

Electronic Supplementary Information

High-Performance, Long Lifetime Chloride Ion Battery using a NiFe-Cl Layered Double Hydroxide Cathode

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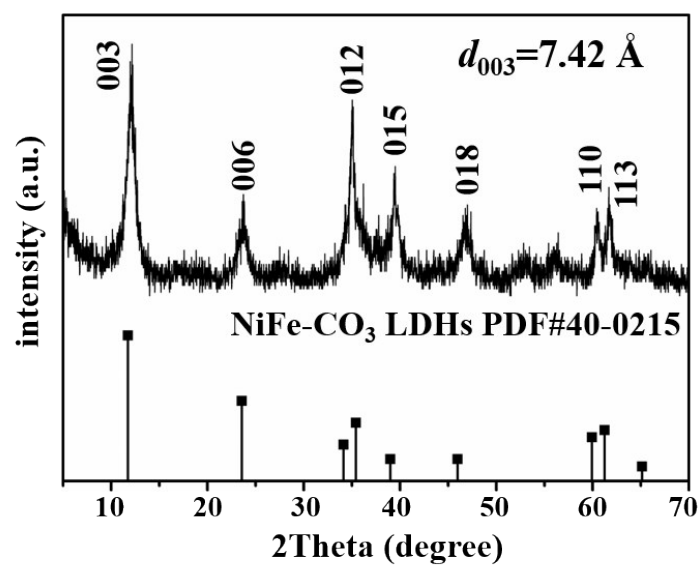


Fig. S1. Powder XRD pattern of NiFe-CO₃ LDH.

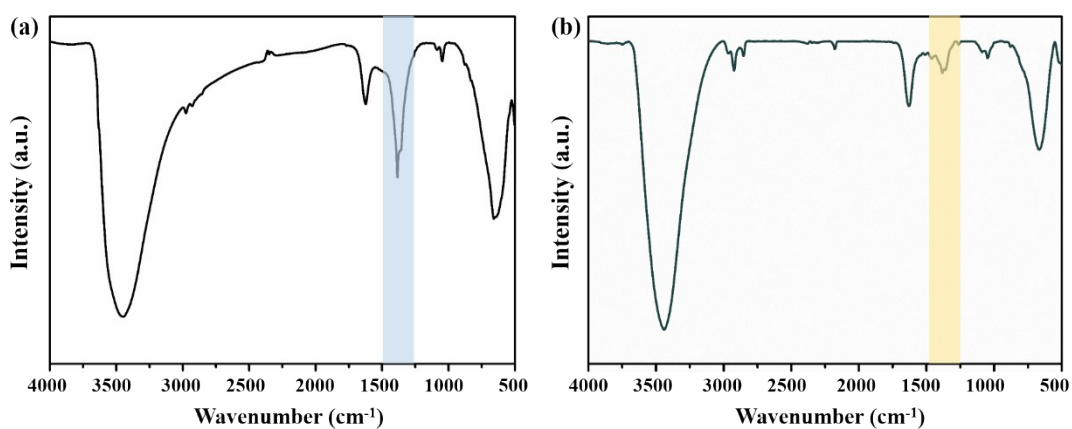


Fig. S2. FT-IR spectra of (a) NiFe-CO₃ LDH and (b) NiFe-Cl LDH.

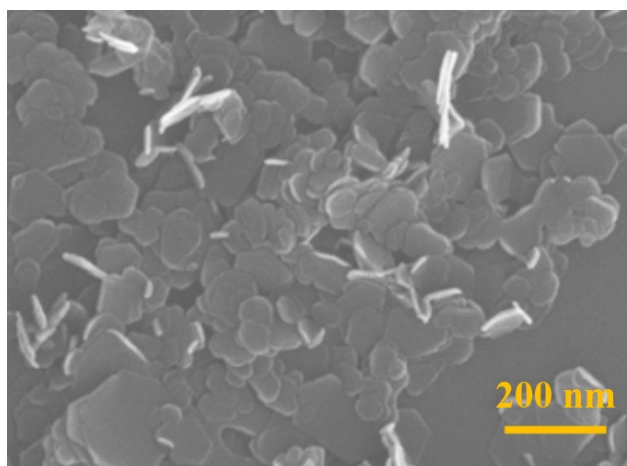


Fig. S3. SEM image of NiFe-CO₃ LDH.

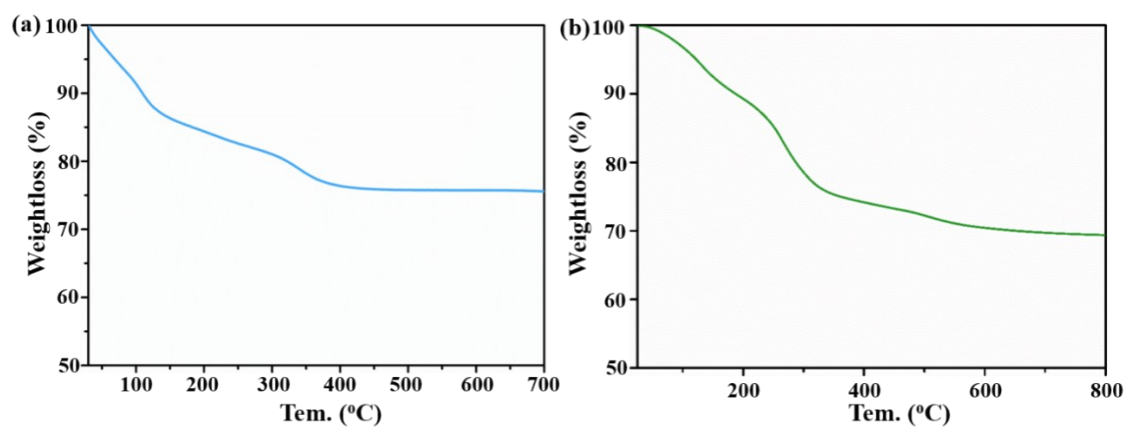


Fig. S4. Thermogravimetry analysis of (a) NiFe-CO₃ LDH and (b) NiFe-Cl LDH.

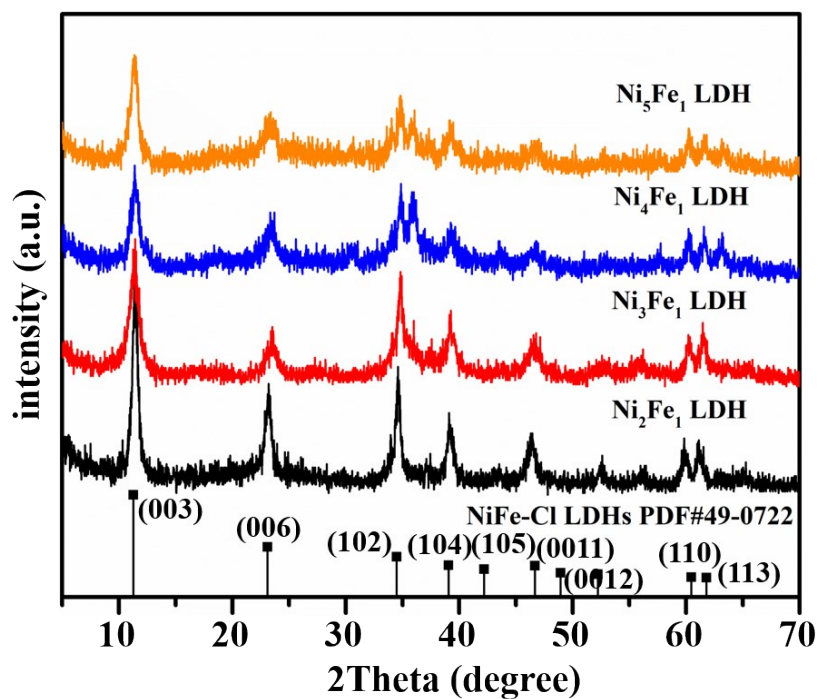


Fig. S5 XRD patterns of $\text{Ni}_x\text{Fe-Cl}$ LDH samples ($x = 2, 3, 4$ and 5). For ease of comparison, the black line is the same as that shown in Fig. 1a.

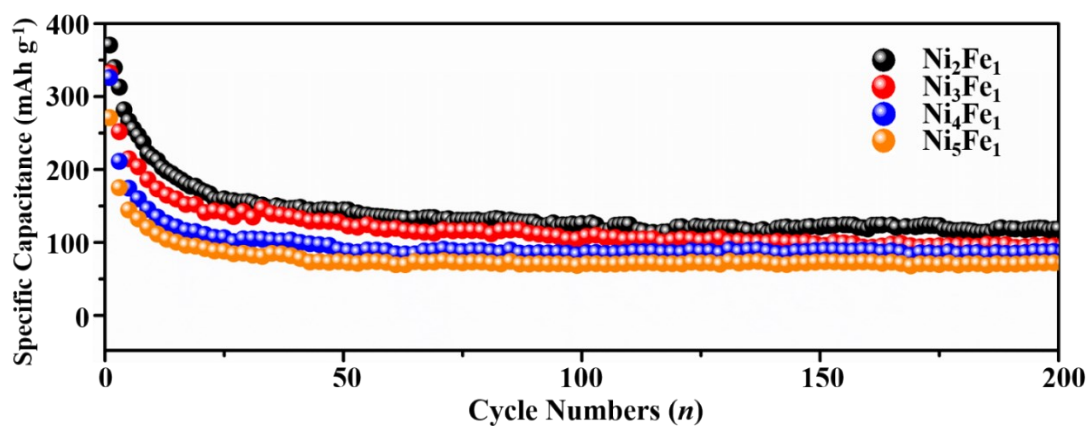


Fig. S6 Cycle performances of $\text{Li/Ni}_x\text{Fe-Cl}$ LDH cells ($x = 2, 3, 4$ and 5) at the current density of 100 mA g^{-1} . For ease of comparison, the black line ($x = 2$) is the same as that shown in Fig. 2c.

Table S1. Comparison of electrochemical performance of cathode materials in CIB system.

Cathode	Current density (mA g ⁻¹)	Best capacity (mAh g ⁻¹)	Capacity after 30cycles (mAh g ⁻¹)	Cycle life	Ref.
NiFe-Cl LDH	100	370.6	156.1	800	This work
BiCl ₃	3	142.9	55 (3th cycle)	3	1
BiOCl	5	63	43 (6th cycle)	6	2
FeOCl	10	158	60	40	2
VOCl	522	151	120	100	3
PPy/CNT	10	118	90	40	4
FeOCl/CMK-3	10	202	165	30	5
PANI/CNT	10	92	88	50	6
Sb ₄ O ₅ Cl ₂ -GAG	10	327	65	80	7
FeOCl@PPy	10	187	155	30	8
CoFe-Cl LDH	10	249.3	160	100	9

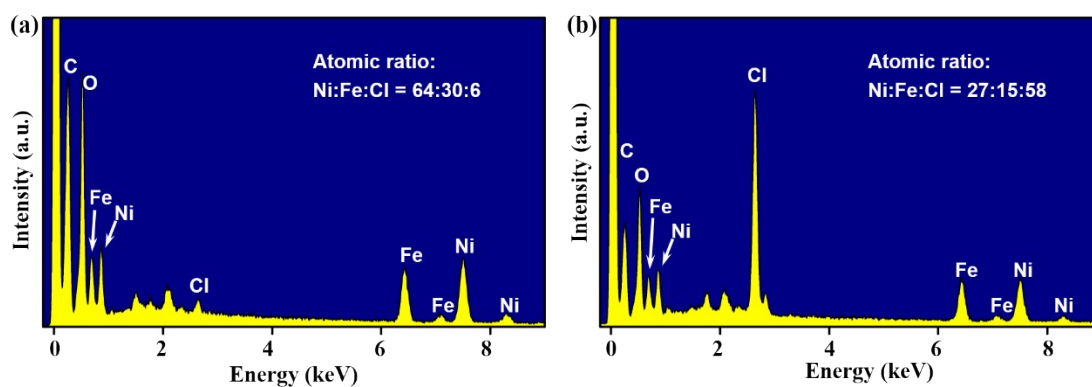


Fig. S7. Energy dispersive X-ray spectroscopy (EDS) results of the NiFe-Cl LDH cathode at (a) 1.2V and (b) 3.0V.

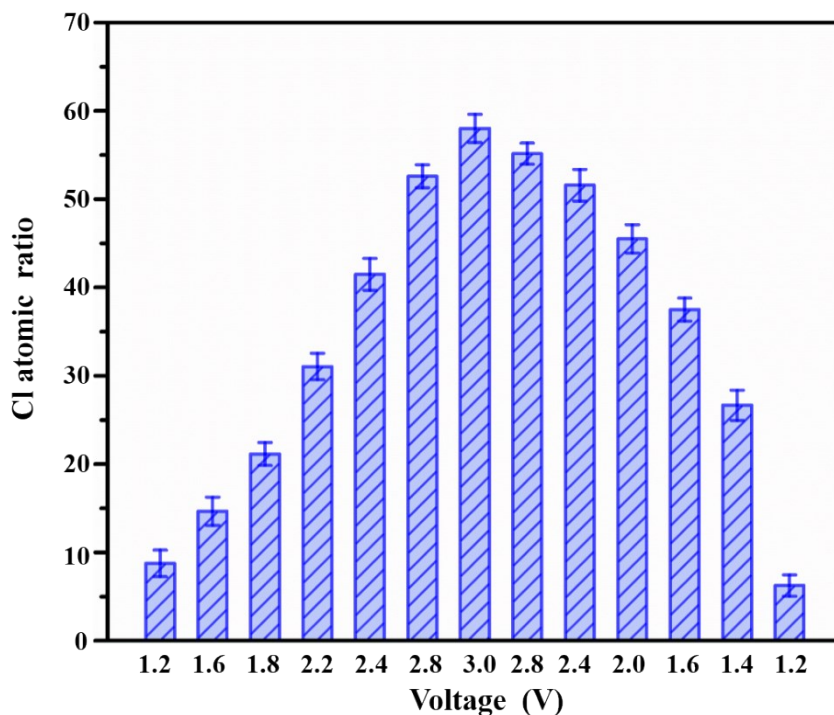


Fig. S8. Cl atomic ratio ($\text{Cl}/[\text{Cl}+\text{Fe}+\text{Ni}]$) of NiFe-Cl LDH cathode in different charge/discharge states (obtained from EDS analysis).

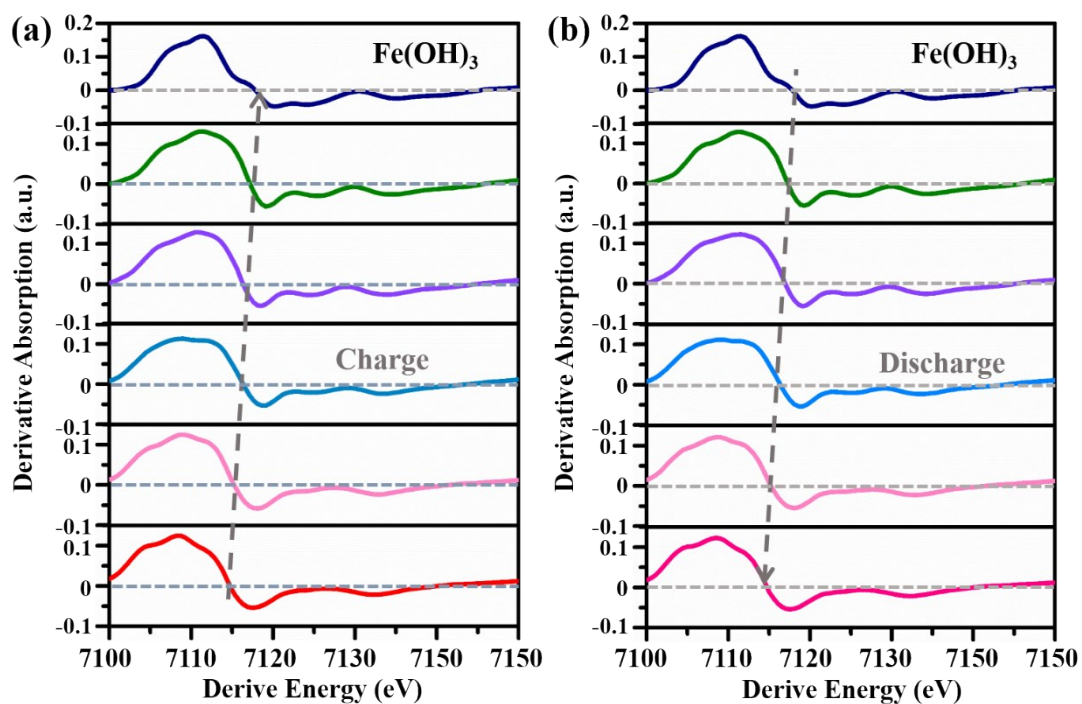


Fig. S9. The first-order derivative from Fe K-edge XANES spectra of NiFe-Cl LDH in (a) charge and (b) discharge process.

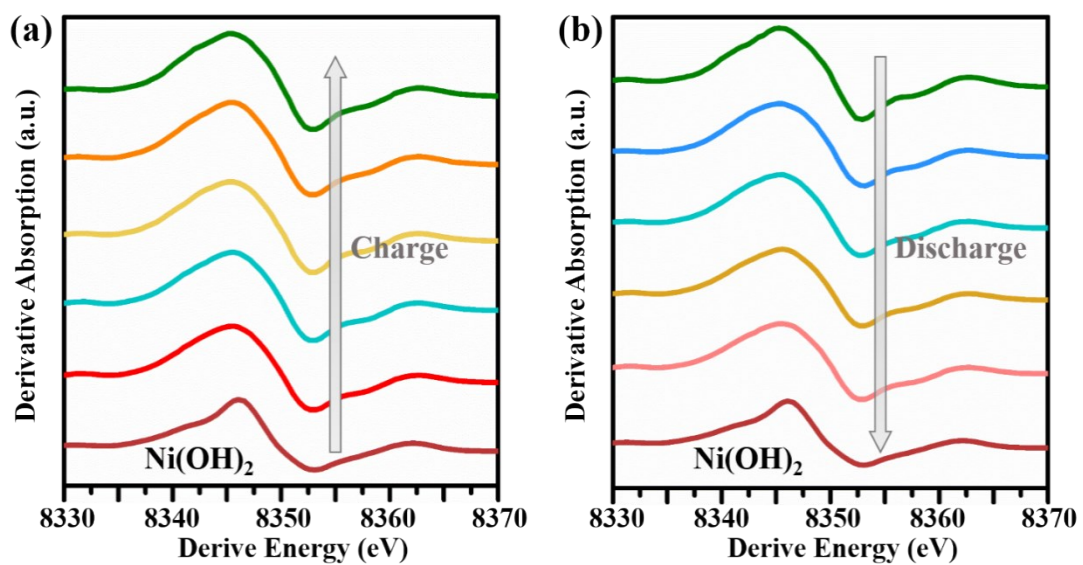


Fig. S10. The first-order derivative from Ni K-edge XANES spectra of NiFe-Cl LDH in (a) charge and (b) discharge process.

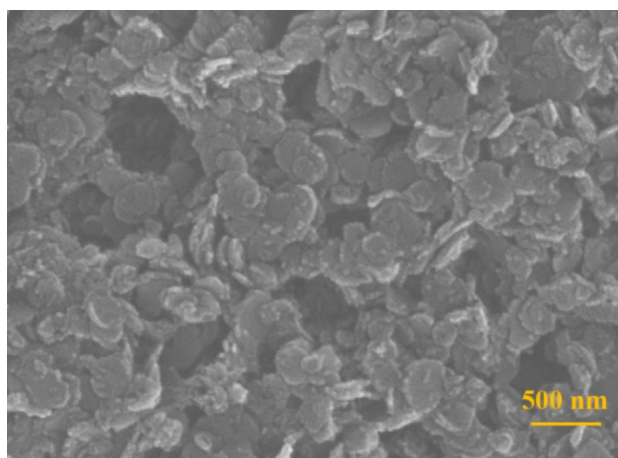


Fig. S11. SEM image of the NiFe-Cl LDH cathode after 800 charge/discharge cycles.

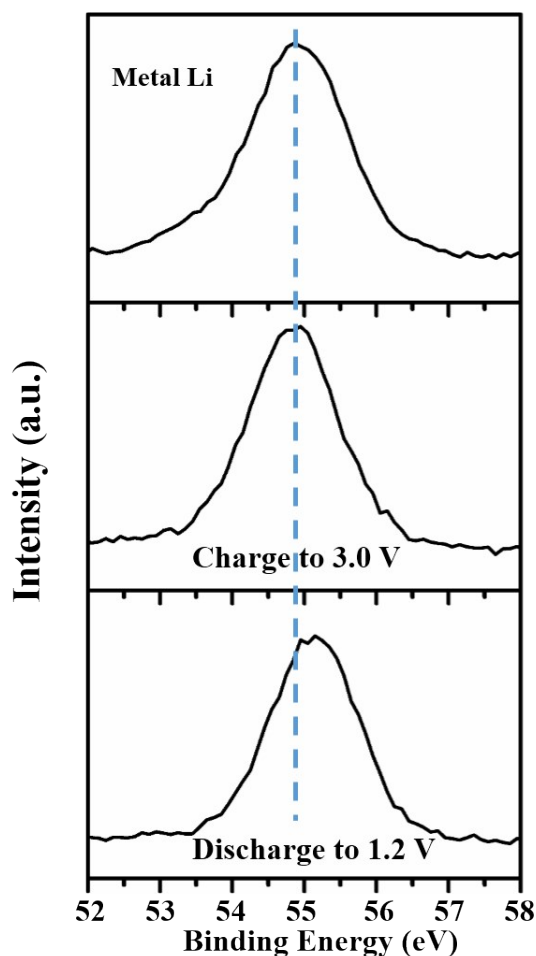


Fig. S12. XPS spectra of Li anode at fully charged and discharged states.

References

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