Geophysical Research Abstracts
Vol. 16, EGU2014-6980, 2014
EGU General Assembly 2014

The pH-dependent contaminant leaching from the copper smelter fly ash and slag

Alice Jarosikova (1), Vojtech Ettler (1), Martin Mihaljevic (1), and Vit Penizek (2)

(1) Institute of Geochemistry, Mineralogy and Mineral Resources, Faculty of Science, Charles University in Prague, Albertov 6, 128 43 Prague 2, Czech Republic (A.lik@seznam.cz), (2) Department of Soil Science and Soil Protection, Faculty of Environmental Sciences, Czech University of Life Sciences Prague, Kamýcká 129, 165 21 Prague 6 - Suchdol, Czech Republic

Metallurgical wastes produced during smelting processes represent a potential risk of environmental contamination, depending particularly on the content and mobility of the elements contained. Due to leaching, serious environmental impact especially in contaminated soil systems in the vicinity of the smelting plants may occur. In this respect two potentially hazardous metallurgical wastes from the copper smelter Tsumeb (Namibia, Africa) were investigated by laboratory leaching experiments. The leaching behaviours of (i) Ausmelt slag from Cu smelting (9500 ppm As, 24000 ppm Cu, 10200 ppm Pb, 24500 ppm Zn; mineralogy: glass, fayalite, spinel, metallic/sulphide droplets) and (ii) fly ash from Cu smelter bag house filters (43.7 wt% As, 13000 ppm Cu, 39700 ppm Pb, 20000 ppm Zn; mineralogy: arsenolite, galena, gypsum, litharge, anglesite) were studied using a 48-h pH-static leaching test (CEN/TS 14997). The release of metals/metalloids at a range of pH 3–12, investigation of changes in mineralogical composition and PHREEQC speciation-solubility modelling were used to understand processes governing the contaminant leaching from these waste materials. It was observed that the contaminant leaching was highly pH-dependent. The release of metals from slag corresponded to “L-type” leaching curve with Cu being the key contaminant leached (up to 1780 mg/kg). In contrast, As was highly leached also in alkaline conditions (31-173 mg/kg) and significantly exceeded the limit value for hazardous waste materials in all cases (25 mg/kg). Fly ash was found to be extremely reactive in terms of the As release with a “J-type” leaching curve indicating the highest leaching at pH of 11 and 12 (up to 314 g/kg). Arsenic was considered to be the most important contaminant for both waste materials and its release can represent a risk for the environment, especially in case, where the fly ash- or slag-derived particulates are deposited into the soil systems. This study was supported by the Czech Science Foundation (projects no. 13-17501S and P210/12/1413) and IGCP project no. 594.