	Experiment title: Understanding the effect of the doping current intensity on the electrochemical Er doping of porous silicon	**Experiment number**: MA2539
Beamline: BM08 LISA	**Date of experiment**: from: 01 April 2015 to: 07 April 2015	**Date of report**: 3.5.2016
Shifts: 18	**Local contact(s)**: Francesco d'Acapito	*Received at ESRF:*

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Report:

EXAFS data at the Er-L_{III} edge have been collected at the BM08-LISA (former GILDA) beamline at the European Synchrotron Radiation Facility. The monochromator was equipped with a pair of Si (311) crystals and was run in dynamically focusing mode. Mirrors coated with Pd were used for beam collimation/focusing and harmonic rejection ($E_{cutoff} \approx 18$ keV). The absorption coefficient from the sample was measured in fluorescence mode using a 12 elements array of high purity Ge detectors with an energy resolution of about 200 eV on the Er-Lα line. For each sample, 2 to 4 spectra were collected and averaged to increase the signal-to-noise ratio. EXAFS spectra were extracted and analyzed with the ATHENA-ARTEMIS codes.

In this experiment we verified the homogeneity of the Er deposition by X-ray fluorescence mapping on the external surface area. This ensured that the EXAFS spectrum were measured in the optimal sample area.

In figure 1 we show two 2D maps of the intensity of the Lα Er emission in 12x10 mm scan covering the entire porous area. The EXAFS measurements were performed in the red areas, that is the most Er-rich and homogeneous part of the samples.

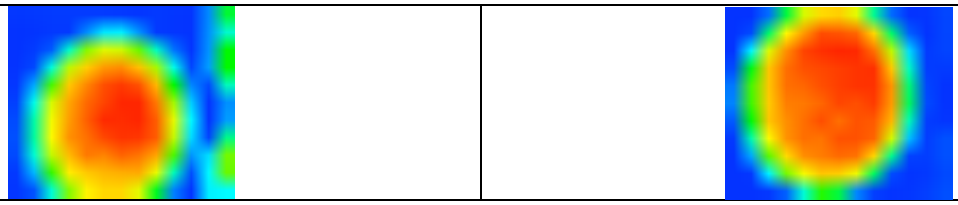

Figure 1. Fluorescence map for two typical porous Si samples electrochemically doped with Er in 12x10 mm scans covering the entire porous area. Blue is the minimum Er content and red is the maximum.

The measurements were performed in the whole set of samples initially scheduled, including then samples with very different Er content (high and low current, short and long doping times) and different thermal treatments (600 and 700°C and 1 or 2h annealing times).

The collected data for the most relevant samples are shown in Figure 2:

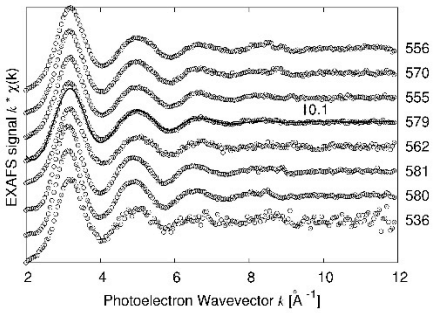

Fig.2a: EXAFS spectra of the samples. For sample 579 the best fitting curve is also shown. The numbers on the right side are the reference numbers of the samples.

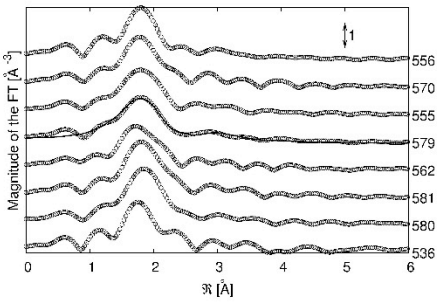

Fig.2b: Fourier Transforms (k=3..10 $Å^{-1}$, k^2 weight, Hanning window apod. 0.2 $Å^{-1}$) of the EXAFS spectra of the samples. For sample 579 the best fitting curve is also shown.

The quantitative data analysis has been completed and an article is going to be submitted together with state-of-art morphological and optical characterization.