

Modelling exciton–phonon interactions in optically driven quantum dots - DTU Orbit (08/11/2017)

Modelling exciton–phonon interactions in optically driven quantum dots: Topical Review

We provide a self-contained review of master equation approaches to modelling phonon effects in optically driven self-assembled quantum dots. Coupling of the (quasi) two-level excitonic system to phonons leads to dissipation and dephasing, the rates of which depend on the excitation conditions, intrinsic properties of the QD sample, and its temperature. We describe several techniques, which include weak-coupling master equations that are perturbative in the exciton–phonon coupling, as well as those based on the polaron transformation that can remain valid for strong phonon interactions. We additionally consider the role of phonons in altering the optical emission characteristics of quantum dot devices, outlining how we must modify standard quantum optics treatments to account for the presence of the solid-state environment.

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Authors: Nazir, A. (Ekstern), McCutcheon, D. (Intern)

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