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Angular dependence of the anomalous Hall effect in $La_{0.8}Sr_{0.2}MnO_3$ films NETANEL NAFTALIS, NOAM HAHAM, Department of Physics, Nano-magnetism Research Center, Institute of Nanotechnology and Advanced Materials, Bar-Ilan University, JASON HOFFMAN, MATTHEW MARSHALL, CHARLES AHN, Department of Applied Physics, Yale University, LIOR KLEIN, Department of Physics, Nano-magnetism Research Center, Institute of Nanotechnology and Advanced Materials, Bar-Ilan University — The anomalous Hall effect (AHE) is an intriguing magnetotransport phenomenon linked to various intrinsic and extrinsic mechanisms. While for some conductors quantitative understanding of this phenomenon has been achieved, the understanding of the AHE in the manganites is far from comprehensive. We measured the transverse resistivity (ρ_{xy}) of thin films of $La_{0.8}Sr_{0.2}MnO_3$ at temperatures between 5 to 200 K and magnetic fields up to 9 T as a function of the angle θ between the film normal and the magnetic field. We find that for fields above 4 T, for which the magnetization (M) is practically parallel to the magnetic field, $\rho_{xy} = A\cos\theta + B\cos(3\theta)$. The first term is attributed to the ordinary and anomalous Hall effect, and the unexpected $\cos(3\theta)$ term is attributed only to the anomalous Hall effect. We show that the angular dependence of the longitudinal resistivity, ρ_{xx}, and of the magnitude of M cannot explain the existence of a $\cos(3\theta)$ term. We discuss the implication of this term on the possible mechanisms of the anomalous Hall effect in this compound.

Netanel Naftalis
Department of Physics, Nano-magnetism Research Center,
Institute of Nanotechnology and Advanced Materials, Bar-Ilan University

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