Electronic structures of (In,Ga)As/GaAs quantum dot molecules made of dots with dissimilar sizes

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M - - w
I ,G A /G AS (QDM’)

-QDM M.

M M S

$$\left[-\frac{1}{2}\nabla^2 + V(\mathbf{r})\right]\psi_i(\mathbf{r}) = \epsilon_i\psi_i(\mathbf{r}), \quad (1)$$

$V(\mathbf{r})$ $v(\mathbf{r})$ V ., $V(\mathbf{r}) = \sum_{n,\alpha} v(\mathbf{r} - \mathbf{R}_{n,\alpha}) + V$. $(\mathbf{R}_{n,\alpha})$ FF [12,13] v $=$ I, G, A I A G A, [14] B I A/G A I. E (1) $(\epsilon_{m,\sigma}(\mathbf{k}))$ B m $\mathbf{k}$ $=$ I A, G A, $\overleftrightarrow{}$ R. 15.

H

$$H = \sum_{i} \epsilon \hat{c}_{i} \hat{c}_i$$

t t s $E_X = 1156$ V.

tw ts

[illegible] $2t$ [illegible] M [illegible] $2t$ [illegible] M [illegible]
[illegible]. H [illegible] w [illegible], [illegible] -
[illegible] w [illegible] -
[illegible] I [illegible] A[illegible]/G A[illegible] QDM,[9] [illegible]

QDM M , $e'_T = e'_B = (e_T + e_B)/2$ $J'_{TT} = J'_{BB} = (J_{TT} + J_{BB})/2$ M E . [9]. M *ideal* -QDM, w , - , , , .

, , -

-QDM's, w QDM's, Q 0.5 d 4.5 , , w - w . F QDM's, Q - w , d 10 , Q 0, , w , w .

O , , , Q_{TT} Q_{BB} -QDM's -QDM's: F -QDM M, $Q_{BB} = Q_{TT}$ w . Q_{BB} Q_{TT} M , , Q_{BB} , Q_{TT} , . T -QDM , I A/G A .[8,9] I -QDM's M, Q_{TT} Q_{BB} , - , e_T e_B. Q_{BB} w , Q_{TT} d 7 . T d 4.5 , , , $2t$ $e_B - e_T$; , - , w w , Q_{TT} Q_{BB}. A d, $2t$ $e_B - e_T$, w - , Q_{TT} Q_{BB}. T , w - , w , Q_{TT} d

B. Degree of entanglement vs double occupation

E [illegible] DOE [illegible] QDM [illegible] DOE [illegible] P [illegible] H [illegible] DOE [illegible] $^1\square_g^{(a)}$. [illegible] s [illegible] $^1\square_g^{(a)}$ w [illegible]

$$\square(^1\square_g^{(a)})\rangle = c_1|e_T^{\uparrow}, e_B^{\downarrow}\rangle + c_2|e_B^{\uparrow}, e_T^{\downarrow}\rangle + c_3|e_T^{\uparrow}, e_T^{\downarrow}\rangle + c_4|e_B^{\uparrow}, e_B^{\downarrow}\rangle \quad (12)$$

$|c_1|^2+|c_2|^2+|c_3|^2+|c_4|^2=1$. A [illegible], w

$$\square(^1\square_g^{(a)})\rangle = \sum_{i,j} \square_{ij}|i\rangle \otimes |j\rangle, \quad (13)$$

w

$$\square = \begin{bmatrix} 0 & -c_3 & 0 & -c_1 \\ c_3 & 0 & c_2 & 0 \\ 0 & -c_2 & 0 & -c_4 \\ c_1 & 0 & c_4 & 0 \end{bmatrix} \quad (14)$$

$|i\rangle, |j\rangle = |e_T^{\uparrow}$e

-QDM's . -QDM's. -QDM's -QDM's -QDM's . M -QDM's, -QDM's - . C , -QMD -QDM's, . T QDM . M -QDM's.

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