

Anomalous Hall Effect induced by metal-insulator transition in Co ion-implanted ZnO Single Crystals

이은경¹, 박광호¹, 송영열¹, 강희재¹, 양동석², 신상원³, 송종한³

¹충북대학교 물리학과, ²충북대학교 과학교육학부, ³한국과학기술연구원

The structural, magnetic and transport properties of Co-ion-implanted ZnO were investigated. The Co K-edge Extended X-ray Absorption Fine Structure revealed the coexistence of Co-O and Co-Co bonds, while x-ray diffraction pattern showed Co (111) clusters with a size ranging from 5.8 to 8.7 nm for the post-annealed samples at 800°C and 900°C, respectively. The magnetization data showed superparamagnetic behavior at 300 K due to small size of Co cluster. The strong Anomalous Hall Effect (AHE) was observed up to 50 K, even though the samples are superparamagnetic. The AHE can be explained by a metal-insulator transition (MIT). Moreover, the resistivity and magnetoresistance data support the MIT between 50 K and 77K.