

Supporting Information

NIR-induced photodynamic therapy of pancreatic tumor using temoporfin-conjugated poly(methyl vinyl ether-*alt*-maleic acid)-coated upconversion nanoparticles in animal model

Table S1. Characterization of the nanoparticles with different Er content.

Particles	D_n (nm)	\bar{D}
NaYF ₄ :Yb,Er(2 mol.%)	25±1	1.01
NaYF ₄ :Yb,Er(10 mol.%)	24±1	1.01
NaYF ₄ :Yb,Er(15 mol.%)	23±1	1.01

D_n – number-average particle diameter (TEM); \bar{D} – dispersity (TEM).

Table S2. Concentrations of ions in UCNPs determined by atomic absorption and inductively coupled plasma mass spectroscopy.

	Concentrations	
	(wt.%) ^a	(M)
[Na ³⁺] ¹	12.1	5.28
[Y ³⁺] ²	26.9	3.03
[Yb ³⁺] ²	13.4	0.80
[Er ³⁺] ²	18.6	1.07
[Fe ²⁺] ¹	1.0	0.18

^a Percentage represents relative weight content of the specific ions a in the particles according to ¹ atomic absorption and ² inductively coupled plasma mass spectroscopy.

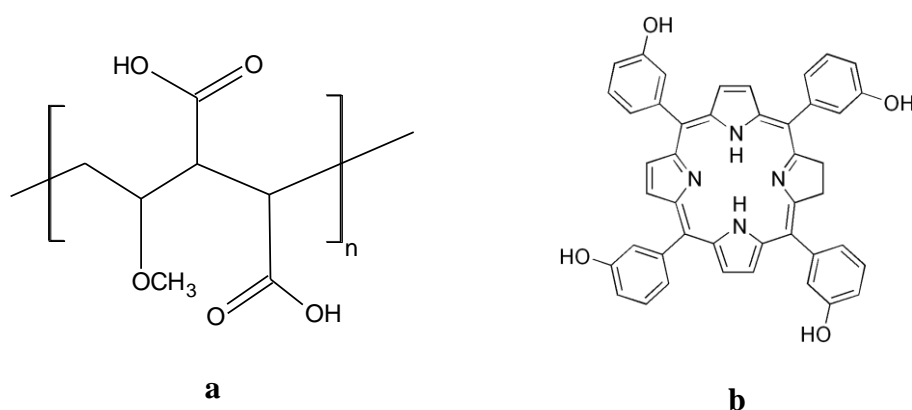


Figure S1. Chemical structure of (a) poly(methyl vinyl ether-*alt*-maleic acid) (PMVEMA) and (b) 5,10,15,20-tetra(m-hydroxyphenyl)chlorin (THPC; temoporfin; Foscan®).

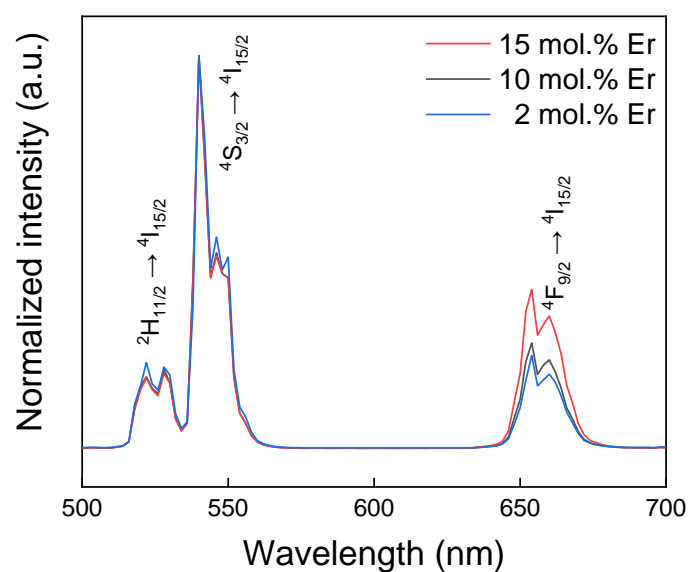


Figure S2. Normalized upconversion photoluminescence emission spectra of NaYF₄:Yb (20 mol.%),Er nanoparticles with different Er content excited at 980 nm with a power density of 2.11 W/cm².

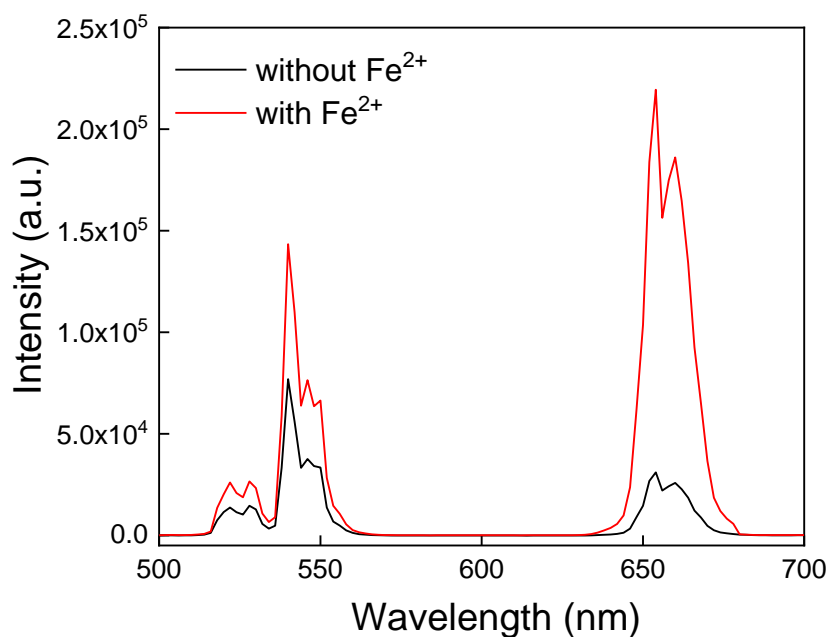


Figure S3. Upconversion photoluminescence emission spectra of NaYF₄:Yb(20 mol%),Er(15 mol%) aqueous dispersions (2 mg/ml) codoped with Fe²⁺ excited at 980 nm with a power density of 2.11 W/cm².

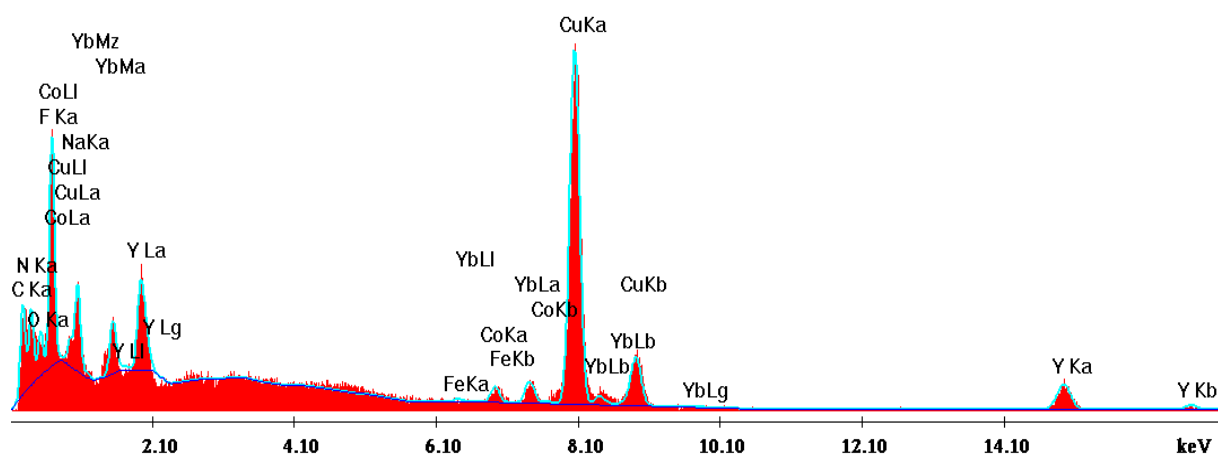


Figure S4. TEM/EDX analysis of UCNPs.

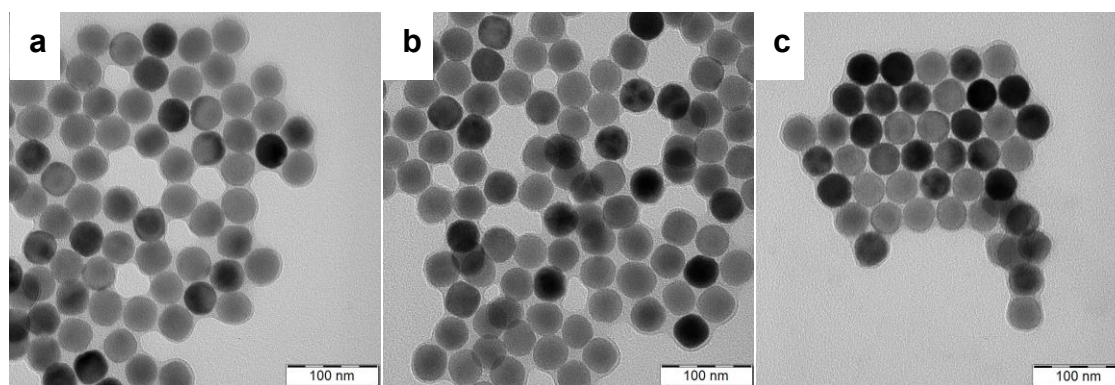


Figure S5. TEM micrograph of (a) UCNPs@PVMEMA, (b) UCNPs@PVMEMA-THPC-1 and (c) UCNPs@PVMEMA-THPC-2 particles.

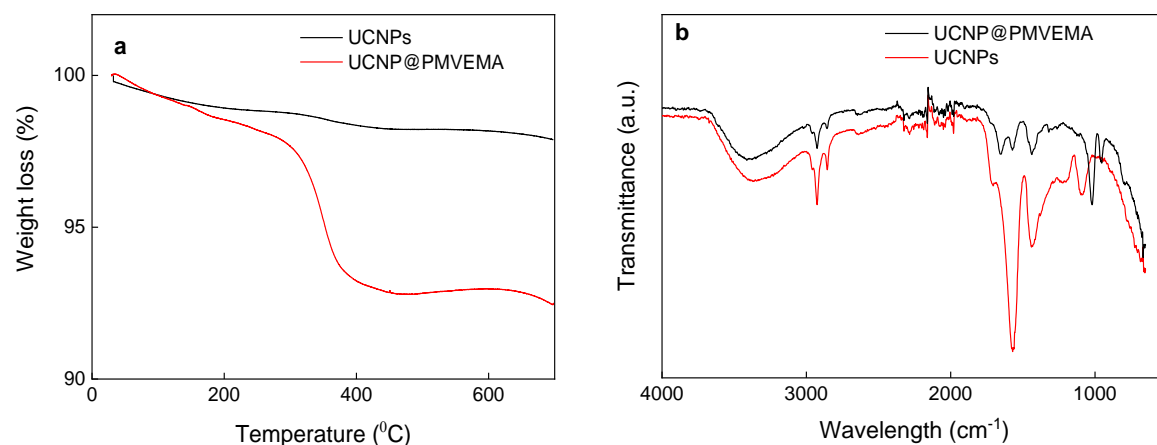


Figure S6. (a) TGA thermograms and (b) ATR FTIR spectra of UCNPs and UCNPs@PVMEMA nanoparticles.

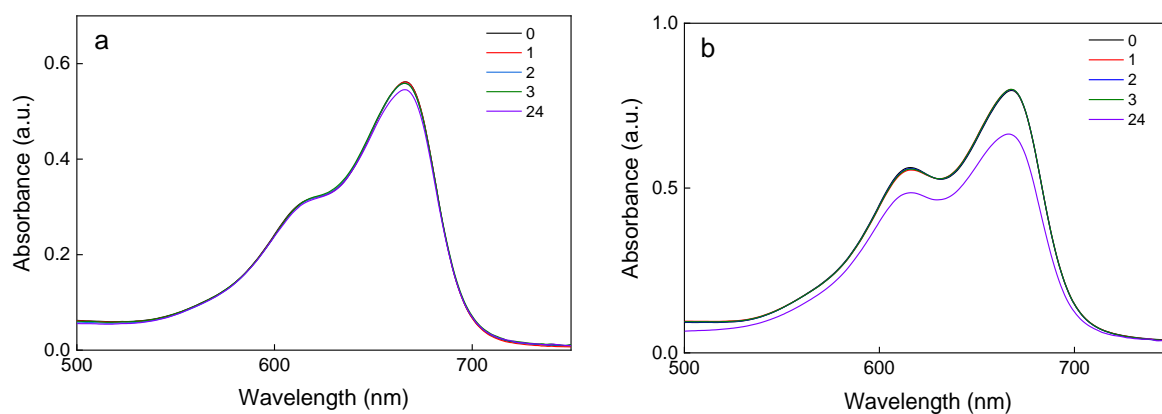


Figure S7. UV-Vis spectra of methylene blue degrading in (a) water and (b) PBS in the presence of UCNP@PVMEMA particles and H_2O_2 .

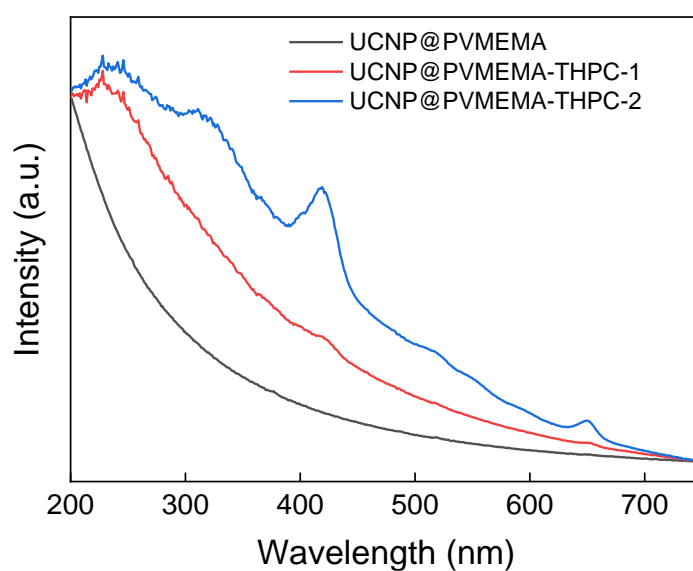


Figure S8. UV-Vis absorption spectra of UCNP@PVMEMA, UCNP@PVMEMA-THPC-1 and UCNP@PVMEMA-THPC-2.

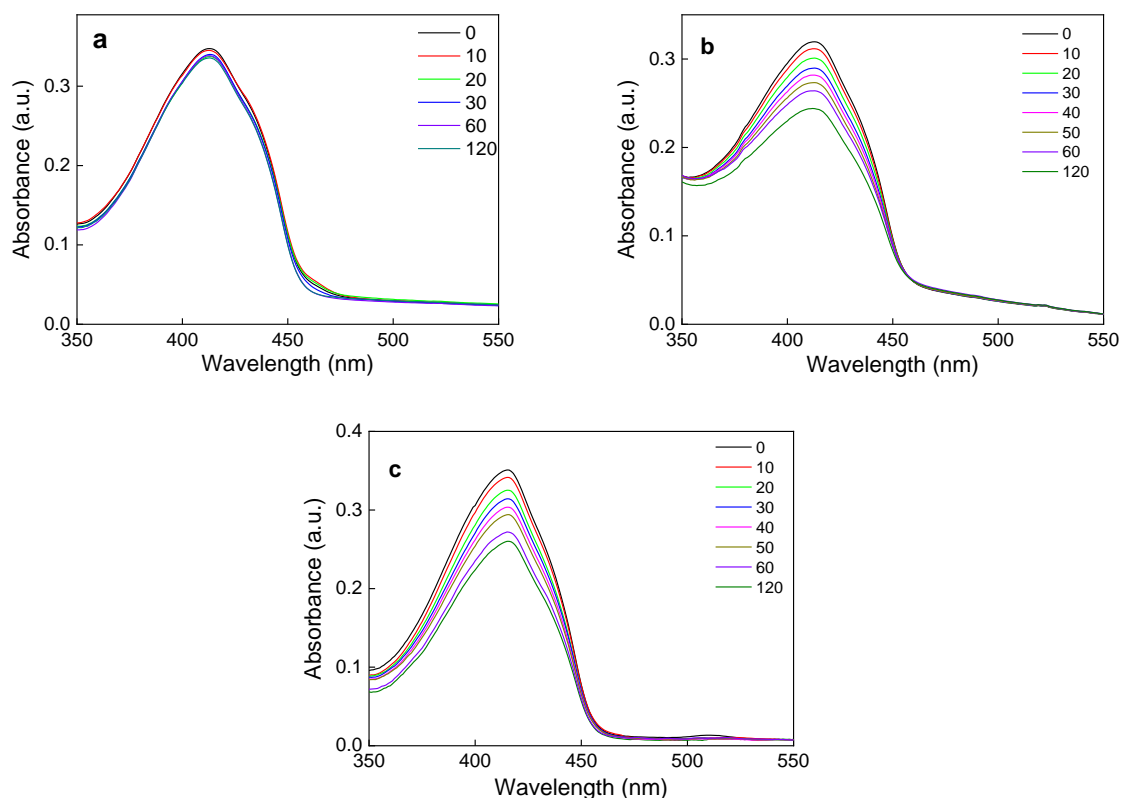


Figure S9. UV-Vis spectra of DPBF in ethanol/H₂O (50/50; v/v) containing (a) UCNP@PVMEMA, (b) UCNP@PVMEMA-THPC-1 and (c) UCNP@PVMEMA-THPC-2 particles versus irradiation time (min) at 980 nm excitation with a power density of 2.11 W/cm². The time-dependent decrease in the absorbance of DPBF is evidence of ¹O₂ generation.

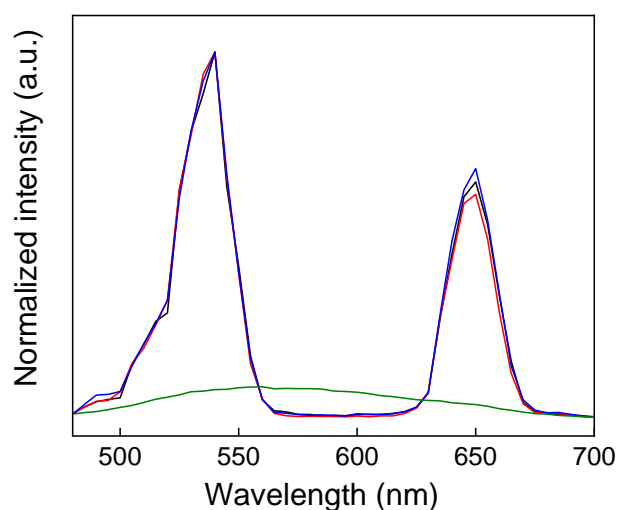


Figure S10. Normalized upconversion photoluminescence emission spectra of UCNP@PVMEMA (black), UCNP@PVMEMA-THPC-1 (red) and UCNP@PVMEMA-THPC-2 (blue) localized in the INS-1E cells and cell autofluorescence without particles (green) excited at 980 nm.