Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry.

Supplementary Information

Synthesis and characterization of pentaerythritol derived glycoconjugates as supramolecular gelators

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Gel characterization method

Optical Microscopy: A small amount of gels was placed on a clean glass slide and this was observed under an Olympus BX60M optical microscope and the Olympus DP73-1-51 high performance 17MP digital camera with pixel shifting and Peltier cooled. The imaging software for image capturing is CellSens 1.11.

Gel Testing: About 2 mg of dried compound was transferred to a 1 dram glass vial and the corresponding solvent was added to obtain a concentration of 20 mg/mL. The mixture was then heated until the solid was fully dissolved, sometimes sonication was needed to dissolve the sample, and then the solution was allowed to cool to room temperature and left standing for 30 minutes. If a stable gel formed (observed by inverting the vial), it was then serially diluted till the minimum gelation concentration (MGC), which is the concentration prior to unstable gelation, was obtained.

Rheological Analyses: The rheological behavior of the gel was studied using an HR-2 Discovery hybrid rheometer from TA Instruments with TRIOS software. A sample (approximately 1mL of the gel) was placed on the steel plate of the rheometer. The cone geometry is a 25 mm Peltier plate with a gap of 100 μm. The experimental temperature was 25 °C, and the sample was subjected to amplitude sweep for oscillation strain from 0.125 to 10%. A frequency sweep was then performed for the sample in the range of 0.1 to 100 rad/s for the angular frequency. The results were expressed as the storage modulus (G') and loss modulus (G'') as a function of angular frequency.

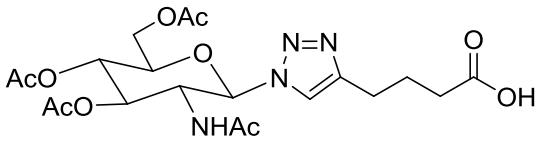
Drug trapping and release: A hydrogel was prepared in a 1 dram vial using 10 mg of compound **21** and corresponding drugs with 1 mL of H_2O, after a stable gel was formed and the gel was left

undisturbed for 2 hours, 2 mL of water at pH 7 or 10 was added to the top of the gel carefully. Drug release from the gel was monitored by UV absorption or Fluorescence at certain time by transferring the supernatant with a pipet to a cuvette, after each measurement the aqueous phase was carefully transferred back to the vial and placed on top of the gel again till the next measurement. The gel for naproxen release study was prepared using 10 mg gelator and 0.5 mg naproxen. The gel of vitamin B_2 was using 10 mg gelator and 0.1 mg vitamin B_2 in 1 mL water; and the vitamin B_{12} gel was prepared using 10 mg gelator and 0.3 mg vitamin B_{12}.

*Synthesis, characterization data and gelation test result for compound **1***

Compound (100 mg, 0.268 mmol, 1 equiv.) was dissolved in 2 mL solvent mixture of EtOH:water (v/v 1:1). To this solution, 5-Hexynoic acid (0.036 mL, 36 mg, 0.322 mmol, 1.2 equiv.) was added. $CuSO_4$ pentahydrate (13.4 mg, 0.054 mmol, 0.2 equiv.) and sodium L-ascorbate (21.4 mg, 0.108 mmol, 0.4 equiv.) were added to the reaction mixture and the reaction was stirred for 6 hours at 40 °C. The solvent was removed under reduced pressure. DCM (3 mL) and H_2O (2 mL) were added to the crude product. Precipitate was observed and filtered via vacuum filtration to obtain white solid (124 mg, 0.256 mmol, 89 %) as the desired product. ^{1}H NMR (400 MHz, $CDCl_3$ + d_4-MeOH) δ 7.64 (s, 1H), 5.87 (d, J = 9.9 Hz, 1H), 5.33 (t, J = 9.9 Hz, 1H), 5.17 (t, J = 9.7 Hz, 1H), 4.51 (t, J = 10.1 Hz, 1H), 4.29-4.21 (m, 1H), 4.15-4.06 (m, 1H), 4.00-3.92 (m, 1H), 2.84-2.68 (m, 2H), 2.34-2.24 (m, 2H), 2.09-1.92 (m, 11H), 1.71 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$ + d_4-MeOH) δ 171.4, 170.8, 170.7, 169.4, 120.2, 85.9, 74.8, 72.4, 68.0, 61.7, 53.1, 33.0, 24.6, 24.2, 22.3, 20.6, 20.4.

Gelation test result of compound **1** is shown in the table below.



1

Tol	EtOH	i-PrOH	n-PrOH	n-BuOH	Glycerol	EtOH: H_2O (1:2)	EtOH: H_2O (1:1)	DMSO: H_2O (1:2)	DMSO :H_2O (1:1)	H_2O	Ethylene glycol	Triethylene glycol	Hexane
I	P	P	S	S	S	P	P	S	S	P	S	S	I

I, insoluble; P, crystallize or precipitate; S, soluble at ~20 mg/mL.

*General procedure for the synthesis of tetrameric compounds **13**, **14**, **15**, **19***

To a 50 mL round bottomed flask, azide (4.4 equiv.) and tetra-alkyne (1 equiv.) were dissolved in 9 mL of solvent mixture of *t*-BuOH: H_2O: THF (v/v/v = 1:1:1). $CuSO_4$ (0.8 equiv.) and L-ascorbic acid sodium salt (1.6 equiv.) were added to the reaction mixture. Reaction was stirred for 24 hours at room temperature. Solvent was removed under reduced pressure to give the crude, which was purified by column chromatography using pure DCM to 5% MeOH/DCM as the eluent to afford the desired tetrameric compounds **13**, **14**, **19**. Synthesis of tetramer **13** and **19** were carried out through above-mentioned procedure using 200 mg of azide as the starting material. Yields for synthesizing tetramer **13** and **19** are 81% and 83% respectively. Compound **15** was synthesized using CuI method and the detailed procedure of synthesis is shown below.

Synthesis of tetrameric galactosyl triazole derivative 15

To a 50 mL round bottomed flask, compounds **7** (160 mg, 0.431 mmol, 4.4 equiv.) and **8** (50 mg, 0.098 mmol, 1 equiv.) were dissolved in 6 mL of solvent mixture of THF:toluene (1:1). CuI (7.6 mg, 0.040 mmol, 0.4 equiv.) and DIEA (0.068 mL, 0.392 mmol, 4 equiv.) were added to the

reaction mixture. Reaction was stirred at 80 °C for 36 hours. Solvent was removed under reduced pressure to give the crude, which was then purified by column chromatography using eluent from 1% MeOH/DCM to 5% MeOH/DCM to afford off-white solid (147 mg, 0.073 mmol, 75%) as the desired product (R_f = 0.5 in 5% MeOH/DCM). *Characterizations are included in the main text.*

*Synthesis of dimeric compound **20** and trimeric compound **21***

Synthesis of dimeric glucosamine triazole conjugate **20** and trimeric glucosamine triazole conjugate **21** are depicted in Schemes 3 and 4. Benzylidene acetal protected diol **22** and trityl protected triol **25** were prepared following literature method with slight modifications using pentaerythritol as the starting material.[3, 4]

Synthesis of benzylidene acetal protected di-alkyne 23

To a 50 mL round bottomed flask, compound **22**[3] (1.50 g, 6.69 mmol, 1 equiv.) was mixed with anhydrous DMF (5 mL) and then the mixture was cooled to 0 °C in an ice bath. To the mixture, NaH (60% dispersion in mineral oil, 803 mg, 20.07 mmol, 3 equiv.) was added portion-wise and the mixture was stirred at 0 °C for 30 minutes. Propargyl chloride (1.85 mL, 16.73 mmol, 2.5 equiv.) was added and then the mixture was allowed to warm to room temperature and stirred overnight. The reaction mixture was poured into a mixture of water (5 mL) and EtOAc (30 mL). Then the mixture was transferred to a separatory funnel. The aqueous phase was washed twice with EtOAc (30 mL x 2). The combined organic phase was dried (over anhydrous Na_2SO_4), filtered, and concentrated to give the crude, which was purified by column chromatography using eluent from pure hexanes to 10% EtOAc/hexanes to afford the colorless oil (1.81 g, 5.99 mmol, 90%) as the product (R_f = 0.55 in 20% EtOAc/hexanes). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53-7.46

(m, 2H), 7.41-7.33 (m, 3H), 5.44 (s, 1H), 4.21 (d, J = 2.4 Hz, 2H), 4.15-4.09 (m, 4H), 3.93-3.86 (m, 4H), 3.38 (s, 2H), 2.44, 2.43 (2 overlapping triplets, J = 2.4 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 138.3, 128.9, 128.3, 126.1, 101.8, 79.9, 79.5, 74.5, 74.2, 69.9, 69.8, 68.7, 58.77, 58.75, 38.5; LC-MS (ESI+) $[M+H]^+$ calcd for $C_{18}H_{21}O_4$ 301.1, found 301.1.

Synthesis of di-alkyne 24

To a 50 mL round bottomed flask, compound **23** (150 mg, 0.500 mmol, 1 equiv.) was added with 2 mL of acetic acid and water mixture (v/v = 4:1). The mixture was heated at 50 °C for 3 hours. Solvent was removed under reduced pressure to give the crude product, which was purified by column chromatography using eluent from pure hexanes to 40% EtOAc/hexanes to yellowish oil (81 mg, 0.382 mmol, 76%) as the desired product. (R_f = 0.2 in 40% EtOAc/Hexanes). ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.15 (d, J = 2.4 Hz, 4H), 3.69 (s, 4H), 3.60 (s, 4H), 2.45 (t, J = 2.4 Hz, 2H), 2.29 (br s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 79.4, 74.8, 71.0, 64.4, 58.8, 44.9; LC-MS (ESI+) $[M+H]^+$ calcd for $C_{11}H_{17}O_4$ 213.2, found 213.2.

Synthesis of dimeric compound 20

To a 50 mL round bottomed flask, compound **5** (232 mg, 0.623 mmol, 2.2 equiv.), intermediate **24** (60 mg, 0.283 mmol, 1 equiv.) were dissolved in a solvent mixture of *t*-BuOH: H_2O: THF (6 mL, v/v/v=1:1:1). Then $CuSO_4$ (18 mg, 0.113 mmol, 0.4 equiv.) and L-ascorbate sodium salt (45 mg, 0.226 mmol, 0.4 equiv.) were added to the mixture. The resulting mixture was heated at 50 °C and stirred for 2 hours. Solvent was removed under the reduced pressure to give the crude product, which was purified by column chromatography using eluent from pure DCM to 5%

MeOH/DCM to give white solid (227 mg, 0.237 mmol, 84%) as the desired product (R_f = 0.5 in 10% MeOH/DCM). *Characterization included in the main text.*

Synthesis of trityl protected tri-alkyne 26

To a 50 mL round bottomed flask, compound **25** [4](500 mg, 1.3 mmol, 1 equiv.) was mixed with anhydrous DMF (10 mL) and then the mixture was cooled to 0 °C in an ice bath for about half an hour. Sodium hydride (60% dispersion in mineral oil, 210 mg, 5.3 mmol, 4 equiv.) was added portion-wise and the mixture was stirred at 0 °C. Propargyl chloride (70 wt% in toluene, 1.0 mL, 9.1 mmol, 7.0 equiv.) was added to the reaction mixture and the mixture was stirred for half an hour at 0 °C and continued with stirring at r.t. for 8 h. The reaction mixture was quenched with ice water (~5 mL), then EtOAc (10 mL) was added to the mixture. The aqueous phase was extracted with EtOAc again (10 mL x 2). The combined organic phase was dried over anhydrous Na_2SO_4, filtered, and concentrated to obtain the crude product. The crude was purified by column chromatography using eluent from hexane to 35% EtOAc/hexanes to afford a light yellow solid (569 mg, 1.15 mmol, 89%) as the desired product. R_f = 0.5 in 15% EtOAc/hexanes, m.p. 65.0-67.0 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.51-7.45 (m, 6H), 7.35-7.28 (m, 6H), 7.27-7.22 (m, 3H), 4.08 (d, J = 2.4 Hz, 6H), 3.57 (s, 6H), 3.14 (s, 2H), 2.38 (t, J = 2.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 144.2, 128.9, 127.6, 126.8, 86.2, 80.1, 74.0, 68.9, 61.2, 58.6, 45.2; LC-MS (ESI+) $[M+Na]^+$ m/z calcd for $C_{33}H_{32}O_4$ 515.2, found 515.2.

Synthesis of trimeric intermediate 27

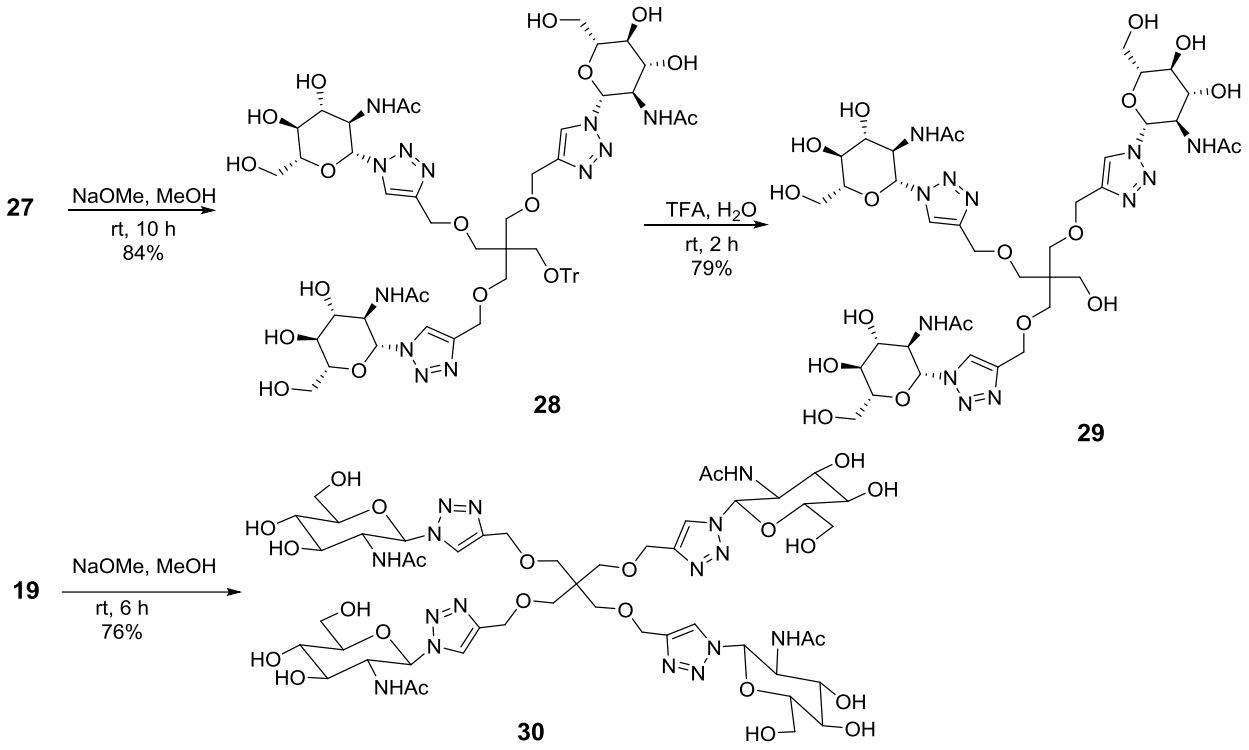
To a 50 mL round bottomed flask, compound **5** (264 mg, 0.709 mmol, 3.5 equiv.), alkyne **26** (100 mg, 0.203 mmol, 1 equiv.) were dissolved in a solvent mixture of *t*-BuOH: H_2O: THF (6 mL,

v/v/v=1:1:1). Then $CuSO_4$ (19.5 mg, 0.122 mmol, 0.6 equiv.) and L-ascorbate sodium salt (48.3 mg, 0.244 mmol, 1.2 eq) were added to the mixture. The resulting mixture was stirred at room temperature and for 20 hours. Solvent was removed under the reduced pressure to give the crude product, which was purified by column chromatography using eluent from 1% to 10% MeOH/DCM to give white solid (281 mg, 0.175 mmol, 86%) as the desired product (R_f = 0.58 in 10% MeOH/DCM). m.p. 141.0-143.0 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87 (br s, 3H), 7.45-7.14 (m, 18H), 6.40-6.04 (m, 3H), 5.71-5.46 (m, 3H), 5.30 (t, J = 9.3 Hz, 3H), 4.73-4.40 (m, 8H), 4.40-4.25 (m, 4H), 4.22-4.06 (m, 6H), 3.64-3.24 (m, 6H), 3.15-2.94 (m, 2H), 2.05 (s, 9H), 2.03 (s, 9H), 2.00 (s, 9H), 1.63 (br s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.1, 170.6, 170.4, 169.3, 144.0, 143.7, 128.6, 127.6, 126.8, 122.0, 86.1, 85.5, 74.8, 72.4, 68.4, 68.2, 64.3, 61.8, 60.4, 53.5, 45.5, 22.6, 20.6, 20.5; LC-MS (ESI+) $[M+Na]^+$ m/z calcd for $C_{75}H_{92}N_{12}O_{28}$ 1631.6, found 1631.6.

Synthesis of compound 21

To a 50 mL round bottomed flask, compound **27** (150 mg, 0.093 mmol, 1 equiv.) was dissolved in 3 mL of DCM, then 5 drops of TFA was added to the reaction mixture. After stirring at room temperature for 2 hours, 2 mL of $NaHCO_3$ (5 wt%) was added to neutralize the mixture. The mixture was transferred to a separatory funnel. Organic layer was dried over anhydrous Na_2SO_4 and concentrated to give the crude product, which was purified by column chromatography using eluent from 1% to 10% MeOH/DCM to afford white solid (114 mg, 0.083 mmol, 90 %) as the desired product (R_f = 0.42 in 10% MeOH/DCM). *Characterization included in the main text.*

*Synthesis, characterization data and gelation test result for compounds **29** and **30***



Scheme S1. Synthesis of deacetylated sugar triazole conjugates **29**-**30**.

Synthesis of trimeric free sugar triazole intermediate 28

To a scintillation vial, compound **27** (160 mg, 0.100 mmol, 1 equiv.) and NaOMe (6.3 mg, 0.12 mmol, 1.2 equiv.) were dissolved in MeOH (3 mL). Reaction was stirred at room temperature for 10 hours. Solvent was removed to give the crude, which was purified by column chromatography using eluent from pure DCM to 50% MeOH/DCM to afford white solid (103 mg, 0.084 mmol, 84%) as the desired product (R_f = 0.5 in 50% MeOH/DCM). ^{1}H NMR (400 MHz, D_2O) δ 7.96 (s, 3H), 7.23-7.00 (m, 6H), 6.91-6.57 (m, 9H), 5.81 (d, J = 8.9 Hz, 3H), 4.43-4.08 (m, 9H), 3.90-3.63 (m, 15H), 3.24 (s, 6H), 2.84 (s, 2H), 1.61 (s, 9H); ^{13}C NMR (100 MHz, D_2O) δ 173.5, 144.6, 143.8, 128.4, 127.7, 127.0, 123.6, 86.2, 86.0, 79.0, 73.8, 69.4, 68.5, 63.7, 61.5, 60.6, 55.3, 45.1, 21.9; LC-MS m/z calcd for $C_{57}H_{75}N_{12}O_{19}$ $[M+H]^+$ 1231.5, found 1231.5.

Synthesis of trimeric free sugar triazole conjugate 29

To a scintillation vial, compound **28** (30 mg, 0.024 mmol, 1 equiv.) was dissolved in 2 mL of H_2O. 2 drops of TFA was added to the reaction mixture. After stirring at room temperature for 2 hours, the reaction showed full conversion by the analysis of ^{1}H NMR spectrum. 2 mL of hexane was added to the mixture. Aqueous layer was dried to afford white solid (19 mg, 0.019 mmol, 79%) as the desired product. ^{1}H NMR (400 MHz, D_2O) δ 8.15 (s, 3H), 5.79 (d, J = 9.7 Hz, 3H), 4.60-4.42 (m, 6H), 4.21 (t, J = 9.9 Hz, 3H), 3.90-3.84 (m, 3H), 3.82-3.60 (m, 12H), 3.48-3.29 (m, 8H), 1.73 (s, 9H); ^{13}C NMR (100 MHz, D_2O) δ 174.0, 123.9, 86.4, 78.9, 73.6, 69.3, 68.6, 63.4, 60.5, 55.3, 44.8, 21.6; LC-MS m/z calcd for $C_{38}H_{60}N_{12}O_{19}Na$ $[M+Na]^+$ 1011.4, found 1011.4.

Synthesis of tetrameric free sugar triazole conjugate 30

To a scintillation vial, compound **19** (178 mg, 0.100 mmol, 1 equiv.) and NaOMe (7 mg, 0.120 mmol, 1.2 equiv.) were dissolved in MeOH (3 mL). Reaction was stirred at room temperature for 6 hours. Solvent was removed to give the crude which was added 3 mL of DCM and extracted by H_2O (5 mL × 2). Aqueous phase was dried to afford crude which was purified by column chromatography using eluent MeOH/DCM (5% to 30%) to afford white solid (96 mg, 0.076 mmol, 76%) as the desired product (R_f = 0.14 in 50% MeOH/DCM). ^{1}H NMR (400 MHz, D_2O) δ 8.14 (s, 4H), 5.82 (d, J = 9.7 Hz, 4H), 4.55-4.44 (m, 8H), 4.24 (t, J = 9.9 Hz, 4H), 3.93-3.87 (m, 4H), 3.83-3.67 (m, 16H), 3.34-3.30 (m, 8H), 1.74 (s, 12H); ^{13}C NMR (100 MHz, D_2O) δ 174.0, 144.4, 123.7, 86.3, 79.0, 73.6, 69.3, 68.1, 63.4, 60.5, 55.3, 44.6, 21.7; LC-MS m/z calcd for $C_{49}H_{76}N_{16}O_{24}$ $[M+H]^+$ 1273.5, found 1273.5.

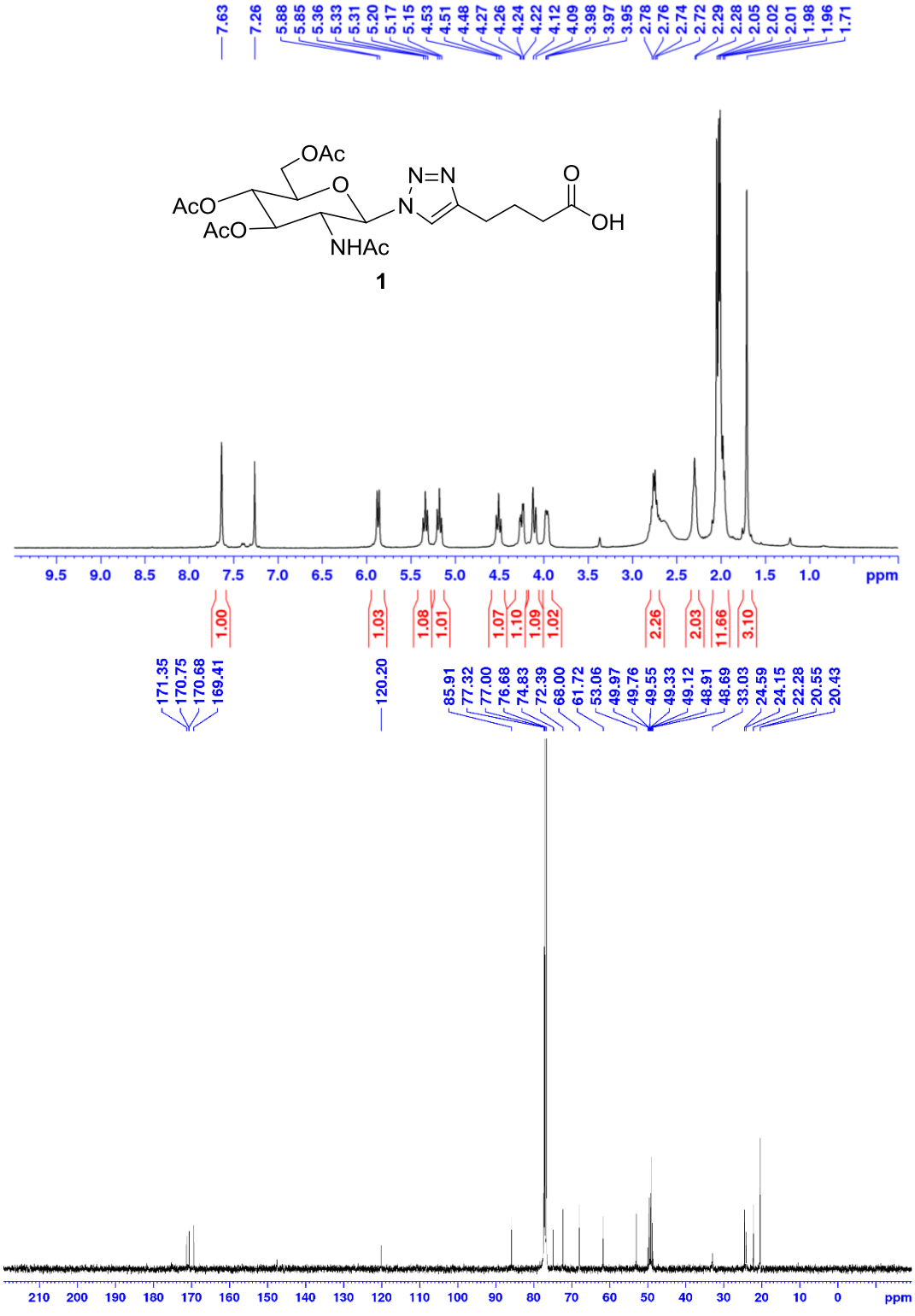
Table S1. Gelation test result of compounds **29** and **30**

Compound	Tol	EtOH	i-PrOH	n-PrOH	n-BuOH	EtOH: H_2O (1:2)	EtOH :H_2O (1:1)	DMSO :H_2O (1:2)	DMSO: H_2O (1:1)	H_2O	Hexane
29	I	S	S	S	S	S	S	S	S	S	I
30	I	I	I	I	I	S	S	S	S	S	I

References:

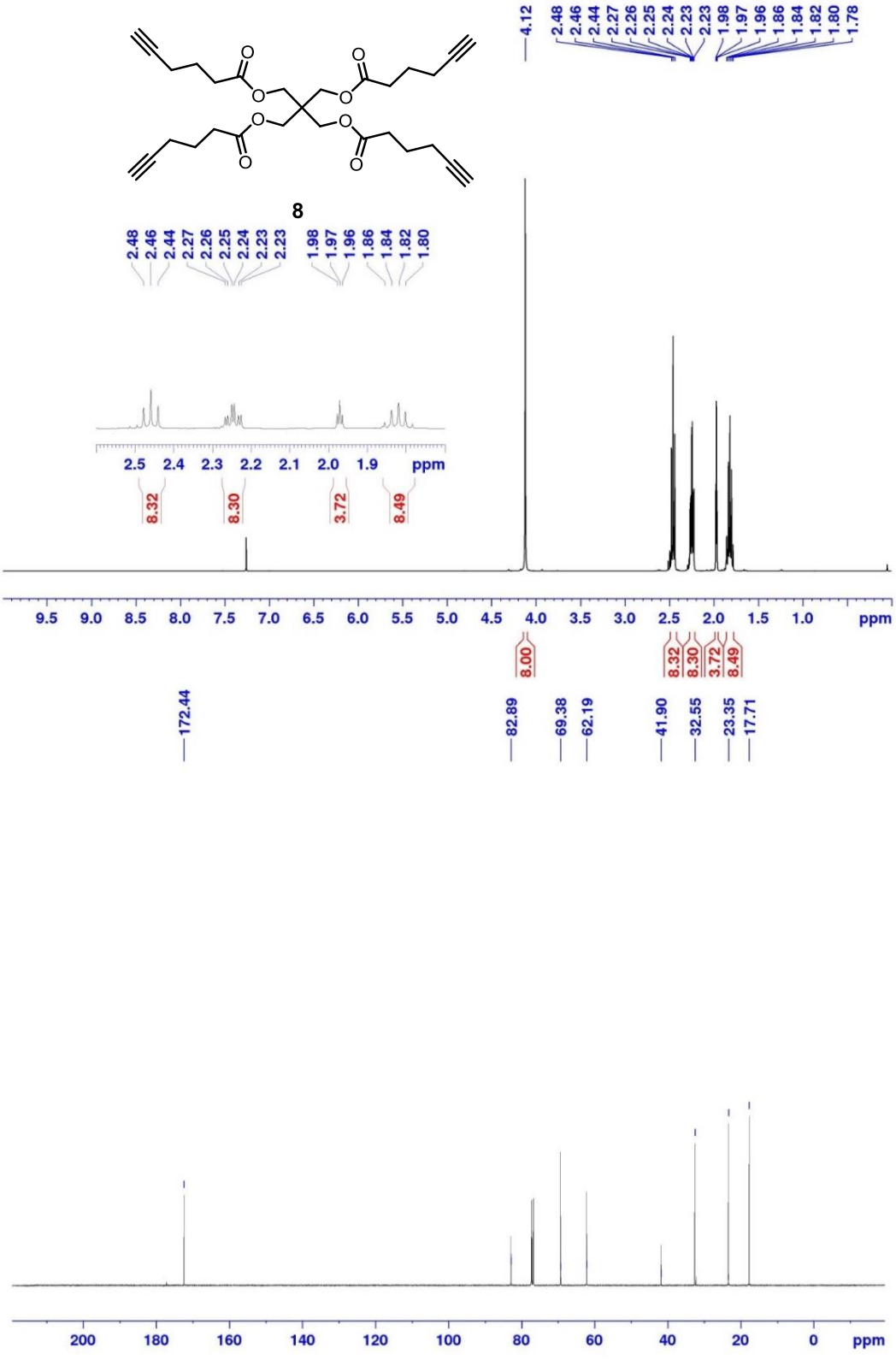
1. T. Lee, J. Oh, J. Jeong, H. Jung, J. Huh, T. Chang, H.-j. Paik, *Macromolecules* **2016**, *49*, 3672-3680.
2. Y. Chen, N. Xiao, M. Fukuoka, K. Yoshida, Q. Duan, T. Satoh, T. Kakuchi, *Polym. Chem.* **2015**, *6*, 3608-3616.
3. X. Fan, B. Huang, G. Wang, J. Huang, *Polymer* **2012**, *53*, 2890-2896.
4. I. Elkin, J.-M. Rabanel, P. Hildgen, *Macromol. Chem. Phys.* **2015**, *216*, 2356-2367.

^{1}H and ^{13}C NMR spectra for compound 1

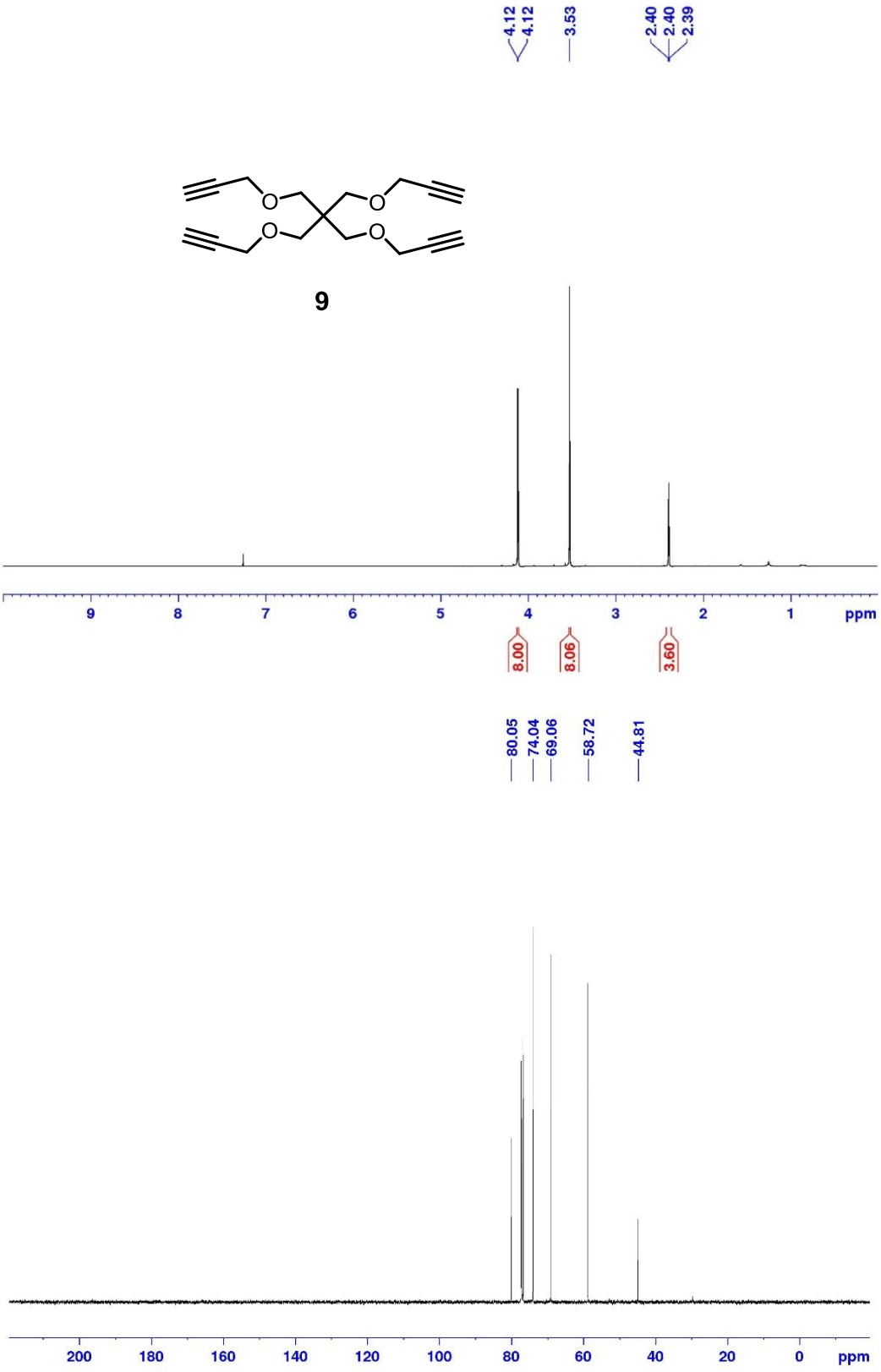


^{1}H NMR and ^{13}C NMR spectra of compound **1** in $CDCl_3$ + d_4-MeOH

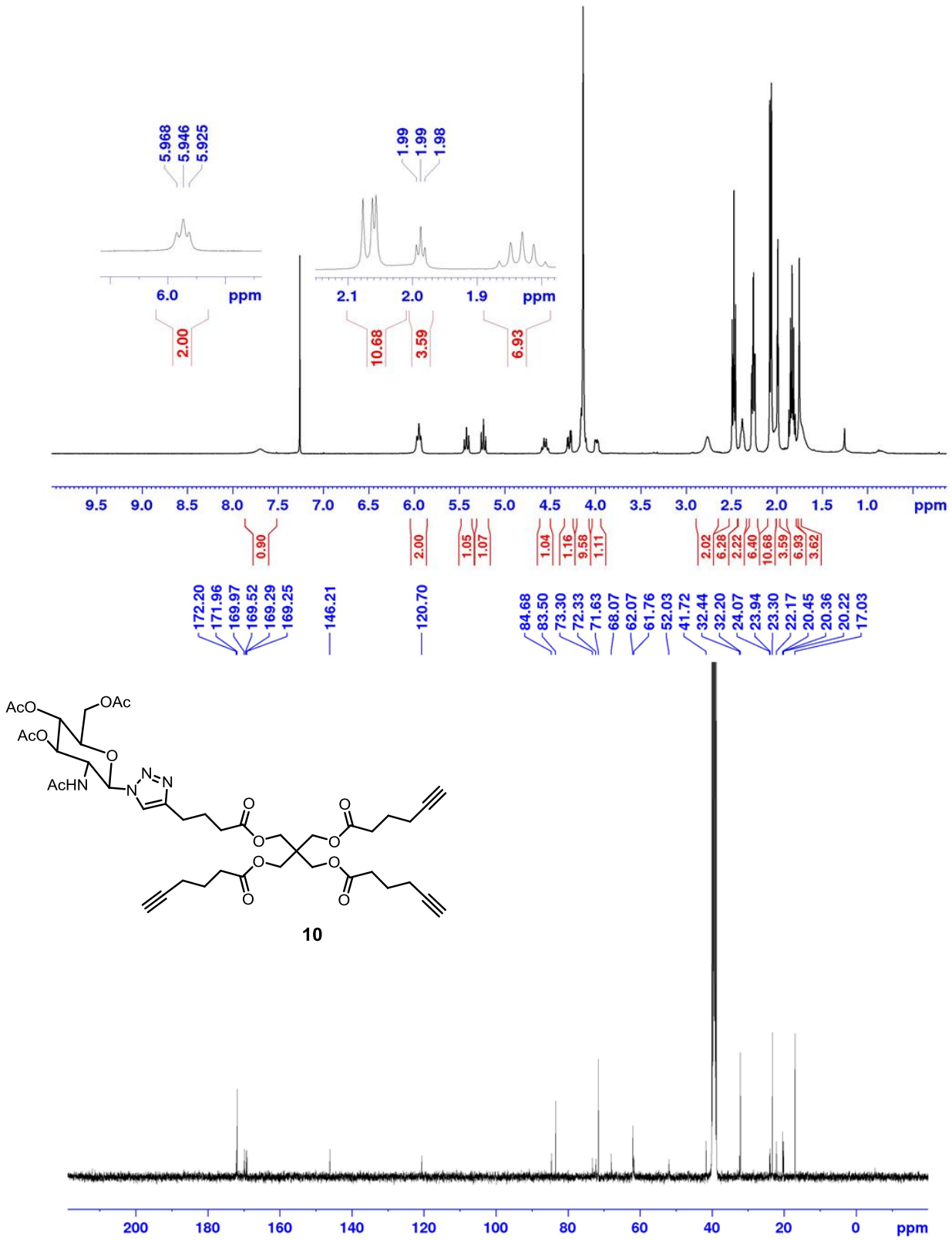
^{1}H and ^{13}C NMR spectra for compounds 8-30 and 2D NMR (HSQC and COSY) spectra for compounds 14, 15, 19, 20



^{1}H NMR and ^{13}C NMR spectra of compound **8** in $CDCl_3$

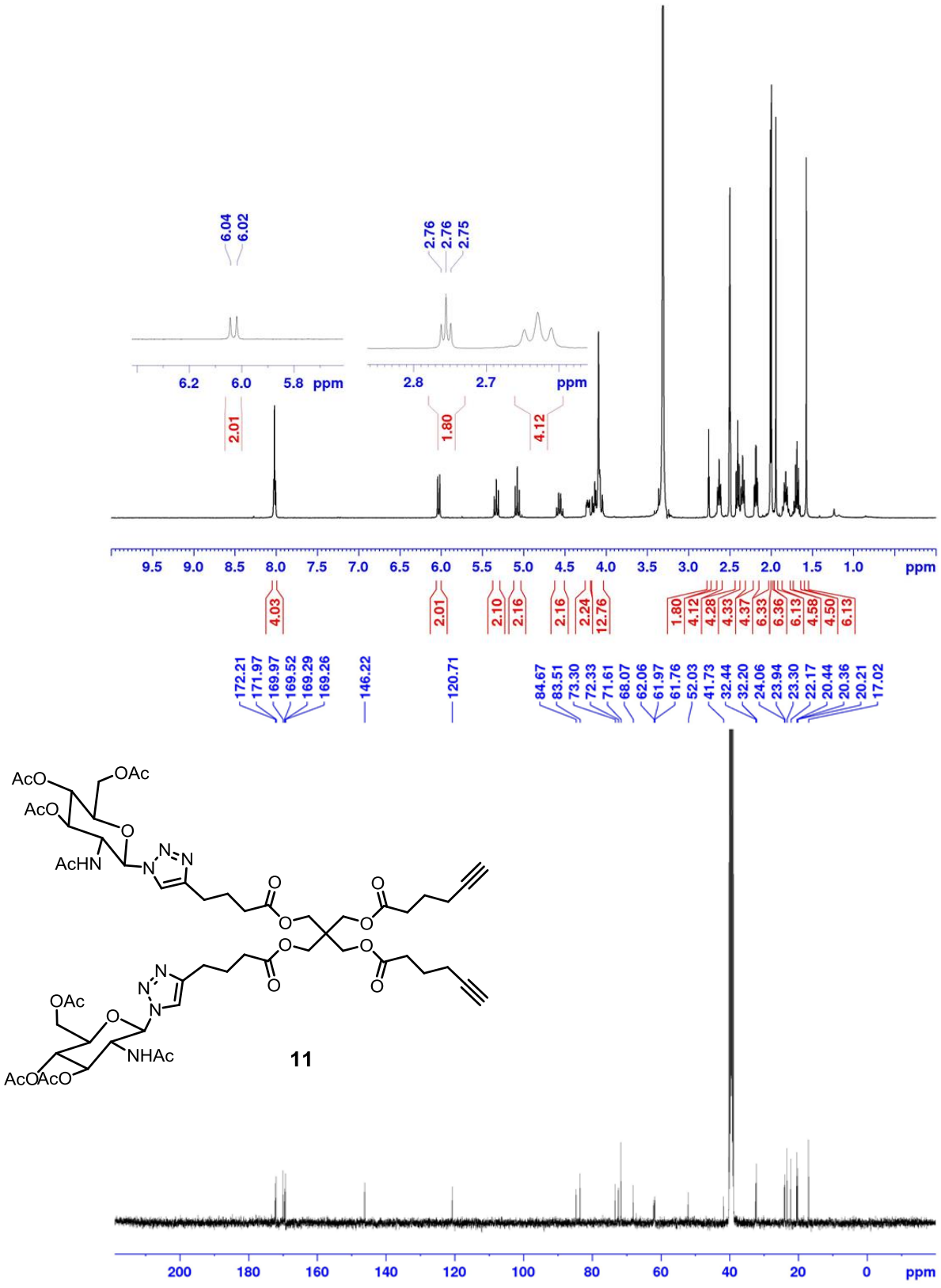


^{1}H NMR and ^{13}C NMR spectra of compound **9** in $CDCl_3$

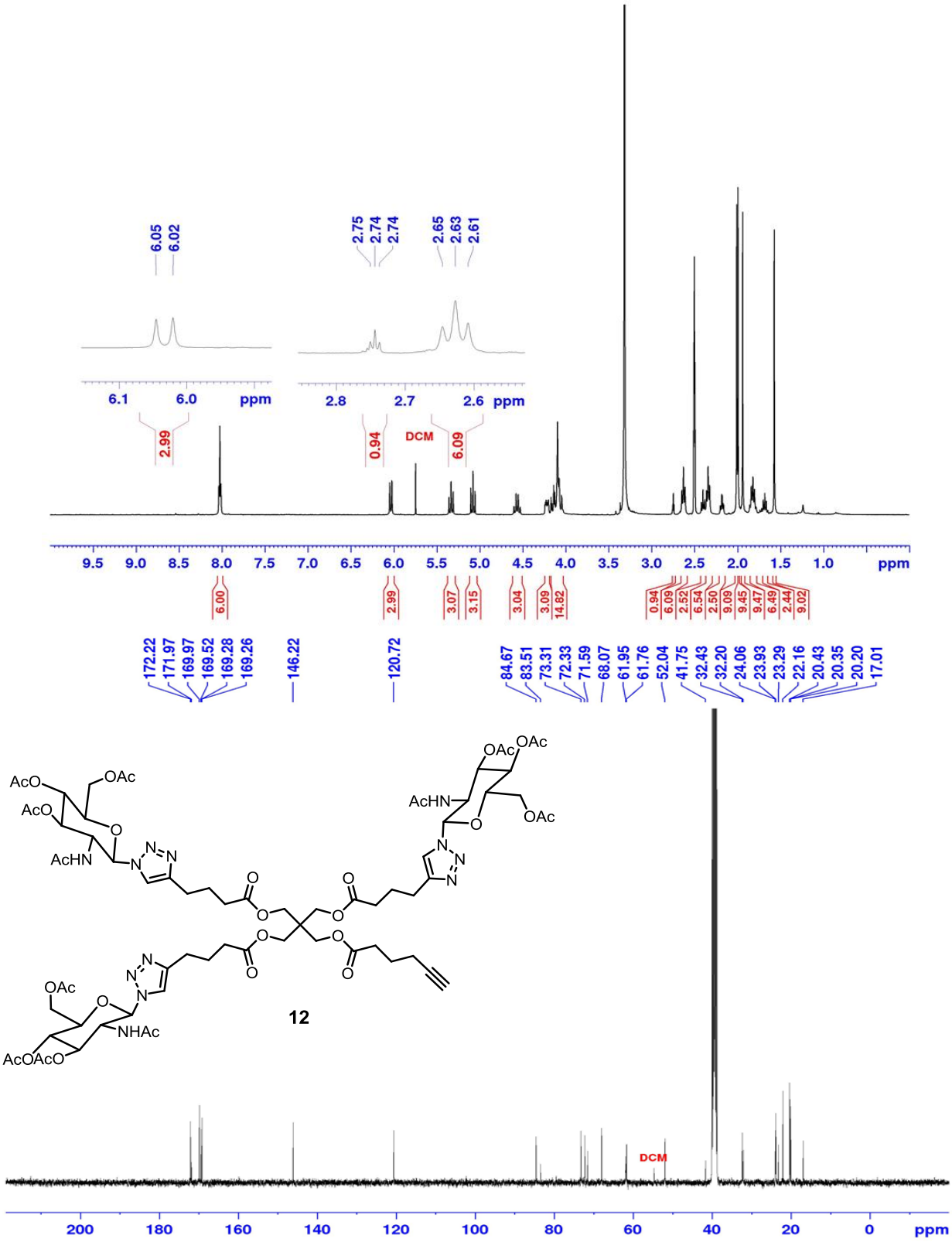


10

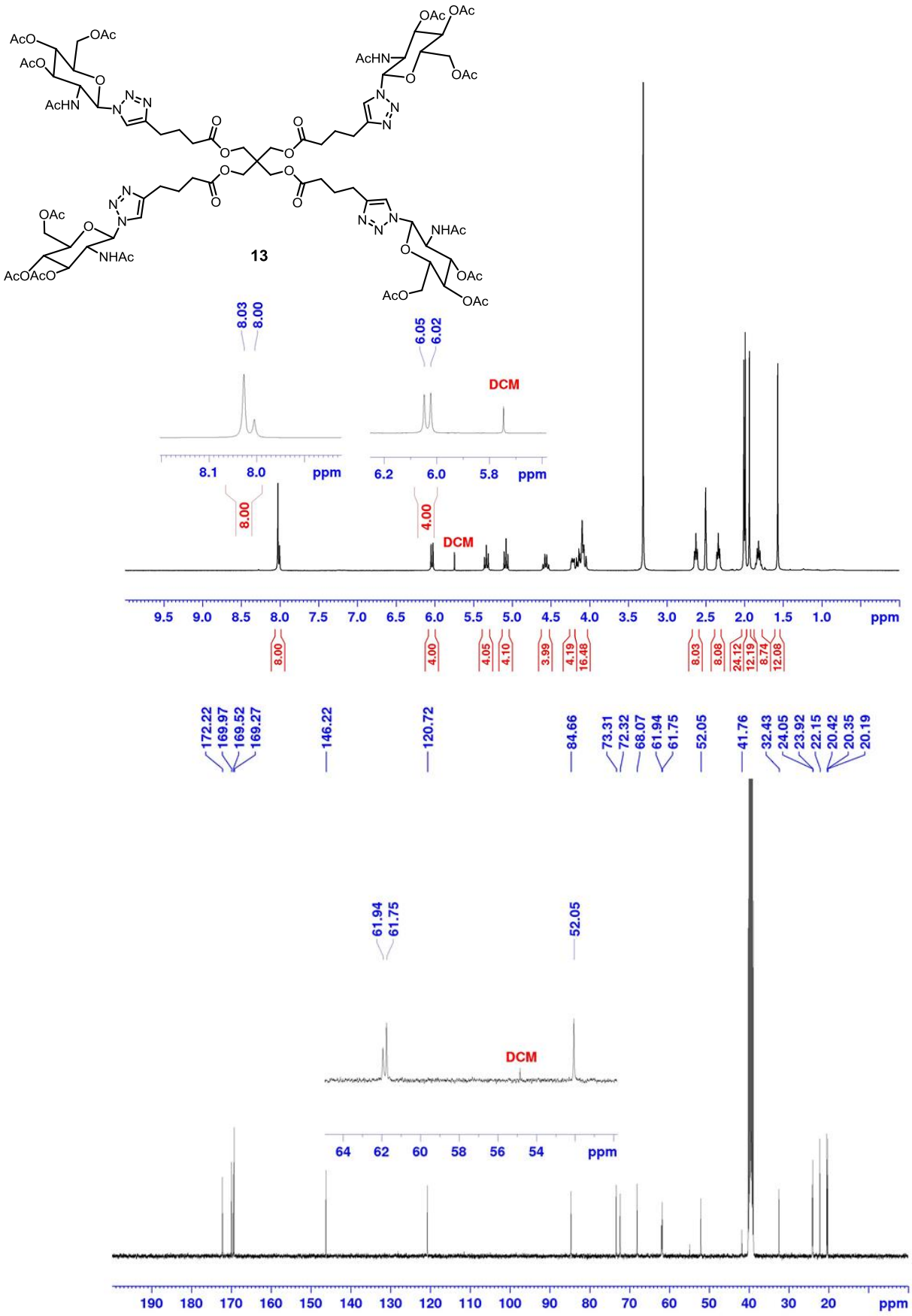
^{1}H NMR and ^{13}C NMR spectra of compound **10** in $CDCl_3$



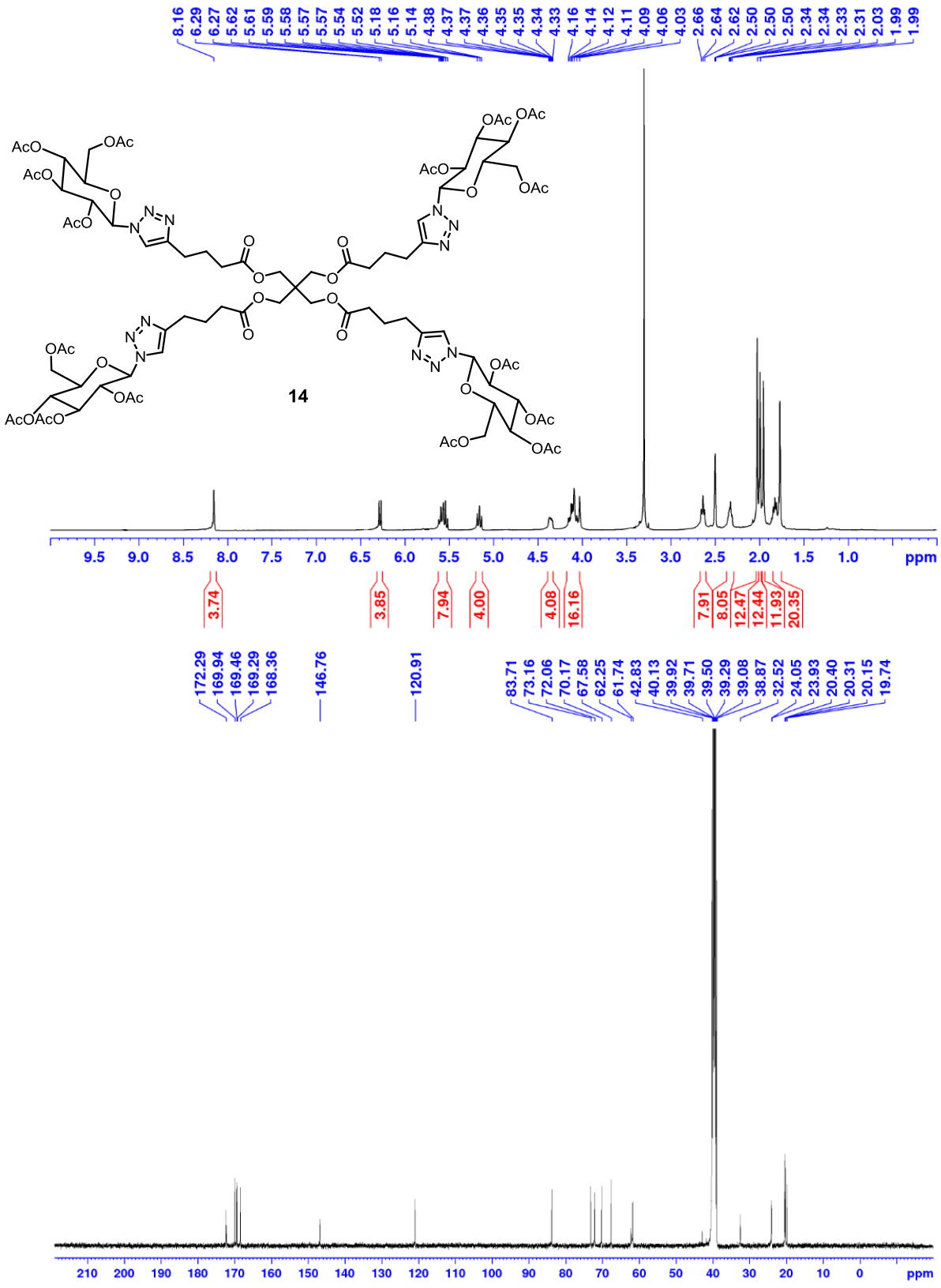
^{1}H NMR and ^{13}C NMR spectra of compound **11** in $CDCl_3$



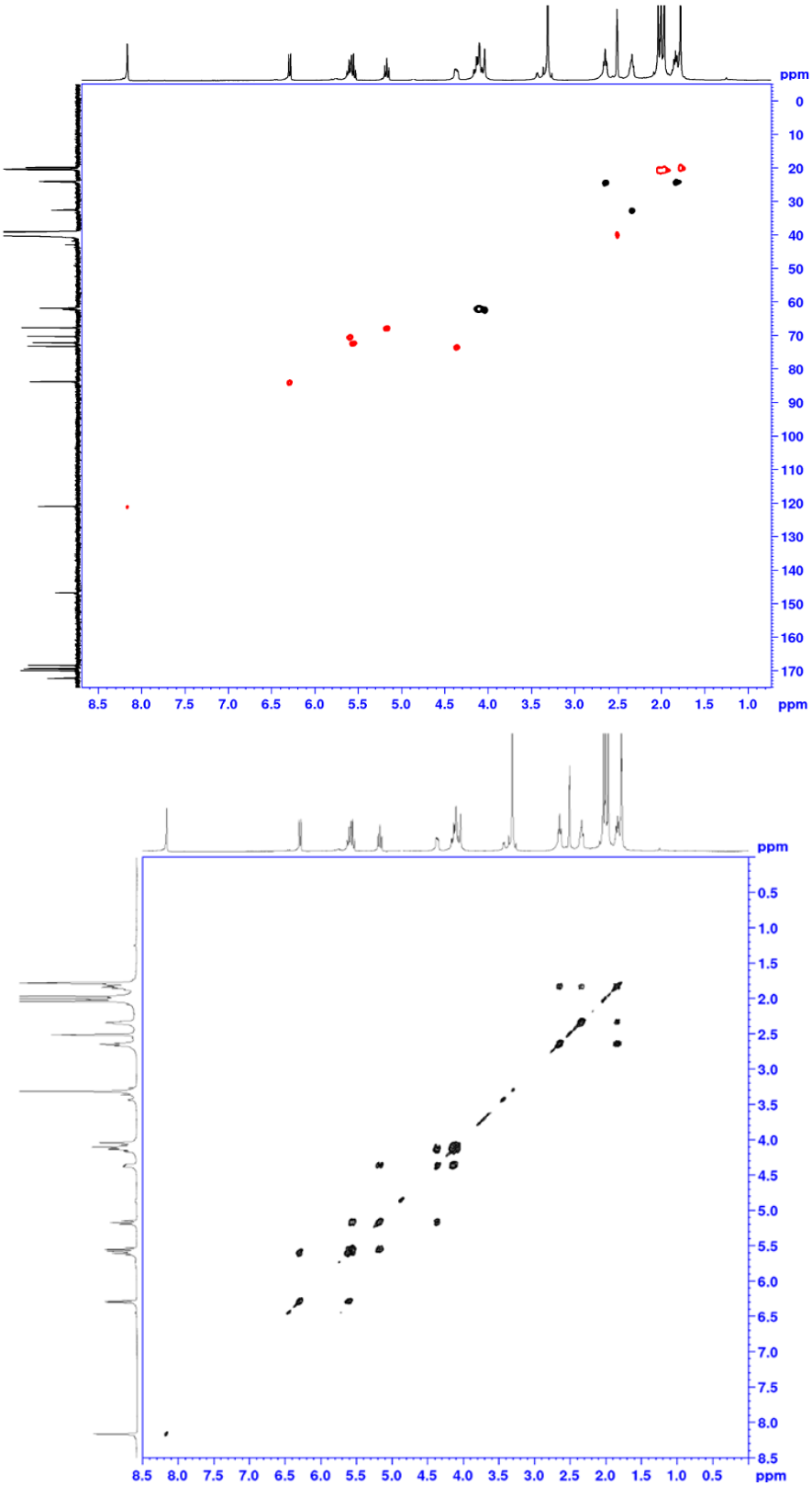
^{1}H NMR and ^{13}C NMR spectra of compound **12** in d_6-DMSO



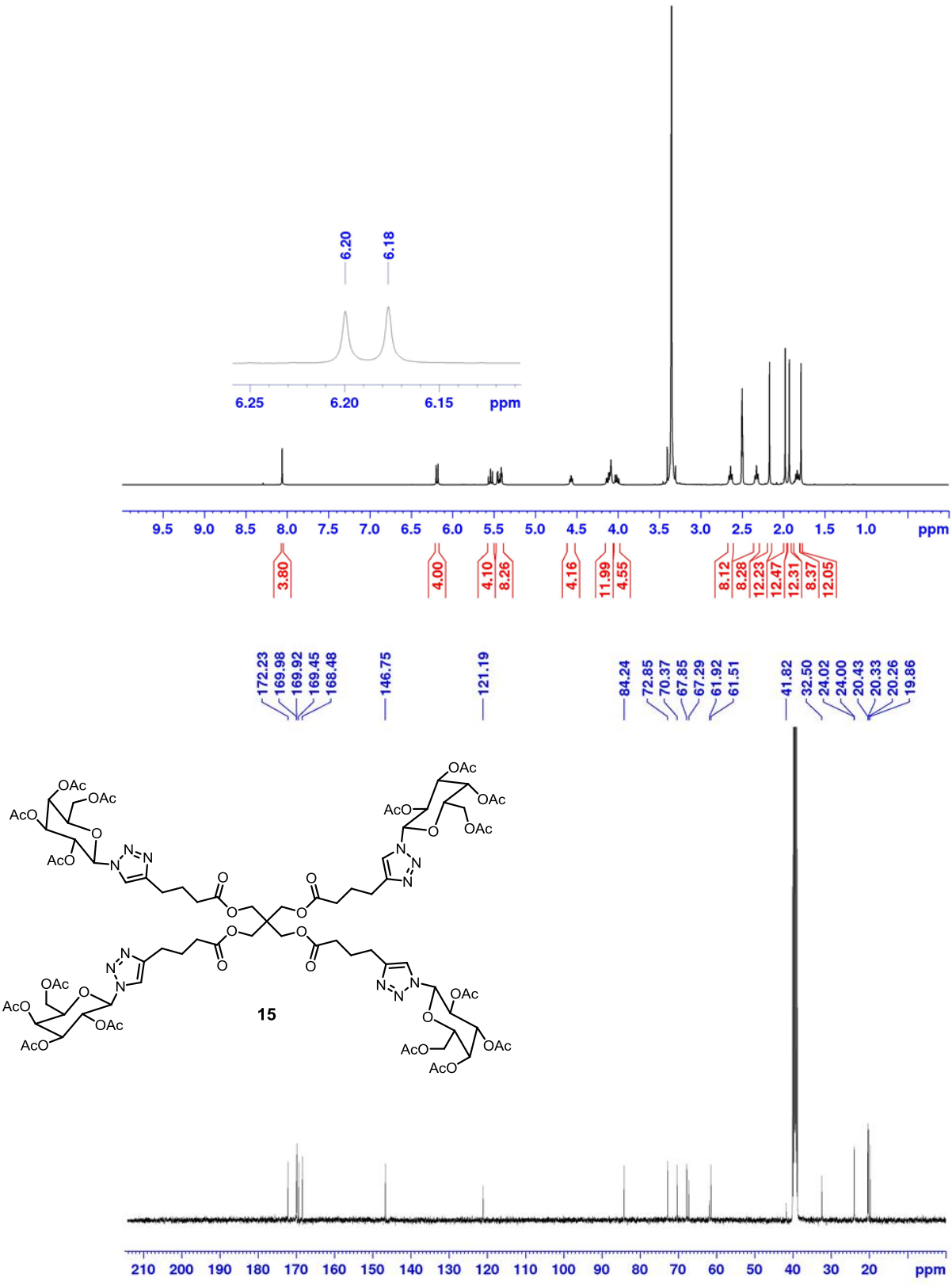
^{1}H NMR and ^{13}C NMR spectra of compound **13** in d_6-DMSO



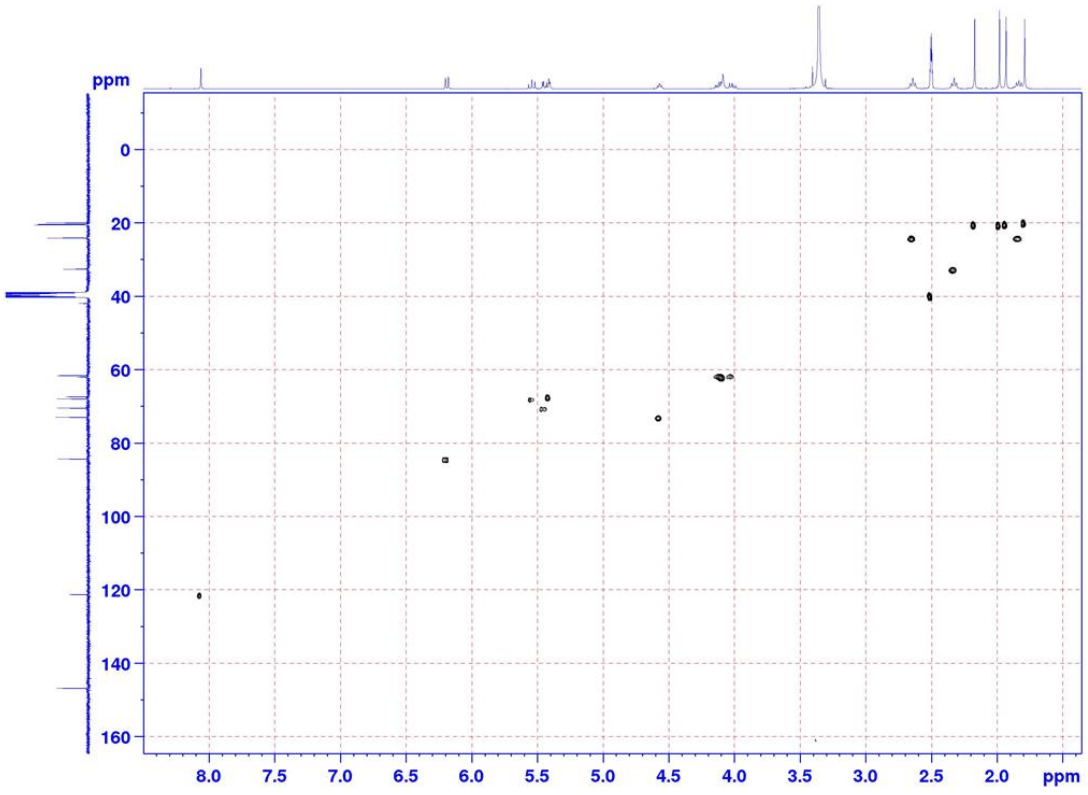
^{1}H NMR and ^{13}C NMR spectra of compound **14** in d_6-DMSO

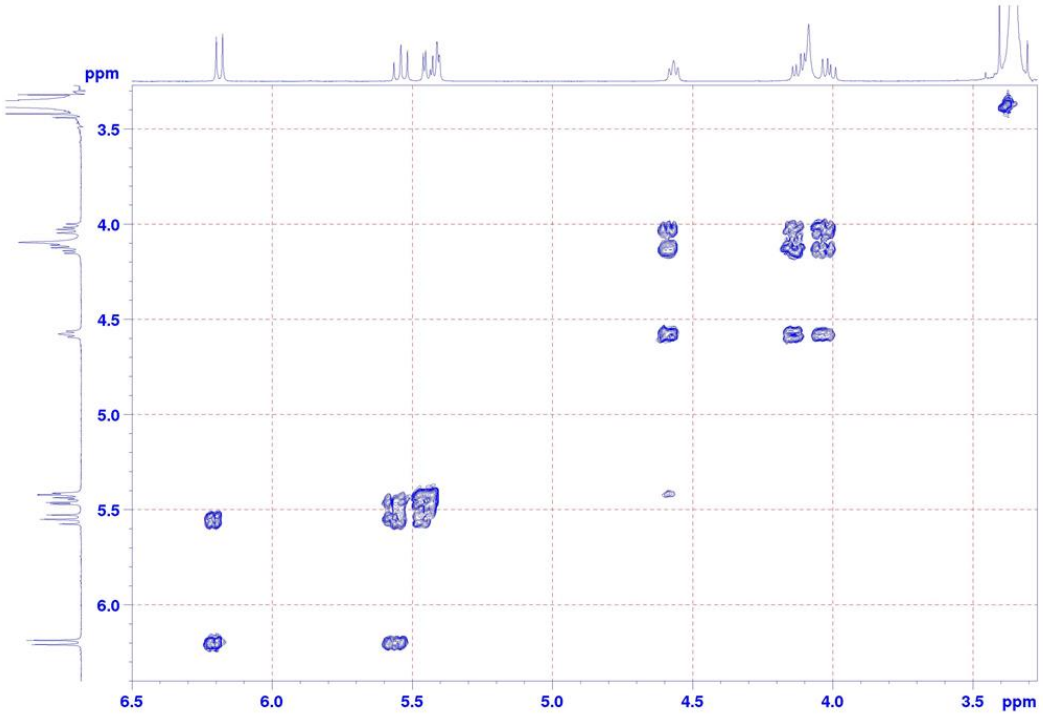


HSQC and COSY spectra of compound **14** in d_6-DMSO

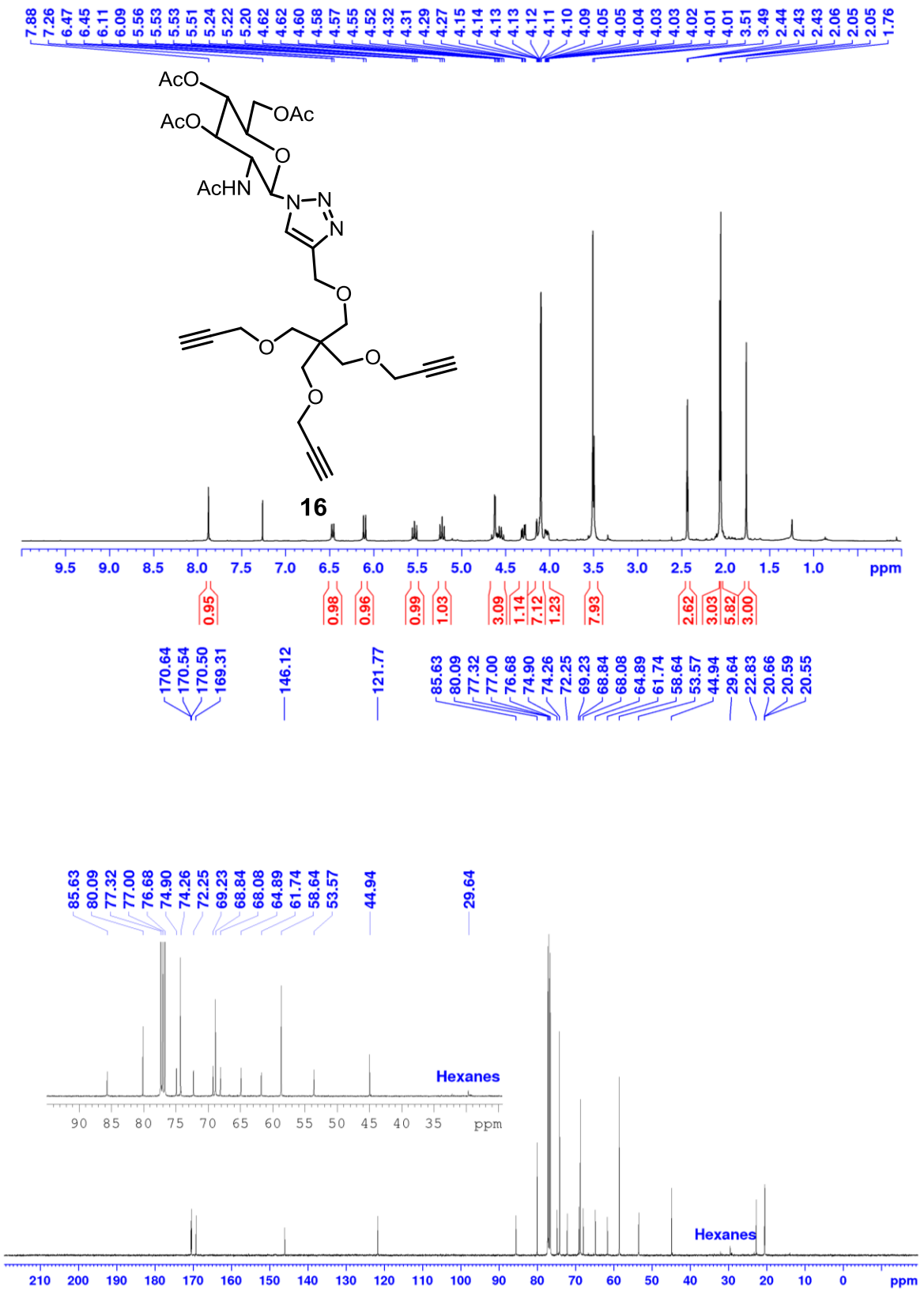


^{1}H NMR and ^{13}C NMR spectra of compound **15** in d_6-DMSO

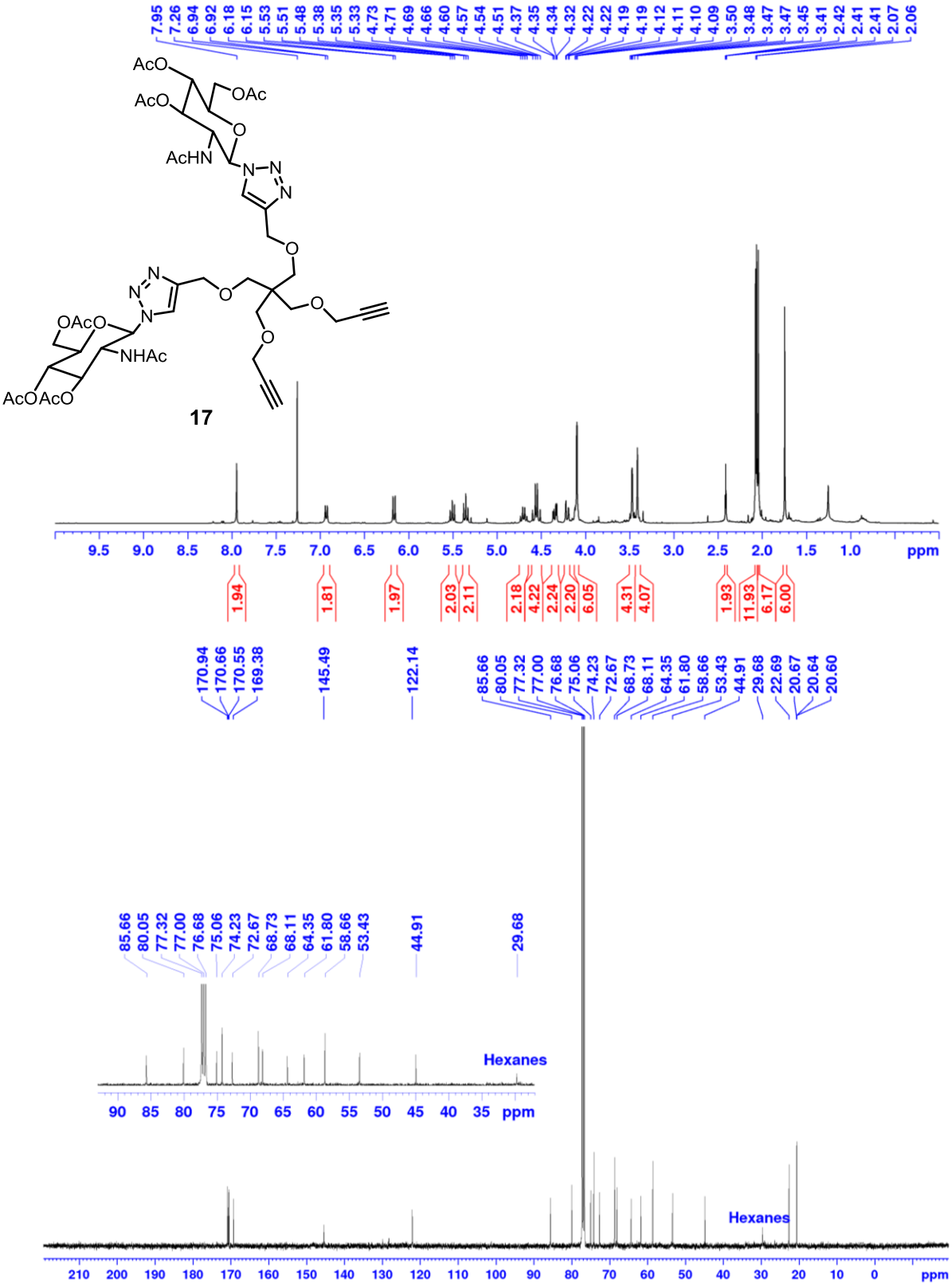




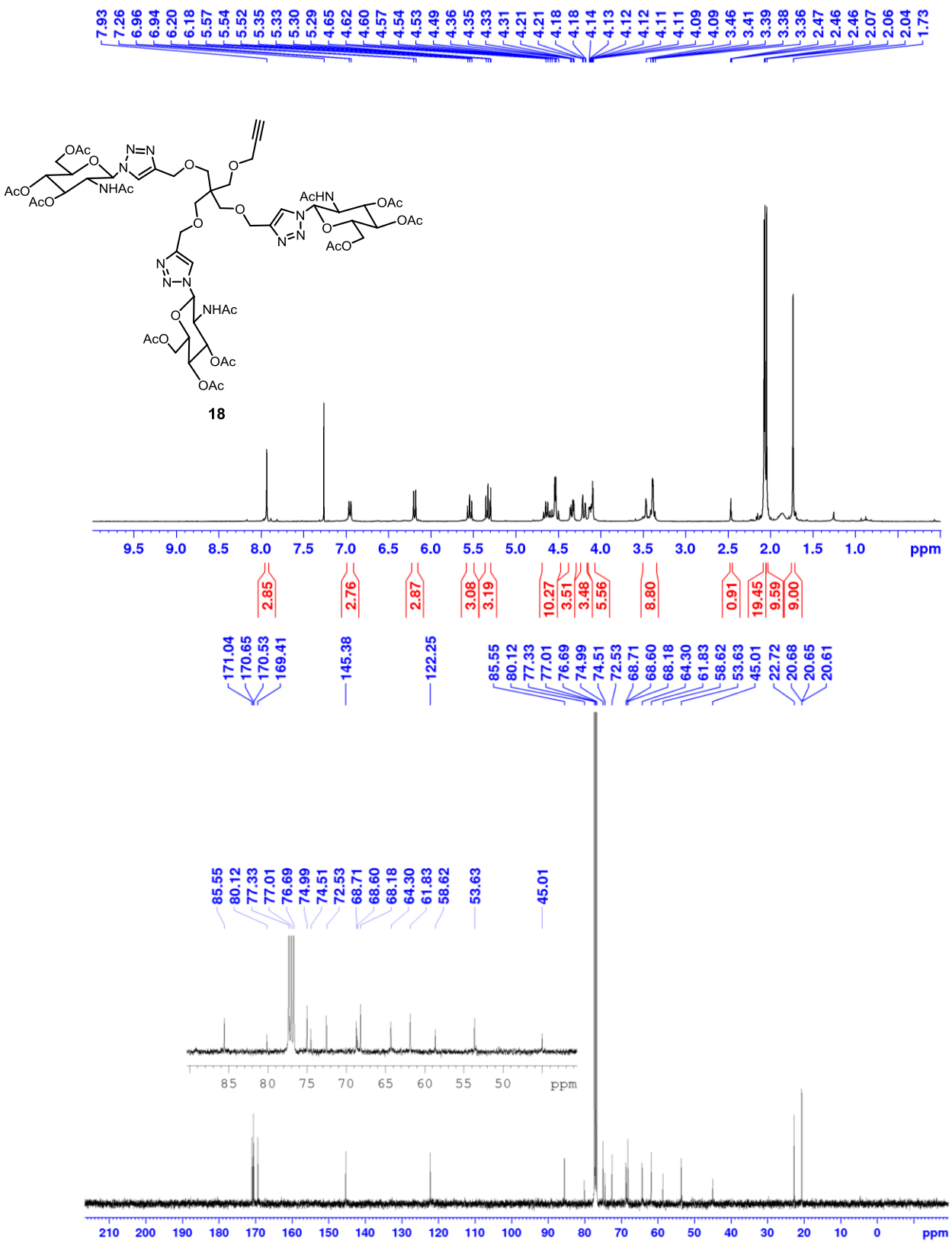
HSQC and COSY spectra of compound **15** in d_6-DMSO **(sugar ring region)**



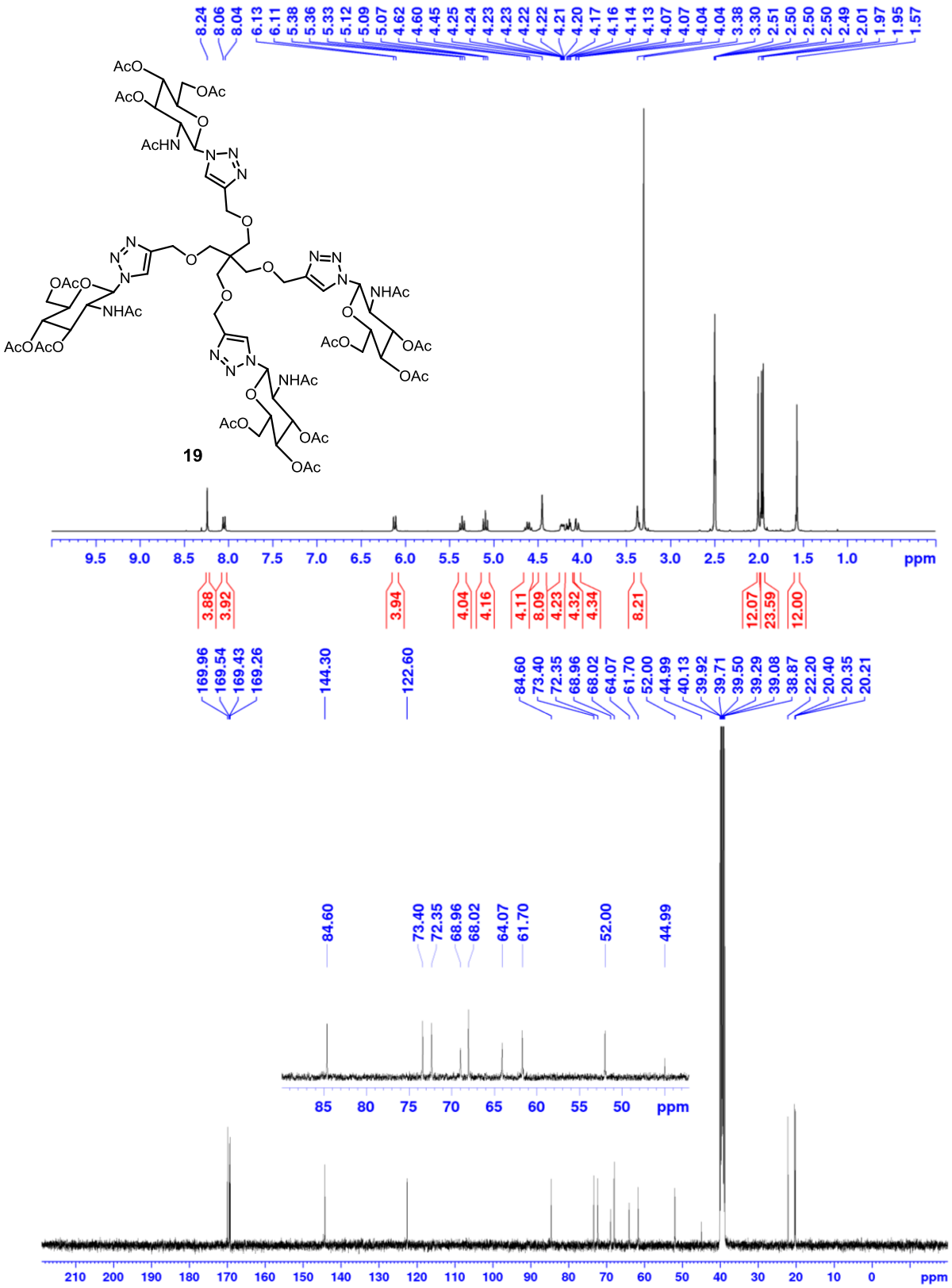
^{1}H NMR and ^{13}C NMR spectra of compound **16** in $CDCl_3$



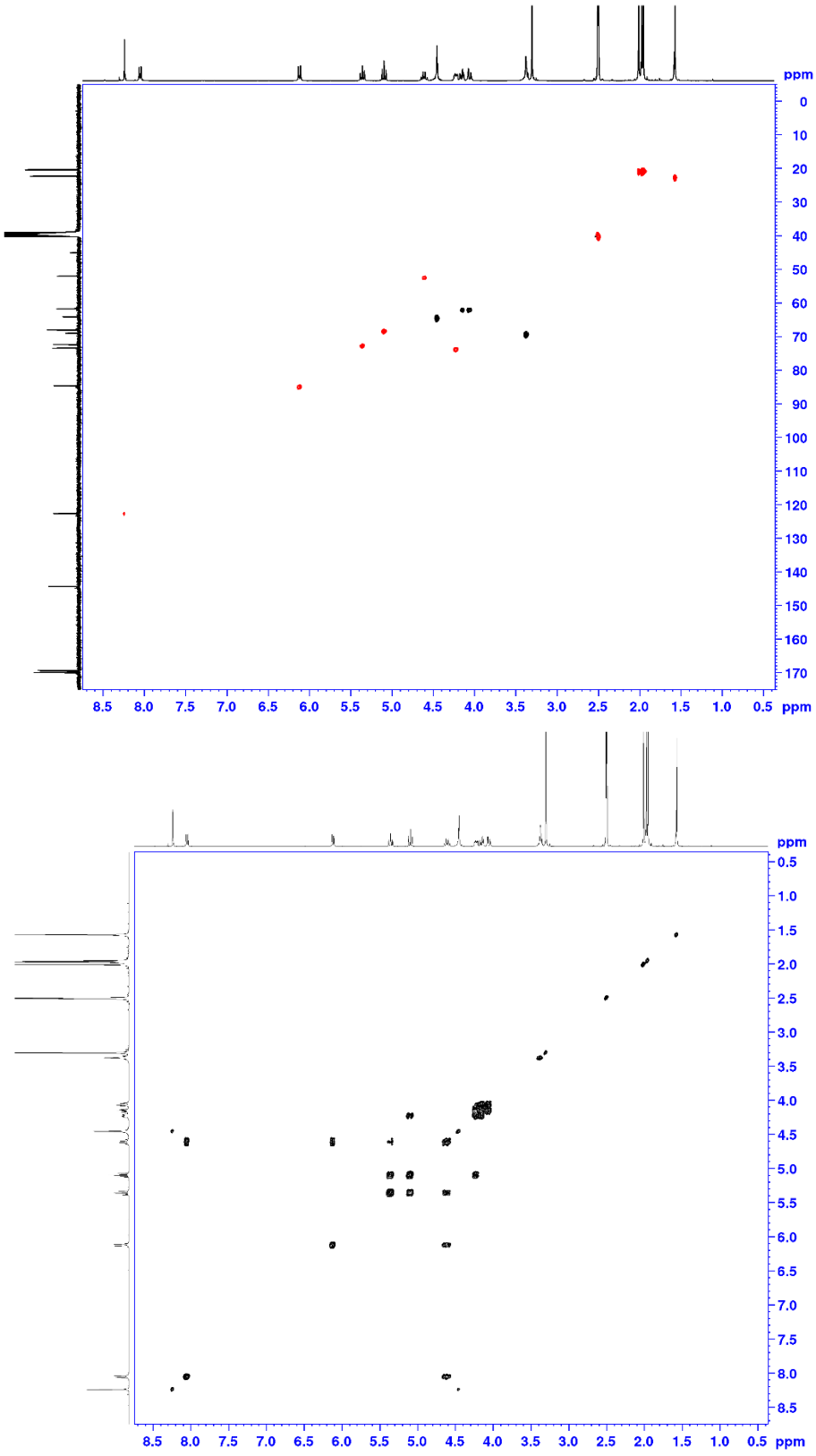
^{1}H NMR and ^{13}C NMR spectra of compound **17** in $CDCl_3$



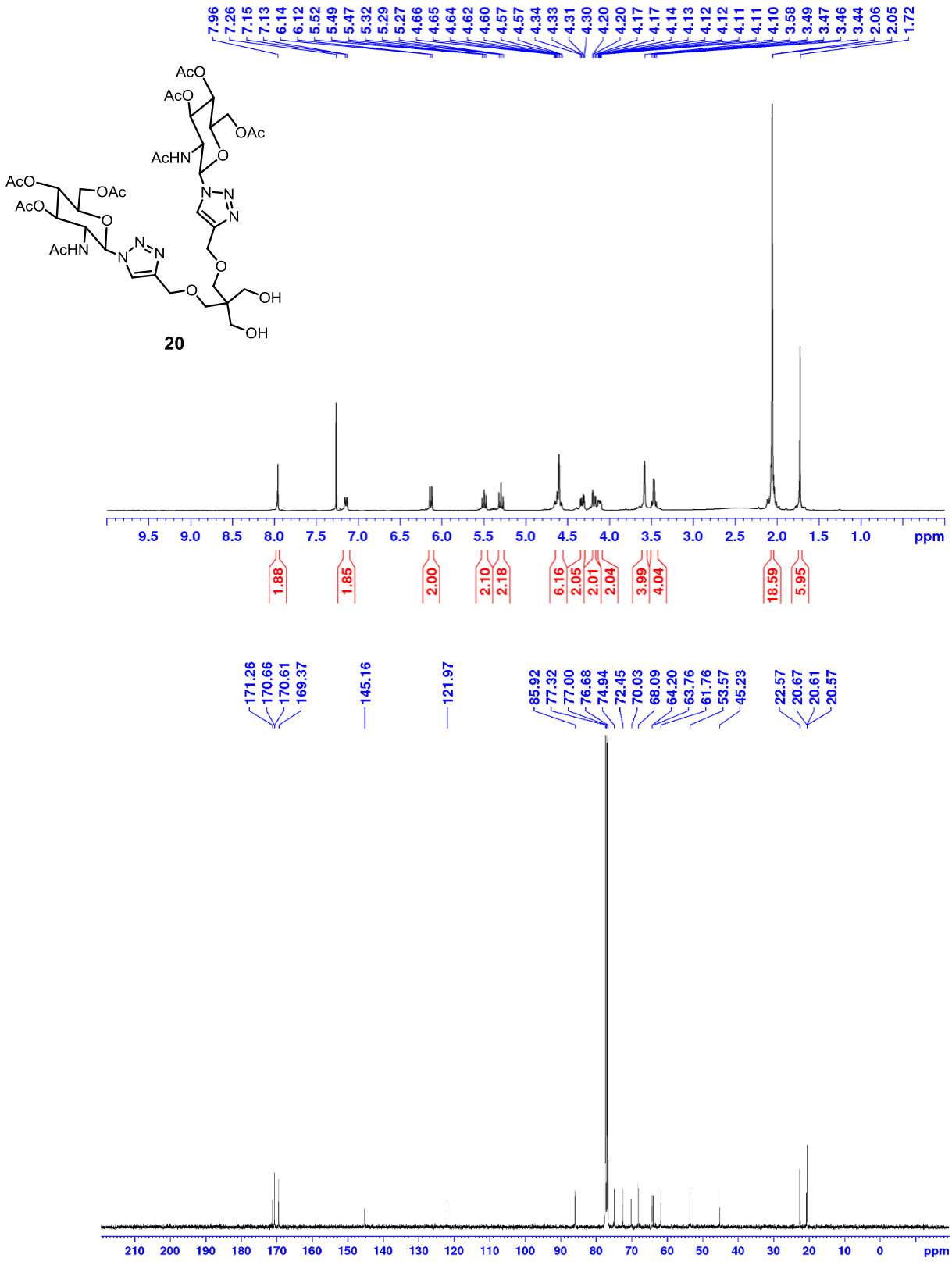
^{1}H NMR and ^{13}C NMR spectra of compound **18** in $CDCl_3$



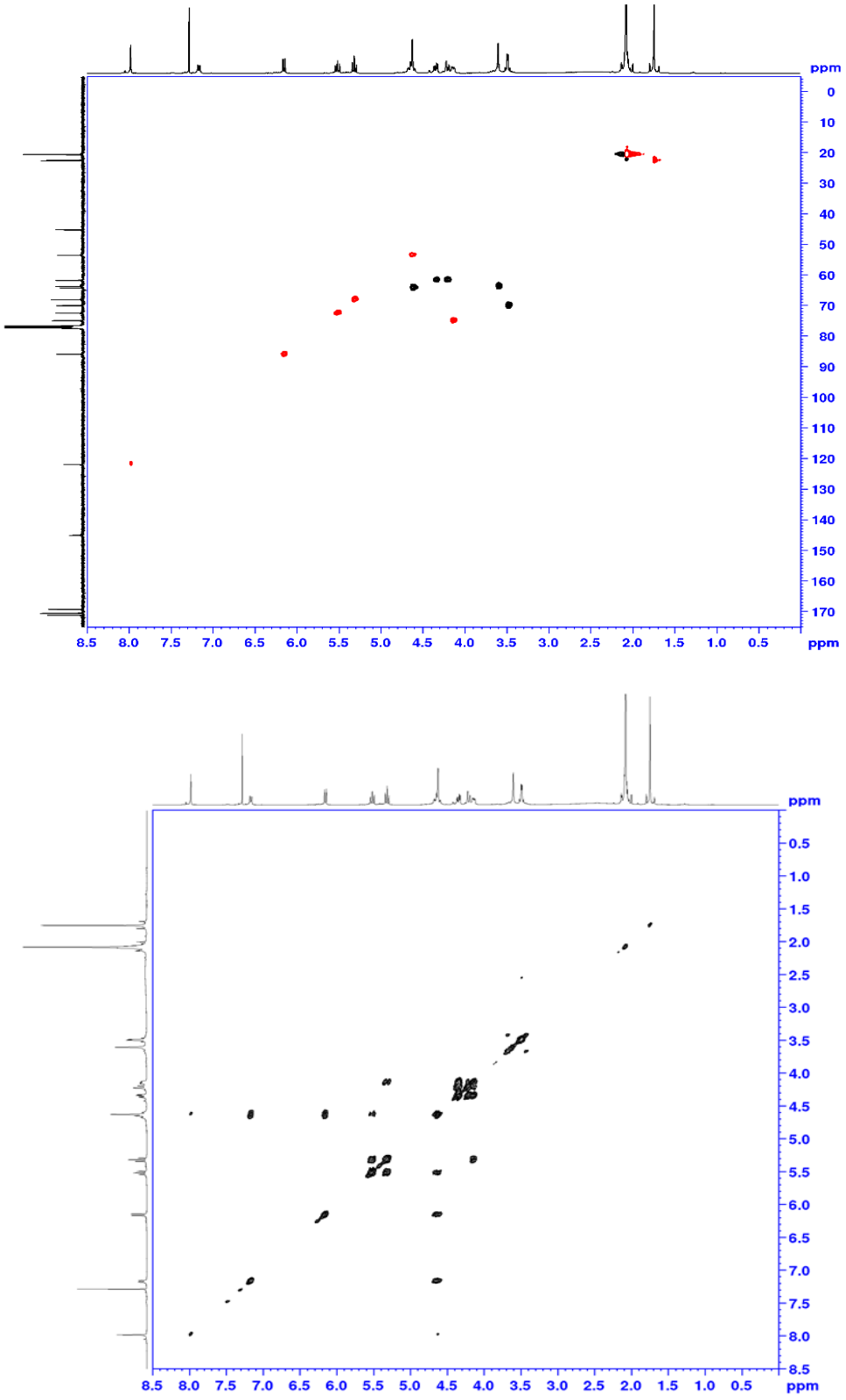
^{1}H NMR and ^{13}C NMR spectra of compound **19** in d_6-DMSO



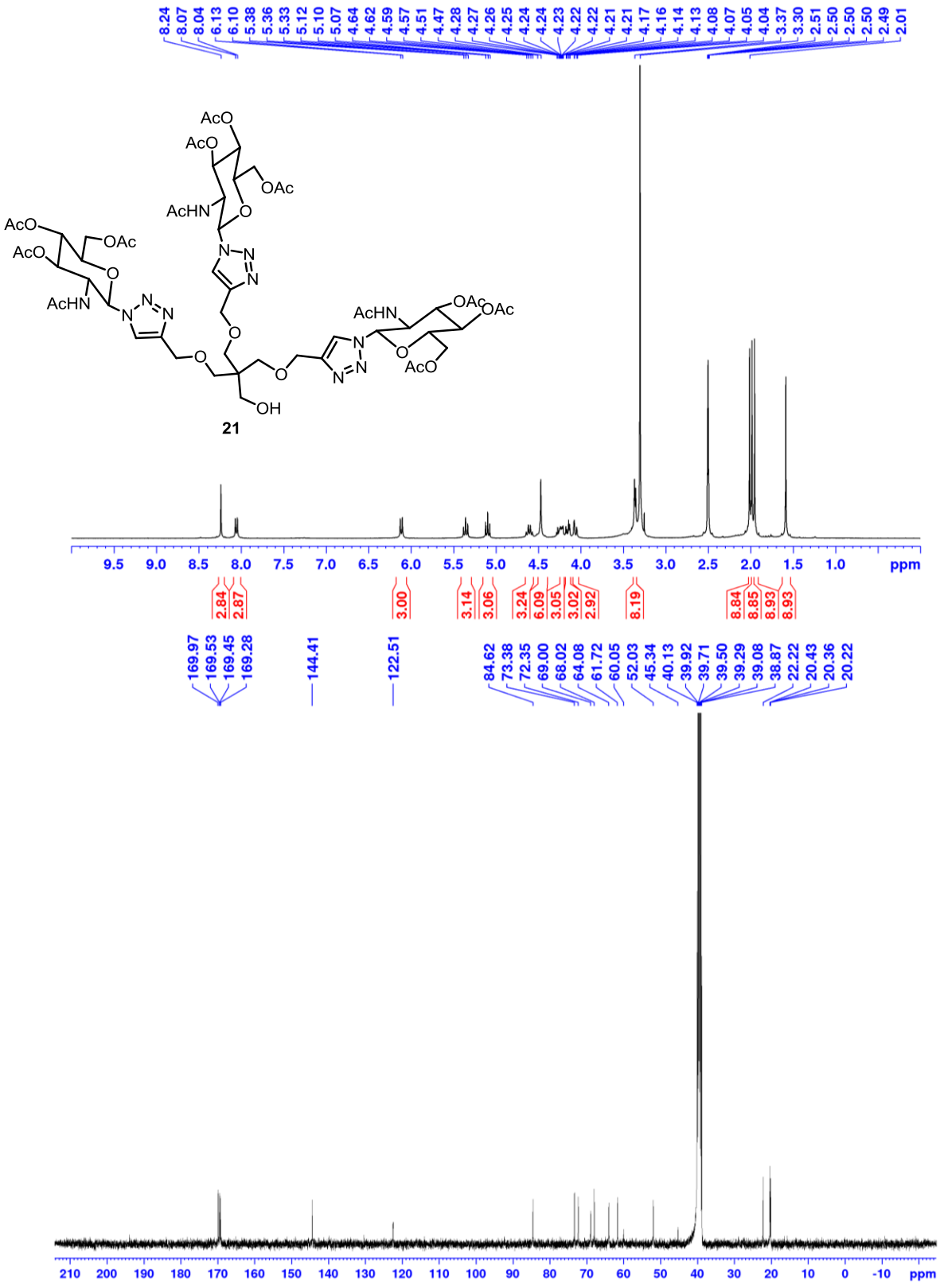
HSQC and COSY spectra of compound **19** in d_6-DMSO



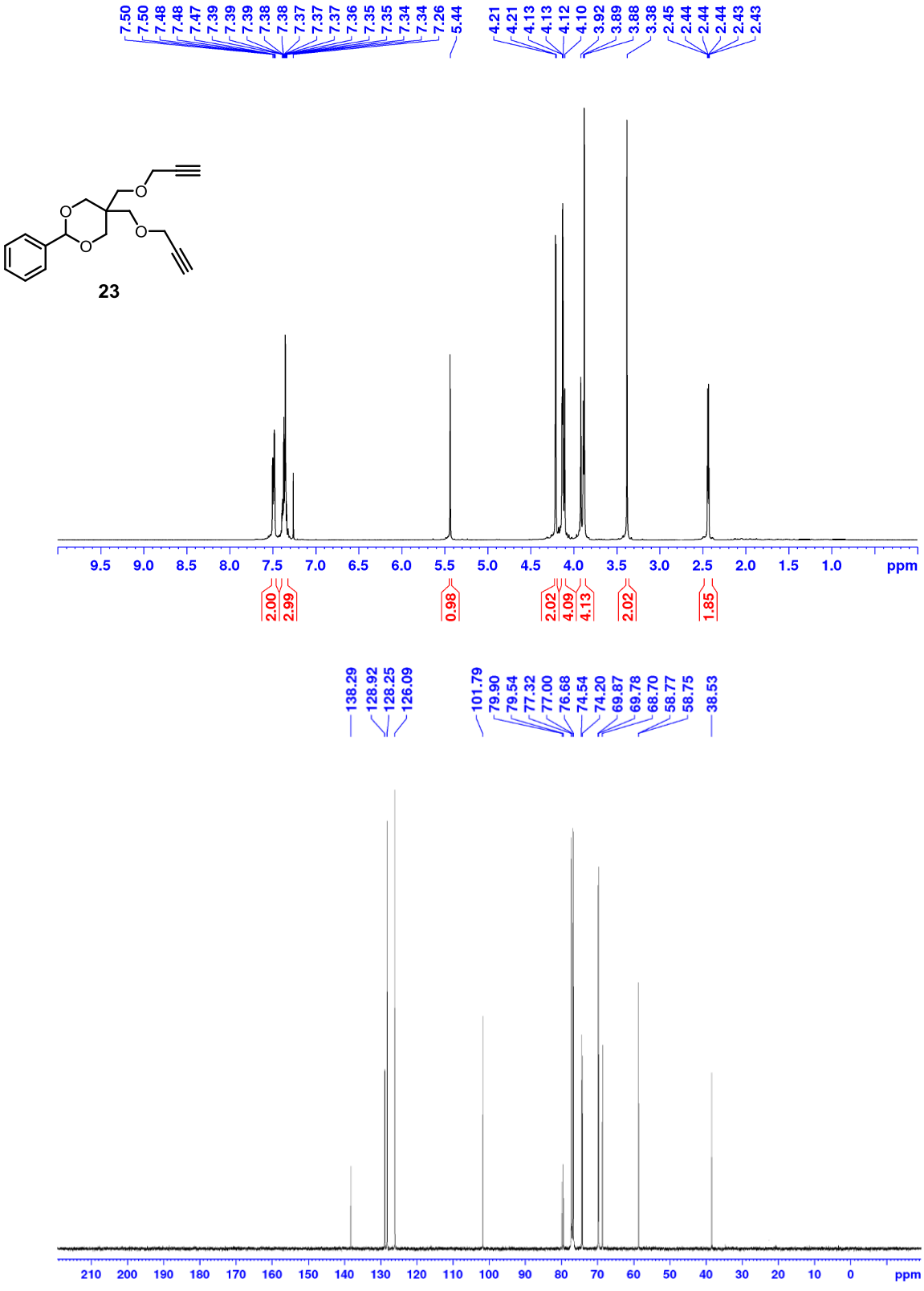
^{1}H NMR and ^{13}C NMR spectra of compound **20** in $CDCl_3$



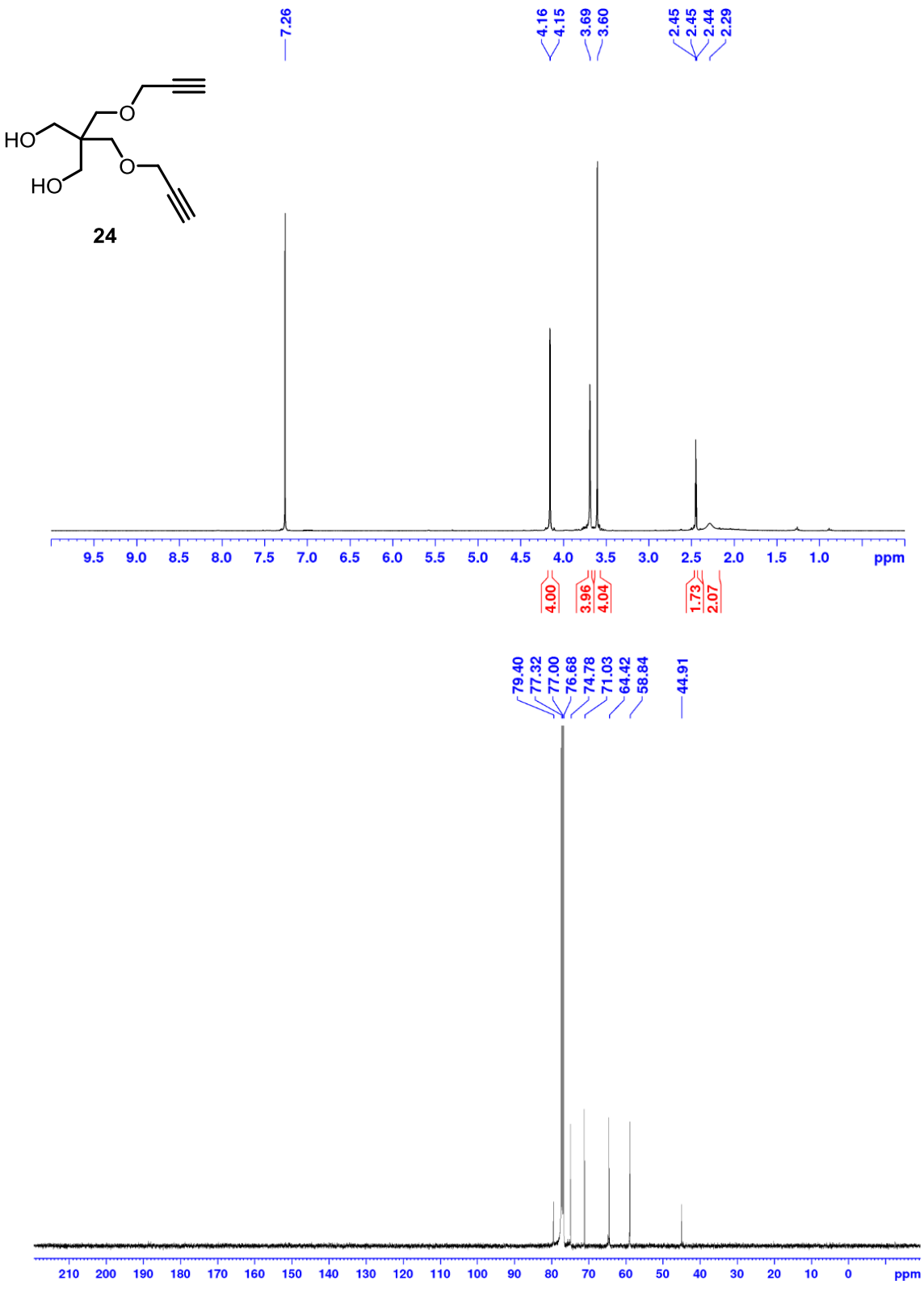
HSQC and COSY spectra of compound **20** in $CDCl_3$



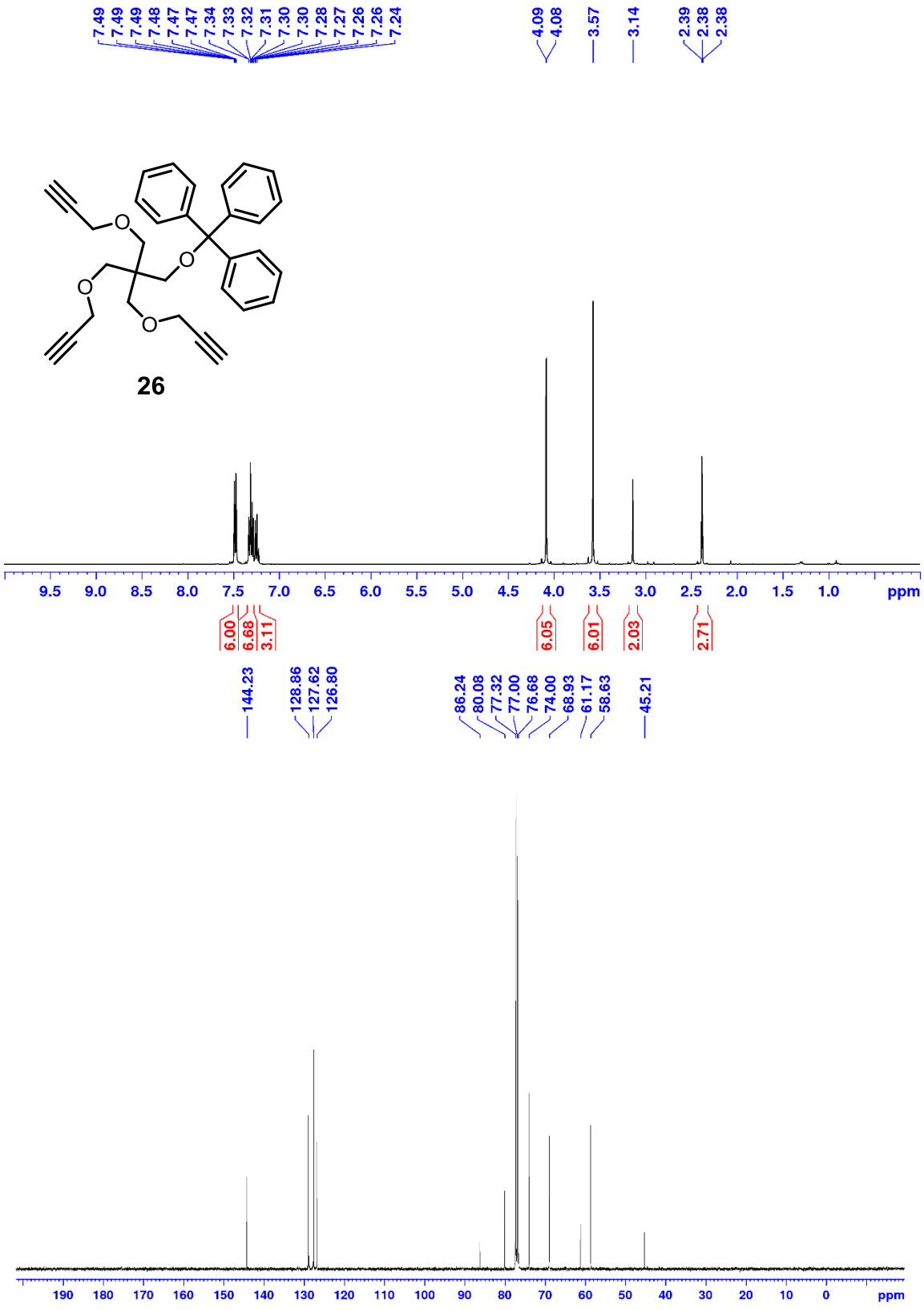
^{1}H NMR and ^{13}C NMR spectra of compound **21** in d_6-DMSO



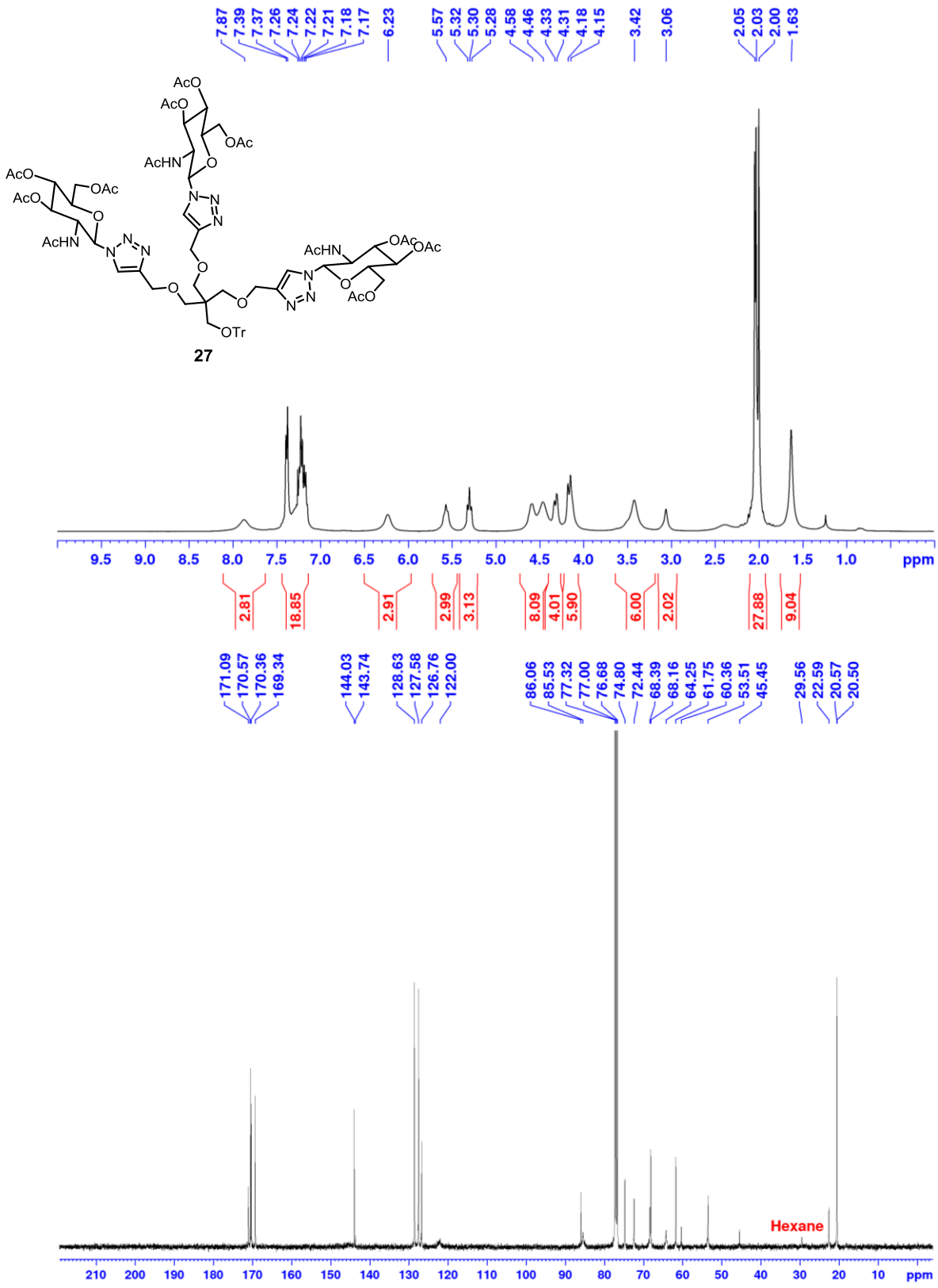
^{1}H NMR and ^{13}C NMR spectra of compound **23** in $CDCl_3$



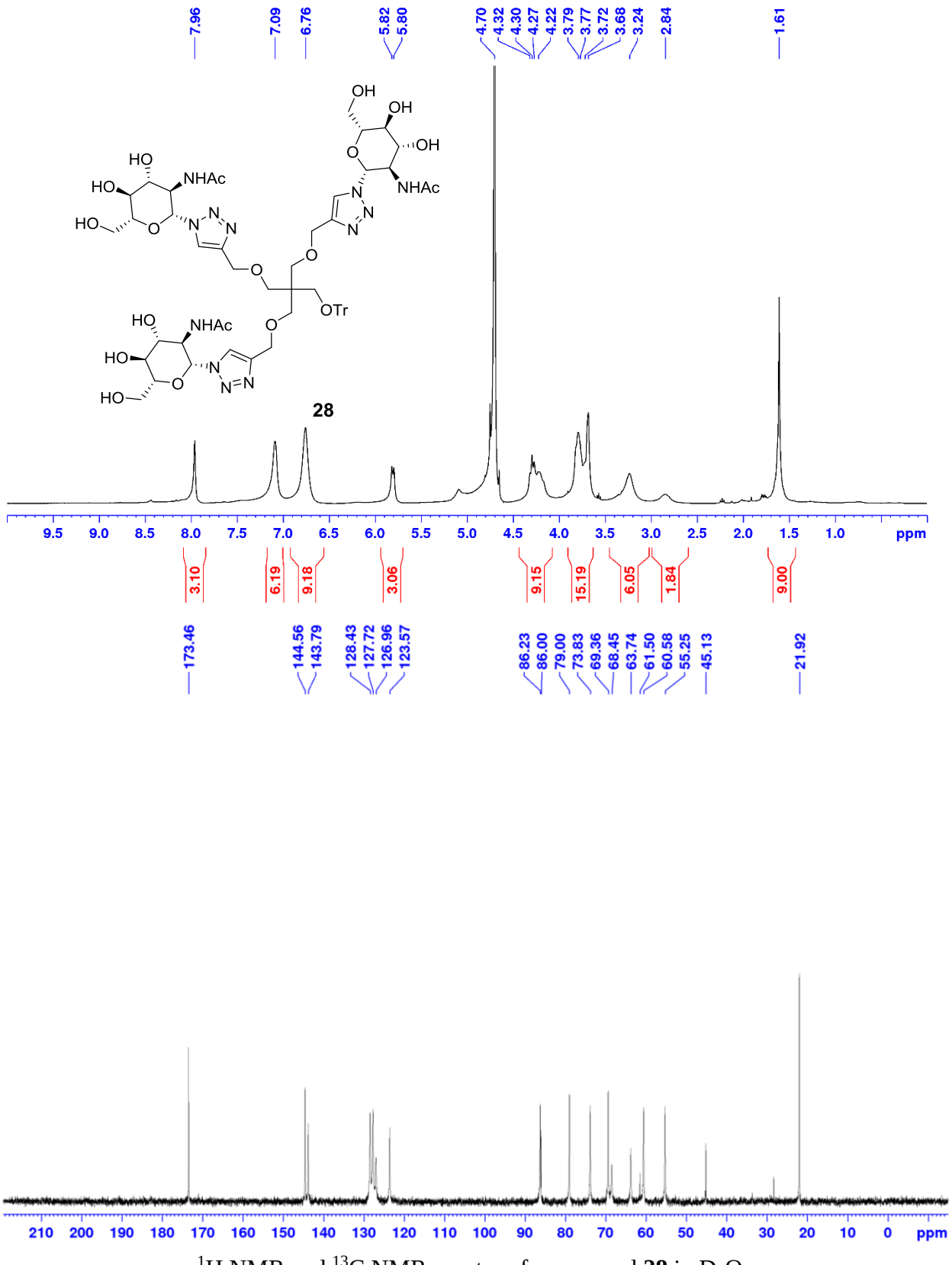
^{1}H NMR and ^{13}C NMR spectra of compound **24** in $CDCl_3$



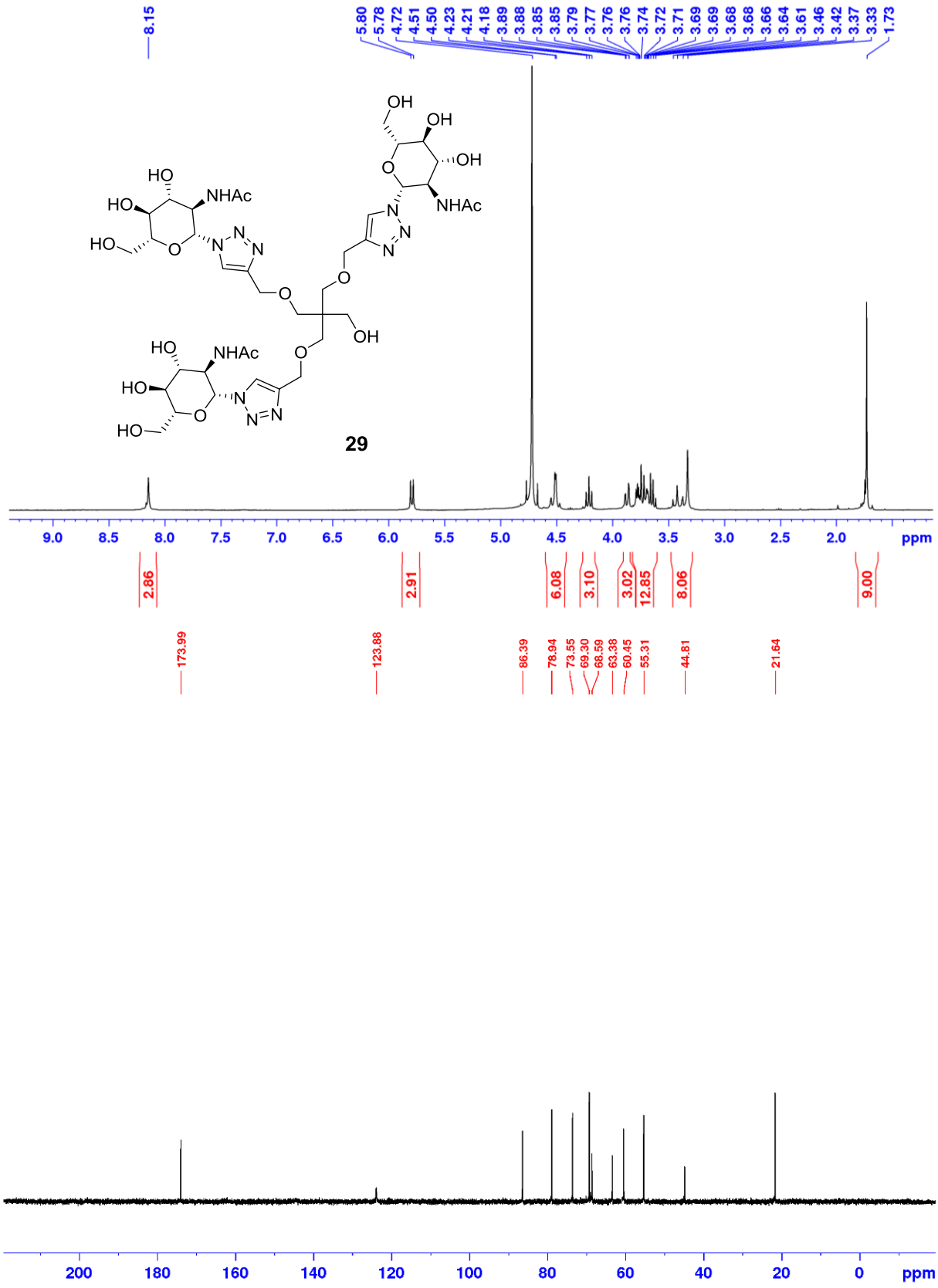
^{1}H NMR and ^{13}C NMR spectra of compound **26** in $CDCl_3$



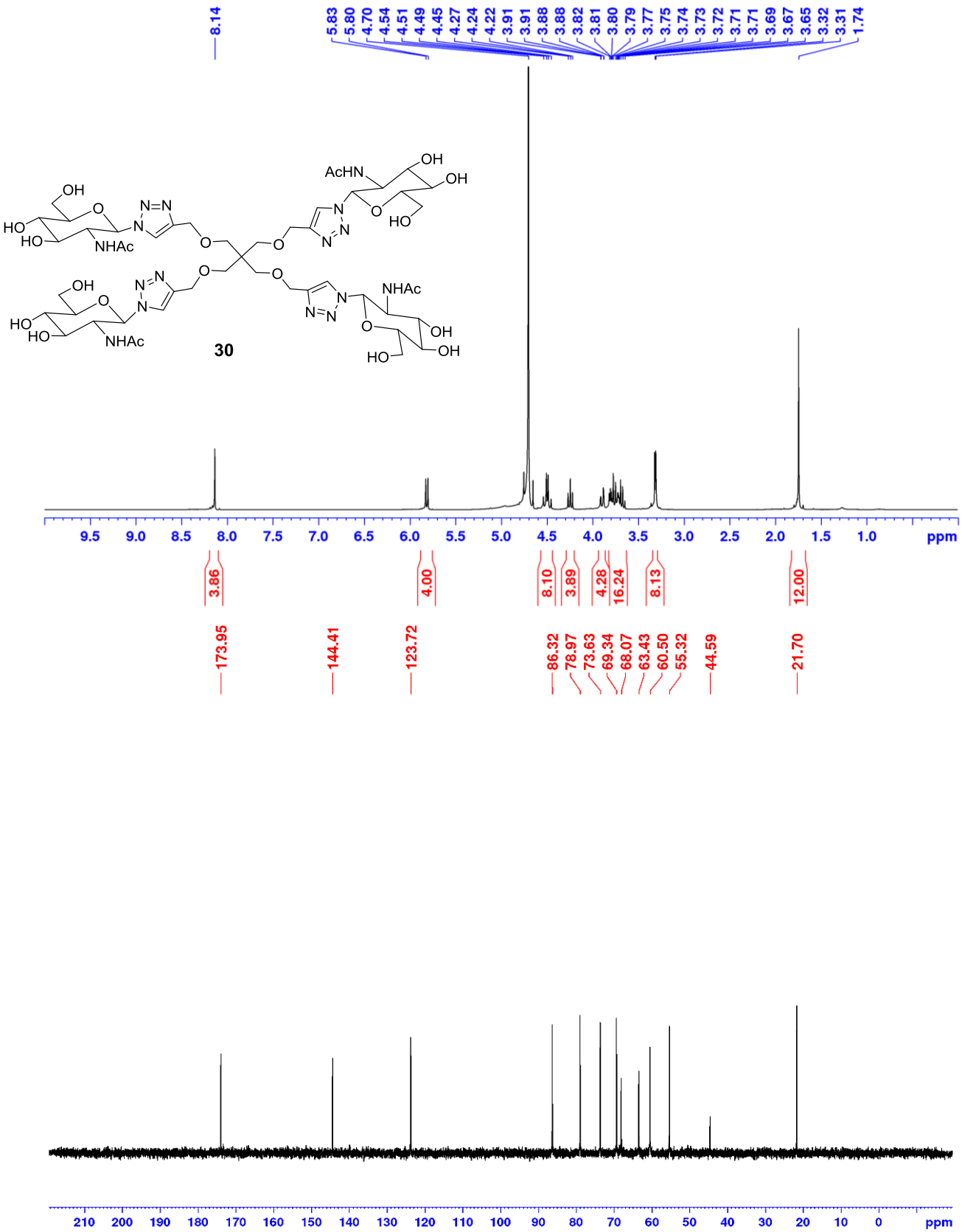
^{1}H NMR and ^{13}C NMR spectra of compound **27** in $CDCl_3$



^{1}H NMR and ^{13}C NMR spectra of compound **28** in D_2O



^{1}H NMR and ^{13}C NMR spectra of compound **29** in D_2O



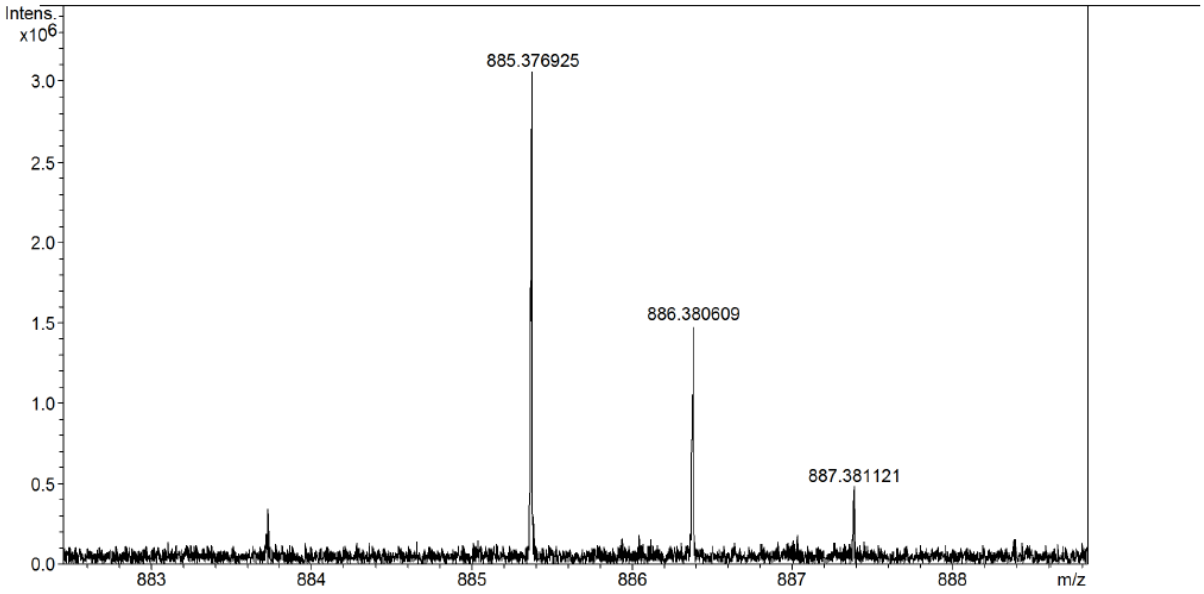
^{1}H NMR and ^{13}C NMR spectra of compound **30** in D_2O

HRMS spectra of compounds 10-21

Analysis Info			
Analysis Name	Z:\FTICR-MS\MS-1\Data\2019\apexdata031919\OBC_CPD10_pos_000001.d	Acquisition Date	3/19/2019 1:37:32 PM
Method		Operator	FTMS_USER
Sample Name	OBC_CPD10_pos	Instrument	apex-Qe
Comment	OBC_CPD10 in MeOH:water w/NaCl	C43H56N4O16 H+	

Sample Name	OBC_CPD10 in MeOH:water w/NaCl			
Exact Mass of	C43H56N4O16 H+	=	885.376408	m/z
Mass Observed		=	885.376925	m/z

Difference < 1.0 ppm

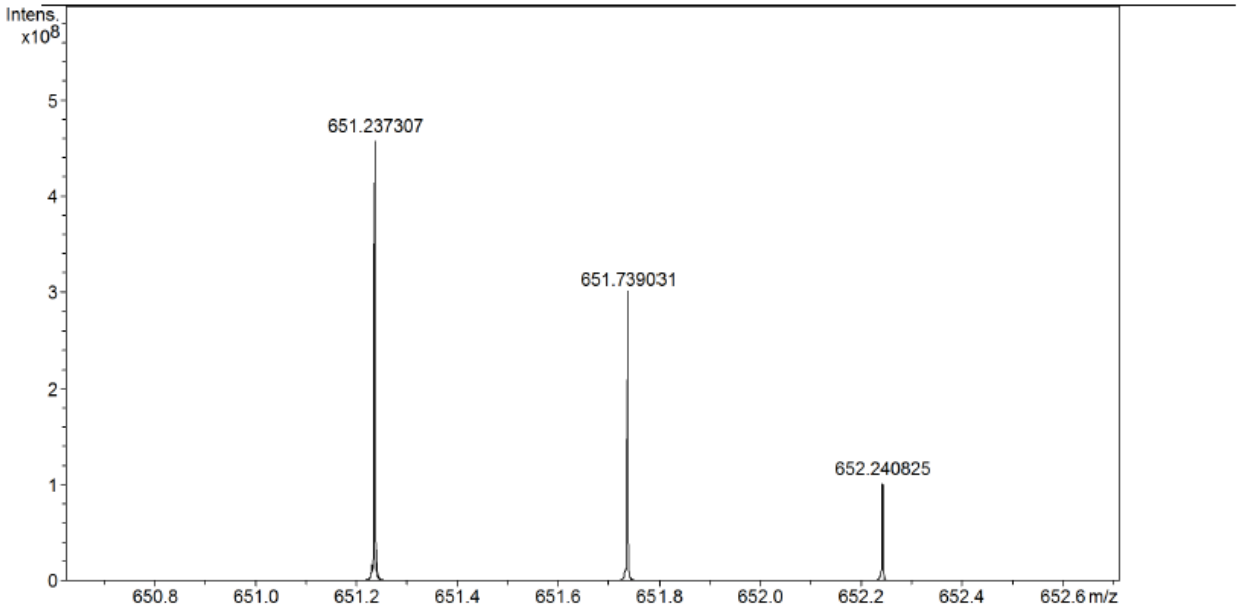


HRMS spectrum of compound **10**

Analysis Info			
Analysis Name	Z:\FTICR-MS\MS-1\Data\2019\apexdata031919\OBC_Cpd11_pos_000001.d	Acquisition Date	3/19/2019 1:52:38 PM
Method		Operator	FTMS_USER
Sample Name	OBC_Cpd11_pos	Instrument	apex-Qe
Comment	OBC_Cpd11 in MeOH:water w/NaCl	[C57H76N8O24 + Na]+2	

Sample Name	OBC_Cpd11 in MeOH:water w/NaCl			
Exact Mass of	[C57H76N8O24 + Na]+2	=	651.237844	m/z
Mass Observed		=	651.237307	m/z

Difference < 1.0 ppm

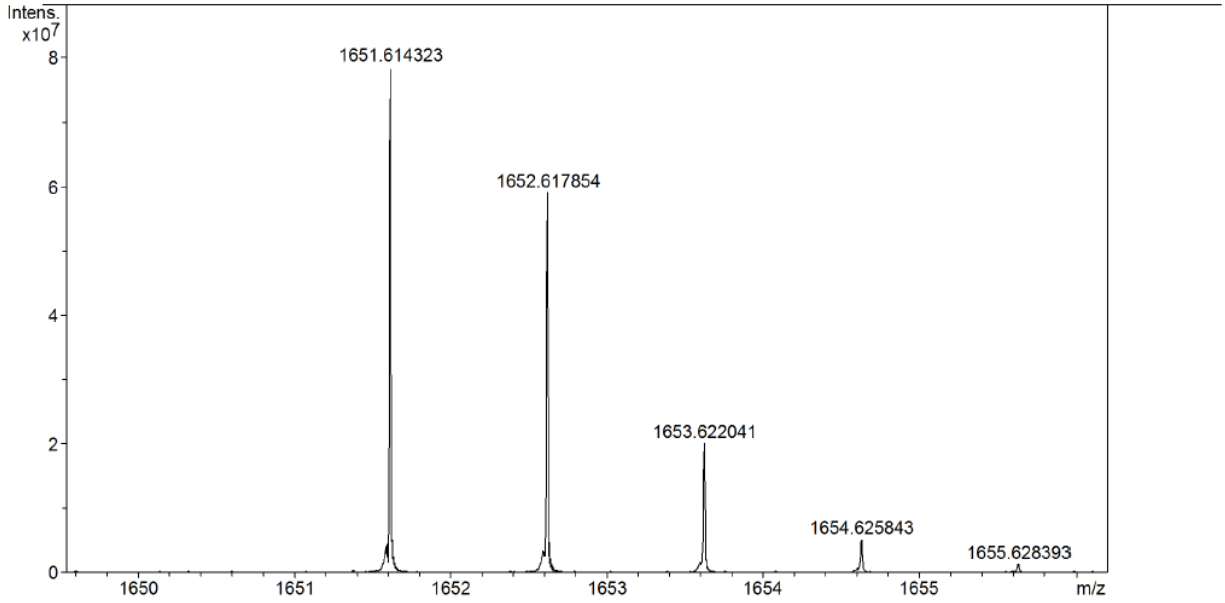


HRMS spectrum of compound **11**

Analysis Info			
Analysis Name	Z:\FTICR-MS\MS-1\Data\2019\apexdata031919\OBC_Cpd12_pos_000001.d	Acquisition Date	3/19/2019 2:03:31 PM
Method		Operator	FTMS_USER
Sample Name	OBC_Cpd12_pos	Instrument	apex-Qe
Comment	OBC_Cpd12 in MeOH:water w/NaCl C71H96N12O32 Na+		

Sample Name	OBC_Cpd12 in MeOH:water w/NaCl			
Exact Mass of	C71H96N12O32 Na+	=	1651.614580	m/z
Mass Observed		=	1651.614323	m/z

Difference < 1.0 ppm

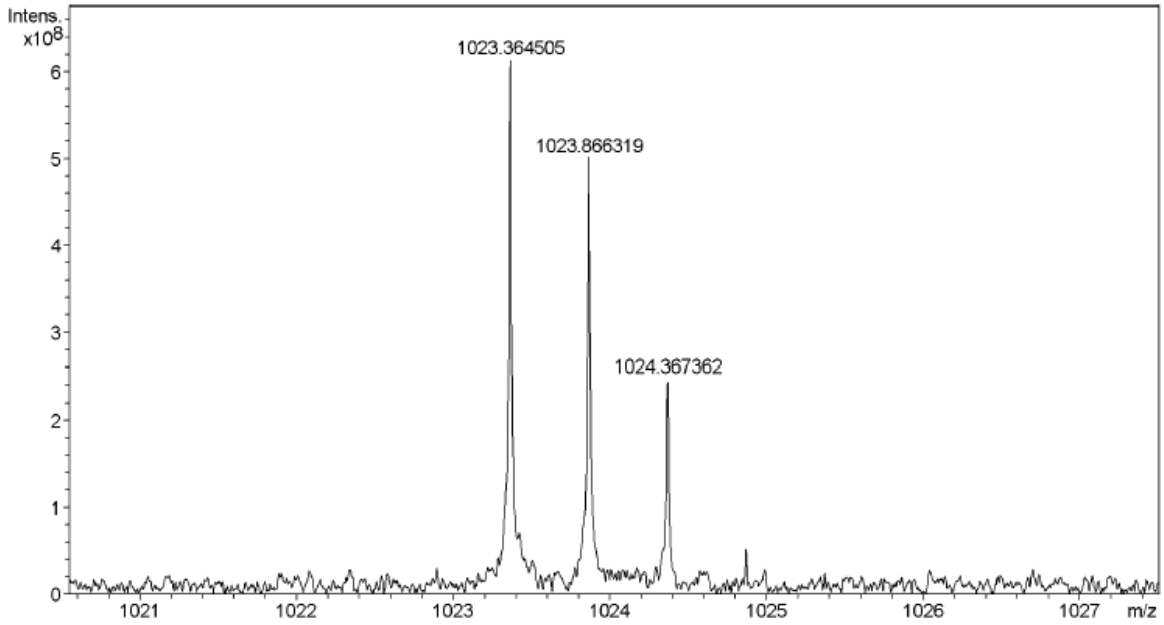


HRMS spectrum of compound **12**

Analysis Info			
Analysis Name	G:\Data\apexdata081617\1007_049_pos_000002.d	Acquisition Date	8/17/2017 3:14:18 AM
Method		Operator	FTMS_USER
Sample Name	1007_049	Instrument	apex-Qe
Comment	1007_049 in MeOH:H2O C85H116N16O40 Na2+		

Sample Name	1007_049 in MeOH:H2O		
Exact Mass of	C85H116N16O40 Na2+	=	1023.365957 m/z
Mass Observed		=	1023.364505 m/z

Difference < -1.5 ppm

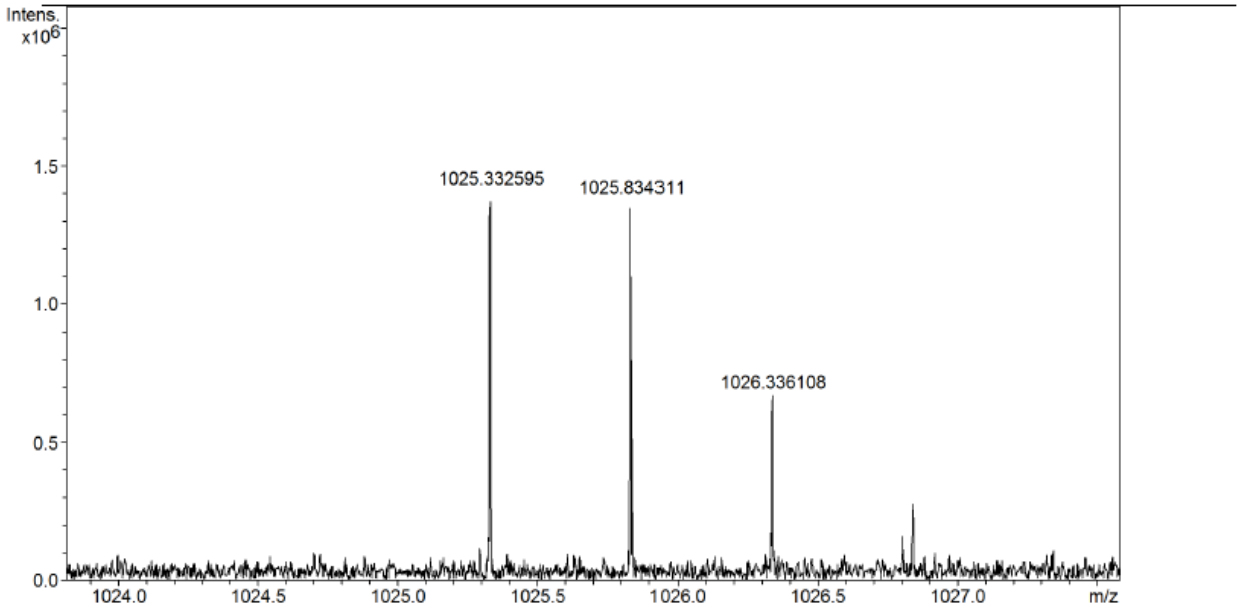


HRMS spectrum of compound **13**

Analysis Info			
Analysis Name	Z:\FTICR-MS\MS-1\Data\2019\apexdata031919\OBC_Cpd14_pos_000002.d	Acquisition Date	3/19/2019 2:15:54 PM
Method		Operator	FTMS_USER
Sample Name	OBC_Cpd14_pos	Instrument	apex-Qe
Comment	OBC_Cpd14 in MeOH:water w/NaCl [C85H112N12O44+ Na]+2		

Sample Name	OBC_Cpd14 in MeOH:water w/NaCl			
Exact Mass of	[C85H112N12O44+ Na]+2	=	1025.333989	m/z
Mass Observed		=	1025.332595	m/z

Difference = 1.4 ppm

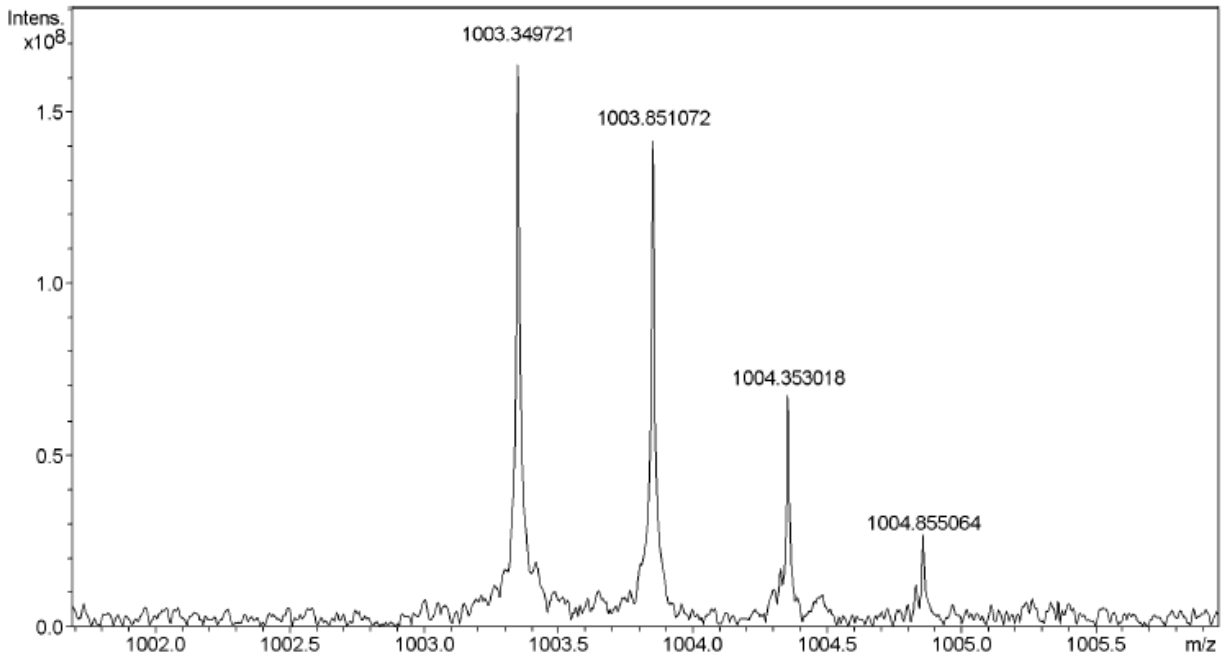


HRMS spectrum of compound **14**

Analysis Info			
Analysis Name	G:\Data\apexdata081617\1007_055_pos_000001.d	Acquisition Date	8/17/2017 2:50:59 AM
Method		Operator	FTMS_USER
Sample Name	1007_055	Instrument	apex-Qe
Comment	1007_055 in MeOH:H2O C85H112N12O44 H2+		

Sample Name	1007_055 in MeOH:H2O		
Exact Mass of	C85H112N12O44 H2+	=	1003.352044 m/z
Mass Observed		=	1003.349721 m/z

Difference = -2.3 ppm

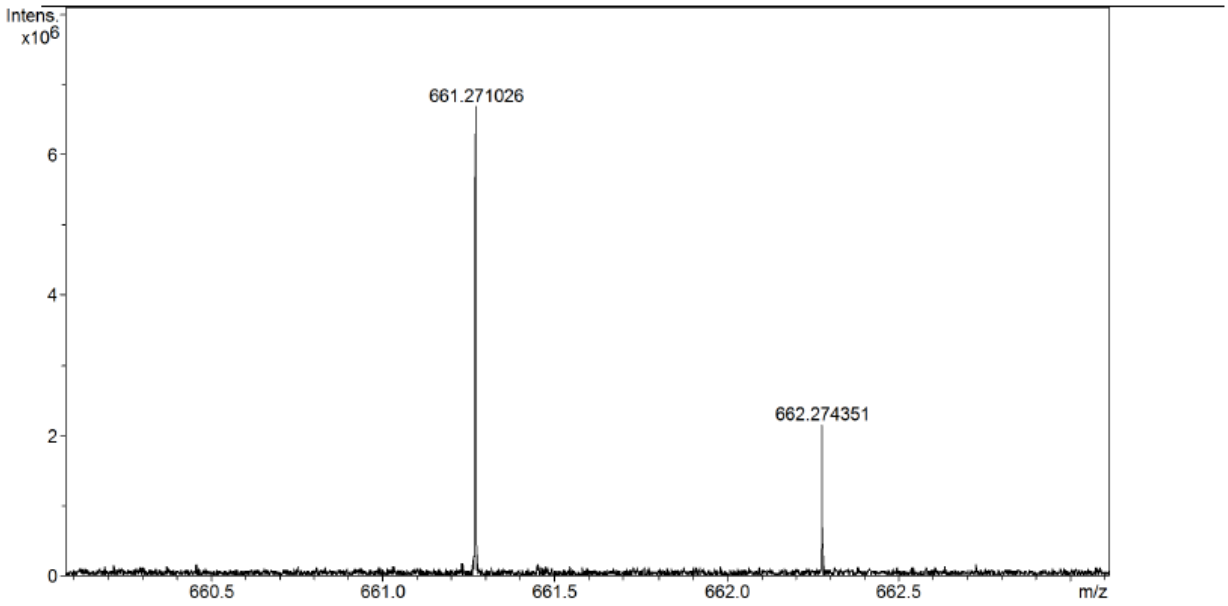


HRMS spectrum of compound **15**

Analysis Info			
Analysis Name	Z:\FTICR-MS\MS-1\Data\2019\apexdata031919\OBC_Cpd16_pos_000002.d	Acquisition Date	3/19/2019 2:27:09 PM
Method		Operator	FTMS_USER
Sample Name	OBC_Cpd16_pos	Instrument	apex-Qe
Comment	OBC_Cpd16 in MeOH:water w/NaCl C31H40N4O12 H+		

Sample Name	OBC_Cpd16 in MeOH:water w/NaCl			
Exact Mass of	C31H40N4O12 H+	=	661.271549	m/z
Mass Observed		=	661.271026	m/z

Difference < 1.0 ppm

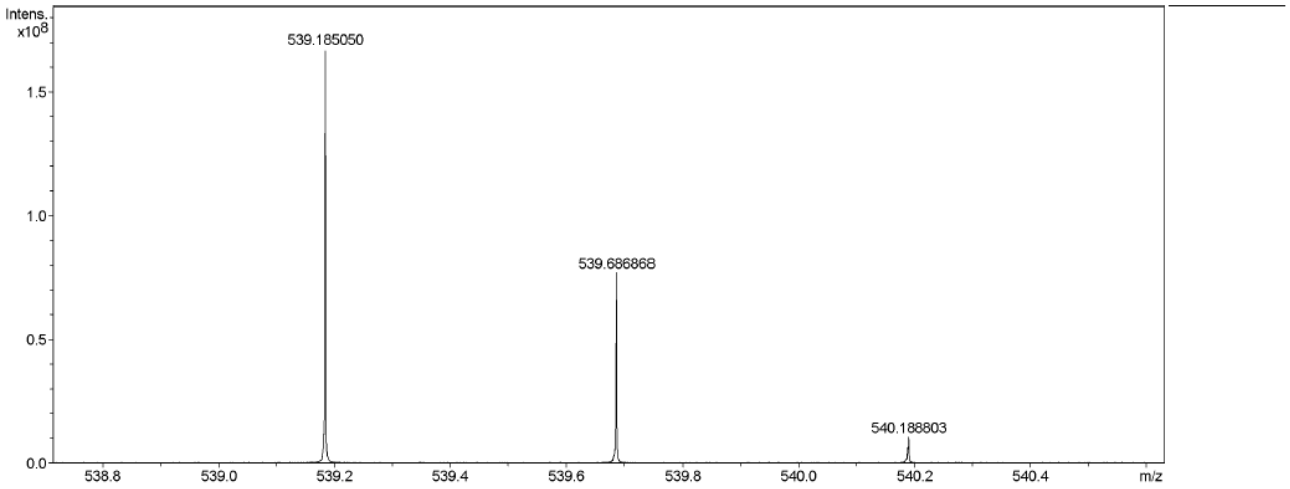


HRMS spectrum of compound **16**

Analysis Info			
Analysis Name	Y:\FTICR-MS\MS-1\Data\2019\apexdata032819\OBC_Cpd17_pos_000001.d	Acquisition Date	3/28/2019 10:47:23 AM
Method		Operator	FTMS_USER
Sample Name	OBC_Cpd17_pos	Instrument	apex-Qe
Comment	OBC_Cpd17 in MeOH:water w/NaCl [C45H60N8O20 + Na] +2		

Sample Name	OBC_Cpd17 in MeOH:water w/NaCl		
	[C45H60N8O20 + Na] +2 =	539.185414	m/z
Mass Observed	=	539.185050	m/z

Difference < 1.0 ppm

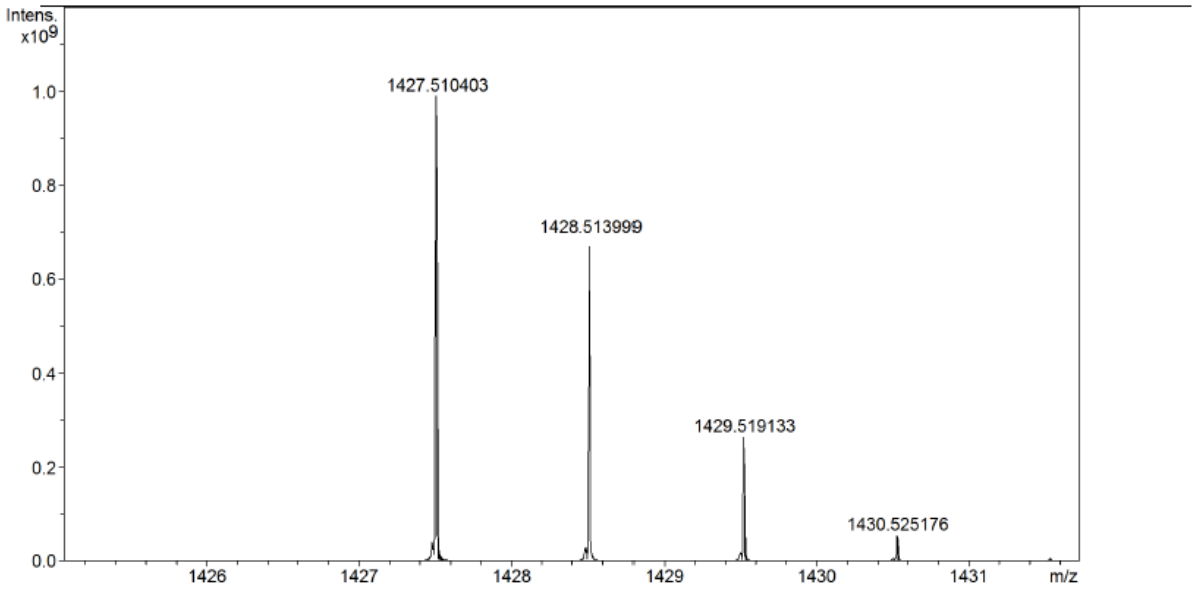


HRMS spectrum of compound **17**

Analysis Info			
Analysis Name	Z:\FTICR-MS\MS-1\Data\2019\apexdata031919\OBC_Cpd18_pos_000001.d	Acquisition Date	3/19/2019 2:57:39 PM
Method		Operator	FTMS_USER
Sample Name	OBC_Cpd18_pos	Instrument	apex-Qe
Comment	OBC_Cpd18 in MeOH:water w/NaCl C59H80N12O28 Na+		

Sample Name	OBC_Cpd18 in MeOH:water w/NaCl			
Exact Mass of	C59H80N12O28 Na+	=	1427.509721	m/z
Mass Observed		=	1427.510403	m/z

Difference < 1.0 ppm

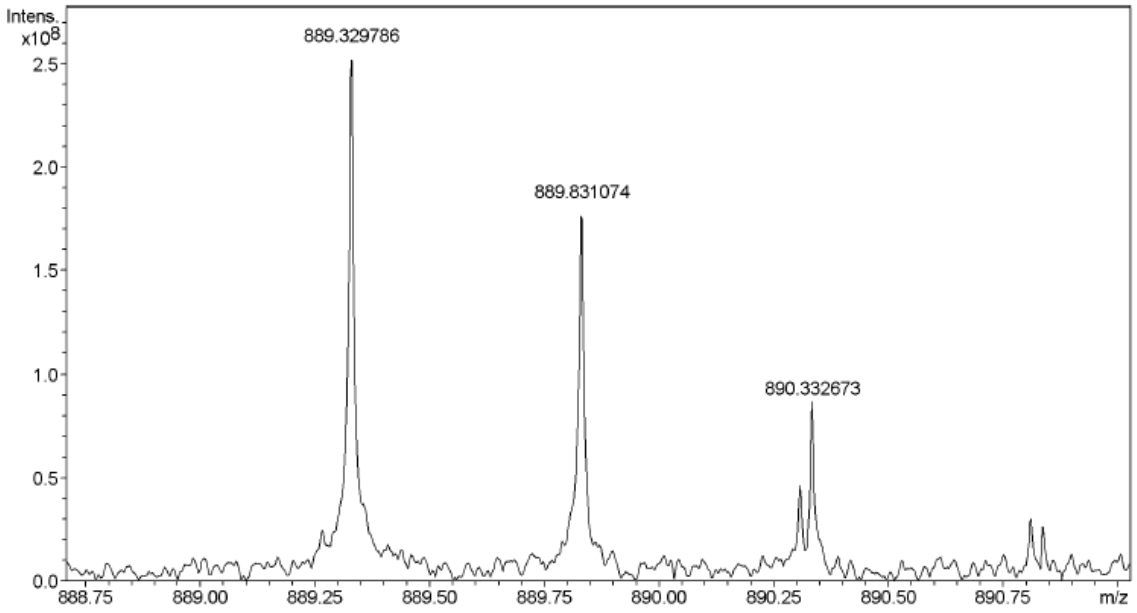


HRMS spectrum of compound **18**

Analysis Info			
Analysis Name	G:\Data\apexdata081617\1018_139_pos_000003.d	Acquisition Date	8/17/2017 2:33:54 AM
Method		Operator	FTMS_USER
Sample Name	1018_139	Instrument	apex-Qe
Comment	1018_139 in MeOH:H2O C73H100N16O36 H2+		

Sample Name	1018_139 in MeOH:H2O			
Exact Mass of	C73H100N16O36 H2+	=	889.331583	m/z
Mass Observed		=	889.329786	m/z

Difference = -2.0 ppm

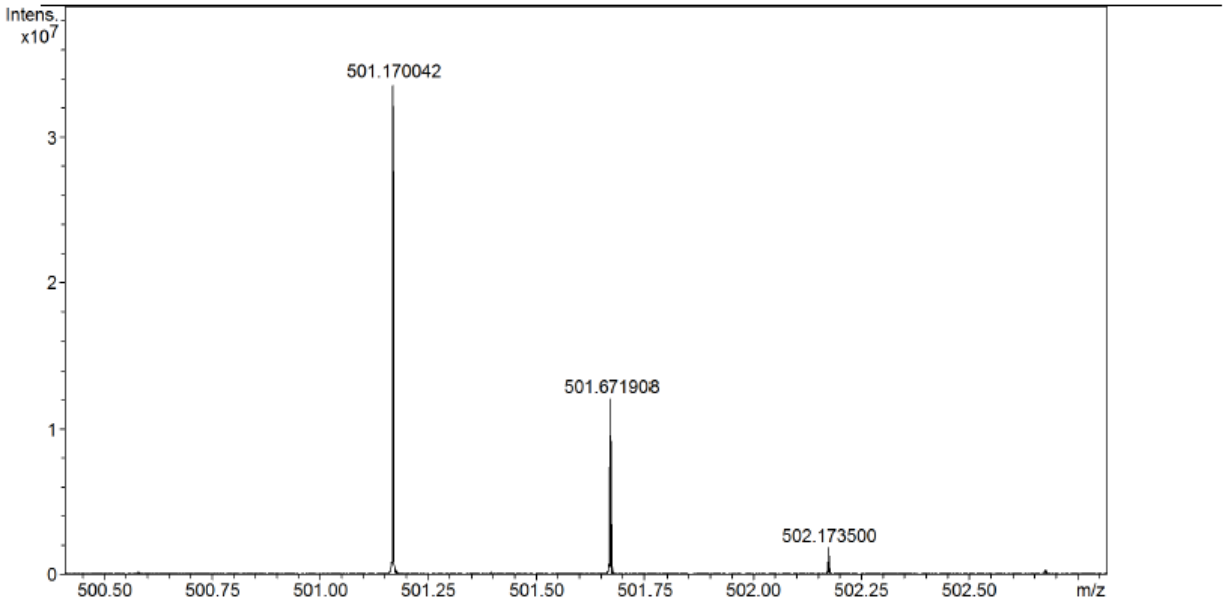


HRMS spectrum of compound **19**

Analysis Info			
Analysis Name	Z:\FTICR-MS\MS-1\Data\2019\apexdata031919\OBC_Cpd20_pos_000001.d	Acquisition Date	3/19/2019 3:03:46 PM
Method		Operator	FTMS_USER
Sample Name	OBC_Cpd20_pos	Instrument	apex-Qe
Comment	OBC_Cpd20 in MeOH:water w/NaCl [C39H56N8O20+ Na]+2		

Sample Name	OBC_Cpd20 in MeOH:water w/NaCl			
Exact Mass of	[C39H56N8O20+ Na]+2	=	501.169764	m/z
Mass Observed		=	501.170042	m/z

Difference < 1.0 ppm

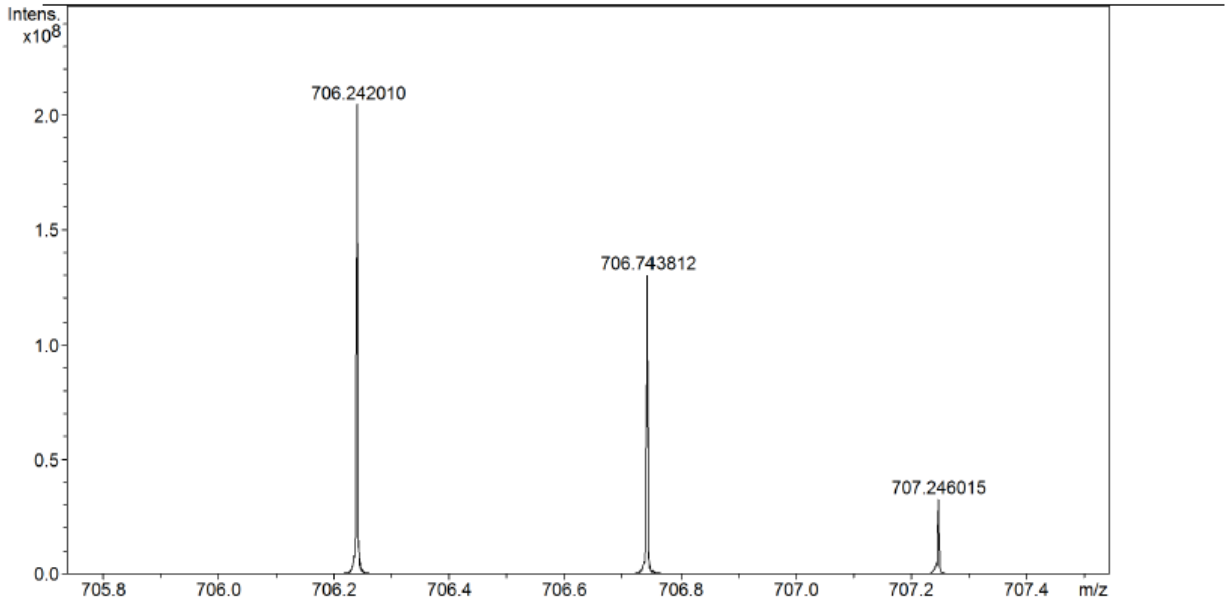


HRMS spectrum of compound **20**

Analysis Info			
Analysis Name	Z:\FTICR-MS\MS-1\Data\2019\apexdata031919\OBC_Cpd21_pos_000001.d	Acquisition Date	3/19/2019 3:13:11 PM
Method		Operator	FTMS_USER
Sample Name	OBC_Cpd21_pos	Instrument	apex-Qe
Comment	OBC_Cpd21 in MeOH:water w/NaCl	[C56H78N12O28 +Na]+2	

Sample Name	OBC_Cpd21 in MeOH:water w/NaCl			
Exact Mass of	[C56H78N12O28 +Na]+2	=	706.241646	m/z
Mass Observed		=	706.242010	m/z

Difference < 1.0 ppm



HRMS spectrum of compound **21**

Rheological Studies

Table S2. Storage modulus (*G′*), loss modulus (*G″*) and *G′*/*G″* value for compound **13** (i-PrOH, 4.0 mg/mL) under different angular frequency.

Compound **13** i-PrOH, 4.0 mg/mL			
Angular frequency	**Storage modulus (*G′*)**	**Loss modulus (*G″*)**	***G′*/*G″***
rad/s	**Pa**	**Pa**	
0.1	2241.69	404.457	5.54
0.15849	2434.06	371.291	6.56
0.251189	2546.71	336.85	7.56
0.398107	2654.48	303.032	8.76
0.630957	2738.17	282.673	9.69
1.0	2816.35	276.519	10.19
1.5849	2883.92	263.159	10.96
2.51189	2944.78	248.119	11.87
3.98105	3011.54	247.01	12.19
6.30957	3065.31	237.697	12.90
10.0001	3126.1	238.702	13.10
15.849	3185.1	246.567	12.92
25.1188	3246.87	254.004	12.78
39.8105	3316.23	279.154	11.88
63.0957	3401.63	307.833	11.05
100.0	3513.55	353.137	9.95

Table S3. Storage modulus (*G′*), loss modulus (*G″*) and *G′*/*G″* value for compound **19** (EtOH/H_2O, v/v 1:2, 4.0 mg/mL) under different angular frequency.

Compound **19** EtOH/H_2O, v/v 1/2, 4.0 mg/mL			
Angular frequency	**Storage modulus (*G′*)**	**Loss modulus (*G″*)**	***G′*/*G″***
rad/s	**Pa**	**Pa**	
0.1	1110.95	199.3	5.57
0.15849	1203.97	156.911	7.67
0.251189	1249.59	159.657	7.83
0.398107	1298.26	148.881	8.72
0.630957	1341.19	138.872	9.66
1.0	1374.62	133.004	10.34
1.5849	1416.46	129.812	10.91
2.51189	1445.99	124.755	11.59
3.98105	1479.49	119.77	12.35
6.30957	1509.16	115.377	13.08
10.0001	1535.64	115.004	13.35
15.849	1563.66	112.578	13.89
25.1188	1594.74	116.217	13.72
39.8105	1625.92	122.248	13.30
63.0957	1664.49	135.245	12.31
100.0	1725.81	155.111	11.13

Table S4. Storage modulus (*G′*), loss modulus (*G″*) and *G′*/*G″* value for compound **21** (H_2O, 10.0 mg/mL) under different angular frequency.

Compound **21** H_2O, 10.0 mg/mL			
Angular frequency	**Storage modulus (*G′*)**	**Loss modulus (*G″*)**	***G′*/*G″***
rad/s	**Pa**	**Pa**	
0.1	11398.4	4717.28	2.42
0.15849	12738.3	4231.1	3.01
0.251189	13468.5	3989.79	3.38
0.398107	14074.7	3737.58	3.77
0.630957	14486.3	3522.18	4.11
1.0	14979.5	3302.28	4.54
1.5849	15384.8	3198.71	4.81
2.51189	15910.8	3079.59	5.17
3.98105	16296.9	2972.95	5.48
6.30957	16776.6	2932.69	5.72
10.0001	17262.8	2852.35	6.05
15.849	17648.2	2748.47	6.42
25.1188	18193.2	2764.35	6.58
39.8105	18637.9	2750.31	6.78
63.0957	18960.8	2821.77	6.72
100.0	19543.0	2762.92	7.07

Amplitude sweep experiments

Amplitude sweep experiment was performed by HR-2 Discovery Hybrid Rheometer from TA instrument. All gels at their minimum gelation concentration were prepared in 4-dram vial in different solvent (or solvent mixtures) and they were left undisturbed on bench for 2 hrs. Sample (approximately 1 mL) was placed on the steel plate of the rheometer. The experimental temperature was 25 °C. The sample were subjected to amplitude sweep between 25-mm peltier plate and steel plate with a gap of 100 μm. Angular frequency was set as 10.0 rad/s. Operating and processing software is TRIOS. Results were expressed as the storage modules (*G′*), loss modules (*G″*) as function of oscillation strain in a range from 0.1% to 125%.

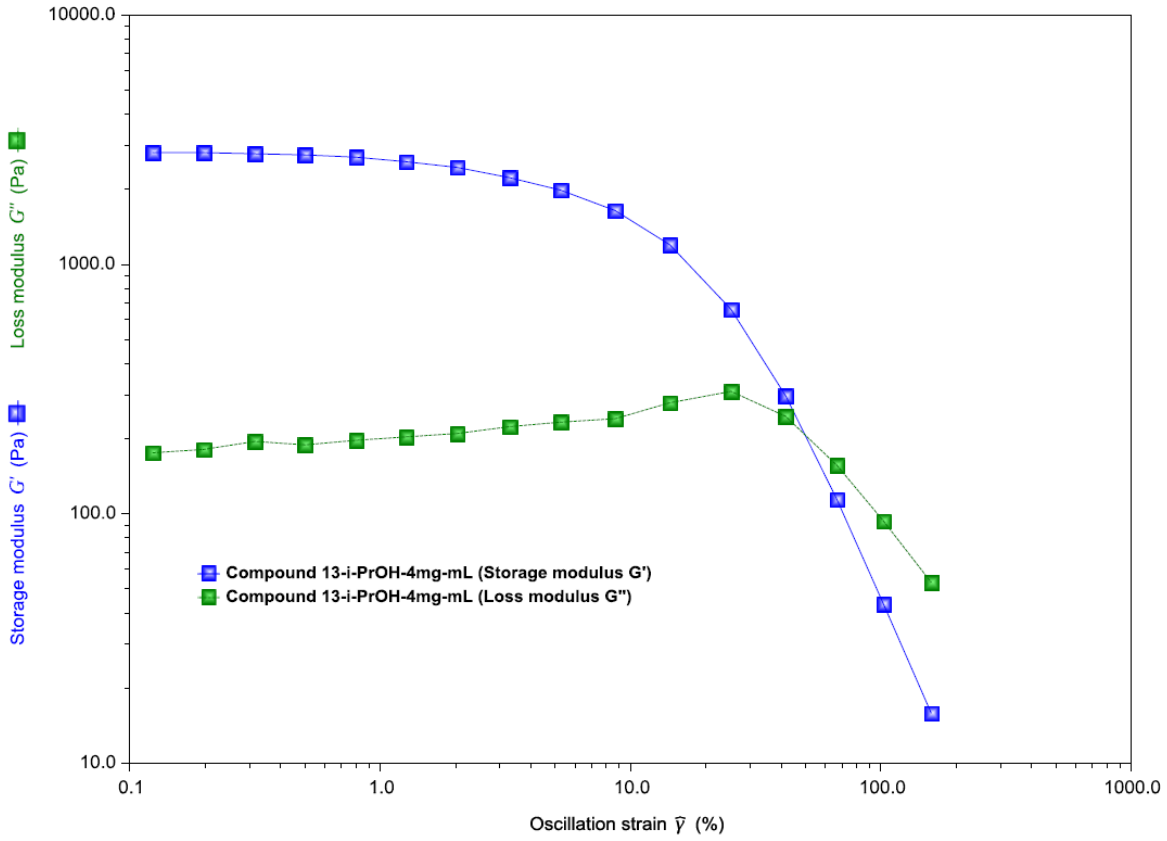


Figure S1. Rheological properties of amplitude sweep experiment for the gel of compound **13** (i-PrOH, 4.0 mg/mL).

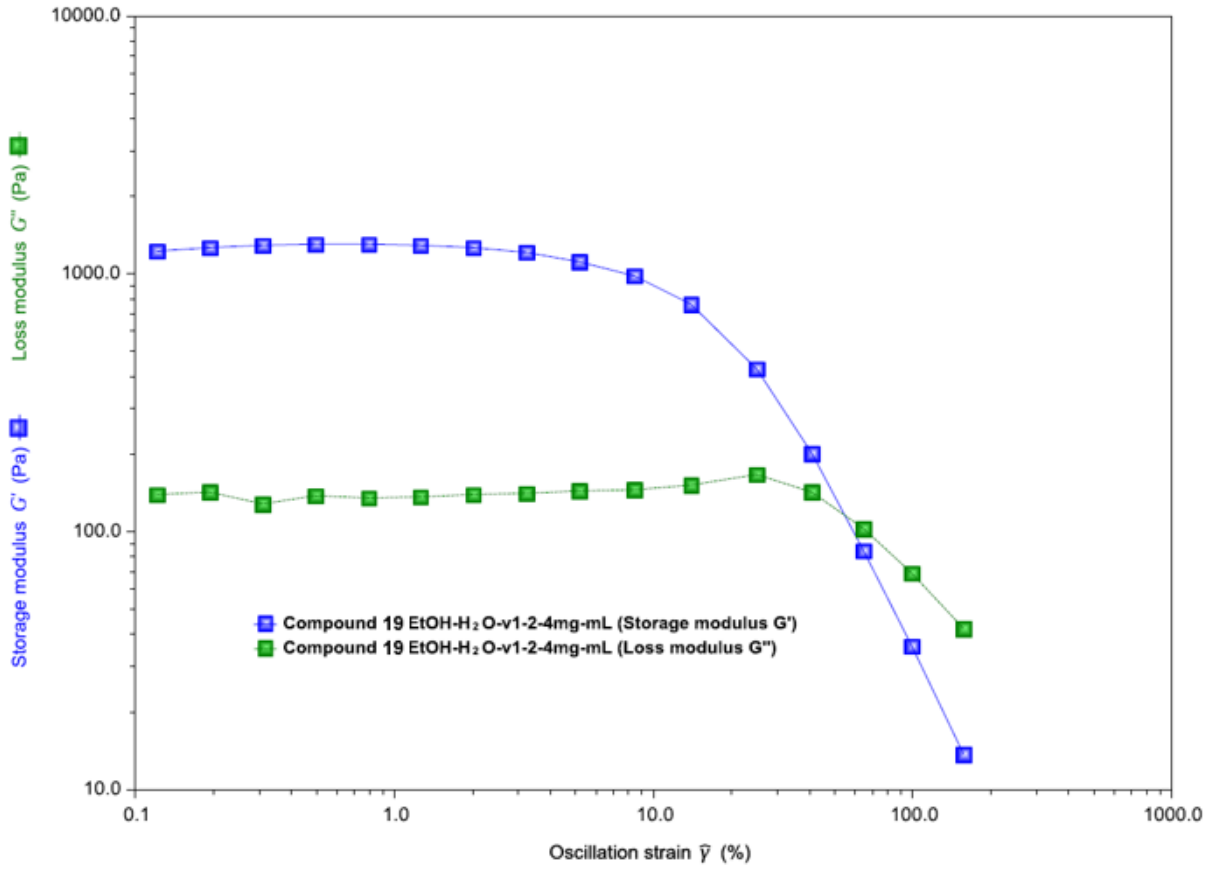


Figure S2. Rheological properties of amplitude sweep experiment for the gel of compound **19** ($EtOH/H_2O$, v/v 1:2, 4.0 mg/mL).

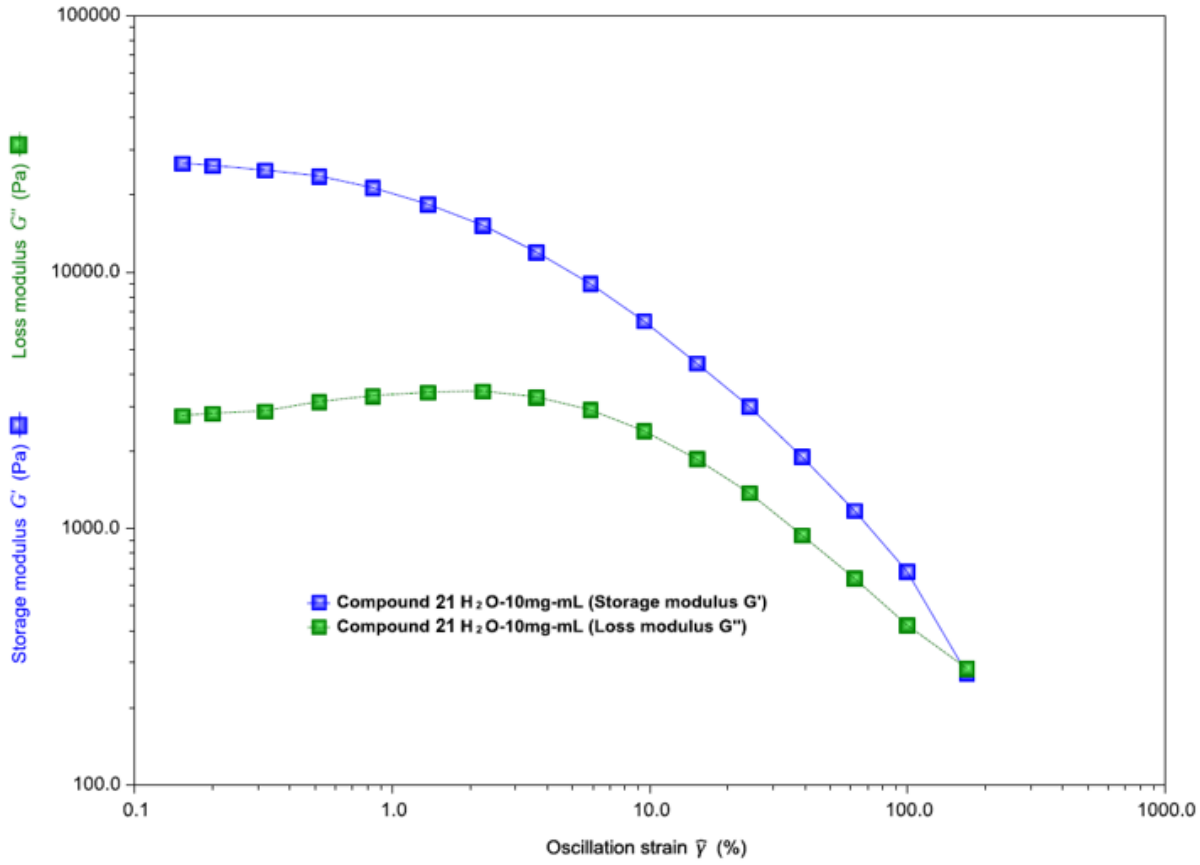


Figure S3. Rheological properties of amplitude sweep experiment for the gel of compound **21** (H_2O, 10.0 mg/mL).

Variable temperature ^{1}H NMR studies

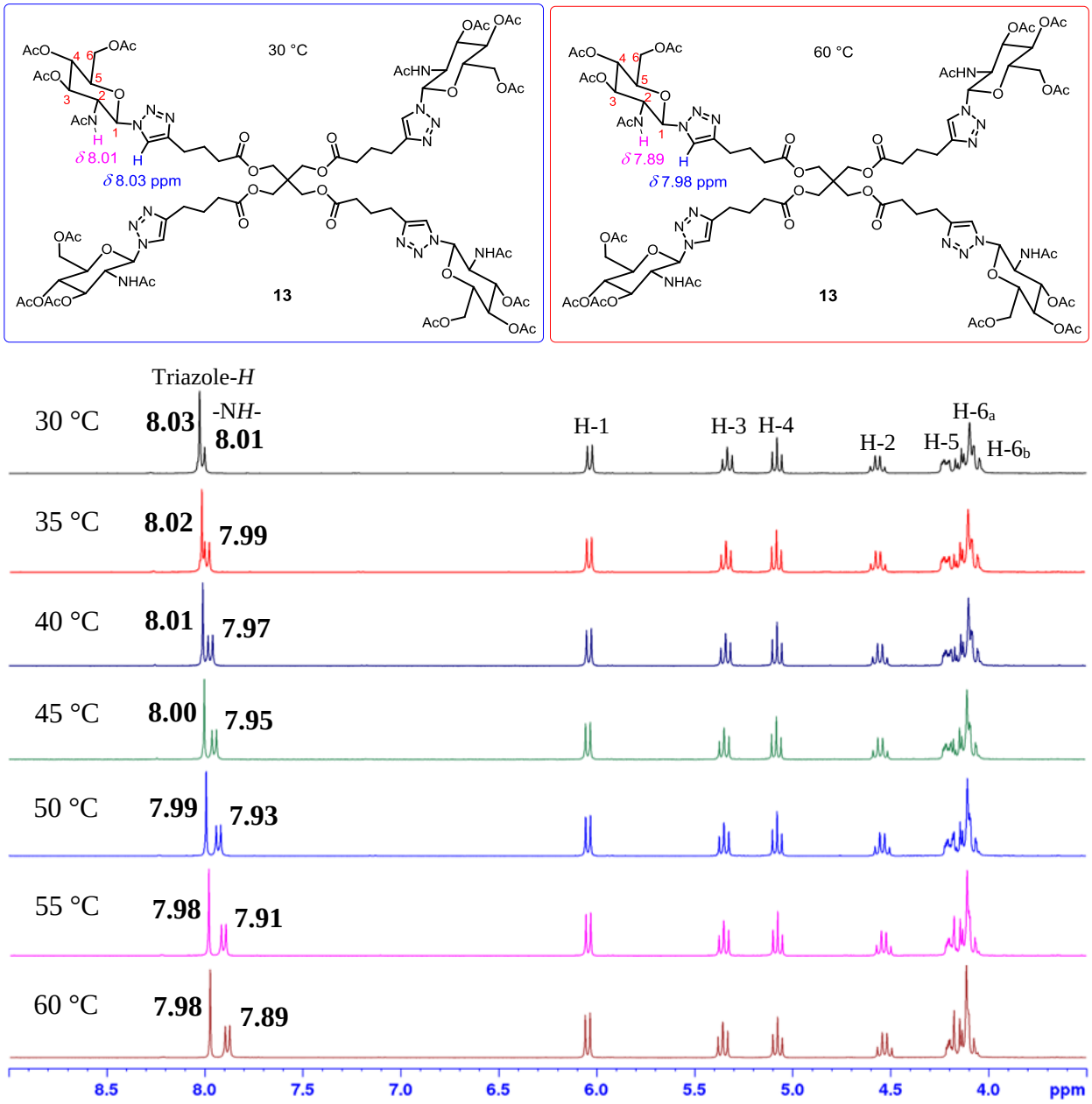


Figure S4. The ^{1}H NMR spectra (3.5 to 9.0 ppm) of compound **13** from 30 °C to 60 °C in d_6-DMSO (10.0 mg/mL).

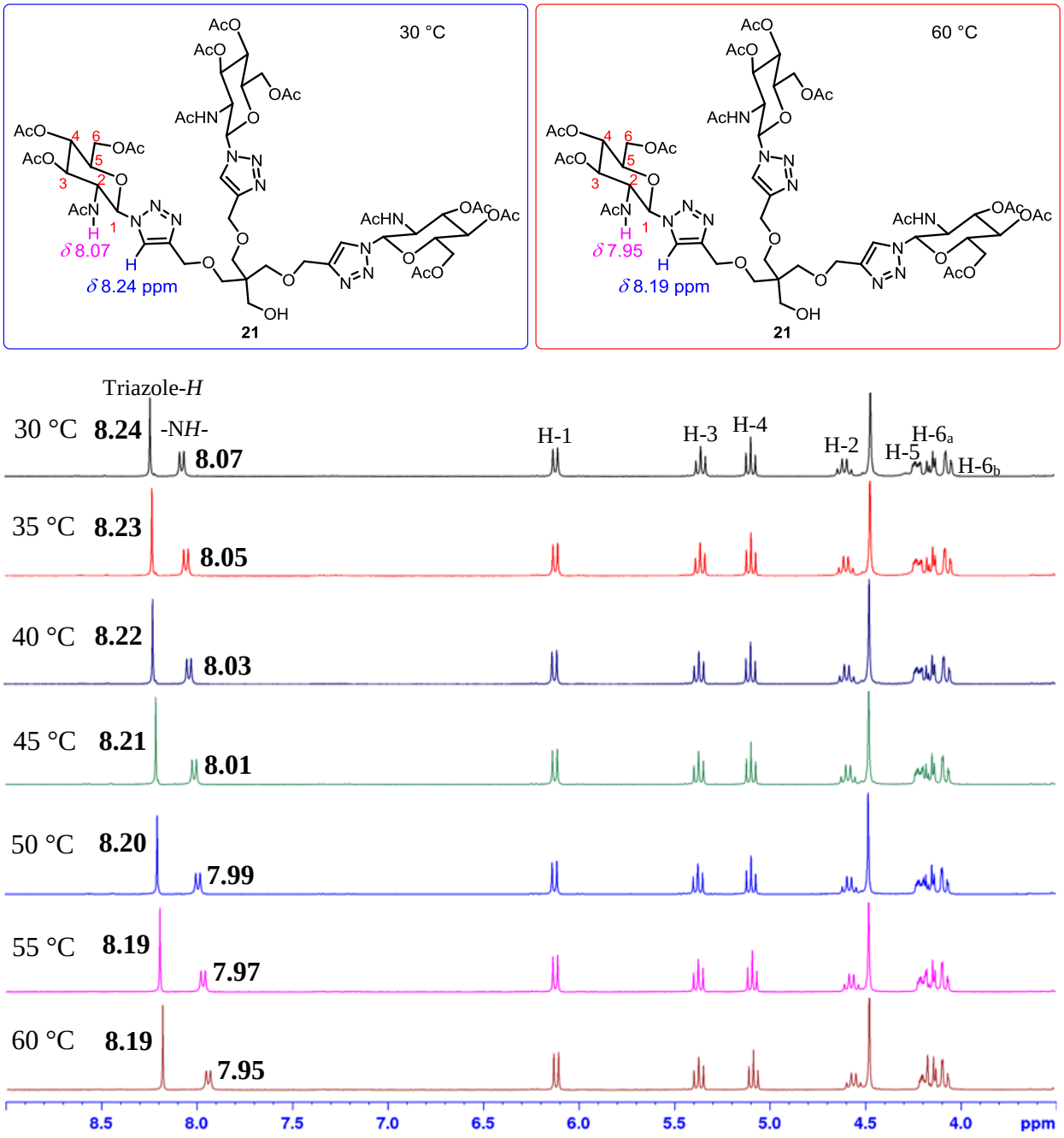


Figure S5. The ^{1}H NMR spectra (3.5 to 9.0 ppm) of compound **21** from 30 °C to 60 °C in d_6-DMSO (10.0 mg/mL).

Naproxen co-gels and release profile with gelator 21 at pH 7 and 10

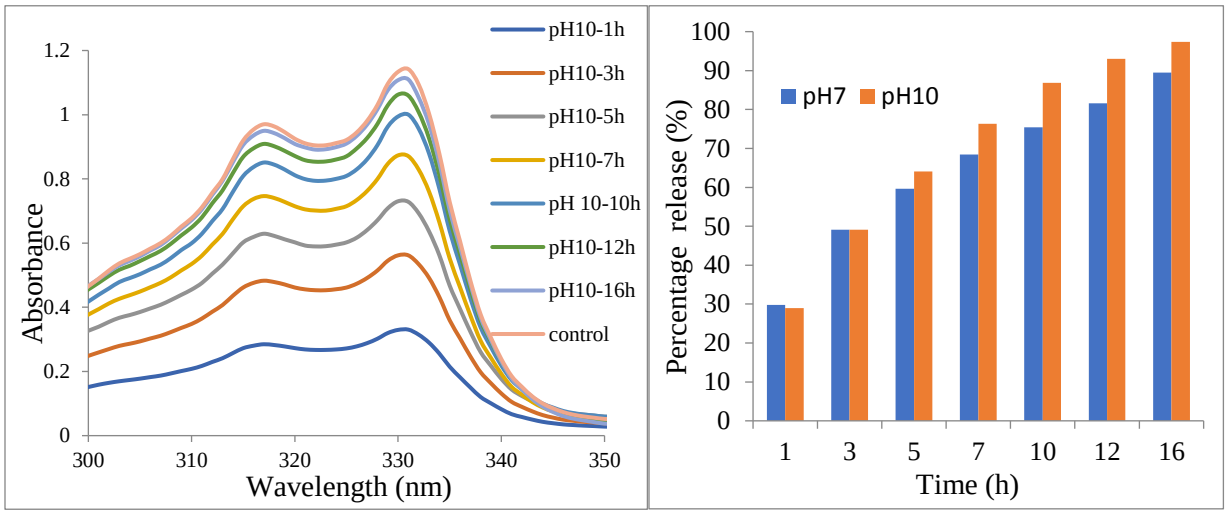


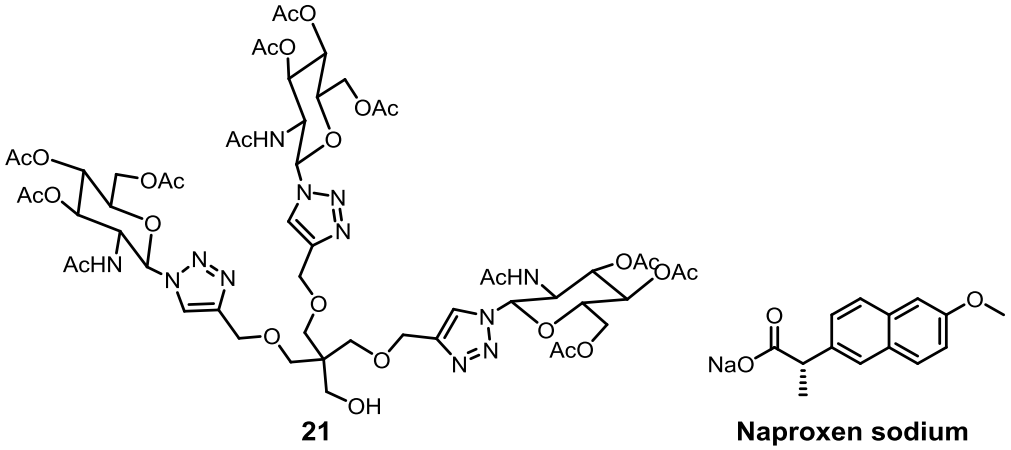
Figure S6. Release profile of naproxen with gelator **21** at pH 7 and 10 from gel to aqueous phase. a) UV spectra of naproxen from aqueous phase at pH 10. The gel was formed by 10 mg of compound **21** in 1.0 mL H_2O (pH 7) with 0.5 mg of naproxen, then 2.0 mL of water (pH 10) was added on top of the gel; naproxen control was prepared by dissolving 0.5 mg naproxen in 3.0 mL of water (pH 7). b) The percent release profile of naproxen at different time under pH 7 and 10, data was obtained using absorbance at 330 nm at different time versus the standard.

Drug encapsulation and release studies

Naproxen release study

Figure S7. Photos at different time periods of naproxen release study.

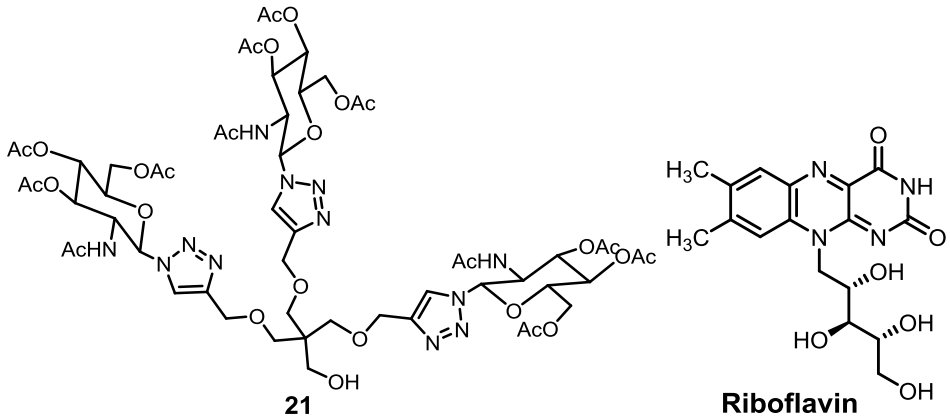
A hydrogel was prepared in a 1 dram via using 10 mg of compound **21** and 0.5 mg of naproxen sodium and 1 mL H_2O, 2 mL of water at pH 7 was added to the top of the gel carefully. Naproxen control was prepared by dissolving 0.5 mg naproxen in 3 mL of water (pH 7). Naproxen release from the gel was monitored by UV absorption at certain time by transferring the supernatant with a pipet to a cuvette, after each measurement the aqueous phase was carefully transferred back to the vial and placed on top of the gel again till the next measurement.



Riboflavin release study

Figure S8. Photos at different time periods of riboflavin release study.

A hydrogel was prepared in a 1 dram via using 10 mg of compound **21** and 0.1 mg of riboflavin and 1 mL H_2O, 2 mL of water at pH 7 was added to the top of the gel carefully. Riboflavin control was prepared by dissolving 0.1 mg riboflavin in 3 mL of water (pH 7). Riboflavin release from the gel was monitored by fluorescence microscopy at certain time by transferring the supernatant with a pipet to a cuvette, after each measurement the aqueous phase was carefully transferred back to the vial and placed on top of the gel again till the next measurement.



Vitamin B_{12} release study

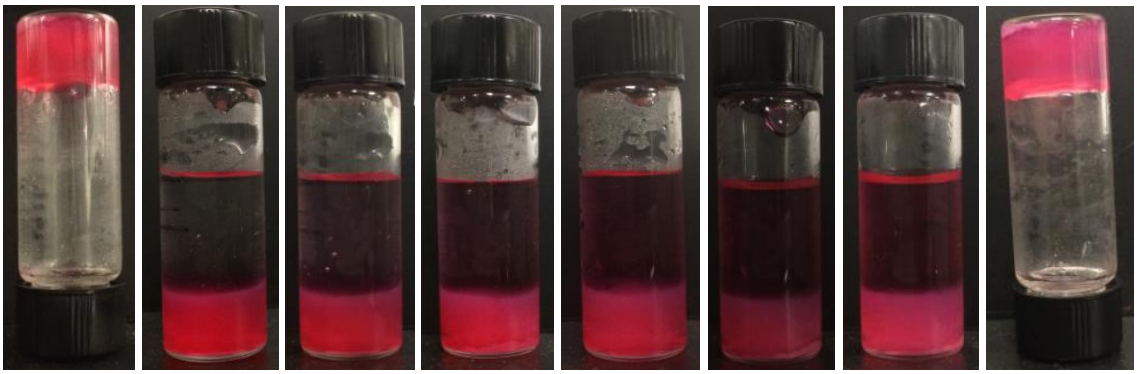
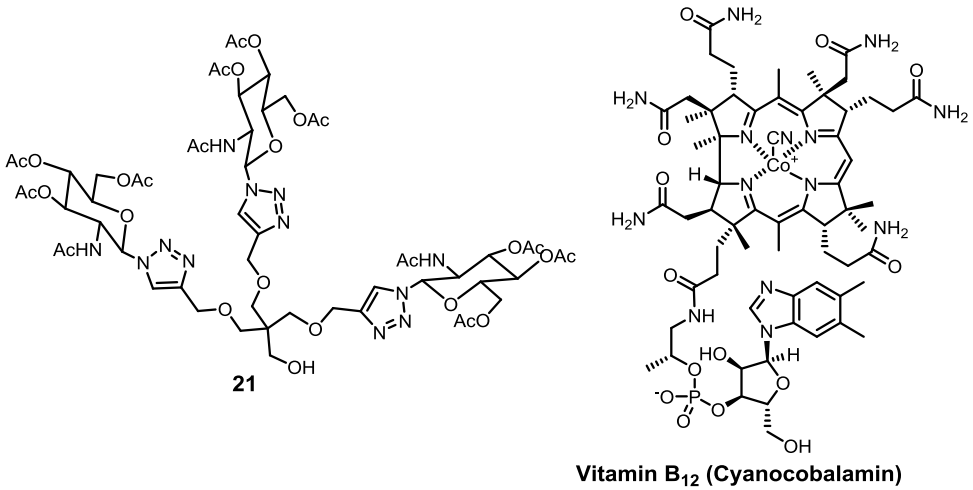


Figure S9. Photos at different time periods of vitamin B_{12} release study.

A hydrogel was prepared in a 1 dram via using 10 mg of compound **21** and 0.3 mg of Vitamin B_{12} (Cyanocobalamin) and 1 mL H_2O, 2 mL of water at pH 7 was added to the top of the gel carefully. Vitamin B_{12} control was prepared by dissolving 0.3 mg Vitamin B_{12} in 3 mL of water (pH 7). Vitamin B_{12} release from the gel was monitored by UV absorption at certain time by transferring the supernatant with a pipet to a cuvette, after each measurement the aqueous phase was carefully transferred back to the vial and placed on top of the gel again till the next measurement.



Atomic force microscopy (AFM) images for several gels

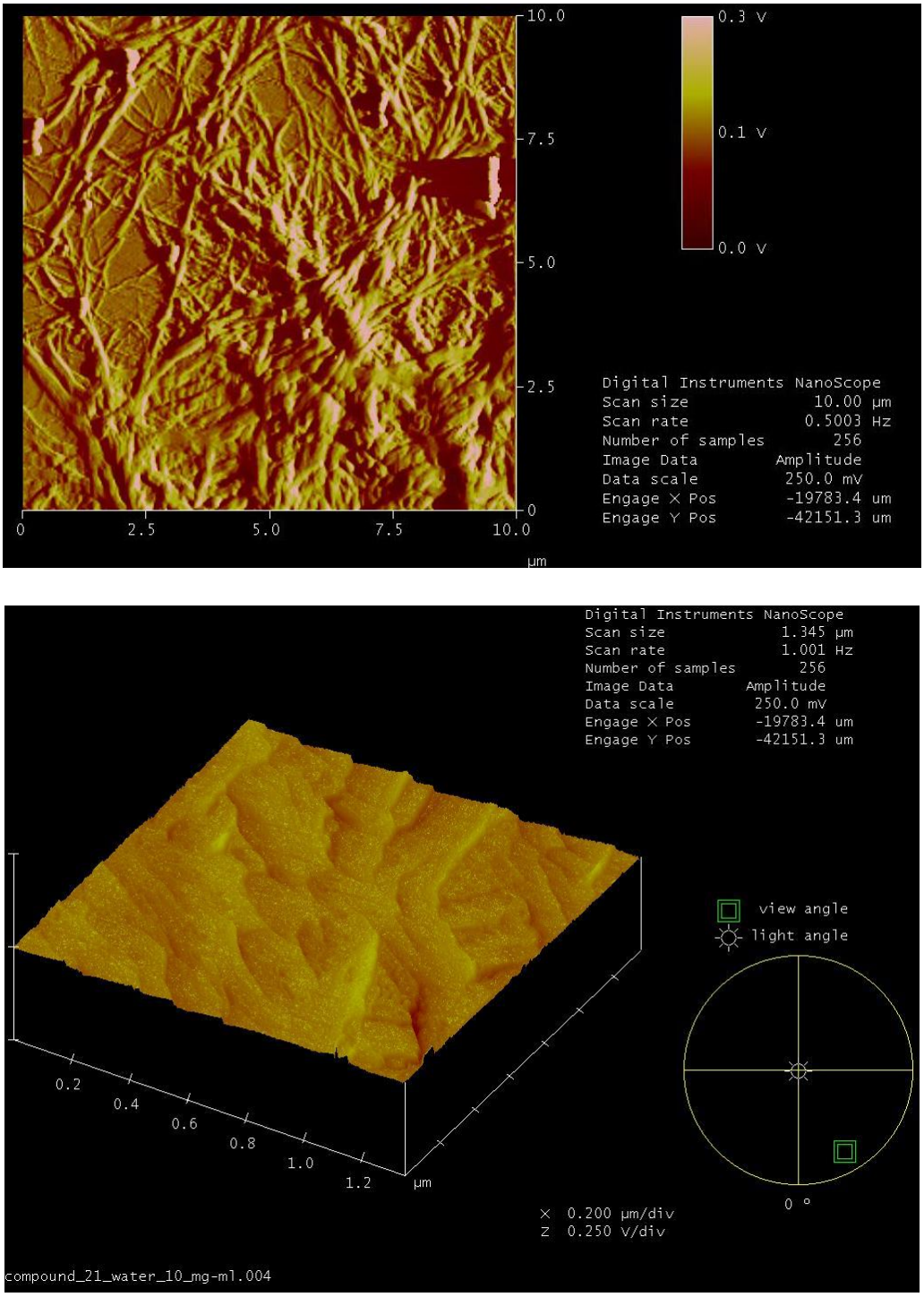


Figure S10. AFM characterization images of the gel formed by compounds **21** in water at 10 mg/mL.

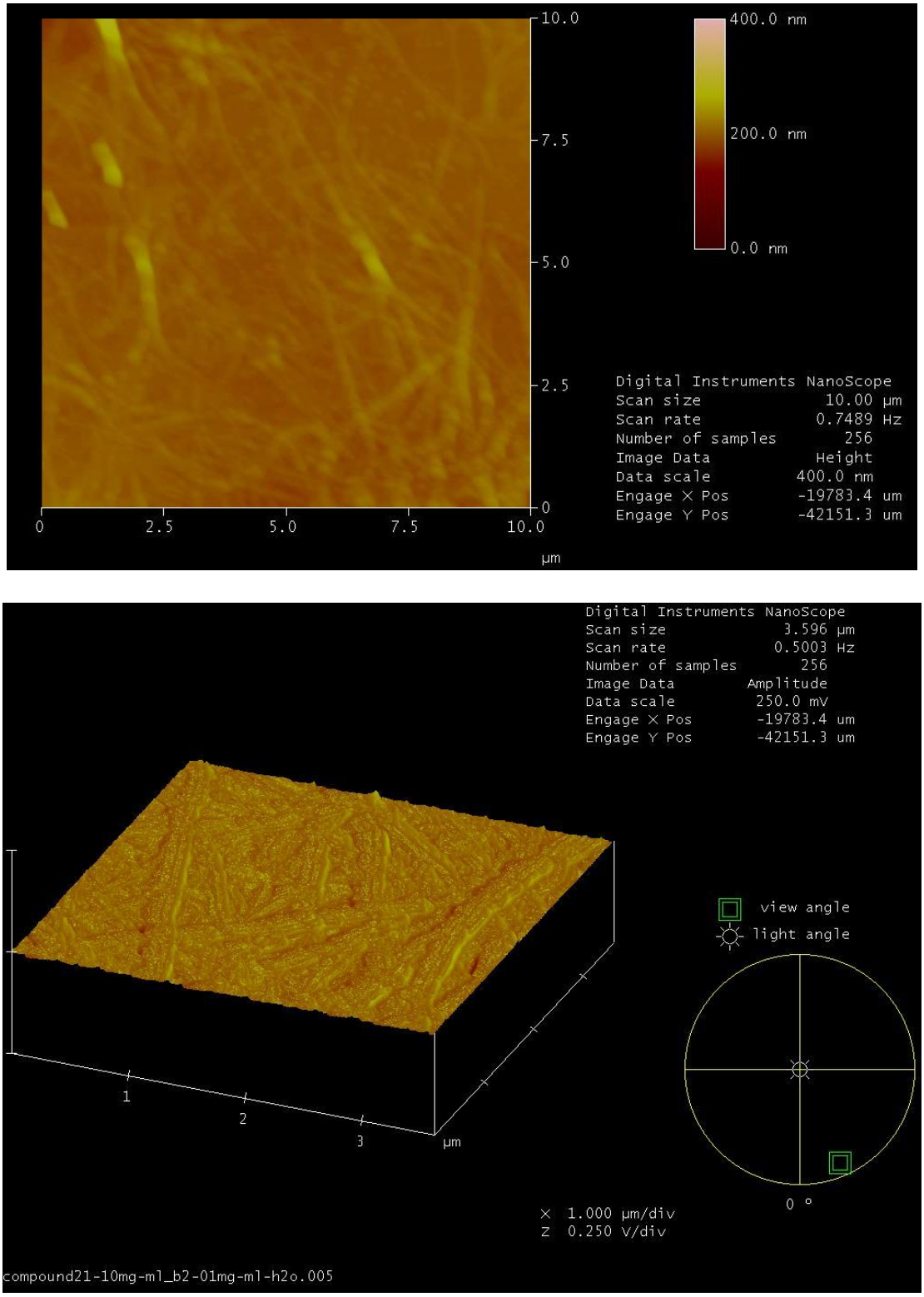


Figure S11. AFM images of the gel formed by compounds **21** in water at 10 mg/mL with 0.1 mg/mL of vitamin B_2.