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Title: "Hydrothermal Atomic Microscopy Investigation of Barite Growth: The Role of Spectator Ions in Elementary Step Edge Growth Kinetics and Hillock Morphology."

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## Abstract

To better understand the role of spectator ions in barite growth, the kinetics of step edge growth on barite (001) surfaces were studied under various salt solutions. Hydrothermal Atomic Force Microscopy (HAFM) was used to investigate the effect of background electrolytes (NaCl, NaBr and NaNO<sub>3</sub>) as a function of saturation index and ionic strength ( $I$ ) on barite growth sourced at dislocations at 108 °C. Results show that hillock morphology is affected by  $I$ , as well as type of anion, where the prevalence of steps aligned on the [010] direction is highest under Cl<sup>-</sup>. There is a modest increase in kinetic coefficient of 55-130% with a ten-fold increase in  $I$  for each salt. In comparing the kinetic coefficients of the salts at low ionic strength (0.01 M), there is a moderate difference, suggesting that the anion may play a role in barium attachment.