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Dependence of the Spin Hall Torque Efficiency on the Transparency of Pt-Ferromagnetic Layer Interfaces CHI-FENG PAI[1], YONGXI OU, DANIEL C. RALPH, ROBERT A. BUHRMAN, Cornell University — We report that spin current transport across Pt-ferromagnet (FM) interfaces is strongly dependent on the type and the thickness of the FM layer and on post-deposition processing protocols. By employing both harmonic voltage response measurements and spin-torque ferromagnetic resonance measurements on various Pt-Co and Pt-CoFe magnetic heterostructures, we find that the efficiency of the Pt spin Hall effect in exerting a damping-like spin torque on the FM ranges from < 0.05 to > 0.10 under different interfacial conditions. We also show that the temperature dependence of the spin torque efficiencies for both the damping-like torque and field-like torque is dependent upon the details of the Pt-FM interface. The "internal" spin Hall angle of the Pt thin films used in this study, after taking the interfacial spin transmission factor that is derived from the spin mixing conductance into account, is estimated to be $\sim$0.20. This suggests that a careful engineering of Pt-FM interfaces can improve the spin-Hall-torque efficiency of Pt-based spintronic devices.

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