Alcohol chemical vapor deposition growth of millimeter-sized single-crystal of graphene

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Abstract: The growth of large-sized single crystalline graphene with mono layer is necessary for large-scale integration of graphene devices. Ethanol as a precursor has proven effective in the chemical vapor deposition (CVD) synthesis of graphene on Cu substrates.[1] For applications of graphene in devices or as transparent conducting films, larger singe-crystal graphene without any grain boundaries shows superior electrical performance and has attracted enormous interests. Here we report a technique to grow large graphene single crystals (up to 5 mm) using ethanol as precursor on commercially-available polycrystalline Cu foils. We explored the mechanism by studying the influences of different growth parameters such as pressure, flow rate and temperature. Low partial pressure and low flow rate of ethanol and pre-oxidation are essential in achieving low nucleation density over the metal surface and therefore large graphene grains can be obtained. The CVD growth of large graphene single crystals involves no electro-polishing or annealing treatments to the metal surface, presenting a significant simplification to the current graphene synthesis process. Electronic properties of millimeter-sized graphene to apply transistors and solar cells will be discussed.

Key words: milimeter-sized graphene, single crystal, chemical vapor deposition

Reference:

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