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Supporting Information

for

Flexible freestanding MoS_2-based composite paper for energy conversion and storage

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Additional experimental results

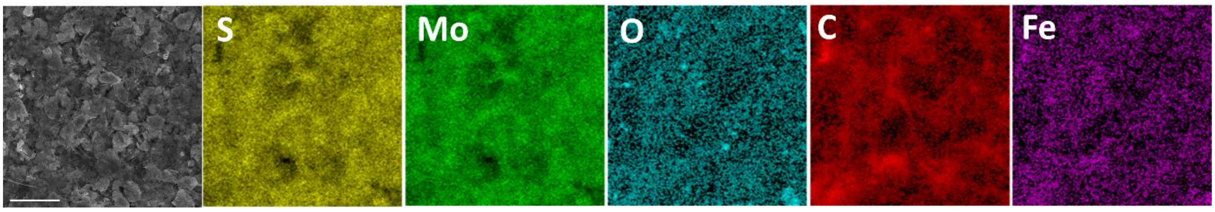

Figure S1. Elemental distribution maps of the MoS_2/SWCNT-paper.

Table S1. Elemental composition obtained from SEM-EDS.

Sample	S wt %	Mo wt %	O wt %	C wt %	Fe wt %
MoS_2 based composite paper	29.7	40.9	2.1	25.1	2.1

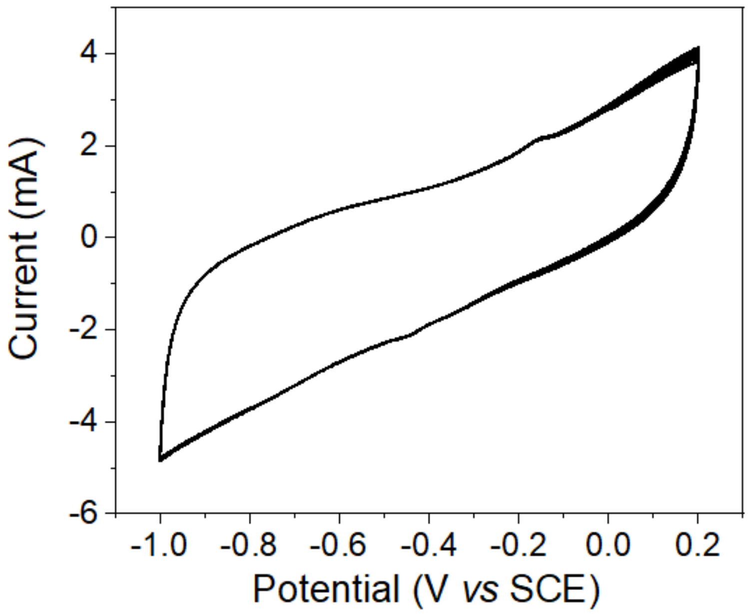

Figure S2. Cyclic voltammograms of MoS_2 based composite paper in 1 M KCl. Scan rate 100 mV s^{-1}.

Kinetics analysis

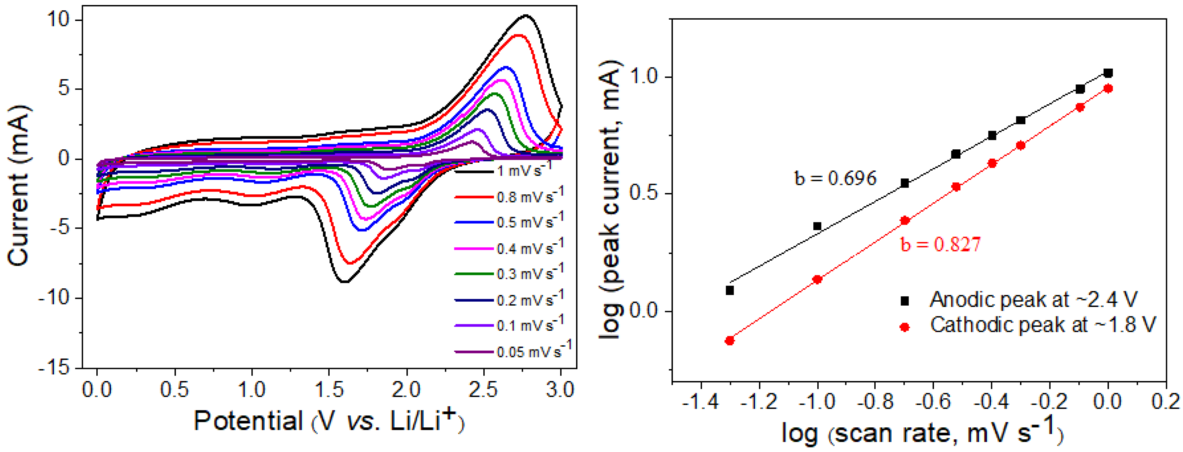

Figure S3. Kinetic analysis of the freestanding MoS_2 based composite paper. (a) CV curves at different scan rates, (b) relationship between logarithmic peak current (cathodic peak at ~1.8 V and anodic peak at ~2.4 V) and logarithmic scan rates.

CV measurements were conducted at different scan rates ranging from 1 to 0.05 mV s^{-1} to gain insights into the reaction kinetics (Figure S2). The degree of capacitive effect can be qualitatively analyzed according to the power law:

$$i = av^b \qquad \text{(S1)}$$

which relates the measured peak current (i) to the scan rate (v), a and b are adjustable parameters [1]. The b value can be determinate by fitting log(i) *versus* log(v) (Figure S2) [2]. In general, $b = 1$ entails a capacitive surface-limited process, while $b = 0.5$ implies a semi-infinite linear diffusion-controlled mechanism [S1-S3]. For the cathodic peak at ~1.8 V and the anodic peak ~2.4 V b values of 0.827 and 0.696 were calculated, respectively. Those values indicate a higher capacitive contribution in the case of the reduction process compared to the oxidation analogue.

References

S1. Xia, S.; Wang, Y.; Liu, Y.; Wu, C.; Wu, M.; Zhang, H. *Chem. Eng. J.* **2018**, *332*, 431-439.

S2. Wu, J.; Lu, Z.; Li, K.; Cui, J.; Yao, S.; Ihsan-ul Haq, M.; Li, B.; Yang, Q.-H.; Kang, F.; Ciucci, F.; Kim, J.-K. *J. Mater. Chem. A* **2018**, *6*, 5668-5677, 10.1039/C7TA11119C.

S3. Wang, G.; Zhang, J.; Yang, S.; Wang, F.; Zhuang, X.; Müllen, K.; Feng, X. *Adv. Energ. Mater.* **2017**, *8*, 1702254.