

ON CURRENT AND BULK POLARIZATION IN NANOSTRUCTURES

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Electron transport phenomena have been deeply studied in the last decades, spin dependent problems are an interesting field, where we can both understand the interesting physical mechanisms underlying and develop new spin-based electronic applications.

We will focus our attention on the different definitions of polarization used in the literature, and the relationship between them. In this poster we study the current polarization in ferromagnet/insulator/metal junctions. We find that the current polarization changes sign as a function of the depth or height of the insulating barrier. This sign change happens for barrier depths of around 0.4-1 nm, depending on the specific materials parameters.

The sign of the current polarization has already been shown to depend on the type of orbitals carrying the current [1]. Here we propose a completely different mechanism[2], based on the different transmission of each band.

We will study the behavior of the current polarization as a function of the barrier height and depth, so we will be able to determine the most favorable conditions for the experimental corroboration of the phenomenon. We will also check the validity of the BTK models [3] in this kind of barriers and study the magnetoresistance of these junctions[4].

References:

[1] J.M.D. Teresa, A. Barthelemy, A. Fert, J.P. Contour, F. Montaigne, and P. Seneor, *Science* **286** 507 (1999)

[2] J.C. Slonczewski, *Phys. Rev. B* **39** 6995-7002 (1989)

[3] G.E. Blonder, M. Tinkham and T.M. Klapwijk, *Phys. Rev. B* **25** 4515 (1982)

[4] J.S. Moodera, L.R. Kinder, T.M.Wong and R. Meservey, *Phys. Rev. Lett.* **74** 3273-3276 (1995)