Growth and atomic-scale characterization of graphene-h-BN hybrids on single crystal substrates

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Abstract

We have performed systematic STM studies of the growth and the microscopic structure of graphene on Cu, Pt, Rh etc. foil substrates, and clarified their growth mechanisms along with the aid of traditional methods like Raman spectroscopy, scanning electron microscopy (SEM) and so on.[4] Interestingly, we found that randomly stacked bilayer or few layer segregated graphene on Rh foils usually exhibit various moiré patterns, on which angel-dependent van hove singularities was observed by STM/STS.[5,6] Moreover, we showed that h-BN, a structural analogue of graphene, can be patched onto graphene to form a monolayer hybrid on Rh(111). This hybrid formation was considered be promising for opening up a small band gap of graphene, and most of the efforts were performed by growing the sample on Cu foil substrates. In our work, we show that, on the deliberately selected Rh(111) and Ir(111) substrates with strong and weak interface interactions with graphene and h-BN, a monolayer hybrid of G-h-BN can be constructed with atomic scale continuity at their interfaces mostly with a preferred zigzag type, as identified by STM and also verified by DFT calculations. The influence of the substrates on the electronic properties of the two analogue materials were also presented.

References

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