

Chapter 8: Leaching Behavior of Elements

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Nine elements and four general chemistry parameters exhibited distinctive behavior during the 14 week test among the five rocks and seven laboratories. The test successfully distinguished weathering characteristics of the five rocks on concentration, flux and leachate composition bases. Solid rock chemistry and mineralogy, mineral solubility, gas pressure, pyrite and carbonate content all combined to influence the rate and intensity of chemical weathering and leachate chemistry. Pyrite content, as represented by sulfur measurements and mineralogical studies described in chapter 5, was one of the most important influences on leachate chemistry. Pore gas composition, including the partial pressure of carbon dioxide (CO₂), strongly influenced the observed solution alkalinity concentrations and carbonate mineral dissolution.

Chemical Concentration

Calcium, magnesium, sodium, potassium, sulfate and alkalinity were typically present as macro constituents (mg/L range) in all samples. Selenium and zinc are present in trace amounts in the rocks, and were usually as micro constituents (ug/L to a few mg/L) in leachates. Iron and aluminum, although major components in the rocks, were present at detections levels or ug/L, for most of the leaching cycle in four rocks. The low concentrations reflect pH and redox solubility controls on these metals. Sample HCS-IN, which produced acidic leachate during the test, leached significant quantities of iron and aluminum.

The rocks leached varying concentrations of the major constituents, and were generally consistent with mineralogical composition. Figure 8-1 shows the concentration distribution at weeks 1 and 14 for calcium, magnesium, sodium, potassium, and alkalinity in the five rocks. Other data for weeks 1 and 14 include sulfate concentration and specific conductance (Figure 8-2), selenium and zinc (figure 8-3), and iron, aluminum and manganese (Figure 8-4).

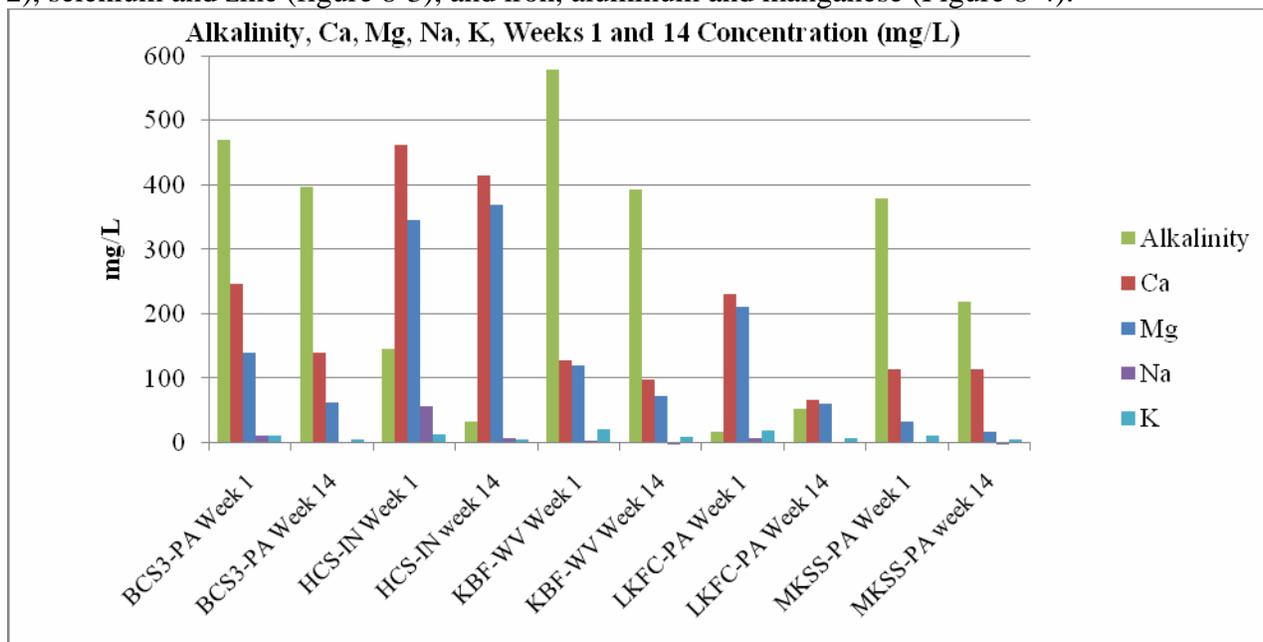


Figure 8-1. Alkalinity, Calcium, Magnesium, Sodium and Potassium Concentrations at Weeks 1 and 14 for 5 Rocks. Values are medians of all labs in mg/L.