Dzyaloshinskii-Moriya interaction and damping-like spin-orbit torque in Co/Gd/Pt ferrimagnetic multilayers

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Dzyaloshinskii–Moriya interaction (DMI) and spin–orbit torque (SOT) are essential ingredients in spintronics. These effects are known to be a consequence of the inversion symmetry breaking, and main platforms for the investigation of them have been interfaces of heavy-metal/ferromagnet bilayers where the inversion symmetry are locally broken. We investigated DMI and SOT in Co/Gd/Pt ferrimagnetic multilayers in which the inversion symmetry is broken throughout whole structure. For this study, Ta(5)/Pt(3)/[Co(0.5)/Gd(1)/Pt(1)]$_N$/Ta(3) [unit : nm] ferrimagnetic films were prepared on thermally oxidized Si wafers at room temperature by using direct current magnetron sputtering. Here, N denotes the repetition number of Co/Gd/Pt trilayers and were varied from 1 to 5. All films were confirmed to have perpendicular magnetizations with square hysteresis loops. DMI and damping-like SOT were evaluated from current-assisted field-driven DW motion by using magneto-optical Kerr effect microscope [1]. As shown in Figs. 1(a) and 1(b), DMI constant D and spin Hall angle θ_{SH} are found to be almost constant against N. Detailed discussion of these observations will be given in the presentation.

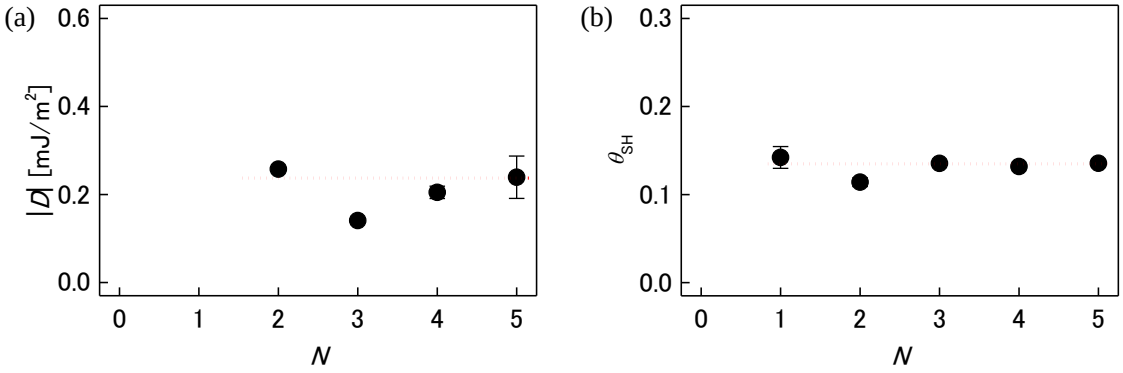

Figure 1(a) DMI constant D and (b) spin Hall angle θ_{SH} with respect to the repetition number N.

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