Lead sources in Lower Silesia (S.W. Poland): Isotopic study of soils, basement rocks and anthropogenic materials

R. TYSZKA[1]*, A. PIETRANIK[2], J. KIERCZAK[2], V. ETTLER[3] AND M. MIHALJEVIČ

[1]**Wroclaw University of Environmental And Life Sciences**, C.K. Norwida 25/27, 50-375 Wroclaw, Poland (*correspondence: rafal.tyszka@up.wroc.pl)

[2]University of Wroclaw, Cybulskiego 30, 50-205 Wroclaw, Poland

[3]Charles University, Albertov 6, 128 43, Prague 2, Czech Republic

At present, water and atmosphere is contaminated by heavy metals derived from different sources. The main challenge is to identify these sources and estimate their contributions. In environmental studies isotopic ratios of $^{206}Pb/^{207}Pb$ and $^{208}Pb/^{206}Pb$ are routinely used to track Pb contamination in these sources, because at the first approach, the anthropogenic Pb has lower $^{206}Pb/^{207}Pb$ and higher $^{208}Pb/^{206}Pb$ than the lithogenic one.

In this study we characterize Pb isotopic ratios of various lithogenic backgrounds and anthropogenic materials in Lower Silesia, SW Poland. The area comprises several important mining and smelting sites, mainly of Cu ores, and coal mines. We also provide isotopic data for soil profiles developed on different geological units, in contaminated and uncontaminated sites, in order to characterize interactions between anthropogenic and lithogenic materials in the area.

Samples of basement rock, ore, coal, slag, fly ash and soil were collected from different parts of Lower Silesia. Anthropogenic materials from Lower Silesia have uniform $^{206}Pb/^{207}Pb$ of ca. 1.18 with Pb concentrations varying from 3 to over 10000 ppm. On the other hand, $^{206}Pb/^{207}Pb$ in natural rocks varies from 1.17 to 1.38 and the Pb concentration is generally low, below 30 ppm.

The soil profiles formed on natural bedrock are characterized by increase in Pb concentration from the bottom to the top of each profile, which is correlated with decrease in $^{206}Pb/^{207}Pb$ and are good records of contamination by antropogenic airborne material. The uppermost soil horizons (A and O) contain from 40 to 70% of anthropogenic Pb and deeper horizons may contain up to 10% of anthropogenic Pb. The source of this Pb is best approximated by coal burning.