Supporting Information for

FOLATE TARGETED SELF-LIMITING HYPERTHERMIC NANOPARTICLES FOR CONTROLLED PHOTOTHERMAL THERAPY

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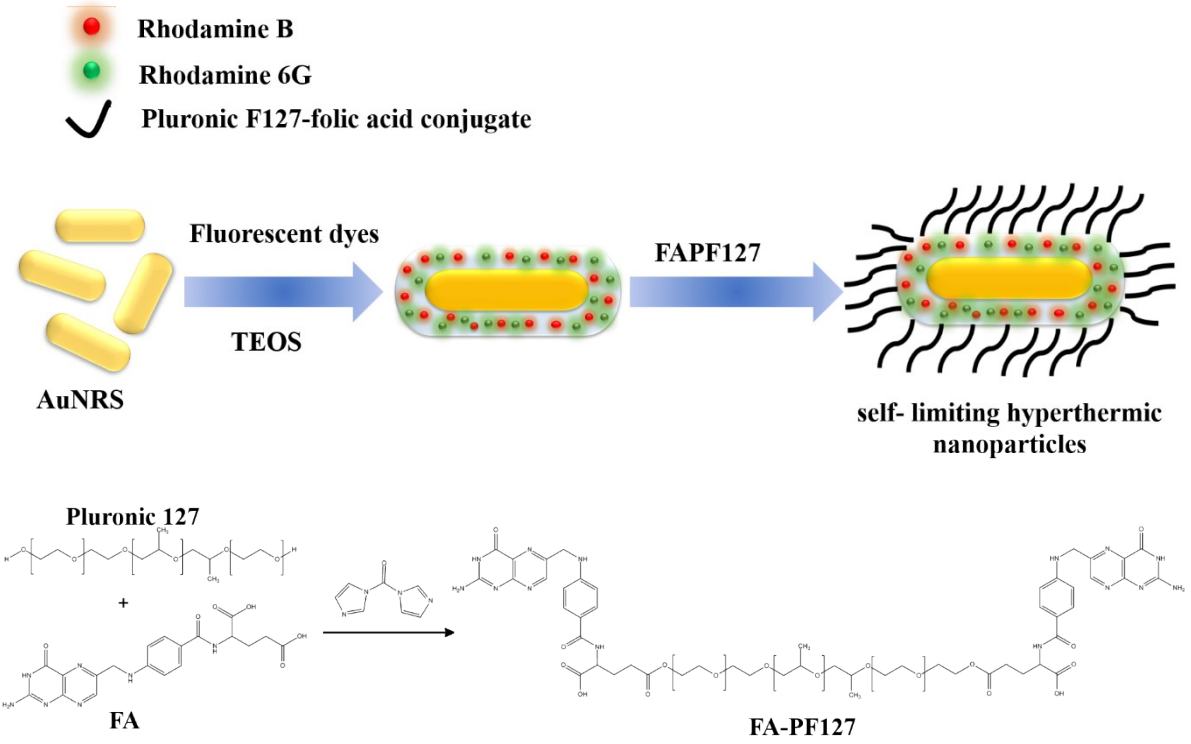

Figure S1. Folate targeted self- limiting hyperthermic gold nanoparticles were first synthesized by seed-mediated synthesis. Then, enclosed by an exterior shell is made of silica that encapsulates fluorescent dyes. After encapsulation, functionalization with folic acid was done using physical coating of a pluronic F127-folic acid conjugate.

Gold nanorod characteristics

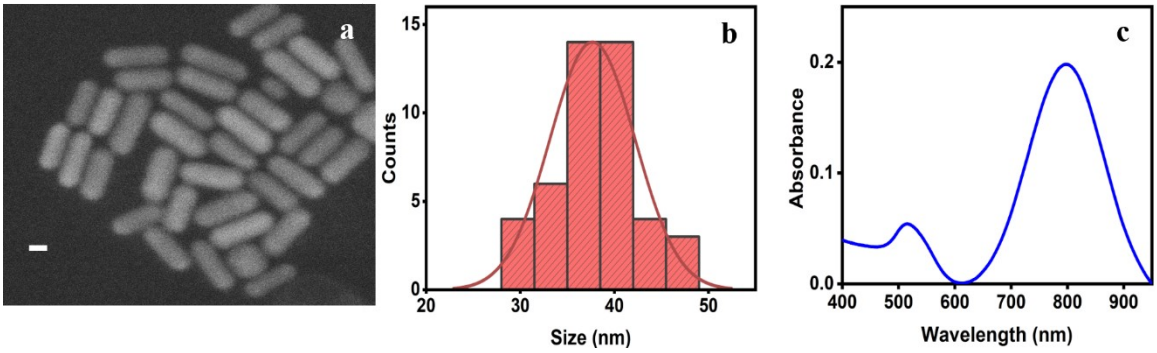

Figure S2. a) FESEM images of AuNRs. Scale bar: 10 nm. b) Size of AuNRs calculated from the SEM image. (c) Absorption spectra of AuNRs, the transverse peak at 516 nm and the peak longitudinal peak at 798 nm.

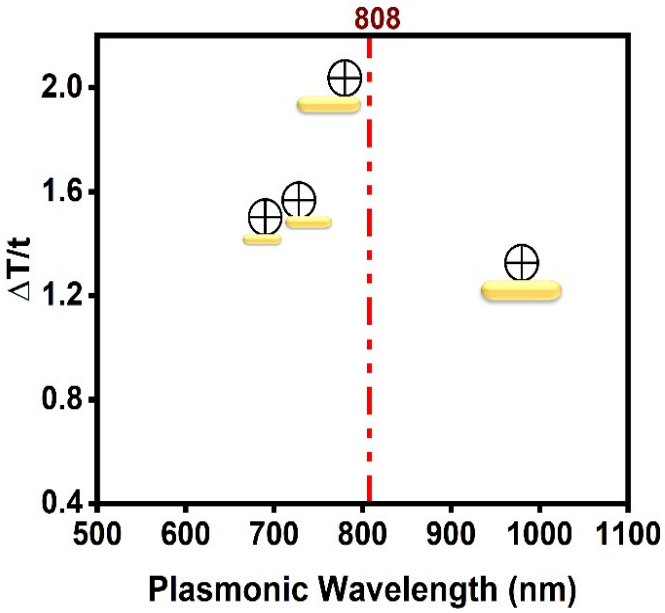

Figure S3. Photothermal heating rate of different AuNRs at laser irradiation (808 nm diode laser 2W/cm^2).

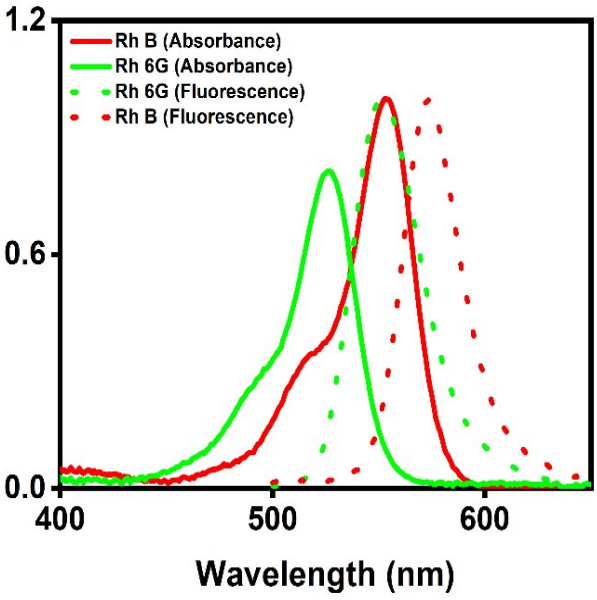

Figure S4. Fluorescence and absorbance spectra of rhodamine 6G and rhodamine B.

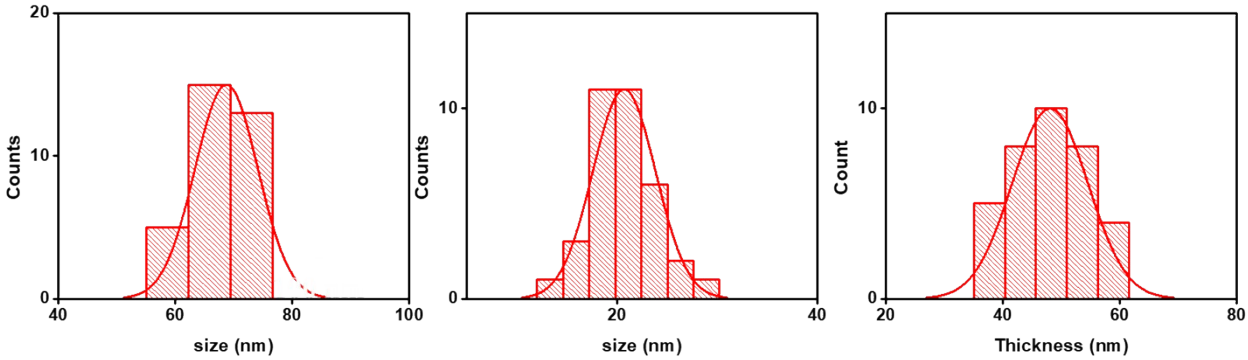

Figure S5. a) Particle distribution of silica coated AuNRs. b) Width of AuNRs calculated from the SEM images. c) Silica shell's thickness from SEM image.

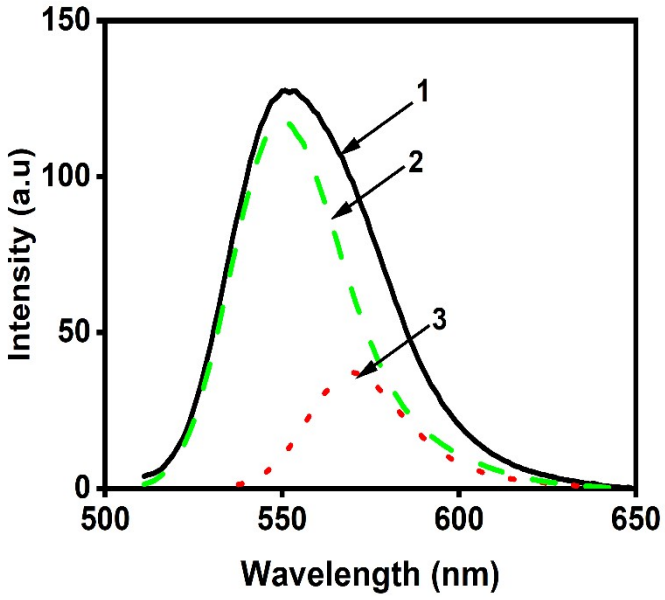

Figure S6. Decomposed fluorescence emission spectra of self-limiting hyperthermic nanoparticles excited at 488 nm after addition of 1 % hydrofluoric acid, (1-Measured spectra, (2-3) spectral contribution from rhodamine 6G and from rhodamine B obtained by linear decomposition of measured spectra).

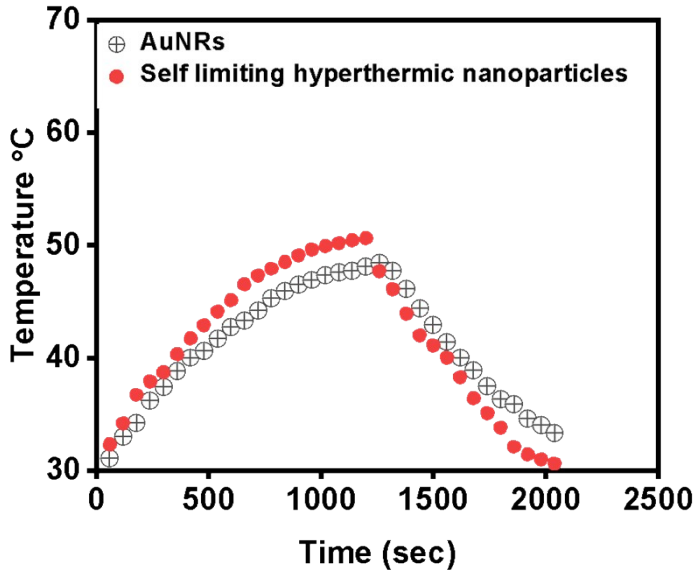

Figure S7. Heating-Cooling curve (bulk temperature) obtained for different particles under 808 nm, 2 Wcm^{-2} illumination. Bare gold nanorods are open circles and self-limiting nanoparticles are solid circles. The laser was turned off after reaching saturation which happened at 1260 s for self-limiting particles and 1200 s for gold nanorods.

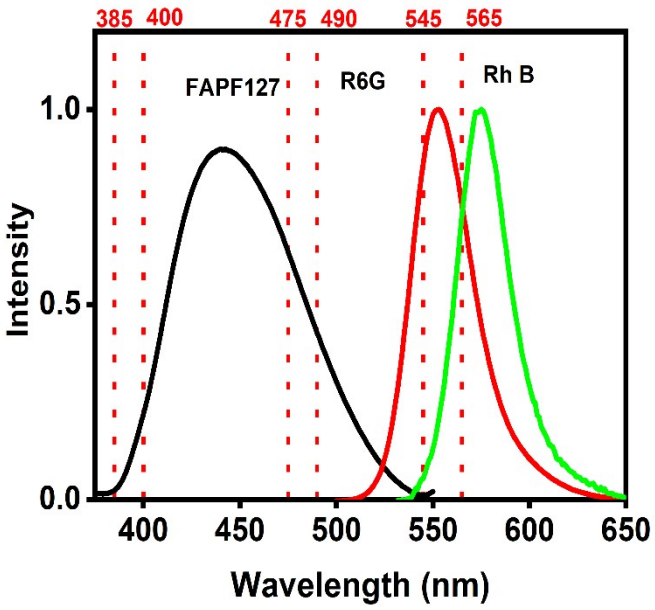

Figure S8. Normalized fluorescence intensities of folic acid, rhodamine 6G and rhodamine B.

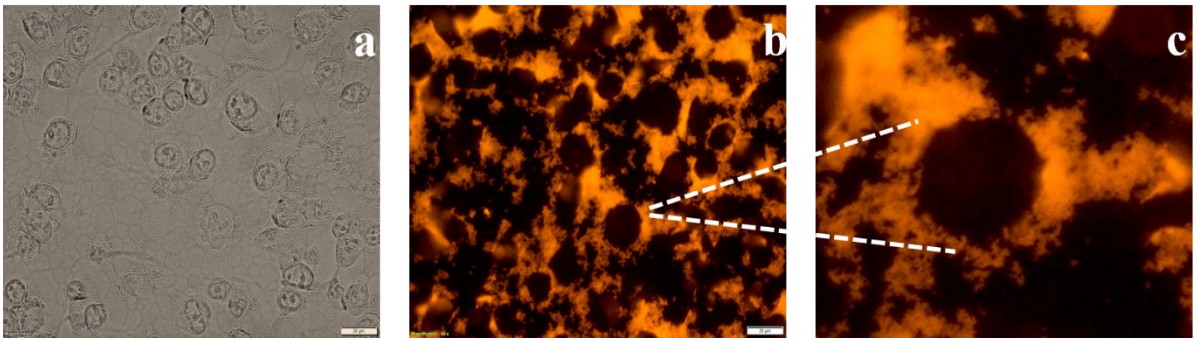

Figure S9. Fluorescence image of HeLa cells incubated with (60 µg/mL) self-limiting nanoparticles for 3 h under a) Bright field. b) TRITC filter cube. Bar size 20 µm.

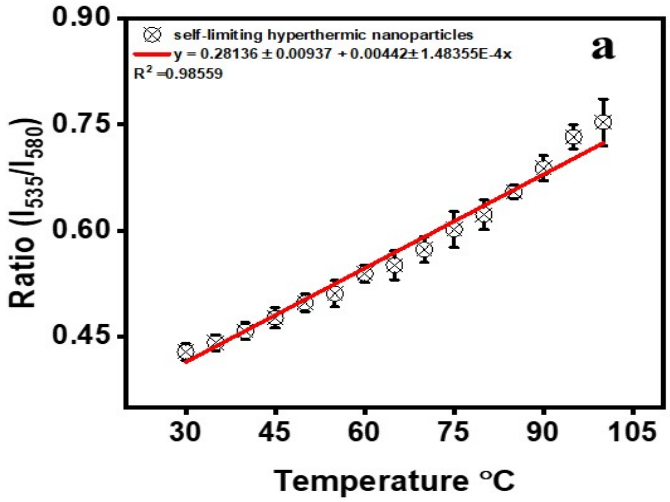

Figure S10. Temperature calibration curve used to convert fluorescent ratio to temperature in photothermal measurements.

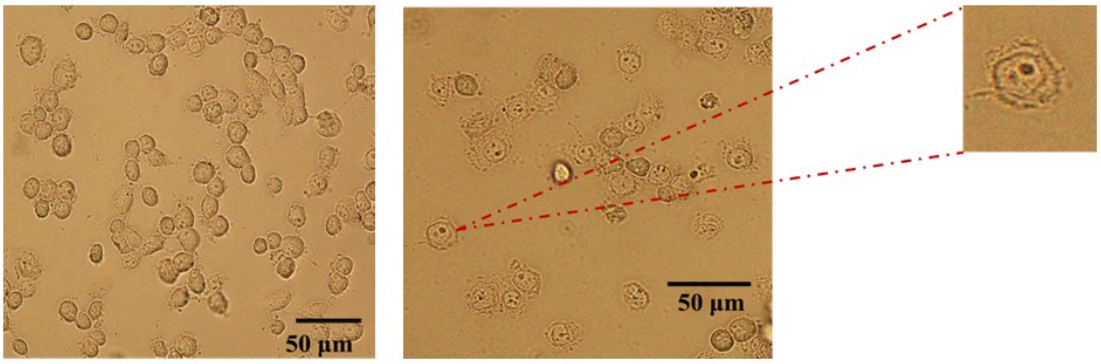

Figure S11. Bright field image of self-limiting nanoparticle-labelled HeLa cells under 808 nm irradiation at 2 Wcm^{-2} for a) 2 min b) 5 min.

Temperature calibration in cell like medium

The refractive index of cells ranges from 1.34-1.41 according to Gul et. al. [1] Polyvinylpyrrolidone hydrogels are known to possess refractive indexes in this range.[2] Herein we tried to mimic the cellular environment in terms of refractive index. We demonstrated a medium having refractive index that theoretically match the refractive index of the cells. PVP hydrogels compositions are known that have similar refractive index as cells (~1.34 at 488 nm. In the calibration experiment a cuvette containing self- limiting hyperthermia nanoparticles loaded PVP hydrogel was placed in the sample holder and the temperature was varied using the temperature controller of the cuvette holder. The temperature dependence of the ratio of fluorescent intensities of self-limiting hyperthermic nanoparticles was measured. Figure shows a linear temperature response to the ratios of the fluorescent intensities (I535/I580).

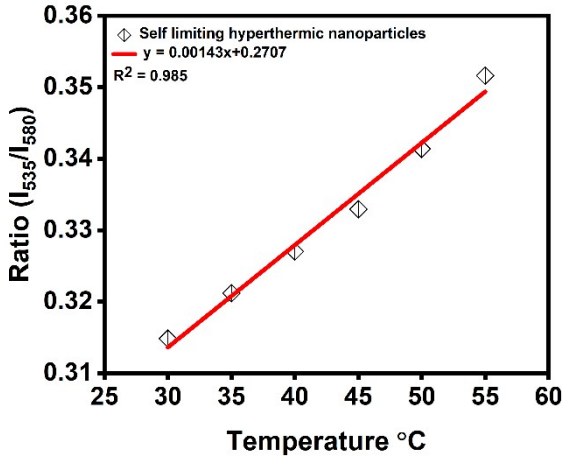

Figure S12 Temperature dependence of the ratio of fluorescent intensities (I_{535}/I_{580}) of self-limiting hyperthermic nanoparticles loaded hydrogel.

The refractive index of the self- limiting hyperthermia nanoparticles loaded PVP hydrogel was determined from the transmittance.

$$n = \frac{1 + \sqrt{1 - T^2}}{T}$$

Where T is the transmittance.

1. B. Gul, S. Ashraf, S. Khan, H. Nisar and I. Ahmad, *Photodiagnosis and Photodynamic Therapy*, 2021, **33**, 102096.
2. M. Guettari, A. Belaidi, S. Abel and T. Tajouri, *Journal of Solution Chemistry*, 2017, **46**, 1404-1417.