Energy Materials

Supplementary Materials

Multifunctional zinc silicate coating layer for high-performance aqueous zinc-ion batteries

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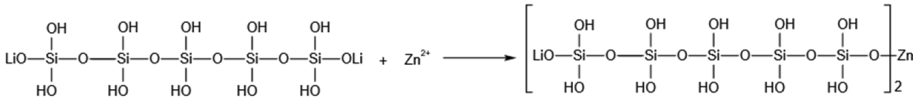
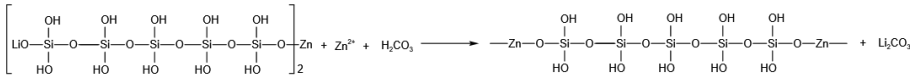
Reactions procedures to form Zinc silicate polymer protection film:

(S1)

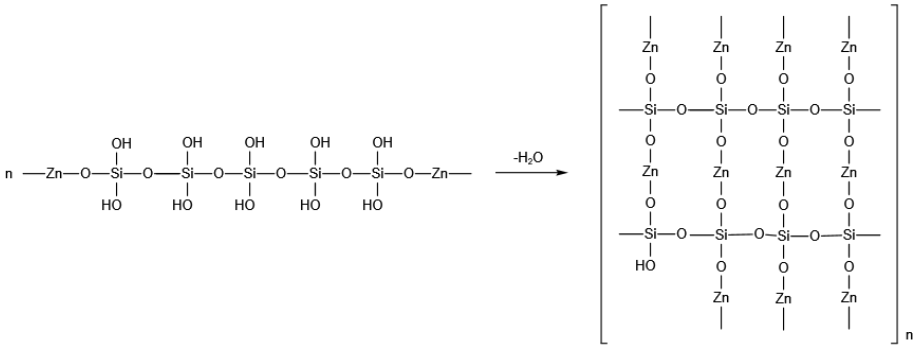


(S2)

$CO_2 + H_2O \rightarrow H_2CO_3$ (S3)



(S4)



(S5)

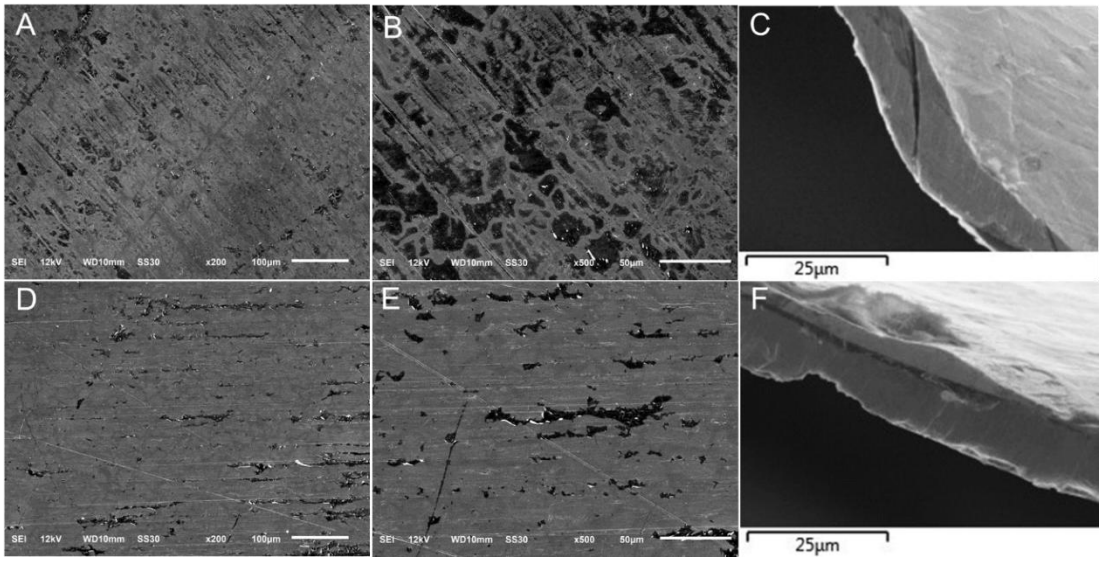


Figure 1. SEM images of (A, B) Zn-LSO-0.5; (D, E) Zn-LSO-1.5 with different magnification and cross-section of (C) Zn and Zn-LSO-0.5; (F) Zn and Zn-LSO-1.5.

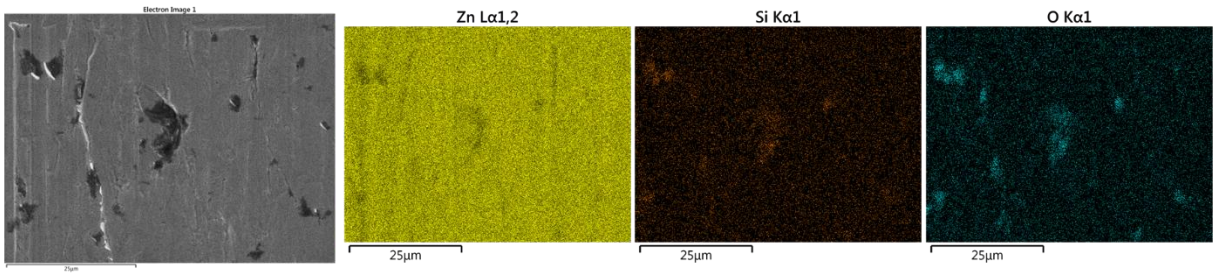


Figure 2. Elements mapping of Zn-LSO-1.

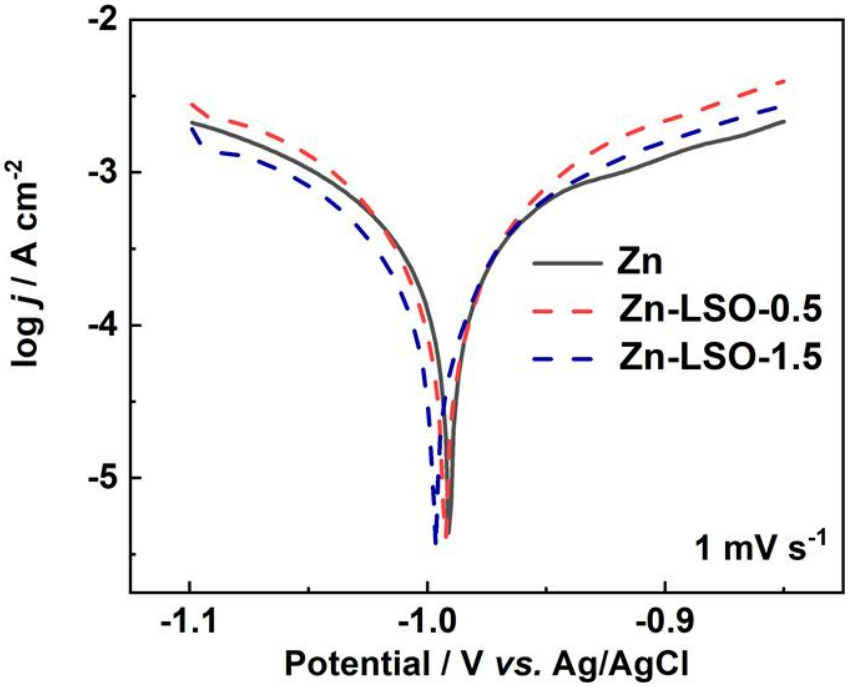


Figure 3. Tafel curves of Zn, Zn-LSO-0.5 and Zn-LSO-1.5 anode under the three-electrode system.

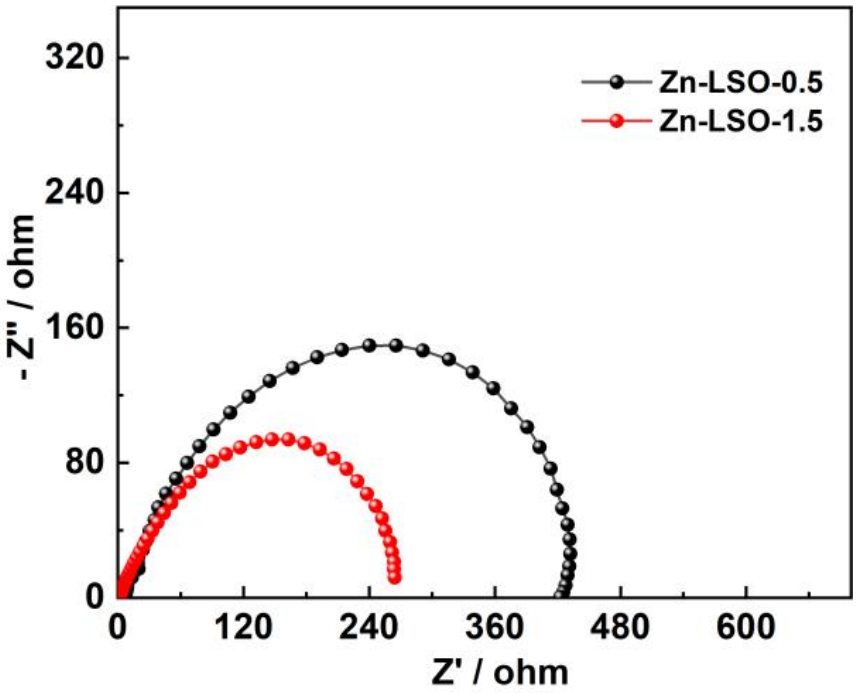


Figure 4. Nyquist plots of Zn-LSO-0.5 and Zn-LSO-1.5 anode.

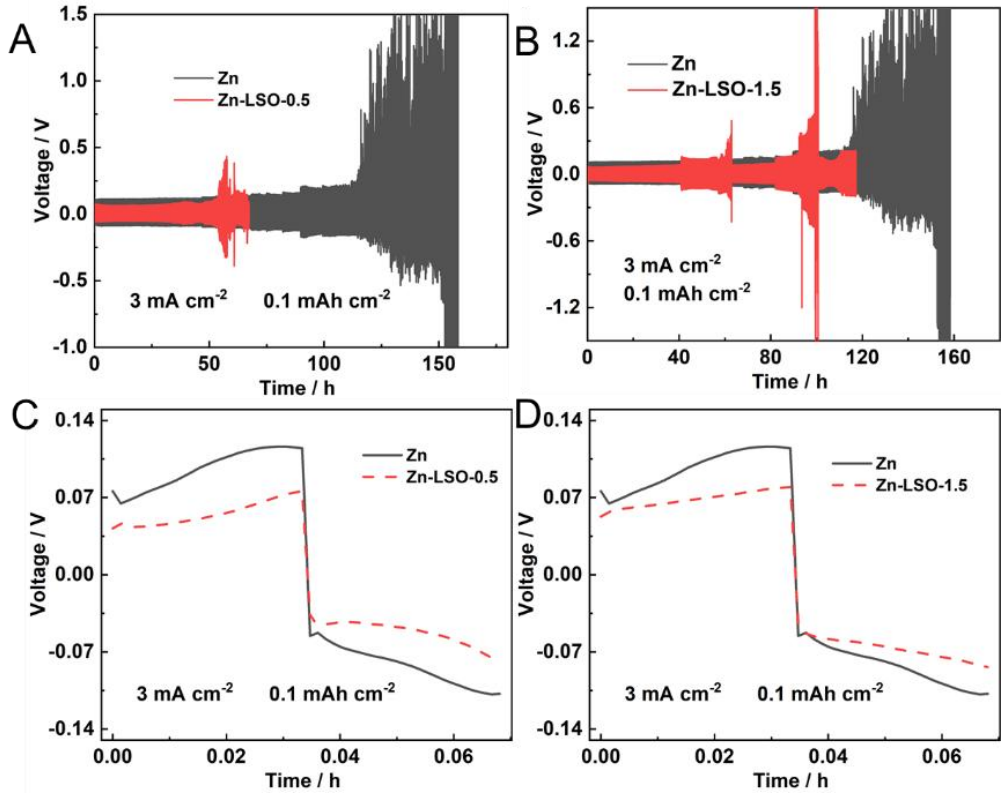


Figure 5. Galvanostatic cycling stability at a current density of 3 mA cm^{-2} with an areal capacity of 0.1 mAh cm^{-2} for symmetrical (A) Zn and Zn-LSO-0.5; (B) Zn and Zn-LSO-1.5 cells, and initial voltage profiles of symmetrical (C) Zn and Zn-LSO-0.5; (D) Zn and Zn-LSO-1.5 cells.

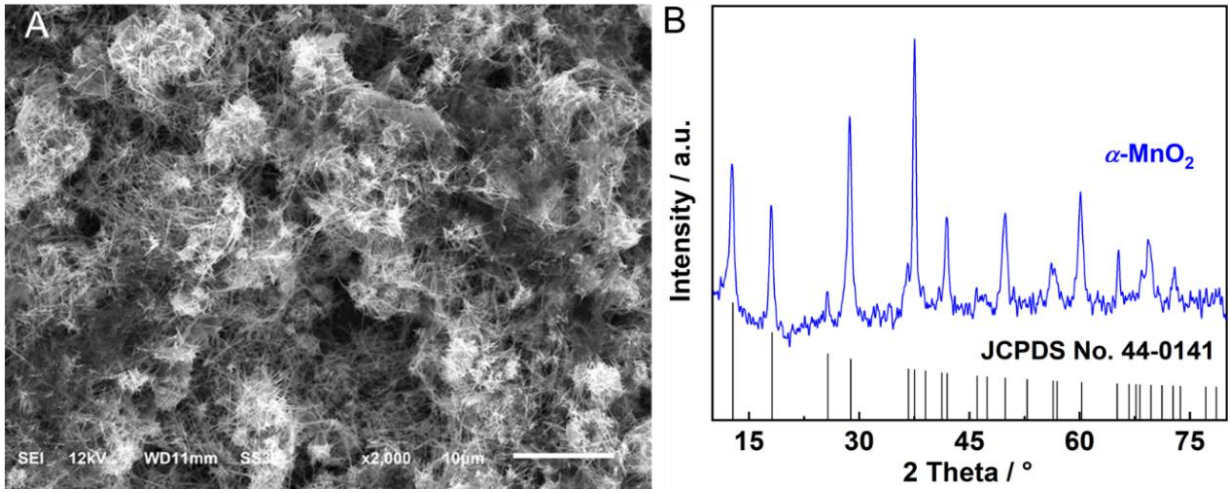


Figure 6. (A) X-ray diffraction of MnO2 Zn-LSO-1.5; (B) SEM images of MnO_2.

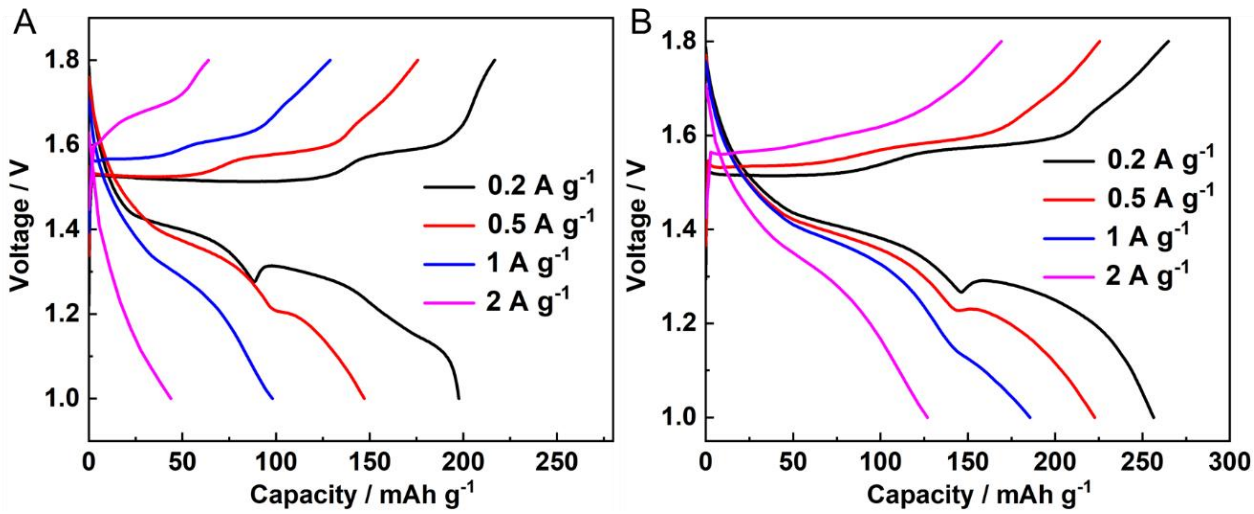


Figure 7. (A) galvanostatic charge and discharge potential profiles of (B) Zn/MnO_2 and (d) Zn-LSO-1/MnO_2 cells at different current densities.

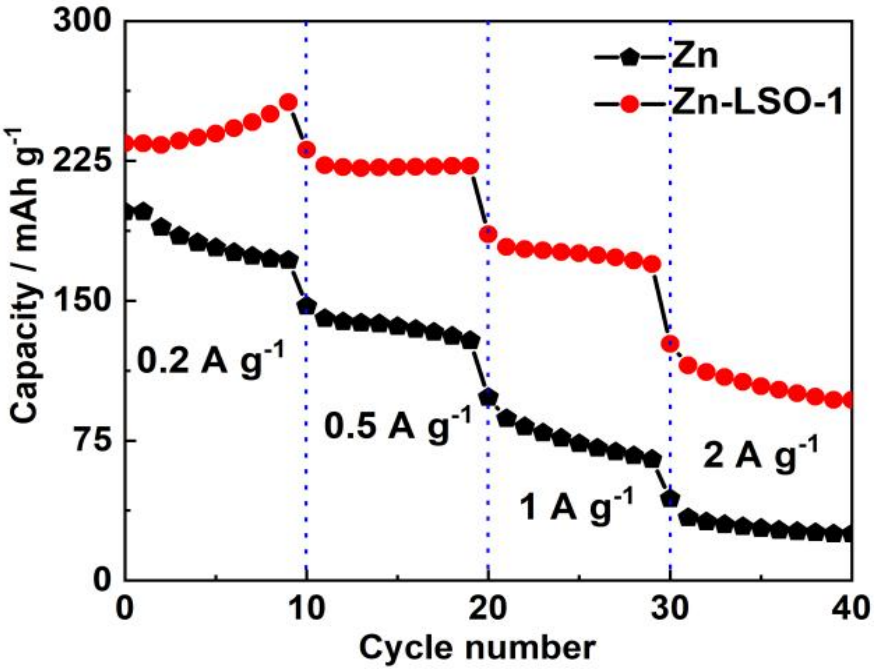


Figure 8. Rate performance of Zn/MnO_2 and Zn-LSO-1/MnO_2 cells from 0.2 to 2 A g^{-1}.

Table 1. Comparison of lifespan of Zn-LSO-1 with reported Zn anodes

Electrode	Electrolyte	Capacity (mAh cm^{-2})	Current density (mA cm^{-2})	Voltage hysteresis (mV)	Cycling life (h)	Reference
Graphite-coated Zn anode	2 M $ZnSO_4$	0.1	0.1	28	200	[1]
Nanoporous $CaCO_3$	3 M $ZnSO_4$ + 0.1 M $MnSO_4$	0.05/0.1/0.1/0.1	0.25/1/2/3	80/140/200/160	836/80/80/80	[2]
Kaolin-coated Zn anode	2 M $ZnSO_4$ + 0.1 M $MnSO_4$	1.1	4.4	70	800	[3]
PVB@Zn	1 M $ZnSO_4$	0.5	0.5	108.6	2200	[4]
Zn/CNT	2 M $ZnSO_4$	2	2	27	200	[5]
MXene@Zn Paper	2 M $ZnSO_4$	1	1	75	300	[6]
100TiO_2@Zn	3 M $Zn(SO_3CF_3)_2$	1	1	57.2	150	[7]
Zn/rGO	2 M $ZnSO_4$ + 0.1 M $MnSO_4$	1/2	1	60/100	200	[8]

Zn-LSO-1	2 M $ZnSO_4$ + 0.1 M $MnSO_4$	0.1	0.5/1/3/5	66/80/118/141	835/455/344/260	This work

References

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