Supporting Information

Polymerizable aggregation-induced emission dye for fluorescent nanoparticles: synthesis, molecular structure and application in cell imaging

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Experimental Section

The kinetics procedure of TPES and PEGMA RAFT polymerization was shown as follows: TPES (162.1 mg, 0.290 mmol), PEGMA (720 mg, 1.514 mmol), CTA (5.1 mg, 1.94×10^{-2} mmol), AIBN (3.4 mg, 2.08×10^{-2} mmol), trimethylbenzene (0.201 g) and 5.0 mL 1,4-dioxane solvent were put into a Schlenk tube with a magnetic stir bar, which was cooled by liquid nitrogen and then followed by freeze-pump-thaw circle for three times with nitrogen. The Schlenk tube was kept at 70 °C for 36 h in an oil bath. In the polymerization process, samples for ^{1}H NMR analysis were collected at various times.

Kinetics of RAFT polymerization

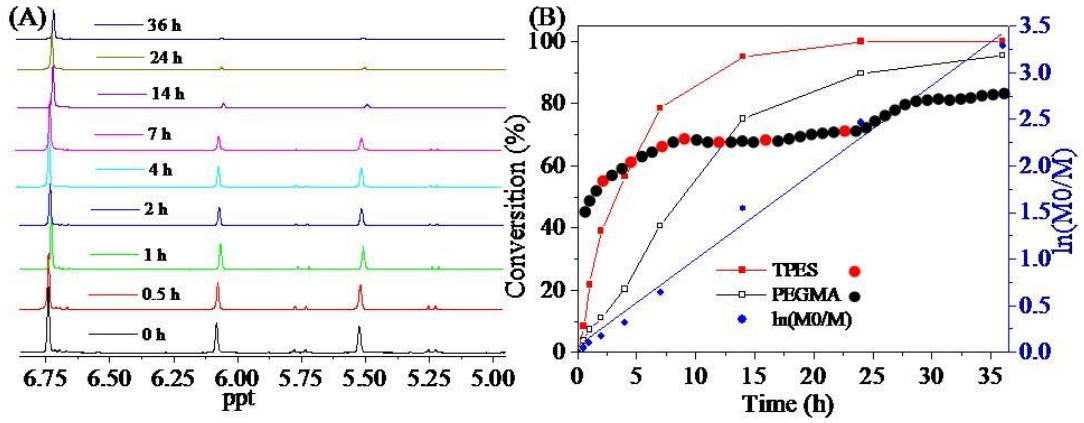

Fig. S1. Kinetics study of RAFT polymerization of PEGMA and TPES: (A) ^{1}H NMR spectrum ($CDCl_3$) of reaction mixture at various reaction time; (B) conversion and the kinetic curve of

PEGMA and TPES *vs* reaction time.

On the basis of the above ^{1}H NMR spectrum of **Fig. S1 (A)**, the conversation of TPES and PEGMA monomers was monitored by the intensity changing of peaks at 6.08 ppm assigned to PEGMA and 5.80 ppm assigned to TPES with the peak at 6.75 ppm assigned to trimethylbenzene as internal standard. From the exhibition of the figure, the relative intensity of peaks at 6.08 ppm and 5.80 ppm gradually decreased, indicating the desirable incorporation of TPES and PEGMA monomers into the polymers. The polymerization continuously proceeded to high monomer conversion after 36 hours. The kinetics study presented a linear pseudo-first-order kinetic plot versus time as shown in **Fig. S1 (B)**. Referring to the monomer conversion at various polymerization time, the possible PEG-TS polymers compositions and structure were also presented in **Fig. S1 (B).** On the whole, TPES dye mainly incorporated into the front-end of PEG-TS polymers and the obtained polymers were nearly gradient polymers. In the initial stage of polymerization (about 2 h), the molar fraction of TPES in polymers gradually increased due to its higher monomer conversion as compared with that of PEGMA, but with the polymerization proceeding, the molar fraction of TPES in polymers gradually decreased because its concentration in reaction mixture was less and less as compared with that of PEGMA.

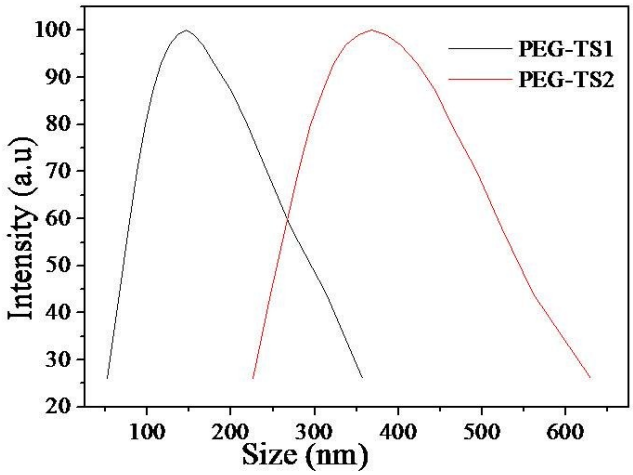

Fig. S2. Particles size of PEG-TS1 and PEG-TS2 in aqueous solution.

The distribution of particles diameter, morphology and structure of PEG-TS1 and PEG-TS2 in aqueous solution were respectively exhibited in **Fig. S2** and **Fig. S3**. The particles diameter of PEG-TS1 was about 150 nm and the particles size of PEG-TS2 increased to about 400 nm with the spherical morphology.

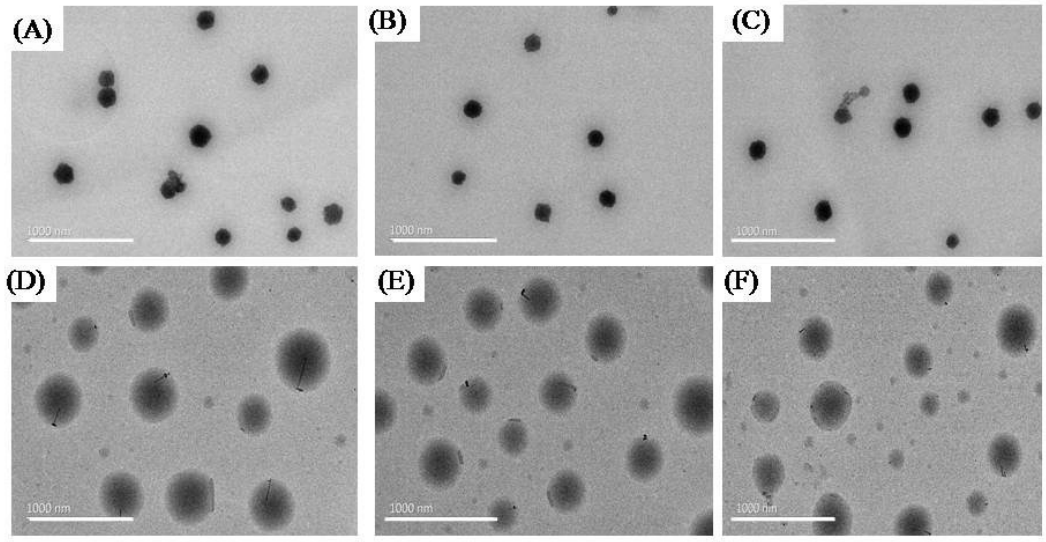

Fig. S3. (A) (B) (C) TEM image of PEG-TS1 FONs dispersed in water solution; (D) (E) (F) TEM image of PEG-TS2 FONs dispersed in water solution. Scale bar=1000 nm.

Properties and biological application of PEG-TS

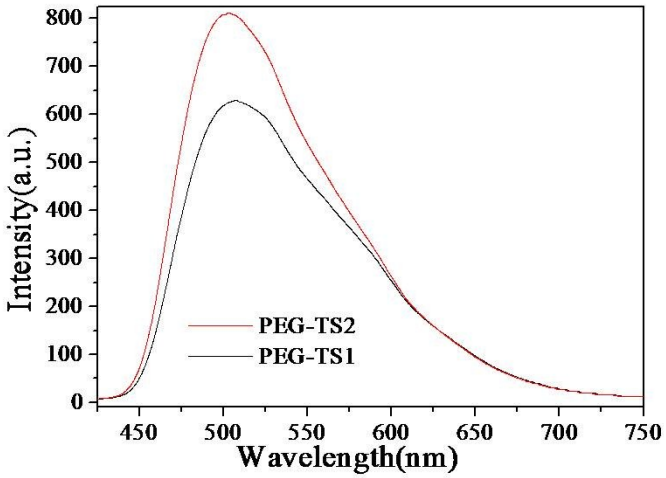

Fig. S4. Fluorescence emission difference of PEG-TS1 and PEG-TS2 at same temperature and TPES concentration.

In aqueous solution, the particle size of amphiphilic polymers was affected by many factors such as the molar fraction of TPES in polymers, the hydrophilic lipophilic balance (HLB) value of polymers, the temperature and concentration of solution. In order to investigate the correlation of the particle size and fluorescent characteristics, we devoted ourselves to preparing the PEG-TS1 and PEG-TS2 samples in aqueous solution with same temperature and TPES concentration. As shown in the **Fig. S4**, the fluorescence intensity of PEG-TS2 samples was stronger than that of PEG-TS2 samples, that is to say, the fluorescence intensity increased with the aggregation degree and particle size increasing.

In order to investigate the effect of concentration on cells imaging, the cells with 20 μg mL^{-1} of PEG-TS1 FONs were additionally evaluate by CLSM again as shown in **Fig. S5.** The prepared PEG-TS1 FONs could easily enter into the cells and also presented good imaging effect.

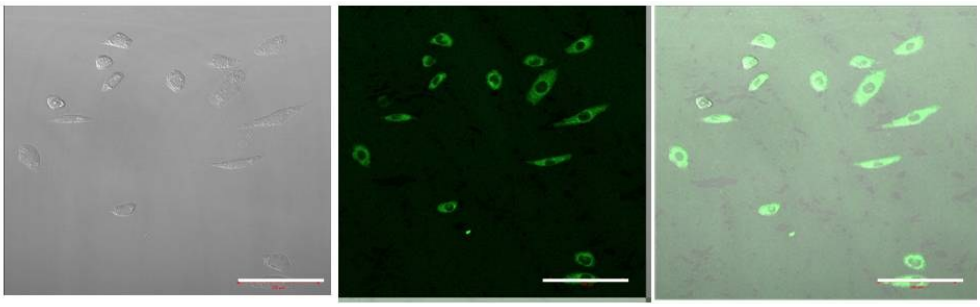

Fig. S5. CLSM images of HepG2 cells incubated with 20 μg mL^{-1} of PEG-TS1 FONs. (A) bright field, (B) excited with a 405 nm laser, (C) merged image of (A) and (B). Scale bar = 100 μm.