Electronic Supplementary Material (ESI) for Green Chemistry.

Supporting information

Green and efficient method for realization of full-component recovery of $LiFePO_4$ black powder

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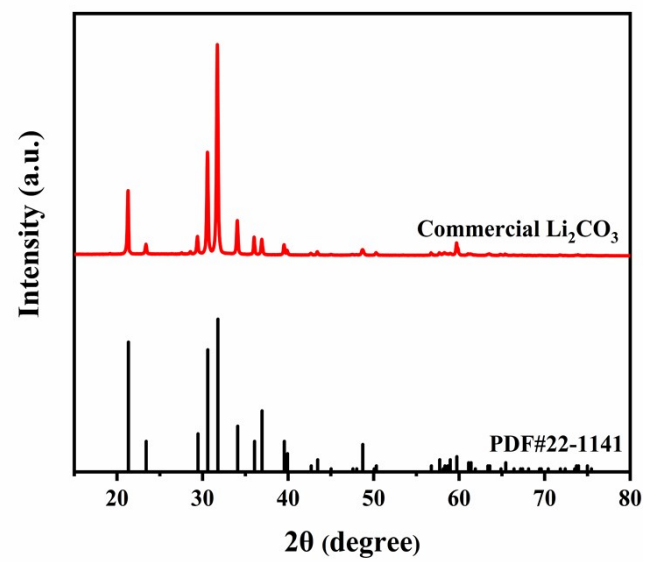

Fig. S1 XRD pattern of commercial Li_2CO_3.

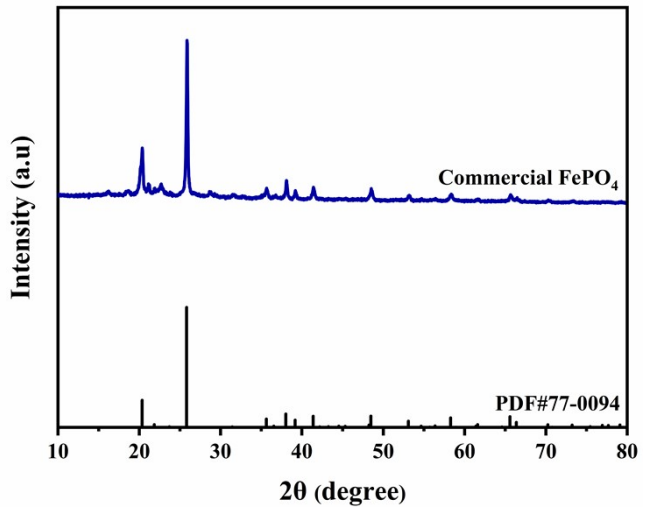

Fig. S2 XRD pattern of commercial $FePO_4$.

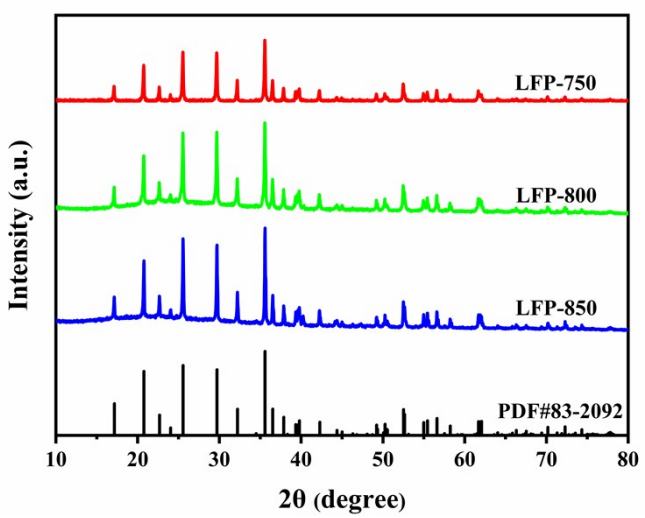

Fig. S3 XRD patterns of $LiFePO_4$ materials synthesized at different temperature.

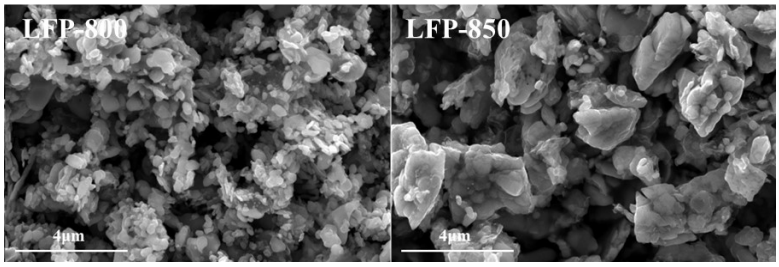

Fig. S4 SEM images of $LiFePO_4$ materials synthesized at different temperature.

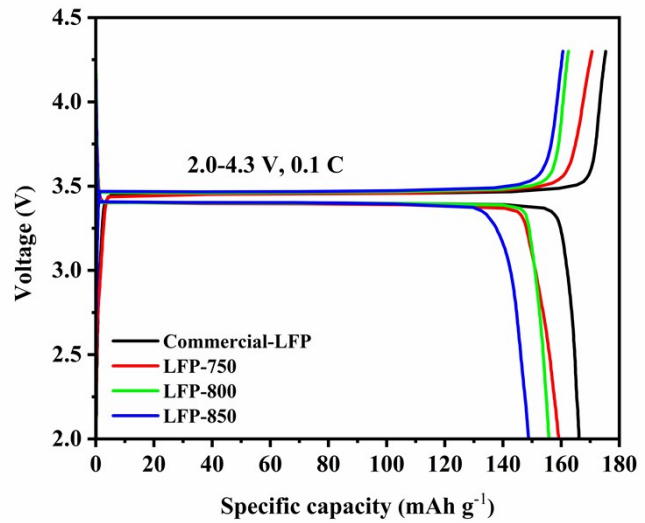

Fig. S5 $LiFePO_4$ cathodes synthesized at different temperature at 0.1 C.

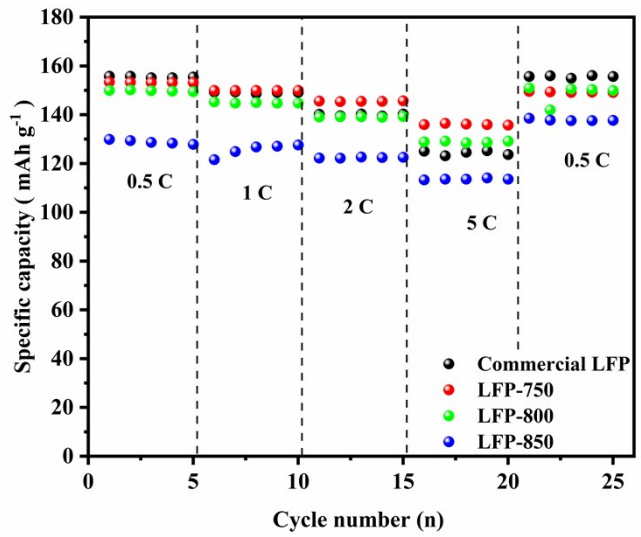

Fig. S6 Rate performance of $LiFePO_4$ cathodes synthesized at different temperature.

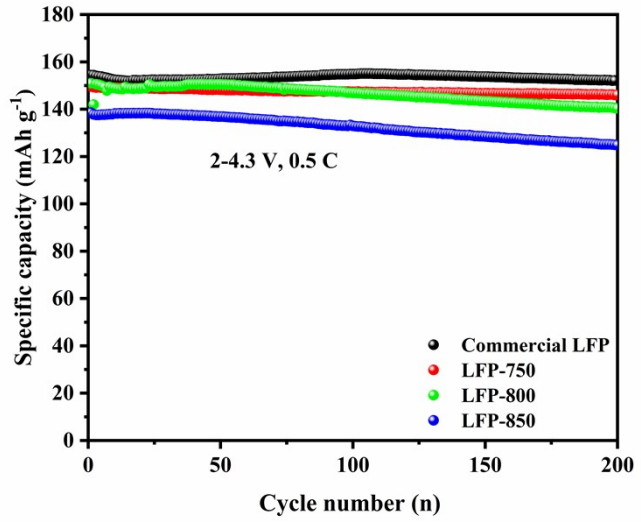

Fig. S7 Cycle performance curves of $LiFePO_4$ cathodes synthesized at different temperature.

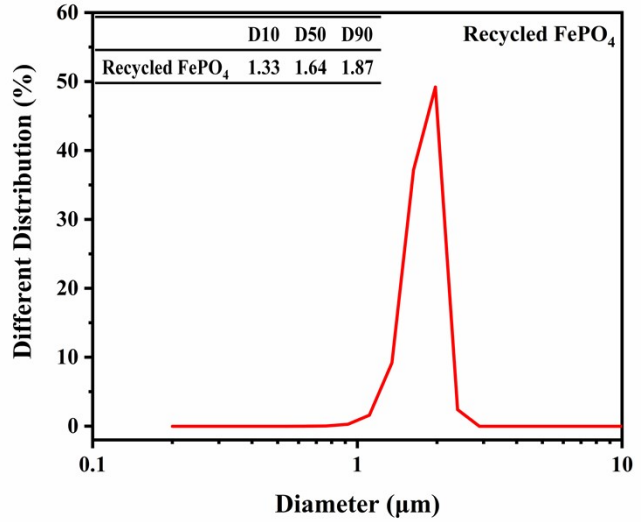

Fig. S8 Size distribution curve of recycled $FePO_4$.

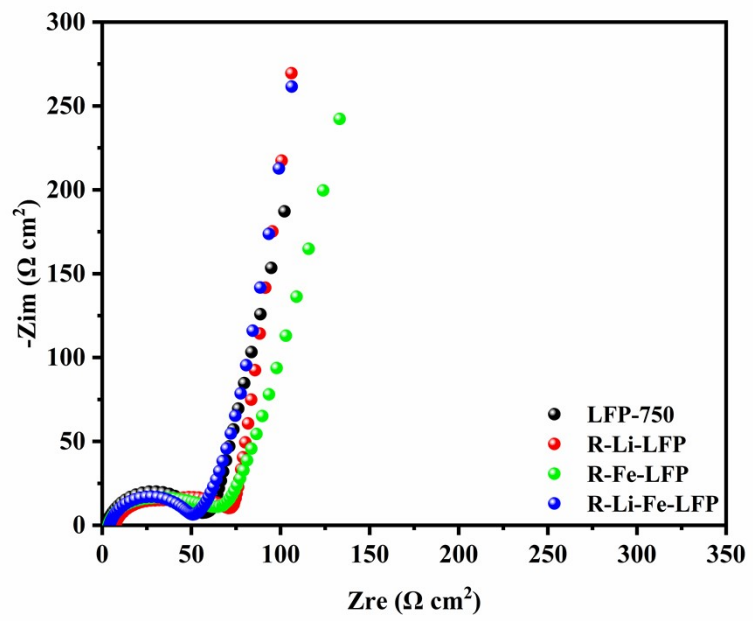

Fig. S9 Electrochemical impedance mapping of $LiFePO_4$ cathodes.

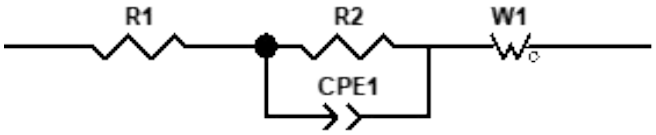

Fig. S10 Equivalent circuit diagram.

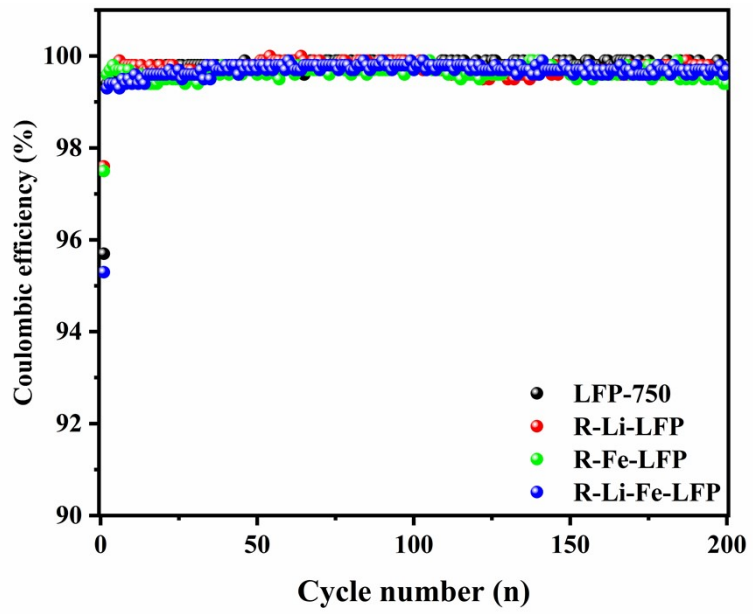

Fig. S11 Coulombic efficiencies of $LiFePO_4$ cathodes at 0.5 C.

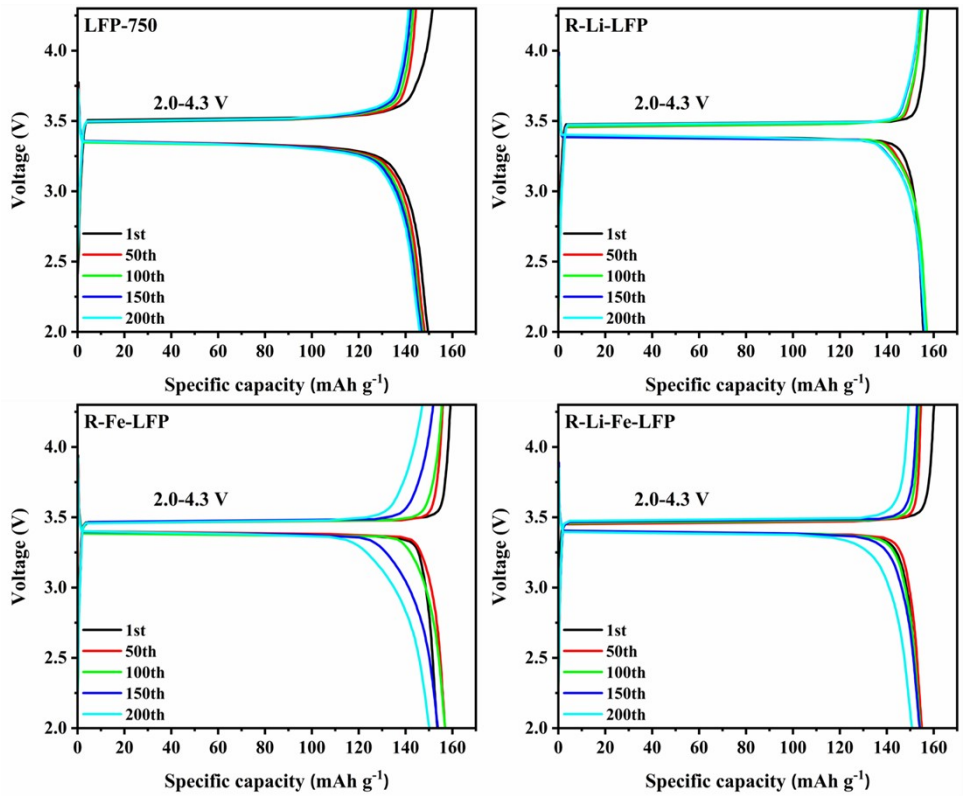

Fig. S12 Charging and discharging curves for different cycles.

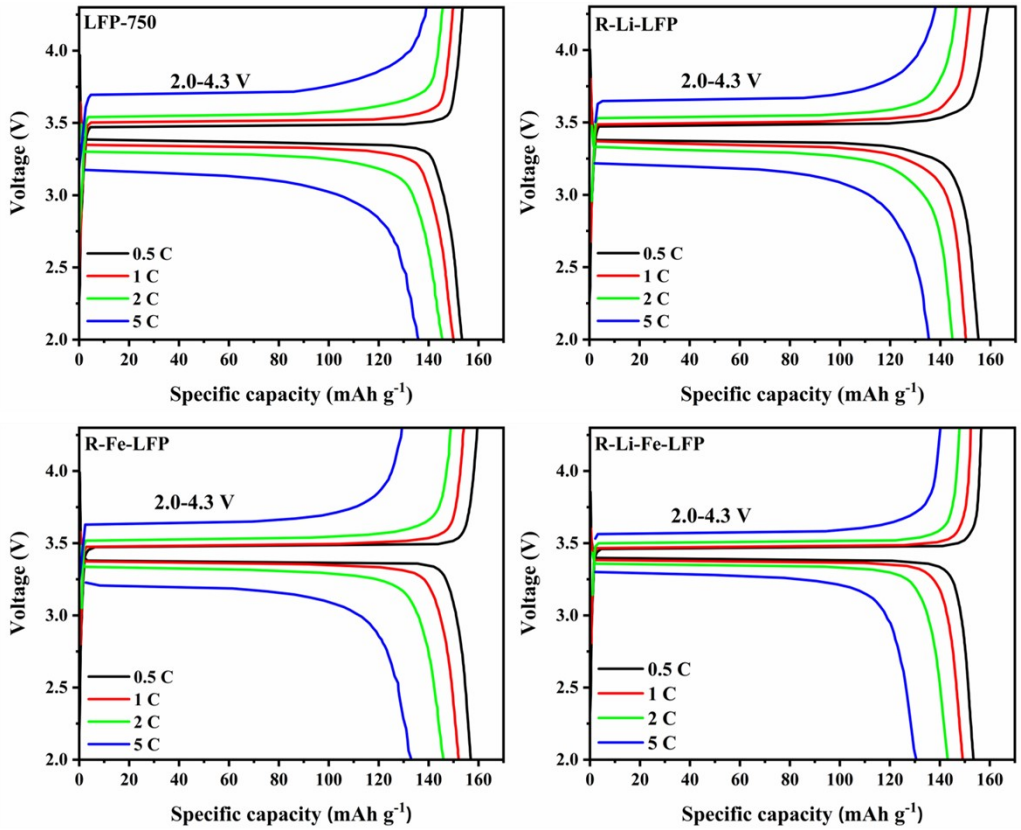

Fig. S13 Charge discharge curves at different rates.

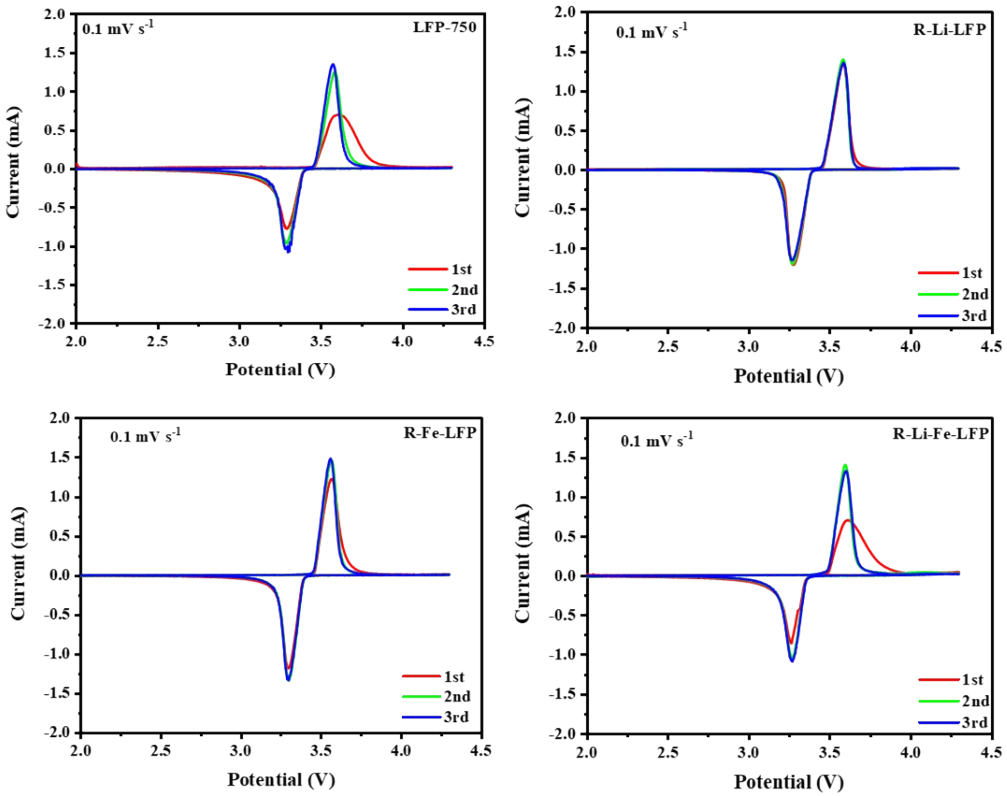

Fig. S14 CV curves of $LiFePO_4$ cathodes.

Table S1 ICP element composition of the recycled Li_2CO_3.

Element	Li_2CO_3	P	Na	Ca	Fe、Al
wt.%	>99.4	0.11	0.13	0.03	<0.01

Table S2 Tap densities of $LiFePO_4$ materials.

$LiFePO_4$ materials	Tap density (g cm^{-3})
LFP-750	1.02
R-Li-LFP	1.02
R-Fe-LFP	1.03
R-Li-Fe-LFP	1.06

Table S3 Area loading of active substances in $LiFePO_4$ cathodes.

$LiFePO_4$ cathodes	Area loading of active substances (mg cm^{-2})
LFP-750	2.33
R-Li-LFP	2.35
R-Fe-LFP	2.39
R-Li-Fe-LFP	2.43

Table S4 Initial coulombic efficiencies of $LiFePO_4$ cathodes.

$LiFePO_4$ cathodes	Coulombic efficiency (%)
LFP-750	95.7
R-Li-LFP	97.6
R-Fe-LFP	97.5
R-Li-Fe-LFP	95.3