ESRF	**Experiment title:** *Establishing the links between optical properties and local environment of Yb^{3+} ions embedded in optical fiber preforms containing Y_2O_3 nanoparticles. An EXAFS study.*	**Experiment number**: CH-2817
Beamline: BM08	**Date of experiment**: from:28-1-09 to: 1-2-09	**Date of report**: 23-2-09
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Report:

The aim of Exp ch-2817 was to determine the local environment around Yb ions in optic fiber glassy matrices. These matrices are doped with Y2O3 in order to promote the formation of nanocrystals of this phase.

The EXAFS data at the Yb-L_3 edge (8944 eV) were collected at the GILDA beamline with the monochromator equipped with a pair of Si(311) monochromating crystals and running in dynamically focusing mode. The harmonic rejection was achieved by using two Pd-coated mirrors with an energy cutoff of 18 keV. The absorption coefficient was measured via the fluorescence yield from the samples detected with a 13 elements High Purity Ge detector. The beam size was approximately 150*150 mm in order to correctly analyze the core of the fibre preforms.

Fig 1 shows a typical distribution profile of Yb ions in the preform measured by Xray fluorescence: this permits to determine the size of the Yb-doped zone that resulted to be of about 1.5 mm. The vertical bars indicate the point where the EXAFS spectra have been carried out that was chosed to be in the middle of the fibre core.

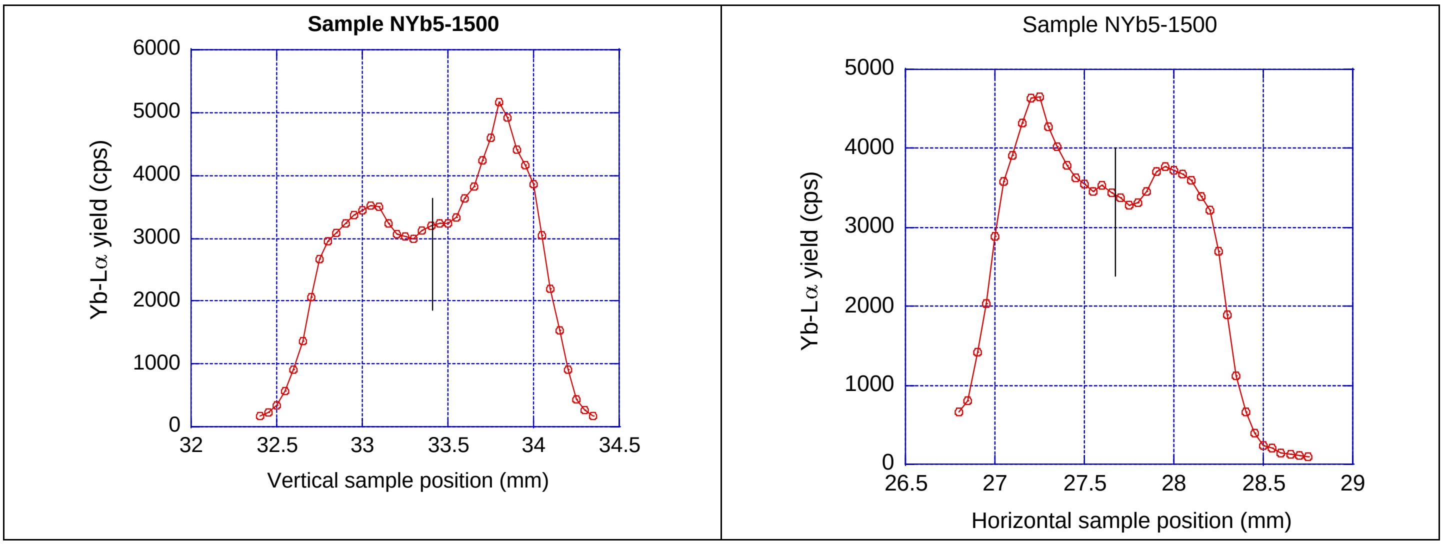

Fig.1: Distribution of Yb ions in the glass as determined by the fluorescence yield of the Yb-Lα line. The vertical line marks the point where the XAS measurement has been carried out.

EXAFS spectra were collected on two complete series called NYb5 and NYb7 and for thermal treatment temperatures of 1000, 1300, 1500 and 1900 deg. The EXAFS spectra related to NYb5 series are shown in Fig.2.

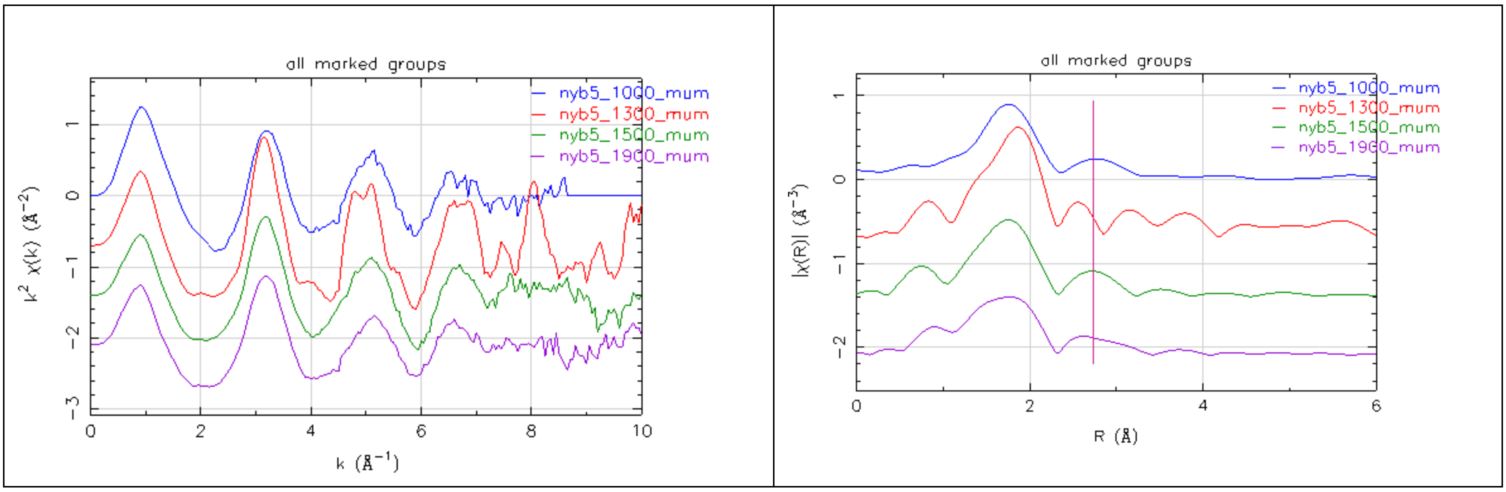

Fig.2: EXAFS spectra of the samples belonging to the NYb5 series (left) and the related Fourier Transsforms (right). Transforms were carried out in the interval k=2-9 Å with a Hanning window and a k^2 weighting factor. The vertical bar marks the position of the second coordination shell visible in the amorphous samples.

The EXAFS spectrum of sample 1 is dominated by a single frequency similarly to samples annealed at 1500 and 1900 deg. This means that Yb in these cases in surrounded by an “amorphous” matrix. A more careful inspection of the Fourier Transform reveals the presence of a second coordination shell (vertical bar mark in Fig.2), presumably due to Si. In the case of sample annealed at 1300 deg the spectrum contains also oscillations at higher frequencies suggesting the incorporation of Yb ions in a crystalline matrix. The first shell consists in 6± 1 Oxygen atoms at 2.25± 0.02 Å for the “amorphous” matrices and 2.29± 0.02 Å for the crystalline one.

Further analysis in in progress with the aim of determining the nature of the crystalline phase as well as the remainder of the structural details of the amorphous one.