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TVA Kingston Fly Ash Release: Environmental Studies in Progress

Abstract Title:

Geochemical speciation of selenium and other heavy metals in coal fly ash after prolonged submersion in the Emory River at the Kingston Fossil Plant site

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Abstract:

The U.S. Army Engineer Research & Development Center (ERDC) conducted geochemical investigations of the coal fly ash spilled in the Emory River at the Kingston Fossil Plant. Commissioned by the Tennessee Valley Authority (TVA), these investigations were designed to geochemically characterize the fly ash, in order to distinguish any changes or transformations that may have occurred during its prolonged submersion in the Emory River that would promote hazardous release of metals (especially selenium) during cleanup dredging operations. Fly ash samples were collected from the original source pile, the Emory River, and the ash recovery ditch, and brought back to the ERDC laboratory in Vicksburg, MS. C and N profiles showed the ash had accumulated humics from the Emory River. Fly ash manganese reduced to Mn (II) while Fe and other metals changed nominally, with the exception of fly ash selenium, which transformed from mostly selenite (Se(IV)) in the source pile to organoselenium (Se(II)) or thiol-bound forms. A series of extended elutriate tests (EET) were performed by suspending collected samples in background Emory River water and bubbling extensively with either nitrogen (anoxic regime) or air (oxic regime) for 10 days. These tests were designed to push the ash to redox and perturbation extremes to release metals, particularly selenium. Both anoxic and oxic regimes released similarly low concentrations of metals through dissolution driven by the prolonged gas bubbling. For the oxic regime, liquid speciation of the solution phase measured low concentrations of selenite, while on the solid phase,

selenium was dominated by a mixture of selenite and organoselenium. The results show that the fly ash exhibits geochemical stability, but is undergoing kinetically slow transformations while submerged in the Emory River.