



EXPERIMENTAL DETERMINATION OF PHASE EQUILIBRIA IN THE SYSTEM
H₂O-CO₂-NaCl AT 0.5 KB FROM 500 TO 800°C

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An understanding of activity-composition (a/X) relations and phase equilibria for halite-bearing, mixed-species supercritical fluids is critically important to many geological and industrial applications. We have performed experiments on the phase equilibria of H₂O-CO₂-NaCl fluids from 500°C to 800°C at 500 bars, conditions of significant importance in studies of magma-hydrothermal systems, geothermal reservoirs and some ore deposits, to obtain highly accurate and precise data for this ternary system. These experiments are conducted using a double capsule technique. An excess of NaCl is placed in an inner Pt capsule, which is crimped shut and placed in an outer capsule containing H₂O and CO₂. During the experiment NaCl dissolves out of the inner capsule, and is deposited in the outer capsule during the quench. After the experiment the capsule is opened, and the amount of NaCl remaining in the inner capsule determined by dissolution. The difference between the initial and final amounts of NaCl in the inner capsule yields the solubility of NaCl at the P-T conditions of the experiment. At 500°C data from these experiments suggest that the vapor corner of the three-phase field lies near $X(\text{H}_2\text{O}) = 0.760$, $X(\text{NaCl}) = 0.065$, which is a significantly more water-rich composition than suggested by previous models. As expected, increasing temperature increases the solubility of NaCl in the NaCl – vapor field. For example, at intermediate H₂O/CO₂ ratios the vapor field extends from approximately near $X(\text{H}_2\text{O}) = 0.66$, $X(\text{NaCl}) = 0.06$ at 500°C to near $X(\text{H}_2\text{O}) = 0.65$, $X(\text{NaCl}) = 0.08$ at 600°C.

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