Electronic Supplementary Information

Improvisation of luminescent carbon dots and methylene blue NIR-emitting FLIM-FRET pair in niosomes for controlled ROS generation

Arunavo Chatterjee, Ankit Kumar Sharma and Pradipta Purkayastha*

Department of Chemical Sciences and Center for Advanced Functional Materials, Indian Institute of Science Education and Research (IISER) Kolkata, Mohanpur 741246, WB, India.

*Email: ppurkayastha@iiserkol.ac.in

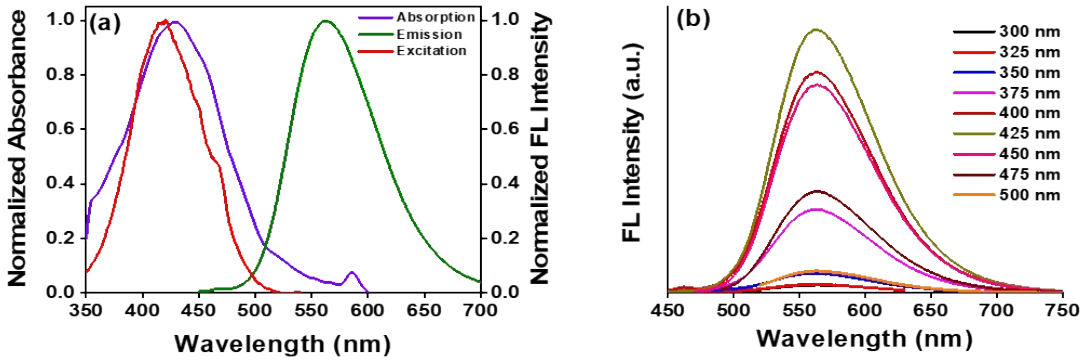

Fig. S1. (a) Absorption, steady state emission (λ_{ex} = 405 nm) and photoluminescence excitation spectra (λ_{em} = 563 nm), and (b) the excitation wavelength independent emission spectra of the YCDs in aqueous medium at 25 °C.

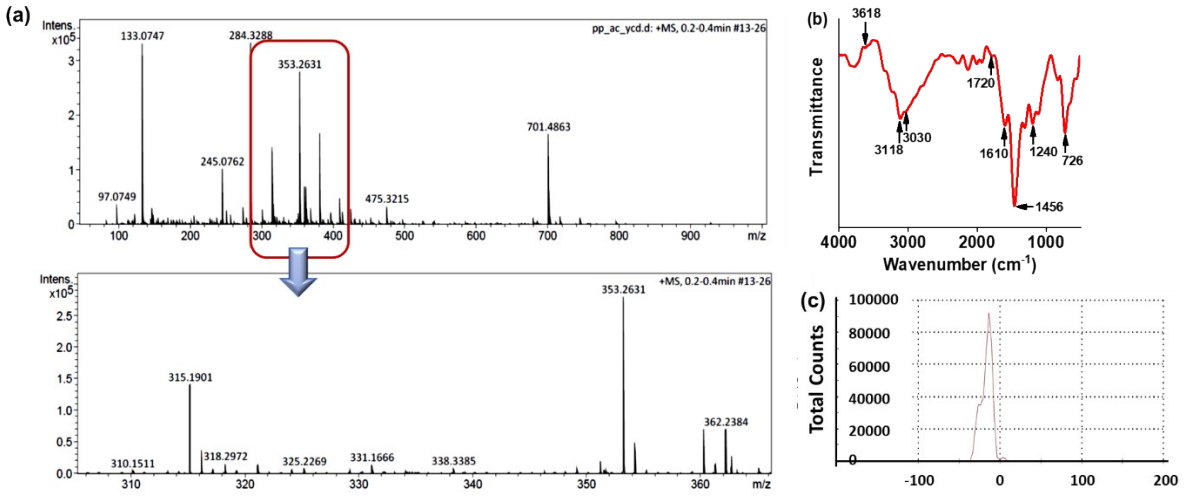

Fig. S2. (a) HRMS of the YCDs (up to m/z 1000) and magnified HRMS of YCDs (m/z 300-400), (b) FTIR spectrum, and (c) the zeta potential of the YCDs in aqueous solution at 25 °C.

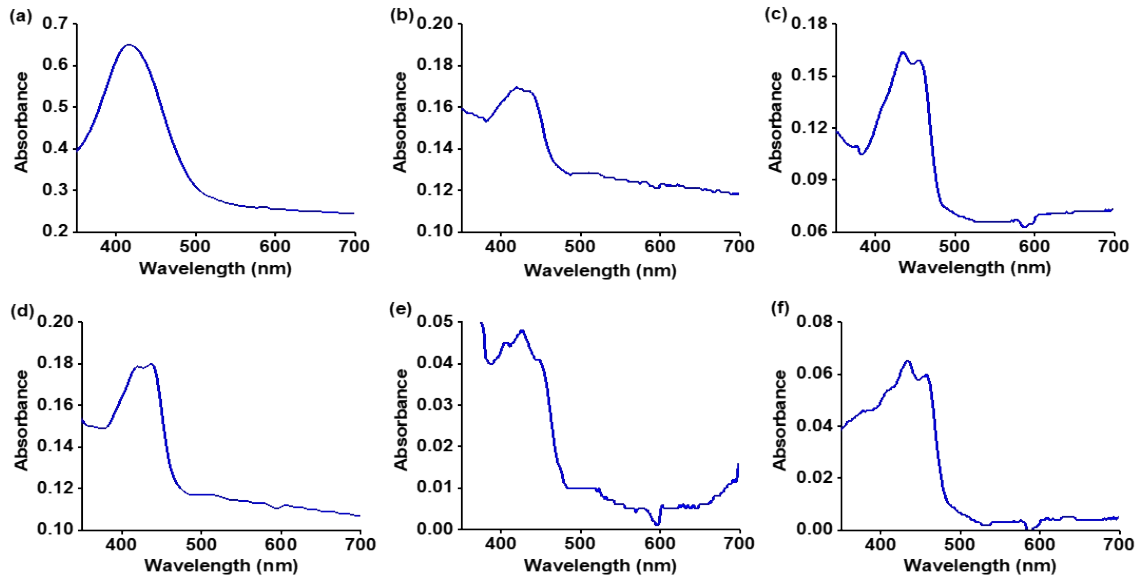

Fig. S3. Absorption spectra of the YCDs in (a) water, (b) acetonitrile, (c) ethanol, (d) acetone, (e) DMSO, and (f) and hexane at 25 °C.

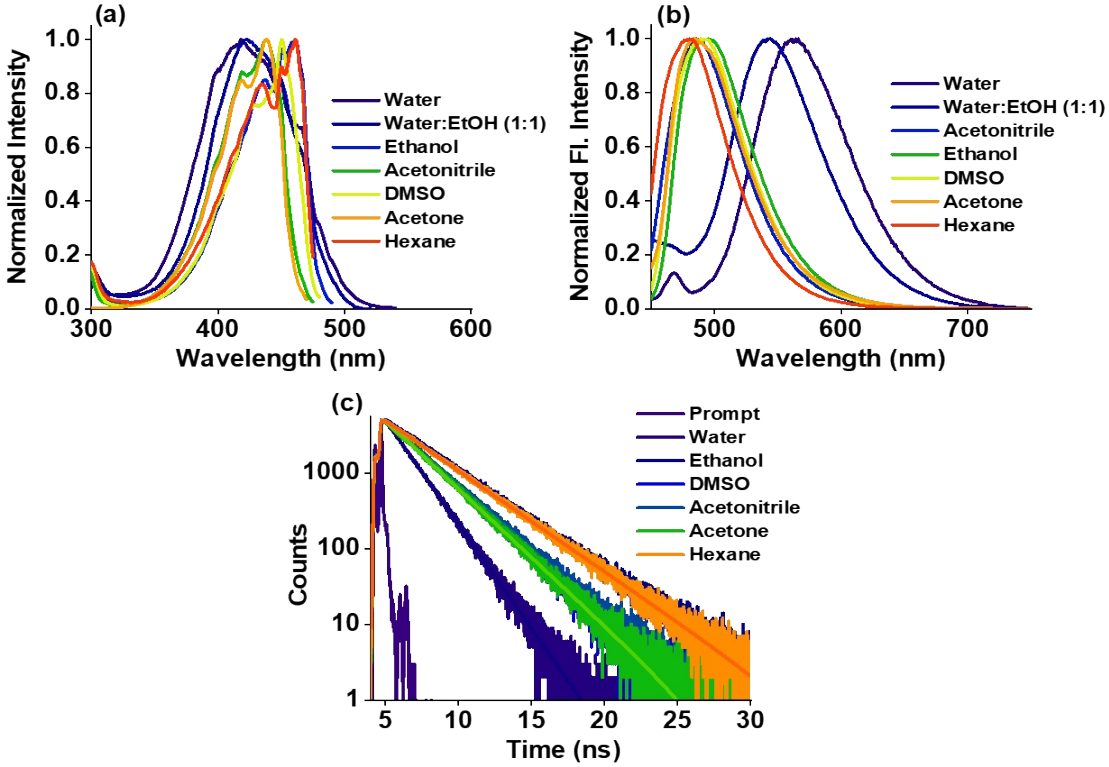

Fig. S4. Normalized (a) excitation (λ_{em} = 563nm), and (b) emission (λ_{ex} = 405 nm) spectra, and (c) the PL decays of the YCDs in different solvents at 25 °C

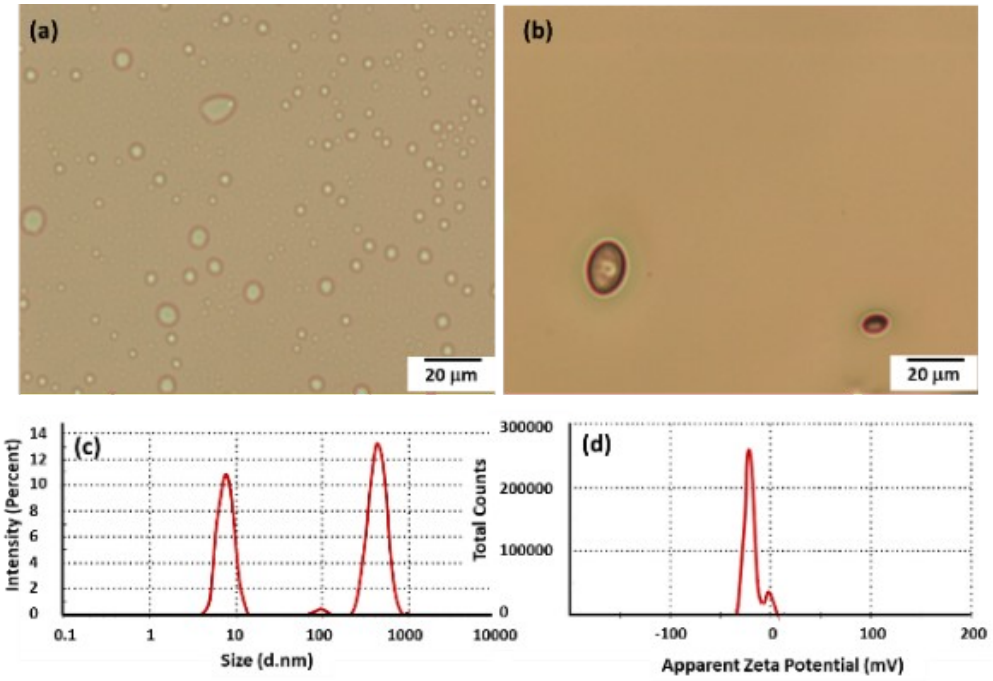

Fig. S5. (a, b) POM images, (c) size distribution (from DLS measurements), and (d) apparent zeta potential of the niosomes

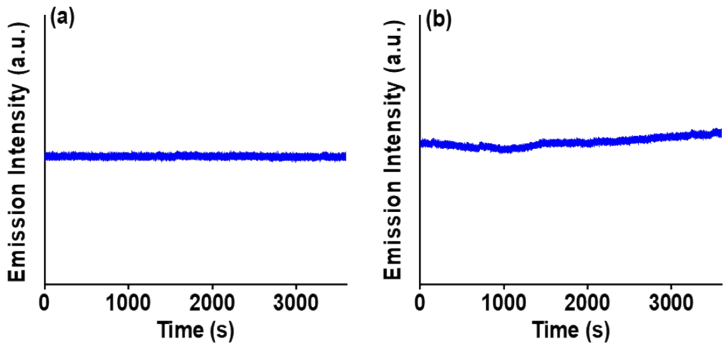

Fig. S6. Photostability of the YCDs in (a) bulk water and (b) niosomes.

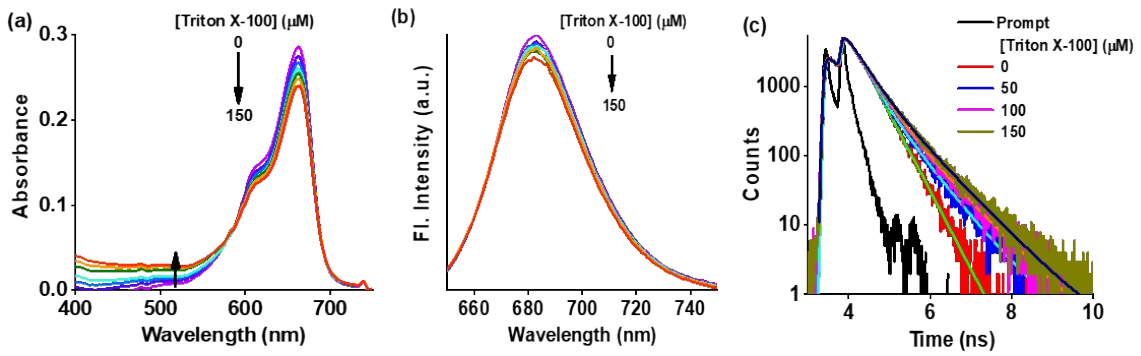

Fig. S7. (a) Changes in the absorption spectrum, and (b) fluorescence spectrum (630 nm excitation) and (c) PL decay of MB (6.25 μM) with gradual addition of niosomes in aqueous medium at 25 °C.

Table S1. Decay parameters of MB in presence of niosomes (λ_{ex} = 630 nm, λ_{em} = 690 nm). Values in the parentheses represent percentage contribution of each component and χ^2 provides the goodness of the fits.

[Triton X-100] (μM)	τ_1 (ps)	τ_2 (ps)	τ_3 (ps)	τ_{av} (ps)	χ^2
0	102 (11)	381 (89)	-		1.20
50	70 (7)	314 (59)	633 (34)	480	1.21
100	104 (11)	363 (63)	761 (26)	538	1.21
150	117 (9)	391 (51)	739 (39)	586	1.07

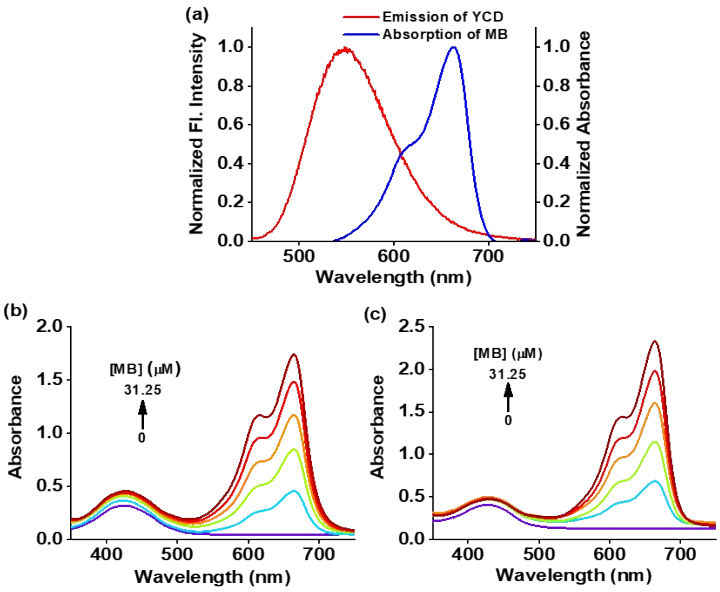

Fig. S8. (a) Overlap of the emission spectrum of YCD with the absorption spectrum of MB in aqueous medium; change in the absorption spectrum of YCD with gradual addition of MB (b) in bulk water and (c) in niosomes.

Table S2. FRET results between the YCDs and the MBs in aqueous solution.

Condition	J (M^{-1} cm^{-1} nm^4)	R_0 (Å)	QY	Efficiency of quenching due to $^1O_2$	Rate constant of quenching due to $^1O_2$ (s^{-1})
Bulk water	8.15×10^{15}	87.04	0.29	34 %	35.17×10^8
in niosomes	9.77×10^{13}	50.38	0.91	30 %	4.72×10^8

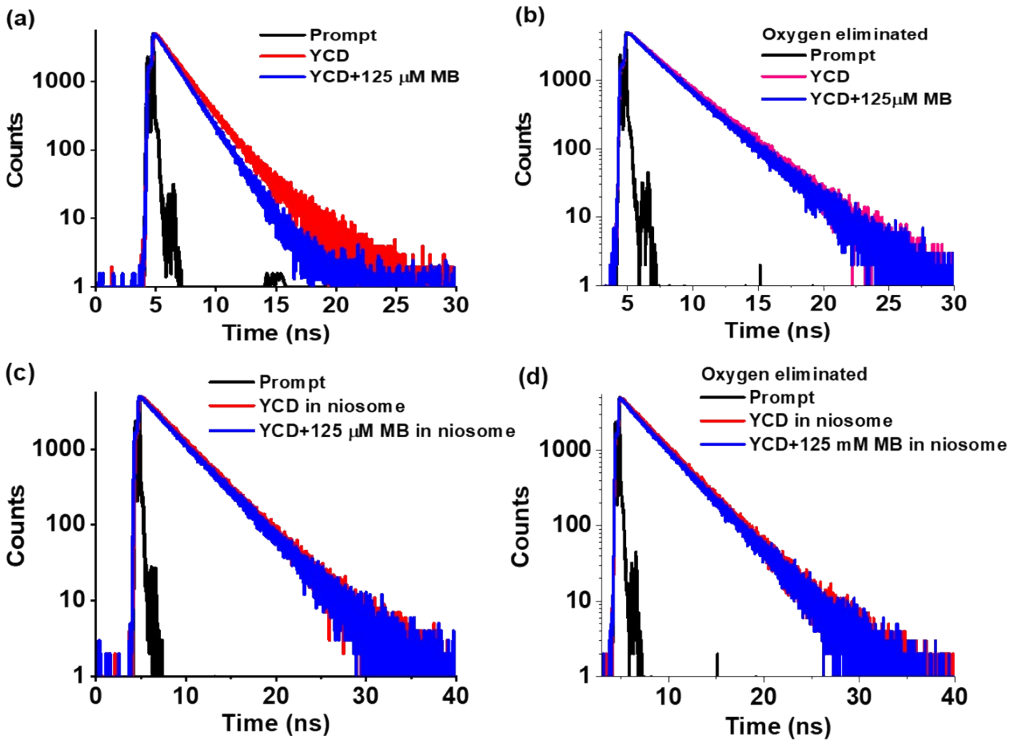

Fig. S9. Decay profiles of YCDs added with 125 μM of MB (a and b) with and without dissolved oxygen in bulk aqueous medium, and (c and d) with and without dissolved oxygen in niosomes.