Extreme Seebeck anisotropy in the quasi-one-dimensional metal, Li$_{0.9}$Mo$_6$O$_{17}$

JOSHUA COHN, SAEED MOSHFEGHYEGANEH, University of Miami, CARLOS A.M. DOS SANTOS, Escola de Engenharia de Lorena - USP, Brazil, JOHN J. NEUMEIER, Montana State University — We present resistivity and thermopower measurements in the range $300 \, K \leq T \leq 500 \, K$ on single crystals of the quasi-one-dimensional (q1D) metal, Li$_{0.9}$Mo$_6$O$_{17}$ (LiPB) transverse to the q1D metallic chains. Direct electron transfer between the chains of this material is sufficiently weak that inter-chain transport above 400 K is predominated by thermal activation of valence-band states ($\sim 0.14 \, eV$ below $E_F$), yielding a large, $p$-type inter-chain Seebeck coefficient that coexists with $n$-type metallic behavior confined along the q1D chains. A significant Seebeck anisotropy, $\Delta S \simeq 200 \, \mu V/K$, along mutually perpendicular directions gives LiPB potential as a transverse thermoelectric. This anisotropy along with a relatively low inter-chain thermal conductivity ($\kappa \simeq 2W/mK$) results in a substantial transverse Peltier effect.

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Joshua Cohn
University of Miami

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