Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Charge-density wave transitions of rare-earth tritellurides investigated by femtosecond electron crystallography[1] TZONG-RU HAN, ZHENSHENG TAO, SUBHENDRA D. MAHANTI, KISEOK CHANG, CHONG-YU RUAN, Physics and Astronomy Department, Michigan State University, East Lansing, Michigan 48824, USA, CHRISTOS D. MALLIAKAS, MERCOURI G. KANATZIDIS, Department of Chemistry, Northwestern University, Evaston, Illinois 60208, USA, CHONG-YU RUAN TEAM, MERCOURI G. KANATZIDIS TEAM
— The electron-phonon mechanism that gives rise to various charge-ordered systems depends on the topology of the Fermi surface that is subjective to the influence of hybridization, nesting, and electron correlation at low dimensions. Rare-earth tritellurides are ideal systems to investigate the two-dimensional charge-density density wave (CDW) formation as both nesting and hybridization are at play to select the unidirectional CDW at different temperatures. Using fs electron crystallography, we investigate the noncooperative suppression of the structural order parameters following ultrafast electronic quenching and correlate electronic and ionic evolutions based on a framework of three-temperature model and nonisotropic fluctuational analysis. We show that a joint consideration of the couplings between the lattice phonons, the CDW collective modes, and the corresponding electronic subsystem is required to account for the various novel structural dynamics features.

[1]This work is supported by DOE under DE-FG02-06ER46309 and NSF under DMR 0702911.

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Date submitted: 17 Nov 2012 Electronic form version 1.4