Copper Containing Carbon Feedstock for Growing High Quality Graphene

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Abstract

Chemical vapor deposition (CVD) grown graphene holds great potential in controllable regulation and scalable production[1], especially for methane gaseous carbon source on Cu substrate[2]. However, it's still unclear about the reaction mechanism of copper and carbon species in the CVD system during high-temperature graphene synthesis. Herein, we choose copper containing carbon feedstock, $Cu(OAc)_2$, instead of common CH_4, to change the content of copper in the system and then study the gas-phase reaction kinetics. Meanwhile, additional Cu cluster will catalyze the decomposition of carbon feedstock and graphitization process, giving high-quality graphene film without defects and amorphous carbon by-product. This work not only opens up new thought for growing high-quality graphene film, but also has reference value and significance for the graphene synthesis mechanism.

References

[1] Li, X.; Cai, W.; An, J.; Kim, S.; Nah, J.; Yang, D.; Banerjee, S. K. Science, 2011, 6: 1312.
[2] Hao, Y.; Bharathi, M. S.; Wang, L.; Liu, Y.; Chen, H.; Nie, S.; Ramanaravan, H. Science, 2013, 10: 1243879.

Figures

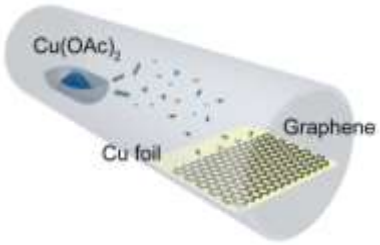

Figure 1: Schematic of CVD-derived graphene grown by $Cu(OAc)_2$

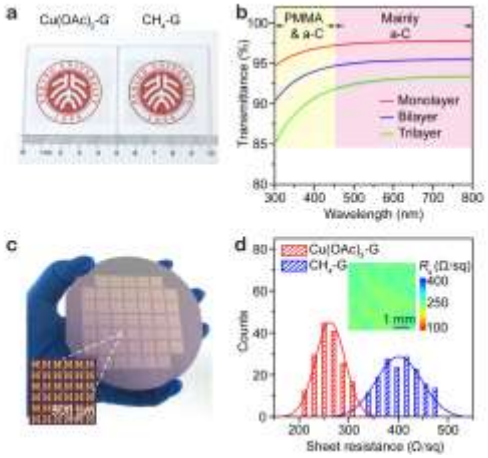

Figure 2: Optical and electrical properties of graphene grown by $Cu(OAc)_2$. (a) Photograph of graphene film transferred onto quartz glass using $Cu(OAc)_2$ and CH_4 as carbon feedstocks, recpectively. (b) UV-vis spectra of monolayer, bilayer, and trilayer graphene film grown by $Cu(OAc)_2$. (c) Photograph of graphene device patterns on a 4-inch Si/SiO_2 wafer. Inset: OM image of graphene devices. (d) Statistic of sheet resistance of graphene grown by $Cu(OAc)_2$ (red) and CH_4 (blue). Inset: Sheet resistance mapping of $Cu(OAc)_2$-grown graphene.