Abstract Submitted
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Superlattice formed by quantum dot sheets: density of states and IR absorption[1] VLADIMIR MITIN, FEDIR VASKO, Electrical Engineering Department, University at Buffalo, SUNY — Low-energy electronic states in heterostructures formed by periodically placed quantum dot (QD) sheets are studied taking into account (i) ultranarrow (single or several monolayers thickness) wetting layers and (ii) scattering by randomly-placed QDs. The host material is described within the effective mass approximation, scattering by the QD sheets is governed by the periodical Dyson equation, and effect of wetting layers is taken into account within the transfer matrix approach. Using the current conservation and inversion symmetry requirements, the transfer matrix is evaluated beyond effective mass approximation. The binding energy of localized state, the reflection (transmission) coefficient for the single QD sheet case, and the energy spectrum of superlattice are determined for the case of GaAs host matrix with InAs QD sheets. Spectral dependency of mid-IR absorption in superlattice due to photoexcitation of electrons from localized states into minibands is determined by the QD's concentration, period of sheets, and wetting layer characteristics. Such a dependency modifies the characteristics of optoelectronic devices based on heterosrtuctures with QD sheets.

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