

Advanced Materials & Sustainable Manufacturing



Green And Sustainable Manufacturing Of Advanced Material

**Shanmugam Suresh
Kumar,Sundaresan Thirumalai
Kumaran**

Green And Sustainable Manufacturing Of Advanced Material:

Green and Sustainable Manufacturing of Advanced Material Mrityunjay Singh, Tatsuki Ohji, Rajiv Asthana, 2015-08-18

Sustainable development is a globally recognized mandate and it includes green or environment friendly manufacturing practices. Such practices orchestrate with the self healing and self replenishing capability of natural ecosystems. Green manufacturing encompasses synthesis, processing, fabrication, and process optimization, but also testing, performance evaluation, and reliability. The book shall serve as a comprehensive and authoritative resource on sustainable manufacturing of ceramics, metals, and their composites. It is designed to capture the diversity and unity of methods and approaches to materials processing, manufacturing, testing, and evaluation across disciplines and length scales. Each chapter incorporates in depth technical information without compromising the delicate link between factual data and fundamental concepts, or between theory and practice. Green and sustainable materials processing and manufacturing is designed as a key enabler of sustainable development. A one stop compendium of new research and technology of green manufacturing of metals, ceramics, and their composites. In depth cutting edge treatment of synthesis, processing, fabrication, process optimization, testing, performance evaluation, and reliability, which are of critical importance to green manufacturing. Stimulates fresh thinking and exchange of ideas and information on approaches to green materials processing across disciplines.

Green and Sustainable Manufacturing of Advanced Material Mrityunjay Singh, 2015-08-14 **Using Computational Intelligence for Sustainable Manufacturing of Advanced Materials** Muduli, Kamalakanta, Moharana, Bikash

Ranjan, Ales, Steve Korakan, Biswal, Dillip Kumar, 2025-04-23 The shift toward sustainable manufacturing is vital for addressing the pressing environmental challenges of the 21st century. By integrating sustainability principles, manufacturing processes can minimize resource consumption, reduce greenhouse gas emissions, and extend product lifecycles. This approach emphasizes designing for regeneration using eco friendly materials and adopting advanced digital technologies like artificial intelligence, AI, Internet of Things, IoT, and blockchain to optimize production and promote environmental stewardship. Sustainable manufacturing not only mitigates ecological harm but also fosters innovation, enhances competitiveness, and supports long term economic and societal resilience. Adopting such practices is essential for transitioning to a more responsible and sustainable global economy. **Using Computational Intelligence for Sustainable Manufacturing of Advanced Materials** highlights how the application of computational intelligence techniques can promote resource and environmental sustainability in manufacturing systems and operational practices. It further examines how sustainable practices and advanced technologies in materials manufacturing can revolutionize production processes while minimizing environmental impact and promoting resource efficiency. Covering topics such as energy storage, nanoparticles, and biomaterials, this book is an excellent resource for computer scientists, business professionals, manufacturers, environmentalists, researchers, professionals, scholars, academicians, and more.

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Green Photocatalysts for Energy and Environmental Process Saravanan Rajendran, Mu. Naushad, Lorena Cornejo Ponce, Eric Lichtfouse, 2019-09-04 This book describes green photocatalysts and their diverse applications in the fields of environmental sciences and energy. It especially takes a closer look at the removal of air and water pollutants, the generation of hydrogen, photo fuel cells, electrophotocatalysts, solar energy conversions and green biophotocatalysts. Furthermore, it also discusses the role of catalysts along with their chemical reactions, challenges, past developments and directions for further research on photocatalysts. It includes recent developments of quantum dots (QDs) and photocatalytic applications of QDs such as carbon materials like carbon and graphene based QDs, metal metal sulfide and metal oxide based QDs as well as a detailed review on various types of templates used for the preparation of porous g-C₃N₄ and its applications in detail. This is done with special reference to dye degradation, reduction of hexavalent Cr and reduction of CO₂ and for the evolution of H₂ photocatalytically. This book offers an intriguing and useful guide for a broad readership in various fields of catalysis, material sciences, environment and energy.

Emerging Technologies in Manufacturing Matthew N. O. Sadiku, Abayomi J. Ajayi-Majebi, Philip O. Adebo, 2023-03-15 The manufacturing industry is a cornerstone of national economy and people's livelihood. It is the way of transforming resources into products or goods which are required to cater to the needs of the society. Traditional manufacturing companies currently face several challenges such as rapid technological changes, inventory problem, shortened innovation, short product life cycles, volatile demand, low prices, highly customized products and ability to compete in the global markets. Modern manufacturing is highly competitive due to globalization and fast changes in the global market. This book reviews emerging technologies in manufacturing. These technologies include artificial intelligence, smart manufacturing, lean manufacturing, robotics, automation, 3D printing, nanotechnology, industrial Internet of things and augmented reality. The use of these technologies will have a profound impact on the manufacturing industry. The book consists of 19 chapters. Each chapter addresses a single emerging technology in depth and describes how manufacturing organizations are adopting the technology. The book fills an important niche for manufacturing. It is a comprehensive jargon

free introductory text on the issues ideas theories and problems on emerging technologies in manufacturing It is a must read book for beginners or anyone who wants to be updated about emerging technologies **Emerging Green Technologies**

Matthew N. O. Sadiku,2020-03-10 Green Technology deals with using science and technology to protect the environment as well as curb the negative impacts of human involvement The emerging green technologies covered in this book will propel our economy in the near future Their development will lead to global and sustainable powers that will impact our economics societies cultures and the way of life This book provides researchers students and professionals a comprehensive introduction applications benefits and challenges of 15 emerging green technologies It presents the impact of these cutting edge technologies on our global economy and its future The book will help a beginner to have an introductory knowledge about these emerging technologies The main objective of the author is to provide a concise treatment that is easily digestible It is a must read for those graduate students or scholars who consider researching green technologies It can also serve as a valuable resource for those business professionals who seek ways to green their processes Life Cycle Assessment on

Green Building Implementation Vivian W. Y. Tam,Khoa N. Le,Liyin Shen,2018-09-27 This book is a printed edition of the Special Issue Life Cycle Assessment on Green Building Implementation that was published in Sustainability Applications of Advanced Green Materials Shakeel Ahmed,2020-10-22 Applications of Advanced Green Materials provides a comprehensive and authoritative review on recent advancement in green materials in various applications Each chapter is focused on a specific application of advanced green materials from packaging to sensor technology biomedical to environmental applications textile to catalysis to electronic shielding applications supercapacitors drug delivery tissue engineering bioelectronic gas storage and separation etc This book also discusses life cycle assessment and circular economy of green materials and their future prospective The book is unique with contributions from renowned scientists working on biopolymers and biocomposites bioactive and biodegradable materials composites and metallic natural materials This book is an essential resource for academicians researchers students and professionals interested in exploring potential of advanced green materials Includes up to date information on applications of advanced green materials Each chapter is specifically discussing a particular application with examples Present a unified approach to discuss in detail about origin synthesis and application of green materials **Electronic Enclosures, Housings and Packages** Frank Suli,2018-11-01 Electronic

Enclosures Housings and Packages considers the problem of heat management for electronics from an encasement perspective It addresses enclosures and their applications for industrial electronics as well as LED lighting solutions for stationary and mobile markets The book introduces fundamental concepts and defines dimensions of success in electrical enclosures Other chapters discuss environmental considerations shielding standardization materials selection thermal management product design principles manufacturing techniques and sustainability Final chapters focus on business fundamentals by outlining successful technical propositions and potential future directions **Laser-based Technologies**

for Sustainable Manufacturing Avinash Kumar,Ashwani Kumar,Abhishek Kumar,2023-07-26 This book provides scientific and technological insights on novel techniques of design and manufacturing using laser technologies It showcases applications of laser micromachining in the biomedical industry laser based manufacturing processes in aerospace engineering and high precision laser cutting in the home appliance sector Features Each chapter discusses a specific engineering problem and showcases its numerical and experimental solution Provides scientific and technological insights on novel routes of design and manufacturing using laser technologies Synergizes exploration related to the various properties and functionalities through extensive theoretical and numerical modeling Highlights current issues developments and constraints in additive manufacturing Discusses applications of laser cutting machines in the manufacturing industry and laser micromachining for the biomedical industry The text discusses optical and laser based green manufacturing technologies and their application in diverse engineering fields including mechanical electrical biomedical and computer It further covers sustainability issues in laser based manufacturing technologies and the development of laser based ultra precision manufacturing techniques The text also discusses the use of artificial intelligence and machine learning in laser based manufacturing techniques It will serve as an ideal reference text for senior undergraduate graduate students and researchers in fields including mechanical engineering aerospace engineering manufacturing engineering and production engineering

Smart Materials for Science and Engineering Upendra Kumar,Piyush Kumar Sonkar,2024-06-05 SMART MATERIALS FOR SCIENCE AND ENGINEERING Smart materials also known as advanced or creative materials are described as advanced materials that react intuitively to environmental changes or as materials that can return to their original shape in response to certain stimuli Smart materials are classified as either active or passive based on their characteristics There are two types of active materials The first kind cannot change its characteristics when subjected to outside stimuli for example photochromatic spectacles that only alter their color when exposed to sunlight The other which includes piezoelectric materials can change one sort of energy thermal electrical chemical mechanical or optical into another When subjected to external pressure it can generate an electric charge As an example optical fibers can transmit electromagnetic waves In contrast passive smart materials can transmit a specific sort of energy They have some amazing qualities that set them apart from other materials such as transiency meaning they can react to different kinds of external stimuli immediately self actuation or the capacity to change their appearance and shape selectivity where the response is divided and expected directness when the response is limited to the activating event shape changing where the material can change its shape to external stimuli their ability to determine their own health also known as self diagnosis and their ability to self heal The ability to synthesize novel materials has substantially progressed thanks to science and technology over the past 20 years They fall mostly into the following four categories polymers ceramics metals and smart materials Among these smart materials are gaining popularity since they have more uses than conventional materials Smart materials are unusual

substances that have the ability to alter their properties such as those that can immediately change their phase when placed near a magnet or their shape simply by applying heat Humanity will be significantly impacted by this new era of smart materials For instance some of them can adapt their properties to the environment some have sensory capabilities some can repair themselves automatically and some can degrade themselves These extraordinary properties of smart materials will have an effect on all facets of civilization There are many different types of intelligent materials including magnetorheological materials electro rheostat materials shape memory alloys piezoelectric materials and more This book describes many forms of smart materials and their possible uses in various fields A literature survey discusses the different types of smart materials such as based ceramics polymers and organic compounds and their needs advantages disadvantages and applications will be comprehensively discussed A discussion of well established smart materials including piezoelectric magnetostrictive shape memory alloy electro rheological fluid and magnetorheological fluid materials will be discussed with their present prospects

Green Solutions for Sustainability Rasaan Olawale Medupin, Kingsley Ukoba, Tien-Chien Jen, 2025-10-27 This book is a comprehensive exploration of innovative approaches to addressing pressing global challenges through the lens of sustainability looking into four critical areas biomedical marvels waste polymers corrosion inhibition and nanotechnology It takes multidisciplinary approach bringing together insights from biomedical engineering materials science chemistry and environmental science to offer a holistic perspective on sustainability documenting the latest research and developments in each field Features Addresses pressing environmental challenges and offers practical solutions for a more sustainable future Provides a comprehensive exploration of innovative and eco conscious approaches to addressing a wider range of pressing global challenges Features updated research findings and advancements in each field covered Offers a unique blend of insights from diverse fields such as biomedical engineering materials science chemistry and environmental science Includes real world case studies and success stories This book is aimed at graduate students and researchers in materials environmental and sustainability engineering

Handbook of Nanotechnology Applications Kajornsak Faungnawakij, Woei Jye Lau, Uracha Rungsardthong Ruktanonchai, Kuakoon Piyachomkwan, 2020-10-22 Handbook of Nanotechnology Applications Environment Energy Agriculture and Medicine presents a comprehensive overview on recent developments and prospects surrounding nanotechnology use in water wastewater separation and purification energy storage and conversion agricultural and food process and effective diagnoses and treatments in medical fields The book includes detailed overviews of nanotechnology including nanofiltration membrane for water wastewater treatment nanomedicine and nanosensor development for medical implementation advanced nanomaterials of different structural dimensions 0D 1D 2D and 3D for energy applications as well as food and agricultural utilization Other sections discuss the challenges of lab based research transitioning towards practical industrial use Helps scientists and researchers quickly learn and understand the key role of nanotechnology in important industrial applications Takes an interdisciplinary approach

demonstrating how nanotechnology is being used in a wide range of industry sectors Outlines the role nanotechnology plays in creating safer cheaper and more energy efficient projects and devices **Sustainable Machining and Green**

Manufacturing S. Thirumalai Kumaran,Tae Jo Ko,2024-03-12 This book aims to be a source for understanding sustainable machining and green manufacturing The goal is to gain new ideas and encourage readers to utilize fewer natural resources to reduce pollution Some examples include cutting material needs recycling and reusing materials and promoting environmentally friendly practices such as dry machining and eco friendly cutting fluids By reducing pollution and waste more environmentally friendly practices will help encourage a more environmentally conscious future Ideas evaluated in this book The investigating of synergy between natural fibers and epoxy composites that enhance mechanical properties Explores the potential of sustainable reinforcements in polymer composites Uncovers the critical role of manufacturing methods in determining the mechanical prowess of biofiber reinforced composites Details the importance of environmentally friendly conscious manufacturing processes Discusses topics on precision machining additive manufacturing and optimizing manufacturing processes Green Manufacturing and Materials Processing Methods

Sarbjeet Kaushal,Sandeep Bansal,Chander Prakash,Bhupinder Singh,Dheeraj Gupta,2024-09-16 In this modern technological era conserving and making better use of resources like energy water and other essential resources have recently been one of the main concerns for the manufacturing industry To successfully compete against the competition industries are replacing outdated manufacturing techniques with cutting edge ones that are sustainable in terms of cost energy usage better product quality and environmental safety Green manufacturing has become one of the key priorities for attaining this Green Manufacturing and Materials Processing Methods Characterizations Applications and Design offers a critical review of the past work done in green manufacturing and material processing technologies It presents recent research and development that is going on currently with green manufacturing techniques and discusses characterizations applications and the design aspect of materials processed through green manufacturing technologies With a focus on the sustainability aspect this book showcases new breakthroughs and comparisons of cutting edge sustainable manufacturing and materials processing with currently available conventional methods Highlights throughout the book are on improvements used in various manufacturing processes such as casting joining drilling surface engineering sintering and composite manufacturing This book will serve as a first hand information source for academic researchers and industrial firms With the help of this book readers will have a unique opportunity to comprehend and evaluate recent advancements in green manufacturing and material processing technology This book will be the go to resource for individuals who desire to do research or development in the area of sustainable manufacturing and material processing technologies **Digital Technologies for Sustainable**

Manufacturing Arturo Molina,Alex Elías Zúñiga,Dora Iliana Medina,Fernando Gómez Zaldívar,Juana Isabel Méndez,Pedro Ponce,Rita Q. Fuentes-Aguilar,Alejandro Montesinos-Castellanos,2025-10-28 Digital Technologies for Sustainable

Manufacturing provides a practical framework for promoting sustainability in manufacturing by combining Life Cycle Engineering with the 5S principles Social Sustainable Sensing Smart and Safe This book introduces ten core digital technologies including AI simulation tools IoT digital twins additive manufacturing CAD tools blockchain cloud computing AR VR and robotics and automation as vital drivers for fostering innovation and resilience across materials products processes manufacturing systems and supply chains Each chapter blends theory with real world case studies and shows how competitive intelligence helps stakeholders anticipate trends and make strategic decisions This comprehensive book prepares engineers scientists and leaders to create a more sustainable efficient and future ready manufacturing ecosystem

Green Manufacturing Shanmugam Suresh Kumar,Sundaresan Thirumalai Kumaran,2025-07-15 Presenting the concept of green manufacturing in a comprehensive manner Green Manufacturing covers green technologies for advanced manufacturing systems and discusses circular economy and waste management This book Presents a transition from conventional manufacturing to green manufacturing and discusses innovative technical ideas for production Discusses concepts methods and strategies for zero waste in manufacturing implementation and analysis of clean energy Includes cutting edge case studies adopted in the industrial sectors quoting the need for and importance of supply chain management Covers additive manufacturing for sustainable design and production and lean manufacturing Explains nature inspired biomaterials renewable biocomposites circular economy and waste management The text is primarily written for senior undergraduates graduate students and academic researchers in the fields of manufacturing engineering production engineering industrial engineering mechanical engineering and aerospace engineering **Green Composites**

Manufacturing Gurminder Singh,Ravinder Pal Singh,Neeraj Sharma,J. Paulo Davim,2024-05-20 In today s society researchers are more focused on cleaner materials production for environmental sustainability This approach aims at reducing waste and the development of materials with enhanced properties and functionality This book focuses on optimizing manufacturing processes for sustainable composite materials It discusses optimum utilization of resources by using minimum effort to save cost and energy Green Technology and Smart Materials for Engineering Applications Jashanpreet

Singh,Hitesh Vasudev,Ankit Sharma,Murali Mohan Cheepu,2025-08-08 Sustainability and technological advancements are rapidly gaining traction on a global scale and are becoming increasingly prominent across a wide range of industries as evidenced by current market trends Companies are making significant investments in the research and development of smart materials that can adapt to their surroundings in real time thereby improving their performance and productivity The heightened interest in environmentally friendly and intelligent materials can be attributed to the recent surge in research conferences and patent applications in this field highlighting the need for a comprehensive resource that can provide a thorough explanation of these developments Green Technology and Smart Materials for Engineering Applications provides a thorough examination of smart materials including their unique properties and applications in sustainable construction It

explores the versatile uses of green materials in different industries emphasizing sustainable manufacturing practices and resource efficient materials The integration of eco design and innovation is looked at for the creation of sustainable materials highlighting the importance of green and smart materials in optimizing energy consumption Additionally the book offers insights into reuse and recycling techniques that promote circular economy principles and sustainable business models related to green and smart materials Real world examples and success stories are used to illustrate the environmental and economic impacts of implementing smart and green materials in various industries This book is intended to serve as a comprehensive reference guide for academics researchers scholars and professionals working in the fields of manufacturing processing material science and environmental engineering The primary objective of this book is to showcase sustainability by emphasizing the diverse array of green and smart materials utilized in various engineering applications Through this publication readers will gain valuable insights into the importance of incorporating environmentally friendly materials into their work ultimately contributing to a more sustainable future

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