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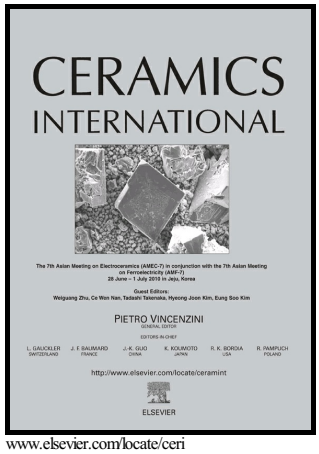

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Fibre-reinforced boroaluminosilicate geopolymers: A comparative study

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Abstract:

This paper investigates the effect of fibres on the physical and mechanical behaviour of boroaluminosilicate geopolymers (BASG) compared to conventional aluminosilicate binders. The use of various types of fibres by the means of reinforcing geopolymers against flexural loads is very common. In this work, fly ash and ground granulated blast furnace slag (GGBS) are utilised as raw materials to generate geopolymer specimens. Different alkaline solutions comprising sodium hydroxide, sodium silicate, and borax are prepared to activate precursors. The sodium silicate solution is substituted with borax by 30 wt% and 70 wt% in order to produce fly ash and slag-based BASG respectively. Steel and polymer fibres are employed in the mixtures for reinforcement. Three-point bending and mini slump tests are conducted for assessing the flexural strength, elastic modulus, toughness, and flow of geopolymer specimens. A pair plotting interpretation is also used in order to illustrate the patterns. The obtained results indicate that the fly ash-based BASG mortar shows superior flexural strength to the GGBS-based BASG mortar. The flexural strength of fly ash-made aluminosilicate geopolymer declines from 7.3 MPa to 6.4 MPa with an increase in the content of steel fibres from 1% to 2%. Inversely, rising the percentage of steel fibres in the fly ash-based BASG mortar caused a slight growth in the flexural strength of specimens. The polypropylene fibres, when added sufficiently, play a significant role in improving the toughness of fly ash-based BASG and slag-based aluminosilicate mixtures, more than 0.8 and 0.7 J surge in the