

## Current-induced spin dynamics and its application to spintronic devices

Teruo Ono

(Kyoto University, Institute for Chemical Research, Professor)

### 【Outline of survey】

This year's Nobel Prize in Physics is awarded to Albert Fert and Peter Grünberg for their discovery of Giant Magnetoresistance (GMR). Applications of this phenomenon have revolutionized techniques for reading data from hard disks. The discovery also leads to the development of a completely new type of electronics, called spintronics, where both the electron's charge and its spin are utilized.

We have shown that we can excite nano-spin-structures in ferromagnets like a domain wall and a vortex core by injecting electric currents into the ferromagnets. In this project, we investigate this current-induced spin dynamics in detail and explore the possibilities of its application to spintronic devices.

### 【Expected results】

The big success of the application of the GMR to the reading head of hard disks proves that fundamental science can be directly linked to industry in the field of spintronics.

This project will provide fundamental knowledge of the current-induced spin dynamics in micro-structured ferromagnets, which leads to innovative spintronic devices.

### 【References】

- “Electrical switching of the vortex core in a magnetic disk”, K. Yamada, S. Kasai, Y. Nakatani, K. Kobayashi, H. Kohno, A. Thiaville, T. Ono, *Nature Materials*, **6**, 269. (2007).
- “Current-driven resonant excitation of magnetic vortex”, S. Kasai, Y. Nakatani, K. Kobayashi, H. Kohno, T. Ono, *Phys. Rev. Lett.*, **97**, 107204 (2006).
- “Real-space observation of current-driven domain wall motion in submicron magnetic wires”, A. Yamaguchi, T. Ono, S. Nasu, K. Miyake, K. Mibu, T. Shinjo, *Phys. Rev. Lett.*, **92** 077205 (2004).

【Term of project】 FY2007 - 2011

【Budget allocation】 17,200,000 yen

(2007 direct cost)

【Homepage address】

<http://sse1.kuicr.kyoto-u.ac.jp/indexj.html>