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FMR spin pumping in YIG/ferromagnet bilayers (ferromagnet = Fe, Co, Ni, Py) FENGYUAN YANG, HAILONG WANG, CHUNHUI DU, P. CHRIS HAMMEL, The Ohio State University — Generation of pure spin currents from ferromagnets (FM) to normal metals (NM) has been extensively studied by thermal and ferromagnetic resonance (FMR) spin pumping. Recently, Miao et al. demonstrated thermal injection of spin currents from Y3Fe5O12 (YIG) into Py detected by inverse spin Hall effect (ISHE) in the FM [1]. The ISHE in FM is in fact the inverse anomalous Hall effect (SHE), but with all the signatures of ISHE in NMs. Here we report robust FMR spin pumping in YIG/FM bilayers with FM = Fe, Co, Ni and Py using cavity FMR. The resonance fields of the FMs and YIG are clearly separated, which allows distinction of spin pumping induced ISHE voltages at the YIG resonance field and the voltage signals at the FM resonance fields. The ISHE voltages reaches 220 uV for YIG/Py(2nm) bilayer and tens of uV for all YIG/FM bilayers with 10-nm FM at an rf power of 200 mW. The sign of the ISHE voltages for Py and Ni are opposite to those for Fe and Co, which agrees with the opposite signs of AHE in Ni as compared to Fe and Co.

[1] B. F. Miao, S.Y. Huang, D. Qu, and C. L. Chien, "Inverse Spin Hall Effect in a Ferromagnetic Metal," Phys. Rev. Lett. 111, 066602 (2013).

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