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ESRF	**Experiment title:** The use of DAFS to determine surface and interface structures	**Experiment number:** MI-256
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Report:

Aim of the experiment was to exploit the DAFS technique in the study of surfaces. In particular we intended to measure the intensity of peaks characteristic of a reconstructed surface as a function of the photon energy near and above an absorption edge. In this manner we should determine bond lengths characteristic of the atoms participating in the reconstruction only.

In order to fully achieve our goal we planned to perform the following measurements:

a) Exafs and DAFS signal from a thin layer of Germanium grown onto a Silicon substrate. Those data were collected to give us a reference and to prove the experimental feasibility, Moreover, because of the high symmetry of the sample they can also be used to test the theory linking f" and f'. In fig. (1a) we report the absorption signal measured in fluorescence mode at ID32 from a 1000 Å thick Ge film. In fig (1b) we show the f' measured on the (111) reflection. f' has been measured using also the (311) and (220) reflections. All the three curves agree each other within the error bars. The continuous line in fig. (1b) is the f' calculated by using the absorption data. The agreement is excellent.

b) DAFS on a peak characteristic of the 2x1 reconstruction of the clean Ge (100) surface. We could measure with a high statistic the DAFS signal from several non integer order rods at different values of the critical exchanged momentum "l".

For some peaks at very low values of "l" we observed sharp features at an energy close to the absorption edge which are probably due to multibody effects and which should give a precise measurement of the dimer bond length. The DAFS signal measured in ultra grazing conditions (both incident and exit angles smaller than the critical value) show oscillations with a frequency different from the bulk reference data.

3) To study the absorption geometry of metals on the surface of semiconductors. In particular we intended to deposit Sb on the surface of Silicon and Germanium, in order to determine the bond distance between the metal and the substrate. In fact it is not possible to measure directly the dimer bond length because of the polarization vector direction which is perpendicular to the dimer bond direction. Unfortunately we could not complete this point because of beam time lack.

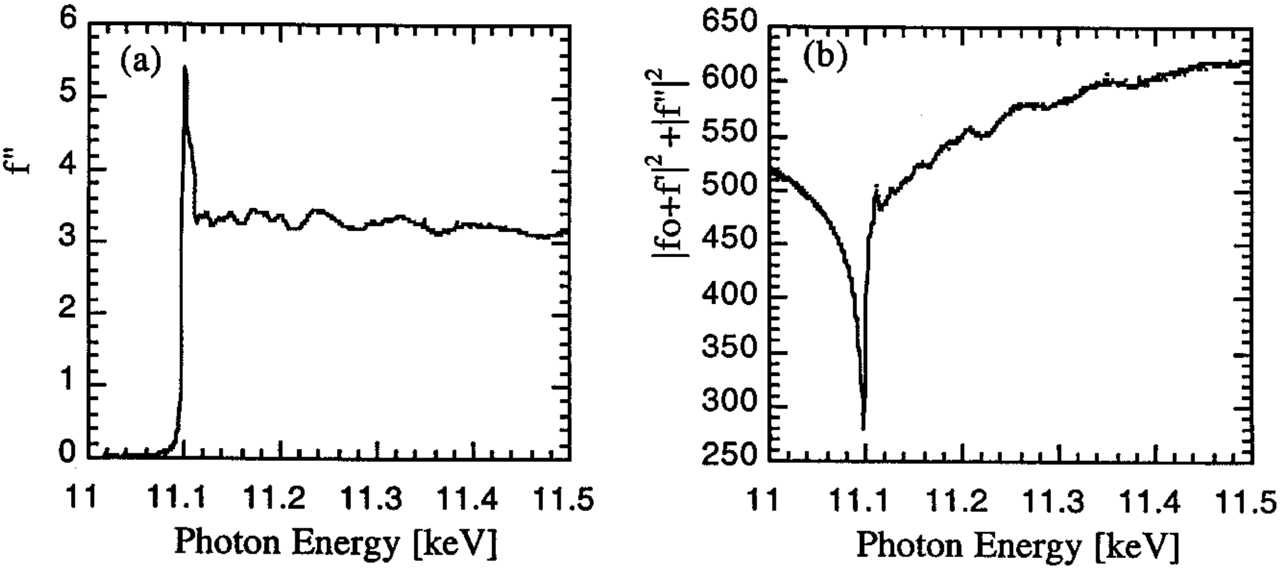

Fig.1) EXAFS (a) and DAFS (b) signals measured from a Ge film deposited onto a Si (100) substrate. In (b) the continuous line has been calculated from the experimental f'', while the points are the experimental values.