Wafer-scale single-crystalline AB-stacked bilayer graphene

Van Luan Nguyen
Young Hee Lee

Center for Intergrated Nanostructure Physics (CINAP), Institute for Basic Science, Sungkyunkwan University, Suwon, 440-746, Korea
vanluan@skku.edu

Abstract

While a lot of efforts on preparing large area AB-BLG using Cu or Cu-Ni alloy substrate via chemical vapour deposition method have been reported, the obtained BLG is polycrystalline with the grain size still limit in micrometer-scale and bilayer region is partially achieved because the catalytic activity of the Cu surface is suppressed by the presence of monolayer [1,2]. Because of these critical difficulties, we introduce a new concept to form wafer-scale single-crystalline AB-BLG.

Firstly, wafer-scale single-crystalline monolayer graphene (MLG) was prepared on single crystal Cu(111) film via seamless stitching concept that we have reported [3] . This MLG is then aligned transfer onto another MLG, while second MLG remains on the initial Cu(111) film (**Figure 1**). This process allows exact alignment and polymer-free interface between two layers, resulting in wafer-scale single-crystalline AB-BLG that is electronically equivalent to exfoliated BLG (**Figure 2**). Evidence of AB-BLG is supported via transmission electron microscopy, angle-resolved photoemission spectroscopy, quantum Hall Effect and self-consistent effective mass characterization [4].

References

[1] L. Liu et. al. , ACS Nano 6 (2012), 8241
[2] W. Liu et. al. , Chem. Mater., 26 (2014) 907
[3] V. L. Nguyen et. al. , Adv. Mater., 27 (2015) 1376
[4] V. L. Nguyen et. al. , Adv. Mater., 28 (2016) 8187

Figures

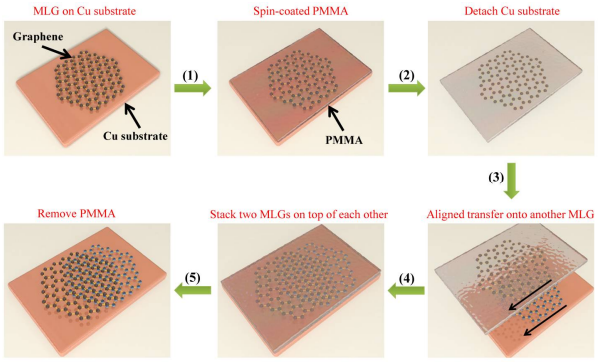

Figure 1: Schematic for overlapping two single-crystalline graphene layers to form AB-BLG by aligned transfer technique.

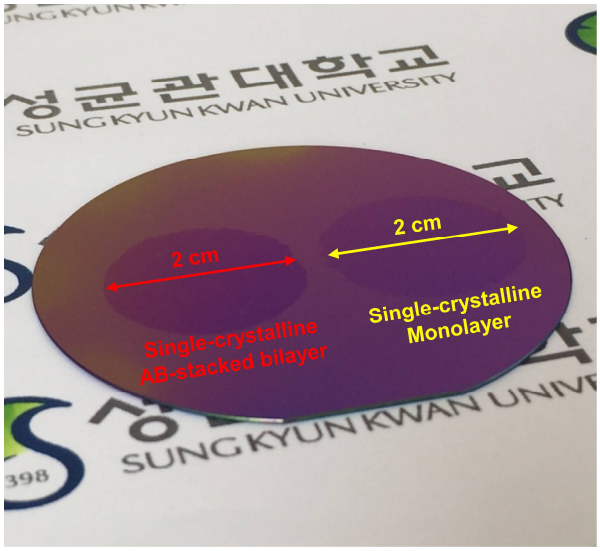

Figure 2: Photograph of wafer-scale single-crystalline AB-stacked bilayer (left) and monolayer graphene (right).