MASTER DE PHYSIQUE ET APPLICATIONS - 2ème année
Spécialité Sciences des Matériaux et Nano-objets
International Nanomat Master Program

Internship proposal 2011-2012

Laboratory :Institut des Nanosciences de Paris
Laboratoire de Physique des Solides (Orsay)
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Domain wall propagation in nanometric layers of ferromagnetic semiconductor

Scientific project

This experimental internship will seek to evidence for the first time in an in-plane magnetized ferromagnetic semiconductor the propagation of magnetic domain walls under magnetic field and electric current. This phenomenon is at the basis of many promising applications in spintronics. This internship will enable students to develop experimental skills in imaging of magnetic domains, microfabrication clean room work and cryogenics, as well as further their knowledge of magnetism.

The propagation of magnetic domain walls is the subject of intense research in particular because of potential applications in the development of magnetic memories. The study of this dynamics is particularly interesting in systems that are both semiconductor and ferromagnetic such as the compounds (Ga, Mn) As and (Ga, Mn) (As, P). Recent results in our group have shown for the first time domain wall propagation speeds of several hundred m/s in ultra-thin layers with planar magnetization, but no demonstration of domain wall propagation by an electric current has so far been conclusive.

The first part of the internship will consist in designing and fabricating micron-wide wires of (Ga, Mn) (As, P) on which we will study the effect of patterning on the propagation of walls in a magnetic field. The domain wall propagation under electric current will then be studied in a partner laboratory, the Laboratory of Solid State Physics (Orsay).

Techniques in use : magnetic domain (Weiss) imaging using Faraday microscopy. Pulsed magnetic fields. Low temperatures.

Applicant skills : good knowledge of condensed matter, strong interest for experimental physics

Granted internship : yes (_400_€/month) /
C'nano IdF laboratory (France only) : yes
Possibility for a thesis : yes (type of grant : _Ecole Doctorale_398, 389)