

Colloquium Cukrovarnická

v pondělí dne 7. března 2011 ve 14:00 hod.
ve Fyzikálním ústavu Cukrovarnická v seminární
místnosti (budova A, 1. patro)

Pure Spin Currents: Discharging Spintronics



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As semiconducting electronic devices are miniaturized to ever-smaller dimensions, power dissipation becomes an ever-increasing problem due to leakage charge currents. Spintronics may help addressing some of these issues by utilizing besides the charge degree of freedom also the electron spin and the question arises, whether eliminating charge currents altogether could provide additional benefits for applications. Towards addressing this question, non-local device geometries allow for separating spin and charge currents, which in turn enables the investigation and use of pure spin currents [1].

In this lecture, I will discuss different approaches for generating pure spin currents, such as non-local electrical injection from a ferromagnet, charge-to-spin current conversion via spin Hall effects, and spin pumping from ferromagnetic resonance. Furthermore, I will show how spin currents can then be used for gaining new insights into spin dependent phenomena. In particular, the temperature dependence of spin and charge relaxation times allows to identify different spin relaxation mechanisms [2]. In addition, spin pumping facilitates the generation of macroscopically large pure spin currents. This permits to quantify spin Hall effects with great precision, even in materials where these effects are relatively weak [3]. A brief outlook will be given on current scientific and future technological opportunities for pure spin currents.

[1] A. Hoffmann, Phys. Stat. Sol. (c) **4**, 4236 (2007).

[2] G. Mihajlović et al., Phys. Rev. Lett. **104**, 237202 (2010).

[3] O. Mosendz et al., Phys. Rev. Lett. **104**, 046601 (2010).