

Soluble Metals in Gasification By-Products

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ABSTRACT

The By-Product Utilization Team at the National Energy Technology Laboratory (NETL) of the US Department of Energy has conducted column leaching tests to characterize the release of various cations, particularly heavy metals, from coal utilization by-products (CUB). The NETL column leaching system, designed to simulate the reaction of granular materials during exposure to natural fluids uses five leachant solutions to cover the acid/alkaline range. The release of metals from the nine samples of residues generated in three coal gasification installations was determined; 1/3 of the samples were alkaline (initially high pH in H₂O) and 2/3 were acidic (initially low pH in H₂O). The acidic samples were those generated from a mixture of coal and petroleum coke. As with pulverized coal (PC) by-products, most cations tended to be more soluble in acidic leachants. The cations Al, As, Be, Co, Cr, Cu, Fe, Mn, Ni, and Pb were slightly (2%-20%) or moderately soluble (20%-65%) in the acidic residues, and the ions Sb and Zn were moderately or very soluble (>65%). For the alkaline gasification samples, Al, As, Co, Fe, Mn, Ni, and Pb were slightly soluble; Ba, Ca, K, Mg, Na, and Se were moderately soluble. Total cation solubility was related to relatively high concentrations in a few of the leachate samples. The maximum leachate concentrations of Fe, Ni and Zn were very high for the acidic gasification samples much higher than from the alkaline samples or from typical PC fly ashes.

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