†Supplementary data

Exciton-phonon scattering and nonradiative relaxation of excited carriers in hydrothermally synthesized CdTe quantum dots

Amardeep M Jagtap[1], Jayakrishna Khatei[1,2], K S R Koteswara Rao[1*]

1. Department of Physics, Indian Institute of Science, Bnagalore – 560012, India

2. State Institute and Schulich Faculty of Chemistry, Technion-Israel Institute of Technology, Haifa, Israel

*Email: ksrkrao@physics.iisc.ernet.in
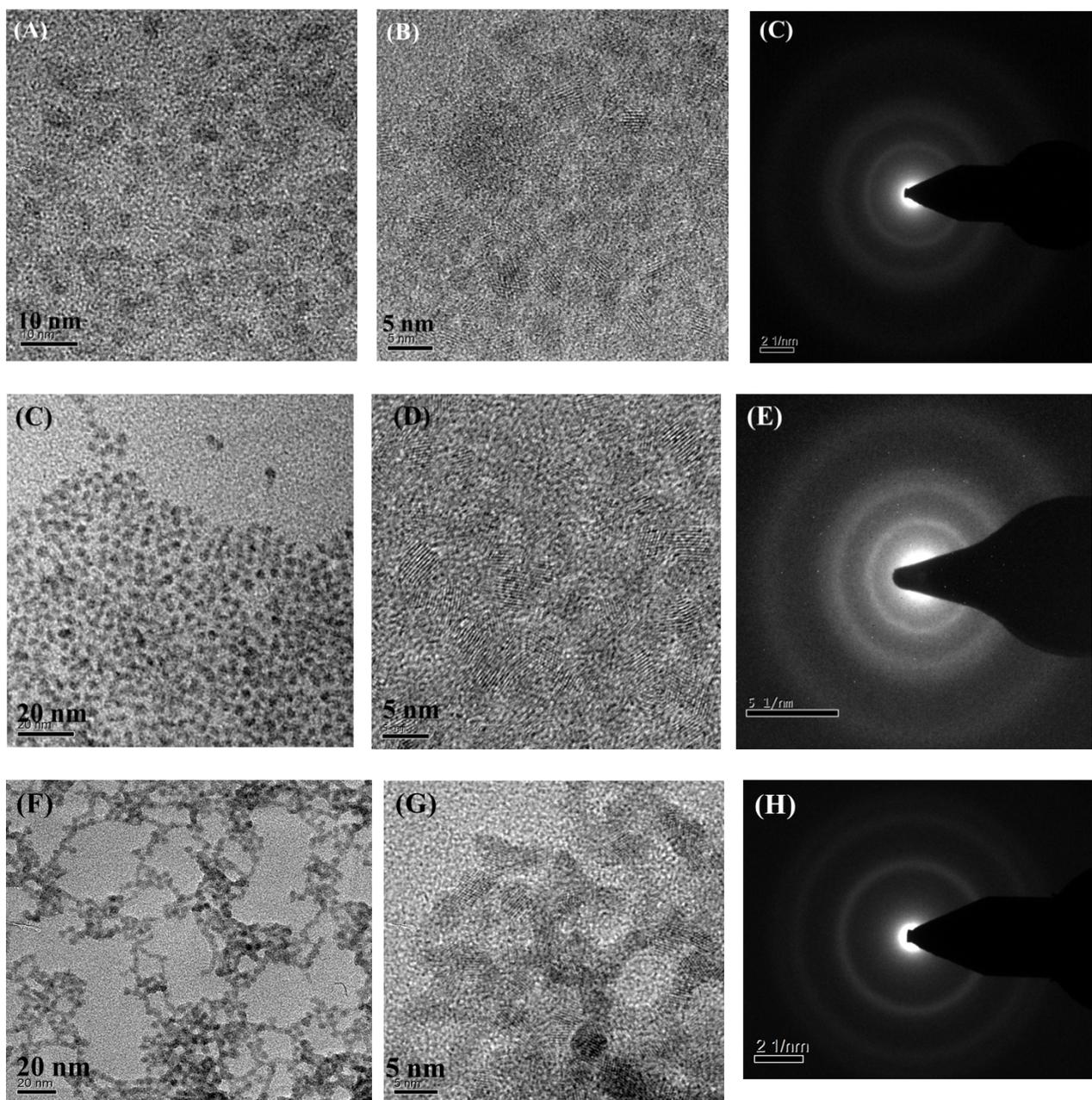
Fig. S1 TEM, HRTEM image and electron diffraction pattern of (A – C) 20, (C – E) 35 and (F – H) 43 minutes synthesized QDs.

The curve equation shown in the plot legend:

$$E_g(d)(\text{CdTe}) = 1.596 + \frac{1}{0.137d^2 + 0.000d + 0.206}$$

Legend: Energy gap of our QDs (From first excitonic absorption peak)
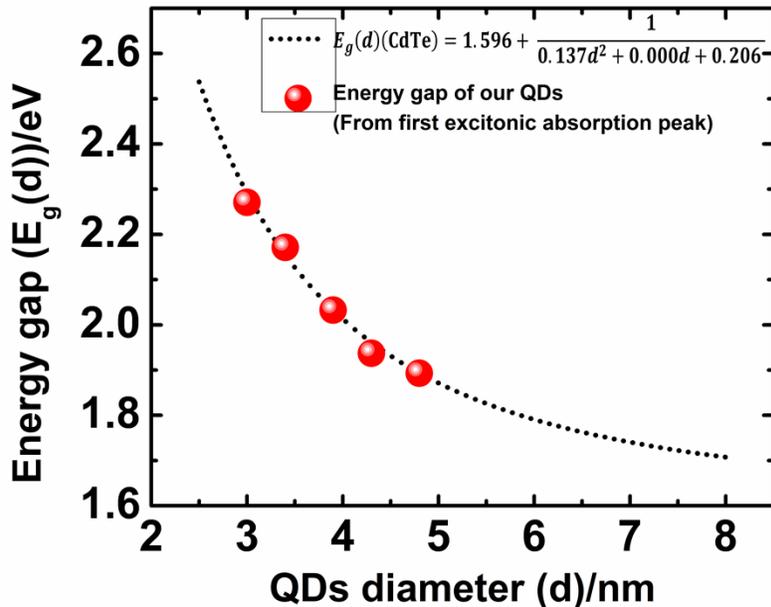
Fig. S2 Energy gap from spectral position of first excitonic absorption peak plotted as function of CdTe QDs size determined from TEM. Dotted line is the simulated curve of size dependent energy gap (First absorption peak).[1*]

1* C. de Mello Donegà and R. Koole, *J. Phys. Chem. C,* 2009, **113**, 6511.

Table S1† Content of Cd, Te, S from EDX elemental analysis.

QDs diamaeter/nm	Cd (%)	Te (%)	S (%)
3.0	51.4	26.1	22.5
3.4	53.6	21.8	24.6
3.9	55.1	16.2	28.7
4.3	38.3	19.6	42.1
4.8	37.0	25.7	37.3
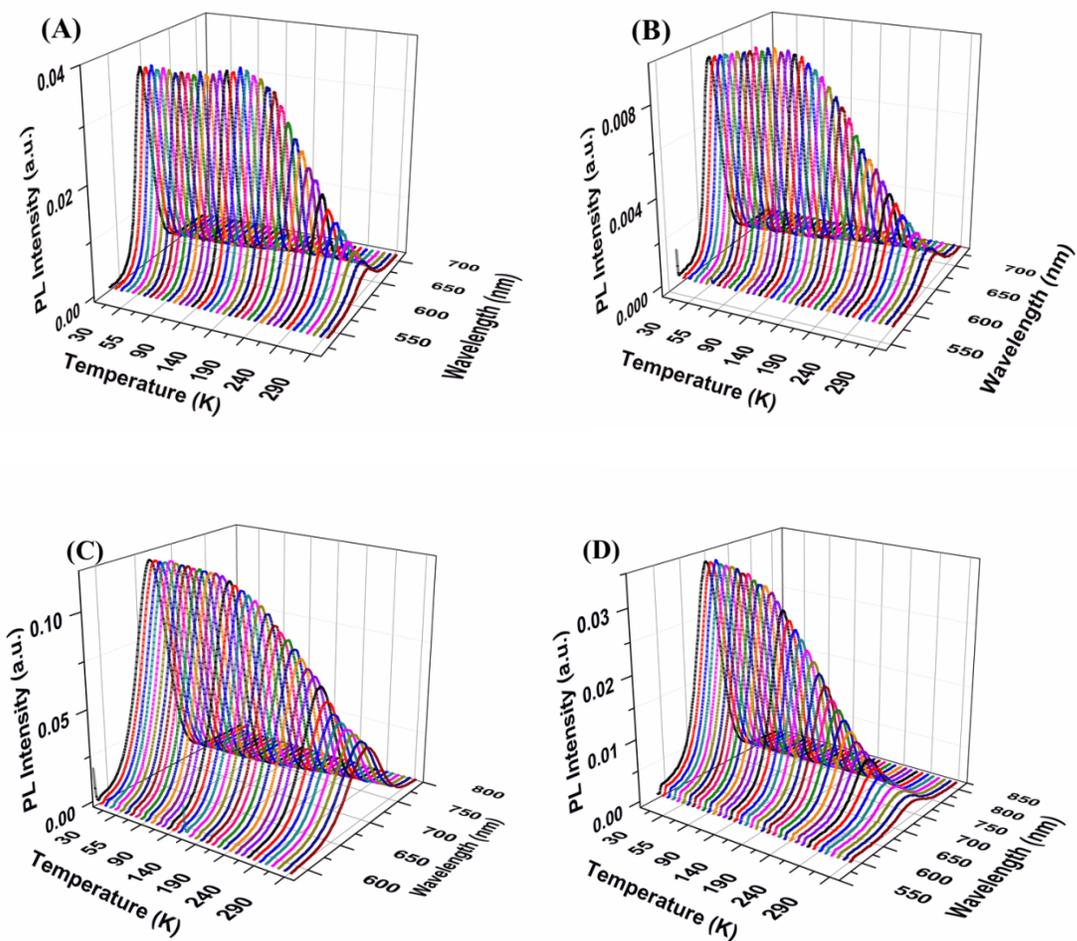
Fig. S3 Temperature dependent photoluminescence spectra for (A) 3.0 (B) 3.4 (C) 4.3 and (D) 4.8 nm size QDs.
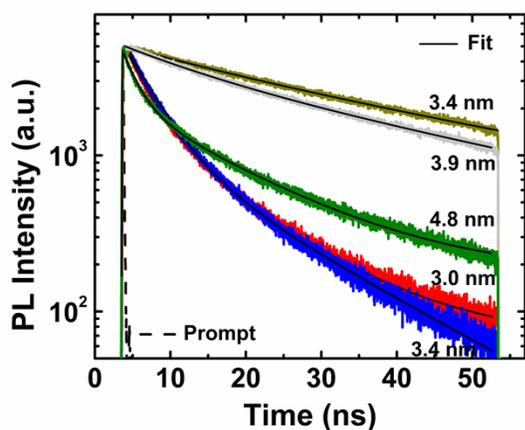
Fig. S4 Time resolved photoluminescence decay for $3.0 - 4.8$ nm size QDs. Solid lines represents the fitted curves by bi-exponential functions whereas the average lifetime is determined by $\sum_{i}^{n}\left(A_i\tau_i^2/A_i\tau_i\right), i = 1,2.$ The average lifetime determined are 10.5, 13.4, 43.1,40.9 and 14.1 ns for 3.0, 3.4, 3.9, 4.3 and 4.8 nm size QDs, respectively.
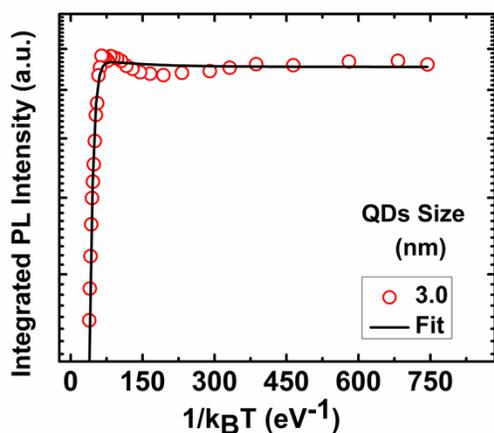
Fig. S5 Integrated PL intensity as a function of $1/k_BT$ that confirms the enhancement in PL intensity with increase in temperature up to 130 K for 3.0 nm QDs sample. Solid line represents the fitted curve by eqn (6).