

Supporting Information

Hollow amphiphilic crosslinked nanocapsules from sacrificial silica nanoparticle templates and their application as dispersants for oil spill remediation

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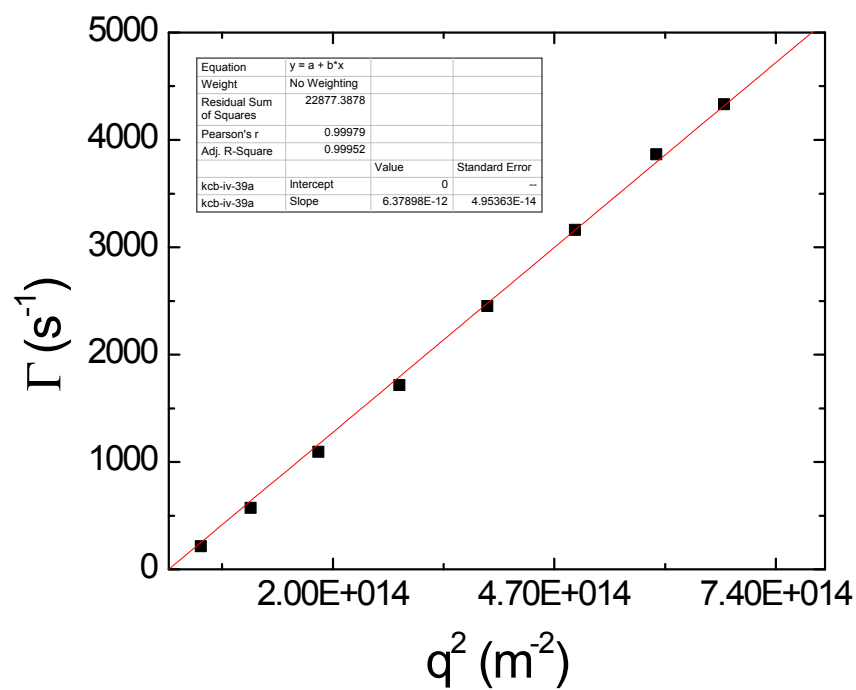


Figure S1. Gamma vs. q^2 plot for NP-GPS-xPCL, 40 min polymerization time, in THF. $R_h = 75$ nm

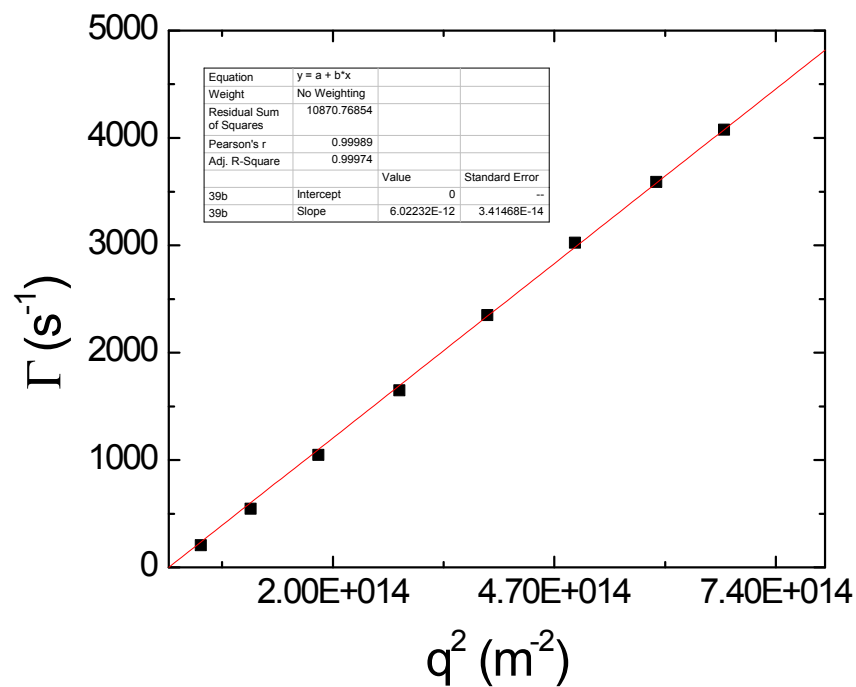


Figure S2. Gamma vs. q^2 plot for NP-GPS-xPCL, 80 min polymerization time, in THF. $R_h = 79$ nm

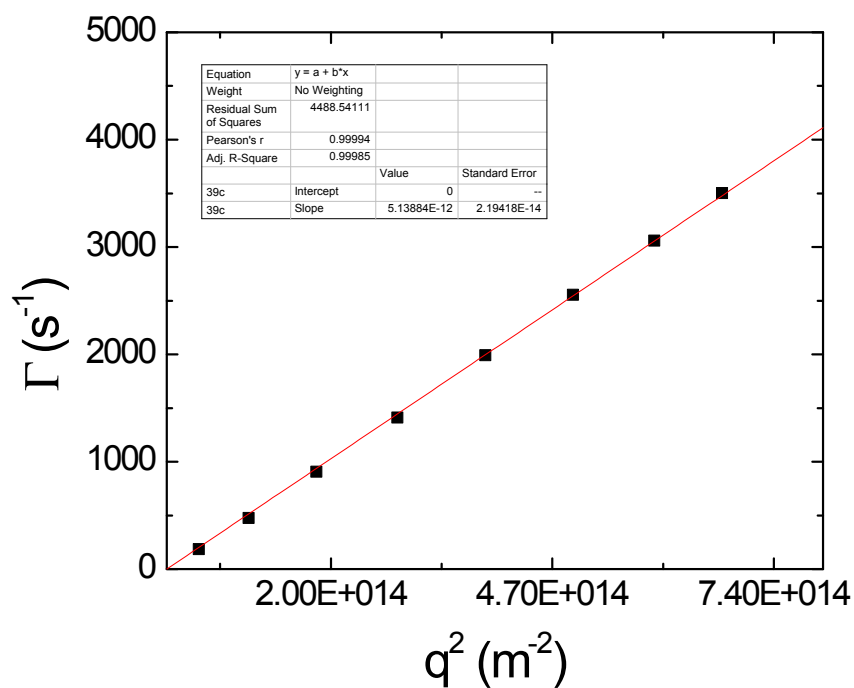


Figure S3. Gamma vs. q^2 plot for NP-GPS-xPCL, 120 min polymerization time, in THF. $R_h = 93$ nm

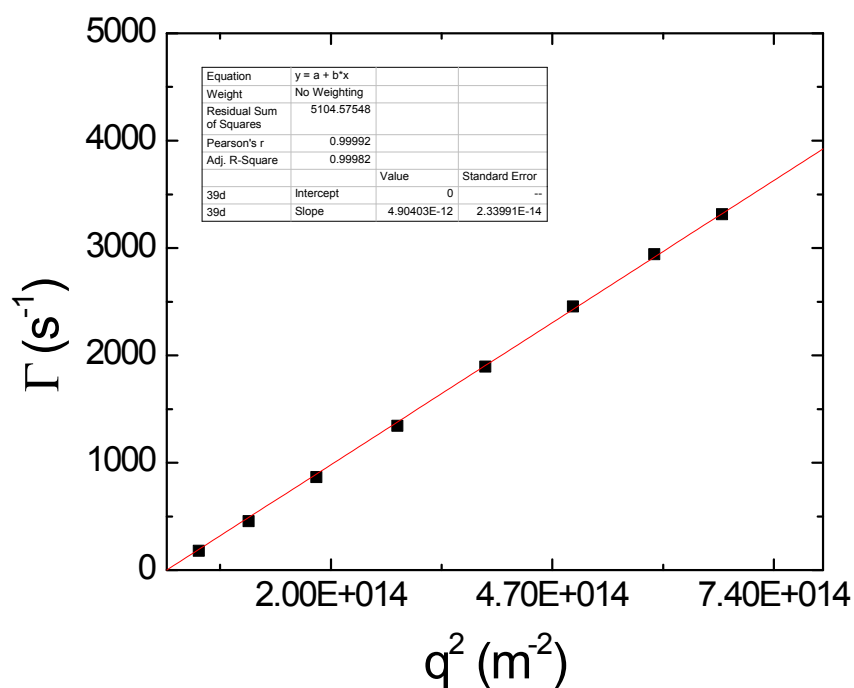


Figure S4. Gamma vs. q^2 plot for NP-GPS-xPCL, 160 min polymerization time, in THF. $R_h = 98$ nm

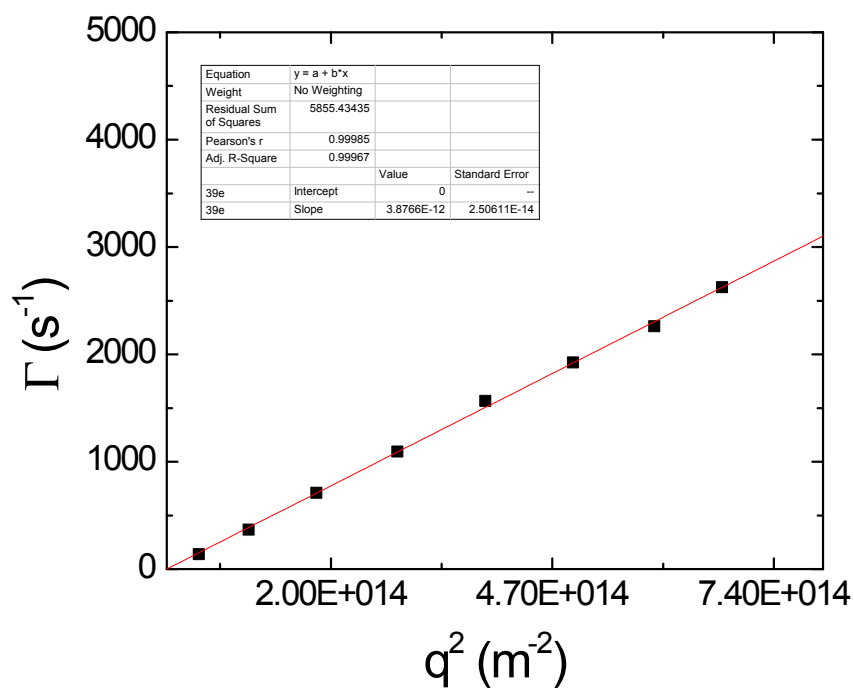


Figure S5. Gamma vs. q^2 plot for NP-GPS-xPCL, 200 min polymerization time, in THF. $R_h = 123$ nm

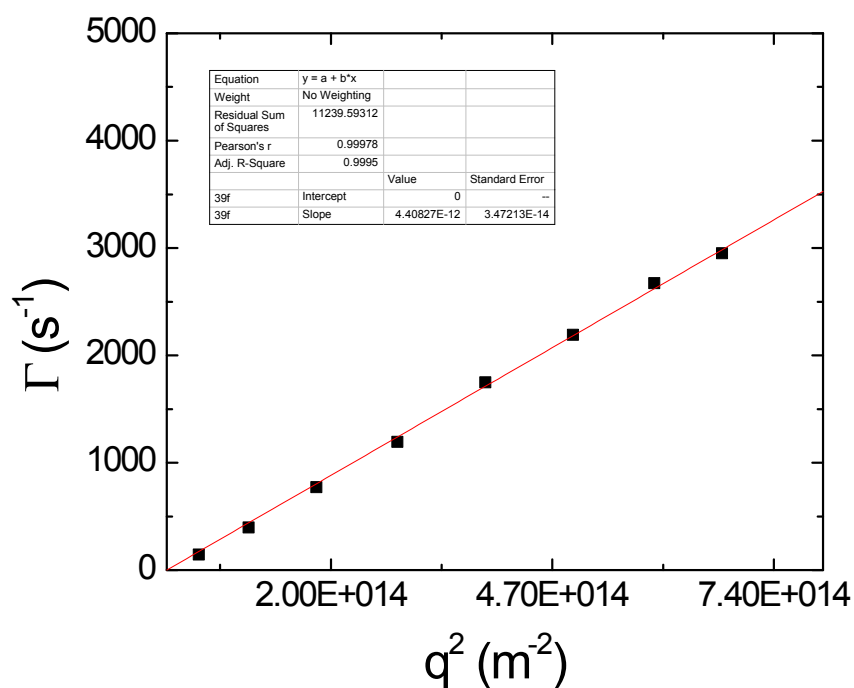


Figure S6. Gamma vs. q^2 plot for NP-GPS-xPCL, 240 min polymerization time, in THF. $R_h = 109$ nm

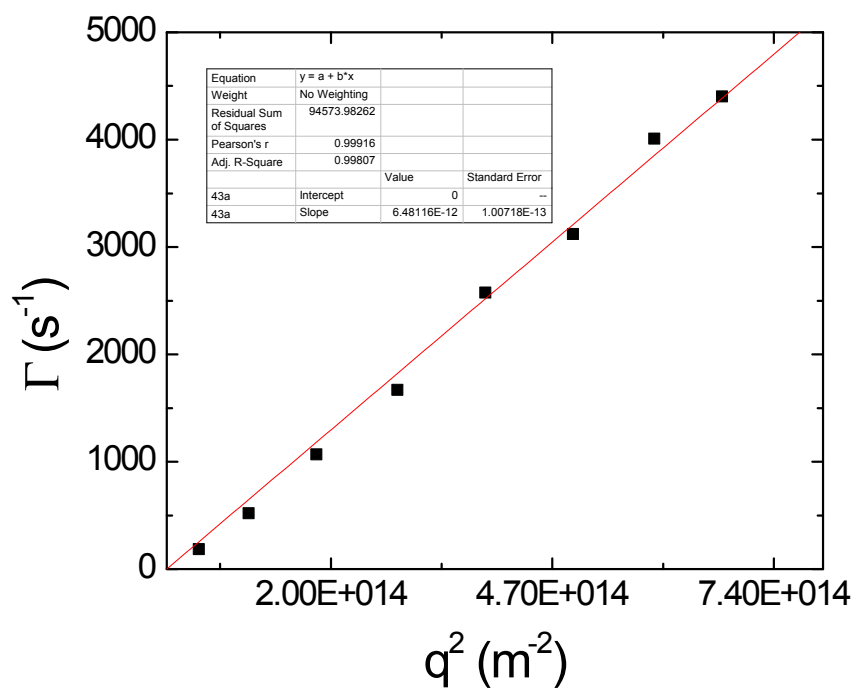


Figure S7. Gamma vs. q^2 plot for NP-GPS-PCL, 40 min polymerization time, in THF. $R_h = 74$ nm

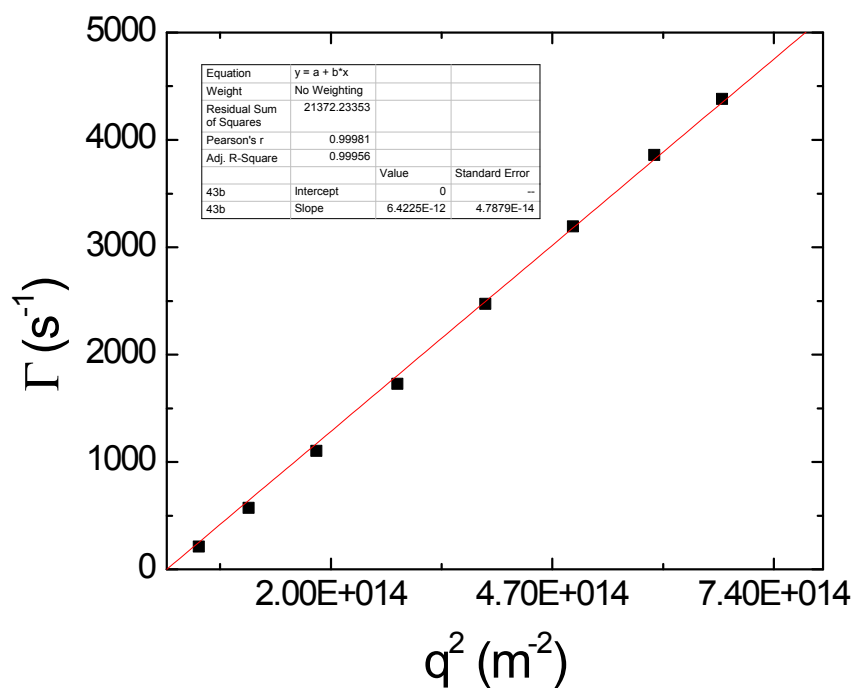


Figure S8. Gamma vs. q^2 plot for NP-GPS-PCL, 80 min polymerization time, in THF. $R_h = 74$ nm

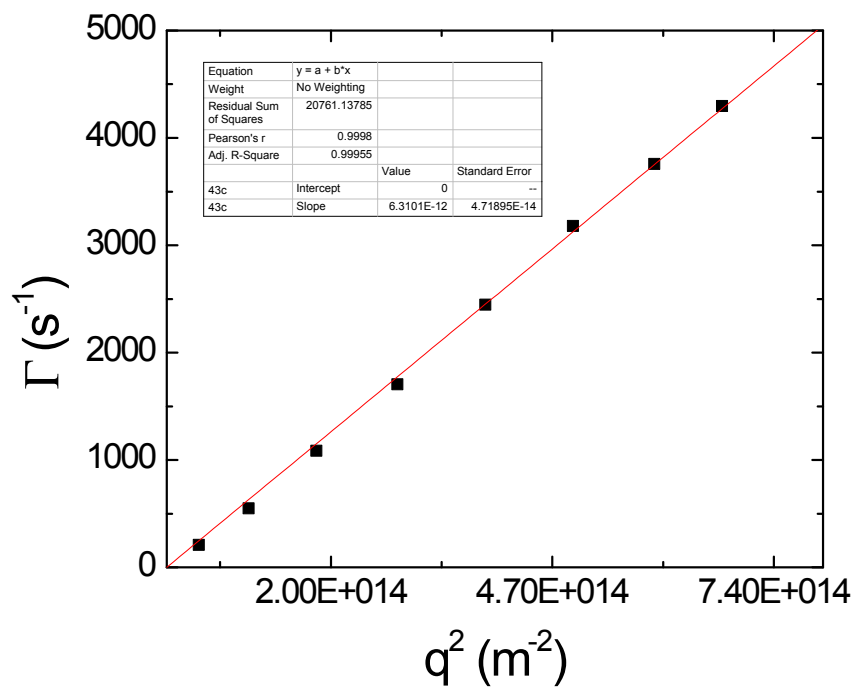


Figure S9. Gamma vs. q^2 plot for NP-GPS-PCL, 120 min polymerization time, in THF. $R_h = 76$ nm

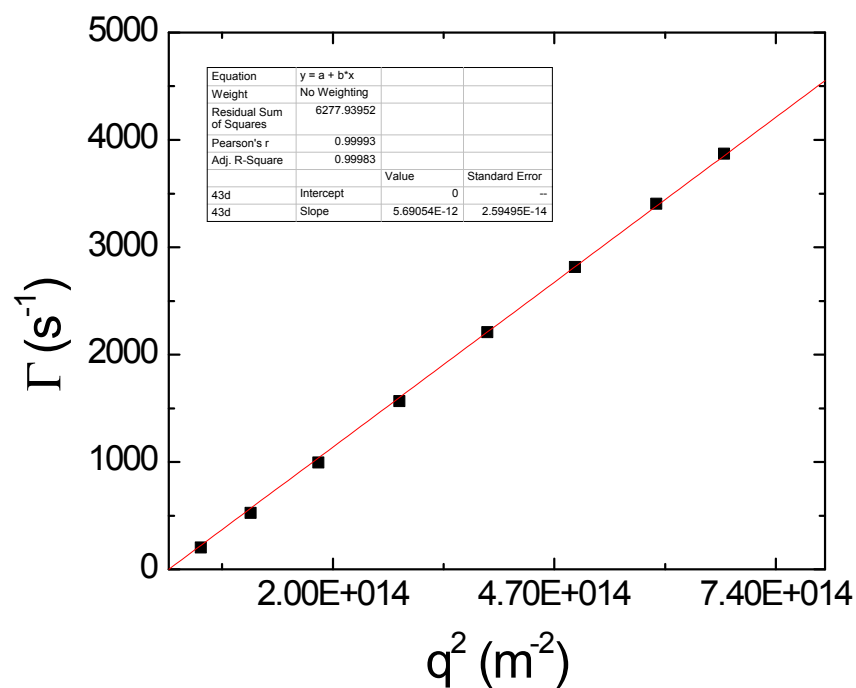


Figure S10. Gamma vs. q^2 plot for NP-GPS-PCL, 160 min polymerization time, in THF. $R_h = 84$ nm

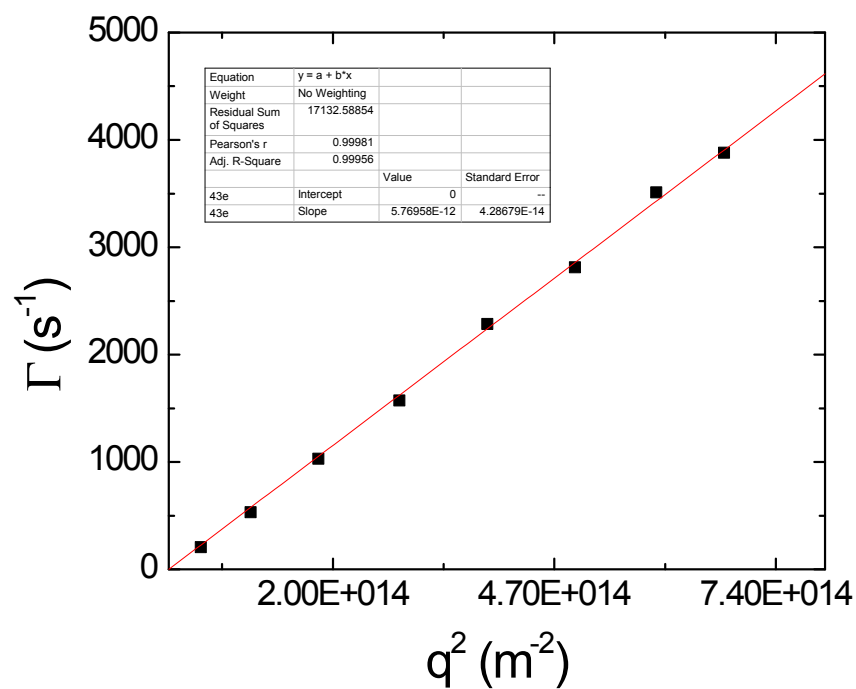


Figure S11. Gamma vs. q^2 plot for NP-GPS-PCL, 200 min polymerization time, in THF. $R_h = 83$ nm

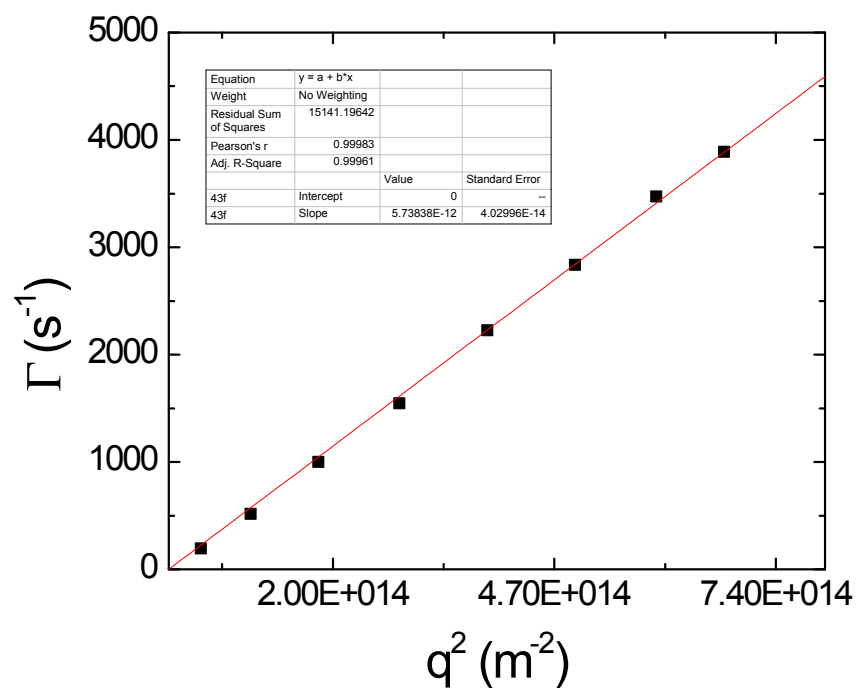


Figure S12. Gamma vs. q^2 plot for NP-GPS-PCL, 240 min polymerization time, in THF. $R_h = 83$ nm

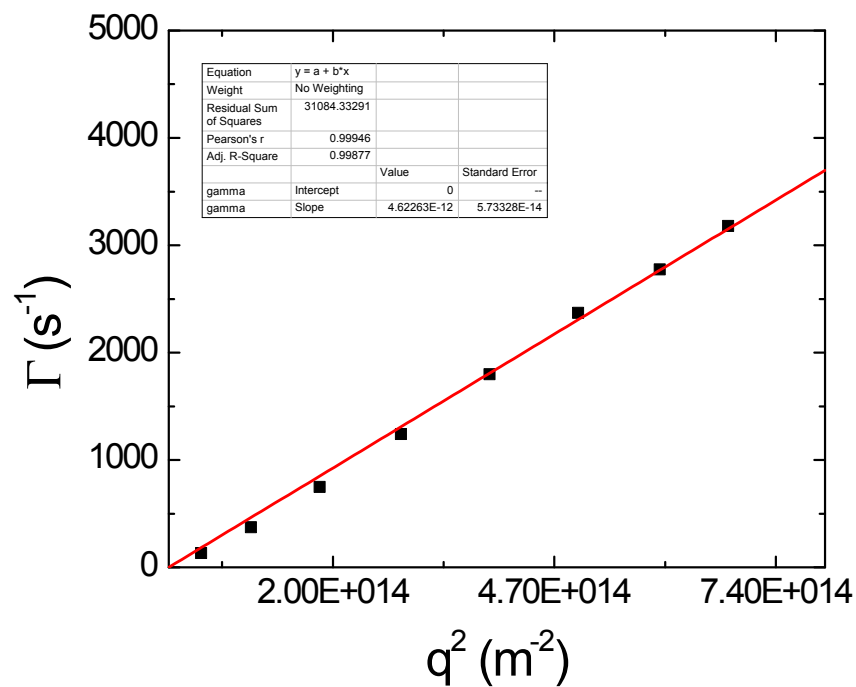


Figure S13. Gamma vs. q^2 plot for NP-GPS-PCL used for subsequent reactions towards hollow nanocapsules, in THF, $R_h = 104$ nm

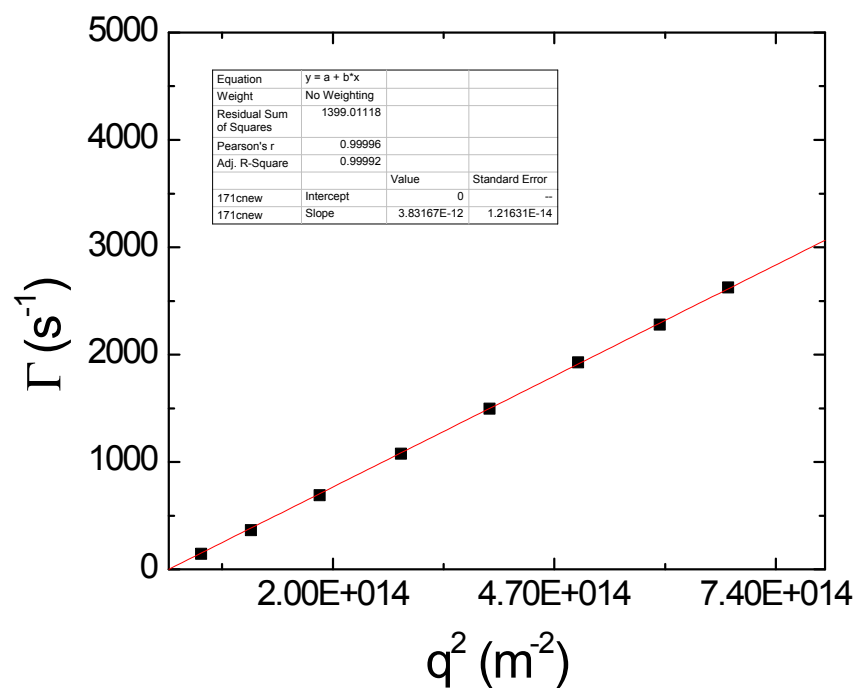


Figure S14. Gamma vs. q^2 plot for NP-GPS-PCL-xPCL, in THF. $R_h = 125$ nm

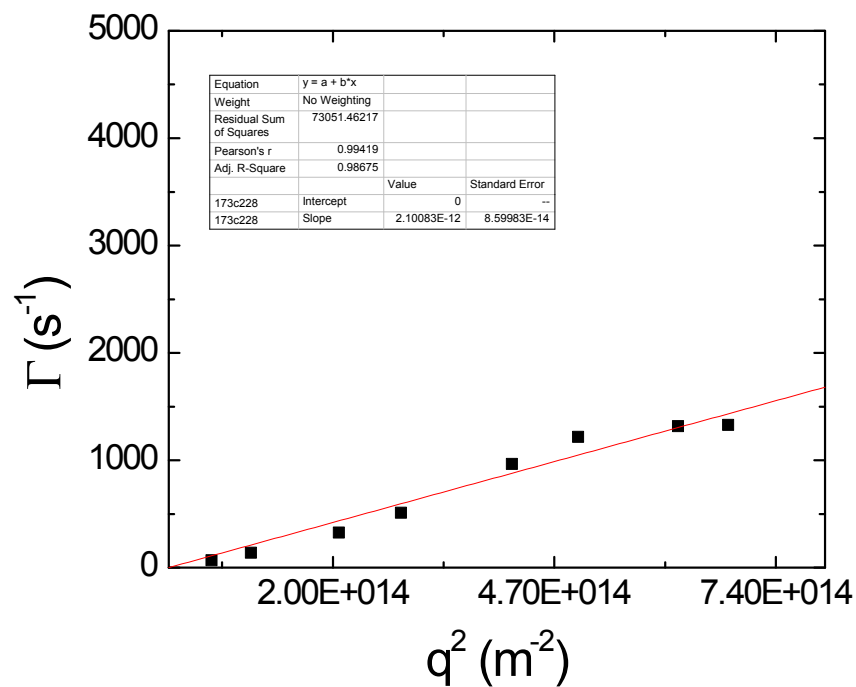


Figure S15. Gamma vs. q^2 plot for Hollow-GPS-PCL-xPCL, in THF. $R_h = 228$ nm

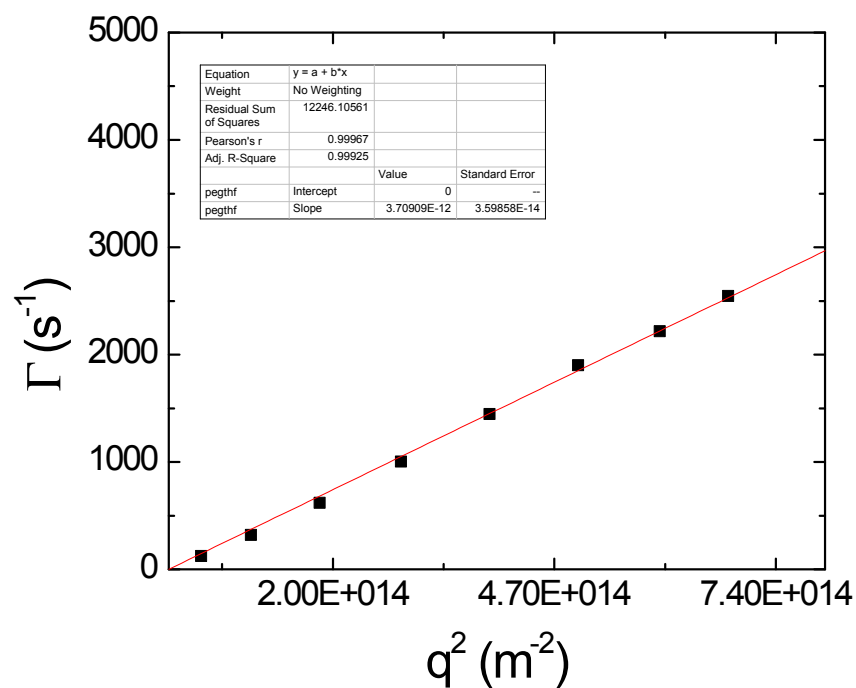


Figure S16. Gamma vs. q^2 plot for NP-GPS-PCL-xPCL-PEG in THF, $R_h = 129$ nm

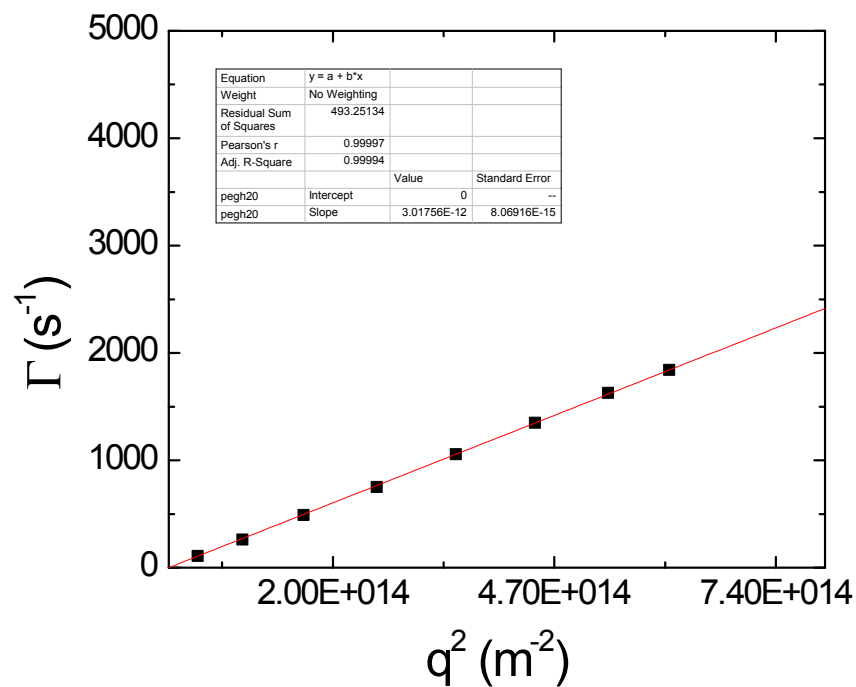


Figure S17. Gamma vs. q^2 plot for NP-GPS-PCL-xPCL-PEG, in H_2O , $R_h = 81$ nm

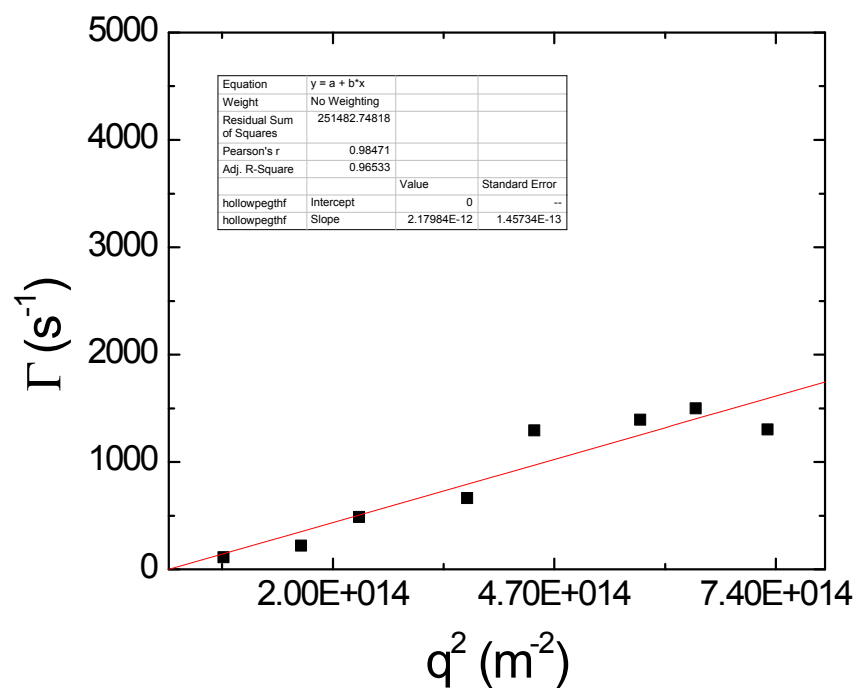


Figure S18. Gamma vs. q^2 plot for Hollow-GPS-PCL-xPCL-PEG, in THF. $R_h = 219$ nm

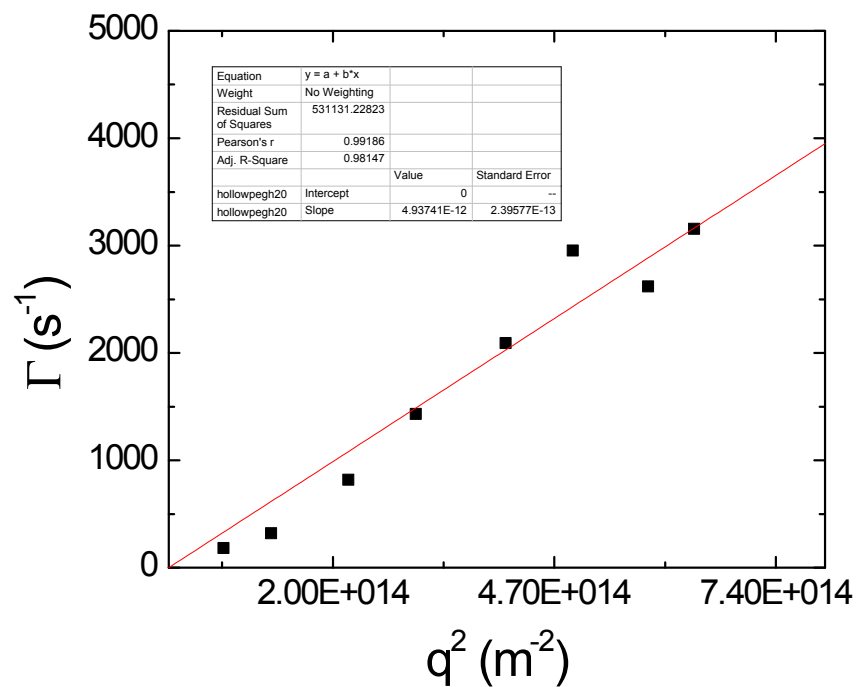


Figure S19. Gamma vs. q^2 plot for Hollow-GPS-PCL-xPCL-PEG, in H_2O . $R_h = 50$ nm

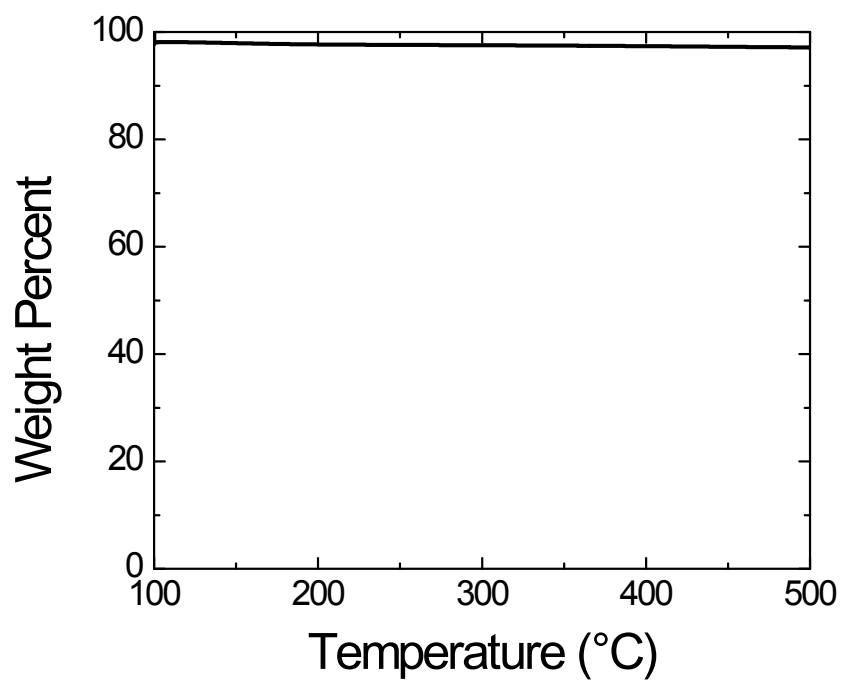


Figure S20. TGA mass loss profile for bare silica nanoparticles.

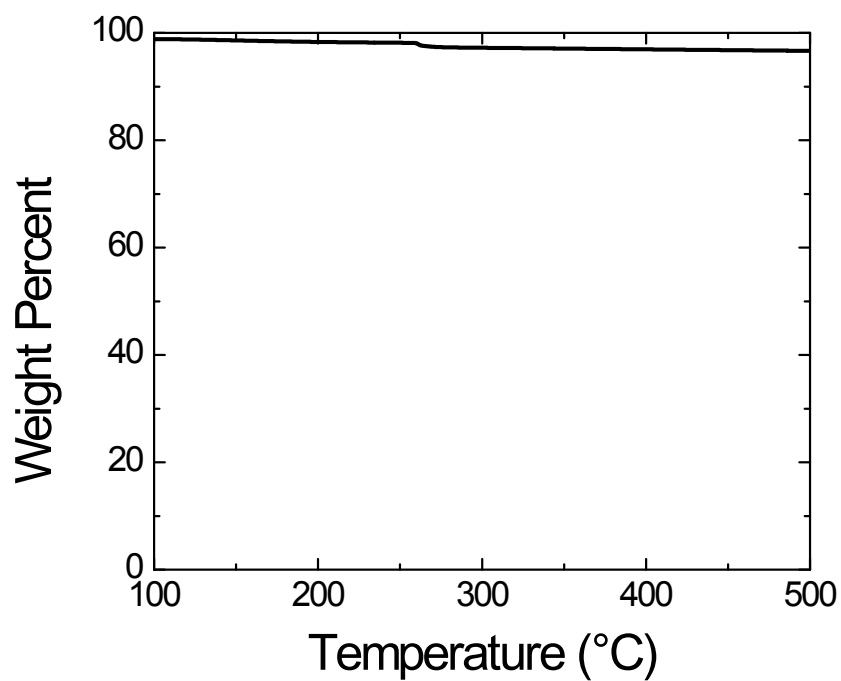


Figure S21. TGA mass loss profile for NP-GPS.

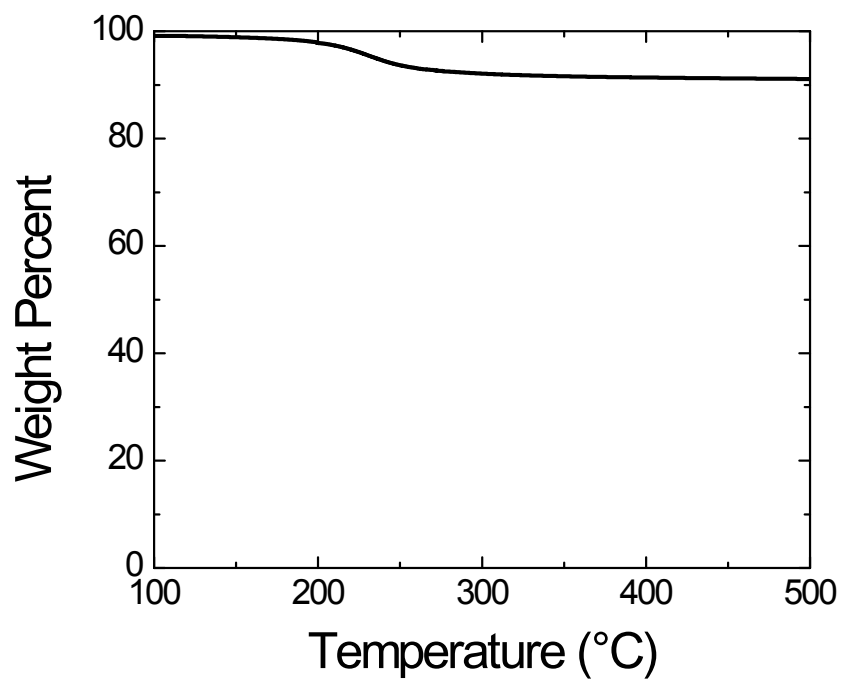


Figure S22. TGA mass loss profile for NP-GPS-xPCL, 40 minute polymerization time.

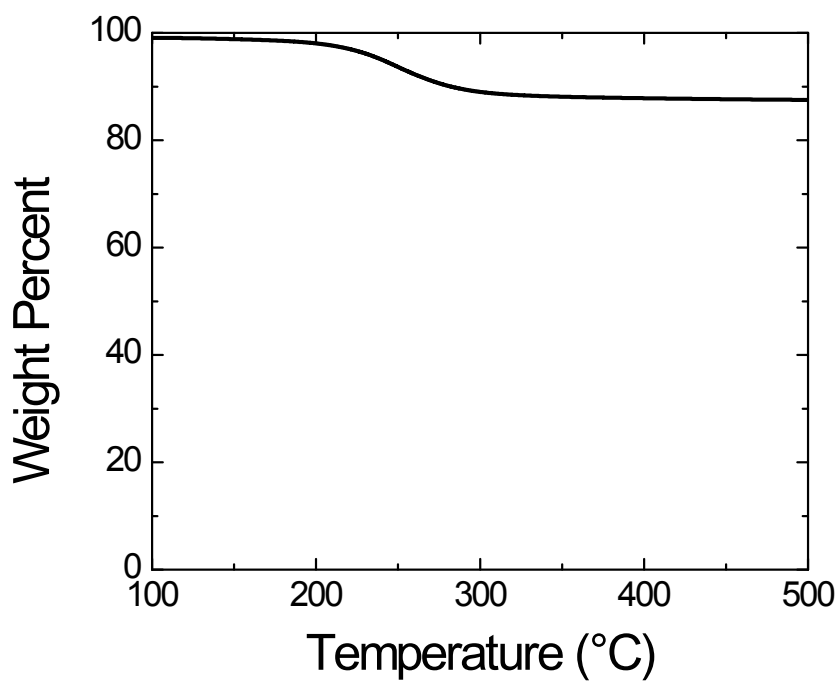


Figure S23. TGA mass loss profile for NP-GPS-xPCL, 80 minute polymerization time.

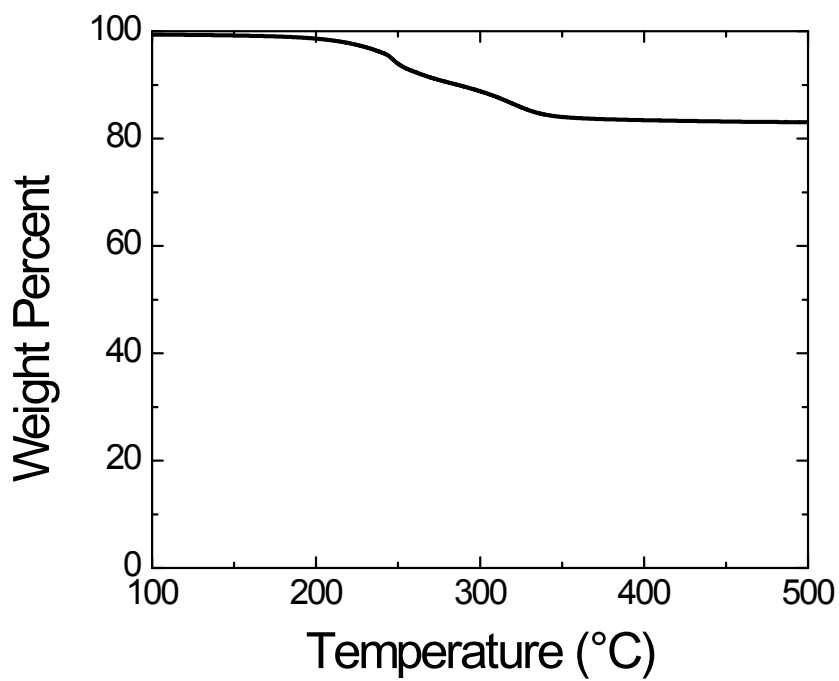


Figure S24. TGA mass loss profile for NP-GPS-xPCL, 120 minute polymerization time.

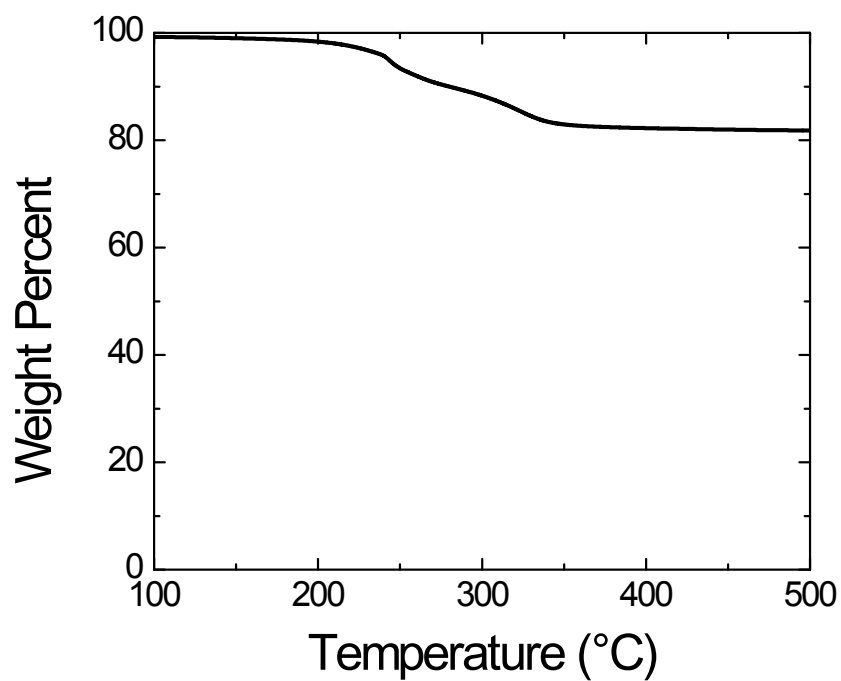


Figure S25. TGA mass loss profile for NP-GPS-xPCL, 160 minute polymerization time.

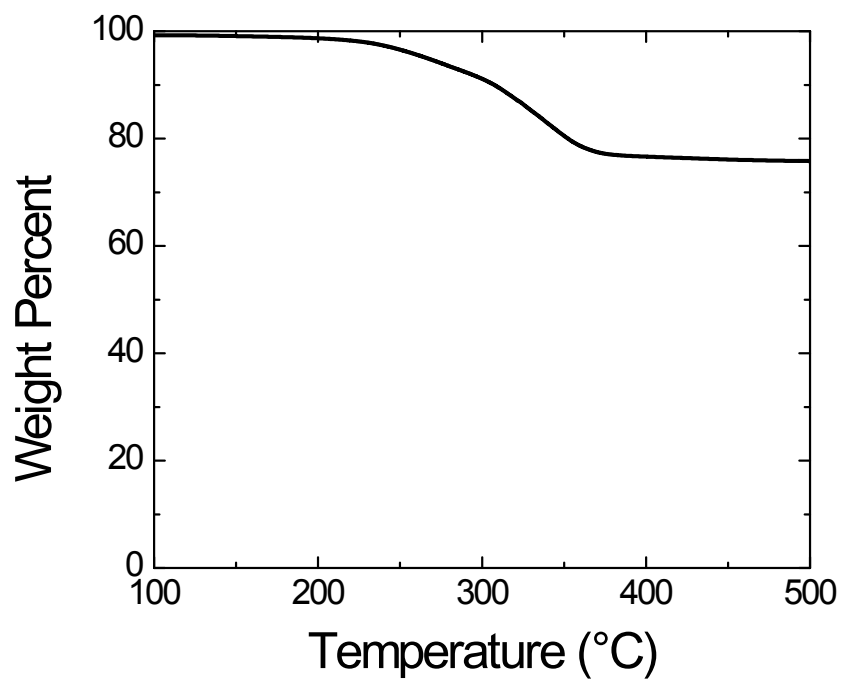


Figure S26. TGA mass loss profile for NP-GPS-xPCL, 200 minute polymerization time.

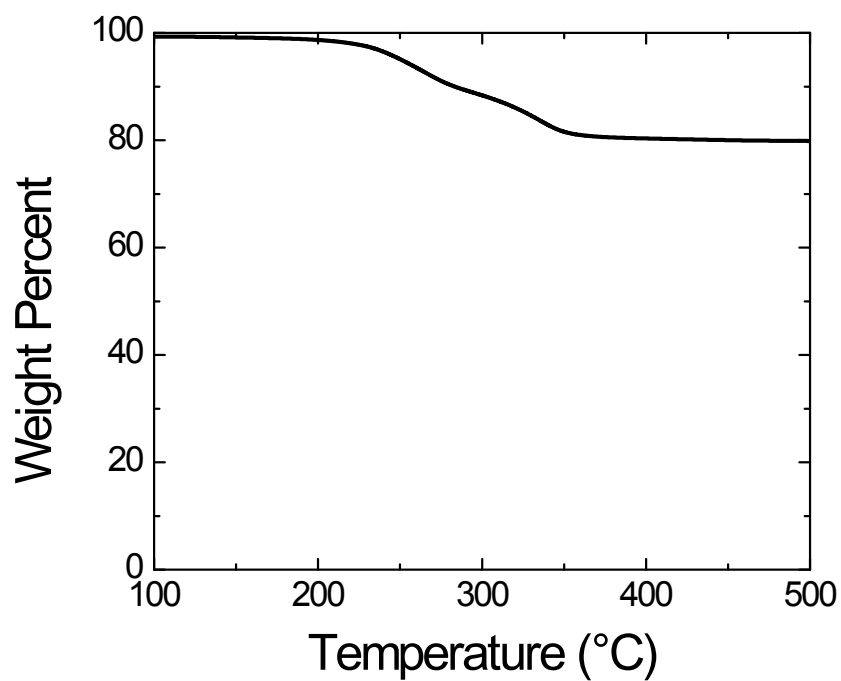


Figure S27. TGA mass loss profile for NP-GPS-xPCL, 240 minute polymerization time.

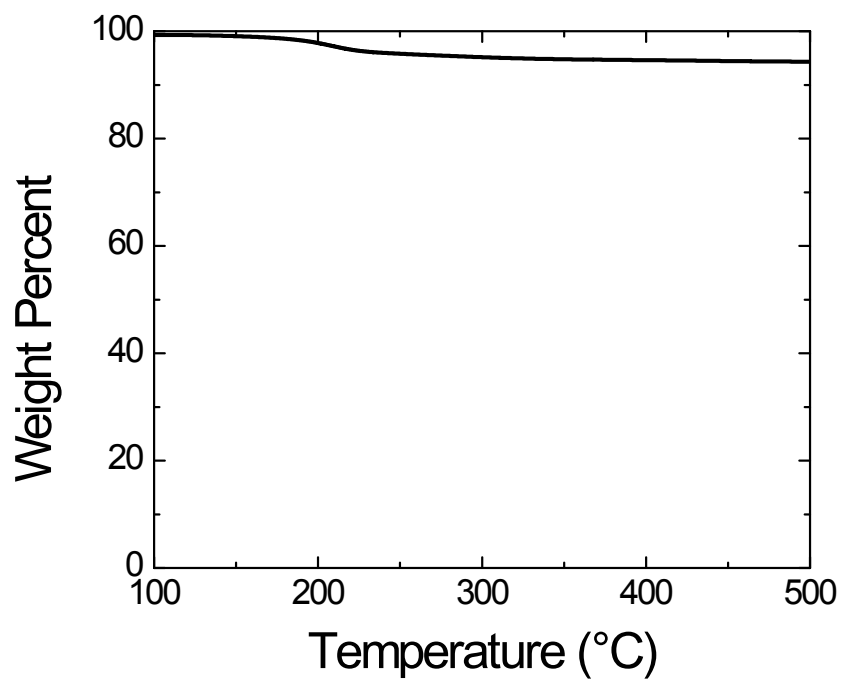


Figure S28. TGA mass loss profile for NP-GPS-PCL, 40 minute polymerization time.

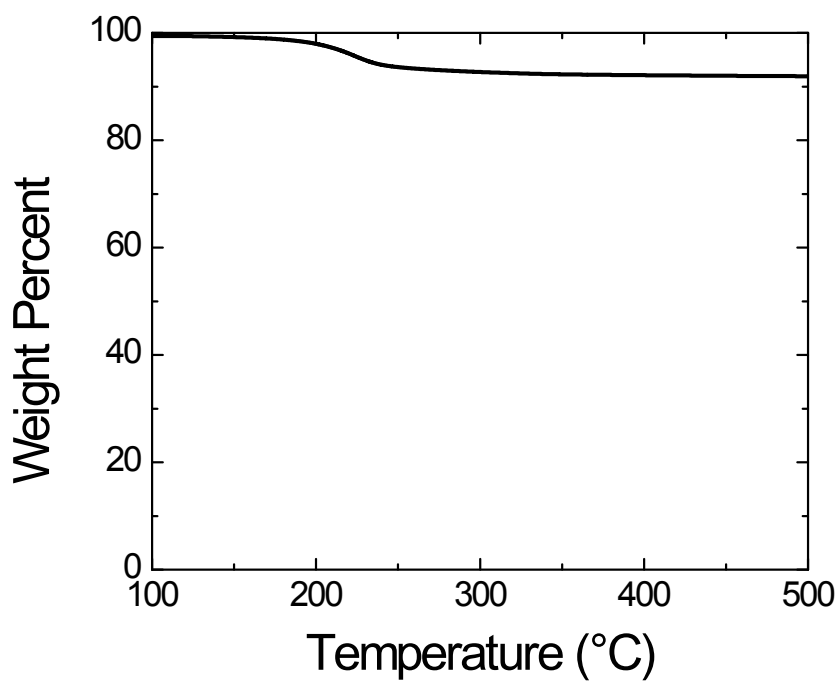


Figure S29. TGA mass loss profile for NP-GPS-PCL, 80 minute polymerization time.

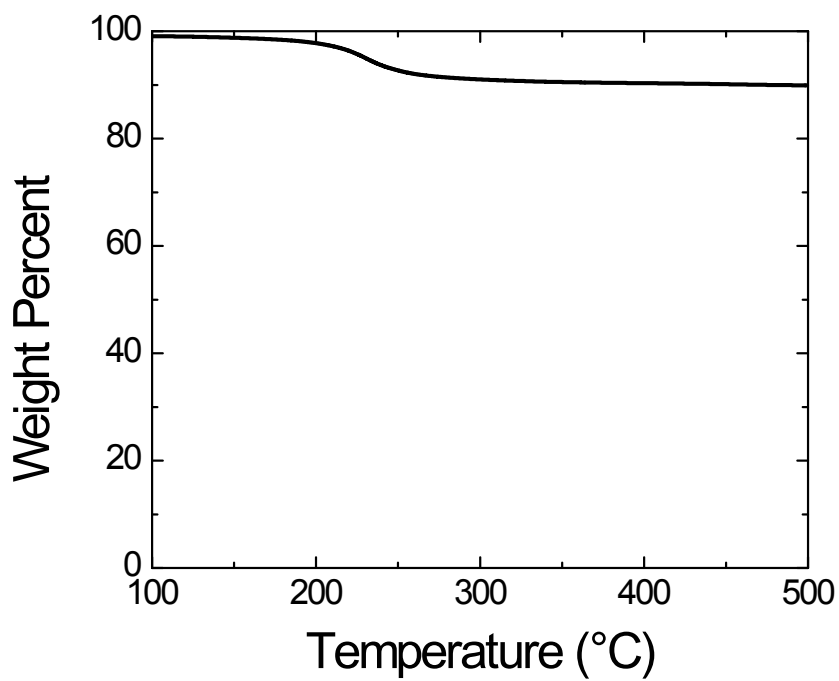


Figure S30. TGA mass loss profile for NP-GPS-PCL, 120 minute polymerization time.

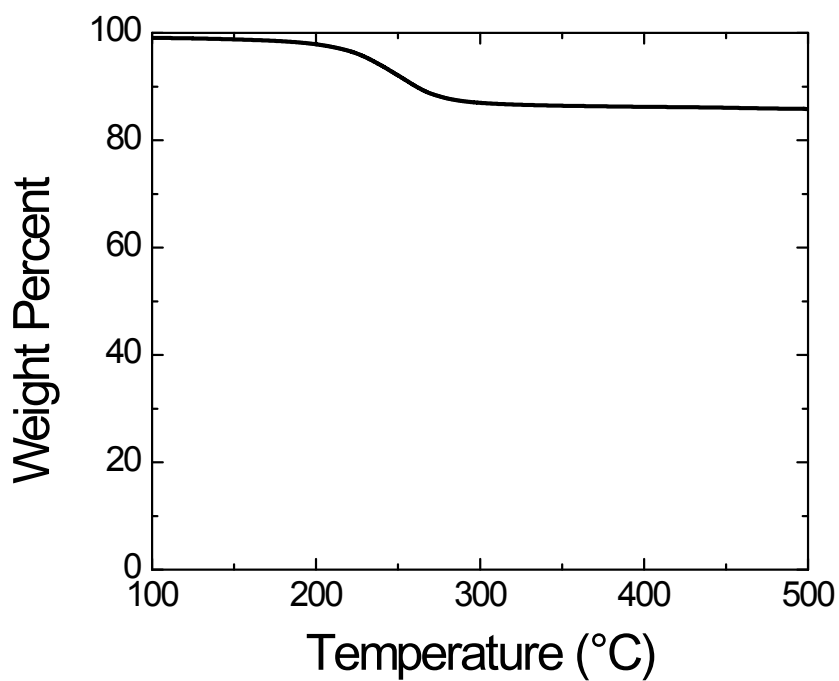


Figure S31. TGA mass loss profile for NP-GPS-PCL, 160 minute polymerization time.

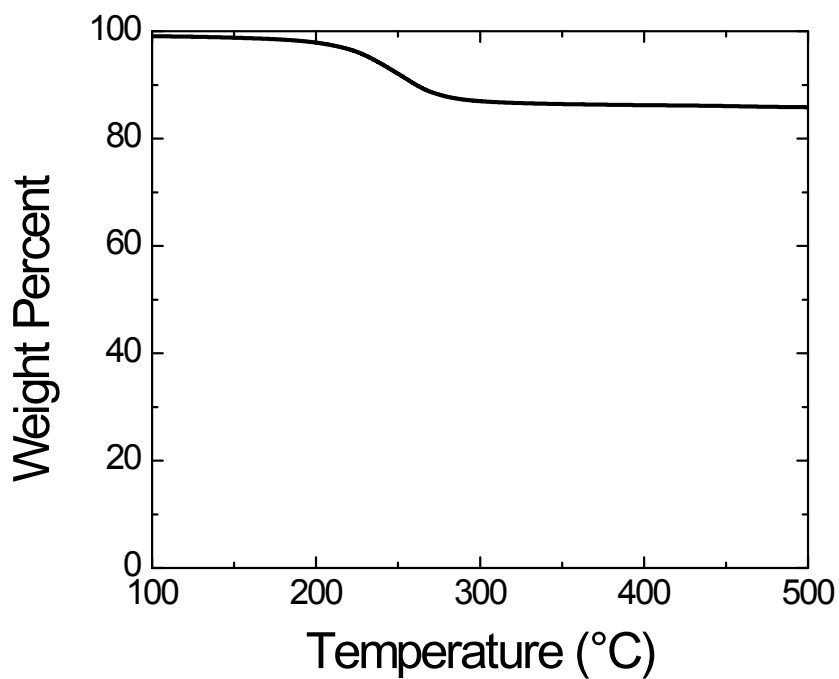


Figure S32. TGA mass loss profile for NP-GPS-PCL, 200 minute polymerization time.

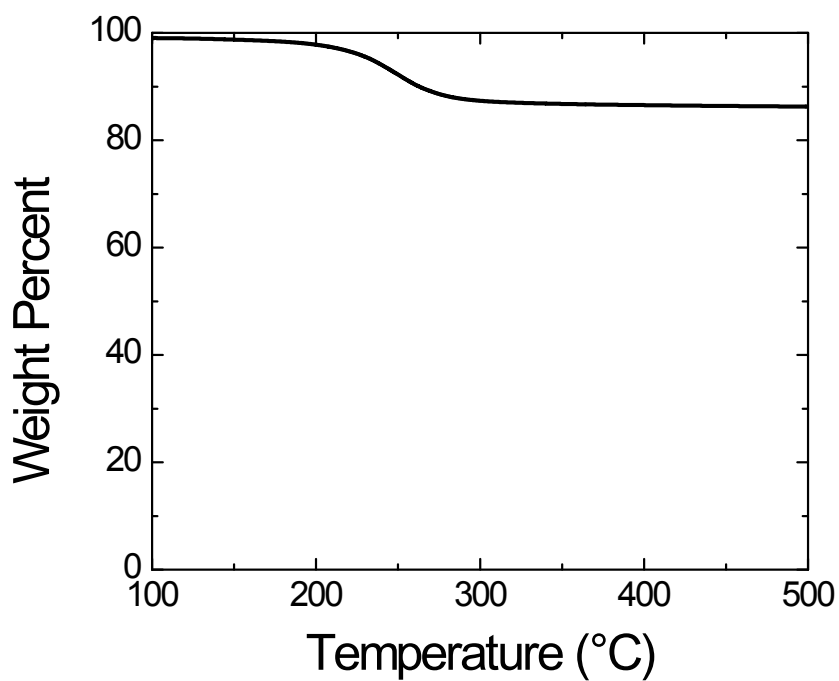


Figure S33. TGA mass loss profile for NP-GPS-PCL, 240 minute polymerization time.

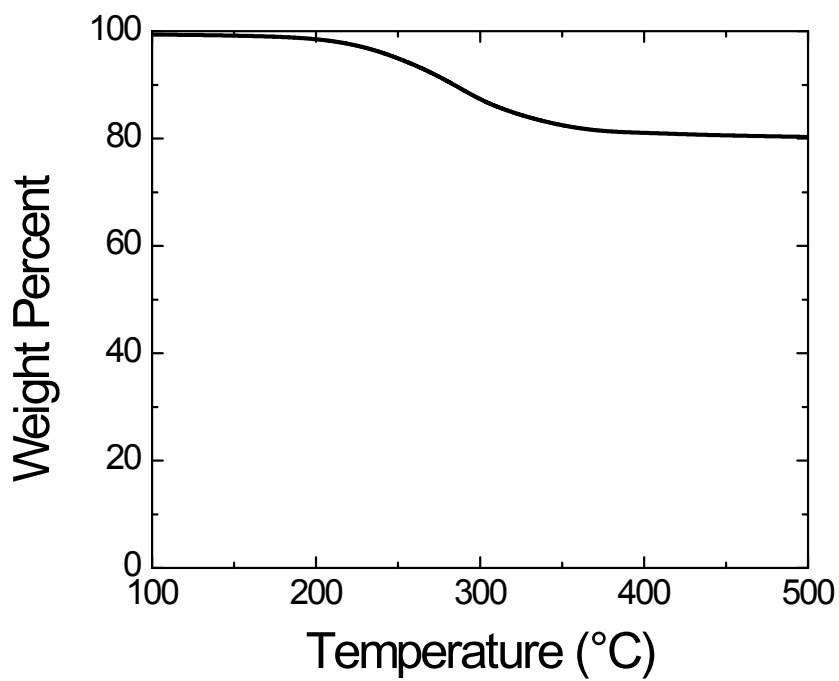


Figure S34. TGA mass loss profile for NP-GPS-PCL used for subsequent reactions towards hollow nanocapsules

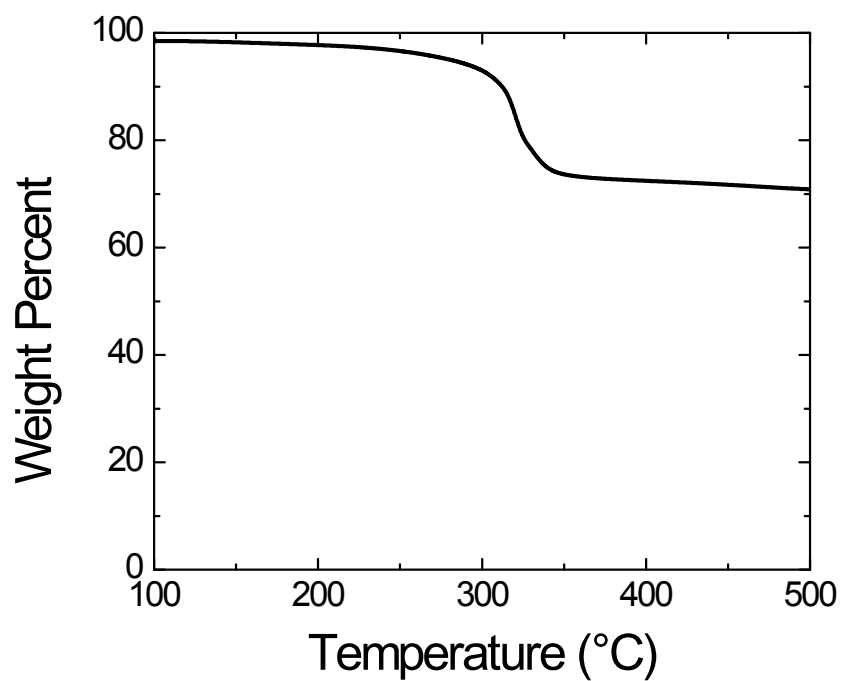


Figure S35. TGA mass loss profile for NP-GPS-PCL-xPCL

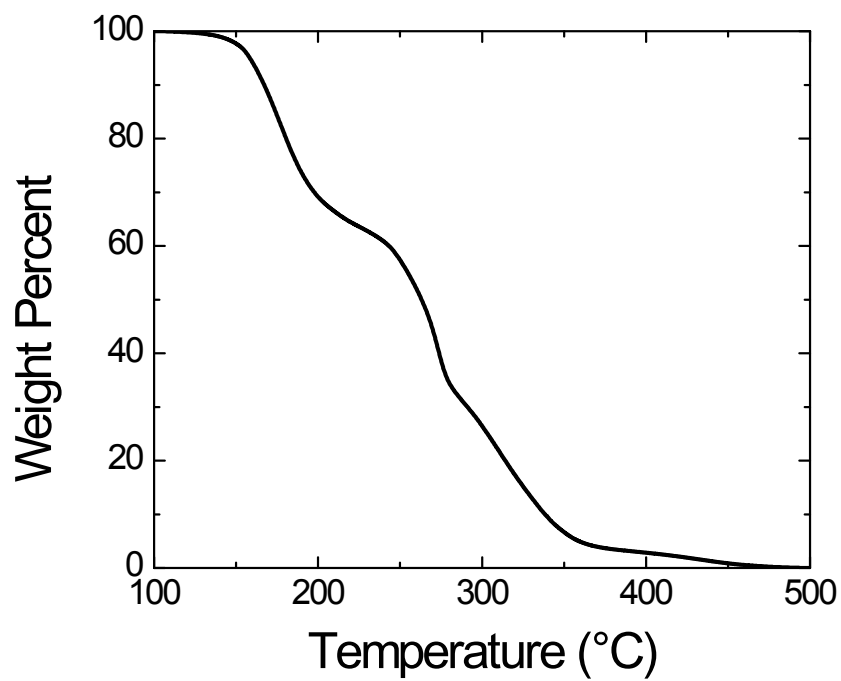


Figure S36. TGA mass loss profile for Hollow-GPS-PCL-xPCL

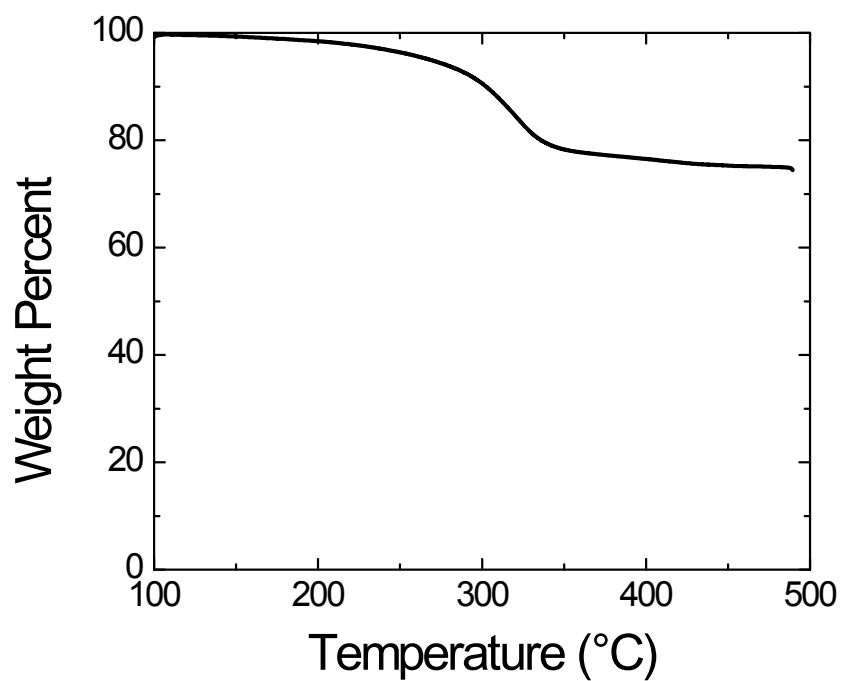


Figure S37. TGA mass loss profile for NP-GPS-PCL-xPCL-PEG

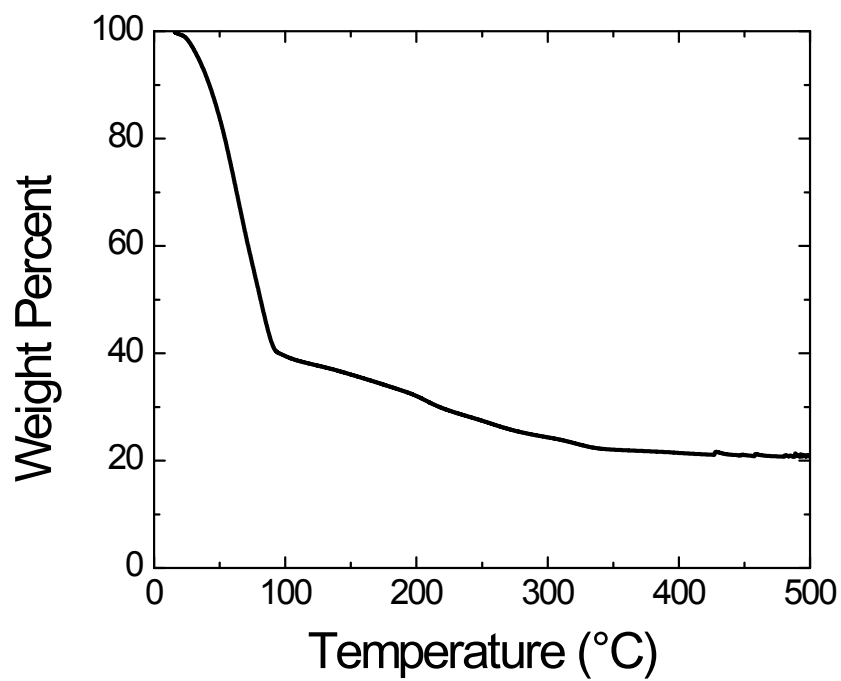


Figure S38. TGA mass loss profile for Hollow-GPS-PCL-xPCL-PEG

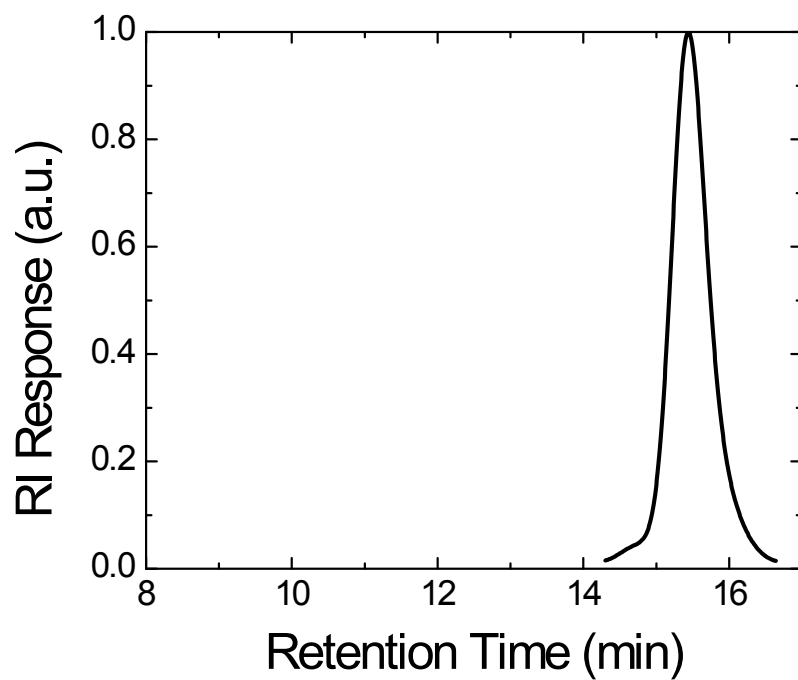


Figure S39. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-xPCL, 40 min polymerization time. $M_n = 5,100$, $\bar{D} = 1.09$

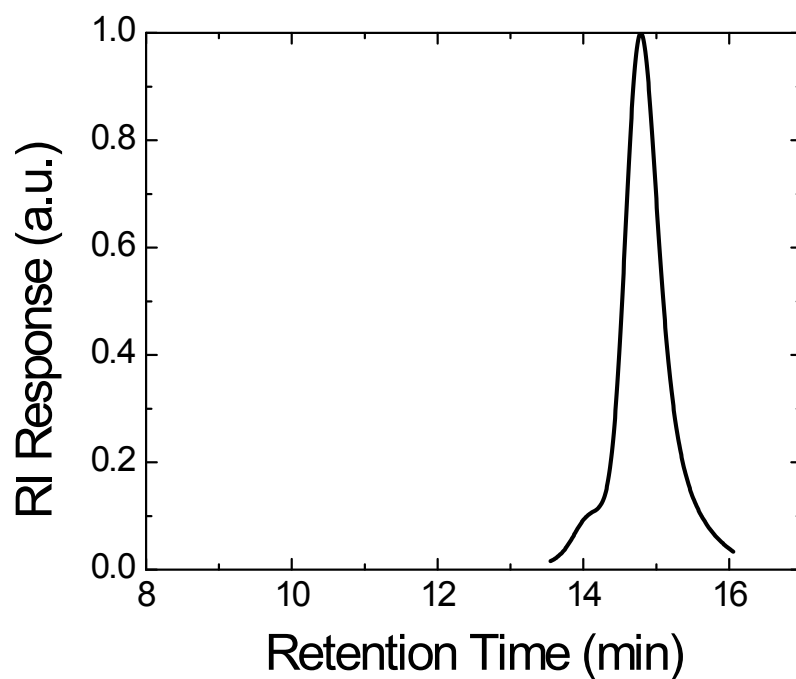


Figure S40. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-xPCL, 80 min polymerization time. $M_n = 9,000$, $\bar{D} = 1.14$

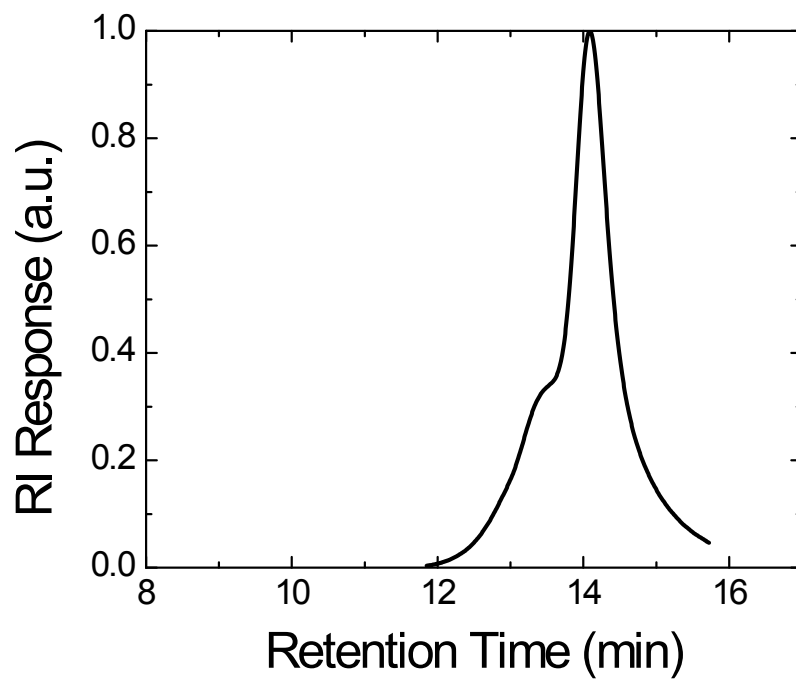


Figure S41. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-xPCL, 120 min polymerization time. $M_n = 17,100$, $\bar{D} = 1.37$

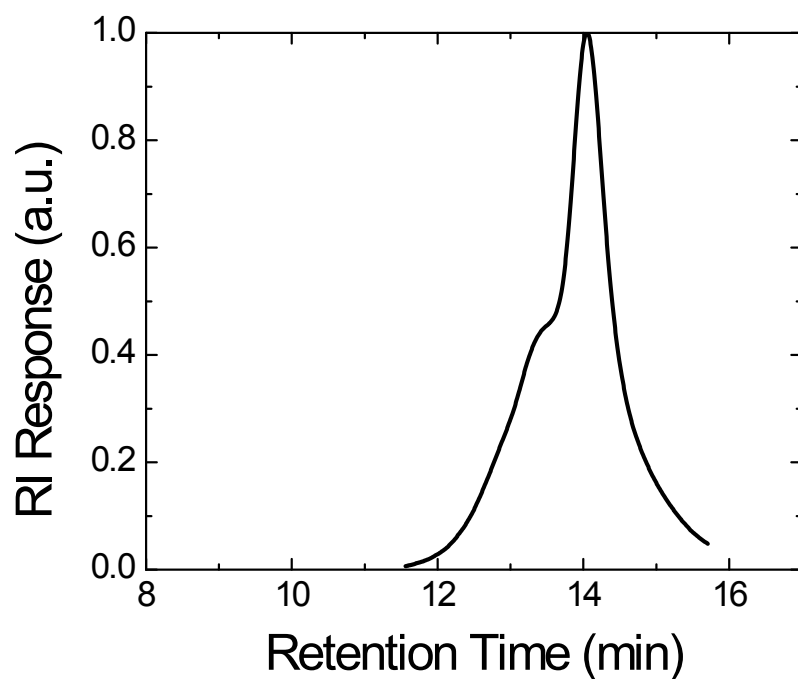


Figure S42. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-xPCL, 160 min polymerization time. $M_n = 18,600$, $\bar{D} = 1.49$

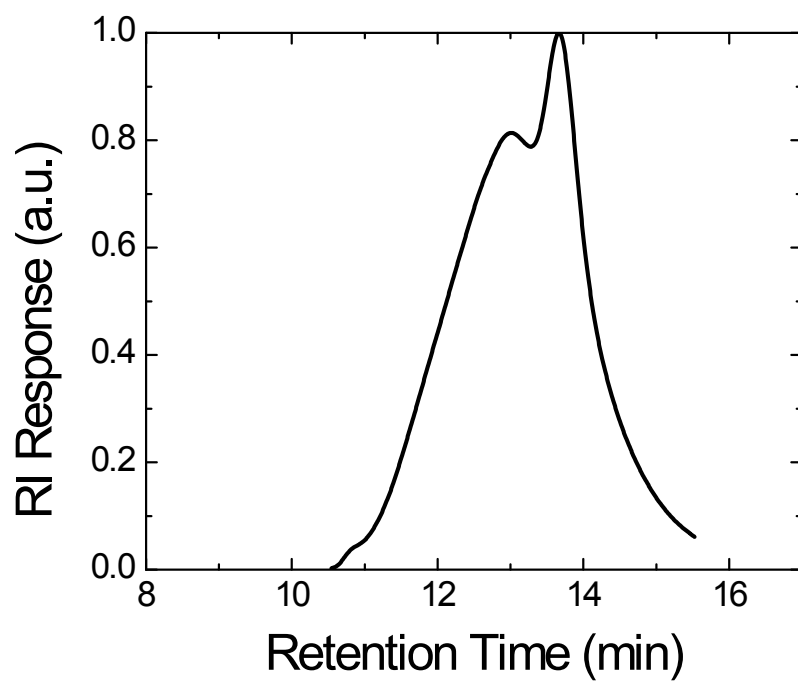


Figure S43. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-xPCL, 200 min polymerization time. $M_n = 31,100$, $\bar{D} = 1.94$

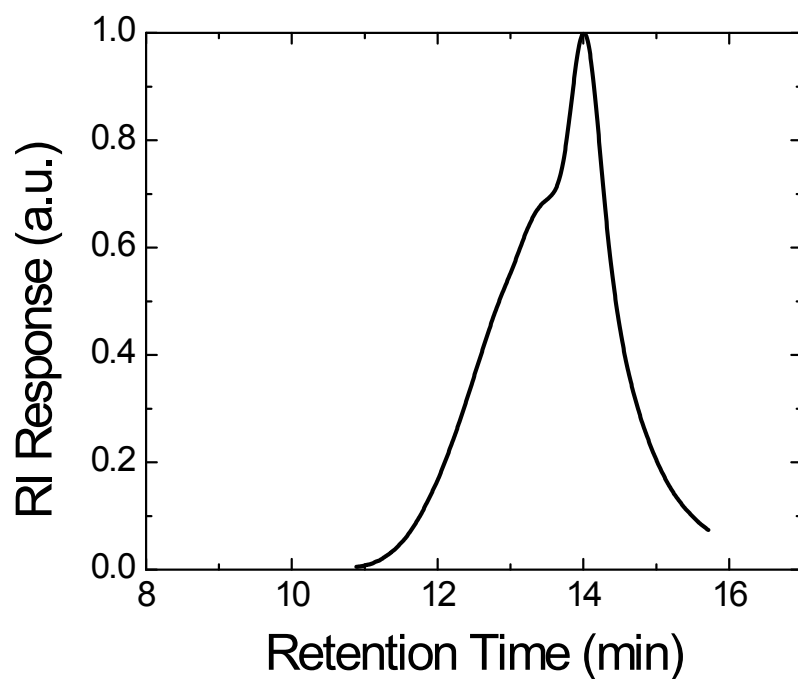


Figure S44. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-xPCL, 240 min polymerization time. $M_n = 21,600$, $\text{Đ} = 1.81$

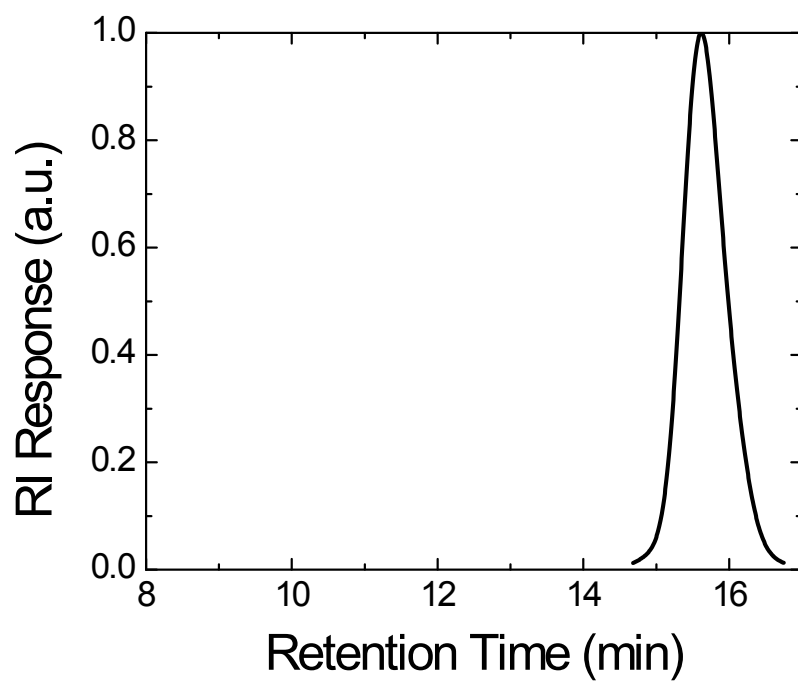


Figure S45. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-PCL, 80 min polymerization time. $M_n = 4,300$, $\text{Đ} = 1.08$

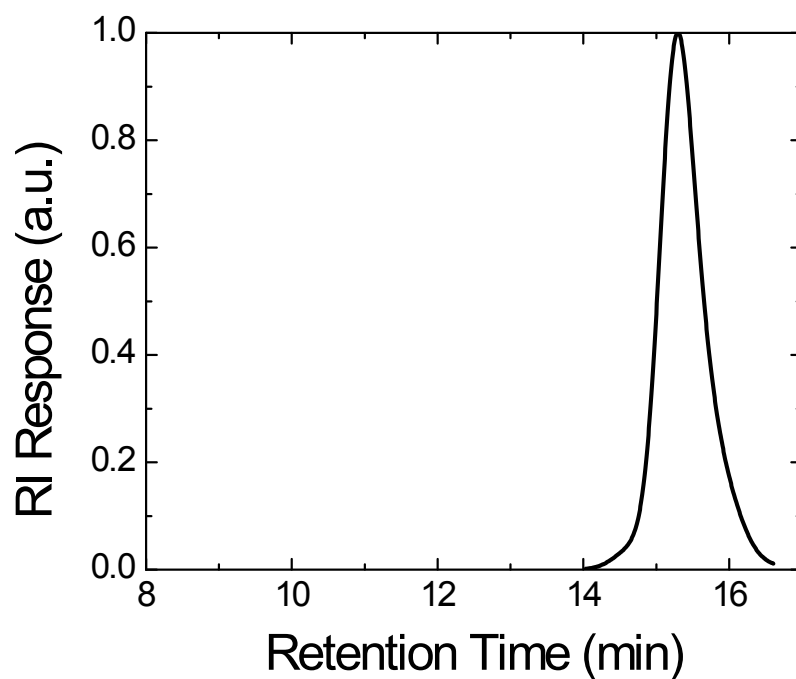


Figure S46. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-PCL, 120 min polymerization time. $M_n = 5,500$, $\bar{D} = 1.10$

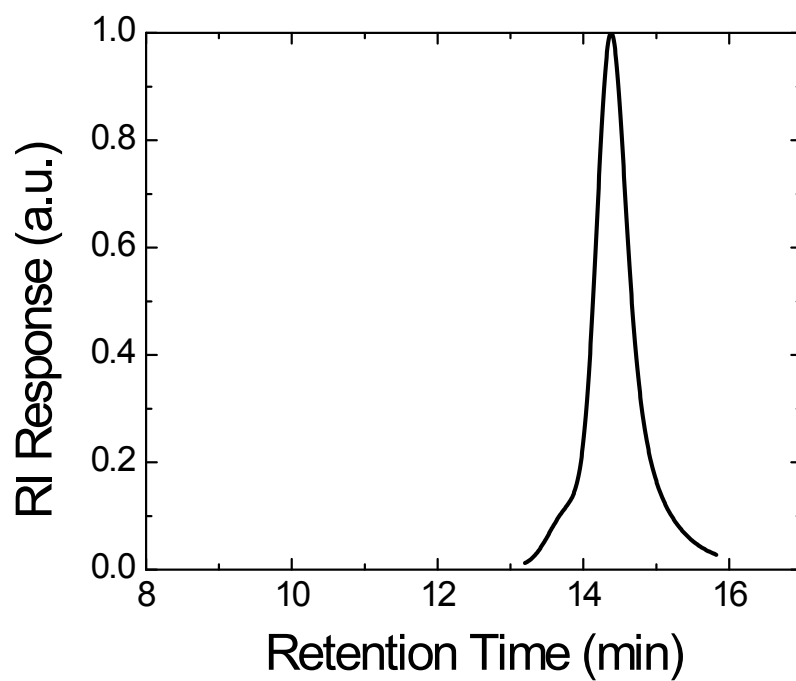


Figure S47. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-PCL, 160 min polymerization time. $M_n = 12,700$, $\bar{D} = 1.14$

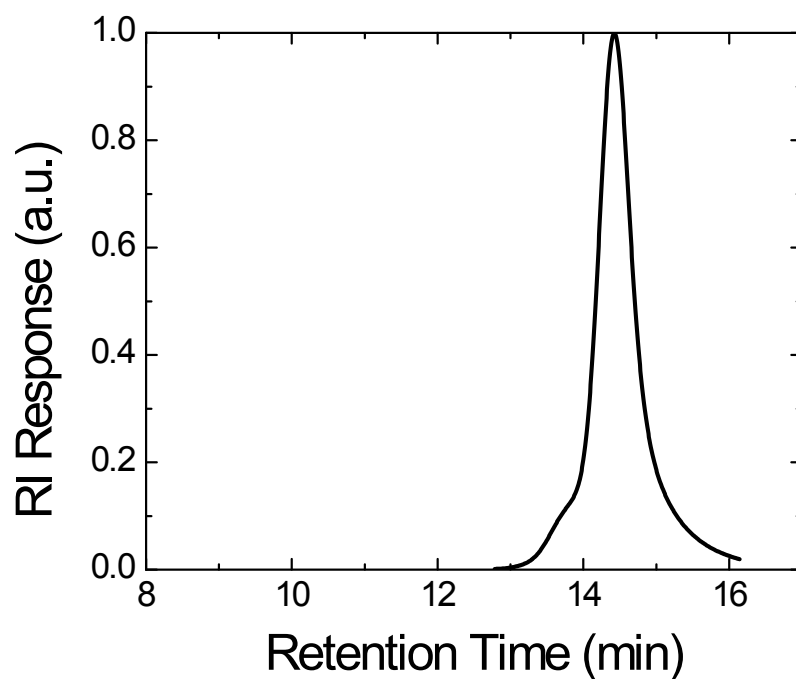


Figure S48. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-PCL, 200 min polymerization time. $M_n = 11,900$, $\text{Đ} = 1.18$

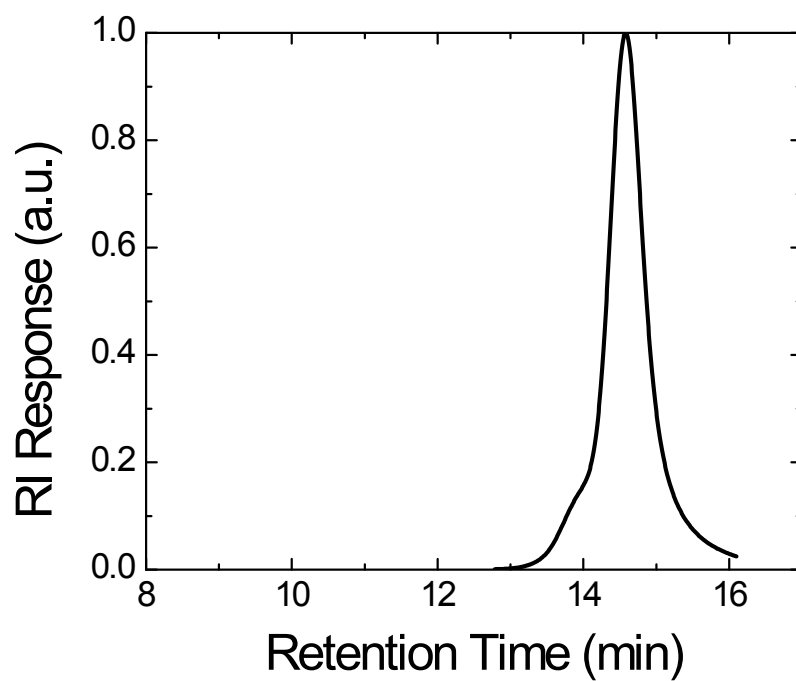


Figure S49. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-PCL, 160 min polymerization time. $M_n = 10,800$, $\text{Đ} = 1.16$

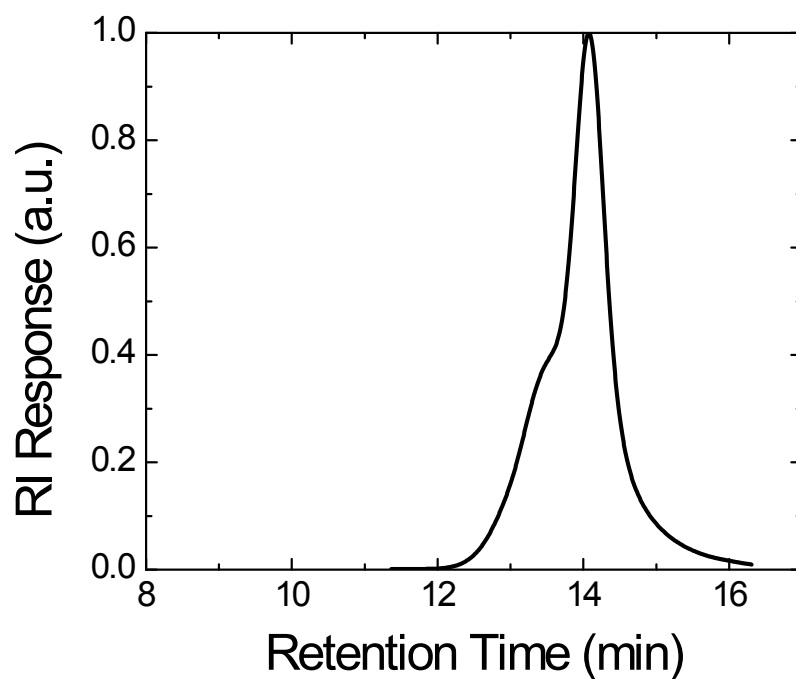


Figure S50. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-PCL, used for subsequent reactions towards hollow nanocapsules $M_n = 16,200$, $\bar{D} = 1.35$

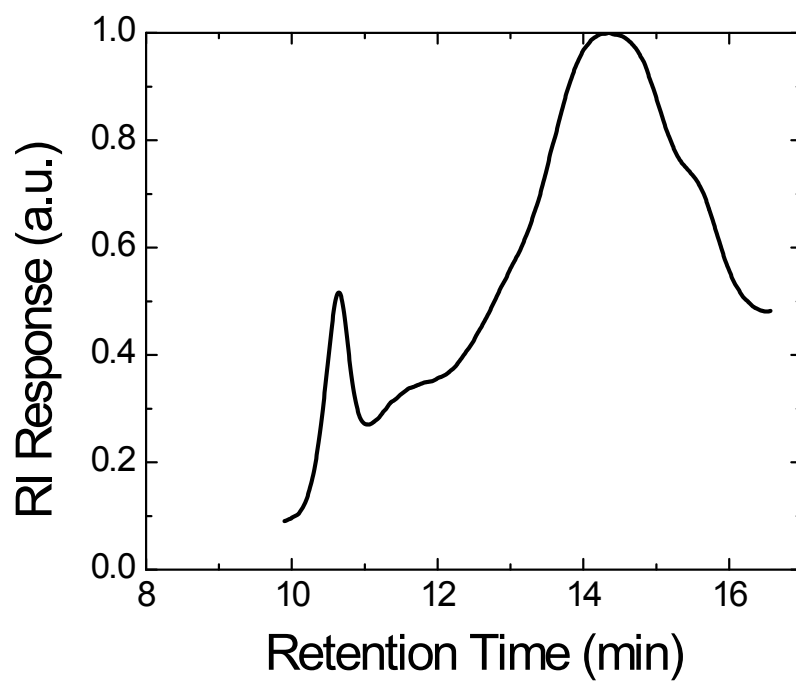


Figure S51. GPC chromatogram of Hollow-GPS-PCL-xPCL.

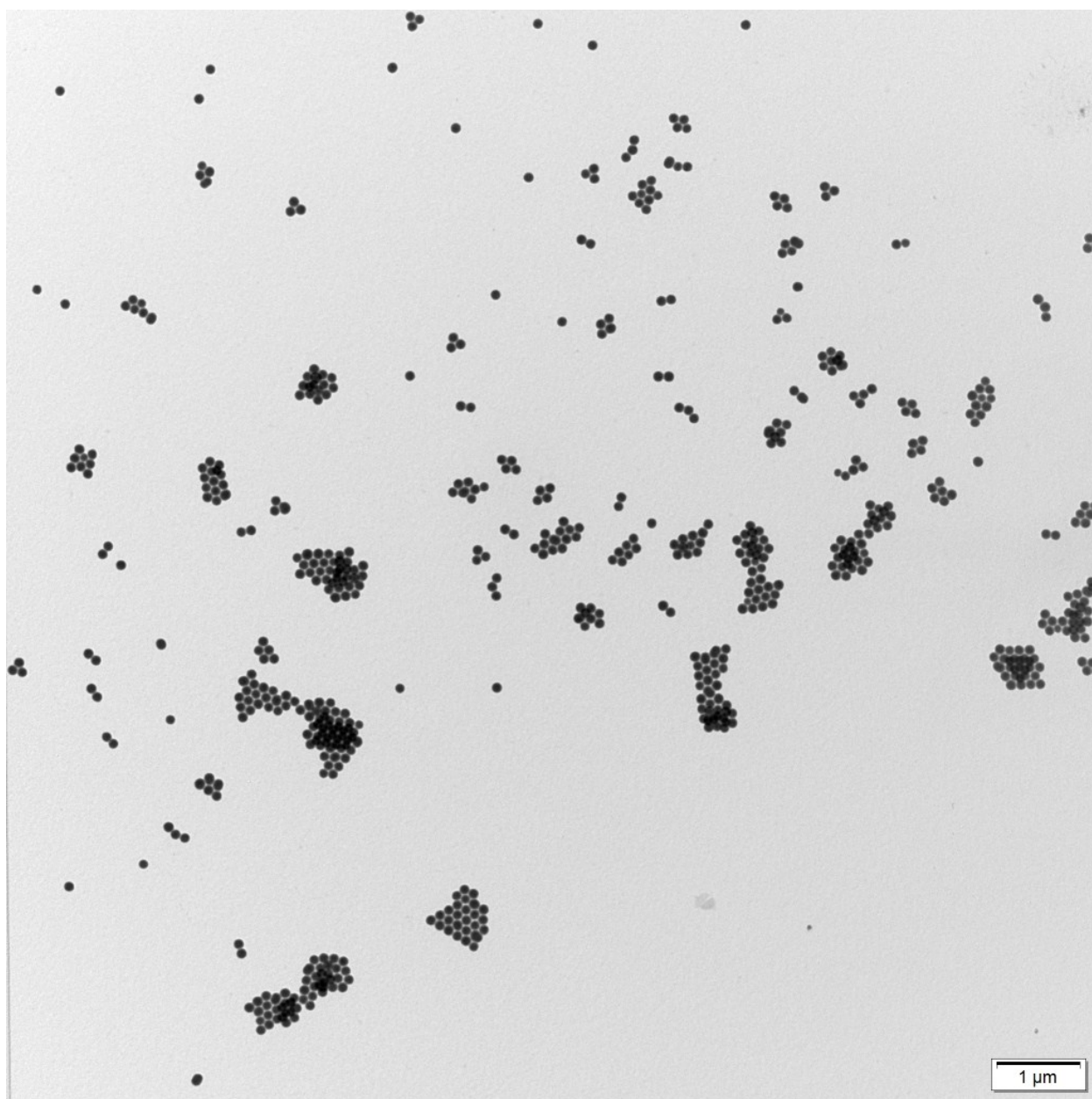


Figure S52. TEM image of NP-GPS-PCL, used for subsequent reactions towards hollow nanocapsules, scale bar = 1000 nm.

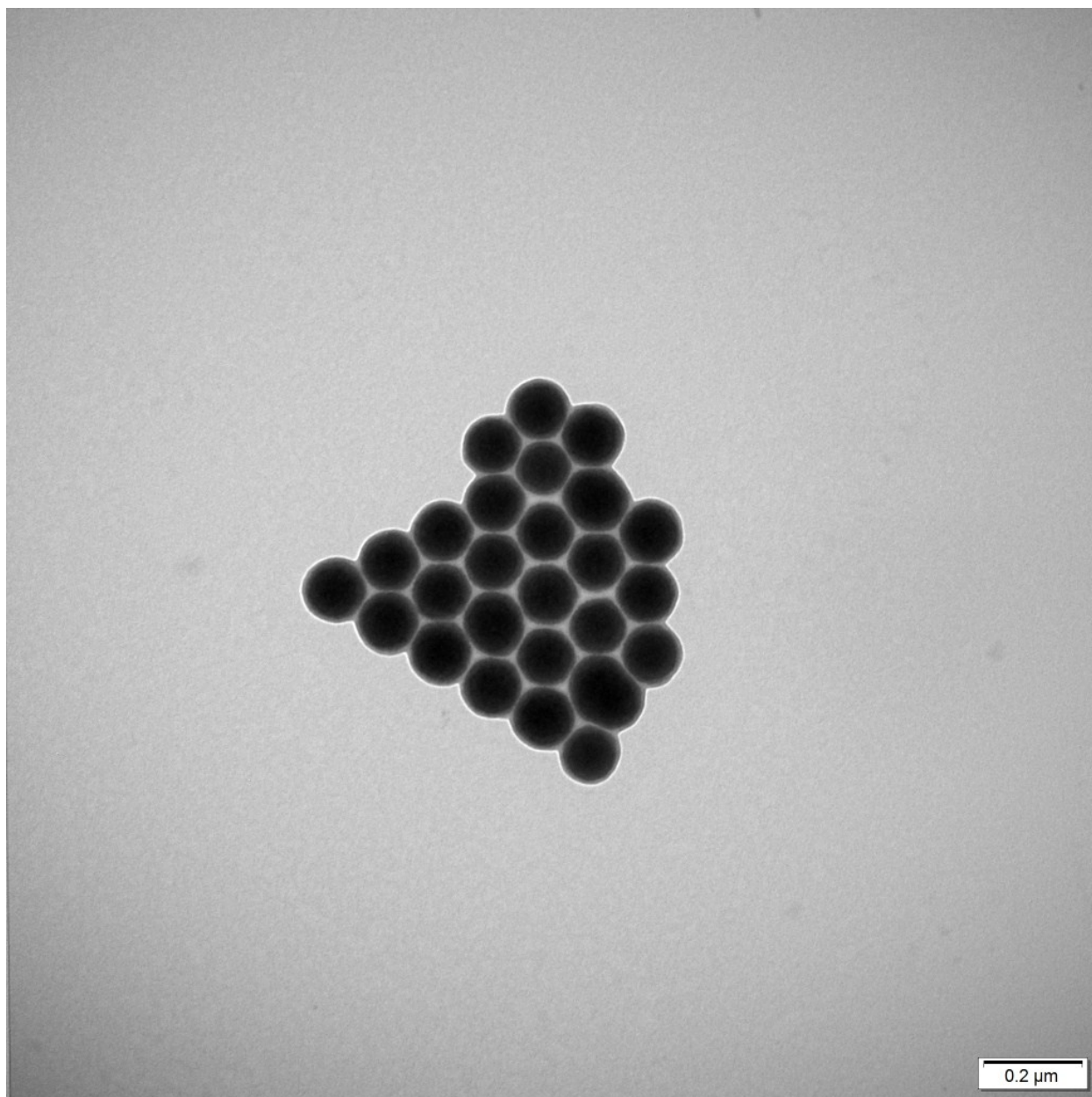


Figure S53. TEM image of NP-GPS-PCL, used for subsequent reactions towards hollow nanocapsules, scale bar = 200 nm.

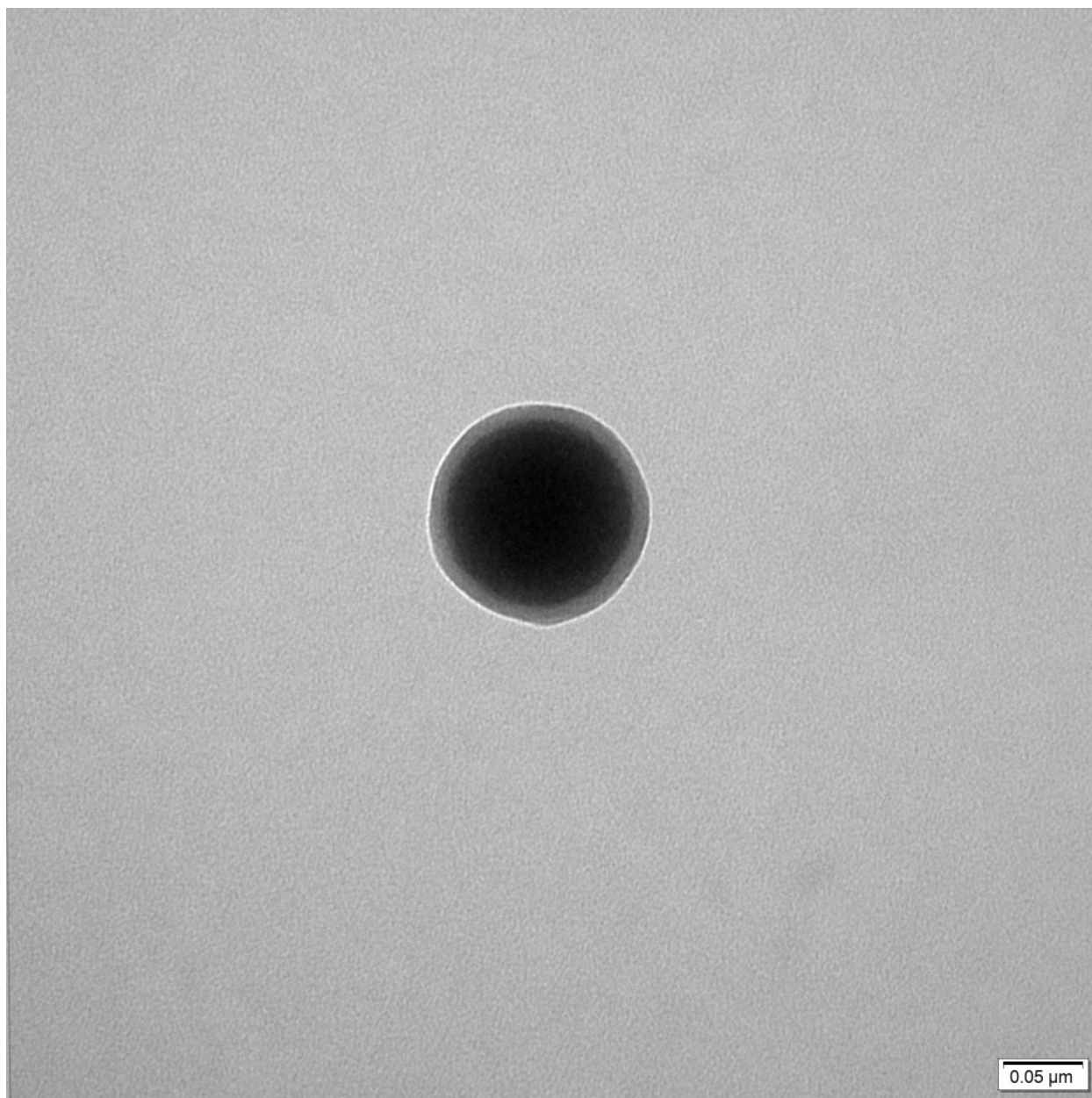


Figure S54. TEM image of NP-GPS-PCL, used for subsequent reactions towards hollow nanocapsules, scale bar = 50 nm.

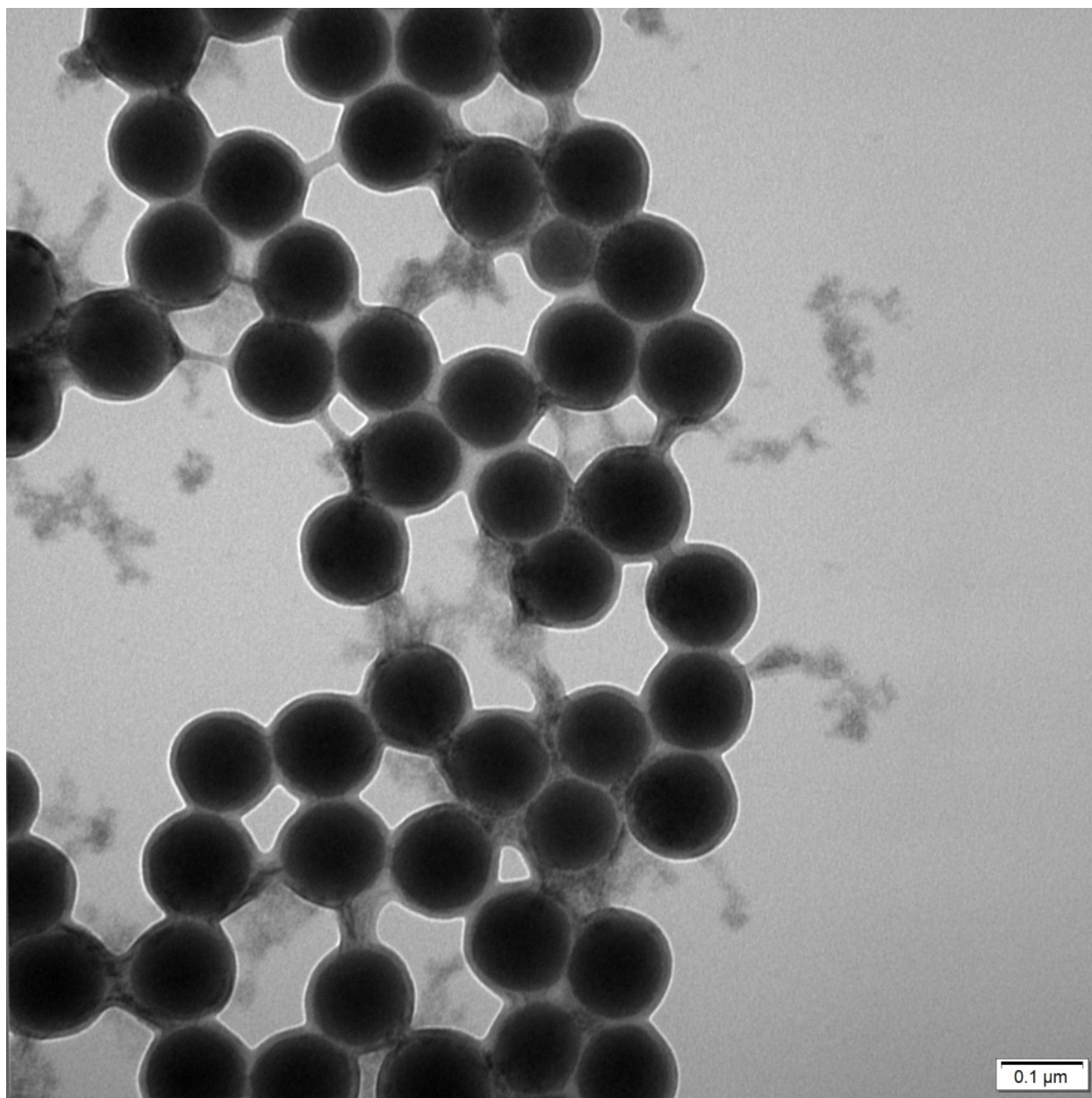


Figure S55. TEM image of NP-GPS-PCL-xPCL, scale bar = 100 nm.

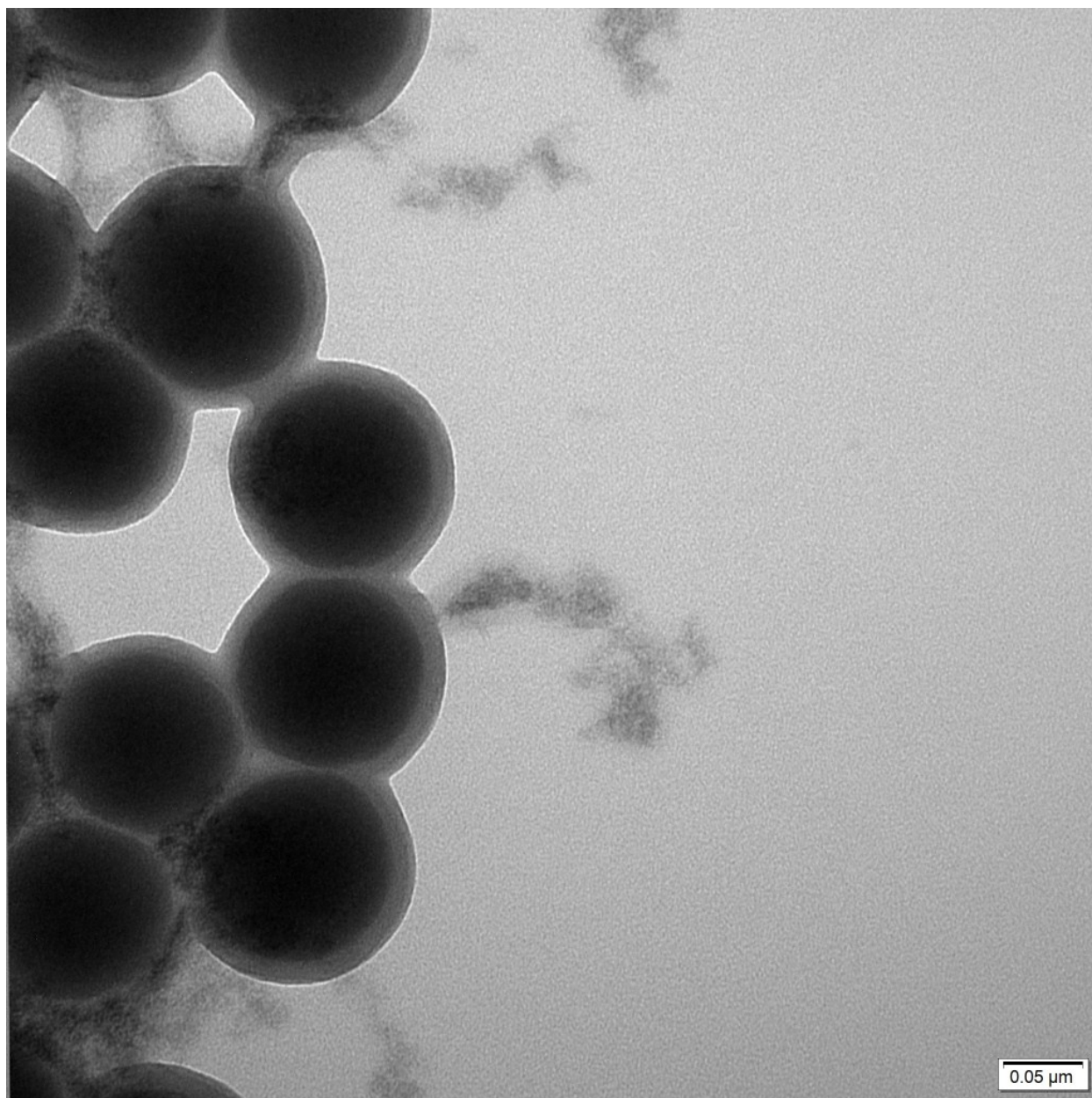


Figure S56. TEM image of NP-GPS-PCL-xPCL, scale bar = 50 nm.

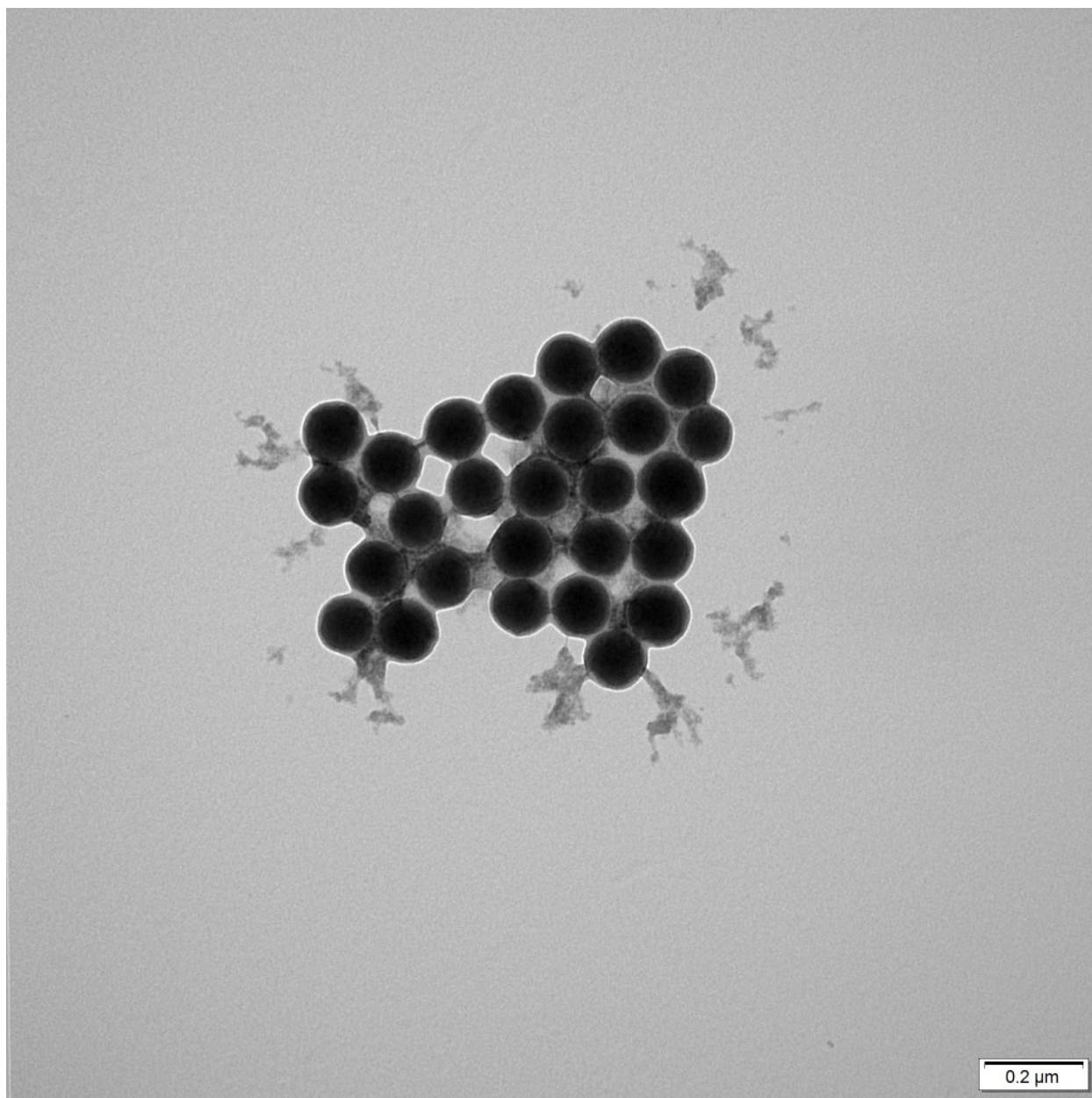


Figure S57. TEM image of NP-GPS-PCL-xPCL, scale bar = 200 nm.

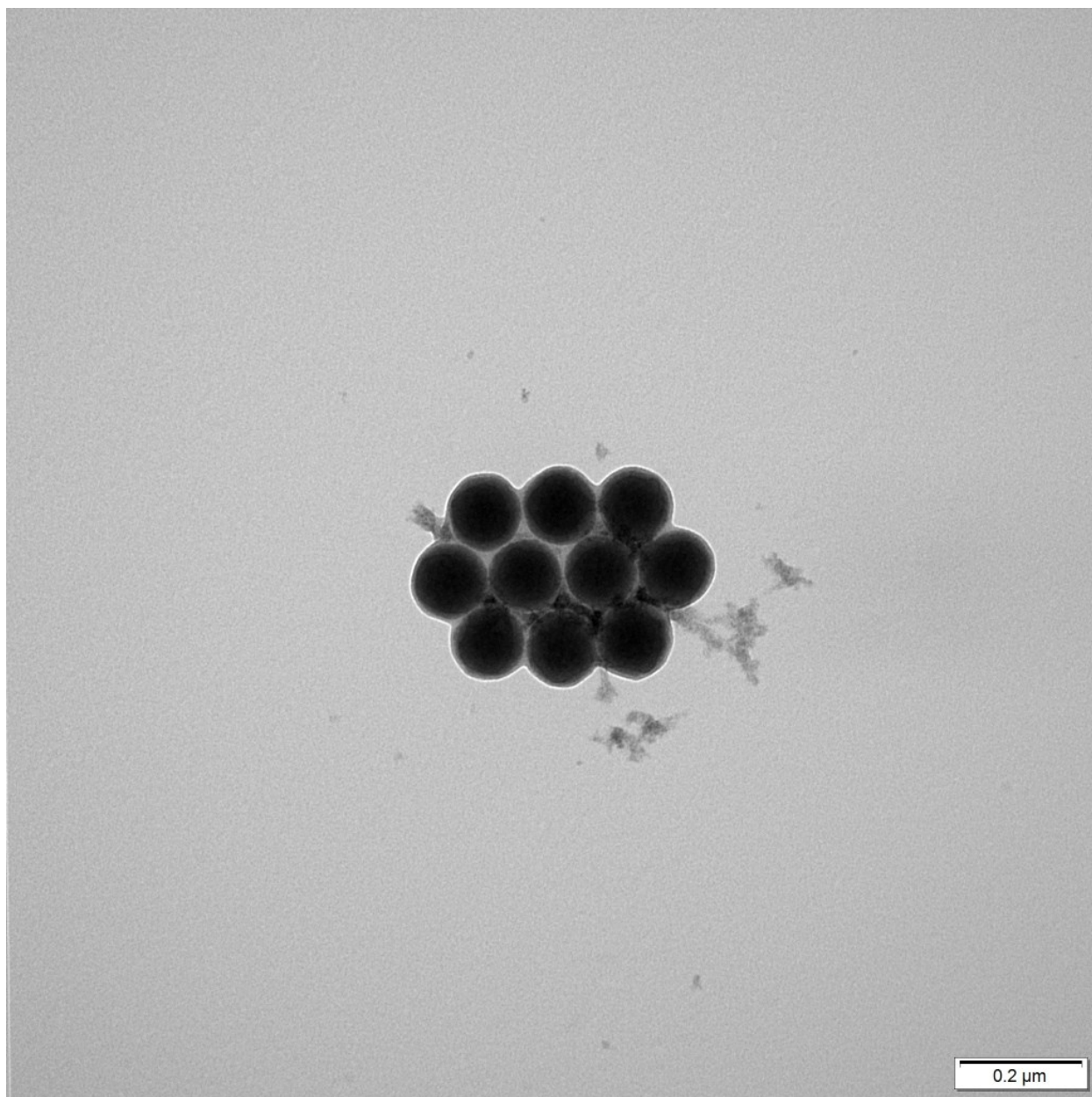


Figure S58. TEM image of NP-GPS-PCL-xPCL, scale bar = 200 nm.

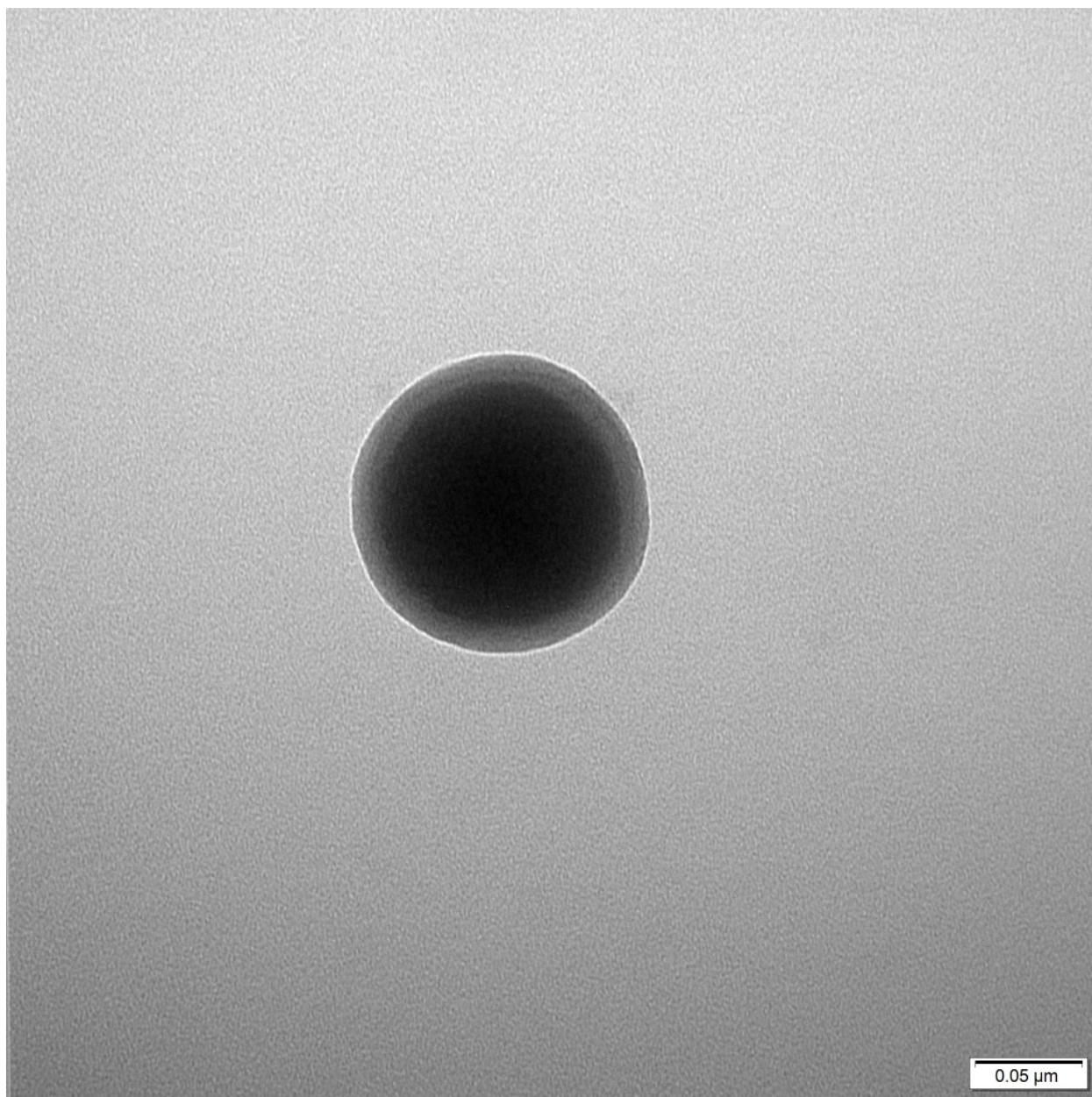


Figure S59. TEM image of NP-GPS-PCL-xPCL, scale bar = 50 nm.

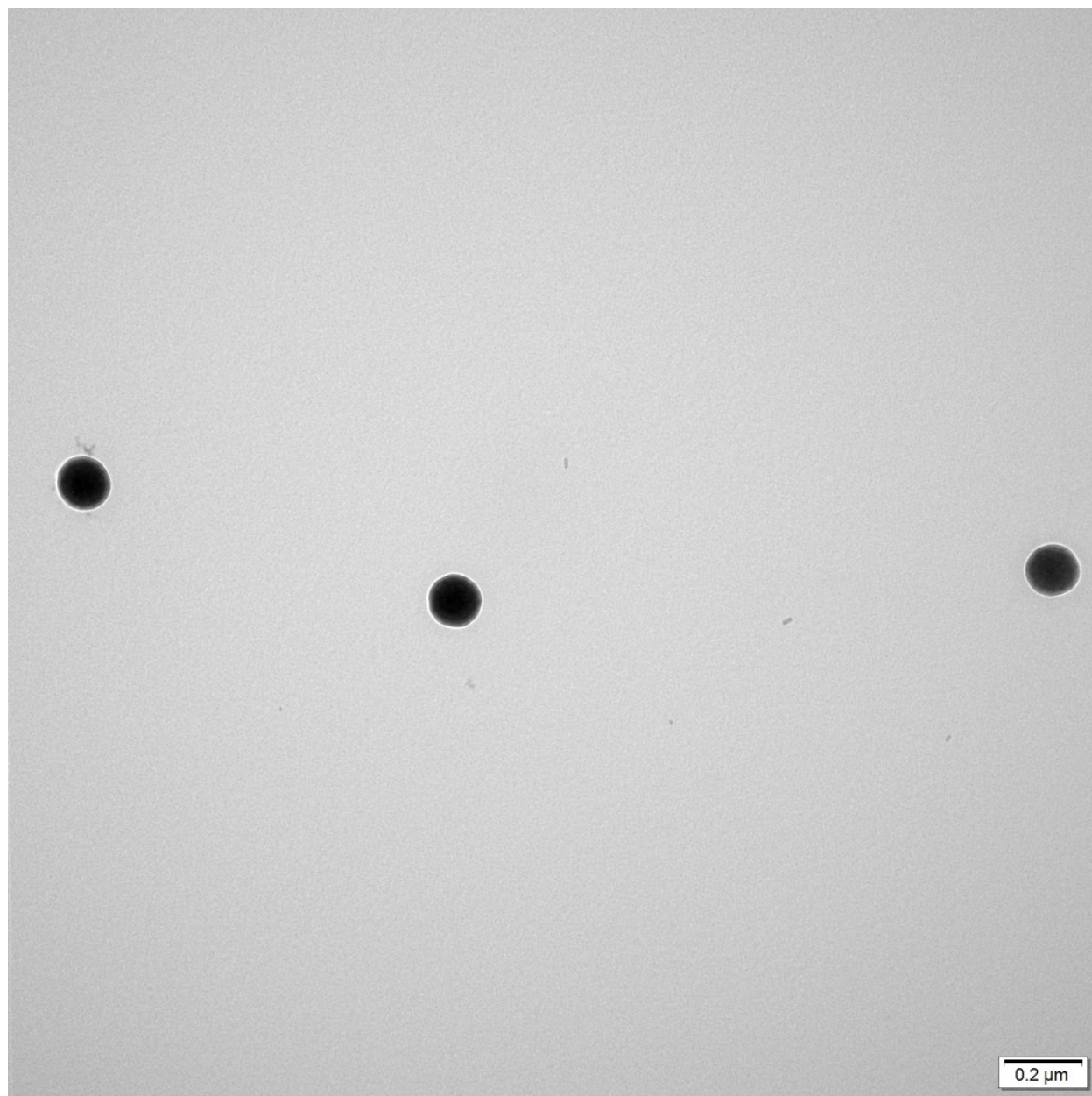


Figure S60. TEM image of NP-GPS-PCL-xPCL, scale bar = 200 nm.

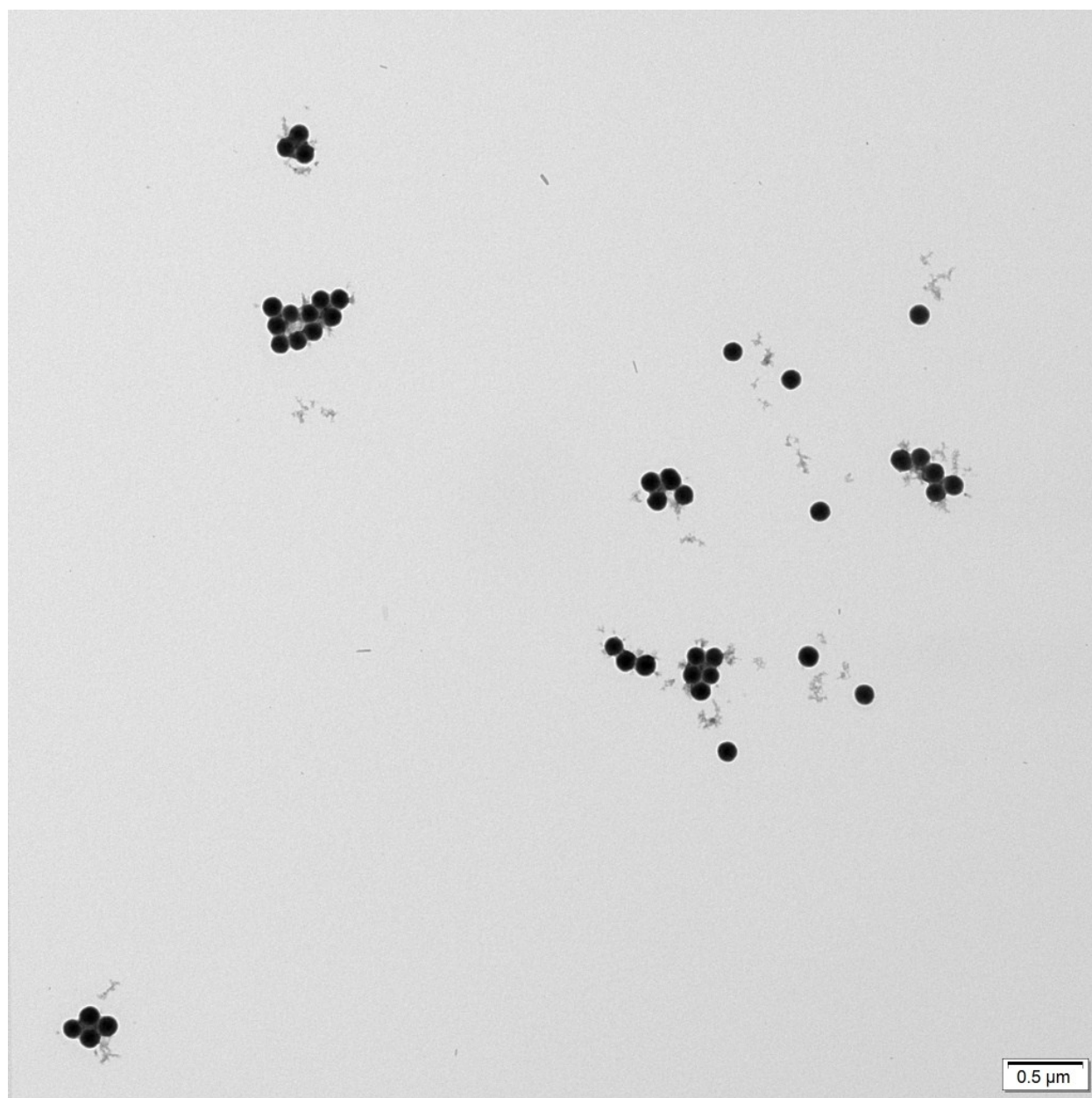


Figure S61. TEM image of NP-GPS-PCL-xPCL, scale bar = 500 nm.

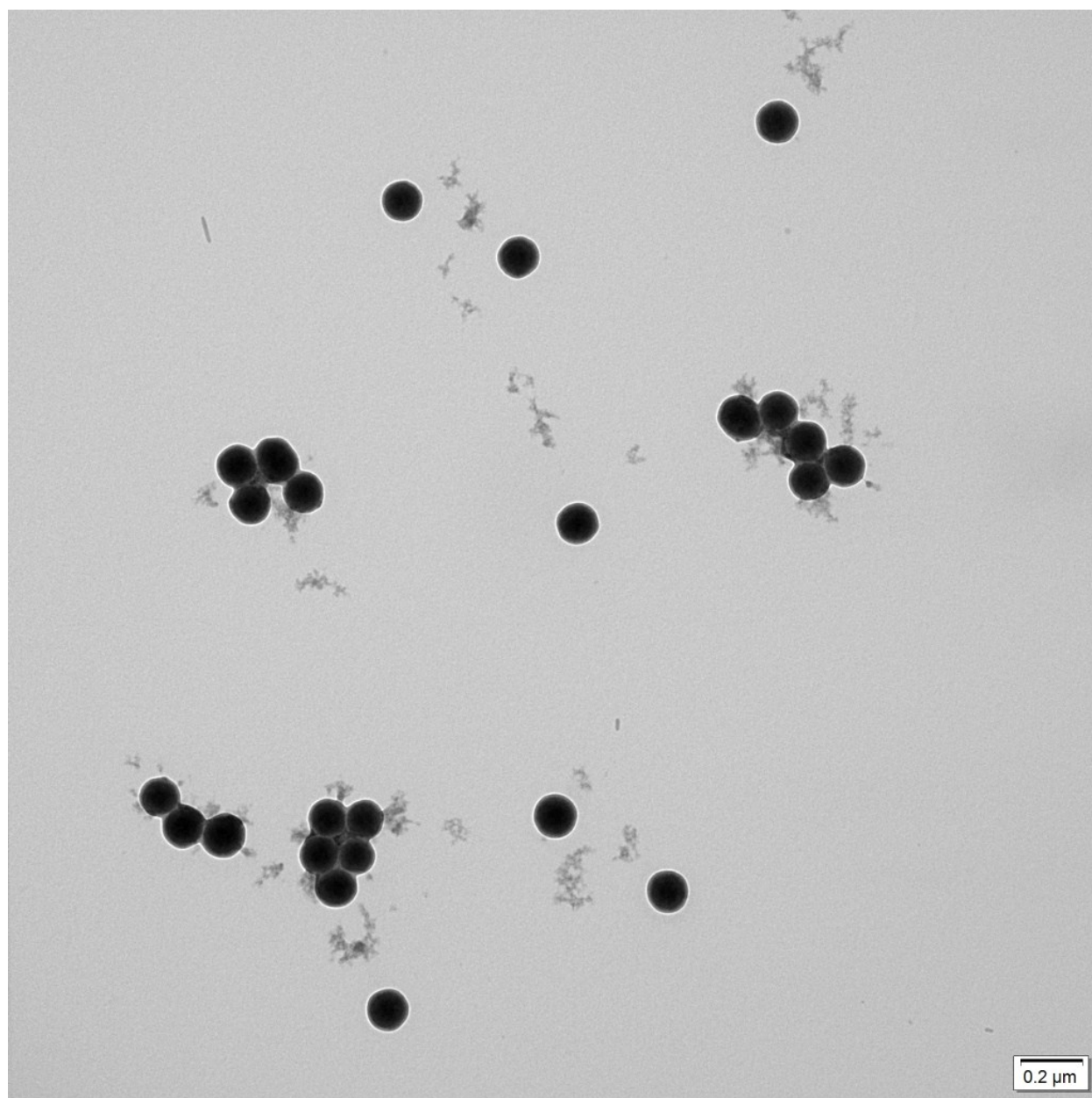


Figure S62. TEM image of NP-GPS-PCL-xPCL, scale bar = 200 nm.

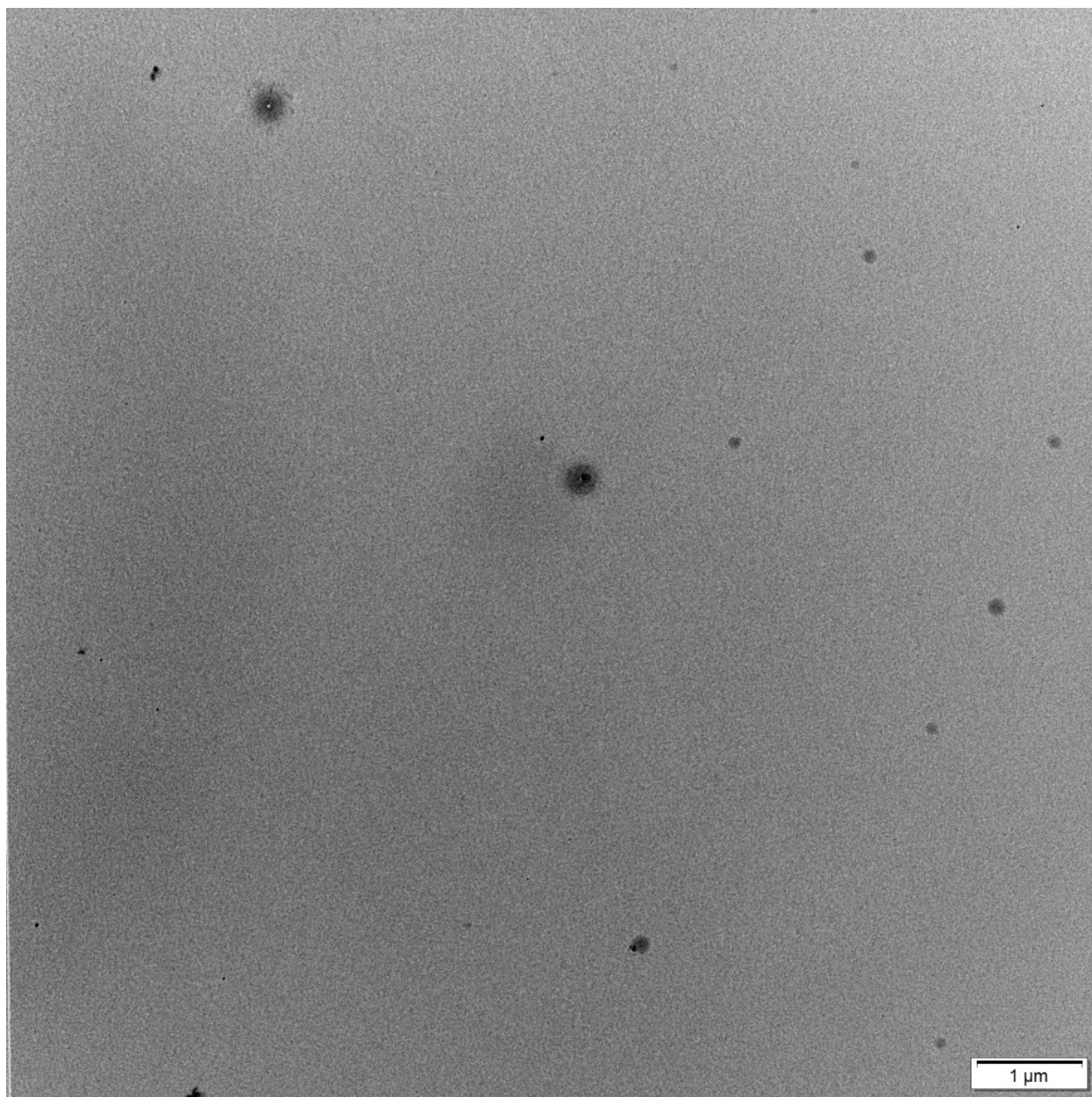


Figure S63. TEM image of Hollow-GPS-PCL-xPCL, scale bar = 1000 nm.

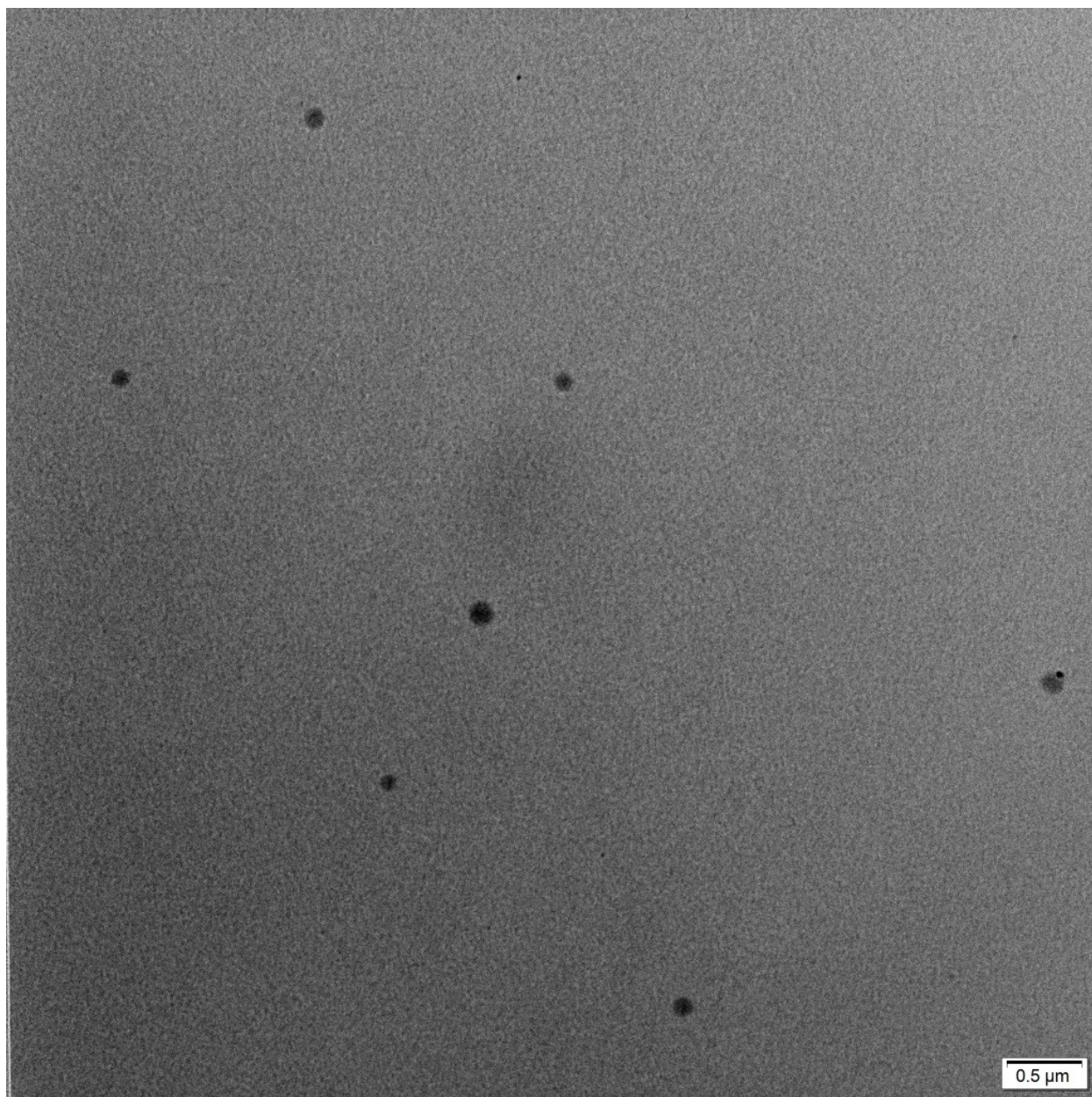


Figure S64. TEM image of Hollow-GPS-PCL-xPCL, scale bar = 500 nm.

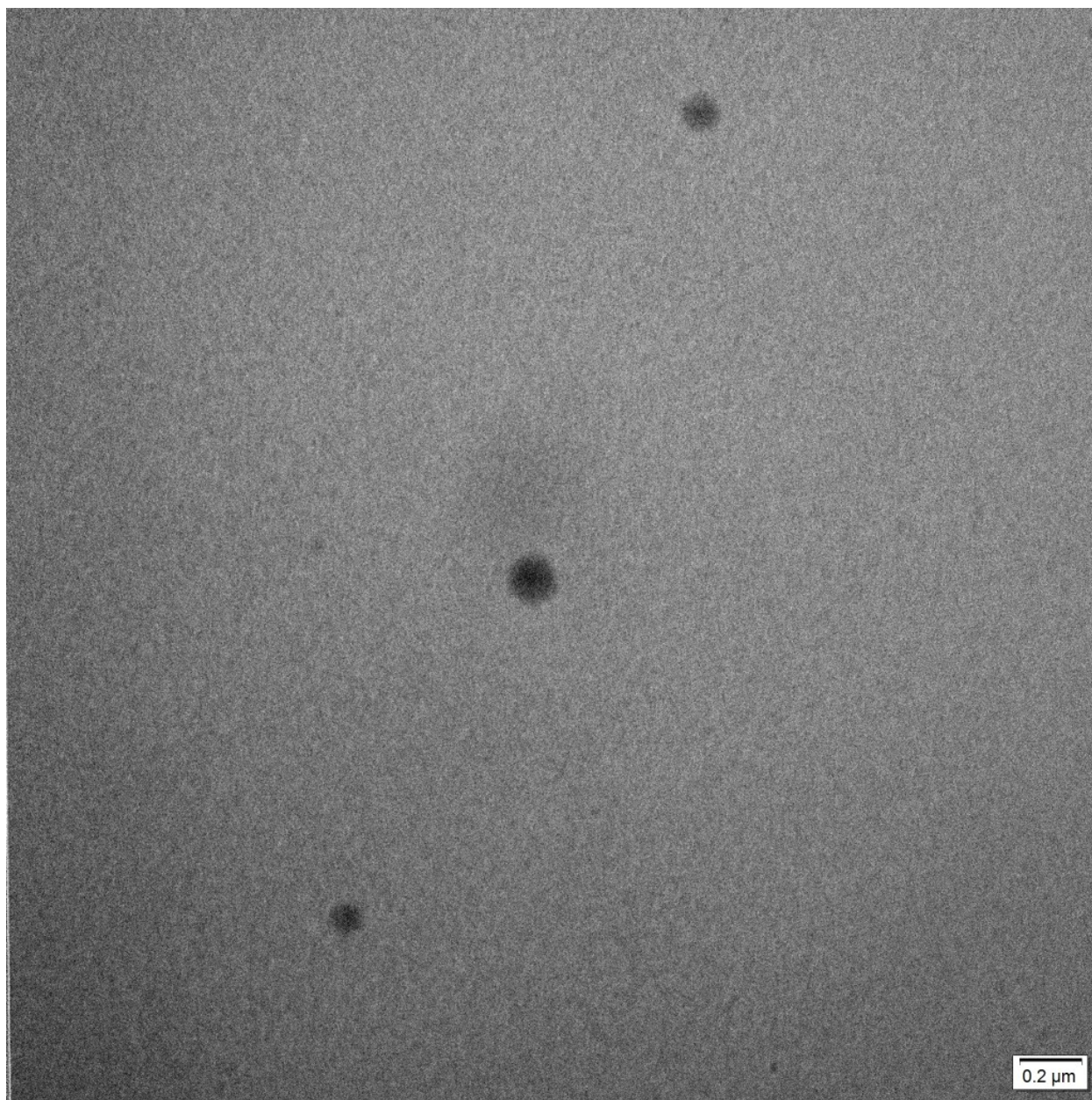


Figure S65. TEM image of Hollow-GPS-PCL-xPCL, scale bar = 200 nm.

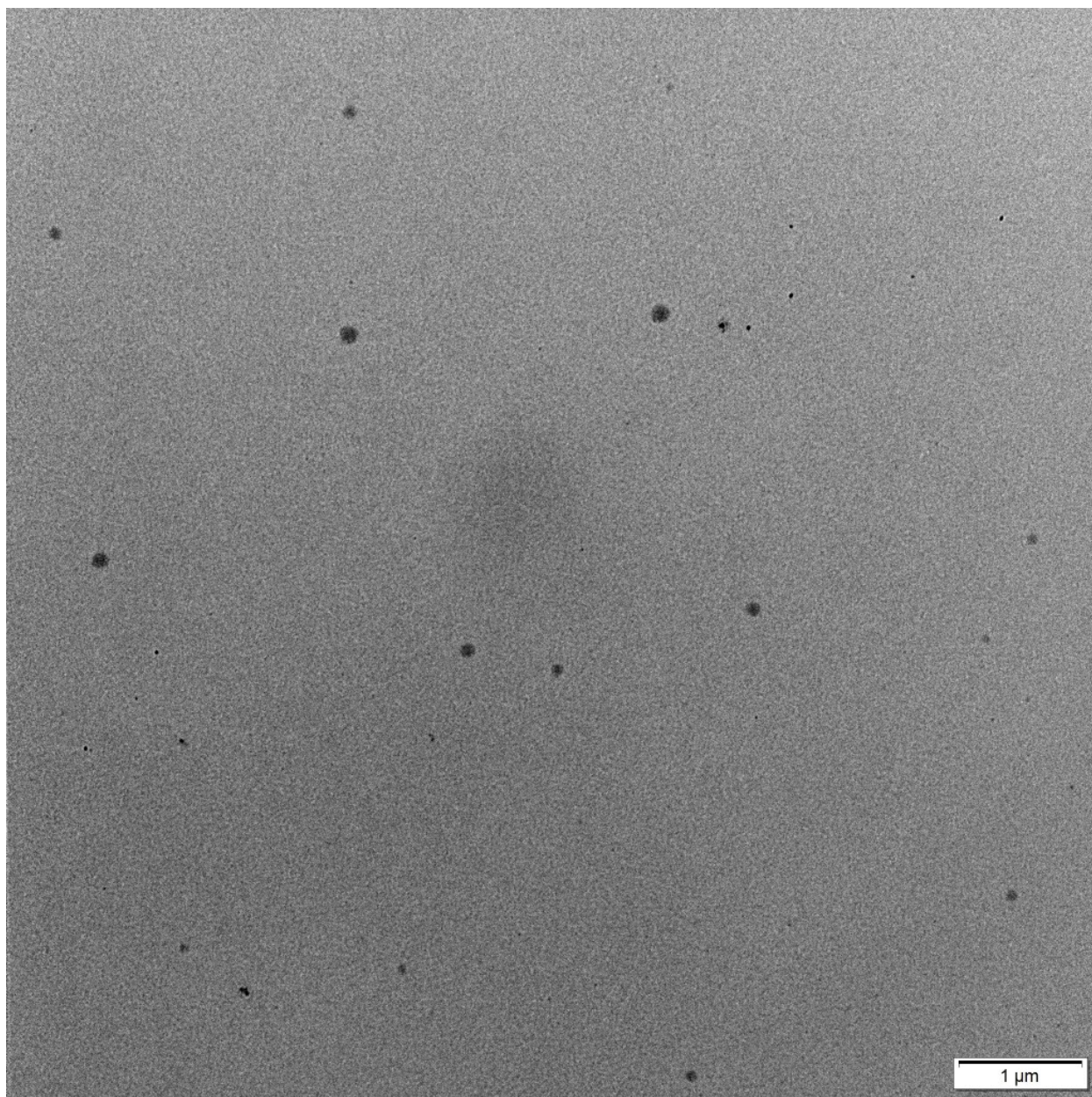


Figure S66. TEM image of Hollow-GPS-PCL-xPCL, scale bar = 1000 nm

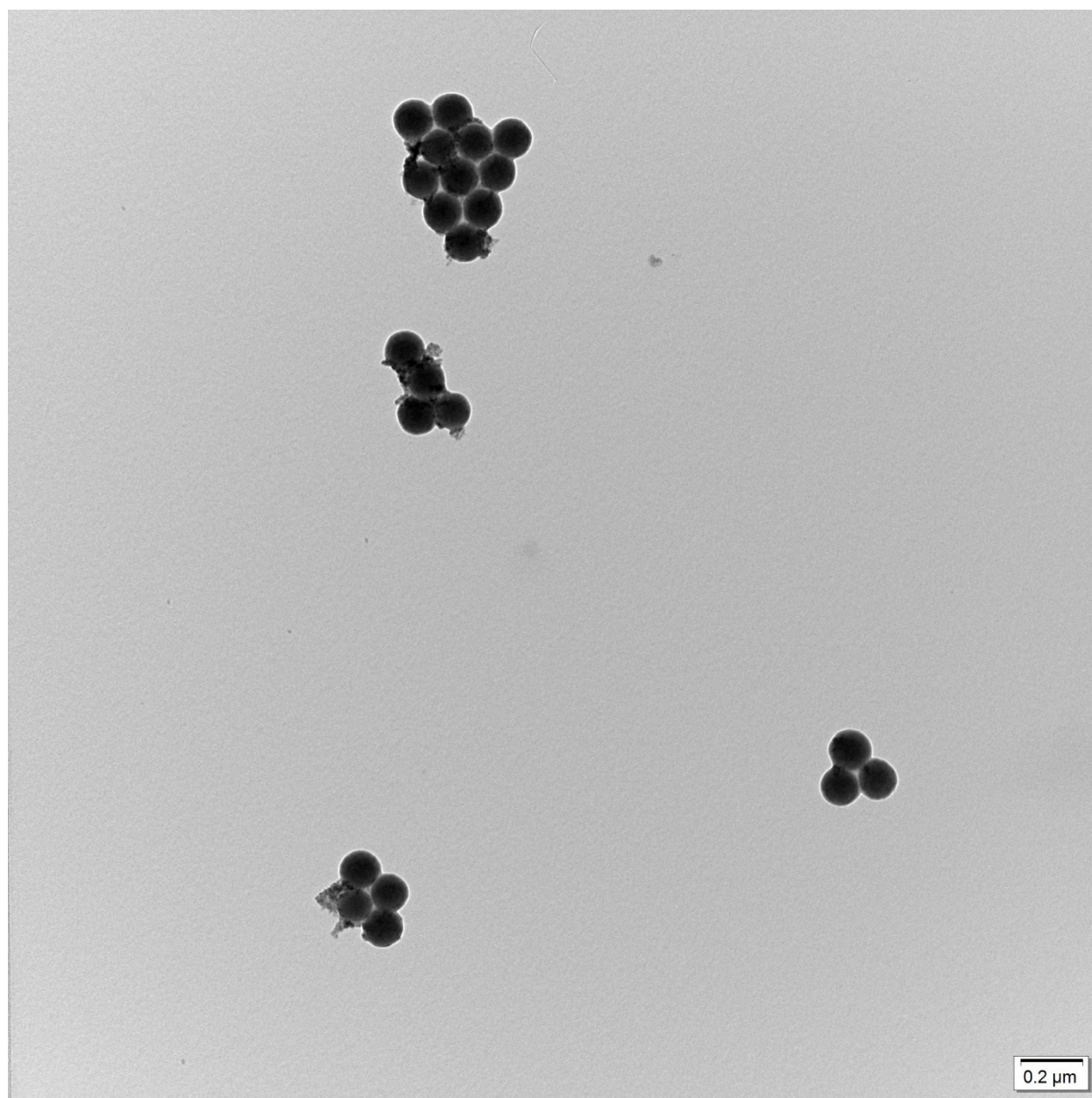


Figure S67. TEM image of NP-GPS-PCL-xPCL-PEG, scale bar = 200 nm

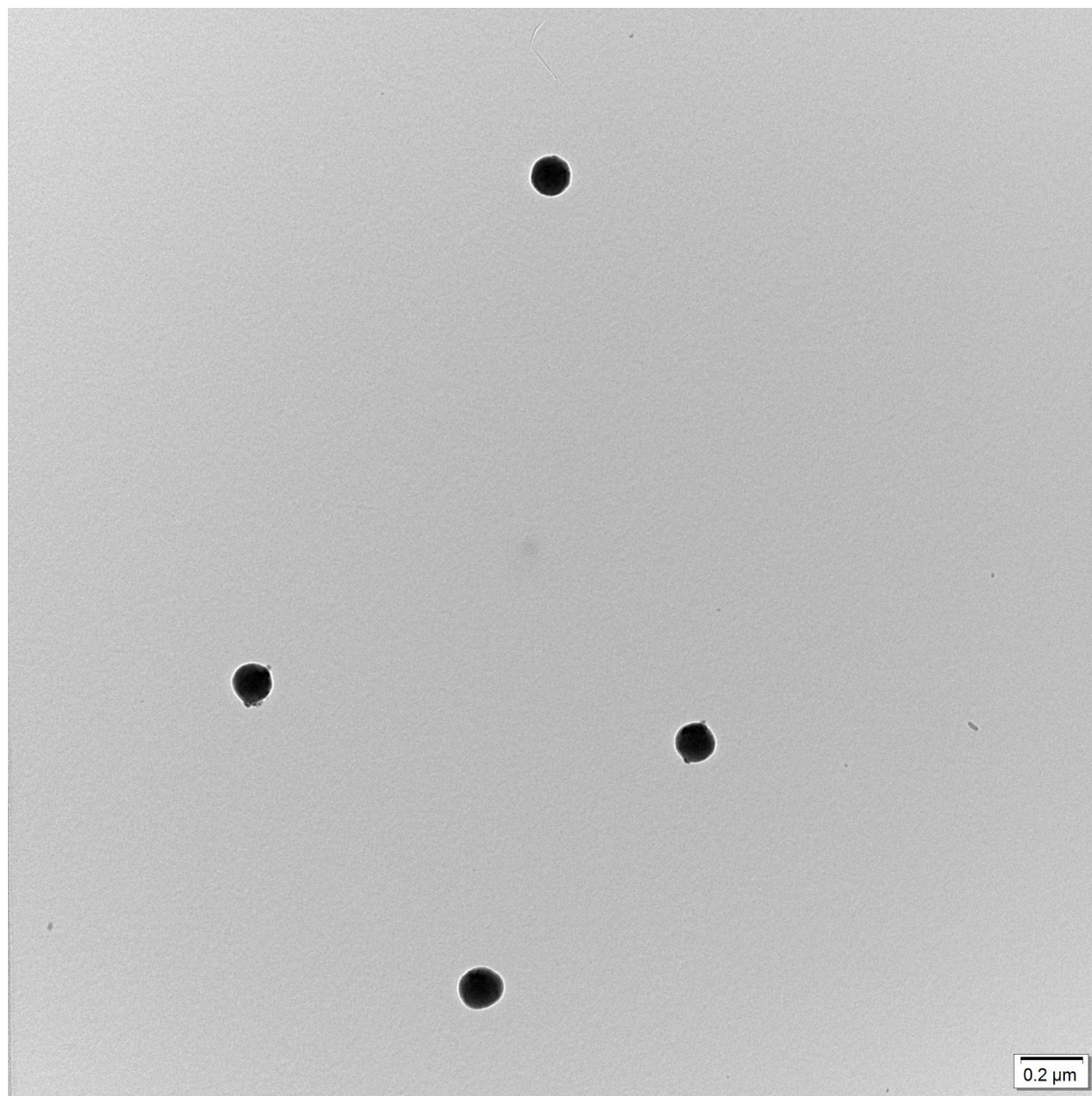


Figure S68. TEM image of NP-GPS-PCL-xPCL-PEG, scale bar = 200 nm

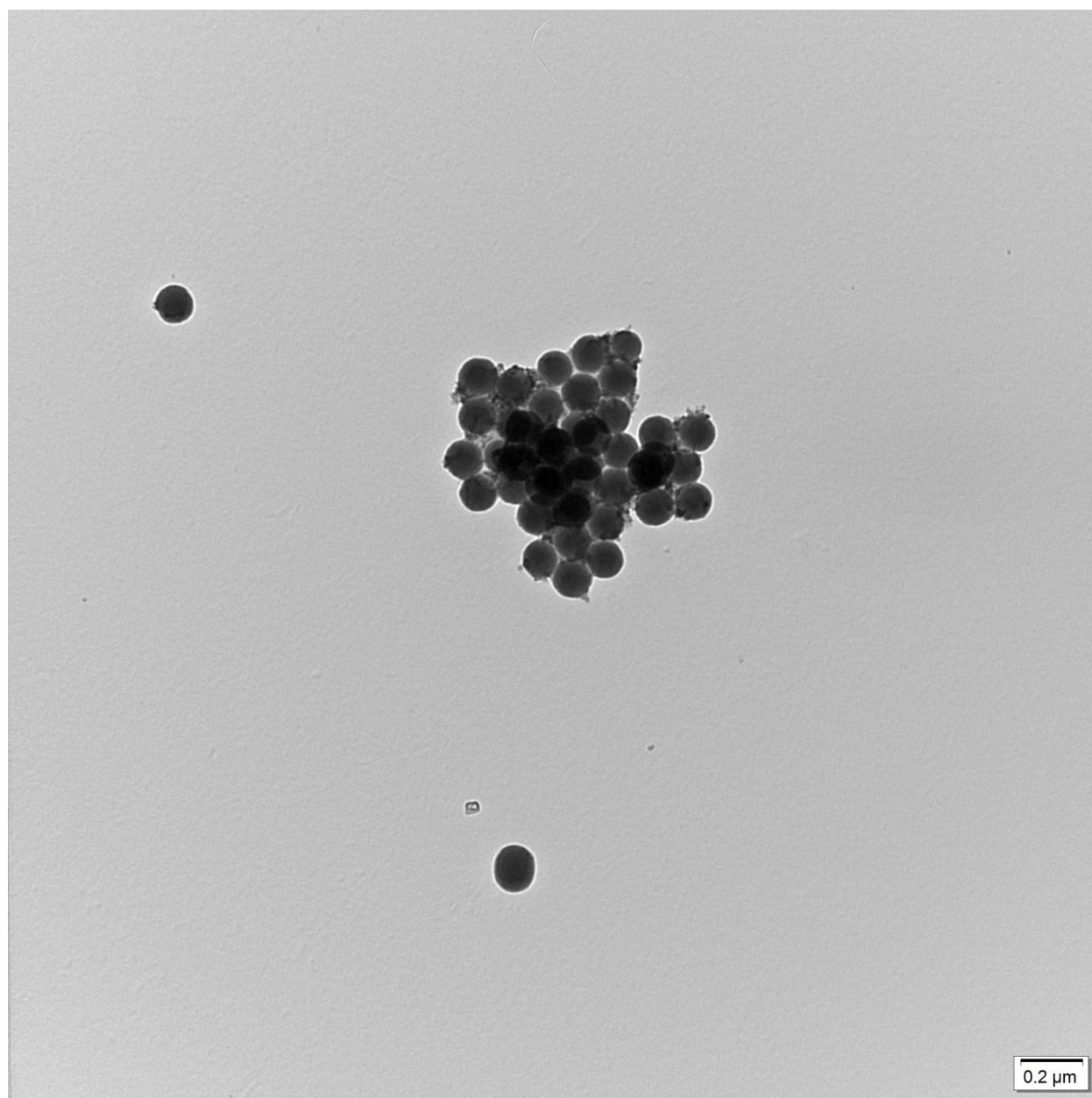


Figure S69. TEM image of NP-GPS-PCL-xPCL-PEG, scale bar = 200 nm

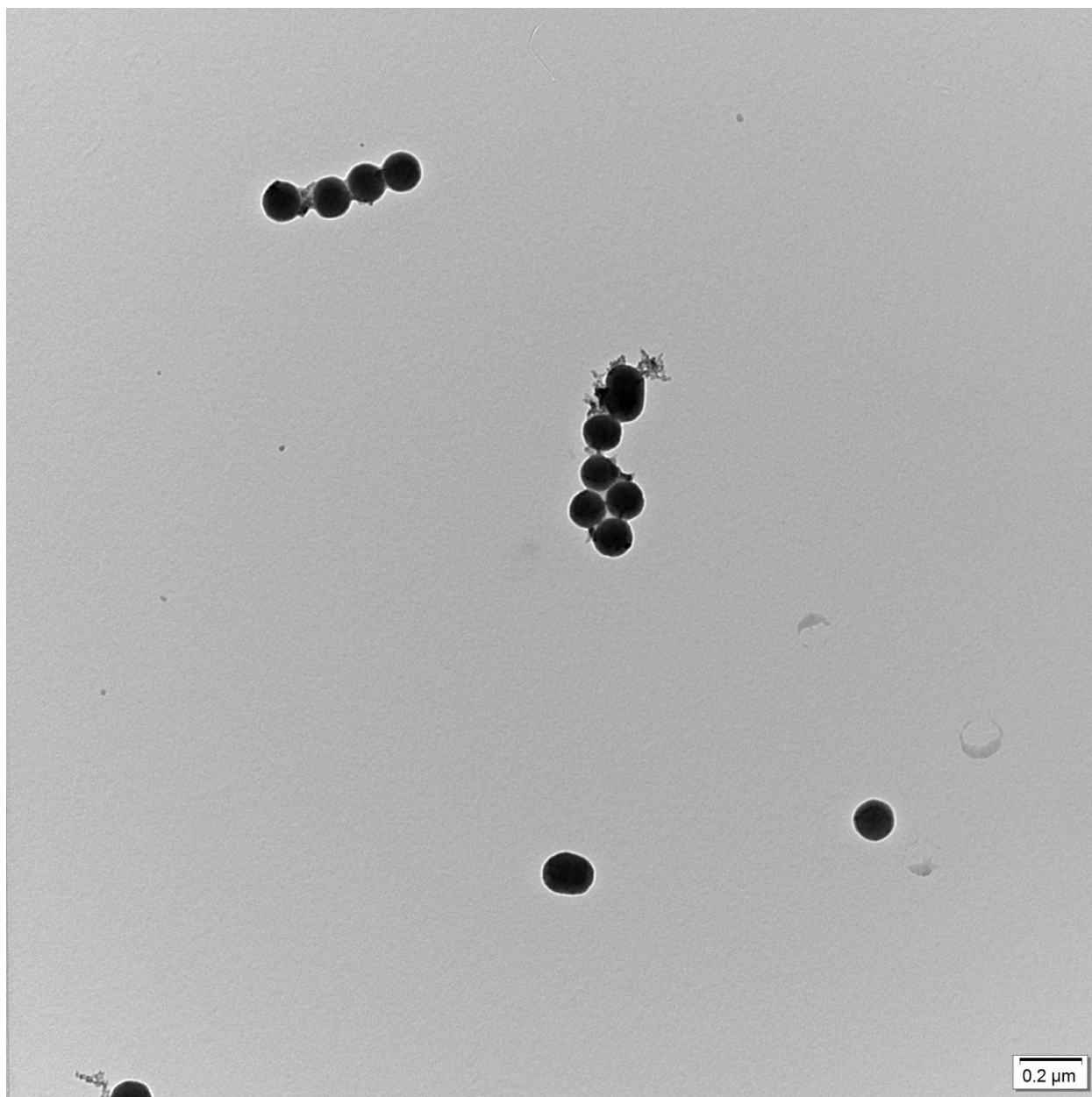


Figure S70. TEM image of NP-GPS-PCL-xPCL-PEG, scale bar = 200 nm

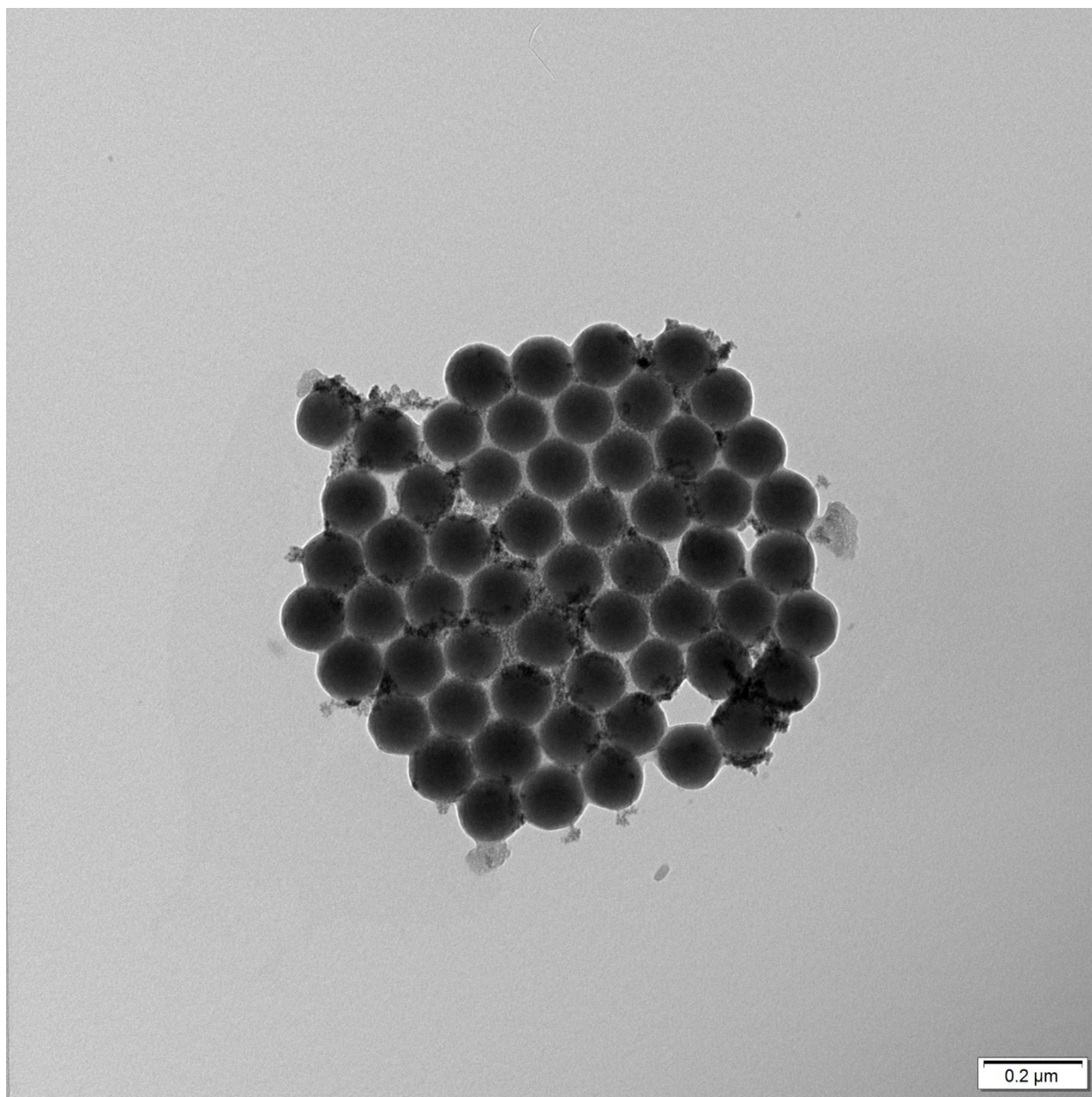


Figure S71. TEM image of NP-GPS-PCL-xPCL-PEG, scale bar = 200 nm

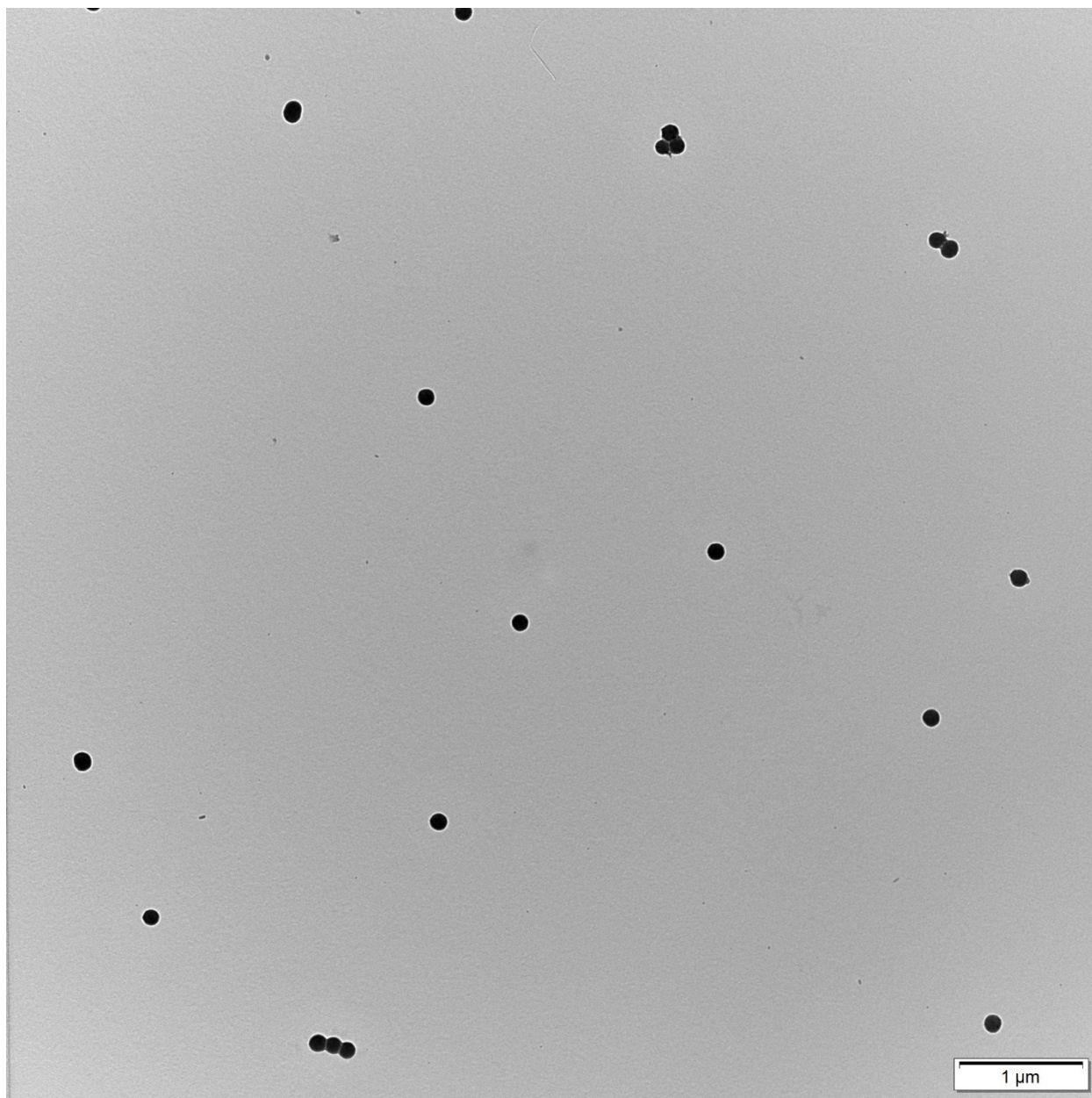


Figure S72. TEM image of NP-GPS-PCL-xPCL-PEG, scale bar = 1000 nm

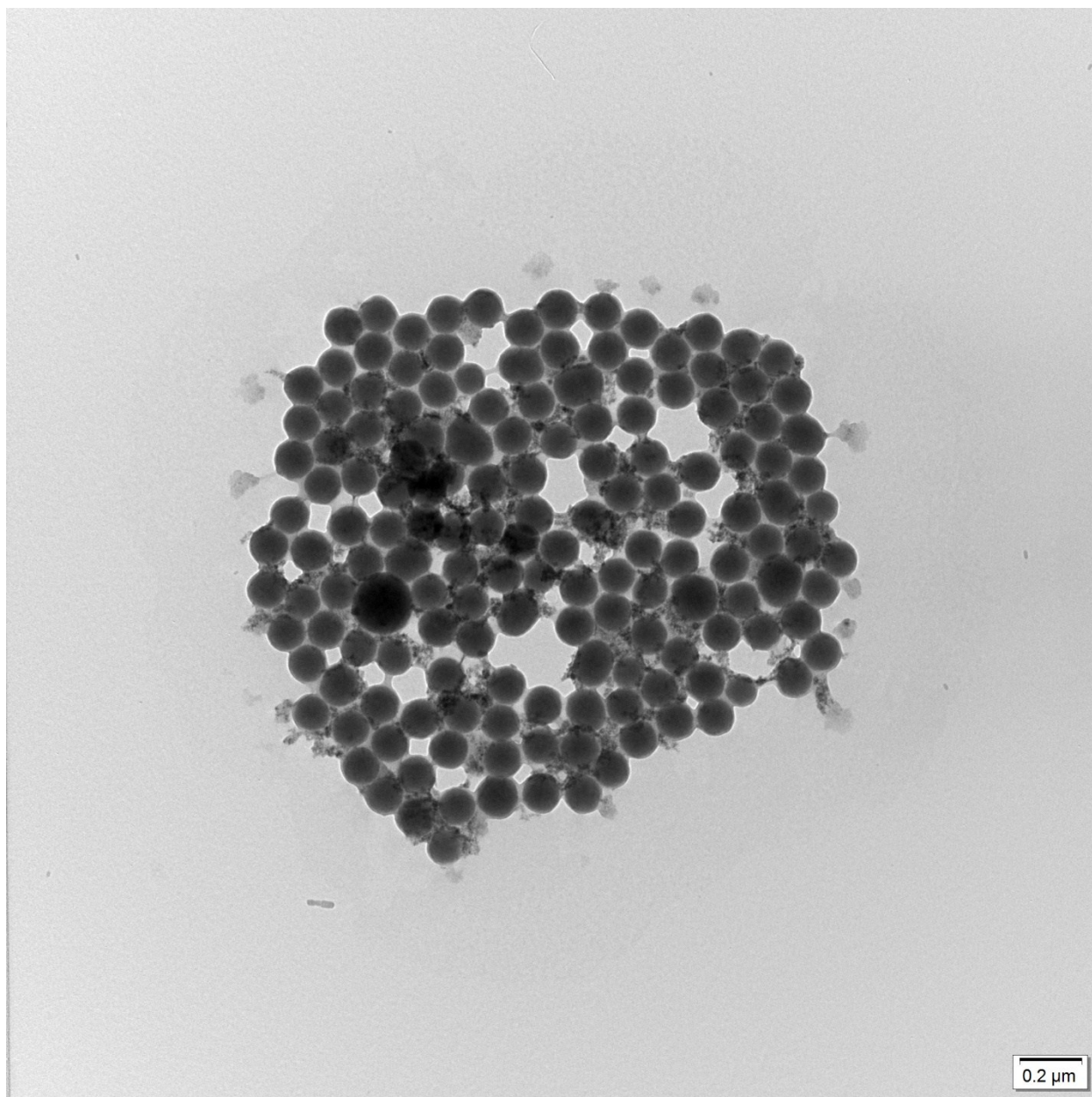


Figure S73. TEM image of NP-GPS-PCL-xPCL-PEG, scale bar = 200 nm

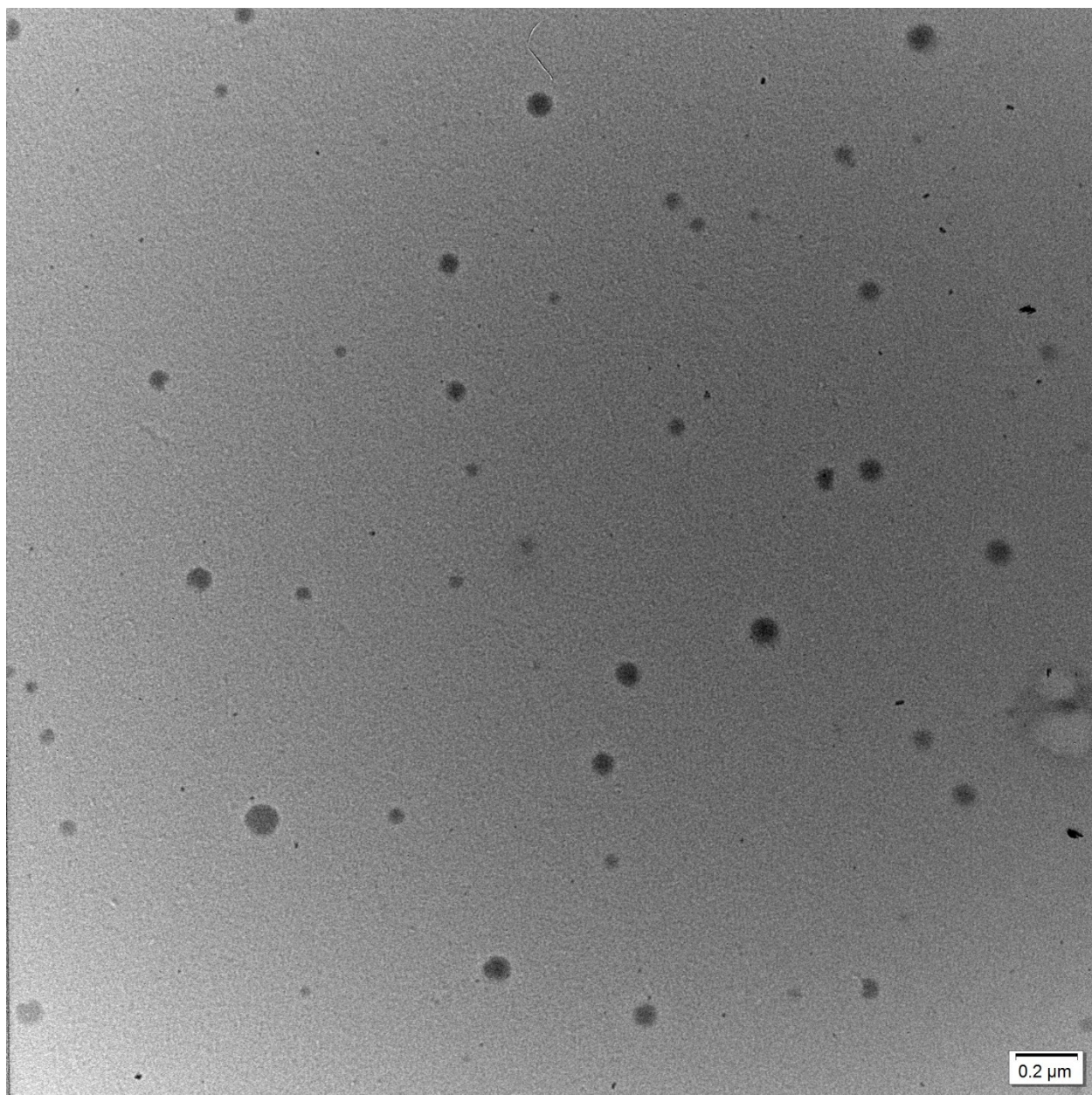


Figure S74. TEM image of Hollow-GPS-PCL-xPCL-PEG, scale bar = 200 nm

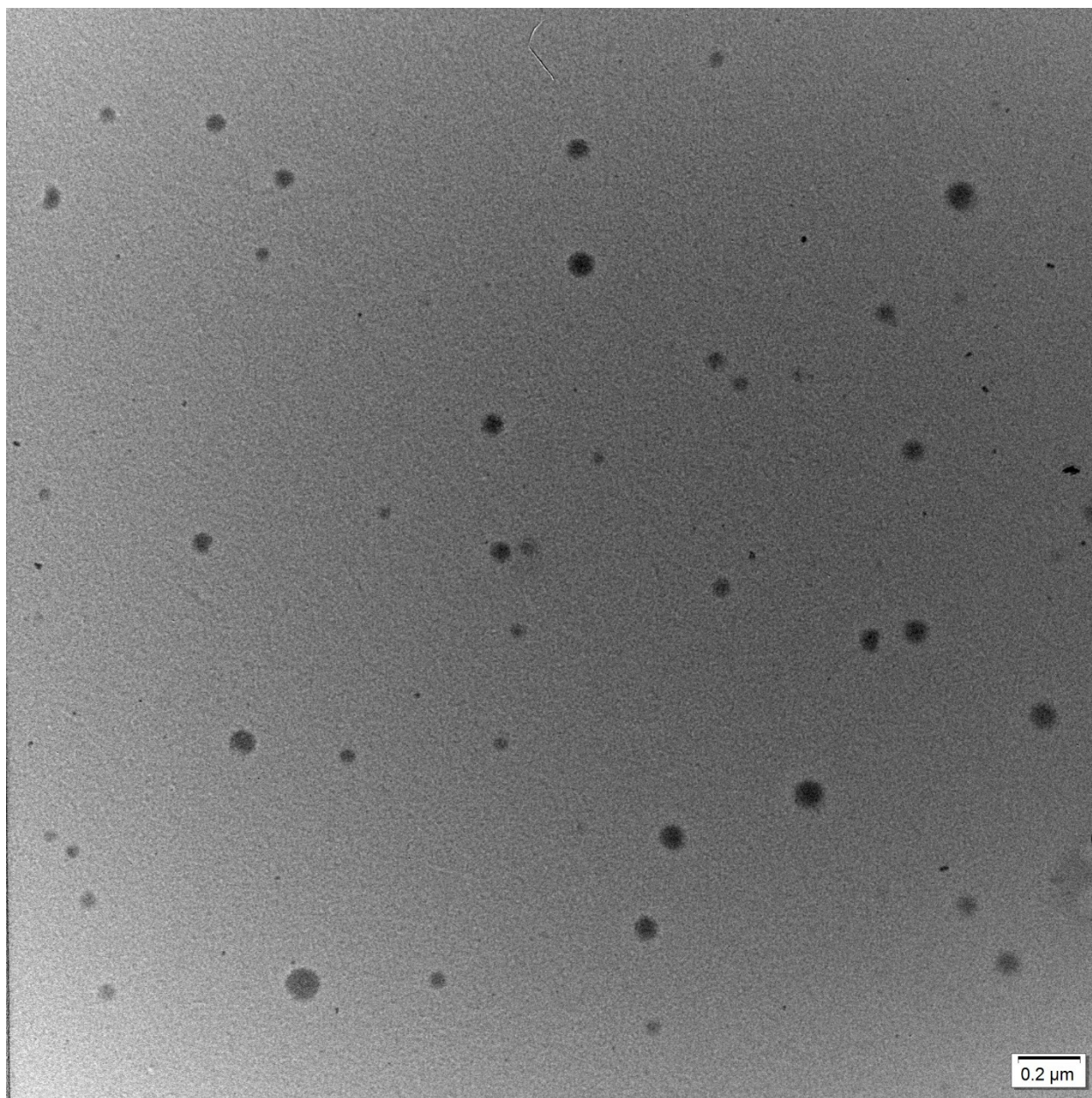


Figure S75. TEM image of Hollow-GPS-PCL-xPCL-PEG, scale bar = 200 nm

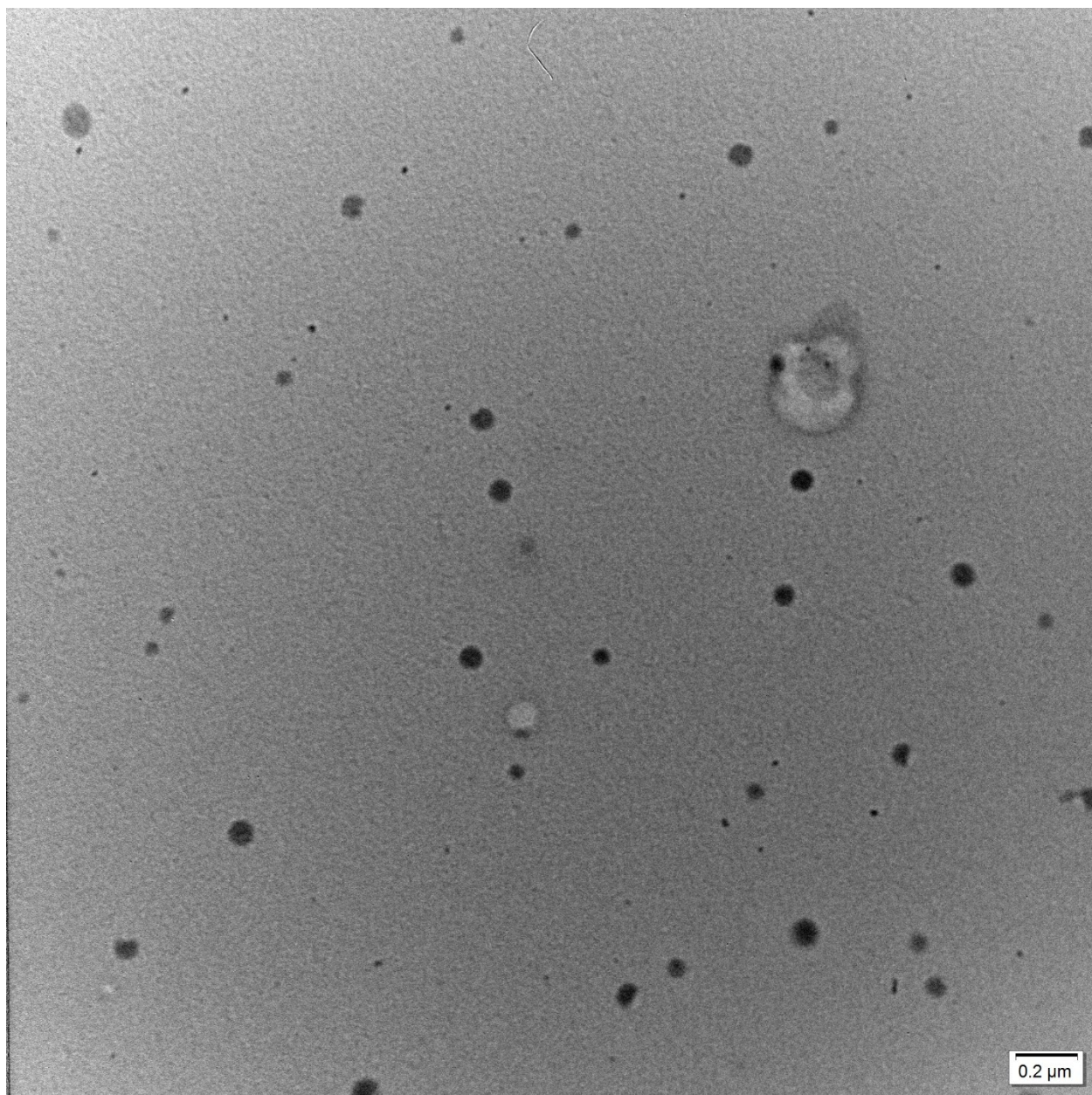


Figure S76. TEM image of Hollow-GPS-PCL-xPCL-PEG, scale bar = 200 nm

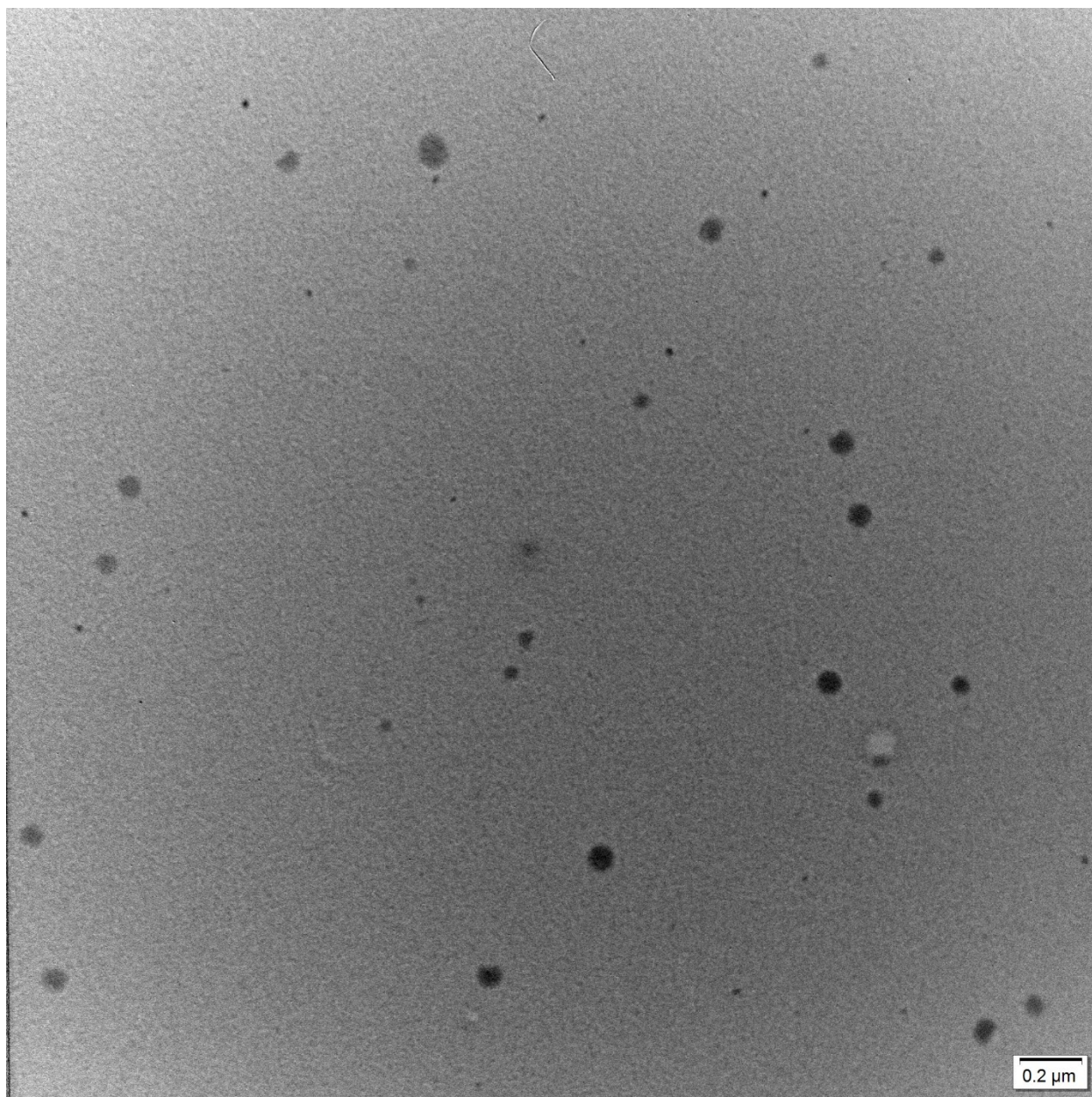


Figure S77. TEM image of Hollow-GPS-PCL-xPCL-PEG, scale bar = 200 nm

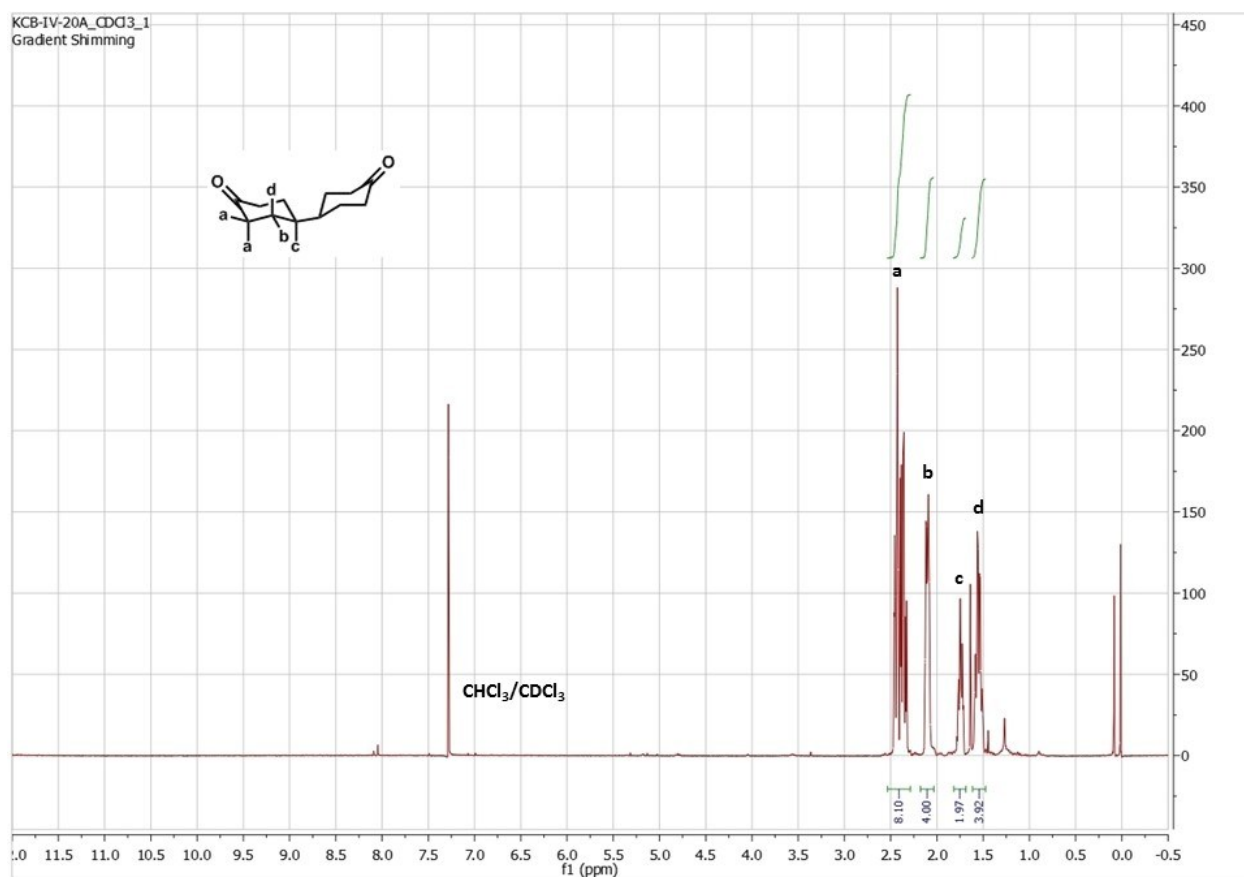


Figure S78. ^1H NMR spectrum of dicyclohexanone.

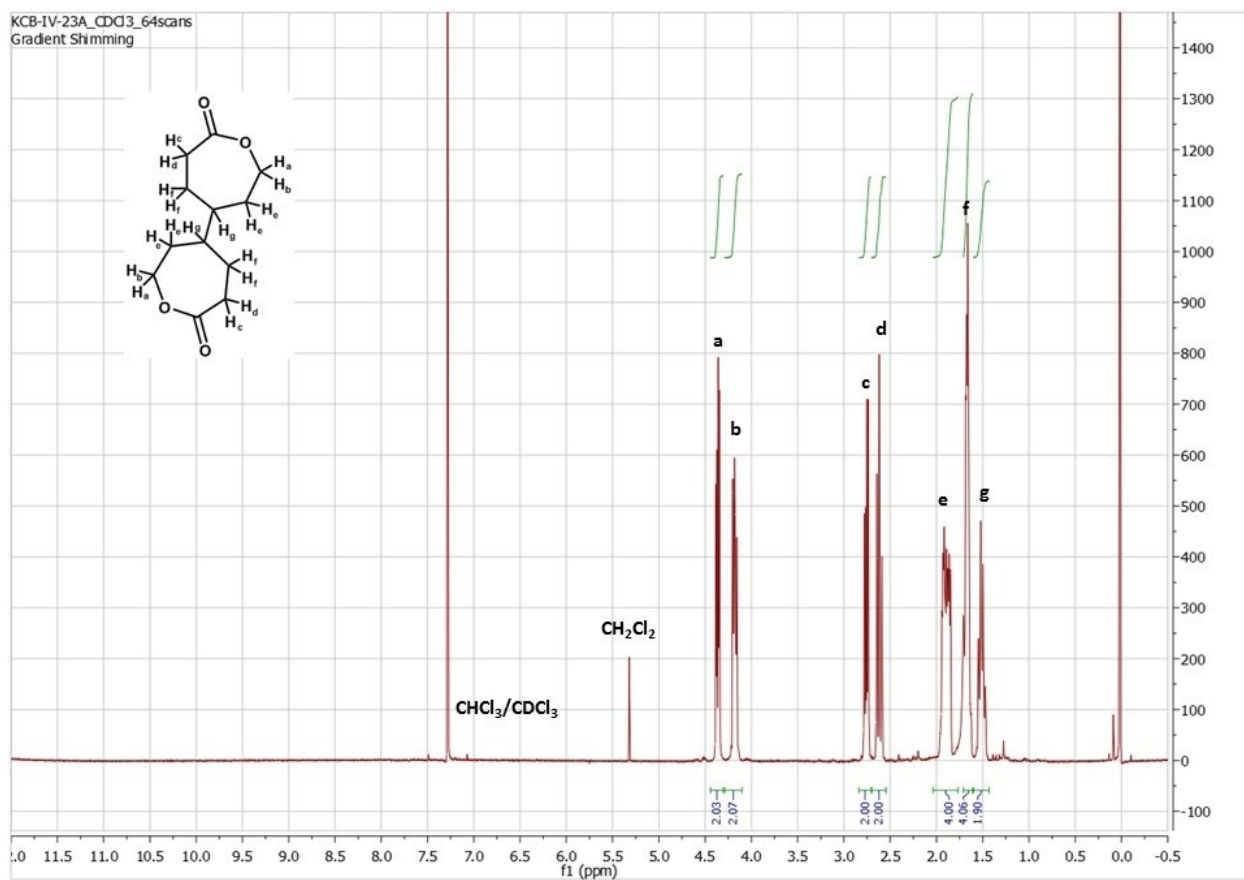


Figure S79. ^1H NMR spectrum of *bis*-caprolactone.

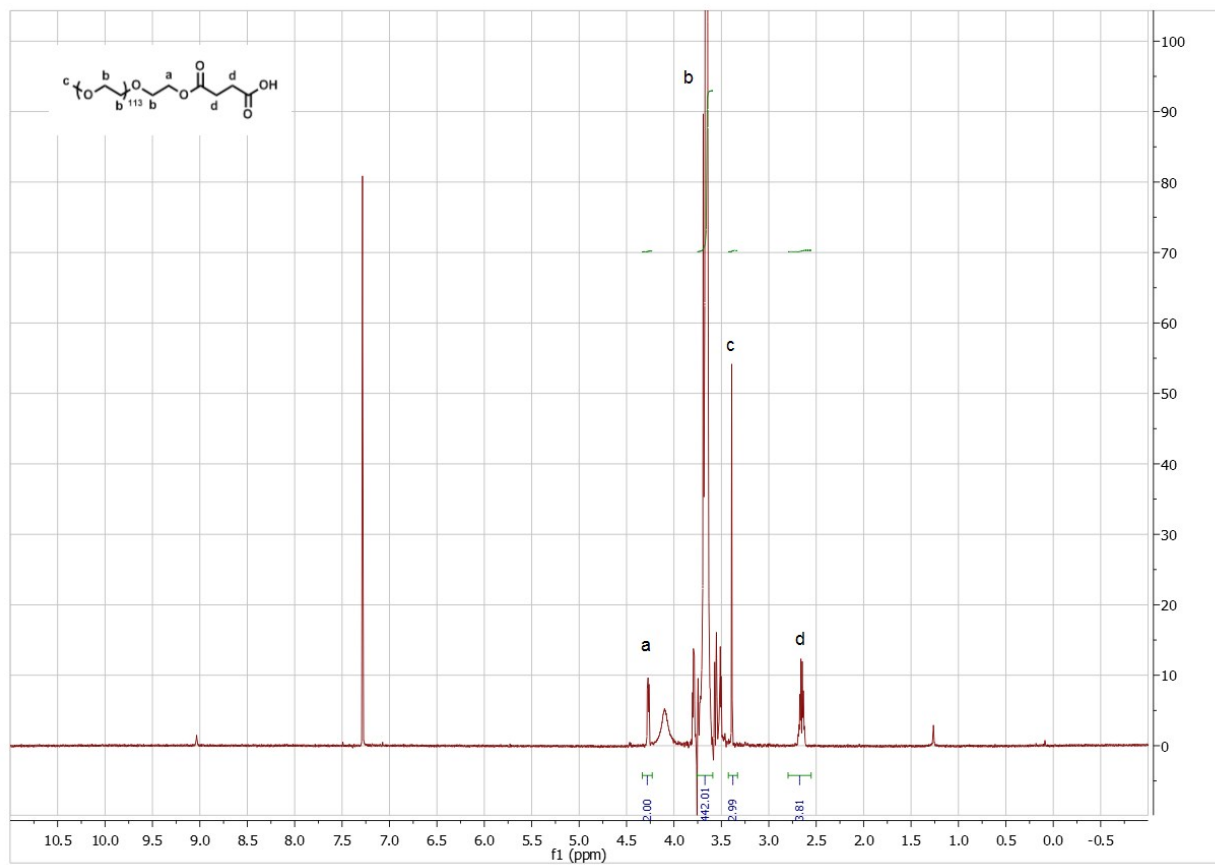


Figure S80. ^1H NMR spectrum of acid-functionalized poly(ethylene glycol).

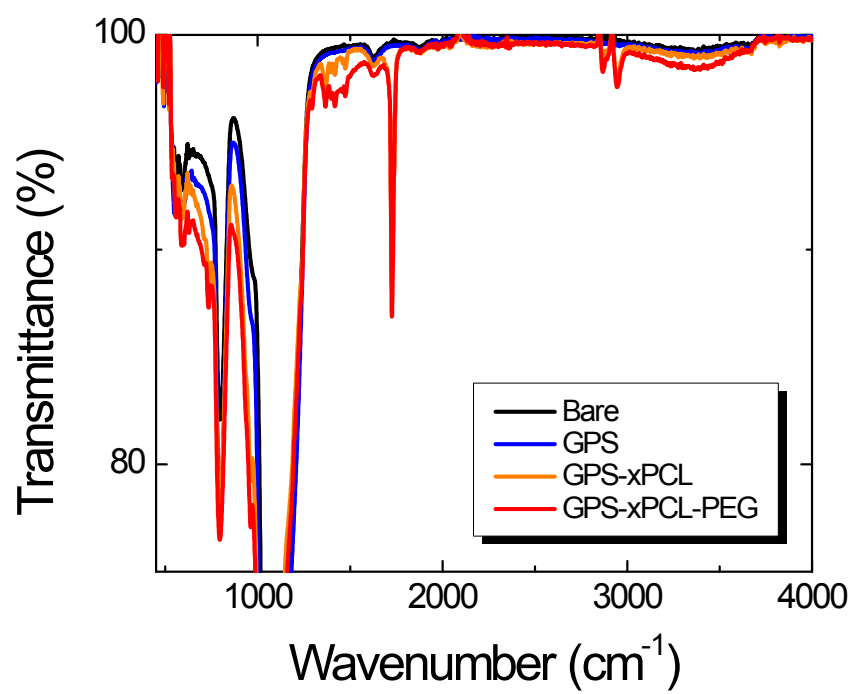


Figure S81. FTIR spectra of bare silica nanoparticles (black), NP-GPS (blue), NP-GPS-xPCL (yellow), NP-GPS-xPCL-PEG (red).

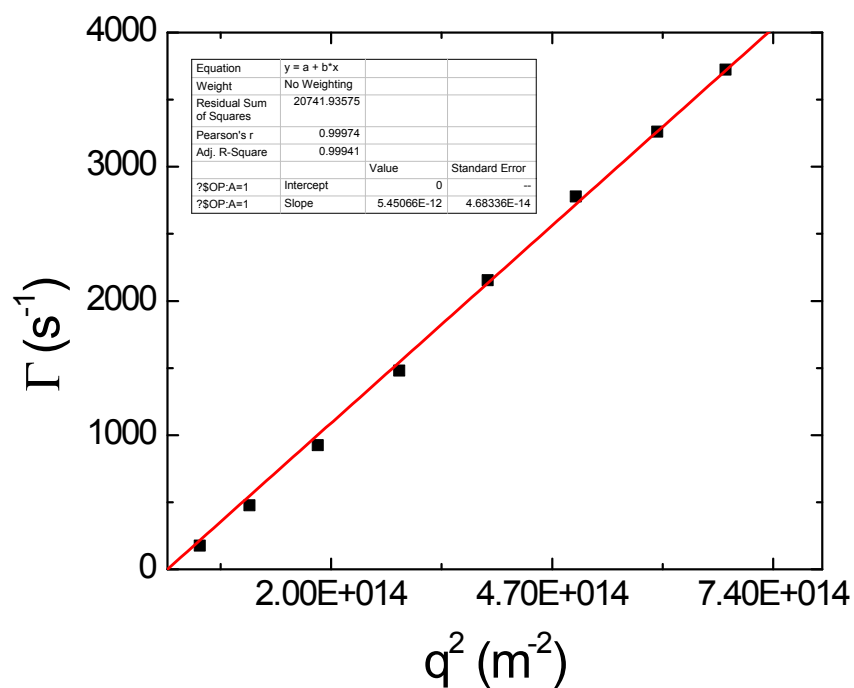


Figure S82. Gamma vs. q^2 plot for NP-GPS-PCL for subsequent dilute solution grafting of ϵ -caprolactone in the absence of crosslinker. $R_h = 88$ nm.

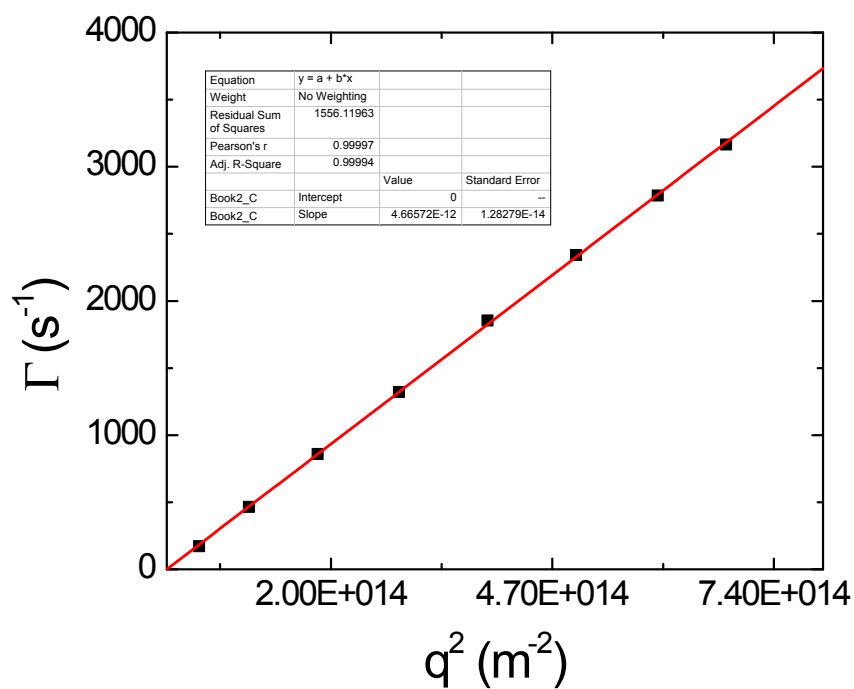


Figure S83. Gamma vs. q^2 plot for NP-GPS-PCL-PCL. NP-GPS-PCL (50 mg), ϵ -caprolactone (1.5 g), stannous octoate (10 mg), *o*-xylene (8.5 mL), 1440 min polymerization time. $R_h = 103$ nm.

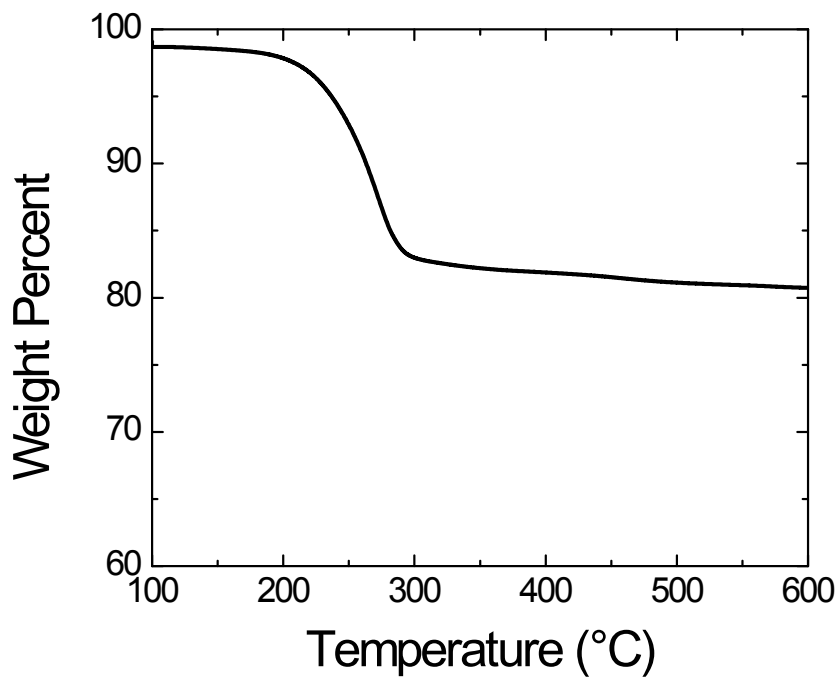


Figure S84. TGA mass loss profile for NP-GPS-PCL for subsequent dilute solution grafting of ϵ -caprolactone in the absence of crosslinker.

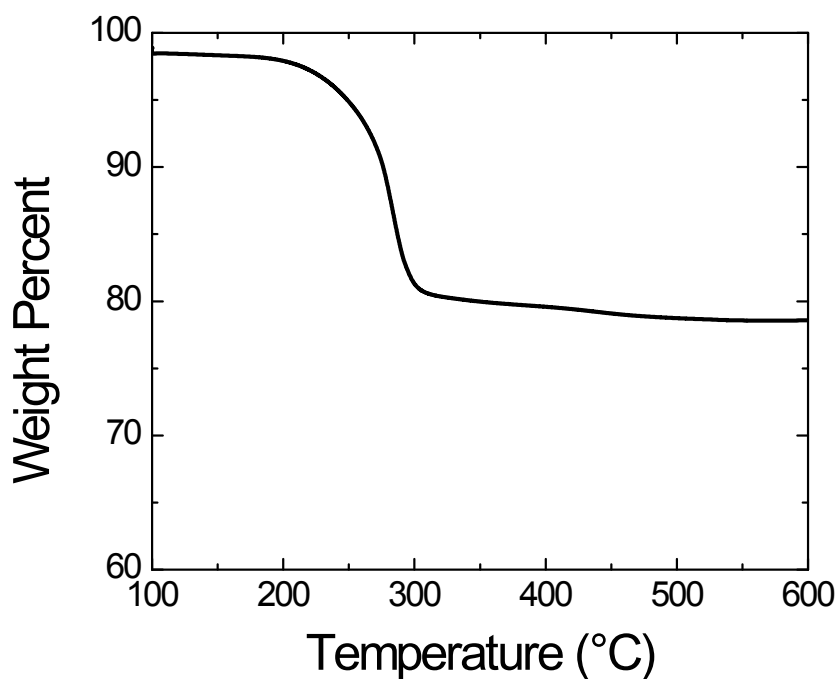


Figure S85. TGA mass loss profile for NP-GPS-PCL-PCL.

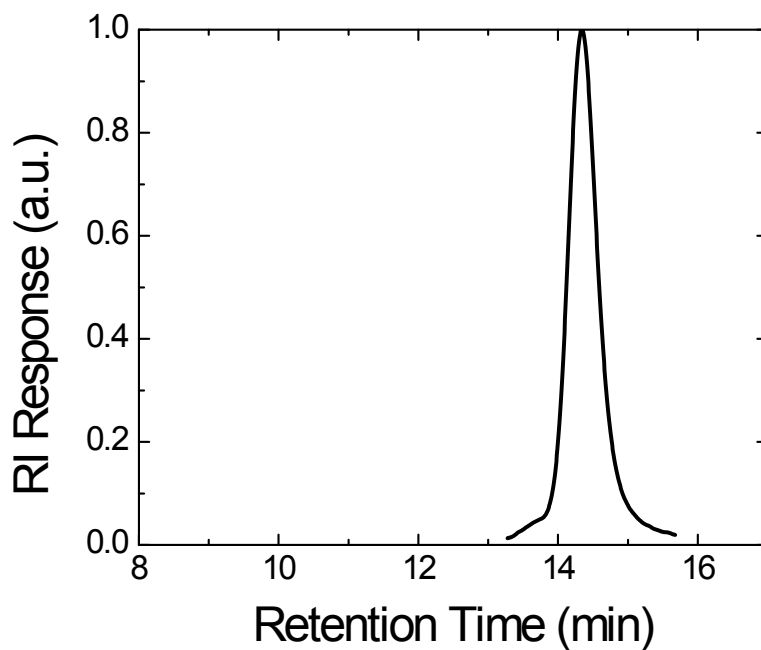


Figure S86. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-PCL for subsequent dilute solution grafting of ϵ -caprolactone in the absence of crosslinker, $M_n = 12,200$, $\bar{D} = 1.09$

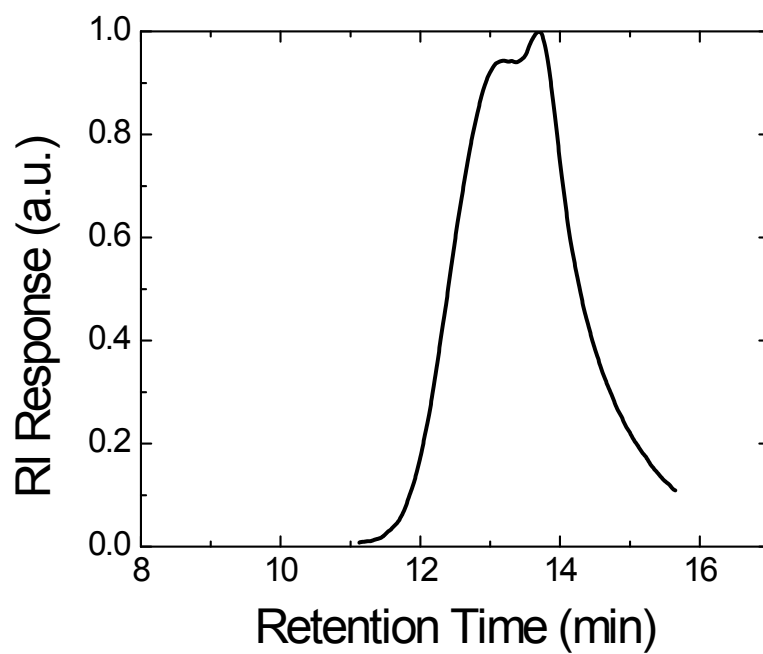


Figure S87. GPC chromatogram for free polymer formed in grafting reaction of NP-GPS-PCL-PCL. $M_n = 21,800$, $\bar{D} = 1.75$