Tohoku Univ. Technology

Magnetic metamaterial, spin current control device and spin current control method

The direction and magnitude of the spin flow can be freely controlled by light!

Overview

In recent years, spintronics, which make active use of the small magnetic property (spin) of electrons, has attracted attention from the viewpoint of realizing devices with low power consumption and high density. Many of the spintronics functions are driven by a spin flow. So the pioneering of innovative generation and control methods of spin flow has been required.

The present invention is a new development of magnetic metamaterials with artificially manipulated symmetry in nano space, and pioneered a new principle that completely controls the propagation direction and magnitude of spin flow at room temperature and at ultra-high speed by the polarization state of light pulses.

The present invention is expected not only to dramatically improve the degree of freedom in designing next-generation spintronics devices, but also to be applied to ultrafast optical spintronics, in which conventional optical science and spintronics technologies are developed through nanotechnology.

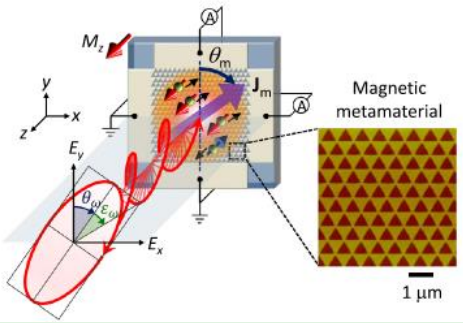
Application example

- Next-generation spintronic devices
  (Next-generation memory, next-generation transistors)

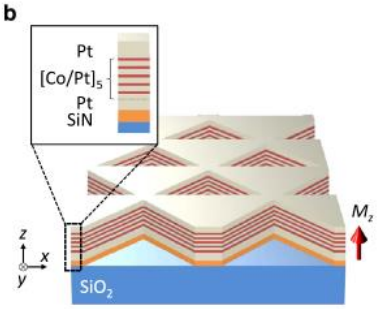
Related literature

[1] Matsubara, M., Kobayashi, T., Watanabe, H. et al. Nat Commun **13,** 6708 (2022).

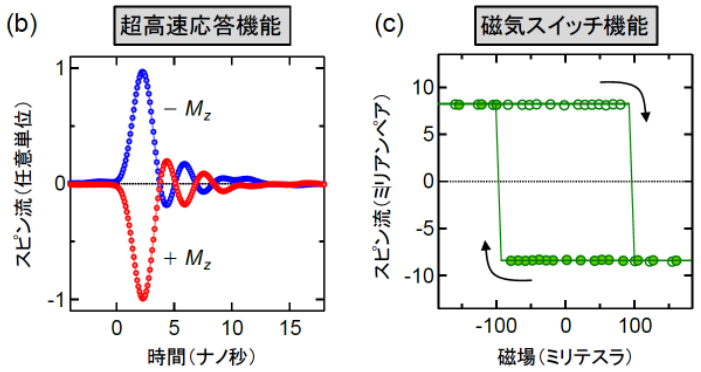
Performance, features, etc.



Incident light with a polarized state enters the magnetic metamaterial, creating a spin flow



Structure of magnetic metamaterials



- Irradiation of a light pulse causes a spin flow.
- Inversion of the Mz reverses the direction of the spin flow
- When an external magnetic field reverses the orientation of a magnetic metamaterial,the propagation direction and direction of the spin flow are reversed.

- Companies wishing to conduct joint research and development based on this technology
- Companies interested in next-generation spintronics

Please feel free to contact us.

Intellectual Property Data

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