Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

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, CHIA-LING CHIEN, The Johns Hopkins University — In Spin Seebeck Effect (SSE), a pure spin current can be generated by a temperature gradient (∇T) and detected by the inverse spin Hall effect usually by Pt. Due to the propensity of out-of-plane ∇_zT through substrate, the SSE in the transverse configuration with an in-plane ∇_xT has been shown contaminated by the anomalous Nernst effect.[1] The SSE in the longitudinal configuration with ∇_zT 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 0.1μV/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.

[1]S. Y. Huang, et al. Phys. Rev. Lett. 107, 216604 (2011)
[2]S. Y. Huang, et al. Phys. Rev. Lett. 109, 107204 (2012)

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Date submitted: 27 Nov 2012 Electronic form version 1.4