

Measuring overall reaction rates with X-ray micro-tomography

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The dissolution and precipitation kinetics of minerals, combined with the effect of transport of species to and from the fluid-mineral interface, exerts an important control on the processes of mass transfer between fluids and minerals along a flow path. X-ray microtomography (XMT) allows for 3D characterization of the fluid-mineral interface, and offers the possibility to follow its displacement with time during dynamic experiments. The velocity of the moving interface is generally non-uniform over space and time as a result of the difference in reaction rates between minerals and the modification of transport processes at the pore scale. XMT, after segmentation and registration of 3D data sets, can offer an alternative method for calculating rates at the pore scale in such dynamic systems. Application of the technique to the determination of rates during dissolution and precipitation experiments will be presented.