



Contribution ID: 421

Type: **Poster Presentation**

Assessment of hydrogen uptake ability of clay-rich caprocks

Wednesday 24 May 2023 16:10 (1h 30m)

Underground Hydrogen Storage (UHS) has the potential to play an important role in the transition to renewable energy resources. In geological hydrogen storage, safety and efficiency are principal factors. We want to be able to get back as much as possible of the stored hydrogen and it is important that the seal can hold the injected hydrogen. One of possible leakage paths is through caprock. Hydrogen can migrate through the caprock within the pore solution. H₂ molecules which are extremely small, can diffuse (or even advect) through pores and/or fractures of the seal. To do a throughout risk analysis, we need to assess the amount of hydrogen loss through caprock. Therefore, hydrogen transport properties in caprock in terms of uptake ability and diffusion are extremely important. However, due to the safety concerns of working with hydrogen gas (high diffusivity, low interaction energy, invisible flame, etc.) there is few data on the interaction of hydrogen gas with different natural settings. In this work we provide hydrogen uptake capacity of several natural materials (several Norwegian and international caprock samples). We used high-pressure gas adsorption analyzer to obtain the hydrogen sorption isotherms and hydrogen diffusion coefficient for the shale and clay samples. The data can be used for risk assessments of geological hydrogen storage in depleted hydrocarbon reservoirs and saline aquifers.

Participation

In-Person

References

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Session Classification: Poster

Track Classification: (MS01) Porous Media for a Green World: Energy & Climate