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Silicene Nano-Ribbons: Strong Resistance Towards Oxidation due to sp^2 Hybridization of the Si Valence Orbitals GUY LE LAY, CINaM-CNRS, PAOLA DE PADOVA, CLAUDIO QUARESIMA, CNR-ISM, BRUNO OLIVIERI, CNR-ISAC, PAOLO PERFETTI, CNR-ISM — We have synthesized for the first time silicene, that is, a new silicon allotrope analogous to graphene recently theoretically predicted [1], in the form of a massively parallel array of quantized zigzag nano-ribbons with a common "magic" width of 1.6 nm. They display characteristic linear band dispersions similar to the Dirac cones of graphene, in correspondence with their hexagonal arrangement seen in STM imaging [2]. Here we show, through the angle-dependence of REEL spectra taken at the Si $L_{2,3}$ edge, the typical signatures of $2p \rightarrow \pi^*$ and $2p \rightarrow \sigma^*$ transitions associated with sp^2 hybridization of the Si valence orbitals. We further show through high-resolution synchrotron radiation Si 2p core-level spectroscopy measurements that the afore mentioned silicene grating is very resistant toward oxidation. Typically, the oxygen uptake starts at about 10^4 higher doses than on the clean Si(111)7x7 surface. Indeed, this striking behavior is directly related to the sp^2 bonding, an additional confirmation of the silicene (i.e., graphene-like) nature of the nano-ribbons.

[1] S. Cahangorov et al., Phys. Rev. Lett., **102**, 236804 (2009).
[2] P. De Padova et al., Appl. Phys. Lett. **96**, 261905 (2010).

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