1096-76-1889 **W. Brent Lindquist*** (blindquist@stonybrook.edu), Applied Mathematics and Statistics, Stony Brook University, Stony Brook, NY 11794-3600, and **Daesang Kim** (daesang.kim@kaust.edu.sa), Clean Combustion Research Center, KAIST, Thuwal, 23955-6900, Saudi Arabia. *Up-scaling Reaction Rates from Pore to Core Scale.*

Effective up-scaling requires identifying key information that must be transmitted from smaller to larger length scales. We examine this issue in the context of predicting reaction rates in flow through geologic media. We focus on up-scaling, from pore to core scale, of rates of anorthite and kaolinite reaction in sandstone under acidic condition. Due to inherent heterogeneities in rock structure, mineral placement, fluid velocity, and geometric changes induced by reaction, core-scale reaction rates differ significantly from the microscopic rate laws. Core up-scaled reaction rates were computed using network flow models. The simulations captured the time development of bulk reaction rates and allowed investigation of uncertainties in our knowledge of micro-scale reaction rates, as well as dependence of bulk reaction rates on flow rate. For the far-from-equilibrium reaction, our results indicate that the ability to correctly capture the heterogeneity in dissolution changes in the reactive mineral surface area is critical to accurately predict up-scaled reaction rates. For the near-equilibrium reaction, the ability to correctly capture the heterogeneity in the saturation state remains critical. (Received September 16, 2013)