



Experiment title:

X-ray diffraction studies of the clean Si (001) at high temperatures

**Experiment number:
SI-138**

Beamline:
BL7 ID3

Date of experiment:

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Shifts:
18

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Report:

Intensities of several non-integer rods due to the (2x1) reconstruction of the clean silicon (001) surface have been successfully measured at room temperature, 450 °C and 600 °C up to a vertical exchanged momentum $l=2$ r.l.u.

We also took few data at 800 °C but the allocated shifts were not enough to complete the data collection at this temperature.

With respect to our previous experiment performed on the same system (experiment in collaboration with a danish group, exp. # SI-71) we were able to obtain very intense and sharp peaks due to (2x1) reconstruction (see figure 1).

Unfortunately some experimental shifts were lost for technical reasons.

The first two days of experiment were lost because the life time of the reconstruction was about two hours. This was due to the poor vacuum conditions. Even if the vacuumeter was measuring a pressure of the order of 8×10^{-11} mbar an analysis with the residual gas analyzer showed a high relative pressure of water which was responsible for the degradation of the surface. We were then forced to bake the experimental chamber.

More shifts were lost because the goniometer was not perfectly aligned.

After the baking of the chamber the reconstruction life was much longer and we could not observe any detectable degradation of the signal in 24 hours. The data collection for each temperature took about one day of measurement, and before starting to collect the data at the new temperature the sample was flashed to about 900 °C and slowly cooled to the right temperature.

We should also note that after beam injection a long time is necessary to thermalize the monochromator and during this time the beam changes position slightly forcing us to check continuously the sample alignment. It would be worth to install a device to stabilize the temperature of the monochromator also during the injection period.

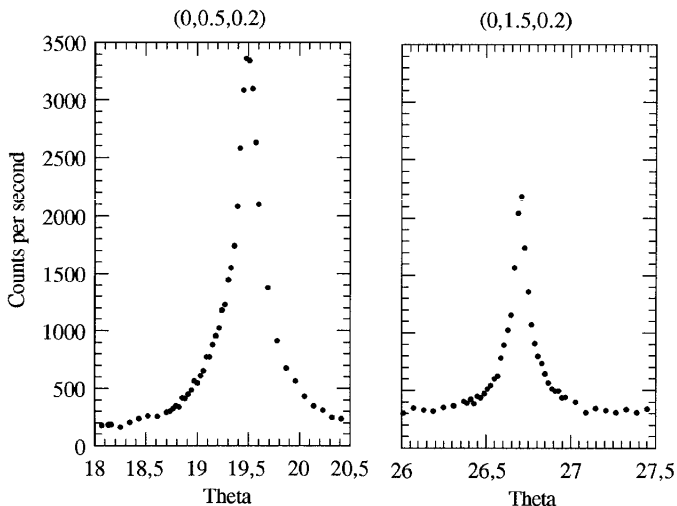


Fig. 1) Room temperature non-integer peaks of the clean Si(OOI) 2x1 reconstruction