Tracing metal and metalloid sources using lead isotopes: An example from the San Antonio-El Triunfo mining district, Baja California Sur, México

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Over the years, metals and metalloids from tailings of abandoned mines around the San Antonio-El Triunfo mining district, Baja California Sur, México, have polluted sediments and water bodies. On the other hand, there is evidence to suggest local hot springs as an additional source for contamination in the area [1]. The aim of this study is to identify lead sources by applying lead isotope signatures and to draw conclusions with regard to other metals and metalloids. Samples were taken from sulfides and scoria from the abandoned mines, fluvial sediments from adjacent basins, and rocks with secondary disseminated mineralization. Sediments and whole rock samples were leached with 1N HCl to differentiate between superposed lead and residual lead in mineral structures. Leachate and residua samples were performed separately. Sample preparation and ion exchange chromatography was conducted in cleanlab facilities at Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE). The Isotope ratios were measured with a Thermo TRITON at LUGIS, Universidad Nacional Autónoma de México.

Most of the residua have lead isotope ratios similar to those from sulfides and scoria of the mining district (Source A), indicating that most of the detritus is related to the mineralized plutons. However, there is evidence for an additional detrital component (Source B). Lead isotope ratios from the leachates indicate a different source for the superimposed lead (Source C) which is best explained by contamination with the average Mexican anthropogenic lead [2]. Secondary disseminated mineralization presumably related to younger deep structures (hot springs) has different lead isotope ratios (Source D). Hence, lead isotope systematics is a feasible method to trace sources for metals and metalloids.

[1] Razo *et al* (2004) *Water Air Soil Pollut.,* **152**, 129-152. [2] Martínez *et al* (2004) *J. Atmos. Chem.*, **49**, 415-424.