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**Weak ferromagnetism in single crystalline  $\text{Zn}_{1-x}\text{Co}_x\text{O}$  thin films**

H.-J. LEE, B.-G. PARK, Department of Physics, POSTECH, J.-Y. KIM, Pohang Accelerator Laboratory, POSTECH, J.-H. PARK, Y. H. JEONG, Department of Physics, POSTECH — Diluted Magnetic Semiconductors (DMS) have been actively searched for many years; a prospect of spintronic devices. Transition metal doped oxide materials, especially ZnO-based DMS, have been of particular interest as a high  $T_c$  material. Co doped ZnO thin films, for example, were reported to show ferromagnetic properties at room temperature. However, various subsequent studies including ours do not seem to converge on a definite picture and controversy continues. The observed ferromagnetism in DMS is very sensitive to the preparation methods and conditions. Therefore, what is needed to resolve the situation are well synthesized and thoroughly characterized samples.  $\text{Zn}_{1-x}\text{Co}_x\text{O}$  thin films were epitaxially grown on sapphire (0001) substrates by PLD technique and monitored by In-situ RHEED. Surface morphology and crystallographic characteristic evaluated using AFM and XRD. The magnetization, resistivity, and Hall effect measurements were carried out systematically as a function of Co contents using a QD PPMS. To clarify the electronic structure and the magnetic properties associated with the Co ions in  $\text{Zn}_{1-x}\text{Co}_x\text{O}$ , we have performed X-ray Absorption Spectroscopy and X-ray Magnetic Circular Dichroism measurements. These results and their implications for the understanding of ferromagnetism in  $\text{Zn}_{1-x}\text{Co}_x\text{O}$  will be discussed.

Hyo-Jin Lee  
Department of Physics, POSTECH

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