

Evaluating the Interaction of Coal Ash Leachates with Rock Materials for Mine Backfill Studies

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ABSTRACT

Two different laboratory-based leaching test protocols have been developed to evaluate the chemical interaction between ash, water and different mine-site rock materials, as a basis for assessing the potential environmental impact of using coal combustion products as backfill in mining operations. One was a two-stage serial batch testing program in which leachates from representative ash samples were allowed to interact separately with relevant rock materials under laboratory conditions, intended to duplicate the reactions expected when ash leachate percolates into surrounding rock strata. The other was a single-stage mixed batch testing program where mixtures of the ash and relevant rock samples were extracted with water, intended to evaluate the leachate characteristics expected from interaction of water with an intimate admixture of ash and rock materials.

The concentrations of major and trace elements released from both tests were compared to the concentrations expected from the leaching characteristics of the individual ash and rock samples when tested alone. Lower than expected concentrations of key elements were found in solution after interaction of the ash leachate with the rock samples, indicating that the elements released from the ash in a mine backfill may be significantly attenuated when the ash leachate comes into contact with other rock materials. The extent of attenuation was greatest for those rocks with high proportions of clay minerals (e.g. shales) or iron oxy-hydroxides (e.g. iron-stained sandstones). Rocks with lower clay or iron mineral contents, such as white quartz sandstones, appear to have a lesser attenuating effect.

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