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A NEW ADSORBENT BASED ON RICE HUSK ASH AND CERAMIC RESIDUE FOR ACID MINE DRAINAGE TREATMENT

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Abstract

The coal, rice and ceramic industries can release polluting effluents and residues into the environment. This work aimed the use of a new geopolymer based on rice husk ash and ceramic residues to remove acidity, metals and toxicity in Acid Mine Drainage (AMD). The geopolymer was synthesized and its microstructure analyzed before and after its use in the drainage treatment. AMD sample was collected and its pH, Fe, and Mn concentrations, as well as acute toxicity in *Daphnia magna* microcrustaceans, were determined. Drainage was treated with geopolymer in a batch system. The Scanning Electron Microscopy (SEM) analysis revealed heterogeneous surface, low porosity, and acicular structures in the geopolymer. The Energy Dispersive X-Ray Spectroscopy System (EDS) test detected an increase in the percentage of Fe and Mn in the geopolymer after its use in the treatment, suggesting its ability to remove metals. The X-Ray Fluorescence Spectrometry (XRF) detected the oxides SiO_2 and Al_2O_3, which could be involved in the adsorption of metals. The X-Ray Diffractometry (XRD) indicated Thermonatrite and Quartz as the main crystalline phases. Untreated AMD presented high acidity (pH=2.2), significant concentration of Fe (1,208.4 mg L^{-1}) and Mn (15.65 mg L^{-1}) and acute toxicity in *D. magna* (Dilution Factor-DF = 64). The adsorbent caused an increase in the pH (9.0), significant removal of Fe (98.7%) and Mn (98.9%), as well as a reduction in acute toxicity (DF=32). In conclusion, the new geopolymer shows promise in the treatment of AMD and in the valorization of industrial waste.

Key words: acid mine drainage, geopolymer, heavy metals, toxicity

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