

Supplementary Material

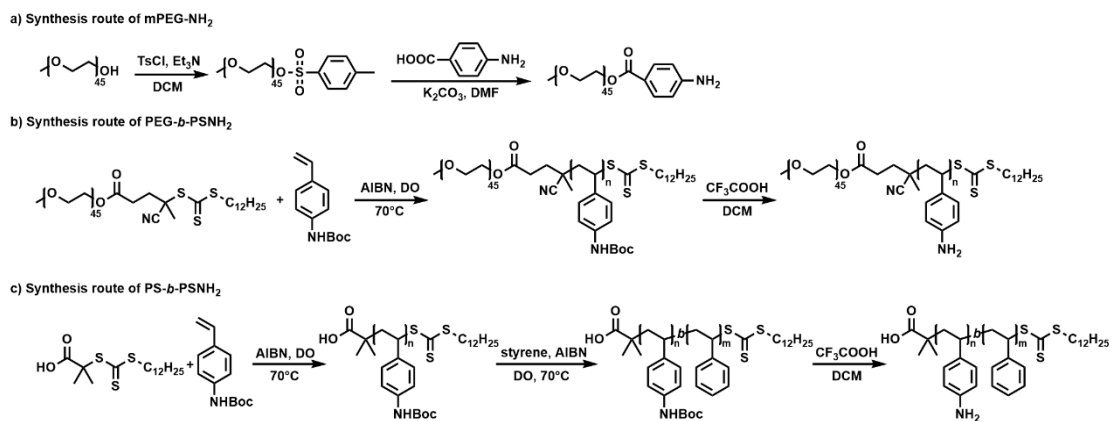
One-step Photo-induced Modification of Carbon Nanotubes via Polymeric Diazonium Chemistry

Zixuan Zhu, Xinyi Pan and Yaning He *

Department of Chemical Engineering, Key Laboratory for Advanced Materials (MOE),
Tsinghua University, Beijing, 100084, China.

* Corresponding author.

E-mail address: heyanning@mail.tsinghua.edu.cn (Y. He).



Scheme S1 Synthesis routes of (a) mPEG-NH₂, (b) PEG-*b*-PSNH₂ and (c) PS-*b*-PSNH₂.

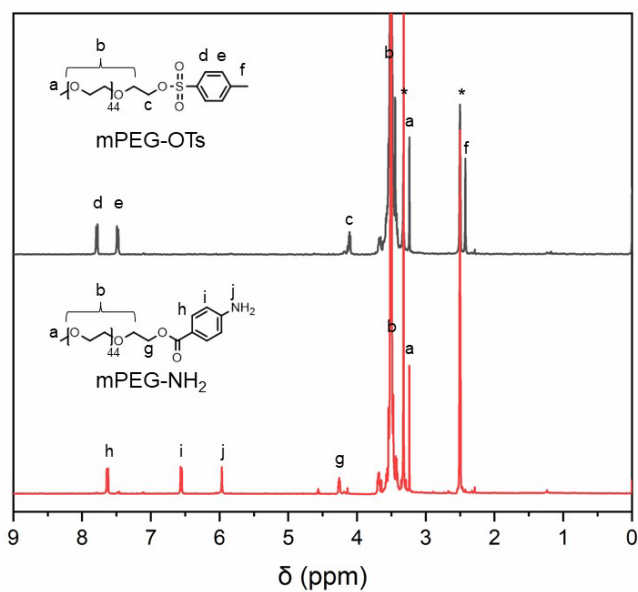


Fig. S1 ¹H NMR spectra of mPEG-OTs and mPEG-NH₂ in DMSO-d₆. Black asterisks (*) indicate the solvent and water peaks.

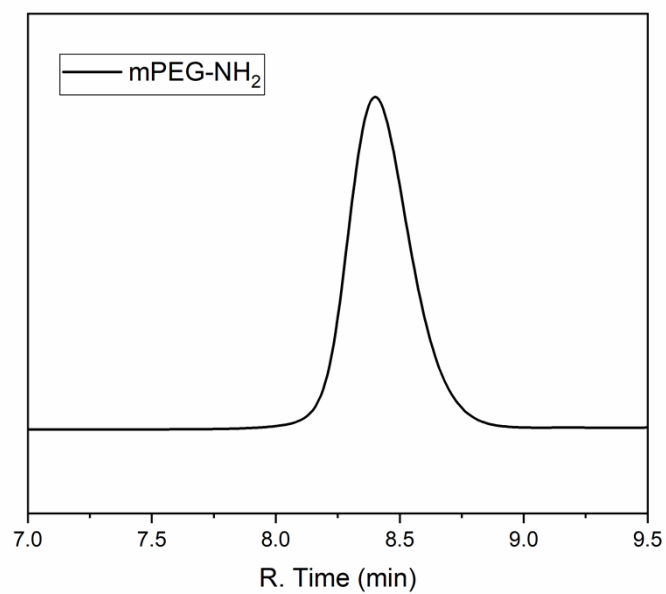


Fig. S2 GPC trace of aniline-terminated poly(ethylene glycol) (mPEG-NH₂). $M_n = 2700$, PDI = 1.04.

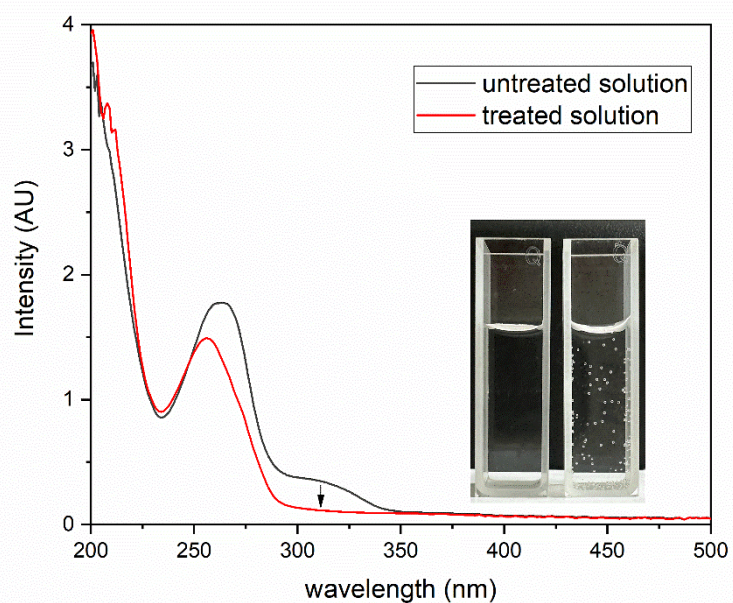


Fig. S3 UV-vis absorption spectra of mPEG-N₂⁺ before and after UV irradiation (275 nm). The inset optical graph of untreated solution (left) and treated solution (right) showed the formation of tiny bubbles after irradiation.

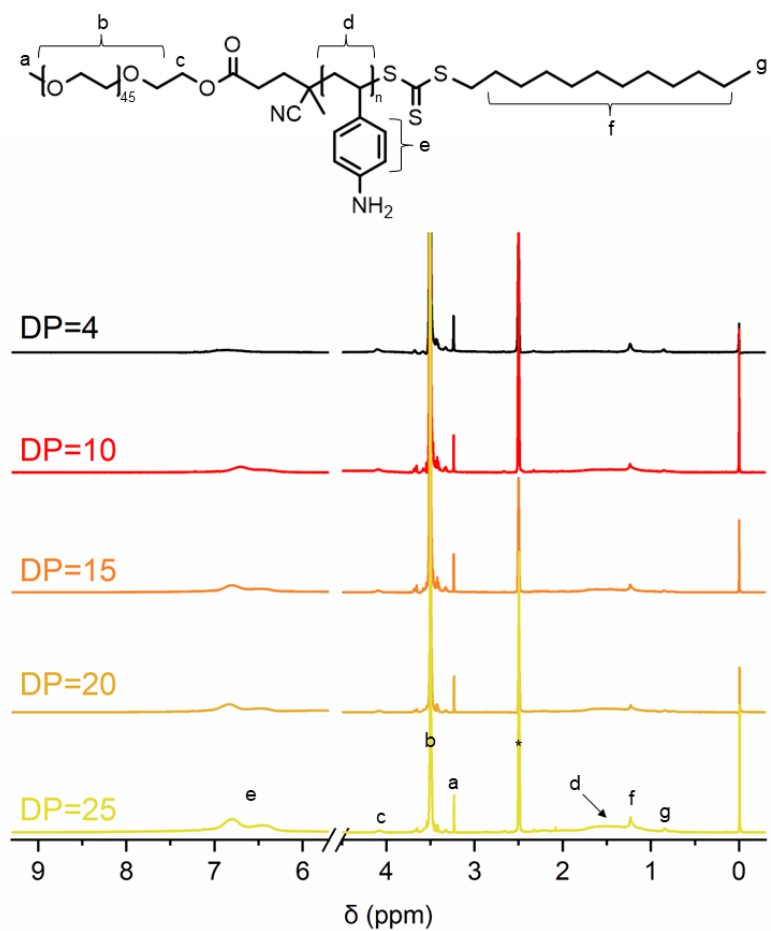


Fig. S4 ¹H NMR spectra of PEG-*b*-PSNH₂ (DP = 4, 10, 15, 20, 25) in DMSO-*d*₆. Black asterisk (*) indicate the solvent peak.

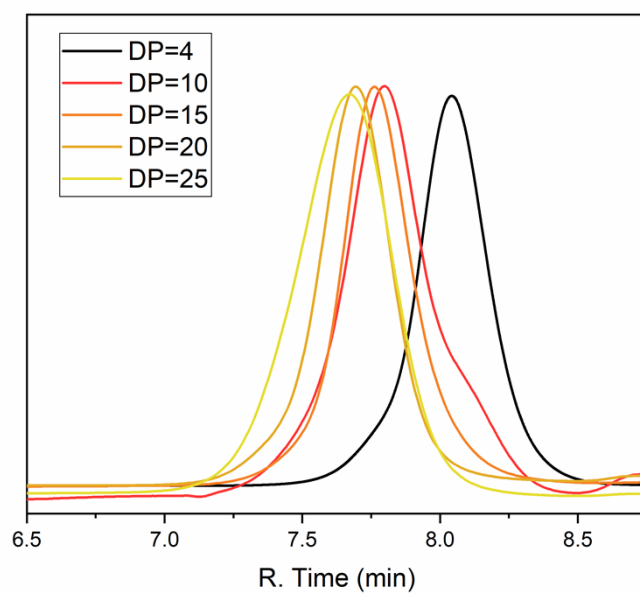


Fig. S5 GPC traces of block copolymer PEG-*b*-PSNHBoc (DP = 4, 10, 15, 20, 25).

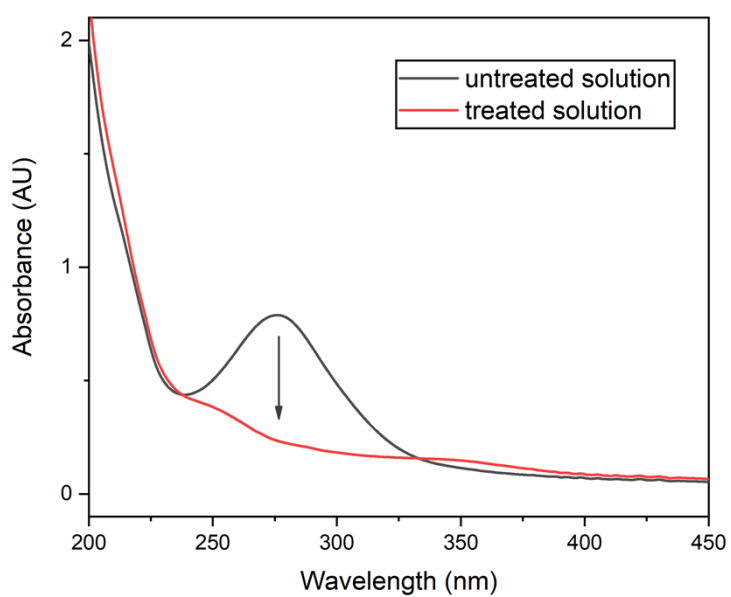


Fig. S6 UV-vis absorption spectra of PEG-*b*-PSN₂⁺ before and after UV irradiation (275 nm).

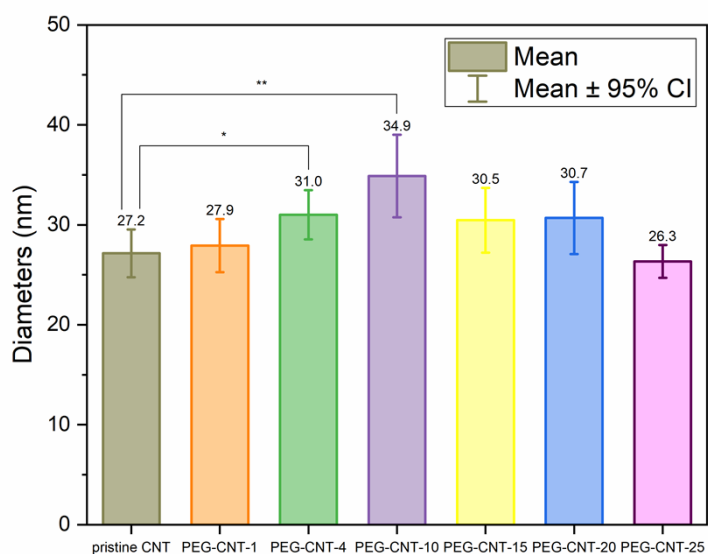


Fig. S7 Diameter distributions of pristine CNTs and PEG-CNTs after modification, where the statistically significant differences were only observed between pristine CNTs and PEG-CNT-4 ($p < 0.05$) and between pristine CNTs and PEG-CNT-10 ($p < 0.01$).

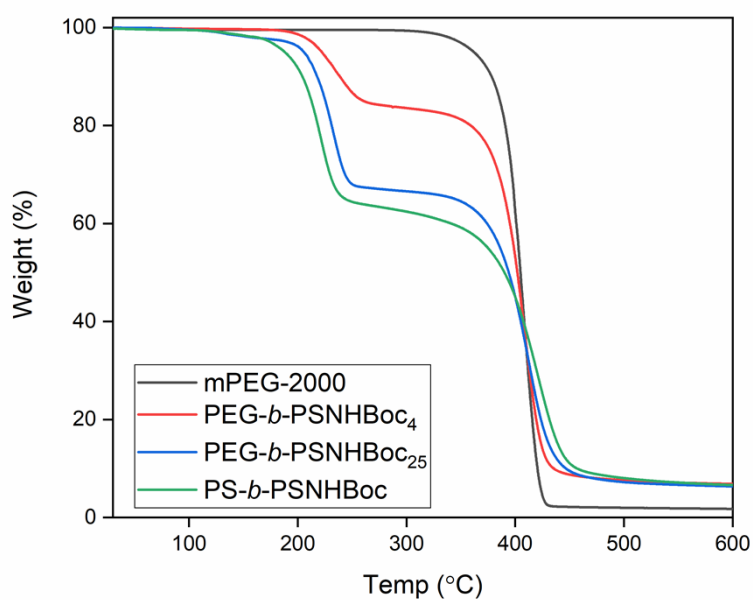


Fig. S8 TGA curves of mPEG-2000 and precursors of block polymeric diazonium salts.

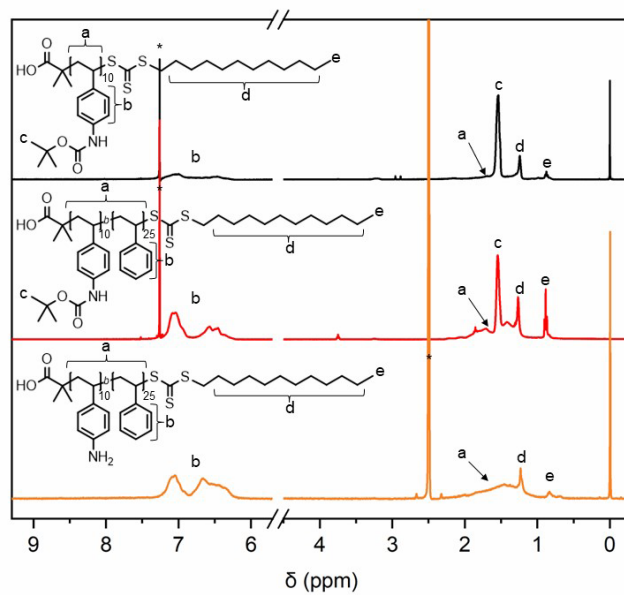


Fig. S9 ¹H NMR spectra of PSNHBoc-DDMAT (black), PS-*b*-PSNHBoc (red) in CDCl₃ and PS-*b*-PSNH₂ (orange) in DMSO- δ_6 . Black asterisks (*) indicate the solvent peaks.

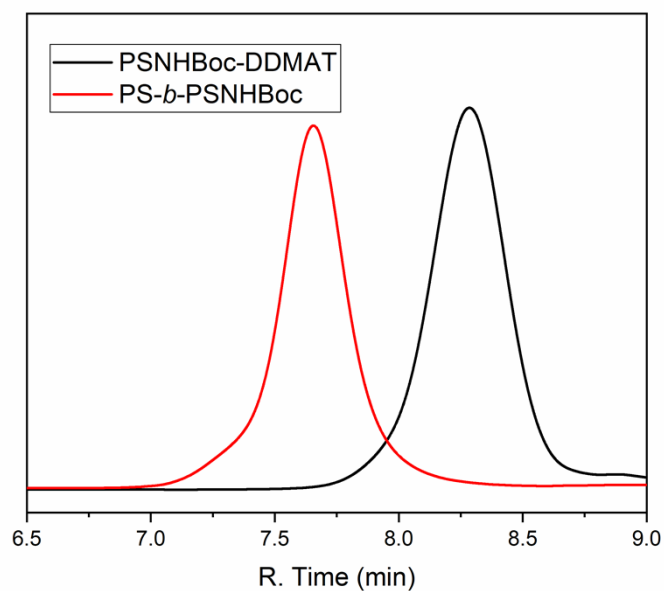


Fig. S10 GPC traces of PSNHBoc-DDMAT (black) and PS-*b*-PSNHBoc (red).

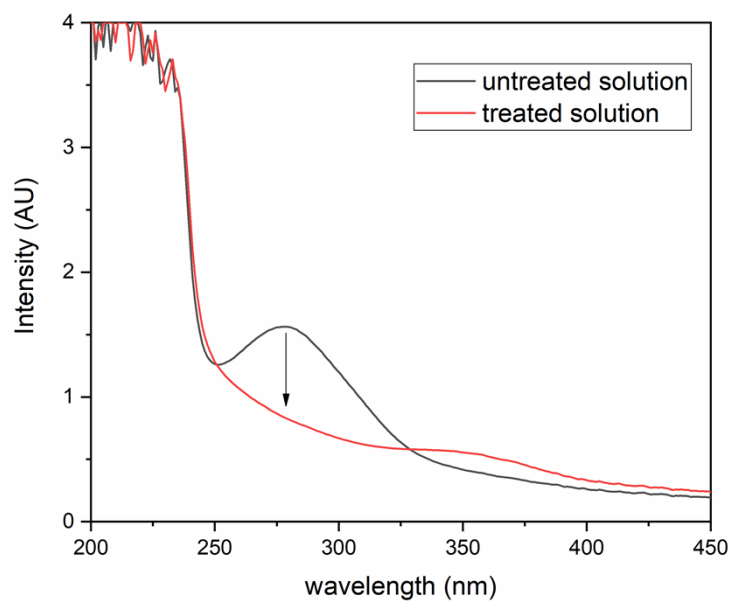


Fig. S11 UV-vis absorption spectra of PS-*b*-PSN₂⁺ before and after UV irradiation (275 nm).

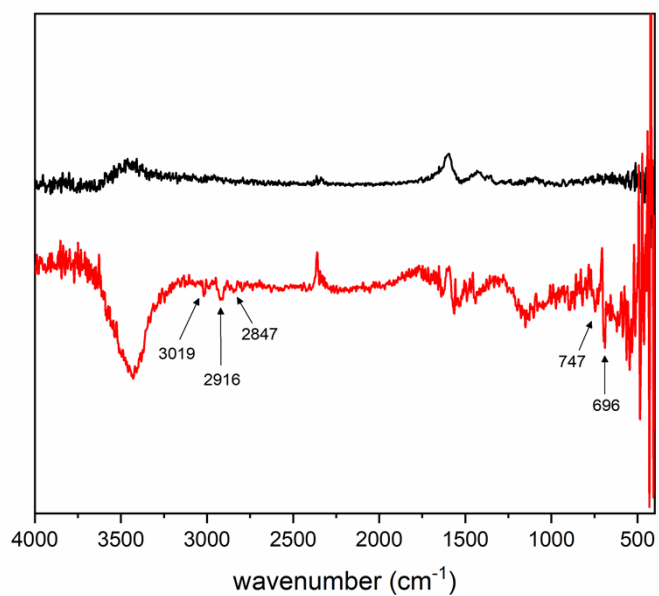


Fig. S12 FTIR spectra of pristine CNT (black) and PS-CNT (red).

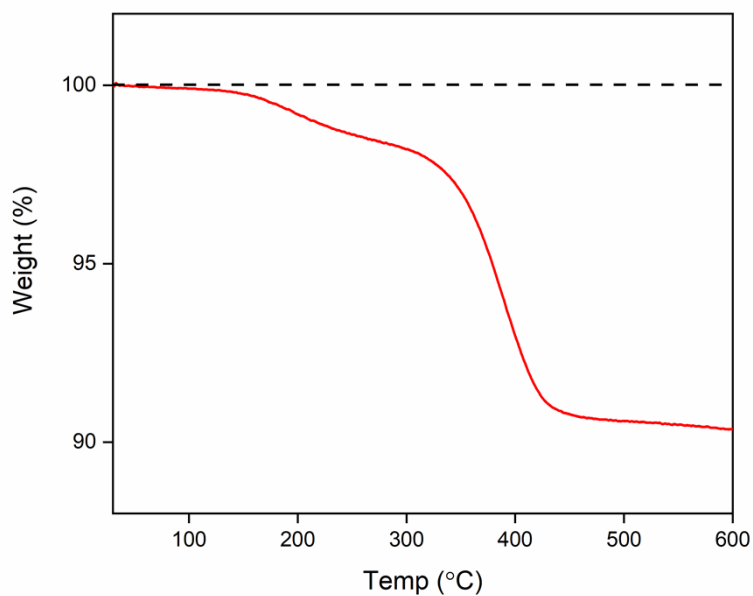


Fig. S13 TGA curve of PS-CNT (red) with dash line that highlights the original weight.

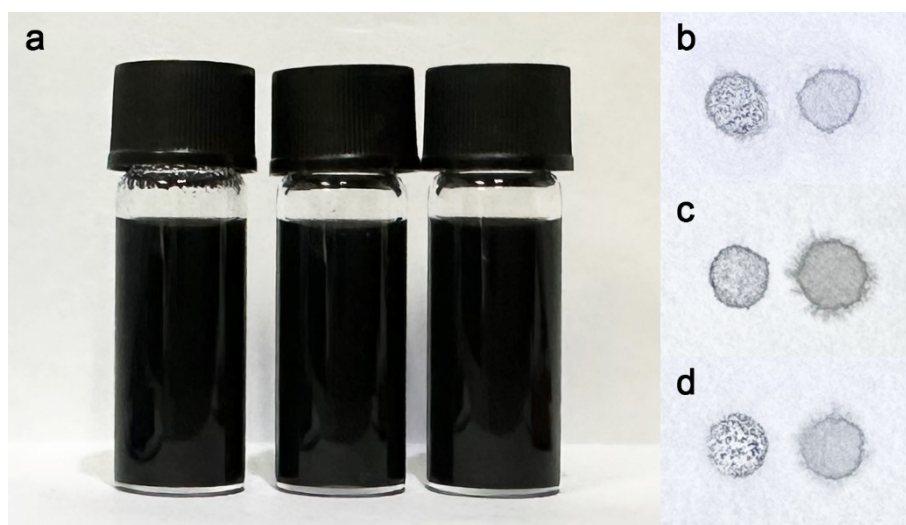


Fig. S14 (a) Organic suspensions of PS-CNT with the concentration of 1 mg/mL after 48 h. Bottles from left to right are suspensions in DMF, THF and acetone. Sediment on filter paper of 10 μ L suspension of pristine CNT (left) and PS-CNT (right) in (b) DMF, (c) THF and (d) acetone.

Table S1 Number Average Molecular Weights (M_n) and Corresponding Molecular Weight Distributions (M_w/M_n) of Block Copolymer PEG-*b*-PSNHBoc (DP = 4, 10, 15, 20, 25).

Polymer	M_n	M_w/M_n
PEG- <i>b</i> -PSNHBoc ₄	5.0×10^3	1.06
PEG- <i>b</i> -PSNHBoc ₁₀	7.1×10^3	1.09
PEG- <i>b</i> -PSNHBoc ₁₅	7.6×10^3	1.06
PEG- <i>b</i> -PSNHBoc ₂₀	9.0×10^3	1.06
PEG- <i>b</i> -PSNHBoc ₂₅	9.5×10^3	1.08

Table S2 Number Average Molecular Weights (M_n) and Corresponding Molecular Weight Distributions (M_w/M_n) of PSNHBoc-DDMAT and PS-*b*-PSNHBoc.

Polymer	DP of PSNHBoc	DP of PS	M_n	M_w/M_n
PSNHBoc-DDMAT	10	/	3.4×10^3	1.06
PS- <i>b</i> -PSNHBoc	10	25	9.4×10^3	1.09

Table S3 Feed Amounts of Reagents in Diazotization of mPEG-NH₂ and PEG-*b*-PSNH₂

Polymer	V _{HCl} (mL)	V _{H₂O} (mL)	V _{NaNO₂} (mL)
mPEG-NH ₂	0.15	3.54	0.06
PEG- <i>b</i> -PSNH ₂ (DP = 4)	0.15	3.36	0.24
PEG- <i>b</i> -PSNH ₂ (DP = 10)	0.15	3.00	0.60
PEG- <i>b</i> -PSNH ₂ (DP = 15)	0.15	2.70	0.90
PEG- <i>b</i> -PSNH ₂ (DP = 20)	0.15	2.40	1.20
PEG- <i>b</i> -PSNH ₂ (DP = 25)	0.15	2.10	1.50