Rapid Room Temperature Conversion of Hydroxy Double Salt to MOF-505 for CO$_2$ Capture

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Figure S1. Thermogravimetric analysis (TGA) curves of MOF-505 products.
Figure S2. Elemental mapping images of (a) [(Zn, Cu)(OH)NO$_3$] intermediate and MOF-505 products synthesized by rapid room temperature method for (b) 10 min, (c) 15 min, (d) 20 min, (e) 25 min, and (f) 30 min.

Figure S3. Density functional theory (DFT) pore size distribution of MOF-505 products.

Calculation of Adsorption Selectivity. The adsorption selectivities of CO$_2$/CH$_4$ and CO$_2$/N$_2$ for MOF-505-25 are calculated on the basis of ideal adsorbed solution theory (IAST), serving as a widely employed method to evaluate the separation performance of porous materials. Firstly, the measured single-component isotherms of CO$_2$, CH$_4$ and N$_2$ at 298 K are fitted to the Langmuir-Freundlich (L-F) model:

\[ q = q_m \frac{b \ p^m}{1 + b \ p^m} \]  

(1)
where \( q \) (mmol/g) is the adsorbed amount; \( q_m \) (mmol/g) is the saturation capacity; \( p \) (kPa) is the pressure of the bulk gas at equilibrium with the adsorbed phase; \( b \) (1/kPa) is the affinity coefficient of the sites; \( m \) refers to the deviation from an ideal homogeneous surface. Here, all isotherms are well described by using the L-F model, giving the correlation coefficients (\( R^2 \)) values high up to 0.9998, listed in Table S1. Then the adsorption selectivities of \( \text{CO}_2/\text{CH}_4 \) and \( \text{CO}_2/\text{N}_2 \) mixtures can be obtained according to the following equation:

\[
S = \frac{q_1}{q_2} \frac{p_1}{p_2}
\]

where \( q_1 \) and \( q_2 \) are the adsorbed amounts of the adsorbed phase in the mixture; \( p_1 \) and \( p_2 \) are the pressures in the gas phase.

**Table S1**

Fitting parameters of the Langmuir-Freundlich model

<table>
<thead>
<tr>
<th>Parameters</th>
<th>( q_m )</th>
<th>b</th>
<th>m</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{CO}_2 )</td>
<td>9.13764</td>
<td>0.01147</td>
<td>0.86757</td>
<td>0.99988</td>
</tr>
<tr>
<td>( \text{CH}_4 )</td>
<td>6.39268</td>
<td>0.00174</td>
<td>1.01547</td>
<td>0.99999</td>
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<tr>
<td>( \text{N}_2 )</td>
<td>4.92541</td>
<td>5.0554E-4</td>
<td>1.03874</td>
<td>0.99992</td>
</tr>
</tbody>
</table>