Spin Currents in Epitaxial Nanopillars and Lateral Spin Valves

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A spin-polarized current entering into a ferromagnetic material exerts a torque on the magnetization by transferring spin angular momentum from the current to the ferromagnet. This so-called spin-transfer torque (STT) gives rise to current-driven magnetization dynamics with unprecedented properties like the switching of the magnetization without applying an external field or the excitation of persistent large-angle precessions of the magnetization with frequencies in the GHz range, which are the basis of spin-transfer oscillators (STO) devices. I will discuss our recent experiments on STT effects in epitaxial, single-crystalline Fe/Ag/Fe(001) nanopillars.

The second part briefly addresses pure spin currents, which bear the potential for electronic devices with significantly reduced dissipation. Pure spin currents transport spin momentum without net motion of charge. They result for instance from spin accumulation in a non-magnetic metal. I will introduce the lateral spin valve configuration that allows detecting pure spin currents by nonlocal transport measurements.