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Supporting Information

Site-controlled single photon emitters fabricated by near field illumination

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1. **Calculation of QD diameter**

Using the emission energies in Figure 1b of the manuscript, we can estimate the size of our QDs. We assume that they have a cylindrical shape, with a radius R, determined by the QD fabrication parameters, and thickness $L = 6$ nm, the same of the original QW, since it is reasonable that hydrogen is uniformly removed all along the thickness of the GaAs/GaAsN/GaAs QW. Since the emission energy, E, of an exciton in a QW of thickness L and in a cylindrical QD of thickness L and radius R are respectively

$$E^{\mathrm{QW}} = E_{\mathrm{g}} + E_{\mathrm{L}} - E_{\mathrm{b}}^{\mathrm{QW}}$$

and

$$E^{\mathrm{QD}} = E_{\mathrm{g}} + E_{\mathrm{L}} + E_{\mathrm{R}} - E_{\mathrm{b}}^{\mathrm{QD}}$$

where E_{g} is the energy gap, E_{L} and E_{R} are the confinement energies along the z-direction and radial direction, respectively. $E_{\mathrm{b}}^{\mathrm{QD}}$ and $E_{\mathrm{b}}^{\mathrm{QW}}$ are the (positive) exciton binding energies for the QD and QW, respectively. The difference between these two emission energies is given by

$$\Delta E = E_{\mathrm{R}} - \left(E_{\mathrm{b}}^{\mathrm{QD}} - E_{\mathrm{b}}^{\mathrm{QW}}\right).$$

ΔE is experimentally determined by the data in Figure 1b of the manuscript, between the QD and QW exciton emissions.

The expression for E_{R} as a function of R is given by [1]

$$E_{\mathrm{R}} = b\frac{\hbar^2 u_{mp}^2}{2m^* R^2}$$

where u_{mp} is the p-th zeros of the m-th Bessel function (J_m) and $m^* = 0.14\, m_0$ is the GaAsN electron effective mass (m_0 being the electron mass) [2,3]. We are interested in the lowest energy level, where $u_{01} \approx 2.4048$. b is a factor to take into account the finite barrier (about 245 meV for the electrons) around the dot. Assuming b is the same of the z-direction, we have $b = 0.63$, which is given by the ratio of the electron confinement energies calculated for the GaAs/GaAsN/GaAs QW with finite and infinite potential barriers. We are neglecting the hole confinement contribution since the holes are subjected to a much smaller confinement

potential (about 7 meV) [4] with respect to the electrons and its value is within our uncertainty.
The lowest energy exciton (formed by an electron and a light hole for every kind of GaAsN nanostructure [5,6,7]) in a QW like ours has been demonstrated to have about $E_{\mathrm{b}}^{\mathrm{QW}} = 10$ meV [8]. However, no calculation or data exist in the literature for the $E_{\mathrm{b}}^{\mathrm{QD}}$. Considering the $E_{\mathrm{b}}^{\mathrm{QD}}$ in other III-V systems [9], we have assumed $E_{\mathrm{b}}^{\mathrm{QD}} = (20 \pm 10)$ meV.

The QD diameter, $2R$, has therefore been calculated with the formula

$$2R = \sqrt{\frac{2b\hbar^2 u_{01}^2}{m^*\left(\Delta E + E_{\mathrm{b}}^{\mathrm{QD}} - E_{\mathrm{b}}^{\mathrm{QW}}\right)}}$$

Considering the ΔE values $140, 125, 80, 30, 10$ meV, corresponding to $0.7, 0.8, 0.9, 1.0$ and 1.1 mW fabrication power and 1 s time exposure, we obtain $2R = 4.8, 5.0, 6.1, 9.2, 13$ nm, respectively, with an error of about $\pm 15\%$. This proves that with the SNOM tip we have removed hydrogen from an area much smaller than the diffraction limit.

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