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Understanding electron-phonon interactions in doped graphene: the case of Li-intercalated graphite ANDREW WALTERS, MPI for Solid State Research, Germany, MARK DEAN, Brookhaven National Lab, USA, CHRISTOPHER HOWARD, MARK ELLERBY, JONATHAN PAYNE, University College London, UK, MICHAEL KRISCH, ALEXEI BOSAK, European Synchrotron Radiation Facility, France, GIANNI PROFETA, University of L'Aquila, Italy, MATTEO CALANDRA, FRANCESCO MAURI, University Paris 6, France — The recent explosion of research on doped graphene systems together with the discovery of superconductivity in CaC_6 has reignited the interest in graphite intercalation compounds (GICs). While it is generally agreed that the superconductivity observed in GICs is BCS-like, there is still much controversy over which electrons and which phonons are primarily involved in the electron-phonon (e-ph) coupling leading to superconductivity. Moreover, thanks to the close similarity between the electronic structure of GICs and doped graphene, the study of e-ph interactions in GICs provides a unique approach to help elucidate the complex e-ph interactions in doped graphitic systems. We present inelastic x-ray scattering measurements of the high energy ($\sim$ 200 meV) graphitic phonons in LiC_6 across the Brillouin zone. The LiC_6 phonons are much softer than in pure graphite, as the electron doping destabilizes the C-C bonds. We observe large phonon broadening for all phonons at the graphite Brillouin zone center, suggestive of unusual e-ph interaction phenomena. We discuss our results in the light of the e-ph coupling reported from angle-resolved photoemission spectroscopy and in relation to strong non-adiabatic effects observed using Raman scattering.

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