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Magneto-optic-Kerr-effect-based spin-orbit torque magnetometer[1] HALISE CELIK, XIN FAN, WENRUI WANG, JUN WU, CHAOYING NI, University of Delaware, KYUNG-JIN LEE, Korea University, JOHN XIAO, VIRGINIA LORENZ, University of Delaware
— Current-induced spin-orbit torques in heavy metal (HM)/ferromagnetic metal (FM) bilayers have attracted great attention for their potential in spintronic applications. It is essential to be able to measure the magnitude and direction of the spin-orbit torques. There have been several methods developed to measure spin-orbit torques based on second-order rectifying voltages, including spin-torque ferromagnetic resonance [1] and second-order harmonic voltage detection [2]. While these techniques have been widely used, they have their respective limits, e.g. requirement of an in-plane/out-of-plane magnetization configuration, small damping, etc. Here we present the development of a first-order spin-orbit torque magnetometer that is based on the magneto-optic Kerr effect (MOKE). The MOKE-based spin-orbit torque magnetometer is sensitive and versatile and can be used in both in-plane and out-of-plane magnetized samples. References: [1] L. Liu et al., Spin-Torque Ferromagnetic Resonance Induced by the Spin Hall Effect, Physical Review Letters 106, 036601 (2011). [2] J. Kim et al., Layer thickness dependence of the current-induced effective field vector in Ta|CoFeB|MgO, Nature Materials 12, 240-245 (2013).

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