Performance Of Polypropylene Fibre Reinforced Concrete

Sustainable Development Through Engineering Innovations Polypropylene Fibers in Portland Cement Concrete

This book introduces the concept of using polypropylene fibers in Portland cement concrete as a sustainable and resilient approach to design and protect the built-environment through engineering innovations. It presents recent advances, new directions, and opportunities for sustainable and resilient approaches to design and protect the built-environment through engineering innovations. The topics covered are highly diverse and include all civil engineering and construction-related aspects.
such as construction and environmental issues, durability and survivability under extreme conditions, design of new materials for sustainability, eco-efficient and ultra-high performance cementitious materials, embedded structural and foundation systems and environmental geomechanics. The book will be of potential interest to the researchers and students in the fields of civil engineering, architecture and sustainable development.

This volume highlights the latest advances, innovations, and applications in the field of fibre-reinforced concrete (FRC), as presented by scientists and engineers at the RILEM-fib X International Symposium on Fibre Reinforced Concrete (BEFIB), held in Valencia, Spain, on September 20-22, 2021. It discusses a diverse range of topics concerning FRC: technological aspects, nanotechnologies related with FRC, mechanical properties, long-term properties, analytical and numerical models, structural design, codes and standards, quality control, case studies, Textile-Reinforced Concrete, Geopolymer Concrete. After the symposium postponement in 2020, this new volume concludes the publication of the research works and knowledge of FRC in the frame of BEFIB from 2020 to 2021 with the successful celebration of the hybrid symposium BEFIB 2021. The contributions present traditional and new ideas that will open novel research directions and foster multidisciplinary collaboration between different specialists.

This book presents selected articles from the 5th International Conference on Geotechnics, Civil Engineering Works and Structures, held in Ha Noi, focusing on the theme “Innovation for Sustainable Infrastructure", aiming to not only raise awareness of the vital importance in infrastructure development but also highlight the essential roles of innovation and technology in planning and building sustainable infrastructure. It provides an international platform for researchers, practitioners, policymakers and entrepreneurs to present their recent advances and to exchange knowledge and experience on various topics related to the theme of “Innovation for Sustainable Infrastructure”.

This volume consists of papers presented at the International Conference on Recent Developments in Fibre Reinforced Cements and Concretes, held at the School of Engineering, University of Wales College of Cardiff, UK, 18-20 September 1989.

Concrete is widely used because of its versatility, affordability, and availability of raw materials, strength, and durability. Urban development that took place through the world in the last few decades yielded significant developments for concrete technology. The term high-performance concrete (HPC) is relatively new, and it refers to many properties such as strength, durability, sound and heat insulation, waterproofing, and side advantages such as air purification, self-cleaning, etc. Researchers and engineers are constantly working for improving concrete properties. This book provides the state of the art on recent progress in the high-performance concrete applications written by researchers and experts of the field. The book should be useful to graduate students, researchers, and practicing engineers in related fields.

This book summarizes and simplifies the results of a considerable body of research and practical experience with a wide range of fiber-reinforced cementitious composites.

This book presents the select proceedings of the International Conference on Civil Engineering Trends and Challenges for Sustainability (CTCS 2020). The chapters discuss emerging and latest research and advances in sustainability in different areas of civil engineering, which aim to provide solutions to sustainable development. The contents are broadly divided into the following categories: construction technology and building materials, structural engineering, transportation and geotechnical engineering, environmental and water resources engineering, and RS-GIS applications. This book will be of potential interest to beginners, researchers, and professionals working in the area of sustainable civil engineering and related fields.

This volume highlights the latest advances, innovations, and applications in the field of fibre reinforced concrete (FRC) and discusses a diverse range of topics concerning FRC: rheology and early-age properties, mechanical properties, codes and standards, long-term properties, durability, analytical and numerical models, quality control, structural and industrial applications, smart FRC’s, nanotechnologies related to FRC, textile reinforced concrete, structural design and UHPFRC. The contributions present improved traditional and new ideas that will open novel research directions and foster multidisciplinary collaboration between different specialists. Although the symposium was postponed, the book gathers peer-reviewed papers selected in 2020 for the RILEM-fib International Symposium on Fibre Reinforced Concrete (BEFIB).

Determined to evaluate compatibility of the earthen mortar with the fiber-reinforced CEBs. There was a general improvement in flexural performance and ductility of the fiber-reinforced matrices as evidenced by the load-deflection behavior, equivalent flexural strength, residual strength, and flexural toughness. Relationships between fiber quantity and enhancements in tested mechanical properties were observed and predictive models for compressive strength and equivalent flexural strength proposed. An observation of fractured surfaces after flexural strength testing using scanning electron microscopy (SEM) showed both fiber fracture and pullout; an indication of good fiber-matrix bonding. The earthen mortar was deemed compatible with the fiber-reinforced CEBs based on prism compressive strength, flexural bond strength, and failure mode. The results of this research show that when carefully designed and produced, polypropylene fiber-reinforced CEBs can be used to construct CEB masonry with improved ductility, deformability, and flexural performance.

This volume presents the proceedings of the symposia organized under the umbrella of Celebrating concrete: People and practice, an international meeting organized by the University of Dundee’s Concrete Technology Unit. CONTENTS include: Mechanical Properties for Concrete; Role of Fibers in Ductility and Strength; Durability and Performance; Withstanding Severe Conditions; Specialist Concrete and Construction Techniques; and Exploiting Concrete.

This paper describes the materials used, mixture proportions, mixing and shotcreting operation, and properties of the fresh and hardened polypropylene fiber-reinforced shotcrete incorporating silica fume and high volumes of fly ash. The polypropylene fiber-reinforced high-volume fly ash shotcrete produced had satisfactory workability, mechanical properties, and resistance to freezing and thawing cycling. The shotcrete containing silica fume had negligible rebound compared with that without silica fume. The incorporation of fly ash and silica fume improved the workability of the fresh shotcrete, and this resulted in lower operating pressure for the shotcreting. The use of polypropylene fibers up to 0.5% by the volume of the shotcrete did not affect significantly the compressive strength, and the shotcrete incorporating both fly ash and silica fume bonded well to the base concrete. The fiber-reinforced shotcrete showed satisfactory performance after 30 cycles of freezing and thawing with a durability factor >80 even though the air contents were relatively low, and the spacing factor L7 was relatively high.
Saint-Gobain/Vetrotex developed a new fiber known as "FibraShield" for potential application to fiber reinforced concrete. There was need to evaluate the performance of this new fiber and compare its performance with other fibers in order to determine its viability for commercial use. This thesis summarized the results of one experimental investigation conducted to evaluate the performance of the newly developed high tenacity monofilament polypropylene fiber "FibraShield" manufactured in three different lengths 0.5 inch (12.5mm), .075 inch (18mm) and 1.5 inch (38mm) when added to concrete at different dosage levels ranging from 0.33 to 5.0 lbs/yd³ (0.196 to 2.965 kg/m³). The performance evaluation includes a set of uniaxial tensile tests, flexural tests, pullout tests of single fibres and compressive tests. A new analytical model to achieve these objectives, ASTM and other standard tests were performed in the Rama Materials Laboratory of the South Dakota School of Mines and Technology. Fresh concrete tests included slump test, air content test, temperature of freshly mixed concrete, and plastic shrinkage tests. Hardened concrete tests included compressive strength, flexural strength, splitting tensile strength, bond strength, impact strength, average residual strength test and resistance to rapid cooling and thawing of concrete. The workability characteristics of the newly developed high tenacity monofilament polypropylene fiber-reinforced concrete pipe under short and long-term loads in terms of strength, deflection response, strain response, crack width, and crack patterns. Concrete pipes with diameters of 1,200 and 1,500 mm with respective wall thicknesses of 50 and 63 mm were subjected to the short-term three-edge bearing test. To ensure maximum fiber contribution to pipe strength, a 9 kg/m³ fiber dosage was used with different amounts of steel reinforcement. For the long-term three-edge bearing test, a pipe with a diameter of 1,200 mm reinforced with fiber dosage of 9 kg/m³ along with steel reinforcement with an area of 5.7 cm²/m was tested for 30 days at 40 % of the ultimate load (Load Stage 1) obtained from the short-term test, for another 30 days at 50 % ultimate load (Load Stage 2), and subsequently at 70 % ultimate load for a final 30 days (Load Stage 3). Short-term results showed that synthetic fiber was a viable replacement for the steel reinforcement cage, as some of the tested pipe achieved the strength requirement specified by ASTM C76-15a, Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe. In response to sustained load, the tested pipe initially exhibited a linear response, followed by a stable response with a slight increase in deflection over time. Fiber creep did not significantly increase the crack width or affect the time dependent strain, indicating that the fiber will successfully transfer the stresses without significantly increasing the moisture migration and limiting the crack width. The cracks propagated longitudinally at the invert, crown, and springline, where there were high flexural tensile stresses.

Portland cement concrete is a brittle material. The main reason for incorporating fibres into a cement matrix is to improve the cracking deformation characteristics, increasing not only the toughness, impact and tensile strength, but also eliminating temperature and shrinkage cracks. Several different types of fibres have been used to reinforce cement-based materials. This chapter briefly discusses the characteristics of fibre-reinforced concrete (FRC), reporting the effect of the fibres on the physico-chemical and mechanical properties. It also presents some of the recent research and future perspectives of FRC.

"In the research project presented in this PhD-thesis, an innovative type of fibre concrete is developed, with improved both the tensile strength and the ductility: the Hybrid-Fibre Concrete (HFC). The expression "Hybridization" of fibres: short and long steel fibres were combined together in one concrete mixture. This is opposite to conventional steel fibre concretes, which contain only one type of fibre. The basic goal of combining short and long fibres is from one side to improve the tensile strength by the action of short fibres, and from the other side to improve the ductility by the action of long fibres." "In this research project, all important aspects needed for the development and application of Hybrid-Fibre Concrete have been considered. In total 15 mixtures, with different types and amounts of steel fibres were developed and tested in the fresh state (workability) as well as in the hardened state (uniaxial tensile tests, flexural tests, pullout tests of single fibres and compressive tests). A new analytical model for bridging of cracks by fibres was developed and successfully implemented for tensile softening response of HFC. At the end, the utilization of HFC in the engineering practice was discussed, including a case-study on light prestressed long-span beams made of HFC."—BOOK JACKET.

Concrete made using mineral cements, the raw materials which on earth are practically endless, is known as one of the oldest building materials and during the last decades of the twentieth century has become a dominant building material for modern construction. On the same time, the properties of concrete and its performance in particular compressive strength, durability, economical efficiency, and low negative impact of its manufacture on the environment have not yet been completely met. Bearing these requirements in mind, researchers and engineers worldwide are working on how to satisfy these requirements. This book has been written by researchers and experts in the field and provides the reader with the characteristics of concrete and its performance in different applications where industrial by-products are utilized. The book is dedicated to graduate students, researchers, and practicing engineers in related fields.
Bangalore. The papers in this volume cover the theme of earthen structures, with technical content on materials and methods, structural design and seismic performance, durability, seismic response, climatic response, hygrothermal performance and durability, design and codes, architecture, heritage and conservation, and technology dissemination. This book will be of use to professionals, academics, and students in architecture and engineering.

Advanced cementitious composites can be designed to have outstanding combinations of strength (five to ten times that of conventional concrete) and energy absorption capacity (up to 1000 times that of plain concrete). This second edition brings together in one volume the latest research developments in this rapidly expanding area. The book is split into two parts. The first part is concerned with the mechanics of fibre reinforced brittle matrices and the implications for cementitious systems. In the second part the authors describe the various types of fibre-cement composites, discussing production processes, mechanical and physical properties, durability and applications. Two new chapters have been added, covering fibre specification and structural applications. Fibre Reinforced Cementitious Composites will be of great interest to practitioners involved in modern concrete technology and will also be of use to academics, researchers and graduate students.

This book outlines a methodology for producing macro recycled polypropylene (PP) fibres with optimal mechanical properties and illustrates the reinforcing effects of recycled PP fibres in concrete. It describes the great potential of using these fibres in concrete applications such as footpaths and precast elements. Further, it sheds new light on the environmental impacts of using recycled PP fibres, which are evaluated by means of cradle to gate life cycle assessment based on the Australian context. The use of recycled PP fibre not only helps reduce consumption of virgin materials like steel or plastic but also provides an attractive avenue for recycling plastic waste. The book will appeal to engineers, governments, and solid waste planners, and offers a valuable reference for the plastic waste recycling and plastic fibre reinforced concrete industries.

Over the last forty years I have been lucky enough to have experienced a unique career researching and developing composite materials, in both industry and academia, during a time of unprecedented expansion in the global composites business. Over that time, I have been involved in areas as diverse as the development of new and novel fibre and composite products through to fundamental materials research. My research efforts have been focussed in three main areas; the fibre-matrix interface region, fibre reinforcements and in particular glass fibres, and the structure-processing-performance relationships of reinforced thermoplastics. The published output of that work is collected together in this series of volumes. The 23 papers collected in this volume summarise my more than thirty year journey through the research and development of fibre reinforced polypropylene. Of all the materials that I have worked on, PP based composites have been my favourite where all three areas of my research expertise had to be brought into play. The story starts with fundamental research to better understand the phenomenon of the transcrySTALLised interphase in fibre reinforced PP. It then moves on to structure-processing-performance of PP composites with emphasis on the development of long fibre technology. This includes the influence of fibre length, concentration, and diameter, and the use of glass and natural fibre as a PP reinforcement. Finally, throughout most of this collection, there is a continual focus on the characterisation and nature of adhesion of PP to fibres.

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This text covers the fundamental scientific principles of fibres that have been modified to be compatible with cementitious matrices. It also provides information and a description of the properties of specific systems prepared with different types of fibres such as steel, glass, asbestos, polypropylene, natural fibres and various types of high performance polymeric fibres. It includes a reference list and sets of tables describing the engineering properties of the different systems and micrographs.

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