

## Supporting Information

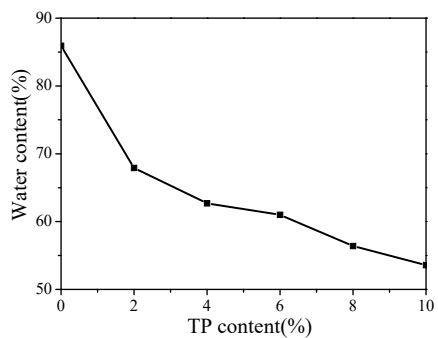
### Fabrication of polyvinyl alcohol hydrogels with excellent shape memory and ultraviolet shielding behavior via introduction of healthcare matter tea polyphenols

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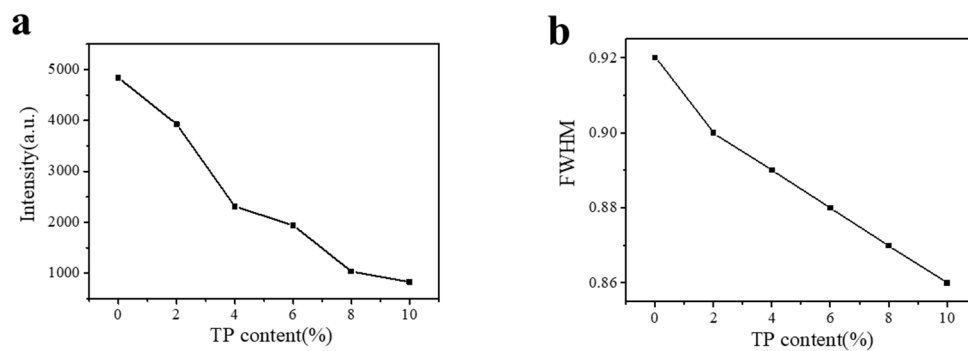
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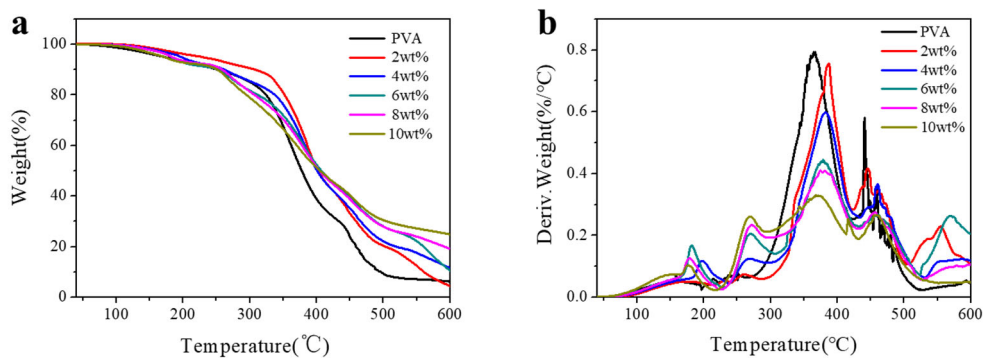
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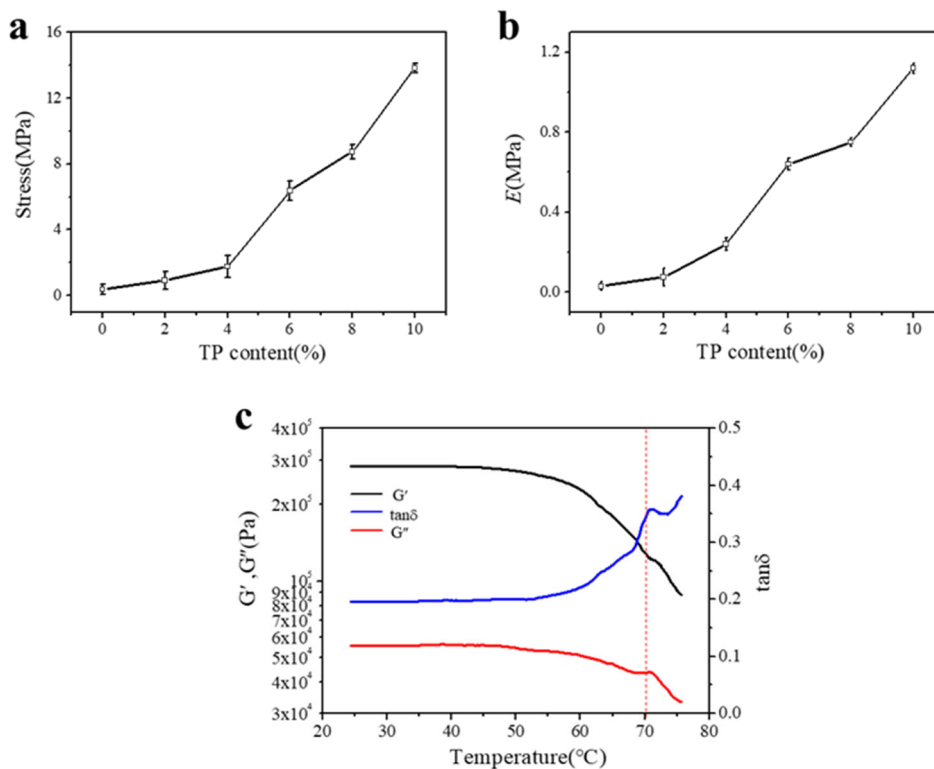
**Figure S1.** Water contents of the PVA/TP hydrogels measured at 25 °C as a function of TP content.



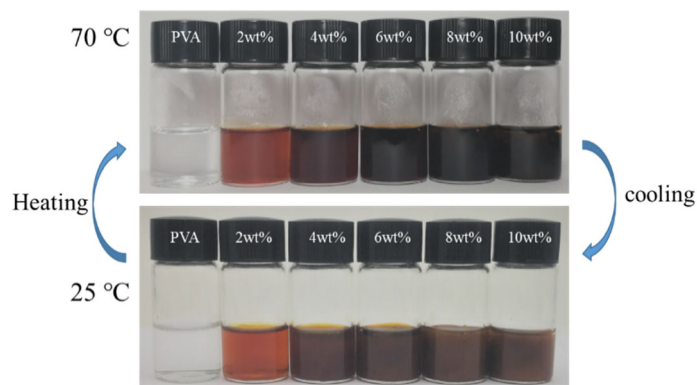
**Figure S2.** (a) Diffraction peak intensity and (b) FWHM at  $\theta = 20.3^\circ$  of the XRD pattern of PVA/TP hydrogels with different TP content.



**Figure S3.** (a) TGA and (b) DTG curves of PVA/TP hydrogels with different TP loadings.



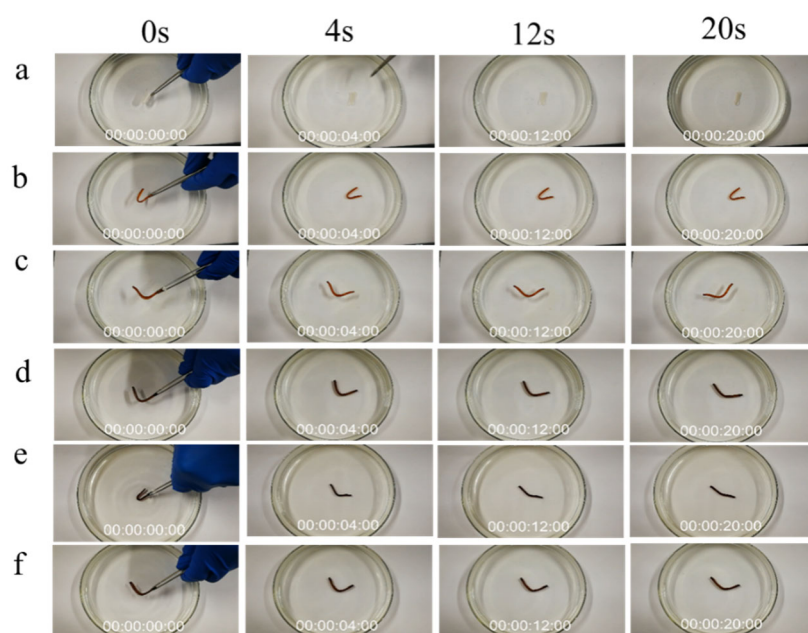
**Figure S4.** (a) Stress and (b) elastic moduli of PVA/TP hydrogels with different TP loadings. (c) Storage modulus ( $G'$ ), loss modulus ( $G''$ ), and loss factor ( $\tan\delta$ ) of the PVA/TP hydrogel (8 wt % TP) as a function of temperature.



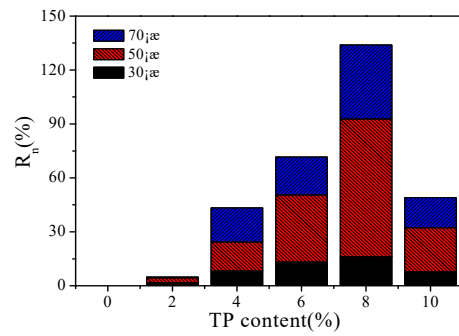
**Figure S5.** Photos of PVA/TP composite dispersions at different temperature.



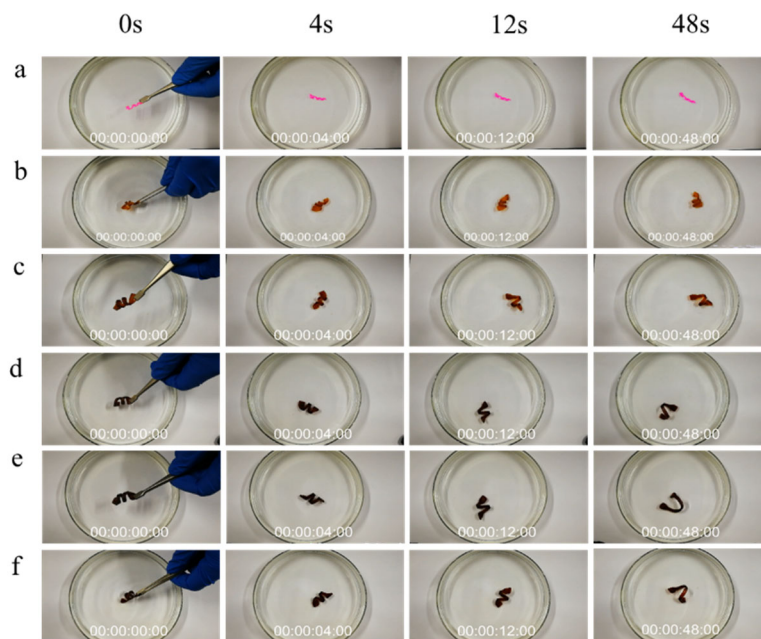
**Figure S6.** Schematic of angle measurement of a U-shaped PVA/TP hydrogel during shape recovering.



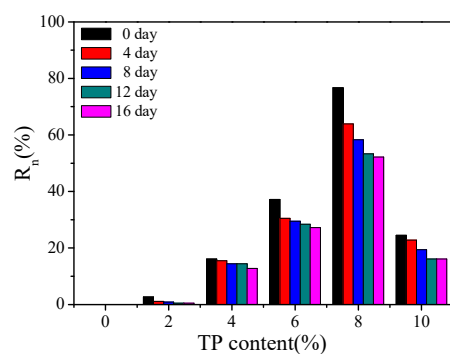
**Figure S7.** Shape memory behavior of PVA/TP hydrogels bent into U-shape in water at 50 °C. The content of TP in (a)-(f) corresponds to 0, 2, 4, 6, 8 and 10 wt%, respectively.



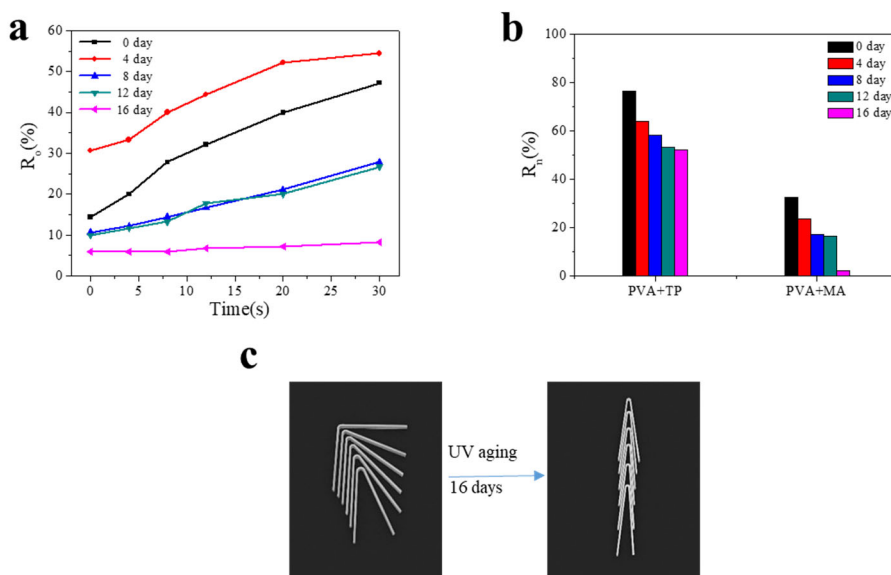
**Figure S8.** Net recovery rates ( $R_n$ ) of PVA/TP hydrogels with different TP loadings immersed in 30 °C, 50 °C and 70 °C water.



**Figure S9.** Shape memory behaviour of PVA/TP hydrogels bent into spring-like shape in 50 °C water. The content of TP in (a)-(f) corresponds to 0, 2, 4, 6, 8 and 10 wt%, respectively. In order to more clearly see the change of pure PVA (a), rhodamine B was added into the transparent PVA hydrogels.



**Figure S10.** Net recovery rates ( $R_n$ ) of PVA/TP hydrogels with different TP loadings after UV aging 4, 8, 12 and 16 days.



**Figure S11.** (a) Observed shape recovery rate ( $R_o$ ) of the PVA/MA hydrogel (MA loading was selected 1.5 wt%, with which the hydrogel showed the best shape memory behavior according to the literature<sup>1</sup>) after UV aging 4, 8, 12 and 16 days as a function of time, (b) Net recovery rate ( $R_n$ ) of the PVA/TP hydrogel and PVA/MA hydrogel after different UV aging time. (c) Schematic diagram of the shape recovery of PVA/MA hydrogels with (right) and without (left) UV irradiation.

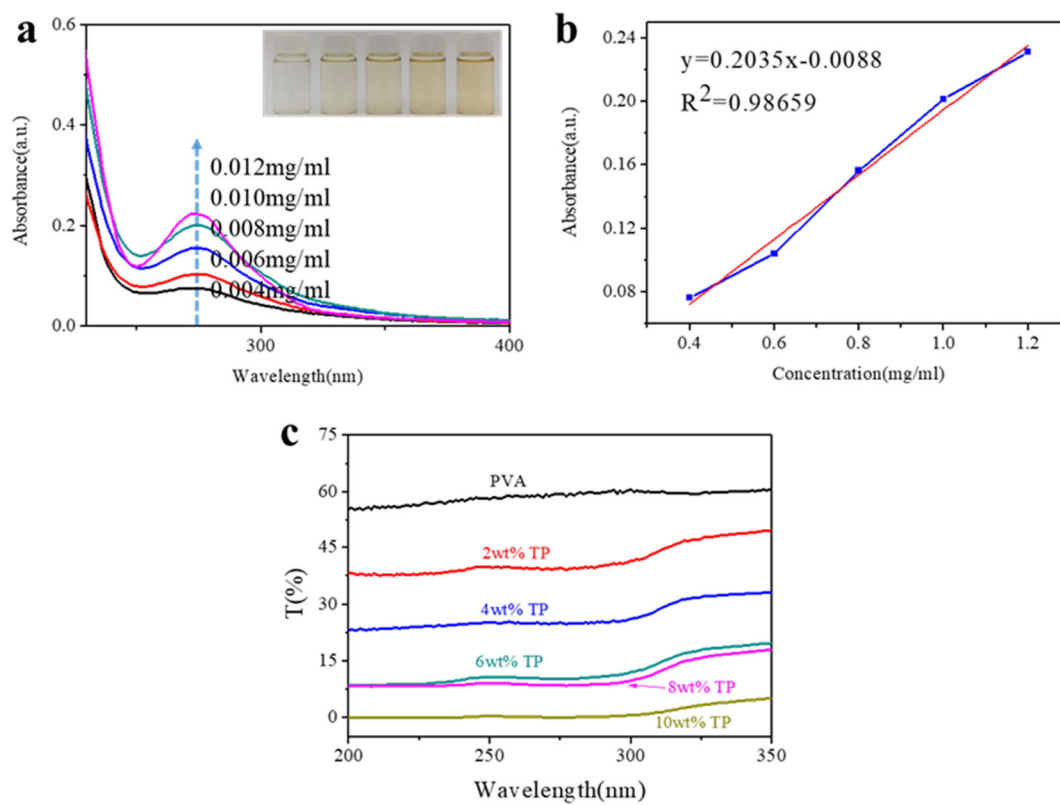


Figure S12. (a) UV-vis absorption spectra of TP dispersions in H<sub>2</sub>O. (b) Correlation of absorbance at 274 nm against the concentration of TP dispersions. (c) Ultraviolet transmission spectra of composite hydrogels at different TP contents.

## Reference

1 G. Li, Q. Yan, H. Xia and Y. Zhao, ACS Appl. Mater. Interfaces, 2015, 7, 12067-12073.

