ESRF	**Experiment title:** **Crystalline SiO_2 in breathable dusts: Fe reactivity and crystal chemistry**	**Experiment number**: CH-3059
Beamline: BM-08	**Date of experiment**: from: 26 April 2010 to: 02 May 2010	**Date of report**: 24 Aug. 2010
Shifts: 15	**Local contact(s)**: D'Acapito Francesco	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

DI BENEDETTO Francesco, ROMANELLI Maurizio
Department of Chemistry
University of Florence
Via della Lastruccia 3
50019 Sesto Fiorentino
MONTEGROSSI Giordano
IGG-CNR
Via G. La Pira, 4
50121 Firenze (Italy)

Report:

The experiment dealt with investigation, using XAS spectroscopy at the Fe K-edge, on samples consisting of suspended dusts. These were correspondent to the relevant bulk samples of the processing lines (e.g. ceramic and brick productions, cements, quarry activity, casting, building activity), already object of the previous experiments SI-1593 and SI-1773. Samples included:

a) environmental ones, through samplers acting the whole duration of the processing activity (1-6 hours). Dusts were collected on polycarbonate filters (tot amount < 1 mg, silica < 100 μg)

b) personal worker ones, through samplers acting the whole duration of the worker access to the processing activity (0.5-2 hours). Dusts collected on polycarbonate filters (dust and silica amounts even smaller)

Although the limited amount of collected materials, XANES/EXAFS investigations were possible, by analysing directly the polycarbonate filters (which, after proper experimental check, resulted not interfering with the considered measurements).

Experiment, carried out on over 15 filters (and more than 10 corresponding bulk powders), were succesfull in detecting significant information on:

- Valence state and coordination of Fe in the considered airborne dusts
- dimensional enrichment of components in the original processed mixture of materials
- further reactivity occurred in a specific fraction of materials

It is noteworthy recall that data on suspended dusts are largely more precise in defining crystal chemical bases of the workers exposure, considering that personal sampling describes almost exactly what workers inhale.
The preliminary interpretation of acquired spectra allowed, e.g. to observe in the ceramic processing of quartz the following features:
- industrial raw qz samples are characterised by the occasional Fe(0) contamination (this holds true for several other industrial processing)
- suspended dustsare characterised by a Fe XANES speciation different from bulk powders (at both the starting and ending of processing), as confirmed by EXAFS