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Supplementary data

Titanium-protoporphyrin IX coordinated nanoparticles for tumor photodynamic and sonodynamic combination therapy

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1. Experimental section

1.1. Chemical reagents

Protoporphyrin IX (PpIX, analytical grade) was purchased from Shanghai McLin Biochemical Technology Co., Ltd.; Polyvinylpyrrolidone (PVP-K30, analytical grade) was purchased from Shanghai McLin Biochemical Technology Co., Ltd.; Titanium tetrachloride ($TiCl_4$, 99%, analytical grade) was purchased from Shanghai McLin Biochemical Technology Co., Ltd.; N,N-Dimethylformamide (DMF, superior grade), Triethylamine ($C_6H_{15}N$, analytical grade), and 1,3-Diphenylisobenzofuran (DPBF, spectral grade) were purchased from Shanghai Aladdin Biochemical Technology Co., Ltd.; Thiazolyl blue tetrazolium bromide (MTT, analytical grade), Calcein-AM, and Propidium iodide (PI, analytical grade) were provided by Biotium Biotechnology Co., Ltd.

1.2. Characterization instruments

The morphology of the materials was characterized using a JSM-7500F field emission scanning electron microscope (SEM) from Japan Electron Optics Laboratory (JEOL); the particle size and Zeta potential

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of the nanomaterials were measured using a NANOTRAC WAVE II dynamic light scattering instrument from Microtrac, USA; elemental chemical state analysis was performed using an AXIS Supra X-ray photoelectron spectrometer (XPS) from Shimadzu, Japan; Fourier-transform infrared (FT-IR) spectra were obtained using a Spectrum Two spectrometer from PerkinElmer, USA; UV-visible absorption spectra were measured using a UV-2600 spectrophotometer from Shimadzu, Japan; fluorescence spectra were recorded using a F-4600 fluorescence spectrophotometer from Hitachi, Japan; cell viability was measured using a Multiskan MK3 microplate reader from Thermo Fisher Scientific, USA.

2. Supplementary figures

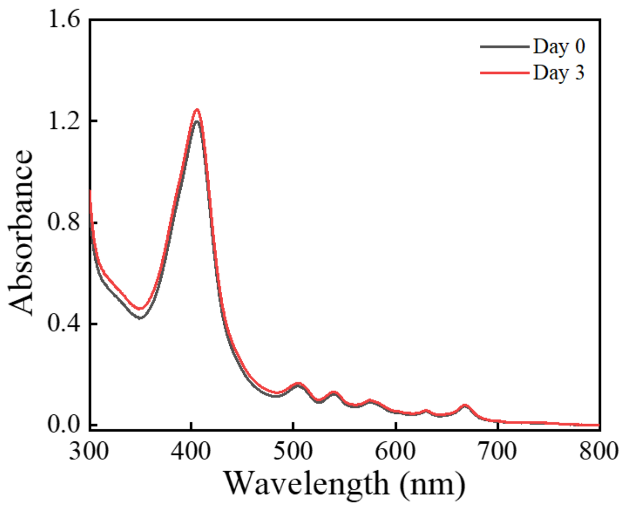

Figure S1. Stability of TiPPs in PBS solution.

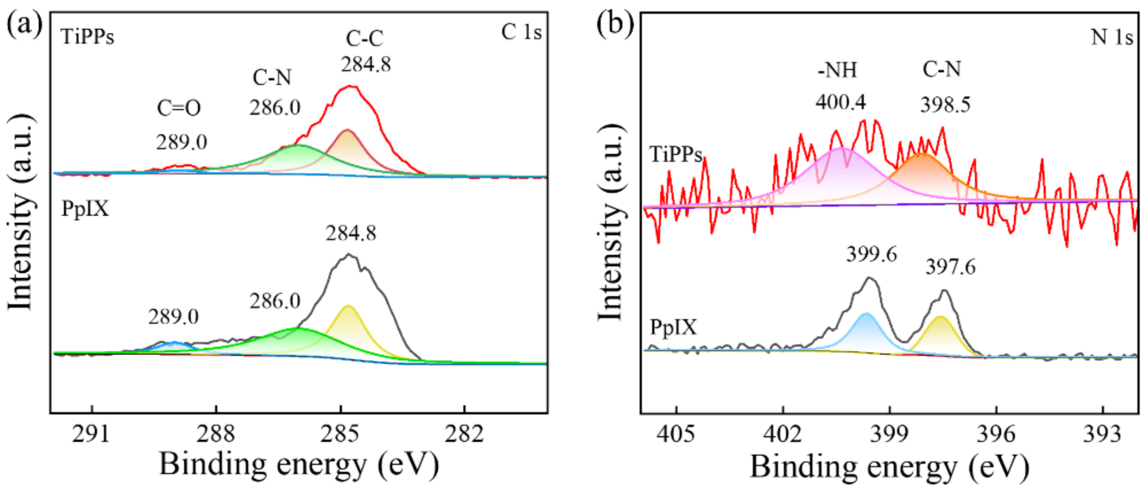

Figure S2. Comparison of C 1s**(a)** and N 1s**(b)** peaks of TiPPs and PpIX.

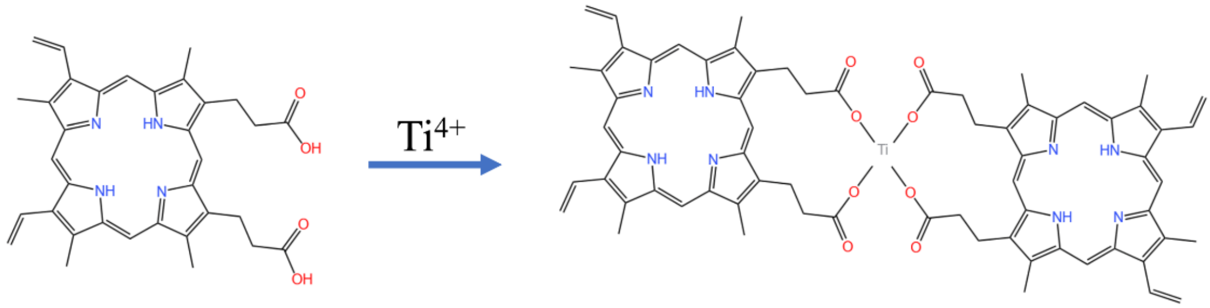

Figure S3. Schematic illustration of the synthesis of TiPPs.

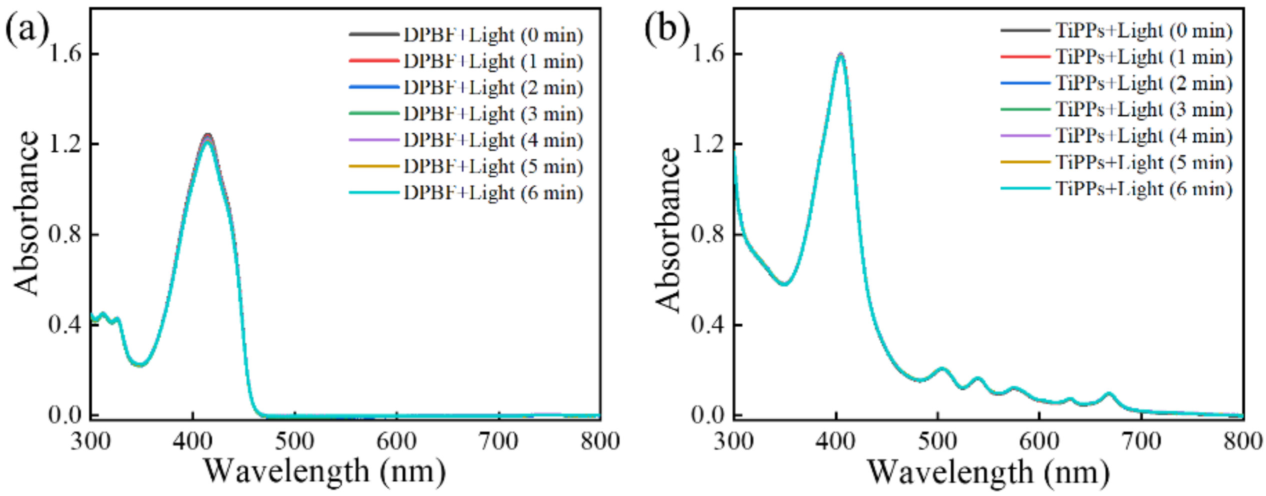

Figure S4. Time-dependent UV-visible absorption spectra of DPBF+Light **(a)** and TiPPs+Light **(b)**.

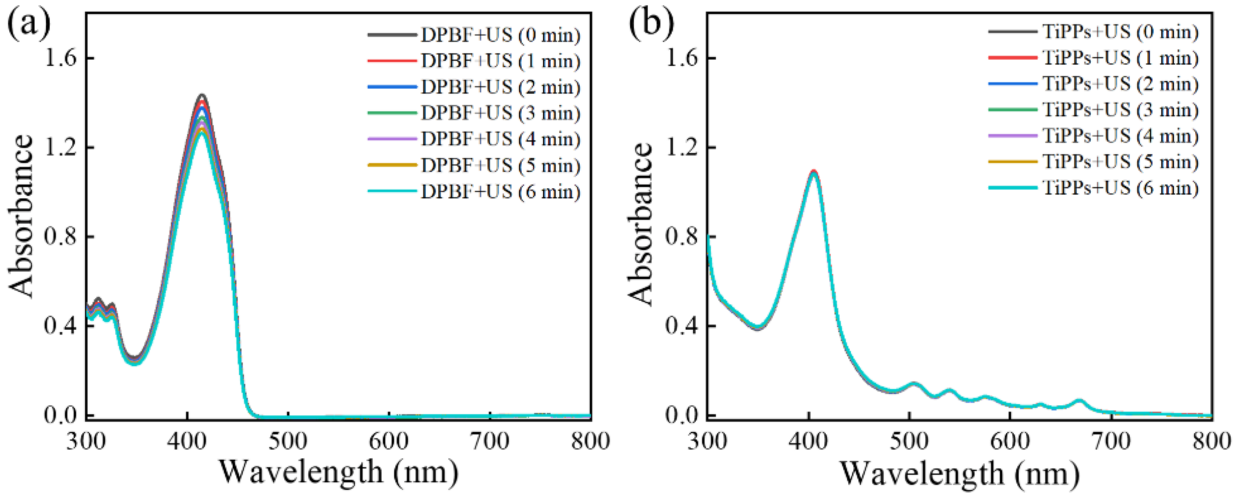

Figure S5. Time-dependent UV-visible absorption spectra of DPBF+US **(a)** and TiPPs+US **(b)**.

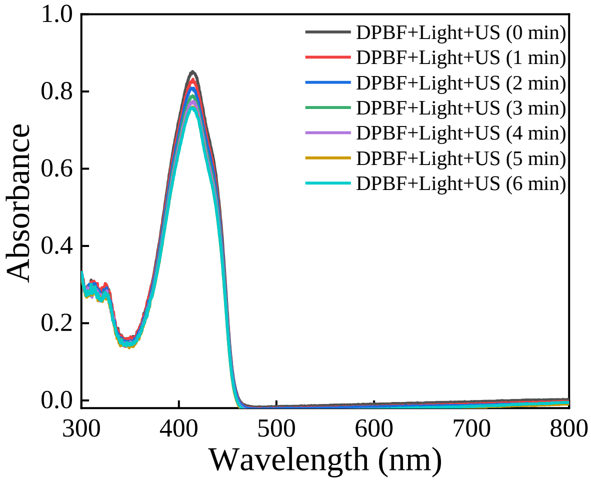

Figure S6. Time-dependent UV-visible absorption spectra of DPBF+Light+US.

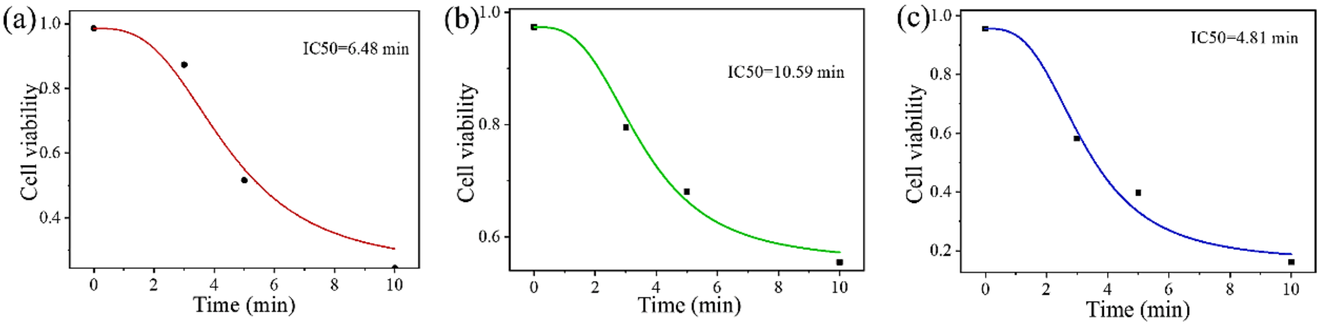

Figure S7. The IC50 values of TiPPs for PDT **(a)**, SDT **(b)**, and PDT-SDT **(c)** in the treatment of 4T1 cells.