Supporting Information for

Synthesis of CuS nanoplates-contained PDMS film with excellent near-infrared shielding property

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The determination of photothermal conversion efficiency of CuS nanoplates

The photothermal conversion efficiency of CuS nanoplates was measured by a classic solution method developed by Roper et al in 2007.[1] We heat the aqueous dispersion containing CuS nanoplates (0.25 mg mL^{-1}) by 980 nm laser (0.5 W cm^{-2}) irradiation, until a steady state temperature was reached (Fig. S1). The highest temperature elevation was determined to be 22.3 °C at about 720 s. Subsequently, the laser was completely shut off, and the aqueous dispersion containing CuS nanoplates cools down naturally to environmental temperature. The photothermal conversion efficiency (η_T) can be calculated by using the equation (1):

$$\eta_T = \frac{\mathrm{h}S(T_{Max} - T_{Surr}) - Q_{Dis}}{P(1 - 10^{-A_{980}})} \qquad (1)$$

where T_{Max} is the equilibrium maximum temperature of the dispersion and T_{Surr} is the ambient temperature (26.0 °C), and the value (T_{Max}–T_{Surr}) was 22.3 °C (Fig. S1). P is the power of incident laser, and herein it is 0.125 W. In addition, A_{980} is the absorbance of aqueous dispersion of CuS nanoplates (0.25 mg mL^{-1}) at wavelength 980 nm which

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should match the irradiated depth of solution, and it can be determined to be 0.8. h is the heat transfer coefficient, S is the surface area of the container. The value of hS is calculated by the equation (2):

$$\tau_s = \frac{\sum_i m_i C_{p,i}}{hS} \qquad (2)$$

where τ_s is the system time constant which can be determined by the slope of the linear fitting between cooling time (t) and negative natural logarithm of driving force temperature ($-ln\theta$), as shown in (Fig. S2). In our experiment τ_s is 356.4 s. m_i and $C_{p,i}$ represent the mass and heat capacity of system components (photothermal agent, solvent, quartz sample cell and so on) and $\sum_i m_i C_{p,i}$ was determined to be 0.838 J °C^{-1}. Herein, the value of hS can be calculated to be 0.00235 W °C^{-1} in the present case. Q_{Dis} represents the heat dissipated from light absorbed by the quartz sample cell and solvent, it can be measured to be 0.0247 W by independently using the same sample cell containing pure water under the other identical conditions. Substituting all these data into equation (1), the photothermal conversion efficiency (η_T) can be calculated to be 26.4 %.

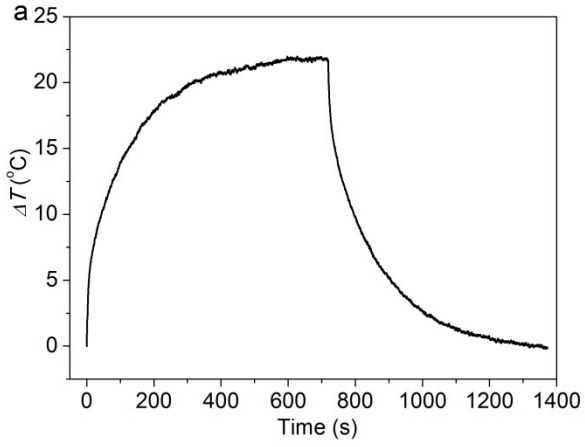

Fig. S1 Temperature elevation of aqueous dispersion of CuS nanoplates (0. 25 mg mL^{-1}) as a function of the time, under the irradiation of 980 nm laser with the intensity of 0.5 W cm^{-2}.

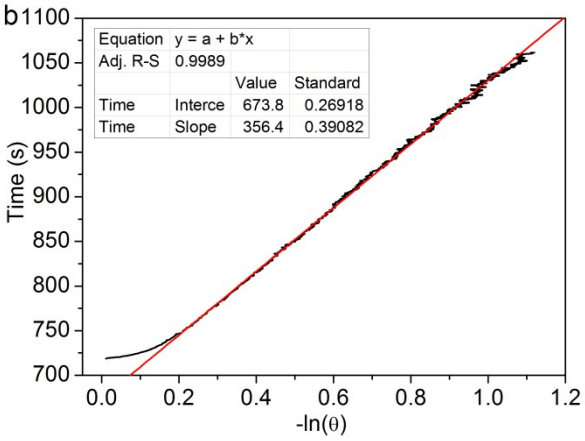

Fig. S2 Linear fitting of the function between time and negative natural logarithm of driving force temperature (-lnθ) of CuS aqueous solution, corresponding to the cooling period of Fig.S1.

Notes and references

1. D. K. Roper, W. Ahn and M. Hoepfner, *J. Phys. Chem. C*, 2007, **111**, 3636-3641.