

Abstract Submitted
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Design and operating regimes of quantum-dot photodetectors for room temperature operation¹ LI-HSIN CHIEN, University at Buffalo, ANDREI SERGEEV, VLADIMIR MITIN, University at Buffalo — To optimize quantum dot photodetectors for room temperature operation, we develop a detailed model of kinetic and transport processes in quantum dot structures. The model takes into account electron-phonon and electron-electron interactions in quantum dots and in the inter-dot space. We also consider formation of potential barriers around dots due to electrons captured into dots. Monte-Carlo method is used to investigate effects of the electric field on electron kinetics and transport. Results of our simulations demonstrate that electron capture process can be substantially suppressed due to barriers and specific operating regimes. Design and operating regimes provide wide possibilities for manageable (adaptive) kinetics of photoelectrons, which in turn allows significant improvements in responsivity (photoconductive gain) and noise characteristics (detectivity) of photodetectors.

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