

Mix design and compressive strength of geopolymer concrete containing blended ash from agro-industrial wastes

Abstract:

Geopolymer concrete is a type of amorphous alumino-silicate cementitious material. Geopolymer can be polymerized by polycondensation reaction of geopolymeric precursor and alkali polysilicates. Compared to conventional cement concrete, the production of geopolymer concrete has a relative higher strength, excellent volume stability and better durability. This paper presents the mix design and compressive strength of geopolymer concrete manufactured from the blend of palm oil fuel ash (POFA) and pulverized fuel ash (PFA) as full replacement of cement with a combination of sodium silicate and sodium hydroxide solution used as alkaline liquid. The density and strength of the geopolymer concrete with various PFA: POFA ratios of 0:100, 30:70, 50:50 and 70:30 together with sodium silicate to sodium hydroxide solution by mass at 2.5 and 1.0, are investigated. The concentrations of alkaline solution used are 14 Molar and 8 Molar. Tests were carried out on 100×100×100 mm cube geopolymer concrete specimens. Specimens were cured at room temperature and heat curing at 60°C and 90°C for 24 hours, respectively. The effects of mass ratios of PFA: POFA, the alkaline solution to PFA: POFA, ratio and concentration of alkaline solution on fresh and hardened properties of concrete are examined. The results revealed that as PFA: POFA mass ratio increased the workability and compressive strength of geopolymer concrete are increased, the ratio and concentration of alkaline solution increased, the compressive strength of geopolymer concrete increases with regards to curing condition.