Electronic Supplementary Material (ESI) for Nanoscale.

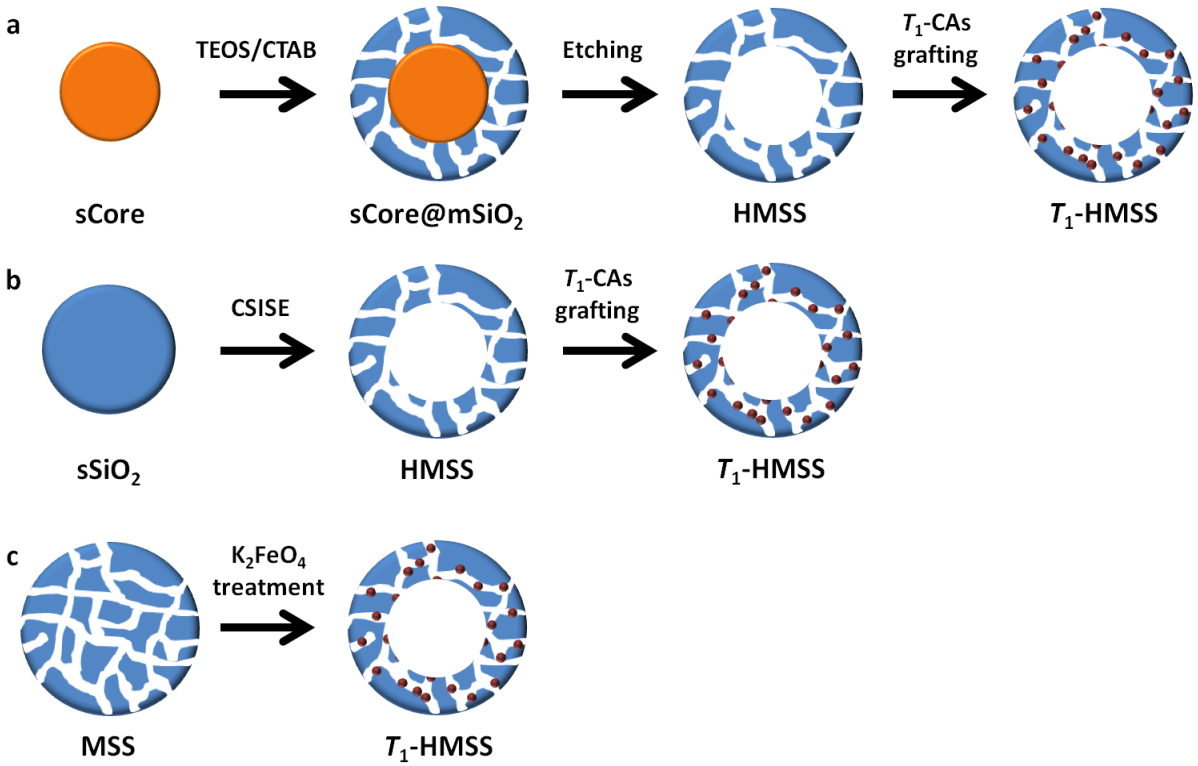
Supporting Information for

One-step Synthesis of Biodegradable T_1-FeOOH Functionalized Hollow Mesoporous Silica Nanocomposites From Mesoporous Silica Spheres

Yung-Kang Peng,[1,2] Yu-Jui Tseng,[1] Chien-Liang Liu,[1] Shang-Wei Chou,[1] Yu-Wei Chen,[1] S.C. Edman Tsang[2] and Pi-Tai Chou[1*]

[1]Department of Chemistry, National Taiwan University, Taipei 106, Taiwan

[2]Department of Chemistry, University of Oxford, Oxford OX1 3QR, UK



Scheme S1. Schematic illustration of the synthetic procedures of T_1-HMSS via (a) core-sacrificing, (b) cationic surfactant induced selective etching (CSISE) strategies and (c) one-step methodology used in this report.

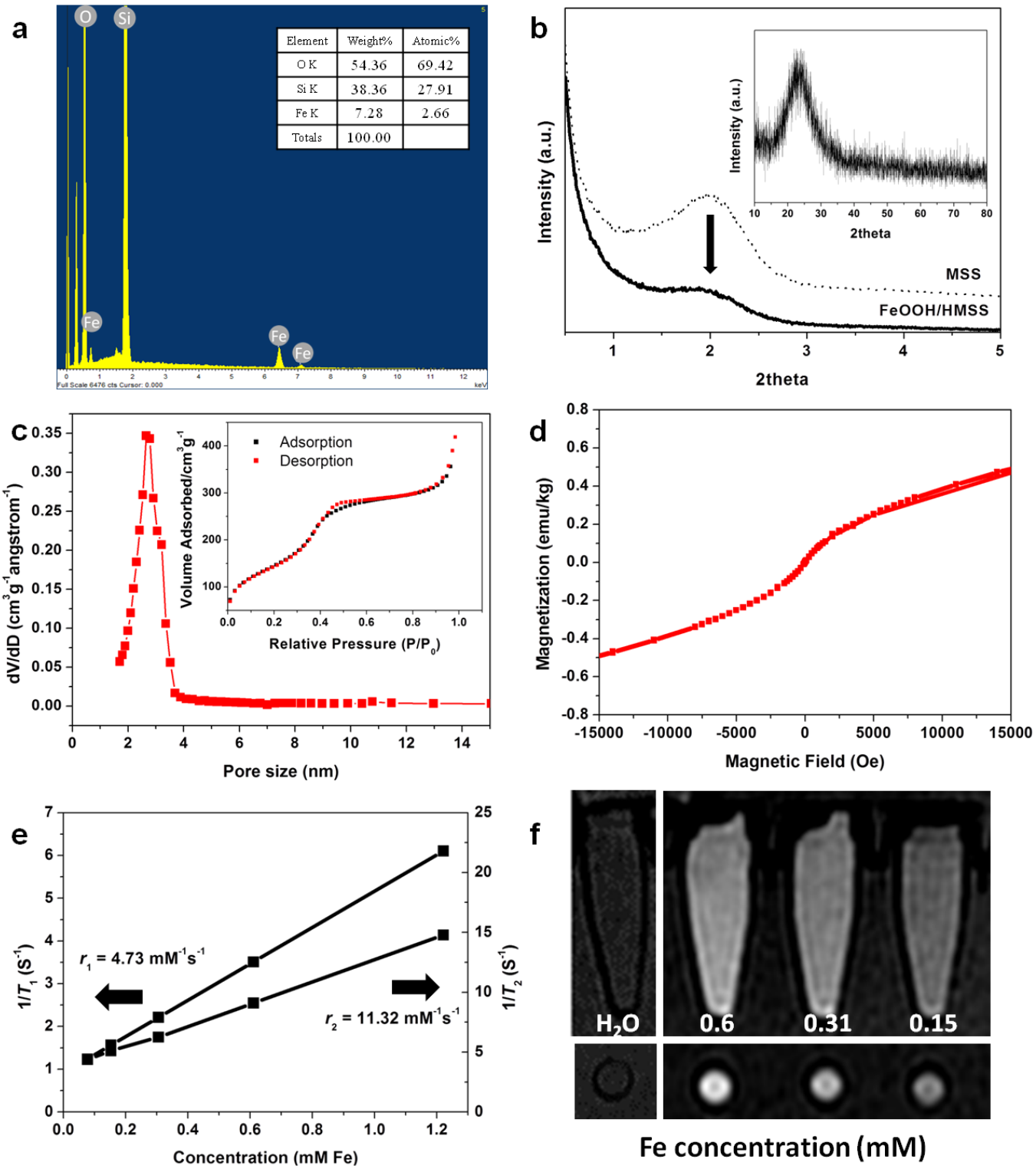


Figure S1. Structure and property characterizations of as-prepared FeOOH/HMSS. (a) EDX spectrum, (b) low-angle XRD pattern (inset: high-angle pattern), (c) pore size distribution (inset: N_2 adsorption-desorption isotherms), (d) Field-dependent magnetization curves (at 300 K), (e) relaxation properties of FeOOH/HMSS at 0.47T and (f) side and bottom view of T_1-weighted MR image of FeOOH/HMSS. The actual added concentration was carefully determined by the inductively coupled plasma mass spectrometry (ICP-MS).

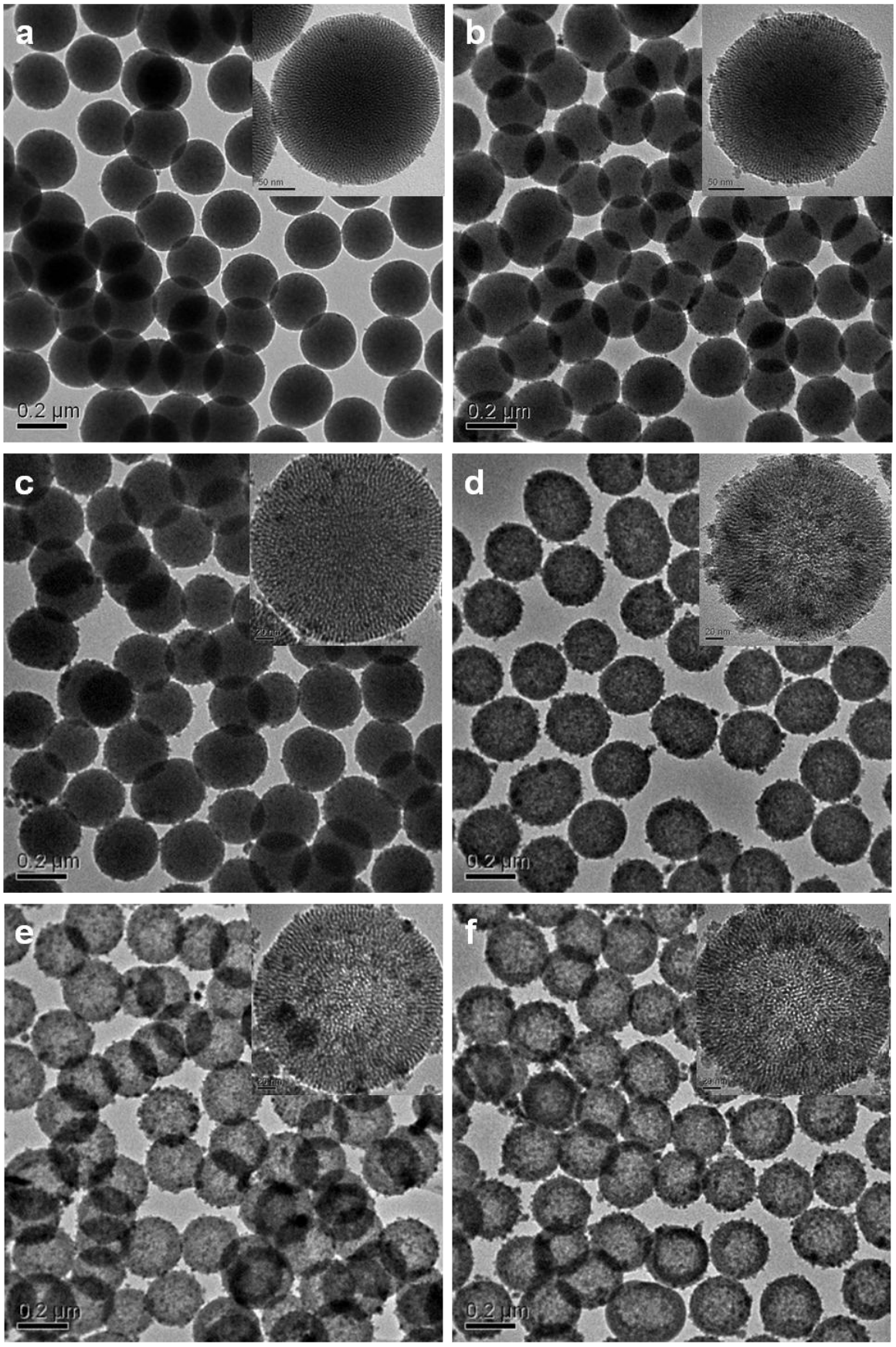


Figure S2. A time course TEM images of sample a5 (precursor: 10 mg MSS) (a) 3 min, (b) 6 min, (c) 12 min, (d) 18 min, (e) 24 min and (f) 30 min during K_2FeO_4 treatment.

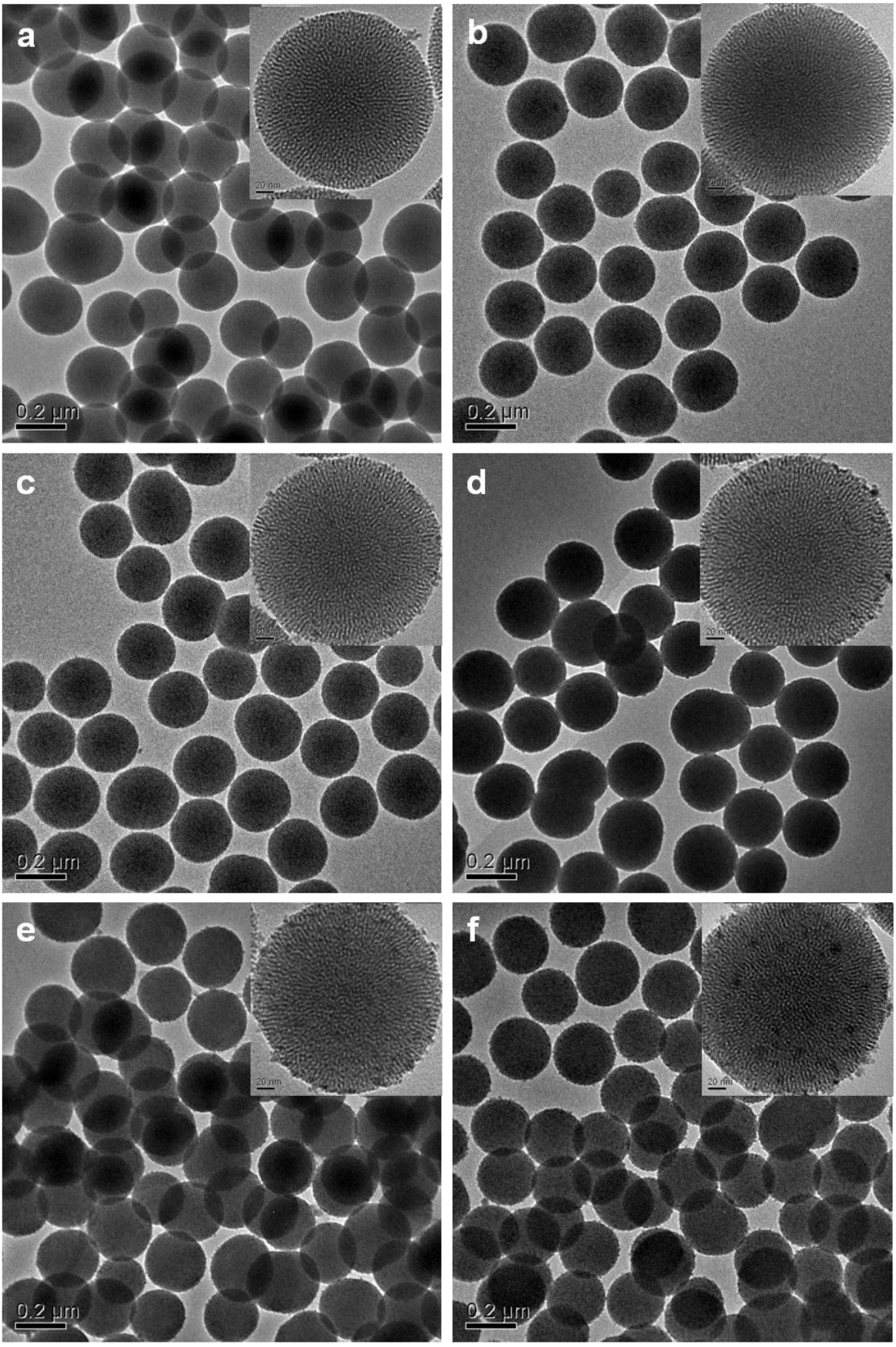


Figure S3. A time course TEM images of sample a6 (precursor: 20 mg MSS) (a) 3 min, (b) 6 min, (c) 12 min, (d) 18 min, (e) 24 min and (f) 30 min during K_2FeO_4 treatment.

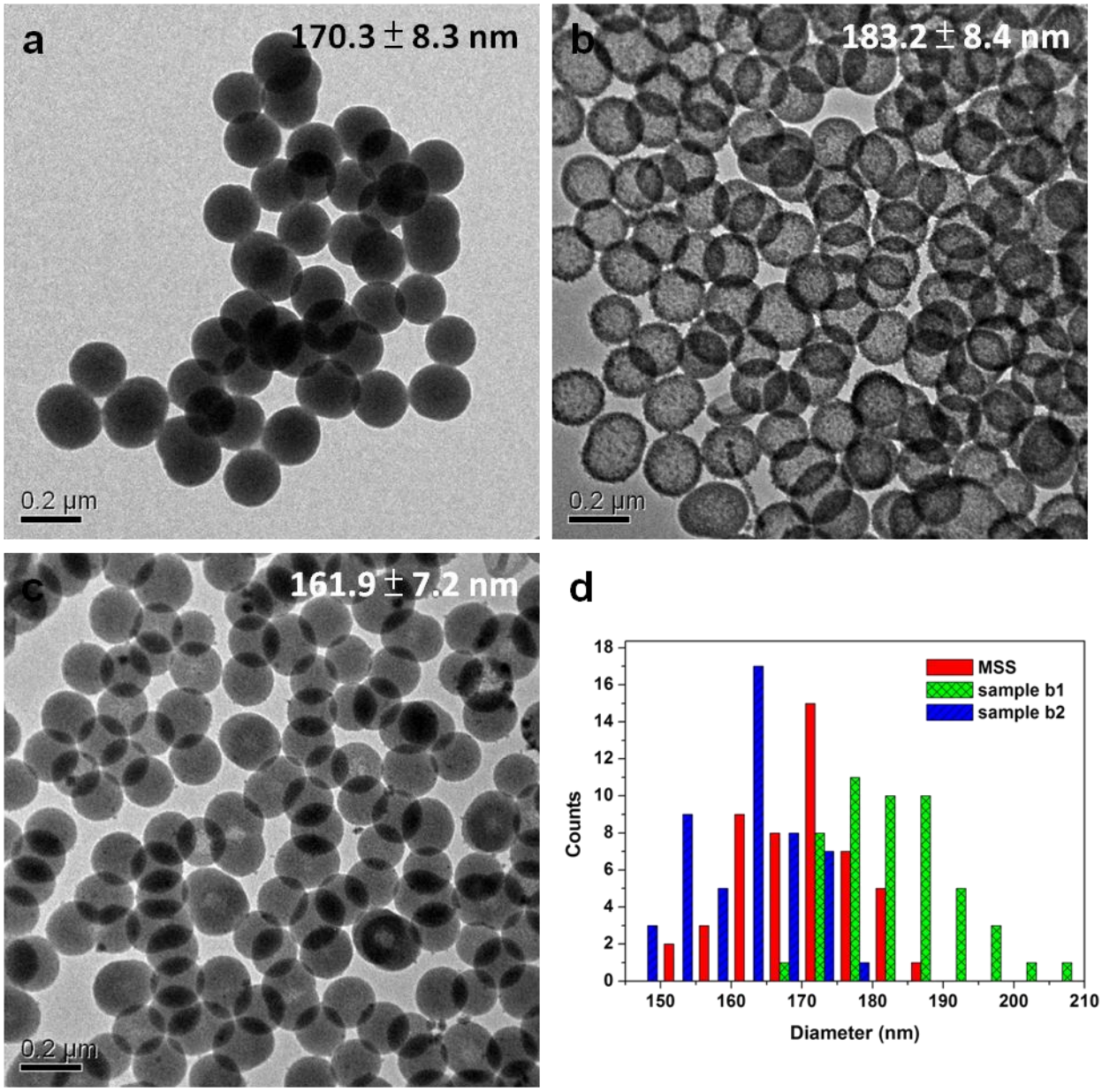
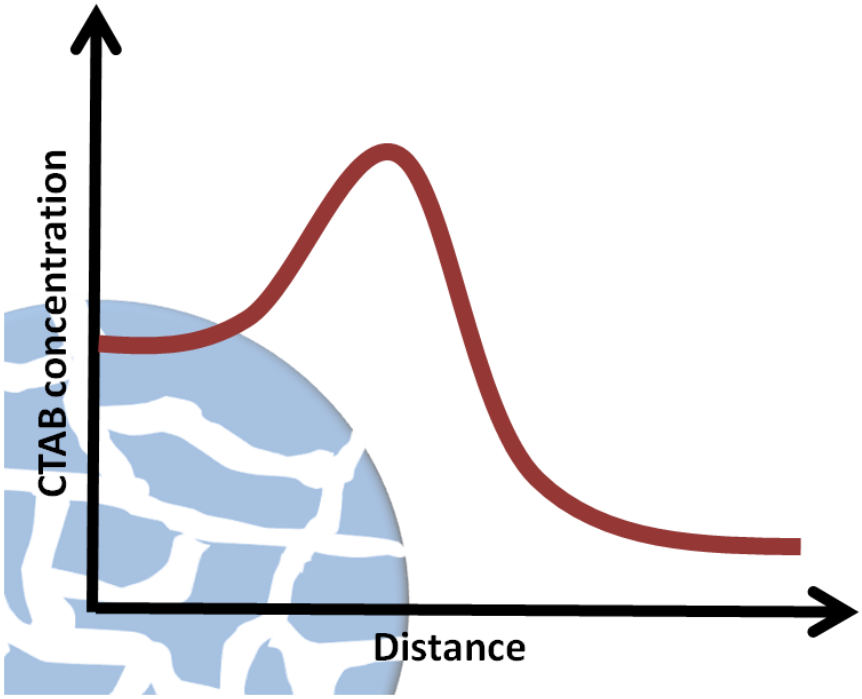


Figure S4. TEM images of (a) MSS, (b) sample b1 and (c) sample b2 (CTAB washed). (d) The histogram analysis of the diameter of MSS, sample b1 and sample b2. (50 particles of each sample are used in this histogram)



Scheme S2. Schematic illustration of the thermodynamic distribution of CTA^+ molecules in particle when MSS are dispersed in solution.

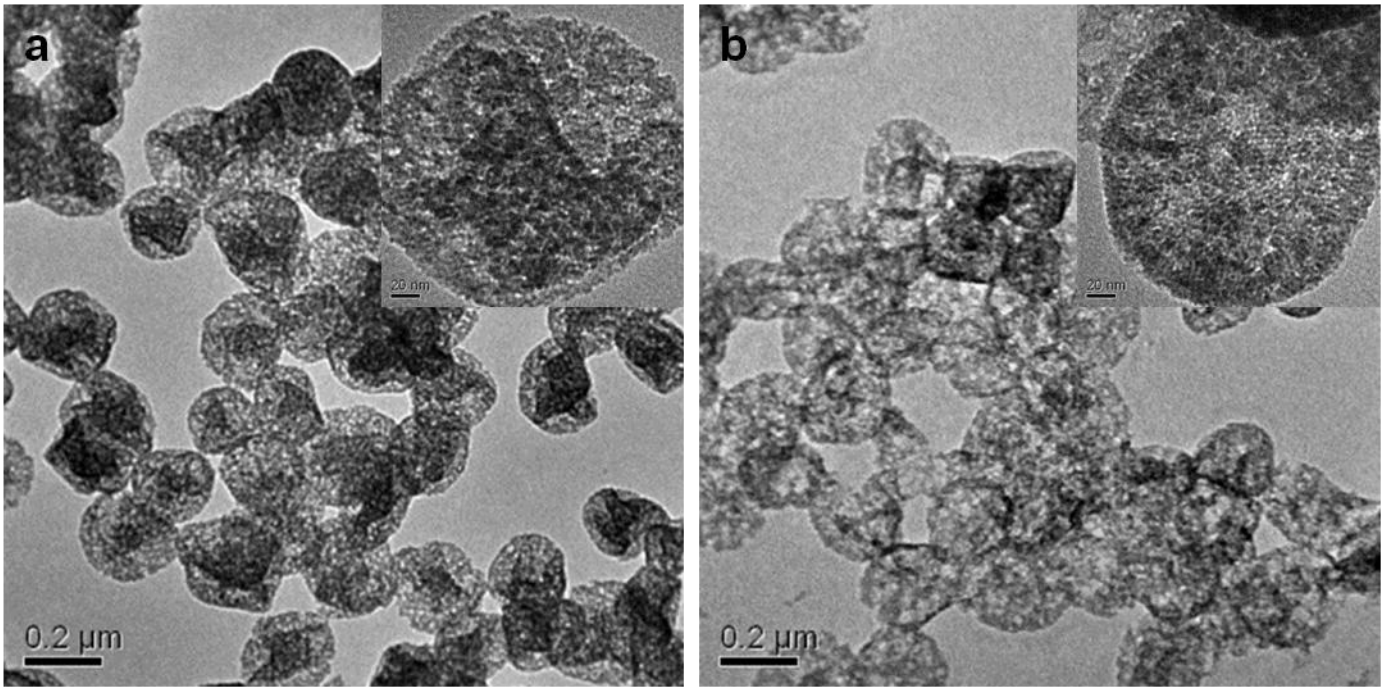


Figure S5. TEM images of MSS treated with (a) 6 mM and (b) 8 mM KOH for 30 min.

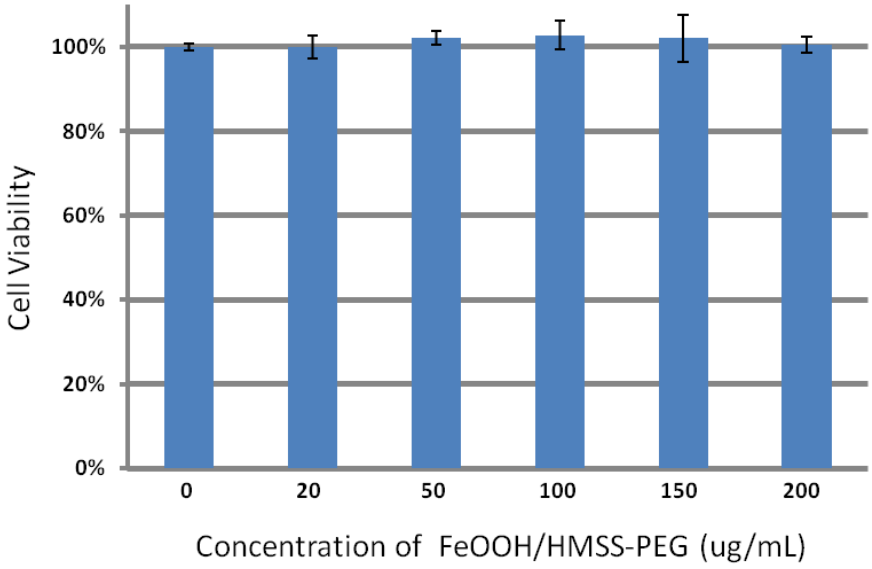


Figure S6. MTT Assay of HeLa cells treated with FeOOH/HMSS-PEG ranged from 0 to 200 μg/mL. The neglect bio-toxicity of FeOOH/HMSS-PEG can be clear evidenced by the nearly 100% viability up to 200 μg/mL after 12 hours of incubation.

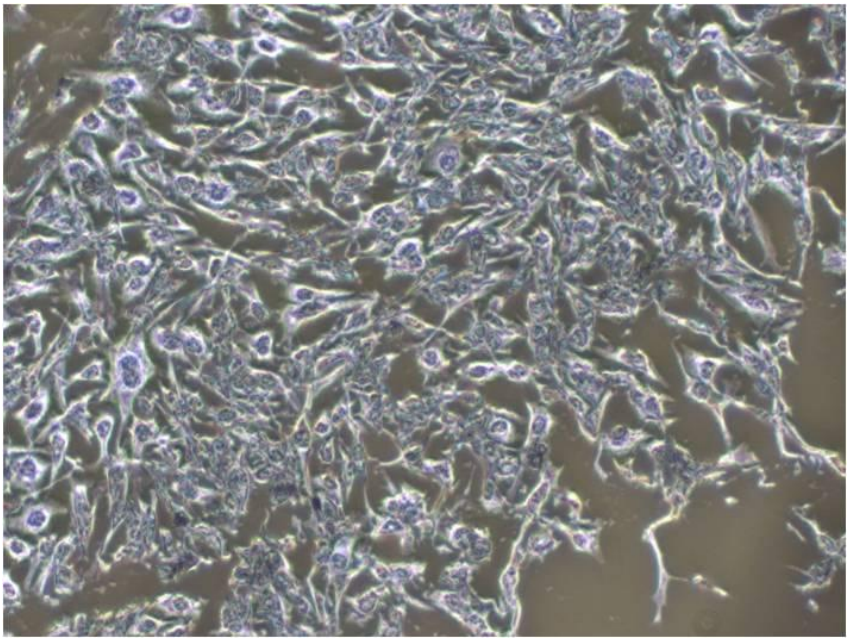


Figure S7. Prussian blue stained image of FeOOH/HMSS-PEG treated HeLa cells at low magnification. A noticeable blue color staining in the cytoplasm of HeLa cells indicated that the cells could ingest these iron-containing nanoparticles.

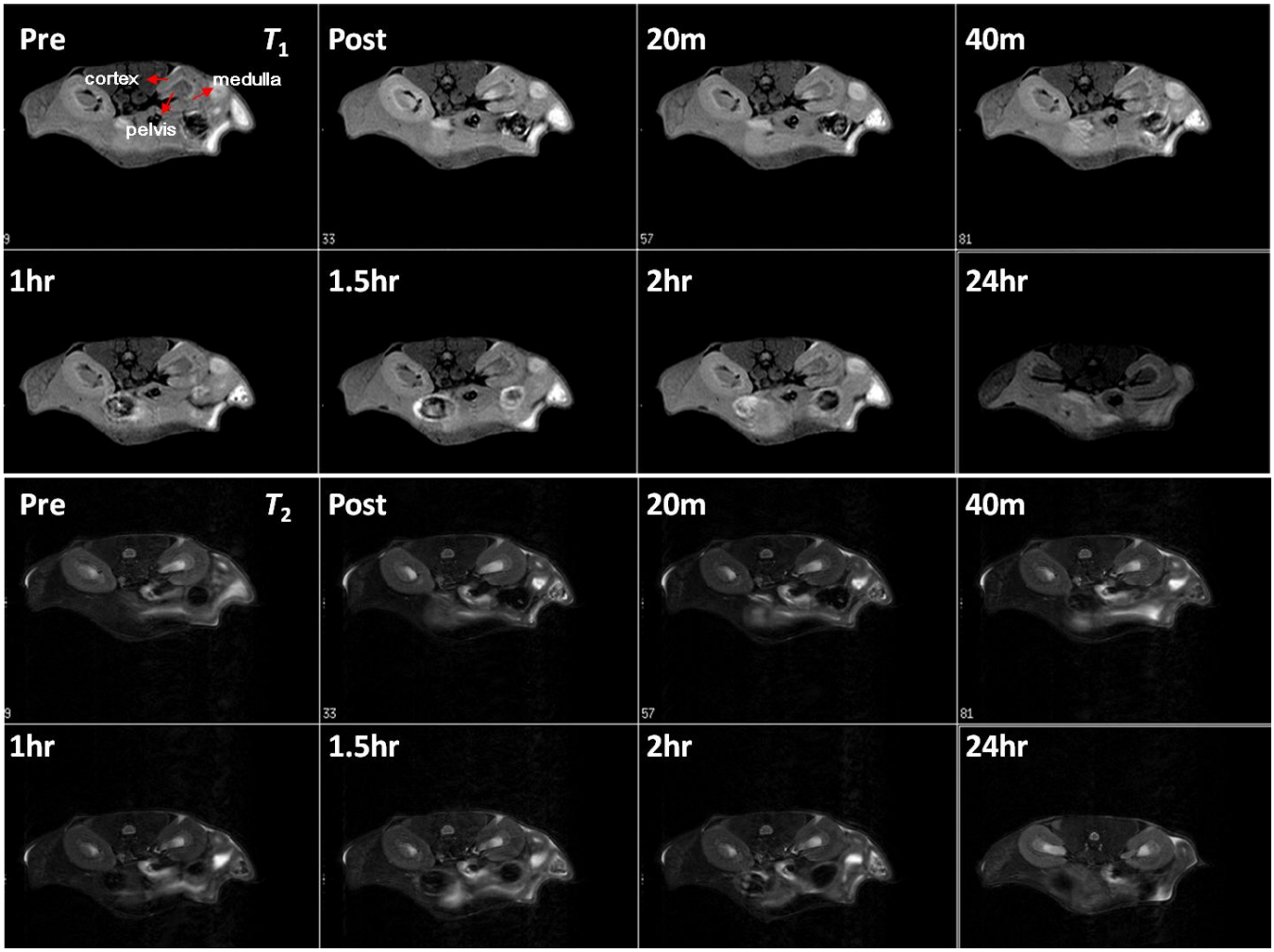


Figure S8. A time course of T_1- (upper) and T_2- (lower) weighted MR imaging of a mouse kidney after orbital fossa injection of FeOOH/HMSS-PEG at a dose of 1.5 mg Fe kg^{-1} (body weight).

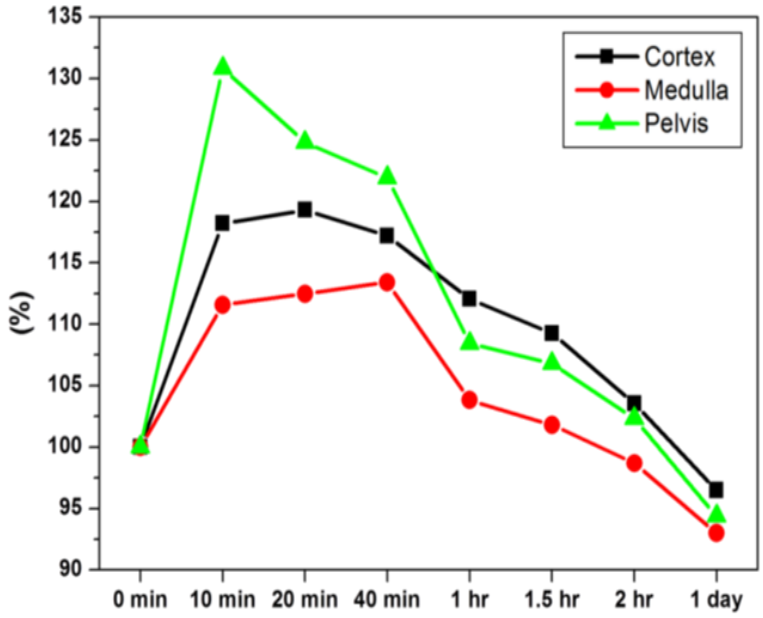


Figure S9. A time course of T_1 signal intensity of kidney (selected area) along the time interval.

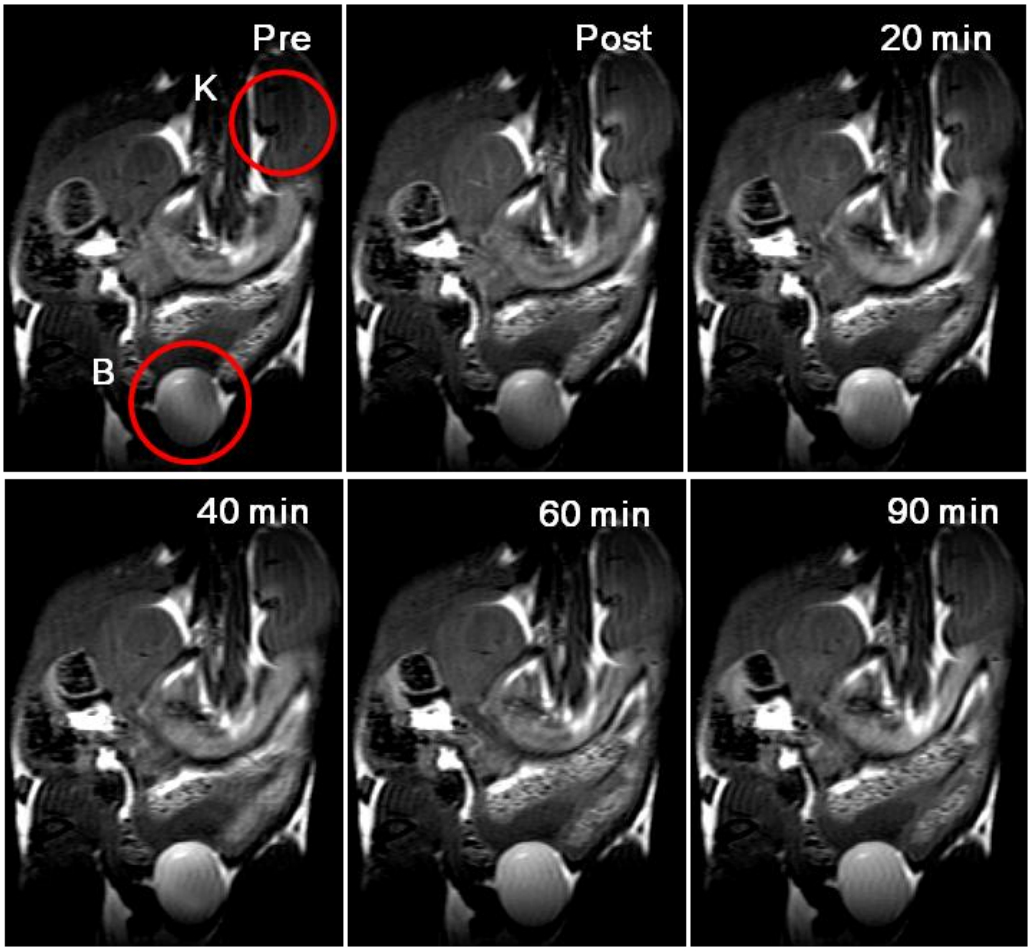


Figure S10. T_1-weighted images of a mouse kidney (K) and bladder (B) before and after orbital fossa injection of FeOOH/HMSS-PEG for 20, 40, 60, and 90 min. Sequential enhancement of renal pelvis followed by urinary bladder is noted.

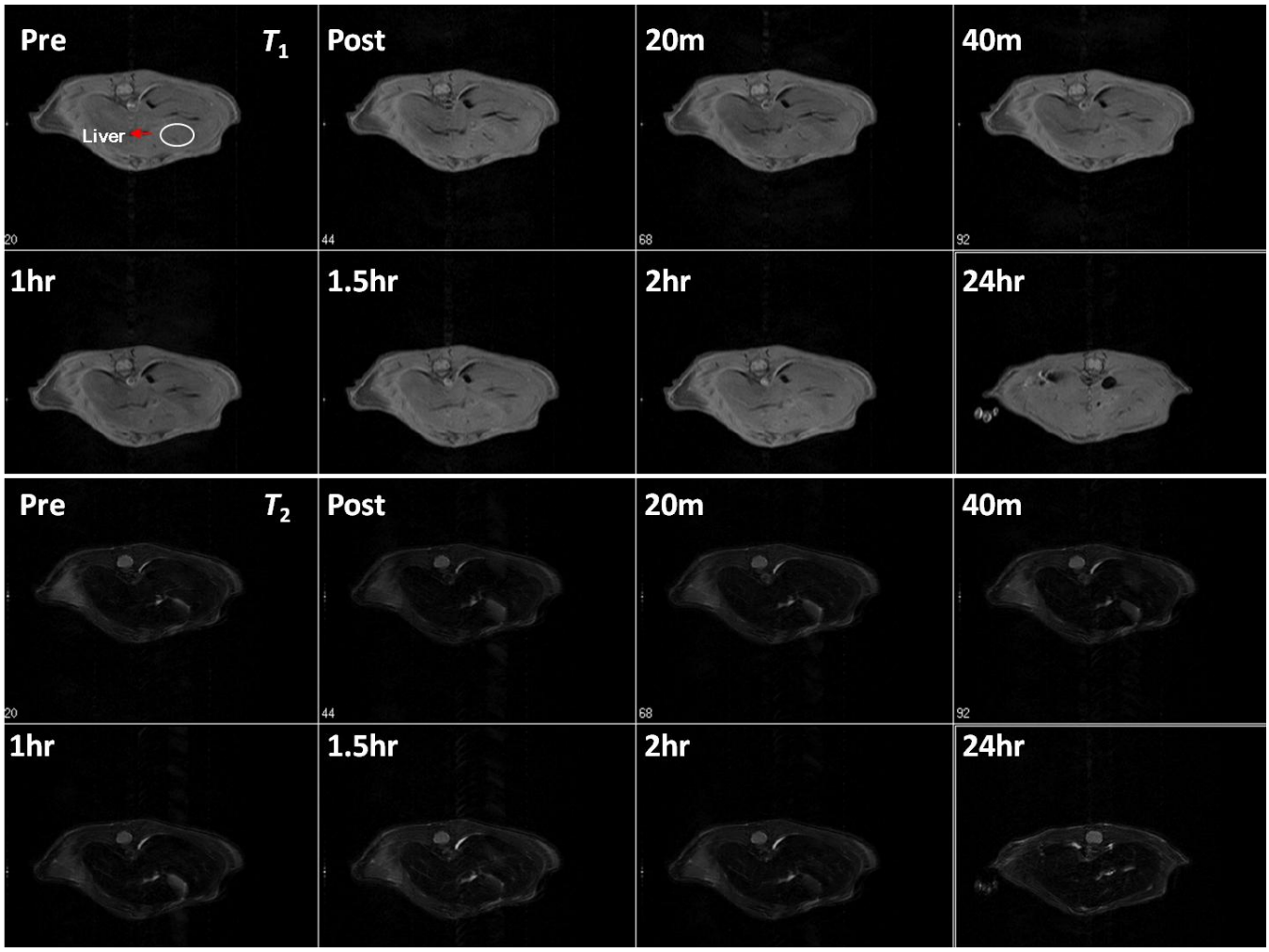


Figure S11. A time course of T_1- (upper) and T_2- (lower) weighted MR imaging of a mouse liver after orbital fossa injection of FeOOH/HMSS-PEG at a dose of 1.5 mg Fe kg^{-1} (body weight).

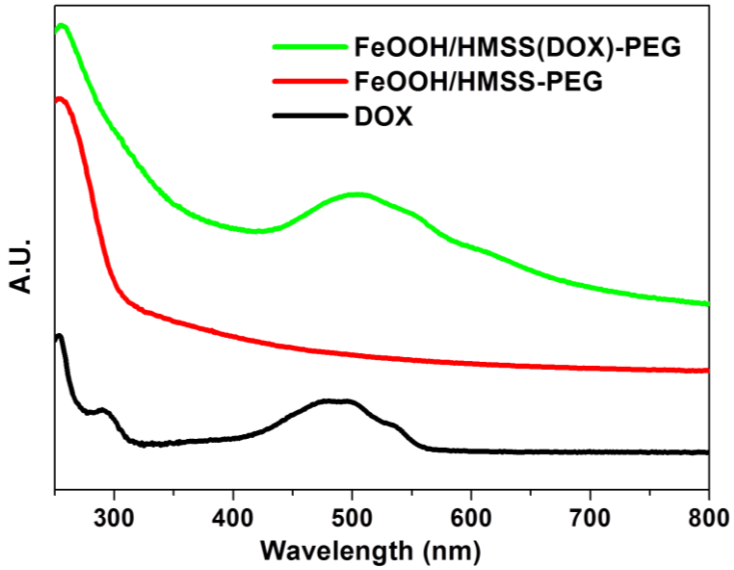


Figure S12. Absorption spectra of the DOX (black), FeOOH/HMSS-PEG (red) and FeOOH/HMSS(DOX)-PEG (green) in water.

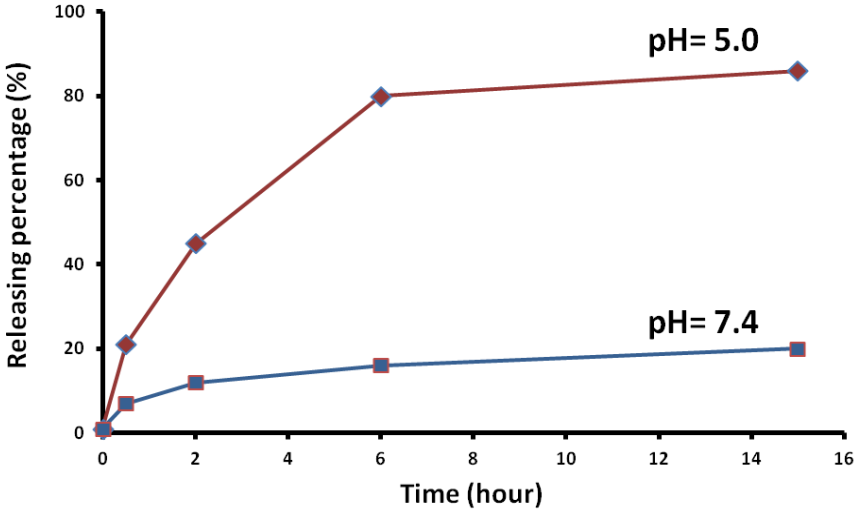


Figure S13. The release profiles of DOX from FeOOH/HMSS(DOX)-PEG at different pH values.

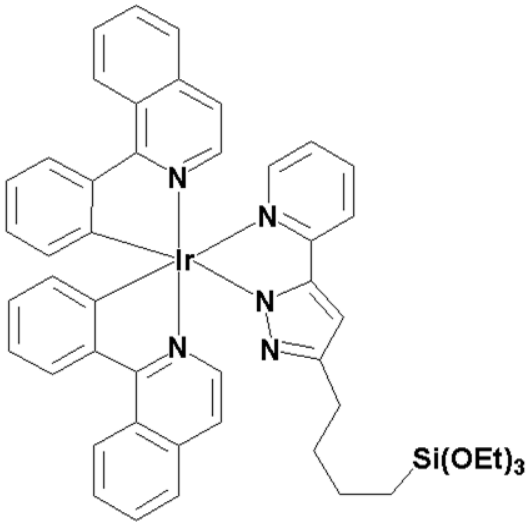


Figure S14. Structure of the red-emissive Iridium complex used in FeOOH/HMSS(Ir)-PEG. Detailed photophysical properties of the this complex, such as emission lifetime, quantum yield in degassed and aerated solution please refer to our previous study (*ACS Nano* **2011**, *5*, 4177–4187).

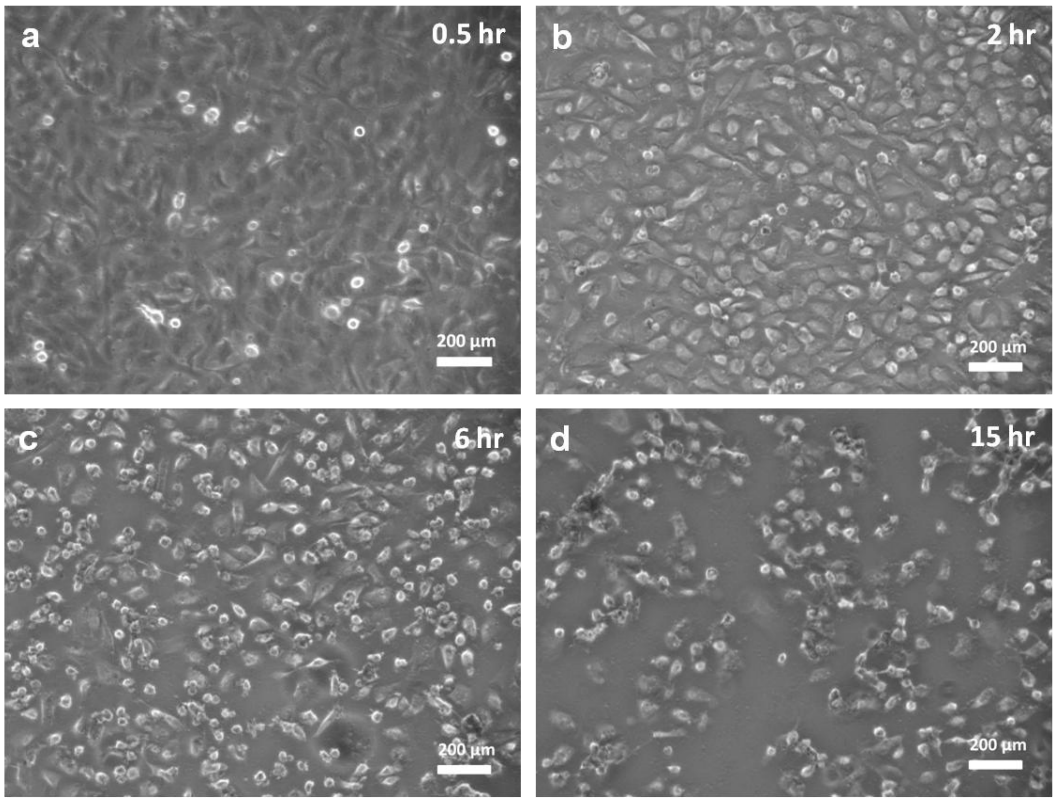


Figure S15. Bright-field images of HeLa cells treated with FeOOH/HMSS(DOX)-PEG for (a) 0.5 hr, (b) 2 hr, (c) 6 hr and (d) 15 hr at low magnification.

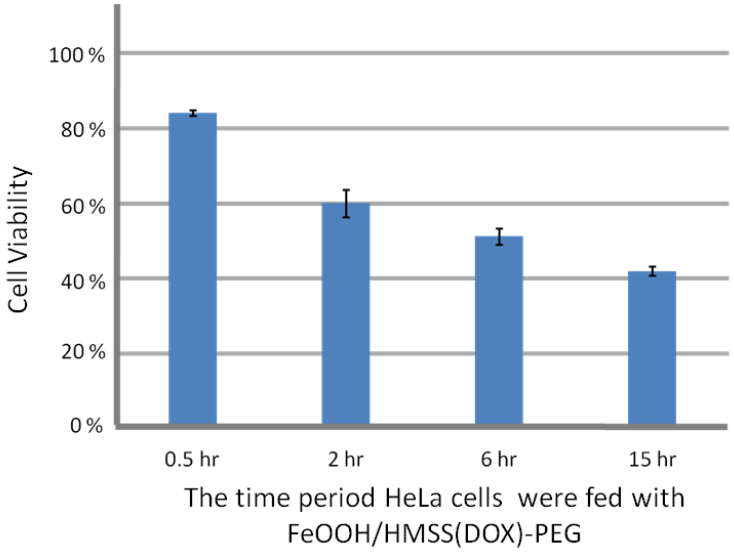


Figure S16. The MTT Assay of HeLa cells treated with FeOOH/HMSS(DOX)-PEG for 0.5 hr, 2 hr, 6 hr and 15 hr.