OPTICAL PROPERTIES OF QUANTUM DOTS AND QUANTUM POSTS

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We discuss the growth and optical properties of InGaAs/GaAs self assembled quantum posts (QPs). The MBE grown QP is formed of a seed quantum dot (QD) connected to a short quantum wire and is capped by another QD. The QP length along the growth direction can be adjusted between 10 and 60nm. We briefly discuss the QP structural and chemical composition. Their optical properties measured by micro-photoluminescence (micro-PL) are compared to an 8-bands strain-dependent k.p model incorporating the detailed structure and alloy composition. The calculations for QPs larger than 20nm show full electron delocalization in the quantum wire part of the quantum post and the hole localization in the strain-induced quantum dots at the ends of the QP. By embedding the QPs inside an n-i-p structure, measurements of the bias dependent micro-PL spectra show strongly tunable excitons transitions due to the Quantum Confined Stark effect. In addition, we find anti-crossings, which are consistent with delocalized electron and localized holes states. Thus, QP offers the possibility of controlling the strength of the electric dipole moment and the oscillator strength in the structure. We have measured dipole moments 40 times larger than those of isolated QDs. This opens up new possibilities for the studies of light matter interactions in the strong coupling regime.