Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.35106

Quantification and characterisation of mineral nanoparticles in bio-indicators (Dreissenes) by micro-injection spICP-TOFMS

MS. FRANCINE WANG, MARC F. BENEDETTI AND **MICKAEL THARAUD**

IPGP-CNRS UMR 7154 -Université de Paris

Over the last two decades, the emergence of a new potential contaminant, nanoparticles (NPs: size < 100 nm), has raised many concerns about

their impact on human health and the environment. Estimating the flow of NPs in water, their main vector, is therefore essential to assess the

risks and gain a better understanding of their transport and fate. On a large scale, continuous high-frequency monitoring is often difficult to set

up. Bio-indicators, such as bivalve molluscs, can be used as an alternative to integrate the flow of metals in dissolved and nanoparticulate form

[Kraak et al., 1991]. Here, Dreissenes are placed in the Seine over a period of several weeks, allowing the NPs present to accumulate.

For the characterisation of accumulated NPs using single-particle ICP-MS (spICP-MS), a targeted digestion step is required. Enzymatic digestion,

combining pancreatin and lipase, has been shown to be effective in rapidly extracting NPs from organs [Taboada-López et al., 2018]. However,

analysis of the resulting complex matrix often proves difficult via conventional introduction systems [Bings et al., 2014]. The latter are generally

affected by matrix effects, leading in particular to a drastic reduction in signal intensity. We propose here to use an ICP-Time-Of-Flight-MS (Vitesse

- Nu Instrument) in single particle mode associated with a µFAST autosampler (Elemental Scientific) coupled to a CytoSpray chamber equipped

with a CytoNeb nebuliser (Meinhard). This consists in particular in i/ introducing the digestion solution using a µ-syringe for stable and

reproducible injection at a very low flow rate (≤ 10µL min-1) into ii/ a total consumption nebulisation chamber thanks to an high-efficiency

nebulizer for iii/ characterization of the NPs by spICP-TOFMS. Using this innovative approach, Dreissenes from multiple PIREN campaigns were

analysed after enzymatic digestion.