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# Arsenic-rich smelter dust transformation in contrasting soils: a long-term in situ study

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## Abstract

Smelting industry is an important anthropogenic source of local contamination by metals and metalloids. Especially surrounding soils represent significant sink for dispersed smelter emissions. The purpose of this study was to investigate the long-term (2-year) transformation of As-rich dust from copper smelter in contrasting soils under different vegetation cover using an in situ experimental approach.

The dust, predominantly composed of arsenolite (As<sub>2</sub>O<sub>3</sub>), galena (PbS) and gypsum (CaSO<sub>4</sub>·2H<sub>2</sub>O), was placed in perforated experimental bags and incubated in different depths of four contrasting soils: neutral-to-alkaline Chernozem on loess, neutral-to-slightly acidic Cambisol and acidic Cambisols developed under the beech and spruce forests. Each 6 months, bags were collected and soils and soil pore water were sampled and analyzed. Arsenic speciation analysis in soil pore water was performed by anion exchange HPLC-ICP-MS. Changes in phase composition of dust were determined by XRD and SEM/EDS.

Dust particles were highly reactive in soil systems and their dissolution increased over time (from 4 to 42 %). The highest dissolution leading to As release into the soil was observed in forest Cambisol (up to 1502 mg/kg As in soil and 13 mg/l in soil pore water) due to lowest pH and specific seepage conditions leading to more rapid flush regime. Transport of released As in soils was observed within the closest few centimetres below the experimental bag's position. SEM and XRD investigation indicated that arsenolite was highly weathered and complex Ca-Pb-Cu-Fe-Zn-As-S phase formed as a secondary alteration product.

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