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Nanotechnology in eco-efficient construction is a technical guide for all those involved in the design, production and application of eco-efficient construction materials, including civil engineers, materials scientists, researchers and architects within any field of nanotechnology, eco-efficient materials or the construction industry.

Nanotechnology in Eco-Efficient Construction | ScienceDirect

Description. Covering the latest technologies, Nanotechnology in eco-efficient construction provides an authoritative guide to the role of nanotechnology in the development of eco-efficient construction materials and sustainable construction. The book contains a special focus on applications concerning concrete and cement, as nanotechnology is driving significant development in concrete technologies.

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Nanotechnology In Eco-Efficient Construction : Materials ...

Nanotechnology in eco-efficient construction is an authoritative guide to the role of nanotechnology in the development of eco-efficient construction materials and sustainable construction.Following an introduction to the use of nanotechnology in eco-efficient construction materials, part one considers such infrastructural applications as nanoengineered cement-based materials, nanoparticles for high-performance and self-sensing concrete, and the use of nanotechnology to improve the bulk and ...

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Covering the latest technologies, Nanotechnology in eco-efficient construction provides an authoritative guide to the role of nanotechnology in the development of eco-efficient construction materials and sustainable construction. The book contains a special focus on applications concerning concrete and cement, as nanotechnology is driving significant development in concrete technologies. The new edition has 14 new chapters, including 3 new parts: Mortars and concrete related applications; Applications for pavements and other structural materials; and Toxicity, safety handling and environmental impacts. Civil engineers requiring an understanding of eco-efficient construction materials, as well as researchers and architects within any field of nanotechnology, eco-efficient materials or the construction industry will find this updated reference to be highly valuable. Addresses issues such as toxicity and LCA aspects New chapters covering safety handling on occupational exposure of nanoparticles and the assessment of personal exposure to airborne nanomaterials Discusses the effects of adding nano-particles on the durability and on the properties of geopolymers

As the environmental impact of existing construction and building materials comes under increasing scrutiny, the search for more eco-efficient solutions has intensified. Nanotechnology offers great potential in this area and is already being widely used to great success. Nanotechnology in eco-efficient construction is an authoritative guide to the role of nanotechnology in the development of eco-efficient construction materials and sustainable construction. Following an introduction to the use of nanotechnology in eco-efficient construction materials, part one considers such infrastructural applications as nanoengineered cement-based materials, nanoparticles for high-performance and self-sensing concrete, and the use of nanotechnology to improve the bulk and surface properties of steel for structural applications. Nanoclay-modified asphalt mixtures and safety issues relating to nanomaterials for construction applications are also reviewed before part two goes on to discuss applications for building energy efficiency. Topics explored include thin films and nanostructured coatings, switchable glazing technology and third generation photovoltaic (PV) cells, high-performance thermal insulation materials, and silica nanogel for energy-efficient windows. Finally, photocatalytic applications are the focus of part three, which investigates nanoparticles for pollution control, self-cleaning and photosterilisation, and the role of nanotechnology in manufacturing paints and purifying water for eco-efficient buildings. Nanotechnology in eco-efficient construction is a technical guide for all those involved in the design, production and application of eco-efficient construction materials, including civil engineers, materials scientists, researchers and architects within any field of nanotechnology, eco-efficient materials or the construction industry. Provides an authoritative guide to the role of nanotechnology in the development of eco-efficient construction materials and sustainable construction Examines the use of nanotechnology in eco-efficient construction materials Considers a range of important infrastructural applications, before discussing applications for building energy efficiency

Eco-efficient Construction and Building Materials provides essential reading about materials for the construction industry in the twenty-first century. It covers the latest findings in the field, especially the toxicity aspects, embodied energy, construction and demolition wastes, the use of wastes in concrete, masonry units, materials reinforced with vegetable fibres, earth construction, the durability aspects, and also the importance of nanotechnology to the development of more environmentally-friendly materials. Based on more than nine hundred references, Eco-efficient Construction and Building Materials is of fundamental importance to academics, engineers and architects who are dedicated to the creation of a greener and more holistic construction industry.

This chapter discusses the development of a materials science approach with an application to nanotechnology to optimize the processing and micro/nanoscale structure of cement-based materials reinforced with nanosized fibers and carbon nanotubes. The dispersion of multi-walled carbon nanotubes (MWCNTs) and carbon nanofibers (CNFs) for use in cementitious composites and specifically the effect of ultrasonication energy are discussed in detail. The nanomechanical properties of the CNT/ CNF cementitious nanocomposites are examined through nanoindentation experiments. Additionally, the excellent reinforcing ability of both the MWCNTs and CNFs is demonstrated. Finally, the effect of the addition of silica nanoparticles on the degradation by calcium leaching is discussed and explained.

Bio-based Materials and Biotechnologies for Eco-efficient Construction fills a gap in the published literature, discussing bio-based materials and biotechnologies that are crucial for a more sustainable construction industry. With comprehensive coverage and contributions from leading experts in the field, the book includes sections on Bio-based materials and biotechnologies for infrastructure applications, Bio-based materials and biotechnologies for building energy efficiency, and other applications, such as using biotechnology to reduce indoor air pollution, for water treatment, and in soil decontamination. The book will be an essential reference resource for academic researchers, civil engineers, contractors working in construction works, postgraduate students and other professionals.

Sustainable Nanotechnology for Environmental Remediation provides a single-source solution to researchers working in environmental, wastewater management, biological and composite nanomaterials applications. It addresses the potential environmental risks and uncertainties surrounding the use of nanomaterials for environmental remediation, giving an understanding of their impact on ecological receptors in addition to their potential benefits. Users will find comprehensive information on the application of state-of-the-art processes currently available to synthesize advanced green nanocomposite materials and biogenic nanomaterials. Other sections explore a wide range of promising approaches for green nanotechnologies and nanocomposites preparations. Case study chapters connect materials engineering and technology to the social context for a sustainable environment. Applications and different case studies provide solutions to the challenges faced by industry, thus minimizing negative social impacts. Provides information on the use of biologically mediated synthetic protocols to generate nanomaterials Discusses a wide range of promising approaches for green nanotechnologies and nanocomposites preparations Presents novel fabrication techniques for bionanocomposites, paving the way for the development of a new generation of advanced materials that can cope with spatiotemporal multi-variant environments

Eco-efficient concrete is a comprehensive guide to the characteristics and environmental performance of key concrete types. Part one discusses the eco-efficiency and life cycle assessment of Portland cement concrete, before part two goes on to consider concrete with supplementary cementitious materials (SCMs). Concrete with non-reactive wastes is the focus of part three, including municipal solid waste incinerator (MSWI) concrete, and concrete with polymeric, construction and demolition wastes (CDW). An eco-efficient approach to concrete carbonation is also reviewed, followed by an investigation in part four of future alternative binders and the use of nano and biotech in concrete production. With its distinguished editors and international team of expert contributors, Eco-efficient concrete is a technical guide for all professionals, researchers and academics currently or potentially involved in the design, manufacture and use of eco-efficient concrete. The first part of the book examines the eco-efficiency and life cycle assessment of Portland cement concrete Chapters in the second part of the book consider concrete with supplementary cementitious materials, including properties and performance Reviews the eco-efficient approach to concrete carbonation

The recast of the Energy Performance of Buildings Directive (EPBD) was adopted by the European Parliament and the Council of the European Union on 19 May 2010. For new buildings, the recast fixes 2020 as the deadline for all new buildings to be "nearly zero energy" (and even sooner for public buildings - by the end of 2018). This book gives practitioner an important tool to tackle the challenges of building refurbishment towards nearly zero energy. This book is welcome at this time and sets the scene for professionals whether practitioners or researchers to learn more about how we can make whether old or new buildings more efficient and effective in terms of energy performance.

At the beginning of the Fourth Industrial Revolution, the advent of digitalization, innovative technologies and materials, and new construction techniques have begun transforming the way that infrastructure, real estate, and other built assets can be designed, constructed, and operated in order to create a more attractive, energy-efficient, comfortable, affordable, safe, and sustainable built environment. Developments in materials and cutting-edge technologies (such as artificial intelligence, robotics, nanotechnology, 3D printing, and biotechnology) have finally started to move the construction towards a new era. Massive changes are occurring as a result of the possibilities created by big data and the Internet of Things, along with the technological advances that are driving down the cost of sensors, data storage, and computer services. Construction 4.0: Advanced Technology, Tools and Materials for the Digital Transformation of the Construction Industry presents a thorough review of developments in materials, emerging trends, cutting-edge technologies, and strategies in the fields of smart building design, construction, and operation, providing the reader with a comprehensive guideline on how to exploit the new possibilities offered by the digital revolution. It will be an essential reference resource for academic researchers, material scientists and civil engineers, undergraduate and graduate students, and other professionals working in the fields of smart eco-efficient construction and cutting-edge technologies applied to construction. Features discussions on how nanomaterials, bio-based materials, and recycled materials are applied in the construction of buildings Analyzes the lifecycle of materials, buildings and design and construction operations Covers new methodologies and construction processes Provides case studies on cutting-edge digital technology such as AI and machine learning Examines all aspects of sustainability, including end-of-life of buildings

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