Electronic Supplementary Material (ESI) for Materials Advances.

pH-responsive and antibacterial PANI-PEDOT:PSS fibres for wearable applications

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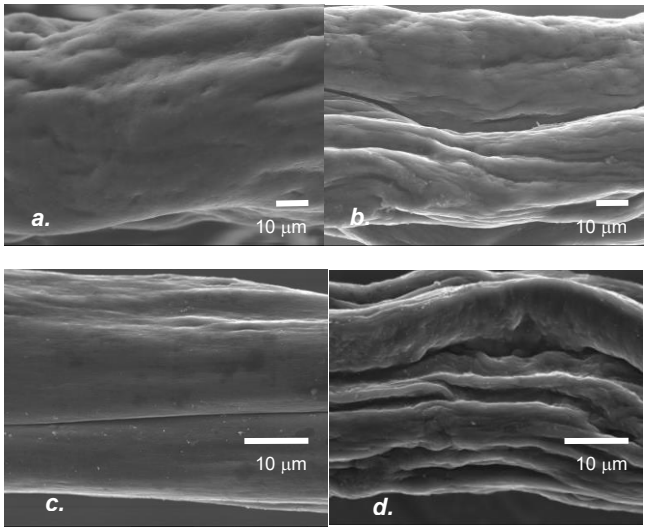


Fig. S1 SEM images of the PEDOT:PSS fibres: (a) thick with no post-solvent treatment, (b) thick with DMSO treatment, (c) thin with no post-solvent treatment, and (d) thin with DMSO treatment.

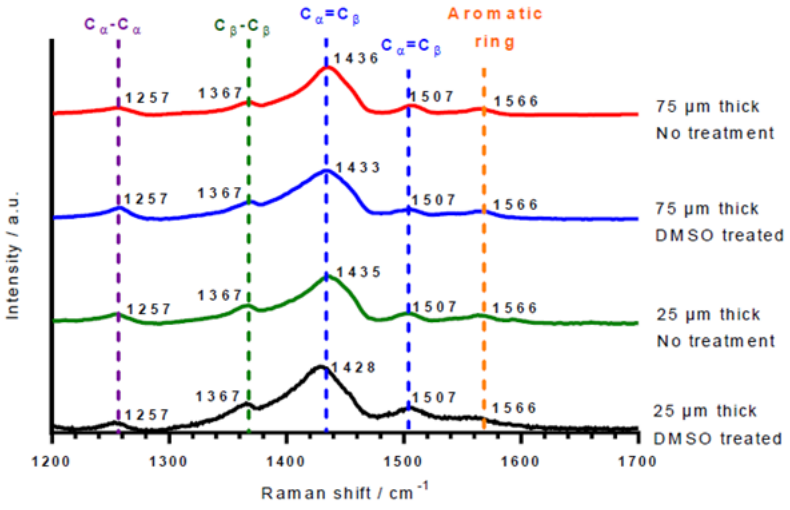
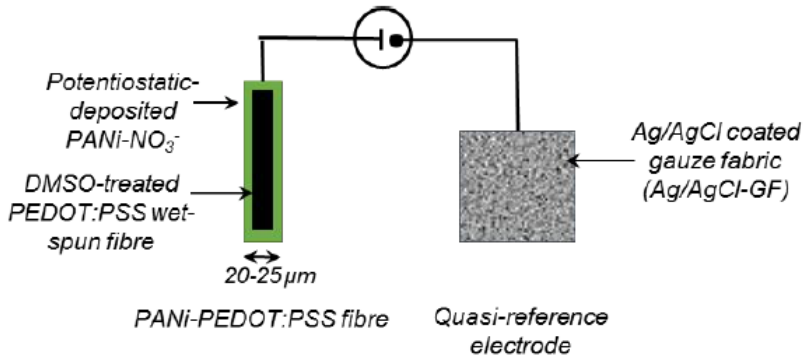
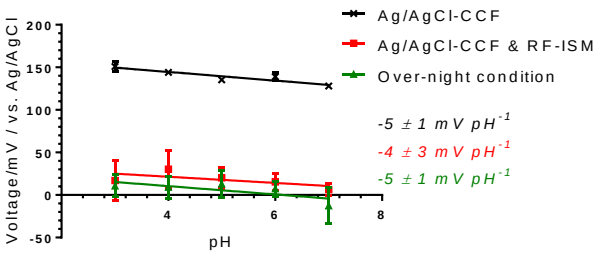


Fig. S2 Raman spectra of PEDOT:PSS fibres: (a) thick with no post-solvent treatment, (b) thick with DMSO treatment, (c) thin with no post-solvent treatment, and (d) thin with DMSO treatment.

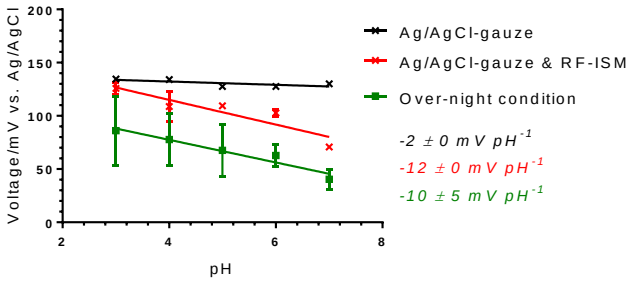
Table S1 Raman spectra assignments for PANi-PEDOT:PSS fibres.

Raman shift / cm^{-1}	Assignments
1163	C-H bending (quinoid diimine segment; bipolaron)
1190	C-H bending (semiquinone radical cation segment; polaron)
1221-1222	C-N stretching (benzenoid diamine)
1340	C-N+. stretching (semiquinone radical cation segment; polaron)
1484-1486	C=N and CH=CH stretching (quinoid diimine)
1593-1596	C=C ring stretching (quinoid diimine)
1615-1624	C-C ring stretching (benzenoid diamine)





(a)



(b)

Fig. S3 pH sensitivity of (a) carbon fibres (CF) and (b) gauze coated with Ag/AgCl ink, Ag/AgCl and reference membrane with and without overnight conditioning. The error bars represent the standard deviation of three replicate measurements.

Scanning Electron Microscopy

The SEM images suggest an explanation for the limited success of the reference membrane in contrast to the bare Ag/AgCl-coated substrates. The surface of the bare Ag/AgCl-coated substrates is cured/dried, which is consistent with published images of cured Ag/AgCl surfaces (Fig. S3(a) and (c)).[1,2] Ag/AgCl-CF surface shows more ridges than the Ag/AgCl-gauze because CF are a circular bundle compared to the flat surface of the gauze. Consequently, the Ag/AgCl coating on the gauze has cured more smoothly. In contrast, the Ag/AgCl-coated substrates dipped in the reference membrane displayed large pores in the membrane and NaCl salt crytals. These observations correlate with the unstable response with pH variation displayed by the substrates because the holes would accelerate the leaching of Cl^- ions from the membrane.

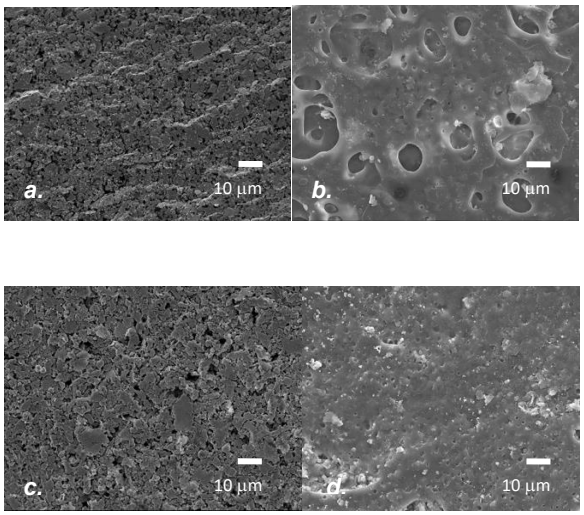


Fig. S4 Scanning electron microscopy images of (Ag/AgCl-coated carbon fibres (CF) (a) without and (b) with reference membrane (RF-ISM), and Ag/AgCl-gauze (c) without and (d) with reference membrane (RF-ISM).

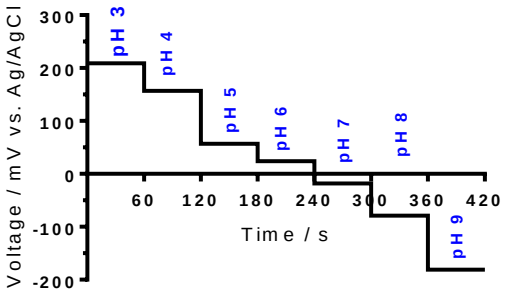


Fig. S5 Potentiometric response of solid-state pH analysis: response time in buffered solution to varying pH levels (vs. Ag/AgCl pseudoreference electrode).

References

[1] A. E. Musa, F. J. D. Campo, N. Abramova, M. Alonso-Lomillo, O. Dominguez-Renedo, M. J. Acros-Martinez, M. Brivio, D. Snakenborg and O. Geschke, "Disposable miniaturised screen-printed pH and reference electrodes for potentiometric systems." Electroanalysis, vol. 23, pp. 115-121, 2011.

[2] N. K. Kwon, K. S. Lee, M. S. Won and Y. B. Shim, "An all-solid-state reference electrode based on the layer-by-layer polymer coating." Analyst, vol. 132, pp. 906-912, 2007.