

Recycled Waste Materials in Reinforced Concrete Construction

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Abstract

This talk discusses different types of industrial, agricultural and/or natural wastes; some have been already utilized in the concrete industry while many others demonstrate promise for future use. Recycling of those waste materials, found in abundance, not only wards off deleterious environmental hazards, but also have been known to actually produce wealth by adding value through ecology.

The presented study compiles information about an extensive variety of wastes that could be used in the concrete industry to generate low-cost environmental friendly materials. Moreover, it will reveal a combination of these wastes, new approaches to old materials and unique demands related to waste materials.

The results presented in this talk are not only beneficial both economically and environmentally, they also provide the concrete industry with technical information about valuable resources which play a key role in meeting the challenges of sustainable construction in today's world. The high demand of natural resources due to rapid urbanization and the disposal problem of industrial and agricultural wastes in developed and in developing countries have created opportunities for utilizing these wastes in concrete.

Many of them have already been used in concrete as additive or replacement to cement, fine aggregates and coarse aggregates. By doing so, these wastes drastically improve many properties of fresh and hardened concrete, paving the way for major developments in concrete and construction industries. The principal binder in concrete is Portland cement whose production requires exorbitant amount of energy consumption, is costly and a major contributor to green-house gases (GHG; one ton of Portland cement releases approximately one ton of CO₂). Furthermore, it consumes huge quantities of virgin materials that cause depletion of natural resources, such as forests, hill, mountains, etc. at an alarming rate.

Given that these challenges must be dealt with effectively, the commitment to deploy immense quantities of industrial, agricultural and natural waste materials (palm-oil fuel ash, fly ash, coal and oil-burning by-products, bottom ash, rice husk ash, bagasse ash, metakaolin, used tires, cement dust, stone crushers dust, marble dust, silica fume, glass, etc.) becomes imperative. Effective utilization of various waste materials in the concrete and construction industry whose growth knows no boundaries and mounting evidence of worldwide interest suffice the need to produce a collective anthology of a wide variety of waste materials available today.

Keywords: Concrete; recycled waste; cementitious material; sustainability.

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Biography of Presenting Author



Mohamed A. Ismail is currently working as a full professor at Dept. of Civil Engineering, Miami College of Henan University, Kaifeng, China since October 2018. He is also an adjunct professor at School of Civil and Mechanical Engineering, Faculty of Engineering and Science, Curtin University, Bentley, Australia.

Before joining Miami College, Prof. Ismail was working as an Associate Professor at Civil and Construction Engineering Department, Faculty of Engineering and Science, Curtin University Malaysia, Sarawak, Malaysia. He received his B. Sc. and M. Sc. degrees from Alexandria University, Egypt in 1991 and 1996, respectively and his PhD from Nanyang Technological University (NTU), Singapore in 2003.

Prof. Ismail teaches undergraduate courses in Civil Engineering Materials, Concrete Technology, Engineering Mechanics, Reinforced Concrete Structural Design, Engineering and Environmental Principles and Theories, Construction Management, Concrete Laboratory, Mechanics of Solids, Structural Analysis and Fluid mechanics. For graduate students, he teaches courses in Advanced Concrete Technology and Advanced Structural Analysis. His research work includes Concrete Technology, Smart Materials in Construction, High Performance Concrete, Durability of Concrete, NDT, Arc Thermal Metal Spray Technology, Sustainable Building Materials and Protection Methods of Reinforced Concrete Structures.

Prof. Ismail has extensive teaching and research experiences over 30 years in Canada, South Korea, Malaysia, Egypt, Japan and China. He also had broad experience at Engineering Consultancies and Oil & Gas Firms. Prof. Ismail has published more than 120 papers in referred Journals and International Conferences and 5 Books. He served as a reviewer for many International Journals, Editorial Board Member of few journals and Editor-in-chief of Challenge Journal of Concrete Research Letters (CJCRL). He is a member of ASCE and EES and a Professional Engineer of APEGA-Canada.

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