Supporting Information

Multifunctional theranostic graphene oxide nanoflakes as MR imaging agents with enhanced photothermal and radiosensitizing properties

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Calculation of photothermal conversion efficiency

The photothermal conversion efficiency (η) of NFs was calculated according to the following formulas (1, 2):

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

where h is the heat transfer coefficient, S is the surface area of the container, T_{max} and T_{sur} are the maximum equilibrium temperature and the ambient temperature, I is the laser power, A_{808} is the absorbance of NFs at 808 nm, and Q_{dis} is heat dissipation due to light absorbance of the solvent. hS can be calculated according to the following equation:

$$hS = \frac{m_s C_s}{\tau} \qquad (2)$$

where τ is the sample system time constant, and m_s and C_s are the mass and the heat capacity of the solvent (water), respectively.

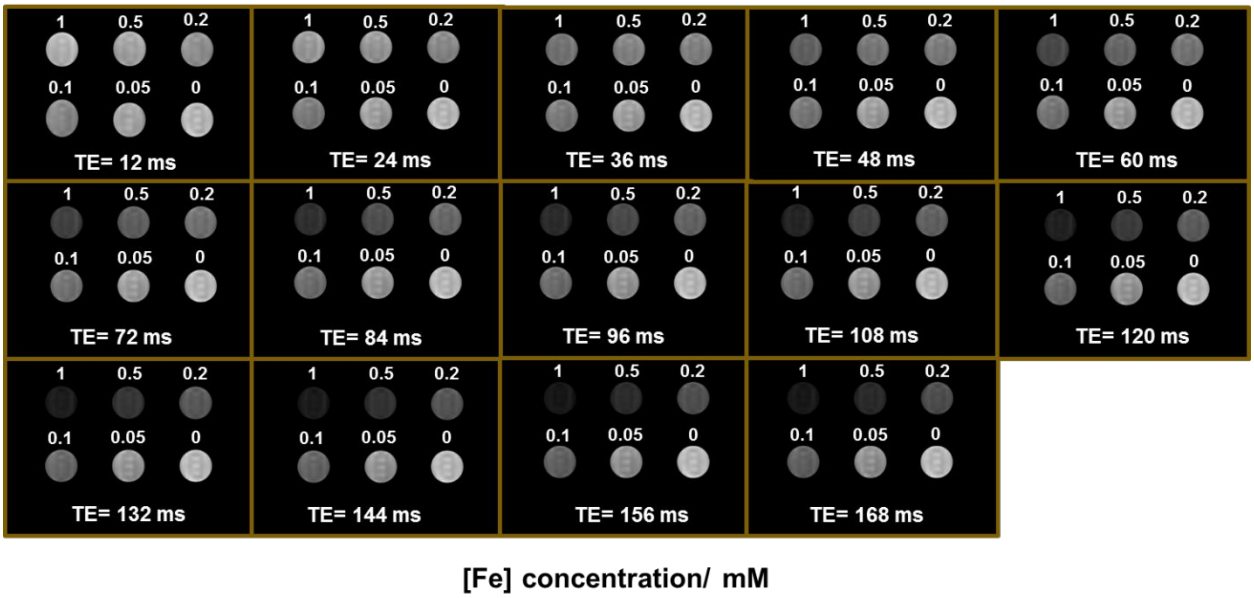

Figure S1. T2-weighted MR images of NF solutions containing 0-1.0 mM Fe. Images were obtained for various TE values, with the TR value fixed at 2,000 ms.

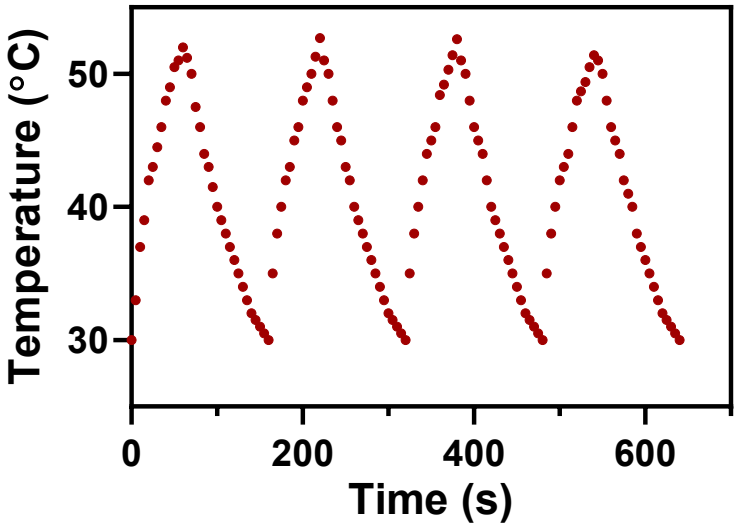

Figure S2. Temperature changes of the NF solution (50 μg/mL) during NIR heating (laser on, 1.8 W/cm²) and cooling (laser off) cycles.

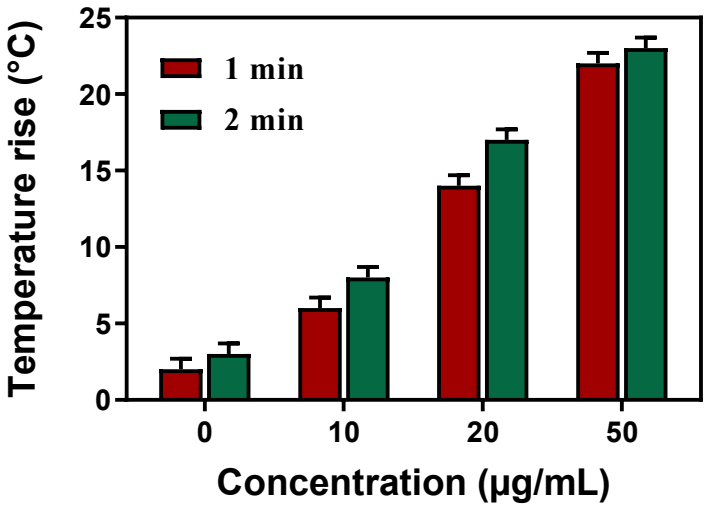

Figure S3. Temperature increase of CT26 cells incubated with various concentrations of NFs for 4 h. Temperatures were recorded after 808 nm laser irradiation for 1 or 2 min at 1.5 W/cm².

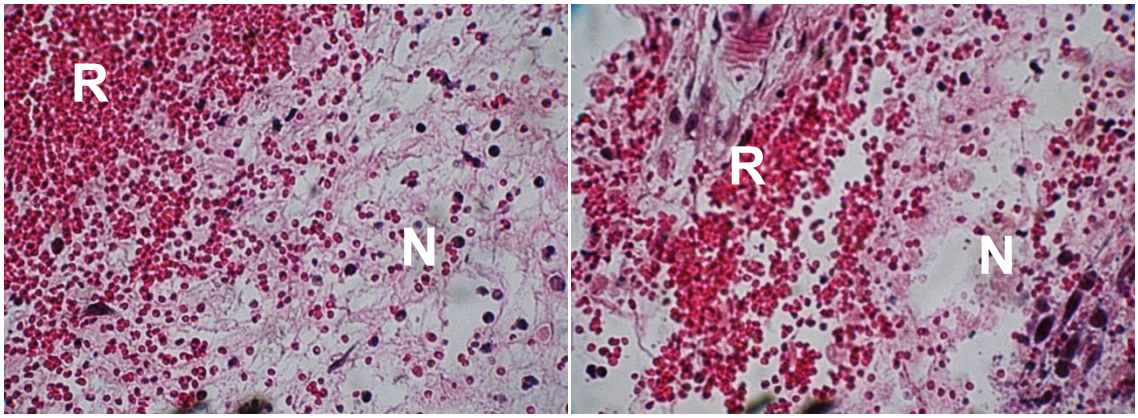

Figure S4. Representative H&E images from the combined NF + PTT/RT group at day 2 post-treatment, showing marked vascular hemorrhaging (R: red blood cells; N: necrotic zone).

References

S1. Bhana S, Lin G, Wang L, Starring H, Mishra SR, Liu G, et al. Near-infrared-absorbing gold nanopopcorns with iron oxide cluster core for magnetically amplified photothermal and photodynamic cancer therapy. ACS applied materials & interfaces. 2015;7(21):11637-47.
S2. Hu Y, Wang R, Wang S, Ding L, Li J, Luo Y, et al. Multifunctional Fe3O4@ Au core/shell nanostars: a unique platform for multimode imaging and photothermal therapy of tumors. Scientific Reports. 2016;6.