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Temperature Dependence of the Spin Hall Effect in Perpendicularly Magnetized Magnetic Materials[1] SHUOYING YANG, Bryn Mawr College, IBM Almaden Research Center, WEIFENG ZHANG, Stanford University, IBM Almaden Research Center, SALVATORE MESORACA, Polytechnic University of Turin, Université Paris Diderot, IBM Almaden Research Center, AAKASH PUSHP, TIMOTHY PHUNG, SEE-HUN YANG, IBM Almaden Research Center, X.M. CHENG, Bryn Mawr College, STUART S.P. PARKIN, IBM Almaden Research Center — The spin Hall effect (SHE) and spin torque generated from it have been of great interest recently due to their potential use in future spintronic memory and logic devices. A solid understanding of the detailed mechanisms behind SHE is key to effectively utilizing and enhancing this effect. In this work, we report the experimental study of switching perpendicularly magnetized magnetic layers using the spin torque from SHE. Multilayers with the repeated units consisting of normal metal (Pt or Ta)/ ferromagnet with perpendicular magnetic anisotropy (CoFeB, CoNiCo, or Co) were deposited on Si substrates by sputtering deposition. Magnetoresistance and Hall resistance of the samples were measured by the Quantum Design PPMS DynaCool system with the field up to 6 tesla at various temperatures ranging from 10 K to 300 K. The spin Hall angle, calculated by comparing the field dependence of Hall resistance measured with the currents of the same magnitude but opposite directions, depends linearly on temperature. The contributions of the skew-scattering and side-jump mechanisms to SHE have been quantitatively separated.

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