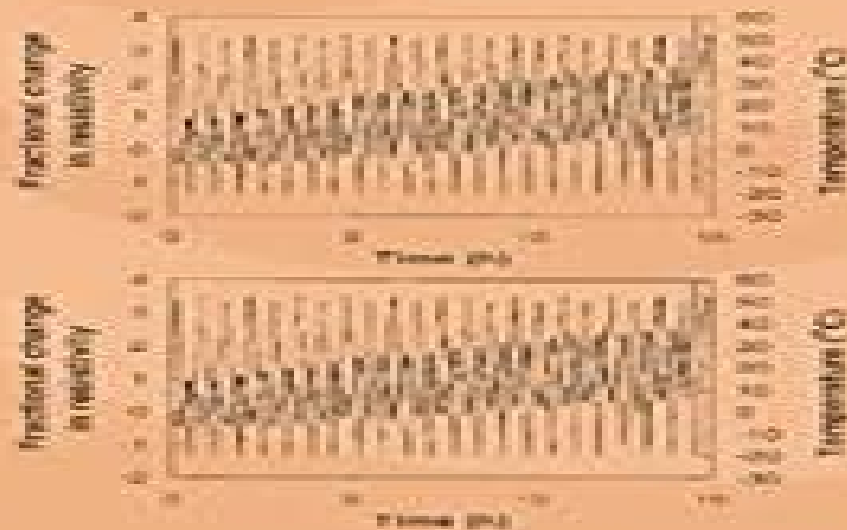


Multifunctional Cement-Based Materials



Deborah D. L. Chung



CRC Press
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Multifunctional Cement Based Materials

**Ashraf Ashour, Xinyue Wang, Baoguo
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Multifunctional Cement Based Materials:

Multifunctional Cement-Based Materials Deborah D. L. Chung, 2019-09-27 Unique in its focus on functional properties this book examines the resistive piezoresistive thermoelectric and electromagnetic behavior of multifunctional cement based materials for reduced cost improved durability and maintenance and optimization of various structural designs The author analyzes cement based compounds for enhancing a wide range of structures including buildings bridges highways automobiles and aircrafts exploring characteristics such as vibration damping strain sensing electromagnetic and magnetic shielding electrical conductivity and thermal insulation for improved structure stability and performance *Multifunctional Cement-Based Materials* Deborah D. L. Chung, 2003-07-11 Unique in its focus on functional properties this book examines the resistive piezoresistive thermoelectric and electromagnetic behavior of multifunctional cement based materials for reduced cost improved durability and maintenance and optimization of various structural designs The author analyzes cement based compounds for enhancing a wide range of structures including buildings bridges highways automobiles and aircrafts exploring characteristics such as vibration damping strain sensing electromagnetic and magnetic shielding electrical conductivity and thermal insulation for improved structure stability and performance *Nanotechnology in Cement-Based Construction* Antonella D'Alessandro, Annibale Luigi Materazzi, Filippo Ubertini, 2020-01-22 Many books on new smart materials are available but specialized analysis of particular topics is still in high demand This multiauthor book focuses on applying nanotechnology to cement based materials to make numerous engineering applications possible The addition of novel smart nanofillers allows the development of multifunctional composite materials not just limited to improving mechanical strength but also including several enhanced features Special attention is devoted to types of nano inclusions novel techniques to mix components and analysis of properties that can be achieved by paste mortar or concrete if added with nanofillers Among these properties the capability of self sensing is very promising Moreover the use of phase changing materials improves the energy efficiency of nanocomposites resulting in important applications in engineering Particular attention is also focused on energy harvesting and electromagnetic shielding properties Comprehensive and up to date this is an important reference book that not only provides in depth information about recent developments and perspectives in this field but also discusses topics that promise major developments in the near future **Multifunctional Cement-Based Sensors for Intelligent Infrastructure** Wengui Li, Wenkui Dong, Surendra P. Shah, 2024-09-11 Multifunctional Cement Based Sensors for Intelligent Infrastructure Design Fabrication and Application covers the development and use of cement based sensors for monitoring structural health durability and environmental conditions in concrete infrastructure Monitoring the performance and condition of bridges buildings and roads improves safety and longevity while preventing failures and reducing maintenance costs Cement based sensors offer low cost ease of installation and compatibility with existing building materials and can also provide real time monitoring data to detect and diagnose potential issues before they become major

problems This book sets out the principles of the sensing mechanisms fabrication techniques and performance evaluation along with several case studies It also provides a glimpse into a future where concrete structures will not only stand as pillars of strength but also become an indispensable part of smart cities as the core of automation The book suits researchers engineers and practitioners involved in design construction and maintenance of concrete buildings and infrastructure

Wengui Li is a Scientia Associate Professor in the School of Civil and Environmental Engineering and the group leader of Intelligent Concrete and Infrastructure Materials in the Centre for Infrastructure Engineering and Safety CIES at The University of New South Wales UNSW Sydney Australia He is the recipient of Australian Research Council ARC Future

Fellow and ARC DECRA Fellow Wenkui Dong earned his PhD from the University of Technology Sydney Australia Currently he works as Postdoctoral Research Fellow at the Institute of Construction Materials at Technische Universität Dresden

Germany Surendra P Shah is a Presidential Distinguished Professor at the University of Texas at Arlington Walter P Murphy Professor emeritus at Northwestern University and a member of the National Academy of Engineering USA

Smart Nanoconcretes and Cement-Based Materials Mohd Shahir Liew,Phuong Nguyen-Tri,Tuan Anh Nguyen,Saeid

Kakooei,2019-11-16 *Smart Nanoconcretes and Cement Based Materials Properties Modelling and Applications* explores the fundamental concepts and applications of smart nanoconcretes with self healing self cleaning photocatalytic antibacterial piezoelectrical heating and conducting properties and how they are used in modern high rise buildings hydraulic engineering highways tunnels and bridges This book is an important reference source for materials scientists and civil engineers who are looking to enhance the properties of smart nanomaterials to create stronger more durable concrete Explores the mechanisms through which active agents are released from nanocontainers inside concrete Shows how embedded smart nanosensors including carbon cement based smart sensors and micro nano strain sensors are used to increase concrete performance Discusses the major challenges of integrating smart nanomaterials into concrete composites

Construction 3D Printing

Ming Jen Tan,Mingyang Li,Yi Wei Daniel Tay,Teck Neng Wong,Paulo Bartolo,2024-07-10 This book presents the dynamic advancements achieved in Construction 3D Printing showcasing a wealth of insights from the conference held from 19-21 July 2023 at Nanyang Technological University NTU Singapore Covering a broad spectrum of topics this volume presents research on established technologies modeling simulation diverse materials including recycled and geopolymer materials fiber reinforcement and composite materials as well as testing protocols and standards It also delves into applications Building Information Modeling BIM design methodologies optimization strategies structural considerations intelligent monitoring and the role of robotics and automation Serving as a timely and invaluable resource this book offers both scholars and professionals in the expansive field of Construction 3D Printing profound insights into its decade long progress and its preparedness for wider adoption

Proceedings of Italian Concrete Days 2018 Marco di Prisco,Marco Menegotto,2019-09-04 This book gathers the best peer reviewed papers presented at the Italian Concrete Days national

conference held in Lecco Italy on June 14 15 2018 The conference topics encompass the aspects of design execution rehabilitation and control of concrete structures with particular reference to theory and modeling applications and realizations materials and investigations technology and construction techniques The contributions amply demonstrate that today's structural concrete applications concern not only new constructions but more and more rehabilitation conservation strengthening and seismic upgrading of existing premises and that requirements cover new aspects within the frame of sustainability including environmental friendliness durability adaptability and reuse of works and or materials As such the book represents an invaluable up to the minute tool providing an essential overview of structural concrete as well as all new materials with cementitious matrices

New-Generation Cement-Based Nanocomposites Siqi Ding,Xinyue Wang,Baoguo Han,2023-05-18 The subject of this book is civil engineering material and nanotechnology Recent advances in nano synthetic technologies and nanocomposite technologies as well as nano surface modification technologies are driving the progressive exploitation of advanced nanomaterials In view of their unique structures and mutual synergy these advanced nanomaterials are expected to alleviate the dispersion issue of traditional nanomaterials in cement based composites improve their nanocomposite effectiveness and efficiency as well as impart new properties and functionalities to cement based composites thus boosting the development of new generation cement based nanocomposites Based on the authors latest research accumulations and achievements this book presents the fundamentals fabrications characterizations performances and applications of the new generation cement based nanocomposites It features numerous illustrations and data graphs as well as summary tables to visually describe the topics This book is dedicated to students researchers scientists and engineers in the field of civil engineering materials and nanotechnology The readers can find information on progress of civil engineering materials and nanotechnologies cutting edge research ideas and findings and practical guidance for developing sustainable and multifunctional cement based nanocomposites

Sensor Technologies for Civil Infrastructures Jerome P. Lynch,Hoon Sohn,Ming L. Wang,2022-07-19 Sensor Technologies for Civil Infrastructure Volume 2 Applications in Structural Health Monitoring Second Edition provides an overview of sensor applications and a new section on future and emerging technologies Part one is made up of case studies in assessing and monitoring specific structures such as bridges towers buildings dams tunnels pipelines and roads The new edition also includes sensing solutions for assessing and monitoring of naval systems Part two reviews emerging technologies for sensing and data analysis including diagnostic solutions for assessing and monitoring sensors unmanned aerial systems and UAV application in post hazard event reconnaissance and site assessment Includes case studies in assessing structures such as bridges buildings super tall towers dams tunnels wind turbines railroad tracks nuclear power plants offshore structures naval systems levees and pipelines Reviews future and emerging technologies and techniques including unmanned aerial systems LIDAR and ultrasonic and infrared sensing Describes latest emerging techniques in data analysis such as diagnostic solutions for assessing and monitoring sensors and

big data analysis **Advanced Nanocarbon Polymer Biocomposites** Md Rezaur Rahman, Muhammad Khusairy Bin Bakri, 2024-07-26 Nanocarbon polymer biocomposites have gained increased attention from both researchers and manufacturers due to the significant improvement in their physico mechanical thermal and barrier properties when compared to conventional materials Their dimensions biodegradable character cost effectiveness and sustainability are among the main drivers for increasing demand However it is difficult to achieve uniform dispersion between the carbon filler and matrix as it easily forms agglomerations Production of nanocarbon polymer biocomposites with high mechanical and thermal properties is also limited but there has been rapid progress in processing possibilities to produce nanocomposites based on various biodegradable fillers *Advanced Nanocarbon Polymer Biocomposites Sustainability Towards Zero Biowaste* collects all these novel scientific findings in one place It discusses in detail their physical chemical and electrical properties and presents the latest research findings on nanocarbon polymer biocomposites with filler loadings and their improvement on compatibility The book will be of great interest for those researchers who are concerned with the production and use of nanocarbon polymer biocomposites as a new innovative advanced material Emphasis on nanoscale fillers and their improvement on compatibility Evaluates the impact of polymer production through life cycle analysis of both single and hybrid polymers and nanocomposites A strong focus on sustainability and green chemistry perspectives Innovation in Construction Seyed Hamidreza Ghaffar, Paul Mullett, Eujin Pei, John Roberts, 2022-03-23 This book tackles the complex topic of implementing innovation and the successful application of advanced technology in the construction industry It provides a practical guide for the transformation of the industry by detailing appropriate and effective implementation methods required skill sets and structural changes necessary to facilitate the practical and innovative application of technology The construction industry is behind other industries in its level of innovation and adoption of technology and is of critical importance to many of today s global challenges such as climate change global warming and resource scarcity There is therefore a need for smarter and more efficient ways of managing available resources This book elaborates on how the innovative application of technology could offer hope for the construction industry in it s imperative to rise to current and future global challenges It includes the real world case studies of innovative projects that go beyond the current state of the art academic research and have improved productivity quality and performance in the construction sector This book provides readers from both industrial and academic backgrounds with a comprehensive guide on transforming the construction industry with the efficient and effective implementation of technologies and modern methods of construction *Sustainable Nanotechnology for Environmental Remediation* Rama Rao Karri, Janardhan Reddy Koduru, Nabisab Mujawar Mubarak, Erick R. Bandala, 2022-01-13 *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 New Materials in Civil Engineering Pijush Samui,Dookie Kim,Nagesh R. Iyer,Sandeep

Chaudhary,2020-07-07 New Materials in Civil Engineering provides engineers and scientists with the tools and methods needed to meet the challenge of designing and constructing more resilient and sustainable infrastructures This book is a valuable guide to the properties selection criteria products applications lifecycle and recyclability of advanced materials It presents an A to Z approach to all types of materials highlighting their key performance properties principal characteristics and applications Traditional materials covered include concrete soil steel timber fly ash geosynthetic fiber reinforced concrete smart materials carbon fiber and reinforced polymers In addition the book covers nanotechnology and biotechnology in the development of new materials Covers a variety of materials including fly ash geosynthetic fiber reinforced concrete smart materials carbon fiber reinforced polymer and waste materials Provides a one stop resource of information for the latest materials and practical applications Includes a variety of different use case studies

Sustainable Concrete Materials and Structures Ashraf Ashour,Xinyue Wang,Baoguo Han,2024-06-03 Sustainable Concrete Materials and Structures focuses on recent research progress and innovations in this important field of research All aspects of the technical routes to sustainable concrete and structures are discussed in detail These include recent findings on sustainable concrete production and structural design and construction Low carbon cement sustainable concrete mix design durability and structural applications are discussed in detail Emphasis is placed on how to bring some of the innovations in concrete technology closer to market Information on techno economic analysis economy of scale and the supply chain of sustainable concrete is also addressed The book will be an essential reference resource for academic and industrial researchers working in civil engineering material science chemical engineering and the development and manufacture of construction materials Provides a comprehensive collection of technical reviews on the latest advancements in sustainable concrete materials and structures Presents state of the art research on preparation production processing and implementation techniques for sustainable concrete materials and structures Features techno economic analysis for each

technology discussed Covers lifecycle assessment the Circular Economy and end of life of concrete structures Includes industry case studies on implementation **Nanotechnology in Civil Infrastructure** Kasthurirangan

Gopalakrishnan,Bjorn Birgisson,Peter Taylor,Nii O. Attah-Okine,2011-03-31 Nanotechnology in Civil Infrastructure is a state of the art reference source describing the latest developments in nano engineering and nano modification of construction materials to improve the bulk properties development of sustainable intelligent and smart concrete materials through the integration of nanotechnology based self sensing and self powered materials and cyber infrastructure technologies review of nanotechnology applications in pavement engineering development of novel cost effective high performance and long lasting concrete products and processes through nanotechnology based innovative processing of cement and cement paste and advanced nanoscience modeling visualization and measurement systems for characterizing and testing civil infrastructure materials at the nano scale Researchers practitioners undergraduate and graduate students engaged in nanotechnology related research will find this book very useful Nanotechnology in Construction for Circular Economy Wenhui Duan,Lihai

Zhang,Surendra P. Shah,2023-07-24 This open access book covers emerging opportunities and future use of nanotechnology in construction including deep advances in cement chemistry nanotechnology artificial intelligence robotics concrete technology and extreme engineering blast impact and fire The proceedings also presents sectorial interactions within the traditional construction industry supply chain enabled by the dynamic partnership between international industry government agencies and universities Nanotechnology has transformed the construction materials industry into an advanced manufacturing sector to address climate change and carbon neutrality challenges by delivering sustainable and resilient infrastructure assets Hence this book reports specific advances in nanoscience and nano engineering and their impacts on numerous novel construction materials including binders additives high performance concrete materials concrete structural systems polymer composites and pavement materials Proceedings of the Canadian Society for Civil Engineering Annual Conference 2023, Volume 7 Serge Desjardins,Gérard J. Poitras,M. Shahria Alam,Xiomara Sanchez-Castillo,2024-09-14 This

book comprises the proceedings of the Annual Conference of the Canadian Society for Civil Engineering 2023 The contents of this volume focus on the specialty track in materials with topics on recycled materials concrete durability geopolymers alkali activated and other alternative binders fiber reinforced and engineered cementitious composites advanced composite materials ultra high performance materials and innovative and emerging materials among others This volume will prove a valuable resource for researchers and professionals The Rise of Smart Cities Amir Hossein Alavi,Maria Feng,Pengcheng

Jiao,Zahra Sharif-Khodaei,2022-04-12 The Rise of Smart Cities Advanced Structural Sensing and Monitoring Systems provides engineers and researchers with a guide to the latest breakthroughs in the deployment of smart sensing and monitoring technologies The book introduces readers to the latest innovations in the area of smart infrastructure enabling technologies and how they can be integrated into the planning and design of smart cities With this book in hand readers will

find a valuable reference in terms of civil infrastructure health monitoring advanced sensor network architectures smart sensing materials multifunctional material and structures crowdsourced social sensing remote sensing and aerial sensing and advanced computation in sensornetworks Reviews the latest development in smart structural health monitoring SHM systems Introduces all major algorithms with a focus on practical implementation Includes real world applications and case studies Opens up a new horizon for robust structural sensing methods and their applications in smart cities *Sensor Technologies for Civil Infrastructures, Volume 1* Jerome P. Lynch, Hoon Sohn, Ming L. Wang, 2014-04-26 Sensors are used for civil infrastructure performance assessment and health monitoring and have evolved significantly through developments in materials and methodologies Sensor Technologies for Civil Infrastructure Volume I provides an overview of sensor hardware and its use in data collection The first chapters provide an introduction to sensing for structural performance assessment and health monitoring and an overview of commonly used sensors and their data acquisition systems Further chapters address different types of sensor including piezoelectric transducers fiber optic sensors acoustic emission sensors and electromagnetic sensors and the use of these sensors for assessing and monitoring civil infrastructures Developments in technologies applied to civil infrastructure performance assessment are also discussed including radar technology micro electro mechanical systems MEMS and nanotechnology Sensor Technologies for Civil Infrastructure provides a standard reference for structural and civil engineers electronics engineers and academics with an interest in the field Describes sensing hardware and data collection covering a variety of sensors Examines fiber optic systems acoustic emission piezoelectric sensors electromagnetic sensors ultrasonic methods and radar and millimeter wave technology Covers strain gauges micro electro mechanical systems MEMS multifunctional materials and nanotechnology for sensing and vision based sensing and lasers *Heat and Mass Transfer in Building Energy Performance Assessment* Robert Černý, Ákos Lakatos, Václav Kočí, 2019-12-03 The building industry is influenced by many factors and trends reflecting the current situation and developments in social economic technical and scientific fields One of the most important trends seeks to minimize the energy demand This can be achieved by promoting the construction of buildings with better thermal insulating capabilities of their envelopes and better efficiency in heating ventilation and air conditioning systems Any credible assessment of building energy performance includes the identification and simulation of heat and mass transfer phenomena in both the building envelope and the interior of the building As the interaction between design elements climate change user behavior heating effectiveness ventilation air conditioning systems and lighting is not straightforward the assessment procedure can present a complex and challenging task The simulations should then involve all factors affecting the energy performance of the building in questions However the appropriate choice of physical model of heat and mass transfer for different building elements is not the only factor affecting the output of building energy simulations The accuracy of the material parameters applied in the models as input data is another potential source of uncertainty For instance neglecting

the dependence of hygric and thermal parameters on moisture content may affect the energy assessment in a significant way. Boundary conditions in the form of weather data sets represent yet another crucial factor determining the uncertainty of the outputs. In light of recent trends in climate change, this topic is vitally important. This Special Issue aims at providing recent developments in laboratory analyses, computational modeling, and in situ measurements related to the assessment of building energy performance based on the proper identification of heat and mass transfer processes in building structures. Potential topics include but are not limited to the following: Development, calibration, and validation of advanced mathematical models for the description of heat and mass transfer in building materials and structures; Computational modeling of heat and mass transfer in building materials and structures aimed at energy performance assessment; Boundary conditions for building energy performance simulations in light of climate change trends; Advanced experimental techniques for the determination of heat and mass transport and the storage properties of building materials; On-site monitoring and verification of building energy performance; Research and development of new materials with high potential to improve the energy performance of buildings.

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