

New experimental data on phase relations for the system Na_2CO_3 - CaCO_3 at 6 GPa and 900–1400 °C

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ABSTRACT

Phase relations in the system Na_2CO_3 - CaCO_3 have been studied in the compositional range, $X(\text{Na}_2\text{CO}_3)$, from 100 to 10 mol%, at 6.0 GPa and 900–1400 °C. Below 1100 °C, the system has three intermediate compounds: $\text{Na}_4\text{Ca}(\text{CO}_3)_3$, $\text{Na}_2\text{Ca}_3(\text{CO}_3)_4$, and $\text{Na}_2\text{Ca}_4(\text{CO}_3)_5$. The $\text{Na}_4\text{Ca}(\text{CO}_3)_3$ and $\text{Na}_2\text{Ca}_3(\text{CO}_3)_4$ compounds melt congruently slightly above 1200 and 1300 °C, respectively. The eutectics were established at 70 and 52 mol% near 1200 °C and at 21 mol% near 1300 °C. The $\text{Na}_2\text{Ca}_4(\text{CO}_3)_5$ compound decomposes to the $\text{Na}_2\text{Ca}_3(\text{CO}_3)_4$ + aragonite assembly at 1100 °C. Maximum solid solution of CaCO_3 in Na_2CO_3 is 6–8 mol% at 1100–1300 °C. Melting of Na_2CO_3 occurs between 1350 and 1400 °C. Na solubility in aragonite does not exceed the detection limit (<0.5 mol%). Aragonite remains a liquidus phase at 1300 and 1400 °C.

Keywords: Na-Ca carbonate, high-pressure, aragonite, natrite, shortite, nyerereite, natrocarbonate, Earth's mantle