

Exploring the isotopic signatures of Tin in environmental pollution

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Identifying pollution sources in our environment has become a societal challenge since the industrial revolution. The pollutants emitted into the atmosphere are constantly evolving. Among these pollutants, trace metals are some of the most critical. Developments in technology have led to increased emissions of certain elements, while reducing emissions of others.

At the same time, the development of instrumental techniques has enabled the precise measurement of new elements, making it possible to monitor them in the biogeochemical cycle. Tin, for example, has been used in the manufacture of objects since antiquity, and its emission rate has increased over time. Tin is particularly present in metal alloys, in the soldering of electronic components, as well as in anti-corrosion coatings, and in certain batteries and display technologies. Although tin metal is not very toxic, its organic forms can be harmful to health.

Studies carried out over the last 15 years have revealed differences in the isotopic distribution of tin when subjected to physico-chemical variations, such as evaporation or changes in the redox state. On the other hand, the isotopic distribution is relatively homogeneous within the bulk silicate earth and shows differences with tin ores.

Furthermore, tin is a moderately volatile element. All these factors make tin an excellent candidate for tracing sources of anthropogenic pollution in the environment. However, the biological compartment likely to modify tin into its organic compounds needs to be studied to determine the extent of its impact on tin's isotopic composition. Part of this study of the biogeochemical cycle will be outlined in this presentation, with initial results showing the full potential of this element.