Title: Guerbet Reactions for Biofuel Production from ABE fermentation Using Bifunctional Ni-MgO-Al$_2$O$_3$ Catalysts

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Supporting Information

Fig. S1. (a) and (b): SEM images of Ni–MgO–Al₂O₃ catalyst (Mg/Al=3).

Fig. S2. XRD patterns of Ni–MgO–Al₂O₃ (Mg/Al=3, Ni content = 6 wt.%) catalysts before and after reactions.

Fig. S3. (a) Pore size distributions and (b) N₂ adsorption/desorption isotherms of fresh and spent
catalysts.

Table S1. BET results of Ni–MgO–Al₂O₃ catalysts (Ni content = 6 wt.%) before and after reactions.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Surface area (m²/g)</th>
<th>Pore volume (cm³/g)</th>
<th>Mean pore size (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>237.5</td>
<td>0.68</td>
<td>5.7</td>
</tr>
<tr>
<td>Cycle₁</td>
<td>234.4</td>
<td>0.66</td>
<td>5.6</td>
</tr>
<tr>
<td>Cycle₂</td>
<td>229.4</td>
<td>0.65</td>
<td>5.6</td>
</tr>
<tr>
<td>Cycle₃</td>
<td>222.5</td>
<td>0.64</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Fig. S4. (a) TEM image of spent catalyst Ni–MgO–Al₂O₃ (Mg/Al=3) catalysts. (b) Histogram of particle size distribution of Ni nanoparticles.

Figure S5. CO₂-TPD profiles of the fresh, used Ni–MgO–Al₂O₃ catalysts.
Figure S6. Results of the catalytic coupling of ABE mixture. Reaction conditions: 1.5g cat: Ni–MgO–Al₂O₃, 240°C for 20 hours. Values determined by FID, using internal standard.