# Post-doctoral position on the

## *Fate and Transport of Engineered Nanoparticles in Soils*

*A two-years post-doctoral position is available within the framework of the French ANR program funded project* ***QUADOS: Elucidating the Effects of Molecular-Scale Physico-Chemical Processes on the Fate and Transport of Quantum Dots in Soils*** *(Ref. ANR-14-CE01-0013-01).*

We are looking for a motivated post-doctoral research scientist to join the Aquatic Geochemistry team at the Institut de Physique du Globe de Paris (IPGP), under the joint supervision of Dr. Yann Sivry and Dr. Alexandre Gélabert. The Institute is located downtown Paris, and provides an internationally renowned research environment (**http://www.ipgp.fr/en**).

## Description

Recent progresses in nanotechnology have led to the development of functionalized nanoparticles (NPs) that are today incorporated in a wide amount of technical applications. Because of their high production volumes associated to a high physico-chemical reactivity, NPs raise major concerns regarding their potential release in the environment (water and soils). Particularly, they exhibit strong redox properties, they are usually composed of toxic elements, and their small size is likely to favor interactions with living organisms.

Many studies have focused on the direct exposure of model organisms to NPs, but only few of them have investigated their fate once transferred into soils, whereas this compartment is considered as the main NPs accumulator system in the environment. Once released in soils, it is hypothesized that NPs will be transported by advection and diffusion, and their fate will be controlled by the presence of organic matter that can stabilize the particles, the existence of bacteria that can complex, breakdown or uptake them, and the abundance of sorption sites available on the mineral surfaces. Hence, critical information regarding the physico-chemical processes controlling the NPs distribution and transformation in soils, as well as the associated kinetics, are still missing to accurately assess the NPs environmental impact.

*The overarching goal of the QUADOS project is thus to decipher how molecular-scale physico-chemical processes, promoted by mineral surfaces, microorganisms and organic ligands, affect NPs (here CdSe/ZnS Quantum Dots, QDs) transport, reactivity and dissolution in soils.*

## Tasks

The responsibilities of the post-doctorate fellow will mainly focus on the transfer dynamics of QDs in soils using flow-through columns, incorporating ferrihydrite coated sands and organic matter (humic acids and microbial exopolymeric substances). QDs retention time and transformations at the column scale will be measured using a combination of analytical approaches: QDs concentration, size, surface properties and association with organic ligands will be investigated in the outflow samples using Flow Field-Flow Fractionation technique (FIFFF) and single-counting ICPMS (spICPMS). In addition, microscopy (TEM, cryo-TEM, FEG-SEM) will be used to monitor changes in QDs morphology during their transport in soil columns, to detect aggregate formation, and define the QDs/minerals modes of interaction. Based on these results, the reactive transfer of QDs through the soil column will be described and modelled.

## Requirements

• PhD or equivalent in Environmental science, Geochemistry, or Chemistry. Extensive experience in at least two of the following topics is highly encouraged: reactive transport, nanoparticles, soil columns, and/or analytical chemistry.

• Ability to work as part of a collaborative multidisciplinary team, to develop project objectives, and to conduct independent research within the overall context of the project.

• Write research papers and publications for submission to international peer-reviewed journals. Communicate and discuss project progresses with members of the project consortium, and present the project results during international scientific conferences.

• The working language will be English. Excellent English oral and writing skills are mandatory.

## Benefits

The grant has a duration of 24 months, with an anticipated starting date in September 2016.

Salary: Dependent on the researcher experience, between 2.028,53 and 2.231,38 Euros NET/month.

## Additional job details

Applications must be submitted by e-mail to sivry@ipgp.fr and gelabert@ipgp.fr with the following subject "*Application for a post-doc position to ANR - QUADOS*".

Application must contain pdf files of:

- Cover letter
- Detailed Curriculum Vitae
- Names and contact details of at least two references
- Copy of degree certificate
- Other documents considered relevant (selection of scientific publications, etc.)

## **Deadline:** August 31st 2016