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Direct Growth of Polymer-Derived Graphene via Mobile Hot-Wire-Assisted CVD

Abstract

We demonstrate transfer-free growth of graphene on dielectric substrate via mobile hot-wire (MHW) assisted chemical vapor deposition (CVD). By the movement of a MHW at various speed as an independent heat source over a spin-coated polymer/Nickel/SiO_2/Si which is on a bottom heater, the cooling late and growth time can be controlled.[1] The spin-coated polymer is thermally decomposed into carbon precursor and diffused into nickel by the heat energy from the bottom heater before the movement of MHW. We can find the single-layer graphene growth condition through controlling the external variables including the substrate temperature and hotwire scan speed. We also improve the coverage of graphene by polymer selection bases on the thermal stability of polymers. From our synthetic method, thermal decomposition temperature determines the amount of the carbon precursor dissolved into nickel for graphene growth because the spin-coated polymer exposes in high-temperature condition. Finally, we can obtain nearly full-covered single-layer graphene using polyethylene, confirmed by Raman spectroscopy, XPS depth profile, and TGA analysis. We believe our simple method of growing graphene using MHW-CVD is potentially scalable and provides us various electronic and optical device applications.

References

[1] Jinsup Lee, Jinwook Baek, Gyeong Hee Ryu, Mi Jin Lee, Seran Oh, Seul Ki Hong, Bo-Hyun Kim, Seok-Hee Lee, Byung Jin Cho, Zonghoon Lee, Seokwoo Jeon, Nano Letters, 14 (2014) 4352-4359

Figures

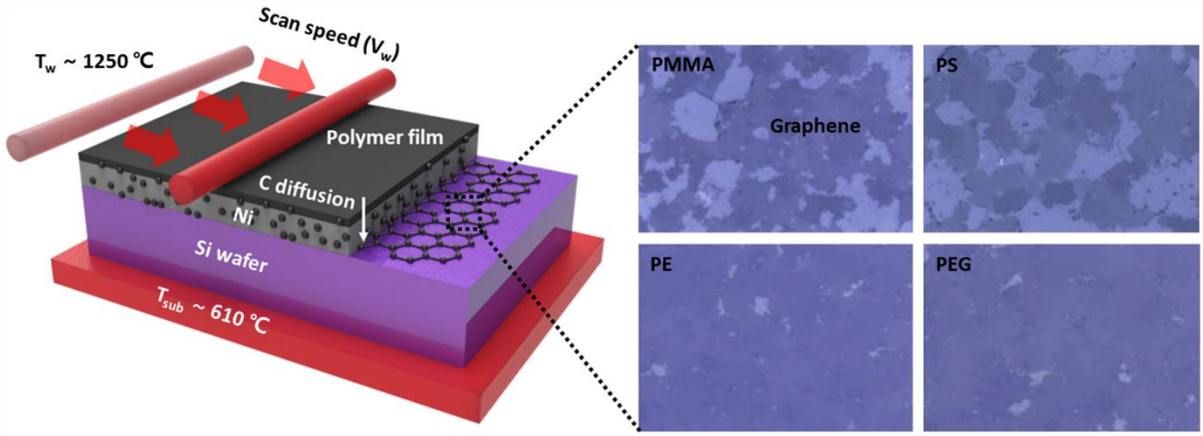

Figure 1: Synthetic method of graphene by MHW-CVD system and the optical image of graphene from various polymers.