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
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(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](image)

**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](image)

**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 polar coefficients of the 14 solvents that dissolve HCDs.

Table S1. The polarity coefficients of HCDs solvents

| Number | Solvent | Polarity |
|--------|---------|----------|
| 1      | H2O     | 10.2     |
| 2      | DMSO    | 7.2      |
| 3      | MeOH    | 6.6      |
| 4      | ACN     | 6.2      |
| 5      | PK      | 5.4      |
| 6      | EA      | 4.3      |
| 7      | EtOH    | 4.3      |
| 8      | IPA     | 4.3      |
| 9      | THF     | 4.2      |
| 10     | NBA     | 3.9      |
| 11     | DCM     | 3.4      |
| 12     | Tol     | 2.4      |
| 13     | CTC     | 1.6      |
| 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 2p3/2 and 2p1/2 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 $\lambda_{em}$ 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 $\lambda_{ex}$ increases, the $\lambda_{em}$ of HCDs redshifts from
450 nm to 550 nm, exhibiting excitation dependence. And the excitation map of HCDs-W is more similar to HCDs.

![Image](image_url)

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