

Interfacial tensions between reservoir brine and CO₂ at high pressures for different salinity

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In this paper, an experimental technique has been developed to study the interfacial interactions of the reservoir brine and CO₂ system at high pressures and elevated temperatures. Using the axisymmetric drop shape analysis (ADSA) for the pendant drop case, this new technique makes it possible to determine the interfacial tension (IFT) and visualize the interfacial interactions phenomenon between the reservoir brine and CO₂ under practical reservoir conditions.

The laboratory experiments were conducted for the measurement of the IFT between CO₂ and pure water or brine covering three interesting salinity (0 mg/L, 14224.2 mg/L and 21460.6 mg/L).

Comparing the data of the CO₂/pure water interfacial tension with other papers at 45 °C, at low pressures (<7.38 MPa), all data accord well; but at high pressures (>7.38 MPa), all data have slight deviation.

The dynamic and equilibrium IFT are measured as a function of pressure at the stratum temperature (97.53 °C). It is found that the dynamic IFT gradually approaches to a constant value, which is the equilibrium IFT. The equilibrium IFT decreases as the pressure increases, but increases as the salinity increases.

In addition, the wettability of the reservoir brine and CO₂ system changes from the hydrophilic case to the hydrophobic case as the pressure increases, and the same phenomenon decreases as the salinity of brine increases.

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