Supporting Information

Electrocatalytic reduction of PhCH₂Br on Ag-Y zeolite modified electrode

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1. Materials and Instruments

All reagents were used as received.

XRD patterns were collected using a Rigaku Ultima IV diffractometer with nickel filtered Cu Kα radiation at 35 kV and 25 mA.

SEM images were obtained on a Hitachi S-4800 field-emission scanning microscope.

TEM analyses were carried on a FEI TECNAI G2 F30 operating at 300 KV.

The amounts of Si, Al, Na and Ag etc. in zeolites were quantified by ICP on a Thermo IRIS Intrepid II XSP atomic emission spectrometer after dissolving the samples in HF solution.

Nitrogen adsorption–desorption isotherms at -196 °C were obtained on a BELSORP-max volumetric adsorption analyzer. The samples were out-gassed at 300 °C for 6 h before the adsorption measurement. The specific surface area was determined by the BET method using the data points of P/P₀ in the range of about 0.01-0.2 and the micropore surface area and the micropore volume of the samples were calculated using the t-plot method.

XPS was measured using a Thermo Fisher Scientific ESCALAB 250 spectrometer with Al Kα radiation (1486.6 eV) as incident beam with a monochromator.

H₂-TPR and O₂-TPO analysis was carried out with the Quantachrome Chem 3000 apparatus.
All electrochemical experiments were performed on a CHI 660D electrochemical work station (Chenhua, Shanghai, China) in an undivided cell.

2. General procedure

2.1 Prepare Ag-exchanged Y zeolite

Prior to Ag\(^+\) ion exchange, the impurity extraframework cations of NaY were removed by treatment in 0.1 M NaNO\(_3\) for 2 h, followed by filtering, washing with distilled water and drying. The catalysts were prepared by impregnation of 0.5 g NaY in 50 mL 0.04 M AgNO\(_3\) solution for 2 h under stirring in the dark at room temperature. After filtering, washing 3 times with distilled water and drying at 100\(^\circ\)C for 1 h, a white powder was obtained. Then the samples were calcinated at 350\(^\circ\)C for 3 h to obtain a little yellow powder, labeled Ag-Y.

2.2 Prepare Ag-Y/GC modified electrodes

Prior to the modification, GC electrode was polished with 0.5 \(\mu\)m alumina, and then sonicated for 5 min each in distilled water and acetone. 3 mg Ag-Y was adhered to the electrode surface with 10 \(\mu\)L POV as adhesive. The modified electrode, labeled Ag-Y/GC, was air dried.

2.3 Electrochemical process

Linear sweep voltammograms were carried out using a traditional three-electrode system with a GC (d = 2 mm), Ag (d = 2 mm), or Ag-Y/GC (d = 2 mm) as working electrode, a Pt wire as counter electrode and a Ag/AgI/I\(^-\) as reference electrode, in MeCN – 0.1 M TEABF\(_4\) – 5 mM PhCH\(_2\)Br solution.

Potentiostatic electrolysis were carried out with a Ag, GC or Ag-Y/GC as working electrode, a Mg rod as sacrificial anode and a Ag/AgI/I\(^-\) as reference electrode, in MeCN – 0.1 M TEABF\(_4\) – 0.1 M PhCH\(_2\)Br solution in the presence of N\(_2\) or CO\(_2\). The products were extracted by diethyl ether and quantitatively analyzed by GC instrument (GC-2014, Shimadzu). For the electrocarboxylation carried out in the presence of CO\(_2\), the electrolyte should be esterified by addition of anhydrous K\(_2\)CO\(_3\) and methyl iodide at 50-60\(^\circ\)C for 5 h before the extraction.
3. N$_2$ adsorption-desorption isotherms

![Graph showing N$_2$ adsorption-desorption isotherms of NaY and Ag-NaY](image)

Fig. S1 N$_2$ adsorption-desorption isotherms of (a) NaY and (b) Ag-NaY

4. ICP data for Ag-Y

Table S1 Influence of concentration of AgNO$_3$ to exchange capacity

<table>
<thead>
<tr>
<th>Entry</th>
<th>Zeolite</th>
<th>$C_{Ag^+}$ (mol L$^{-1}$)</th>
<th>Ion concentration (g L$^{-1}$)</th>
<th>Exchange capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ag$^+$</td>
<td>Na$^+$</td>
</tr>
<tr>
<td>1</td>
<td>NaY</td>
<td>0</td>
<td></td>
<td>82.9</td>
</tr>
<tr>
<td>2</td>
<td>Ag-Y-2</td>
<td>0.02</td>
<td>186.8</td>
<td>46.3</td>
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<tr>
<td>3</td>
<td>Ag-Y-4</td>
<td>0.04</td>
<td>285.3</td>
<td>23.3</td>
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<tr>
<td>4</td>
<td>Ag-Y-6</td>
<td>0.06</td>
<td>337.4</td>
<td>18.0</td>
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<tr>
<td>5</td>
<td>Ag-Y-8</td>
<td>0.08</td>
<td>344.6</td>
<td>8.3</td>
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