Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Ultrafast Spectroscopy of Hot Carriers in Graphite[1] B. PANDIT CHHETRI, S. SINGH, J. HOLT, E. OLEJNIK, Z.V. VARDENY, Department of Physics & Astronomy, University of Utah, Salt Lake City, Utah 84112, A. KIRAKOSYAN, T. SHABAZYAN, Department of Physics, Jackson State University, Jackson, Mississippi 39217 — We studied the ultrafast dynamics of photogenerated hot carriers in graphite single crystal by using transient pump-probe photoreflectivity (PR) spectroscopy with ∼100 fs resolution. Using two different laser systems;visible/near-IR & mid IR range with pump excitation photon energies at 1.55 & 3.1 eV, our transient PR spectrum covers a broad spectral range from 0.2 – 2.4 eV. Surprisingly, we found that the transient PR spectrum resembles the cw thermo-modulation spectrum that was measured and explained previously by the well-known band structure of graphite; and contains several zero-crossings modulated reflectivity that are determined by the van-Hove singularities in the band structure at the K point of the Brillouin zone. We interpret the transient PR spectrum as due to hot carriers in the various valence and conduction bands of graphite. The decay dynamics can be fit with a bi-exponential decay with two processes that are interpreted as: sub-picosecond Auger recombination following hot plasma with well defined electronic temperature; and a longer process of hot plasma cooling to the lattice temperature by emitting strongly coupled phonons.

[1]Supported by DOE Grant 05-03172 & NSF DMR 08-03325.

B. Pandit Chhetri
Department of Physics & Astronomy, University of Utah, Salt Lake City, Utah 84112

Date submitted: 20 Nov 2009 Electronic form version 1.4