Supplementary Material for

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Hierarchically Structured rGO/MoS_2 Flexible Films via Facile Synthesis for High Performance K-Ion Supercapacitors

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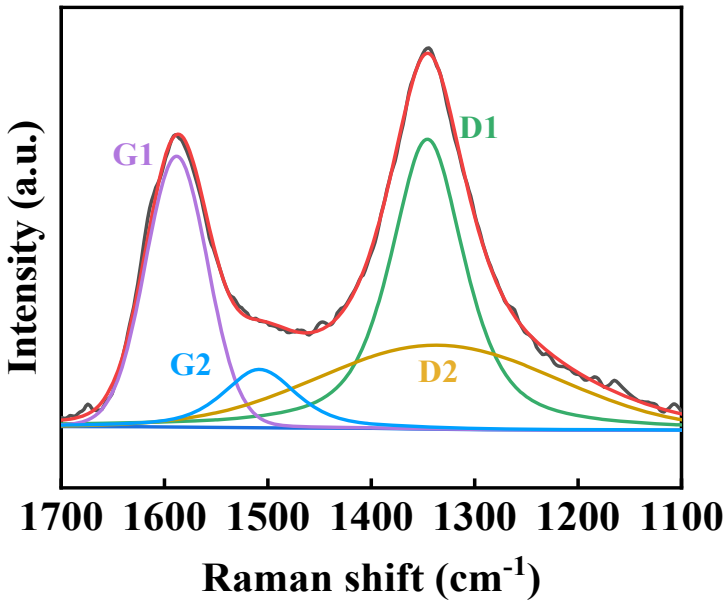

Figure S1. Raman spectrum of rGO film.

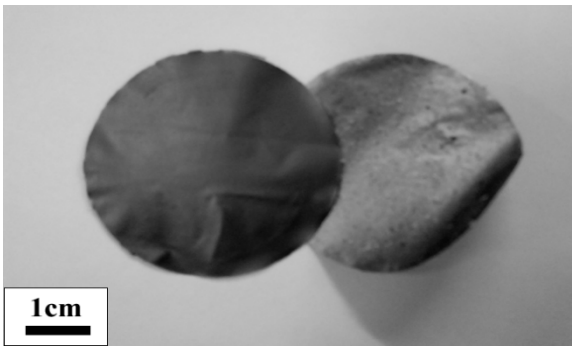

Figure S2. Optical image of the self-standing GO/MoS_2 film (left side) and RGO/MoS_2 film (right side), separated from the filter paper after filtration, with scale bar 1 cm.

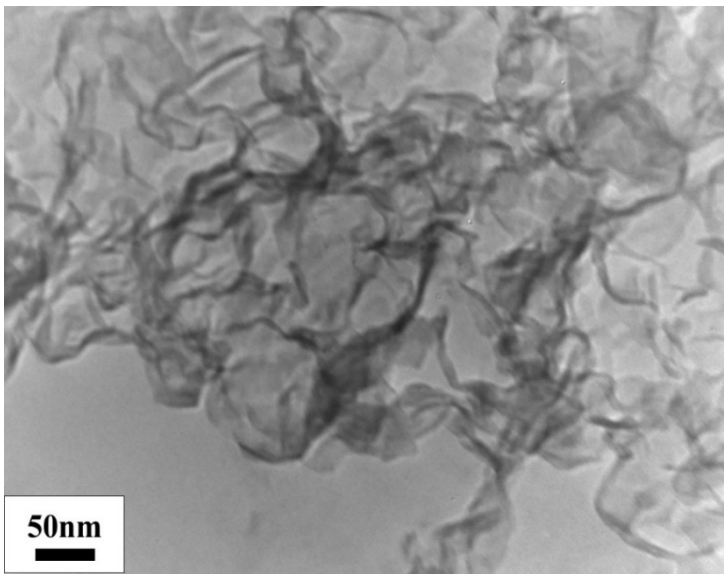

Figure S3. TEM image of MoS_2 nanosheets, scale bar 50 nm.

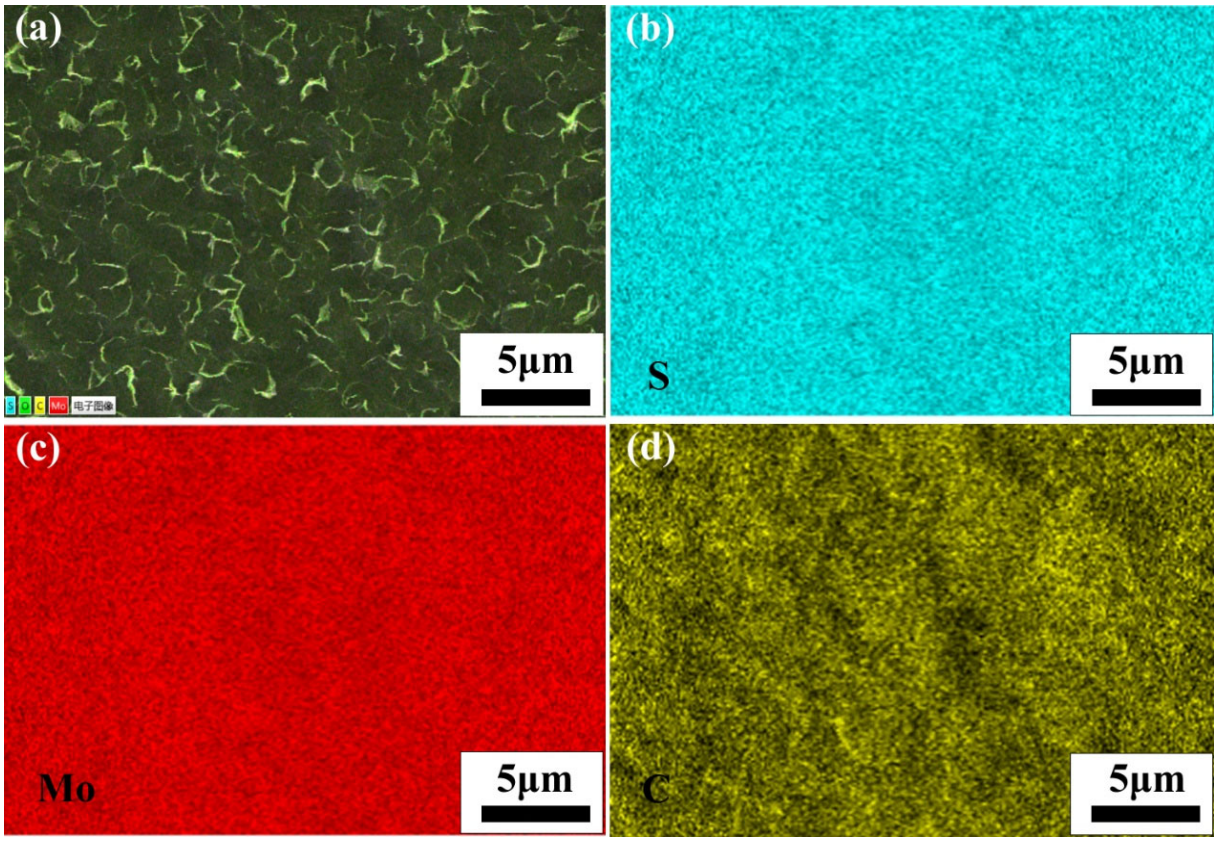

Figure S4. (a) SEM image of the rGO/MoS_2 film, scale bar 5 μm. The (b) S, (c) Mo and (d) C distributions of the rGO/MoS_2 film, scale bar 5 μm.

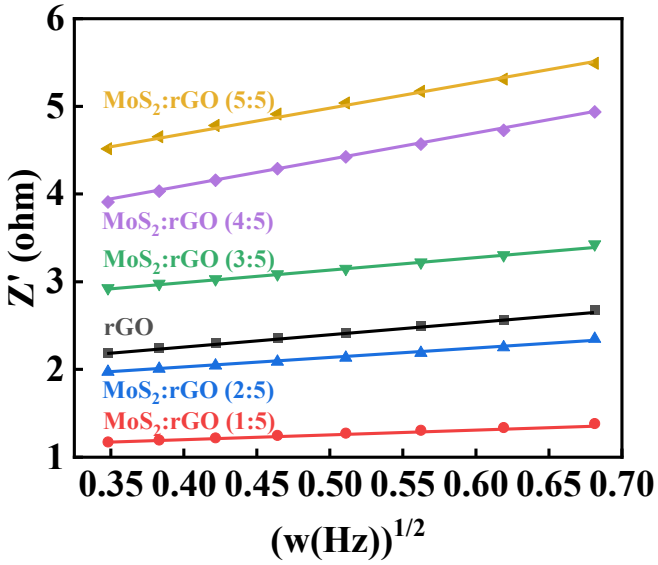

Fig. S5. The plots of Z' vs. $w^{-1/2}$ of rGO/MoS_2 electrodes evaluated in aqueous electrolyte of 3 mol L^{-1} KOH.

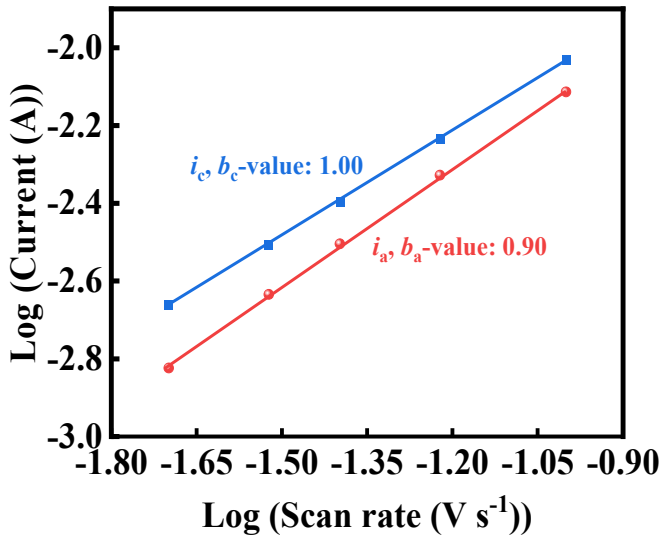

Fig. S6. The plots of current versus scan rate for rGO/MoS_2 electrode evaluated in aqueous electrolyte of 3 mol L-1 KOH.

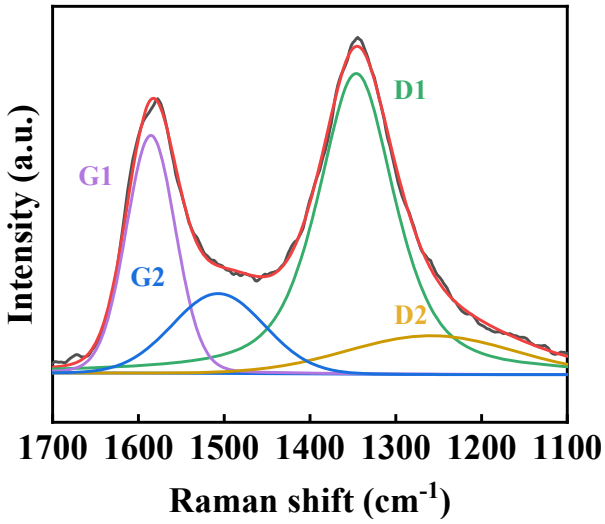

Figure S7. Ex-situ Raman spectrum of rGO in rGO/MoS_2 film.

Electrodes with Different Mass Ratios

MoS_2:rGO Mass Ratio	R_s (Ω)	R_{ct} (Ω)	Inflection Frequency (f_o, Hz)	Time Constant (τ_o, s)	Warburg Coefficient (σ_v)	K^+ Diffusion Coefficient (cm^2/s)	K^+ Diffusion Path Length (cm)
0:5	0.3824	1.6176	1.22	0.82	Slope-derived	3.15×10^{-15}	1.61×10^{-7}
1:5	0.3368	0.7002	2.14	0.47	Slope-derived	1.67×10^{-14}	2.80×10^{-7}
2:5	0.3711	1.5185	1.00	1.00	Slope-derived	5.32×10^{-15}	2.31×10^{-7}
3:5	0.3819	2.5127	0.69	1.49	Slope-derived	3.01×10^{-15}	2.12×10^{-7}
4:5	0.3120	3.6516	0.55	1.82	Slope-derived	7.00×10^{-16}	1.13×10^{-7}
5:5	0.4555	4.2482	0.46	2.17	Slope-derived	7.84×10^{-16}	1.30×10^{-7}

Notes:

- **R_s**: Equivalent series resistance (similar for all samples).
- **R_{ct}**: Charge transfer resistance (lowest at 1:5, highest at 5:5).
- **f_o/τ_o**: Reflects charge/discharge kinetics (optimal at 1:5 with smallest τ_o).
- **Diffusion Coefficients**: Highest for 1:5, indicating superior ion transport.
- **Path Lengths**: Longer paths correlate with better ion accessibility (e.g., 1:5 and 2:5).