High Pressure and High Temperature Triaxial System

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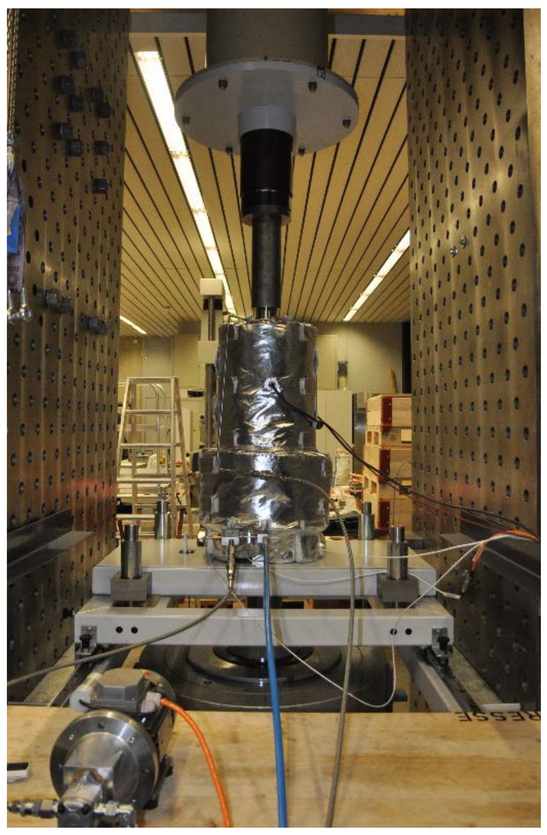
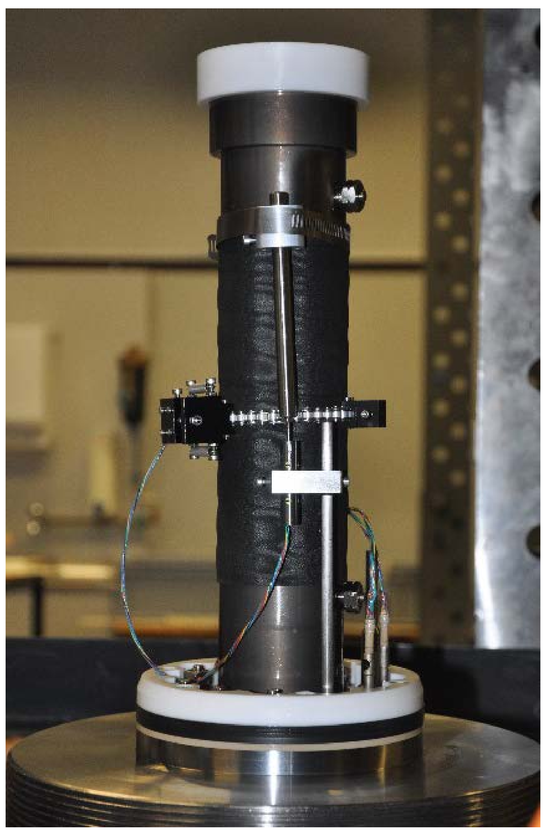
System Overview

The high pressure and high temperature triaxial equipment is a fully automated system specifically designed for testing a variety of materials under high pressure and high temperature conditions. The main parts of the equipment consist of the loading frame, a hydraulic cylinder and the triaxial cell including a heating mantle. Vertical forces up to 20'000 kN can be applied either displacement or load controlled. The triaxial system is constructed such that temperatures up to 220 °C can be applied simultaneously with confining pressures of up to 200 MPa. The triaxial cell accommodates cylindrical samples of up to 70 mm in diameter.

High pressure and high temperature triaxial system with the heating mantle. The cell is filled with heated oil.





Prepared sample prior to testing equipped with internal on-specimen vertical and circumferential transducers.

Specifications

- Vertical load up to 20'000 kN
- Confining pressure up to 200 MPa
- Temperatures up to 220 °C
- Sample size up to 70 mm in diameter
- Vertical and radial deformation measurement
- Vertical and radial ultrasonic P- and S-waves measurement (accurate sample stiffness)
- External and internal temperature measurement

Instrumentation

A real-time data acquisition system allows high frequency (8 channels) continuous monitoring and device steering based on type of measurement during testing.

The triaxial system is equipped with a internal on-specimen circumferential transducer for recording the radial strain and a internal on-specimen as well as an external vertical transducer for recording the axial strain.

The temperature is measured on-specimen and on the heating mantle. This allow to take into account the heating loss through the cell and the oil.

The system is also equipped with an ultrasonic device to measure P- and S-waves velocity vertically as well as radially.

All the devices are connected to a computer, where the "GEOsys" Software is used for closed-loop control and data acquisition in real-time.

Type of Tests

The closed-loop control of load, displacement, position and volume enables a variety of different stress paths under undrained conditions either displacement or load controlled to be performed.

The system is capable of testing a wide variety of materials ranging from soils and rocks to building materials specifically under high temperature and pressure conditions.

The maximum loading and temperature conditions correspond to soil or rock conditions at depth range of about 8'000 m.

Add - ons

It is possible to implement sensors for measuring the pore water pressure during the laboratory test and follow the protocols according to Ewy and Al. (2017) [1].

It is possible to conduct consolidation tests by implementation of porous stones on both sides of the specimen.

The specimen could be additionally instrumented with our fiber optics sensors for distributed vertical and radial strain measurements

[1] Ewy R., Giger S. & Stankovic R. (2017): Consolidated-undrained triaxial test result of Opalinus Clay and comparison with caprock shales. Advanced in Laboratory Testing and Modelling of Soil and Shales. International Workshop 18-20. January 2017, Villars/Switzerland.

Our partners and programs we are involved

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