

Comprehensive Understanding of Norsethite Crystallization

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Norsethite $\text{BaMg}(\text{CO}_3)_2$ has the space group of $R\bar{3}2$, and shows strong asymmetry. Hence, norsethite exhibits the high birefringence (norsethite:0.175; quartz:0.009), and expect that norsethite can be utilized as new piezoelectric crystals. Furthermore, norsethite is one of the dolomite analogue (space group of dolomite $\text{CaMg}(\text{CO}_3)_2$: $R\bar{3}$ -), and attracts much attention as the model material to clarify the dolomite issue. Here, we demonstrate the norsethite crystallization mechanism under atmospheric pressure. By the comparison of nucleation kinetics between norsethite and barium carbonate, we revealed that norsethite is apparently formed from barium carbonate by the solution-mediated transformation. In contrast, when the dissolution enthalpy and entropy were obtained from the van't Hoff plots of norsethite and barium carbonate, respectively, we revealed that norsethite co-precipitate with barium carbonate at less than 80 °C, and norsethite emerge by the solution-mediated transformation over 80 °C. We concluded that it is essential to analyze both the thermodynamic stability and the nucleation kinetics for the understanding of the norsethite crystallization mechanism.

Keywords: Norsethite, Solution-mediated transformation