Supporting Information

Growth of Vertically Aligned \(\text{Co}_3\text{S}_4/\text{CoMo}_2\text{S}_4\) Ultrathin Nanosheets on Reduced Graphene Oxide as High-performance Supercapacitor Electrode

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Supporting Figures

**Fig. S1** FE-SEM images of a) the CMS nanoparticles; b) the CMS-rGO hybrid (rGO 15%), c) the CMS-rGO hybrid (rGO 7.5%), d) the CMS-rGO hybrid (rGO 5%).

**Fig. S2** FE-SEM images of a) the MoS$_2$-rGO hybrid, b) the Co$_3$S$_4$-rGO hybrid.
Fig. S3 Raman spectrum of the as-prepared GO.

Fig. S4 a) N$_2$ adsorption–desorption isotherm and b) pore-size distribution curve of the as-obtained CMS-rGO hybrid.
Fig. S5 a) CV curves at the scanning rates of 20 mv s\(^{-1}\); b) charge-discharge curves and c) the calculated specific capacitance of the CMS-rGO, CMS, Co\(_2\)S\(_4\)-rGO, and MoS\(_2\)-rGO electrode. d) Nyquist plots of the CMS-rGO, CMS, Co\(_2\)S\(_4\)-rGO, MoS\(_2\)-rGO electrode.

Fig. S6 Specific and areal capacitance of the electrode of CMS-rGO at different current densities.
Fig. S7  a) CMS thickness; b) CV curves at the scanning rates of 20 mv s$^{-1}$; c) charge-discharge curves and d) the calculated specific capacitance of the CMS-rGO (rGO 15%), rGO 10%, rGO 7.5%, and rGO 5% electrode.

Fig. S8  FE-SEM image of the CMS-rGO hybrid after 2000 cycles.
**Fig. S9** CV curves AC at the scanning rates of 5 mV s\(^{-1}\), 10 mV s\(^{-1}\) and 20 mV s\(^{-1}\).

**Table S1** Comparison of the specific capacitance, rate retention, energy density and cycling stability based on Co\(_3\)S\(_4\)/CoMoS\(_4\)-rGO in present work and other reported work.

<table>
<thead>
<tr>
<th>Electrode material</th>
<th>Specific capacitance</th>
<th>Rate retention</th>
<th>Energy density</th>
<th>Cycling stability</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co(_3)S(_4)/CoMoS(_4) ultrathin</td>
<td>1457.8 F g(^{-1}) at 1 A g(^{-1})</td>
<td>45.1%</td>
<td>33.1 Wh kg(^{-1}) at 0.85 kW kg(^{-1})</td>
<td>93.8%</td>
<td>This work</td>
</tr>
<tr>
<td>nanosheets on rGO</td>
<td></td>
<td></td>
<td></td>
<td>5000 cycles</td>
<td></td>
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<tr>
<td>Amorphous CoMoS(_4)</td>
<td>661 F g(^{-1}) at 1 A g(^{-1})</td>
<td>62%</td>
<td>27.2 Wh kg(^{-1}) at 0.4 kW kg(^{-1})</td>
<td>86%</td>
<td>10000 cycles</td>
</tr>
<tr>
<td>NiMoO(_4) nanotubes</td>
<td>864 F g(^{-1}) at 1 A g(^{-1})</td>
<td>70%</td>
<td>/</td>
<td>71%</td>
<td>1000 cycles (three-electrode system)</td>
</tr>
<tr>
<td>NiCoS(_4) arrays on carbon fiber paper</td>
<td>1056 F g(^{-1}) at 5 mV s(^{-1})</td>
<td>43%</td>
<td>31.4 Wh kg(^{-1}) at 0.2 kW kg(^{-1})</td>
<td>90%</td>
<td>5000 cycles (three-electrode system)</td>
</tr>
<tr>
<td>NiCoS(_4)@MnO(_2) core–shell heterostructure</td>
<td>1337.8 F g(^{-1}) at 2 A g(^{-1})</td>
<td>44%</td>
<td>/</td>
<td>82%</td>
<td>2000 cycles (three-electrode system)</td>
</tr>
<tr>
<td>NiCoS(_4) arrays on carbon fiber paper</td>
<td>9.781 F cm(^{-2}) at 5 mA cm(^{-2})</td>
<td>61.5%</td>
<td>34.62 Wh kg(^{-1}) at 0.12 kW kg(^{-1})</td>
<td>80.64%</td>
<td>2500 cycles</td>
</tr>
<tr>
<td>NiCoS(_4) arrays on carbon fiber paper</td>
<td>1154 F g(^{-1}) at 1 A g(^{-1})</td>
<td>62%</td>
<td>17.3 Wh kg(^{-1}) at 0.28 kW kg(^{-1})</td>
<td>107%</td>
<td>8000 cycles</td>
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</table>

Reference:
1. [1]
2. [2]
3. [3]
4. [4]
5. [5]
6. [6]
7. [7]
Notes and references