Book Reviews

Reviewed by Janez Grum

Email: janez.grum@fs.uni-lj.si

1 Characterization of Minerals, Metals, and Materials 2015
Proceedings of a Symposium Sponsored by the Materials Characterization Committee of the Extraction and Processing Division of The Minerals, Metals & Materials Society (TMS)
144th Annual Meeting & Exhibition
March 15–19, 2015 Walt Disney World • Orlando, Florida, USA
by: J.S. Carpenter, C. Bai, J.P. Escobedo, J.Y. Hwang, S. Ikhmayies, B. Li, J. Li, S.N. Monteiro, Z. Peng and M. Zhang
Published 2015
Wiley, The Minerals, Metals & Materials Society,
by John Wiley & Sons, Inc., Hoboken, New Jersey, 792pp,
ISBN: 978-1-119-08246-0

The relationships between processing, microstructure, and properties form the basis for the materials science field. Characterisation is a critical step along the pathway of discovery in understanding these relationships. This collection of proceedings covers the use of characterisation across the entire life cycle of materials, from extraction to processing to utilisation to recycling. In addition, the breadth of this volume is meant to cover characterisation across the spectrum of science and engineering consistent with technology or manufacturing readiness levels from one to nine. This will serve the dual purpose of furnishing a broad introduction of the field to novices while simultaneously serving to keep subject matter experts up-to-date.

The Materials Characterization Committee of TMS sponsors a *Symposium on Characterization of Minerals, Metals, and Materials* as a major event during the annual TMS meeting. The 2015 symposium held in Orlando, Florida, USA received more than 250 submissions and is expected to have 109 oral presentations and 127 poster presentations. Of these presentations, more than 100 accompanying papers were accepted for publication in this book after a peer review process. *The Characterization of Minerals, Metals, and Materials Symposium* at TMS is not only one of the largest and most broad symposia in terms of scientific coverage but in speaker participation as well.

Manuscripts included within this volume will include characterisation studies on materials such as ferrous metal, non-ferrous metal, clay, ceramic, composite, polymeric, electronic, magnetic, environmental and advanced materials. Also included are papers related to the characterisation of welding, solidification, processing, corrosion, and extraction of materials. Various characterisation technologies are developed and utilised throughout this volume to solve current problems in materials science. Although sections in this book are generally divided among material (e.g., minerals vs. soft materials) or

processing step lines (e.g., welding vs. extraction), the editors entreat the readers to view the entire book as potentially being of use in providing applicable solutions across the entire spectrum of materials.

2 Plastics and Environmental Sustainability
by: A.L. Andrady
Published 2015
by John Wiley & Sons, Inc., John Wiley & Sons, Inc., Hoboken, New Jersey, Wiley, ISBN: 978-1-118-31260-5(cloth), 324pp

The issue of plastics in the environmental has attracted widespread attention from the scientific community as well as from the informed general public. Plastics offer a variety of valuable societal benefits. However, their production, use, and disposal present many environmental concerns. Some of these are real and justified while others have little support in scientific fact. *Plastics and environmental sustainability* presents a clear analysis of the key plastic-related issues, citing the research based that supports or contradicts the popularly held notions.

Plastics and environmental sustainability features the following:

- sustainability issues associated with use of plastics as a material
- discussions on postconsumer fate of plastic on load and in the oceans, highlighting the environmental impacts of disposal methods
- toxicity of plastic, particularly as it applies to human health
- a clear analysis of the key plastic-related issues including numerous citations of the research base the supports and contradicts the popularly held notions.

This highly readable value treats the subject of plastics and sustainability in a balanced and critical manner for the technical reader. Despite its multidisciplinary content covered in it, the author guides the reader through the economics, technology, and assessment of data pertaining to the topic.

3 Modeling and Analysis of Compositional Data
by: V.P. Glahn, J.J. Egozcue and R.T. Delgado
Published 2015
by John Wiley & Sons Ltd, The Atrium, Southern Gate, Chicher, West Sussex, PO19 8 SQ, UK, Wiley, ISBN: 978-1-118-44306-4, 247pp

Statistics in Practice is an important international series of texts which provide detailed coverage of statistical concepts, methods and worked case studies in specific fields of investigation and study.

With sound motivation and many worked practical examples, the books show in down-to-earth terms how to select and use an appropriate range of statistical techniques in a particular practical field within each title's special topic area.

Authors provide a complete and current compendium of fundamental to advanced methodologies along with exercises at the end of each chapter aid the readers' understanding.

- present a compressive and practical introduction to the analysis of compositional data
- presents numerous examples of compositional data and exercises from many fields of science
- uses samples space approach to compositional data and exercises from many fields of sciences
- accompanied by a website featuring a manual with solutions, instructions to access free software, and datasets.

The books provide statistical support for professionals and research workers across a range of employment fields and research environments. Subject areas covered include medicine and pharmaceutics; industry, finance and commerce; public services; the earth and environmental sciences, and so on.

The books also provide support to students studying statistical courses applied to the above areas. The demand for graduates to be equipped for the work environment has led to such courses becoming increasingly prevalent at universities and colleges.

It is our aim to present judiciously chosen and well-written workbooks to meet everyday practical needs. Feedback of views from readers will be most valuable to monitor the success of the aim.

A complete of titles in this appears at the end of the volume.

4 Data Mining Algorithms: Explained using R
by: P. Cichosz
Published 2015
by John Wiley & Sons Ltd, The Atrium, Southern Gate, Chicher, West Sussex, PO19 8 SQ, UK, ISBN: 9781118332580, 683pp

Data mining has been a rapidly growing field of research and practical applications during the last two decades. From a somewhat niche academic area at the intersection of machine learning and statistics it has developed into an established scientific discipline and a highly valued branch of the computing industry. This is reflected by data mining becoming an essential part of computer science education as well as the increasing overall awareness of the term 'data mining' among the general (not just computing-related) academic and business audience.

Various definitions of data mining may be found in the literature. Some of them are broad enough to include all types of data analysis, regardless of the representation and applicability of their results. This book narrows down the scope of data mining by adopting a heavily modelling-oriented perspective. According to this perspective the ultimate goal of data mining is delivering predictive models. The latter can be thought of as computationally represented chunks of knowledge about some domain of interest, described by the analysed data, that are capable of providing answers to queries transcending the data, i.e., such that cannot be answered by just extracting and

aggregating values from the data. Such knowledge is discovered from data by capturing and generalising useful relationship patterns that occur therein.

Activities needed for creating predictive models based on data and making sure that they meet the application's requirements fall in the scope of data mining as understood in this book. Analytical activities which do not contribute to model creation – although they may still deliver extremely useful results – remain therefore beyond the scope of our interest. This still leaves a lot of potential contents to be covered, including not only modelling algorithms, but also techniques for evaluating the quality of predictive models, transforming data to make modelling algorithms easier to apply or more likely to succeed, selecting attributes most useful for model creation, and combining multiple models for better predictions.

The book is not intended to be a 'data mining bible' providing a complete coverage of the area, but rather to selectively focus on a number of algorithms that:

- are known to work well for the most common data mining tasks
- are good representatives of typical data mining techniques
- can be well explained to the general technically educated audience without an excessive required mathematical and computing background
- can be used to illustrate good practices as well as caveats of data mining.

It is not supposed to be a business-oriented manager's guide to data mining or a bird's eye-perspective overview of the field, either. Topics covered by the book are discussed in a technical way, with a level of detail believed to be adequate for most practical needs, albeit not overwhelming. This includes the presentation of the internal mechanisms, properties, and usage scenarios of algorithms that are not extremely complex mathematically or implementationally and offer the potential of excellent results in many applications, but may need expertise and experience to be used fruitfully. The ambition of the book is to help the reader develop that expertise and experience.

The book's technical and practical orientation, with very limited theoretical background, but a relatively high level of detail on algorithm internal operation and application principles, makes it appropriate for a mixed audience consisting of

- students of computer science and related fields
- researchers working on experimental or applied research projects in any area where data analysis capabilities are used
- analysts and engineers working with data and creating or using predictive models.

The book should be particularly appealing to computer scientists and programmers due to its extensive use of R code examples, as explained below.

While the little-background assumption makes the book suitable as an introductory text, the level of detail and precision puts it actually on an advanced or semi-advanced level, since on many occasions – whenever it is justified by practical utility – it discusses issues that tend to be overlooked or taken lightly in typical introductions to data mining.

5 Gefüge Der Gusseisenlegierungen: Structure of Cast Iron Alloys

by: S. Hasse
Published 2008
by Fachverlag Schiele & Schön GmbH, Berlin, Schiele & Schön,
ISBN: 978-3-7949-0753-3, 212pp

Today the quality demands on casting materials are complicated and on high level. Therefore, the quality of the components made of these materials has to be continuously monitored. In addition, the structure of the respective material with all its specific features is one of the most important quality signs.

While there results of most testing methods can be displayed as measured data, casting structures must be described and be interpreted, i.e., there must be a description as to which phases exist within the structure, in which amount and shape they are distributed and which properties have to be expected. This demands ability and knowledge.

The present book describes and explains the most important cast iron structures and its specific features for experts dealing with castings in foundries, casting-using and similar industries to make their work easier in this field. Beside the description of the structure which is expressed in more than 300 figures. This seems very important, because beside the normal structure components, primarily structure-specific features influence the expected properties of real casting alloys.

Therefore, according to the state-of-the-art not only optical microscopic figures are shown, but a huge number of scanning electron micrographs are displayed and described. In addition, EDX analyses are also presented as unequivocal proof of structure components.

6 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 & Matreials 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.

7 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 & Matreials 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.

8 TMS 2016 145th Annual Meeting Exhibition Supplemetal Proceedings

by: J.A. Schneider, M. Stoudt, K. Clark, L. Semiatin and M.A. Zaeem
Published 2016
The Minerals, Metals & Matreials 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.

9 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 & Matreials 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, it can be regarded as a central repository of the nest 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, solidi cation 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 solidi cation remain as important as ever.

10 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 & Matreials Society,
by John Wiley & Sons Inc., Hoboken, New Jersey, 1053pp
ISBN: 978-1-119-22579-9, ISSN Number 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.

11 Roll-to-Roll Vacuum Deposition of Barrier Coatings
2nd Edition
by: Charles A. Bishop
Published 2015
by John Wiley & Sons, Inc., Hoboken, New Jersey
and Scrivener Publishing LLC, Salem Massachusetts, 297pp
Published simultaneously in Canada
ISBN: 978-1-118-94614-5

The book *Roll-to-Roll Vacuum Deposition of Barrier Coatings* is a practical guide, providing the reader with basic information to help them understand what is necessary in order to produce a good barrier coated web or to improve the quality of an existing barrier product.

After providing an introduction where the terminology is outlined and some of the science is given, including barrier testing methods, the vacuum deposition process is described. The book looks at the whole process from the source materials through to the post deposition handling of the coated material. This historic view of the vacuum coating process provides a description of the common sources of defects and includes the

possible methods of limiting the defects. This enables readers to decide where their development efforts and money can best be used to improve the barrier performance of their own process or materials.

The second edition of this well-adopted text contains much new material including additional barrier testing techniques that have been developed as well as testing and cleaning equipment brought to market since the first edition was published in 2010. The topic of adhesion is covered in more detail and there is a section on the Hanson Solubility Parameter which is a method of predicting the solubility of gases of liquids in materials.

People using roll-to-roll vacuum coating technology including R&D scientists and engineers, operators, technicians, and line managers involved in producing vacuum deposited barrier coatings. Industries that will use this book include food packing, organic light emitting devices companies such as electronics, solar energy and photovoltaics, thin film battery as well as vacuum insulation panels and medical packaging. The book can be used in engineering schools, technical universities, and companies for education and training purposes.

12 Fracture Mechanics: Fundametals and Applications

by: S.K. Maiti
Published 2015
by Cambridge University Press, Delhi, 279pp
ISBN: 978-107-09676-9 (hardback)

Fracture mechanics studies the development and spread of cracks in materials. It uses methods of analytical solid mechanics to calculate the driving force on a crack and those of experimental solid mechanics to characterise the material's resistance to fracture. The subject has relevance to the design of machines and structures in application areas including aerospace, automobiles, power sector, chemical industry, oil industry, shipping, atomic energy and defence.

This book presents the gradual development in the fundamental understanding of the subject and in numerical methods that have facilitated its applications. The subject can be studied from the viewpoint of material science and mechanics; the focus here is on the latter.

The book, consisting of nine chapters, introduces readers to topics like linear elastic fracture mechanics, yielding fracture mechanics, mixed mode fracture and computational aspects of linear elastic fracture mechanics. It also discusses the calculation of theoretical cohesive strength of materials and the Griffith theory of brittle crack propagation and its Irwin and Orowan modification. Explaining analytical determination of crack tip stress field, it also provides an introduction to the airy stress function approach of two dimensional elasticity and Kolosoff-Mukheslishvili potential formulation based on analytic functions. In addition a chapter deals with the characteristics of fracture in terms of crack opening displacement and J integral and the interpretation of J as potential energy release rate for linear elastic materials. Other relevant topics discussed in the book include stress intensity factor; factors that affect cyclic crack growth rate and Elber's crack closure effect; fundamentals of elastic plastic fracture mechanics and the experimental measurements of fracture toughness parameters KIC, JIC, crack opening displacement, K-resistance curve etc.

The book contains the following chapters:

- introduction
- linear elastic fracture mechanics
- determination of crack-tip stress field
- crack opening displacement, J integral, and resistance curve
- determination of stress intensity factors
- mixed mode brittle fracture
- fatigue crack growth
- elastic plastic fracture mechanics
- experimental measurement of fracture toughness data.

13 Fuzzy Logic and Information Fusion
To commemorate the 70th Birthday of Professor Gaspar Mayor
by: T.C. Sánchez and J.T. Sastre
Published 2016
by Springer International Publishing, Switzerland, 242pp
ISSN: 1431-992 ISSN 1860-0808 (elektronic)
ISBN: 978-3-319-30419-9
ISBN: 978-3-319-30421-2 (eBook)

The series "Studies in Fuzziness and Soft Computing" contains publications on various topics in the area of soft computing, which include fuzzy sets, rough sets, neural networks, evolutionary computation, probabilistic and evidential reasoning, multi-valued logic, and related fields. The publications within "Studies in Fuzziness and Soft Computing" are primarily monographs and edited volumes. They cover significant recent developments in the field, both of a foundational and applicable character.

This book offers a timely report on key theories and applications of soft-computing. Written in honour of Professor Gaspar Mayor on his 70th birthday, it primarily focuses on areas related to his research, including fuzzy binary operators, aggregation functions, multi-distances, and fuzzy consensus/decision models. It also discusses a number of interesting applications such as the implementation of fuzzy mathematical morphology based on Mayor-Torrens t-norms. Importantly, the different chapters, authored by leading experts, present novel results and offer new perspectives on different aspects of Mayor's research. The book also includes an overview of evolutionary fuzzy systems, a topic that is not one of Mayor's main areas of interest, and a final chapter written by the Spanish pioneer in fuzzy logic, Professor E. Trillas. Computer and decision scientists, knowledge engineers and mathematicians alike will find here an authoritative overview of key soft-computing concepts and techniques.

The book contains the following chapters:

- Gaspar Mayor: a prolific career on fuzzy sets and aggregation functions
- smooth finite T-norms and their equational axiomatisation

- associative copulas: a survey
- powers with respect to t-norms and t-conorms and aggregation functions
- modus tollens on fuzzy implication functions derived from uninorms
- a survey of Atanassov's intuitionistic fuzzy relations
- on weighting triangles using fuzzy relations and its application to aggregation
- new advances in the aggregation of asymmetric distances. the bounded case
- multidistances and dispersion measures
- soft consensus models in group decision making
- relation between AHP and operators based on different scales
- evolutionary fuzzy systems: a case study in imbalanced
- Mayor-Torrens t-norms in the fuzzy mathematical morphology and their applications
- a short dialogue concerning 'what is' and 'what is not' with imprecise words.

14 Additive Manufacturing: Innovations, Advances, and Applications

by: T.S. Srivatsan and T.S. Sudarshan
Published 2016
by CRC Press, Taylor & Francis Group, Boca Raton, London, New York, Boca Raton, 444pp
ISBN-13: 987-1-4987-1477-8 (Hardback)
ISBN: 987-1-4987-1477-8 (alk. paper)

The innovation of creating a three-dimensional object layer by layer using computer-aided design was originally termed rapid prototyping, a valuable technique that was developed in the early 1980s for the purpose of manufacturing. In its early stages, rapid prototyping was typically used to create models and prototype parts and offered quick realisation of what engineers had envisioned. Rapid prototyping was one of the preliminary processes that eventually culminated in additive manufacturing, which allows the production of actual printed parts, in addition to models. The most notable advances the process offers are the development and production of products with a noticeable reduction in both time and cost, facilitated by increased human interaction and optimisation of the product development cycle, thus making it possible to create almost any shape that would otherwise be difficult to machine using conventional techniques. With the emergence of additive manufacturing, scientists, engineers, and even students can rapidly build and analyse models for the purpose of theoretical comprehension and related studies. In the medical profession, doctors have been able to build models of various parts of the body to analyse injuries or disease and to plan appropriate medical procedures. Additive manufacturing has also made it possible for market researchers to gather the opinions of potential buyers of newly developed products and for artists to explore their creativity.

The book contains the following chapters:

- additive manufacturing of materials: viable techniques, metals, advances, advantages, and applications
- additive manufacturing using free space deposition in metals: experiment and theory
- additive manufacturing of metals via selective laser melting: process aspects and material developments
- projection microstereolithography as a micro-additive manufacturing technology: processes, materials, and applications
- printed and hybrid electronics enabled by digital additive manufacturing technologies
- application of radiometry in laser powder deposition additive manufacturing
- powder and part characterisations in electron beam melting additive manufacturing
- simulation of powder-based additive manufacturing processes
- advances in additive manufacturing: effect of process parameters on microstructure and properties of laser-deposited materials
- integration of gas-permeable structures in laser additive manufactured products
- additive manufacturing of components from engineering ceramics
- reactive inkjet printing of nylon materials for additive manufacturing applications
- comparison of additive manufacturing materials and human tissues in computed tomography scanning
- additive manufacturing of medical devices
- medical applications of additive manufacturing
- additive manufacturing of pluronic/alginate composite thermogels for drug and cell delivery
- additive manufacturing of rare earth permanent magnets.

Overall, this text on additive manufacturing provides a solid background for understanding the immediate past, the ongoing present, and emerging trends, with an emphasis on innovations and advances in its use for a wide spectrum of manufacturing applications, including the human healthcare system. This text can very well serve as a single reference book or even as textbook for

- seniors in undergraduate programs in the fields of materials science and engineering, manufacturing engineering, and biomedical engineering
- beginning graduate students

- researchers in both research and industrial laboratories who are studying various aspects related to materials, products, and additive manufacturing
- engineers seeking technologically novel and economically viable innovations for a spectrum of both performance-critical and non-performance-critical applications.

15 Handbook of Biomaterial Properties 2nd Edition by: W. Murphy, J.Black and G. Hastings Published 2016 Springer Science+Business Media New York, 676pp ISBN: 978-1-4939-3303-7 ISBN: 978-1-4939-3305-1 (eBook)

Progress in the development of surgical implant materials has been hindered by the lack of basic information on the nature of the tissues, organs and systems being repaired or replaced. Materials' properties of living systems, whose study has been conducted largely under the rubric of tissue mechanics, has tended to be more descriptive than quantitative. In the early days of the modern surgical implant era, this deficiency was not critical. However, as implants continue to improve and both longer service life and higher reliability are sought, the inability to predict the behaviour of implanted manufactured materials has revealed the relative lack of knowledge of the materials properties of the supporting or host system, either in health or disease. Such a situation is unacceptable in more conventional engineering practice: the success of new designs for aeronautical and marine applications depends exquisitely upon a detailed, disciplined and quantitative knowledge of service environments, including the properties of materials which will be encountered and interacted with. Thus the knowledge of the myriad physical properties of ocean ice makes possible the design and development of icebreakers without the need for trial and error. In contrast, the development period for a new surgical implant, incorporating new materials, may well exceed a decade and even then only short term performance predictions can be made.

A great body of data has accumulated concerning the materials aspects of both implantable materials and natural tissues and fluids. Unfortunately, these data are broadly distributed in many forms of publication and have been gained from experimental observations of varying degrees of accuracy and precision. This is a situation very similar to that in general engineering in the early phases of the Industrial Revolution. The response then was the publication of engineering handbooks, drawing together, first in general publication and later in specialty versions, vi the known and accepted data of the time. In this spirit, we offer this 2nd Edition of the Handbook of Biomaterial Properties Biomaterials, as manufactured for use in implants, do not exist usefully out of context with their applications. Thus, a material satisfactory in one application can be wholly unsuccessful in another. In this spirit, the Editors have given direction to the experts responsible for each part of this Handbook to consider not merely the intrinsic and interactive properties of biomaterials but also their appropriate applications as well as their historical context. The experts have in some cases added significant content specific to each class of material. It is hoped that the results will prove

valuable, although in different ways, to the student, the researcher, the engineer and the practicing physician who uses implants.

16 Machining, Joining and Modifications of Advanced Materials

by: Andreas Öchsner and Holm Altenbach
Published 2016
by Springer Science+Business Media Singapore, 269pp
ISSN:1869-8433 ISSN1869-8441 (electronic)
ISBN: 978-981-10-1081-1
ISBN: 978-981-10-1082-8 (eBook)

The idea of this monograph is to present the latest results related to mechanical and materials engineering applied to the machining, joining, and modifying modern engineering materials. The contributions cover the classical fields of casting, forming, and injection moulding as representatives of manufacturing methods. Additive manufacturing (rapid prototyping and laser sintering) is treated as a more innovative and recent technology which opens the possibility for the manufacturing of shapes and features which are not possible to achieve based on traditional methods. Water jet cutting is treated as an innovative cutting technology which avoids the heat increase as in the case of classical mechanical cutting. As a different technology for separation of materials, the laser cutting technology is introduced. Classical bonding and friction stir welding approaches are treated as joining technologies. In many cases, forming and machining technologies require a post-treatment to achieve a required surface quality or to equip the component with a protective layer. This area is covered based on laser treatment, shot peening, and the generation of protective layers.

The 9th International Conference on Advanced Computational Engineering and Experimenting, ACE-X 2015, was held in Munich, Germany, from June 29 to July 2, 2015, with a strong focus on computational based and supported engineering. This conference served as an excellent platform for the engineering community to meet with each other and to exchange the latest ideas. This volume contains 18 revised and extended research articles written by experienced researchers participating in the conference. Well-known experts present their research on casting, forming, injection moulding, and laser-based methods.

17 Essentials of Inorganic Materials Synthesis

by: C.N.R. Rao and K. Biswas
Published 2015
by John Wiley & Sons, Inc., Hoboken, New Jersey, 209pp
Published simultaneously in Canada
ISBN: 978-1-118-83254-7 (hardback)

Chemical methods of synthesis play a crucial role in designing and discovering novel materials, especially metastable ones which cannot be prepared otherwise. They often provide better and less cumbersome methods for preparing known materials. There is a tendency nowadays to avoid brute-force methods and instead employ methods involving mild reaction conditions. Soft-chemistry routes are indeed becoming popular and will

continue to be pursued greatly in the future. In view of the increasing importance of materials synthesis, we considered it appropriate to provide a proper account of the chemical methods of synthesis of inorganic materials in a book.

In this book, the authors briefly examine the different types of reactions and methods employed in the synthesis of inorganic solid materials. Besides the traditional ceramic procedures, we discuss precursor methods, combustion method, topochemical reactions, intercalation reactions, ion-exchange reactions, alkali-flux method, sol–gel method, mechanochemical synthesis, microwave synthesis, electrochemical methods, pyrosol process, arc and skull methods and high-pressure methods. Hydrothermal and solvothermal syntheses are discussed separately and also in sections dealing with specific materials. Superconducting cuprates and intergrowth structures are discussed in separate sections. Synthesis of nanomaterials is dealt with in some detail. Synthetic methods for metal borides, carbides, nitrides, fluorides, silicides, phosphides and chalcogenides are also outlined.

Serving to assist student, teachers and practitioners in the broad area of chemistry of solids, Essentials of Inorganic Materials Synthesis covers the following:

- common reactions employed in synthesis, combustion synthesis, arc and skull methods, reactions at high pressures, use of microwaves and soft chemistry routers
- comprehensive treatment of synthesis and discussions of the techniques
- modern inorganic materials with application in nanotechnology and energy materials
- key references to obtain greater details of preparative producers and related aspects.

18 Flow, Deformation and Fracture
Lectures on Fluid Mechanics and the Mechanics of Deformable Solids for Mathematicians and Physicists
by: G. Isaakovich Barenblatt
Published 2014
Cambridge University Press, Cambridge University Press is part of the University of Cambridge, 255pp
ISBN: 978-0-521-88752-6 Hardback
ISBN: 978-0-521-71538-6 Paperback

The present book is a masterful exposition of fluid and solid mechanics, informed by the ideas of scaling and intermediate asymptotics, a methodology and point of view of which Professor Barenblatt is one of the originators. Most physical theories are intermediate, in the sense that they describe the behaviour of physical systems on spatial and temporal scales intermediate between much smaller scales and much larger scales; for example, the Navier–Stokes equations describe fluid motion on spatial scales larger than molecular scales but not so large that relativity must be taken into account and on time scales larger than the time scale of molecular collisions but not so large that the vessel that contains the fluid collapses through aging. An awareness of the scales that are relevant to each problem must guide the formulation of mathematical models as well as the asymptotics that lead to their solution. Accordingly, the book makes explicit the intermediate asymptotic nature of many of the well-known arguments in mechanics, leading to a clear understanding of their domains of validity and their limitations. Along the way, the

assumptions that underlie the various models are spelled out in detail and expressed in terms of the appropriate dimensionless numbers. Dimensional and scaling considerations are introduced early, allowing the reader an easy way to understand the consequences of the various assumptions without the heavy mathematical machinery that can impede understanding if it is introduced prematurely.

The aim of Cambridge Texts in applied mathematics series is to provide a focus for publishing textbooks in applied mathematics at the advanced undergraduate and beginning graduate level. It is planned that the books will be devoted to covering certain mathematical techniques and theories and exploring their applications.