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 (ηT) can be calculated by using the equation (1):

\[
\eta_T = \frac{hS(T_{\text{Max}} - T_{\text{Surr}}) - Q_{\text{Dis}}}{P(1 - 10^{-A_{980}})}
\]

(1)

where \(T_{\text{Max}}\) is the equilibrium maximum temperature of the dispersion and \(T_{\text{Surr}}\) is the ambient temperature (26.0 °C), and the value \((T_{\text{Max}} - T_{\text{Surr}})\) 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):

\[
\tau_s = \frac{\sum m_i C_{p,i}}{hS} \tag{2}
\]

where \( \tau_s \) 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 \( \tau_s \) 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).

\[
\sum m_i C_{p,i}
\]

and 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. \( Q_{\text{dis}} \) 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 (\( \eta_T \)) 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**