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Effect of thickness and O_2 flow rate on the properties of ITO thin films deposited by RF magnetron sputtering for RGB LED applications

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We investigated the electrical and optical properties of indium tin oxide (ITO) thin films, which were deposited using an RF magnetron sputtering system, by varying the thickness and O_2 flow rate. The electrical resistivity and sheet resistance were measured, together with the optical transmittance. The good electrical characteristics of ITO films were observed with O_2 flow rates below 3%. The resistivity and sheet resistance was reduced with the increase of film thickness (t) and the values were 4.49×10^{-3} Ω-㎝ and 1.82×10^{2} Ω/□, respectively, for the 240 nm thick ITO film with 1% O_2.. The optical transmittance above 80% was obtained in the visible wavelength range. Finally, for uses in RGB LED, ITO films will be functioned as a current spreading layer by increasing the carrier concentration.

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Spin-transfer torque behavior between ferromagnetic layers in spin-valve with an insulating antiferromagnetic layer

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Spin transfer torque is a phenomenon in which the spin angular momentum of the charge carriers gets transferred from one location to another. This effect has been studied in exchange bias spin-valves for both current-perpendicular-to-plane and current-in-plane configurations (CIP). In this report, we present the influence of ac current on the magnetotransport properties Co85Fe15/Ni0.85Co0.15O/ Co85Fe15/Cu/Co85Fe15 spin valve in the CIP configuration. By using an insulating antiferromagnetic (AFM) layer, it is expected to rule out the presence of spin-transfer torque acting on the spins in the AFM layer. Resistance and magnetoresistance (MR) were measured on an 1 ◈ 5 mm2 sample by the standard four-probe method by using a Quantum Design PPMS 7100 with an ac current at a frequency f =7.5 Hz. The results showed that the resistance is increased, the maximum MR ratio decreases, and the reversal field of the pinned layer is suppressed in both field sweeping directions by increasing current. With increasing current, Joule heating effect is responsible for the change in magnetotransport properties of the exchange-bias spin-valve structure. Thorough investigations on the changes in resistance and exchange bias depending on current and pure temperature reveal that a clear evidence for spin-transfer torques between ferromagnetic layers, which compete with the exchange bias at sufficiently high current.