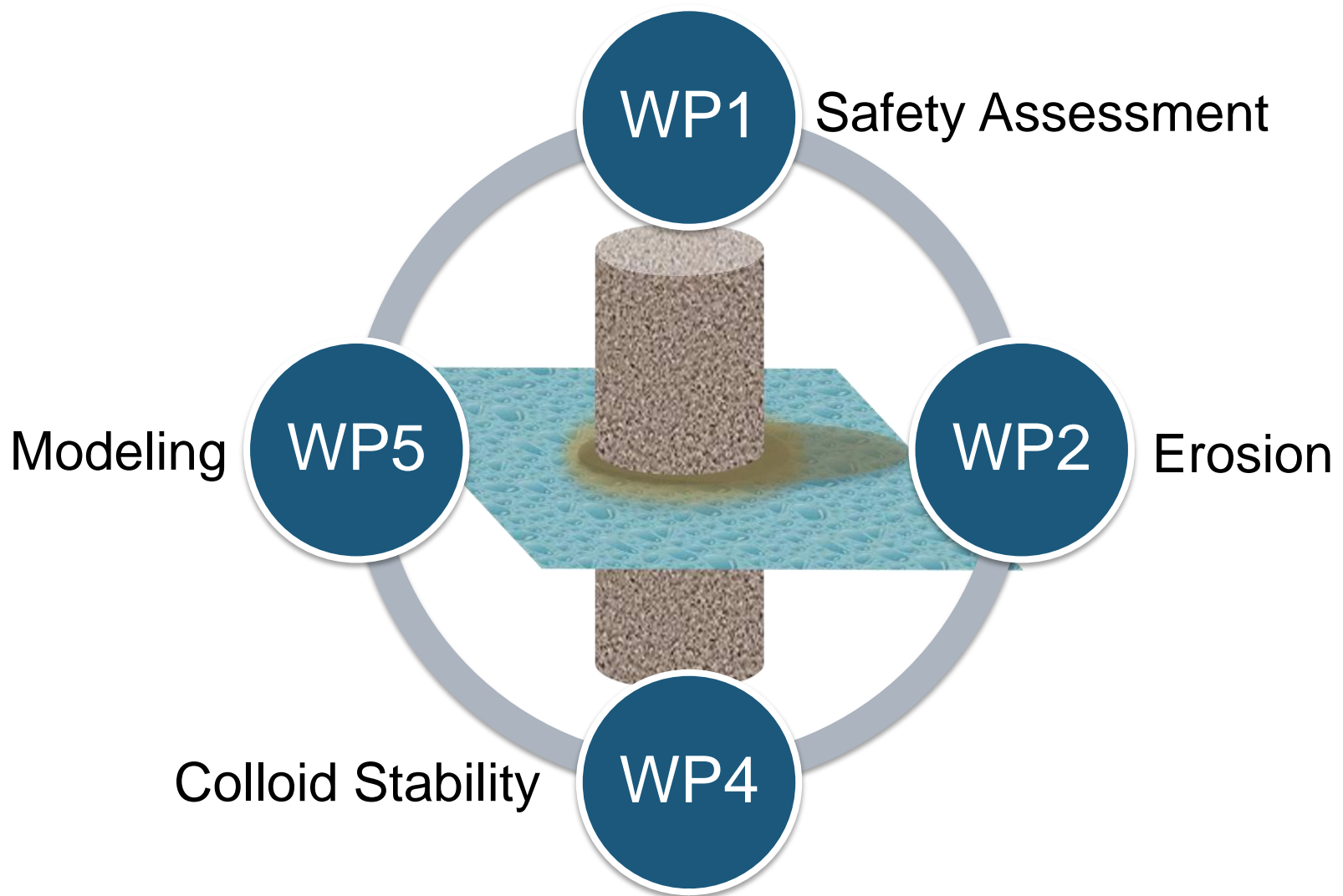




BELBaR Start-up Meeting:
B+Tech Plans

8 March 2012

B+TECH and BELBaR



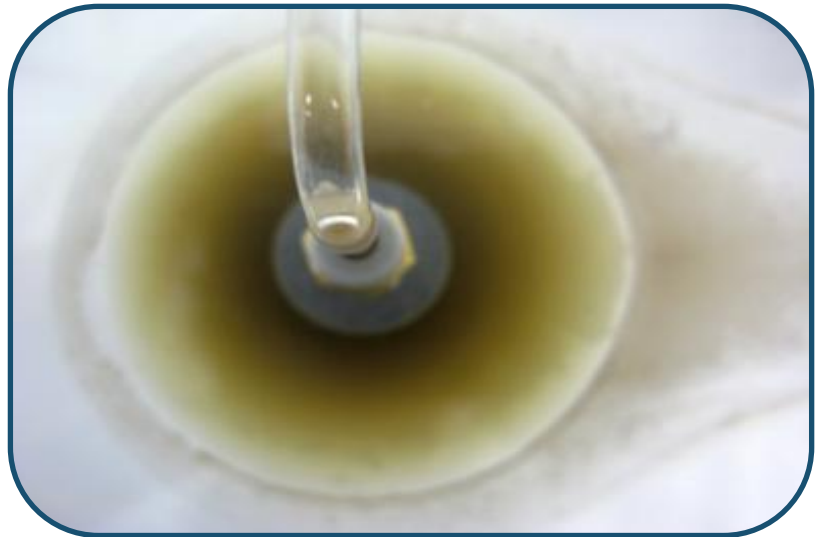
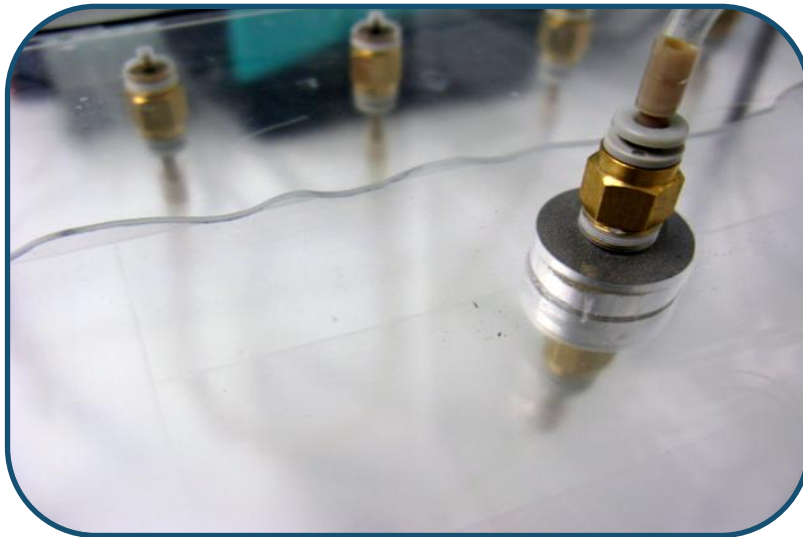
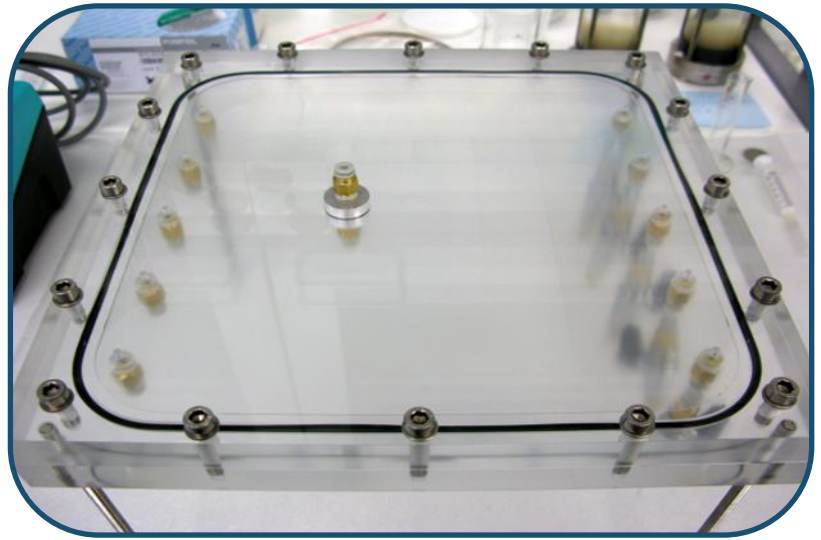
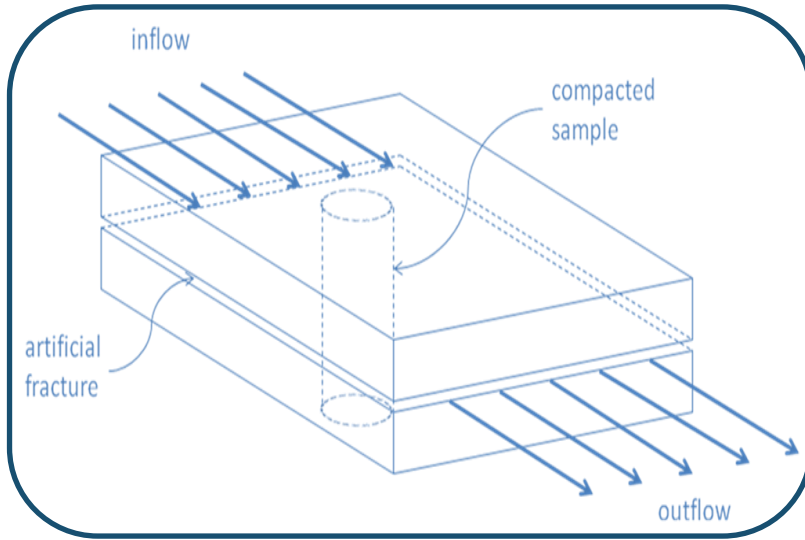
WP2

- ❑ Understand the main mechanisms of erosion of clay particles from the bentonite surface and quantify the (maximum) extent of possible erosion.

- ❑ Relevant physico-chemical conditions to be experimentally evaluated with the work plan:
 - ❑ bentonite clay characteristics
 - ❑ groundwater chemistry
 - ❑ clay/groundwater interaction
 - ❑ groundwater conditions
 - ❑ extrusion/erosion path characteristics

- flow-through, artificial fracture experiments

Flow-Through, Artificial Fracture Tests

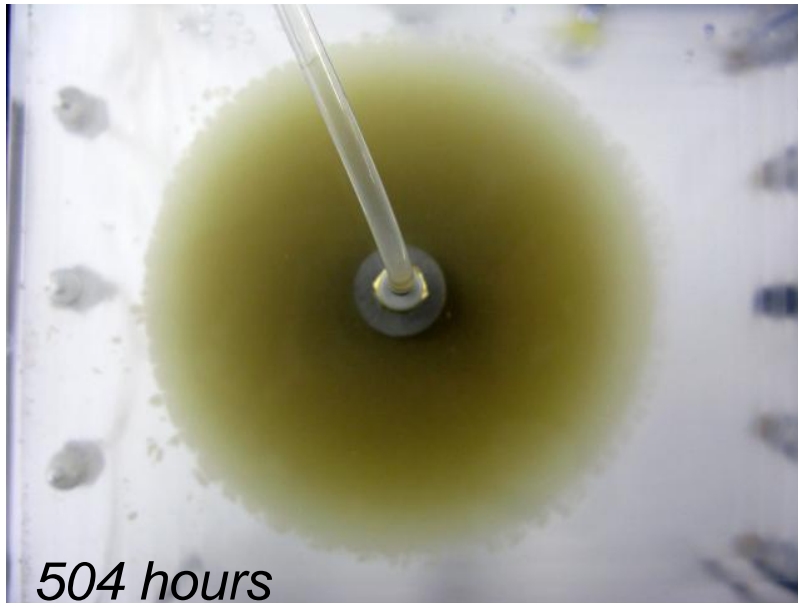


Experimental Approach

- flow-through, artificial fracture experiments will be used to simulate the extrusion/erosion behaviour of bentonite buffer material at a transmissive fracture interface
 - effect of solution chemistry (salt concentration and composition), material composition (sodium montmorillonite, mixtures of sodium and calcium montmorillonites, as-received bentonites), and flow velocity
 - effect of accessory minerals (both added, e.g., kaolinite, silica, sand, etc. and natural)
 - effect of gravity (tilted fractures)

Solution Chemistry Effects

NaMt : 0.5 g/L NaCl : 3 ml/min



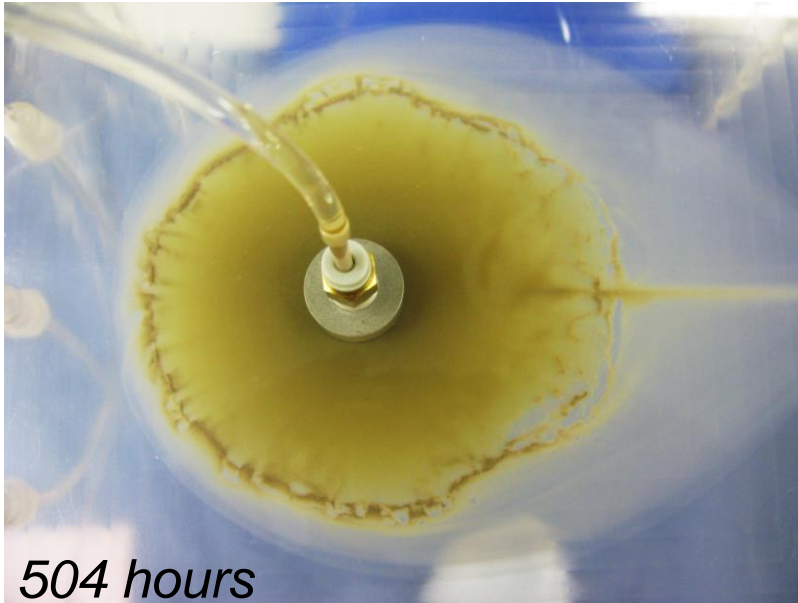
NaMt : DI : 3 ml/min



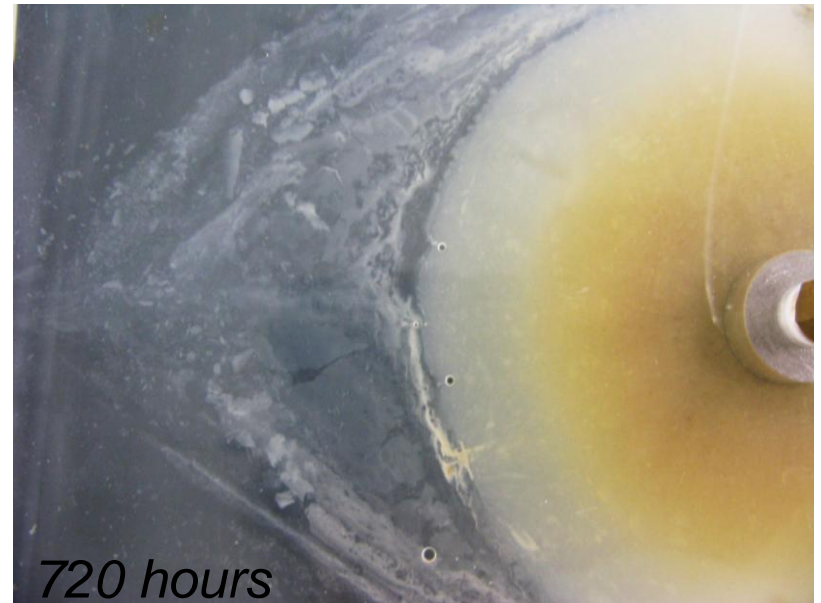
- Clear effect of solution chemistry on erosion stability.

Material Composition Effects

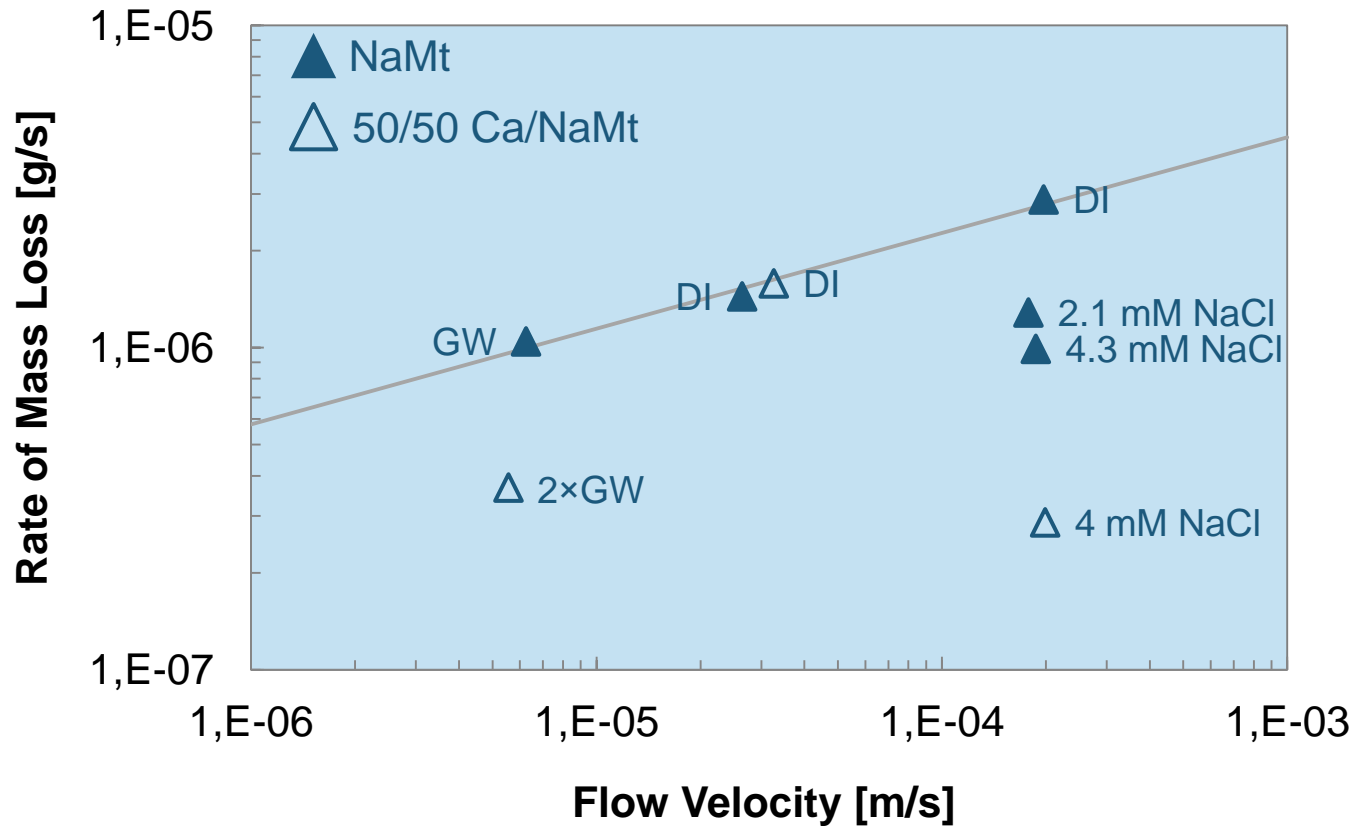
NaMt : 4 mM NaCl : 3 ml/min



50/50 : 4 mM NaCl : 3 ml/min



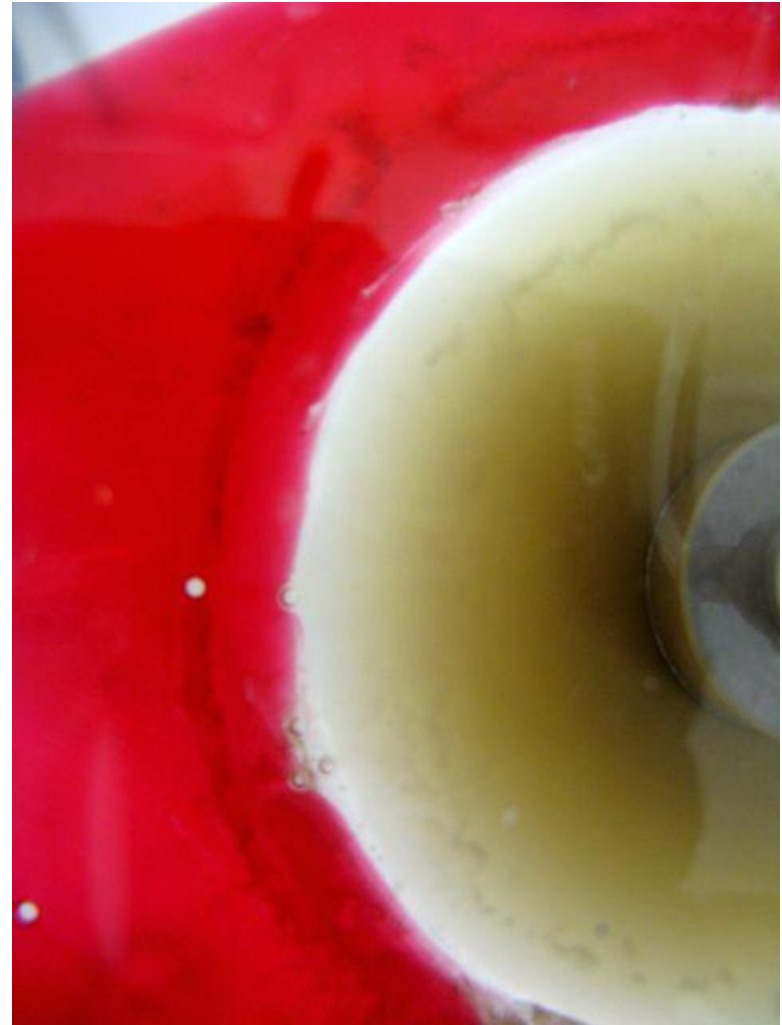
Rate of Mass Loss



Flow Visualization

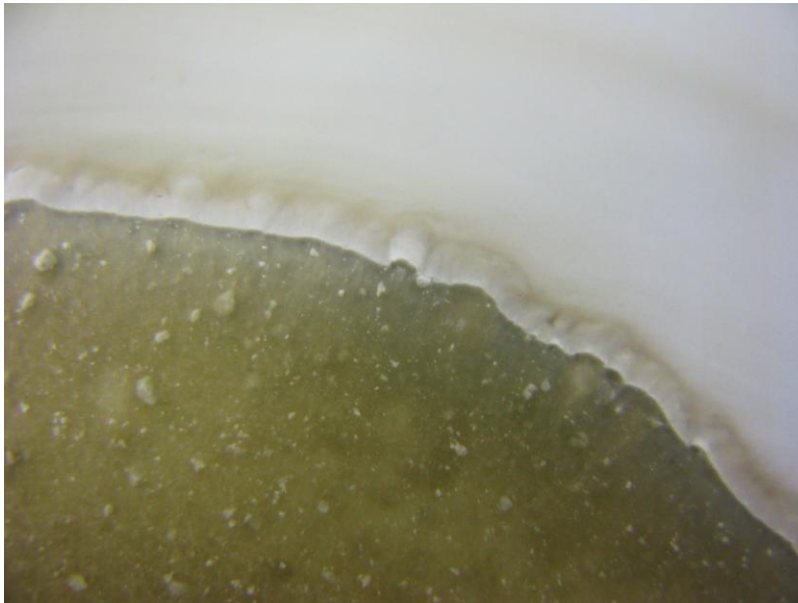


*extruded material forms extended
diffusive barrier*



Accessory Mineral Effects

Kt/Mt : GWS : 0.8 ml/min

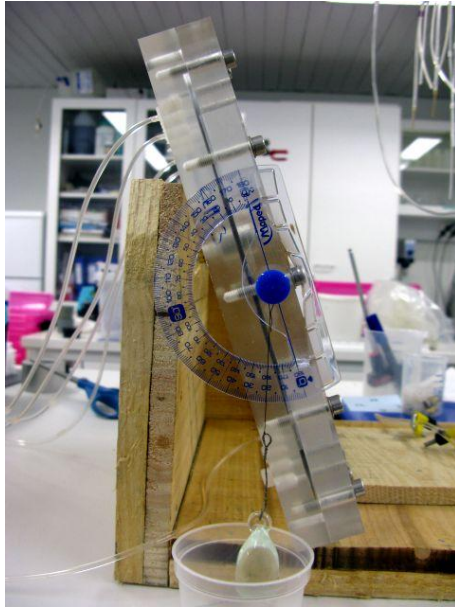


QS/Mt : GWS : 0.8 ml/min



- Layering or deposition of added minerals at the erosion interface.

Gravitational Effects



- More rapid mass loss in downward sloping fracture.

Image Analysis

The screenshot displays the NI Vision Assistant interface. The main window shows a grayscale image of a circular object with a green line profile drawn across it. The interface includes a menu bar (File, Edit, View, Image, Color, Grayscale, Binary, Machine Vision, Identification, Tools, Help), a toolbar with various icons, and buttons for 'Acquire Images', 'Browse Images', and 'Process Images'. A smaller thumbnail of the image is visible in the top-left corner.

Below the thumbnail, the file name is '110809105019238.apd - 8-bit - 640x480'. Navigation controls include a play button, a slider, and a '4 of 4' indicator.

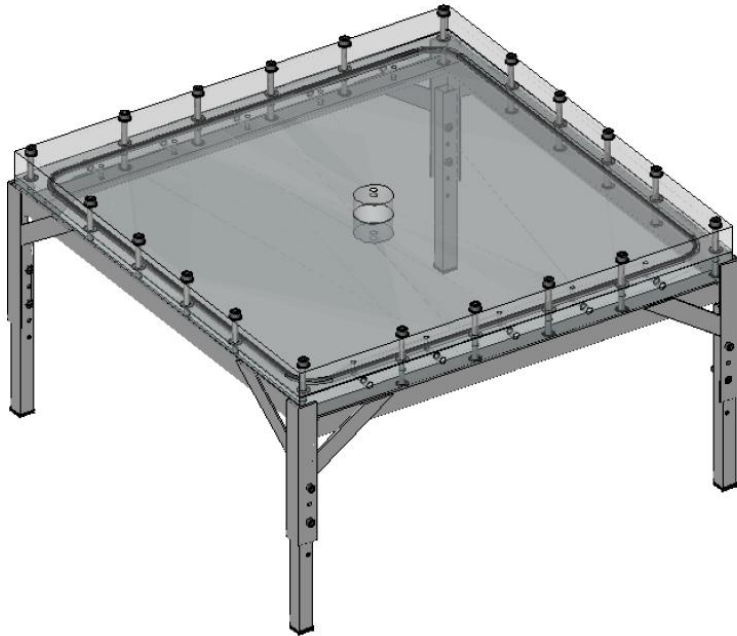
The 'Line Profile Setup' dialog box is open, showing the 'Line Profile' tab. It contains a line profile graph with a red line representing the intensity profile. The graph's y-axis ranges from 0 to 255, and the x-axis ranges from 0 to 148. Below the graph, the following statistics are displayed:

Mapping Mode	Minimum Value:	35,00
<input checked="" type="radio"/> Linear	Maximum Value:	255,00
<input type="radio"/> Logarithmic	Mean Value:	84,04
	Std Deviation:	48,95
	Number of Pixels:	149

Buttons for 'OK' and 'Cancel' are at the bottom of the dialog.

The main image window shows a script titled 'Untitled Script 2'. The script steps are: Original Image, Clamp (Rate) 1, Image Calibration 1, Find Circular Edge 1, and Line Profile 1. The 'Line Profile 1' step is highlighted with a blue box.

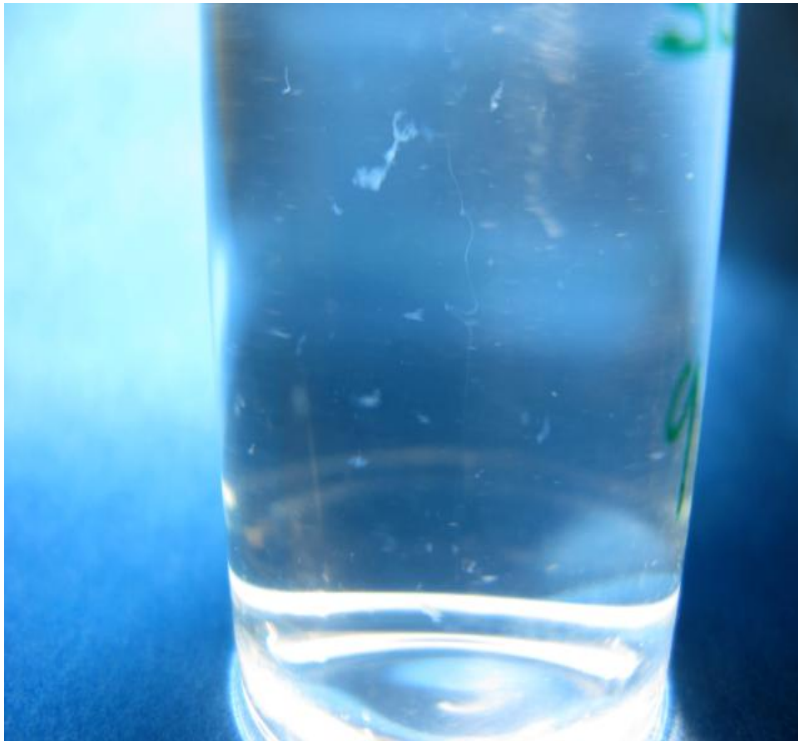
Planned



- Variable fracture apertures (0.1 to 1 mm)
- Variable test scales (20 and 50 mm diameter samples)
- Lower flow velocities (HPLC pump)

- *Design and build fracture cell applicable for in situ X-ray tomography at JYU*
- *Explore possibility of post-mortem resin impregnation and microstructural analysis*

WP4



- Variety of behavior can be observed (and possibly analysed) at the extrusion/erosion interface and in the effluent during the fracture tests, depending on the clay material, the solution composition, and the flow velocity.
- gel/sol transitions
- rheological and colloidal properties of clay dispersions