ESRF	**Experiment title:** Structural study of the incorporation of rare-earth species in amorphous sol-gel films by XAFS spectroscopy	**Experiment number:** Ch 580

Beamline: GILDA	**Date of experiment:** from: 02/04/99 to:05/04/997	**Date of report:** 31/08/99
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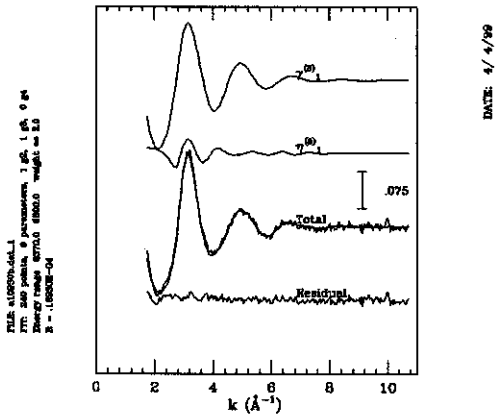
The aim of this experiment was to describe, with the help of X-ray Absorption Spectroscopy technique, the local environment of Er^{3+} ions in glasses for optoelectronic applications of various compositions. In particular glasses of the family SiO_2-TiO_2-(P_2O_5 or Al_2O_3)-Er_2O_3-Yb_2O_3 were studied with different amounts of (P_2O_5 or Al_2O_3) and Er_2O_3. Those glasses were previously shown to exhibit different optical luminescence lifetimes depending on Er, Al or P concentrations.

The experiment was done on the GILDA beamline in fluorescence mode using the 7 elements HP-Ge detector. Some experimental difficulties were encountered (i.e. the crystallinity of the substrates (that lead to unwanted Bragg peaks) and the machine mode (16 bunch) not well adapted) that permitted to perform only investigations on samples trated at 900 °C. All the same we succeeded in collecting data of good quality that permitted us to:

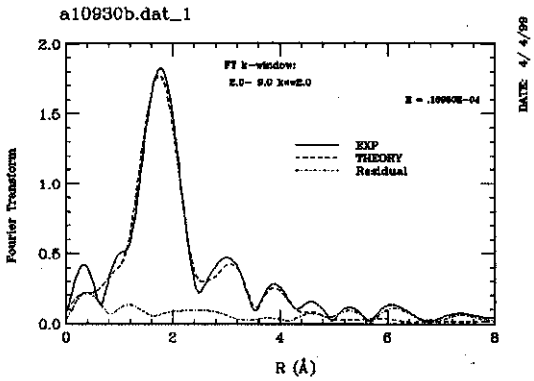
i) determining the studied cases the local structure around Er. In particulatr this is made up of a shell of O atoms plus a shell of Si atoms that can be correctly accounted for by data analysis based on Multiple Scattering (MS).

ii) Observe a correlation between the concentration of some glass components and the local structure

The following pictures show a preliminary MS analysis of the EXAFS spectra showing the correctness of our model to reproduce the experimental data.



Fit of the experimental data:
- Er-O single scatering (topmost curve).
- Er-O-Si triangulasr signal (2nd curve from top)
- Comparison between 'best fit' and experimental signals (3rd from top)
- residual (Bottom)



Fourier transforms of the
- Experimetnal data
- Best fit signal
- Residual