

Solubility of CO₂ in [(1 - x)NaCl + x KCl](aq) or CaCl₂(aq) or MgCl₂(aq) at temperatures from (308 to 423) K and at pressures up to 40 MPa.

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Carbon capture and storage is seen as an essential part of the transition to low-carbon electricity generation, and storage in deep saline aquifers appears to be a favorable option. Modelling this process depends greatly upon models for dissolution equilibria since it is solubility trapping of CO₂ in deep saline aquifers that accounts for 90 % of the total storage capacity [1], solubility being the principal trapping mechanism in the medium term (10⁰ to 10² years). We report the solubility of carbon dioxide in the mixed brine system [(1 - x)NaCl + xKCl](aq), with $x = 0.136$ and $b = 1.05 \text{ mol}\cdot\text{kg}^{-1}$, CaCl₂(aq) with $b = (1, 3, \text{ and } 5) \text{ mol}\cdot\text{kg}^{-1}$, and also in MgCl₂(aq) with $b = (1 \text{ and } 5) \text{ mol}\cdot\text{kg}^{-1}$, where b denotes molality of salt in water. A synthetic method based on visual observation and quantitative measurements of temperature, pressure and composition was employed. The measurements were made at temperatures between (308 and 423) K at various pressures up to 40 MPa. The expanded uncertainties at 95 % confidence are 0.03 K in temperature, between (0.15 and 0.30) MPa in pressure and 0.0001 in the salt-free mole fraction of CO₂ in the solution at its bubble point. The results show a strong salting-out effect, whereby the solubility declines with increasing molality of salt. The Krichevsky-Kasarnovsky model, an extension of the Henry's law to high pressures, was used to fit the experimental data.

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[1] R. Shukla, P. Ranjith, A. Haque, X. Choi, Fuel 89 (2010) 2651-2664.