Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supplementary Information

A spatially-microscopic-confined strategy to realize the completely reversible self-healing lattice restoration of MoS_2 anode for ultralong cycling performance sodium-ion batteries

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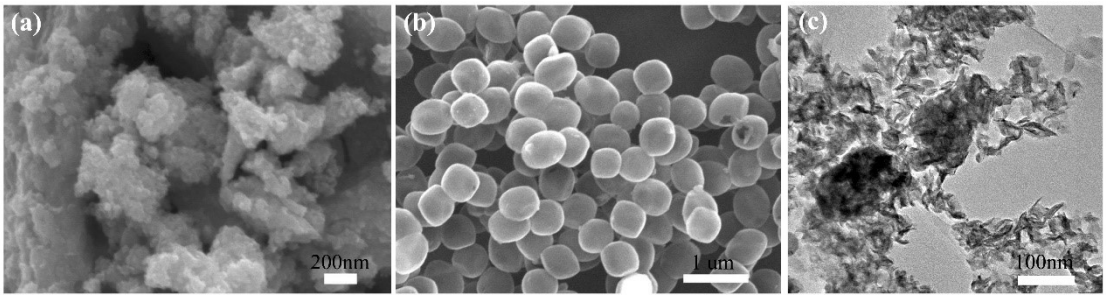

Figure S1. (a-b) SEM images of MoS_2 and N-doped carbon nanoboxes, (c) TEM image of MoS_2.

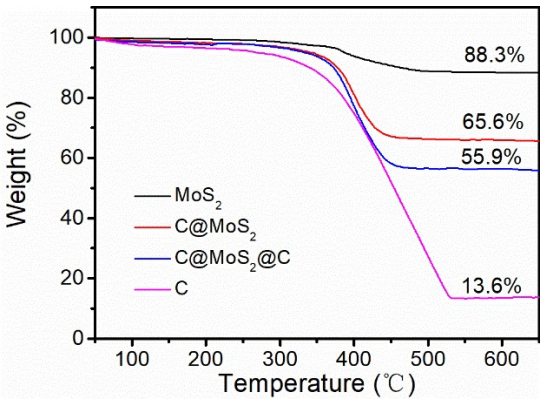

Figure S2. TGA curves of $C@MoS_2@C$, $C@MoS_2$, MoS_2 and C.

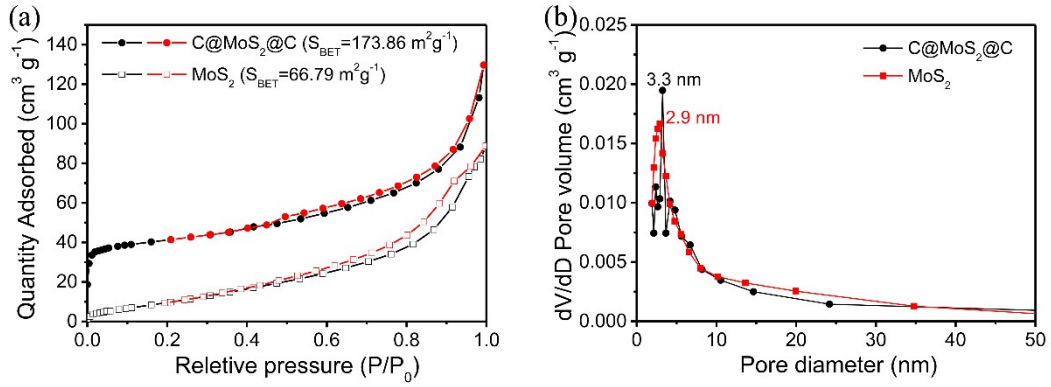

Figure S3. (a) N_2 adsorption-desorption isotherms of the MoS_2 and $C@MoS_2@C$, (b) the pore-size distributions of the MoS_2 and $C@MoS_2@C$.

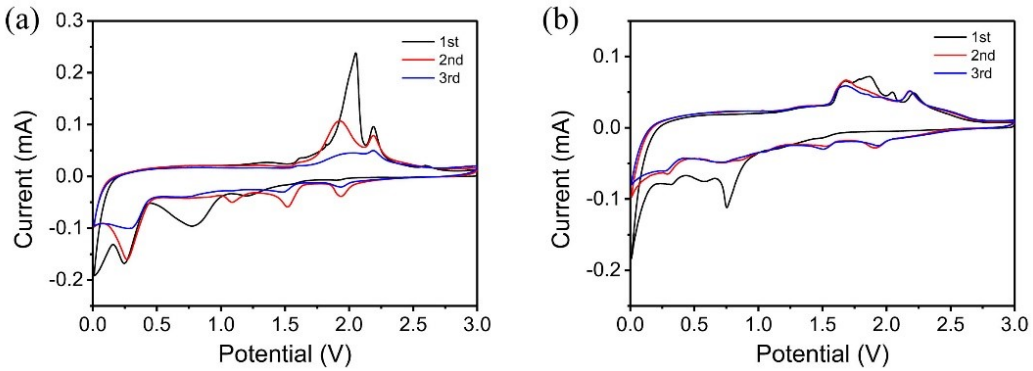

Figure S4. (a) CV curves of MoS_2 based electrode; (b) CV curves of C@MoS_2 based electrode.

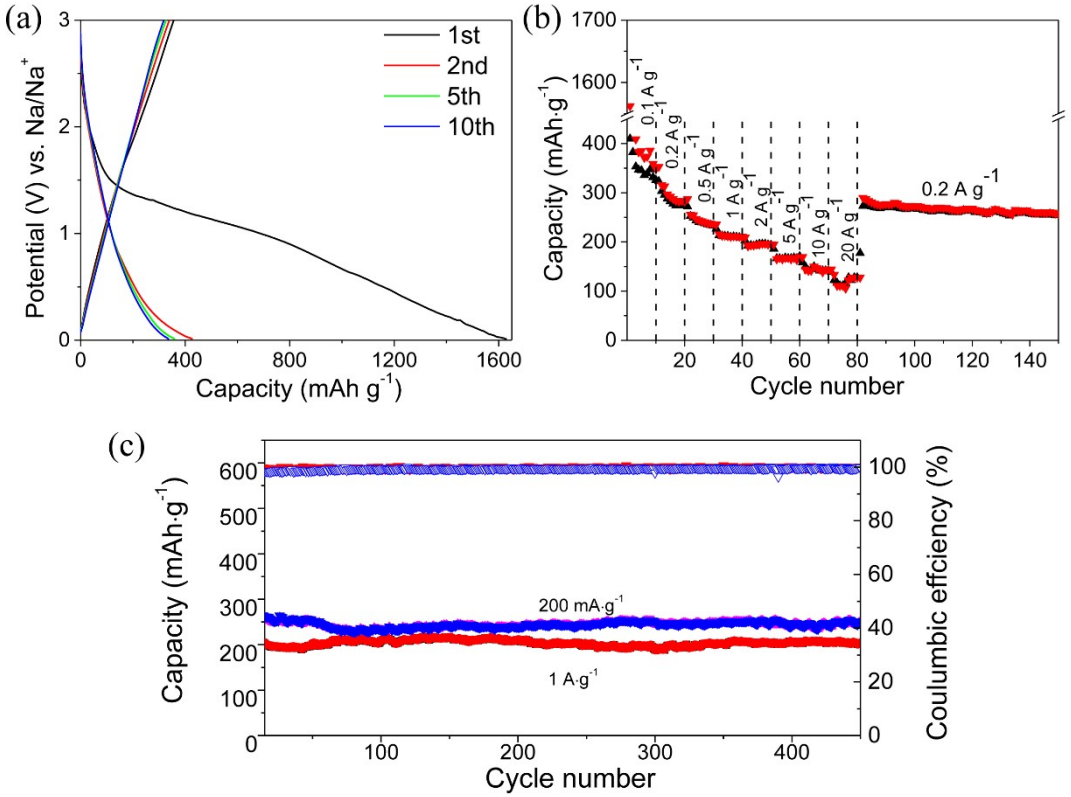

Figure S5. (a) The galvanostatic charge/discharge profiles for the 1st, 2nd, 5th and 10th cycles of the C electrode at a current density of 0.05 A g^{-1}; (b) Rate performance of C electrode; (e) Cycling performance of the C electrode at a current rate of 0.2 and 1.0 A g^{-1}

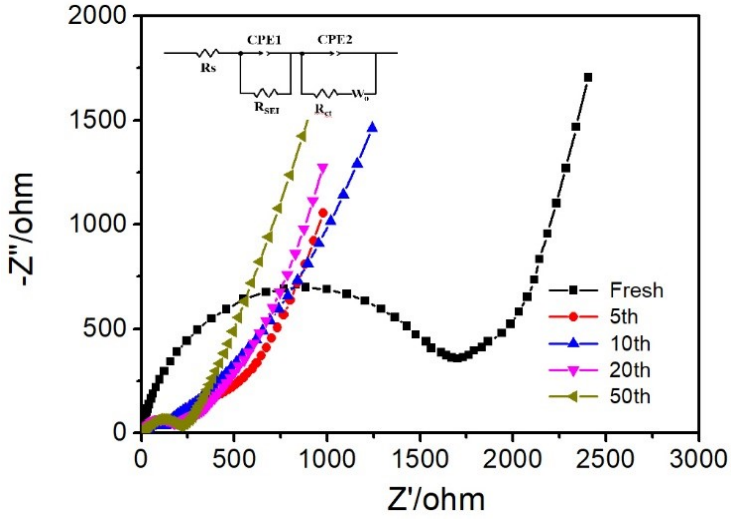

Figure S6. Nyquist plots of C@MoS_2@C electrode at the different cycle numbers (inset: equivalent-circuit diagram)

Table S1. The fitted data of the C@MoS_2@C electrode.

Sample	State	R_S (Ω)	R_{SEI} (Ω)	Rct (Ω)
C@MoS_2@C	Before dicharge	2.74	0	1219.39
	After 5 cycles	2.78	8.08	9.43
	After 10 cycles	2.65	12.28	18.63
	After 20 cycles	2.68	14.51	162.90
	After 50 cycles	2.96	14.84	194.51

Table S2. Rate capacity and cycling performance comparison of the C@MoS_2@C based electrode with the reported MoS_2-based ones with long cycle life in literatures.

Materials	Rate capacity (mA h g^{-1})	Cycling performance		[Ref]
		current density cycles (th)	Capacity (mA h g^{-1})	
MoS_2/C⊂pCS	270 (2 A g^{-1}) 194 (4 A g^{-1})	1 A g^{-1} (300)	337	[1]
Few-layered MoS_2/C	374 (1 A g^{-1}) 349 (2 A g^{-1})	1 A g^{-1} (300)	350	[2]
MoS_2/C	267 (2 A g^{-1}) 242 (5 A g^{-1})	2 A g^{-1} (5000)	128	[3]
CC@CN@MoS_2	306 (1 A g^{-1}) 235 (2 A g^{-1})	1 A g^{-1} (1000)	265	[4]
E-MoS_2/carbon fibers	164 (5A g^{-1}) 138 (10A g^{-1})	1 A g^{-1} (700) 2 A g^{-1} (700)	241 216	[5]

	104 (20A g^{-1})	5 A g^{-1} (3000)	127	
		10 A g^{-1} (3000)	109	
US-MoS_2@NG.	141 (12.8 A g^{-1})	1 A g^{-1} (1000)	198	[6]
C@ MoS_2@C	**309 (1 A g^{-1})** **281.9 (2 A g^{-1})** **247.2 (5A g^{-1})** **222.2 (10A g^{-1})** **200 (20A g^{-1})**	**1 A g^{-1} (1000)** **10 A g^{-1} (10000)**	**324.1** **163.9**	**This work**

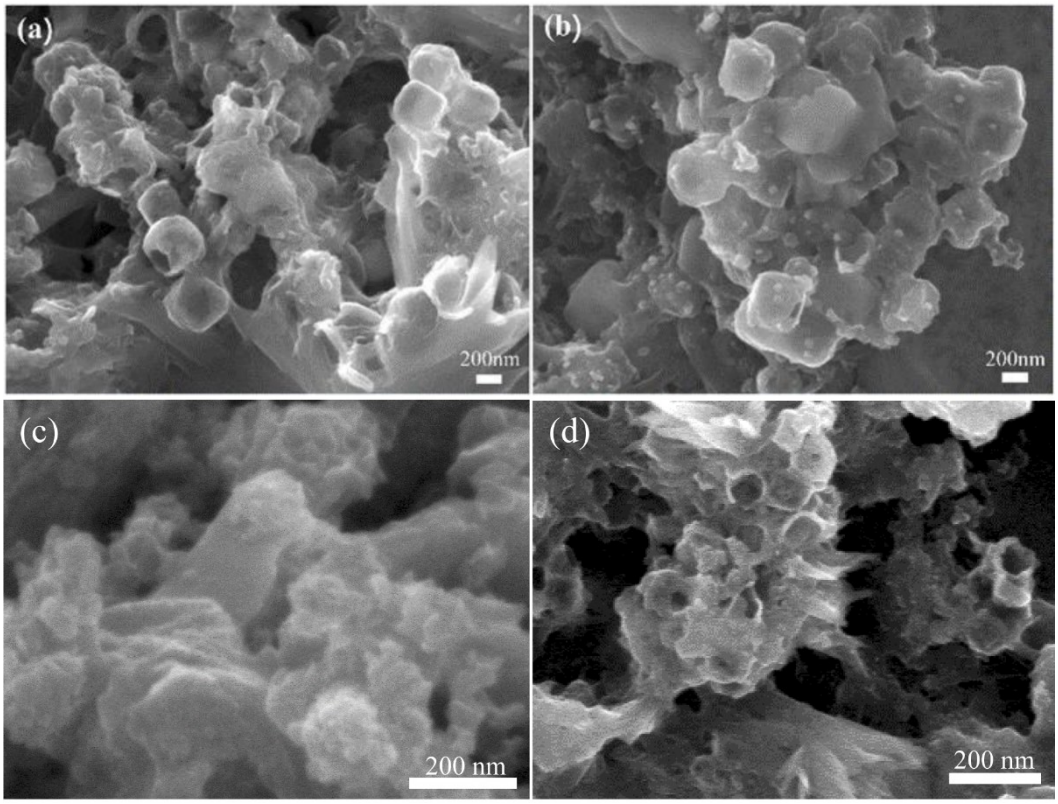

Figure S7. (a) SEM images of C@MoS_2@C based electrode after the 3400th cycle at a current of 1A g^{-1} and (b) after the 10,000th cycle at a current of 10A g^{-1}; (c, d) SEM images of pure MoS_2 and C@MoS_2 based electrodes after the 2000th cycle at a current of 1A g^{-1}.

References

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