# Fabrication of Composite Gel Electrolyte and F-Doping Carbon/Silica Anode from Electro-Spun P(VDF-HFP)/Silica Composite Nanofiber Film for Advanced Lithium-Ion Batteries

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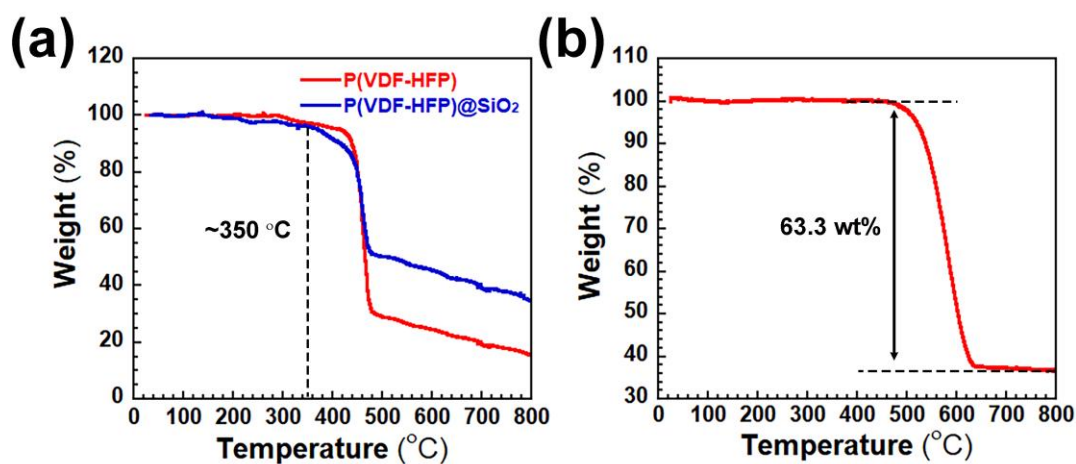*   Correspondence: liyi@suda.edu.cn; Tel.: +86-512-6588-2052

Figure S1. TGA curve of (a) P(VDF-HFP)@SiO$_2$ and (b) F-C@SiO$_2$.
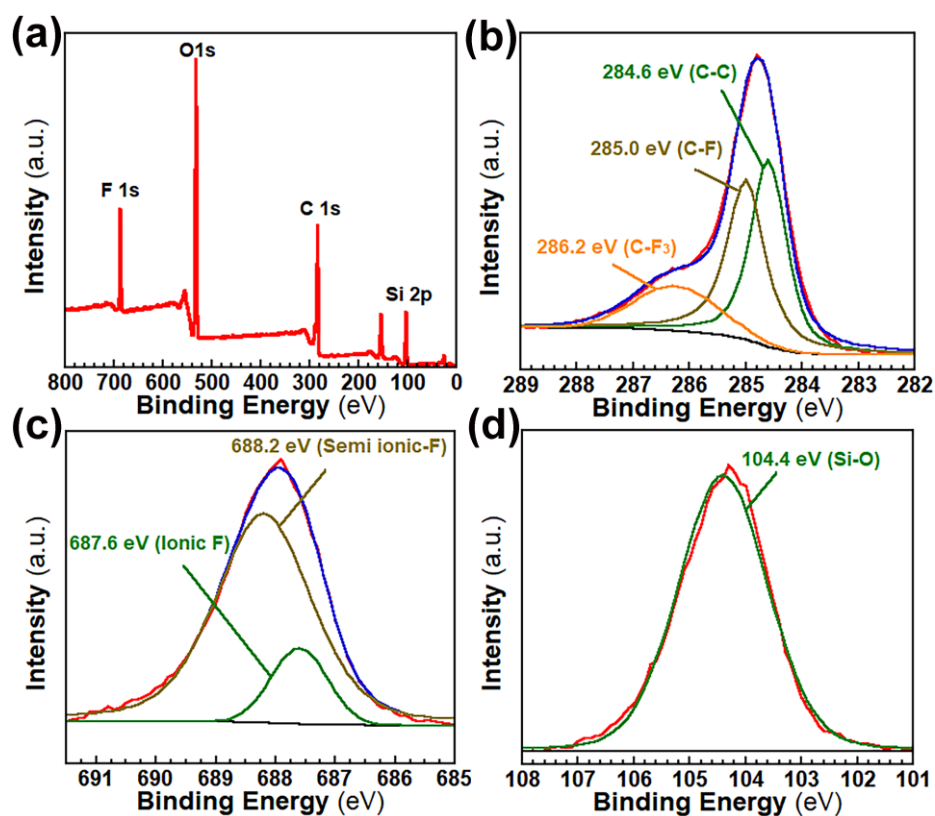
Figure S2. The XPS curve of F-C@SiO$_2$ composite nanofibers: (a) full spectrum, (b) C 1s, (c) F 1s, (d) Si 2p orbital high-resolution spectrum.
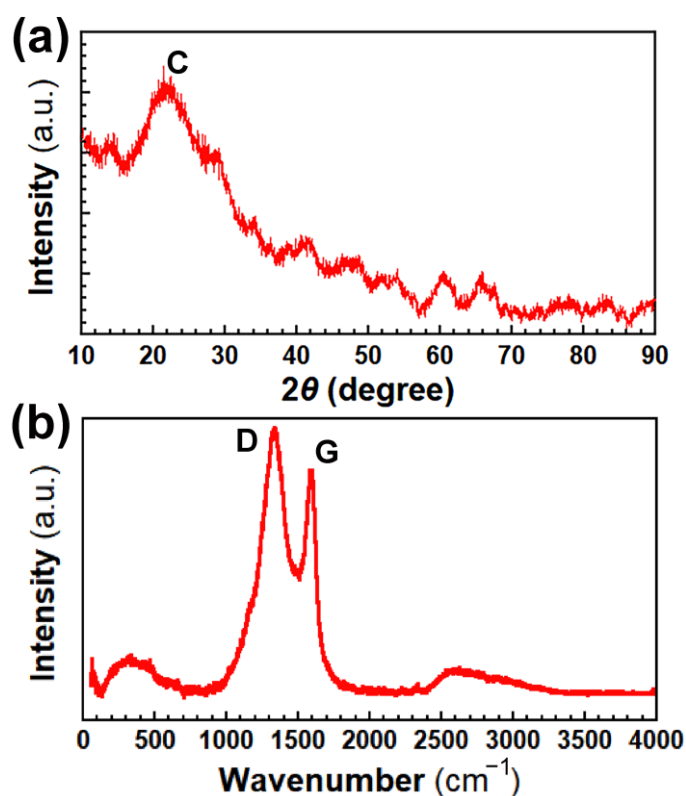


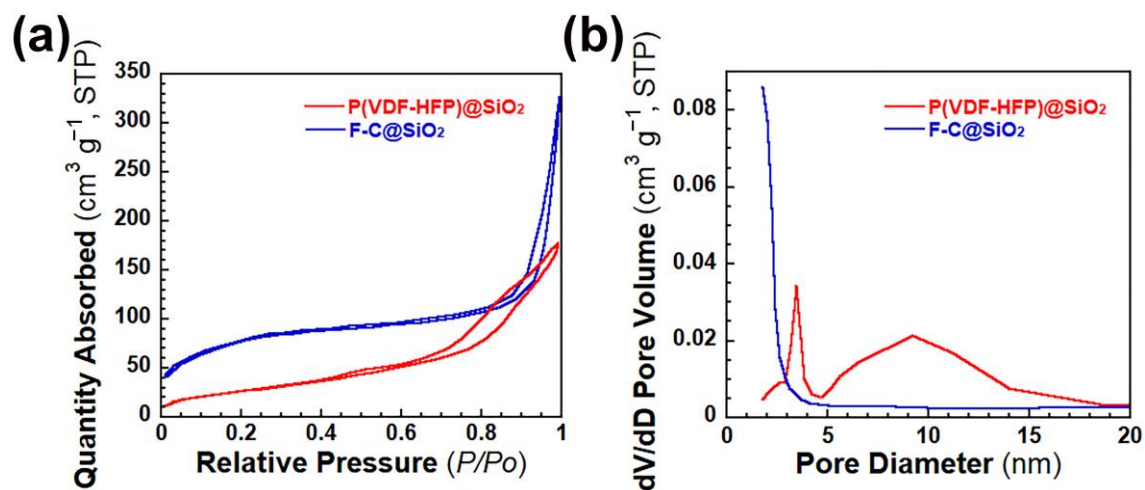Figure S3. (a) WAXRD pattern and (b) Raman spectrum of F-C@SiO$_2$.

Figure S4. (a) Nitrogen sorption isotherms and (b) BJH pore size distribution plot calculated from the adsorption branch of P(VDF-HFP)@SiO$_2$ and F-C@SiO$_2$.



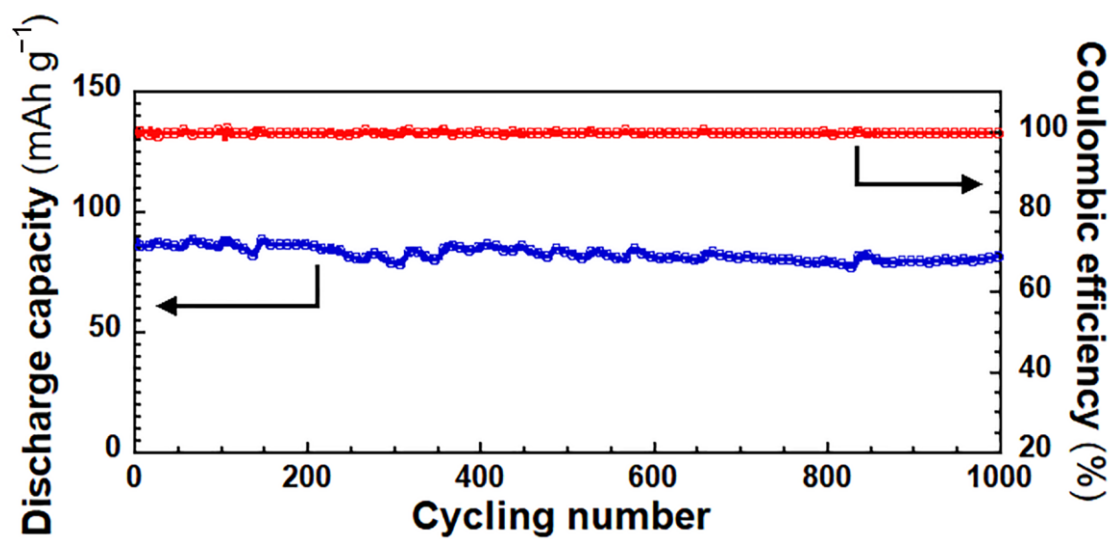Figure S5. Cycling performance of LiFePO$_4$|P(VDF-HFP)@SiO$_2$-GE|Li cell at 1C.
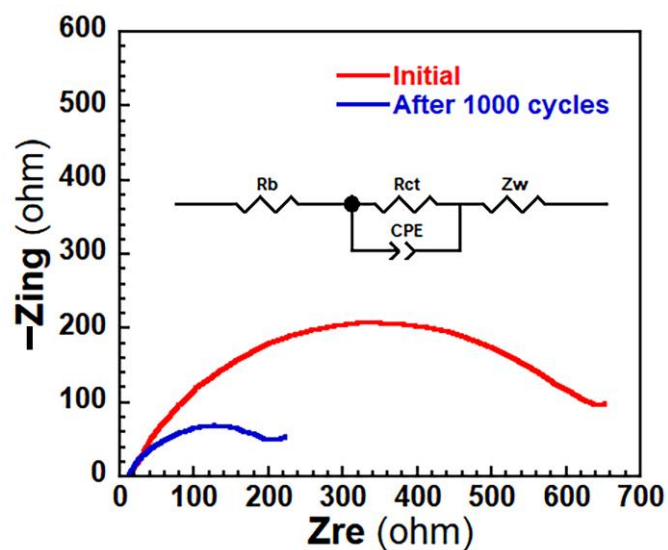
Figure S6. Nyquist plots for the LiFePO$_4$|P(VDF-HFP)@SiO$_2$-GE|Li battery acquired in the frequency range of 10 Hz to 100 KHz before and after 1000 cycles at the current density of 1C.
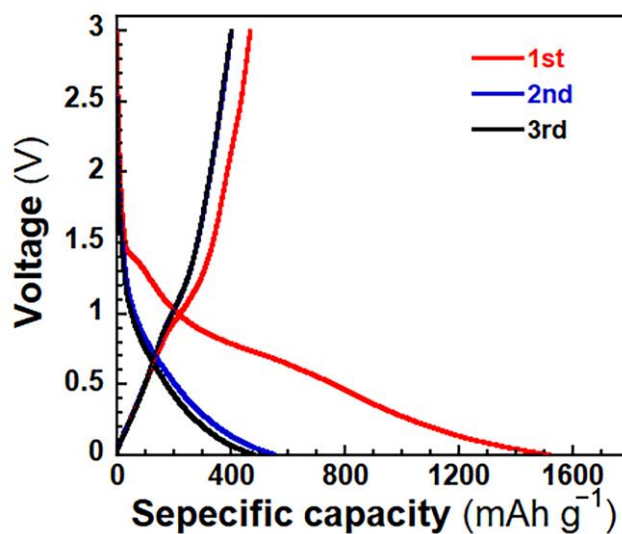


Figure S7. The voltage profile of the first three cycles of F-C@SiO$_2$|P(VDF-HFP)@SiO$_2$-GE|Li cell at current density of 0.2 A g$^{-1}$.

**Table S1.** Comparison of ionic conductivity (σ), electrolyte adsorption rate, capacity and capacity retention ratio of different gel electrolytes.

| Gel electrolyte | $\sigma$ (mS cm$^{-1}$) | Electrolyte Uptake (%) | Capacity (mAh g$^{-1}$) | Capacity retention ratio (%) | Ref. |
|---|---|---|---|---|---|
| P(VDF-HFP) | 1.42 | 420 | 133.2 (1C) | 95.9 (500 cycles, 1C) | [1] |
| P(VDF-HFP)/ LLZA | 2.25 | 330 | 160 (0.1C) | 87.5 (100 cycles, 0.1C) | [2] |
| PMIA@P(VDF-HFP)/Al$_2$O$_3$ | 0.908 | 445 | 138.2 (0.1C) | 95.6 (600 cycles, 1C) | [3] |
| P(VDF-HFP)-SiO$_2$@PPC | 1.05 | 460 | 167 (1C) | 94 (100 cycles, 1C) | [4] |
| P(VDF-HFP)@SiO$_2$ | 2.6 | 1000 | 134 (0.1C) | 95 (1000 cycles, 1C) | This work |

**References**

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