

# **Surfactant effect on the physicochemical characteristics of solid lipid nanoparticles based on pillar[5]arenes**

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Electronic Supplementary Information (33 pages)

Fig. S1.  $^1\text{H}$  NMR spectrum of 4-(3-(3-carboxypropanamido)propoxy)-8,14,18,23,26,28,31,32,35-nonamethoxypillar[5]arene (4),  $\text{CDCl}_3$ , 298 K, 400 MHz.

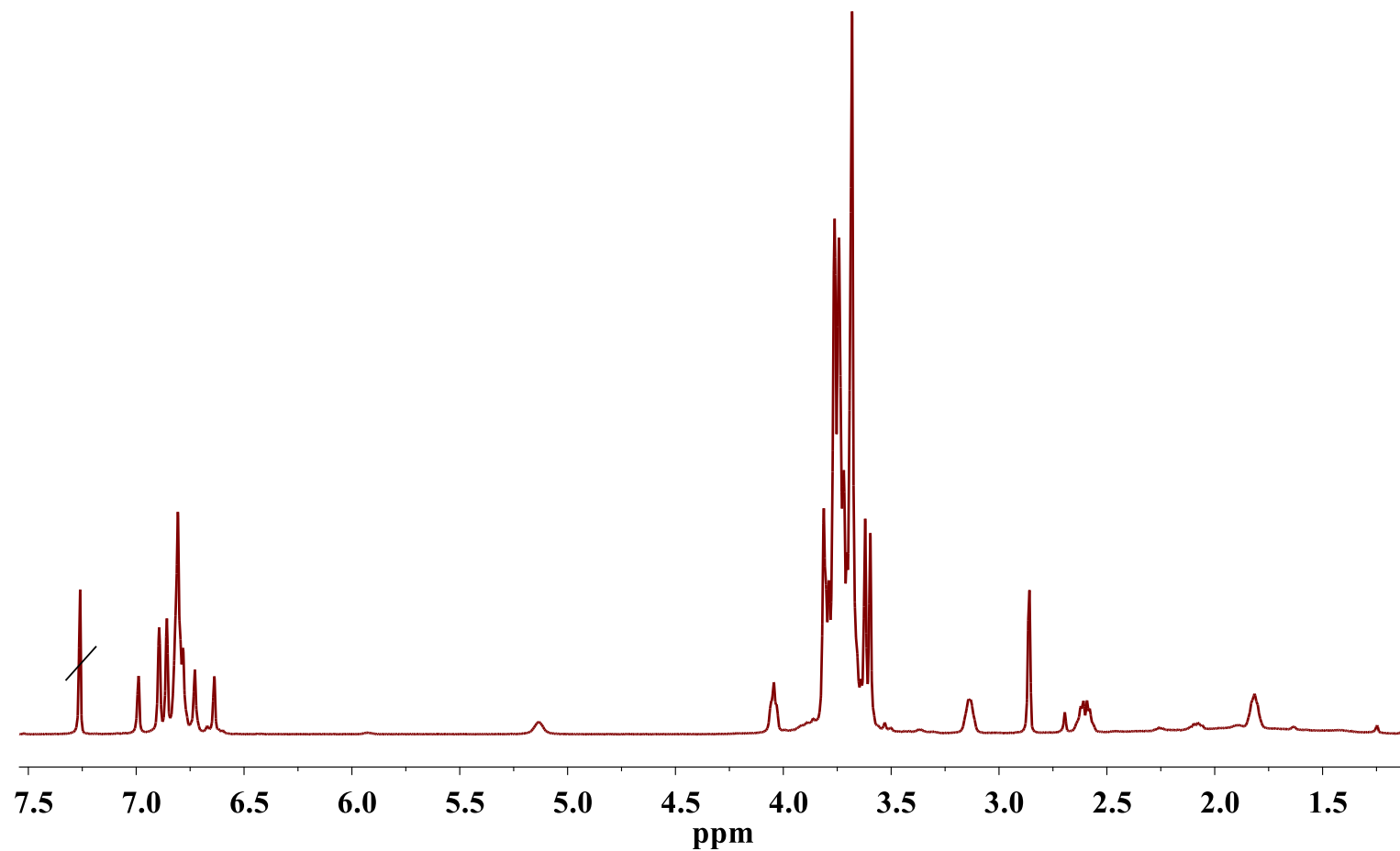


Fig. S2.  $^1\text{H}$  NMR spectrum of 4-(3-(3-carboxypropanamido)propoxy)-8,14,18,23,26,28,31,32,35-nonamethoxypillar[5]arene (4),  $\text{DMSO-}d_6$ , 298 K, 400 MHz.

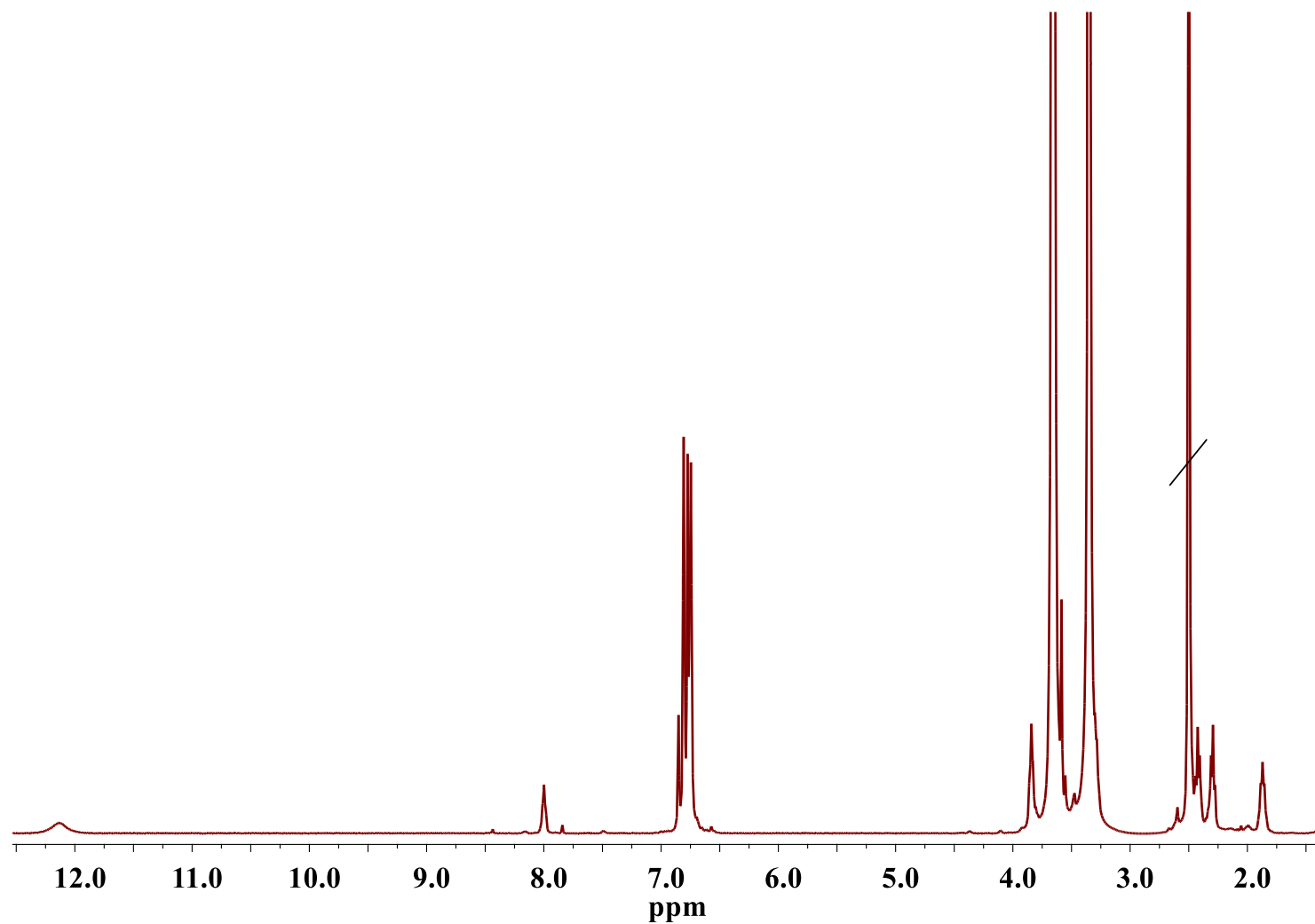


Fig. S3.  $^1\text{H}$  NMR spectrum of 4-[(*N*-(3-carboxypropanamido)-{4'-aminobutyl}-amino)-carbamoylmethoxy]-8,14,18,23,26,28,31,32,35-nonamethoxy-pillar[5]arene (5),  $\text{CDCl}_3$ , 298 K, 400 MHz.

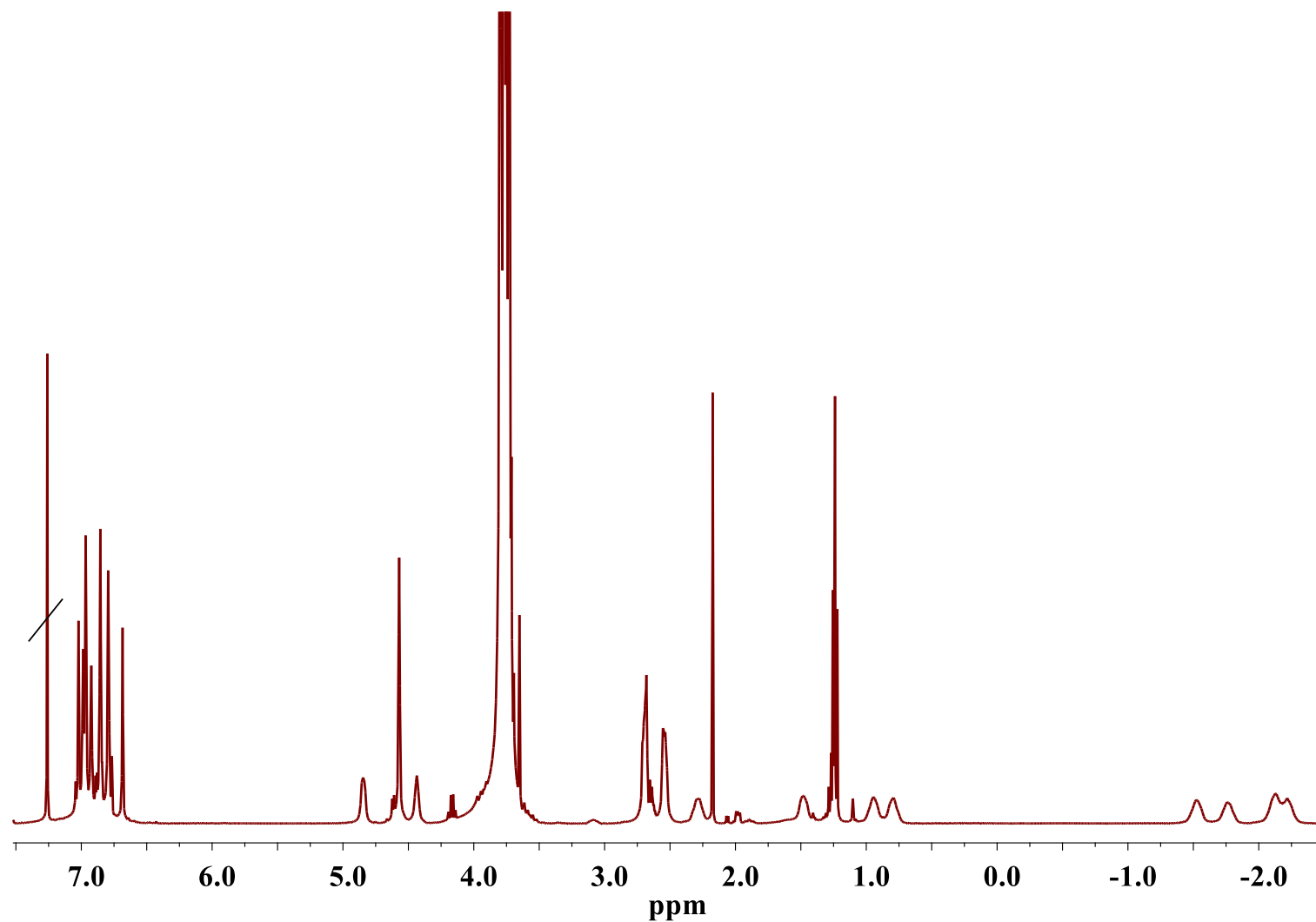


Fig. S4.  $^1\text{H}$  NMR spectrum of 4-[(*N*-(3-carboxypropanamido)-{4'-aminobutyl}-amino)-carbamoylmethoxy]-8,14,18,23,26,28,31,32,35-nonamethoxy-pillar[5]arene (5),  $\text{DMSO-}d_6$ , 298 K, 400 MHz.

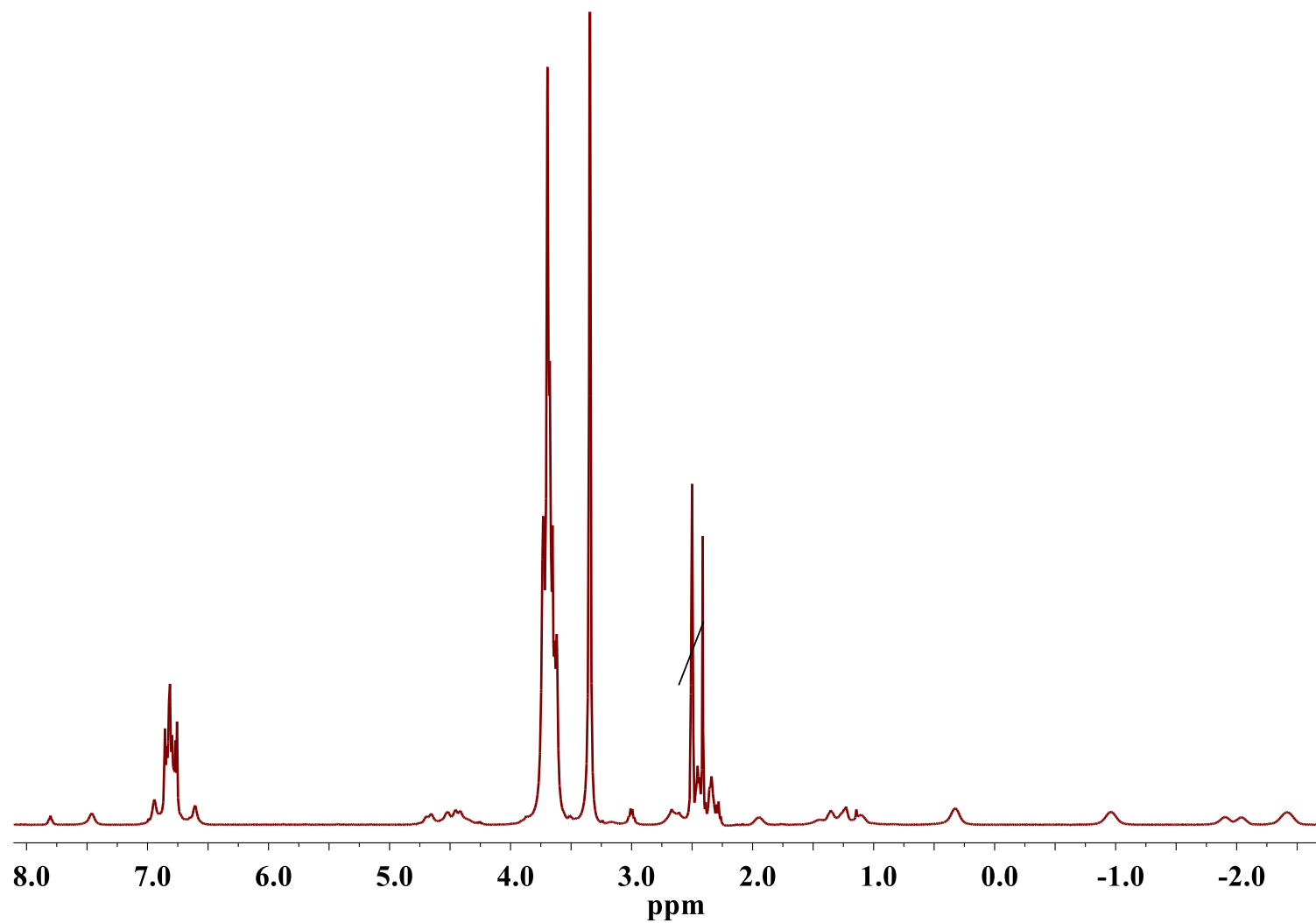


Fig. S5.  $^1\text{H}$  NMR spectrum of 4-[(*N*-(3-carboxypropanamido)-{6'-aminohexyl}-amino)-carbamoylmethoxy]-8,14,18,23,26,28,31,32,35-nonamethoxypillar[5]arene (6),  $\text{CDCl}_3$ , 298 K, 400 MHz.

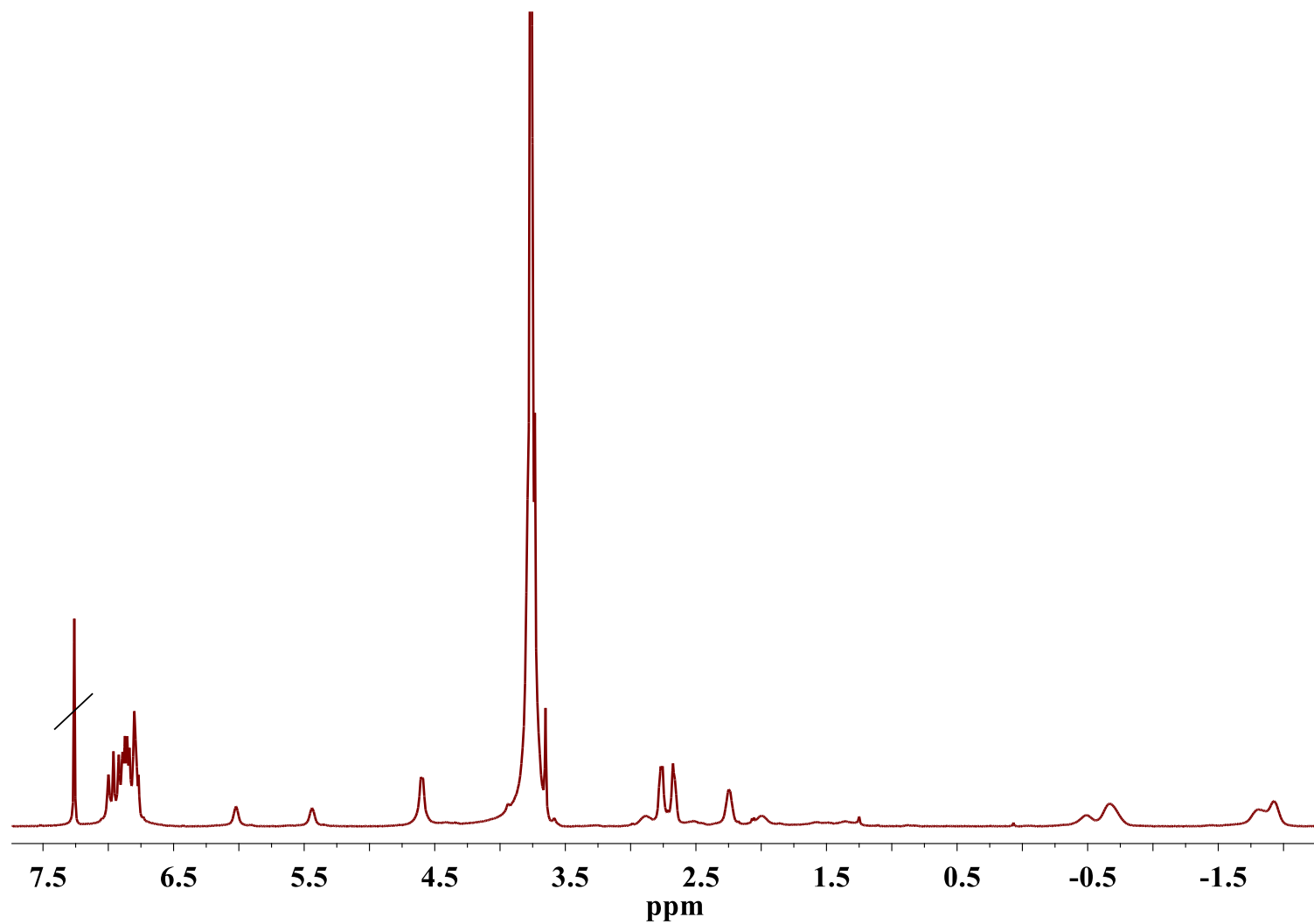


Fig. S6.  $^1\text{H}$  NMR spectrum of 4-[(*N*-(3-carboxypropanamido)-{6'-aminohexyl}-amino)-carbamoylmethoxy]-8,14,18,23,26,28,31,32,35-nonamethoxypillar[5]arene (6),  $\text{DMSO-}d_6$ , 298 K, 400 MHz.

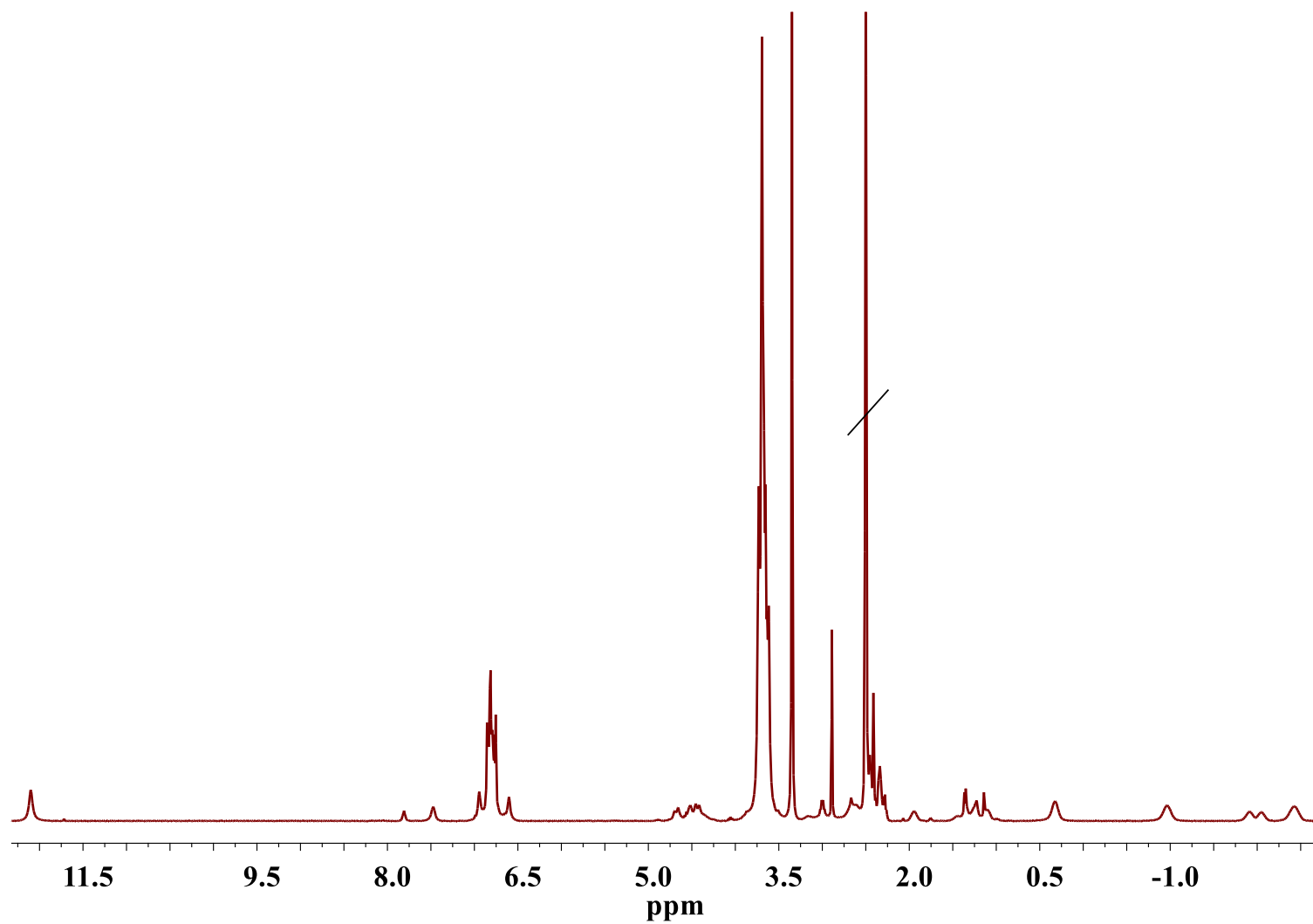


Fig. S7.  $^{13}\text{C}$  NMR spectrum of 4-(3-(3-carboxypropanamido)propoxy)-8,14,18,23,26,28,31,32,35-nonamethoxypillar[5]arene (4),  $\text{DMSO-}d_6$ , 298 K, 100 MHz.

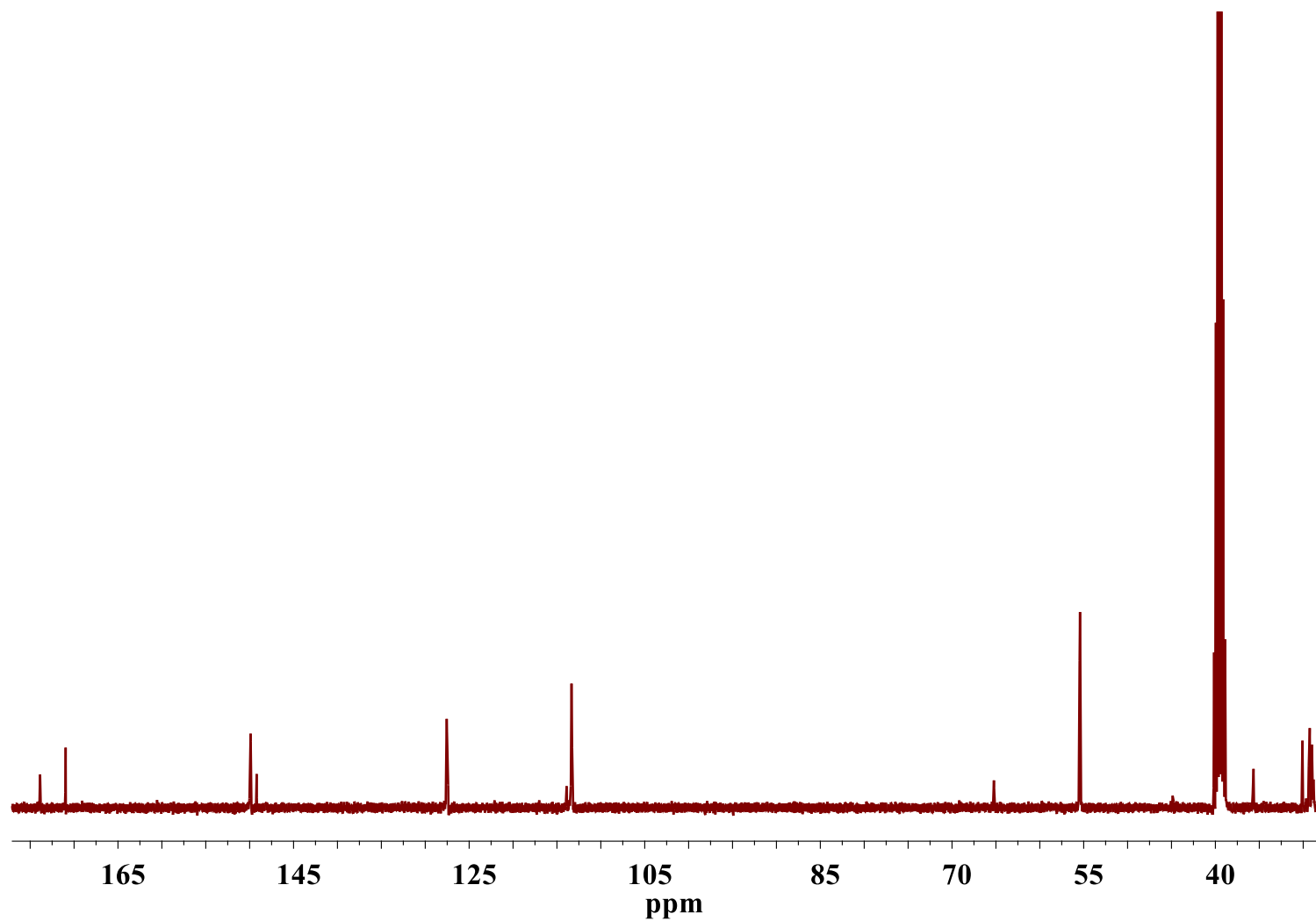




Fig. S8.  $^{13}\text{C}$  NMR spectrum of 4-[(*N*-(3-carboxypropanamido)-{4'-aminobutyl}-amino)-carbamoylmethoxy]-8,14,18,23,26,28,31,32,35-nonamethoxy-pillar[5]arene (5), DMSO- $d_6$ , 298 K, 100 MHz.

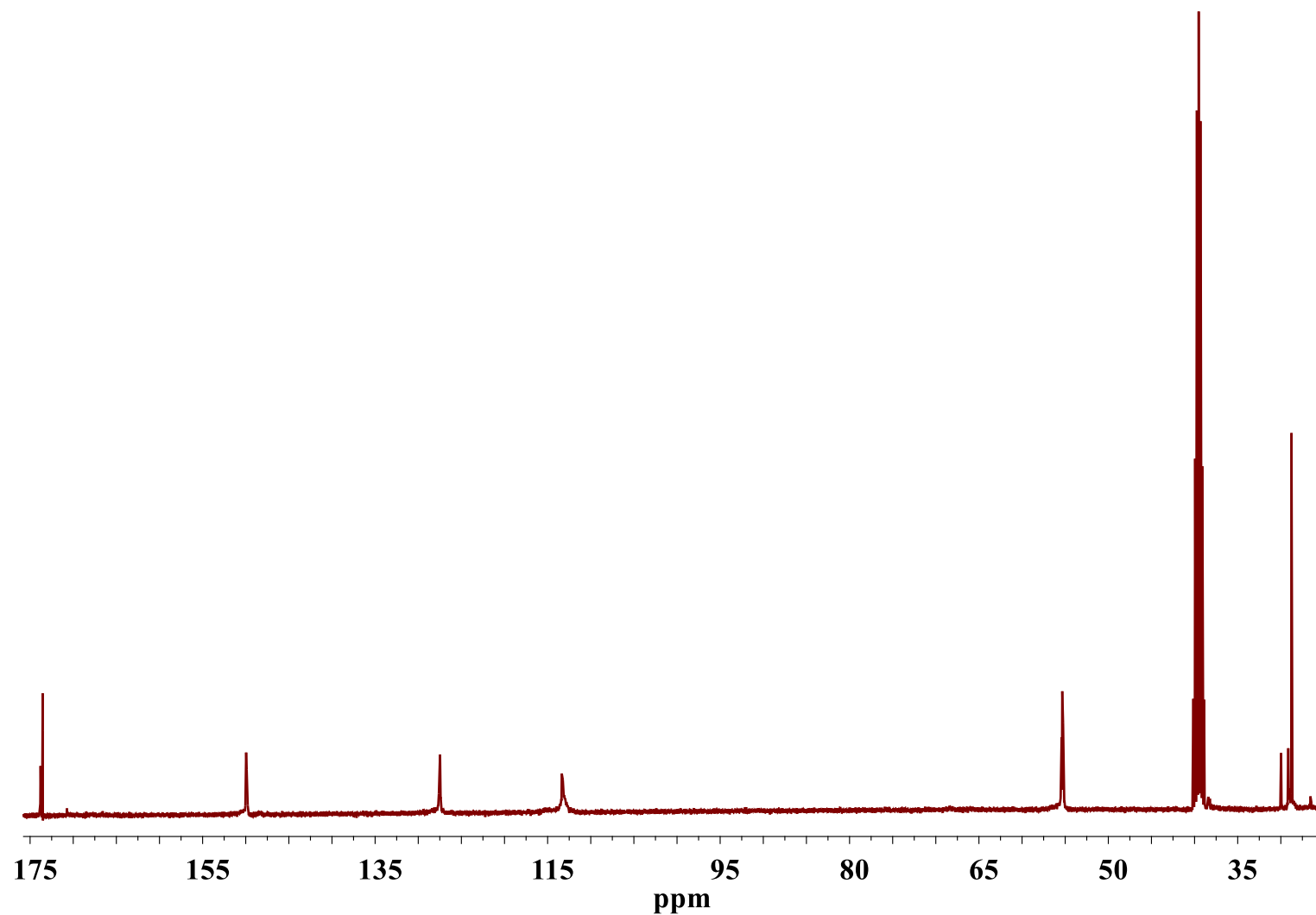


Fig. S9.  $^{13}\text{C}$  NMR spectrum of 4-[(*N*-(3-carboxypropanamido)-{6'-aminohexyl}-amino)-carbamoylmethoxy]-8,14,18,23,26,28,31,32,35-nonamethoxypillar[5]arene (6),  $\text{DMSO-}d_6$ , 298 K, 100 MHz.

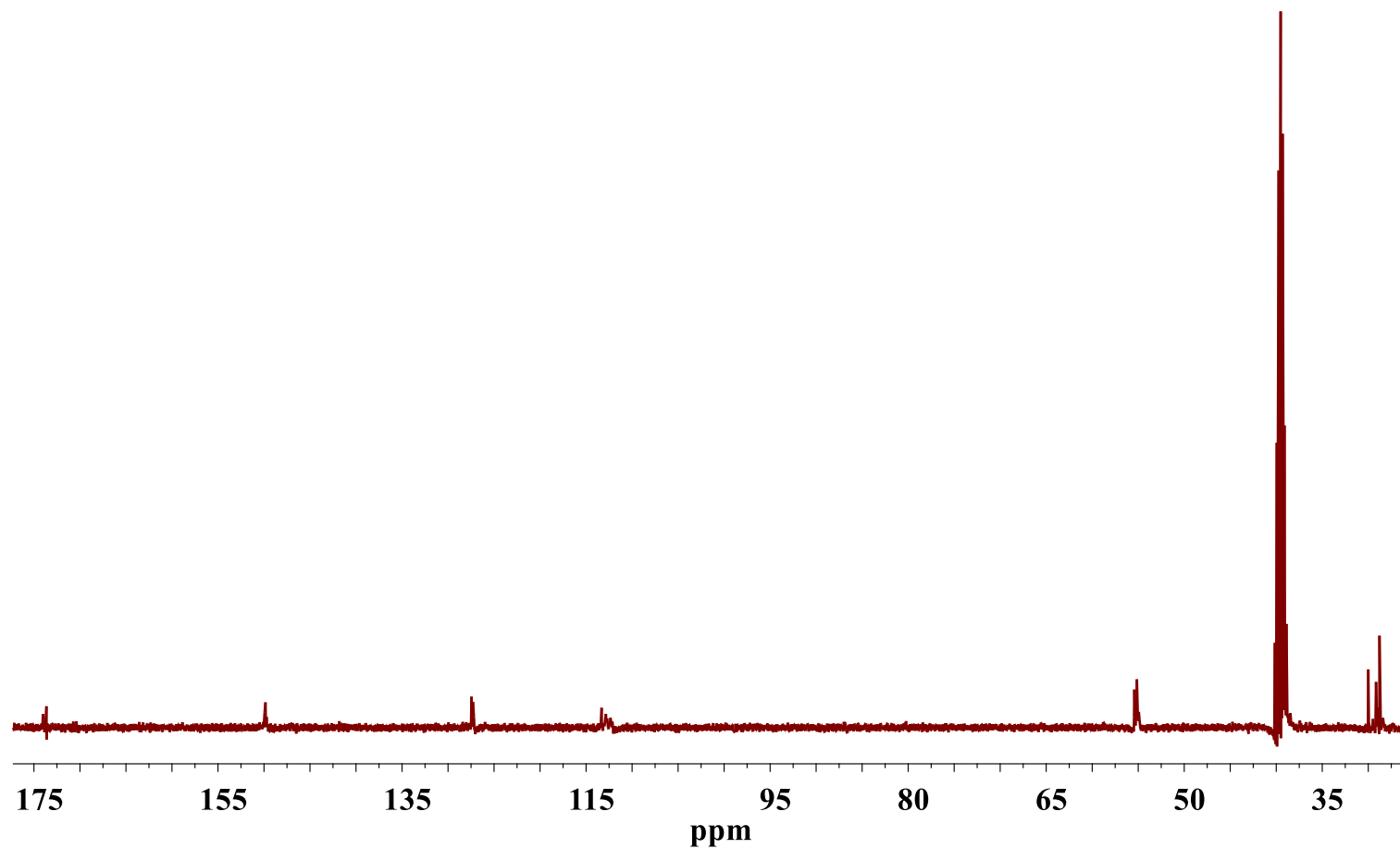
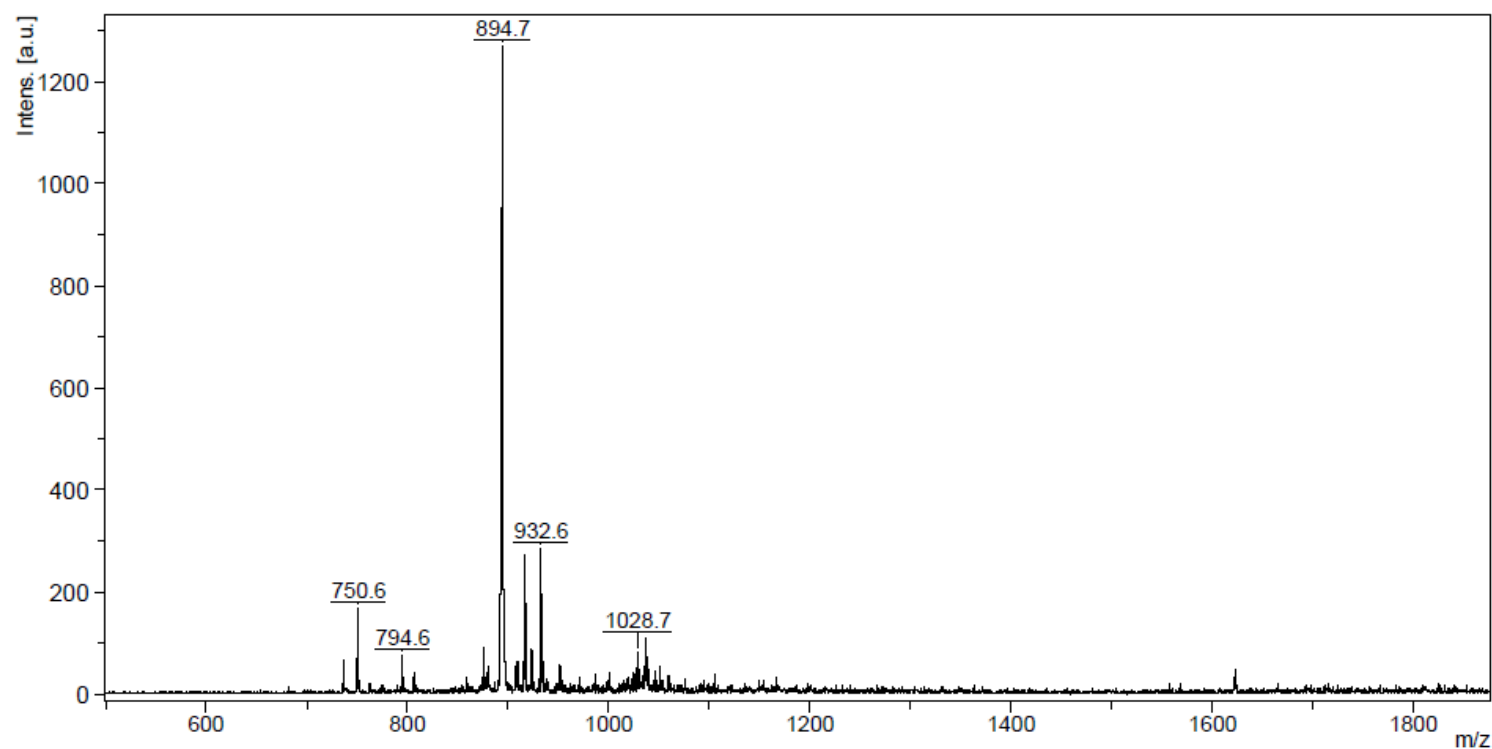


Fig. S10. Mass spectrum (MALDI) of 4-(3-(3-carboxypropanamido)propoxy)-8,14,18,23,26,28,31,32,35-nonamethoxypillar[5]arene (4).



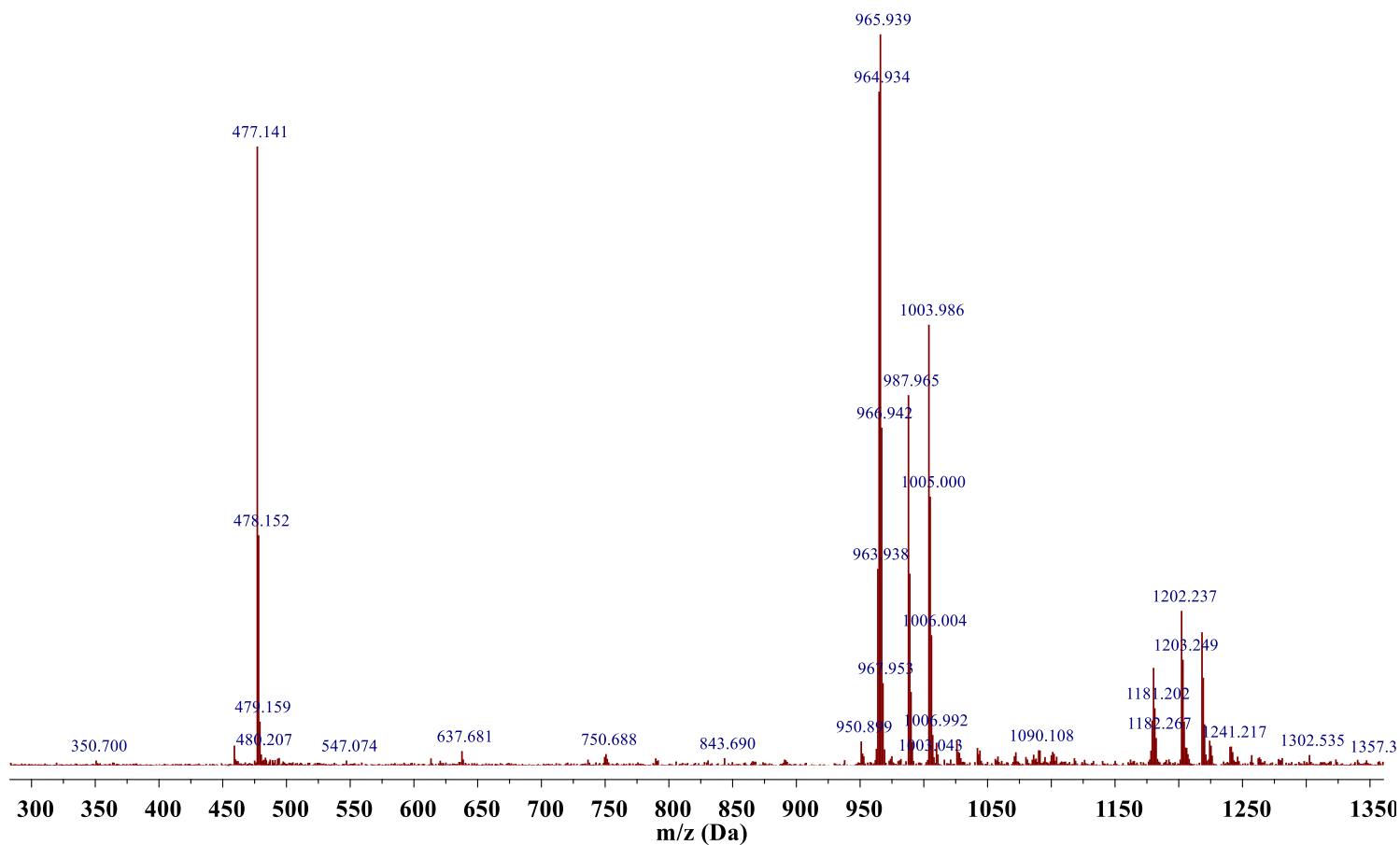
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 flexAnalysis version 3.0.96.0

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 Ion source voltage 2 23.65 kV  
 Lens voltage 6 kV  
 Linear detector voltage 1.405 kV  
 Reflector voltage 1 0 kV  
 Reflector voltage 2 0 kV  
 Reflector detector voltage 1.569 kV

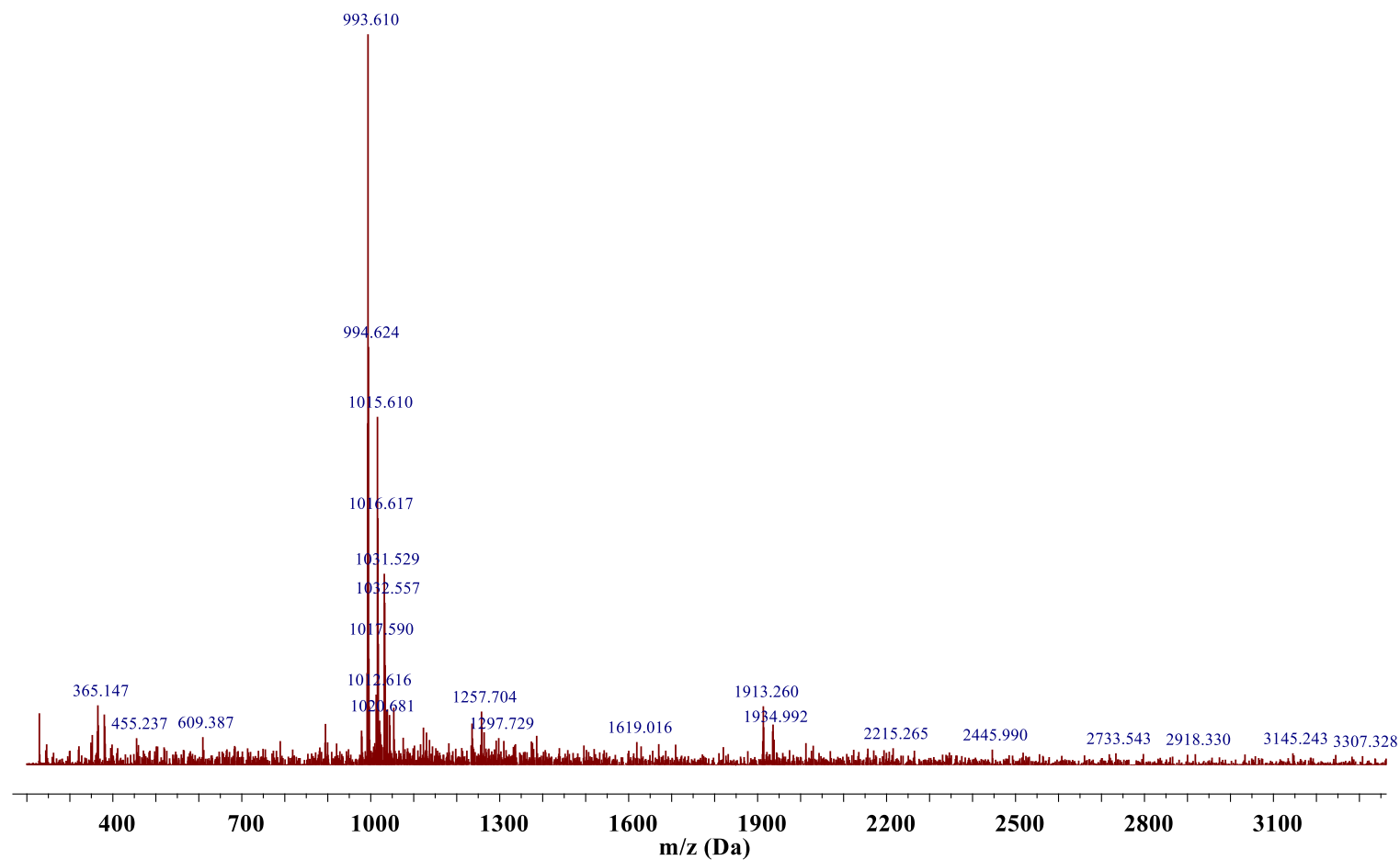
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 Laser Type Nd:YAG  
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 Number of shots 50  
 Laser repetition rate 100 Hz

**Target**  
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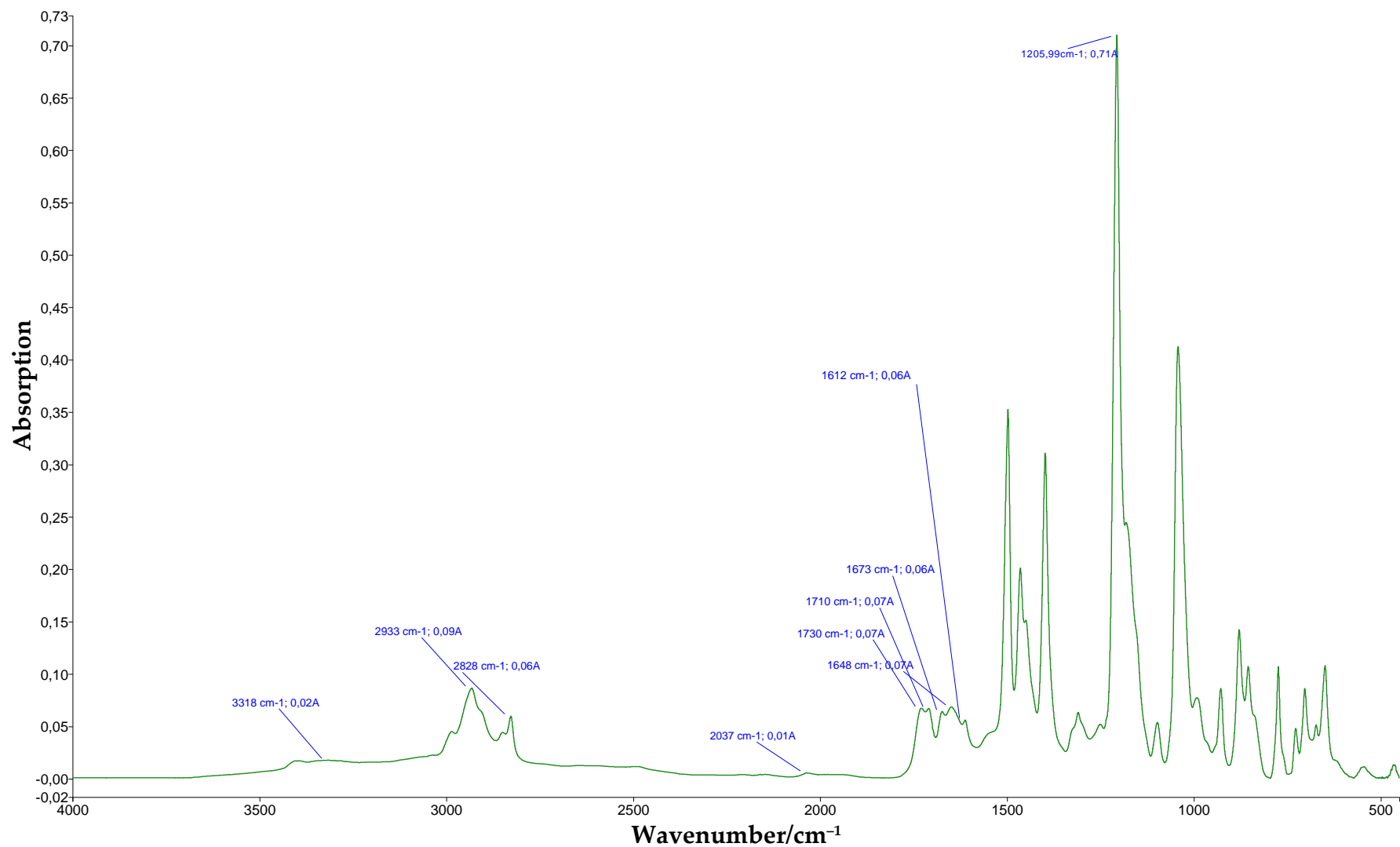
**Fig. S11. Mass spectrum (MALDI) of 4-[(N-(3-carboxypropanamido)-{4'-aminobutyl}-amino)-carbamoylmethoxy]-8,14,18,23,26,28,31,32,35- nonamethoxy-pillar[5]arene (5).**



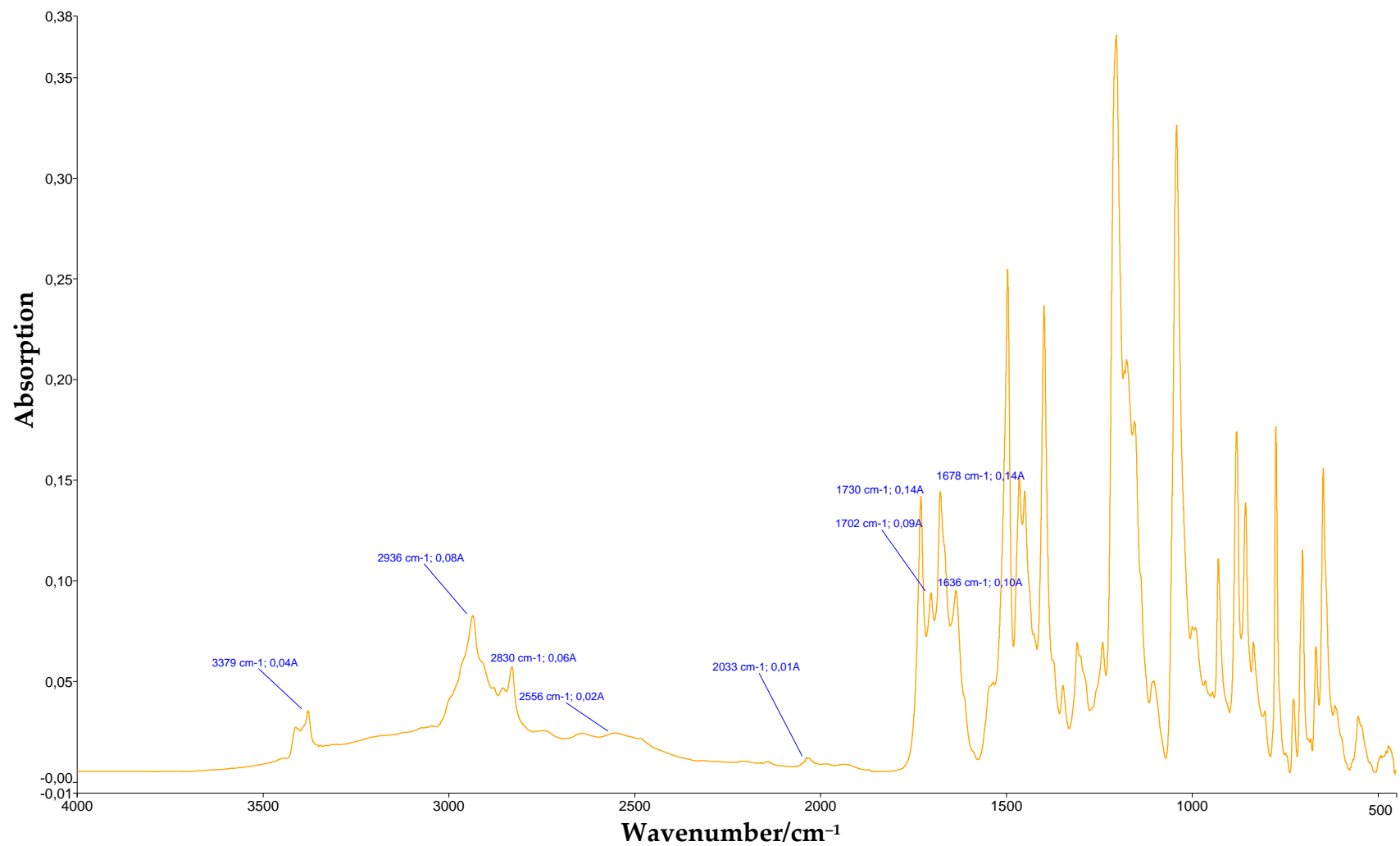
**Fig. S12. Mass spectrum (MALDI) of 4-[(N-(3-carboxypropanamido)-{6'-aminohexyl}-amino)-carbamoylmethoxy]-8,14,18,23,26,28,31,32,35-nonamethoxypillar[5]arene (6).**



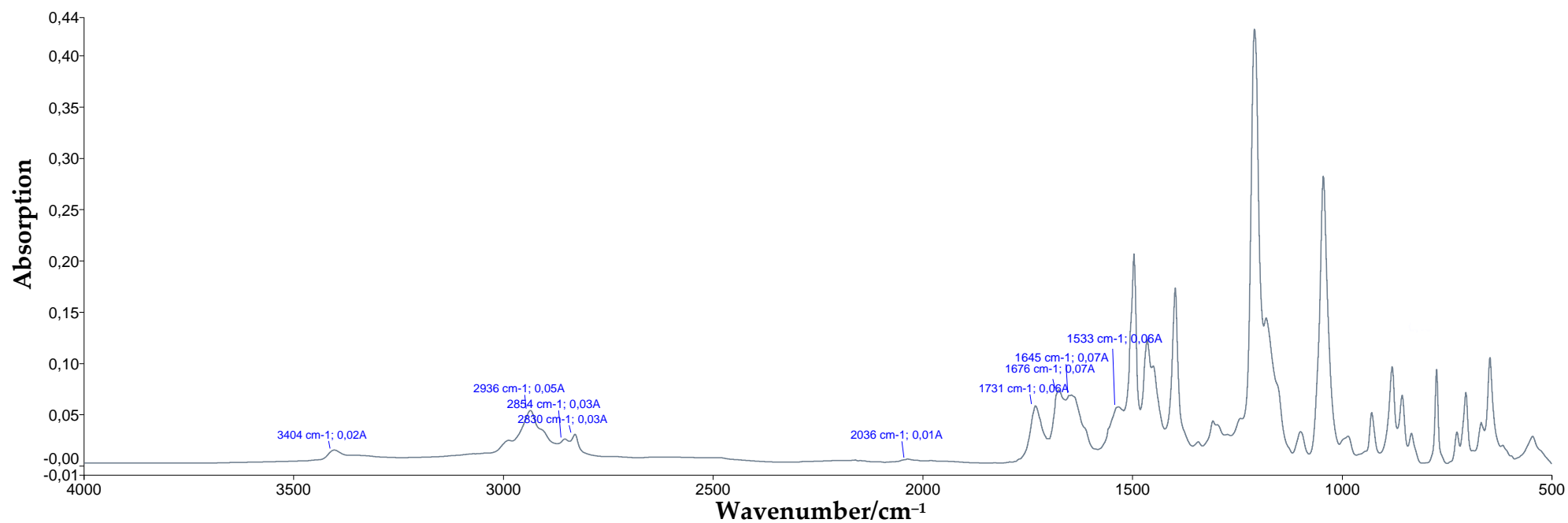
**Fig. S13. IR spectrum of 4-(3-(3-carboxypropanamido)propoxy)-8,14,18,23,26,28,31,32,35-nonamethoxypillar[5]arene (4).**



**Fig. S14. IR spectrum of 4-[(N-(3-carboxypropanamido)-{4'-aminobutyl}-amino)-carbamoylethoxy]-8,14,18,23,26,28,31,32,35-nonamethoxy-pillar[5]arene (5).**

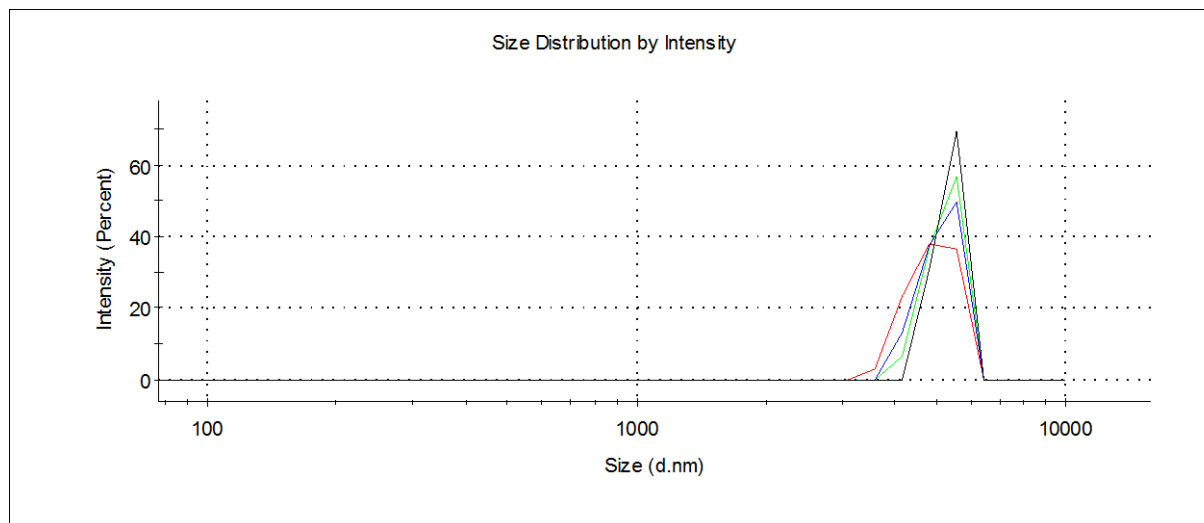


**Fig. S15. IR spectrum of 4-[(N-(3-carboxypropanamido)-{6'-aminohexyl}-amino)-carbamoylethoxy]-8,14,18,23,26,28,31,32,35-nonamethoxypillar[5]arene (6).**

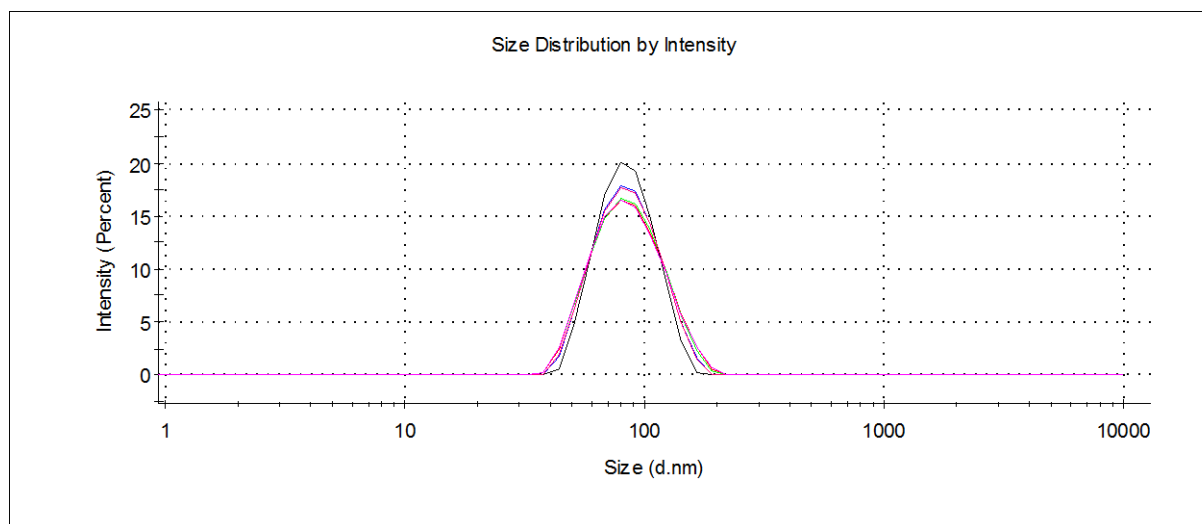




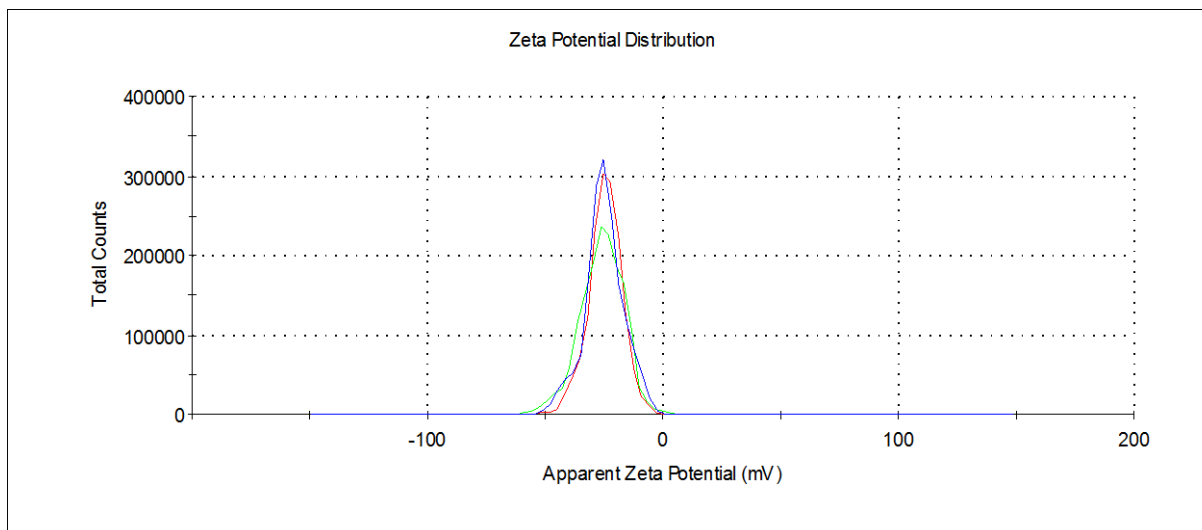
**Fig. S16. Size distribution of particles by intensity for SLN-4 ( $3 \times 10^{-4}$  M) in water (the each colored line on the graph means one repeated measurement).**



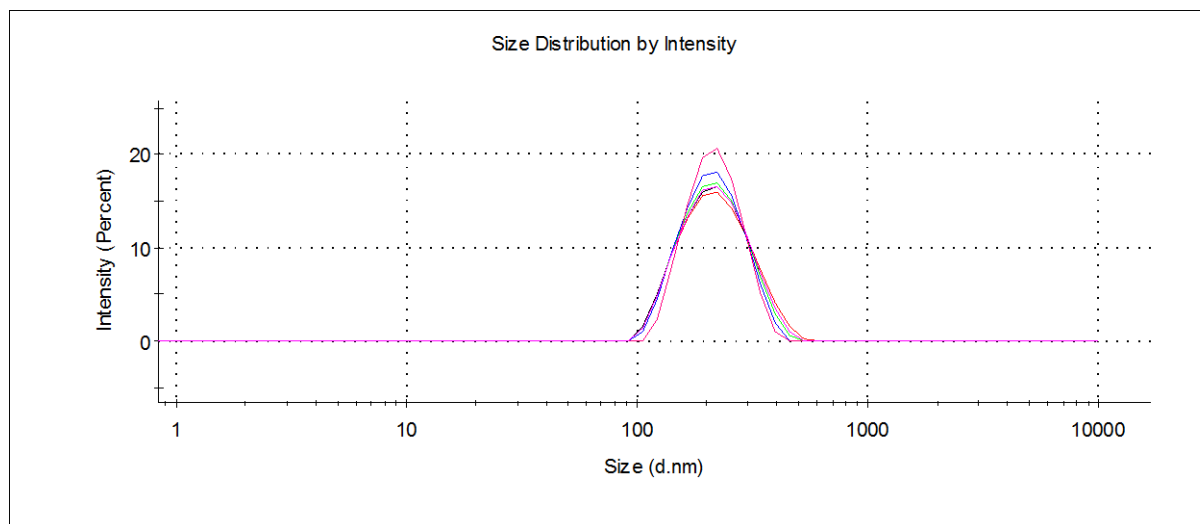
**Fig. S17. Size distribution of particles by intensity for SLN-4 ( $1 \times 10^{-4}$  M) in water (the each colored line on the graph means one repeated measurement).**



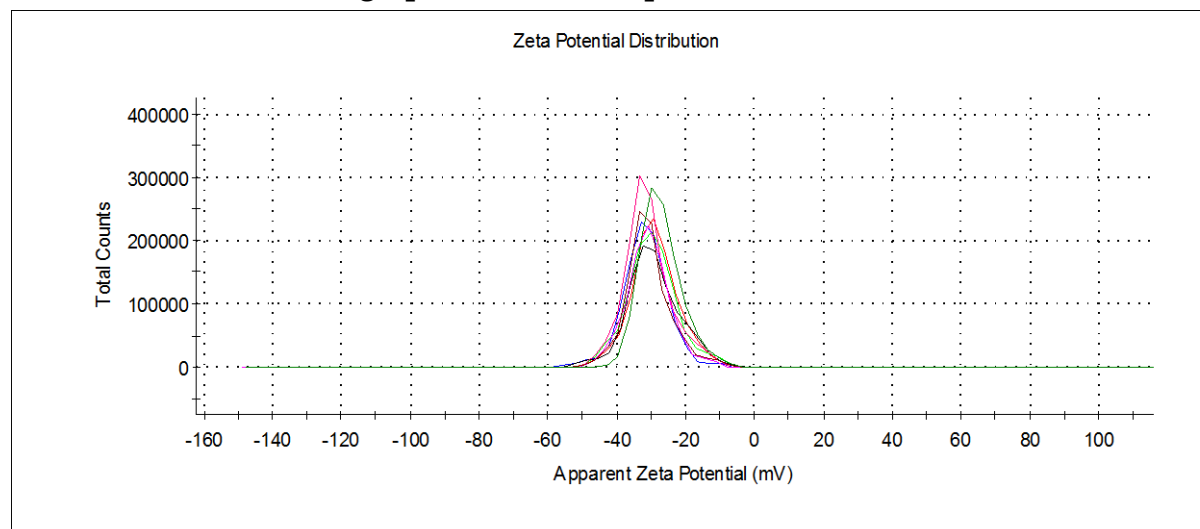
**Fig. S18. Zeta potential distribution of the particles SLN-4 ( $1 \times 10^{-4}$  M) in water (the each colored line on the graph means one repeated measurement).**



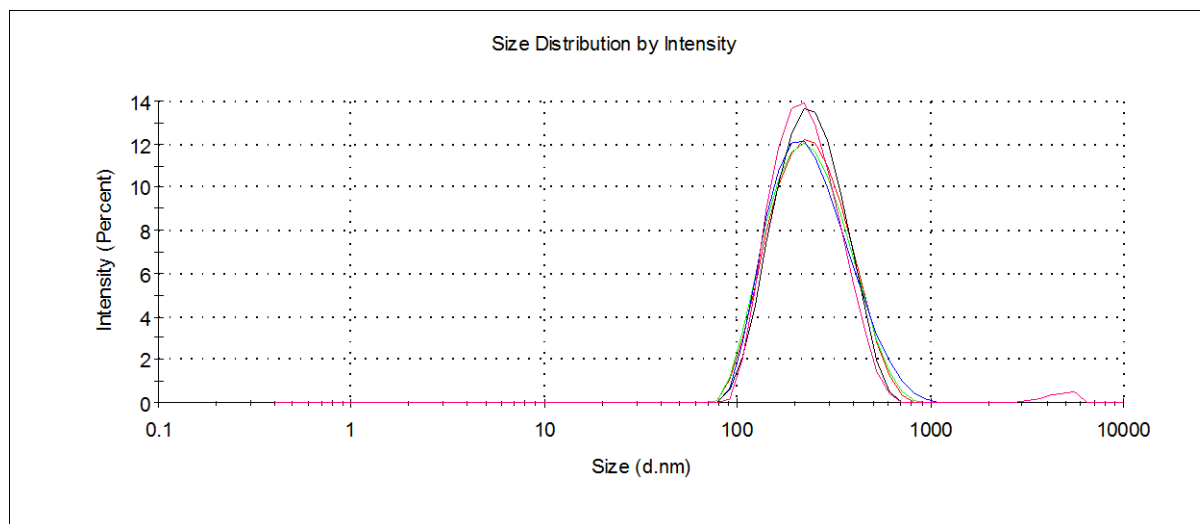
**Fig. S19. Size distribution of particles by intensity for SLN-4 ( $5 \times 10^{-5}$  M) in water (the each colored line on the graph means one repeated measurement).**



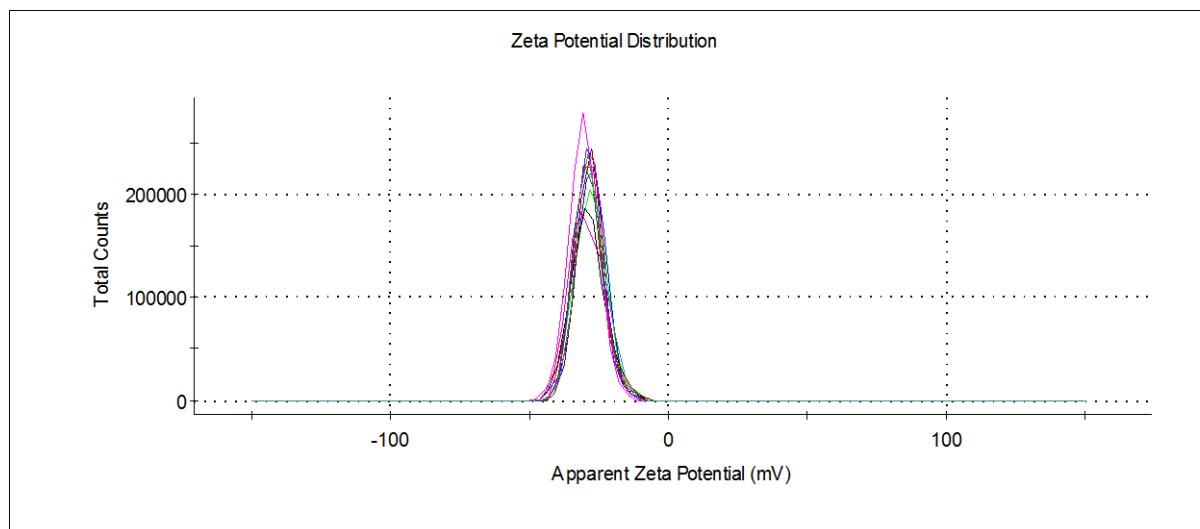
**Fig. S20. Zeta potential distribution of the particles SLN-4 ( $5 \times 10^{-5}$  M) in water (the each colored line on the graph means one repeated measurement).**



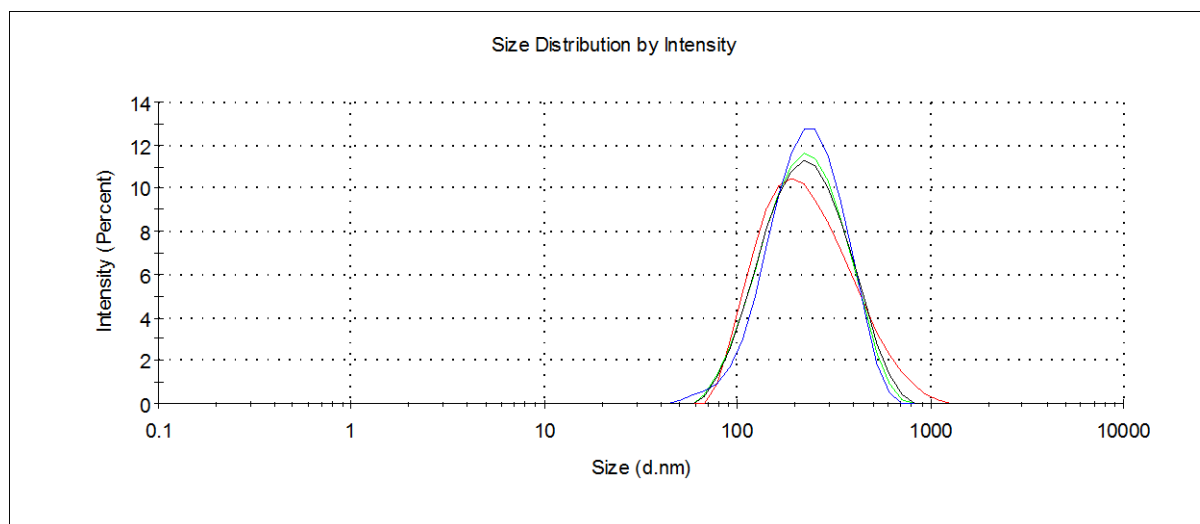
**Fig. S21. Size distribution of particles by intensity for SLN-5 ( $5 \times 10^{-5}$  M) in water (the each colored line on the graph means one repeated measurement).**



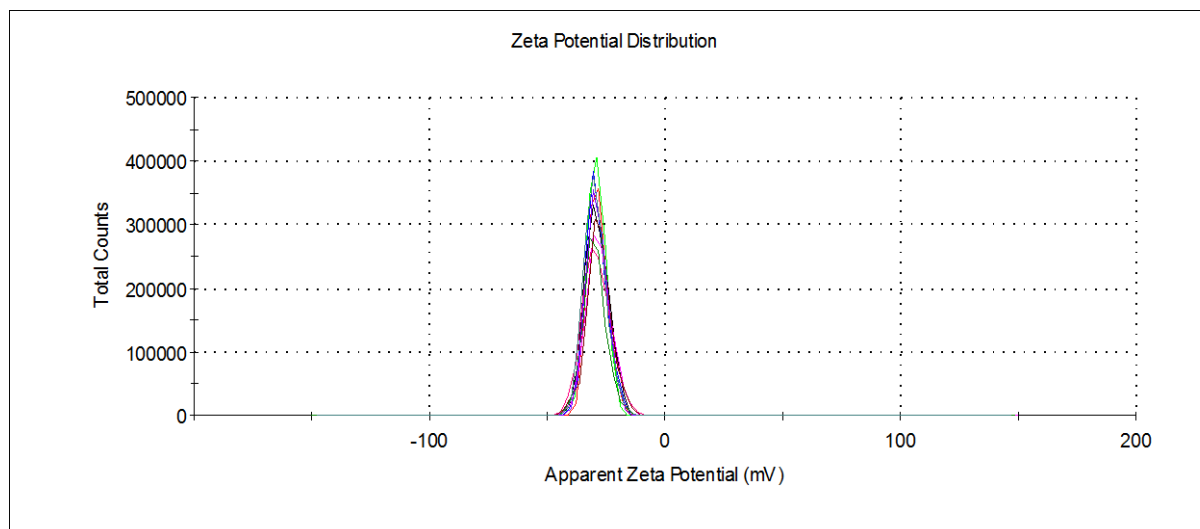
**Fig. S22. Zeta potential distribution of the particles for SLN-5 ( $5 \times 10^{-5}$  M) in water (the each colored line on the graph means one repeated measurement).**



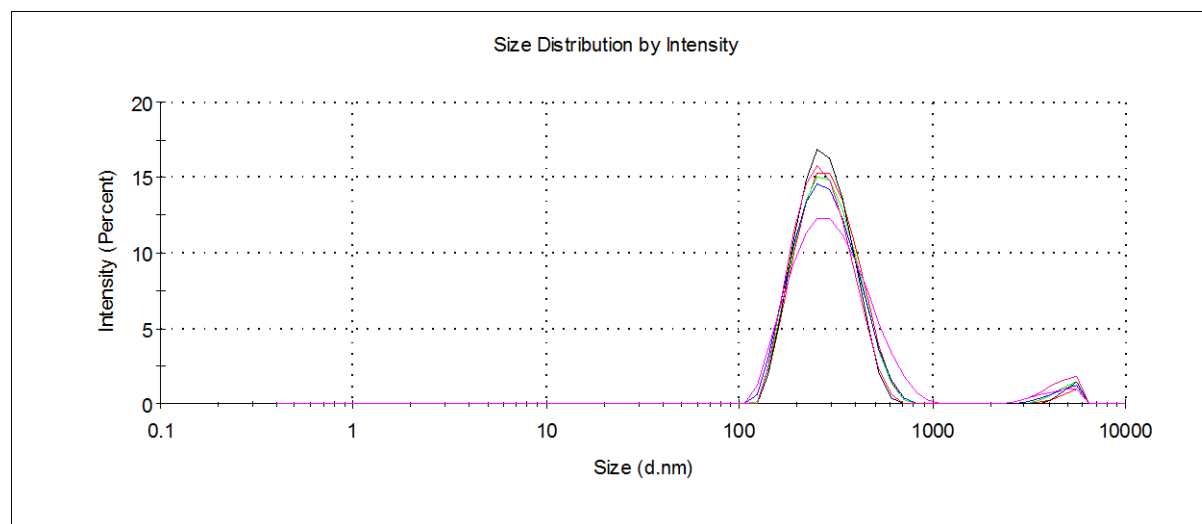
**Fig. S23. Size distribution of particles by intensity for SLN-5 ( $1 \times 10^{-4}$  M) in water (the each colored line on the graph means one repeated measurement).**



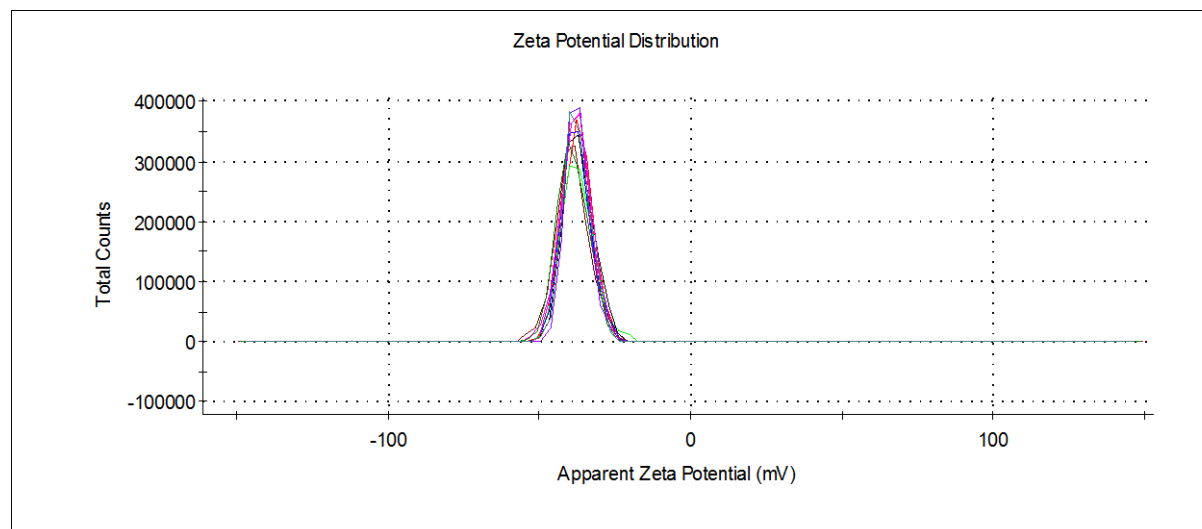
**Fig. S24. Zeta potential distribution of the particles for SLN-5 ( $1 \times 10^{-4}$  M) in water (the each colored line on the graph means one repeated measurement).**



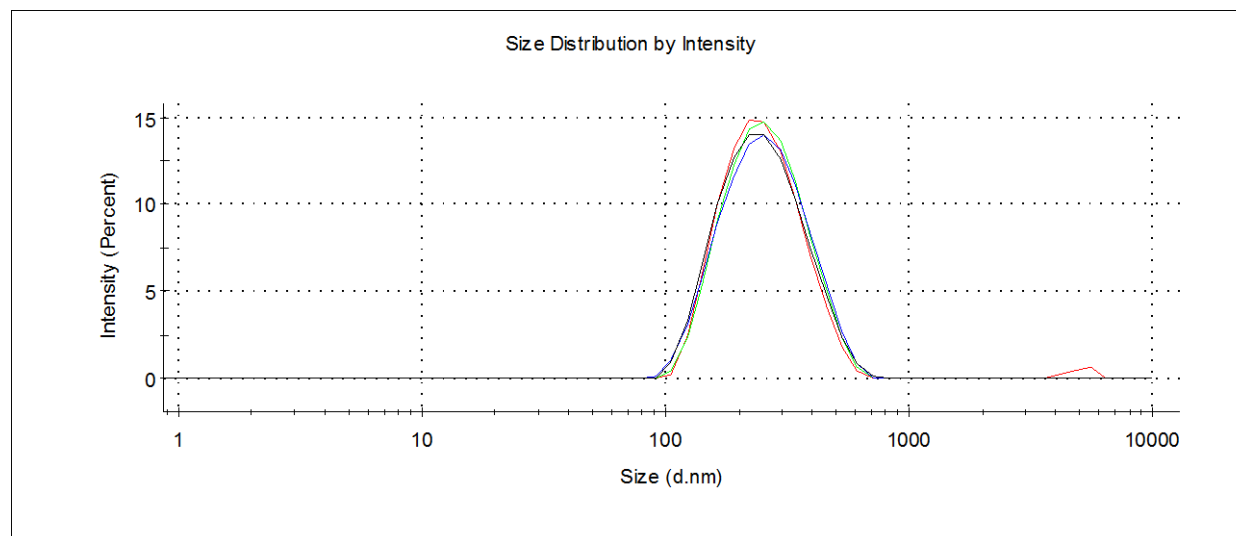
**Fig. S25. Size distribution of particles by intensity for SLN-5 ( $3 \times 10^{-4}$  M) in water (the each colored line on the graph means one repeated measurement).**



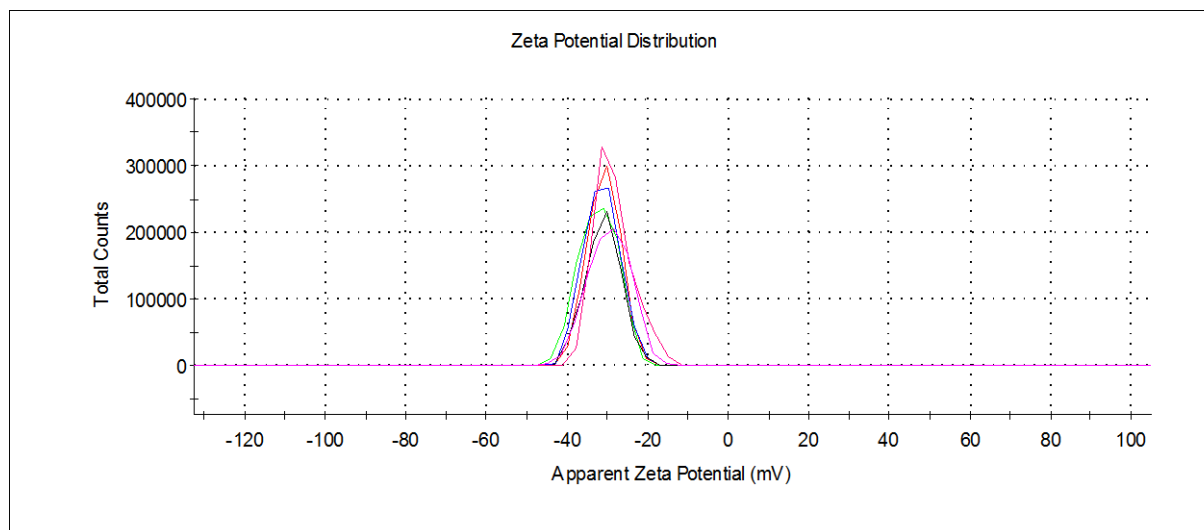
**Fig. S26. Zeta potential distribution of the particles for SLN-5 ( $3 \times 10^{-4}$  M) in water (the each colored line on the graph means one repeated measurement).**



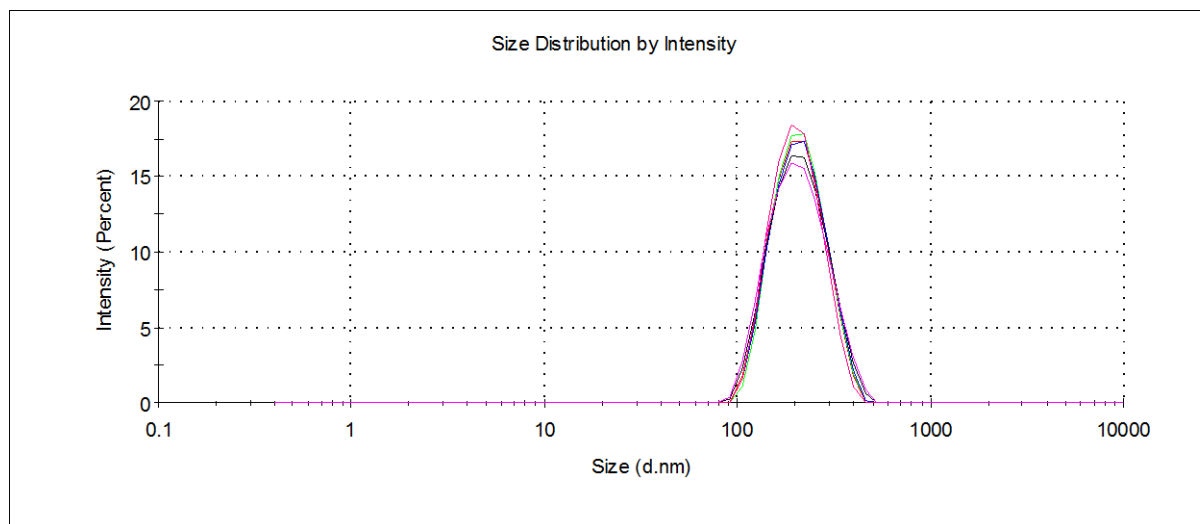
**Fig. S27. Size distribution of particles by intensity for SLN-6 ( $5 \times 10^{-5}$  M) in water (the each colored line on the graph means one repeated measurement).**



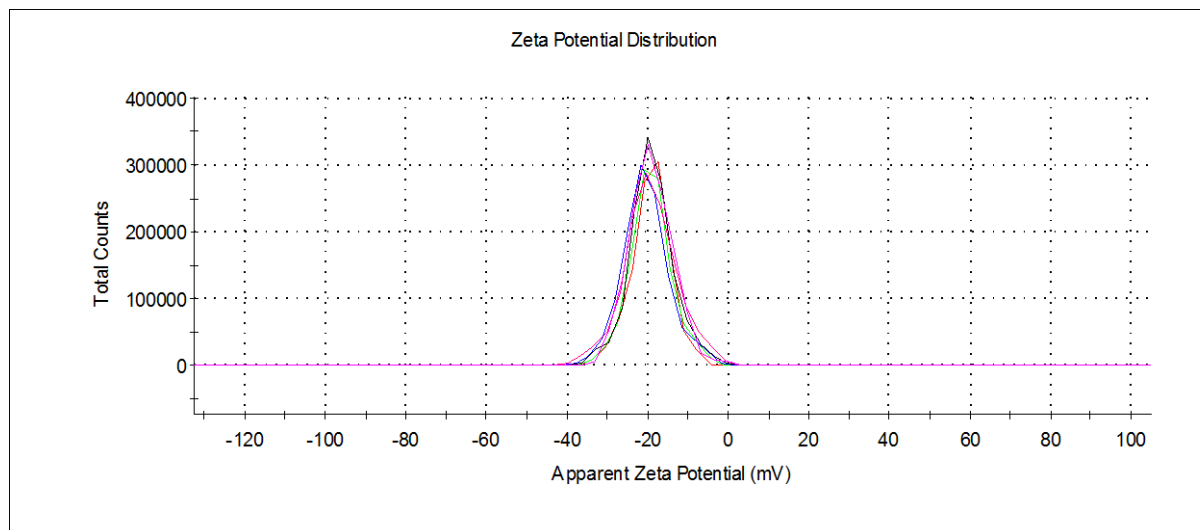
**Fig. S28. Zeta potential distribution of the particles for SLN-6 ( $5 \times 10^{-5}$  M) in water (the each colored line on the graph means one repeated measurement).**



**Fig. S29. Size distribution of particles by intensity for SLN-6 ( $1 \times 10^{-4}$  M) in water (the each colored line on the graph means one repeated measurement).**

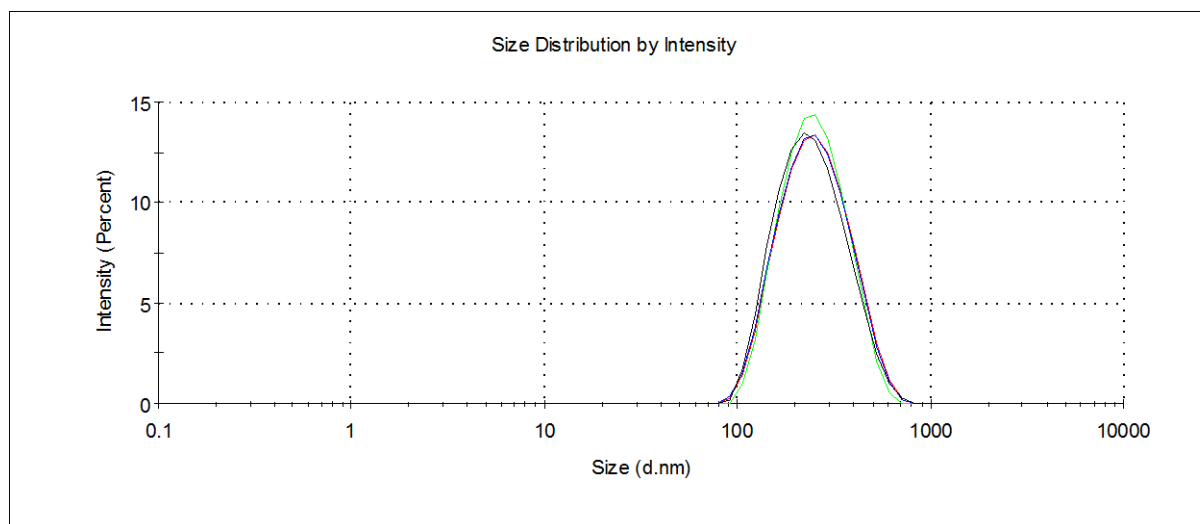


**Fig. S30. Zeta potential distribution of the particles for SLN-6 ( $1 \times 10^{-4}$  M) in water (the each colored line on the graph means one repeated measurement).**

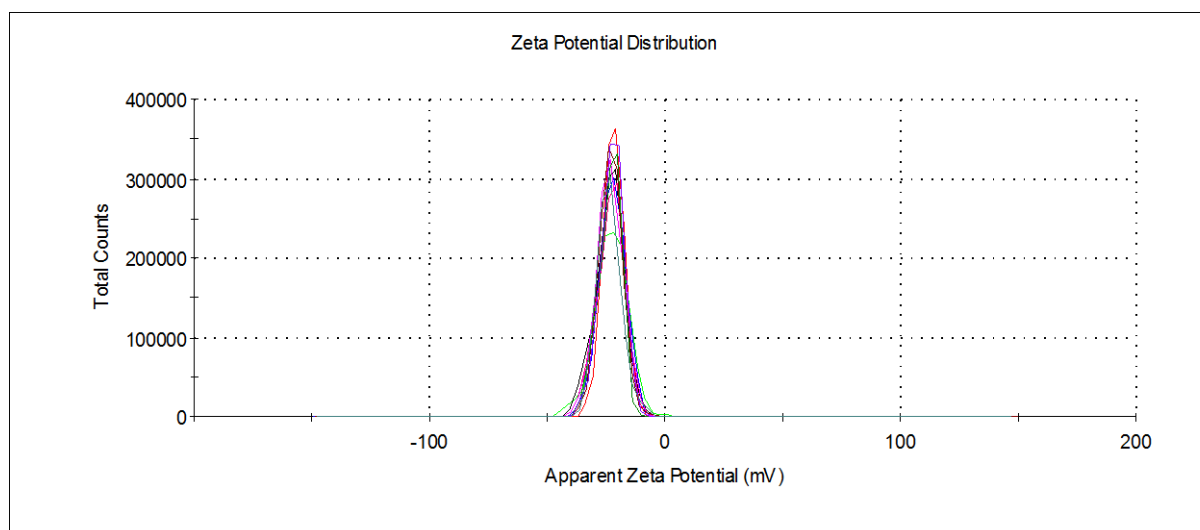




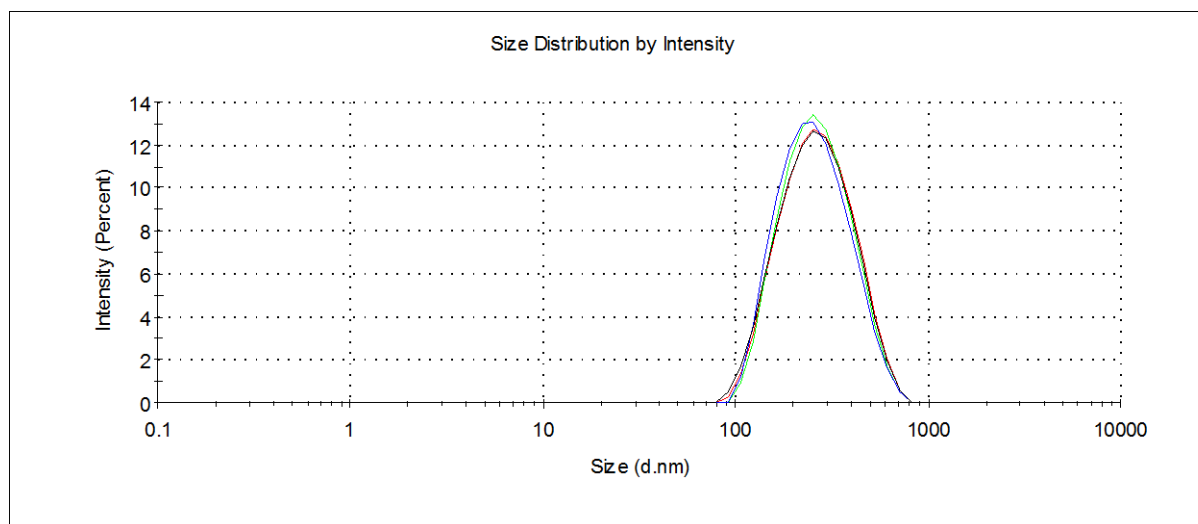
**Fig. S31. Size distribution of particles by intensity for SLN-6 ( $3 \times 10^{-4}$  M) in water (the each colored line on the graph means one repeated measurement).**



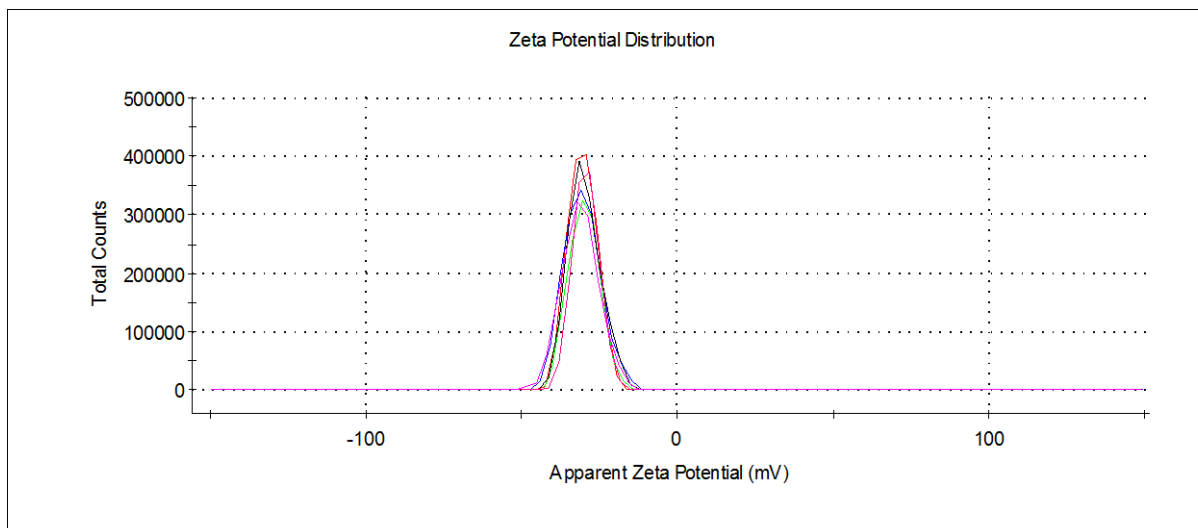
**Fig. S32. Zeta potential distribution of the particles for SLN-6 ( $3 \times 10^{-4}$  M) in water (the each colored line on the graph means one repeated measurement).**



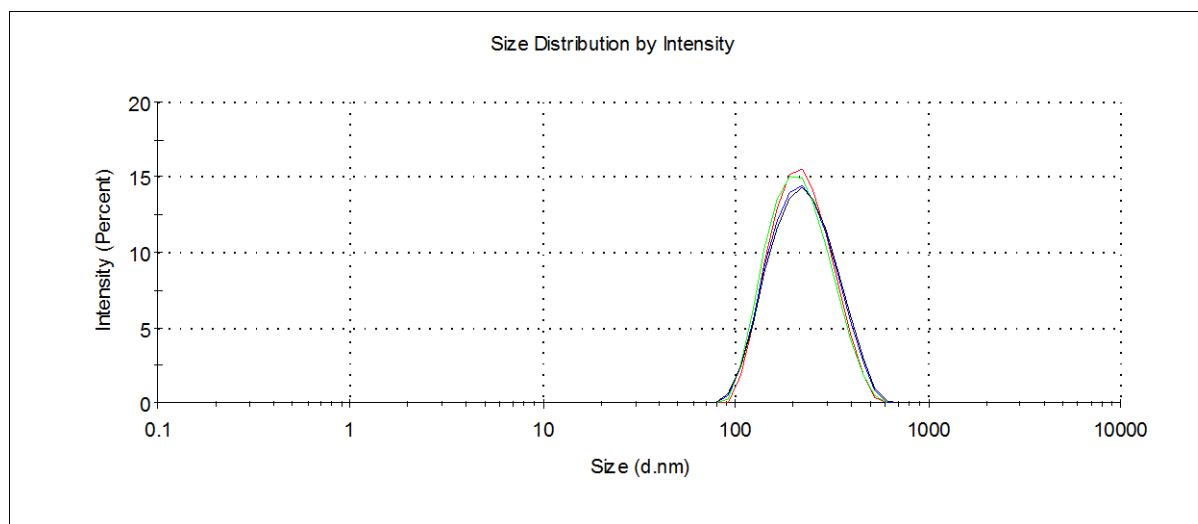
**Fig. S33. Size distribution of the particles by intensity for SLN-4-DTAC ( $1 \times 10^{-4}$  M) at 1:1 ratio in water (the each colored line on the graph means one repeated measurement).**



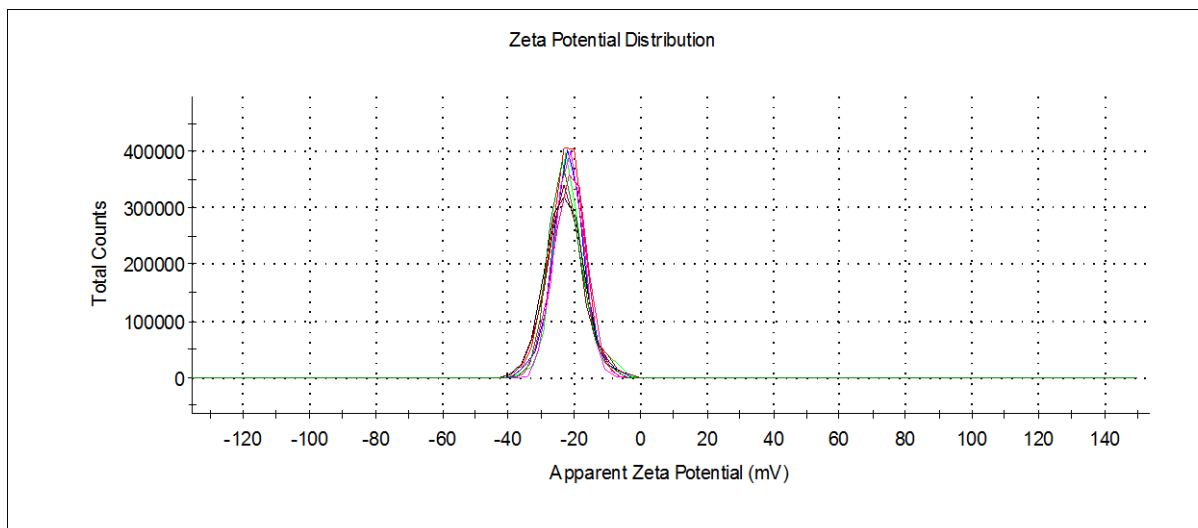
**Fig. S34. Zeta potential distribution of the particles for SLN-4-DTAC ( $1 \times 10^{-4}$  M) at 1:1 ratio in water (the each colored line on the graph means one repeated measurement).**



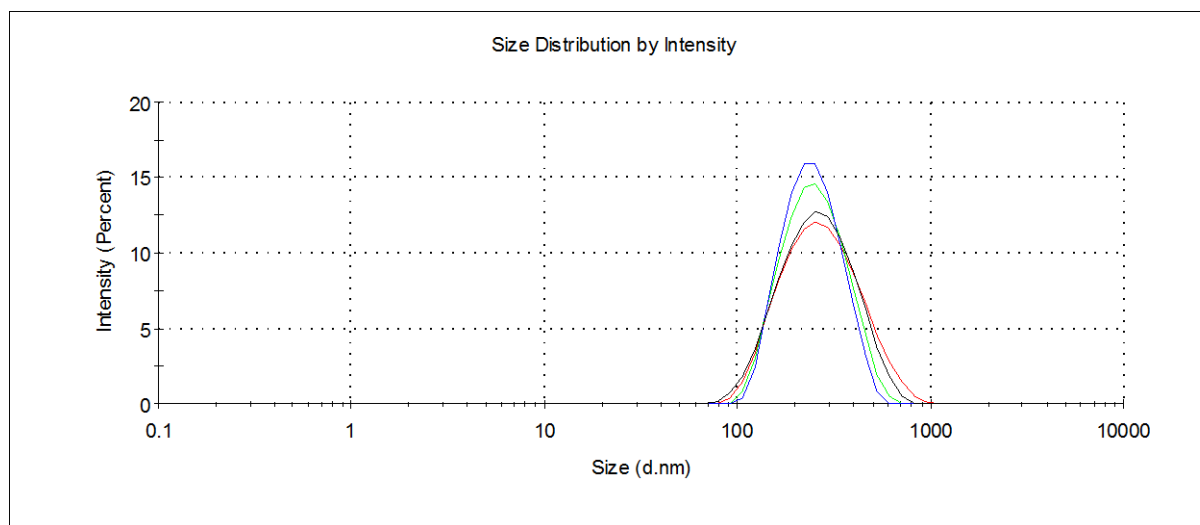
**Fig. S35. Size distribution of the particles by intensity for SLN-4-DTAC ( $3 \times 10^{-4}$  M) at 1:1 ratio in water (the each colored line on the graph means one repeated measurement).**



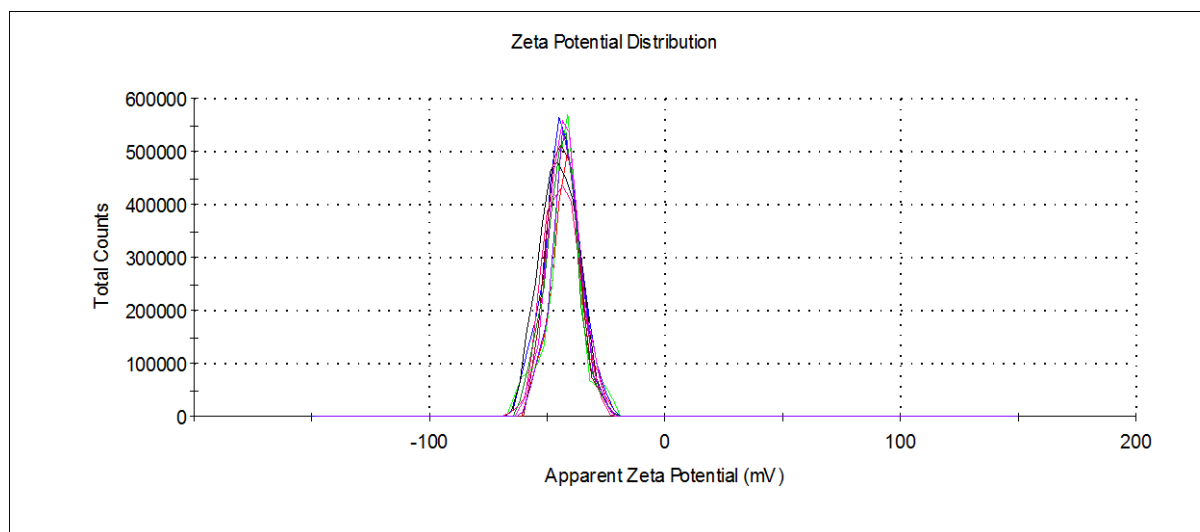
**Fig. S36. Zeta potential distribution of the particles for SLN-4-DTAC ( $3 \times 10^{-4}$  M) at 1:1 ratio in water (the each colored line on the graph means one repeated measurement).**



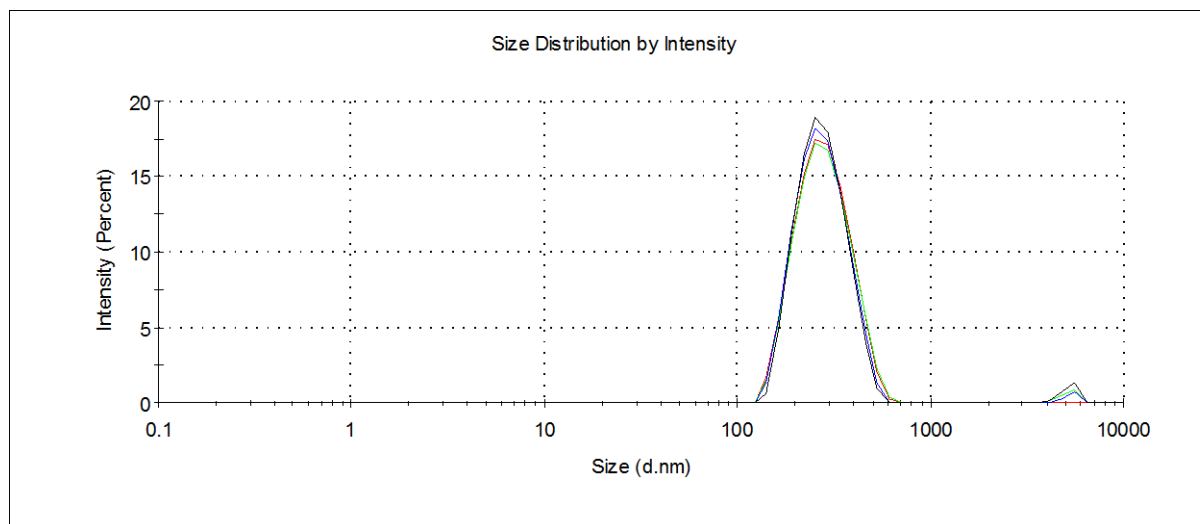
**Fig. S37. Size distribution of the particles by intensity for SLN-5-DTAC ( $1 \times 10^{-4}$  M) at 1:1 ratio in water (the each colored line on the graph means one repeated measurement).**



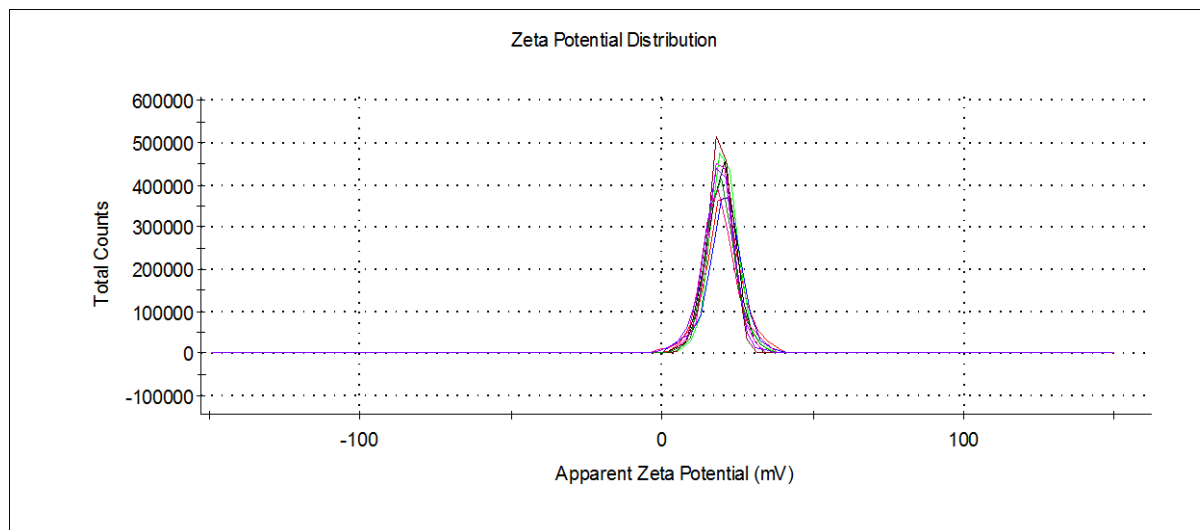
**Fig. S38. Zeta potential distribution of the particles for SLN-5-DTAC ( $1 \times 10^{-4}$  M) at 1:1 ratio in water (the each colored line on the graph means one repeated measurement).**



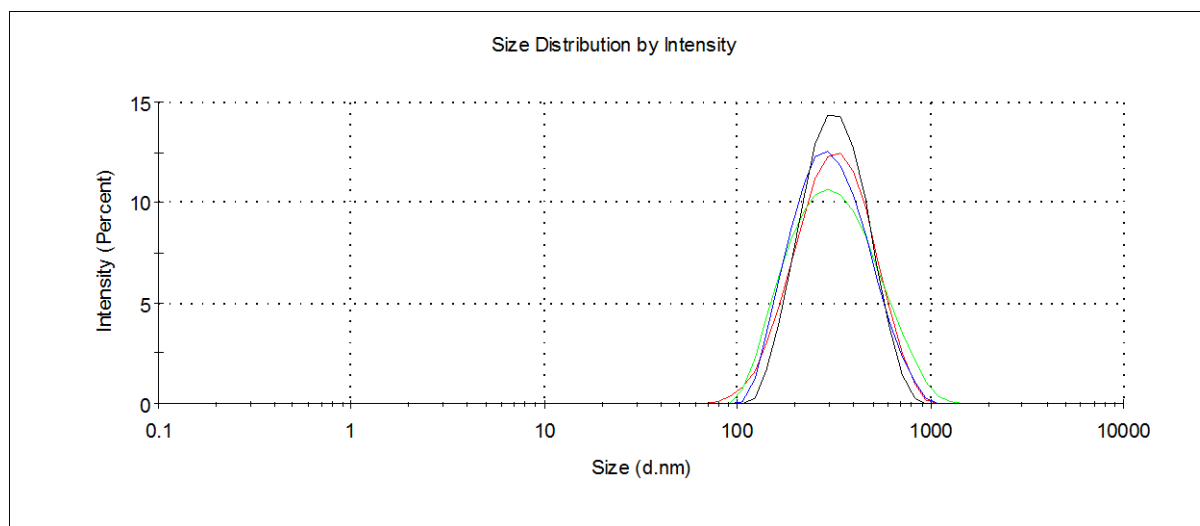
**Fig. S39. Size distribution of the particles by intensity for SLN-5-DTAC ( $1 \times 10^{-4}$  M) at 1:1000 ratio in water (the each colored line on the graph means one repeated measurement).**



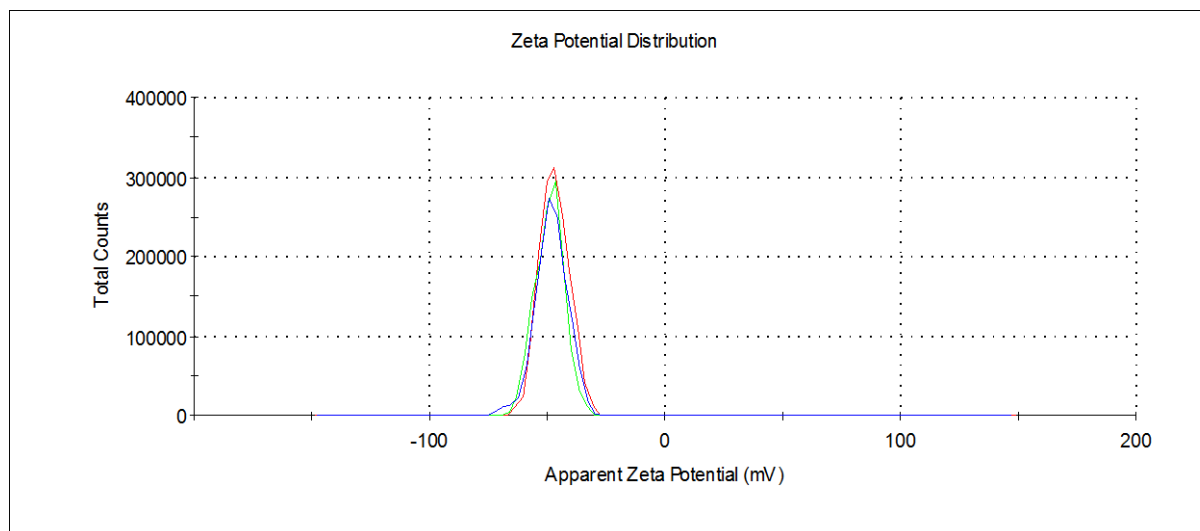
**Fig. S40. Zeta potential distribution of the particles for SLN-5-DTAC ( $1 \times 10^{-4}$  M) at 1:1000 ratio in water (the each colored line on the graph means one repeated measurement).**



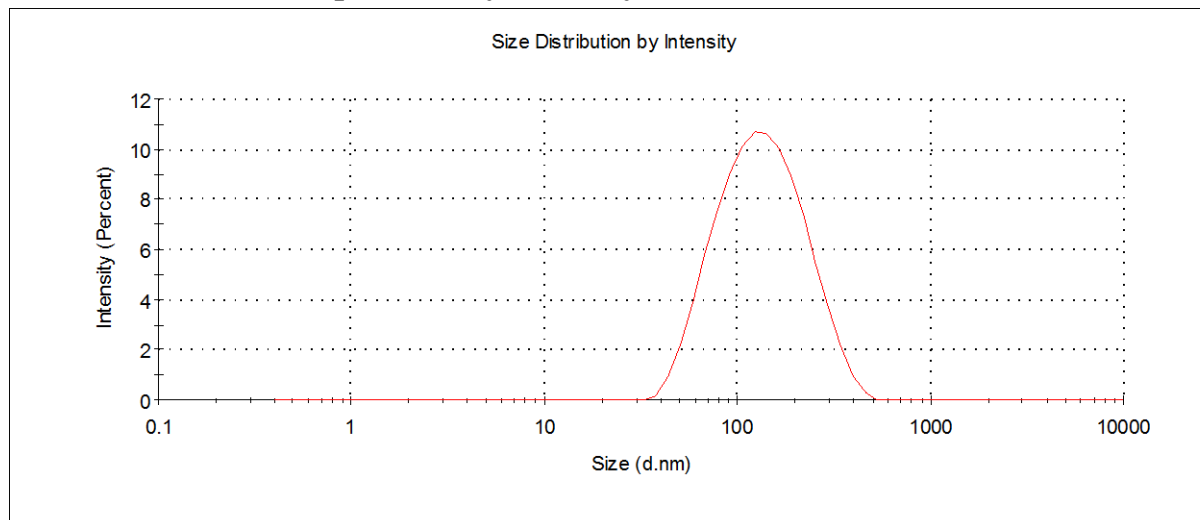
**Fig. S41. Size distribution of the particles by intensity for SLN-6-DTAC ( $1 \times 10^{-4}$  M) at 1:1 ratio in water (the each colored line on the graph means one repeated measurement).**



**Fig. S42. Zeta potential distribution of the particles for SLN-6-DTAC ( $1 \times 10^{-4}$  M) at 1:1 ratio in water (the each colored line on the graph means one repeated measurement).**



**Fig. S43. Size distribution of the particles by intensity for SLN-6-DTAC ( $1 \times 10^{-4}$  M) at 1:100 ratio in water.**



**Fig. S44. Zeta potential distribution of the particles for SLN-6-DTAC ( $1 \times 10^{-4}$  M) at 1:100 ratio in water.**

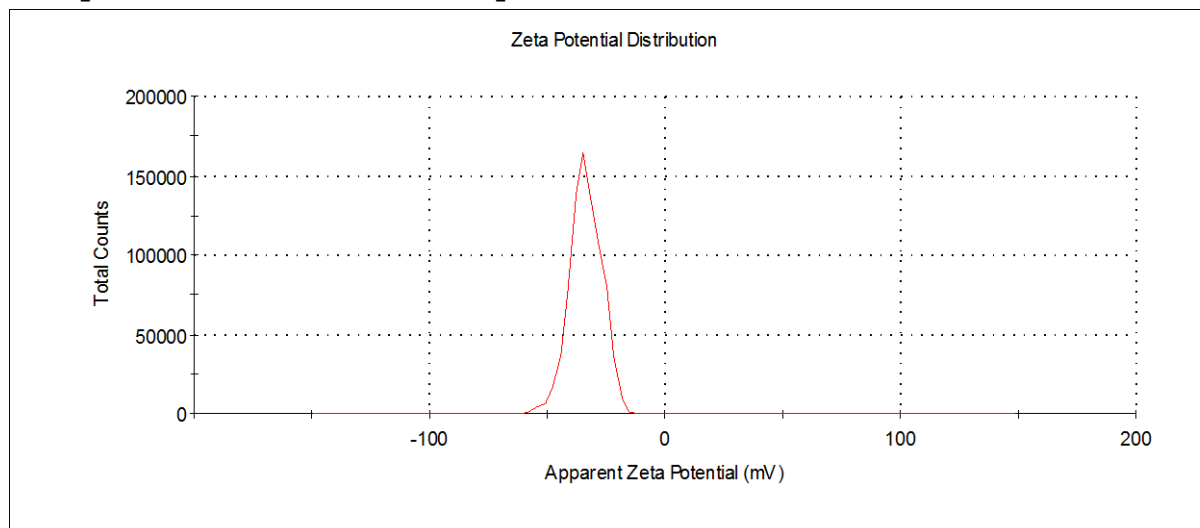


Fig. S45.  $^1\text{H}$  NMR spectra (MeOD- $d_4$ , 298 K, 400 MHz): a) dodecyltrimethylammonium chloride (0.005 mol/l); b) 5 (0.005 mol/l) + dodecyltrimethylammonium chloride (0.005 mol/l); c) 5 (0.005 mol/l).

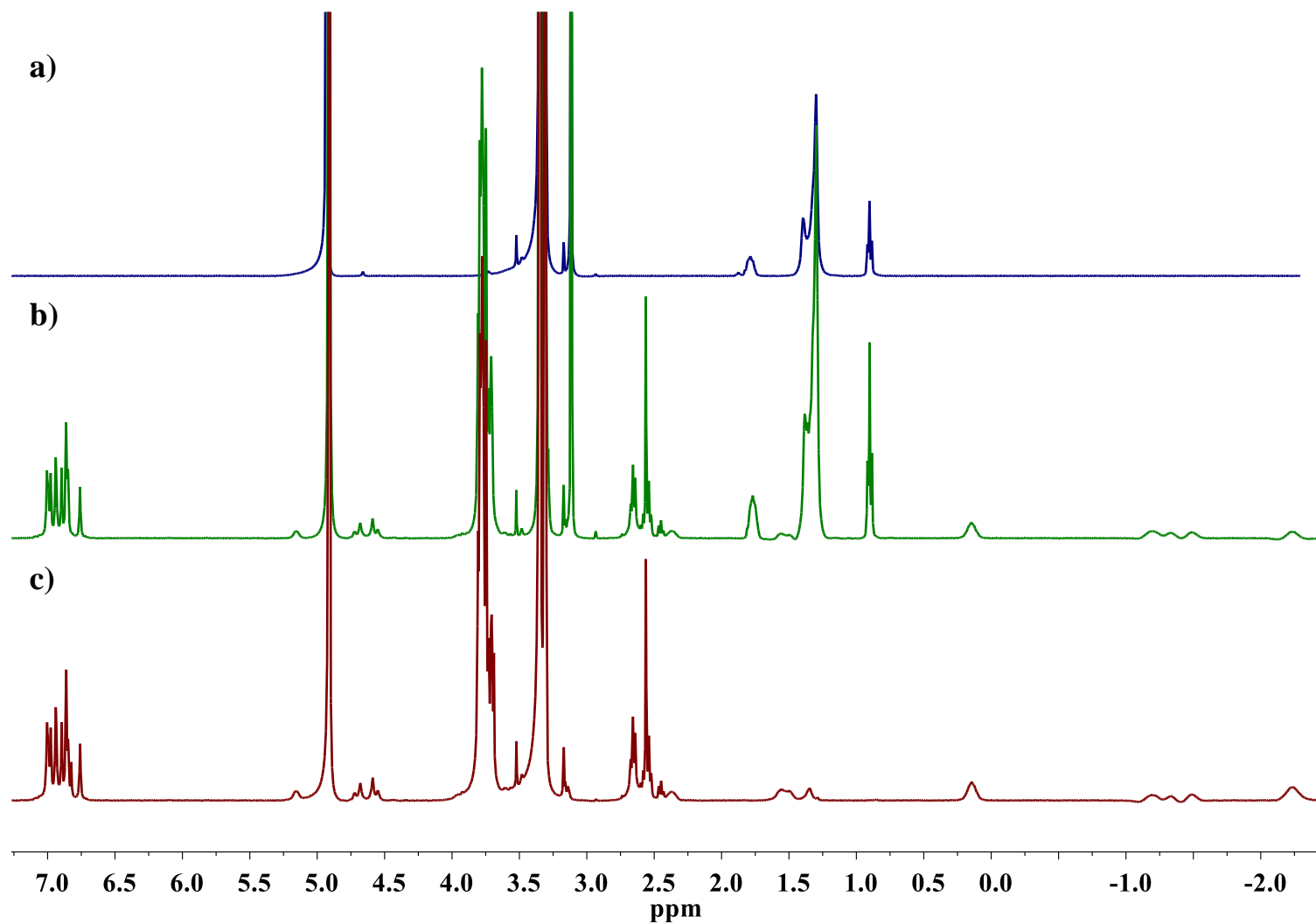




Fig. S46.  $^1\text{H}$  NMR spectra (MeOD- $d_4$ , 298 K, 400 MHz): a) dodecyltrimethylammonium chloride (0.005 mol/l); b) 6 (0.005 mol/l) + dodecyltrimethylammonium chloride (0.005 mol/l); c) 6 (0.005 mol/l).

