Evaporation of aqueous salt solutions in sandstone during dissolution/crystallization cycles

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We have investigated the dynamics of sodium chloride recrystallization and its effect on the drying kinetics of sandstones saturated with NaCl solutions at different relative humidities.

On the microscopic-scale, we studied the kinetics of nucleation and growth in the porous material during dissolution/deliquescence followed by drying using high resolution X-ray computed tomography, Scanning Electron Microscopy and microscale experiments on salt nucleation and growth in confined geometries as models for a single pore in the stone.

Depending on the relative humidity, the dynamics of growth, the crystallisation pattern and its localization may be very different in different cycles (Fig. 1)[1]. The results of the microscale experiments give insight into why at the macroscale the kinetics of evaporation of sandstone samples varies with the number of evaporation/wetting cycles and with the size of the sample.

FIG. 1. Crystallization patterns on the top face of sandstone. (a) After 1 cycle, and (b) 3 cycles. (Relative Humidity = 20%, T = 20°C).