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# Impurity induced anomalous thermal Hall effect in chiral superconductors

**Dr. Vudtiwat Ngampruetikorn**

Northwestern University, Evanston, USA

**Place: Room G215, Graduate School of Engineering Science Bldg., Toyonaka Campus, Osaka University (大阪大学・豊中キャンパス・基礎工学研究科棟 G 棟 215 号室)**
**Date: July 3 (Tuesday), 2018**
**Time: 10:30-12:00**

Abstract:

We report theoretical results for the electronic contribution to thermal transport for chiral superconductors belonging to even or odd-parity $E_1$ and $E_2$ representations of the tetragonal and hexagonal point groups. Chiral superconductors exhibit novel transport properties that depend on the topology of the order parameter, topology of the Fermi surface, the spectrum of bulk Fermionic excitations, and -- as we highlight -- the structure of the impurity potential. The anomalous thermal Hall effect is shown to be sensitive to the structure of the electron-impurity t-matrix, as well as the winding number, $\nu$, of the chiral order parameter, $\Delta(\boldsymbol{p}) = |\Delta(\boldsymbol{p})|e^{i\nu\phi_p}$. For heat transport in a chiral superconductor with isotropic impurity scattering, i.e., point-like impurities, a transverse heat current is obtained for $\nu = \pm 1$, but vanishes for $|\nu| > 1$. This is not a universal result. For finite-size impurities with radii of order or greater than the Fermi wavelength, $R \geq \hbar/p_f$, the thermal Hall conductivity is finite for chiral order with $|\nu| \geq 2$, and determined by a specific Fermi-surface average of the differential cross-section for electron-impurity scattering. Our results also provide quantitative formulae for interpreting heat transport experiments for superconductors predicted to exhibit broken time-reversal and mirror symmetries.

Host: Takeshi Mizushima [Osaka Univ. / Core Research Group D01]
( 06-6850-6441, mizushima@mp.es.osaka-u.ac.jp)