Developments in New and Sustainable Concretes and High-Performance Reinforcing Materials and their Incorporation into National Building Standards

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Concrete is one of the most versatile materials used in the building construction and civil infrastructure industries; it is also one of the most common materials used by humanity, second only to that of water. The past 50 years has seen significant advancement of concrete to the extent that it cannot be described as a low or 'common' technology material. Modern concretes consist of highly designed combinations of cements, reactive fine powders and supplementary cementitious materials (e.g. silica fume, fly-ash and granulated ground slags) and advanced chemical admixtures such as retarders, and high range water reducing agents (i.e. superplasticizers). Modern concrete is combined with both conventional and new reinforcing products, such as high strength steels, fibre reinforced plastics and steel, and other, fibres. Cement, a major constituent of concrete, has a high carbon footprint and, as a result of the vast quantities used, has a not insignificant contribution to national greenhouse gas emissions, associated with negative climate change impacts. This presentation looks at research into advanced concretes and structural design technologies, including alternative binder concretes with lower embedded carbon by product volume, high-technology ultra-high performance concrete that, used intelligently, can provide both cost-efficient and low carbon solutions to development of national infrastructure, and cost-efficient and durable design with alternative reinforcing materials such as high-strength steel reinforcement, fibre reinforced plastic bars and steel-fibre reinforced concrete. The presentation looks at the use of these new materials in the context of development of national design standards and codes.