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Engineering graphene and TMDCs for nanoelectronic device applications

Moon-Ho Ham
Gwangju Institute of Science and Technology, Korea

Two-dimensional (2D) materials such as graphene and transition metal dichalcogenides (TMDCs) have unique physical and electrical properties. There is currently an interest in taking advantage of these properties for future electronic applications. In this talk, I will first introduce a modified chemical vapor deposition (CVD) technique to produce large-area, high-quality continuous monolayer graphene films from benzene on Cu at 100–300°C at ambient pressure. In this method, we extended the graphene growth step in the absence of residual oxidizing species by introducing pumping and purging cycles prior to growth. Further, Cu/graphene stacked interconnects are fabricated by directly synthesizing graphene onto Cu interconnects using this method, which show the improved electrical properties compared to Cu interconnects. In the second part, I will present a simple and facile route to reversible and controllable modulation of the electrical and optical properties of WS2 and MoS2 via hydrazine doping and sulfur annealing. Hydrazine treatment of TMDSs improves the field-effect mobilities and photo-responsivities of the devices. These changes are fully recovered via sulfur annealing. This may enable the fabrication of 2D electronic and optoelectronic devices with improved performance.

Biography

Moon-Ho Ham is an Associate Professor in the Department of Materials Science and Engineering at Gwangju Institute of Science and Technology (GIST), South Korea. He has received his BS and PhD degrees in Materials Science and Engineering at Yonsei University, South Korea. He was a Post-doctoral Associate in Chemical Engineering at Massachusetts Institute of Technology. His research focuses on nanomaterials including nanocarbon and 2D materials for nanoelectronic and energy applications.

mhham@gist.ac.kr

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