INVESTIGATIONS ON CONTROL OF DOMAIN WALL MOTION USING SYNTHETICALLY TEXTURED MAGNETIC NANOSTRUCTURES

Domain wall (DW) motion-based devices such as racetrack memory have been proposed as promising candidates for high capacity, non-volatile storage. In these devices, multiple DWs can be propagated through nanowires at speeds of kilometer per second using electrical current, thus allowing data to be written, read and processed. A major challenge towards the commercial realization for DW memories is the stochasticity of DW motion. Such stochastic behavior limits the reliability and maximum data density. To overcome this issue, researchers have investigated the forming geometrical pinning sites, fabricating notches at specific positions. In this thesis, we investigated the use of synthetic magnetic texture to control and pin domains in nanowires. The synthetic magnetic texture can be achieved by modified of the magnetic properties of nanowires using thermal diffusion of non-magnetic species or ion-implantation, as well as tilting the magnetization of nanowire at particular positions. In comparison to lithographically fabricated notches, which is non-uniform and increases the local heating at the notch position, the methods proposed in our study, can potentially be used in future DW memory applications.