

Supplementary materials:

In situ formation of LiF decoration on Li-rich material for long-cycle life and superb low-temperature performance

Xiang Ding^a, Yi-Xuan Li^a, Fei Chen^a, Xiao-Dong He^a, Aqsa Yasmin^a, Qiao Hu^a, Zhao-Yin Wen^b

and Chun-Hua Chen^{a,*}

^aCAS Key Laboratory of Materials for Energy Conversions, Department of Materials Science and Engineering & Collaborative Innovation Center of Suzhou Nano Science and Technology, University of Science and Technology of China, Anhui Hefei 230026, China

^bKey Laboratory of Energy Conversion Laboratory, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai 200050, China

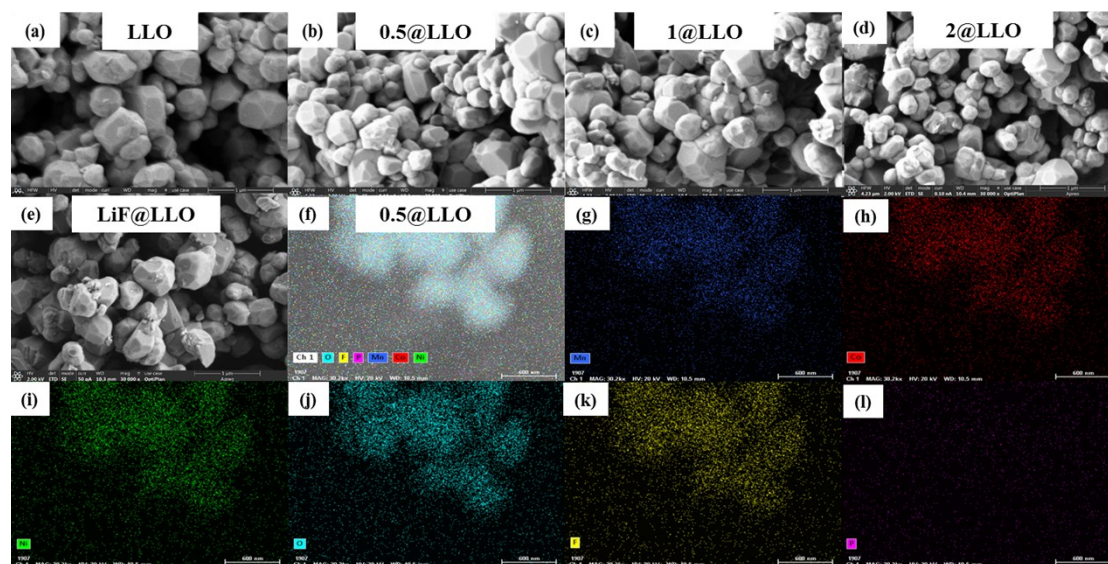


Fig. S1 SEM images of (a) LLO, (b) 0.5@LLO, (c) 1@LLO, (d) 2@LLO, (e) LiF@LLO and (f, g, h, i, j, k, l) the EDS mapping images of Mn, Co, Ni, O, F and P elements for 0.5@LLO, respectively.

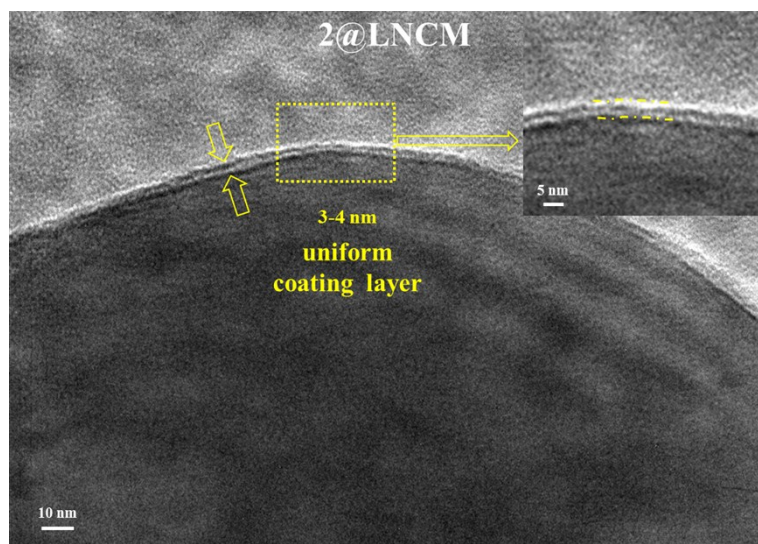


Fig. S2 TEM image of 2@LLO.

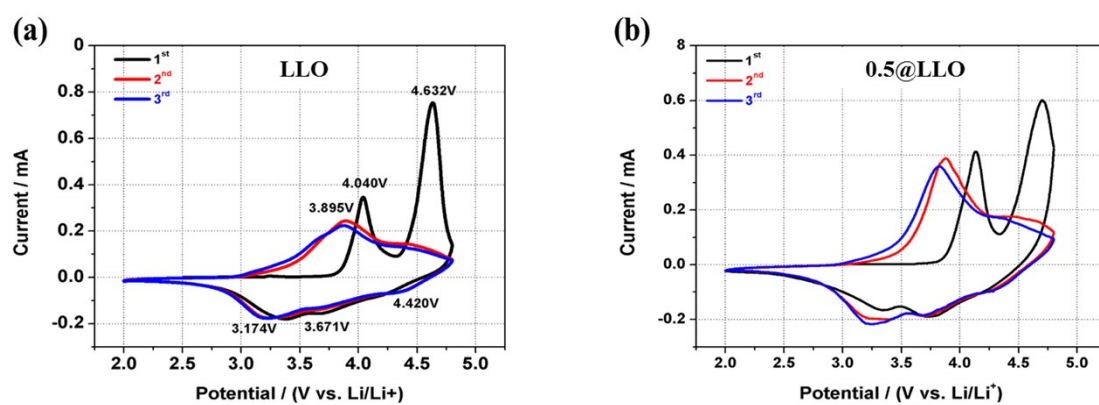


Fig. S3 CV curves of (a) LLO and (b) 0.5@LLO in half-cells during 2.0-4.8 V at a scan rate of 0.01 mV s⁻¹.

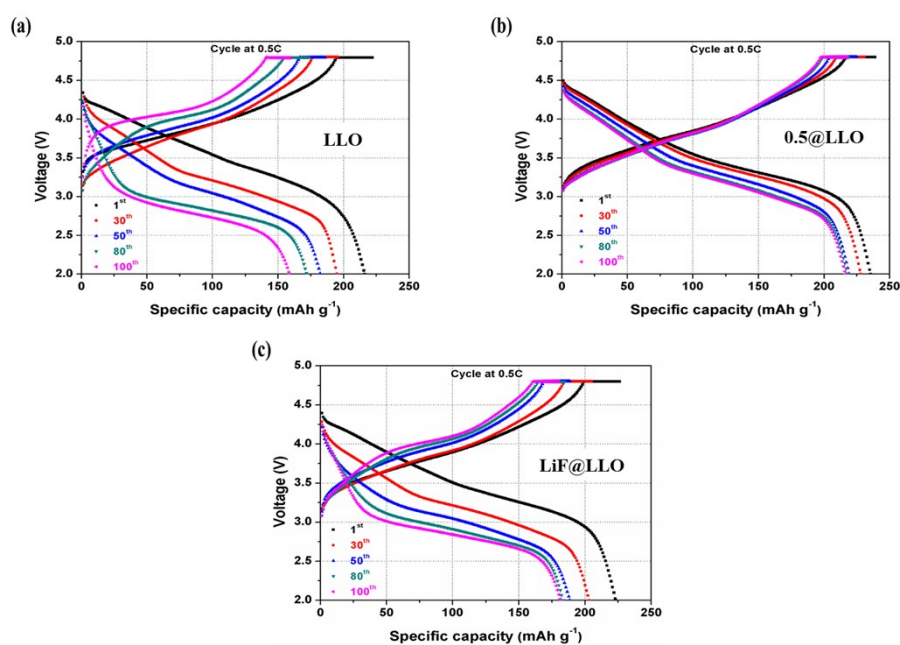


Fig. S4 The charge-discharge curves of (a) LLO, (b) 0.5@LLO and (c) LiF@LLO during 100 cycles at 0.5 C.

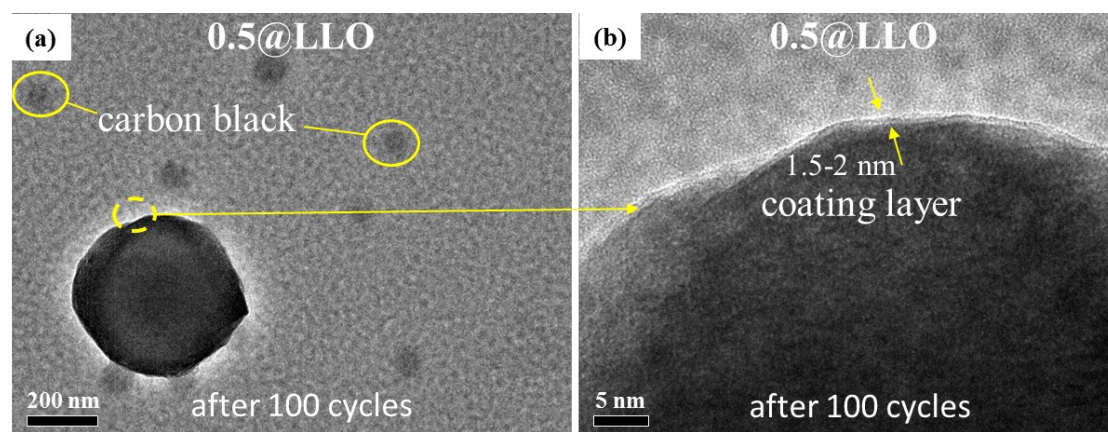


Fig. S5 TEM images of 0.5@LLO after 100 cycles at 0.5 C.

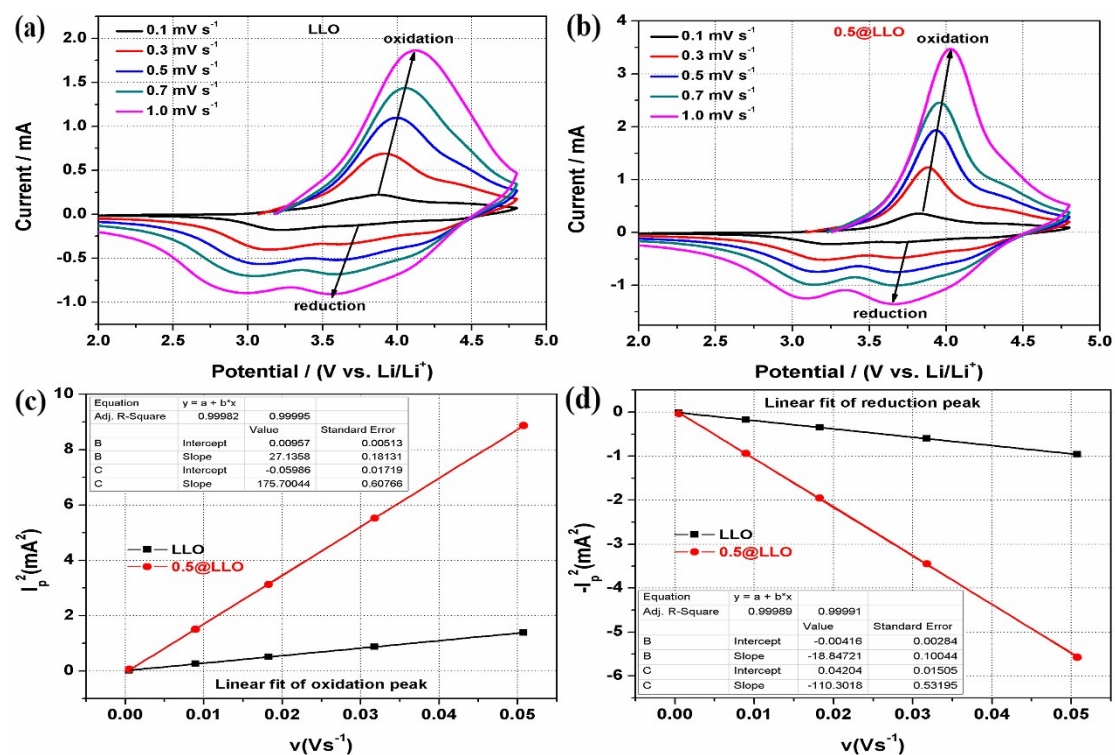


Fig. S6 CV curves of (a) LLO and (b) 0.5@LLO at selected scan rate from 0.1 to 1.0 mV s^{-1} . The peak current I_p as a function of square of scan rate v for these two samples: the linear fit of (c) oxidation peak and (d) reduction peak.

Table S1 A comparison of electrochemical performance at -30 °C.

Samples	Synthesis method	Coating material	Capacity (mA h g ⁻¹) at -30 °C and retention	Ref.
Li _{1.2} Ni _{0.2} Mn _{0.6} O ₂	sol-gel	3wt% Li ₂ O-2B ₂ O	87.6/288@30.4%	1
Li _{1.2} Ni _{0.13} Co _{0.13} Mn _{0.54} O ₂	sol-gel	0.085 wt% LiF	112/280@40.0%	This work

Table S2 The values of I₍₀₀₃₎/I₍₁₀₄₎ of LLO, 0.5@LLO and LiF@LLO before and after cycle.

Samples	value of I ₍₀₀₃₎ /I ₍₁₀₄₎
pristine LLO	1.17
LLO after 100 cycles	0.84
LiF@LLO after 100 cycles	0.96
0.5@LLO after 100 cycles	1.02

Table S3 The values of R_s of all the samples after 3 and 100 cycles.

Samples	R _s (Ω)/3 cycles	R _s (Ω)/100 cycles
LLO	86	436
0.5@LLO	30	80
1@LLO	40	115
2@LLO	38	118
LiF@LLO	40	244

References

1 S. Chen, L. Chen, Y. Li, Y. Su, Y. Lu, L. Bao, J. Wang, M. Wang, F. Wu, ACS Appl. Mater. Interfaces 9 (2017)

8641–8648.