Photoelectron diffraction of corrugated single layers: h-BN nanomesh and nanotents

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When a monolayer of hexagonal boron nitride (h-BN) is epitaxially grown on the surface of a transition metal, this monolayer may exhibit a corrugation perpendicular to the surface of the order of a few Å. The h-BN/Rh(111) nanomesh can be described by a hexagonal superstructure of low h-BN regions called "pores" surrounded by high h-BN regions called "wires" with an in-plane superlattice constant of about 3.2 nm [1]. The apparent height of the corrugation observed in Tunneling Microscopy (STM) measurements is strongly dependent on the tunneling conditions and, in general, differ from the results calculated by Density Functional Theory (DFT). In addition, the use of distinct functionals result in discrepancies in the height calculated by DFT. Here we show the combined use of angle- and energy-resolved photoelectron diffraction (XPD) to determine the height of the corrugation in the h-BN/Rh(111) nanomesh. Furthermore, the exposure of the h-BN/Rh(111) nanomesh to low energy argon ions leads to the formation of stable atomic structures at room temperature [2]. We showed that these nanotents may also be formed with rubidium atoms [3]. The electronic and atomic structure of the Rb-nanotents were investigated by XPS/STS and XPD/STM, respectively, at the PEARL beamline of Swiss Light Source (SLS) [4]. We applied XPD to this very diluted system to confirm the identity of the protrusions, probing the Rb 3d core level.

References