Geophysical Research Abstracts
Vol. 19, EGU2017-12172-1, 2017
EGU General Assembly 2017

Local CO_2-induced swelling of shales

Anne Pluymakers and Dag Kristian Dysthe
Oslo University, Oslo, Norway (pluymakers@gmail.com)

In heterogeneous shale rocks, CO_2 adsorbs more strongly to organic matter than to the other components. CO_2-induced swelling of organic matter has been shown in coal, which is pure carbon. The heterogeneity of the shale matrix makes an interesting case study. Can local swelling through adsorption of CO_2 to organic matter induce strain in the surrounding shale matrix? Can fractures close due to CO_2-induced swelling of clays and organic matter?
We have developed a new generation of microfluidic high pressure cells (up to 100 bar), which can be used to study flow and adsorption phenomena at the microscale in natural geo-materials. The devices contain one transparent side and a shale sample on the other side. The shale used is the Pomeranian shale, extracted from 4 km depth in Poland. This formation is a potential target of a combined CO_2-storage and gas extraction project. To answer the first question, we place the pressure cell under a Veeco NT1100 Interferometer, operated in Vertical Scanning Interferometry mode and equipped with a Through Transmissive Media objective. This allows for observation of local swelling or organic matter with nanometer vertical resolution and micrometer lateral resolution. We expose the sample to CO_2 atmospheres at different pressures. Comparison of the interferometry data and using SEM-EDS maps plus optical microscopy delivers local swelling maps where we can distinguish swelling of different mineralogies. Preliminary results indicate minor local swelling of organic matter, where the total amount is both time- and pressure-dependent.