

Materials Processing At Casting

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Materials Processing Fundamentals 2020 - Jonghyun Lee
2020-01-08

This volume includes contributions on the physical and numerical modeling of materials processing, and covers a range of metals and minerals. Authors present models and results related to the basics of processing such as extraction, joining, separation, and casting. The corresponding fundamentals of mass and heat transport as well as physical and thermodynamics properties are addressed, allowing for a cross-disciplinary vision of the field.

Materials Processing Handbook - Joanna R. Groza
2007-03-28

The field of materials science and engineering is rapidly evolving into a science of its own. While traditional literature in this area often concentrates primarily on property and structure, the Materials Processing Handbook provides a much needed examination from the materials processing perspective. This unique focus reflects the changing comple

Materials Processing - Lorraine F. Francis 2015-12-28

Materials Processing is the first textbook to bring the fundamental concepts of materials processing together in a unified approach that highlights the overlap in scientific and engineering principles. It teaches students the key principles involved in the processing of engineering materials, specifically metals, ceramics and polymers, from starting or raw materials through to the final functional forms. Its self-contained approach is based on the state of matter most central to the shaping of the material: melt, solid, powder, dispersion and solution, and vapor. With this approach, students learn processing fundamentals and appreciate the similarities and differences between the materials classes. The book uses a consistent nomenclature that allow for easier comparisons between various materials and processes. Emphasis is on fundamental principles that gives students a strong foundation for understanding processing and manufacturing methods. Development of connections between processing and structure builds on students' existing knowledge of structure-property relationships. Examples of both

standard and newer additive manufacturing methods throughout provide students with an overview of the methods that they will likely encounter in their careers. This book is intended primarily for upper-level undergraduates and beginning graduate students in Materials Science and Engineering who are already schooled in the structure and properties of metals, ceramics and polymers, and are ready to apply their knowledge to materials processing. It will also appeal to students from other engineering disciplines who have completed an introductory materials science and engineering course. Coverage of metal, ceramic and polymer processing in a single text provides a self-contained approach and consistent nomenclature that allow for easier comparisons between various materials and processes. Emphasis on fundamental principles gives students a strong foundation for understanding processing and manufacturing methods. Development of connections between processing and structure builds on students' existing knowledge of structure - property relationships. Examples of both standard and newer additive manufacturing methods throughout provide students with an overview of the methods that they will likely encounter in their careers.

CFD Modeling and Simulation in Materials Processing 2016
- Minerals, Metals and Materials Society. Annual Meeting 2016

CFD Modeling and Simulation in Materials Processing 2018
- Laurentiu Nastac 2018-01-10

This collection presents contributions on computational fluid dynamics (CFD) modeling and simulation of engineering processes from researchers and engineers involved in the modeling of multiscale and multiphase

phenomena in material processing systems. The following processes are covered: Additive Manufacturing (Selective Laser Melting and Laser Powder Bed Fusion); Ironmaking and Steelmaking (Ladle Metallurgical Furnace, EAF, Continuous Casting, Blown Converter, Reheating Furnace, Rotary Hearth Furnace); Degassing; High Pressure Gas Atomization of Liquid Metals; Electroslag Remelting; Electrokinetic Deposition; Friction Stir Welding; Quenching; High Pressure Die Casting; Core Injection Molding; Evaporation of Metals; Investment Casting; Electromagnetic Levitation; Ingot Casting; Casting and Solidification with External Field (electromagnetic stirring and ultrasonic cavitation) Interaction and Microstructure Evolution. The collection also covers applications of CFD to engineering processes, and demonstrates how CFD can help scientists and engineers to better understand the fundamentals of engineering processes.

Materials Processing Fundamentals 2019 - Guillaume Lambotte 2019-02-09

This book includes contributions from the Materials Processing Fundamentals Symposium held at the TMS 2019 Annual Meeting & Exhibition in San Antonio, Texas. This volume includes contributions on the physical and numerical modeling of materials processing, and covers a range of metals and minerals. Authors present models and results related to the basics of processing such as extraction, joining, separation, and casting. The corresponding fundamentals of mass and heat transport as well as physical and thermodynamics properties are addressed, allowing for a cross-disciplinary vision of the field.

Eco-Materials Processing and Design X - Hyung Sun Kim 2009-04-28

The aim of this special volume is to give an overview of the historical background and present status of eco-materials processing and design for materials research, and to foresee future trends in the field. Serious global and environmental problems have led the materials manufacturing industries to monitor closely the formation and accumulation of carbon dioxide and other deleterious gases in the atmosphere, as well to reduce raw materials use and energy consumption and limit other factors which reflect the environmental impact of the industry. Volume is indexed by Thomson Reuters CPCI-S (WoS).

Processing of Metals and Advanced Materials - Ben Q. Li 1998

The papers in this book were presented at the 1998 TMS Annual Meeting & Exhibition and address issues concerning the inter-relationship between process modeling, process design, and product properties during processing. Many different processing systems are discussed.

Materials processing. 16v in 12 - Open University. Faculty of Technology 1979

CFD Modeling and Simulation in Materials Processing - Laurentiu Nastac 2012-03-20

Proceedings of a symposium sponsored by Association for Iron and Steel Technology and the Process Technology and Modeling Committee of the Extraction and Processing Division and the Solidification Committee of the Materials Processing and Manufacturing Division of TMS (The Minerals, Metals & Materials Society) Held during the TMS 2012 Annual Meeting & Exhibition Orlando, Florida, USA, March 11-15, 2012.

Transport Phenomena in Manufacturing and Materials

Processing - W.-J. Yang 2016-01-21

Motivated by international competition and an easy access to high-speed computers the manufacturing and materials processing industry has seen many changes in recent times. New techniques are constantly being developed based on a broad range of basic sciences including physics, chemistry and particularly thermal-fluids sciences and kinetics. In order to produce and treat massive products, the industry is also in need of a very wide range of engineering knowledge and skill for integrating metallurgy, mechanics, electricity, transport phenomena, instrumentation and computer control. This monograph covers a part of these demands, namely by presenting the available knowledge on transport phenomena in manufacturing and materials processing. It is divided into four parts. Part I deals with the fundamentals of transport phenomena, including the transfer of momentum, energy, mass, electric and magnetic properties. Parts II and III are concerned with applications of the fundamentals in transport phenomena occurring in manufacturing and materials processing, respectively. Emphasis has been placed on common aspects of both disciplines, such as forming, machining, welding, casting, injection molding, surface processes, heating and cooling, solidification, crystal growth and diffusion. Part IV deals with beam technology and microgravity, two topics of current importance.

Materials Processing. Unit 10. Casting Processes - Open University

Shape Casting - Minerals, Metals and Materials Society 2014

Comprehensive Materials Processing - 2014-04-07

Comprehensive Materials Processing provides students and professionals with a one-stop resource consolidating and enhancing the literature of the materials processing and manufacturing universe. It provides authoritative analysis of all processes, technologies, and techniques for converting industrial materials from a raw state into finished parts or products. Assisting scientists and engineers in the selection, design, and use of materials, whether in the lab or in industry, it matches the adaptive complexity of emergent materials and processing technologies. Extensive traditional article-level academic discussion of core theories and applications is supplemented by applied case studies and advanced multimedia features. Coverage encompasses the general categories of solidification, powder, deposition, and deformation processing, and includes discussion on plant and tool design, analysis and characterization of processing techniques, high-temperatures studies, and the influence of process scale on component characteristics and behavior. Authored and reviewed by world-class academic and industrial specialists in each subject field Practical tools such as integrated case studies, user-defined process schemata, and multimedia modeling and functionality Maximizes research efficiency by collating the most important and established information in one place with integrated applets linking to relevant outside sources

Proceedings of the Merton C. Flemings Symposium on Solidification and Materials Processing - Merton C. Flemings 2001

This text comprises a collection of papers from the Merton C. Flemings Symposium held on the MIT campus in June, 2000. The papers cover such topics as dendritic solidification dynamics, control of casting quality,

interdendritic fluid flow, semi-solid processing, and engineering education.

Materials Processing Fundamentals 2023 - Samuel Wagstaff 2023-02-05

This volume covers various aspects of the fundamentals, synthesis, analysis, design, monitoring, and control of metals, materials, and metallurgical processes and phenomena. Topics represented include but are not limited to:

- Use of artificial intelligence or big data in the control or optimization of industrial processes
- Modelling or optimization of recycle streams and scrap loops
- Measurement and control in hostile environments
- Modeling transport phenomena in materials processing and metallurgical processes involving iron, steel, nonferrous metals, and composites
- Thermodynamics, kinetics, and physical chemistry of materials processes and modelling thereof

Heat And Mass Transfer In Materials Processing - Noam Lior 1991-10-01

Presents the proceedings of an international workshop on heat mass transfer in materials processing. The papers focus on advances in manufacturing and in the process industries. Topics include plasma spraying, laser and electron beam processing, modeling of crystal growth, solidification, heat transfer in quenching, thermocapillary action in materials processing, transport phenomena in laser processing, steel processing, casting and molding.

Casting Design and Performance - 2009

Porous Materials - Peisheng Liu 2014-08-12

Engineers and scientists alike will find this book to be an excellent introduction to the topic of porous materials, in particular the three main groups of porous

materials: porous metals, porous ceramics, and polymer foams. Beginning with a general introduction to porous materials, the next six chapters focus on the processing and applications of each of the three main materials groups. The book includes such new processes as gel-casting and freeze-drying for porous ceramics and self-propagating high temperature synthesis (SHS) for porous metals. The applications discussed are relevant to a wide number of fields and industries, including aerospace, energy, transportation, construction, electronics, biomedical and others. The book concludes with a chapter on characterization methods for some basic parameters of porous materials. Porous Materials: Processing and Applications is an excellent resource for academic and industrial researchers in porous materials, as well as for upper-level undergraduate and graduate students in materials science and engineering, physics, chemistry, mechanics, metallurgy, and related specialties. A comprehensive overview of processing and applications of porous materials – provides younger researchers, engineers and students with the best introduction to this class of materials Includes three full chapters on modern applications - one for each of the three main groups of porous materials Introduces readers to several characterization methods for porous materials, including methods for characterizing pore size, thermal conductivity, electrical resistivity and specific surface area

Thermo-Mechanical Aspects Of Manufacturing And Materials Processing - Ramesh K. Shah 1991-08-01

Covering thermomechanical aspects of manufacturing and materials processing, this volume provides basic fundamentals for understanding and analyzing various manufacturing processes and materials processing. It

covers metal casting, metal forming, metal cutting, and the experimental tools available for solving problems of practical significance. It explores areas of future research and identifies problem areas with a view to minimizing energy losses and maximizing cost effective manufacture of industrial goods.

CFD Modeling and Simulation in Materials Processing 2016
- Laurentiu Nastac 2017-08-31

Shape Casting - Murat Tiryakioğlu 2016

Principles of Laser Materials Processing - Elijah Kannatey-Asibu, Jr. 2023-02-07

Principles of Laser Materials Processing Authoritative resource providing state-of-the-art coverage in the field of laser materials processing, supported with supplementary learning materials Principles of Laser Materials Processing goes over the most recent advancements and applications in laser materials processing, with the second edition providing a welcome update to the successful first edition through updated content on the important fields within laser materials processing. The text includes solved example problems and problem sets suitable for the readers' further understanding of the technology explained. Split into three parts, the text first introduces basic concepts of lasers, including the characteristics of lasers and the design of their components, to aid readers in their initial understanding of the technology. The text then reviews the engineering concepts that are needed to analyze the different processes. Finally, it delves into the background of laser materials and provides a state-of-the-art compilation of material in the major application areas, such as laser cutting and drilling,

welding, surface modification, and forming, among many others. It also presents information on laser safety to prepare the reader for working in the industry sector and provide practicing engineers the updates needed to work safely and effectively. In Principles of Laser Materials Processing, readers can expect to find specific information on: Laser generation principles, including basic atomic structure, atomic transitions, population distribution, absorption, and spontaneous emission Optical resonators, including standing waves in a rectangular cavity, planar resonators, beam modes, line selection, confocal resonators, and concentric resonators Laser pumping, including optical pumping, arc/flash lamp pumping, energy distribution in the active medium, and electrical pumping Broadening mechanisms, including line-shape functions, homogeneous broadening such as natural and collision, and inhomogeneous broadening Principles of Laser Materials Processing is highly suitable for senior undergraduate and graduate students studying laser processing, and non-traditional manufacturing processes; it is also aimed at researchers to provide additional information to be used in research projects that are to be undertaken within the technology field.

TMS 2012 141st Annual Meeting and Exhibition, Materials Processing and Interfaces - The Minerals, Metals & Materials Society (TMS) 2012-05-02

Contains papers relating to materials processing and interfaces presented at various symposia at the 2012 TMS Annual Meeting.

Introduction to Manufacturing Processes and Materials - Robert Creese 2017-12-19

The first manufacturing book to examine time-based break-even analysis, this landmark reference/text

applies cost analysis to a variety of industrial processes, employing a new, problem-based approach to manufacturing procedures, materials, and management. An Introduction to Manufacturing Processes and Materials integrates analysis of material costs and process costs, yielding a realistic, effective approach to planning and executing efficient manufacturing schemes. It discusses tool engineering, particularly in terms of cost for press work, forming dies, and casting patterns, process parameters such as gating and riser design for casting, feeds, and more.

Materials Processing Fundamentals 2018 - Guillaume Lambotte 2018-01-09

This book includes contributions from the Materials Processing Fundamentals Symposium held at the TMS 2018 Annual Meeting & Exhibition in Phoenix, Arizona. Covering the physical and numerical modeling of materials processing, the volume covers a range of metals and minerals. Authors present models and results related the basics of processing such as extraction, joining, separation, and casting. The corresponding fundamentals of mass and heat transport as well as physical and thermodynamics properties are addressed, allowing for a cross-disciplinary vision of the field.

Materials Processing During Casting - Hasse Fredriksson 2006-05-12

Casting is one of the most important processes in materials technology. In this unique book, each step in the casting and solidification process is described and models are set up, which in many cases can be approximated by simplified analytical expressions. All casting methods are featured, including component casting, ingot casting and continuous casting.

Applications of the results are given in numerous worked

examples within the text. Conclusions on how to avoid cracks, solidification pores, slag inclusions and other defects of the castings, can be drawn from the theoretical models. These conclusions are based on research results, which together give an idea of the development in the manufacture of castings. Most chapters conclude with a number of exercises, answers to which are given at the end of the book. The accompanying 'Guide to Exercises', provides the complete solutions to each of the exercises.

Materials Processing Fundamentals 2021 - Jonghyun Lee
2021-03-21

This volume covers various aspects of the fundamentals, synthesis, analysis, design, monitoring, and control of metals, materials, and metallurgical processes and phenomena. Topics represented include but are not limited to:

- Experimental, analytical, physical, and computer modeling of physical chemistry and thermodynamics
- Modeling of the transport phenomena in materials processing and metallurgical processes involving iron, steel, nonferrous metals, and composites
- Second-phase particles in metals and processes and the fundamentals (experimental studies or theoretical studies) on the nucleation, growth, motion, and removal of these particles from the molten metal or reactors
- Physical chemistry, thermodynamics, and kinetics for the production and refining of rare-earth metals
- Control of industrial processes in the field of extraction and processing of metals and materials

Proceedings of the 2013 International Symposium on Liquid Metal Processing and Casting - Matthew Krane
2016-12-06

Materials Processing and Manufacturing Science - Rajiv

Asthana 2006-01-09

"Materials Science in Manufacturing focuses on materials science and materials processing primarily for engineering and technology students preparing for careers in manufacturing. The text also serves as a useful reference on materials science for the practitioner engaged in manufacturing as well as the beginning graduate student. Integrates theoretical understanding and current practices to provide a resource for students preparing for advanced study or career in industry. Also serves as a useful resource to the practitioner who works with diverse materials and processes, but is not a specialist in materials science. This book covers a wider range of materials and processes than is customary in the elementary materials science books. This book covers a wider range of materials and processes than is customary in the elementary materials science books. * Detailed explanations of theories, concepts, principles and practices of materials and processes of manufacturing through richly illustrated text * Includes new topics such as nanomaterials and nanomanufacturing, not covered in most similar works * Focuses on the interrelationship between Materials Science, Processing Science, and Manufacturing Technology

Campbell Symposium on Shape Casting - Murat Tiryakioğlu
2006

Laser Material Processing - William Steen 2013-03-14
Laser Material Processing (2nd ed) by William M Steen is an updated and expanded version of the original which sold very well with reprints in 1994 and 1996. This new edition includes a whole extra chapter - Rapid Prototyping and Low Volume Manufacture - and updates

other sections such as those dealing with types of industrial lasers and new applications, and recent developments in Surface Treatment and In-Process Sensing. It comprises some additional 60-80 pages whilst retaining the value of the original edition. It provides the reader with an understanding of laser process mechanisms, methods of application, automation and In-Process Sensing and industrial potential. The use of Patrick Wright's humorous cartoons and the many diagrams and tables to illustrate points make it a very useful and lively reference guide for students at all stages. Since laser technology is a rapidly changing field this new updated and expanded version will be particularly topical.

Advances in Materials Processing - Yafang Han 2018-04-17

This proceedings volume gathers selected papers presented at the Chinese Materials Conference 2017 (CMC2017), held in Yinchuan City, Ningxia, China, on July 06-12, 2017. This book covers a wide range of material surface science, advanced preparation and processing technologies of materials, high purity materials, silicon purification technology, solidification science and technology, performance and structure safety of petroleum tubular goods and equipment materials, materials genomes, materials simulation, computation and design. The Chinese Materials Conference (CMC) is the most important serial conference of the Chinese Materials Research Society (CMRS) and has been held each year since the early 1990s. The 2017 installment included 37 Symposia covering four fields: Advances in energy and environmental materials; High performance structural materials; Fundamental research on materials; and Advanced functional materials. More than 5500 participants attended the

congress, and the organizers received more than 700 technical papers. Based on the recommendations of symposium organizers and after peer reviewing, 490 papers have been included in the present proceedings, which showcase the latest original research results in the field of materials, achieved by more than 300 research groups at various universities and research institutes.

Materials Processing Fundamentals 2017 - Antoine Allanore 2018-05-04

Covering the physical and numerical modeling of materials processing, this book includes contributions across the range of metals and minerals. This collection offers a unique opportunity to present models and results for key processes involved in extraction, joining, separation, and casting of materials. The corresponding fundamentals of mass and heat transport as well as physical and thermodynamics properties are addressed, allowing for a cross-disciplinary vision of the field.

Modeling in Materials Processing - Jonathan A. Dantzig 2001-11-12

Mathematical modeling and computer simulation are useful tools for improving materials processing. While courses in materials processing have covered modeling, they have traditionally been devoted to one particular class of materials, that is, polymers, metals, or ceramics. This text offers a different approach, presenting an integrated treatment of metallic and non-metallic materials. The authors show that a common base of knowledge - specifically, the fundamentals of heat transfer and fluid mechanics - provides a unifying theme for these seemingly disparate areas. Emphasis is placed on understanding basic physical phenomena and knowing

how to include them in a model. The book also treats selected numerical methods, showing the relationship between the physical system, analytical solution, and the numerical scheme. A wealth of practical, realistic examples are provided, as well as homework exercises. Students, and practising engineers who must deal with a wide variety of materials and processing problems, will benefit from the unified treatment presented in this book.

Innovations in Materials Processing - Gordon Bruggeman
2012-12-06

The Army Materials and Mechanics Research Center in cooperation with the Office of Sponsored Programs of Syracuse University has been conducting the Annual Sagamore Army Materials Research Conferences since 1954. The specific purpose of these conferences has been to bring together scientists and engineers from academic institutions, industry and government to explore in depth a subject of importance to the Department of Defense, the Army, and the scientific community. This 30th Sagamore Conference, entitled Innovations in Materials Processing, has attempted to focus on the inter disciplinary nature of materials processing, looking at recent advancements in the development of unit processes from a range of standpoints from the understanding and control of the under lying mechanisms through their application as part of a manufactur ing sequence. In between, the classic link between processing and materials properties is firmly established. A broad range of materials are treated in this manner: metals, ceramics, plastics, and composites. The interdisciplinary nature of materials processing exists through its involvement with the basic sciences, with, process and product design, with process control,

and ultimately with manufacturing engineering. Materials processing is interdisciplinary in another sense, through its application within all materials disciplines. The industrial community (and the Army as its customer) is becoming increasingly concerned with producibility/reliability/ affordability issues in advanced product development. These concerns will be adequately addressed only by employing the full range of disciplines encompassed within the field of materials processing.

Handbook Of Green Materials: Processing Technologies, Properties And Applications (In 4 Volumes) - Oksman Kristiina 2014-04-11

Green materials and green nanotechnology have gained widespread interest over the last 15 years; first in academia, then in related industries in the last few years. The Handbook of Green Materials serves as reference literature for undergraduates and graduates studying materials science and engineering, composite materials, chemical engineering, bioengineering and materials physics; and for researchers, professional engineers and consultants from polymer or forest industries who encounter biobased nanomaterials, bionanocomposites, self- and direct-assembled nanostructures and green composite materials in their lines of work. This four-volume set contains material ranging from basic, background information on the fields discussed, to reports on the latest research and industrial activities, and finally the works by contributing authors who are prominent experts of the subjects they address in this set. The four volumes comprise of: The first volume explains the structure of cellulose; different sources of raw material; the isolation/separation processes of nanomaterials from

different material sources; and properties and characteristics of cellulose nanofibers and nanocrystals (starch nanomaterials). Information on the different characterization methods and the most important properties of biobased nanomaterials are also covered. The industrial point of view regarding both the processability and access of these nanomaterials, as well as large scale manufacturing and their industrial application is discussed – particularly in relation to the case of the paper industry. The second volume expounds on different bionanocomposites based on cellulose nanofibers or nanocrystals and their preparation/manufacturing processes. It also provides information on different characterization methods and the most important properties of bionanocomposites, as well as techniques of modeling the mechanical properties of nanocomposites. This volume presents the industrial point of view regarding large scale manufacturing and their applications from the perspective of their medical uses in printed electronics and in adhesives. The third volume deals with the ability of bionanomaterials to self-assemble in either liquids or forming organized solid materials. The chemistry of cellulose nanomaterials and chemical modifications as well as different assembling techniques and used characterization methods, and the most important properties which can be achieved by self-assembly, are described. The chapters, for example, discuss subjects such as ultra-light biobased aerogels based on cellulose and chitin, thin films suitable as barrier layers, self-sensing nanomaterials, and membranes for water purification. The fourth volume reviews green composite materials – including green raw materials – such as biobased carbon fibers, regenerated cellulose fibers and

thermoplastic and thermoset polymers (e.g. PLA, bio-based polyolefines, polysaccharide polymers, natural rubber, bio-based polyurethane, lignin polymer, and furfurylalcohol). The most important composite processing technologies are described, including: prepregs of green composites, compounding, liquid composite molding, foaming, and compression molding. Industrial applications, especially for green transportation and the electronics industry, are also described. This four-volume set is a must-have for anyone keen to acquire knowledge on novel bionanomaterials – including structure-property correlations, isolation and purification processes of nanofibers and nanocrystals, their important characteristics, processing technologies, industrial up-scaling and suitable industry applications. The handbook is a useful reference not only for teaching activities but also for researchers who are working in this field.

Annual Statistics of Materials-processing Industries of Japan, 2002 - Sokeizai Sentā (Japan) 2003

Transport Phenomena and Materials Processing - Sindo Kou 1996-11-15

An extremely useful guide to the theory and applications of transport phenomena in materials processing. This book defines the unique role that transport phenomena play in materials processing and offers a graphic, comprehensive treatment unlike any other book on the subject. The two parts of the text are, in fact, two useful books. Part I is a very readable introduction to fluid flow, heat transfer, and mass transfer for materials engineers and anyone not yet thoroughly familiar with the subject. It includes governing equations and boundary conditions particularly useful for studying materials processing.

For mechanical and chemical engineers, and anyone already familiar with transport phenomena, Part II covers the many specific applications to materials processing, including a brief description of various materials processing technologies. Readable and unencumbered by mathematical manipulations (most of which are allocated to the appendixes), this book is also a useful text for upper-level undergraduate and graduate-level courses in materials, mechanical, and chemical engineering. It includes hundreds of photographs of materials processing in action, single and composite figures of computer simulation, handy charts for problem solving, and more. Transport Phenomena and Materials Processing: Describes eight key materials processing technologies, including crystal

growth, casting, welding, powder and fiber processing, bulk and surface heat treating, and semiconductor device fabrication Covers the latest advances in the field, including recent results of computer simulation and flow visualization Presents special boundary conditions for transport phenomena in materials processing Includes charts that summarize commonly encountered boundary conditions and step-by-step procedures for problem solving Offers a unique derivation of governing equations that leads to both overall and differential balance equations Provides a list of publicly available computer programs and publications relevant to transport phenomena in materials processing
HANDBOOK OF GREEN MATERIALS: PROCESSING TECHNOLOGIES -
Kristiina Oksman 2014