# supporting Information

# A water-soluble conjugated polymeric micells as carrier for studying Pt (IV) releasing and imaging in cell nucleus

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#### 1. Synthetic method

1.1 Synthesis of 1,4 - di (ethyl 4-oxybutyrate) benzene (M<sub>1</sub>)

The potassium hydroxide powder (2.24 g, 40 mmol) was dispersed in 20 mL DMSO and agitated violently. After rapid addition of hydroquinone (0.88 g, 8 mmol) in argon atmosphere, ethyl 4-bromobutyrate (4.6 mL, 32 mmol) was injected slowly into the mixture. After stirring for 48 h, the reaction mixture was extracted with dichloromethane, then washed with saturated salt water. The crude product was purified by column chromatography (Ethyl acetate / petroleum ether, V/V=1:5) after vacuum distillation to remove the solvent, the white powder M<sub>1</sub> was obtained. Yield: 83%. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>,  $\delta$ ): 6.83 (s, 4H, Ar H), 4.22 – 4.09 (m, 4H, CH<sub>2</sub>), 3.97 (t, *J* = 6.1 Hz, 4H, CH<sub>2</sub>), 2.52 (t, *J* = 7.3 Hz, 4H, CH<sub>2</sub>), 2.14 – 2.04 (m, 4H, CH<sub>2</sub>), 1.28 (t, *J* = 7.1 Hz, 6H, CH<sub>3</sub>). MS (ESI) *m/z*: [M + Na]<sup>+</sup>: 362.3. The <sup>1</sup>H NMR and MS spectra were shown in Fig. S1 and Fig. S2. 1.2 Synthesis of 1,4-di (ethyl 4-oxybutyrate)-2,5-diiodobenzene (M<sub>2</sub>)

KI (0.31 g, 1.44 mmol) and I<sub>2</sub>(0.8 g, 3.15 mmol) was dissolved in a mixture of 12 mL ethanol, 0.2 mL sulfuric acid and 0.6 mL water. The reaction mixture was stirred for 24 hours after adding the compound M<sub>1</sub>(0.98 g, 2.9 mmol), the reaction was monitored by TLC (Ethyl acetate / petroleum ether, V/V=1:5). Finally, the crude product was added to 500 ml of ice water, then vacuum was pumped and washed with a large amount of cooled ethanol. The final product was collected as white powder. Yield: 80 %. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>,  $\delta$ ) 7.18 (s, 1H, Ar H), 4.16 (q, J = 7.1 Hz, 2H, CH<sub>2</sub>), 4.00 (t, J = 6.0 Hz, 2H, CH<sub>2</sub>), 3.80 – 3.62 (m, 1H , CH<sub>2</sub>), 2.59 (t, J = 7.3 Hz, 2H, CH<sub>2</sub>), 2.17 – 2.04 (m, 2H, CH<sub>2</sub>), 2.19 – 2.02 (m, 2H, CH<sub>2</sub>), 1.36 – 1.14 (m, 4H, CH<sub>3</sub>). MS (ESI) *m/z*: [M + Na]<sup>+</sup>: 613.0. The <sup>1</sup>H NMR and MS spectra were shown in Fig. S3 and Fig. S4.

1.3 Synthesis of poly(2,5-bis(ethyl oxbutyrate)-1,4-phenylethynylene-alt-1,4-phenyleneethynylene) (PPE-OBE) A mixture of 1,4-diethynylbenzene (201.6 mg, 1.60 mmol), Pd(PPh<sub>3</sub>)<sub>4</sub> (23.04 mg, 0.02 mmol), CuI (3.82 mg, 0.02 mmol) and compound M<sub>2</sub> (973.5 mg, 1.65 mmol) was poured into a 100 ml flask. Then a mixture of 36 mL chloroform and 6 mL triethylamine was added into the flask, after stirring at 50 °C for 24 h under nitrogen protection, the mixture was cooled to room temperature. The coarse product was slowly added into 200 ml of ether, and the pure product was collected by centrifugation, then dried and collected in a vacuum dryer, and the golden powder PPE-OBE was observed. Yield: 76 %. <sup>1</sup>H NMR (400MHz, CDCl<sub>3</sub>,  $\delta$ ): 7.53 (s, 4H, *J* = 4.5 Hz, Hg), 7.03 (s, 2H, H<sub>a</sub>), 4.24-4.04 (m, 8H, H<sub>b</sub>, H<sub>e</sub>), 2.63 (d, *J* = 7.6 Hz, 4H, H<sub>d</sub>), 2.18 (d, *J* = 6.2 Hz, 4H, H<sub>c</sub>), 1.26 (t, *J* = 6.7 Hz, 6H, H<sub>i</sub>). The <sup>1</sup>H NMR spectrum was shown in Fig. S5.

1.4 Synthesis of poly (2,5-bis (Polyethylene glycol oxybutyrate)-1,4 phenylethynylene-alt-1,4phenyleneethynylene) (PPE-O-PEG)

A mixture of MPEG-2000 (10 g, 5 mmol),  $K_2CO_3$  (0.028 g, 0.2 mmol) and PPE-OBE (0.477 g, 1 mmol, repeat unit) was dissolved into 50 mL DMSO and Stirred for 6 h at 70 °C under decompression. The coarse product was poured into ether and stirred for 1 h at room temperature. The yellow powder PPE-O-PEG was observed. Yield: 80 %. GPC measurement indicated that the weight-average molecular weight was 21170 with a polydispersity of 1.27. <sup>1</sup>H NMR (400MHz, CDCl<sub>3</sub>,  $\delta$ ): 7.53 (4 H, d, *J* = 9.7), 7.02 (2 H, s), 4.39 – 3.95 (4 H, m), 3.66 (357 H, s), 3.40 (6 H, s), 2.09 (8 H, d, *J* = 6.2). The <sup>1</sup>H NMR spectrum was shown in Fig. S6.

1.5 Synthesis of poly (2,5-bis (Polyethylene glycol oxybutyrate)-1,4 phenylethynylene-alt-1,4phenyleneethynylene)-Pt conjugate (PPE-O-PEG-Pt)

PPE-O-PEG (44.3 mg, 0.01 mmol, repeat unit), and chloroplatinic acid (8.24 mg, 0.02 mmol) were stirred in 10 ml water for 1 h. After dialysis with distilled water for 2 days, the dialysate was taken out and freeze-dried. The yellow powder of PPE-O-PEG-Pt was obtained. Yield: 86 %.

## 2. Figures S1-S11











Fig.S3 <sup>1</sup>HNMR data for compound M<sub>2</sub> in CDCl<sub>3</sub>



Fig.S4 ESI-MS of Compound  $M_2$  in ethanol



Fig.S5 <sup>1</sup>HNMR data for PPE-OBE in CDCl<sub>3</sub>



Fig.S6 <sup>1</sup>HNMR data for PPE-O-PEG in CDCl<sub>3</sub>



Fig.S7 XPS spectra of free PPE-O-PEG



Fig.S8 XPS spectra of PPE-O-PEG-Pt



**Fig. S9** (a) TEM image of PPE-O-PEG-Pt; (b) Hydrodynamic diameter distribution of PPE-O-PEG-Pt measured by DLS.



Fig. S10 The effect of DNA content on PPE-O-PEG fluorescence intensity.



Fig. S11 The interference of common ions on Pt loading to PPE-O-PEG. Black bar: fluorescent emission intensity of PPE-O-PEG-Pt conjugate with different ions and amino acids; red bar: fluorescent emission intensity of PPE-O-PEG with different metal ions.

PPE-O-PEG as Pt (IV) carrier can directly deliver Pt (IV) to the cell nucleus. It is well known that there are some common metal ions and amino acids in physiological environments, such as  $K^+$ , Na<sup>+</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup>, valine (Val), serine (Ser), threonine (Thr), aspartic acid (Asp), glutamic acid (Glu), tryptophan (Trp), tyrosine (Tyr), arginine (Arg) and methionine (Met). Therefore, some experiments were performed to study the selective coordination ability of PPE-O-PEG to Pt (IV). The fluorescence intensity of PPE-O-PEG (10  $\mu$ M, repeat unit) was measured when 10  $\mu$ M interfering substance (Pt (IV), K<sup>+</sup>, Na<sup>+</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup>, valine (Val), serine (Ser), threonine (Thr), aspartic acid (Asp), glutamic acid (Glu), tryptophan (Trp), tyrosine (Tyr), arginine (Arg) and methionine (Met)) was added, respectively. As shown in Fig. S11, the red bar shows that interfering substances have no effect on the fluorescence of PPE-O-PEG. Therefore, it indicates that PPE-O-PEG has a better selectivity for Pt (IV).

In order to test the anti-interference ability of PPE-O-PEG to Pt (IV), PPE-O-PEG (10  $\mu$ M, repeat unit) was dissolved in water with different interfering substance (10  $\mu$ M), and then Pt (IV) with the same concentration was added, respectively. The fluorescence intensity of the mixed solution was measured. The black bar in Fig. S11 shows that the interfering substances do not have obvious interference. These experimental results show that PPE-O-PEG has the highly selective coordination ability to Pt (IV) and the common interfering substances in physiological environment do not affect the coordination of PPE-O-PEG with Pt (IV).



Fig. S12 Cell viability of MCF-7 cells treated with PPE-O-PEG-Pt (30  $\mu$ M) and Pt (60  $\mu$ M) for 24h, 48h and 72h, respectively.

#### 3. Table S1-S2

Intensity	Platinum loading	ICP	DNA	Platinum releasing
(a.u.)	(µM)	(µM)	(nM)	(μΜ)
354	20.0	19.87	0	0
433.6	13.5		19.0	6.5
453.0	12.2		75.0	7.8
482.6	10.6		130.0	9.4
502.8	9.5		168.0	10.5
523.3	8.6		243.0	11.4
545.8	7.6		280.0	12.4
568.7	6.7		350.0	13.3

Table S1 The specific content of platinum loading and releasing.

The initial content of platinum loading is 20  $\mu$ M, the specific content of platinum loading and releasing could be calculated by the linear equation (I<sub>0</sub>/I=1.017+0.068[Pt], I<sub>0</sub>=837.9 a.u.). ICP: the concentration of Pt in PPE-O-PEG-Pt by ICP-AES.

PPE-O-PEG	The content of Pt loading in theory	The content of Pt in PPE-O-PEG-Pt	
(µM)	(μM)	by ICP-AES (µM)	
10	20	19.84	
20	40	39.77	
30	60	59.58	
40	80	80.21	
50	100	99.70	

Table S2 The content of Pt in PPE-O-PEG-Pt.

The content of platinum was measured by ICP-AES after the platinum completely coordination with PPE-O-PEG.