

## Supporting information

### High optical and thermal stable carbon dots enabled by thermal treatment for laser illumination

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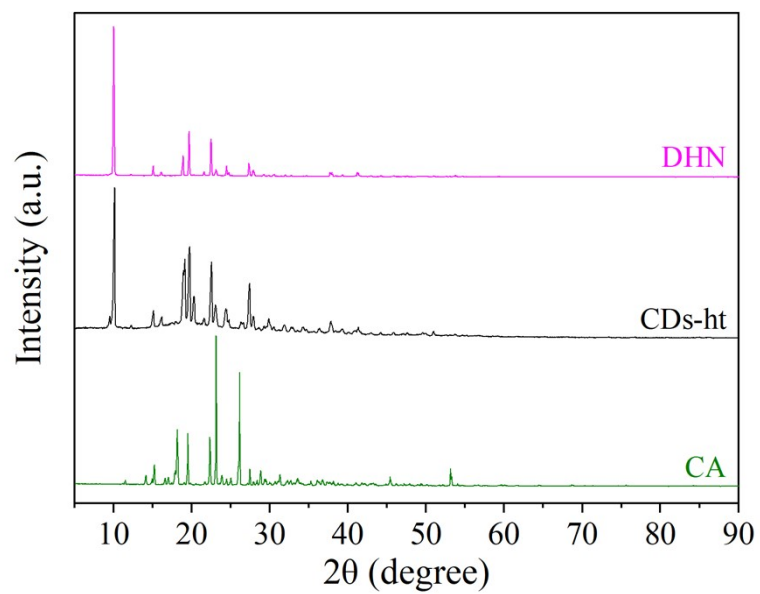
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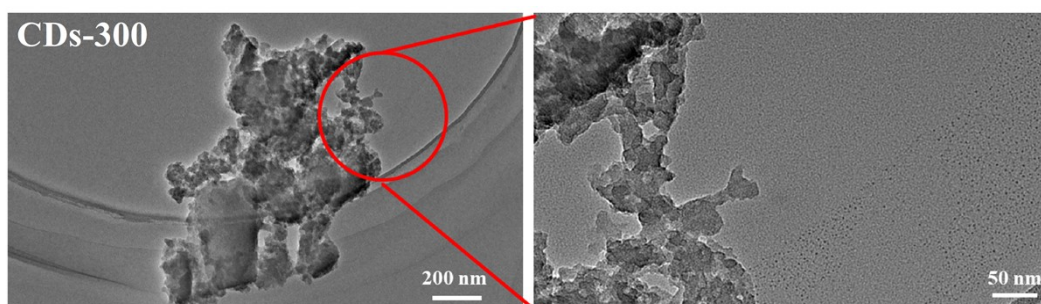
<sup>c</sup> Shanxi-Zheda Institute of Advanced Materials and Chemical Engineering, Taiyuan 030032, China

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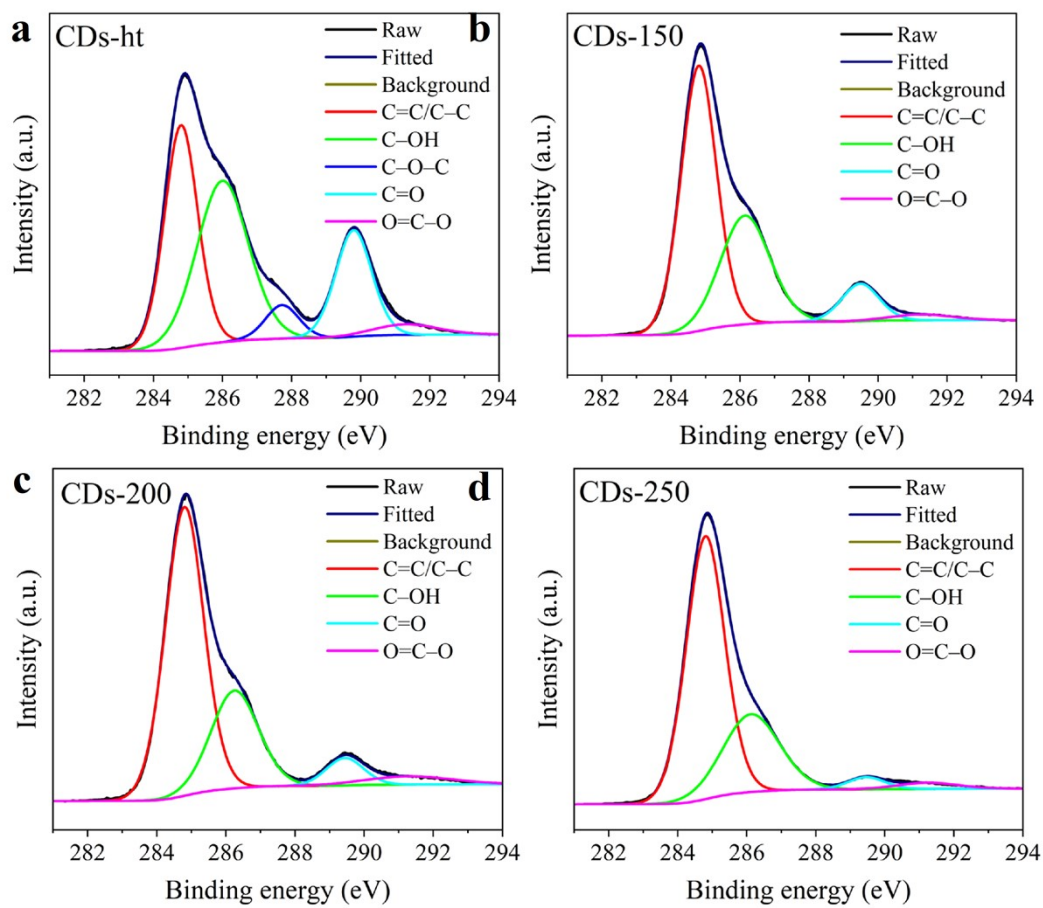
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**Fig. S1.** XRD patterns of DHN, CA, and CDs-ht

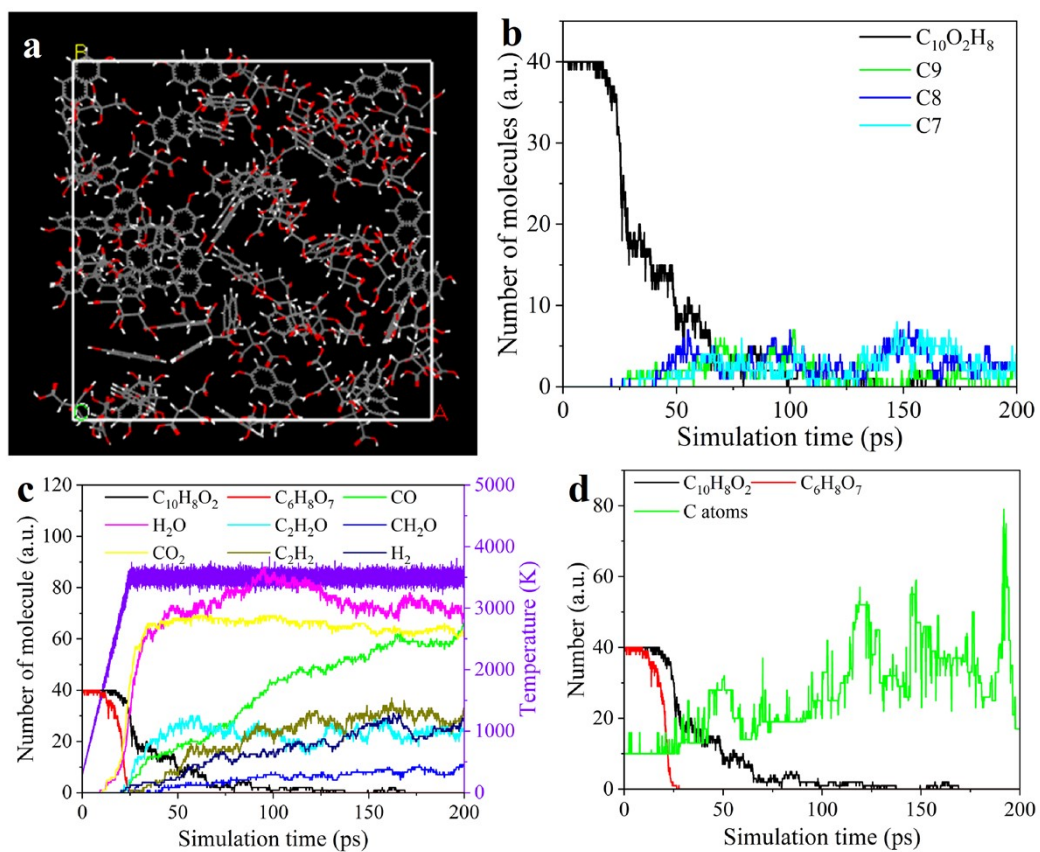


**Fig. S2.** TEM images of CDs-300

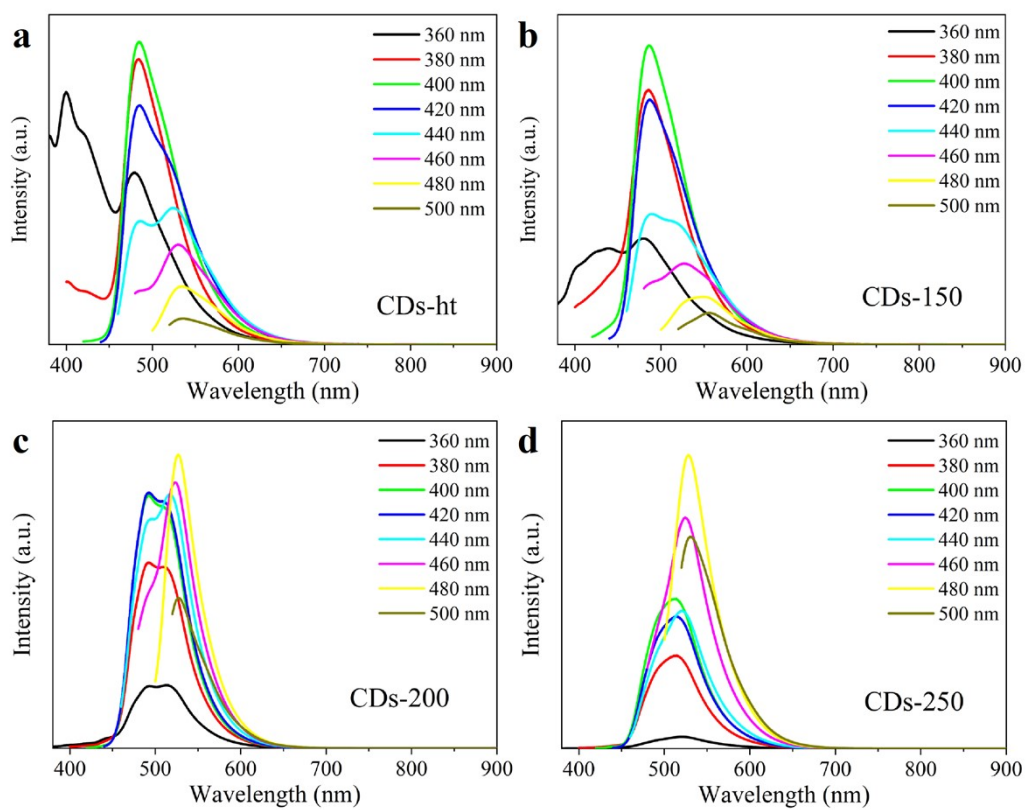


**Fig. S3.** High resolution C 1s XPS spectra of (a) CDs-ht,

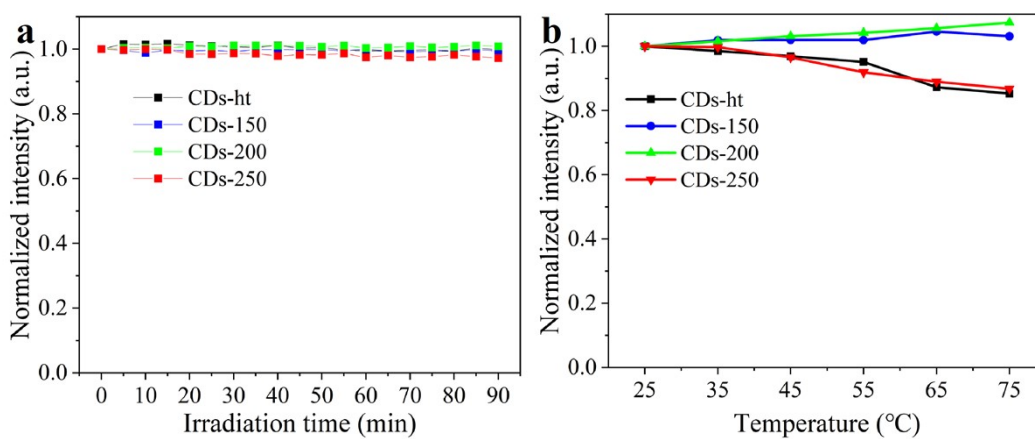
(b) CDs-150, (c) CDs-200, and (d) CDs-250



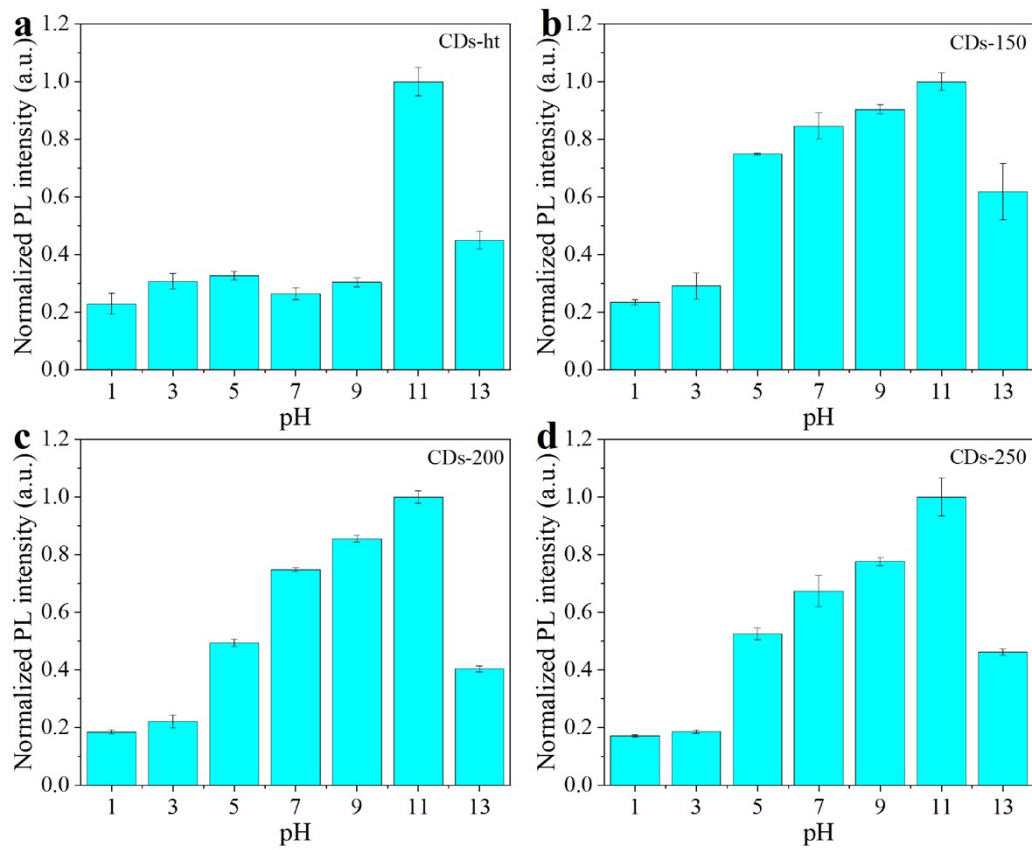
**Fig. S4.** (a) The simulation model; (b) The number of DHN molecules and their decomposition products; (c) Evolution curves of the number of different molecules and temperature as a function of simulation time; (d) The number of CA and DHN molecules and the number of C atoms for the largest molecule as a function of simulation time



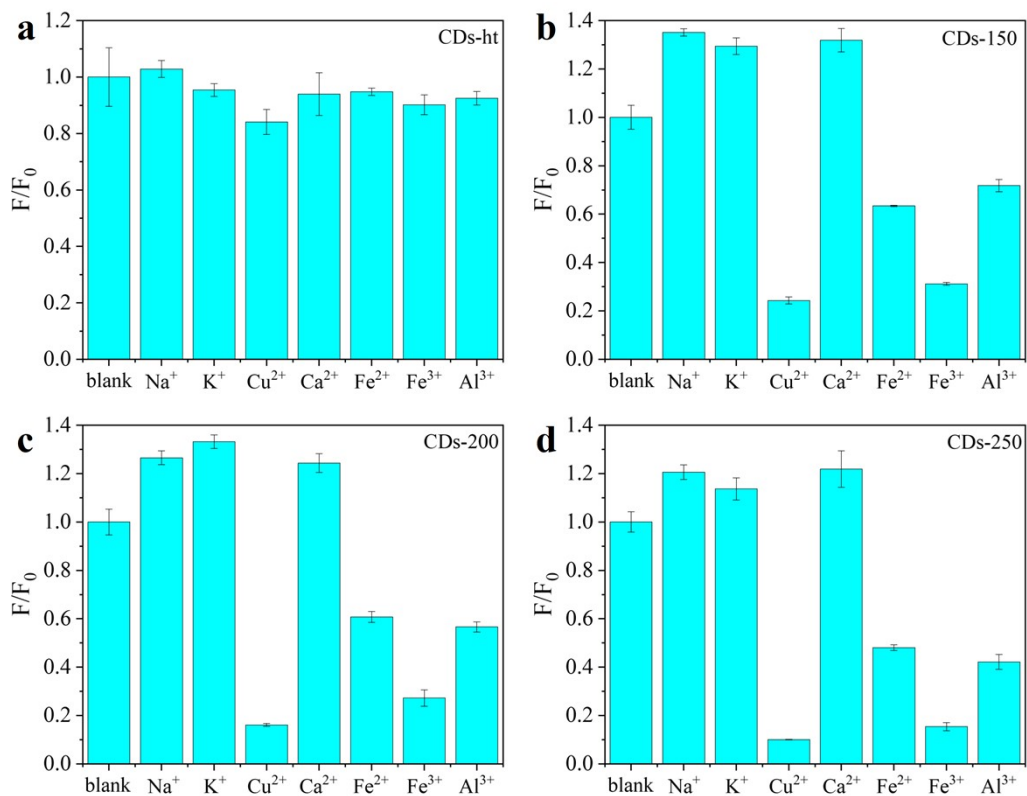
**Fig. S5.** PL emission spectra of (a) CDs-ht, (b) CDs-150, (c) CDs-200, and (d) CDs-250 under different excitation wavelengths



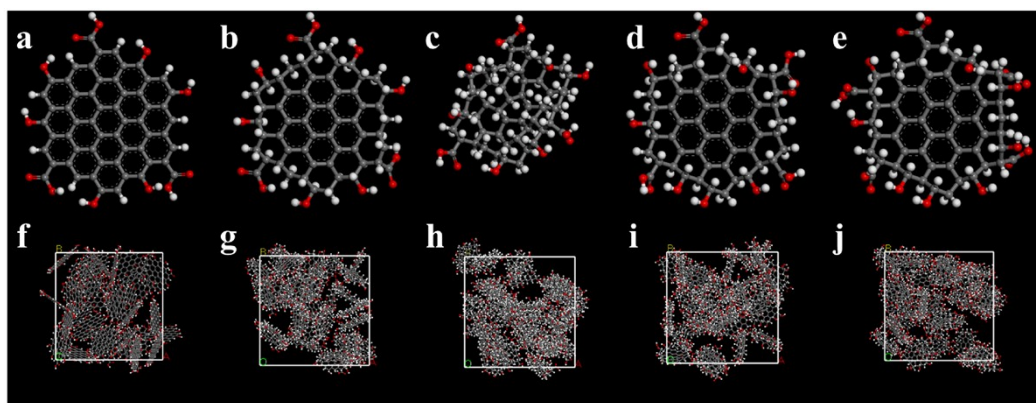
**Fig. S6.** PL intensity of CDs-ht, CDs-150, CDs-200, and CDs-250 under (a) continuous irradiation for 90 min under 450 nm and (b) different temperatures (from 25 to 75 °C with an interval of 10 °C)



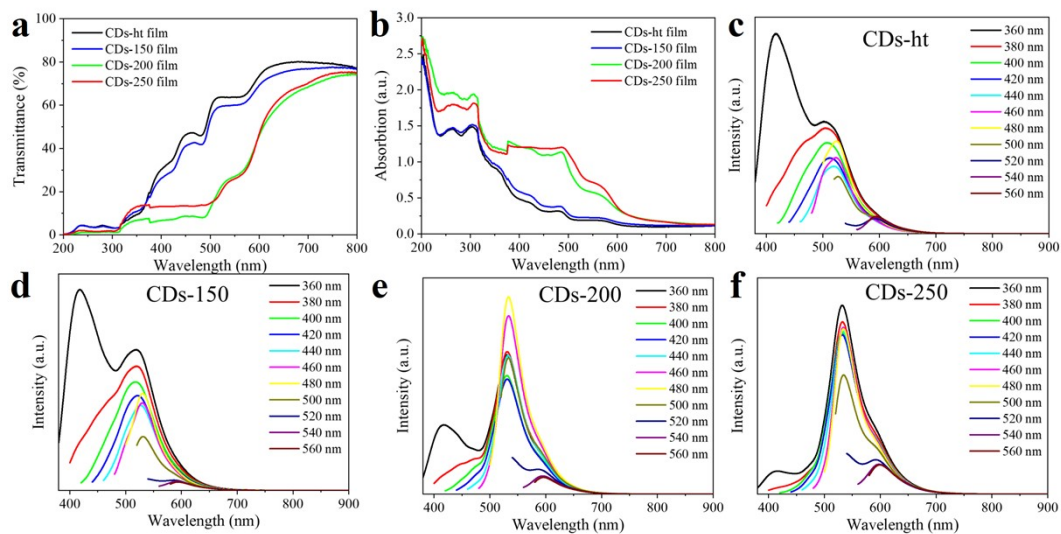
**Fig. S7.** PL intensity of (a) CDs-ht, (b) CDs-150, (c) CDs-200, and (d) CDs-250 under different pH



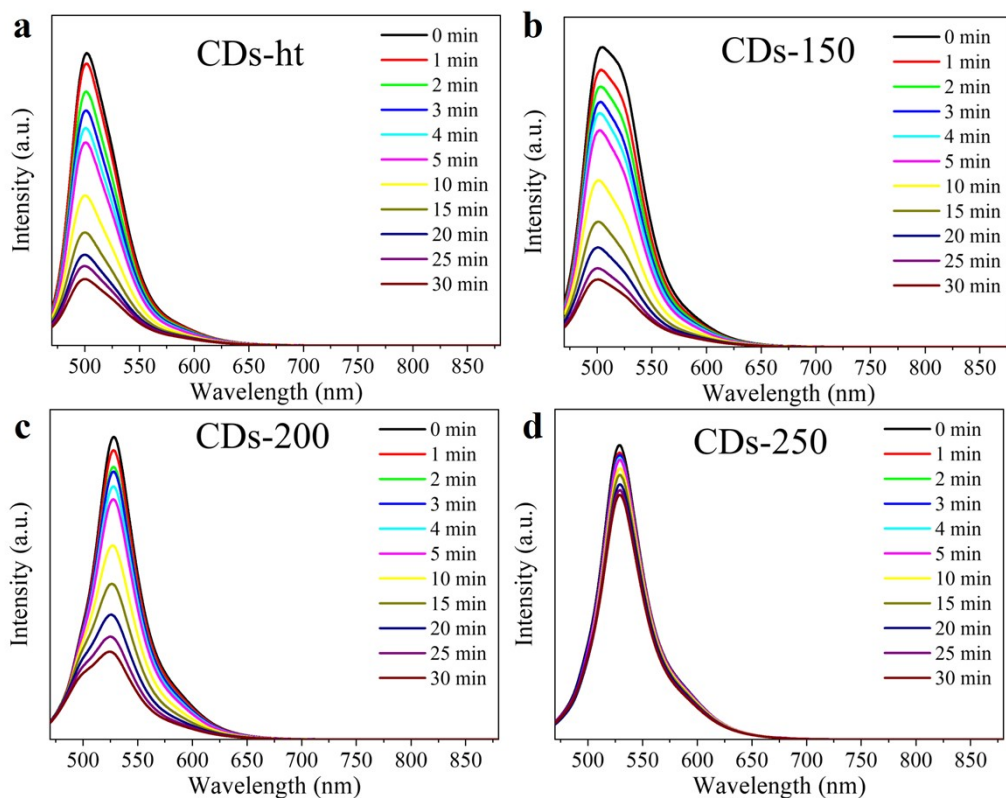
**Fig. S8.** PL intensity of (a) CDs-ht, (b) CDs-150, (c) CDs-200, and (d) CDs-250 under different metal ion solutions



**Fig. S9.** (a–e) CD model with different structures; (f–j) Corresponding periodic boxes



**Fig. S10.** (a) Transmittance and (b) UV-vis spectra of four CD films; (c–f) PL emission spectra of CD film under different excitation wavelengths



**Fig. S11.** PL intensity of stability of (a) CDs-ht film, (b) CDs-150 film, (c) CDs-200 film, and (d) CDs-250 film under 450 nm laser irradiation for 30 min



Table S1 WLD performance based on different laser wavelength and phosphors

Laser wavelength (nm)	Phosphors	CIE coordinate	CCT (K)	CRI	Ref.
400	CDs and lanthanide complexes	(0.31, 0.32)	—	—	[12]
405	GQDs	(0.34, 0.39)	5288	70	[24]
450	LuAG/CASN	—	5600±300	84	[51]
450	Nitride phosphor	(0.33, 0.32)	5362	85	[7]
455	CASN/LuAG	—	8665	89	[20]
450	CDs	(0.42, 0.35)	2822	85	This work