

Optimization of alkaline activator/fly ash ratio on the compressive strength of manufacturing fly ash-based geopolymer

Abstract

Fly ash and a mixture of alkaline activators namely sodium silicate (Waterglass) and sodium hydroxide (NaOH) solution were used for preparing geopolymer. The aim of this research is to determine the optimum value of the alkaline activator/fly ash ratio. The effect of the oxide molar ratios of $\text{SiO}_2/\text{Al}_2\text{O}_3$, water content of the alkaline activator and the Waterglass% content were studied for each Alkaline activator/fly ash ratio. The geopolymers were synthesized by the activation of fly ash with alkaline solution at three different alkaline activator/fly ash ratios which were 0.3, 0.35, and 0.4 at a specific constant ratio of waterglass/NaOH solution of 1.00. The geopolymers were cured at 70°C for 24 h and cured to room temperature. Results revealed that the alkaline activator/fly ash ratio of 0.4 has the optimum amount of alkaline liquid, which shows the highest rate of geopolymerization compared to other ratios. A high strength of 8.61 MPa was achieved with 0.4 of activator/fly ash ratio and 14% of waterglass content.