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Experimental measurements on caprock CO₂-water wettability at reservoir pressure and temperature

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Most CO₂ geological storage sites, such as saline formations and depleted hydrocarbon reservoirs, rely on structural trapping provided by the caprock and fault gouge material as one of the trapping mechanisms. Clay- and quartz-rich caprocks are expected to be water-wet at reservoir conditions and create a positive capillary pressure to ensure CO₂ trapping. However, most experimental studies so far have limited to either temperature lower than 60°C or pressure lower than 25 MPa posing uncertainties about high-temperature and high-pressure conditions. This study shows the result of water imbibition experiments in synthetic caprock at temperature equal or larger than 60°C and pressure equal or larger than 25 MPa. The results show spontaneous imbibition of water droplets in synthetic caprock partially saturated with supercritical CO₂ and water. Thus, the results show that caprock building minerals remain water-wet to CO₂ at typical temperature and pressure reservoir conditions. The results indicate that clay- and quartz-rich caprock and fault gouge are expected to develop a positive entry and breakthrough pressure (i.e., $P_{CO_2} - P_w > 0$ MPa), thus, favoring CO₂ structural trapping.

Participation

In-Person

References

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