Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Ordered Self-assembled Alkane Monolayer on Graphite and Graphene Surface YUDAN SU, Department of Physics, Fudan University, HUILING HAN, FENG WANG, Department of Physics, University of California at Berkeley, QUN CAI, CHUANSHAN TIAN, Department of Physics, Fudan University, Y.R. SHEN, Department of Physics, University of California at Berkeley — The 2D self-assembly of long chain alkane molecule on graphite and graphene had been studied with phase-sensitive sum-frequency vibrational spectroscopy (PS-SFVS) and scanning tunneling microscopy (STM). The spectrum of $\mathrm{Im}\chi_s^{(2)}(\omega_{IR})$ which directly characterizes the surface resonances, shows 10-cm^{-1} red-shift of the symmetric-stretch frequency of the CH_2 groups pointing towards graphite (or graphene) surface indicating Van der Waals interaction in between. The Gibbs adsorption energy of polyethylene (PE, n $\sim$ 140) on graphite from chloroform solution was determined to be -42kJ/mol per molecule or -0.6 kJ/mol per CH_2 unit. This large adsorption energy drives the long alkane chain to form an ordered self-assembled monolayer on graphite (or graphene). The sum frequency spectra suggest the orientation of carbon skeleton plane of alkane is predominately perpendicular to the graphite/graphene surface. Our STM result also provides clear evidence for the proposed molecular adsorption model. These results explain the large amount residual of long chain alkane on polystyrene (PS) or poly(methyl methacrylate) (PMMA) transferred graphene, and facilitate a better way to fabricate cleaner large-size graphene.

Yudan Su
Fudan University

Date submitted: 14 Nov 2014 Electronic form version 1.4