Electronic Supplementary Information

Effect of Pyrolysis Pressure on Activity of Fe-N-C Catalysts for Oxygen Reduction

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S1. Cyclic voltammogram for Fe-N-C (3.5 g batch) was obtained in room-temperature, nitrogen saturated 0.5 M H₂SO₄ with a 50 mV s⁻¹ scan rate.
S2. TEM image of Fe-N-C catalyst (3.5 g batch), arrows indicate some of random pores.
<table>
<thead>
<tr>
<th>Precursor Loading (g)</th>
<th>Current Density* (mA cm(^{-2}))</th>
<th>Kinetic Current Density# (mA cm(^{-2}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.48</td>
<td>0.31</td>
<td>0.34</td>
</tr>
<tr>
<td>0.75</td>
<td>0.53</td>
<td>0.61</td>
</tr>
<tr>
<td>2.4</td>
<td>0.88</td>
<td>1.13</td>
</tr>
<tr>
<td>3.5</td>
<td>1.1</td>
<td>1.47</td>
</tr>
</tbody>
</table>

Table S1. Fe-N-C catalyst loading-ORR activities relationship.

*Derived from polarization curves in Fig. 5 at 0.8 V. #The kinetic current density, \(i_k\), was calculated based on the equation \(i^{-1} = i_d^{-1} + i_k^{-1}\), where \(i\) is the observed current density and \(i_d\) is the diffusion-limited current density obtained at 0.4 V.\(^1\)
S3. Steady-state polarization curve for 3.5 g batch in 0.5 M oxygen saturated H₂SO₄ at 1200 rpm rotating speed at room temperature. Ring electrode was poised at 1.2 V, 30s hold at each potential. Corresponding H₂O₂ production plot. The loading was 0.5 mg cm⁻².

Generated peroxide percentage, \( X_{\text{H}_2\text{O}_2} \), was calculated from the collection efficiency \( (N = 0.23 \pm 0.01) \), ring current, \( I_{\text{ring}} \), and disk current, \( I_{\text{disc}} \)

\[
X_{\text{H}_2\text{O}_2} = \frac{2I_{\text{ring}}/N}{I_{\text{disc}} + I_{\text{ring}}/N} \times 100\%
\]

Collection efficiency, \( N \), was calculated from similar potentiostatic measurements in 0.1 M NaOH, 0.01 M K₃Fe(CN)₆.¹
S4. Square wave-voltammetry (SWV) profile of a Fe-N-C sample (3.5 g batch). Experiment was performed with a step potential of 5 mV, amplitude of 20 mV, and frequency of 10 Hz.
S5. LSVs for DOE durability protocol for Fe-N-C (3.5 g Batch). LSVs were obtained in room-temperature, oxygen saturated 0.1 M H₂SO₄ with a 900 rpm rotating speed at a 0.5 mVs⁻¹ scan rate.

Durability conditions: 0.1 M H₂SO₄ saturated with O₂, 900 rpm, 50 mVs⁻¹ in the potential range of 0.2 – 1.1 V and loading amount: 0.2 mgcm⁻².

References
