

The Effect of Super-Plasticizer and Ultra-sonic Process on the Carbon Nano Tubes Dispersion in Combination with Nano Silica in Cement Composites to Enhance Its Mechanical Properties

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Abstract : nowadays, nanotechnology is the main trend of research in different areas due to the new potential of using nanometer materials sized less than 100nm. Nanomaterials are needed in cement composites to act as bridging for Nano and micro-cracks to increase tensile strength, reduce the permeability of gases and water in concrete to solve corrosion problem, react with excess Calcium Hydroxide, produce additional C-S-H, act as filler materials to densify the cement matrix and increase its mechanical properties. The present study focuses on the effectiveness of super-plasticizers and ultrasonic processing on the dispersion of Carbon Nanotube at first in water and then in cement composites in combination with Nano silica to enhance the mechanical properties of cement composites. A qualitative analysis using a compressive strength test is conducted with a view to investigate the influence of different dispersion techniques on the mechanical properties of cement composites containing Carbon Nanotube (CNT) and Nano Silica (NS) particles with different percentages. In addition, micro-structural analysis was carried out to understand the surface morphology and microstructure of cement composites with different dosages of NS addition. The investigational study results showed that the combination of NS with a low amount of CNT had a positive effect on the hydration reaction; on the other hand, the combination of CNT and a high amount of NS had a negative effect on the hydration reaction. The compressive strength can be improved by optimum combination 0.02% CNT and 1% NS with gain in strength by 72% and 35% after 7 and 28 days compared to control samples; these results were with an agreement with the morphology structure of composites using microstructure analysis.

Keywords : nano silica, dispersion, sonication, carbon nano tubes

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