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Columnar structural FePt films with good perpendicular anisotropy induced by tuning the crystal structure of doping materials

K. F. Dong [a, b,*], J.Y. Deng [c], F. Jin [a, b], W. Q. Mo [a, b], J. L. Song [a, b], J. S. Chen [c]

[a] School of Automation, China University of Geosciences, Wuhan 430074, China

[b] Hubei key Laboratory of Advanced Control and Intelligent Automation for Complex Systems, Wuhan 430074, China

[c] Department of Materials Science and Engineering, National University of Singapore, Singapore 117576, Singapore

Abstract

Crystalline ZrO_2 doping would degrade the perpendicular texture of FePt films due to the epitaxial growth of FePt (200) textured phase on the tetragonal (002) textured ZrO_2. In the present paper, crystalline HfO_2 was used to replace crystalline ZrO_2 as the crystalline doping material and FePt media with columnar structure and good perpendicular anisotropy were achieved. It is found that HfO_2 crystallized on TiON intermediate layer presented the coexistence of both monoclinic and tetragonal phase. The extremely large lattice mismatch strain (around 25-28%) between FePt and HfO_2 would prohibit the (200) or (001) epitaxial growth of FePt phase on HfO_2. This would cause FePt-HfO_2 film to have better (001) texture and perpendicular anisotropy compared to FePt-ZrO_2 films. By tuning the crystal structure of doping crystalline phase material, columnar structural FePt films with better perpendicular anisotropy could be obtained, which may offer a method for the application of FePt media in heat assisted magnetic recording.

Keywords: Crystalline Oxide doping; Epitaxial growth; Columnar structure

* Corresponding author, Electronic mail: dongkf1981@163.com. Tel.: 86-27-87175128. FAX: 86-27-87175128