« Environmental fate and behavior of nanoparticles in dynamical conditions using reactors-on-a-chip »

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Nano-Bio-Geochemical group

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Duration: 12 monts (extendable 12 additional months)

Topic :
One of the main challenge in the environmental fate studies (liquid and/or porous media) of nanoparticles (NPs) is the limited accessibility to dynamic processes affecting their transport and transformation while being representative of actual conditions. Traditional experiments to model their fate in the environment are performed using static systems (batch experiments), by varying a single parameter at a time (a single salinity, temperature, exposure wavelength, etc. .). Although these experiments provide first fundamental data on the processes affecting NP behavior, they cannot capture all the relevant characteristics of natural environments such as physical-chemical heterogeneities and their spatial-temporal dynamics, characterized by gradients, mixture and the physical specificity of the medium. Recently, new experiments based on microfluidic devices opened a new area to environmental science, to better understand the fate of emerging contaminants, such as nanoparticles, in a dynamic system representative to realistic conditions. We have recently demonstrated in the case of fullerene aggregates that the evolution of the state of aggregation, characterized by size, is totally different depending on the salinity depending on whether the system is static or dynamic (salinity gradient). One of the experimental challenges and objectives of this post-doctoral position will be to develop such specific microfluidic devices associated with in situ characterization methods to assess the representative environmental fate and transportation pathways of nanoparticles.

The candidate must have skills in environmental science, nanomaterials and analytical chemistry.

Please feel free to contact us by email for any questions.