†Electronic Supplementary Information (ESI)

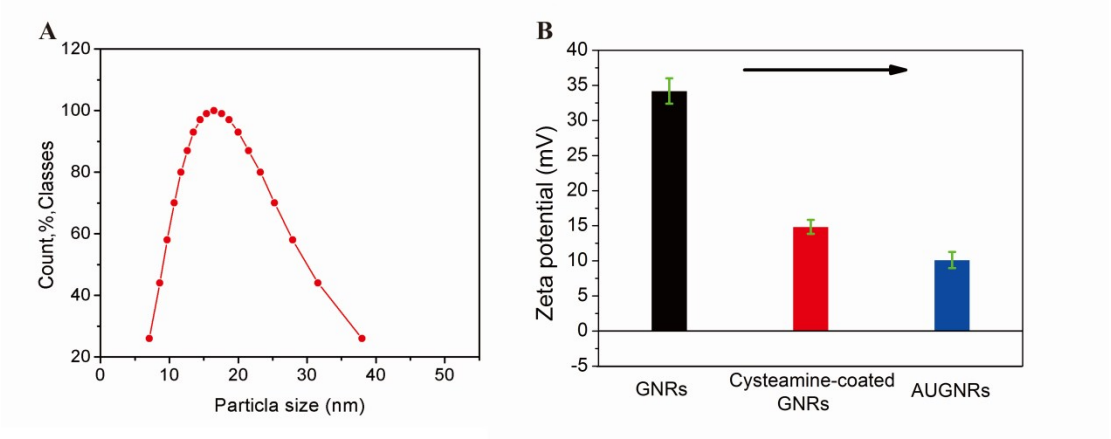

Figure S1. Dynamic light scattering (DLS) of the AUGNRs (A) and zeta potentials of GNRs, cysteamine-coated GNRs, and AUGNRs (B).

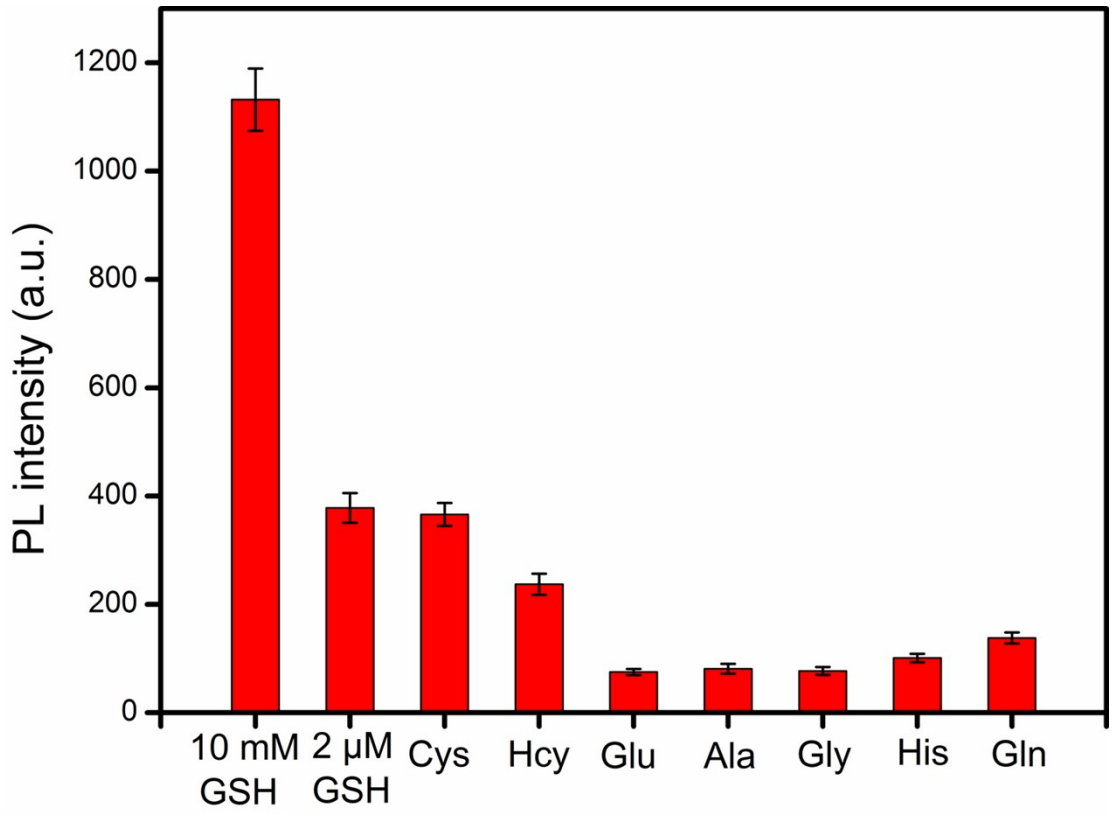

Figure S2: Fluorescence intensity of AUGNRs mixed with 10 mM of glutathione (GSH), 2 μM of GSH, cysteine (Cys), homocysteine (Hcy), glucose (Glu), alanine (Ala), Glutamine (Gly), histidine (His) and glutamic acid (Gln), respectively.

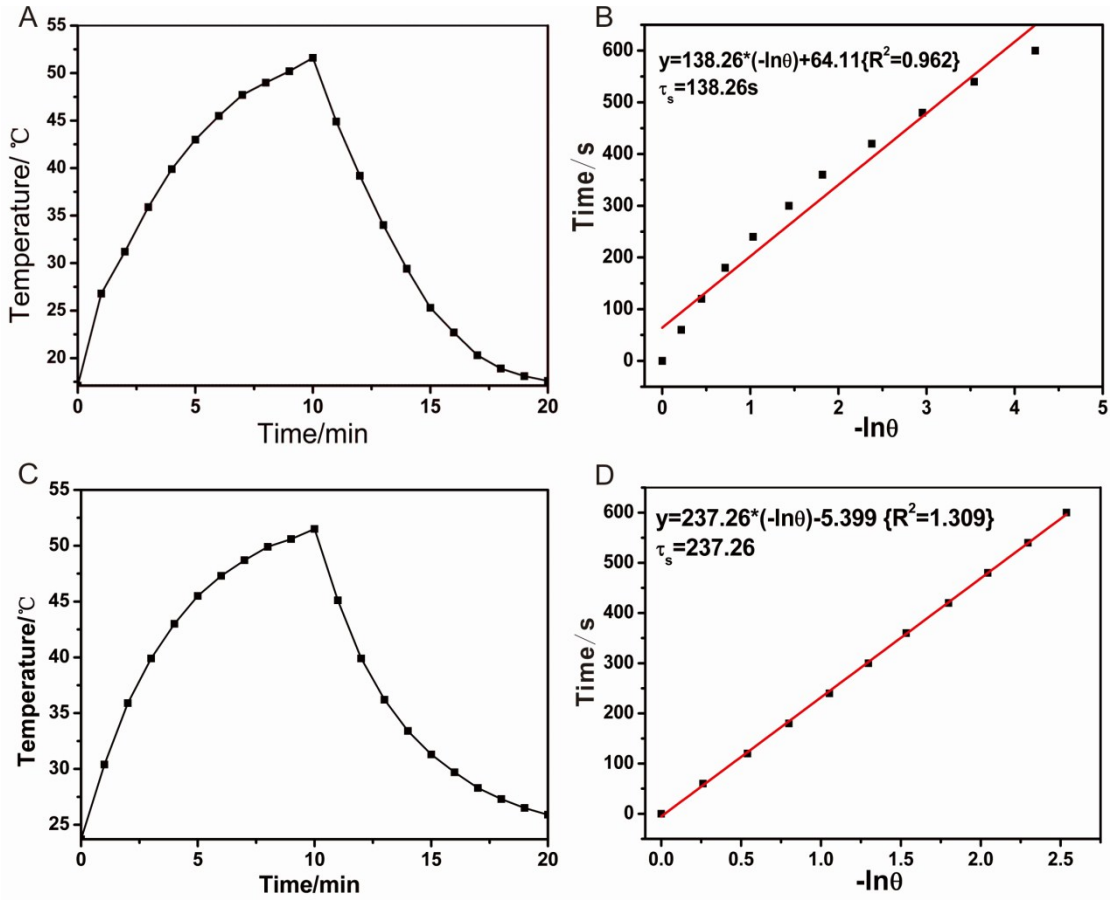

Figure S3. Heating/Cooling experiment of 200 μg/mL ultrasmall GNRs (A) and large size GNRs (C) aqueous solution with exposure of 1.5 W/cm^2 808 nm laser irradiation. The continuous wave (CW) laser was switched off after 10 min and the cooling rate was recorded. (B), (D): Plot of time versus negative natural logarithm of the temperature increment for the cooling cycle (after 10 min in A. C). The linear fit of the data points results in a half-life time τ_s are 138.26 s and 237.26s respectively.

The photothermal efficiency η can be calculated by eq. (1) as reported by Roper *et al.*: [1]

$$\eta = \frac{hS\,(T_{max} - T_{sur}) - Q_{diss}}{I\,(1 - 10^{-A_{808}})} \qquad (1)$$

Where

$$hS = \frac{\sum_i m_i c_{pi}}{\tau_s} \qquad (2)$$

With

$$\tau_s = -\ln\theta \qquad (3)$$

And

$$\theta = \frac{T(t) - T_{sur}}{T_{max} - T_{sur}} \qquad (4)$$

The half-life time τ_s is the slope of the linear fit of the experimental data plotted in Figure S2B (*t* vs. -lnθ). With values of *m* = 0.3 g and *Cp* = 4.2 J/g·K in eq. (2) and with τ_s = 138.26 s, T_{max} = 51.43 °C, *hS* (eq. (2)) is equal to 0.3144W/K. *Qdiss* was individually calculated to be 0.0126 W.

With the previously measured extinction coefficient at 808 nm, the A_{808} = 0.8. With an incident laser power of *I* = 1.5 W cm^{-2}, the photothermal efficiency was calculated with eq. (1) to be 24%. In the same method, the photothermal efficiency of large size GNRs was 17%.

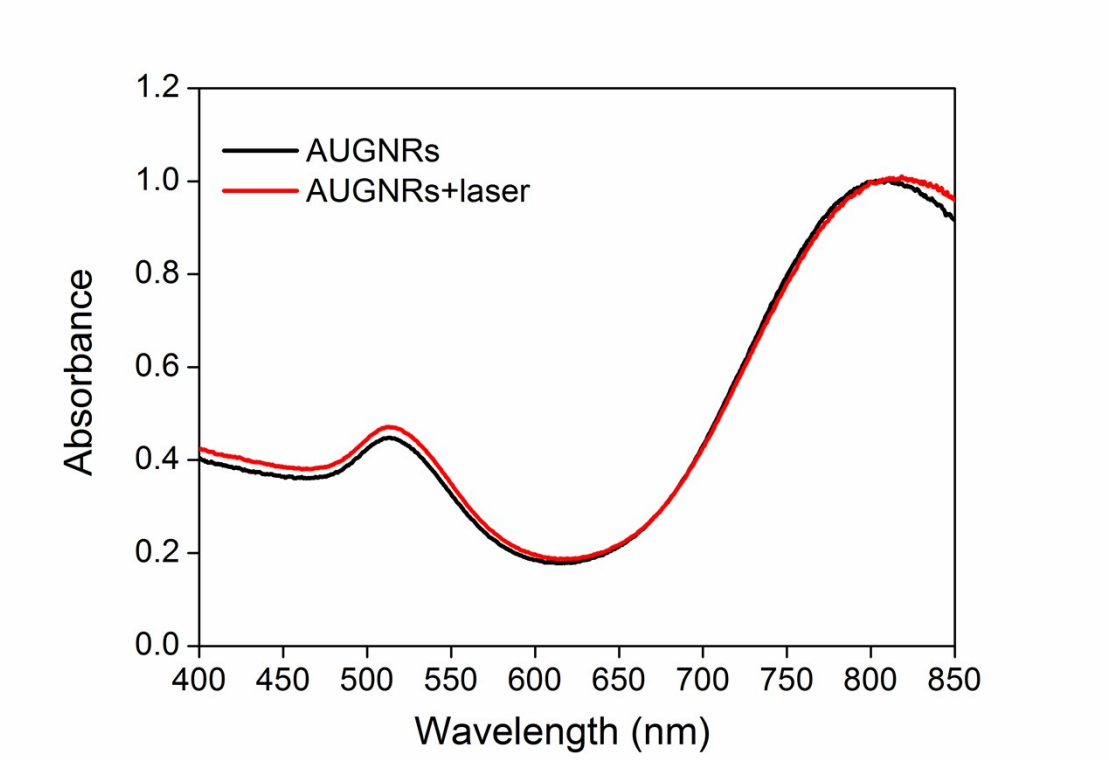

Figure S4. UV-vis-NIR absorbance spectra of AUGNRs with or without irradiation.

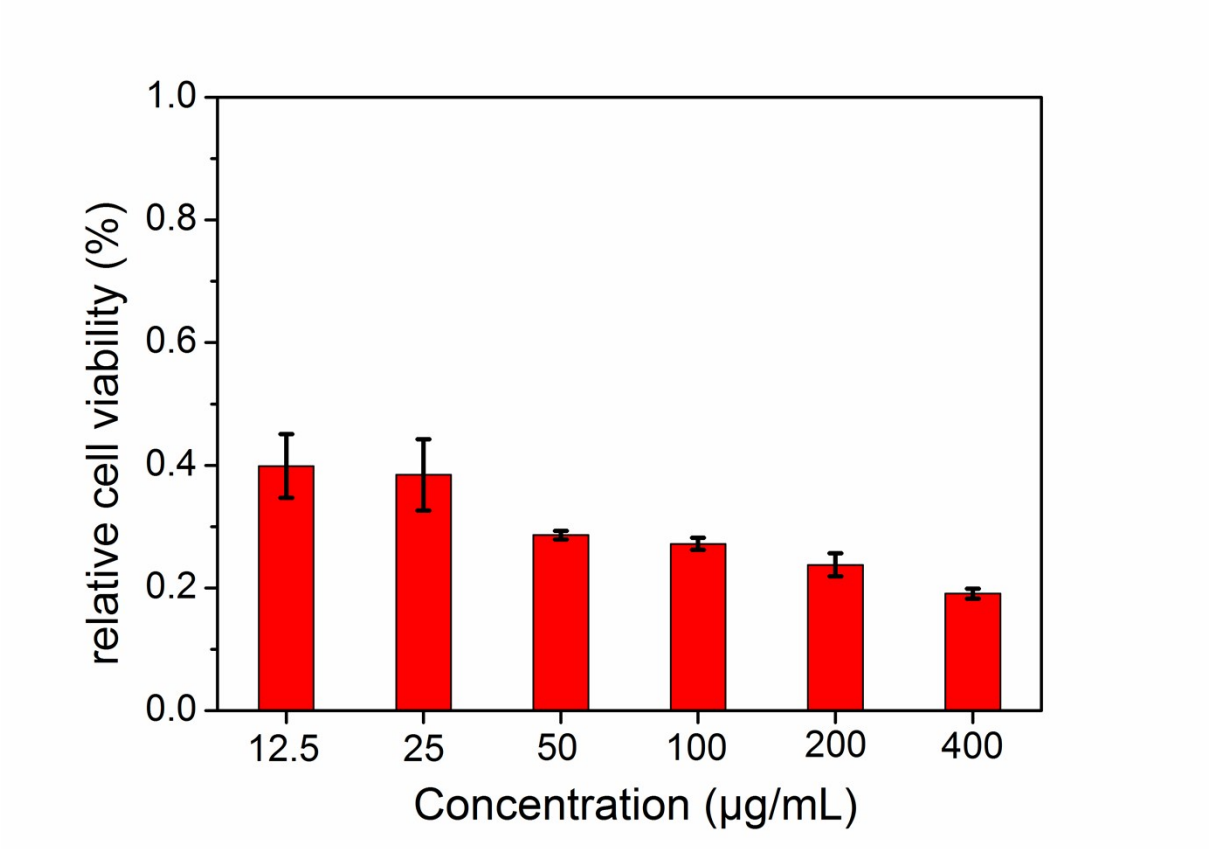

Figure S5. Relative cell viability of CTAB-coated ultrasmall GNRs. Error bars show standard deviations (n=5).

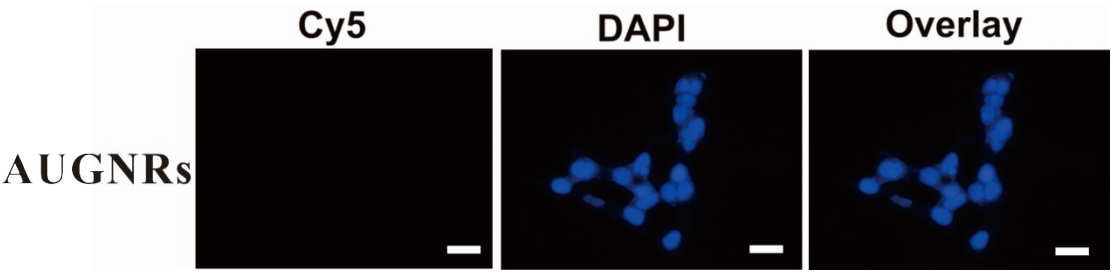

Figure S6: Fluorescence images analyses of 293T cells incubated with the AUGNRs for 1 h. All scale bars are 10 mm.

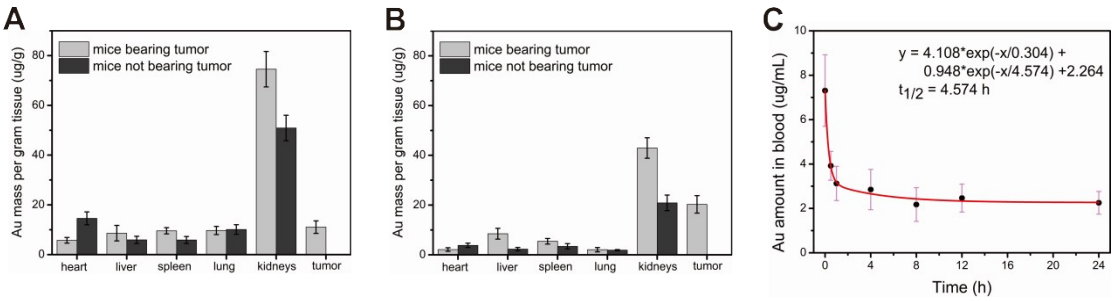

Figure S7: Biodistribution of AUGNRs in Balb/c mice bearing or not bearing tumors at day 1 (A) and

day 7 (B) postinjection measured by inductively coupled plasma atomic emission spectrometric (ICP-AES) analysis of Au in different organs and tissues (n=3). (C) the blood half-life of AUGNRs in Balb/c mice not bearing tumors.