**Development of a sequential extraction method to assess bioavailability of rare earth elements**

Birgit Daus, Marc Mittermueller, Jessica Saatz

UFZ - Helmholtz Centre for Environmental Research, Department of Analytical Chemistry, Permoserstrasse 15, 04318 Leipzig, Germany, birgit.daus@ufz.de

Sequential extraction methods are used to estimate the mobilisation behaviour of interesting elements from soils, sludge and sediments simulating different leaching conditions. Especially the mobilisation behaviour of heavy metals was in the focus to access the risk potential of contaminated media for many years. Hardly mobile or inertly bound elements pose a lower risk compared to easily soluble fractions. In sequential extraction methods the sample is successively suspended in extraction solutions of increasing strength and the mobilized amount of analytes is quantified.

The development of a novel five step sequential extraction method for evaluation of the mobilisation behaviour of rare earth elements from soils and tailing materials will be presented. These group of elements have a similar chemical behaviour which differ from the heavy metals. The sequence consists of the five fractions 0.05M Ca(NO3)2 (easily soluble and exchangeable), 0.1 M citric acid (mobilization by complexation and carbonate bound), 0.05 M hydroxylamine in 0.05 M HNO3 (mobilized under reducing conditions), and 6.5% HNO3 (acid soluble). (Mittermueller et al., 2015).

Dynamic leaching techniques (with a rotation coiled column device, RCC, Fedotov et al. 2005) were applied investigating the leaching kinetics. The procedure was applied to a certified soil material and a mine tailings material with higher REE concentrations. The different results obtained by using either the developed method or for comparison to the widespread BCR-Method will be discussed. There are clear advantages using the new developed sequential extraction procedure in getting more detailed information about the bioavailable fraction and a fraction which adresses REE phosphates.

References:

Mittermueller, M., Saatz, J., Daus. B., 2015. A sequential extraction procedure to evaluate the mobilisation behaviour of rare earth elements in soils and tailings materials, Chemosphere, submitted

Fedotov, P.S., Wennrich, R., Stark, H.J., Spivakov, B.Y., 2005. Continuous-flow fractionation of trace metals in environmental solids using rotating coiled columns. Some kinetic aspects and applicability of three-step BCR leaching schemes. Journal of Environmental Monitoring 7, 22-28.