Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Testing the minimum thermal conductivity model for amorphous polymers using high pressure WEN-PIN HSIEH, Department of Physics, University of Illinois, Urbana, MARK LOSEGO, PAUL BRAUN, Department of Materials Science and Engineering, University of Illinois, Urbana, SERGEI SHENOGIN, PAWEL KEBLINSKI, Department of Materials Science and Engineering, Rensselaer Polytechnic Institute, Troy, NY, DAVID CAHILL, Department of Materials Science and Engineering, University of Illinois, Urbana — Pressure dependence of thermal conductivity provides a critical test of the validity of the model of the minimum thermal conductivity for describing heat transport by molecular vibrations of an amorphous polymer. We measure the pressure dependence of the thermal conductivity of poly(methyl methacrylate) (PMMA) brushes grafted from SiC substrates using a combination of time-domain thermoreflectance and SiC anvil cell techniques. We also determine the pressure dependence of the thermal conductivity from a computational model of amorphous polystyrene. In both cases, thermal conductivity as a function of pressure is accurately predicted by the minimum thermal conductivity model via the pressure dependence of the elastic constants and density.

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Date submitted: 08 Nov 2010 Electronic form version 1.4