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## Distribution and chemical speciation of Pb in agricultural soils near a mine tailing deposit in northwestern México

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### Abstract

Management of industrial residues is a growing concern all around the world. In Mexico and specially in Sonora, mining is one of the most active and economically relevant industries, associated with environmental problems. Mine tailings contain potentially toxic elements (PTE), that are dispersed during long periods of time by erosion and weathering processes of the minerals they are in and suffer chemical transformations, that in turn, mediate the mobilization to other environmental compartments. This study focused on the agricultural soils near the mine tailings in San Felipe de Jesús, Sonora. For this, the presence of Pb in the tailings and agricultural soils was quantified, using inductively coupled plasma mass spectroscopy (ICP-MS) and X-Ray fluorescence (XRF). Physicochemical parameters were measured as indicators of Pb presence (pH, EC, real density). Anthropogenic pollution using the geoaccumulation index (Igeo) was calculated and the parameters were analyzed using geostatistical and GIS software (ArcGIS) to visualize its distribution in the study area. The mineralogy and chemical species were carried out using XRD, scanning electron microscope with an energy dispersive detector (SEM-EDS) and X-Ray absorption spectroscopy (XAS) using synchrotron light. The main results showed that Pb concentrations exceed mexican regulations and concentration maps suggest a possible mobilization by water associated to “El Lavadero” creek and a negative spatial correlation with pH values. Pb rich jarosite was identified and a correlation between Pb and S in oxidized pyrite crystals was observed which may indicate a relation with its mobilization. Additionally, Pb can mainly be found with an oxidation state of Pb<sup>2+</sup>. Agricultural soils and mine tailings contain chemical species of Pb with structures like massicot and galena, with a minor presence of beudantite, cerussite and anglesite like structures. The species associated to its mobility are beudantite, cerussite and anglesite.

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