

Titre du projet : Thermogravimétrie et calorimétrie différentielle à balayage : deux outils fondamentaux à l'OSUG (TGA-DSC)

Volet : Recherche

Porteur du projet : Alejandro Fernandez-Martinez (ISTerre)

Laboratoires impliqués : ISTerre, IPAG, IRSTEA

Bilan du projet pour March 2016- Oct 2017

Bilan d'activité

Scientific case

The TGA-DSC has been used as a characterization tool to quantify mainly the water content of different mineral and amorphous solids. The scientific areas range from serpentinization reactions, to amorphous precursors in biomineralization, to organic adsorption onto clay minerals. TGA and DSC curves have been acquired in a range of temperatures, up to 1100°C. New scientific areas will be added to the list later in 2017, with the implication of the IPAG team.

Practical aspects

The TGA-DSC3+ instrument from Mettler-Toledo was installed at the ISTerre laboratory on March 1st 2016. The instrument is integrated in a chemistry laboratory with other solid characterization techniques, such as the gas adsorption and micro X-ray fluorescence instruments. It is managed by the Geochemistry team of ISTerre. The TGA-DSC3+ is integrated in the geochemistry platform of the OSUG.

The instrument has been used moderately (~50 days during 2016 and ~40 days so far during 2017) by users from the ISTerre geochemistry and mineralogy teams. Experiments with IPAG users are planned for later this year (2017) and external users from Germany have shown interest. The user community is therefore formed by ~10 people.

There is no associated technician to the instrument. Most of the experiments were performed by Ph.D. and master students (Geochemistry), and by permanent researchers. Currently, three people are trained and capable of setting up experiments. In view of the future increase in the number of users (end of 2017), a technician from the Geochemistry team of ISTerre will be trained and will supervise some of the experiments.

The maintenance has been assured by Alejandro Fernandez-Martinez (CR1, CNRS, ISTerre). The current maintenance contract will arrive to an end in December 2017. A new contract is being negotiated with Mettler Toledo, including a technical revision every two years.

The instrument has been working without an official fee during 2016 and 2017, with own funds from Geochemistry. A fee of 25 €/ 4 h will be implemented in 2018 to cover the cost of the maintenance contract, the gas bottles and other consumables.

Illustrations - avec légende et crédit (à envoyer également séparément)



Figure 1: Left: General view of the TGA-DSC3+ instrument, with the cooling system (Minichiller, left down) and the gas entries (right side). Right: detailed view of the instrument, with the automatic sample changer (left column) and the touch screen (right).

Production scientifique

- Ayumi Koishi Ph.D. Thesis. « Carbonate Mineral Nucleation Pathways ». October 2017.
- « Nanoscopic dynamics of amorphous calcium carbonate : understanding the mechanisms controlling crystallization kinetics ». Submitted to Angewandte Chim. Int. Ed. 2017

Bilan financier succinct (avec suivant les cas : co-financements éventuels, équipements achetés, missions, recrutements divers, fonctionnements divers...)

- TGA-DSC3+ instrument : 47,113 €
 - o Labex OSUG@2020: 40,000 €
 - o CNRS EC2CO and ANDRA contracts : 7,113 €
- N₂ gaz bottle : 400 €
- **TOTAL : 47,513 €**