

## **The fabrication of plagioclase feldspar microdevices: experimental tool for pore scale mineral weathering studies**

HEEWON JUNG<sup>1</sup>, ALEXIS NAVARRE-SITCHLER<sup>1</sup>, NATHAN WORTS<sup>2</sup>, JEFF SQUIER<sup>2</sup>

<sup>1</sup>Hydrologic Science and Engineering, Colorado School of Mines, Golden, CO, 80401, hjung@mines.edu

<sup>2</sup>Department of Physics, Colorado School of Mines, Golden, CO, 80401

Heterogeneous fluid flow and transport has been recognized as an important factor attributing the discrepancy between lab and field weathering rates. However, continuum scale heterogeneity cannot fully explain the discrepancy given the large difference in weathering rate of relatively homogeneous media to lab-measured rates. Therefore, careful comparison of the inherent differences between lab and natural system is necessary. One of the inherent differences is the pore-scale heterogeneity. For example, the measurement of surface area in laboratories ignores the fluid accessibility to the pores within mineral grains.

In order to investigate the effect of pore scale heterogeneity, reactive transport simulations have been widely employed. Even though modeling studies provide invaluable insight to weathering processes, simulation results are lacking of data directly measured at the pore scale.

In this regard, microfluidic approaches provide a unique opportunity for investigating the physicochemical behavior of fluid in porous media at the pore scale. Microfluidics has been successfully applied for characterizing and visualizing fluid flow at the pore scale. Its application to chemical reactions, however, has been limited mainly to simple bimolecular mixing reactions due to the use of non-reactive substrates such as glass or PDMS.

Here we present a combined method of femtosecond laser ablation and chemical etching to create a reactive substrate microdevice with plagioclase feldspars, albite and anorthite. We are expecting this research to (1) provide direct experimental evidences of coupled reactive transport at the pore scale and (2) improve applicability of lab measured mineral dissolution rate to field scale.