

Abstract for an Invited Paper
for the MAR09 Meeting of
The American Physical Society

Thermal Spin Transfer Torques¹

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The coupling between spin and charge in electronic transport is studied in the field of spintronics. Heat currents are coupled to both charge and spin currents as well [1]. This extension of spintronics to what may be called “spin caloritronics” recently enjoys renewed attention [2]. The spin-transfer torque associated with electric currents can excite magnetizations in nanostructures, switching magnetic configuration in spin valves and move domain walls in magnetic wires when exceeding critical values of the order of 10^7 Acm^{-2} [3]. Also heat currents transfer spin angular momentum [4], either intrinsically or via the thermoelectric generation of particle spin currents. We predict that temperature differences of the order of 100 K over typical metallic nanostructures cause effects equivalent to the critical charge current densities. In this talk I will give a brief review of various aspects of spin caloritronics with emphasis on thermal spin transfer torques. This work has been carried out in collaboration with Moosa Hatami, Qinfang Zhang, Paul Kelly, Hans Joakim Skadsem, Arne Brataas and Sadamichi Maekawa.

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¹Supported by NanoNed and the EC project DynaMax.