Electronic Supplementary Information for

Supramolecular nanobiological hybrid as a PET sensor for bacterial DNA isolated from *Streptomyces sanglieri*

*Sudesna Chakravarty[1], Dilip Saikia[2], Priyanka Sharma[3], Nirab Chandra Adhikary[4], Debajit Thakur[5] and Neelotpal Sen Sarma[6]**

Institute of Advanced Study in Science and Technology, Guwahati-781035, India

FTIR Analysis: The successful attachment of MSA ligands on the surface of QDs was revealed from the Fourier Transform Infrared (FTIR) measurements as shown in Fig. S1. The absence of –SH peak in 2500-2600 cm^{-1} region of QDs, indicates the cleavage of thiol moiety and the formation of new S-Cd bond with the Cd-thiolate complex on the surface. The presence of peak around 1325 cm^{-1} indicates the presence of sulfide group.

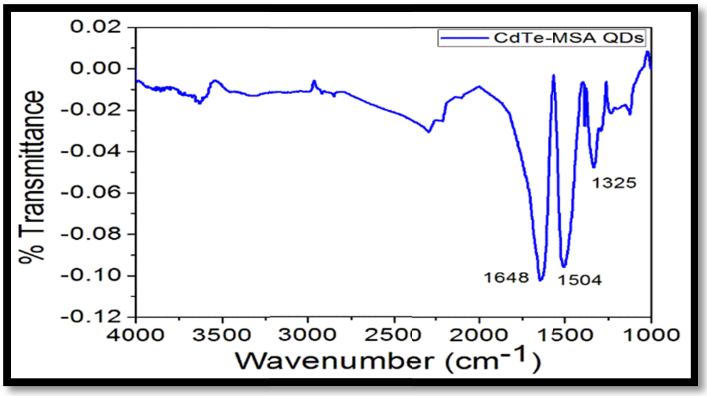


Fig. S1 FTIR spectrum of synthesized CdTe/MSA

FTIR spectra were also done to characterize the formation of ester between curcumin and NBOC-L-Tryptophan (Fig. S2). The FTIR spectrum shows peaks at 1783 cm^{-1} for the ester C=O stretching. Here, the shift towards higher frequency compared to C=O stretch (1720 cm^{-1}) is ascribed to extensive conjugation involving the single bonded oxygen of the ester group. The next important characterization is the presence of diketone in enol form, which is suggested by C=O (H-bonded) stretching frequency at 1681 cm^{-1} and O-H (H-bonded) stretching frequency at 3285 cm^{-1}. The peaks at 1621 cm^{-1}, 1376 cm^{-1} and 1307 cm^{-1} are ascribed to C=C (aromatic) stretching frequencies. Further, peaks at 1214 cm^{-1} is due to C-N stretching while peaks at 756 cm^{-1}, 705 cm^{-1} and 484 cm^{-1} are due to C-H out of plane bending.

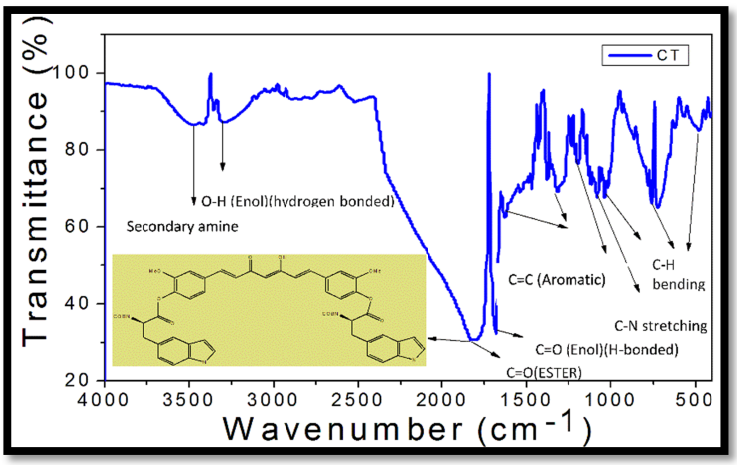


Fig. S2 FTIR spectrum of the synthesized protected CT ester.

^{1}H NMR Analysis: The formation of pure protected CT ester has been confirmed by ^{1}H NMR ($CDCl_3$, 400 MHz): δ 1.263-1.296 [S, 18 H, $N(OCH_3)_3$], 3.142-3.221 (t, 2H, C_2-H), 4.427-4.692 (m, 4H, CH=CH and CH=CHOH), 6.871-7.106 (m, 6H, Ar-H), 7.260-7.302 (d, 4H, C_1-H), 8.555 [s, 2H, N-H (indole)] (Fig. S3)

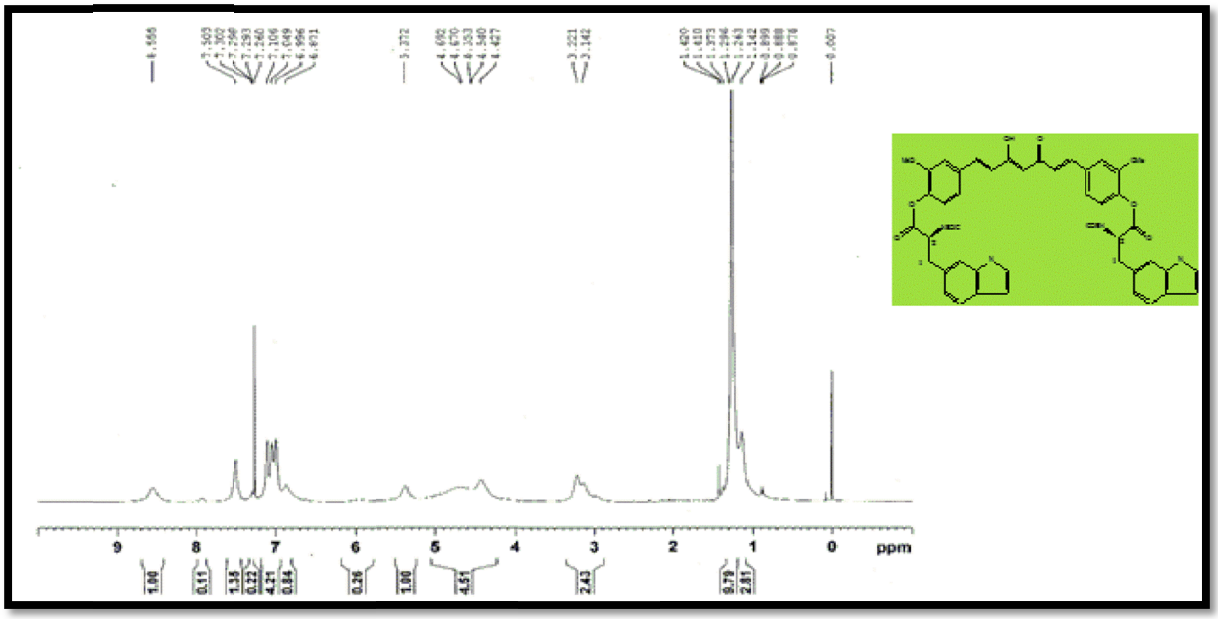
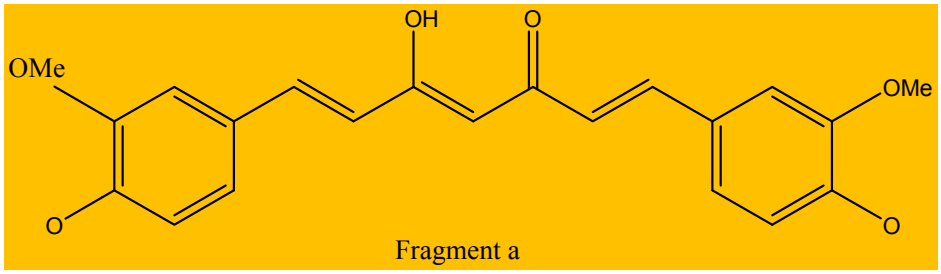
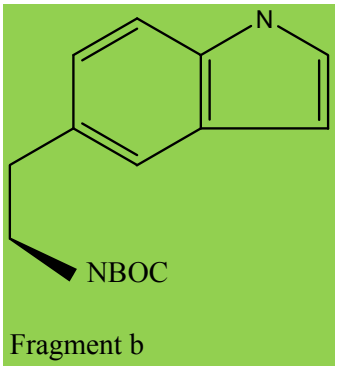


Fig. S3 ^{1}H NMR spectrum of protected CT

MS Study: The formation of protonated CT is suggested by the presence of base peak with m/z value 375.2675 (corresponding to fragment a) and fragment peak with m/z value 248.9363 (corresponding to fragment b) (Fig. S4).





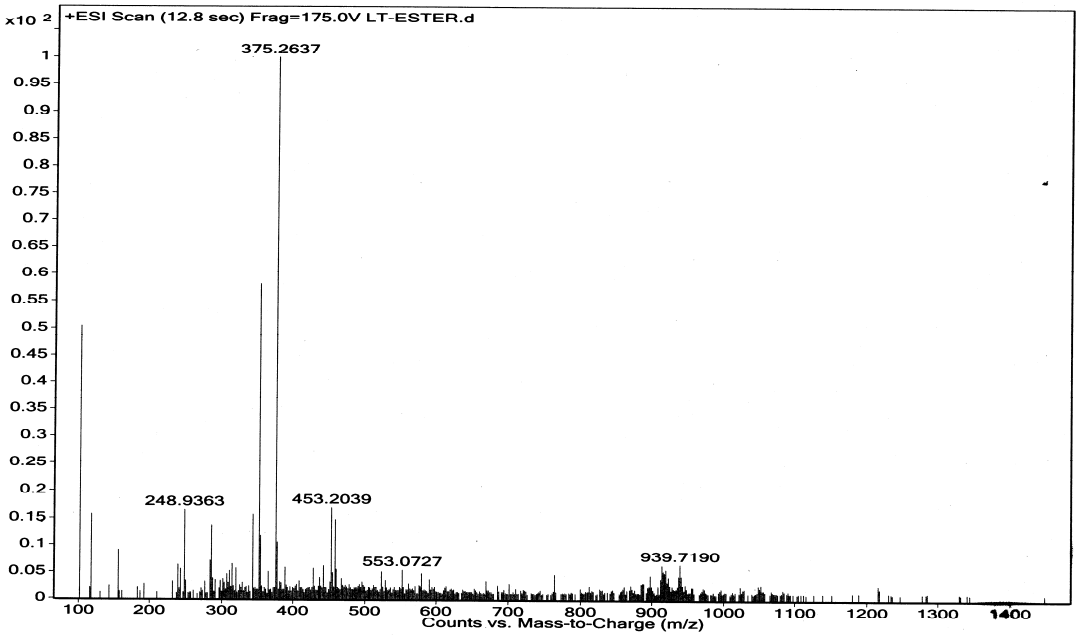


Fig. S4 The MS spectrum of protected CT.

The formation of deprotected CT is suggested by the absence of peak corresponding to m/z 248.9363 and appearance of a new peak corresponding to m/z 200.44 (Fig. S5).

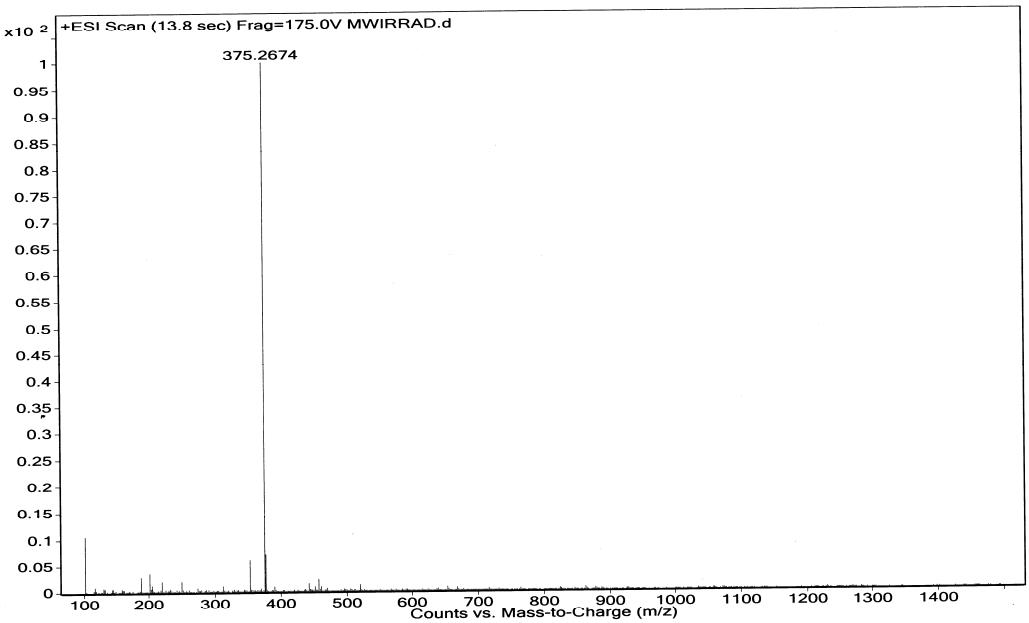


Fig. S5 The MS spectrum of deprotected CT

DLS study: Zeta potential measurement: The zeta potential value of deprotected CT was found to be -14.1 eV as shown in Fig. S6.

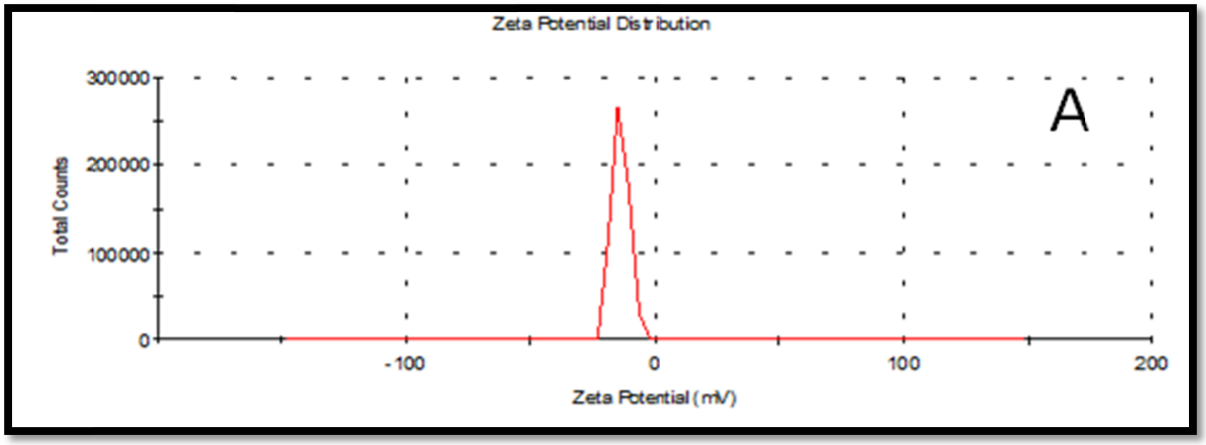
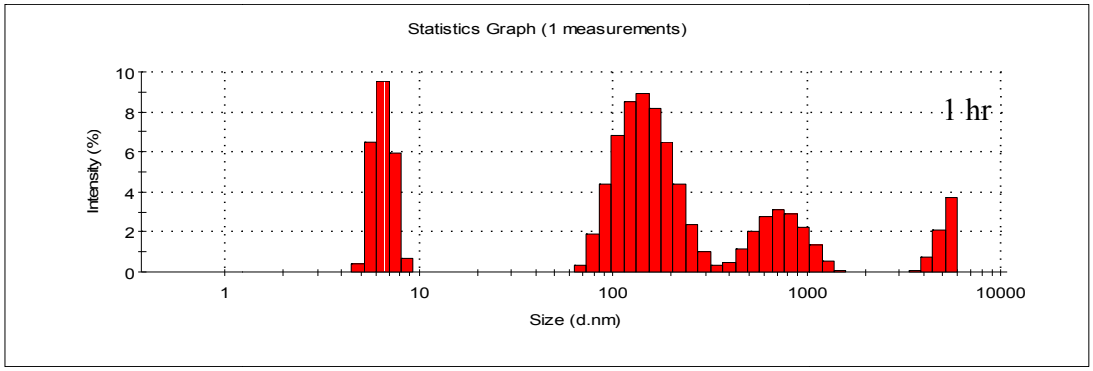
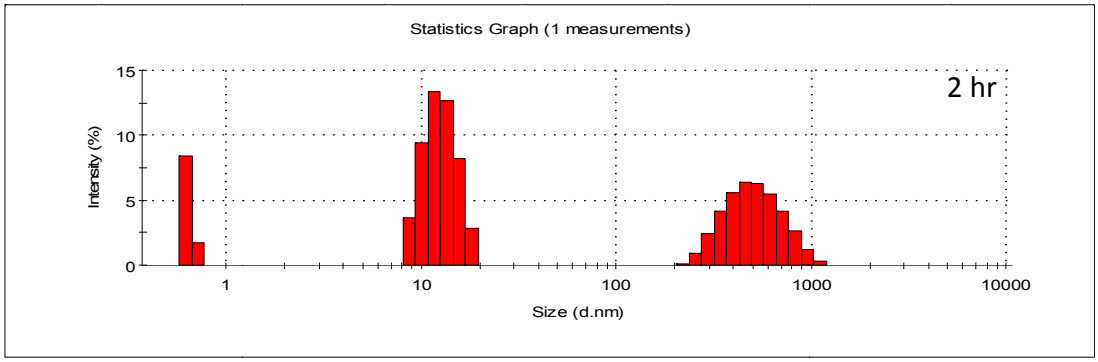
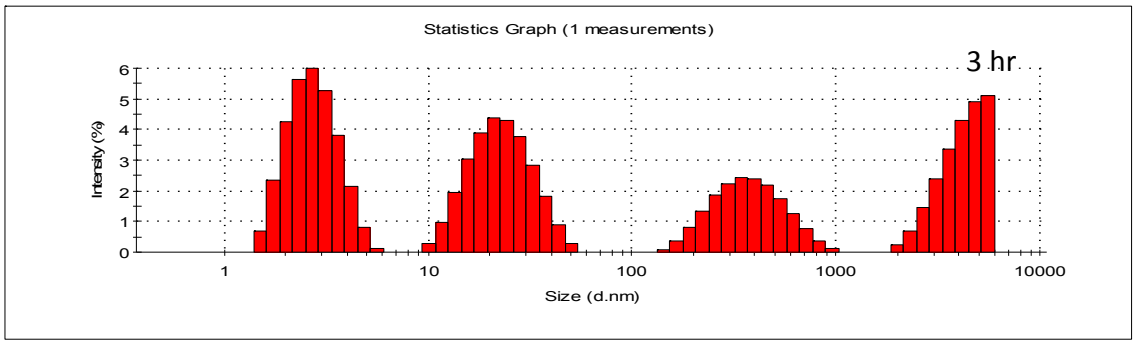


Fig S6 The Zeta potential distribution plot of deprotected CT

Size (average): The variation of size of QDs synthesized with time was studied with the help of DLS. It was found that with increase in time from 1 hr to 7 hrs, the size of QDs increases in a regular manner which is a generalized property of QDs (Fig. S7).



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Intensity (%)
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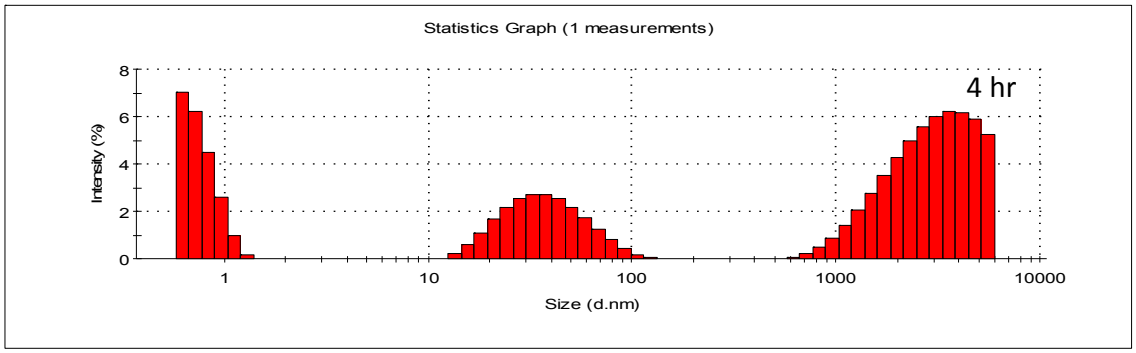
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Intensity (%)
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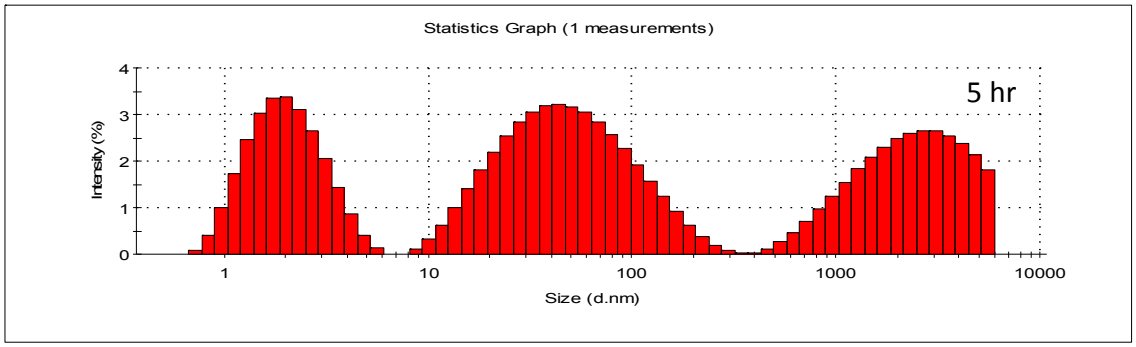
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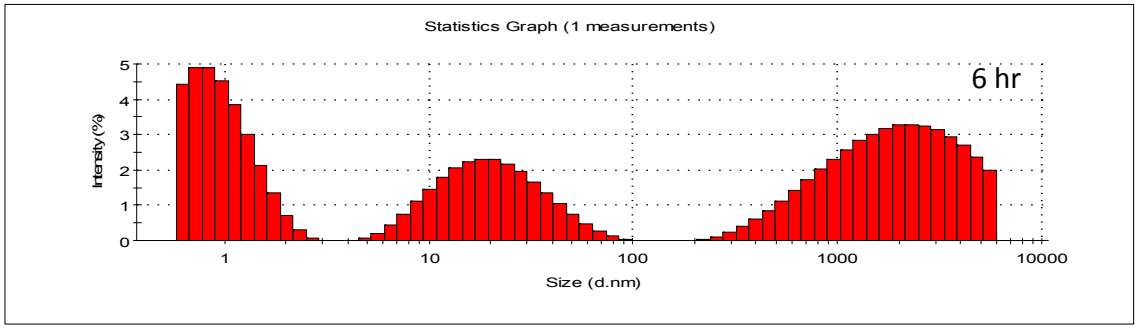
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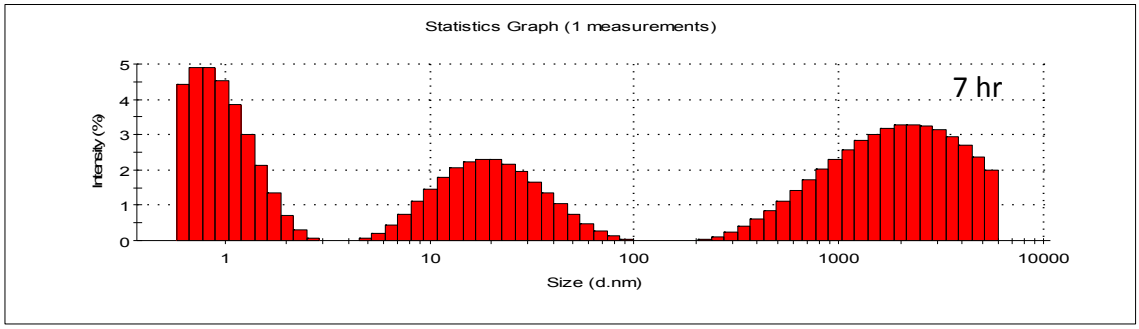

Fig. S7 The variation in size distribution with time

PL Study: The variation of PL intensity with time was studied and shown in Fig. S8. It was found that with increase in time of synthesis of QDs, a regular red shift was observed which depicted particle growth with time.

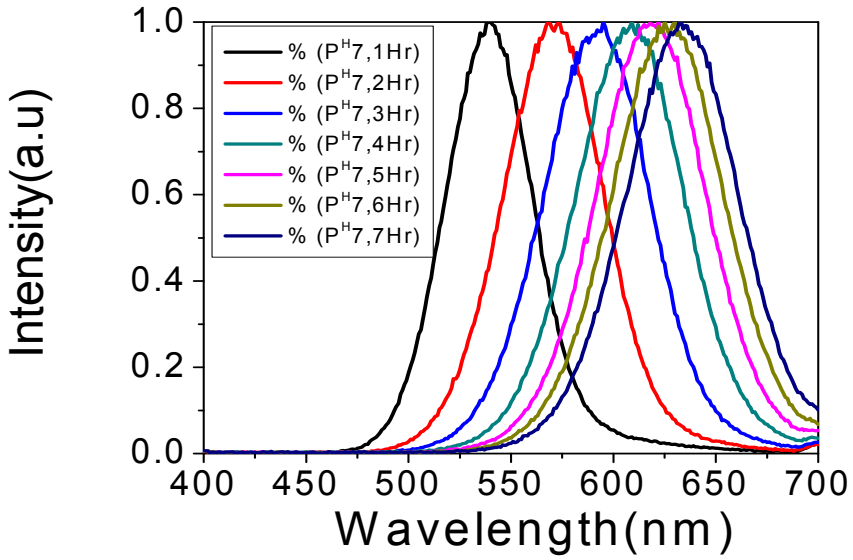

Fig. S8 The variation of PL intensity of QDs with time (1hr-7hrs)

EDAX Analysis: The presence of S was confirmed by EDAX measurements. Here, S depicts not only the S in the crystals but also the MSA capping on the surface of CdTe QDs (Fig. S9).

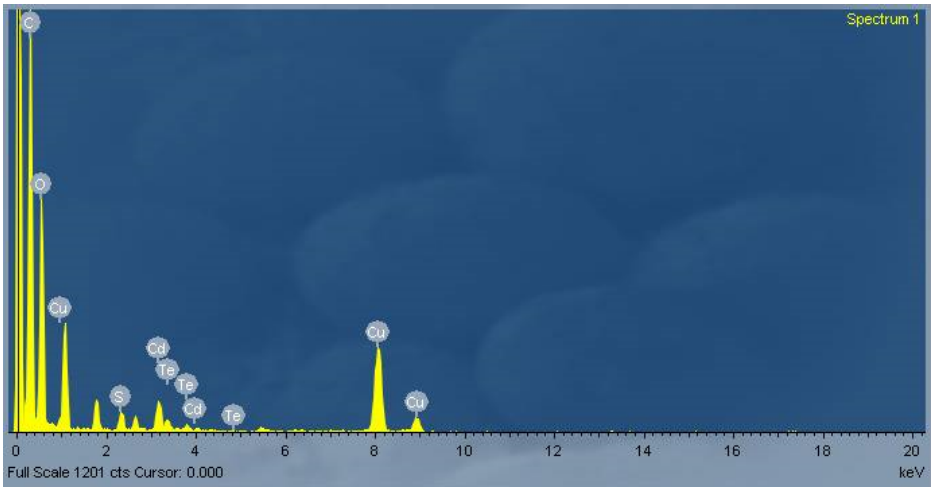

Fig. S9 EDAX profile of synthesized CdTe QDs.

UV-Vis study: Comparative plots showing UV-Vis spectra of curcumin, tryptophan and CT (Fig. S10).

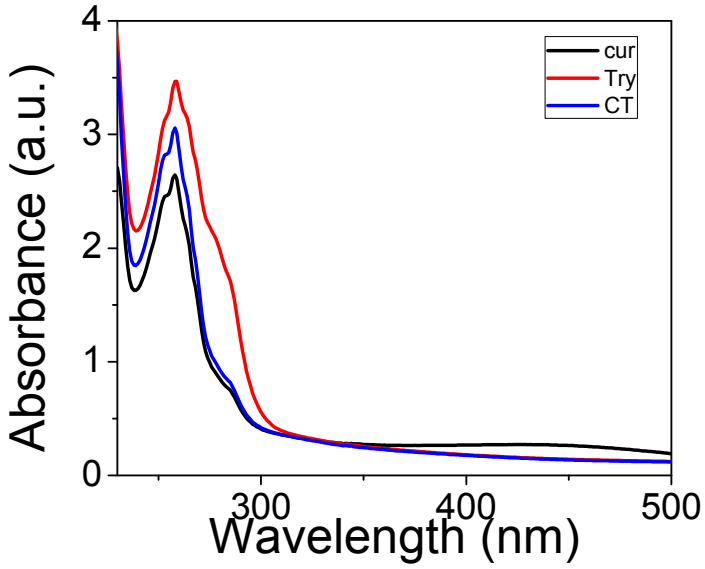

Fig. S10 UV-Vis spectra of curcumin, tryptophan and CT

QDs-CT hybrid interaction with NaCl: The quenching process of QDs with the addition of incremental amounts of CT via electrostatic process was further confirmed by the fluorescence regain of QDs with the addition of 0.001M NaCl solution to the QDs-CT hybrid (Fig. S11)

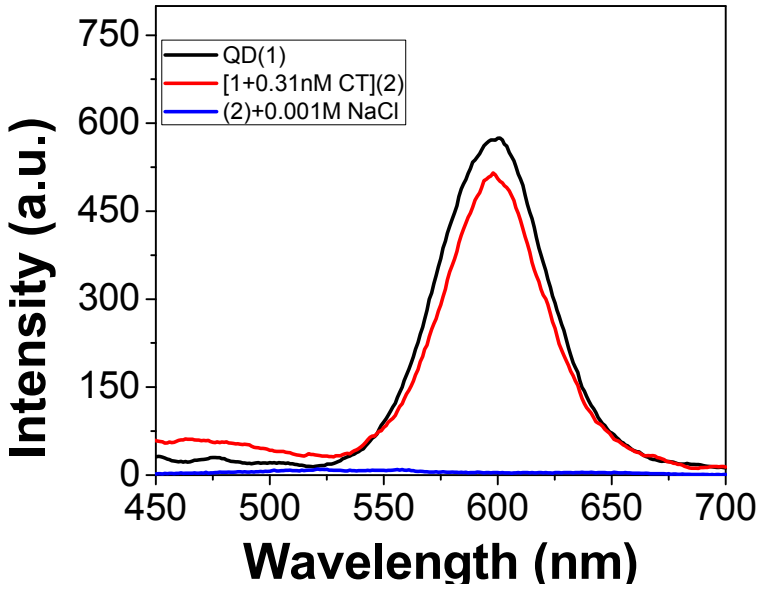

Fig. S11 The PL intensity regain with NaCl

Absence of FRET: The absence of FRET between the fluorophore and the quencher was confirmed by the absence of overlap between the absorbance of acceptor (cationic CT) and PL intensity of donor (QDs) (Fig. S12). Thus, the occurrence of quenching due to FRET is ruled out.

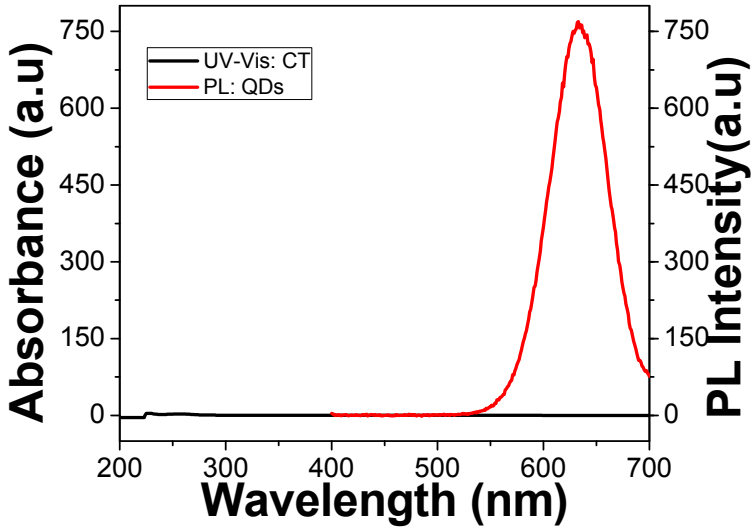

Fig. S12 Absence of FRET process between fluorophore (QDs) and the quencher (Cationic CT)

CV measurements:
Further evidence for DNA sensing via electrostatic interaction is provided by CV measurements. There is variation in oxidation and reduction potentials for QD, QD+CT and QD+CT+DNA [Fig. S13]. Upon addition of DNA to QD-Cationic CT, PL

restoration was observed with blue shift. This blue shift is due to change in band gap which occurs due to detachment of QD from CT with the formation of DNA-CT as depicted from the change in electrode potentials.

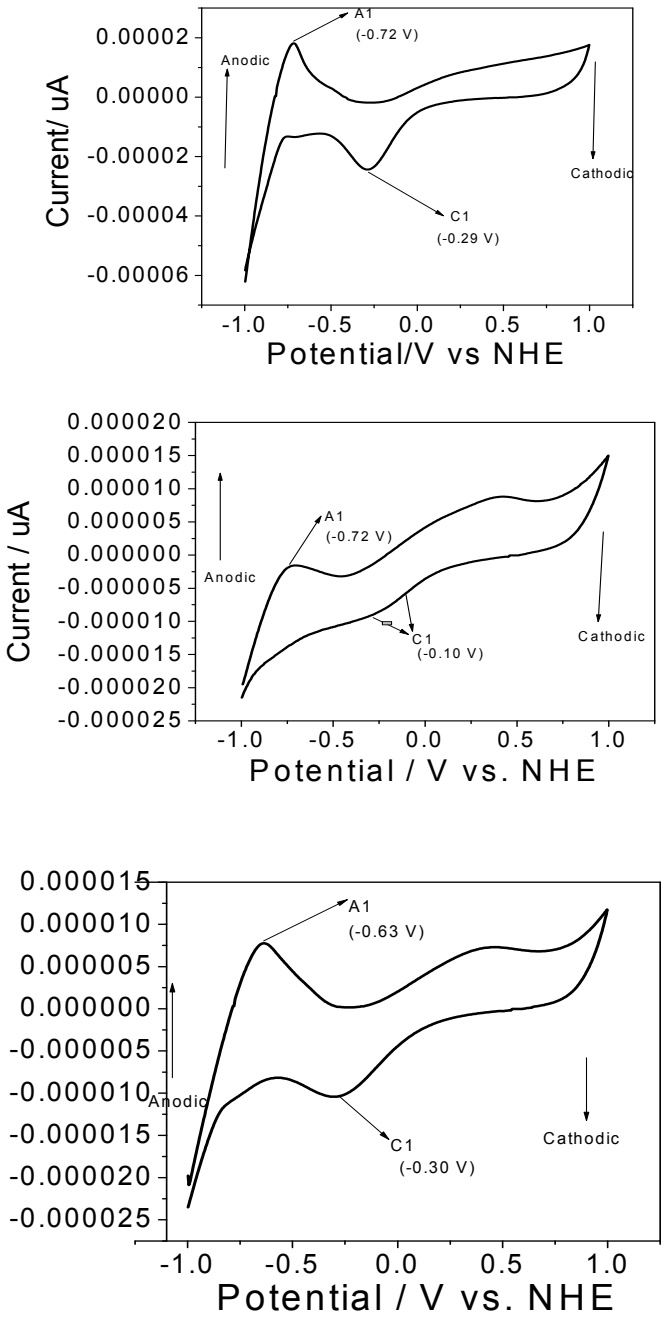

Fig. S13 CV plots of QDs, QDs + CT and QDs + CT + DNA respectively.