TM-P013

Bonding And Anti-bonding Nature of Magnetic Semiconductor Thin Film of Fe(TCNQ:tetracyanoquinodimethane)

Junhyeon Jo, Mi-jin Jin, Jungmin Park, Vijayakumar Modepalli, Jung-Woo Yoo

Ulsan National Institute of Science and Technology (UNIST)

Developing magnetic thin films with desirable physical properties is a key step to promote research in spintronics. Organic-based magnetic material is a relatively new kind of materials which has magnetic properties in a molecular and microscopic level. These materials have been constructed by the coordination between 3d transition metal and organic materials producing long-range magnetic orders with a relatively high transition temperature. However, these materials were mostly synthesized as a form of powder, which is difficult to study for their physical properties as well as apply for electronic/spintronic devices. In this study, we have employed physical vapor deposition (PVD) to develop a new organic-based hybrid magnetic film that is achieved by the coordination of Fe and tetracyanoquinodimethane (TCNQ). The IR spectra of the grown film show modified CN vibration modes in TCNQ, which suggest a strong bonding between Fe and TCNQ. The thin film has both ferromagnetic and semiconducting behaviors, which is suitable for molecular spintronic applications. The high resolution photoemission (HRPES) spectra also show shift of 1s peak point of nitrogen and the carbon 1s peaks display traces of charge transfer from Fe to TCNQ as well as shake-up features, which suggest strong bonding and anti-bonding nature of coordination between Fe and TCNQ.

Keywords: spintronics, magnetic, thin film