Superfast and Highly Selective Water Transport by Hybrid Aquapentamers Incorporating a Non-Helicity Codon

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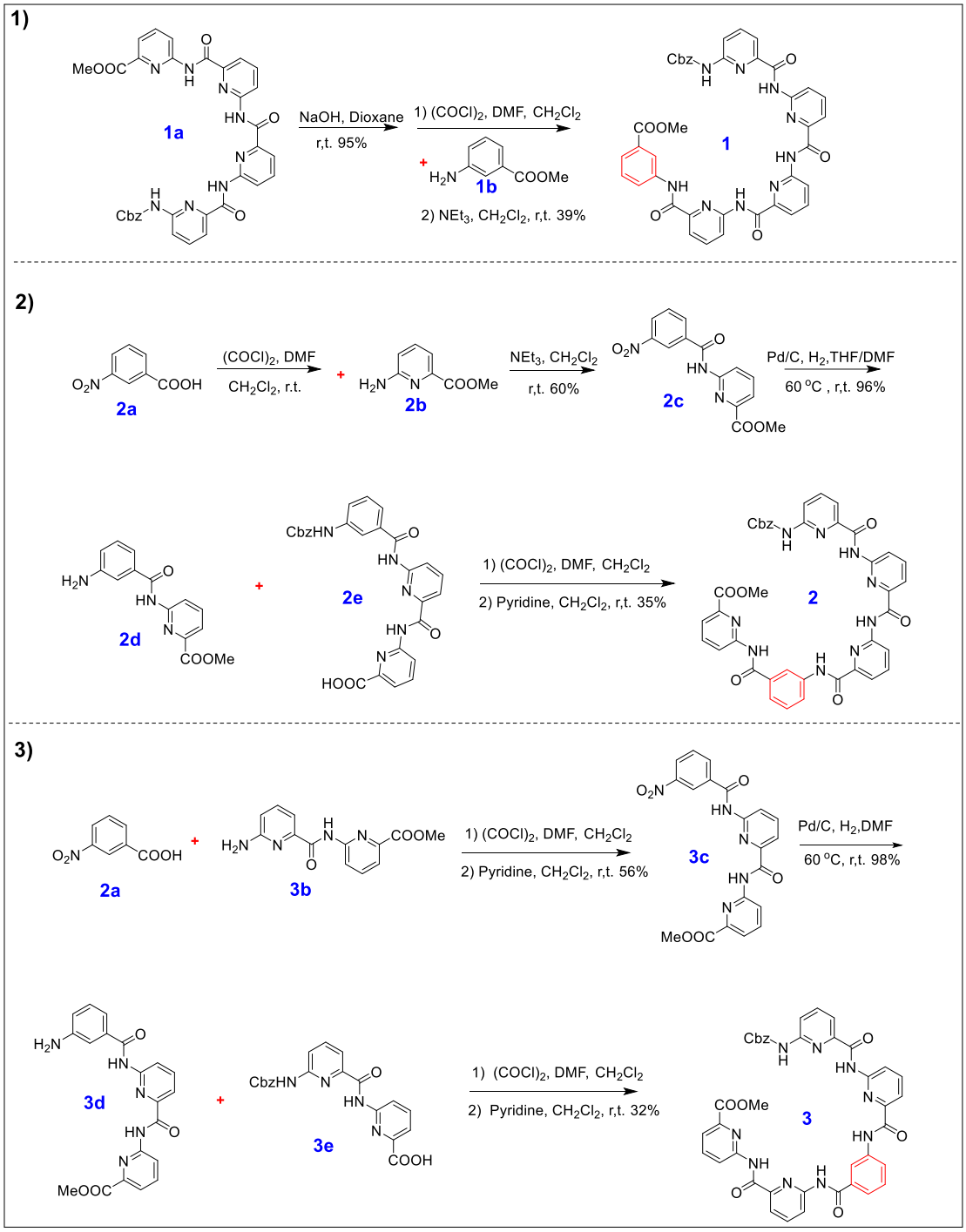
Supporting Information

1. General Remarks

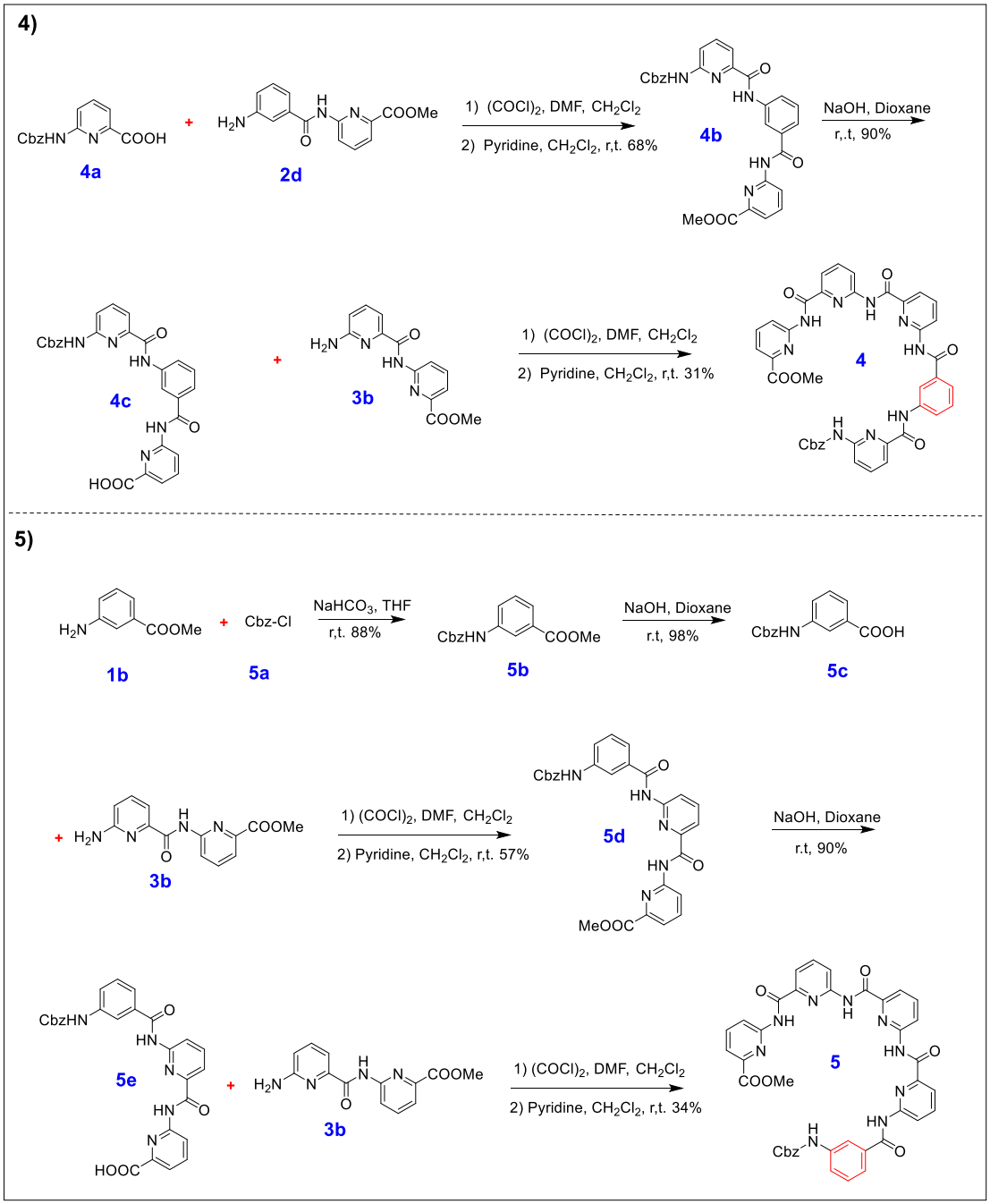
All the reagents were obtained from commercial suppliers and used as received unless otherwise noted. Aqueous solutions were prepared from MilliQ water. Flash column chromatography was performed using pre-coated 0.2 mm silica plates from Selecto Scientific. Chemical yield refers to pure isolated substances.^{1}H and ^{13}C NMR spectra were recorded on Bruker ACF-500 spectrometer. The solvent signal of $CDCl_3$ was referenced at δ = 7.26 ppm. The solvent signal of DMSO-d_6 was referenced at δ = 2.50 ppm. Coupling constants (*J* values) are reported in Hertz (Hz). ^{1}H NMR data are recorded in the order: chemical shift value, multiplicity (s, singlet; d, doublet; t, triplet; q, quartet; m, multiplet; br, broad), number of protons that gave rise to the signal and coupling constant, where applicable. ^{13}C spectra are proton-decoupled and recorded on Bruker ACF-500 (500 MHz). The solvent, $CDCl_3$, was referenced at δ = 77 ppm. The solvent, DMSO-d_6, was referenced at δ = 39.5 ppm. $CDCl_3$ (99.8%-Deuterated) and DMSO-d_6 (99.8%-Deuterated) were purchased from Aldrich and used without further purification. Egg yolk phosphatidylcholine (**EYPC**) and 1,2-dioleoyl-sn-glycero-3-phosphocholine lipid (**DOPC**) used in this study were obtained from Avanti Polar Lipids. The ESI mass spectra were obtained by Thermo-Finnigan LCQ mass spectrometer. Fluorescence was recorded using fluorescence spectrophotometer (Hitachi, Model F7100,Japan).

2. Synthetic Scheme

Scheme S1: Synthetic route that affords water channels **1**, **2** and **3**



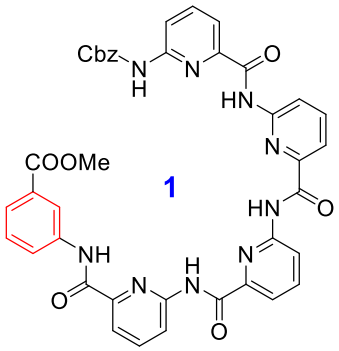
Scheme S2: Synthetic route that affords water channels **4** and **5**



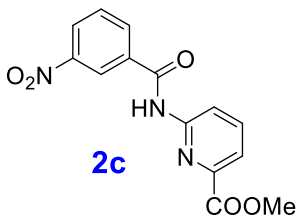
3. Experimental Procedures and Compound Characterizations

For synthesis of **1a**, **2b**, **2e**, **3b**, **3e** and **4a** see:

1. Ong, W. Q.; Zhao, H.; Du, Z.; Yeh, J. Z. Y.; Ren, C.; Tan, L. Z. W.; Zhang, K.; Zeng, H. *Chem. Commun.* **2011**, *47*, 6416.
2. Zhao, H.; Ong, W. Q.; Fang, X.; Zhou, F.; Hii, M. N.; Li, F. Y. S.; Su, H.; Zeng, H. *Org. Biomol. Chem.* **2012**, *10*, 1172.
3. Zhao, H.; Ong, W. Q.; Zhou, F.; Fang, X.; Chen, X.; Li, S. F. Y.; Su, H.; Zeng, H. *Chem. Sci.* **2012**, *3*, 2042
4. Zhao, H.; Shen, S; Zeng, H. *J. Am. Chem. Soc.* **2014**, 136, 14270.

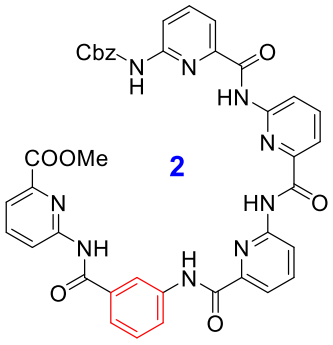


Solid NaOH (0.16 g, 4.0 mmol) was dissolved in minimal amount of deionized water and was then added into the round bottom flask containing **1a** (1.29 g, 2.0 mmol) in dioxane (50 mL). The mixture was stirred at room temperature overnight and the solvent was then removed *in vacuo*. Water (20 mL), MeOH (20 mL) and solid $KHSO_4$ (0.54 g, 4.0 mmol) was then added. The suspension was then filtered, washed and the residue obtained was dried to give the acid intermediate. The acid intermediate (0.63 g, 1.0 mmol) was dissolved in dry dichloromethane (20 mL) in a round bottom flask. DMF (0.1 mL) was added, followed by the dropwise addition of oxalyl chloride (0.3 mL, 2.0 mmol) into the round bottom flask. The reaction mixture was stirred for 2 hrs and thereafter the solvent and excess oxalyl chloride were removed *in vacuo* and dry dichloromethane (10 mL) was added to the acid chloride in nitrogen atmosphere. Minimal amount of dry dichloromethane was added to a mixture containing **1b** (0.227 g, 1.5 mmol) and triethylamine (0.1 mL, 0.3 mmol) and the mixture was injected into the acid chloride. The mixture was allowed to stir for 6 hrs at room temperature and after the reaction, the product was washed with water (2 x 10 mL), 1 M HCl (2 x 10 mL) and 1 M NaOH (2 x 10 mL). The solvent was removed *in vacuo* to give the crude product and the flash column chromatography was used to afford the pure product as a white solid **1** (0.30 g, 39 %). ^{1}H NMR (500 MHz, $CDCl_3$) δ 10.50 (s,1H), 10.48 (s, 1H), 10.25 (s,1H), 9.86 (s,1H), 8.76 (t, J = 8.2 Hz, 2H), 8.67 (d, J = 8.2 Hz, 1H), 8.41 (d, J = 8.1 Hz, 1H), 8.13 (t, J = 7.3 Hz, 2H), 8.63 – 8.61 (m, 2H), 8.06 – 7.99 (m, 2H), 7.92 – 7.82 (m, 3H), 7.75– 7.73 (m, 1H), 7.68 – 7.65 (m, 1H), 7.43 – 7.39 (m, 2H), 7.23 – 7.16 (m, 3H), 7.09 – 7.07 (m, 2H), 5.04 (s, 2H), 3.74 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 165.98, 162.34, 162.21, 162.17, 161.54, 152.01, 150.12, 149.96, 149.63, 147.23, 146.44, 140.38, 140.28, 140.20, 139.75, 137.73, 135.21, 130.85, 130.14, 129.16, 128.78, 128.36, 128.14, 127.76, 125.02, 123.33, 119.77, 118.93, 118.68, 117.77, 117.58, 117.41, 116.92, 115.50, 67.32, 52.27. HRMS-ESI: calculated for $[M+Na]^+$ ($C_{40}H_{31}N_9O_8Na$): *m/z* 788.2188, found: *m/z* 788.2200.



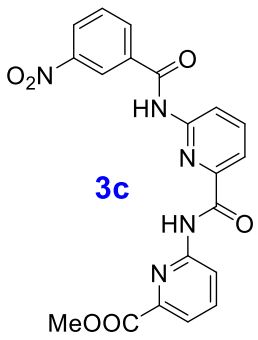
2c

The acid **2a** (1.67 g, 10 mmol) was dissolved in dry dichloromethane (40mL) in a round bottom flask. DMF (0.43 mL) was added, followed by the dropwise addition of oxalyl chloride (1.7 mL, 20 mmol) into the round bottom flask. The reaction mixture was stirred for 2 hrs and thereafter the solvent and excess oxalyl chloride were removed *in vacuo* and dry dichloromethane (50 mL) was added to the acid chloride in nitrogen atmosphere. Minimal amount of dry dichloromethane was added to a mixture containing **2b** (2.28 g, 15 mmol) and triethylamine (4.2 mL, 30 mmol) and the mixture was injected into the acid chloride. The mixture was allowed to stir for 6 hrs at room temperature and after the reaction, the product was washed with water (2 x 50 mL), 1 M HCl (2 x 50 mL) and 1 M NaOH (2 x 10 mL). The solvent was removed *in vacuo* to give the crude product and the flash column chromatography was used to afford the pure product as a white solid (1.81 g, 60%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.95 (s, 1H), 8.81 (t, J = 1.9 Hz, 1H), 8.61 (dd, J = 6.5, 2.7 Hz, 1H), 8.46 – 8.44 (m, 1H), 8.30 – 8.28 (m, 1H), 8.03 – 7.90 (m, 2H), 7.74 (t, J = 8.0 Hz, 1H), 4.02 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 164.95, 163.55, 151.07, 148.37, 146.10, 139.77, 135.47, 133.08, 130.16, 126.95, 122.47, 121.89, 118.12, 53.08. HRMS-ESI: calculated for $[M-H]^-$ ($C_{14}H_{10}N_3O_5$): *m/z* 300.0626, found: *m/z* 300.0629.

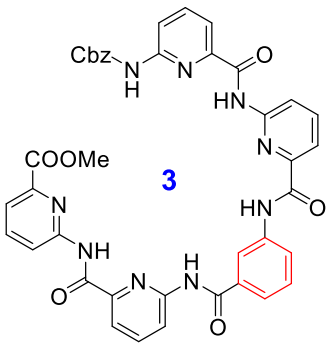


2c (1.0 g, 3.3 mmol) was reduced by catalytic hydrogenation in THF/DMF (30 mL/15 mL) at 60 °C, using Pd/C (0.1 g, 10%) as the catalyst overnight. The reaction mixture was then filtered and the solvent removed in *vacuo* to give the pure amine product as a white solid, which was directly used in the next step without further purification. The acid **2e** (2.0 mmol) was dissolved in dry dichloromethane (10 mL) in a round bottom flask. DMF (0.1 ml) was added, followed by the dropwise addition of oxalyl chloride (0.3 mL, 2.0 mmol) into the round bottom flask. The reaction mixture was stirred for 2 hrs and thereafter the solvent and excess oxalyl chloride were removed *in vacuo* and dry dichloromethane (10 mL) was added to the acid chloride in nitrogen atmosphere. Minimal amount of dry dichloromethane was added to a mixture containing **2d** (0.271g, 1.0 mmol) and triethylamine (0.1 mL, 0.3 mmol) and the mixture was injected into the acid chloride. The mixture was allowed to stir for 6 hrs at room temperature and after the reaction, the product was washed with water (2 x 10 mL), 1 M HCl (2 x 10 mL) and 1 M $NaHCO_3$ (2 x 10 mL). The solvent was removed *in vacuo* to give the crude product and the flash column chromatography was used to afford the pure product as a white solid **2** (0.27 g, 35 %). ^{1}H NMR (500 MHz, DMSO-d_6) δ 11.04 (s,1H), 10.76 (s,1H), 10.72 (s,1H), 10.54 (s,1H), 10.27 (s,1H), 8.56 (t, J = 8.8 Hz, 4H), 8.27 -8.20 (m, 3H), 8.03 – 8.00 (m, 3H), 7.81 (t, J = 7.9 Hz, 1H), 7.73 (d, J = 7.4 Hz, 2H), 7.67 (d, J = 7.5 Hz, 1H), 7.55 – 7.52 (m, 2H), 7.19 (t, J = 7.2 Hz, 1H), 7.12 (t, J = 7.4 Hz, 2H), 6.91 (d, J = 7.4 Hz, 2H), 4.84 (s, 2H), 3.66 (s, 3H). ^{13}C NMR (126 MHz, DMSO-d_6) δ 166.82,

164.79, 162.25, 162.15, 161.92, 153.08, 152.65, 151.19, 149.96, 149.82, 148.33, 147.34, 146.17, 145.69, 141.73, 141.50, 140.64, 139.63, 138.08, 135.81, 134.93, 129.23, 128.67, 128.56, 128.45, 124.14, 122.59, 121.28, 121.10, 118.90, 118.73, 118.35, 117.09, 116.63, 116.32, 115.49, 66.83, 52.39, 40.44, 40.28, 40.11, 39.94, 39.77, 39.61, 39.44. HRMS-ESI: calculated for $[M+Na]^+$ ($C_{40}H_{31}N_9O_8Na$): *m/z* 788.2188, found: *m/z* 788.2184.

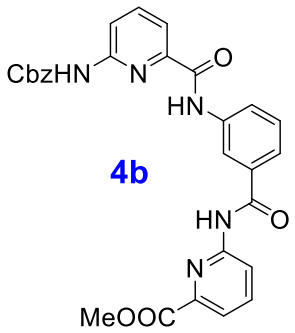


2a (1.67 g, 10 mmol) was dissolved in dry dichloromethane (40 mL) in a round bottom flask. DMF (0.43 mL) was added, followed by the dropwise addition of oxalyl chloride (1.7 mL, 20 mmol) into the round bottom flask. The reaction mixture was stirred for 2 hrs and thereafter the solvent and excess oxalyl chloride were removed *in vacuo* and dry dichloromethane (50 mL) was added to the acid chloride in nitrogen atmosphere. **3b** (1.36 g, 5 mmol) was added to the mixture, then pyridine (2.4 mL, 30 mmol) was injected into the solution. The mixture was allowed to stir for 6 hrs at room temperature and after the reaction, the product was washed with water (2 x 50 mL), 1 M HCl (2 x 50 mL) and 1 M NaOH (2 x 40 mL). The solvent was removed *in vacuo* to give the crude product and the flash column chromatography was used to afford the pure product as a white solid (1.17 g, 56%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 10.42 (s, 1H), 8.98 (s, 1H), 8.92 (s,1H), 8.70 (dd, *J* = 7.0, 2.2 Hz, 1H), 8.62 (d, *J* = 8.2 Hz, 1H), 8.49 (d, *J* = 8.2 Hz, 1H), 8.42 (d, *J* = 7.8 Hz, 1H), 8.11 (d, *J* = 7.5 Hz, 1H), 8.03 (t, *J* = 7.9 Hz, 1H), 7.97 – 7.89 (m, 2H), 7.81 (t, *J* = 8.0 Hz, 1H), 4.03 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 165.26, 163.55, 162.16, 151.29, 149.89, 147.32, 146.21, 140.50, 139.56, 135.50, 132.92, 130.24, 127.08, 122.88, 121.52, 119.31, 117.82, 117.72, 53.09. HRMS-ESI: calculated for $[M+Na]^+$ ($C_{20}H_{15}N_5O_6Na$): *m/z* 444.0915, found: *m/z* 444.0923.

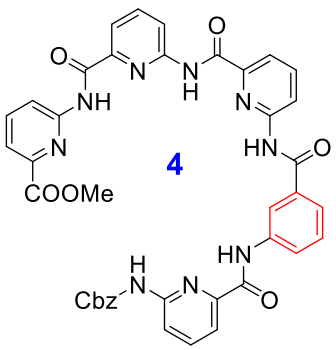


The acid **3e** (0.78 g, 2.0 mmol) was dissolved in dry dichloromethane (10mL) in a round bottom flask. DMF (0.1 mL) was added, followed by the dropwise addition of oxalyl chloride (0.3 mL, 2.0 mmol) into the round bottom flask. The reaction mixture was stirred for 2 hrs and thereafter the solvent and excess oxalyl chloride were removed *in vacuo* and dry dichloromethane (10 mL) was added to the acid chloride in nitrogen atmosphere. **3d** (0.391g, 1.0 mmol) was added to the solution, then pyridine (0.5 mL, 0.3 mmol) and the mixture was injected into the acid chloride. The mixture was allowed to stir for 6 hrs at room temperature and after the reaction, the product was washed with water (2 x 10 mL), 1 M HCl (2 x 10 mL) and 1 M NaOH (2 x 10 mL). The solvent was removed *in vacuo* to give the crude product and the flash column chromatography was used to afford the pure product as a white solid **3** (0.25 g, 32 %).^{1}H NMR (500 MHz, $CDCl_3$) δ 10.40 (s, 1H), 10.15 (s,1H), 9.85 (s,1H), 9.00 (s, 1H), 8.63

(d, J = 8.2 Hz, 1H), 8.52 (d, J = 8.2 Hz, 2H), 8.33 (s,1H), 8.16 (d, J = 8.3 Hz, 1H), 8.11 (d, J = 8.0 Hz, 1H),8.03(s, 1H), 8.00 - 7.96 (m, 3H), 7.93 – 7.77 (m, 5H), 7.74 (d, J = 7.7 Hz, 1H), 7.41 (t, J = 7.9 Hz, 1H), 7.33 – 7.29 (m, 2H), 7.28 – 7.24 (m, 3H), 5.15(s, 2H), 3.79 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 165.16, 165.01, 162.24, 161.94, 152.80, 151.22, 150.46, 150.27, 149.57, 147.70, 146.89, 140.07, 139.98, 139.40, 138.23, 135.42, 134.29, 129.84, 128.58, 128.44, 128.18, 123.62, 123.33, 121.27, 118.72, 118.60, 118.41, 117.85, 117.72, 117.40, 117.26, 116.00, 67.43, 52.85. HRMS-ESI: calculated for $[M+Na]^+$ ($C_{40}H_{31}N_9O_8Na$): *m/z* 788.2188, found: *m/z* 788.2201.

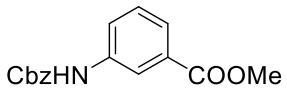


The acid **4a** (1.64g, 6.0 mmol) was dissolved in dry dichloromethane (60 mL) in a round bottom flask. DMF (0.45 mL) was added, followed by the dropwise addition of oxalyl chloride (1.8 mL, 12.0 mmol) into the round bottom flask. The reaction mixture was stirred for 2 hrs and thereafter the solvent and excess oxalyl chloride were removed *in vacuo* and dry dichloromethane (50 mL) was added to the acid chloride in nitrogen atmosphere. **2d** (0.813g, 3.0 mmol) was added to the solution, and pyridine (1.45 ml, 18 mmol) and the mixture was injected into the acid chloride. The mixture was allowed to stir for 6 hrs at room temperature and after the reaction, the product was washed with water (2 x 50 mL), 1 M HCl (2 x 50 mL) and 1 M NaOH (2 x 50 mL). The solvent was removed *in vacuo* to give the crude product and the flash column chromatography was used to afford the pure product as a white solid **4b** (1.1 g, 68 %).^{1}H NMR (500 MHz, $CDCl_3$) δ 9.719 (s, 1H), 8.98 (s,1H), 8.62 (dd, J = 6.0, 3.3 Hz, 1H), 8.22 (dd, J = 8.3, 2.9 Hz, 2H), 8.03 (s,1H), 7.99 – 7.97 (m, 1H), 7.95 – 7.83 (m, 3H), 7.79 (s,1H), 7.69 (d, J = 7.9 Hz, 1H), 7.50 (t, J = 7.9 Hz, 1H), 7.46 – 7.32 (m, 5H), 5.27 (s,2H), 3.98 (s,3H).^{13}C NMR (126 MHz, $CDCl_3$) δ 165.57, 165.18, 161.65, 152.88, 151.59, 150.17, 147.48, 140.19, 139.52, 138.23, 135.57, 134.64, 129.92, 128.68, 128.54, 128.30, 123.33, 123.04, 121.45, 118.17, 117.78, 115.68, 67.51, 52.96. HRMS-ESI: calculated for $[M-H]^-$ ($C_{28}H_{22}N_5O_6$): *m/z* 524.1576, found: *m/z* 524.1586.



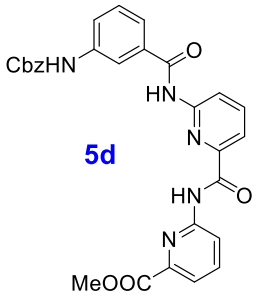
Solid NaOH (0.08 g, 2.0 mmol) was dissolved in minimal amount of deionized water and was then added into the round bottom flask containing **4b** (0.525g, 1.0 mmol) in dioxane (20 mL). The mixture was stirred at room temperature overnight and the solvent was then removed *in vacuo*. Water (20 mL), MeOH (20 mL) and solid $KHSO_4$ (0.27 g, 2.0 mmol) was then added. The suspension was then filtered, washed and the residue obtained was dried to give the acid intermediate **4c**. The acid intermediate (1.0 mmol) was dissolved in dry dichloromethane (10 mL) in a round bottom flask. DMF (0.1 mL) was added, followed by the dropwise addition of oxalyl chloride (0.3 mL, 2.0

mmol) into the round bottom flask. The reaction mixture was stirred for 2 hrs and thereafter the solvent and excess oxalyl chloride were removed *in vacuo* and dry dichloromethane (10 mL) was added to the acid chloride in nitrogen atmosphere. **3b** (0.136g, 0.5 mmol) was added to the solution, then pyridine (0.25 mL, 3 mmol) and the mixture was injected into the acid chloride. The mixture was allowed to stir for 10 hrs at room temperature and after the reaction, the product was washed with water (2 x 10 mL), 1 M HCl (2 x 10 mL) and 1 M NaOH (2 x 10 mL). The solvent was removed *in vacuo* to give the crude product and the flash column chromatography was used to afford the pure product as a white solid **4** (0.12 g, 31 %). ^{1}H NMR (500 MHz, $CDCl_3$) δ 10.47 (s,1H), 10.33 (s,1H), 9.77 (s,1H), 9.36 (s,1H), 8.56 (d, J = 8.2 Hz, 2H), 8.52 (d, J = 8.3 Hz, 1H), 8.19 (s,1H), 8.07 (d, J = 8.1 Hz, 1H), 8.03 – 7.93 (m, 3H), 7.93 – 7.85 (m, 2H), 7.80 – 7.70 (m, 4H), 7.60 (d, J = 7.4 Hz, 1H), 7.46 (t, J = 7.9 Hz, 1H), 7.54 (s,1H), 7.37 – 7.28 (m, 5H), 5.18 (s,2H), 3.65 (s,3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 165.54, 164.73, 162.39, 162.30, 161.64, 152.60, 151.21, 150.64, 149.90, 149.83, 147.28, 147.12, 146.98, 140.06, 140.03, 139.93, 139.43, 138.02, 135.45, 134.48, 129.90, 128.62, 128.50, 128.21, 123.59, 123.00, 121.02, 118.56, 118.38, 117.74, 117.48, 117.37, 115.40, 67.45, 52.74. HRMS-ESI: calculated for $[M+Na]^+$ ($C_{40}H_{31}N_9O_8Na$): *m/z* 788.2188, found: *m/z* 788.2184.



5b

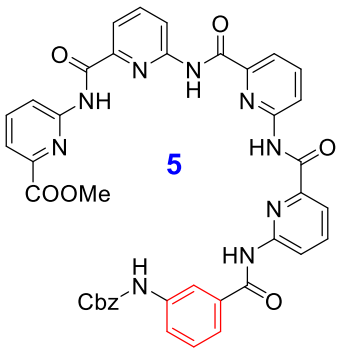
The amine **1b** (1.51 g, 10 mmol) was dissolved in THF (50 mL) in a round bottom flask, $NaHCO_3$ (1.0 g, 12 mmol) was added to the solution, then benzyl carbonochloridate (1.57 mL, 11 mmol) was dropped to the solution at 0 °C, then warmed them to room temperature. The reaction was allowed to proceed overnight. After washing with Brine, the organic layer was dried over anhydrous Na_2SO_4. The solvent was removed in vacuo. The residue was recrystallized from MeOH to give the pure product **5b**. Yield: 2.5 g, 88%. ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.00 (s,1H), 7.76 – 7.72 (m, 2H), 7.41 – 7.36 (m, 6H), 7.04 (s,1H), 5.21 (s, 2H), 3.87 (s, 3H).^{13}C NMR (126 MHz, $CDCl_3$) δ 166.83, 153.32, 138.21, 135.89, 130.94, 129.23, 128.66, 128.46, 128.39, 124.53, 123.01, 119.64, 67.22, 52.26. HRMS-ESI: calculated for $[M+Na]^+$ ($C_{16}H_{15}NO_4Na$): *m/z* 308.0893, found: *m/z* 308.0896.



5d

Solid NaOH (0.67g, 16.8 mmol) was dissolved in minimal amount of deionized water and was then added into the round bottom flask containing **5b** (2.4g, 8.4 mmol) in dioxane (100 mL). The mixture was stirred at room temperature overnight and the solvent was then removed *in vacuo*. Water (20 mL), MeOH (20 mL) and solid $KHSO_4$ (2.16 g, 16 mmol) was then added. The suspension was then filtered, washed and the residue obtained was dried to give the acid intermediate **5c**. The acid intermediate (8.0 mmol) was dissolved in dry dichloromethane (40 mL) in a round bottom flask. DMF (0.35 mL) was added, followed by the dropwise addition of oxalyl chloride (1.4 mL, 16 mmol) into the round bottom flask. The reaction mixture was stirred for 2 hrs

and thereafter the solvent and excess oxalyl chloride were removed *in vacuo* and dry dichloromethane (50 mL) was added to the acid chloride in nitrogen atmosphere. **3b** (1.1 g, 4 mmol) was added to the solution, then pyridine (2.0 mL, 24 mmol) was injected into the acid chloride. The mixture was allowed to stir for 10 hrs at room temperature and after the reaction, the product was washed with water (2 x 40 mL), 1 M HCl (2 x 40 mL) and 1 M NaOH (2 x 40 mL). The solvent was removed *in vacuo* to give the crude product and the flash column chromatography was used to afford the pure product as a white solid **5d** (1.2g, 57%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 10.36 (s, 1H), 8.82 (s,1H), 8.70 (dd, J = 6.0, 3.3 Hz, 1H), 8.60 (d, J = 8.3 Hz, 1H), 8.04 (d, J = 7.5 Hz, 1H), 7.96 – 7.87 (m, 5H), 7.72 (d, J = 7.8 Hz, 1H), 7.50 (t, J = 7.9 Hz, 1H), 7.39 – 7.29 (m, 6H), 5.22 (s, 2H), 4.01 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 165.50, 165.31, 162.41, 153.40, 151.40, 150.39, 147.16, 146.16, 140.15, 139.47, 138.82, 135.88, 134.62, 129.83, 128.60, 128.39, 128.29, 122.06, 121.42, 118.82, 117.92, 117.69, 67.25, 53.01. HRMS-ESI: calculated for $[M-H]^-$ ($C_{28}H_{22}N_5O_6$): *m/z* 524.1576, found: *m/z* 524.1577.



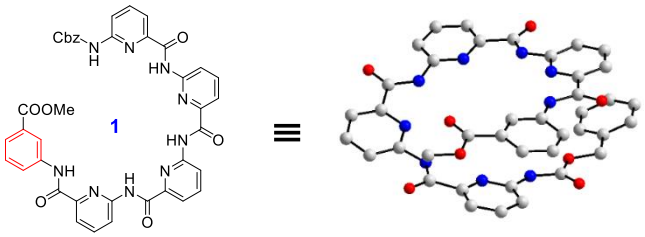
Solid NaOH (0.16 g, 4 mmol) was dissolved in minimal amount of deionized water and was then added into the round bottom flask containing **5d** (1.05 g, 2.0 mmol) in dioxane (50 mL). The mixture was stirred at room temperature overnight and the solvent was then removed *in vacuo*. Water (30 mL) and solid $KHSO_4$ (0.54 g, 4 mmol) was then added. The suspension was then filtered, washed and the residue obtained was dried to give the acid intermediate **5e**. **5e** (1.0 mmol) was dissolved in dry dichloromethane (40 mL) in a round bottom flask. DMF (0.05 mL) was added, followed by the dropwise addition of oxalyl chloride (0.2 mL, 2 mmol) into the round bottom flask. The reaction mixture was stirred for 2 hrs and thereafter the solvent and excess oxalyl chloride were removed *in vacuo* and dry dichloromethane (50 mL) was added to the acid chloride in nitrogen atmosphere. **3b** (0.138 g, 0.5 mmol) was added to the solution, then pyridine (0.24 mL, 3 mmol) was injected into the acid chloride. The mixture was allowed to stir for 10 hrs at room temperature and after the reaction, the product was washed with water (2 x 30 mL), 1 M HCl (2 x 30 mL) and 1 M NaOH (2 x 30 mL). The solvent was removed *in vacuo* to give the crude product and the flash column chromatography was used to afford the pure product as a white solid **5** (0.13g, 34%). ^{1}H NMR (500 MHz, DMSO) δ 10.99 (s, 1H), 10.77 (s, 1H), 10.74 (s, 1H), 10.50 (s, 1H), 9.85 (s, 1H), 8.52 – 8.45 (m, 4H), 8.15 – 8.08 (m, 3H), 8.00 – 7.94 (m, 3H), 7.87 (d, J = 7.4 Hz, 1H), 7.83 (d, J = 7.5 Hz, 1H), 7.62 (d, J = 7.5 Hz, 1H), 7.51 (d, J = 7.7 Hz, 1H), 7.42 – 7.31 (m, 6H), 6.76 (t, J = 7.9 Hz, 1H), 5.12 (s, 2H), 3.54 (s, 3H). ^{13}C NMR (126 MHz, DMSO-d_6) δ 166.26, 164.59, 163.33, 162.76, 162.57, 153.69, 151.39, 151.18, 150.46, 150.27, 148.44, 147.64, 147.05, 146.08, 140.89, 140.11, 139.69, 136.97, 134.41, 128.91, 128.55, 128.32, 121.76, 121.63, 119.18, 119.00, 118.37, 117.84, 117.40, 66.27, 52.44. HRMS-ESI: calculated for $[M+Na]^+$ ($C_{40}H_{31}N_9O_8Na$): *m/z* 788.2188, found: *m/z* 788.21.

4. X-Ray crystallographic data

Crystallization Method:

For compound **1**, high-quality crystals were obtained by slowly diffusing 0.5 mL of an acetone/water (1:2, v:v) mixture into 0.4 mL of a CH_2Cl_2 solution containing 0.4 mg of compound **1** over the course of one week at room temperature. Similarly, for compounds **2** and **5**, quality crystals were obtained by slow diffusion of 0.5 mL of a DMSO/water (1:2, v:v) mixture into 0.4 mL of a CH_2Cl_2 solution containing 0.4 mg of compound **2** or **5**, respectively, also over the course of one week at room temperature.

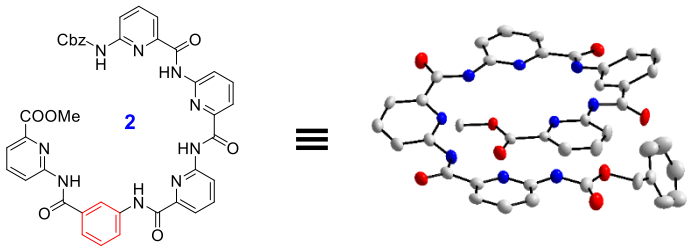
4.1. X-ray crystal structure of **1** (CCDC 2405480)



Empirical formula	$C_{41}H_{33}Cl_2N_9O_8$
Formula weight	850.66
Temperature/K	100(2)
Crystal system	orthorhombic
Space group	$P2_12_12_1$
a/Å	10.5465(13)
b/Å	13.7309(17)
c/Å	25.530(3)
α/°	90.00
β/°	90.00
γ/°	90.00
Volume/Å^3	3697.1(8)
Z	4
ρ_{calc}g/cm^3	1.528
μ/mm^{-1}	0.247
F(000)	1760.0
Crystal size/mm^3	0.5 × 0.32 × 0.16
Radiation	MoKα (λ = 0.71073)
2Θ range for data collection/°	4.18 to 50
Index ranges	$-12 \le h \le 12$, $-13 \le k \le 16$, $-30 \le l \le 30$
Reflections collected	21883
Independent reflections	6511 [R_{int} = 0.0647, R_{sigma} = 0.0695]
Data/restraints/parameters	6511/13/554

Goodness-of-fit on F^2	1.044
Final R indexes [I>=2σ (I)]	R_1 = 0.0842, wR_2 = 0.2075
Final R indexes [all data]	R_1 = 0.1061, wR_2 = 0.2228
Largest diff. peak/hole / e $Å^{-3}$	0.54/-1.24
Flack parameter	0.0(3)

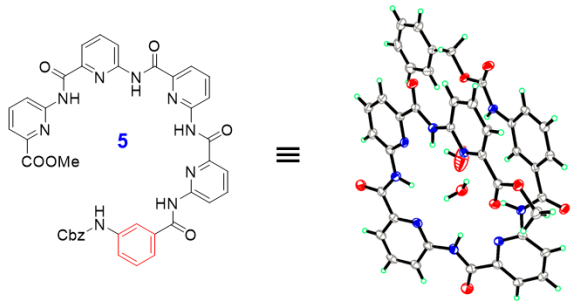
4.2. X-ray crystal structure of **2** (CCDC 2405739)



Empirical formula	$C_{45}H_{46.50}N_9O_{10.75}S_{2.50}$
Formula weight	964.5
Temperature/K	100
Crystal system	monoclinic
Space group	$C_{12}/c1$
a/Å	53.511(3)
b/Å	13.7997(6)
c/Å	26.0348(12)
α/°	90.00
β/°	105.6
γ/°	90.00
Volume/$Å^3$	18512.5(15)
Z	16
ρ_{calc}g/cm^3	1.386
μ/mm^{-1}	0.208
F(000)	8088
Crystal size/mm^3	0.04 × 0.12 × 0.28
Radiation	MoKα (λ = 0.71073)
2Θ range for data collection/°	2.15 to 26.05
Index ranges	-65 < = h < = 66, -15 < = k< = 17, -32 < = l < = 32
Reflections collected	88449
Independent reflections	18220 [R_{int} = 0.1708, R_{sigma} = 0.1259]
Data/restraints/parameters	18220 / 297 / 1302
Goodness-of-fit on F^2	1.024
Final R indexes [I>=2σ (I)]	R_1 = 0.0956, wR_2 = 0.2331

Final R indexes [all data]	R_1 = 0.1820, wR_2 = 0.2933
Largest diff. peak/hole / e Å^{-3}	1.459/-0.996

4.3. X-ray crystal structure of **5** (CCDC 2405479)



Empirical formula	$C_{160}H_{134}N_{36}O_{37}$
Formula weight	3153.03
Temperature	123(2) K
Crystal system	Monoclinic
Space group	P2(1)/c
a/Å	7.4505(4)
b/Å	14.1511(7)
c/Å	34.9000(17)
α/°	90
β/°	94.337(3)
γ/°	90
Volume/Å^3	3669.1(3)
Z	1
F(000)	1642
Crystal size/mm^3	0.30 × 0.20 × 0.06
Θ range for data collection/°	3.37 to 63.68
Index ranges	-8 < = h < = 4, -16 < = k < = 16, -40 < = l < = 40
Reflections collected	33587
Independent reflections	5921 [$R_{(int)}$ = 0.1005]
Data/restraints/parameters	5921 / 8 / 555
Goodness-of-fit on F^2	1.011
Final R indexes [I > = 2σ (I)]	R_1 = 0.0849, wR_2 = 0.2069
Final R indexes [all data]	R_1 = 0.1122, wR_2 = 0.2238
Largest diff. peak/hole / e Å^{-3}	0.465 and -0.358

5. Ion Transport Study using the HPTS Assay

EYPC (1 ml, 25 mg/mL in $CHCl_3$, Avanti Polar Lipids, USA) was added in a round-bottom flask. The solvent was removed under reduced pressure at 30 ºC. After drying the resulting film under high vacuum overnight, the film was hydrated with 4-(2-hydroxyethyl)-1-piperazine-ethane sulfonic acid (HEPES) buffer solution (1 mL, 10 mM HEPES, 100 mM NaCl, pH = 7.0) containing a pH sensitive dye 8-hydroxypyrene-1,3,6-trisulfonic acid (HPTS, 1 mM) at room temperature by vortexing for 60 minutes to give a milky suspension. The mixture was then subjected to 10 freeze-thaw cycles: freezing in liquid N_2 for 1 minute and heating 55 ºC water bath for 2 minutes. The vesicle suspension was extruded through polycarbonate membrane (0.1 μm) to produce a homogeneous suspension of large unilamellar vesicles (LUVs) of about 120 nm in diameter with HPTS encapsulated inside. The unencapsulated HPTS dye was separated from the LUVs by using size exclusion chromatography (stationary phase: Sephadex G-50, GE Healthcare, USA, mobile phase: HEPES buffer with 100 mM NaCl, pH = 7.0) and diluted with the mobile phase to yield 13 mL of 2.5 mM lipid stock solution.

Method 1: The HPTS-containing LUV suspension (25 μL, 2.5 mM in 10 mM HEPES buffer containing 100 mM NaCl at pH 7.0) was added to a HEPES buffer solution (1.95 mL, 10 mM HEPES, 100 mM MCl at pH 8.0, where $M^+ = Na^+$ and K^+) to create a pH gradient for ion transport study. A solution of channel in DMSO was then injected into the suspension under gentle stirring.

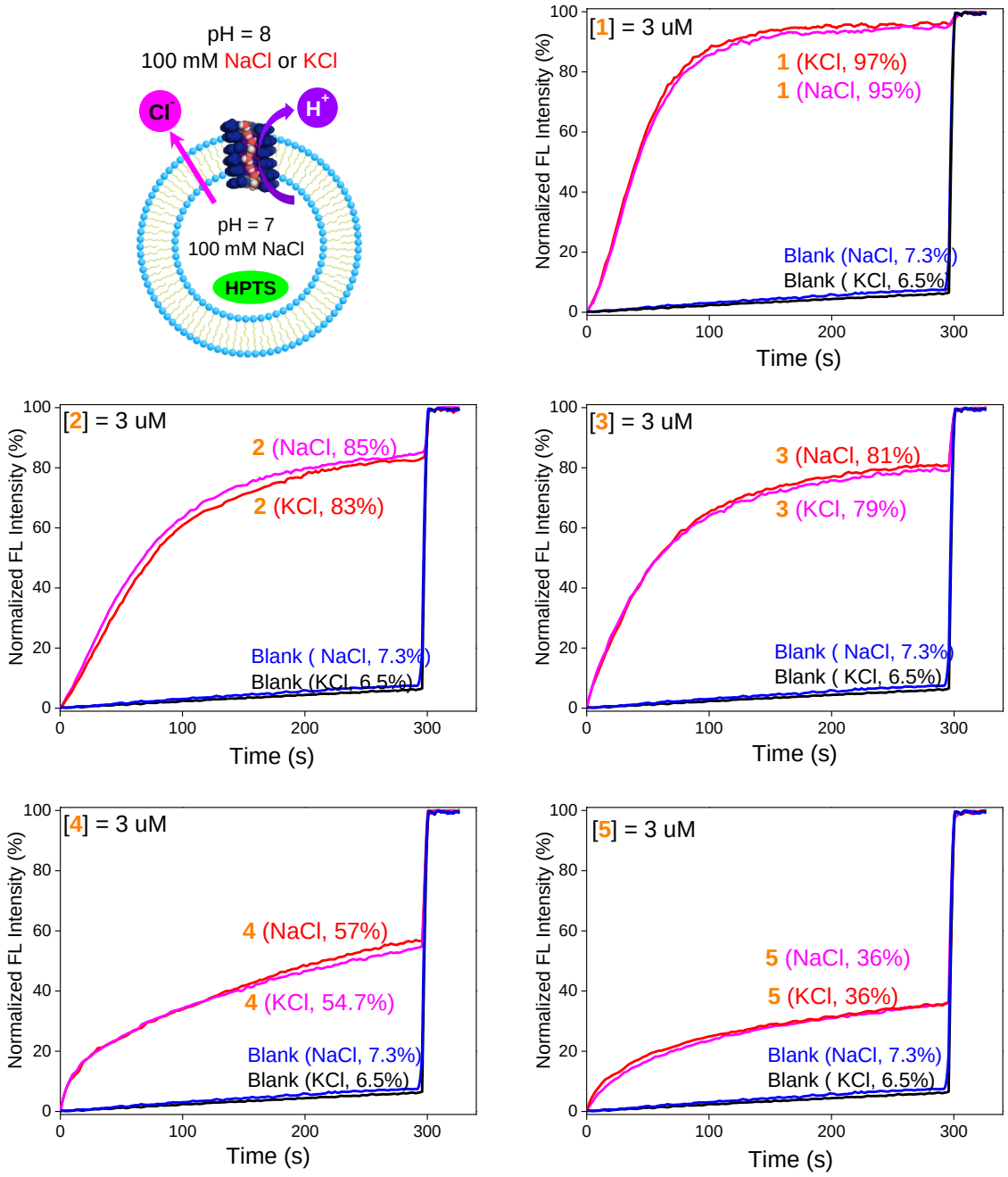
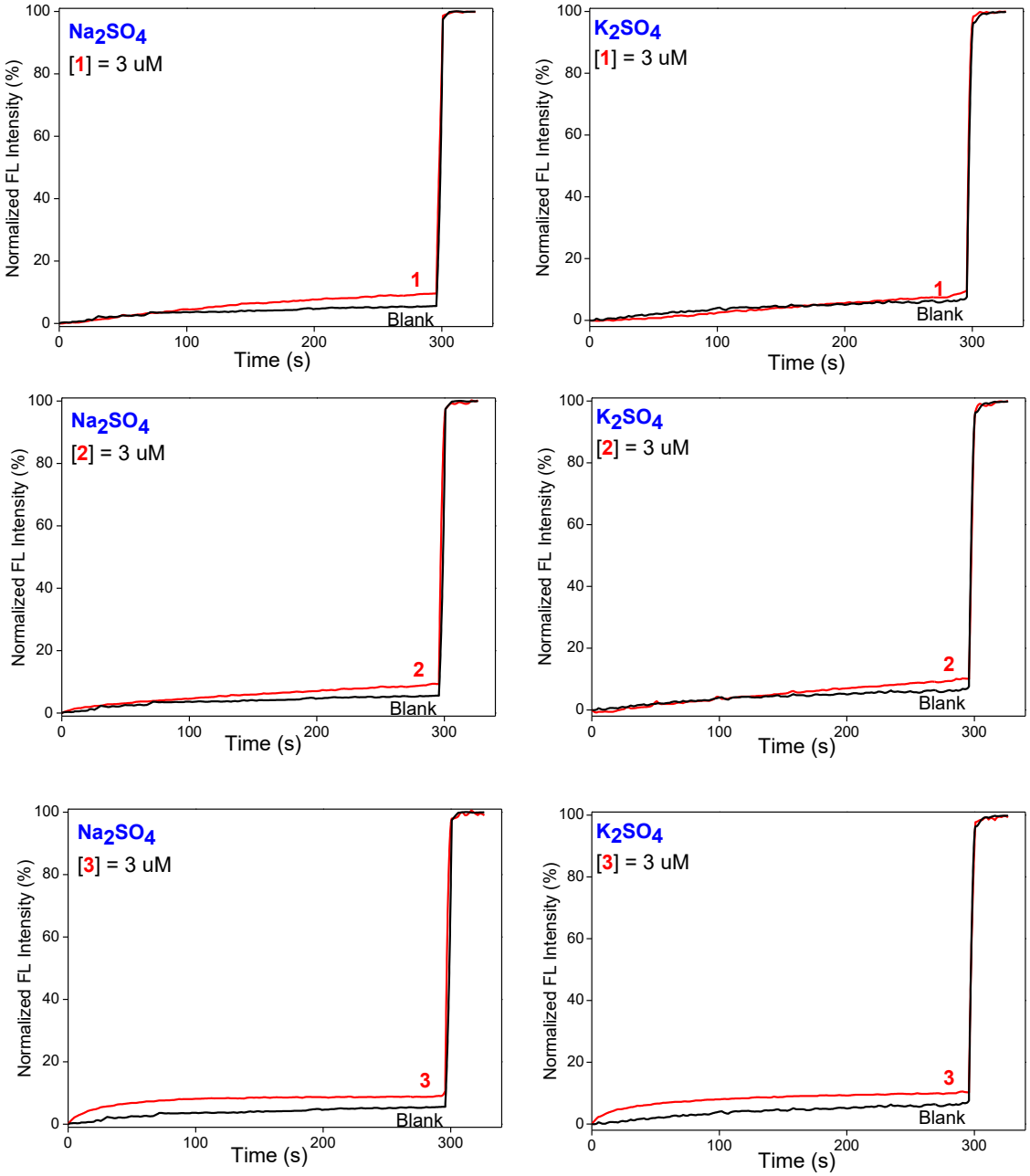


Figure S1. HPTS-based LUV assays under a proton gradient, suggesting that channels **1-5** do not transport Na^+ or K^+.

Method 2: The HPTS-containing LUV suspension (25 μL, 2.5 mM in 10 mM HEPES buffer at pH 7.0) was added to a HEPES buffer solution (1.95 mL, 10 mM HEPES, 200 mM M_2SO_4 at pH 7.0, where $M^+ = Na^+$ and $K^{+)}$ to create a metal ion gradient for ion transport study. A solution of channel in DMSO was then injected into the suspension under gentle stirring.



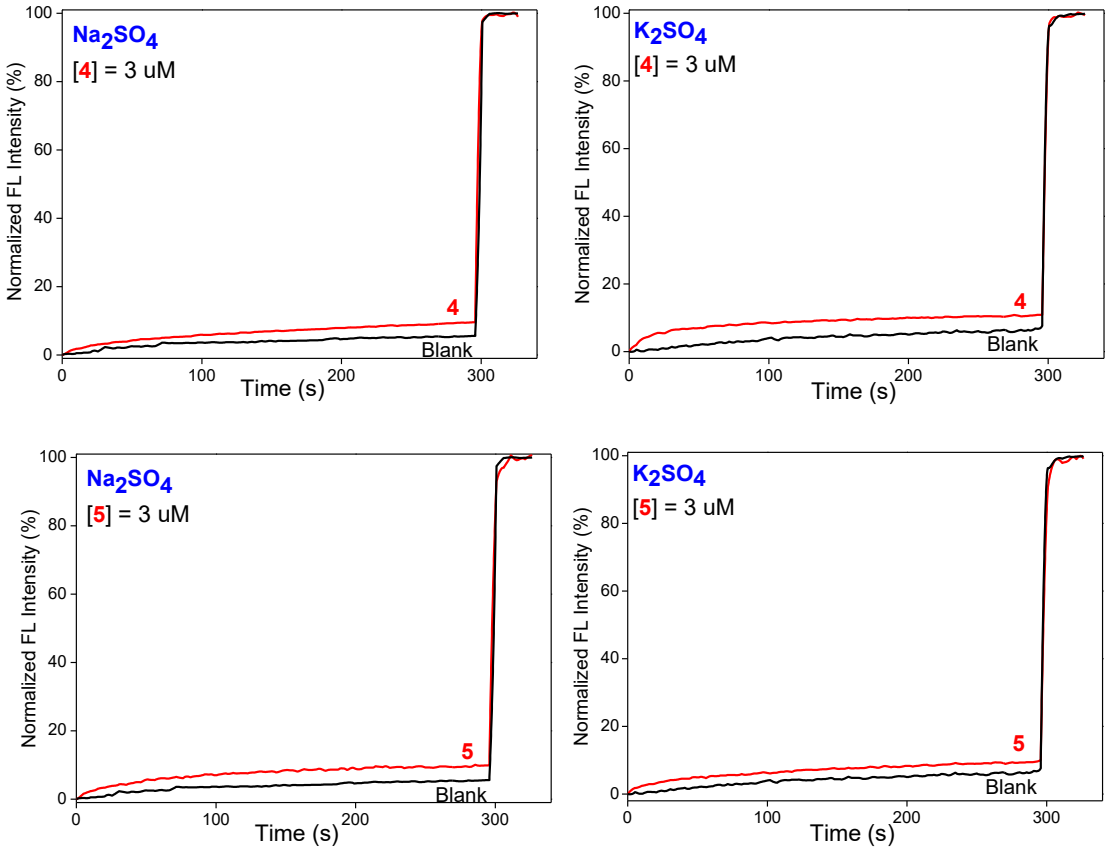


Figure S2. HPTS-based LUV assays under high ionic concentration gradients (0.4 M), confirming that channels **1-5** do not transport both Na^+ and K^+ ions

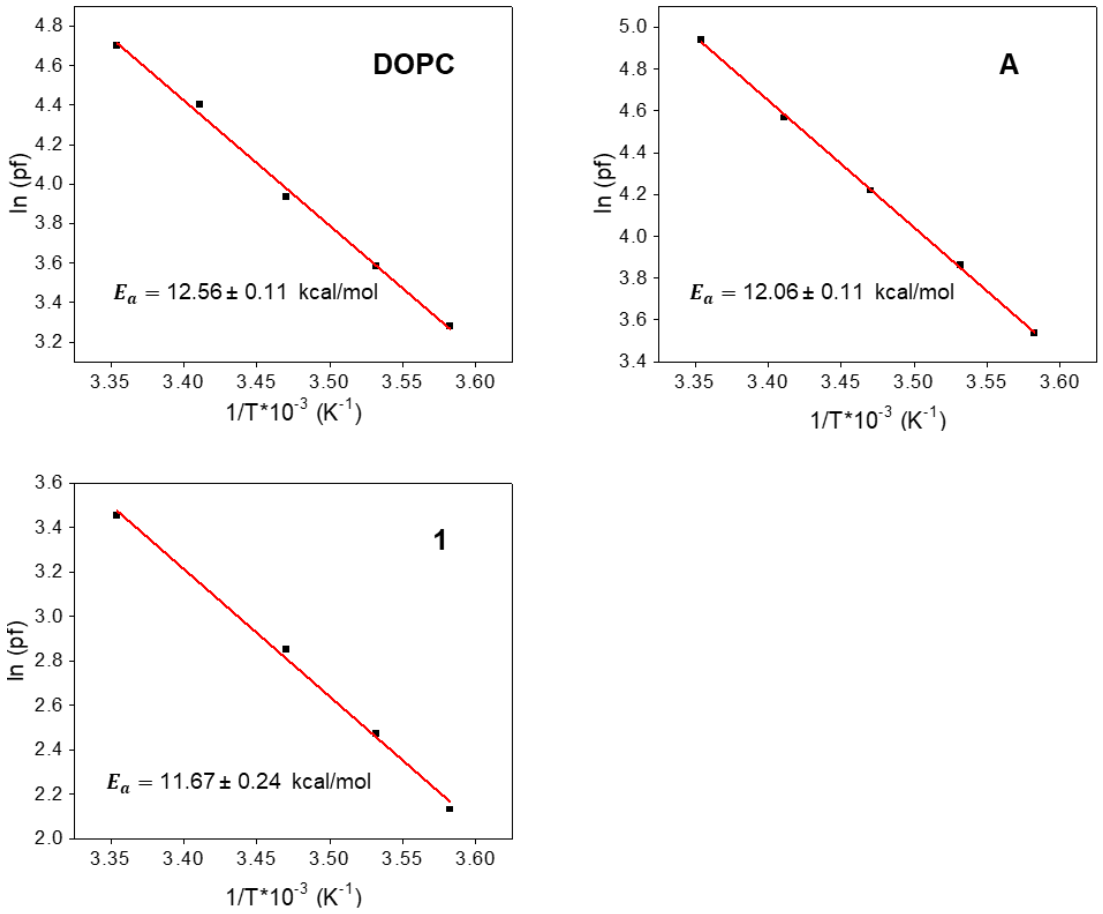


Figure S3. Arrhenius plots of the water permeability as a function of temperature (at 6-25 °C) for DOPC only, **A** and **1** for determining activation energies (E_a) averaged over three runs.

Method 3: The SPQ-containing LUV suspension (25 μL, 2.5 mM in 200 mM $NaNO_3$) was added to a solution (1.95 mL, 200 mM NaCl) to create anion concentration gradients for ion transport study. A solution of channel in DMSO was then injected into the suspension under gentle stirring.

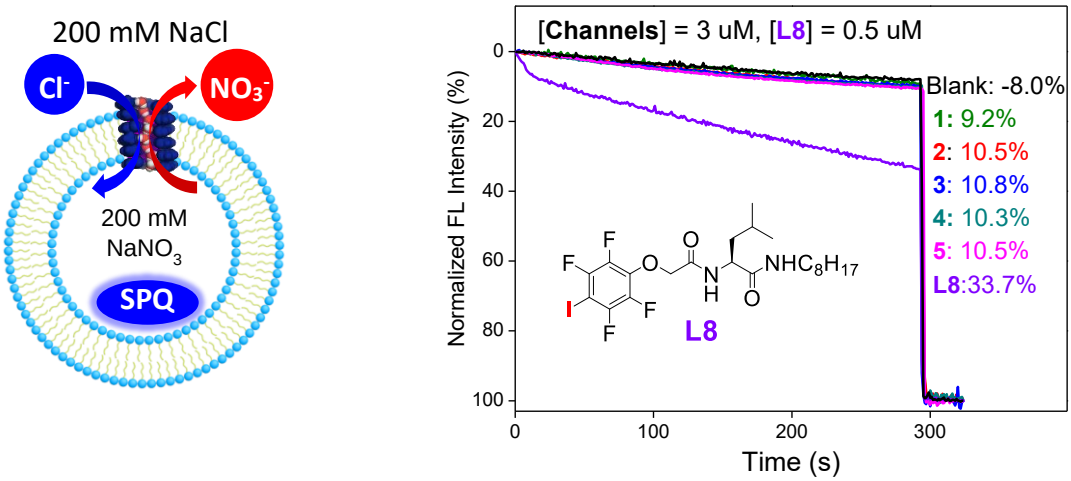


Figure S4. SPQ-based LUV assay, confirming that channel channels **1-5** do not transport Cl^- anions. **L8** is a chloride channel recently reported by us (See: *Chem. Sci.* **2018**, *9*, 4044).

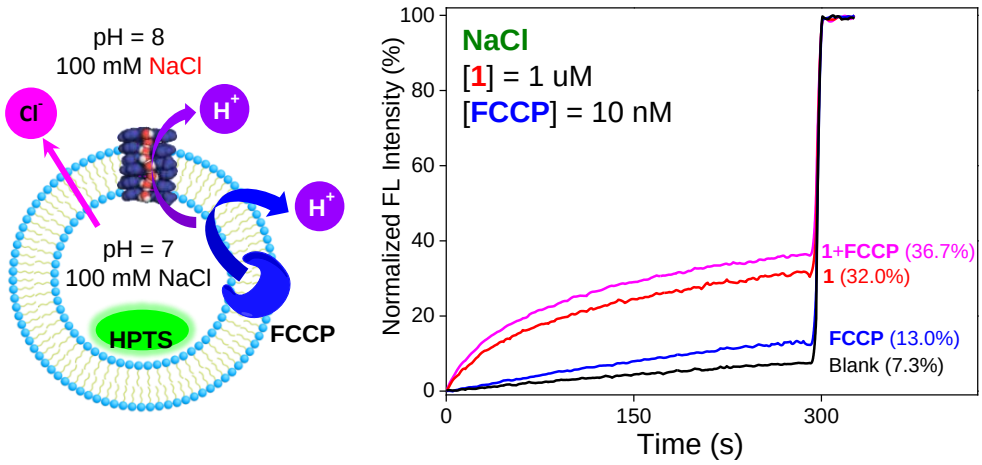


Figure S5. FCCP-based HTPS assay that suggests chloride transport to be the rate-limiting step.

6. Water Transport Study

DOPC (0.24 ml, 25 mg/mL in $CHCl_3$, Avanti Polar Lipids, USA) and channel samples (**1**, **2** or gA in chloroform) were mixed at different molar ratios (300:1 to 1300:1) in micro-tubes (2 ml). The solvent was removed by N_2 flow and the resulting film was dried under high vacuum overnight. HEPES buffer (10 mM HEPES, 100 mM NaCl, pH = 7.0, 1.0 mL) was then added, followed by vortexing the solution for 30 s and then ten cycles of sonication (37 kHz, power 100, 70 °C, 2.5 min) in order to maximize incorporation extent of channel molecules into membrane. And glass spatula was used if necessary to make sure the residue was fully detached from the surface of the micro-tube. The mixture was further subjected to 10 freeze-thaw cycles (freezing in liquid N_2 for 1 min and heating 55 ^{o}C water bath for 2 min), and extruded at 80 °C for 15 times. The LUVs obtained this way contain 6 mg/mL of lipids, were stored in 4 °C fridge before use, and diluted six times with HEPES buffer to make 1 mg/mL LUV for stopped flow measurement. The particle size of LUV (120 nm) was characterized by dynamic light scattering (Zetasizer Nano, Malvern Instruments Ltd., UK). The water permeability measurements were conducted on a stopped-flow instrument (Chirascan Circular Dichroism Spectrometer, Applied Photophysics, UK). Exposure of vesicles to three types of hypertonic osmolytes resulted in the shrinkage of the vesicles due to an outwardly directed osmotic gradient. The abrupt decrease of the vesicle size leads to an increase in light scattering intensity at 90° angle based on the Rayleigh-Gans theorym. The changes of light scattering intensity caused by vesicle shrinkage were recorded at a wavelength of 577 nm, and were fitted in the following form of single exponential function.

$$y = A*exp(-kx) + y^{0}$$

where y = change in the light scattering, k is the exponential coefficient of the change in the light scattering and x is time.

With the assumption that change in the light scattering intensity is proportional to the change in the vesicle volume ($\Delta V/V_0$) based on the Boyle-van't Hoff law[1], the osmotic permeability (P_f) in the unit of cm/s was calculated as follow:

$$P_f = k / ((S/V_0) * V_W \text{ x } \Delta_{osm})$$

where k is the exponential coefficient of the change in the light scattering; S and V_0 are the initial surface area and volume of the vesicles, respectively; V_w is the molar volume of water, and Δ_{osm} is the osmolarity difference.

To calculate the true water permeability (P_W in the unit of cm^3/s) of water channels, the $P_{f(\text{blank})}$ value of the blank vesicle without water channels needs to be deducted from $P_{f\ (\text{channel})}$, which was multiplied by the vesical surface area (S) and divided by the number of water channels (N) incorporated in the liposome as shown below. Here, we assume 100% incorporation of the water channels, and calculated P_W value therefore is the minimum value.

$$P_W = (P_{f(channel)} - P_{f(blank)})*(S/\text{N})$$

7. Actual Concentration of DOPC Lipid after Extrusion

Determination of actual concentration of DOPC lipid after extrusion: The calibration curve of DOPC, which correlates its fluorescence intensity at 280 nm to its concentration, obtained by recording the fluorescence in the HEPES buffer (10 mM HEPES, 100 mM NaCl, pH = 7.0) that contains DOPC from 3 mg/mL to 7 mg/mL. We found that fluorescence intensity at 280 nm increases linearly with increasing concentration (**Figure S6**). We then measured the fluorescence of extruded liposomes made up of DOPC lipids at 6 mg/mL at the same wavelength of 280 nm based on which the loss of liposomes, averaged over three runs, was calculated to be 25.0 ± 6.0 %. That is, 25.0% liposome was lost during the extrusion process, and the remaining 75.0% liposome was then used for calculating the true lipid:channel molar ratio as shown in **Table S1**.

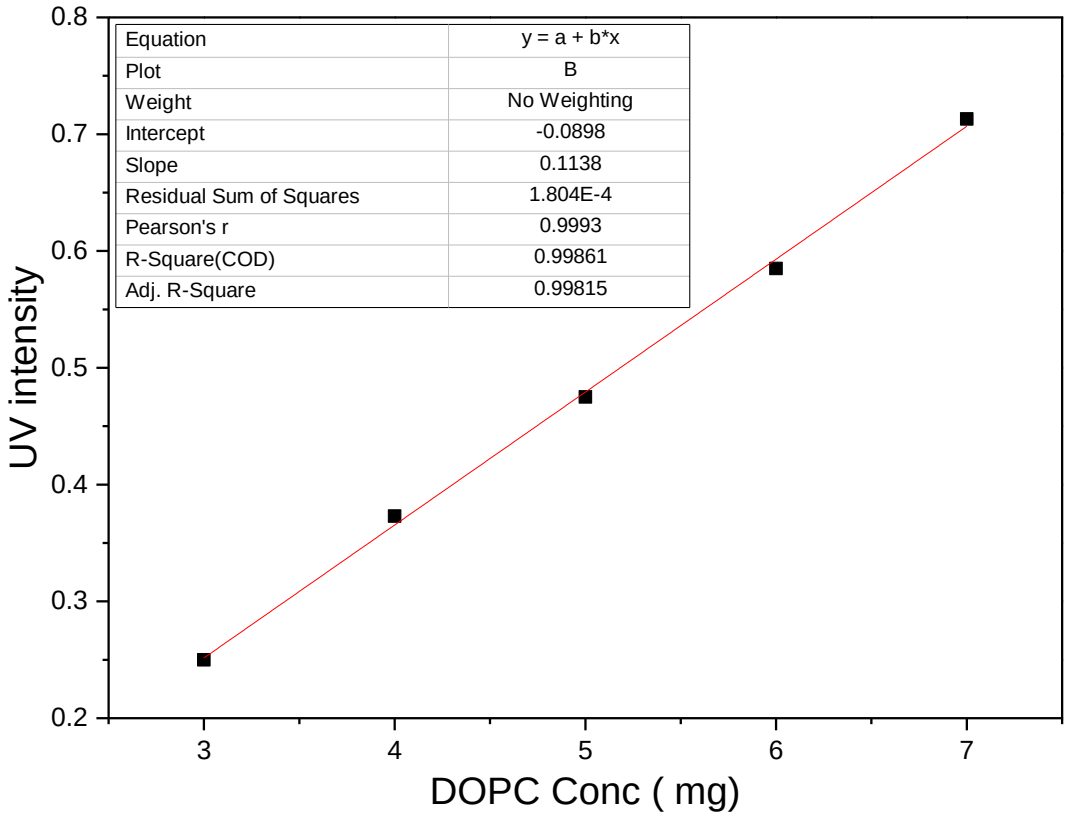


Figure S6. Linear correlation between absorbance intensity at 280 nm and the concentration of DOPC lipids (3 to 7 mg/mL) in the HEPES buffer (10 mM HEPES, 100 mM NaCl, pH = 7.0).

8. Actual Lipid:Channel Molar Ratio in DOPC Lipid after Extrusion

Determination of actual lipid:channel molar ratio in DOPC lipid after extrusion: During the extrusion, 25.0% liposome was lost, which may carry some channels in it and alter the original lipid:channel molar ratios. To determine the actual and accurate lipid:channel molar ratios for calculating the single-channel water permeability, the actual concentration of channels in lipid after extrusion needs to be determined. For this purpose, we have measured the fluorescence intensities of channels **1**- **5** premixed with lipids at varying molar ratios from 1:3000 to 1:5400 before and after extrusion at 425 nm for **1**, 445 nm for **2** or **3**, 443 nm for **4** and 439 nm for **5** (**Figures S7** and **S8**). The relative ratio obtained by dividing the fluorescence intensity after extrusion over that before extrusion and summarized in **Table S1** tells us the retaining percentages of the channel in the liposome. Further dividing this ratio by 75.0% (e.g., the percent of liposome that remains in solution after the extrusion process) yields the actual lipid:channel molar ratios based on which the number of channel molecules can be further determined for calculating single-channel water permeability data.

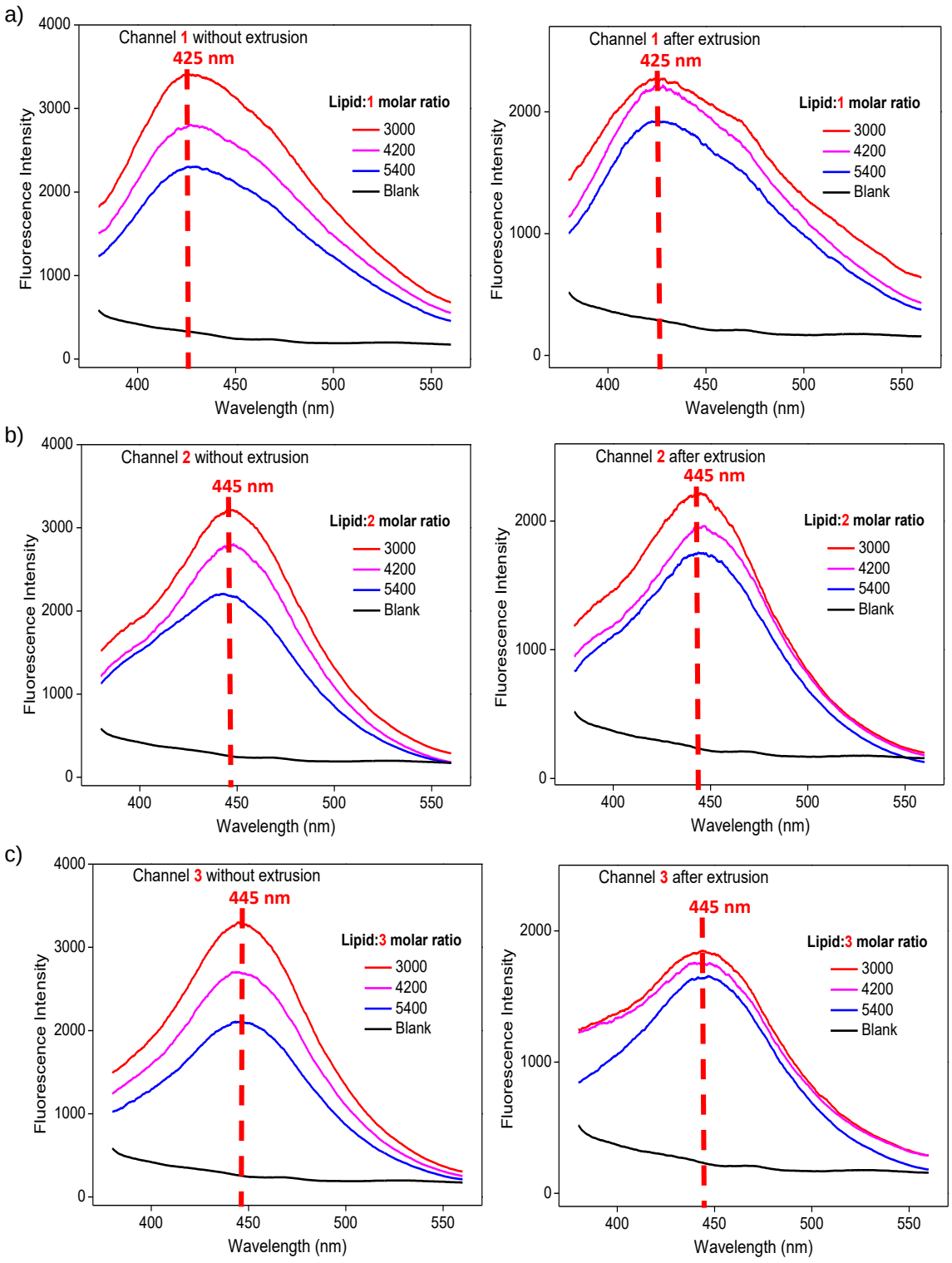


Figure S7. Fluorescence spectra and intensities of channels **1** (a), **2** (b) or **3** (c) mixed with lipids at varying ratios.

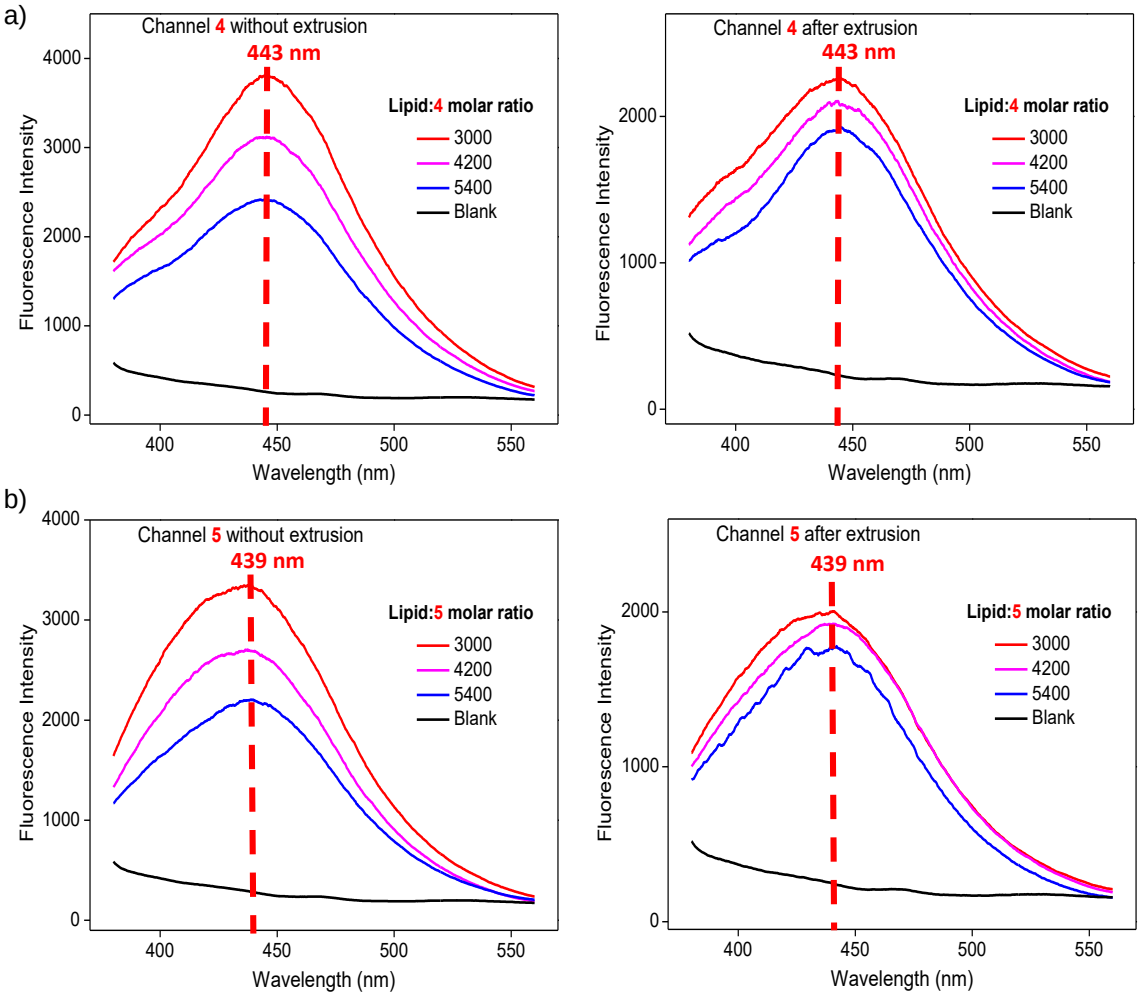


Figure S8. Fluorescence spectra and intensities of channels **4** (a) or **5** (b) mixed with lipids at varying ratios.

9. Calculated Actual Lipid:Channel Molar Ratios after Extrusion

Table S1. Calculated actual lipid:channel molar ratios after extrusion for channels **1-5**.

	Initial molar ratio before extrusion (DOPC:Channel)	Intensity ratio $\frac{I_{after\ extrusion}}{I_{before\ extrusion}}$	Actual molar ratio after extrusion (DOPC:Channel)
Channel 1	3000	61.8 ± 2.0%	3641
	4200	74.0 ± 4.4%	4257
	5400	78.8 ± 3.6%	5140
Channel 2	3000	61.1 ± 5.3%	3682
	4200	71.1 ± 2.6%	4430
	5400	83.5 ± 1.0%	4850
Channel 3	3000	51.8 ± 2.1%	4343
	4200	62.3 ± 1.4%	5056
	5400	76.3 ± 3.9%	5308
Channel 4	3000	57.6 ± 4.2%	3906
	4200	66.7 ± 3.3%	4722
	5400	78.3 ± 4.4%	5172
Channel 5	3000	60.7 ± 3.3%	3707
	4200	72.4 ± 2.7%	4351
	5400	81.3 ± 2.5%	4982

[a] Obtained by dividing the intensity ratio by 75.0% and then multiplying the initial lipid:channel molar ratio. For instance, 3641 = (75.0%/61.8%) x 3000.

10. Molecular Dynamics Simulation Details

Simulation setup:

The general AMBER force field (GAFF),[1] with improved torsional parameters,[2] was used in all simulations. Each simulated system contains a water channel solvated in ~ 10 K TIP3P water molecules in a periodic box. For systems with ions, 110 cation (Na^+ or K^+) and anion (Cl^-) pairs were added into the system, to reach a salt level roughly at seawater salt concentration. The systems were initially equilibrated for 3 ns in an NPT ensemble at a constant temperature of 300 K and a pressure of 1 atm. For the first 2 ns of NPT, the channel is constrained for water molecules to disperse into the channel and reach equilibrium. Then all constraints are removed in subsequent simulations. The production run of each system is carried out in an NVT ensemble at constant temperature of 300 K. Extended simulations of 2000 ns were carried out using the AMBER 20 package.[3]

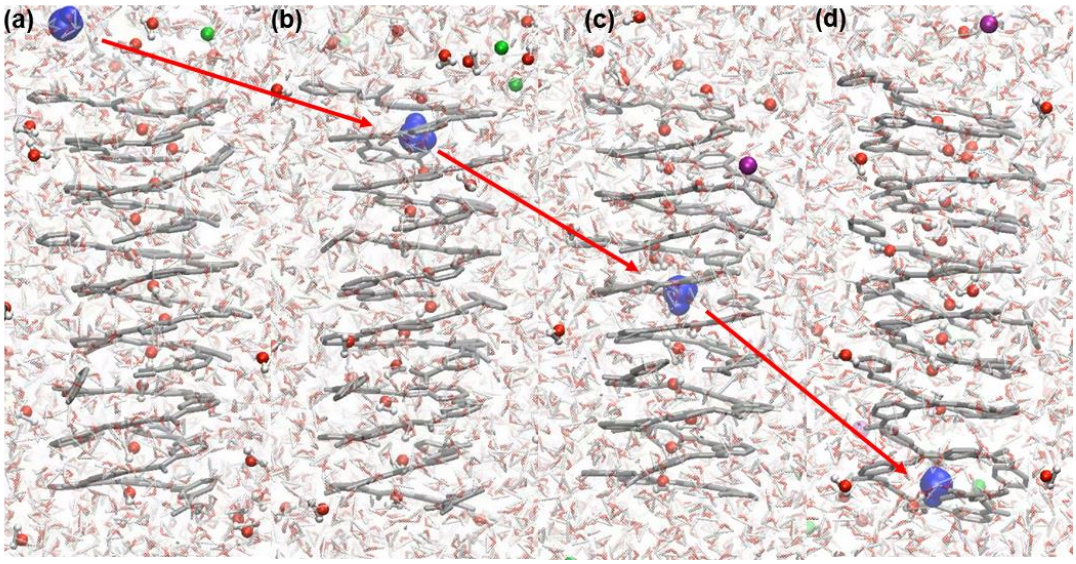
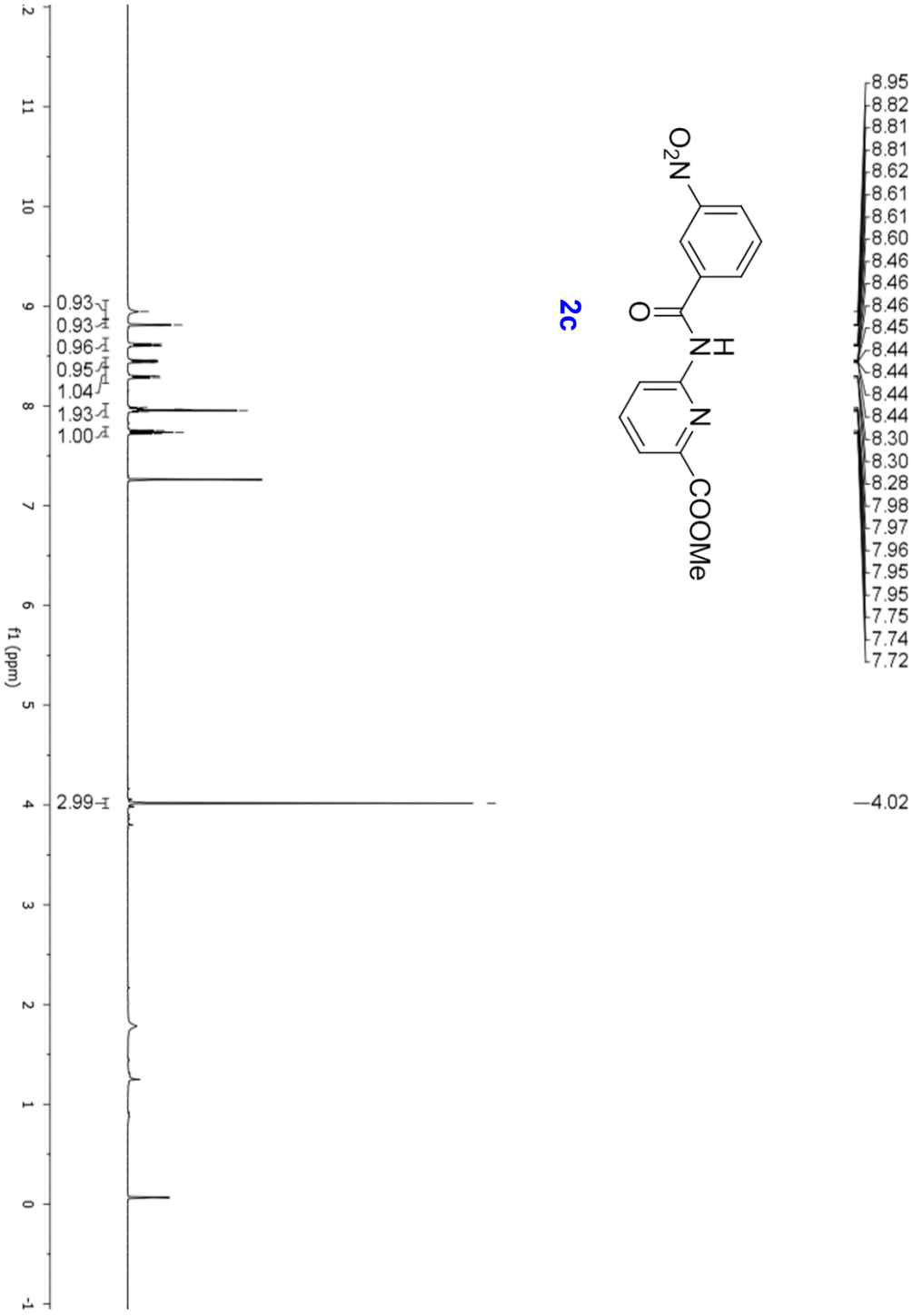


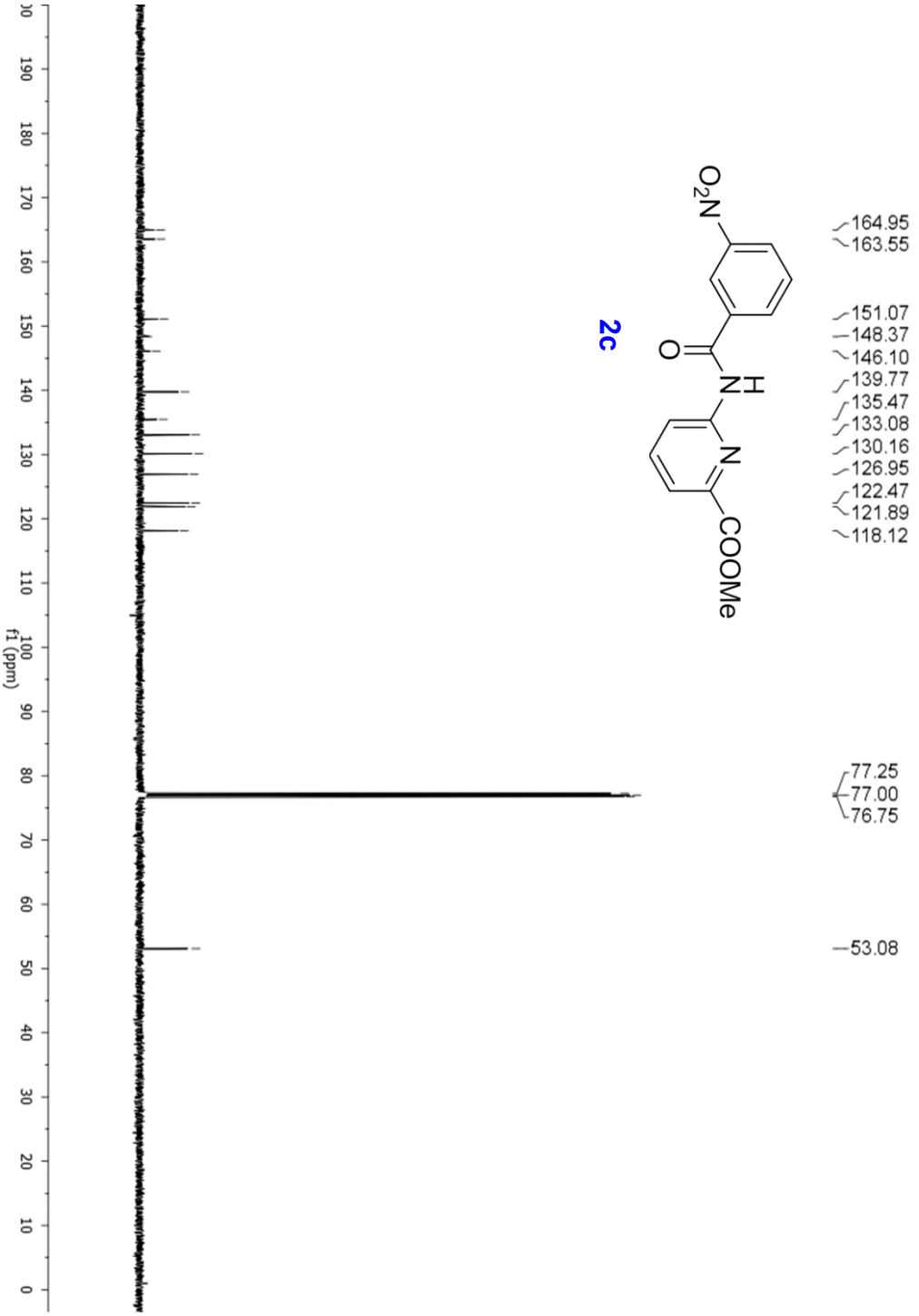
Figure S9. Snapshots of one water (blue vdW representation) transporting through the channel in about 1.5 ns, with those waters inside the channel within this 1.5 ns period in red/white ball and stick representation and all other remaining waters in red/white transparent stick representation. Channel = gray; K^+ = green; Cl^- = purple.

1. J. Wang, R. M. Wolf, J. W. Caldwell, P. A. Kollman, D. A. Case, *J. Comput. Chem.* **2004**, *25*, 1157–74.
2. Z. Liu, A. M. Abramyan and V. Pophristic, *New J. Chem.*, **2015**, *39*, 3229.
3. D.A. Case, R.M. Betz, D.S. Cerutti, T.E. Cheatham, III, T.A. Darden, R.E. Duke, T.J. Giese, H. Gohlke, A.W. Goetz, N. Homeyer, S. Izadi, P. Janowski, J. Kaus, A. Kovalenko, T.S. Lee, S. LeGrand, P. Li, C. Lin, T. Luchko, R. Luo, B. Madej, D. Mermelstein, K.M. Merz, G. Monard, H. Nguyen, H.T. Nguyen, I. Omelyan, A. Onufriev, D.R. Roe, A. Roitberg, C. Sagui, C.L. Simmerling, W.M. Botello-Smith, J.

Swails, R.C. Walker, J. Wang, R.M. Wolf, X. Wu, L. Xiao and P.A. Kollman (2020), AMBER **2020**, University of California, San Francisco.

11. ^{1}H and ^{13}C NMR Spectra

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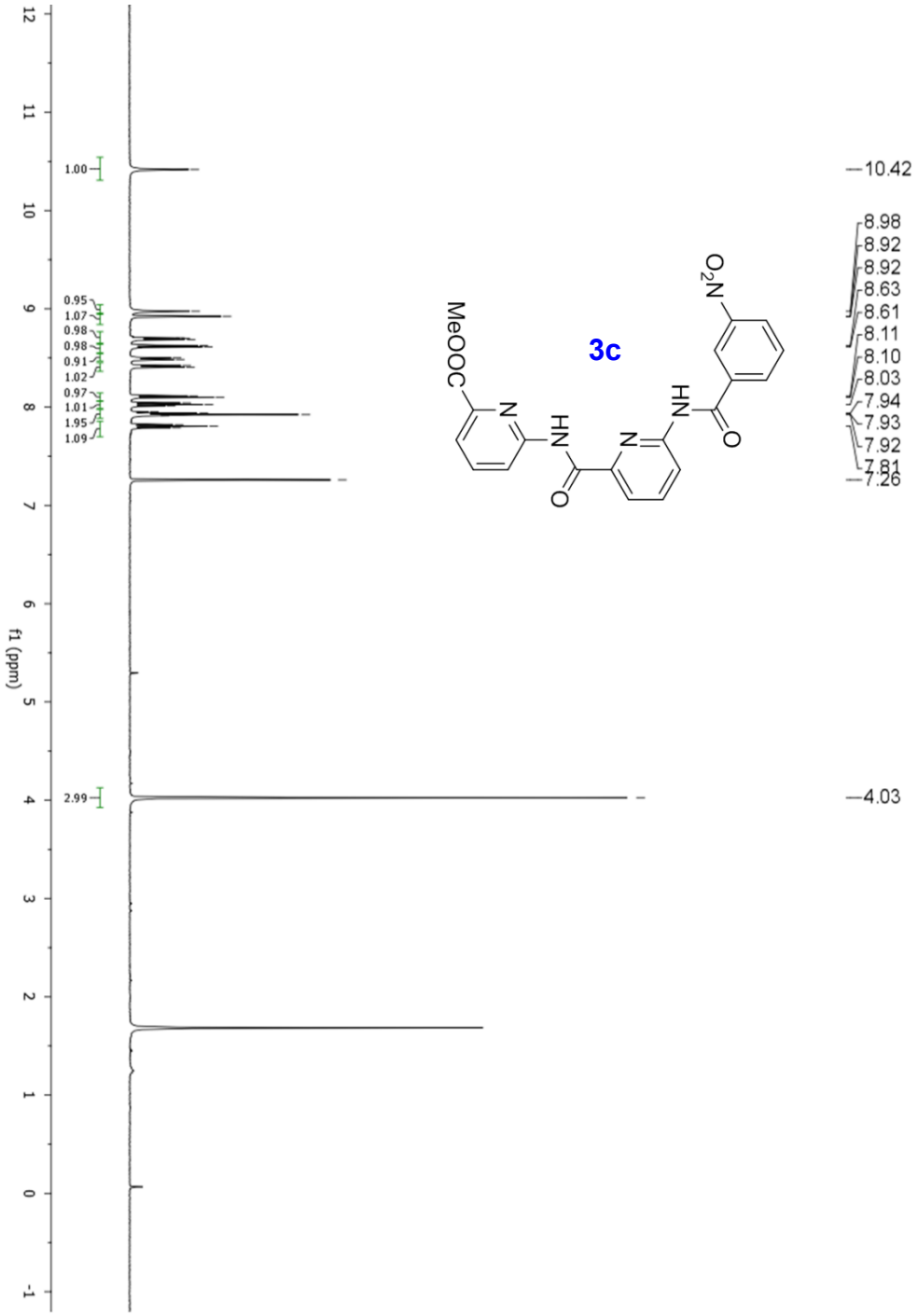
O2N
O
N
H
N
COOMe
164.95
163.55
151.07
148.37
146.10
139.77
135.47
133.08
130.16
126.95
122.47
121.89
118.12
77.25
77.00
76.75
53.08
f1 (ppm)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MeOOC
O2N
HN
HN
N
N
O
O
f1 (ppm)
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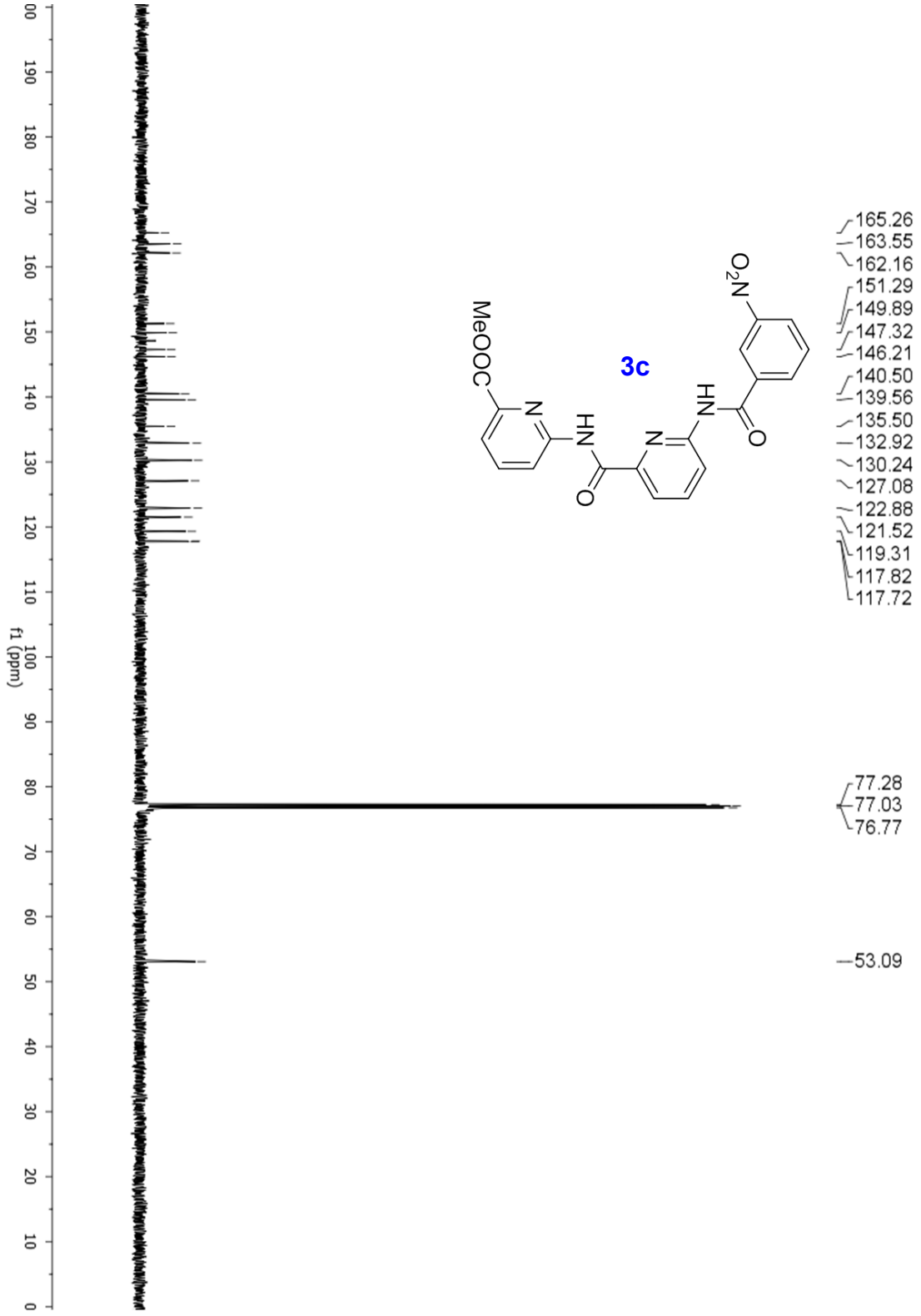
0.95
1.07
0.98
0.98
0.91
1.02
0.97
1.01
1.95
1.09
2.99
10.42
8.98
8.92
8.92
8.63
8.61
8.11
8.10
8.03
7.94
7.93
7.92
7.81
7.26
4.03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MeOOC
N
HN
O
N
HN
O
O2N
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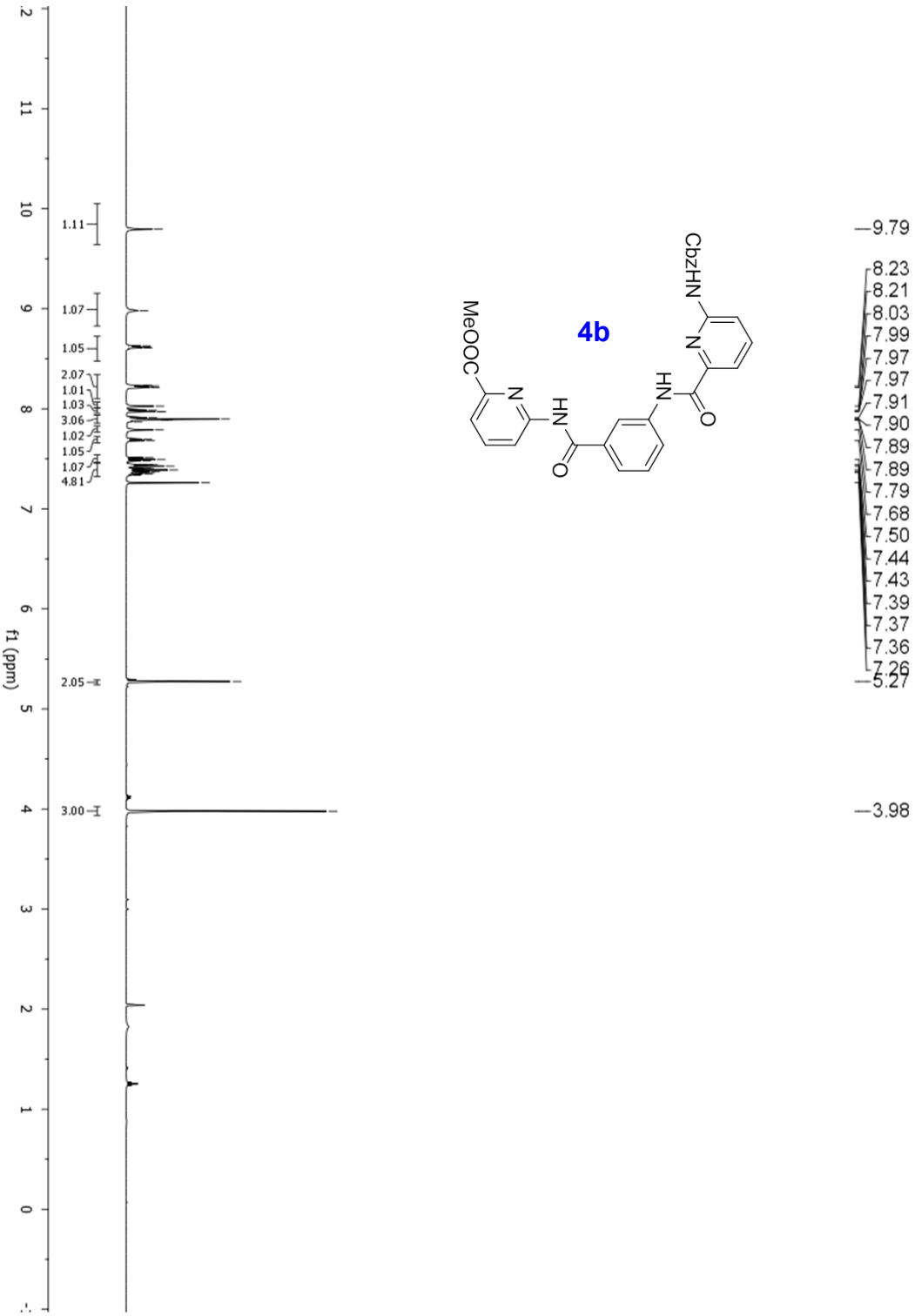
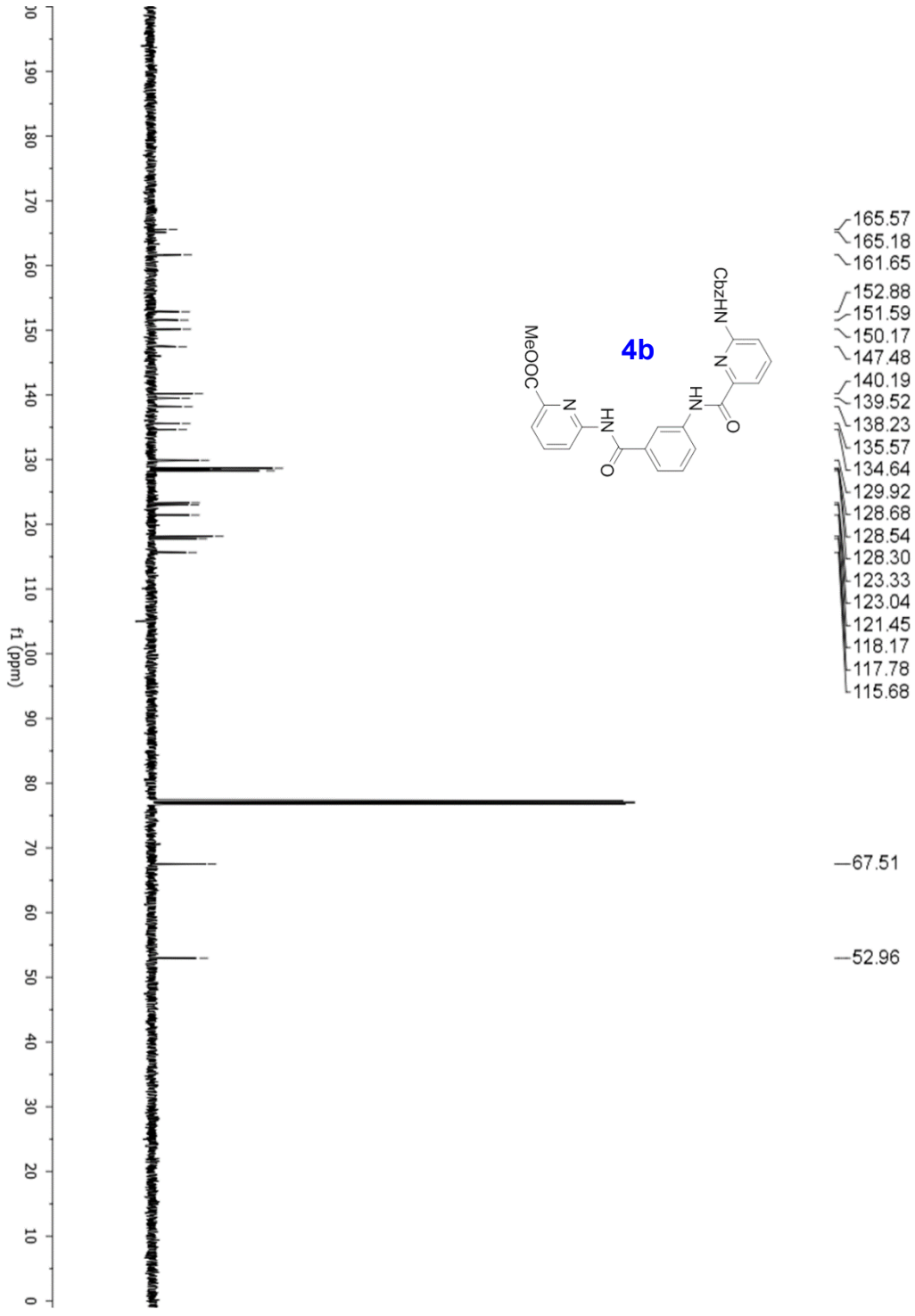
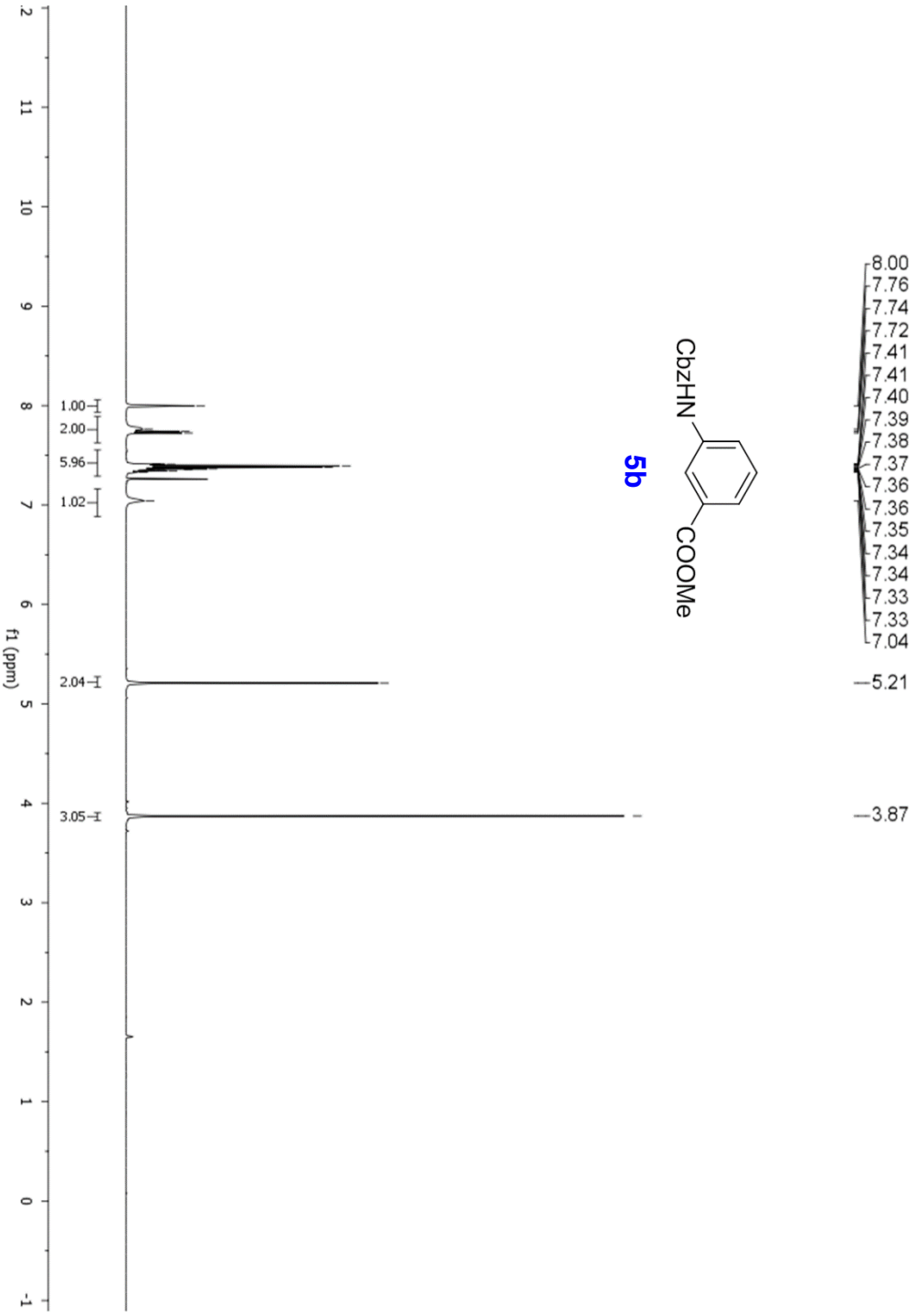
163.55
162.16
151.29
149.89
147.32
146.21
140.50
139.56
135.50
132.92
130.24
127.08
122.88
121.52
119.31
117.82
117.72
77.28
77.03
76.77
53.09
f1 (ppm)


4b
MeOOC
CbzHN
HN
HN
O
O
N
N
f1 (ppm)
1.11
1.07
1.05
2.07
1.01
1.03
3.06
1.02
1.05
1.07
4.81
2.05
3.00
9.79
8.23
8.21
8.03
7.99
7.97
7.97
7.91
7.90
7.89
7.89
7.79
7.68
7.50
7.44
7.43
7.39
7.37
7.36
7.26
5.27
3.98


4b
MeOOC
N
HN
O
HN
O
N
CbzHN
165.57
165.18
161.65
152.88
151.59
150.17
147.48
140.19
139.52
138.23
135.57
134.64
129.92
128.68
128.54
128.30
123.33
123.04
121.45
118.17
117.78
115.68
67.51
52.96
f1 (ppm)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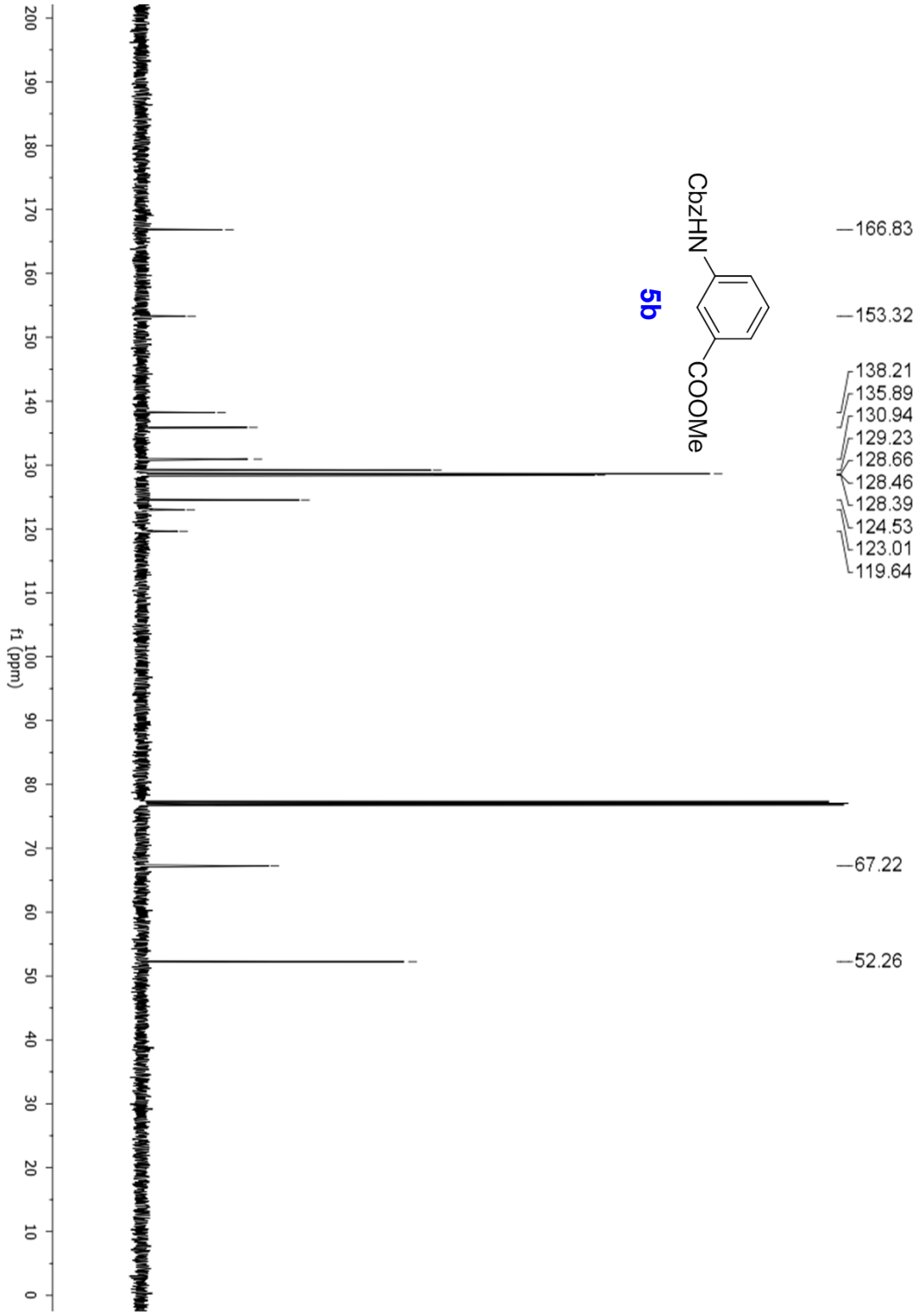
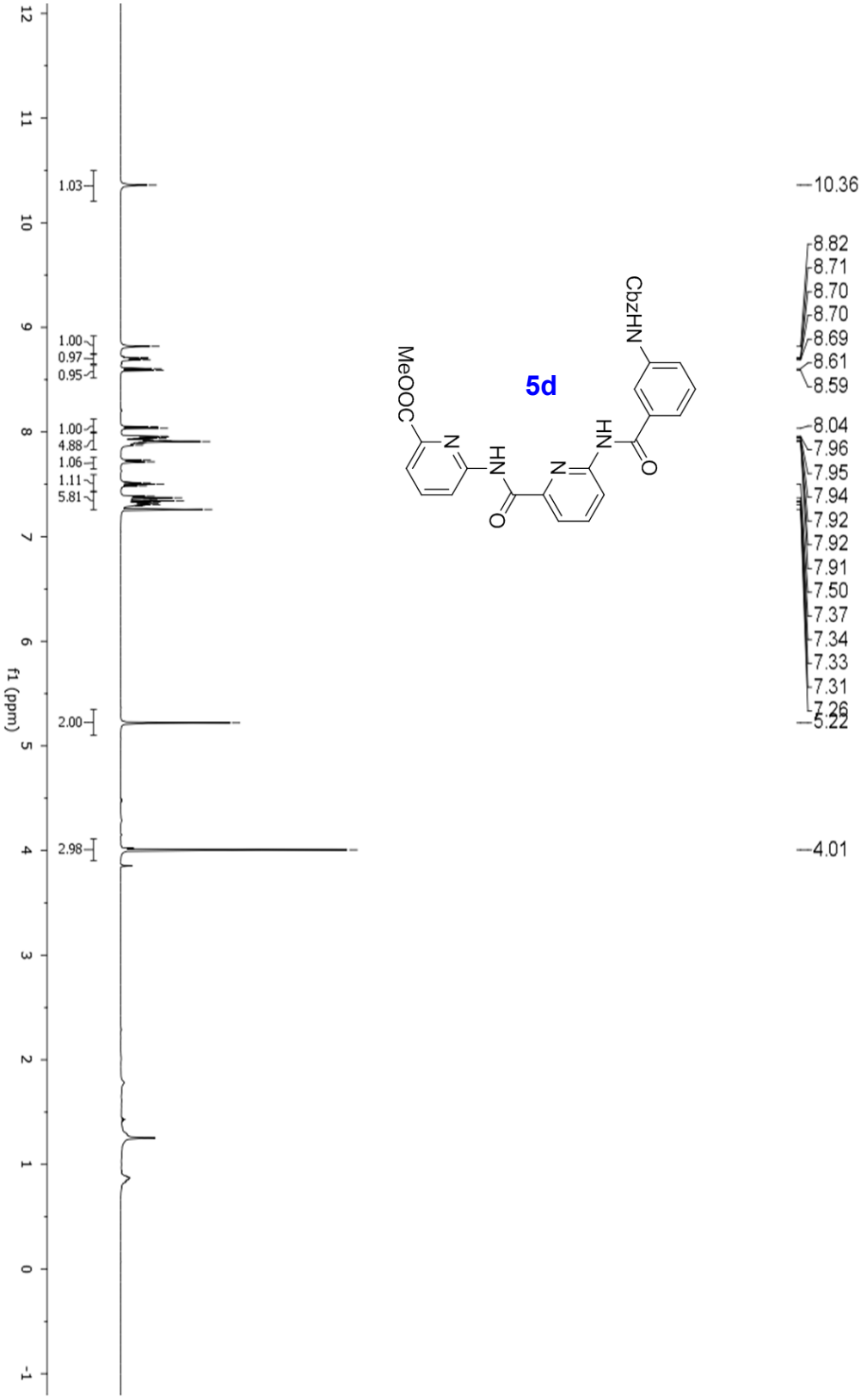
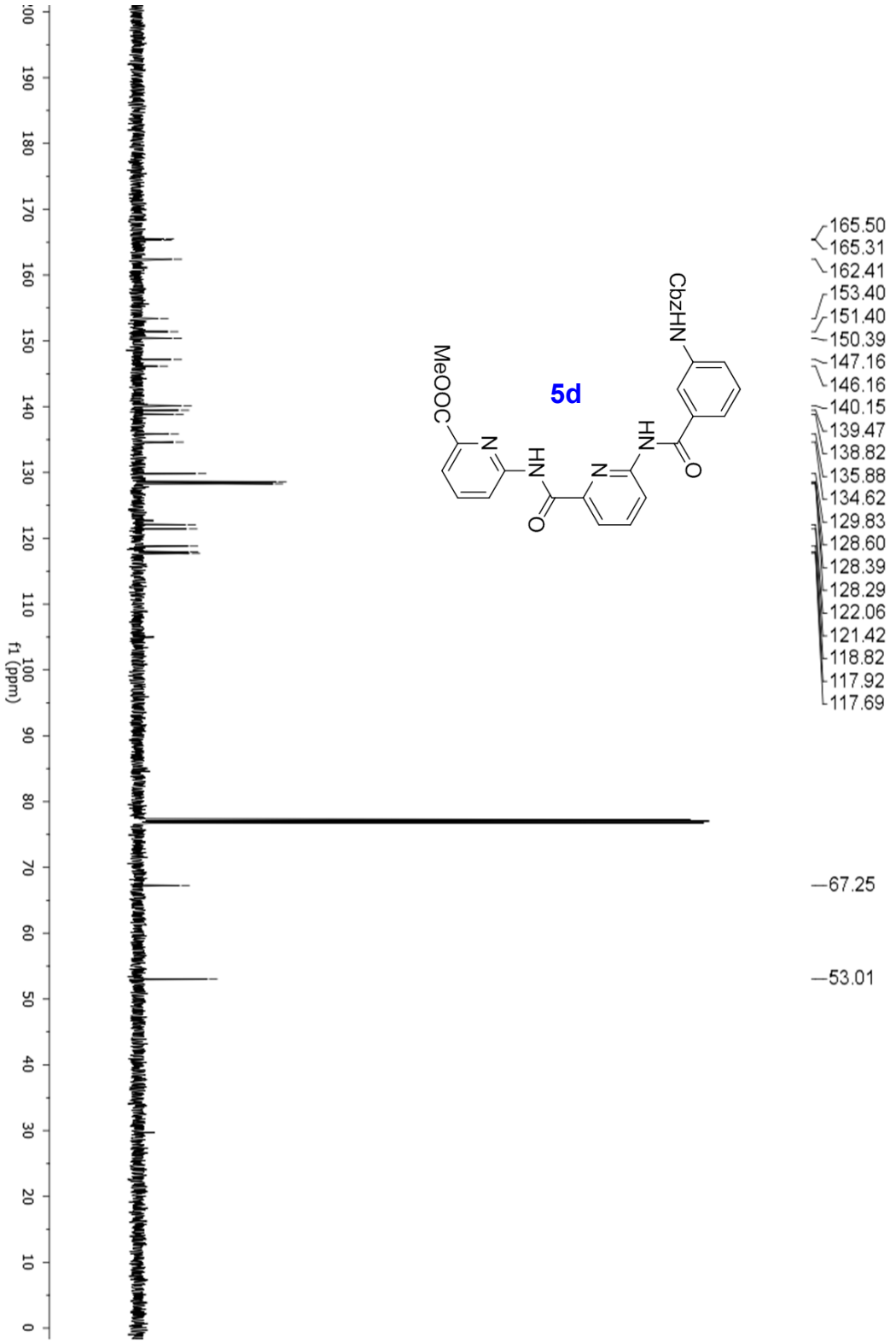
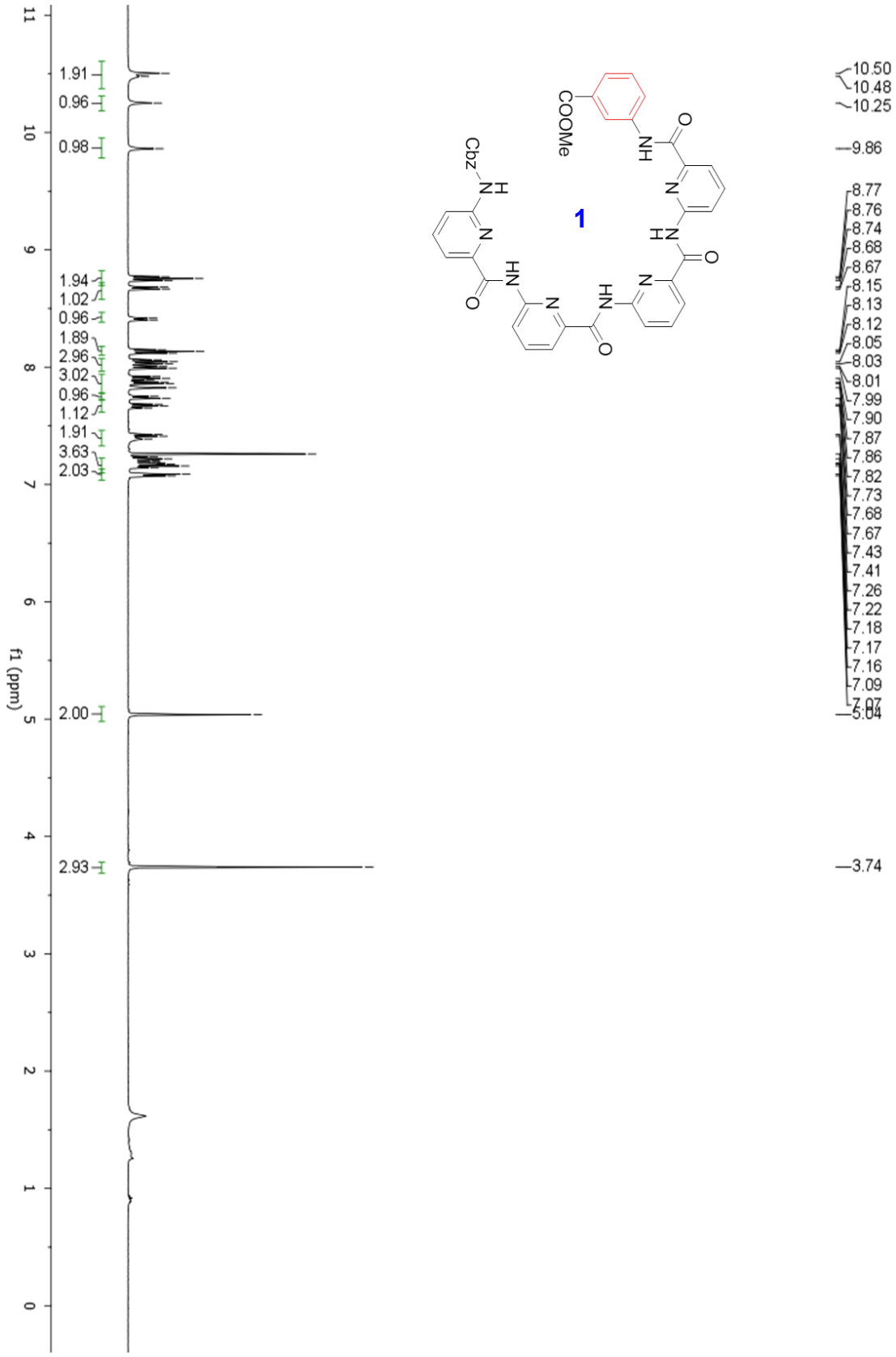
7.76
7.74
7.72
7.41
7.41
7.40
7.39
7.38
7.37
7.36
7.36
7.35
7.34
7.34
7.33
7.33
7.04
5.21
3.87
1.00
2.00
5.96
1.02
2.04
3.05
f1 (ppm)
CbzHN
COOMe
5b


CbzHN
COOMe
5b
166.83
153.32
138.21
135.89
130.94
129.23
128.66
128.46
128.39
124.53
123.01
119.64
67.22
52.26
f1 (ppm)


5d
MeOOC
CbzHN
HN
HN
N
N
O
O
f1 (ppm)
1.03
1.00
0.97
0.95
1.00
4.88
1.06
1.11
5.81
2.00
2.98
10.36
8.82
8.71
8.70
8.70
8.69
8.61
8.59
8.04
7.96
7.95
7.94
7.92
7.92
7.91
7.50
7.37
7.34
7.33
7.31
7.26
5.22
4.01


5d
MeOOC
N
HN
O
N
HN
O
CbzHN
165.50
165.31
162.41
153.40
151.40
150.39
147.16
146.16
140.15
139.47
138.82
135.88
134.62
129.83
128.60
128.39
128.29
122.06
121.42
118.82
117.92
117.69
67.25
53.01
f1 (ppm)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0.96
0.98
1.94
1.02
0.96
1.89
2.96
3.02
0.96
1.12
1.91
3.63
2.03
2.00
2.93
f1 (ppm)
COOMe
Cbz
1
10.50
10.48
10.25
9.86
8.77
8.76
8.74
8.68
8.67
8.15
8.13
8.12
8.05
8.03
8.01
7.99
7.90
7.87
7.86
7.82
7.73
7.68
7.67
7.43
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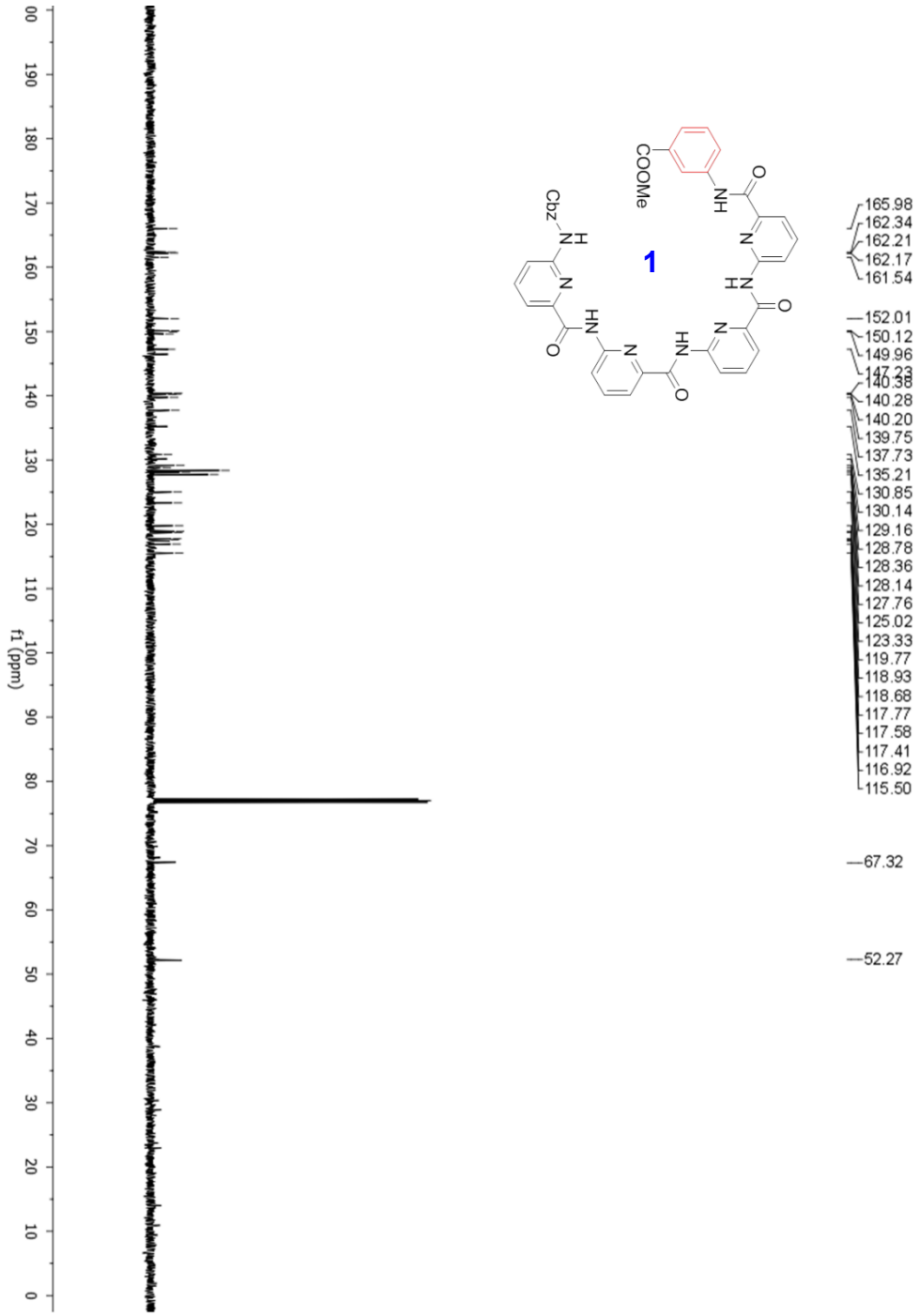
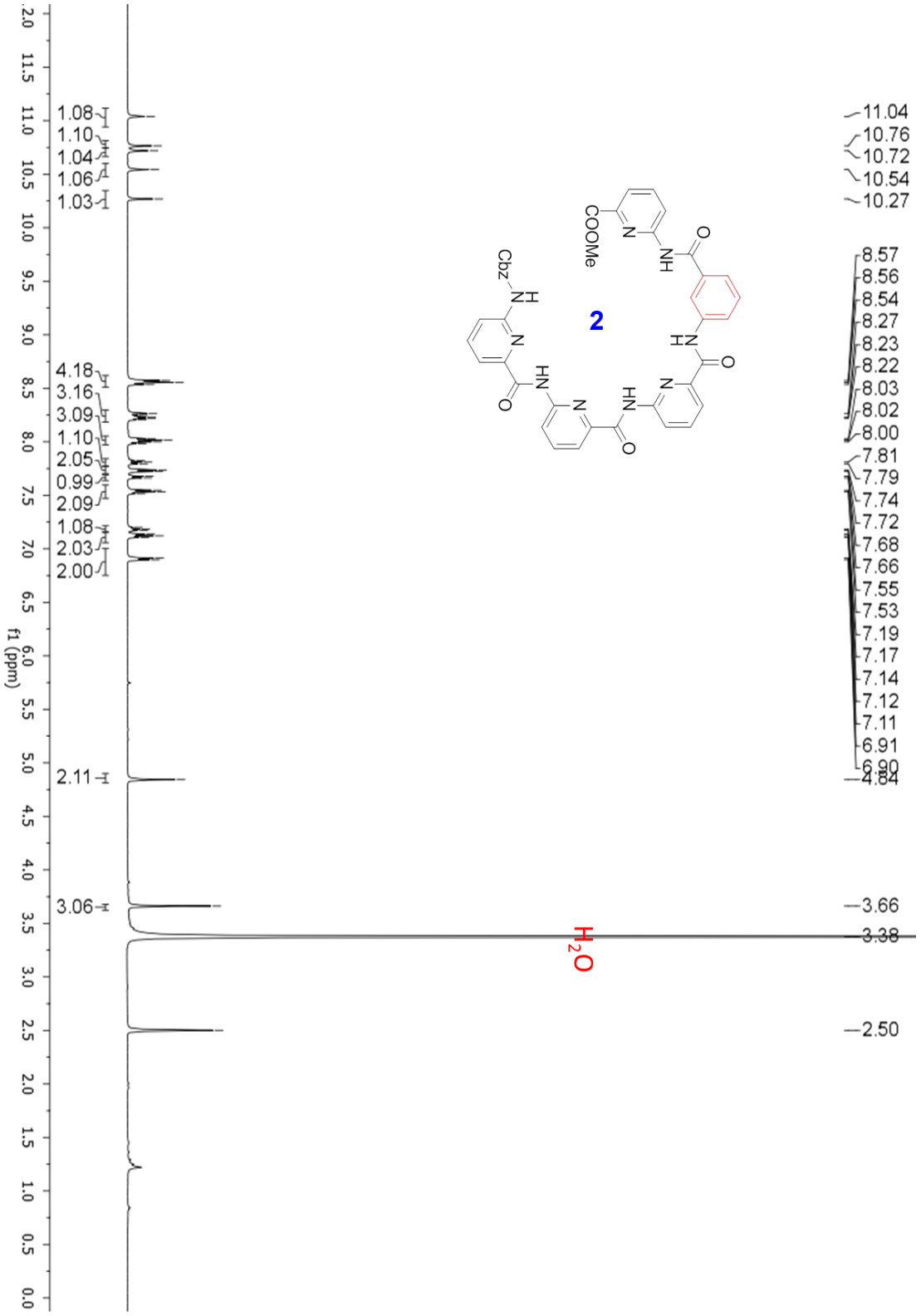
7.17
7.16
7.09
7.07
5.04
3.74


f1 (ppm)
1
COOMe
Cbz
NH
HN
N
O
165.98
162.34
162.21
162.17
161.54
152.01
150.12
149.96
147.23
140.38
140.28
140.20
139.75
137.73
135.21
130.85
130.14
129.16
128.78
128.36
128.14
127.76
125.02
123.33
119.77
118.93
118.68
117.77
117.58
117.41
116.92
115.50
67.32
52.27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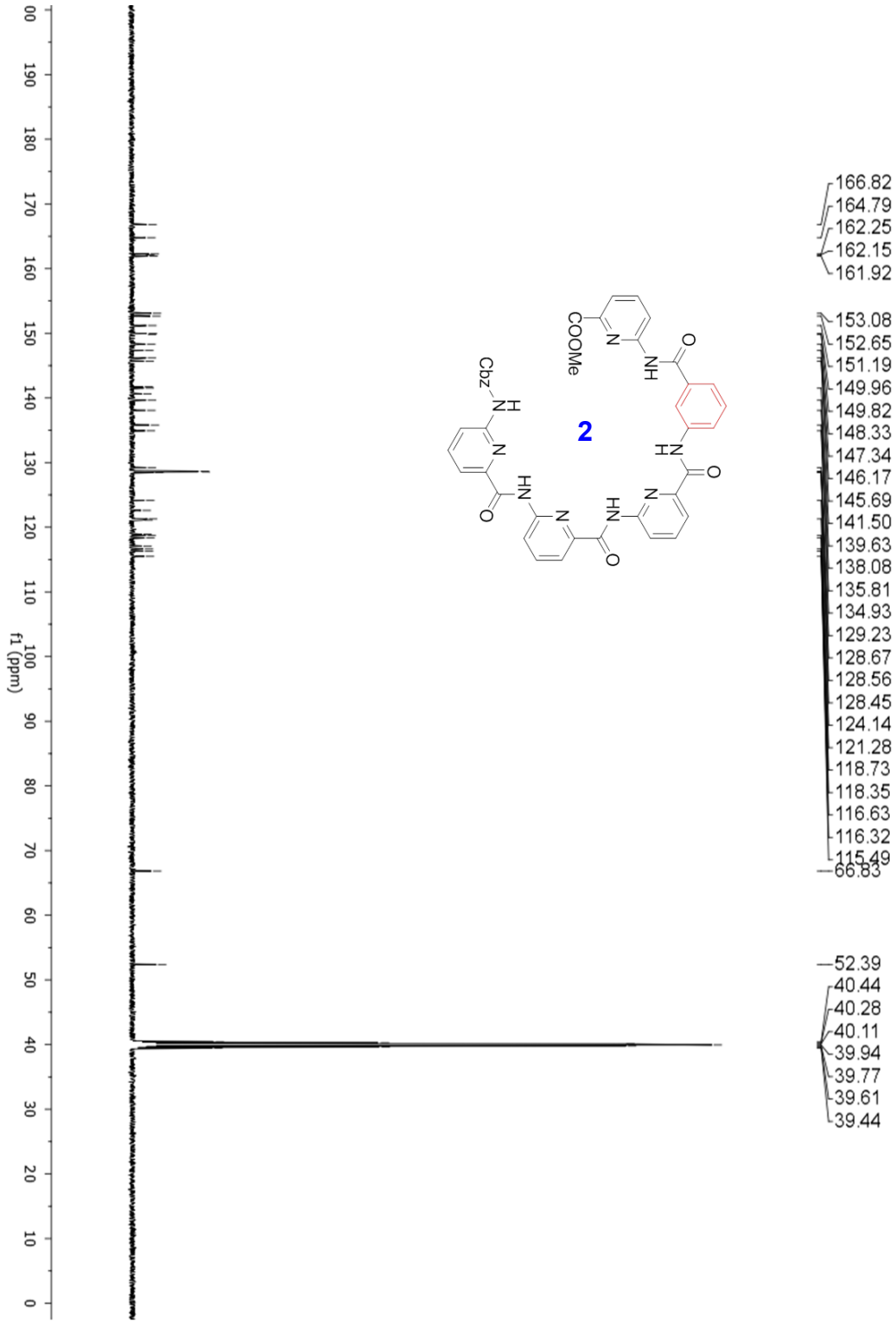
1.10
1.04
1.06
1.03
4.18
3.16
3.09
1.10
2.05
0.99
2.09
1.08
2.03
2.00
2.11
3.06
f1 (ppm)
11.04
10.76
10.72
10.54
10.27
8.57
8.56
8.54
8.27
8.23
8.22
8.03
8.02
8.00
7.81
7.79
7.74
7.72
7.68
7.66
7.55
7.53
7.19
7.17
7.14
7.12
7.11
6.91
6.90
4.84
3.66
3.38
2.50
H2O
COOMe
Cbz
2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151.19
149.96
149.82
148.33
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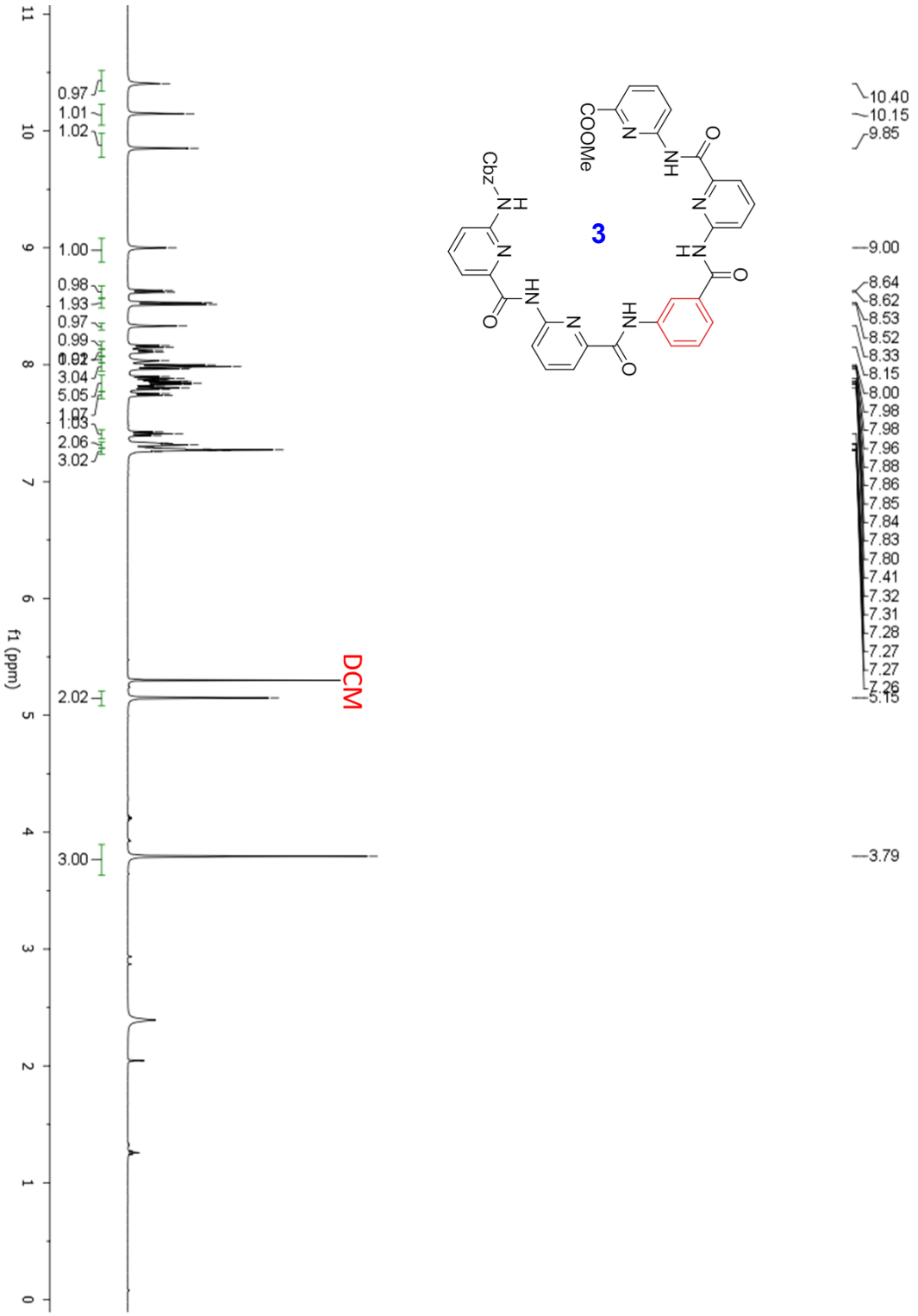
146.17
145.69
141.50
139.63
138.08
135.81
134.93
129.23
128.67
128.56
128.45
124.14
121.28
118.73
118.35
116.63
116.32
115.49
66.83
52.39
40.44
40.28
40.11
39.94
39.77
39.61
39.44
f1 (ppm)
COOMe
Cbz
2


f1 (ppm)
DCM
3
Cbz
COOMe
10.40
10.15
9.85
9.00
8.64
8.62
8.53
8.52
8.33
8.15
8.00
7.98
7.98
7.96
7.88
7.86
7.85
7.84
7.83
7.80
7.41
7.32
7.31
7.28
7.27
7.27
7.26
5.15
3.79
0.97
1.01
1.02
1.00
0.98
1.93
0.97
0.99
3.04
5.05
1.03
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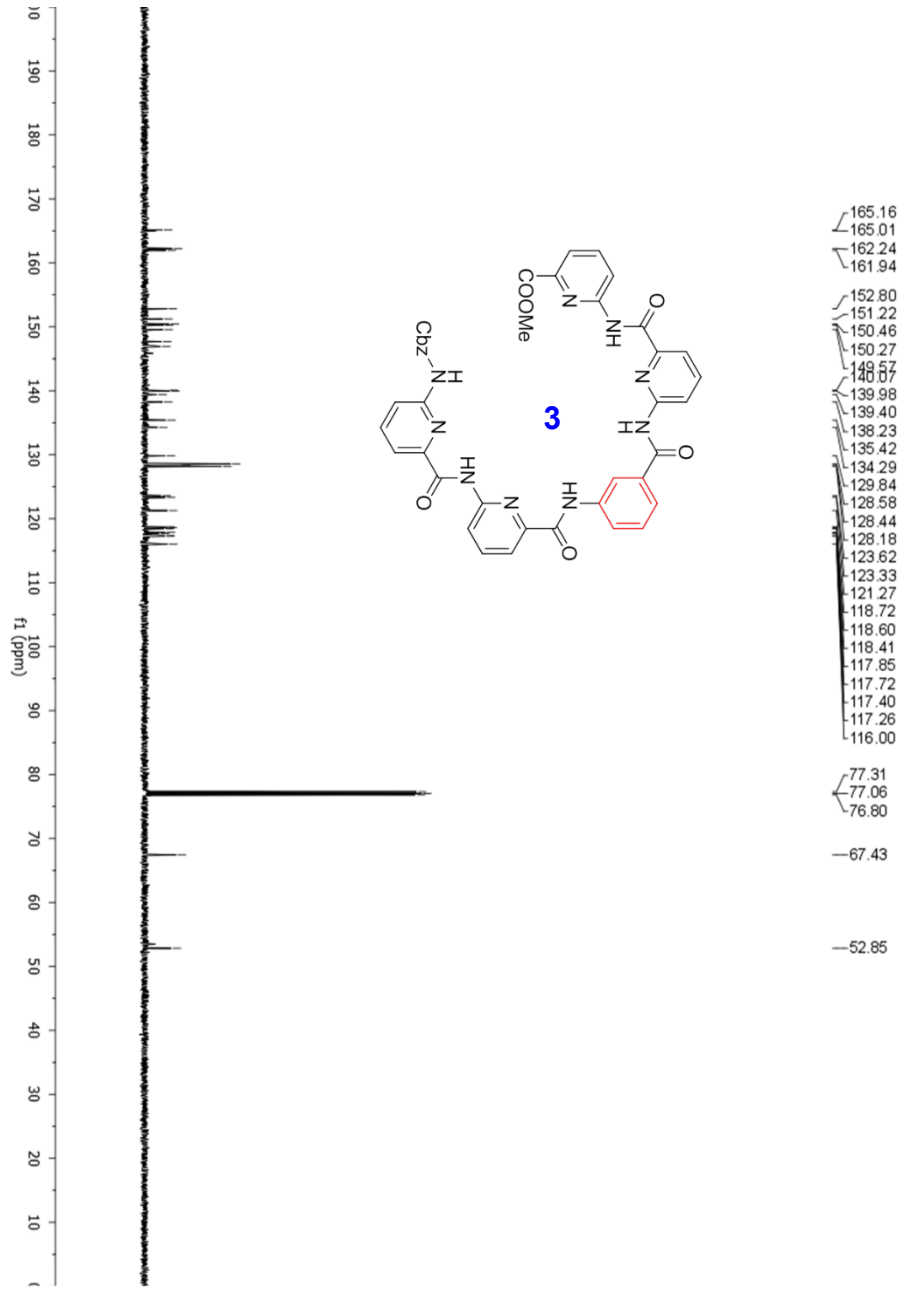
3.02
2.02
3.00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3
COOMe
Cbz
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165.01
162.24
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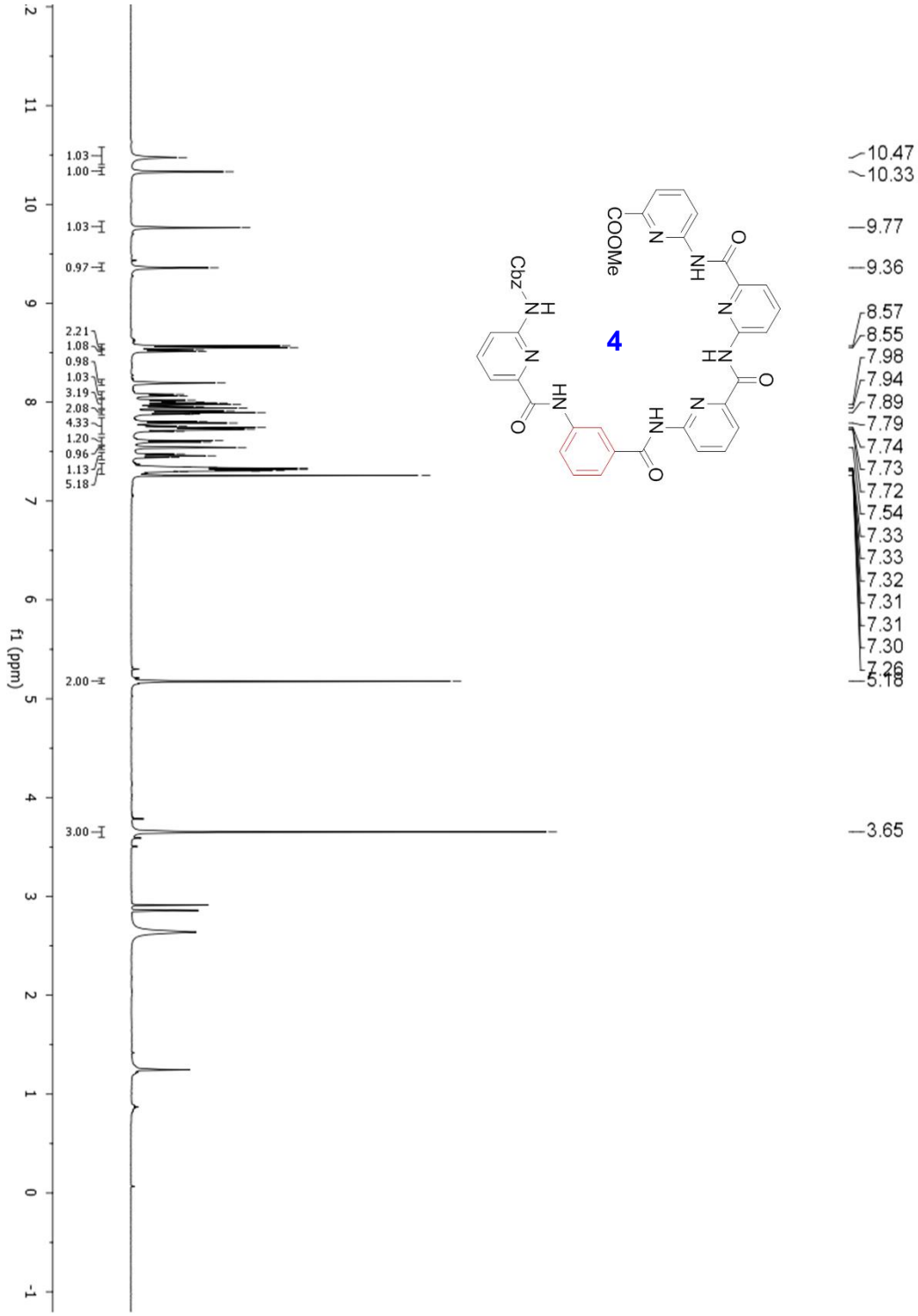
152.80
151.22
150.46
150.27
149.57
140.07
139.98
139.40
138.23
135.42
134.29
129.84
128.58
128.44
128.18
123.62
123.33
121.27
118.72
118.60
118.41
117.85
117.72
117.40
117.26
116.00
77.31
77.06
76.80
67.43
52.85


4
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COOMe
NH
HN
N
O
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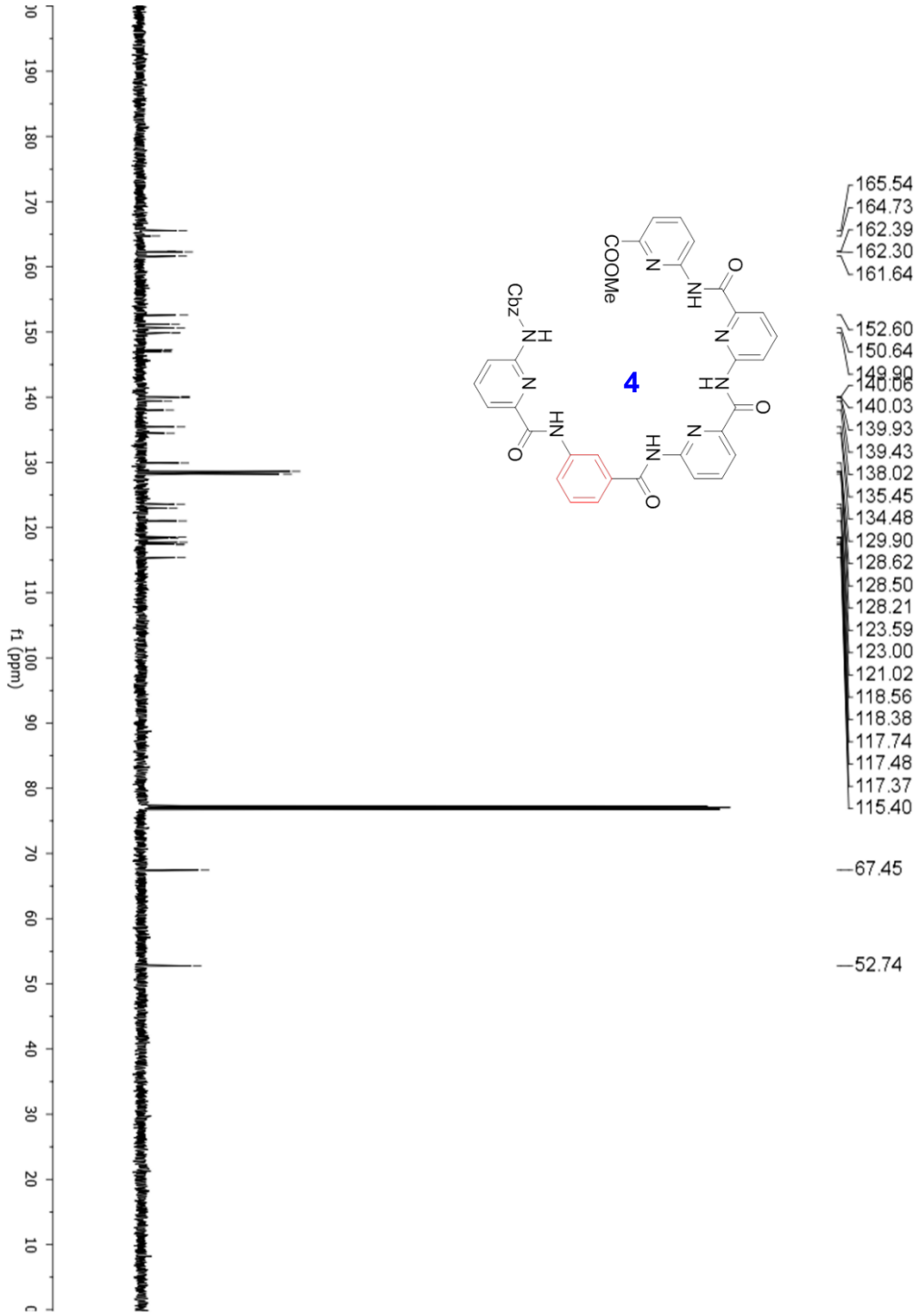
1.03
0.97
2.21
1.08
0.98
1.03
3.19
2.08
4.33
1.20
0.96
1.13
5.18
2.00
3.00
10.47
10.33
9.77
9.36
8.57
8.55
7.98
7.94
7.89
7.79
7.74
7.73
7.72
7.54
7.33
7.33
7.32
7.31
7.31
7.30
7.26
5.18
3.65


f1 (ppm)
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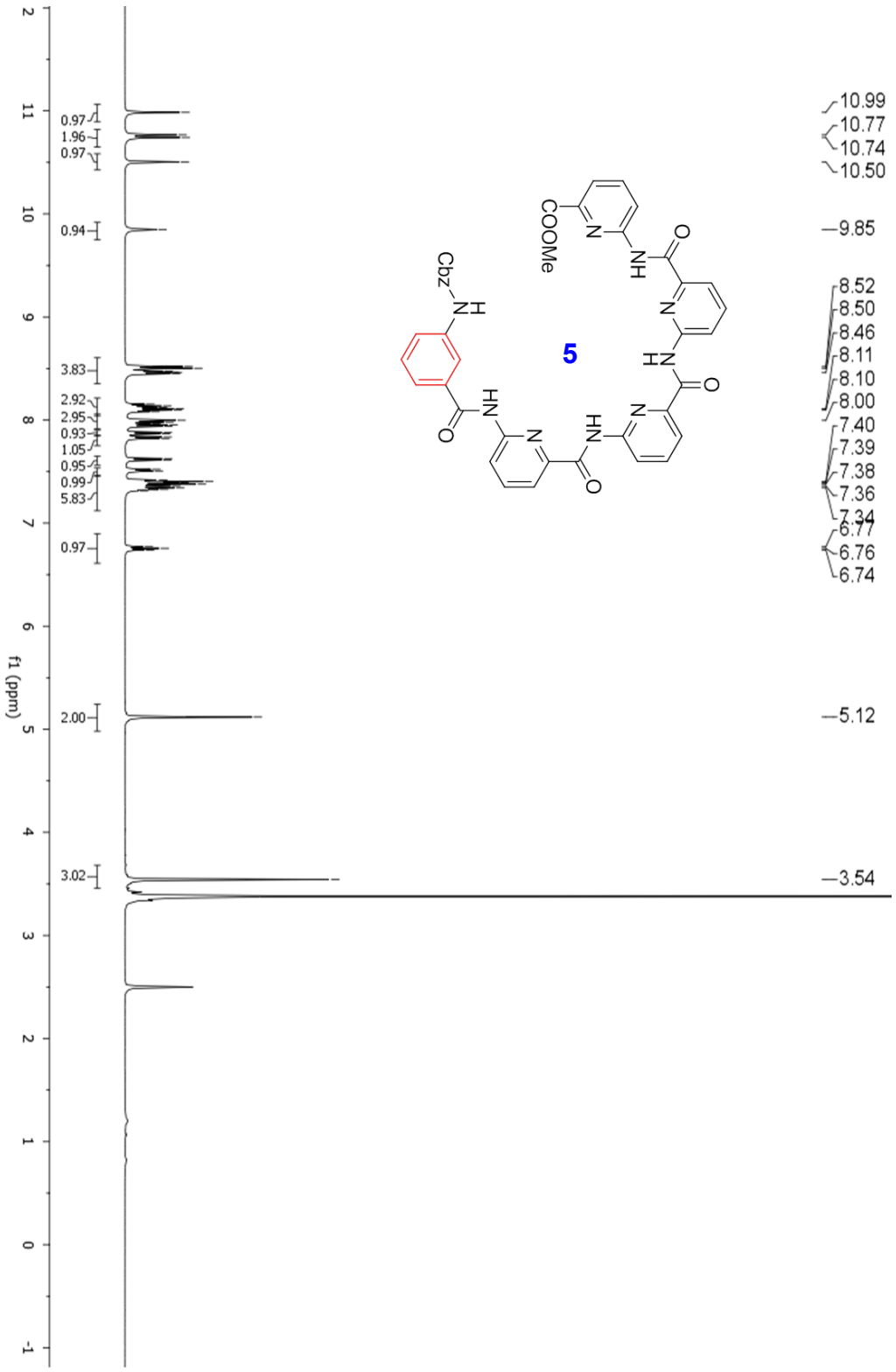
152.60
150.64
140.06
140.03
139.93
139.43
138.02
135.45
134.48
129.90
128.62
128.50
128.21
123.59
123.00
121.02
118.56
118.38
117.74
117.48
117.37
115.40
67.45
52.74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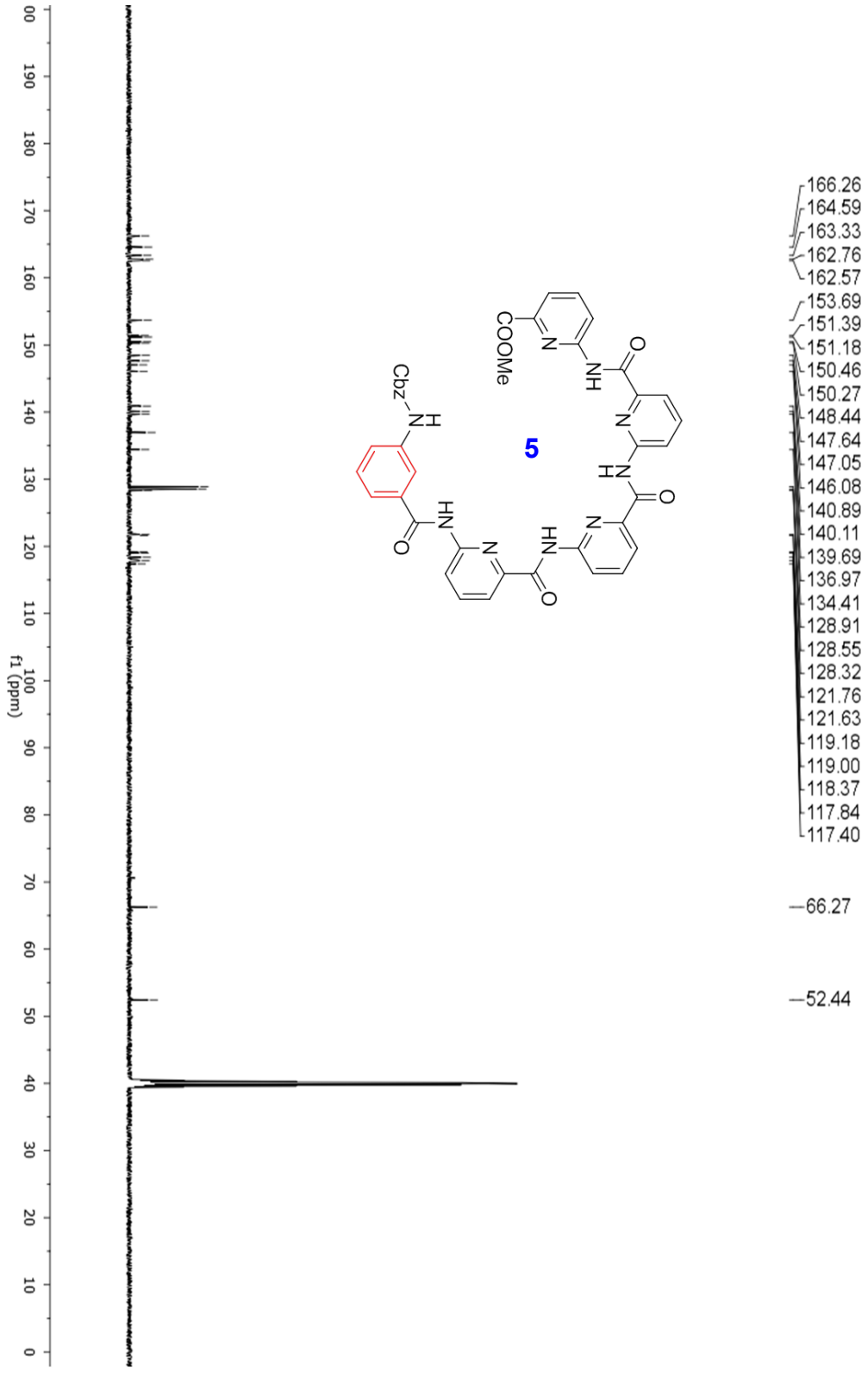
0.94
3.83
2.92
2.95
0.93
1.05
0.95
0.99
5.83
0.97
2.00
3.02
10.99
10.77
10.74
10.50
9.85
8.52
8.50
8.46
8.11
8.10
8.00
7.40
7.39
7.38
7.36
7.34
6.77
6.76
6.74
5.12
3.54
COOMe
Cbz
5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164.59
163.33
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162.57
153.69
151.39
151.18
150.46
150.27
148.44
147.64
147.05
146.08
140.89
140.11
139.69
136.97
134.41
128.91
128.55
128.32
121.76
121.63
119.18
119.00
118.37
117.84
117.40
66.27
52.44
f1 (ppm)
Cbz
COOMe
5