Supporting information

Antibiotic Residue Derived Solid Acids for Ethanolysis of Furfuryl Alcohol into Ethyl Levulinate

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**Table S1.** Essential mesoporous information of as-prepared GR derived solid acids.

<table>
<thead>
<tr>
<th>Sample</th>
<th>BET surface area m²/g</th>
<th>aP.D. nm</th>
<th>bT.P.V. cm³/g</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR300-S0.25</td>
<td>51.93</td>
<td>4.32</td>
<td>0.16</td>
</tr>
<tr>
<td>GR300-0.5-S0.25</td>
<td>49.31</td>
<td>3.83</td>
<td>0.14</td>
</tr>
<tr>
<td>GR300-1-S0.25</td>
<td>26.94</td>
<td>3.83</td>
<td>0.098</td>
</tr>
<tr>
<td>GR300-2-S0.25</td>
<td>30.04</td>
<td>30.06</td>
<td>0.17</td>
</tr>
</tbody>
</table>

*a* P.D., pore diameter, *b* T.P.V., total pore volume.

**Fig. S1.** XRD patterns of as-prepared GR derived solid acids.
Fig. S2. N$_2$ adsorption-desorption isotherms of as-prepared GR derived solid acids.
Fig. S3. Pore size distribution of as-prepared GR derived solid acids.
Fig. S4. XPS spectra of GR derived solid acids.
**Fig. S5.** TG/DTG curves of as-prepared GR derived solid acids: (a) TG; (b) DTG.

**Fig. S6.** GC-MS spectra for FA ethanolysis at 160 °C.
**Fig. S7.** Effect of chlorosulfonic acid dosage on FA ethanolysis. Reaction conditions:

FA (1 mmol), catalyst (20 mg), ethanol (5 mL), 160 °C, 600 rpm, 1.5 h.

![Graph showing the effect of chlorosulfonic acid dosage on FA ethanolysis](image)

**Fig. S8.** Effect of catalyst dosage on FA ethanolysis. Reaction conditions: FA (1 mmol), GR300-0.5-S0.25, ethanol (5 mL), 160 °C, 600 rpm, 1.5 h.

![Graph showing the effect of catalyst dosage on FA ethanolysis](image)
**Fig. S9.** Effect of reaction time on FA ethanolysis. Reaction conditions: FA (1 mmol), GR300-0.5-S0.25 (20 mg), ethanol (5 mL), 160 °C, 600 rpm.

**Fig. S10.** SEM images for GR300-0.5-S0.25. (a) fresh sample; (b) reactivated sample after four cycles.