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Electronic Supplementary Information (ESI)

One-step green synthesis of carbon dots derived from *Plumeria alba* flowers for sensing and bioimaging

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The elucidation of the static quenching mechanism for detection of Cu^{2+}:

It is well known that nitrogen atoms have the ability to coordinate with copper ions[1]. As illustrated in Fig. 2, there exists amino moieties on the B-paCDs. The amino moieties on the B-paCDs may play a role in the recognition and detection of copper ions. The possible sensing mechanism is that the coordination between Cu^{2+} and the amino moieties on the B-paCDs inducing the formation of complex. After complexation, electrons from the conduction band are transferred to the empty d-orbitals of Cu^{2+}, causing fluorescence quenching[2]. To further elucidate the mechanism of fluorescence quenching, the UV–vis spectra of B-paCDs, B-paCDs+Cu^{2+} and Cu^{2+} were carried out. As shown in the Fig. S3a significant decrease in absorption intensity is observed on the UV–vis spectra after adding Cu^{2+} (100 μM) into B-paCDs solutions, hinting that a static quenching mechanism has occurred[3]. Moreover, fluorescence lifetimes of B-paCDs before and after adding Cu^{2+} (100 μM) were measured to ascertain the mechanism. In Fig. S3b, the fluorescence lifetime of the B-paCDs is 6.64ns. The lifetime decreased to 6.63 ns after adding Cu^{2+} (100 μM) into the solution of B-paCDs. The nearly identical fluorescence lifetimes proves that it is static quenching[4].

Figures

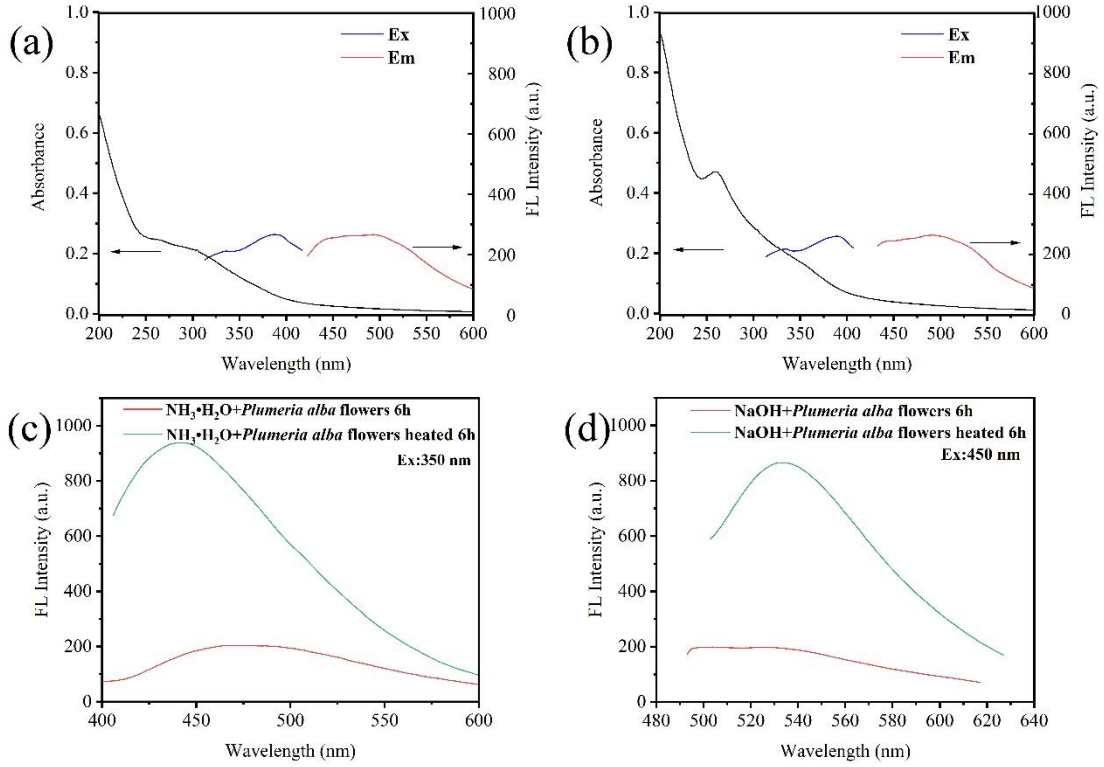

Fig. S1 UV–vis absorption, fluorescence excitation and emission spectra of the ammonia water (a) and NaOH water (b) containing dried *Plumeria alba* flower (without heating, after 6 h), respectively. PL spectra of the ammonia water (c) containing dried *Plumeria alba* flower (with or without heating, after 6 h) and NaOH water (d) containing dried *Plumeria alba* flower (with or without heating, after 6h), respectively.

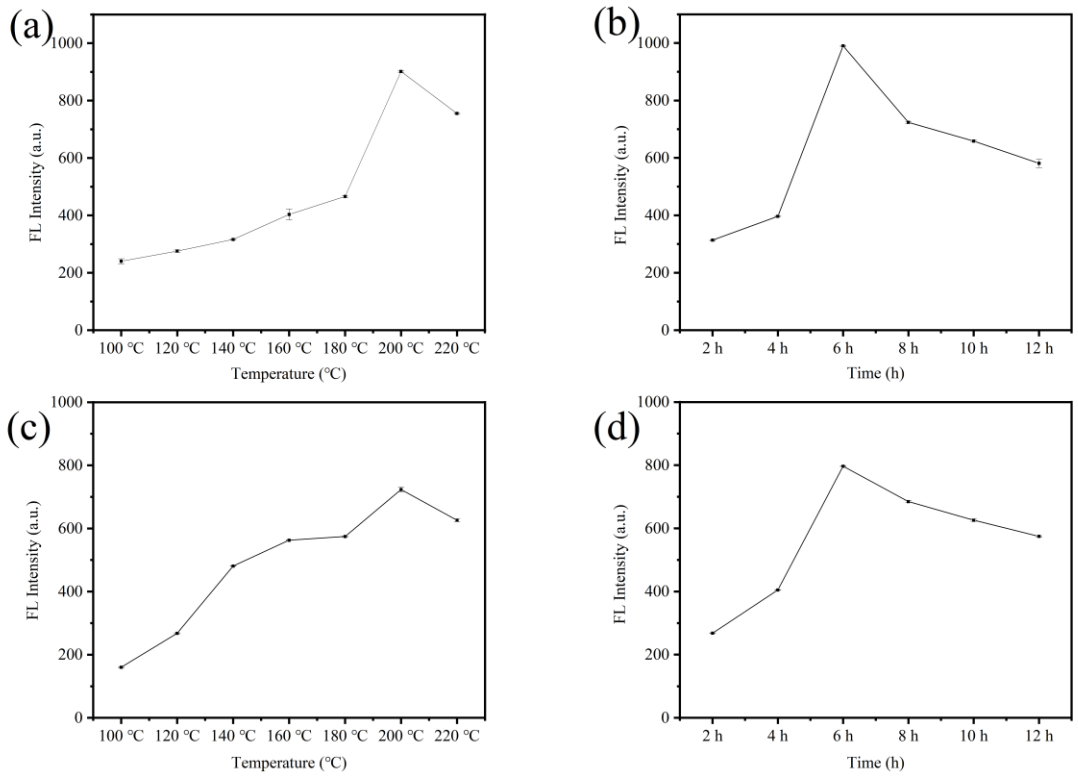

Fig. S2 Effects of different reaction temperatures (a) and reaction times (b) on the fluorescence intensity of B-paCDs. Effects of different reaction temperatures (c) and reaction times (d) on the fluorescence intensity of G-paCDs.

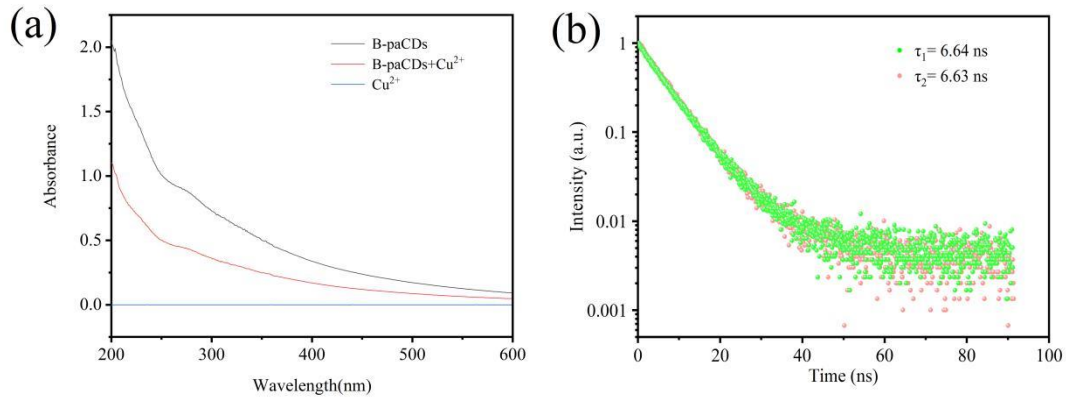

Fig. S3 UV–vis spectra of B-paCDs, B-paCDs+Cu^{2+} and Cu^{2+} (a). The fluorescence lifetimes of B-paCDs before and after adding Cu^{2+} (b).

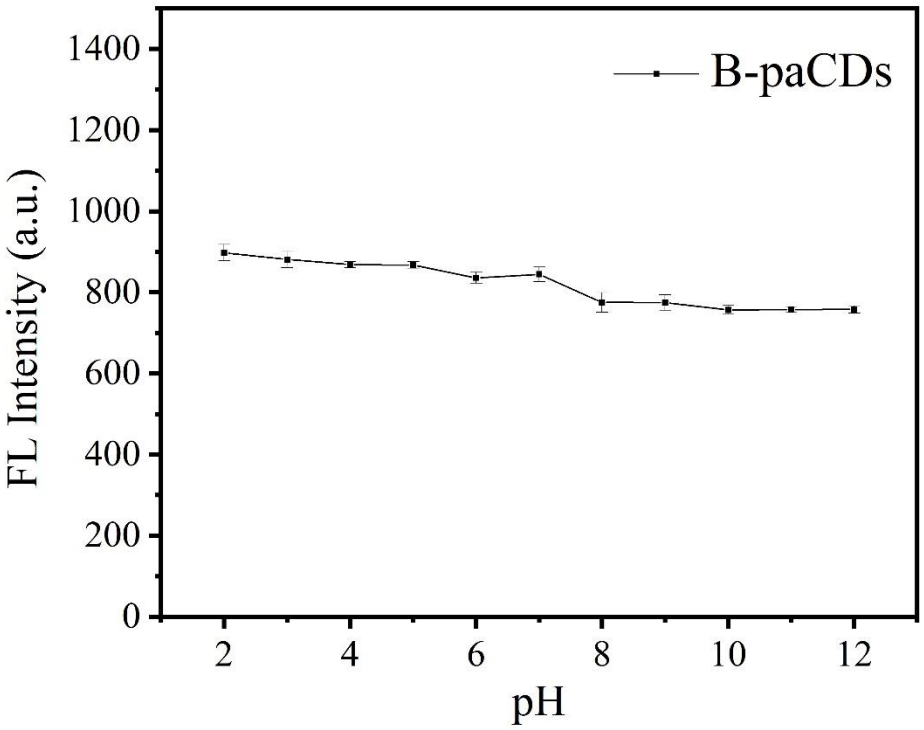

Fig. S4 Dose–response curve for the FL intensity of B-paCDs with pH.

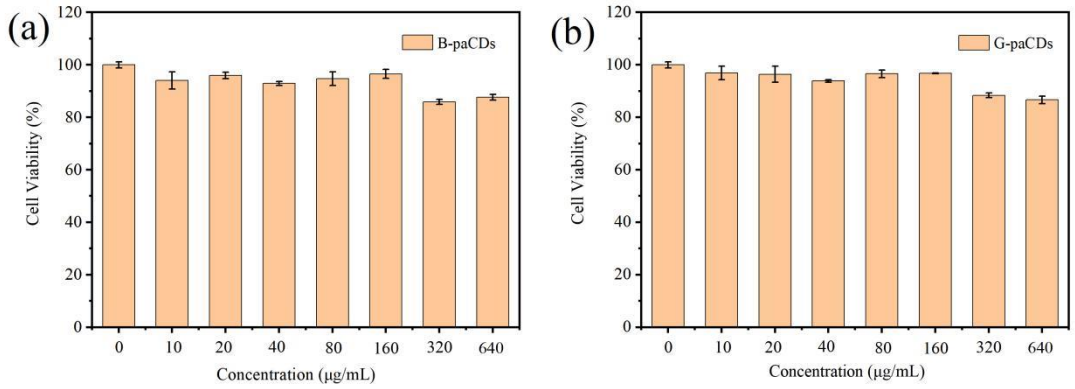

Fig. S5 Cell viabilities of HepG2 cells with different concentrations of B-paCDs (a) and G-paCDs (b).

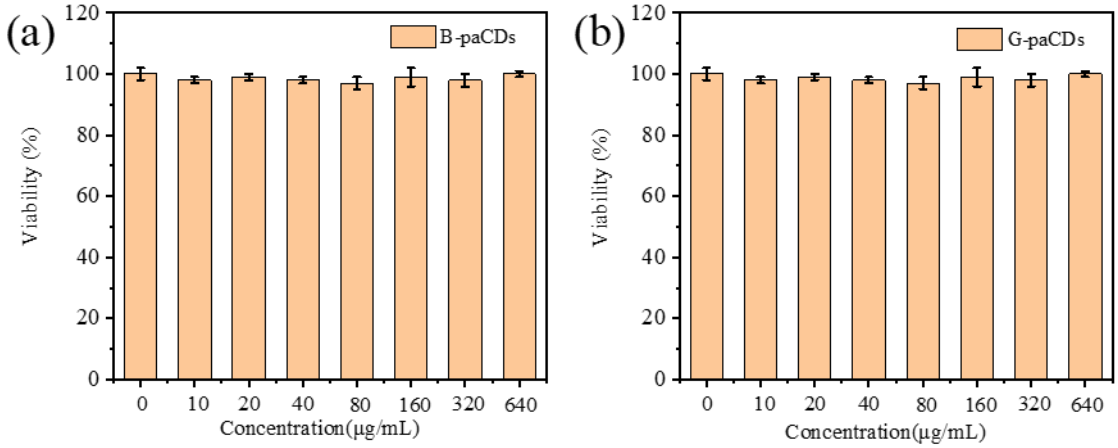

Fig. S6 Toxicity experiments of *C. elegans* incubated with different concentrations of the B-paCDs (a) and G-paCDs (b).

Tables

Table S1 Comparison of different green synthetic CDs for detection of Cu^{2+}.

Fluorescent probes	Raw material	Linear range	Detection limit	Ref.
CQDs	Rambutan and Pandan leaves	-	123.67 μM	5
OPD-CDs	o-phenylenediamine	0.5 μM - 40 μM	0.28 μM	6
N-CDs	polyethylene glycol 20,000 and p-phenylenediamine	45-70 μM	45.87 μM	7
BTSC-CDs	EDTA	0.20–30 μM	0.27 μM	8
B,N-CDs	APBA	1–25 μM	0.3 μM	9
CDs-Cl,P	sucrose, muriatic acid and phosphoric acid	5 μM - 100 μM	0.14 μM	10
N.S-CDs	CA and TSC	5-125 μM	1.326 μM	11
h-CDs	o-phenylenediamine and terephthalic acid	0-10 μM	0.18 μM	12
NECDs	citric acid, polyoxyethylene bis(amine), polyvinyl polyamine and norepinephrine	0.1-10 μM	0.18 μM	13
N-CDs	Ascorbic acid and urea	-	0.15 μM	14
CDs	radish	10-60 μM	6.8 μM	15
FCDs	peanut shells	0-5μM	4.8 μM	16
C-dots	coconut water and ethanol	10 - 50 μM	0.28 μM	17
BPEI-CQDs	bamboo leaves	0.333-5.66 μM	0.115 μM	18
G-CDs	*Spirulina* algae powder	0 - 45 μM	3.5 μM	19
B-paCDs	*Plumeria alba* flowers	0.1 -100 μM	0.08 μM	This work

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