Supporting Information

A versatile Fe$_3$O$_4$ based platform via iron-catalyzed AGET ATRP: towards various multifunctional nanomaterials

Weiwei He$^a$, Liang Cheng$^b$, Lifen Zhang$^a$, Zhuang Liu$^b$*, Zhenping Cheng$^a$* and Xiulin Zhu$^a$*

$^a$Jiangsu Key Laboratory of Advanced Functional Polymer Design and Application, Department of Polymer Science and Engineering, College of Chemistry, Chemical Engineering and Materials Science, Soochow University, Suzhou 215123, China Fax: +86-512-65882787E-mail: chengzhenping@suda.edu.cn (Z. P. Cheng), xlzhu@suda.edu.cn (X. L. Zhu)

$^b$Institute of Functional Nano and Soft Materials (FUNSOM) and Jiangsu Key Laboratory for Carbon-Based Functional Materials and Devices, Soochow University, Suzhou 215123, China E-mail: zliu@suda.edu.cn (Z. Liu)

Scheme S1. Synthetic route of the precursor consisting of thiol groups towards various multifunctional NPs by iron-mediated AGET ATRP.
Fig. S1 $^1$H NMR spectrum of monomer ETCEMA.

Fig. S2 TEM of (a) Fe$_3$O$_4$@SiO$_2$@Br and (b) Fe$_3$O$_4$@SiO$_2$@PPEGMA-$co$-ETCEMA; scale bars are 200 and 20 nm for a and b, respectively.
**Fig. S3** FT-IR spectra of NPs of (a) Fe$_3$O$_4$@SiO$_2$-Br, (b) Fe$_3$O$_4$@SiO$_2$@PPEGMA-co-PETCEMA.

**Fig. S4** TEM images of Fe$_3$O$_4$@SiO$_2$ with different silica feeding dose of 0.1, 0.2 and 0.4 mL for (a), (b) and (c) respectively. Scale bars are 50 nm.
Fig. S5 TGA curves of NPs of (a) Fe₃O₄@SiO₂-Br, (b) Fe₃O₄@SiO₂@PPEGMA-co-PETCEMA and (c) Fe₃O₄@SiO₂@PPEGMA-co-PMEMA.

Fig. S6 Cell viability of Fe₃O₄@SiO₂@PPEGMA-co-PMEMA with different iron concentration.
Fig. S7 Magnetic hysteresis loops at 300K of (a) Fe₃O₄ and (b) Fe₃O₄@SiO₂ NPs.

Fig. S8 ¹H NMR spectrum of CS-2.
**Fig. S9** $^1$H NMR spectrum of azopyridine.

**Fig. S10** Magnetic hysteresis loops at 300K of the as-prepared Fe$_3$O$_4$@SiO$_2$@PPEGMA-co-PMEMA@CS2 NPs.
Fig. S11 $^1$H NMR spectrum of IR825.

Fig. S12 Magnetic hysteresis loops at 300K of the as-prepared Fe$_3$O$_4$@SiO$_2$@PPEGMA-\textit{co-}PMEMA@IR825 NPs.
Fig. S13 Fluorescence spectra of Fe$_3$O$_4$@SiO$_2$@PPEGMA-co-PMEMA@IR825 NPs in methanol and water. Both samples were tested at iron concentration of 0.025 mg/mL.