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Model for the Spin Seebeck Effect in InSb in a Magnetic Field[1]
NICHOLAS PIKE, DAVID STROUD, The Ohio State University — The spin Seebeck effect is the generation of a voltage due to spin currents in the presence of a temperature gradient. We have developed a theory for this effect in the semiconductor InSb in a magnetic field. We consider spin-1/2 electrons in the conduction band of InSb with a temperature gradient parallel to the applied magnetic field. A Boltzmann equation approach leads to a spin current parallel to the field and proportional to the temperature gradient. The spin-orbit interaction induces a canting of the electronic spin which produces an electric field perpendicular to the temperature gradient via the inverse spin Hall effect. This effect is measured in experiments as the spin Seebeck coefficient [1]. We find that the spin current exhibits oscillations as a function of magnetic field which arise when the Fermi energy crosses the bottom of a Landau band. These oscillations resemble those seen in measurements of the spin Seebeck coefficient in the semiconductor InSb.

[1] C.M. Jaworski, et al. Nature **487**, 210-213 (2012).

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Nicholas Pike
The Ohio State University

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