NT-P021

Low-temperature synthesis of graphene on nickel foil by microwave plasma chemical vapor deposition

Y. Kim, W. Song, S. Y. Lee, W. Jung, M. K. Kim, C. Jeon, and C.-Y. Park*

BK21 Physics Research Division and Center for Nanotubes and Nanostructured Composites (CNNC), Sungkyunkwan University, Suwon 440-746, Korea

E-mail: kimys1216@skku.edu,

Graphene has attracted tremendous attention for the last a few years due to it fascinating electrical, mechanical, and chemical properties. Up to now, several methods have been developed exclusively to prepare graphene, which include micromechanical cleavage, polycrystalline Ni employing chemical vapor deposition technique, solvent thermal reaction, thermal desorption of Si from SiC substrates, chemical routes via graphite intercalation compounds or graphite oxide. In particular, polycrystalline Ni foil and conventional chemical vapor deposition system have been widely used for synthesis of large-area graphene. [1-3]

In this study, synthesis of mono-layer graphene on a Ni foil, the mixing ratio of hydrocarbon (CH_4) gas to hydrogen gas, microwave power, and growth time were systemically optimized. It is possible to synthesize a graphene at relatively lower temperature (500 ℃) than those (~1000 ℃) of previous results. Also, we could control the number of graphene according to the growth conditions. The structural features such as surface morphology, crystallinity and number of layer were investigated by scanning electron microscopy (SEM) and atomic force microscopy (AFM), transmission electron microscopy (TEM) and resonant Raman spectroscopy with 514 nm excitation wavelength. We believe that our approach for the synthesis of mono-layer graphene may be potentially useful for the development of many electronic devices.

Reference

[1] A. K. Geim and K. S. Novoselov, Naturematerials, 6, 183 (2007)

[2] Alfonso Reina et al., Nano Lett., 9, 30 (2009)

[3] Keun Soo Kim et al., Nature, 457, 706 (2009)