Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supplementary Information

Hexagonal MoO_3 as Zinc Intercalation Anode towards Zinc Metal-Free Zinc-Ion Battery

Ting Xiong [a,b], Yaoxin Zhang[a], Yinming Wang[a], Wee Siang Vincent Lee* [a], Junmin Xue* [a]

[a] National University of Singapore, Department of Materials Science and Engineering, Singapore 117573.

[b] Centre for Advanced 2D Materials and Graphene Research Centre, National University of Singapore, Singapore 117546.

*To whom correspondence should be addressed. E-mail: mseleew@nus.edu.sg (Wee Siang Vincent Lee); msexuejm@nus.edu.sg (Junmin Xue). Tel./fax +65 65164655.

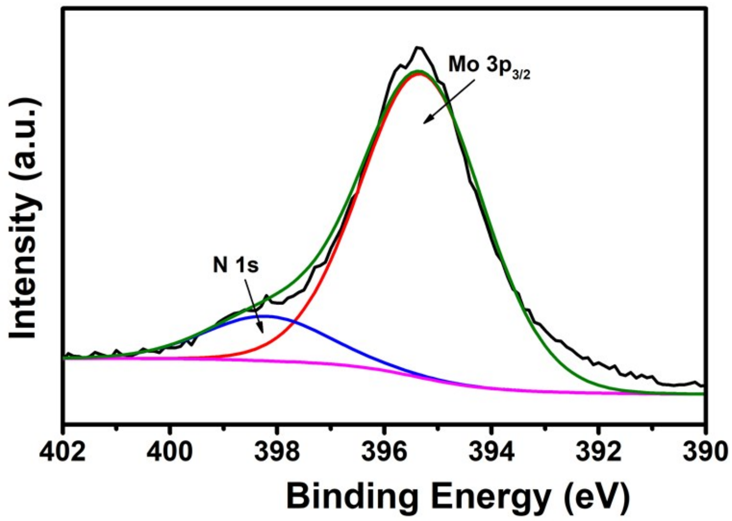

Fig. S1 N 1s and Mo $3p_{3/2}$ XPS of the as-prepared h-MoO_3.

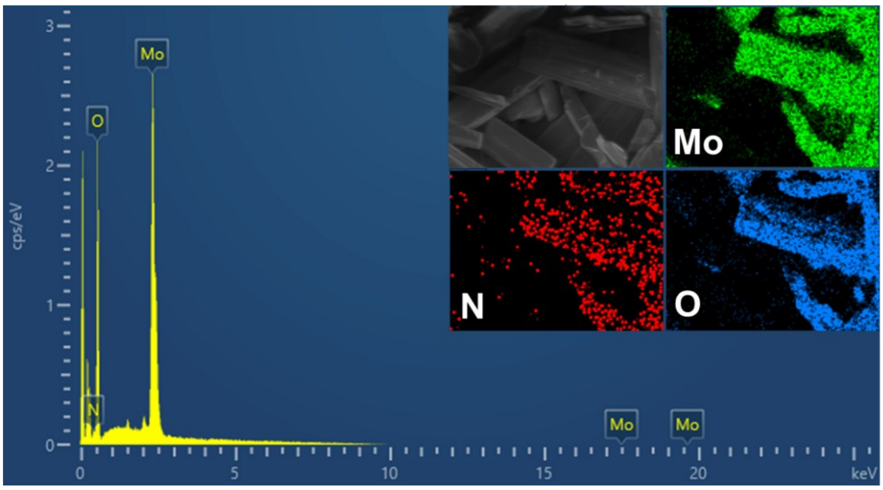

Fig. S2 EDX-mapping result for the as-prepared h-MoO_3.

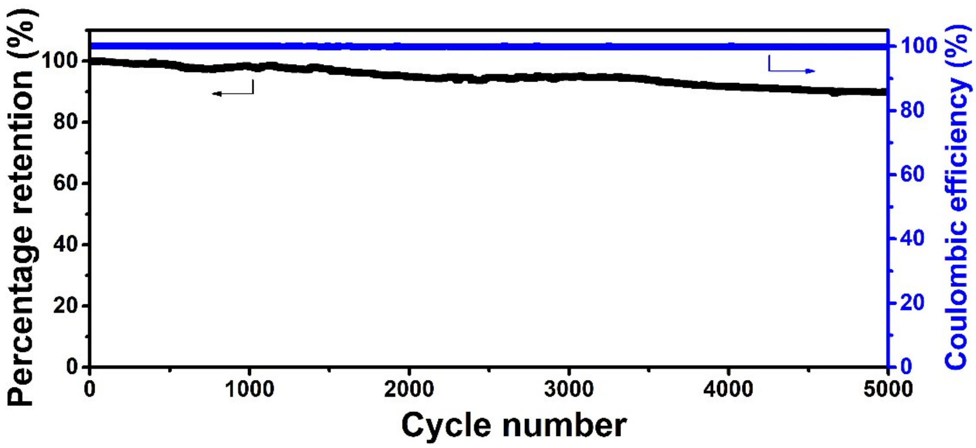

Fig. S3 The cyclic stability and Coulombic efficiency of Zn//h-MoO_3 cell at 2 A g^{-1}.

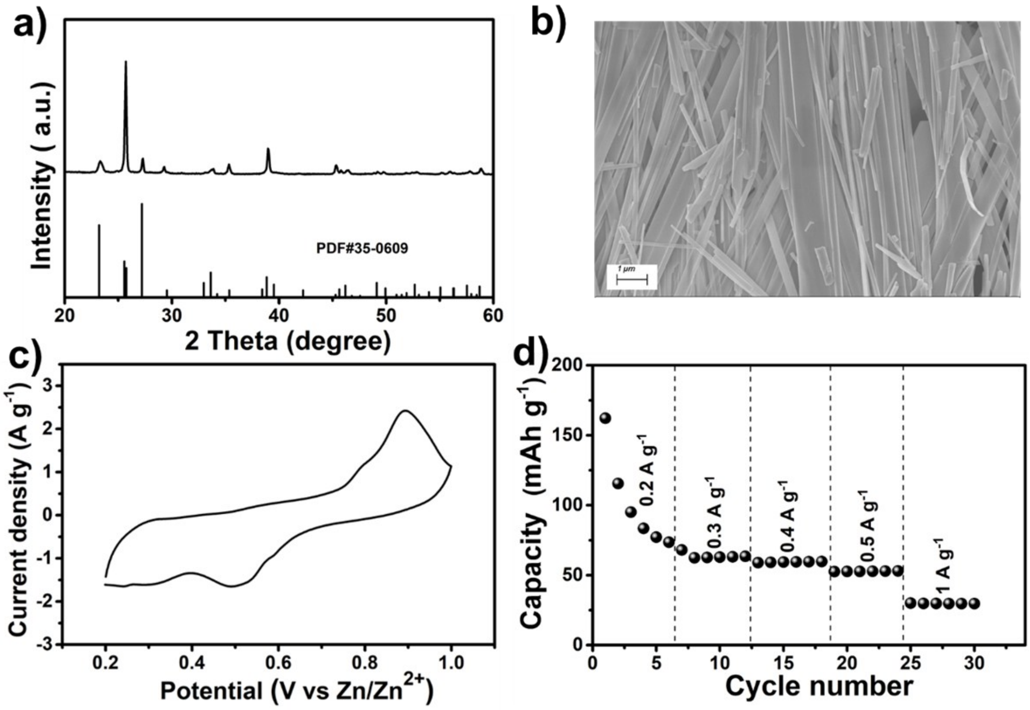

Fig. S4 a) XRD, b) SEM of the as-prepared α-MoO_3, c) CV, d) Rate performance of the Zn//α-MoO_3 cell.

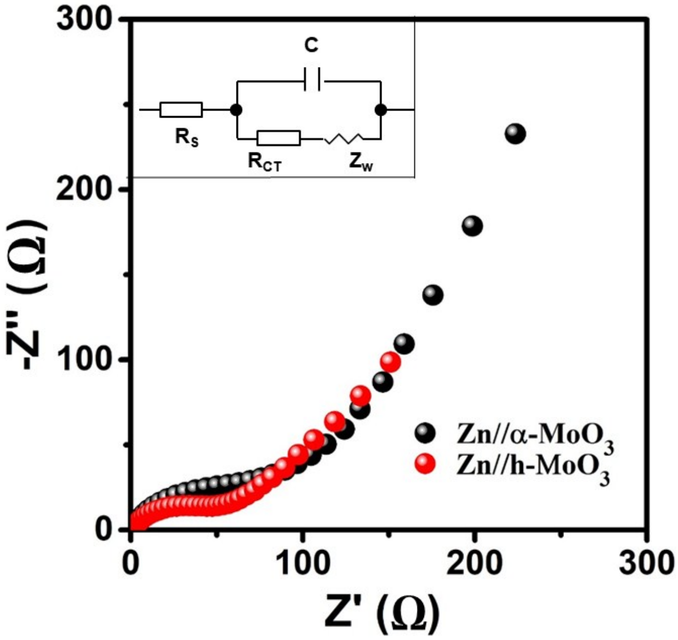

Fig. S5 Nyquist plots of the fresh Zn//α-MoO_3 and fresh Zn//h-MoO_3 cells.

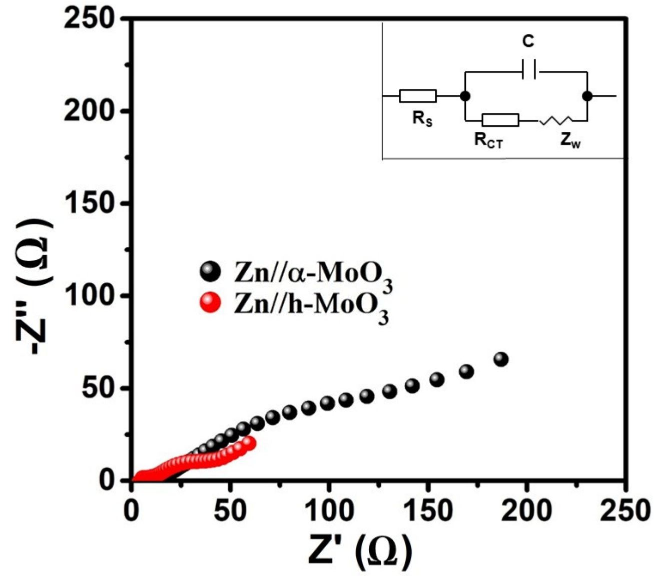

Fig. S6 Nyquist plots of the cycled Zn//α-MoO_3 and cycled Zn//h-MoO_3 cells.

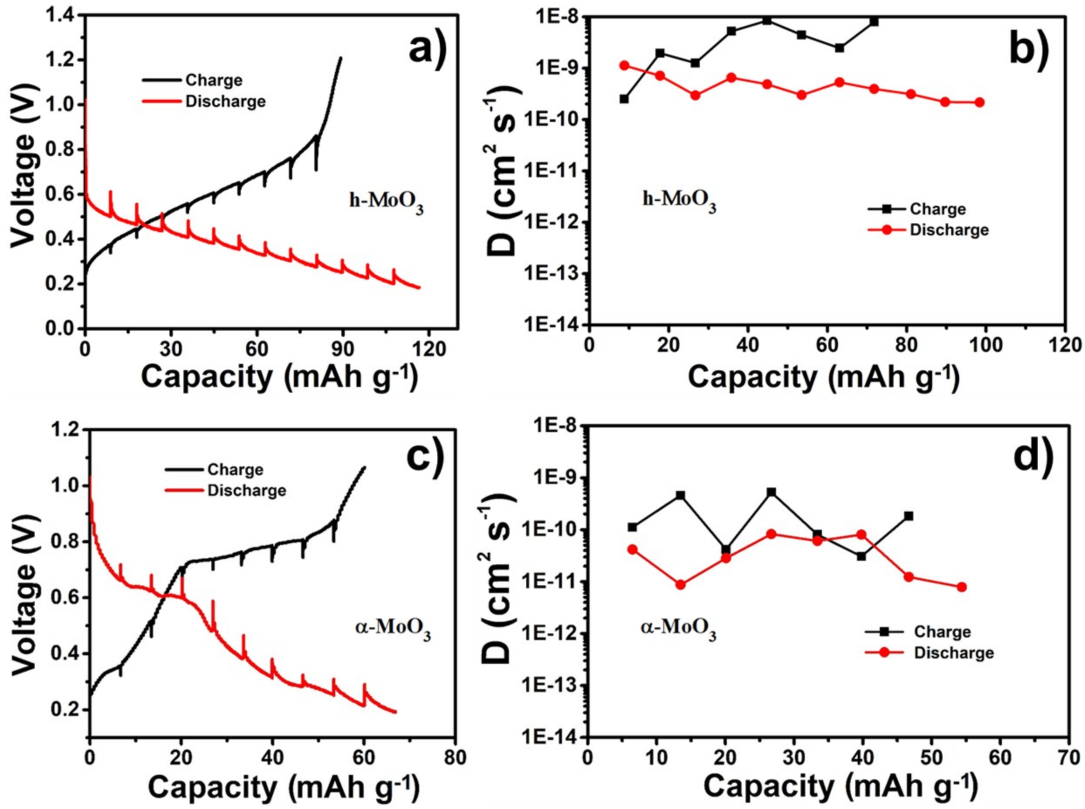

Fig. S7 GITT curves and diffusion coefficients of a),b) h-MoO_3 and c),d) α-MoO_3.

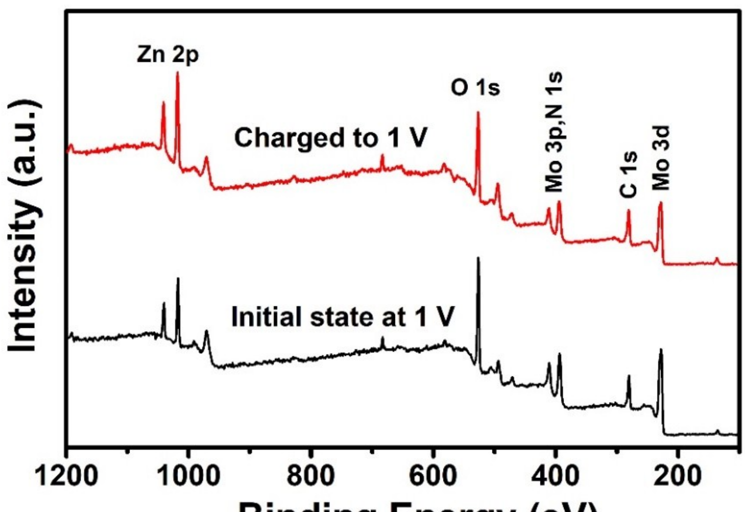

Fig. S8 XPS survey spectra of the h-MoO_3 at the initial state at 1V and the fully charged state at 1V.

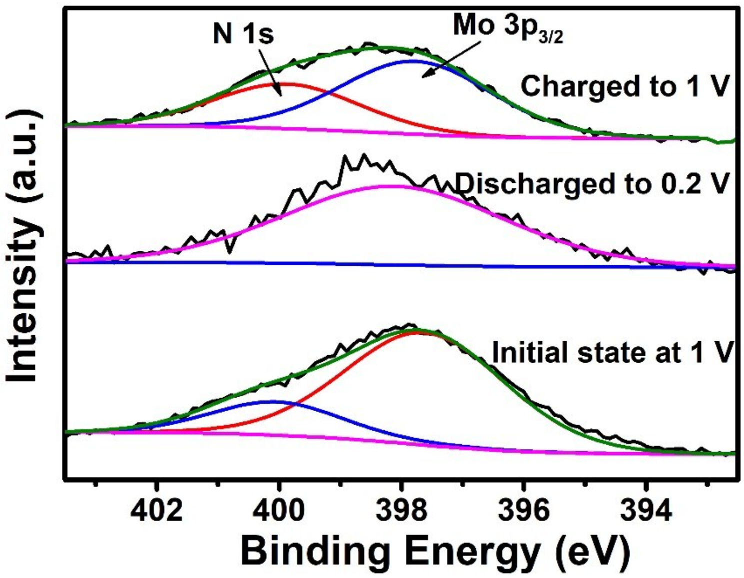

Fig. S9 N 1s XPS of the as-prepared h-MoO_3 at different states.

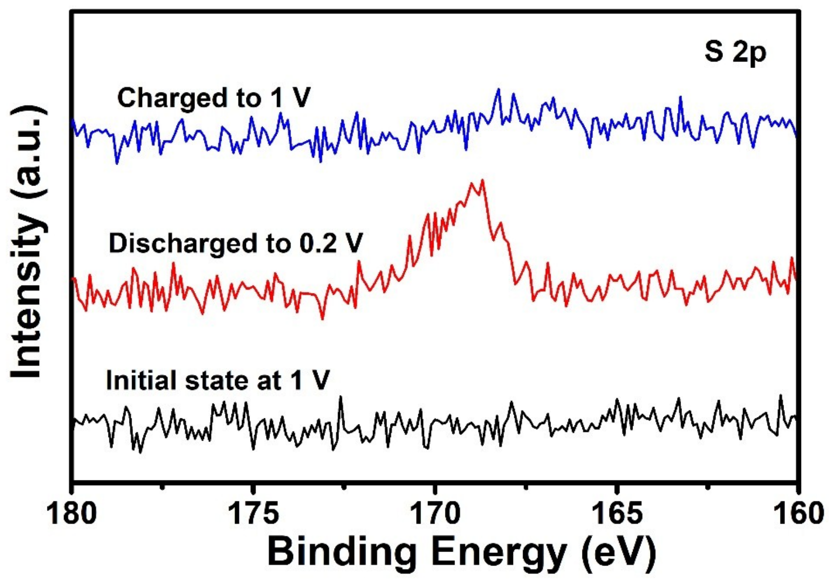

Fig. S10 S 2p XPS of the as-prepared h-MoO_3 at different states.

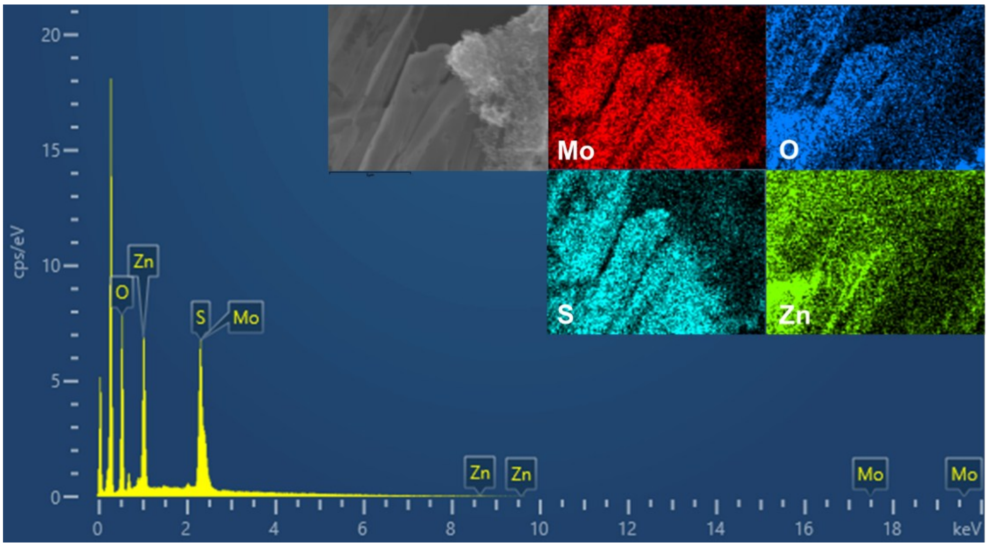

Fig. S11 EDX mapping of the h-MoO_3 at the fully discharged state.

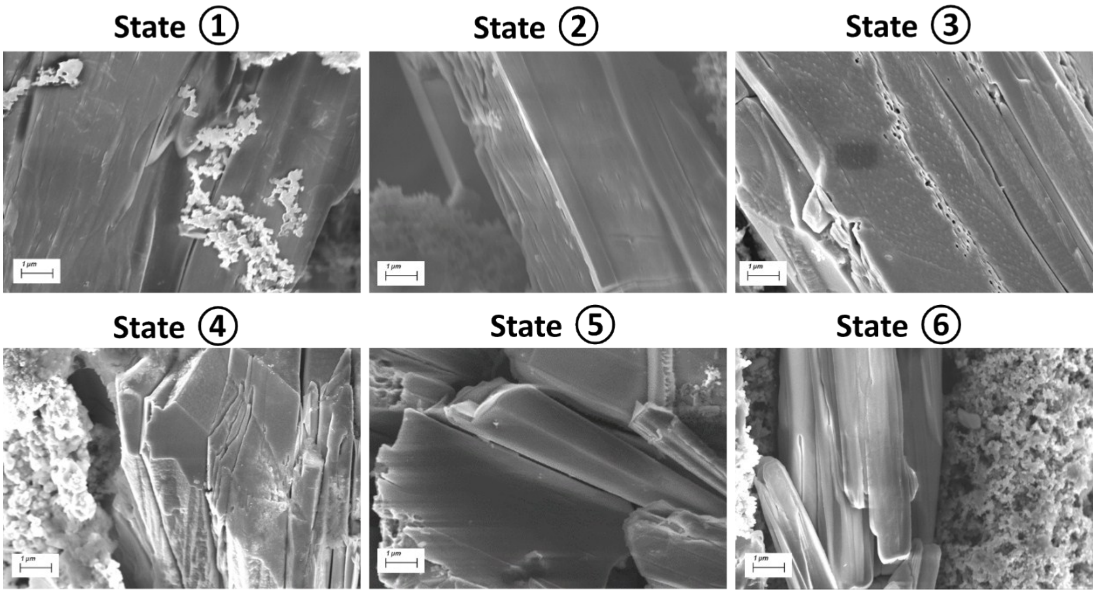

Fig. S12 SEM images of the h-MoO_3 at various state in Fig. 2a.

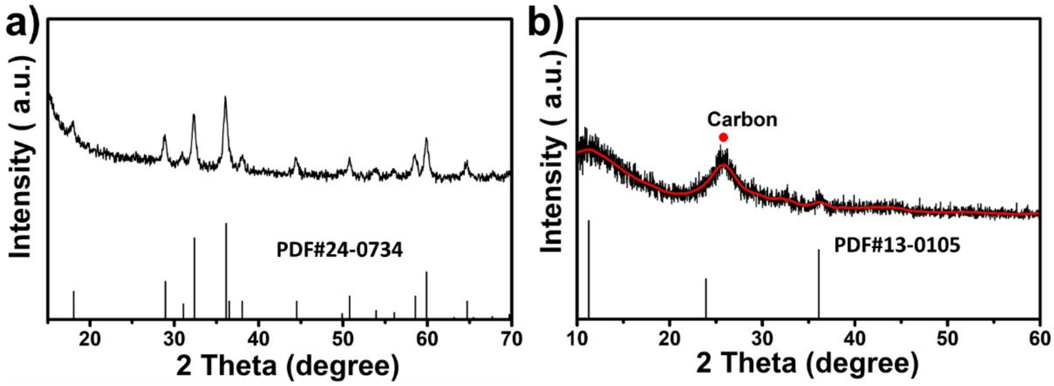

Fig. S13 XRD of a) Mn_3O_4 and b) Zn^{2+}-intercalated MnO_2 (denoted as $Zn_{0.2}MnO_2$).

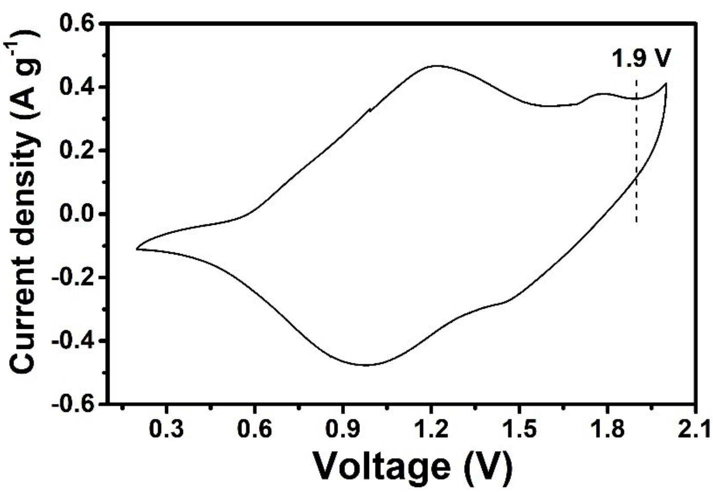

Fig. S14 CV curve of h-MoO_3//$Zn_{0.2}MnO_2$ battery at 1 mV s^{-1} in the voltage of 0.2-2.0 V.

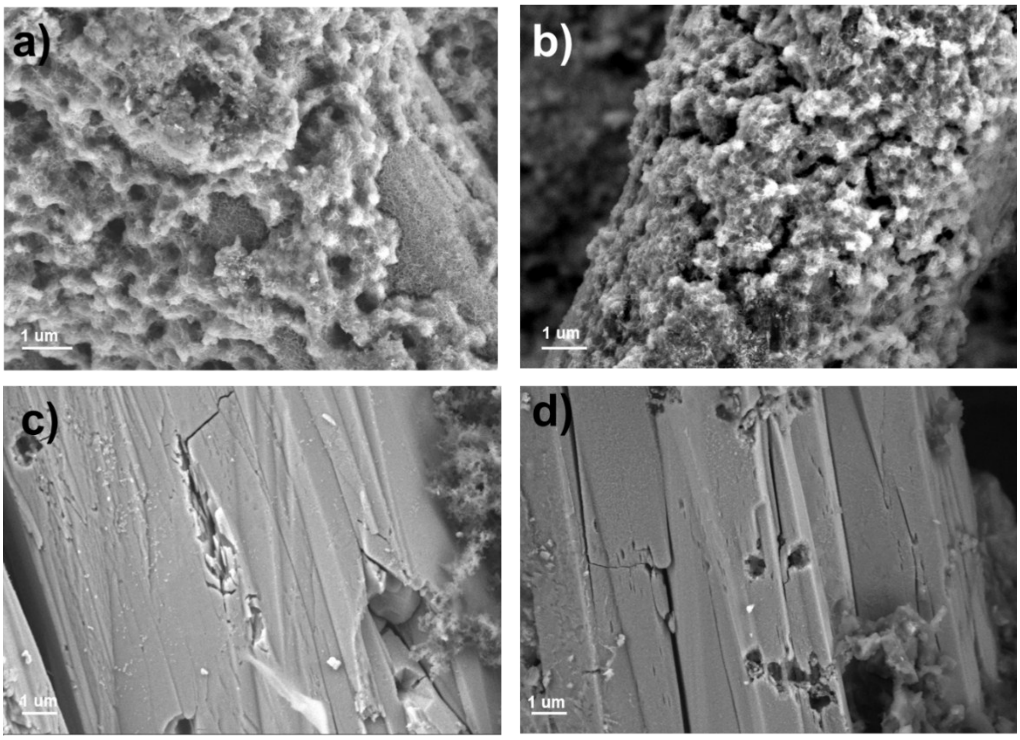

Fig. S15 SEM images of the a) discharged $Zn_{0.2}MnO_2$, b) charged $Zn_{0.2}MnO_2$, c) discharged h-MoO_3, and d) charged h-MoO_3.

Table S1. Comparison of the batteries performance parameters for Zn metal batteries and our zinc metal free battery.

Active material (active mass)	**Electrolytes**	**Potential window**	**Capacity (based on the mass of cathode)**	**Capacity (based on the mass of cathode and anode)**	**Ref.**
Zn//polyaniline-intercalated MnO_2	2M $ZnSO_4$ + 0.1M $MnSO_4$	1–1.8 V	280 mA h g^{-1} at 0.2 A g^{-1}	1.1 mA h g^{-1} at 0.2 A g^{-1}	1
Zn//$NaV_3O_8 \cdot 1.5H_2O$	1M $ZnSO_4$ + 1M Na_2SO_4	0.3–1.25 V	380 mA h g^{-1} at 0.1 A g^{-1}	1.5 mA h g^{-1} at 0.1 A g^{-1}	2
Zn//$Co_{0.247}V_2O_5 \cdot 0.944H_2O$	20M LiTFSI + 1M Zn $(TFSI)_2$	0.6–2.2 V	15 Wh kg 432 mA h g^{-1} at 0.1 A g^{-1}	1.7 mA h g^{-1} at 0.1 A g^{-1}	3
Zn//vanadium oxynitride	3 M Zn $(CF_3SO_3)_2$	0.2–1.8 V	15 Wh kg 603 mAh g^{-1} at 0.2C	2.4 mAh g^{-1} at 0.2C	4
Zn//oxygen-deficient V_6O_{13}	3 M $Zn(TFSI)_2$	0.2–1.5 V	15 Wh kg 401 mA h g^{-1} at 0.2 A g^{-1}	1.6 mA h g^{-1} at 0.2 A g^{-1}	5
Zn//E-MoS_2	1 M $ZnSO_4$	0–1.3 V	15 Wh kg 202.6 mA h g^{-1} at 0.1 A g^{-1}	0.8 mA h g^{-1} at 0.1 A g^{-1}	6
Zn//V_2O_5 nanopaper	2 M $ZnSO_4$	0.2–1.6V	375 mAh g^{-1} at 0.5 A g^{-1}	1.5 mAh g^{-1} at 0.5 A g^{-1}	7
Zn//oxygen-deficient MnO_2	1 M $ZnSO_4$+ 0.2M $MnSO_4$	1–1.8 V	345 mAh g^{-1} at 0.2 A g^{-1}	1.4 mAh g^{-1} at 0.2 A g^{-1}	8
h-MoO_3//$Zn_{0.2}MnO_2$	1 M $ZnSO_4$	0.2–1.9 V	-	56.7 mAh g^{-1} at 0.1 A g^{-1}	This work

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