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Electronic Supplementary Information (ESI)

Ultra-highly fluorescent N-doped carbon dots-CdTe QDs nanohybrids with excitation-independent emission in blue-violet region

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SUPPORTING FIGURES AND CAPTIONS

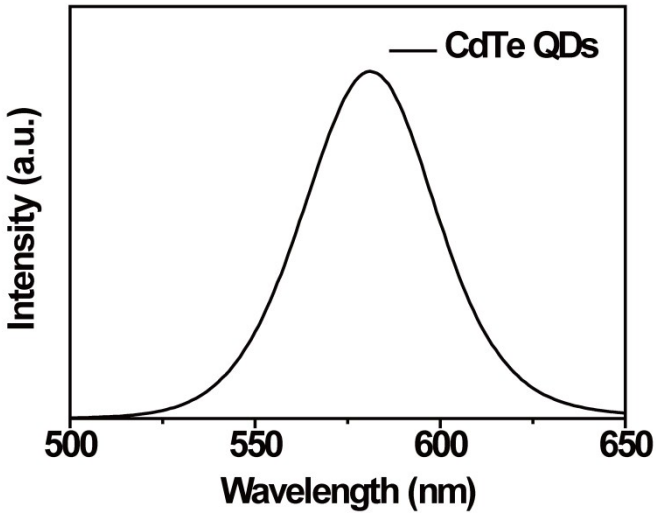

Fig.S1 PL spectrum of CdTe QDs. The excitation wavelength is 400nm. CdTe QDs are prepared in water with thioglycolic acid (TGA) as thiol ligand.

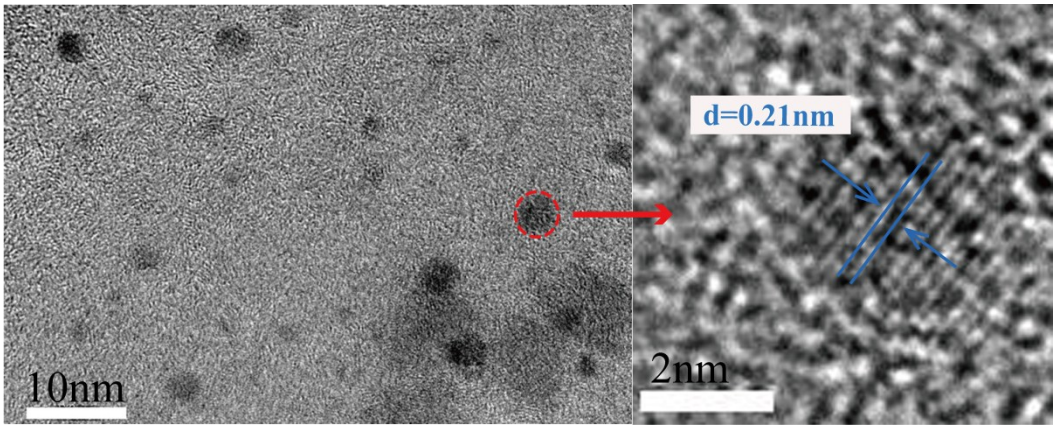

Fig.S2 TEM image of N-CDs. Right: HRTEM image of N-CDs.

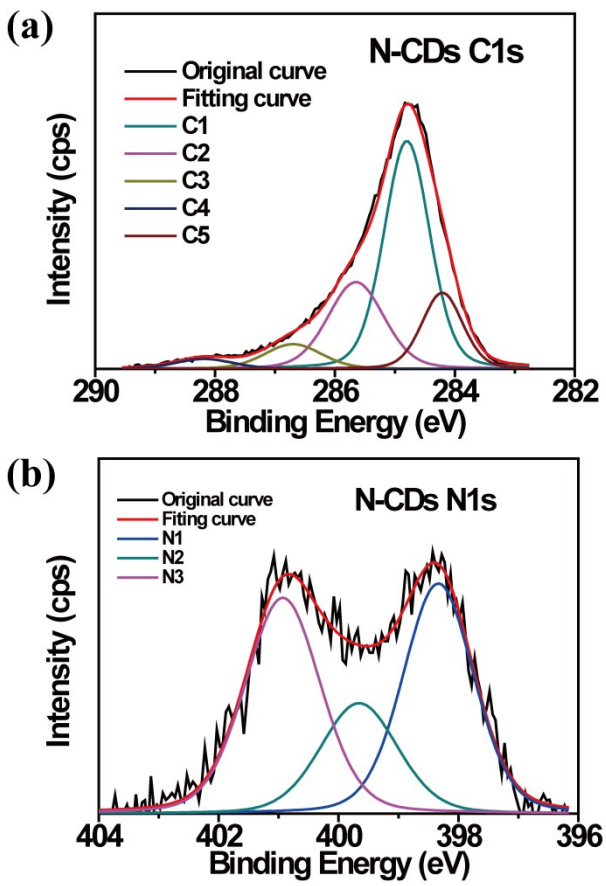

Fig.S3 (a) High-resolution XPS spectrum of C1s in N-CDs. The deconvolution reveals five binding energy peaks centered at C1 (284.8eV), C2 (285.5eV), C3 (286.5eV), C4 (288.6eV) and C5 (284.4eV). (b) High-resolution XPS spectrum of N1s in N-CDs. The deconvolution reveals three binding energy peaks centered at N1 (398.3eV), N2 (399.7eV) and N3 (400.9eV), respectively.

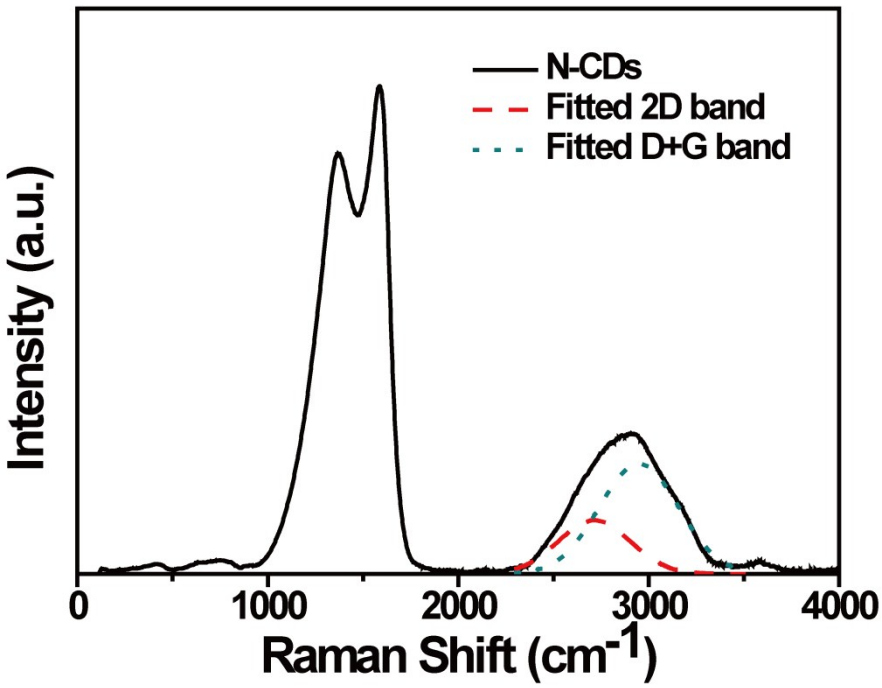

Fig.S4 Raman scatting spectra of N-CDs, recorded at room temperature. Dash and dot lines are fitted 2D and D+G peak curves, respectively.

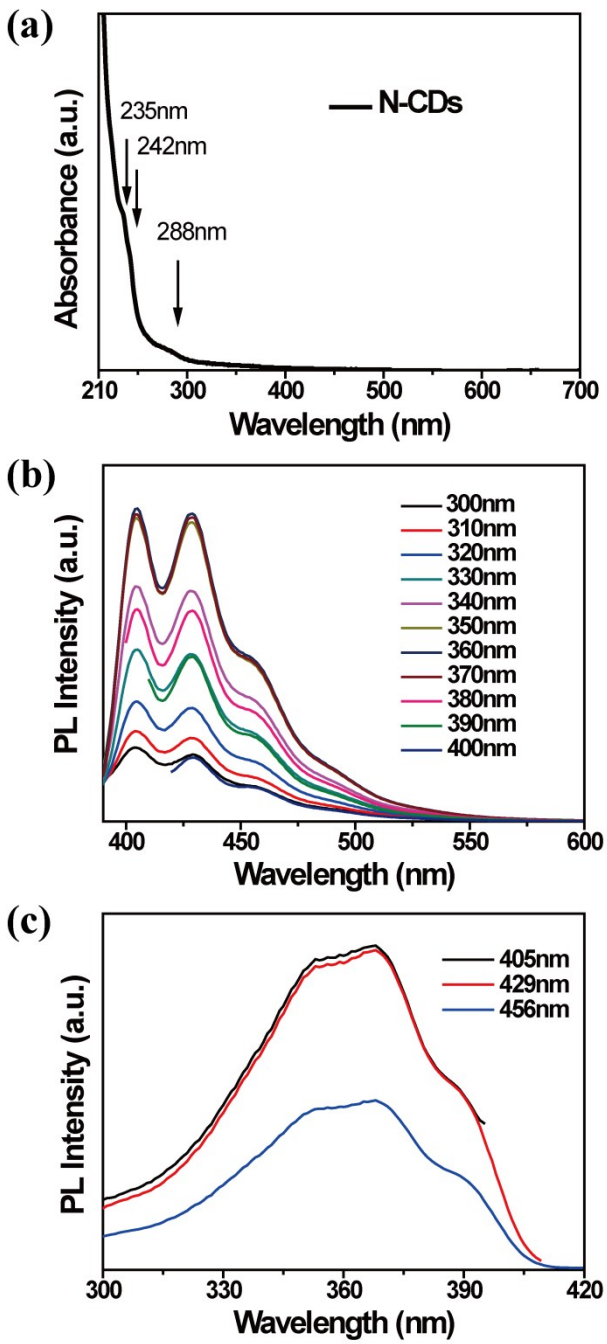

Fig.S5 (a) UV-Visible absorbance spectra of N-CDs. The materials were sonicated and dispersed in ethanol. (b) PL spectra of N-CDs. The excitation wavelength ranges from 300nm to 400nm. (c) PLE spectra of N-CDs. The emission wavelengths are 405nm, 429nm, 456nm.

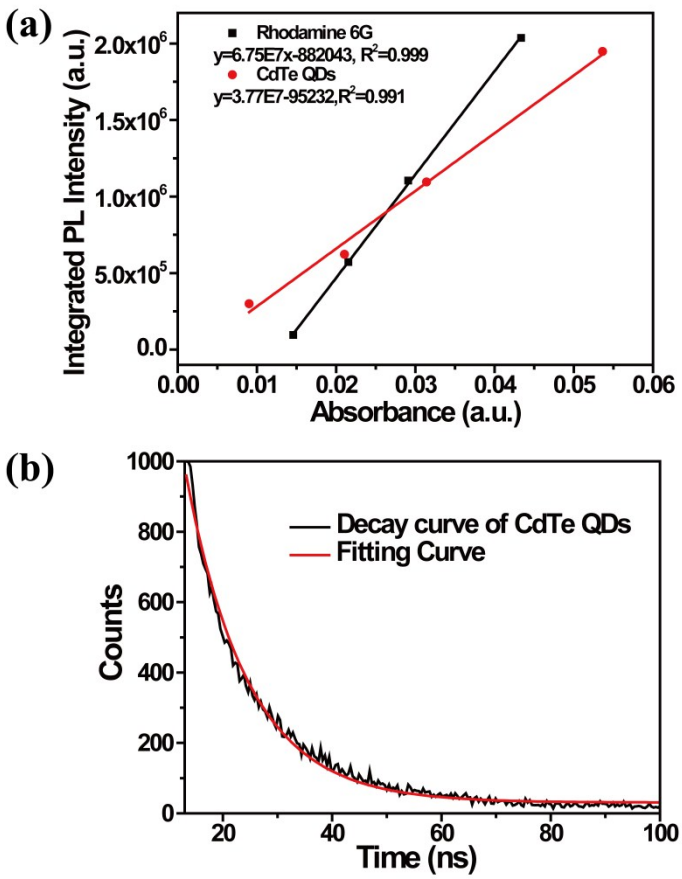

Fig.S6 (a) Fluorescence quantum yield measurement results of Rhodamine 6G (in ethanol, QY~ 95%) and CdTe QDs. The excitation wavelength is 400nm. The QY of CdTe QDs is calculated to be 53%. (b) Experimental PL decay spectra of CdTe QDs. The transient PL curve is well fitted with a single-exponential function with lifetimes of τ 11.4 ns.

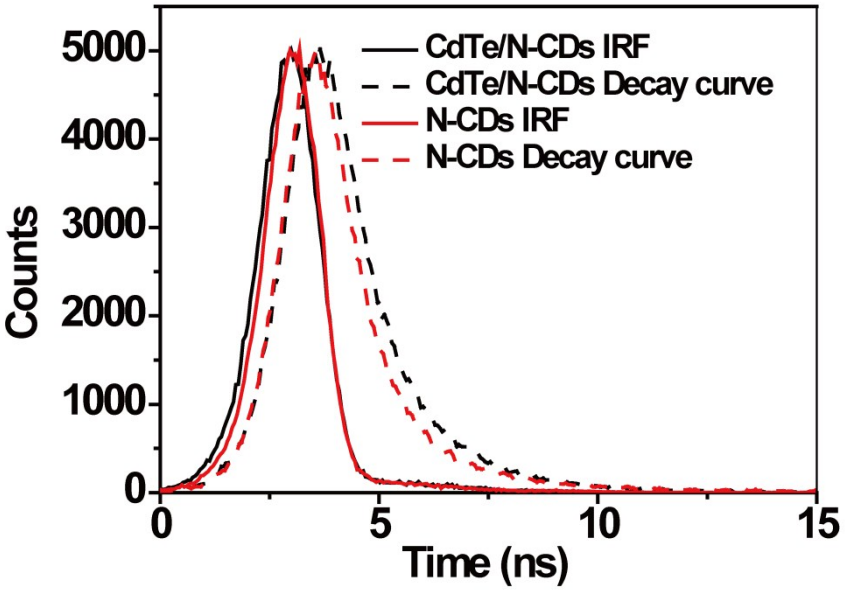

Fig.S7 Experimental PL decay spectra of CdTe /N-CDs and N-CDs. Solid and dash lines were instrument response and decay curves, respectively. The fluorescence decay curve is the convolution of instrument response function (IRF) and real fluorescence decay function.

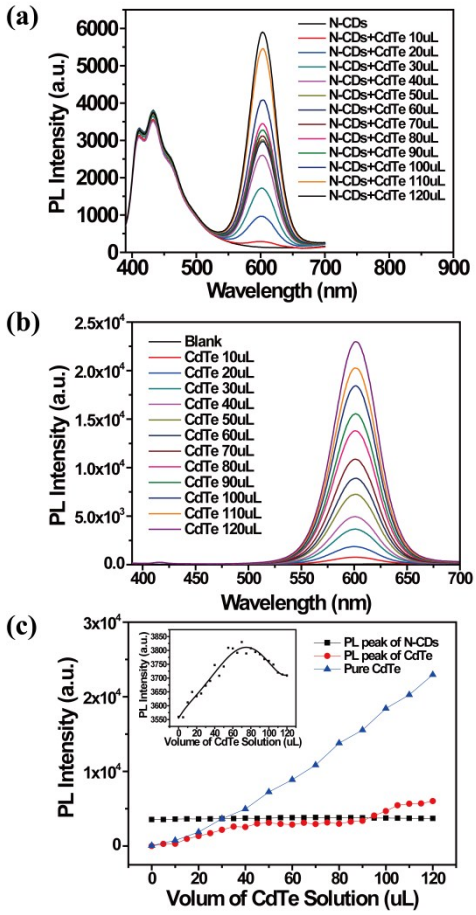

Fig.S8 (a) PL spectra of the mixture of N-CDs and CdTe QDs solution. The volume of adding CdTe QDs solution varies from 0uL to 120uL. (b) PL spectra of CdTe QDs solution in ethanol. The volume of adding CdTe QDs solution varies from 0uL to 120uL. (c) Evolution of the PL intensities of 433nm and 600nm in the mixture and 600nm in pure ethanol with the increase of CdTe QDs. The inset is magnified curve of 433nm in the mixture.

Description: PL spectra of the mixture of pure N-CDs solution and CdTe QDs were monitored. The N-CDs solution is fixed and CdTe QDs is added with volume varying from 0uL to 120uL. The volume of N-CDs is 3mL, much larger than that of adding CdTe QDs, thus the concentration of N-CDs is considered as unchanged during the process.

PL spectra of the mixture show two emission peaks, in which the peak of 433nm belongs to N-CDs and the peak of 600nm is from CdTe QDs. The adding CdTe QDs emit 580nm in water and red shifted 20nm after mixed in ethanol solvent of N-CDs. The red-shift results from the change of solvent environment. A control experiment was also made. The same concentration of CdTe QDs is directly added to pure ethanol solvent (3mL). The emission is also 600nm as shown in Fig. S 8(b).

To study the influence of each emission process in the mixture of N-CDs and CdTe QDs, the PL intensities of 433nm and 600nm in the mixture and 600nm in pure

ethanol is recorded with the increase of CdTe QDs. As shown in Fig.S 8(c) inset, the PL intensity of N-CDs (433nm) gradually increased with the addition of CdTe QDs. The PL intensity enhanced maximum about 8% and then decreased with further addition. The enhancement effect is far weak than that of CdTe/N-CDs (84%). Besides, the emission at 600nm in the mixture is greatly quenched compared to that in ethanol. However, unlike the totally quench in CdTe/N-CDs, the emission of CdTe QDs still exists.

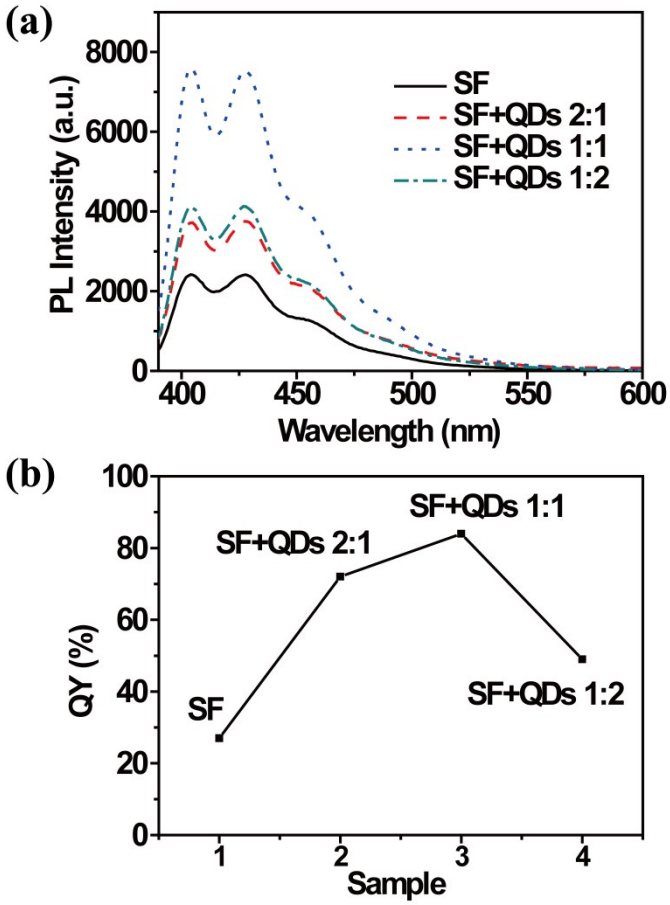

Fig. S9 (a) PL spectra and (b) QY of different samples. The starting materials are pure SF, SF and CdTe QDs of volume ratio 2:1, 1:1 and 1:2, respectively.

SUPPORTING TABLES AND CAPTIONS

Table S1 Parameters of two-exponential fitted decay curves in CdTe/N-CDs and N-CDs fitted by two-exponential function.

	A_1(%)	τ_1 (ns)	A_2(%)	τ_2(ns)	Average τ (ns)
CdTe/N-CDs	89.7	1.0	10.3	2.4	1.0
N-CDs	93.3	0.9	6.7	5.0	0.9