EFFECT OF GRAPHENE NANOPLATELETS ON MECHANICAL PROPERTIES OF HIGH-VOLUME FLY ASH CONCRETE CONTAINING PLASTIC WASTE

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Abstract

Plastic wastes have been increasing every year due to the high demands of plastic use in many applications. This is one of the important environmental problems and leads to the challenge issue on waste management. Attempts have been made to reuse and/or recycle of plastic wastes by applying in construction. An idea on use of plastic waste in concrete as partial replacement to fine or coarse aggregate has been introduced. However, the major setback on using plastic waste in concrete is its negative effect on the mechanical and durability performance of concrete. This study aims to use graphene nanoplatelets (GNP) as an additive in order to mitigate the negative effect of plastic waste in concrete. 40% fly ash replacement by volume of cement was used in this study. Plastic waste was used to partially replace coarse aggregate in concrete mix at 30% by volume, and GNP was added at 0%, 0.15%, and 0.30% by weight of cementitious materials. Four mixes were prepared and tested for compressive strength, splitting tensile strength, and flexural strength at 3, 7, and 28 days of curing. The results showed that GNP can partially reduce the loss in strengths in concrete due to negative effect of plastic waste, as the mixes with GNP showed higher strengths compared to those without GNP. In conclusion, GNP can effectively enhance the mechanical properties of concrete containing plastic waste for structural applications.

Keywords: *Fly Ash, Plastic Waste, Graphene Nanoplatelets, Compressive Strength, Splitting Tensile Strength, Flexural Strength.*