Supplementary Materials

For

High-Value Utilization of Silicon Cutting Waste and Excrementum Bombycis to Synthesize Silicon–Carbon Composites as Anode Materials for Li-Ion Batteries

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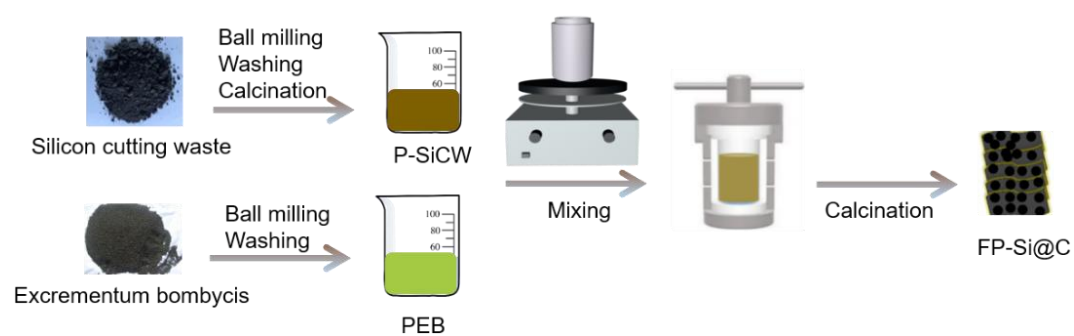† These authors contributed equally to this work.

Supplementary Figures:

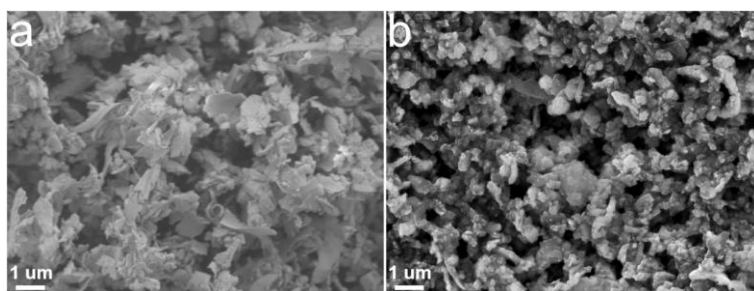**Figure S1.** Schematic illustration of the synthesis process for FP-Si@C composites.

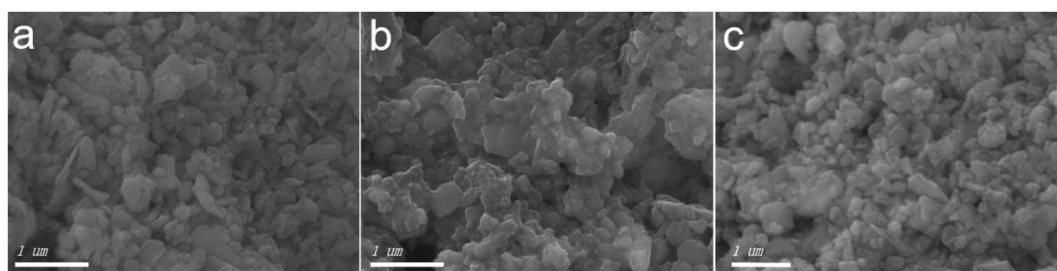**Figure S2.** SEM images of (**a**) silicon cutting waste scragglomerations and (**b**) P-SiCW.

Figure S3. SEM images of (**a**) FP-Si@C-1, (**b**) FP-Si@C-2, and (**c**) FP-Si@C-3.
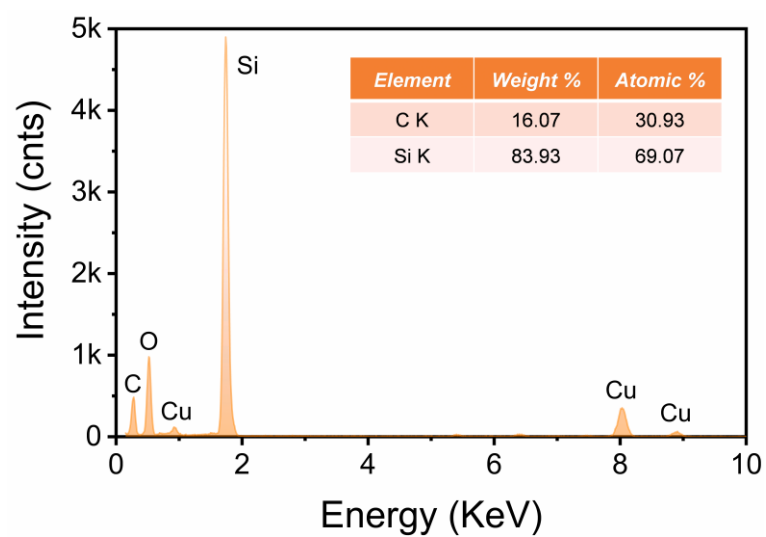
Figure S4. EDS spectrum of FP-Si@C-2 (Inset is the weight and atomic content of C and Si).
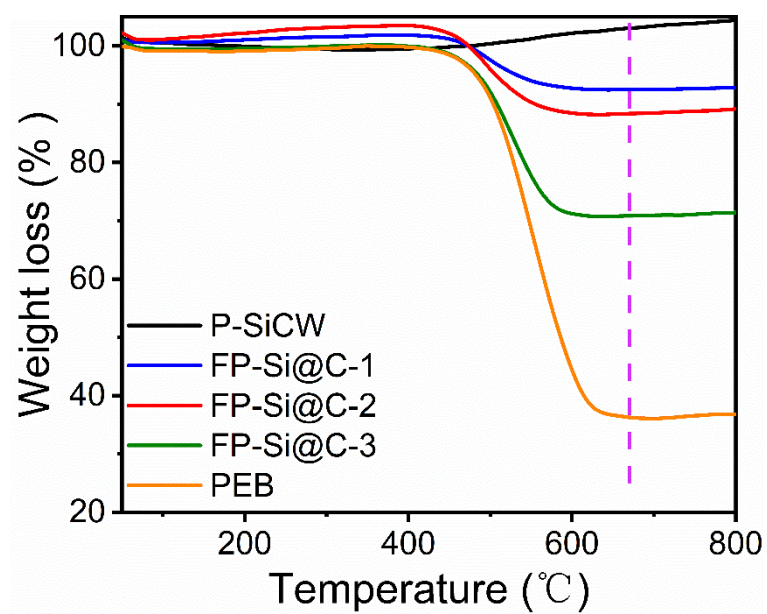
Figure S5. TGA curves of P-SiCW, PEB, FP-Si@C-1, FP-Si@C-2, and FP-Si@C-3.
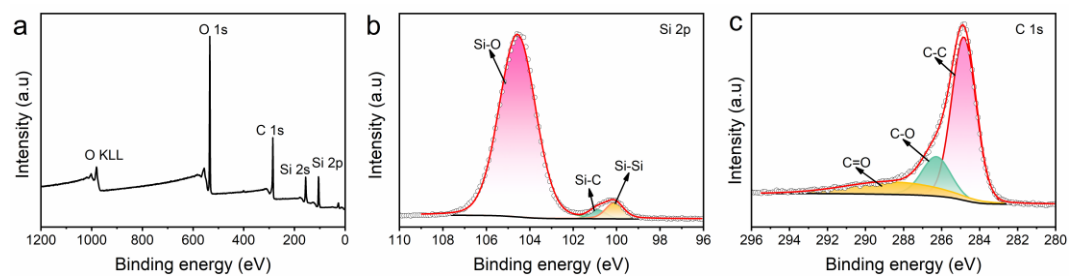
Figure S6. (**a**) XPS full spectrum, (**b**) XPS Si 2p spectrum, and (**c**) XPS C 1s spectrum of FP-Si@C-2.
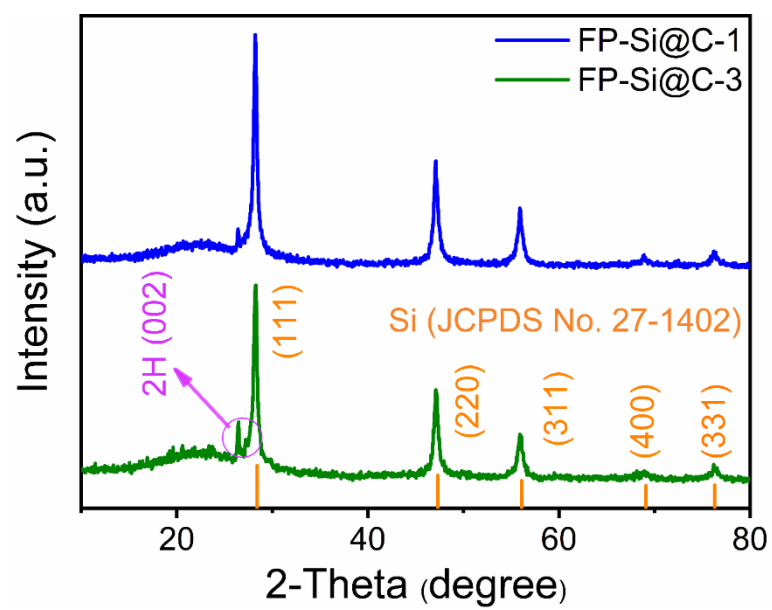
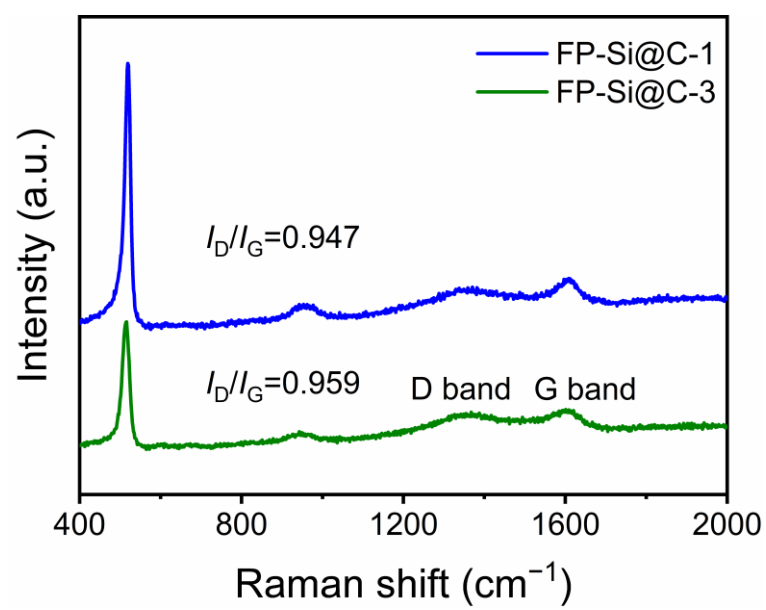**Figure S7.** XRD patterns of FP-Si@C-1 and FP-Si@C-3.

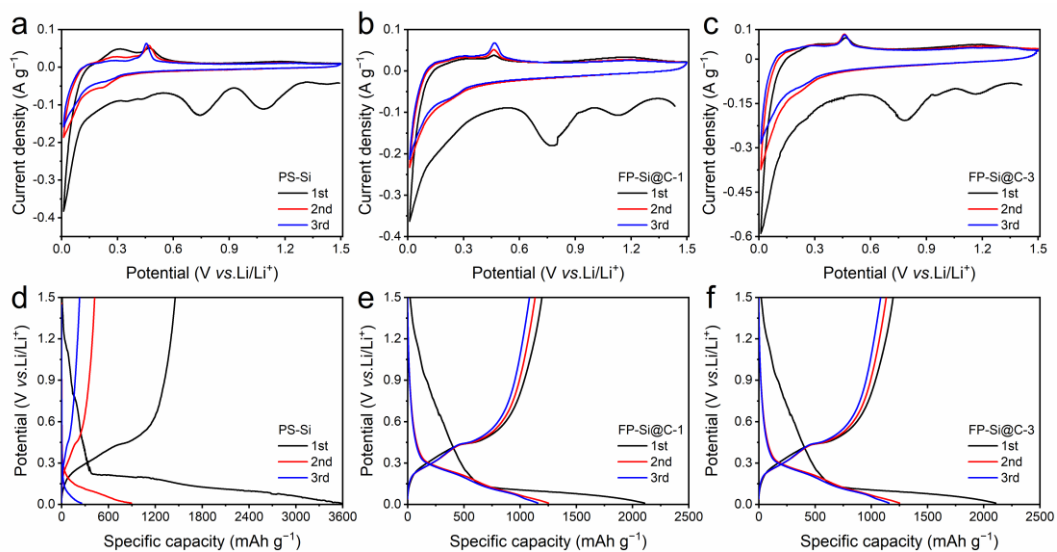**Figure S8.** Raman spectra of FP-Si@C-1 and FP-Si@C-3.

Figure S9. (**a–c**) The initial three CV curves of P-SiCW, FP-Si@C-1, and FP-Si@C-3 at 0.1 mV s⁻¹. (**d–f**) The

initial three GCD curves of P-SiCW, FP-Si@C-1, and FP-Si@C-3 at 0.1 A g⁻¹.
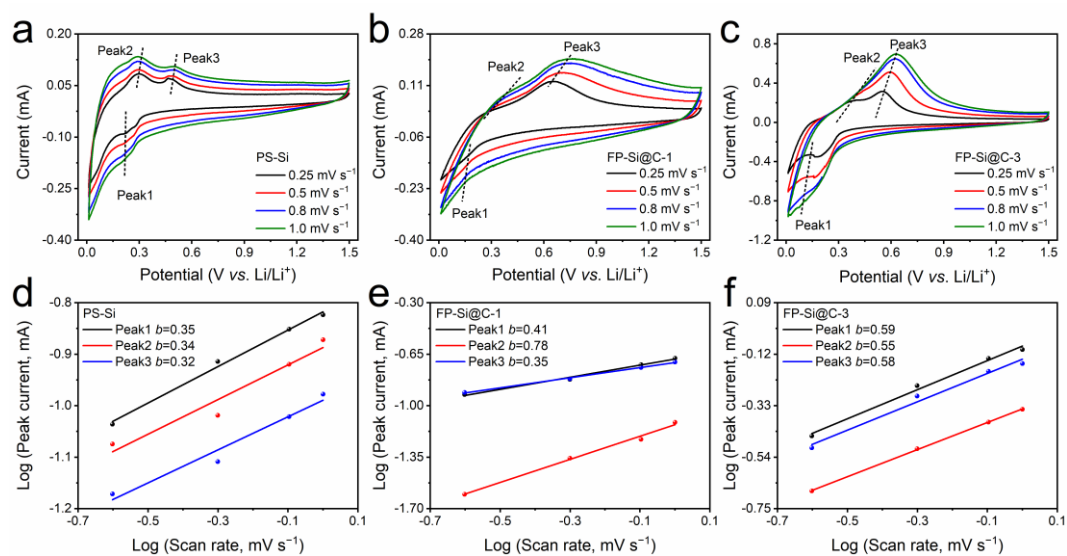
Figure S10. (**a–c**) The CV curves of P-SiCW, FP-Si@C-1, and FP-Si@C-3 at different scan rates. (**d–f**) The log(*i*)-log(*v*) plots of P-SiCW, FP-Si@C-1, and FP-Si@C-3.
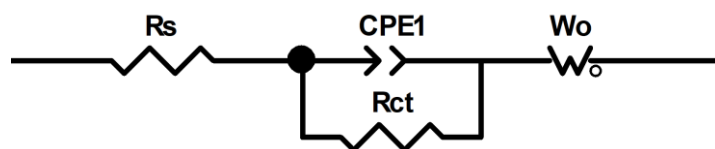
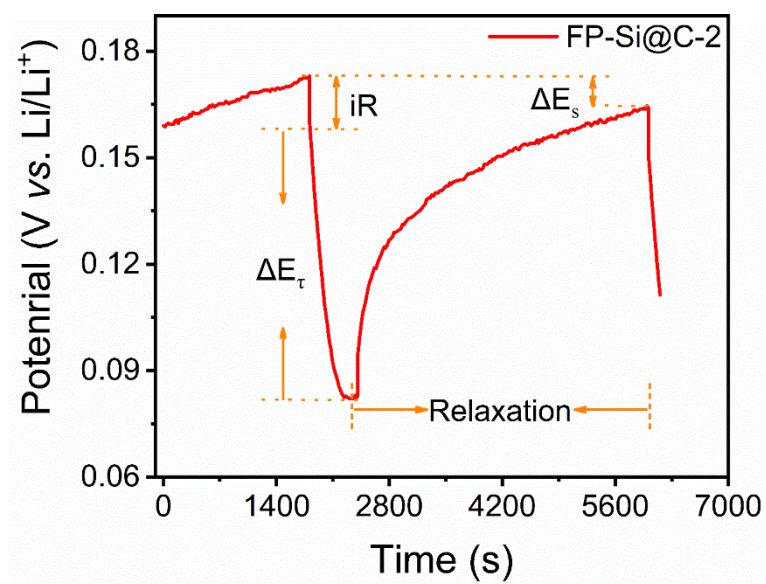**Figure S11.** Equivalent circuit model linked with EIS curves.

Figure S12. Partial enlarged view about GITT results and marked ΔE_S and ΔE_τ of FP-Si@C-2.

Supplementary Tables:

Table S1. XRF results of silicon cutting waste and P-SiCW.

Sample EA		Si	Fe	Cr	Ni	Cu	Cl	Mg	Mo
Weight（%）	Silicon cutting waste	83.84	10.34	3.44	1.8	0.134	0.0637	0.0382	0.037
	P-SiCW	99.83	0.0067	0.0007	0.0256	0.0005	0.0027	0.0336	0.0043

Table S2. BET specific surface area, pore volume, and BJH pore size of P-SiCW and FP-Si@C-2.

Sample	S_{BET} (m^2 g^{-1})	V_{total} (cm^3 g^{-1})	Average pore size (BJH) (nm)
P-SiCW	113.50	0.24	8.31
FP-Si@C-2	61.76	0.14	9.32

Table S3. The R_{ct} and Warburg values of P-SiCW, FP-Si@C-1, FP-Si@C-2 and FP-Si@C-3.

Sample	R_{ct} (ohm)	σ (Ω S$^{-1/2}$)
P-SiCW	97.8	46.9
FP-Si@C-1	102.8	27.2
FP-Si@C-2	91.5	25.9
FP-Si@C-3	116.5	40.2