-101 gypsum contact twins experimentally obtained from a calcium carbonate rich solutions: mineralogical implications for natural gypsum deposits

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Gypsum twins are frequently observed in nature triggered by a wide array of impurities which are present in their depositional environments and may exert a critical role in the selection of different twin laws [1,2]. Therefore, identifying the impurities able to promote the selection of specific twin laws has relevant implications for the geological studies aimed at interpreting the gypsum depositional environments in ancient and modern deposits.

Here, the effect of calcium carbonate ($CaCO_3$) on gypsum ($CaSO_4 \cdot 2H_2O$) growth morphology has been investigated by performing temperature-controlled laboratory experiments with and without adding carbonate ions.

The precipitation of twinned gypsum crystals has been experimentally obtained (-101 contact twin law) by adding carbonate to the solution, and the involvement of rapidcreekite ($Ca_2SO_4CO_3 \cdot 4H_2O$) in selecting the -101 gypsum contact twin law was invoked, suggesting an epitaxial mechanism. Moreover, the occurrence of -101 gypsum contact twins in nature has been suggested, by comparing the natural gypsum twin morphologies observed in evaporitic environments with those obtained in our experiments. Finally, both the orientations of primary fluid inclusions (of the negative crystal-shaped) with respect to the twin plane and the main elongation of sub-crystals making the twin are proposed as a fast and useful method (especially in geological samples) to distinguish between the 100 and -101 twin laws. The results of this study provide new insights into the mineralogical implications of twinned gypsum crystals and their potential use as a tool to better understand the natural gypsum deposits.

References

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