Electronic Supplementary Material (ESI) for Biomaterials Science.

Supporting Information

Microwave-Assisted Ultrafast Fabrication of High-Performance Polypyrrole Nanoparticles for Photothermal Therapy of Tumors in Vivo

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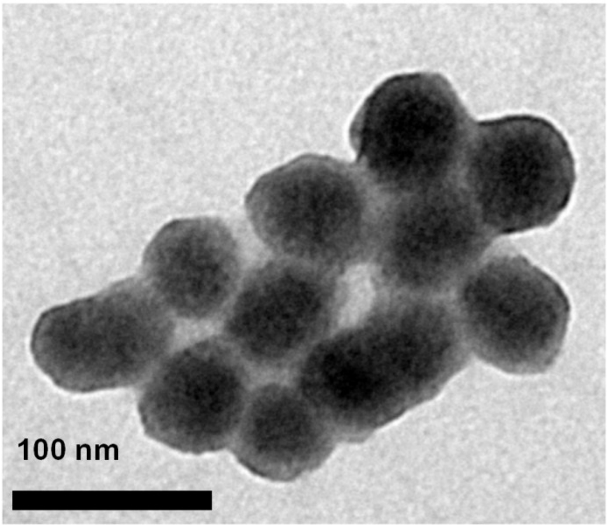

Figure S1. TEM of PPy nanoparticles synthesized using a traditional method.

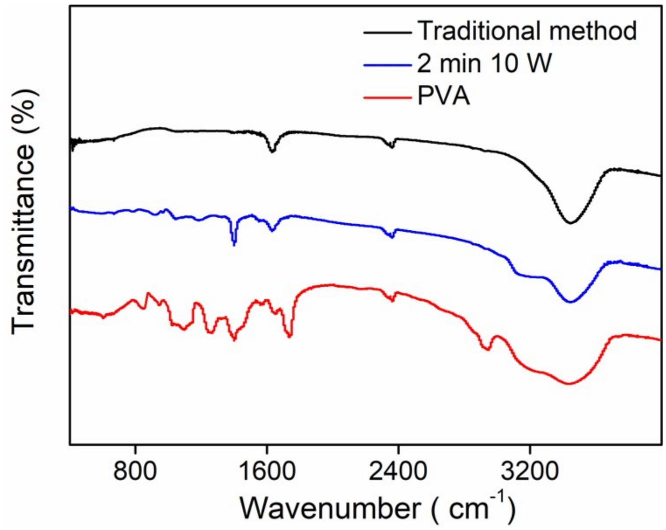

Figure S2. FTIR spectra of PVA and two kinds of PPy nanoparticles synthesized by microwave-assisted and traditional method, respectively.

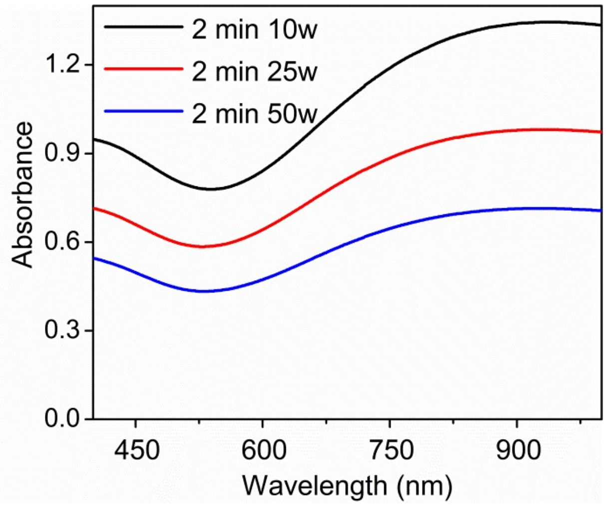

Figure S3. Absorption spectra of PPy nanoparticles (100 μg/mL) synthesized with different microwave power densities and fixed synthetic time of 2 mins.

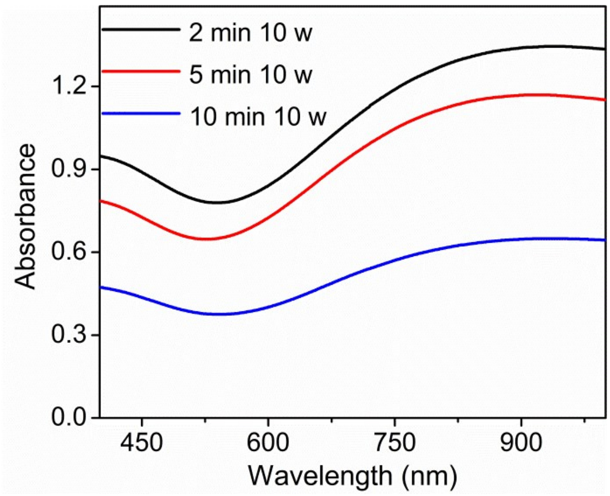

Figure S4. Absorption spectra of PPy nanoparticles (100 μg/mL) produced with different synthetic time and fixed power (10 W).

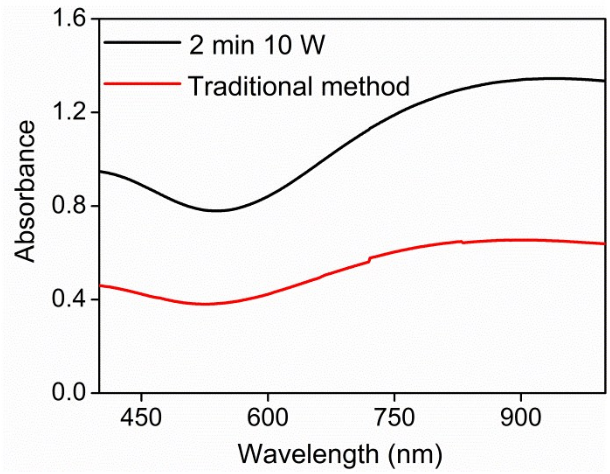

Figure S5. Absorption spectra of the two types of PPy nanoparticles produced by different methods.

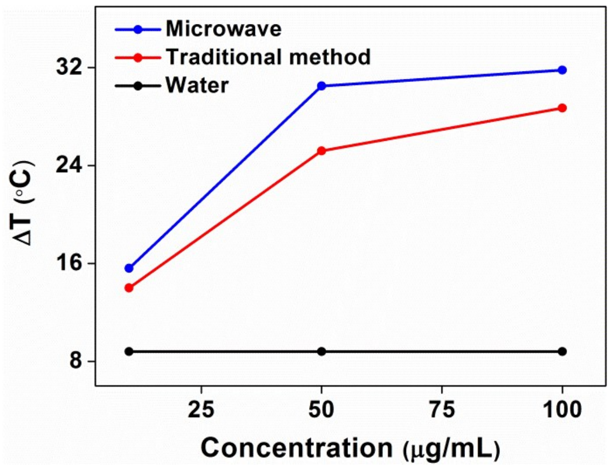

Figure S6. Temperature changes of water and two types of PPy nanoparticles (synthesized by microwave-assisted and traditional methods) with different concentrations (10, 50, 100 μg/mL) after irradiated by 808 nm laser for 10 mins.

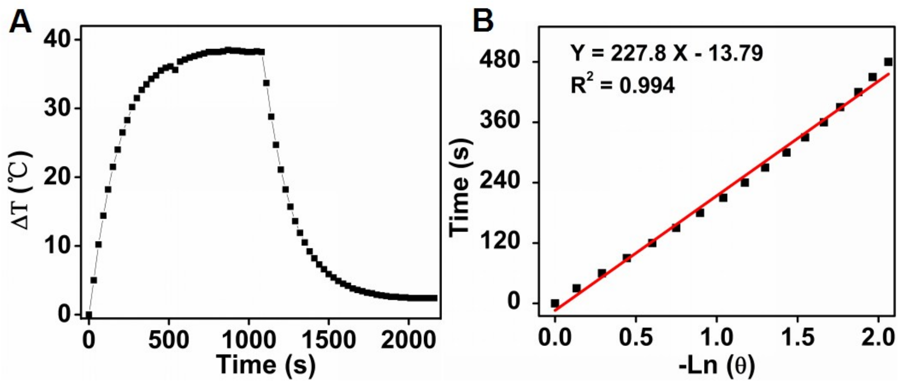

Figure S7. (A) The photothermal conversion efficiency (η) of PPy prepared by microwave method was measured by a cycle of LASER ON/OFF treatment. (B) Plot of cooling time versus negative natural logarithm of the driving force temperature was obtained from the cooling stage. Time constant for heat transfer (τ_s) of this system is determined to be 227.8 s.

Detailed calculation of the photothermal conversion efficiency (η) was given as follows:

$\eta = (hs(T_{max}–T_{surr})–Q_0)/(I(1\text{-}10^{-A}))$, where h means the heat transfer coefficient and s is the surface area of the container. The value of hs is gained from Figure S7B, and T_{max}-T_{surr} is the temperature change of the PPy solution between the maximum steady temperature and ambient temperature (Figure S7A). Q_0 refers to heat dissipated from light absorbed by the solvent and the container. I is the power density of the laser, and A represents the absorbance of PPy at 808 nm. According to the equation, the photothermal conversion efficiency of PPy nanoparticles at 808 nm is calculated to be 21.47%.

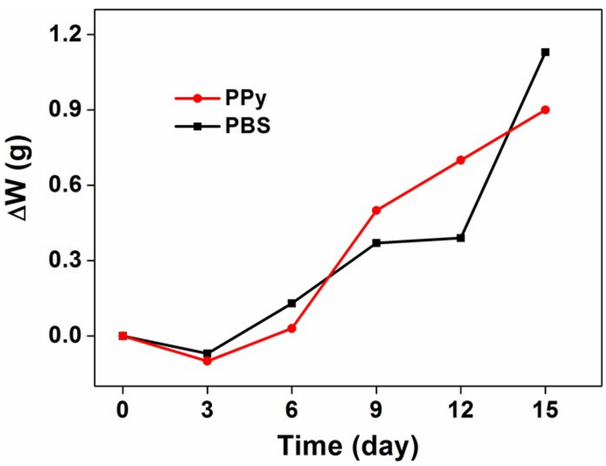

Figure S8. Body weight changes of mice after the administration of PPy nanoparticles (20 μL, 4 mg/mL) or PBS in 15 days.

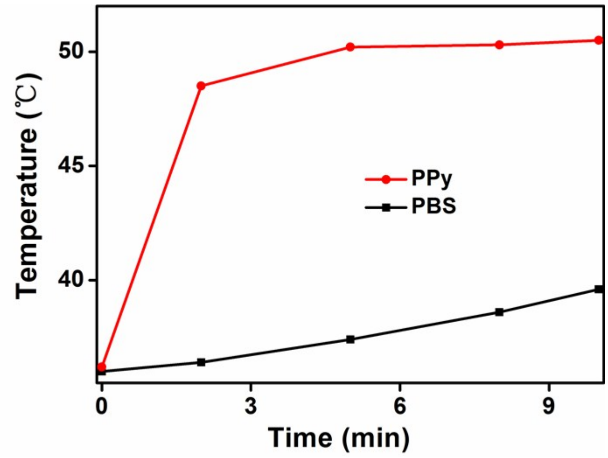

Figure S9. The surface temperature change of the tumors treated with PPy nanoparticles or PBS and laser irradiation at a power density of 0.33 W/cm^2 for 10 mins.

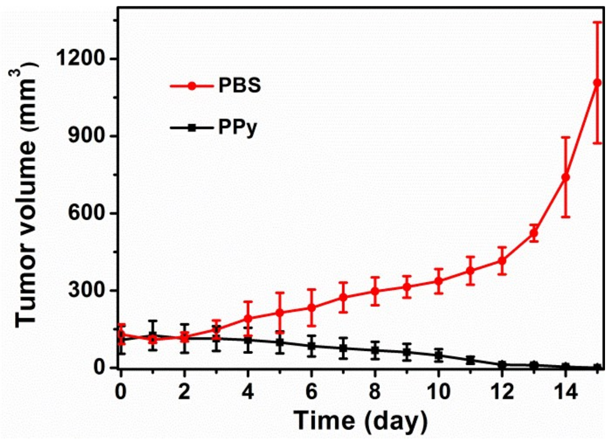

Figure S10. Tumor volume monitoring of mice after treated with PBS or PPy nanoparticles and laser irradiation (0.33 W/cm^2, 10 mins) in 15 days (20 μL, 4 mg/mL).