Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

Bright tricolor ultrabroad-band emission carbon dots for white light-emitting diodes with a 96.5 high color rendering index

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List of Contents

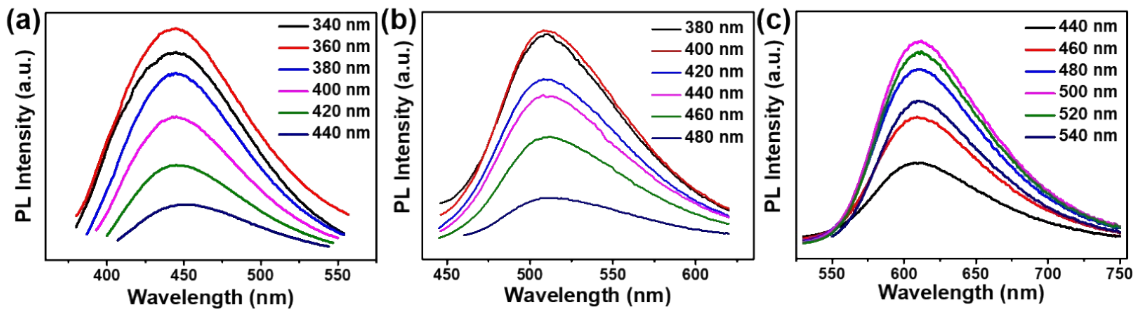

Fig. S1. PL spectra of B- (a), G- (b), and R-CDs (c) recorded upon excitation at different wavelengths.

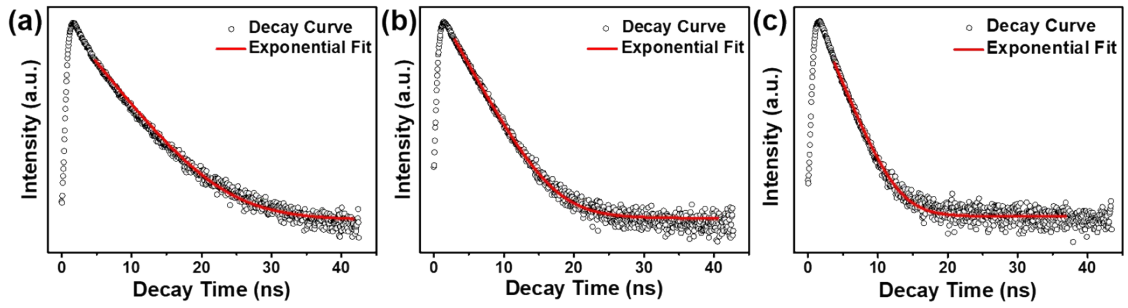

Fig. S2. Time-resolved PL spectra of B- (a), G- (b), and R-CDs (c), respectively.

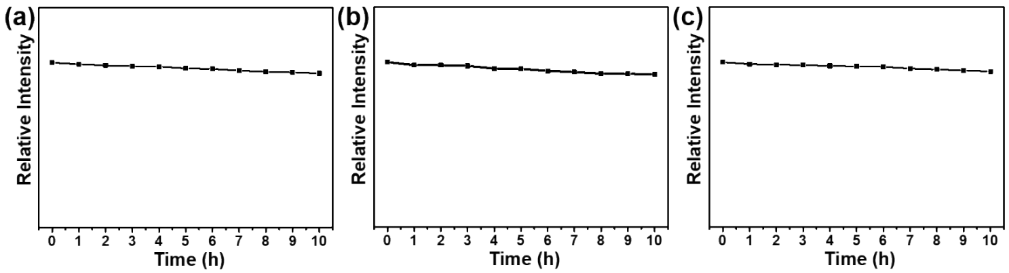

Fig. S3. Photostability of B- (a), G- (b), and R-CDs (c) under continuous illumination with an UV (365 nm, 5 W) lamp for 10 h.

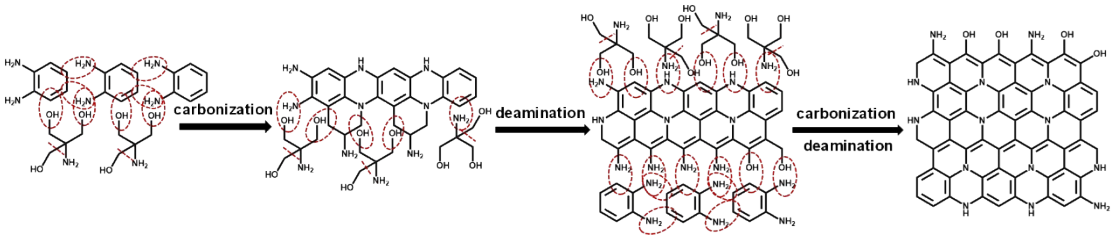

Fig. S4. Illustration of the growth mechanism of Tri-CDs.

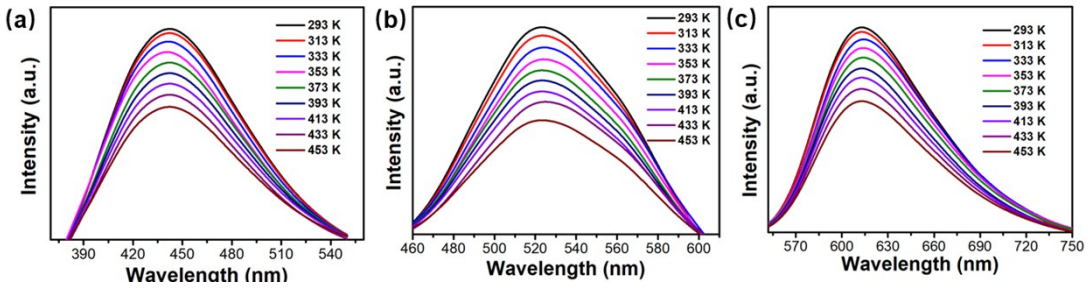

Fig. S5. PL spectra of B-, G- and R-CD films (left to right) at different temperatures from 293 to 453 K.

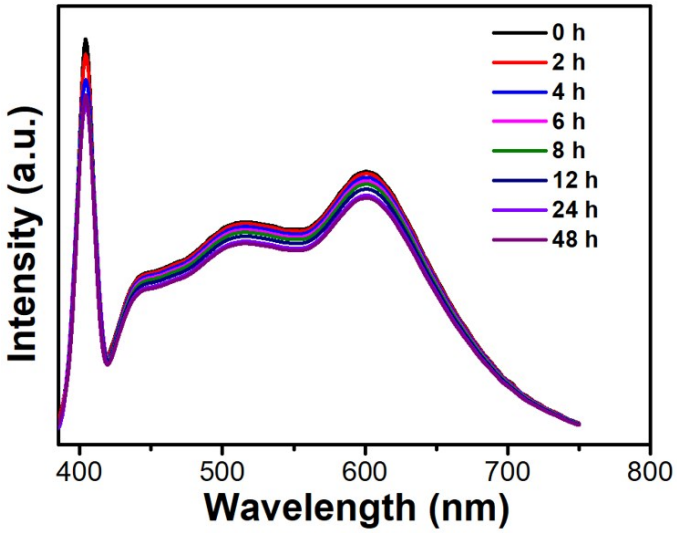

Fig. S6. EL spectra of the WLED recorded under different operating time intervals.

Table S1. FWHM values of B-, G-, and R-CDs of the PL spectra obtained upon excitation at different wavelengths.

Sample	**B-CDs**						**G-CDs**						**R-CDs**						
Ex (nm)	340	360	380	400	420	440	380	400	420	440	460	480	400	440	460	480	500	520	540
FWHM	103	106	118	120	122	123	111	109	107	106	104	101	109	108	106	105	103	102	100

Table S2. The C, N, and O element contents of the three selected products determined by XPS results.

Sample	C (%)	N (%)	O (%)
B-CDs	55.23	37.47	7.3
G-CDs	73.79	19.99	6.22
R-CDs	75.80	18.94	5.26

Table S3. The content of various chemical bonds in three samples.

Samples	C 1s			N 1s		
	284.3 eV	285.3 eV	286.8 eV	398.9 eV	399.9 eV	400.5 eV
	C-C/C=C	C-N	C-O	Pyridinic N	Amine N	Graphitic N
B-CDs	55.23%	37.47%	7.3%	46.67%	30.83%	22.50%
G-CDs	73.79%	19.99%	6.22%	37.40%	33.96%	28.64%
R-CDs	75.80%	18.90%	5.26%	33.21%	35.51%	31.28%

Table S4. CIE color coordinates (x, y), CRI, and CCT of WLEDs 1–7.

WLEDs	CIE (x, y)	CRI	CCT/K
1	(0.2957,0.3074)	93.1	8203
2	(0.3344,0.3415)	94.6	5762
3	(0.3616,0.3698)	96.5	4650
4	(0.3908,0.3878)	95.2	3750

Table S5. Comparison of CRI of WLEDs based on CDs and rare-earth phosphors.

Luminescent materials	**CIE**	**CRI**	**References**
$CsVO_3/Mg_2TiO_4:Mn^{4+}$ red phosphor	(0.330, 0.382)	91.1	[27]
$Mg_{14}Ge_5O_{24}:Mn^{4+}$ red phosphor/YAG yellow phosphor	(0.36, 0.37)	80.6	[28]
$BaMgAl_{10-2x}O_{17}:xMn^{4+},xMg^{2+}$/ YAG:$Ce^{3+}$ phosphor	(0.339, 0.349)	86.0	[29]
R-CDs/green CNP phosphors	(0.35, 0.36)	84.9	[30]
G-CDs/R-CDs	(0.34, 0.31)	82.4	[31]
B-CDs/carbon nanoplates	(0.3308, 0.3312)	88.0	[32]
B-/G-/R-CDs	(0.362, 0.370)	96.5	This work