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Magnetoresistance in Double Spin Filter Tunnel Junctions with Nonmagnetic Electrodes and Its Unconventional Bias Dependence[1] GUO-XING MIAO, MARTINA MULLER, JAGADEESH MOODERA, MIT — We demonstrate a large tunnel magnetoresistance (TMR) originating purely from the tuning of tunnel barrier heights in double barrier junctions with nonmagnetic electrodes. This is achieved by the spin filtering that occurs due to the selective tunneling probabilities for spin-up and -down electrons through a magnetic semiconductor barrier resulting in highly spin polarized tunnel currents. Combining two such barriers in a tunnel junction thus leads to a TMR without the necessity of magnetic electrodes. This is significantly different from traditional approaches for generating TMR involving two ferromagnetic electrodes and for example, using Al2O3 or MgO barriers. We demonstrate the first realization of such unconventional tunnel junctions and TMR using EuS / EuO based spin filter barriers with nonmagnetic Al electrodes. The novel non-monotonic and asymmetric bias behavior in magnetoresistance can be qualitatively modeled in the framework of WKB approximations.

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