Requests for Collaboration

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Research Interests

- Spintronic devices development: for instance, logic circuits with a novel concept, energy harvesting devices, and so on.
- Smart energy researches: for instance, energy creation, energy charging, saving-energy, in electronic devices, and so on.

Creative Achievements in The Application of New and Existing Science and Technology

(1) Energy harvesting using ferromagnetic resonance in ferromagnetic metal films. [1, 4]

Electromotive forces have been generated in ferromagnetic metal (Fe, Co, $Ni_{80}Fe_{20}$) single-layer samples under the ferromagnetic resonance (FMR), where the FMR is excited by using electron spin resonance system and the microwave frequency for the FMR excitation is generally from several GHz to 10 GHz [1, 4]. We are trying to generate the electromotive forces under the FMR of the ferromagnetic metal films by using electromagnetic high frequency waves in environments.

(2) Spin transport for energy saving and a new concept pf information propagation. [2, 3, 5]

Spin transport, which is a flow of spin angular momenta and called as a "spin current", has been achieved in various materials: for example, a thermally evaporated pentacene film which is an organic molecular film prepared by vacuum evaporation and the film has relatively-high electrical conductivity and photo-conductivity [2, 3], and a *p*-type silicon which is an inorganic semiconductor and is a representative material for electronics industry [5], and so on. Due to these achievements, spintronic devices with a new operation mechanism using the spin current will be developed.

Research Theme That I Want to Collaborate

- Logic circuits with the spin current.
- Energy-harvesting using the ferromagnetic resonance.
- Effective generation and control of the spin current.
- Smart detection and conversion of high frequency magnetic fields.
- Smart spin transport and spin conversion with rare-metal-less and/or rare-metal-free materials.
- Clarification of spin transport mechanism in organic evaporated thin films.

A List of 5 Key Publications

[1] K. Kanagawa, Y. Teki, E. Shikoh, "Self-induced inverse spin-Hall effect in an iron and a cobalt single-layer films themselves under the ferromagnetic resonance.", *AIP Advances*, **8**, 055910-1 - 055910-6 (2018).
[2] Y. Tani, T. Kondo, Y. Teki, E. Shikoh, "Spin current relaxation time in thermally evaporated pentacene films.", *Appl. Phys. Lett.*, **110**, 032403-1 - 032403-4 (2017).
[3] Y. Tani, Y. Teki, E. Shikoh, "Spin-pump-induced spin transport in a thermally evaporated pentacene film.", *Appl. Phys. Lett.*, **107**, 242406-1 - 242406-4 (2015).
[4] *A. Tsukahara, *Y. Ando, *Y. Kitamura, H. Emoto, E. Shikoh, M.P. Delmo, T. Shinjo, M. Shiraishi, " Self-induced inverse spin Hall effect in permalloy at room temperature.", *Phys. Rev. B*, **89**, 235317-1 - 235317-6 (2014).
[5] E. Shikoh, K. Ando, K. Kubo, E. Saitoh, T. Shinjo, M. Shiraishi, "Spin-Pump- Induced Spin Transport in p-Type Si at Room Temperature.", *Phys. Rev. Lett.*, **110**, 127201-1 - 127201-5 (2013).