N-002

P-Type Doping of Graphene Films by Hybridization with Nickel Nanoparticles

Su Il Lee[1], Wooseok Song[1], Yooseok Kim[1], Inkyung song[1], Sangeun Park[1], Myung-Jun Cha[1], Dae Sung Jung[2], Min Wook Jung[3], Ki-Seok An[3], Chong-Yun Park[1,2]*

[1]BK21 Physics Research Division, Sungkyunkwan University, Suwon 440-746, [2]Department of Energy Science, Sungkyunkwan University, Suwon 440-746, [3]Thin Film Materials Research Group, Research Institute of Chemical Technology (KRICT), Daejeon 305-600, Korea

Graphene has emerged as a fascinating material for next-generation nanoelectronics due to its outstanding electronic properties. In particular, graphene-based field effect transistors (GFETs) have been a promising research subject due to their superior response times, which are due to extremely high electron mobility at room temperature. The biggest challenges in GFET applications are control of carrier concentration and opening the bandgap of graphene. To overcome these problems, three approaches to doping graphene have been developed. Here we demonstrate the decoration of Ni nanoparticles (NPs) on graphene films by simple annealing for p-type doping of graphene. Ni NPs/graphene films were fabricated by coating a NiCl2・6H2O solution onto graphene followedby annealing. Scanning electron microscopy and atomic force microscopy revealed that high-density, uniformly sized Ni NPs were formed on the graphene films and the density of the Ni NPs increased gradually with increasing NiCl2・6H2O concentration. The formation of Ni NPs on graphene films was explained by heat-driven dechlorination and subsequent particlization, as investigated by X-ray photoelectron spectroscopy. The doping effect of Ni NPs onto graphene films was verified by Raman spectroscopy and electrical transport measurements.

Keywords: Graphene, Ni Nanoparticle, Doping, CVD