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Spin current control of damping in YIG/Pt nanowires CHRISTOPHER SAFRANSKI, IGOR BARSUKOV, HAN KYU LEE, University of California Irvine, TOBIAS SCHNEIDER, Helmholtz-Zentrum Dresden Rossendorf, ALEJANDRO JARA, ANDREW SMITH, University of California Irvine, HOUCHEN CHANG, 3 Colorado State University, YAROSLAV TSERKOVNYAK, University of California Los Angeles, MINGZHONG WU, 3 Colorado State University, ILYA KRIVOROTOV, University of California Irvine — Understanding of spin transport at ferromagnet/normal metal interfaces is of great importance for spintronics applications. We report the effect of pure spin currents in YIG(30 nm)/Pt(6 nm) nanowires. The samples show magneto-resistance from two distinct mechanisms: (i) spin Hall magnetoresistance (SMR) and (ii) inverse spin Hall effect (iSHE) along with spin Seebeck current (SSC) induced by Ohmic heating of the Pt layer. Using the SMR and iSHE effects, we measure the spin wave eigenmodes by spin-torque ferromagnetic resonance (ST-FMR). Direct current applied to the Pt layer results in injection of spin Hall current into YIG that acts as damping or anti-damping spin torque depending on the polarity. In addition, Ohmic heating gives rise to a SSC acting as anti-damping regardless of current polarity. ST-FMR reveals current-induced variation of the spin wave mode linewidth that is asymmetric in the bias current and decreases to zero for anti-damping spin Hall current. Near this current, we observe complex interaction among the spin wave eigenmodes that we asses using micromagnetic simulations. Our results advance understanding of magnetization dynamics driven by pure spin currents.

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