TT-P062

MBE Growth and Electrical and Magnetic Properties of CoxFe3-xO4 Thin Films on MgO Substrate

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Giant magnetoresistance (GMR), tunneling magnetoresistance (TMR), and magnetic random-access memory (MRAM) are currently active areas of research. Magnetite, Fe3O4, is predicted to possess as half-metallic nature, ~100% spin polarization (P), and has a high Curie temperature (TC~850 K). On the other hand, Spinel ferrite CoFe2O4 has been widely studies for various applications such as magnetorestrictive sensors, microwave devices, biomolecular drug delivery, and electronic devices, due to its large magnetocrystalline anisotropy, chemical stability, and unique nonlinear spin-wave properties. Here we have investigated the magneto-transport properties of epitaxial CoxFe3-xO4 thin films. The epitaxial CoxFe3-xO4 (x=0; 0.4; 0.6; 1) thin films were successfully grown on MgO (100) substrate by molecular beam epitaxy (MBE). The quality of the films during growth was monitored by reflection high electron energy diffraction (RHEED). From temperature dependent resistivity measurement, we observed that the Werwey transition (1st order metal-insulator transition) temperature increased with increasing x and the resistivity of film also increased with the increasing x up to 1.6 Ω-cm for x=1. The magnetoresistance (MR) was measured with magnetic field applied perpendicular to film. A negative transverse MR was disappeared with x=0.6 and 1. Anomalous Hall data will be discussed.

Keywords: thin film, Fe3O4, MBE

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Static Bending 영향에 따른 Ti/Au의 전기적 특성 변화

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본 연구에서는 Bending 시간에 따른 Ti/Au의 전기적 특성 변화에 대한 실험을 진행하였다. 전기적 특성을 평가하기 위해 PET 기판 위에 Ti/Au을 Greek Bridge와 Line Bridge를 합친 Cross Bridge 형태로 증착하였고, Cross Bridge의 Line을 bending하여 시간 경과에 따른 정적인(static) bending 영향을 확인하였다. Bending은 0~100시간까지 진행하였고, Line의 width를 200, 400, 800, 1000 μm로 가변하여 시간에 따른 비저항의 변화를 측정하였다. 실험결과 Bending시간이 길어짐에 따라 비저항이 감소하였고, 일정시간에서 크게 감소하며, 그 이후에는 포화되는 경향을 보였다. 또한 Width가 증가함에 따라 비저항의 변화가 컸다. 800 um, 1000 μm에서는 bending 직후 비저항이 초기대비 약 90%까지 떨어졌으며 100시간 후에는 80%까지 감소하였다. 100시간 뒤 Width에 따라 초기대비 비저항이 78%~91%까지 감소하는 것을 확인하였다.

Keywords: bending, cross bridge, Ti/Au, PET