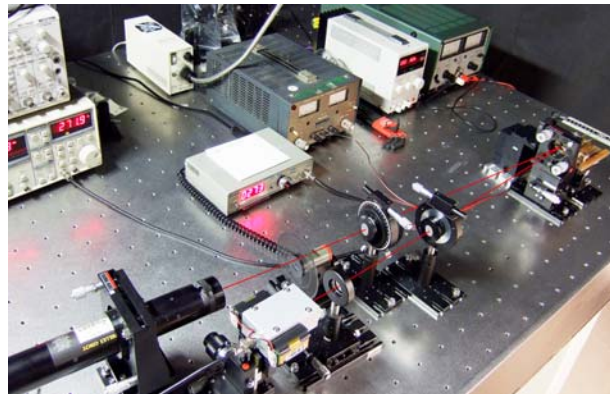
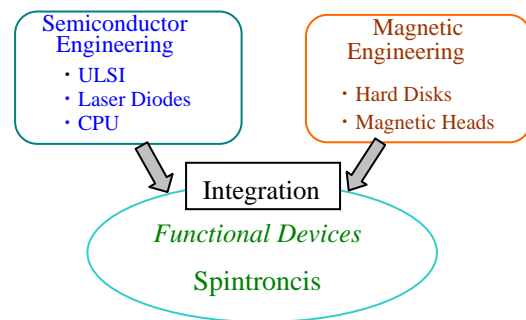


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|----------------|---|
| Group name     | <b>Semiconductor Optical Electronics</b>  |
| Staff (e-mail) | Yutaka Takahashi ( t a k a h a s y @yz.yamagata-u.ac.jp)  |
| Group Homepage |   |
| Main Subjects  | <ol style="list-style-type: none"> <li>1. <i>Spintronics</i> in semiconductor optical devices</li> <li>2. Transport of spin-polarized carriers in semiconductor and magnetic devices</li> <li>3. Optical characterization of magnetic properties in thin films</li> </ol> |

### Content

Development of semiconductor devices (laser diodes, LSIs) and magnetic devices (magnetic hard disks) drives the rapid growth of information processing instruments. Further increase of processing speed and storage capacity is required to meet the demand from a present society heavily dependent on information. In these devices *electrons* are key particles, which have two properties: *charge* and *spin*. The semiconductor devices work by controlling charge only, while the magnetic devices depend on the directions of spin. Recently new design of devices, in which both charge and spin degrees of freedom are controlled in a single device, is extensively studied.



Development of these *spintronics* devices requires integration of semiconductor and magnetic engineering.

In our lab., we study the basic properties of semiconductor and magnetic thin films, e.g., crystal structures, (static) magnetization, magnetization (spin) relaxation dynamics, and carrier mobility.

- (1) Magnetic thin film growth on semiconductors by rf magnetron sputtering
- (2) Magnetization measurement by MagnetoOptical Kerr Effect
- (3) Spin dynamics by Ferromagnetic resonance measurement
- (4) Transport of spin-polarized electrons in semiconductor heterostructures

## Publications

"Effect of electron-electron interaction on the diffusion current of spin-polarized electrons"

Yutaka Takahashi, Nobuyuki Inaba, and Fumihiko Hirose, *physica status solidi (c)*, Vol. 5, No. 1, 314-317 (Oct. 23 2007)

"Electron-electron scattering in the spin polarized transport: A feasibility of observing spin drag"

Yutaka Takahashi, Fumihiko Hirose, Yuuki Sato, and Hitoshi Kawaguchi, *Journal of Applied Physics*, Vol. 101, No. 9, 093707-1~8 (May 7 2007)

"Spin Drag Effect in Temperature Dependence of Spin-Polarized Electron Mobilities"

Yutaka Takahashi, Yuuki Sato, Fumihiko Hirose, and Hitoshi Kawaguchi, *Japanese Journal of Applied Physics Part 1*, Vol. 46, No. 4B, pp. 2585-2591 (Apr. 24 2007)

"Field Dependence of Electron Spin Relaxation during Transport in GaAs"

Yuuki Sato, Yutaka Takahashi, Yuichi Kawamura and Hitoshi Kawaguchi, *Japanese Journal of Applied Physics*, Vol. 43, No. 2A, pp.L230-L232 (Jan. 2004)

"Strain-Dependence of the Gain Saturations in InGaAsP/InP Quantum-Well Gain Media"

Y. Takahashi and H. Kawaguchi, *IEEE Journal of Quantum Electronics*, Vol. 38 No.10, pp. 1384 -1389 (Oct. 2002)