SUPPLEMENTARY INFORMATION

Effects of Nitrogen-Doping on the Photophysical Properties of Carbon Dots

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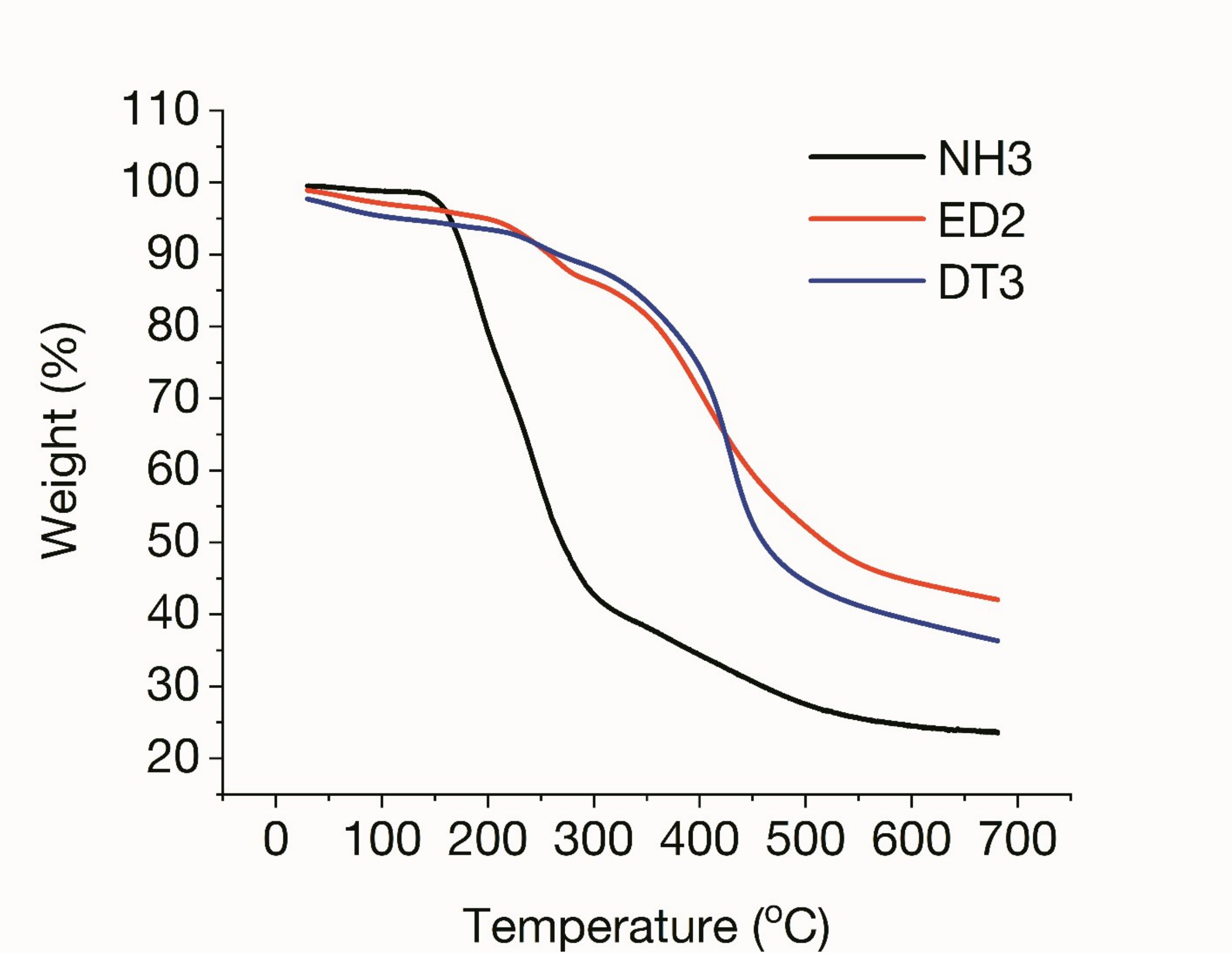

Fig. S1 Thermogravimetric analysis of amino-passivated CDs. ED2- and DT3-CDs exhibit excellent thermal stability up to ~300 ^{o}C, with a maximal weight loss of 11%. Conversely, for NH_3-CDs, we note a sharp onset of thermal instability for NH_3 at 160 ^{o}C.

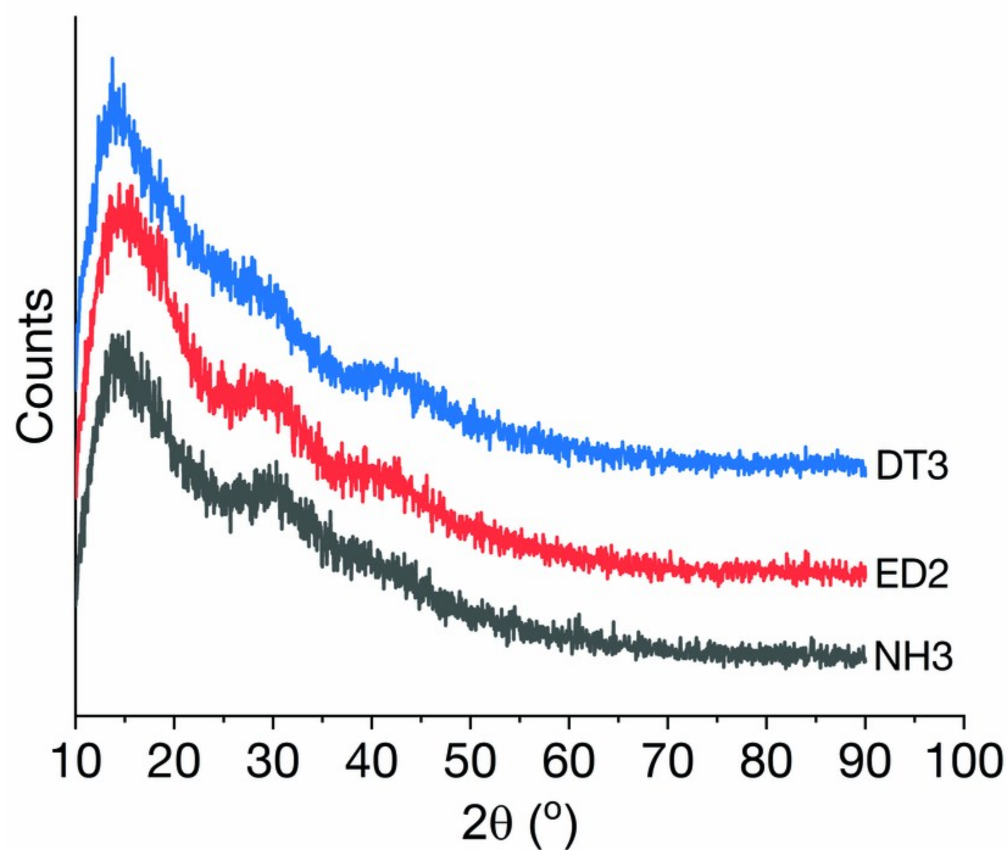

Fig. S2 X-ray diffraction patterns for CDs synthesized using 500 mM citric acid and 375 mM of the passivating agent at a reaction temperature of 210 ^{o}C. The X-ray patterns reveal that the CDs are amorphous.

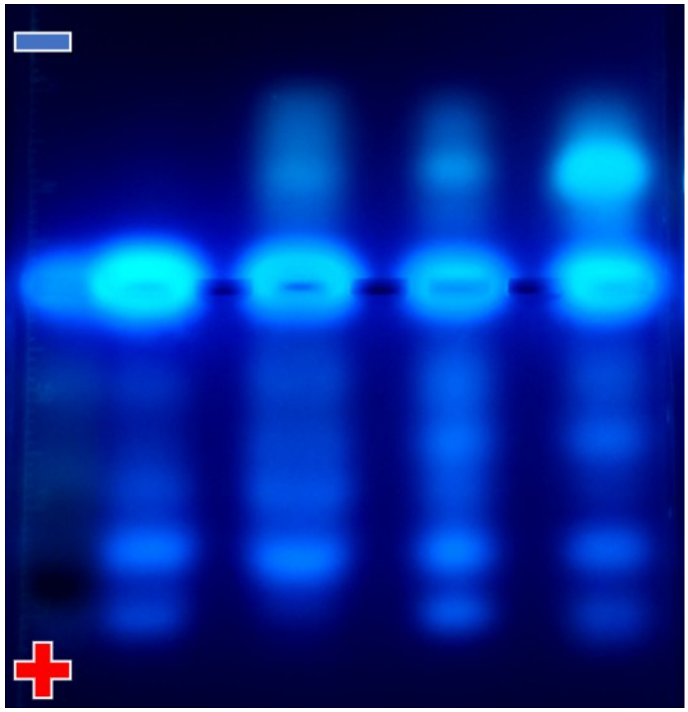

Fig. S3 Agarose gel electrophoresis image of DT3-passivated CDs synthesized at 210 ^{o}C using 125 – 750 mM DT3 and visualised under 365 nm light. The positive and negative poles are marked on the top and bottom left corner of the image. The wells in the gel contain, from left to right, DT3-CDs synthesized using 125, 250, 375, 500 and 750 mM DT3 passivating agent, respectively. The results indicate that at higher DT3 concentrations, the proportion of positively-charged CDs progressively increases.

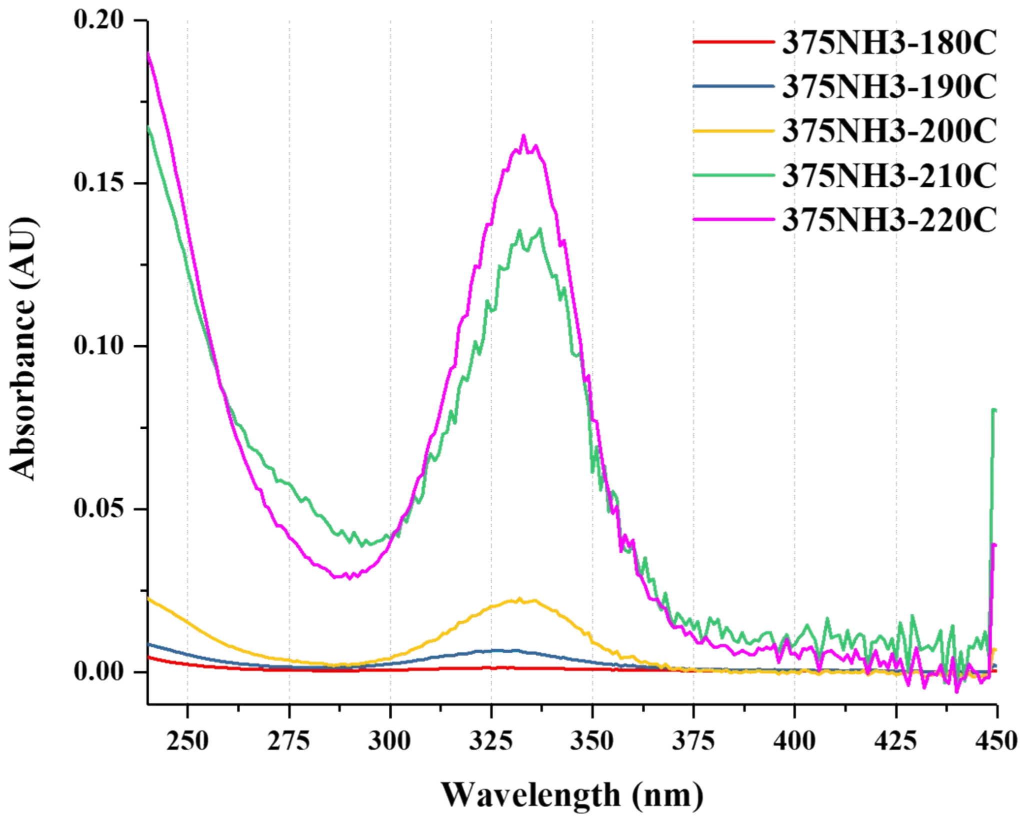

Fig. S4 UV-Vis absorbance spectra of NH_3-passivated CDs. All CDs were synthesized for 10 minutes using 500 mM citric acid with 375 mM NH_3 at 180, 190, 200, 210 and 220 ^{o}C.

Fig. S5 UV-Vis absorbance spectra of ethylenediamine-passivated CDs. All CDs were synthesized for 10 minutes using 500 mM citric acid with: (A) 375 mM ethylenediamine at 180, 190, 200, 210 and 220 ^{o}C, (B) 125, 250, 375, 500 and 750 mM ethylenediamine at 220^{o}C (data normalized to 16 µg/mL).

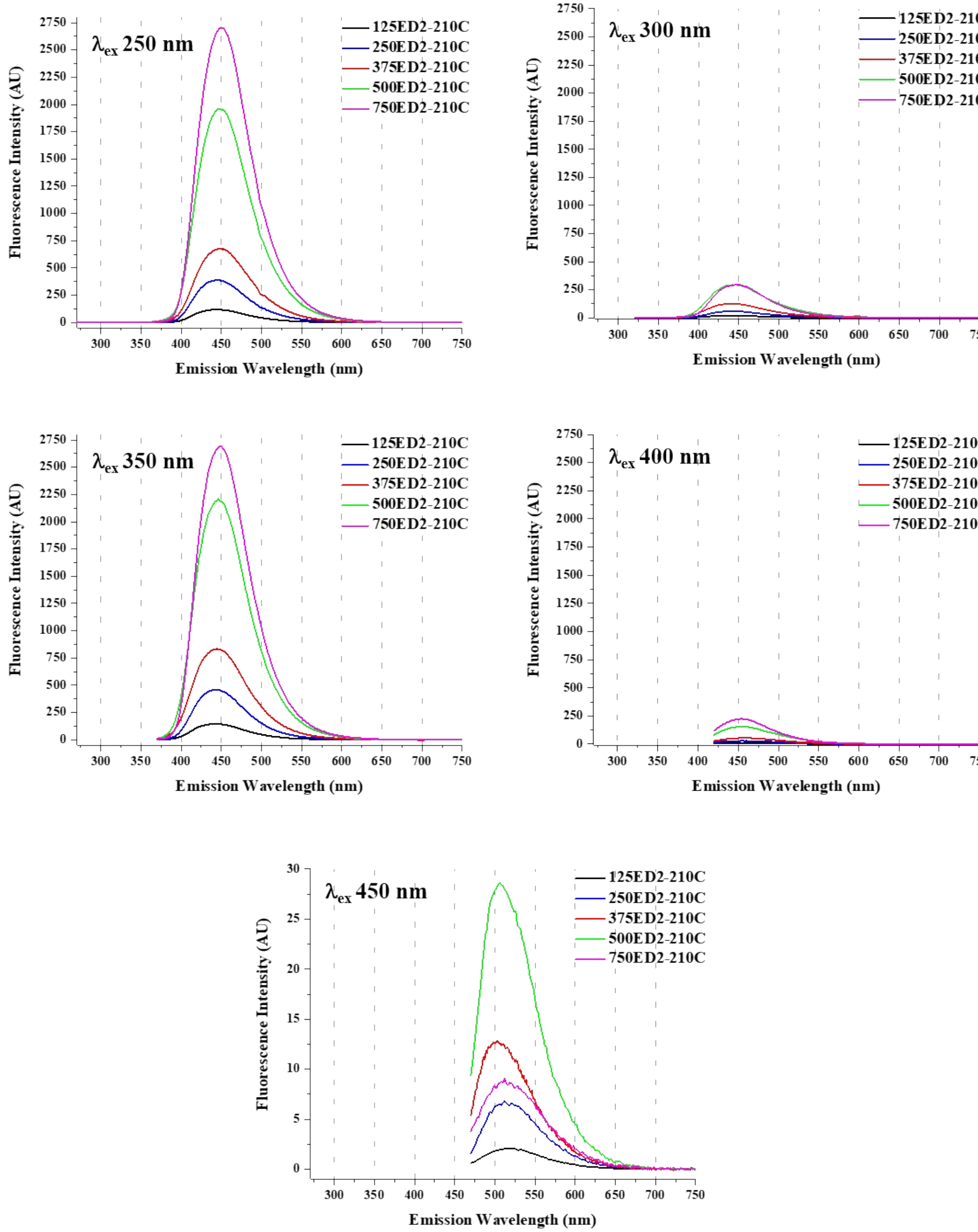

Fig. S6 Steady state fluorescence spectra of ED2-passivated CDs**.** All CDs were synthesized for 10 minutes at 210 °C using 500 mM citric acid with 125, 250, 375, 500 and 750 mM ED2 (data normalized to 16 μg/mL).

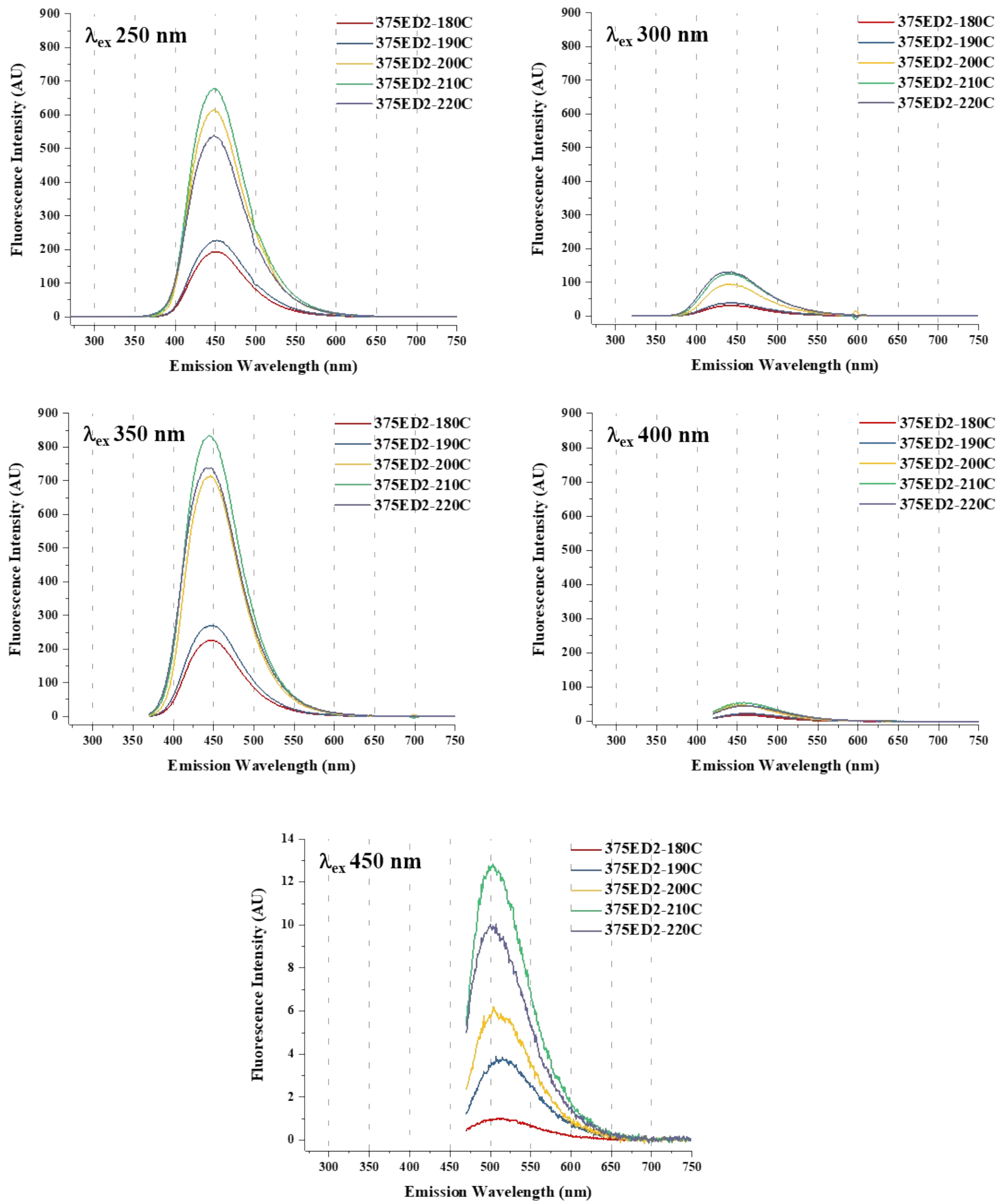

Fig. S7 Steady state fluorescence spectra of ED2-passivated CDs. All CDs were synthesized for 10 minutes at 180, 190, 200, 210 and 220 ^{o}C using 500 mM citric acid with 375 mM ED2 (data normalized to 16 μg/mL).

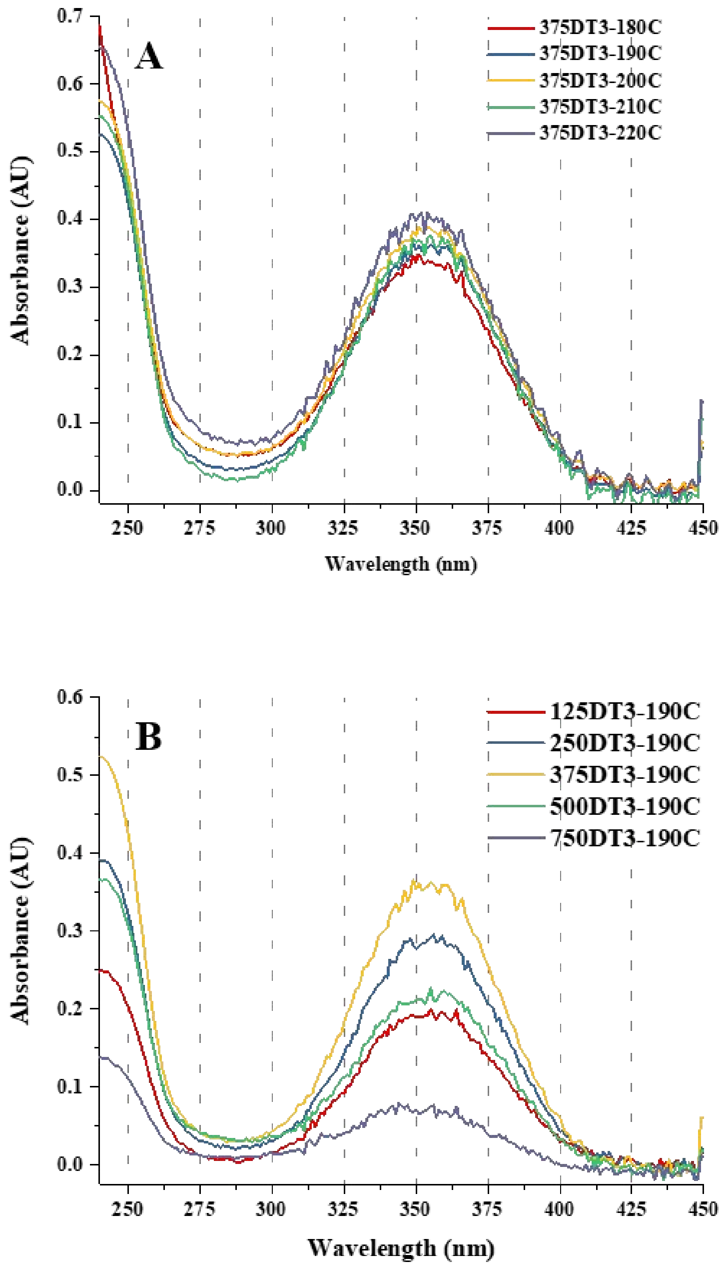

Fig. S8 UV-vis absorbance spectra of DT3-passivated CDs. All CDs were synthesized for 10 minutes using 500 mM citric acid with (A) 375 mM DT3 at 180, 190, 200, 210 and 220 ^{o}C, (B) 125, 250, 375, 500 and 750 mM DT3 at 190 ^{o}C (data normalized to 16 μg/mL).

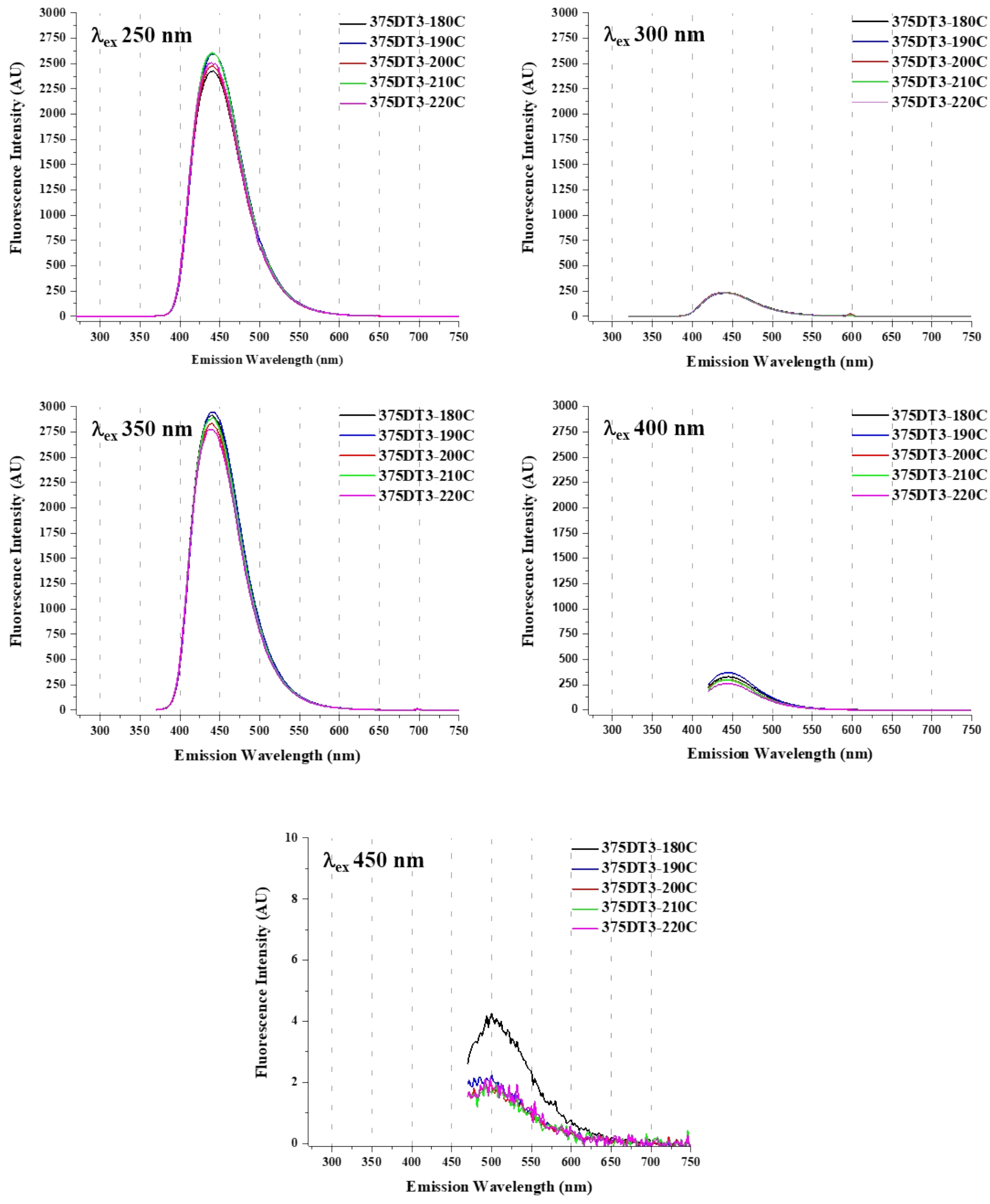

Fig. S9 Steady state fluorescence spectra of DT3-passivated CDs. All CDs were synthesized for 10 minutes at 180, 190, 200, 210 and 220 °C, using 500 mM citric acid with 375 mM DT3 (data normalized to 16 μg/mL).

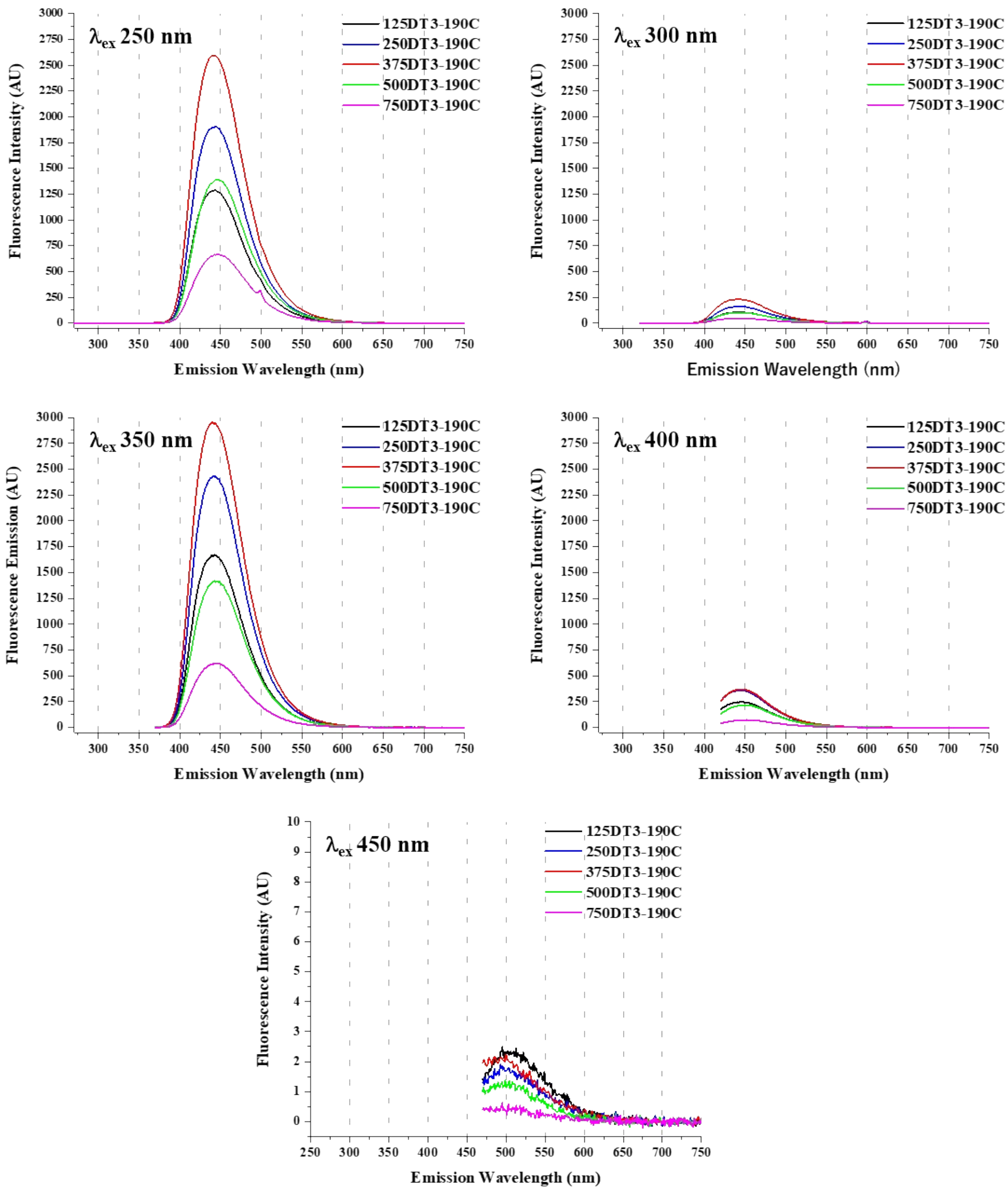

Fig. S10 Steady state fluorescence spectra of DT3-passivated CDs. All CDs were synthesized for 10 minutes at 190 °C using 500 mM citric acid with 125, 250, 375, 500 and 750 mM DT3 (data normalized to 16 µg/mL).

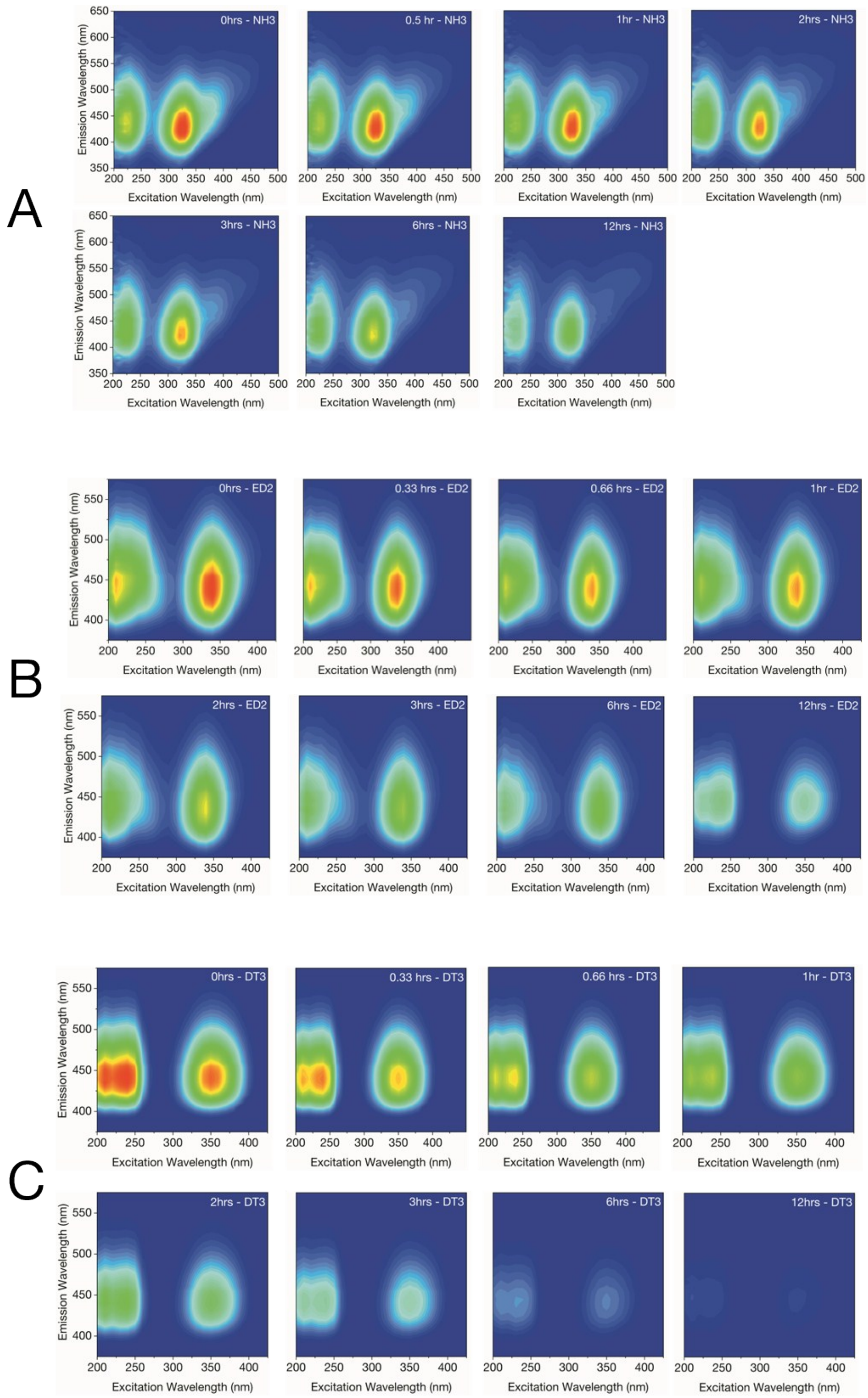

Fig. S11 Time-based CD photobleaching experiment upon exposure at 365 nm. Fluorescence contour plots are shown for times 0, 0.33, 0,5, 0.66, 1, 2, 3, 6, and 12 hours (left to right) for (A) NH_3-CDs, (B) ED2-CDs and (C) DT3-CDs. The contour plots exhibit the loss in fluorescence intensity for each CD system following timed exposure to 365 nm UV light, with NH_3-CDs being most resistant to photobleaching, then ED2-CDs and finally DT3-CDs.

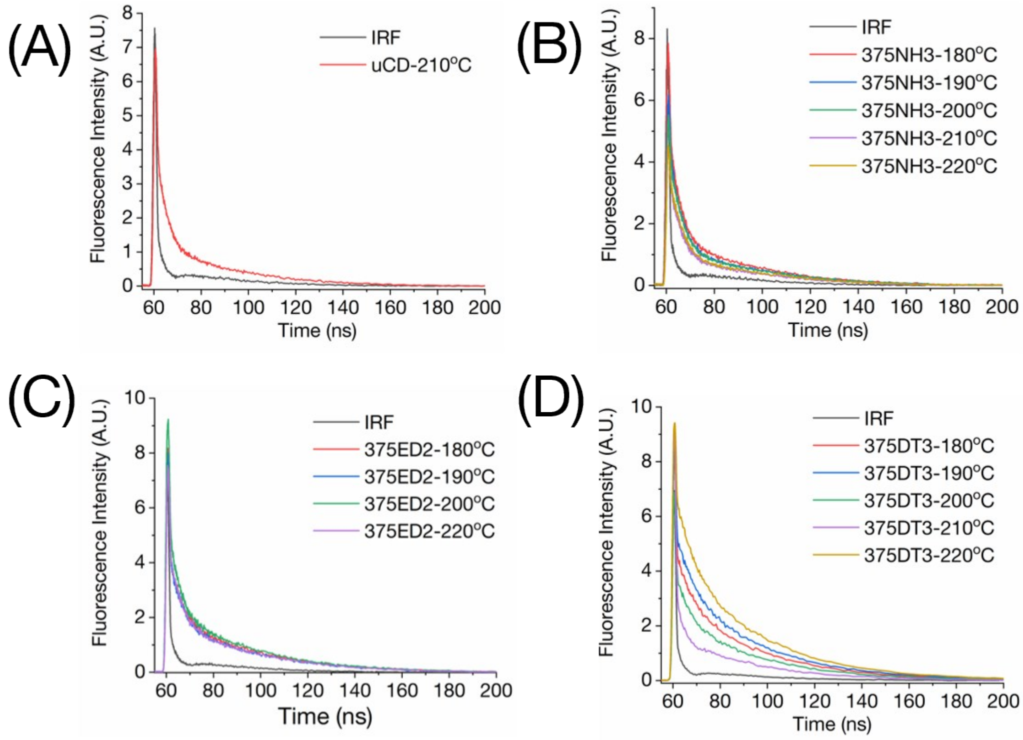

Fig. S12 Fluorescence lifetime data plots for uCD and amine-passivated CDs synthesized using 375 mM passivating agent, at temperatures from 180 – 220 °C. (A) uCD; (B) NH_3-CDs; (C) ED2-CDs; (D) DT3-CDs.

Table S1 Tabulated volumes required to prepare 4 mL of 125, 250, 375, 500 and 750 mM amine-passivating agent. Each sample contains 500 mM citric acid.

Passivating Agent	Passivating Agent Concentration (mM)				
	125	250	375	500	750
	Total Volume of Passivating Agent in 4 mL of Reaction Mixture (μL)				
NH_3	34	69	103	138	206
ED2	34	67	100	134	200
DT3	54	108	162	216	324

Table S2 Fluorescence lifetime properties of aqueous suspensions of uCD, NH_3- and polyamine-passivated carbon dots synthesized using 500 mM citric acid and 375 mM passivating agent at 180, 190, 200, 210 and 220 ^{o}C. The fluorescence data was fitted to a 2-component decay system.

CD Type	τ_1 (ns)		Population 1 (%)		τ_2 (ns)		Population 2 (%)		χ^2
uCD-210C	**0.3012**	±9.7891e-3	**91.2**	±2.9560%	**5.7210**	±6.5937e-2	**8.8**	±0.0687%	1.086
375NH3-180C	**0.4029**	±2.3598e-2	**86.6**	±4.1860%	**5.7170**	±1.3228e-1	**13.4**	±0.1727%	1.024
375NH3-190C	**0.4146**	±7.5880e-4	**81.6**	±0.1560%	**5.5580**	±4.6432e-3	**18.4**	±0.0143%	1.118
375NH3-200C	**0.3673**	±3.3595e-2	**79.8**	±6.8530%	**5.4960**	±9.8743e-2	**20.2**	±0.2188%	0.881
375NH3-210C	**0.3254**	±5.5024e-3	**79.1**	±1.3720%	**5.2900**	±2.2494e-2	**20.9**	±0.0949%	1.489
375NH3-220C	**0.4971**	±4.8880e-2	**75.8**	±6.2970%	**5.4000**	±1.6131e-1	**24.2**	±0.3802%	0.955
375ED2-180C	**0.2168**	±2.1277e-2	**94.3**	±8.7170%	**8.0680**	±1.0029e-1	**5.7**	±0.0411%	0.981
375ED2-190C	**0.2312**	±3.4104e-4	**93.1**	±0.1520%	**7.5390**	±5.5115e-3	**6.9**	±0.0050%	1.065
375ED2-200C	**0.2976**	±1.8108e-2	**92.0**	±5.2620%	**7.4710**	±9.2560e-2	**8.1**	±0.0733%	0.915
375ED2-210C	**0.3406**	±3.1448e-2	**94.2**	±10.3500%	**7.1220**	±9.5495e-2	**5.8**	±0.0654%	1.218
375ED2-220C	**0.2614**	±1.6011e-2	**91.5**	±5.3350%	**7.1290**	±7.7469e-2	**8.5**	±0.0566%	1.031
375DT3-180C	**0.3001**	±7.7830e-4	**89.4**	±0.1985%	**11.4000**	±6.8647e-3	**10.6**	±0.0065%	2.069
375DT3-190C	**0.2893**	±7.7435e-4	**88.0**	±0.2091%	**12.0800**	±7.2093e-3	**12.0**	±0.0059%	2.359
375DT3-200C	**0.2766**	±2.5180e-2	**91.1**	±7.7230%	**11.3200**	±1.6233e-1	**8.9**	±0.0887%	1.592
375DT3-210C	**0.3210**	±5.8865e-4	**96.6**	±0.1381%	**11.2900**	±1.1086e-2	**3.4**	±0.0032%	2.061
375DT3-220C	**0.3992**	±8.4451e-4	**82.0**	±0.1711%	**12.3200**	±6.7195e-3	**18.0**	±0.0075%	2.243