

Real-Time Measurement Magnetic Memory Cell Switching

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PhD may follow: Yes

Summary :

Magnetic memories (MRAM) is an emerging technology with the potential to become the standard solution for applications in non-volatile memories. This type of memory is attractive because it combines non-volatility with ultra high speed writing (sub-ns) and high-density storage.

The objective of this project is to characterize the switching of the magnetization direction storage layer that encodes the information. This will be done to evaluate the switching speed of different cell concepts with in-plane or perpendicular magnetization. We can then evaluate the reversal under simultaneous application of spin-polarized current and a magnetic field to write the orientation of the MRAM memory element. This measure also allows the observation of thermoelectric effects, i.e. the temperature gradient between the two electrodes of the junction gives rise to a bias voltage in the junction.

The project will use existing experimental setups at Spintec and be realised on samples made by Crocus Technology or at INAC's Advanced Technology Platform (PTA).

Full description :

Magnetic memories (MRAM) is an emerging technology with the potential to become the standard solution for applications in non-volatile memories. This type of memory is attractive because it combines non-volatility with ultra high speed writing (sub-ns) and high-density storage. The most advanced MRAM concepts use current pulses for switching between two resistance states. The switching of the magnetization direction of the storage layer results in a variation in resistance of the cell may be greater than 100%. For current densities of $4E6A/cm^2$ the spin transfer torque effect, can be used to write the bit "1" or "0" depending on the polarity of the applied current. This writing a bit can be done with or without using an external magnetic field

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The electrical tests will be conducted using MATLAB routines. It is desirable that the (a) candidate (s) has basic knowledge of computer and / or electrical instrumentation. Analysis of the results will also require an understanding of the underlying physical phenomena.

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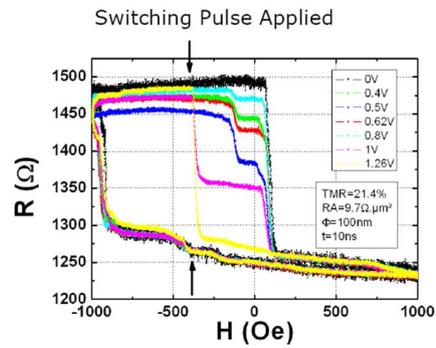


Fig. 1 : Retournement de cellule MRAM à anisotropie perpendiculaire à l'aide d'un pulse de courant de 10ns.

Requested skills :

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