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Tracing exciton formation and relaxation in (6,5)- enriched single walled carbon nanotubes with sub-10 fs resolution LARRY LÜER, CNR/INFM ULTRAS Politecnico di Milano, CALOGERO SCIASCIA, Dipartimento di Fisica, Politecnico di Milano, CHRISTOPH GADERMAIER, Jožef Stefan Institute, Ljubljana, GUGLIELMO LANZANI, Dipartimento di Fisica, Politecnico di Milano, JARED CROCHET, TOBIAS HERTEL, Vanderbilt University, Nashville, TN — We perform pump and probe spectroscopy on (6,5) enriched single walled carbon nanotubes using broadband visible pulses of 7 fs duration. Apart from the direct photogeneration of the E22 exciton, we find a delayed channel which is operative at higher pump intensities during the first 20 fs after photoexcitation. It results in i) a saturation of the maximum population of the E22 exciton and ii) a strong retardation of the relaxation kinetics of E22 into E11, that cannot be accounted for by considering regeneration of E22 states by annihilation of E11 states. We suggest free carrier recombination as origin of the delayed E22 formation channel. The G mode oscillation of the nanotubes is traced via coherent oscillations as function of probe wavelength. It exhibits an abrupt phase jump at the maximum of the E22 absorption band, clearly demonstrating the oscillation of the E22 transition energy exerted by the G mode vibrational distorsion. Mapping the oscillatory amplitudes against probe wavelength allows us to separate oscillations in the ground state from those in the excited state.

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