Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Raman Spectroscopic Studies of Room-Temperature-Grown Graphene by Plasma-Assisted Chemical Vapor Deposition CHEN-CHIH HSU, DAVID BOYD, WEI-HSIANG LIN, JONG YEON LEE, NAI-CHANG YEH, Department of Physics, Caltech, Pasadena, CA 91125, USA — We have synthesized graphene using plasma-assisted chemical vapor deposition (CVD) at room temperature (RT). Structural analysis through Raman spectroscopy reveals that high quality large-area graphene can be grown reproducibly. From the frequency shifts of the G-band and 2D-band, it is evident that the average strain of RT-grown graphene becomes much reduced relative to the high-temperature ($1000°C$) CVD-grown graphene. This finding is confirmed by the atomically resolved images taken with scanning tunneling microscopy (STM). To investigate the effect of different substrates on the resulting strain in graphene, we have grown graphene on Cu(111) and Cu(100) single crystals and polycrystalline Cu foils. Compared to high temperature CVD-grown graphene, strain is reduced no matter which substrate was used for the RT growth. However, graphene grown on Cu(111) is more inhomogeneous because anisotropic plasma etching of the substrate results in excess steps on the surface and creates stripe-like superstructures in graphene. Upon transferring the RT-grown graphene to SiO2 substrates, we find the average strain minimized. Our results suggest a promising pathway to inexpensive growth of high-quality large-area graphene. This work was supported by NSF through IQIM at Caltech.

Chen-Chih Hsu
Department of Physics, Caltech, Pasadena, CA 91125, USA

Date submitted: 09 Nov 2012 Electronic form version 1.4