

Adsorption of Mercury onto Fly Ash

Karl Schroeder, Mike Schoffstall, and Ann Kim

U.S. Dept. of Energy, NETL, P.O. Box 10940, Pittsburgh PA 15236

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ABSTRACT

Regulating gas-stack emissions of mercury will shift the environmental burden from the flue gas to the solids formed as by-products of the combustion and flue-gas clean up processes. Those coal utilization by-product (CUB) uses that may allow for transport of the mercury into surface or ground water may be jeopardized if the captured Hg is released. For this reason, it is important to understand the chemistry at the CUB-water interface, to be able to predict the environmental fate of the CUB-bound Hg, and to be able to anticipate the effect of additional Hg loads in the CUB material.

Here we present a study of Hg(II) adsorption isotherms. Mercury concentrations relevant to US coals were used. The range included not only currently found Hg loadings but also the maximum attainable if all of the Hg in the coal were to be captured in the CUB. The effect of pH was studied by pre-equilibration of the CUB at the desired pH prior to introduction of a Hg(II) solution of the same pH.

The results indicated that complete equilibrium was not attained, even after one month, although the changes were small. Prior leaching of the fly ash to remove materials soluble at a pH of 2 did not eliminate the problem. Because the trend was toward increasing Hg adsorption at longer times, the measured values may underestimate the Hg retention capacity of the fly ashes. The data were analyzed using the Langmuir adsorption isotherm equation.