Magnetic Interfaces and Nanostructures
Room: Hall 3 - Session MI-TuP

Magnetic Interfaces Poster Session

MI-TuP1 Optical and Magneto-Optical Properties of $Zn_{1-x}Mn_xO$ / ZnO Hollow Nanospheres, ***Da-Ren Liu***, *C.J. Weng*, National Applied Research Laboratories, Taiwan, Republic of China

Recently, diluted magnetic semiconductors (DMS) have generated widespread interest due to their potential applications for spintronic devices. Mn-doped ZnO is one of the most promising diluted magnetic semiconductors materials due to its room temperature ferromagnetism. In this study, ZnO layer was conformally deposited on the surface of polystyrene (PS) nanoshpere with different diameter (100nm~800nm) by atomic layer deposition (ALD). Then the $Zn_{1-x}Mn_xO$ ($0 < x < 0.1$) coatings were grown on ZnO hollow nanospheres by pulsed laser deposition(PLD). According to the results of high-resolution x-ray diffraction, Mn-doping does not change the wurtzite structure of ZnO and the $Zn_{1-x}Mn_xO$ hollow nanospheres are polycrystalline. Photoluminescence spectra and transmittance show an increase of the band gap with the increasing Mn ion concentration. The magneto-optical properties of the $Zn_{1-x}Mn_xO$ / ZnO hollow nanospheres were measured by micro-MOKE spectroscopy and strongly depend on the Mn composition fraction.

MI-TuP3 Scanning Tunneling Microscopy Study of Magnetic Layers Grown on MgO(001) by Molecular Beam Epitaxy, ***Jeongihm Pak***, *A.-O. Mandru*, *J.P. Corbett*, *A.R. Smith*, Ohio University

Magnetic coupling between ferromagnetic (FM) and antiferromagnetic (aFM) layers is of high importance to exchange bias and related magnetic technologies. It is essential to achieve atomically smooth and flat magnetic films onto which we can deposit transition metals (e.g. Fe, Mn and Cr) to create magnetic bi-layer systems that will allow us to probe possible magnetic coupling. In this study, we grow FM Fe and aFM Mn and Cr films on MgO(001) using molecular beam epitaxy (MBE) and investigate the surfaces using scanning tunneling microscopy (STM).

The growth experiments take place in an ultra-high vacuum (UHV)-MBE chamber, equipped with Fe, Mn and Cr effusion cells, a 20 keV reflection high energy electron diffraction (RHEED), and a quartz crystal sensor (for flux calibrations). Fe, Mn and Cr films are grown on MgO(001) over a range of sample temperatures. The prepared samples are transferred *in-situ* to the adjacent UHV room temperature STM analysis chamber for surface studies. The streaky RHEED patterns indicate single crystal films grown with smooth surfaces and STM topography images reveal atomically smooth and flat surfaces on each film. X-ray diffraction (XRD) confirms the (001) growth face for Fe and Cr. Magnetic force microscopy (MFM) is performed on each film to explore the magnetic domain structure. Ultimately, we aim to extend the present study to include spin-polarized STM measurements that will probe the magnetic coupling between FM and aFM layers, e.g. sub-monolayer Fe on Mn (or Cr) substrates (and vice versa).

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