TOWARDS AN ELECTRIC CONTROL OF SPINTRONICS DEVICES

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Multiferroics should allow to achieve a low power electric control of spintronics devices of great interest on the route to high density data storage.
One of the most suitable multiferroic material is the antiferromagnetic-ferroelectric $BiFeO_3$ due to its high ordering temperatures. To exploit its potential, $BiFeO_3$ films have been used to establish a robust exchange-bias effect [1]. Optimizations performed in order to obtain an electric control of a spin valve will be presented [2]. We will also present experiments on heterostructures combining ferroelectric tunnel barriers of $BaTiO_3$ and ferromagnetic electrodes (Fe or Co). This kind of heterostructures allows to generate, within a single device, a tunnel magnetoresistance (TMR) together with a very large tunnel electroresistance (TER) induced by the ferroelectric polarisation of the barrier. They also give rise to a unusual modulation of the spin polarisation at the interface by the ferroelectricity resulting in a large TEMR (Tunnel Electro MagnetoResistance) effect [3].

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[3] V. Garcia et al.; Nature 460, 81 (2009) and Science 327, 1106 (2010)