

Spider web structured CNTs/CuS coating-based flexible pressure sensor with extreme self-heating and anti-freezing ability for winter sports safeguard

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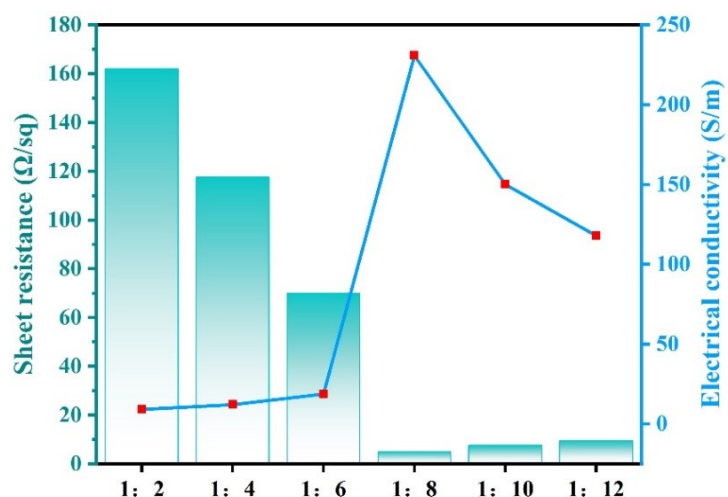


Fig. S1. Sheet resistance and electrical conductivity of CNTs/CuS coatings with different weight ratios of CNTs: CuS.

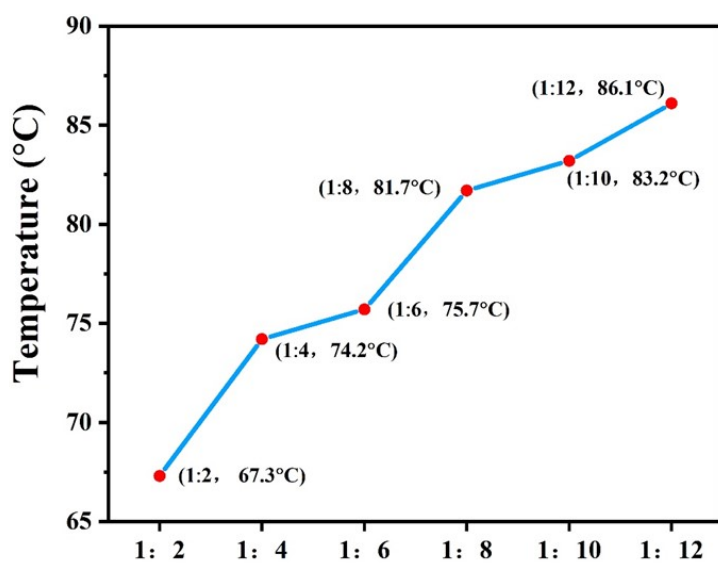


Fig. S2. Surface temperature of CNTs/CuS coatings with different weight ratios of CNTs: CuS after being irradiated for 5 min under a light intensity of 100 mW/cm².

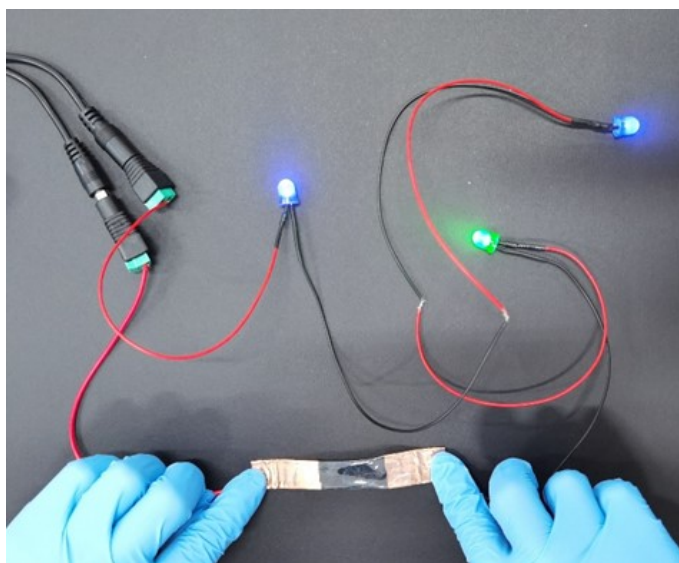


Fig. S3. Digital photograph of the SF/CNTs/CuS pressure sensor illuminating 3 LEDs.

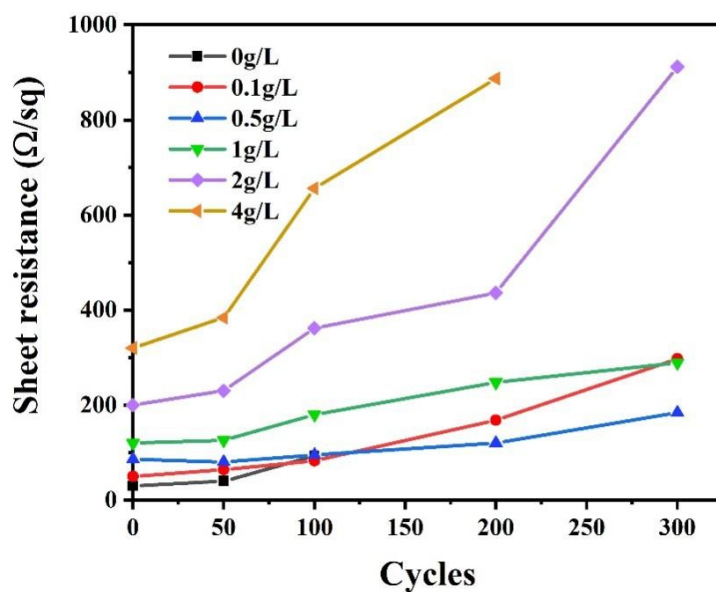


Fig. S4. Surface resistance of CNTs/CuS coatings with different HPMC concentration with the increase of rubbing cycle (The resistance is unmeasurable because the coating falls off after 100 and 200 rubbing cycles at HPMC concentrations of 0 and 4 g/L).

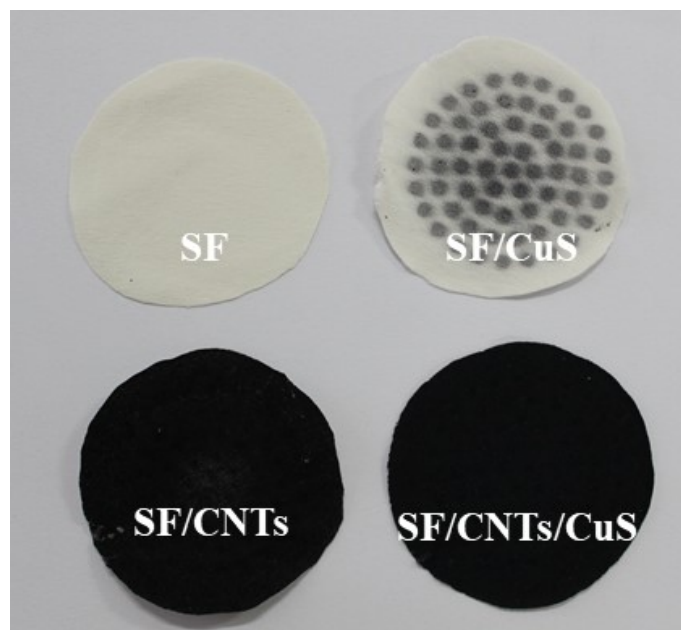


Fig. S5. Digital photographs of SF, SF/CuS, SF/CNTs and SF/CNTs/CuS.

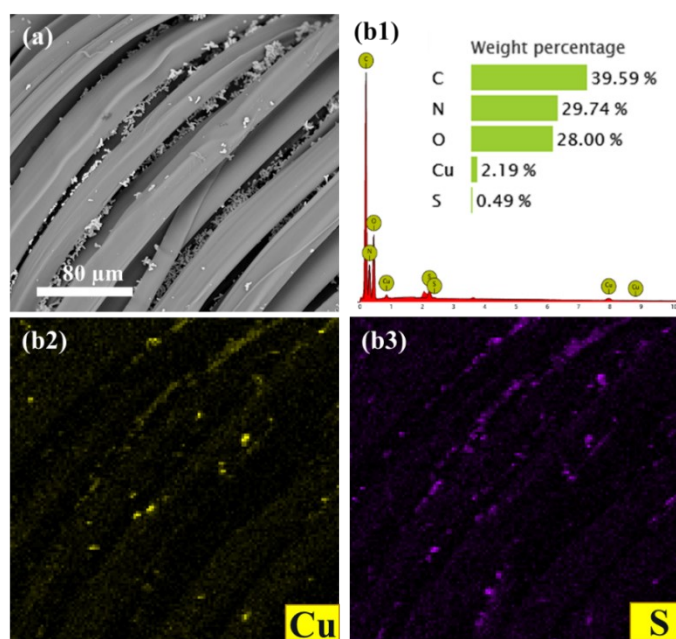


Fig. S6. (a) Surface morphology and (b) Elemental scanning analysis of SF/CuS.

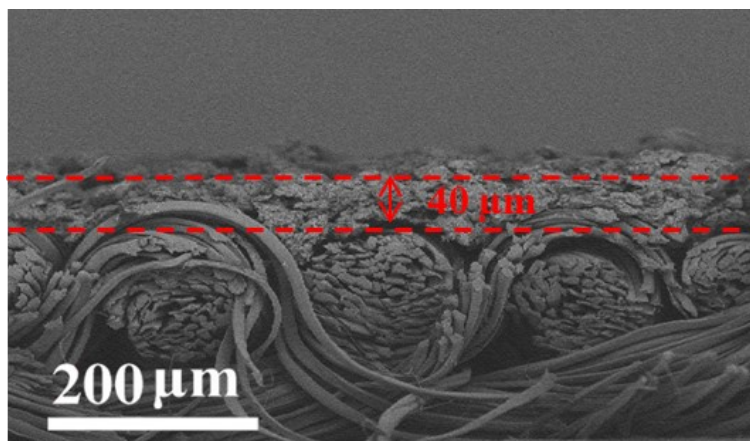


Fig. S7. Cross-sectional morphology of the SF/CNTs/CuS pressure sensor.

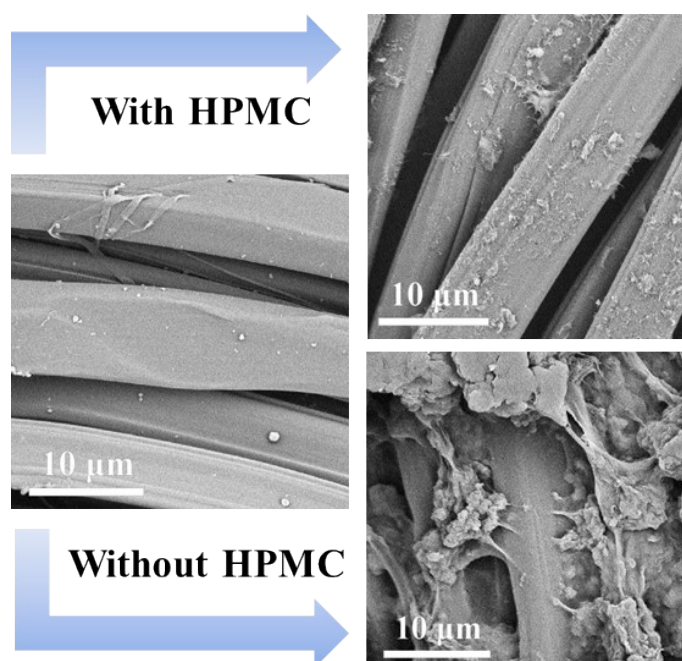


Fig. S8. Surface morphologies of the SF/CNTs/CuS pressure sensors with and without HPMC.

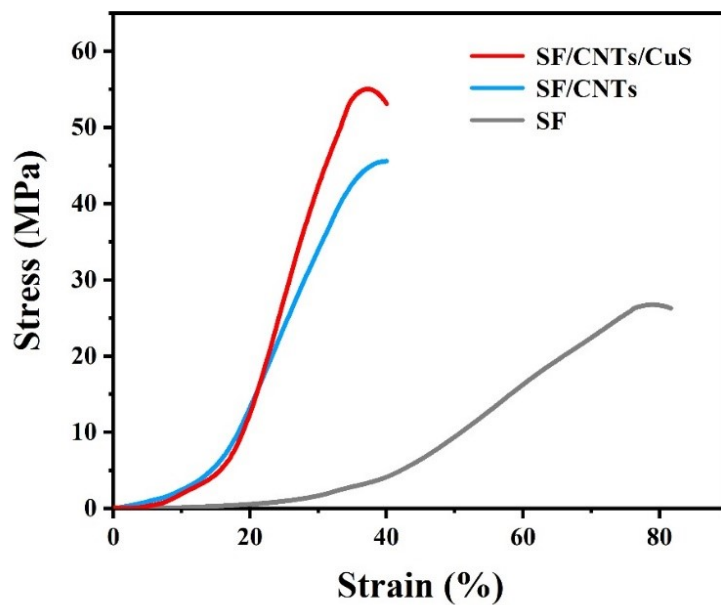


Fig. S9. Stress-strain curves of SF, SF/CNTs and SF/CNTs/CuS.

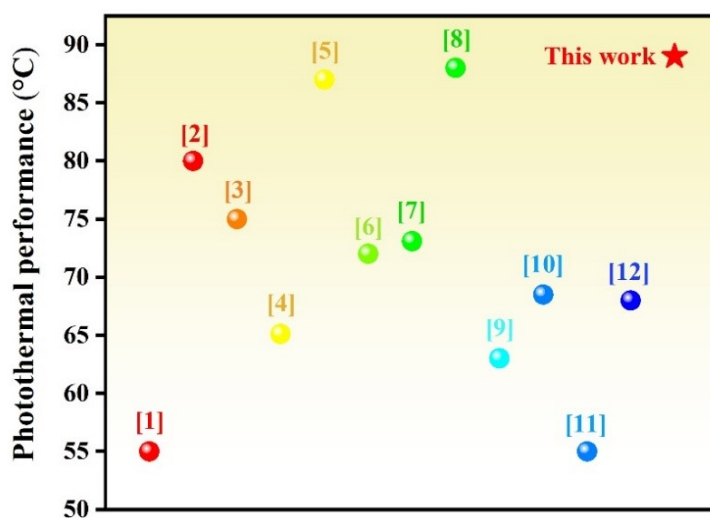


Fig. S10. Photothermal performance of recently reported flexible materials ¹⁻¹².

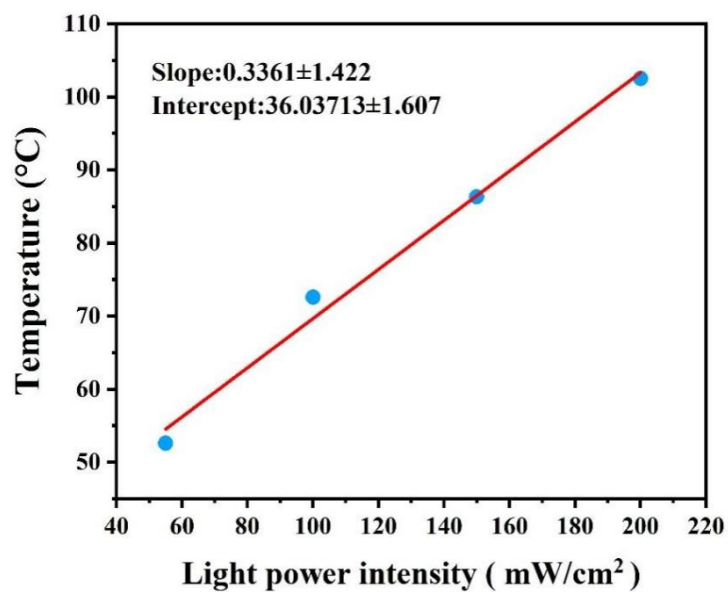


Fig. S11. Linear fit of temperature and light intensity of SF/CNTs/CuS.

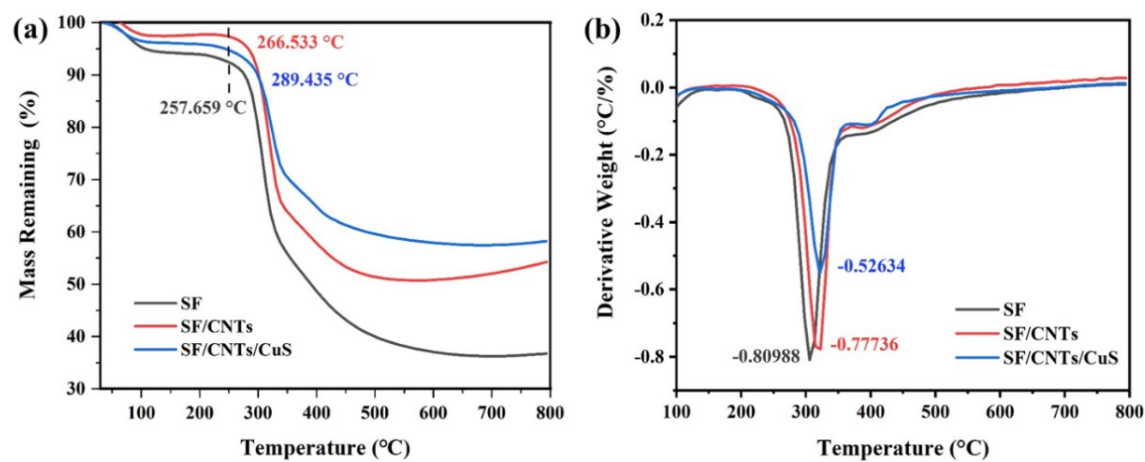


Fig. S12. (a) TGA and (b) DTG of SF, SF/CNTs and SF/CNTs/CuS.

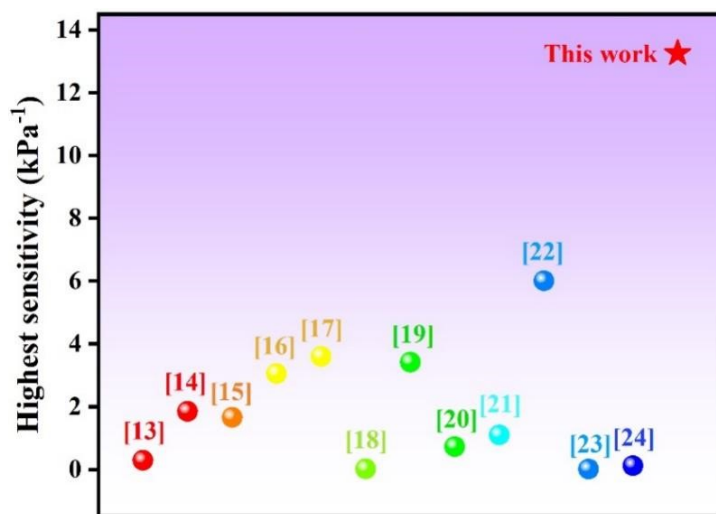


Fig. S13. Sensing properties of recently reported flexible pressure sensors ¹³⁻²⁴.

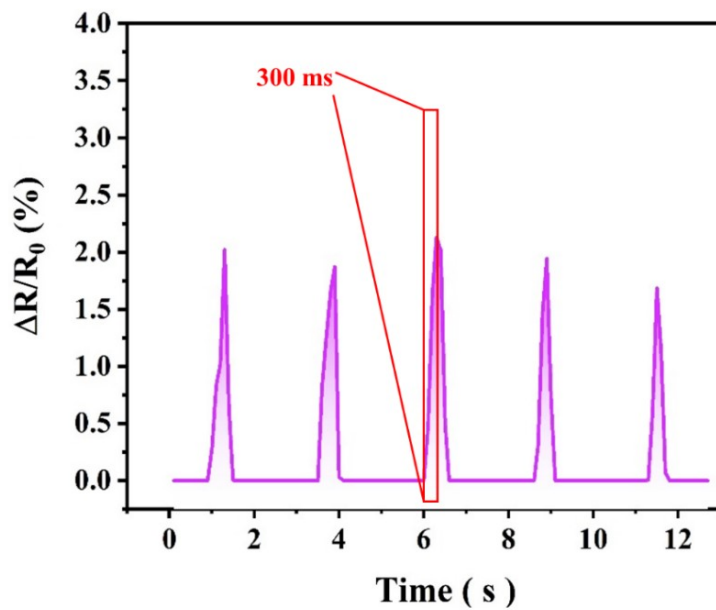


Fig. S14. Response time of the SF/CNTs/CuS pressure sensor.

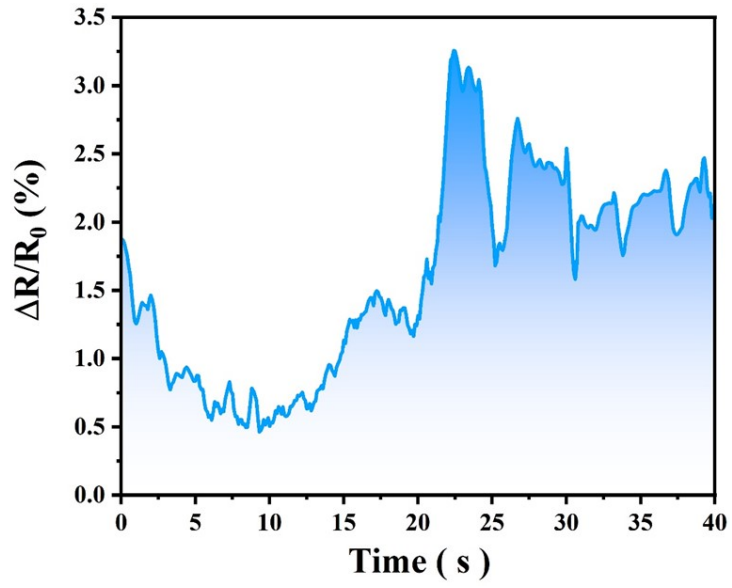


Fig. S15. Electronic signal for the SF/CNTs/CuS pressure sensor without HPMC.

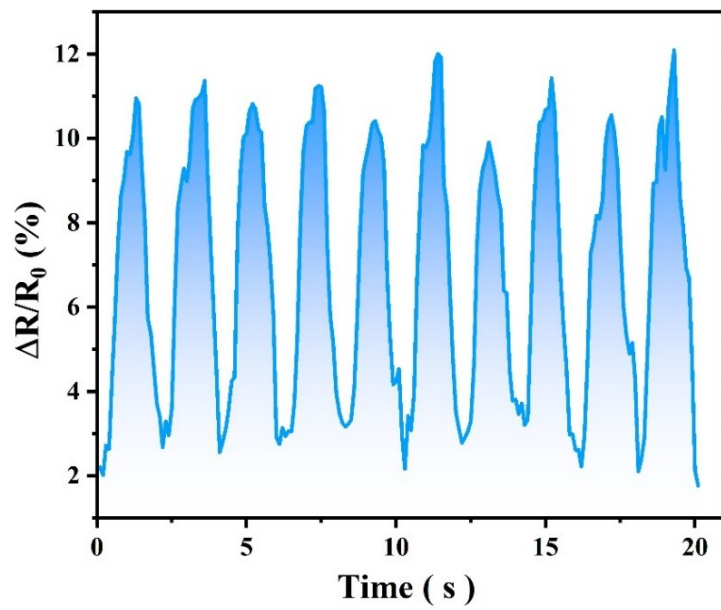


Fig. S16. Sensing tests of the SF/CNTs/CuS pressure sensor on finger bending.

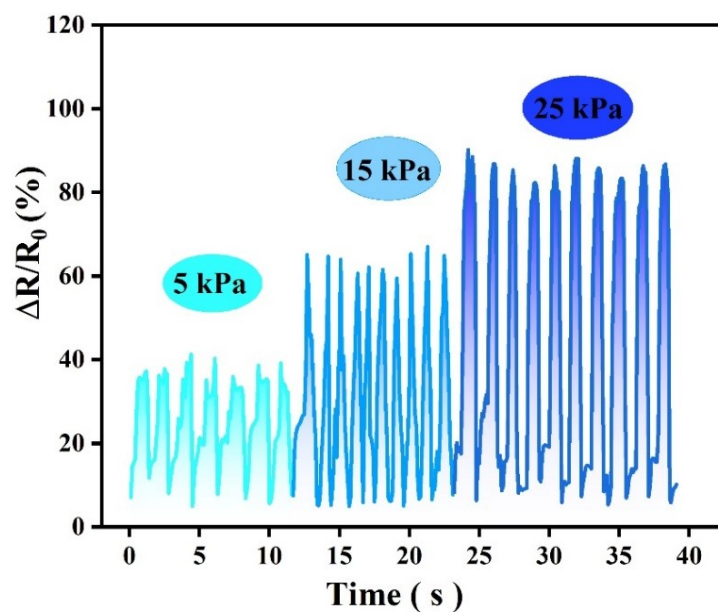


Fig. S17. Sensing tests of the SF/CNTs/CuS pressure sensor under different pressures at -20 °C.

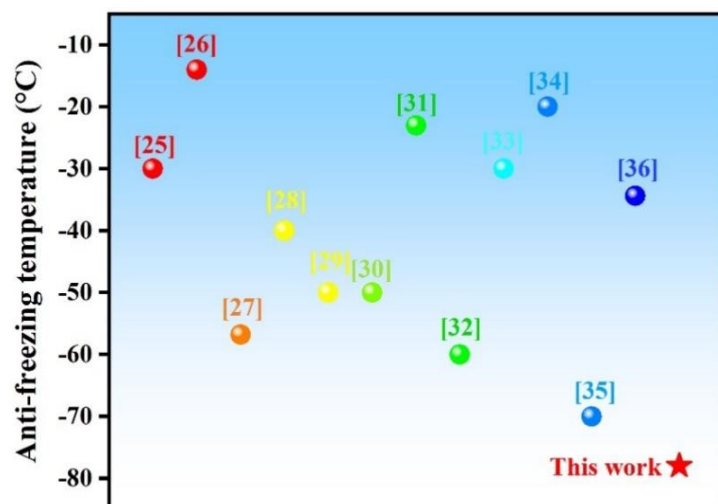


Fig. S18. Anti-freezing properties of recently reported anti-freezing materials ²⁵⁻³⁶.

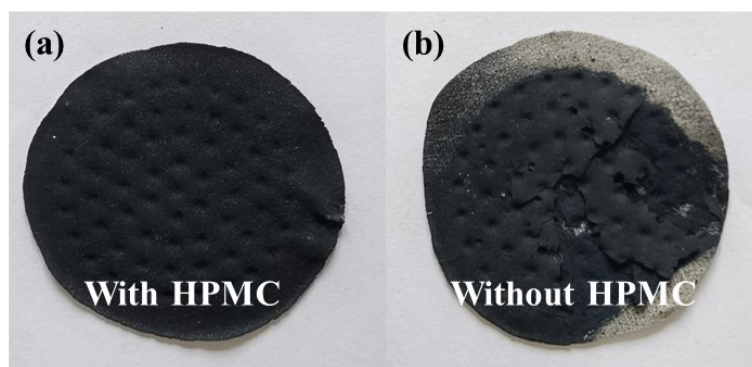


Fig. S19. Digital photographs of the SF/CNTs/CuS pressure sensors (a) with and (b) without HPMC after photothermal heating.

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