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Probing the Spin Transfer Efficiency at Topological Insulator/Ferromagnetic Insulator Interfaces[1] HAILONG WANG, JAMES KALLY, JOON SUE LEE, ANTHONY RICHARDELLA, SUSAN KEMPINGER, YU PAN, ERIC KAMP, NITIN SAMARTH, Pennsylvania State university, TAO LIU, HOUCHENG CHANG, MINGZHONG WU, Colorado State University, DANIELLE REIFSNYDER-HICKEY, ANDRE MKHOYAN, University of Minnesota — The development of next-generation spintronics devices has driven extensive studies of spin-charge conversion through measurement of the inverse spin Hall effect (ISHE) and ferromagnetic resonance (FMR) driven spin pumping of pure spin currents in ferromagnet/non-magnet bilayers. Topological insulators (TIs) such as the Bi-chalcogenides are naturally relevant in this context because the inherent spin-momentum locking in their surface states promises very efficient spin-charge conversion, although the first experimental studies have involved ferromagnetic metals that provide a shunting current path [e.g. Nature, 511,449 (2014)]. To circumvent the current shunting problem, we are growing and characterizing bilayers of TIs and the ferrimagnetic insulator $Y_3Fe_5O_{12}$ (YIG). Here, we report measurements of FMR-driven spin pumping in TI/YIG bilayers, showing robust spin pumping signals at room temperature. Analysis of the ISHE voltages and FMR linewidth broadening show that, as in other studies of spin pumping into TIs [Nano Lett., 15 (10) (2015)], the interface condition presents a critical challenge for enhancing the spin conversion efficiency in these devices.

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