Root exudates driven weathering of historical copper metallurgical slags

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Pyrometallurgical slags resulting from historical copper industry have been disposed in Poland for a long period of time. That enabled the weathering processes to go on, especially at dump-soil interface where variety of factors including root exudates and rhizospheric microbes jointly affect the geochemical stability of the slags.

The objective of this study was to simulate the weathering of historical slags under the rhizosphere conditions. The experiments were carried out in a semi open-flow reactor mode with: i) artifical root exudates (composed of sugars and organic acids) and ii) ultrapure water. The solution renewal was fixed at 5 days interval during initial 30 days. The experiments were implemented under sterile dark conditons in order to exclude the contribution of microbial activity to the process. At each sampling time, the leachate composition (including major and minor elements, anions and dissolved organic carbon content) was determined and data was used for geochemical modelling (Visual MinteQ). Experimentally weathered slags were subjected to scaning electron microscopic observations in order to determine the weathering features.

The results of this study demonstrated that long-term slag maintenance under organic acids rich rhizosphere conditions results in weathering of slag phases and subsequent release of metallic elements into the surrounding environment. The next steps of this study aim to explore the effect of microbial activity on slags weathering as well as plant involvement in metal cycling at slag dumping site. This integrated approach is required for the development of appropriate remediation method to be implemented on historical industrial areas.

Acknowledgment: This work was funded by National Science Centre in Poland in the frame of FUGA 5 programme under grant agreement UMO-2016/20/S/ST10/00545.