# Magnetic Properties of Fe Film Adjacent to Epitaxial Graphene

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Graphene is one of the two-dimensional materials under intensive investigation. Among its novel properties under exploration, the magnetism of a metallic thin film sitting adjacent to the graphene layer has attracted much attention for its potential roles in spintronics, [1-2] such as forming a high efficiency spin filter at 3*d* transition metal/graphene heterojunction.[3] However, recent study [4] has suggested that the heterogeneous interface is more complex than anticipated, and may eventually hinder the anticipated efficiency in spin filtering. Here we report our recent efforts on identifying the crystal properties and magnetic behavior of Fe/graphene bilayers grown on Pt(111) surface. The heterostructure was prepared under UHV condition at NSRRC TLS 05B2 station with a single layer of graphene grown on Pt(111) via the chemical vapor deposition (CVD), followed by Fe deposition through thermal evaporation. The quality of graphene layer was checked in advance with the low energy electron diffraction (LEED) and the polarized X-ray absorption near edge structure (XANES). The as-grown heterostructures were probed by the in-situ magneto-optical Kerr effect (MOKE) and X-ray photoemission electron microscopy (XPEEM) to build a link between thickness-dependent hysteresis behavior and magnetic images. Finally, the heterostructures were removed from UHV to study their magnetic anisotropy in ambient environment. The experimental results reveal that Fe/graphene heterostructure turns on its room temperature ferromagnetic order after a 16 monolayer (ML) of Fe was introduced on graphene. Furthermore, there is a clear magnetic anisotropy at heterostructure with 25 ML of Fe. Preliminary results indicate that such an anisotropy is related to deposition oblique angle more than to crystal structure of graphene and substrate.

Keywords – graphene, magnetism, XPEEM

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