## CP04

# Structural and Transport Properties of Fully Epitaxial Grown Fe/MgO/InAs for Electrical Spin Injections

**Kyung Ho Kim[1], Hyung-jun Kim[1]*, Il Jae Shin[1,2], Hyun Cheol Koo[1], and Suk Hee Han[1]**

[1]Center for Spintronics Research, Korea Institute of Science and Technology, Seoul, Korea
[2]NFMD labortory, Department of Physics, Hanyang University, Seoul, Korea

*Corresponding author: Hyung Jun Kim, e-mail: mbeqd@kist.re.kr

Fe/MgO/InAs junction has a significant adventage compared to Fe/MgO/GaAs due to a higher electron mobility and larger spin-orbit interaction for spintronics device applications. Furthermore, spin coherent tunneling is expected to result from the high quality of an epitaxial MgO tunnel barrier. In this experiment, we first obtained the growth of single crystal MgO layers on InAs substrates. Using by a cluster molecular beam epitaxy (MBE) all the sequential layers of Fe, MgO, and InAs buffer layer were in-situ grown on (2 × 4) reconstructed InAs (001) substrates without vacuum break. Reflection high-energy electron diffraction (RHEED) patterns in fig. 1 indicates that the MgO grown at room temperature is polycrystalline while ones grown at higher temperature (100-400$^{o}$C) are single crystalline. In addition, it is clearly shown that the polycrystalline component disapprears as the growth temerature increases. Fe layer grown at 200$^{o}$C exhibits polycrystalline dominant only on top of MgO at room temperature. In this study, we will further discuss epitaxial relationship and I-V junction charicteristics of Fe/MgO/InAs structures as a function of the growth temperature. High resolution transmission electron microscopy (HRTEM) clearly demostrates the crystallinities of Fe/MgO/InAs heterostructures.

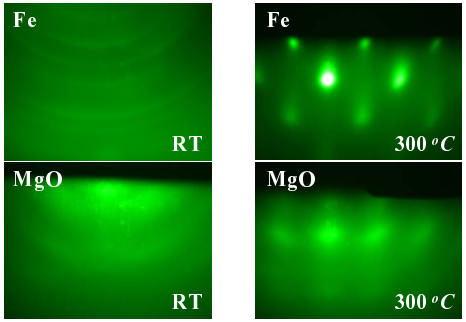


**Fig. 1.** RHEED patterns of the MgO(below) and Fe(above) along the [100] azimuths of the InAs(001) substrate. Growth temperatures during MgO deposition are RT(left) and 300°C (right).

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## CP05

# The Electrical Transport Properties of $La_{0.7-x}Nd_xPb_{0.3}MnO_3$ Compounds

**C. H. Lin[1]*, S. L. Young[1]*, H. Z. Chen[1], C.R. Ou[1], M. C. Kao[2], and Lance Horng[3]**

[1]Department of Electrical Engineering, Hsiuping Institute of Technology, Taichung, Taiwan
[2]Department of Electronic Engineering, Hsiuping Institute of Technology, Taichung, Taiwan
[3]Department of Physics, Changhua University of Education, Chunghua, Taiwan

*Corresponding author: C. H. Lin, e-mail:jhlin@mail.hit.edu.tw; S. L. Young, slyoung@mail.hit.edu.tw

The electrical transport properties of the $La_{0.7-x}Nd_xPb_{0.3}MnO_3$ ($0.0 \le x \le 0.7$) have been systematically studied from both the experimental and theoretical viewpoints. The temperature dependence of the resistivity was found the metal insulator transition (MIT) at the transition temperature, $T_P$, between 56-331 K (depend on x). On the metallic side the low temperature conductivity varies as a power law contributions, $\rho=\rho_0+\rho_2T^2+\rho_{5/2}T^{5/2}$, due to the effects of electron-electron interaction and electron-magnon scattering [1]. On the insulating side of the transition the resistivity will be good fitted using the equation $\rho(T)=\rho_n\exp[(T_0/T)^n]$, n=1/4 and n=1/2, for sample $x$=0.5 and 0.7 at different temperature ranges. The reasonable $T_0$ values indicated the variable range hopping (VRH) with the presence of the Coulomb interactions in these compounds. At intermediate temperatures near $T_P$, the sample contains both paramagnetic (PM) and ferromagnetic (FM) regions, the transport conductivity originates from the competition between the metallic conduction mechanism and the VRH conduction regime [3]. To study the transition behavior we employ a numerical simulations on random resistor networks. These numerical results are in good agreement with experimental measurements.

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