# Supporting information

## Interface engineering of calligraphic ink mediated conformal polymer fibers for advanced flexible supercapacitors

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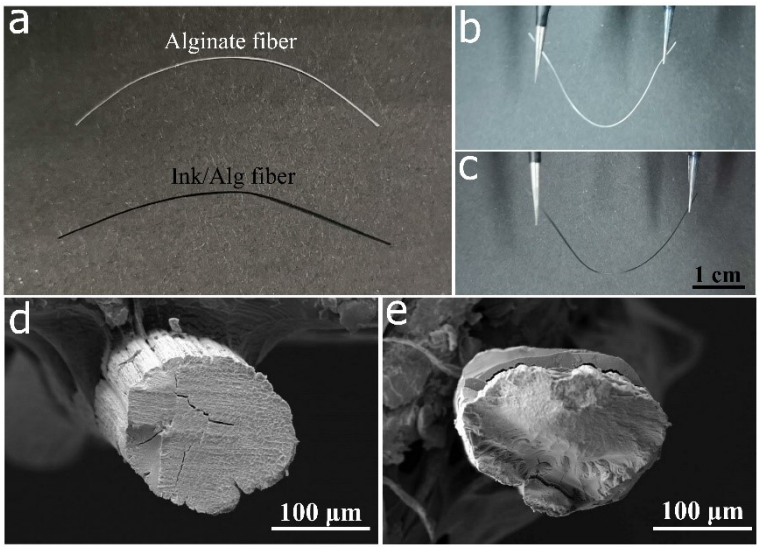


Fig. S1 (a-c) Photographs of obtained alginate (Alg) fiber (b) and Ink/Alg fiber (c), showing the color change from white to black. (d-e) Cross-sectional SEM images of Alg fiber (d) and Ink/Alg fiber (e).

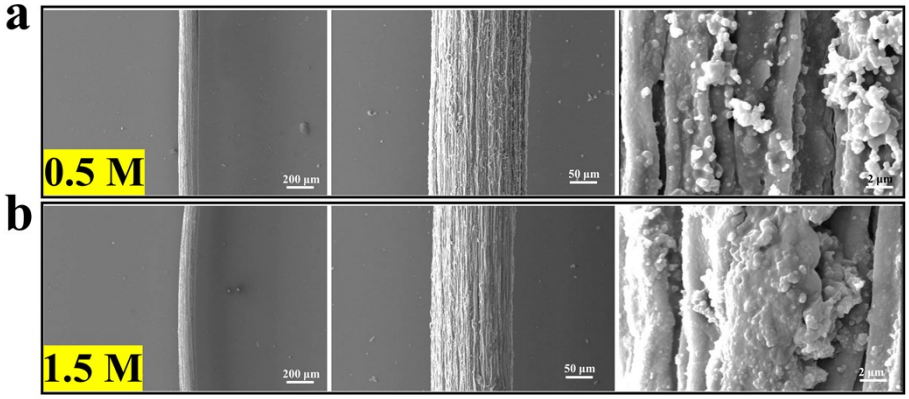


**Fig. S2** (a) SEM images of $PPy_{0.5\text{-}60}$/Ink/Alg. (b) SEM images of $PPy_{1.5\text{-}60}$/Ink/Alg.

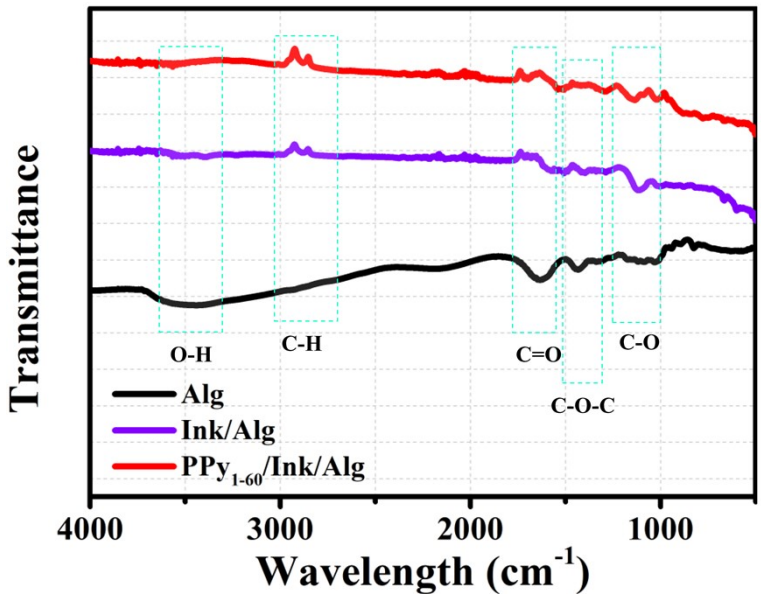


**Fig. S3** FT-IR spectra of Alg, Ink/Alg and $PPy_{1\text{-}60}$/Ink/Alg.

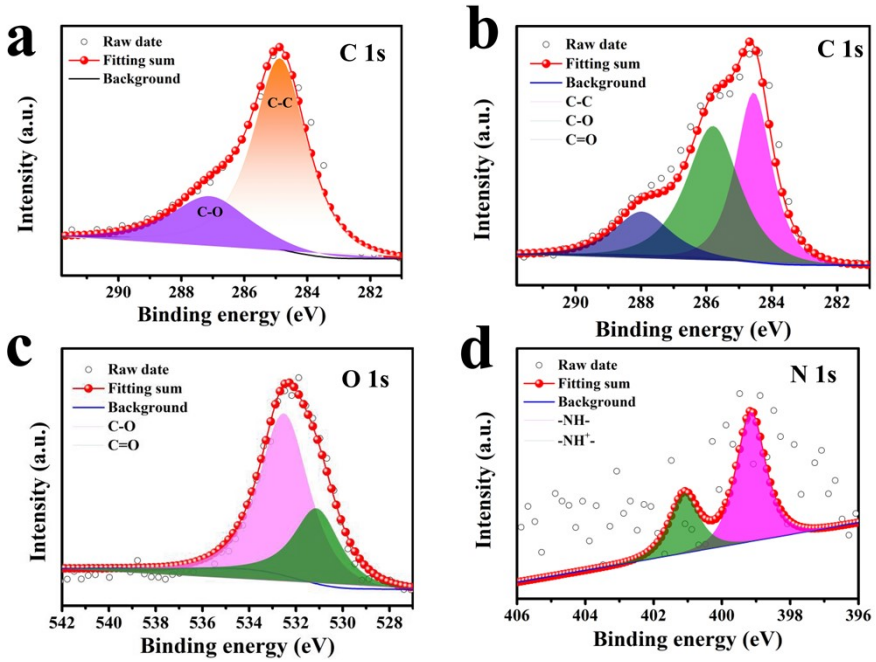


**Fig. S4** (a) C 1s XPS spectra of $PPy_{1\text{-}60}$/Ink/Alg. (b-d) High-resolution XPS spectra of Alg, showing C 1s (b), N 1s (c) and O 1s (d).

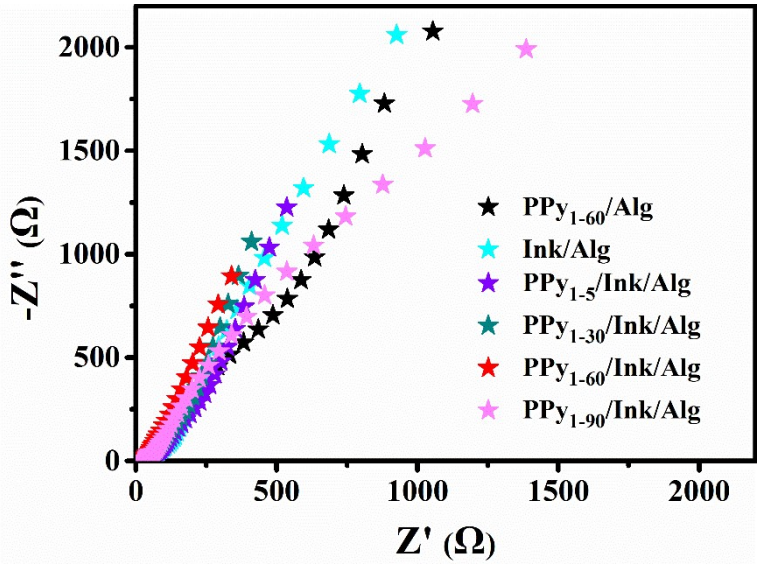


**Fig. S5** Nyquist plots of $PPy_{1\text{-}60}$/Alg, Ink/Alg and $PPy_{1\text{-}y}$/Ink/Alg ($y$ = 5, 30, 60 and 90 min).

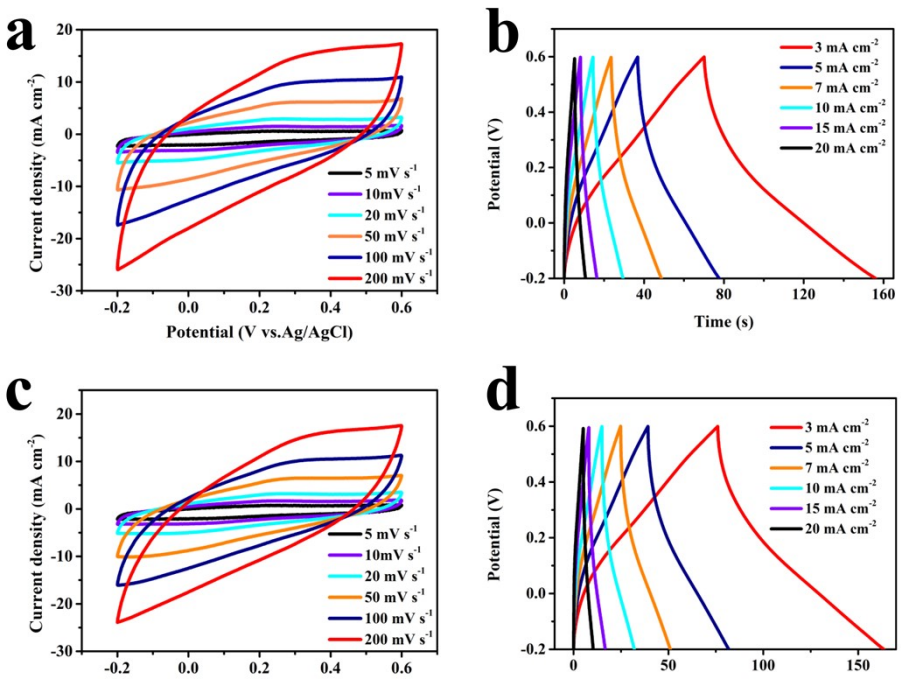


**Fig. S6** (a-b) CV curves and GCD profiles of $PPy_{0.5\text{-}60}$/Ink/Alg at different scan rates and areal current densities. (c-d) CV cures and GCD profiles of $PPy_{1.5\text{-}60}$/Ink/Alg at different scan rates and areal current densities.

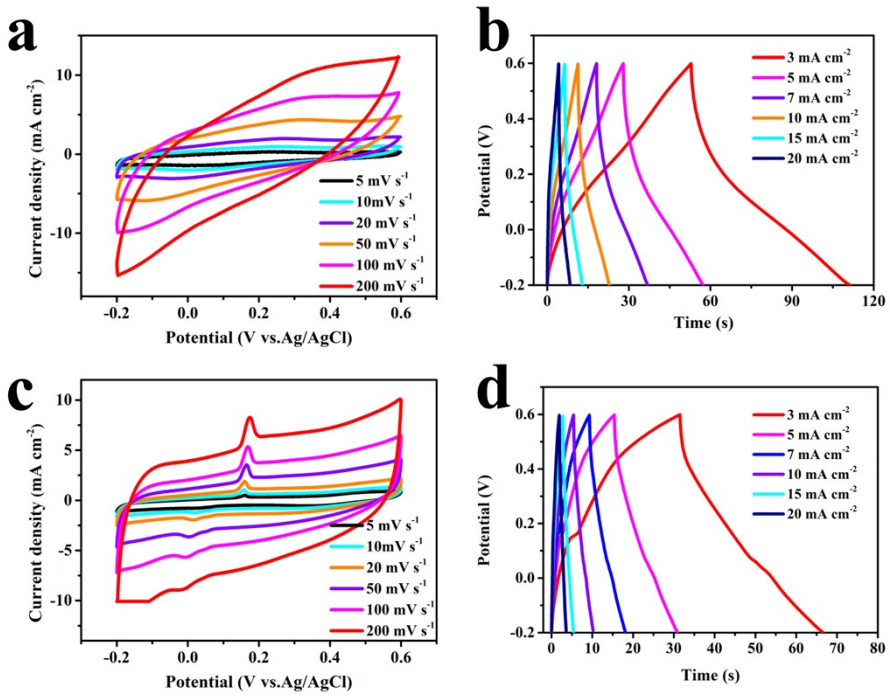


**Fig. S7** (a-b) CV curves and GCD profiles of Ink/Alg at different scan rates and areal current densities. (c-d) CV curves and GCD profiles of $PPy_{1\text{-}60}$/Alg at different scan rates and areal current densities.

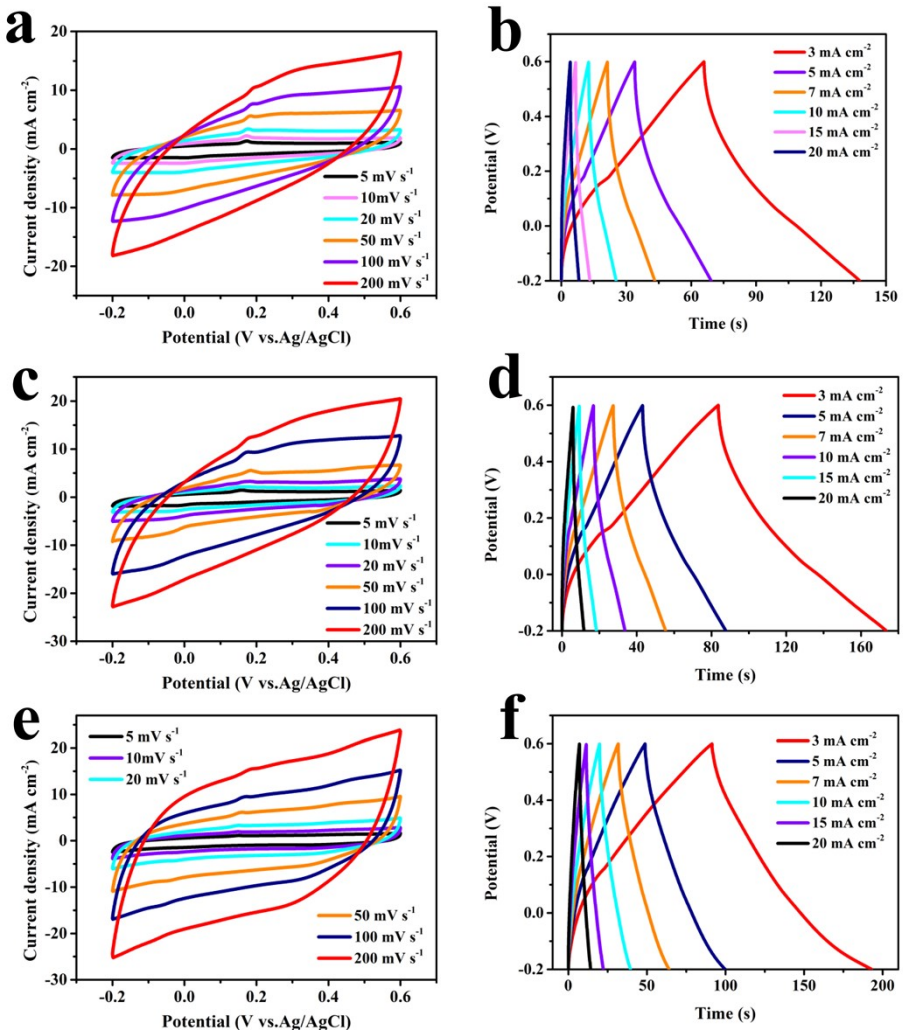


**Fig. S8** (a-b) CV and GCD profiles of $PPy_{1\text{-}5}$/Ink/Alg at different scan rates and areal current densities. (c-d) CV and GCD profiles of $PPy_{1\text{-}30}$/Ink/Alg at different scan rates and areal current densities. (e-f) CV and GCD profiles of $PPy_{1\text{-}90}$/Ink/Alg at different scan rates and areal current densities.

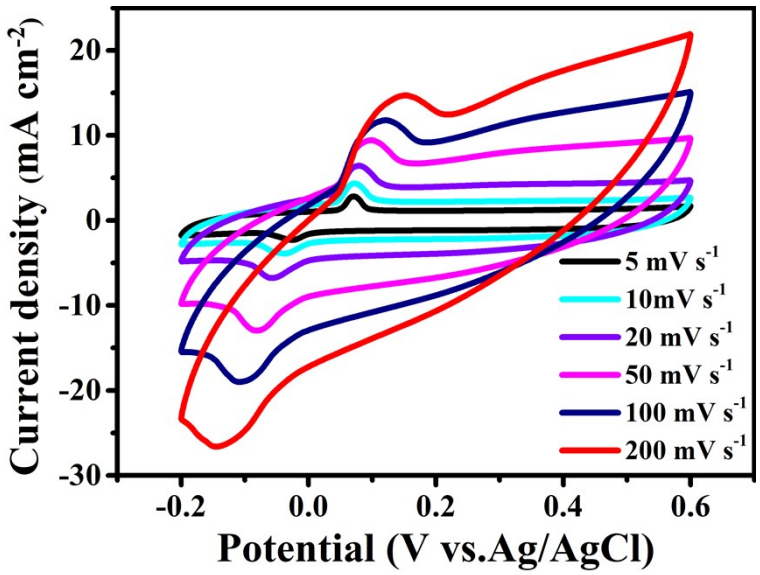


**Fig. S9** CV profiles of $PPy_{1\text{-}60}$/Ink/Alg at different scan rates (1 M KCl aqueous solution served as electrolyte).

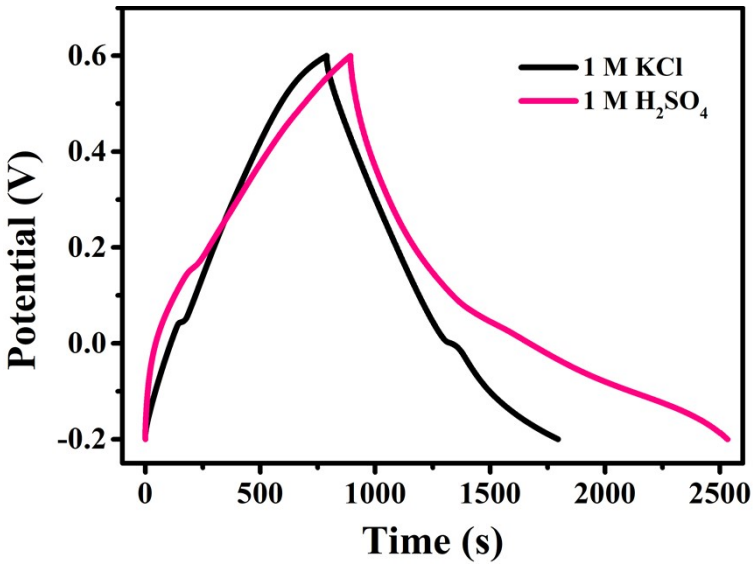


**Fig. S10** GCD profiles of $PPy_{1\text{-}60}$/Ink/Alg at different electrolytes.

**Table S1** XPS peak fitting results of Alg and $PPy_{1\text{-}60}$/Ink/Alg.

| Sample | C (at. %) | | | N (at. %) | | O (at. %) | | Ca (at. %) |
|---|---|---|---|---|---|---|---|---|
| | C=O | C-O | C-C | $-NH^{+}-$ | -NH- | C=O | C-O | |
| **Alg** | 8.95 | 25.81 | 22.57 | 0.48 | 1.04 | 16.98 | 19.77 | 4.39 |
| **$PPy_{1\text{-}60}$/Ink/ Alg** | | 17.25 | 53.48 | 6.17 | 5.50 | 2.37 | 5.50 | 0.40 |

**Table S2** Specific capacities of $PPy_{1\text{-}60}$/Ink/Alg at areal current densities.

| I (mA $cm^{-2}$) | 0.5 | 0.7 | 1 | 1.5 | 2 | 3 | 4 | 5 | 7 | 10 | 15 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $C_A$ (mF $cm^{-2}$) | 1025.6 | 816.4 | 640.0 | 546.6 | 507.3 | 430.9 | 366.5 | 355.0 | 314.1 | 271.3 | 226.9 | 192.5 |

**Table S3** Volumetric specific capacitances of the composite fiber and the corresponding supercapacitor at different scan rates.

| Scan rate (mV $s^{-1}$) | 5 | 10 | 20 | 50 | 100 | 200 |
|---|---|---|---|---|---|---|
| $C_{PPy/Ink/Alg}$ (F $cm^{-3}$) | 85.5 | 75.9 | 62.0 | 44.2 | 31.2 | 21.1 |
| Scan rate (mV $s^{-1}$) | 1 | 2 | 3 | 4 | 5 | 10 |
| $C_{FESCs}$ (F $cm^{-3}$) | 6.3 | 5.8 | 5.4 | 5.1 | 4.8 | 3.7 |