Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Anharmonic Effects in Raman Scattering Few-Layer Graphene System[1] TIMOTHY RUSSIN, Pennsylvania State University, AWNISH GUPTA, PETER EKLUND — Result of Raman scattering studies from supported and suspended n-layer graphene films (nGLs) are presented for the temperature range of -190 to 500 °C. The samples were either supported directly on a Si/SiO_2 substrate or suspended over lithographically produced trenches; the measurements were performed in a N_2 atmosphere. For both supported and suspended films, the magnitude of the negative temperature coefficient of the G-band frequency (cm^{-1}/K) is found to decrease with number of layers n in the nGL films (i.e., supported 1GL, 2GL and 5GL show -0.037, -0.031, and -0.028 cm^{-1}/K, respectively.) The anharmonic coefficients are significantly higher than for highly oriented pyrolytic graphite (HOPG). Surprisingly, the G-band linewidth increases with temperature for the supported films and decreases with temperature for the suspended films. Furthermore, we see evidence for a permanent morphological change at T $\sim$ 200 °C for supported nGLs via new D-band and D'-band scattering. Unsupported films exhibit these changes at higher temperatures. The mechanism and details of the irreversible morphological change(s) is not yet known.

[1]NSF-ECS0609243

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Date submitted: 05 Dec 2007 Electronic form version 1.4