

# Release of Ammonium and Mercury From NO<sub>x</sub> Controlled Fly Ashes

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## ABSTRACT

One of the goals of the Department of Energy is to increase the reuse of coal utilization byproducts (CUB). This will require both developing new markets and maintaining traditional ones such as the use of fly ash in concrete. However, the addition of pollution control devices can introduce side-effects that affect the marketability of the CUB. Such can be the case when NO<sub>x</sub> control is achieved using selective catalytic or non-catalytic reduction (SCR or SNCR). Depending on site-specific details, the ammonia slip can cause elevated levels of NH<sub>3</sub> in the fly ash. Disposal of ammoniated fly ash can present environmental concerns related to the amount of ammonia that might be released, the amount of water that might become contaminated, and the extent to which metals might be mobilized by the presence of the ammonia.

The objective of this project was to determine the total amount of ammonia released from the ash and if mercury is mobilized in the presence of ammonia. SCR and SNCR are technologies designed to reduce the levels of NO<sub>x</sub> by reaction with ammonia or urea by converting NO<sub>x</sub> to nitrogen and water. Not all of the ammonia is consumed in the process and may be released from the stack or partition to the ash.

This project used sets of ash with the SCR/SNCR both on-line and off-line. Small columns tests were used to determine the ammonia released from fly ash. The ash was leached with deionized water and the ammonia concentration in the leachate was determined with a specific ion electrode. Mercury in the ash was measured using the Milestone DMA-80 and CVAA in the leachate. The tests were conducted by filling a liquid chromatography column with a fly-ash slurry and the drip rate was controlled with the stopcock. To prevent the loss of ammonia 1mL of HCL was added to the containers prior to collecting the samples.

The experiment was done on 27 samples including some matched pairs. The amount of ammonia in the first 100mL of leachate ranged from 0.5 to 400 mg/L. Ammonium was always most concentrated in the first 100 ml of leachate and the total eluted correlated well with this initial concentration. About 75% of the ammonium eluted in the first fraction. Average ammonium concentrations were higher when the SCR or SNCR was on-line. Statistics describing the Mercury and LOI indicate increased LOI and Hg when the control device was

on-line but the high variability in the data makes any conclusion based on average responses tenuous. A weak correlation was found between the percent of LOI and leachable ammonium content of the ash. Ammonia retained in fly ash appears to be present as either an ammonium salt or as a chemisorbed species.

Ammonium appears to be present as an ammonium salt or as a chemisorbed species. Leachable ammonium was normally below 200mg/kg. Most of the ammonium was removed in the first batch of leachate. Mercury in the leachates correlated to neither the amount of leachable ammonium nor to the total amount of Hg in the ash. The strongest correlation was between the decreases in the amount of Hg leached with increased LOI.