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High Resolution Patternning for Graphene Nanoribbons (GNRs) Using Electro-hydrodynamic Lithography

Suok Lee[1], Hanah Kim[2], Jaejong Lee[2], Dae Joon Kang[1]

[1]BK21 Physics Research Division, Department of Energy Science, Institute of Basic Sciences, Sungkyunkwan University, Suwon, [2]Nano-Mechanical Systems Research Division, Korea Institute of Machinery and Materials, Daejeon, Korea

Graphene has been the subject of intense study in recent years owing to its good optoelectronic properties, possibility for stretchable electronics, and so on. Especially, many research groups have studied about graphene nanostructures with various sizes and shapes. Graphene needs to be fabricated into useful devices with controllable electrical properties for its successful device applications. However, this been far from satisfaction owing to a lack of reliable pattern transfer techniques. Photolithography, nanowire etching, and electron beam lithography methods are commonly used for construction of graphene patterns, but those techniques have limitations for getting controllable GNRs. We have developed a novel nanoscale pattern transfer technique based on an electro-hydrodynamic lithography providing highly scalable versatile pattern transfer technique viable for industrial applications. This technique was exploited to fabricate nanoscale patterned graphene structures in a predetermined shape on a substrate. FE-SEM, AFM, and Raman microscopy were used to characterize the patterned graphene structures. This technique may present a very reliable high resolution pattern transfer technique suitable for graphene device applications and can be extended to other inorganic materials.

Keywords: Graphene Nanoribbon (GNR), Electrohydrodynamic Lithography, Non-conventional Pattern Transfer