

# Poly(3,4-ethylenedioxythiophene): Polystyrene Sulfonate (PEDOT:PSS) as Insulin Carrier in Silk Fibroin Hydrogel for Transdermal Delivery via Iontophoresis

## Supporting Information

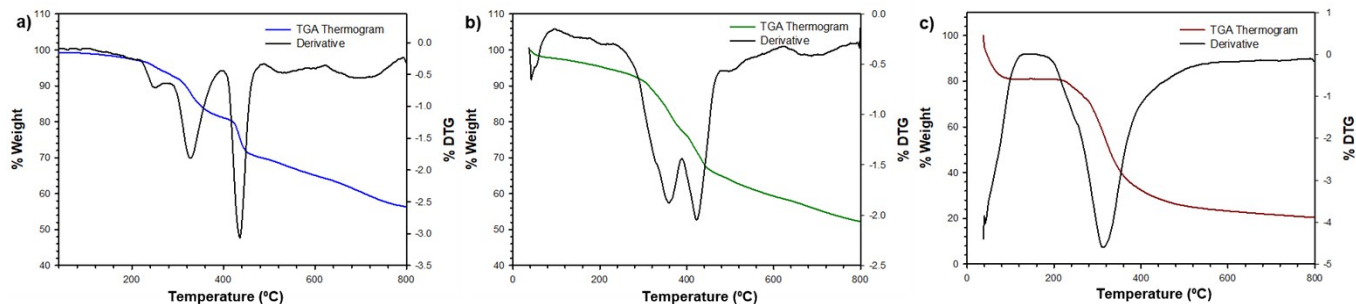
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**Fig. S1** The TGA thermograms and derivatives of: a) Insulin powders; b) PEDOT: PSS; c) Insulin loaded PEDOT: PSS.

Sample Code	$T_d$ (°C)	% Weight loss
Insulin powders	313	56.58%
PEDOT: PSS	360	18.35%
	428	19.23%
Insulin loaded PEDOT: PSS	250	4.13%
	326	12.33%
	414	17.27%

**Table S1**  $T_d$  and % weight losses of insulin powder, PEDOT: PSS, and Insulin loaded PEDOT: PSS

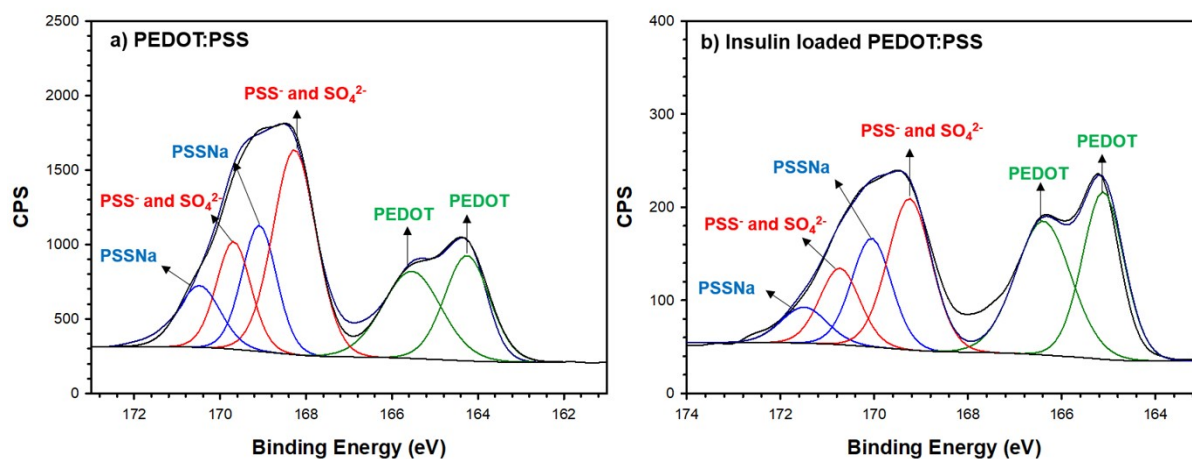


Fig. S2 High resolution XPS spectra of S 2p of: (a) PEDOT:PSS; and (b) Insulin loaded PEDOT:PSS.

Table S2 XPS deconvoluted contribution of S 2p (sulphur)

Sample Code	% PEDOT	% PSS <sup>-</sup> and SO <sub>4</sub> <sup>2-</sup>	% PSSNa
PEDOT: PSS	33.43	45.07	21.49
Insulin loaded PEDOT: PSS	47.87	36.45	15.68

**Table S3 The percentages of cell viability from the MTT cytotoxicity assay**

<b>Sample Code</b>	<b>OD 570 nm</b>	<b>% Cell Viability (p value &lt;0.01)</b>
Blank	0.447	100
3.0 %w/v SF	0.391	87
5.0 %w/v SF	0.403	90
PEDOT:PSS_3.0 %w/v SF	0.360	80

$$\% \text{ Cell Viability} = 100 \times \text{OD}_{570\text{e}} / \text{OD}_{570\text{b}}$$

where  $\text{OD}_{570\text{e}}$  is the mean value of the measured optical density of the 100% extracts of the test sample, and  $\text{OD}_{570\text{b}}$  is the mean value of the measured optical density of the 100% extracts of the blanks.

**Table S4 The swelling times to equilibrium, the percentages of swelling, and the mesh sizes of SF hydrogels and PEDOT:PSS/SF hydrogels of various concentrations, with and without electric**

Conditions	Electric Voltages (V)	pH	Swelling time to Equilibrium (min)	% Swelling	Mesh Size (Å)
3%w/v SF	0.0	7.4	90	111 ± 16	13.7
	3.0	7.4	85	140 ± 21	48.8
	6.0	7.4	75	154 ± 19	63.8
4%w/v SF	0.0	7.4	100	93 ± 12	12.8
5%w/v SF	0.0	7.4	110	61 ± 13	12.3
PEDOT:PSS_ 3%w/v SF	0.0	5.5	80	652 ± 18	21.3
	0.0	7.4	70	850 ± 26	26.5
	3.0	7.4	50	964 ± 62	324.1
	6.0	7.4	40	1137 ± 30	473.2
PEDOT:PSS_ 4%w/v SF	0.0	7.4	90	787 ± 53	21.1
PEDOT:PSS_ 5%w/v SF	0.0	7.4	100	573 ± 76	19.7

**voltages**

Remarks: The p values of the percentage of swelling for the effects of SF concentrations (3 %, 4 %, and 5 %w/v SF), and electrical voltages (3 %w/v SF at 0.0, 3.0, 6.0 V) were < 0.01, and < 0.05, respectively.

The p values of the percentage of swelling for the effects of PEDOT:PSS/SF concentrations (PEDOT:PSS\_3 %, 4 %, and 5 %w/v SF), pHs (PEDOT:PSS\_3 %w/v SF at pHs 5.5 and 7.4), and electrical voltages (PEDOT:PSS\_3 %w/v SF at 0.0, 3.0, 6.0 V) were < 0.01, <0.01, and < 0.01, respectively.