Supplementary Information

Experimental details:

Typically, 2 g high-pressure hydrolyzed precipitates of cobalt-iron ally acid solution were dispersed in deionized water, and the high-pressure hydrolyzed precipitates were dissolved using dilute phosphoric acid solution at an elevated temperature. After the complete dissolution of high-pressure hydrolyzed precipitates, the mixed solution was cooled to room temperature. After that, some reduced iron powders were added into the mixed solution to consume the excess phosphoric acid, and then the pH value of the mixed solution was adjusted to 2.57 and a lot of white precipitates occurred. The mixture was elevated to 85 ^{o}C for 30 min, and then the precipitates were washed by dilute nitric acid and deionized water and centrifuged at 4000 rpm using a centrifugal machine. The obtained products were dried at 60 ^{o}C for 24 h, and then the composition and structure of synthesized battery grade $FePO_4$ were characterized by X-ray diffraction (XRD), scanning electron microscope (SEM), transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS), thermos-gravimetric curve analysis (TGA) and X-ray fluorescence spectrometer (XRF).

Figures:

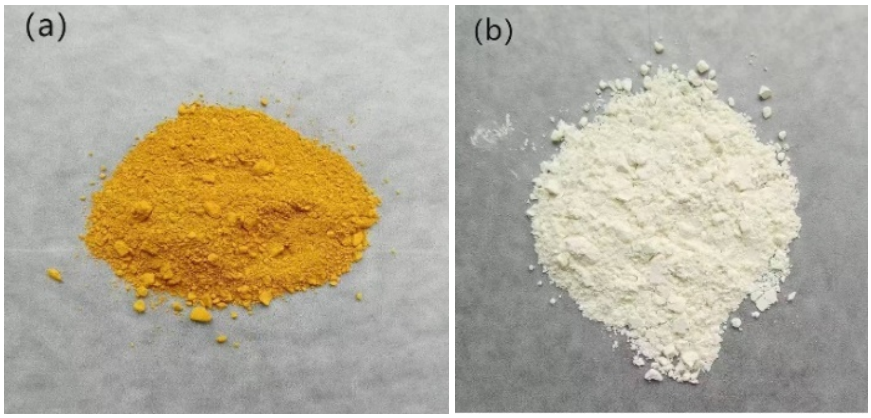
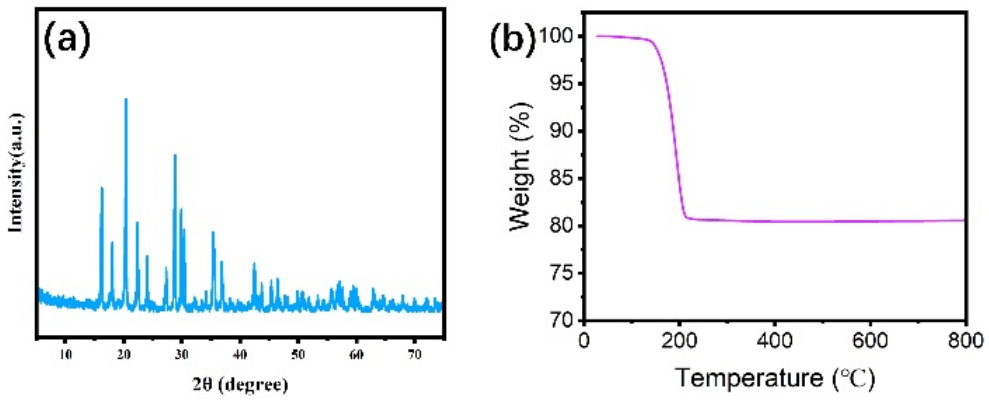


Fig. 1 Optical photograph of the high-pressure hydrolyzed precipitates (a), and the synthesized $FePO_4{\cdot}2H_2O$ samples (b).



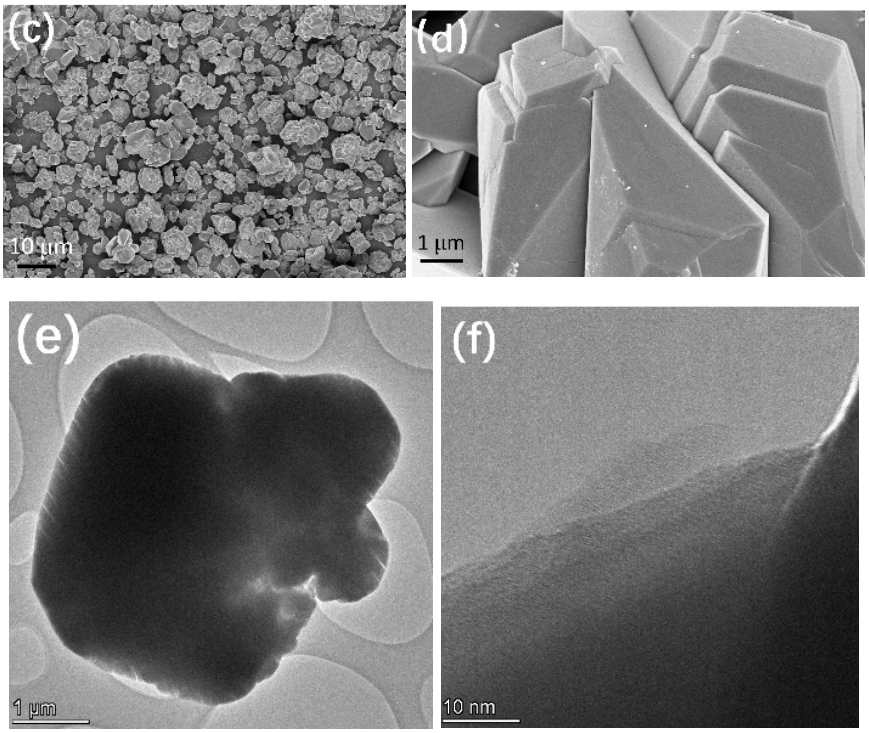
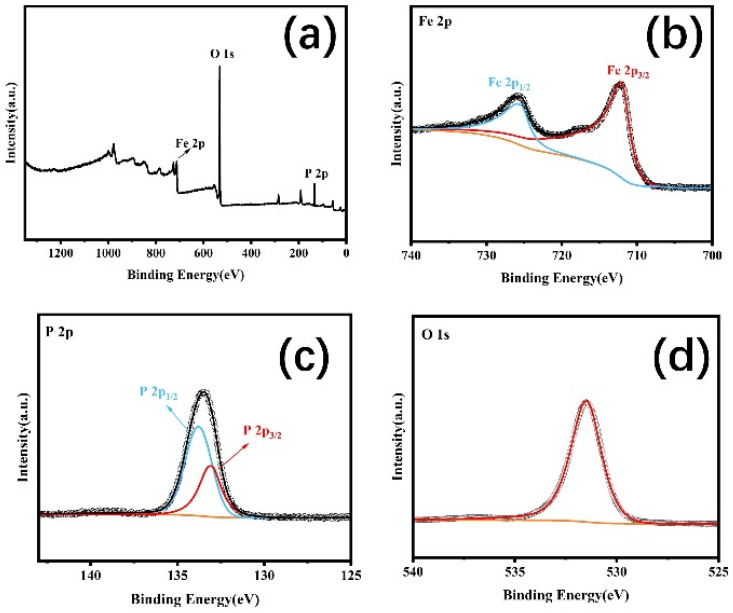


Fig. 2 XRD (a), TGA (b), SEM (c, d) and TEM (e, f) images of the synthesized battery grade $FePO_4 \cdot 2H_2O$ samples.



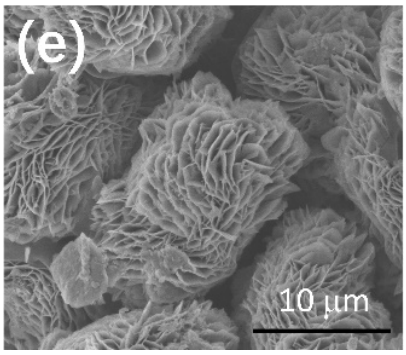


Fig. 3 XPS of the synthesized battery grade $FePO_4 \cdot 2H_2O$ samples (a), Fe2p (b), P2p (c), O1s (d) and the SEM of the prepared $FePO_4 \cdot 2H_2O$ samples in the absence of 85 °C heat treatment (e).

Tables:

Table 1 XRF analysis of high-pressure hydrolyzed precipitates

Comp.	Al_2O_3	SiO_2	SO_3	CaO	V_2O_5	Cr_2O_3	Fe_2O_3
Conc.	785.6	387.0	6.457	0.118	54.9	0.127	85.957
Unit	ppm	ppm	%	%	ppm	%	%
Comp.	NiO	ZnO	ZrO_2	MoO_3	Ag_2O	SnO_2	Bi_2O_3
Conc.	0.119	403.2	224.8	9.3	0.140	78.7	425.0
Unit	%	ppm	ppm	ppm	%	ppm	ppm

Table 2 ICP analysis of synthesized battery-grade $FePO_4 \cdot 2H_2O$

Element	Al	Ca	Co	Cr	Cu	Fe	K
Conc.	0.005	0.007	—	0.003	—	31.909	—
Unit	%	%		%		%	
Element	Mg	Mn	Na	P	Pb	Ti	Zn
Conc.	—	—	—	17.146	0.003	0.022	0.002
Unit				%	%	%	%

Table 3 ICP analysis of prepared $FePO_4 \cdot 2H_2O$ without acid washing

Element	Al	Ca	Co	Cr	Cu	Fe	K
Conc.	0.007	0.006	—	0.003	—	30.477	—
Unit	%	%		%		%	
Element	Mg	Mn	Na	P	Pb	Ti	Zn
Conc.	—	—	—	18.192	0.003	0.031	—
Unit				%	%	%	