

Abstract Submitted
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Coexistent Ferromagnetic and Semiconducting behavior in CoO/ZnO Multilayer Films¹ FRANCES HELLMAN, HYEON-JUN LEE, CATHERINE BORDEL, MICHALIS CHARILAOU, JULIE KAREL, Department of Physics, University of California, Berkeley and LBNL Materials Sciences Division — Ferromagnetic semiconductor behavior up to just below 300 K is shown in CoO/Al-doped ZnO (AZO) multilayers, shown by magnetic measurements and anomalous and ordinary Hall effect. The magnetism oscillates with odd versus even number of Co layers in the insulating antiferromagnetic CoO and (separately) with the thickness of the doped semiconducting AZO layers, and vanishes if AZO is replaced by undoped insulating ZnO. Magnetization is attributed to uncompensated (111) ferromagnetic planes of insulating CoO for odd numbers of atomic planes per layer which are coupled together via RKKY exchange mediated by electron carriers in the non-magnetic AZO layers. The period of the oscillation with AZO thickness qualitatively matches the Fermi wavevector calculated from the carrier concentration measured by ordinary Hall effect. Magnetic polarization of the AZO carriers is confirmed via anomalous Hall effect which is proportional to the magnetization. X-ray magnetic circular dichroism confirm magnetic properties.

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