Seminar Schedule

Dr. Igor Zutic

(Dept. of Phys., Univ. of Maryland at College Park)

Date: Aug. 25, (Mon.) 16:00〜

Room: Seminar room, 2nd floor, prefab bldg

Spin dependent transport in magnetic p-n junctions

Most of the solid state applications which exploit spin degrees of freedom rely on magnetoresistive effects in metals and insulators. Considering semiconductors, on the other hand, offers additional flexibility in manipulating spin dependent properties in a wide range of heterostructures and nanostructures leading to novel spintronic applications. Nonlinear current-voltage characteristics and inhomogeneous doping in semiconductors imply important differences as compared to the spin dependent transport in metallic systems. We focus on specific semiconductor structures based on magnetic p-n junctions, the magnetic analogues of ordinary p-n junctions. They are characterized by spatially dependent spin splitting of carrier bands–a consequence of doping with magnetic impurities and/or an applied magnetic field. We predict that the injected nonequilibrium spin leads to the spin-voltaic effect –a spin analogue of the photo-voltaic effect. By reversing either the sign of the equilibrium magnetization or the direction of injected spin polarization it is possible to switch the direction of charge current in a closed circuit. Properties of the spin-voltaic effect can be used to perform all-electrical measurements of spin relaxation time, as well as to design devices with large magnetoresistance and spin-controlled amplification. Work done in collaboration with J. Fabian and S. Das Sarma.

連絡先：金属材料研究所

前川　禎通（内 2005）