

CVD Synthesis of Large Area Twisted Multilayer Graphene

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Multilayer graphene (MLG) has introduced a novel twist for future electronics after the astounding discovery of MIT researchers [1]. Bilayer graphene (BLG) shows staggering properties when twisted at the magic angle of 1.1° . In order to leverage its complete potential and inherent properties at a great extent, synthesis of large area twisted MLG (t-MLG) is crucial. As a consequence, we have developed a promising and time effective approach for the large area synthesis of t-MLG by carefully controlling the Cu foil reduction time and high hydrogen to methane ratio. Surface confinement also plays an important role in the large area synthesis of t-MLG. In our samples, we have observed nontwisted, partially twisted ($<10^\circ$) and twisted graphene layers, that show unusual RAMAN spectra with the increase in no of layers. We have found that maximum flake size of our bilayer domain is 168 micron in just 100 min, far better than reported complex and time consuming ($<6h$) approaches reported previously [1]. We have also found the partial presence of M-band [2] in the RAMAN spectra that is dependent on the stacking (twist angle) of the layers in our samples. Twist dependent properties such as the impact on mobility, resistivity, modulus of elasticity and more have to be explored at an advanced level to understand the full potential of t-MLG. Mechanism of twisted graphene via CVD

process is not clear so far. We have proposed a time effective approach for the synthesis of large area t-MLG as compared to reported results. Our results will give a spark towards the controllable synthesis of twisted BLG & MLG.

References

- [1] Yuan C., Valla F., Shiang F. et al. Nature, 556, (2018), 43-50.
- [2] Chunxiao C., Ting Y., Riichiro S. et al. ACS Nano, 5, 3, (2011) 1600-1605.

Figures

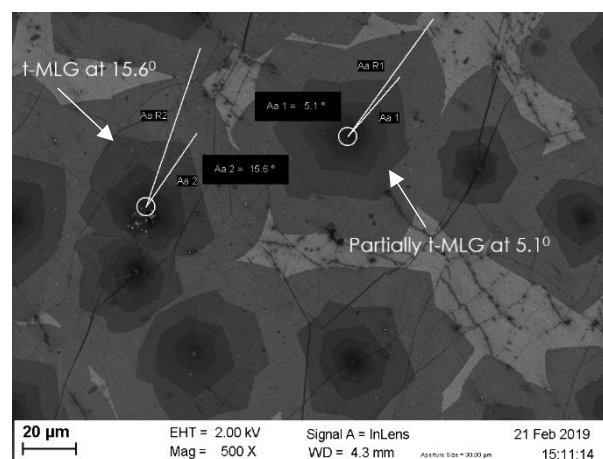


Figure 1: SEM Image of CVD synthesized twisted MLG

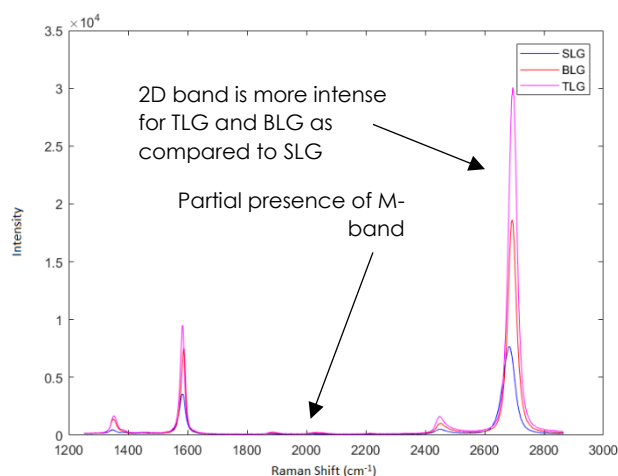


Figure 2: Unusual RAMAN spectra of twisted MLG's