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Enhancement of Pure Spin Currents in Spin Pumping $Y_3Fe_5O_{12}$/Cu/metal Trilayers Through Spin Impedance Matching[1] P. CHRIS HAMMEL, CHUNHUI DU, HAILONG WANG, FENGYUAN YANG, Ohio State Univ - Columbus — Spin pumping, driven thermally as well as by Ferromagnetic Resonance (FMR), is being widely used to generate pure spin currents from ferromagnets (FM) into normal metals (NM). Typically, the NM is chosen to be a spin-sink-Pt, W or Ta, while lighter metals such as Cu are rarely used, except to decouple the FM and spin sink. The efficiency of spin pumping is largely determined by the spin mixing conductance of the FM/NM interface. Here, we report a comparative study of spin pumping in $Y_3Fe_5O_{12}$/Cu/Pt and $Y_3Fe_5O_{12}$/Cu/W trilayers with varying Cu thicknesses. Remarkably, we find that insertion of a Cu interlayer between YIG and W substantially improves (over a factor of 4) the spin current injection into W while similar insertion between YIG and Pt degrades the spin current. This is a consequence of a much improved YIG/Cu spin mixing conductance relative to that for YIG/W. This result shows that high quality multilayer FM/NM heterostructures can enable spin mixing conductances to be engineered to enable optimal spin pumping efficiency.

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