

Design, processing and characterization of fly ash-based geopolymers for lightweight concrete application

Abstract

The mix design of geopolymers plays important role in obtaining desirable compressive strength. Optimum mix design of geopolymers can be applied for application, such as lightweight concrete. In order to determine the maximum compressive strength for lightweight concrete production, fly ash geopolymers were produced with various ratios of fly ash/alkaline activator (0.5 - 3.0), Na₂SiO₃ solution/ NaOH solution (0.5 - 3.0) and 12 M of NaOH solution. The geopolymer materials were mixed and cured at 70°C for 24 h and tested on 7 days. Maximum compressive strength was obtained when the ratios of fly ash/alkaline activator and Na₂SiO₃ solution/ NaOH solution were 2.0 and 2.5, respectively. The characterization and morphology of geopolymers were performed by using X-Ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM). It was clearly shown that the best mix design of geopolymers produced denser matrix and less unreacted fly ash compared to other samples.

Keyword

Compressive strength; Fly ash; Geopolymers; Lightweight; Mix design