Influence of Brine Composition on CO_2 Solubility and *p*H at Storage Reservoir Conditions

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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 systems comprising CO_2 and brines at reservoir conditions. Among these properties, the solubility limits of CO_2 and the *p*H of the resulting solution are of paramount importance. To date, most studied of these properties have been restricted to NaCl brines. In the present work, we explore the influence of brine chemistry on both CO_2 solubility and *p*H. In particular, aqueous solutions of KCl and $NaHCO_3$ are considered. Experimental CO_2-solubility and *p*H data for these systems are presented. The solubility measurements were made with a semi-analytical method operating at temperatures between (298 and 398) K and at pressures up to about 50 MPa. The *p*H was measured using an electrode system operating at temperatures between (303 and 373) K and at pressures up to approximately 20 MPa. The electrode system was calibrated using buffer solutions qualified for hypersaline systems using an operational definition of pH based on the MacInnes assumption. The results are compared with the Pitzer model as implemented in the geochemical modelling platform PHREEQC.

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