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Patterned growth of graphene by using Cr seed

Songjae Lee and **Chong Yun Park**
Sungkyunkwan University, Republic of South Korea

With high flexibility, optical transparency and carrier mobility, graphene is of interest in the fields of next generation nanoelectronic devices. Especially, in the areas of field effect transistors, many researchers have been attempting use of graphene as a channel material because of its thinnest layer and high carrier mobility. CVD is the most general method to synthesize large scale of graphene and the synthesis cost is also economical in other methods. Therefore, CVD method is at center of attention in field of graphene synthesis, recently. However, there are still many hurdles for high quality CVD graphene, such as defect during transfer process, transfer material residues, controlling nucleation density and number of layer. Although low nucleation density provides high quality graphene, there are many challenges in reduction of nucleation density. An well known method of many approches is oxidizing copper before the growth step. In this study, we synthesized graphene film using Cr seeds with oxidizing copper surface. The Cr seeds would help to control number of the nucleation sites, relating with decreasing nucleation density and quality of graphene. To synthesize graphene, first, the surface of copper was polished electro-chemically to smooth and decrease defects of copper surface. Second, copper foil was patterned by photolithography process and then Cr was sputtered on the surface of the patterend copper foil. After Cr sputtering, the copper foil was rinsed with acetone and DI water. Finally graphene was synthesized on the patterned copper foil in CVD chamber. We made seed patterns in shape of hexagon which has length of 5 μm and the distance of seeds was 200 μm, 500 μm and 1 mm. we investigated roll of seed in the graphene growth. We got high quality graphene film which is consisted of well-aligned single-crystalline graphene hexagons.

Recent Publications:

1. Vaidotas Miseikis et al. (2017) Deterministic patterned growth of high-mobility large-crystal graphene: a path towards wafer scale integration. 2D Materials. 4:021004.
2. Dong Ding et al. (2017) Behavior and role of superficial oxygen in Cu for the growth of large single-crystalline graphene. Applied Surface Science. 408:142-149.
3. Yufeng Hao et al. (2016) Oxygen-activated growth and bandgap tenability of large single-crystal bilayer graphene. Nature Nanotechnology. 11:426-432.
4. Ruizhe Wu et al. (2017) Concurrent fast growth of sub-centimeter single-crystal graphene with controlled nucleation density in a confined channel. Nanoscale. 9(27):9631-9640.
5. Sohail Shah et al. (2017) Impact of short duration, high-flow H2 annealing on graphene synthesis and surface morphology with high spatial resolution assessment of coverage. Carbon. 125:318-326.

Biography

Songjae Lee is a graduate student of Sungkyunkwan University, Republic of South Korea. His major is in Physics and he completed Bachelor's Degree from Sejong Univiersity, Republic of South Korea in 2017. He has studied the synthesis of graphene and application in the Nanophysics lab.

cncc6021@naver.com