Supporting Information

Aggregation behaviour and application properties of novel glycosylamide quaternary ammonium salts in aqueous solution

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Characterization of C_nDDLPB

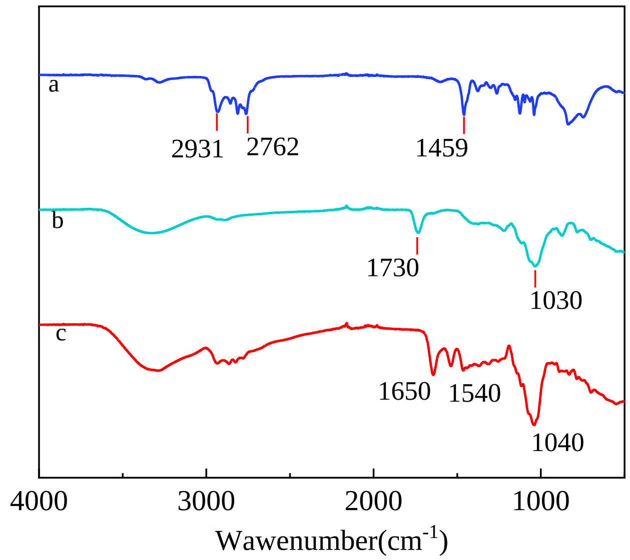

Figure S1. FT-IR spectra of (a) N-N-Dimethyldipropyltriamine, (b)Lactobionic Acid, (c) DDLPD

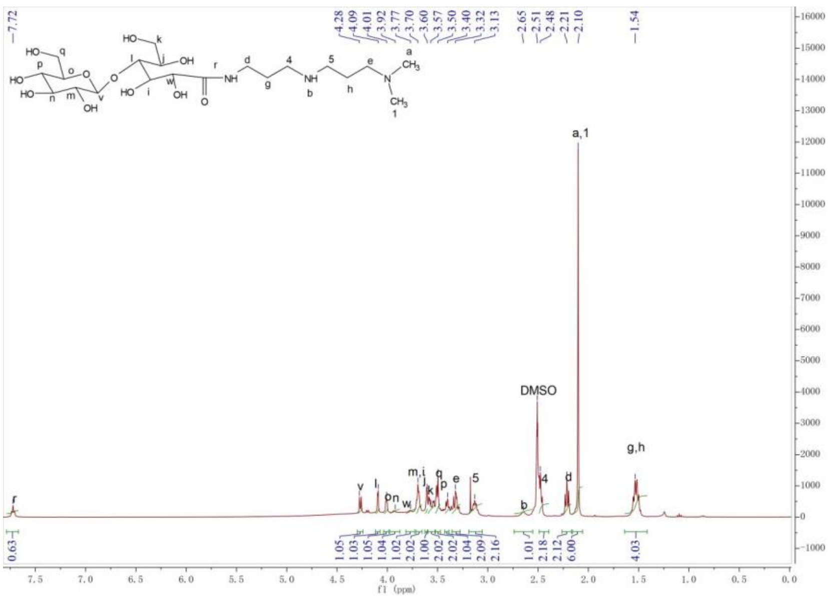

Figure S2. ^{1}H-NMR spectra of DDLPD

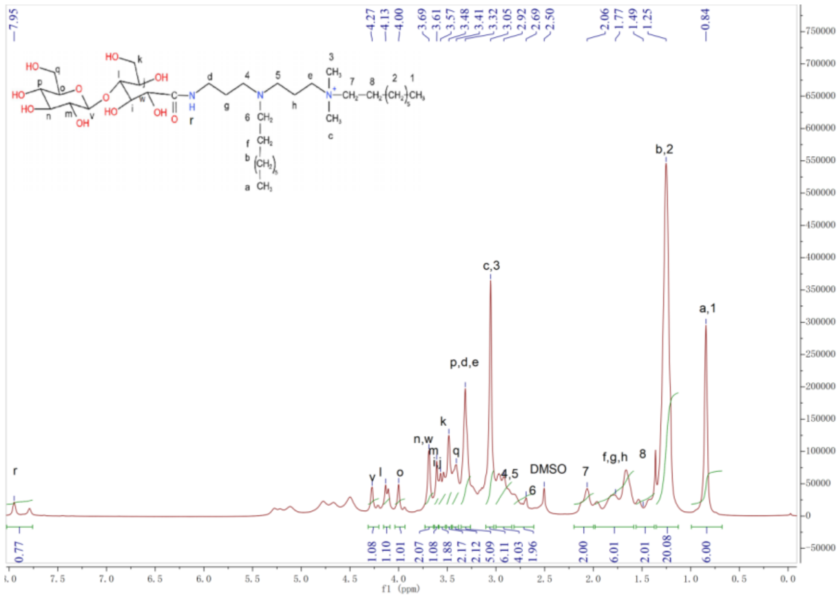

Figure S3. ^{1}H-NMR spectra of C_8DDLPB

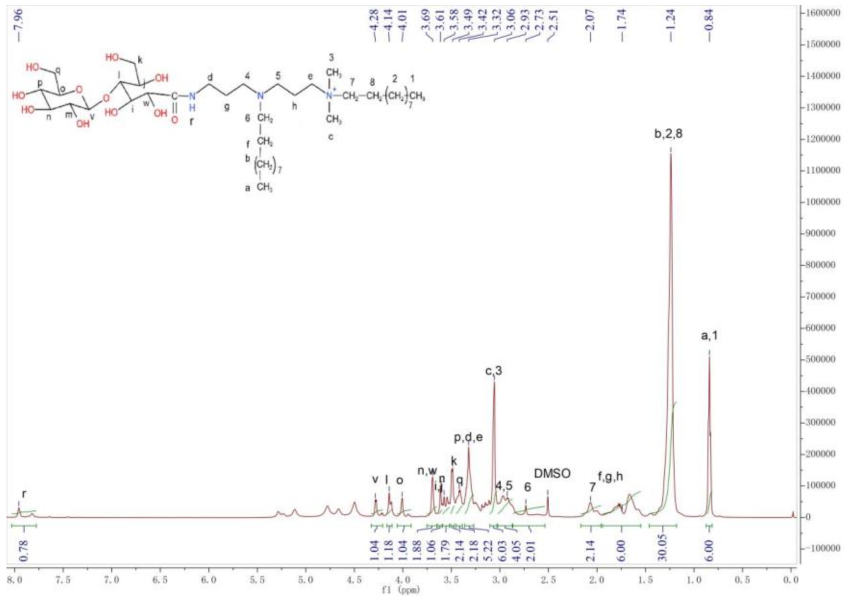

Figure S4. ^{1}H-NMR spectra of C_{10}DDLPB

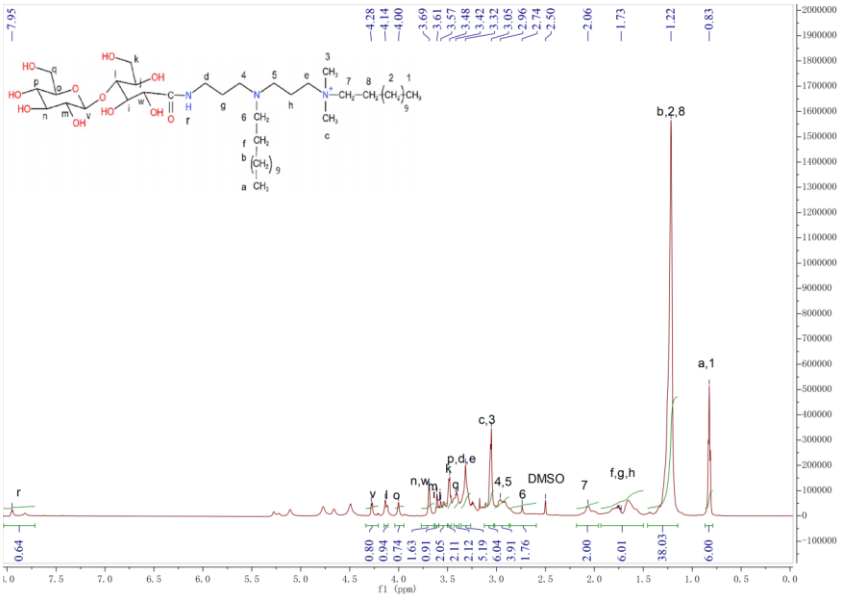

Figure S5. ^{1}H-NMR spectra of C_{12}DDLPB

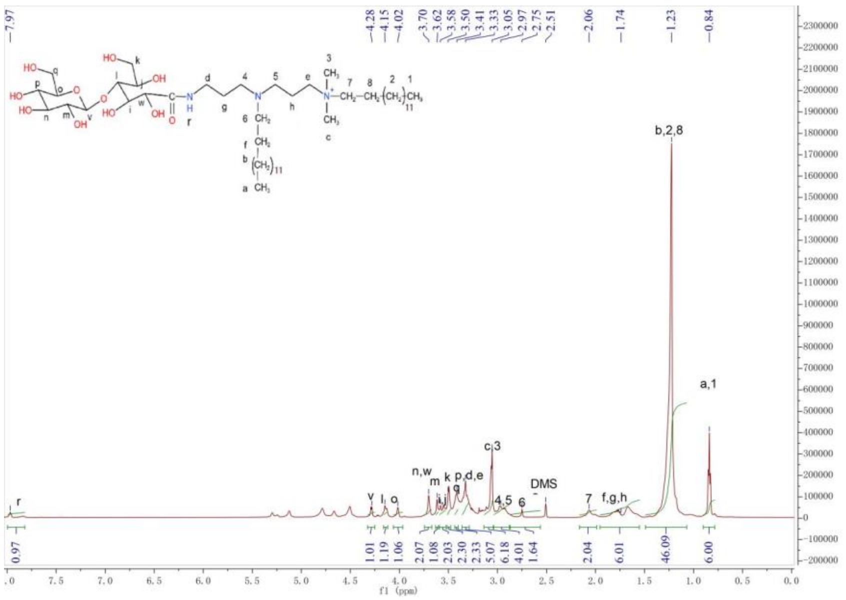

Figure S6. ^{1}H-NMR spectra of C_{14}DDLPB

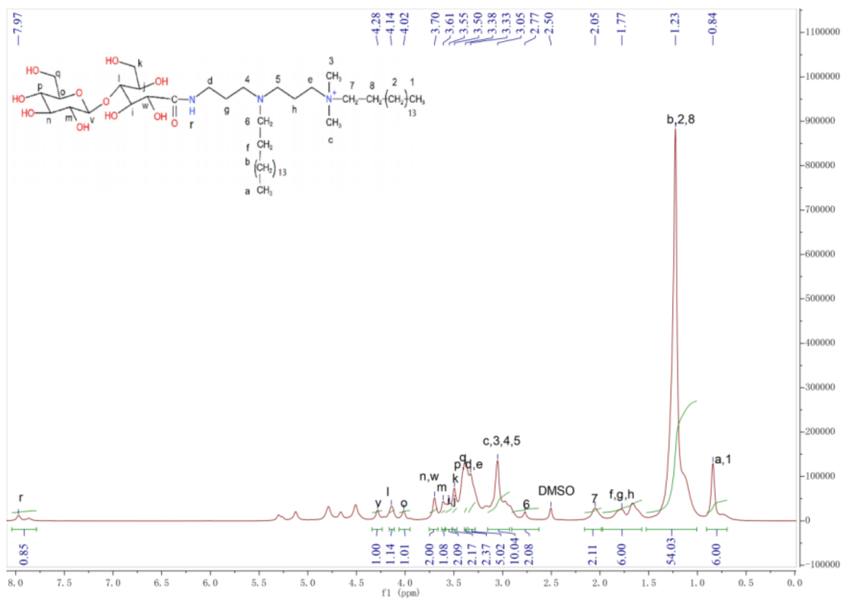

Figure S7. ^{1}H-NMR spectra of C_{16}DDLPB

DDLPD: ^{1}H-NMR(DMSO-d6, 600MHz): δ: 1.54(m, 4H, $NHCH_2C\underline{\mathbf{H_2}}$, $NHCH_2C\underline{\mathbf{H_2}}CH_2$), 2.10(s, 6H, $NC\underline{\mathbf{H_3}}C\underline{\mathbf{H_3}}$), 2.21(t, 2H, $NHCH_2CH_2C\underline{\mathbf{H_2}}NHCO$), 2.48(t, 2H, $NHC\mathbf{H_2}CH_2CH_2$ NHCO), 2.65(s, 1H, $N\underline{\mathbf{H}}$), 3.13(m, 2H, $NHC\underline{\mathbf{H_2}}CH_2CH_2N(CH_3)_2$), 3.32(m, 2H, $NHCH_2$ $CH_2C\underline{\mathbf{H_2}}N(CH_3)_2$), 3.40-4.28(m, 13H, O$\underline{\mathbf{H}}$ groups from sugar part), 7.72(s, 1H, CON$\underline{\mathbf{H}}$).

C_8DDLPB: ^{1}H-NMR(DMSO-d6, 600MHz): δ: 0.84(m, 6H, $CH_2CH_2(CH_2)_5C\underline{\mathbf{H_3}}$, $CH_2CH_2(CH_2)_5C\underline{\mathbf{H_3}}$), 1.25(s, 20H, $CH_2CH_2(C\underline{\mathbf{H_2}})_5CH_3$, $CH_2CH_2(C\underline{\mathbf{H_2}})_5CH_3$), 1.49(s, 2H, N^+ $CH_2C\underline{\mathbf{H_2}}(CH_2)_5CH_3$), 1.77(m, 6H, $NCH_2C\underline{\mathbf{H_2}}CH_2$, $NCH_2C\underline{\mathbf{H_2}}CH_2$, $NCH_2C\underline{\mathbf{H_2}}(CH_2)_5CH_3$), 2.06(m, 2H, $N^+C\underline{\mathbf{H_2}}CH_2(CH_2)_5CH_3$), 2.69(m, 2H, $NC\underline{\mathbf{H_2}}CH_2(CH_2)_5CH_3$), 2.92(m, 4H, $NC\underline{\mathbf{H_2}}$ CH_2CH_2, $NC\underline{\mathbf{H_2}}CH_2CH_2$), 3.05(d, 6H, $N^+C\underline{\mathbf{H_3}}$, $N^+C\underline{\mathbf{H_3}}$), 3.32(m, 5H, $CONHC\underline{\mathbf{H_2}}$, $N^+C\underline{\mathbf{H_2}}CH_2CH_2N$, OH groups from sugar part), 3.32-4.27(m, 12H, O$\underline{\mathbf{H}}$ groups from sugar part), 7.95(d, 1H, CON$\underline{\mathbf{H}}$).

C_{10}DDLPB : ^{1}H-NMR(DMSO-d6, 600MHz): δ: 0.84(m, 6H, $CH_2CH_2(CH_2)_7C\underline{\mathbf{H_3}}$, $CH_2CH_2(CH_2)_7C\underline{\mathbf{H_3}}$), 1.24(s, 30H, $CH_2CH_2(C\underline{\mathbf{H_2}})_7CH_3$, $N^+CH_2C\underline{\mathbf{H_2}}(C\underline{\mathbf{H_2}})_7CH_3$), 1.74(m, 6H, $NCH_2C\underline{\mathbf{H_2}}CH_2$, $NCH_2C\underline{\mathbf{H_2}}CH_2$, $NCH_2C\underline{\mathbf{H_2}}(CH_2)_7CH_3$), 2.07(m, 2H, $N^+C\underline{\mathbf{H_2}}CH_2(CH_2)_7CH_3$), 2.73(m, 2H, $NC\underline{\mathbf{H_2}}CH_2(CH_2)_7CH_3$), 2.93(m, 4H, $NC\underline{\mathbf{H_2}}CH_2CH_2$, $NC\underline{\mathbf{H_2}}CH_2CH_2$), 3.06(d, 6H, $N^+C\underline{\mathbf{H_3}}$, $N^+C\underline{\mathbf{H_3}}$), 3.32(m, 5H, $CONHC\underline{\mathbf{H_2}}$, $N^+C\underline{\mathbf{H_2}}CH_2CH_2N$, OH groups from sugar part), 3.32-4.28(m, 12H, O$\underline{\mathbf{H}}$ groups from sugar part), 7.96(d, 1H, CON$\underline{\mathbf{H}}$).

C_{12}DDLPB : ^{1}H-NMR(DMSO-d6, 600MHz): δ: 0.83(m, 6H, $CH_2CH_2(CH_2)_9C\mathbf{H_3}$, $CH_2CH_2(CH_2)_9C\underline{\mathbf{H_3}}$), 1.22(s, 38H, $CH_2CH_2(C\underline{\mathbf{H_2}})_9CH_3$, $N^+CH_2C\underline{\mathbf{H_2}}(C\underline{\mathbf{H_2}})_9CH_3$), 1.73(m, 6H, $NCH_2C\underline{\mathbf{H_2}}CH_2$, $NCH_2C\underline{\mathbf{H_2}}CH_2$, $NCH_2C\underline{\mathbf{H_2}}(CH_2)_9CH_3$), 2.06(m, 2H, $N^+C\underline{\mathbf{H_2}}CH_2(CH_2)_9CH_3$), 2.74(m, 2H, $NC\underline{\mathbf{H_2}}CH_2(CH_2)_9CH_3$), 2.96(m, 4H, $NC\underline{\mathbf{H_2}}CH_2CH_2$, $NC\underline{\mathbf{H_2}}CH_2CH_2$), 3.05(d, 6H, $N^+C\underline{\mathbf{H_3}}$, $N^+C\underline{\mathbf{H_3}}$), 3.32(m, 5H, $CONHC\underline{\mathbf{H_2}}$, $N^+C\underline{\mathbf{H_2}}CH_2CH_2N$, O$\underline{\mathbf{H}}$ groups from sugar part),3.32-4.28(m, 12H, O$\underline{\mathbf{H}}$ groups from sugar part), 7.95(d, 1H, CON$\underline{\mathbf{H}}$).

C_{14}DDLPB : ^{1}H-NMR(DMSO-d6, 600MHz): δ: 0.84(m, 6H, $CH_2CH_2(CH_2)_{11}C\underline{\mathbf{H_3}}$, CH_2 $CH_2(CH_2)_{11}C\underline{\mathbf{H_3}}$), 1.23(s, 46H, $CH_2CH_2(C\underline{\mathbf{H_2}})_{11}CH_3$, $N^+CH_2C\underline{\mathbf{H_2}}(C\underline{\mathbf{H_2}})_{11}CH_3$), 1.74(m, 6H, $NCH_2C\underline{\mathbf{H_2}}CH_2$, $NCH_2C\underline{\mathbf{H_2}}CH_2$, $NCH_2C\underline{\mathbf{H_2}}(CH_2)_{11}CH_3$), 2.06(m, 2H, $N^+C\underline{\mathbf{H_2}}CH_2(CH_2)_{11}CH_3$), 2.75(m, 2H, $NC\underline{\mathbf{H_2}}CH_2(CH_2)_{11}CH_3$), 2.97(m, 4H, $NC\underline{\mathbf{H_2}}CH_2CH_2$, $NC\underline{\mathbf{H_2}}CH_2CH_2$), 3.05(d, 6H, $N^+C\underline{\mathbf{H_3}}$, $N^+C\underline{\mathbf{H_3}}$), 3.33(m, 5H, $CONHC\underline{\mathbf{H_2}}$, $N^+C\underline{\mathbf{H_2}}CH_2CH_2N$, O$\underline{\mathbf{H}}$ groups from sugar part),3.33-4.28(m, 12H, O$\underline{\mathbf{H}}$ groups from sugar part), 7.97(d, 1H, CON$\underline{\mathbf{H}}$).

C_{16}DDLPB : ^{1}H-NMR(DMSO-d6, 600MHz): δ: 0.84(m, 6H, $CH_2CH_2(CH_2)_{13}C\underline{\mathbf{H_3}}$, $CH_2CH_2(CH_2)_{13}C\underline{\mathbf{H_3}}$), 1.23(s, 54H, $CH_2CH_2(C\underline{\mathbf{H_2}})_{13}CH_3$, $N^+CH_2C\underline{\mathbf{H_2}}(C\underline{\mathbf{H_2}})_{13}CH_3$), 1.77(m, 6H, $NCH_2C\underline{\mathbf{H_2}}CH_2$, $NCH_2C\underline{\mathbf{H_2}}CH_2$, $NCH_2C\underline{\mathbf{H_2}}(CH_2)_{13}CH_3$), 2.05(m, 2H, $N^+C\underline{\mathbf{H_2}}CH_2(CH_2)_{13}CH_3$), 2.77(m, 2H, $NC\underline{\mathbf{H_2}}CH_2(CH_2)_{13}CH_3$), 3.05(m, 10H, $NC\underline{\mathbf{H_2}}CH_2CH_2$, $NC\underline{\mathbf{H_2}}CH_2CH_2$, $N^+C\underline{\mathbf{H_3}}$, $N^+C\underline{\mathbf{H_3}}$), 3.33(m, 5H, $CONHC\underline{\mathbf{H_2}}$, $N^+C\underline{\mathbf{H_2}}CH_2CH_2N$, OH groups from sugar part),3.33-4.28(m, 12H, O**H** groups from sugar part), 7.97(d, 1H, CON**H**).

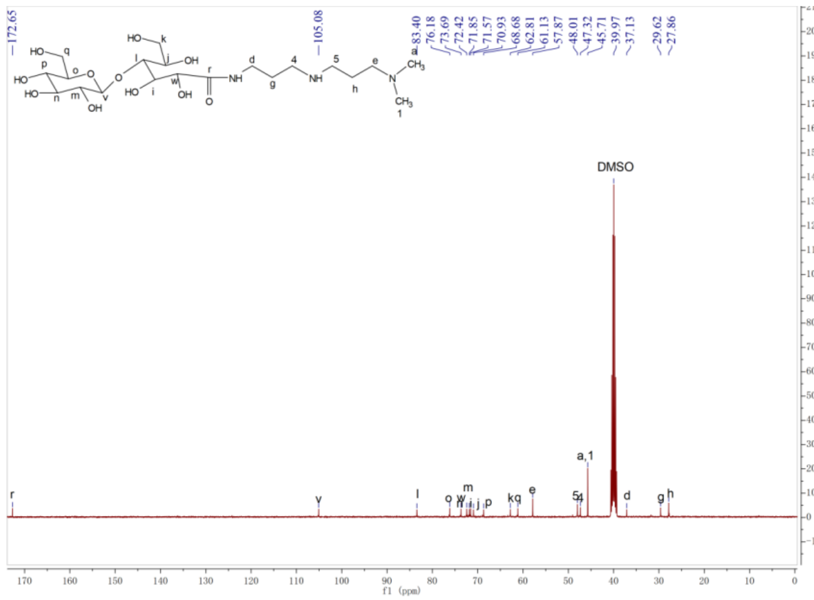

Figure S8. ^{13}C-NMR spectra of DDLPD

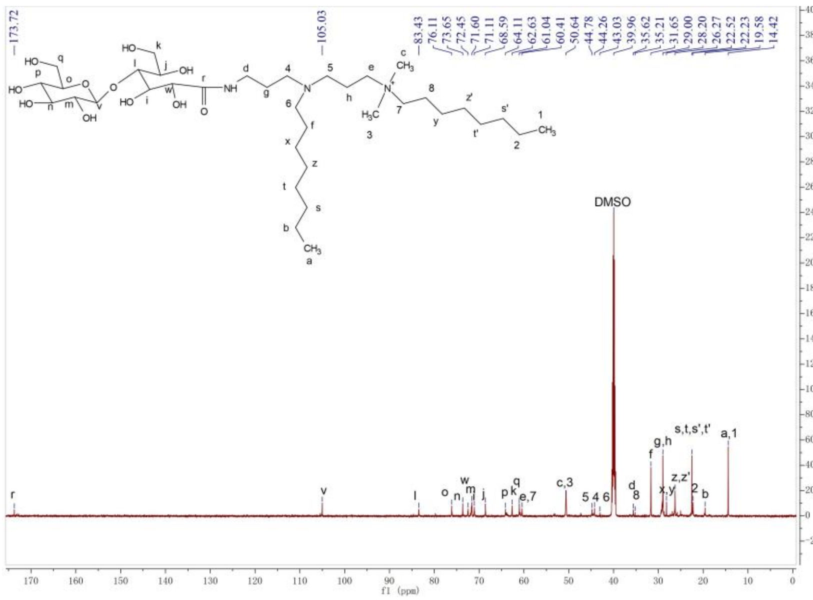

Figure S9. ^{13}C-NMR spectra of C_8DDLPB

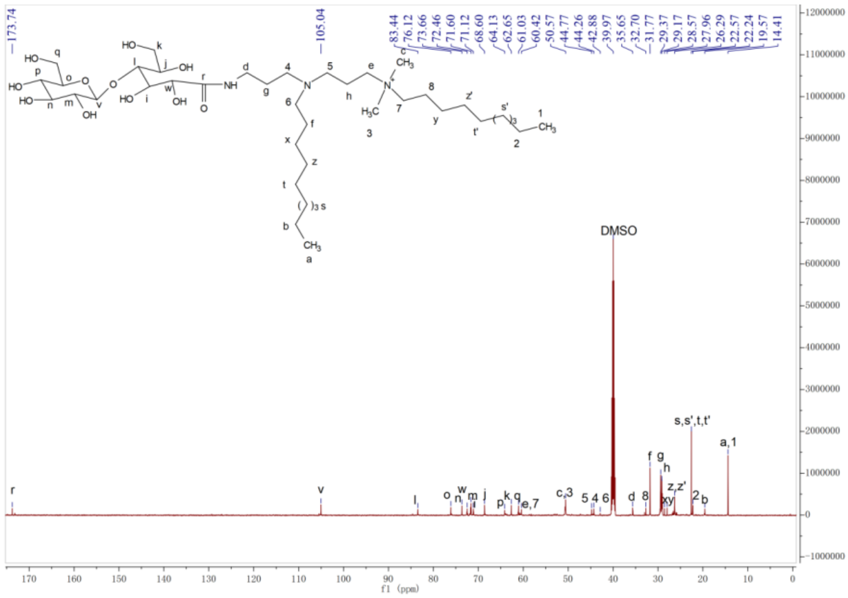

Figure S10. ^{13}C-NMR spectra of C_{10}DDLPB

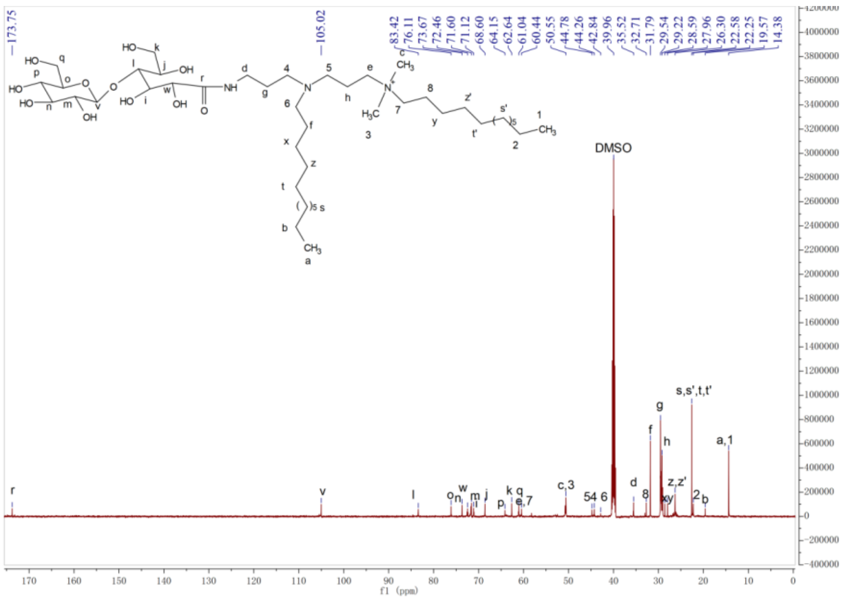

Figure S11. ^{13}C-NMR spectra of C_{12}DDLPB

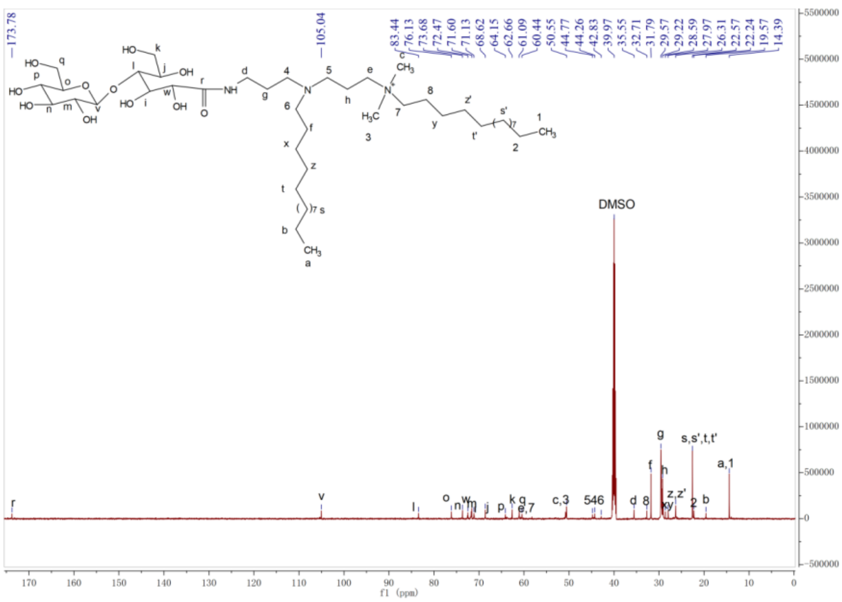

Figure S12. ^{13}C-NMR spectra of C_{14}DDLPB

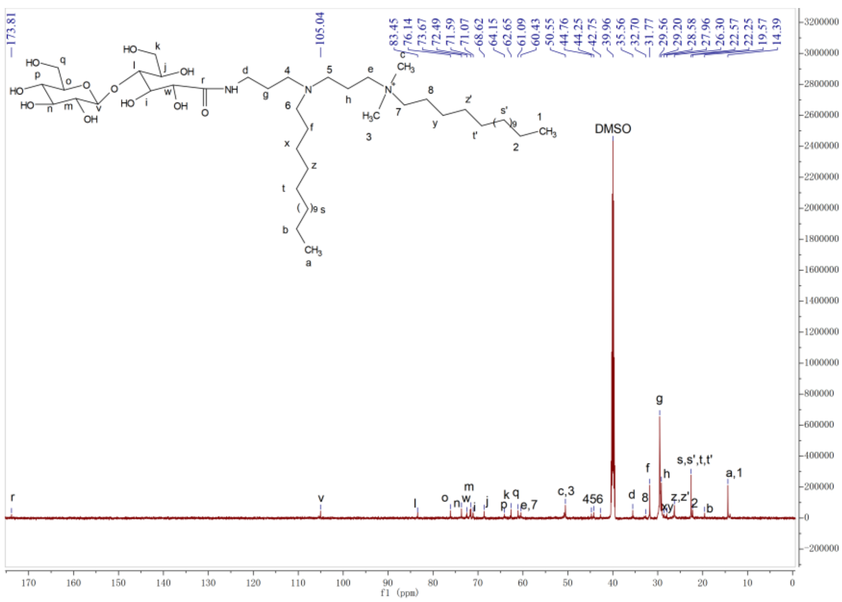

Figure S13. ^{13}C-NMR spectra of C_{16}DDLPB

DDLPD : ^{13}C-NMR(DMSO-d6, 600MHz): δ: 27.86 (NHCH$_2$**C**H$_2$CH$_2$N), 29.62 (CONHCH$_2$**C**H$_2$CH$_2$NH), 37.13 (CONH**C**H$_2$CH$_2$CH$_2$NH), 45.71 (N**C**H$_3$, N**C**H$_3$), 47.32 (CONHCH$_2$CH$_2$**C**H$_2$NH), 48.01(NH**C**H$_2$CH$_2$CH$_2$N), 57.87 (NHCH$_2$CH$_2$**C**H$_2$N), 61.13 (**C**H$_2$ OH), 62.81 (**C**H$_2$OH), 68.68 (**C**HOH), 70.93 (**C**H), 71.57 (**C**HOH), 71.85 (**C**HOH), 72.42 (**C**HOH), 73.69 (**C**HOH), 76.18 (**C**HO), 83.40 (**C**HO), 105.08 (O**C**HO), 172.65 (**C**ONH).

C$_8$DDLPB: ^{13}C-NMR(DMSO-d6, 600MHz): δ: 14.42 (CH$_2$CH$_2$(CH$_2$)$_5$**C**H$_3$, CH$_2$CH$_2$ (CH$_2$)$_5$**C**H$_3$), 19.58 (N(CH$_2$)$_6$**C**H$_2$CH$_3$), 22.23 (N$^+$(CH$_2$)$_6$**C**H$_2$CH$_3$), 22.52 (N(CH$_2$)$_4$ **C**H$_2$**C**H$_2$ CH$_2$CH$_3$, N$^+$(CH$_2$)$_4$**C**H$_2$**C**H$_2$CH$_2$CH$_3$), 26.27 (N(CH$_2$)$_3$**C**H$_2$(CH$_2$)$_3$CH$_3$, N$^+$(CH$_2$)$_3$**C**H$_2$ (CH$_2$)$_3$ CH$_3$), 28.20 (N(CH$_2$)$_2$**C**H$_2$(CH$_2$)$_4$CH$_3$, N$^+$(CH$_2$)$_2$**C**H$_2$(CH$_2$)$_4$CH$_3$), 29.00 (CONH CH$_2$**C**H$_2$ CH$_2$N, NCH$_2$**C**H$_2$CH$_2$N$^+$), 31.65 (NCH$_2$**C**H$_2$(CH$_2$)$_5$CH$_3$), 35.21 (N$^+$CH$_2$**C**H$_2$(CH$_2$)$_5$ CH$_3$), 35.62 (CONH**C**H$_2$CH$_2$CH$_2$N), 43.03 (N**C**H$_2$(CH$_2$)$_6$CH$_3$), 44.26 (CONHCH$_2$CH$_2$**C**H$_2$N), 44.78 ($N\underline{\mathbf{C}}H_2CH_2CH_2N^+$), 50.64 ($N^+CH_3$, N^+CH_3), 60.41 ($NCH_2CH_2\underline{\mathbf{C}}H_2N^+$, $N^+\underline{\mathbf{C}}H_2(CH_2)_6CH_3$), 61.04 ($\underline{\mathbf{C}}H_2OH$), 62.63 ($\underline{\mathbf{C}}H_2OH$), 64.11 ($\underline{\mathbf{C}}HOH$), 68.59 ($\underline{\mathbf{C}}HOH$), 71.11 ($\underline{\mathbf{C}}HOH$), 71.60 ($\underline{\mathbf{C}}HOH$), 72.45 ($\underline{\mathbf{C}}HOH$), 73.65 ($\underline{\mathbf{C}}HOH$), 76.11 ($\underline{\mathbf{C}}HO$), 83.43 ($\underline{\mathbf{C}}HO$), 105.03 ($O\underline{\mathbf{C}}HO$), 173.72 ($\underline{\mathbf{C}}ONH$).

C_{10}DDLPB: ^{13}C-NMR(DMSO-d6, 600MHz): δ: 14.41 ($CH_2CH_2(CH_2)_7\underline{\mathbf{C}}H_3$, $CH_2CH_2(CH_2)_7\underline{\mathbf{C}}H_3$), 19.57 ($N(CH_2)_8\underline{\mathbf{C}}H_2CH_3$), 22.24 ($N^+(CH_2)_8\underline{\mathbf{C}}H_2CH_3$), 22.57 ($N(CH_2)_4(\underline{\mathbf{C}}H_2)_{\underline{\mathbf{4}}}CH_2CH_3$, $N^+(CH_2)_4(\underline{\mathbf{C}}H_2)_{\underline{\mathbf{4}}}CH_2CH_3$), 26.29 ($N(CH_2)_3\underline{\mathbf{C}}H_2(CH_2)_5CH_3$, $N^+(CH_2)_3\underline{\mathbf{C}}H_2(CH_2)_5CH_3$), 27.96 ($N^+(CH_2)_2\underline{\mathbf{C}}H_2(CH_2)_6CH_3$,), 28.57 ($N(CH_2)_2\underline{\mathbf{C}}H_2(CH_2)_6CH_3$), 29.17 ($NCH_2\underline{\mathbf{C}}H_2CH_2N^+$), 29.37($CONHCH_2\underline{\mathbf{C}}H_2CH_2N$), 31.77 ($NCH_2\underline{\mathbf{C}}H_2(CH_2)_7CH_3$), 32.70 ($N^+CH_2\underline{\mathbf{C}}H_2(CH_2)_7CH_3$), 35.65 ($CONH\underline{\mathbf{C}}H_2CH_2CH_2N$), 42.88 ($N\underline{\mathbf{C}}H_2(CH_2)_8CH_3$), 44.26 ($CONHCH_2CH_2\underline{\mathbf{C}}H_2N$), 44.77 ($N\underline{\mathbf{C}}H_2CH_2CH_2N^+$), 50.57 ($N^+CH_3$, N^+CH_3), 60.42 ($NCH_2CH_2\underline{\mathbf{C}}H_2N^+$, $N^+\underline{\mathbf{C}}H_2(CH_2)_8CH_3$), 61.03 ($\underline{\mathbf{C}}H_2OH$), 62.65 ($\underline{\mathbf{C}}H_2OH$), 64.13 ($\underline{\mathbf{C}}HOH$), 68.60 ($\underline{\mathbf{C}}HOH$), 71.12 ($\underline{\mathbf{C}}HOH$), 71.60 ($\underline{\mathbf{C}}HOH$), 72.46 ($\underline{\mathbf{C}}HOH$), 73.66 ($\underline{\mathbf{C}}HOH$), 76.12 ($\underline{\mathbf{C}}HO$), 83.44 ($\underline{\mathbf{C}}HO$), 105.04 ($O\underline{\mathbf{C}}HO$), 173.74 ($\underline{\mathbf{C}}ONH$).

C_{12}DDLPB: ^{13}C-NMR(DMSO-d6, 600MHz): δ: 14.38 ($CH_2CH_2(CH_2)_9\underline{\mathbf{C}}H_3$, $CH_2CH_2(CH_2)_9\underline{\mathbf{C}}H_3$), 19.57 ($N(CH_2)_{10}\underline{\mathbf{C}}H_2CH_3$), 22.25 ($N^+(CH_2)_{10}\underline{\mathbf{C}}H_2CH_3$), 22.58 ($N(CH_2)_4(\underline{\mathbf{C}}H_2)_{\underline{\mathbf{6}}}CH_2CH_3$, $N^+(CH_2)_4(\underline{\mathbf{C}}H_2)_{\underline{\mathbf{6}}}CH_2CH_3$), 26.30 ($N(CH_2)_3\underline{\mathbf{C}}H_2(CH_2)_7CH_3$, $N^+(CH_2)_3\underline{\mathbf{C}}H_2(CH_2)_7CH_3$), 27.96 ($N^+(CH_2)_2\underline{\mathbf{C}}H_2(CH_2)_8CH_3$), 28.59 ($N(CH_2)_2\underline{\mathbf{C}}H_2(CH_2)_8CH_3$), 29.22 ($NCH_2\underline{\mathbf{C}}H_2CH_2N^+$), 29.54($CONHCH_2\underline{\mathbf{C}}H_2CH_2N$), 31.79 ($NCH_2\underline{\mathbf{C}}H_2(CH_2)_9CH_3$), 32.71 ($N^+CH_2\underline{\mathbf{C}}H_2(CH_2)_9CH_3$), 35.52 ($CONH\underline{\mathbf{C}}H_2CH_2CH_2N$), 42.84 ($N\underline{\mathbf{C}}H_2(CH_2)_{10}CH_3$), 44.26 ($CONHCH_2CH_2\underline{\mathbf{C}}H_2N$), 44.78 ($N\underline{\mathbf{C}}H_2CH_2CH_2N^+$), 50.55 ($N^+CH_3$, N^+CH_3), 60.44 ($NCH_2CH_2\underline{\mathbf{C}}H_2N^+$, $N^+\underline{\mathbf{C}}H_2(CH_2)_{10}CH_3$), 61.04 ($\underline{\mathbf{C}}H_2OH$), 62.64 ($\underline{\mathbf{C}}H_2OH$), 64.15 ($\underline{\mathbf{C}}HOH$), 68.60 ($\underline{\mathbf{C}}HOH$), 71.12 ($\underline{\mathbf{C}}HOH$), 71.60 ($\underline{\mathbf{C}}HOH$), 72.46 ($\underline{\mathbf{C}}HOH$), 73.67 ($\underline{\mathbf{C}}HOH$), 76.11 ($\underline{\mathbf{C}}HO$), 83.42 ($\underline{\mathbf{C}}HO$), 105.02 ($O\underline{\mathbf{C}}HO$), 173.75 ($\underline{\mathbf{C}}ONH$).

C_{14}DDLPB: ^{13}C-NMR(DMSO-d6, 600MHz): δ: 14.39 ($CH_2CH_2(CH_2)_{11}\underline{\mathbf{C}}H_3$, $CH_2CH_2(CH_2)_{11}\underline{\mathbf{C}}H_3$), 19.57 ($N(CH_2)_{12}\underline{\mathbf{C}}H_2CH_3$), 22.24 ($N^+(CH_2)_{12}\underline{\mathbf{C}}H_2CH_3$), 22.57 ($N(CH_2)_4(\underline{\mathbf{C}}H_2)_{\underline{\mathbf{8}}}CH_2CH_3$, $N^+(CH_2)_4(\underline{\mathbf{C}}H_2)_{\underline{\mathbf{8}}}CH_2CH_3$), 26.31 ($N(CH_2)_3\underline{\mathbf{C}}H_2(CH_2)_9CH_3$, $N^+(CH_2)_3\underline{\mathbf{C}}H_2(CH_2)_9CH_3$), 27.97 ($N^+(CH_2)_2\underline{\mathbf{C}}H_2(CH_2)_{10}CH_3$), 28.59 ($N(CH_2)_2\underline{\mathbf{C}}H_2(CH_2)_{10}CH_3$), 29.22 ($NCH_2\underline{\mathbf{C}}H_2CH_2N^+$), 29.57($CONHCH_2\underline{\mathbf{C}}H_2CH_2N$), 31.79 ($NCH_2\underline{\mathbf{C}}H_2(CH_2)_{11}CH_3$), 32.71 ($N^+CH_2\underline{\mathbf{C}}H_2(CH_2)_{11}CH_3$), 35.55 ($CONH\underline{\mathbf{C}}H_2CH_2CH_2N$), 42.83 ($N\underline{\mathbf{C}}H_2(CH_2)_{12}CH_3$), 44.26 ($CONHCH_2CH_2\underline{\mathbf{C}}H_2N$), 44.77 ($N\underline{\mathbf{C}}H_2CH_2CH_2N^+$), 50.55 ($N^+CH_3$, N^+CH_3), 60.44 ($NCH_2CH_2\underline{\mathbf{C}}H_2N^+$, $N^+\underline{\mathbf{C}}H_2(CH_2)_{12}CH_3$), 61.09 ($\underline{\mathbf{C}}H_2OH$), 62.66 ($\underline{\mathbf{C}}H_2OH$), 64.15 ($\underline{\mathbf{C}}HOH$), 68.62 ($\underline{\mathbf{C}}HOH$), 71.13 ($\underline{\mathbf{C}}HOH$), 71.60 ($\underline{\mathbf{C}}HOH$), 72.47 ($\underline{\mathbf{C}}HOH$), 73.68 ($\underline{\mathbf{C}}HOH$), 76.13 ($\underline{\mathbf{C}}HO$), 83.44 ($\underline{\mathbf{C}}HO$), 105.04 ($O\underline{\mathbf{C}}HO$), 173.78 ($\underline{\mathbf{C}}ONH$).

C_{16}DDLPB: ^{13}C-NMR(DMSO-d6, 600MHz): δ: 14.39 ($CH_2CH_2(CH_2)_{13}\underline{\mathbf{C}}H_3$, $CH_2CH_2(CH_2)_{13}\underline{\mathbf{C}}H_3$), 19.57 ($N(CH_2)_{14}\underline{\mathbf{C}}H_2CH_3$), 22.25 ($N^+(CH_2)_{14}\underline{\mathbf{C}}H_2CH_3$), 22.57 ($N(CH_2)_4(\underline{\mathbf{C}}H_2)_{\underline{\mathbf{10}}}CH_2CH_3$, $N^+(CH_2)_4(\underline{\mathbf{C}}H_2)_{\underline{\mathbf{10}}}CH_2CH_3$), 26.30 ($N(CH_2)_3\underline{\mathbf{C}}H_2(CH_2)_{11}CH_3$, $N^+(CH_2)_3\underline{\mathbf{C}}H_2(CH_2)_{11}CH_3$), 27.96 ($N^+(CH_2)_2\underline{\mathbf{C}}H_2(CH_2)_{12}CH_3$), 28.58 ($N(CH_2)_2\underline{\mathbf{C}}H_2(CH_2)_{12}CH_3$), 29.20 ($NCH_2\underline{\mathbf{C}}H_2CH_2N^+$), 29.56($CONHCH_2\underline{\mathbf{C}}H_2CH_2N$), 31.77 ($NCH_2\underline{\mathbf{C}}H_2(CH_2)_{13}CH_3$), 32.70 ($N^+CH_2\underline{\mathbf{C}}H_2(CH_2)_{13}CH_3$), 35.56 ($CONH\underline{\mathbf{C}}H_2CH_2CH_2N$), 42.75 ($N\underline{\mathbf{C}}H_2(CH_2)_{14}CH_3$), 44.25 ($CONHCH_2CH_2\underline{\mathbf{C}}H_2N$), 44.76 ($N\underline{\mathbf{C}}H_2CH_2CH_2N^+$), 50.55 ($N^+CH_3$, N^+CH_3), 60.43 ($NCH_2CH_2\underline{\mathbf{C}}H_2N^+$, $N^+\underline{\mathbf{C}}H_2(CH_2)_{14}CH_3$), 61.09 ($\underline{\mathbf{C}}H_2OH$), 62.65 ($\underline{\mathbf{C}}H_2OH$), 64.15 ($\underline{\mathbf{C}}HOH$), 68.62 ($\underline{\mathbf{C}}HOH$), 71.07 ($\underline{\mathbf{C}}HOH$), 71.59 ($\underline{\mathbf{C}}HOH$), 72.49 ($\underline{\mathbf{C}}HOH$), 73.67 ($\underline{\mathbf{C}}HOH$), 76.14 ($\underline{\mathbf{C}}HO$), 83.45 ($\underline{\mathbf{C}}HO$), 105.04 ($O\underline{\mathbf{C}}HO$), 173.81 ($\underline{\mathbf{C}}ONH$).

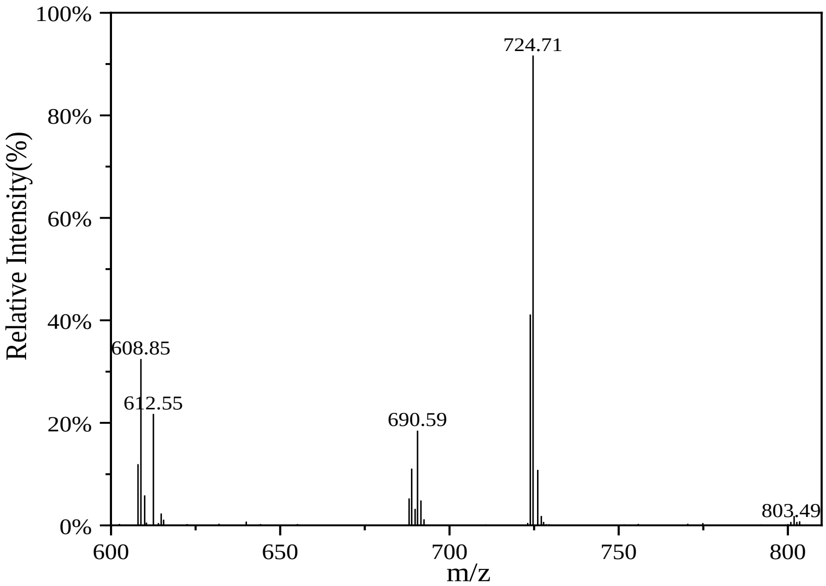

Figure S14. ESI-MS spectra of C_8DDLPB

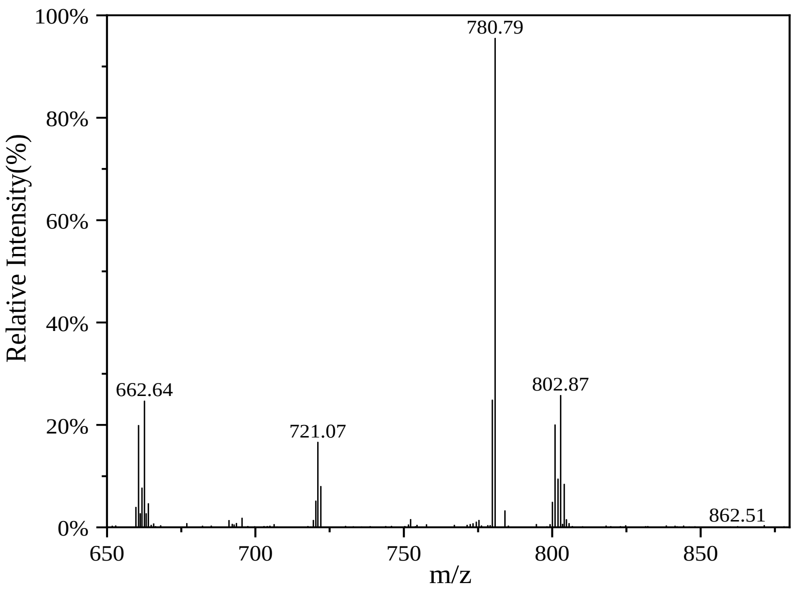

Figure S15. ESI-MS spectra of C_{10}DDLPB

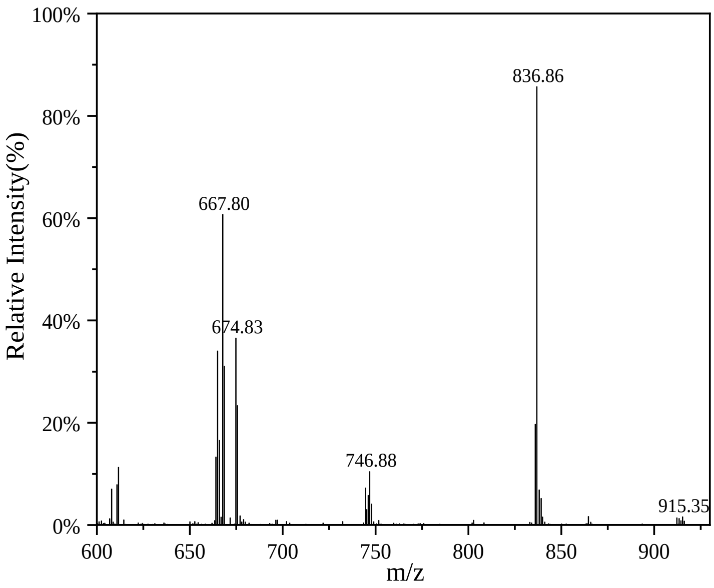

Figure S16. ESI-MS spectra of C_{12}DDLPB

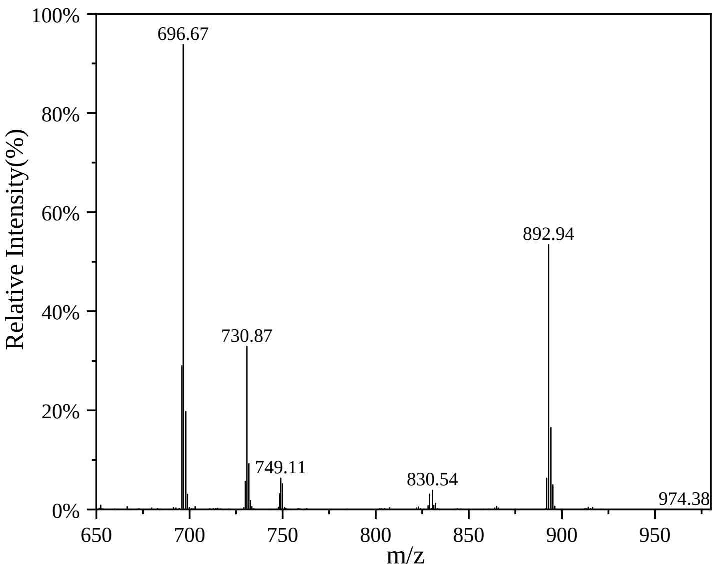

Figure S17. ESI-MS spectra of C_{14}DDLPB

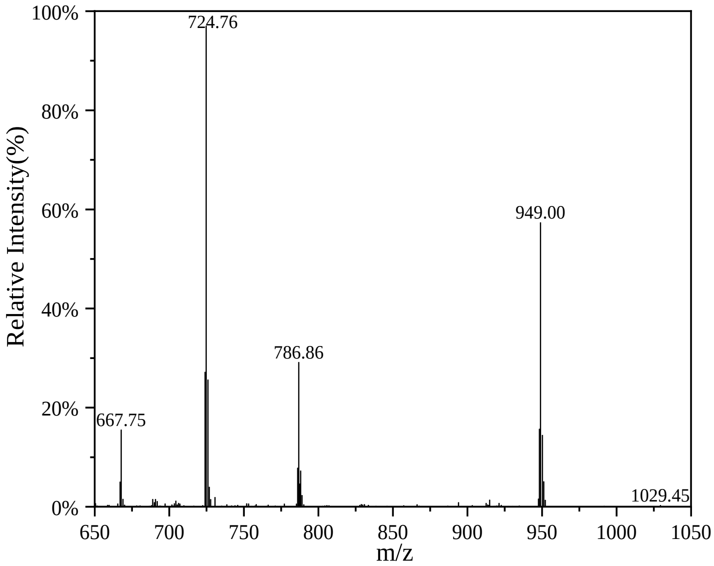

Figure S18. ESI-MS spectra of C_{16}DDLPB

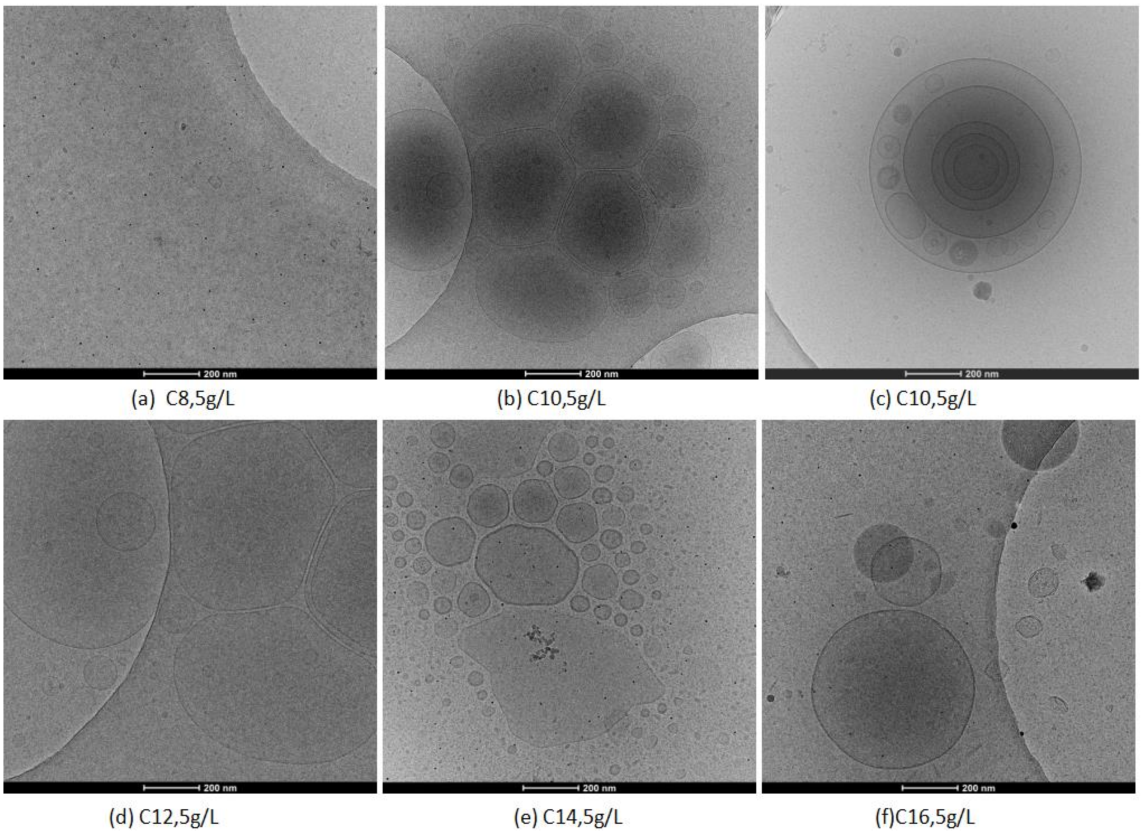

Figure S19. cryo-EM spectra of C_nDDLPB