Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Quantitative Probes of Electron-Phonon Coupling in an Organic Charge-Transfer Material AARON RURY, SHAYNE SORENSON, ERIC DRISCOLL, JAHAN DAWLATY, University of Southern California — While organic charge transfer (CT) materials may provide alternatives to inorganic materials in electronics and photonics applications, properties central to applications remain understudied in these organic materials. Specifically, electron-phonon coupling plays a pivotal role in electronic applications yet this coupling in CT materials remains difficult to directly characterize. To better understand the suitability of organic CT materials for electronic applications, we have devised an experimental technique that can directly assess electron-phonon coupling in a model organic CT material. Upon non-resonant interaction with an ultrafast laser pulse, we show that coherent excitation of Raman-active lattice vibrations of quinhydrone, a 1:1 co-crystal of the hydroquinone and p-benzoquinone, modulates the energies of electronic transitions probed by a white light pulse. Using a well-established theoretical framework of vibrational quantum beat spectra across the probe bandwidth, we quantitatively extract the parameters describing these electronic transitions to characterize electron-phonon coupling in this material. In conjunction with temperature-dependent resonance Raman measurements, we assess the hypothesis that several sharp transitions in the near-IR correspond to previously unknown excitonic states of this material. These results and their interpretation set the foundation for further elucidation of the one of the most important parameters in the application of organic charge-transfer materials to electronics and photonics.

Aaron Rury
University of Southern California

Date submitted: 03 Nov 2015 Electronic form version 1.4