

Fluid Extraction of Metals from PC Fly Ash

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The National Energy Technology Laboratory has conducted a long term study of the release of metals from coal utilization by-products (CUB). As part of this study, thirty-two samples of Class F fly ash from pulverized coal (PC) combustion boilers were leached with aqueous, acidic and alkaline solutions. The leachate was analyzed for 19 cations including heavy metals. The release of metal ions from fly ash is a complex function of the alkalinity of the ash, the distribution of elements in various chemical compounds or minerals, and the characteristics of the leachant solution, particularly its pH. The fluid extraction of metals can be described in three discrete phases. During the first, the alkalinity of the ash is neutralized, and the release of metal ions, except for Ca, is relatively low. When the pH of the leachate decreases to <7 , the release of metal ions increases by one or more orders of magnitude. It remains at that level until the readily soluble cations are released. Then the rate of cation release decreases by one or more orders of magnitude. Most cations in fly ash are only slightly to moderately soluble at all pH's. Elements, other than those that form oxyanions, tend to be most soluble in acid solutions, and the chemical or mineral matrix for an element is a primary control of its solubility.