

Tumor-Targeting Semiconducting Polymer Nanoparticles: Efficient Adjuvant Photothermal Therapy Using Ultra-Low Laser Power Inhibits Recurrences After Breast-Conserving Surgery

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Supplementary Materials

Photothermal conversion efficiency calculation

The photothermal conversion efficacy was calculated by using the following equation³⁰. In details, RGD-SPN_{NIR775} (1 OD at 808 nm) was irradiated (0.3 W/cm², 808 nm) for 30 min, stable at the highest temperature, then cooled to room temperature. The temperature changes were monitored by thermal camera.

$$\eta = \frac{hS(T_{max} - T_{sur}) - Q_0}{I(1 - 10^{-A})}$$

Where h stands for transfer coefficient, S is the surface area, T_{max} is the equilibrium temperature, T_{sur} is the ambient temperature of the surroundings, Q_0 represents heat dissipated from the laser mediated by the solvent and container. I is the laser power (0.3 W/cm²), and A is the absorbance of RGD-SPN_{NIR775} at 808 nm (1 OD).

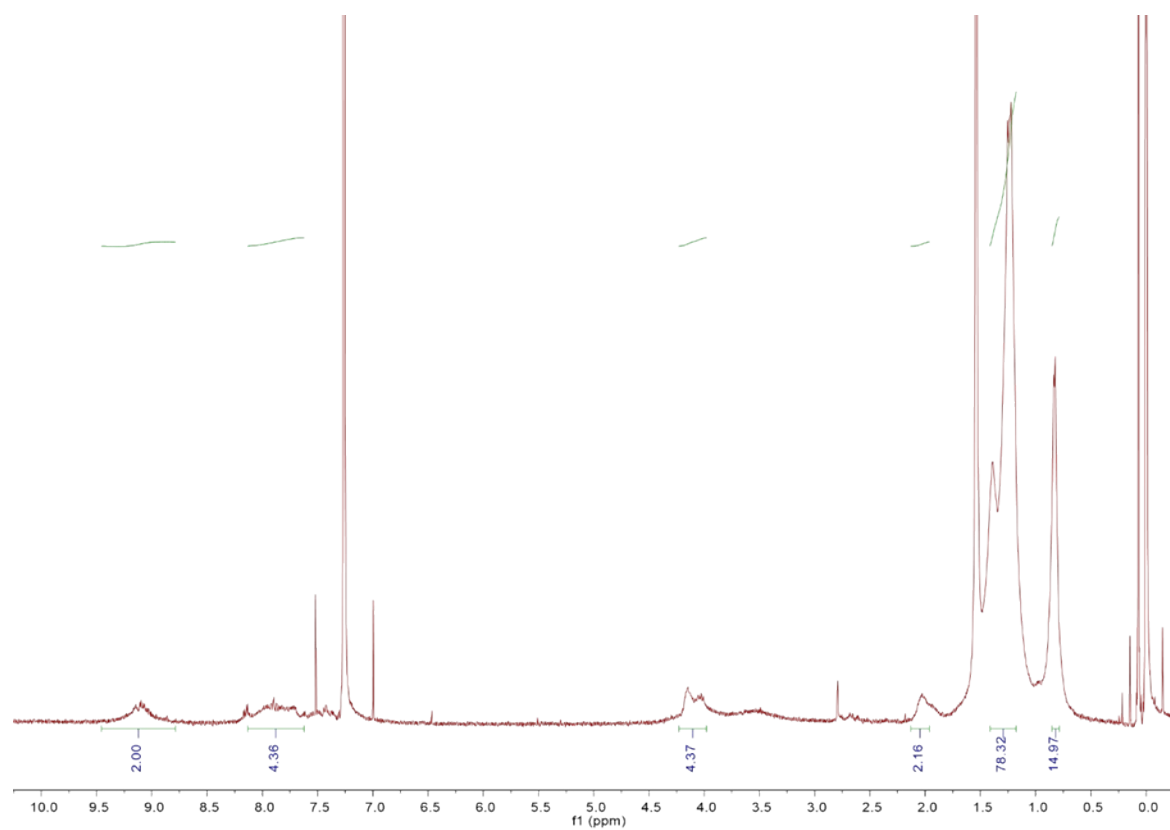
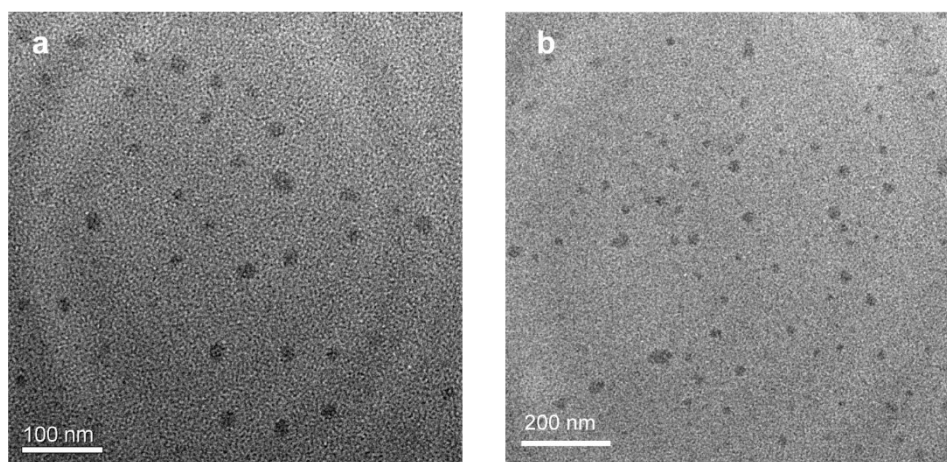
When the heat input is equal to the heat output, the hS is calculated by the following equation.

$$hS = \frac{m_{H2O}C_{H2O}}{\tau_s}$$

where τ_s stands for the sample system time constant, m_{H2O} is the weight of water, and C_{H2O} is the specific heat capacity of water.

The time constant τ_s is determined by applying the linear time data from the cooling stage vs negative natural logarithm of driving force temperature using the following equation:

$$t = -\tau_s \ln \theta = -\tau_s \ln \frac{T - T_{sur}}{T_{max} - T_{sur}}$$

Figure S1. ^1H NMR spectrum of PDPP-BTFigure S2. TEM images of RGD-SPN_{NIR775}

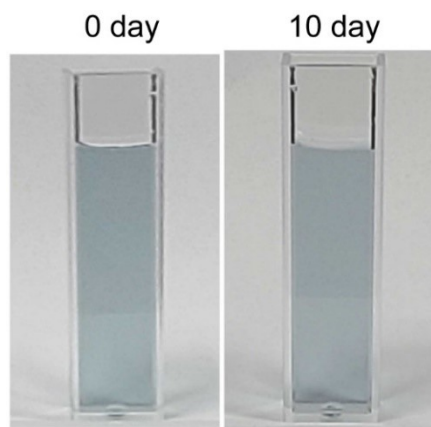


Figure S3. Images of RGD-SPN_{R775} solutions on day 1 and 10.

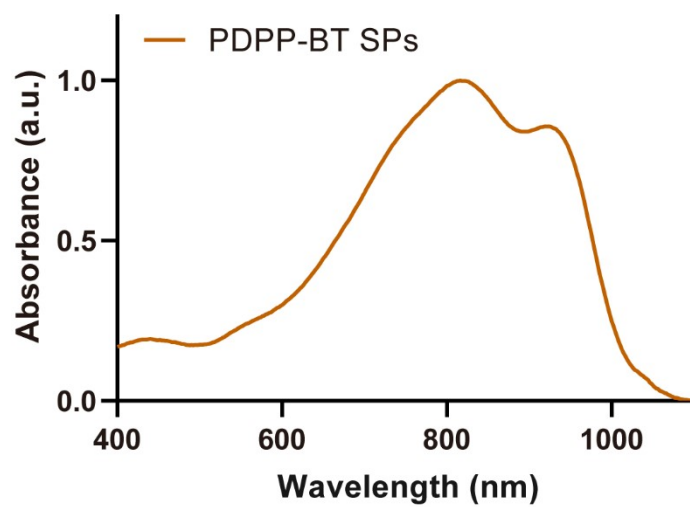


Figure S4. Absorption spectrum of PDPP-BT SPs.

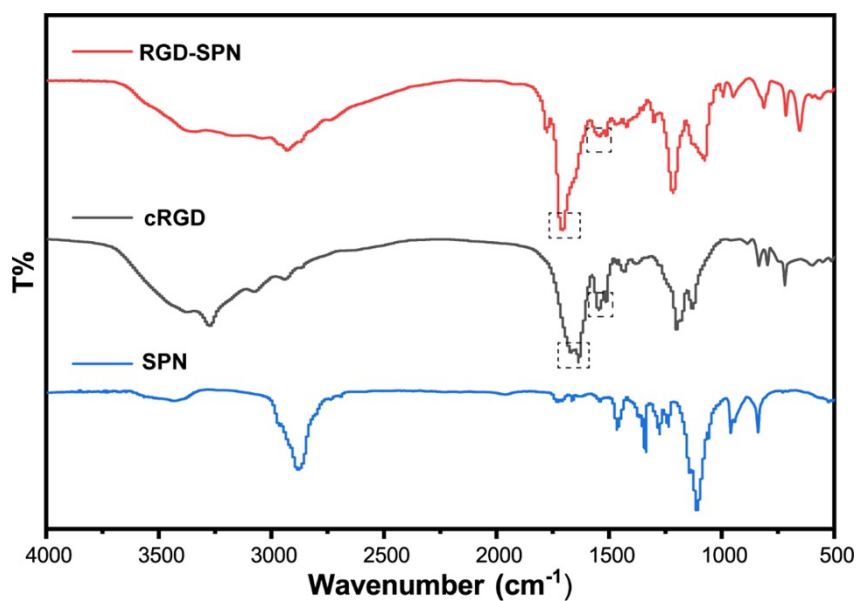


Figure S5. FT-IR spectra of RGD-SPN, cRGD peptide and SPN.

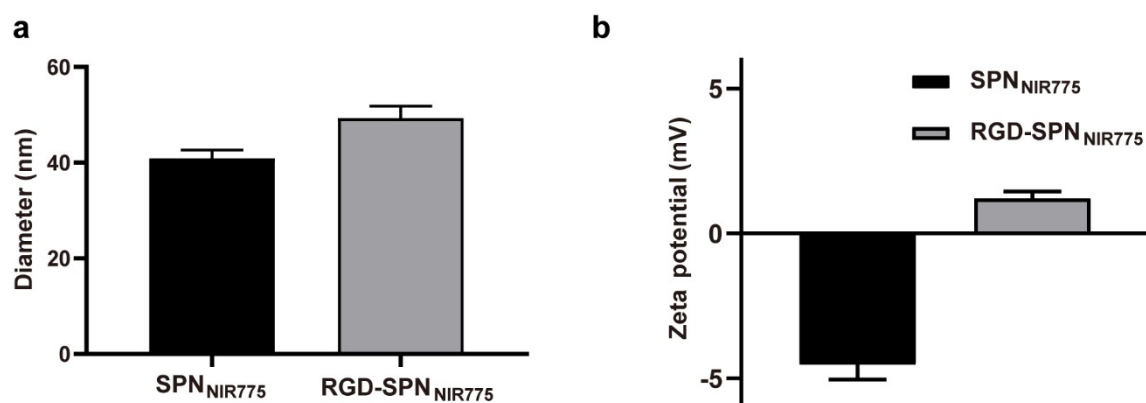


Figure S6. Hydrodynamic diameter and Zeta potential value changes of RGD-SPN_{NIR775} and SPN_{NIR775}.

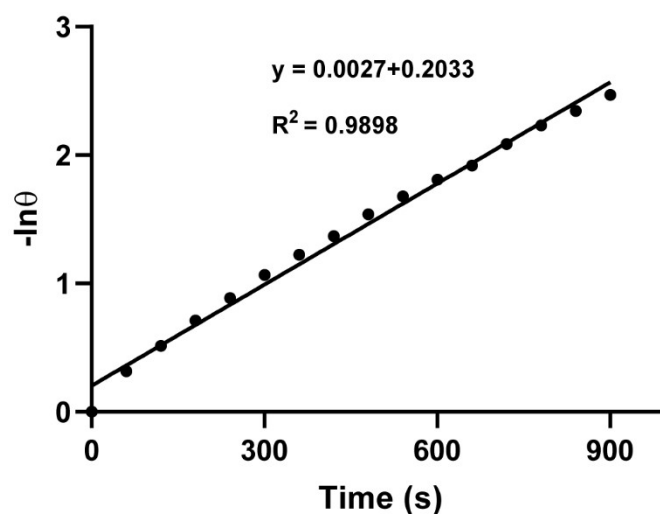


Figure S7. The linear regression between cooling period after reaching the equilibrium temperature and negative natural logarithm of driving force temperature.

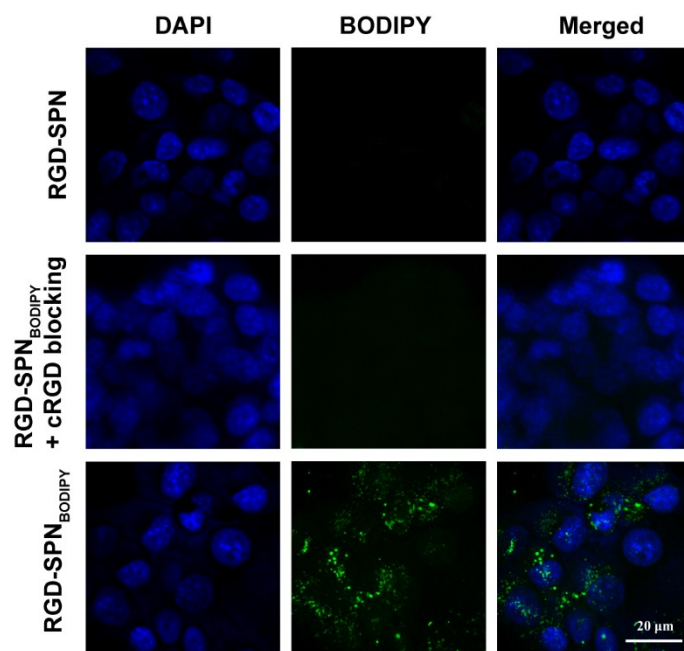


Figure S8. Confocal laser scanning micrographs of 4T1 cells incubated with SPN_{BODIPY} or RGD-SPN_{BODIPY} with or without free cRGD blocking. Scale bar: 20 μm .

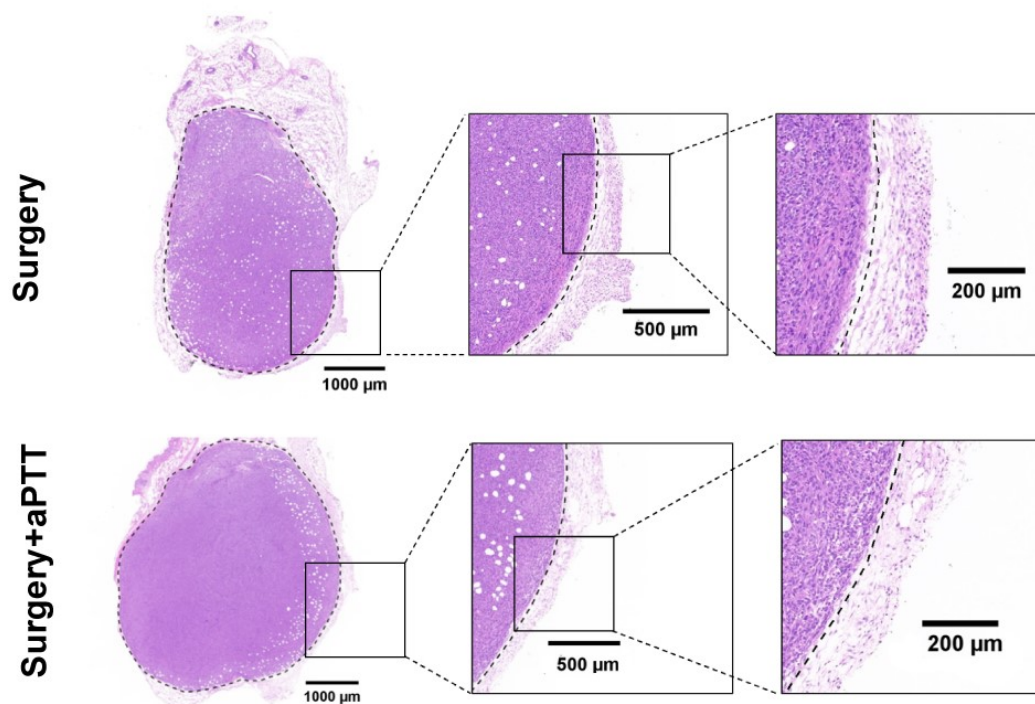


Figure S9. Histological sections of tumors in surgery and surgery+aPTT groups with negative margins.

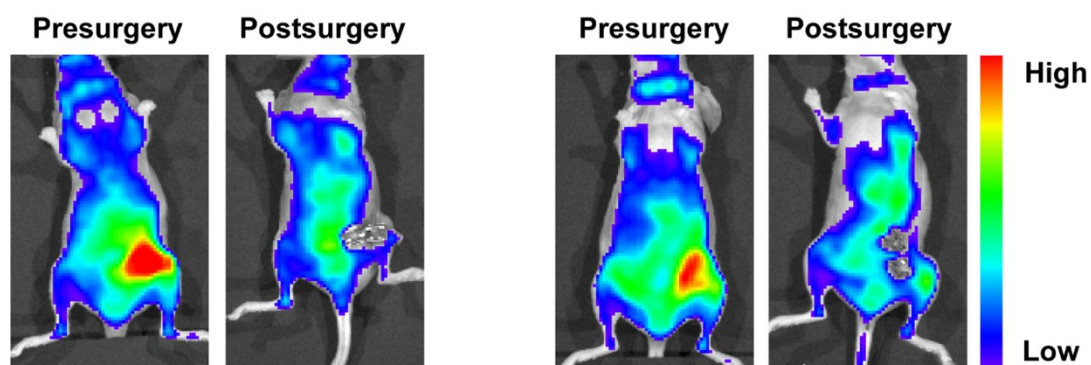


Figure S10. Preoperative and postoperative fluorescence imaging of mice

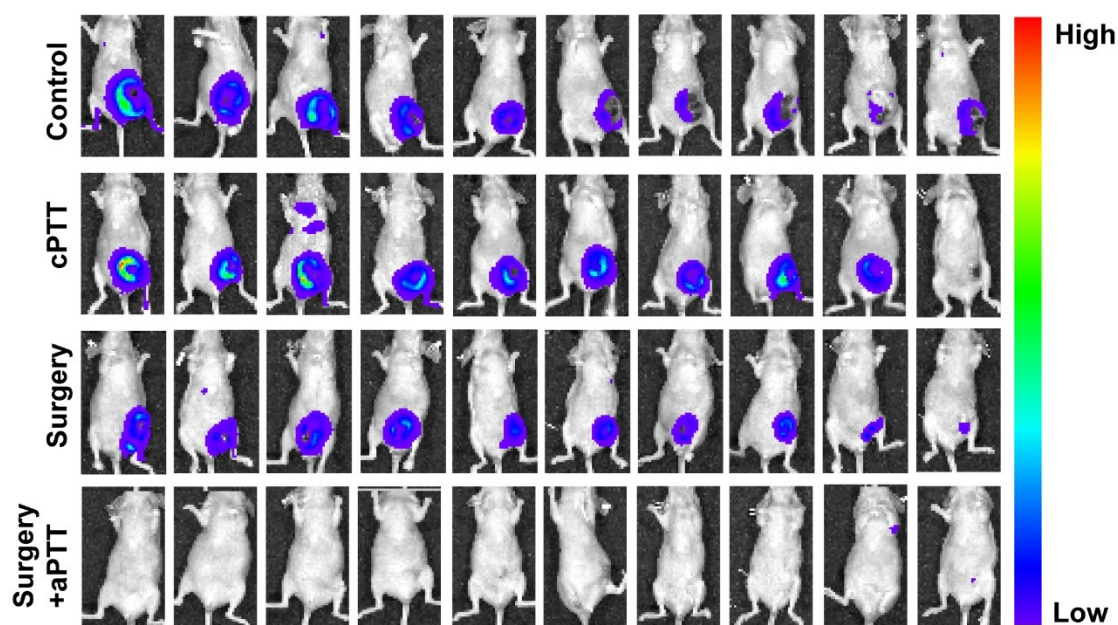


Figure S11. Bioluminescent images of mice showing the signal of tumors from different groups of mice on day 18. (n=10)

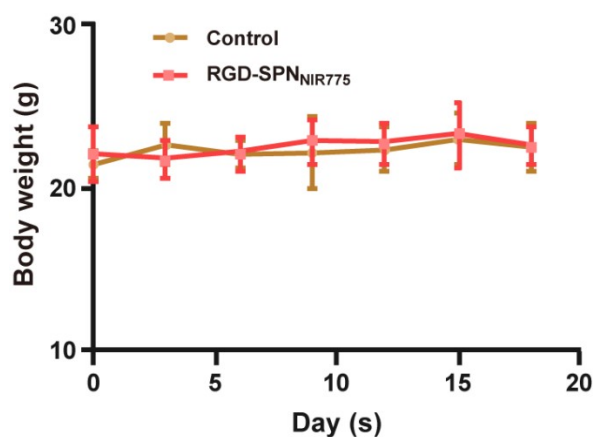


Figure S12. Body weight of mice during 18 days.