Modification of Magnetic Properties for Single Layer and Laminated Cores of Cobalt Rich Amorphous Films Resulting from Post Deposition Magnetic Annealing

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DESCRIPTION:--
This work investigates the effect of post deposition Magnetic Annealing to modify the induced magnetic anisotropy and coercivity of sputtered cobalt rich amorphous thin films and laminated cores. Studies were carried out both on a) Samples deposited with no magnetic field and subsequently magnetically annealed and b) Samples deposited in a magnetic field and subsequently magnetically annealed with stronger field strengths. The study utilizes a magnetic annealing tool, capable of applying fields of up to 5 Tesla at different orientations during thermal processing. The measurement of magnetic properties was carried out using a Shä Mass B-H loop tracer.

MAIN CONCLUSIONS:--
- For single and multilayer films deposited without a magnetic field; post deposition magnetic annealing is shown to reorient the 'as deposited' radially distributed anisotropy by up to 90° providing the opportunity to achieve uniform uniaxial anisotropy over a wafer.
- The strength of the magnetic anisotropy can be further tuned in uniaxial anisotropic thin films by reorientation of the magnetic anisotropy, by a post deposition magnetic annealing process.
- The effects of applying a 0.5 Tesla field during annealing is reported in this work. Investigation using fields up to 5 Tesla is planned.

(a) Deposited with no magnetic field & then magnetically annealed

- *As deposited* anisotropy direction distributed radially in the wafer.  
- After Magnetic Annealing, uniform magnetic properties across the wafer can be achieved.

(b) Deposited in a magnetic field & then magnetically annealed

- Deposition in a magnetic field can achieve uniform magnetic properties.  
- The direction of anisotropy can be reoriented and its value tuned by post deposition magnetic annealing.

- *Hc* is in a similar range for single layer films before and after annealing  
- *Hc* increases for multilayer films after magnetic annealing in a field of 0.3 Tesla at temperatures up to 350 °C, with maximum <0.4 Oe

- *Hc* decreases in multilayer films following post deposition magnetic annealing at temperatures > 290 °C in a field of 0.5 Tesla.

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