

Supporting Information

for

Octopod PtCu Nanoframe for Dual-Modal Imaging-Guided Synergistic Photothermal Radiotherapy

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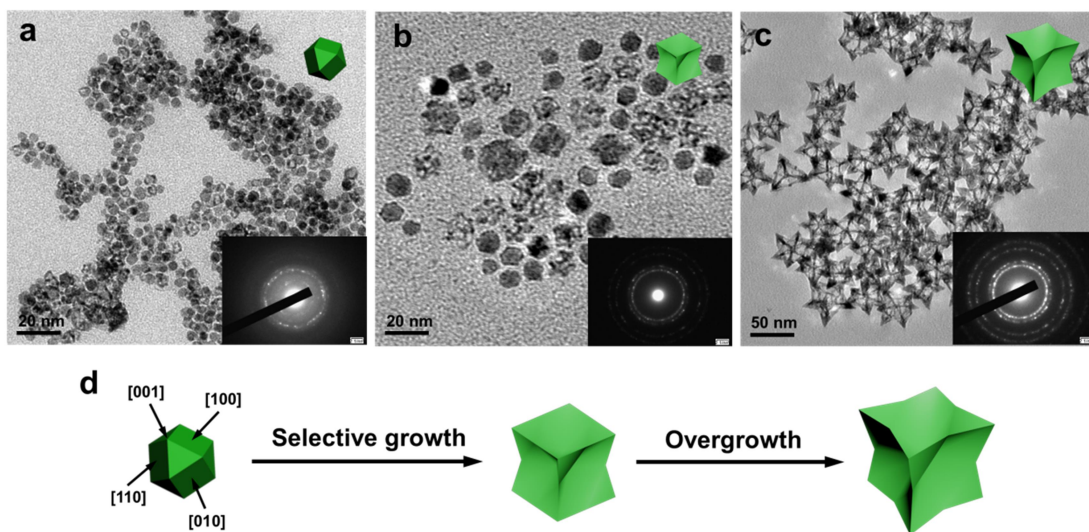


Figure S1. TEM images obtained at different times during the fabrication of octopod PtCu nanoframes: (a) 1 h, (b) 6 h and (c) 48 h, respectively. The inset images exhibit the diffraction rings of nanoframes at different steps; and (d) schematic preparation of OPCNs of the major steps during synthesis process.

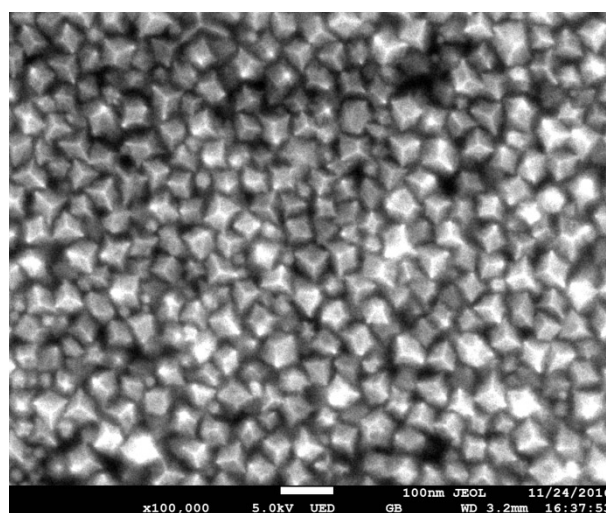


Figure S2. Representative SEM image of the as-synthesized OCPNs. Scale bar: 100 nm.

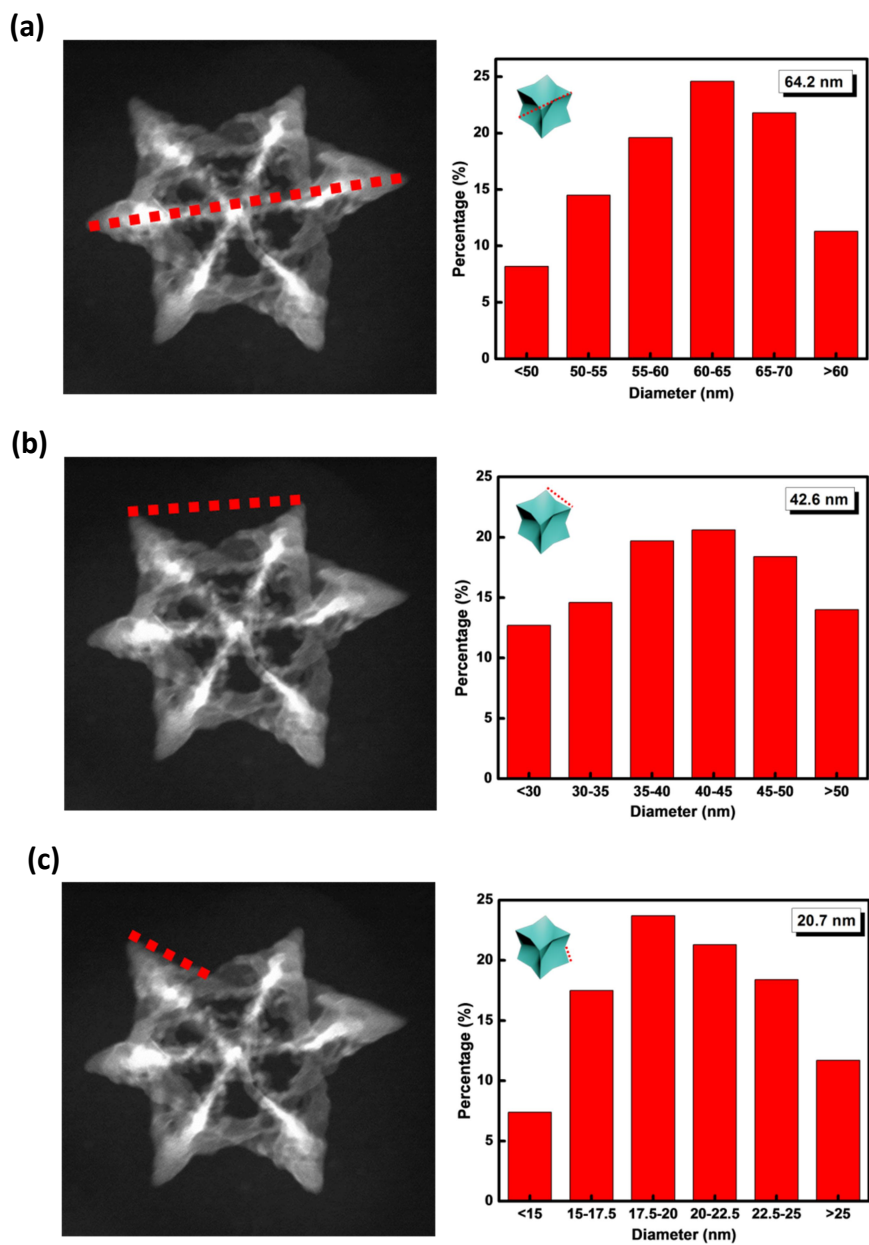


Figure S3. Particle size distributions of the as-synthesized OPCNs: (a) diagonal length; (b) edge breadth; and (c) eight symmetric feet length, respectively.

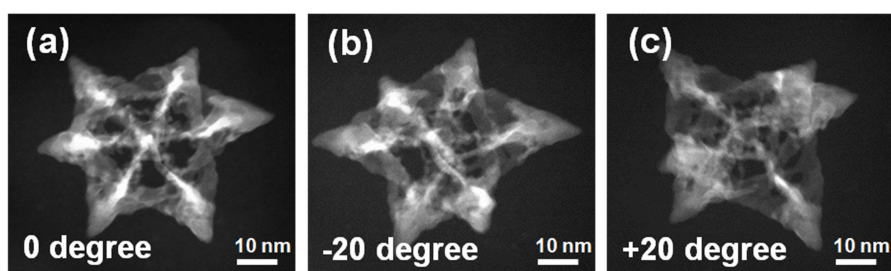


Figure S4. Angle dependent HAADF-STEM images of the OPCNs from different perspectives with concave octopod feature: (a) original position; (b) -20 degree at X-axis; and (c) +20 degree at X-axis.

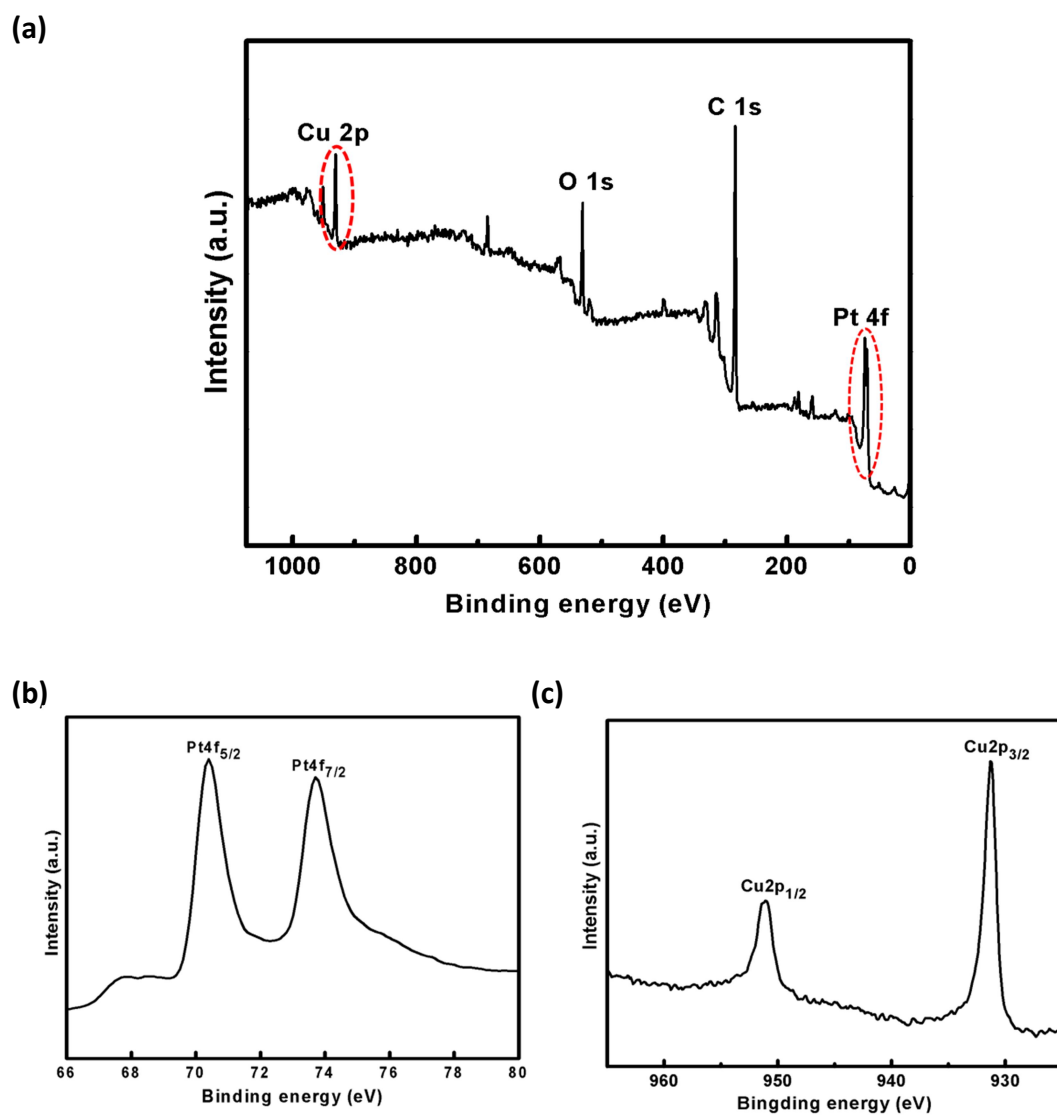


Figure S5. XPS spectra of the as-prepared PtCu nanoframes: (a) OPCNs; (b) Pt 4f; and (c) Cu 2p bands.

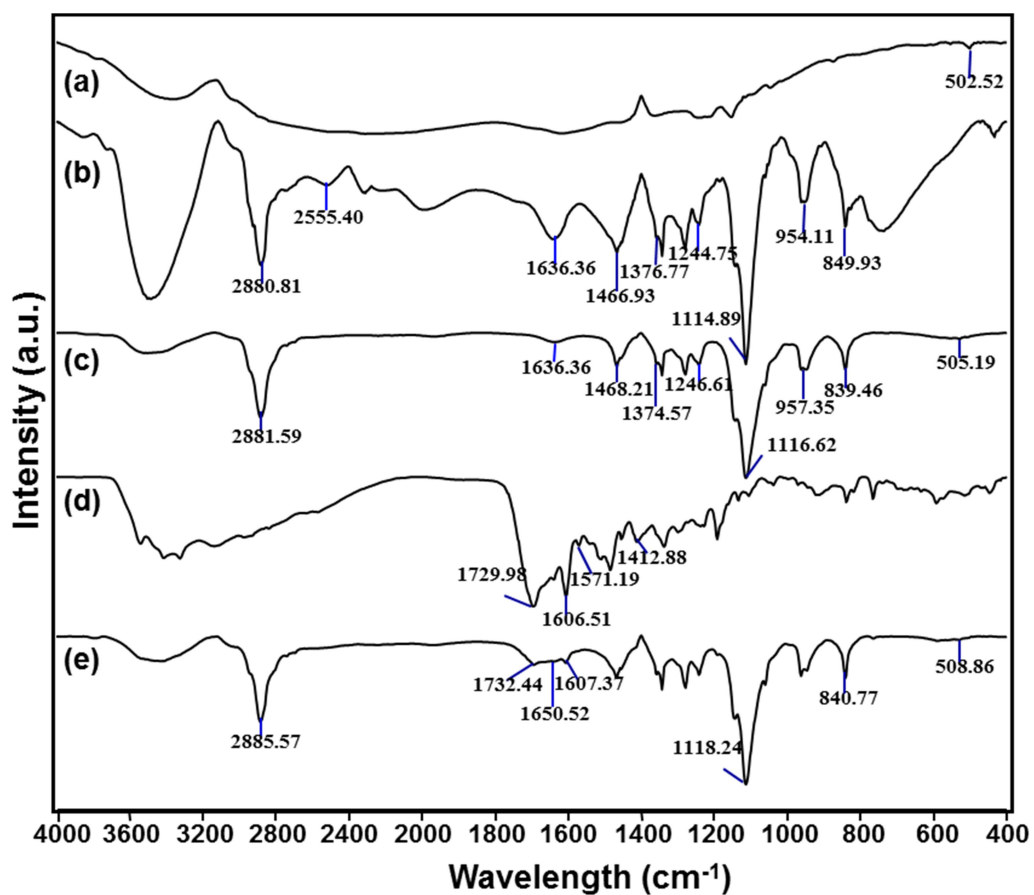


Figure S6. FTIR spectra of nanoparticles at major steps during the synthesis process of OPCNs-PEG-FA: (a) OPCNs; (b) Pure SH-PEG-NH₂; (c) OPCNs-PEG; (d) Pure FA; and (e) OPCNs-PEG-FA, respectively.

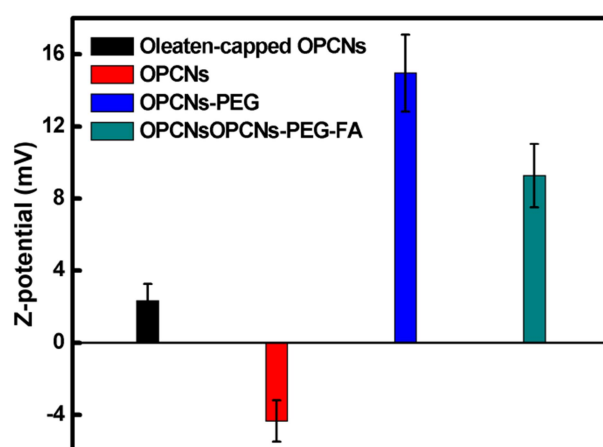


Figure S7. Zeta potentials of the as-synthesized nanoparticles at different steps during the fabrication process (n = 5).

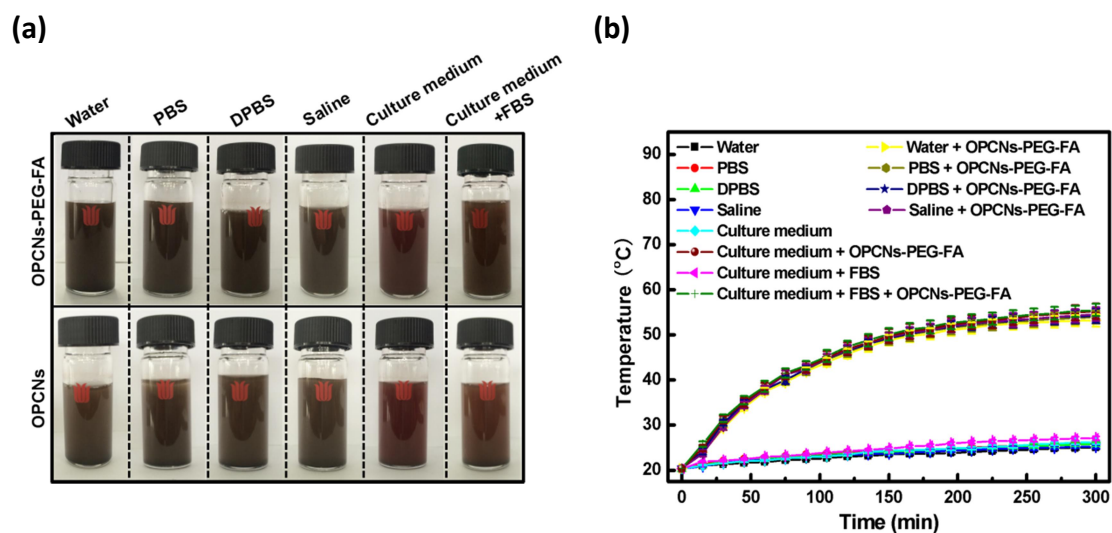


Figure S8. (a) The stability and dispersion of OPCNs nanoparticles in different solutions after 24 h; and (b) thermogenesis capacity of OPCNs-PEG-FA (200 $\mu\text{g/mL}$) irradiated with NIR laser (808 nm, 2.4 W/cm^2 , 5 min) in different solutions.

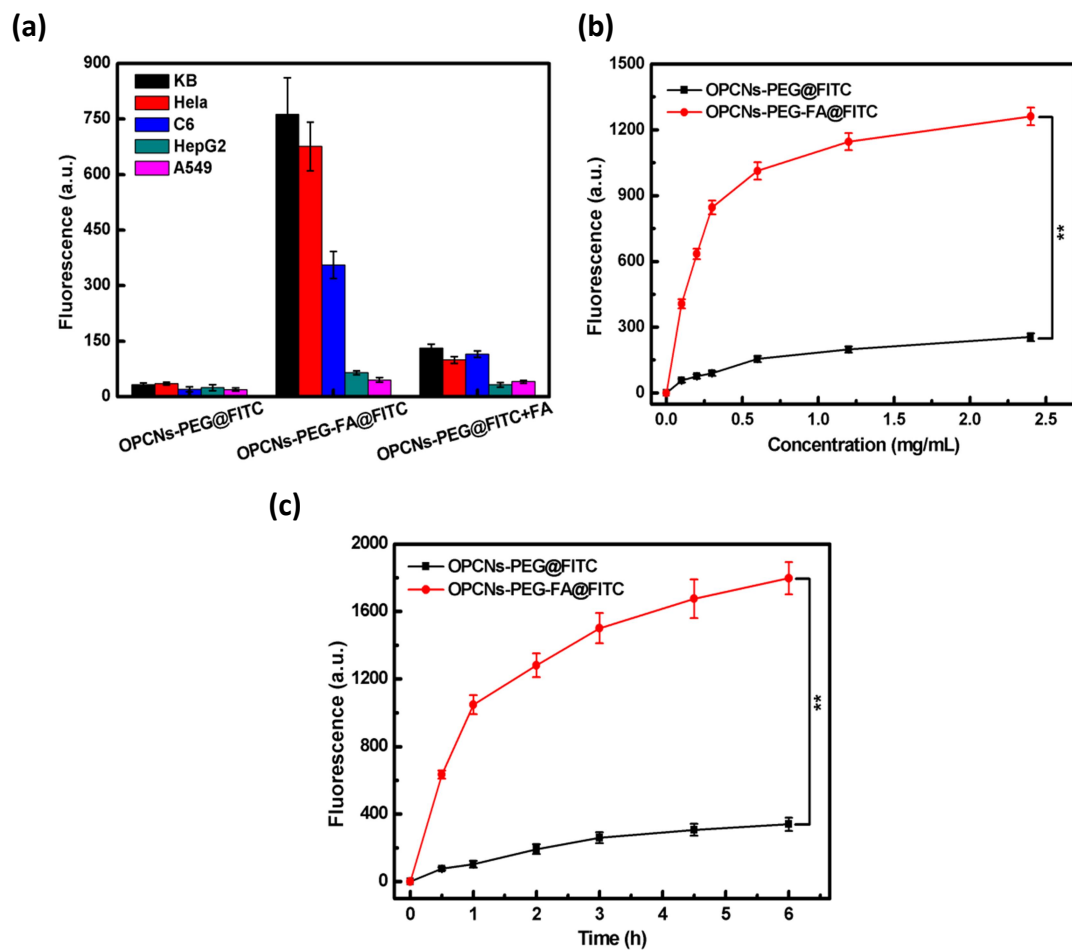


Figure S9. Targeting uptake assay: (a) folic acid-receptor (FR) mediated targeting capacity of OPCNs-PEG-FA evaluated with FR positive (KB, HeLa, C6) and negative (HepG2, A549) cancer cells; (b) concentration dependence of OPCNs-PEG-FA@FITC nanoparticles uptake by HeLa cells (incubation time: 1 h); and (c) time dependence of OPCNs-PEG-FA@FITC (200 μ g/mL) uptake by HeLa cells. ** p < 0.01 (n = 3).

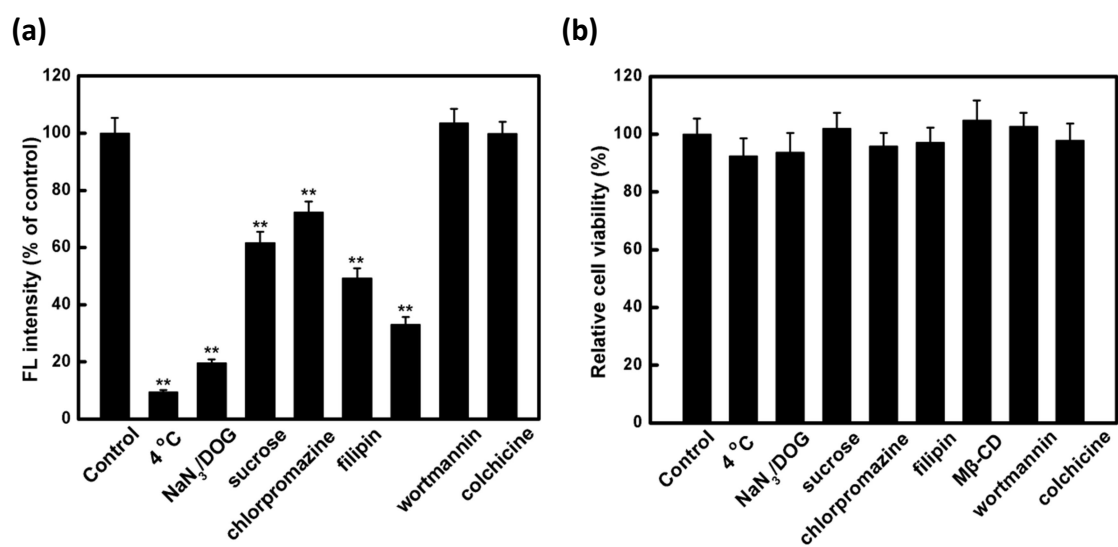


Figure S10. Cell endocytosis mechanism assay: (a) relative uptake percentages of OPCNs-PEG-FA after treatment with different uptake inhibitors; (b) relative cells viability when incubating with corresponding different uptake inhibitors. Data are presented as means \pm SD, $p < 0.01$ ($n=3$).

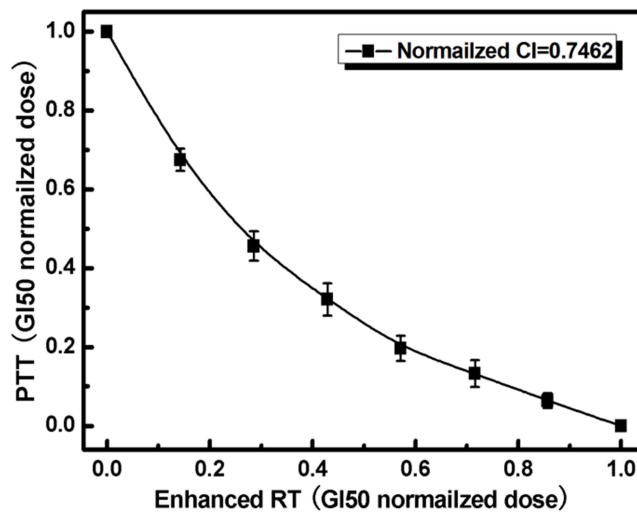


Figure S11. The predicted isobologram for combination enhanced radiotherapy and photothermal therapy.

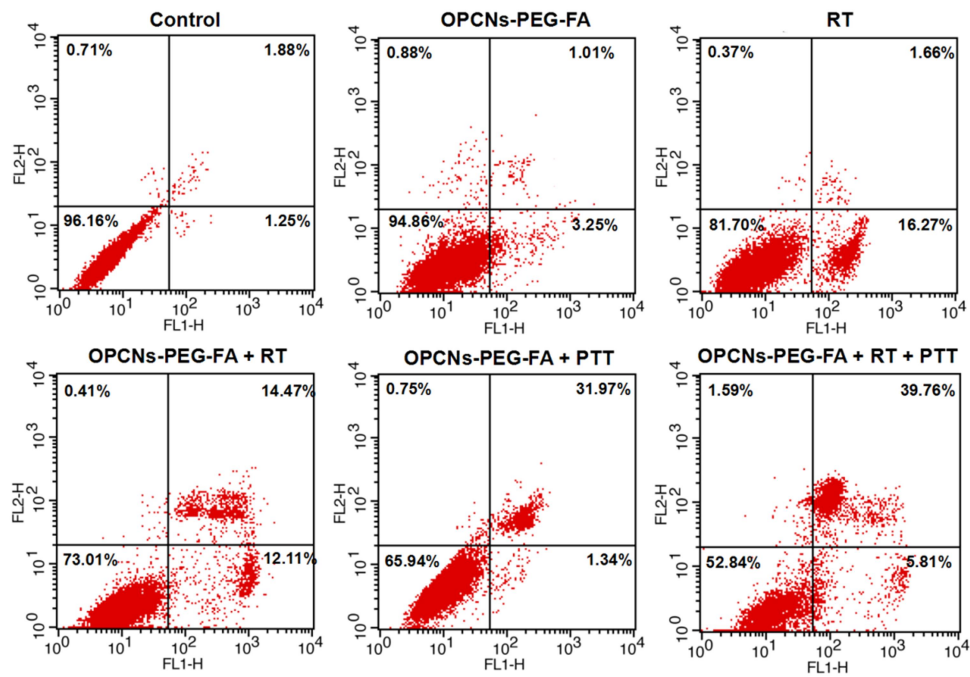


Figure S12. Cell death assay of HepG2 cells after synergic photothermal radiotherapy by flow cytometry.

Table S1. The main pharmacokinetic parameters of the as-synthesized nanoparticles (n = 5).

<i>Parameters</i>	<i>OPCNs</i>	<i>OPCNs-PEG-FA</i>
C_{\max} (mg/L)	20.620 ± 3.690	21.587 ± 3.025
A (mg/L)	17.639 ± 1.780	14.764 ± 3.533
α (1/h)	0.125 ± 0.014	0.178 ± 0.022
B (mg/L)	3.590 ± 0.630	2.448 ± 0.890
β (1/h)	0.007 ± 0.003	0.011 ± 0.005
$AUC_{0-\infty}$ (mg/L/h)	141.230 ± 27.554**	367.620 ± 43.264**
$T_{1/2}$ (h)	1.859 ± 0.478**	3.223 ± 0.674**
MRT (h)	0.976 ± 1.641**	2.357 ± 3.504**
CL (L/kg/h)	2.18 ± 0.530**	1.271 ± 3.110**

Table S2. Hemolytic ratio (HR), Prothrombin time (PT), activated partial thromboplastin time (APTT) and thrombin time (TT) of the as-synthesized nanoparticles (n = 5).

<i>Materials</i>	<i>HR(%)</i>	<i>PT(s)</i>	<i>APTT(s)</i>	<i>TT(s)</i>
Control	2.92± 0.46	11.3 ± 2.3	32.4 ± 3.8	14.5 ± 2.5
OPCNs	4.02 ± 0.64	13.7 ± 1.6	34.7 ± 4.6	15.6 ± 1.1
OPCNs-PEG	2.18 ± 0.53	11.8 ± 3.1	33.1 ± 4.1	13.6 ± 3.1
OPCNs-PEG-FA	3.38 ± 0.99	12.4 ± 2.8	33.8 ± 3.5	14.7 ± 2.4