

# Testing Mechanisms of Mercury Retention in FGD Products

**William Lee Beatty<sup>1</sup>, Karl Schroeder<sup>1</sup>, Candace Kairies<sup>1</sup>**

<sup>1</sup>U. S. Department of Energy, National Energy Technology Laboratory, 626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236

KEYWORDS: mercury, FGD products, sequential extraction, gypsum, iron oxides

## ABSTRACT

The natural mode of retention of Hg in FGD products is a key issue in the utilization of coal byproducts as environmentally acceptable resources. This is being investigated with a sequential extraction scheme that subjects FGD material to a series of phase-targeted reagents. Mineral phases with the greatest affinity for Hg and the form in which Hg is naturally immobilized can be discovered by observing the amount of Hg mobilized by each successive extracting solution.

The extraction procedure consists of a prolonged water rinse in a continuously stirred tank extractor to dissolve  $\text{CaSO}_4$  followed by a series of batch extractions. These extraction include: a water rinse of the resulting residue to remove any remaining water soluble and loosely sorbed ions, 0.11M acetic acid to target carbonate minerals and exchangeable ions, 0.1 M hydroxylamine hydrochloride to dissolve manganese oxides and hydroxides, 0.25 M hydroxylamine hydrochloride in 0.25 M HCl to dissolve iron oxides and hydroxides, and hydrogen peroxide and 0.1 M ammonium acetate to oxidize organic matter and dissolve sulfide minerals. Analysis of the supernatant after each extraction step includes ICP-OES or ICP-MS for major and trace elemental composition and CVAF for mercury.

Initial results indicate that Hg is associated with two distinct fractions of FGD materials. Although most of the solubilized Hg is extracted by the iron oxide and hydroxide dissolution reagent, ICP analysis suggests an association with clay minerals present in this fraction. The organic matter and sulfide minerals fraction typically yields lower but still significant amounts of Hg.

**Submitted for consideration in the 2007 World of Coal Ash Conference, May 7-10, 2007.**