CA03

Effect of Granular Oxide-to-Cap Exchange Coupling on Switching and Recording Characteristics in Perpendicular Magnetic Recording Media

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Perpendicular recording technology has advanced significantly with areal density approaching 300 Gb/in^2 in commercially available products today. In order to sustain high areal density with adequate thermal stability, advanced media structures such as exchange spring (ES) media comprising hard and soft layers in the grain [1] or coupled granular/continuous (CGC) media [2] were proposed to improve writeability of high anisotropy (K_u) grains. According to our recent study of media with exchange control layer (ECL) between granular oxide and highly exchange coupled cap layer, the recording performance can be enhanced by optimizing the exchange coupling between granular oxide and cap layers [3]. In this study, a systematic investigation of the switching and recording characteristics of PMR media with various granular oxide-to-continuous cap layer exchange couplings is reported. The exchange coupling strength between the granular oxide and cap layers was controlled by varying the M_s as well as the thickness of the ECL. Fig. 1 shows the saturation field, H_s, as a function of ECL thickness with two different M_s values. For each ECL series, three distinct regions representing different degrees of granular oxide-to-cap exchange coupling are illustrated: I (strong coupling), II (weak coupling) and III (decoupling). When the ECL thickness is less than its value at the minimum H_s, strongoxide-to-capcouplingoccurs. When the ECL thickness is greater than its value at the minimum H_s, weak coupling leads to increase in H_s. As shown in Fig. 2, SNR and double sided squeeze induced amplitude change (DSAC), which measures performance under adjacent track encroachment, are strongly affected by oxide-to-cap exchange coupling. In case I, with increasing MWW, DSAC decreases and SNR_m increases. However, in case II, DSAC decreases even with decreasing MWW and at the same MWW, it is higher for the ECL with higher M_s. IncaseIII, SNR_m degradessharplyduetoincreasedjitterinthecontinuouscaplayerwhenitisdecoupledfromthegranularoxidelayer. More detailed recording and switching properties will be discussed in the full paper.

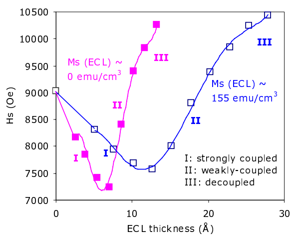

Fig. 1. Saturation field vs ECL thickness for different Ms values of ECL.

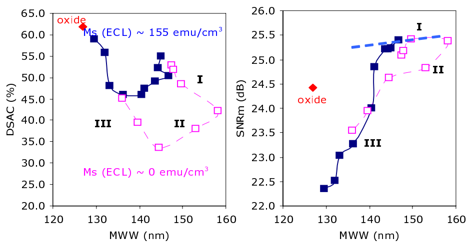

Fig. 2. DSAC (double sided squeeze induced amplitude change, TAAAFTER/TAABEFORE) and SNR_m vs MWW (magnetic write width) for various ECL thicknesses.

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CA04

Study of Nano-composite Particles and Multi-layers of FeRh/FePt with First Order Magnetic Phase Transition

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Much attention has been recently paid on magnetic multi-layers and nano-particles which undergo the magnetic first order transition between anti-ferro (AFM) and ferro-magnetic (FM) phases.

Such materials-systems have high-potential for applications, such as spintoronics devices and heat-assisted-bits-patterned magnetic recording.

This talk includes an overview of the recent developments of nano-composite particles and multi-layers of FeRh and its related, and also the recent results of a systematic study on the field dependence of transition temperature. Some simulation results of ferro/anti-ferro magnetic nano-composites are also presented.