Electronic Supplementary Material

Template-Free and Room Temperature Synthesis of Hierarchical Porous Zeolitic Imidazole Framework Nanoparticles and Their Dye and CO$_2$ Adsorption

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Figure S1 XRD patterns of samples obtained at different Hmim: Zn ratios (NaOH, 0.2 mmol).
Figure S2 Pore size distribution of hierarchical porous ZIF-8 estimated from the N₂ sorption isotherms using NLDFT.

Figure S3 SEM images of ZIF-8 synthesized using a) 0.2 mmol and b) 1.0 mmol of NaOH (Hmim:Zn~35).
Figure S4 XRD of the synthesized materials using large scale synthesis.
Figure S5 TGA curve of ZIF-8 nanoparticles.
Figure S6 XRD patterns of 2D ZIF8-L synthesized using different amounts of NaOH (Hmim: Zn ~ 8).
Figure S7 TEM images of 2D ZIF-L using a) 0.01 mmol, b) 0.2 mmol, c) 1 mmol, and d) 2 mmol of NaOH (Hmim:Zn~8).
Figure S8 Chemical structures of the investigated dyes; a) methyl blue, b) rhodamine B, and c) methylene blue.

Figure S9 Photos showing time-dependent adsorption of a) RhB, and b) MB on ZIF-8 nanoparticles.
**Figure S10** UV-vis absorption spectra for adsorption of a-b) RhB and c-d) MB (1000 mg/L) on ZIF-8 synthesised with a-c) 0 mmol and b-d) 0.02 mmol of NaOH.
Figure S11 UV-vis absorption spectra for MB adsorption on ZIF-8 synthesised with a) 0 mmol and b) 0.02 mmol of NaOH.
Figure S12 UV-vis absorption spectra for dyes MB, RhB and methylene blue on ZIF-8 synthesized using NaOH of a) 0 mmol, b) 0.02 mmol, c) 1 mmol, d) 2 mmol and e) 3 mmol, and the efficiency of MB adsorption.
Figure S13 SEM images of ZIF-8 using NaOH a-b) 0 mmol and c-d) 0.02 mmol before a-c) and after b-d) adsorption of MB.
Table S1. Comparison among different ZIF-8 materials reported for dye adsorption

<table>
<thead>
<tr>
<th>Materials</th>
<th>Size (nm)</th>
<th>Synthesis condition</th>
<th>Porosity/surface area</th>
<th>Dye</th>
<th>Efficiency%</th>
<th>Contact time</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZIF-8</td>
<td>500 nm</td>
<td>Zn:Hmim: NH₄OH 1:2:54</td>
<td>Nomesoporous structure and only microporous in ZIF-8, S_{BET} and S_{Lan} area are 1007.4 and 1322.9 m² g⁻¹, respectively.</td>
<td>MB</td>
<td>99.5</td>
<td>30 min</td>
<td>1</td>
</tr>
<tr>
<td>ZIF-8-SLM</td>
<td>14.8-15.3 nm</td>
<td>Zn:Hmim: MeOH 1:4:1, RT, 1h</td>
<td>ND</td>
<td>RhB and MB</td>
<td>88.3-99.1</td>
<td>10 h</td>
<td>2</td>
</tr>
<tr>
<td>ZIF-8 or ZIF-67</td>
<td>3.5–4.5 μm</td>
<td>Zn²⁺: Hmim: NH₃: TEA: H₂O molar compositions of 1: 2: 32: (0–32): 157</td>
<td>Mesoporous volume is 0.04-0.14 cm³ g⁻¹, S_{BET} is 395-441 m² g⁻¹</td>
<td>RhB, anionic methyl orange and cationic methylene blue</td>
<td>30-89</td>
<td>2h</td>
<td>3</td>
</tr>
<tr>
<td>ZIF-8</td>
<td>50-200</td>
<td>Zn:Hmim: NaOH 1:35:0-2.3</td>
<td>Pore size 10-60 nm, S_{BET} and S_{Lan} area are 1320-1708 m² g⁻¹ and 1738-1837 m² g⁻¹, respectively</td>
<td>MB</td>
<td>&gt; 95</td>
<td>&lt; 10 min</td>
<td>Here</td>
</tr>
</tbody>
</table>

Note: S_{BET}, BET surface area; S_{Lan}, Langmuir surface area; ND, not detected.

