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Mechanical Properties of Fly Ash Geopolymers Reinforced with Graphene Oxide

Geopolymers are a type of binding materials that can be used to replace cement to reduce environmental problems. In this research, the compressive strength, the curing time, was the microstructure and the chemical composition of the graphene oxide-based fly ash geopolymer material were studied, Geopolymer was prepared from high calcium fly ash, sodium silicate (Na2SiO3) sodium hydroxide (NaOH) and graphene oxide powder, reinforcing materials The concentrations of graphene oxide were 0, 0.05, 0.1, 0.2, 0.3 and 0.4 percent by weight. The liquid to fly ash ratio (L/A) was 0.45. The curing temperature was 60℃ and the curing period was 7, 14 and 28 days. From the experiment al results for the flow characteristics, it was found that the viscosity increased as the proportion of graphene oxide increased. When analyzing with of XRD and FTIR techniques, there was a decrease in the crystallinity because the peak is wide. Crystal phase peaks of quartz and hematite derived from fly ash components were found. The spectral bands from the FTIR technique for all samples were similar. An increase in graphene oxide content may result in a change in peak strength. when increasing the amount of graphene oxide more. The addition of graphene oxide did affect the geopolymerization reaction changes. From the Raman spectroscopy technique, it was found that the amount of graphene oxide increased proportion ally with the increased graphene oxide concentration. In addition, the compressive strength tended to increase in proportion with the higher graphene oxide content, and the curing time as well But at the concentration of 0.4% by weight for 28 days, the strength was reduced because the reinforced material had larger particle size or poor adhesion. The SEM results showed that graphene oxide particles were not visible. This could be that graphene oxide is transformed or embedded into the geopolymer body. As a result, graphene oxide particles were not visible.

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