3D determination of dissolution rates on single crystals

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Reactions that occur at the mineral surface exert an important control on the processes of mass transfer between fluids and rocks. Determination of dissolution rates in the laboratory is commonly done from batch and flow-through experiments on mineral powders or 2D microscopic analysis of single faces under controlled flow conditions (AFM, VSI). However, crystal faces often exhibit a large variability in dissolution rates and the changes in crystal morphology, as well as the relative contribution of edge regions to mineral dissolution, cannot be taken into account by these techniques.

We present here a method that uses X-ray micro-tomography (XMT) to directly measure the displacement of the fluid-mineral interface in 3D and calculate the correpsonding dissolution rates. The velocity of the moving interface is generally non-uniform over space and time as a result of the difference in reaction rates between different faces and mineral heterogeneites Application of this technique to the determination of rates during dissolution experiments will be presented.