Supporting Information for

Binaphthyl-based Molecular Barrier Materials for Phosphoric Acid Poisoning in High-Temperature Proton Exchange Membrane Fuel Cells

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✓ Figure S1. Comparisons of cyclic voltammograms in an N2-purged 0.1 M HClO4 solution with 0.01 M H3PO4 at a scan rate of 50 mV s⁻¹.
✓ Table S1. ECSA and kinetic current densities at 0.8 V vs. RHE
✓ Figure S2. Comparisons of cyclic voltammograms with different dipping times in an N2-purged 0.1 M HClO4 solution with 0.01 M H3PO4 at a scan rate of 100 mV s⁻¹.
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✓ Figure S19 and S20. 1H and 13C NMR spectra of compound NASH
✓ Figure S21 and S22. 1H and 13C NMR spectra of compound BNCN
Figure S1. Comparisons of cyclic voltammograms in an N$_2$-purged 0.1 M HClO$_4$ solution with 0.01 M H$_3$PO$_4$ at a scan rate of 50 mV s$^{-1}$
**Table S1.** Electrochemically active surface area (ECSA) and kinetic current densities at 0.8 V vs. RHE$^a$

<table>
<thead>
<tr>
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<th>specific ECSA (m² g⁻¹Pt)</th>
<th>$j$ (mA cm⁻² at +0.80 V)</th>
<th>$j_k$ (mA cm⁻² at +0.80 V)</th>
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<tbody>
<tr>
<td>Pt</td>
<td>24.0</td>
<td>5.6</td>
<td>22.1</td>
</tr>
<tr>
<td>Pt_PA$^b$</td>
<td>22.4</td>
<td>4.5</td>
<td>11.0</td>
</tr>
<tr>
<td>Pt_BNSH_PA</td>
<td>23.0</td>
<td>5.5</td>
<td>20.4</td>
</tr>
<tr>
<td>Pt_BNCN_PA</td>
<td>22.8</td>
<td>5.3</td>
<td>17.0</td>
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<tr>
<td>Pt_BN-1-SH_PA</td>
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<td>5.2</td>
<td>16.4</td>
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<td>Pt_C12-BNSH_PA</td>
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<td>12.9</td>
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<tr>
<td>Pt_NSH_PA</td>
<td>20.1</td>
<td>3.6</td>
<td>6.9</td>
</tr>
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</table>

$^a$The ORR activities were measured in 0.1 M HClO₄ and 0.01 M H₃PO₄ solutions under O₂ using a glassy carbon rotating disk electrode (RDE) at a rotation and sweep rate of 1600 rpm and 10 mV s⁻¹, respectively.

$^b$PA: Phosphoric acid (0.01 M).
**Figure S2.** Comparisons of cyclic voltammograms with different dipping times in an N\textsubscript{2}-purged 0.1 M HClO\textsubscript{4} solution with 0.01 M H\textsubscript{3}PO\textsubscript{4} at a scan rate of 100 mV s\textsuperscript{-1}.
- $^1$H NMR and $^{13}$C NMR spectra for all products:

**Figure S3.** $^1$H NMR spectrum of compound 2a

**Figure S4.** $^{13}$C NMR spectrum of compound 2a
Figure S5. $^1$H NMR spectrum of compound BNSH

Figure S6. $^{13}$C NMR spectrum of compound BNSH
Figure S7. $^1$H NMR spectrum of compound 2b

Figure S8. $^{13}$C NMR spectrum of compound 2b
Figure S9. $^1$H NMR spectrum of compound C2-BNSH

Figure S10. $^{13}$C NMR spectrum of compound C2-BNSH
Figure S11. $^1$H NMR spectrum of compound 2c

Figure S12. $^{13}$C NMR spectrum of compound 2c
Figure S13. $^1$H NMR spectrum of compound C12-BNSH

Figure S14. $^{13}$C NMR spectrum of compound C12-BNSH
Figure S15. $^1$H NMR spectrum of compound 2d

Figure S16. $^{13}$C NMR spectrum of compound 2d
Figure S17. $^1$H NMR spectrum of compound BN-1-SH

Figure S18. $^{13}$C NMR spectrum of compound BN-1-SH
Figure S19. $^1$H NMR spectrum of compound NASH

Figure S20. $^{13}$C NMR spectrum of compound NASH
Figure S21. $^1$H NMR spectrum of compound BNCN

Figure S22. $^{13}$C NMR spectrum of compound BNCN