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Nanoconcrete for sustainable infrastructures

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Currently, extensive study is being made by the researchers towards concrete, which is the most widely used construction material to impart its strength and make it eco-friendly. Studies in relation to this have resulted that nanoparticles can be used as binders for the cement to enhance its properties, such as strength, durability and workability. Nanomaterials are employed in concrete to intervene in new materials at the nanoscale level and thereby increase the mechanical, chemical and durable properties. Nanomaterials used in concrete are generally nanosilica, polycarboxylate, multi-walled carbon nanotubes and nano titanium oxide. These nanomaterials are used to produce high-performance concrete, which exhibits tremendous strength and durability of concrete. The multi-walled carbon nanotubes (MWCNTs) for instance exhibit exceptionally high mechanical property and also acts as a reinforcing material for high-performance concrete. These MWCNTs are effectively incorporated in concrete by the ultrasonic method and using a surfactant. The raw materials used to fabricate the high-performance nano specimens include ordinary portland cement of grade 53, fine aggregate and manufactured sand, coarse aggregate, MWCNTs, water, and high range water reducing agent (polycarboxylate) for dispersing the carbon nanotubes. Since these MWCNTs have a diametre of 10-30 nm, they reduce the size of the pores and hence attain a higher strength. The compressive strength of the MWCNTs concrete has shown 22% higher performance than the conventional concrete; the flexural property has been reported to be 35% higher on using pristine multi-walled carbon nanotubes as a result of which they have gained tremendous scientific interests. According to research, nanoparticles’ implementation in cement not only enhances the characteristics of cement but also reduces the environmental impact owing to its production.

Keywords: Durability, Nanosilica, Surfactant, Polycarboxylate, Flexural, Eco-friendly, Sustainable, Cement, Concrete, Nanotechnology, MWCNTs, Carbon nanotubes, Nanomaterials

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