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Assessment of geochemical mobility of natural lanthanides, U and Th from a former uranium mine (Bistrita Mountains, Romania)

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XRF and ICP analytical methods was used to evaluate the geochemical mobility of natural lanthanides, U and Th on surface waters from the surroundings of a former uranium mine (Bistrița Mts., Romania). Uranium is the most significant trace element in the river waters nearby the waste rock dumps, sometimes reaching levels up to 1-mg·L^{-1}, well in excess of the Romanian standards limits. The metal release was amplified by mining activities. The concentrations of dissolved Th are quite low, with median values of 0.015- mg·L^{-1}.

A remarkably good correlation exists between dissolved U and the sum of anion concentrations (NO+ CO+ SO+ Cl), indicating that uranium in these stream waters derived mainly from oxidation of uraniferous mineralisation and/or dissolution of carbonates. The pollution degree of the bottom sediments shown that U and Th presents medium and punctual high values, while the rest of the elements presents concentration close to the background values or lowers to them. 71% of uranium from bottom sediments is present as primary fractions and 21% is associated to carbonates. Thorium resulted even more insoluble (94% in primary fractions). In view of the substantial mobility and bioavailability of the fractions, this is not an alarming feature. Among the lanthanides, light and medium lanthanides were identified: La, Ce, Nd and Sm. The average concentration of lanthanides in the sediments in the area is as follows: Ce>La>Nd>Sm.

The measurements carried out in the surroundings of a former Romanian uranium mine show that the impact of mine dumps on water quality of Bistrita River is insignificant.