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Intraband Optical Transitions in InGaAs/GaAs quantum dot and InAs/InGaAs/GaAs Dots-in-Well VENKATA CHAGANTI, VADYM APALKOV, Gerogia State University — We present the results of our numerical analysis of intraband optical transitions within the valance band of pyramidal Quantum Dot (QD) of type $In_xGa_{(1-x)}As/GaAs$ and conduction band of Pyramidal Quantum Dot-in-Well (DWELL) structure of type $InAs/In_xGa_{(1-x)}As/GaAs$. The electronic states and optical transitions within the valence bands of p-doped semiconductor QD were found numerically within 8 band kp model and the intraband optical absorptions within the conduction bands of n-doped semiconductor DWELL structure were obtained within effective mass model with the use of NEXTNANO software and our Fortran program. In application to quantum dot photodetectors, we study how the size of the dot and its composition affect the optical transition within the dot. With increasing the QD size the absorption spectra are shifted to lower energies. The optical spectra are more sensitive to X-polarized light, with corresponding intensity one order magnitude greater than the absorption intensity of Z-polarized light. In application to DWELL photodetectors we study how the size of the dot and the position of the dot in the well affect the optical transitions within the system. For small QD size (<12nm), the main optical transitions occur either between the QD and quantum well states or between the QD and substrate states. The wavelengths of optical transitions for such small QDs vary between 2 μm and 6 μm. DWELL systems are more sensitive to X-polarized light which has intensities 2 orders of magnitude higher than the absorption intensity for Z-polarized light.

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