Supporting information

Synergistic Optimization of Composition-Structure-Conductive Network for High-Performance Integrated Transition Metal Oxide Anodes for Lithium-Ion Batteries

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1.Supporting Figures

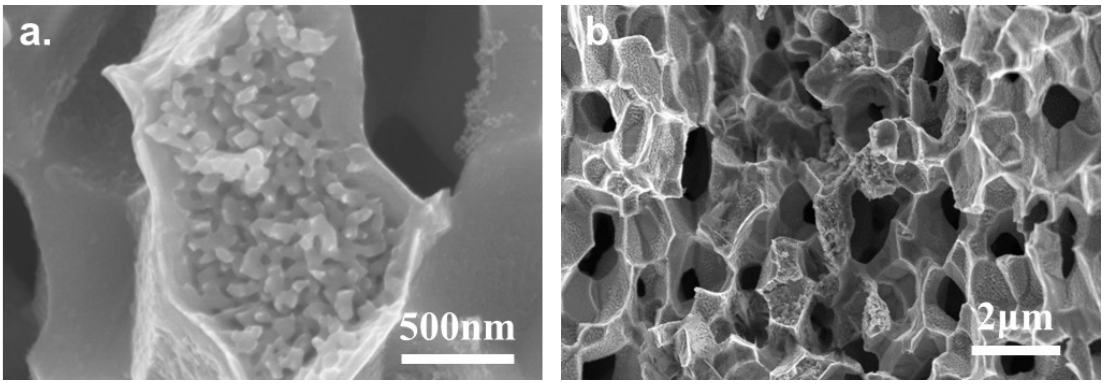

Fig. S1. The structure of hp-CM

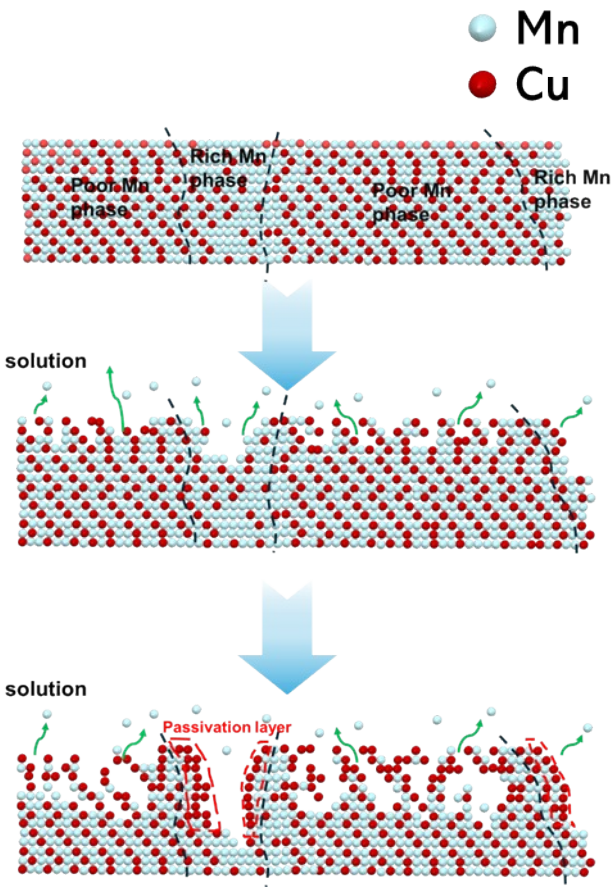

Fig. S2.Description of dealloying process about hp-CM

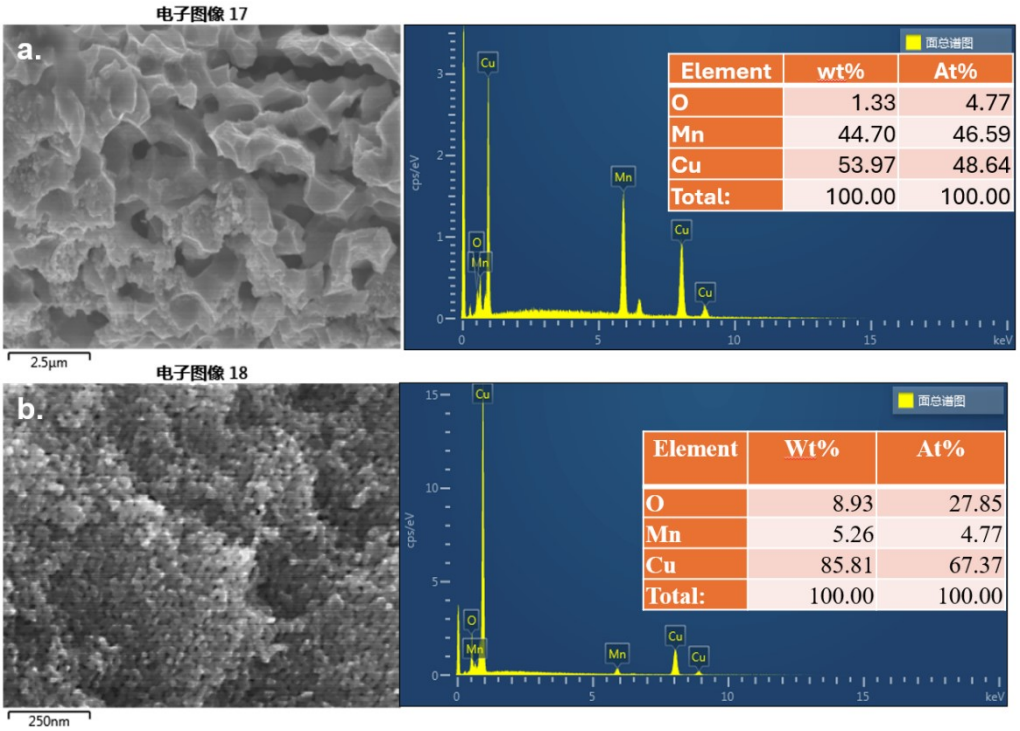

Fig. S3. The structure and chemical composition of a) hp-CM and b) np-CM

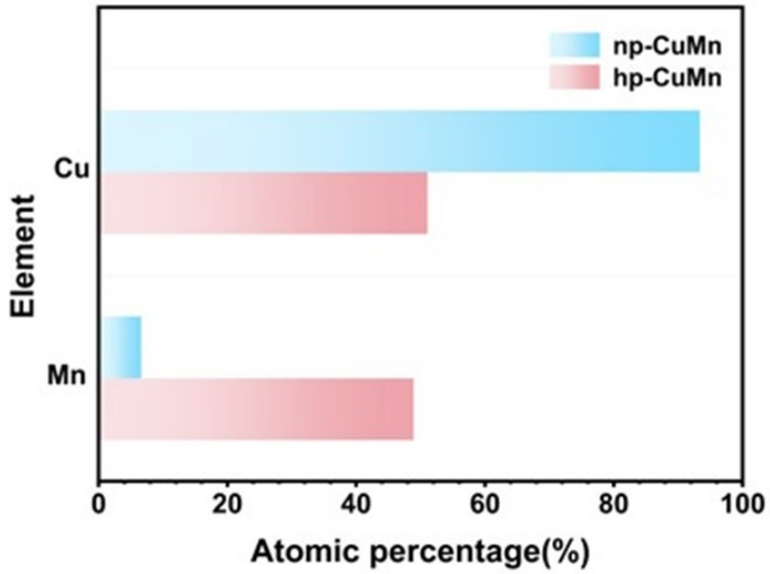

Fig. S4. Comparison of elemental composition between np-CM and hp-CM

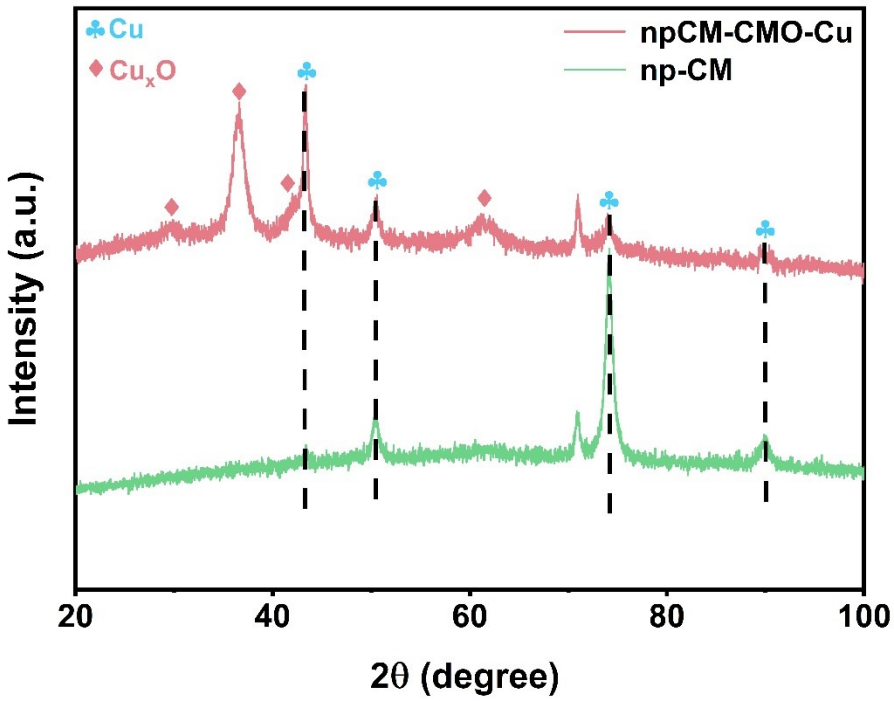

Fig. S5. XRD patterns of np-CM and npCM-CMO-Cu

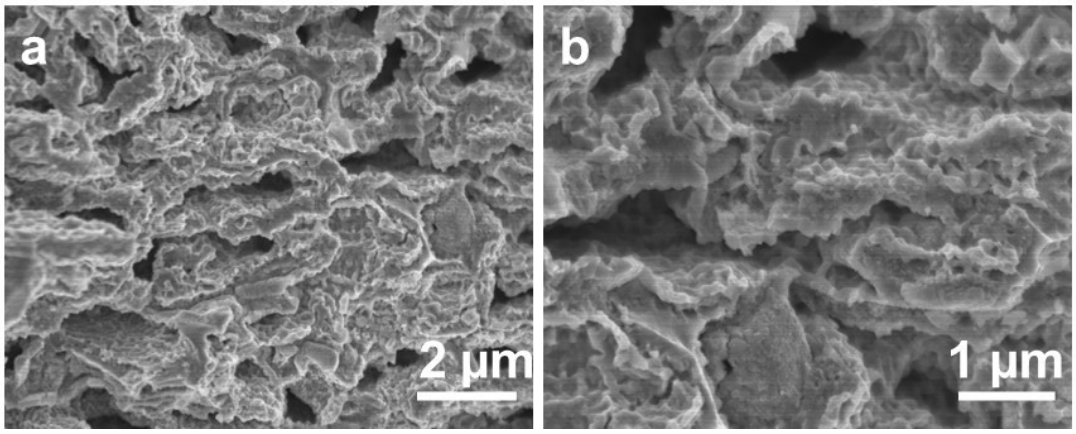

Fig. S5. SEM images of hpCM@CMO

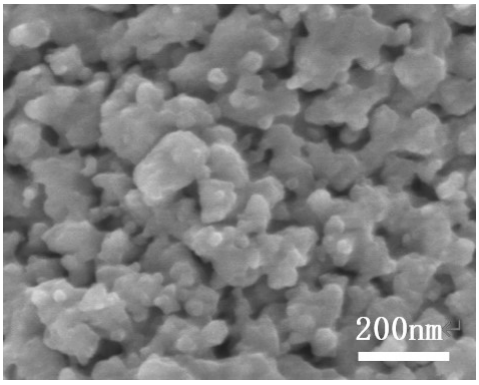

Fig. S6. SEM images of npCM-CMO-Cu

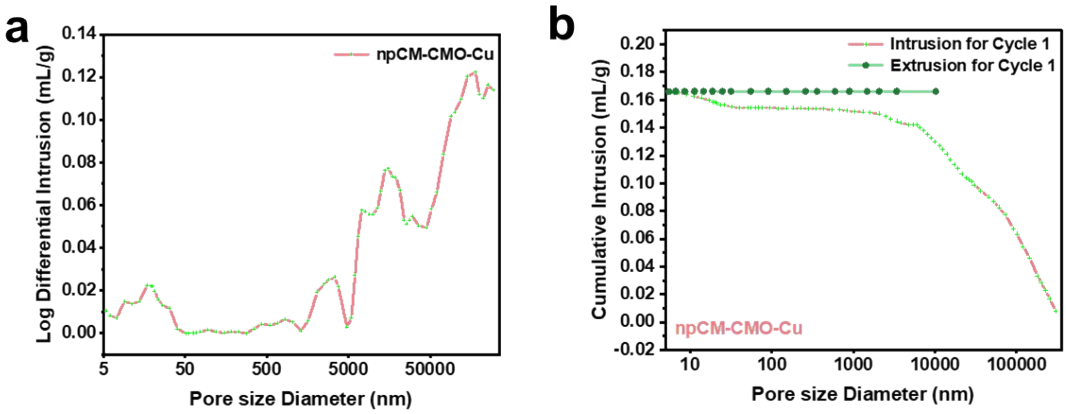

Fig. S7 MIP patterns of npCM-CMO-Cu electrode. a) Log Differential Intrusion vs Pore size and b) Cumulative Intrusion vs Pore size of npCM-CMO-Cu.

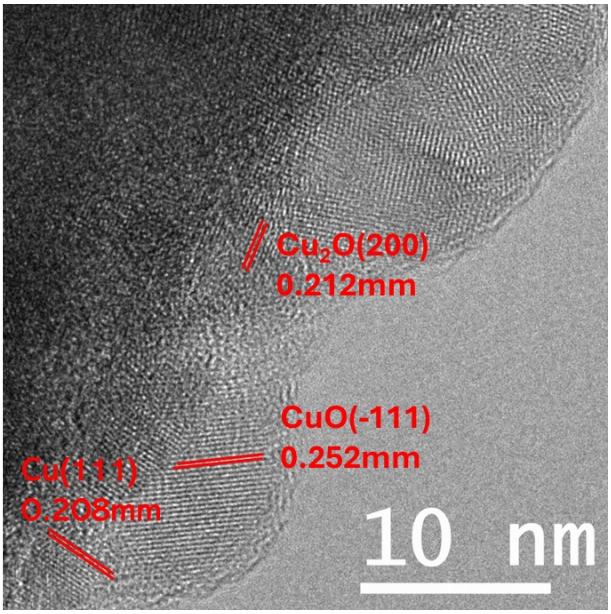

Figure S8 HRTEM images of hpCM-CMO-Cu.

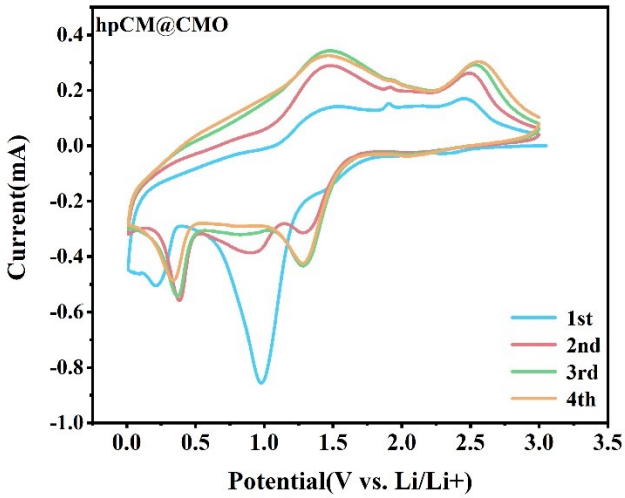

Fig. S9. CV curves of hpCM@CMO electrode at 0.2 mV s^{-1}

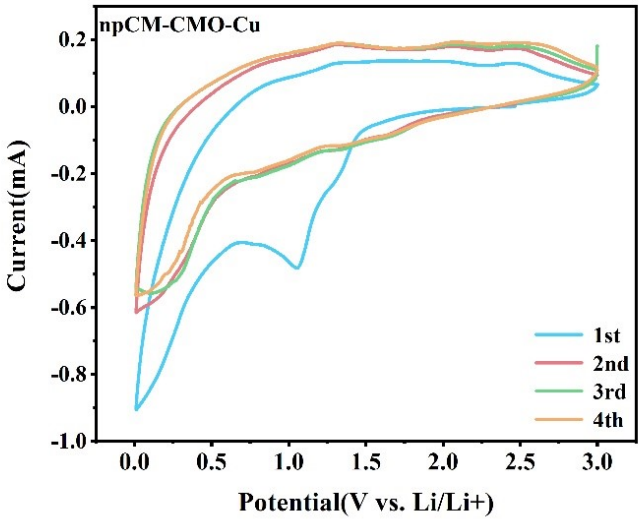

Fig. S10. CV curves of npCM-CMO-Cu electrode at 0.2 mV s^{-1}

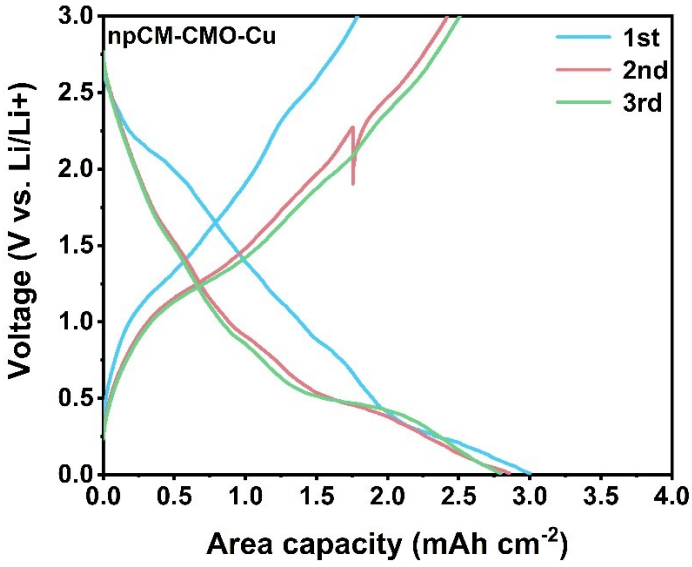

Fig. S11. Galvanostatic charge - discharge profiles of npCM-CMO-Cu electrode at 0.4 mA cm^{-2}

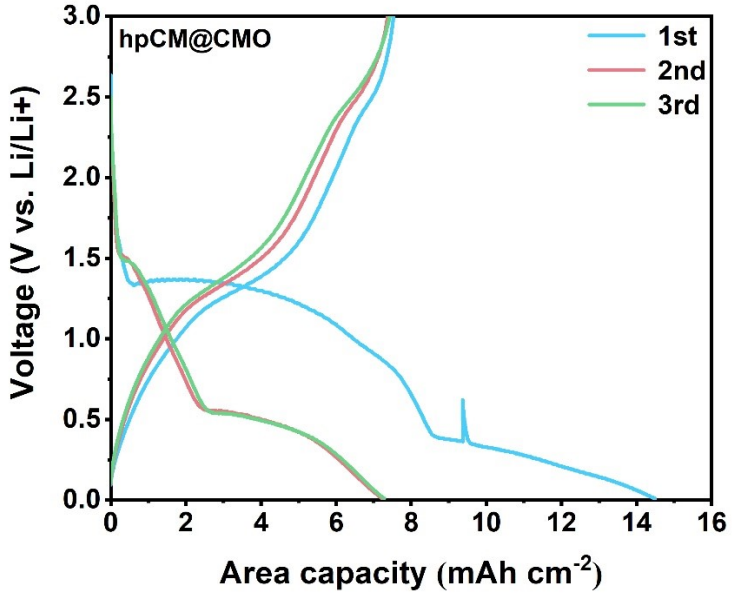

Fig. S12. Galvanostatic charge – discharge profiles of hpCM@CMO electrode at 0.4 mA cm^{-2}

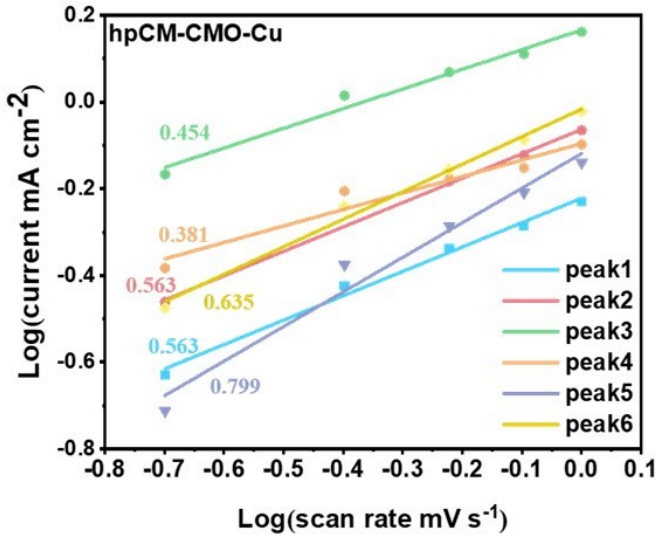

Fig. S13. Linear relationship between log(i) and log(v).

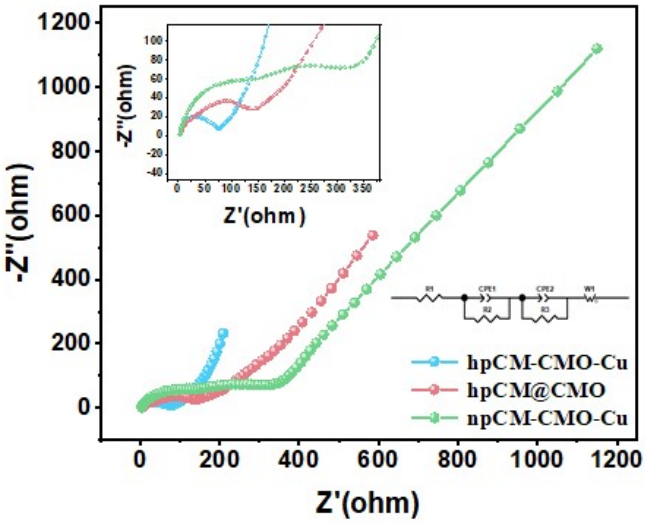

Fig. S14. EIS spectra of hp-CM, hpCM@CMO, and hpCM-CMO-Cu after 50th cycles.

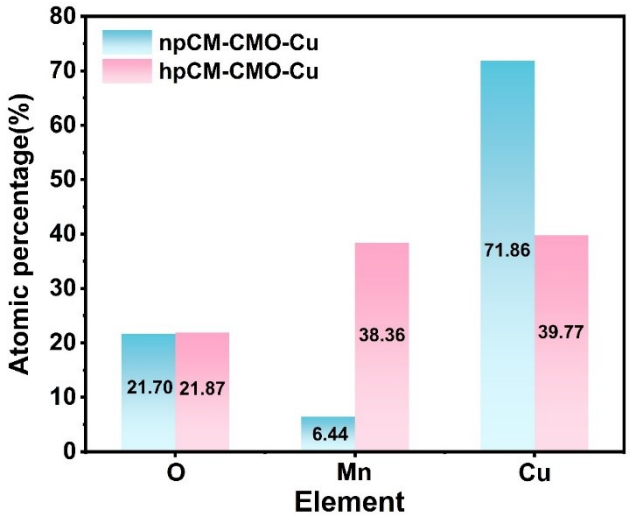

Fig. S15. Comparison of elemental composition between hpCM-CMO-Cu and npCM-CMO-Cu.

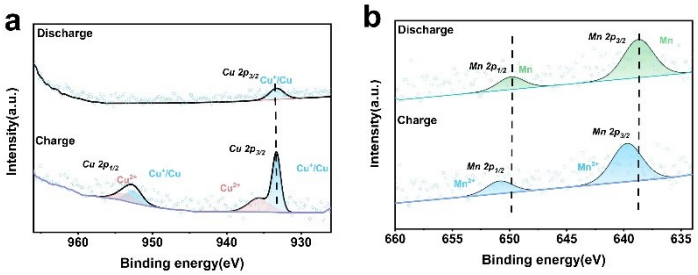

Fig S16 XPS spectra of hpCM-CMO-Cu first discharge and charge. a)Cu 2p, b)Mn 2p.

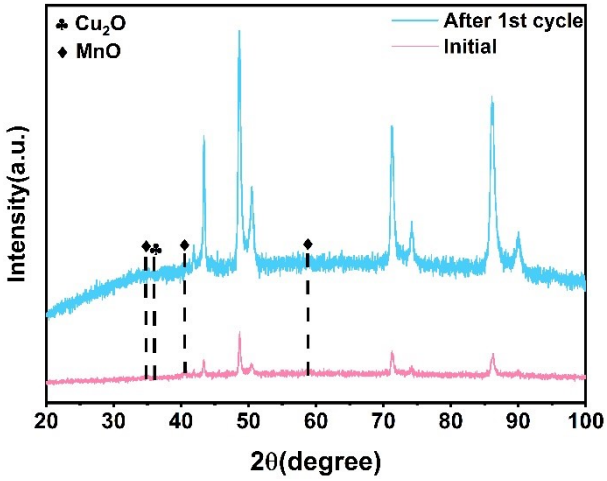

Fig. S17. XRD patterns of hpCM-CMO-Cu before and after 1st cycle.

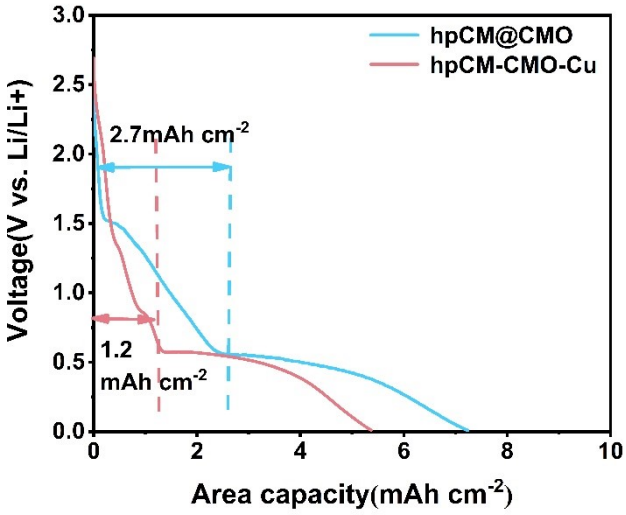

Fig. S18 Comparison of hpCM-CMO-Cu and hpCM@CMO discharge profiles.

3. Supporting Tables

Table S1 Pore structure comparison of hpCM-CMO-Cu and npCM-CMO-Cu

Materials	Porosity	Specific surface area (m^2/g)	The average size of nanopore(nm)	The average size of submicron pore(nm)
hpCM-CMO-Cu	53.8660%	3.390	18.24	456.38
npCM-CMO-Cu	48.9512%	3.486	11.47	/

Table S2 Comparison of charge capacities of various three-dimensional self-supported oxide electrodes from the literature

Materials	active substance	Electrochemical performance			Ref.
		Current density [mA cm^{-2}]	Cycle number	Capacity retention [mAh cm^{-2}]	
hpCM@CMO	Cu_xO, MnO	1	250	1.25	This work
npCM-CMO-Cu	Cu_xO, MnO	1	250	0.492	This work
hpCM-CMO-Cu	Cu_xO, MnO	1	250	4.38	This work
3D-HNP Cu_xO@m-Cu	Cu_xO	1	200	2.02	1
3D-HNP SnO_2/CuxO@n-Cu	Cu_xO, SnO_2	1	200	3.34	2
3D NPCu@Cu_2O	Cu_2O	0.175	120	1.45	3
3D NPC@1D Cu_2O NWN	Cu_2O	0.1	150	1.64	4
nanoporous Sn − Co alloy	Co_3Sn_2	1	200	0.89	5
ATO/CC/OTO	TiO_2,	1.6	140	~2.2	6
MnO/3DGS	MnO, Fe_3O_4	4.16	1000	1.57	7
MF-P 700	MnO, Fe_3C	0.4	250	0.97	8

References

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