Scanning tunneling microscopy and spectroscopy on edges of epitaxial graphene/Ir(111)

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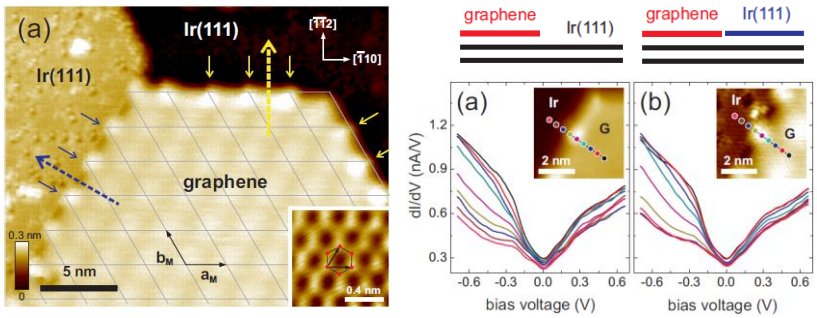
We performed scanning tunneling microscopy/spectroscopy (STM/S) on monolayer graphene islands grown on Ir(111). The graphene islands show moiré patterns, which are induced by the lattice mismatch between graphene and Ir(111). The atomic structure at the edge of a graphene island depends on the stacking configurations of the edge atoms, which are correlated with the moiré patterns. The edges of graphene islands terminate with a zigzag carbon configuration and show periodic kinks in the regions of the on-top stacking carbon rings. The periodicity is given by the moiré pattern of the graphene island. The termination of a graphene island at an Ir(111) step also leads to the formation of periodic kinks at the edge. We tentatively ascribe these observations of periodic kinks at the graphene edges to the formation of favorable bonding situations between carbon edge atoms and the underlying Ir lattice. We may speculate that the electronic origin of this bond formation is linked to the interaction of the broken σ-bond of graphene with Ir. Spatially resolved tunnel spectroscopy indicates a considerably reduced density of states at the edge as compared to center regions of the island.

Figure



(left) A graphene island on Ir(111). (right) Spatially resolved STS data along the perpendicular directions to the edges of graphene/Ir(111).