

Lorentz Magnetoresistance of Thin Films in the Presence of Surface Scattering and Domain Structure

I. Knittel and U. Hartmann

A modeling of ballistic electronic transport in thin films with diffuse surface scattering in the presence of a magnetic domain structure is performed. The conductance is obtained from the diffusive mean-square displacement of the conductance electrons. Lorentz magnetoresistance (LMR) effects for several domain structures are simulated and compared to corresponding experiments. We conclude that there is no reason to assume an intrinsic domain-wall resistance (DWR) in pure iron and cobalt films in order to explain experimental results. More generally, simulation results indicate that additional LMR related to the domain structure is best understood in terms of three separate effects, which all scale with the LMR of the homogeneously magnetized film.