Advances In Superplasticity And Superplastic Forming

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Materials Issues in Some Advanced Forming Techniques, Including Superplasticity 1995 From mechanics and macroscopic viewpoints, the sensitivity of the flow stress of a material to the strain rate, i.e. the strain rate sensitivity \((m)\), governs the development of neck formation and therefore has a strong influence on the tensile ductility and hence formability of materials. Values of strain rate sensitivity range from unity, for the case of Newtonian viscous materials, to less than 0.1 for some dispersion strengthened alloys. Intermediate values of \(m = 0.5\) are associated with classical superplastic materials which contain very fine grain sizes following specialized processing. An overview is given of the influence of strain rate sensitivity on tensile ductility and of the various materials groups that can exhibit high values of strain rate sensitivity.
Recent examples of enhanced formability (or extended tensile ductility) in specific regimes between $m = 1$ and $m = 0.3$ are described, and potential areas for commercial exploitation are noted. These examples include: internal stress superplasticity, superplastic ceramics, superplastic intermetallics, superplastic laminated composites, superplastic behavior over six orders of magnitude of strain rate in a range of aluminum-based alloys and composites, and enhanced ductility in Al-Mg alloys that require no special processing for microstructural development.

Advanced Welding and Deforming Kapil Gupta 2021-04-17 Advanced Welding and Deforming explains the background theory, working principles, technical specifications, and latest developments on a wide range of advanced welding-joining and deforming techniques. The book's subject matter covers manufacturing, with chapters specifically addressing remanufacturing and 3D printing applications. Drawing on experts in both academia and industry, coverage addresses theoretical developments as well as practical improvements from R&D. By presenting over 35 important processes, from plasma arc welding to nano-joining and hybrid friction stir welding, this is the most complete guide to this field available. This unique guide will allow readers to compare the characteristics of different processes, understand how they work, and create parameters for their effective implementation. As part of a 4 volume set entitled Handbooks in Advanced Manufacturing, this series also includes volumes on Advanced Machining and Finishing, Additive Manufacturing and Surface Treatment, and Sustainable Manufacturing Processes. Provides theory, operational parameters, and the latest developments in over 35 different processes Addresses new welding technologies such as additive manufacturing using wire and arc, as well as the latest developments in more traditional applications Introduces basic concepts in welding, joining and deformation in three introductory chapters, thus helping readers with a range of backgrounds engage with the subject matter

Advances in superplasticity and superplastic forming: proceedings of a symposium; held at the TMS/ASM Materials Week; 2 - 5 November, 1992 *TMS-ASM* Materials Week 1993 Advanced Materials '93 T Matsumoto 2012-12-02 Computations, Glassy Materials, Microgravity and Non-Destructive Testing is a compilation of the papers presented during the Third IUMRS International Conference on Advanced Materials International Union of The Materials Research Societies that
discussed the concepts and methods behind glassy materials. The book is divided into parts. Part 1 tackles the progresses in sol-gel science and technology; the reaction mechanisms of ormosils and effects of ultrasonic irradiation; and the preparation of different glasses and their properties. Part 2 covers topics such as the neural network system for the identification of materials; the use of computers for simulations of many-body systems; computer system for meeting the supercomputing needs of materials; quality control of materials information by knowledge base; and the development of knowledgebase system for computer-assisted alloy design. Part 3 deals with the properties of different materials, the concepts, and the techniques behind them, and Part 4 discusses the non-destructive evaluation. The text is recommended for chemists and engineers in the field of materials science, especially those who wish to know more about the progress in its field of research. Research and Application of Advanced Superplasticity in Ultrafine Grained Aluminum Alloys and Composites 1999 Ultrafine grained Al 1420 alloy and Al 6061 composite were processed by severe plastic deformation. The requirements to achieve high strain rate superplasticity in the UFG Al 1420 alloy are discussed. Examples of complex shape articles fabricated by high strain rate superplastic forming are demonstrated. The Deformation and Processing of Structural Materials Z. X. Guo 2005-05-25 Having a good understanding of a construction material’s performance under different conditions is essential for helping engineers in selecting the right type of material for a job and for setting design specifications. Keeping abreast of the latest research is an important part of this. The deformation and processing of structural materials is divided into eight chapters, each one exploring a material’s processing and deformation behaviour. They also consider how the microstructural composition of materials is affected by processing and what influence this has on its subsequent in situ performance. The materials and behaviours looked at in the chapters include: aluminium and its alloys; magnesium alloys; ferrous alloys; superalloys (Ni-based alloys); semisolid metal (SSM) processing of metallic alloys; plastic deformation of intermetallic alloys; metal matrix composites (MMCs); and fine grain superplasticity in SP materials. The first of its kind to give comprehensive coverage to the subject, The deformation and processing of structural materials
IS A VALUABLE RESOURCE FOR ENGINEERS, RESEARCHERS IN MECHANICAL, CIVIL AND STRUCTURAL ENGINEERING. CONTAINS RESEARCH ON THE PERFORMANCE OF MATERIALS. VALUABLE RESOURCE FOR RESEARCHERS IN MECHANICAL, CIVIL AND STRUCTURAL ENGINEERING. COMPREHENSIVE COVERAGE TO THE DEFORMATION AND PROCESSING OF ALL TYPES OF STRUCTURAL MATERIALS.

**Advances in Superplasticity and Superplastic Forming**

Eric M. Taleff 2004-03-01 This publication addresses the various advances in materials and process technologies required for superplastic forming to enter mass production environments such as the automotive industry, where fast cycle time is a key requirement. The proceedings focus on the forming of light alloys at more rapid rates and lower temperatures. Results of advanced R&D efforts from both industrial and university laboratories are presented. Scientists and engineers employed at automotive and aerospace manufacturing companies, as well as researchers based at universities, will find this volume particularly useful. From 2004 TMS Annual Meeting which was held in Charlotte, North Carolina, March 14-18, 2004.

**Handbook of Advanced Ceramics** 2013-04-11 This new handbook will be an essential resource for ceramicists. It includes contributions from leading researchers around the world and includes sections on Basic Science of Advanced Ceramics, Functional Ceramics (electro-ceramics and optoelectro-ceramics), and engineering ceramics. Contributions from more than 50 leading researchers from around the world. Covers basic science of advanced ceramics, functional ceramics (electro-ceramics and optoelectro-ceramics), and engineering ceramics. Approximately 750 illustrations.

**Superplasticity in Advanced Materials - ICSAM 2018**

Goroh Itoh 2018-07-20 This volume includes selected and peer reviewed papers presented at the 13th International Conference on Superplasticity in Advanced Materials (ICSAM 2018), August 19-22, 2018, St. Petersburg, Russia. We hope this collection will be interesting and useful for many specialists whose scientific and engineering activity is related to the area of superplastic materials, research of the mechanisms of superplasticity and superplastic processing technologies.

**Superplastic Ceramics and Intermetallics and Their Potential Applications** 2001 Recent advances in the basic understanding of superplasticity and superplastic forming of ceramics and intermetallics are reviewed. Fine-grained superplastic ceramics, including yttria-stabilized tetragonal zirconia.
polycrystal, Y- or MgO-doped Al$_2$O$_3$
Hydroxyapatite, [beta]-spodumene glass ceramics, 
Al$_2$O$_3$-YTZP two-phase composites, SiC-Si$_3$N$_4$ and Fe-Fe$_3$C composites, are discussed. Superplasticity in the nickel-base (e.g., Ni$_3$Al and Ni$_3$Si) and titanium-base intermetallics (TiAl and Ti$_3$Al), is described. Deformation mechanisms as well as microstructural requirements and effects such as grain size, grain growth, and grain-boundary phases, on the superplastic deformation behavior are addressed. Factors that control the superplastic tensile elongation of ceramics are discussed. Superplastic forming, and particularly biaxial gas-pressure forming, of several ceramics and intermetallics are presented with comments on the likelihood of commercial application.

Titanium Alloys Maciej Motyka 2019-11-27
Titanium alloys, due to unique physical and chemical properties (mainly high relative strength combined with very good corrosion resistance), are considered as an important structural metallic material used in hi-tech industries (e.g. aerospace, space technology). This book provides information on new manufacturing and processing methods of single- and two-phase titanium alloys. The eight chapters of this book are distributed over four sections. The first section (Introduction) indicates the main factors determining application areas of titanium and its alloys. The second section (Manufacturing, two chapters) concerns modern production methods for titanium and its alloys. The third section (Thermomechanical and surface treatment, three chapters) covers problems of thermomechanical processing and surface treatment used for single- and two-phase titanium alloys. The fourth section (Machining, two chapters) describes the recent results of high speed machining of Ti-6Al-4V alloy and the possibility of application of sustainable machining for titanium alloys.

Superplasticity -Current Status and Future Potential: Volume 601 Patrick B. Berbon 2000-04-05 Superplasticity refers to the ability of a crystalline material to exhibit large strains when pulled in tension. This phenomenon is of academic interest, but because it provides the capability for forming complex parts from sheet metals, it also has considerable industrial potential. The incentive for organizing the symposium was the recognition that several significant developments have occurred in the field of superplasticity. New techniques have become available for the production of materials with ultrafine grain sizes, typically in the submicrometer or...
These materials provide at least the potential for utilizing superplastic forming capabilities at much faster strain rates, and thereby expanding the technology from the fabrication of low-volume, high-value components to high-volume commercial applications. The book, first published in 2000, includes topics on: superplasticity in metals and intermetallics; superplasticity in ceramics; fundamental aspects of superplasticity; superplasticity in industry; high strain rate superplasticity; and developments using severe plastic deformation.

Superplastic Flow
K.A. Padmanabhan 2012-12-06

Superplasticity is the ability of polycrystalline materials under certain conditions to exhibit extreme tensile elongation in a nearly homogeneous/isotropic manner. Historically, this phenomenon was discovered and systematically studied by metallurgists and physicists. They, along with practising engineers, used materials in the superplastic state for materials forming applications. Metallurgists concluded that they had the necessary information on superplasticity and so theoretical studies focussed mostly on understanding the physical and metallurgical properties of superplastic materials. Practical applications, in contrast, were led by empirical approaches, rules of thumb and creative design. It has become clear that mathematical models of superplastic deformation as well as analyses for metal working processes that exploit the superplastic state are not adequate. A systematic approach based on the methods of mechanics of solids is likely to prove useful in improving the situation. The present book aims at the following. 1. Outline briefly the techniques of mechanics of solids, particularly as it applies to strain rate sensitive materials. 2. Assess the present level of investigations on the mechanical behaviour of superplastics. 3. Formulate the main issues and challenges in mechanics of superplasticity. 4. Analyse the mathematical models/constitutive equations for superplastic flow from the viewpoint of mechanics. 5. Review the models of superplastic metal working processes. 6. Indicate with examples new results that may be obtained using the methods of mechanics of solids.

Advanced Materials in Automotive Engineering
Jason Rowe 2012-02-21

The automotive industry is under constant pressure to design vehicles capable of meeting increasingly demanding challenges such as improved fuel economy, enhanced safety and effective emission control. Drawing on the knowledge of leading...
Experts, Advanced materials in automotive engineering explores the development, potential and impact of using such materials. Beginning with a comprehensive introduction to advanced materials for vehicle lightweighting and automotive applications, Advanced materials in automotive engineering goes on to consider nanostructured steel for automotive body structures, aluminium sheet and high pressure die-cast aluminium alloys for automotive applications, magnesium alloys for lightweight powertrains and automotive bodies, and polymer and composite moulding technologies. The final chapters then consider a range of design and manufacturing issues that need to be addressed when working with advanced materials, including the design of advanced automotive body structures and closures, technologies for reducing noise, vibration and harshness, joining systems, and the recycling of automotive materials. With its distinguished editor and international team of contributors, Advanced materials in automotive engineering is an invaluable guide for all those involved in the engineering, design or analysis of motor vehicle bodies and components, as well as all students of automotive design and engineering. Explores the development, potential and impact of using advanced materials for improved fuel economy, enhanced safety and effective mission control in the automotive industry. Provides a comprehensive introduction to advanced materials for vehicle lightweighting and automotive applications. Covers a range of design ideas and manufacturing issues that arise when working with advanced materials, including technologies for reducing noise, vibration and harshness, and the recycling of automotive materials. 

Superplasticity in Advanced Materials - ICSAM 2012
Gerard Bernhart 2012-12-27 Selected, peer reviewed papers from the 11th International Conference on Superplasticity in Advanced Materials, July 3-5, 2012, Albi, France

Advanced Materials Technology 1982
Recrystallization and Related Annealing Phenomena
F.J. Humphreys 2012-12-02 The annealing of deformed materials is of both technological importance and scientific interest. The phenomena have been most widely studied in metals, although they occur in all crystalline materials such as the natural deformation of rocks and the processing of technical ceramics. Research is mainly driven by the requirements of industry, and where appropriate, the book discusses the extent to which we are able to formulate quantitative, physically-based models...
which can be applied to metal-forming processes. The subjects treated in this book are all active research areas, and form a major part of at least four regular international conference series. However, there have only been two monographs published in recent times on the subject of recrystallization, the latest nearly 20 years ago. Since that time, considerable advances have been made, both in our understanding of the subject and in the techniques available to the researcher. The book covers recovery, recrystallization and grain growth in depth including specific chapters on ordered materials, two-phase alloys, annealing textures and annealing during and after hot working. Also contained are treatments of the deformed state and the structure and mobility of grain boundaries, technologically important examples and a chapter on computer simulation and modelling. The book provides a scientific treatment of the subject for researchers or students in Materials Science, Metallurgy and related disciplines, who require a more detailed coverage than is found in textbooks on physical metallurgy, and a more coherent treatment than will be found in the many conference proceedings and review articles.

Plastic Deformation of Ceramics R.C. Bradt 2013-11-11 This proceedings volume, “Plastic Deformation of Ceramics,” constitutes the papers of an international symposium held at Snowbird, Utah from August 7-12, 1994. It was attended by nearly 100 scientists and engineers from more than a dozen countries representing academia, national laboratories, and industry. Two previous conferences on this topic were held at The Pennsylvania State University in 1974 and 1983. Therefore, the last major international conference focusing on the deformation of ceramic materials was held more than a decade ago. Since the early 1980s, ceramic materials have progressed through an evolutionary period of development and advancement. They are now under consideration for applications in engineering structures. The contents of the previous conferences indicate that considerable effort was directed towards a basic understanding of deformation processes in covalently bonded or simple oxide ceramics. However, now, more than a decade later, the focus has completely shifted. In particular, the drive for more efficient heat engines has resulted in the development of silicon-based ceramics and composite ceramics. The discovery of high-temperature cupric oxide-based superconductors has created a plethora of interesting perovskite-like structured ceramics. Additionally, nanophase ceramics, ceramic thin films,
and various forms of toughened ceramics have potential applications and, hence, their deformation has been investigated. Finally, new and exciting areas of research have attracted interest since 1983, including fatigue, nanoindentation techniques, and superplasticity. Recent Advances in Mechanical Infrastructure Ajit Kumar Parwani 2021-03-01 This book contains high-quality papers presented in the conference Recent Advances in Mechanical Infrastructure (ICRAM 2020) held at IITRAM, Ahmedabad, India, from 21-23 August 2020. The topics covered in this book are recent advances in thermal infrastructure, manufacturing infrastructure and infrastructure planning and design. Superplasticity and Superplastic Forming C. Howard Hamilton 1988 Joining Processes for Dissimilar and Advanced Materials Pawan Kumar Rakesh 2021-11-13 Joining Processes for Dissimilar and Advanced Materials describes how to overcome the many challenges involved in the joining of similar and dissimilar materials resulting from factors including different thermal coefficients and melting points. Traditional joining processes are ineffective with many newly developed materials. The ever-increasing industrial demands for production efficiency and high-performance materials are also pushing this technology forward. The resulting emergence of advanced micro- and nanoscale material joining technologies, have provided many solutions to these challenges. Drawing on the latest research, this book describes primary and secondary processes for the joining of advanced materials such as metals and alloys, intermetallics, ceramics, glasses, polymers, superalloys, electronic materials and composites in similar and dissimilar combinations. It also covers details of joint design, quality assurance, economics and service life of the product. Provides valuable information on innovative joining technologies including induction heating of metals, ultrasonic heating, and laser heating at micro- and nanoscale levels. Describes the newly developed modelling, simulation and digitalization of the joining process. Includes a methodology for characterization of joints Superplasticity and Superplastic Forming of Ceramics 1994 Recent advances in the basic understanding of superplasticity and superplastic forming of ceramics are reviewed. Deformation mechanisms as well as microstructural requirements for superplastic ceramics are discussed. Microstructural effects, such as grain size, dynamic grain growth, and the presence...
of grain-boundary liquid phases, on the superplastic properties and deformation behavior of ceramics are addressed. Superplastic forming, and particularly biaxial gas-pressure forming, of several ceramics, including YTZP and Al2O3/YTZP, is also presented. The forming behavior of these ceramics is correlated with that obtained from conventional uniaxial tests. Examples of concurrent superplastic forming and diffusion bonding (SPF/DB) of metal-ceramic hybrids are given.

**Superplastic Forming of Advanced Metallic Materials**
G Giuliano 2011-06-27 Ultra fine-grained metals can show exceptional ductility, known as superplasticity, during sheet forming. The higher ductility of superplastic metals makes it possible to form large and complex components in a single operation without joints or rivets. The result is less waste, lower weight and manufacturing costs, high precision and lack of residual stress associated with welding which makes components ideal for aerospace, automotive and other applications. Superplastic forming of advanced metallic materials summarises key recent research on this important process. Part one reviews types of superplastic metals, standards for superplastic forming, processes and equipment. Part two discusses ways of modelling superplastic forming processes whilst the final part of the book considers applications, including superplastic forming of titanium, aluminium and magnesium alloys. With its distinguished editor and international team of contributors, Superplastic forming of advanced metallic materials is a valuable reference for metallurgists and engineers in such sectors as aerospace and automotive engineering. Note: The Publishers wish to point out an error in the authorship of Chapter 3 which was originally listed as: G. Bernhart, CLément Ader Institute, France. The correct authorship is: G Bernhart, P. Lours, T. Cutard, V. Velay, Ecole des Mines Albi, France and F. Nazaret, Aurock, France. The Publishers apologise to the authors for this error. Reviews types of superplastic metals and standards for superplastic forming Discusses the modelling of superplastic forming, including mathematical and finite element modelling Examines various applications, including superplastic forming of titanium, aluminium and magnesium alloys

**Advances in Wrought Magnesium Alloys**
Colleen Bettles 2012-04-25 This important book summarises the wealth of recent research on our understanding of process-property relationships in wrought magnesium alloys and the way this understanding can
be used to develop a new generation of alloys for high-performance applications. After an introductory overview of current developments in wrought magnesium alloys, part one reviews fundamental aspects of deformation behaviour. These chapters are the building blocks for the optimisation of processing steps covered in part two, which discusses casting, extrusion, rolling and forging technologies. The concluding chapters cover applications of wrought magnesium alloys in automotive and biomedical engineering. With its distinguished editors, and drawing on the work of leading experts in the field, Advances in wrought magnesium alloys is a standard reference for those researching, manufacturing and using these alloys. Summarises recent research on our understanding of process-property relationships in wrought magnesium alloys. Discusses the way this understanding can be used to develop a new generation of alloys for high-performance applications. Reviews casting, extrusion, rolling and forging technologies, fundamental aspects of deformation behaviour, and applications of wrought magnesium alloys in automotive and biomedical engineering.

Smithells Metals Reference Book
William F. Gale
2003-12-09

Smithells is the only single volume work which provides data on all key aspects of metallic materials. Smithells has been in continuous publication for over 50 years. This 8th Edition represents a major revision. Four new chapters have been added for this edition. These focus on: Non conventional and emerging materials - metallic foams, amorphous metals (including bulk metallic glasses), structural intermetallic compounds and micronano-scale materials. Techniques for the modelling and simulation of metallic materials. Supporting technologies for the processing of metals and alloys. An extensive bibliography of selected sources of further metallurgical information, including books, journals, conference series, professional societies, metallurgical databases and specialist search tools. One of the best known and most trusted sources of reference since its first publication more than 50 years ago. The only single volume containing all the data needed by researchers and professional metallurgists. Fully updated to the latest revisions of international standards.

Fundamentals of Creep in Metals and Alloys
Michael E. Kassner
2004-04-06
Numerous line drawings with consistent format and units allow easy comparison of the behavior of a very wide range of materials. Transmission electron micrographs provide a direct insight in the basic microstructure of
METALS DEFORMING AT HIGH TEMPERATURES * Extensive literature review of over 1000 references provide an excellent reference document, and a very balanced discussion. Understanding the strength of materials at a range of temperatures is critically important to a huge number of researchers and practitioners from a wide range of fields and industry sectors including metallurgists, industrial designers, aerospace R&D personnel, and structural engineers. The most up-to-date and comprehensive book in the field, Fundamentals of Creep in Metals and Alloys discusses the fundamentals of time-dependent plasticity or creep plasticity in metals, alloys and metallic compounds. This is the first book of its kind that provides broad coverage of a range of materials not just a sub-group such as metallic compounds, superalloys or crystals. As such it presents the most balanced view of creep for all materials scientists. The theory of all of these phenomena are extensively reviewed and analysed in view of an extensive bibliography that includes the most recent publications in the field. All sections of the book have undergone extensive peer review and therefore the reader can be sure they have access to the most up-to-date research, fully interrogated, from the world’s leading investigators.

- Numerous line drawings with consistent format and units allow easy comparison of the behavior of a very wide range of materials.
- Transmission electron micrographs provide a direct insight in the basic microstructure of metals deforming at high temperatures.
- Extensive literature review of over 1000 references provide an excellent reference document, and a very balanced discussion.

Advances in Superplasticity and Superplastic Forming
Eric M. Taleff 2004

This publication addresses the various advances in materials and process technologies required for superplastic forming to enter mass production environments such as the automotive industry, where fast cycle time is a key requirement. The proceedings focus on the forming of light alloys at more rapid rates and lower temperatures. Results of advanced R&D efforts from both industrial and university laboratories are presented. Scientists and engineers employed at automotive and aerospace manufacturing companies, as well as researchers based at universities, will find this volume particularly useful. From 2004 TMS Annual Meeting which was held in Charlotte, North Carolina, March 14-18, 2004.

Processing and Fabrication of Advanced Materials XIII 2005

Handbook of Advanced Ceramics
Fumihiro Wakai
2013-04-11
Proceedings of the 8th Pacific Rim International Conference on Advanced Materials and Processing (PRICM-8) FernD.S. Marquis 2017-03-21 PRICM-8 features the most prominent and largest-scale interactions in advanced materials and processing in the Pacific Rim region. The conference is unique in its intrinsic nature and architecture which crosses many traditional discipline and cultural boundaries. This is a comprehensive collection of papers from the 15 symposia presented at this event.

Handbook of Aluminum George E. Totten 2003-03-27 The Handbook of Aluminum: Vol. 1: Physical Metallurgy and Processes covers all aspects of the physical metallurgy, analytical techniques, and processing of aluminium, including hardening, annealing, aging, property prediction, corrosion, residual stress and distortion, welding, casting, forging, molten metal processing, machining, rolling, and extrusion. It also features an extensive, chapter-length consideration of quenching.

Advanced Manufacturing Focusing on Multi-Disciplinary Technologies Zone Ching Lin 2012-10-08 Volume is indexed by Thomson Reuters CPCI-S (WoS). The reader is here presented with recent advances in the field of advanced manufacturing technology, including: forming, machining, automation, manufacturing systems, measurement, precision engineering, bio-manufacturing and green engineering. It is an excellent guide to recent multi-disciplinary integration in manufacturing technology.

Advances in Superplasticity and Superplastic Forming N. Chandra 1993-01-01 This collection of papers examines the latest research into the mechanistic behaviour of new superplastic materials. Topics of discussion include constitutive equations, superplasticity in composites and high strain-rate superplasticity, and novel experimental techniques and process modelling.

SME Technical Paper Society of Manufacturing Engineers 2005 Superplasticity in Metals and Ceramics T. G. Nieh 1997-01-23 This book describes advances in the field of superplasticity, the ability of certain materials to undergo very large tensile strains. This phenomenon has increasing commercial applications, but also presents a fascinating scientific challenge in attempts to understand the physical mechanisms that underpin it. The authors emphasize the materials aspects of superplasticity. Beginning with a brief history of the phenomenon, they describe the two major types of superplasticity-- fine-structure and internal-stress
superplasticity— and discuss their operative mechanisms. They also present microstructural factors controlling the ductility and fracture in superplastic materials. Observations of superplasticity in metals (including aluminum, magnesium, iron, titanium and nickel), ceramics (including monoliths and composites), intermetallics (including iron, nickel, and titanium base), and laminates are thoroughly described. This is a valuable text for graduate students and researchers in materials science and engineering.

Superplasticity K. A. Padmanabhan 2018-12-08 This book combines the perspectives of materials science of Superplasticity, on the one hand, and those of design and mechanics, on the other, in order to provide a holistic view of materials, design, mechanics and performance which will lead to useful solutions of societal benefits, in addition to providing great intellectual challenges. After considering the experimental evidence for superplasticity in different classes of materials, the book discusses the physics-based models, along with their advantages and limitations. Then, the analyses for superplastic forming available in the framework of continuum mechanics, finite element analysis and numerical simulations are presented. Finally, the authors highlight some successful industrial applications. This book is recommended as a text book for courses on Superplasticity and as supplementary use for courses on Materials Processing, Manufacturing, High Temperature Deformation, Nanotechnology and Mechanical Behavior of Materials. Persons working in Department of Materials Science and Engineering, Physics, Mechanics, Mechanical Engineering, Aerospace Engineering, Metallurgy, Ceramics and Geo-sciences are likely to find the book to be useful. It is also recommended as a reference source for practicing engineers involved in the design, processing and manufacture of industrial components, which exploit the unique properties associated with superplastic materials.

Superplasticity and Grain Boundaries in Ultrafine-Grained Materials Peter M. Burgess 2011-05-31 Superplasticity is a state in which solid crystalline materials, such as some fine-grained metals, are deformed well beyond their usual breaking point. The phenomenon is of importance in processes such as superplastic forming which allows the manufacture of complex, high-quality components in such areas as aerospace and biomedical engineering. Superplasticity and grain boundaries in ultrafine-grained materials discusses a number of problems associated with grain
boundaries in metallic polycrystalline materials. The role of grain boundaries in processes such as grain boundary diffusion, relaxation and grain growth is investigated. The authors explore the formation and evolution of the microstructure, texture and ensembles of grain boundaries in materials produced by severe plastic deformation. Written by two leading experts in the field, Superplasticity and grain boundaries in ultrafine-grained materials significantly advances our understanding of this important phenomenon and will be an important reference work for metallurgists and those involved in superplastic forming processes. Discusses significant problems associated with grain boundaries in polycrystals incorporating structural superplasticity and grain boundary sliding. Assesses the role of grain boundaries in processes such as grain boundary diffusion, relaxation and grain growth. Explores the formation and evolution of the microstructure, texture and ensembles of grain boundaries in materials produced by severe plastic deformation.

Severe Plastic Deformation Burhanettin Altan 2006

It has been already well established that the nanostructured materials (materials with a grain size of 100mm or less) is the future materials. Nanostructured materials possess properties superior to those of conventional, coarse grained materials. Hence designing potentially cost efficient and environmentally friendly products with better performance is a possibility. Among others, nanostructured materials exhibit increased strength, hardness and ductility and provide an opportunity for superplastic forming. When all the procedures in use for the production of nanostructured materials are examined, only severe plastic deformation (SPD) processes exhibit a potential for producing relatively large samples suitable for industrial applications. In this monograph, the state-of-the-art on severe plastic deformation methods is presented in one volume. The monograph is organised into eight chapters, each of which contains papers on different aspect of severe plastic deformation methods prepared by the experts in this field. The topics covered in the monograph are structure formation, phase transformation, superplasticity, mechanical properties of nanostructured materials, electronic and magnetic properties of nanostructured materials, deformation analysis, novel SPD methods, commercialisation of ECAE method. Superplasticity in Advanced Materials K. F. Zhang 2007 Interest in the phenomenon of superplasticity has been increasing steadily over the past thirty-four
years, both from the viewpoint of fundamental scientific understanding as well as of industrial application. The scope of superplasticity has also broadened materials-wise, and now includes, in addition to metals: intermetallics, ceramics, bulk metallic glasses, nanostructured materials and composites.

The Fifth Pacific Rim International Conference on Advanced Materials and Processing, November 2-5, 2004, Beijing, China Z. Y. Zhong 2005 This indispensable work is the fifth in a series of international conferences devoted to advanced materials and processing. The conferences, which are held every three years, are jointly sponsored by the Chinese Society for Metals (CSM), the Japan Institute of Metals (JIM), the Korean Institute of Metals and Materials (KIM), and the Minerals, Metals and Materials Society (TMS), and organized by them in rotation. The purpose of this international conference, PRICM, is to provide a forum for the exchange of technical and scientific information, which is always of great benefit to researchers, manufacturers and end-users. The proceedings comprise 988 papers from 20 symposia, and the main topics covered are: Structural Materials, Functional Materials, Materials Processing and Characterization. The five-volume set is further divided into carefully targeted sections: Advanced Ferrous Alloys & Processing; Light Metals; Intermetallics & High-Temperature Alloys; Composite Materials; Advanced Ceramics; Advanced Nuclear Materials; Layered and Graded Materials; Combustion Synthesis; Electronic Materials; Smart Materials & Systems; Magnetic Materials; Biomaterials; Hydrogen-Absorbing Materials; Advanced Melt Processing, Casting & Joining; Spray Forming & Rapid Prototyping; Superplasticity & Superplastic Forming; Modeling and Simulation of Materials and Processes; Amorphous, Quasicrystalline and Nanocrystalline Materials; Thin-Film Materials & Processing; Grain Boundary, Interface & Surface Engineering; Materials Characterization & Evaluation. Altogether, the set offers an incomparable wealth of up-to-date information concerning this whole field.