

Supplementary data

Experimental

Synthesis of carambola and jujube-seed $\text{Li}_2\text{FeSiO}_4$: $\text{LiOH}\cdot\text{H}_2\text{O}$ (Aladdin, AR), SiO_2 (cabosil M5, ~ 12 nm), $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2\cdot 6\text{H}_2\text{O}$ (Sinopharm, AR) and $\text{FeSO}_4\cdot 7\text{H}_2\text{O}$ (Aladdin, AR) were purchased without any further purification. In a typical synthesis, 10 mmol of $\text{LiOH}\cdot\text{H}_2\text{O}$ and 1.67 mmol of SiO_2 were dispersed in 10 mL of deionized water and 10 mL of ethylene glycol. Then the suspension was treated by ultrasound and stirred for 0.5 h. After that, 1.67 mmol of $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2\cdot 6\text{H}_2\text{O}$ in 20 mL of deionized water was added. After vigorous stirring, the suspension was transferred to a Teflon-lined autoclave with a capacity of 60 mL and kept at 160 °C, 180 °C and 200 °C for 12 h, respectively. These resulting precipitates were collected by washing with deionized water and ethanol several times. Finally, the light brown powders were dried at 60 °C overnight in a vacuum oven and the sample prepared at 200 °C was named as LFS-1. In the same procedure, all the starting materials were the same as those of LFS-1 except for $\text{FeSO}_4\cdot 7\text{H}_2\text{O}$ as the iron source. The obtained sample at 200 °C was named as LFS-2. LFS-1 and LFS-2 powders were mixed with 50 wt % beta-cyclodextrin by ball-milling. Then these mixtures were sintered at 700 °C for 5 h under a flow of $\text{Ar}(95\%)/\text{H}_2(5\%)$ for carbon coating. The final black powders were marked as LFS-1/C composite and LFS-2/C composite, respectively.

Structural and electrochemical characterization: The X-ray powder diffraction (XRD) patterns were recorded on a Bruker D8 advance X-ray diffractometer with $\text{Cu K}\alpha$ line as a radiation ($\lambda=1.5418\text{\AA}$). The microstructure was characterized with a

thermal field emission scanning electron microscope (SEM, SUPRA™ 55), a transmission electron microscope (TEM, JEM- 1011), and high resolution transmission electron microscope (HRTEM, JEOL-2100). The carbon contents of LFS-1/C and LFS-2/C were obtained from a Mettler Toledo TGA/SDTA851 thermal analyzer. Raman spectra were recorded by a NEXUS 670 FT-IR Raman spectrometer with an excitation wavelength of 632 nm. The N₂ adsorption/desorption isotherms were obtained by a Quadrasorb SI analyzer at 77 K. The electrodes were prepared by making slurry of 70 wt.% active materials (LFS-1/C and LFS-2/C composites), 20 wt.% acetylene black and 10 wt.% polyvinylidene fluoride (PVDF) in N-methylpyrrolidinone (NMP) as the solvent. The slurry with a wet film thickness of 300 μm was coated on aluminum foil and dried in vacuum at 80 °C. The resulting films were pressed and punched into the discs with a diameter of 14 mm and used as the cathode. The typical disk electrode contained active material of ~2 mg cm⁻². The cell was assembled in an argon-filled glove box using metallic lithium as the counter electrode, Celgard 2300 membrane as a separator and 1 M LiPF₆ in a mixture of EC-DEC-EMC (1:1:1 volume) as the electrolyte. DC resistance was measured at a pulse of 18 s at every 5 % increase of SOC (state of charge) or DOD (depth of discharge). Then, the DC resistance (R_{dc}) could be obtained by $R_{dc} = \Delta U/I$, where ΔU is the voltage variation before and after the interruption. In the calculation of C-rate, 166 mA g⁻¹ is assumed to be equivalent to 1 C.

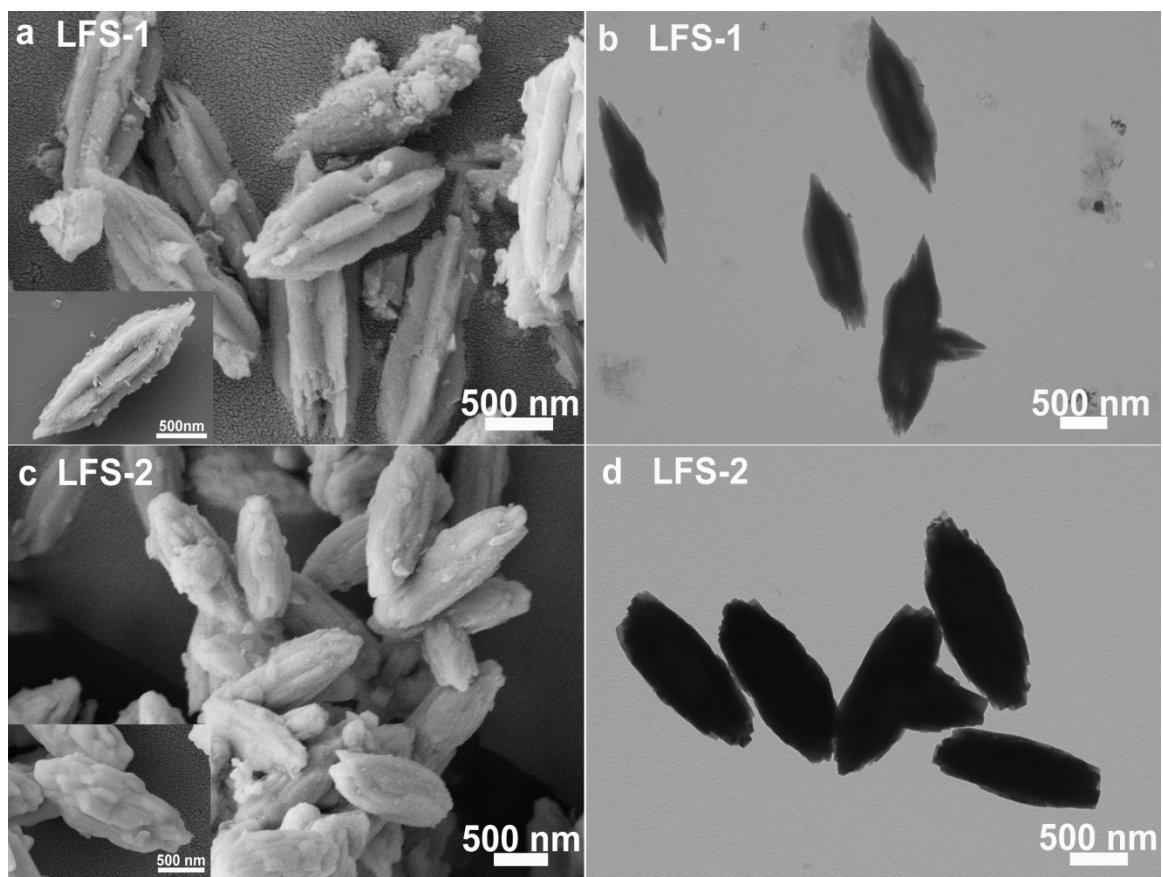


Fig. S1. The SEM and TEM images of pristine LFS-1 (a and b) and LFS-2 (c and d).

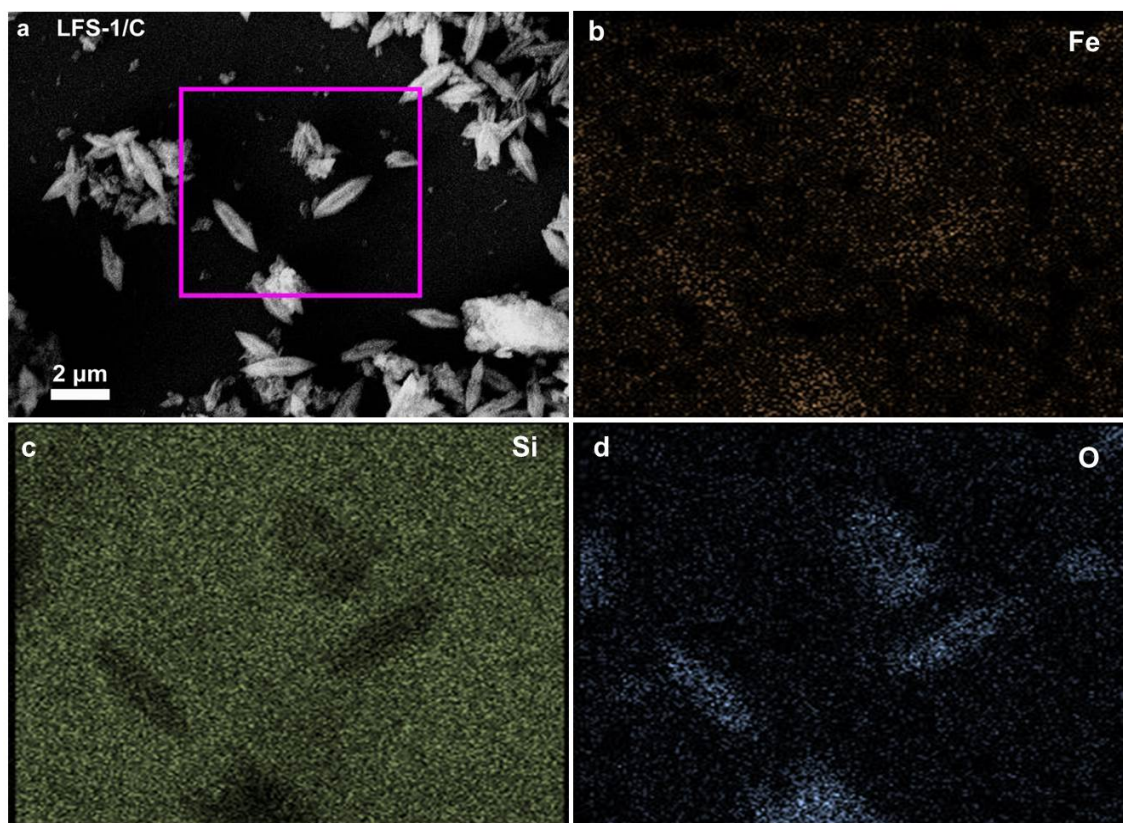


Fig. S2. The EDX element maps of Fe, Si and O in sample LFS-1/C.

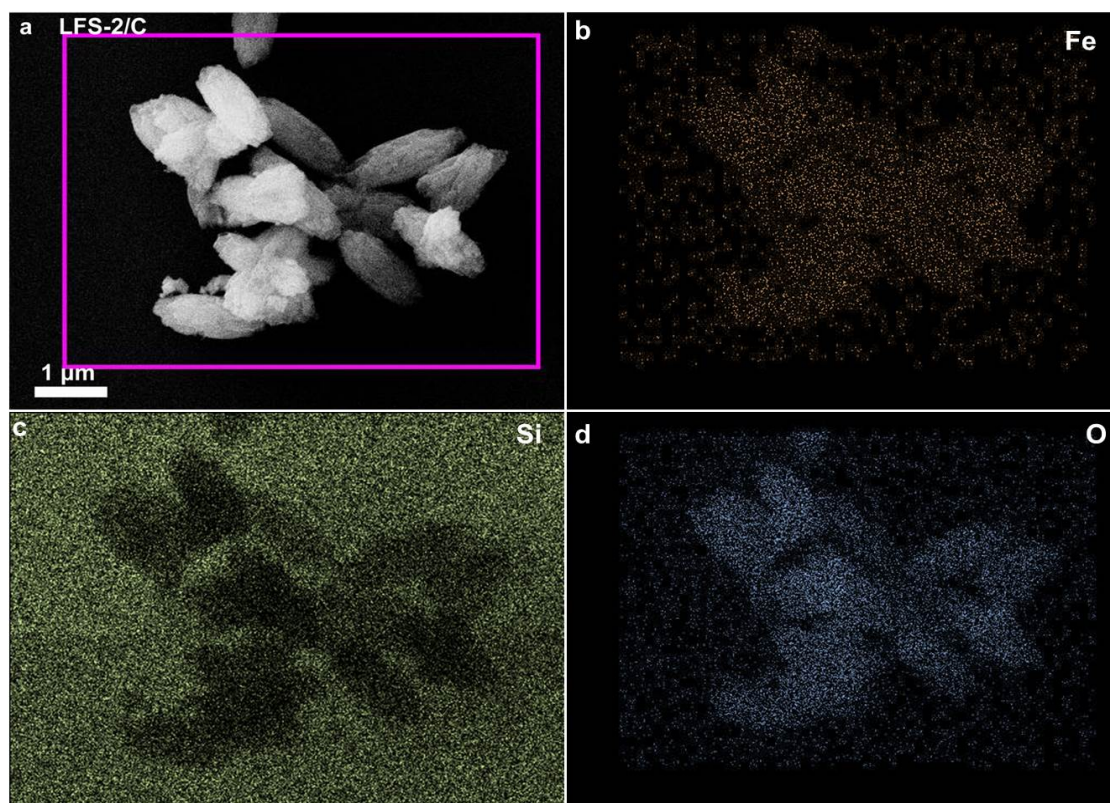


Fig. S3. The EDX element maps of Fe, Si and O in sample LFS-2/C.

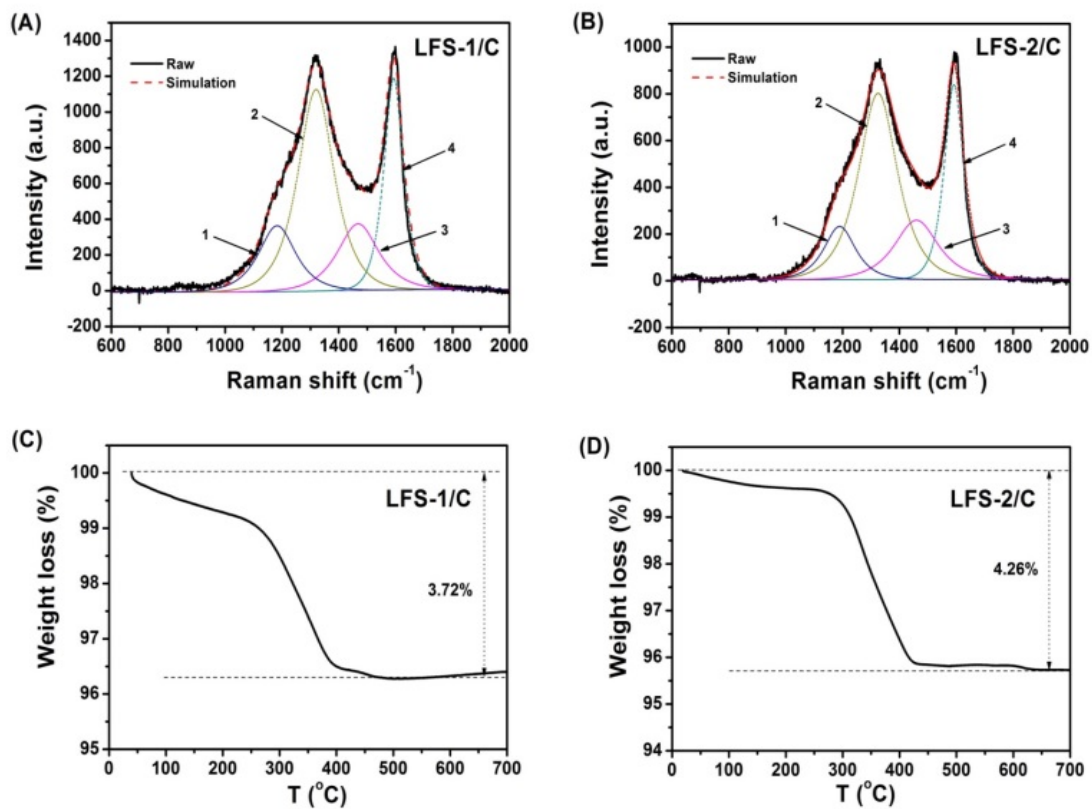


Fig. S4. Raman spectra (A and B) and TGA curves (C and D) of LFS-1/C and LFS-2/C.

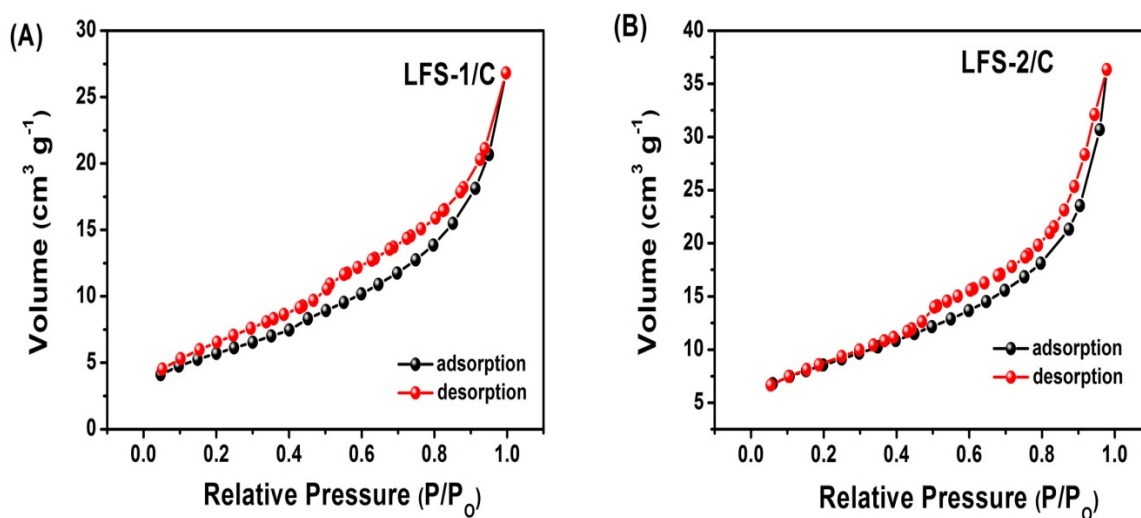


Fig. S5. The Nitrogen adsorption-desorption isotherms of (A) LFS-1/C and (B) LFS-2/C.

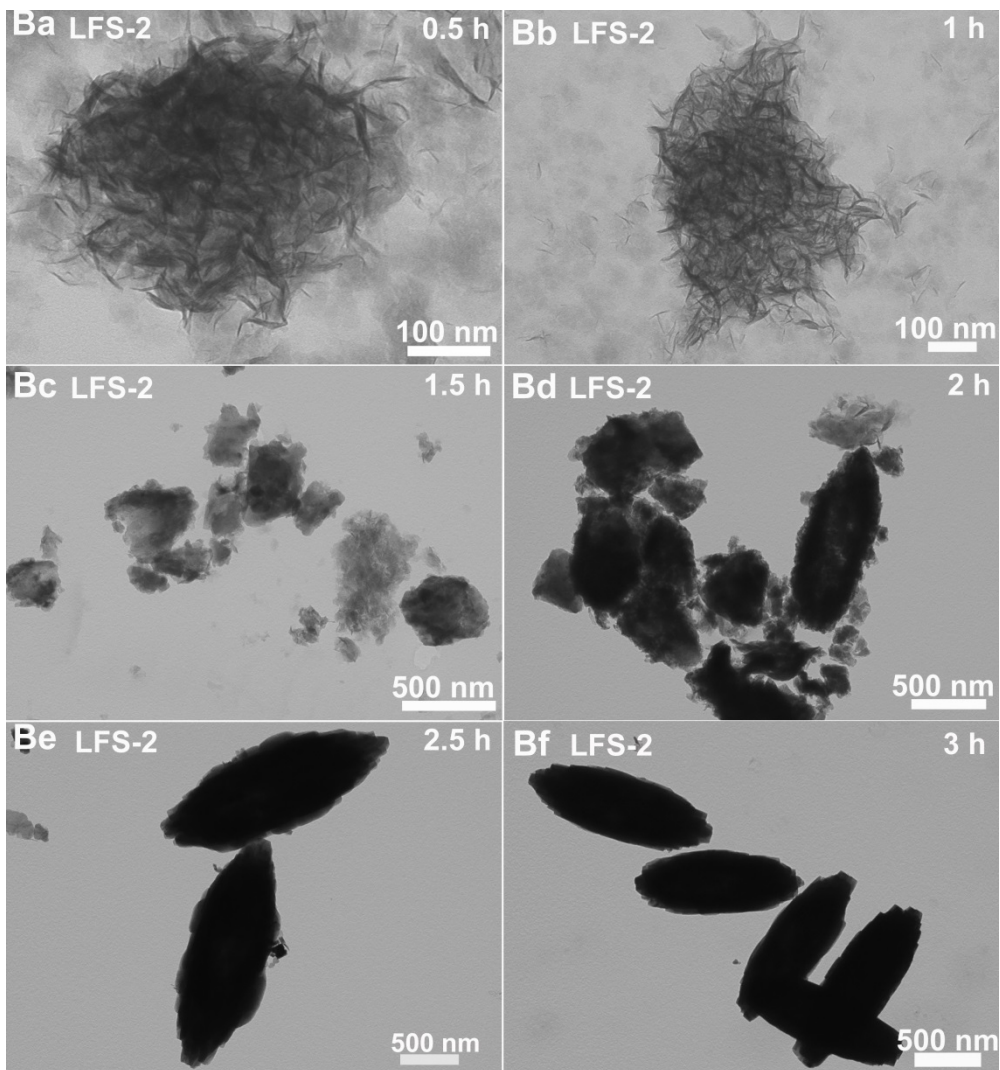
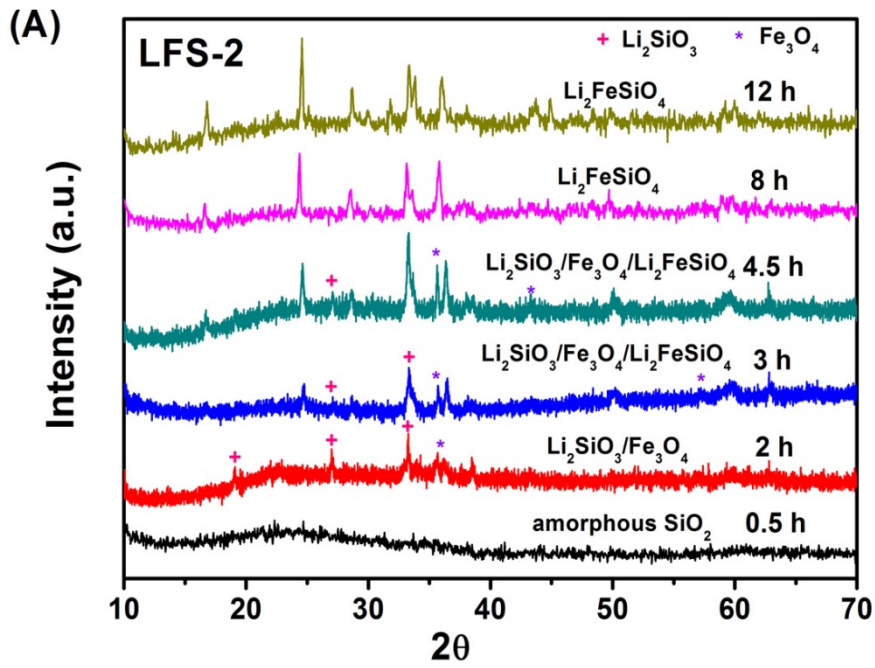


Fig. S6. The XRD patterns (A) and the TEM images (B) of the as-prepared LFS-2.

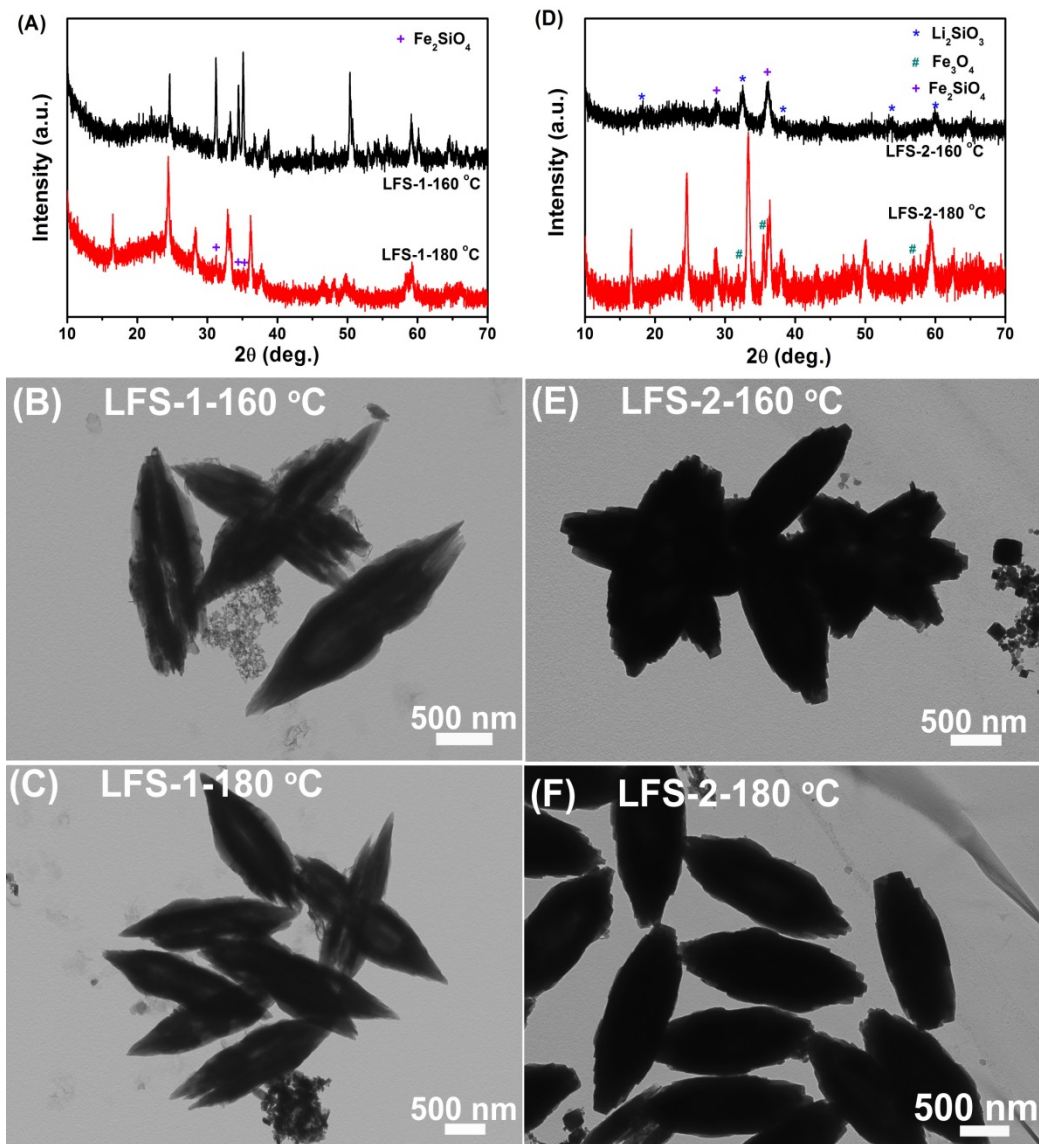


Fig. S7. The XRD patterns of (A) LFS-1/C and (D) LFS-2/C composites at 160 °C and 180 °C; and the TEM images of sample LFS-1/C at 160 °C (B) and 180 °C (C), and of sample LFS-2/C at 160 °C (E) and 180 °C (F)

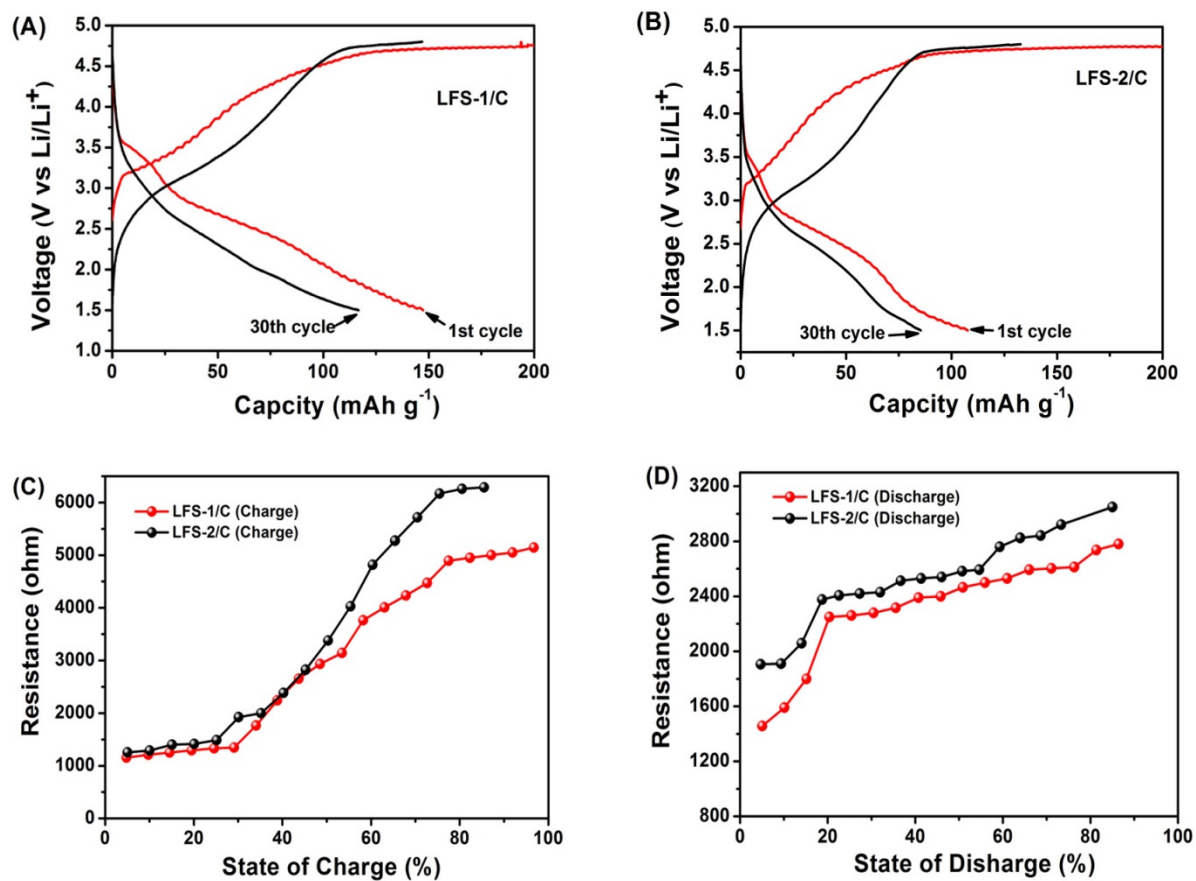


Fig. S8. Electrochemical performances of two samples: (A and B) the typical charge and discharge curves of LFS-1/C and LFS-2/C; the plots of the direct current resistances of LFS-1/C and LFS-2/C vs. state of charge (C) and depth of discharge (D) after 50 cycles.