Magnetic and Spin-Dependent Transport Properties of Co/Cu/Ni Junction

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The electronic structure of fcc Co/Cu/Ni (001) trylayer systems have been studied by means of a self-consistent Green's function technique based on the tight-binding linear muffin-tin method (TB-LMTO) in the atomic sphere approximation (ASA). The results show that at the Co/Cu interfaces the cobalt magnetic moment retains its bulk value while at the Ni/Cu interfaces the nickel magnetic moment is reduced. The different magnetic behavior of interface Co and Ni atoms are explained as a competition effect between the norroving of the density of states (DOS) at the Fermi Level due to the low coordination number and respectively, the hybridization between Co(Ni) and Cu states. An osscilatory interlayer exchange coupling with respect to the Cu spacer thickness is evidenced. The conductance and the giant magnetorezistance ratio (GMR) in the current perpendicular to-the-plane geommetry (CPP) are calculated by means of the transmission matrix formulation of the Kubo-Landauer formalism. In either anti- or ferromagnetic states the conductance is determined by the majority-spin electrons whose contribution to the transmission amplitude is higher due to the difference in the electronic structure at the Co(Ni)/Cu interfaces. Dumped oscillations of the GMR ratio with increasing Cu spacer thickness are obtained.

9.7 cm

13.4 cm

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