

CO₂ Seal Integrity – shale as a barrier

Particle size distribution entropy as a predictor for swelling

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Plugging and abandonment of wells, either due to end of operations or repurposing of depleted oil reservoirs for carbon storage, must avoid leakage pathways to the surface. Due to their low permeability, shales naturally provide a seal to the subsurface. The CO₂ Seal Integrity project investigates mechanisms to promote expansion of shales and seal the interface between these geological formations and the well casing or across the well after milling of the casing. Restoration of the natural sealing formation could create a barrier that is chemically more stable (upon exposure to CO₂), and has a lower permeability than cement. Using the shale as a barrier could also be less time consuming and cheaper than standard operations, especially when annular cement has to be repaired through perf-and-wash and cement squeeze jobs.

This poster shows how some properties related to swelling can be predicted based on particle size distribution, which is described using entropy parameters. Samples from the Danish North Sea corresponding to the potential location of plugs were selected at several depths and their petrophysical properties were measured as well as for a selection the maximum sustained porosity under self-weight sedimentation (critical porosity).

