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Förster optical signatures in quantum dot molecule photoluminescence JUAN E. ROLON, SERGIO E. ULLOA, Ohio University — We formulate a realistic model that predicts the optical signatures of the Förster resonant energy transfer processes (FRET) in InAs/GaAs self-assembled quantum dot molecules (QDMs) in presence of laser illumination and electric fields. We study the time evolution of a multiexcitonic Hamiltonian and construct a map of its dressed spectrum, resulting in effective coupling of the different states under laser illumination. In addition to interdot hole- and electron-tunneling, FRET is found to be an important quantum coupling mechanism in QDMs. We find FRET optical signatures to be highly dependent on structural parameters and severely constrained by the narrow spectral overlap between excitonic transitions in the donor-acceptor pair. However, detailed analysis of the orbital character of the localized hole reveals that it is possible to obtain strong spectral overlap between the first excited single exciton level in the donor dot and the lowest energy single exciton level in the acceptor dot. Remarkably, although FRET occurs via a single pair of exciton levels, its effects are evident throughout the calculated dressed spectrum. We observe a redistribution of spectral weights of direct and Stark shifted exciton lines, and a set of anticrossings among exciton states not directly coupled by FRET. Our results suggest experimental schemes to quantify FRET in photoluminescence experiments.

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