Intrinsic Spin Seebeck Effect in Gold

DANRU QU, The Johns Hopkins University, SSU-YEN HUANG, The Johns Hopkins University, National Tsing Hua University, JUN HU, RUQIAN WU, University of California, Irvine, CHIALING CHIEN, The Johns Hopkins University — In Spin Seebeck Effect (SSE), a pure spin current can be generated by a temperature gradient ($\nabla T$) and detected by the inverse spin Hall effect usually by Pt. Due to the propensity of out-of-plane $\nabla z T$ through substrate, the SSE in the transverse configuration with an in-plane $\nabla x T$ has been shown contaminated by the anomalous Nernst effect.\(^1\) The SSE in the longitudinal configuration with $\nabla z T$ suffers from the magnetic proximity effect (MPE) of Pt in contact with a ferromagnetic material thus also contaminated.\(^2\) In this work, we demonstrate that Au does not exhibit MPE and reveals the intrinsic SSE. In contrast to Pt/YIG, Au/YIG shows no anomalous Hall signals, very weak inverse MR, and non-monotonic thickness dependence of spin thermal voltage, thus very weak if any MPE. Our results place an upper limit to the intrinsic SSE of 0.1 $\mu$V/K at the Au thickness of 8nm, two orders of magnitude smaller than that in Pt/YIG. Spin-polarized density-functional calculations also show a sizable Pt but a negligible Au magnetic moment in contact with YIG, in agreement with experiments.