

Report proposal 1932_De Padova

The objective of this proposal was to investigate and confirm the crystallographic structure of the silicene grown on Ag(110) at 440 K. We performed at ESRF on this system a first experiment (SI-1932). We were able to perform only the 5x1 SiNWs reconstruction on Ag(110), which is probably the precursor of the final 5x2/5x4 silicene, obtained at very low Si coverage. In this case the Si coverage was so small that the 5x1-Si reconstruction could not be unambiguously exploited. Meanwhile, we improved the transition from the 5x1 towards the 5x2/5x4 in our laboratory by LEED, RHEED and REELS, the sp²-like hybridization of Si valence orbitals in silicone nanoribbons [1] and the strong resistance of silicone nanoribbons towards oxidation [2].

We underline that although the experiment was well programmed, the absence of the LEED system on the apparatus has determined a time consuming on the first stage of silicon deposition, resulting in achieving only the 5x1 Si reconstruction on Ag(110). Therefore there was not the time to conclude the experiment as planned, i.e. the 5x2/5x4 Si reconstruction on Ag(110), where the honeycomb Si structure was expected.

We think that the surface x-ray diffraction measurement is fundamental importance to confirm the calculated model proposed for this new allotropic honeycomb structure of silicon and to complete this SI-1932 ESRF accepted proposal, we will apply in the future for a new project.

[1] P. De Padova, et al., Appl. Phys. Lett., 98, 081909 (2011).

[2] P. De Padova, et al., J. Phys. D: Appl. Phys (Fast Track Communication), 44, 312001 (2011).