“The Effect of Flux Addition on Fly ash/Slag based-Geopolymers at High Temperature”

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This research elucidates the effect of decahydrate borax on thermal, foaming and fluxing properties of fly ash-ladle furnace slag (conventional) geopolymers. Conventional geopolymer was prepared by mixing 80 wt.% fly ash, 20 wt.% slag and alkali solution. Borax was used as additives (1 and 2 wt.%) and mix with conventional geopolymer to produce modified geopolymer. All geopolymers were aged at 29°C for 28 days before exposure to elevated temperature (200°C – 1000°C). The increase in the borax dosage looser the microstructure of conventional geopolymers, and increased the water absorption and apparent porosity of conventional geopolymer between 29°C to 1000°C. Even so, the higher porosity was beneficial to the thermal performance of modified geopolymers compared to conventional geopolymers. This was because borax provided alternative moisture escape paths and resulted in no damage to the geopolymer structure. The increase in the borax content reduced the bulk density loss, while increased the crystallinity, additional B-crystals and B-O bonds of conventional geopolymers, resulting in better compressive strength in 2B-modified geopolymers (41.5 – 47.6 MPa) compared to 1B-modified (37.7 – 45.0 MPa) and conventional (36.0 – 43.1 MPa) geopolymers. Modified geopolymer matrix was mainly anorthite at 800°C, which could be classified as anorthite ceramic. Yet, based on the obtained bulk density, the modified geopolymers belonged to porous anorthite ceramics. Nevertheless, the porous anorthite ceramics could be produced at a sintering temperature of 800°C, which was lower than the porous anorthite ceramic produced by conventional method as the conventional porous anorthite ceramics were usually produced at temperature above 1200°C. In short, decahydrate borax was successfully used as a flux and a foaming agent in the production of geopolymer.

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