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Self-Healing Phenomena in Cement-Based Materials Jul 04 2021 Self-healing materials are man-made materials which have the built-in capability to repair damage. Failure in materials is often caused by the occurrence of small microcracks throughout the material. In self-healing materials phenomena are triggered to counteract these microcracks. These processes are ideally triggered by the occurrence of damage itself. Thus far, the self-healing capacity of cement-based materials has been considered as something "extra". This could be called passive self-healing, since it was not a designed feature of the material, but an inherent property of it. Centuries-old buildings have been said to have survived these centuries because of the inherent self-healing capacity of the binders used for cementing building blocks together. In this State-of-the-Art Report a closer look is taken at self-healing phenomena in cement-based materials. It is shown what options are available to design for this effect rather than have it occur as a "coincidental extra".

Fundamental Phenomena in the Material Sciences May 22 2020

Interfacial Phenomena in Metals and Alloys Sep 18 2022

Nonlinear Phenomena and Chaos in Magnetic Materials Nov 27 2020 In this book, some of the principal investigators of the phenomena have reviewed their successes. The contributions include an overview of the field by H Suhl, followed by a detailed review of the high-power response of magnetic materials. Following that chapter, a number of authors review the phenomena for a variety of magnetic materials and pumping configurations. In the final chapter, evidence of another nonlinear effect is reviewed. Using a pulsed driving field, it is possible to excite a travelling spin wave. The nonlinear contributions will give rise to a “bunching” effect which compensates for the dispersive effects to produce a shape-preserving traveling wave pulse known as solitons. Ordered magnetic materials have provided a rich source for the investigation of nonlinear phenomena. These investigations have contributed much to our knowledge of the behavior of chaotic systems, as well as to a better understanding of the high-power response of the magnetic materials themselves. Contents:Nonlinear Phenomena and Chaos in Magnetic Materials (P E Wigen)Some Nonlinear Effects on Magnetically Ordered Materials (H Suhl)Spin-Wave Instability Processes in Ferrites (M Chen & C E Patton)Spin-Wave Dynamics in a Ferrimagnetic Sphere: Experiments and Models (P H Bryant et al.)Spin-Wave Auto-Oscillations in YIG Spheres Driven by Parallel Pumping and Subsidiary Resonance (S M Rezende & A Azevedo)Strong Chaos in Magnetic Resonance (M Warden)Magnetostatic Modes in Thin Films (R D McMichael & P E Wigen)Fractal Properties in Magnetic Crystal (H Yamazaki)Spin-Wave Envelope Solitions in Magnetic Films (A N Slavin et al.) Readership: Materials scientists. keywords:

Transport Phenomena in Materials Processing Jul 28 2023 This text provides a teachable and readable approach to transport phenomena (momentum, heat, and mass transport) by providing numerous examples and applications, which are particularly important to metallurgical, ceramic, and materials engineers. Because the authors feel that it is important for students and practicing engineers to visualize the physical situations, they have attempted to lead the reader through the development and solution of the relevant differential equations by applying the familiar principles of conservation to numerous situations and by including many worked examples in each chapter. The book is organized in a manner characteristic of other texts in transport phenomena. Section I deals with the properties and mechanics of fluid motion; Section II with thermal properties and heat transfer; and Section III with diffusion and mass transfer. The authors depart from tradition by building on a presumed understanding of the relationships between the structure and properties of matter, particularly in the chapters devoted to the transport properties (viscosity, thermal conductivity, and the diffusion coefficients). In addition, generous portions of the text, numerous examples, and many problems at the ends of the chapters apply transport phenomena to materials processing.

Material-Tissue Interfacial Phenomena May 26 2023 Material-Tissue Interfacial Phenomena: Contributions from Dental and Craniofacial Reconstructions explores the material/tissue interfacial phenomena using dental and craniofacial reconstructions as a model system. As the mouth is a particularly caustic environment, the synthetic and/or bio-enabled materials used to repair damaged tissues and restore form, function, and esthetics to oral structures must resist a variety of physical, chemical, and mechanical challenges. These challenges are magnified at the interface between dissimilar structures such as the tooth/material interface. Interfacial reactions at the atomic, molecular, and nano-scales initiate the failure of materials used to repair, restore, and reconstruct dental and craniofacial tissues. Understanding the phenomena that lead to failure at the interface between dissimilar structures, such as synthetic materials and biologic tissues, is confounded by a variety of factors that are thoroughly discussed in this comprehensive book. Provides a specific focus on the oral environment Combines clinical views and basic science into a useful reference book Presents comprehensive coverage of material-interfacial phenomena within the oral environment

Transport phenomena in materials processing. Papers ; 1990 Jun 03 2021

Shock Wave and High-Strain-Rate Phenomena in Materials Aug 25 2020 These proceedings of EXPLOMET 90, the International Conference on the Materials Effects of Shock-Wave and High-Strain-Rate Phenomena, held August 1990, in La Jolla, California, represent a global and up-to-date appraisal of this field. Contributions (more than 100) deal with high-strain-rate deforma

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Recrystallization and Related Annealing Phenomena Jul 24 2020 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.

Transport Phenomena of Foods and Biological Materials Aug 05 2021 Transport Phenomena of Foods and Biological Materials provides comprehensive coverage of transport phenomena modeling in foods and other biological materials. The book is unique in its consideration of models ranging from rigorous mathematical to empirical approaches, including phenomenological and semi-empirical models. It examines cell structure and descriptions of other non-traditional models, such as those based on irreversible thermodynamics or those focused on the use of the chemical and electrochemical potential as

the driving forces of transport. Other topics discussed include the source term (important for the coupling transport phenomena-reaction or other intentional/unintentional phenomena) and the connections between transport phenomena modeling and design aspects. Some 100 tables provide useful summaries of the characteristics of each model and provide data about the transport properties of an extensive variety of foods. Transport Phenomena of Foods and Biological Materials will benefit a broad audience of chemists, biochemists, biotechnologists, and other scientists in the academic and industrial realm of foods and biological materials.

Yield Point Phenomena in Metals and Alloys Apr 20 2020 Exceptions to the rule are always interesting, and the anomalies in the stress-strain curves of mild steel and in many other metals and alloys have excited the curiosity of engineers and scientists for well over a hundred years. Yet it is only during the last twenty years that significant theoretical advances have been made, and the aim of this book has been to examine these theories against the background of the considerable volume of experimental results published over the last few years, up to mid-1969. Hence this review volume has a two-fold aim; the first chapter attempts to review the general theories of yield point phenomena, using sufficient examples only to illustrate the theories. This chapter is intended to be complete in itself, and could be read by under graduates who wish to appraise rapidly the general background to the problem. The remaining chapters deal, in turn, with the various alloys exhibiting yield point phenomena. Thus, chapter 2 on mild steel, is a more extensive study of quench and strain ageing, while Chapter 3 is on the refractory metals and discusses theories of the low-temperature strength. The next concerns hydrogen in meta-Is. Chapters 5 and 6 discuss the face-centred cubic alloys, particularly the cases of the unloading yield point and intermetallic compounds. Chapter 7 covers hexagonal and ionic structures. A brief final chapter considers the areas where further research may be fruitful.

Fundamental Phenomena in the Materials Sciences Jul 16 2022

Solutions Manual to Accompany Transport Phenomena in Materials Processing Oct 19 2022 This text provides a teachable and readable approach to transport phenomena by providing numerous examples and applications. The text leads the reader through the development and solution of relevant differential equations by applying familiar principles of conservation to numerous situations and by including many worked examples in each chapter. The book is organized similarly to other texts in transport phenomena. Section I deals with the properties and mechanics of fluid motion; Section II with thermal properties and heat transfer; and Section III with diffusion and mass transfer. The authors depart from tradition by building on a presumed understanding of the relationships between the structure and properties of matter, particularly in the chapters devoted to the transport properties. Generous portions of the text, numerous examples, and many problems apply transport phenomena to materials processing.

Fluid Flow Phenomena In Metals Processing Dec 09 2021 Fluid Flow Phenomena in Metals Processing outlines the fundamentals of fluid flow theory, emphasizing the potential applications of fluid flow concepts that are illustrated by actual problems drawn from the metallurgical literature. This book is divided into 10 chapters. Chapters 1 to 4 are devoted to the fundamentals of fluid flow, while Chapters 5 to 9 are concerned with the application of basic concepts to specific systems, such as electromagnetically driven flows, surface tension and natural convection driven flows, multiparticle systems, gas bubbles, and impinging jets. The discussion on flow measurements and introduction to physical modeling are provided in the last chapter. This publication is suitable for a one semester graduate level course for metallurgy and chemical engineering students.

Transport Phenomena and Materials Processing Nov 20 2022

Fundamental Phenomena in the Materials Sciences Feb 11 2022

Transport Phenomena and Materials Processing Feb 23 2023 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

Guide to Modeling of Phase Change Phenomena in Chemical and Materials Engineering Apr 01 2021

Fundamental Phenomena in the Materials Sciences Mar 12 2022

Transport Phenomena in Manufacturing and Materials Processing Oct 07 2021 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 devloped 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 disccipline, 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.

Nanoscopic Materials Dec 21 2022 Nanotechnology has been hailed as a key technology of the 21st century. This book focuses on a qualitative and quantitative approach, discussing all areas of nanotechnology with particular emphasis on the underlying physico-chemical and physical principles of nanoscience.

Shock Wave and High-Strain-Rate Phenomena in Materials May 02 2021 These proceedings of EXPLOMET 90, the International Conference on the Materials Effects of Shock-Wave and High-Strain-Rate Phenomena, held August 1990, in La Jolla, California, represent a global and up-to-date appraisal of this field. Contributions (more than 100) deal with high-strain-rate deforma

Ballistic Materials and Penetration Mechanics Sep 06 2021 Ballistic Materials and Penetration Mechanics deals with ballistically protective materials and penetration mechanics. The book discusses historical and practical considerations of ballistic protection, including metallic armor, as well as ballistic testing methodology, the ability of a protective material to stop or slow down a particular projectile, and the theoretical aspects of penetration mechanics. It also highlights the importance of stress wave analysis in the penetration and spalling phenomena. Organized into 12 chapters, this volume begins with an overview of the history of the armor and the modern helmet. It proceeds with a discussion of variations in ballistic test methods, errors in test methods, and the importance of the hardness and geometry of both the target and the projectile. The next chapters focus on the importance of fibrous armor, materials that are visually transparent and resistant to

penetration by high-energy projectiles and fragments, and transparent armor and ceramic composite armor. The reader is also introduced to materials used in the design of metallic armor, the role of stress waves in the penetration problem, and the use of computer simulation to analyze ballistic impact experiments. The book looks at numerical techniques for modeling hypervelocity impact and concludes with a chapter on the penetration mechanics of textile structures. This book is a valuable resource for scientists working at government, industrial, and university laboratories, as well as law enforcement officers and others who want information on materials that provide the best protection against damage from impacts, explosions, and bullets.

Solid State Physics Sep 25 2020 Solid State Physics provides a broad introduction to some of the principal areas of the physical phenomena in solid materials and is aimed broadly at undergraduate students of physics and engineering related subjects. The physical properties of materials are intimately related to the crystalline symmetry of atoms as well as the atomic species present. This includes the electronic, mechanical, magnetic and optical properties of all materials. These subjects are treated in depth and provide the reader with the tools necessary for an understanding of the varied phenomena of materials. Particular emphasis is given to the reaction of materials to specific stimuli, such as the application of electric and magnetic fields. Nanotechnologies are based on the formation of nano-sized elements and structures. The final chapter of the book provides a broad introduction to the topic and uses some of the main tools of solid state physics to explain the behavior of nanomaterials and why they are of importance for future technologies. FEATURES: • Provides a broad introduction to the principal areas of the physical phenomena in solid materials • Includes the electronic, mechanical, magnetic and optical properties of all materials • Explains the behavior of nanomaterials and why they are of importance for future technologies

Transport Phenomena in Materials Processing Aug 29 2023 This text provides a teachable and readable approach to transport phenomena (momentum, heat, and mass transport) by providing numerous examples and applications, which are particularly important to metallurgical, ceramic, and materials engineers. Because the authors feel that it is important for students and practicing engineers to visualize the physical situations, they have attempted to lead the reader through the development and solution of the relevant differential equations by applying the familiar principles of conservation to numerous situations and by including many worked examples in each chapter. The book is organized in a manner characteristic of other texts in transport phenomena. Section I deals with the properties and mechanics of fluid motion; Section II with thermal properties and heat transfer; and Section III with diffusion and mass transfer. The authors depart from tradition by building on a presumed understanding of the relationships between the structure and properties of matter, particularly in the chapters devoted to the transport properties (viscosity, thermal conductivity, and the diffusion coefficients). In addition, generous portions of the text, numerous examples, and many problems at the ends of the chapters apply transport phenomena to materials processing.

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Non Linear Phenomena in Materials Science II Mar 24 2023 One of the main characteristics of materials science is that it deals with properties which often deviate from linear relationships when compared with such parameters as temperature, pressure, and concentration. The reasons for this behavior of materials are twofold: the speed of linear reaction can vary greatly, and abrupt changes may occur in the static or dynamic states of self-organisation.

Basic Transport Phenomena in Materials Engineering Jun 27 2023 This book presents the basic theory and experimental techniques of transport phenomena in materials processing operations. Such fundamental knowledge is highly useful for researchers and engineers in the field to improve the efficiency of conventional processes or develop novel technology. Divided into four parts, the book comprises 11 chapters describing the principles of momentum transfer, heat transfer, and mass transfer in single phase and multiphase systems. Each chapter includes examples with solutions and exercises to facilitate students' learning. Diagnostic problems are also provided at the end of each part to assess students' comprehension of the material. The book is aimed primarily at students in materials science and engineering. However, it can also serve as a useful reference text in chemical engineering as well as an introductory transport phenomena text in mechanical engineering. In addition, researchers and engineers engaged in materials processing operations will find the material useful for the design of experiments and mathematical models in transport phenomena. This volume contains unique features not usually found in traditional transport phenomena texts. It integrates experimental techniques and theory, both of which are required to adequately solve the inherently complex problems in materials processing operations. It takes a holistic approach by considering both single and multiphase systems, augmented with specific practical examples. There is a discussion of flow and heat transfer in microscale systems, which is relevant to the design of modern processes such as fuel cells and compact heat exchangers. Also described are auxiliary relationships including turbulence modeling, interfacial phenomena, rheology, and particulate systems, which are critical to many materials processing operations.

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Transport Phenomena in Material Processing Dec 29 2020

Shock Waves and High-Strain-Rate Phenomena in Metals May 14 2022 The scientific understanding of high-velocity deformation has advanced substantially during the past decade. On the one hand, the framework for a theory explaining the metallurgical effects of shock waves is beginning to take shape; on the other hand, the technological applications of high strain-rate processes have found their way into industries in countries around the world. Ex plosive cladding, welding, forming, compaction and

consolidation, cutting, and hardening, in addition to high energy-rate deformation processes using other energy sources, are some of the topics of contemporary technological importance. Metallurgical effects are of the utmost importance in both the scientific understanding of the phenomena involved, and in the successful development and utilization of the associated applications. The international conference upon which this book is based had as its major objectives the acceleration of progress in the field of high-strain rate deformation and fabrication, including applications, by providing a forum for the exchange of state-of-the art information on the metallurgical effects of high strain-rate deformation and fabrication; and the organization of this informa tion into a timely and coherent body of knowledge focused around significant areas and applications. This volume is a manifestation of these objectives. In addition, the contents of this book were organized to provide for a somewhat logical perspective of the fundamentals, development, and state-of-the-art applications of high strain-rate and shock phenomena.

Multiscale Phenomena in Plasticity: From Experiments to Phenomenology, Modelling and Materials Engineering Oct 27 2020 The various scales of the physical phenomena occurring during plastic flow are reviewed from the atomic level to the constitutive laws, from both theoretical and experimental sides. The fundamentals of plastic flow are revisited, revealing the impact of recent experimental breakthroughs on the theoretical formulation. New developments (constrained plasticity, indentation) are also addressed. The importance of atomic scale phenomena on macroscopic mechanical behaviour are demonstrated in the case of cross-slip and its influence on fatigue properties, and in the effect of hydrogen on ductility. These developments emphasise the importance of the numerical methods used to connect the various scales and show that much remains to be done in this area. Classical fundamental problems, such as the brittle to ductile transition, are described by both experimentalists and theoreticians, as are constrained and heterogeneous deformation.

Non Linear Phenomena in Material Science II. Nov 08 2021

An Introduction to Transport Phenomena in Materials Engineering Jun 15 2022 This introduction to transport phenomena in materials engineering balances an explanation of the fundamentals governing fluid flow and the transport of heat and mass with their common applications to specific systems in materials engineering. It introduces the influences of properties and geometry on fluid flow using familiar fluids such as air and water. Covers topics such as engineering units and pressure in static fluids; momentum transport and laminar flow of Newtonian fluids; equations of continuity and conservation of momentum and fluid flow past submerged objects; turbulent flow; mechanical energy balance and its application to fluid flow; transport of heat by conduction; transport of heat by convection; transient heat flow; heat transport by thermal radiation; mass transport in the solid state by diffusion; mass transport in fluids. Includes extensive appendices.

Yield Point Phenomena in Metals and Alloys Aug 17 2022 For solid-state physicists, metallurgists and engineers.

An Introduction to Transport Phenomena in Materials Engineering Apr 25 2023 This classic textbook book helps readers understand the basic physics of transport phenomena and how to apply them to materials processing. The Third Edition offers a significant shift in the approach to this subject, representing an evolution incorporating the original ideas and extending them to a more comprehensive approach to the topic.

Computer Modelling of Heat and Fluid Flow in Materials Processing Jan 30 2021 The understanding and control of transport phenomena in materials processing play an important role in the improvement of conventional processes and in the development of new techniques. Computer modeling of these phenomena can be used effectively for this purpose. Although there are several books in the literature covering the analysis of heat tra

Transport Phenomena and Drying of Solids and Particulate Materials Apr 13 2022 The purpose of this book, Transport Phenomena and Drying of Solids and Particulate Materials, is to provide a collection of recent contributions in the field of heat and mass transfer, transport phenomena, drying and wetting of solids and particulate materials. The main benefit of the book is that it discusses some of the most important topics related to the heat and mass transfer in solids and particulate materials. It includes a set of new developments in the field of basic and applied research work on the physical and chemical aspects of heat and mass transfer phenomena, drying and wetting processes, namely, innovations and trends in drying science and technology, drying mechanism and theory, equipment, advanced modelling, complex simulation and experimentation. At the same time, these topics will be going to the encounter of a variety of scientific and engineering disciplines. The book is divided in several chapters that intend to be a resume of the current state of knowledge for benefit of professional colleagues.