

Supporting Information

Yellow-Emitting Hydrophobic Carbon Dots via a Solid Phase

Synthesis and Its Application

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■ SUPPORTING INFORMATION STATEMENT

- (1) The images of acquired HCDs powder under daylight and UV light
- (2) The images of obtained products with the increase of DCC amount.
- (3) The images of HCDs dissolved in different solvents.
- (4) The polarity coefficients of HCDs solvents
- (5) XPS spectra of prepared WCDs
- (6) XPS spectra of prepared HCDs-L
- (7) Fluorescence spectra of WCDs and HCDs under different excitation wavelengths
- (8) The comparison of this paper and other recent published papers in discussions on synthesis

(1)The images of acquired HCDs powder under daylight and UV light

Figure S1 shows photographs of obtained HCDs powder (yellow luminescent solids) under daylight and UV light.

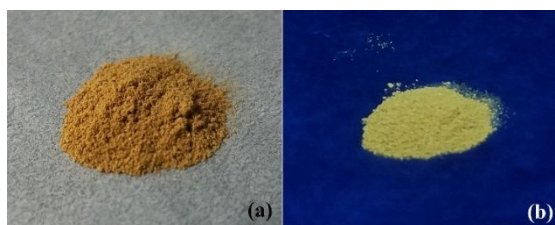


Figure S1. Photographs of HCDs powder under (a) daylight and (b) 365 nm UV lamps.

(2)The images of obtained products with the increase of DCC amount.

Figure S2 shows the change in the state of the obtained product when the amount of DCC gradually increased. As the amount of added DCC gradually increased, the state of the HCDs gradually changed from clear, colorless colloidal solid state to tan and dry solid state.

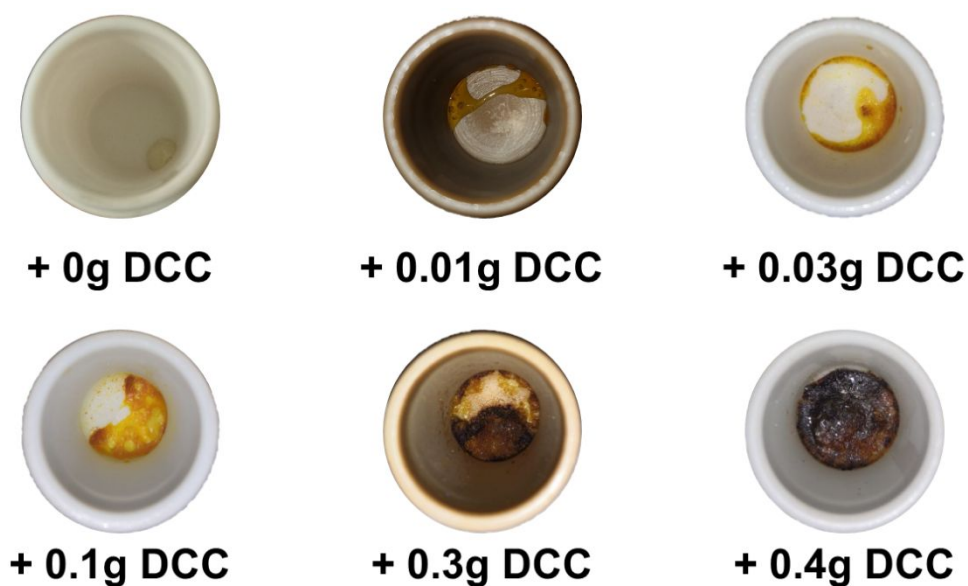


Figure S2. Images of the products when the amount of DCC gradually increased.

(3)The images of HCDs dissolved in different solvents.

Figure S3 shows images of HCDs dissolved in different solvents. The solvents are water, dimethyl sulfoxide, methanol, acetonitrile, acetone, ethyl acetate, ethanol, tetrahydrofuran, isopropanol, n-butanol, dichloromethane, toluene, carbon tetrachloride and cyclohexane (from Left to right).

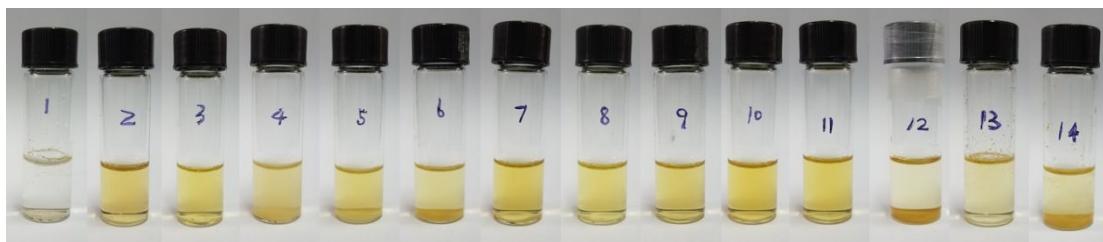


Figure S3. Dissolution of HCDs in solvents (from left to right: water, dimethyl sulfoxide, methanol, acetonitrile, acetone, ethyl acetate, ethanol, tetrahydrofuran, isopropanol, n-butanol, dichloromethane, toluene, carbon tetrachloride and cyclohexane)

(4) The polarity coefficients of HCDs solvents

In order to investigate the solvency of HCDs, we selected fourteen kinds of organic reagents with different polarities and structures as solvents for HCDs. Table S1 shows the polarity coefficients of the 14 solvents that dissolve HCDs.

Table S1. The polarity coefficients of HCDs solvents

Number	Solvent	polarity	Number	Solvent	polarity
1	H ₂ O	10.2	8	IPA	4.3
2	DMSO	7.2	9	THF	4.2
3	MeOH	6.6	10	NBA	3.9
4	ACN	6.2	11	DCM	3.4
5	PK	5.4	12	Tol	2.4
6	EA	4.3	13	CTC	1.6
7	EtOH	4.3	14	CYH	0.1

(5) XPS spectra of prepared WCDs

Figure S4 (i) shows the XPS spectra of WCDs. The four main peaks at 164.1, 284.6, 398.9 and 531.9 eV, attributed to C1s, N1s, O1s and S2p. The XPS spectra of C1s (Figure S4 (ii)) prove the existence of C-C/C=C (284.6 eV), C-O (286.0 eV) and C=O (288.2 eV) groups. The XPS spectrum of N1s (Figure S4 (iii)) shows the existence of three fitting peaks, attributed to N-H (399.2 eV) and -NH₂⁺ (401.6 eV). The peak at 531.9 eV is attributed to C=O in O1s spectrum, peak at 532.4 eV is to C-O-C, and peak at 532.9 eV is to -OH (Figure S4 (iv)). The fitting peaks at 163.23, 164.31, 168.80 eV in S 2p area spectrum (Figure S4 (v)) show three different components, attributing to 2p_{3/2} and 2p_{1/2} sites of -CS covalent bond of thiophene, and -SO₂.

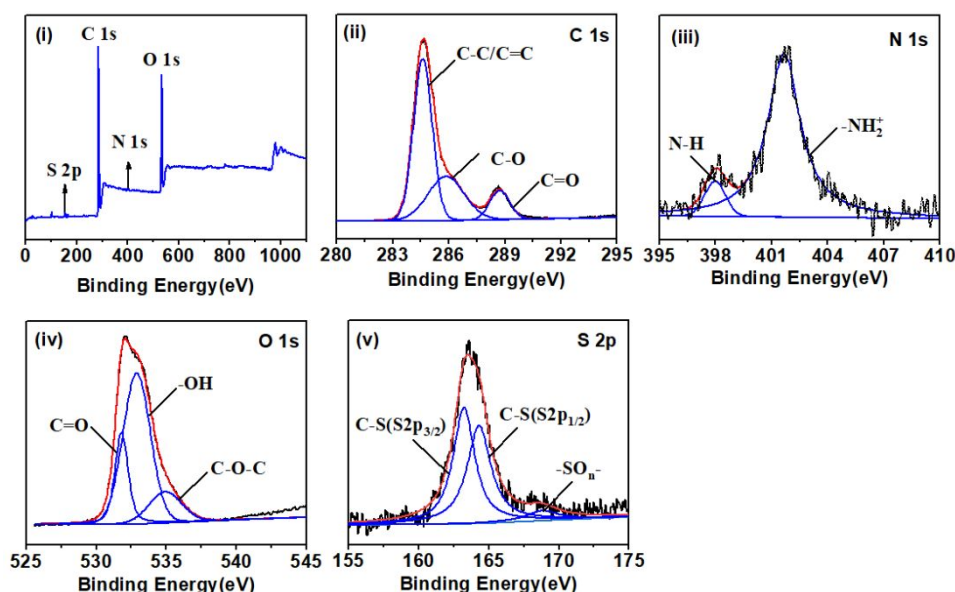


Figure S4. XPS spectra for the simultaneously prepared WCDs. (i) raw data, (ii) high resolution spectra of C1s, (iii) N1s, (iv) O1s, and (v) S2p.

(6) XPS spectra of prepared HCDs-L and HCDs-W

The spectra of HCDs-L and HCDs-W (Figure S5) are similar to those of HCDs. But HCDs-L cannot split the S element due to the small amount of S.

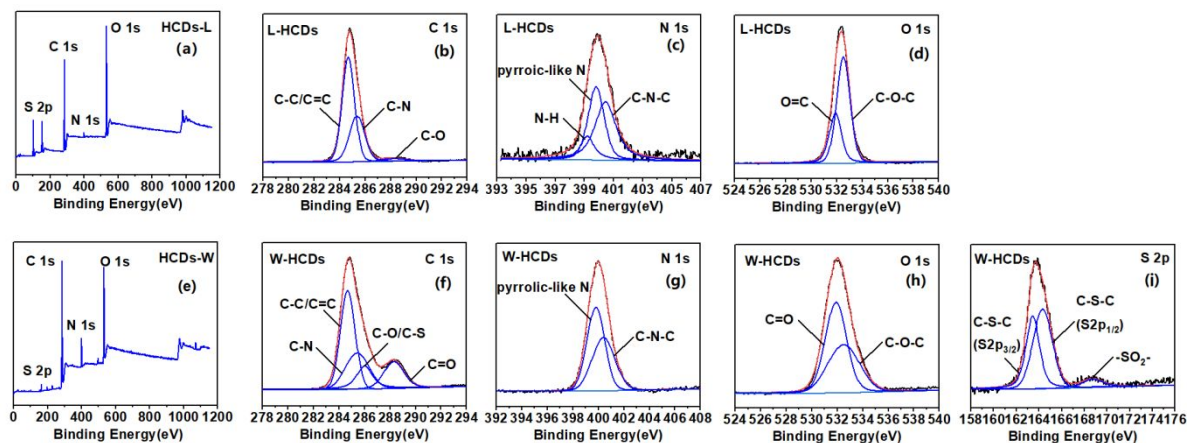


Figure S5. XPS spectra for the separation products HCDs-L (a) raw data, (b) high resolution spectra of C1s, (c) N1s, (d) O1s and HCDs-W (e) raw data, (f) high resolution spectra of C1s, (g) N1s, (h) O1s and (i) S2p.

(7) Fluorescence spectra of WCDs and HCDs under different excitation wavelengths.

Figure S6 shows the fluorescence spectra of WCDs and HCDs under different excitations. As shown in Figure S6(a), at 300-400 nm excitation, the λ_{em} of WCDs are around 450 nm. WCDs exhibit excitation independence and emit blue fluorescence. And the excitation spectrum of HCDs-L is similar to WCDs. In contrast, with the λ_{ex} increases, the λ_{em} of HCDs redshifts from

450 nm to 550 nm, exhibiting excitation dependence. And the excitation map of HCDs-W is more similar to HCDs.

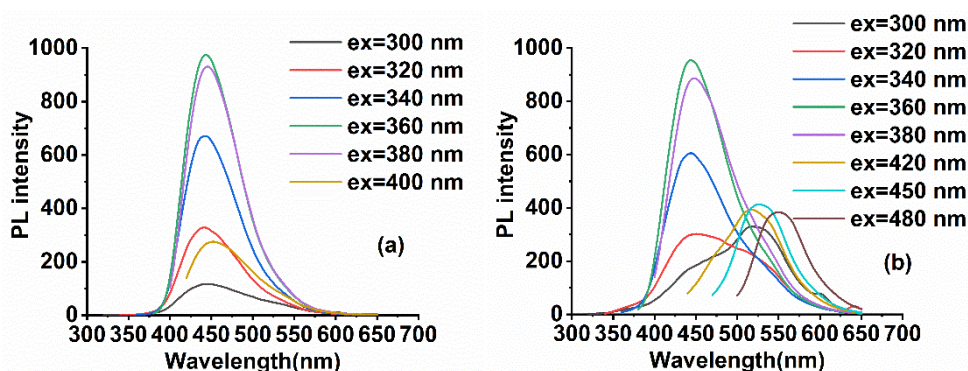


Figure S6. Fluorescence spectra of (a) WCDs and (b)HCDs under different excitations.

(8) The comparison of this paper and other recent published papers in discussions on synthesis mechanisms, luminescence mechanism and the application of prepared products.

Table S2 compares some recent work on HCDs with this manuscript, and lists their differences (QY%, λ_{em} , discussion of synthesis mechanism, discussion of luminescence mechanism and their applications) in the table below (“√” in the table indicates that this article has done this work, and “-“ indicates that it has not done so).

Table S2. The comparison between recent works and this paper

λ_{em}	QY	Synthesis mechanism	luminescence mechanism	Applications	Ref.
541 nm	30%	√	√	white LED light; liposome	This paper
460 nm	4.5%	-	-	OCDs/PMMA composite films	Ref. 47
620 nm	6.0%	-	√	luminescence ink	Ref. 48
570 nm	16.7%	√	-	bioimaging	Ref. 23
510 nm	7.7%	√	-	bioimaging	Ref. 20
492 nm	-	-	-	Sensing	Ref. 26
480 nm	18%	-	-	Sensing	Ref. 27
435 nm	2.1%	-	-	white LED light; imaging of fingerprints	Ref. 13
475 nm	5.8%	-	-	Sensing; bioimaging	Ref. 17
455 nm	21.1%	-	-	-	Ref. 49