Supporting Information for:

Regenerating Spent $LiFePO_4$ with Tailored Molecular Groups: From Bulk Lattice Repair to Surface Conductive Coating for Enhanced Cycling Stability

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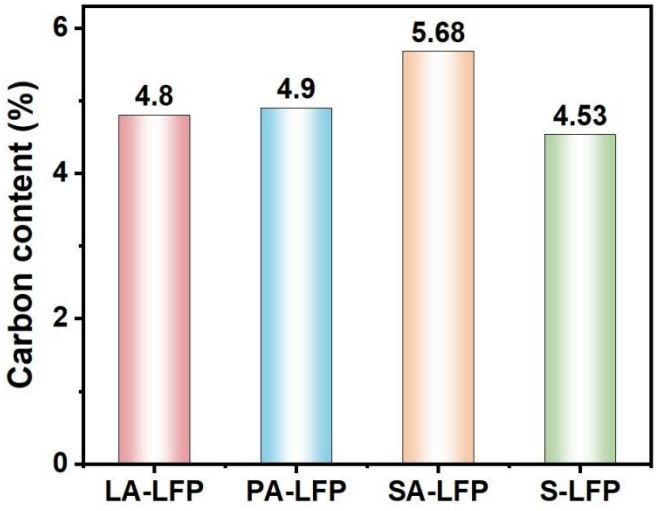

Fig.S1 The carbon content of as-prepared samples

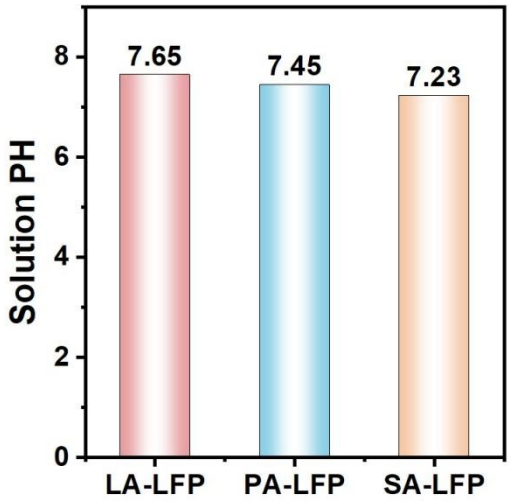

Fig.S2 pH value for different amino acid solutions of as-regenerated samples

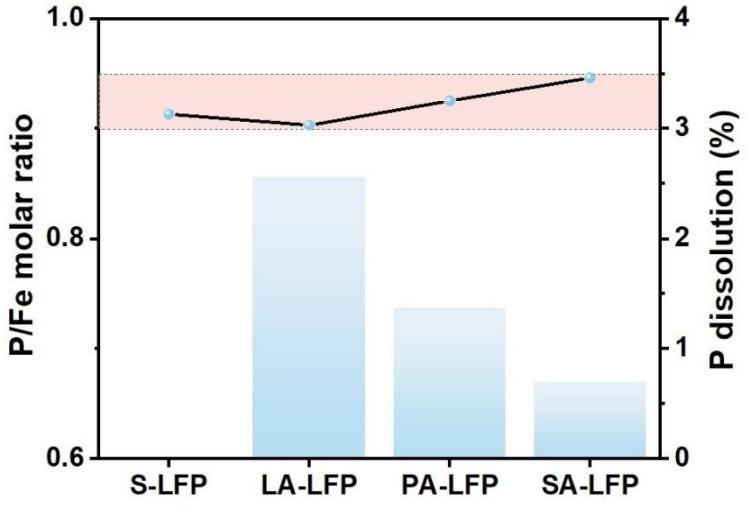

Fig.S3 The ICP results of P/Fe in the samples and P element in the hydrothermal solution

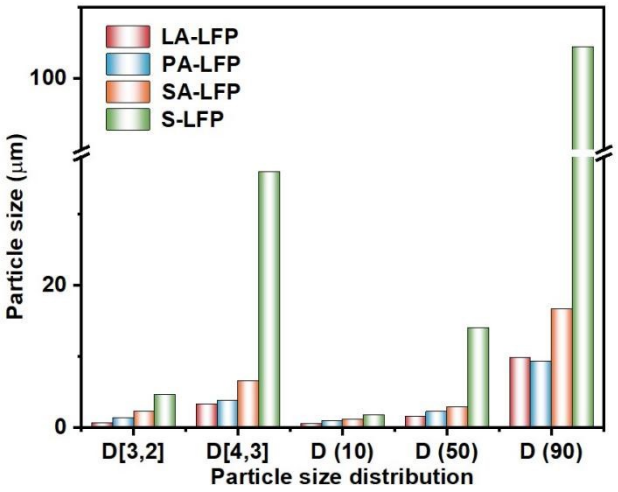

Fig.S4 The particle size parameters of the samples

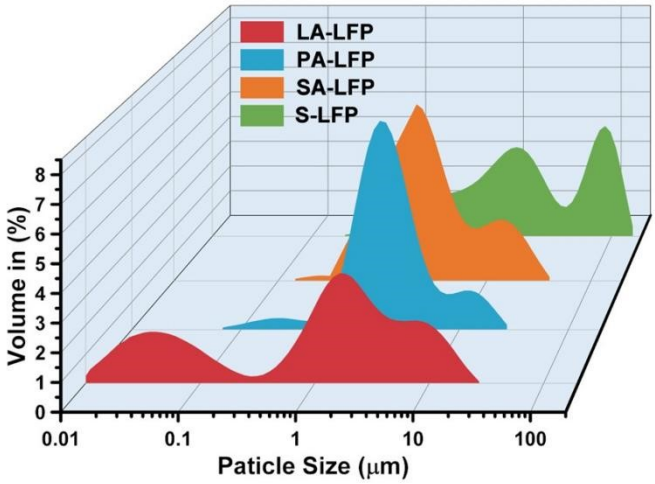

Fig.S5 The particle size distribution of the samples

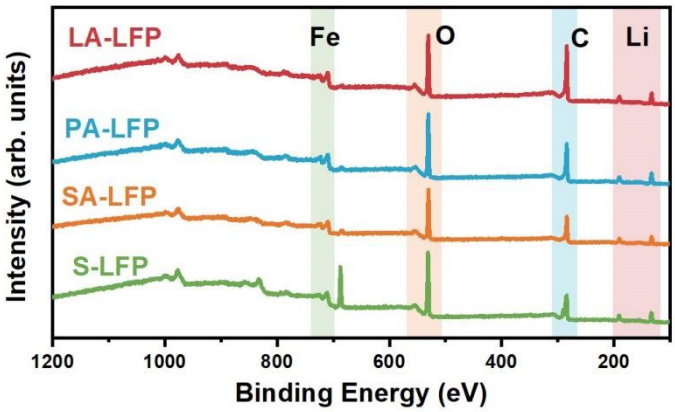

Fig.S6 The full XPS spectrum of the samples

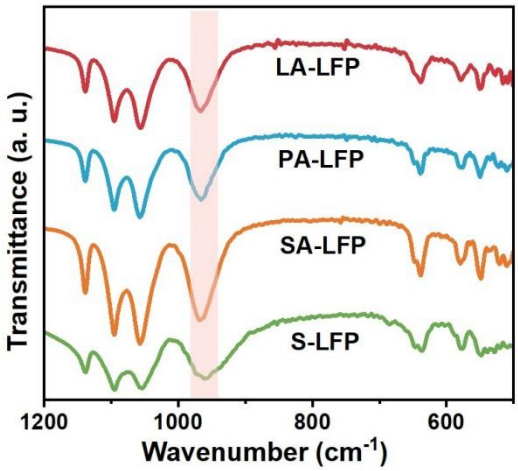

Fig.S7 The FTIR spectrum of the samples

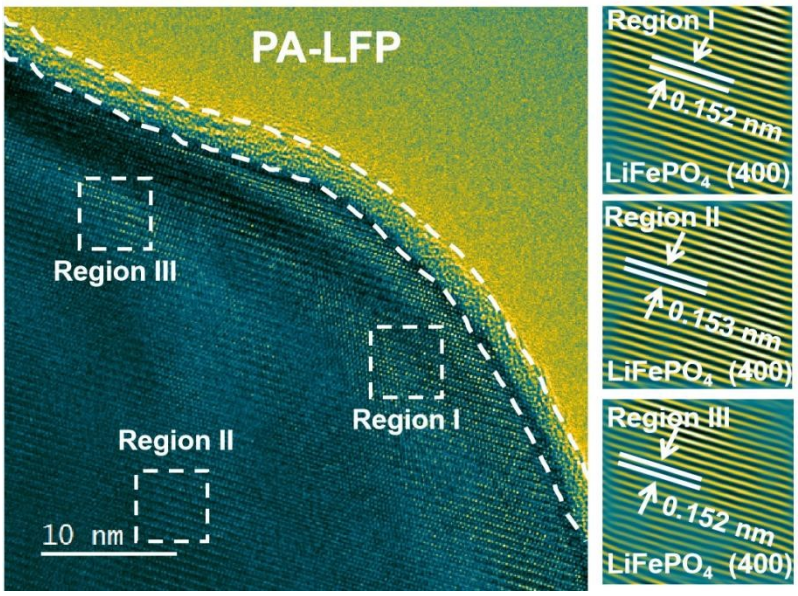

Fig.S8 TEM images of PA-LFP

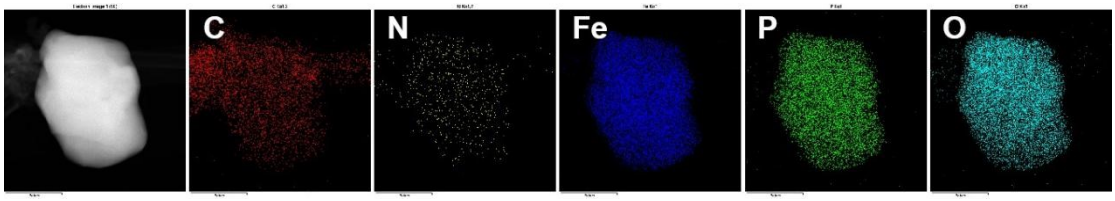

Fig.S9 Mapping images of PA-LFP

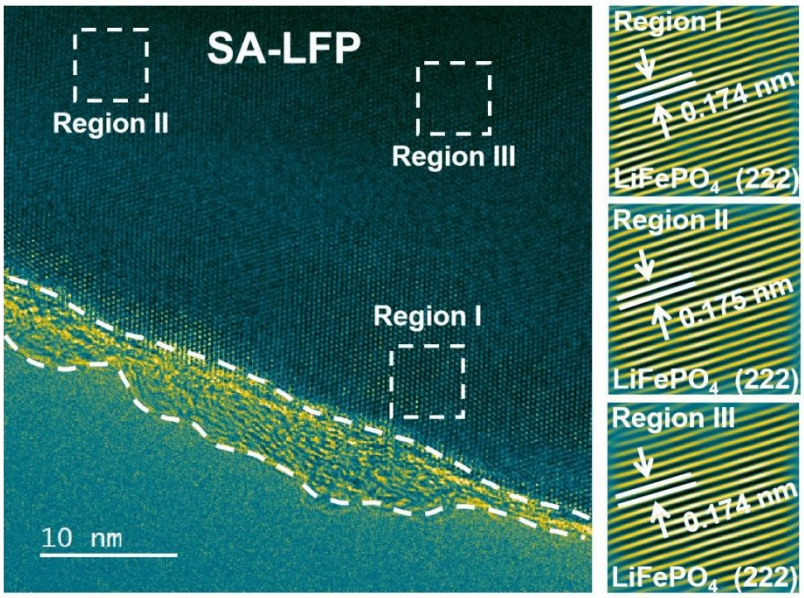

Fig.S10 TEM images of SA-LFP

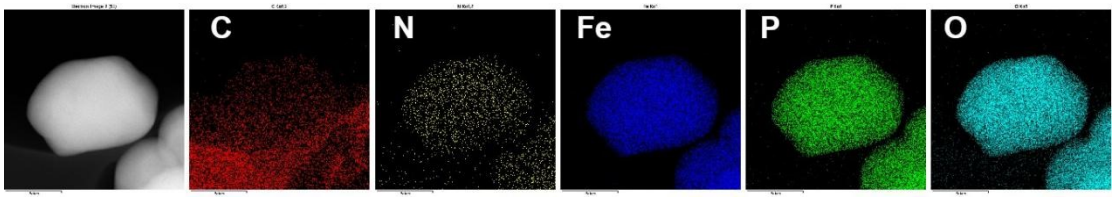

Fig.S11 Mapping images of SA-LFP

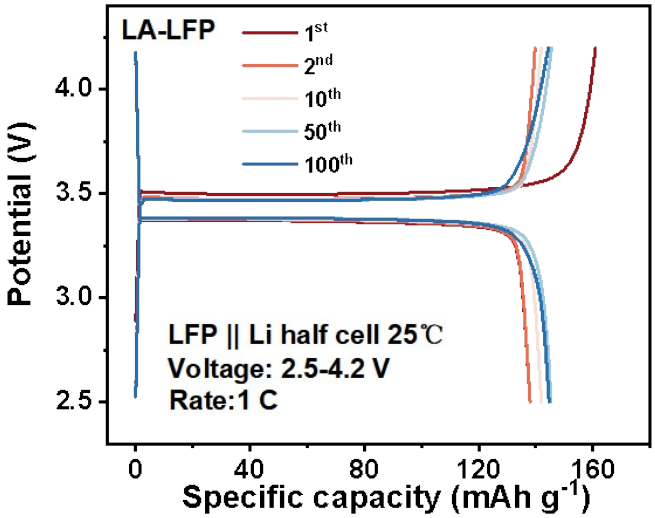

Fig.S12 The charge-discharge platforms of LA-LFP from 1st to 100th cycle and their rate properties

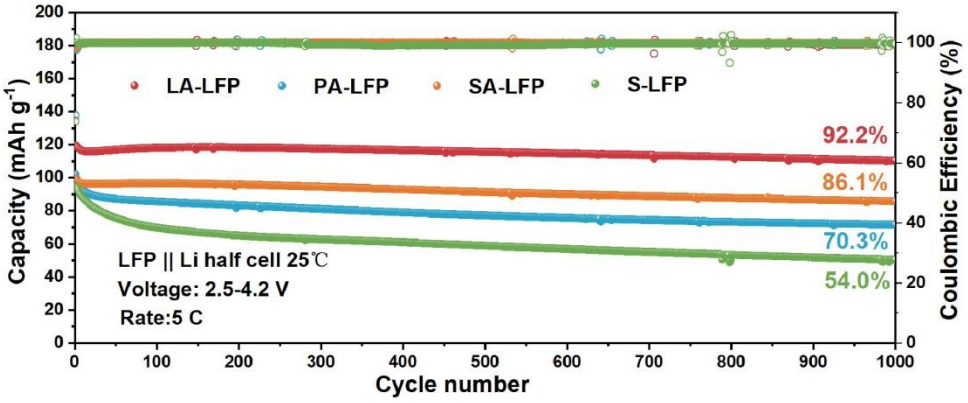

Fig.S13 Cycling performance of samples at 5.0 C

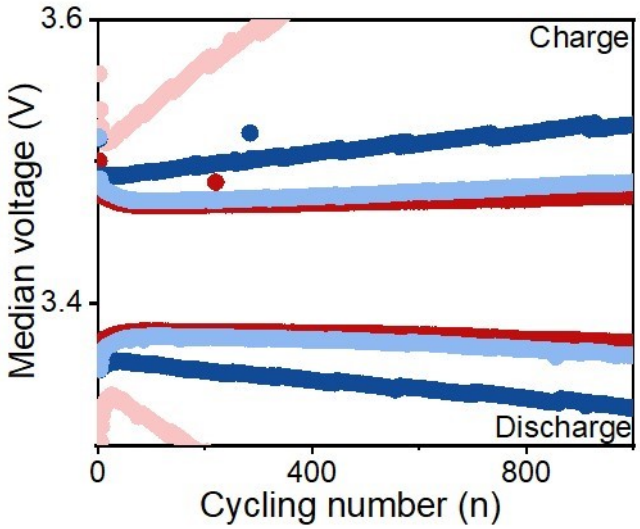

Fig.S14 The charge/discharge median voltages of samples at 1.0 C

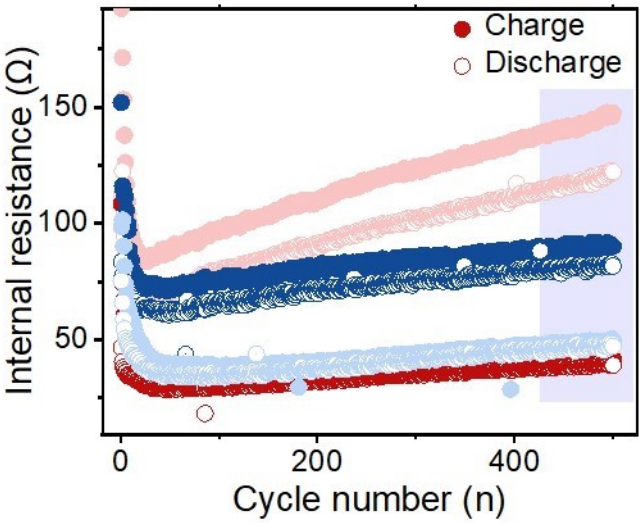

Fig.S15 The internal resistance of samples at 1.0 C

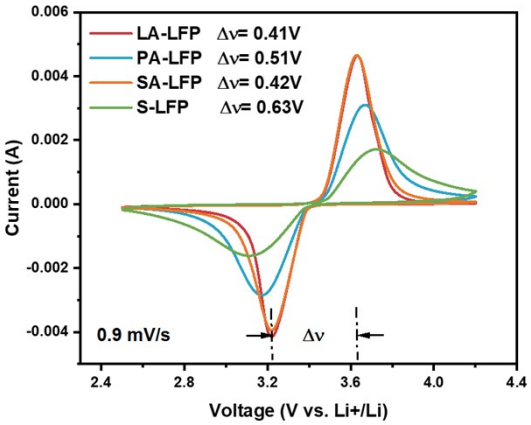

Fig.S16 Voltage difference of as-regenerated samples at 0.9 mV s^{-1}

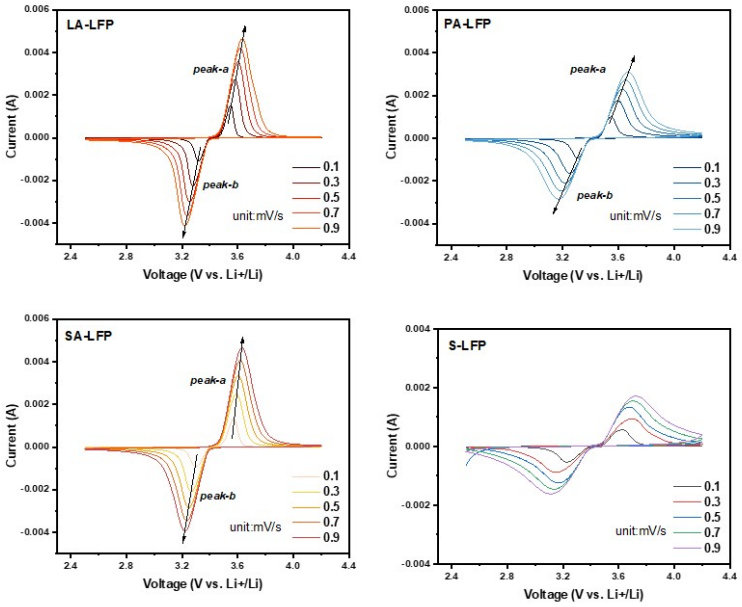

Fig.S17 CV curves of as-regenerated samples

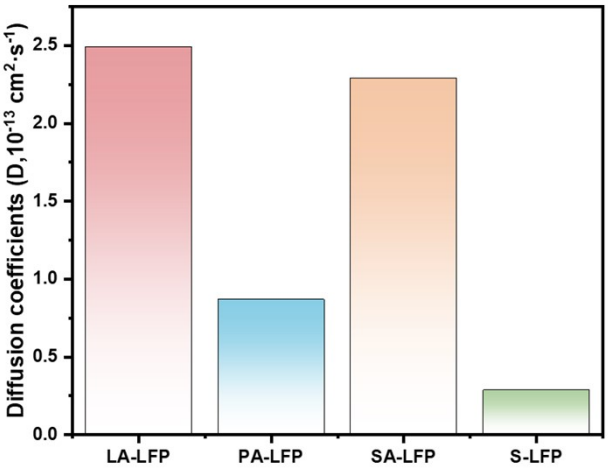

Fig.S18 The calculated results of diffusion coefficient about as-regenerated samples

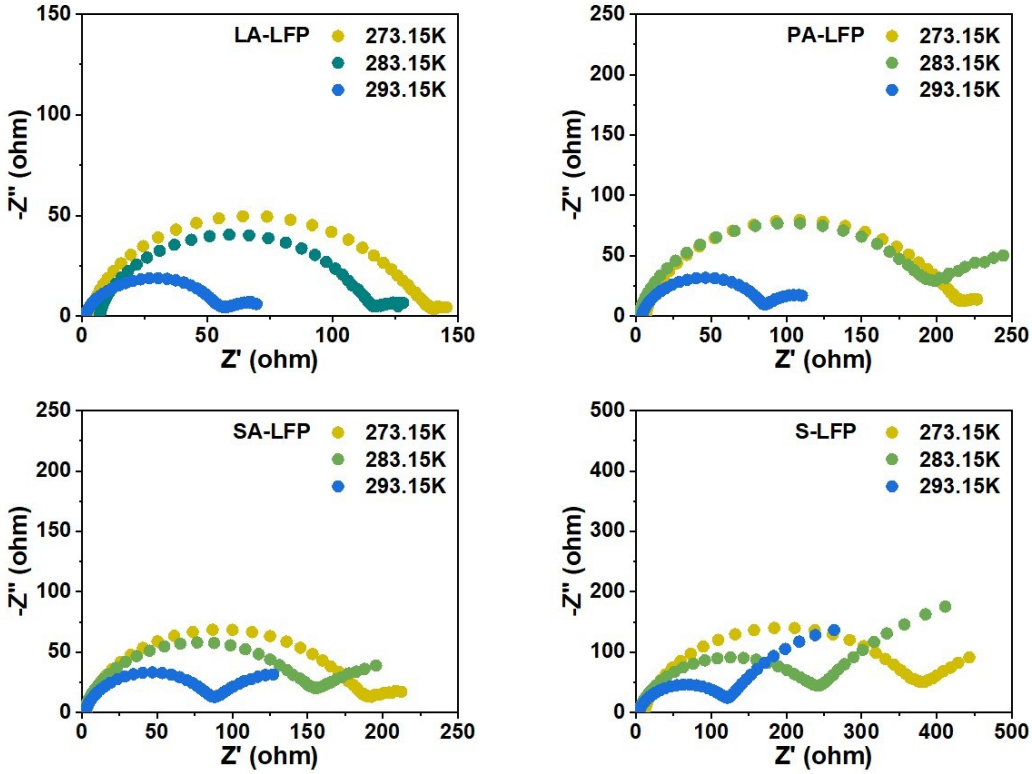

Fig.S19 Nyquist plots of samples at different temperatures

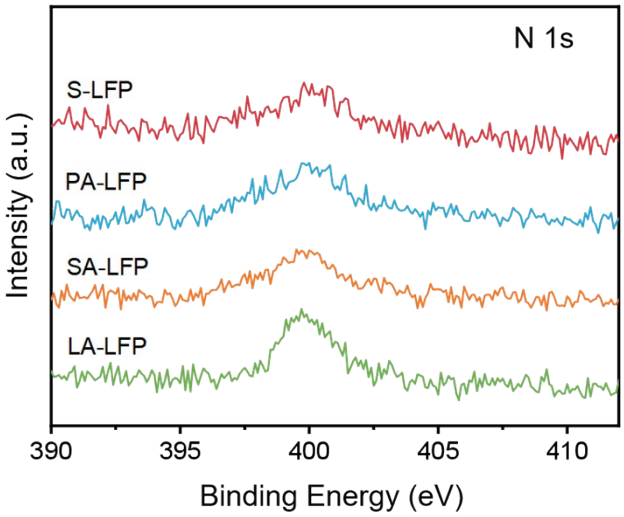

Fig.S20 The N1s XPS spectrum of the samples

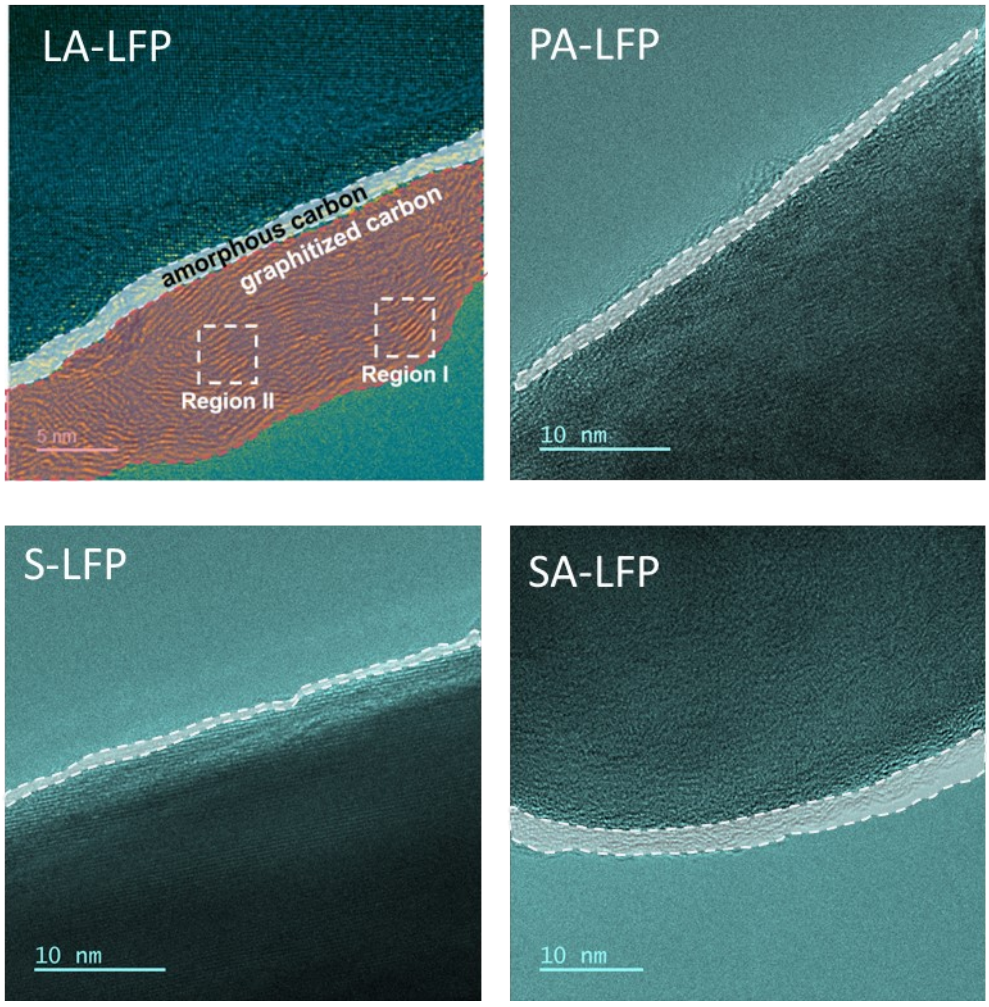

Fig.S21 The comparison of samples carbon layer

Table S1 Rietveld refinement results of high-resolution powder XRD of S-LFP sample

$LiFePO_4$ (Space Group Pnma) Phase Ratio: 83.72%				
Lattice Parameters	***a* / Å**	***b* / Å**	***c* / Å**	***V* / Å^3**
	10.3273	6.0066	4.6909	290.98
Li-Fe Anti-sites	2.00%			
$FePO_4$ (Space Group Pnma) Phase Ratio: 16.28%				
Lattice Parameters	***a* / Å**	***b* / Å**	***c* / Å**	***V* / Å^3**
	5.8090	9.8390	4.7760	272.97
Agreement Factors				
χ^2 3.07%	**R_p** 3.15%	**R_{wp}** 4.04%	**R_{exp}** 2.30%	

Table S2 Rietveld refinement results of high-resolution powder XRD of LA-LFP sample

$LiFePO_4$ (Space Group Pnma) Phase Ratio: 100.00%				
Lattice Parameters	***a* / Å**	***b* / Å**	***c* / Å**	***V* / Å^3**
	10.3344	6.0104	4.6939	291.56
Li-Fe Anti-sites	0.60%			
Agreement Factors				
χ^2 4.07%	**R_p** 3.44%	**R_{wp}** 4.46%	**R_{exp}** 2.21%	

Table S3 Rietveld refinement results of high-resolution powder XRD of PA-LFP sample

$LiFePO_4$ (Space Group Pnma) Phase Ratio: 100.00%				
Lattice Parameters	***a* / Å**	***b* / Å**	***c* / Å**	***V* / Å^3**
	10.3351	6.0110	4.6943	291.63
Li-Fe Anti-sites	1.20%			
Agreement Factors				
χ^2 4.70%	**R_p** 3.75%	**R_{wp}** 5.00%	**R_{exp}** 2.30%	

Table S4 Rietveld refinement results of high-resolution powder XRD of SA-LFP sample

$LiFePO_4$ (Space Group Pnma) Phase Ratio: 100.00%				
Lattice Parameters	***a* / Å**	***b* / Å**	***c* / Å**	***V* / Å^3**
	10.3293	6.0073	4.6915	291.11
Li-Fe Anti-sites	1.70%			
Agreement Factors				
χ^2 4.56%	**R_p** 3.53%	**R_{wp}** 4.65%	**R_{exp}** 2.18%	

Table S5 Rietveld refinement results of XRD of LA-LFP sample after cycles

$LiFePO_4$ (Space Group Pnma) Phase Ratio: 100.00%				
Lattice Parameters	***a* / Å**	***b* / Å**	***c* / Å**	***V* / Å^3**
	10.2911	5.9809	4.6728	287.61
Li-Fe Anti-sites	1.30%			
Agreement Factors				
χ^2 5.03%	**R_p** 4.59%	**R_{wp}** 5.86%	**R_{exp}** 2.61%	

Table S6 Rietveld refinement results of XRD of SA-LFP sample after cycles

$LiFePO_4$ (Space Group Pnma) Phase Ratio: 100.00%				
Lattice Parameters	***a* / Å**	***b* / Å**	***c* / Å**	***V* / Å^3**
	10.2775	5.9779	4.6643	286.56
Li-Fe Anti-sites	3.30%			
Agreement Factors				
χ^2 3.79%	**R_p** 3.94%	**R_{wp}** 5.06%	**R_{exp}** 2.6%	