Visual Monitoring of Laser Power and Spot Profile in Micron Region by a Single Chip of Zn Doped CdS Nanobelts

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Supporting Information

![Green emission](image1.png)
![Red emission](image2.png)

**Fig. S** (a) TRPL spectra at ~500 nm (green emission) for Zn doped CdS nanobelt with the pumping power of 2.87 mW; the hollow circles are the experimental data and the solid lines are the fitting curves using a biexponential decay function. (b) TRPL spectra at ~600 nm (red emission) for Zn doped CdS nanobelt with the pumping power of 2.87 mW; the hollow circles are the experimental data and the solid lines are the fitting curves using a biexponential decay function.

The TRPL spectra were measured by a single-photon counting system (TimeHarp 200), the time resolution is 40 ps. The TRPL decay profile for both the emission could be fitted with a biexponential decay function expressed as follows: 

\[ I(t) = A_1 e^{-t/\tau_1} + A_2 e^{-t/\tau_2} \]

where \( A_1 \) and \( A_2 \) are the amplitudes (or weighting factors), and \( \tau_1 \) and \( \tau_2 \) are the corresponding lifetimes.\(^1\) For the green emission, \( \tau_1 (A_1) \) and \( \tau_2 (A_2) \) are 0.54 ns (75%) and 43.88 ns (25%), respectively. The short component \( \tau_1 \) is attributed to the radiative recombination of free excitons in CdS nanobelt, as described in other references; and the weighting factor \( A_1 \) is dominant component, which means the excitons recombination is the main contribution to the green emission.\(^1\) The long component \( \tau_2 \) is attributed to the weakly bound exciton spontaneous radiative decay.\(^2\) For the red emission, \( \tau_1 (A_1) \) and \( \tau_2 (A_2) \) are 8.29 ns (37%) and 43.84 ns (63%), respectively. The short component \( \tau_1 \) is decay of the charge carries related to the trap states experience a complicated relax and recombination process.\(^3\) The long component \( \tau_2 \) represents that the deep trap results from strong exciton-phonon coupling in this structure as shown in earlier reported results.\(^4\)
Reference


