Supplementary Information

Generalized high-temperature synthesis of zeolite catalysts with unpredictably high space-time yields (STYs)

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<table>
<thead>
<tr>
<th>Sample</th>
<th>BET Area (a) m(^2)/g</th>
<th>Micropore Volume (a) cm(^3)/g</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-MFI</td>
<td>360</td>
<td>0.16</td>
</tr>
<tr>
<td>C-MOR</td>
<td>401</td>
<td>0.19</td>
</tr>
<tr>
<td>C-Beta</td>
<td>460</td>
<td>0.20</td>
</tr>
<tr>
<td>C-RUB-36</td>
<td>300</td>
<td>0.13</td>
</tr>
</tbody>
</table>

\(a\) The data were measured with H-form of zeolites synthesized from hydrothermal routes.
<table>
<thead>
<tr>
<th>Run</th>
<th>DMDEA/Si</th>
<th>Temperature (°C)</th>
<th>Time (day)</th>
<th>Zeolite type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.07</td>
<td>140</td>
<td>20</td>
<td>RUB-36</td>
</tr>
<tr>
<td>2</td>
<td>0.07</td>
<td>160</td>
<td>9</td>
<td>RUB-36</td>
</tr>
<tr>
<td>3</td>
<td>0.07</td>
<td>180</td>
<td>3</td>
<td>RUB-36</td>
</tr>
<tr>
<td>4</td>
<td>0.07</td>
<td>200</td>
<td>1.5</td>
<td>RUB-36</td>
</tr>
<tr>
<td>5</td>
<td>0.43</td>
<td>140</td>
<td>14</td>
<td>RUB-36</td>
</tr>
<tr>
<td>6</td>
<td>0.43</td>
<td>160</td>
<td>9</td>
<td>Amor</td>
</tr>
<tr>
<td>7</td>
<td>0.43</td>
<td>180</td>
<td>3</td>
<td>Amor</td>
</tr>
<tr>
<td>8</td>
<td>0.43</td>
<td>200</td>
<td>2</td>
<td>Amor</td>
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</tbody>
</table>
Supplementary Figure Captions

Fig. S1 XRD patterns of the S-RUB-36-temp synthesized at (a) 140 °C for 20 days, (b) 160 °C for 9 days, (c) 180 °C for 3 days, and (d) 200 °C for 1.5 days.

Fig. S2 (a) XRD pattern and (b) SEM image of the C-RUB-36-140.

Fig. S3 TG curves of the (a) C-RUB-36-140, (b) S-RUB-36-140, and (c) S-RUB-36-180.

Fig. S4 $^{29}$Si MAS NMR spectra of the (a) C-RUB-36, (b) S-RUB-36-140, and (c) S-RUB-36-180.

Fig. S5 XRD patterns of the S-RUB-36-180 crystallized at (a) 0, (b) 0.25, (c) 0.5, (d) 1.0, (e) 3.0, and (f) 4.0 days, respectively.

Fig. S6 SEM images of the S-RUB-36-180 crystallized at (a) 0, (b) 0.25, (c) 0.5, (d) 1.0, (e) 3.0, and (f) 4.0 days, respectively.

Fig. S7 Photographs of the S-RUB-36-180 crystallized at (a) 0, (b) 0.5, (c) 1.0, and (d) 4.0 days, respectively.

Fig. S8 $^{29}$Si MAS NMR spectra of the S-RUB-36-180 crystallized at (a) 0, (b) 1.0, and (c) 4.0 days, respectively.

Fig. S9 XRD patterns of the S-RUB-36-140 crystallized at (a) 0, (b) 10, (c) 15, (d) 20, and (e) 25 days, respectively.

Fig. S10 The dependences of crystallinity on the crystallization time of the (a) C-RUB-36-140, (b) S-RUB-36-140, and (c) S-RUB-36-180.
**Fig. S11** (A) SEM images and (B) XRD patterns of the (a) Beta seeds, (b) MFI seeds, and (c) MOR seeds.

**Fig. S12** (A) SEM images and (B) XRD patterns of the S-Beta-200 crystallized at (a) 0, (b) 0.5, (c) 1, (d) 1.5, (e) 4, and (f) 5 h, respectively. There is impurity of MOR zeolite when the crystallization time reaches to 5 h.

**Fig. S13** (A) SEM images and (B) XRD patterns of the S-MFI-240 crystallized at (a) 0, (b) 0.35, and (c) 0.5 h, respectively.

**Fig. S14** (A) SEM images and (B) XRD patterns of the S-MOR-240 crystallized at (a) 0, (b) 1, and (c) 1.5 h, respectively.

**Fig. S15** Catalytic conversion and product selectivities over S-ZSM-5-240 catalyst in MTO ( ■ C_1; ▲ C_{2-4}; ▼ C_{2=}; ◇ C_3=; ◆ C_4=; ⊙ C_5+ aromatics; ▲ Conv. ).

**Fig. S16** Catalytic conversion and product selectivities over ZSM-5 catalyst by hydrothermal method at 180 °C in MTO ( ■ C_1; ▲ C_{2-4}; ▼ C_{2=}; ◇ C_3=; ◆ C_4=; ⊙ C_5+ aromatics; ▲ Conv., the Si/Al ratio is 128 measured by ICP)
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Fig. S15 Catalytic conversion and product selectivities over S-ZSM-5-240 catalyst in MTO (■ C_{1}; ▲ C_{2-4}; ▼ C_{2}^{=}; ◀ C_{3}^{=}; ◆ C_{4}^{=}; ⊙ C_{5}+aromatics; ▶ Conv.)
Catalytic conversion and product selectivities over ZSM-5 catalyst by hydrothermal method at 180 °C in MTO (■ C₁; ▲ C₂-4; ▼ C₂−; ◆ C₃−; ◆ C₄−; ⊙ C₅+aromatics; ▶ Conv., the Si/Al ratio is 128 measured by ICP)