

Interplay between domain-wall resistance and surface scattering in ferromagnetic thin films

I. Knittel and U. Hartmann

A positive domain-wall resistance at low temperatures has been reported in the literature for cobalt films with a perpendicular magnetic easy axis, in contrast to the behavior observed in microstructures made from cobalt, iron, and permalloy films with an in-plane easy axis and to that seen in perpendicular iron–palladium thin-film compounds. This phenomenon is unexpected if only domain-wall or Fermi-surface properties are considered. It can, however, be understood if an existing domain-wall resistance is considered which is compensated by a magnetoresistance effect arising from surface scattering in a thin film with closure domains. A theory that properly accounts for this interplay between domain-wall resistance and surface scattering is presented and employed to analyze existing experimental data.