Supporting Information

A Direct One-Step Synthetic Route to Pd-Pt Nanostructures with Controllable Shape, Size, and Composition for Electrocatalytic Applications

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<table>
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<tr>
<th>Samples&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Pt-0</th>
<th>Pd&lt;sub&gt;1&lt;/sub&gt;Pt&lt;sub&gt;5&lt;/sub&gt;-0</th>
<th>Pd&lt;sub&gt;1&lt;/sub&gt;Pt&lt;sub&gt;5&lt;/sub&gt;-10</th>
<th>Pd&lt;sub&gt;1&lt;/sub&gt;Pt&lt;sub&gt;5&lt;/sub&gt;-19</th>
<th>Pd&lt;sub&gt;1&lt;/sub&gt;Pt&lt;sub&gt;5&lt;/sub&gt;-35</th>
<th>Pd&lt;sub&gt;1&lt;/sub&gt;Pt&lt;sub&gt;5&lt;/sub&gt;-45</th>
<th>Pd&lt;sub&gt;1&lt;/sub&gt;Pt&lt;sub&gt;5&lt;/sub&gt;-75</th>
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<tr>
<td>Average size (nm)</td>
<td>8.5</td>
<td>20.1</td>
<td>14.6</td>
<td>17.3</td>
<td>24.8</td>
<td>30.5</td>
<td>38.0</td>
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<tr>
<td>RSD (%)</td>
<td>40.8</td>
<td>31.3</td>
<td>19.7</td>
<td>18.8</td>
<td>17.7</td>
<td>14.1</td>
<td>18.8</td>
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**Table S1.** Average diameters and relative size distributions (RSDs) of Pt and Pd<sub>1</sub>Pt<sub>5</sub> NCs.

<sup>a</sup>Numbers are the KBr concentrations (mM).

<table>
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<th>Pd&lt;sub&gt;2&lt;/sub&gt;Pt&lt;sub&gt;1&lt;/sub&gt;-0</th>
<th>Pd&lt;sub&gt;2&lt;/sub&gt;Pt&lt;sub&gt;1&lt;/sub&gt;-75</th>
<th>Pd&lt;sub&gt;2&lt;/sub&gt;Pt&lt;sub&gt;1&lt;/sub&gt;-230</th>
<th>Pd&lt;sub&gt;3&lt;/sub&gt;Pt&lt;sub&gt;1&lt;/sub&gt;-0</th>
<th>Pd&lt;sub&gt;3&lt;/sub&gt;Pt&lt;sub&gt;1&lt;/sub&gt;-75</th>
<th>Pd&lt;sub&gt;3&lt;/sub&gt;Pt&lt;sub&gt;1&lt;/sub&gt;-230</th>
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<tr>
<td>Average size (nm)</td>
<td>9.1</td>
<td>18.8</td>
<td>23.0</td>
<td>9.0</td>
<td>9.4</td>
<td>16.2</td>
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<tr>
<td>RSD (%)</td>
<td>24.9</td>
<td>15.8</td>
<td>17.4</td>
<td>70.5</td>
<td>30.8</td>
<td>25.9</td>
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**Table S2.** Average diameters and relative size distributions (RSDs) of Pd<sub>2</sub>Pt<sub>1</sub> and Pd<sub>3</sub>Pt<sub>1</sub> NCs.
Fig. S1. HRTEM images of Pd\textsubscript{1}Pt\textsubscript{5} dendrites and corresponding FFT patterns. Most of the exposed facets are \{111\} with some \{100\} and \{110\} facets.
Fig. S2. (a) HRTEM image and (b-d) corresponding EELs mapping images of Pd₅Pt₅ dendrites. (b) Overlapped mapping images of Pd and Pt, and mapping images of (c) Pd and (d) Pt.
Fig. S3. (a) TEM image of Pt NCs prepared under the same condition as in Fig. 2a except that Na$_2$PdCl$_4$ was not used. (b) TEM images of Pd-Pt NCs prepared under the same condition as in Figure 1a except that KBr was not used. Size distributions of NCs in (c) Fig. S3a and (d) Fig. S3b.
Fig. S4. TEM images of the Pd$_{1}$Pt$_{5}$ dendrites obtained after (a) 10 min and (b) 15 min.
Fig. S5. Size distributions of Pt and Pd$_{1}$Pt$_{3}$ NCs which are shown in Fig. 3 in the manuscript.
**Fig. S6.** TEM images of Pt NCs with varying KBr concentrations of (a) 0, (b) 19, (c) 60, and (d) 75 mM.
Fig. S7. TEM images of Pd$_4$Pt$_5$ NCs with different KCl/KBr molar ratios of (a) 9, (b) 4, (c) 1, and (d) 0.4.
Fig. S8. Size distributions of Pd$_2$Pt$_1$ and Pd$_{10}$Pt$_1$ NCs which are shown in Fig. 4 in the manuscript.
Fig. S9. TEM images of Pd$_2$Pt$_1$ NCs with KBr concentrations 230 mM, obtained after (a) 25 min and (b) 45 min.
Fig. S10. TEM images of Pd-Pt NCs with different compositions, which were synthesized at 75 mM of KBr concentration; (a) Pd$_1$Pt$_5$, (b) Pd$_1$Pt$_2$, (c) Pd$_1$Pt$_1$, (d) Pd$_2$Pt$_1$. 
Fig. S11. TEM images of Pd$_{10}$Pt$_{1}$ NCs with KBr concentrations 230 mM, obtained after (a) 25 min and (b) 45 min.
Fig. S12. XRD patterns of Pd$_1$Pt$_3$ dendrites supported on carbon black.
Fig. S13. (a) Polarization curves for ORR on a Pd$_1$Pt$_5$/C in a 0.1 M HClO$_4$ solution with a sweep rate of 20 mV s$^{-1}$. (b) Koutecky-Levich plots for Pd$_1$Pt$_5$/C at various potentials. The inset table shows the electron transfer numbers at various potentials.
**Fig. S14.** ORR polarization curves of Pt/C before and after the ADT.

**Fig. S15.** FAOR polarization curves of Pd₁Pt₅/C (black) and Pt/C (red), which show both forward and backward sweeps.