

Experimental verification of relation between skyrmion hall angle and anisotropy, damping constant

Kitae Kim¹, Seong-Hyub Lee¹, Yooleemi Shin², Ji-Wan Kim², Jung-Hyun Park¹, Jun-Young Chang¹ and Sug-Bong Choe^{1,*}

¹*Department of Physics and Astronomy, Seoul National University, Seoul, 08826, Republic of Korea*

²*Department of Physics, Kunsan National University, Kunsan, 54150, Republic of Korea*

Magnetic skyrmion is spin configuration, which is topologically stable so that eagerly studied as promising information carrier in future. Such skyrmion is composed of the Néel-type domain wall with energy stabilization by the Dzyaloshinskii-Moriya interaction. When an electric current is injected, Berry phase makes current deflected from original direction which also induces skyrmion to opposite direction of deflected electron. This effect is called skyrmion Hall effect (SkHE), which leads to information loss while skyrmion annihilation happens near boundary of device. Therefore, people give spotlight to the SkHE in field of skyrmion-memory device.

In this study, we made series of samples, Ta (5) / Pt (2.5) / Co (X) / W (3) / Ta (2 nm), with changing the magnetic layer thickness $X = 0.9, 1.0, 1.1, 1.2, 1.6, 1.7,$ and 1.9 nm using DC magnetron sputtering. We measure then the skyrmion Hall angle by means of a magneto-optical Kerr effect (MOKE) microscope. Based on Thiele equation, Gilbert damping α and anisotropy constant K_U are related to the skyrmion Hall angle. We measure Gilbert damping constant by TR-MOKE, and perpendicular magnetic anisotropy by VSM. Thus, comprehensive results are shown in Fig. 1.

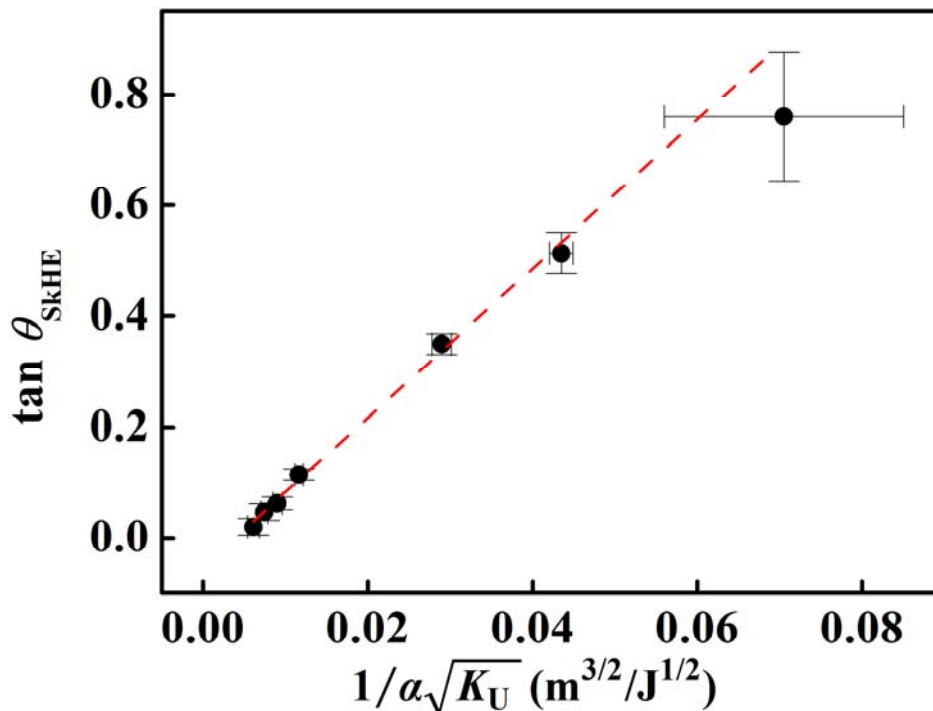


Fig.1 Skyrmion hall angle with respect to $1/\alpha\sqrt{K_U}$