

## Bioaccessibility of lead accumulated in tailing of lead-zinc mining plant

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Waste ore dressing accumulated in tailings is a source of toxic elements entering associated ecosystems. The main mechanism of toxic elements dispersion is the wind-driven transport of finely dispersed metal-containing particles from the surface area of the tailing. Metal-containing particles fall to the surface of soils and vegetation and can impact human health via direct inhalation or ingestion. Studies of heavy metal bioavailability have critical importance for decreasing the health risks of people living in such areas.

The availability of contaminants to ecosystem components is usually controlled by their speciation. However, for assessment of the associated human health risks is necessary to understand the detailed molecular speciation of the toxic elements.

For this study we used X-ray absorption spectroscopy (XAS) coupled with sequential extractions (Tessier et al., 1979) to determine Pb speciation in tailings of the Sadonsky lead-zinc mining plant (North Osetia-Alania, Russia). Spectroscopic measurements were performed for the industrial grounds as well as for synthetic samples, representing different kinds of lead speciation in the most abundant minerals of mining plant.

An in vitro measure of the physiological solubility of the metal that may be available for absorption into the body was carried out using the Simplified Bioaccessibility Extraction Test for lead (SBET, (US EPA Method 1340)).

The total concentration of lead in samples was 2.69 wt.%. According to our study approximately 60%, 25%, and 15% of lead were presented as carbonates/sulphates (specific adsorption), adsorbed by hydrous oxides of iron and residual respectively. The SBET showed that lead bioaccessibility is 1.73 wt.%.

Thus, most of the lead in Sadonsky tailings occurs in non-mobile forms. However, more than 60% of lead would be bioaccessible in the human's body by entering the digestive tract.

### References

1. Tessier A, Campbell PGC, Bisson M. Sequential extraction procedure for the speciation of particulate trace metals. *Anal. Chem.*, 1979; 51: 844-851 pp.
2. US EPA. (2017) SW-846 Test Method 1340: In Vitro Bioaccessibility Assay for Lead in Soil. Retrieved February 2021 from: <https://www.epa.gov/hw->