

Transverse magnetoresistance induced by electron-surface scattering on thin gold films: Experiment and theory

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We report new experimental data regarding the transverse magnetoresistance measured in a family of thin gold films of different thickness with the electric field E oriented perpendicular to the magnetic field B (both fields contained within the plane of the film), as well as a theoretical description of size effects based upon a solution of Boltzmann Transport Equation. The measurements were performed at low temperatures T (4 K $\leq T \leq$ 50 K) under magnetic field strengths B (1.5 T $\leq B \leq$ 9 T). The magnetoresistance signal can be univocally identified as arising from electron-surface scattering, for the Hall mobility at 4 K depends linearly on film thickness. The magnetoresistance signal exhibits a marked thickness dependence, and its curvature as a function of magnetic field B varies with film thickness. The theoretical description of the magnetic field dependence of the magnetoresistance requires a Hall field that varies with the thickness of the film; this Hall field is tuned to reprodu