

Release of Trace Metals from FBC Ash during Leaching with Acidic Solutions

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During storage or use of fluidized bed combustion (FBC) ash, natural fluids might leach out metals causing water pollution. The By-Product Utilization Team at NETL is studying the leaching of metals from Coal Utilization By-products by simulated natural solutions. In this study, 1-kg samples are leached in 5-cm id by 1-meter columns. Seven solutions from pH 1 to pH 11 are used to simulate natural solutions and industrial effluents. Each column is leached with 230 mL/day of one solution for 30 to 180 days. Leachates samples, collected at 2 to 3 day intervals, are analyzed for sulfate, the alkali metals, aluminum, iron, and manganese. The trace elements antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, nickel, lead, mercury, selenium and zinc are also determined. Because limestone is added to FBC reactors, the ash is more alkaline than that produced by a pulverized coal (PC) fired boiler. Leachates of FBC ash are initially alkaline and only arsenic, chromium, selenium and alkali metals have concentrations greater than analytical detection limits. The FBC ash reacts with aqueous solutions to form a cemented mass that stops liquid flow and prevents additional leaching (before any acid soluble metal is released). Two samples of FBC ash solidified by rainfall were crushed and leached. The concentrations of trace metals in the leachates increased after neutralization similarly to a PC fly ash. However, the peak concentrations of metals in the FBC leachates were only 1/10 to 1/100 of those for a PC ash of similar composition. Also, the FBC ash released metals slower than a similar PC ash.