

Waste and Biomass Valorization

Comparative Studies of Alkali Activated South African Class F and Mongolian Class C Fly Ashes.

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Abstract

The 7 days compressive strength of alkali activation of class C fly ash from Mongolia (Banganuur fly ash) and class F fly ashes from South Africa (Ash Resources, Ulala) were measured, depending on different waterglass (WG) to sodium hydroxide ratios in the activator. FTIR, XRD and SEM analyses were carried out. It is observed that Baganuur fly ash can be activated sufficiently using NaOH-solution only obtaining highest strength (33 MPa), whereas Ulala and Ash Resources almost fails (<10 MPa). The South Africa fly ash gains, however, around 28 MPa using 50:50% WG to NaOH ratios, where the class C-fly ash becomes a bit weaker (24 MPa). The different behavior is explained by formation of different geopolymer-types of network. In the case of class C fly ash alkali activation without the contribution waterglass is sufficient for the formation of amorphous C–S–H type phases due to the structure directing effect of the high amount of Ca-ions. This effect is lost with increasing the waterglass content. The waterglass effect—on the other hand—enforces the strength development for class F-fly ashes with high Al content instead of high Ca. Here network is formed mainly via preliminary chain formation due to condensation of the waterglass followed by cross-linking the chains via silicate linkages.