

Treatment of Acid Mine Drainage with Fly Ash: Removal of Major, Minor Elements, SO₄ and Utilization of the Solid Residues for Wastewater Treatment

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ABSTRACT

This study constitutes the next series of experiments designed to develop a treatment system of AMD using fly ash as the liming agent and producing solid residues that are stabilized for backfilling either alone or amended with unreacted fly ash or ordinary portland cement. Natural AMD has been reacted with fly ash in a series of batch reactions to produce neutral and alkaline process waters and precipitate out heavy metals and other toxic elements. The fly ash and AMD were mixed in such a way as to produce a predetermined AMD: FA ratio expressed as a percentage of the total mass of the mixture. Concentration of major, trace elements and sulphates (SO₄²⁻) were characterized in the final process waters in an attempt to elucidate the mechanisms and physical-chemical processes responsible for their removal. The results are used to discern which elements are removed from AMD and which are released from the fly ash. In a secondary study, the precipitates collected from fly ash and AMD co-disposal reactions were used in alkaline hydrothermal zeolite synthesis. The results of the first treatment process were compared to that obtained for the decontamination of AMD with zeolites prepared from co-disposal residues, obtained in the secondary study. XRD, XRF, SEM and SEM-EDS were used to characterize and compare the resulting co-disposal solid residues. The treated wastewaters samples were analysed using ICP-MS spectrometry.

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