

Spin-Orbit-Coupling induced Anisotropy effects in Antiferromagnets

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The tunneling magnetoresistive effects which couple electrical transport with magnetization orientation are the cornerstone of spintronics.

While in ferromagnets these phenomena have more than 150 years of history, and are routinely accessible due to the broken time reversal symmetry of the ferromagnetic state, they have been elusive in anti-ferromagnets (AFMs) with compensated moments.

Replacing ferromagnetic electrodes with antiferromagnets (AFMs) is an attractive prospect which may lead to ultrafast and ultrahigh-density spintronics.

Based on high-accuracy relativistic density functional theory calculations I will discuss the tunnelling anisotropic magnetoresistance (TAMR) phenomena in AFMs. I will consider as examples Mn_2Au [1] and MnIr [2] bimetallic anti-ferromagnets, as well as anti-ferromagnetic semiconductor Sr_2IrO_4 [3]. Large magnitudes of the spin-orbit-coupling induced magnetic anisotropy energies and anisotropies in the density of states can open the route to use these materials in the nanoscale AFM spintronics devices.

References

- [1] A. B. Shick, S. Khmelevskiy, O.N. Mryasov, J. Wunderlich, and T. Jungwirth, Phys. Rev. B 81, 212409 (2010).
- [2] Park, B. G. et al., Nat. Mater. 10, 347 (2011).
- [3] I. Fina et al., Nat. Comm. 5, 4671 (2014).