Lithium adsorption onto mineral surfaces of kaolinite, gibbsite, goethite and hematite

CHAO LIU[1], XIAO-MING LIU[2], ROBERT M. HAZEN[1], ANAT SHAHAR[1] AND JIHUA HAO[3]

[1]Geophysical Lab, 5251 Broad Branch Rd NW, Washington DC 20015, USA (*correspondence: cliu@carnegiescience.edu)

[2]Dept of Geological Sciences, Univ N. Carolina, Chapel Hill, Chapel Hill NC 27599 USA;

[3]Dept of Earth and Planetary Sciences, John Hopkins Univ, Baltimore MD 21218 USA

Lithium isotopes (δ^7Li) are ideal tracers of geologic processes, including continental weathering [1] and reverse weathering [2]. It has been proposed that Li adsorption on mineral surfaces could account for the isotope fractionation observed during continental weathering [3]. This proposal has been tested experimentally [4-6] but needs to be re-examined systematically as previous experiments were performed at a wide range of experimental conditions, and reported different results.

In this study, we investigated Li adsorption on four common secondary minerals formed during continental weathering: kaolinite ($Al_2Si_2O_5(OH)_4$), gibbsite ($Al(OH)_3$), goethite (FeOOH) and hematite (Fe_2O_3). The adsorption experiments were performed at conditions mimicking continental weathering processes, with a range of pH values (4.0-10.0) and realistic Li concentration in solution (~0.1 ppm) at ambient temperature. Preliminary results suggest that Li adsorption is controlled by pH and mineral species, with more Li adsorption at higher pH for kaolinite and gibbsite. These results could shed new insights on Li isotope fractionation during continental weathering.

1. Rudnick et al. (2004) *Chemical Geology,* 212, 45-57; 2. Chan et al. (1992) *EPSL* 108, 151-160; 3.Liu et al. (2013) *GCA*, 115, 73-91; 4. Pistiner and Henderson (2003) *EPSL*, 214, 327-339; 5. Millot and Girard (2007) *Clay in natural & engineered barriers for radioactive waste confinement-3rd International Meeting-Lille*; 6. Wimpenny et al. (2015) *GCA* 168, 133-150.