Supporting Information

Tetrazine Templated Method for Ternary Conjugates

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Contents

General Experimental Techniques

Unless otherwise noted, materials were obtained from commercial suppliers and were used without further purification. Unless otherwise reported all reactions were performed under Argon atmosphere. Removal of solvent *in vacuo* refers to distillation using a rotary evaporator attached to an efficient vacuum pump. Products obtained as solids or syrups were dried under high vacuum. Analytical thin-layer chromatography was performed on pre-coated Merck silica plates (F_{254}, 0.25 mm thickness); compounds were visualized by UV light or by staining with anisaldehyde spray. Optical rotations were measured on a JASCO P-1020 or Rudolph polarimeter. IR spectra were recorded on a Perkin-Elmer 1600 FT-IR spectrometer. NMR spectra were recorded either on a JEOL ECX 400 or Bruker Avance 500 MHz with $CDCl_3$ as the solvent and TMS as the internal standard. High resolution mass spectroscopy (HRMS) was performed on Waters Synapt G2. Low resolution mass spectroscopy (LRMS) was performed on Waters Acquity UPLC-MS (H Class).

DCM refers to CH_2Cl_2

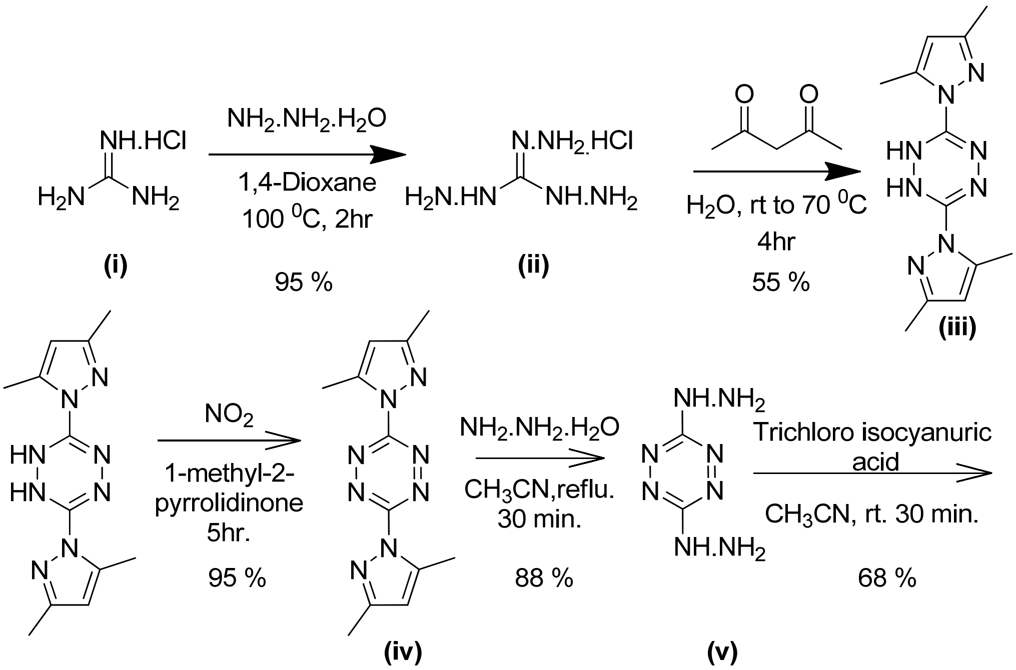
MeOH refers to CH_3OH

DMF refers to *N*, *N*-Dimethyl formamide

Pet Ether refers to Light Petroleum ether with boiling range of 60-80 ºC

Synthesis of Dicholoro Tetrazine:[1-3]

Scheme 1



Triaminoguanidine monohydrochloride[1]**(ii)**: To a suspension of guanidine monohydrochloride (50 g, 523.39 mmol) in 1,4-dioxane (300 mL) was added 104 mL of 98% hydrazine monohydrate solution (2.09 mol). The reaction mixture was heated to reflux for 2 h during which a white precipitate formed. After cooling the reaction mixture to ambient temperature, the solid was collected by suction filtration, washed with 1,4-dioxane and dried in high vacuum overnight to afford 12.1 g of the title compound **ii** as a white solid (95%, m.p. 232-234 ^{o}C).

1,4-Dihydro-3,6-bis(3,5-dimethyl-1H-pyrazol-1-yl)-1,2,4,5-tetrazine[1] **(iii):** To a slurry of **ii** (70 g, 498 mmol) in 400 mL distilled water, was added dropwise acetylacetone (624.44 mmol) while stirring at room temperature over 30 min. The solution turned pale yellow and then a clear orange solution was observed, followed by precipitate formation. The reaction mixture was then heated to 70 ^{o}C for 4h and the resulting solid was filtered, washed with water and dried *in vacuo*, and recrystallised from ethanol to compound **iii** (70%, m.p.148-150 ^{o}C).

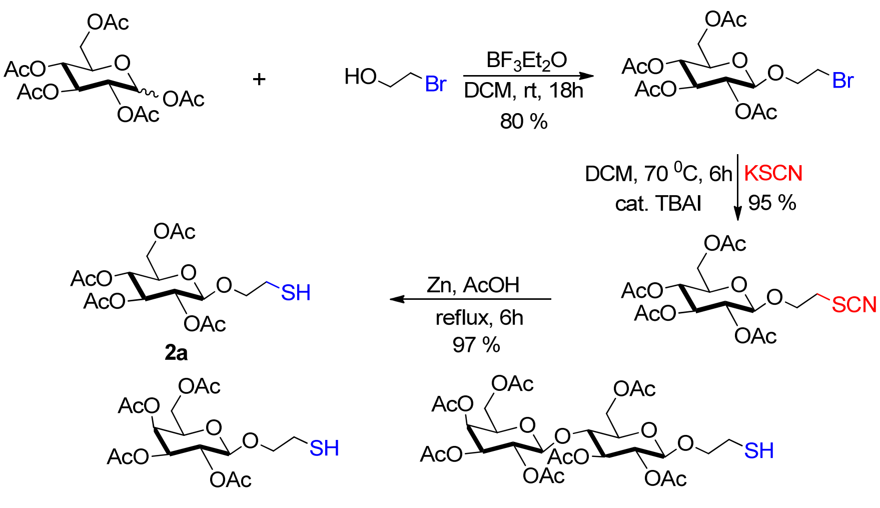
3,6-Bis(3,5-dimethyl-1H-pyrazol-1-yl)-1,2,4,5-tetrazine[1] (iv): To a solution of compound **iii** (45 g, 165.25 mmol) in 150 mL 1-methy-2-pyrrolidinone was stirred for 15 min. NO_2 gas was generated by dissolving 30 g of copper powder in 30 mL of conc.HNO_3. The gas was bubbled for 30 min. Ice cold water was added to the solution which was filtered and washed with cold water, dried under vacuum to obtain compound **iv** as an orange-red solid (98%, m.p. 222 ^{o}C).

3,6-Dihydrazinyl-1,2,4,5-tetrazine[2] (v): To a slurry of compound **iv** (45 g, 166.5 mole) in CH_3CN (300 mL), was added hydrazine monohydrate (18.7 mL, 366.3 mole) drop wise at ambient temperature. After the addition was complete, the reaction mixture was refluxed for 20 min and then cooled to room temperature, filtered, and washed with CH_3CN to give compound **v** as a brown solid (85%, m.p. 158-160 ^{o}C).

3,6-Dichloro-1,2,4,5-tetrazine[3] (1). A 300 mL CH_3CN solution of trichloro isocyanuric acid (65.4 g, 281.5 mmol) was added drop wise over 30 min to a slurry of compound **v** (20 g, 140.7 mmol) in CH_3CN (500 mL) at 0 ^{o}C. After the addition was completed, the reaction vessel was allowed to warm upto room temperature and stirred for additional 20 min. The resulting white precipitate was removed by filtration and the organic volatiles were removed *in vacuo* to afford crude 3,6-dichloro-*s*-tetrazine (**1**) which was purified by sublimation at 55 ^{o}C under nitrogen atmosphere and orange crystals of 3,6-dichloro tetrazine **1** were collected from cold finger (68%).

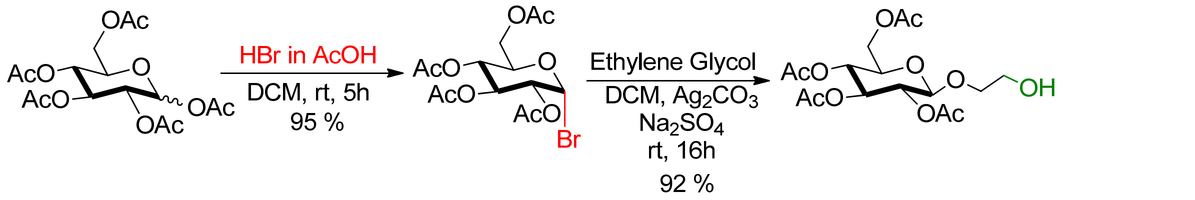
Synthesis of mercaptoethyl glycosides:

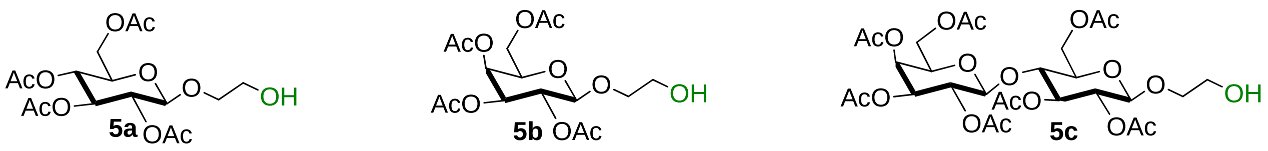
Mercaptoethyl glycosides were prepared by the following scheme adopting reported methodologies.[4, 5]



Synthesis of hydroxyethyl glycosides:

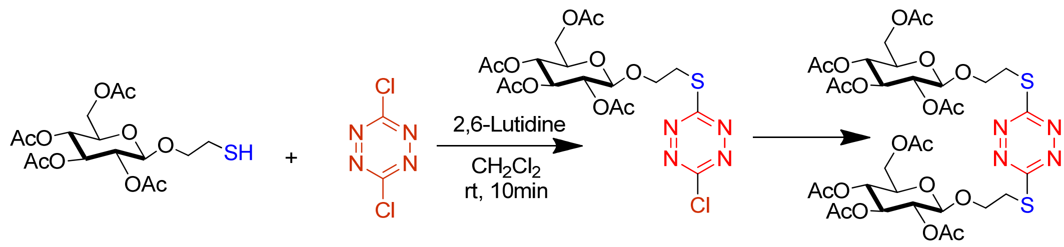
Hydroxyethyl glycosides were prepared by the following scheme adopting reported methodologies [6, 7]



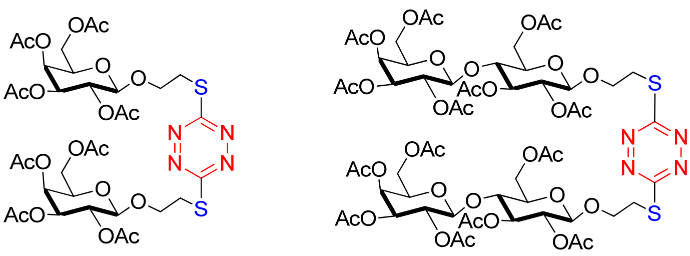


General Procedure for the synthesis of homodimers with sulphur linkage (4a-c):

To a solution of compound **2a** (200 mg, 0.489 mmol) in CH_2Cl_2 (5 mL), 3,6-dichloro-1,2,4,5-tetrazine **1** (73 mg, 0.489 mmol) was added, stirred for one minute and then 2,6-lutidine (1 mL) was added drop wise under nitrogen atmosphere. Stirred at rt for 10 min and then solvent was evaporated, crude residue was purified by column chromatography to yield homodimer **4a**. Same procedure was adopted for compounds **4b** and **4c**. All homodimers are found to be red fluorescent solids.

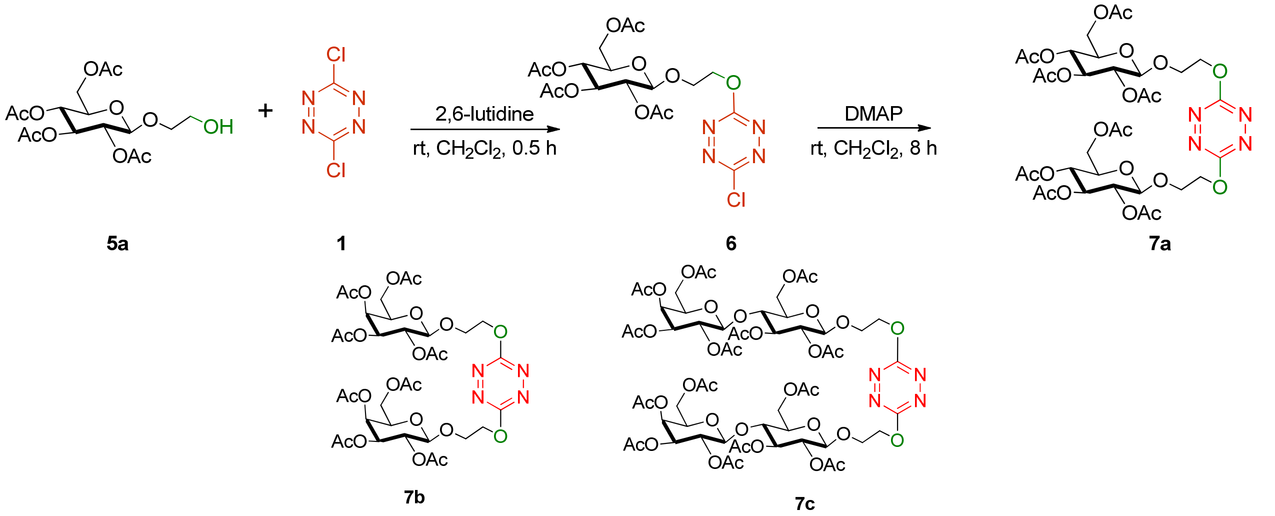


2a **1** **3** **4a**



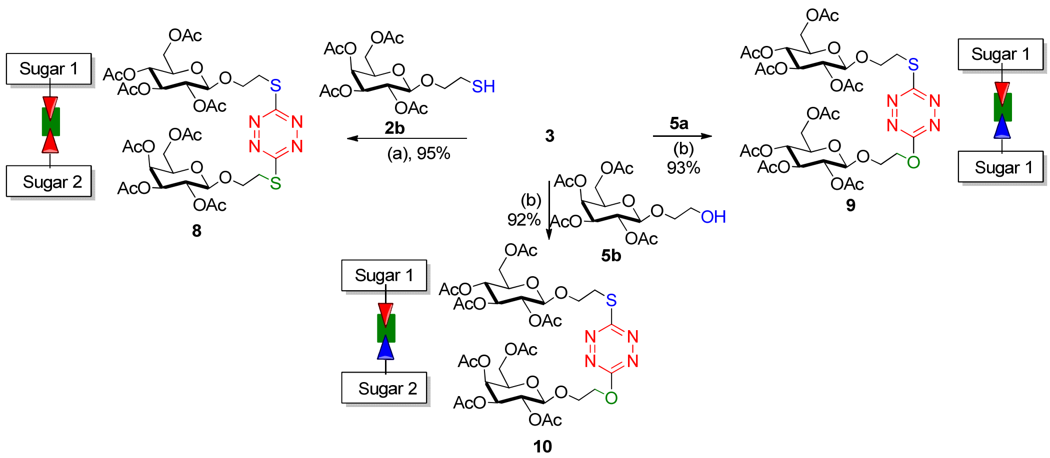
4b **4c**

Synthesis of homodimers with oxygen linkage: To a solution of compound **5a** (200 mg, 0.509 mmol) in CH_2Cl_2 (5 mL), 3,6-dichloro-1,2,4,5-tetrazine(77 mg, 0.510 mmol) was added. Subsequently, 2,6-lutidine (1 mL) was added, stirred for 30 min at room temperature and after complete consumption of 3,6-dichloro-1,2,4,5-tetrazine, DMAP (55 mg, 0.513 mmol) was added and stirred for 8h; volatiles were evaporated, crude was purified by silica gel column chromatography to yield homodimer **7a**. Same procedure was followed for **7b** and **7c** and all are found to be pink coloured fluorescent solids (83-86%).



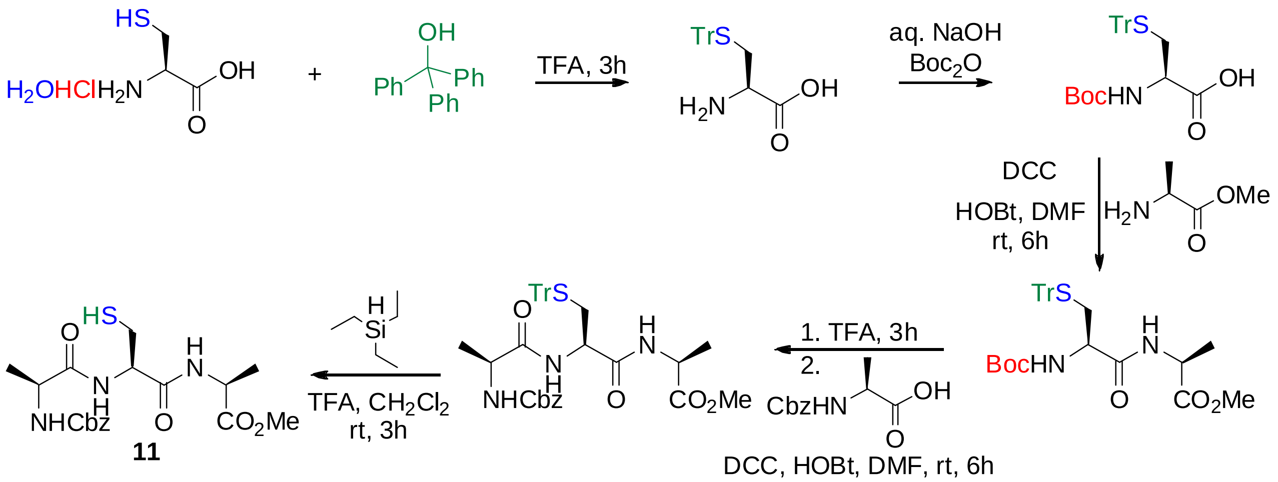
Synthesis of heterodimers:

Above delineated binary conjugation for homodimers are arrested at the mono-conjugation level (e.g. **3**) and can be subjected to the heterodimerization. Accordingly, after the completion of conjugation reaction between **1** and 1 eq. of **2**a, the chlorotetrazine linked glucoside **3** was isolated and subjected to the conjugation reaction with (i) another galactose-derived mercaptan **2b** to form tetrazine-linked gluco-galacto hybrid molecule **8** (95%); (ii) compound **5a** to give tetrazine-linked gluco-gluco hybrid molecule **9** (93%); (iii) galactose derivative **5b** to result in gluco-galacto hybrid molecule **10** (90%).



a) 2,6-Lutidine, 25 ºC, 10min; b) DMAP (1eq.), 25 ^{o}C, 7h

Synthesis of Tripeptide 11:



11

***S*-Trityl-L-Cysteine[8, 9]:** Triphenylmethanol (7.4 g, 28.5 mmol) was added to a solution of cysteine chloro hydrate (5.0 g, 28.5 mmol) in TFA (50 mL) and the mixture was stirred for 3 h. After cooling to 0 ^{0}C, 4 N NaOH and diethyl ether (40 mL) were added until pH is adjusted to 4-5 and then 10% aqueous sodium acetate solution was added until pH 5-6. Resulting precipitate was filtered, washed with fresh Et_2O and dried to obtain the desired product (10.0 g, 96 % yield).

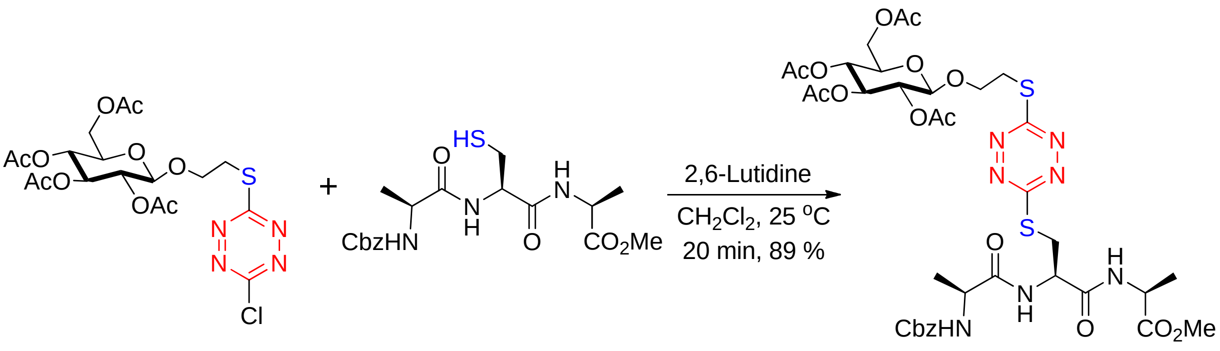
***N*-Boc-*S*-trityl-cysteine[8, 9]**: To a solution of *S*-trityl-L-cysteine(8 g, 22.0 mmol) in 2 N NaOH (130 mL) was added Boc_2O (7.2 g, 33.0 mmol) and the reaction mixture was stirred at room temperature for 24 h. The aqueous solution was then acidified with conc. HCl until pH 2 and extracted with CH_2Cl_2, washed with brine, dried and concentrated under reduce pressure to give *N*-Boc-*S*-trityl-cysteine (9.5 g, 90 %).

***N*-Boc-*S*-trityl-cys-L-ala-OMe:** L-alanine methyl ester (2.3 g, 22.5 mmol) and *N*-Boc-*S*-trityl-cysteine (9.0 g, 18.8 mmol) were taken in 10 mL of DMF and stirred for 5 minutes at rt. Subsequently, HOBt (2.5 g, 18.77 mmol) and DCC (3.9 g, 18.77 mmol) were added and the reaction mixture was stirred for 6 h, extracted with ethyl acetate and washed with dilute HCl solution. Washed with saturated aq. Na_2CO_3 solution, brine and concentrated *in vacuo*. The crude residue was purified by silica gel column chromatography to give *N*-Boc-*S*-trityl-cys-L-ala-OMe (8.9 g, 88 %) as white solid.

***N*-Cbz-ala-*S*-trityl-cys-L-ala-OMe:** *N*-Boc-*S*-trityl-cys-L-ala-OMe (8.0 g, 14.6 mmol) was treated with 60 mL of 1:1 DCM:TFA solution and stirred for 3 h. The reaction mixture was concentrated, diluted with 200 mL of ethyl acetate and washed with saturated aq. Na_2CO_3 solution and brine, dried over anhydrous Na_2SO_4 and organic layers were concentrated *in vacuo*. The crude residue was directly dissolved in DMF and treated with a solution of *N*-Cbz-alanine (3.3 g, 14.6 mmol). HOBt (3.0 g, 14.6 mmol) and DCC (2.0 g, 14.6 mmol) were added, stirred for 6 h and extracted with ethyl acetate. Organic layers were washed with aq. HCl solution and then aq. Na_2CO_3 solution. Washed with brine solution and dried over Na_2SO_4 and concentrated under vacuum. The crude residue was purified by silica gel column chromatography to give *N*-Cbz-ala-*S*-trityl-cys-L-ala-OMe (9.1 g, 78 %) as a white solid.

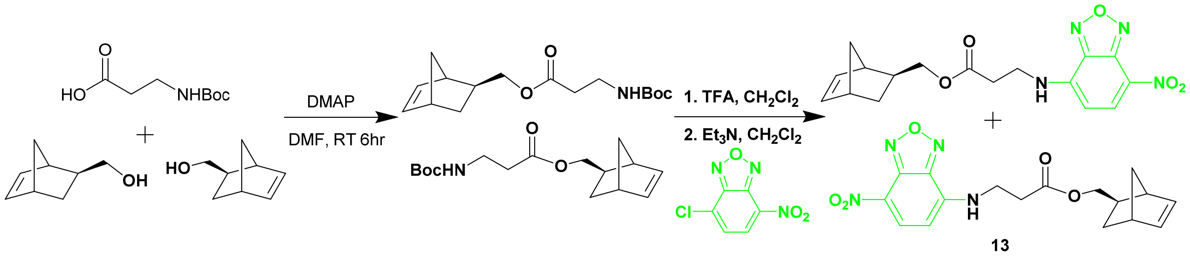
***N*-Cbz-ala-SH-cys-L-ala-OMe (11)**[10]: Triethylsilane (0.6 mL, 3.7 mmol) was added to a solution of *N*-Cbz-ala-*S*-trityl-cys-L-ala-OMe (2.0 g, 3.1 mmol) in CH_2Cl_2 (10 mL). Subsequently, TFA (3 mL) was added drop wise under nitrogen atmosphere and stirred for for 30 min at room temperature. The reaction mixture was concentrated and the crude residue was purified by flash silica gel column chromatography to afford *N*-Cbz-ala-SH -cys-L-ala-OMe (1.2 g, 93 % yield) as a white solid.

Sugar-Peptide-Tetrazine-hybrid: 2, 6-lutidine (1 mL) was added to a mixture of compound **11** (0.5 g, 1.2 mmol) and compound **3** (0.6 g, 1.22 mmol) in CH_2Cl_2 (10 mL). After stirring for 20 min at room temperature, the reaction mixture was concentrated and the residue was purified by silica gel column chromatography to afford compound **12** (1.0 g, 89 %) as a fluorescent red solid.

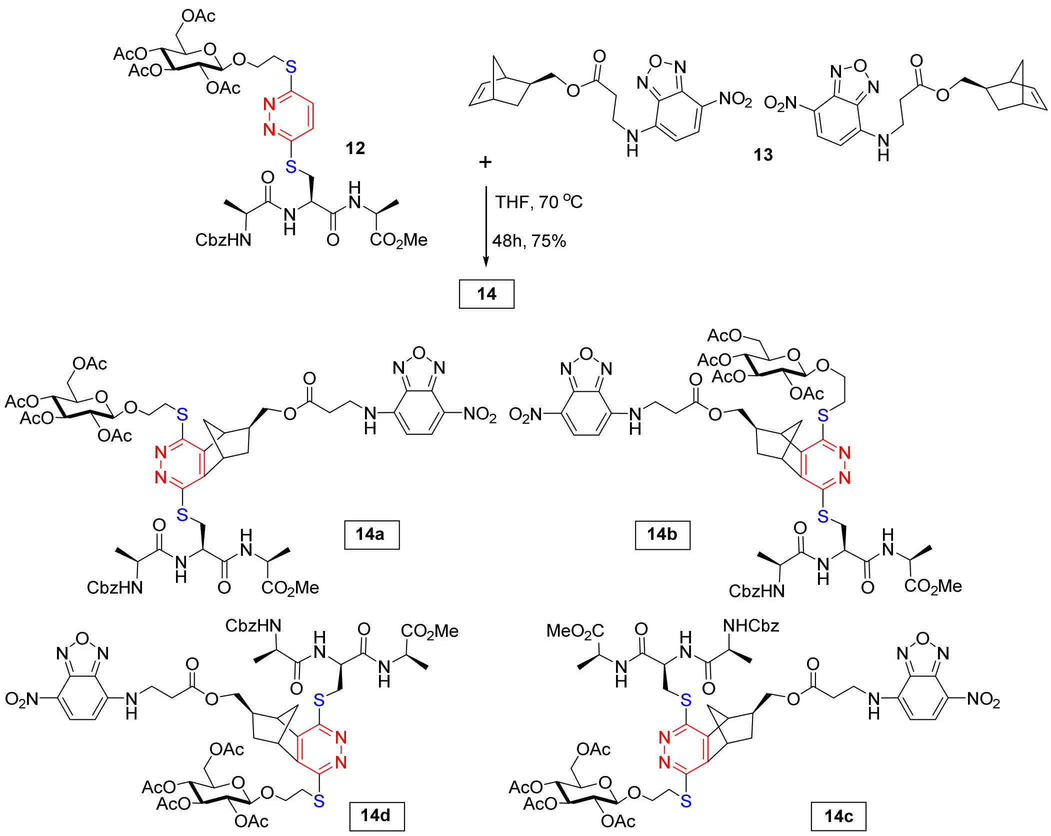


3 **11** **12**

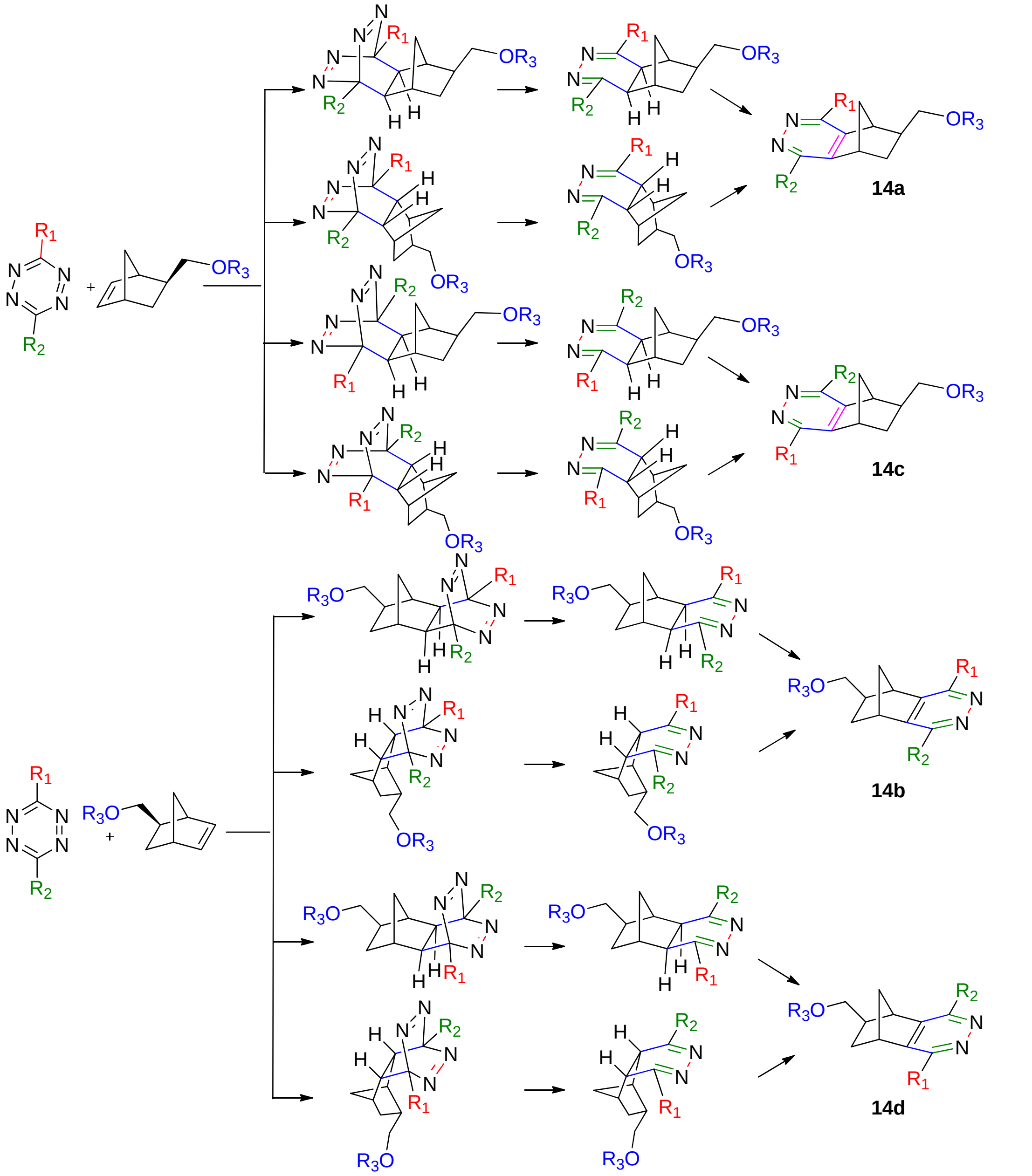
Synthesis of NBD ester of alkene: *exo*-5-Norbornen-2-ol[11, 12] (1.3 g, 10.6 mmol) in DMF (3 mL), cat. DMAP and DCC (2.2 g, 10.6 mmol) were to a mixture of *N*-Boc-β-alanine (2.0 g, 10.6 mmol) and stirred for 6 h. The reaction mixture was diluted with water and extracted with ethyl acetate, washed with aq. Na_2CO_3 solution, brine and dried over anhydrous Na_2SO_4. Combined organic layers were concentrated *in vacuo*, purified by silica gel column chromatography to give exo-5-norbornen-2-ol ester of *N*-Boc-β-alanine as a colourless liquid. Boc deprotection was carried out using TFA in CH_2Cl_2 using above delineated procedure and the resulting residue was redissolved in CH_2Cl_2. NBD-Chloride (2.0 g, 10.0 mmol) and triethyamine (3 mL) were added to the above solution and stirred at room temperature. At the end of the reaction (~10 h), the reaction mixture was concentrated *in vacuo* and purified by silica gel column chromatography to afford dark yellow solid compound **13** as a enantiomeric mixture (2.8 g, 76 %).

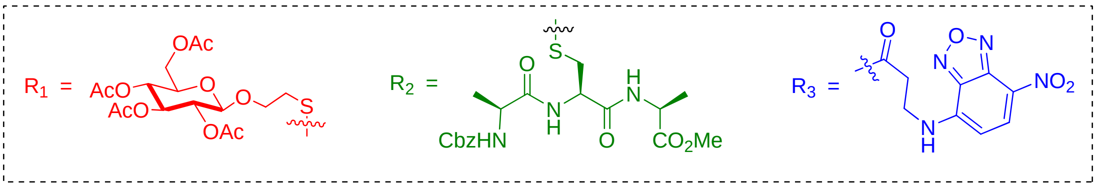


Click Reaction: A mixture of sugar-peptide-tetrazine hybrid **12** (100 mg, 0.11 mmol) and compound **13** (20 mg, 0.06 mmol) was refluxed for 48 h in THF and then cooled to room temperature. THF was removed *in vacuo*, the crude residue was partially purified by silica gel column chromatography to obtain a mixture of compounds **14a-d** (46 mg, 75%). Further purification of diastereomeric mixture was carried out by preparative HPLC using YMC-ODS-A-30x500mm C18 column.

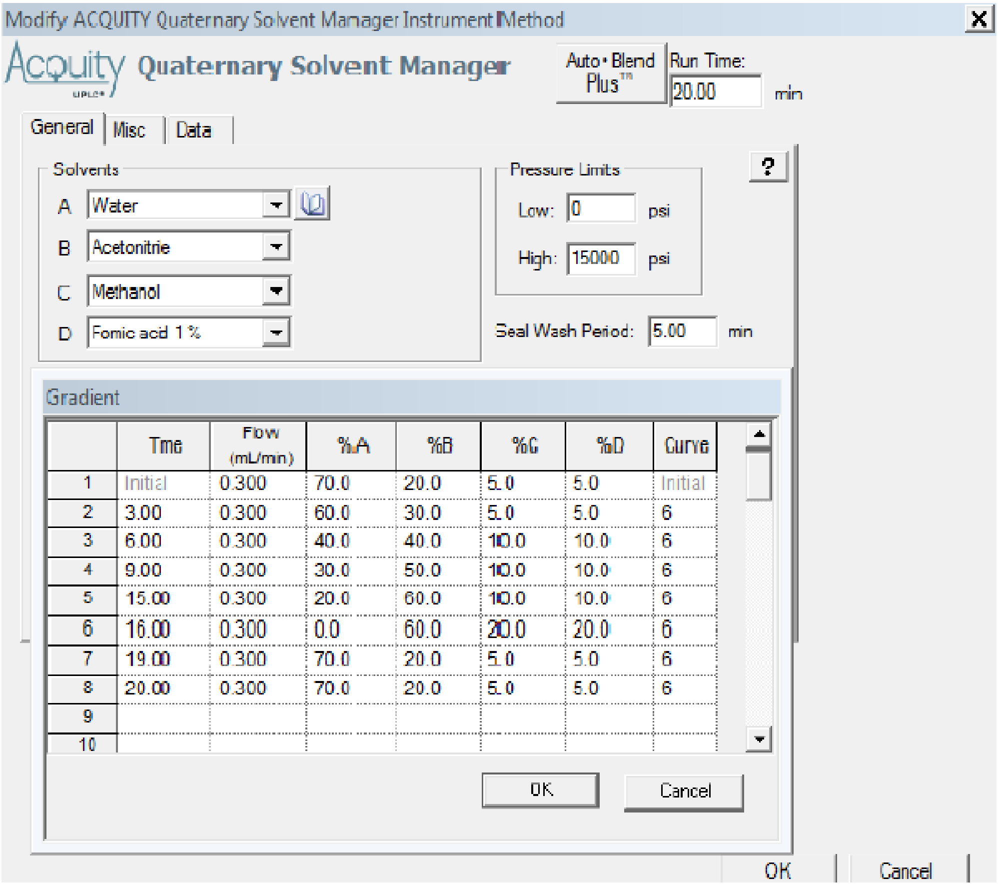


Plausible mechanistic details for the formation of **14a**-**14d**





Mobile phase for the UPLC Analysis:



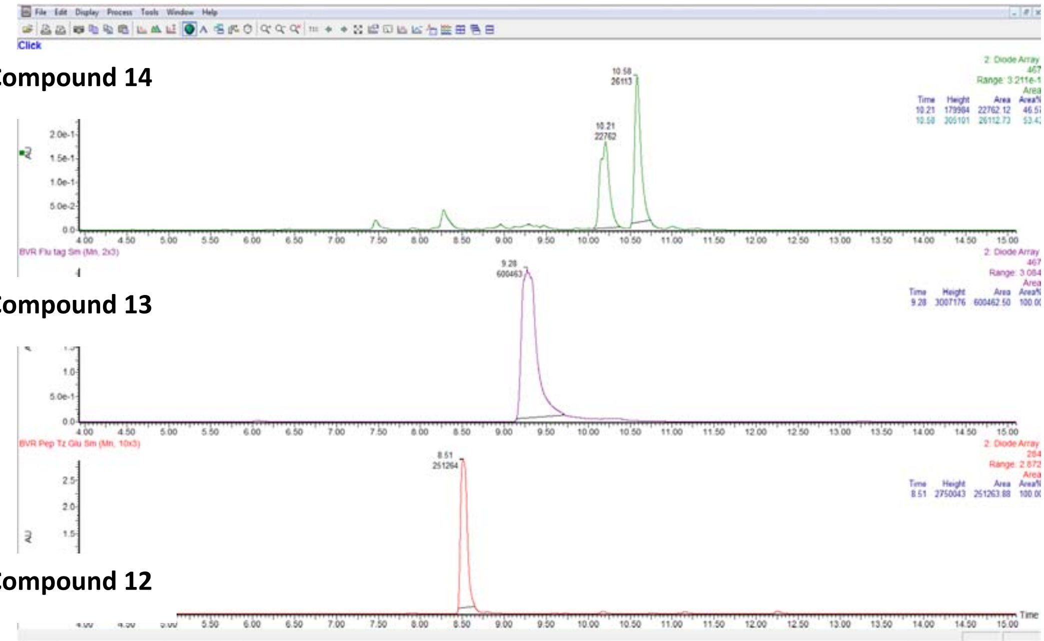
	Time	Flow (mL/min)	%A	%B	%C	%D	Curve
1	Initial	0.300	70.0	20.0	5.0	5.0	Initial
2	3.00	0.300	60.0	30.0	5.0	5.0	6
3	6.00	0.300	40.0	40.0	10.0	10.0	6
4	9.00	0.300	30.0	50.0	10.0	10.0	6
5	15.00	0.300	20.0	60.0	10.0	10.0	6
6	16.00	0.300	0.0	60.0	20.0	20.0	6
7	19.00	0.300	70.0	20.0	5.0	5.0	6
8	20.00	0.300	70.0	20.0	5.0	5.0	6
9							
10							

UPLC Chromatograms of Compounds **12**, **13** and **14**

Compound 14

Compound 13

Compound 12



Compound Characterization Data

Compound (2a): $[\alpha]_D^{25}$ = -8.2 ($CHCl_3$, c 1.00); IR(cm^{-1}): 2947, 2362, 1743, 1211, 1032, 753; δ_H (400 MHz, $CDCl_3$) 1.92 (3 H, s), 1.94 (3 H, s), 1.97 (3 H, s), 2.00 (3 H, s), 2.51 – 2.70 (2 H, m), 3.54 (1 H, ddd, *J* 10.1, 7.5, 6.2), 3.64 (1 H, ddd, *J* 10.0, 4.7, 2.4), 3.88 – 3.96 (1 H, m), 4.05 (1 H, dd, *J* 12.3, 2.3), 4.18 (1 H, dd, *J* 12.3, 4.7), 4.48 (1 H, d, *J* 8.0), 4.91 (1 H, dd, *J* 9.6, 8.0), 4.99 (1 H, t, *J* 9.7), 5.13 (1 H, t, *J* 9.5). δ_C (101 MHz, $CDCl_3$) 20.5 (2C), 20.7 (2c), 24.2, 61.8, 68.2, 71.1, 71.6, 71.7, 72.6, 100.8, 169.3, 169.3, 170.2, 170.6. HRMS (TOF): calcd. for $C_{16}H_{24}NaO_{10}S^+$, [M+Na$^+$]: 431.0987; found: 431.0985. m.p. 85-86 ºC.

Compound (2b): $[\alpha]_D^{25}$ = -8.2 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3023, 2974, 1744, 1215, 1045, 748; δ_H (400 MHz, $CDCl_3$) 1.85 (3 H, s), 1.92 (3 H, s), 1.94 (3 H, s), 2.02 (3 H, s), 2.47 – 2.67 (2 H, m), 3.50 (1 H, ddd, *J* 10.1, 7.5, 6.4), 3.83 (1 H, t, *J* 6.7), 3.86 – 3.93 (1 H, m), 3.96 – 4.06 (2 H, m), 4.41 (1 H, d, *J* 7.8), 4.90 (1 H, dd, *J* 10.5, 3.7), 5.06 (1 H, dd, *J* 10.4, 7.9), 5.25 (1 H, d, *J* 3.3). δ_C (101 MHz, $CDCl_3$) 20.4, 20.5 (2C), 20.6, 24.1, 61.1, 66.8, 68.5, 70.5, 70.6, 71.4, 101.1, 169.2, 169.8, 170.0, 170.1. HRMS (TOF): calcd. for $C_{16}H_{24}NaO_{10}S^+$, [M+Na$^+$]: 431.0987; found: 431.0996. m.p. 82-83 ºC.

Compond (2c): $[\alpha]_D^{25}$ = +12.6 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3419, 2984, 1645, 1217, 1046, 907, 646; δ_H (400 MHz, $CDCl_3$) 1.94 (3 H, s), 2.02 (6 H, s), 2.03 (3 H, s), 2.04 (3 H, s), 2.10 (3 H, s), 2.13 (3 H, s), 2.57 – 2.75 (2 H, m), 2.96 – 3.06 (7 H, m), 3.59 (1 H, dd, *J* 7.0, 3.0), 3.78 (1 H, t, *J* 9.3), 3.85 (1 H, t, *J* 6.7), 3.91 – 3.98 (1 H, m), 4.03 – 4.13 (3 H, m), 4.48 (3 H, dd, *J* 9.7, 8.0), 4.91 (2 H, ddd, *J* 21.9, 12.2, 6.4), 5.08 (1 H, dd, *J* 10.3, 7.8), 5.18 (1 H, t, *J* 9.3), 5.32 (1 H, d, *J* 3.4). δ_C (101 MHz, $CDCl_3$) 20.6, 20.7 (3C), 20.8, 20.9, 20.9, 24.3, 42.3, 60.9, 62.0, 66.7, 69.2, 70.7, 71.0, 71.6, 71.7, 72.7, 76.3, 100.7, 101.1, 169.2, 169.8, 169.8, 170.1, 170.2, 170.4 (2C). HRMS (TOF): calcd. for $C_{28}H_{40}NaO_{18}S+$, [M+Na$^+$]: 719.1832; found: 719.1838. m. p. 62-63 ºC.

Compound (3): $[\alpha]_D^{25}$ = +6.4 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3023, 1747, 1370, 1213, 1036, 746; δ_H (400 MHz, $CDCl_3$) 1.95 (3 H, d, *J* 1.2), 1.97 (3 H, d, *J* 1.1), 1.99 (3 H, d, *J* 1.2), 2.03 (3 H, d, *J* 1.1), 3.47 – 3.61 (2 H, m), 3.67 (1 H, ddd, *J* 9.9, 4.4, 2.3), 3.79 (1 H, ddd, *J* 10.3, 7.6, 5.5), 4.09 (1 H, dd, *J* 12.3, 2.2), 4.15 – 4.23 (2 H, m), 4.51 (1 H, d, *J* 8.1), 4.91 (1 H, ddd, *J* 9.5, 8.2, 1.3), 4.98 – 5.05 (1 H, m), 5.14 (1 H, td, *J* 9.6, 1.2). δ_C (101 MHz, $CDCl_3$) 20.6 (2C), 20.7, 20.8, 30.4, 61.7, 67.2, 68.2, 70.8, 72.0, 72.5, 100.8, 165.9, 169.4 (2C), 170.2, 170.7, 175.4. HRMS (TOF): calcd. for $C_{18}H_{23}ClN_4NaO_{10}S^+$,[M+Na$^+$]: 545.0720; found: 545.0726. m. p. 155- 166 ºC.

Compound (4a): $[\alpha]_D^{25}$ = +6.0 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3022, 2884, 1746, 1370, 746; δ_H (400 MHz, $CDCl_3$) 1.89 (6 H, s), 1.91 (6 H, s), 1.94 (6 H, s), 1.97 (6 H, s), 3.37 – 3.46 (4 H, m), 3.63 (2 H, ddd, *J* 10.0, 4.6, 2.4), 3.74 (2 H, dt, *J* 10.5, 6.7), 4.03 (2 H, dd, *J* 12.3, 2.3), 4.13 (4 H, ddd, *J* 17.9, 11.6, 5.0), 4.49 (2 H, d, *J* 8.0), 4.87 (2 H, dd, *J* 9.6, 8.1), 4.96 (2 H, t, *J* 9.7), 5.09 (2 H, t, *J* 9.5). δ_C (101 MHz, $CDCl_3$) 20.4 (4C), 20.6 (2C), 20.6 (2C), 29.8 (2C), 61.6 (2C), 67.6 (2C), 68.1 (2C), 70.8 (2C), 71.7 (2C), 72.4 (2C), 100.7 (2C), 169.2 (2C), 169.2 (2C), 170.0 (2C), 170.4 (2C), 172.2 (2C). HRMS (TOF): calcd. for $C_{34}H_{46}N_4NaO_{20}S_2^+$,[M+Na$^+$]: 917.2044; found: 917.2050. m. p. 66-67 ºC.

Compound (4b): $[\alpha]_D^{25}$ = +10.6 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3021, 1745, 1217, 1047, 744; δ_H (400 MHz, $CDCl_3$) 1.96 (6 H, s), 2.02 (6 H, s), 2.05 (6 H, s), 2.13 (6 H, s), 3.45 – 3.58 (4 H, m), 3.81 (2 H, ddd, *J* 10.4, 7.7, 5.8), 3.90 (2 H, t, *J* 6.7), 4.12 (4 H, qd, *J* 11.3, 6.7), 4.22 (2 H, dt, *J* 10.6, 5.4), 4.51 (2 H, d, *J* 7.9), 4.99 (2 H, dd, *J* 10.5, 3.4), 5.19 (2 H, dd, *J* 10.5, 8.0), 5.37 (2 H, d, *J* 3.3).). δ_C (101 MHz, $CDCl_3$) 20.6 (2C), 20.7 (4C), 20.9 (2C), 30.1 (2C), 61.3 (2C), 67.0 (2C), 67.7 (2C), 68.5 (2C), 70.8 (2C), 70.9 (2C), 101.5 (2C), 169.6 (2C), 170.2 (2C), 170.3 (2C), 170.4 (2C), 172.4 (2C). HRMS (TOF): calcd. for $C_{34}H_{46}N_4NaO_{20}S_2^+$,[M+Na$^+$]: 917.2044; found: 917.2050. m. p. 67-68 ºC.

Compound (4c): $[\alpha]_D^{25}$ = +9.2 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3023, 2360, 1744, 1216, 1043, 745; δ_H (400 MHz, $CDCl_3$) 1.99 (12 H, s), 2.00 (6 H, s), 2.01 (12 H, s), 2.06 (6 H, s, *J* 4.2), 2.10 (6 H, s, *J* 3.8), 3.43 – 3.48 (2 H, m), 3.57 (2 H, ddd, *J* 9.9, 4.8, 2.0), 3.80 (6 H, dt, *J* 18.8, 8.2), 3.99 – 4.15 (10 H, m), 4.47 (6 H, dd, *J* 15.4, 8.0), 4.88 (4 H, ddd, *J* 17.6, 10.0, 5.8), 5.05 (2 H, dd, *J* 10.4, 7.9), 5.14 (2 H, t, *J* 9.3), 5.29 (2 H, d, *J* 3.1).). δ_C (101 MHz, $CDCl_3$) 20.5 (2C), 20.7 (6C), 20.8 (4C), 20.9 (2C), 30.1 (2C), 60.8 (2C), 61.8 (2C), 66.6 (2C), 67.7 (2C), 69.1 (2C), 70.7 (2C), 71.0 (2C), 71.3 (2C), 72.6 (2C), 72.7 (2C), 76.1 (2C), 100.7 (2C), 101.1 (2C), 169.1 (2C), 169.7 (2C), 169.8 (2C), 170.1 (2C), 170.2 (2C), 170.4 (4C), 172.4 (2C). HRMS (TOF): calcd. for $C_{58}H_{78}N_4NaO_{36}S_2^+$,[M+Na$^+$]: 1493.3734; found: 1493.3719. m. p. 75-78 ºC.

Compound (5a): $[\alpha]_D^{25}$ = -11.60 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3743, 3557, 3022, 2950, 1746, 1370, 1214, 1032, 749; δ_H (400 MHz, $CDCl_3$) 2.00 (3 H, s), 2.02 (3 H, s), 2.05 (3 H, s), 2.08 (3 H, s), 2.51 (1 H, s), 3.63 – 3.79 (5 H, m), 3.83 (2 H, t, *J* 4.3), 4.18 (2 H, d, *J* 4.0), 4.54 (1 H, d, *J* 7.9), 4.97 – 5.08 (2 H, m), 5.21 (1 H, t, *J* 9.5). δ_C (101 MHz, $CDCl_3$) 20.5 (2C), 20.6 (2C), 61.7, 61.9, 68.3, 71.2, 71.7, 72.6, 72.7, 101.2, 169.4, 169.5, 170.1, 170.6. HRMS (TOF): calcd. for $C_{16}H_{24}NaO_{11}^+$,[M+Na$^+$]: 415.1215; found: 415.1211. m. p. 106- 107 ºC.

Compound (5b): $[\alpha]_D^{25}$ = -1.4 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3743, 2944, 2256, 1744, 1217, 1047, 908, 724; δ_H (400 MHz, $CDCl_3$) 1.89 (3 H, s), 1.96 (3 H, s), 1.98 (3 H, s), 2.06 (3 H, s), 2.78 (1 H, s), 3.62 (2 H, s), 3.68 – 3.82 (2 H, m), 3.89 (1 H, t, *J* 6.6), 4.06 (2 H, d, *J* 6.6), 4.44 (1 H, d, *J* 7.9), 4.94 (1 H, dd, *J* 10.5, 3.4), 5.11 (1 H, dd, *J* 10.4, 7.9), 5.30 (1 H, d, *J* 3.3). δ_C (101 MHz, $CDCl_3$) 20.5, 20.5 (2C), 20.7, 61.5, 61.7, 67.0, 68.8, 70.7, 70.7, 72.8, 101.7, 169.7, 170.0, 170.2, 170.4. HRMS (TOF): calcd. for $C_{16}H_{24}NaO_{11}^+$,[M+Na$^+$]: 415.1215; found: 415.1211. m. p. 84-86 ºC.

Compound (5c): $[\alpha]_D^{25}$ = -8.0 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3743, 3022, 2972, 1745, 1216, 1045, 146; δ_H (400 MHz, $CDCl_3$) 1.95 (3 H, s), 2.02 – 2.04 (9 H, m), 2.04 (3 H, s), 2.11 (3 H, s), 2.13 (3 H, s), 2.61 (1 H, s), 3.66 (3 H, dq, *J* 7.9, 5.2, 4.0), 3.72 – 3.80 (2 H, m), 3.81 – 3.89 (2 H, m), 4.01 – 4.15 (3 H, m), 4.46 – 4.55 (3 H, m), 4.92 (2 H, ddd, *J* 17.5, 9.9, 5.7), 5.09 (1 H, dd, *J* 10.3, 7.9), 5.19 (1 H, t, *J* 9.4), 5.33 (1 H, d, *J* 3.3). δ_C (101 MHz, $CDCl_3$) 20.6, 20.8 (3C), 20.9 (3C), 60.9, 62.1, 66.7, 69.1, 70.8, 71.0, 71.7, 72.7, 72.8, 73.6, 76.5, 101.2, 101.4, 169.2, 169.8, 169.9, 170.2, 170.3, 170.5, 170.5. HRMS (TOF): calcd. for $C_{28}H_{40}NaO_{19}^+$,[M+Na$^+$]: 703.2060; found: 703.2076. m. p. 65- 66 ºC.

Compound (6): $[\alpha]_D^{25}$ = -4.8 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3743, 2948, 2361, 2256, 1747, 1217, 1033, 907, 724; δ_H (400 MHz, $CDCl_3$) 1.97 (3 H, s), 1.99 (3 H, s), 2.00 (3 H, s), 2.06 (3 H, s), 3.70 (1 H, ddd, *J* 10.0, 4.5, 2.3), 4.01 (1 H, ddd, *J* 11.0, 7.7, 2.8), 4.11 (1 H, dd, *J* 12.3, 2.2), 4.18 – 4.29 (2 H, m), 4.59 (1 H, d, *J* 7.9), 4.75 (2 H, ddd, *J* 11.9, 4.6, 2.9), 4.87 – 4.97 (2 H, m), 5.04 (1 H, t, *J* 9.7), 5.18 (1 H, t, *J* 9.5). δ $_C$ (101 MHz, $CDCl_3$) 20.7 (3C), 20.8, 61.8, 67.0, 68.3, 68.9, 70.9, 72.1, 72.6, 100.9, 164.6, 166.7, 169.5, 169.5, 170.3, 170.7. HRMS (TOF): calcd. for $C_{18}H_{23}ClN_4NaO_{11}^+$,[M+Na$^+$]: 529.0948; found: 529.0952.

Compound (7a): $[\alpha]_D^{25}$ = -12.2 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3743, 3022, 1746, 1512, 1216, 1040, 745; δ $_H$ (400 MHz, $CDCl_3$) 1.97 (6 H, s), 1.99 (12 H, s), 2.06 (6 H, s), 3.70 (2 H, ddd, *J* 9.9, 4.5, 2.4), 3.99 (2 H, ddd, *J* 11.2, 7.8, 3.1), 4.10 (2 H, dd, *J* 12.3, 2.3), 4.16 – 4.28 (4 H, m), 4.61 (2 H, d, *J* 7.9), 4.63 – 4.71 (2 H, m), 4.77 (2 H, ddd, *J* 11.0, 7.7, 3.0), 4.96 (2 H, dd, *J* 9.6, 7.9), 5.05 (2 H, t, *J* 9.7), 5.18 (2 H, t, *J* 9.4). δ $_C$ (101 MHz, $CDCl_3$) 20.6 (4C), 20.7 (2C), 20.8 (2C), 61.8 (2C), 67.4 (2C), 68.2 (2C), 68.3 (2C), 71.0 (2C), 72.0 (2C), 72.6 (2C), 101.0 (2C), 166.1 (2C), 169.5 (2C), 169.5 (2C), 170.3 (2C), 170.7 (2C). HRMS (TOF): calcd. for $C_{34}H_{46}N_4NaO_{22}^+$,[M+Na$^+$]: 885.2527; found: 885.2503.

Compound (7b): $[\alpha]_D^{25}$ = -7.8 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3743, 3021, 1747, 1218, 1042, 744; δ $_H$ (400 MHz, $CDCl_3$) 1.95 (6 H, s), 2.01 (6 H, s), 2.03 (6 H, s), 2.13 (6 H, s), 3.91 (2 H, t, *J* 6.7), 4.00 (2 H, ddd, *J* 11.1, 7.9, 3.0), 4.07 – 4.17 (4 H, m), 4.25 (2 H, dt, *J* 11.4, 3.7), 4.57 (2 H, d, *J* 8.0), 4.66 (2 H, dt, *J* 11.8, 3.6), 4.76 – 4.82 (2 H, m), 5.00 (2 H, dd, *J* 10.4, 3.4), 5.18 (2 H, dd, *J* 10.4, 7.9), 5.37 (2 H, d, *J* 3.4). δ $_C$ (101 MHz, $CDCl_3$) 20.6 (2C), 20.7 (4C), 20.8 (2C), 53.5 (2C), 61.3 (2C), 67.0 (2C), 67.4 (2C), 68.2 (2C), 68.5 (2C), 70.8 (2C), 70.9 (2C), 101.5 (2C), 166.1 (2C), 169.7 (2C), 170.2 (2C), 170.3 (2C), 170.5 (2C). HRMS (TOF): calcd. for $C_{34}H_{46}N_4NaO_{22}^+$,[M+Na$^+$]: 885.2527; found: 885.2527. m. p. 60- 61 ºC.

Compound (7c): $[\alpha]_D^{25}$ = -11.8 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3743, 3619, 2360, 2257, 1748, 1170, 1050, 904, 721; δ $_H$ (400 MHz, $CDCl_3$) 1.93 (6 H, s), 1.98 (6 H, s), 2.00 (6 H, s), 2.01 (6 H, s), 2.02 (6 H, s), 2.08 (6 H, s), 2.11 (6 H, s), 3.60 (2 H, ddd, *J* 9.8, 4.8, 2.0), 3.77 (2 H, t, *J* 9.5), 3.84 (2 H, t, *J* 7.1), 3.92 – 3.99 (2 H, m), 4.01 – 4.12 (6 H, m), 4.19 (2 H, ddd, *J* 11.4, 4.7, 3.2), 4.42 – 4.49 (4 H, m), 4.56 (2 H, d, *J* 7.9), 4.63 (2 H, ddd, *J* 11.6, 4.6, 3.2), 4.74 (2 H, ddd, *J* 10.5, 7.4, 3.0), 4.85 (2 H, dd, *J* 9.5, 7.9), 4.92 (2 H, dd, *J* 10.4, 3.4), 5.06 (2 H, dd, *J* 10.4, 7.9), 5.16 (2 H, t, *J* 9.3), 5.31 (2 H, d, *J* 2.6). δ $_C$ (101 MHz, $CDCl_3$) 20.6 (2C), 20.7 (8C), 20.8 (2C), 20.9 (2C), 60.8 (2C), 61.8 (2C), 66.6 (2C), 67.3 (2C), 68.2 (2C), 69.1 (2C), 70.7 (2C), 71.0 (2C), 71.4 (2C), 72.6 (2C), 72.8 (2C), 76.1 (2C), 100.7 (2C), 101.1 (2C), 166.1 (2C), 169.1 (2C), 169.8 (4C), 170.1 (2C), 170.2 (2C), 170.4 (4C). HRMS (TOF): calcd. for $C_{58}H_{78}N_4NaO_{38}^+$,[M+Na$^+$]: 1461.4191; found: 1461.4177. m. p. 105-107 ºC.

Compound (8): $[\alpha]_D^{25}$ = +7.2 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3744, 3022, 1746, 1512, 1216, 1040, 745; δ $_H$ (400 MHz, $CDCl_3$) 1.94 (3 H, s), 1.96 (3 H, s), 1.98 (3 H, s), 2.00 (3 H, s), 2.02 (3 H, s), 2.04 (3 H, s), 2.04 (3 H, s), 2.12 (3 H, s), 3.42 – 3.56 (4 H, m), 3.67 (1 H, ddd, *J* 10.0, 4.6, 2.4), 3.79 (2 H, ddd, *J* 9.1, 7.7, 5.5), 3.89 (1 H, td, *J* 6.6, 0.6), 4.05 – 4.25 (6 H, m), 4.52 (2 H, dd, *J* 14.0, 8.0), 4.93 – 5.07 (3 H, m), 5.13 – 5.19 (2 H, m), 5.35 (1 H, d, *J* 2.8). δ $_C$ (101 MHz, $CDCl_3$) 20.6 (4C), 20.7, 20.8, 20.8, 20.9, 30.0, 30.1, 61.3, 61.8, 67.0, 67.7 (2C), 68.3, 68.5, 70.8, 70.8, 71.0, 72.0, 72.6, 100.9, 101.5, 169.4 (2C), 169.6, 170.2, 170.3 (2C), 170.4, 170.7, 172.4, 172.4. HRMS (TOF): calcd. for $C_{34}H_{46}N_4NaO_{20}S_2^+$,[M+Na$^+$]: 917.2044; found: 917.2048. m. p. 57-58 ºC.

Compound (9): $[\alpha]_D^{25}$ = -7.9 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3743, 3022, 2966, 1746, 1371, 1214, 1032, 748; δ $_H$ (400 MHz, $CDCl_3$) 1.98 (6 H, s), 2.00 (3 H, s), 2.01 (6 H, s), 2.04 (3 H, s), 2.07 (3 H, s), 2.07 (3 H, s), 3.50 (2 H, dd, *J* 9.2, 3.7), 3.70 (2 H, tdd, *J* 10.7, 4.5, 2.3), 3.77 – 3.84 (1 H, m), 4.01 (1 H, ddd, *J* 11.1, 7.7, 2.9), 4.09 – 4.16 (2 H, m), 4.16 – 4.29 (4 H, m), 4.53 – 4.57 (1 H, m), 4.62 (1 H, d, *J* 8.0), 4.68 (1 H, ddd, *J* 11.8, 4.2, 3.1), 4.81 (1 H, ddd, *J* 10.8, 7.8, 2.8), 4.94 – 5.01 (2 H, m), 5.07 (2 H, td, *J* 9.7, 2.6), 5.19 (2 H, q, *J* 9.4). δ_C (101 MHz, $CDCl_3$) 20.7 (6C), 20.8 (2C), 30.4, 61.8 (2C), 67.4, 67.9, 68.0, 68.3 (2C), 71.0 (2C), 71.9, 72.0, 72.6 (2C), 101.0 (2C), 166.1, 169.5 (4C), 169.6, 170.3 (2C), 170.8 (2C). HRMS (TOF): calcd. for $C_{34}H_{46}N_4NaO_{21}S$,[$M+Na^+$]: 901.2267; found: 901.2276.

Compound (10): δ_H (400 MHz, $CDCl_3$) 1.95 (3 H, s), 1.97 (3 H, s), 1.99 (3 H, s), 2.01 (3 H, s), 2.02 (6 H, s), 2.05 (3 H, s), 2.12 (3 H, s), 3.49 (2 H, t, *J* 6.1), 3.67 (1 H, ddd, *J* 10.0, 4.5, 2.4), 3.80 (1 H, dt, *J* 10.4, 6.7), 3.88 – 3.94 (1 H, m), 3.99 (1 H, ddd, *J* 11.3, 7.9, 3.0), 4.05 – 4.29 (6 H, m), 4.55 (2 H, dd, *J* 11.5, 7.9), 4.67 (1 H, dt, *J* 11.8, 3.2), 4.80 (1 H, ddd, *J* 11.3, 7.9, 2.9), 4.92 – 5.08 (3 H, m), 5.12 – 5.21 (2 H, m), 5.37 (1 H, d, *J* 3.3). δ_C (101 MHz, $CDCl_3$) 20.7 (3C), 20.8 (3C), 20.9 (2C), 30.5, 61.3, 61.9, 67.1, 67.4, 67.9, 68.1, 68.4, 68.6, 70.8, 70.9, 71.0, 72.0, 72.7, 101.0, 101.6, 166.2, 169.5 (2C), 169.7, 170.2, 170.3 (2C), 170.5, 170.8, 171.3. HRMS (TOF): calcd. for $C_{34}H_{46}N_4NaO_{21}S^+$,[$M+Na^+$]: 901.2267; found: 901.2280

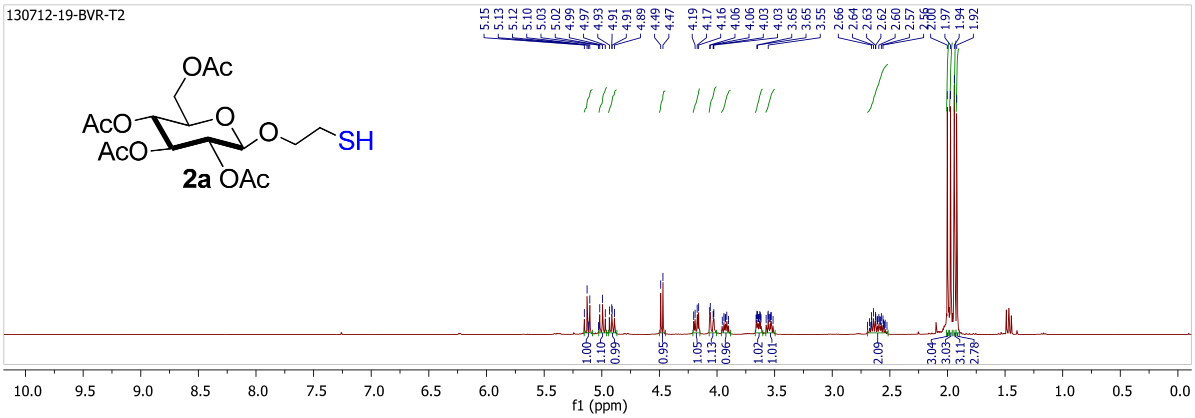
Compound (11): δ_H (400 MHz, $CDCl_3$) 7.33 (5 H, s), 7.11 (1 H, d, *J* 30.6), 5.52 (1 H, d, *J* 6.7), 5.11 (2 H, s), 4.67 (1 H, s), 4.57 – 4.47 (1 H, m), 4.30 (1 H, s), 3.73 (3 H, s), 2.99 (1 H, d, *J* 38.1), 2.74 (1 H, s), 2.04 (1 H, s), 1.74 – 1.62 (1 H, m), 1.41 (3 H, s), 1.40 (3 H, s). δ_C (101 MHz, $CDCl_3$) 17.8, 18.3, 26.7, 48.4, 52.5 (2C), 54.1, 67.2, 76.7, 77.0, 77.0, 77.3, 128.0 (2C), 128.3, 128.6 (2C), 136.0, 169.1, 172.9 (2C). HRMS (TOF): calcd. for $C_{18}H_{25}N_3NaO_6S^+$,[$M+Na^+$]: 434.1356; found: 434.1361.

Compound (12): $[\alpha]_D^{25}$ = -24.7 ($CHCl_3$, c 1.00); IR(cm^{-1}): 3743, 3313, 2948, 2360, 2255, 1746, 1657, 1613, 1452,1371, 1221, 1167, 1041, 907, 724; δ_H (400 MHz, $CDCl_3$) 1.23 – 1.30 (6 H, m), 1.90 (3 H, s), 1.93 (3 H, s), 1.95 (3 H, s), 1.98 (3 H, s), 3.35 – 3.45 (2 H, m), 3.60 (3 H, s), 3.61 – 3.77 (4 H, m), 4.00 – 4.20 (4 H, m), 4.21 – 4.32 (1 H, m), 4.41 (2 H, p, *J* 6.6), 4.50 (1 H, d, *J* 7.9), 4.88 – 5.03 (5 H, m), 5.13 (1 H, t, *J* 9.5), 6.06 (1 H, d, *J* 7.0), 7.22 (5 H, s), 7.53 (1 H, d, *J* 6.2), 7.72 (1 H, d, *J* 6.9). δ_C (101 MHz, $CDCl_3$) 17.6, 18.6, 20.4 (2C), 20.6, 20.6, 29.8, 48.1, 52.3, 61.7, 66.7, 67.5, 68.2, 70.8, 71.6, 72.4, 77.4, 100.6, 127.8, 127.9, 128.3 (2C), 136.1, 155.9, 169.0, 169.3, 169.4, 170.0, 170.6, 172.0, 172.2, 172.6, 173.1. HRMS (TOF): calcd. for $C_{36}H_{47}N_7NaO_{16}S_2$ [$M+Na^+$]: 920.2413; found: 920.2457. m. p. 88-89 ºC.

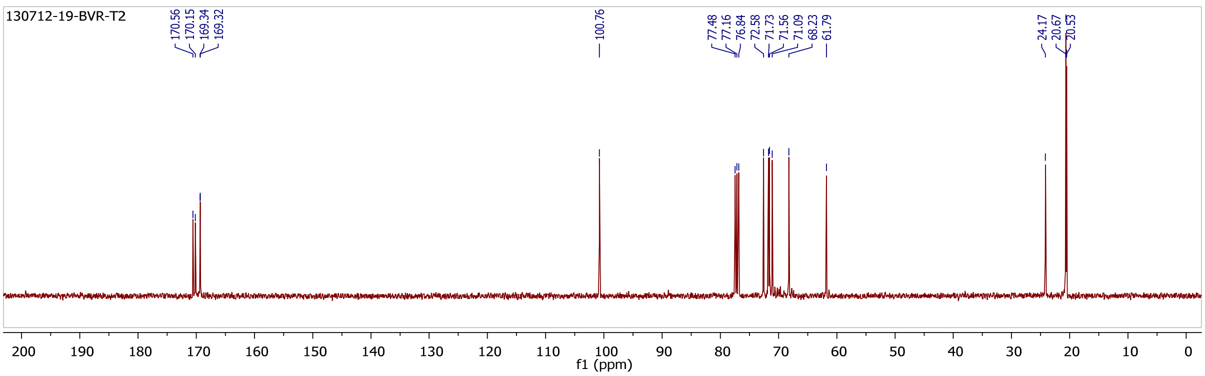
Compound (13): δ H (500 MHz, $CDCl_3$) 1.16 (1 H, dt, J 11.8, 3.9), 1.24 – 1.31 (2 H, m), 1.33 – 1.39 (1 H, m), 1.73 (1 H, tt, J 9.2, 5.3), 2.67 (1 H, s), 2.81 – 2.86 (3 H, m), 3.84 (2 H, q, J 6.0), 4.05 (1 H, dd, J 10.7, 9.3), 4.23 (1 H, dd, J 10.9, 6.5), 6.08 (2 H, p, J 5.6), 6.23 (1 H, d, J 8.6), 6.73 (1 H, s), 8.49 (1 H, d, J 8.6). δ_C (101 MHz, $CDCl_3$) 29.6, 33.0, 37.9, 39.4, 41.6, 43.7, 45.0, 69.6, 98.8, 124.2, 136.1, 136.6, 137.2, 143.7, 143.9, 144.4, 171.5. [HRMS (TOF): calcd. for $C_{17}H_{18}N_4NaO_5$,[$M+Na^+$]: 381.1169; found: 381.1194.

^{1}H-, ^{13}C- and DEPT- NMR Spectral Charts

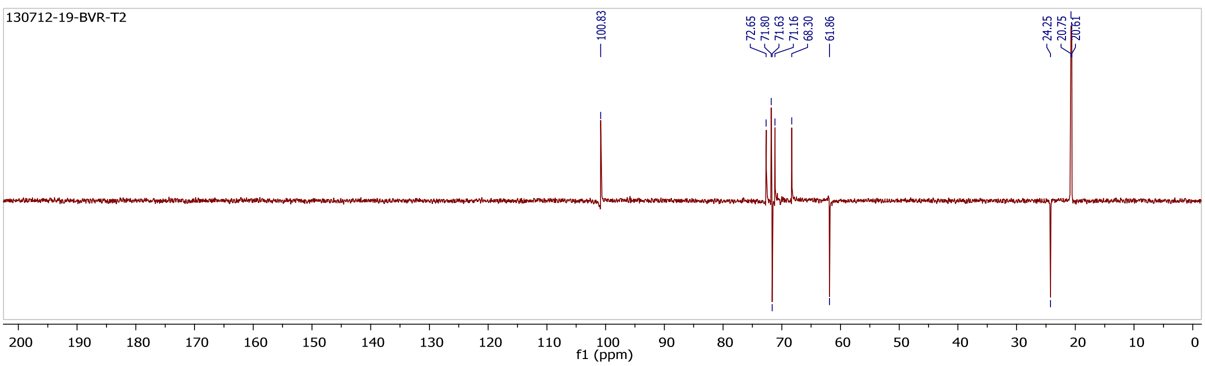
^{1}H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **2a**



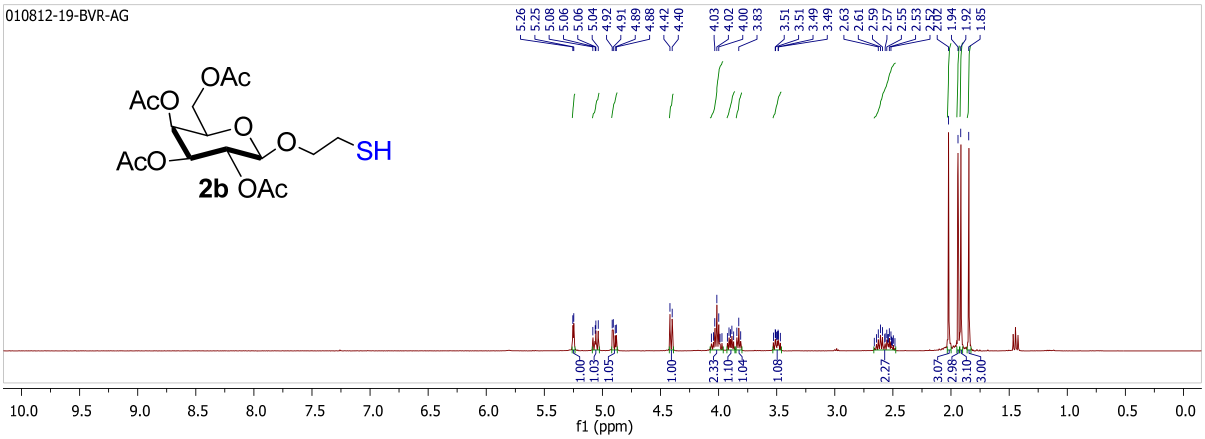
^{13}C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound 2**a**



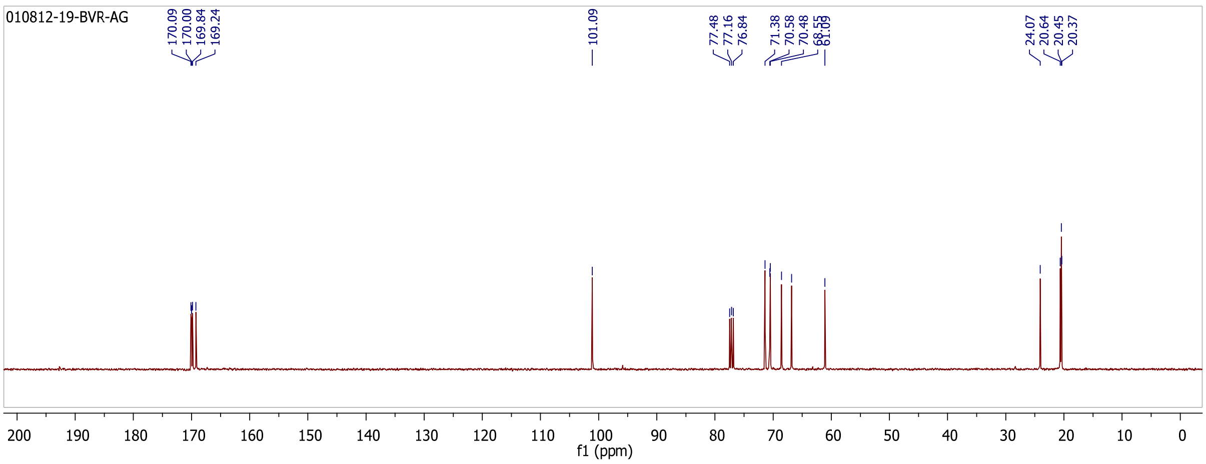
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound 2**a**



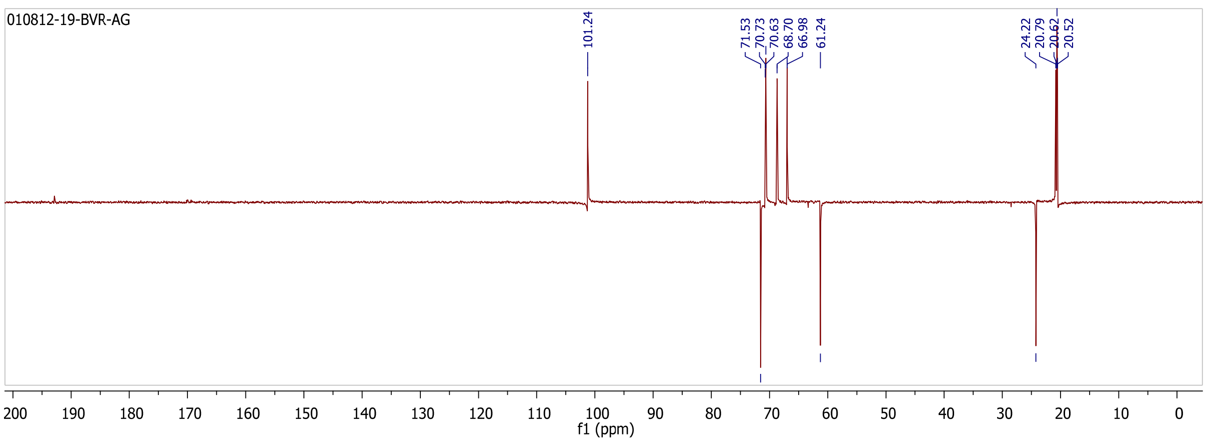
^{1}H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **2b**



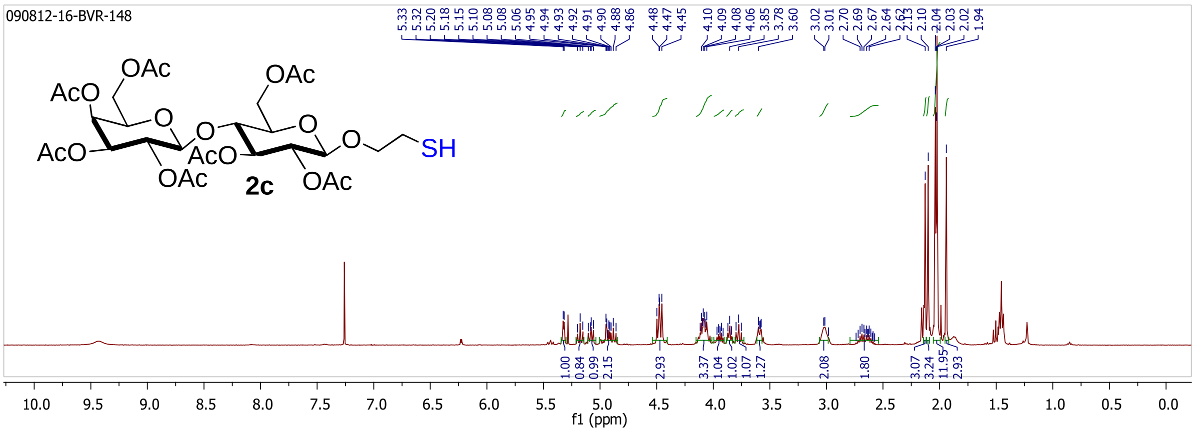
^{13}C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **2b**



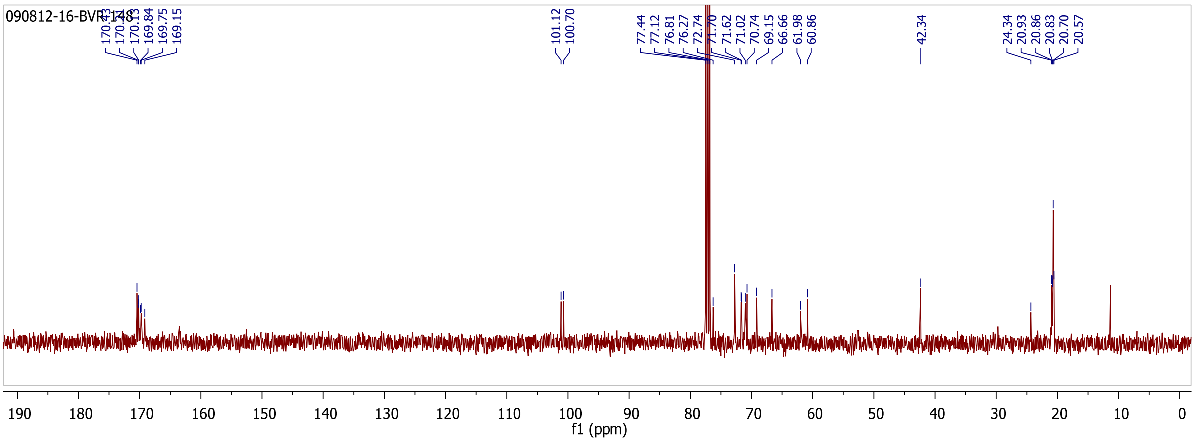
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **2b**



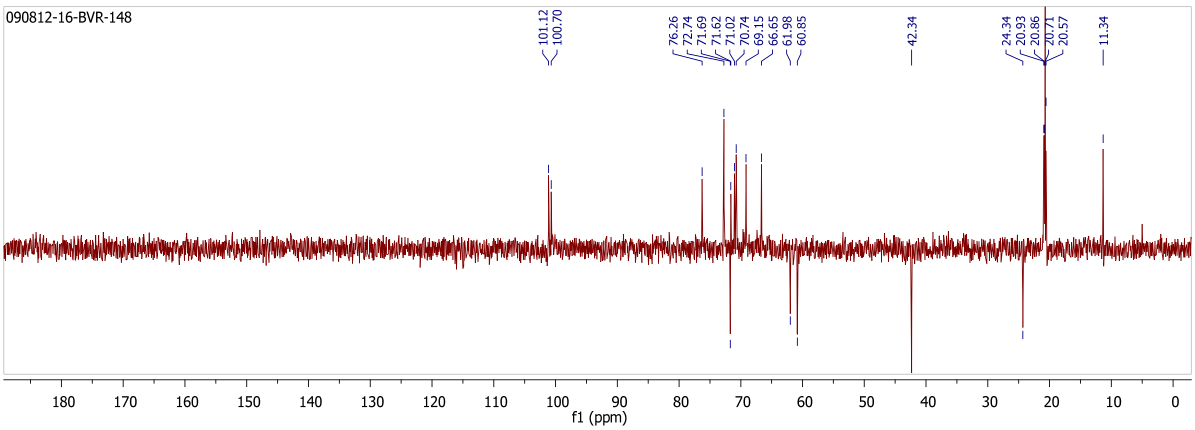
[1]H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **2c**



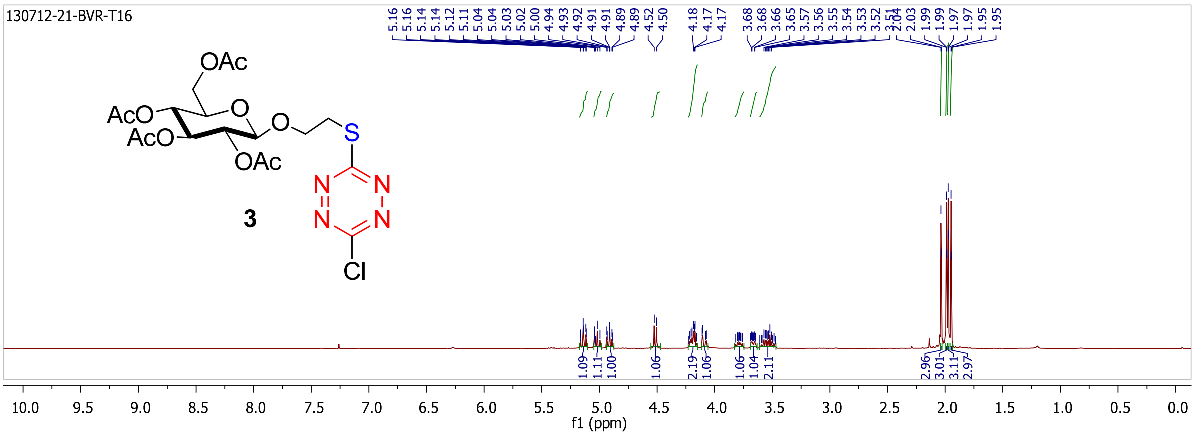
[13]C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **2c**



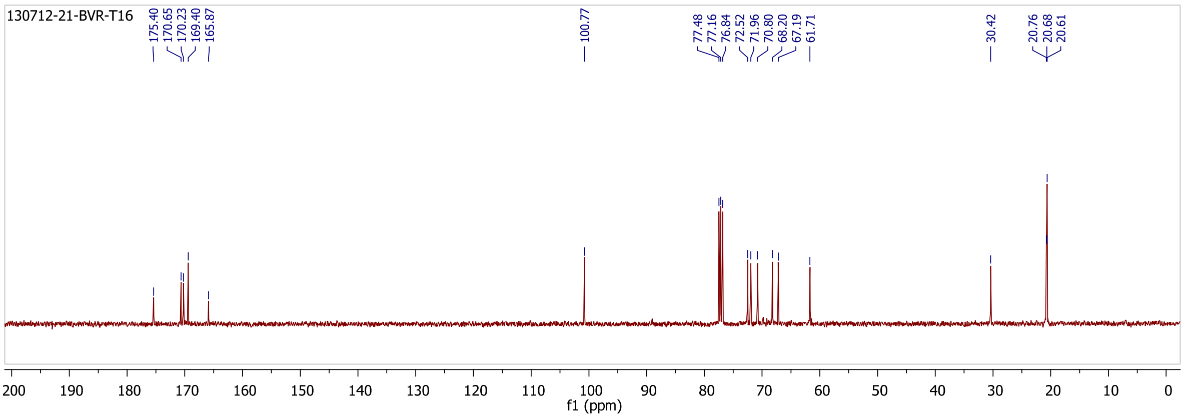
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **2c**



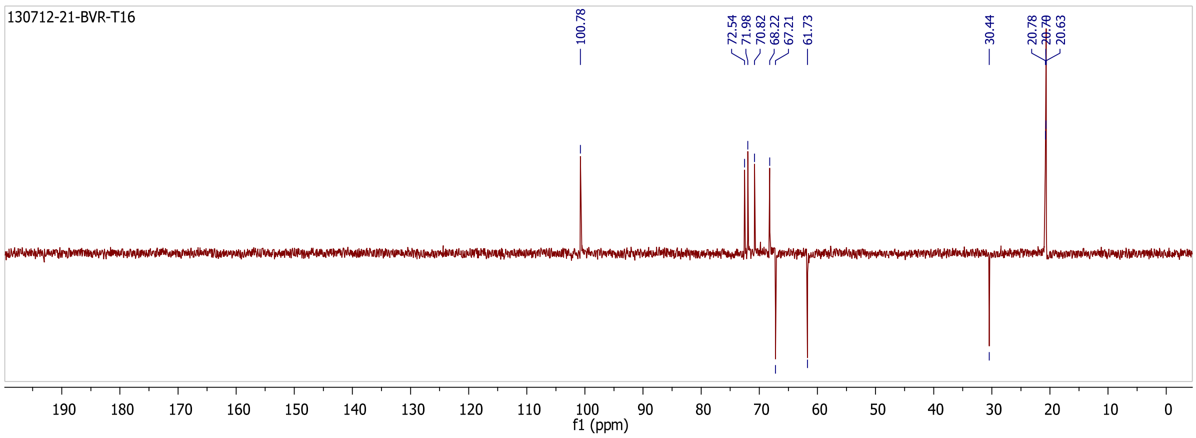
^{1}H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **3**



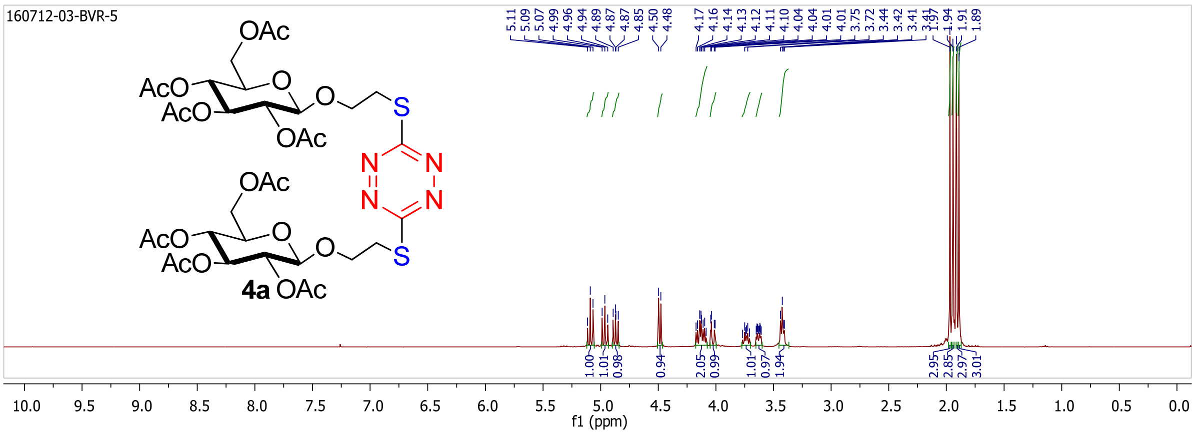
^{13}C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **3**



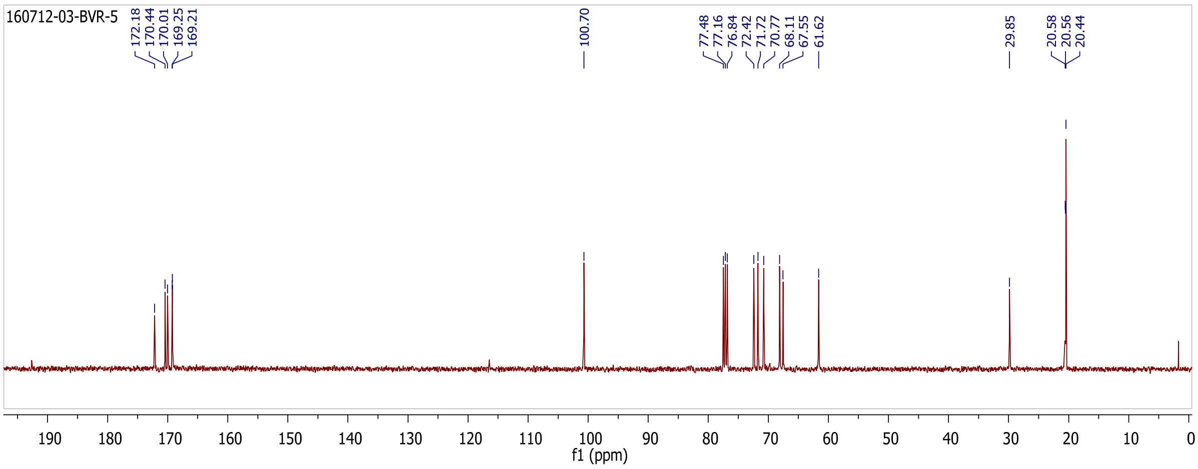
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **3**



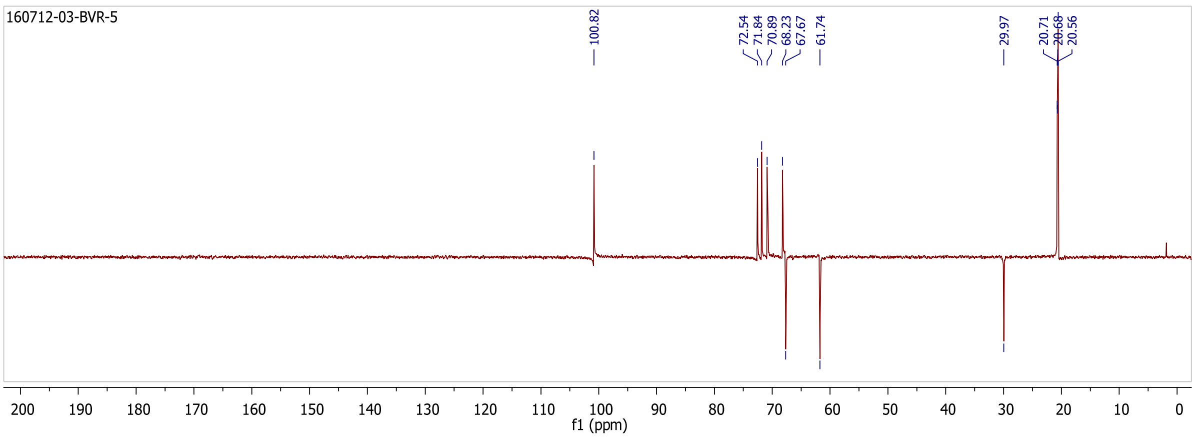
[1]H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **4a**



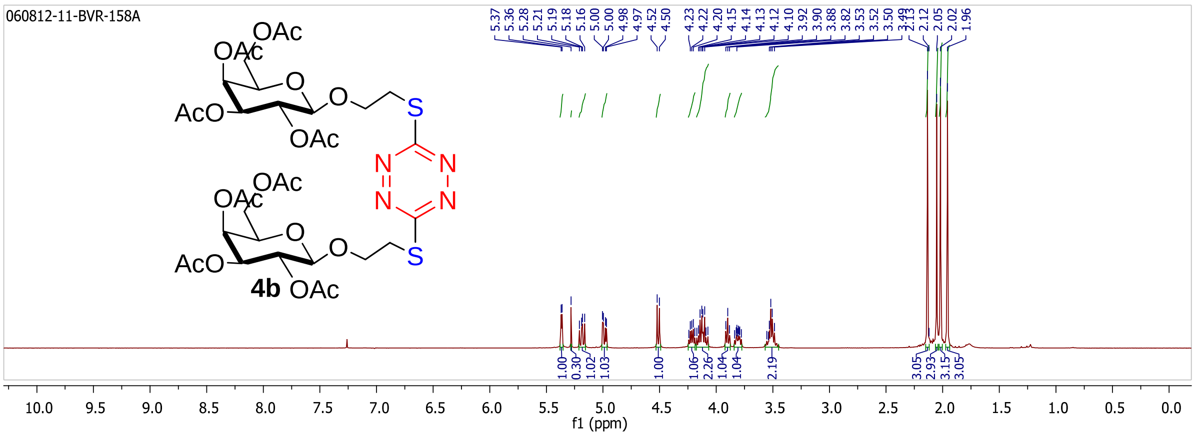
[13]C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **4a**



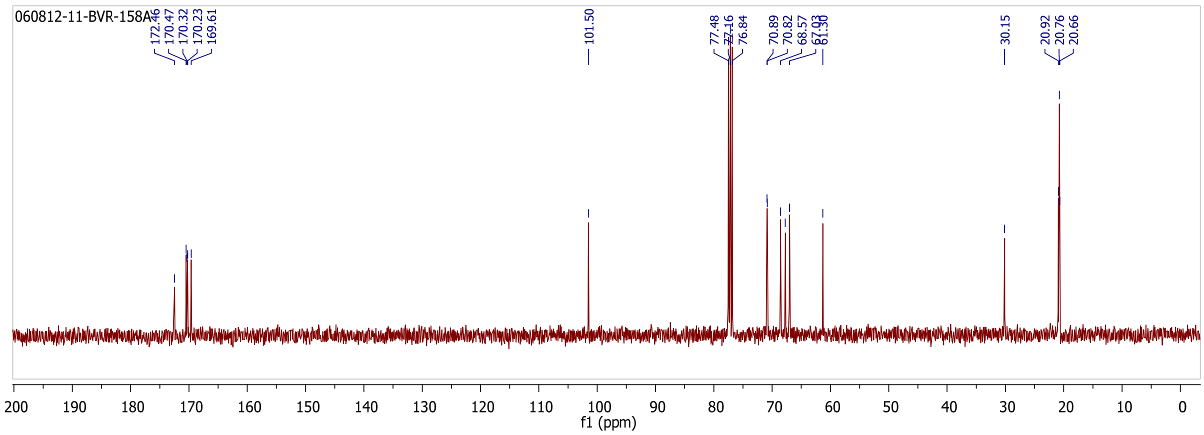
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **4a**



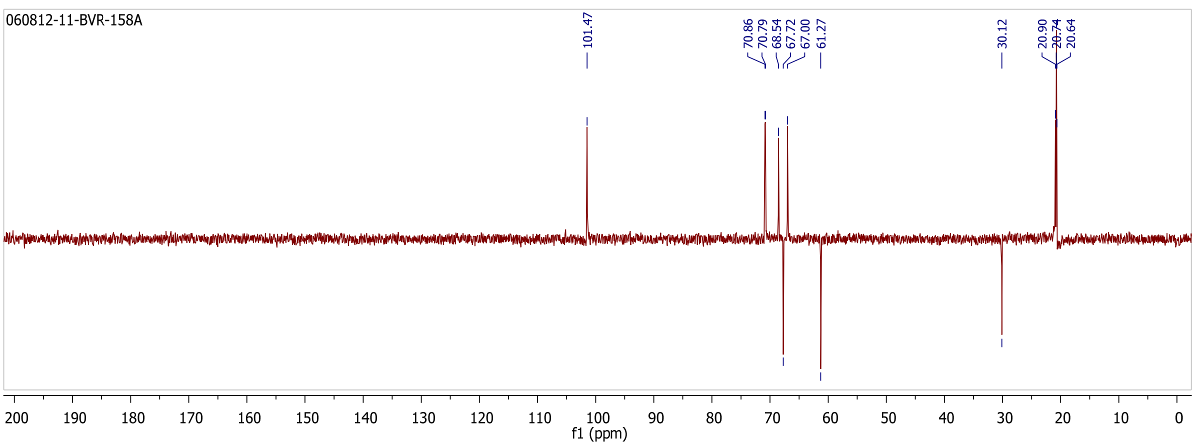
^{1}H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **4b**



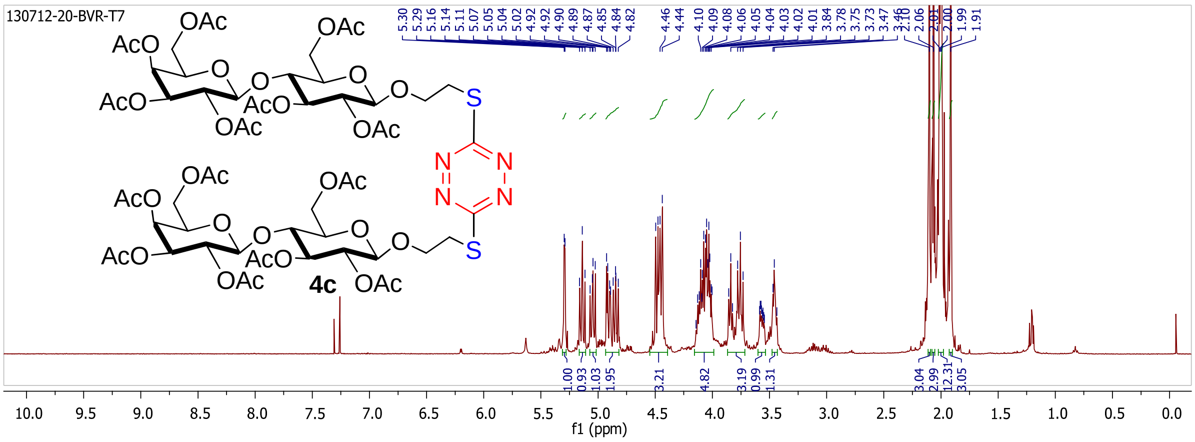
^{13}C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **4b**



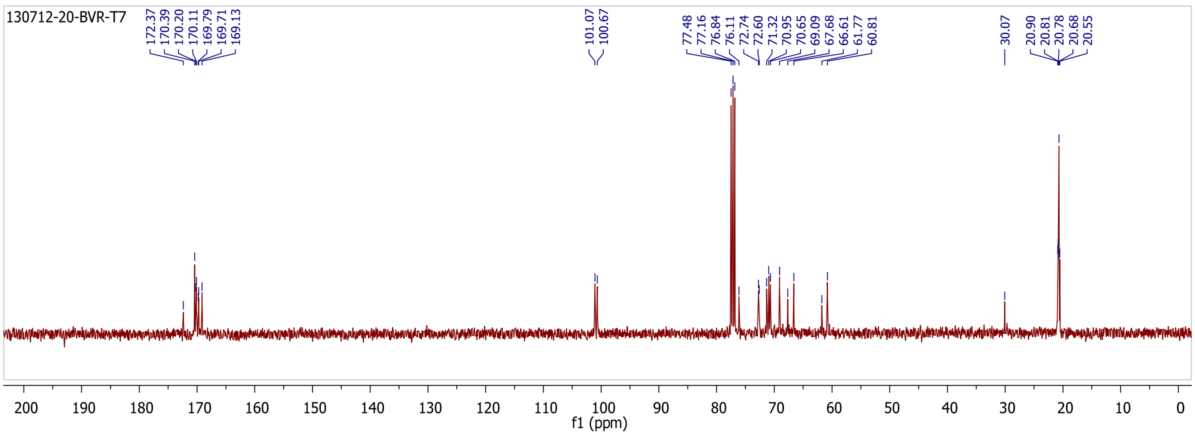
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **4b**



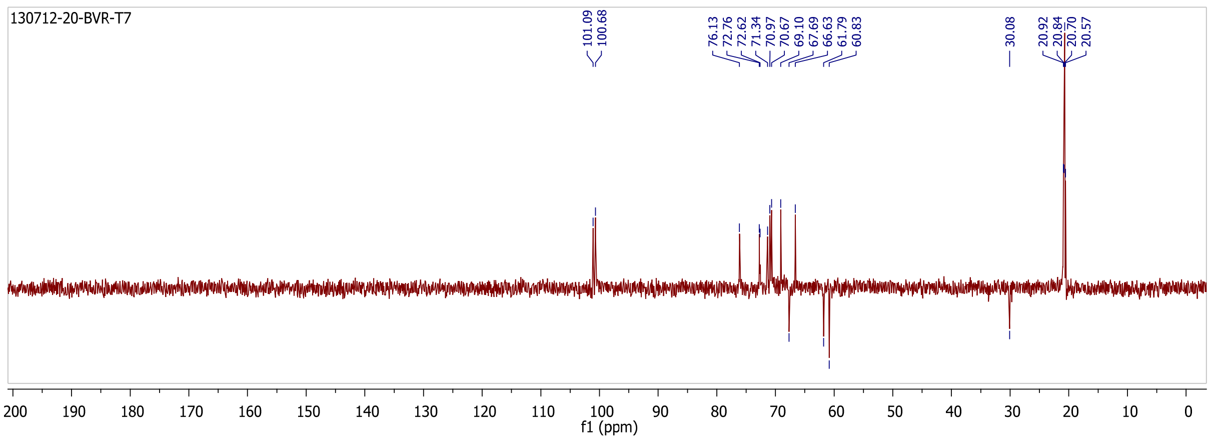
[1]H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **4c**



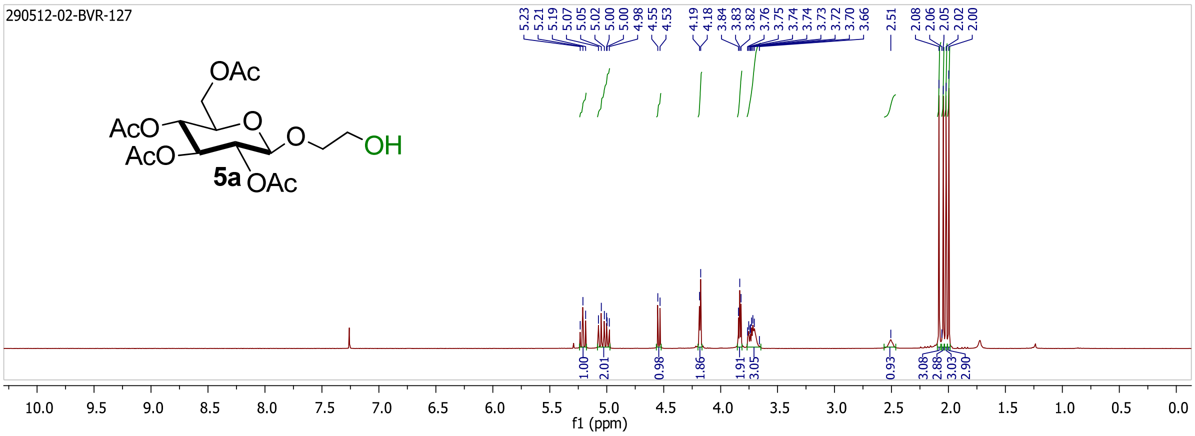
[13]C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **4c**



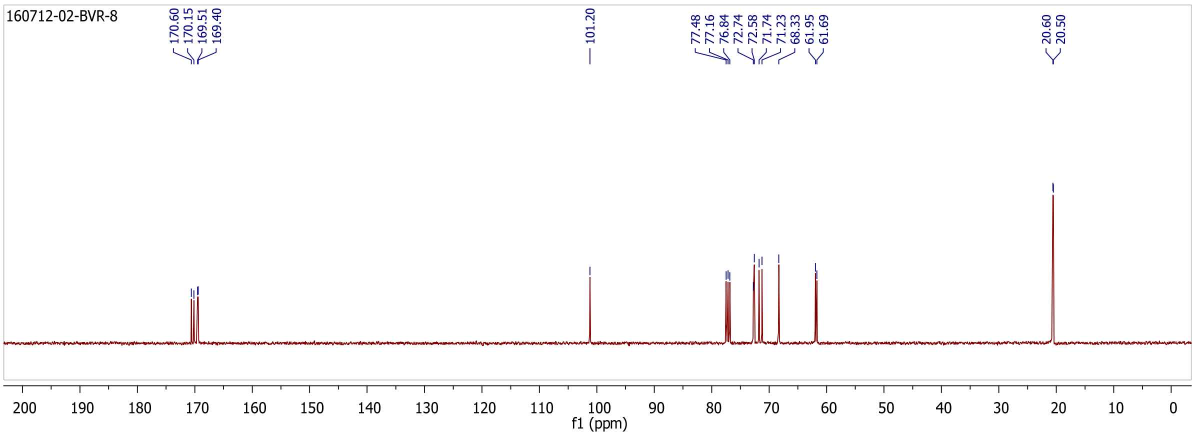
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **4c**



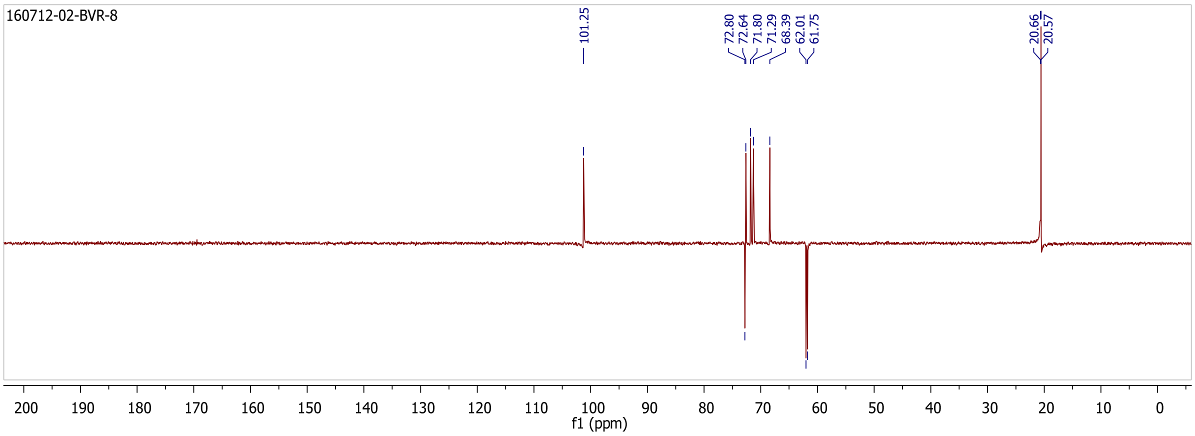
[1]H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **5a**



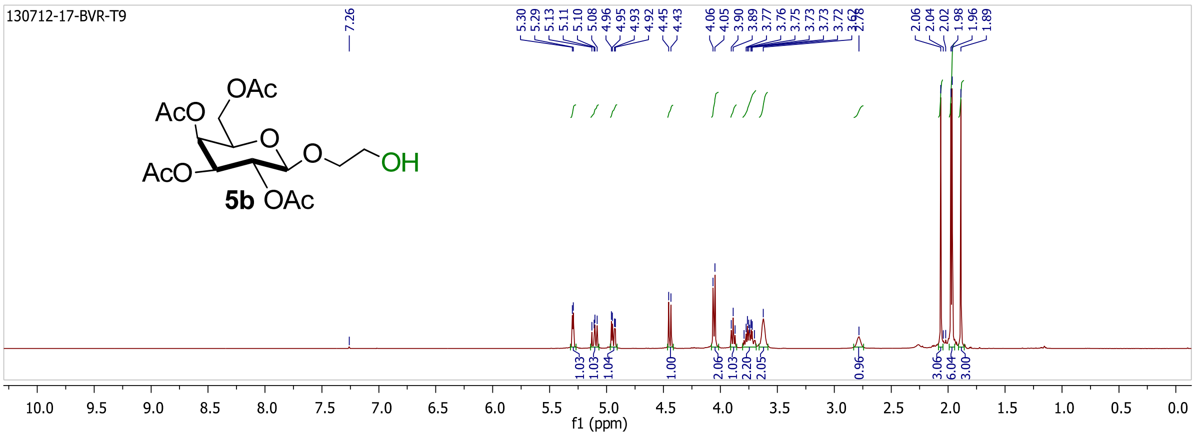
[13]C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **5a**



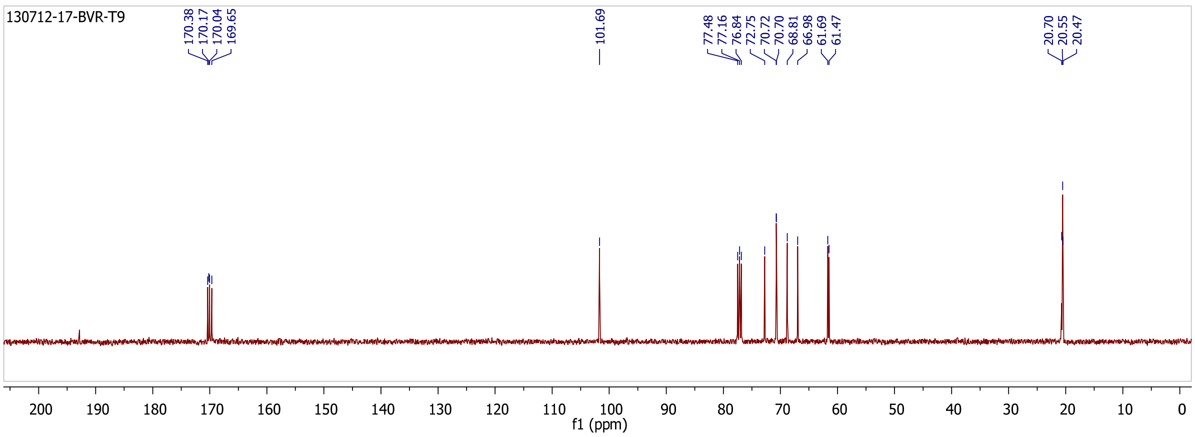
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **5a**



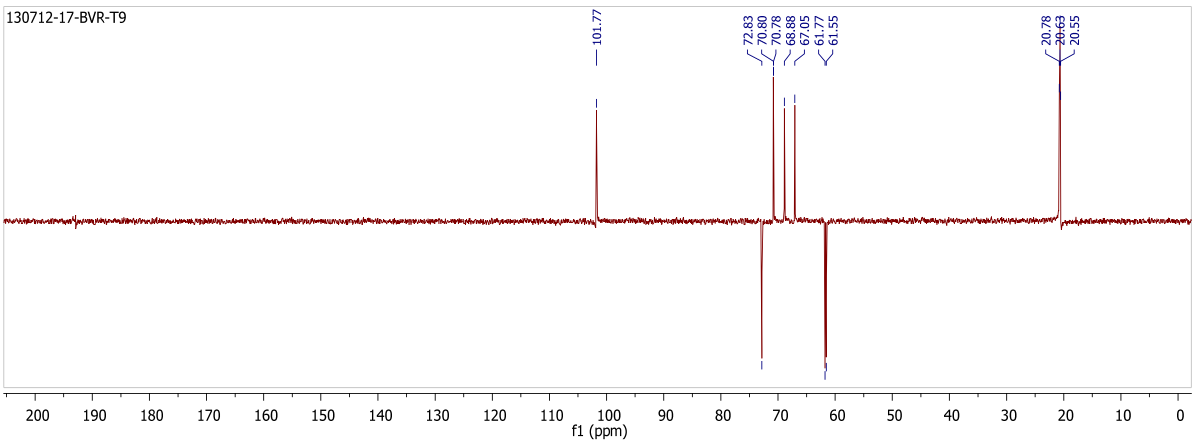
[1]H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **5b**



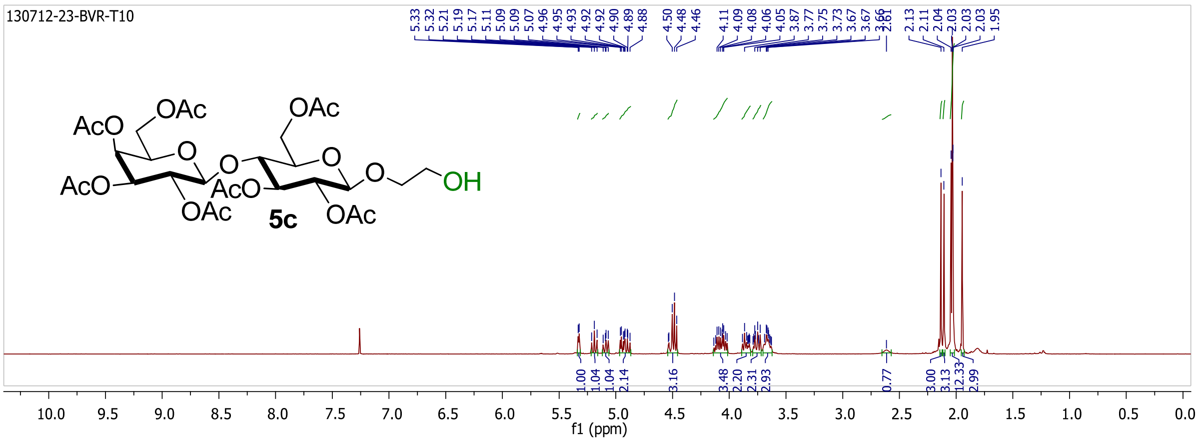
[13]C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **5b**



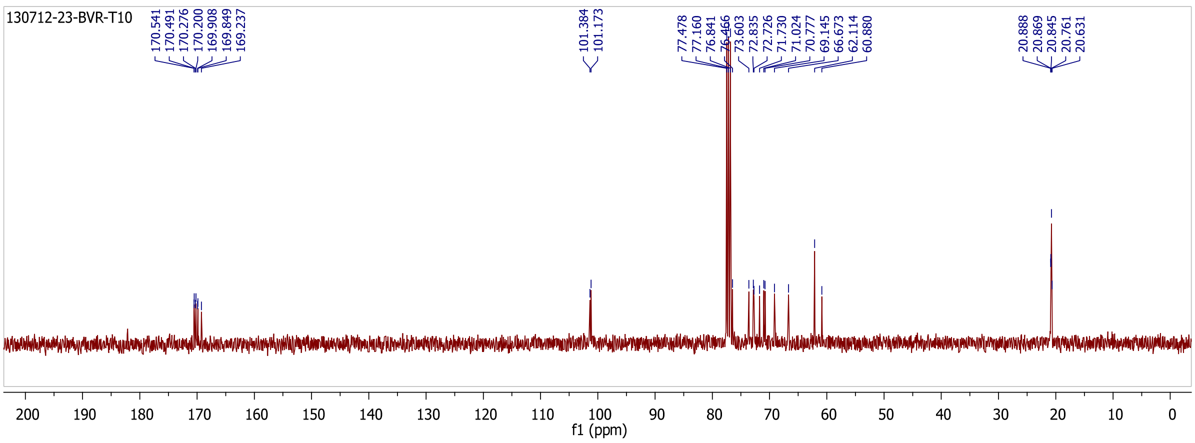
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **5a**



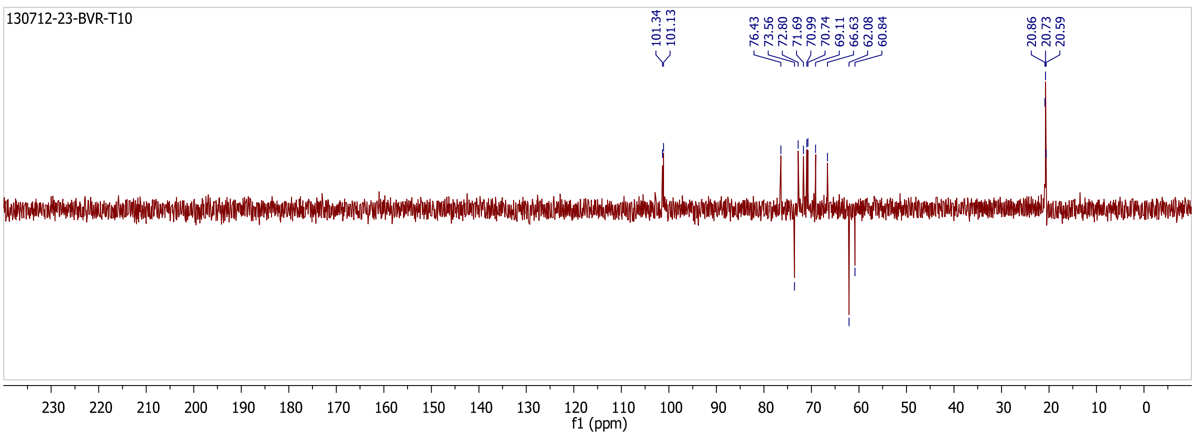
[1]H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **5c**



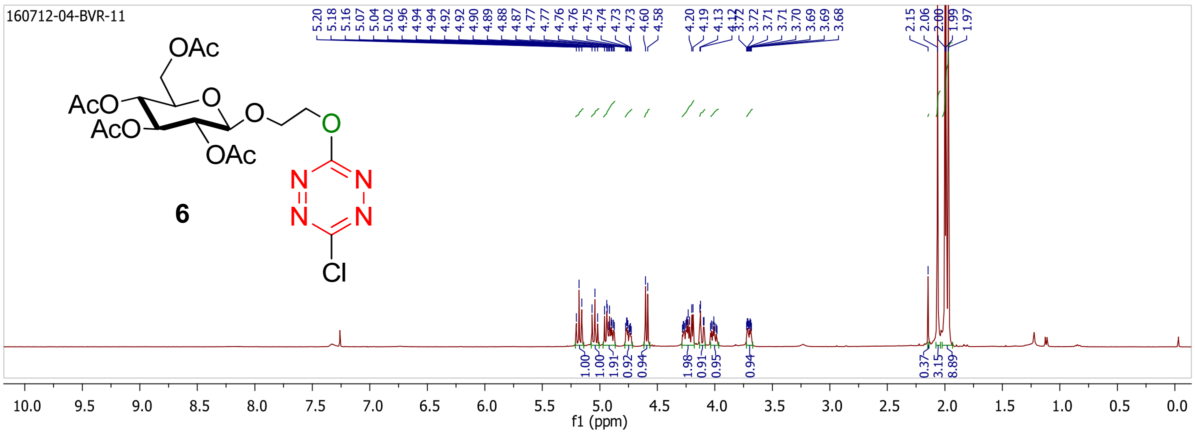
[13]C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **5c**



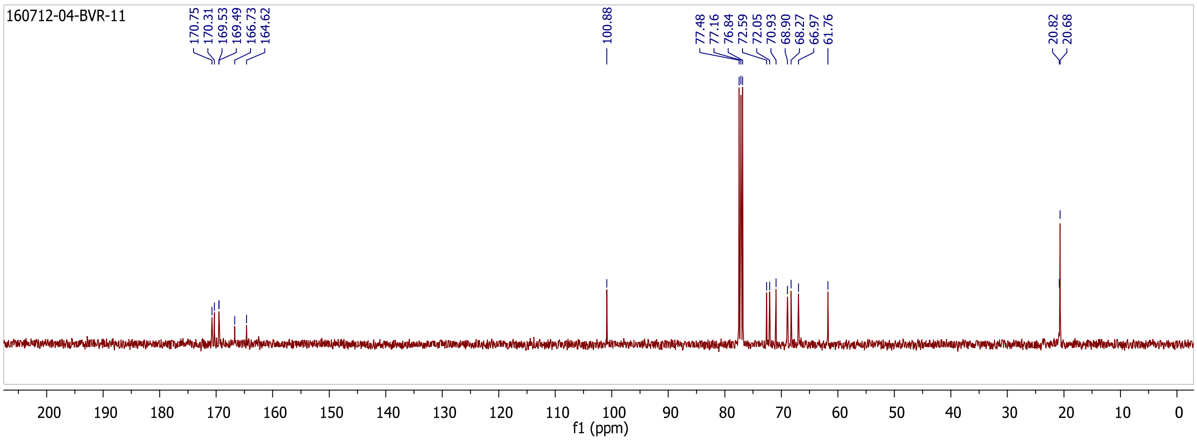
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **5c**



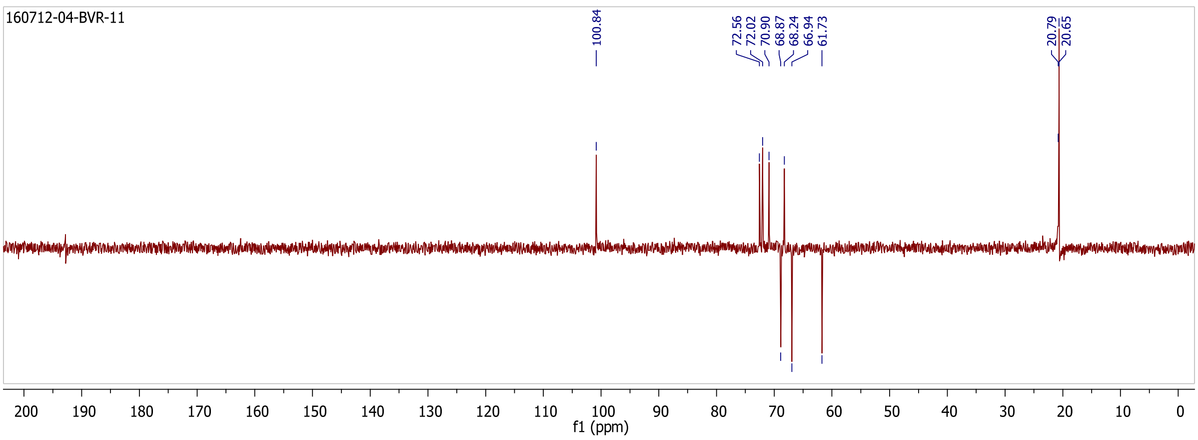
^{1}H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **6**



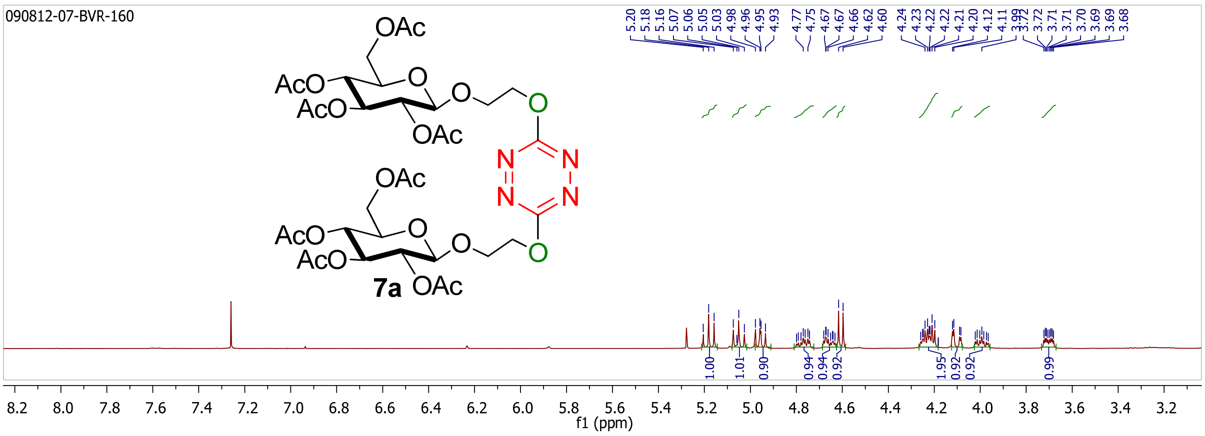
^{13}C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **6**



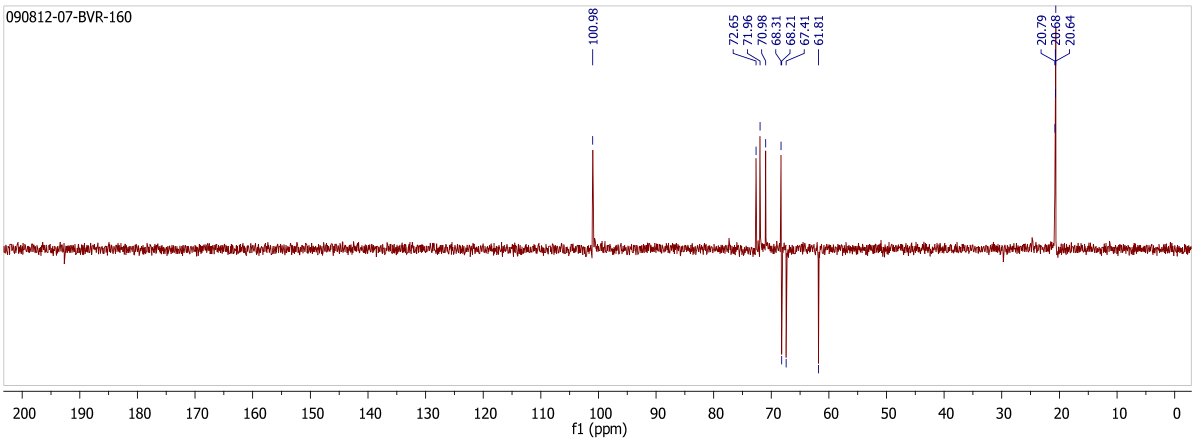
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **6**



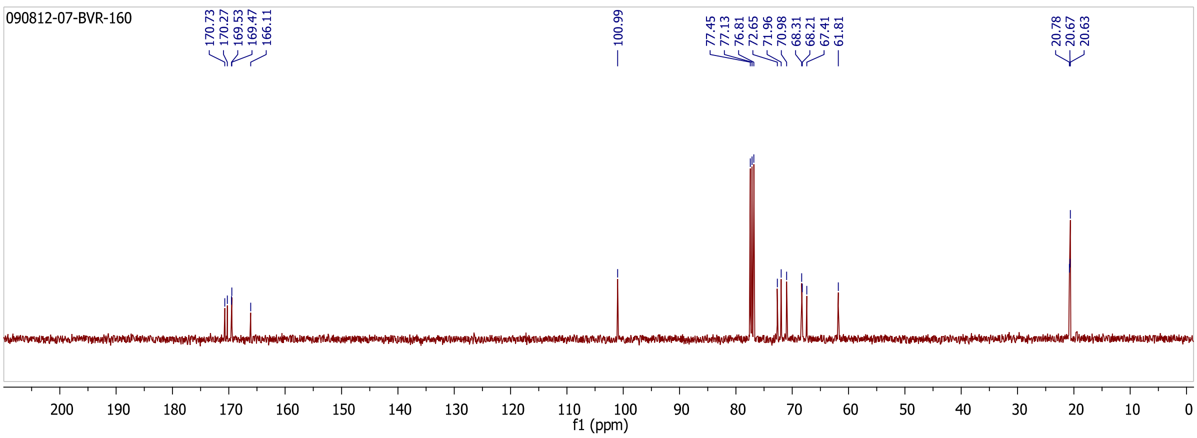
[1]H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **7a**



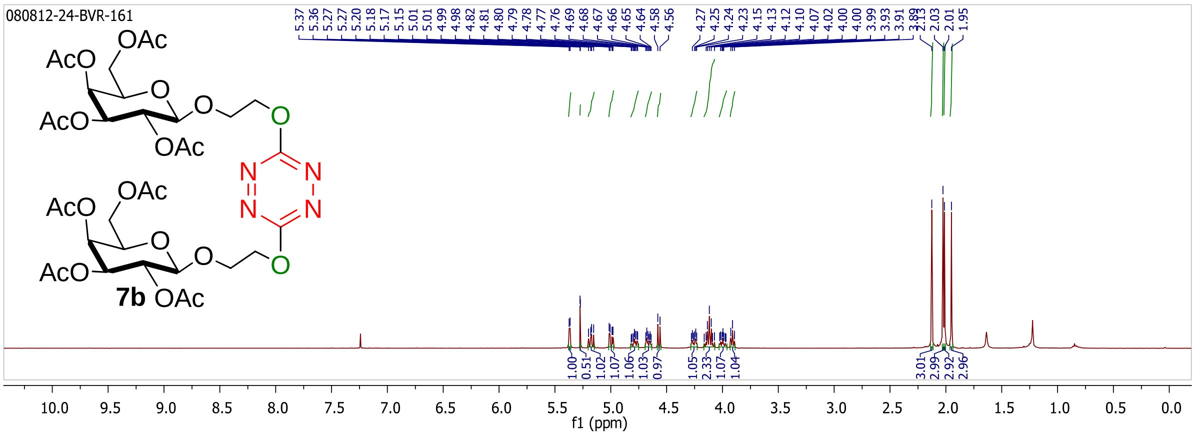
[13]C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **7a**



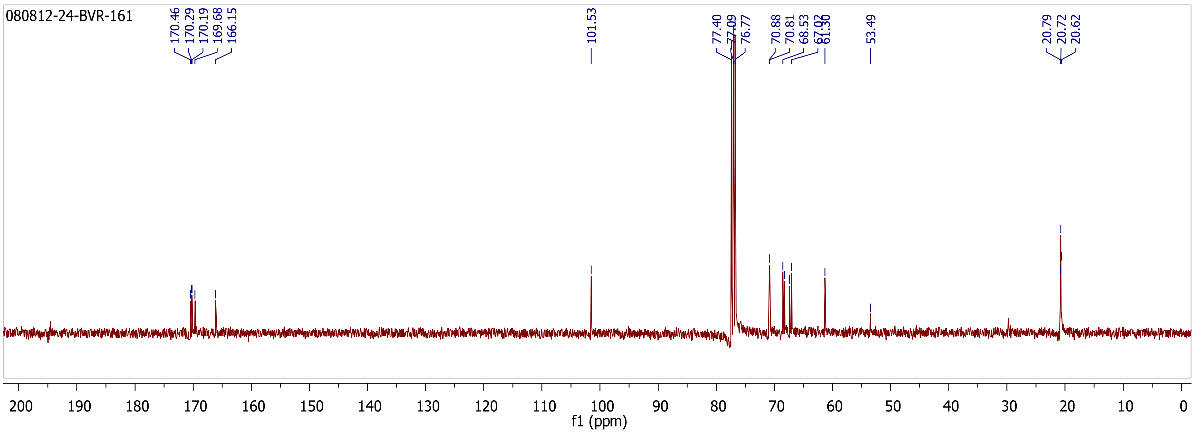
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **7a**



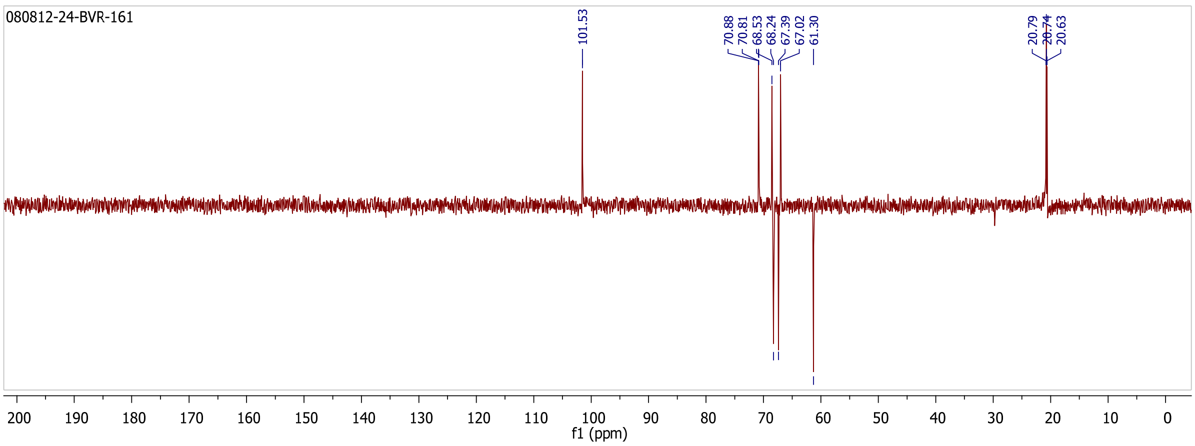
^{1}H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **7b**



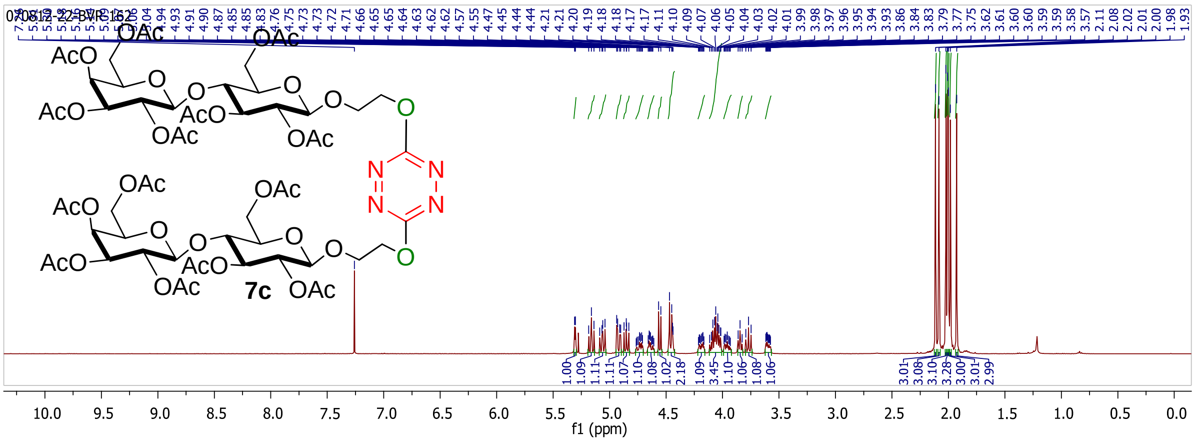
^{13}C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **7b**



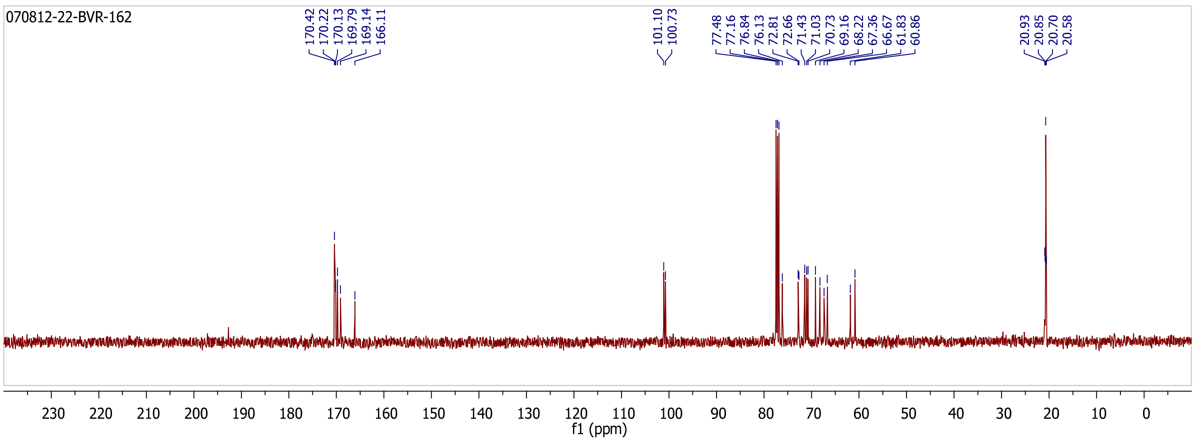
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **7a**



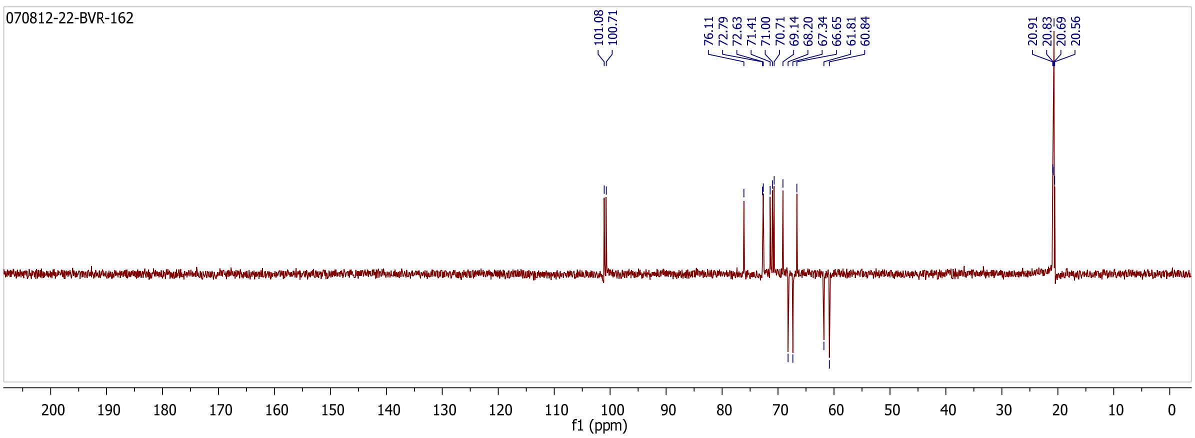
[1]H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **7c**



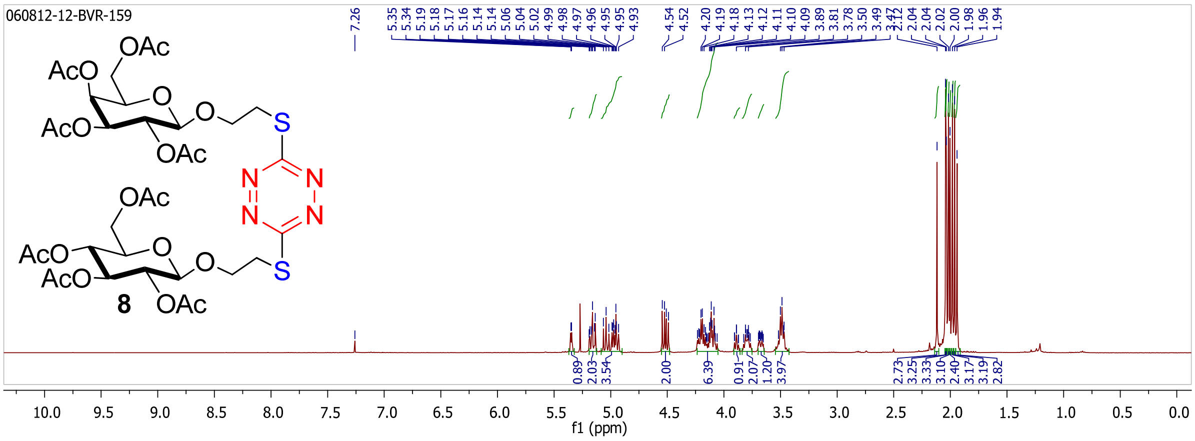
[13]C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **7c**



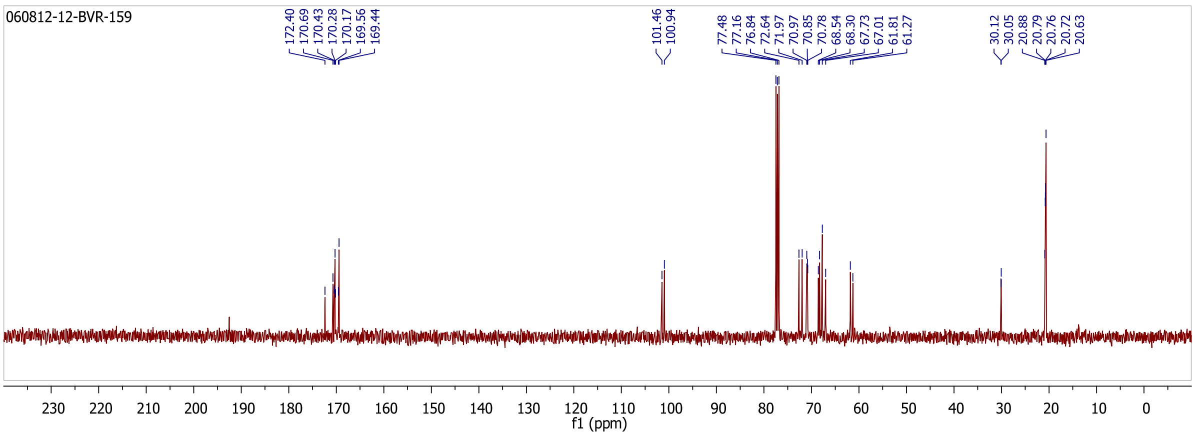
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **7c**



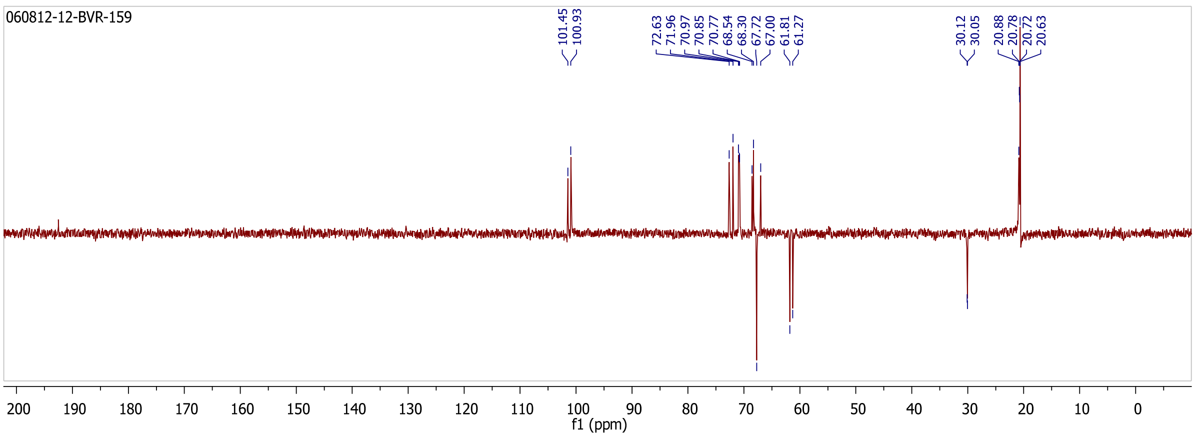
^{1}H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **8**



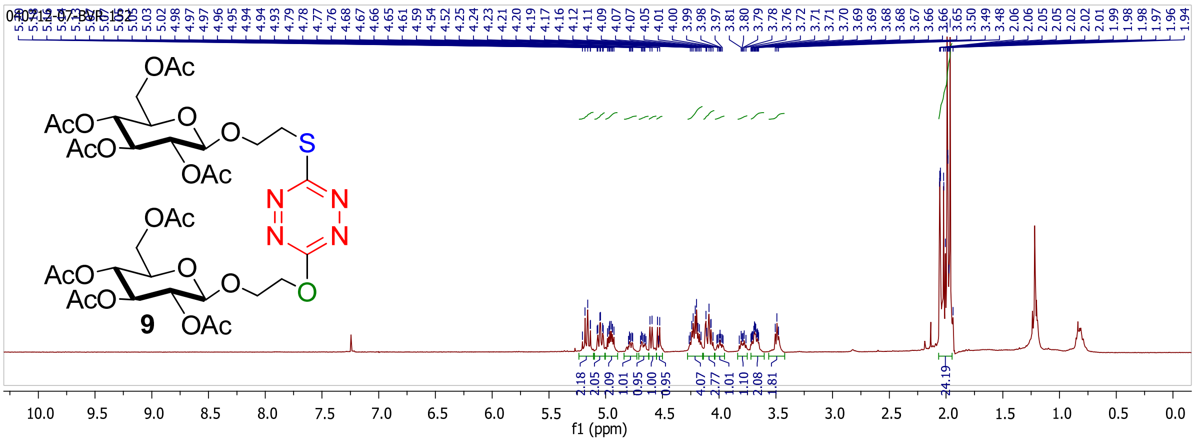
^{13}C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **8**



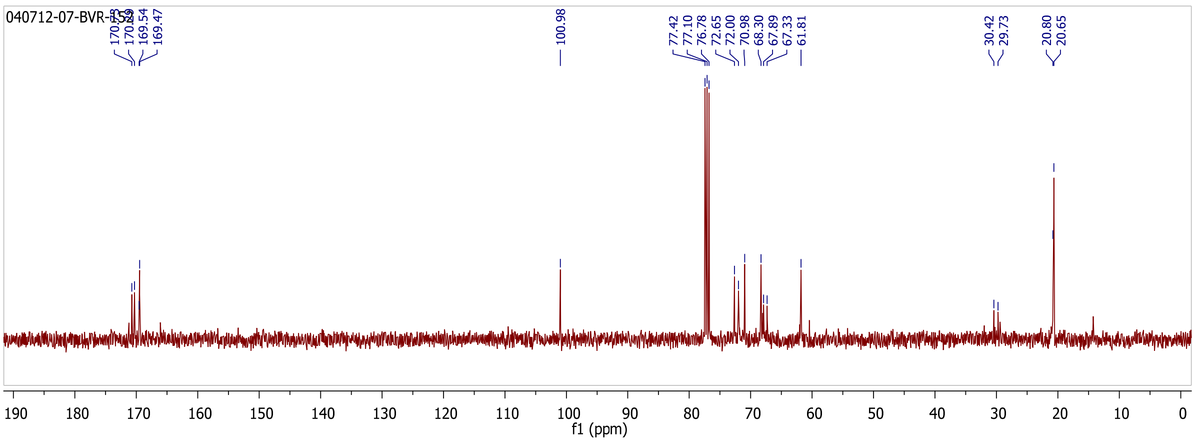
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **8**



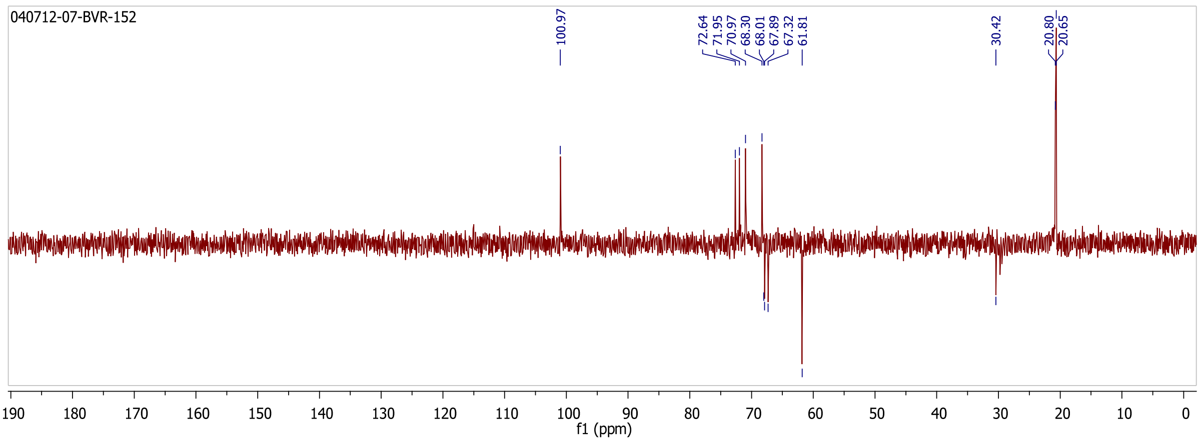
^{1}H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **9**



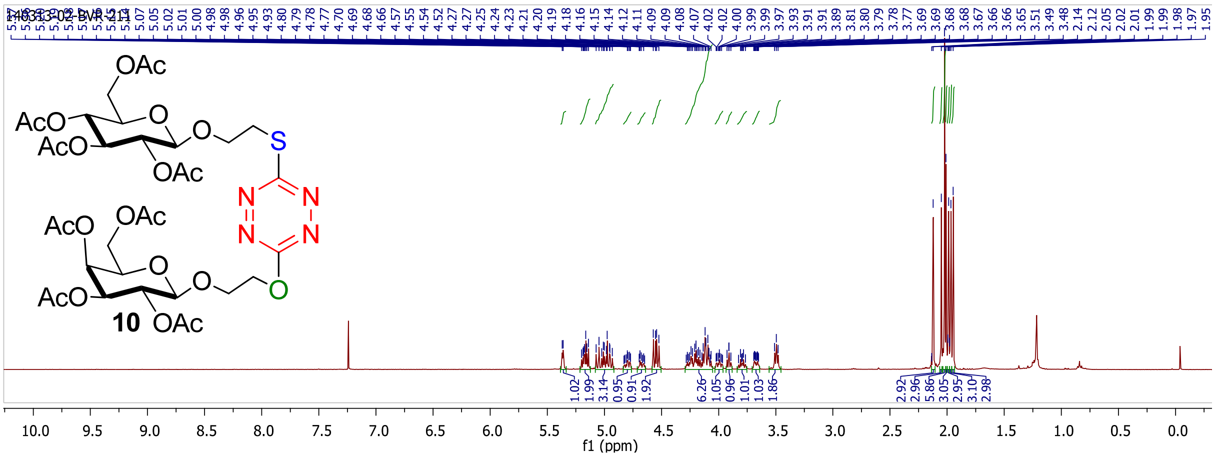
^{13}C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **9**



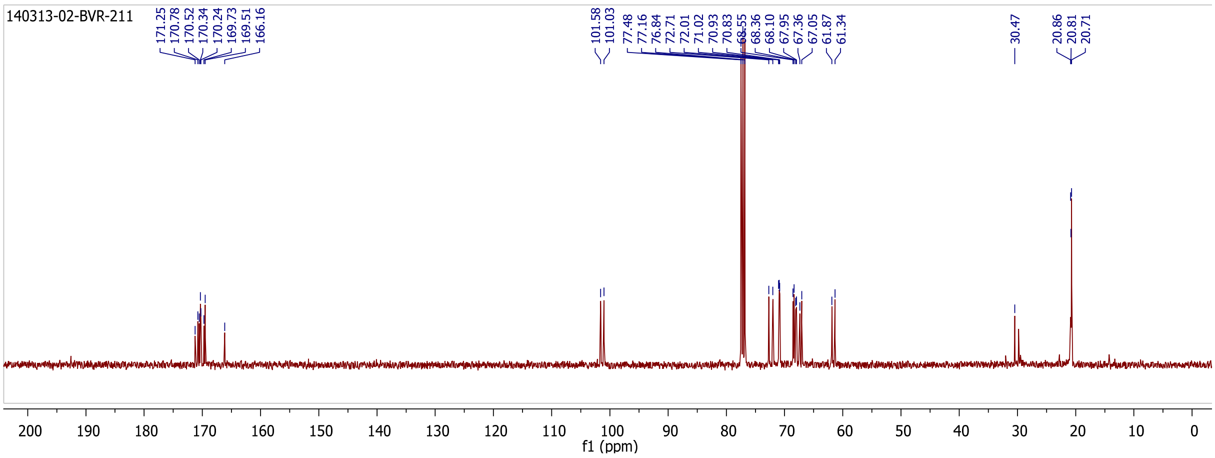
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **9**



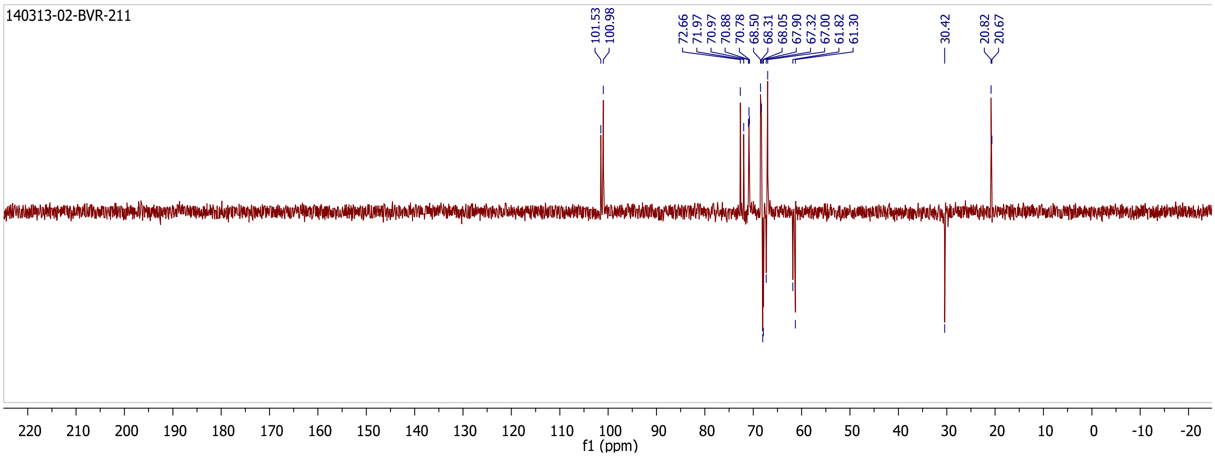
^{1}H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **10**



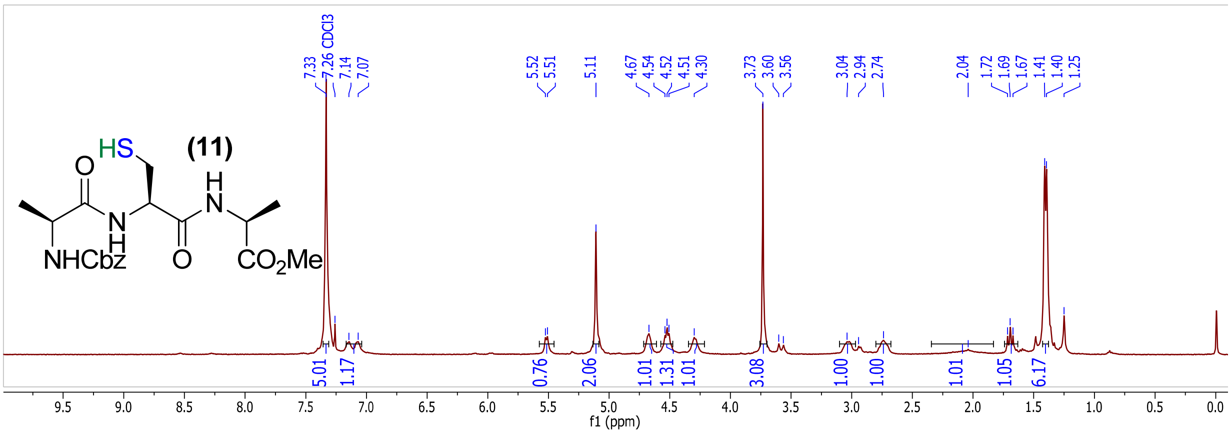
^{13}C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **10**



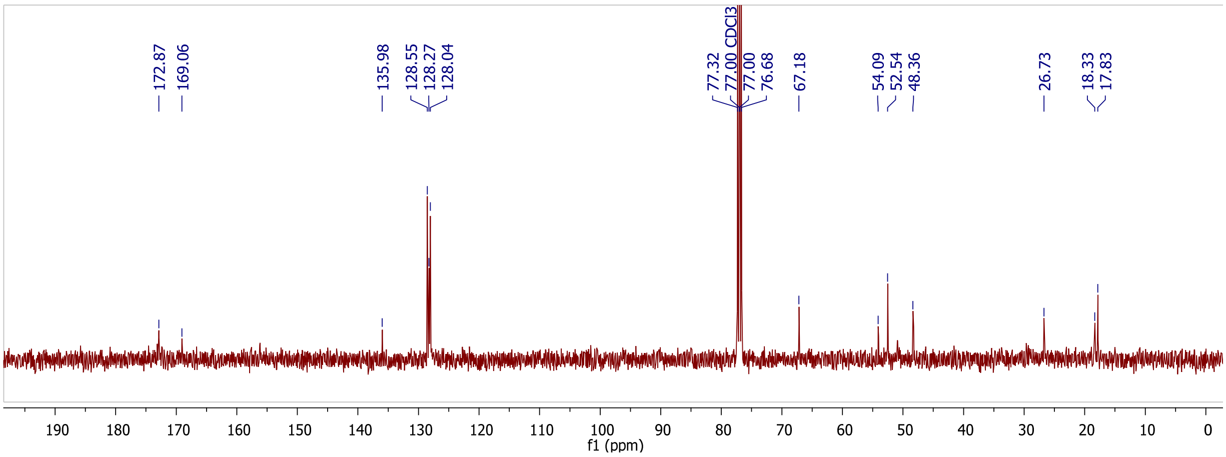
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **10**



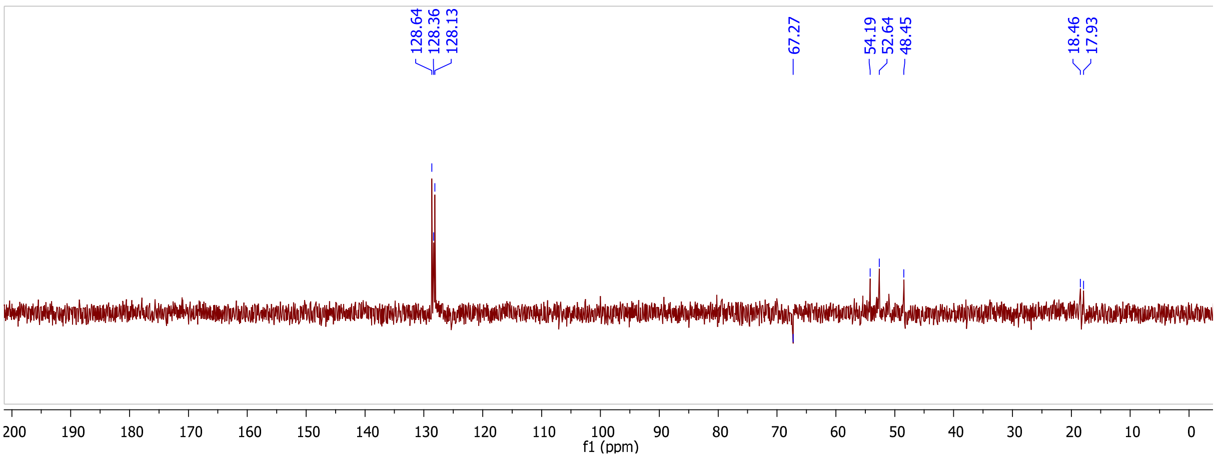
^{1}H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **11**



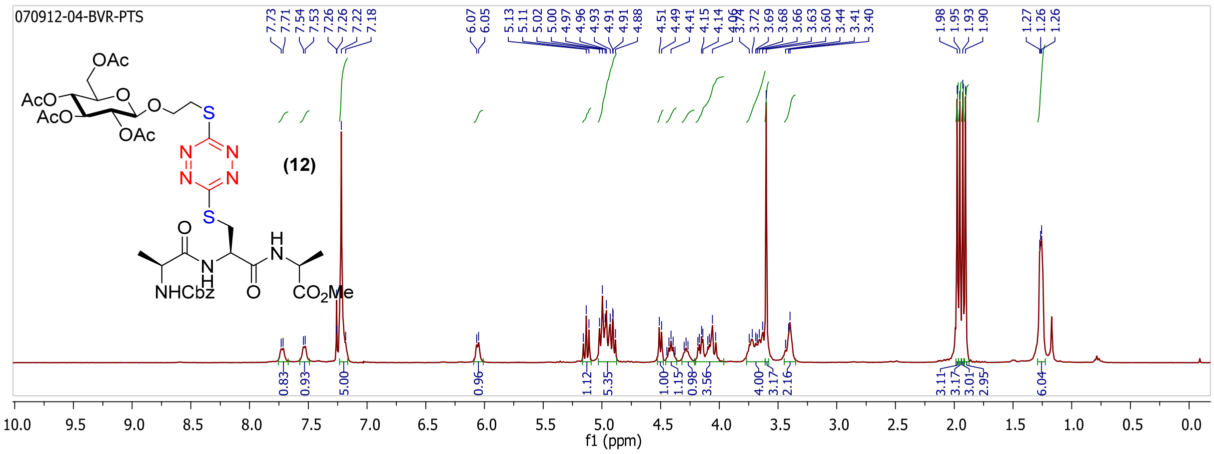
^{13}C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **11**



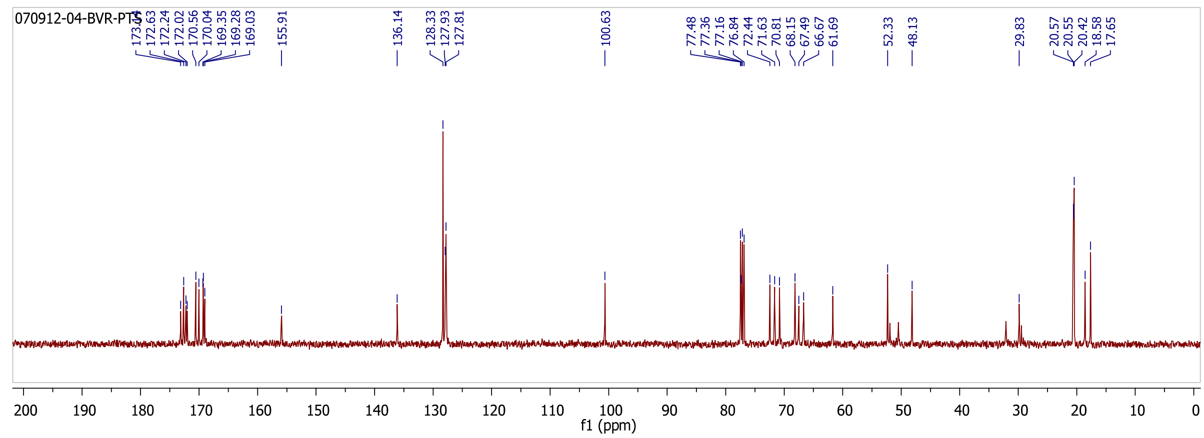
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **11**



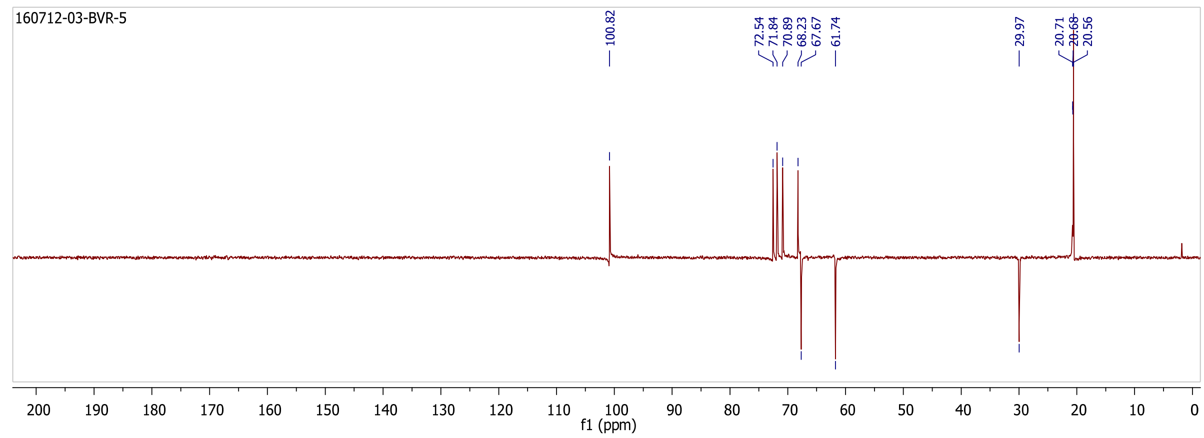
^{1}H NMR Spectrum (399.78MHz, CDCl$_3$) of Compound **12**



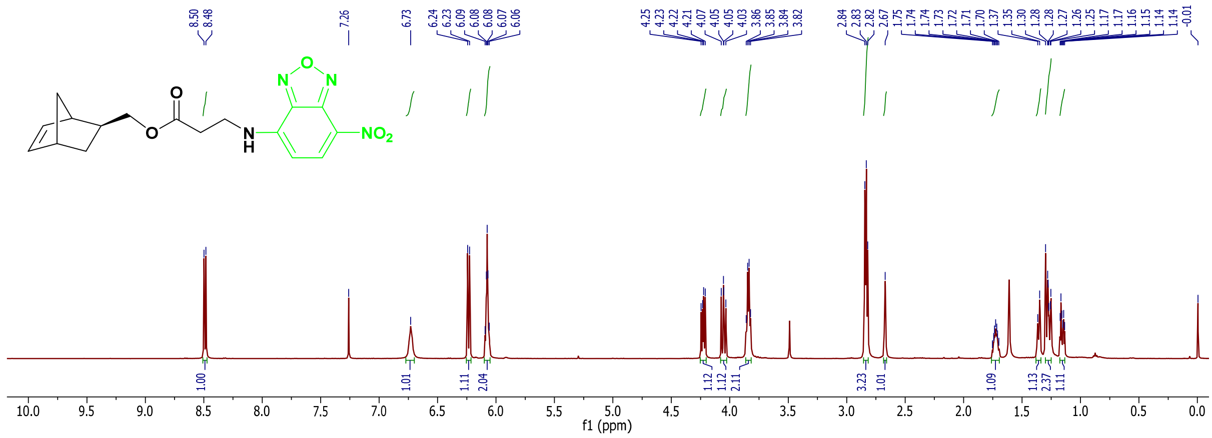
^{13}C NMR Spectrum (100.53MHz, CDCl$_3$) of Compound **12**



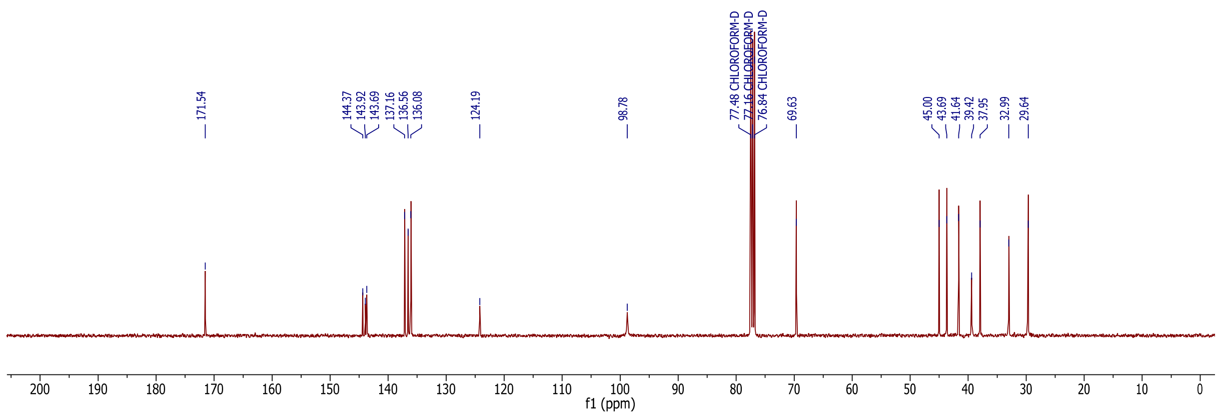
DEPT NMR Spectrum (100.53MHz, CDCl$_3$) of Compound **12**



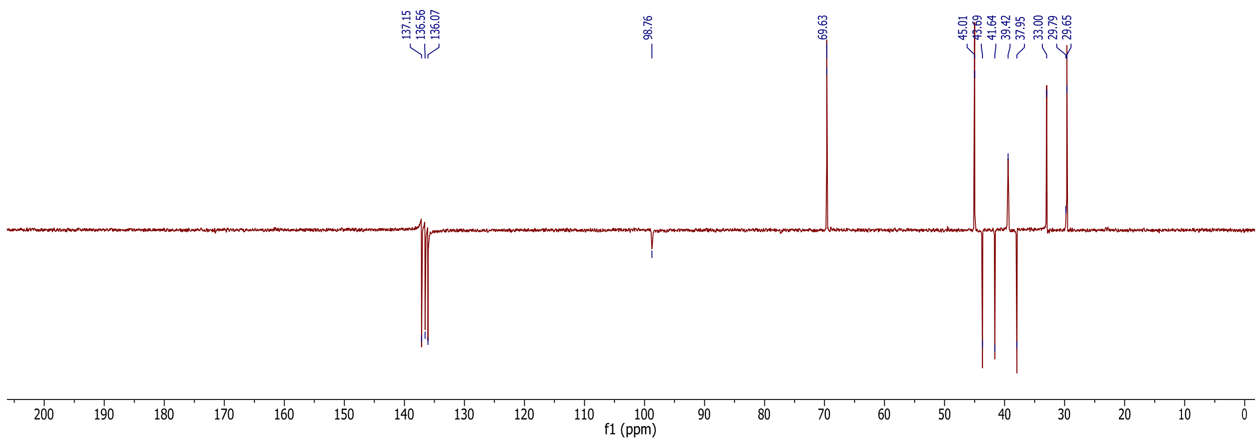
[1]H NMR Spectrum (399.78MHz, $CDCl_3$) of Compound **13**



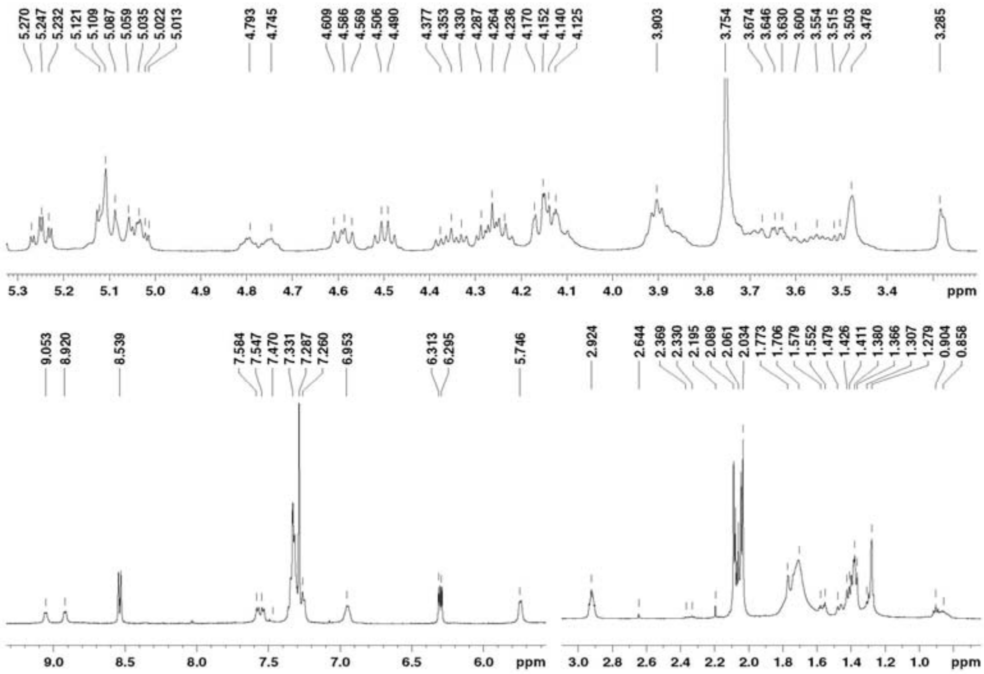
[13]C NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **13**



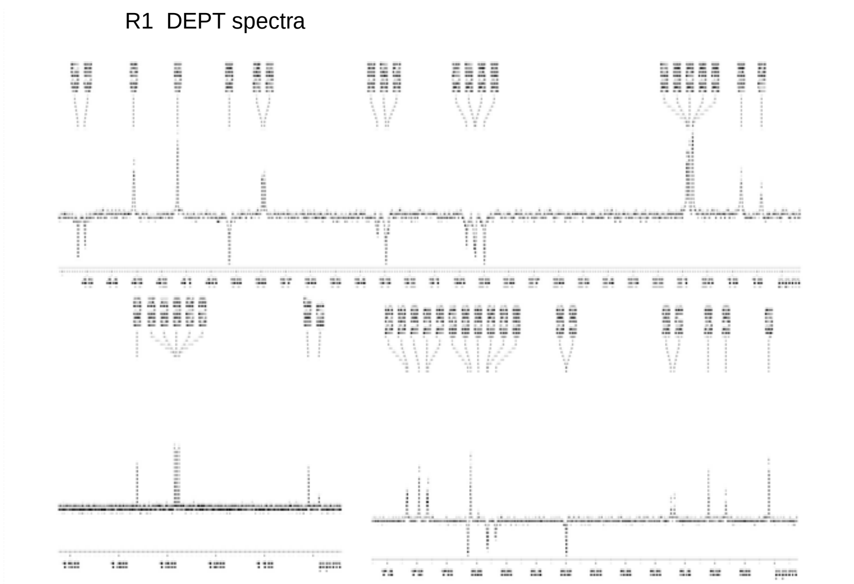
DEPT NMR Spectrum (100.53MHz, $CDCl_3$) of Compound **13**



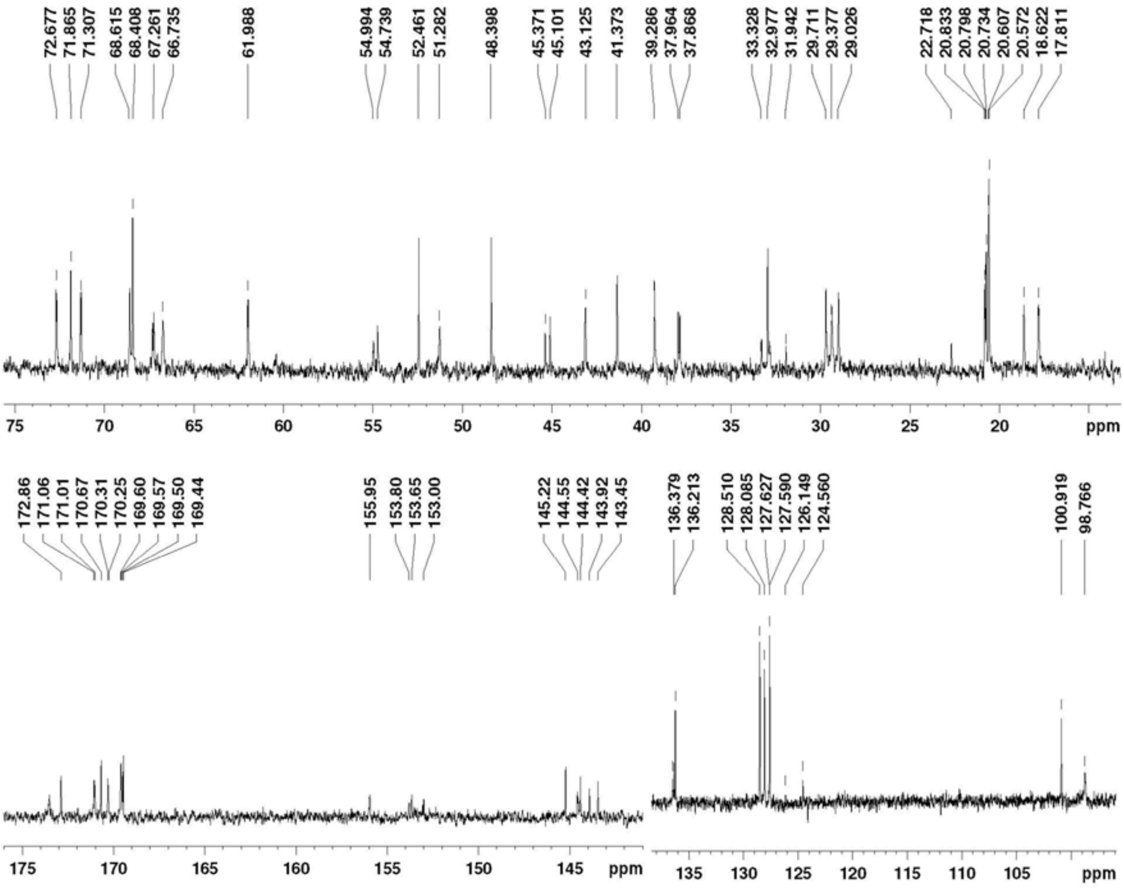
[1]H NMR Spectrum (500.13 MHz, $CDCl_3$) of Compound **14** (Fraction 1)



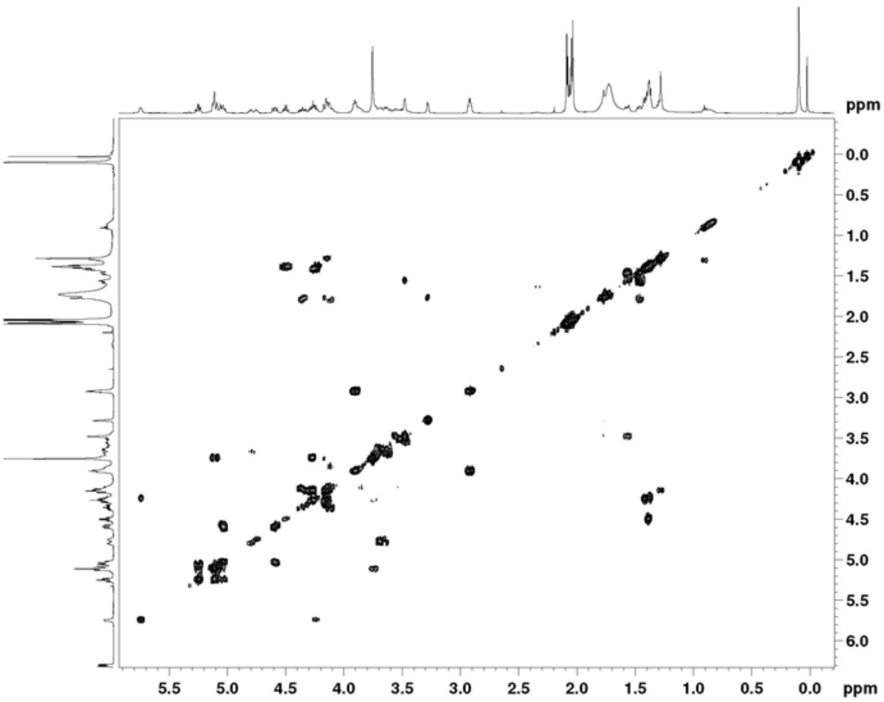
DEPT NMR Spectrum (125.76 MHz, $CDCl_3$) of Compound **14** (Fraction 1)

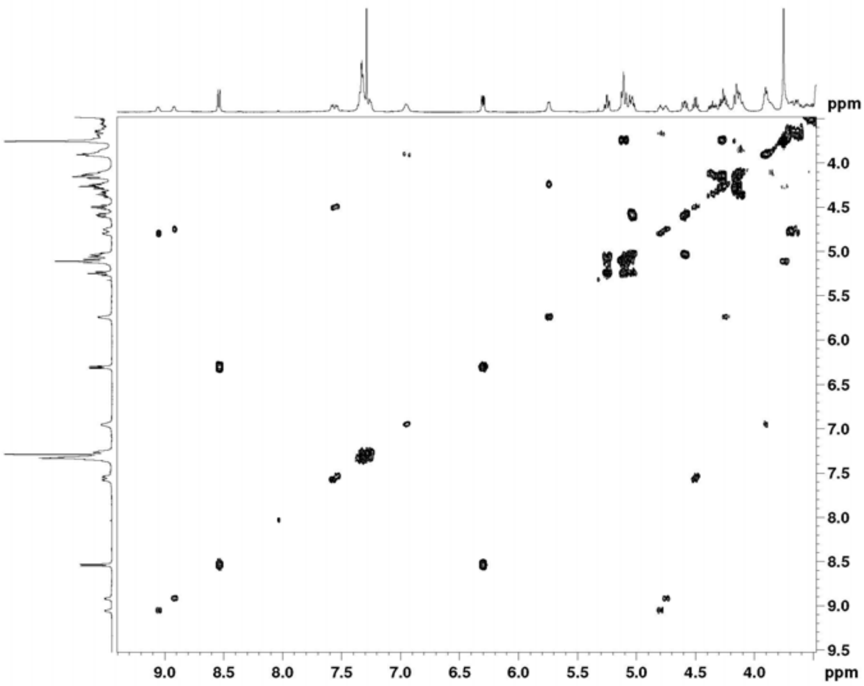


^{13}C NMR Spectrum (125.76MHz, $CDCl_3$) of Compound **14** (Fraction 1)

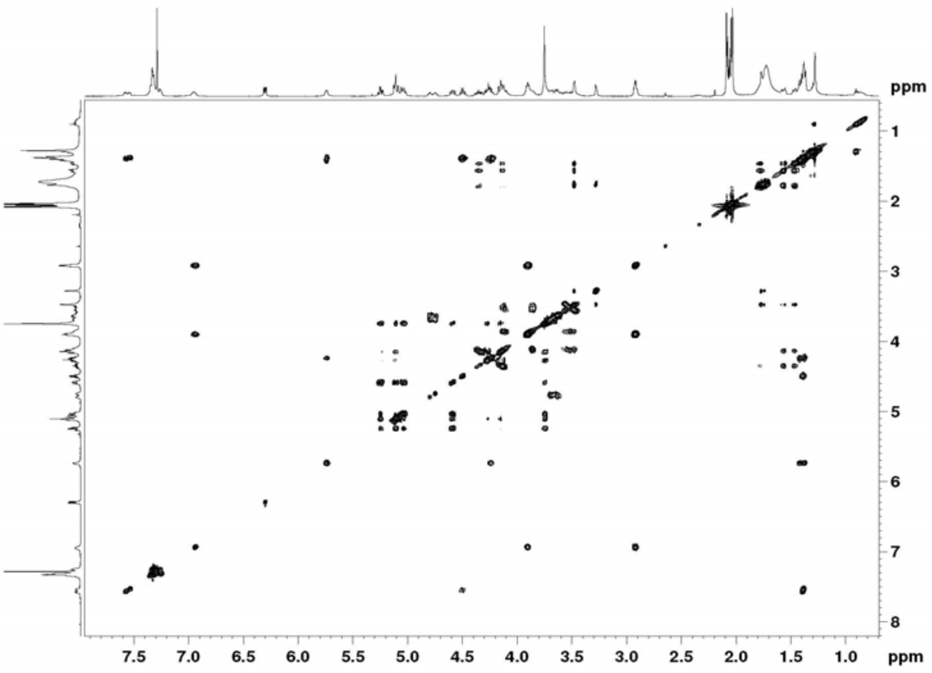


Partial COSY spectra of Fraction 1 (500.13 MHz, $CDCl_3$)

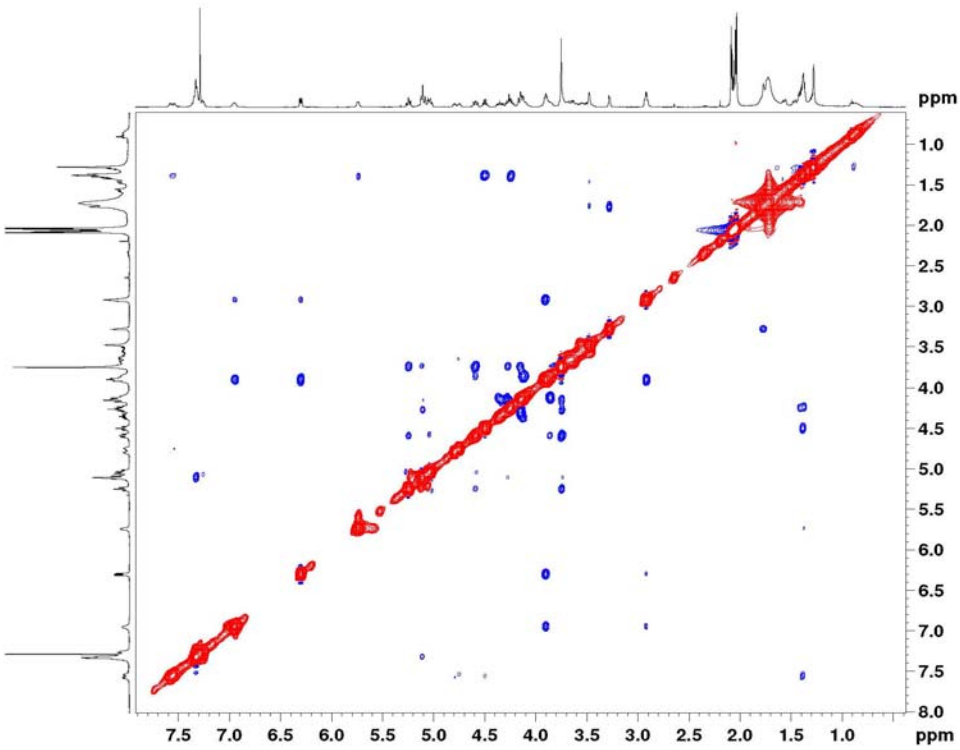




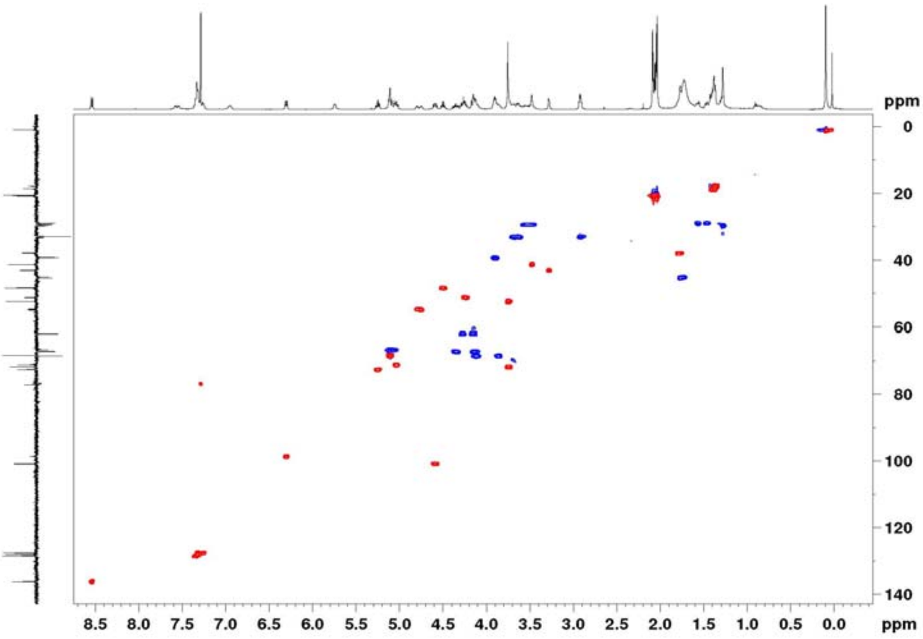
Partial TOCSY spectra of Fraction 1 (500.13 MHz, $CDCl_3$)

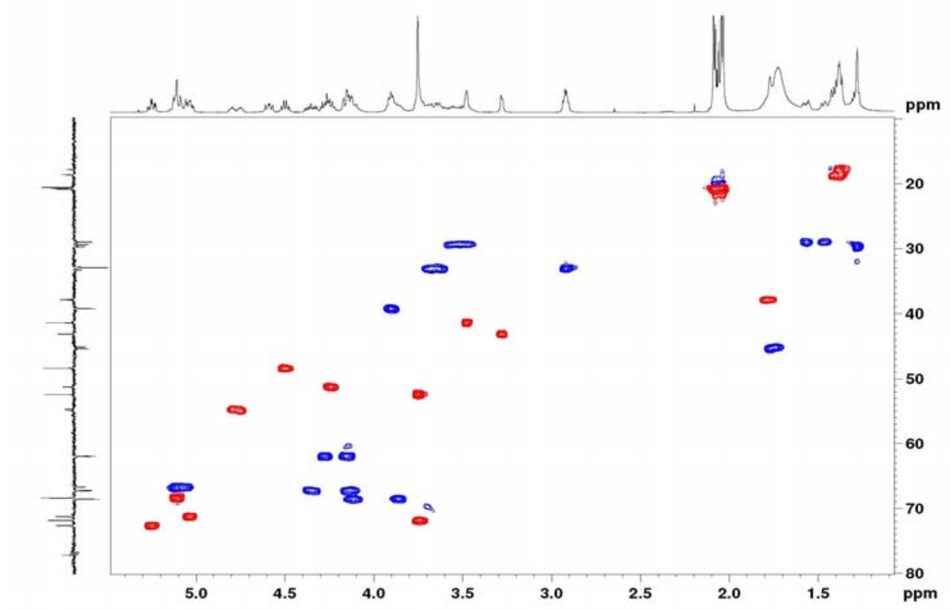


Partial NOESY spectra of Fraction1 (500.13 MHz, $CDCl_3$)

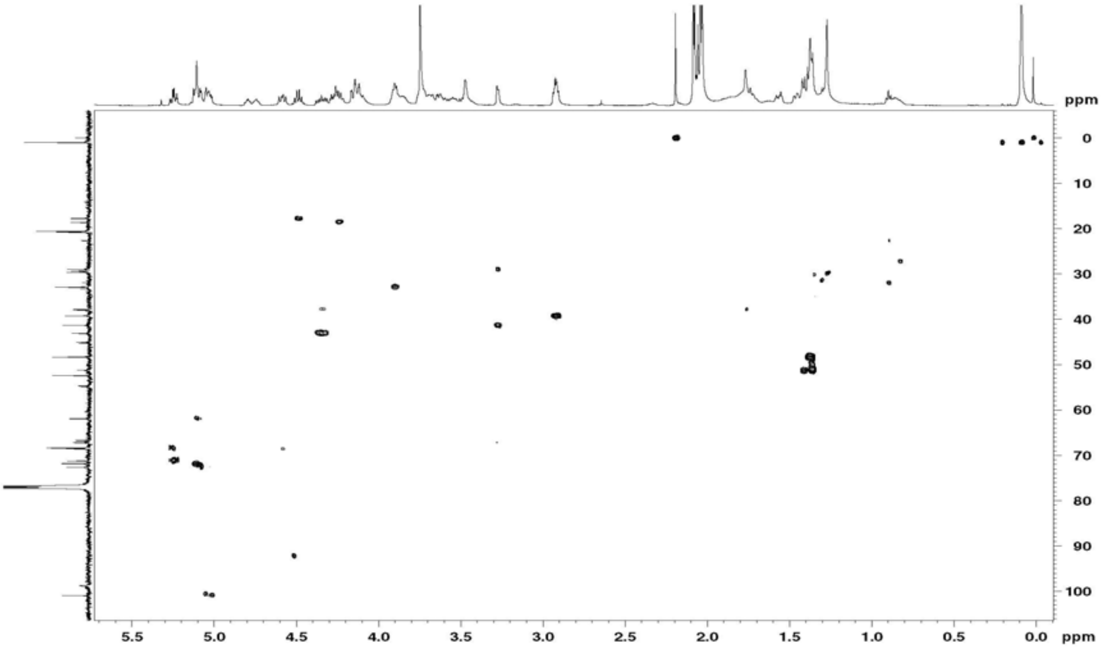


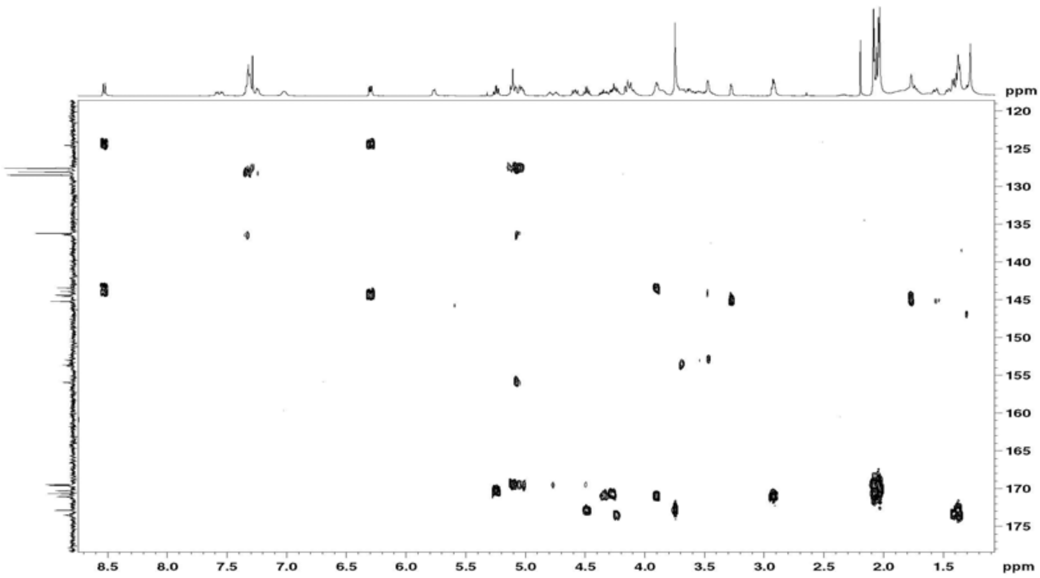
Partial HSQC spectra of Fraction1 (500.13 MHz for ^{1}H and 125.76 MHz for ^{13}C, $CDCl_3$)



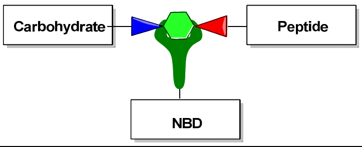


Partial HMBC spectra of Fraction1 (500.13 MHz for ^{1}H and 125.76 MHz for ^{13}C, $CDCl_3$)

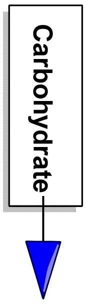


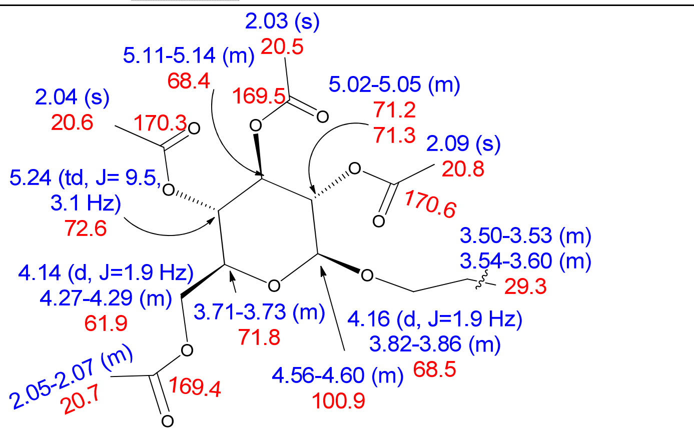


Spectral Data of Fraction 1

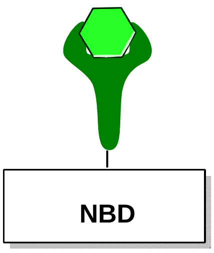


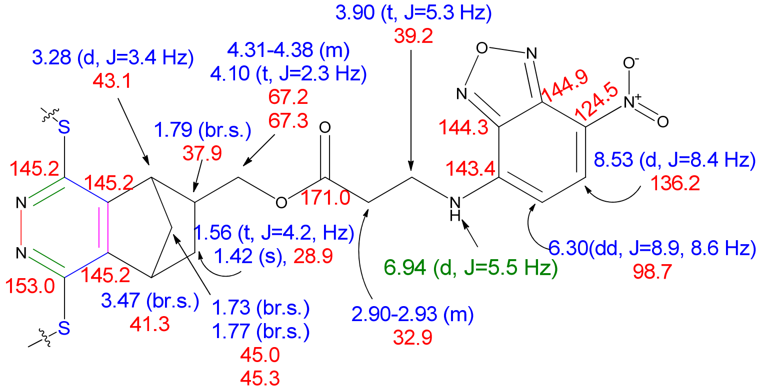
Carbohydrate Moiety



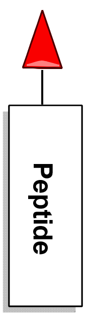


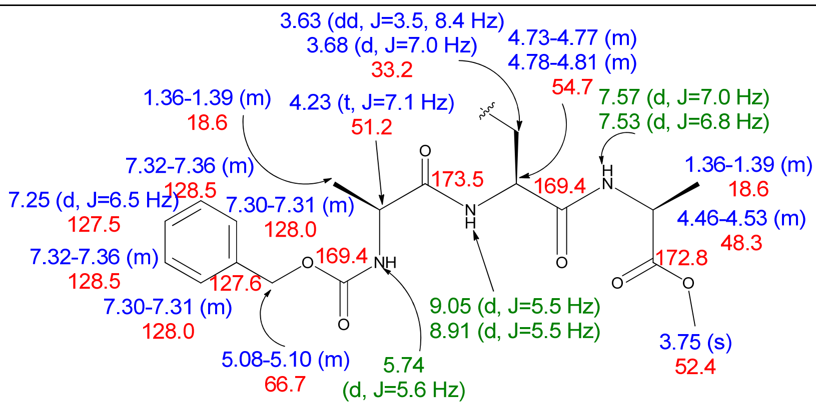
Central Tetrazine core and NBD moiety





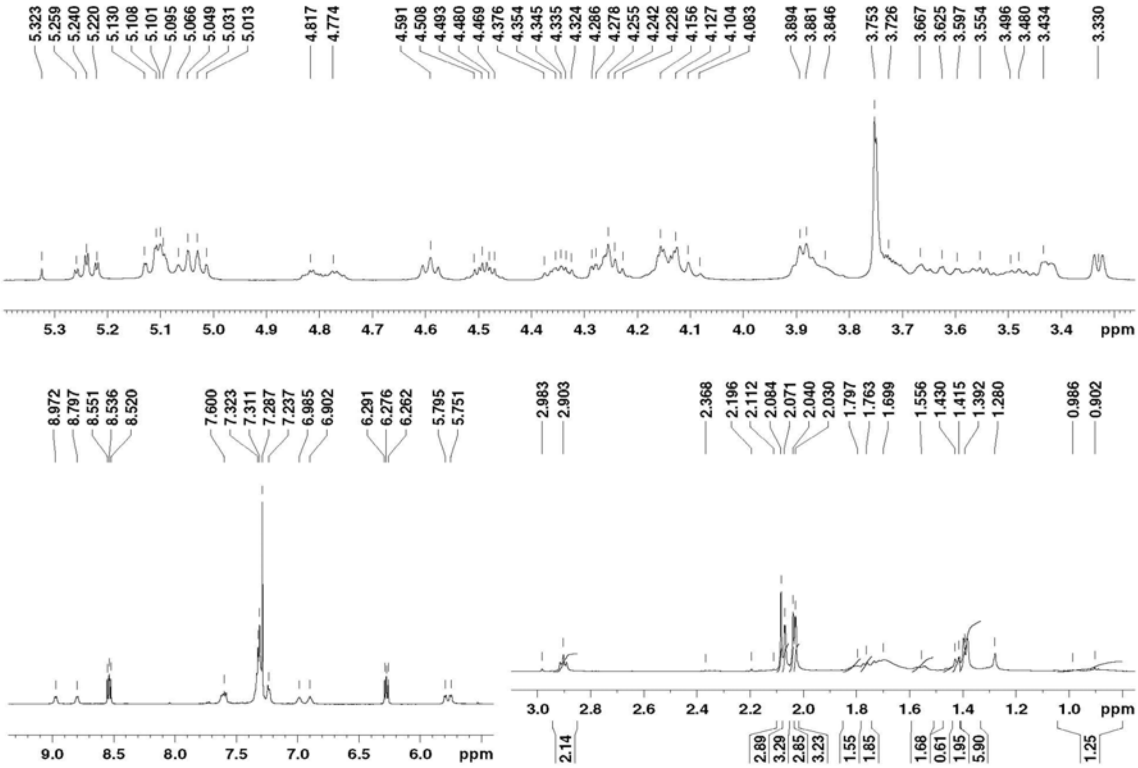
Peptide Moiety



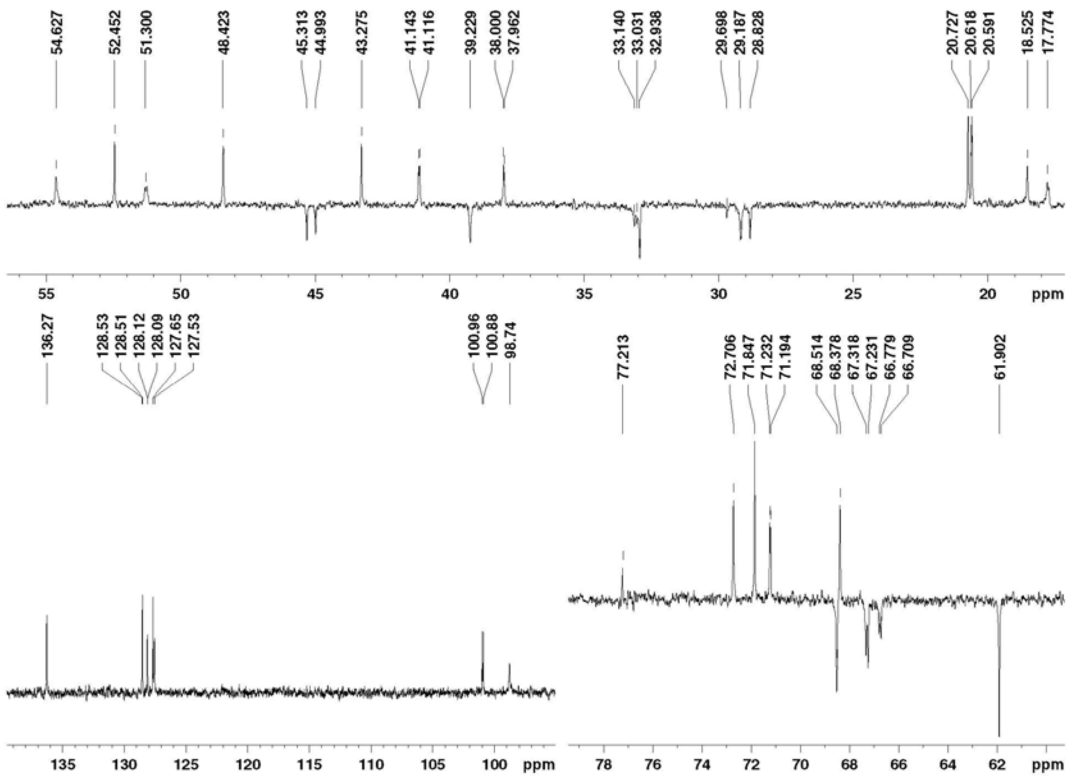


We could not conclusively assign further the position of sugar and peptide moiety relative to the fluorescent NBD moiety due to poor HMBC Correlations.

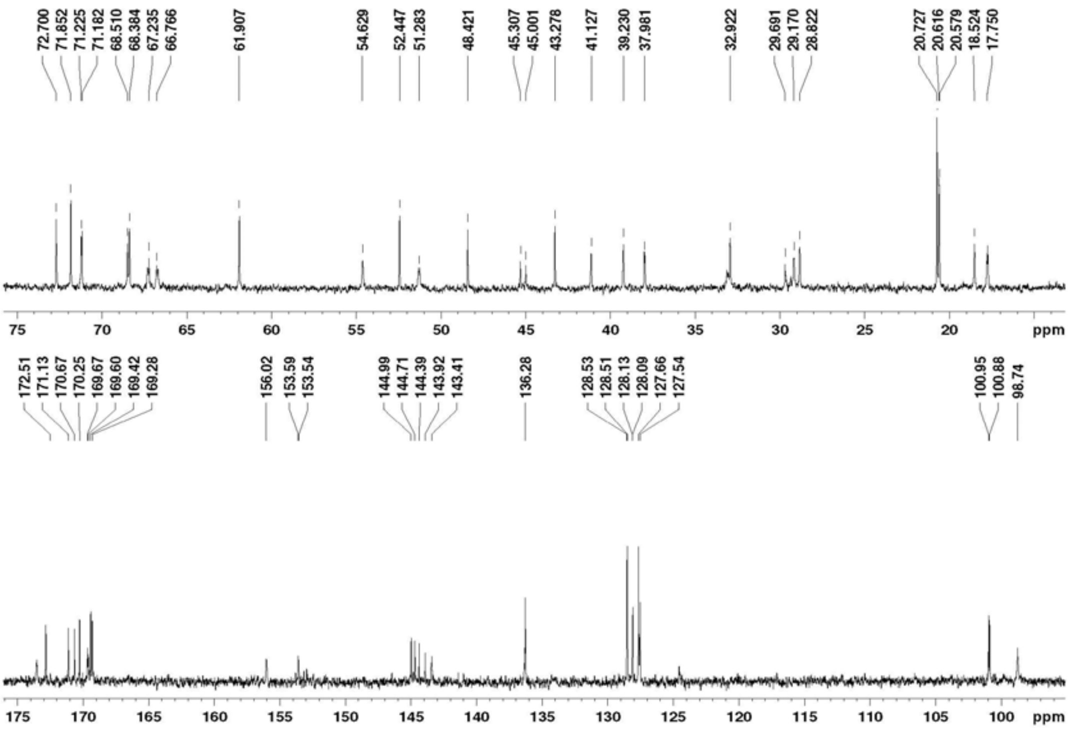
[1]H NMR Spectrum (500.13 MHz, $CDCl_3$) of Compound **14** (Fraction 2)



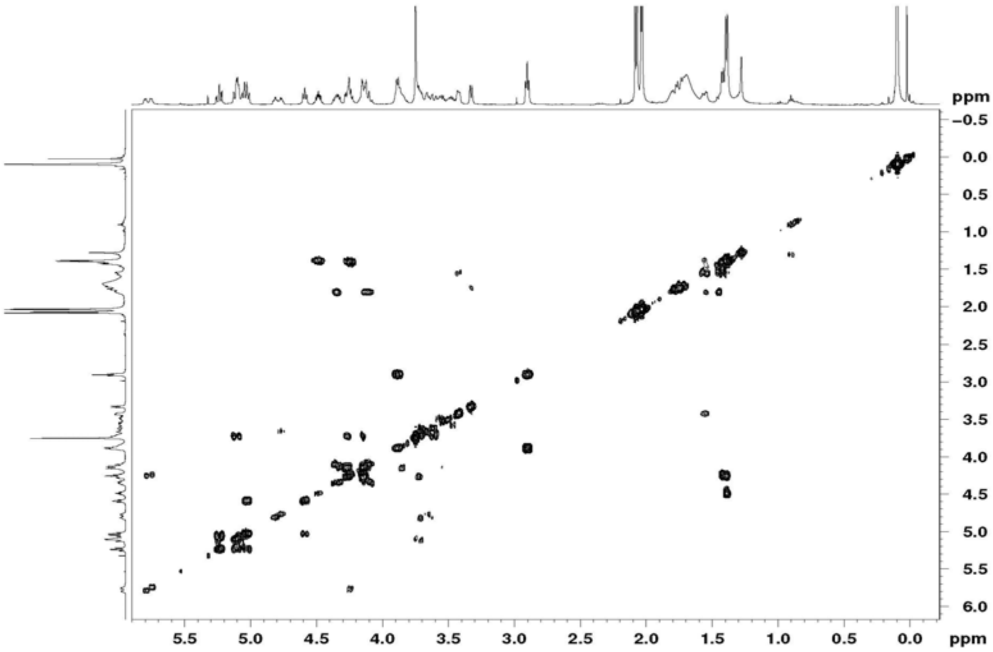
DEPT NMR Spectrum (125.76 MHz, $CDCl_3$) of Compound **14** (Fraction 2)

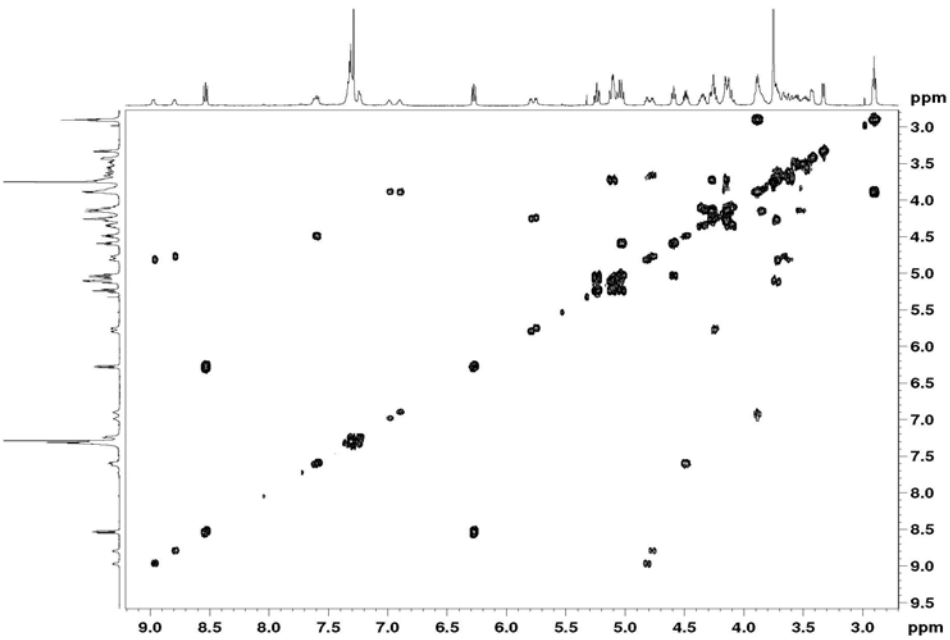


^{13}C NMR Spectrum (125.76 MHz, $CDCl_3$) of Compound **14** (Fraction 2)

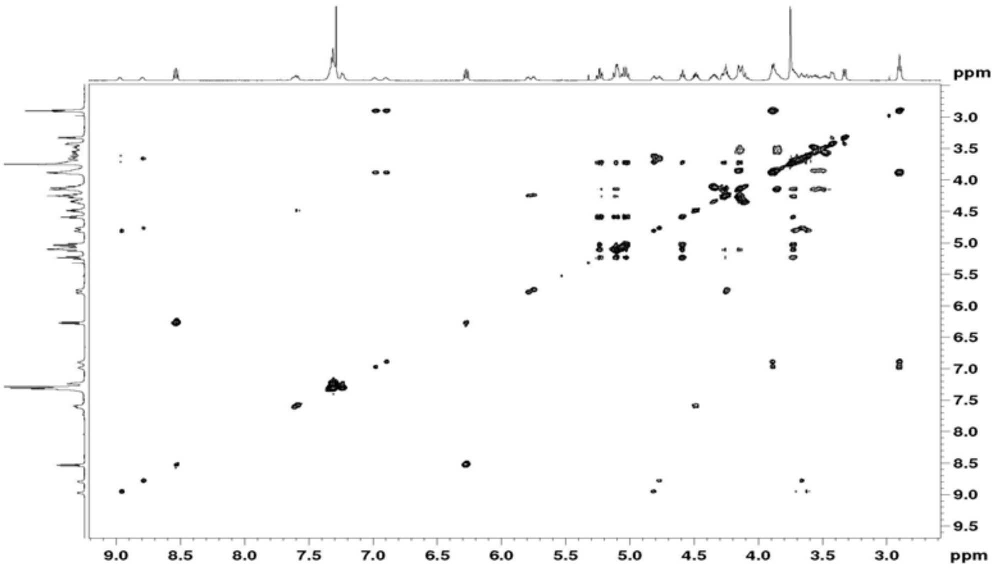


Partial COSY spectra of Fraction 2 (500.13 MHz, $CDCl_3$)

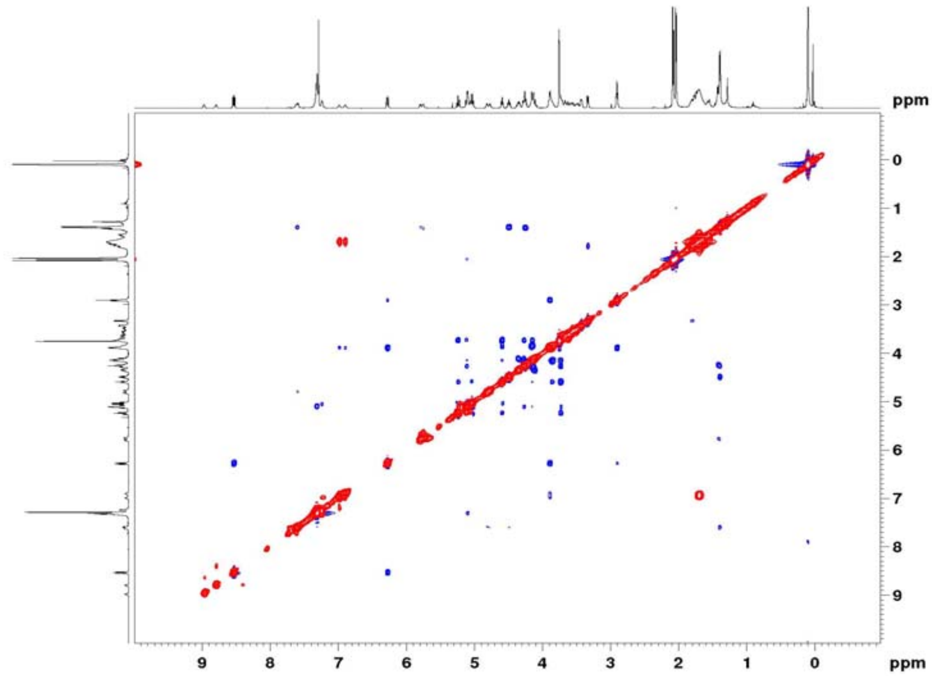


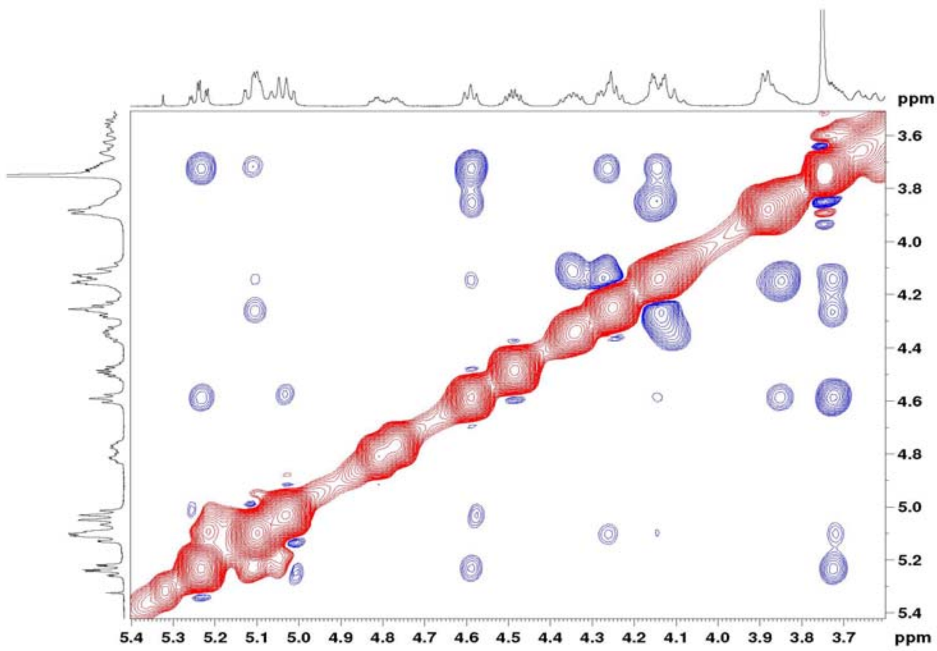


Partial TOCSY spectra of Fraction 2 (500.13 MHz, $CDCl_3$)

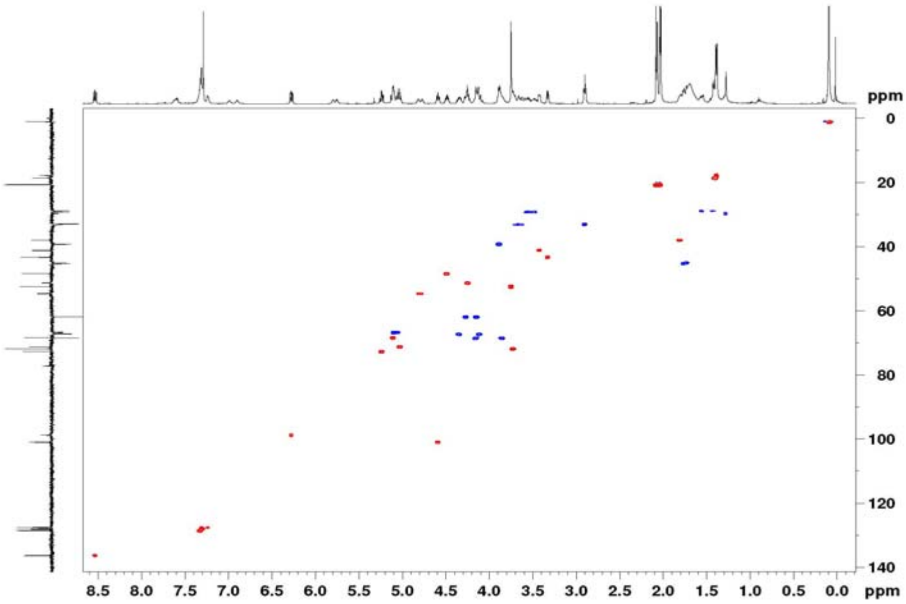


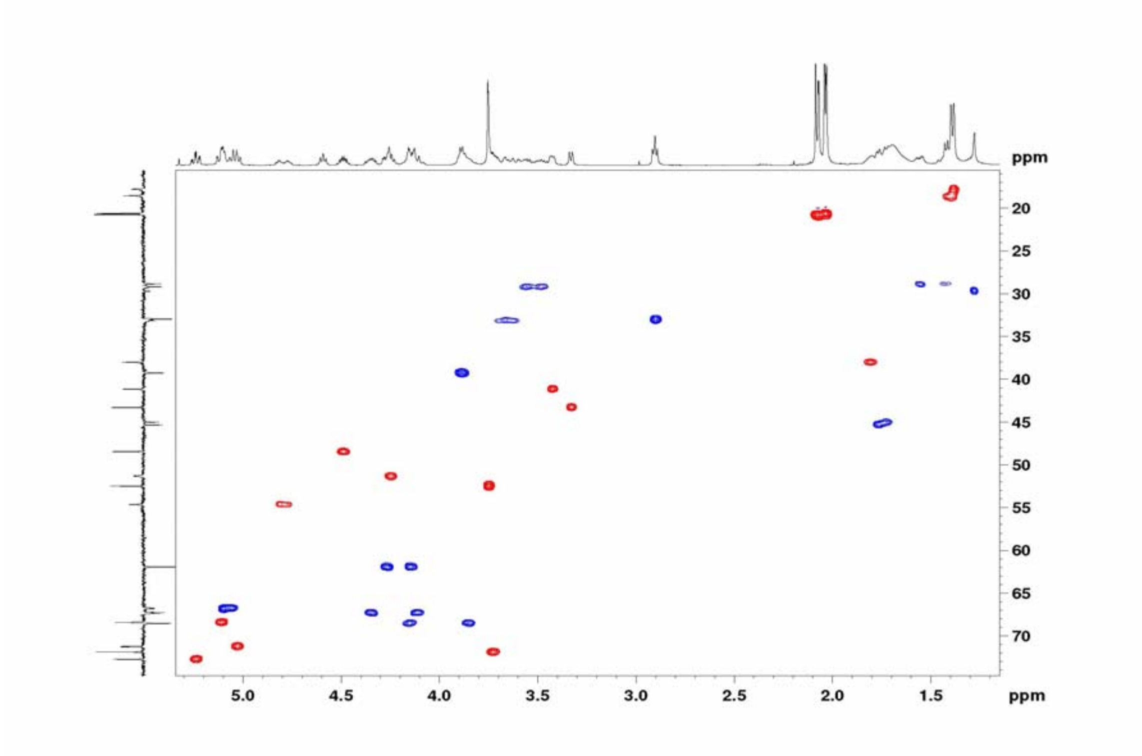
Partial NOESY spectra of Fraction 2 (500.13 MHz, $CDCl_3$)



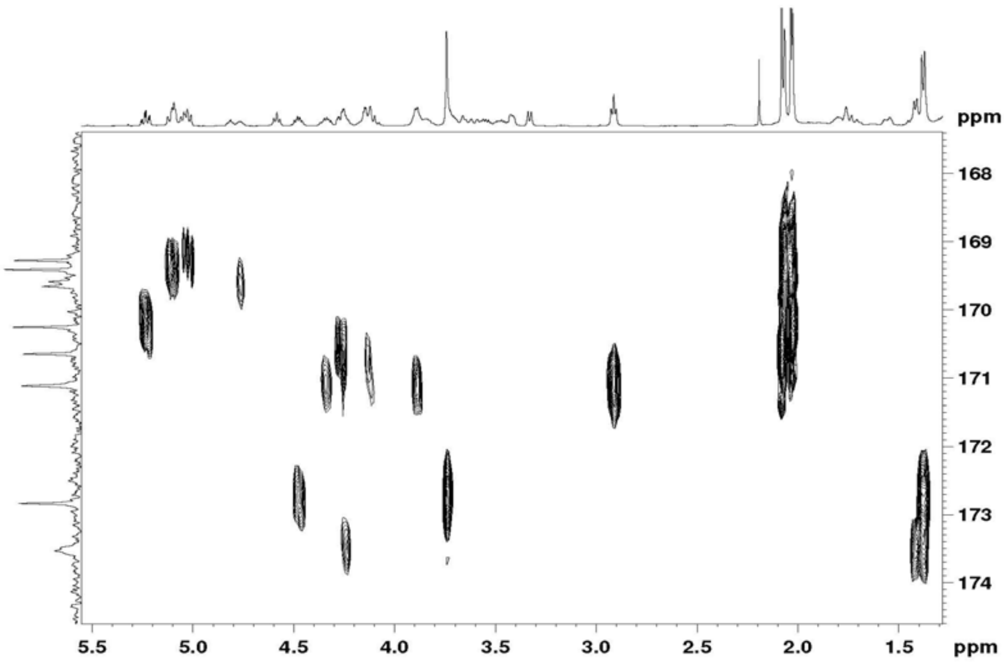


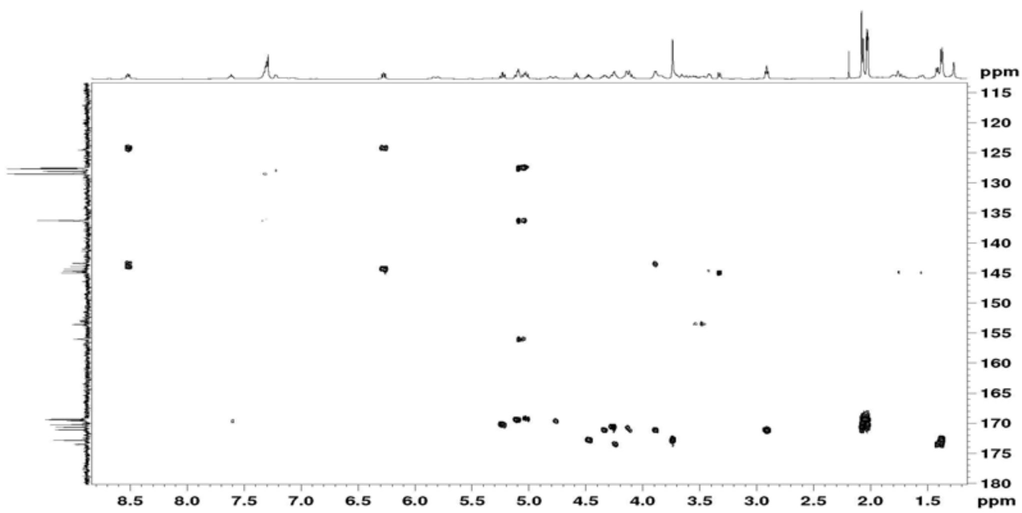
Partial HSQC spectra of Fraction 2 (500.13 MHz for ^{1}H and 125.76 MHz for ^{13}C, $CDCl_3$)





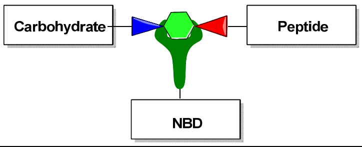
Partial HMBC spectra of fraction 2 (500.13 MHz for ^{1}H and 125.76 MHz for ^{13}C, $CDCl_3$)





Electronic Supplementary Material (ESI) for Chemical Communications

Spectral Data of Fraction 2



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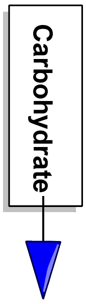
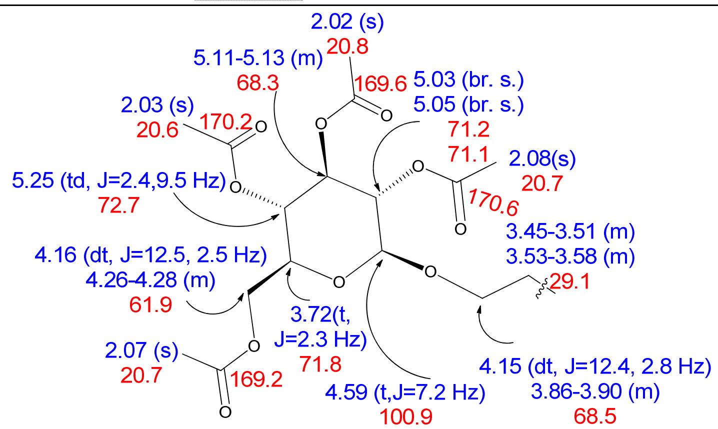
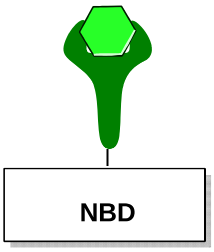
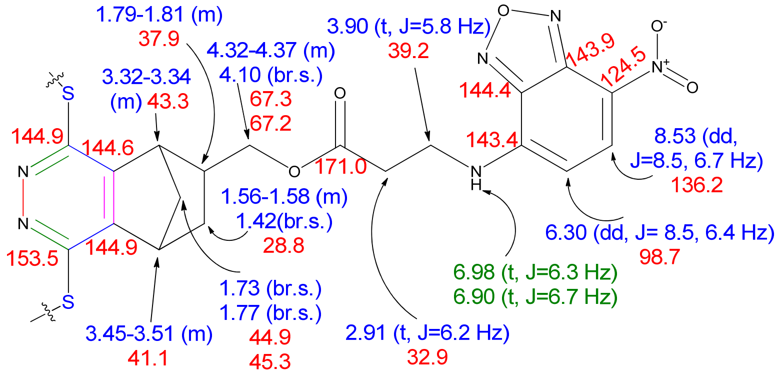
</td><td></td></tr>
<tr><td>Central Tetrazine core and NBD moiety
</td><td></td></tr>
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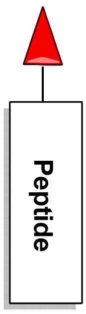
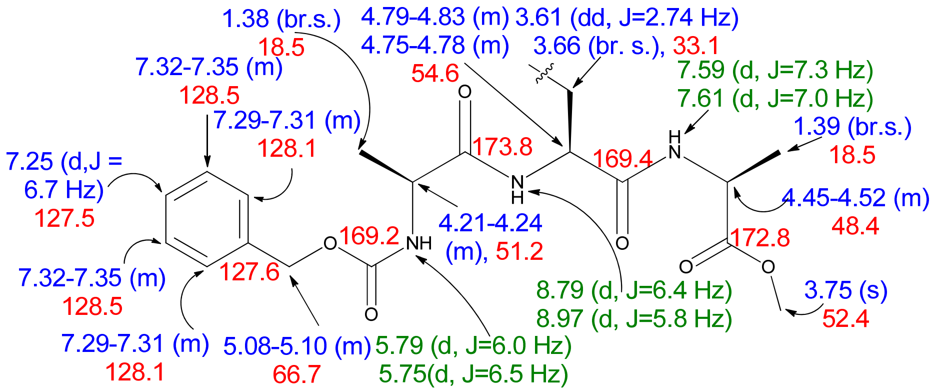
</td><td></td></tr>
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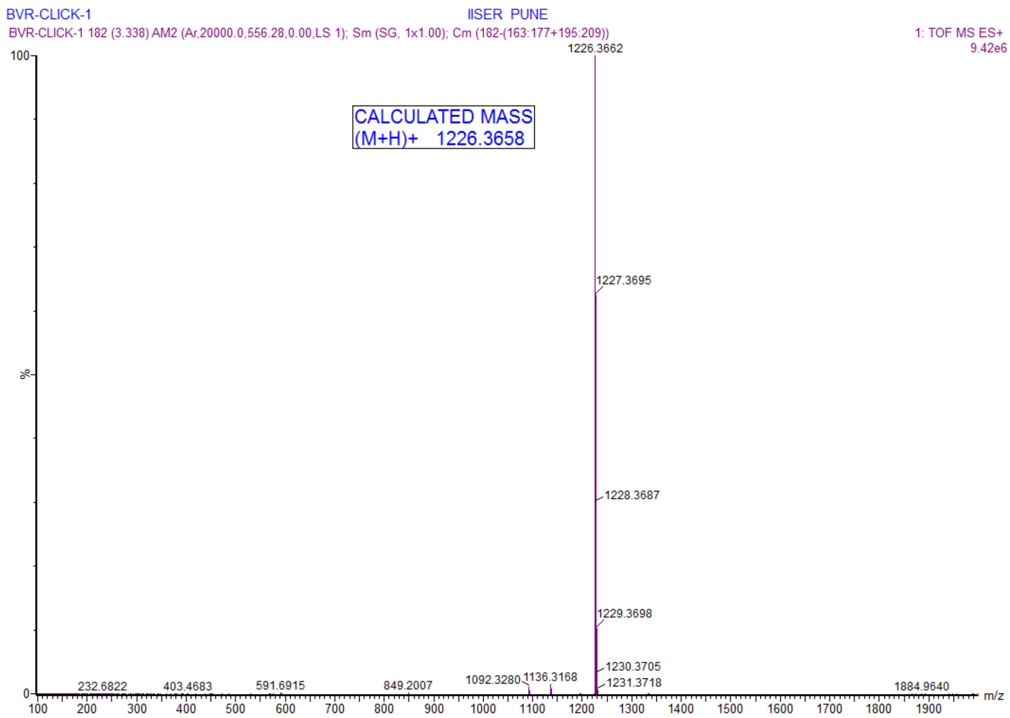
We could not conclusively assign further the position of sugar and peptide moiety relative to the fluorescent NBD moiety due to poor HMBC Correlations.

HRMS spectrum of Ternary Conjugate **14**



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