Motivation
CPP (Current Perpendicular to the Plane) GMR spin valves are candidates for the next generation read heads. We present the fabrication process of a CPP sensor with either antiferromagnetic (AFM) or hard magnet (HM) pinning.

Fabrication process
SV fabrication flow chart

- Deposition of the bottom electrode+stack (blanket layer). Photolithography+ion milling to define shape (dog bone) for bottom electrode.
- Photolithography+ion milling to define shape for the stack (cylinder).
- Deposition of the insulator (SiO₂). Electron lithography+reactive ion etching to define the shape (circular hole) for the contact between stack and upper electrode.
- Photolithography+ion milling to define shape for the stack (cylinder).
- Photolithography+ion milling to define shape for the stack (cylinder).

Ion milling calibration
Two angle milling is used for preventing side wall redeposition
First step – steep angle milling
Second step – shallow angle milling

Evolution of the depth profile during the ion milling of a spin valve: blue line – only the steep milling angle was used, red line – both milling angles were used.

Profiles of the bottom electrode and the SV stack (pillar) after the first two steps of the fabrication (for each step, two angle milling was used).

Images of contact holes on top of different SVs on the same wafer
Bottom electrode + SV stack (pillar) (B5) SV stack (pillar) Contact hole through the SiO₂

Summary
The steps of the fabrication process of a CPP spin valve were described. This process will be used for investigating the CPP GMR in relation to the contact hole diameter.

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