## Nanooptics and photonics

# Electric-drived spin dynamics in tunnel magnetic nanostructures

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There is much current interest in dynamical processes in magnetically ordered systems both from scientific and technological viewpoints. The special interest is related to the problem of the intercoupling between a spin-polarized electron current and the spin dynamics in tunnel magnetic nanostructures (TMN) that can be exhibited in such phenomena, as magnetic switching and a sustained precession of magnetic order vectors. Such phenomena have real potential for application in systems of high-speed magnetic processing information and high-frequency fine-tuned GHz and TGHz electromagnetic radiation [1-3].

The electric current of spin-polarized electrons, after passage the barrier layer in TMN, due to its exchange interaction with local spin at a crucial spin current density can exert switching between magnetic stationary state or the sustained precession with high-frequency radiation due to tunnel magnetoresistance effect [3]. Near the interface of TMN the exchange interaction exerts the torque transfer from the spin current to localized spins and in the distance the impact realized via an effective bias field.

Perspective of using the above-mentioned electric-induced effects of switching and electromagnetic radiation are related to ferrimagnetic based TMN possessing strong enough exchange interaction between magnetic sublattices. The electric-induced spin dynamic have studied for FeCoTb ferrimagnetic-based tunnel magnetic nanostructures with the help of magneto-optic measurements and Landau-Lifshitz-Gilbert-Slonczewski macrospin model. As return out, the ferrimagnetic sublattice exchange interaction provide significant decreasing the crucial current density and frequencies of magnetic switching and electromagnetic radiation controlled by spin-polarized electric current.

**1.** *Brataas A., Kent A.D., Ohno H.,* Current-induced torque in magnetic materials //Nature Matters.-2012.-**11**, N 11.-P. 372- 384.
**2.** *Slavin A., Tiberkevich V., //*Nonlinear auto-oscillator theory of microwave generation of spin-polarized current.-2009.-**45**, N 4.-P. 1875-1918.
**3.** *Klein C., Petijean C., Waintal X.,* Interplay between non equilibrium and equilibrium spin torque using synthetic ferromagnets // Phys. Rev. Lett.-**108,** N 2 .-P. 086601-086605.