The Influence of Ta and Pt on Cr Grain Boundary Segregation in CoCr(TaPt)/Cr Longitudinal Recording Media

J.E. Wittig, Vanderbilt University, J. Bentley, Oak Ridge National Laboratory, T.P. Nolan, P. Dorsey, Komag Inc.

Grain boundary segregation of Cr provides magnetic isolation and exchange decoupling of individual grains in modern longitudinal recording media. Since elements such as Ta and Pt are also typical additions, it is important to understand their influence on the Cr distribution and corresponding magnetic recording properties. Two sets of media were used for this study. Both magnetic layers contain 80% Co and 16% Cr but one has 4% Ta while the other has 4% Pt. The $Co_{80}Cr_{16}Ta_4$ and $Co_{80}Cr_{16}Pt_4$ were d.c. magnetron sputtered to a thickness of 25 nm at 250°C. All samples have a 40 nm Cr underlayer sputtered onto a textured NiP plated aluminum substrate. Magnetic characterization shows superior properties for the $Co_{80}Cr_{16}Ta_4$ alloy compared to $Co_{80}Cr_{16}Pt_4$. The Ta media exhibits greater coercivity (Hc = 2560 Oe for Ta and Hc = 2100 Oe for Pt) with reduced media noise (write jitter of 4.44 nm for Ta compared to 4.62 nm for Pt). Quantitative measurements of the Cr distribution using energy filtered transmission electron microscopy (EFTEM) reveal that both the Ta and Pt media have significant Cr grain boundary enrichment with a mean maximum level of 24 at% Cr. However, the Ta media has considerably more total Cr at the grain boundaries with an average Cr grain boundary profile 75% wider than the Cr profiles in the Pt material. Since both media show similar grain size and defect density, the superior magnetic properties of the $Co_{80}Cr_{16}Ta_4$ media must be related to improved grain boundary isolation.

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