Sequential extraction of radioactive metals in soils from Crucea uranium mine (Romania)

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ICP and XRF Spectroscopy methods were used to evaluate the metals (ppm) from soils for the mining dumps of Crucea-Botusana uranium deposit (Bistrita Mountains, Romania).

The sequential extraction has emphasized the fact that U is associated with all the mineral fractions present in the soil samples. A great percentage of U can be found in the carbonate, organic and oxides fractions. The percentage of U detected in the exchangeable fraction is rather small. The fact that 21.77% of the total U can be found in the specifically absorbed and carbonate bound fraction, indicated the important role played by the carbonates in the retention of U; one the other hand this fraction is liable to release U if the pH should happen to change.

Th appear in high-enough concentration in the soil is scarcely available because 70.29% is present in residual fraction, and about 21.78% in the organic and oxides fractions. This is certainly due to the fact that this naturally occurring radionuclide can be associated with relatively insoluble mineral phases like alumino-silicates and refractory oxides. Its association with the organic matter suggests that it can form soluble organic complexes that can facilitate its removal by the stream waters.

In the case of Sr, the sequential extraction shows that it is very strongly fixed because the residual fraction concentrates the great amount of this element. What is interesting is the percentage of 2.65 % of Sr from the exchangeable fraction because it can be easily released and transported to the surrounding environment.

Pb it is present in various relatively soluble pools (17.81% in carbonate boud and 34.85% in organically bound), which appears to be an efficient sink for this element. This fact may indicate a possible link between the biological activity and the Pb cycling into the soil. In addition, only 17.78% is present in the insoluble residual fraction.

Although from our research it resulted that the radioactive metals does not concentrate in the exchangeable fraction (Th) or it concentrates very little in it (U and Sr), the isolation of the mineral fraction of soil rich in U, Th and Sr helps us in the future identification of the connections which control the cycle of the radioactive metals.

These results have important implications for remediation strategies. The thorium and uranium from Crucea mining area are in labile, not strongly retained, fractions, thus making them amendable for remediation by phytoremediation.

Phase decomposition in non-isotropic multi-component systems: The alkali feldspar example

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Phase decomposition in a multicomponent system is considered theoretically. The approach of non-linear diffusion is used and the corresponding system of Cahn-Hilliard equations is systematically derived from the expansion of the free energy. In contrast to the standard Cahn-Hilliard model the possible anisotropy of the system is taken into account. The final equations set is solved numerically using a finite element approach. Realistic approximtions for the free energy are uased. The numerical solutions are finally compared to observations made on naturally exsolved feldspar. Good qualitative agreement is found. The morphology of exsolution phases depends on the composition of the homogeneous precursor feldspar and on the degree of anisotropy. Host-inclusion arrangements are obtained, when the bulk composition is close to one of the spinodal points and a co-continuous morphology is obtained, if the bulk composition is half way between the respective binodal compositions. For feldspar compositions that lie close to the albite-K-feldspar binary, the anorthite component is preferentially fractionated into the albite-rich exsolutions.