Semiconductor

R&D Project Title: Spin-orbit torque (SOT) MRAM technology as replacement for SRAM in cache memory

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Summary:

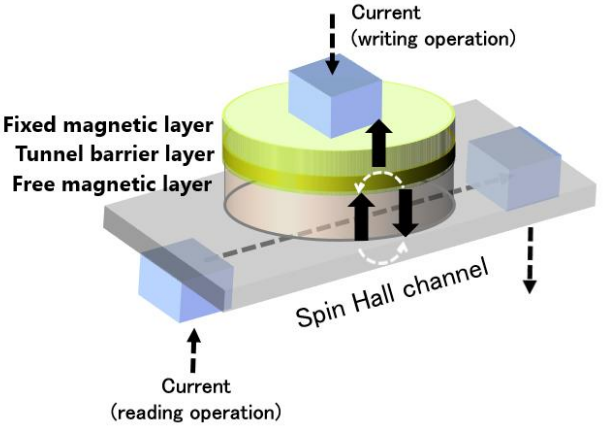
We aim to develop next-generation non-volatile memory technology for use as working memory by leveraging spin–orbit torque (SOT)-based magnetic random-access memory (MRAM). Unlike conventional volatile memories such as SRAM and DRAM, SOT-MRAM offers zero standby power consumption, fast write speed, low write power consumption, and high endurance.

To this end, we are pursuing the following developments:

(1) Reducing the writing current by utilizing amorphous metal materials with large spin Hall effect.

(2) Achieving field-free SOT magnetization switching for perpendicularly magnetized films to minimize the cell area of SOT-MRAM.

(3) Establishing a fabrication process for SOT-MRAM devices that is compatible with CMOS back-end-of-line (BEOL) processes, enabling seamless integration into existing semiconductor platforms.



Schematic of SOT-MRAM

This technology holds great promise for reducing power consumption and enhancing system-level performance in future computing architectures, thereby contributing to the realization of carbon neutrality.