June 10th, 2011 - 14:30 pm

Seminar Room 108, DESY Bldg. 49

CFEL SCIENCE

Max Planck Research Department for Structural Dynamics

SEMINAR

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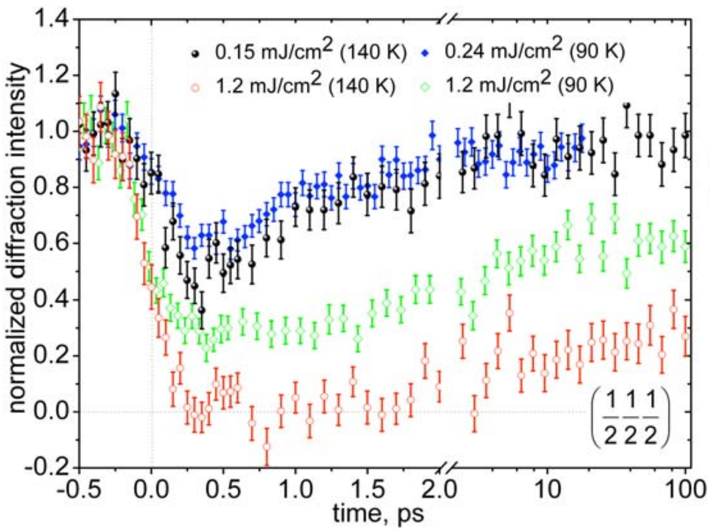
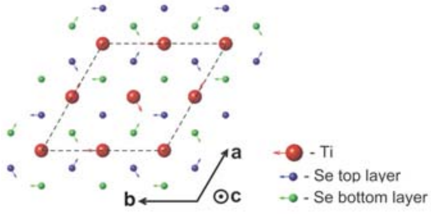
Structural response to a non-thermal melting of a charge density wave

Recent developments in time resolved techniques such as angle resolved photo emission spectroscopy and x-ray diffraction have opened new opportunities to probe directly dynamics of the electronic and structural order on femtosecond time-scales. Charge Density Waves (CDW) comprise a class of collective phenomena arising from a correlation between the electron density and the underlying lattice. 1T-$TiSe_2$ is one example of CDW materials, which undergoes a second order structural phase transition into a commensurate CDW state with a (2a x 2a x 2c) superlattice below 200K.

The origin of this phase transition in $TiSe_2$, although extensively studied both experimentally and theoretically, is not yet unambiguously determined. In our studies we take an advantage of both time-resolved optical reflectivity and x-ray diffraction with femtosecond resolution to study the dynamics of the structural order parameter of the charge density wave phase in $TiSe_2$. We find that the energy density required to melt the charge density wave phase non-thermally is much lower than for thermal suppression of the superlattice, suggesting a purely electronic origin of the charge density wave in $TiSe_2$. With a model based analysis we show that the dynamics of the structural order parameter is consistent with the excitonic insulator model, proposed by Wilson [J. A. Wilson, Solid State Commun., 22, 551 (1977)] as one of the possible mechanisms driving the CDW phase transition in $TiSe_2$.





Host: Andrea Cavalleri, Condensed Matter Division, MPSD, CFEL