

Study of cement hydration and alteration using in situ nanoscale X-ray diffraction techniques

The ID11 team at the [ESRF](#) and the Geochemistry team at the [Earth Sciences Institut \(ISTERre\)](#) of the Grenoble Alpes University and the CNRS, are looking for a motivated PhD candidate.

The aim of the PhD project is to provide a unique insight into **cement hydration and alteration processes through the use of in situ X-ray scattering techniques**, that are able to give crystallographic, textural and volumetric information.

The PhD candidate will investigate:

- **Grain textural features** (using time resolved 3D-XRD) during *in-situ* hydration experiments, to gain information about the precise steps limiting the cement hydration reaction.
- **Cement carbonation reactions** (using diffraction tomography) to characterize the formation of amorphous and crystalline phases of calcium carbonate in the pores of cement cores in situ and in a time resolved manner.

The use of X-ray diffraction in combination with volumetric information will serve to characterize possible links between the microstructure and the reactivity of the clinker and cement grains. These experiments will be first-of-a-kind in the cement community, potentially offering answers to long-standing questions about the reactivity of cement materials.

This project is a collaboration between the ESRF (ID11 Beamline, Grenoble) and the ISTERre (Grenoble), in association with some industrial partners. Part of the PhD thesis will be hosted by the ISTERre, Grenoble.

Information may be obtained from Carlotta Giacobbe (tel.: +33 (0)4 76 88 17.54, email: carlotta.giacobbe@esrf.fr) and from Alejandro Fernandez-Martinez (+33 (0)4 76 63 51 97, email: alex.fernandez-martinez@univ-grenoble-alpes.fr).

PROFILE, SKILLS AND EXPERIENCE

Motivated applicants with a degree allowing enrolment for a PhD (such as MSc, Master 2 'Recherche', Laurea or equivalent) in physics, materials science, chemistry, geology or a closely related science are invited to apply. The candidate should have a strong background in physical-chemistry and in programming, and team-working abilities.

English proficiency (working language at the ESRF)

WORKING CONDITIONS

Contract of two years renewable (subject to satisfactory progress) for one year, with a competitive salary at the PhD studentship level. The ESRF is an equal opportunity employer and encourages diversity. If you are interested in this position, please contact carlotta.giacobbe@esrf.fr

Deadline for application: Aug 3rd

Please send a CV, motivation letter as well as the contact details of two referees.