

## **Mineral speciation and migration of potentially toxic elements from pyrometallurgical slags from Ruda Śląska, Poland**

RAFAŁ WARCHULSKI<sup>1\*</sup> AND ALEKSANDRA GAWĘDA<sup>1</sup>

<sup>1</sup>University of Silesia, Faculty of Earth Sciences,  
Bedzińska st. 60; 41-200 Sosnowiec, POLAND  
(\*correspondence: rwarchulski@us.edu.pl).

Pyrometallurgical slags environmental impact is currently an object of investigations, although there is a lack of complex studies describing the migration of Potentially Toxic Elements (PTE) from the slags through water and soil to organic matter. Such studies were performed on slags from Ruda Śląska, Poland and included chemical composition of slags, soils, water, organic matter and leaching tests from slags as well. Slags from Ruda Śląska are characterized by various amount of PTEs: Pb from 30 to 24298 mg/kg; As from 0 to 6134 mg/kg; Zn from 30 to 53576 mg/kg; Mn from 879 to 36289 mg/kg. All components of the slags: spinel, olivine, melilite, pyroxene, sulphides and glass are carriers of these elements. Sequential leaching tests with demineralized H<sub>2</sub>O, 1 M ammonium acetate and 0.25 M hydroxylamine proved the high mobility of PTE from analyzed slags. Summarized sequential leach reached up to 3112 mg/kg As, 26 mg/kg Cd, 26434 mg/kg Mn, 18426 mg/kg Pb, 7528 mg/kg Zn. Water sample collected 300 meter from the slag bed shown increased amounts of As (20 ppb), Mn (2711 ppb), Pb (53 ppb) and Zn (163 ppb). Soils show pollution with PTEs: Zn in the range of 507-10000 mg/kg; Pb of 234-9226 mg/kg; Mn from 147 to 3563 mg/kg; As from 20 to 972 mg/kg; Cd from 2 to 175 mg/kg. Leaves of birch-tree (*Betula L.*) show heavy contamination with PTEs. It is especially evident in case of Zn, reaching up to 1157 mg/kg in dry organic matter.

All these facts support the thesis of mobility of PTE during slag weathering and the high environmental pollution caused by both the slags accumulation and their potential use in commercial purposes.