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Influence of the substrate orientation on the electronic and optical properties of InAs/GaAs quantum dots[1] VLADAN MLINAR, FRANCOIS PEETERS, Department of Physics, University of Antwerp — Variation of the electronic and optical properties of InAs/GaAs quantum dots (QD) as a function of the substrate orientation is studied in the framework of 3D eight-band k.p model. The QD transition energies are obtained for high index surfaces [11k], where k = 1, 2, 3 and are compared with [001]. We show that the QD size in the growth direction determines the degree of the influence of the substrate orientation, whereas the influence of the shape is of secondary importance. The effects of an external magnetic field applied parallel and perpendicular to the QD growth direction are analyzed taking into account the Zeeman effect and employing the gauge invariant discretization scheme. The available experimental data are successfully described by one of the optically active exciton states of the lowest lying exciton quartet. We also discuss the experimentally observed negative exciton diamagnetic shift for small values of the magnetic field: (1) for samples grown on a (001) substrate and magnetic field applied perpendicular to the growth direction, and (2) for samples grown on a (311) substrate and magnetic field applied parallel to the growth direction.

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