Graphene grain boundary observation *via* plasma and thermal treatment

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Graphene has received great attention because of its superior physical properties, which make graphene suitable for multiple applications. [1] Recently, graphene growth techniques to produce large-scale graphene film with high quality have been developed. Among these techniques, chemical vapor deposition (CVD) on catalytic metal substrate in one of the most promising one. [2] Even though extensive efforts have been devoted to synthesize high quality graphene film, degradation of graphene results from defect formation is unavoidable during the growth and transfer process. Particularly, grain boundaries (GBs) have been considered as a dominant effect on properties of graphene. [3] Typically, transmission electron microscopy and scanning tunnelling microscopy have been used to probe microstructure of GBs in CVD-grown graphene. However, the more convenient method of GB observation will significantly aid in studies of CVD graphene grain structure that closely related with its characteristics. Here we report a straightforward way to detect the GBs of graphene through optical microscope, allowing rapid qualification of graphene as well as the number of layers. The selective oxidation of copper through damaged GBs after oxygen plasma treatment and thermal oxidation induces an optically detectable color change in the copper substrate due to different oxidation between the copper under grain and GBs. Our observation technique can be used to disclose relation between quality of graphene and growth process easily. Furthermore, we integrated plasma generator and CVD system for realizing *in-situ* process.

References

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Figures

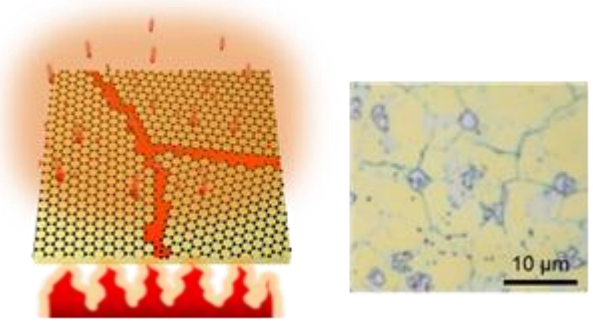

Figure 1: Schematic of GB observation process and optical image of processed graphene sample on Cu substrate.

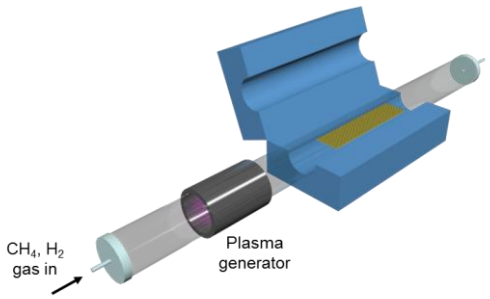

Figure 2: Schematic of CVD growth system incorporated with a plasma generator.