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Supporting Information for

# BODIPY@Carbon Dots Nanocomposites for Enhanced Photodynamic Therapy

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**Experimental Section:**

**Physicochemical characterization:** Instrumentation and characterizations Ultraviolet-visible (UV-vis) absorption spectra were obtained by using a Shimadzu UV-2450 PC UV-vis spectrophotometer. Fluorescence intensity tests were performed on a PerkinElmer LS-55 spectrofluorophotometer. The size and size distributions of the nanoparticles were determined by dynamic light scattering (DLS) using a Malvern Zeta-sizer Nano. The morphologies of the nanoparticles were measured by transmission electron microscopy (TEM) performed on a JEOL JEM-1011 electron microscope operating at an acceleration voltage of 100 kV. $^{1}H$ NMR spectra were recorded on a Bruker NMR 400 DRX Spectrometer using $CDCl_3$ as solvent. Confocal laser scanning microscopy (CLSM) images were taken using a Zeiss LSM 700 (Zurich, Switzerland). MTT assays were measured at 490 nm by a microplate reader (BioTek, EXL808). Flow cytometry analysis was performed by a flow cytometer (Beckman, USA) which collected $1\times10^4$ gated events for each sample.

**Materials and chemicals:** N,N-Dimethylformamide (DMF) were purchased from Sigma-Aldrich. Indocyanine green (ICG) was purchased from Fisher Scientific. Dulbecco's Modified Eagle Medium (DMEM), RPMI-1640 Medium, and fetal bovine serum (FBS) were purchased from Sigma-Aldrich. MTT were obtained from Beyotime Biotechnology Co., Ltd. (China). Cell viability (live dead cell staining)

assay reagent was obtained from Jiangsu KeyGEN Biotechnology Co., Ltd. The Trypsin-EDTA (Phenol Red) was purchased from Dalian Meilun Biotechnology Co., LTD.

**Singlet-oxygen detection:** In vitro singlet oxygen detection of CBNPs, BNPs, and CDs were carried out by a modified method using indocyanine green (ICG) as the chemical detector.The aqueous solution of (CBNPs, BNPs, or CDs, 3 mL, Wherein, the concentration of CDs is 1 μg/mL, the concentration of BODIPY in BNPs and CBNPs was 1vg/mL) was mixed with 10 μL of ICG (1 mg/mL), the mixture was transferred in to a quartz cuvette and illuminated by the LED lamp (power density of 16 mW/cm$^2$ at a wavelength of 625 nm) at room temperature. The absorbance of ICG at the maximum wavelength of 778 nm was recorded after each 20 s of irradiation. and the same concentration of ICG was utilized in the control experiment.

**Cell lines and cell culture:** HeLa (human cervical carcinoma) cell lines were cultured in Dulbecco's modified Eagle's medium (DMEM, GIBCO) with 10% (v:v) heat-inactivated fetal bovine serum (FBS, GIBCO). Cells were cultured in a humidified incubator at 37 $^o$C with 5% $CO_2$, and the culture medium was replaced once every day.

**Cellular uptake measured by CLSM:** The cellular uptake of CBNPs was examined by using a confocal laser scanning microscope (CLSM). HeLa cells were seeded in 6-well plates (a clean cover slip was put in each well) at the density of $2\times10^5$ cells per well and allowed to adhere for 24 h. And then the medium was replaced with CBNPs

diluted with fresh culture medium to a final concentration of 1 μg/mL. Thereafter cells were incubated for additional 0.5, 2, and 6 h at 37 $^{o}$C. Subsequently, the supernatant was removed and the cells were washed gently three times with PBS (pH=7.4), fixed with 4% paraformaldehyde (1 mL/ each well) for 15 min and washed twice with cold PBS, and finally observed by CLSM.

**Cell viability assays:** The cytotoxicities of CBNPs, BNPs and CDs with or without laser irradiation were examined via MTT protocol. Briefly, HeLa cells harvested in a logarithmic growth phase were seeded in 96-well plates at an initial density of $2\times10^3$ cells/well and incubated in 100 μL of DMEM at 37 $^{o}$C in 5% $CO_2$ atmosphere for overnight. After removing incubation medium, CBNPs, BNPs or CDs (100 μL) dispersions diluted with cell culture media to the desired concentration were added to cell wells, respectively. After 6 h of incubation, the cells were illuminated by 625 nm laser lamp (power density of 16 mW/cm$^2$) for 30 min. After incubation for 48 h, 20 μL of MTT in PBS solution with the concentration of 5 mg/mL was added and the plates were incubated at 37 $^{o}$C for another 4 h. After careful removal of the culture medium supernatant, 150 μL of dimethyl sulfoxide (DMSO) was added to each well to dissolve the formed violet formazan crystals. Finally, the plates were shaken for 3 min, and the absorbance of violet product was quantified at 490 nm by a microplate reader.

**Calcein-AM/PI staining tests:** HeLa cells were stained with the calcein-AM/propidium iodide (PI) to identify dead (red) and live (green) cells. Shortly, Hela cells were incubated with different concentrations of CBNPs, BNPs or CDs (0 to 1 μg/mL) for 6 h, resp, and then illuminated by 625 nm laser lamp (power density of 16 mW/cm$^2$) for 30 min. The dark control group was set up identical to that experimental group except for the illumination. After additional incubation for 24 h, the medium was removed and cells were washed gently. Then cells were incubated with Calcein-AM/PI for 30 min at room temperature, subsequently imaged by a NikonC1si laser scanning confocal microscopy.

**Cell apoptosis and necrosis detection assays:** Hela cells were cultured with 1 μg/mL of CBNPs, BNPs or CDs for 6 h, respectively, and then illuminated by 625 nm laser lamp (power density of 16 m W/cm$^2$) for 30 min. After additional incubation for 24 h, cells were washed, harvested and collected, and stained with Annexin V-FITC and PI detection kit for about 20 min. Finally, the ratio analysis of apoptosis and necrosis were determined through flow cytometer.

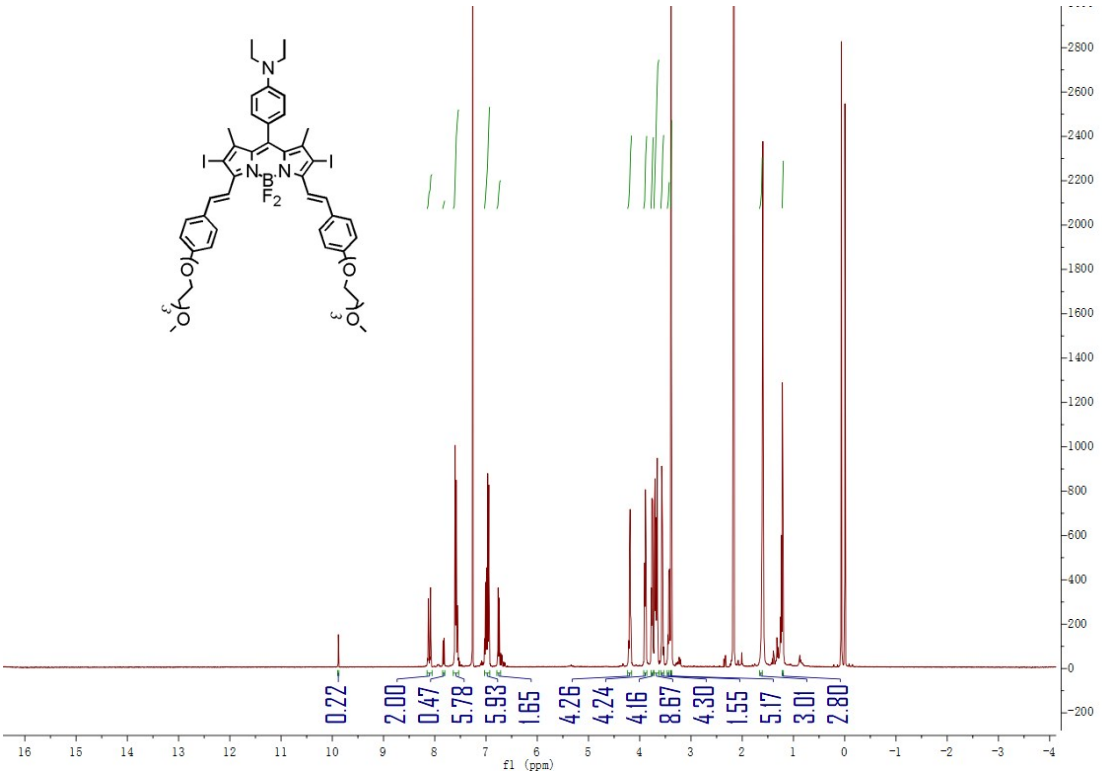


**Fig. S1** $^{1}$H NMR spectra of BODIPY.

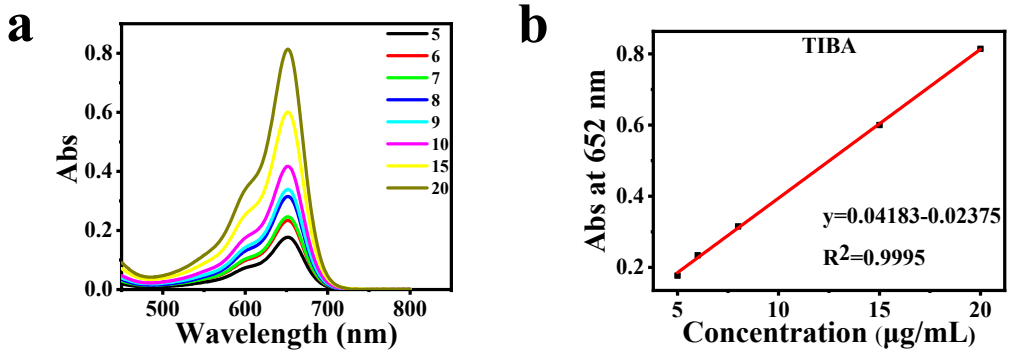


**Fig. S2** (a) Absorption spectra of different concentrations of BODIPY, the unit of concentration is μg/mL. (b) BODIPY standard curve at 652 nm in DMF.

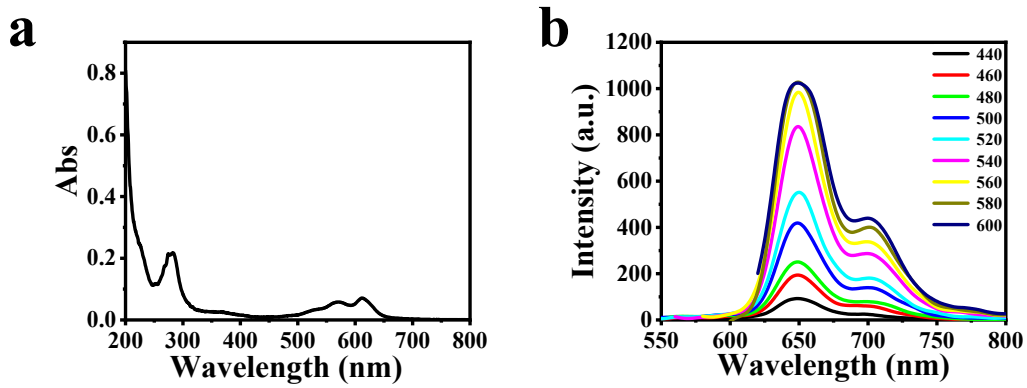


**Fig. S3** The absorption (a) and PL (b) spectra of CDs.