Supporting Information

Crystal phase quantum well emission with digital control

S. Assali[1,*], J. Lähnemann[2], T.T.T. Vu[1], K.D. Jöns[3,‡], L. Gagliano[1],

M. A. Verheijen[1,4], N. Akopian[1,3,‖], E. P. A. M. Bakkers[1,3], and J. E. M. Haverkort[1]

[1] Department of Applied Physics, Eindhoven University of Technology, 5600 MB Eindhoven, The Netherlands
[2] Paul-Drude-Institut für Festkörperelektronik, Hausvogteiplatz 5-7, 10117 Berlin, Germany
[3] Kavli Institute of Nanoscience, Delft University of Technology, 2600 GA Delft, The Netherlands
[4] Philips Innovation Services Eindhoven, High Tech Campus 11, 5656AE Eindhoven, The Netherlands
Corresponding author: J.E.M.Haverkort@tue.nl

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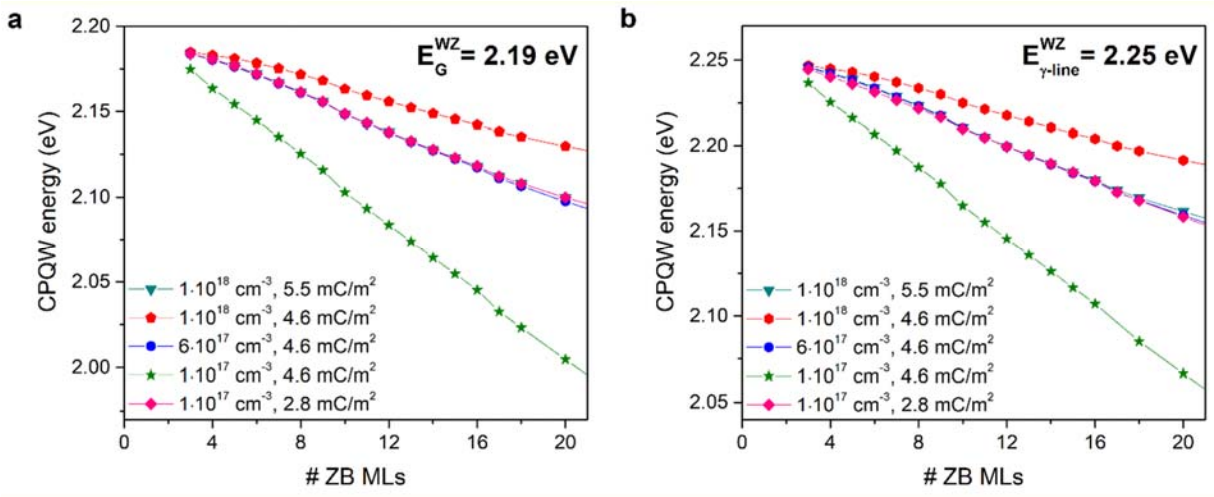
SM1. Schrödinger-Poisson simulations.

The one-dimensional band profiles of the CPQWs in the effective-mass approach were calculated employing the self-consistent Schrödinger-Poisson solver 1D-Poisson.[1] The calculated structure included four CPQWs with a spacing of 100 nm. The ground-state energies and wavefunctions of the electrons and holes, as well as the transition energies, were calculated for a CPQW located in between two other CPQWs. Furthermore, this calculation yields the localized electron and hole ground state energies in the triangular potentials within the WZ segments at opposite sides of the ZB barrier. Note that in this framework electrons and holes are calculated separately, whereby excitonic binding energies (where applicable) are not included and have to be corrected for.

For the calculations, we used a bandgap value of 2.79 eV for the ZB phase, corresponding to the direct gap at the Γ-point (and not the fundamental indirect gap). However, as the ZB segment constitutes a quantum barrier, the actual band gap mainly influences the wavefunction overlap and not the transition energy of the spatially indirect CPQW transition. A valence band offset of 135 meV between the ZB and WZ phases was used.[2] Otherwise, standard material parameters for ZB GaP were used, as the uncertainty in values for WZ GaP (where available) is larger than the difference to the values for the ZB phase. The employed values include 11.1 for the dielectric

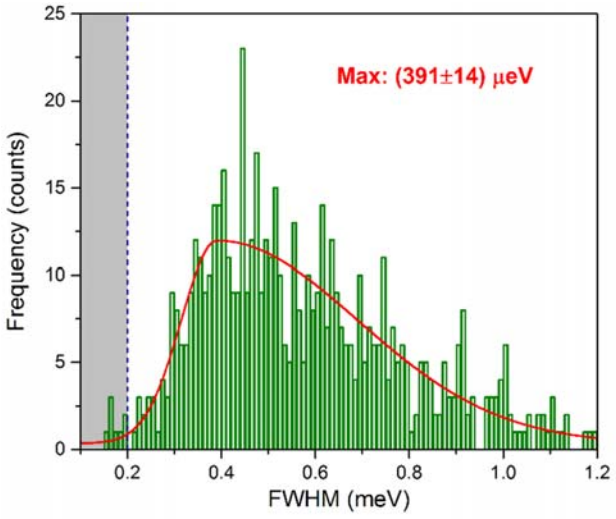
constant, 1.12 for the electron effective mass, as well as 0.79 and 0.14 for the heavy hole and light hole effective masses, respectively.[3]

For the WZ phase, two different energy gaps were used: the fundamental band gap of 2.19 eV and the γ-line bound exciton level at 2.25 eV.[4] In addition, we varied the value of the spontaneous polarization P_{SP}[5,6] and the residual doping in the NW homojunctions. The results of the calculations for CPQW transition energies as a function of the ZB layer thickness, doping levels, and P_{SP} are shown in Fig. S1.



Supporting Figure S1: CPQW transition energies as a function of the ZB layer thickness, the residual background doping levels, and P_{SP} calculated using the WZ fundamental band gap of 2.19 eV (**a**) and the γ-line bound exciton level at 2.25 eV (**b**).

SM2. Statistical distribution FWHM.



Supplementary Figure S2. Statistical counts for the FWHM of the CPQW emission lines. The dashed line is positioned at the setup resolution limit of ~200 μeV.

Bibliography

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