AB07

Angular Dependence and Enhanced Exchange Bias in Ion-beam Bombarded NiCo/(Ni,Co)O Bilayers

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At the interface between ferromagnetic and antiferromagnetic materials, exchange coupling [1] is thought to lead to a unidirectional anisotropy. This unidirectional anisotropy is presumed to arise from order in the antiferromagnet being established in the presence of a field that causes the antiferromagnetic interfacial moments to tilt away from their preferred direction towards an orientation that is similar to that of the ferromagnetic spin moments. In this work, the structural and magnetic properties of ion-beam bombarded NiCo/(Ni,Co)O bilayers [2] were investigated. The bilayer consisted of a fcc NiCo (3.53 Å) and a rock-salt (Ni,Co)O (4.29 Å), as characterized by XRD and TEM. Angular dependence of H_{ex} has shown that NiCo/(Ni,Co)O bilayers exhibited both positive and negative H_{ex} in a zero-filed-cooled (ZFC) process. However, an angular dependence of the exchange coupling in the films systems, shown by negative $H_{ex}(\theta)$ (in a FC process), indicates that during the FC process saturating the magnetization in the FM layer is required to define the polarity of H_{ex}. Further, an enhanced exchange bias effect was observed in NiCo/(Ni,Co)O bilayers that results from the surface of the (Ni,Co)O layer being bombarded with different Ar-ion energies using End-Hall deposition voltages (V_{EH}) from 0 V to 150 V. The magnitude of H_{ex} increases with increasing V_{EH} and a largest H_{ex}~ -400 Oe at 5 K was found in a NiCo/(Ni,Co)O (V_{EH}= 150 V) bilayer. The surface spin structures seems to be altered by a moderate ion-beam bombardment process during deposition that results in the enhanced Hex likely due to AF (Ni,Co)O spin reorientation. This altered spin structure is shown by the transitions in magnetic domain microscopy (MFM) that are particularly significant at low temperatures.

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AB08

Optically Transparent Magnetic Nanocomposite Films Prepared by Aerosol Deposition Method

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Materials containing particles of nanometer dimensions have shown interesting properties related to its extremely small size [1]. More specifically, magnetic nanoparticles have become a subject of growing interest, and intense research is being conducted. An attractive property of the transparent magnetic nanocomposite layer is very closely related to the magneto-optical effects. The scientific as well as industrial applications for this technology include optical fiber sensors, optical switches, optical isolators and information storage. In the report, we demonstrate room-temperature-deposition of transparent cobalt/oxide nanocomposite thick films by the aerosol deposition method (ADM) [2] for the first time. Moreover, their optical, magnetooptical, and structural properties are investigated. Composite magnetic-dielectric powders are prepared from submicron particles of alumina (or PZT) and cobalt nanoparticles (20-35 nm) with concentrations below 2 wt%. The cobalt/alumina nanocomposite thick films obtained no cracks and good spatial distribution of the nanocobalt particles. The room-temperature-deposited transparent nanocomposite films with nanocobalt of 0.1 wt% concentrations acquired Faraday rotation angle of 0.1 degree/Co as well as transmittance of over 60 % at 450 nm. Also, the concentration and spatial distribution of the magnetic particles were controlled by preparing parameters of composite powder for ADM. The production of novel transparent magnetooptical nanocomposite materials is a promising way for both fundamental studies and applications.

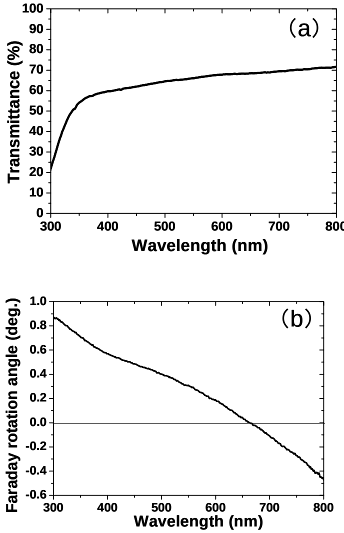

Fig. 1. A plot of (a) transmittance and (b) Faraday rotation angle

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