

Supporting Information

High-rate capability LiFePO₄/C cathode assisted with modulated band structures

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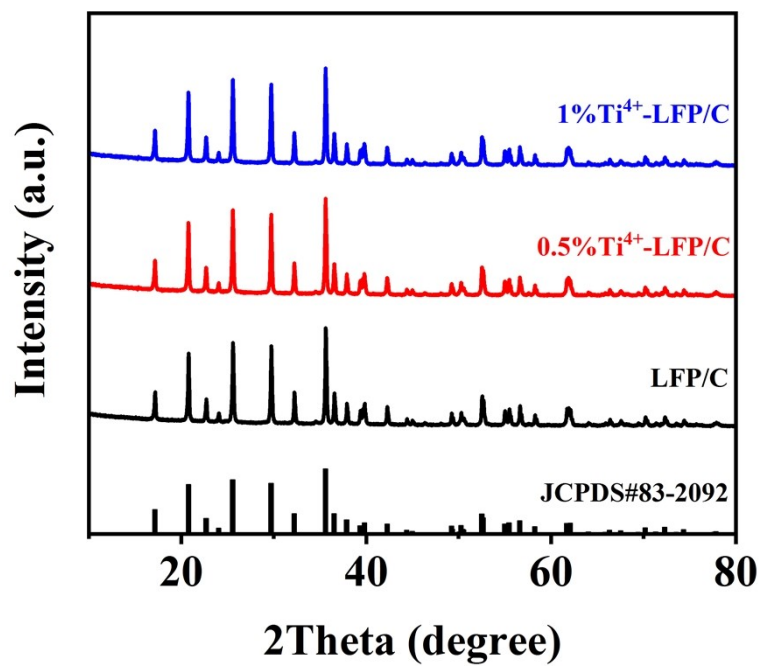


Fig. S1. X-ray diffraction (XRD) patterns of synthesized samples.

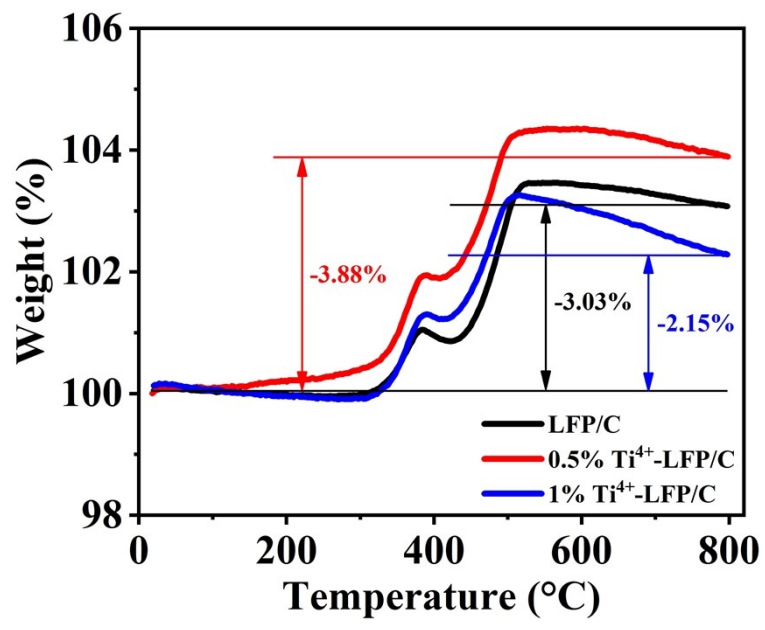


Fig. S2. Thermogravimetry (TG) curves of synthesized samples.

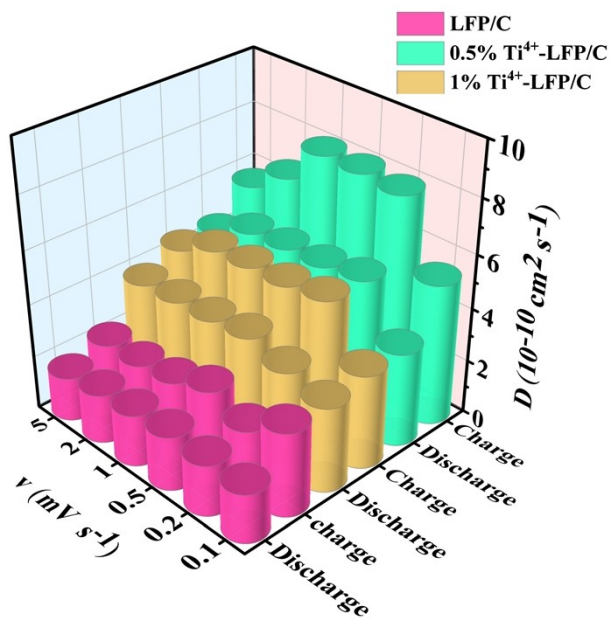


Fig. S3. The histogram of Li⁺ diffusion coefficients during the charge and discharge with different scan rates.

Table. S1. Summary of the potential difference between oxidation peak and reduction peak at different scanning rates.

	LFP/C	0.5%Ti⁴⁺-LFP/C	1%Ti⁴⁺-LFP/C
0.1 mV/s	0.225 V	0.173 V	0.183 V
0.2 mV/s	0.269 V	0.186 V	0.205 V
0.5 mV/s	0.365 V	0.245 V	0.275 V
1 mV/s	0.498 V	0.300 V	0.366 V
2 mV/s	0.65 V	0.374 V	0.491 V
5 mV/s	0.939 V	0.494 V	0.697 V

Table S2. Results of average Li^+ diffusion coefficient for as-synthesized materials calculated by cyclic voltammetry (CV).

	LFP/C		0.5% Ti^{4+} -LFP/C		1% Ti^{4+} -LFP/C	
	Charge	Discharge	Charge	Discharge	Charge	Discharge
Equation			$y=ax$			
Slope (a)	0.14333	-0.12712	0.24015	-0.20868	0.18765	-0.18131
Adjusted R-square	0.99798	0.99845	0.99425	0.99807	0.99976	0.99965
D_{Li}	2.30×10^{-10}	1.81×10^{-10}	6.46×10^{-10}	4.88×10^{-10}	3.95×10^{-10}	3.68×10^{-10}

Table S3. Results of average Li^+ diffusion coefficient for as-synthesized materials calculated by electrochemical impedance spectroscopy (EIS).

	LFP/C	0.5%Ti ⁴⁺ -LFP/C	1%Ti ⁴⁺ -LFP/C
Equation		y=a+bx	
Intercept (a)	284.86170±1.35850	47.57845±2.58782	167.08346±2.03473
Slope (b)	199.61009±1.50351	73.42395±2.86405	133.23154±2.25192
Adj. R-square	0.99915	0.99573	0.99765
D_{Li}	7.20953×10 ⁻¹⁶	5.32840×10 ⁻¹⁵	1.61830×10 ⁻¹⁵

Table S4. The recent progress of LiFePO₄ about elements doping.

Samples	Synthetic methods	Capacity [mAh g ⁻¹]	Capacity retention [%]	Ref.
LiFe _{0.985} Mg _{0.005} Ti _{0.01} PO ₄	Carbothermic reduction + spray drying	139.8 at 5 C	92.9% after 100 cycles at 5 C	1
Li _{0.97} Na _{0.03} Fe _{0.97} Ti _{0.03} PO ₄	High-temperature solid-state	151 at 1 C	99.4% after 100 cycles at 1 C	2
0.5% La and Ce co-doped LiFePO ₄ /C	Hydrothermal	112.1 at 50 C	-	3
S-doped LiFePO ₄	Solvothermal	113 at 10 C	-	4
Mg-doped LiFePO ₄ /rGO	Mechanical mixing + annealing	78 at 20 C	-	5
0.05 Si and F co-doped LiFePO ₄ /C	High-temperature solid-state	70 at 10 C	88% after 200 cycles at 10 C	6
Li _{1.035} Zr _{0.01} FePO ₄ /C	Carbothermic reduction	125 at 20 C	98.5% after 200 cycles at 5C	7
0.5% Ti ⁴⁺ -LFP/C	Ball milling + carbothermic reduction reaction	157 at 1 C 143 at 5 C 136 at 10 C 126 at 20 C	78% after 3000 cycles at 10 C	In this work

Reference

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