Magnetization Dynamics in Magnetic Tunnel Junctions

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Magnetic tunnel junctions (MTJs) consist of two soft magnetic layers separated by an insulating tunnel barrier. Development of materials structures, in particular CoFe/MgO/CoFe MTJs, have enabled very large tunneling magnetoresistance, in which the resistance of an MTJ can change by several hundred percent when the magnetization of the magnetic layers change from parallel to anti-parallel orientation. This large magnetoresistance has led to important device applications of MTJs, such as sensors in magnetic disc drives, magnetic random access memories, and nanoscale high-frequency oscillator. These latter ones are examples of structures in which spin torque plays an important role coupling steady-state DC electrical currents with magnetization dynamics.

The behavior of nanoscale MTJs depend sensitively on the specific materials structures and interfaces, as well as the shape of the MTJs. I will in this presentation give some examples of effects caused by interactions between materials, geometry and magnetization dynamics, in particular spin-torque induced magnetization dynamics and switching in MTJs.