Silicene first time observed with AFM

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Silicene has been synthesized just recently on silver (111) surfaces [1-4] and observed at atomic resolution by Scanning Tunnelling Microscopy (STM) with the appearance of a typical flower pattern for the first layer Ag(111)4x4 dominant phase [1] (Si(h)3x3 with respect to silicene, where Si(h) means honeycomb silicon). This pattern could arise both from electronic and geometric contributions. Measuring for the first time this phase simultaneously by Atomic Force Microscopy (in non contact mode nc-AFM) and STM at liquid nitrogen temperature an identical pattern has been observed with the two methods. This clearly indicates that geometric factors dominate the contrast mechanism as already proposed in the DFT simulations of the STM images [1].
In figure 1 two images obtained on the first silicene layer adsorbed on silver (111) recorded by STM in field A and nc-AFM in Field B are displayed. In nc-AFM the measurements where performed with a Q-plus sensor.
At variance with what has been claimed [4,5] a clear step with respect to the Ag(111)4x4/Si(h)3x3 phase, again measured with both techniques, demonstrates that the Si(h)√ 3x √ 3 phase is the second silicene layer [6].
The synthesis of bilayer silicene opens the way to multilayer stacks offering promising perspectives to separate single free-standing silicene layers, a crucial step for the technological applications of silicene [7].

References

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Figures

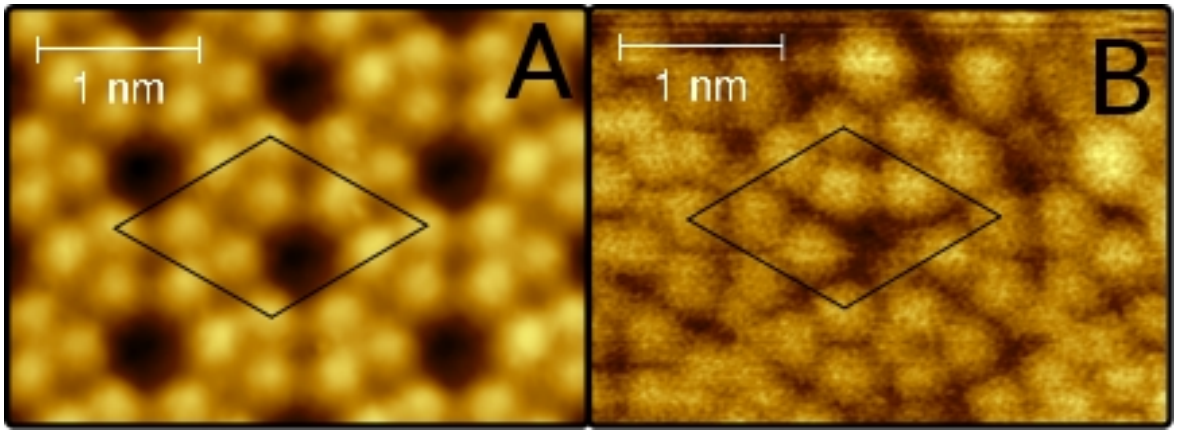

*Figure 1: Silicene 3x3/Ag(111) 4x4 structure: A) measured with STM filled states (-1.14 V, 0.537nA). B) measured with non-contact AFM (**Δf** = -1.5Hz). The black diamond shows the surface unit cell.*