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Measurement of Thermal Effects by Thermoelectric Coolers JI ZHANG, JESSICA GIFFORD, CHARLES SNIDER, GEJIAN ZHAO, DONGRIN KIM, NATHANIEL VARGAS, TINGYONG CHEN, Arizona State University —
Recently, electron transport induced by a thermal gradient in magnetic materials has attracted a great deal of attention since it has a potential to create pure spin current for spin caloritronics. However, unlike voltage potential, the exact thermal gradient direction is experimentally difficult to control, which has already caused misinterpretation of the thermal effects. In this work, we demonstrate that thermoelectric coolers based on the Peltier effect can be utilized to controllably measure thermal effects. Temperature gradient from positive to negative polarity can be induced simply by reversing an electric driven current and low noise measurements can be achieved using a square wave driven current. We show that in Bi both the Nernst and the Seebeck effects are present if the temperature gradient is not along the appropriate direction and the potential induced by the two effects can be separated by analysis of the data. With a well-defined temperature gradient, we show that the thermal effect in Py, Py/Pt, Co and Co/Pt films are mostly anomalous Nernst effect, with the same angular symmetry as the anomalous Hall effects measured in these polycrystalline films.

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