Supporting Information

Facile synthesis of multifunctional pharmaceutical carbon dots for targeted bioimaging and chemotherapy of tumors

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**Figure S1.** The FTIR spectra of CA.

The peaks at 3496.0 cm\(^{-1}\) and 2918.1 cm\(^{-1}\) are the stretching vibrations of -OH and -CH\(_2\)- in CA. 1750 cm\(^{-1}\) and 1175 cm\(^{-1}\) show two sets of parallel peaks caused by the stretching vibrations of C=O and C-O in different chemical environments.

**Fluorescence lifetime:**

**Figure S2.** Parameters related to fluorescence life.
Fluorescence life: 

\[ \tau = \frac{B_1 \tau_1^2 + B_2 \tau_2^2}{B_1 \tau_1 + B_2 \tau_2} \]

or \[ \tau = \tau_1 \cdot \text{Rel}_1 \% + \tau_2 \cdot \text{Rel}_2 \% \]

Calculation method of absolute quantum yield:

**Figure S3.** Calculation diagram of absolute quantum yield.

As shown in **Figure S3**, Absolute quantum yield:

\[ QY \% = \frac{S_a}{S_b} \]

Light bleaching resistant:

Natural light is simulated using Perfectlight's PCX-50 C Discover multi-channel photocatalytic system. The synthesized Met-CDs solution is placed in the above instrument and sunlight is turned on to illuminate the solution. At 0 min, 10 min, 30 min, 60 min, 100 min, 150 min, 210 min, 270 min and so on, 5 mL Met-CDs solution is taken. The fluorescence intensity of Met-CDs solution in each group is measured by fluorescence spectrophotometer LS 55.
Figure S4. The fluorescence intensity of Met-CDs changes with time at the optimal excitation wavelength, simulating natural light. (Ex=290 nm, Em= 440 nm)

Table S1. The fluorescence intensity of Met-CDs changes with time at the optimal excitation wavelength, simulating natural light. (Ex=290 nm, Em= 440 nm)

<table>
<thead>
<tr>
<th>Time/min</th>
<th>FL intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>460.58525</td>
</tr>
<tr>
<td>10</td>
<td>457.46517</td>
</tr>
<tr>
<td>30</td>
<td>449.07401</td>
</tr>
<tr>
<td>60</td>
<td>438.72381</td>
</tr>
<tr>
<td>100</td>
<td>437.18132</td>
</tr>
<tr>
<td>150</td>
<td>443.0613</td>
</tr>
<tr>
<td>210</td>
<td>432.62202</td>
</tr>
<tr>
<td>270</td>
<td>430.22609</td>
</tr>
</tbody>
</table>

pH stability:

The pH of the Met-CDs solutions is first measured using a pH meter, and then the pH of the Met-CDs solutions is adjusted using concentrated HCl solution and NaOH solid particles to
obtain different pH Met-CDs solutions, and 5 mL of the Met-CDs solutions are taken separately. Finally, the fluorescence intensity of each Met-CDs solution is measured using a fluorescence spectrophotometer LS 55.

![Graph showing fluorescence intensity vs pH]

**Figure S5.** The fluorescence intensity of Met-CDs changes with pH at the optimal excitation wavelength. (Ex=290 nm, Em=440 nm)

**Table S2.** The fluorescence intensity of Met-CDs changes with pH at the optimal excitation wavelength. (Ex=290 nm, Em=440 nm)

<table>
<thead>
<tr>
<th>pH</th>
<th>FL intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.92</td>
<td>65.28294</td>
</tr>
<tr>
<td>1.32</td>
<td>84.49211</td>
</tr>
<tr>
<td>2.27</td>
<td>131.50013</td>
</tr>
<tr>
<td>3.06</td>
<td>150.87694</td>
</tr>
<tr>
<td>3.86</td>
<td>201.52866</td>
</tr>
<tr>
<td>4.19</td>
<td>222.87124</td>
</tr>
<tr>
<td>5.14</td>
<td>310.38664</td>
</tr>
<tr>
<td>6.28</td>
<td>342.17601</td>
</tr>
<tr>
<td>7.37</td>
<td>392.12993</td>
</tr>
</tbody>
</table>
Table S3. The fluorescence intensity of Met-CDs changes with temperature at the optimal excitation wavelength. (Ex=290 nm, Em= 440 nm)

<table>
<thead>
<tr>
<th>Temperature/°C</th>
<th>FL intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>294414.875</td>
</tr>
<tr>
<td>35</td>
<td>262753.75</td>
</tr>
<tr>
<td>45</td>
<td>220151.094</td>
</tr>
<tr>
<td>55</td>
<td>170878.281</td>
</tr>
</tbody>
</table>

Figure S6. The fluorescence intensity of Met-CDs changes with temperature at the optimal excitation wavelength. (Ex=290 nm, Em= 440 nm)
Figure S7. (A) Detection of Met toxicity to A549 cells (line graph); (B) Detection of Met-CDs toxicity to A549 cells (line graph).

Figure S8. (A) Inhibitory effect of Met on the growth of A549 cells (line graph); (B) Inhibitory effect of Met-CDs on the growth of A549 cells (line graph).