

Supporting Information

Abundant grain boundaries activate highly efficient lithium ion transportation in high rate $\text{Li}_4\text{Ti}_5\text{O}_{12}$ compact microspheres

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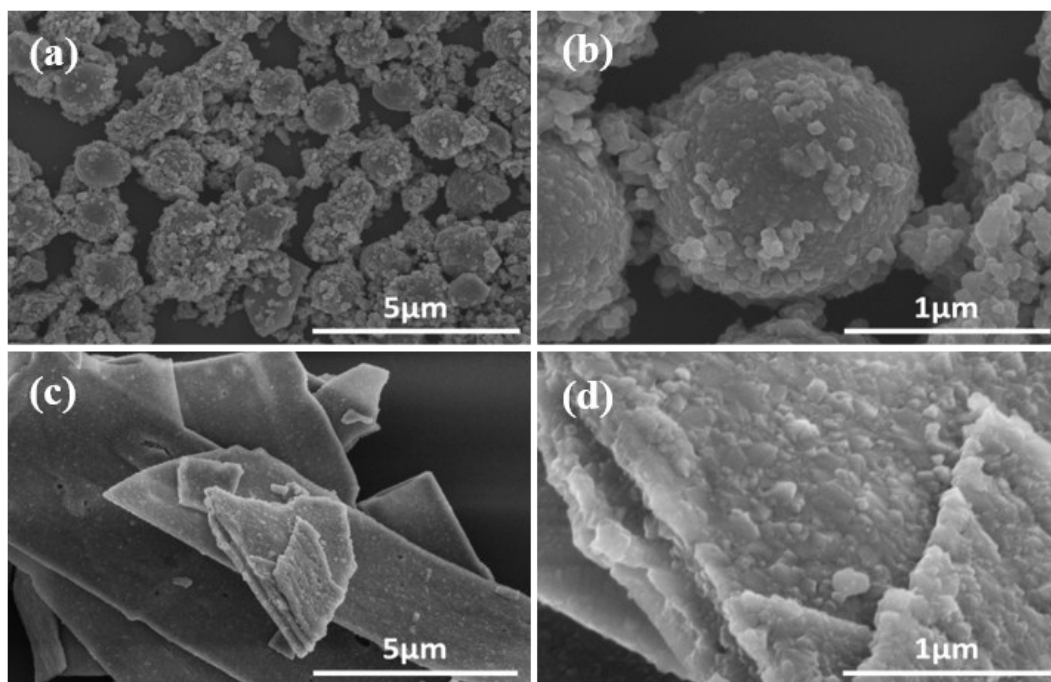


Fig. S1 Scanning electron microscope (SEM) images of (a, b) LTO-40% ethanol, (c, d) LTO-70% ethanol, respectively.

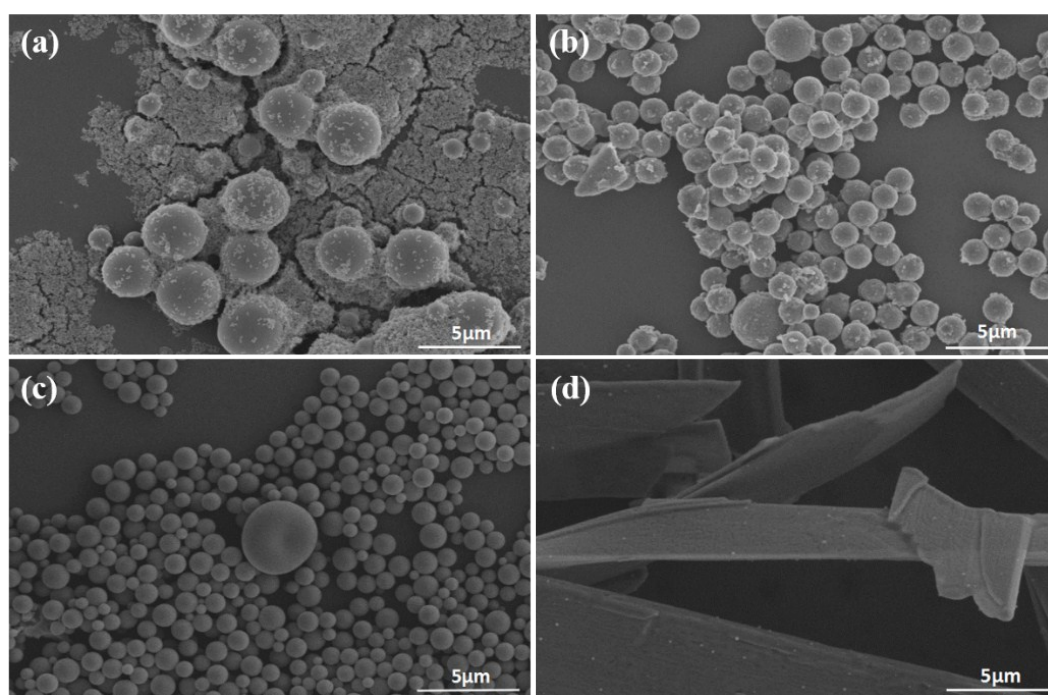


Fig. S2 SEM images of TiO₂/Li⁺ precursors using (a) 40% ethanol, (b) 50% ethanol, (c) 60% ethanol and (d) 70% ethanol.

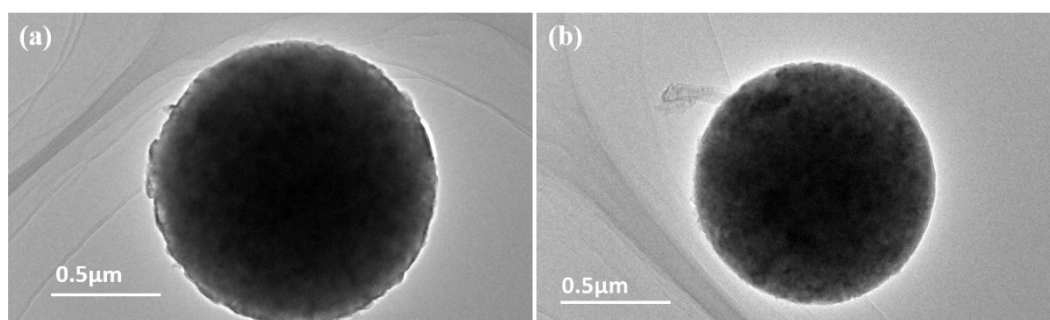


Fig. S3 TEM images of (a) LTO-50% ethanol and (b) LTO-60% ethanol.

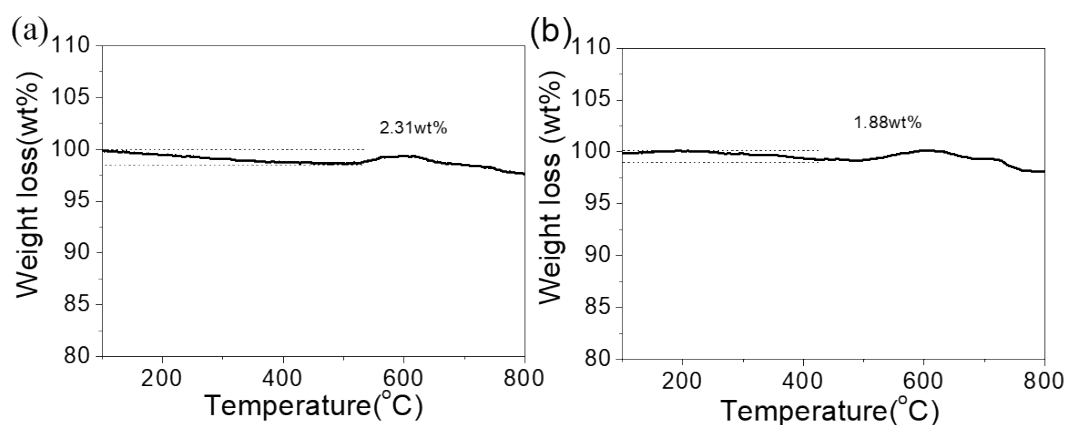


Fig. S4 Thermogravimetric analysis of (a) LTO-50% ethanol and (b) LTO-60% ethanol annealed at 800 °C.

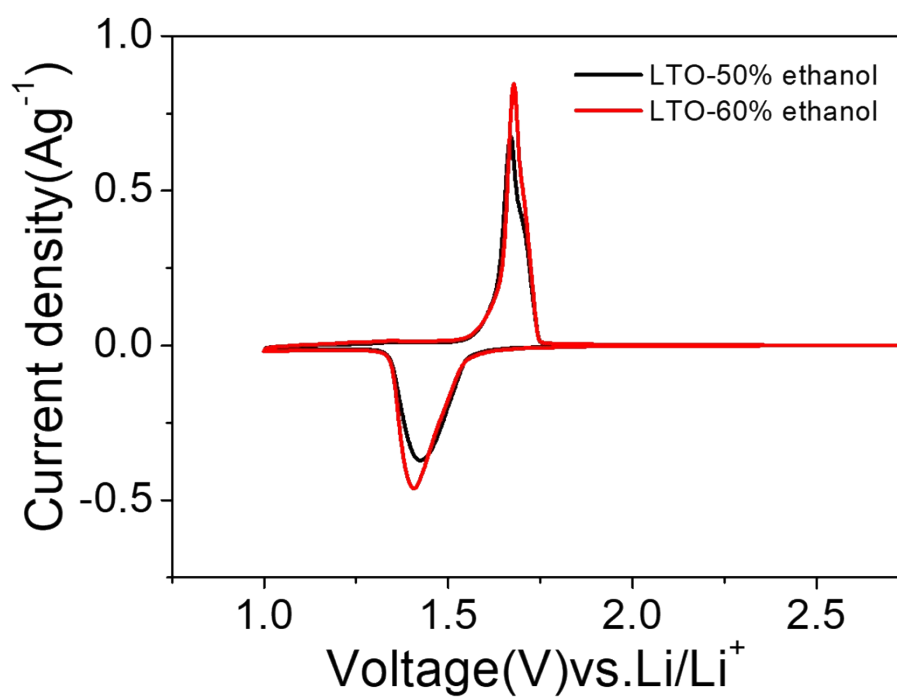


Fig. S5 Cyclic voltammetry (CV) curves of LTO-50% ethanol and (b) LTO-60% ethanol.

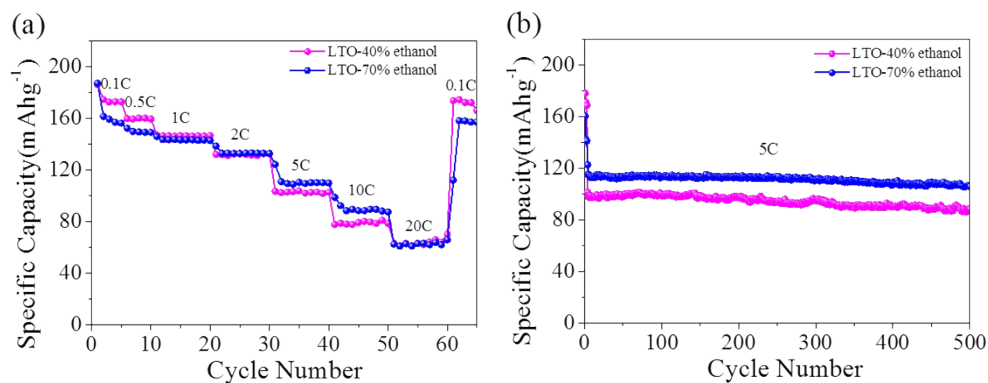


Fig. S6 Electrochemical properties of LTO-40% and LTO-70%: (a) specific capacities at different C rates, (b) cycle performance at a rate of 5 C.

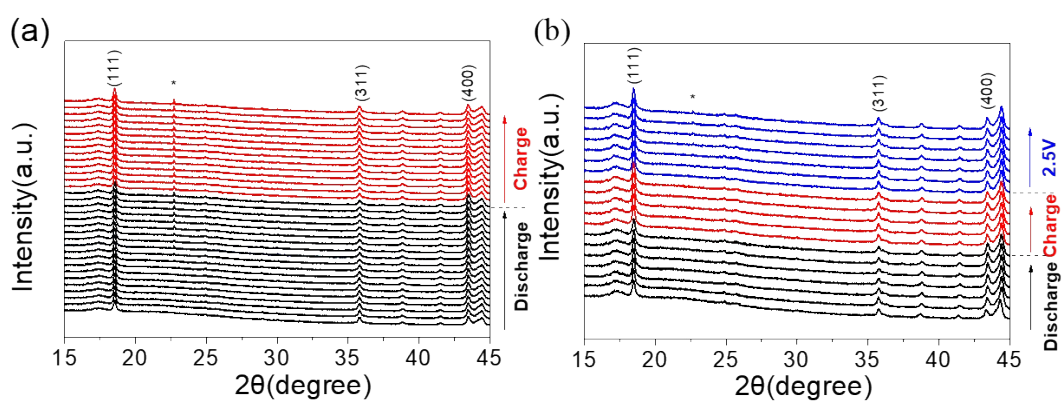


Fig. S7 In-situ XRD collected during the first charge/discharge of the LTO-60% ethanol under a current rate of (a) 0.1 C and (b) 0.5 C between 1.0 and 2.5 V.

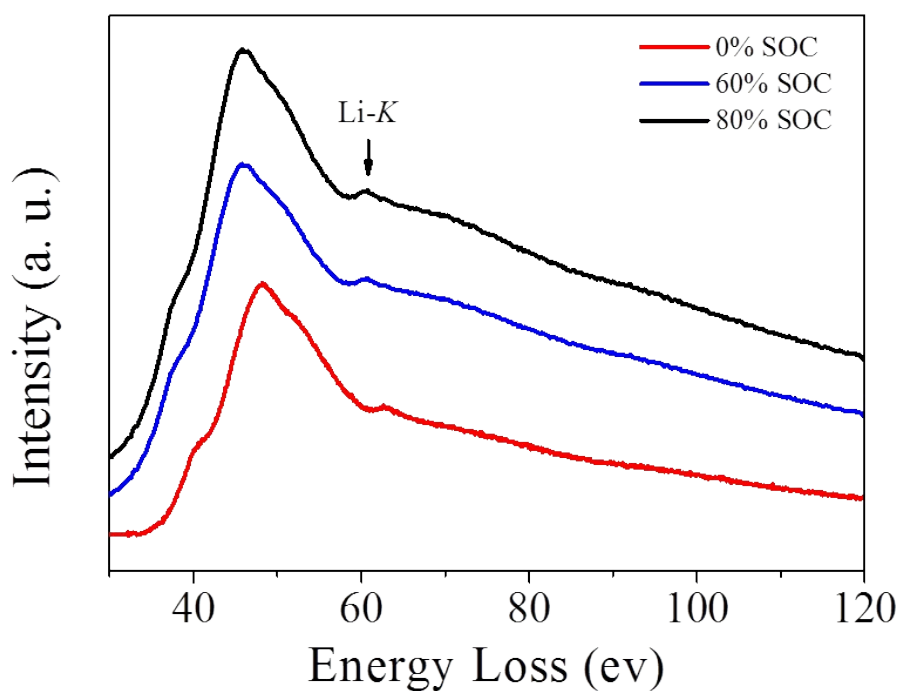


Fig. S8 EELS spectra of the different SOC sample. The Li-K edge was assigned as the peaks of around 61 eV.

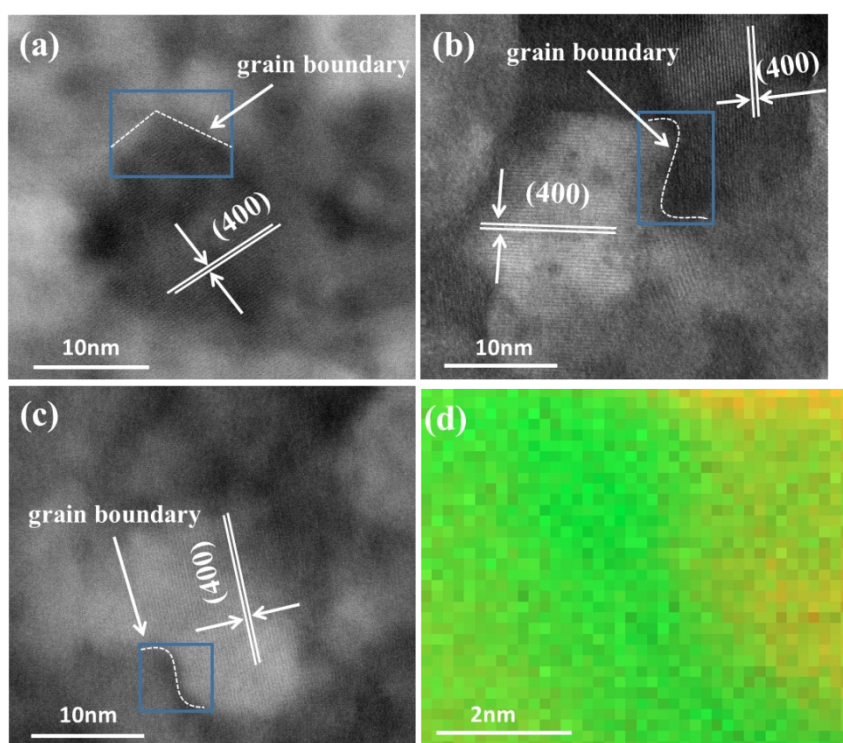


Fig. S9 STEM images of LTO-60% ethanol microspheres at different state of charge (SOC) in a higher magnification: (a) 0% (pristine LTO), (b) 60%, (c) 80%, and EELS mapping of the 80% SOC (d) was collected.

Table S1. Summary of electrochemical performance of high tap density LTO anode in this work and other low tap density LTO anodes.

Reference	Morphology	Tap density (g cm ⁻³)	Rate performance (mA h g ⁻¹)	Cycling rate, Cycling number, Capacity retention
This work	Microspheres	1.23	5C: 146.6 10C: 138.2 20C: 111	5C, 500 cycles, 97.8%
1	Porous particles ¹	No mention	5C: 145 10C: 129	2C, 2200 cycles, 83%
2	Hollow spheres ²	No mention	5C: 128 10C: 115 20C: 104	5C, 300 cycles, 88%
3	Mesoporous hierarchical structure ³	No mention	10C: 133.1 20C: 126.9	1C, 600 cycles, 92%

4	Mesoporous microspheres ⁴	0.81	10C: 136 30C: 114	4C, 200 cycles, 94.5%; 20C, 200 cycles, 125.3 mA h g ⁻¹
5	Hollow microspheres ⁵	No mention	20C: 140.8	20C, 100 cycles, 92.8%
6	Fibers ⁶	No mention	5C: 126 10C: 118	0.5C, 100 cycles, 98.2%;
7	Nanotube arrays ⁷	No mention	30C: 135 60C: 105	10C, 500 cycles, 93%;

References

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