Is Asymmetrical flow field-flow fractionation more than a sizing technique?

I. A. Worms[1], V. I. Slaveykova[1]

[1]Environmental Biogeochemistry and Ecotoxicology, Institute F.-A. Forel, Earth and Environmental Sciences, Faculty of Sciences, University of Geneva, 66, boulevard Carl-Vogt, CH-1211 Geneva, Switzerlan

Flow field-flow fractionation (FlFFF) is well-suited state-of-the-art technique finding growing applications in the separation and size characterization of natural and engineered nanoparticles. The hyphenation of the FlFFF with a very sensitive elemental detection, such as inductively coupled plasma-mass spectrometry (ICP-MS) and single particle ICP-MS, opens novel avenues to explore the interactions of metal-containing forms, e.g. traces metals and engineered nanoparticles, with different abiotic and biotic components in the aquatic systems. Determining the speciation of dissolved trace metals in the complex environmental and biological systems is paramount for the assessment of their reactivity. Some of the recent advances with respect to the understanding of the trace metals and metallic nanoparticles behavior in the aquatic systems by using the asymmetrical FlFFF coupled to ICP-MS will be exposed. With the examples of our own research we will illustrate the capabilities of the AFlFFF-multidetection system (i) to explore metal association, size or molar mass distribution of metal complexes with dissolved and colloidal organic matter; (ii) to characterize engineered nanoparticles and their interactions dissolved and colloidal organic matter, (iii) to explore the interaction of manufactured nanomaterials with intracellular enzymes, (iv) to distinguish between the contaminant forms e.g. dissolved and nanoparticulate.

More than a sizing technique, and thanks to detectors available online, AFlFFF can be considered as a global and integrative tool that give important insights at the nanoscale about the behavior and bioreactivity of the various metal containing forms in complex environment.