Supporting Information

Enhanced electrochemical performance of layered lithium-rich cathode materials by constructing spinel-structure skin and ferric oxide islands

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Figure S1. XPS spectra of P 2p region for the LSO sample.

Table S1 The lattice parameters of the two samples.

samples	a (Å)	c (Å)	c/a (Å)	I_{003}/I_{104}
LLOs	2.8546	14.2488	4.991	1.23
LSO	2.8583	14.2563	4.988	1.34



Figure S2. Powder XRD pattern of Fe₂O₃ nanoparticles prepared under similar conditions.

	$0.1C (1C = 250 \text{ mA} \cdot \text{g}^{-1})$				1C			
samples	1 st cycle			50 th cycle		1 st cycle	150 th cycle	
	charge	discharge	CE (%)	capacity	retention	capacity	capacity	retention
LLOs	378.0	275.9	73.0	167.2	60.6	180.9	109.6	60.6
LSO	349.6	272.0	77.8	228.4	84.0	230.6	165.4	71.7
samples	₃ 0.2C		0.5C		2	C 5C		С
	capacity	retention#	capacity	retention#	capacity	retention#	capacity	retention#
LLOs	229.9	83.3	201.8	73.1	162.4	58.9	134.4	48.7
LSO	241.1	88.6	230.4	84.7	202.6	74.5	165.7	60.9

 Table S2 The detailed values of electrochemical performances for the two samples.

Note: the unit of capacity and retention is $mAh \cdot g^{-1}$ and %, respectively; CE is the abbreviation for coulombic efficiency.

#The retention is the ratio of the discharge capacity at each rate to the capacity at 0.1 C rate.



Figure S3. The dQ/dV plots of the two samples corresponding to their initial charge/discharge curves. The oxidation peak in red circle implies the spinel structure.



Figure S4. (a) The Nyquist plots and the fit curves of the two samples in the second and fiftieth charges at the voltage of 4.0 V, the equivalent circuit is shown inset; (b) discharge capacity vs. cycle number when cycled at 2 C rate between 2 V and 4.8 V.

. Table S3 Impedance parameters of two samples in the 2^{nd} and 5^{th} charges at the voltage of 4.0

V.

samples	2 nd cycle			50 th cycle		
	$\operatorname{Ro}(\Omega)$	$\operatorname{Rs}(\Omega)$	$\operatorname{Ret}(\Omega)$	$\operatorname{Ro}(\Omega)$	$\operatorname{Rs}(\Omega)$	$\operatorname{Ret}(\Omega)$
LLOs	3.75	38.8	14.7	4.3	31.35	592.5
LSO	2.9	32.7	17.1	2.91	21.2	441.3