INNOVATION & TECHNOLOGY TRANSFER

Custom-Made TMR Sensors

Method to freely tune the magneto-resistive properties of thin-film devices

Reference No. P 113

BACKGROUND

Magneto-resistive multilayers devices have to be manufactured with defined magnetic orientation as well as precisely adjusted switching fields of the individual layers, in order to be useful in practice. As a consequence, most of them are rather complex and difficult to prepare, especially for crossed magnetic configurations. Known methods of producing multilayer magneto-electronic devices provide only a limited capability to adapt them to a particular application.

SOLUTION

A new deposition method in oblique incidence (OID) allows for the fabrication of magnetic thin film sensor systems, in which the magnetic orientation and hardness of each magnetic layer can be independently adjusted in a convenient way. Hence, multilayer devices with novel magnetization profiles and adjustable magnetic switching characteristics can be realized. TMR sensor systems prepared with this technique exhibit pure and strong magneto-resistive signals. The approach can be applied to practically all polycrystalline magnetic thin films and eliminates the need for additional magnetic pinning layers in the sensor structure.

ADVANTAGES

- Orientation and strength of magnetic anisotropy adjusted via OID for every single magnetic layer. Magneto-resistive properties of the device can be freely tuned for the first time.
- Identical film structures (e.g. CoFeB/MgO/CoFeB) serve as basis for multiple sensing applications. Functional adjustment solely via polar and azimuthal deposition orientation during coating of magnetic electrodes. No need for additional expensive pinning layers.
- OID-TMR sensors show excellent temperature stability and high signal strength. The OID coating approach maintains excellent compatibility with common large-scale fabrication and micro-structuring methods.

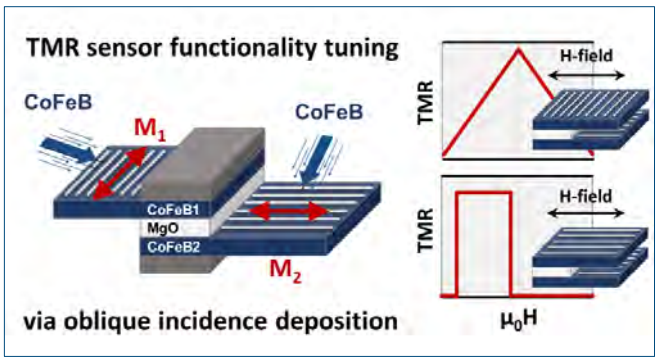

Fig. 1: Functionality tuning of TMR sensor.

APPLICATION FIELDS

- Magnetic field sensors, e.g. in the automotive industry or in spin valve systems
- Customized thin film GMR and TMR sensor systems
- Novel storage media (MRAM)

PROPERTY RIGHTS

EP 2846334 B1
JP 6526008 B2
US 11170805 B2
US 9928860 B2

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POSSIBILITIES OF COOPERATION

- Licensing
- R&D Cooperation

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