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Phase relations in the system MgO-NaCl-H_2O: The dehydroxylation of brucite in the presence of NaCl-H_2O fluids

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Abstract

The dehydroxylation of brucite was determined in the presence of NaCl-H_2O fluids containing 0, 2, 6, 11, 14, 18, 30, and 38 mol% NaCl (0.0, 5.5, 17.0, 28.8, 34.5, 41.7, 58.2, and 66.6 wt% NaCl) to ~2500 bars and ~700 °C by high-pressure differential thermal analysis (HP-DTA). At pressures below 150 bars, brucite dehydrates in two separate reactions involving at least one intermediate phase. The dehydroxylation reaction of brucite at pressure to ~2 kbars follows $\ln P(\text{bars}) = 22.23 - 13620/T(\text{K})$. In the presence of NaCl-H_2O fluids, the dehydroxylation temperature is lowered because of the reduction of the activity of H_2O in these fluids. At 1 kbar pressure, mixing in the NaCl-H_2O fluids is virtually ideal, assuming a nearly complete association of NaCl, but at 2 kbars, the dissociation of NaCl is substantial. The phase relations in the system MgO-NaCl-H_2O show five univariant reactions emanating from an invariant assemblage, periclase + brucite + halite + liquid + vapor, located at 565 ± 5 °C and 440 ± 30 bars.