Supporting Information

1. Size distributions of as-prepared nanocomposites by dynamic light scattering tests.

As exhibited in Fig. S1, the above-mentioned three nanoprobes all had an average hydrodynamic size of less than 100 nm, which indicated that they were suitable for intracellular assays[1]. And PPy@RhB-PAA-FITC nanocomposites had an average hydrodynamic size of 99.9 nm, which was larger than TEM result due to the presence of PAA and PEI. And the PDI value of less than 0.2 indicated that PPy@RhB-PAA-FITC nanocomposites possessed good aqueous dispersity[2].

2. FTIR

FTIR was carried out to further study the chemical composition and structure of obtained nancomposites. As shown in Fig. S4, the peaks at about 3420, 1547 and 1303 cm^{-1} for all nanocomposites were assigned to the stretching vibrations of N-H/O-H, C=C and C-N, respectively. The C-H bending vibration and =C-H in-plane vibration were associated with the bands at 1463 and 1037 cm^{-1}, respectively. The C-H out-plane/in-plane deformation vibration peaks were found at 1176 and 907 cm^{-1}, respectively. The band of C=O stretching vibration was presented at 1636 cm^{-1}. Furthermore, two peaks at 1696 and 1335 cm^{-1} were appeared in PPy@RhB-PAA nancomposites, which belonged to C=O stretching and C-H bending vibrations of PAA. Finally, polymer PEI was chosen as intermediate linker for connecting FITC to nanocomposites. The C-N and C=S vibration were observed at 1469 and 1183 cm^{-1}, respectively, because FITC was connected firstly with PEI via the reaction between isothiocyanate and carboxyl group. Then obtained PEI-FITC was linked with PPy@RhB-PAA nancomposites through amide reaction, resulting the presence of C=O and N-H vibrations in PPy@RhB-PAA-FITC nanocomposites. Moreover, the $-CH_2-$ vibration was emerged at 1875 cm^{-1} and N-H vibration was shifted to 3382 cm^{-1} in the final harvested nanocomposites, which was due to the presence of PEI chains. Therefore, the FTIR data confirmed the successful construction of PPy@RhB-PAA-FITC nanocomposites.

3. Calculation of photothermal conversion efficiency

The photothermal conversion efficiency (η) of nanocomposites was assessed following the Roper's method[3]. The details of calculation of photothermal conversion efficiency were as follows:

$$\eta = \frac{hA\left(\Delta T_{max,mix} - \Delta T_{max,H_2O}\right)}{I(1 - 10^{-A_{808}})} \quad (1)$$

where h is the heat transfer coefficient, A is the surface area of the container. $\Delta T_{max,mix}$ and $\Delta T_{max,H_2O}$ are the temperature variations of nanocomposites solution and deionized water after laser radiation. I refers to the laser power and A_{808} is the absorbance of nanocomposites at 808 nm.

Then the value of hA was calculated from equation (2):

$$hA = \frac{m_{H_2O} C_{p,H_2O}}{\tau_s} \quad (2)$$

where m_{H_2O} refer to the mass and heat capacity of deionized water, separately. τ_s is a sample system time constant.

The value of τ_s was obtained from equation (3) and (4):

$$\theta = \frac{(T - T_{surr})}{(T_{max} - T_{surr})} \quad (3)$$

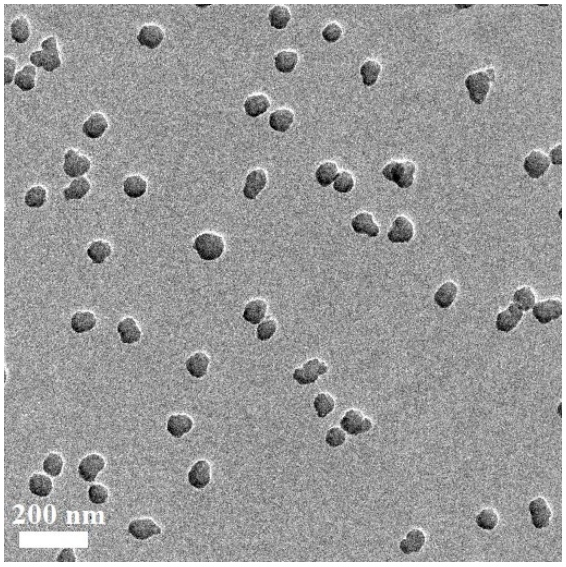
$$t = -\tau_s ln\theta \quad (4)$$

where θ is a dimensionless parameter, T refers the temperature during natural cooling stage. T_{surr} is the environment temperature and T_{max} is the maximum steady temperature. Therefore, τ_s is able to determine.

Finally, substituting the corresponding value into equation (1), the photothermal conversion efficiency (η) of PPy@RhB-PAA-FITC nanocomposites was assessed to be 36.24%.

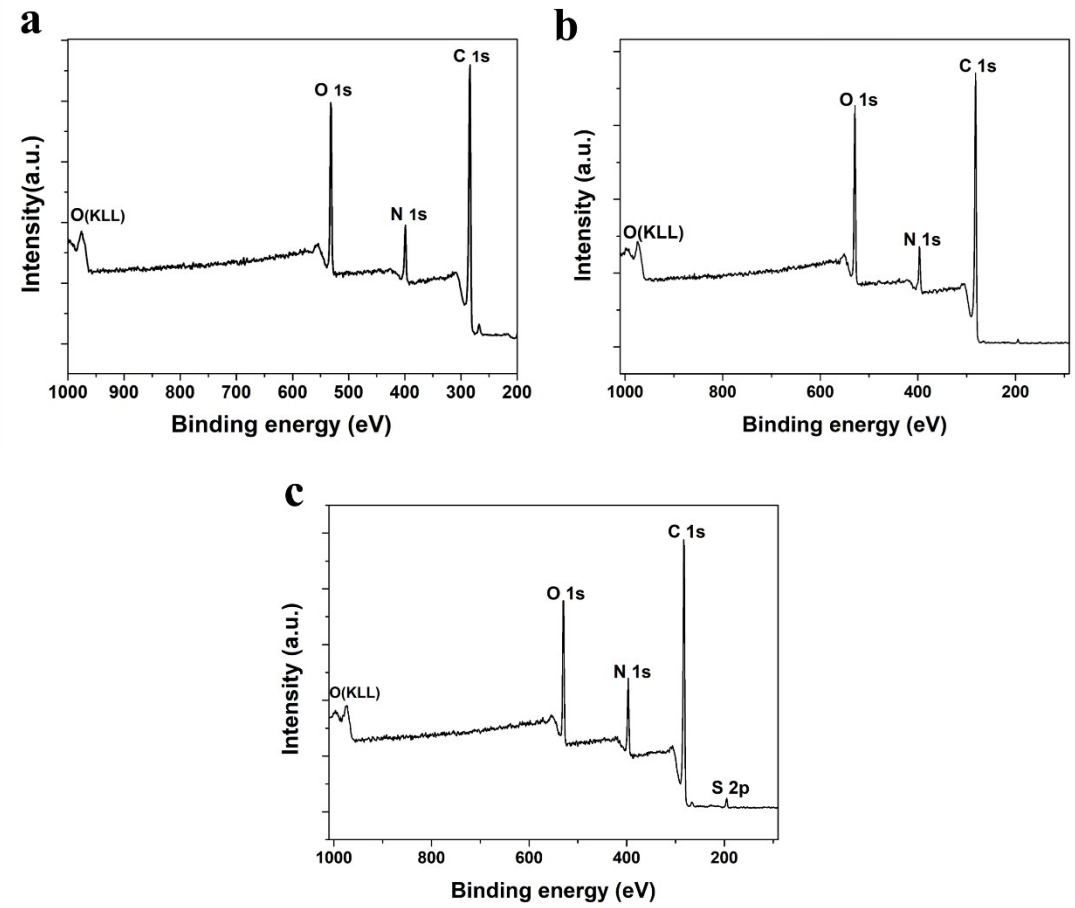
[1] Y. Liu, P. Bhattarai, Z. Dai and X. Chen, Chem. Soc. Rev., 2019, 48, 2053-2108.
[2] M. Chen, X. Liu, A. Fahr, Int. J. Pharmaceut., 2011, 408, 223-234.
[3] D.K. Rope, W. Ahn, M. Hoepfner, J. Phys. Chem. C Nanomater. Interfaces, 2007, 111, 3636-3641.

1



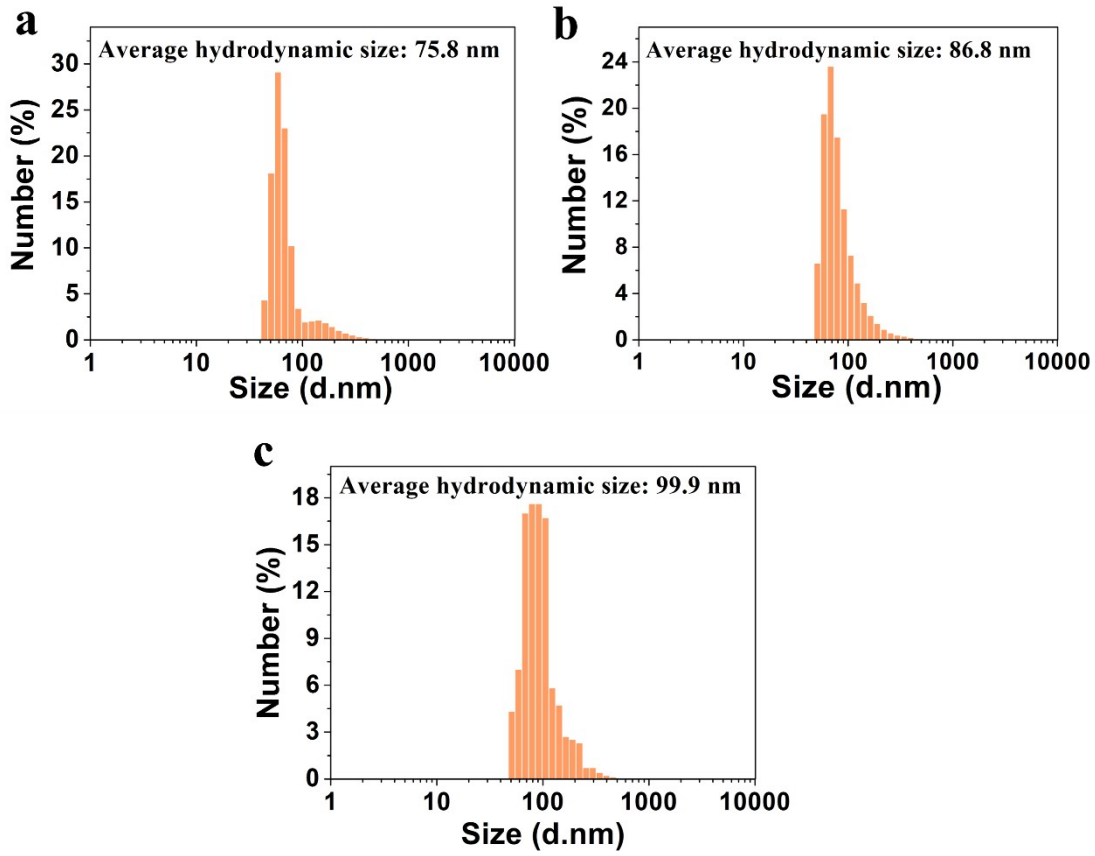
2

3 Figure S1. TEM images of PPy nanoparticles.



4

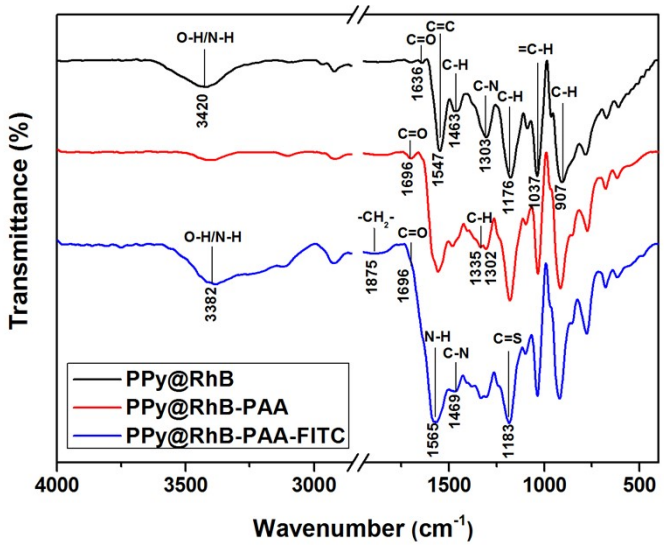
5 Figure S2. The XPS full scan spectra of (a) PPy nanoparticles, (b) PPy@RhB-PAA and (c)
6 PPy@RhB-PAA-FITC nanocomposites.



1

2 Figure S3. Size distributions of (a) PPy@RhB, (b) PPy@RhB-PAA and (c) PPy@RhB-PAA-FITC

3 nanocomposites by dynamic light scattering (DLS) tests.



4

5 Figure S4. The FT-IR spectra of the obtained nanocomposites.

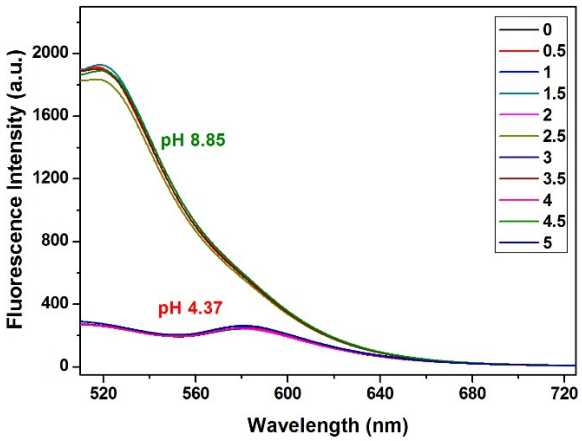


Figure S5. Reversible fluorescence spectra of PPy@RhB-PAA-FITC between pH 4.37 and 8.85.

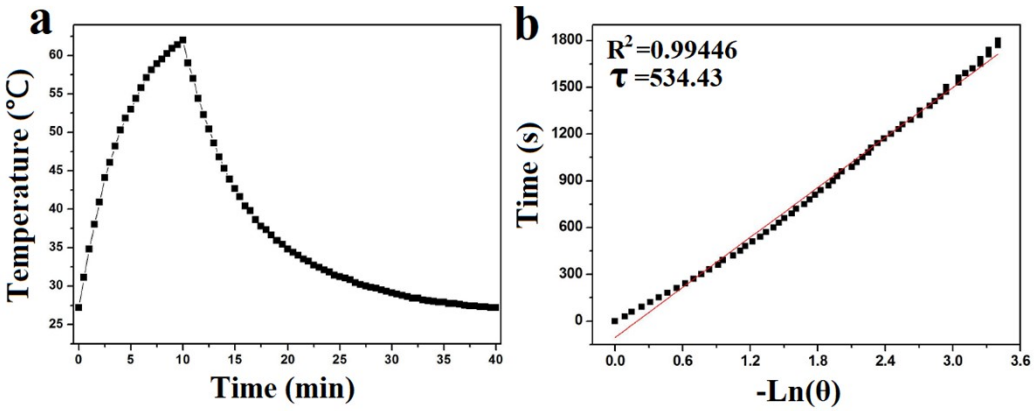


Figure S6. Photothermal conversion efficiency curves of PPy@RhB-PAA-FITC nanocomposites.