Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Sensitive Room-Temperature Terahertz Detection via Photothermoelectric Effect in Graphene XINGHAN CAI, ANDREI SUSHKOV, CNAM, Univ of Maryland, College Park, RYAN SUESS, MOHAMMAD JADIDI, IREAP, Univ of Maryland, College Park, GREGORY JENKINS, CNAM, Univ of Maryland, College Park, LUKE NYAKITI, Texas A&M Univ, Galveston, RACHAEL MYERS-WARD, VIRGINIA WHEELER, CHARLES EDDY, JR., U.S. Naval Research Laboratory, JUN YAN, Dept of Phys, Univ of Massachusetts, Amherst, D. KURT GASKILL, U.S. Naval Research Laboratory, THOMAS MURPHY, IREAP, Univ of Maryland, College Park, H. DENNIS DREW, CNAM, Univ of Maryland, College Park, MICHAEL FUHRER, School of Phys, Monash Univ, Australia — Due to the weak electron-phonon coupling and strong electron-electron interaction in graphene, the thermoelectric effect provides a highly sensitive detection mechanism for heat absorbed in the electronic system. We present here a bi-metal contacted graphene thermoelectric THz photodetector with sensitivity exceeding 100 V/W at room temperature and noise equivalent power less than 100 pW/Hz$^{1/2}$, competitive with the best room-temperature THz detectors, while time-resolved measurements indicate our graphene detector is eight to nine orders of magnitude faster. We also measured the thermoelectric response to Joule heating, and compare to the thermoelectric response due to optical excitation in the near infrared and at THz frequencies. A simple model of the response, including contact asymmetries reproduces the qualitative features of the data. We also suggest that orders-of-magnitude sensitivity improvements are possible by using local gates to define graphene pn-junctions.

Xinghan Cai
Univ of Maryland-College Park

Date submitted: 15 Nov 2013 Electronic form version 1.4