**Support Information**

**Synthesis of Iridium-Based Nanocomposites with Catalase Activity for Cancer PTT/PDT Therapy**

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**1.Materials**

Iridium chloride (IrCl3), polyvinylpyrrolidone (PVP), sodium hydroxide (NaOH), hexadecyl trimethyl ammonium bromide (CTAB), tetraethyl orthosilicate (TEOS), ethanol, ammonia solution (NH3·H2O), dopamine hydrochloride (DA), and 1,3-diphenylisobenzofuran (DPBF) were commercially obtained from Aladdin Bio-Chem Technology Co., Ltd. (Shanghai, China). BSA (fraction V) was purchased from Sangon Biotech Co., Ltd. (Shanghai, China). Mice fibroblast cells (L929) and human colorectal carcinoma (HT29) cells were obtained from the Institute of Biochemistry and Cell Biology, which be owned by the Chinese Academy of Sciences (Shanghai, China). Dulbecco's Modified Eagle Medium (DMEM), phosphate buffer saline (PBS), and Roswell Park Memorial Institute-1640 medium (RPMI-1640) were procured from Corning Co., Ltd. (Shanghai, China). L929 was cultured in RMPI-1640 and HT29 was cultured in DMEM supplemented with 10% fetal bovine serum (FBS, Gibco, Shanghai, China), 100 U/mL penicillin, and 100 μg/mL streptomycin (Gibco, Shanghai, China) in humidified at 37°C under 5% CO2. Cell culture flasks and plates were purchased from Corning Co., Ltd. (Shanghai, China). The Cell counting kit-8 (CCK-8) was purchased from Dojindo Laboratories (Japan). Balb/c nude mice and Kunming (KM) mice (female, 4-6 weeks, 20-25 g) were ordered from Shanghai Slac Laboratory Animal Center (Shanghai, China). All experimental mice are bred strictly in accordance with the rules and regulations of the Minister of Health of the People's Republic of China(MOHC). All water used in this research was purified by the Milli-Q Plus 185 water purification system (Millipore, Bedford, MA) to achieve a resistivity higher than 18.2 MΩ·cm. Every chemical was used after being gained.

**2. Characterization of IrO2@MSN@PDA-BSA NPs**

The particle size, morphology and X-ray energy dispersive spectroscopy (EDS) of IrO2@MSN@PDA-BSA was analyzed with scan electron microscopy (SEM, SIGMA). The particle morphology was also monitored using the transmission electron microscopy (TEM, JEOL-2100F analytical electron microscope). We used Micromeritics Tristar II 3020 (Micromeritics Instrument Corporation, USA) to conducted Nitrogen adsorption–desorption isotherm measurements at 77 K. The Uv-vis-NIR spectrophotometer of IrO2@MSN@PDA-BSA was recorded by a Uv-vis-NIR spectrophotometer (Lambda 25, PerkinElmer, USA). The chemical information of the IrO2@MSN@PDA-BSA was measured by a Fourier transform infrared spectroscopy (FTIR, Nicolet 7000-C spectrometer). We used Rigaku D/max-2200 PC X-ray diffraction (XRD) system to analyze the crystalline structure of the materials. The hydrodynamic size of IrO2@MSN@PDA-BSA in DI water and PBS was characterized by a dynamic light scattering instrument (DLS, Nano ZS 90, Malvern, UK).

**3. Supplementary figures**



**Fig S1.** EDS spectra of IrO2@MSN@PDA-BSA NPs



**Fig S2.** FTIR spectra of PVP, PDA, and IrO2@MSN@PDA-BSA NPs

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**Figure S3.** Routine blood test of IrO2@MSN@PDA-BSA(Ce6) treated KM mice fed for different days. (a) Hemoglobin (HGB); (b) hematocrit (HCT);(c) mean corpuscular hemoglobin (MCH); (d) mean corpuscular hemoglobin concentration (MCHC); (e) mean corpuscular volume (MCV); (f) platelet (PLT); (g) red blood cell count (RBC); (h) red cell distribution width (RDW); (i) white blood cell count (WBC).