Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Nanoscale control of phonon excitations in graphene HYO WON KIM, WONHEE KO, JIYEON KU, Samsung Adv Inst of Tech, SEUNGHWA RYU, Korea Advanced Institute of Science and Technology, SUNG WOO HWANG, Samsung Adv Inst of Tech — Phonons, which are collective excitations in a lattice of atoms or molecules, play a major role in determining various physical properties of condensed matter, such as thermal and electrical conductivities. In particular, phonons in graphene interact strongly with electrons; however, unlike in usual metals, these interactions between phonons and massless Dirac fermions appear to mirror the rather complicated physics of those between light and relativistic electrons. Therefore, a fundamental understanding of the underlying physics through systematic studies of phonon interactions and excitations in graphene is crucial for realizing graphene-based devices. In this study, we demonstrate that the local phonon properties of graphene can be controlled at the nanoscale by tuning the interaction strength between graphene and an underlying Pt substrate. Using scanning probe methods, we determine that the reduced interaction due to embedded Ar atoms facilitates electron-phonon excitations, further influencing phonon-assisted inelastic electron tunneling.

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Date submitted: 05 Nov 2015 Electronic form version 1.4