



ESRF

Experiment title: A coverage dependent SEXAFS study of the structural properties of the Cs / GaAs(110) interface.

Experiment number: SI-219

Beamline: ID32

Date of experiment:
from: 20 June 96 to: 30 June 96

Date of report:
August 31, 1996

Shifts: 27

Local contact(s): Fabio Comin

Received at ESRF:

Names and affiliations of applicants (* indicates experimentalists):

Maddalena PEDIO

Roberto FELICI

Roberto CIMINO

We reached ESRF well in advance with respect to the actual start of the beamtime in order to mount several tools, some of them we prepared, in the experimental chamber. Those were: sample rod able to cool down the sample at liquid nitrogen temperature, cleaving system, sample transfer mechanism, Cs sources and total yield detector,

After checking that the newly built set-up was ready to be operational, we started all the procedures necessary to reach the UHV conditions necessary for the experiment. As specified in the proposal, a pressure in the low 10^{-11} mbar was required because of the high reactivity of alkali metals deposited at low doses on clean GaAs (11 O) surfaces. This took more time than we planned even if it was easy to reach UHV conditions generally sufficient to perform many surface science studies, but more than one bake was necessary to reach the desired conditions. The final preparation of the experimental chamber took place during the first day of beam time.

However this time was not wasted only for this reasons since the beam line scientists were actively working to optimize the beamline parameters to perform EXAFS measurements at the Cs K-edge with energy scans from 36 to 40 keV. This became necessary because the software control of the undulator gap in order to follow the energy scans was still not available. For this reasons we had to spend quite a lot of time to optimize the gap and the tape of the two undulatory to find the fixed position giving, in the required energy range, the maximum intensity with the minimum undulator structures.

One can, of course, take significant spectra even with a structured intensity by having an I0 monitor but the measuring time is dominated by the low intensity regions in the required energy scans. We also spent some more beam time to optimize the I0 monitor.

In the final two days of beam time we performed the measurement and we were able to observe an absorption jump of about 10% of the signal at the Cs k-edge energy. The signal had the expected intensity but unfortunately the data we collected do not have the quality necessary to extract good EXAFS spectra. This is mainly due to the different spatial response of the sample and the Io monitor to small movements of the beam which make the two intensities not comparable. This problem can be solved only having an x-ray position monitor in close loop with the monochromator pitch or with the mirror. We should note that this was the first time a new model of Io monitor for high energy was used and the response of this device was not tested yet. We know that a feedback to stabilize the beam position is going to be available soon.

Nevertheless, under the above conditions, we were able to show that:

- i) in the ESRF experimental chamber it is possible to reach the required UHV conditions and, by inserting some equipment specific to our experiment, it is indeed possible to prepare and characterize clean films of Cs on Ga As (11 O) surface;
- ii) the intensity of the beam in the 35-40 keV range does allow us an acceptable edge jump and it is high enough to have an acquisition time short enough to maintain the system free of contaminants during the whole measurement.

For this latest comment the simultaneous scans in energy of the monochromator and undulatory are strongly requested.

In conclusion this run was not scientifically productive but it showed the feasibility of the experiment once the encountered technical problems will be solved (probably they have already been solved).