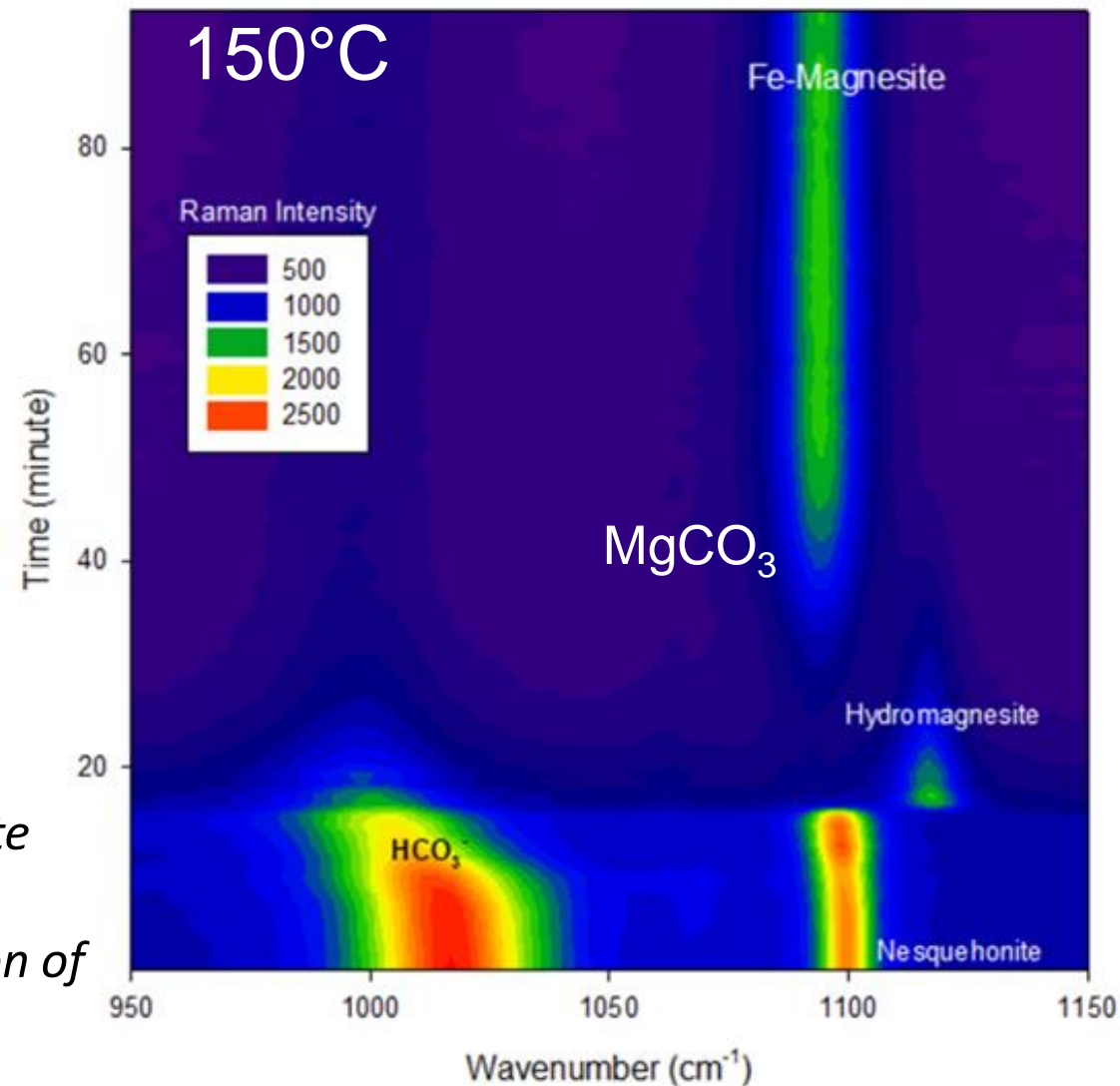


# Experimental setups in Montes-Hernandez Lab

**General Topic:** Nucleation, growth and transformation of minerals and particles under mild and hydrothermal conditions

# Real-time monitoring of gas-solid and/or gas-liquid-solid reactions by Raman spectroscopy

- Up to 300 bar
- Up to 300°C
- Duration: from minutes to weeks
- Time-spectra acquisition: from 3s to hours



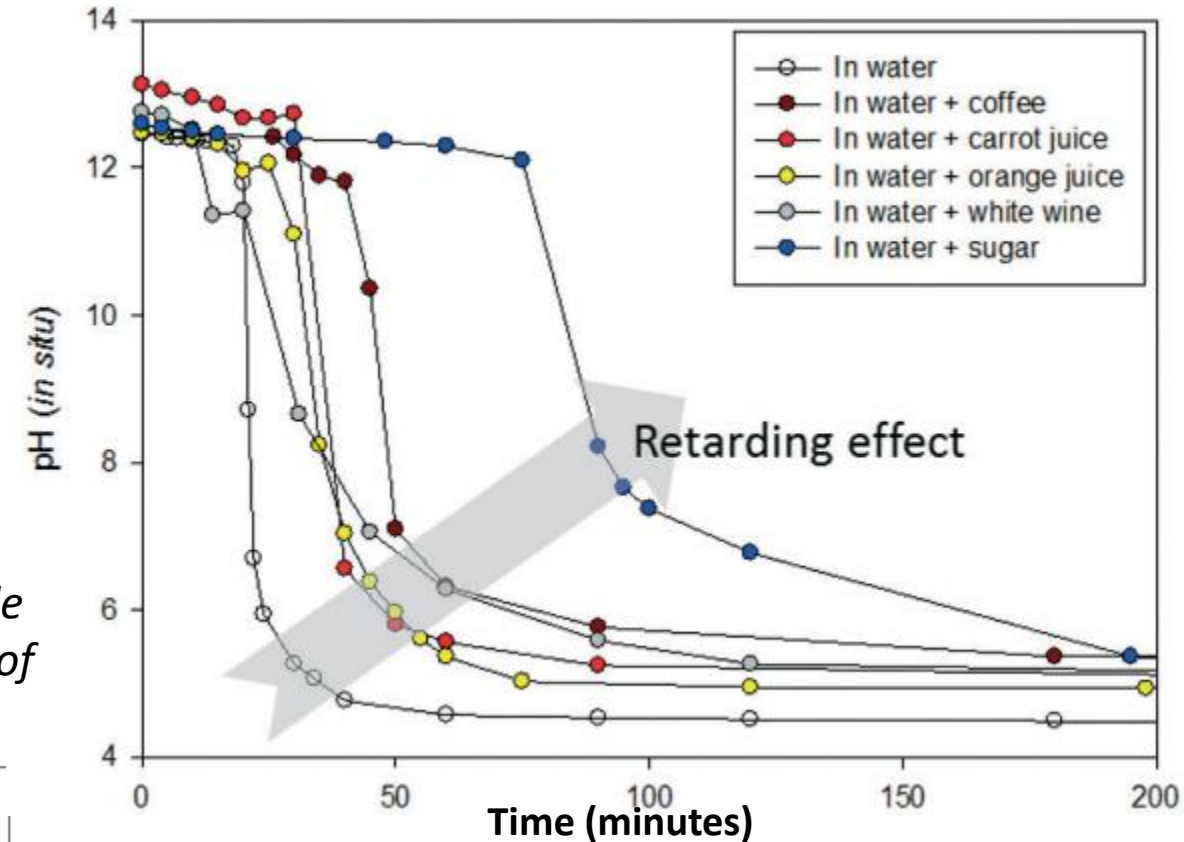
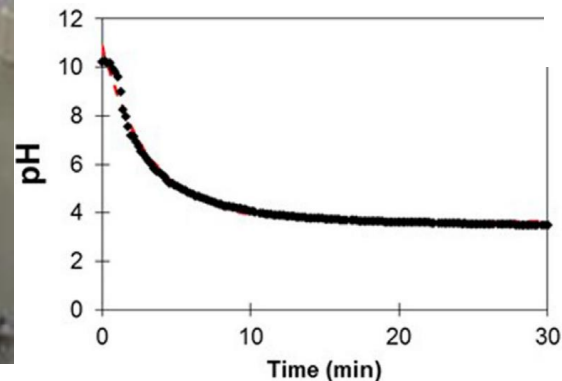
*Example: Magnesite formation from indirect carbonation of peridotite*

# Real-time monitoring of pH in pressured and hydrothermal systems



- Up to 100 bar
- Up to 150°C
- Duration: from minutes to weeks
- Time-pH acquisition: from 1s to hours

*Ex. 2. Direct steel slag carbonation using compressed carbon dioxide (initial pressure of 10 bar of CO<sub>2</sub>)*



*Ex. 1. Calcite formation in presence of organic additives from aqueous carbonation of portlandite at 55 bar of CO<sub>2</sub> pressure...*

# Complementary hydrothermal reactors and ovens for mineral alteration studies and/or mineral synthesis



**3 ovens of 240L for hydrothermal reactions up to 100°C and/or drying of solid materials**



**10 mini-reactors (3ml) for hydrothermal reactions up to 200°C and independent temperature for each reactor**

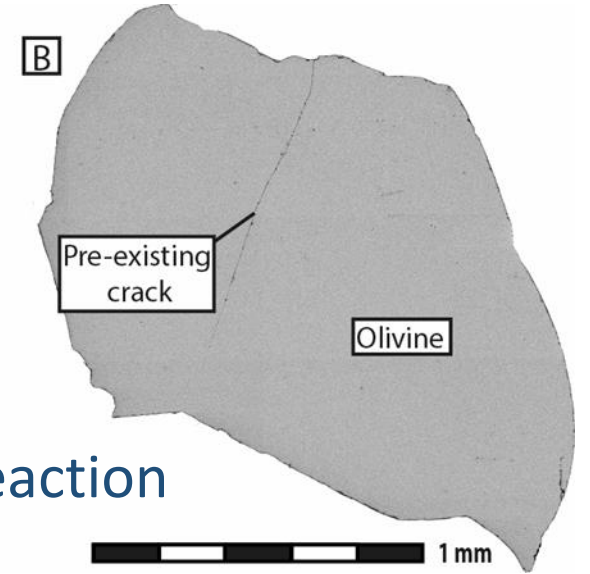


**3 conventional Parr reactors for hydro- and/or solvo-thermal synthesis and mineral alteration:**

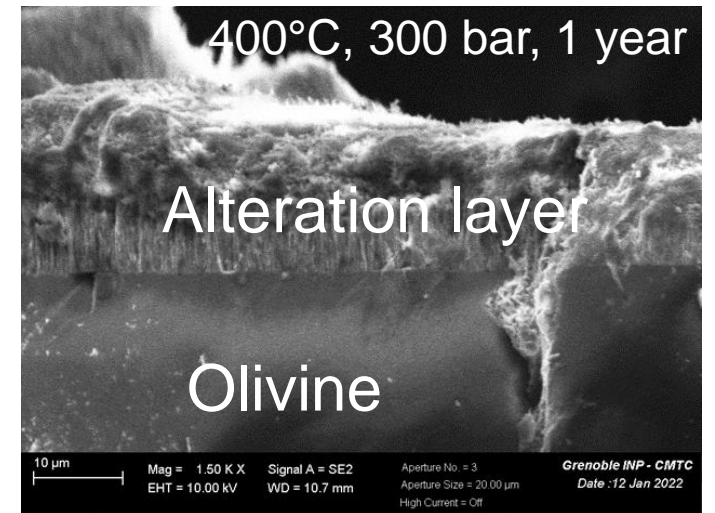
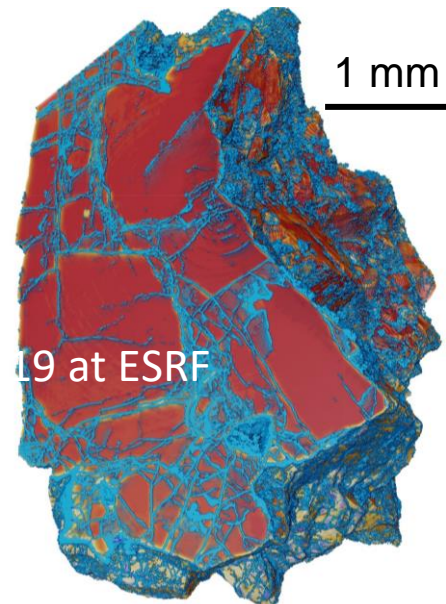
- 2L up to 90 bar and 90°C
- 1L up to 260°C and 70 bar
- 0.3L up to 300°C and 300 bar

# Mineral hydrothermal alteration in tubular reactors under water supercritical conditions

Up to 400°C  
500 bar



Before reaction



# Flowthrough reactors coupled with multi-ionic and pH probes

Room T experiments for pollutant sequestration and mineral precipitation...

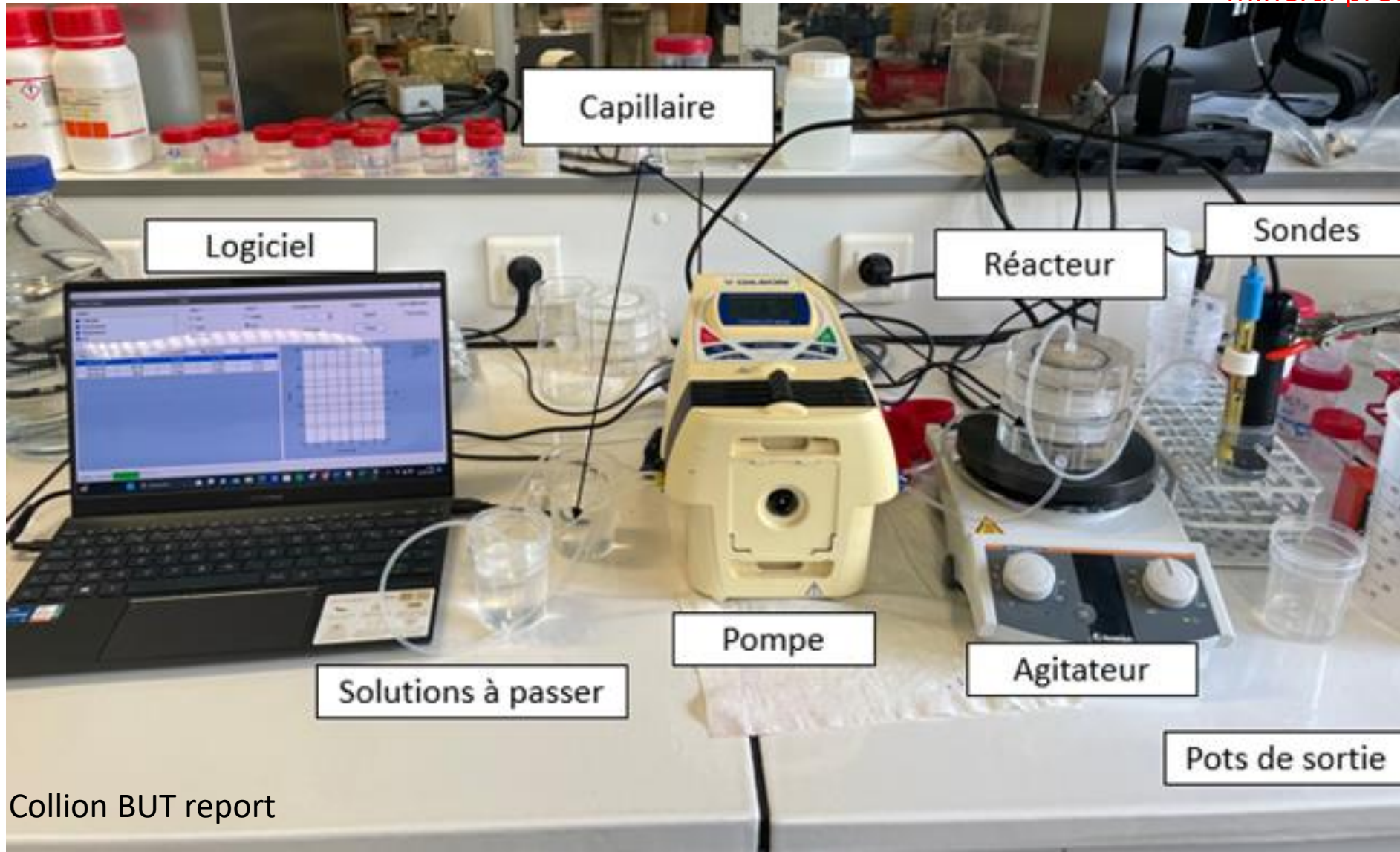
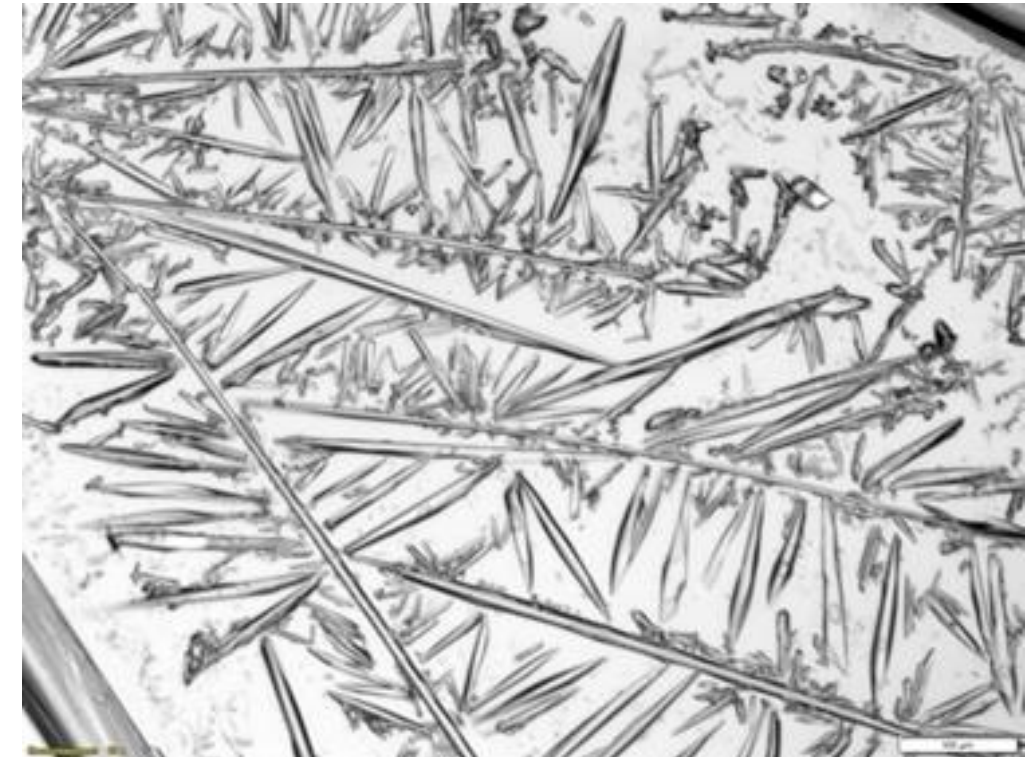


Photo from J. Collion BUT report

# Inverted microscope for crystallization experiments

Microscope Olympus IX70

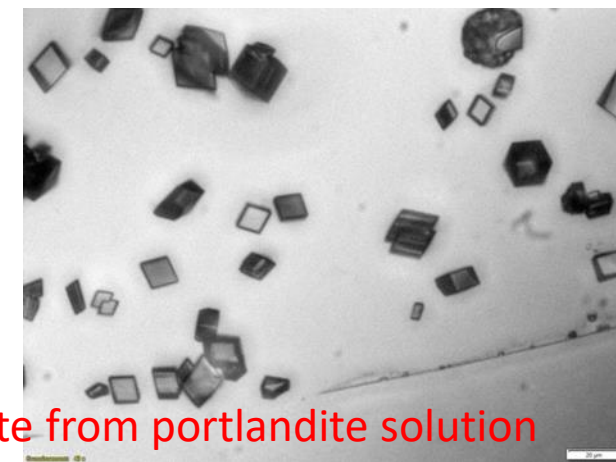
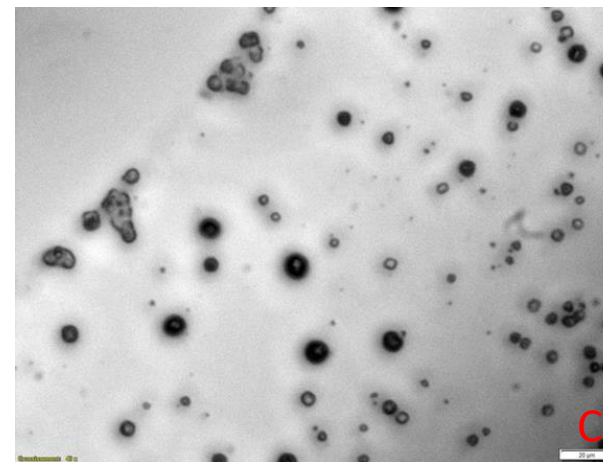
Na<sub>2</sub>CO<sub>3</sub> from soude solution



F-View camera

Crystallization from  $\mu$ -drops ionic solutions and/or by mixing ionic solutions... at room T

Images from S. Marchaland-Le Bihan (L2 and DUT reports)



Calcite from portlandite solution

