Supporting information

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Table S1. Summary of the electrochemical performance of TMDC/G heterostructures applied in SCs modified by different interfacial strategies. N.A. indicates not available.

Samples	**Specific Capacitance**	**Capacitance Retention**	**Energy density (Power density)**	**Ref.**
Interfacial doping model				
3D MoS_2/NG aerogel	532 F g^{-1} (1 A g^{-1})	93.6% (10000 cycles at 10 A g^{-1})	17.24 Wh kg^{-1} (500 W kg^{-1})	1
MoS_2/NG	146 F g^{-1} (20 A g^{-1})	91.3% (1000 cycles at 2 A g^{-1})	N.A.	2
MoS_2/NSG	549.4 F g^{-1} (10 mV s^{-1})	93.2% (10000 cycles at 20 A g^{-1})	65.2 Wh kg^{-1} (900 W kg^{-1})	3
MoS_2/NPG	588 F g^{-1} (1 A g^{-1})	91.67% (5000 cycles at 3 A g^{-1})	24.34 Wh kg^{-1} (300 W kg^{-1})	4
MoS_2-O-G	265 F g^{-1} (10 mV s^{-1})	92% (1000 cycles)	63 Wh kg^{-1}	5
Interfacial stacking model				
MoS_2/G superlattice	2483 F g^{-1} (10 A g^{-1})	92% (8000 cycles at 10 A g^{-1})	N.A.	6
MoS_2/G superlattice	290 F cm^{-3} (0.5 A g^{-1})	90% (10000 cycles at 0.5 A g^{-1})	N.A.	7
Interfacial orientation model				
V-MoS_2/rGO fiber	330 F g^{-1} (0.1 A g^{-1})	95% (10000 cycles, 10 A g^{-1})	69.44 μWh cm^{-2} (0.5 mW cm^{-2})	8
V-MoS_2/G	2182.33 mF cm^{-2} (1 mA cm^{-2})	116.83% (5000 cycles at 10 mA cm^{-2})	130.34 Wh m^{-2} (4000 W m^{-2})	9
V-MoS_2/G	428 F g^{-1} (1 A g^{-1})	88% (5000 cycles at 6 A g^{-1})	36.5 Wh kg^{-1} (9 W kg^{-1})	10

Table S2. Summary of the electrochemical performance of TMDC/G heterostructures applied in ZIBs modified by different interfacial strategies. N.A. indicates not available.

Samples	Interlayer of TMDC (nm)	Specific Capacitance	Specific Capacitance	Capacitance Retention	Energy density	Ref.
Interfacial doping model						
V-MoS_2/C	1.02	385 mAh g^{-1} (0.1 A g^{-1})	230 mAh g^{-1} (0.8 A g^{-1})	88% (150 cycles at 0.1 A g^{-1})	N.A.	11
Interfacial stacking model						
G/ML-MoS_2/G	0.7	202.6 mAh g^{-1} (0.1 A g^{-1})	104.5 mAh g^{-1} (4 A g^{-1})	98.6% (600 cycles at 1A g^{-1})	148.2Wh kg^{-1}	12
hollow MoS_2/NC superlattice	0.96	247.8 mAh g^{-1} (0.1 A g^{-1})	100.9 mAh g^{-1} (8 A g^{-1})	85.6% (3200 cycles at 1A g^{-1})	72.6 Wh kg^{-1}	13
MoS_2/G superlattice	1.16	285.4 mAh g^{-1} (0.05 A g^{-1})	141.6 mAh g^{-1} (5 A g^{-1})	88.2% (1800 cycles at 1A g^{-1})	157.5Wh kg^{-1}	14
MoS_2/PEDOT superlattice	1.29	312.5 mAh g^{-1} (0.1 A g^{-1})	83.6 mAh g^{-1} (15 A g^{-1})	90.1% (4000 cycles at 5A g^{-1})	184.7Wh kg^{-1}	15
MoS_2/CTAB superlattice	1	181.8 mAh g^{-1} (0.1 A g^{-1})	78.5 mAh g^{-1} (10 A g^{-1})	92.8% (2100 cycles at 10A g^{-1})	N.A.	16
Interfacial orientation model						
V-MoSSe/G	0.64	253.8 mAh g^{-1} (0.2 A g^{-1})	124.2 mAh g^{-1} (5 A g^{-1})	83% (1200 cycles at 2A g^{-1})	N.A.	17
V-VS_2/G	0.97	238 mAh g^{-1} (0.1 A g^{-1})	190 mAh g^{-1} (5 A g^{-1})	93% (1000 cycles at 5A g^{-1})	N.A.	18

Table S3. Summary of the electrochemical performance of TMDC/G heterostructures applied in AMSBs modified by different interfacial strategies. N.A. indicates not available.

Samples	Sulfur contents & sulfur loading mass	Electrochemical performance (initial capacity and degradation rate)	Rate Performance	Highest S loading	Voltage window (vs. Li/Li^{+})	Ref.
Interfacial doping model						
Ni-MoS_2/rGO	68.4 wt% & 1 mg cm^{-2}	937.8 mAh g^{-1} at 0.5 C and 0.077% for 140 cycles	757.2 mAh g^{-1} at 2C	5.89 mg cm^{-2}	1.8–2.8 V	19
MoS_2/NG	~80% & 5.2 mg cm^{-2}	772 mAh g^{-1} at 0.2 C and 0.185% for 100 cycles	512 mAh g^{-1} at 3C	5.2 mg cm^{-2}	1.7–2.8 V	20
$MoSe_2$/NG	~62% & 1.1 mg cm^{-2}	1118 mAh g^{-1} at 0.2 C and 0.136% for 100 cycles	632 mAh g^{-1} at 1C	/	1.8–2.8 V	21
WSe_2/NG	1.2 mg cm^{-2}	1063 mAh g^{-1} at 0.2 C and 0.063% for 300 cycles (1C)	743.2 mAh g^{-1} at 6C	10.5 mg cm^{-2}	1.7–2.8 V	22
Co-MoS_2/G	1 mg cm^{-2}	~1100 mAh g^{-1} at 1 C and 0.029% for 1000 cycles	941 mAh g^{-1} at 2C	5.27 mg cm^{-2}	1.8–2.8 V	23
Interfacial stacking model						
NG/ReS_2/NG	63% & 1.4 ~ 1.6 mg cm^{-2}	854 mAh g^{-1} at 2 C and 0.064% for 800 cycles	810 mAh g^{-1} at 2C	6.4 mg cm^{-2}	1.7–2.8 V	24
WSe_2/G superlattice	73.8 wt%	923 mAh g^{-1} at 1 C and 0.0374% for 500 cycles	569.5 mAh g^{-1} at 5C	5.2 mg cm^{-2}	1.7–2.8 V	25
MoS_2/G superlattice	1.02 mg cm^{-2}	1232 mAh g^{-1} at 0.2 C and 0.08% for 200 cycles	593 mAh g^{-1} at 5C	3.8 mg cm^{-2}	1.7–2.8 V	26

Table S3. Summary of the electrochemical performance of TMDC/G heterostructures applied in AMSBs modified by different interfacial strategies. N.A. indicates not available (continued).

Samples	Sulfur contents & sulfur loading mass	Electrochemical performance (initial capacity and degradation rate)	Rate Performance	Highest S loading	Voltage window (vs. Li/Li^+)	Ref.
Interfacial orientation model						
V-MoS_2/G	79.1% & 5.6 mg cm^{-2}	1384 mAh g^{-1} at 0.1 C and 0.028% for 500 cycles	530 mAh g^{-1} at 5C	5.6 mg cm^{-2}	1.7–2.8 V	27
V-ReS_2/G	1 mg cm^{-2}	600 mAh g^{-1} at 1 C and 0.0825% for 400 cycles	577 mAh g^{-1} at 2C	2.2 mg cm^{-2}	1.7–2.8 V	28
V-MoSSe/G	4.2 mg cm^{-2}	1138 mAh g^{-1} at 1C and 0.044% for 1000 cycles	593 mAh g^{-1} at 5C	6.5 mg cm^{-2}	1.7–2.8 V	29

Table S4. Summary of the electrochemical performance of TMDC/G heterostructures applied as electrocatalysts modified by different interfacial strategies. N.A. indicates not available.

Samples	Type	Electrolytes	Overpotential at specific current density	Current density at specific overpotential	Tafel slope	Durability	Ref.
Interfacial doping model							
MoS_2-Fe-C	OER	6M KOH	155 mV at 10 mA cm^{-2}	N.A.	43 mV dec^{-1}	120 h	30
MoS_2/NSG	OER	1M KOH	360 mV at 10 mA cm^{-2}	N.A.	98.2 mV dec^{-1}	10000 cycles	31
MoS_2/NG	ORR	0.1M KOH	onset potential +0.95 V	peak potential +0.82 V	N.A.	10000s	32
MoS_2/NG	ORR	0.1M KOH	onset potential -0.12 V	peak potential -0.23 V	N.A.	N.A.	33
Interfacial orientation model							
V-ReS_2/G	ORR	0.1M KOH	onset potential 0.82 V vs RHE	halt wave potential 0.635 V	76 mV dec^{-1}	3000 s	34
V-ReS_2/NG	ORR	0.1M KOH	N.A.	diffusion-limited current density 5.58 mA cm^{-2}	76 mV dec^{-1}	3000 s	35
V-MoS_2/NC	CO_2RR	0.5 M H_2SO_4	onset potential ~40 mV	34.31 mA cm^{-2} at 590 mV	N.A.	24 h	36

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