RESEARCH PROJECT FOR UNDERGRADUATES | IKASIKER 2016

Design and study of non-collinear magnets for spintronic applications

Spintronics is the branch of Solid State Physics which aims to control and manipulate the spin of the electron. Its potential has been demonstrated in data storage, sensing and information-processing devices contributing to the improvement of communication media and comfort of the modern society. Ferromagnetism has boosted the field of spin electronics based on the tunnelling magnetoresistance and spin-transfer torque (STT) effects. However, current tendencies in miniaturization of electronic devices have led to the loss of spin coherence due to thermal effects and stray fields preventing future developments in this research direction. The objective of this project is to design and engineer 2-dimensional (2D) non-collinear magnetic nanostructures for current-induced magnetization switching in spintronic devices.

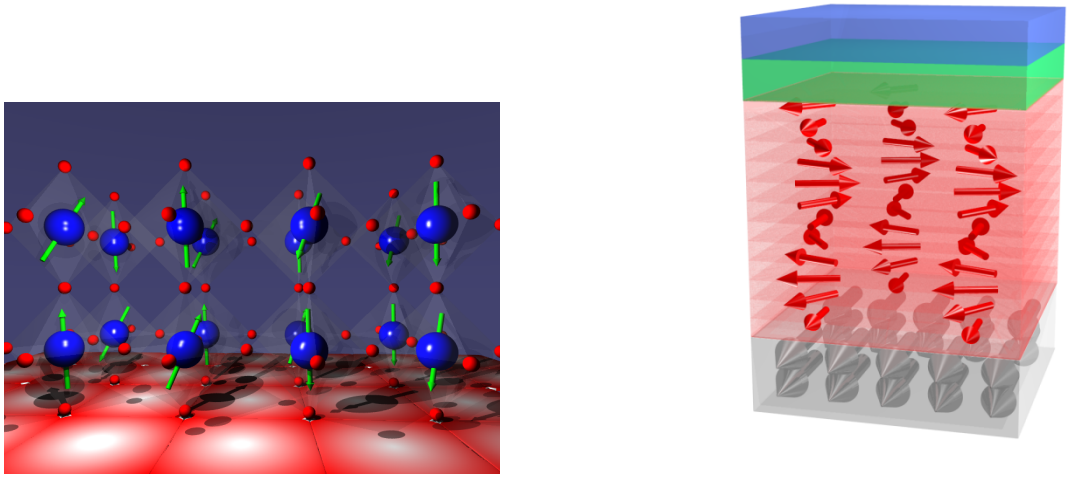

Fig.1 (Left) Non-collinear magnetic nanostructures promise to drive the new generation of materials for data storage and information processing. (Right). The injection of a low density spin polarized current through a FM layer (Gd, bottom layer) will exert a torque on the spin spiral state of Ho which can be used for current induced magnetization switching.

In this project, the student will gain skills and expertise in the field of spin electronics by designing and engineering non-collinear magnetic structures for data storage and information processing. The candidate will measure the magnetic properties of films made of ferromagnetic Gadolinium and helical antiferromagnetic Holmium, Dysprosium and Terbium. For that aim, he/she will use cutting edge techniques like superconducting quantum interference device (SQUID), magnetotransport and

techniques based on Large Scale Facilities like X Ray Magnetic Circular Dichroism and X Ray Magnetic Scattering at BESSY II Synchrotron in Berlin, Germany.

SUPERVISOR: Santiago Blanco

SUITABLE FOR: physicists, chemists, engineers