

Assessing the impact of the interaction supercritical CO₂/interstitial fluid on the nanostructure of caprocks by using adsorption techniques. Application to the safety assessment of CO₂ geological storage

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CO₂ storage is envisioned as a technique which reduces large quantities of CO₂ rejected in the atmosphere because of many human activities.

The effectiveness of this technique is mainly related to the storage capacity as well as its safety. The safety of this operation is primarily based on the conservation of petro-physical properties of the caprock, which prevents the transport of CO₂ through it. However when CO₂ reaches the reservoir/caprock interface due to buoyancy effects, the interaction between interstitial fluid and injected fluid creates a series of dissolution/precipitation reactions affecting the properties of containment of the caprock, which is generally characterized by low transport properties.

This study aims to assess the impact caused by CO₂/interstitial fluid interaction on the nanostructure of the caprock under geological storage conditions. In order to do this, degradation experiments at high pressure of CO₂ (83 bar) and isothermal (55°C) conditions have been conducted using batch reactors. The sample used for these experiments is shale from the formation Tournemire (Aveyron-France). Volumetric Techniques of adsorption at low pressure have been used in order to quantify the changes on the sample nanostructure. The variations on the microporosity, mesoporosity and intrinsic permeability were determined by using the methods of Dubinin-Astakov, BJH (Barret-Joney-Hallenda) and Carman-Kozney respectively.

At short time (58 days) the results show an increasing in the density of pores in a range less than 10nm, which represents an overall increase on the petrophysical properties, suggesting that integrity of the caprock is affected by dissolution/ precipitation reactions.

Biography

David Rhenals has completed his engineering studies at national university of Colombia in 2007. Two years later, he obtains a master in geosciences at university Pierre et Marie Curie (UPMC) France. Actually, David Rhenals is a PhD student at the National School of Engineers of Saint Etienne and works in the French National Institute for Industrial Environment and Risk.

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