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Structural, Magnetic and Transport Properties of Cobalt doped ZnO Epitaxial Thin Films HYOJIN LEE, SUNGHO LEE, FIKRET YILDIZ, YOON HEE JEONG, Dept. of Physics, POSTECH — Semiconductors with ferromagnetism at room temperature has been actively searched for in recent years; a prospect of spintronic devices using both charge and spin continuously gives impetus to the activities. Co substituted 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. What is needed is well synthesized and thoroughly characterized samples. A series of $\text{Zn}_{1-x}\text{Co}_x\text{O}$ ($0 \leq x \leq 0.2$) thin films on sapphire (0001) substrates were epitaxially grown by using Laser MBE deposition technique, controlling laser fluence, substrate temperatures and oxygen partial pressures. In-situ RHEED pattern showed that the films grew in the layer by layer growth mode. We performed high resolution X-ray diffraction (XRD), SEM, TEM, and AFM measurements to confirm the structure and morphology of the films. XRD figures showed that the films were of single phase with the pure ZnO wurtzite structure. AFM measurements showed that the RMS values of roughness of the films were about 2\AA . Magnetization, resistivity, and Hall coefficient measurements were also carried out systematically as a function of x . These measurements revealed that Co doping brings about self-curing of oxygen vacancies. These results will be presented in detail.

Yoon Hee Jeong
POSTECH

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