean Basin Maria Kouli 2018-11-30

This book addresses physical, chemical, and biological methods for the preservation of ancient artifacts. Advanced materials are required to preserve the Mediterranean belt's historic, artistic and archaeological relics against weathering, pollution, natural risks and anthropogenic

hazards. Based upon the 10th International Symposium on the Conservation of Monuments in the Mediterranean Basin, this book provides a forum for international engineers, architects, archaeologists, conservators, geologists, art historians and scientists in the fields of physics, chemistry and biology to discuss principles, methods, and solutions for the preservation of global historical artifacts.

Raman Spectroscopy in Cultural Heritage Preservation - Howell G. M. Edwards 2022

This book addresses the application of Raman spectroscopic techniques to a range of diverse problems which arise in the study, conservation and restoration of artefacts and sites closely related to our cultural heritage as well as in authentication. These themes are naturally wider than what at first might be considered as artworks and archaeological artefacts and the topics include pigments, paintings, ceramics, glass, sculpture and patination / corrosion, textiles, industrial archaeology, the degradation and preservation of biomaterials, mummies and human skeletal remains. An interesting feature is the inclusion of modern case studies which describe specific problems and approaches to the Raman spectral analysis of items important to our cultural heritage. The text is prefaced with an introduction to the important parameters used in nondestructive Raman measurements and also highlights some future applications based upon novel miniaturised instrumentation for in-field studies and potential screening work which will identify specimens which would repay further studies in the laboratory. An attempt is made to give a snapshot of the state-of-the-art evolution since the beginning of the technique (1970s) and to point out potential further development. The book is co-edited by three international experts with many years' experience in the application of Raman spectroscopy to artworks, archaeological artefacts and in the investigation of materials and sites for cultural heritage preservation and each editor has undertaken to write individual chapters and different topics personally. The adopted approach is designed to convey the sort of information which has become available from the adoption of analytical Raman spectroscopy to different problems in the field of cultural heritage preservation through the spectral interrogation

of artefacts and how the interpretation of the spectral data can assist museum curators, archaeologists and cultural heritage historians in the preservation and conservation of ancient materials and sites : a particular advantage in this respect is the ability of Raman spectroscopy to determine generally in a strictly noninvasive procedure - at the laboratory or on-site with mobile instruments, the presence of both organic and inorganic components in a particular specimen together nondestructively without any chemical and mechanical pretreatment being undertaken, which is an essential requirement for rare and valuable samples . An important aside from this work is the means of spectral identification of ongoing biodeterioration and biological colonisation in specimens in storage and the effects of environmental deterioration such as humidity and temperature upon their integrity.

Corrosion of Metallic Heritage Artefacts - P Dillmann 2014-01-23

Understanding long term corrosion processes is critical in many areas, including archaeology and conservation. This important book reviews key themes such as the processes underlying corrosion over long periods, how corrosion rates can be measured and materials conserved. After an overview of the study and conservation of metal archaeological artefacts, a group of chapters reviews long term corrosion in metals such as steel, iron and bronze. Other chapters review the impact of environmental factors on corrosion rates. The book also considers instrumental techniques for measuring corrosion such as electrochemistry and scanning electron microscopy, as well as ways of modelling corrosion processes. There is also coverage of the effectiveness of corrosion inhibitors. With its distinguished editors and contributors, Corrosion of metallic heritage artefacts improves our understanding of long term corrosion and its effects. It provides a valuable reference for those involved in archaeology and conservation, as well as those dealing with the long term storage of nuclear and other waste. Reviews long term corrosion in metals such as steel, iron and bronze Considers instrumental techniques such as electrochemistry for measuring corrosion

Corrosion Under Insulation (CUI) Guidelines - Gino De Landtsheer
2020-08-22

Corrosion Under Insulation (CUI) Guidelines: Technical Guide for Managing CUI, Third Edition, Volume 55 builds upon the success of the first two editions to provide a fully up-to-date, practical source of information on how to monitor and manage insulated systems. In the first edition of this book published in 2008, the EFC Working Parties WP13 and WP15 engaged together to provide guidelines on managing CUI with contributions from a number of European refining, petrochemical, and offshore companies. The guidelines were intended for use on all plants and installations that contain insulated vessels, piping, and equipment, and cover a risk-based inspection methodology for CUI, inspection techniques, and recommended best practices for mitigating CUI. The guidelines include design of plant and equipment, coatings and the use of thermal spray techniques, types of insulation, cladding/jacketing materials, and protection guards. Corrosion-under-insulation (CUI) refers to the external corrosion of piping and vessels that occurs underneath externally clad/jacketed insulation as a result of the penetration of water. By its very nature CUI tends to remain undetected until the insulation and cladding/jacketing is removed to allow inspection, or when leaks occur. CUI is a common problem shared by the refining, petrochemical, power, industrial, onshore and offshore industries. Provides revised and updated technical guidance on managing CUI provided by EFC Working Parties 13 and 15 Discusses the standard approach to risk based inspection methodology Presents the argument that CUI is everywhere, and looks at mitigating actions that can be started from the onset Includes a wide array of concepts of corrosion mitigation

Corrosion and conservation of cultural heritage metallic artefacts
- P. Vassiliou 2013-07-31

The use of silver in ancient civilisations of Mesopotamia, Egypt, Ionia, Greece, Rome and China is presented. Principles of silver corrosion in different environments containing humidity, oxygen, carbonates, sulphur, chlorides, peroxides, ozone and UV, and the morphology of the corrosion layers are described. Cleaning, anti-tarnishing and protection methods are explained. Inhibitor hexadecanethiol (HDT) and a composite coating of Paraloid B-72 containing 2% nano-alumina pigment are tested on

silver specimens with tarnished and corroded surfaces and found to be protective when exposed in sulphides and chloride environments in the laboratory, satisfying aesthetic and reversibility criteria.

Modern Metals in Cultural Heritage - Virginia Costa 2019-07-16

This practical guide provides artists, conservators, curators, and other heritage professionals with tools for understanding, evaluating, and approaching the care and treatment of modern metals. The proliferation of new metals—such as stainless steels, aluminum alloys, and metallic coatings—in modern and contemporary art and architecture has made the need for professionals who can address their conservation more critical than ever. This volume seeks to bridge the gap between the vast technical literature on metals and the pressing needs of conservators, curators, and other heritage professionals without a metallurgy background. It offers practical information in a simple and direct way, enabling curators, conservators, and artists alike to understand and evaluate the objects under their care. This invaluable reference reframes information formerly found only in specialized technical and industrial publications for the context of cultural heritage conservation. As the first book to address the properties, testing, and maintenance issues of the hundreds of metals and alloys available since the beginning of the twentieth century, it is destined to become an essential resource for conservators, artists, fabricators, curators, collectors, and anyone working with modern metals.

Metallography in Archaeology and Art - David A. Scott 2019-08-30

This book provides a comprehensive introduction to the metallographic study of ancient metals. Metallography is important both conceptually as a microstructural science and in terms of its application to the study of ancient and historic metals. Metallography is a well-established methodology for the characterization of the microstructure of metals, which continues to be significant today in quality control and characterization of metallic properties. Not only does the metallographic examination of ancient metals present its own challenges in terms of sample size and interpretation of evidence, but it must be integrated with archaeological data and cultural research in order to obtain the most

meaningful results. Issues of authentication and the establishment of fakes and forgeries of metallic artefacts often involve metallographic evidence of both metal and patina or corrosion interface, as an essential component of such a study. The present volume sets out the basic features of relevant metallic systems, enhanced with a series of examples of typical microstructural types, with illustrative case studies and examples throughout the text derived from studies undertaken by the two authors. This book provides a comprehensive presentation of metallography for archaeologists, archaeometallurgists, conservators, conservation scientists and metallurgists of modern materials.

Nanoscience and Cultural Heritage - Philippe Dillmann 2016-05-24

This book aims to give state of the art in several domains of cultural heritage in which Nanosciences allow fundamental breakthrough. The first part of the book concerns nanostructured materials in ancient artifacts. Understanding their nature and formation processes bring new insight in the apprehension of technical level of ancient societies but can also inspire the design of new materials. The second part is dedicated to the understanding of materials. This crucial issue in material science today, for cultural heritage, needs to perform specific characterization techniques and technologies, but also to create tailored analytical strategies. Part three presents new methods, processes and materials at nano levels that can bring innovative solutions to conservation and restoration issues, linked with the understanding of the alteration processes involved at different scales.

Corrosion and conservation of cultural heritage metallic artefacts

- J. Tidblad 2013-07-31

This chapter focuses primarily on the common environmental aspects of atmospheric metal corrosion. The effects of climate and pollution on corrosion are reviewed across various timescales, from damage over millennia to the present situation, including short descriptions of the indoor environment and recent developments in international standardisation. The chapter concludes with two sections on future trends in air pollution and climate change.

Corrosion and Metal Artifacts: A Dialogue Between Conservators

and Archaeologists and Corrosion Scientists - Benjamin Floyd Brown
2018-11-13

This work has been selected by scholars as being culturally important and is part of the knowledge base of civilization as we know it. This work is in the public domain in the United States of America, and possibly other nations. Within the United States, you may freely copy and distribute this work, as no entity (individual or corporate) has a copyright on the body of the work. Scholars believe, and we concur, that this work is important enough to be preserved, reproduced, and made generally available to the public. To ensure a quality reading experience, this work has been proofread and republished using a format that seamlessly blends the original graphical elements with text in an easy-to-read typeface. We appreciate your support of the preservation process, and thank you for being an important part of keeping this knowledge alive and relevant.

Corrosion and conservation of cultural heritage metallic artefacts
- E. Cano 2013-07-31

This chapter reviews the applicability and specific uses of corrosion inhibitors in metal conservation practice. Corrosion inhibitors are one of the different methods used by conservation-restoration professionals to preserve metallic cultural heritage. In the first part, specific requirements and needs for corrosion inhibitors in conservation treatments are reviewed, as well as the different methods for the assessment of their efficiency. The second part of the chapter reviews the different inhibitors used by type of metals: copper and its alloys, iron and its alloys, and other metals (including silver, lead and zinc), from traditional ones to state-of-the-art treatments.

Analytical Strategies for Cultural Heritage Materials and their Degradation - Juan Manuel Madariaga 2021-01-08

Reviewing the analytical strategies used in the study of cultural heritage assets such as movable artworks and archaeological items, and immovable objects like mural paintings, archaeological sites and historical buildings, this book pays particular attention to analytical methodology. It is not always necessary to use new and sophisticated

instrumentation, what is important is how the instruments are used to obtain reliable, reproducible and repetitive results in view of the problems to be solved. The book considers the influence of the environment on the conservation state including degradation and how modern analytical methods have improved the analysis of materials. It emphasizes multi-method approaches on a range of materials, an approach that is of keen interest to those working in conservation practice. Primarily aimed at final year undergraduate study and masters level students, it would also be useful as supplementary reading for postgraduates and academics who require analytical techniques to enhance their research.

Nanotechnologies and Nanomaterials for Diagnostic, Conservation and Restoration of Cultural Heritage - Giuseppe Lazzara 2018-10-12

Nanotechnologies and Nanomaterials for Diagnostic, Conservation and Restoration of Cultural Heritage explores how advanced nanoscale techniques can help preserve artworks. The book covers lab-scale available techniques as well as advanced methods from neutron sources and X-ray spectroscopy. Other sections highlight a variety of nanomaterials with potential uses in treatments for restoration and conservation, with conservation, consolidation and long-term protection protocols analyzed in each case. The final chapter presents case studies, demonstrates how nanoscale techniques are used to conserve art, and shows what happens when misinterpretation of data sources leads to misdiagnosis. The book is intended for scientists from academic and professional conservators, restorers who are involved in the conservation of artistic and historical artifacts, and those who want to learn how nanotechnology can increase the efficiency of conservation and protection techniques. Cogently explains how nanotechnology is used in the preservation, protection and restoration of artworks Explores the best nanomaterials for a variety of situations Shows how nanomaterials can be used in restoration, for cleaning and in conservation treatments Includes guidelines to prevent the misinterpretation of diagnostic data to help avoid misdiagnosis

Corrosion and conservation of cultural heritage metallic artefacts

- J. Monnier 2013-07-31

The authors consider the case of iron atmospheric corrosion to illustrate the possibility of developing a conservation diagnosis for a given material in a given environment. In the particular case of iron atmospheric corrosion, samples from the site of the Amiens Cathedral in the North of France have been characterised in order to identify the different phases constituting the corrosion product layers. The layers consist of a matrix of iron oxy-hydroxide goethite embedded with several ferrihydrite marblings. Other phases such as as lepidocrocite, maghemite and akaganeite are present in minor quantities. A degradation index is first defined from the phase proportions and from the intrinsic electrochemical properties of those phases. Further, the electrochemical reactivity of scratched rust powders has been studied to define a second degradation index. From these two degradation indices a first step towards a corrosion diagnosis method is proposed.

Corrosion and conservation of cultural heritage metallic artefacts - V.

Argyropoulos 2013-07-31

This chapter discusses the importance of using standards in conservation methodology and practice for cultural heritage (CH) metals. The past general trend in the field is the use of metal industry standards. The chapter surveys the relevant scientific publications, and concludes that conservation researchers use a variety of these standards adopted by different organisations. As a result, it can be difficult to compare scientific data for CH metal studies carried out by different laboratories. The chapter discusses the necessity to draft new standards for metals specific for CH by examining how three independent researchers had different findings when testing the same coating. The role of CEN/TC 346 'Conservation of Cultural Heritage' is also discussed.

Atmospheric Corrosion - Christofer Leygraf 2016-06-07

Presents a comprehensive look at atmospheric corrosion, combining expertise in corrosion science and atmospheric chemistry Is an invaluable resource for corrosion scientists, corrosion engineers, and anyone interested in the theory and application of Atmospheric Corrosion

Updates and expands topics covered to include, international exposure programs and the environmental effects of atmospheric corrosion Covers basic principles and theory of atmospheric corrosion chemistry as well as corrosion mechanisms in controlled and uncontrolled environments Details degradation of materials in architectural and structural applications, electronic devices, and cultural artifacts Includes appendices with data on specific materials, experimental techniques, atmospheric species

Corrosion and conservation of cultural heritage metallic artefacts

- D. Watkinson 2013-07-31

Relationships between conservation and corrosion scientists are assessed and similarities, differences and synergies identified. Corrosion control as a preservation option for heritage metals is advocated as being cost-effective and pragmatic. This will require generation of data to develop predictive conservation and estimation of object lifespan as a function of their intrinsic and extrinsic variables. Methods for quantitative determination of corrosion rates of chloride infested heritage iron and techniques for scaling to heritage value are discussed. The iron hull of the ss Great Britain and an AHRC/EPSRC Heritage Science Research Programme at Cardiff University are used to illustrate the rationale behind using corrosion control in heritage.

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

Corrosion and conservation of cultural heritage metallic artefacts - L.M. Abrantes 2013-07-31

This chapter describes the recent advances in corrosion protection afforded by the use of ultra-thin organic films such as polymer films and self-assembled monolayers. Emphasis is given to the metal surface modification by self-assembled monolayers of carboxylic acids due to their properties and ability to protect metallic artefacts.

Corrosion in Amine Treating Units - Johan van Roij 2021-11-03

Corrosion in Amine Treating Units, Second Edition presents a fully updated resource with a broadened focus that includes corrosion in not only refining operations, but also in oil and gas production. New sections have been added on inhibition, corrosion modeling and metallic coatings. More detailed descriptions of the degradation mechanisms and Integrity Operating Windows (IOW) are now included, as is more in-depth information on guidelines for what sections and locations are most vulnerable to corrosion and how to control corrosion in amine units e.g., using corrosion Loop descriptions and providing indicative integrity operating windows for operation to achieve a suitable life expectancy. Provides new insights on the degradation mechanisms occurring in amine treating units and the locations within the unit where they occur Discusses how to mitigate and control corrosion in amine units Provides guidance for setting up corrosion control documents and inspection and maintenance plans for amine treating units

Corrosion and conservation of cultural heritage metallic artefacts - K. Kreislova 2013-07-31

Europe has a rich industrial cultural heritage, including technical objects and industrial sites. This chapter discusses basic types of metallic objects of industrial cultural heritage including their material properties and surface treatments from the point of view of corrosion behaviour in specific atmospheric conditions to which they are exposed. The general

principles of conservation ethics and problems of these types of cultural heritage are mentioned. Two case studies of evaluation of condition of typical industrial cultural objects are given.

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.

Corrosion and Conservation of Cultural Heritage Metallic Artefacts - P Dillmann 2013-07-31

The conservation of metallic archaeological and historic artefacts is a major challenge whether they are ancient bronzes or relics of our more recent industrial past. Based on the work of Working Party 21 Corrosion of Archaeological and Historical Artefacts within the European Federation of Corrosion (EFC), this important book summarises key recent research on analytical techniques, understanding corrosion processes and preventing the corrosion of cultural heritage metallic artefacts. After an introductory part on some of the key issues in this area, part two reviews the range of analytical techniques for measuring and analysing corrosion processes, including time resolved spectroelectrochemistry, voltammetry and laser induced breakdown spectroscopy. Part three reviews different types of corrosion processes for a range of artefacts, whilst part four discusses on-site monitoring techniques. The final part of the book summarises a range of conservation techniques and strategies to conserve cultural heritage metallic artefacts. Corrosion and conservation of cultural heritage metallic

artefacts is an important reference for all those involved in archaeology and conservation, including governments, museums as well as those undertaking research in archaeology and corrosion science. Summarises key research on analytical techniques for measuring and analysing corrosion processes Provides detailed understanding of corrosion processes and corrosion prevention Discusses on-site monitoring techniques

Conserving Cultural Heritage - María Jesús Mosquera 2018-09-17
The third International congress of Science and Technology for the Conservation of Cultural Heritage, TechnoHeritage 2017, was held in Cadiz, from 21 to 24 May 2017, under the umbrella of the TechnoHeritage network. TechnoHeritage is an initiative funded by the Spanish Ministry of Economy and Competitiveness dedicated to the creation of a network which integrates CSIC and University groups, private companies and end users such as foundations, museums or institutions. The network's purpose is to foster the creation of transdisciplinary (and not only multidisciplinary) initiatives focused on the study of all assets, movable or immovable, that make up Cultural Heritage. A high-quality scientific programme was prepared, which includes new emerging topics on Cultural Heritage (1) Nanomaterials and other Products for Conservation, (2) New Technologies for Analysis, Protection and Conservation, (3) 20th Century Cultural Heritage, (4) Significance of Cultural Heritage. Policies for Conservation, (5) Deterioration of Cultural Heritage, (6) Biodeterioration: Fundamentals, Present and Future Perspectives and (7) Underwater Cultural Heritage. A special session "Biodeterioration: Fundamentals, present and future perspectives, a session in honour of Prof. Cesáreo Sáiz Jiménez" took place. Our intention was to recognise the work of Prof. Sáiz Jiménez, who recently retired, and its impact on the Cultural Heritage conservation community, which he has helped to promote through numerous activities including, in 2011, the creation of the TechnoHeritage network. This volume publishes a total of eighty-three contributions which reflect the state of the art investigations on different aspects of cultural heritage conservation.

Development and Application of Optical Coherence Tomography (OCT) - Michael Pircher 2018-03-23

This book is a printed edition of the Special Issue "Development and Application of Optical Coherence Tomography (OCT)" that was published in Applied Sciences

Microorganisms in the Deterioration and Preservation of Cultural Heritage - Edith Joseph 2021-05-05

This open access book offers a comprehensive overview of the role and potential of microorganisms in the degradation and preservation of cultural materials (e.g. stone, metals, graphic documents, textiles, paintings, glass, etc.). Microorganisms are a major cause of deterioration in cultural artefacts, both in the case of outdoor monuments and archaeological finds. This book covers the microorganisms involved in biodeterioration and control methods used to reduce their impact on cultural artefacts. Additionally, the reader will learn more about how microorganisms can be used for the preservation and protection of cultural artefacts through bio-based and eco-friendly materials. New avenues for developing methods and materials for the conservation of cultural artefacts are discussed, together with concrete advances in terms of sustainability, effectiveness and toxicity, making the book essential reading for anyone interested in microbiology and the preservation of cultural heritage.

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

Advances in Organic Coatings 2018 - Flavio Deflorian 2020-12-10

The recent huge developments in nanotechnology and surface science are allowing the production of multifunctional coatings materials combining different properties: corrosion-protective actions, aesthetic functions, hydrophobic properties, self-healing abilities, etc. Moreover the increasing attention to environmental issues is driving the development of new systems, joining advanced performance with high sustainability, which can be better understood using new highly efficient experimental techniques. This frame is inducing us to consider the advances in organic coatings (the skin of materials) as one of the most interesting and promising innovation fields in material science and technology, with important consequences, not only considering fundamental aspects in science, but also for industrial applications, positively affecting everyday life. The aim of this Special Issue is to provide an update of the most advanced research in this area, showing the innovation trends and promoting further research for better properties of new coating materials.

Conservation Science - Paul Garside 2021-12-03

Conservation techniques for the analysis and preservation of heritage materials are constantly progressing. Building on the first edition of Conservation Science, this new edition incorporates analytical techniques and data processing methods that have emerged in the past decade and presents them alongside notable case studies for each class of material. An introductory chapter on analytical techniques provides a succinct overview to bring the reader up-to-speed with which type of material each technique is suitable for, the differing sampling techniques that can be employed, and the handling and processing of the resultant data. Subsequent chapters go on to cover all common heritage materials in turn, from natural substances such as wood and stone to modern plastics, detailing the up-to-date techniques for their analysis. With contributions by scientists working in the museum and heritage sector,

this textbook will interest students, scientists involved in conservation, and conservators who want to develop their understanding of their collections at a material level.

Corrosion and conservation of cultural heritage metallic artefacts

- M. Abdel Harith 2013-07-31

In the present chapter laser-induced breakdown spectroscopy (LIBS) is introduced as a powerful spectrochemical analytical technique that can be exploited to characterize corroded artifacts. Scientific and technological aspects of LIBS are briefly presented. LIBS does not need sample preparation, it is nondestructive and it can be used for in-situ measurements. Examples of LIBS applications that can help archaeologists in conservation and restoration of metallic artifacts are given. We demonstrated the use of LIBS in analysis of corroded metal threads, depth profiling of copper-based decorative artefact, analysis of corroded Punic coins, and LIBS and XRF analysis of Roman silver denarii.

Artistry in Bronze - Jens M Daehner 2017-11-21

The papers in this volume derive from the proceedings of the nineteenth International Bronze Congress, held at the Getty Center and Villa in October 2015 in connection with the exhibition Power and Pathos: Bronze Sculpture of the Hellenistic World. The study of large-scale ancient bronzes has long focused on aspects of technology and production. Analytical work of materials, processes, and techniques has significantly enriched our understanding of the medium. Most recently, the restoration history of bronzes has established itself as a distinct area of investigation. How does this scholarship bear on the understanding of bronzes within the wider history of ancient art? How do these technical data relate to our ideas of styles and development? How has the material itself affected ancient and modern perceptions of form, value, and status of works of art? www.getty.edu/publications/artistryinbronze

Corrosion Under Insulation (CUI) Guidelines - S Winnik 2015-11-26

Corrosion-under-insulation (CUI) refers to the external corrosion of piping and vessels that occurs underneath externally clad/jacketed insulation as a result of the penetration of water. By its very nature CUI

tends to remain undetected until the insulation and cladding/jacketing is removed to allow inspection or when leaks occur. CUI is a common problem shared by the refining, petrochemical, power, industrial, onshore and offshore industries. In the first edition of this book published in 2008, the EFC Working Parties WP13 and WP15 engaged together to provide guidelines on managing CUI with contributions from a number of European refining, petrochemical and offshore companies. The guidelines are intended for use on all plants and installation that contain insulated vessels, piping and equipment. The guidelines cover a risk-based inspection methodology for CUI, inspection techniques and recommended best practice for mitigating CUI, including design of plant and equipment, coatings and the use of thermal spray techniques, types of insulation, cladding/jacketing materials and protection guards. The guidelines also include case studies. The original document first published in 2008 was very successful and provided an important resource in the continuing battle to mitigate CUI. Many members of the EFC corrosion community requested an update and this has taken between 18-24 months to do so. Hopefully this revised document will continue to serve the community providing a practical source of information on how to monitor and manage insulated systems. Revised and fully updated technical guidance on managing CUI provided by EFC Working Parties WP13 and WP 15 Contributions from a number of European refining, petrochemical and offshore companies Extensive appendices that provide additional practical guidance on the implementation of corrosion-under-insulation best practice, collected practical expertise and case studies

Corrosion and Protection of Materials - Marina Cabrini 2021-04-06

This book contains thirty articles on various topics related to the corrosion and protection of metallic materials. This topic is of strong actuality both due to the aging of plants and infrastructures that require checks and maintenance, and to the use of traditional materials in increasingly aggressive environments, added to the need of changing the current anti-corrosion systems with less environmental impact methods. Finally, the new development of innovative materials, such as additive

manufacturing or high-entropy alloys, needs the characterization of their corrosion behavior. In this issue, there are works on new alloys obtained for additive manufacturing or high entropy, on the study of corrosion and stress corrosion cracking and hydrogen embrittlement mechanisms, through electrochemical and microscopical techniques, studies on low environmental impact inhibitors and biocides, as well as ceramic and metal protective coatings. Finally, there are works on the study of the residual mechanical resistance of corroded infrastructures and on monitoring and non-destructive control. In this way, the book therefore offers a somewhat varied panorama of research trends in the field.

Semi-Solid Processing of Alloys and Composites - Shahrooz Nafisi 2020-06-18

Semi-solid metal (SSM) processing, as a viable alternative manufacturing route to those of conventional casting and forging, has not yet been fully exploited despite nearly half a century since its introduction to the metal industry. The slow pace of adopting SSM routes may be due to various reasons, including capital costs, profit margins, and, most importantly, the lack of detailed analysis of various SSM processes in open literature to confidently establish their advantages over more conventional routes. Therefore, the SSM community must disseminate their findings more effectively to generate increased confidence in SSM processes in the eyes of our industrial leaders. As such, we have embarked on the task to invite the leaders in SSM research to share their findings in a Special Issue dedicated to semi-solid processing of metals and composites. SSM processing takes advantage of both forming and shaping characteristics usually employed for liquid and solid materials. In the absence of shear forces, the semi-solid metal has similar characteristics to solids, i.e., easily transferred and shaped; by applying a defined force, the viscosity is reduced and the material flows like a liquid. These unique dual characteristics have made SSM routes attractive alternatives to conventional casting on an industrial scale. With the intention of taking full advantage of SSM characteristics, it is crucial to understand SSM processing, including topics such as solidification and structural evolution, flow behavior through modelling and rheology, new processes

and process control, alloy development, and properties in general. This Special Issue focuses on the recent research and findings in the field with the aim of filling the gap between industry and academia, and to shed light on some of the fundamentals of science and technology of semi-solid processing.

Physical Techniques in the Study of Art, Archaeology and Cultural Heritage- 2006-05-02

The first of its kind, this series is devoted to the use of physical principles in the study and scientific conservation of objects with cultural heritage significance. It begins with a review of the modern museum, which discusses new techniques employed in the conservation of museum artifacts such as X-ray tomography and other techniques used to study Egyptian mummies, bones and mineralization of bones in the archaeological context, and the degradation of parchment. All of these topics and techniques are essential for the preservation of our history. This includes finding ways to preserve parchment documents and letters, which much of our written heritage is documented on, so that it can be used and understood for generations to come. This book is a must have for any museum as well as any university that teaches or employs the techniques discussed. Written in a style that is readily understandable by conservation scientists, archaeologists, museum curators, and students Provides an introduction to the advanced fields of synchrotron radiation science, neutron science, and computed tomography Outstanding review of the use of modern technology to study museum and archaeological artifacts Offers solutions through advanced scientific techniques to a wide range of problems facing museum staff

Science and Technology for the Conservation of Cultural Heritage

- Miguel Angel Rogerio-Candelera 2013-10-01

From 2nd to 5th October 2012 an International Congress on Science and Technology for the conservation of Cultural Heritage was held in Santiago de Compostela, Spain, organized by the Universidade of Santiago de Compostela on behalf of TechnoHeritage Network. The congress was attended by some 160 participants from 10 countries, which presented a total of 145 contributions among plenary lectures,

oral, and poster communications. The congress was dedicated to eight topics, namely (1) Environmental assessment and monitoring (pollution, climate change, natural events, etc.) of Cultural Heritage; (2) Agents and mechanisms of deterioration of Cultural Heritage (physical, chemical, biological), including deterioration of modern materials used in Contemporary Art and information storage; (3) Development of new instruments, non invasive technologies and innovative solutions for analysis, protection and conservation of Cultural Heritage; (4) New products and materials for conservation and maintenance of Cultural Heritage; (5) Preservation of industrial and rural heritage from the 19th and 20th centuries; (6) Security technologies, Remote sensing and Geographical Information Systems for protection and management of Cultural Heritage; (7) Significance and social value of Cultural Heritage; and (8) Policies for conservation of Cultural Heritage. This volume publishes a total of ninety-three contributions which reflect some of the most recent responses to the challenge of cultural assets conservation.

Advanced Characterization Techniques, Diagnostic Tools and Evaluation Methods in Heritage Science - David M. Bastidas 2018-12-29

This book details the application of advanced characterisation techniques and diagnostic tools to heritage science, including the evaluation of heritage assets' condition, their preservation and restoration. It examines the use of electrochemical techniques in conservation science, with a particular focus on how to solve problems in taking on-site measurements. Specifically, it introduces readers to a new gel polymer (GPE) electrochemical cell developed by the authors for the characterisation of metallic heritage objects. Other techniques used to characterise and monitor reinforced concrete objects in more modern buildings are also covered, including non-destructive electrochemical techniques that allow steel corrosion to be assessed in these structures, and in those that are used to protect and repair such buildings. The usefulness of the NMR-Mouse nuclear magnetic resonance sensor in the assessment and preservation of softer heritage materials, such as wood, parchment, bone, and painted walls, is covered, as well as Infrared reflectography for examining paintings and laser cleaning for restoring

them. The book introduces ultra-High Performance Liquid Chromatography (u-HPLC) with a diode-array (DAD) and mass-mass (MS-MS) quadruple time-of-flight spectroscopy (QTOF). This new technique can be applied to the analysis and identification of natural and

synthetic organic pigments and its use is demonstrated in several case studies. This book provides a rigorous scientific grounding in the application of state-of-the-art techniques in heritage science and conservation, and offers a practical handbook for practitioners.