Holistic Strategy to Study Nanoparticles and Metallic Trace Elements in Surface Waters

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ABSTRACT

Emergent Contaminants (ECs) including nanoparticles (NPs) are preoccupation cause for concern for the scientific community, industrials, territorial communities and the general public. High production volume, potential release from consumer product, environmental exposure, we need to measure the environmental concentrations of NPs and their behavior in natural waters. This is too complicated given the complexity of natural particles and the similarity of Engineering NanoParticles (ENPs) with Natural NanoParticles (NNPs) called here NPs. Thus, we need new methods/protocols dedicated to NPs as ECs which cover the sampling strategy, the analysis and the data valorization using new approaches, theory, paradigms!

Our objective is to propose a global approach addressing the above mentioned concerns conveying: sampling, analysis and concept(s) dedicated to Metallic Trace Elements (MTEs) and Nanoparticles (NPs).

- Sampling: A crucial point due to the representativeness of the samples regarding a water mass (notion of flux) whose matrix integrates organic matter, chemical elements (from the major to the trace) ligands, biological compounds and contaminants such as MTEs and NPs?
- Analysis: Once a representative sample is obtained, how to analyze with minimum artefacts (fractionation, metastable complexes over time, endogenous reaction between the different components, etc.)? What are the basic parameters necessary for understanding the fate of TMEs and NPs in the water column?
- Concept(s): it should be holistic which means able to describe the main scenario allowing for consideration of the parameters controlling the fate and behavior of MTE and NPs.

Holistic approach consists of sampling devices adapted to the target elements, user-friendly, easy to analyze using a dedicated analytical platform that fits the concept of physical chemical speciation.

Key-Words: - Nanoparticle, Metallic Trace Element, NOM, Dissolved, Colloids, Analytic, STEM/X-EDS, DLS, Zetametry, 4F, In Situ Sampling, Speciation, Aggregation, Disaggregation, Surface Waters,.

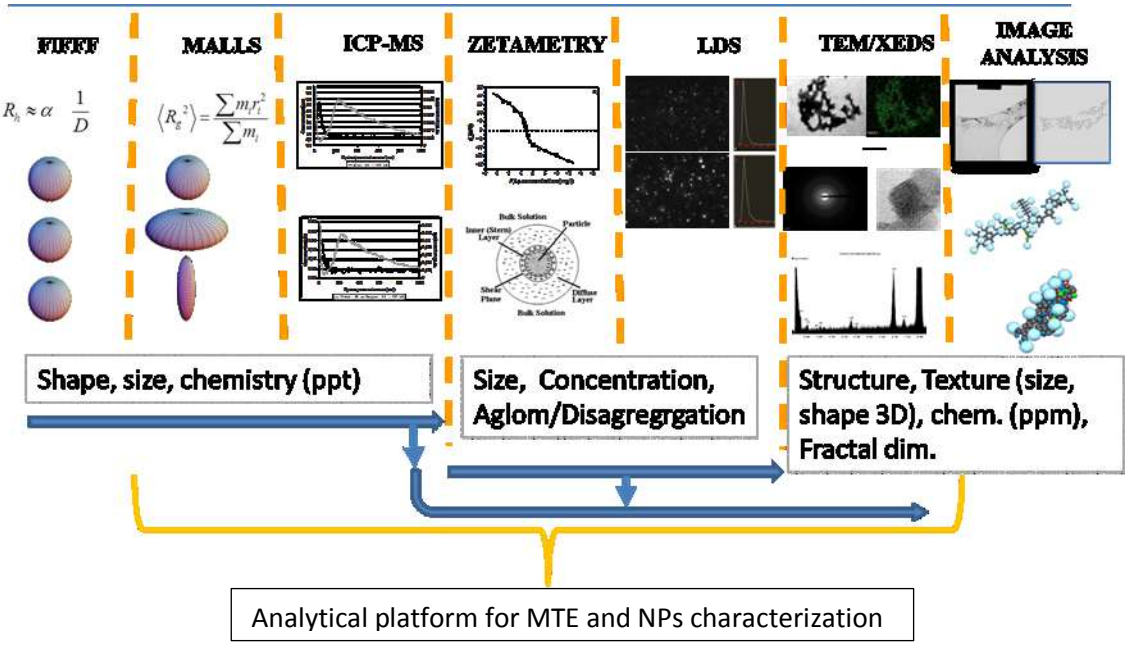

Figure 1: Analytical platform, allowing the determination of the properties of MTE and NPs, to estimate their trends in term of aggregation/dissolution mechanisms

Biography

Philippe Le Coustumer started a scientific career in 1987 (PhD in Physic–Chemistry of Materials, Pau University), as associate professor in Geology at the University of Poitiers (1991) and in Bordeaux university (2000). He obtained his HDR in Earth Sciences (2003); Associate Director of the EA 4592 laboratory (2010-2014). Now, he shares his time between two CNRS laboratories in Bordeaux and one in Pau University. His skills covered solid and soft material analysis, nanoanalytics of colloids and bio-organic-inorganic materials, water & soil quality management, and waste valorization by dual approach. Involved in normalization (AFNOR, CEN, ISO) he has been nominated at the Committee Audit and Evaluation (CAE) by French authorities in 2015. He provides expertise for some companies (BRGM, CEA, EDF, Horiba, Italcementi, Renault, Schott, Suez, Sumitomo). He was head of European INTAS project in Central Asia (1995 – 2001) and the co-authors of 115 publications, 19 PhD direction, 10 ISO norms. More details are available on: www.researchgate.net/profile/Philippe_Le_Coustumer.

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