Trace elements in leachate

Rocks associated with coal beds may contain a variety of trace elements. The target analytes for the interlaboratory leachate tests included selenium and zinc. Because the geochemical data for the unweathered rocks in Table 5.2 showed variable concentrations of some other trace elements of potential environmental concern, we acquired a comprehensive element suite for the final leachates from one of the participating labs (Table 5.6). Effluent from duplicate columns was analyzed for all samples except KBF-WV; effluent from one column was analyzed for KBF-WV.

Zinc was the dominant base-metal in leachates (Table 5.6). Comparison of total base-metal concentrations in starting materials and leachates (Figure 5.36) indicates that the (1) duplicate columns produced similar base-metal leachate concentrations, (2) total base-metal concentration in leachates were < 10 mg/L for all samples, (3) Houchin Creek shale produced the highest concentrations of base metals in leachate. Although cadmium was below detection limits (0.5 parts per million) in the starting materials, the leachate data show that cadmium concentrations increase linearly with increasing effluent zinc (Figure 5.37). None of the effluents contained mercury above detection levels (6 nanograms per liter). Selenium was detected in concentrations of >5 micrograms per liter in effluent from the Houchin Creek, Lower Kittanning, and Brush Creek shales whereas the Kanawha Black Flint shale from West Virginia had the lowest selenium leachate concentration of all the samples (Figure 5.38). Other elements that can be released upon weathering of pyrite include arsenic and thallium, both of which were detected in all of the leachates.

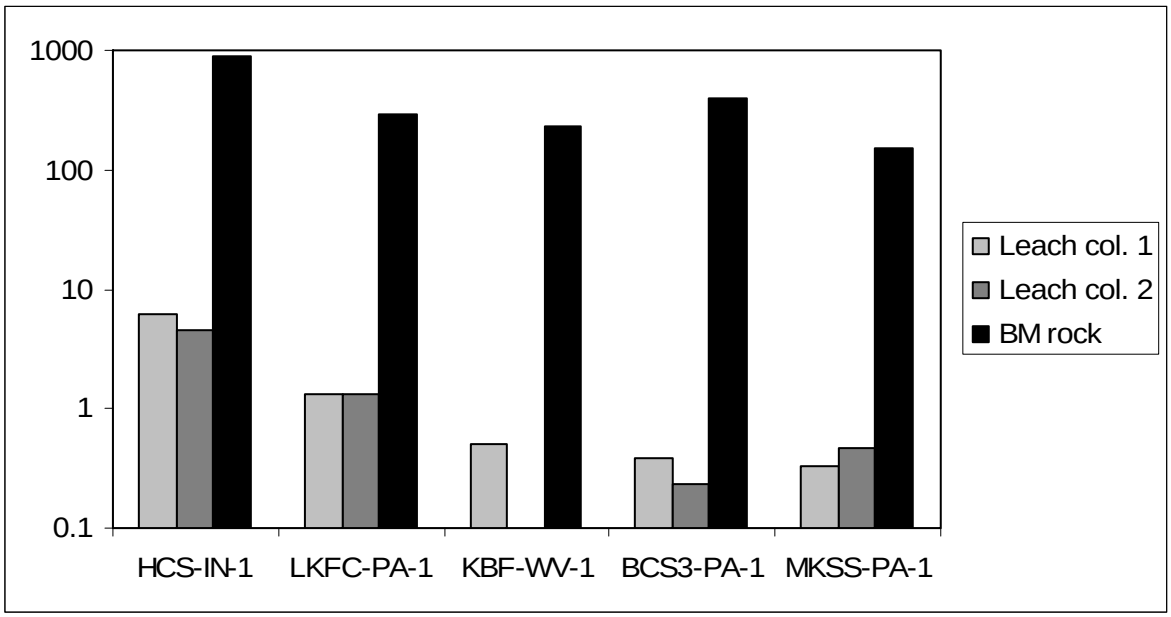

Figure 5.36. Base-metal concentrations in starting materials (BM rock) and leachates in parts per million and mg/L, respectively.