Electronic Supplementary Information

Development of a novel method to grow MoS$_2$ mono/few-layer films and MoS$_2$-graphene hybrid films for supercapacitor applications†

Sagar Patil, ¹ Arti Harle,¹ Shivaram Sathaye² and Kashinath Patil¹*

¹ National Chemical Laboratory, Dr. Homi Bhabha Road, Pashan, Pune- 411008, India.

²759/83 Deccan Gymkhana, Pune 411004, India.

AUTHOR EMAIL ADDRESS : kr.patil@ncl.res.in

CORRESPONDING AUTHOR FOOTNOTE

Tel. No. : 91-020 25902250

Mob. No. : 9881045770

Fax No. : (020) 25902647

E-mail : kr.patil@ncl.res.in
FT-IR spectra of MoS$_2$–GNS composites were compared between 400 – 4000 cm$^{-1}$. As shown in Fig. S1, in the FT-IR spectra, the bands between 3400 to 3700 cm$^{-1}$ are attributed to the oxygen containing functional groups of graphene.$^1$ The peak at 2260 cm$^{-1}$ were caused by CO$_2$ absorbed in the sample.$^2$ Furthermore, the observed absorption band between “1620-1730 cm$^{-1}$” for MoS$_2$-GNS, indicates the skeletal vibration of graphene sheets.

Fig. S1. Fourier transform infrared spectra of MoS$_2$ nanosheets and MoS$_2$–GNS composites.
Fig. S2. SEM image of acid-intercalated exfoliated MoS$_2$ nanosheets deposited on Si wafer.
Fig. S3. HRTEM of MoS$_2$ image display the curved graphene like morphology at low magnification.
Fig. S4. Thickness distribution based on 50 randomly selected 2D nanosheets of MoS$_2$ in the AFM topographic image, Fig. 4a.
Fig. S5 Raman spectra of GNS and MoS$_2$–GNS composite
Table S1:

<table>
<thead>
<tr>
<th>Scan Rate</th>
<th>20mVs⁻¹</th>
<th>50 mVs⁻¹</th>
<th>100 mVs⁻¹</th>
<th>150 mVs⁻¹</th>
<th>% Retention</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoS₂</td>
<td>155</td>
<td>153</td>
<td>124</td>
<td>108</td>
<td>69%</td>
</tr>
<tr>
<td>MoS₂/GNS</td>
<td>282</td>
<td>169</td>
<td>152</td>
<td>141</td>
<td>85%</td>
</tr>
</tbody>
</table>

Table S2:

<table>
<thead>
<tr>
<th>Current Density</th>
<th>20 µA</th>
<th>40 µA</th>
<th>60 µA</th>
<th>80 µA</th>
<th>% Retention</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoS₂</td>
<td>156</td>
<td>152</td>
<td>147</td>
<td>144</td>
<td>92.3%</td>
</tr>
<tr>
<td>MoS₂/GNS</td>
<td>255</td>
<td>243</td>
<td>240</td>
<td>236</td>
<td>92.5%</td>
</tr>
</tbody>
</table>

References
