

Supplementary Material

Thermo-sensitivity of hybrid nanogels for specific endogenous hydrogen sulfide detection and efficient flash chill treatment

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1. Synthesis of functionalized fluorescent nanoparticles PNP_s-COOH

The carboxyl-modified fluorescent nanoparticles PNP_s-COOH were synthesized by a previously reported co-precipitation method. 10 mg fluorescent conjugated polymer (TPb) and 20 mg polystyrene-maleic anhydride (PSMA) copolymer were dissolved by 10 mL tetrahydrofuran, respectively. fluorescent conjugated polymer reserve solution (1 mg/mL) and PSMA reserve solution (2 mg/mL) were prepared.

The conjugated polymer solution of 0.5 mL and PSMA solution of 0.1 mL were taken from the reserve solution and stirred to anhydrous THF (9.4 mL) to form a homogeneous solution containing conjugated polymer (50 µg/mL) and PSMA (20 µg/mL). Then in ice bath and ultrasonic environment, the solution was quickly added to 20 mL ultra-pure water and the ultrasound lasted for 5-10 minutes. Finally, THF was removed by rotating evaporator and the solution was concentrated to 10 mL. A clear yellow-green liquid was obtained by filtration with a filter head with a diameter of 0.22 µm (PNP_s-COOH concentration 50 µg/mL).

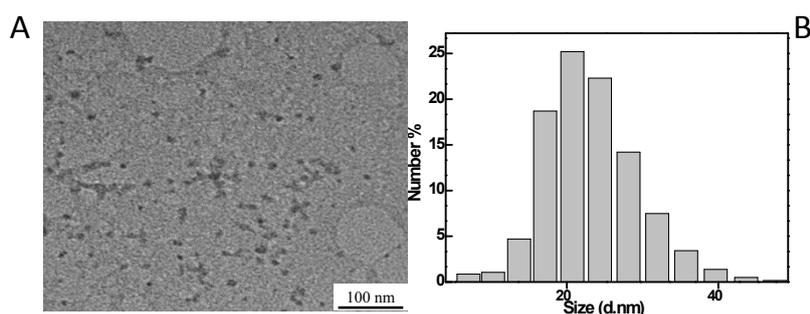


Fig. S1 (a)TEM image of the PNP_s-COOH and (a) the particle size distribution of PNP_s-COOH.

2. Fe³⁺/Poly(NIPAM- AAM)-PNP_s-COOH hybrid system

PNP_s-COOH can chelate with Fe³⁺ to induce fluorescence quenching. The Poly (NIPAM-AAM)-PNP_s-COOH hybrid nanogels also has this performance. With the increase of Fe³⁺ concentration (0-800µmol/L), the fluorescence signal of hybrid nanogels are obvious quenched. A linear correlation between the PL intensity and Fe³⁺ can be established across the concentration range of 0-800 µmol/L, R value about 0.973.

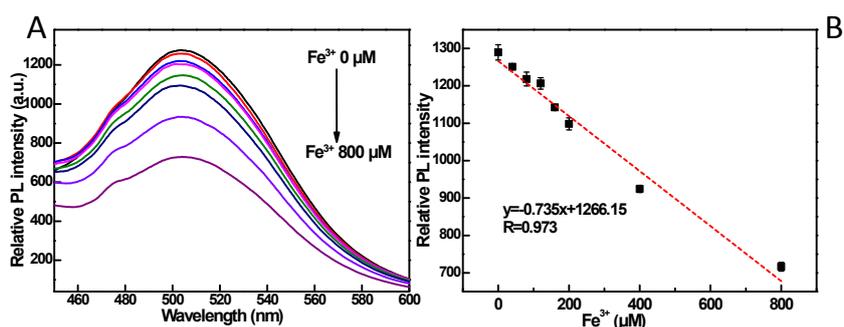


Fig. S2 (a) Fe^{3+} Sensitivity of Poly(NIPAM-AAm)-PNPs_{-COOH}. (b) Fe^{3+} concentration range 0, 40, 80, 120, 160, 200, 400, 800 $\mu\text{mol/L}$.

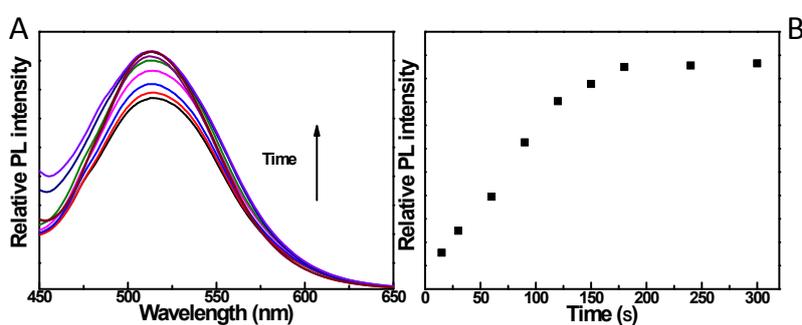


Fig. S3 The effect of incubation time (0-300 s) between Fe^{3+} /Poly (NIPAM-AAm)-PNPs_{-COOH} and Na_2S

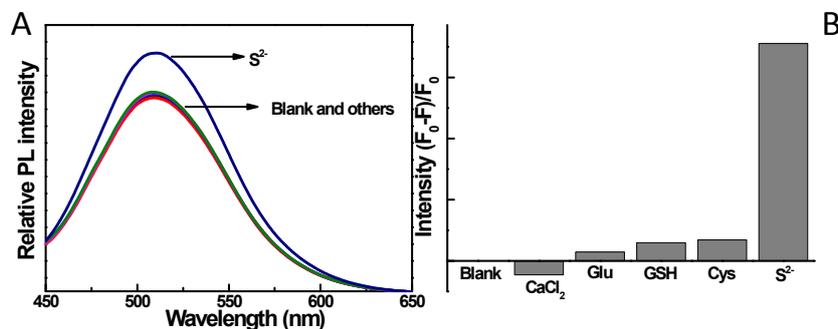


Fig. S4 (a) Fluorescence spectra of Fe^{3+} /Poly (NIPAM-AAm)-PNPs_{-COOH} in the presence of different disturbed substances (1 mM). (b) The selective fluorescence histogram of Fe^{3+} /Poly (NIPAM-AAm)-PNPs_{-COOH} for S^{2-} .

Table S1. The limitation of detection in reported methods.

Detection Nanoprobes	LOD (10^{-6}M)	Linear Range (10^{-6}M)	References
TPSNP	0.86	0-5	[1]
Au Nanosphere Array with Silver Coating	0.79	2-30	2
SulpHensor	0.5	0-10	3

Ag NPI-coated	0.52	1.64-16.4	4
Fluorescent probe Na-H ₂ S-ER.	7.7	0-150	5
TMSDNPOB	1.27	0-50	6
Silver/Nafion-containing PVP membranes	1.4	3.125-50	7
Fe ³⁺ /Poly(NIPAM- AAM)-PNPs _{-COOH}	0.409	0-30	this work

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