Experiment title: The relevance of sheet silicate fabric strength and its formation – from a juvenile to an evolved microstructure		Experiment number: ES-1195
Beamline: ID22	**Date of experiment**: from: 22 Nov 2022 to: 27 Nov 2022	**Date of report**:
Shifts: 15	**Local contact(s)**: Ola Gjonnes Grendal	*Received at ESRF:*

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Report:

The proposal included two different sets of experiments which were combined in one proposal. The first one considers in-situ sedimentation experiments and the second one normal diffraction experiments on small drilled rock cores of phyllosilicate-rich rocks. An adjustable experimental setup was provided by the beamline scientist which allowed us to leave the sedimentation experiment in the hutch even when not measured. Two rotational tables were mounted side by side and could be brought into the beam when necessary. Both sets of experiments were performed successfully and will be described separately.

1) Sedimentation experiments

The aim of the experiment was to observe the orientation of clay particles during settling at the sediment-water interface and during the first millimeters of burial and the development over time.

Four different experiments were conducted: pure kaolinite in deionized water, pure kaolinite in sea water, a kaolinite-illite mixture in deionized water and a kaolinite-illite mixture in sea water. Texture was measured at different heights above zero sedimentation level at regular intervals during the sedimentation experiments. Beam energy was set to 70 keV at a sample-detector distance of 1396 mm. For a good spatial resolution in height we used a beam size of 1mm width and 0.5 mm height. A 2D detector plate image consisting of 40 frames of 0.27 s exposure time was recorded on a Perkin Elmer detector and then the column was rotated 30° about a vertical axis to the next measurement position. 2D diffraction images were corrected for background and experimental variabilities. Intensity data from single hkl rings were written to pole figures using the Matlab toolbox MTEX (Hielscher & Schaeben, 2008). An early texture was observed in all samples (Fig. 1). The development of texture strength varies in deionized water and sea water.

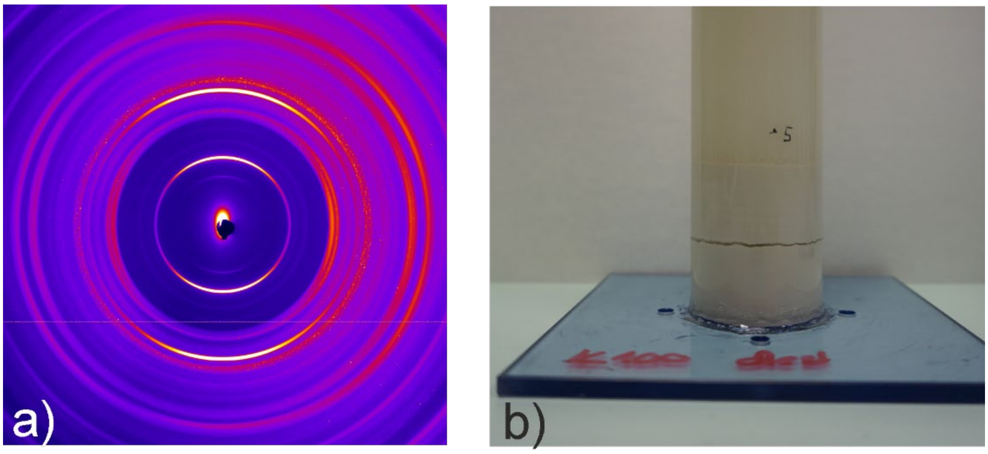

Figure 1) Results of experimental sedimentation a) 2D detector image showing a strongly textured material during one of the pure kaolinite experiments b) sedimentation column after experiment with resulting sample. Crack at the bottom occurred due to unmounting and transport after the experiment.

2) Phyllosilicate textures

The aim of the experiment was to measure the CPO of polyphase, phyllosilicate-rich rocks, to combine this data with macroscopic rock fabric models in order to determine the rock elastic anisotropy. The results will be used in tectonic modeling along a cross-section through the eastern Alps parallel to the new Brenner Base Tunnel.

During experimental breaks of experiment 1), 39 natural phyllosilicate-rich samples have been successfully measured. The experimental setup was the same as for the sedimentation experiments. The only difference is the rotational step during the texture measurements which varied between 5 and 10° for the natural samples. Results show variable texture strength for the samples from the Brenner tunnel which will be interpreted and interpolated in the regional framework. A characteristic pole figure is shown in Fig. 2. Since the samples are polymineralic and therefore more time-consuming to analyze, the analysis is still proceeding. Texture results will be combined with the macroscopic fabric models to calculate bulk rock elastic anisotropies.

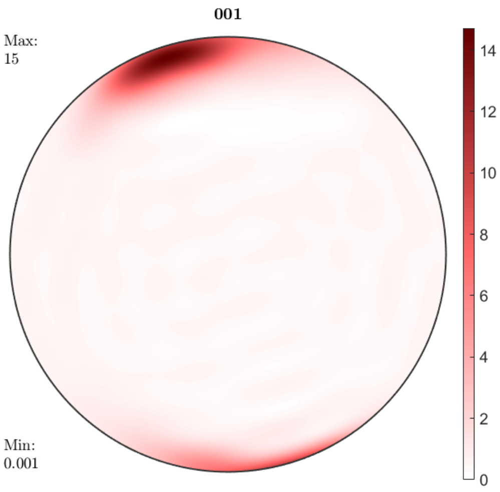

Figure 2) Muscovite (001) pole figure of a Bündnerschiefer sample from the tunnel axis

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