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Spin-Seebeck effect: Local nature of thermally induced spin currents in GaMnAs[1]

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The spin-Seebeck effect refers to a spatial distribution of spins in a ferromagnetic material induced by a thermal gradient. This macroscopic spatial distribution of spins is several orders of magnitude larger than the spin diffusion length [1]. Here we describe measurements of the spin-Seebeck effect in the ferromagnetic semiconductor, GaMnAs [2]. The thermally induced spatial distribution of spins is inferred from the sign and magnitude of the inverse spin Hall voltage generated from local spin currents in platinum bars that are in electrical contact with the ferromagnetic material. From an experimental point of view, GaMnAs provides unique measurement geometries since the magnetic easy axes can be engineered in different directions and the low Curie temperature makes it convenient to perform spin-Seebeck measurements across the magnetic phase transition. Using different experimental configurations we measure either the isolated spin-Seebeck signal, the planar and transverse Nernst effect, or a combination of the spin-Seebeck and Nernst effects. One of the most intriguing aspects of the spin-Seebeck effect is the observation that the spatial distribution of spins is maintained across electrical breaks revealing that the effect does not arise from a longitudinal spin current of charge carriers.

[1] K. Uchida, S. Takahashi, K. Harii, J. Ieda, W. Koshibae, K. Ando, S. Maekawa, E. Saitoh, *Nature* **455**, 778 (2008).
[2] C. M. Jaworski, J. Yang, S. Mack, D. D. Awschalom, J. P. Heremans, R. C. Myers, *Nature Materials* **9**, 898 (2010).

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