

The Influence of Sulphur Slime on the Properties of Alkali Binding Material from Biomass Bottom Ashes

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Alkali-activated materials are potential alternatives for Portland cement. Their use leads to reductions in CO₂ emissions and recycling of various industry by-products. These new alternative binders have a wide range of uses and high technological properties. In the research presented in this paper, the influence of additional sulphur slime powder (as accelerator) was investigated. The biomass bottom ash (BBA) was used as raw material and sodium hydroxide was used as the alkaline activator. The sulphur slime is a by-product in a fertilizer production plant. The samples were prepared with different amounts of sulphur slime; the levels of sulphur slime additive were 0%, 0.5%, 1.0%, 3.0% and 5.0% by weight in the raw material mixtures. Alkali activated binders were mixed and conditioned at a temperature of 60 °C for 48 h, followed by curing at room temperature for 26 days. The microstructure of the material was analysed through scanning electron microscopy (SEM) and the composition of the materials was analysed using X-ray diffraction (XRD) and X-ray fluorescence (XRF) spectroscopy. The compressive strength of hardened alkali activated paste was measured after 28 days. In all cases investigated, the compressive strength of hardened cement paste samples increases with the presence of Sulphur slime powder. It was found that during the hardening process sulphur reacts with sodium hydroxide forming Na₂SO₄ which acts as an accelerator. According to some researchers Na₂SO₄ has shown a significant accelerating influence in the alkali activated binder systems. The optimal amount of sulphur slime in raw materials mixtures was also evaluated.