SPIN DEPENDENT TUNNELING IN FERROMAGNET/INSULATOR/PARAMAGNET JUNCTIONS

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One of the main challenges of the field of spintronics [1] is the controlled injection of spin polarized currents from ferromagnetic into nonmagnetic materials by means of an insulating tunnel barrier. In order to get a better understanding of the involved tunnelling process, novel devices have been developed that, in contrast to the widely studied magnetic tunnel junctions, allow one to distinguish between tunnelling out-of or into a ferromagnetic electrode by inverting the applied voltage bias [2]. The obtained data with such devices show a strong asymmetry about zero bias, which we analyze with a theoretical approach based on an analytical free-electron model. Our simple model is unable to render all of the complexity inherent to nonideal interfaces, scattering, or complex band structures. However, it qualitatively explains the experimental observations and shows that complex behaviour of the polarization as a function of voltage is intrinsic to spin tunnelling and is highly sensitive to the ratio between the electron wave numbers inside and outside the barrier region.

References:

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