

Investigation of the Paris city contribution to CeO₂NPs and TiO₂NPs in the Seine River by spICPMS and FEG-SEM imaging

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A field investigation was made along the Seine River watershed from upstream to downstream Paris city to survey the occurrence of two engineered nanoparticles (NPs): CeO₂ and TiO₂. single particle Inductively Coupled Plasma-Mass Spectroscopy (spICPMS) [1] and Field Gun Emission-Scanning Electron Microscopy (FEG-SEM) were applied on the river water samples to detect and characterize these NPs.

In the Seine River water, Ce and Ti particle number concentrations increase from upstream to downstream of Paris city. The highest particle number concentration was found in the Marne River, a tributary of the Seine River, with 1.60×10^6 part mL⁻¹ and 6.00×10^6 part mL⁻¹ for Ce and Ti, respectively. This influences the NPs concentrations measured downstream the Marne and Seine rivers confluence, where it increases up to 1.40×10^6 part mL⁻¹ and 4.70×10^6 part mL⁻¹ for Ce and Ti, respectively. Another increase was observed 11 km downstream the Paris city, near a waste water treatment plant (Bougival) where 1.20×10^6 Ce-bearing part mL⁻¹ and 4.60×10^6 Ti-bearing part mL⁻¹ were detected.

FEG-SEM imaging confirmed the occurrence of both Ti- and Ce-bearing particles, with sizes ranging from 0.2 to 5 μm in the suspended matter isolated from the water samples.

[1] Mitrano et al. (2012), Environmental Toxicology and Chemistry 31, 115-121.