

## **New experimental data on phase relations for the system $\text{Na}_2\text{CO}_3$ - $\text{CaCO}_3$ at 6 GPa and 900–1400 °C**

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### **ABSTRACT**

Phase relations in the system  $\text{Na}_2\text{CO}_3$ - $\text{CaCO}_3$  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  $\text{CaCO}_3$  in  $\text{Na}_2\text{CO}_3$  is 6–8 mol% at 1100–1300 °C. Melting of  $\text{Na}_2\text{CO}_3$  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