# Thermophysical Properties of $CO_2$-Brine Systems for Applications in Carbon Storage

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Deep saline aquifers have been identified as promising sinks for the storage of large amounts of anthropogenic carbon dioxide. In order to design safe, effective and economic carbon storage projects utilizing saline aquifers, it is necessary to have a thorough understanding of the physical and chemical properties of mixtures of $CO_2$ and reservoir brines at reservoir conditions. This requires a combination of empirical evidence (i.e. experimental data) and suitable models that can be applied in reservoir simulations. A survey of the literature reveals some significant gaps in the available data, especially in relation to $CO_2$-saturated brines at elevated temperatures and pressure. With QCCSRC, we have embarked on a program of measurements to extend the database of experimental measurements for $CO_2$-water and $CO_2$-brine systems at reservoir conditions. This has involved studies of the solubility of $CO_2$ in brines and measurements of the density, viscosity, *p*H and diffusion coefficients in the solutions. These properties have been measured over wide ranges of temperature and pressure that, in many cases, extend beyond currently anticipated reservoir conditions and provide a robust test for modelling approaches. In this lecture, I will detail the experimental approaches and results and compare the results with available models. A number of regularities emerge from the data that can be captured by quite simple models that are suitable for application in reservoir simulations.

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