Electronic Supplementary Information

Low-temperature vapour phase polymerized polypyrrole nanobrushes for supercapacitors

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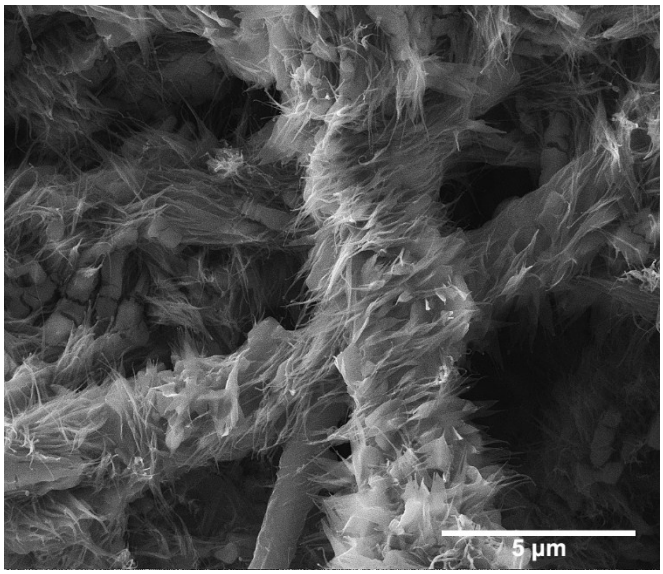


Figure S1. PPy can also be synthesized on glass fiber filter paper.

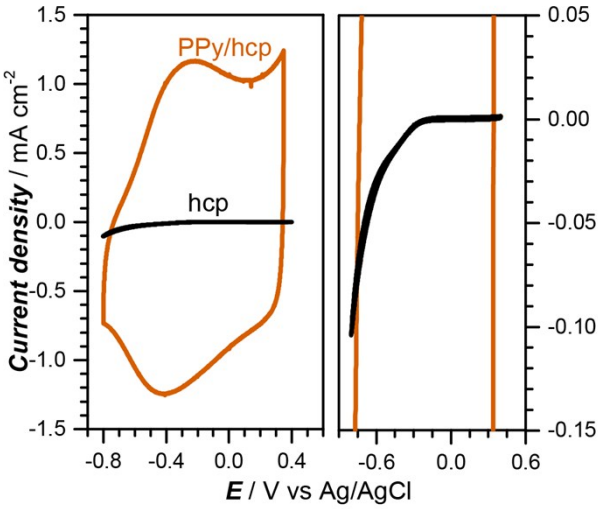


Figure S2. Three-electrode cyclic voltammetry response of PPy on hard carbon paper and bare hard carbon paper.

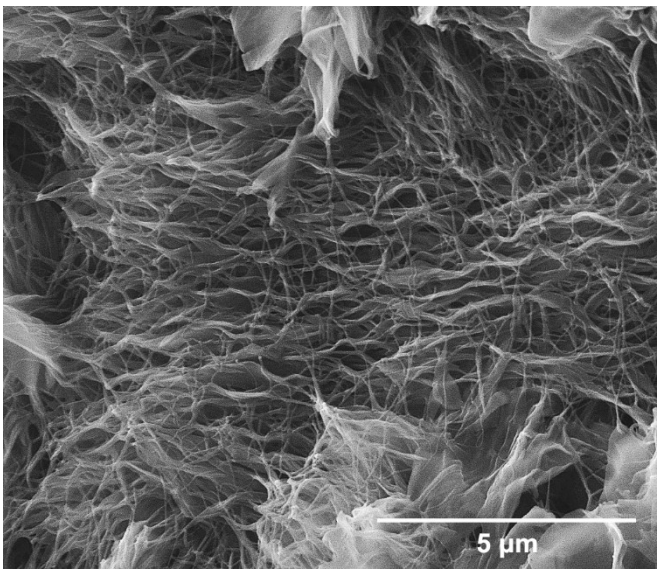


Figure S3. Purified PPy exhibits a relaxed nanofibrillar structure.

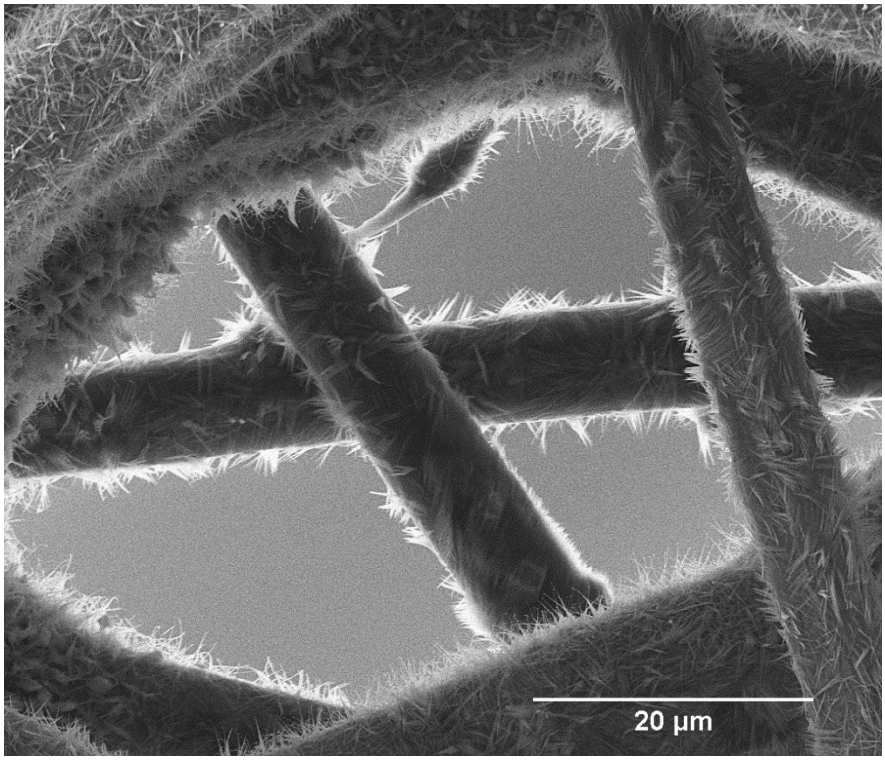


Figure S4. SEM shows that nanofibrillar PPy conformally coats the inner architecture of the hard carbon fiber paper substrate.

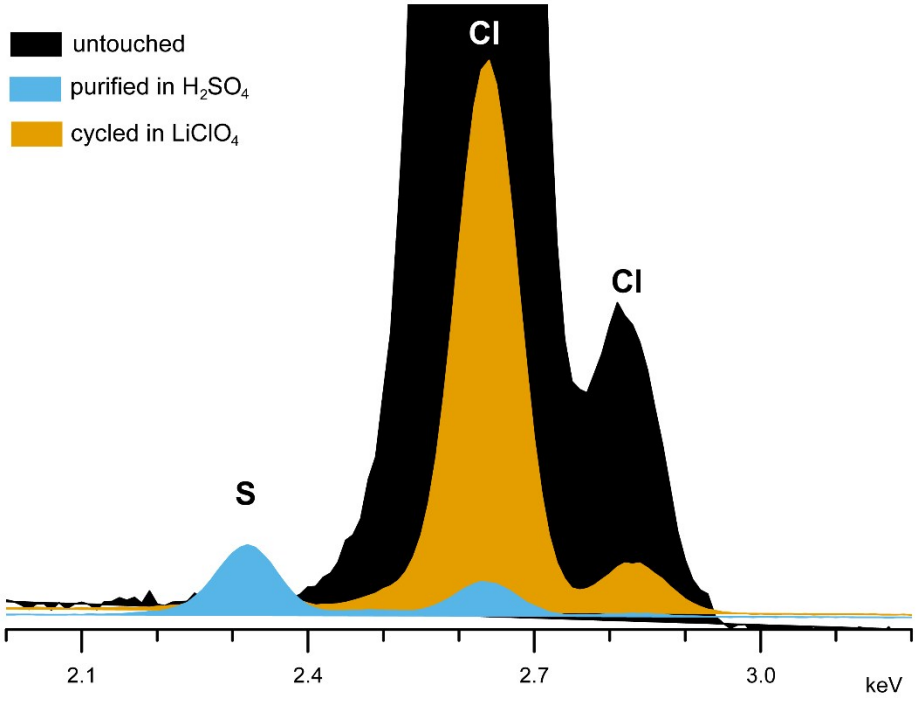


Figure S5. EDS survey spectra showing dopant region for a film on hard carbon paper after synthesis, after washing in 6 M H_2SO_4, and after cycling in 1 M $LiClO_4$ (final potential was the open circuit potential). Spectra normalized for the carbon peak.

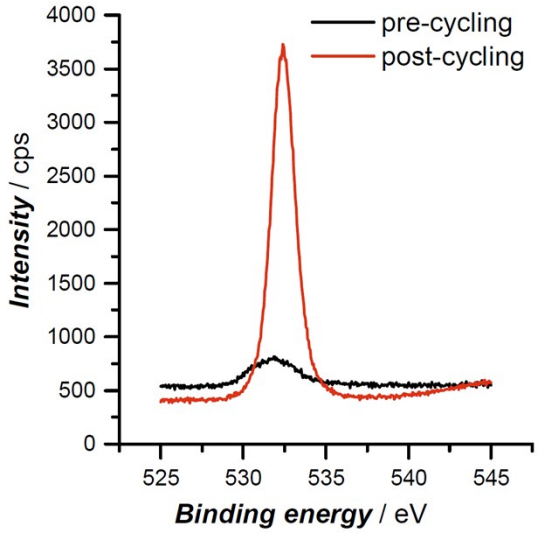


Figure S6. XPS of the O_{1s} peak before and after cycling ten times at 10 mV/s in 1 M $LiClO_4$ for a 50 °C polymerized PPy sample. Final potential equals the initial open circuit potential for PPy.

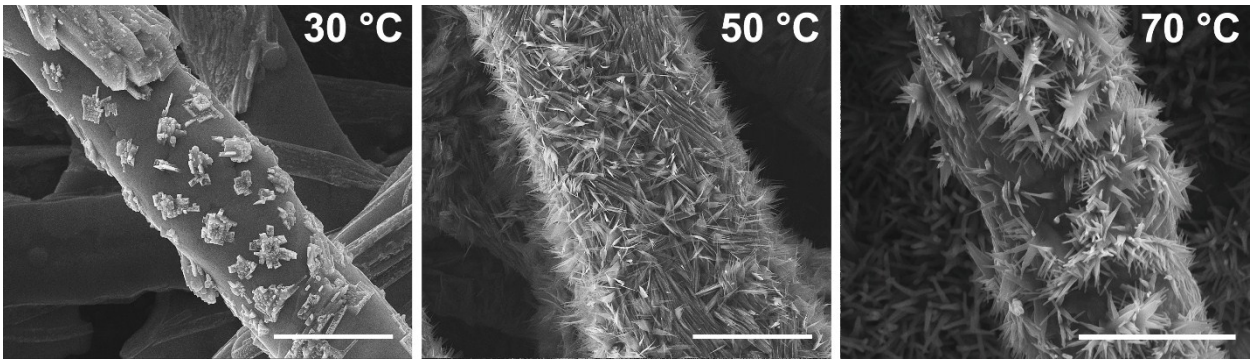


Figure Sx. Scanning electron micrographs for syntheses at various temperatures. All scale bars 10 μm.

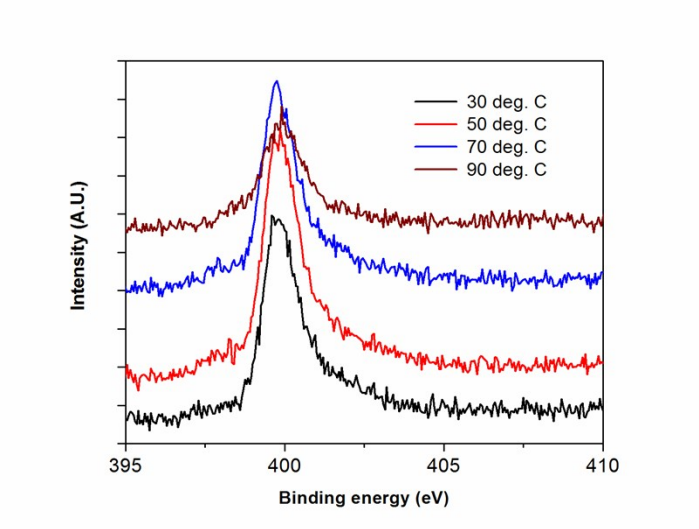


Figure S8. N_{1s} XPS spectra of samples synthesized at various temperatures from 30 to 90 °C.

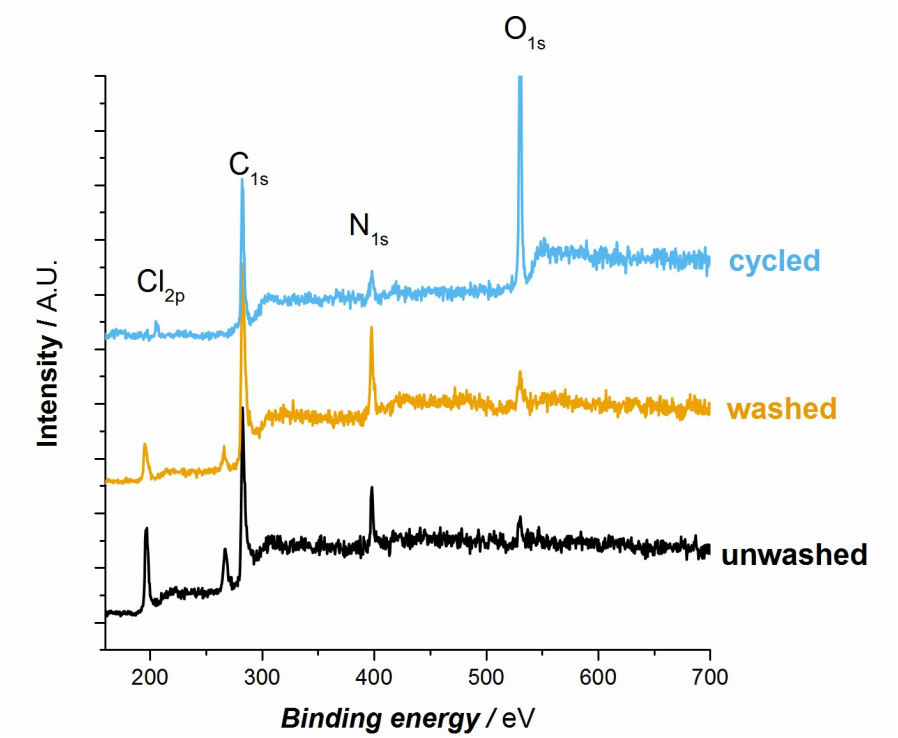


Figure S9. XPS survey scans of unwashed, washed, washed and cycled samples.

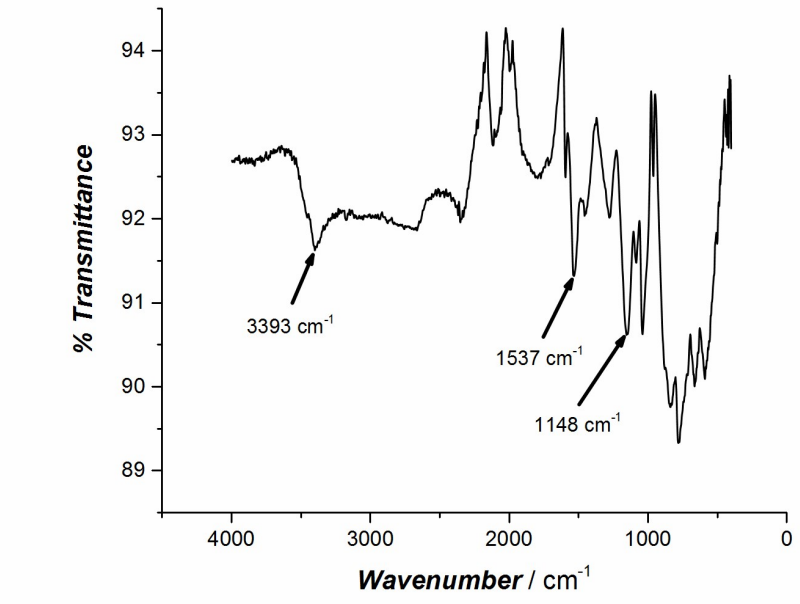


Figure S10. FTIR spectrum of a purified PPy sample.

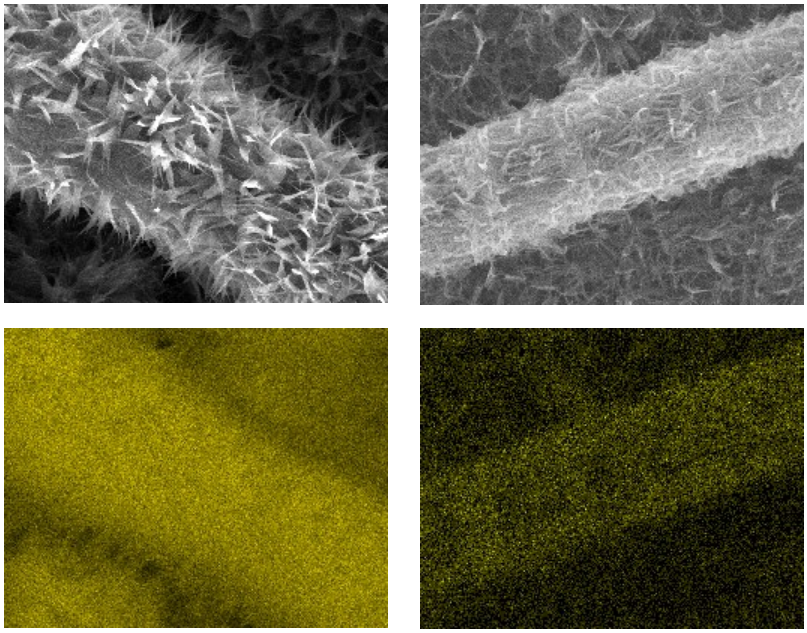


Figure S11. EDS maps show the Cl_{1s} signal for unwashed (left) and washed (right) PPy samples.

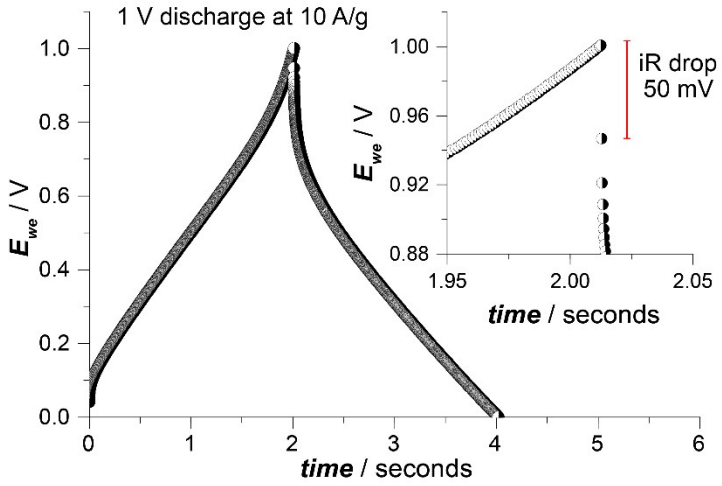
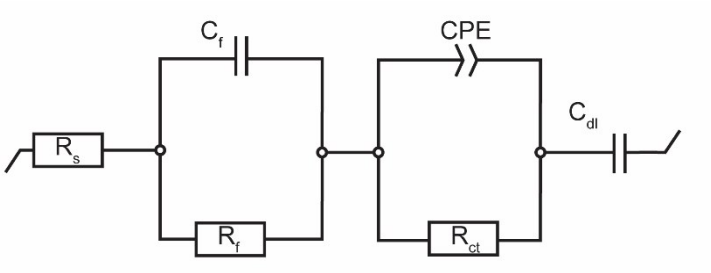


Figure S12. Galvanostatic charge-discharge curve for 1 V PPy supercapacitor at 10 A/g. Inset: Magnification of iR drop.

Table S1. Nyquist equivalent circuit fitting parameters for a single PPy on hard carbon paper electrode in 1 M $LiClO_4$.



Equivalent circuit: $R_1+C_1/R_2+Q_1/R_3+C_2$

Parameter	Value	Unit
$\mathbf{R_s}$	1.661	Ω
$\mathbf{C_f}$	0.2633	mF
$\mathbf{R_f}$	0.1952	Ω
$\mathbf{Q_1}^*$	0.3541	$Fs^{(a-1)}$
$\mathbf{A_1}^*$	0.496	
$\mathbf{R_{ct}}$	6.07	Ω
$\mathbf{C_{dl}}$	0.09166	F

$$\frac{\chi^2}{|Z|} = 9.098 \times 10^{-3}$$

*Calculated as C_{pseudo} = 0.7705 F from constant phase element with an equivalent circuit reduced to $R_1+C_1/R_3+C_1/R_2+C_2$ using the equation:

$$\frac{1}{2\pi(RQ)^{1/\alpha}} = \frac{1}{2\pi RC}$$

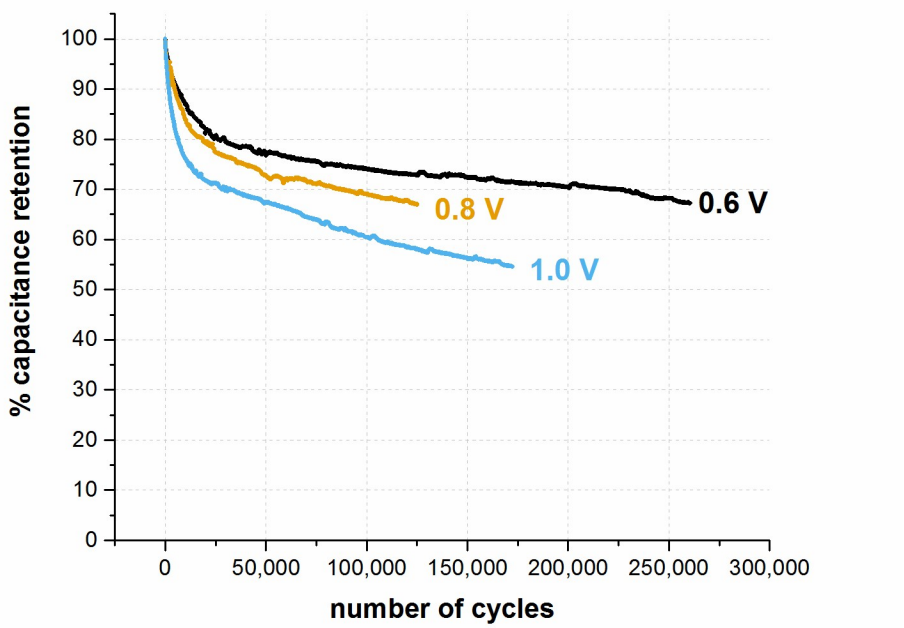


Figure S13. Extended cycling stability at 5 A/g shows that a device with a maximum charging voltage of 0.6 V retains roughly 70% initial capacitance over 200 000 cycles.