The Institute for Earth Sciences (ISTerre) at the University Grenoble Alpes, France invites applications for a three-year Ph.D. project focusing on

**Mineral nucleation in nanoporous media**

The nanoporosity of Earth materials controls in large part their reactivity and coupling with environmental processes. It is, for instance, an inherent property of shale gas host rocks and cap-rocks of geological reservoirs used to sequester CO₂. It also influences the permeability of amorphous surface layers formed during chemical weathering of minerals and corrosion of borosilicate glasses used for nuclear waste disposal. The presence of nanoporosity implies that dissolution-(re)precipitation processes occur in nanoconfined environments. Nanoconfinement, for example, plays a specific role in the formation of biominerals, which is characterized by the interplay between organic pore wall matrices and reactive fluids. Fluids in nanoconfined spaces have different properties compared to their bulk fluid counterparts, including degree of water structuring, H-bonding, and ionic diffusion rates. The surface chemistry of pore walls also exerts a strong influence on how fluids interact with them. Thus, the specific properties of both pore fluids and pore walls affect the intrinsic precipitation (nucleation) processes occurring in nanoconfined environments, which is crucial for understanding the temporal evolution of the chemical and structural properties of nanoporous materials. In a broader sense, this research will help to bridge the gap between nanoscale pore properties and continuum macroscale transport phenomena of fluids through geological media.

In this context, the Geochemistry group at ISTerre, through the ANR-funded project "**Dynamic characterization and modeling of coupled structural - chemical - and transport processes: a multiscale approach**", is interested in understanding the control that nanoconfinement exerts on the thermodynamics and kinetics of mineral precipitation processes, and in turn, how these affect macroscopic transport properties.

To achieve these goals, synchrotron-based X-ray and neutron scattering techniques, and advanced electron microscopy and tomography experiments will be employed. These will be coupled to wet chemistry column experiments to gain an overall understanding of precipitation kinetics, mineralogy of secondary authigenic phases, and cation adsorption processes in nanoconfined environments.

The PhD research project will take place in Grenoble (France), in strong collaboration with our partners from ISTO and BRGM (Orleans, France), as well as the ERM consulting company (http://www.erm-poitiers.fr/). The successful candidate will be employed for a period of three years, with a net salary of approx. 1430 €/month, in addition to other benefits (social security and health insurance). Three scientists from the geochemistry group at ISTerre will supervise the work of the PhD student.

We are seeking an outstanding and motivated candidate with a Masters degree in a relevant chemistry, materials science or geosciences discipline. A strong command of the English language (both written and spoken) is necessary. The application file should contain a detailed CV, copies of university grades (Bachelors and Masters levels), a cover letter, and the addresses of two referees. The deadline for applying is Nov. 30th 2018. The successful candidate will be able to start in the beginning of 2019.

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