

Utilization of Aluminium Dross as a Main Raw Material for Synthesize the Geopolymers via Mechanochemistry Method

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Abstract : The use of aluminium dross as a raw material for geopolymer synthesis via mechanochemistry method was studied. The geopolymers were prepared using aluminium dross from secondary aluminium industry, fly ash from a biomass power plant and liquid alkaline activators, which is a mixture of sodium silicate solution (Na_2SiO_3) and sodium hydroxide solution (NaOH) ($\text{Na}_2\text{SiO}_3/\text{NaOH}$ ratio 4:1, 3:1 and 2:1). Aluminium dross consists mostly of alumina (Al_2O_3), silicon oxide (SiO_2) and aluminium nitride (AlN). The raw materials were mixed and milled using the high energy ball milling method for 5, 10 and 15 minutes in order to reduce the particle size. The milled powders were uniaxially pressed into a cylinder die with the pressure of 2200 psi. The cylinder samples were cured in the sealed plastic bags for 3, 7 and 14 days at the room temperature and 60°C for 24 hour. The mechanical property of geopolymers was investigated. In addition, scanning electron microscopy (SEM) and X-ray diffraction (XRD) analysis were carried out in order to study the microstructure and phase structures of the geopolymers, respectively. The results showed that aluminium dross could enhance the mechanical property of geopolymers product by mechanochemistry method and meet the TISI requirements.

Keywords : aluminium dross, fly ash, geopolymer, mechanochemistry

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