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Optical inverse spin-Hall effect in semiconductors and metal/semiconductor junctions

FEDERICO BOTTEGONI, Dipartimento di Fisica, Politecnico di Milano

III-V and group-IV semiconductors lie at the cutting edge of spintronics due to their large spin-orbit interaction (SOI) and electron spin lifetimes. The spin transport and dynamics in metal/semiconductor junctions can be deeply investigated through the inverse spin-Hall effect, where a spin current, injected into the semiconductor, is converted into a transverse electromotive field at the edges of the non-magnetic metal layer. In this context, we studied the properties of optically injected spin currents in a Pt/Ge and a Pt/GaAs junction under diffusive regime at room temperature, as a function of the initial electron spin polarization, generation depth and doping of the structures. Moreover, considering heavily Si-doped bulk GaAs, we exploited the optical extrinsic inverse spin-Hall effect to experimentally evaluate the spin-Hall conductivity of the system at room temperature.