Ce projet est soutenu par le Laboratoire d'Excellence OSUG@2020 (ANR10 LABX56) financé par le programme d'Investissements d'Avenir lancé par l'Etat et mis en oeuvre par l'ANR.

Titre du projet : Nucleation, Growth and Aggregation Behavior of Environmentally Relevant Al and Fe Oxyhydroxide Mineral Colloids (AMICO)

Volet : Recherche

Porteur du projet : Alejandro Fernandez-Martinez

Laboratoires impliqués : ISTerre, ESRF, Universidad de Huelva (Spain)

Bilan du projet

Bilan d'activité *(1 page max)*

The AMICO project has facilitated the acquisition, installation and continuous operation of a Minifors® chemical reactor (INFORS-HT, Switzerland). This reactor is a portable device, allowing its installation in synchrotron beamlines for chemically controlled in situ experiments. It is equipped with a pH, eH, pO_2, and T probes, 4 peristaltic pumps, general gas and O_2 inlets, a temperature controller up to 65°C, and solution level detector and antifoam disperser for bacterial incubation experiments. It has been customized in collaboration with INFORS-HT to prevent the contact of metallic parts with the solution, allowing for extreme pH and eH conditions. It can be operated remotely, allowing its installation and operation in high-energy beamlines with closed hutches.

Two experiments have been performed so far at the high-energy X-ray diffraction beamline ID15B at the ESRF, Grenoble. The experiments were devoted to (1) the nucleation and growth of basaluminite and schwertmannite, two important poorly crystalline solids in Acid-Mine Drainage affected environments, (2) the precipitation kinetics of green rust, a Fe^{2+}/Fe^{3+} mineral formed in groundwater under O_2-poor conditions, and (2) the anionic exchange of sulphate and carbonate by iodine and selenite, two important anionic radionuclides, in the interlayer of aluminum sulfates (AFm), an important constituent of cement. A third beamtime is scheduled at the ALBA synchrotron (Barcelona, Spain) to continue studies on AFm phases.

Future plans include testing it at X-ray absorption spectroscopy beamlines. The reactor is available for its use to the OSUG scientific community.

Illustrations

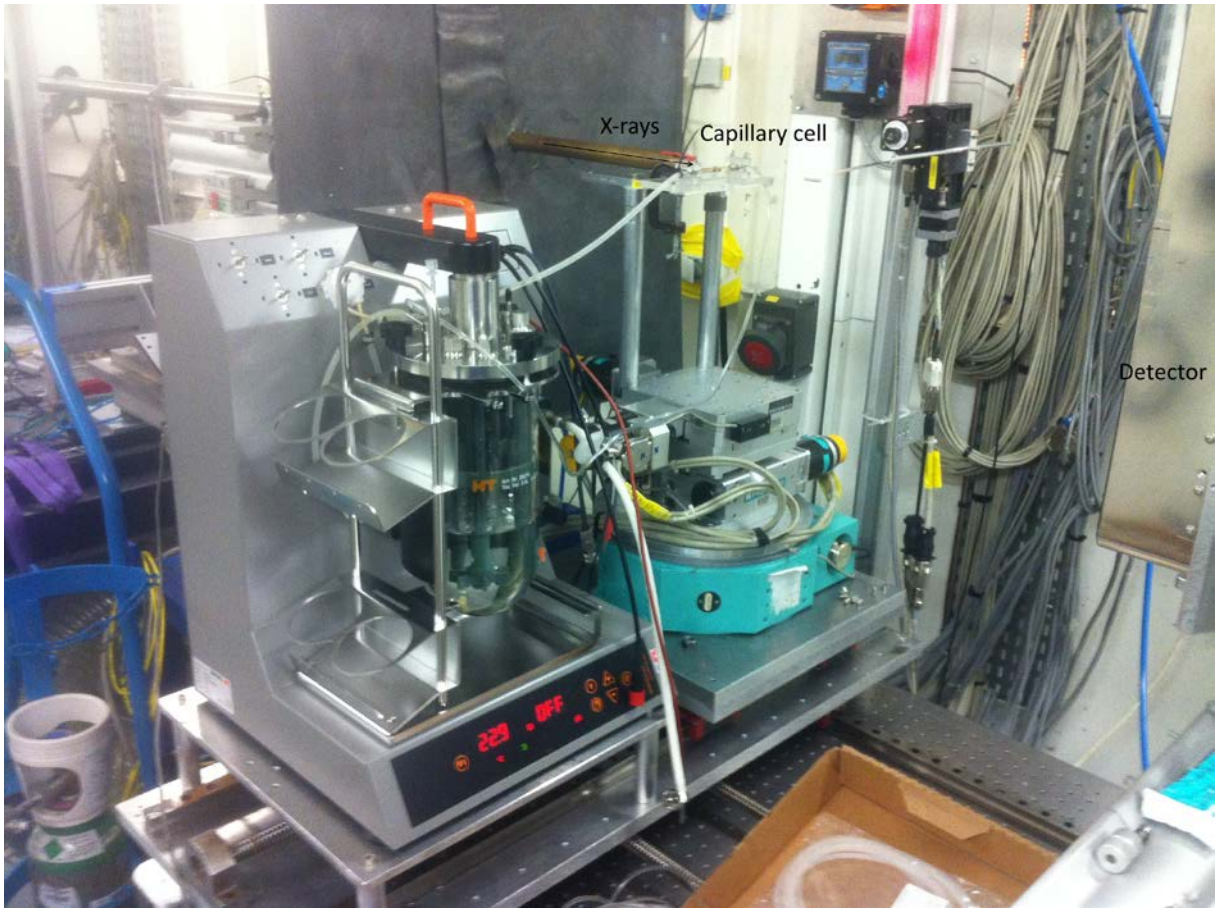

Figure 1. Minifors chemical reactor installed at beamline ID15B (ESRF) for high-energy X-ray diffraction experiments. The reactor is coupled to an observation cell. Credit: Alejandro Fernandez-Martinez.

Production scientifique

- *The role of newly-formed phases in the behavior of contaminants from acid mine drainage*. Sergio Carrero, Rafael Pérez-López, Alejandro Fernández-Martínez, José Miguel Nieto and Agnieszka Poulain. To be submitted to Chemical Geology (December 2014).
- *The structure of basaluminite, a poorly crystalline aluminum sulfate oxyhydroxide*. Sergio Carrero, Alejandro Fernández-Martínez, Daniel Lee, Rafael Pérez-López, José Miguel Nieto and Agnieszka Poulain. To be submitted to the American Mineralogist (February 2014).

Bilan financier succinct

LabEx OSUG@2020

Observatoire des Sciences de l'Univers de Grenoble

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Item	Price (euros)
Minifors chemical reactor + in situ cells	5742.25
Chemicals and consumables	3057.75
Chemical analyses	200
Co-financement ANDRA Minifors chemical reactor + in situ cells	7000
Co-financement ISTerre Minifors chemical reactor + in situ cells	15000