Fluorescent carbon quantum dots, capacitance and catalysis active porous carbon microspheres from beer

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**Fig. S1** CQDs solution before and after hydrothermal treatment under natural light (a) and UV lamp (b).

(c) SEM of the formed precipitate.

**Fig. S2** EDS of NCQDs.

**Fig. S3** Zeta of CQDs aqueous solution at different pH media.
**Fig. S4** (a) UV-vis absorption spectrum and (b) excitation wavelength dependent fluorescence spectra of maltose hydrothermal synthesized carbon quantum dots. Inset in panel a: image of maltose derived carbon quantum dots solution under daylight and UV light.

**Fig. S5** SEM of (a) a-PCM$_{600}$, (b) a-PCM$_{700}$, (c) a-PCM$_{800}$, and (d) a-PCM$_{900}$.

**Fig. S6** High resolution C1s (a, c) and N1s (b, d) XPS spectra of PCM (a, b) and a-PCM$_{600}$ (c, d).
Fig. S7 $N_2$ sorption isotherm and BJH pore size distribution of PCM.

Fig. S8 Contact angle tests of (a) PCM, (b) a-PCM$_{600}$ and (c) a-PCM$_{900}$.

Table S1 Surface and pore properties of PCM and a-PCMs.

<table>
<thead>
<tr>
<th>Sample</th>
<th>$S_{BET}$ (m$^2$ g$^{-1}$)</th>
<th>$S_{micro}$ (m$^2$ g$^{-1}$)</th>
<th>$S_{meso}$ (m$^2$ g$^{-1}$)</th>
<th>Pore volume (cm$^3$ g$^{-1}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCM</td>
<td>488.2</td>
<td>317.6</td>
<td>170.6</td>
<td>0.246</td>
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<tr>
<td>a-PCM$_{600}$</td>
<td>2120.7</td>
<td>1613.0</td>
<td>507.7</td>
<td>1.163</td>
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<tr>
<td>a-PCM$_{700}$</td>
<td>1917.8</td>
<td>1467.3</td>
<td>450.5</td>
<td>1.028</td>
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<tr>
<td>a-PCM$_{800}$</td>
<td>1779.5</td>
<td>1379.4</td>
<td>400.1</td>
<td>0.956</td>
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<tr>
<td>a-PCM$_{900}$</td>
<td>1727.2</td>
<td>1214.6</td>
<td>512.6</td>
<td>0.947</td>
</tr>
</tbody>
</table>

  

* Specific surface area from multiple BET method.  
  b Micropore surface area from t-plot method.  
  c The t-method external surface area ($S_{e}=S_{BET}-S_{micro}$).  
  d Total pore volume at $p/p_0=0.99$. 
**Fig. S9** UV-vis absorption spectra during the catalytic reduction of 4-nitrophenol by (a) PCM, (b) a-PCM$_{600}$, (c) a-PCM$_{700}$ and (d) a-PCM$_{800}$.

**Fig. S10** FTIR of 4-nitrophenol and the a-PCM$_{900}$ catalyst after 4 cycles of catalytic reduction reaction.

From the FTIR spectra, characteristic absorption peaks belonging to 4-nitrophenol can not be observed in the catalyst, which excludes the adsorption of 4-nitrophenol onto catalyst. This result also manifests that decreased UV-Vis absorbance of 4-nitrophenol is caused by the catalytic reduction reaction.