	Experiment title: Oxidation state and retention mechanisms of arsenic in polluted soils and rivers	**Experiment number:** ME 411
Beamline: ID 26	**Date of experiment:** from: 19/06/02 to: 24/06/02	**Date of report:** 29/08/02 *Received at ESRF:*
Shifts: 15	**Local contact(s):** Laurent ALVAREZ	

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Report:

EXAFS and XANES data were recorded at the As-K edge (11869) using a (220) monochromator at the ID26 beamline. Data were collected at 10K and at room temperature in fluorescence mode using Si photo-diodes and a 3 or 6µ Ge filter to attenuate elastic scattering and Fe fluorescence. EXAFS and XANES data were recorded in step-scan mode after recording few quick-scan XANES spectra in order to check for unwanted photo-oxydation or reduction of the samples under the beam.

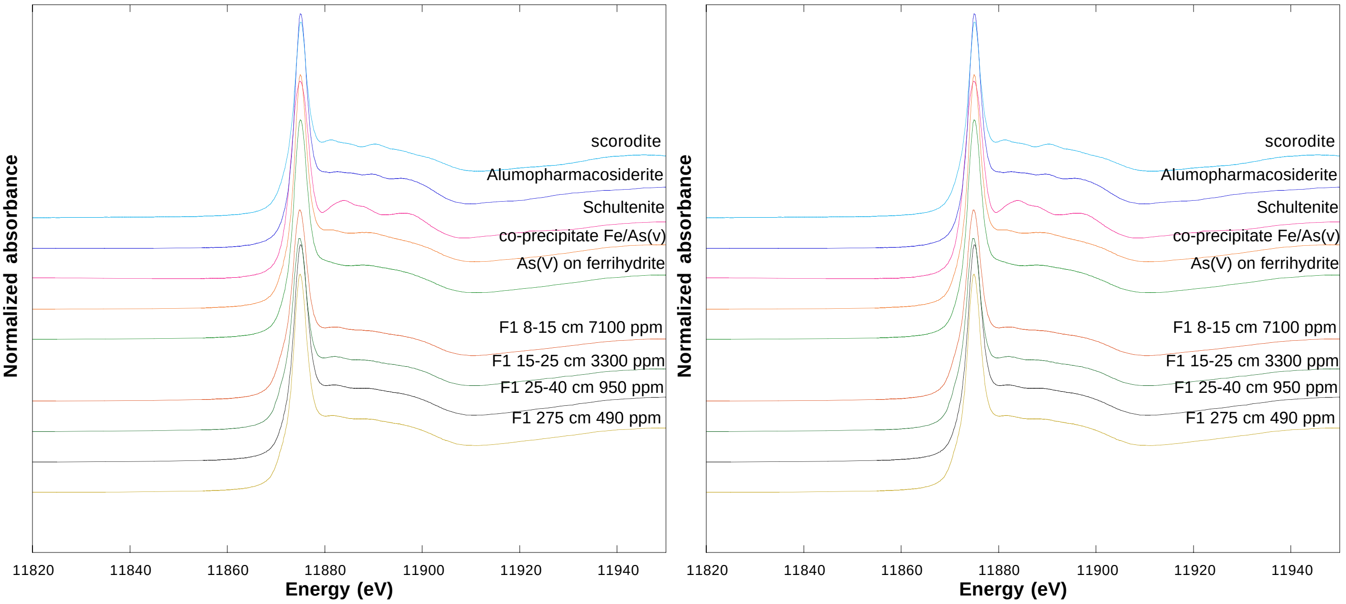

Figure 1. As K-edge XANES spectra of bulk soils samples from two soil profiles in an arsenic contaminated area in the vicinity of an industrial site. Comparison with experimental model compounds data suggests that As is mainly co-precipitated with and/or sorbed onto finely divided iron-oxyhydroxides.

According to preliminary linear least-squares fitting of XANES data of bulk soil samples, using model compounds XANES data, As(V) largely dominates over As(III) in the both soil profiles studied (down to 4 m depth), even though few percent of As(III) are present in the water-table zone. This preliminary data analysis indicates that arsenic is mainly present as As(V) co-precipitated and adsorption of As(V) with(on) poorly ordered iron oxyhydroxides, such as ferrihydrite (Fig. 1). Similar arsenic speciation was revealed by XAS in topsoil horizons of natural analogues of polluted soils [1]. These findings emphasize the role of iron-oxides in scavenging arsenic in soils [2].

Preliminary analysis of EXAFS data of selected As-rich bulk soil samples roughly confirm XANES data but also suggest that a minor fraction of arsenic is hosted by As-bearing crystalline compounds, likely inherited from the industrial activity (lead arsenates and aluminum arsenates) (Fig. 2). XAS data are still under interpretation and will be used for modeling As mobility at this site, in relation with water chemistry analyses which are currently carried out at the same site.

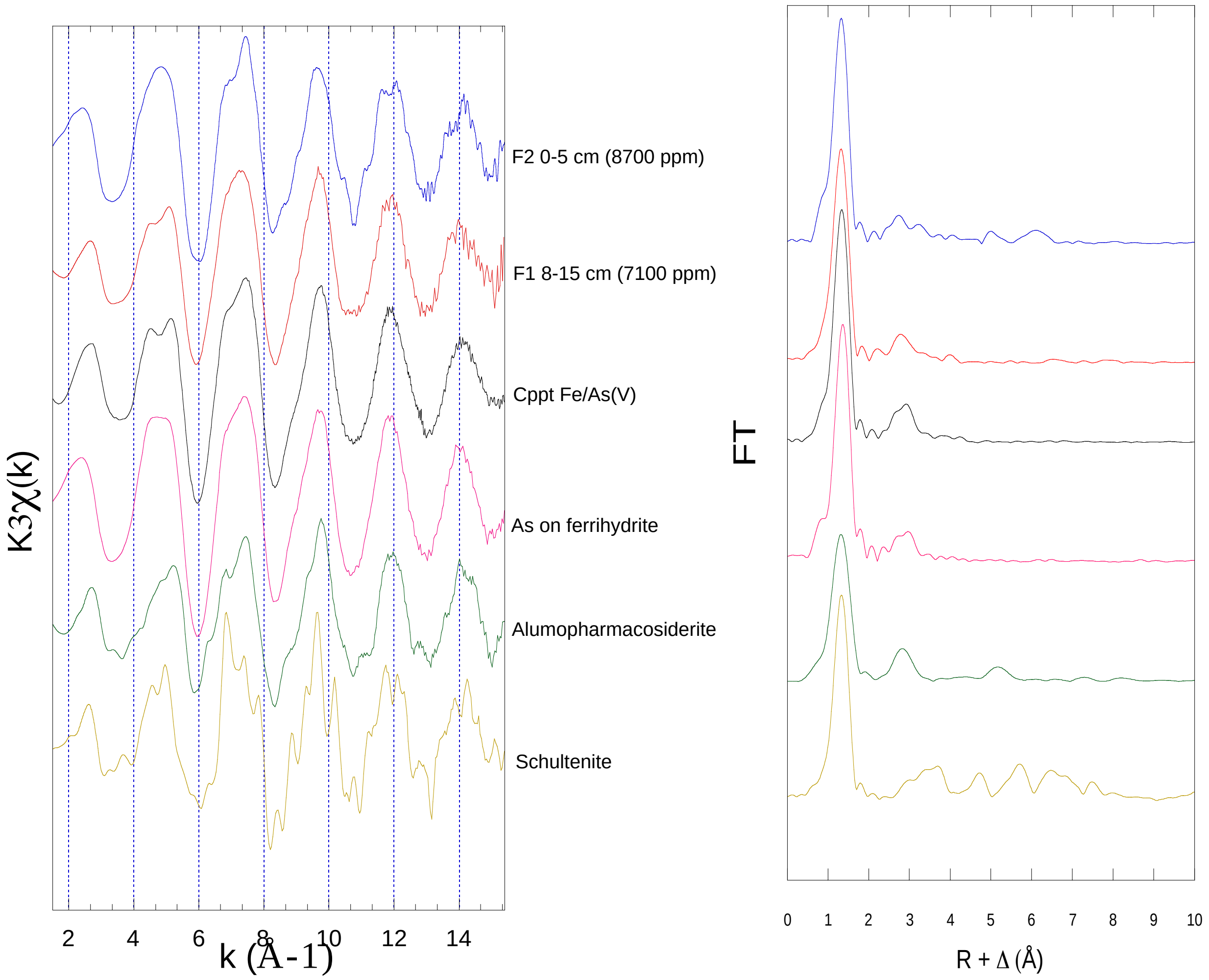

Figure 2. As K-edge EXAFS spectra of bulk soils samples of two contaminated surface soils samples compared with experimental spectra of model compounds.

References

[1] Morin G. et al. **(2002)** EXAFS evidence for sorbed arsenic(V) and pharmacosiderite in a soil overlying the Echassieres geochemical anomaly, Allier, France. *Bull. Soc. Géol. Fr.* **173**, 281-291.

[2] Morin et al. **(2002)** XAS monitoring of Arsenic (Bio-)Oxidation and Immobilisation in soils and acid mine drainage. *Geochim. Cosmochim. Acta*, Abstracts of the 12th Goldschmidt conf., Davos, Switzerland, August 18-23, A526