

**NUS Graduate School for Integrative Sciences and Engineering
Research Project Write-up**

Title of Project : Magnetic Nanostructures & Devices

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Short Description

In the last decade, there has been growing interest in the study of both static and dynamic properties of ferromagnetic nanostructures due to advances in nanofabrication techniques (top-down and bottom-up approaches), nano-characterization tools and advanced computational methods. Nanomagnets are of scientific interest both from a fundamental viewpoint and also due to their potential in a wide range of applications such as non-volatile magnetic random access memory (MRAM), highly sensitive magnetic field sensor, field programmable spin logic, and patterned media for ultra high density data storage. Novel magnetic properties can be observed when the lateral size of a nanomagnet is smaller than or comparable to certain length scales such as the spin diffusion length and domain wall width. Magnetic nanostructures, by virtue of their extremely small size possess very different properties from their parent bulk material. Magnetization reversal processes can therefore be drastically modified in nanostructures confined to sizes that preclude the formation of domain walls.

There are various challenges with research in magnetic nanostructures including the following; How to make high quality and reproducible magnetic nanostructures? How to characterize the properties of magnetic nanostructures? How to interpret the magnetic and transport properties of nanomagnets?

The following projects are currently available

- ✓ Spin dependent transport in individual nanostructures
- ✓ Magnetostatic interactions in array of nanostructures
- ✓ Development of ultra-high sensitive magnet-optic Kerr Effect (MOKE) system
- ✓ Probing the Exchange Bias in Magnetic Nanostructures