Supplementary Information (SI)

Supramolecular Assembly Affording Ratiometric Two-Photon Fluorescent Nanoprobe for Quantitative Detection and Bioimaging

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EXPERIMENTAL SECTION

Materials and instruments

All chemicals were obtained from commercial suppliers and used without purification. Ultrapure water was utilized from a Milli-Q reference system (Millipore). The field emission scanning electron microscope (SEM) results were obtained on JSM-6700F (JEOL). The atomic force microscopy (AFM) images were gained on a Multimode 8 (Bruker) with ScanAsyst. Dynamic light scattering (DLS) measurements were made on a Zetasizer 3000Hs (Malvern). The UV-vis absorption spectra were collected on a UV-2450 UV-vis spectrometer (Shimadzu). Fluoromax-4 spectrofluorometer (HORIBA JobinYvon) was used to collect the fluorescence signal with the slits set at 3.0 nm. One-photon and TP fluorescence bioimages of living tumor cells and tissues were picked up through an Olympus FV1000-MPE multiphoton laser scanning confocal microscope (Olympus). Endogenous hydrogen sulfide (H_2S) assay kit was obtained from Nanjing Jiancheng Bioengineering Institute. All living cells, living nude mice and rat experiments were performed in compliance with the relevant laws and institutional guidelines, and also the institutional committee of Hunan University has approved the experiments.

Organic Synthesis and Characterization

Synthesis of Poly-β-CD

β-CD (10 g, 8.81 mmol) was dissolved in 15 mL NaOH aqueous solution (15 wt %) by stirring for 4 h at 35 °C. Subsequently, the accordant amount of epichlorohydrin (690 µL, 8.81 mmol) was added to the mixture. After 3 h of stirring, the solution was added to isopropanol (200 mL) and the precipitate was filtered. The raw product was neutralized with diluted hydrochloric acid and dialyzed for 7 days. The poly-β-CD was isolated via lyophilization as white powder (2g, ~20%).

Synthesis of compound 2

Compound 1 was synthesized according to a previous literature.[1] Compound 1 (522 mg, 1.0 mmol),

HATU (456 mg, 1.2 mmol) were dissolved in dry DMF (4 mL) and DIPEA (0.35 mL, 2.0 mmol) was added dropwise with stirring at 0 °C under N_2-atmosphere for 1 h. Then, piperazine (430 mg, 5.0 mmol) dissolved in dry DMF (1 mL) was introduced, and the mixture solution was stirred at room temperature for 5 h. The reaction mixture was poured into water (30 mL) and extracted with dichloromethane (3 × 30 mL). The organic layer was thoroughly washed with dilute HCl and brine, followed by drying with Na_2SO_4 and concentrated under vacuum. After purification by silica gel chromatography (dichloromethane : methyl alcohol, 30 : 1, v/v), compound 2 was obtained as a dark purple solid (248 mg, 21%). ^{1}H NMR (400 MHz, Chloroform-d) δ 7.83 (d, *J* = 8.3 Hz, 1H), 7.73 (s, 1H), 7.26 (s, 1H), 7.17 (d, *J* = 9.4 Hz, 2H), 6.98 (d, *J* = 9.9 Hz, 2H), 6.76 (d, 2H), 3.71 (m, *J* = 14.0, 6.9 Hz, 8H), 3.39 (m, 4H), 2.97 (t, *J* = 18.9 Hz, 4H), 1.32 (t, *J* = 8 Hz, 12H). MS (ESI): *m/z* 591.2 $[M + H]^+$, calcd 590.5.

Synthesis of compound 3

1-Adamantaneacetic acid (233mg, 1.2 mmol), 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride (EDC·HCl, 288 mg, 1.5 mmol) and 4-dimethylaminopyridine (DMAP, catalytic amount) were dissolved into dichloromethane (50 mL) and stirred with ice-bath for 0.5 h. Subsequently, compound 2 (590 mg, 1.0 mmol) dissolved in dichloromethane (10 mL) was introduced. The reaction mixture was stirred at room temperature for overnight and then the solvent was removed under vacuum. The crude product was purified by silica gel column chromatography (dichloromethane : methyl alcohol, 50 : 1, v/v) to afford compound 3 as a dark purple solid (574 mg, 75%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.97 (d, *J* = 8.6 Hz, 1H), 7.83 (s, 1H), 7.67 (d, *J* = 8.3 Hz, 1H), 7.20 (d, *J* = 10.0 Hz, 1H), 7.11 (d, *J* = 9.5 Hz, 1H), 6.95 (s, 2H), 6.55 (d, 1H), 6.44 (d, *J* = 5.2 Hz, 1H), 4.04 (dt, *J* = 12.7, 6.5 Hz, 2H), 3.66 (m, *J* = 7.1 Hz, 8H), 3.43 (m, 8H), 1.57 (d, *J* = 21.0 Hz, 15H), 1.21 (d, *J* = 7.0 Hz, 12H). MS (ESI): *m/z* 767.3 $[M + H]^+$, calcd 766.8.

Synthesis of compound 5

Compound 4 was synthesized according to a previous literature.[1] Compound 4 (367 mg, 1 mmol), bis(pinacolato)diboron (381 mg, 1.5 mmol), potassium acetate (147 mg, 1.5 mmol) and Pd(dppf)Cl_2 (20 mg, 0.025 mmol) were refluxed in 100 mL of 1,4-dioxane under N_2-atmosphere for 10 h. Then

the solvent was removed under vacuum and the crude product was purified by silica gel column chromatography (petroleum ether : ethyl acetate = 5 : 1, v/v) to afford compound 5 as a yellow solid (290 mg, 70%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.62 (s, 1H), 8.09 (d, *J* = 8.6 Hz, 1H), 7.99 (d, *J* = 9.1 Hz, 1H), 7.93 (s, 1H), 7.82 (d, *J* = 8.8 Hz, 1H), 7.78 (d, *J* = 7.8 Hz, 1H), 7.71 (d, *J* = 7.9 Hz, 1H), 7.32 (dd, *J* = 9.1, 2.3 Hz, 1H), 7.01 (d, *J* = 2.3 Hz, 1H), 3.09 (d, *J* = 1.4 Hz, 6H), 1.34 (s, 12H). MS (EI): *m/z* 414.2, calcd 414.3.

Synthesis of NpRh-Ad

Compound 3 (766 mg, 1 mmol), compound 5 (414 mg, 1 mmol), potassium acetate (147 mg, 1.5 mmol), and Pd(dppf)Cl_2 (20 mg, 0.025 mmol) were refluxed in 100 mL of toluene/H_2O (50:1, v/v) mixed solution under N_2-atmosphere for overnight. The solvent was concentrated under reduced pressure. After purification by silica gel chromatography, NpRh-Ad was obtained as a dark purple solid (535 mg, 55%). ^{1}H NMR (400 MHz, Chloroform-d) δ 8.66 (s, 1H), 8.54 (s, 1H), 8.22 (d, J = 8.7 Hz, 1H), 7.94 (s, 2H), 7.87 (d, J = 8.7 Hz, 2H), 7.77 (d, J = 8.7 Hz, 1H), 7.71 (d, J = 8.2 Hz, 1H), 7.55 (d, J = 7.8 Hz, 1H), 7.35 (s, 1H), 7.23 (d, 2H), 7.21 (d, 2H), 7.07 (d, 2H), 6.93 (s, 1H), 3.52 (m, *J* = 7.4 Hz, 8H), 3.13 (s, 6H), 2.31 (s, 2H), 1.69 (m, 8H), 1.27 (d, *J* = 10.2 Hz, 27H). MS (ESI): *m/z* 973.65 $[M - H]^-$, calcd 974.28.

Synthesis of compound 6

6-Amino-2-naphthoic acid (935 g, 5 mmol) and $SOCl_2$ (10 mL) were added into a 100 mL round-bottomed flask with an ice water bath for 20 min, and the mixture solution was refluxed under N_2-atmosphere for 5 h. After cooling to room temperature, the solvent was removed under vacuum. Then pyridine (20 mL) and 3-hydroxy-4-aminobenzoic acid (918 mg, 6 mmol) were added into the residue, which was stirred at 120 °C under N_2-atmosphere for 12 h. The solvent was concentrated under reduced pressure. After purification by silica gel chromatography, compound 6 was obtained as a gray solid (1140 mg, 75%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.59 (d, *J* = 7.5 Hz, 1H), 8.24 (s, 1H), 8.06 (m, 2H), 7.86 (q, *J* = 8.0, 7.2 Hz, 2H), 7.68 (d, *J* = 8.7 Hz, 1H), 7.05 (d, *J* = 8.4 Hz, 1H), 6.89 (s, 1H), 5.91 (s, 2H). MS (ESI): *m/z* 303.0 $[M - H]^-$, calcd 304.3.

Synthesis of Np-Ad

Compound 6 (304 mg, 1.0 mmol), HATU (456 mg, 1.2 mmol) were dissolved in dry DMF (4 mL) and DIPEA (0.35 mL, 2.0 mmol) was added dropwise with stirring at 0 °C under N_2-atmosphere for 1 h. Then, 1-adamantanamin (181 mg, 1.2 mmol) dissolved in dry DMF (1 mL) was introduced, and the mixture solution was stirred at room temperature for overnight. The reaction mixture was poured into water (30 mL) and extracted with dichloromethane (3 × 30 mL). The combined organic layers were concentrated under reduced pressure. After purification by silica gel chromatography, Np-Ad was obtained as a yellow solid (218 mg, 50%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.61 (s, 1H), 8.24 (s, 1H), 8.08 (d, *J* = 8.7 Hz, 1H), 7.92 (d, *J* = 4.9 Hz, 1H), 7.90 (d, *J* = 5.2 Hz, 1H), 7.83 (d, *J* = 8.3 Hz, 1H), 7.77 (s, 1H), 7.73 (d, *J* = 8.8 Hz, 1H), 7.10 (d, *J* = 8.7 Hz, 1H), 6.94 (s, 1H), 5.96 (s, 2H), 2.15 (d, *J* = 15.9 Hz, 9H), 1.74 (s, 6H). MS (EI): *m/z* 437.1, calcd 437.5.

Synthesis of NHS-Ad

Hydrochloric acid (6 mL) and Np-Ad (437 mg, 1 mmol) were dissolved in ethanol (15 mL). After the solution was cooled to 0 °C, sodium nitrite (103.50 mg, 1.5 mmol) was added and the mixture was stirred for 0.5 h. Sodium azide (97.52 mg, 1.5 mmol) was added slowly, and the mixture was stirred for another 2 h at room temperature. The suspension was extracted with CH_2Cl_2 (3 × 30 mL), and the combined organic layers were concentrated under reduced pressure. The residue was purified by the silica gel chromatography to afford compound NHS-Ad as a faint yellow solid (139 mg, 30%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.85 (s, 1H), 8.26 (dd, *J* = 18.2, 9.3 Hz, 3H), 8.12 (d, *J* = 8.7 Hz, 1H), 7.90 (d, *J* = 8.1 Hz, 1H), 7.85 (d, *J* = 8.4 Hz, 1H), 7.81 (d, *J* = 2.2 Hz, 1H), 7.77 (s, 1H), 7.41 (dt, *J* = 8.9, 1.9 Hz, 1H), 2.10 (d, *J* = 16.1 Hz, 9H), 1.68 (d, *J* = 3.6 Hz, 6H). MS (ESI): *m/z* 463.26, calcd 463.54.

Preparation and Characterization of TPSNP

The stock solution of NpRh-Ad, Np-Ad and NHS-Ad in different concentration gradient was prepared by dissolved into DMF. To form the host-guest supramolecular nanoparticles, the TPSNP was first prepared according the previous report.[2] Briefly, poly-β-CD was dissolved in 10 mM phosphate buffered solution (PBS, pH = 7.4) at a final concentration of 10 mM (the molarity of β-

CD were converted to the concentrations of poly-β-CD) and the stock solution of NpRh-Ad and Np-Ad was added into the above solution at a final concentration of 10 μM and 5 μM, respectively. Then, the mixtures were incubated with 300 rpm at 25 °C. After 4 h, the mixtures were filtrated with an ultrafiltration device (10K MWCO) to get rid of the free NpRh-Ad and Np-Ad. The resultant suspension was used in further experiments.

The morphology and size of TPSNP were investigated by SEM, AFM and DLS using the diluent of TPSNP. To confirm the combination of NpRh-Ad or/and Np-Ad with poly-β-CD, agarose gel electrophoresis (AGE) experiments have been carried out. The samples were put on 3% agarose gel and were carried in 1 × TBE at 100 V constant voltage for 20 min. Then the gel was excited by 365 nm UV illumination and imaged by smart phone made in China. The spectroscopic properties of TPSNP were studied in PBS (pH = 7.4). The fluorescence emission spectra was recorded by the excitation wavelength of 420 nm and the emission wavelength ranging from 440 to 650 nm with the slits set at 3.0 nm. The binding constants of NpRh-Ad or Np-Ad with poly-β-CD was calculated by the Benesi-Hildebrand plot. The TP excited fluorescence emission spectra was measured from 700 to 900 nm (at intervals of 20 nm) by using Rhodamine B as the reference. The single-dye-doped and two-dye-doped host-guest complex with poly-β-CD were dissolved in PBS (pH = 7.4), then the TP fluorescence intensities of the samples and reference were determined by excited at the same wavelength. According to the previous literature, TP absorption active cross-section was calculated respectively.[35] Stability of the TPSNP in PBS (pH = 7.4) and cell culture medium was investigated for different times (0, 10, 20, 30, 40, 50, 60, 120, 180, 240, 300, 360, 420, 480, 540, 600 min) by recorded its fluorescence ratio (F_{475}/F_{575}).

H_2S Sensing of TPSNP-1 in Vitro

To exhibit the outstanding bioapplication potential of TPSNP, TPSNP-1 was prepared at varied molar ratios between NHS-Ad and NpRh-Ad (4:1, 2:1, 1:1 and 1:2, the concentration of NpRh-Ad kept 5 μM). NaHS solution were added into the above solution at a final concentration ranging from 0.5 to 200 μM with incubation for 40 min and then the fluorescence emission spectra was recorded. In view of the sensitivity and effectiveness of internal reference, we chose TPSNP-1 prepared with a molar ratio of 2:1 for further study. TPSNP-1 was treated with various testing

species, including Cl^-, Br^-, I^-, HCO_3^-, HPO_4^{2-}, OAc^-, SCN^-, NO_2^-, SO_4^{2-}, SO_3^{2-}, HSO_3^-, $S_2O_4^{2-}$, $S_2O_5^{2-}$, ClO^-, H_2O_2, glutathione (GSH) and cysteine (Cys). The time-dependent fluorescence spectra of TPSNP-1 response to H_2S was investigated from 0 to 90 min at intervals of 5 min.

Cell Culture and Cytotoxicity Assay

The HeLa cells were grown in Dulbecco's Modified Eagle's medium (DMEM) supplemented with 10% fetal bovine serum (FBS) and 1% antibiotics (penicillin-streptomycin) at 37 °C in a humidified incubator containing 5% CO_2. A standard MTS assay was used to assess the cytotoxic of TPSNP. HeLa cells were seeded at 10^4 cells per well in 96-well plates and grown for 24 h under above conditions. Then HeLa cells were incubated with poly-β-CD, free dyes (NHS-Ad, Np-Ad and NpRh-Ad) and dyes/poly-β-CD complex at varied concentrations (the total concentrations of dyes were 0, 2, 10, 20, and 40 μM; the total concentrations of poly-β-CD were 0, 1, 5, 10, and 20 mM, respectively) for another 24 h. After washing with DPBS for three times, the standard MTS solution was added to each well and incubated for 0.5 h. Then the cells were used a multimode microplate to determine the cell viability.

Imaging of H_2S in Living Cells and Deep Tissues

HeLa cells were first incubated with DMEM culture medium in a 30 mm optical culture dish for 24 h at 37 °C, then culture medium was replaced and TPSNP-1 was added into the fresh culture medium for incubating another 2 h at 37 °C. After washing with DPBS for three times, HeLa cells were incubated with different concentrations of NaHS solution (0, 5, 10, 15, 20, 50, 100 μM, respectively) for additional 40 min at 37 °C. After washing with DPBS for three times, one-photon and TP excited fluorescence imaging of HeLa cells was recorded with magnification at 60 × by an Olympus FV1000-MPE. The TP images were collected at 440-540 nm (green channel) and 560-660 nm (red channel) upon excitation at 780 nm with femtosecond pulses.

The frozen normal liver tissue slices with a thickness of 500 μm were prepared from nude mice. The tissue slices were incubated with TPSNP-1 at 37 °C for 2 h. Washed with DPBS three times, the tissue slices were co-incubated 100 μM NaHS solution at 37 °C for additional 40 min. The tissue slices were incubated without NaHS solution as control. Then the TP fluorescence microscopy

images were collected after washed with DPBS three times.

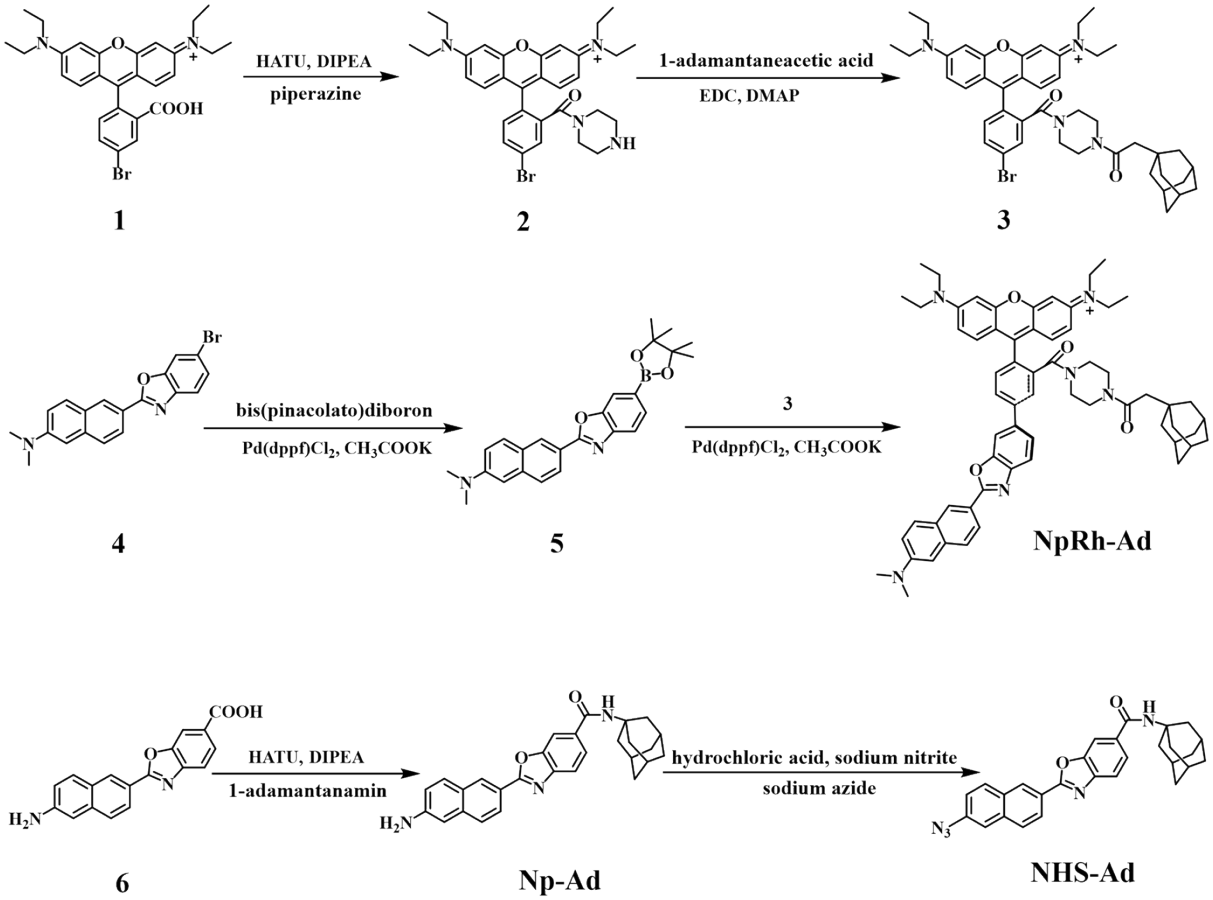
H_2S Quantitative Analysis in Organs

The mice were sacrificed and the samples of brain, heart, liver, spleen, lung and kidney were dissected immediately. Then the samples were homogenized with ice-cold DPBS (tissue 10 mg/ mL) in a 50 mL sealed conical tube and sonicated with a sonic tip for 30 min at the power of 300 W (the ultrasound probe worked 2 s with the interval of 4 s). The temperature of sample solution was kept below 4 °C by an ice bath. Tissue homogenates were centrifuged (3000 r/min for 10 min at 4 °C), and then the supernatant was evaluated for H_2S content by TPSNP-1 and commercial kits instantly.

Supplementary References

1. L. Zhou, X. Zhang, Q. Wang, Y. Lv, G. Mao, A. Luo, Y. Wu, Y. Wu, J. Zhang and W. Tan, *J. Am. Chem. Soc.*, 2014, **136**, 9838-9841.
2. L. He, X. Yang, F. Zhao, K. Wang, Q. Wang, J. Liu, J. Huang, W. Li and M. Yang, *Anal. Chem.*, 2015, **87**, 2459-2465.

Supplementary Figures



Scheme S1. Synthesis route of NpRh-Ad, Np-Ad, NHS-Ad.

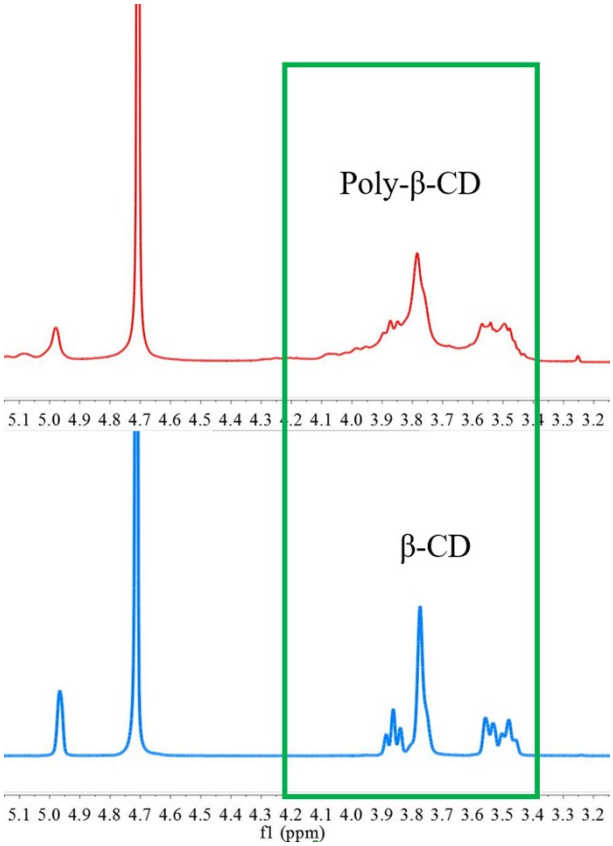


Fig. S1. ^{1}H-NMR of poly-β-CD and β-CD.

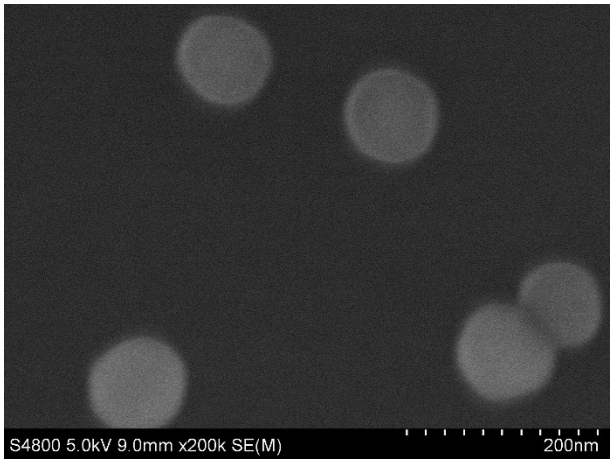


Fig. S2. SEM image of poly-β-CD.

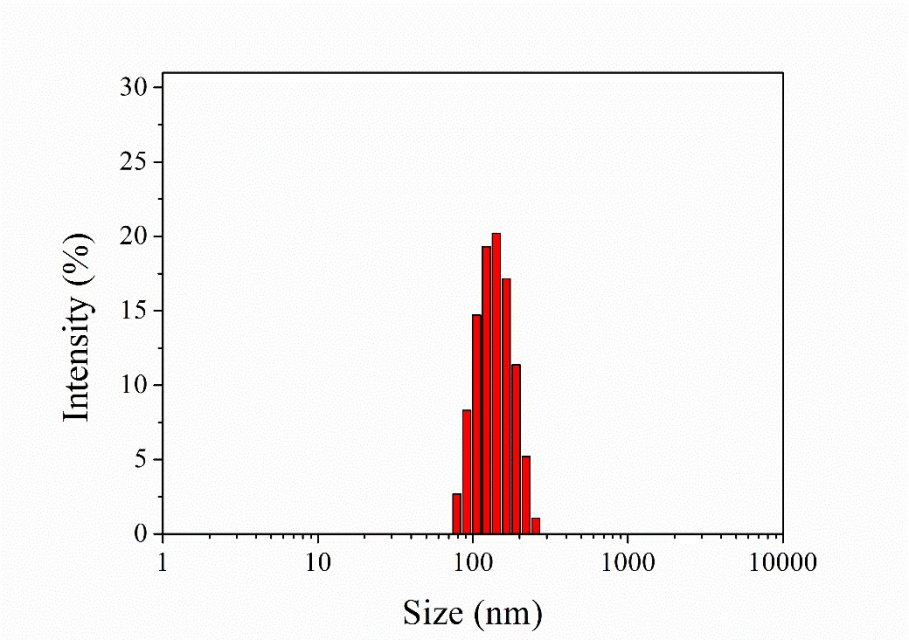


Fig. S3. The size distribution of poly-β-CD by DLS.

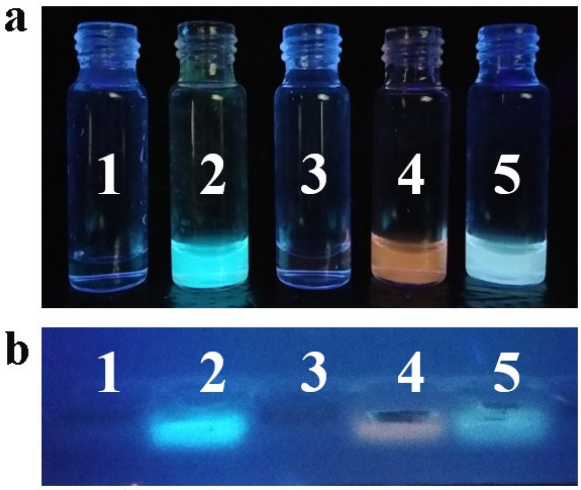


Fig. S4. Photographs (a) and the corresponding gel electrophoresis images (b) of free dyes, single-dye-doped and two-dye-doped inclusion complex with poly-β-CD in PBS (pH = 7.4) with 365 nm UV illumination. Channel 1, Np-Ad (5 μM); Channel 2, Np-Ad (5 μM) + poly-β-CD (10 mM); Channel 3, NpRh-Ad (10 μM); Channel 4, NpRh-Ad (10 μM) + poly-β-CD (10 mM); Channel 5, Np-Ad (5 μM) + NpRh-Ad (10 μM) + poly-β-CD (10 mM) (TPSNP).

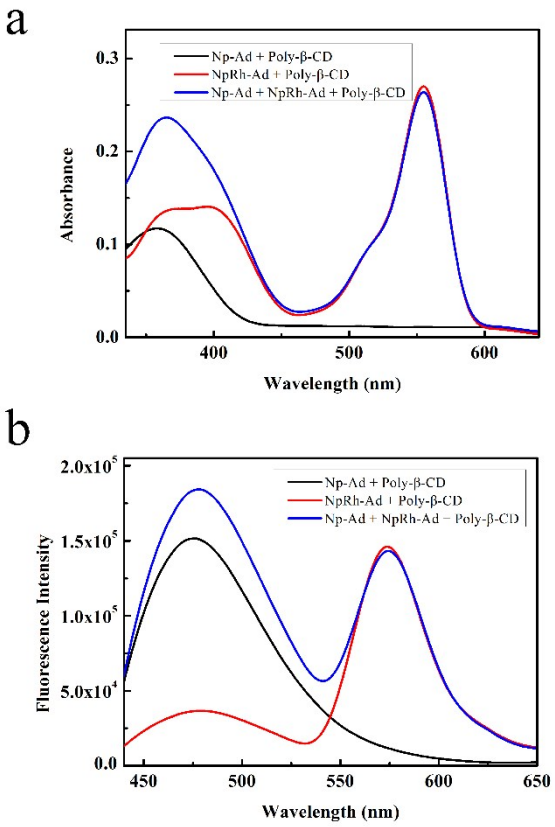


Fig. S5. Absorption (a) and fluorescence emission (b) spectra of single-dye-doped and two-dye-doped TPSNP in PBS (pH = 7.4). λ_{ex} = 420 nm.

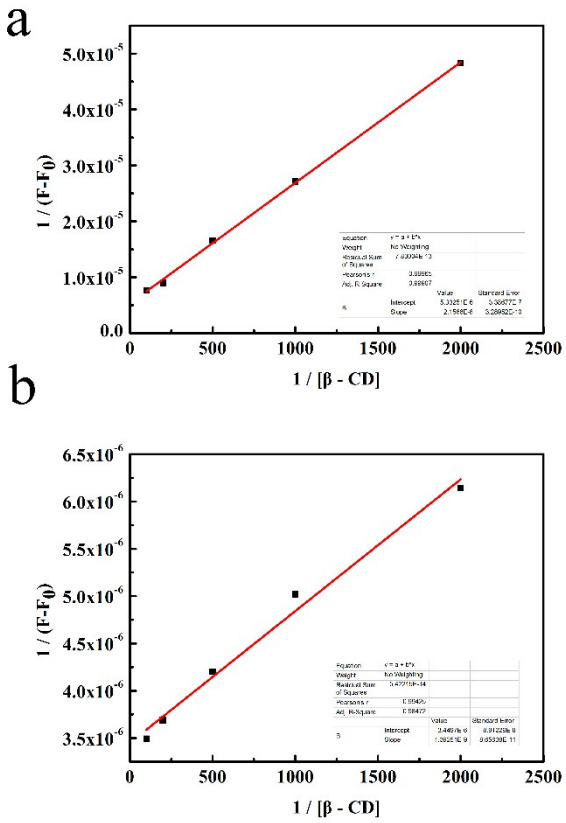


Fig. S6. The plots of $1/(F-F_0)$ vs $1/[\beta\text{-}CD]$ in PBS (pH = 7.4). (a) for the binding constants measurement of NpRh-Ad with poly-β-CD. (b) for the binding constants measurement of Np-Ad with poly-β-CD.

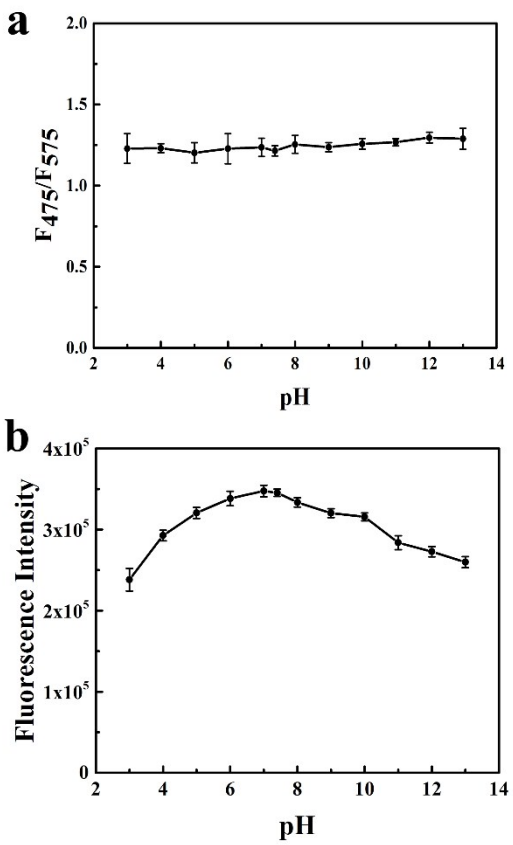


Fig. S7. (a) The plots of F_{475}/F_{575} versus pH values for TPSNP. (b) The fluorescence intensity at 475 nm versus pH values for Np-Ad with poly-β-CD. λ_{ex} = 420 nm.

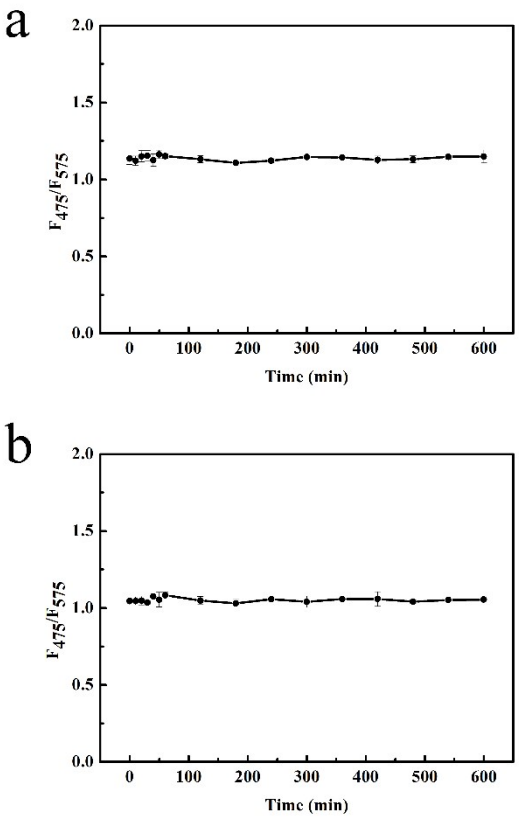


Fig. S8. Stability of the TPSNP in (a) PBS (pH = 7.4), (b) DMEM-contained (15% v/v) solution.

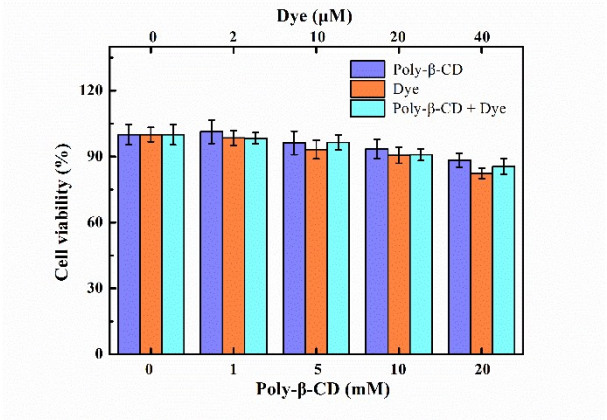


Fig. S9. Effects of dye, poly-β-CD and TPSNP with varied concentrations on the viability of Hela cells. The viability of the cells without additive is defined as 100%. The results are the mean ± standard deviation of five separate measurements.

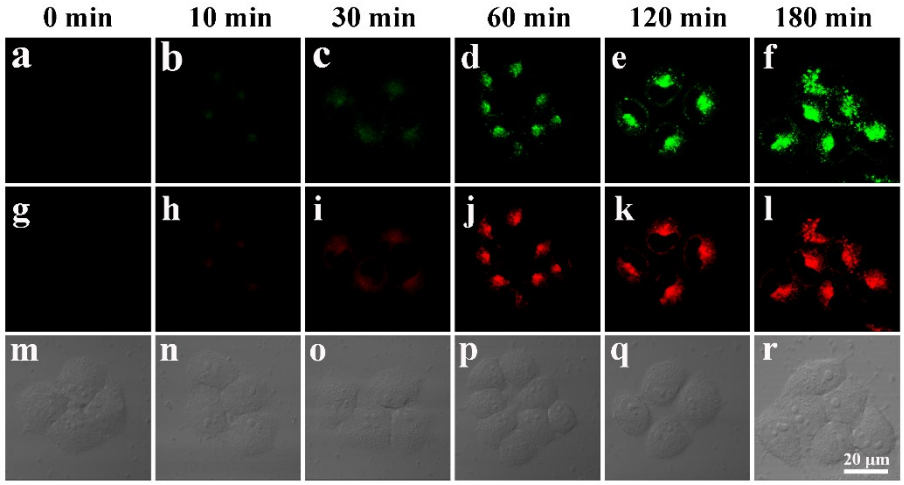


Fig. S10. Cellular uptake experiments using TPNSP. Images were obtained at green channel (a-f) 440-540 nm and red channel (g-l) 560-660 nm (λ_{ex} = 405 nm). (m-r) were the images of bright field.

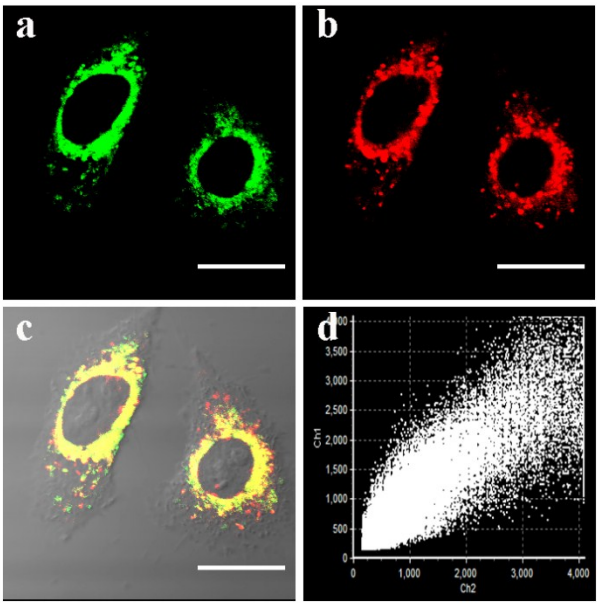


Fig. S11. Colocalization test of TPSNP in lysosome. (a) Np-Ad/poly-β-CD (5 μM, λ_{ex} = 405 nm, λ_{em} = 440-540 nm). (b) LysoTracker Red (2.5 μM, λ_{ex} = 543 nm, λ_{em} = 560-660 nm). (c) Overlay of (a) and (b). (d) Intensity scatter plot of Ch1 and Ch2, the Pearson's correlation factor is 0.9295. Scale bar: 20 μm.

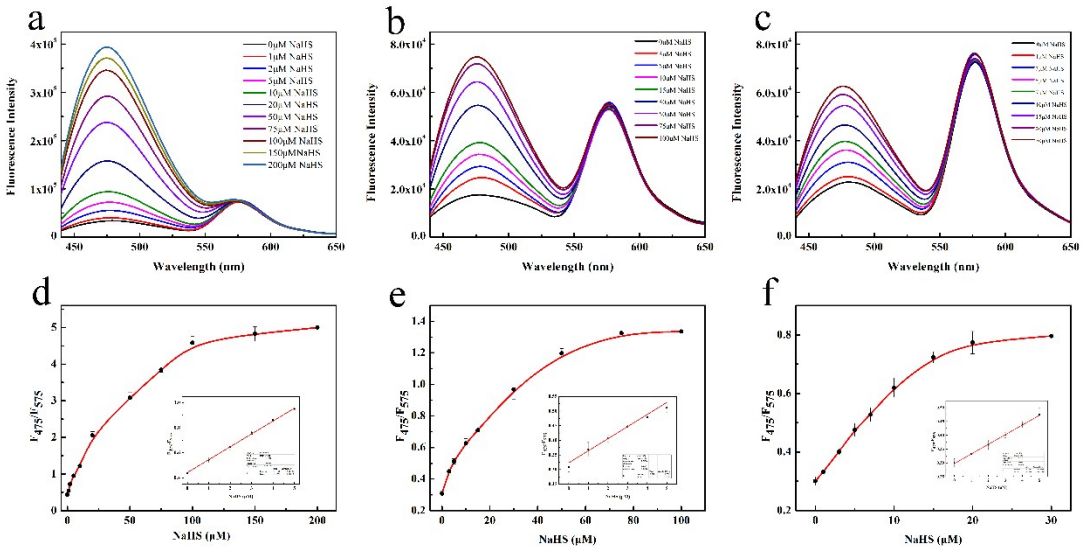


Fig. S12. Fluorescence response of TPSNP-1 with varied molar ratios of probes to NaHS at different concentrations. Fluorescence response (a) and calibration curve (d) of TPSNP-1 (4:1, 20 μM NHS-Ad + 5 μM NpRh-Ad + 10 mM Poly-β-CD) to NaHS at different concentrations (0, 1, 2, 5, 10, 20, 50, 75, 100, 150 and 200 μM, respectively). Fluorescence response (b) and calibration curve (e) of TPSNP-1 (1:1, 5 μM NHS-Ad + 5 μM NpRh-Ad + 10 mM Poly-β-CD) to NaHS at different concentrations (0, 3, 5, 10, 15, 30, 50, 75 and 100 μM, respectively). Fluorescence response (c) and calibration curve (f) of TPSNP-1 (1:2, 2.5 μM NHS-Ad + 5 μM NpRh-Ad + 10 mM Poly-β-CD) to NaHS at different concentrations (0, 1, 3, 5, 7, 10, 15, 20 and 30 μM, respectively). The inset shows the linear responses at low NaHS concentrations, respectively. λ_{ex} = 420 nm.

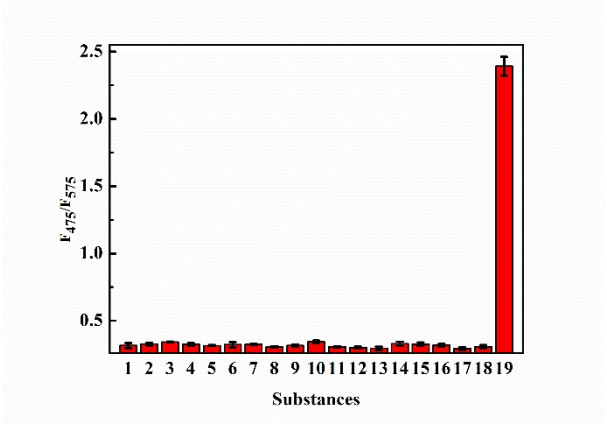


Fig. S13. Fluorescence response of TPSNP-1 to various substances: (1) Blank; (2) Cl^-

(1 mM); (3) Br^- (1 mM); (4) I^- (1 mM); (5) HCO_3^- (1 mM); (6) HPO_4^{2-} (1 mM); (7) OAc^- (1 mM); (8) SCN^- (100 μM); (9) NO_2^- (1mM); (10) 1 mM SO_4^{2-}; (11) SO_3^{2-} (100 μM); (12) HSO_3^- (100 μM); (13) $S_2O_4^{2-}$ (100 μM); (14) $S_2O_5^{2-}$ (100 μM); (15) GSH (1 mM); (16) Cys (1 mM); (17) ClO^- (1 mM); (18) H_2O_2 (100 μM); (19) NaHS (100 μM).

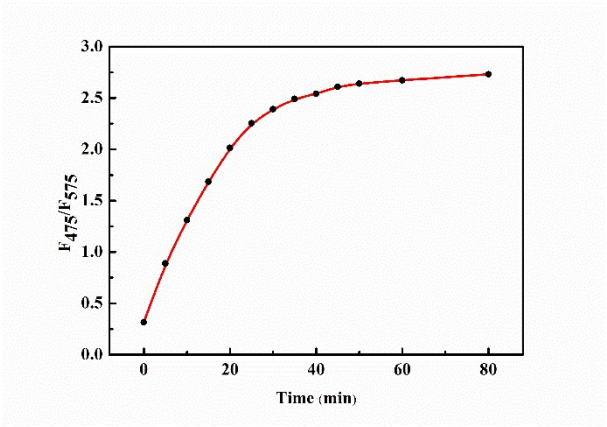
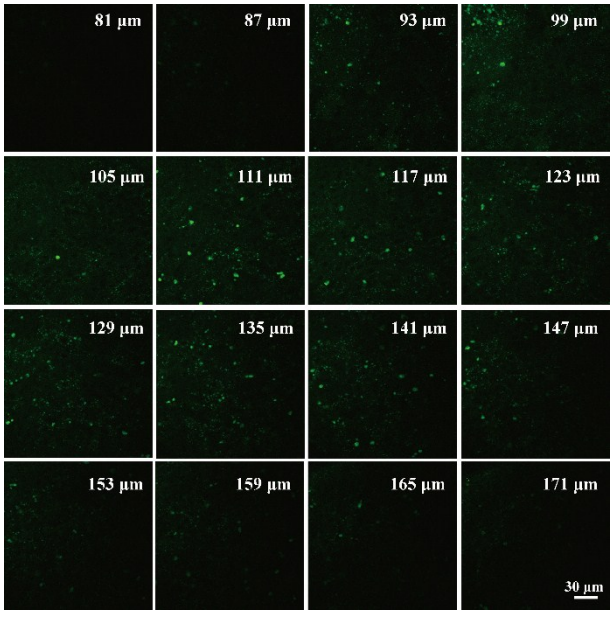
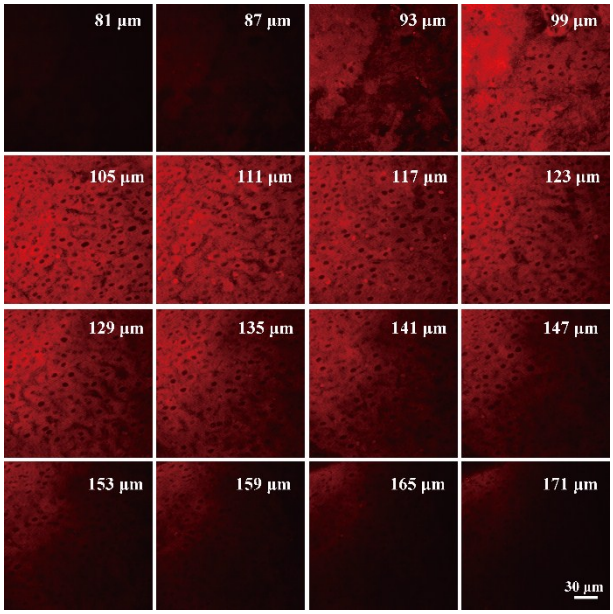


Fig. S14. Time-dependent fluorescence response of TPSNP-1 to NaHS (150 μM) in PBS (pH = 7.4). Time points represent 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60 and 80 min.



a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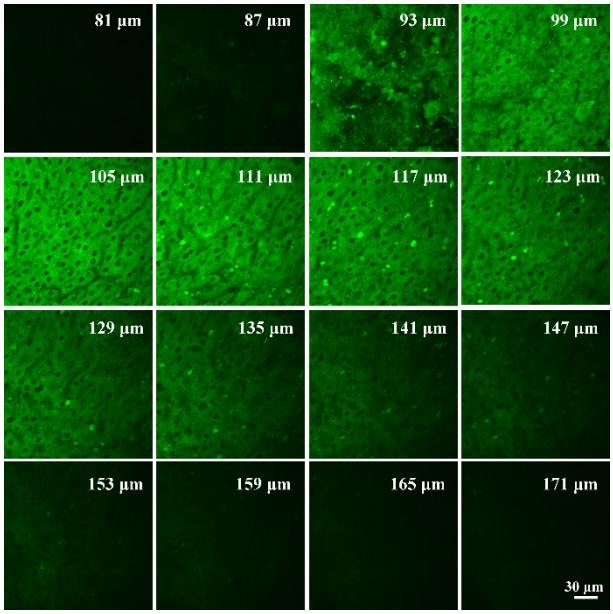
b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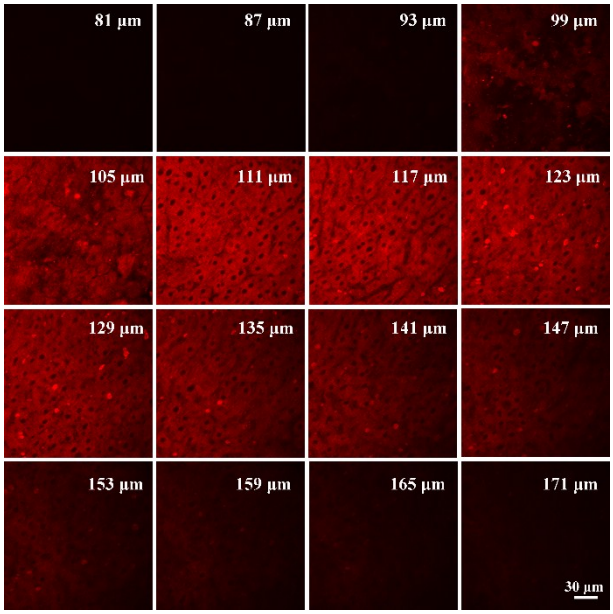
c



d

Fig. S15. Depth of TP fluorescence images of TPSNP-1 in tissues incubated without (a,b) and with (c,d) NaHS (100 μM). Images were obtained at green channel (a,c) 440-540 nm and red channel (b,d) 560-660 nm (λ_{ex} = 708 nm). Scale bars: 30 μm.

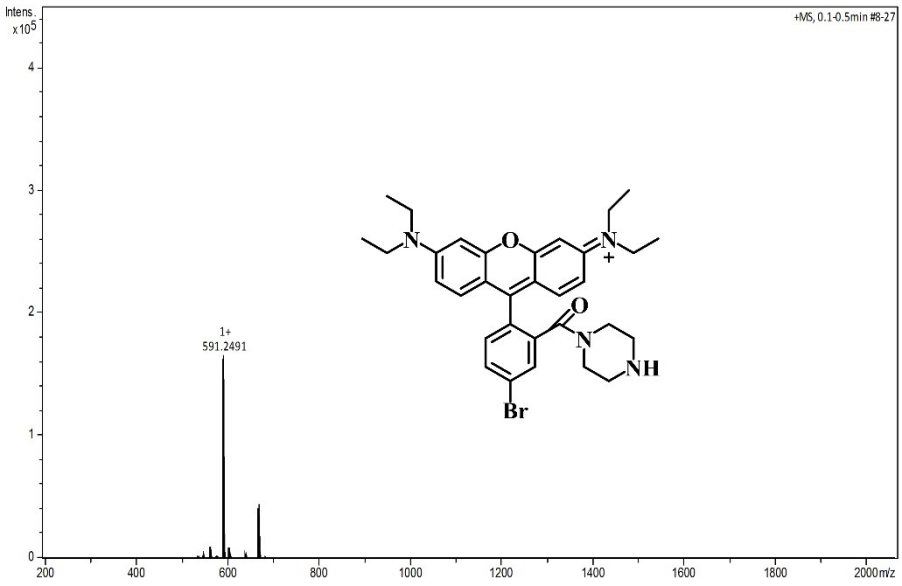


Fig. S16. ESI-MS spectrum of the compound 2.

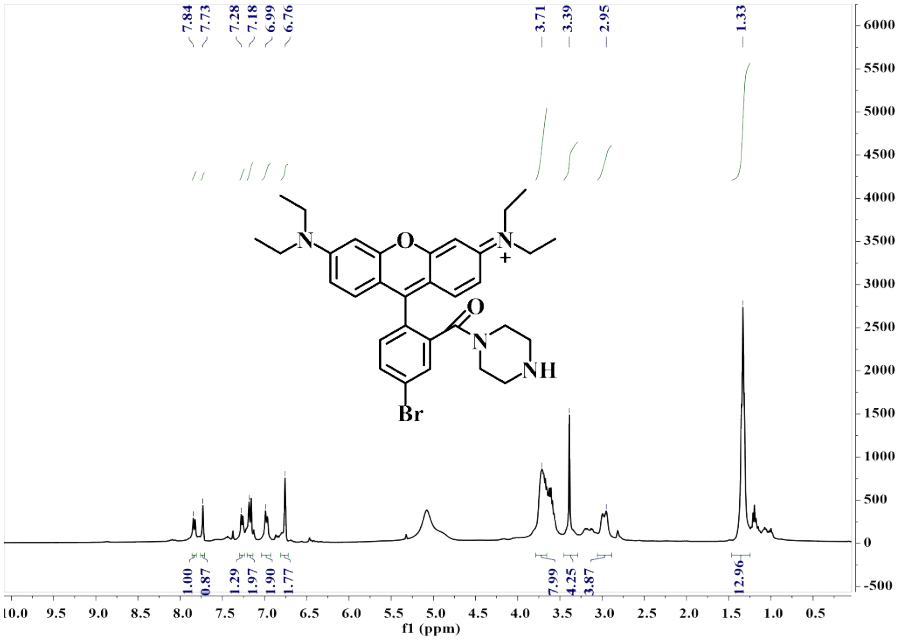


Fig. S17. ^{1}H NMR spectrum of the compound 2.

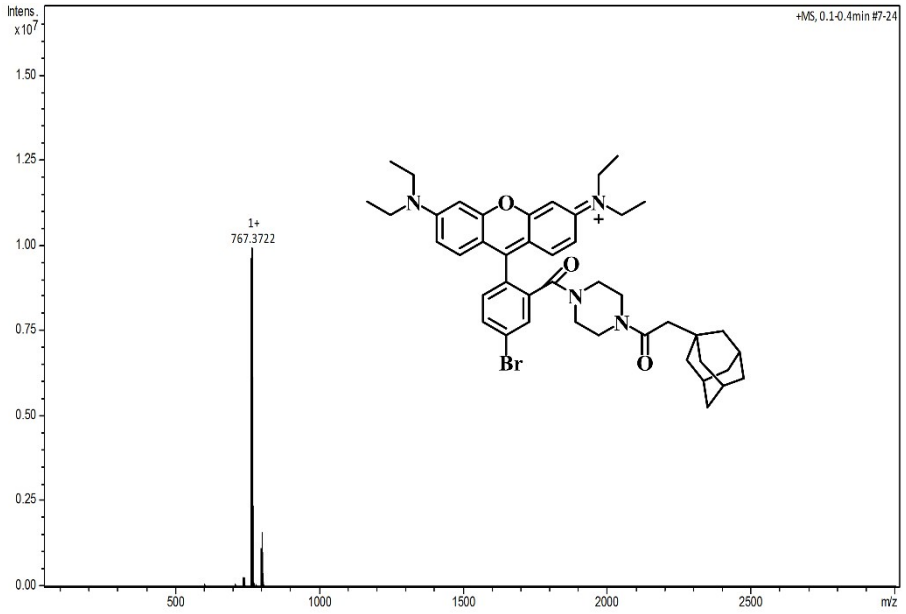


Fig. S18. ESI-MS spectrum of the compound 3.

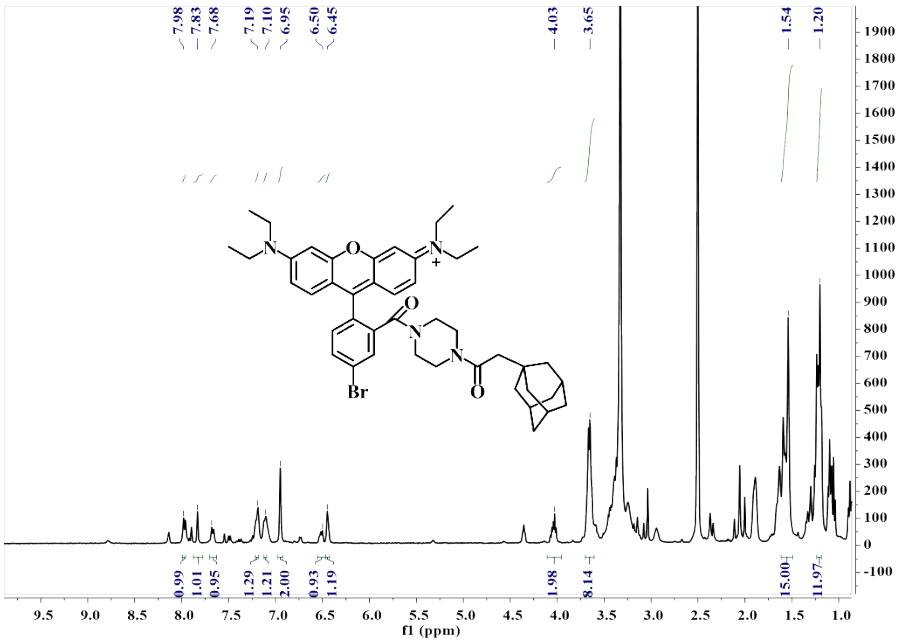


Fig. S19. ^{1}H NMR spectrum of the compound 3.

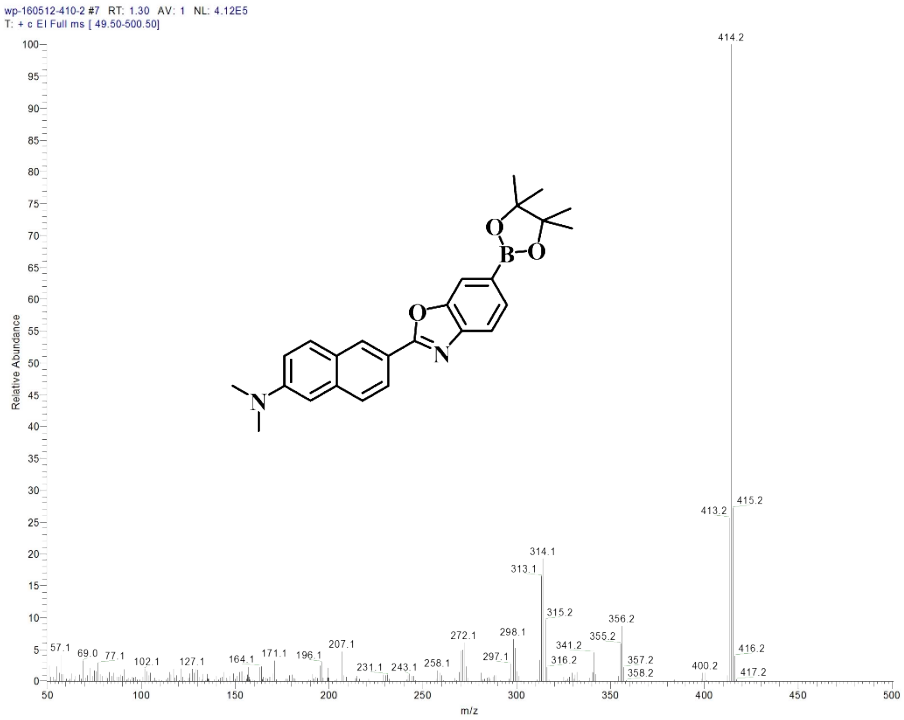


Fig. S20. EI-MS spectrum of the compound 5.

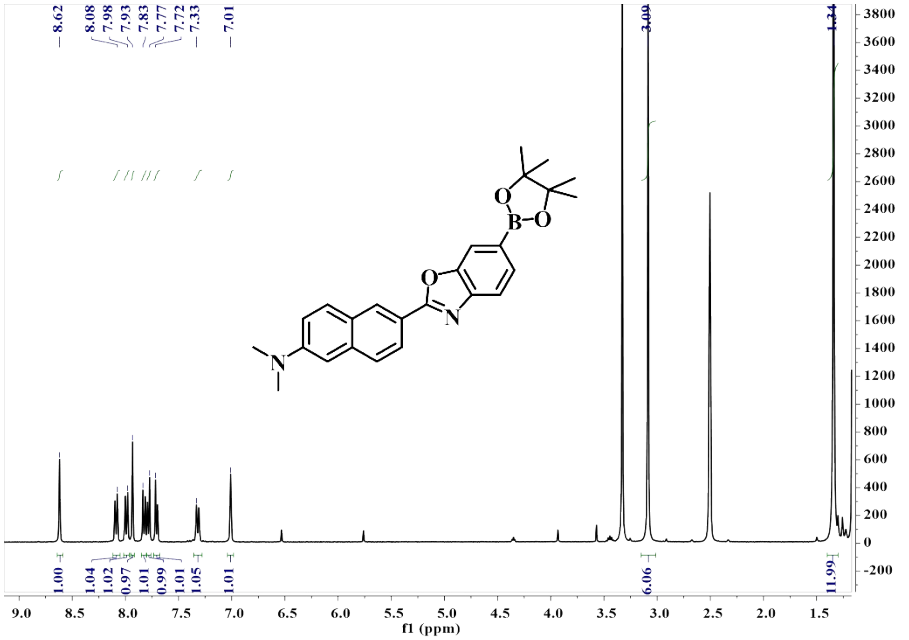


Fig. S21. ^{1}H NMR spectrum of the compound 5.

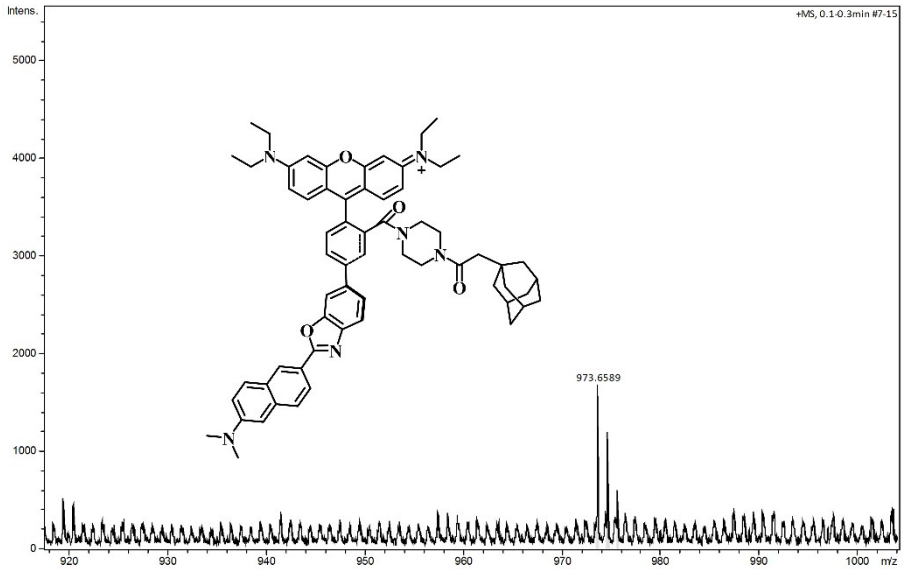


Fig. S22. ESI-MS spectrum of the compound NpRh-Ad.

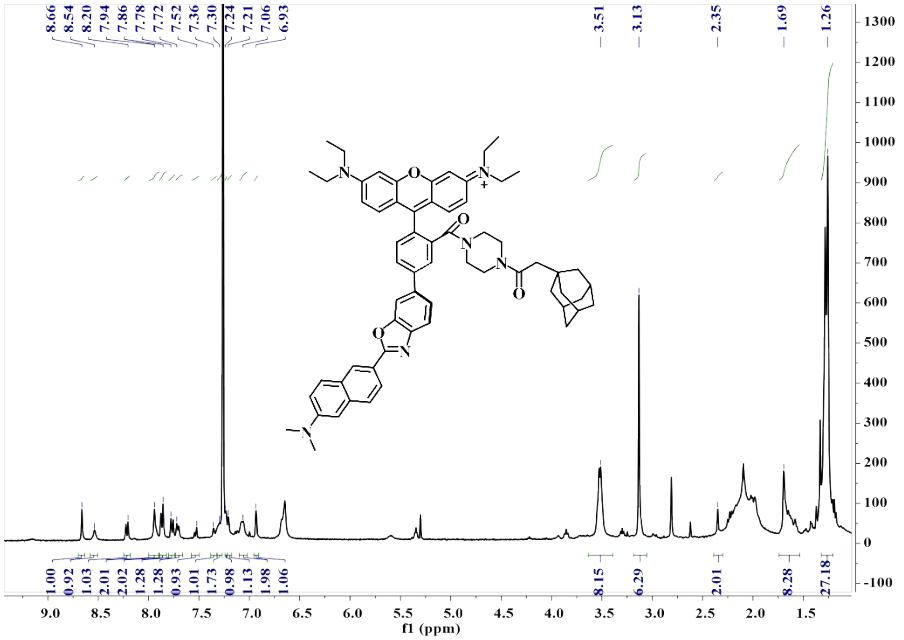


Fig. S23. ^{1}H NMR spectrum of the compound NpRh-Ad.

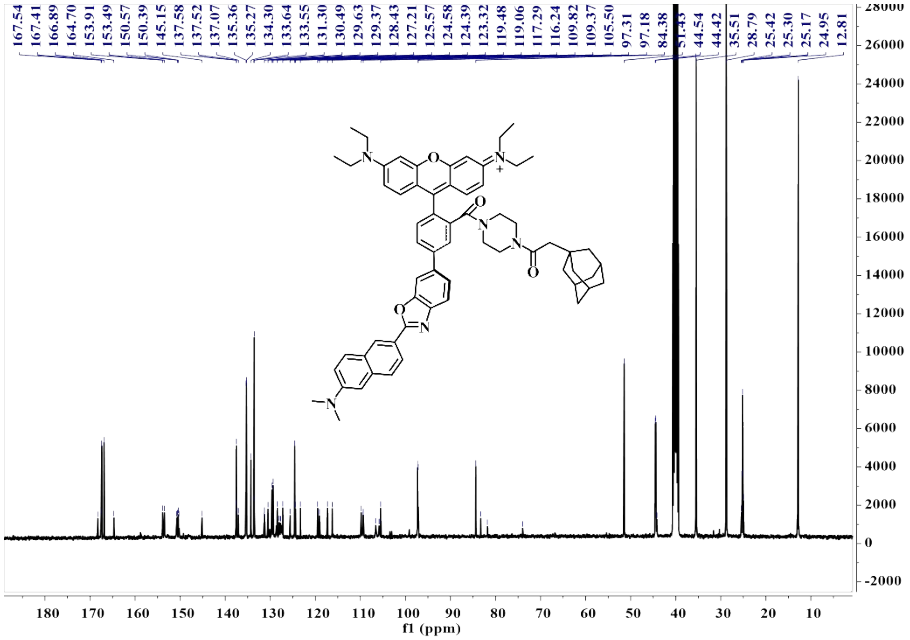


Fig. S24. ^{13}C NMR spectrum of the compound NpRh-Ad.

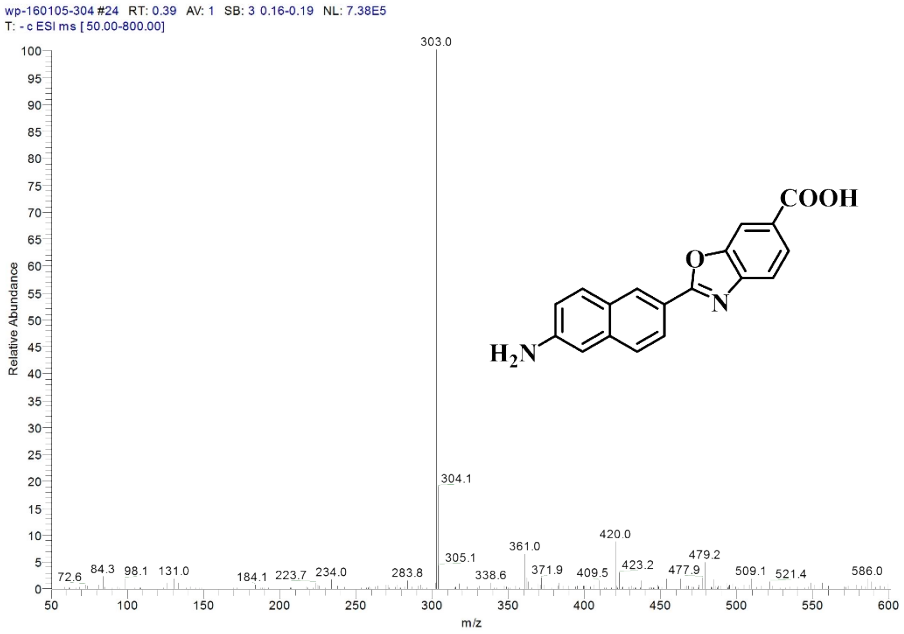


Fig. S25. ESI-MS spectrum of the compound 6.

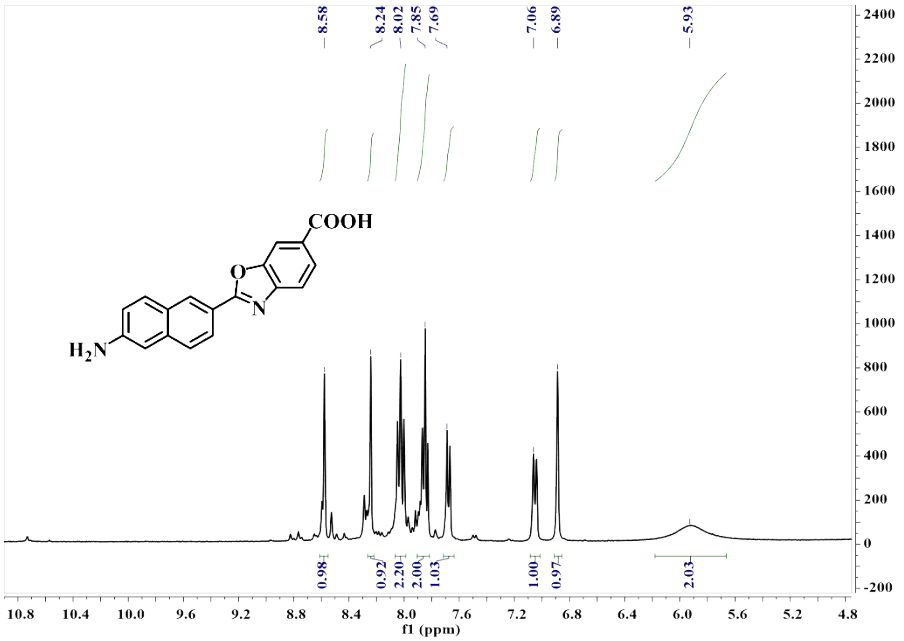


Fig. S26. ^{1}H NMR spectrum of the compound 6.

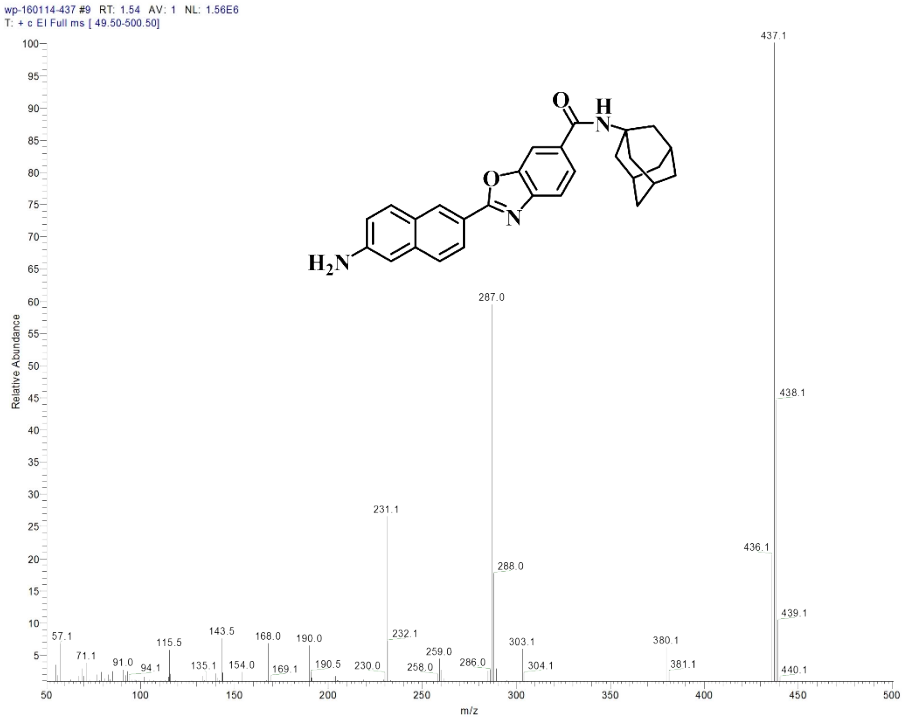


Fig. S27. ESI-MS spectrum of the compound Np-Ad.

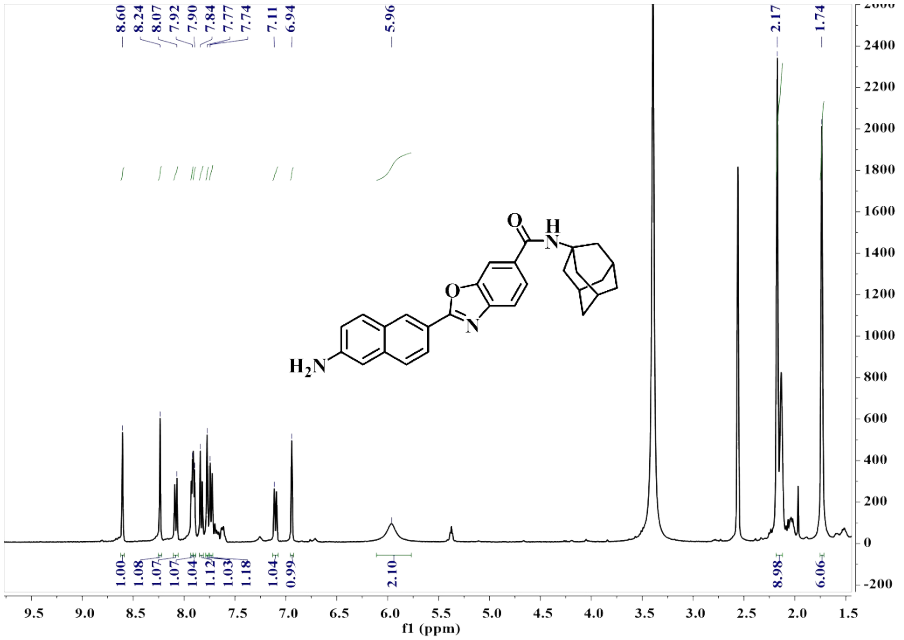


Fig. S28. ^{1}H NMR spectrum of the compound Np-Ad.

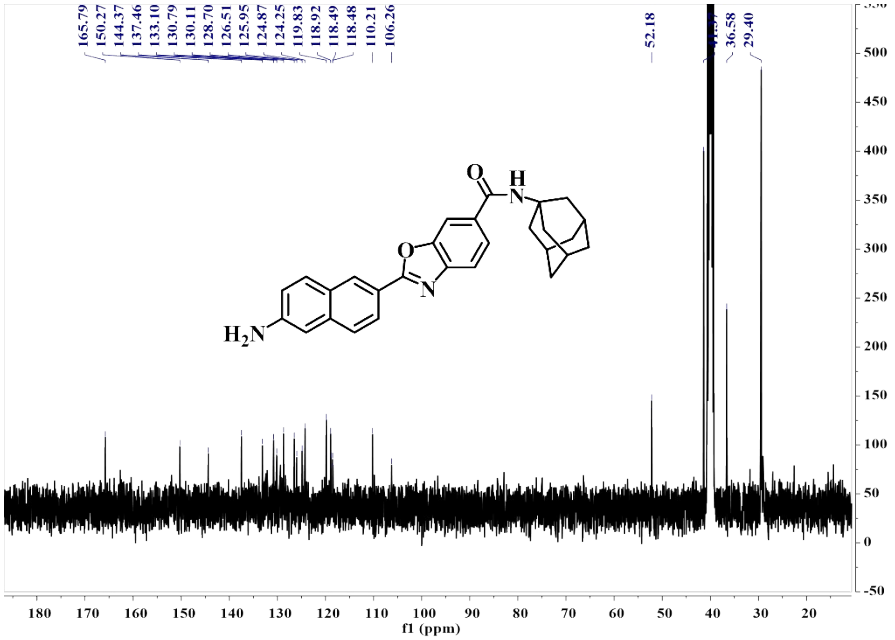


Fig. S29. ^{13}C NMR spectrum of the compound Np-Ad.

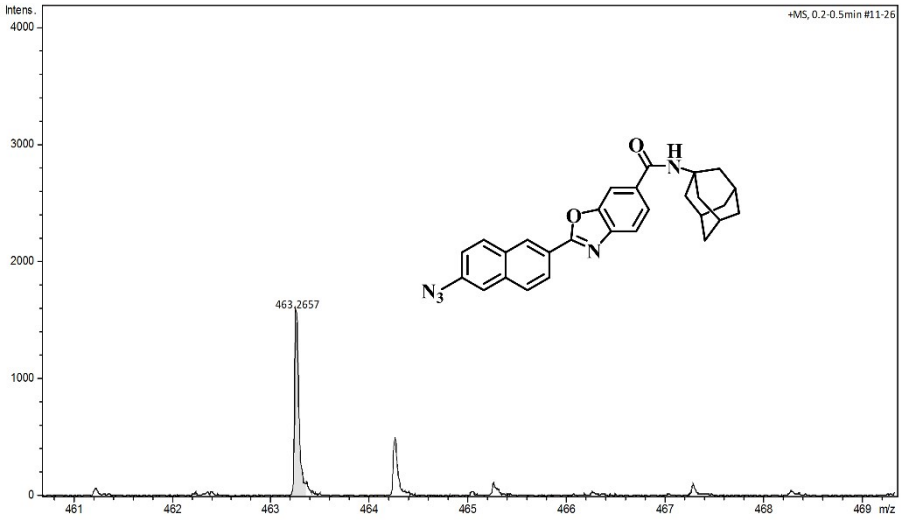


Fig. S30. EI-MS spectrum of the compound NHS-Ad.

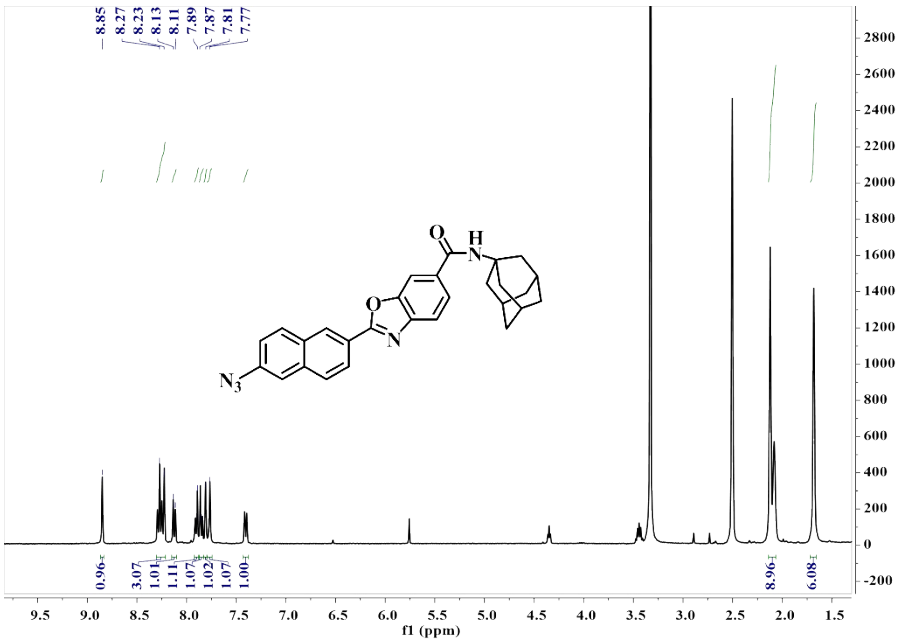


Fig. S31. ^{1}H NMR spectrum of the compound NHS-Ad.

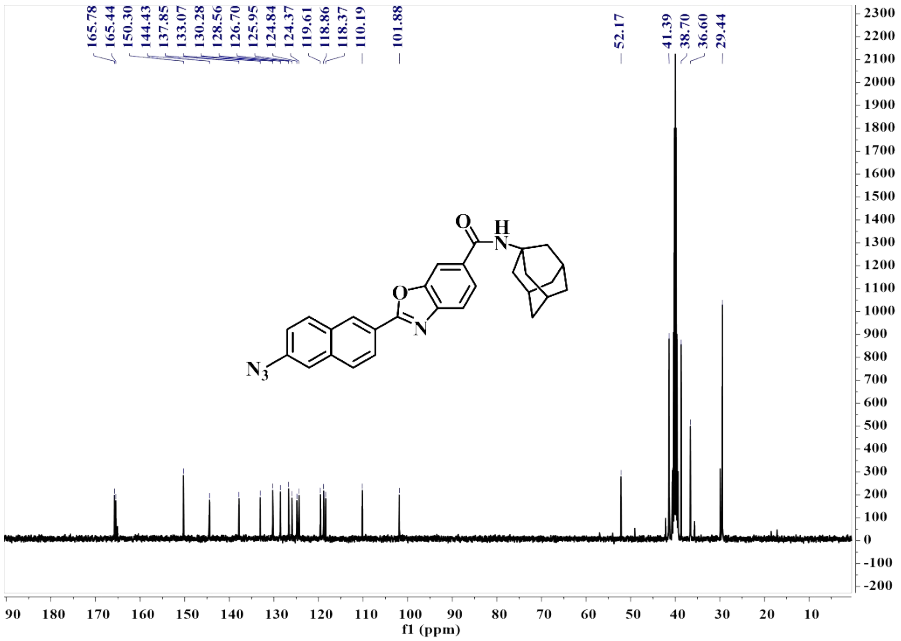


Fig. S32. ^{13}C NMR spectrum of the compound NHS-Ad.