Investigation of using Ni isotopes as anthropogenic source tracer in river sediments: a preliminary study

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In the past decade, high precision Ni stable isotopes of continental rocks and sediments, river and seawater have been studied and significant isotope variation has been reported [1-4]. Recently, Ni isotope fractionation during ore smelting and refining have been demonstrated, showing that slag holds isotopically heavier Ni than the feeding material and fly ash [5]. These studies showed the potential of using Ni isotopes for anthropogenic source tracing in the environment.

As metal pollution in riverine systems poses a serious threat to water and sediment quality, it is of key importance to understand the pollution sources and their fate. Therefore, this study aims to (i) determine the Ni isotopic compositions of two river sediment cores from an industrial surrounded river in northern France and their origin; (ii) assess the movement of the anthropogenic sources in the riverine systems.

We observed that 1) the $\delta^{60/58}Ni_{NIST986}$ values of the surface river sediments and suspended particles ranged from -0.15 ±0.04‰ to -0.04 ±0.04‰. 2) In the sediment cores, significantly different isotope signatures were measured (from -0.09‰ to -0.53‰ with a cluster around -0.36‰). Nearby natural soil dust, slag tailings could explain the excessive Ni of the river sediments. However, further studies of the isotope fractionation mechanisms in the riverine system are needed to better evaluate the anthropogenic source movements by using Ni isotope signatures as tracers.

[1]Cameron et al.,2009,*PNAS* 106,10944-10948; [2]Cameron and Vance,2014,*GCA* 128,195-211; [3]Gall et al., 2013, *EPSL* 375,148-155; [4]Estrade et al.,2015,*EPSL* 423,24-35; [5]Ratié et al.,2016,*APPL GEOCHEM* 64, 136-145.