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# Supplementary Information

## Synthesis of cationic β-cyclodextrin functionalized silver nanoparticles and their drug-loading applications

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**1. Synthesis of Diaminopropane-β-cyclodextrin (DAP-β-CD):**

Two-step synthesis of DAP-β-CD[1,2]: Briefly, 50.0 g of β-CD was dissolved in 500 mL of a 0.4 M NaOH solution (0~5 °C), then 35.0 g of TsCl was added in batches within 5 min and stirred for another 30 min below 5 °C, after removing the unreacted TsCl by filtration, the filtrate was neutralized to pH 8 with 3 M HCl and stirred for 1 h. The resultant precipitates were filtered off, washed three times with water, and finally dried under vacuum at 40 °C. 4.0 g of Ts-β-CD was dissolved in 20 mL of 1,3-propanediamine and stirred at 80°C for 4 h. Then poured into 250 mL of EtOH. The precipitates were collected by filtration and were washed by EtOH thoroughly. The solid was dried under vacuum at 40 °C to obtain the DAP-β-CD. (yield: 94%). $^{1}$H-NMR (600 MHz, $D_2O$): δ(ppm)5.09-5.04 (m,7H), δ3.98-3.82 (m, 26H), δ3.67-3.55 (m, 14H), δ3.46-3.41 (t, 1H), δ3.11-3.03 (m, 1H), δ2.87-2.60 (m, 7H), δ1.73-1.62 (m, 2H); $^{13}$C-NMR (151 MHz, $D_2O$): δ(ppm)101.84, 83.65, 81.12, 73.10, 72.04, 71.83, 60.26, 49.44, 46.43, 37.86, 30.25. FT-IR: (KBr, $cm^{-1}$): v 3377, 2929, 1639, 1570, 1156, 1080, 1032, 945, 580. ESI-MS (*m/z*): 1190.44 (Calcd.) and 1191.45 (Found) for [ M + H] $^{+}$

**2. Synthesis of cationic-β-cyclodextrin (C-β-CD):**

C-β-CD was synthesized as follows: 0.6 g of EPTAC was dissolved in 10 mL of DMSO, subsequently, 4.5 g of DAP-β-CD was dissolved in 10 mL of DMSO solution and added to the above EPTAC solution, and then reacted at 80 °C for 4 h. Then poured into 250 mL of EtOH. The precipitates were collected by filtration and were washed by EtOH thoroughly. The solid was dried under vacuum at 40 °C to obtain the C-β-CD. (yield: 82%). $^{1}$H-NMR (600 MHz, $D_2O$): δ(ppm)5.10-5.01 (m,7H), δ4.09-3.73 (m, 26H), δ3.67-3.55 (m, 14H), δ3.47-3.35 (m, 2H), δ3.31-3.13 (s, 5H), δ3.09-3.03 (d, 2H) δ2.89-2.55 (m, 8H), δ1.83-1.60 (m, 2H); $^{13}$C NMR (151 MHz, $D_2O$) δ 102.94, 83.65, 81.87, 73.07, 72.04, 71.82, 69.12, 64.68, 60.29, 54.15, 52.29, 49.39, 46.97, 46.32, 38.19. FT-IR: (KBr, $cm^{-1}$): v 3377, 2928, 1639, 1570, 1155, 1080, 1032, 945, 580. ESI-MS (*m/z*): 1341.52 (Calcd.) and 1306.55 (Found) for [ M - Cl] $^{+}$

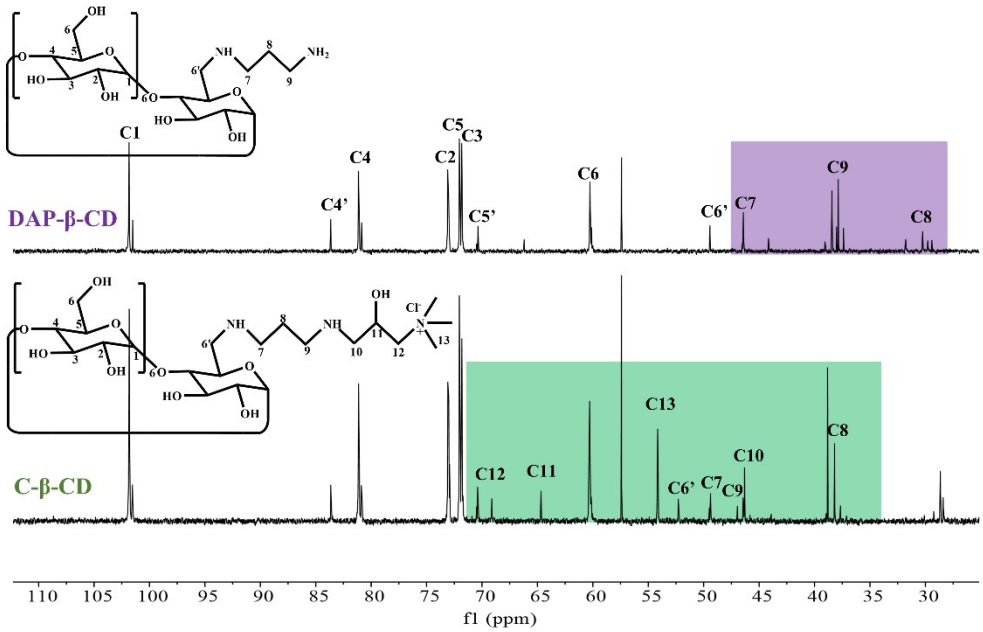


**Figure S1 $^{13}$C-NMR spectrum of DAP-β-CD and C-β-CD.**

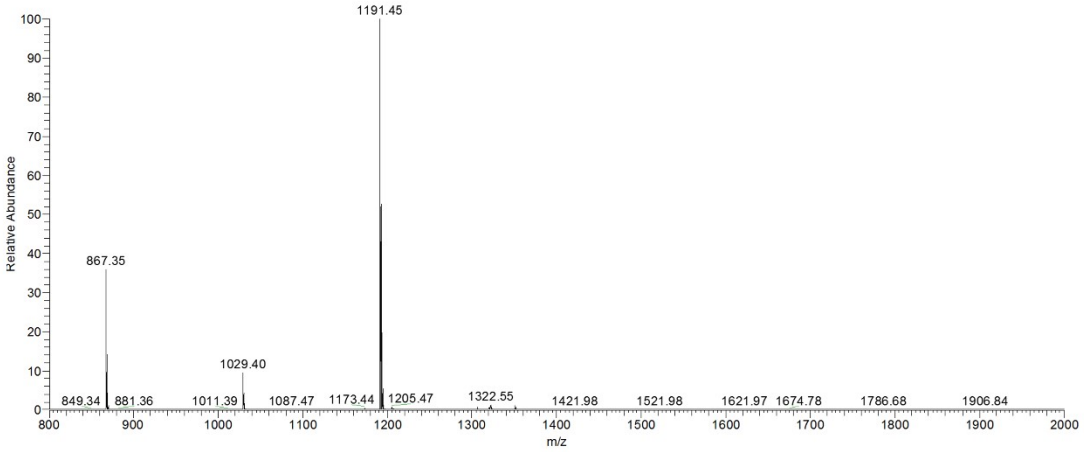


**Figure S2 Mass spectrum of DAP-β-CD.**

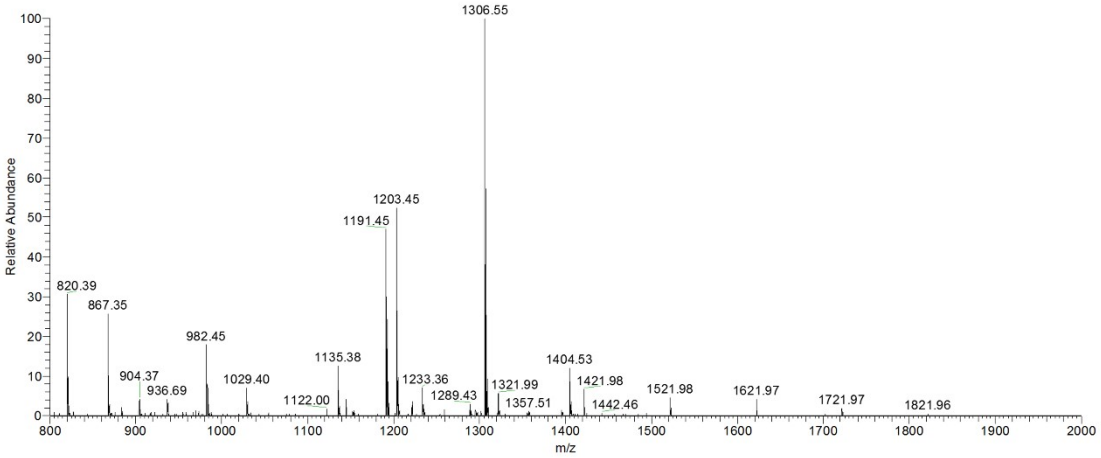


**Figure S3 Mass spectrum of C-β-CD.**

**References:**

1. J. Stadermann, H. Komber, M. Erber, F. Däbritz, H. Ritter and B. Voit, Macromolecules, 2011, 44, 3250–3259.

2. P. Jiao, H. Zhou, M. Otto, Q. Mu, L. Li, G. Su, Y. Zhang, E. R. Butch, S. E. Snyder, G. Jiang and B. Yan, J. Am. Chem. Soc., 2011, 133, 13918–13921.