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Coherent ultrafast charge transfer in organic solar cells

Light-induced charge transfer is the primary step towards light-to-current conversion in organic photovoltaic (OPV) devices. It is now accepted that this charge separation process occurs on a sub-100-fs time scale [1]. However, still very little is known about the initial quantum dynamics of this photoinduced process in technologically relevant material systems. Charge photogeneration in organic materials, like conjugated polymers, is a complex process that has been described for a long time in the frame of an incoherent model, i.e. the jump of electrons from the excited donor to the acceptor. In recent years, experimental evidence of quantum coherence in biological light harvesting systems [2, 3] is challenging this classical model. By combining coherent femtosecond spectroscopy and advanced theoretical simulations, we show compelling evidence for the dominant role of vibronic coupling in driving charge transfer in the initial stages of the dynamics in a reference material of technological relevance for OPV devices [4].

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