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Nov. 2-5, 2014 | Long Beach, CA

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435-6 Zinc Mobility and Speciation in Soils Affected By Mining and Smelting Activities in Minas Gerais, Brazil Using X-Ray Absorption Spectroscopy.

Poster Number 1119

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Wednesday, November 5, 2014

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Zinc contents exceeding regulatory levels have been documented in several areas in Brazil and elsewhere, especially in sites surrounding mining and smelting activities. Zinc is essential for plants and humans, but excessive amounts in soil can adversely impact plant growth. Although the determination of total Zn contents may be of environmental relevance, studies involving Zn release and speciation are key to assess the mobility and bioavailability, and thus the potential ecological risk of such important elements. This study evaluated Zn desorption and speciation in soils affected by Zn mining (soils M1, M2, and M3) and smelting (tailing) activities in Brazil using stirred-flow and synchrotron-based techniques, to better assess Zn availability and mobility in such environments. The exchangeable fraction represented only a small (< 1%) portion of the Zn desorbed from soils from the mining site, while accounting for ~ 80% of the Zn released from tailings at the smelting site. In the mine area, X-ray absorption fine structure (XAFS) showed that Zn was associated with hemimorphite, Zn-ferrihydrite, Zn-phyllsilicates (Zn-kerolite), and Zn-layered double hydroxides (Zn-LDH). This could explain the small desorption of Zn from these soils taking into consideration that these secondary forms (Zn-ferrihydrite, Zn-kerolite, and Zn-LDH) can lead to a significant decrease in the exchangeable/mobile fraction of Zn in the soils. On the other hand, the higher Zn percentage desorbed from the tailing material located at the smelting site could be attributed to the predominance of weakly bound forms of Zn, comparable to Zn(NO₃)₂ (~ 70%), which is an aqueous form of Zn. Sponsored by Fapemig, CNPq, and Capes.

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