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Correlating composition design and properties of calcined kaolin geopolymeric powder

Abstract

This paper discussed the relation between composition design and properties of calcined kaolin geopolymeric powder. Geopolymeric powder was produced by applying the geopolymerization process. The solids-to-liquid ratios were varied while the NaOH concentration and waterglass-to-NaOH ratios were kept constant. The oxide molar ratios (SiO2/Al2O3, Na2O/SiO2, Na2O/Al2O3 and H2O/Na2O) were calculated from the mixture proportion. Compressive strength and SEM analysis were conducted. The results showed solids-to-liquid ratio affected the compressive strength significantly. For a geopolymer system, there was an optimum value of S/L ratios and hence optimum oxide molar ratios that leads to materials with better compressive strength. The compressive strength of samples maximized at an optimum and then decreased gradually for subsequent increases. The optimum SiO2/Al2O3, SiO2/Na2O, Al2O3/Na2O and H2O/Na2O molar ratios were 3.16, 2.78, 0.88 and 14.36, respectively. SEM showed growth of microstructure towards a more homogeneous structure after addition of water and S/L ratios influenced the level of porosity in the resulted geopolymer pastes.

Keywords

Calcined kaolin; Geopolymeric powder; Geopolymers; Mix composition; Molar ratio; Solids-to-liquid ratio