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Surface Plasmon Magnetization Switching

CMOS-compatible plasmonic materials enable all-optical magnetization switching in spintronic memory devices, significantly boosting switching speeds beyond the nanosecond limit.

The demand for faster magnetization switching speeds and lower energy consumption has driven the field of spintronics in recent years. The magnetic tunnel junction is the most developed spintronic memory device in which the magnetization of the storage layer is switched by spin-transfer-torque or spin-orbit torque interactions. Whereas these novel spin-torque interactions exemplify the potential of electron-spin-based devices and memory, the switching speed is limited to the ns regime by the precessional motion of the magnetization. All-optical magnetization switching based on the inverse Faraday effect, has been shown to be an attractive method for achieving magnetization switching at ps speeds. Successful magnetization reversal in thin films has been demonstrated by using circularly polarized light. However, a method for all-optical switching of on-chip nanomagnets in high density memory modules has not been described.

Researchers at Purdue University have developed a method for all-optical switching of the magnetization spintronic devices integrated in on-chip memory and logic as well as photonic devices and utilizes CMOS-compatible plasmonic materials. This technology overcomes the precision-limited switching times (ns) of the magnetization in spintronic devices through the utilization of surface plasmons in nanomagnet structures.

Advantages:

-Produces higher opto-magnetic field

-High switching speeds

Potential Applications:

-Spintronics

-Memory devices

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Category

Semiconductors/Devices & Components
Materials Science & Nanotechnology/Nanomaterials & Nanostructures
Computing/Photonic & Optical Computing Technologies

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