Angular dependence of magnetoresistance in CPP-GMR spin valves: A diffusive approach

M. Gmitra[a], **J. Barnaś** [b]

[a] Institute of Physics, P. J. Šafárik University, Park Angelinum 9, 040 01 Košice, Slovak Republic

[b] Department of Physics, Adam Mickiewicz University, Umultowska 85, 61-614 Poznań, Poland; and Institute of Molecular Physics, Polish Academy of Sciences, Smoluchowskiego 17, 60-179 Poznań, Poland

Electrical current flowing through a spin-valve structure can lead to magnetic switching when the current exceeds a certain critical value. In typical spin valves current of a certain orientation leads to switching from the parallel to antiparallel configuration, while the opposite current restores the parallel configuration. In systems showing normal GMR effect, resistance of the system in parallel configuration is lower than in the antiparallel one, and the angular dependence of the magnetoresistance is a monotonous function of the angle between the leads' magnetic moments. In contrast, in asymmetric spin valves both the parallel and antiparallel configurations could be stable for one bias polarization and unstable for the opposite current direction. This leads to the non-standard angular dependence of the spin-transfer torque. We have found that the angular dependence of magnetoresistance in asymmetric valves can reveal a minimum at a non-collinear configuration. Here we report on the correlation between the non-standard spin-transfer torque and non-standard angular dependence of the magnetoresistance.

9.7 cm

13.4 cm

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Corresponding author :

M. Gmitra

Address for correspondence :

Institute of Physics, P. J. Šafárik University, Park Angelinum 9, 040 01 Košice, Slovak Republic

Email address :

martin.gmitra@upjs.sk