

Mass Release of Trace Elements from Coal Combustion By-Products

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KEYWORDS: Column leaching, trace elements

ABSTRACT

More than 100 million short tons of coal combustion by-products (CCB) are generated annually. More stringent environmental regulations and increasing costs will discourage placement in landfills, encouraging increased utilization and the development of new uses for CCB. However, the potential release of trace elements from CCB is a continuing environmental concern. A study at the Federal Energy Technology Center is quantifying the release of trace elements from CCB's by a series of column leaching tests. A one kg fly ash sample is placed in each of seven 5-cm by 1-m acrylic columns. The material is leached at a nominal rate of 150 mL/d for 60 days. Leachants include deionized water, synthetic groundwater, synthetic precipitation, and 0.1 N solutions of acetic acid, sodium carbonate, sulfuric acid, and ferric chloride. The leachate is analyzed for antimony, arsenic, barium, boron, cadmium, chromium, cobalt, copper, lead, nickel, selenium, and zinc. Data, as the mass extracted with respect to the concentration in the solid, have been evaluated for 20 fly ash samples. In deionized water, the cumulative concentration of each trace element in the leachate was less than 1 per cent of the amount in the 1 kg sample. In the acidic solutions, the amount of trace element released increased at the lower pH. Only arsenic was released at greater than 1 per cent in the alkaline leaching solutions. Although there were general solubility trends, there was significant variation in the amount of a trace element released for individual CCB samples.