University of Idaho

Department of Chemistry

Spring 2009 Seminar Series

# The Reduction of Arsenates by Humic Substances (HS)

Research Seminar

Presented by:


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Abstract:

The reduction potentials of dissolved humic acids (HA) and fulvic acids (FA) have been found to vary with pH, ionic strength, and type of humate used[1]. Changes in HS reduction potential ranged from 60-140 mV upon additions of divalent cations, while no significant changes were observed with equivalent additions of monovalent cations. Dynamic light scattering measurements showed that this behavior paralleled the size changes obtained with humic aggregates under the same conditions. Quinoid moieties, which are known to play an important role in the redox chemistry of HS[2], displayed fluorescence excitation/emission matrices (EEMs) with features related to changes in the reduction potential of HS[3].

It is known that HA and FA can serve as reducing agents a variety of metal compounds[4,5,6]. Inorganic arsenates were found to be reduced to arsenite by homogeneous aq. solutions of several HS[7]. Ion chromatography, validated by inductively coupled plasma AES spectroscopy, was used to speciate arsenic after exposure to aq. humates and fulvates. Reduction of As(V) proceeded in the 20-60% range, depending on the humic or fulvic acid used. Leonardite humic acid, adsorbed to the surface of kaolinite was also able to reduce arsenate, although the extent of this reaction was diminished by 20%.


***References:***


[1] Palmer, Noel; von Wandruszka, Ray. **The Influence of Aggregation on the Redox Properties of Humic Substances.** Environmental Chemistry, 2008. (accepted)

[1] Klapper, Lisa; McKnight, Diane M.; Fulton, J. Robin; Blunt-Harris, Elizabeth L.; Nevin, Kelly P.; Lovley, Derek R.; Hatcher, Patrick G. **Fulvic Acid Oxidation State Detection Using Fluorescence Spectroscopy.** Environmental Science and Technology (2002), 36(14), 3170-3175.

[1] Helburn, Robin S.; MacCarthy, Patrick. **Determination of some redox properties of humic acid by alkaline ferricyanide titration.** Analytica Chimica Acta (1994), 295(3), 263-72.

[1] Szilagyi, Maria. **Reduction of Fe3+ ion by humic acid preparations.** Soil Science (1971), 111(4), 233-5.

[1] Yin, Yujun; Allen, Herbert E.; Huang, C. P.; Sanders, Paul F. **Interaction of Hg(II) with soil-derived humic substances.** Analytica Chimica Acta (1997), 341(1), 73-82.

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## Thursday, Jan 20, 2009

## 12:30 p.m., Renfrew Hall Room 111