



**Experiment title: Cobalt(II) sorption to Mn and Fe oxides**

**Experiment number:**  
30-02-960

**Beamline:**  
FAME

**Date of experiment:**  
from: 30/03/2010 to: 06/04/2010

**Date of report:**  
28/05/2010

**Shifts:**  
21

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*Received at ESRF:*

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**Report:**

The aim of this experiment was to use the x-ray emission spectrometer on the FAME beamline to obtain high resolution XES spectra of Co(II) (K alpha 1) sorbed onto Mn and Fe oxides. This technique was required for this experiment as the high fluorescence of Fe and Mn from the oxides generally excludes the possibility of obtaining workable Co XAS spectra at relatively low sorbed Co concentrations (Figure 1). XES spectra were obtained for Co(II) sorbed onto the Fe oxides - hematite, goethite, 2-line ferrihydrite and ferrihydrite coprecipitated with silicate - with the data suggesting differences in the coordination environment of Co(II) when sorbed onto these oxides. Similar results were obtained for Co(II) sorbed onto the Mn oxides hausmannite, pyrolusite and birnessite although, in this case, the spectrometer was not required to obtain this data. No oxidation of Co(II) to Co(III) was observed when Co(II) was sorbed to the Mn (and Fe) oxides. With further ab initio modelling, these data will assist in comprehending Co sorption mechanisms to the surface of these common, and natural, minerals with a view to understanding Co mobility in the environment.

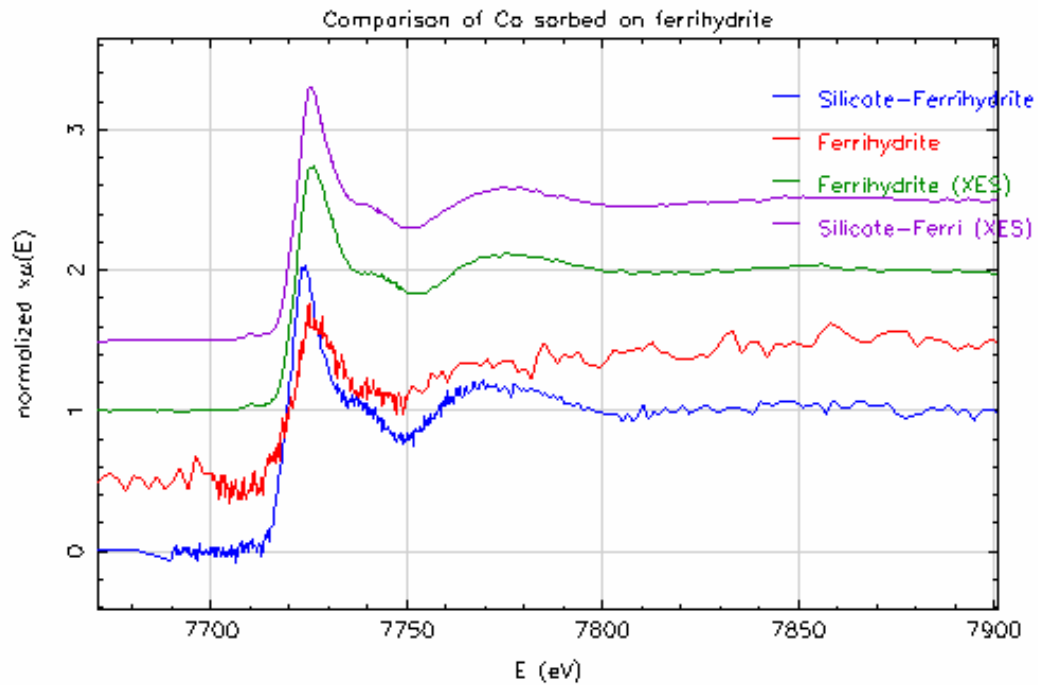


Figure 1: Comparison of Co K edge XANES data obtained for Co(II) sorbed onto 2-line ferrihydrite and ferrihydrite co-precipitated with silicate by XAS and XES. The pre-edge feature in the XES data is not observable in the XAS data.