

Effect of Nano-silica additions on Mechanical and Microstructure analysis of High Performance Concrete

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Abstract : Concrete is the material of choice where strength, performance, durability, impermeability, fire resistance and abrasion resistance are required. The hunger for the higher strength leads to other materials to achieve the desired results and thus emerged the contribution of cementitious material for the strength of concrete. Addition of pozzolonic admixture like the pulverized Fly ash (PFA) contributes to the improvement of strength and also by adding the Nano materials, concrete composites with superior properties can be produced. Nano Technology applied to concrete includes the use of Nano materials like Nano-silica, Nano fibers etc. The micro-level does not provide enough insights into building materials. Therefore, all around the world, increasing amounts of research funding are being diverted into the Nano level, which is claimed to have tremendous potential for the future. Nano-silica improves the microstructure by making it denser. The objective of this project is to study the mechanical and microstructural properties of M60 high performance concrete with Nano-silica as admixture partially replacing cement in 1%, 2%, 3% and 4%. Specimens namely cubes, cylinders and prism are cured for 14 days in standard environment, after this curing period test to analyze the mechanical properties are carried out. Compressive test, Split tensile test, Flexural test and test for Modulus of elasticity are carried out to study the mechanical properties. The mechanical properties start showing increasing trend with increase in the quantity of Nano-silica. TEM, EDS and SEM techniques are used to study the microstructure of the concrete. The Nano-silica addition reduces the pore amount and makes the concrete denser in microstructure level which in turn increases the mechanical properties.

Keywords: Nano – SiO₂, SEM, EDS.

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