

Spontaneous Hall effect in Amorphous CoSiB/Pt/CoSiB structure

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Magnetic multilayer films with perpendicular magnetic anisotropy have been extensively studied for the application of magnetic recording media and magnetic sensor. The spontaneous Hall effect (Extraordinary Hall effect) in magnetic metals and alloys which is caused by spin-orbit interaction is substantially larger than the ordinary Hall effect due to Lontz force. Some materials exhibit quite large spontaneous Hall effect suitable for Hall sensor. These materials include amorphous rare earth (RE)-transition metal (TM) alloy and Pt-based magnetic multilayer.

In this study, we have quantitatively investigated the Spontaneous Hall effect (SHE) in amorphous CoSiB/Pt/CoSiB sandwich structure. The amorphous CoSiB/Pt/CoSiB sandwich structure were prepared by changing Pt thickness. The thickness of Pt were varied in the range of from 11 to 42 Å. The amorphous CoSiB/Pt/CoSiB sandwich structure exhibited moderate spontaneous Hall resistivity (ρ_H , $0.016 \times 10^{-6} \Omega \cdot \text{cm} \sim 0.39 \times 10^{-6} \Omega \cdot \text{cm}$) and large Hall angle (ρ_H/ρ , 2.5~9.5%), which was larger than those of amorphous rare-transition metal alloys (ρ_H/ρ , 3%) and normal transition metal alloys (ρ_H/ρ , 6~8%).