Cadmium rich smelting wastes issued from processing of Zn-Pb ores in Poland (Central Europe)

J. KIERCZAK[1], R. TYSZKA[2], A. PIETRANIK[1]

[1] *University of Wrocław, Institute of Geological Sciences, Cybulskiego 30, 50-205 Wrocław, Poland; jakub.kierczak@uwr.edu.pl, anna.pietranik@uwr.edu.pl*

[2] Wrocław University of Environmental and Life Sciences, Department of Soil Sciences and Environmental Protection, CK Norwida 25/27, 50-375 Wrocław; tyszkarafal@gmail.com

Non-ferrous slags are by-products issued from pyrometallurgical processing of metallic (e.g., Cu, Zn, Pb, Ni etc.) ores. For several decades, due to the high demand for base metals, these wastes are produced in large quantities. Slags may constitute a valuable secondary source of useful substances as they often concentrate considerable amounts of metallic elements. Therefore, research focusing on slags is related to their potential application and/or environmental impact caused by weathering and metal(loid)s release.

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 is classified as Spolic Technosol (Skeletic, Toxic). The exposed, highly altered zone is characterized by high concentration of metallic elements such as Zn, Pb and Cd (up to 8.6 wt. %, 2.7 wt. %, and 600 mg kg^{-1} respectively). Microprobe analyses indicate that Zn is associated with primary zincite, willemite and spinel group minerals and secondary Fe-oxyhydroxides (up to 30 wt. %). Lead and Cd are bound in primary Pb silicates (up to 60 and 3 wt. % respectively) forming presumably at the last stage of slag solidification. Lead occurs in secondary Fe-oxyhydroxides (up to 16 wt %), but no secondary phases containing Cd have been identified by microprobe. However, laser ablation analyses showed that Cd is disseminated in ubiquitous secondary phases. This observations indicate that Cd is highly mobile and as a result of slag weathering it is easily released into solution. The results show that some slag types may be extremely hazardous to the environment and it puts in question they possible re-use as, for example, construction material.

Acknowledgment: This study was funded by the National Science Centre (project UMO-2014/13/B/ST10/01120).

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