

# Quantitative Raman spectroscopic measurements of the solubility and diffusivity of water in CO<sub>2</sub> under reservoir condition

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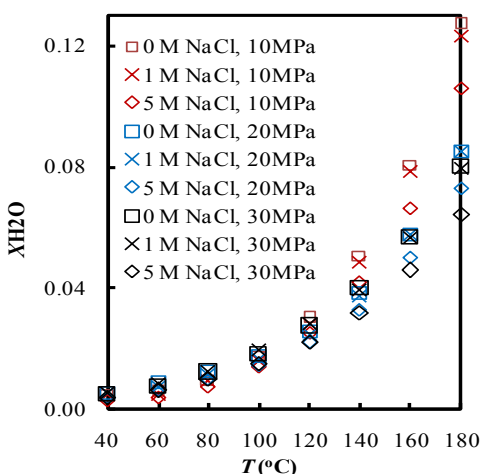
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Accurate knowledge of the solubility and diffusivity of water in CO<sub>2</sub> is essential for numerical modeling the dry-out and salt precipitation processes during the injection of dry carbon dioxide into reservoirs. However, the experimental data at high pressures and temperatures are very limited.

We observed the evaporation of brine by CO<sub>2</sub> via Raman spectroscopy, determined the water molar fraction in carbon dioxide at equilibrium (Figure 1) from 40 to 180 °C at pressures from 10 to 30 MPa, and measured diffusion coefficients of water in supercritical carbon dioxide from 100 to 140 °C at pressures from 10 to 30 MPa (Table 1).



**Figure 1: Water molar fraction in carbon dioxide phase.**

$D$ ( $10^{-8} \text{ m}^2/\text{s}$ )	10 MPa	20 MPa	30 MPa
100 °C	16.5	6.48	0.70
120 °C	25.9	9.36	1.73
140 °C	29.4	10.7	5.43

**Table 1: Diffusion coefficients ( $D$ ) of water in CO<sub>2</sub>.**