Capillary seals for trapping carbon dioxide (CO_2) in underground reservoirs

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Abstract

Pore -scale capillary processes within geologic reservoirs and seals influence buoyancy-driven fluid migration. This chapter reviews these processes and considers their relevance to CO_2 sequestration. The ability of membrane seals in water/brine -wet rocks to retard buoyant fluid migration (including CO_2) relates to the capillary pressures and pore throat diameters of the seal rock. An attempt is made here to calculate anticipated ambient capillary pressures in the lowest portions of the seal, using existing laboratory data on the petrophysical properties of the CO_2-brine-reservoir system as the basis and calculations carried out using a Monte Carlo approach. The values thus reached can then be used to constrain minimum seal capacities, offering the potential to predict containment capacities. The chapter concludes with a discussion of some aspects of capillary sealing which have been consdiered for hydrocarbon systems but not yet discussed for CO_2 systems.