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## Book Reviews

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### Reviewed by Janez Grum

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Volume I: Cast Iron  
ISBN 978-1-4665-1108-8  
832 pages

Volume II: Chromium – Heat Treatment: Regenerative  
ISBN 978-1-4665-1109-5  
759 pages

Volume III: Heat Treatment: Special – Molten  
ISBN 978-1-4987-6266-3  
759 pages

Volume IV: Nanofluids – Residual Stresses  
ISBN 978-1-4987-6267-0  
759 pages

Volume V: Retained – Wetting  
ISBN 978-1-4987-6268-7  
731 pages

Edited by Rafael Colás and George E. Totten  
CRC Press, Taylor & Francis Group  
6000 Broken Sound Parkway, NW  
Suite 300, Boca Raton, FL 33489, USA

The first of many important works featured covering all the fundamental, theoretical, and application related aspects of the metallurgical science, engineering, and technology of iron, steel, and their alloys.

Various topics are presented in five volumes and is going to be issued also in electronic version. The printed version consists of 5200 pages with additional pages stating editorial board of 32 members. Prof. Dr. Rafael Colás and Prof. Dr. George E. Totten are Editors-in-Chief. There are more than 330 authors with their contributions.

The book contains valuable information from the fields of:

- *Physical metallurgy*: Iron and steel making: iron ore direct reduction, continuous casting processes semi solid processing, large steel ingots, metallurgical cake, direct reduced iron, steel transformation, aging, grain boundaries, transformation induced plasticity, classification and mechanism of steel transformation, superstrengthening, wetting kinematics, stability in a nanostructured bainitic steel, growth kinetics and mechanical characterisation.
- *Mechanical working*: Direct quenching structural steels, fasting system, forging technology, high carbon steel wire, patenting in bath, hot rolled steels, modelling and stimulation of mechanical behaviour.

- *Casting*: Austempered ductile cast iron, semi-solid processing investment casting, cast iron and steel metallography, spheroidal graphite iron, steel casting tomography, thioforming, continuous casting process.
- *Steels and heat treating*: Carbon iron alloys, fundametals, post welds, steels, special steels, effect on heat treatment and properties of steels, high alloyed steels, austenitic steels, dynamic strain aging, microstructure evaluation, duplex, stainless steels, ferritic-martensitic steels, cyclic softing behaviour, manganese steels, maraging steels, stainless steels, tool steels, cryogenic treatment, feature toughness, physical metallurgy of tool steels, boride layer, boroaluminised carbon steels, boronising of iron based alloys, chromising, electroless nickel-boron coatings, galvanised coatings, hardfacing, electrochemical boriding.
- *Heat treatment*: Hardening and hardenability, flame hardening, induction hardening, computer modelling of induction heating and heat treating, cryogenic treatment, tempering parameter development, carburising, plasma carbonising, carbonised steels, quenching effect, jominy test results, microwave plasma carbonising, case hardening, nitriding, gas and plasma nitriding, nitride and nitrocarborazed materials, nitriding and austenitic and ferritic nitrocarborazing, sack cyaniding.
- *Quenching and distortion*: Cooling curves, high pressure process, gas quenching and equipment design, fluids, quench factor analysis, quench processing, quench system design, polymer quenchants, quenching and tempering, brine and caustic, intensive steel quenching, simulation of quenching, quenching techniques, distortion and residual stresses, minimisation of residual stress in steel casting, weld residual stress, residual stress of thermally processed residual stresses.
- *Laser and plasma treating*: Laser transformation hardening and remelting, laser peening, plasma nitride steels, corrosion resistance by plasma post oxidation, plasma carburising, laser modification process, laser physical vapour deposition.
- *Powder metallurgy*: Powder injection moulding, sinter herding, powder metallurgy alloys, heat treatment, sintering and surface treating, plasma assisted parts manufacturing.
- *Surface degradation*: Oxidation of ferrous alloys, stress corrosion cracking, hydrogen diffusion and environmentally assisted cracking, corrosion inhibitors, coating to present it, structural characterisation of products, cracking of steel embrittlement, surface integrity.

The set of books is highly recommended for materials scientists and engineers, manufacturers, chemists, researchers as it provides extensive coverage of various types and state of their materials properties as well as their practical use.

- 1 CFD Modeling and Simulation in Materials Processing 2016**  
**Proceedings of a symposium sponsored by Process Technology and Modeling Committee of the Extraction and Processing Division and the Solidification Committee of the Materials Processing and Manufacturing Division of The Minerals, Metals & Materials Society (TMS) held during TMS 2016 145th Annual Meeting Exhibition, February 14–18 Downtown Nashville Tennessee**  
**by: L. Nastac, L. Zhang, B.G. Thomas, M. Zhu, A. Ludwig, A.S. Sabau, K. Pericleous and H.Combeau**  
**Published 2016**  
**The Minerals, Metals & Materials Society,**  
**by John Wiley & Sons Inc., Hoboken, New Jersey, 277pp**  
**ISBN: 978-1-119-22576-8**

This symposium dealt with computational fluid dynamics (CFD) modelling and simulation of engineering processes. The papers published in this book were requested from researchers and engineers involved in the modelling of multiscale and multiphase phenomena in material processing systems.

The symposium focused on the CFD modelling and simulation of the following processing areas: iron and steel-making (tundish, casting, converter, blast furnace), smelting, degassing, ladle processing, mechanical mixing, and ingot casting, casting with external field interaction and microstructure evolution.

The symposium also covered applications of CFD to engineering processes and demonstrated how CFD can help scientists and engineers to better understand the fundamentals of engineering processes.

- 2 Shape Casting: 6th International Symposium**  
**Proceedings of a symposium sponsored by the Aluminum Committee of the Light Metals Division and the Solidification Committee of the Materials Processing & Manufacturing Division of The Minerals, Metals & Materials Society (TMS) held during TMS 2016 145th Annual Meeting Exhibition, February 14–18 Downtown Nashville Tennessee**  
**by: M.Tiryakioğlu, M. Jolly and G. Byczynski**  
**Published 2016**  
**The Minerals, Metals & Materials Society**  
**by John Wiley & Sons Inc., Hoboken, New Jersey, 212pp**  
**ISBN: 978-1-119-22582-9**

This is the 6th in the series of International Shape Casting Symposia to be held at the annual TMS meeting and exhibition.

Over the last 10 years a wide range of topics has cropped up, some of which remain as significant aspects in the symposium. Oxide films have become bi-films, modelling is now not just fashionable but essential, and the provenance of defects will always be argued about. Other topics are now becoming hot. Energy in manufacturing, sustainability, and the circular economy – none of which were discussed in the first symposium – are now in everyday conversations in manufacturing plants as climate change and the overheating globe becomes more of a concern and energy process begin to rise.

The casting industry has not yet been hit by resource constraints, but inevitably this will come. Water, energy, and the materials we cast may well become scarcer and then we, as foundry engineers and scientists, have to work in smarter and more efficient ways with what we have. High quality and yield will be drivers for all in the sector and that can only be achieved by carrying out the research in liquid metal engineering that we all do. Understanding the science and applying it as an engineer is the only way forward in this very challenging environment.

### **3 TMS 2016 145th Annual Meeting Exhibition**

#### **SUPPLEMENTAL PROCEEDINGS**

**by: J.A. Schneider, M. Stoudt, K. Clark, L. Semiatin and M.A. Zaeem**

**Published 2016**

**The Minerals, Metals & Materials Society**

**by John Wiley & Sons Inc., Hoboken, New Jersey, 804pp**

**ISBN: 978-1-119-22583-6**

*The TMS 2016 Annual Meeting Supplemental Proceedings* is a collection of papers from the TMS 2016 Annual Meeting & Exhibition, held February 14–18 in Nashville, Tennessee, USA. The papers in this volume represent 21 symposia from the meeting. This volume, along with the other proceedings volumes published for the meeting, and archival journals, such as *Metallurgical and Materials Transactions* and *Journal of Electronic Materials*, represents the available written record of the 67 symposia held at TMS2016. This proceedings volume contains both edited and unedited papers; the unedited papers have not necessarily been reviewed by the symposium organisers and are presented ‘as is’. The opinions and statements expressed within the papers are those of the individual authors only, and no confirmations or endorsements are intended or implied.

### **4 Magnesium Technology 2016**

**Proceedings of a symposium sponsored by Magnesium Committee**

**of the Light Metals Division of The Minerals, Metals & Materials**

**Society (TMS) held during TMS 2016 145th Annual Meeting Exhibition,**

**February 14–18 Downtown Nashville Tennessee**

**by: A. Singh, K. Solanki, M.V. Manuel and N.R. Neelameggham**

**Published 2016**

**The Minerals, Metals & Materials Society**

**by John Wiley & Sons Inc., Hoboken, New Jersey, 402pp**

**ISBN: 978-1-119-22580-5**

This volume of Magnesium Technology 2016 is the proceedings of the Magnesium Technology Symposium held at annual TMS Annual Meeting & Exhibition in Nashville, 2016. With contributions from 16 countries, representing the latest trends in the field of magnesium research, this volume can be regarded as a central repository of the most recent research carried out in magnesium technology from around the world. With the tradition of presenting the most recent and highest quality work, all presenters have submitted their work to this edited proceedings volume or other peer reviewed TMS journals. All papers included in this volume were peer reviewed by the best possible experts in the concerned

fields of magnesium research. The reviewers' contribution continues to be important to the success of this symposium. These contributions were presented in nine sessions including a plenary session. Extended abstracts of the six keynote lectures given in the plenary session are also included here.

Going by the current trends, the contributions are classified into primary production and recycling, solidification and casting, alloy development, joining (welding) and diffusion, magnesium–rare-earth alloys, long period stacking ordered (LPSO) alloys and composites, twinning and plasticity, texture and formability, and corrosion. Challenges to improve plasticity and formability continue to excite researchers; most contributions deal with twinning, dislocation slip and texture. A fairly large number of contributions deal with the improvement of properties by the addition of rare-earth elements, investigating different aspects. Alloys forming the LPSO phase are also a part of this effort. Efforts are also seen in the areas of joining and corrosion, which are crucial for the application of magnesium alloys. Primary production, recycling and solidification remain as important as ever.

## **5 Light Metals 2016**

**Proceedings of the symposia sponsored by the Aluminum Committee of the Light Metals Division of The Minerals, Metals & Materials Society (TMS) held during TMS 2016 145th Annual Meeting Exhibition, February 14–18 Downtown Nashville Tennessee**

**by: E. Williams**

**Published 2016**

**The Minerals, Metals & Materials Society**

**by John Wiley & Sons Inc., Hoboken, New Jersey, 1053pp**

**ISBN: 978-1-119-22579-9, ISSN: 1096-9586**

The global aluminium industry has gone through dramatic shifts over the past several years, with China now accounting for more than half of the world's primary aluminium production. The Gulf States (GCC) have also seen significant increases in total smelting capacity and they are now the second largest region in terms of aluminium production. These geographic changes in smelting are reflected in the papers represented in this volume, with roughly a third each coming from North America and Europe, and the remaining third from China and the Middle East. This global diversity in the source of the research work strengthens the quality of these proceedings, and helps to make sure that is staying relevant in today's truly global production environment.

As in past years, this volume contains collected research and development work for aluminium processes organised into symposia: aluminium and bauxite, electrode technology, aluminium reduction technology, and cast shop for aluminium production. This year, there has been a change in the structure of the programming, combining the former aluminium alloys and aluminium processing into one new symposia: aluminium alloys, processing and characterisation. This new grouping covers work in the areas of aluminium alloy development, microstructure, deformation processes, and characterisation.

## **6 Materials with Internal Structure: Multiscale and Multifield Modeling and Simulation**

**by: P. Trovalusci**

**Published 2016**

**Springer Cham Heidelberg New York Dordrecht London**

**by Springer International Publishing, Switzerland, 131pp**

**ISBN: 978-3-319-21493-1, ISBN: 978-3-319-21494-8 (eBook)**

**ISSN: 2195-9862 ISSN 2195-9870 (electronic)**

**DOI: 10.1007/978-3-319-21494-8**

Springer tracts in mechanical engineering (STME) publishes the latest developments in mechanical engineering – quickly, informally and with high quality.

This volume presents a series of papers by expert researchers specialised in various fields of continuum and computational mechanics, as well as material science. The focus is on principles and strategies for multiscale modelling and simulation of complex heterogeneous materials, with periodic or random microstructure, subjected to various types of mechanical, thermal, chemical loadings and environmental effects. A wide overview of complex behaviour of materials is provided. Among the various approaches, attention is particularly addressed to non-local field descriptions, which are characterised by the presence of internal lengths and spatial dispersion in wave propagations. These descriptions allow us to circumvent physical inadequacies and the well known theoretical/computational problems of the classical local models, related to the ill-posedness of field equations and the consequent loss of objectivity of the numerical solutions as dependent on the discretisation. In such a framework, various kinds of advanced continuum models are presented which, provided by constitutive characterisation for the internal and external actions, constitute a very powerful frame for the gross mechanical description of complex material behaviours, without the restrictions of classical coarse-graining multiscale approaches.

Entering in some details, the chapters deals with:

- homogenisation methods aimed at deducing the overall properties of polycrystalline aggregates in the elastic–plastic and elastic–visco–plastic regime
- phase–field approaches proposed to describe both brittle and cohesive fracture phenomena
- effective material properties of nanostructures material derived accounting for surface/interface properties
- simulation the fatigue crack nucleation process in polycrystals through effective microstructural parameters for plastic flow
- development of second order homogenisation methods, including second gradient and gradient Cosserat, for granular material descriptions basing on generalised macrohomogeneity conditions of Hill’s type
- stochastic continuum thermomechanics involving tensor random fields for the representation of spatially varying material properties

- design of composite materials basing on structural stochasticity with reference to elastic–plastic and damping behaviour
- guidelines for deriving scale–dependent continuum formulations starting from discrete material descriptions and basing on the virtual power equivalence.

This volume in particular will be an opportunity, offered by researchers active in different fields (continuum mechanics, computational mechanics, experimental mechanics), to provide a forum for the presentation of fundamental, theoretical, experimental and practical aspects of mechanical modelling of materials with complex microstructures and complex behaviour oriented at bridging the gap between mechanical engineering and material science.

## **7 Ecotribology: Research Developments**

**by: J. Paulo Davim**

**Published 2016**

**Springer Cham Heidelberg New York Dordrecht London**

**by Springer International Publishing, Switzerland, 174pp**

**ISBN: 978-3-319-21005-3, ISBN: 978-3-319-21007-7 (eBook)**

**ISSN: 2195-0911 ISSN 2195-092X (electronic)**

**DOI: 10.1007/978-3-319-24007-7**

In the recent years, ecotribology (or environmentally friendly tribology) has gained increasing importance in green science and engineering. It is current report ecotribology or green tribology, as environmentally acceptable tribological practices, namely savings of resources of energy and materials, optimising product usage and design, reducing energy consumption and the impact on the environment. Today, it is normal to include several topics under the umbrella of ecotribology, namely biomimetics surfaces, control of friction and wear, biolubricants, environmental aspects of lubrication and surface modification techniques as well as tribological aspects of green applications, such as wind-power turbines, or solar panels. The purpose of this book is to present a collection of examples illustrating review studies and research in ecotribology. Chapter 1 of the book provides ecotribology development, prospects, and challenges. Chapter 2 is dedicated to advancements in ecofriendly lubricants for tribological applications (past, present, and future). Chapter 3 describes new emerging self-lubricating metal matrix composites for tribological applications. Chapter 4 contains information about multiobjective optimisation of engine parameters with biolubricant-biofuel combination of VCR engine using Taguchi–Grey approach. Chapter 5 describes biolubricants and potential of waste cooking oil. Finally, Chap. 6 is dedicated to two-body abrasion of bamboo fibre/epoxy composites. The present book can be used as a research book for a final undergraduate engineering course or as a topic on tribology at the postgraduate level. Also, this book can serve as a useful reference for academics, researchers, mechanical, materials and industrial engineers, professionals in tribology and related industries. The scientific interest in this book is evident for many important centres of research, laboratories, and universities as well as industry. Therefore, it is hoped this book will inspire and entuse others to undertake research in ecotribology.

**8 Handbook of Modern Sensors: Physics, Designs, and Applications**  
**by: Jacob Fraden**  
**Published 2016**  
**5th Edition, Springer Cham Heidelberg New York Dordrecht London**  
**by Springer International Publishing, Switzerland,**  
**2004, 2010, 2016, 758pp**  
**American Institute of Physics 1993, 1997**  
**ISBN: 978-3-319-19302-1, ISBN: 978-3-319-19303-8 (eBook)**  
**DOI: 10.1007/978-3-319-19303-8**

This book presents a comprehensive and up-to-date account of the theory (physical principles), design, and practical implementations of various sensors for scientific, industrial and consumer applications. This latest edition focuses on the sensing technologies driven by the expanding use of sensors in mobile devices. These new miniature sensors will be described, with an emphasis on smart sensors which have embedded processing systems. The chapter on chemical sensors has also been expanded to present the latest developments.

Digital systems, however complex and intelligent they may be, must receive information from the outside world that is generally analogue and not electrical. Sensors are interface devices between various physical values and the electronic circuits that ‘understand’ only a language of moving electrical charges. In other words, sensors are the eyes, ears, and noses of silicon chips.

This book contains the following chapters:

- data acquisition
- transfer functions
- sensor characteristics
- physical principles of sensing
- optical components of sensors
- interface electronic circuits
- detectors of humans
- presence, displacement, and level
- velocity and acceleration
- force and strain
- pressure sensors
- flow sensors
- microphones
- humidity and moisture sensors
- light detectors

- detectors of ionising radiation
- temperature sensors
- chemical and biological sensors
- materials and technologies.

Unlike other books on sensors, the Handbook of Modern Sensors is organised according to the measured variables (temperature, pressure, position, etc.). This book is a reference text for students, researchers interested in modern instrumentation (applied physicists and engineers), sensor designers, application engineers and technicians whose job it is to understand, select and/or design sensors for practical systems.

## **9 Progress in Ultrafast Intense Laser Science**

**by: K. Yamanouchi, L. Roso, R. Li, D. Mathur and D. Normand**

**Published 2015**

**Volume XII, Springer Cham Heidelberg New York Dordrecht London**

**by Springer International Publishing, Switzerland, 758pp**

**ISBN: 978-3-319-23656-8, ISBN: 978-3-319-23657-5 (eBook)**

**ISSN: 0172-6218**

**DOI: 10.1007/978-3-319-23657-5**

The purpose of this series is to provide comprehensive up-to-date monographs in both well established disciplines and emerging research areas within the broad fields of chemical physics and physical chemistry. The books deal with both fundamental emphasis. They are aimed primarily at researchers and graduate students in chemical physics and related fields.

As in previous volumes of PUILS, each chapter of this book begins with an introductory part, in which a clear and concise overview of the topic and its significance is given, and moves on to a description of the authors' most recent research results. All chapters are peer-reviewed. The articles of this twelfth volume cover a diverse range of the interdisciplinary research field, and the topics may be grouped into four categories: atoms, molecules, and clusters interacting in intense laser field, laser-induced filamentation and laser propagation, laser-plasma interaction and application, and ultrafast photo-induced processes of organic materials.

This book contains the following chapters:

- image-based closed-loop control of molecular dynamics: controlling strong-field dissociative-ionisation pathways
- classical trajectory methods for simulation of laser-atom and laser-molecule interaction
- nonadiabatic molecular alignment and orientation
- dynamics of atomic clusters under intense femtosecond laser pulses
- backward lasing of femtosecond plasma filaments

- propagation of ultrashort, long wavelength laser pulses
- dense matter states produced by laser pulses
- laser-plasma particle sources for biology and medicine
- observation of ultrafast photoinduced dynamics in strongly correlated organic materials.

**10 Micro- and Nanostructured Multiphase Polymer Blend Systems:  
Phase Morphology and Interfaces**  
**by: C.Harrats, S. Thomas and G. Groeninckx**  
**Published 2006**  
**by CRC Press, Taylor & Francis Group, Boca Raton, London,  
New York, 6000 Broken Sound Parkway NW, Suite 300,  
Boca Raton FL 33487-2742, 442pp**  
**ISBN: 0-8493-3734-8**

Many new multicomponent polymeric materials have been developed during the past two decades. The large number of scientific papers, industrial patents, scientific meetings, and exhibitions devoted to this class of materials is a sufficient witness to their strategic importance.

The present book is mainly centred around the phase morphologies and interface multiphase polymer blend systems. Since phase morphologies and interface properties are two of the main parameters that determine the thermal, physical, chemical, and mechanical properties of polymer blends, the book covers a very sensitive area, one that relates to the performance of polymer blend-based materials.

- micro- and nanostructured polymer blends: state of the art, challenges, and future prospects
- theoretical aspects of phase morphology development
- cocontinuous phase morphologies: predictions, generation, and practical applications
- phase morphology development in polymer blends: processing and experimental aspects
- the role of interfaces and phase morphology on mechanical properties of multiphase: copolymer systems
- polymer-polymer interfaces: theoretical, experimental, and adhesion aspects
- phase morphology and solidification under shear in immiscible polymer blends
- simultaneous interpenetrating network structured vinyl ester/epoxy hybrids and their use in composites
- phase morphology of dynamically vulcanised thermoplastic vulcanisates

- nanostructuring of in situ formed abc triblock copolymers for rubber toughening of thermoplastics
- phase morphology of nanostructured thermosetting multiphase blends
- relationship between phase morphology, crystallisation, and semicrystalline structure in immiscible polymer blends
- rheology-morphology relationships in immiscible polymer blends.

This book is intended to be a reference for basic and practical knowledge about phase morphology in multiphase polymer blend systems for students, engineers, and researchers. The way the topics are gathered, the selection of the contributors, and the survey of the phase morphology area (from its theoretical to its practical aspects) make this book an outstanding scientific reference for those involved in the field of polymer materials design. The book is an easy-to-consult volume for teachers giving courses in the field of polymer materials science.

#### *Features*

- presents new strategies for controlling the nanomorphology and the mechanical properties of multiphase polymeric materials
- enumerates and gathers the versatile routes of designing versatile types of phase morphologies in multicomponent polymer blend systems
- relates recent developments with vinylester/epoxy hybrid systems
- extracts information from the huge volume of open literature, industrial patents, scientific meetings, and exhibitions
- offers more than 400 tables, figures, and illustrations of phase morphology observed in polymer blends
- contains over 1350 literature references to original research.

### **11 Handbook of Manufacturing Industries in the World Economy**

**by: J.R. Bryson, J. Clark and V. Vanchan**

**Published 2015**

**by Edward Elger Publishing Limited, The Lypiatts, 15 Landsdown Road, Cheltenham, Glos GL50 2JA, UK**

**Edward Elger Publishing, Inc., William Pratt House, 9 Dewey Court, Northampton, Massachusetts 01060, UK, 519pp**

The book provides a critical and multi-disciplinary review of current manufacturing processes, practices and policies, and broadens our understanding of production and innovation in the world economy. Chapters highlight how firms and industrial modify existing processes to produce for established and emerging markets through dynamic and design-driven strategies. This approach allows readers to view transformation in production systems and processes across sectors, technologies and industrial.

Contributors include scholars ranging from engineering to policy to economic geography. This collection demonstrates the manufacturing continues to matter in developed market economies as in emerging economies.

This book highlights contributions the critically engage in understanding manufacturing and production. It brings together chapters that dynamics of manufacturing theoretical and empirically to advance debates and understanding of manufacturing from pre- to post-industrial worlds. The book also develops conversations between different but often unrelated debates in economic geography, for example manufacturing and financialisation, manufacturing and creative work, manufacturing and logistics, and manufacturing and consumption. Chapters examine topics including theory and methods as well as theoretically grounded empirical analysis of production processes, pre and post production, factors of production, financialisation, and the growth policy debates about how to shape and sustain manufacturing in the 21st century world economy.

Particularly in light of the renewed policy interest in manufacturing as a core component of national and regional export strategies, there are targeted policy efforts underway to support manufacturing in advanced industrialised economics. A stated goal of these new policy initiatives is to 'push innovation down the supply chain' to create localised competitive advantage by combining production and innovation capacities. In a global economy often defined by the complexity of extent of its geographically distributed supply networks, such a policy priority requires a precise and nuanced understanding of the current state of manufacturing and its shifting dynamics. The goal of the book is both to inform readers about the realities of manufacturing in the world economy and make the case for the ongoing support of such critical, interdisciplinary research.

The book will be warmly welcomed by scholars and students as well as practitioners. It provides essential reading for those involved in the renaissance of manufacturing and will enable them to take a broad and informed view of this vital and fascinating activity.

## **12 Ceramic Matrix Composites: Materials, Modeling and Technology**

**by: N.P. Bansal and J. Lamon**

**Published 2015**

**The American Ceramic Society**

**by John Wiley & Sons, Inc., Hoboken, New Jersey, 694pp**

**ISBN: 978-1-118-23116-6 (hardback)**

During the past 30 years, tremendous progress has been made in CMC developments. A large amount of knowledge has been acquired, and numerous processing/microstructure/property data have been produced. Results and state-of-the-art at a certain point in time were discussed in published conference proceedings, journal articles, and a few books. However, since we have entered the new millennium, the CMCs have reached maturity for use in systems working at high temperatures. They have now reached a high level of technological development. The issues have moved from processing methods and basic characteristics to stability at high temperatures in aggressive environments, life of material and components, predictive models, and simulation.

Among the features of long fibre-reinforced composites that have to be capitalised, versatility is quite important. For this purpose, characteristics and behaviour of constituents have to be considered. The performance of primary constituents requires further and full consideration. From this point of view, the fibres, the interfaces/interphases, the reinforcing performs, and the matrices are key elements. Some efforts have been devoted to multiscale approaches to thermostructural behaviour, including

- bottom-up approaches to establish microstructure/property relations with a view to a complete approach integrating processing/microstructure/property relations
- top-down approaches for component simulations.

In this book, opportunity was given to international specialists to produce a comprehensive review of recent developments in their field of expertise. They were encouraged to discuss state-of-the-art knowledge on the following topics related to CMCs:

- behaviour and properties of constituents: fibres (including single filaments and tows), fibre/matrix interfaces and interphases, and preforms
- carbon/carbon, C/SiC, C/C-SiC, SiC/SiC, oxide/oxide, and ultrahigh temperature ceramic-based composites: manufacturing methods, properties, technology development, and recent advances for major continuous fibre reinforced composite systems
- environmental effects, including effects of steam on high temperature performances of oxide/oxide composites, stress-oxidation degradation in SiC-based composites, thermomechanical ablation, radiation effects on SiC-based and carbon fibre composites, and foreign object damage
- protective coatings against surface recession in SiC/SiC and oxidation of ultrahigh temperature composites
- multiscale modelling of material behaviour and computational simulation of life of engineering structures
- integration and joining of CMCs and mechanical testing of joined structures
- acoustic emission-based detection and quantification of damage with a view to life prediction
- applications of CMCs in key sectors including aeronautics, space, and nuclear plants.

With chapters contributed by internationally recognised experts in the field of CMCs and its coverage of state-of-the art information, this book is recommended for scientists, engineers, technologists, and researchers in industry, research laboratories, and academia. Students in materials science, ceramics, structural materials, mechanical, civil and biomedical engineering will find it an invaluable supplement to their studies.

**13 Materials Characterization: Introduction to Microscopic and Spectroscopic Methods****by: Y. Leng****Published 2013****2nd Edition****by Wiley-VCH, Verlag GmbH & Co. KGaA, Boschstr. 12, 376pp****Print ISBN: 978-3-527-33463-6****ePDF ISBN: 978-3-527-67080-2****ePub ISBN: 978-3-527-67079-6****mobi ISBN: 978-3-527-67078-9****oBook ISBN: 978-3-527-67077-2**

The new edition retains the successful didactical concept of introductions at the beginning of chapters, exercise questions and an online solution manual. In addition, all the sections have been thoroughly revised, updated and expanded, with two major new topics (electron backscattering diffraction and environmental scanning electron microscopy), as well as 50 additional questions – in total about 20% new content.

The first part covers commonly used methods for microstructure analysis, including light microscopy, X-ray diffraction, transmission and scanning electron microscopy, as well as scanning probe microscopy. The second part of the book is concerned with techniques for chemical analysis and introduces X-ray energy dispersive spectroscopy, fluorescence X-ray spectroscopy and such popular surface analysis techniques as photoelectron and secondary ion mass spectroscopy. This section concludes with the two most important vibrational spectroscopies (infra-red and Raman) and the increasingly important thermal analysis.

The theoretical concepts are discussed with a minimal involvement of mathematics and physics, and the technical aspects are presented with the actual measurement practice in mind. Making for an easy-to-read text, the book never loses sight of its intended audience.

Now in its second edition, this continues to serve as an ideal textbook for introductory courses on materials characterisation, based on the author's experience in teaching advanced undergraduate and postgraduate university students.

**14 Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications****by: W.G. Fahrenholtz, E.J. Wuchina, W.E. Lee and Y. Zhou****Published 2014****The American Ceramic Society****by John Wiley & Sons, Inc., Hoboken, New Jersey, 441pp****ISBN: 978-1-118-70078-5 (hardback)**

Contributions are based on presentations by leading research groups at the conference "Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications II" held May 13–19, 2012 in Hernstein, Austria. Bringing together disparate researchers from academia, government, and industry in a singular forum, the meeting cultivated didactic discussions and efforts between bench researchers, designers and

engineers in assaying results in a broader context and moving the technology forward toward near- and long-term use.

Ultra-high temperature ceramics are a family of compounds that display an unusual combination of properties, including extremely high melting temperatures ( $>3000^{\circ}\text{C}$ ), high hardness, and good chemical stability and strength at high temperatures. Typical UHTC materials are the carbides, nitrides, and borides of transition metals, but the Group IV compounds (Ti, Zr, Hf) plus TaC are generally considered to be the main focus of research due to the superior melting temperatures and stable high-melting temperature oxide that forms in situ. Rather than focusing on the latest scientific results, *Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications* broadly and critically combines the historical aspects and the state-of-the-art on the processing, densification, properties, and performance of boride and carbide ceramics.

In reviewing the historic studies and recent progress in the field, *Ultra-high temperature ceramics: materials for extreme environment applications* provides:

- original reviews of research conducted in the 1960s and 1970s
- content on electronic structure, synthesis, powder processing, densification, property measurement, and characterisation of boride and carbide ceramics
- emphasis on materials for hypersonic aerospace applications such as wing leading edges and propulsion components for vehicles travelling faster than Mach 5
- information on materials used in the extreme environments associated with high speed cutting tools and nuclear power generation.

## **15 Welding Metallurgy and Weldability**

**by: John C. Lippold**

**Published 2015**

**by John Wiley & Sons, Inc., Hoboken, New Jersey, 400pp**

**ISBN: 978-1-118-23070-1 (hardback)**

Welding metallurgy and weldability describes weld failure mechanisms associated with either fabrication or service, and failure mechanisms related to microstructure of the weldment. Weldability issues are divided into fabrication and service related failures; early chapters address hot cracking, warm (solid-state) cracking, and cold cracking that occur during initial fabrication, or repair. Guidance on failure analysis is also provided, along with examples of SEM fractography that will aid in determining failure mechanisms. Welding metallurgy and weldability examines a number of weldability testing techniques that can be used to quantify susceptibility to various forms of weld cracking.

- reviews welding metallurgy principles including weld solidification behaviour
- describes the mechanisms of weldability along with methods to improve weldability
- includes an introduction to weldability testing and techniques, including strain-to-fracture and Varestraint tests

- chapters are illustrated with practical examples based on 30 plus years of experience in the field.

Illustrating the weldability aspects of structural materials used in a wide variety of engineering structures, welding metallurgy and weldability provides engineers and students with the information needed to understand the basic concepts of welding metallurgy and to interpret the failures in welded components.

## **16 Fundamentals of Manufacturing Engineering**

**by: D.K. Singh**

**Published 2014**

**3rd Edition**

**Taylor & Francis Group, Boca Raton, London, New York, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487 USA,**

**Ane Books Pvt. Ltd., 4821 Parwana Bhawan, 1 st Floor, 24 Ansari Road, Darya Ganj, New Delhi-110 002, India, 599pp**

**ISBN: 978-1-4822-5443-3**

Manufacturing engineering is an interesting field and it has vast scope, as it finds extensive application in many types of industries. This author has made an attempt to sincerely present the subject in an interesting manner using simplified language. This subject forms the core subject for all branches of engineering, which shows its importance. The entire subject is divided into 22 chapters and each chapter contains a number of multiple choice questions along with many short questions to test the knowledge of the readers. The questions will certainly raise curiosity in the minds of the readers.

### *Contents*

- introduction to materials and their properties
- ferrous materials and their heat treatment
- nonferrous materials and heat treatment
- nonconventional materials
- introduction to casting
- casting process
- design consideration in casting
- introduction to joining processes
- gas welding processes
- arc welding processes
- solid state welding processes
- resistance welding processes
- modern welding processes

- soldering, brazing and adhesive bonding
- design consideration joining processes
- theory of metal cutting
- machining operations
- cutting tool materials
- metrology
- manufacturing tools and workshop application, bibliography, index.

The third edition of the book contains a large number of short answer questions which are added to every chapter. Two separate sections on Flux and another on Forging Defects have also been added. Forging section has been rewritten to include its important advantages and limitations. Simultaneously, the whole book has been thoroughly revised to eliminate the printing errors noticed in the previous editions of the book.

**17 Methods In Product Design: New Strategies in Reengineering**

**by: A.K. Kamrani, M. Azimi and A.M. Al-Ahmari**

**Published 2013**

**by CRC Press Taylor & Francis Group, Boca Raton London New York,**

**6000 Broken Sound Parkway NW, Suite 300, Boca Raton,**

**FL 33487-2742, 324pp**

**ISBN-13: 978-1-4398-0832-0 (hardback)**

The current marketplace is undergoing an accelerated pace of change that challenges corporation to apply new techniques to response to this ever-developing environment. At the centre of this change is in a new generation of customers. As the industry adopts a consumer focus in this product development strategy, it must offer broader product ranges, shorter model lifetimes, and the required ability to process products in less time and costs. A consumer-focused product design must simultaneously meet the conflicting objectives of consumer and manufacturing. It is based on premise that

- changing consumer requirements dictate varied product features
- the structure of products and process must be aligned with dynamic product features
- manufacturing productivity requires managing conflicting objectives due to these structural alignments.

Organisations now fail or succeed based upon their ability to respond quickly to changing customer demands and to utilise new technological innovations. In such an environment, the advantage goes to the firm that can offer greater varieties of new products with higher performance and more overall appeal. In order to compete in this fast-paced global market, organisations need to produce products that can be easily configured to offer distinctive capabilities comparable to the competition. Furthermore, organisations need to develop new methods and techniques to react rapidly to required changes and to shorten the product development cycle which will enable them to gain more economic

competitiveness. This edited book is a collection of methods and state-of-the-art technologies in new strategies for customer-focused product design and development.

The book defines customer-focused design and discusses ways to assess changing demands and sources, and delves into what is needed to successfully manufacture goods in demanding market. It reviews proven methods for assessing customer need. Then, after showing how changing needs impact the reengineering of products, it explains how change can be efficiently achieved. It details how IT advantages and technology support customer-focused product development, discussing cutting-edge mass customisation principles that maximise cost-effective production and illustrates how to implement effective predictive maintenance policies.

### **18 Ceramic Matrix Composites: Materials, Modeling and Technology**

**by: N.P. Bansal and J. Lamon**

**The American Ceramic Society**

**Published 2015**

**by John Wiley & Sons, Inc., Hoboken, New Jersey, 694pp**

**ISBN: 978-1-118-23116-6 (hardback)**

Ceramic composites are considered an enabling for advanced aer propulsion, space propulsion, space power, aerospace vehicle, space structures, ground transport, as well as nuclear and chemical industries. In the last 30 years, tremendous progress has been made in the development and advancement of ceramic matrix composites (CMC). *Ceramic Matrix Composites: Materials, Modelling and Technology* provides a coherent overview of this progression and guides readers through the most recent developments on various aspects of CMCs including:

- behaviour and properties of constituents: fibres, fibre/matrix interfaces, and interphases, and performs
- processing, properties and technology of continuous fibre-reinforced C/C, C/SiC, C/C-SiC, SiC/SiC, oxide/oxide, and ultra-high temperature ceramic composites, as well as application of CMCs in key sectors including aeronautics, space, and nuclear industries
- environment effects, including the effects of steam on oxide/oxide composites; stress\*oxidation degradation in SiC-based composites; thermomechanical ablation; radiation effects on SiC-based and carbon fibre composites; and foreign object damage
- proactive coatings against oxidation and surface recession of CMCs
- multiscale modelling of material behaviour and computational simulation of lift-of-engineering structures
- integration and joining of CMCs and mechanical testing of joined structures
- acoustic emission-based detection and quantification of damage with a view to life-prediction.

With chapter contributed by internationally recognised experts in the field of C;MCs and its coverage of state-of-the art information, this book is recommended for scientists, engineers, technologists, and researchers in industry, research laboratories, and academia. Students in materials science, ceramics, structural materials, mechanical, civil and biomedical engineering will find in an invaluable supplement to their studies.

## **19 Biocidal Polymers**

**by: Narendra Pal Singh Chauhan**

**Published 2016**

**by Smithers Rapra, A Smithers Group Company, Shawbury,  
Shrewsbury, Shropshire, SY4 4NR, UK, 370pp**

**<http://www.polymer-books.com>**

**ISBN: 978-1-91024-225-4 (hardback)**

**ISBN: 978-1-91024-226-1 (softback)**

**ISBN: 978-1-91024-227-8 (ebook)**

Biocidal polymers have the ability to inhibit or kill microorganisms such as bacteria, fungi and protozoa. These polymers have been engineered to mimic antimicrobial peptides, which are used by the immune systems of living things to kill bacteria, by attaching or inserting an active antimicrobial agent, such as biocidal functional groups, including hydroxyl, carboxyl or amino groups, onto a polymer backbone via an alkyl or acetyl linker. The antimicrobial activity of the biocidal agents may either be reduced or enhanced by polymerisation and depends on the antibacterial mechanism of action of the agent, i.e., depleting the bacterial food supply or bacterial membrane disruption, and the kind of monomer used. Some of the major advantages of antimicrobial polymers over conventional antimicrobial agents are their non-volatile nature, chemical stability, non-toxic behaviour and minimal environmental impact. There is a pressing demand to fabricate different kinds of natural and synthetic polymers that have the potential to act against specific microorganisms.

This book is comprised of 12 chapters which summarised the state-of-the-art of the polymer industry, i.e., the synthetic strategy of using various antimicrobial polymers including: cationic biocidal polymers, amphiphilic biocidal polymers, biomimetic antimicrobial polymers and polymer-metal nanocomposites which exhibit biocidal properties, biodegradable polymers which antibacterial properties, polyethylene glycol- and polylactic acid-based antimicrobial polymers and N-halamine-based biocidal polymers which exhibit antimicrobial properties, different methods of antimicrobial testing and future perspectives in this field. The main focus of this volume is on the synthesis and mechanistic strategy of using biocidal activities of natural, biodegradable and synthetic polymers.

The book will be of a general interest to microbiologist, biotechnologists, medical doctors, organic chemists, pharmacists, polymer scientists, food scientists and technologists. This book offers a balanced, interesting and innovative perspective which is applicable to academic and industries.