Charge control and tunability of InAs/InP droplet-epitaxy quantum dots

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In this presentation I will review recent progress at the University of Sheffield on InAs/InP quantum dots emitting in the C-band telecom spectral region. The QDs are grown by MOVPE using the droplet-epitaxy method [1]. Work on shorter wavelength quantum dots has demonstrated the benefits of developing gated diode structures that stabilize the charge state and reduce the electrical noise. Transferring these methods to InP-based structures has so far proven to be challenging, probably due to issues related to p-dopant diffusion. We have circumvented this issue by developing n^{++}-i-n^{+} diodes inspired by work on shorter wavelength structures [2]. We find that the background emission is much reduced in forward bias and that clear charging thresholds are obtained [3]. The linewidths are resolution-limited and the QD wavelengths can be tuned by 2.4 nm. The fine-structure splitting tunes with applied bias and reaches a minimum value of 16 μeV. These results provide a promising route forward for developing tunable single-photon sources and spin-photon interfaces in the telecom wavelength band.

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References

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