

NICKEL, CADMIUM AND SELENIUM LEVELS IN NATIVE SOIL, OVERBURDEN AND SPOIL MATERIALS

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Overburden samples from the high wall were taken from the Big Brown mining site near Fairfield, Texas to evaluate the use of $\text{HNO}_3\text{-HCl}$, $\text{HNO}_3\text{-HC10}_4\text{-HC10}_4$ DTPA-TEA and $\text{HNO}_3\text{-HC10}_4\text{-HF}$ digestion mixtures in the analysis of cadmium (Cd), nickel (Ni) and selenium (Se) for applications to overburden and spoil materials. The $\text{HNO}_3\text{-HC10}_4\text{-HF}$ digestion mixture was selected, because it showed excellent accuracy and precision and was the only mixture which resulted in complete dissolution of the samples. Conventional atomic absorption spectrometry (AAS) was selected for Cd and Ni analyses. Hydride generation atomic absorption was selected for the Se determinations.

The selected methods were applied to native soil, overburden core and spoil materials obtained from four surface mining operations. In general, native soil, overburden core and spoil concentrations of Ni, Cd and Se were not significantly different. Actual individual concentrations of the native soil, overburden and spoil samples ranged from 0.00 to 2.46 ppm Cd, 4.01 to 71.4 ppm Ni and 0.04 and 10.7 ppm Se.

Strong positive correlations were observed between Cd and Ni, Cd, Ni and Se with clay, and Se with total S. Cadmium and Ni concentrations decreased with depth. There was no significant relationship of Cd, Ni or Se with PH in general, but there was with the electrical conductivity.

The levels of Cd, Ni and Se were significantly different over the different geological environments of deposition. Environments with slow deposition of fine materials (backswamp, flood basin, etc.) had the highest concentrations of Cd and Ni, Selenium was highest in the lignite and deposits closely associated with the lignite.

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