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New Developments in Perpendicular Magnetic Recording Media

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Recording areal density in current drives is approaching 200 Gb/in^2. While compositions of individual layers do generally vary, the structure of the PMR media in today's drives is remarkably similar with synthetic antiferromagnetically coupled soft underlayer (SAF SUL) structures, Ru based nucleation layers and oxide segregated recording (storage) layers [e.g., 1,2]. As areal density increases and track width is correspondingly decreased, a serious writability problem develops limiting the usable coercivity. This limitation, combined with the need to decrease grain size to improve signal-to-noise ratio (SNR), imposes serious constrains in the design of improved PMR media. New media structures using dynamic tilting switching mechanisms such as exchange coupled composite media (ECC) [3] and exchange spring media [4] have been proposed in order to overcome these obstacles. In this paper we will discuss the merits and limitations of current PMR media structures and propose possible improvement direction for media applicable for $>$ 200 Gb/in^2 recording including results from our latest attempts to reduce exchange spring media and related conceptual structures into practice. [1] G. Choe, A. Roy, Z. Yang, B.R. Acharya, and E.N. ABarra, *IEEE Trans. Magn.*, vol. 42, no. 10, pp. 2327-2329, Oct. 2006 [2] U. Kwon, H.S. Jung, M. Kuo, E.M.T. Velu, S.S. Malhotra, W. Jiang, G. Bertero, R. Sinclair , *IEEE Trans. Magn.*, vol. 42, no. 10, pp. 2330-2332, Oct. 2006 [3] R. Victora and X. Shen, *IEEE Trans. Magn.*, vol. 41, no. 2, pp. 537-542, Feb. 2005 [4] D. Suess, T. Schrefl, M. Kirschner, G. Hrkac, F. Dorfbauer, O. Ertl, J. Fidler, *IEEE Trans. Magn.*, vol 41, no.10, pp. 3166-3168, Oct. 2005.