Geochemistry of Coal Refuse Disposal Alternatives: Results of Kinetic Testing.

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Previous investigations have identified coal processing and refuse disposal areas as a significant source of elevated SO_4^{2-} and Cl^- derived from the weathering of coal waste, which triggered greater restrictions on water quality standards for these facilities to protect aquatic life. This research paper provides the results of a 41-month kinetic test performed to determine the SO_4^{2-} , Cl^- and associated metal leach rates of a simulated coal refuse disposal area. Two refuse disposal options were investigated using 15.2-cm dia. by 63.5-cm high leaching columns: three simulated the conventional method of encasing fine coal refuse in coarse refuse (the control) and three leached a blend of dewatered fine with coarse refuse (co-disposal). This experiment differed from most previous kinetic testing in that a measured amount of compaction was applied to the refuse materials to better simulate mine placement. The experiment validated our hypothesis that co-disposal minimizes the mobilization of SO_4^{2-} and Cl^- from coal refuse disposal facilities. Metal (i.e. Fe, Ni, Zn, and Cd) mobility was minimized by the presence of inherent alkalinity-producing minerals that maintained circumneutral pH conditions in blended refuse columns. In one of the three columns simulating coarse refuse disposal low pH, high metal (Al, Fe, Mn) leachate discharged after 12 months. Na and Cl^- levels are initially high in all columns but declined rapidly as salt flushed from the columns. For example, average year 1 release rates were 30.9 and 3.2 mg/kg-wk., respectively, for coarse refuse columns. Additional field-scale leaching experiments are investigating the scale-factor.