Pressurized Quartz Crystal Microbalance Technique

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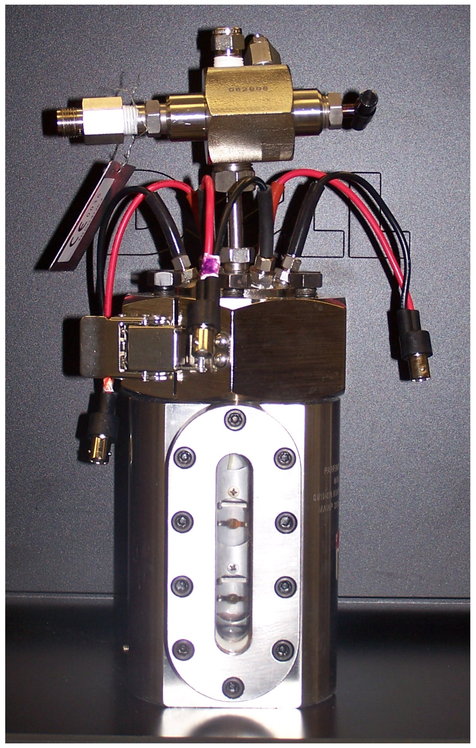
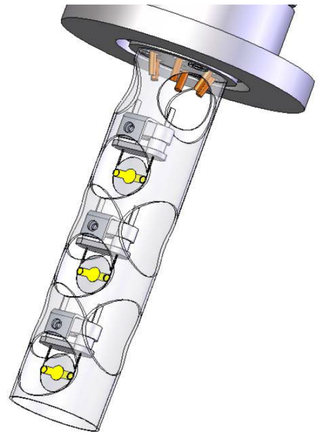
Proudly Operated by Battelle Since 1965

Capability Description

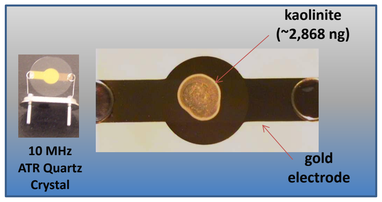
QCM Reactor





Operating Conditions
200 bar
RT to 100°C

Coated Crystal



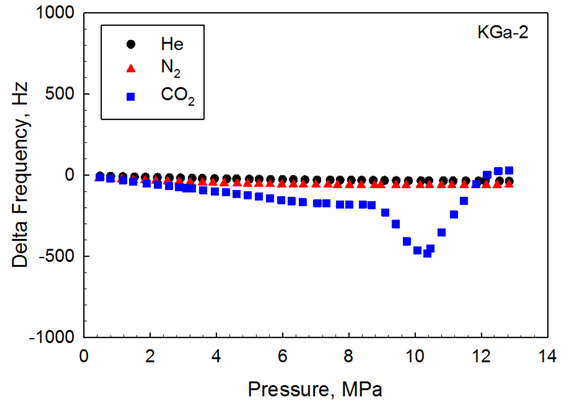
Key Features

- High mass sensitivity for micro weighing in pressurized environments
- Insight into gas sorption and chemical processes at the mineral-fluid interface
- Coupled to other *in situ* capabilities to provide calibration for sorbed gas concentrations at specific conditions

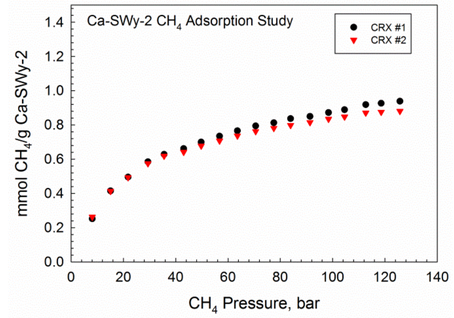
Application

The *in situ* QCM technique, with an ~2 ng resolution, is capable of measuring mass changes occurring to the crystal while exposed to gases at temperatures up to 100°C.

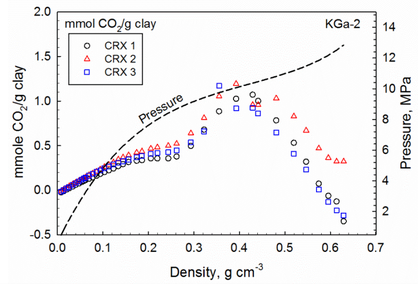
Uncorrected frequency response of crystal coated in clay and exposed to He, N_2, and CO_2



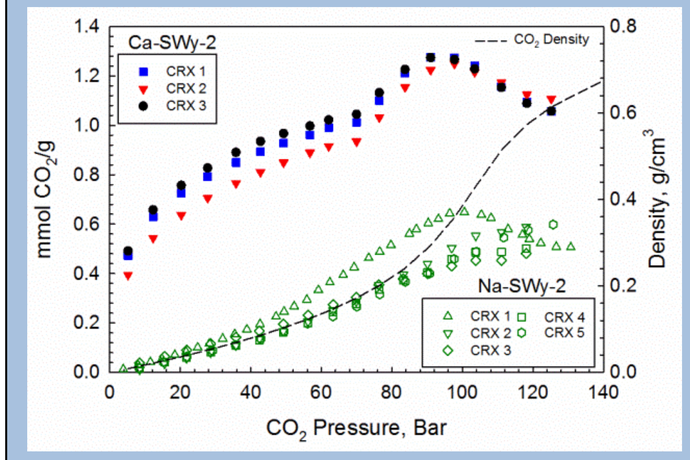
Methane sorption onto natural shale samples



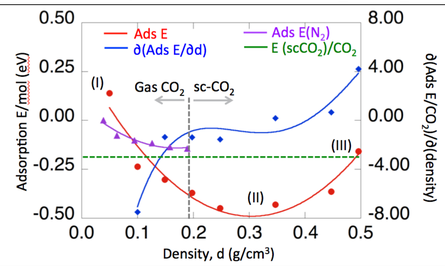
Gas Sorption Behavior: Pressurized QCM measurements (50°C) reveal a peculiar behavior of $scCO_2$. Sorption was nearly linear on kaolinite through the gaseous phase, but increased dramatically in the supercritical phase and peaked at ~10 MPa before desorbing.



Objective: Quantifying interlayer and surface sorbed $scCO_2$ concentrations for swelling clays at reservoir conditions.



Molecular modeling studies indicate a less favorable CO_2-mineral interaction at higher pressures compared to bulk CO_2-CO_2.



Relevant Publications:
HT Schaef, V-A Glezakou, et al, 2014. "Surface Condensation of CO_2 onto Kaolinite", ES&T Letters ,1(2): 142-145.
Schaef, HT, JS Loring, et al., 2014. Competitive Sorption of CO_2 and H_2O in 2:1 Layer Phyllosilicates. Geochimica et Cosmochimica Acta , **under review**.

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