SF-P003

Electronic structure of the Au intercalated monolayer graphene on Ni(111)

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We have investigated an Au intercalated monolayer graphene on Ni(111) using angle-resolved photoemission spectroscopy (ARPES), high resolution photoemission spectroscopy (HRPES), and low energy electron diffraction (LEED) at the 3A2 ARUPS beamline in Pohang Accelerator Laboratory. We find the monolayer graphene is well grown on the Ni(111) surface by the adsorption of acetylene. However, the graphene does not show the characteristic π band near the Fermi level due to its strong interaction with the underlying substrate. When Au is adsorbed on the surface and then annealed at high temperature, we observe that Au is intercalated underneath the monolayer graphene. The process of the Au intercalation was monitored by HRPES of corresponding Au 4f and C 1s core levels as well as the electronic structure of the σ, π states at Γ, K points. The σ, π bands of graphene shift towards the Fermi level and the π band is clearly observed at K point after the intercalation of full monolayer Au. The full width at half maximum (FWHM) of the C 1s peak narrows to approximately 0.42 eV after intercalation. These results imply that the interaction between the graphene and substrate is considerably weakened after the Au intercalation. We will discuss the graphene is really closer to ideal free standing graphene suggested recently.