Supporting Information

Composite of K-doped (NH₄)₂V₃O₈/Graphene as an Anode Material for Sodium-ion Batteries

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**Fig. S1** XRD pattern of \((\text{NH}_4)_1.92\text{V}_3\text{O}_8/\text{graphene.}\)
Fig. S2 Raman spectrum of (a) pristine graphene and (b) K-doped (NH₄)₂V₃O₈/graphene materials.
Fig. S3 EDX spectrum of K-doped (NH₄)₂V₃O₈/graphene materials.
**Fig. S4** C(1s) X-ray photoelectron spectrum (XPS) of (a) pristine graphene and (b-d) K-doped (NH$_4$)$_2$V$_3$O$_8$/graphene materials, respectively.
Fig. S5 (a) cycling capacities of the pure reduced graphene at the current density of 0.1 A g\(^{-1}\); (b) cycling performance of K-2 at the current rate of 0.4 A g\(^{-1}\); (c) cycling performance of K-doped (NH\(_4\))\(_2\)V\(_3\)O\(_8\) materials without graphene at the current density of 100 mA g\(^{-1}\); (d) cycling performance of (NH\(_4\))\(_{1.92}\)V\(_3\)O\(_8\)/graphene at the current density of 0.1 A g\(^{-1}\).
Fig. S6 (a) XRD pattern of K-doped (NH₄)₂V₃O₈ (molar ratio K: V=7.5%); (b) cycling performance of K-doped (NH₄)₂V₃O₈ (molar ratio K: V=7.5%) at the current density of 100 mA g⁻¹; (c-d) SEM images of K-doped (NH₄)₂V₃O₈ (molar ratio K: V=7.5%).

The composition at the molar ratio of K:V=7.5% was investigated in Fig. S6. It can be found that all the diffractions can be indexed with the JCPD: 00-51-1733(Fig. S6a). Meanwhile, the capacity of 193 mA h g⁻¹ was exhibited at the current density of 100 mA g⁻¹ after 100 cycles (Fig. S6 b). SEM images showed that the nanosheets are in the ranges of 200 – 500 nm in width (Fig. S6c, d).
Table S1 The comparison of different vanadium oxides’ electrochemical performances.

<table>
<thead>
<tr>
<th>V-based materials</th>
<th>Capacity (mA h g$^{-1}$) $^{1)}$</th>
<th>Current density (mA g$^{-1}$) $^{1)}$</th>
<th>Reference</th>
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<tbody>
<tr>
<td>K-doped</td>
<td></td>
<td></td>
<td>Present</td>
</tr>
<tr>
<td>(NH$_4$)$_2$V$_3$O$_8$/graphene</td>
<td>235.4 (after 100 cycles)</td>
<td>100</td>
<td>Present</td>
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<tr>
<td>Na$<em>6$(V$</em>{10}$O$_{28}$).16H$_2$O</td>
<td>220 (after 27 cycles)</td>
<td>50</td>
<td>4</td>
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<tr>
<td>V$_2$O$_5$ nano-spheres</td>
<td>177 (after 100 cycles)</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>VO$_2$·1.65H$_2$O/graphene</td>
<td>303.1 (after 20 cycles)</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

