FePt-Based Bit Patterned Media fabricated Using Electron-beam Lithography

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In order to realize high-density magnetic recording media, grain size should be decreased. However, as the grain size becomes smaller, thermal stability of magnetization deteriorates, causing a ferromagnetic material to behave like a paramagnetic material. This phenomenon is called superparamagnetism. To overcome superparamagnetism, bit patterned media (BPM) have been suggested. In BPM, a magnetic layer is replaced by an ordered array of highly uniform islands, each island capable of storing an individual bit. L10 ordered FePt has been one of the most heavily intensively investigated candidates for the next generation high-density magnetic recording media because the material shows high magneto-crystalline anisotropy and high coercivity. Self-assembly methods have been universally used in fabrication of FePt-based BPM. However, there was a limitation in enhancement of the magnetic properties of the media prepared by this method due to the absence of underlayer. In this work, L10 ordered FePt-based BPM were fabricated using e-beam lithography (EBL) and their properties were investigated.

L10 ordered FePt thin films were deposited on a glass substrate by RF magnetron sputtering under a base pressure of 4×10^{-9} Torr. The film structure was FePt(10nm)/Pt(2nm)/CrV(70nm). The magnetic properties of as-grown L10 ordered FePt thin films were characterized by a vibrating sample magnetometer (VSM). In order to fabricate a patterned structure of the FePt, a combination of EBL and dry etching was utilized. Figure 1 shows the FePt-based BPM fabrication process. And the fabricated dot array with a pitch of 200 nm and a diameter of 100 nm was shown in Figure 2. The patterned structure exhibited higher anisotropy than continuous magnetic films, suggesting that the coercivity of the patterned structure is larger than that of the as-grown FePt. Further studies are under way. From this approach, it is expected to make it possible to implement high-density magnetic recording media by well-designing a patterned structure.

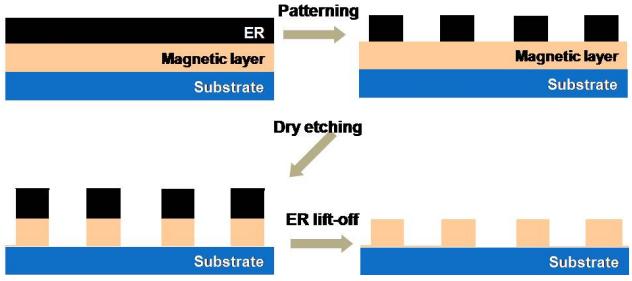

Figure 1. Schematic pictures of BPM patterning process

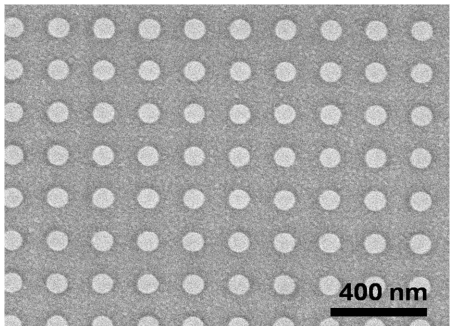

Figure 2. SEM image of patterned FePt structure