

# Polaron Effects on the Third-Order Susceptibility of a CdSe/ZnS Quantum Dot Quantum Well

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Theoretical investigation of the polaron effects on the third-order susceptibility associated with the intersubband transition in the conduction band in a CdSe/ZnS quantum dot quantum well is presented. Contributions from the confined longitudinal optical (LO) and surface optical phonon modes are considered and the wave function is derived under the frame work of the perturbation theory. We carried a detailed calculation of third-harmonic generation (THG), Quadratic electro-optic effects (QEOE), and electro-absorption (EA) process on such a quantum dot as a function of pump photon energy with different incident photon energy and under different sizes. The results reveal that the polaron effects are quite important especially around the peak value of the third-order susceptibility. By increasing the size of the quantum dots, the peaks of  $\chi_{\text{THG}}^{(3)}$ ,  $\chi_{\text{QEOE}}^{(3)}$ , and  $\chi_{\text{EA}}^{(3)}$  will shift to the lower energy, and the intensities of the peaks will increase.

*Key words:* Core-Shell Quantum Dot; Nonlinear Optical Susceptibility; Polarons.

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