	Experiment title: Fe speciation as an indicator of microbial weathering of seafloor basalt under anaerobic conditions	Experiment number: 30 02 835
Beamline: BM 30B (FAME)	**Date of experiment**: from: 20 September 2007 to 28 September 2007	**Date of report**: Sept. 20 2008
Shifts: 12	**Local contact(s)**: Jean-Louis Hazemann	*Received at ESRF:*

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Report:

The objective of this proposal was to determine the nature of poorly ordered iron biogenic minerals forming upon anaerobic microbial Fe(II) oxidation in natural and laboratory model systems, including the weathering of seafloor basalts under anoxic conditions.

During the 12 shifts beamtime, EXAFS and XANES data were recorded at the Fe K-edge in fluorescence detection mode using 30 Ge-element detector, on 10 samples containing 1 – 10 wt% of iron diluted in appropriate amounts of cellulose to get 1 wt% Fe, in order to avoid autoabsorption effects. Data were also recorded on 8 concentrated samples in transmission detection mode. All data were recorder at a temperature of 10-15 Kin a liquid He cryostat. The monochromator was equipped with Si(200) crystals and the whole experiment was done using dynamic saggital focusing of the second crystal. XANES data were recorded within the same scans as EXAFS data, by defining various regions in the scan.

The data were of good quality, combining very good energy resolution in the pre-edge region, to good signal to noise ratio up to k= 13 Å^{-1} in the EXAFS region. Part of these data are included in two forthcoming publications (Miot et al. *submitted*)
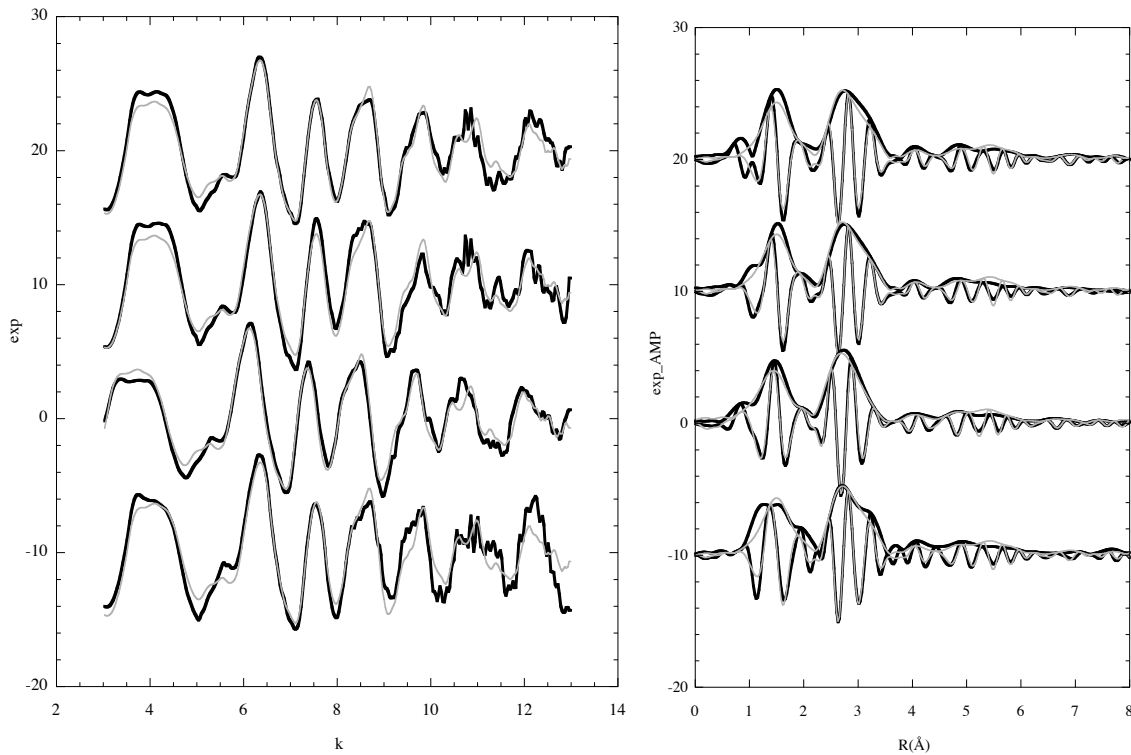
Examples of transmission EXAFS data at the Fe K-edge of biogenic samples (black) fit by linear combination of model compounds spectra of iron (oxyhydr)oxides (gray). Discrepancies on the bottom spectrum is due to poor quality of the spectrum above 10 Å-1, caused by the heterogeneity of the sample.
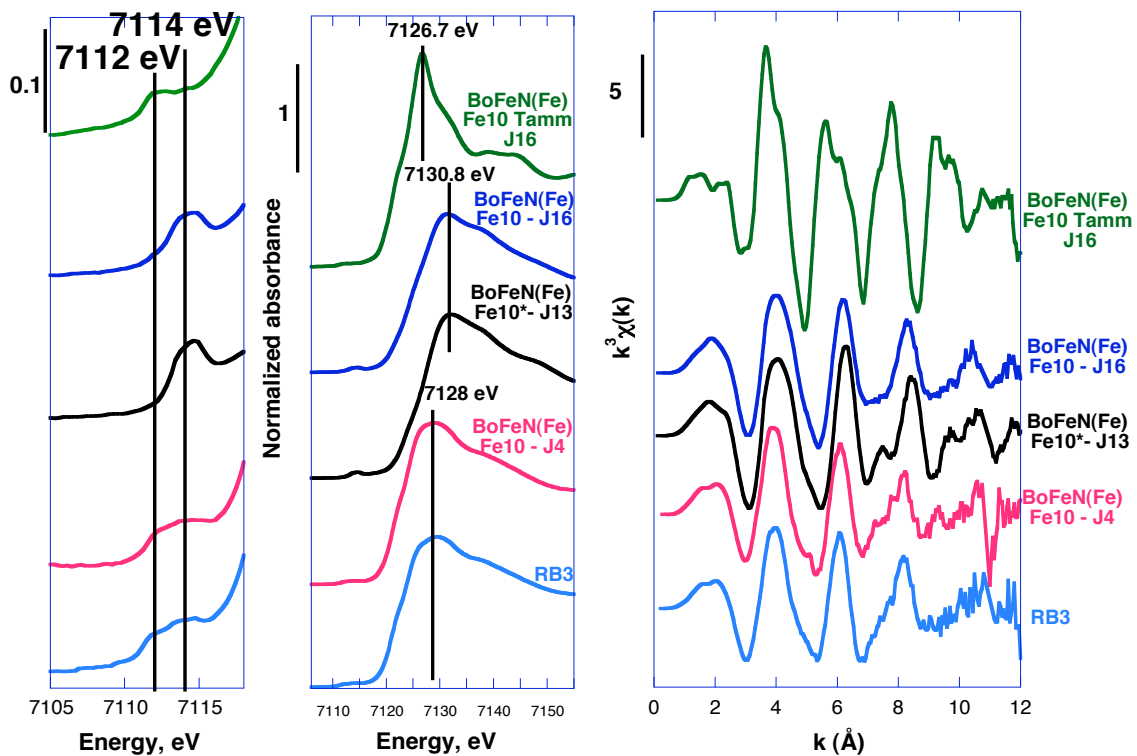
Examples of Fluorescence XANES and EXAFS data at the Fe K-edge of biogenic samples and model compounds showing qualitatively a mixture of Fe(II) and Fe(III) mineral phases, that can be distinguished by the position of the centroid of the pre-edge at 7112 and 7114 eV, respectively. Poor quality of the spectra above 11 Å-1 is caused by the heterogeneity of the samples.

References

J. Miot, K. Benzerara, G. Morin, E. Larquet, G. Ona-Nguema, A. Kappler, F. Guyot. Transformation of Fe(II)-minerals by anaerobic iron-oxidizing bacteria. Submitted to *Geobiology*