

An Experimental Study on the Mechanical Performance of Concrete Enhanced with Graphene Nanoplatelets

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Abstract : The cement production process is one of the major sources of carbon dioxide (CO₂), a potent greenhouse gas. Indeed, as a result of its cement manufacturing process, concrete contributes approximately 8% of global greenhouse gas emissions. In addition to environmental concerns, concrete also has a low tensile and ductility strength, which can lead to cracks. Graphene nanoplatelets (GNPs) have proven to be an eco-friendly solution for improving the mechanical and durability properties of concrete. The current research investigates the effects of preparing concrete enhanced with GNPs by using different wet dispersions techniques and mixing methods on its mechanical properties. Concrete specimens were prepared with 0.00 wt%, 0.10 wt%, 0.20 wt%, 0.30 wt% and wt% GNPs. Compressive and flexural strength of concrete at age 7 days were determined. The results showed that the maximum improvement in mechanical properties was observed when GNPs content was 0.20 wt%. The compressive and flexural were improved by up to 17.5% and 8.6%, respectively. When GNP dispersions were prepared by the combination of a drill and an ultrasonic probe, mechanical properties experienced maximum improvement.

Keywords : concrete, dispersion techniques, graphene nanoplatelets, mechanical properties, mixing methods

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