Supporting information

NIR-Triggered Chemo-Photothermal Therapy by Thermosensitive Gold Nanostar@Mesoporous Silica@Liposome Composited Drug Delivery System

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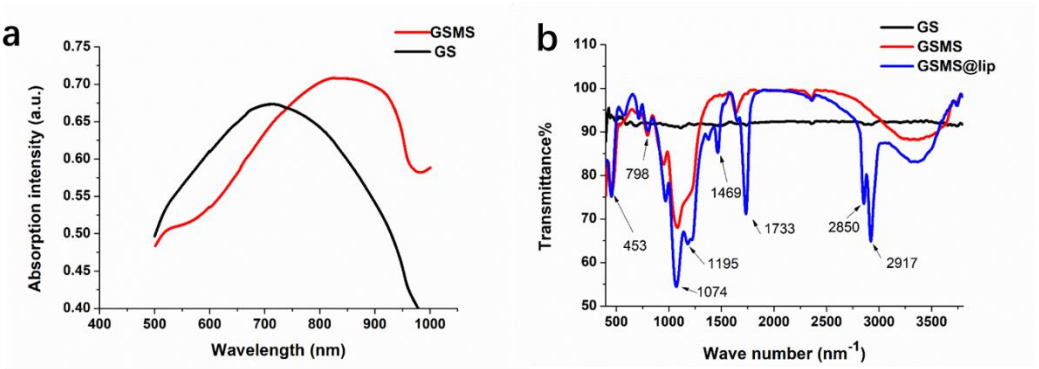

Fig. S1 UV-Vis spectra of GS and GSMS (a); FT-IR spectra of GS, GSMS and GSMS@lip (b).

The UV-Vis absorbance spectra showed that the GSMS exhibited high NIR adsorption at ~800 nm (Fig. S1a). It was found that there was a slight red-shift compared with GS because the surface of the latter was coated with a layer of mesoporous silica. To provide insight on the nanocarrier proceed, FT-IR spectrums of GS, GSMS and GSMS@lip were also measured. As shown in Fig. S1b, the broad bands centered at 2600–3700 and 1636 cm^{-1} were assigned to O-H stretching and adsorbed water. The strong absorption peaks in the framework region at about 1074, 768 and 483 cm^{-1} were generally attributed to stretching vibrations of Si-O-Si, bending vibrations of O-Si-O, and rocking vibrations of Si-O-Si, respectively.[1] Peaks were observed at 2932, 1733, 1469 and 1195 cm^{-1} which corresponds to the presence of stretching C-H (presence of alkanes), C=O, N-O, C-N (presence of aliphatic amines).[2] The above results demonstrated the successful preparation of the composite, which supported that the liposome had encapsulated on the GSMS.

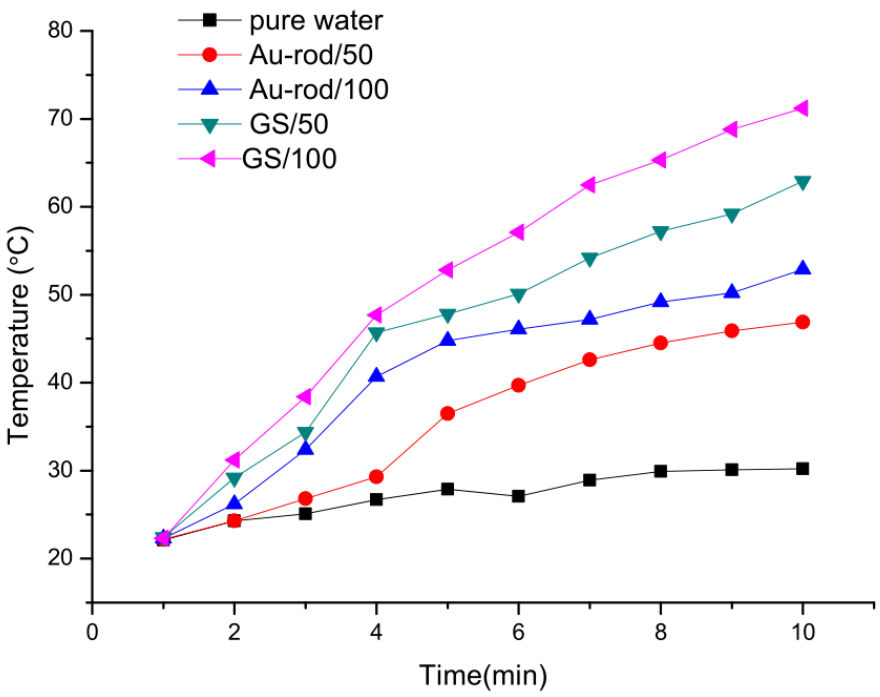

Fig. S2 The change of temperature after laser irradiation as a function of time.

Compared to Au rod, GS had superior photo-thermal conversion efficiency. In Fig. S2, it was noted that under the NIR laser with a power density of 2.4 W cm^{-2}, Au rod, GS with a concentration of 50 and 100 mg mL^{-1} could rapidly heat the surrounding bulk solution, while pure water showed little temperature elevation under the same conditions, suggesting their feasibility as sensitive nano-modulators and efficient photothermal agents in PTT.

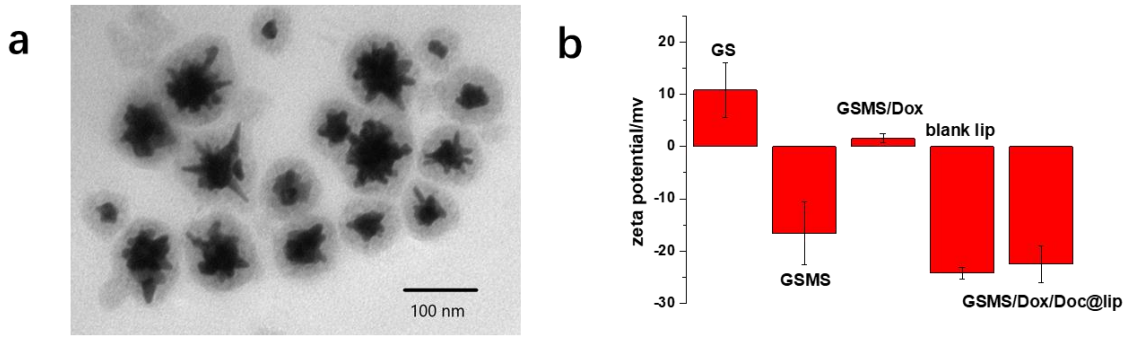

Fig. S3 TEM of GSMS@lip after 10 min laser radiation and cooling three times (a); the

variations of zeta potential values during the preparation of the GSMS/Dox/Doc@lip (b).

After multiple irradiation and cooling processer, the nanoparticles still retained the original morphology, indicating the good stability (Fig. S3a). The surface potential of the GS was 10.8 ± 5.2 mV. After the coating of the mesoporous silica, the zeta potential of GSMS changed to -16.6 ± 5.96 mV due to the silanol group on the surface. When the GSMS was loaded with positively charged Dox, the zeta potential increased to 1.57 ± 0.911 mV. The surface potential of blank liposome was -24.2 ± 1.08 mV, so the potential of GSMS/Dox packed with liposome was negative (Fig. S3b).

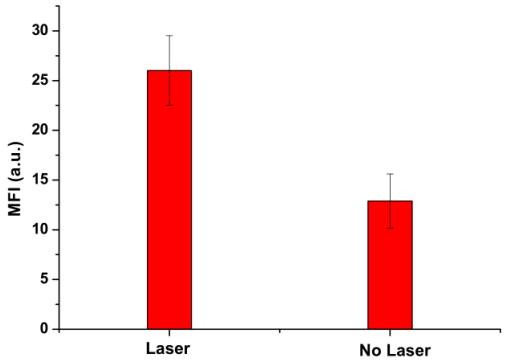

Fig. S4 Quantitative median fluorescence intensity (MFI) of intracellular Dox. Each analysis was recorded on at least 22 cells using Image J.

In order to verify the cellular uptake of the nanoparticles, we quantified the intracellular content of Au element based on inductively coupled plasma mass spectroscopy (ICP-MS). MDA-MB-231 were seeded in 6-well plates with a density of 10^5 cells/well and cultured overnight to allow cell adherence. Afterwards, the cells were cultured with fresh medium containing GSMS/Dox/Doc@lip nanoparticles for 2 h. After rinsing with cold PBS, the cells were collected, counted, digested by aqua regia, diluted, filtrated, and finally subjected to ICP-MS analysis.

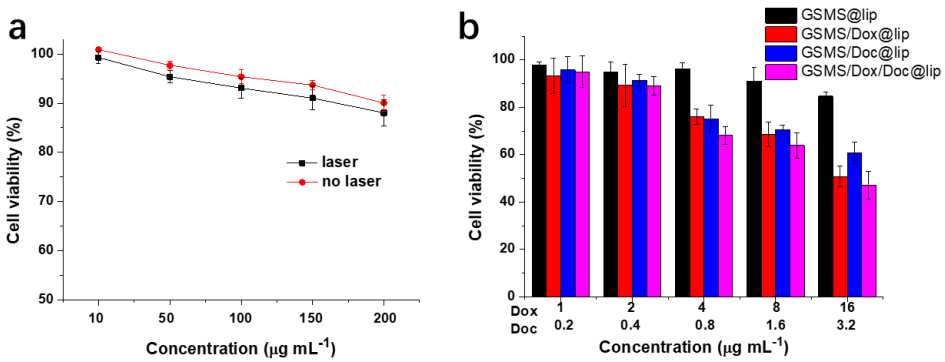

Fig. S5 The cytotoxicity of MDA-MB-231 cells after 48 h of culture with GSMS@lip (a), GSMS@lip, GSMS/Dox@lip, GSMS/Doc@lip, GSMS/Dox/Doc@lip (b). No laser was applied in each group in Fig. S5b.

REFERENCES

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(2) Nayak, D.; Boxi, A.; Ashe, S.; Thathapudi, N. C. and Nayak B. Stavudine loaded gelatin liposomes for HIV therapy: Preparation, characterization, and in vitro cytotoxic evaluation. *Mater. Sci. Eng. C* 2017, **73**, 406–416, DOI: 10.1016/j.msec.2016.12.073.