Supporting Information

Alkali-Site Lithium Doping Enables a High-Performance $Na_3Fe_2(PO_4)(P_2O_7)$ Cathode for Sodium-Ion Batteries

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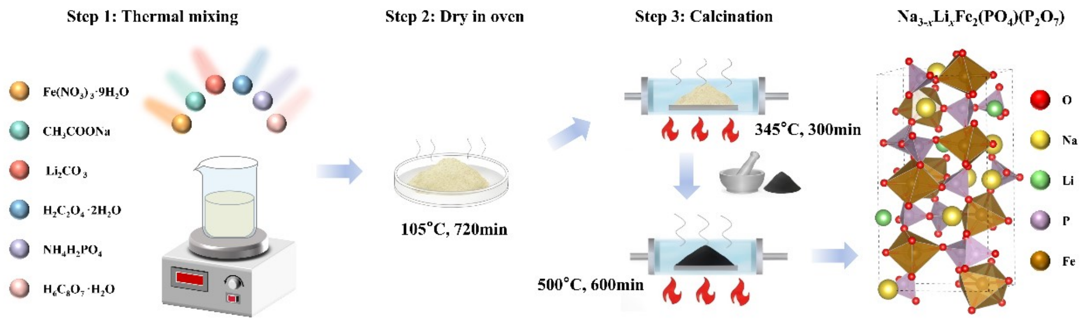

Figure S1. Schematic illustration of the synthesis process of the as-prepared samples.

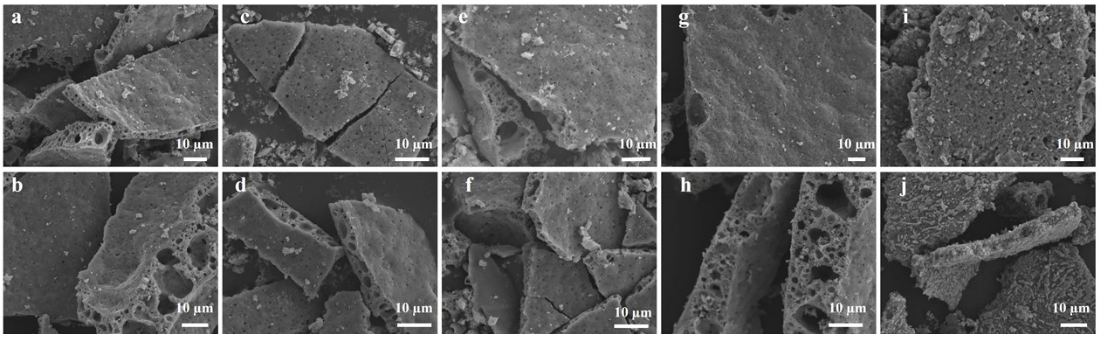

Figure S2. SEM images of $Na_{3-x}Li_xFe_2(PO_4)(P_2O_7)$@C material. Among them, (a and b) N3F2PP@C, (c and d) NLF2PP@C-0.01, (e and f) NLF2PP@C-0.05, (g and h) NLF2PP@C-0.1, (i and j) NLF2PP@C-0.2.

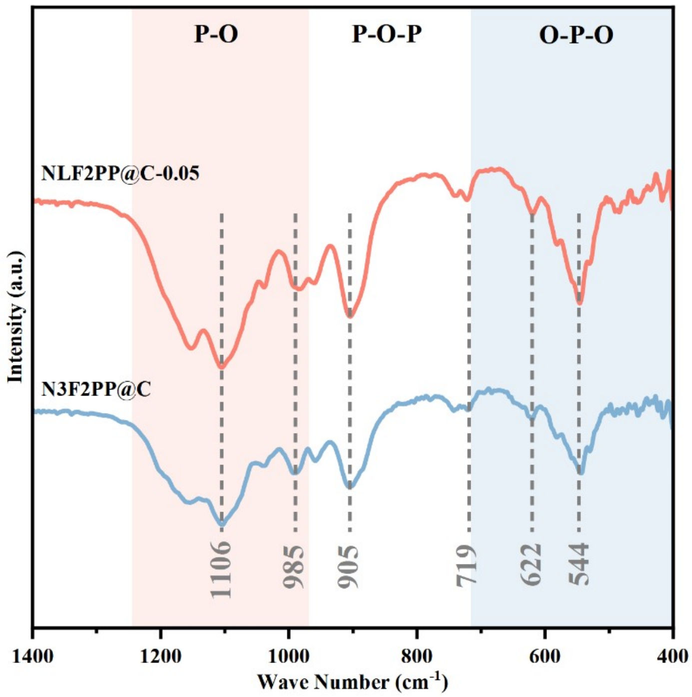

Figure S3. Fourier transform infrared (FT-IR) spectra of N3F2PP@C and NLF2PP@C-0.05.

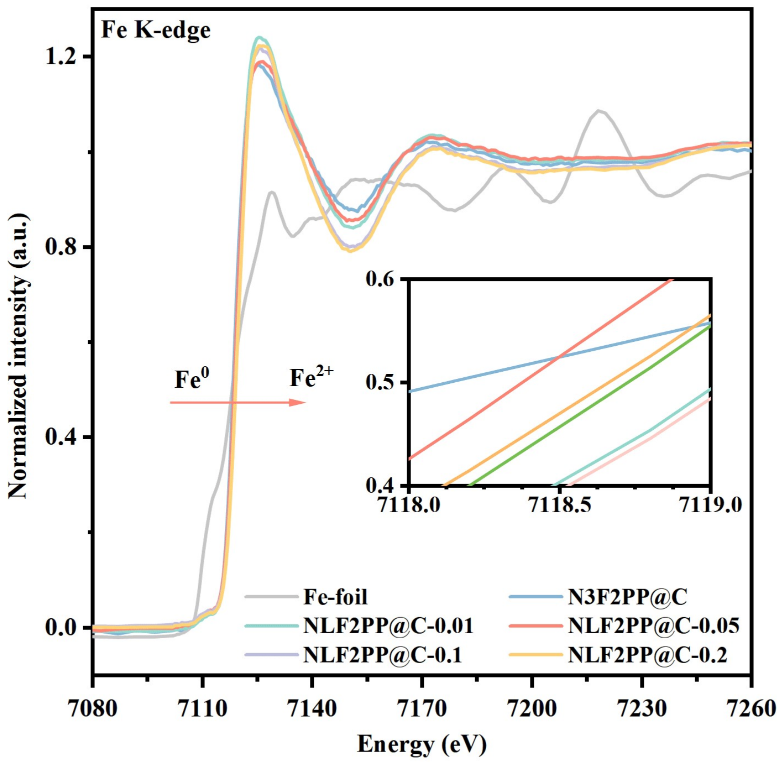

Figure S4. Fe K-edge XAS spectra of all cathodes.

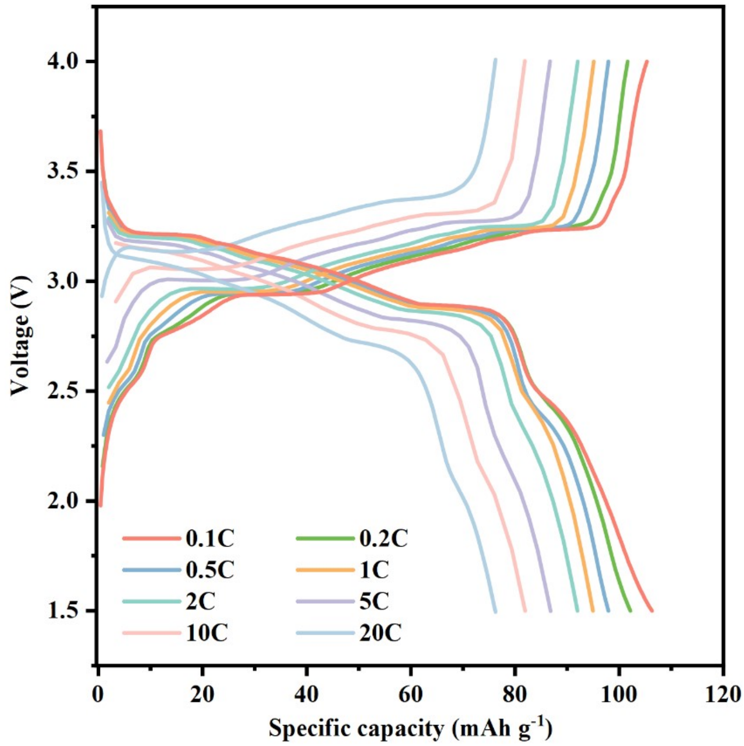

Figure S5. The GCD curves of N3F2PP@C at current rates from 0.1 to 20 C.

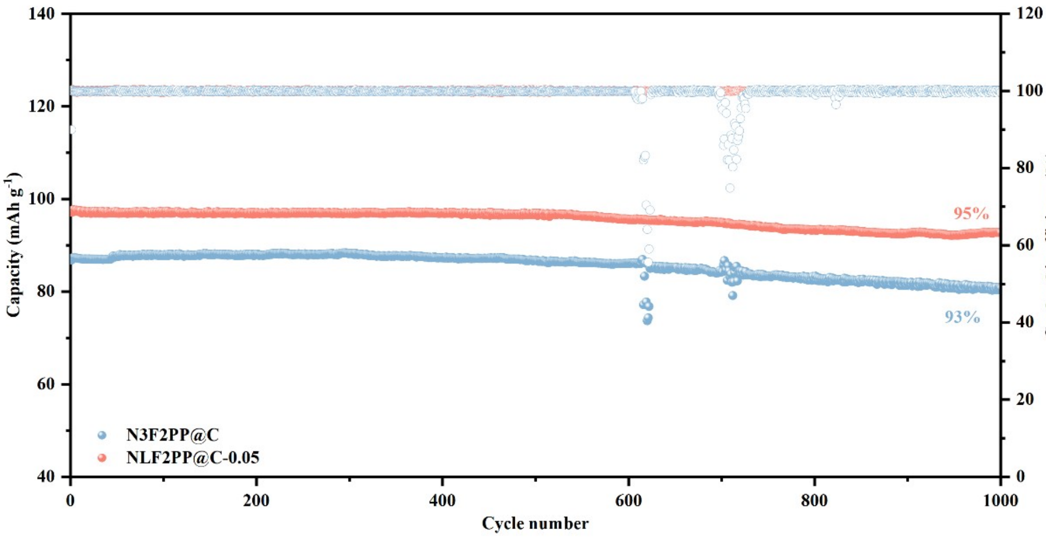

Figure S6. Long-term cycling performance of N3F2PP@C and NLF2PP@C-0.05 at 5 C.

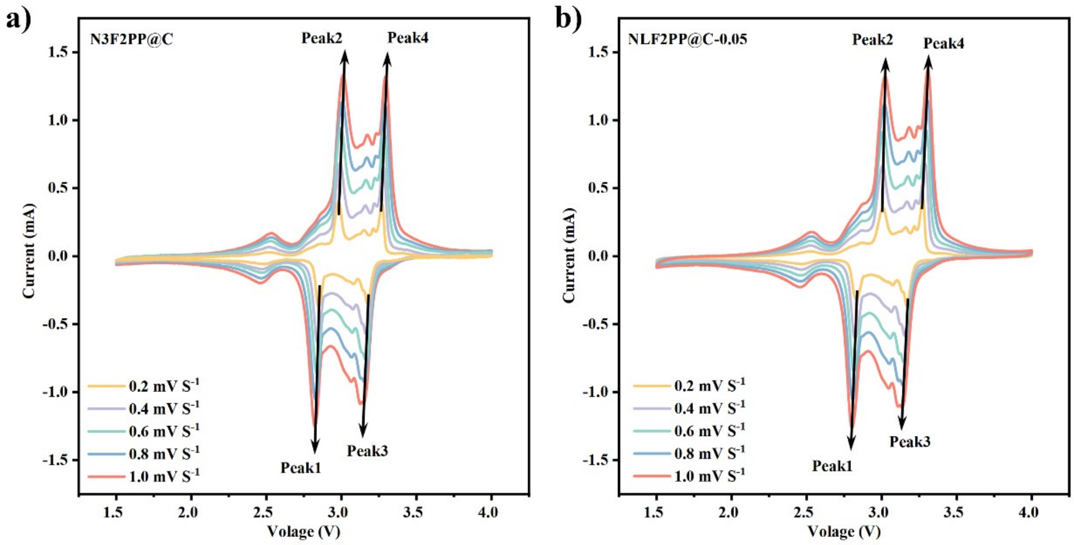

Figure S7. CV curves of (a) N3F2PP@C and (b) NLF2PP@-0.05 cathode at different sweep rates.

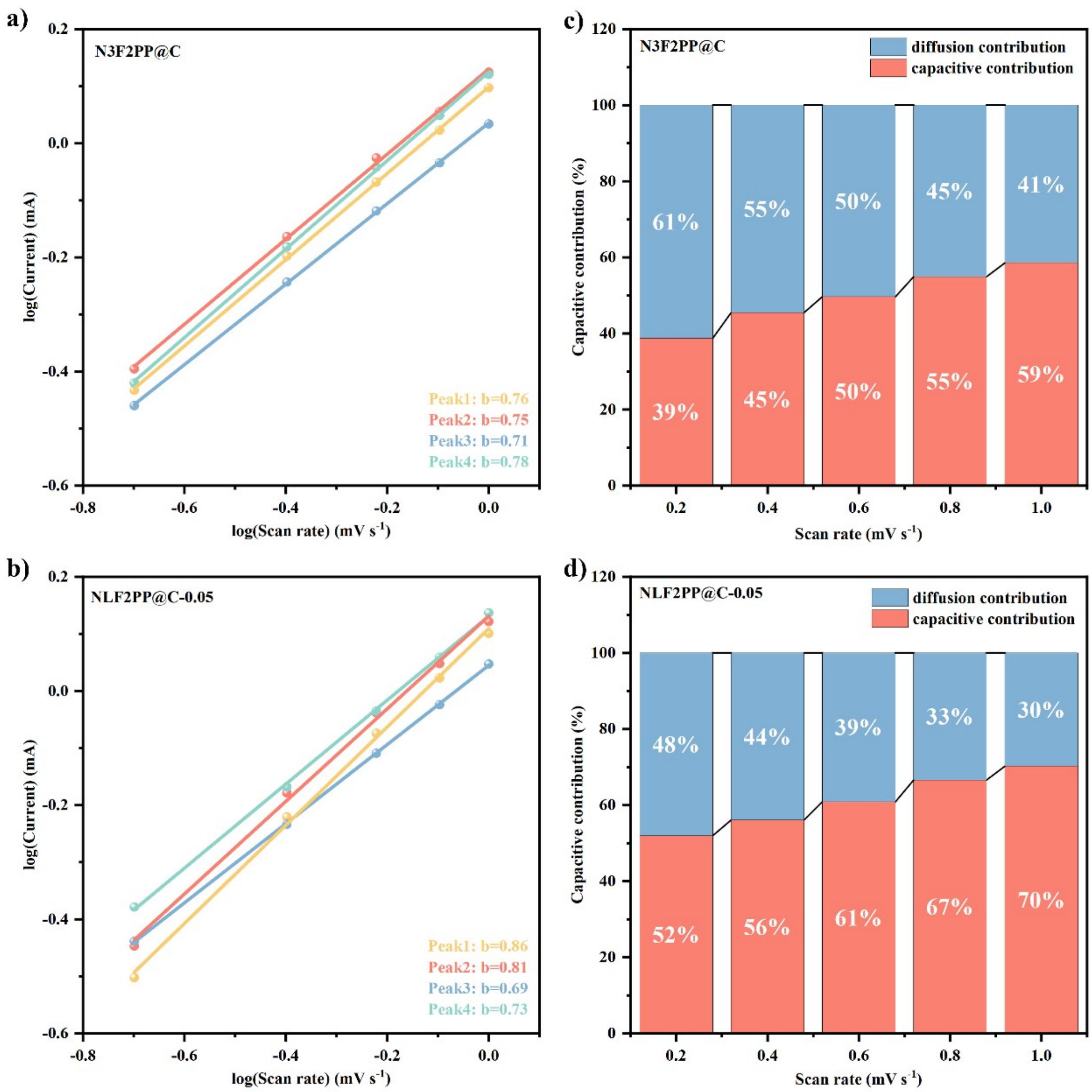

Figure S8. Electrochemical kinetics analysis of (a and c) N3F2PP@C and (b and d) NLF2PP@C-0.05. (a and b) The relationship between peak current (I_p) and scan rate (v). (c and d) Percentage of pseudo-capacitance control at different scan rates.

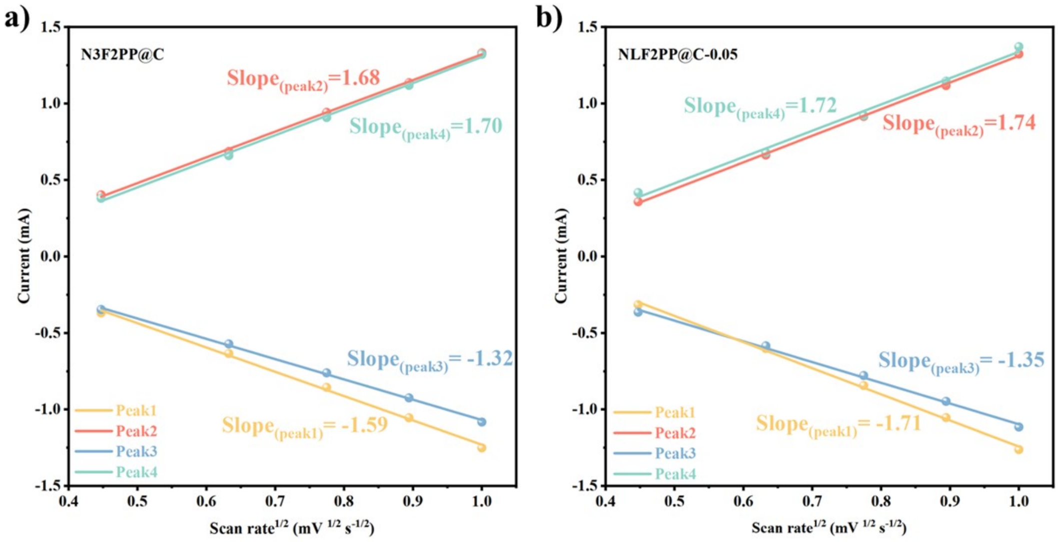

Figure S9. The relationship between the peak current (I_p) of the (a) N3F2PP@C and (b) NLF2PP@C-0.05 cathode and the square root of the scan rate ($v^{1/2}$).

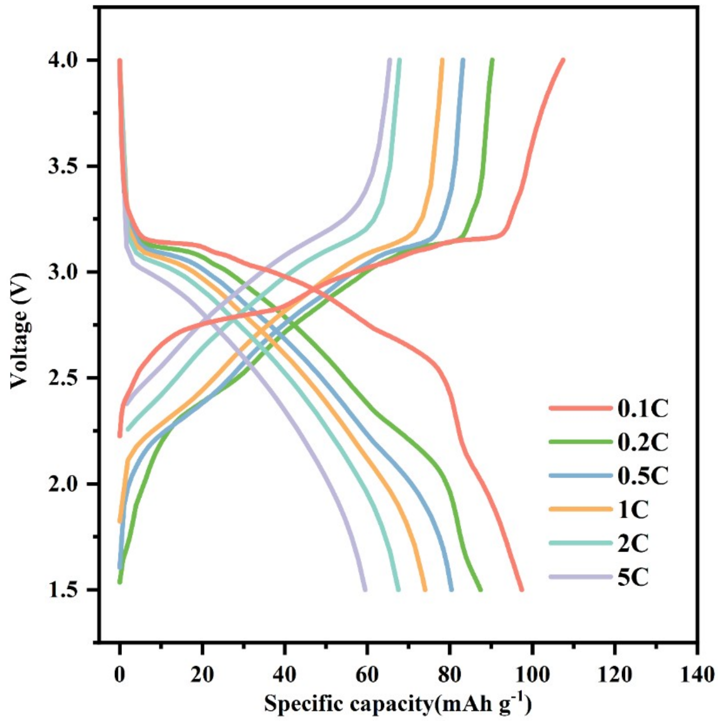

Figure S10. The GCD curves of N3F2PP@C||HC at current rates from 0.1 to 5 C.

Table S1. Specific discharge capacities and the corresponding capacity recovery rates of NLF2PP@C-*x* electrodes. The recovery rate is calculated by comparing the discharge capacity at 1 C after high-rate cycling (up to 20 C) with the initial capacity at 1 C.

Sample	Initial Capacity (1 C, mAh/g)	Restored Capacity (1 C, mAh/g)	Capacity Recovery Rate (%)
N3F2PP@C	95.2	95.5	100.3%
NLF2PP@C-0.01	95.8	96.7	100.9%
NLF2PP@C-0.05	102.4	103.5	101.1%
NLF2PP@C-0.1	96.2	97.3	101.1%
NLF2PP@C-0.2	88.2	88.2	100.0%