Characterization of Acid Leaching Reactions in Coal Refuse/Coal Fly Ash Bulk Blends

W. Lee Daniels[1], Barry R. Stewart[2] and Lucian Zelazny[1]

[1]Department of Crop and Soil Environmental Sciences
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061-0404.

[2]American Coal Ash Association
2760 Eisenhower Ave. Suite 304
Alexandria, VA 22314

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The exclusion of coal fly ash from regulation as a hazardous waste has led to increased interest in returning ash to the coalfields for co-disposal. A column study used coal refuse with high potential acidity (4% total-S), and two ashes with varying levels of alkalinity. The ashes were bulk blended at varying ratios (0, 5, 10, 20 and 33%) with the coal refuse and packed into replicated (n=3) leaching columns. The columns were run unsaturated, and received 2.5 cm of simulated rainfall per week for 165 weeks. The unamended refuse acidified rapidly, producing acidic (pH 1.7) leachates, high in dissolved metals. Columns treated with the low alkalinity ash acidified sequentially over time, releasing significant levels of Fe, Mn, Zn, and Cu to the eluted leachates. Treatments blended with 20 and 33% of the more alkaline ash produced alkaline (pH >8.4) leachates with low metal levels. Examination of solid phase materials from the columns indicated that pyrite oxidation was occurring in all treatments, and a highly significant linear regression was developed to predict acid breakthrough over time based on total alkaline loading to the system. Our data clearly indicated that ash alkalinity and refuse potential acidity must be balanced to insure long term water quality protection from ash/refuse co-disposal practices and that the breakthrough of acidic leachates may take greater than five years under certain co-disposal scenarios modeled in our study.