POZVÁNKA

na seminář oddělení 15 Fyzikálního ústavu AV ČR, v.v.i.

Seminář se koná

ve čtvrtek 10.března 2016 v 10.00 hod.
v zasedací místnosti Fyzikálního ústavu, Cukrovarnická 10, Praha 6, budova A.

Na programu je přednáška

Antiferromagnetic spintronics: Large magnitude magneto-resistance effects and current controlled switching

kterou prosloví

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Abstrakt:

Modern magnetic storage technologies are based on classical spin-transfer magneto resistance and torque effects enabling the detection and manipulation of magnetisation in ferromagnets by spin-polarised currents. [1]
A promising new development in spintronics research considers antiferromagets as active elements for robust magnetic storage and ultrafast information processing. Antiferromagnets possess a microscopic staggered magnetic order with no overall magnetization, resulting in much faster dynamics (~THz) than the one of ferromagnets (~GHz). [2, 3]
Although antiferromagnets have been known for about eighty years, their (spin) transport properties have only attracted interest lately. This is because it was believed to be difficult to manipulate and to detect the magnetic state of antiferromagnets. For example, only strong applied magnetic fields can affect the antiferromagnetic order directly and conventional ST effects proposed to read and write antiferromagnets require rather perfect antiferromagnetic model systems. [4, 5]
However, large magnitude anisotropic magneto-resistance effects in the tunnelling transport regime have indicated the possibility to detect antiferromagnetic order electrically. [6-8] In these experiments, low magnetic field manipulation of the anti-ferromagnetic state was realised indirectly by an exchange-coupled ferromagnet.
Apart from spin transfer torque (STT), also relativistic current induced spin-orbit torque (SOT) effects due to the inverse spin Galvanic effect [9-12] and/or the Spin Hall effect [9, 11] can be used to manipulate magnetic moments. [13-19] SOT effects require broken inversion symmetry and were first observed in a ferromagnetic semiconductor with bulk inversion asymmetric of the crystal lattice. [13] They are present also in systems with structurally broken inversion symmetry [14-16] and can reverse efficiently and fast the magnetisation of thin ferromagnetic films by SOT-driven DW propagation. [18, 19]
Most importantly, SOT effects can also act on the magnetic states of antiferromagnets. [20] They have been observed in antiferromagnetic thin films with structural inversion asymmetry [21] and SOT-driven switching of antiferromagnetic states has been very recently realised in CuMnAs, a system with locally broken inversion symmetry of the individual magnetic sublattices. [22]
In my talk I will discuss potentially large magnitude magneto resistance and current induced SOT effects able to detect and to manipulate potentially fast and magnetic field independent the staggered magnetic order of antiferromagnets.

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