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LETTER

A nanoscopic approach to the kinetics of anhydrite (100) surface growth in the range of temperatures between 60 and 120 °C

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ABSTRACT

In situ observations of the growth of the anhydrite (100) surface in contact with supersaturated aqueous solutions under conditions within the stability field of this mineral (60–120°C) were conducted using a hydrothermal atomic force microscope (HAFM). Advancement rates were measured for [001] steps, the most stable ones on the anhydrite (100) surface. Isothermal data fit well to linear correlations between step advancement rate and supersaturation; the activation energy for step advancement is 73 ± 5 kJ/mol. This is not significantly higher than activation energies reported for the growth of gypsum (60–70 kJ/mol) and does not support that slow dehydration rates of aqueous calcium is responsible for the well-known difficulty to precipitate anhydrite crystals from supersaturated aqueous solutions at temperatures well above the anhydrite-gypsum equilibrium temperature. The role of structural factors that could inhibit the growth of anhydrite is discussed.

Keywords: Anhydrite, kinetics, activation energy, HAFM