# Alteration of arsenopyrite in soils under different tree stands

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Alteration of arsenopyrite (FeAsS) was studied using an *in situ* weathering experiment. Fraction of 200-300 μm of FeAsS was inserted in porous polyamide bags into litter, organic and mineral horizons of soils under Norway spruce (*Picea abies*), European beach (*Fagus sylvatica*) and on unforested sites in Krušné hory Mts (Czech Republic). While all the stands have similar climatic/pollution history and underlying rocks, the soils differ in major chemical parameters (e.g. pH, CEC, base saturation and TOC).

After one year of weathering the bags were collected and the mineral and surrounding soils samples were studied by SEM/EDS, XRD and leaching methods. Scorodite ($FeAsO_4 \cdot 2H_2O$) was identified as the only alteration product of FeAsS at all studied sites and soil horizons.

In soils sampled before experiment, As was mainly bound in the residual fraction. In soils sampled after weathering experiment the speciation of As was as follows: in organic horizons (litter, A) of forested sites, As was equally bound into acid extractable, oxidizable, reducible and residual fraction of BCR sequential scheme. In mineral horizons of forested sites and all horizons of unforested site, prevailing part of As is bound in residual fraction. Weathering experiment increased amount of As in „labile“ fractions of soils.

Amount of scorodite was determined by leaching the weathered FeAsS samples with diluted $HNO_3$ (pH 2) at S/L = 1/10 and analysing of leachates for As, Fe and S. While the S content in the leachates was negligible, the highest amount of As and Fe in leachates were observed for samples inserted in 3-10 cm depth at both forested sites. The bags inserted into soil layers on unforested site had lower amount of produced scorodite and amount of scorodite is increasing with depth.

The result indicate that faster weathering of arsenopyrite in beech stand is evoked by quality and amount of litterfall and seepage conditions of stemflow and throughflow at broadleaved tree stand.

# Uranium transport at the intermediate scale: Micro-scale causes of macro-scale effects

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The use of reactive transport models (RTM) is a powerful tool to describe contaminant behavior within the context of risk assessments for legacy management and nuclear waste disposal. However, the widespread use of RTM is hindered by the twin issues of physical and chemical heterogeneity. Heterogeneity of both sorts can lead to water flow variations and chemical gradients well below a typical model grid cell, but contaminant behavior at a macroscopic level often depends on these sub-grid processes. Thus the question is raised: how are RTM up-scaled from pore scale processes to field scale observed behavior? In this presentation we report on experiments that are taking place at the intermediate scale (between lab and field scales) which are designed to elucidate methodologies to ‘link’ pore- and field-scale processes.

A 3-D intermediate scale tank (2.44 m x 0.61 m x 0.61 m) has been constructed. Sediment from the Naturita Uranium Mill Tailings Remedial Action (UMTRA) site was separated into five distinct size fractions: <2mm composite, <0.250mm, >0.250mm, 125-250μm, and 4-12mm. These five particle sizes were packed in the tank in a manner that would induce a non-ideal flow field. Samples were removed through small sampling wells that were placed in the sediment as the tank was being packed. The samples were analyzed for major ground water ions, pH, alkalinity, and uranium. The uranium outflow and distribution within the tank were found to vary with the nature of the physical heterogeneity and local chemical characteristics.