Abstract

Photoexcitations in Trans-Polyacetylenes: Long-Living Story about Short-Living Species

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We studied the primary photoexcitations in doubly phenyl-substituted polyacetylenes (PDPAs) using femtosecond pump-probe spectroscopy in the spectral range from 0.5 to 2.5 eV. We show that excitons and neutral solitons with distinctly different absorption bands and dynamics are photogenerated in pristine films and fullerene-doped films within 100 fs. The obtained polarization memory decay reveals that during relaxation excitons migrate among different polymer chains, whereas solitons are highly localized on the chains in which they were originally photogenerated. We also found that in C_{60} doped PDPA the branching between neutral solitons and intrachain emissive excitons occurs prior to the exciton dissociation, so that the soliton band dynamics remains unaffected. Finally, we compare the fundamental photoexcitations in degenerate-ground state polymers to those in nondegenerate ground state polymers.

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