Measurement of current-generated torques in transition metal dichalcogenide / ferromagnet bilayers

GREGORY M. STIEHL, DAVID MACNEILL, MARCOS H. D. GUIMARAES, HUI GAO, JIWOONG PARK, DANIEL C. RALPH, Cornell University — We present measurements of current-generated torques in ferromagnet / transition metal dichalcogenide (TMD) bilayers for a wide range of semi-conducting TMDs, including MoS$_2$, MoSe$_2$, WS$_2$ and WSe$_2$. TMDs present a unique opportunity to study interfacial spin-orbit torques at the two dimensional limit due to a wide range in material properties and large spin-orbit coupling. Thin TMD films are either grown by chemical vapor deposition or exfoliated from readily available TMD crystals and are incorporated into ferromagnet / TMD bilayers by either evaporation or off-axis sputtering of the ferromagnet to avoid damage to the TMD surface. Measurements of the current-generated torque are made by spin transfer ferromagnetic resonance and the magneto-optical Kerr effect. Dependence on layer number, spin-orbit coupling strength, mobility and gate dependence will be explored.