ESRF

Experiment title: LOCAL STRUCTURE OF GaSe and GaS UNDER HIGH PRESSURE

Experiment number: HC 609

Beamline: ID24

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Report:

We have performed a first trial to study the high pressure behaviour of GaS, GaSe in the energy dispersive XAFS set-up of ID24. As this experiments must be realised using single crystals, the spot size on the sample should attain a dimension smaller that the one of the sample itself that is confined in a diamond anvil cell. The single crystals were of 150 x 50 μm^2. This experiment has shown that the conditions need for the success of the project can be fulfilled. In particular the stringent conditions in terms of spot size on the sample were attained. In fact, a focalised spot of 100 μm in the energy dispersion direction was obtained and in the vertical dimension the beam was slit to 40 pm. The in-situ pressure measurements set-up could be mounted and successfully tested. The intensity on the sample was also enough for the realisation of the experiment. Unfortunately instabilities of the beam on the sample did not allow to collect spectra with a good signal to noise ratio. This is think to be mainly due to the coupling of fine the structure of the intensity-spatial distribution of the beam that is probably due to coherence problems, with intensity fluctuations produced by the coupling of the electron beam fluctuations with the dispersive optics.

We also tested the possibility of performing beam in-out measurements through the diamond anvil cells, that showed that the diamond diffraction peaks could be compensated within ± 1 pixel of the position sensitivity detector. We think that combining this type of measurements with a software correction, real absorption experiments through diamond anvil cells will be possible.

We foresee follow this scientific program on ID24. For the time a new experiment could be realised, several improvements in ID24 are expected. The elimination of the pre-monochromator Be-window that seems to be responsible of part of the speckle structure of the beam (already done), the cooling of the crystal monochromator (already done), the installation of the beam shutter that will allow to enter the experimental hutch leaving the beam on the monochromator (foreseen for September), the installation of a new system of slits to define the vertical size of the beam on the sample, the installation of a new detector system with better performances (already done) and the automatization of the search of the best focus.