セミナーのご案内

SEMINAR

November 28 (Wed.) 2018, 13:30 ~ 15:00
IMR, International Center of Education Research,
Seminar Room 1　（国際教育研究棟 2F セミナー室 1）

“Magnetization Switching in Ferromagnetic Thin Film Induced by Adsorbed Chiral Helical Molecules Realized without Current or External Magnetic Field”

Prof. Lech Tomasz Baczewski

Institute of Physics, Polish Academy of Sciences, Warsaw, Poland

In ferromagnets magnetization reversal can be realized either by the external magnetic field or by the spin-polarized current. The manipulation of magnetization by spin-current occurs through the spin-transfer torque (STT) effect. In this effect the spin angular momentum of electrons current is transferred to the magnetic moments of the ferromagnetic (FM) film. However, the current density required for inducing STT is of the order of 1×10^6 A/cm^2, or about $1x10^{25}$ electrons/·sec·cm^2. This relatively high current density significantly affects the devices' structure and performance. Here a new effect is presented: magnetization switching of FM thin layers induced solely by adsorption of chiral molecules (magnetism induced by a proximity of adsorbed chiral molecules - MIPAC), where about 10^{13} electrons per cm^2 are sufficient to induce the magnetization reversal. The local magnetization switching is achieved by adsorbing the chiral molecules as a self-assembled monolayer (SAM) on a gold-coated FM layer with perpendicular magnetic anisotropy. The direction of the magnetization depends on the handedness of the adsorbed chiral molecules [1].

The problem of separation of enantiomers by their enantiospecific interaction with achiral magnetic substrates will be also discussed and proved experimentally that the interaction of chiral molecules with a perpendicularly magnetized substrate is enantiospecific. Thus, one enantiomer adsorbs preferentially when the magnetic dipole is pointing up, whereas the other adsorbs faster for the opposite alignment of the magnetization [2].

[1] Nature Comm. **8**, 14567 (2017). [2] Science, **360**, 1331 (2018).

Contact: Takeshi Seki (Takanashi Lab.)
ext: 2097