Supporting Information

NH₄V₄O₁₀/rGO Composite as High Performance Electrode Material for Hybrid Capacitive Deionization

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Fig. S1 Crystal structure diagram of NH$_4$V$_4$O$_{10}$.

Fig. S2 (a, b) SEM images and (c, d) TEM images of NHVO.
Fig. S3 (a) Raman spectra of NHVO/rGO composite and pure GO; (b) TGA curve of NHVO/rGO composite.

Fig. S4 (a) N 1s and (b) V 2p XPS spectrum of NHVO.

Fig. S5 (a) Nitrogen adsorption-desorption isotherm and (b) pore-size distribution of
The BET surface area of AC used in our CDI system is $2153.7 \text{ m}^2/\text{g}$. The pore size distribution is mainly microporous.

**Fig. S6** (a) conductivity change curves of effluent and (b) NaCl removal capacity of rGO//AC cell (rGO as the cathode and AC as the anode) in 500 mg/L NaCl solution at different cell voltages. (The mass of active material (containing AC and rGO) is 45.0 mg. The thickness of AC electrode, and rGO electrode is about 255.2 $\mu$m and 326.1 $\mu$m, respectively.)

**Fig. S7** (a) relationship between conductivity and concentration of CaCl$_2$; (b) relationship between conductivity and concentration of MgCl$_2$
Fig. S8 (a) the effluent conductivity variation and (b) effluent pH changes of NHVO/rGO cell during 100 cycles of charging and discharging process in 500 mg/L NaCl solution at the cell voltage of 0.8 V.

Fig. S9 (a, b) SEM images of NHVO/rGO composite after 100 cycles in 500 mg/L NaCl solution at the cell voltage of 0.8 V.

Fig. S10 (a) atomic ratio of C and O on the surface of AC after 100 cycles; (b) C 1S XPS spectrum of AC before cycling; (c) C 1s XPS spectrum of AC after 100 cycles.
Table S1 Comparison of desalting performance among different capacitive deionization systems

<table>
<thead>
<tr>
<th>Material</th>
<th>Voltage or Current density</th>
<th>NaCl concentration</th>
<th>SAC</th>
<th>Electrode Mass</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na₃V₂(PO₄)₃@C</td>
<td>1.0 V</td>
<td>100 mM</td>
<td>137.2 mg/g</td>
<td>10-20 mg</td>
<td>¹</td>
</tr>
<tr>
<td>hV₂O₅-MWCNT</td>
<td>166 mA/g</td>
<td>600 mM</td>
<td>23.6±2.2 mg/g</td>
<td>15 mg</td>
<td>²</td>
</tr>
<tr>
<td>Na₃V₂(PO₄)₃@C wire</td>
<td>100 mA/g</td>
<td>1000 mg/L</td>
<td>98.0 mg/g</td>
<td>10 mg</td>
<td>³</td>
</tr>
<tr>
<td>A mixture of VOHPO₄·0.5(H₂O) and Na₀.₅VOPO₄·2(H₂O)</td>
<td>50 mA/g</td>
<td>100 mM</td>
<td>24.3 mg/g</td>
<td>64 mg</td>
<td>⁴</td>
</tr>
<tr>
<td>NH₄V₄O₁₀/rGO</td>
<td>1.2 V</td>
<td>500 mg/L</td>
<td>20.1 mg/g</td>
<td>75 mg</td>
<td>This work</td>
</tr>
</tbody>
</table>

By contrast, the SAC of NH₄V₄O₁₀/rGO CDI system in this work can reach the level that had been already reported in literatures.
Reference


