



Structural Characteristics and Adsorption Properties of Alkali Activated Blends Ashes/Metakaolin

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The aim of this paper is to show the possibility of using waste materials, blends of (wood ash, fly ash, from thermal power plant, and metakaolin) for the production of alkali activated materials that can be used to purify wastewater from different kinds of pollutants such as heavy metals. Heavy metals are toxic, especially cadmium, so they must be removed from wastewater to prevent or minimize contact with the environment and humans. The synthesis of the alkali activated materials was performed by mixing solid precursors with a liquid alkali activator. Two- and three-component systems of wood ash, fly ash and metakaolin (wood ash/fly ash, wood ash/metakaolin, fly ash/metakaolin and wood ash/fly ash/metakaolin) were used as precursor materials. The alkali activator solution was a mixture of sodium silicate solution and sodium hydroxide solution of concentrations (6M and 12M). The characterization of alkali activated materials was studied by X-ray diffraction (XRD), Fourier transform infrared (FTIR) spectroscopy, Scanning electron microscopy and energy-dispersive X-ray spectroscopy (SEM/EDS). XRD measurements of investigated samples showed a characteristic halo between 18° and $35^\circ 2\theta$ with a dominant crystal phase of quartz. FTIR spectroscopy showed that the main vibration band of all investigated samples appeared between 1037-996 cm^{-1} , and corresponds to Si-O-Si/Si-O-Al bands. SEM/EDS analysis was used to determine the microstructure of the samples. The adsorption efficiency of the investigated alkali activated materials for removing cadmium ions from aqueous solution was tested under different conditions: initial concentration of cadmium ions in the range of 20-100 mg/l, pH values from 3 to 7 and mass of adsorbents from 0.02-0.05 g.

Keywords: wood ash, fly ash, metakaolin, alkali activated materials, adsorption, cadmium