Electronic Supplementary Information

pH and reduction dual-responsive nanogel cross-linked by quaternization reaction for enhanced cellular internalization and intracellular drug delivery

Mingqiang Li,[a,b] Zhaohui Tang,[a] Hai Sun,[a] Jianxun Ding,[a,b] Wantong Song,[a,b] and Xuesi Chen*[a]

[a] *Key Laboratory of Polymer Ecomaterials, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun 130022, P. R. China. Fax: +86 431 85262112; Tel: +86 431 85262112; E-mail: xschen@ciac.jl.cn*
[b] *Graduate University of the Chinese Academy of Sciences, Beijing 100039, P. R. China*

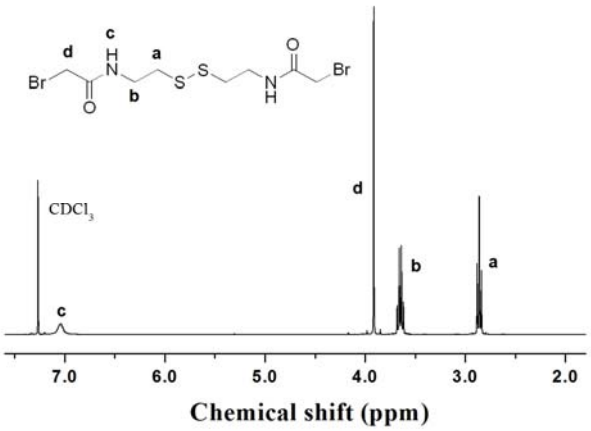

Fig. S1 ^{1}H NMR spectrum of *N,N′*-bis(bromoacetyl) cystamine in $CDCl_3$ (δ ppm).

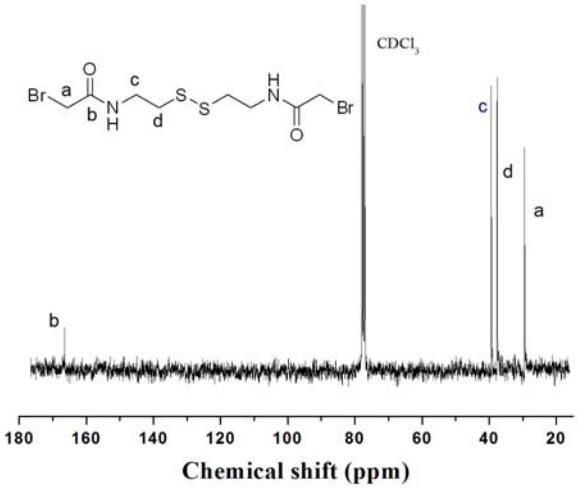

Fig. S2 ^{13}C NMR spectrum of *N,N′*-bis(bromoacetyl) cystamine in $CDCl_3$ (δ ppm).

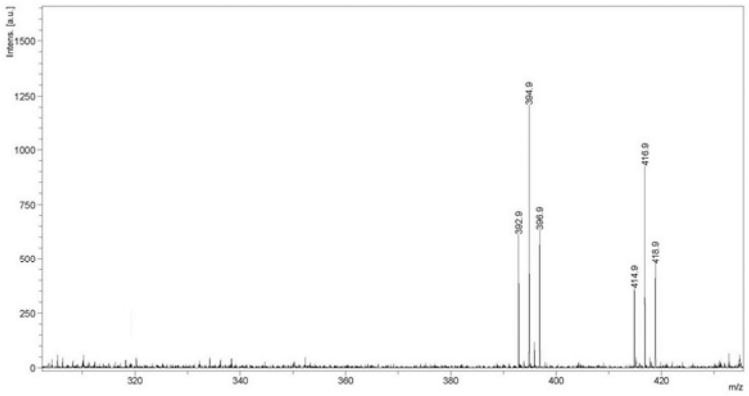

Fig. S3 The MALDI-TOF mass spectrum of *N,N′*-bis(bromoacetyl) cystamine. m/z calcd. for $C_8H_{14}Br_2N_2O_2S_2$ 393.8, found 394.9 $[M+H]^+$, 416.9 $[M+Na]^+$ and 392.9, 396.9, 414.9, 418.9 (bromine isotope pattern).

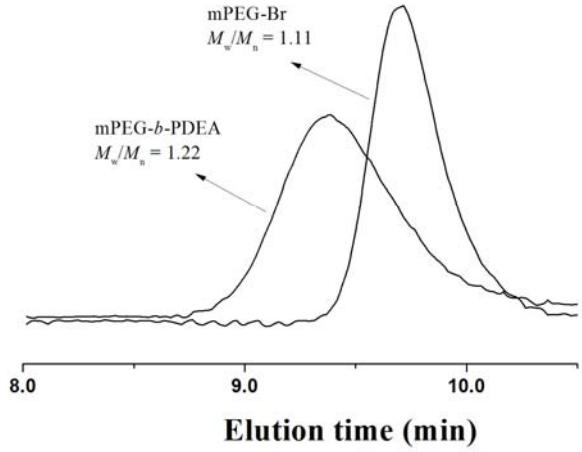

Fig. S4 GPC traces recorded for mPEG-Br and mPEG-*b*-PDEA with THF as elution.

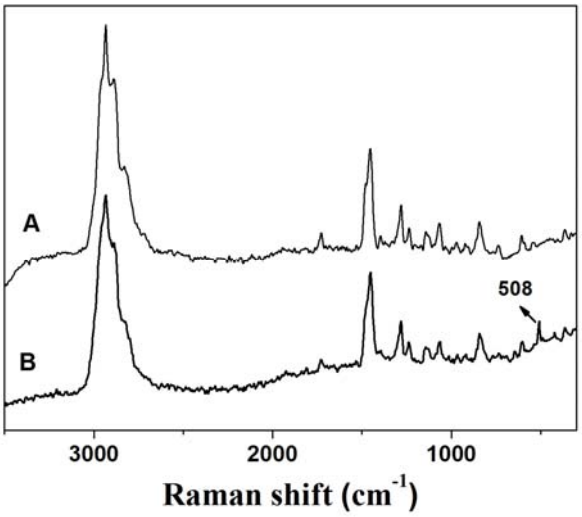

Fig. S5 Raman spectra of (A) mPEG-*b*-PDEA and (B) disulfide core-cross-linked mPEG-*b*-PDEA nanogel. The absorption at 508 cm^{-1} corresponded to -S-S- stretch ($\nu_{S\text{-}S}$).

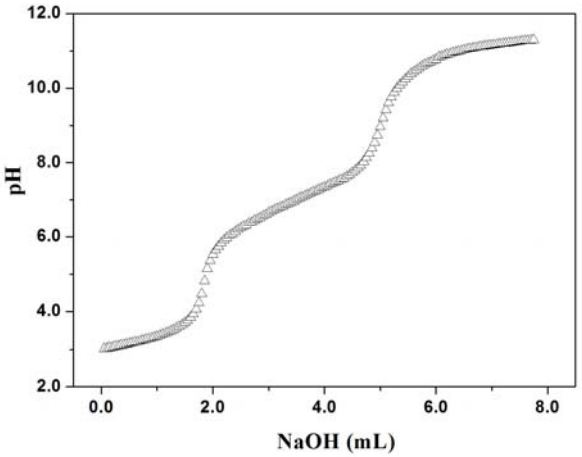

Fig. S6 Potentiometric titration curve obtained for 1.0 g L^{-1} aqueous solution of core-cross-linked mPEG-*b*-PDEA nanogel.

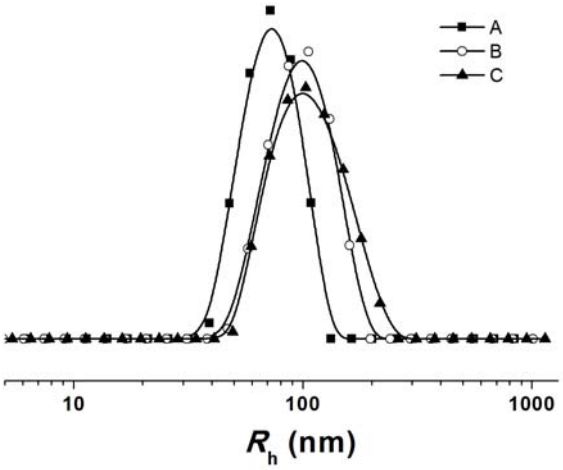

Fig. S7 Hydrodynamic radius distributions of core-cross-linked mPEG-*b*-PDEA nanogel in (A) water, (B) THF and (C) $CHCl_3$.