In situ X-ray observation of the reaction dolomite = aragonite + magnesite at 900–1300 K

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ABSTRACT

To determine the reaction boundary dolomite = aragonite + magnesite, in situ X-ray experiments on dolomite decomposition and synthesis were carried out in the temperature range 900 to 1300 K. Dolomite decomposition experiments were conducted with increasing pressure at constant temperature, and the boundary was determined to be 5.3–5.9 GPa in the temperature range 800–1200 K and 5.9–6.3 GPa at 1300 K. Dolomite synthesis experiments were carried out with decreasing pressure at constant temperature or with increasing temperature at constant press load. The dolomite synthesis boundary was determined to be 6.7–6.9 GPa at 1300 K, 3.7–4.4 GPa at 1100 K, and 2–3 GPa at 800 K. Except at 1300K, the synthesis boundary is much lower in pressure and has a steeper dP/dT slope than the decomposition boundary. The difference in the reaction boundary reflects the different kinetics between decomposition and synthesis reactions, and the former may be closer to the equilibrium phase boundary. The experimental results show that the phase boundary between dolomite and aragonite + magnesite is located at ~6.4 GPa at 1300 K and has a dP/dT slope of 0.001 ± 0.001 GPa/ K in the temperature range 900 to 1200 K.