

# Supplementary Information

## **Soft, stretchable thermal protective substrates for wearable electronics**

Shuang Nie<sup>1</sup>, Min Cai<sup>1</sup>, Huang Yang<sup>2</sup>, Liyin Shen<sup>2</sup>, Suhao Wang<sup>1</sup>, Yang Zhu<sup>2\*</sup> & Jizhou Song<sup>1,3,4\*</sup>

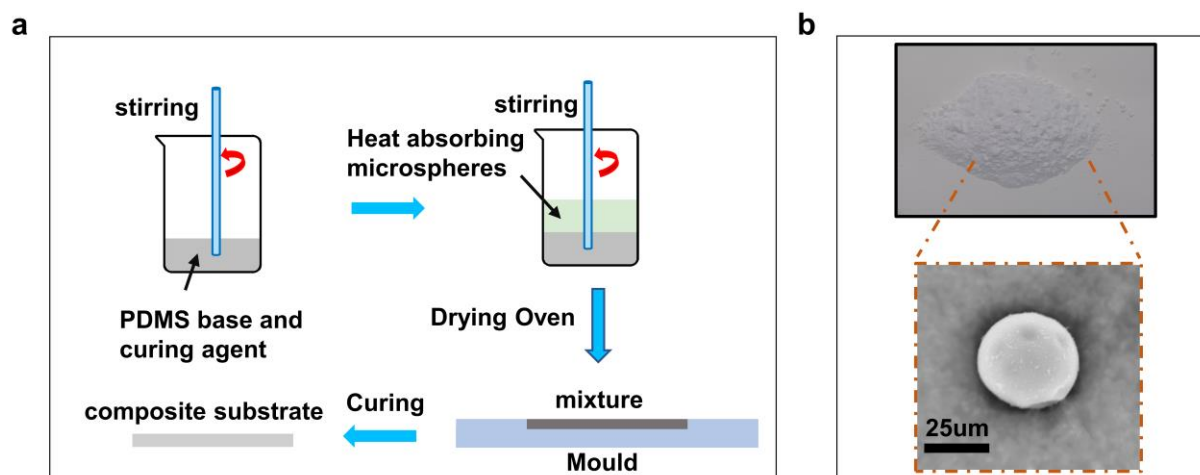
<sup>1</sup>Department of Engineering Mechanics, Soft Matter Research Center, and Key Laboratory of Soft Machines and Smart Devices of Zhejiang Province, Zhejiang University, Hangzhou 310027, China

<sup>2</sup>MOE Key Laboratory of Macromolecular Synthesis and Functionalization, Department of Polymer Science and Engineering, Zhejiang University, Hangzhou 310027, China

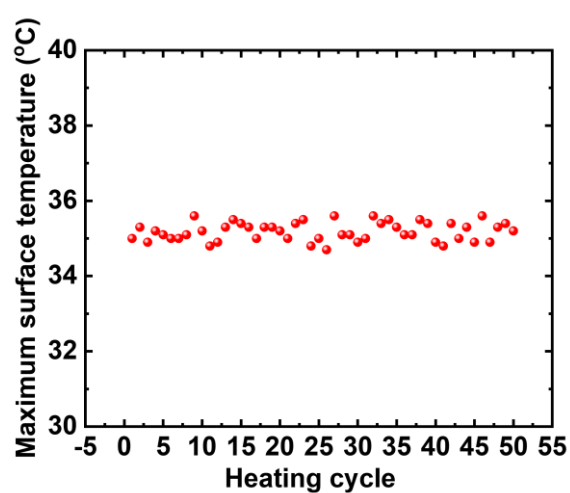
<sup>3</sup>State Key Laboratory of Fluid Power and Mechatronic Systems, Zhejiang University, Hangzhou 310027, China

<sup>4</sup>Department of Rehabilitation Medicine, The First Affiliated Hospital College of Medicine, Zhejiang University, Hangzhou 310003, China

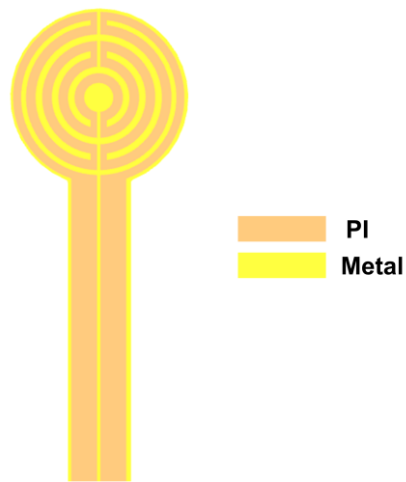
\*email: zhuyang@zju.edu.cn, jzsong@zju.edu.cn



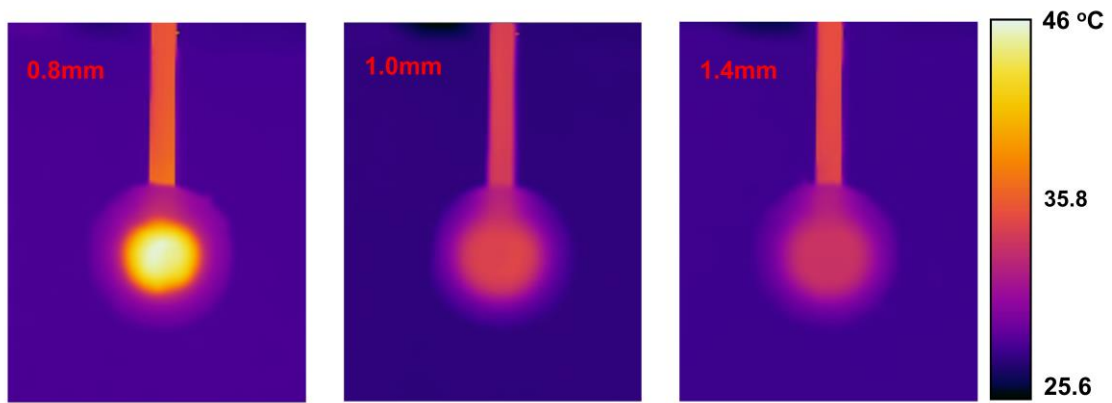
**Supplementary Figure 1** (a) Schematic illustration of the fabrication process of TPS. (b) The optical and SEM image of heat absorbing microspheres.



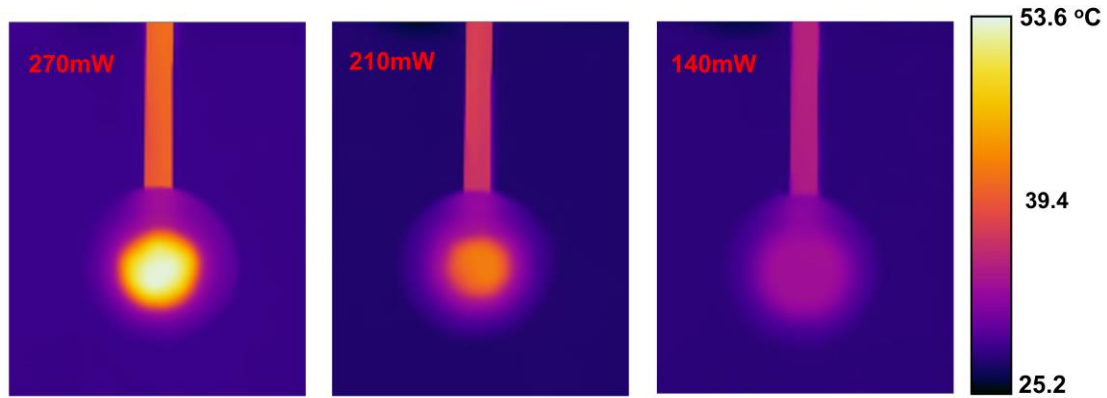
**Supplementary Figure 2** The heat insulating performance of TPS (mass ratio: 80%; thickness: 1.3 mm) over multiple heating cycles (heating the TPS on a 70 °C hot plate for 40 s followed by cooling it to room temperature).



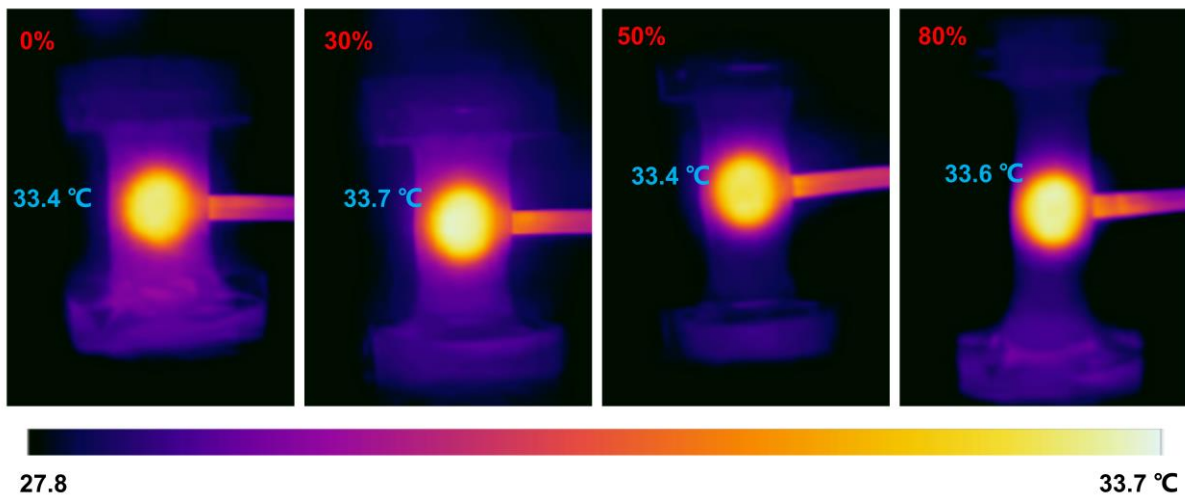
**Supplementary Figure 3** Schematic illustration of the heater.



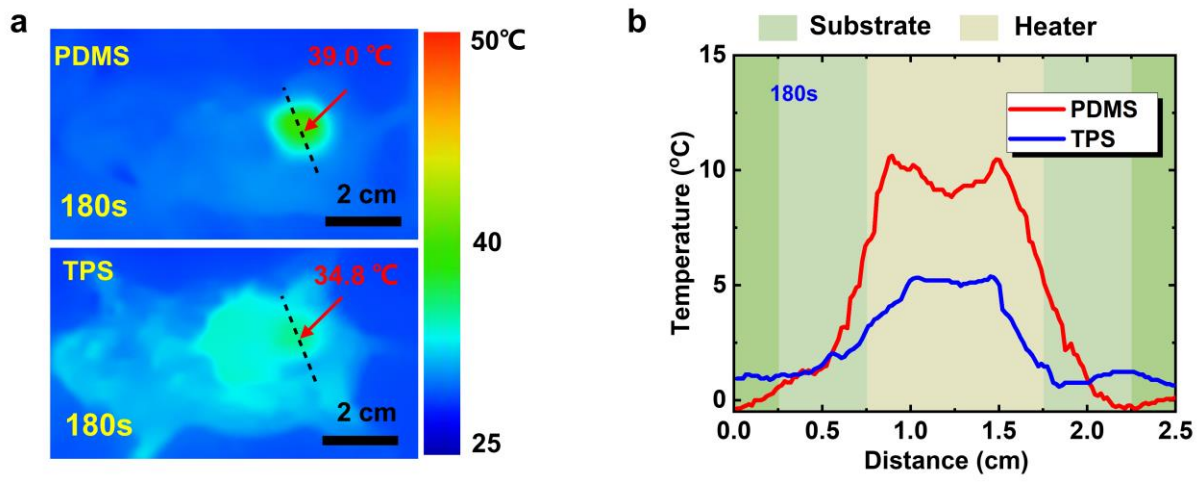
**Supplementary Figure 4** The temperature distribution on the bottom surface of TPS with different TPS thicknesses. The heating power is 140 mW, and the mass ratio of heat absorbing microspheres is 80%.



**Supplementary Figure 5** The temperature distribution on the bottom surface of TPS with different heating powers. The TPS thickness 1.4 mm and the mass ratio of heat absorbing microspheres is 80%.



**Supplementary Figure 6** The temperature distribution on the bottom surface of TPS after heating for 75 s with different tensile strains. The heating power is 140 mW, the mass ratio of heat absorbing microspheres is 80% and the TPS thickness is 1.3 mm.



**Supplementary Figure 7** (a) Thermal images of the mouse skin after cooling for 140 s. (b) The temperature change (between 40 s and 180 s) along the dotted line in Supplementary Figure 7a.