Poster-1-21

Spin-orbit torques and photoemission spectroscopy of Bi/Ag Rashba system

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The Rashba-Eldestein effect occurs in systems characterized by broken inversion symmetry and spin-orbit coupling in the conduction electron bands. These systems present surface states characterized by spin-momentum locking, which allows for charge-to-spin conversion with efficiencies comparable to or larger than the spin Hall effect. This makes Rashba systems highly valuable for studies of magnetic and logic devices via spin-orbit torques [1]. Our research focuses on the study of Bi(111)/Ag–based heterostructures, grown by molecular beam epitaxy. The choice of this system is motivated by the enhancement of the inverse Rashba-Eldestein effect reported in Bi/Ag heterostructures relative to bare Bi, as probed by spin pumping measurements [2]. However, the impact of the Ag layer on the Bi helical surface states, which are considered to play a major role in charge-to-spin conversion, is still debated [3]. Our research aims at shedding light on this controversy. For this purpose, harmonic Hall voltage measurements of the spin-orbit torques acting on a ferromagnet in contact with the Bi/Ag layer are performed to probe the Rashba-Eldestein effect. These results are compared to angle-resolved photoemission measurements to study the Bi-Ag interdiffusion properties and the possible emergence of a Bi-Ag surface alloy, as observed for the reversed structure, sub-ML of Bi grown on top of Ag(111), with giant Rashba spin-splitting of the surface states [4,5]. Our preliminary results show non-negligible spin-orbit torques in BaF_2(111)/5nm thick Bi(111)/Ag/$Fe_{0.5}Co_{0.5}$/AlO_x, despite no surface alloy was detected by photoemission measurements.

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