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Resistivity, transverse magnetoresistance and Hall effect induced by electron-surface scattering on thin gold films deposited onto preheated mica substrates under high vacuum RAUL C. MUNOZ, JUAN P. GARCIA, RICARDO HENRIQUEZ, GERMAN KREMER, LUIS MORAGA, Department of Physics, University of Chile — We report measurements of the resistivity ρ, transverse magnetoresistance $\Delta\rho/\rho$ and Hall effect carried out on 4 gold films (thickness of 69, 93, 150 and 185 nm) evaporated onto mica substrates under high vacuum, where the signal is primarily determined by electron-surface scattering. The experiments were performed at low temperatures T (4K $\leq$ T $\leq$ 50K) under high magnetic field strengths **B** (1.5 T $\leq$ B $\leq$ 9 T). ρ, $\Delta\rho/\rho$ and the Hall tangent $\tan(\theta) = E_H/E_x$ (E_H stands for the transverse Hall field, E_x for the longitudinal field) depend on film thickness. Sondheimer's theory predicts ρ and $\tan(\theta)$, but leads to $\Delta\rho/\rho$ *one order of magnitude smaller than observed.* Calecki's model predicts ρ and $\tan(\theta)$, but leads to $\Delta\rho/\rho$ *several orders of magnitude smaller than observed.* The failure of current theories to predict all 3 transport coefficients is the first compelling evidence pointing to the need of a new, fresh theory to describe size effects arising from electron-surface scattering in metallic films in the presence of a magnetic field. Work funded by FONDECYT 1040723.

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