

Determination of Amorphous Alloy Compositions with Reduced Cobalt and Optimal Magnetomechanical Response for Magnetoelastic Sensors

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There is a clear and pressing need to reduce bias field (H_b) used on linear magnetomechanical resonator tag by at least a factor of two to allow low-bias operation near the frequency minimum since reducing H_b causes a dramatic increase in well depth, which implies increased stability. However, this makes it more difficult to maintain tight frequency specs. It can be solved by a reduction of magnetomechanical coupling factor (k) [1]. We determined from an equivalent circuit model that optimal reduced k is near 0.3. Also, we determined the material properties (λ_s : saturated magnetostriction, M_s , and H_a : anisotropy field) that give $k = 0.3$. From these evaluations, we suggested that an optimal composition with adequate material properties is $Fe_{55}Co_{15}Cr_6Nb_2B_{18}Si_4$. This composition exhibits the optimum magnetization with minimal use of cobalt which is costly.

References

- [1] C. K. Kim, Mat. Sci. & Eng. B, **B34** 1-6 (1995)