

## Supporting Information

### Flexible Composites with Variable Conductivity and Memory of Deformation Obtained by Polymerization of Polyaniline in PVA Hydrogel

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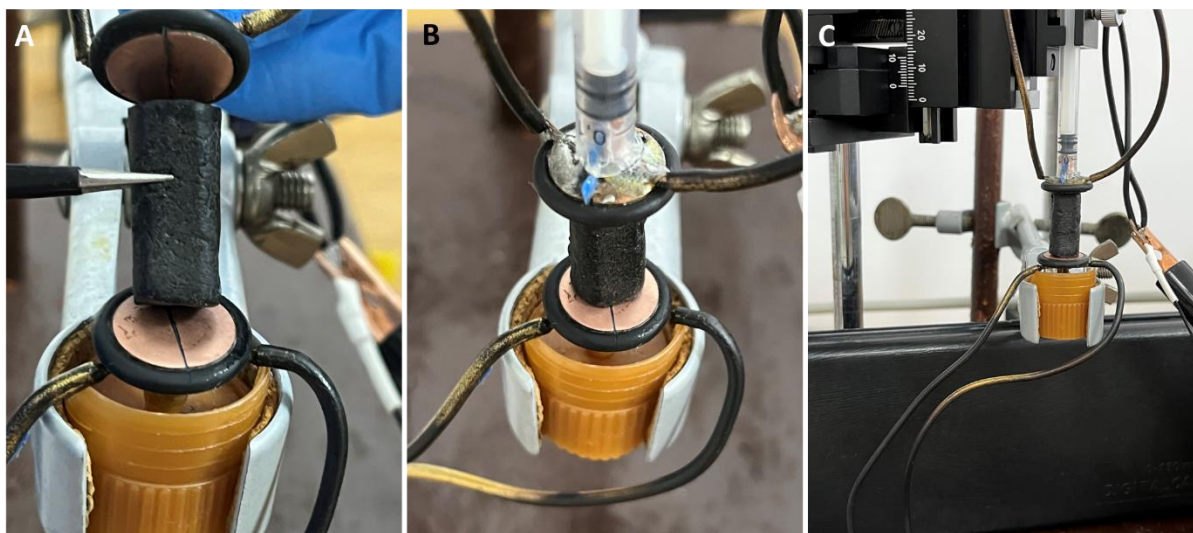
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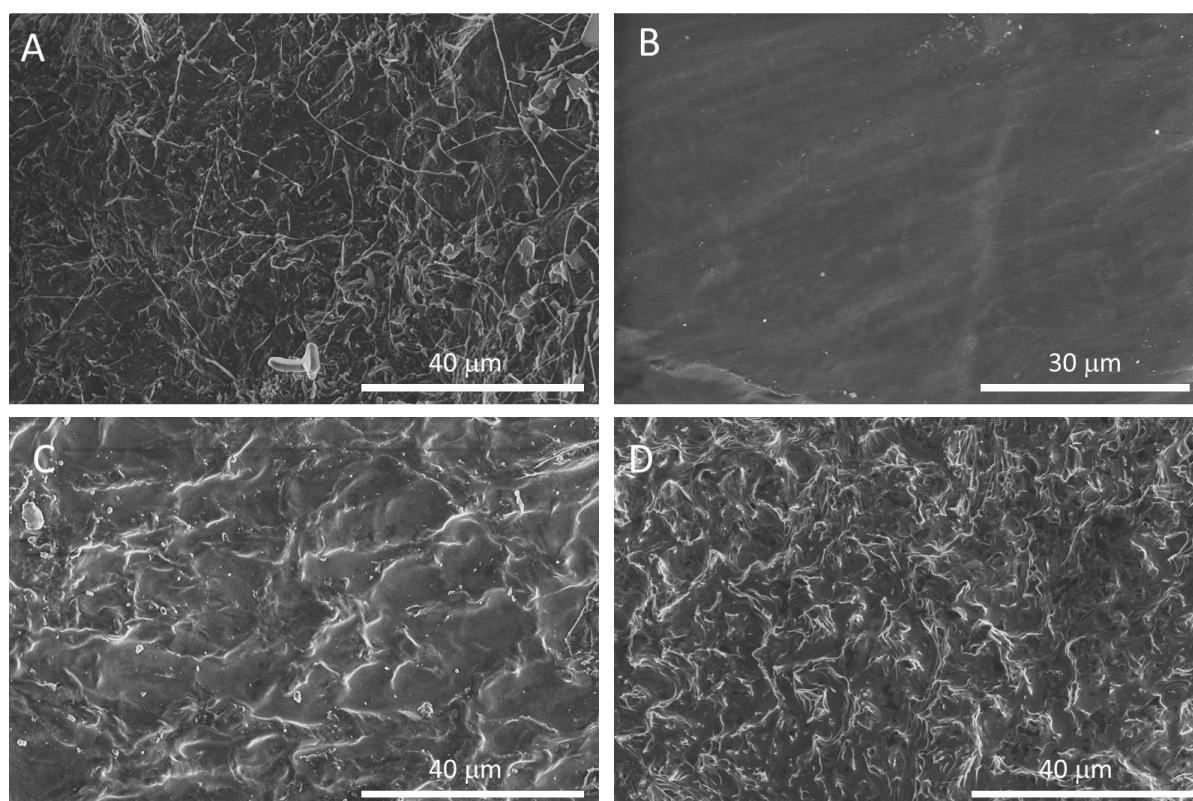
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**Table S1.** Conductivity function of composition, relative weight content of PANi and Glycerol to PVA, whereas the PVA reference concentration is unity.

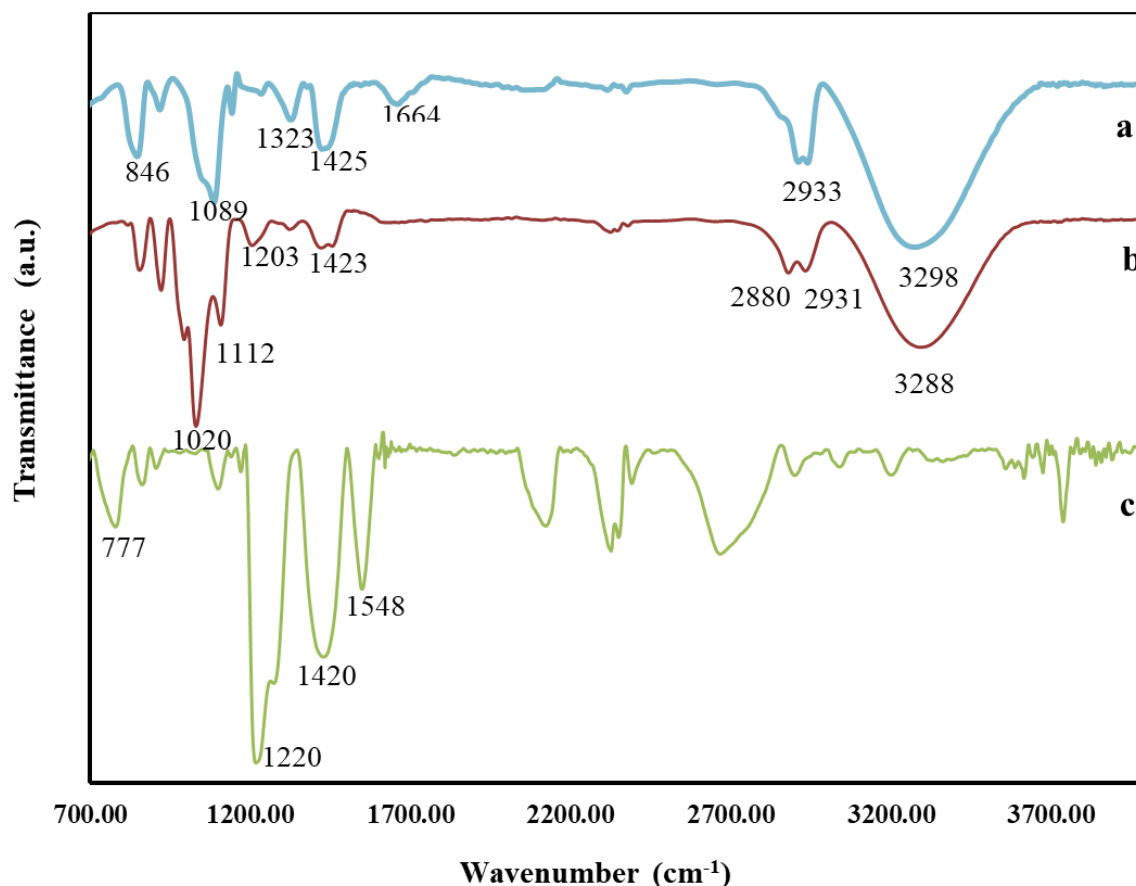
Sample name	Conductivity			Observations
	(S/cm)	PANi:PVA	Gly:PVA	
AM2	1.6E-05	1: 1	2: 1	rubbery
AM7	1.7E-04	1: 1	5: 1	rubbery
AM8	5.3E-04	1: 1	10: 1	soft, gel-like
AM9	6.0E-05	2: 1	5: 1	brittle rubber
AM10	2.2E-05	5: 1	5: 1	brittle rubber
AM11	4.6E-05	5: 1	10: 1	brittle rubber
AM1	3.6E-08	1: 1	0: 1	hard rubber
AM3	1.0E-10	0: 1	0: 1	glassy, hard, brittle
AM4	1.7E-06	0: 1	0.5: 1	soft, sticky



**Figures S1.** Photograph of the electrical measurement set-up: **(A)** the four-point probe set-up with disk shaped copper electrodes, whereas the four-point contacts were achieved by using hemispherical copper disks glued together by electrically insulating epoxy resin; **(B)** the PANi/PVA composite fixed between the copper electrodes; **(C)** cylindrical PANi/PVA composite immobilized between the copper electrode, the top Cu electrode is controlled by a micromanipulator.



**Figure S2.** SEM images of the (A) AM1, (B) AM3, (C) AM4, and (D) AM7.



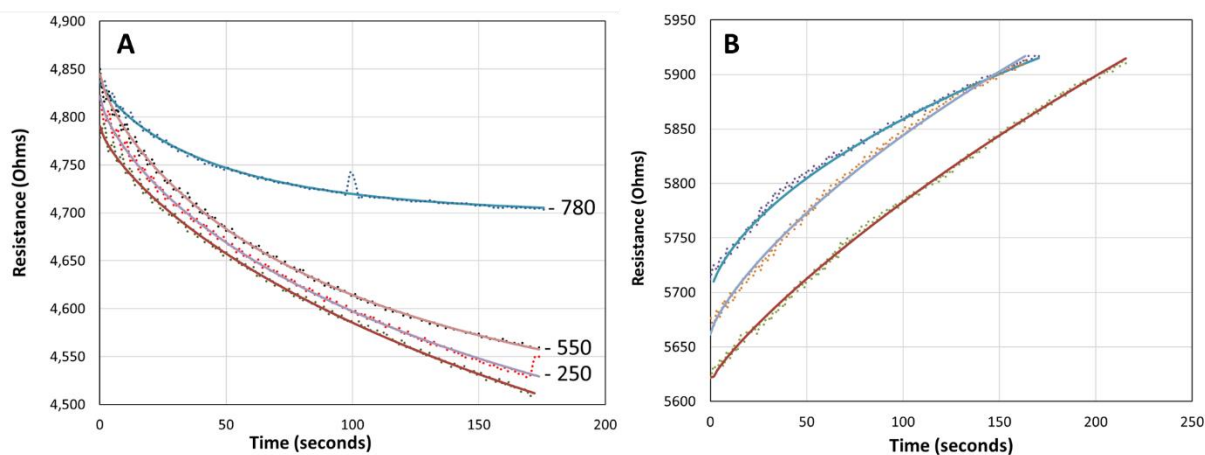
**Figure S3.** FTIR spectra of a) PVA, b) Gly and c) PANi.

Figure S3 shows the FTIR spectra of pure components PANi, Gly and PVA used in the synthesis of the composite. First, in the spectrum of PVA the characteristic bands appear at  $3298\text{ cm}^{-1}$  that can be assigned to the O-H stretching vibration, while that at  $2933\text{ cm}^{-1}$  and  $1425\text{ cm}^{-1}$  are specific to stretching vibration and bending vibration of C-H in  $\text{CH}_2$ . At  $1664\text{ cm}^{-1}$  we find the band specific to the stretching of C=O group, most likely originating in the acetate impurities (PVA is obtained from acetate by hydrolysis)[1].

Gly spectrum presents a wide band at  $3288\text{ cm}^{-1}$  which is due to O-H group. The bands at  $2931\text{ cm}^{-1}$  and  $2880\text{ cm}^{-1}$  belong to the C-H stretching of the alkyl groups [2]. The peaks at  $1423\text{ cm}^{-1}$  and  $1215\text{ cm}^{-1}$  correspond to the C-H bonds and those from  $1020\text{ cm}^{-1}$  and  $1112\text{ cm}^{-1}$  is attributed to C-O bonds [3]

PANi spectrum presents the main bands located at  $1548\text{ cm}^{-1}$  assigned to C=C stretching of the quinoid rings, at  $1420\text{ cm}^{-1}$  due to C=C stretching vibration of benzenoid rings, at  $1220\text{ cm}^{-1}$  –C-N stretching vibration and at  $777\text{ cm}^{-1}$  C-H out of plane bending of 1,4 rings [4]. In the region  $2250\text{ -}2700\text{ cm}^{-1}$  in FTIR spectrum appear the ammonium ions ( $\text{NH}_4^+$ )

and because the synthesis of polyaniline was performed using APS as oxidant the peaks specific to ammonium cations, which inevitably remain in the sample, can also appear in this region.



**Figure S4.** Fitting of the equilibration (**A**) and relaxation regions (**B**) of the curve in Figure 4B, main text, with the Kohlrausch-Williams-Watts function (KWW) function, Equation 1. The experimental data is represented by the dotted line and the fits by the solid lines. For better visualization, the curves in graph (A) were offset on the vertical axis by the quantities shown.

## References

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