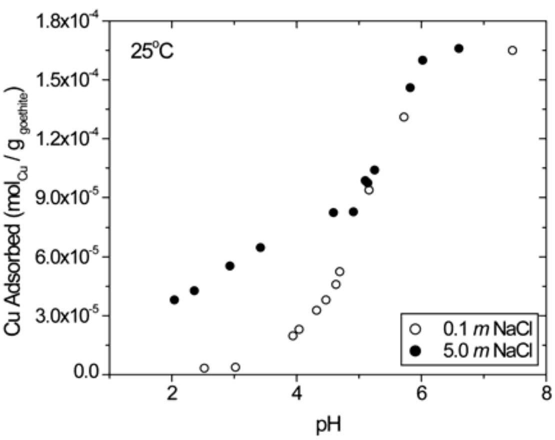
The effect of NaCl on Cu(II) sorption on goethite

C.G. GUNTON, A.G. CHRISTY AND D.C. MCPHAIL

CRC LEME and the Department of Earth Sciences, Australian National University, Canberra, Australia (chrisg@ems.anu.edu.au)

Copper mobility in water and regolith is affected by sorption; however the effect of salinity is poorly known. We determined experimentally the effect of $NaNO_3$ and NaCl on Cu(II) sorption onto synthetic goethite, in 16-hour experiments at 25°C, 2-8 pH, 0.1-3 *m* $NaNO_3$ and 0-5 *m* NaCl. Copper sorption decreased with increasing $NaNO_3$ concentration (0.1-1 *m*) at pH > 5 and is constant at higher concentrations. In contrast, copper sorption increased up to 20-fold at pH < 5 with increasing NaCl concentration (0.1-1 *m*) and is nearly constant at higher concentrations (Figure 1).

Figure 1: Adsorption of $Cu(II)_{ads}$ on goethite.



Surface complexation modelling of the $NaNO_3$ and NaCl data indicates the presence of $SOCu^+$, $SOHCu^{2+}$, $SOCuCl^0$ and $SOHCuCl_2^0$. The copper chloride surface complexes enhance sorption up to 1 *m* NaCl, but at higher values, the presence of Cu(II) chloride aqueous complexes minimizes further increases in sorption. Higher salinity is likely to decrease the dispersion of copper during weathering and contamination.

Laser and optical chemical imaging of diagenesis in iron-oxide deposits

JM KOTLER, N HINMAN AND A TENESCH

Department of Geology, University of Montana, Missoula, MT 59812, U.S.A. (julia.kotler@umontana.edu, nhinman@selway.umt.edu, snobowl@aol.com)

Martian soils consist of iron-oxide minerals reported to include jarosite and hematite, and possibly akaganeite, goethite, schwertmannite, and ferrihydrite [1-5]. The origin of hematite is unclear, but could include direct precipitation from water or hydrothermal fluids, weathering of reduced lavas, or diagenetic alteration of soils or sediments. If Martian hematite is secondary, then it is important to determine whether phase and depositional environment signatures persists through the alteration processes. We investigate diagenetic processes that alter iron-oxide phases in layered deposits formed under acidic conditions. To search for primary signatures and document diagenetic changes, we use a combination of standard chemical and mineralogical methods, with a new method, Laser and Optical Chemical Imaging (LOCI), laser-desorbtion mass spectrometry coupled with fluorescence spectroscopy. Using LOCI, we are able to examine surface films as well as conduct chemical depth profiling. In a previous study, loss of some trace elements and sulfate was accompanied by a transition from schwertmannite to goethite [6]. Other trace elements appear immobile during the transition. Some chemical signatures indicative of depositional environment may be lost during diagenesis of iron-oxide deposits while other signatures persist. We use LOCI to determine at what point and under what conditions these trace element and spectroscopic signatures are lost.

References

[1] Bishop J. L. and Murad E. (1996) *The Geochemical Society, special publication* **5**, 337-358.

[2] Bishop J. L., Pieters C. M., and Burns R. G. (1993) *Geochimica et Cosmochimica Acta* **57**, :4583-4595.

[3] Christensen P. R., Morris R. V., Lane M. D., Bandfield J. L., and Malin M. C. (2001) *Journal of Geophysical Research-Planets* **106**(23873-23885).

[4] Morris R. V., Golden D. C., Bell J. F., Shelfer T. D., Scheinost A. C., Hinman N. W., Furniss G., Mertzman S. A., Bishop J. L., Ming D. W., Allen C. C., and Britt D. T. (2000) *Journal of Geophysical Research* **105**(E1), 1757-1817.

[5] Morris R. V., Golden D. C., Shelfer T. D., and Lauer H. V. j. (1998) *Meteoritics and Planetary Science* **33**, 743-751.

[6] Hinman N. W., Alt D., and Furniss G. (2001) WRC rept. 1.200. Montana State University, 34p.