

## SOURCE IDENTIFICATION USING Pb ISOTOPIC COMPOSITION: CONTAMINATION FINGERPRINTING IN CITY OF OSTRAVA, CZECH REPUBLIC

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### Introduction

Intensive industrial activities, often lead to widespread contamination of the environment with metals and metal(oid)s. Deposition of metals is considered as a major environmental problem as metals are known to have a significant impact on ecosystems (Agnan et al., 2013). City of Ostrava is known for its long tradition in heavy industry, engineering and mining of black coal. There are several large industrial sources directly in the city or in the close vicinity. Using of stable Pb isotopes was proven valid as tool for tracing (“fingerprinting”) of environmental pollution. This method is based on comparison of Pb isotopic composition (e.g.  $^{206}\text{Pb}/^{207}\text{Pb}$ ) in environmental samples and in different Pb sources in the area. Each Pb source has its own specific isotopic composition, thus it is possible to distinguish individual sources of Pb in the environment (Komárek et al., 2008).

### Methods

Samples of snow, lichen (*Phycia tenella*) and PM<sub>10</sub> were gathered on 13 sampling points in city of Ostrava and its surroundings. Samples were totally mineralized. All Pb measurements (isotope composition  $^{206}\text{Pb}$ ,  $^{207}\text{Pb}$ ,  $^{208}\text{Pb}$  and concentration analyses) presented here were determined using ICP-MS (iCAP-Q, Thermo Fisher Scientific, Germany). Correction for mass bias was performed using analyses of SRM 981 (Common lead NIST, USA) after every two samples.

## Results

**Table 1.** Pb isotopic composition in samples of lichen (*Physcia tenella*), snow and PM<sub>10</sub> filters

Sampling site	Snow <sup>206</sup> Pb/ <sup>207</sup> Pb	Lichen <sup>206</sup> Pb/ <sup>207</sup> Pb	PM <sub>10</sub> winter <sup>206</sup> Pb/ <sup>207</sup> Pb	PM <sub>10</sub> summer <sup>206</sup> Pb/ <sup>207</sup> Pb
1	1.176	1.171	1.166	1.175
2	1.179	1.175	1.165	1.171
3	1.173	1.178	1.165	1.166
4	1.167	1.187	1.167	1.167
5	1.197	1.172	1.167	1.166
6	1.174	1.182	1.169	1.167
7	1.232	1.185	1.188	1.166
8	1.190	1.181	1.183	1.167
9	1.214	1.184	1.179	1.166
10	1.204	1.172	1.177	1.167
11	1.189	1.173	1.171	1.166
12	1.177	1.175	1.178	1.167
13	1.165	1.168	1.166	1.166

## Conclusion

Isotopic ratios of <sup>206</sup>Pb/<sup>207</sup>Pb ranged from 1.165 to 1.232 in snow samples, from 1.168 to 1.187 in samples of lichen *Physcia tenella*, from 1.165 to 1.188 in PM<sub>10</sub> filters sampled in winter and from 1.166 to 1.175 in filters from summer. Broad range of isotopic ratios in samples indicates combination of different pollution sources, the strongest among them are metallurgy industry, bituminous coal combustion and traffic. Snow samples were proven as the most relevant medium for tracing metal(oid)s and recent local contamination of atmosphere, respectively. Lichens can be successfully used as traces of long-term activity of local and remote sources of contamination. PM<sub>10</sub> filters are not reliable tool for tracing of local sources of contamination, because they reflect sources related to actual wind direction.

## References

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