

Mobility of trace metals between contaminated sediments and river water: an experimental study

N. SHUMSKIKH^{1*}, C. GROSBOIS¹, N. GASSAMA¹, M. DESMET¹

¹ Université François Rabelais de Tours, EA 6293
GéoHydrosystèmes continentaux, 37200 Tours, France
(*correspondence: mykyta.shumskykh@univ-tours.fr)

The aim of this study is to characterize the mobility of trace metals (TM) at sediment-water interface under different physicochemical conditions to assess their potential bioavailability. Several riverbed sediment samples were selected for their high TM content and their contrasted matrix characteristics (grain-size, mineralogy and organic matter mostly). Bulk sediment chemical analyses and SEM observation (identification of TM bearing phases) were used to characterize samples. To determine controlling factors of TM release, time-dependent leaching tests were performed under different physicochemical conditions.

Chemical results show that Ag, Cu, Zn are correlated to TOC. SEM observations demonstrate that TMs were mostly bounded to Fe-oxides. Some samples contained TM-rich anthropogenic phases: Cu, Ni and Zn in alloys (<1-15 μm) and isolated grains of pure Ag (<10 μm) (figure 1). During a leaching experiment under sub-oxic and neutral pH conditions, TM release was very low compared to the high bulk content in sediments (less than 8% of total concentration). Among the five TMs (Cd, Cu, Ni, Pb and Zn) Cu, Zn and Ni seem to be the most mobile. According to the matrix characteristics, Cd and Pb can be soluble but with a lesser extent (<1% of total content). The TM maximum release occurred during the first 24 h. After a stabilization, TM concentrations (and also Fe and Mn) decreased for the next 2 to 3 days. The decrease of TM concentrations seems to be linked to precipitation and adsorption on colloids (newly formed) and/or sediment particles [1, 2].

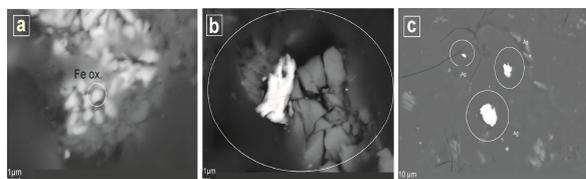


Figure 1: BSE images: Fe-oxide with traces of V and Cr (a); Cu-Zn-Ni alloy (b); anthropogenic Ag (c)

[1] Chatain *et al.* (2013) *Environ. Sci. Pollut* **20**, 51-59. [2] Dijkstra *et al.* (2004) *Environ. Sci. Technol* **38**, 4390-4395.