Electronic Supplementary Information

Tunable wavelength of fluorescence and afterglow in super-bright carbon dot-based composite materials

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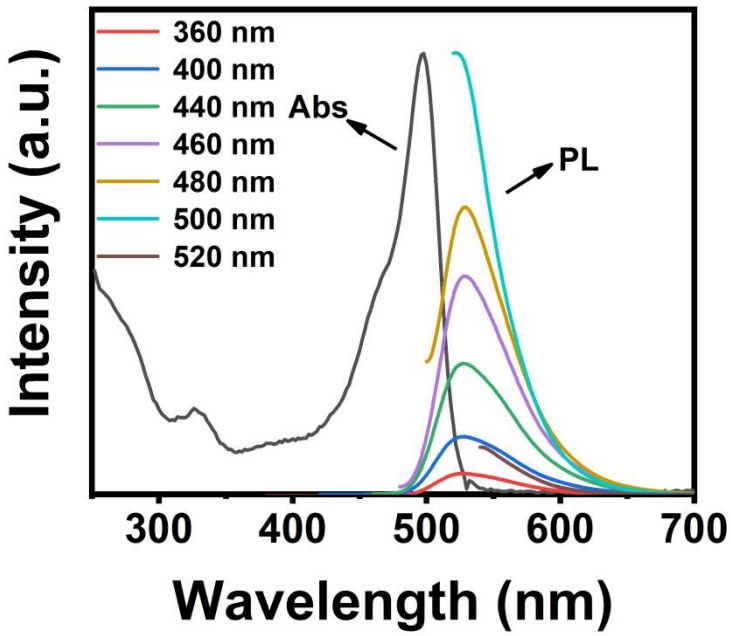

Fig S1. The absorption and photoluminescence spectrum of the dilute solution of G-CDs.

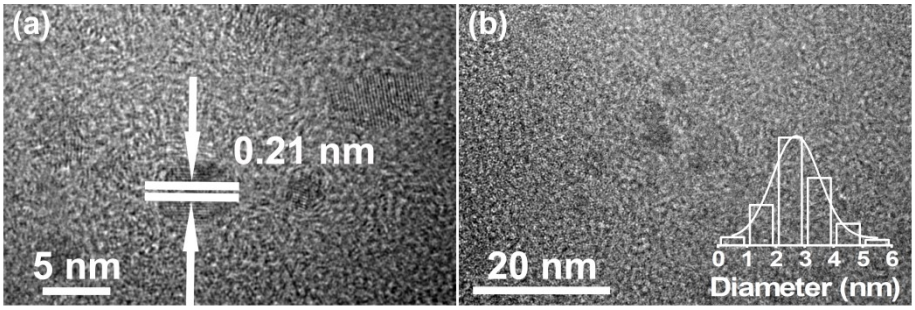

Fig S2. a) TEM and b) HRTEM images of G-CDs, with the inset illustrating the size distribution of G-CDs.

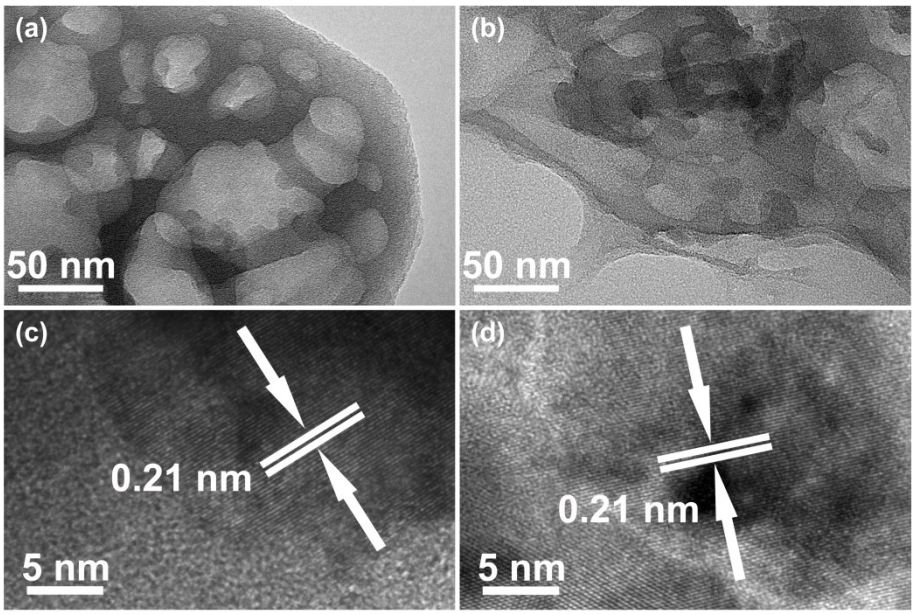

Fig S3. TEM images of a) G@BU-3 and b) G@Urea. HRTEM images of c) G@BU-3 and d) G@Urea.

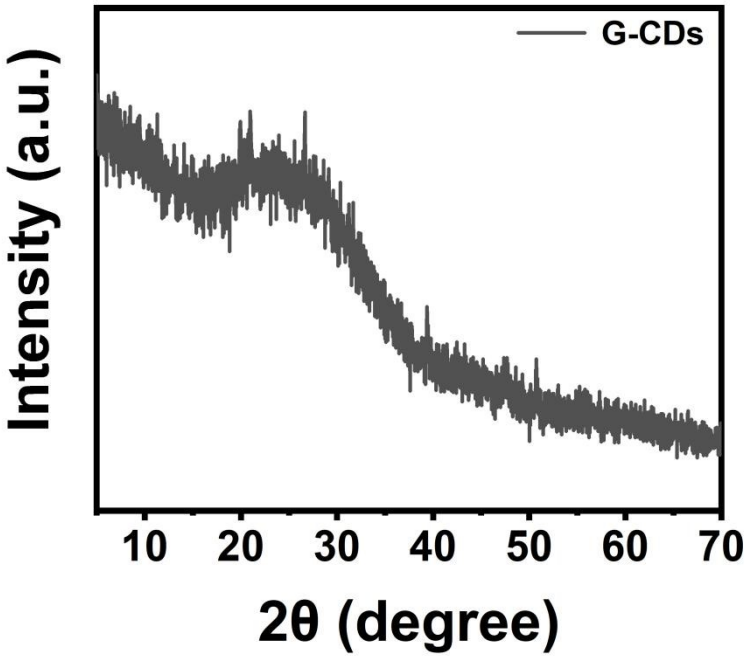

Fig S4. XRD of G-CDs.

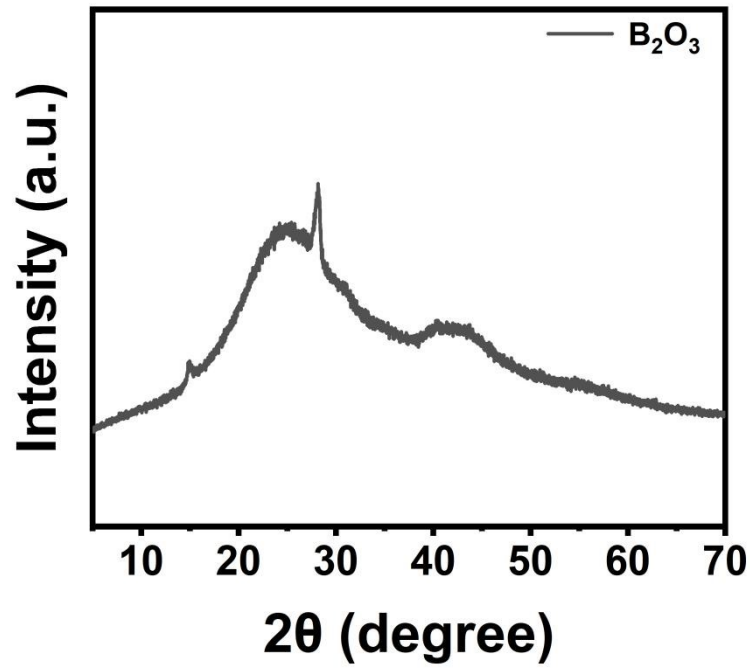

Fig S5. XRD of B_2O_3.

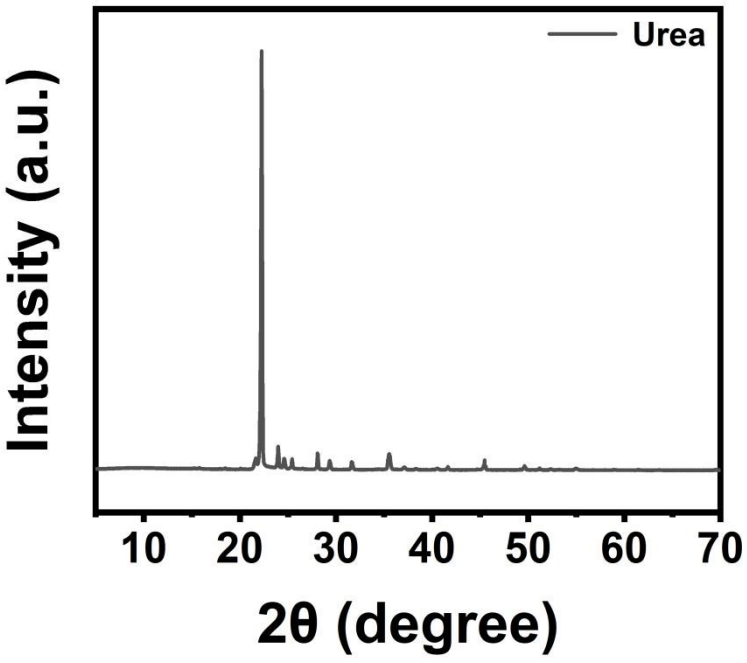

Fig S6. XRD of urea.

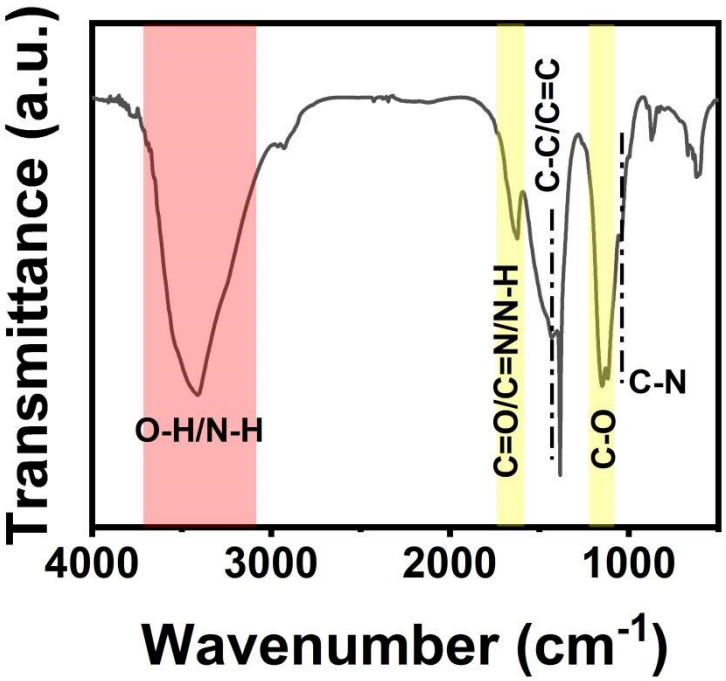

Fig S7. FT-IR of G-CDs.

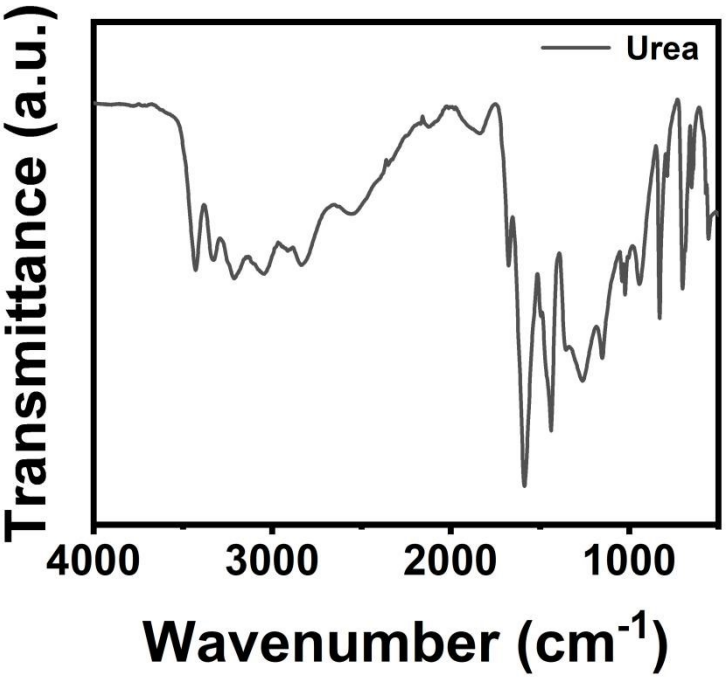

Fig S8. FT-IR of urea.

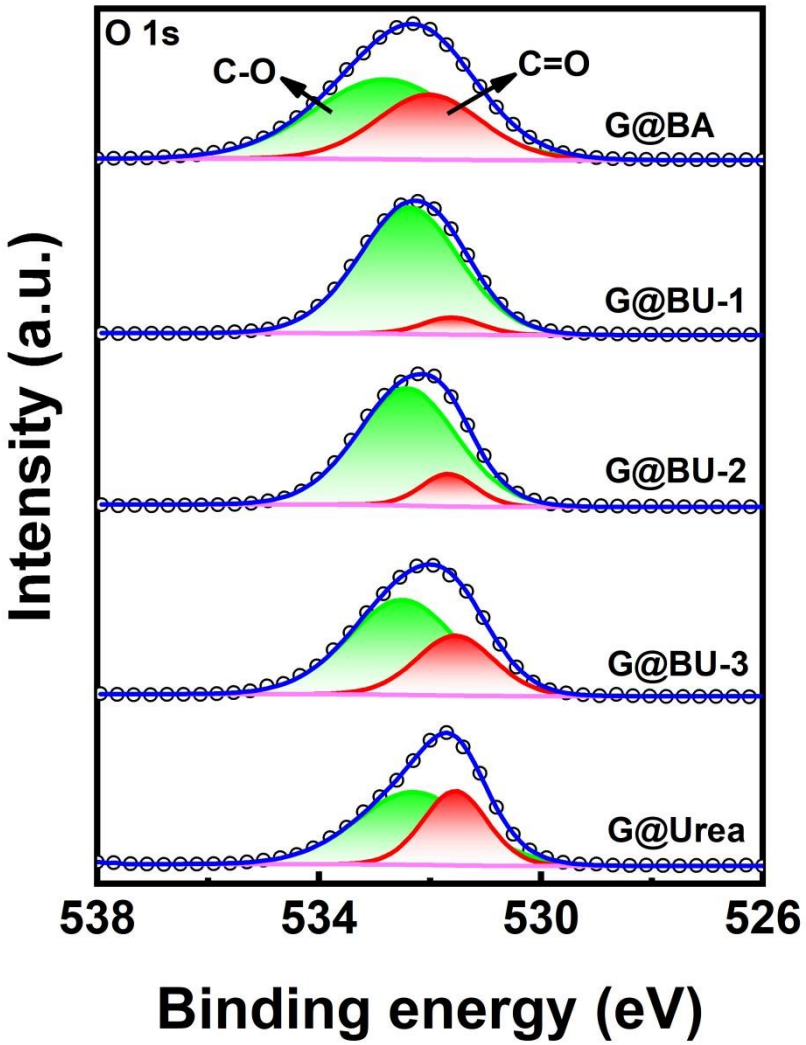

Fig S9. O 1s results of G@BA, G@BU-1, G@BU-2, G@BU-3, and G@Urea.

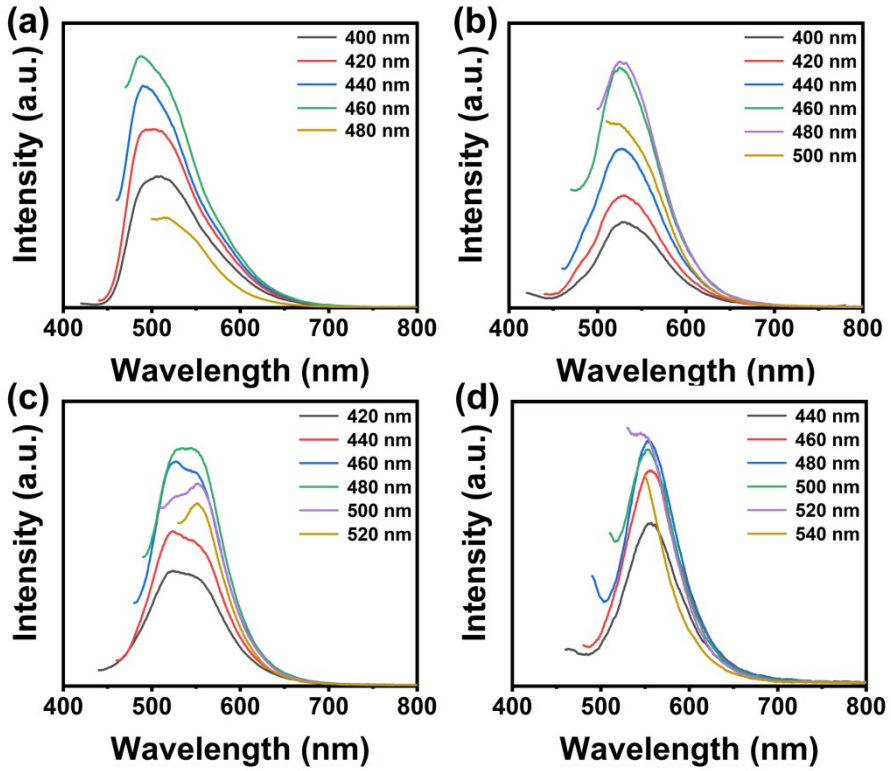

Fig S10. Solid-state fluorescence spectra of a) G@BA, b) G@BU-1, c) G@BU-3, and d) G@Urea.

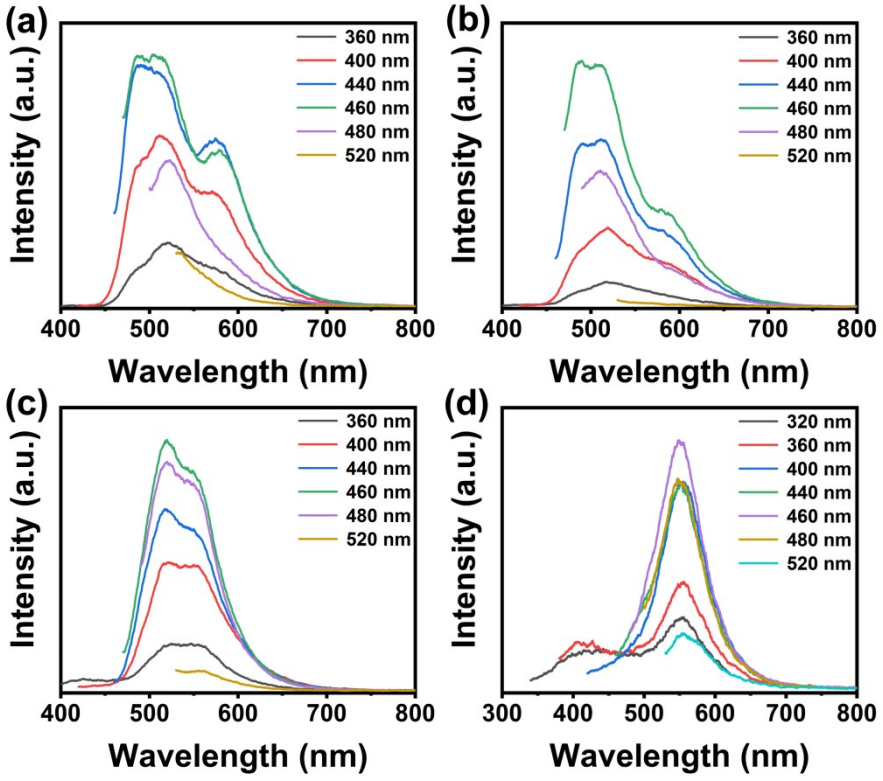

Fig S11. Afterglow spectra of a) G@BA, b) G@BU-1, c) G@BU-3, and d) G@Urea.

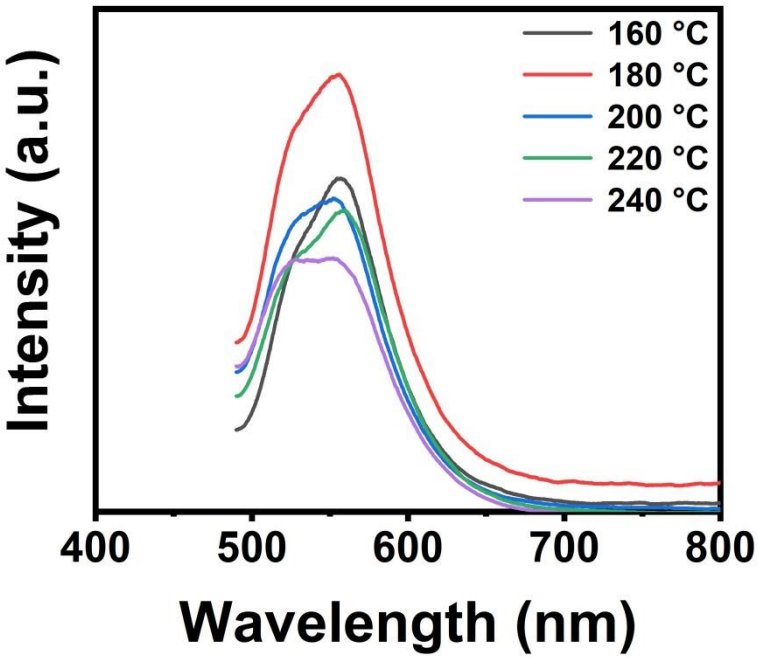

Fig S12. G@BU-2 was obtained through reactions at different temperatures, and they were excited at 480 nm to obtain solid-state fluorescence spectra.

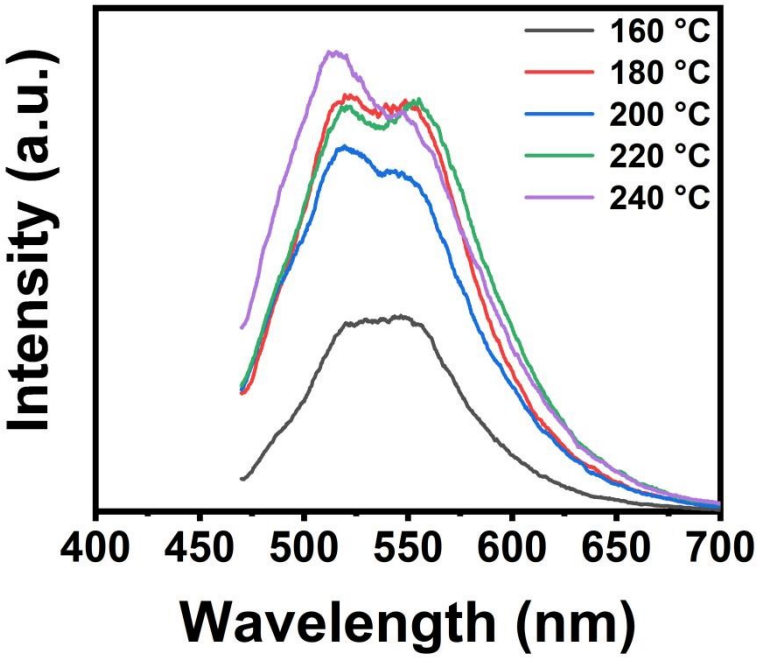

Fig S13. G@BU-2 was obtained through reactions at different temperatures, and they were excited at 460 nm to obtain afterglow spectra.

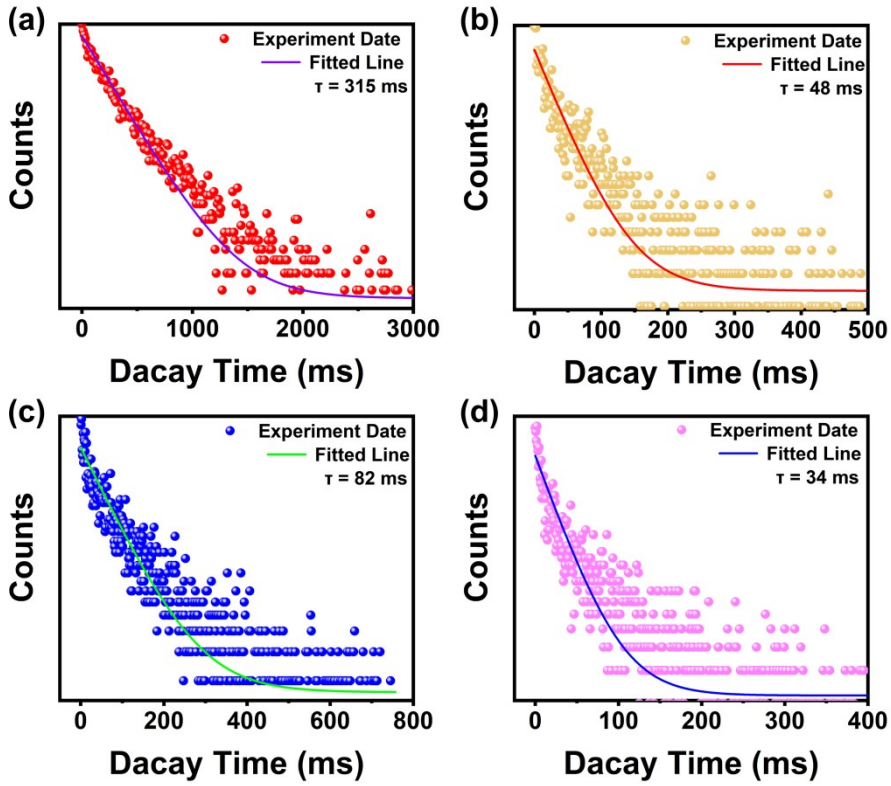

Fig S14. The afterglow decay curves corresponding to the emission centers of (a) G@BA, (b) G@BU-1, (c) G@BU-3, and (d) G@Urea.

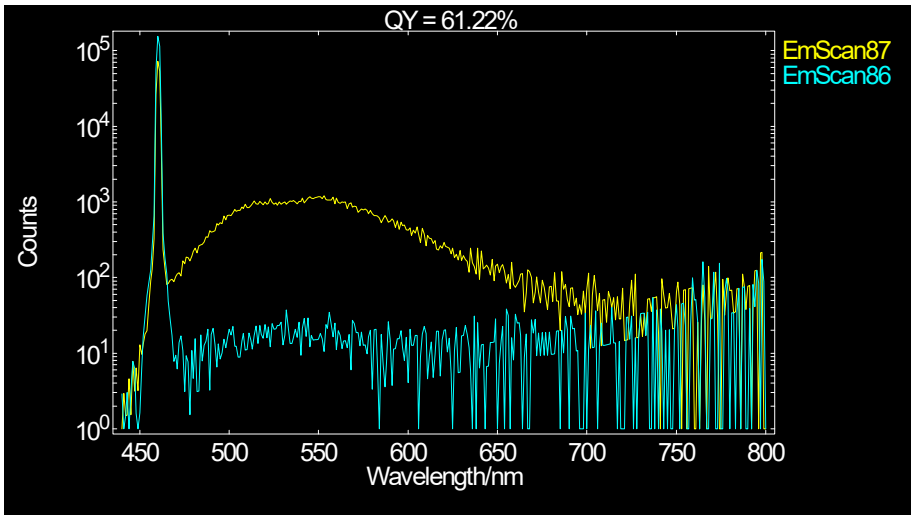

Fig S15. QY of G@BU-2 under excitation at 460nm.

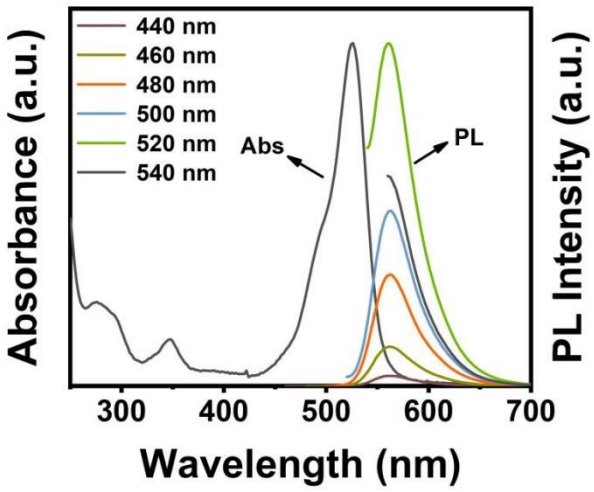

Fig S16. Absorption spectra and liquid fluorescence spectra of Rhodamine 6G

Table S1. The peak area ratio of chemical bonds in C 1s of G@BA, G@BU-1, G@BU-2, G@BU-3 and G@Urea.

C 1s	G@BA	G@BU-1	G@BU-2	G@BU-3	G@Urea
C=C/C-C (%)	29.72	66.3	64	48.29	46.89
C-O/C-N (%)	63.47	22.83	17.57	15.9	9.4
C=O/C=N (%)	6.81	10.87	18.43	35.81	43.71

Table S2. The peak area ratio of chemical bonds in N 1s of G@BA, G@BU-1, G@BU-2, G@BU-3 and G@Urea.

N 1s	G@BA	G@BU-1	G@BU-2	G@BU-3	G@Urea
-NH (%)	84.6	57.23	19.61	45.02	33.07
C-N (%)	15.4	42.77	80.39	54.98	66.93

Table S3. The peak area ratio of chemical bonds in B 1s of G@BA, G@BU-1, G@BU-2, G@BU-3 and G@Urea.

B 1s	G@BA	G@BU-1	G@BU-2	G@BU-3	G@Urea
B_2O_3 (%)	63.46	21	14.49	8.16	NA
BCO_2 (%)	36.54	66.76	69.83	83.16	NA
B-N (%)	NA	12.24	15.68	8.68	NA

Table S4. Elemental proportions of G@BA, G@BU-1, G@BU-2, G@BU-3, and G@Urea.

	O (%)	N (%)	C (%)	B (%)

G@BA	57.07	0.83	7.8	34.3
G@BU-1	43.15	6.66	28.28	21.91
G@BU-2	33.57	9.48	45.87	11.08
G@BU-3	32.87	19.63	35.39	12.1
G@Urea	23.29	25.66	51.06	0

Table S5. The summary of G@BA, G@BU-1, G@BU-2, G@BU-3, and G@Urea phosphorescent lifetimes.

Sample	τ_1 (ms)	%	τ_{avg} (ms)	X^2
G@BA	315	100	315	0.9777
G@BU-1	48	100	48	0.9063
G@BU-2	94	100	94	1.0043
G@BU-3	82	100	82	0.9107
G@Urea	34	100	34	0.8965