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Graphene growth on polycrystalline Cu foil using solid carbon source by atmospheric pressure chemical vapor deposition

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Graphene is a two-dimensional (2D) honeycomb of sp^2 hybridized network of carbon atoms with excellent electrical, mechanical, and chemical properties for electronic device applications [1]. Due to the advancement in chemical vapor deposition (CVD) process, synthesis of large-area high quality graphene films has become possible [2]. We have previously studied the growth process and mechanism of graphene formation from solid camphor on Cu and Ni foil and demonstrated the effect of carrier gas on the formation of graphene domain. It has been observed that the growth parameters such as hydrogen concentration play a critical role on domain size and quality [3].

Here, we report synthesis of graphene crystals on Cu foil by the CVD process from camphor and polystyrene solid precursors. It was found that with controlled experimental conditions large individual graphene crystals can be synthesized using camphor and polystyrene. Graphene crystals with hexagonal shape and size of around 30 μm were synthesized using camphor as carbon source. Optical and scanning electron microscopy studies show formation of hexagonal graphene crystals across the grain, grain boundaries and twin boundaries of polycrystalline Cu foil. Electron back scattered diffraction (EBSD) analysis is carried out after the graphene growth to identify the Cu grain orientation correlating the graphene structure [4]. On the other hand, much large graphene crystals were grown using polystyrene. Graphene domain with a size of 70 μm and mostly round in shape was obtained on polycrystalline Cu foil. Growth of individual graphene crystals, formation of large cluster and eventually a continuous graphene structures were analyzed with growth conditions. Details studies of graphene growth using camphor and polystyrene in an atmospheric pressure CVD process will be discussed in the conference.

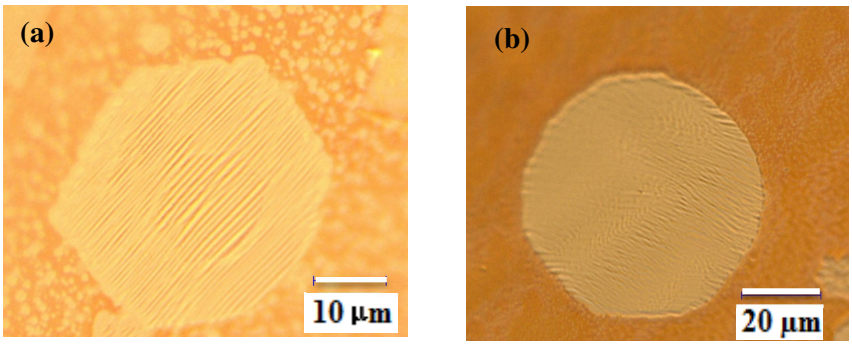

Figure 1: (a) Hexagonal shaped graphene from camphor (b) round-shaped graphene from polystyrene on polycrystalline Cu copper foil

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