

SPIN ACCUMULATION DYNAMICS IN A BI-LAYER WITH ROTATING MAGNETIZATION

A.V. Vedyayev¹, M.Ye. Zhuravlev²

¹ *Department of Physics, Lomonosov Moscow State University, Leninskie Gory,
119992 Moscow, Russia*

² *Kurnakov Institute of General and Inorganic Chemistry of RAS, Leninskii prosp.
31, 119991 Moscow, Russia*

We theoretically investigate spin accumulation in a bi-layer consisting of two ferromagnets, the magnetization of one of which rotates. It is assumed that the rotation of the layer magnetization is caused by an outside source which has fixed frequency. The magnetization of the second layer is fixed. The charge and spin currents are described within the linear response by the equation for diffusive transport. The generalized Landau-Lifshits-Gilbert equation is chosen as the equation of motion for spin accumulation [1]. The rotation of the magnetization leads to the oscillation of the spin-polarized current in both layers. We have found stationary solution for charge and spin accumulation. In the stationary state the current oscillation in the layer with rotating magnetization is a superposition of the harmonics which are multiples of the magnetization rotation frequency and of the time-independent term. The same is true for the charge and spin current in the second layer. The amplitudes of the harmonics are different in the two layers. The dependence of the amplitudes on diffusion coefficient and spin relaxation time is investigated. The components of magnetization current rotate due to spin accumulation.

To estimate the time of relaxation of the system to the stationary state we consider an interaction between spin-polarized current and rotating magnetization of a single layer. A closed analytical solution for initial-value problem is constructed. The exponentially decayed terms give the estimation of relaxation time to stationary state.

[1] A. Shpiro, P. M. Levy, S. Zhang, Phys. Rev. B, **67**, 104430 (2003)