Artificial Stacking for Large Twisted Bilayer Graphene Domain with Van Hove Singularity

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Abstract

Twisted bi-layer graphene (tBLG) has shown many promising properties in performance of graphene based devices due to its modified electronic band structure different from monolayer or A-B stacked bilayer graphene[1]. People obtain such attractive material mainly through direct chemical vapor deposition (CVD) growth or transferring two pieces of graphene single layer together. CVD sample[2-3] is limited to its domain size with certain twisted angle, while previous transfer method[4] can hardly guarantee well interlayer coupling. We develop an approach to get large twisted bilayer graphene (tBLG) domain (100 μm) with certain angle and clean interface through twice transfer of square graphene from chemical vapor deposition (CVD). In detail, we report the first observation of van Hove singularities in artificial stacking tBLG by spatial- and angle-resolved photoemission spectroscopy (Micro-ARPES). The twisted angle and interlayer coupling are further confirmed by selective area electron diffraction (SAED), and Raman spectroscopy. Moreover, we find enhanced photocurrent generation phenomena in artificial stacking tBLG, which fully describe the clean interface between two artificial stacking layers. Our findings pave the way for constructing novel optoelectronic devices based on large scale and angle tunable characteristics.

References

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Figures