Supporting Information

High-Rate and Long-Life Sodium-Ion Batteries Based on Sponge-Like 3D Porous Na-Rich Ferric Pyrophosphate Cathode Material

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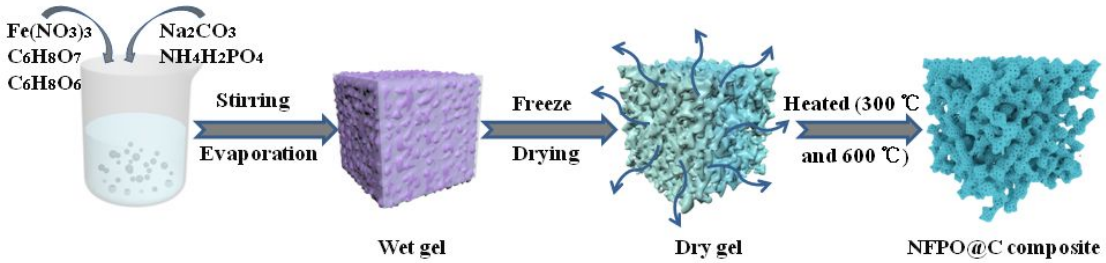

Figure S1. Schematic illustration of the formation mechanism of sponge-like NFPO@SC nano-particles.

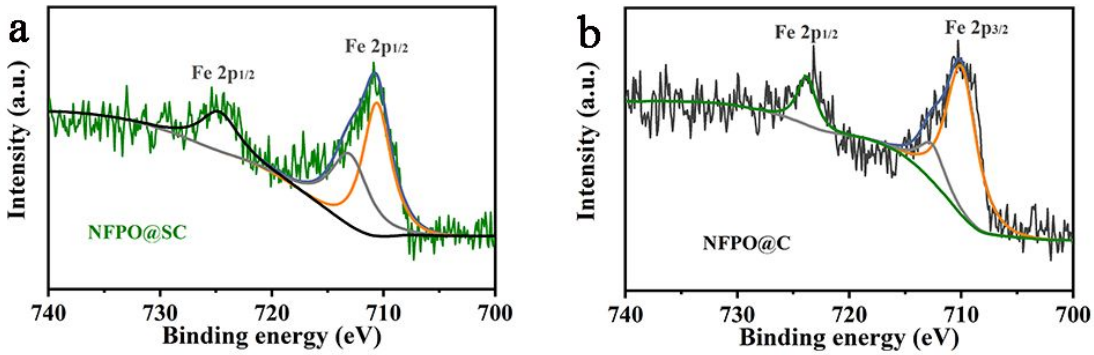

Figure S2. XPS narrow spectra of Fe 2p for NFPO@SC (a) and NFPO@C (b).

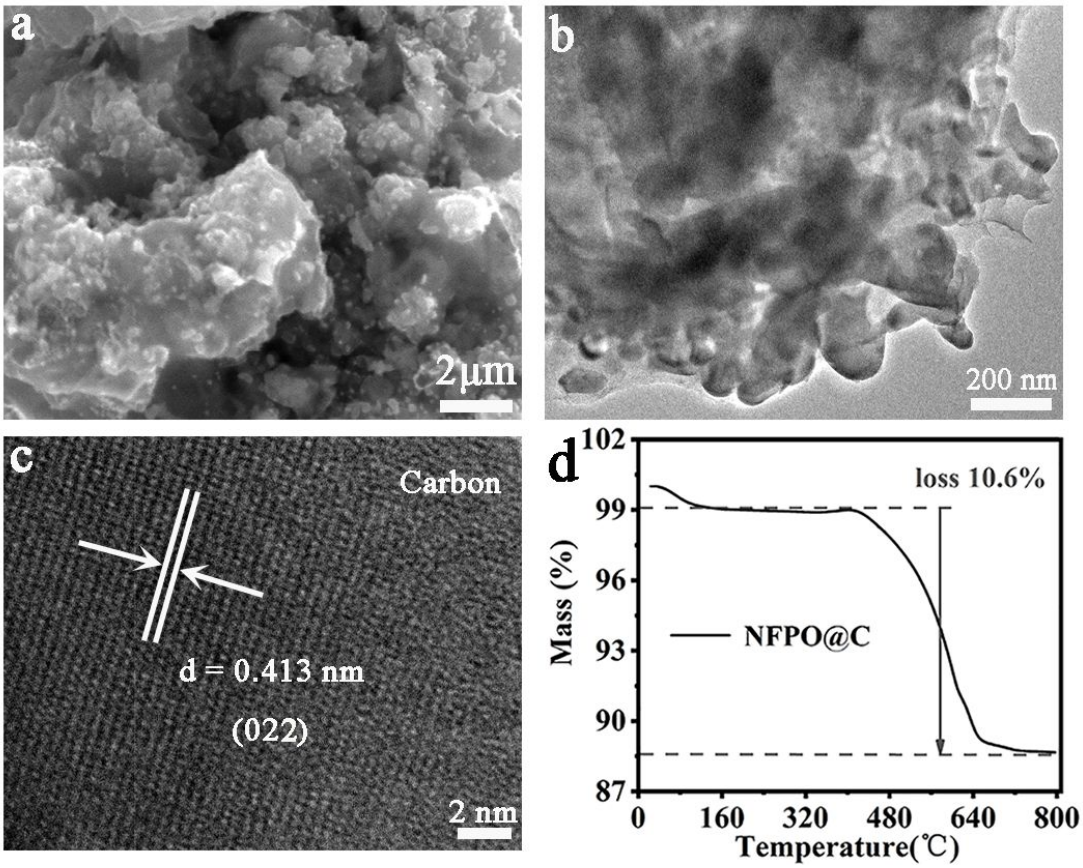

Figure S3. (a) SEM image of NFPO@C at low resolution; (b) TEM image of NFPO@C at low resolution; (c) TEM image of NFPO@C at high resolution; (d) Carbon content of NFPO@C analyzed by thermogravimetric (TGA) measurements.

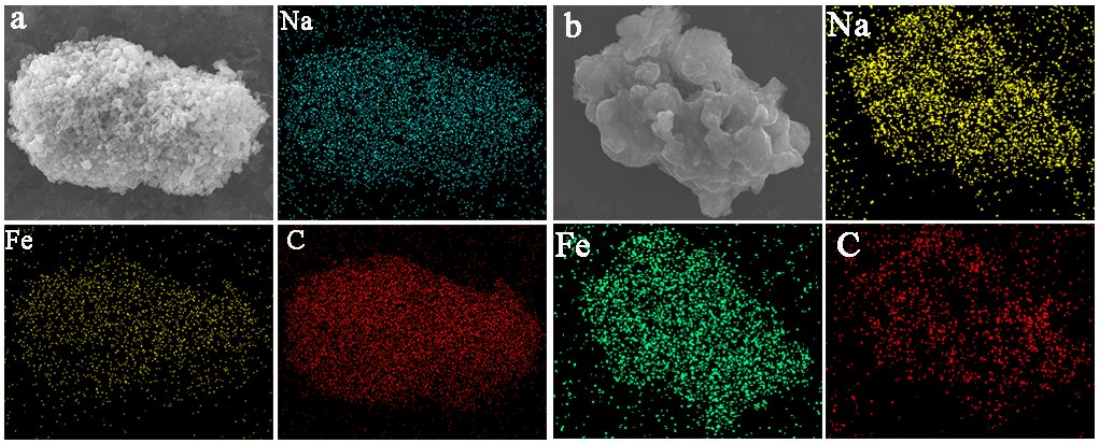

Figure S4. EDS images of NFPO@SC and NFPO@C (a, b).

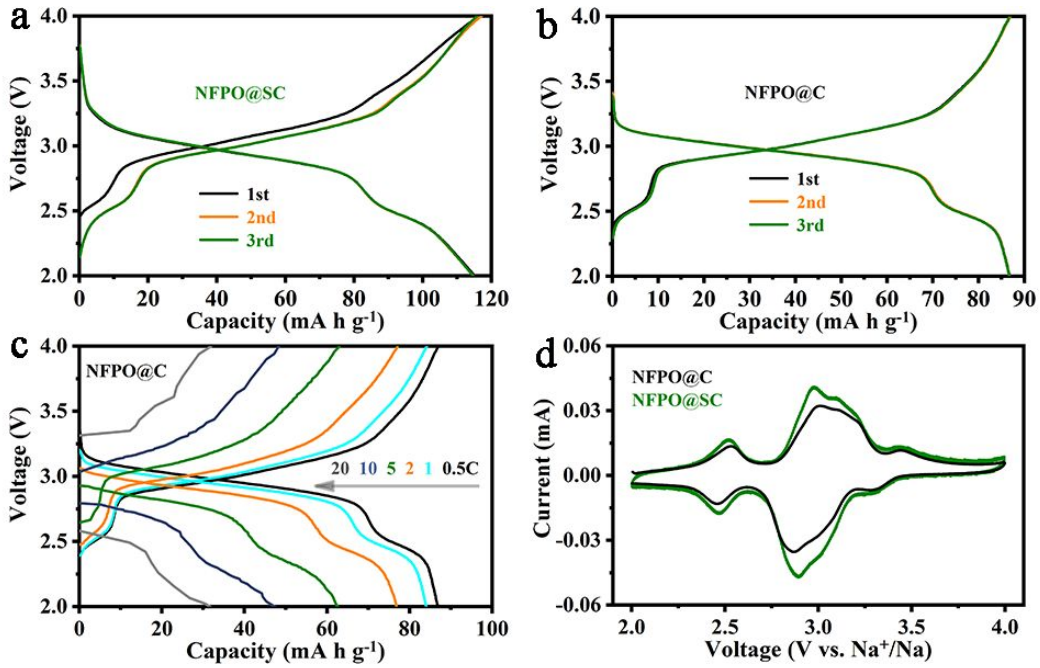

Figure S5. (a and b) Voltage vs. specific capacity profiles (first to third cycles) of NFPO@SC and NFPO@C, respectively; (c) Charge-discharge profiles of NFPO@C at different C-rates; (d) Cyclic voltammograms (CV) of NFPO@C and NFPO@SC.

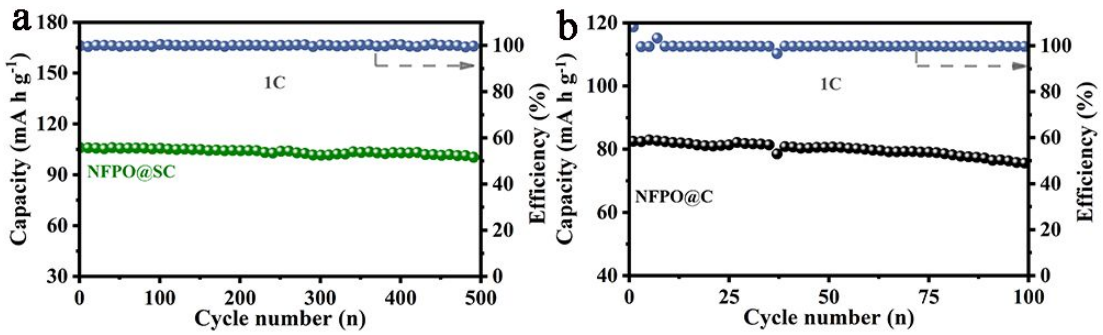

Figure S6. (a, b) Cycling stability and corresponding Coulombic efficiency of NFPO@SC electrode and NFPO@C at 1 C, respectively.

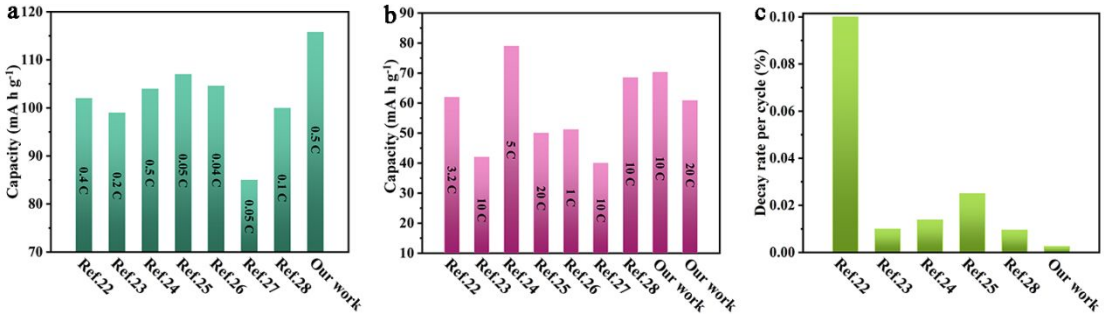

Figure S7. Comparisons of performance with others ferric sodium pyrophosphate electrodes (a) at low rate, (b) at high rate, (c) decay rate per cycle.

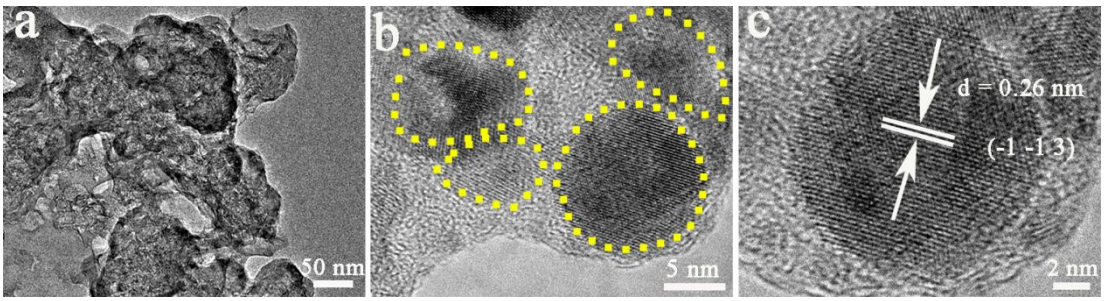

Figure S8. Morphology of NFPO@SC after circulation.

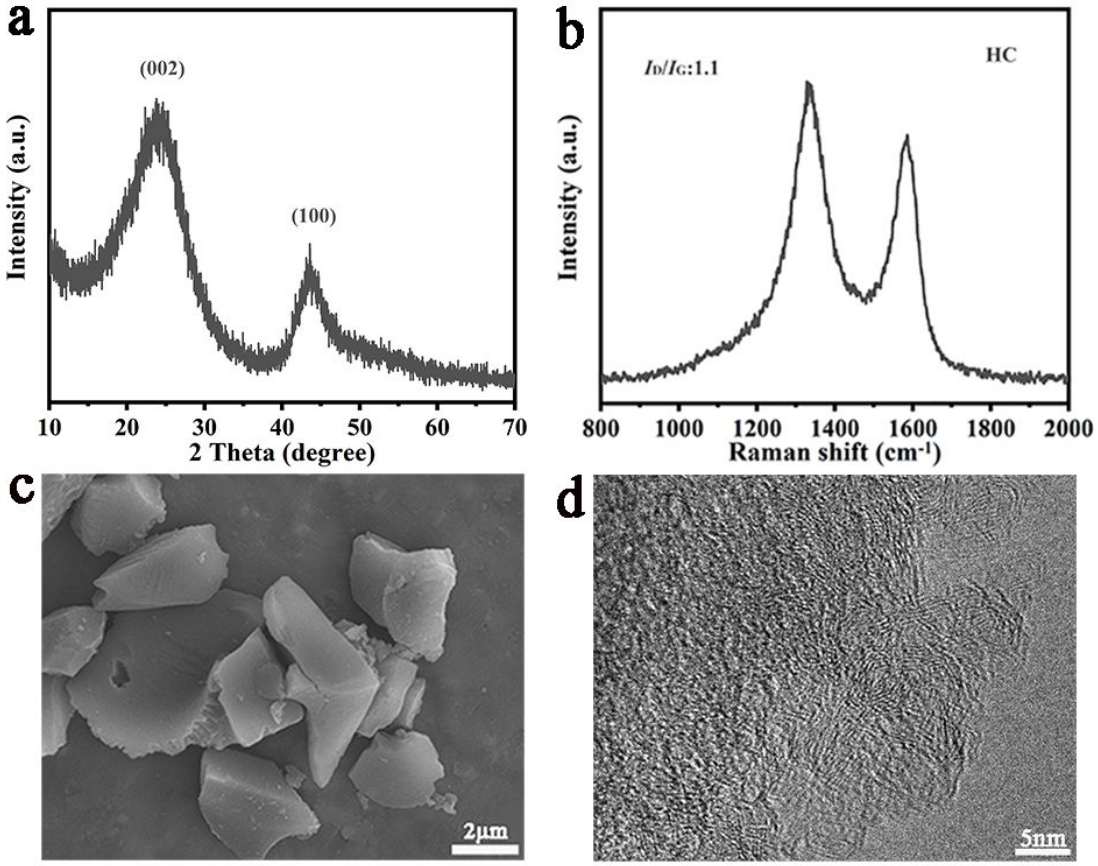

Figure S9. (a) XRD pattern of hard carbon; (b) Raman spectra of hard carbon.(c) FESEM pattern of hard carbon; (d) HRTEM image of hard carbon.

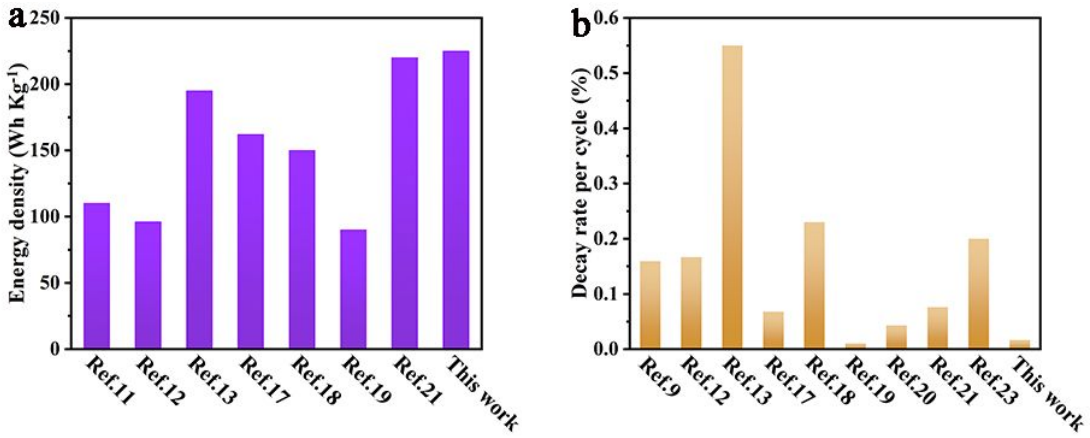

Figure S10. Comparisons of full battery energy density (a) and decay rate per cycle (b) with other works.

Table S1. Kinetic parameters of NFPO@C and NFPO@SC obtained from equivalent circuit fitting.

Cathode material	Rct (Ω)	Zw (Ω)
NFPO@C	547	887
NFPO@SC	488	653

Table S2. The D_{Na+} values for the electrochemistry processes of NFPO@C and NFPO@SC

Cathode material	Diffusion coefficient ($cm^2\ s^{-1}$)
NFPO@C	$2.34x10^{-12}$
NFPO@SC	$3.47x10^{-11}$