

Experimental investigation of gas transport in the shaly facies of Opalinus Clay

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Abstract

An experimental setup was designed to measure gas permeability and gas breakthrough pressures in Opalinus clay samples. The confining pressures applied were higher than the maximum in situ stress, and the tests were performed by slowly increasing the injection pressure whereas backpressure was kept atmospheric and the outflow was measured. The breakthrough pressure perpendicular to bedding was generally higher than 18 MPa, which is consistent with the air entry values deduced from mercury intrusion porosimetry tests for this material, which was between 19 and 36 MPa. In samples with degrees of saturation lower than 70% flow occurred for lower gas injection pressures, and the effective gas permeability measured was in the range from $8 \cdot 10^{-21}$ to $4 \cdot 10^{-23}$ m², decreasing with confining pressure. The gas transport mechanism in those cases was probably 2-phase flow.