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Synthesis of Few-Layer Graphene on Ni Foil by Microwave Plasma Chemical Vapor Deposition

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Graphene has a well-defined two-dimensional (2D) honeycomb lattice structure and is the building block of several other carbon based substances, such as fullerenes (0D), carbon nanotubes (1D), and graphite (3D). It has many unique properties that provide fundamental studies as well as for potential applications. In order to adopt for many applications, large-area sample preparation will be a essential. The synthesis of large-area graphene has been performed by using single crystalline transition metals, such as Pt, Ru, Ir and Ni is well known. In particular, polycrystalline Ni film and conventional thermal chemical vapor deposition system have been widely used for synthesis of large-area graphene [1-3].

In this study, synthesis of highly crystalline few-layer graphene on a Ni foil, the mixing ratio of hydrocarbon gas to hydrogen gas, microwave power, and growth time were systemically optimized. It is possible to synthesize a graphene at relatively lower temperature (750 ℃) than those (~1000 ℃) of previous results. Also, we could control the number of graphene according to the growth conditions. The structural feature 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 wavelengths. We believe that our approach for the synthesis of few-layer graphene may be potentially useful for the development of many electronic devices.

Reference

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