Excitonic exchange effects on the radiative decay time of monoexcitons and biexcitons in quantum dots

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E k . k ( ), (I ,A)G /G A C $\tau_R(X^0)$ k . I k , $\tau_R(XX^0)$. $\tau_R(X^0)/\tau_R(XX^0)$ 4 0 -2.1667 D-0.0001 D I: 0 0 1 2 20 .

[4,5] I $e_0^2h_0^2$ $e_0^1h_0^1$ [F . 1( )].

I ( )

$\tau_R(X^0)$ k τ_{BD} $R_{BD}=\tau_{BD}^{-1}$. B ,[6] B (R_{B0}) D (R_{D0}) R_{BD} $\simeq R_{B0}$, τ_{BD}, $R_{B0}/2$ ( ) R_{0B} R_{0D} k $R_{0B}\simeq R_{B0}$ $R_{0D}\simeq R_{D0}$ $\tau(XX^0)\simeq 2R_{0B}^{-1}$ R_{BD}. ( ) R_{BD}, $\tau_R(X^0)/\tau_R(XX^0)$ 4 2 k ,[7] $\tau_R(X^0)/\tau_R(XX^0)\simeq 2$, $\tau_R(X^0)$ $\tau_R(XX^0)$ [8] $\tau_R(X^0)/\tau_R(XX^0)\simeq 4$. I $_{0.6}$G $_{0.4}$A /G A C

II. RATE EQUATIONS FOR THE RADIATIVE DECAY OF THE MONOEXCITON

F 1( )

F F . 1( ) R_{ij}. F . 1( ) $n_0(t)$ $e_0^1h_0^1$ $e_0^0h_0^0$:

$$dn_b/dt = (R_{bb'} + R_{bd} + R_{bd'} + R_{b0})n_b + R_{d'b}n_{d'} + R_{db}n_d + R_{b'b}n_{b'},$$

$$dn_{b'}/dt = (R_{b'b} + R_{b'd} + R_{b'd'} + R_{b'0})n_{b'} + R_{d'b'}n_{d'} + R_{db'}n_d + R_{bb'}n_b,$$

$$dn_d/dt = (R_{db} + R_{d'b'} + R_{dd'} + R_{d0})n_d + R_{d'd}n_{d'} + R_{b'd}n_{b'} + R_{bd}n_b,$$

$$dn_{d'}/dt = (R_{14} + R_{13} + R_{12} + R_{10})n_{d'} + R_{dd'}n_d + R_{b'd'}n_{b'} + R_{bd'}n_b,$$

ddt

[illegible] E[illegible]. (6) [illegible] $I(t) = R_{B0}\, n_B(t) + R_{D0}\, n_D(t)$, [illegible] ([illegible]) [illegible].

III. RATE EQUATION FOR THE RADIATIVE DECAY OF THE BIEXCITON

T[illegible] B-D

$$F = \frac{1}{2}\left(\frac{R_{B0} \quad \square_S}{\square_F \quad \square_S}\right), \tag{12}$$

$$S = \quad \frac{1}{2}\left(\frac{R_{B0} \quad \square_F}{\square_F \quad \square_S}\right). \tag{13}$$

I [illegible] $I(t)$ [illegible]: dn_0/dt [E. (6)], [illegible] $R_{D0}=0$ [illegible] $I(t)=R_{B0}\,n_B(t)$. [illegible] $I(t)$ [illegible] ([illegible]) [illegible].

I ,
D et al.[9] F et al.,[13]
[illegible]$_R(X^0) \simeq R_{B0}^{1} = 1.1$ I$_{0.6}$G$_{0.4}$A /GA -
B et al.,[14] -
1.55 -
1 B k et al.[15] et
al.[16] I , C