Effect of Leaching Scale on Prediction of Total Dissolved Solids Release from Coal Mine Spoils and Refuse

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Abstract: Coal surface mining in the Appalachian USA coalfields can lead to significant environmental impacts including elevated total dissolved solids (TDS) levels in receiving streams. Column leaching procedures are recommended by many studies for TDS prediction, but many question their applicability to field conditions. The objective of this study was to assess results from a simple column leaching method relative to larger scale leaching vessels (scales) using one coal mine spoil and two coarse coal refuse materials. A non-acidic mine spoil sample from SW Virginia (crushed to < 1.25 cm) was placed into PVC columns (~10 cm x 40 cm) in the laboratory and leached unsaturated with simulated acidic rainfall. The same spoil was also placed into larger “mesocosms” (~1.5 m3) with run-of-mine material and into barrels (~0.1 m3; screened to < 15 cm) under natural field environmental and leaching conditions. Similarly, two coarse coal refuse samples were placed into lab columns and field barrels. Comparative results suggest the column method was a reasonable predictor of TDS release from the coal mine spoil relative to the two larger scales studied. However, there were significant differences at times during the study, including during initial peak TDS elution (1,750 μS cm⁻¹ in columns vs. 2,250 μS cm⁻¹ in mesocosms). Field leaching also produced a distinct seasonal time-lagged EC pattern that was not observed in the columns. On the other hand, significantly different and dissimilar leaching results were noted for the refuse column vs. barrel leachates, calling into question their prediction ability for refuse.

References and Related Publications:


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