

Arsenic Solid State Speciation in Industrially Contaminated Materials Using Microfocused (μ) XANES and XRF

Y. Arai, J.Dyer and D. L. Sparks (U. of Delaware)

Abstract No. arai9412

Beamline(s): X26A

Introduction: We investigated the arsenic solid state speciation [oxidation states (III and V) and arsenic precipitate phases] in industrially arsenic contaminated materials using *in-situ* μ -XANES and μ -XRF. The areas are rich in Ca and S due to disposal of the residual sulfuric acid neutralized by lime. The spatial resolution ($\cong 15\mu\text{m}$) from microfocused techniques have provided important information on different arsenic oxidation states in heterogeneous soil matrices. While As(V) is predominant in the samples ($\text{pH} \cong 6$ and $\text{Eh} < -150\text{mV}$) where Fe, Ca and Ba are rich, mixtures of As(III and/or V) were detected where Ba, Ca, Fe are not concentrated. The distribution of As(V) becomes more pronounced in oxidized samples ($\text{Eh} > -50\text{mV}$) and it is also associated with Fe and Ba, indicating an As(V) adsorption complex and/or Ba-As(V) precipitates. The position of As(III) excitation energy ($< 11871\text{eV}$) was similar to that of As(III)-sulfide minerals, indicating the presence of orpiment (As_2S_3) and/or realgar (AsS) like minerals instead of As(III) adsorption complexes on metal hydroxides (see figures below).

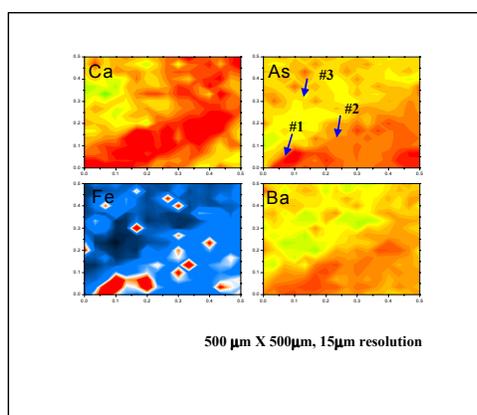


Fig. 1 Elemental mapping of arsenic Contaminated Soils ($\text{pH} \cong 6.5$ and $\text{Eh} \cong -150\text{mV}$)
[As]_T $\cong 75\text{ppm}$ [S]_T > 450000ppm[Ba]_T $\cong 2000\text{ppm}$ [Fe]_T $\cong 74000\text{ppm}$

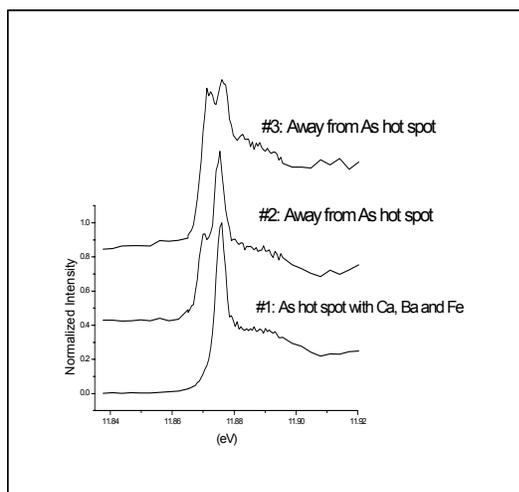


Fig. 2 As K edge Xanes spectra at different soil matrices