Electronic Supplementary Information (ESI)

CuO nanoclusters coated with mesoporous SiO$_2$ as highly active and stable catalyst for olefin epoxidation

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Fig. S1 TG profile of CuO CNCs. The TG plot shows three major weight loss regimes, the two areas before 250 °C can be mainly assigned to the loss of adsorbed and hydrated water in the CuO CNCs. The final one starting around 265 °C is corresponded to the degradation of PVP, resulting in 1.8% weight loss.$^1$

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**Fig. S2** SEM image of sample obtained at the same reaction conditions without the addition of surfactant PVP.

**Fig. S3** N₂ adsorption-desorption isotherms of the CuO CNCs and Cu₂O hollow nanospheres.

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**Fig. S4** X-ray diffraction patterns of samples obtained with different reaction times.

**Fig. S5** SEM image of commercial available CuO.

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**Fig. S6** X-ray diffraction patterns of fresh, used CuO CNCs@meso-SiO$_2$ nanocomposite and used Cu$_2$O hollow nanospheres.

**Fig. S7** The styrene epoxidation over CuO CNCs@meso-SiO$_2$ nanocomposite as a function of reaction time. Conditions: 1 mmol styrene, 5 mmol TBHP, 10 mg catalyst, stirred in 10 mL of acetonitrile under reflux (70°C).
**Fig. S8** The trans-stilbene epoxidation over CuO CNCs@meso-SiO\(_2\) nanocomposite as a function of reaction time. Conditions: 1 mmol trans-stilbene, 5 mmol TBHP, 10 mg catalyst, stirred in 10 mL of acetonitrile under reflux (70°C).

**Table S1** Influence of reaction temperature on alkene epoxide selectivities over CuO CNCs@meso-SiO\(_2\) nanocomposite

<table>
<thead>
<tr>
<th>Temperature, °C</th>
<th>Time, h</th>
<th>Conversion, %</th>
<th>Selectivity of alkene epoxide, %</th>
<th>Time, h</th>
<th>Conversion, %</th>
<th>Selectivity of alkene epoxide, %</th>
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</thead>
<tbody>
<tr>
<td>60</td>
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<td>28.9</td>
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<td>45.2</td>
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<td>61.2</td>
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</tr>
<tr>
<td>80</td>
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<td>56.1</td>
<td>4</td>
<td>93.4</td>
<td>78.3</td>
</tr>
</tbody>
</table>

*1 mmol alkene, 5 mmol TBHP, and 10 mg catalyst, stirred in 10 mL of acetonitrile under given reaction temperature*
Fig. S9 TEM image of CuO CNCs@meso-SiO₂ nanocomposite stirred uninterruptedly in the same reaction mixture for 720 h.

References: