

REPP-CO₂: Static and dynamic laboratory experiments with scCO₂

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Introduction

REPP-CO₂ was launched early 2015 as a joint Czech-Norwegian research project focusing primarily on the development of the CO₂ geological storage technology in the Czech Republic. The project represents a major step in the advancement towards validation by means of a pilot project in geological settings similar to possible future CO₂ storage sites.

The core part of the project focuses on the first preparatory phase of the research pilot project on CO₂ geological storage. This consists of obtaining the necessary data (geological, geophysical, well log, etc.), constructing a three-dimensional geological model of the storage complex, developing a dynamic simulation model, which will be subsequently used to model the storage complex behavior during the site's operational (CO₂ injection) phase and post-injection one, executing a risk analysis, and compiling a monitoring plan. In future stages these outcomes could be used as a basis for a future Storage Site Permit Application.

A critical element of the project, supporting the activities mentioned above, is the characterisation of reservoir rock and caprock behaviour under dynamic (CO₂ injection) and static (post-injection) conditions. This is addressed using both static and dynamic experiments with supercritical CO₂ (scCO₂).

Experimental work

A detailed characterisation of both formation (reservoir and caprock) and groundwater was carried out. A representative synthetic reservoir brine (Na-Cl type) was prepared from existing analyses of deep groundwater reservoir samples.

The static experiments were based on long-term interactions of scCO₂ with different types of rock sample materials under CO₂ storage site conditions namely, 10 MPa pressure and 35°C temperature.

In addition, the permeability of rock samples was measured using both with water and scCO₂ in a dynamic (flow-through) apparatus. For both static and dynamic experiments, rock samples were thoroughly characterized pre- and post-testing and changes in rock mineralogy, porosity and permeability were determined/quantified.

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