Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Pressure-tuning of the thermal conductivity of a layered crystal, muscovite WEN-PIN HSIEH, Department of Physics, University of Illinois, Urbana, Illinois 61801, BIN CHEN, JIE LI, Department of Geology, University of Illinois, Urbana, Illinois 61801, PAWEL KEBLINSKI, Department of Materials Science and Engineering, Rensselaer Polytechnic Institute, Troy, New York 12180, DAVID CAHILL, Department of Materials Science and Engineering, University of Illinois, Urbana, Illinois 61801 — We study the physics of heat conduction in layered, anisotropic crystals by measuring the cross-plane elastic constant C_{33} and thermal conductivity Λ of muscovite mica as a function of hydrostatic pressure. Picosecond interferometry and time-domain thermoreflectance provide high precision measurements of C_{33} and Λ, respectively, of micron-sized samples within a diamond anvil cell; Λ changes from the anomalously low value of 0.46 W m^{-1} K^{-1} at ambient pressure to a value more typical of oxides crystals with large unit cells, 6.6 W m^{-1} K^{-1}, at P=24 GPa. We find good agreement between the data and a simple theoretical model that takes into account the pressure dependence of the cross-plane sound velocities.

Wen-Pin Hsieh
Department of Physics, University of Illinois, Urbana, Illinois 61801

Date submitted: 18 Nov 2009 Electronic form version 1.4