

Electronic Supplementary Information

Porous Cobalt Sulfide Hollow Nanospheres with Tunable Optical Property for Magnetic Resonance Imaging Guided Photothermal Therapy

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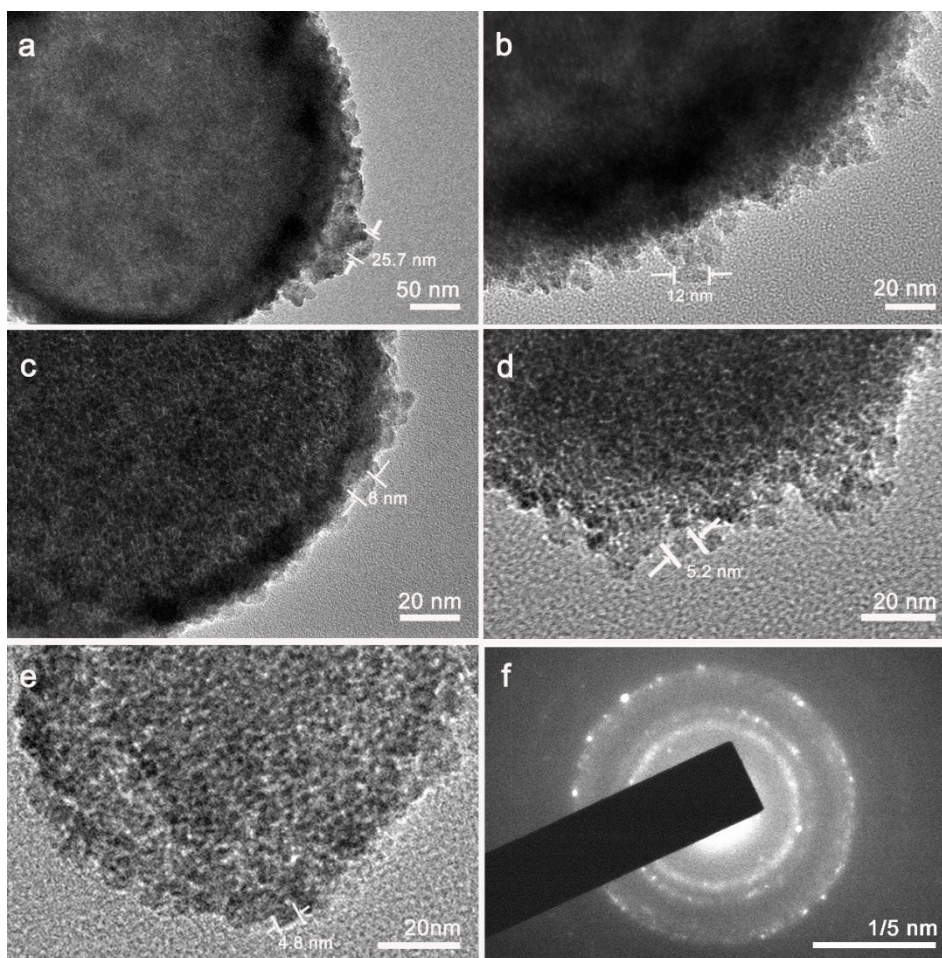


Fig. S1. TEM images of the edge of a sphere synthesized by different thioacetamide concentrations: (a) 4 mmol, (b) 5 mmol, (c) 7 mmol, (d) 11 mmol, and (e) 14 mmol. (f) ED pattern from the PCSH NSs as shown in (c).

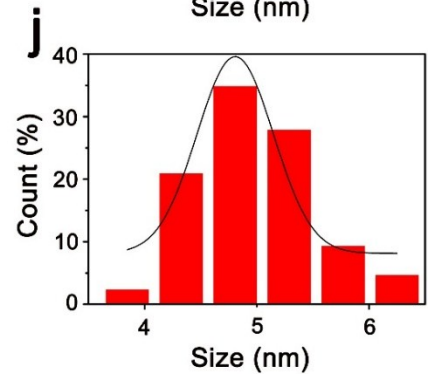
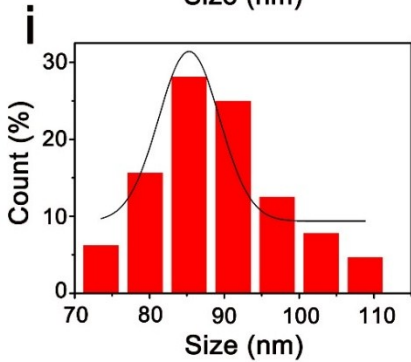
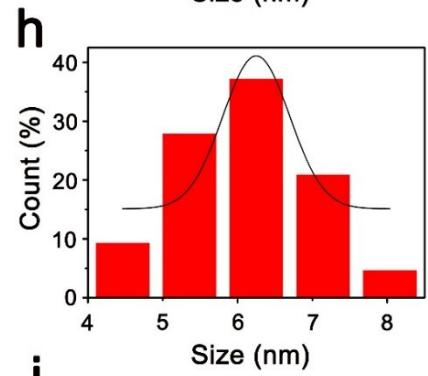
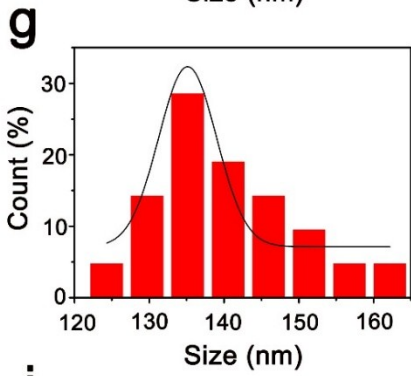
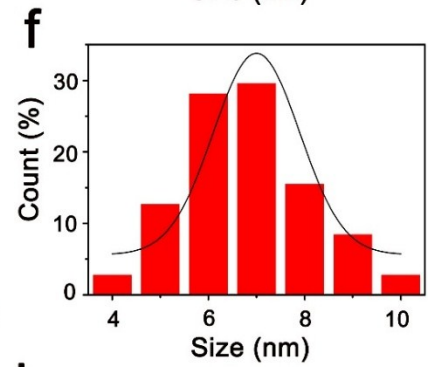
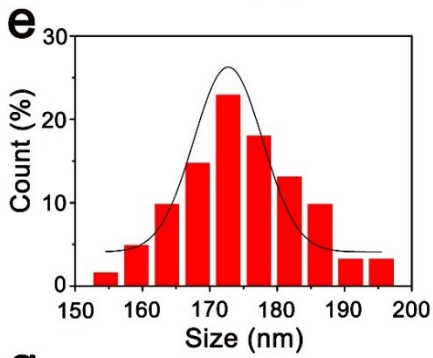
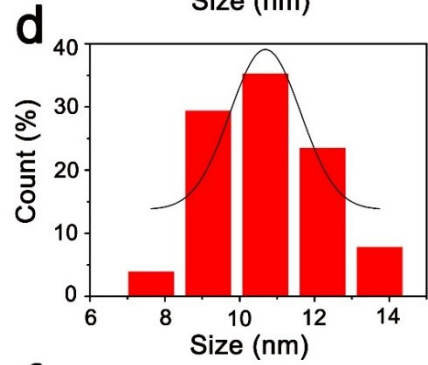
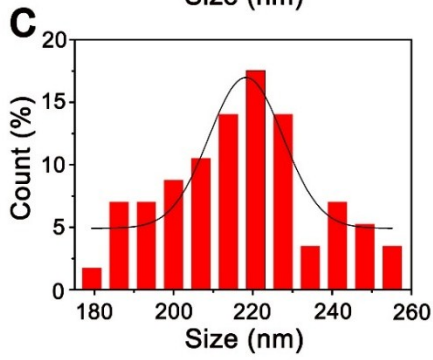
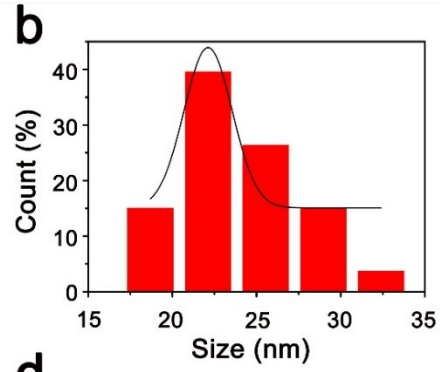
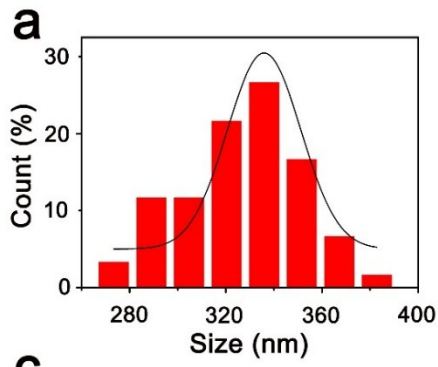


Fig. S2. PCSH NSs obtained using 4 mmol thioacetamide with (a) an external diameter of 335 ± 25.6 nm and (b) the edge length of the corresponding constituted nanocrystals of 22.1 ± 2.9 nm, PCSH NSs obtained using 5 mmol thioacetamide with (c) an external diameter of 218 ± 18.7 nm and (d) the edge length of corresponding constituted nanocrystals of 10.7 ± 1.9 nm, PCSH NSs obtained using 7 mmol thioacetamide with (e) an external diameter of 172.7 ± 10.2 nm and (f) the edge length of corresponding constituted nanocrystals of 7 ± 1.8 nm, PCSH NSs obtained using 11 mmol thioacetamide with (g) an external diameter of 135 ± 11.1 nm and (h) the edge length of corresponding constituted nanocrystals of 6.3 ± 0.9 nm, PCSH NSs obtained using 14 mmol thioacetamide with (i) an external diameter of 85 ± 7.1 nm and (j) the edge length of corresponding constituted nanocrystals of 4.8 ± 0.7 nm. Histograms of the dimension distributions of over 100 randomly selected NSs from TEM images. Data are presented as the mean \pm s.e.m.

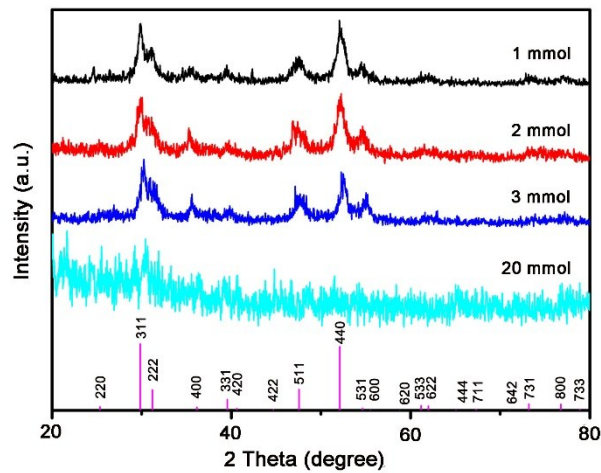


Fig. S3. Power XRD patterns of cobalt sulfide samples prepared by 1, 2, 3, and 20 mmol, respectively.

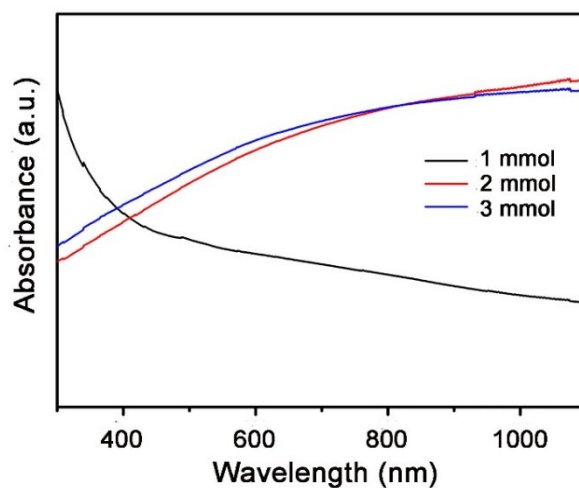


Fig. S4. UV-vis-NIR spectra of cobalt sulfide materials produced with 1, 2, 3 mmol thioacetamide added, respectively.

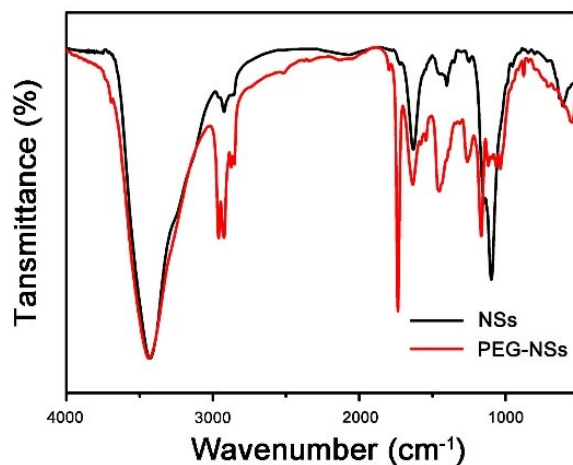


Fig. S5. FT-IR spectra of the PCSH NSs before and after the modification with C18-PEG, in which the absorption band at $\sim 2900 \text{ cm}^{-1}$ was attributed to the C-H vibration in PEG.

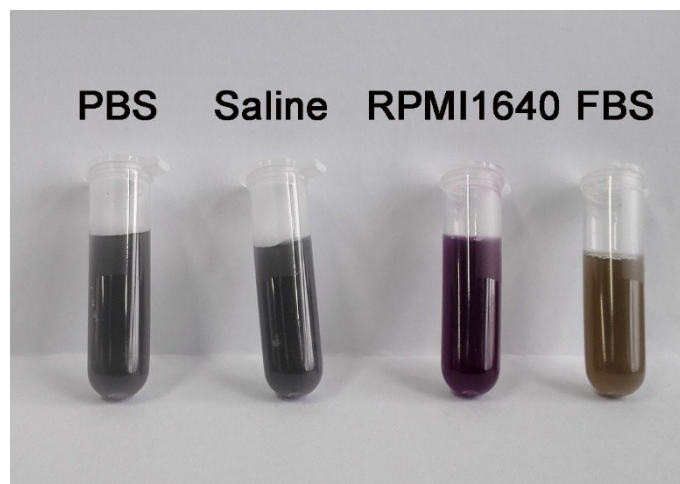


Fig. S6. A camera image of the PEG- PCSH NSs dispersed in PBS, Saline, RPMI1640, FBS for over two weeks. Particularly, the PEG- PCSH NSs' FBS solution could unchanged for over two months.

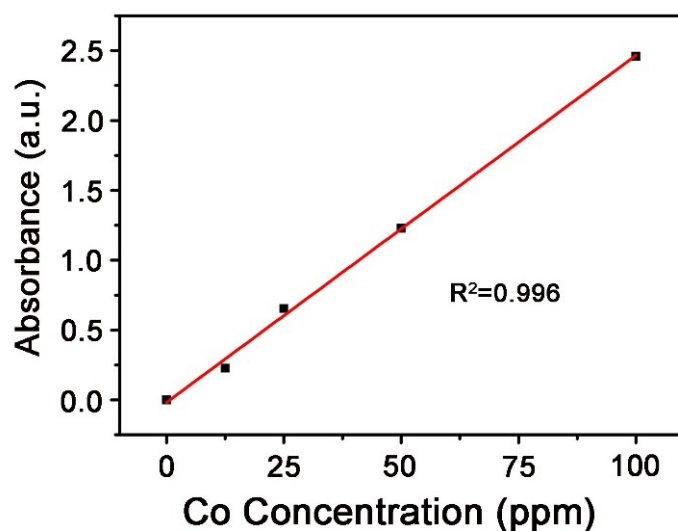


Fig. S7. Corresponding linear relationship of the absorbance at 808 nm versus Co concentration.

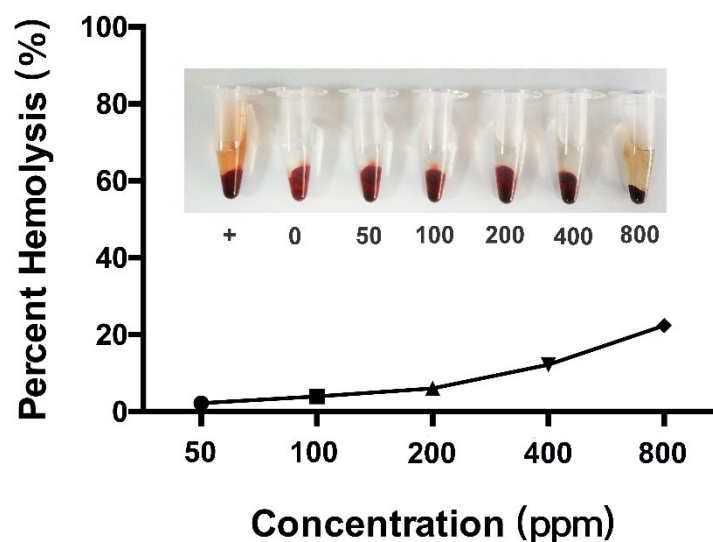


Fig. S8. Hemolytic percent of RBCs incubated with PEG-PCSH NSs' solution at different concentrations, inset showing the photo for direct observation of hemolysis.

Table S1. Determination of the molar ratio of S and Co in the PCSH NSs with the

different thioacetamide concentrations by ICP and XPS, respectively.

S/Co (Added)	1.0	2.0	3.0	4.0	5.0	7.0	11.0	14.0	20.0
S/Co (ICP)	0.79	1.14	1.35	1.49	1.73	1.89	2.06	2.31	2.42
S/Co (XPS)	/	/	/	0.8	0.98	1.41	1.82	3.0	/

Table S2. The detailed peak positions for the fitted Co peaks.

Samples	Co ²⁺	Co ²⁺	<i>E_g</i>	Co ³⁺	Co ³⁺	<i>E_g</i>
	2p3/2	2p1/2		2p3/2	2p1/2	
E1	778.69	792.98	14.29	781.55	797.65	16.10
E2	778.52	793.42	14.90	781.55	797.55	16.00
E3	778.65	793.69	15.04	781.45	797.70	16.25
E4	778.89	794.00	15.11	781.85	797.75	15.90
E5	778.67	793.60	14.93	781.30	797.05	15.75

Table S3. The detail peak positions for the fitted S peaks.

Samples	S ²⁻	S ²⁻	<i>E_g</i>	S ₂ ²⁻	S ₂ ²⁻	<i>E_g</i>	Co _x S _y	Co _x S _y
	2p3/2	2p1/2		2p3/2	2p1/2			
F1	161.48	162.75	1.27	161.74	163.45	1.61	168.60	169.73
F2	161.62	162.78	1.16	161.80	163.26	1.46	168.64	169.77
F3	161.57	162.79	1.22	161.81	163.43	1.62	168.88	170.01
F4	161.58	162.79	1.21	161.79	163.54	1.75	168.84	169.98
F5	161.62	162.80	1.18	161.78	163.47	1.69	168.79	169.56

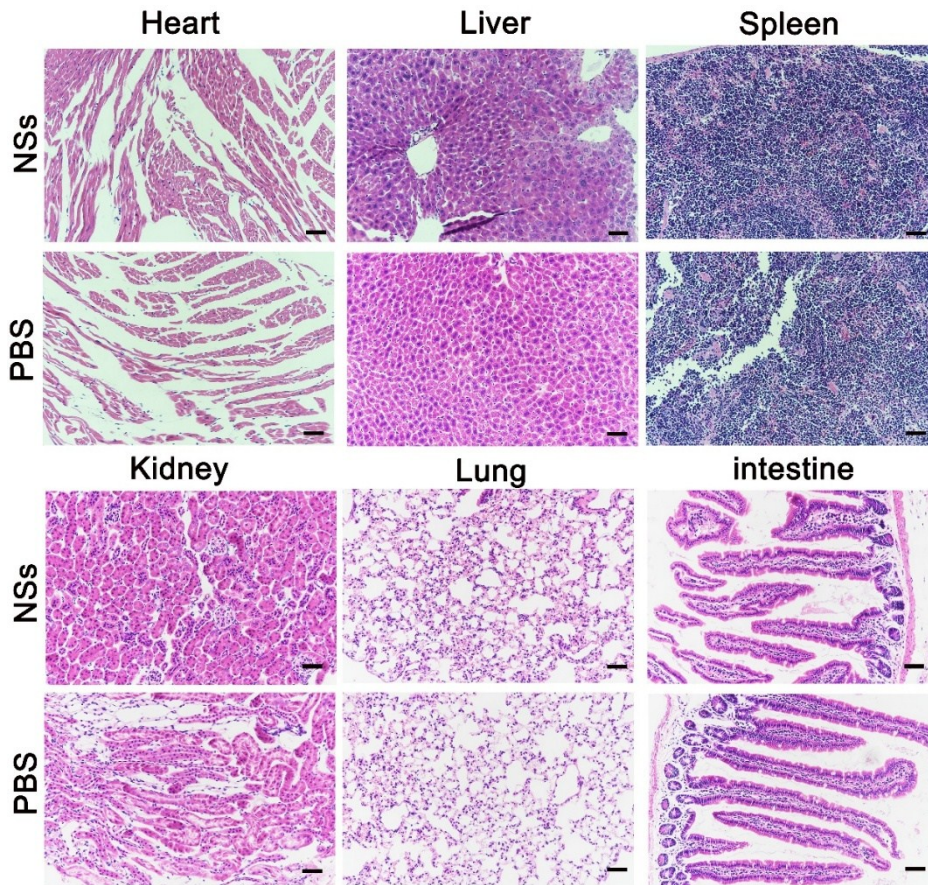


Fig. S9. H&E-stained tissue sections of major organs including heart, liver, spleen, kidney, lung and intestine of healthy mice and treated mice with the PEG-PCSH NSs 30 days after treatment. All scale bar: 50 μm .

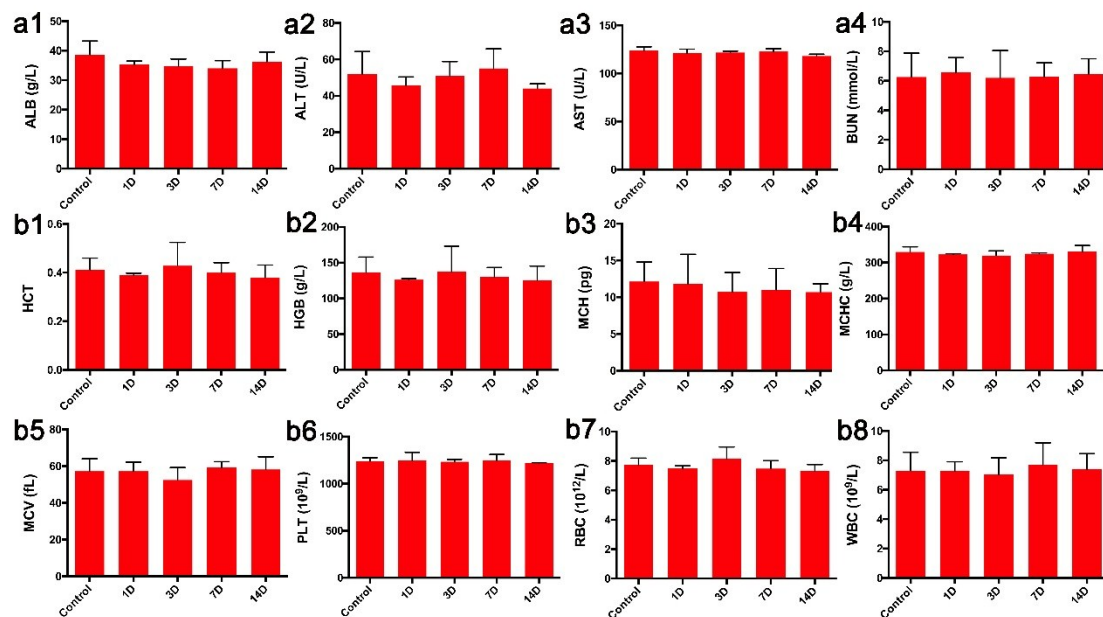


Figure S10. (a1-a4) blood biochemistry, include serum albumin (ALB), alanine aminotransferase (ALT), aspartate aminotransferase (AST), blood urea nitrogen (BUN) and (b1-b8) complete blood counts of mice receiving i.v. injection of PEG-PCSH NSs

(100 μ L, 800 ppm) at different time points, which included hematocrit (HCT), hemoglobin (HGB), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), mean corpuscular volume (MCV), blood platelet (PLT) red blood cells (RBC), and white blood cells (WBC).