

SUMMARY

The fly ash from secondary lead metallurgy was placed in two different soils in order to investigate the kinetics of release (in a time horizon of 504 h) and mobility of metals/metalloids in soil water and soil. Uncontaminated soils used for the pot experiment were two: acidified forest soil N and agricultural soil H. An experimental bag containing 0.5 g of fly ash was placed in a pot with 200 g of soil, which was watered using deionised water at the 60 % water holding capacity (WHC) level. Using Rhizon pore water samplers the soil solution was regularly sampled and subsequently analysed. The soil solution analysis was supplemented by the geochemical speciation-solubility modelling using the PHREEQC-2 code and the mineralogical investigation of solid phase. For Cd, Zn and As the release in soil water had similar behaviour in time: during first 96 hours of the experiment their concentration increased up to maximum values and then slowly decreased till the end of experiment. This trend has not been observed for Cu, Pb and Sb, being tightly bound to secondary phases newly formed directly in the fly ash or to soil constituents, or indicating possible resistance to leaching. Weight loss after the experiment for the fly ash was in both soils approximately 60 %, indicating high level of its dissolution. Metal release was governed by a number of mechanisms; Cu was mobilised by complexation with DOC, whereas the amount of nitrates influenced significantly the Zn leaching into the pore water. Lead was rather resistant to leaching because its precipitation as newly formed phases directly in the fly ash (anglesite, leadhillite and PbSO_3). During the release of contaminants there was a strong difference between soils N and H, the most obvious for Cd. Although Cd was found in initial soils in relatively low concentration, it was massively released from the fly ash in the soil water and its final concentration in the soil was increasing with depth in the pot. The experiment was designed to simulate the natural leaching conditions in smelter-affected soils and indicated a rapid release of some contaminants (e.g. Cd, As) to soil water and differences in the release of metals/metalloids related to differences of studied soils.