Supporting Information

Sesame-ball-like PTT nanoplatforms with autofluorescence-free imaging and temperature sensing

Biying Bao, Jia Song, Jian Yang, Shuai Wang, Hancheng Zhu, Duanting Yan, Chunguang Liu, Changshan Xu and Yuxue Liu*

School of Physics, Northeast Normal University, 5268 Ren min Street, Changchun, 130024, China.

*E-mail: yxliu@nenu.edu.cn

Experimental Section

1.1 Calculation of the bandgap of Ag_2S nanoparticles

The absorption spectrum of Ag^+-poor Ag_2S nanoparticles (as shown in Fig.2a) was taken as a function according to the Tauc method [1]:

$$\alpha hv = A(hv - E_g)^n \quad \text{(S1)}$$

Where, α is the absorption coefficient, h is Planck's constant (h≈4.13567×10^-15 eV·s), v is the frequency, hv represents the photon energy, hv=1240/c, c is the speed of light (c≈3×10^8 m/s), A is the proportionality constant, E_g is the band gap width and n is a constant. According to the reported research, n=1/2 and n=2 were used in the equations corresponding to a direct bandgap semiconductor and an indirect bandgap semiconductor. [2]Ag_2S is a direct bandgap semiconductor and the n=1/2 was used [3-5]:

$$(\alpha hv)^2 = A(hv - E_g) \quad \text{(S2)}$$

The relationship curve between y axis $(\alpha hv)^2$ and x axis (eV) (tauc diagram) is shown in Fig.2a. The bandgap energy (E_g) of Ag^+-poor $Ag_{2-x}S$ nanoparticles was determined from the value of the intersection of the tangent line and x axis (eV) of the light absorption region. It is found that the E_g value of Ag^+-poor Ag_2S nanoparticles is the same as the reported value (~1.1 eV)[6, 7].

Figures

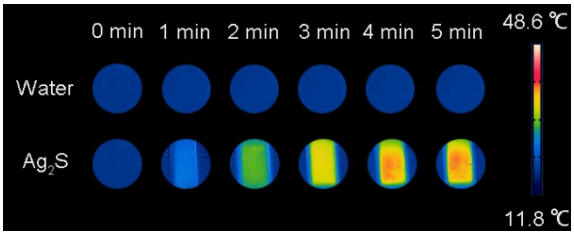

Figure S1 The time-dependent temperature change of the aqueous solution with Ag^+-poor Ag_2S nanoparticles and water after 5-min 635 nm laser irradiation

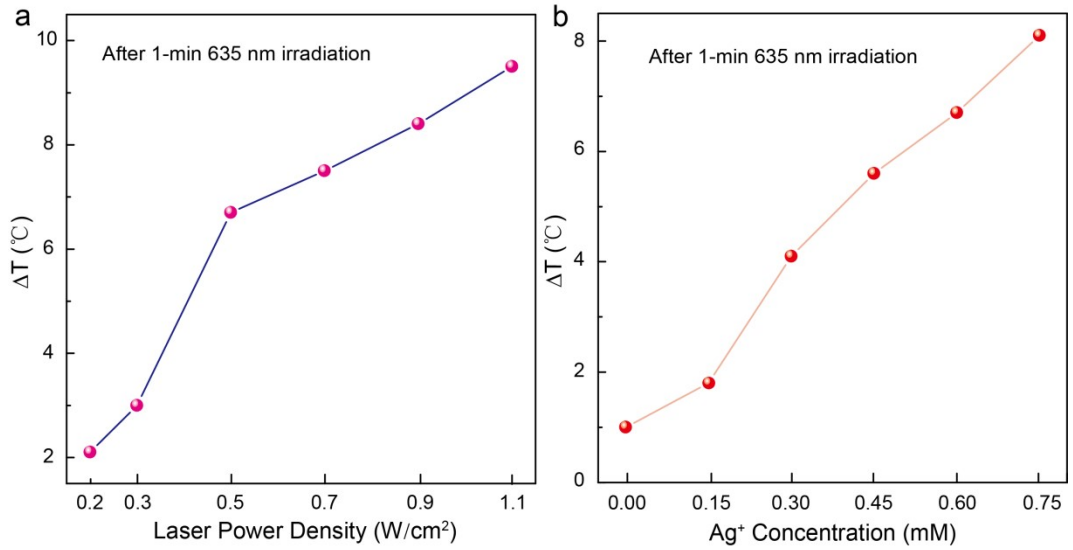

Figure S2 (a) Temperature change curves within 1 minute of ZGGO:Cr,Hf-Ag_2S composite nanoplatforms (0.75 mM) under different 635 nm laser irradiation power density (0.2, 0.3, 0.5, 0.7, 0.9, 1.1 W/cm^2); (b) Temperature change curves within 1 minute of ZGGO:Cr,Hf-Ag_2S composite nanoplatforms with different concentrations (Ag^+: 0, 0.15, 0.30, 0.45, 0.60, 0.75 mM) under 635 nm (0.7 W/cm^2) laser irradiation

References

1. J. Tauc, *Mater. Res. Bull.*, 1968, **3**, 37-46.
2. M. Cardona and G. Harbeke, *Phys. Rev.*, 1965, **137**, A1467-A1476.
3. S. I. Sadovnikov, A. V. Ishchenko and I. A. Weinstein, *Mater. Sci. Eng., B*, 2023, **296**, 116667.
4. P. George and P. Chowdhury, *Analyst*, 2019, **144**, 3005-3012.
5. S. I. Sadovnikov, *Opt. Mater.*, 2023, **141**, 113928.
6. M. Yarema, S. Pichler, M. Sytnyk, R. Seyrkammer, R. T. Lechner, G. Fritz-Popovski, D. Jarzab, K. Szendrei, R. Resel, O. Korovyanko, M. A. Loi, O. Paris, G. Hesser and W. Heiss, *ACS Nano*, 2011, **5**, 3758-3765.
7. Y. Du, B. Xu, T. Fu, M. Cai, F. Li, Y. Zhang and Q. Wang, *J. Am. Chem. Soc.*, 2010, **132**, 1470-1471.