Contribution ID: **504** Type: **Oral Presentation**

Direct nanoscale investigation of calcite dissolution kinetics

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We illustrate experimental protocols designed to acquire Atomic Force Microscopy (AFM) images for the nanoscale investigation of key patterns of mineral dissolution reactions at solid-fluid interfaces. These reactive processes are critical in numerous scenarios of application in natural porous systems as they drive alterations of fundamental properties of the host solid matrix (e.g., permeability, porosity, and storage capacity). Advanced high resolution imaging techniques such as the AFM or the Vertical Scanning Interferometry (VSI) enable direct observation of crystal surfaces subject to reaction and document the presence of several local processes that contribute to the space-time development of the reaction. The action of these processes, in turn, yields marked spatial heterogeneities in the strength of reaction rates even at such very small scales, thus hampering the possibility to exhaustively represent material flux across the crystal surface through an average rate value. In this framework, a stochastic characterization of the reaction kinetics is then important to account for such spatial variability. We consider different setups designed to mimic conditions that are typical of natural scenarios of environmental concern, such as (i) diffusion-dominated and (ii) surface-controlled conditions. The former are typical of (extremely) low velocity/stagnant regions (e.g., dead-end pores), whereas the latter resemble flowing areas. We show through qualitative and quantitative analyses that data obtained via the proposed experimental settings can be readily employed for the evaluation of reaction rate maps that are then well suited for interpretations grounded on stochastic characterization approaches.

Participation

In-Person

References

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