Characterization and quantification of engineered and natural nanoparticles in small watersheds with different land use

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The rapid increase of applications of engineered nanoparticles (ENPs) raises several concerns about their fate and toxicity. Their detection, quantification, and characterization is needed. However, is not only the nanosize that limits the application of already developed techniques but also their low concentrations in the environment, *ca.* ppt-ppb levels[1]. An other critical issue, related to the presence of natural NPs in the environment, is the differentiation between natural and engineered nanosized objects.

The objective of this work is to selectively quantify engineered and natural NPs dispersed in natural and complex matrices. The state-of-the-art technique single particle-ICPMS was used to quantify size and concentration of Ag, CeO_2, and TiO_2 NPs in river water samples collected from sub-watersheds, of the Seine river, with different land use. Monthly sampling on these watersheds is performed, to follow the impact of the biogeochemical characteristics of the different sites. CeO_2 and TiO_2 NPs can have both natural and manufactured origins, which will have an impact on the background signal, whereas Ag NP that only has an anthropogenic origin will help us to trace the other manufactured inputs.

The results show that Ag and CeO_2 NPs are present at *ca.* 10 and 50 ppt, respectively, whereas TiO_2 NPs are present at *ca.* 10 ppb, consistent with predicted values[1]. Ag and CeO_2 NPs sizes are in the nano-scale, however, TiO_2 NPs are larger between 100 to 200 nm. Both their concentrations and sizes change as function of the sampling site, as well as of the sampling period. Moreover, among the three rivers sampled, we observed a higher concentration for all types of NPs in the agricultural site. The origin of the NPs, which is still being investigated by evaluating their elemental ratio, will be evidently discussed in the presentation.

[1] T.Y. Sun et al, Environ. Pollut 2014 (185) 69-76.