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Describing the history and state-

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of-the-art of the thermo-  
hydrous manipulation of wood,  
this book provides either a desk  
reference or a field manual of  
wood science. It examines the  
polymeric components of wood  
and its multilevel hierarchical

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structure that confer its unique  
general-purpose character and  
faculty for transformation.

Exceeding all other material in  
its capacity to deform under  
controlled conditions and for a  
proscribed outcome, wood,

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under thermo-hydrous conditions, permits a multitude of industrial processes.

Discussing the processes at work and the industrial applications, this book is a must for all interested in the

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manipulation of wood.

In spite of extensive efforts,  
material weathering testing still  
requires improvement. This  
book presents findings and  
opinions of experts in material  
degradation testing. The aim is

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to improve testing methods and procedures. Materials are presented to show that photochemical degradation rate depends on a combination of environmental factors such as UV radiation, temperature,

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humidity, rain, stress, and concentration of reactive pollutants. The potential effect of each parameter of degradation on data gathered is discussed based on known results from a long experience in

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testing. This book contains data obtained in laboratories of the largest manufacturers of UV stabilizers and chemical companies that manufacture durable materials. The book gives details of testing



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procedures and choice of parameters of exposure which are crucial for obtaining laboratory results correlating with environmental performance of materials. In addition to exposure conditions,

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the book contains many suggestions on sample preparation and post-exposure testing. The effective use of these methods shortens testing time of materials and determines acceleration rate of

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testing. The book also gives examples of complete, well-designed weathering experiments which may be used as patterns for selection of parameters and techniques for new studies. The areas of

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research that still require more attention in future studies are clearly indicated.

The Handbook of Environmental Degradation of Materials, Third Edition, explains how to measure, analyze and control

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environmental degradation for a wide range of industrial materials, including metals, polymers, ceramics, concrete, wood and textiles exposed to environmental factors, such as weather, seawater, and fire. This

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updated edition divides the material into four new sections, Analysis and Testing, Types of Degradation, Protective Measures and Surface Engineering, then concluding with Case Studies. New chapters

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include topics on Hydrogen  
Permeation and Hydrogen  
Induced Cracking, Weathering  
of Plastics, the Environmental  
Degradation of Ceramics and  
Advanced Materials,  
Antimicrobial Layers, Coatings,

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and the Corrosion of Pipes in  
Drinking Water Systems. Expert  
contributors to this book  
provide a wealth of insider  
knowledge and engineering  
expertise that complements  
their explanations and advice.



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Case Studies from areas such as pipelines, tankers, packaging and chemical processing equipment ensure that the reader understands the practical measures that can be put in place to save money, lives and

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the environment. Introduces the reader to the effects of environmental degradation on a wide range of materials, including metals, plastics, concrete, wood and textiles  
Describes the kind of

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degradation that effects each material and how best to protect it Includes case studies that show how organizations, from small consulting firms, to corporate giants design and manufacture products that are

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more resistant to environmental effects

This book presents a collection of recent research works intended to assist in the effective management of service loss. It develops and

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evaluates methodologies for the assessment of defects and failures, and proposes methodologies for preventing and mitigating building defects. As such, the book will appeal to a broad readership of scientists,

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practitioners, students and  
lecturers.

Introduction to Polymers and  
Resins

Photostabilization of Polymers  
Service Life Prediction of  
Exterior Plastics

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Service Life Prediction of  
Polymers and Plastics Exposed  
to Outdoor Weathering  
Theory and Practice  
Coatings Technology Handbook  
**Provides practical  
guidance on the latest**

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quality assurance and  
accelerated stress test  
methods for improved  
long-term performance  
prediction of PV modules  
This book has been  
written from a



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historical perspective  
to guide readers through  
how the PV industry  
learned what the failure  
and degradation modes of  
PV modules were, how  
accelerated tests were

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developed to cause the  
same failures and  
degradations in the  
laboratory, and then how  
these tests were used as  
tools to guide the  
design and fabrication

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of reliable and long-  
life modules.

Photovoltaic Module

Reliability starts with  
a brief history of  
photovoltaics,  
discussing some of the

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different types of  
materials and devices  
used for commercial  
solar cells. It then  
goes on to offer  
chapters on: Module  
**Failure Modes;**

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Development of  
Accelerated Stress  
Tests; Qualification  
Testing; and Failure  
Analysis Tools. Next, it  
examines the use of  
quality management

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systems to manufacture  
PV modules. Subsequent  
chapters cover the PVQAT  
Effort; the Conformity  
Assessment and IECRE;  
and Predicting PV Module  
Service Life. The book

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finishes with a look at  
what the future holds  
for PV. A comprehensive  
treatment of current  
photovoltaic (PV)  
technology reliability  
and necessary

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improvement to become a significant part of the electric utility supply system Well documented with experimental and practical cases throughout, enhancing



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relevance to both  
scientific community and  
industry Timely  
contribution to the  
harmonization of  
methodological aspects  
of PV reliability

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evaluation with test  
procedures implemented  
to certify PV module  
quality Written by a  
leading international  
authority in PV module  
reliability Photovoltaic

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Module Reliability is an excellent book for anyone interested in PV module reliability, including those working directly on PV module and system reliability

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and preparing to  
purchase modules for  
deployment.

Hybrid Polymer Composite  
Materials: Applications  
provides a clear  
understanding of the

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present state of-the-art  
and the growing utility  
of hybrid polymer  
composite materials. It  
includes contributions  
from world renowned  
experts and discusses

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the combination of  
different kinds of  
materials procured from  
diverse resources. In  
addition, this volume  
from the four volume  
series provides deep

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insights on the  
potential of hybrid  
polymer composite  
materials for advanced  
applications. Provides a  
clear understanding of  
the present state-of-the-

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art and the growing  
utility of hybrid  
polymer composite  
materials Includes  
contributions from world  
renowned experts and  
discusses the



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combination of different  
kinds of materials  
procured from diverse  
resources Discusses  
their synthesis,  
chemistry, processing,  
fundamental properties,

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and applications

Provides insights on the  
potential of hybrid  
polymer composite  
materials for advanced  
applications  
Sustainable Composites

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for Aerospace

Applications presents  
innovative advances in  
the fabrication,  
characterization and  
applications of LDH  
polymer nanocomposites.

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It covers fundamental structural and chemical knowledge and explores various properties and characterization techniques, including microscopic,

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spectroscopic and  
mechanical behaviors.

Users will find a strong  
focus on the potential  
applications of LDH  
polymer nanocomposites,  
such as in energy,

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electronics,  
electromagnetic  
shielding, biomedical,  
agricultural, food  
packaging and water  
purification functions.  
This book provides

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comprehensive coverage  
of cutting-edge research  
in the field of LDH  
polymer nanocomposites  
and future applications,  
and is an essential read  
for all academics,

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researchers, engineers  
and students working in  
this area. Presents  
fundamental knowledge of  
LDH polymer  
nanocomposites,  
including chemical



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composition, structural  
features and fabrication  
techniques Provides an  
analytical overview of  
the different types of  
characterization  
techniques and

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technologies Contains  
extensive reviews on  
cutting-edge research  
for future applications  
in a variety of  
industries

Polymer nanotechnology

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**offers exciting benefits  
to the food industry,  
including better  
materials for food  
packaging and safer  
foods on supermarket  
shelves with lower**

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incidences of  
contamination.

Ecosustainable Polymer  
Nanomaterials for Food  
Packaging: Innovative  
Solutions,  
Characterization Needs,

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**Safety and Environmental  
Issues examines the  
complete life cycle of  
packaging based on  
polymer nanomaterials.  
Focusing on current  
developments in**

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nanomaterial packaging  
applications most likely  
to be accepted by  
consumers and attract  
regulatory attention in  
the immediate future,  
the book begins with a

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general introduction to  
current issues and  
future trends. The  
remaining chapters  
explore: The concept of  
"ethical design"—putting  
into practice key ideas

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such as the

precautionary principle  
and presenting a model  
for accountability,  
responsibility, and  
ethical consideration  
The evolution of the



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rheology, structure, and  
morphology of  
nanomaterials with  
regard to processing  
conditions and  
constituents The  
application of plasma

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technologies for the  
production of barrier  
coatings on polymeric  
materials by  
nonequilibrium gas  
discharges Nanomaterials  
for food packaging

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developed from oil  
polymers (polyolefins)  
and from renewable  
resource polymers The  
use of cellulose  
nanowhiskers for food  
biopackaging and edible

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nano-laminate coatings

The interactions of  
nanomaterials with food  
Examples of degradation  
under natural  
weathering, exposure,  
and recycling The book

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concludes with a  
discussion on the use of  
polymer nanocomposite  
materials for food  
packaging applications.  
From raw material  
selection to properties

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characterization to  
marketing and disposal,  
the expert contributors  
consider the balance  
between cost and  
performance, risk and  
benefit, and health and

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environmental issues.

They also identify  
barriers to progress  
that prevent a complete  
successful development  
of the new technology  
and recommend strategies

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for further advancement .

Astronomical

Observations Made at the  
Observatory of Cambridge  
Corrosion Control

Through Organic Coatings  
Multicomponent Polymeric



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**Materials**

**Proceedings of the  
Thirty-Ninth Annual  
International  
Waterborne, High-Solids,  
and Powder Coatings  
Symposium Held in New**

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**Orleans, Louisiana**

**February 13-17, 2012**

**A Guide to Polymeric  
Geomembranes**

**Hybrid Polymer Composite  
Materials**

The book offers an in-depth

*Page 66/238*

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review of the materials design and manufacturing processes employed in the development of multi-component or multiphase polymer material systems. This field has seen rapid growth in both academic and

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industrial research, as multiphase materials are increasingly replacing traditional single-component materials in commercial applications. Many obstacles can be overcome by processing and using

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multiphase materials in  
automobile, construction,  
aerospace, food processing,  
and other chemical industry  
applications. The  
comprehensive description of  
the processing,  
characterization, and

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application of multiphase materials presented in this book offers a world of new ideas and potential technological advantages for academics, researchers, students, and industrial manufacturers from diverse

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fields including rubber engineering, polymer chemistry, materials processing and chemical science. From the commercial point of view it will be of great value to those involved in processing,

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optimizing and manufacturing new materials for novel end-use applications. The book takes a detailed approach to the description of process parameters, process optimization, mold design, and other core manufacturing



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information. Details of injection, extrusion, and compression molding processes have been provided based on the most recent advances in the field. Over two comprehensive sections the book covers the entire

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field of multiphase polymer materials, from a detailed description of material design and processing to the cutting-edge applications of such multiphase materials. It provides both precise guidelines and general

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concepts for the present and future leaders in academic and industrial sectors.

This book defines the current state-of-the-art for predicting the lifetime of plastics exposed to weather and outlines the future

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research needed to advance this important field of study. Coverage includes progress in developing new science and test methods to determine how materials respond to weather exposure. This book is ideal for

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researchers and professionals working in the field of service life prediction. This book also:  
Examines numerous consensus standards that affect commercial products allowing readers to see the future of

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standards related to service  
life prediction Provides  
scientific foundation for  
latest commercially viable  
instruments Presents  
groundbreaking research  
including the blueprint of a  
new test method that will

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significantly shorten the service life prediction process time Covers two of the latest verified predictive models, which demonstrate realized-potential to transform the field

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This collection gives broad and up-to-date results in the research and development of materials characterization and processing. Coverage is well-rounded from minerals, metals, and materials



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characterization and developments in extraction to the fabrication and performance of materials. In addition, topics as varied as structural steels to electronic materials to plant-based composites are

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explored. The latest research presented in this wide area make this book both timely and relevant to the materials science field as a whole. The book explores scientific processes to characterize

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materials using modern technologies, and focuses on the interrelationships and interdependence among processing, structure, properties, and performance of materials. Topics covered include ferrous materials,

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non-ferrous materials,  
minerals, ceramics, clays,  
soft materials, method  
development, processing,  
corrosion, welding,  
solidification, composites,  
extraction, powders,  
nanomaterials, advanced

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materials, and several others.

Corrosion Control Through Organic Coatings, Second Edition provides readers with useful knowledge of the practical aspects of corrosion protection with

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organic coatings and links  
this to ongoing research and  
development. Thoroughly  
updated and reorganized to  
reflect the latest advances,  
this new edition expands its  
coverage with new chapters  
on coating degradation,

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protective properties,  
coatings for submerged  
service, powder coatings,  
and chemical pretreatment.  
Maintaining its  
authoritative treatment of  
the subject, the book  
reviews such topics as

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corrosion-protective  
pigments, waterborne  
coatings, weathering, aging,  
and degradation of paint,  
and environmental impact of  
commonly used techniques  
including dry- and wet-  
abrasive blasting and



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hydrojetting. It also discusses theory and practice of accelerated testing of coatings to assist readers in developing more accurate tests and determine corrosion protection performance.

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Weathering of Plastics

Science and Technology

Ageing and Stabilisation of

Paper

Journal of the Society of

Wood Science and Technology

Mechanism, Measurement, and

Mitigation

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Fascinating Fluoropolymers  
and Their Applications

Fluoropolymers are unique  
materials. Since the middle of  
the twentieth century  
fluoropolymers have been used in  
applications where a wide

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temperature range, a high resistance to aggressive media, excellent tribological characteristics, and specific low adhesion are required. Today, researchers turn to fluoropolymers to solve new

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challenges and to develop  
materials with previously  
unattainable properties.

Fascinating Fluoropolymers and  
Their Applications covers recent  
developments of fluoropolymer  
applications in energy, optical

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fibers, blood substitutes, textile coatings, membranes and other areas, written by experts in these fields. This volume in the Progress in Fluorine Science series is ideal for researchers and engineers who want to learn

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about the technology and applications of these special polymers, as well as industrial manufacturers who are interested in achieving new product characteristics in their respective industries. Written by

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a global team of fluoropolymer  
experts Includes use of  
fluoropolymer membranes for  
various applications in fuel cells,  
for gases separation, and more  
Covers fluoropolymer materials  
with shape memory, in



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cardiopulmonary bypass  
systems, in the production of  
textile materials, and in other  
areas

This state-of-the-art reference  
contains chapters on all aspects  
of the characterization of

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minerals, metals, and materials.

The title presents papers from one of the largest yearly gatherings of materials scientists in the world and thoroughly discusses the characterization of minerals, metals, and materials

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The scope includes current industrial applications and research and developments in the following areas: •  
Characterization of Ferrous Metals • Characterization of Non-Ferrous Materials •

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Characterization of Minerals and  
Ceramics • Characterization  
Technologies •  
Characterization of  
Environmental and Construction  
Materials • Characterization of  
Energy, Electronic and Optical

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Materials • Characterization of  
Carbon and Soft Materials •  
Characterization of Light Metals  
An excellent reference for global  
extractive and process  
metallurgy industries, materials  
scientists and engineers,

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metallurgists, and mechanical  
engineers.

Advances in Materials and  
Pavement Performance  
Prediction contains the papers  
presented at the International  
Conference on Advances in

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Materials and Pavement  
Performance Prediction (AM3P,  
Doha, Qatar, 16- 18 April 2018).  
There has been an increasing  
emphasis internationally in the  
design and construction of  
sustainable pavement systems.

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Advances in Materials and  
Pavement Prediction reflects this  
development highlighting  
various approaches to predict  
pavement performance. The  
contributions discuss links and  
interactions between material



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characterization methods,  
empirical predictions,  
mechanistic modeling, and  
statistically-sound calibration  
and validation methods. There is  
also emphasis on comparisons  
between modeling results and

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observed performance. The topics of the book include (but are not limited to): •  
Experimental laboratory material characterization • Field measurements and in situ material characterization •

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Constitutive modeling and  
simulation • Innovative  
pavement materials and  
interface systems • Non-  
destructive measurement  
techniques • Surface  
characterization, tire-surface

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interaction, pavement noise •  
Pavement rehabilitation • Case  
studies Advances in Materials  
and Pavement Performance  
Prediction will be of interest to  
academics and engineers  
involved in pavement

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engineering.

The degradable nature of high-performance, wood-based materials is an attractive advantage when considering environmental factors such as sustainability, recycling, and

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energy/resource conservation.

The Handbook of Wood

Chemistry and Wood

Composites provides an

excellent guide to the latest

concepts and technologies in

wood chemistry and bio-based

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composites. The book analyzes the chemical composition and physical properties of wood cellulose and its response to natural processes of degradation. It describes safe and effective chemical

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modifications to strengthen wood against biological, chemical, and mechanical degradation without using toxic, leachable, or corrosive chemicals. Expert researchers provide insightful analyses of



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the types of chemical modifications applied to polymer cell walls in wood, emphasizing the mechanisms of reaction involved and resulting changes in performance properties. These include modifications that

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increase water repellency, fire retardancy, and resistance to ultraviolet light, heat, moisture, mold, and other biological organisms. The text also explores modifications that increase mechanical strength,

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such as lumen fill, monomer polymer penetration, and plasticization. The Handbook of Wood Chemistry and Wood Composites concludes with the latest applications, such as adhesives, geotextiles, and

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sorbents, and future trends in the use of wood-based composites in terms of sustainable agriculture, biodegradability and recycling, and economics. Incorporating over 30 years of teaching

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experience, the esteemed editor of this handbook is well-attuned to educational demands as well as industry standards and research trends.

Principles and Application

An Assessment and Evaluation of

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Acidic Cleaning Methods on  
Unglazed Terracotta Using  
Accelerated Weathering Test  
Protocols

Applications

Principles and applications

Thermo-Hydro-Mechanical

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Wood Processing

Improving the Durability and  
Mechanical Properties of Wood-  
plastic Composites Through  
Coextrusion

According to the published  
literature, there has been very

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little quantitative evaluation of the short or long-term effects of cleaning terra cotta, other than visual assessment where success is pronounced by the degree of soiling removed. Very little work (only 3% of our literature review)



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has attempted to measure the effects on terra cotta of various cleaning methods. Nevertheless, today, still 80% of terracotta cleaning relies on chemical products, the majority acid-based. This research evaluates the

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effects of acidic cleaners on unglazed terracotta to verify the potential for damage by accelerated weathering testing. This investigation continues previous studies (Matero et. al. 1996) where findings showed that

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by using hydrofluoric acid-based commercial cleaning system, an increased porosity of unglazed terra cotta resulted. The questions remains whether this physical alteration will lead to accelerated weathering and material damage.

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In the first phase of this research a Literature Review of past and current cleaning of terra cotta was completed, together with a survey of professionals involved in terra cotta restoration. In the second phase, two commercial

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chemical cleaners are being tested in two applications on new unglazed red and tan terracotta samples: Prosoco Heavy Duty Restoration cleaner based on HF (1:3), and Prosoco Enviro Klean based on Ammonium Bi-fluoride

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(generally applied as a concentrate). These are now undergoing accelerated weathering based on the Rilem salt test (V.1B) and a QUV weatherometer (ASTM G154-12) to access the effects of acid

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cleaning on performance. Several methods of assessment were used to evaluate the tiles before and after testing: optical microscopy, scanning electron microscopy, porosity by liquid nitrogen immersion, color change, and

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texture mapping imaging. By examining physical changes and their response to accelerated weathering across two typical terra cotta clay bodies, it is hoped that better cleaning methods will be considered in practice and



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parameters to measure potential damage as well as cleaning efficacy become established. During the last two decades, the production of polymers and plastics has been increasing rapidly. In spite of developing new

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polymers and polymeric materials, only 40~60 are used commercially on a large scale. It has been estimated that half of the annual production of polymers is employed outdoors. The photochemical instability of most

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polymers limits their outdoor application as they are photodegraded quickly over periods from months to a few years. To the despair of technologists and consumers alike, photodegradation and

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environmental ageing of polymers occur much faster than can be expected from knowledge collected in laboratories. In order to improve polymer photostability there has been a very big effort during the last 30 years to

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understand the mechanisms involved in photodegradation and environmental ageing. This book represents the author's attempt, based on his 25 years' experience in research on photodegradation and photo stabilization, to collect

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and generalize a number of available data on the photodegradation of polymers. The space limitation and the tremendous number of publications in the past two decades have made a detailed

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presentation of all important results and data difficult. The author apologizes to those whose work has not been quoted or widely presented in this book. Because many published results are very often contradictory, it

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has been difficult to present a fully critical review of collected knowledge, without antagonizing authors. For that reason, all available theories, mechanisms and different suggestions have been presented together, and only



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practice can evaluate which of them are valid.

Wood-plastic composite (WPC) is a non-recyclable composite material lumber or timber made of recycled plastic and wood wastes which has become one of the most

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dynamic sectors of the plastics industry in this decade. It is used in numerous applications, such as, outdoor deck floors, railings, fences, landscaping timbers, park benches, window and door frames. This book starts with a

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brief glimpse at the basic structures and properties of WPCs. Aspects such as surface treatment, machinery used and testing types of WPCs are also covered. The following chapters of the book give a view of foam

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technology, flame retardant properties and colour retardant properties of WPCs. The way morphology affects or controls the physical and mechanical behaviours of the finished materials is discussed. Finally, the

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authors give an overview of the applications of wood-plastic composites in daily life. The book may serve as a source book for scientists wishing to work in this field.

Geomembranes are flexible

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polymeric sheets which are used as relatively impermeable liners to contain liquid and vapour. With uses ranging from canal liners to hazard waste landfills, they are used extensively in a range of industries such as water

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conservation, mining, construction and waste management. A Guide to Polymeric Geomembranes: A Practical Approach offers an informed overview of the developments in this field and includes: Detailed discussion of

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the major geomembrane types  
Manufacturing methods Key  
performance properties Industrial  
applications Testing and chemical  
resistance of geomembranes  
Failure analysis methodology  
Written by a polymer research



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specialist with more than fifteen years experience in industry, this practical handbook covers the manufacture, use, installation, durability, lifespan and performance of geomembranes. It covers all the information

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required to enable the reader to select the most suitable geomembrane material for the job. This book is a useful reference for engineers and professionals in industry, environmental consultants,

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polymer and materials scientists,  
and government agencies and  
policy makers. It is of particular  
interest to those designing,  
commissioning and operating  
waste management sites, landfills,  
mine leachate ponds and water

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containment facilities.

Durability Testing of Nonmetallic  
Materials

Mechanisms and experimental  
methods

Innovative Solutions,  
Characterization Needs, Safety

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and Environmental Issues  
Papers from the International  
Conference on Advances in  
Materials and Pavement  
Performance Prediction (AM3P  
2018), April 16-18, 2018, Doha,  
Qatar

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New Approaches to Building  
Pathology and Durability  
Polymer Photodegradation

**This unique book presents  
ways to mitigate the  
disastrous effects of  
snow/ice accumulation and**

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discusses the mechanisms of new coatings deicing technologies. The strategies currently used to combat ice accumulation problems involve chemical, mechanical or electrical

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approaches. These are expensive and labor intensive, and the use of chemicals raises serious environmental concerns. The availability of truly icephobic surfaces or



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coatings will be a big boon in preventing the devastating effects of ice accumulation. Currently, there is tremendous interest in harnessing nanotechnology in

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rendering surfaces

icephobic or in devising  
icephobic surface  
materials and coatings,  
and all signals indicate  
that such interest will  
continue unabated in the

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future. As the key issue regarding icephobic materials or coatings is their durability, much effort is being spent in developing surface materials or coatings

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which can be effective  
over a long period. With  
the tremendous activity in  
this arena, there is  
strong hope that in the  
not too distant future,  
durable surface materials

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or coatings will come to  
fruition. This book  
contains 20 chapters by  
subject matter experts and  
is divided into three  
parts- Part 1:  
Fundamentals of Ice

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Formation and

Characterization; Part 2:  
Ice Adhesion and Its  
Measurement; and Part 3:  
Methods to Mitigate Ice  
Adhesion. The topics  
covered include: factors

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influencing the formation,  
adhesion and friction of  
ice; ice nucleation on  
solid surfaces; physics of  
ice nucleation and growth  
on a surface; condensation  
frosting; defrosting

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properties of structured  
surfaces; relationship  
between surface free  
energy and ice adhesion to  
surfaces; metrology of ice  
adhesion; test methods for  
quantifying ice adhesion



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strength to surfaces;  
interlaboratory studies of  
ice adhesion strength;  
mechanisms of surface  
icing and deicing  
technologies;  
icephobicities of

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superhydrophobic surfaces;  
anti-icing using  
microstructured surfaces;  
icephobic surfaces:  
features and challenges;  
bio-inspired anti-icing  
surface materials;

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durability of anti-icing  
coatings; durability of  
icephobic coatings; bio-  
inspired icephobic  
coatings; protection from  
ice accretion on aircraft;  
and numerical modeling and

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Astm D4329 Astm  
its application to  
inflight icing.

Details the basics of wood  
formation, structure, and  
chemistry, by describing  
both fundamental and  
applied studies. Reviews

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Japanese approaches on  
wood chemistry research  
and interpretation of  
data, examines chemical  
modifications of wood and  
its constituents, and  
introduces biomass

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conversion. Topi

Serving as an all-in-one  
guide to the entire field  
of coatings technology,  
this encyclopedic  
reference covers a diverse  
range of topics—including

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basic concepts, coating  
types, materials,  
processes, testing and  
applications—summarizing  
both the latest  
developments and standard  
coatings methods. Take

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advantage of the insights  
and experience of over  
This volume contains  
dozens of original  
investigations into the  
materials, chemistry,  
formulation and



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applications of waterborne  
coatings.

Wood and Fiber Science

Multifunctional Composites

Durability and Reliability

of Polymers and Other

Materials in Photovoltaic

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Modules

Testing to Mirror Life  
Performance  
Degradable Polymers  
Ecosustainable Polymer  
Nanomaterials for Food  
Packaging

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***During the last two decades,  
the production of polymers  
and plastics has been  
increasing rapidly. In spite of  
developing new polymers and  
polymeric materials, only  
40-60 are used commercially***

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***on a large scale. It has been  
estimated that half of the  
annual production of polymers  
is employed outdoors.  
Increasing the stability of  
polymers and plastics towards  
heat, light, atmospheric***

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***oxygen and other  
environmental agents and  
weathering conditions has  
always been a very important  
problem. The photochemical  
instability of most of polymers  
limits them to outdoor***

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***application, where they are  
photo degraded fast over  
periods ranging from months  
to a few years. To the despair  
of technologists and  
consumers alike,  
photodegradation and***

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***environmental ageing of  
polymers occur much faster  
than can be expected from  
knowledge collected in  
laboratories. In many cases,  
improved methods of  
preparation and purification of***

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***both monomers and polymers  
yield products of better quality  
and higher resistance to heat  
and light. However, without  
stabilization of polymers by  
application of antioxidants (to  
decrease thermal oxidative***



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***degradation) and  
photostabilizers (to decrease  
photo-oxidative degradation) it  
would be impossible to  
employ polymers and plastics  
in everyday use.***

***Durability and Reliability of***

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***Polymers and Other Materials  
in Photovoltaic Modules  
describes the durability and  
reliability behavior of  
polymers used in Si-  
photovoltaic modules and  
systems, particularly in terms***

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***of physical aging and  
degradation  
process/mechanisms,  
characterization methods,  
accelerated exposure chamber  
and testing, module level  
testing, and service life***

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***prediction. The book  
compares polymeric materials  
to traditional materials used in  
solar applications, explaining  
the degradation pathways of  
the different elements of a  
photovoltaic module, including***

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***encapsulant, front sheet, back sheet, wires and connectors, adhesives, sealants, and more. In addition, users will find sections on the tests needed for the evaluation of polymer degradation and aging, as well***

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***as accelerated tests to aid in  
materials selection. As  
demand for photovoltaics  
continues to grow globally,  
with polymer photovoltaics  
offering significantly lower  
production costs compared to***

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***earlier approaches, this book  
will serve as a welcome  
resource on new avenues.  
Provides comprehensive  
coverage of photovoltaic  
polymers, from fundamental  
degradation mechanisms, to***

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***specific case studies of  
durability and materials failure  
Offers practical, actionable  
information in relation to  
service life prediction of  
photovoltaic modules and  
accelerated testing for***



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***materials selection Includes  
up-to-date information and  
interpretation of safety  
regulations and testing of  
photovoltaic modules and  
materials***

***Wood Coatings addresses the***

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***factors responsible for the performance of wood coatings in both domestic and industrial situations. The term 'wood coatings' covers a broad range of products including stains, varnishes,***

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***paints and supporting  
ancillary products that may be  
used indoors or outdoors.  
Techniques for coating wood  
go back many centuries but in  
recent decades there has been  
a move towards more***

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***environmentally-friendly materials, for example, the use of water-borne rather than solvent-borne chemicals. A major objective of Wood Coatings is to explain the underlying factors that***

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***influence selection,  
application and general  
operational issues. Basic  
information on the chemistry  
and technology of coatings is  
included for the benefit of  
students and laboratory***

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***technicians. Additionally, the book includes individual chapters of interest to architects, specifiers, and industrial users. \* Offers up-to-date guidance on current availability and usage of wood***

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***coatings \* Provides the reader  
with a basic understanding of  
both coating and substrate  
interactions \* Covers both  
architectural (trade and DIY)  
and industrial sectors  
Few scientific developments in***

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***recent years have captured the popular imagination like the subject of 'biodegradable' plastics. The reasons for this are complex and lie deep in the human subconscious. Discarded plastics are an***



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***intrusion on the sea shore and  
in the countryside. The fact  
that nature's litter abounds in  
the sea and on land is  
acceptable because it is  
biodegradable - even though it  
may take many years to be***

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***bioassimilated into the ecosystem. Plastics litter is not seen to be biodegradable and is aesthetically unacceptable because it does not blend into the natural environment. To the***

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***environmentally aware but  
often scientifically naive,  
biodegradation is seen to be  
the ecologically acceptable  
solution to the problem of  
plastic packaging waste and  
litter and some packaging***

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***manufacturers have exploited  
the 'green' consumer with  
exaggerated claims to  
'environmentally friendly'  
biodegradable packaging  
materials. The principles  
underlying environmental***

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***degradation are not  
understood even by some  
manufacturers of  
'biodegradable' materials and  
the claims made for them have  
been categorized as  
'deceptive' by USA legislative***

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***authorities. This has set back  
the acceptance of plastics with  
controlled biodegradability as  
part of the overall waste and  
litter control strategy. At the  
opposite end of the  
commercial spectrum, the***

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***polymer manufacturing industries, through their trade associations, have been at pains to discount the role of degradable materials in waste and litter management. This negative campaign has***

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***concentrated on the supposed  
incompatibility of degradable  
plastics with aspects of waste  
management strategy, notably  
materials recycling.***

***Characterization of Minerals,  
Metals, and Materials 2017***



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***Accelerated and Outdoor  
Durability Testing of Organic  
Materials  
Handbook of Environmental  
Degradation of Materials  
Developments in Corrosion  
Protection***

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## ***Sustainable Composites for Aerospace Applications Organic Coatings***

*One of the first thing that comes  
to your mind after hearing the  
term “corrosion” is corrosion of a  
metal. Corrosion is a basically*

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*harmful phenomenon, but it can be useful in some cases. For instance, environment's pollution with corrosion products and damage to the performance of a system are among its harmful effects, whereas electric energy generation in a battery and*

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*cathodic protection of many structures are among its advantages. However, these advantages are almost nothing as compared to the costs and effects imposed by its detrimental influences. The enormous costs of this phenomenon can be better*

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*understand through studying the published statistics on direct and indirect corrosion damages on economy of governments. The direct cost of corrosion is near 3 % of the gross domestic product (GDP) of USA. Considering this huge cost, it is necessary to*

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*develop and expand the corrosion science and its protection technologies.*

*The definitive guide to organic coatings, thoroughly revised and updated—now with coverage of a range of topics not covered in previous editions Organic*

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*Coatings: Science and  
Technology, Fourth Edition offers  
unparalleled coverage of organic  
coatings technology and its many  
applications. Written by three  
leading industry experts  
(including a new, internationally-  
recognized coatings scientist) it*

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*presents a systematic survey of the field, revises and updates the material from the previous edition, and features new or additional treatment of such topics as superhydrophobic, ice-phobic, antimicrobial, and self-healing coatings; sustainability,*



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*artist paints, and exterior architectural primers. making it even more relevant and useful for scientists and engineers in the field, as well as for students in coatings courses. The book incorporates up-to-date coverage of recent developments in the*

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*field with detailed discussions of the principles underlying the technology and their applications in the development, production, and uses of organic coatings. All chapters in this new edition have been updated to assure consistency and to enable*

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*extensive cross-referencing. The material presented is also applicable to the related areas of printing inks and adhesives, as well as areas within the plastics industry. This new edition Completely revises outdated chapters to ensure consistency*

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*and to enable extensive cross-referencing Correlates the empirical technology of coatings with the underlying science throughout Provides expert troubleshooting guidance for coatings scientists and technologists Features hundreds*

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*of illustrative figures and  
extensive references to the  
literature A new, internationally-  
recognized coatings scientist  
brings fresh perspective to the  
content. Providing a broad  
overview for beginners in the field  
of organic coatings and a handy*

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*reference for seasoned  
professionals, Organic Coatings:  
Science and Technology, Fourth  
Edition, gives you the information  
and answers you need, when you  
need them.*

*Service Life Prediction of  
Polymers and Plastics Exposed to*

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*Outdoor Weathering discusses plastics and polymers and their unique applications, from sealants used in construction, to polymer composites used in planes. While these materials are important enablers for advanced technologies, exposure to*

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*weather changes the very  
properties of plastics that make  
them so useful. This book reviews  
current research needs and  
provides a consensus roadmap of  
the scientific barriers to validated  
predictive models for the  
response of polymers and plastics*



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*to outdoor exposure. Despite extensive efforts over the past 20-30 years, testing of polymeric materials in accelerated or natural weathering conditions and the interpretation of the weathering results still require substantial improvements. This*

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*book represents the state-of-the-art in the prediction techniques available and in development. Engineers and materials scientists working in this field will be able to use the content of this book to assess the strengths and challenges of a range of different*

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*methods and approaches.*

*Enables engineers and scientists  
in a range of industries to more  
successfully predict the durability  
of polymers, paints and coatings  
when exposed to weather*

*Provides the latest information to  
help determine the sustainability*

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*of polymeric materials Reviews  
the current state-of-the-art in this  
area and identifies research  
needs that are followed by more  
detailed discussions of specific  
polymers and applications  
Addcon World 2003 was our 9th  
international conference on*

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*additives for plastics. The two day conference focused on the technical advances and issues facing the plastics additives and modifiers industry. Papers consider value creation in the additives business and various aspects of additive technology,*

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*including flame retardants,  
stabilisers, process aids,  
compatibilisers, impact modifiers,  
and new pigments.*

*Vision for the Future*

*Wood and Cellulosic Chemistry*

*Characterization of Minerals,*

*Metals and Materials*

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*Wood Coatings*

*Addcon World*

*Recent Advances in the  
Processing of Wood-Plastic  
Composites*

***With the progress in  
nanotechnology and  
associated production***

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*methods, composite materials are becoming lighter, cheaper, more durable, and more versatile. At present, great progress has been made in the design,*



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*preparation, and  
characterization of  
composite materials,  
making them smarter and  
versatile. By creating new  
properties using suitable  
fillers and matrix,*

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*functional composites can meet the most challenging standards of users, especially in high-tech industries. Advanced composites reinforced by high-performance carbon*

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*fibers and nanofillers are popular in the automotive and aerospace industries thanks to their significant advantages, such as high specific strength to weight ratio*

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*and noncorrosion*

*properties. In addition to  
the improvement of the  
mechanical performance,  
composite materials today  
are designed to provide  
new functions dealing with*

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*antibacterial, self-cleaning, self-healing, super-hard, and solar reflective properties for desired end-use applications. On the other hand, composite materials*

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*can contribute to  
mitigating environmental  
issues by providing  
renewable energy  
technologies in  
conjunction with  
multifunctional,*

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*lightweight energy storage  
systems with high  
performance and  
noncorrosive properties.  
They are also used to  
prepare a new generation  
of batteries and directly*

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*contribute to H2  
production or CO2  
reduction in fuels and  
chemicals. This Special  
Issue aims to collect  
articles reporting on  
recent developments*



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*dealing with preparative  
methods, design,  
properties, structure, and  
characterization methods  
as well as promising  
applications of  
multifunctional*

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*composites. It covers  
potential applications in  
various areas, such as  
anticorrosion,  
photocatalyst, absorbers,  
superhydrophobic, self-  
cleaning,*

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*antifouling/antibacterial,  
renewable energy, energy  
storage systems,  
construction, and  
electronics. The modeling  
and simulation of  
processes involving the*

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*design and preparation of  
functional and  
multifunctional composites  
as well as experimental  
studies involving these  
composites are all covered  
in this Special Issue.*

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*Advances in Materials and  
Pavement Prediction*

*A Practical Approach*

*Handbook of Wood Chemistry  
and Wood Composites*

*The Waterborne Symposium*

*Photovoltaic Module*

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***Reliability***  
***Ice Adhesion***