Supporting Information

Phosphonate/zwitterionic/cationic terpolymer as high-efficiency bactericidal and antifouling coating for metallic substrates

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Experimental

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Preparation of phosphonate/zwitterionic/cationic terpolymers

By calculating the ratio of the integral area of H at position “1” in pDEMMP to the integral area of H in the benzene ring in CTA, the actual DP of pDEMMP was obtained. The peak area of H corresponding to position “5” in pDEMMP-b-p(SBMA-co-DMAEMA) was taken as reference for normalization calculation, and the ratio of the peak area of H corresponding to -CH$_3$ at position “2, 7, 12” to the peak area of H corresponding to -N(CH$_3$)$_2$ at position “15” was obtained. Combining with the degree of polymerization of pDEMMP, the actual molar ratio of SBMA to DMAEMA content was obtained.

Result and Discussion

![Fig. S1 $^1$H NMR spectrum of pDEMMP macro–CTA.](image)
Fig. S2 $^1$H NMR spectra of pDEMMP, pDEMMP-$b$-pSBMA, and pDEMMP-$b$-p(SBMA-$co$-DMAEMA).
(a) pDEMMP, (b) pDEMMP$_{15}$-$b$-pSBMA$_{64}$, (c) pDEMMP$_{15}$-$b$-p(SBMA-$co$-DMAEMA) (54 : 18), (d) pDEMMP$_{15}$-$b$-p(SBMA-$co$-DMAEMA) (18 : 32), and (e) pDEMMP$_{15}$-$b$-p(SBMA-$co$-DMAEMA) (9 : 52).

Fig. S3 Bactericidal properties of various block terpolymers coated surfaces. (a) Antibacterial efficiency of TC4 substrates against *S. aureus*. (b) Antibacterial efficiency of TC4 substrates against *E. coli*. Data are shown as mean ± SEM (n = 3). Statistical significance was determined by one-way ANOVA multiple comparison. Pairwise comparisons are statistically significant as denoted as *.
**Fig. S4** Antifouling properties of various block terpolymers coated surfaces. (a) Antibacterial efficiency of TC4 substrates against *S. aureus* after washing with PBS. (b) Antibacterial efficiency of TC4 substrates against *E. coli* after washing with PBS. Data are shown as mean ± SEM (n = 3). Statistical significance was determined by one-way ANOVA multiple comparison. Pairwise comparisons are statistically significant as denoted as *.

**Fig. S5** Antibacterial and antifouling properties of pure titanium, stainless steel and Ni/Cr alloys coated with block terpolymers. (a) Antibacterial efficiency of titanium, stainless steel and Ni/Cr alloy substrates against *S. aureus*. (b) Antibacterial efficiency of titanium, stainless steel and Ni/Cr alloy substrates against *E. coli*. Data are shown as mean ± SEM (n = 3). Statistical significance was determined by two-way ANOVA multiple comparison tests. Pairwise comparisons are statistically significant as denoted as *.