Electronic Supplementary Information (ESI)

Design, synthesis and biocidal effect of novel amine *N*-halamine microspheres based on 2,2,6,6-tetramethyl-4-piperidinol as promising antibacterial agents

Chenghao Li,[a] Linyan Xue,[a] Qian Cai,[a] Sarina Bao,[a] Tianyi Zhao,[b] Linghan Xiao,[c] Ge Gao,[b] Chokto Harnoode[a] and Alideertu Dong*[a]

[a]*College of Chemistry and Chemical Engineering, Inner Mongolia University, Hohhot 010021, People's Republic of China*

[b]*College of Chemistry, Jilin University, Changchun 130021, People's Republic of China*

[c]*College of Chemistry and Life Science, Changchun University of Technology, Changchun 130012, People's Republic of China*

*Corresponding authors: Alideertu Dong

E-mail address: dongali@imu.edu.cn; Tel: +86 471 4992982.

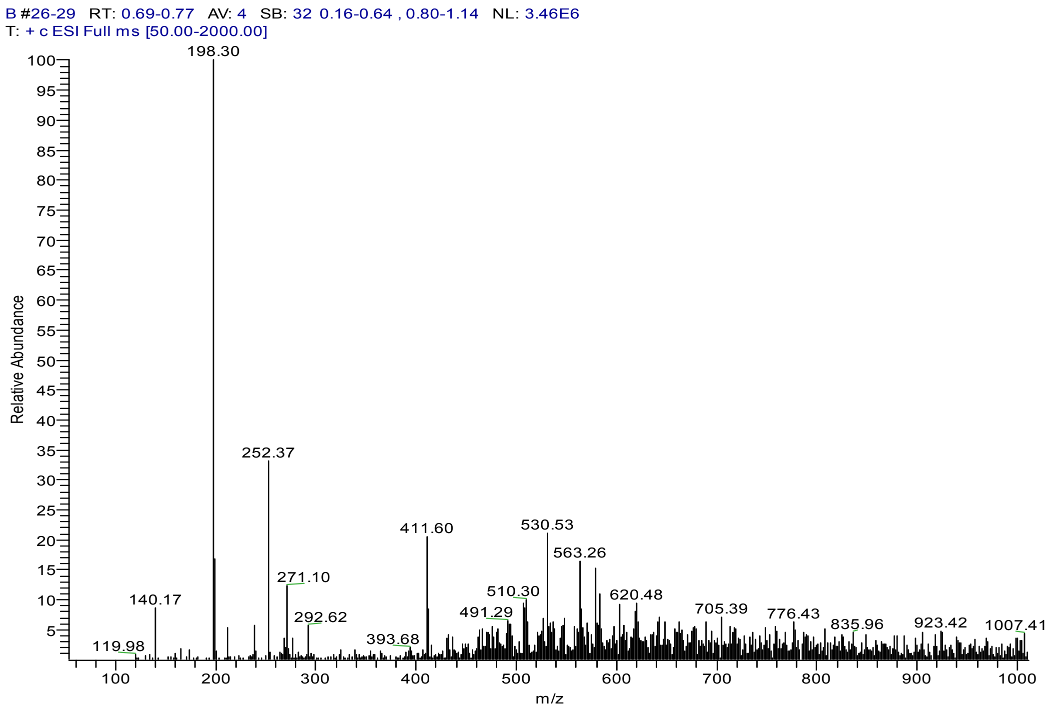


Fig. S1. Mass spectrogram of ATMP

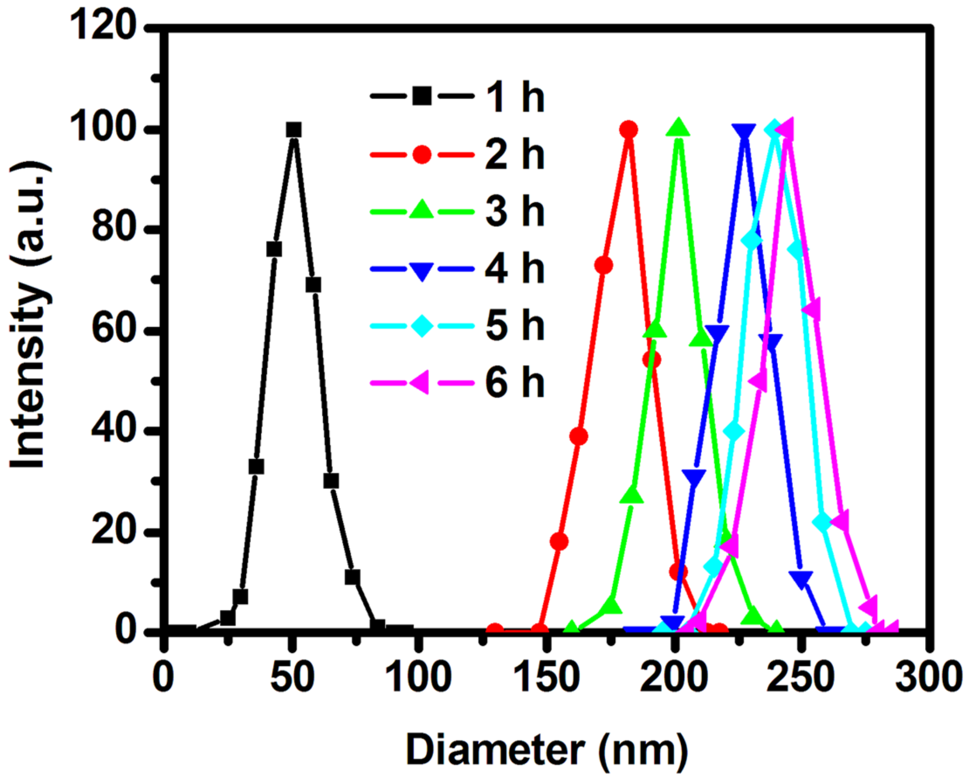
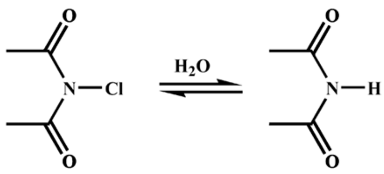
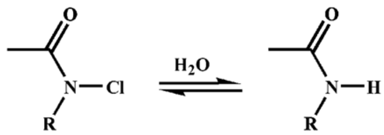
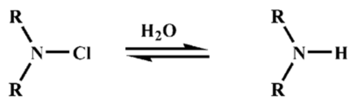


Fig. S2. Particle size distribution of poly(ATMP-*co*-MMA) microspheres with different copolymerization period.

Table S1. Dissociation constant of different *N*-halamine in aqueous solution

***N*-halamine type**	**Dissociation reaction**	**Dissociation constant[a]**
Imide		$< 10^{-4}$
Amide		$< 10^{-9}$
Amine		$< 10^{-12}$

[a]Dissociation constant was from references.[1-4]

Table S2. Particle size and surface area characteristics of poly(ATMP-*co*-MMA) microspheres formed with different copolymerization period

Sample	Copolymerization period (h)	Particle size (nm)[a]		Surface area[b] ($m^2 \cdot g^{-1}$)
		Size distribution	**Average size**	
S1	1	20-90	50.7	118.3
S2	2	150-210	181.8	33.0
S3	3	170-240	201.9	29.7
S4	4	190-250	227.5	26.4
S5	5	210-260	239.2	25.1
S6	6	210-280	244.5	24.5

[a]Particle size was determined by TEM images.

[b]The surface area was calculated based on the assumption that the particles are non-porous spheres with density of 1.0 $g \cdot cm^{-3}$. The calculation was performed according to the following equation: $S = 6(D \cdot d)^{-1}$, wherein S is the surface area ($m^2 \cdot g^{-1}$); D is the diameter (μm); and d is the density ($g \cdot cm^{-3}$) of the particles.[5]

Table S3. Minimum inhibitory concentration (MIC) of different products against *S. aureus*, *B. subtilis*, *E. coli*, and *P. aeruginosa*

Sample	MIC (mg/mL)				Reference
	Gram-positive bacteria		**Gram-negative bacteria**		
	S. aureus	***B. subtilis***	***E. coli***	***P. aeruginosa***	
PSA@Fe_3O_4@SiO_2-*N*-halamine[a]	80	-	-	60	6
HMNH NPs[b]	160	160	160	80	7
BAMNH NPs[c]	80	80	80	40	7
H-NHFS NPs[d]	160	-	-	80	8
BA-NHFS NPs[e]	40	-	-	40	8
Amine *N*-halamine microspheres	10	-	10	-	This study

[a]Amide *N*-halamine-immobilized PSA@Fe_3O_4@SiO_2 nanoparticles.

[b]Hydantoin-structural magnetic amide *N*-halamine nanoparticles.

[c]Barbituric acid-based magnetic imide *N*-halamine nanoparticles.

[d]Hydantoin-originated amide *N*-halamine-functionalized silica nanoparticles.

[e]Barbituric acid-originated imide *N*-halamine-functionalized silica nanoparticles.

Table S4. Oxidative chlorine content of amine *N*-halamine microspheres with different soaking period

Soaking period (h)[a]	**Oxidative chlorine (%)**[b]	**Reduction (%)**[c]
0	1.17	0
6	1.16	0.85
12	1.16	0.85
18	1.14	2.56
24	1.11	5.13
30	1.10	5.98
36	1.08	7.69
42	1.08	7.69
48	1.07	8.55

[a]Period since initial soaking.

[b]Oxidative chlorine content was determined by the iodometric/thiosulfate titration after a certain soaking age.

[c]Reduction percentage of oxidative chlorine after a certain soaking age.

Supplementary References

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