The hydrothermal synthesis of alkali-carbonates: an hypothetical equivalent of the Ceres bright spots.

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Alkali carbonates have been related to different terrestrial and extra-terrestrial environments. The deconvolution of VIR spectra from Ceres showed the occurrence of Na-Ca carbonates on bright areas on its surface [1]. Moreover, alkali carbonates are intriguing mineral phases linked to the origin of alkaline carbonatite magmas [2]. Very poor data are known on Na-Ca carbonates since their paucity and ephemeral behavior [3]. The present project is aimed to (i) study the emissivity evolution of Na-Ca carbonates and (ii) investigate their crystal structure evolution at both ambient and extreme *P-T* conditions. Na-Ca carbonates were synthesized starting from a mixture of 60mole% of $NaCO_3$ and 40mole% of $CaCO_3$ loaded into Au capsules (25 mm length, 3 mm inner diameter, 3.4 mm outer diameter) together with 10ml of distilled water [3]. The capsules after welding were placed in water-pressurized cold seal pressure vessels and treated at 550°C and 100MPa. Ten experiments were performed lasting from 1 to 2 weeks. A coling rate of 100°C/min was attained during the quench. The run products were analysed by means of XRPD and SC-XRD. Results showed that the main synthesized mineral phases were nyerereite $Na_2Ca(CO_3)_2$ (~80wt%) and thermonatrite $Na_2CO_3 \cdot (H_2O)$. The nyerereite crystal structure was refined in the $P2_1ca$ space group having a = 10.041(1) Å, b = 8.747(1) Å and c = 12.236(3) Å. The data we are collecting on the synthesized samples will give insigths on both the interpretation of the Ceres's surface VIR spectra and the possible stability of alkali-bearing phases to the Earth's mantle.

[1] Palomba *et al.* (2019) *Icarus*, **320**, 202-212. [2] D'Orazio *et al.* (2007) *Lithos*, **98**, 313-334. [3] Gavryushkin *et al.* (2016) *Cryst. Growth Des.*, **16**, 1893–1902.