Microstructure of a Pinned Wall Sensor using Rapidly Solidified Amorphous Co-rich Magnetic Alloy

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Transmission Electron Microscopy (TEM) analysis of the amorphous $Co_{74.26}Fe_{4.74}B_{18.9}Si_{2.1}$ pinned wall sensors produced through rapid solidification process identified complex sub-surface microstructures, which exhibited different degree of domain wall pinning depending on the structure. The wall pinning threshold, H_p of 1.2 Oe is obtained when the structure was composed of SiC/CoO/Co in which CoO and Co are in direct contact, providing a strong exchange coupling whereas the alloy with the low H_p had the Co grains surrounded by the borosilicate oxide losing the direct contact with the CoO [1]. The different microstructures appear to have stemmed from the inconsistency in the solidification process and the carbon contamination that resulted in different metalloid re-distribution and subsequent development of different sub-surface structures during field annealing [2]. To obtain reliable performance from the $Co_{74.26}Fe_{4.74}B_{18.9}Si_{2.1}$ sensors, it would be critical to closely control the chill block speed and cooling system to ensure the consistent metalloid distribution and sub-surface microstructure.

References

[1] C. K. Kim, Mat. Sci. & Eng., **B38** 194 (1996)
[2] W. Kurz, D. J. Fisher, Fundamentals of Solidification, (Trans Tech Publications Ltd., Switzerland, 1989), p. 133.