

# NUSNNI FOCUS GROUPS

**FOCUS GROUP:** Nanomagnetics and Spintronics

**FOCUS GROUP CHAIRS:** A/P Ding Jun (MSE, FOE)

Asst/P Ramanathan Mahendiran (Physics, FOS)

## Focus Group Information

### 1. Objectives & Planned Deliverables

The main objectives of the **Nanomagnetics and Spintronics** focus group are to develop fabrication techniques of nanomagnets and fundamental understanding of the physics of the nanostructured materials, such as magnetic and magneto-electronic properties:

- i) Development of techniques of nanofabrication/characterization/materials (nanoparticles, nanowires, self-assembly, nano-patterning, nanohybrid, magnetic clusters in organic compounds etc.).
- ii) Investigation of magnetic properties of nanomagnets (magnetic, magneto-electronic, Hall effect, magneto-optic etc.).
- iii) Modeling/simulation/theoretical work of magnetism and spin phenomena, and interpretation of experimental results.

Corresponding deliverables are

- i) fundamental theoretical understanding and computer modeling of the effects of spin injection and spin transfer torque in magnetic nanostructures
- ii) develop in-situ techniques of combined nanofabrication, magnetic imaging and transport measurements.
- iii) develop workable prototypes of semiconductor-based spintronic memory and transistor devices, as well as metal-based spintronics which makes use of spin transfer mechanism.
- iv) Fabrication of nanoparticles and nanocomposites for bio-medical applications.
- v) Magnetic thin films with high coercivity as candidates for high-density recording media.

### 2. Research Plan & Focus

Research areas and directions

- i) Develop unique capabilities in-situ fabrication/characterization/transport measurement techniques of magnetic nanostructures
- ii) Develop high  $T_c$  magnetic-semiconductors and novel hybrid ferromagnetic-semiconductor spintronic sensors/transistors/devices.
- iii) Metal-based (multilayers, granular or patterned nanostructures) spintronics or spin-logic devices
- iv) Theory and computer modeling/simulation of spin transport/dynamics in magnetic and hybrid nanostructures
- v) Fabrication of magnetic nanoparticles for bio-medical applications.
- vi) Nanostructured magnetic thin films with high coercivity.

### 3. Websites of Affiliated Focus Group Members & Laboratories

ISML website: <http://www.ece.nus.edu.sg/isml/>

DingJun's website: <http://www.matsci.nus.edu.sg/staff/ding.html>

FGC's (FOE) website: <http://www.ee.nus.edu.sg/ee/view1.asp?user=elembaj>