ASSESSING PH VARIATIONS IN DRAINAGE WATER FROM COAL MINES USING FIELD AND AIRBORNE SPECTRAL REFLECTANCE METHODS

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Spectral reflectance measurements are being analyzed for assessing pH variations in mine discharges in the anthracite region of Pennsylvania. Contaminated drainage pH is bimodal: acidic (pH 2.5-4, acidityalkalinity) and near-neutral (pH 6-7, alkalinityacidity). We are developing tools to identify the most acidic contamination for prioritizing remediation efforts. Ground based methods of water chemistry, mineralogy, microbial ecology, and spectral reflectance were compared to airborne digital multispectral video images at two sites. The images are false color composites produced using wavelengths sensitive to iron-bearing minerals and centered at 550 nm (green), 680 nm (red), and 770 nm (infrared). Acidic mine drainage produced yellow-colored solids with schwertmannite; sulfate averages 1,500 mg/L; and microbial community contains schwertmannite-coated rods, cocci, and filaments. The water chemistry computer model, WATEQ4F, indicates that ferric hyroxysulfates will precipitate. The ground reflectance spectrum in the 400-700 nm visible region contains a sharp maximum. Multispectral false color composite images show a yellow tinted color. In contrast, near-neutral mine drainage produces orange-colored solids with ferrihydrite; sulfate averages 87mg/L; and iron-coated stalks of Gallionella are prominent. WATEQ4F indicates that ferric oxy-hydroxides will precipitate. The ground reflectance spectrum in the visible region has a broader maximum compared to the acidic site. Multispectral composite images have a darker, greenish color. The data show that pH has an observable effect from the atomic level to the landscape level so remote sensing can provide proxies for pH where iron is present in the drainage.