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Measurement of Thermal Effects by Thermoelectric Coolers[1] JI ZHANG, JESSICA GIFFORD, CHARLES SNIDER, NATHANIEL VARGAS, TINGYONG CHEN, Arizona State University — In pure spin current, electrons of opposite spins flow in opposite directions,to convey information only by spin current without any charge current. This process causes little power consumption, which has the potential to realize ultra-low-power-consumption electronics. Recently, thermal effects, such as the spin Seebeck effect in magnetic materials have been proposed to generate pure spin currents using a thermal gradient (∇T). However, unlike electric potential, direction of ∇T is difficult to control, which has already caused misinterpretation of thermal effects in Py and Py/Pt films. In this poster, we show that a well-defined ∇T can be created by two thermoelectric coolers (TECs) based on Peltier effect. ∇T can be accurately controlled by the driven voltage on the TECs. Using a square-wave driven potential, μV scale signal is measured. With this technique, we have measured the thermal effects in bulk Bi, thin film Py and Co samples. In Bi both the Nernst and the Seebeck effects are present if ∇T is not along the appropriate direction.With a well-defined ∇T,we show that thermal effect in polycrystalline Py/Pt and Co/Pt films are mostly anomalous Nernst effect, with the same angular symmetry as the anomalous Hall effect.

[1]Measurement of Thermal Effects by Thermoelectric Coolers

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