Using Attenuated Total Reflectance Fourier Transform Infrared Spectroscopy to Investigate the Surface Chemistry of a Drying Soil. (4172)

Authors:
- C.E. Dowding - *Univ. of Stellenbosch, South Africa*
- M.J. Borda* - *Univ. of Delaware*
- M.V. Fey - *Univ. of Stellenbosch, South Africa*
- D.L. Sparks - *Univ. of Delaware*

Abstract:

Wetting and drying cycles are an everyday event in terrestrial environments, however, very little is known about the chemical changes that occur on drying at the solid-water interface. Although it is thought that the chemical environment at a drying surface is likely to be different from that of a hydrated surface, the difficulty of quantitative measurement has left this crucial aspect of surface chemistry largely overlooked. The present study, involving the examination of a manganese-rich soil, represents the first direct spectroscopic measurement, to the authors' knowledge, of the effect of drying on pH changes in real-time at a soil surface. Attenuated total reflectance Fourier transform infrared (ATR-FTIR) spectroscopy was employed by adsorbing a thymol blue pH indicator onto natural Mn-rich clay and observing the real time pH change by tracking the protonation of an acid-base dependent functional group. The pH of the overlaying solution dropped from pH 5 to below the indicator's acid dissociation constant of pH 1.65 with the removal of free water from the surface. The implications of this chemistry bridge several disciplines and are far reaching. A number of processes, including chemical speciation, redox reactivity, mineral solubility and surface charge, are pH dependent making drying a significant control on the fate and transport of species in the environment.

Speaker Information: Michael Borda, Univ. of Delaware, Department of Plant and Soil Sciences 153 Townsend Hall, Newark, DE 19716-1303; Phone: 302.831.0608; E-mail: mborda@udel.edu

Session Information: Wednesday, November 3, 2004, 10:00 AM-12:00 PM

Presentation Start: 10:00 AM (Poster Board Number: 2615)

Keywords: ATR-FTIR; spectroscopy; surface chemistry; drying