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Charge Doping in Graphene on Highly Polar Mica

심지혜, 고택영, 류순민

경희대학교 응용화학과

Graphene, one single atomic layer of graphite, has attracted extensive attention in various research fields since its first isolation from graphite. Application in the future electronics requires better understanding and manipulation of electronic properties of graphene supported on various solid substrates. Here, we present a study on charge doping and morphology of graphene prepared on atomically flat and highly polar mica substrates. Ultra-flat single-layer graphene was prepared by micro-exfoliation of graphite followed by deposition on cleaved mica substrates. Atomic force microscopy (AFM) revealed presence of ultra-thin water films formed in a layer-by-layer manner between graphene and mica substrates. Raman spectroscopy showed that a few angstrom-thick water films efficiently block electron transfer from graphene to mica. Hole doping in graphene caused by underlying mica substrates was also visualized by scanning Kelvin probe microscopy (SKPM).

Keywords: Graphene, mica, Raman spectroscopy, AFM