Supplementary Information for

Vertically-Aligned VS_2 on Graphene as 3D Heteroarchitectured Anode Materials with Capacitance-Dominated Lithium Storage

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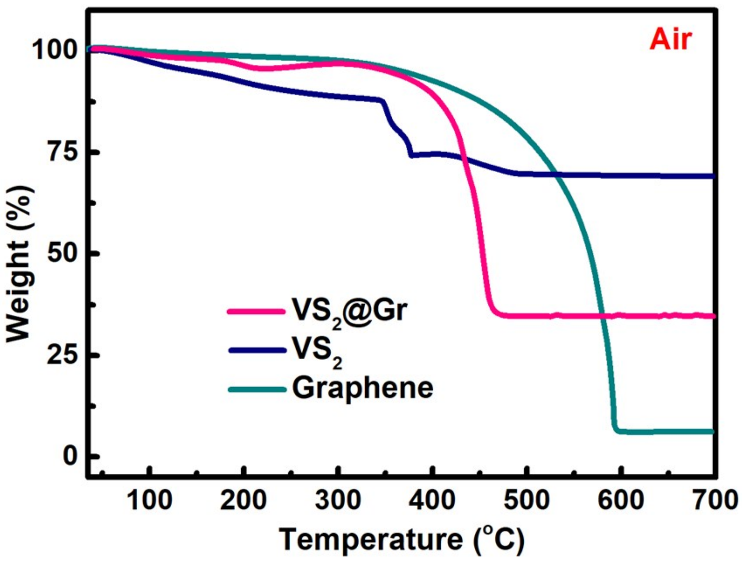

Fig. S1 TGA curves of VS_2, graphene, and VS_2@Gr under an Air atmosphere.

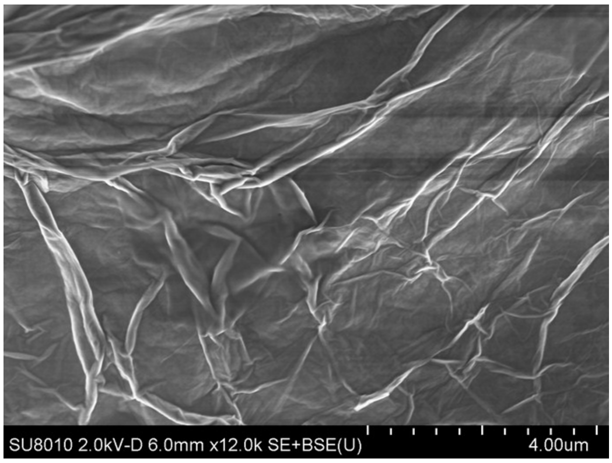

Fig. S2 Typical SEM image of graphene oxide (GO).

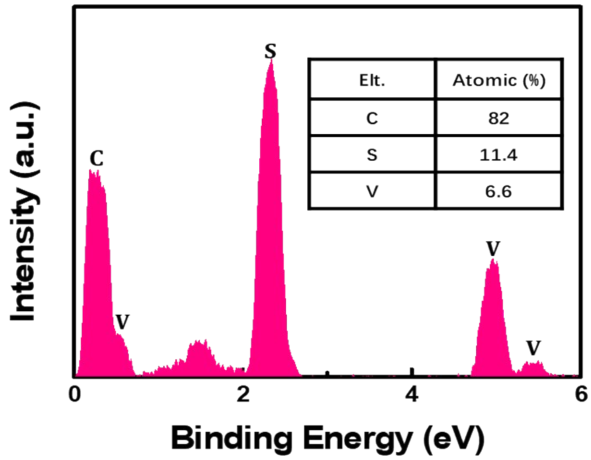

Fig. S3 EDS spectrum of VS_2@Gr.

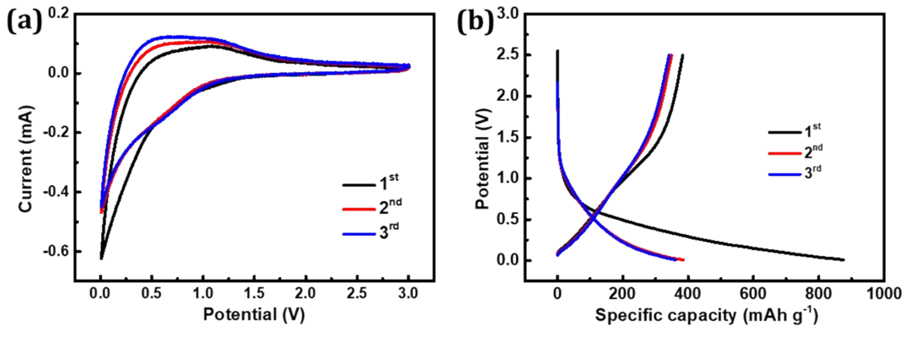

Fig. S4 Electrochemical performance of graphene anode: (a) CV curves at a scan rate of 0.2 mV s^{-1}, and (b) charge/discharge curves at 0.1 A g^{-1} in the first three cycles.

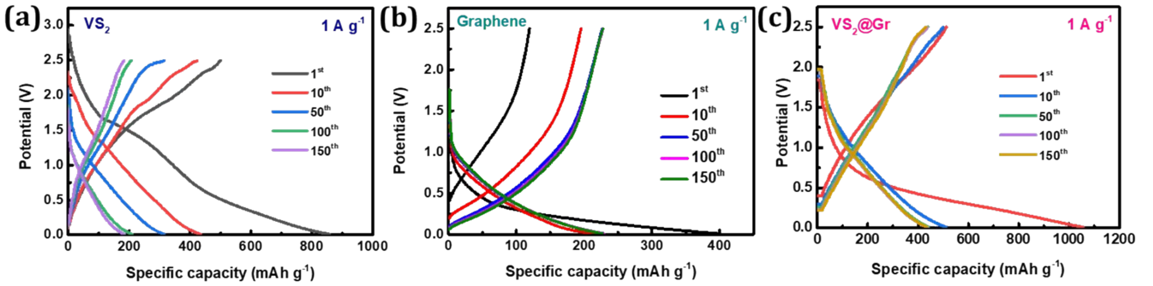

Fig. S5 Charge/discharge curves of (a) VS_2, (b) graphene, and (c) VS_2@Gr at 1.0 A g^{-1} for different cycles.

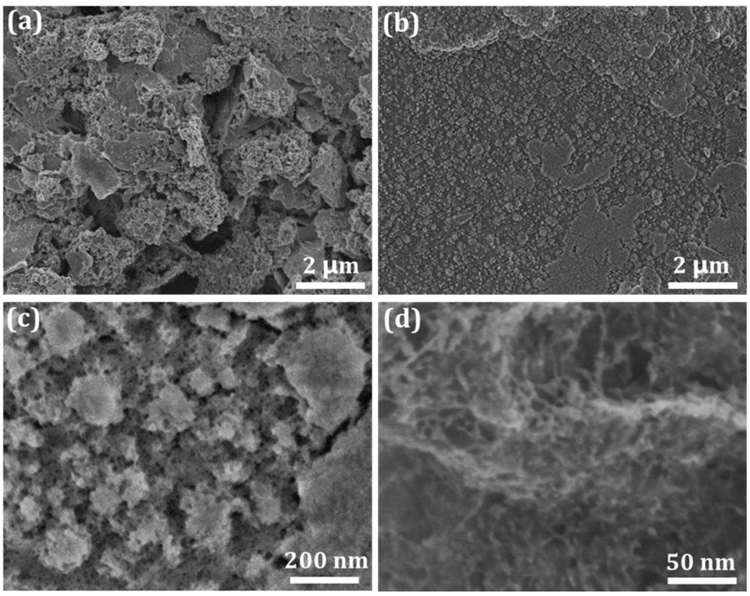

Fig. S6. SEM images of the VS_2@Gr electrode slice before (a) and after (b-d) running 150 cycles at 1 A g^{-1}.

Table S1 A survey of lithium storage performance of graphene-containing transition metal dichalcogenide composites

Materials	Reversible capacity	Capacity retention	Rate capacity	References
Vertical MoS_2 nanosheets on graphene	1000 mAh g^{-1} at 1 A g^{-1}	1250 mAh g^{-1} after 150 cycles	1385 mAh g^{-1} at 0.1 A g^{-1} 970 mAh g^{-1} at 5 A g^{-1}	***Adv. Energy Mater***., 2017, **8** 1702254
ReS_2 nanosheets vertically aligned on graphene	600 mAh g^{-1} at 1 A g^{-1}	343 mAh g^{-1} after 500 cycles	921 mAh g^{-1} at 0.2 A g^{-1} 375 mAh g^{-1} at 5 A g^{-1}	***J. Mater. Chem. A***, 2018, **6**, 20267–20276
3D MoS_2/graphene nanovesicles	815 mAh g^{-1} at 0.5 A g^{-1}	706 mAh g^{-1} after 200 cycles	964 mAh g^{-1} at 0.1 A g^{-1} 739 mAh g^{-1} at 1 A g^{-1}	***Chem. Eng. J.,*** 2018, **350**,1066–1072
WS_2/carbon nanotube-graphene	656 mA h g^{-1} at 0.2 mAh g^{-1}	572 mAh g^{-1} after 100 cycles	749 mAh g^{-1} at 0.1 A g^{-1} 337 mAh g^{-1} at 10 A g^{-1}	***Adv. Energy Mater***. 2016, 1601057
MoS_2 nanosheets on graphene	890 mAh g^{-1} at 1 A g^{-1}	900 mAh g^{-1} after 400 cycles	1035 mAh g^{-1} at 0.2 A g^{-1} 890 mAh g^{-1} at 1 A g^{-1}	***ACS Nano***, 2016, **10**, 8526−8535
VS_4 particles homogenously wrapped by graphene	987.5 mAh g^{-1} at 0.2 A g^{-1}	890.8 mAh g^{-1} after 80 cycles	987.5 mAh g^{-1} at 0.2 A g^{-1} 479.2 mAh g^{-1} at 4 A g^{-1}	***J. Alloys. Compd***., 2016, **685**, 294-299
MnS hollow microspheres on graphene	800 mAh g^{-1} at 1 A g^{-1}	640 mAh g^{-1} after 400 cycles	1050 mAh g^{-1} at 0.3 A g^{-1} 580 mAh g^{-1} at 2 A g^{-1}	***ACS Appl. Mater. Interfaces***, 2015, **7**, 20957−20964
WS_2 nanosheets on graphene	740 mAh g^{-1} at 0.1 A g^{-1}	416 mAh g^{-1} after 100 cycles	728 mAh g^{-1} at 0.1 A g^{-1} 323 mAh g^{-1} at 1 A g^{-1}	***J. Mater. Chem. A***, 2015, **3**, 24128–24138
MoS_2 nanosheets on N-doped graphene	830 mAh g^{-1} at 0.5 A g^{-1}	675 mAh g^{-1} after 450 cycles	934 mAh g^{-1} at 0.1 A g^{-1} 573 mAh g^{-1} at 1 A g^{-1}	***Electrochim. Acta***, 2019, **308**, 217-226
Hollow MgS nanocrystals on graphene	1050 mAh g^{-1} at 5 A g^{-1}	838 mAh g^{-1} after 3000 cycles	1208 mAh g^{-1} at 0.1 A g^{-1} 1000 mAh g^{-1} at 1 A g^{-1}	***ACS Nano***, 2018, **12,** 12741−12750
MoS_2-carbon microflowers on graphene	700 mAh g^{-1} at 1 A g^{-1}	600 mAh g^{-1} after 300 cycles	759 mAh g^{-1} at 0.1 A g^{-1} 375 mAh g^{-1} at 10 A g^{-1}	***Energy Storage Mater***., 2017, **9**, 195–205
3D porous MoS_x/graphene	1214 mAh g^{-1} at 0.1 A g^{-1}	1504 mAh g^{-1} after 100 cycles	1214 mAh g^{-1} at 0.1 A g^{-1} 1016 mAh g^{-1} at 2 A g^{-1}	***Small***, 2017, **14**, 1703096