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Electron-mediated ferromagnetic behavior in CoO/Al:ZnO multilayers[1]

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(111)-oriented epitaxial CoO/Al-doped ZnO (AZO) multilayers show a ferromagnetic behavior up to room tempareture. Their magnetization exhibits an oscillatory behavior as a function of (*i*) the number of Co layers in the insulating antiferromagnetic CoO, and *(ii)* the thickness of the AZO layers. The ferromagnetism vanishes if AZO is replaced by intrinsic ZnO. This behavior can be explained by the existence of an RKKY-coupling, mediated by the free electrons of the non-magnetic AZO layers, between the uncompensated (111) ferromagnetic planes of insulating CoO when there is an odd number of planes in the layer. The oscillation period of the spontaneous magnetization as a function of the AZO layer thickness matches the Fermi wavevector calculated from the carrier concentration that was deduced from Hall effect measurements. The spin-polarization of the carriers in the AZO layer is confirmed via anomalous Hall effect.

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