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Interfacial tension measurement between CO_2 and brines under high temperature and elevated pressure conditions

X. Li, E.S. Boek, G.C. Maitland, and J.P.M. Trusler
Chemical Engineering Department, Imperial College London, London, United Kingdom (x.li09@ic.ac.uk)

We have investigated the dependence of interfacial tension of (CO_2 + brine) on temperature, pressure and salinity (including both salt type and molality) over the range of conditions applicable to CO_2 storage in saline aquifers. The study covered a wide range of measurements of the interfacial tensions between carbon dioxide and (NaCl + KCl)(aq), CaCl2(aq), MgCl2(aq), Na2SO4(aq), $KHCO_3$(aq), $NaHCO_3$(aq) and two laboratory constructed brines with molality ranging from (0.3 to 5.0) molkg-1. The measurements were made at temperatures between (298 and 448) K at various pressures up to 50 MPa, using the pendant drop method in a high-pressure view cell filled with water-saturated CO_2. The drop to be imaged was created by injecting brine from a high-pressure syringe pump into a capillary sealed through the top of the cell. The expanded uncertainties of the experimental state variables at 95 % confidence are +0.05 K in temperature and +70 kPa in pressure. For the interfacial tension, the overall expanded relative uncertainty at 95 % confidence was +1.6%. The experimental results show that interfacial tension for all the systems increases linearly with molality, indicating that relatively few measurements and simple interpolation procedures are adequate for describing this property accurately over wide ranges of conditions.