



## **An AFM study of calcite dissolution in concentrated electrolyte solutions**

E. Ruiz Agudo (1), C.V. Putnis (1), A. Putnis (1), and C. Rodriguez-Navarro (2)

(1) Institut für Mineralogie, Universität Münster, Corrensstrasse 24, D-48149, Münster, Germany (encaruiz@ugr.es), (2)  
2Dept. Mineralogía y Petrología, Universidad de Granada, Fuentenueva s/n, 18002 Granada, Spain

Calcite-solution interactions are of a paramount importance in a range of processes such as the removal of heavy metals, carbon dioxide sequestration, landscape modeling, weathering of building stone and biomineralization. Water in contact with minerals often carries significant amounts of solutes; additionally, their concentration may vary due to evaporation and condensation. It is well known that calcite dissolution is affected dramatically by the presence of such solutes. Here we present investigations on the dissolution of calcite in the presence of different electrolytes. Both bulk (batch reactors) experiments and nanoscale (in situ AFM) techniques are used to study the dissolution of calcite in a range of solutions containing alkali cations balanced by halide anions. Previous works have indicated that the ionic strength has little influence in calcite dissolution rates measured from bulk experiments (Pokrovsky et al. 2005; Glendhill and Morse, 2004). Contrary to these results, our quantitative analyses of AFM observations show an enhancement of the calcite dissolution rate with increasing electrolyte concentration. Such an effect is concentration-dependent and it is most evident in concentrated solutions. AFM experiments have been carried out in a fluid cell using calcite cleavage surfaces in contact with solutions of simple salts of the alkali metals and halides at different undersaturations with respect to calcite to try to specify the effect of the ionic strength on etch pit spreading rate and calcite dissolution rate. These results show that the presence of soluble salts may critically affect the weathering of carbonate rocks in nature as well as the decay of carbonate stone in built cultural heritage.

### References:

- Pokrovsky, O.S.; Golubev, S.V.; Schott, J. Dissolution kinetics of calcite, dolomite and magnesite at 25°C and 0 to 50 atm pCO<sub>2</sub>. *Chemical Geology*, 2005, 217 (3-4) 239-255.
- Glendhill, D.K.; Morse, J.W. Dissolution kinetics of calcite in NaCl-CaCl<sub>2</sub>-MgCl<sub>2</sub> Brines at 25 °C and 1 bar pCO<sub>2</sub>, dolomite and magnesite at 25°C and 0 to 50 atm PCO<sub>2</sub>. *Aquatic Geochemistry*, 2004, 10 171-190.