Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

SUPPORTING INFORMATION

Continuous silicon oxycarbide fiber mats with tin nanoparticles as high capacity anode for lithium-ion batteries

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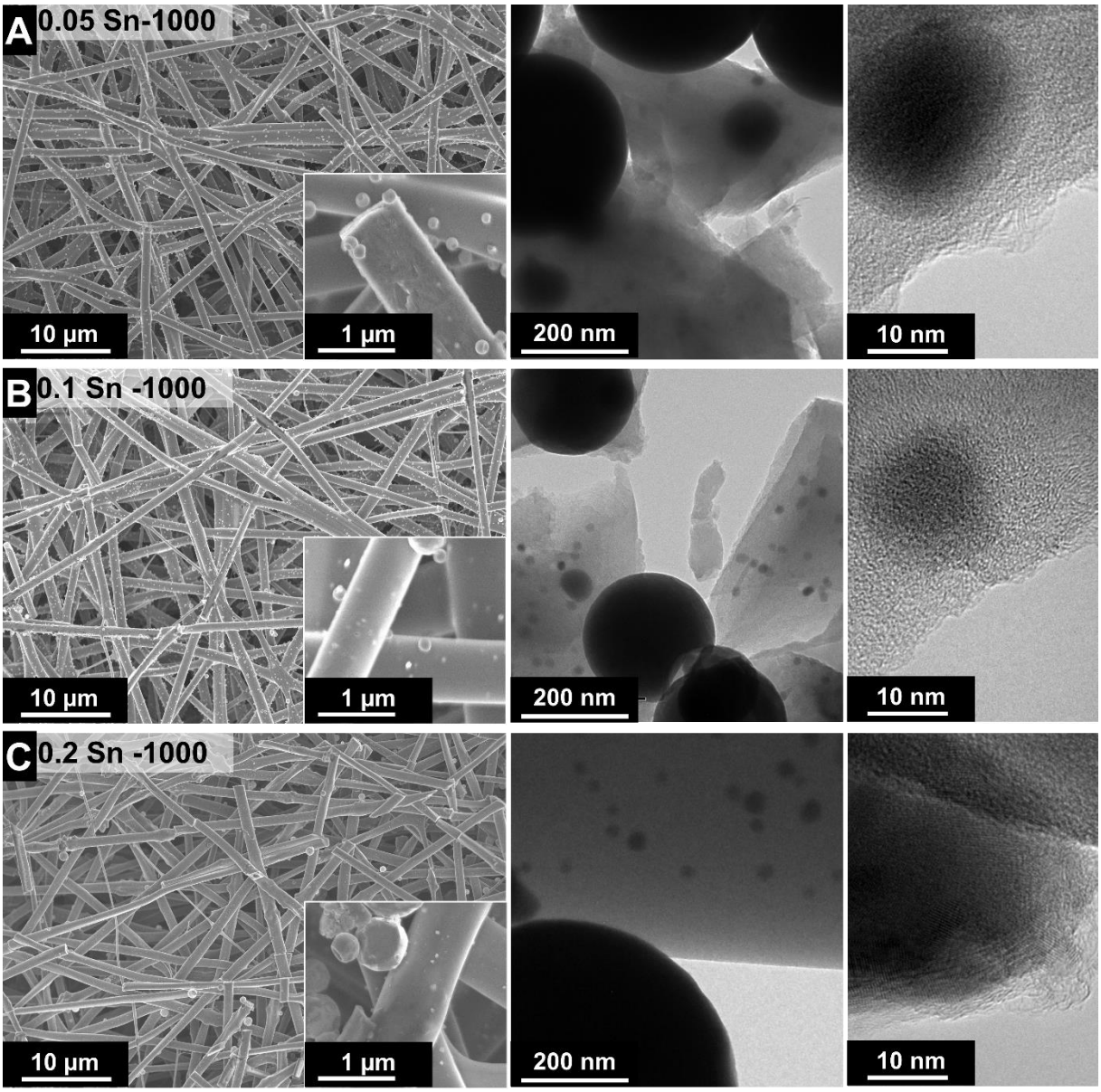

Figure S1: SEM and TEM micrographs (inset) of the SiOC fibers synthesized at 1000 °C, containing different amounts of Sn: 0.05 (A), 0.1 (B), and 0.2 (C).

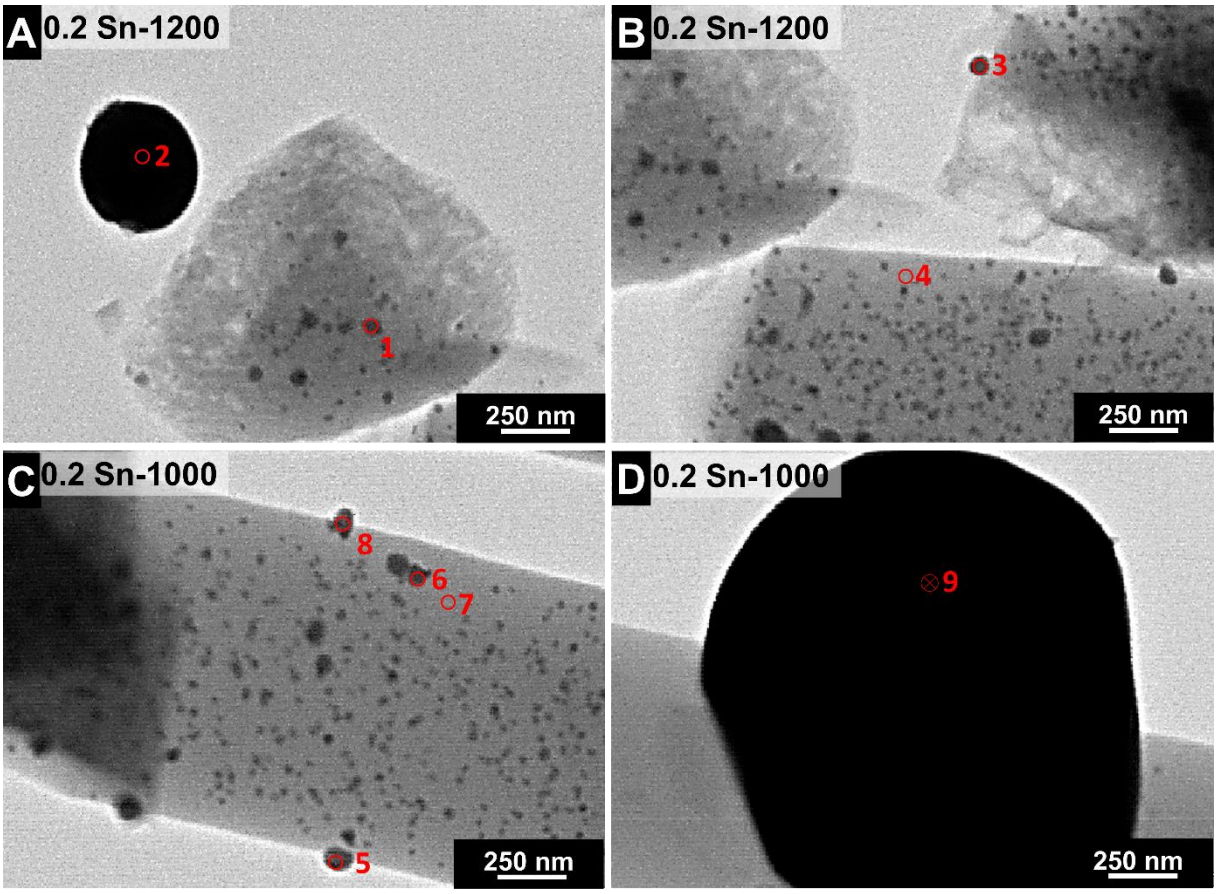

Figure S2: TEM micrographs corresponding to EDX point analysis, for the samples containing 0.2 Sn synthesized at 1200 °C (A-B) and 1000 °C (C-D).

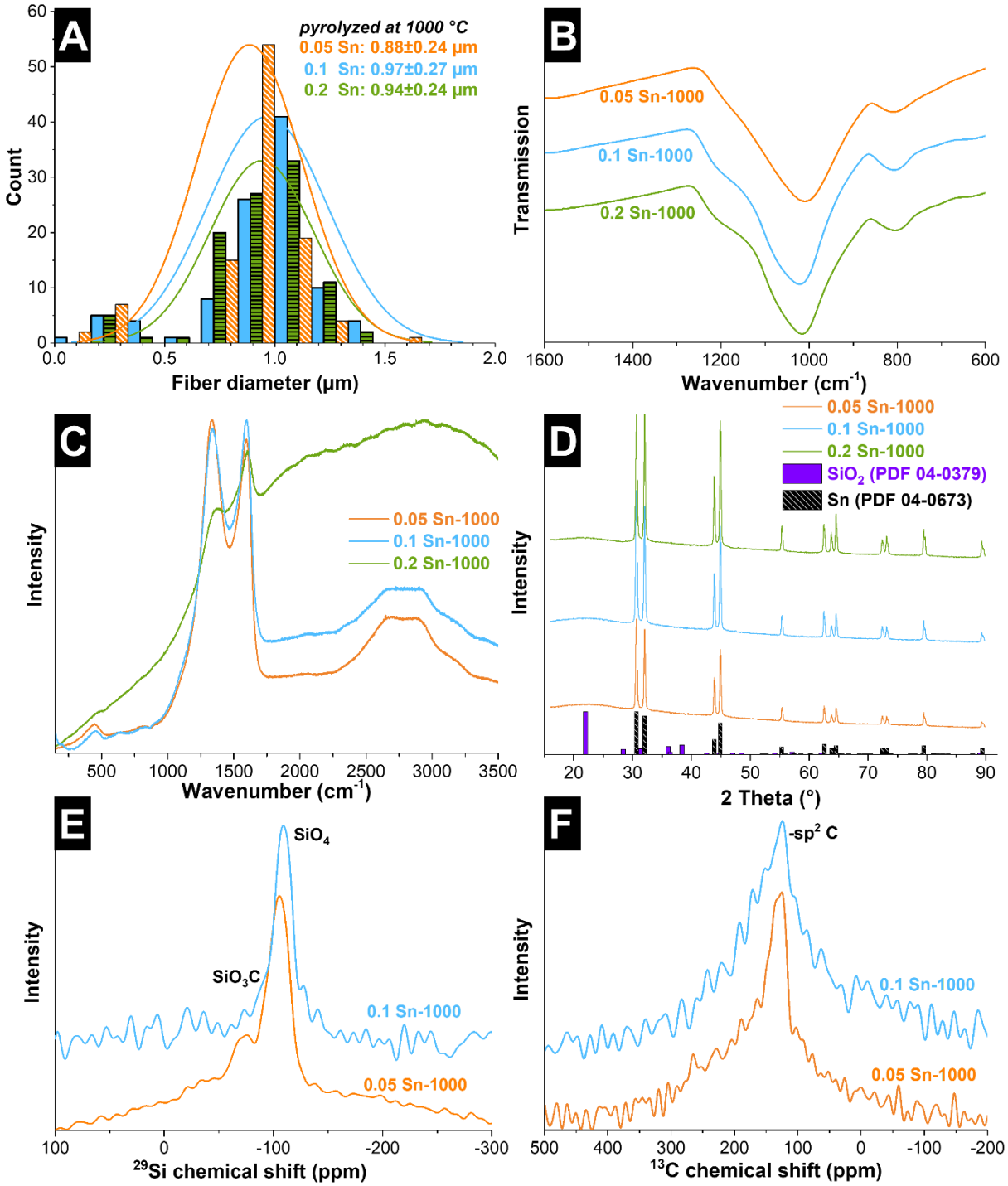

Figure S3: Material characterization of fibers synthesized at 1000 °C. Fiber diameter distribution (A), Fourier transform infrared spectra (B), Raman spectra (C), X-ray diffraction pattern and literature values for diffraction peak positions (D), solid-state ^{29}Si NMR (E), and ^{13}C NMR (F).

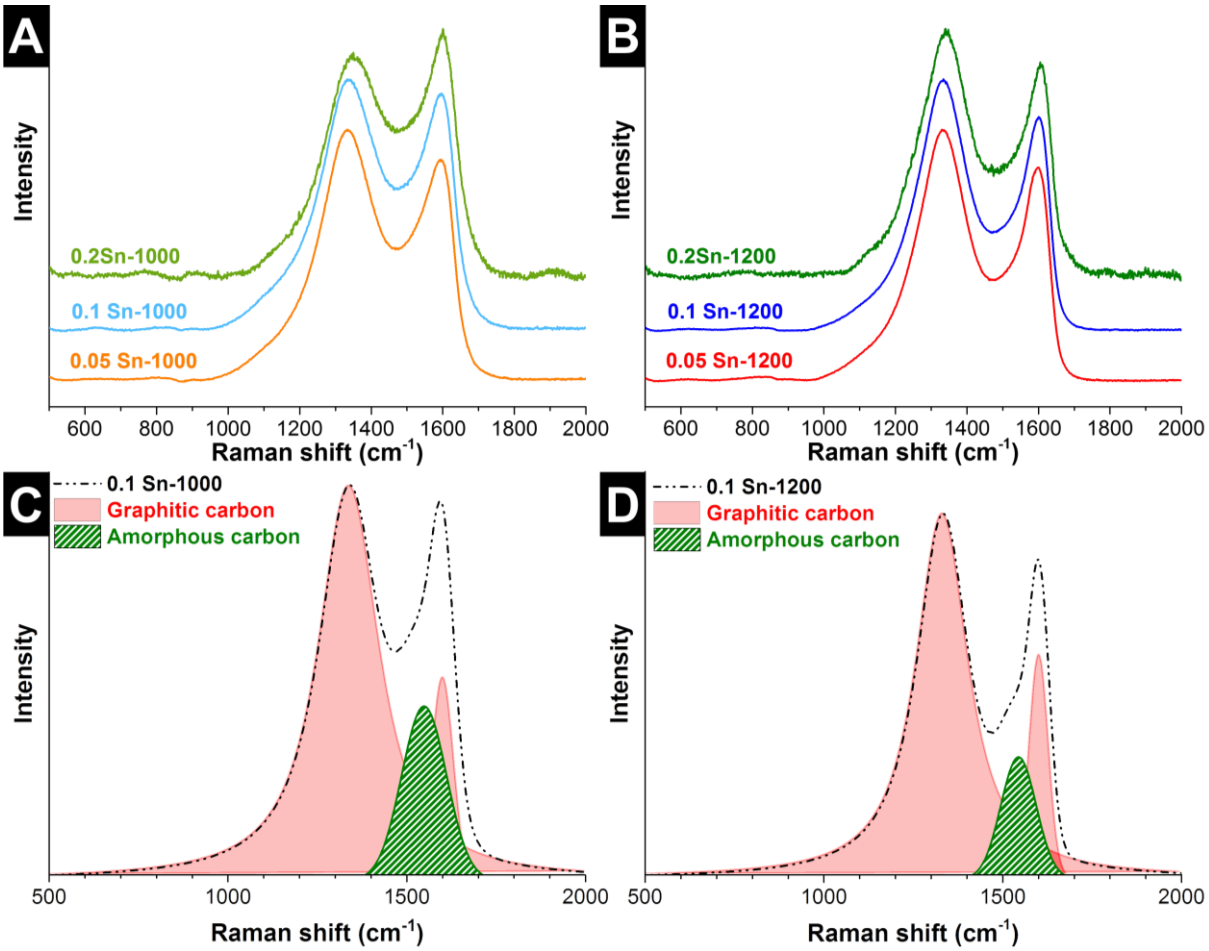

Figure S4: Comparative Raman spectra for the samples synthesized at 1000 °C (A) and 1200 °C (B) after background normalization. Representation of peak deconvolution of the samples containing 0.1 Sn synthesized at 1000 °C (C) and 1200 °C (D).

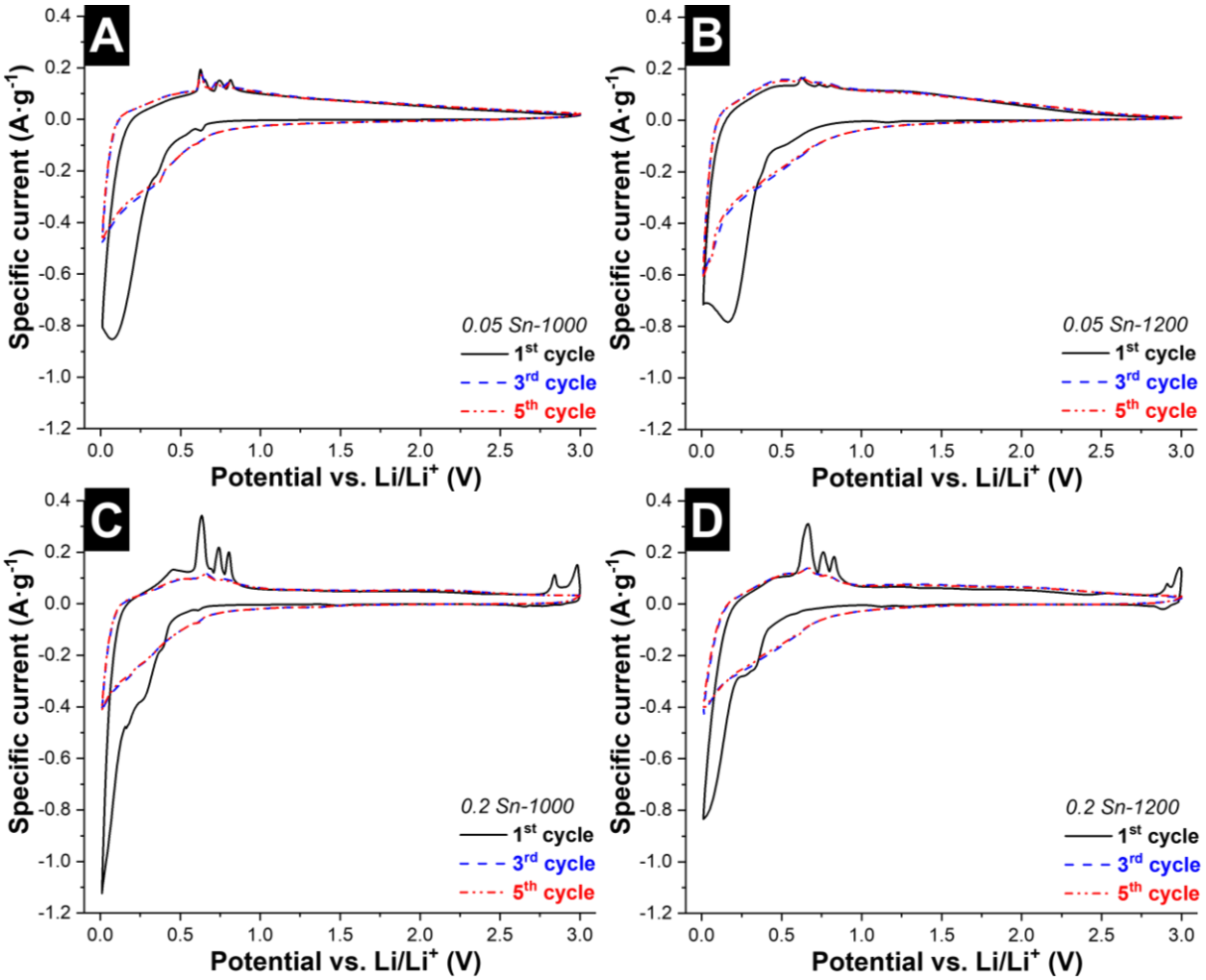

Figure S5: Initial five cycles at 0.1 mV·s^{-1} for the samples containing 0.05 Sn (A-B) and 0.2 Sn (C-D) synthesized at 1000 °C (A, C) and 1200 °C (B, D).

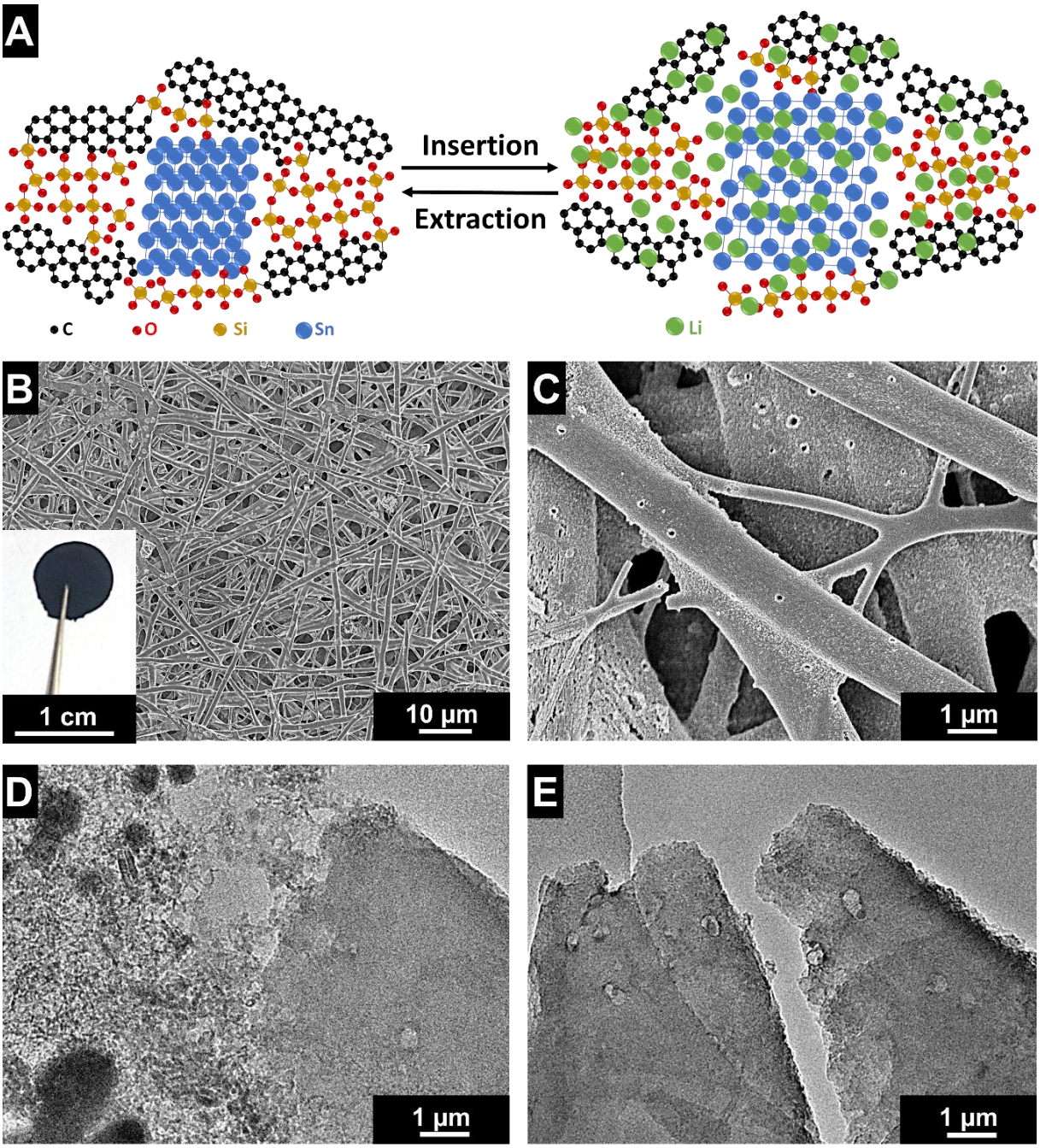

Figure S6: Schematic representation of lithium insertion and extraction in the hybrid material Sn/SiOC (A). Scanning electron micrographs and photograph (*inset*) (B, C), and transmission electron micrographs of the sample 0.05 Sn-1200 after GCPL for 100 cycles (D, E).

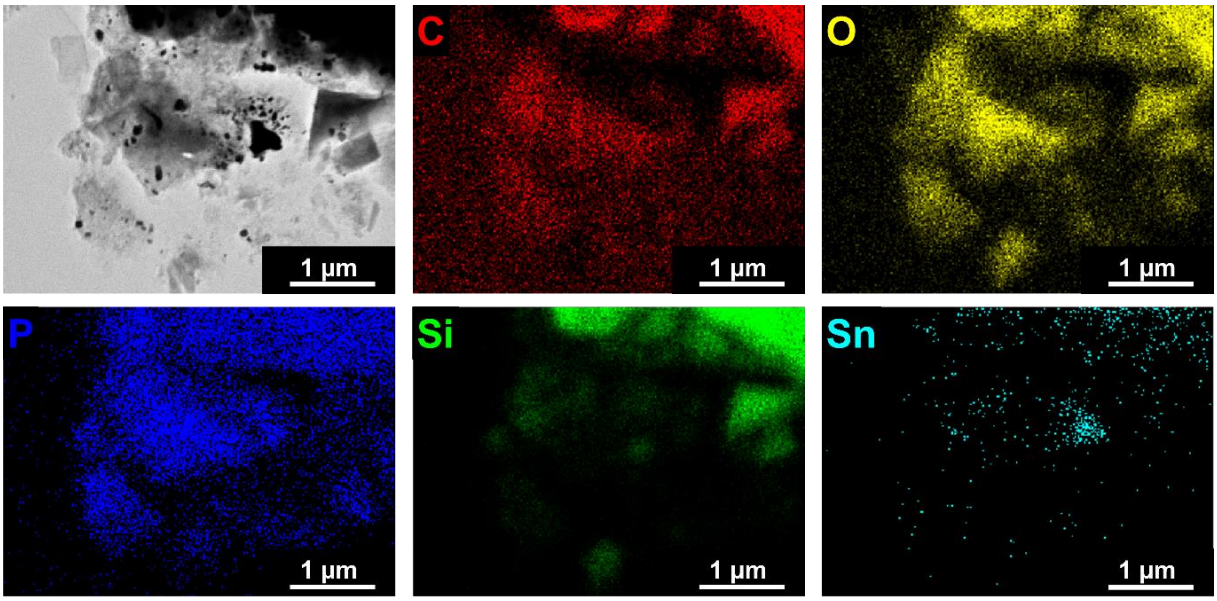

Figure S7: Element mapping analysis of the sample 0.05 Sn-1200 after GCPL for 100 cycles, from EDX analysis during TEM imaging.

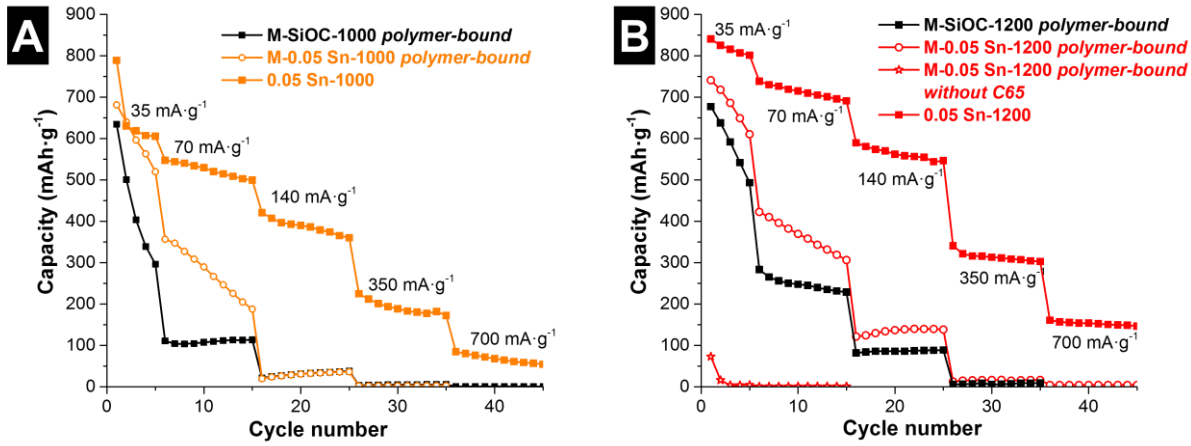

Figure S8: Electrochemical performance of free-standing electrodes. Comparison between polymer-bound electrodes and fiber mats synthesized at 1000 °C (A) and 1200 °C (B).

Table S1: EDX results (all values in at%) from the point analysis during TEM imaging.

Spot	C	O	Si	Sn
1	20.9	39.7	36.5	2.9
2	26.8	5.1	3.0	65.1
3	8.6	15.9	53.5	22.0
4	27.8	32.7	39.5	0.0
5	44.0	22.2	17.4	16.4
6	35.0	33.3	26.6	5.1
7	28.9	38.8	32.1	0.2
8	51.5	28.5	12.0	8.0
9	7.1	4.5	2.6	85.8

Table S2: Simplified calculated composition based on EDX and ICP-AES results, and calculated theoretical capacity.

Sample	Calculated composition (mass%)			Capacity ($mAh \cdot g^{-1}$)
	Sn	SiO_2	C_{free}	
0.05 Sn-1000	6.2	55.7	38.1	1197
0.1 Sn-1000	10.4	56.1	33.5	1229
0.2 Sn-1000	22.1	53.1	24.8	1259
0.05 Sn-1200	6.4	54.2	39.4	1178
0.1 Sn-1200	10.7	54.6	34.7	1210
0.2 Sn-1200	21.9	55.7	22.4	1295

Table S3: Sheet resistance of the polymer-bound electrodes compared to the fiber mat electrodes.

Sample	Sheet resistance (Ω·cm)
M-SiOC-1000 (*polymer-bound*)	9.67 ± 0.91
M-0.05 Sn-1000 (*polymer-bound*)	3.57 + 1.01
0.05 Sn-1000 (*fiber mat*)	0.71 ± 0.10
M-SiOC-1200 (*polymer-bound*)	2.79 ± 0.32
M-0.05 Sn-1200 (*polymer-bound*)	3.54 + 0.38
0.05 Sn-1200 (*fiber mat*)	0.28 ± 0.05