Title: Guerbet Reactions for Biofuel Production from ABE fermentation Using Bifunctional Ni-MgO-Al₂O₃ 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.

| Sample   | Surface area (m²/g) | Pore volume (cm³/g) | Mean pore size (nm) |
|----------|---------------------|---------------------|---------------------|
| Fresh    | 237.5               | 0.68                | 5.7                 |
| Cycle₁   | 234.4               | 0.66                | 5.6                 |
| Cycle₂   | 229.4               | 0.65                | 5.6                 |
| Cycle₃   | 222.5               | 0.64                | 5.5                 |

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.