Supporting Information

A Hierarchical Interconnected Nanosheet Structure of Porous $\delta$-MnO$_2$ on Graphite Paper as Cathode with a Broad Potential Window for NaNO$_3$ Aqueous Electrolyte Supercapacitors

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Figure S1. SEM images of the graphite paper (GP) before (a-c) and after (d-f) electrochemical roughening in the 0.5 M K$_2$CO$_3$ aqueous solution.

Figure S2. TEM characterization of the pores in δ-MnO$_2$. 

S2
**Figure S3.** CV curves (scan rate: 20 mV s\(^{-1}\); potential window: 0-1.4 V) of the δ-MnO\(_2\) cathode material/structure (a) in different sodium salt aqueous solutions of 1 M and (b) in the NaNO\(_3\) solutions of different concentrations.

**Figure S4.** Electrochemical performance of GP and electrochemically roughened GP: a) CV and b) GCD curves of GP, c) CV and d) GCD curves of roughened GP, e) rate performance and f) Nyquist plot of GP and roughened GP.
Figure S5. The $IR$ drop plot.

Figure S6. Equivalent circuit diagram for fitting the EIS in Figure 4h.

$R_{ESR}$: equivalent series resistance.
$R_{ct}$: charge transfer resistance.
$C_{CPE}$: equivalent capacitance.
$Z_{w}$: Warburg complex resistance.
Figure S7. a) low-magnification and b) high-magnification SEM images of the δ-MnO$_2$ after cycling.

Figure S8. Cycle stability and the coulombic efficiency of δ-MnO$_2$ at different potential windows: a) 0-1.0 V and b) 0-1.3 V.
Figure S9. Electrochemical performance of activated carbon. a) CV curves at different scan rates in the potential window of −1.0-0 V, b) GCD curves of −1.0-0 V at different current densities, c) rate performance at different current densities, d) Nyquist plot (The inset exhibits the EIS at high frequency), e) cycling stability at 4 A g$^{-1}$. 
<table>
<thead>
<tr>
<th>Active materials</th>
<th>Electrolytes</th>
<th>Cell voltage (V)</th>
<th>Capacitance (F g⁻¹)</th>
<th>Max Energy (Wh kg⁻¹)</th>
<th>Max Power density (kW kg⁻¹)</th>
<th>Capacitance retention</th>
<th>Ref.</th>
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<tbody>
<tr>
<td>FeOOH // MnO₂</td>
<td>1M Li₂SO₄</td>
<td>0-1.85</td>
<td>51</td>
<td>24</td>
<td>2</td>
<td>85% after 2000 cycles</td>
<td>[44]</td>
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<tr>
<td>AC // Carbon nanofibers/MnO₂ and 4mM NaHCO₃</td>
<td>1M Na₂SO₄</td>
<td>0-2.0</td>
<td>57</td>
<td>36.7</td>
<td>7.7</td>
<td>92% after 10000 cycles</td>
<td>[45]</td>
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<tr>
<td>AC // MnO₂</td>
<td>0.1M K₂SO₄</td>
<td>0-2.2</td>
<td>31</td>
<td>19</td>
<td>1.2</td>
<td>—</td>
<td>[46]</td>
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<tr>
<td>Graphitic carbon sphere // MnO₂</td>
<td>1 M Na₂SO₄</td>
<td>0-2.0</td>
<td>—</td>
<td>22.1</td>
<td>5.5</td>
<td>99% after 1000 cycles</td>
<td>[47]</td>
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<tr>
<td>AC // δ-MnO₂</td>
<td>5M NaNO₃</td>
<td>0-2.4</td>
<td>48</td>
<td>38.4</td>
<td>12</td>
<td>88.6% after this 5000 cycles</td>
<td>work</td>
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