

Environmental impact of the weathered Zn-Pb slag heap in Upper Silesia, Poland

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Slags from base metal smelting are often deposited for over 100 years with no barriers between the heap and the surrounding environment. As long-term disposal of slags causes release of metal(loid)s, leachates from such slag heaps may contaminate nearby soils. The soils surrounding the studied heap have high concentrations of potentially toxic elements Zn, Pb and Cd (over 1 wt%, 0.25 wt % and 100 mg/kg respectively), which reflects high concentration of these elements in the slag material (up to 8.6 wt. %, 2.7wt. %, and 600 mg/kg for Zn, Pb and Cd respectively). However, the contamination process is not straightforward. Recent mechanical removal of Zn-Pb slag heaps in Upper Silesia (Poland) led to the exposure of a fine grained and weathered material from the dump interior [1]. It shows that the release of metal(loid)s from the slag heap could happen in two stages: (1) weathering of the primary slag to produce metastable slag weathering zone [1]; (2) further weathering and decomposition of this weathered product. To reconstruct, which of the stages played the role in the soils contamination, we performed one-year long experiments in variable conditions (acid rain, soil solution, with or without pH adjustment). Our results show that the primary slag releases relatively more metal(loid)s than weathered material, despite higher total concentrations of e.g. Zn, Pb and Cd in the latter. This confirms general stability of the weathered material and suggests that the soils were contaminated early after the slag disposal, when the ratio between primary slag and the weathered material was high. Alternatively, the soils are contaminated by air-borne fine grained material from the slag heap, perhaps both primary and weathered with the dominance of the latter.

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[1] Tyszka R. et al., 2014, Appl.Geochem.40, 70-81.