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A Sorption Based Study on the Effect of Supercritical CO₂ Interaction with Clay and Organic-Rich Shales

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CO₂ injection into reservoirs will change the state of stress in both reservoir and caprock formations due to poro-mechanical, thermal and chemical effects. As a result of induced stress, the caprock can be mechanically damaged or new fracture systems can be created. It is the objective of this study to determine the behavior of intact and fractured caprock when exposed to supercritical CO₂ at elevated pressures, including the characterization of the physical, chemical and geomechanical process associated with fluid flow and storage in these systems. Hereby, a self-designed experimental apparatus that allows high pressure, supercritical CO₂ adsorption and desorption measurement on powdered rock samples is built in order to create excess isotherm. Clay samples such as montmorillonite, illite and shale samples with different clay content and maturity are used as adsorbent to perform CO₂ sorption experiment to study the corresponding adsorption capacity. Meanwhile, acoustic properties, such as P-wave, are also measured simultaneously during the adsorption process as a method to study the stiffness change of the sample. Standard protocol of conducting high-pressure adsorption experiment is written in order to eliminate possible error and improve reproducibility.

References

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