

ASSESSING DOLOMITE REACTIVITY BY HYDROTHERMAL ATOMIC FORCE MICROSCOPY

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Dolomite reactivity is perplexing. Surface seawater is strongly oversaturated with respect to dolomite but there is no evidence of dolomite precipitation in modern marine depositional environments (ARVIDSON & MACKENZIE, 1999). The ancient sedimentary records however often contain dolomite. Laboratory preparation of synthetic dolomite generally requires hydrothermal conditions (KESSELS et al., 2000). Commonly this is interpreted as a kinetic limitation that inhibits dolomite formation at lower temperatures (HIGGINS & HU, 2005).

This study was designed to investigate dolomite reactivity on the (104) surface at elevated temperatures by applying hydrothermal atomic force microscopy. Experiments were conducted at temperatures up to 120 °C, pH ranging from 4-8 and pressures up to 5 bars.

All dissolution experiments produced crystallographically well defined etch pits which indicate stoichiometric release of ordered lattice cations. Most of the growth experiments however lead to the growth of two layers of a carbonate (~3 angstroms thick) which morphologically reproduced the initial surface features, resembling a template effect. Growth after these layers was strongly inhibited and does not show preferred crystallographic features.

In summary, the results show that, while dissolution proceeded uninhibited, growth kinematics were clearly self-limiting

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