Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Thermomagnetic effects in elemental rare-earth single crystals[1]
AUDREY M. CHAMOIRE[2], JOSEPH P. HEREMANS[3], The Ohio State University — Thermomagnetic properties and magnetothermal conductivity of elemental rare-earth (R-E) metals are for the first time systematically presented from 80 to 400 K. Measurements are given with heat flux applied along the [100] and the [111] directions since R-E present mainly a hexagonal symmetry at room temperature. This work is motivated by the complex Fermi surfaces of the R-E's and by their magnon contributions to the thermal conductivity. Elemental rare-earths are multicarrier systems involving electron (e) and hole (h) pockets and have a very small thermopowers (S), which can result in large Nernst coefficients. This would be suitable for transverse Nernst cooler since they could be used as a single material with a particular design, then resolving the problems of contact resistances of actual Peltier coolers where materials need to be cascaded. Magnetic field dependent thermal conductivity is used to extract magnon heat conduction. Magnons are bosons, but unlike acoustic phonons they can have energy gaps. Taken together, these two properties should theoretically lead to a non-linear thermal conductivity in the presence of a magnetic field gradient.

[1]DOE-BES, EFRC-RMSSEC, 61-3212B
[2]Department of Mechanical and Aerospace Engineering
[3]Department of Mechanical and Aerospace Engineering and Department of Physics

Audrey M. Chamoire
The Ohio State University

Date submitted: 09 Nov 2012 Electronic form version 1.4