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Electronic Supplementary Information (ESI)

Crystal alignment of an $LiFePO_4$ cathode material for lithium ion batteries using its magnetic properties

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ESI 1: Crystal alignment process

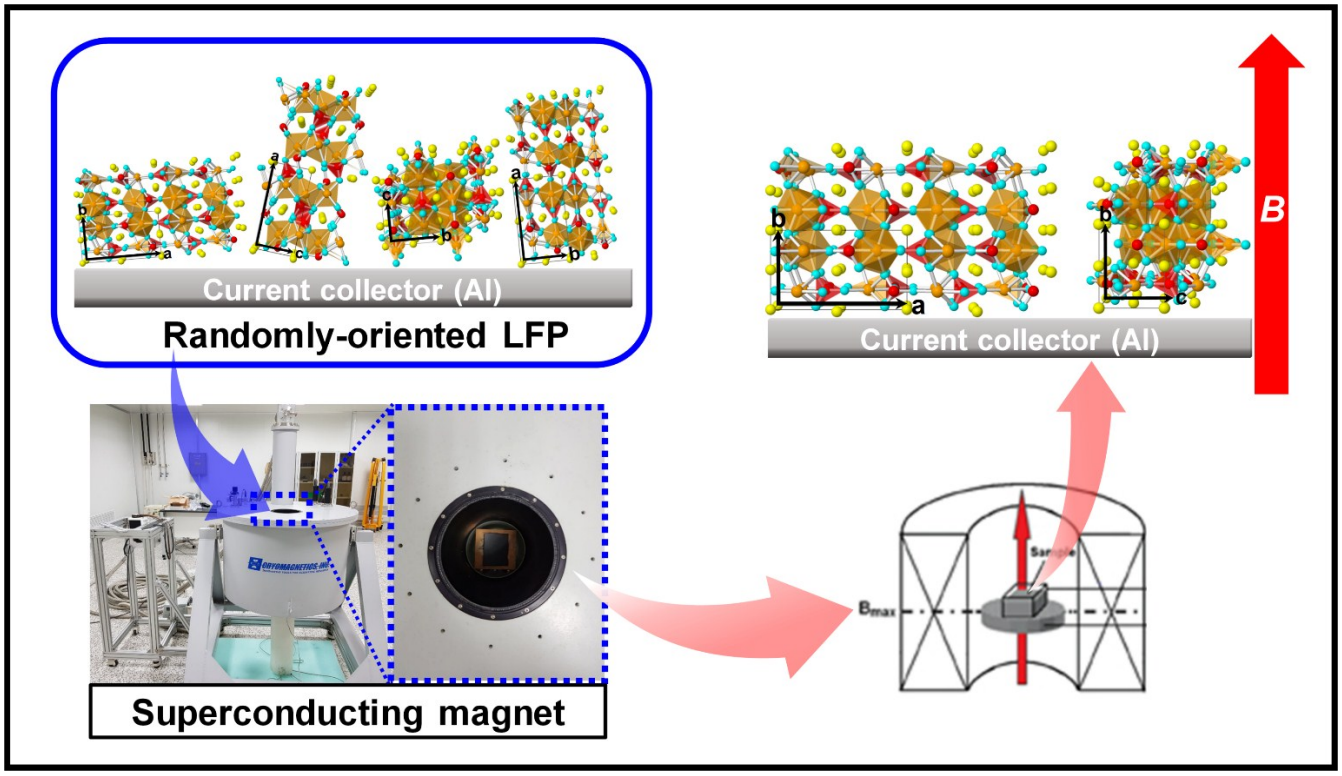

Fig. S1. Crystal alignment process for a randomly-oriented $LiFePO_4$ film, in which a magnetic field is applied perpendicular to a current collector by using a superconducting magnet, possibly resulting in the b-axis of $LiFePO_4$ aligned parallel to the magnetic field.

ESI 2: X-ray diffraction data

Table S1. Intensities of the (*hkl*) planes for the fabricated (LFP, mf-LFP) and randomly-oriented $LiFePO_4$ (JCPDS card No. 83-2092). p and p_0 values indicate the intensity fractions of (0k0) planes for the fabricated and randomly-oriented samples, respectively.

hkl	LFP (p = 0.1176)	mf-LFP (p = 0.4933)	JCPDS card No. 83-2092 (p_0 = 0.1122)
	$I(hkl)$	$I(hkl)$	$I_0(hkl)$
200	217	270	38
101	377	345	76
210	283	503	24
011	225	405	9
111	448	613	83
020	565	6930	78
301	180	180	31
311	575	605	100
121	222	547	31
410	167	198	22
102	102	117	13
401	145	267	18
112	122	96	16
321	58	112	6
212	37	54	4
022	72	113	12
511	108	305	7
222	200	263	31
412	95	83	15
610	127	145	17
331	135	385	20
430	87	242	11
113	137	800	16
620	120	470	17

ESI 3: Magnetic and physical properties

Table S2. Magnetic and physical properties of the $LiFePO_4$ crystal, which were used to calculate the minimum magnetic flux density (B, Eq. 4) required for rotating the crystal.

Quantity	[a] Gaussian unit	Conversion factor	SI unit
χ_m	8.45×10^{-3} emu mol^{-1}	$4\pi \times 10^{-6}$	[b] 1.06×10^{-7} m^3 mol^{-1}
V	–	–	3.05×10^{-15} m^3
μ_0	1 (dimensionless)	$4\pi \times 10^{-7}$	$4\pi \times 10^{-7}$ H m^{-1}
k_B	–	–	1.38×10^{-23} J K^{-1}
T	–	–	298 K
B	–	–	3.74×10^{-5} Wb m^{-2} (=T)

[a] Quantities in Gaussian unit are multiplied by conversion factors to convert to those in SI unit.[1-3]
[b] The molar susceptibility (χ_m) is converted to a dimensionless susceptibility (χ) by using the theoretical density (ρ) and molecular weight (M) of $LiFePO_4$ (i.e., $\chi = (\rho/M)\chi_m$).

References

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