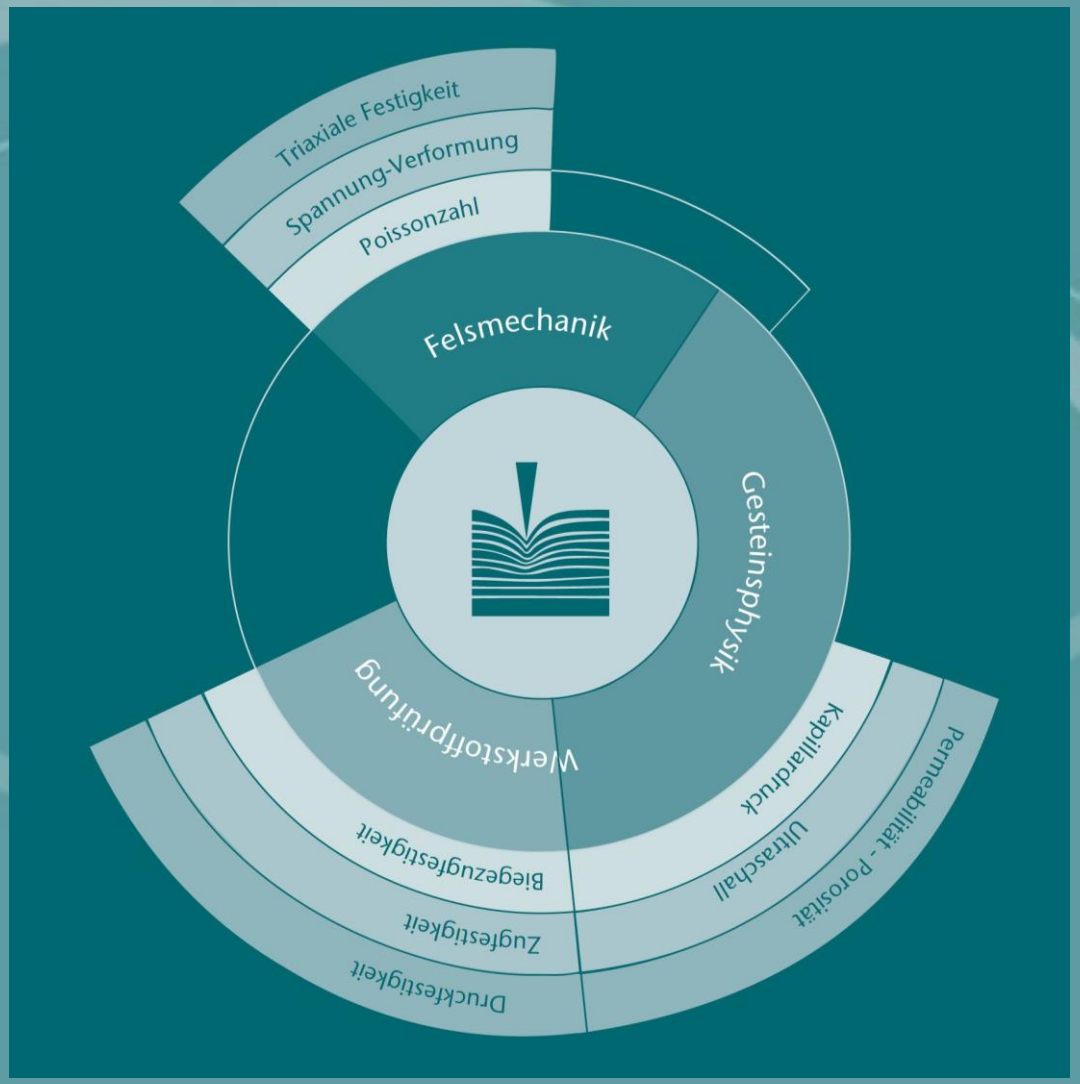
Geomaterial Testing

The Gesteinslabor



- Founded in January 1997 as an independent testing laboratory for standard and sophisticated laboratory services
- Located in Heiligenstadt, in the centre of Germany
- Specialised in rock physics and rock mechanics

The Gesteinslabor

National and international clients from the fields of:

Quelle: https://www.happywall.com/black-and-white-world-map-wallpaper

- Oil and gas industry
- Underground storage of natural gas
- Underground storage of hydrogen
- Tunnelling
- Deep geothermal drilling
- Final storage of nuclear waste

The Gesteinslabor

More than 1000 m² of laboratory space, equipped with state-of-the-art experimental technology in the fields of rock mechanics and rock physics.

➢ Scheduled work in the Henri project

Support for core removal, preservation, transport and storage

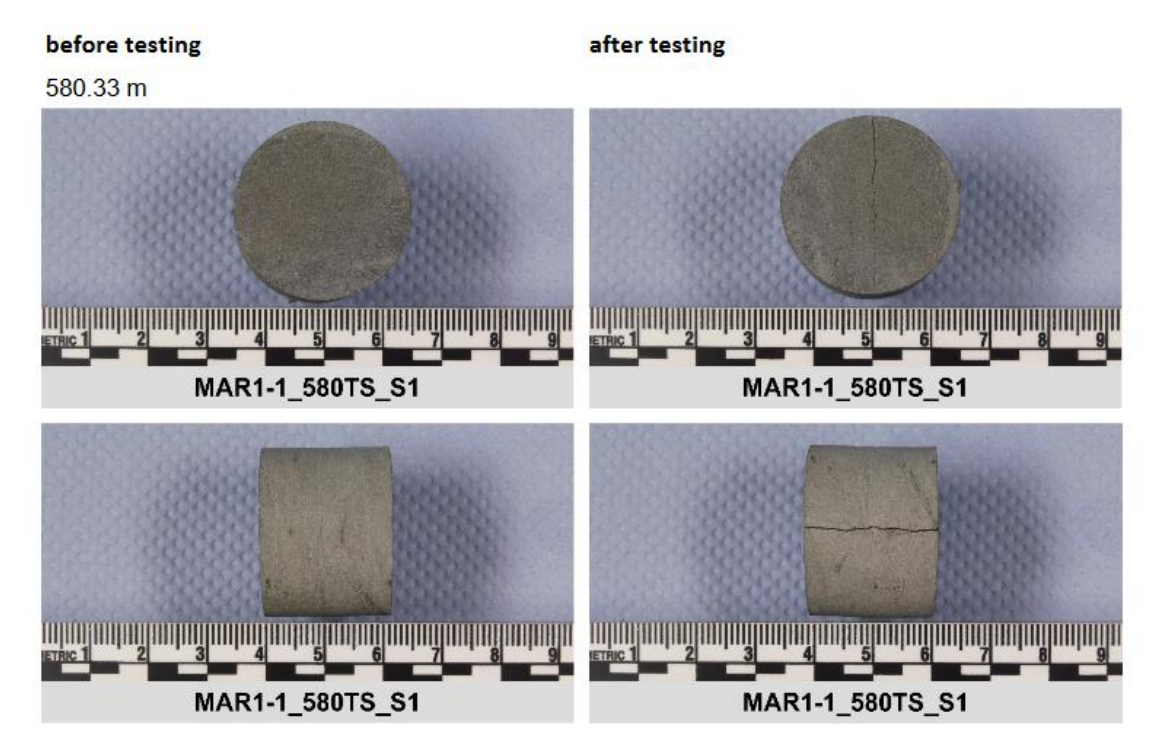
➢ Scheduled work in the Henri project

Sample preparation, conditioning and documentation

- High-precision cutting and grinding
- Rectangular and parallel end faces according to ASTM and DIN EN
- Use of different cutting fluids.

➢ Scheduled work in the Henri project

Sample preparation, conditioning and documentation

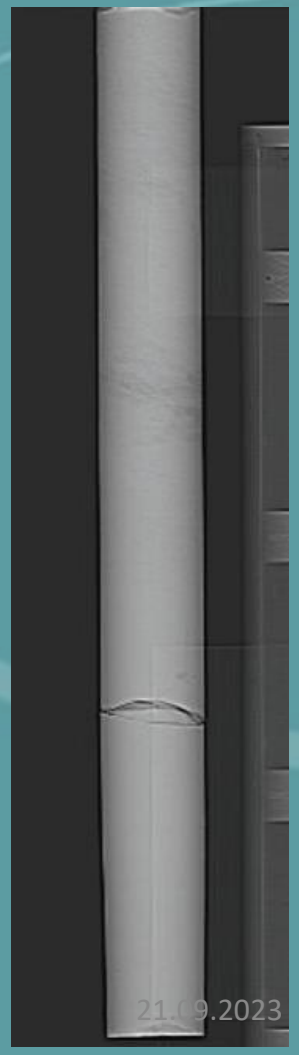


Quelle: https://www.nagra.ch/de/arbeitsbericht-21-20
Arbeitsbericht NAB 21-20, TBO Marthalen-1-1: Data report; Dossier IX

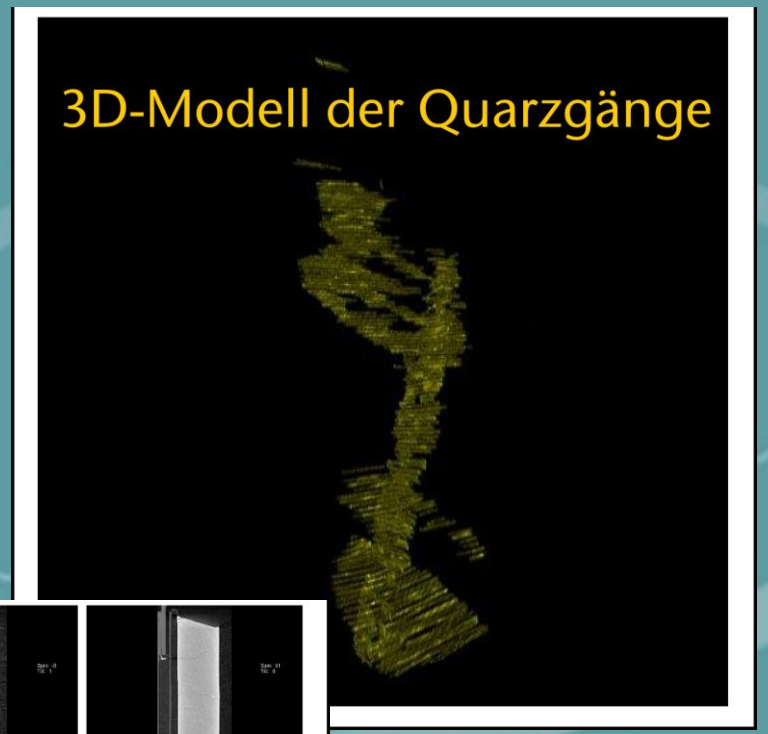
- Photographic documentation of drill cores as well as test specimens before and after the test.

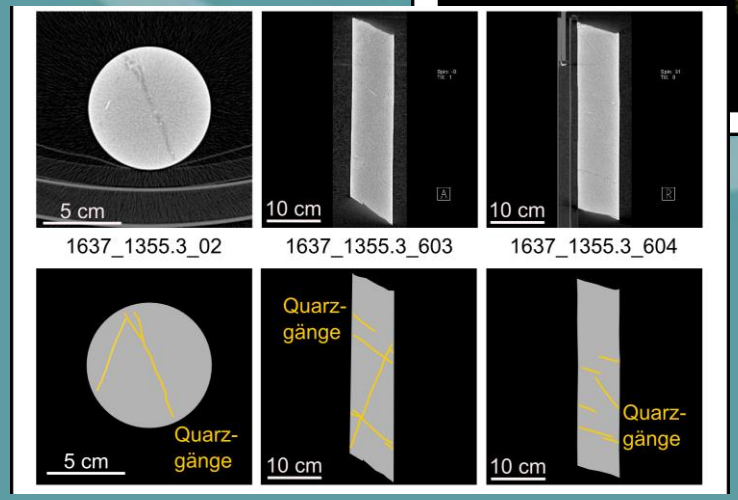
➢ Scheduled work in the Henri project

Computed tomography on cores and specimens



- non-destructive image processing technique
- Identification of damaged core sections
- identification of structural features e.g. joints, fractures, folds and bedding planes.
- 3D analysis of the structural inventory of geological bodies such as drill cores or test plugs





➢ Determination of the diffusion coefficient

- Estimation of losses through H2-diffusion
- Very good sealing is extremely important
- Measurment of the gas diffusion in brine
- Measurment of the gas diffusion in the rock sample
- Numerical modelling with the help of COMSOL®
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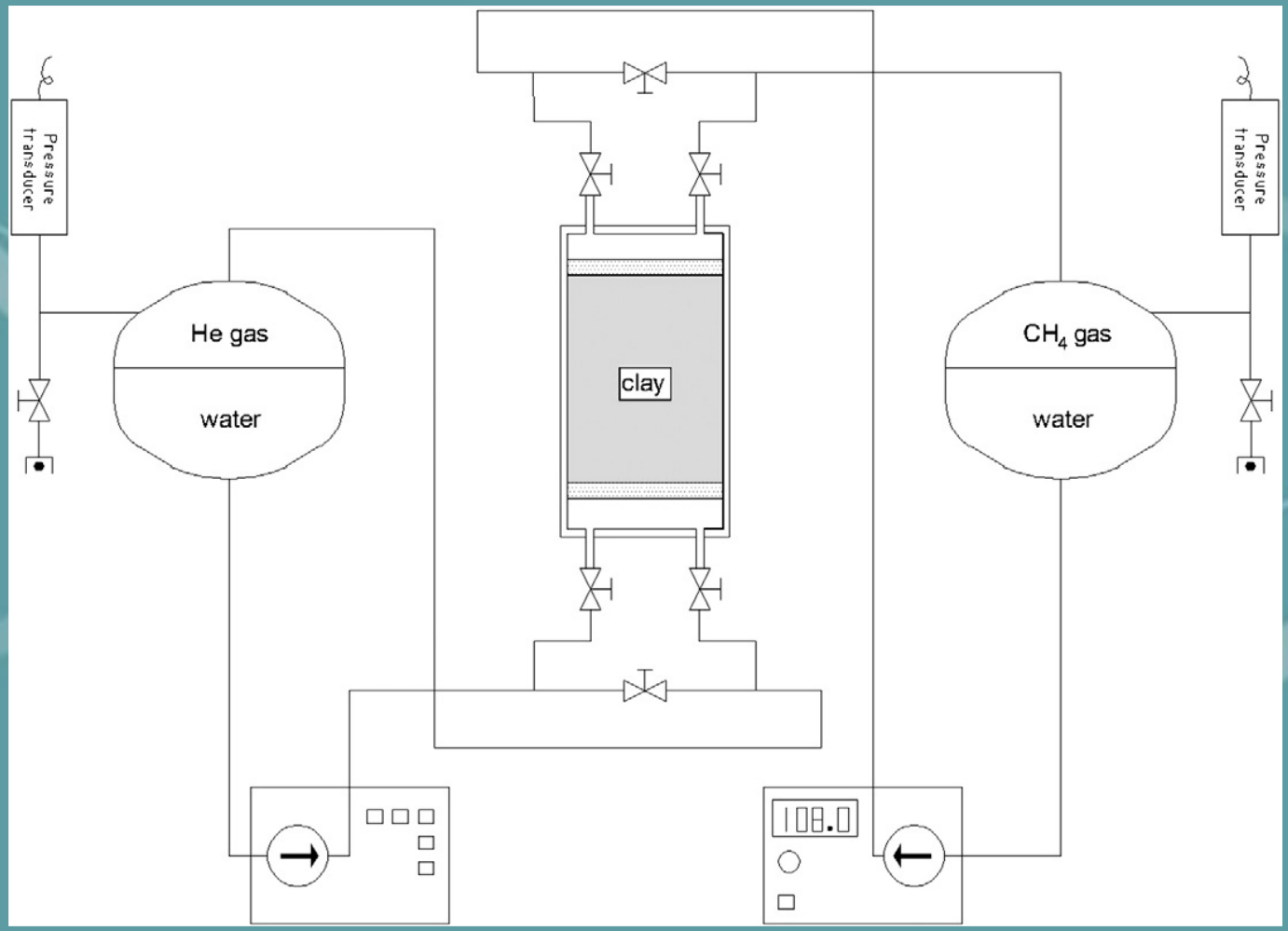
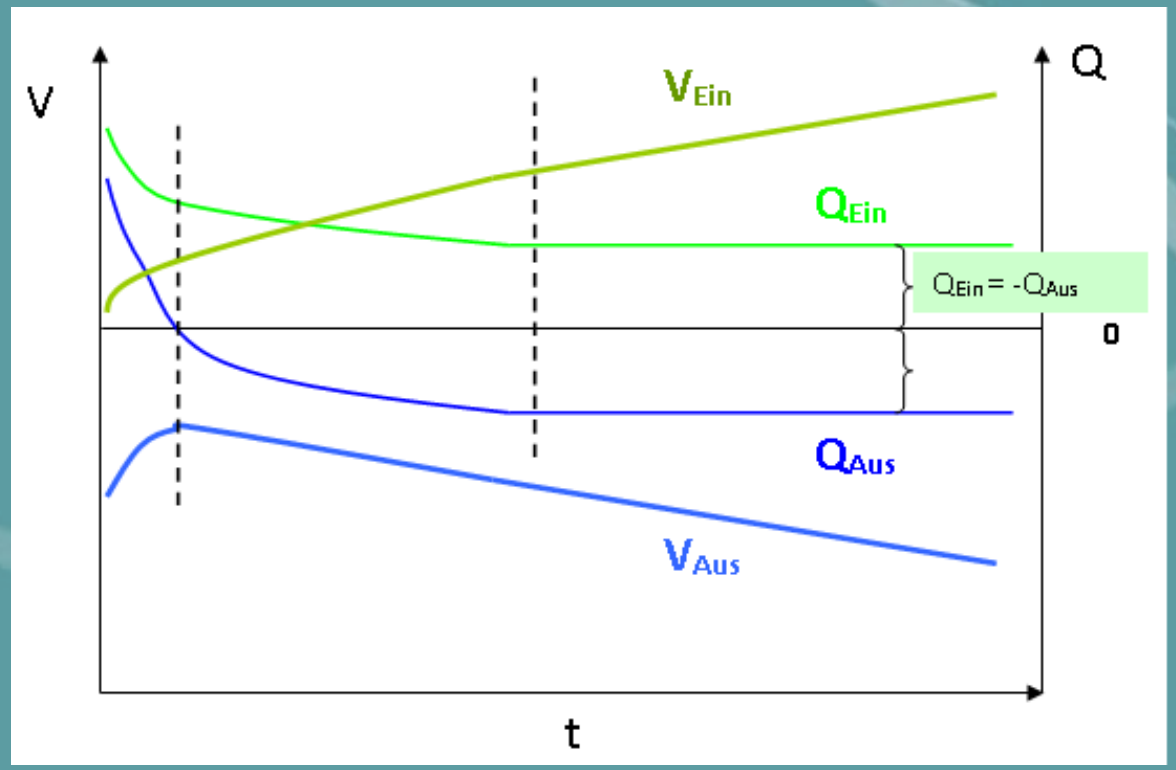


Scheme from Jacops et al. 2013, Elsevier

➢ Scheduled work in the Henri project

Steady-State permeability measurement for low-permeability rocks

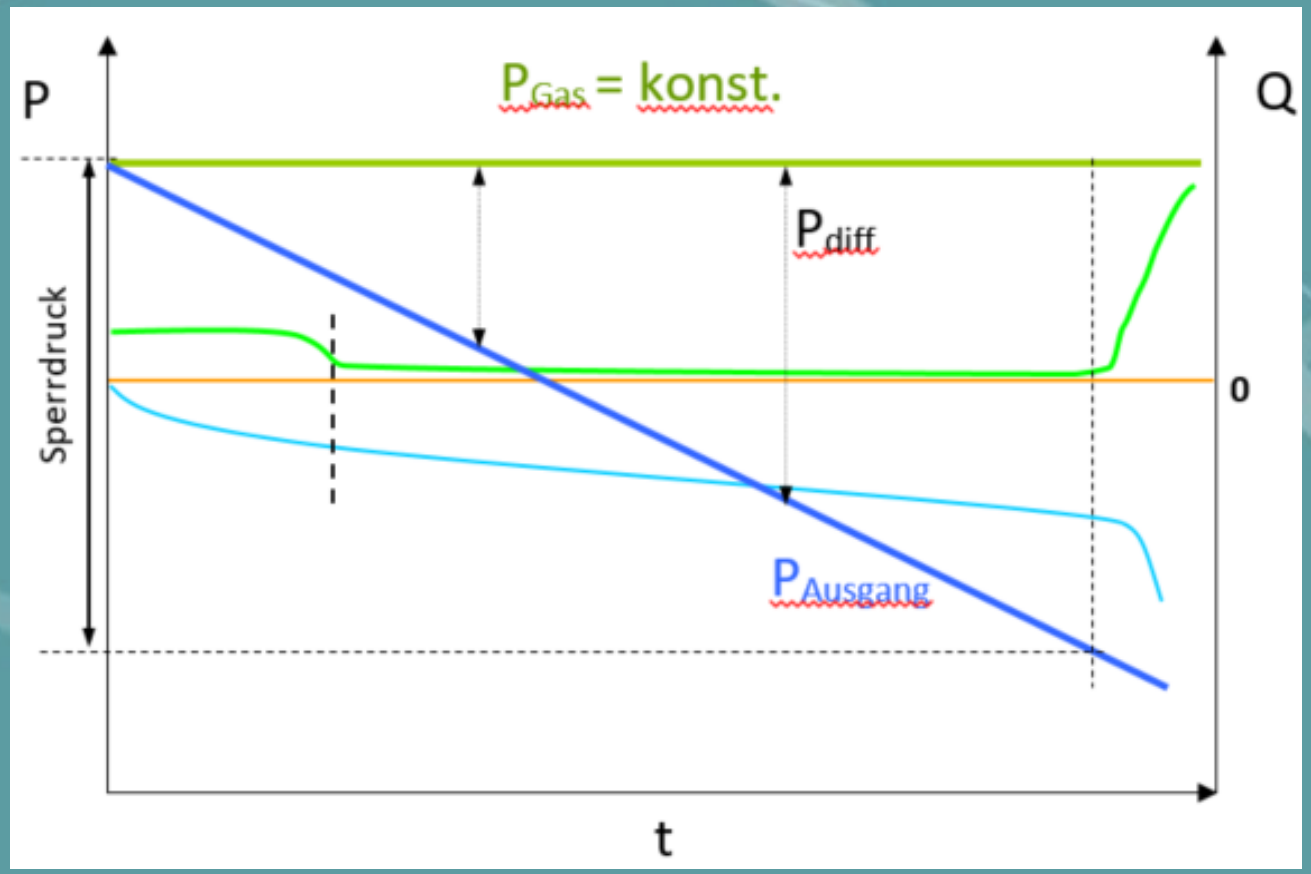
(typically in the range of $10^{-18}m^2$ - $10^{-21}m^2$)



- Overburden pressure:
  - Up to 70 MPa (others on request)
- Pore pressure:
  - Up to overburden
- Operating temperature:
  - From ambient to 125°C
- Sample diameter:
  - 30 mm
- Sample length:
  - 10-40 mm
- Liquid phase:
  - Water, brine, oil
- Gas phase:
  - Nitrogen, hydrogen, air, methane or mixtures hereof

➢ Scheduled work in the Henri project

Measurement of the threshold pressure under reservoir conditions



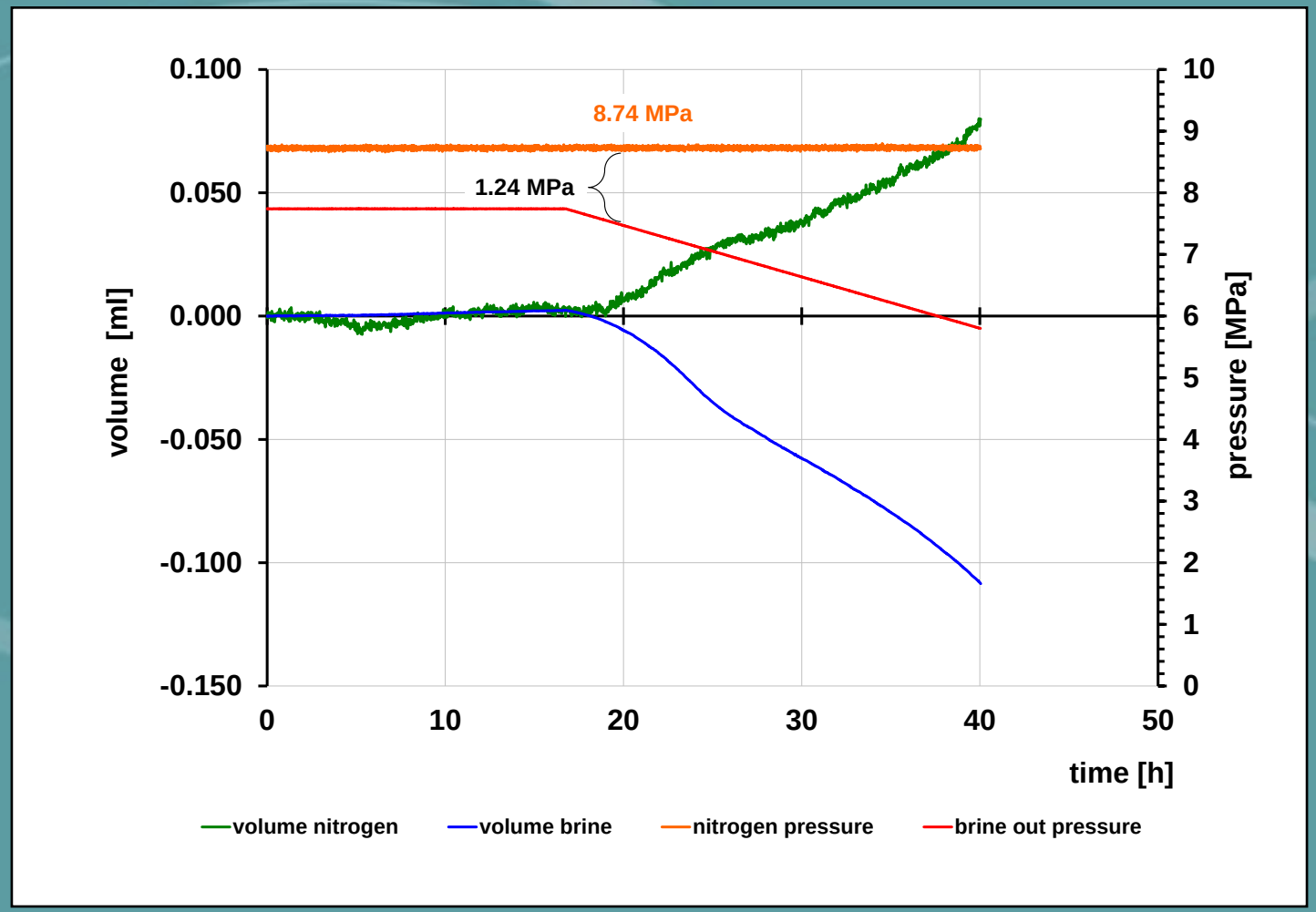
Verfahren gemäß Meyn (DGMK 1999)

- Modified dynamic injection method:

  Constant injection pressure, decreasing back pressure, volume control
  - less holding time
  - prevention of gas dissolution
  - exact detection of threshold pressure
  - Measurement of threshold pressure directly at the relevant side of the specimen

Example for a threshold determination

Measurement of the threshold pressure under reservoir conditions



- Real data from a caprock shale
- Significant slope increase of the injection rate after exceeding the threshold pressure
- Followed by an increase in flow rate at the outlet

➢ Summary

Our scheduled work in HENRI:

- Sample preparation from preserved core pieces
- Documentation of the work including white light photography
- CT-scanning for the documentation of the specimen’s integrity
- Saturation under simulated in situ stresses
- Determination of the effective diffusion coefficient
- Determination of the brine permeability
- Determination of the threshold pressure using hydrogen, methane and mixtures hereof