PVA FIBER/MATRIX INTERFACE CHARACTERIZATION IN ALKALI-ACTIVATED SLAG/FLY ASH SYSTEM: EFFECT OF SIO_2/NA_2O RATIO

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Bond behavior between fiber and matrix plays crucial role in the nonlinear properties and performance of fiber reinforced composites. However, the available information on the fiber/matrix interface properties in composites made of alkali-activated materials is still quite limited which have hindered the scientific design and production of these materials.

This study presents an experimental investigation for evaluating the bonding characteristics of PVA fiber/alkali-activated matrix interface by performing single fiber pullout tests. Four SiO_2/Na_2O ratios (0.8, 1.0, 1.2 and 1.5) within the alkaline activator were used for mixture preparation to investigate the effect of chemistry of the matrix on the bond performance. All the specimens were tested after 28-days curing. The interface characteristics including chemical bonding energy, interfacial frictional force as well as the slip-hardening properties were determined from the fiber pullout tests. It was found that the chemical bonding energy increased initially and then decreased with increment of SiO_2/Na_2O ratio, indicating an optimal alkaline activation condition at SiO_2/Na_2O ratio of 1.0-1.2. At the same time, the interfacial frictional strength and the slip-hardening properties did not change significantly by increasing the SiO_2/Na_2O ratio. These changes with SiO_2/Na_2O ratios were further correlated with the chemical nature of the reaction products to provide preliminary insight into the interfacial bonding properties of PVA fibers to the alkali-activated slag/fly ash matrices.