

## Electronic Supplementary Information

# A Simple PVA/Cu(OAc)<sub>2</sub> Thermogel with Inherent Near-Infrared Light Response and Its Applications in Smart Window and Photoresistor

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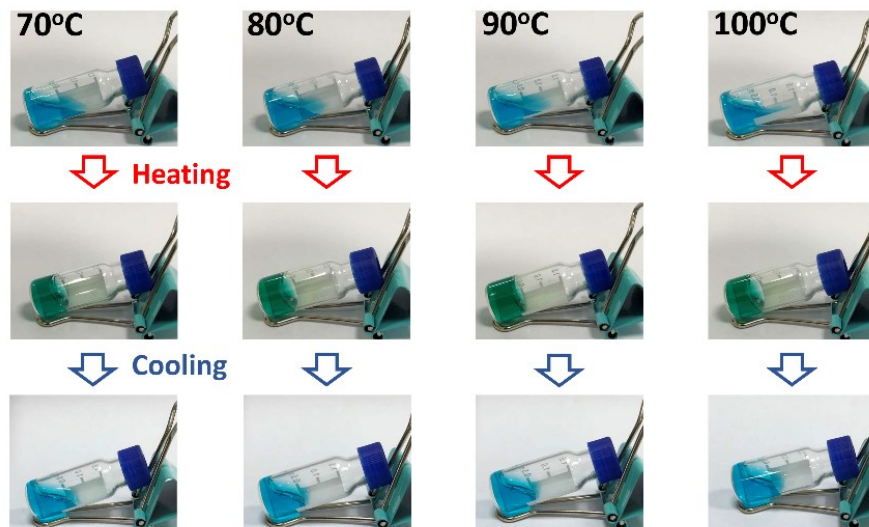
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The supporting information includes 8 pages and 15 figures.

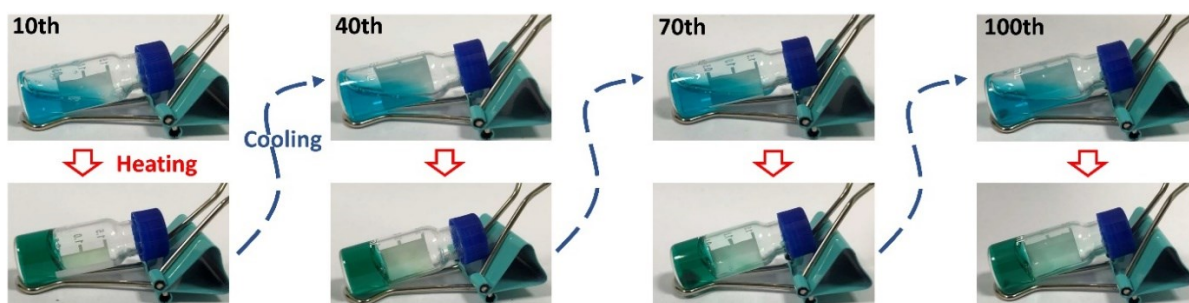
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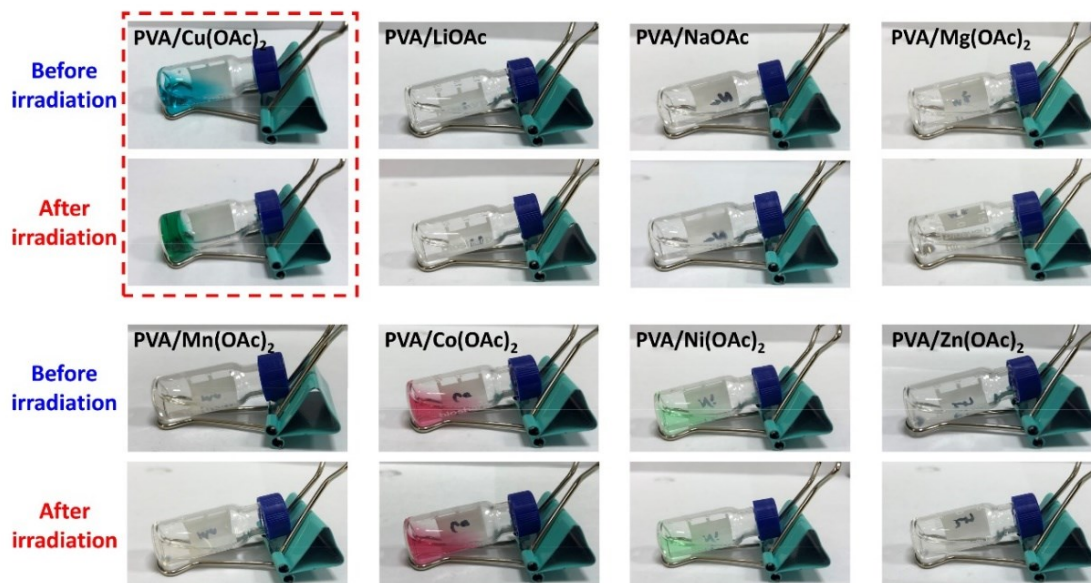




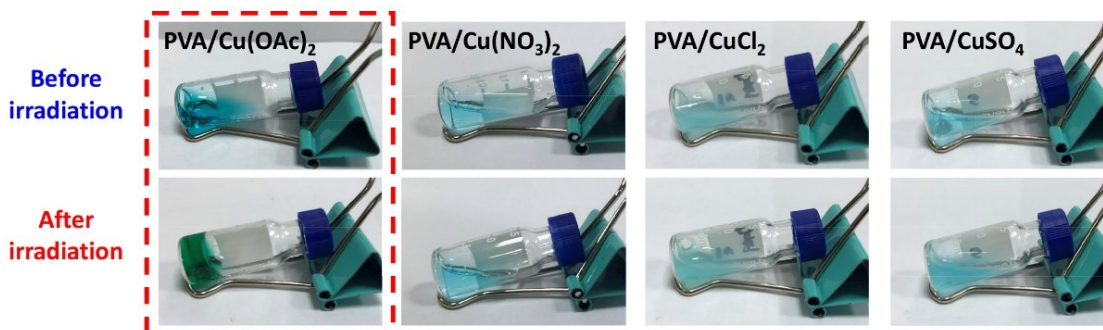
**Fig. S1** Optical photographs of PVA/Cu(OAc)<sub>2</sub> thermogel at 70, 80, 90 and 100°C, respectively, as well as its recover to solution after cooling to room temperature.



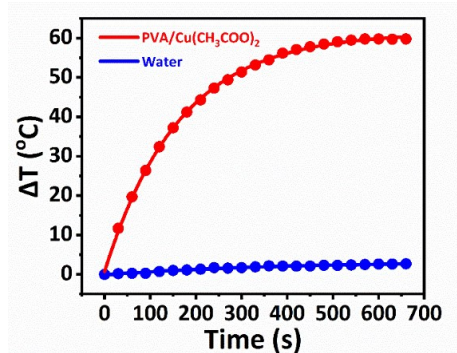
**Fig. S2** Optical photographs of gel-sol transitions of PVA/Cu(OAc)<sub>2</sub> upon 100 heating/cooling cycles.



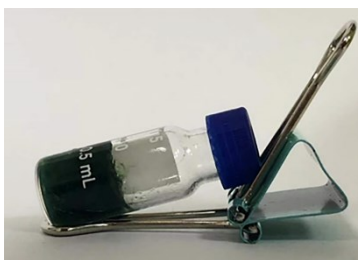
**Fig. S3** Optical photographs of PVA/metal acetate ( $\text{Cu}^{2+}$ ,  $\text{Li}^+$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Zn}^{2+}$ ) solutions before and after irradiation of NIR light at 808 nm.



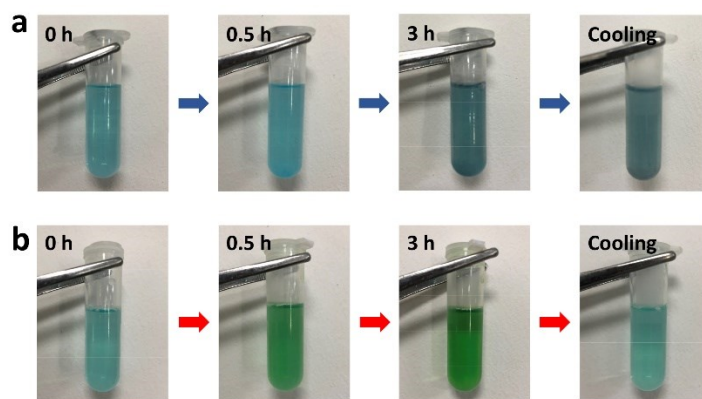
**Fig. S4** Optical photographs of PVA/Cu(OAc)<sub>2</sub>, PVA/Cu(NO<sub>3</sub>)<sub>2</sub>, PVA/CuCl<sub>2</sub>, and PVA/CuSO<sub>4</sub> solutions before and after irradiation of NIR light at 808 nm.



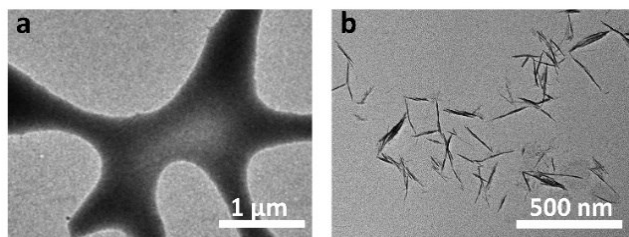
**Fig. S5** Photothermal effect of PVA/Cu(OAc)<sub>2</sub> solutions and water upon NIR light irradiation.



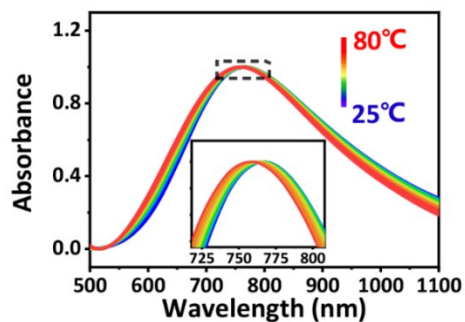
**Fig. S6** Optical photograph of PVA/Cu(OAc)<sub>2</sub> hydrogel with addition of NaOH (concentration was 0.1 M) at 25°C.



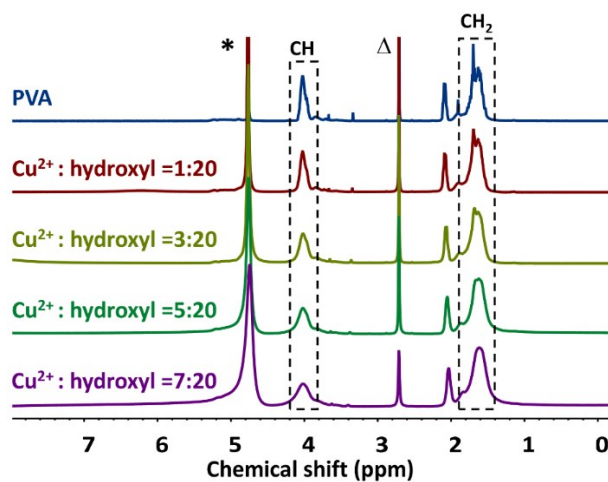
**Fig. S7** Optical photographs of (a) Cu(OAc)<sub>2</sub> and (b) PVA/Cu(OAc)<sub>2</sub> solution upon heating at 80°C (concentration of PVA was 1.0%, and the molar ratio of hydroxyl group/Cu<sup>2+</sup> was 20/3).



**Fig. S8** TEM images of (a) PVA and (b)  $\text{Cu}(\text{OAc})_2$  solutions upon heating at  $80^\circ\text{C}$  for 15 min.

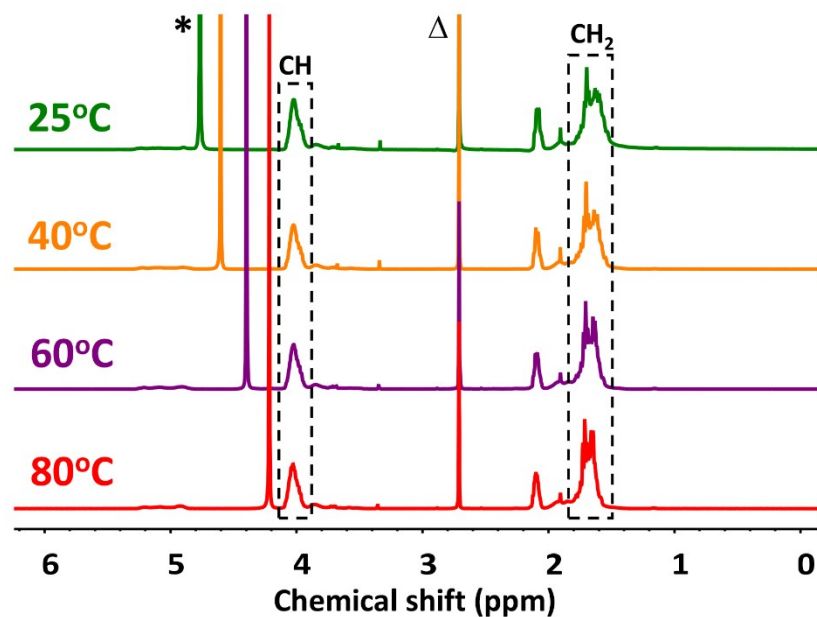


**Fig. S9** Temperature-dependent UV-vis spectra of PVA/ $\text{Cu}(\text{OAc})_2$  solution (concentration of PVA was 1.25%, and the molar ratio of hydroxyl group/ $\text{Cu}^{2+}$  was 20/3).

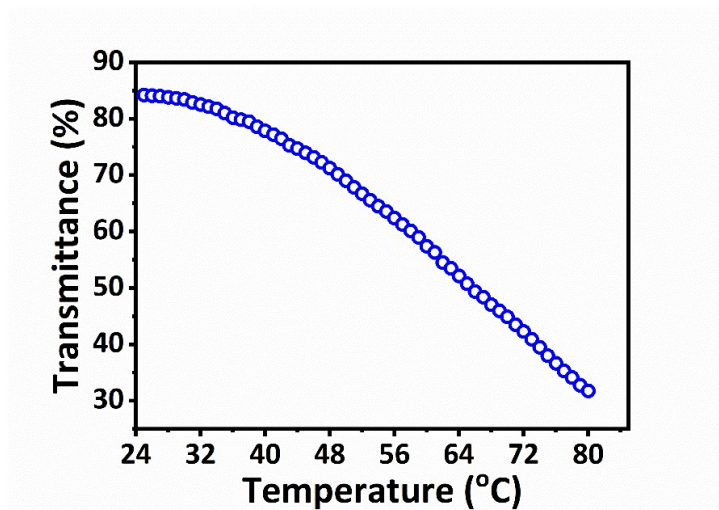


**Fig. S10**  $^1\text{H}$  NMR spectra (400 MHz,  $\text{D}_2\text{O}$ ) of PVA/ $\text{Cu}(\text{OAc})_2$  solution as increasing the molar ratio of  $\text{Cu}^{2+}$ /hydroxyl group from 0/20 to 7/20 at  $25^\circ\text{C}$ . \* and  $\Delta$  represent  $\text{D}_2\text{O}$  and  $\text{DMSO}-d_6$ , respectively.



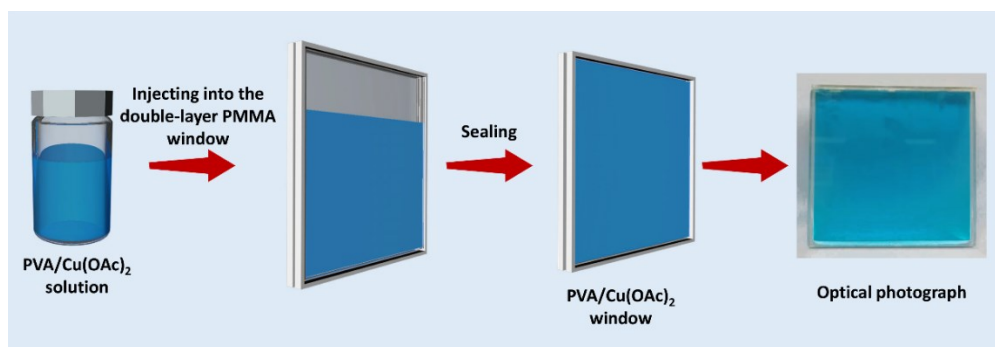


**Fig. S11** Temperature-dependent <sup>1</sup>H NMR spectra (400 MHz, D<sub>2</sub>O) of PVA solution. \* and Δ represent the <sup>1</sup>H NMR peak of D<sub>2</sub>O and DMSO-*d*<sub>6</sub>.

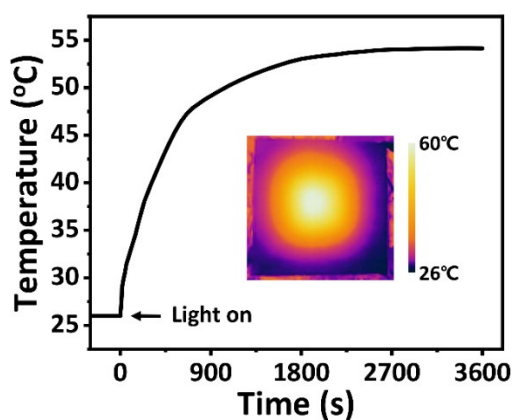


**Fig. S12** Transmittance variation of PVA/Cu(OAc)<sub>2</sub> solution as a function of temperature at 485 nm.

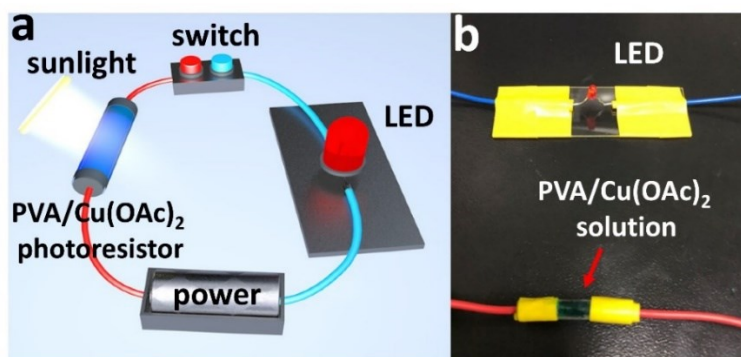




**Fig. S13** The fabrication process and optical photograph of PVA/Cu(OAc)<sub>2</sub> window.



**Fig. S14** Time-dependent top surface temperatures of PVA/Cu(OAc)<sub>2</sub> window. Inset is the IR thermal image of PVA/Cu(OAc)<sub>2</sub> window under 1000 W m<sup>-2</sup> sunlight irradiation.



**Fig. S15** (a) Schematic illustration and (b) photograph of the PVA/Cu(OAc)<sub>2</sub> photoresistor connected into a circuit.