	Experiment title: EXAFS analysis of the Ge-environment in $Ge_xC_ySi_{1-x-y}$ /Si(001) epitaxial single layer with compressive null and tensile average lattice strain.	Experiment number: HC599
ESRF		

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Shifts: 15	Local contact(s): J. L. Hazemam	*Received at ESRF:* 0 1 .!!!! 1996

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Report: The aim of the experiment was the EXAFS investigation of two series of six $Si_{1-x-y}Ge_xC_y$ samples where the Ge atomic fraction is constant (x=15% and x=13.5%) while the carbon concentration ranges from O to **2%** in order to change the strain from compressive to tensile. In particular we have investigated the local Ge environment as a function of the average strain. Pre-characterization of the samples by X-diffraction (to measure the in and out plane lattice parameter) and by RBS - Nuclear Reaction Analysis (to measure the absolute content of Ge and (new result) of C) had been previuosly performed .

Necessary condition for the experiment exploitation were the following:

1) Collection of EXAFS spectra with polarization field parallel (horizontal configuration=H) and perpendicular (vertical configuration=V) to plane interface. This allows to look for differences among distances of NNN standing in or out of the plane parallel to the interface.

2) Collection of the EXAFS spectra at liquid nitrogen temperature in order to reduce the Debay-Waller factor

3) Rotation of the sample during spectra collection in order to avoid the presence of spurious Bragg peaks.

The experimental set up exploited fullfill all these conditions.

Unfortunately, the largest part of the beam time has been spent in order to find the right alligment of the beam (about 60% of the time) and the right procedure of cooling in order to avoid the humidity frozening inside the atmosferic pression chamber (about 20% of the time). As a matter of fact, in spite of the efforts spent by the local contacts J.L. Hazemann and Y. Soldo during all the the experiment long (Saturday and Sunday included), after that the right line-up of the beam was reached we have been able to collect spectra only during the last 10 hours and only at room temperature.

Now we are going to begin the complex procedure of data analysis of the few spectra collected, but it is already clear that they are too much damped and not enough to cover the projected series of samples (only 3 samples of x=13.5% series has been measured). However, preliminary results showing that the aim of the experiment could be reached are available. The following figure shows the comparison of the Fourier transform of two EXAFS spectra collected in horizontal and vertical configuration. As far as the first shell is concern no difference can be seen, as expected according to the geometry of the lattice structure. On the contrary, a clear difference in the distribution of the second shell is due to the tetragonal distortion.

Summary: Problems related to the beam line-up have characterized the run. The right methodology for the correct cooling of the chamber has been determined. The few spectra collected at room temperature do not allow to achieve the aim of the experiment, but allow only to realize that the effects that we are looking for are present.

Because of the failure of the experiment is due to technical problems of the beam line and experimental set-up, and because of these problems have been solved only at the end of the allocated time, we apply for having other beam time as soon as possible.