Electronic Supplementary Material (ESI) for RSC Advances.


# Synthesis of Glycopeptoid Sulfonamides Diversifying *N*-glycopeptide Linkage Region Mimic

Anadi Singhamahapatra,[a]* Laxminarayan Sahoo,[a] Babu Varghese[b] and Duraikkannu Loganathan[ła]

[a] Department of Chemistry, Indian Institute of Technology Madras, Chennai-600036, India
Email: singhaindia@gmail.com

[b] Sophisticated Analytical Instrumentation Facility, Indian Institute of Technology Madras, Chennai- 600036, India

- Correspondence: Anadi Singhamahapatra, Department of Chemistry, Indian Institute of Technology Madras, Chennai – 600036, India; Tel.: +91-44-22575221, +91-9884242732; Fax: 091-44-22570509; E-mail: singhaindia@gmail.com

[ł] Deceased on 9th February, 2013

**Contents**

## Experimental Section (synthesis and spectral data of compounds)

**General Information:** All the solvents were used after distillation and dry solvents were prepared using standard methods. All reagents purchased from commercial sources were used without any purification. $^{1}H$ and $^{13}C$ NMR spectra were recorded on 400 MHz NMR spectrometer. The assignment of $^{1}H$ NMR spectra was done with the help of $^{1}H$-$^{1}H$ COSY spectra. All mass spectra were recorded in Q-TOF electrospray ionization spectrometer. Column chromatography was performed over 100-200 mesh silica with ethyl acetate and hexane as the eluent.

**1. Synthesis of vinylsulfonamide functionalized *N*-propargylated α-peptoid building block (1):** Propargyl amine (0.5 mL, 7.8 mmol) was added to a suspension of $K_2CO_3$ (1.07 g, 7.8 mmol) in dry acetonitrile (10 mL) at 0 $^{o}$C. To this stirred mixture, *tert*-butyl bromoacetate (1.2 mL, 8.0 mmol) was added drop wise at 0 $^{o}$C. Stirring was continued for 24 h allowing the mixture to come to room temperature. The reaction mixture was filtered and the residue was washed with dichloromethane (5 mL x 2). The combined filtrate was concentrated and dried under vacuum. The crude reaction mixture was dissolved in dry dichloromethane (10 mL) and cooled to 0 $^{o}$C. Then diisopropylethylamine (2.7 mL, 15.0 mmol) was added to the stirred reaction mixture followed by dropwise addition of chloroethanesulfonyl chloride (0.8 mL, 7.8 mmol) at 0 $^{o}$C. The reaction mixture was stirred for 24 h allowing it to come to room temperature. After completion of the reaction, the reaction mixture was diluted with dichloromethane (30 mL), washed with water (20 mL x 2) and brine solution (20 mL). The organic layer was dried over anhydrous sodium sulfate, and then concentrated to dryness. The crude reaction mixture thus obtained was purified by column chromatography to give the title compound as syrup.

Yield 70% (1.50 g), $^{1}$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 6.64-6.58 (m, 1H, alkene C<u>H</u>), 6.26 (d, 1H, $J$ = 16.8 Hz, alkene C<u>H</u>), 5.98 (d, 1H, $J$ = 9.6 Hz, alkene C<u>H</u> ), 4.15 (d, 2H, $J$ = 2.0 Hz, -C<u>H</u>$_2$-), 4.00 (s, 2H, -C<u>H</u>$_2$-), 2.37 (t, 1H, $J$ = 2.4 Hz, alkyne C<u>H</u>), 1.47 ( s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 167.8 (-<u>C</u>O-), 135.2, 127.2, 82.6, 74.4, 47.6, 37.2, 28.1 ppm; ESI-MS HRMS: Calculated for $C_{11}H_{17}NO_4NaS$ ($[M+Na]^+$): 282.0776; found 282.0774.

**2. Synthesis of vinylsulfonamide functionalized *N*-propargylated β-peptoid building block (2):** Propargyl amine (0.7 mL, 10.9 mmol) was added to a solution of *tert*-butyl acrylate (1.1 mL, 7.8 mmol) in dry methanol (10 mL) at room temperature. The mixture was stirred at 50 $^{o}$C for 24 h. Then excess reagent and solvent were removed by applying vacuum. The crude reaction mixture was dissolved in dry dichloromethane (10 mL) and cooled to 0 $^{o}$C. Then diisopropylethylamine (2.7 mL, 15 mmol) was added to the stirred reaction mixture followed by dropwise addition of chloroethanesulfonyl chloride (0.8 mL, 7.8 mmol) at 0 $^{o}$C. The reaction mixture was stirred for 24 h allowing it to come to room temperature. After completion of the reaction the reaction mixture was diluted with dichloromethane (30 mL), washed with water (20 mL x 2) and brine solution (20 mL). The organic layer was dried over anhydrous sodium sulfate, and then concentrated to dryness. The crude reaction mixture thus obtained was purified by column chromatography to give the title compound as syrup.

Yield 85% (1.96 g), $^{1}$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 6.56-6.53 (m, 1H, alkene C<u>H</u>), 6.26 (d, 1H, $J$ = 13.2 Hz, alkene C<u>H</u>), 6.01 (d, 1H, $J$ = 8.0 Hz, alkene C<u>H</u>), 4.14 (s, 2H, -C<u>H</u>$_2$-), 3.42 (t, 2H, $J$ = 5.6 Hz, N-C<u>H</u>$_2$-CH$_2$), 2.60-2.57 (m, 2H, N-CH$_2$-C<u>H</u>$_2$), 2.35 (t, 1H, $J$ = 2.0 Hz, alkyne C-<u>H</u>), 1.45 (s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.5 (-<u>C</u>O-), 134.1, 127.8, 81.2, 74.1, 42.6, 37.3, 35.1, 28.0 ppm; ESI-MS HRMS: Calculated for $C_{12}H_{19}NO_4NaS$ ($[M+Na]^+$): 296.0932; found 296.0919.

**3. Synthesis of *N*-propargylated phthalimide protected α/β-peptoid sulfonamide building blocks (3 & 4):** A mixture of vinylsulfonamide functionalized *N*-propargylated peptoid building block (**1** or **2**; 1 mmol), potassium phthalimide (40 mg, 0.2 mmol) and phthalimide (147 mg, 1 mmol) were dissolved in dry acetonitrile (15 mL) and stirred at 60 $^{o}$C for 24 h. After completion of the reaction as monitored by TLC, the reaction mixture was concentrated to dryness. Analytically pure compounds were obtained after purification by column chromatography to give the title compounds.

Compound **3**: yield 94% (400 mg), m.p. 114-116 °C, $^{1}$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.86-7.84 (m, 2H, aromatic C<u>H</u>), 7.73-7.71 (m, 2H, aromatic C<u>H</u>), 4.24 (d, 2H, $J$ = 2.4 Hz, N-C<u>H</u>$_2$-C), 4.18 (t, 2H, $J$ = 6.4 Hz, N-C<u>H</u>$_2$-CH$_2$), 4.10 (s, 2H, N-C<u>H</u>$_2$-CO), 3.54 (t, 2H, $J$ = 6.4 Hz, -N-CH$_2$-C<u>H</u>$_2$), 2.35 (t, 1H, $J$ = 2.3 Hz, alkyne C<u>H</u>), 1.48 ( s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 168.1 (-<u>C</u>O-), 167.8 (-<u>C</u>O-), 134.3, 134.2 (x 2), 132.0, 123.6 (x 2), 82.8, 77.4, 74.4, 50.2, 48.3, 37.8, 32.3, 28.1 ppm; ESI-MS HRMS: Calculated for $C_{19}H_{22}N_2O_6NaS$ ([M+Na]$^+$): 429.1096; found 429.1114.

Compound **4**: yield 96% (425 mg), m.p. 110-112 °C, $^{1}$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.87-7.85 (m, 2H, aromatic C<u>H</u>), 7.74-7.72 (m, 2H, aromatic C<u>H</u>), 4.20-4.15 (m, 4H, N-C<u>H</u>$_2$-C & N-C<u>H</u>$_2$-CH$_2$-S), 3.61 (t, 2H, $J$ = 6.8 Hz, N-C<u>H</u>$_2$-CH$_2$-CO), 3.48 (t, 2H, $J$ = 6.8 Hz, N-CH$_2$-C<u>H</u>$_2$-S), 2.58 (t, 2H, $J$ = 6.8Hz, N-CH$_2$-C<u>H</u>$_2$-CO), 2.39 (t, 1H, $J$ = 2.3 Hz, alkyne -C<u>H</u>), 1.45 (s, 9 H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.5 (-<u>C</u>O-), 167.7 (-<u>C</u>O-), 134.3, 132.0, 123.6, 81.4, 77.6, 74.5, 48.7, 43.0, 37.0, 35.2, 32.4, 28.1 ppm; ESI-MS HRMS: Calculated for $C_{20}H_{24}N_2O_6NaS$ ([M+Na]$^+$): 443.1253; found 443.1265.

**4. Synthesis of triazole linked *N*-glycopeptoid sulfonamides (9-18):** *N*-propargylated peptoidsulfonamide building block (**1**-**4**, 1 mmol) and per-*O*-acetylated sugar azide (**5**-**8**, 1 mmol) were dissolved in acetone (15 mL). To the stirred reaction mixture, a solution of copper sulfate (50 mg, 0.2 mmol) in water (3 mL) was added followed by the addition of aqueous solution (3 mL) of sodium ascorbate (80 mg, 0.4 mmol). The reaction mixture was allowed to stir at room temperature for 24 h. After completion of the reaction as monitored by TLC, acetone was removed by applying vacuum. Ethyl acetate (50 mL) was added to the reaction mixture and washed with water (20 mL) followed by brine solution (20 mL). The organic layer was dried over anhydrous sodium sulfate and concentrated to dryness. The crude product was purified by column chromatography by eluting with ethyl acetate and hexane.

Compound **9**: yield 90% (590 mg), m.p. 144-146 $^{\circ}$C, $[\alpha]_D$: -0.6$^{\circ}$ (c = 0.3, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.89 (s, 1H, triazole C<u>H</u>), 6.72-6.65 (m, 1H, alkene C<u>H</u>), 6.29 (d, 1H, *J* = 16.4 Hz, alkene C<u>H</u>), 5.99 (d, 1H, *J* = 9.6 Hz, alkene C<u>H</u>), 5.86-5.83 (m, 1H, H-1), 5.43-5.41 (m, 2H, H-2 & H-3), 5.27-5.23 (m, 1H, H-4), 4.48 (s, 2H, N-C<u>H</u>$_2$-CO), 4.34-4.29 (m, 1H, H-6a), 4.18-4.13 (m, 1H, H-6b), 4.03-3.99 (m, 1H, H-5), 3.95 (s, 2H, N-C<u>H</u>$_2$-triazole), 2.10, 2.07, 2.03, 1.89 (4s, 12, 4 x COC<u>H</u>$_3$), 1.46 (s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.5, 169.9, 169.2, 168.7, 168.3, 144.1, 135.9, 126.7, 121.9, 85.8, 82.5, 75.2, 72.5, 70.4, 67.6, 61.4, 48.2, 42.6, 28.0, 20.7, 20.5, 20.1 ppm; ESI-MS HRMS: Calculated for $C_{25}H_{36}N_4O_{13}SNa$ ($[M+Na]^+$): 655.1897; found 655.1872.

Compound **10**: yield 92% (615 mg), m.p. 118-120 $^{\circ}$C, $[\alpha]_D$: -5.3$^{\circ}$ (c = 0.7, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.88 (s, 1H, triazole C<u>H</u>), 6.49-6.43 (m, 1H, alkene C<u>H</u>), 6.21 (d, 1H, *J* = 16.4 Hz, alkene C<u>H</u>), 5.91 (d, 1H, *J* = 10 Hz, alkene C<u>H</u>), 5.85 (d, 1H, *J* = 8.8 Hz, H-1), 5.46-5.37 (m, 2H, H-2 & H-3), 5.25 (t, 1H, *J* = 9.2 Hz, H-4), 4.57-4.48 (m, 2H, N-C<u>H</u>$_2$-triazole), 4.34-

4.30 (m, 1H, H-6a), 4.18-4.15 (m, 1H, H-6b), 4.03-3.99 (m, 1H, H-5), 3.40 (t, 2H, *J* = 7.2 Hz, N-C<u>H</u>$_2$-CH$_2$-CO), 2.58-2.55 (m, 2H, N-CH$_2$-C<u>H</u>$_2$-CO), 2.10, 2.07, 2.03, 1.87 (4s, 12, 4 x COC<u>H</u>$_3$), 1.44 (s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR (CDCl$_3$, 100 MHz): $\delta$ 170.7, 170.6, 170.0, 169.4, 168.8, 144.4, 135.1, 127.0, 122.0, 86.0, 81.2, 77.4, 75.3, 72.5, 70.6, 67.7, 61.5, 43.3, 42.7, 35.2, 28.1, 20.8, 20.7, 20.6, 20.2 ppm; ESI-MS HRMS: Calculated for $C_{26}H_{38}N_4O_{13}NaS$ ([M+Na]$^+$): 669.2054; found 669.2080.

Compound **11**: yield 95% (740 mg), m.p. 164-166 $^\circ$C, $[\alpha]_D$: -4.5$^\circ$ (c = 0.5, CHCl$_3$), $^1$H-NMR (CDCl$_3$, 400 MHz): $\delta$ 8.01 (s, 1H, triazole C<u>H</u>), 7.91-7.86 (m, 2H, aromatic C<u>H</u>), 7.75-7.73 (m, 2H, aromatic C<u>H</u>), 5.86-5.82 (m, 1H, H-1), 5.45-5.39 (m, 2H, H-2 & H-3), 5.30-5.25 (m, 1H, H-4), 4.72-4.60 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.33-4.29 (m, 1H, H-6a), 4.25-4.12 (m, 3H, H-6b & N-C<u>H</u>$_2$-CH$_2$-S), 4.04-3.99 (m, 3H, H-5 & N-C<u>H</u>$_2$-CO), 3.64-3.54 (m, 2H, N-CH$_2$-C<u>H</u>$_2$-S), 2.09, 2.07, 1.97, 1.85 (4s, 12H, 4 x COC<u>H</u>$_3$), 1.46 (s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR (CDCl$_3$, 100 MHz): $\delta$ 170.6, 169.9, 169.4, 168.8, 168.5, 167.9, 144.1, 134.1, 132.0, 123.5, 122.1, 85.8, 82.6, 75.2, 72.5, 70.4, 67.7, 61.5, 50.6, 48.6, 43.2, 32.6, 28.0, 20.7, 20.6, 20.5, 20.1 ppm; ESI-MS HRMS: Calculated for $C_{33}H_{42}N_5O_{15}S$ ([M+H]$^+$): 780.2398; found 780.2373.

Compound **12**: yield 92% (730 mg), m.p. 134-136 $^\circ$C, $[\alpha]_D$:-1.3$^\circ$ (c = 0.4, CHCl$_3$), $^1$H-NMR (CDCl$_3$, 400 MHz): $\delta$ 8.04 (s, 1H, triazole C-<u>H</u>), 7.90-7.88 (m, 2H, aromatic C-<u>H</u>), 7.74-7.72 (m, 2H, aromatic C-<u>H</u>), 5.85-5.83 (m, 1H, H-1), 5.42-5.40 (m, 2H, H-2 & H-3), 5.33-5.28 (m, 1H, H-4), 4.68-4.55 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.35-4.30 (m, 1H, H-6a), 4.21-4.11 (m, 3H, H-6b & N-C<u>H</u>$_2$-CH$_2$-S), 4.04-4.00 (m, 1H, H-5), 3.50-3.42 (m, 4H, N-CH$_2$-C<u>H</u>$_2$-S & N-C<u>H</u>$_2$-CH$_2$-CO), 2.61-2.57 (m, 2H, N-CH$_2$-C<u>H</u>$_2$-CO), 2.09, 2.08, 1.96, 1.83 (4s, 12H, 4 x COC<u>H</u>$_3$), 1.44 (s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR (CDCl$_3$, 100 MHz): $\delta$ 170.6, 169.9, 169.4, 168.9, 167.8, 144.0,

134.2, 132.0, 123.6, 122.1, 86.0, 81.2, 75.3, 72.5, 70.6, 67.8, 61.6, 49.7, 42.9, 42.0, 34.8, 32.6, 28.1, 20.8, 20.6, 20.5, 20.1 ppm; ESI-MS HRMS: Calculated for $C_{34}H_{44}N_5O_{15}S$ ($[M+H]^+$): 794.2555; found 794.2523.

Compound **13**: yield 85% (680 mg), m.p. 188-190 °C, $[\alpha]_D$: -19.6° (c = 0.6, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 8.02 (s, 1H, triazole C<u>H</u>), 7.89-7.86 (m, 2H, aromatic C<u>H</u>), 7.74-7.72 (m, 2H, aromatic C<u>H</u>), 6.13 (d, 1H, *J* = 9.2 Hz, N<u>H</u>), 6.00 (d, 1H, *J* = 10 Hz, H-1), 5.47 (t, 1H, *J* = 10 Hz, H-3), 5.26 (t, 1H, *J* = 9.6 Hz, H-4), 4.71-4.60 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.54-4.47 (m, 1H, H-2), 4.32-4.27 (m, 1H, H-6a), 4.23-4.11 (m, 3H, H-6b & N-C<u>H</u>$_2$-$CH_2$-S), 4.05-3.94 (m, 3H, H-5 & N-C<u>H</u>$_2$-CO), 3.62-3.58 (m, 2H, N-$CH_2$-C<u>H</u>$_2$-S),2.08, 2.07, 2.01, 1.73 (4s, 12H, 4 x COC<u>H</u>$_3$), 1.46 (s, 9H, C{$CH_3$}$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.9, 170.7, 170.4, 169.4, 168.6, 167.9, 143.7, 134.2, 132.1, 123.6, 122.7, 86.2, 82.7, 75.1, 72.1, 68.0, 61.8, 53.9, 50.6, 48.6, 43.2, 32.6, 28.1, 22.8, 20.8, 20.7 ppm; ESI-MS HRMS: Calculated for $C_{33}H_{42}N_6O_{14}NaS$ ($[M+Na]^+$): 801.2377; found 801.2360.

Compound **14**: yield 80% (630 mg), m.p. 150-152 °C, $[\alpha]_D$: -14.8° (c = 0.9, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 8.06 (s, 1H, triazole C<u>H</u>), 7.89-7.87 (m, 2H, aromatic C<u>H</u>), 7.73-7.71 (m, 2H, aromatic C<u>H</u>), 6.24 (d, 1H, *J* = 9.2 Hz, N<u>H</u>), 6.03 (d, 1H, *J* = 9.6 Hz, H-1), 5.49 (t, 1H, *J* = 9.6 Hz, H-3), 5.30 (t, 1H, *J* = 10 Hz, H-4), 4.67-4.55 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.53-4.46 (m, 1H, H-2), 4.33-4.29 (m, 1H, H-6a), 4.19-4.12 (m, 3H, H-6b & N-C<u>H</u>$_2$-$CH_2$-S), 4.08-4.03 (m, 1H, H-5), 3.52-3.45 (m, 4H, N-$CH_2$-C<u>H</u>$_2$-S & N-C<u>H</u>$_2$- $CH_2$-CO), 2.59 (t, 2H, *J* = 6.8 Hz, N-$CH_2$-C<u>H</u>$_2$-CO), 2.08, 2.07, 2.00, 1.72 (4s, 12H, 4 x COC<u>H</u>$_3$), 1.43 (s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.8, 170.7, 170.4, 169.4, 167.9, 143.6, 134.2, 132.1, 123.6, 122.7, 86.2,

81.3, 75.1, 72.1, 68.1, 61.8, 54.1, 49.7, 43.0, 42.1, 34.9, 32.7, 28.1, 22.8, 20.8, 20.7, 20.6 ppm; ESI-MS HRMS: Calculated for $C_{34}H_{45}N_6O_{14}S$ ($[M+H]^+$): 793.2714; found 793.2695.

Compound **15**: yield 94% (730 mg), m.p. 79-80 $^{\circ}$C, $[\alpha]_D$: +3.0$^{\circ}$ (c = 1, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz):$\delta$ 7.97 (s, 1H, triazole C<u>H</u>), 7.89-7.84 (m, 2H, aromatic C<u>H</u>), 7.75-7.71 (m, 2H, aromatic C<u>H</u>), 5.81 (d, 1H, *J* = 9.2 Hz, H-1), 5.54 (d, 1H, *J* = 3.2 Hz, H-4), 5.49 (t, 1H, *J* = 9.2 Hz, H-2), 5.26-5.23 (m, 1H, H-3), 4.70-4.61 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.25-4.09 (m, 5H, H-5, H-6a, H-6b & N-C<u>H</u>$_2$-CH$_2$-S), 3.99 (s, 2H, N-C<u>H</u>$_2$-CO), 3.61-3.58 (m, 2H, N-CH$_2$-C<u>H</u>$_2$-S), 2.25, 2.05, 2.00, 1.87 (4s, 12H, 4 x COC<u>H</u>$_3$), 1.47 (s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.4, 170.2, 169.8, 168.9, 168.6, 167.8, 134.1, 132.1, 123.5, 122.2, 86.4, 82.7, 74.2, 70.7, 68.1, 66.8, 61.3, 50.5, 48.3, 43.1, 32.5, 28.0, 20.8, 20.7, 20.5, 20.2 ppm; ESI-MS HRMS: Calculated for $C_{33}H_{42}N_5O_{15}S$ ($[M+H]^+$): 780.2398; found 780.2385.

Compound **16**: yield 92% (730 mg), m.p. 86-88 $^{\circ}$C, $[\alpha]_D$: +7.5$^{\circ}$ (c = 1, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.96 (s, 1H, triazole C<u>H</u>), 7.89-7.84 (m, 2H, aromatic C<u>H</u>), 7.73-7.71 (m, 2H, aromatic C<u>H</u>), 5.78 (d, 1H, *J* = 9.2 Hz, H-1), 5.54 (d, 1H, *J* = 3.2 Hz, H-4), 5.49 (t, 1H, *J* = 9.6 Hz, H-2), 5.25-5.22 (m, 1H, H-3), 4.60-4.59 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.22-4.13 (m, 5H, H-5, H-6a, H-6b & N-C<u>H</u>$_2$-CH$_2$-S), 3.50-3.45 (m, 4H, N-CH$_2$-C<u>H</u>$_2$-S & N-C<u>H</u>$_2$-CH$_2$-CO), 2.60-2.58 (m, 2H, N-CH$_2$-C<u>H</u>$_2$-CO), 2.25, 2.04, 2.00, 1.85 (4s, 12H, 4 x COC<u>H</u>$_3$), 1.44 (s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.7, 170.4, 170.2, 169.9, 169.0, 167.8, 144.1, 134.2, 132.1, 123.5, 122.2, 86.6, 81.3, 74.3, 70.7, 68.2, 66.8, 61.3, 49.4, 43.0, 42.2, 34.9, 32.6, 28.2, 20.8, 20.7, 20.6, 20.2 ppm; ESI-MS HRMS: Calculated for $C_{34}H_{44}N_5O_{15}S$ ($[M+H]^+$): 794.2555; found 794.2552.

Compound **17**: yield 87% (615 mg), m.p. 76-78 °C, $[\alpha]_D$: -9.1° (c = 1, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.98 (s, 1H, triazole C<u>H</u>), 7.89-7.87 (m, 2H, aromatic C<u>H</u>), 7.74-7.72 (m, 2H, aromatic C<u>H</u>), 5.76-5.74 (m, 1H, H-1), 5.41-5.38 (m, 2H, H-2 & H-3), 5.21-5.15 (m, 1H, H-4), 4.70-4.60 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.32-4.28 (m, 1H, H-5a), 4.20 (t, 2H,*J* = 6.4 Hz, N-C<u>H</u>$_2$-$CH_2$-S), 3.97 (s, 2H, N-C<u>H</u>$_2$-CO), 3.63-3.52 (m, 3H, H-5b & N-$CH_2$-C<u>H</u>$_2$-S), 2.08, 2.01, 1.87 (3s, 9H, 3 x COC<u>H</u>$_3$), 1.45 (s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 169.9, 169.8, 168.9, 168.6, 167.9, 144.1, 134.1, 132.0, 123.5, 122.1, 86.4, 82.6, 72.0, 70.5, 68.4, 65.6, 50.6, 48.5, 43.2, 32.6, 28.0, 20.7, 20.6, 20.2 ppm; ESI-MS HRMS: Calculated for $C_{30}H_{38}N_5O_{13}S$ ($[M+H]^+$): 708.2187; found 708.2182.

Compound **18**: yield 90% (650 mg), m.p. 156-158 °C, $[\alpha]_D$ -24.7° (c = 0.5, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.99 (s, 1H, triazole C<u>H</u>), 7.89-7.87 (m, 2H, aromatic C<u>H</u>), 7.73-7.71 (m, 2H, aromatic C<u>H</u>), 5.74 (d, 1H, *J* = 8.4 Hz, H-1), 5.44-5.35 (m, 2H, H-2 & H-3), 5.25-5.19 (m, 1H, H-4), 4.65-4.55 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.34-4.29 (m, 1H, H-5a), 4.14-4.10 (m, 2H, N-C<u>H</u>$_2$-$CH_2$-S), 3.60 (t, 1H, *J* = 10.8 Hz, H-5b), 3.49-3.43 (m, 4H, N-$CH_2$-C<u>H</u>$_2$-S & N-C<u>H</u>$_2$-$CH_2$-CO), 2.60-2.56 (m, 2H, N-$CH_2$-C<u>H</u>$_2$-CO), 2.08, 2.00, 1.85 (3s, 9H, 3 x COC<u>H</u>$_3$), 1.44 (s, 9H, -C{C<u>H</u>$_3$}$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.7, 169.9, 169.8, 169.0, 167.8, 144.0, 134.2, 132.1, 123.6, 122.1, 86.7, 81.2, 72.0, 70.7, 68.4, 65.7, 49.6, 42.8, 42.0, 34.9, 32.6, 28.2, 28.1, 20.7, 20.6, 20.1 ppm; ESI-MS HRMS: Calculated for $C_{31}H_{40}N_5O_{13}S$ ($[M+H]^+$): 722.2343; found 722.2350.

**5. Synthesis of methanesulfonamide of amino acids (23-26):** To a solution of amino acid (**19**-**22**, 1 mmol) in dry methanol (10 mL), thionyl chloride (0.2 mL, 2.7 mmol) was added at 0 °C. The reaction mixture was stirred for 24 h allowing it to come to room temperature. The

excess reagent and solvent were removed by applying vacuum. Dry dichloromethane (10 mL) was added to the reaction mixture followed by addition of diisopropylethylamine (0.4 mL, 2 mmol). The reaction mixture was cooled to 0 $^{o}$C and methanesulfonyl chloride (0.1 mL, 1.2 mmol) was added drop by drop. After stirring the reaction mixture for 24 h at room temperature, it was diluted with dichloromethane (100 mL). The organic layer was washed successively with aqueous saturated sodium bicarbonate (30 mL), water (30 mL) and brine solution (20 mL). Then it was dried over anhydrous sodium sulfate and concentrated to dryness to give the desired compounds.

Compound **23**: yield 95% (200 mg), $[\alpha]_D$ -6.0$^{\circ}$ (c = 0.7, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 5.27 (d, 1H, *J* = 9.2 Hz, NH), 3.98-3.94 (m, 1H, NH-C<u>H</u>), 3.79 (s, 3H, COOC<u>H</u>$_3$), 2.95 (s, 3H, $SO_2C\underline{H}_3$), 2.22-2.18 (m, 1H, C<u>H</u>$Me_2$), 1.03 (d, 1H, *J* = 6.4 Hz, CH(C<u>H</u>$_3$)$_2$), 0.89 (d, 1H, *J* = 6.8 Hz, CH{C<u>H</u>$_3$}$_2$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 172.5, 61.2, 52.6, 41.1, 31.2, 19.1, 17.1 ppm; ESI-MS HRMS: Calculated for $C_7H_{16}NO_4S$ ($[M+H]^+$): 210.0800; found 210.0801.

Compound **24**: yield 94% (260 mg), $[\alpha]_D$ 0.9$^{\circ}$ (c = 0.5, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.32-7.18 (m, 5H, aromatic C<u>H</u>), 5.26 (d, 1H, *J* = 9.6 Hz, N<u>H</u>), 4.40-4.34 (m, 1H, NH-C<u>H</u>), 3.17-3.13 (m, 1H, C<u>H</u>$_2$-Ph), 3.01-2.96 (m, 1H, C<u>H</u>$_2$-Ph), 3.75 (s, 3H, $CO_2C\underline{H}_3$), 2.63 (s, 3H, $SO_2C\underline{H}_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz) $\delta$ 172.0, 135.7, 129.5, 128.8, 128.7, 127.4, 57.3, 52.7, 41.2, 39.3 ppm; ESI-MS HRMS: Calculated for $C_{11}H_{15}NO_4NaS$ ($[M+Na]^+$): 280.0619; found 280.0615.

Compound **25**: yield 96% (270 mg), $[\alpha]_D$: +8.0$^{\circ}$ (c = 0.7, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.33-7.18 (m, 5H, aromatic C<u>H</u>), 5.09 (d, 1H, *J* = 8.4 Hz, N<u>H</u>), 4.42-4.36 (m, 1H, NH-C<u>H</u>), 3.77 (s, 3H, $CO_2C\underline{H}_3$), 3.18-3.13 (m, 1H, C<u>H</u>$_2$-Ph), 3.03-2.97 (m, 1H, C<u>H</u>$_2$-Ph), 2.64 (s, 3H, $SO_2C\underline{H}_3$)

ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 172.0, 135.5, 129.7, 129.6, 128.9, 127.5, 57.3, 52.8, 41.3, 39.4 ppm; ESI-MS HRMS: Calculated for $C_{11}H_{15}NO_4NaS$ ($[M+Na]^+$): 280.0619; found 280.0628.

Compound **26**: yield 92% (220 mg), $[\alpha]_D$: +57.4° (c = 0.9, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 5.16 (bs, 1H, NH), 4.02-3.99 (m, 1H, NHCH), 3.79 (s, 3H, $COOCH_3$), 2.94 (s, 3H, $SO_2CH_3$), 1.93-1.91 (m, 1H, CHMe-Et), 1.45-1.35 (m, 1H, $CH_2$-$CH_3$), 1.21-1.13 (m, 1H, $CH_2$-$CH_3$), 1.00-0.89 (m, 6H, CH-$CH_3$& $CH_2$-$CH_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 172.7, 60.7, 52.6, 41.1, 38.2, 24.6, 15.7, 11.5 ppm; ESI-MS HRMS: Calculated for $C_8H_{17}NO_4NaS$ ($[M+Na]^+$): 246.0776; found 246.0769.

**6. Synthesis of *N*-propargylated sulfonamide of amino acids (27-30):** To a mixture of methanesulfonamide of amino acid (**23-26**, 1 mmol.) and potassium carbonate (280 mg, 2 mmol) in a two necked RB flask, dry dimethylformamide (10 mL) was added at room temperature. To this stirred mixture, propargyl bromide (0.1 mL, 1.2 mmol) was added drop by drop. After stirring the reaction mixture for 24 h at room temperature, it was diluted with ethyl acetate (50 mL) and washed with water (30 mL x 3) followed by brine solution (20 mL). The organic layer was dried over anhydrous sodium sulfate and concentrated to dryness. The crude product was purified by column chromatography to give analytically pure compound.

Compound **27**: yield 92% (250 mg), $[\alpha]_D$: -13.5° (c = 0.4, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 4.39-4.34 (m, 1H, N-$CH_2$-C),4.02 (d, 1H, *J* = 10.8 Hz, N-CH-), 3.96-3.91 (m, 1H, N-$CH_2$-C), 3.77 (s, 3H, $COOCH_3$), 3.09 (s, 3H, $SO_2CH_3$), 2.33 (t, 1H, *J* = 2.4 Hz, alkyne CH), 2.23-2.17 (m, 1H, $CHMe_2$), 1.00 (d, 3H, *J* = 6.8 Hz, $CH\{CH_3\}_2$), 0.97 (d, 3H, *J* = 6.8 Hz, $CH\{CH_3\}_2$) ppm;

$^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.4, 78.6, 72.9, 64.9, 52.1, 40.8, 33.2, 27.4, 19.4, 19.1 ppm; ESI-MS HRMS: Calculated for $C_{10}H_{17}NO_4NaS$ ($[M+Na]^+$): 270.0776; found 270.0789.

Compound **28**: yield 94% (300 mg), m.p. 66-68 °C, $[\alpha]_D$: -39.4° (c = 0.4, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 500 MHz): $\delta$ 7.32-7.22 (m, 5H, aromatic C<u>H</u>), 4.82-4.79 (m, 1H, N-C<u>H</u>-), 4.19-4.08 (m, 2H, N-C<u>H</u>$_2$-), 3.77 (s, 3H, COOC<u>H</u>$_3$), 3.40-3.35 (m, 1H, C<u>H</u>$_2$-Ph), 3.07-3.02 (m, 1H, C<u>H</u>$_2$-Ph), 2.77 (s, 3H, $SO_2C$<u>H</u>$_3$), 2.35 (t, 1H, *J* = 2.5 Hz, alkyne C<u>H</u>) ppm; $^{13}$C-NMR ($CDCl_3$, 125 MHz): $\delta$ 170.5, 136.5, 129.5, 128.7, 127.2, 78.6, 73.5, 61.3, 52.5, 41.0, 36.3, 34.1 ppm; ESI-MS HRMS: Calculated for $C_{14}H_{17}NO_4NaS$ ($[M+Na]^+$): 318.0776; found 318.0765.

Compound **29**: yield 90% (285 mg), m.p. 70-72 °C, $[\alpha]_D$: +10.1° (c = 0.2, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.31-7.26 (m, 5H, aromatic C<u>H</u>), 4.83-4.79 (m, 1H, N-C<u>H</u>-), 4.20-4.07 (m, 2H, N-C<u>H</u>$_2$-), 3.74 (s, 3H, COOC<u>H</u>$_3$), 3.40-3.35 (m, 1H, C<u>H</u>$_2$-Ph), 3.08-3.02 (m, 1H, C<u>H</u>$_2$-Ph), 2.76 (s, 3H, $SO_2C$<u>H</u>$_3$), 2.34 (t, 1H, *J* = 2.4Hz, alkyne C<u>H</u>) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.6, 136.6, 129.5, 128.7, 127.2, 78.6, 73.5, 61.4, 52.6, 41.4, 36.4, 34.2 ppm; ESI-MS HRMS: Calculated for $C_{14}H_{17}NO_4NaS$ ($[M+Na]^+$): 318.0776; found 318.0778.

Compound **30**: yield 85% (240 mg), $[\alpha]_D$ -52.6° (c = 0.7, $CHCl_3$, 25 °C), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 4.38-4.34 (m, 1H, N-C<u>H</u>$_2$-C), 4.10 (d, 1H, *J* = 8.4 Hz, N-C<u>H</u>-CH), 3.99-3.95 (m, 1H, N-C<u>H</u>$_2$-C), 3.76 (s, 3H, COOC<u>H</u>$_3$), 3.07 (s, 3H, $SO_2C$<u>H</u>$_3$), 2.33 (t, 1H, *J* = 2.0 Hz, alkyne C<u>H</u>), 1.99-1.93 (m, 1H, C<u>H</u>Me-Et), 1.68-1.63 (m, 1H, C<u>H</u>$_2$-Me), 1.16-1.09 (m, 1H, C<u>H</u>$_2$-Me), 0.94-0.91 (m, 6H, CH-C<u>H</u>$_3$ & $CH_2$-C<u>H</u>$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.6, 78.7, 72.8, 63.9, 52.1, 40.7, 33.6, 33.5, 25.0, 15.6, 10.8 ppm; ESI-MS HRMS: Calculated for $C_{11}H_{19}NO_4NaS$ ($[M+Na]^+$): 284.0932; found 284.0926.

**7. Synthesis of triazole-linked *N*-glycopeptoid sulfonamides with amino acids (31-34):** *N*-propargylated sulfonamide of amino acid (**27-30**, 0.5 mmol) and per-*O*-acetylated β-D-glucopyranosyl azide (**5**, 0.5 mmol) were dissolved in acetone (15 mL). To the stirred reaction mixture, a solution of copper sulfate (25 mg, 0.1 mmol) in water (3 mL) was added followed by the addition of aqueous solution (3 mL) of sodium ascorbate (40 mg, 0.2 mmol). The reaction mixture was allowed to stir at room temperature for 24 h. After completion of the reaction as monitored by TLC, acetone was removed by applying vacuum. Ethyl acetate (50 mL) was added to the reaction mixture and washed with water (20 mL) followed by brine solution (20 mL). The organic layer was dried over anhydrous sodium sulfate and concentrated to dryness. The crude product was purified by column chromatography by eluting with ethyl acetate and hexane.

Compound **31**: yield 93% (288 mg), m.p. 154-155 $^{\circ}$C, $[\alpha]_D$: -38.7$^{\circ}$ (c = 1.2, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 500 MHz): $\delta$ 7.90 (s, 1H, triazole C<u>H</u>), 5.85 (d, 1H, *J* = 9.0 Hz, H-1), 5.45-5.39 (m, 2H, H-2 & H-3), 5.25 (t, 1H, *J* = 10.0 Hz, H-4), 4.85-4.48 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.31-4.27 (m, 1H, H-6a), 4.17-4.14 (m, 1H, H-6b), 4.04 (d, 1H, *J* = 10.5 Hz, N-C<u>H</u>), 4.01-3.98 (m, 1H, H-5), 3.72 (s, 3H, $CO_2C\underline{H}_3$), 2.87 (s, 3H, $SO_2C\underline{H}_3$), 2.33-2.30 (m, 1H, C<u>H</u>Me$_2$), 2.09, 2.07, 2.02, 1.86 (4s, 12H, 4 x $COC\underline{H}_3$), 0.93 (d, 3H, *J* = 6.5 Hz, $CH\{C\underline{H}_3\}_2$), 0.84 (d, 3H, *J* = 6.5 Hz, $CH\{C\underline{H}_3\}_2$) ppm; $^{13}$C-NMR ($CDCl_3$, 125MHz): $\delta$ 171.2, 170.6, 170.0, 169.4, 168.8, 145.0, 122.5, 85.8, 77.4, 75.2, 72.7, 70.3, 67.7, 65.8, 61.5, 52.1, 40.2, 39.4, 31.6, 28.0, 20.7, 20.6, 20.5, 20.2, 19.4, 19.3 ppm; ESI-MS HRMS: Calculated for $C_{24}H_{37}N_4O_{13}S$ ($[M+H]^+$): 621.2078; found 621.2058.

Compound **32**: yield 94% (315 mg), m.p. 174-176 $^{\circ}$C, $[\alpha]_D$: -38.8$^{\circ}$ (c = 0.3, $CHCl_3$, 25 $^{\circ}$C), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.77 (s, 1H, triazole –C<u>H</u>-), 7.29-7.10 (m, 5H, aromatic C<u>H</u>), 5.79 (d, 1H, *J* = 8.8 Hz, H-1), 5.46-5.38 (m, 2H, H-2 & H-3), 5.24 (t, 1H, *J* = 9.6 Hz, H-4), 4.84-4.79 (m,

1H, N-C<u>H</u>), 4.65-4.47 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.32-4.28 (m, 1H, H-6a), 4.18-4.15 (m, 1H, H-6b), 4.01-3.97 (m, 1H, H-5), 3.64 (s, 3H, $CO_2C\underline{H}_3$), 3.36-3.30 (m, 1H, C<u>H</u>$_2$Ph), 3.12-3.06 (m, 1H, C<u>H</u>$_2$Ph), 2.64 (s, 3H, $SO_2C\underline{H}_3$), 2.09, 2.07, 2.02, 1.82 (4s, 12H, 4 x –COC<u>H</u>$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.9, 170.6, 170.1, 169.4, 168.9, 144.8, 137.0, 129.3, 129.1, 128.7, 128.6, 127.0, 122.7, 85.8, 75.3, 72.7, 70.4, 67.7, 61.8, 61.6, 52.6, 40.6, 40.3, 36.4, 20.8, 20.6, 20.2 ppm; ESI-MS HRMS: Calculated for $C_{28}H_{37}N_4O_{13}S$ ($[M+H]^+$): 669.2078; found 669.2083.

Compound **33**: yield: 90% (300 mg), m.p. 184-186 $^\circ$C, $[\alpha]_D$: +1.0$^\circ$ (c = 0.9, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.70 (s, 1H, triazole –C<u>H</u>-), 7.27-7.10 (m, 5H, aromatic C<u>H</u>), 5.81 (d, 1H, *J* = 8.4 Hz, H-1), 5.43-5.41 (m, 2H, H-2 & H-3), 5.24 (t, 1H, *J* = 9.6 Hz, H-4), 4.83-4.79 (m, 1H, N-C<u>H</u>), 4.63-4.47 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.30-4.28 (m, 1H, H-6a), 4.18-4.15 (m, 1H, H-6b), 4.03-3.98 (m, 1H, H-5), 3.67 (s, 3H, $CO_2C\underline{H}_3$), 3.38-3.36 (m, 1H, C<u>H</u>$_2$Ph), 3.09-3.07 (m, 1H, C<u>H</u>$_2$Ph), 2.78 (s, 3H, $SO_2CH_3$), 2.09, 2.07, 2.03, 1.85 (4s, 12H, 4 x –COC<u>H</u>$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 171.0, 170.9, 170.6, 170.0, 169.4, 168.9, 144.8, 136.7, 129.3, 129.1, 128.7, 128.6, 127.0, 126.9, 122.6, 85.8, 75.2, 72.7, 70.3, 67.7, 61.8, 61.6, 52.6, 40.7, 40.3, 40.2, 36.4, 20.8, 20.7, 20.6, 20.2 ppm; ESI-MS HRMS: Calculated for $C_{28}H_{37}N_4O_{13}S$ ($[M+H]^+$): 669.2078; found 669.2089.

Compound **34**: yield 88% (280 mg), m.p. 142-144 $^\circ$C, $[\alpha]_D$: +1.7$^\circ$ (c = 0.3, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.89 (s, 1H, triazole –C<u>H</u>-), 5.84 (d, 1H, *J* = 9.2 Hz, H-1), 5.49-5.39 (m, 2H, H-2 & H-3), 5.25 (t, 1H, *J* = 9.6 Hz, H-4), 4.88-4.49 (ABq, 2H, N-C<u>H</u>$_2$-triazole), 4.31-4.26 (m, 1H, H-6a), 4.16-4.12 (m, 2H, H-6b & N-C<u>H</u>), 4.01-3.97 (m, 1H, H-5), 3.73 (s, 3H, $CO_2C\underline{H}_3$), 2.87 (m, 3H, $SO_2C\underline{H}_3$), 2.09, 2.07 (2s, 7H, 2 x COC<u>H</u>$_3$ & C<u>H</u>MeEt), 2.03, 1.87 (2s, 6H, 2 x COC<u>H</u>$_3$), 1.48-1.36 (m, 1H,C<u>H</u>$_2$-Me), 1.06-0.95 (m, 1H, C<u>H</u>$_2$-Me), 0.90-0.77 (m, 6H, CH-C<u>H</u>$_3$ &

$CH_2$-C<u>H</u>$_3$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 171.4, 170.6, 170.1, 169.4, 168.8, 145.1, 122.6, 85.8, 75.1, 72.8, 70.3, 67.7, 64.5, 61.5, 52.1, 40.0, 39.5, 34.0, 25.2, 20.8, 20.6, 20.2, 15.5, 10.5 ppm; ESI-MS HRMS: Calculated for $C_{25}H_{39}N_4O_{13}S$ ($[M+H]^+$): 635.2234; found 635.2216.

**8. Synthesis of acrylamide of L-valine (35):** To a solution of L-valine (**19**, 1 mmol) in dry methanol (10 mL), thionyl chloride (0.2 mL, 2.7 mmol) was added at 0 $^o$C. The reaction mixture was stirred for 24 h allowing it to come to room temperature. The reagent and solvent were removed by applying vacuum. Dry dichloromethane (10 mL) was added to the reaction mixture followed by addition of diisopropylethylamine (0.4 mL, 2 mmol). The reaction mixture was cooled to 0 $^o$C and acryloyl chloride (0.1 mL, 1.2 mmol) was added drop by drop. After stirring the reaction mixture for 24 h at room temperature it was diluted with dichloromethane (100 mL). After washing the organic layer successively with aqueous saturated sodium bicarbonate (30 mL), water (30 mL) and brine solution (20 mL), it was dried over anhydrous sodium sulfate and concentrated to dryness to give the title compound.

Yield 92% (170 mg), $[\alpha]_D$ -18.7$^\circ$ (c = 1, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 6.33-6.29 (m, 2H, N<u>H</u> & alkene C<u>H</u>), 6.22-6.15 (m, 1H, alkene C<u>H</u>), 5.69-5.66 (m, 1H, alkene C<u>H</u>), 4.68-4.64 (m, 1H, NH-C<u>H</u>), 3.75 (s, 3H, COOC<u>H</u>$_3$), 2.22-2.17 (m, 1H, $CHMe_2$), 0.97-0.91 (m, 6H, CH{C<u>H</u>$_3$}$_2$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 172.7, 165.4, 130.5, 127.1, 57.1, 52.2, 31.5, 18.9, 17.9 ppm; ESI-MS HRMS: Calculated for $C_9H_{16}NO_3$ ($[M+H]^+$): 186.1130; found 186.1139.

**9. Synthesis of vinylsulfonamide of L-valine (38):** Dry dichloromethane (10 mL) was added to methyl ester of L-valine (1 mmol, prepared following the method used for compound **35**) followed by addition of diisopropylethylamine (0.5 mL, 2.8 mmol). The reaction mixture was cooled to 0 $^o$C and chloroethanesulfonyl chloride (0.1 mL, 1 mmol) was added drop by drop.

After stirring the reaction mixture for 24 h at room temperature, the reaction mixture was diluted with dichloromethane (100 mL) and washed with aqueous saturated sodium bicarbonate (30 mL), water (30 mL) and brine solution (20 mL). The organic layer was dried over anhydrous sodium sulfate and concentrated to dryness to give the title compound as a syrup.

Yield 90% (220 mg), $[\alpha]_D$: -36.1° (c = 0.7, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 6.52-6.46 (m, 1H, alkene C<u>H</u>), 6.23 (d, 1H, *J* = 16.8 Hz, alkene C<u>H</u>), 5.90 (d, 1H, *J* = 10.0 Hz, alkene C<u>H</u>), 5.09 (d, 1H, *J* = 9.6 Hz, N<u>H</u>), 3.78-3.73 (m, 4H, NH-C<u>H</u> & COOC<u>H</u>$_3$), 2.18-2.10 (m, 1H, CH{$CH_3$}$_2$), 1.02 (d, 1H, *J* = 6.8 Hz, CH{C<u>H</u>$_3$}$_2$), 0.89 (d, 1H, *J* = 6.8 Hz, CH{C<u>H</u>$_3$}$_2$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 172.4, 136.1, 126.9, 61.0, 52.5, 31.5, 19.1, 17.3 ppm;ESI-MS HRMS: Calculated for $C_8H_{15}NO_4NaS$ ($[M+Na]^+$): 244.0619; found 244.0623.

**10. Synthesis of β-amide or sulfonamide linked *N*-propargylated sulfonamide of L-valine (36 & 39):** Propargyl amine (0.1 mL, 1.5 mmol) was added to a solution of acrylamide or vinylsulfonamide of L-valine (**35** or **38**, 1 mmol) in dry methanol (10 mL) at room temperature. The mixture was stirred at 50 °C for 24 h. Then excess reagent and solvent were removed by applying vacuum. The crude reaction mixture was dissolved in dry dichloromethane (10 mL) and cooled to 0 °C. Then diisopropylethylamine (0.2 mL, 1 mmol) was added to the stirred reaction mixture followed by dropwise addition of methanesulfonyl chloride (0.1 mL, 1.2 mmol) at 0 °C. The reaction mixture was stirred for 24 h allowing it to come to room temperature. After completion of the reaction, the reaction mixture was diluted with dichloromethane (30 mL) and washed with water (20 mL x 2) and brine solution (20 mL). The organic layer was dried over anhydrous sodium sulfate and concentrated to dryness. The crude reaction mixture thus obtained was purified by column chromatography to give the title compounds as syrup.

Data for compound **36**: Yield: 94% (320 mg), $[\alpha]_D$: +35.2° (c = 1, $CHCl_3$, 25 °C), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 6.19 (d, 1H, *J* = 8.4 Hz, NH), 4.56-4.52 (m, 1H, NH-CH), 4.14 (d, 2H, *J* = 2.4 Hz, N-$CH_2$-C), 3.74 (s, 3H, COO$CH_3$), 3.60-3.55 (m, 2H, N-$CH_2$-$CH_2$), 2.96 (s, 3H, $SO_2CH_3$), 2.65-2.61 (m, 2H, N-$CH_2$-$CH_2$), 2.36 (t, 1H, *J* = 2.4 Hz, alkyne CH), 2.18-2.13 (m, 1H, C$HMe_2$), 0.95-0.91 (m, 6H, CH{$CH_3$}$_2$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 172.4, 170.3, 77.6, 74.4, 57.4, 52.3, 43.6, 38.0, 37.6, 36.3, 31.2, 19.0, 17.9 ppm; ESI-MS HRMS: Calculated for $C_{13}H_{22}N_2O_5NaS$ ($[M+Na]^+$): 341.1147; found 341.1162.

Data for compound **39**: Yield: 90% (340 mg), $[\alpha]_D$: -32.0° (c = 0.2, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 5.25 (d, 1H, *J* = 9.6 Hz, NH), 4.15 (d, 2H, *J* = 2.4 Hz, N-$CH_2$-C), 4.00-3.96 (m, 1H, NH-CH), 3.79-3.73 (m, 5H, COO$CH_3$ & N-$CH_2$-$CH_2$), 3.37-3.33 (m, 2H,N-$CH_2$-$CH_2$), 2.99 (s, 3H, $SO_2CH_3$), 2.42 (t, 1H, *J* = 2.4 Hz, alkyne CH), 2.23-2.18 (m, 1H, C$HMe_2$), 1.03 (d, 3H, *J* = 6.8 Hz, CH{$CH_3$}$_2$), 0.90 (d, 3H, *J* = 7.2 Hz, CH{$CH_3$}$_2$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 172.6, 77.4, 74.8, 61.4, 52.8, 52.0, 42.2, 38.1, 37.7, 31.4, 19.1, 17.3 ppm; ESI-MS HRMS:Calculated for $C_{12}H_{22}N_2O_6NaS_2$ ($[M+Na]^+$): 377.0817; found 377.0807.

**11. Synthesis of β-amide or β-sulfonamide linked glycopeptoid sulfonamide of L-valine (37 & 40):** *N*-propargylated peptoid sulfonamides (**36** or **39**, 0.5 mmol) and per-*O*-acetylated β-D-glucopyranosyl azide (**5**, 0.5 mmol) were dissolved in acetone (15 mL). To the stirred reaction mixture a solution of copper sulfate (25 mg, 0.1mmol) in water (3 mL) was added followed by aqueous solution (3 mL) of sodium ascorbate (40 mg, 0.2 mmol). The reaction mixture was allowed to stir at room temperature for 24 h. After completion of the reaction as monitored by TLC, acetone was removed by applying vacuum. Ethyl acetate (50 mL) was added to the reaction mixture and washed with water (20 mL) followed by brine solution (20 mL). The

organic layer was dried over anhydrous sodium sulfate and concentrated to dryness. The crude product was purified by column chromatography by eluting with ethyl acetate and hexane.

Data for compound **37**: Yield: 95% (330 mg), m.p.: 156-158 $^{\circ}$C, $[\alpha]_D$: -16.8$^{\circ}$ (c = 0.2, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.94 (s, 1H, C<u>H</u> triazole), 6.55 (d, 1H, *J* = 8.8 Hz, N<u>H</u>), 5.86 (d, 1H, *J* = 9.2 Hz, H-1), 5.47-5.35 (m, 2H, H-2 & H-3), 5.26 (t, 1H, *J* = 9.6 Hz, H-4), 4.63-4.50 (m, 3H, NH-C<u>H</u> & C<u>$H_2$</u>), 4.34-4.29 (m, 1H, H-6a), 4.20-4.16 (m, 1H, H-6b), 4.05-4.01 (m, 1H, H-5), 3.72 (s, 3H, $SO_2C$<u>$H_3$</u>), 3.62-3.44 (m, 2H, N-C<u>$H_2$</u>-$CH_2$), 2.92 (s, 3H, COOC<u>$H_3$</u>), 2.62-2.56 (m, 2H, N-$CH_2$-C<u>$H_2$</u>), 2.17-2.12 (m, 1H, C<u>H</u>$Me_2$), 2.10, 2.07, 2.02, 1.90 (4s, 12H, 4 x COC<u>$H_3$</u>), 0.95-0.90 (m, 6H, CH{C<u>$H_3$</u>}$_2$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 170.7, 170.6 (x 2), 169.9, 169.4, 169.3, 144.5, 122.0, 86.0, 75.3, 72.4, 70.9, 67.7, 61.5, 57.3, 57.2, 52.1, 44.0, 43.0, 38.8, 36.1, 31.0, 20.7, 20.6, 20.5, 20.1, 19.0, 17.9 ppm; ESI-MS HRMS: Calculated for $C_{27}H_{42}N_5O_{14}S$ ($[M+H]^+$): 692.2449; found 692.2429.

Data for compound **40**: Yield: 94% (350 mg), m.p.: 152-154 $^{\circ}$C, $[\alpha]_D$: -10.1$^{\circ}$ (c = 0.6, $CHCl_3$), $^1$H-NMR ($CDCl_3$, 400 MHz): $\delta$ 7.97 (s, 1H, C<u>H</u> triazole), 5.87 (d, 1H, *J* = 8.8 Hz, H-1), 5.62 (d, 1H, *J* = 10.0 Hz, N<u>H</u>), 5.48-5.38 (m, 2H, H-2 & H-3), 5.26 (t, 1H, *J* = 9.6 Hz, H-4), 4.67-4.58 (ABq, 2H, C<u>$H_2$</u>), 4.35-4.31 (m, 1H, H-6a), 4.18-4.15 (m, 1H, H-6b), 4.05-4.02 (m, 1H, H-5), 3.99-3.96 (m, 1H, NH-C<u>H</u>), 3.78 (s, 3H, $SO_2C$<u>$H_3$</u>), 3.68-3.53 (m, 2H, N-C<u>$H_2$</u>-$CH_2$), 3.35-3.31(m, 2H, N-$CH_2$-C<u>$H_2$</u>), 2.98 (s, 3H, COOC<u>$H_3$</u>), 2.25-2.20 (m, 1H, C<u>H</u>$Me_2$), 2.10, 2.07, 2.02, 1.89 (4s, 12H, 4 x COC<u>$H_3$</u>), 1.03, 0.87 (2d, 6H, *J* = 6.8 Hz, CH{C<u>$H_3$</u>}$_2$) ppm; $^{13}$C-NMR ($CDCl_3$, 100 MHz): $\delta$ 172.7, 170.6, 169.9, 169.5, 169.4, 143.5, 122.4, 85.9, 75.3, 72.3, 70.8, 67.7, 61.5, 61.2, 52.7, 52.3, 42.4, 41.7, 39.4, 31.3, 20.8, 20.6, 20.5, 20.1, 19.2, 17.1 ppm; ESI-MS HRMS: Calculated for $C_{26}H_{41}N_5O_{15}S_2Na$ ($[M+Na]^+$): 750.1938; found 750.1937.

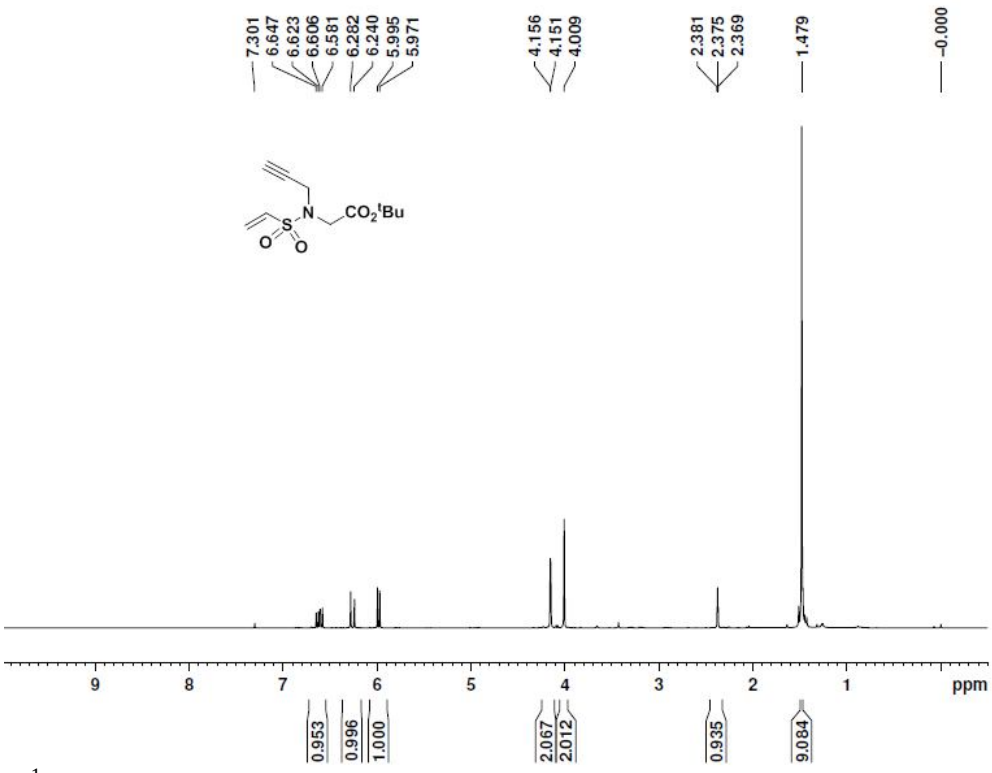


**Figure S1** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **1**

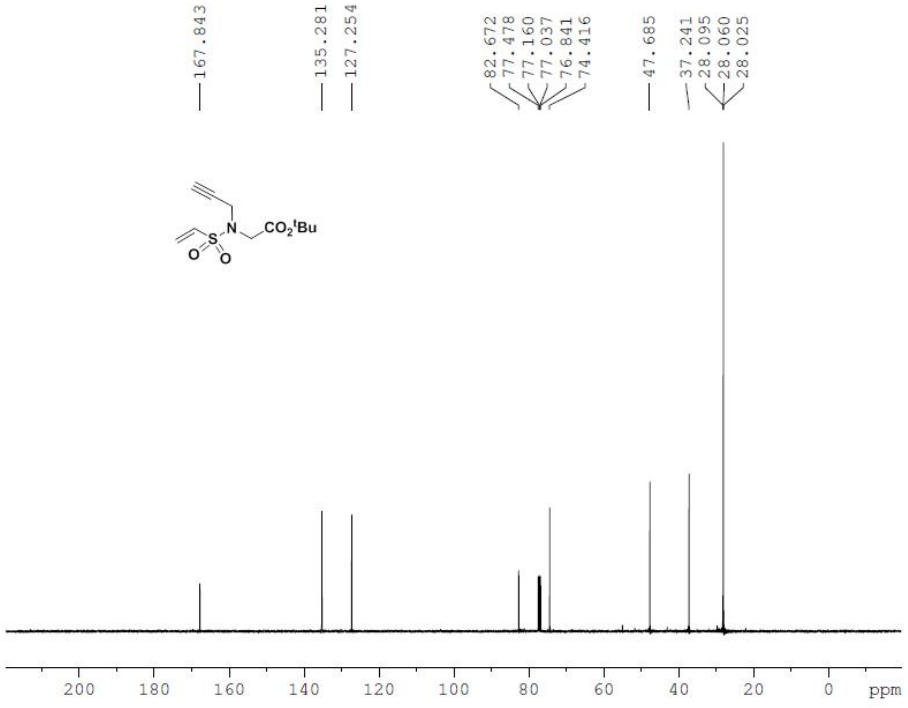


**Figure S2** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **1**

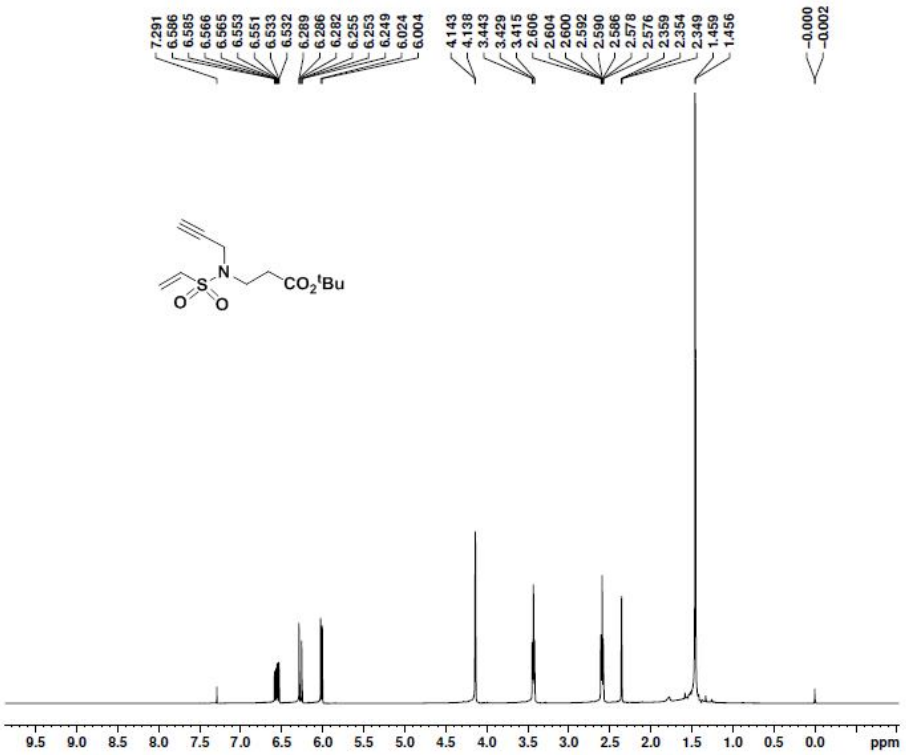


**Figure S3** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **2**

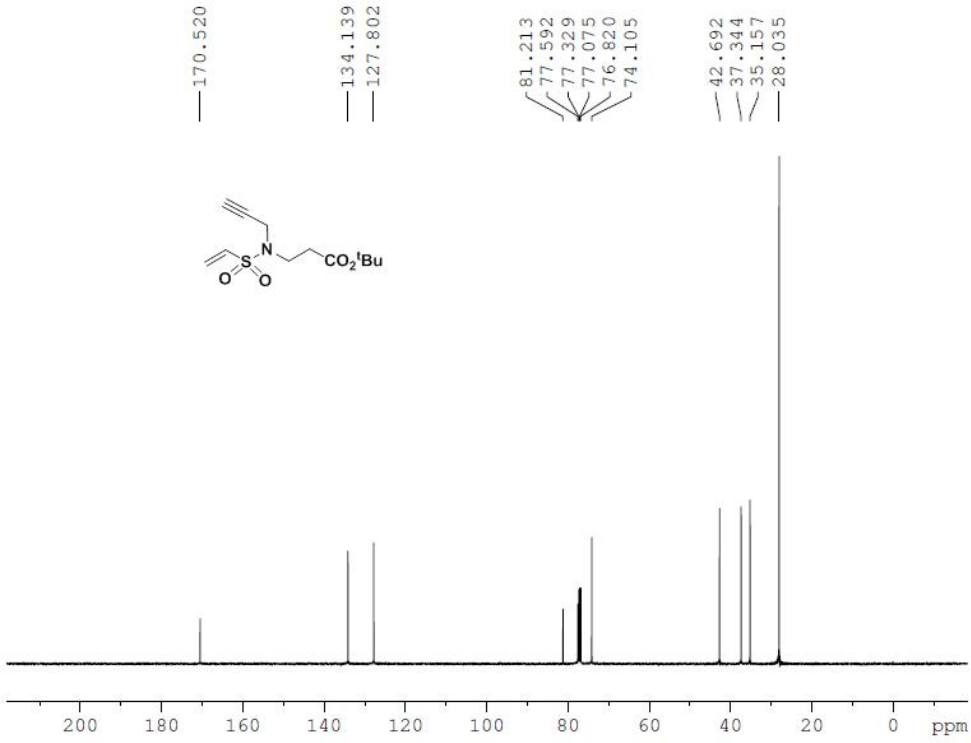


**Figure S4** $^{13}$C (100 MHz, $CDCl_3$) spectrum of compound **2**

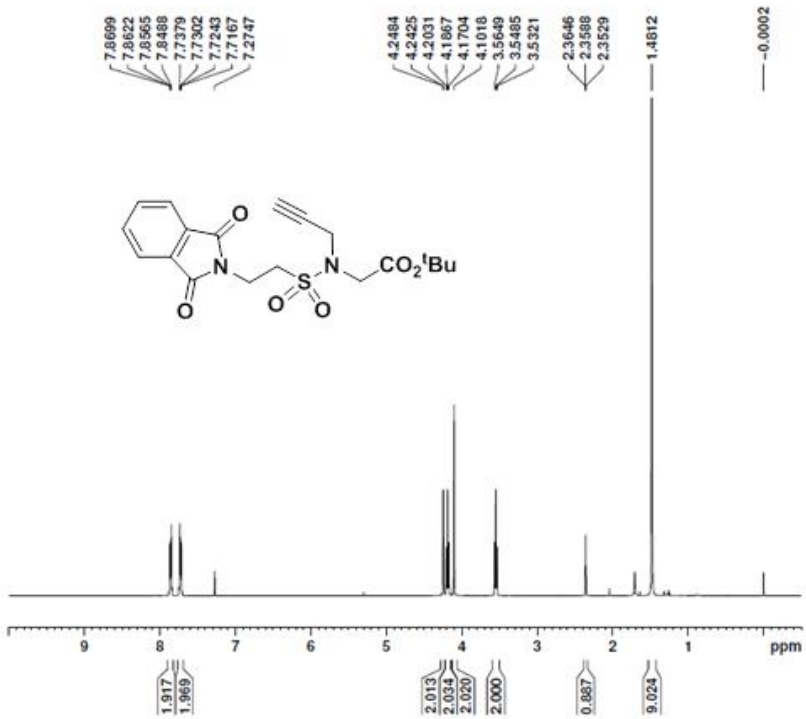


**Figure S5** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **3**

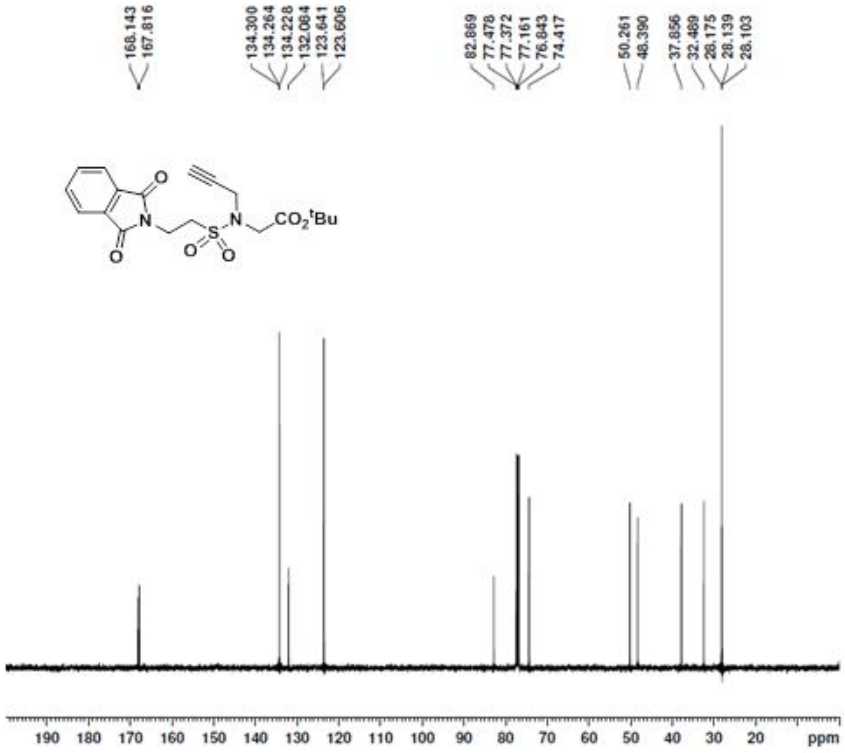


**Figure S6** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **3**

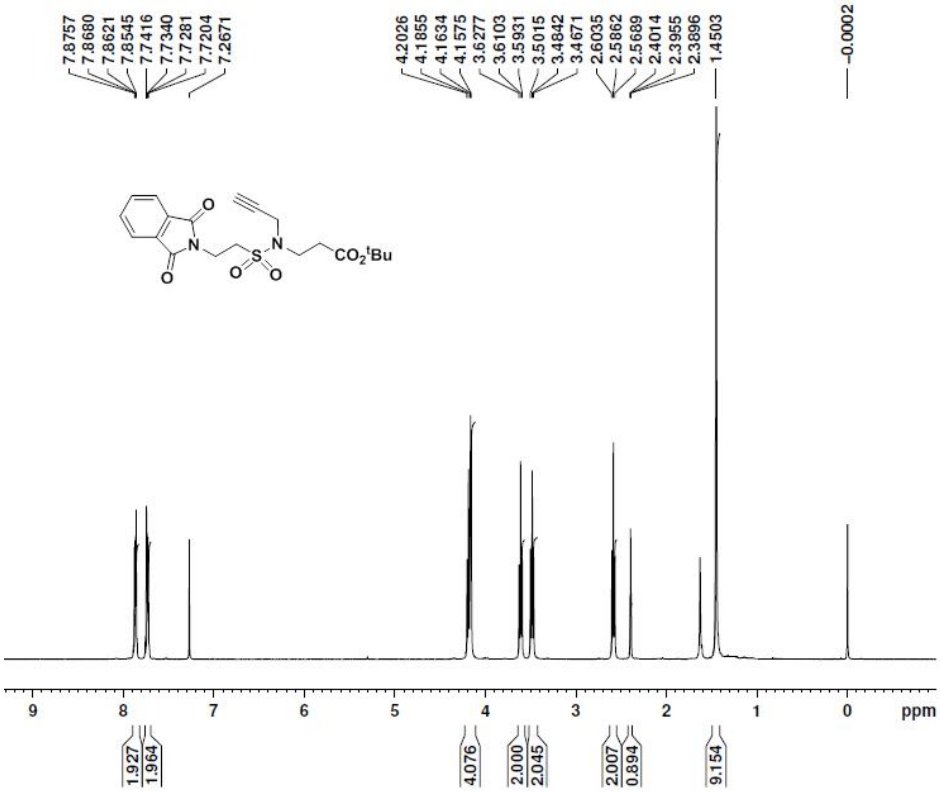


**Figure S7** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **4**

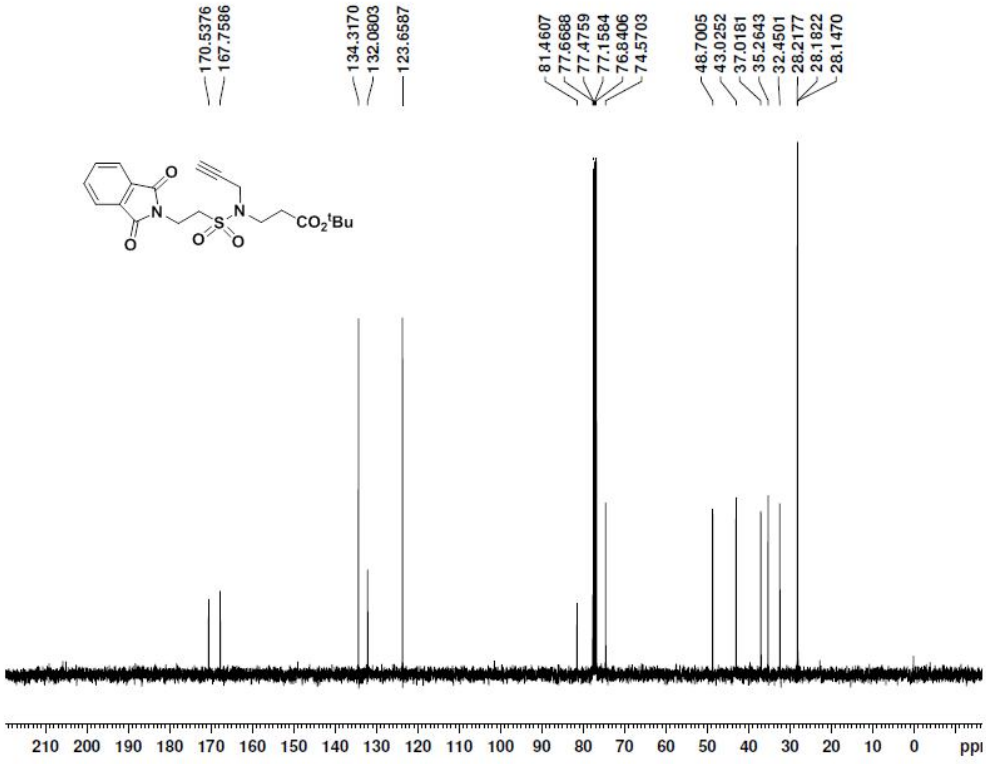


**Figure S8** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **4**

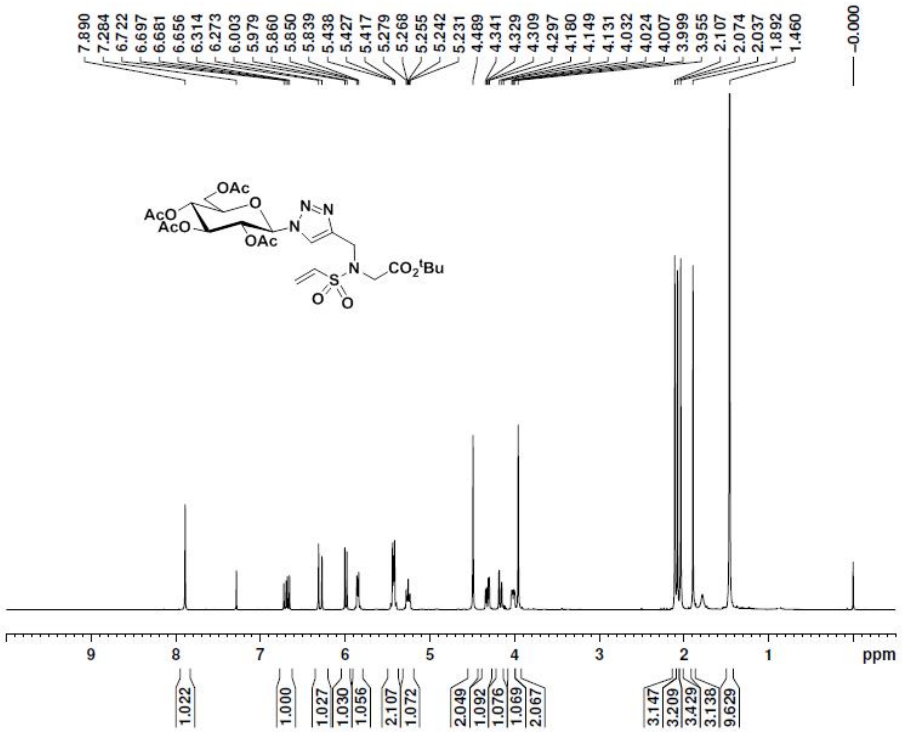


**Figure S9** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **9**

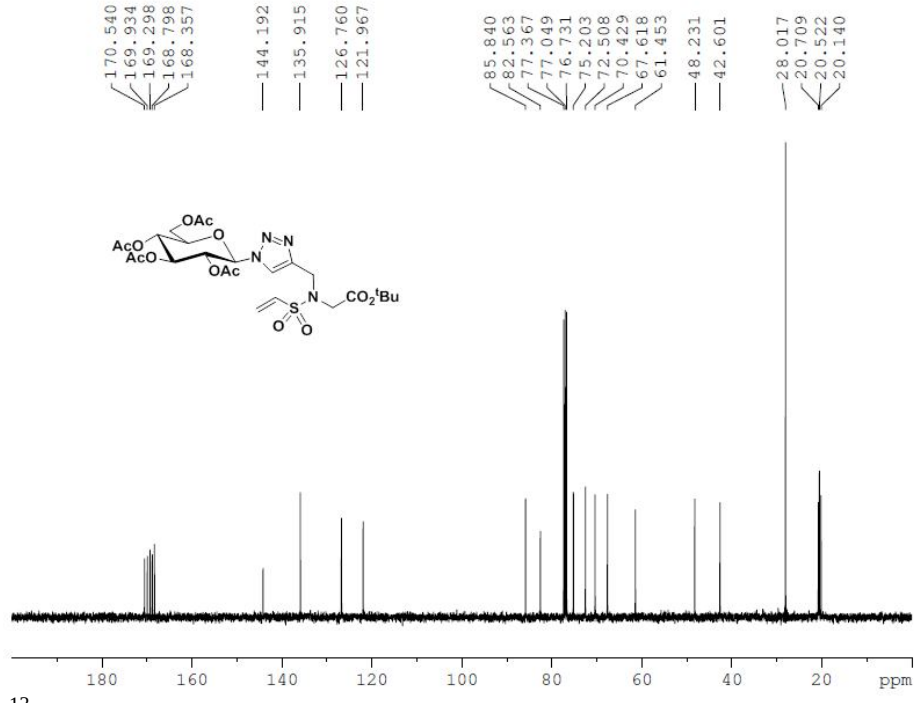


**Figure S10** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **9**

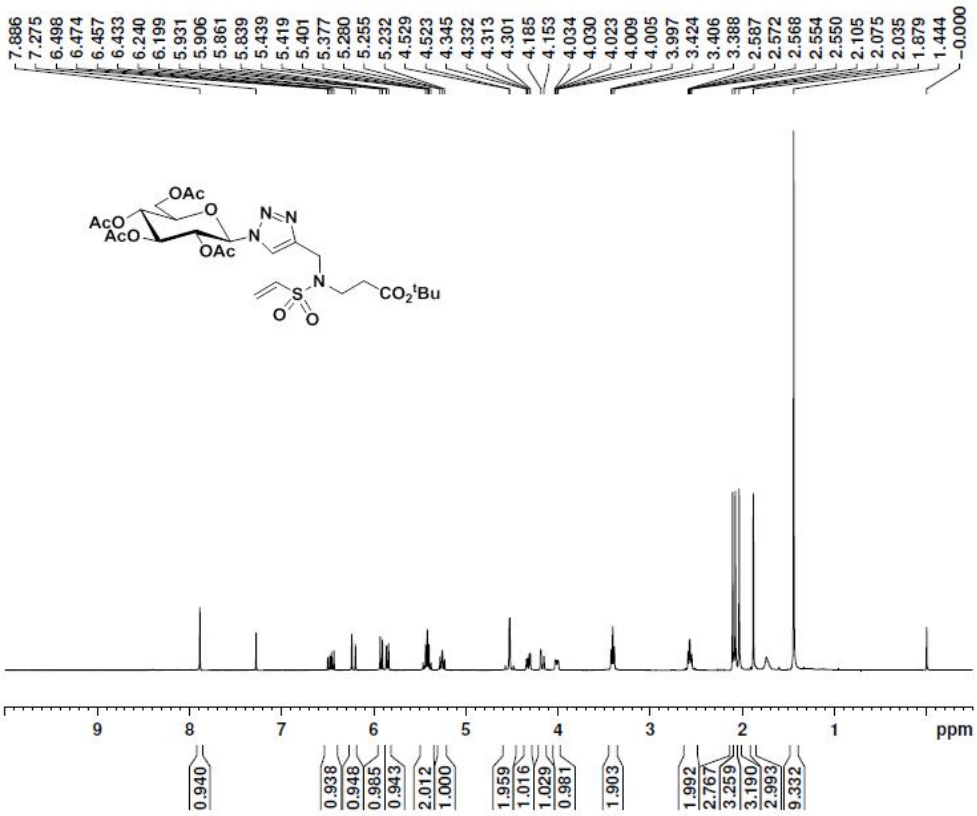


**Figure S11** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **10**

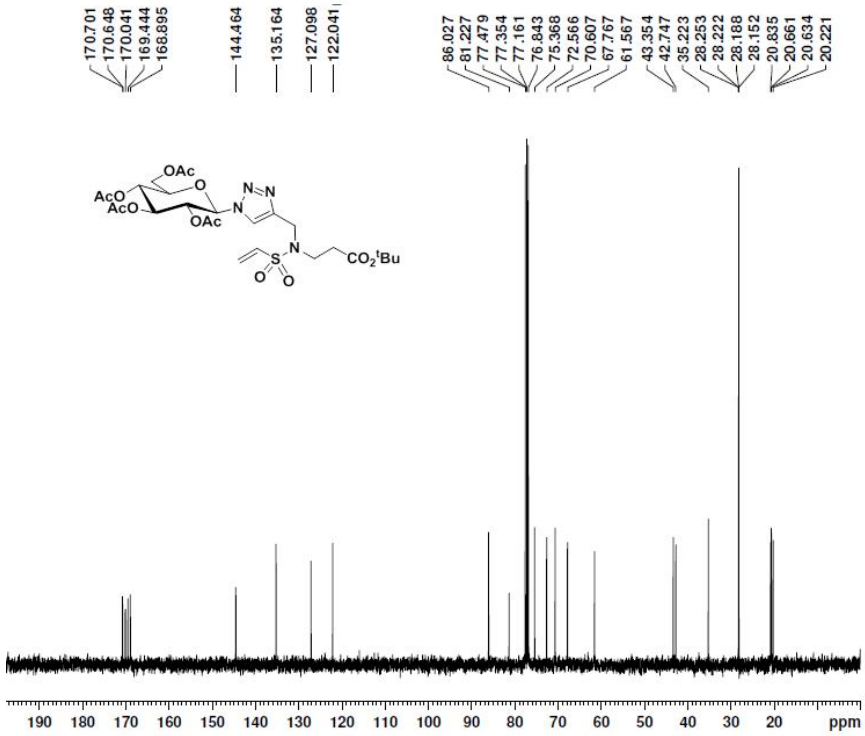


**Figure S12** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **10**

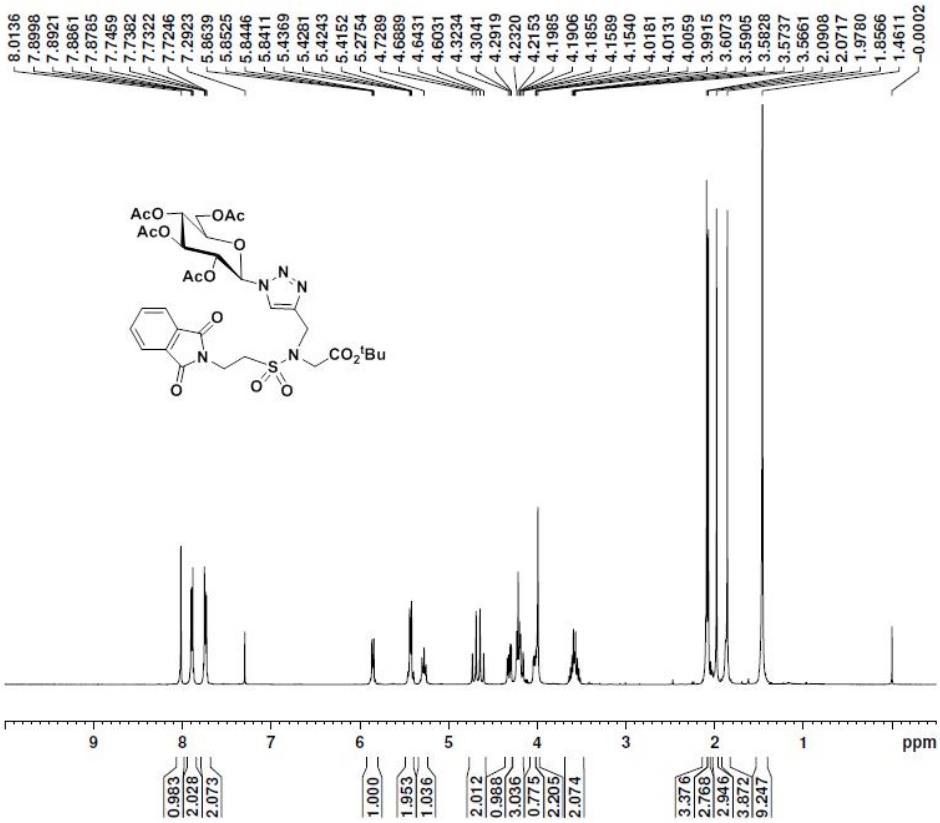

**Figure S13** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **11**

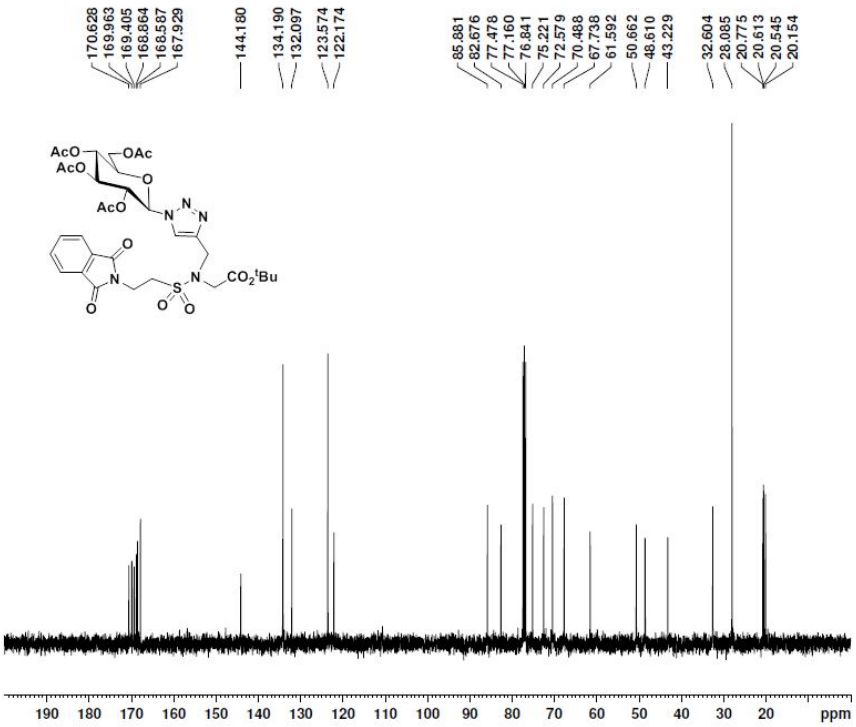

**Figure S14** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **11**

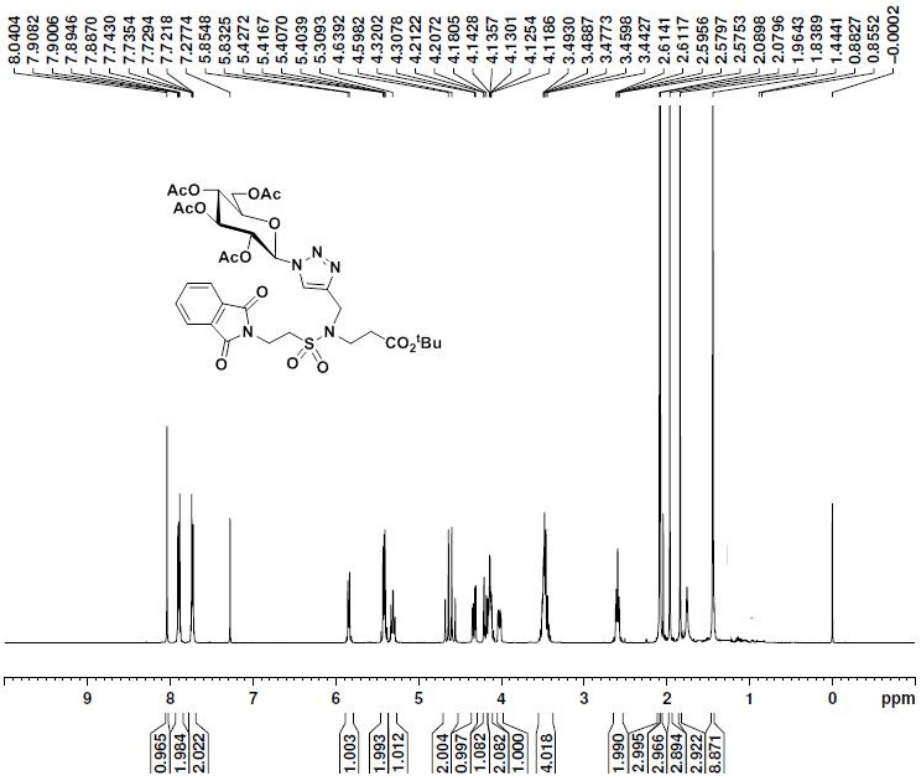


**Figure S15** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **12**

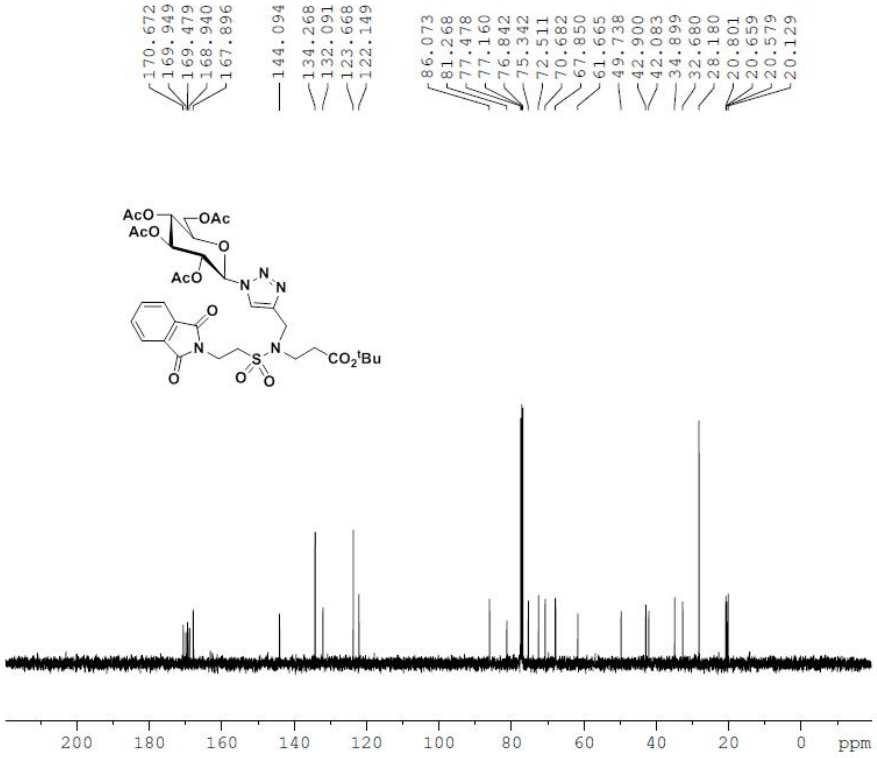


**Figure S16** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **12**

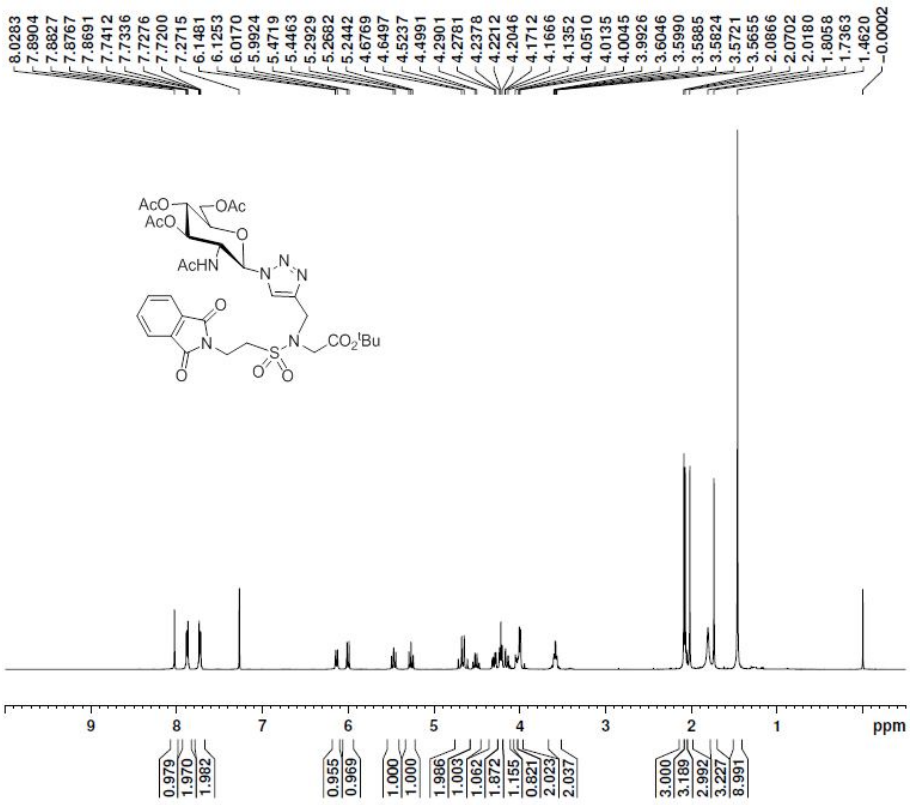


**Figure S17** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **13**

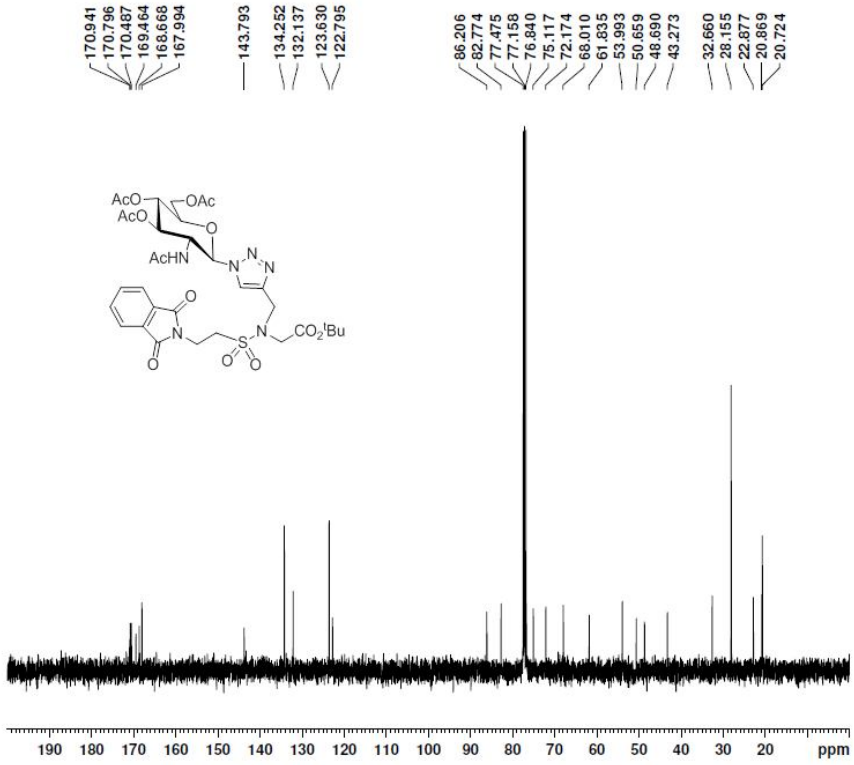


**Figure S18** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **13**

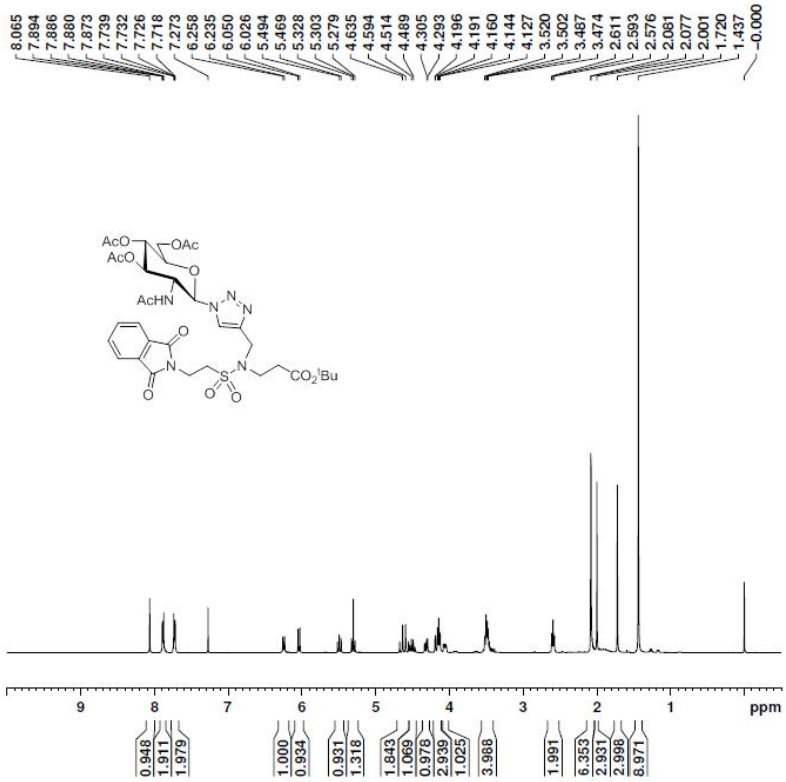


**Figure S19** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **14**

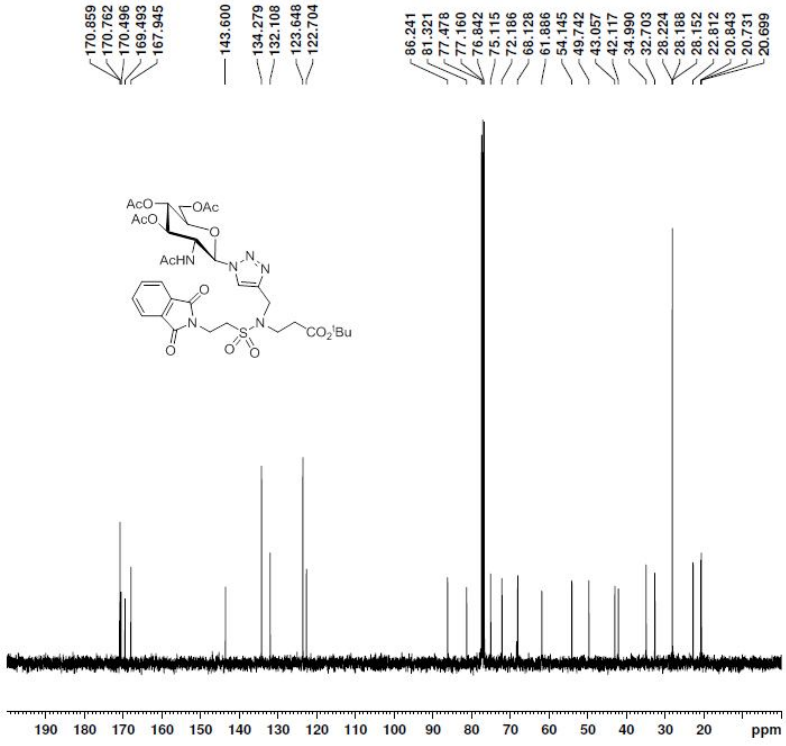


**Figure S20** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **14**

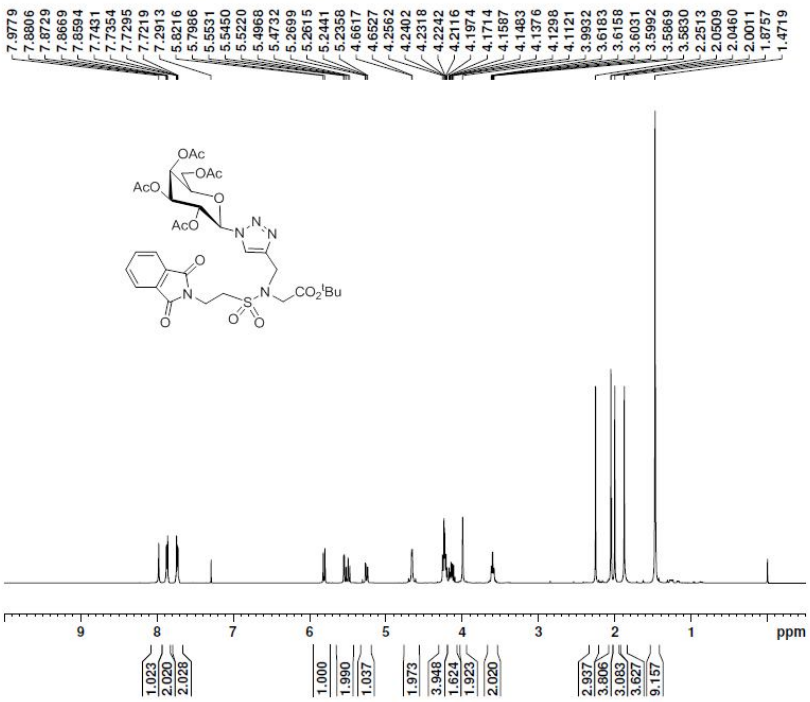

**Figure S21** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **15**

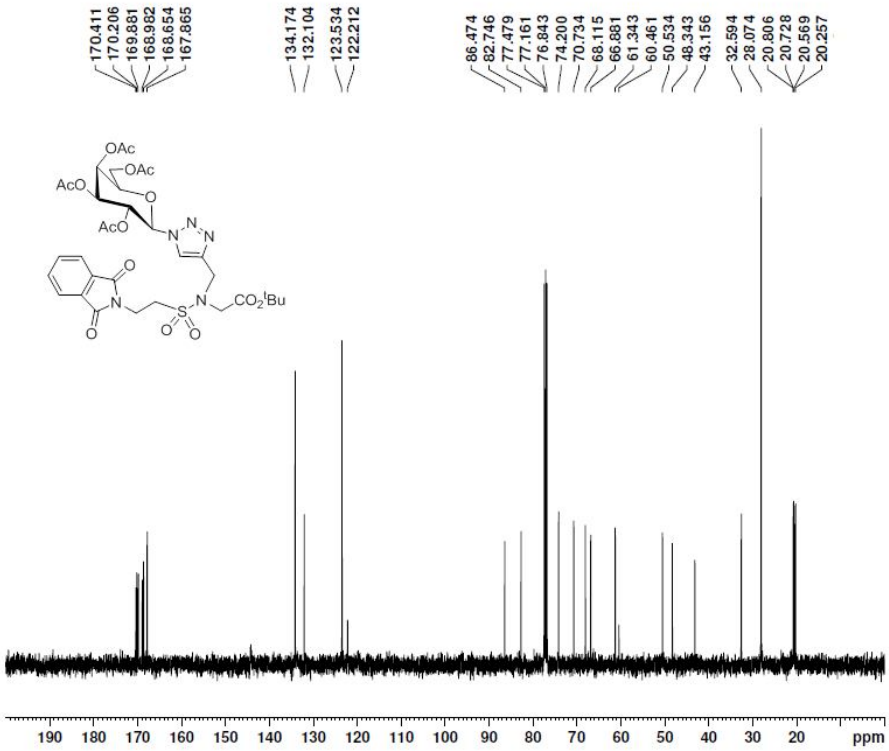

**Figure S22** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **15**

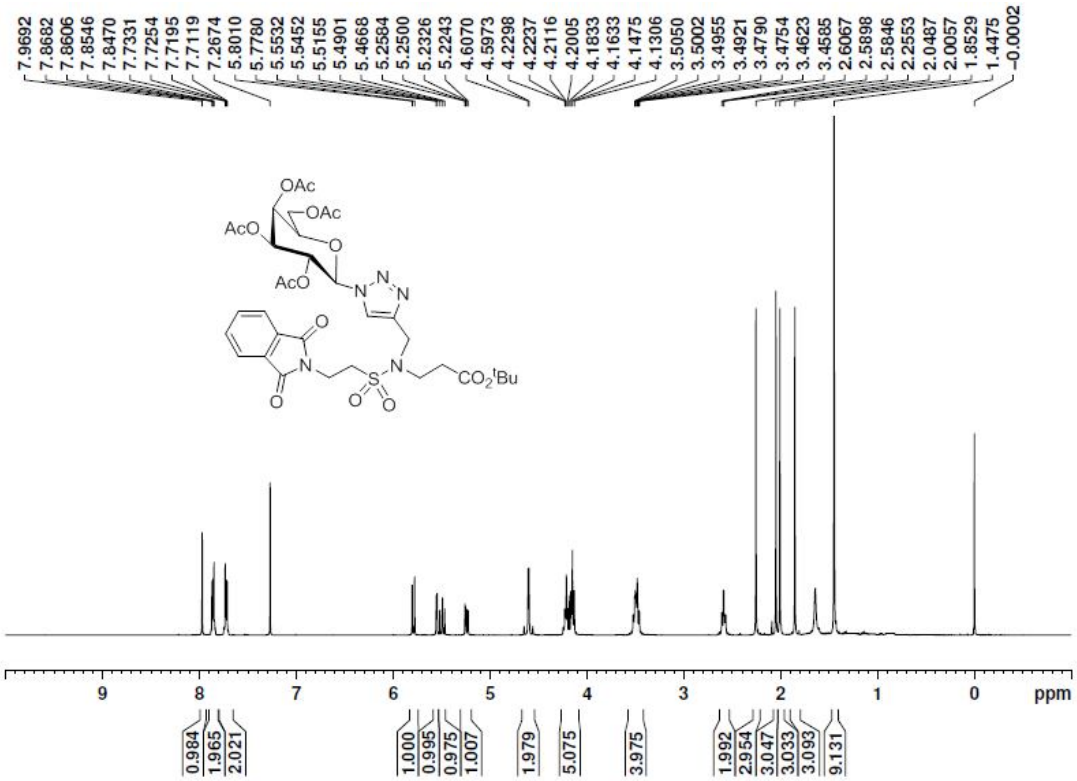


**Figure S23** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **16**

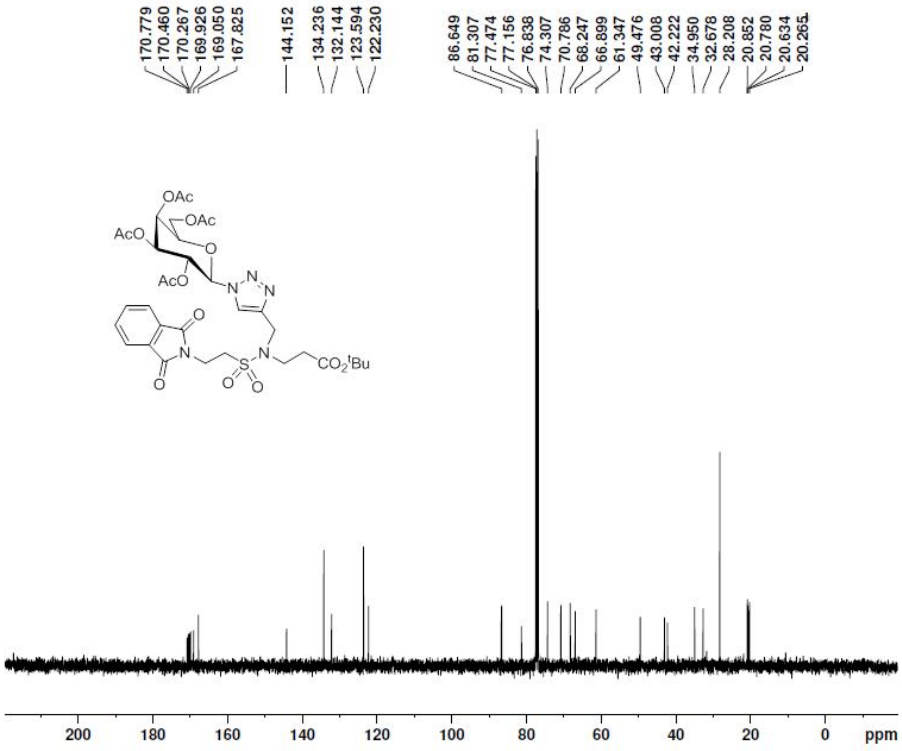


**Figure S24** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **16**

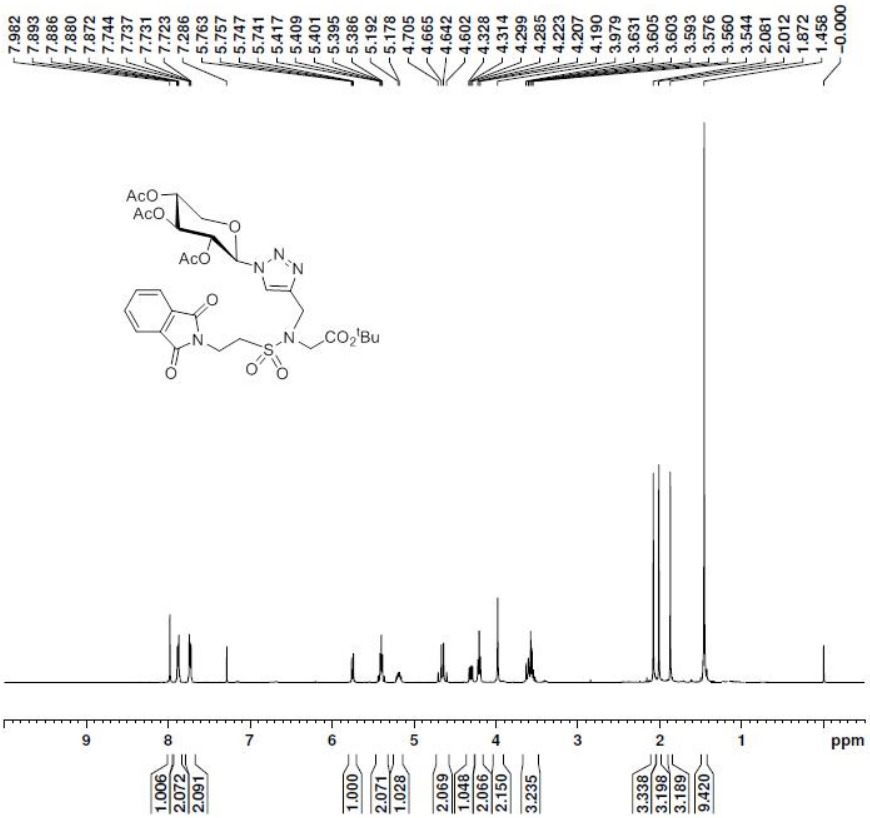


**Figure S25** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **17**

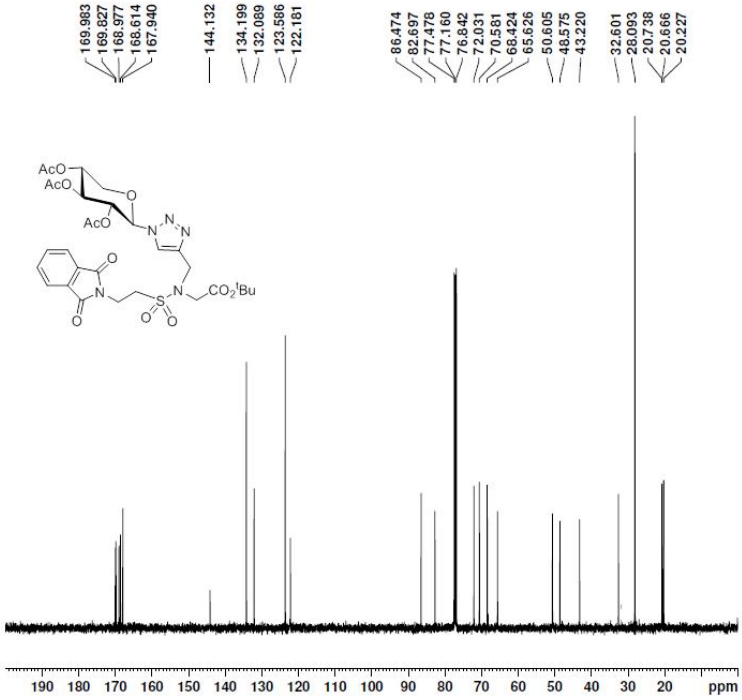


**Figure S26** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **17**

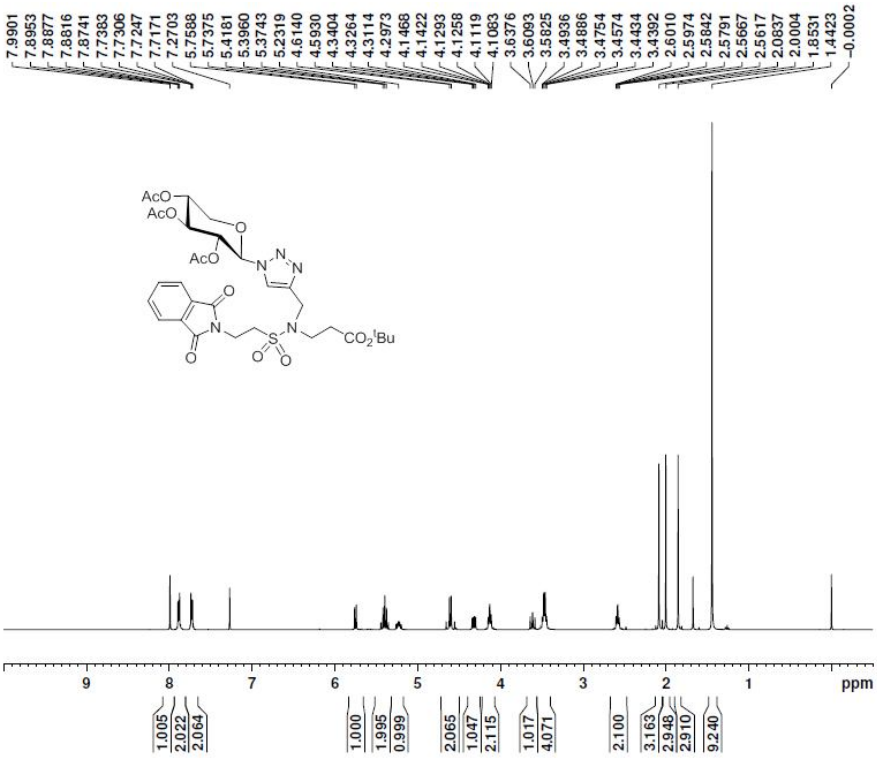


**Figure S27** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **18**

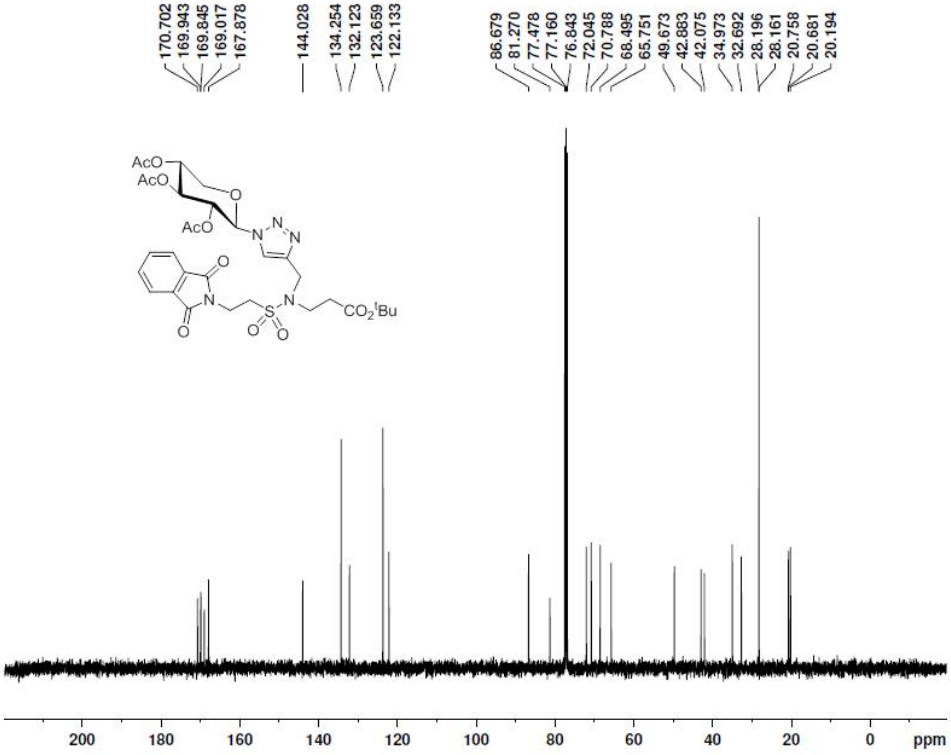


**Figure S28** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **18**

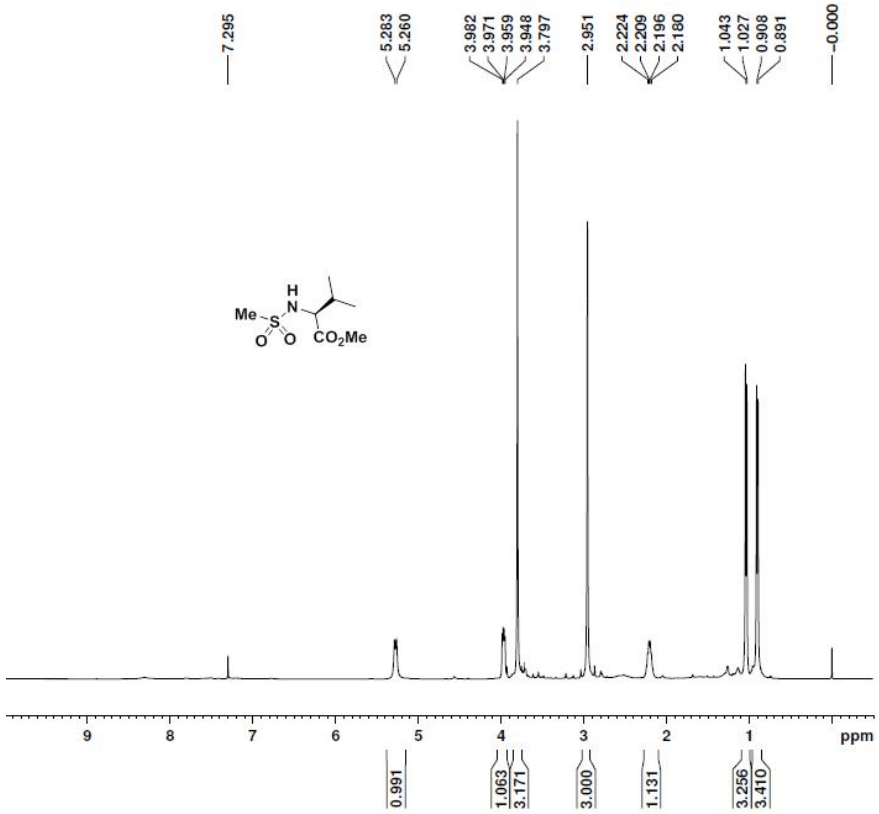


**Figure S29** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **23**

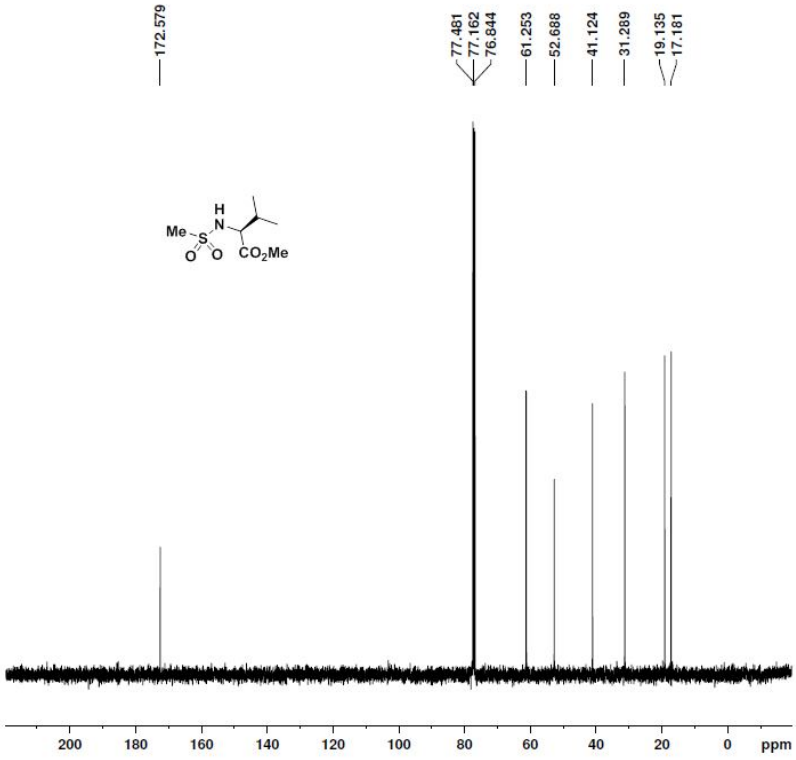


**Figure S30** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **23**

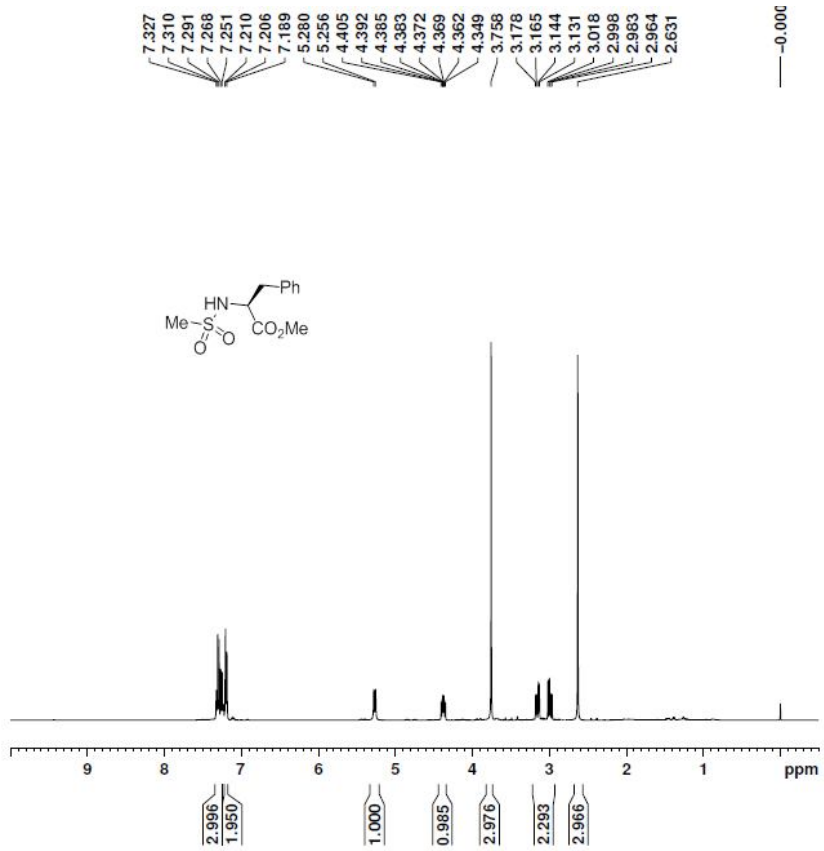


**Figure S31** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **24**

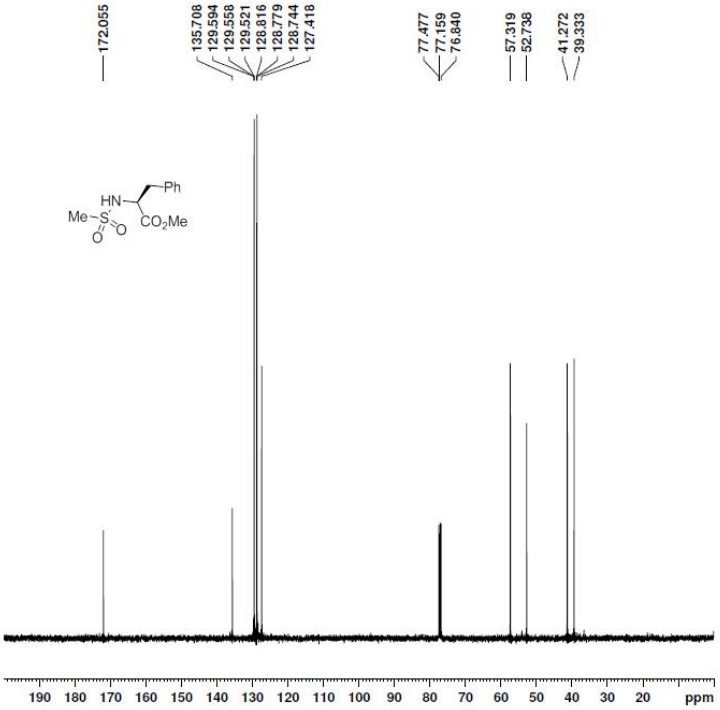


**Figure S32** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **24**

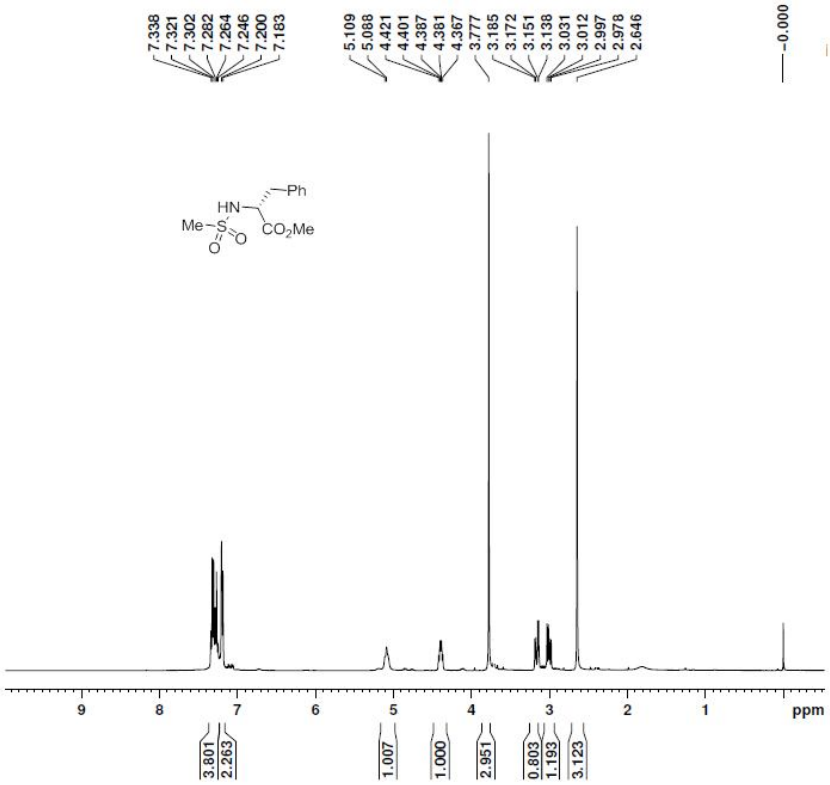


**Figure S33** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **25**

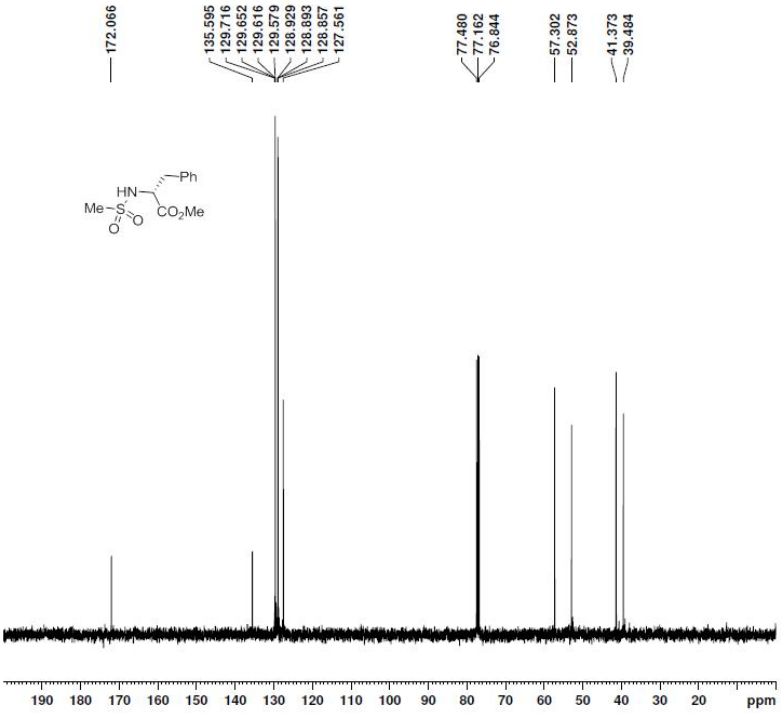


**Figure S34** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **25**

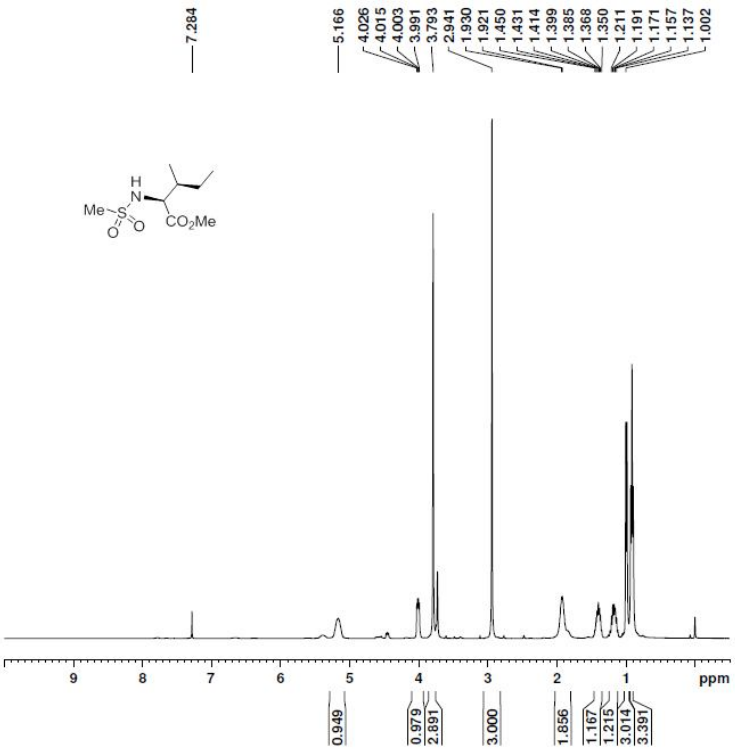


**Figure S35** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **26**

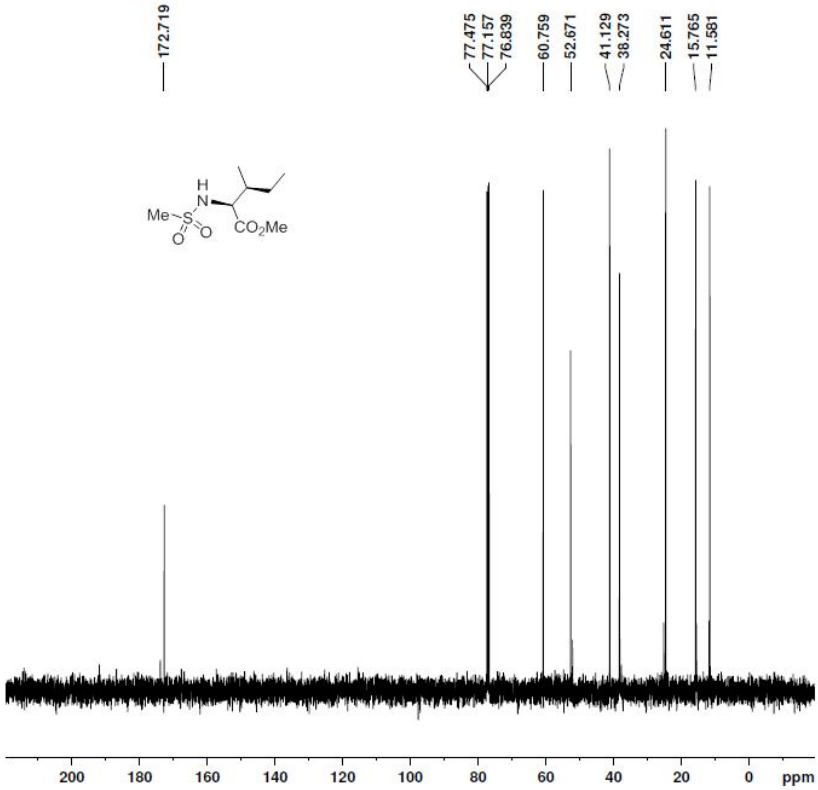


**Figure S36** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **26**

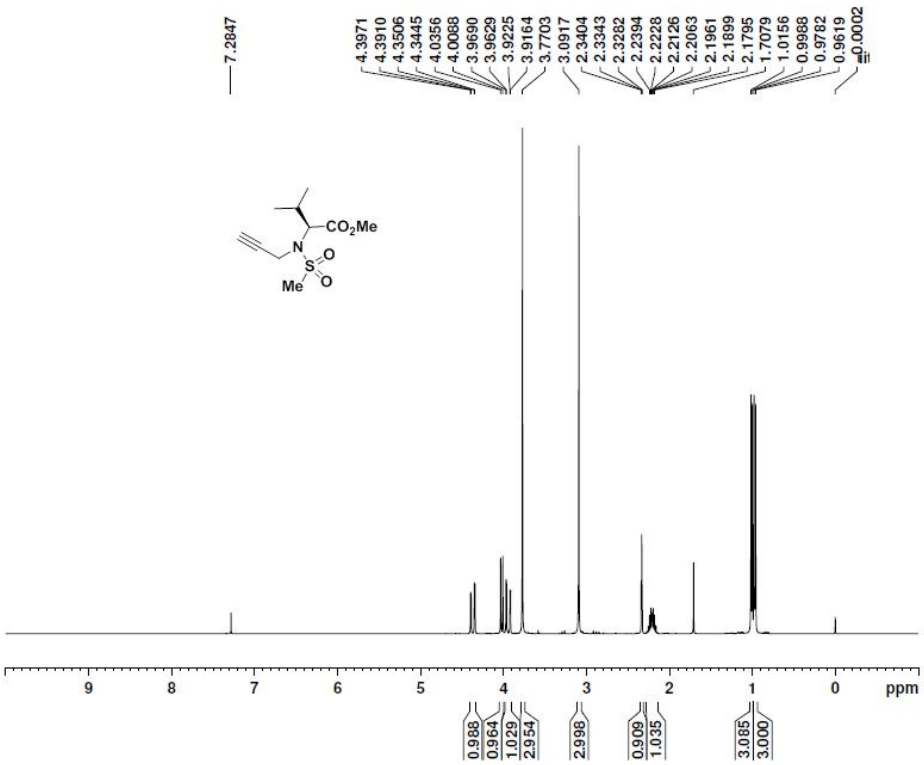


**Figure S37** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **27**

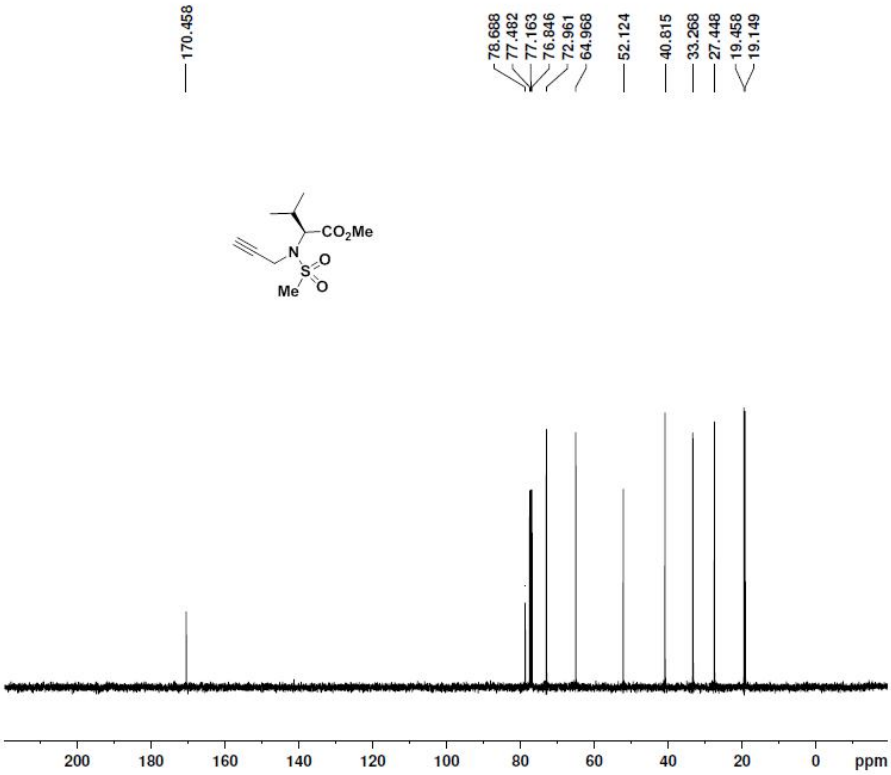


**Figure S38** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **27**

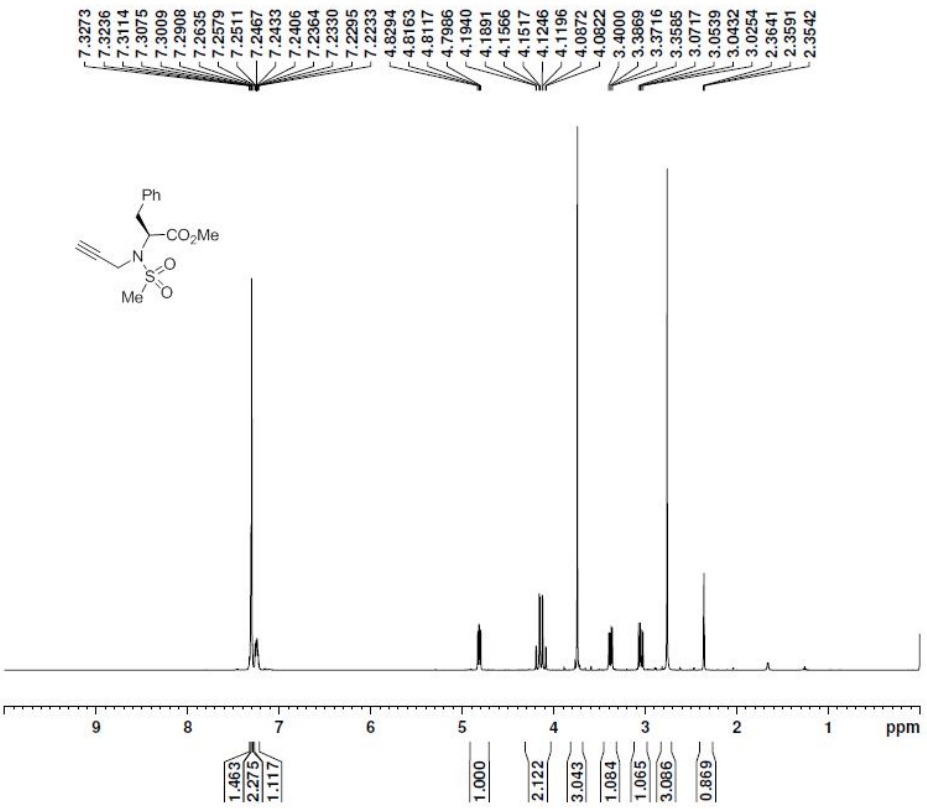


**Figure S39** $^{1}$H NMR (500 MHz, $CDCl_3$) spectrum of compound **28**

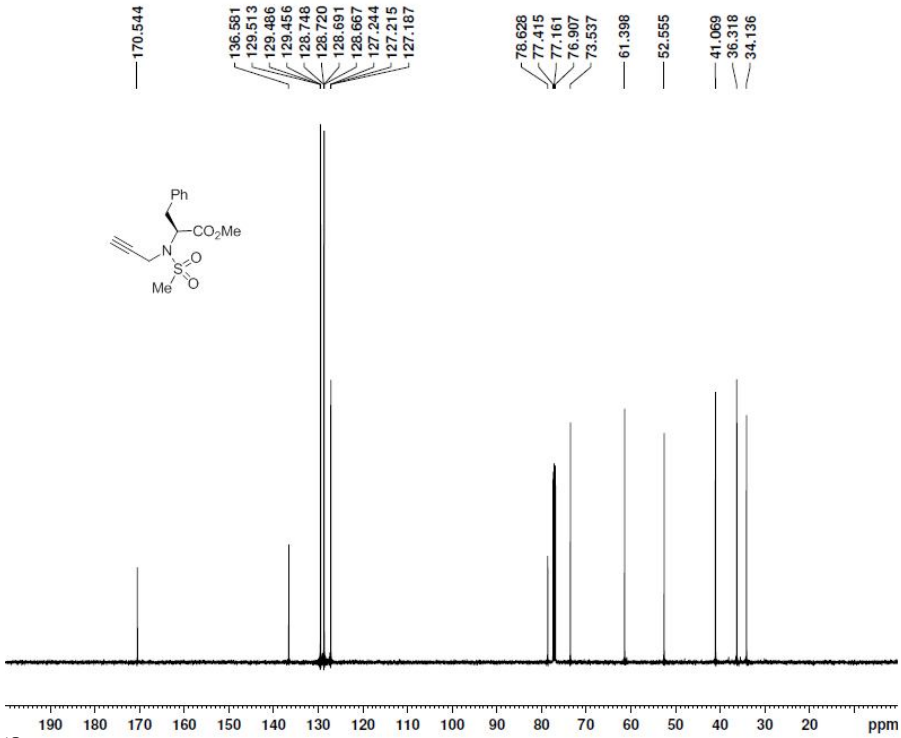


**Figure S40** $^{13}$C NMR (125 MHz, $CDCl_3$) spectrum of compound **28**

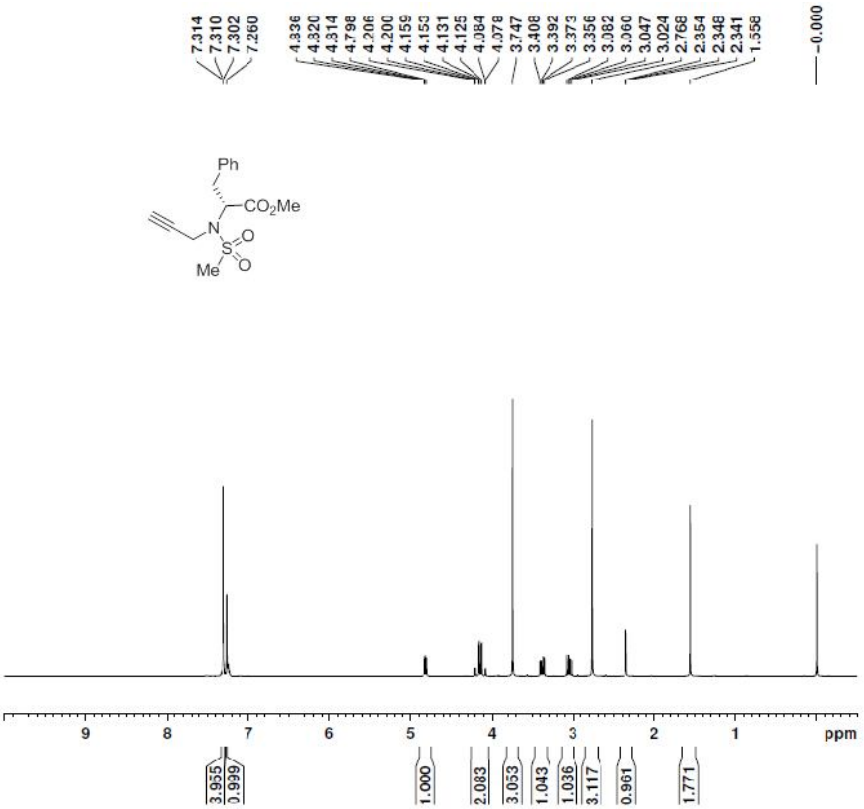


**Figure S41** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **29**

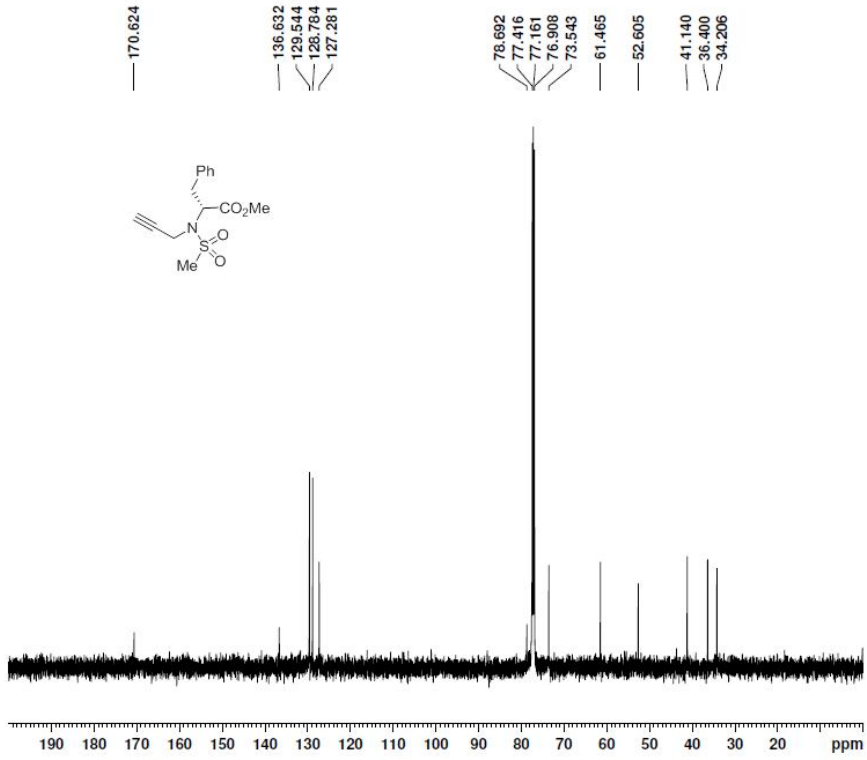


**Figure S42** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **29**

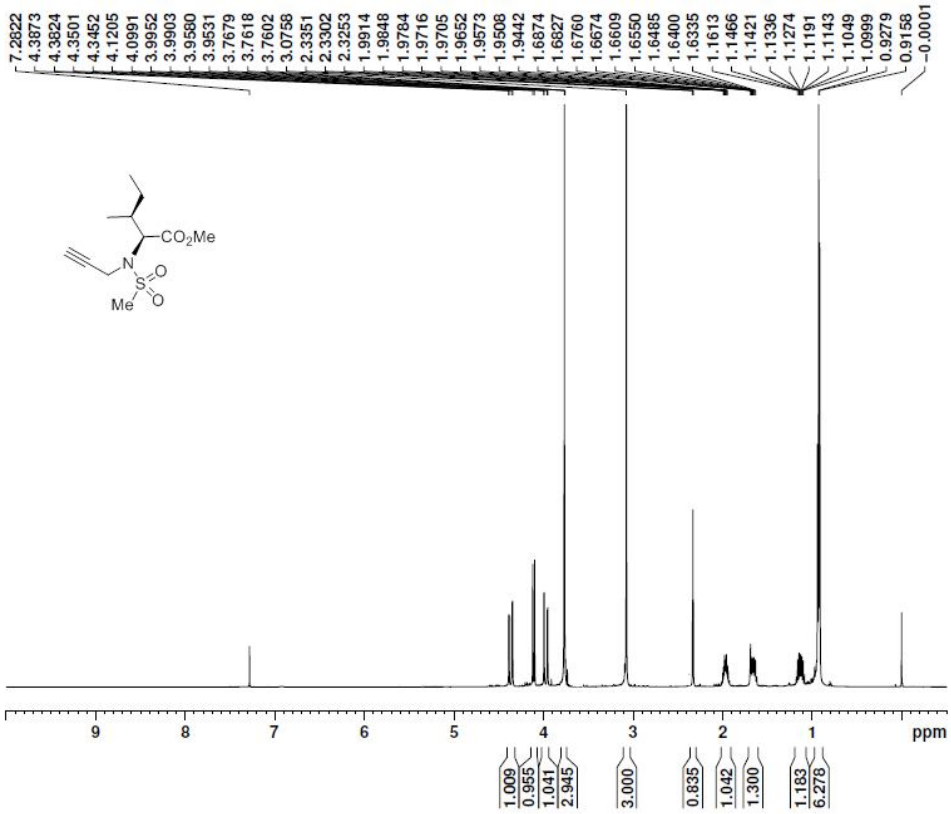


**Figure S43** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **30**

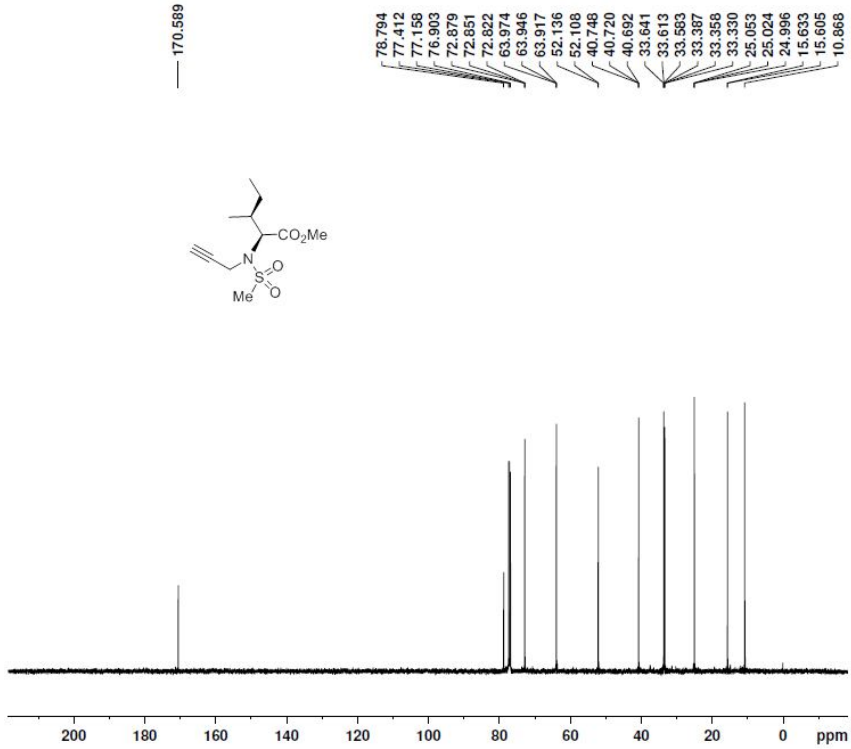


**Figure S44** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **30**

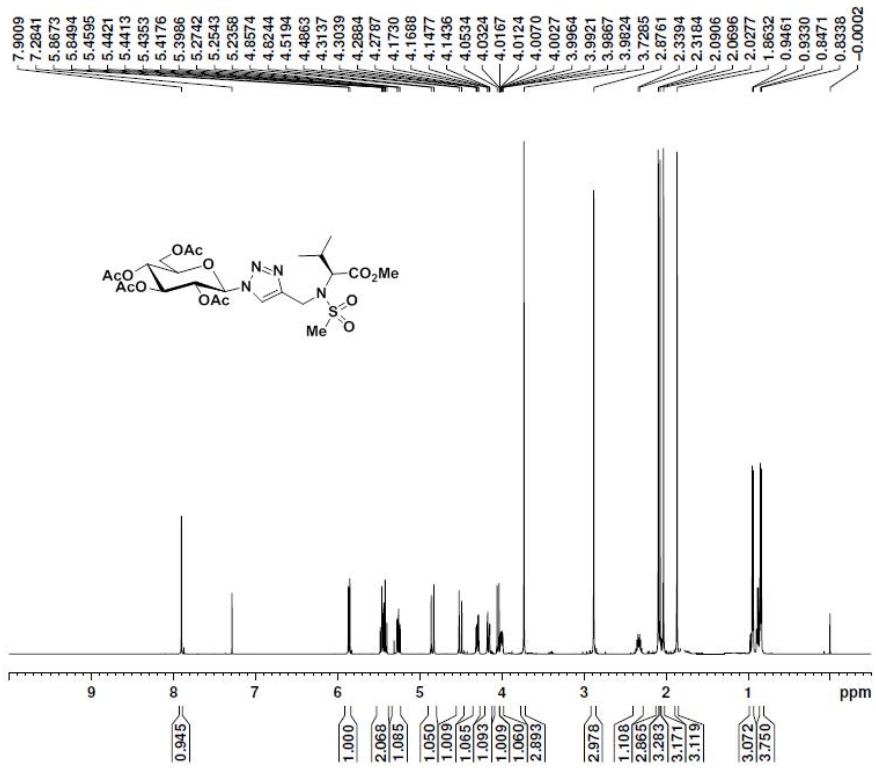


**Figure S45** $^{1}$H NMR (500 MHz, $CDCl_3$) spectrum of compound **31**

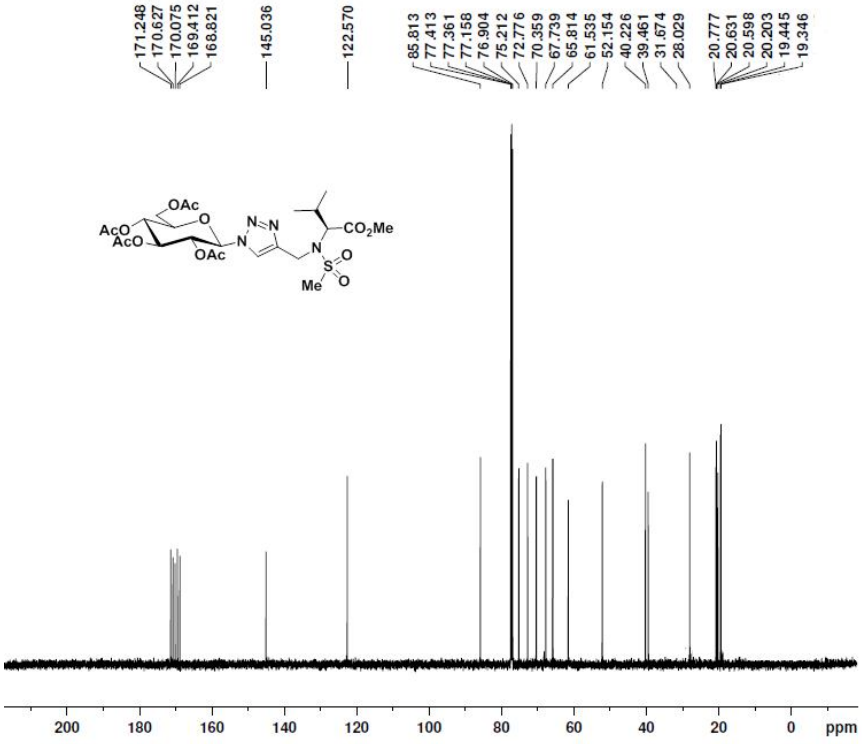


**Figure S46** $^{13}$C NMR (125 MHz, $CDCl_3$) spectrum of compound **31**

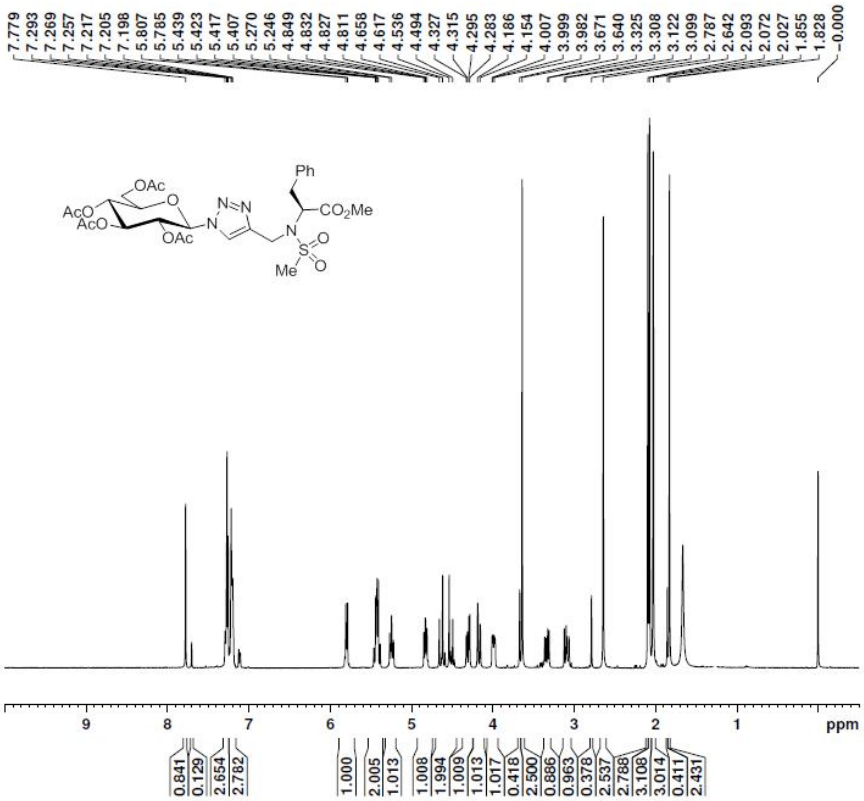

**Figure S47** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **32**

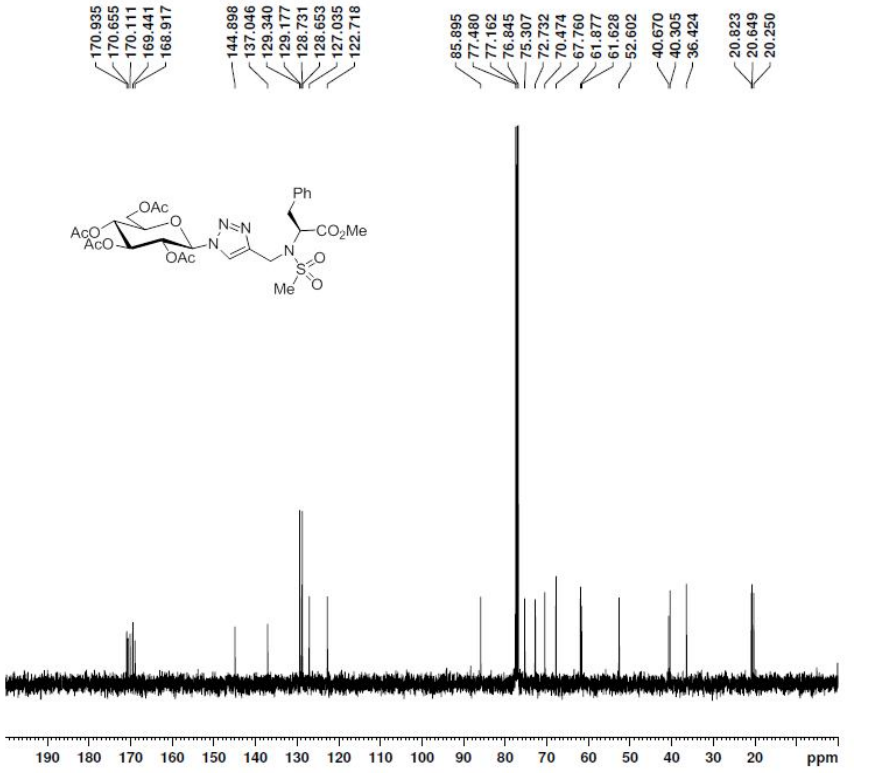

**Figure S48** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **32**

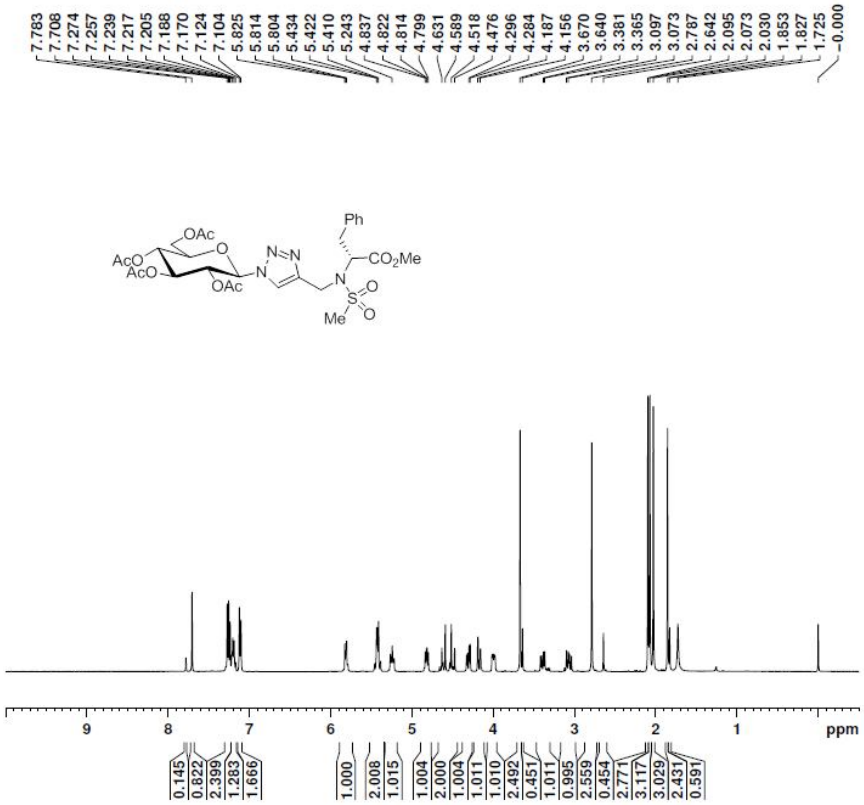


**Figure S49** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **33**

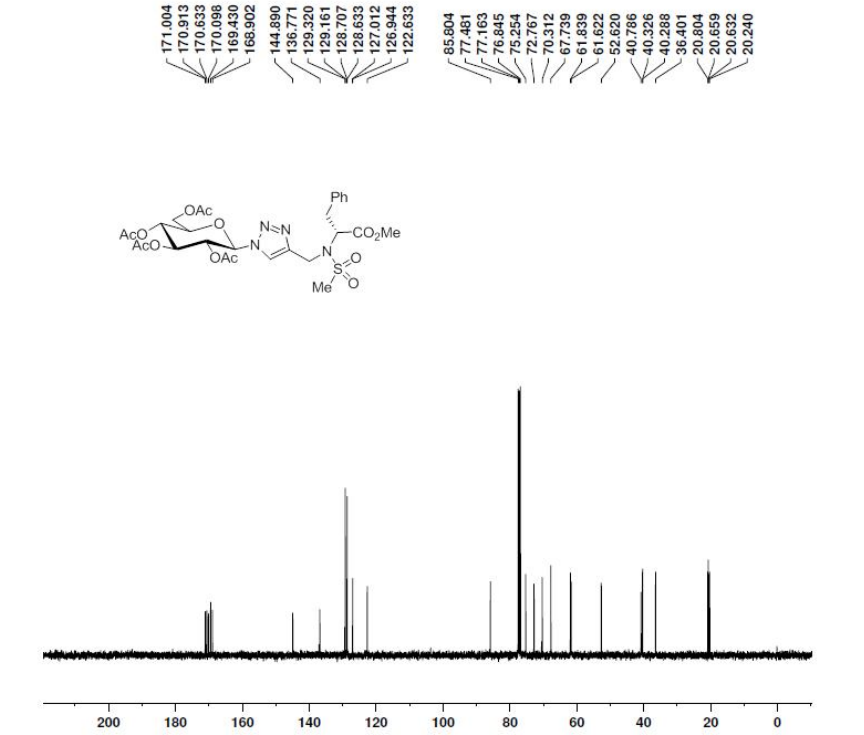


**Figure S50** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **33**

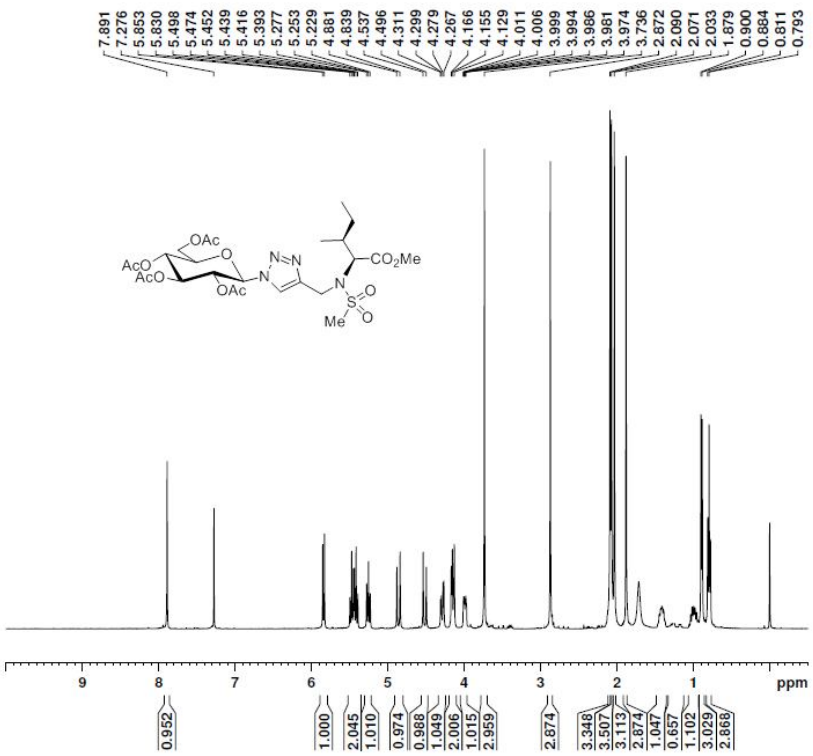


**Figure S51** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **34**

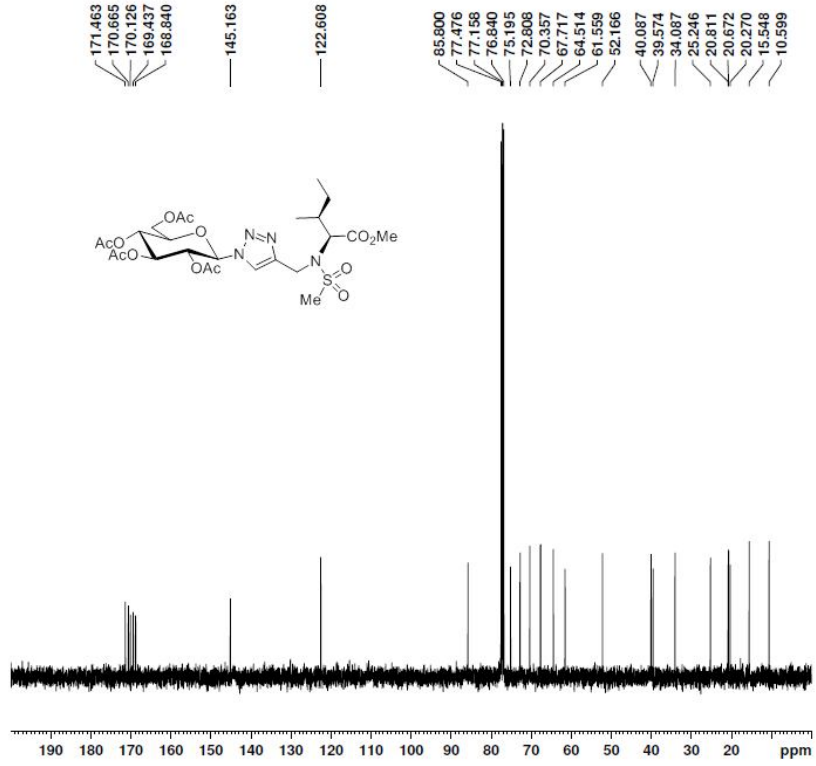


**Figure S52** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **34**

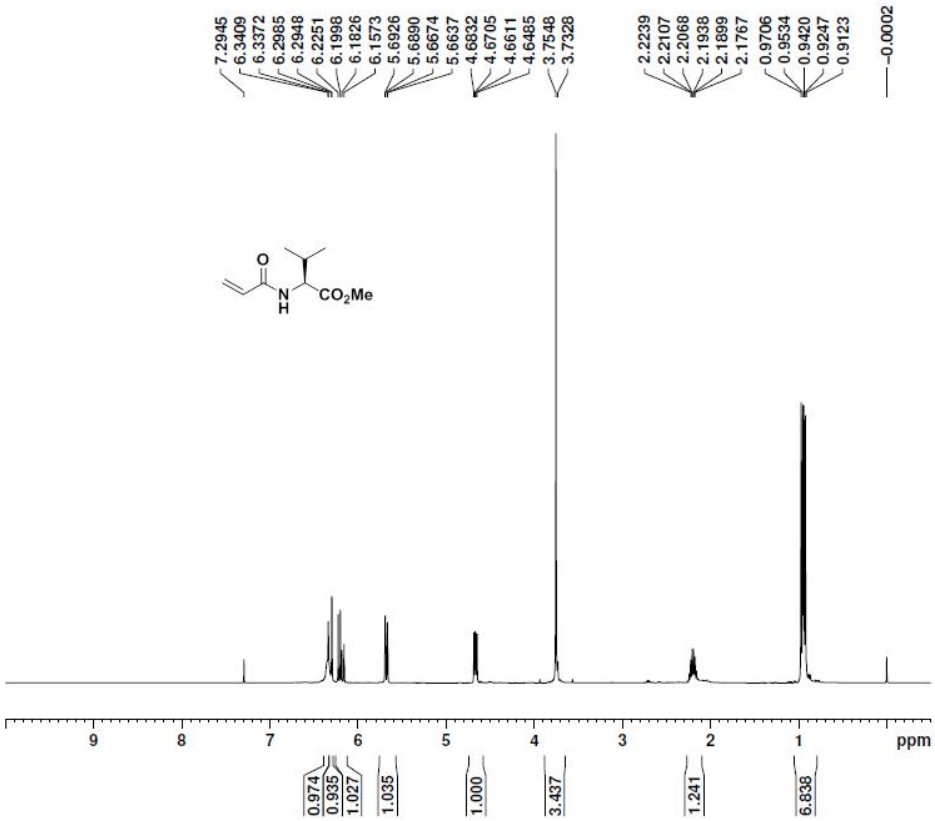


**Figure S53** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **35**

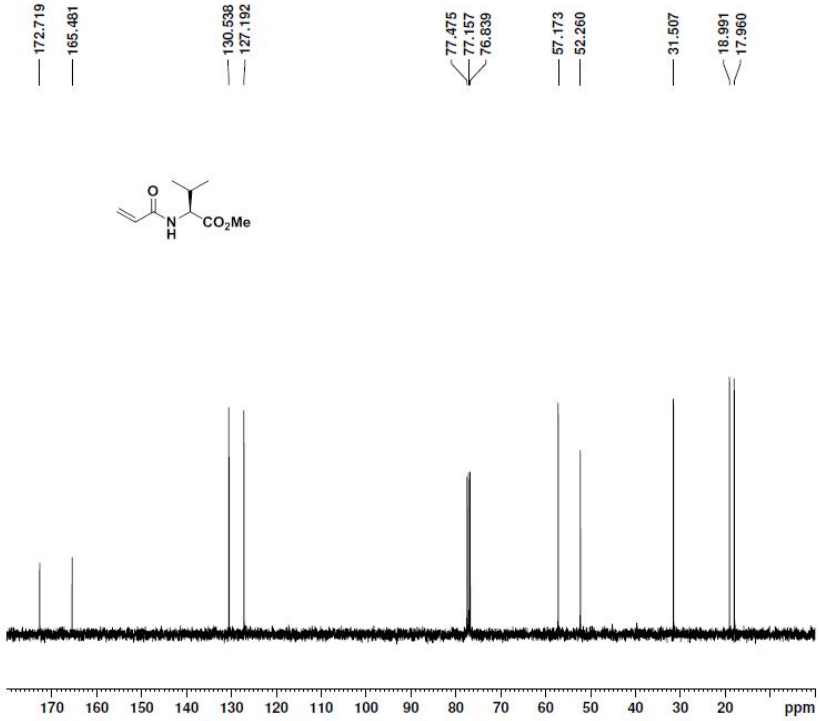


**Figure S54** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **35**

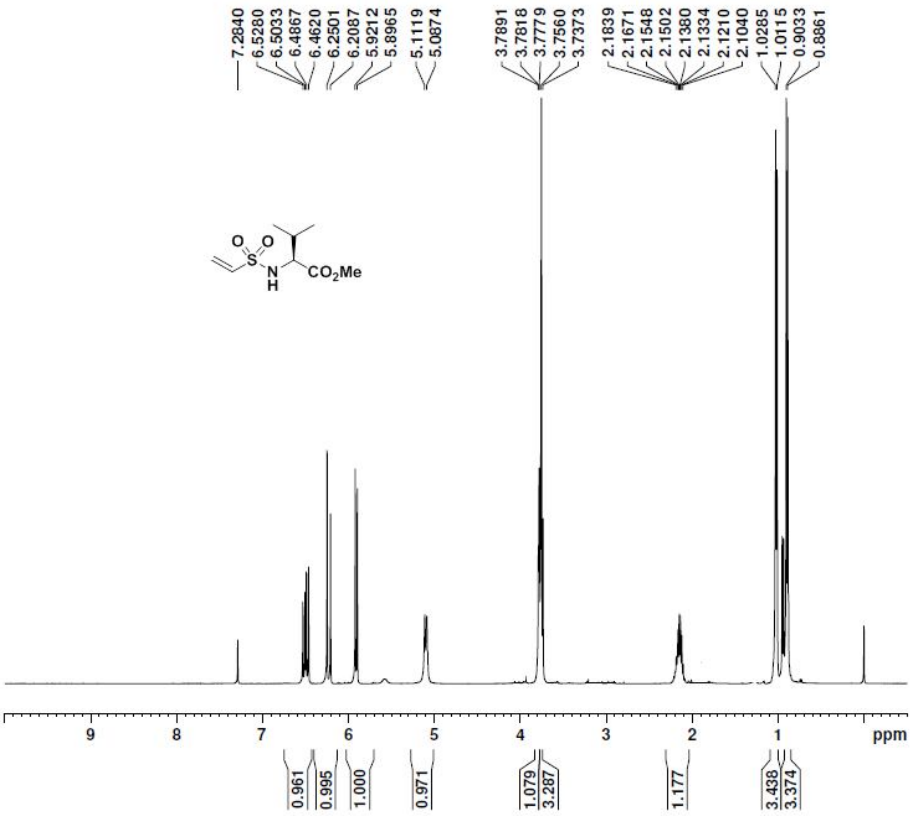


**Figure S55** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **38**

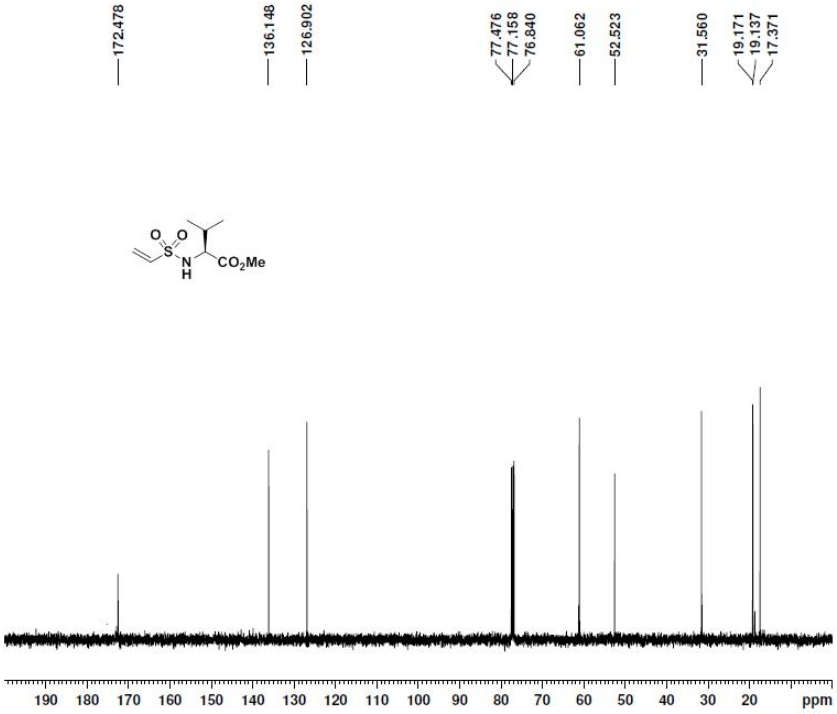


**Figure S56** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **38**

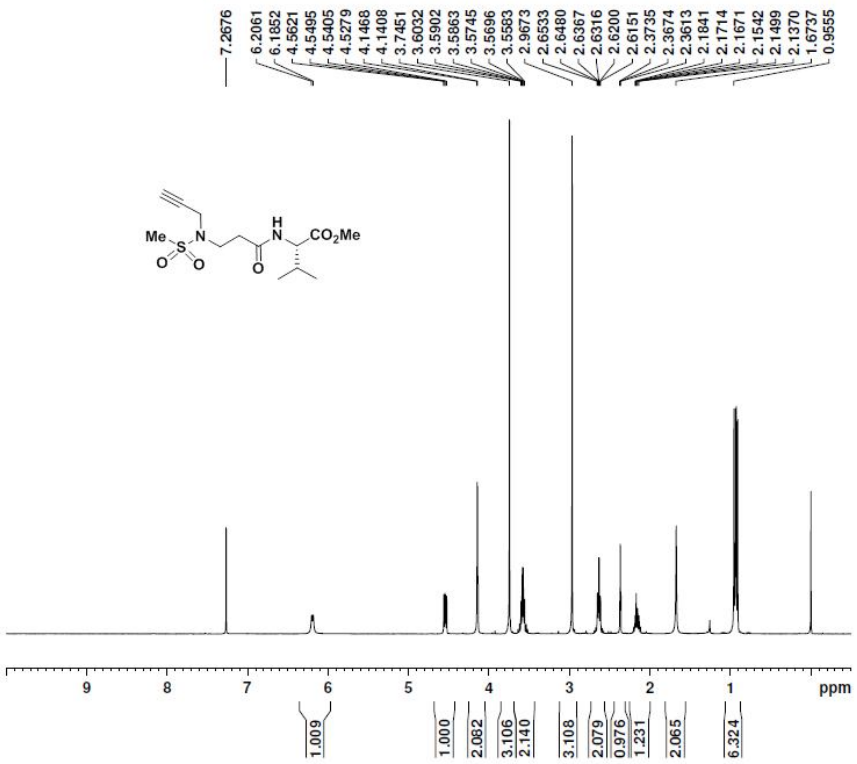


**Figure S57** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **36**

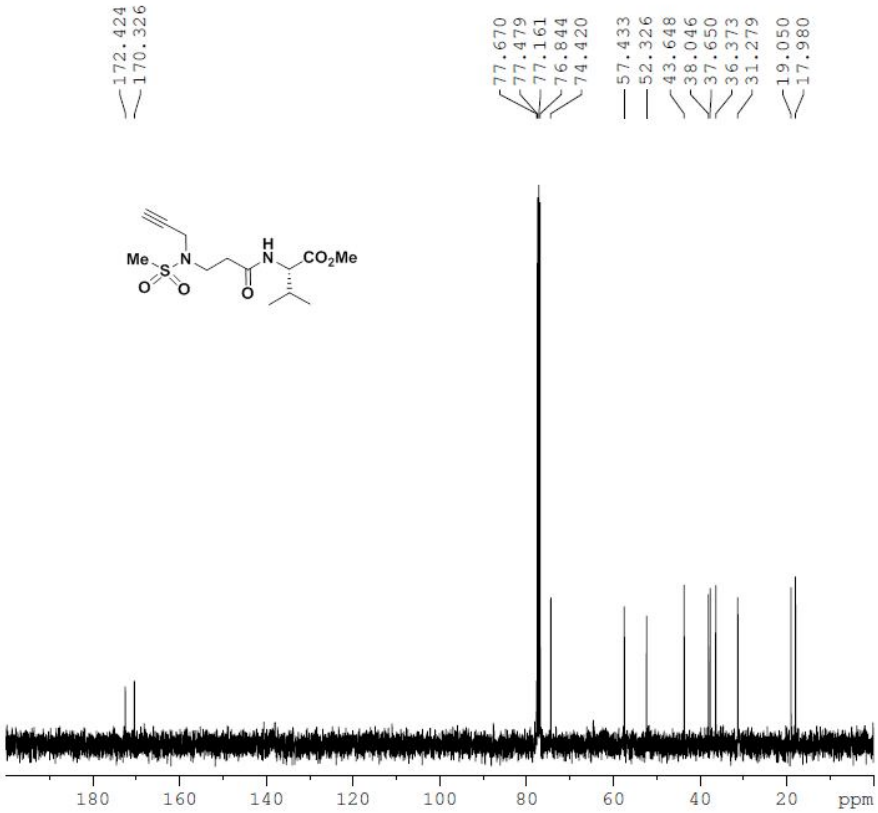


**Figure S58** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **36**

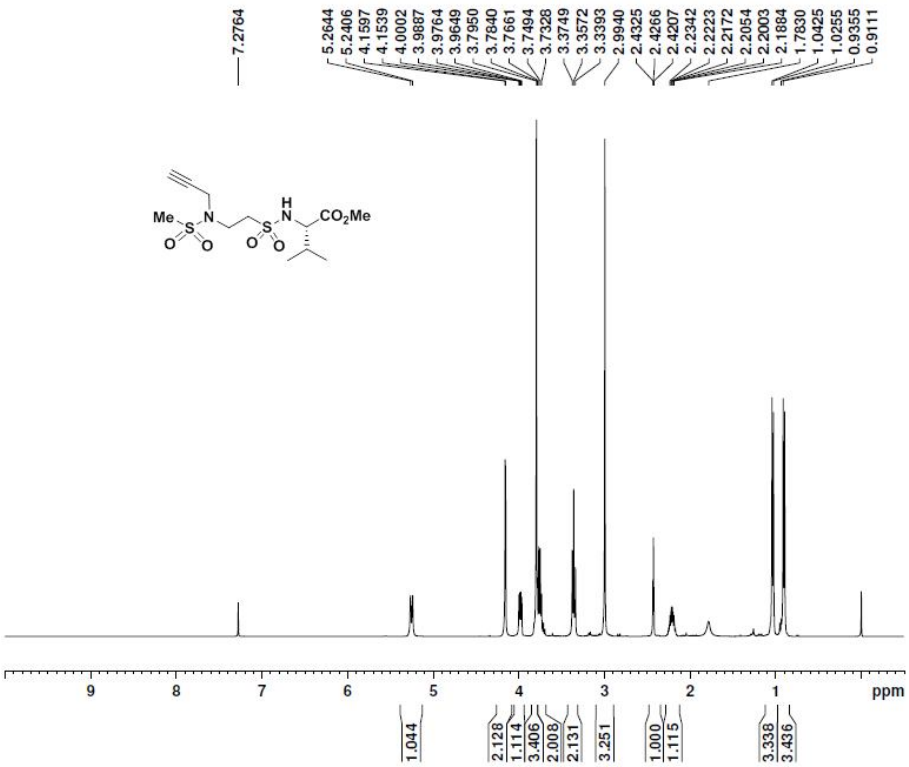


**Figure S59** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **39**

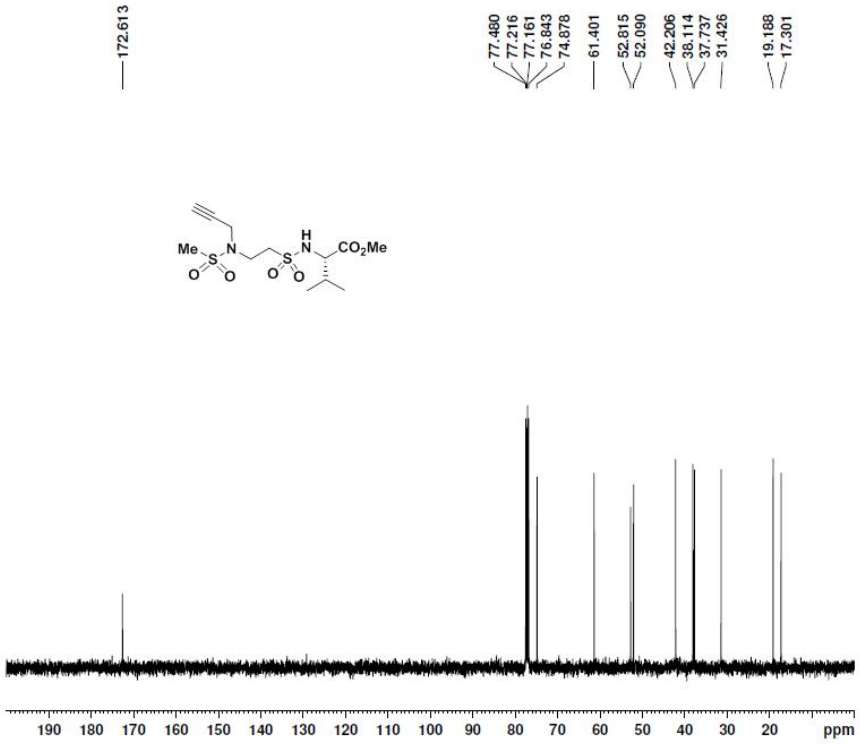


**Figure S60** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **39**

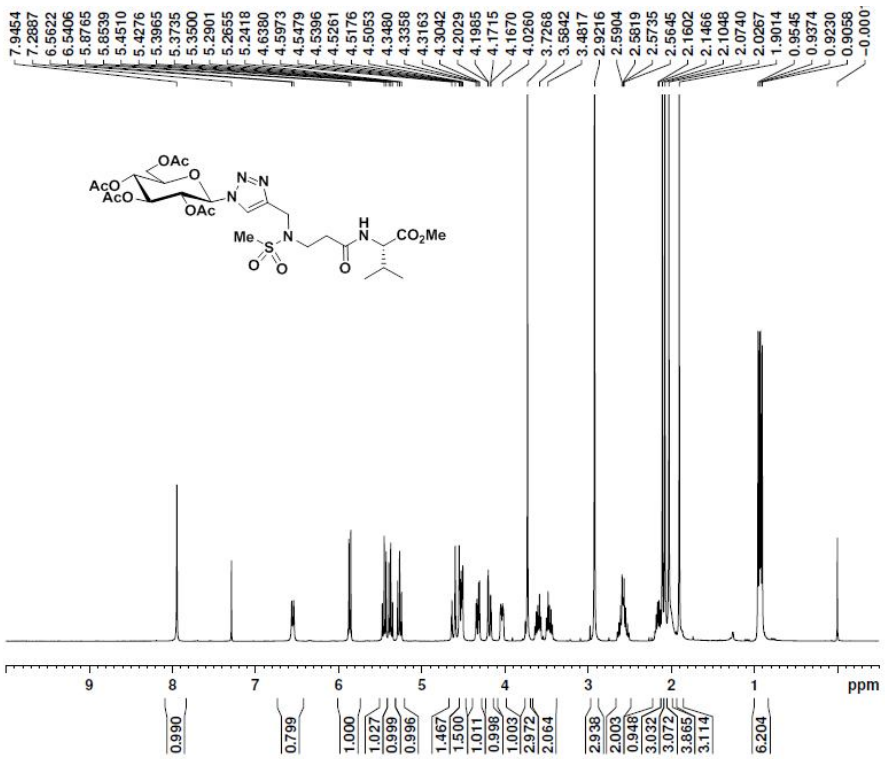

**Figure S61** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **37**

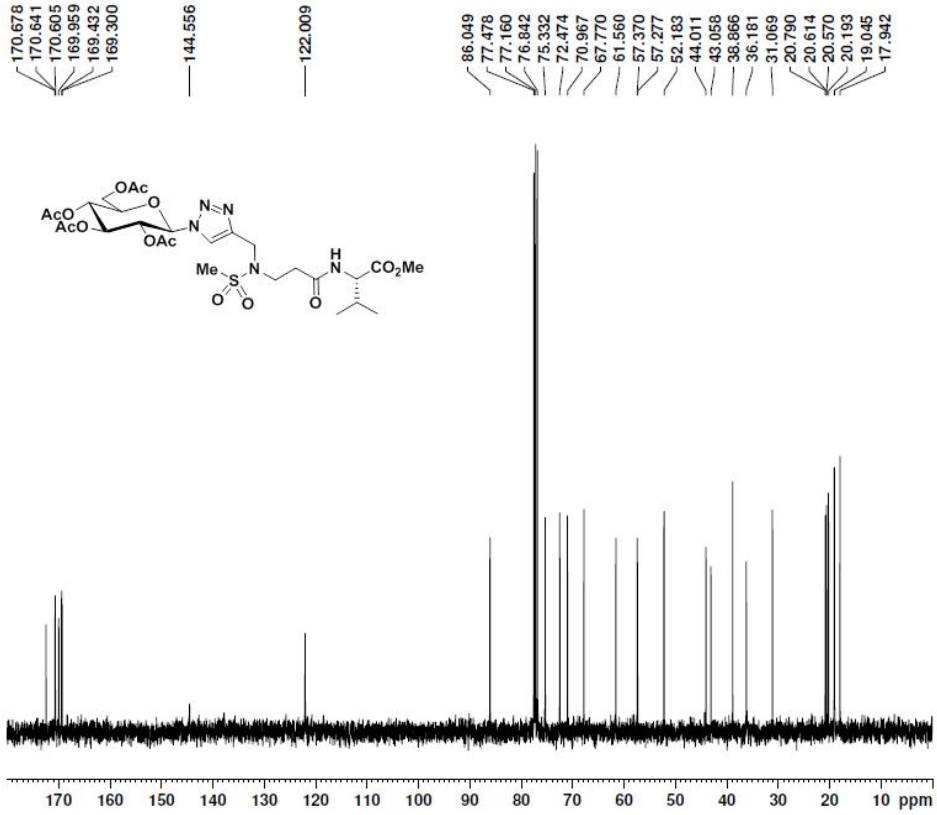

**Figure S62** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **37**

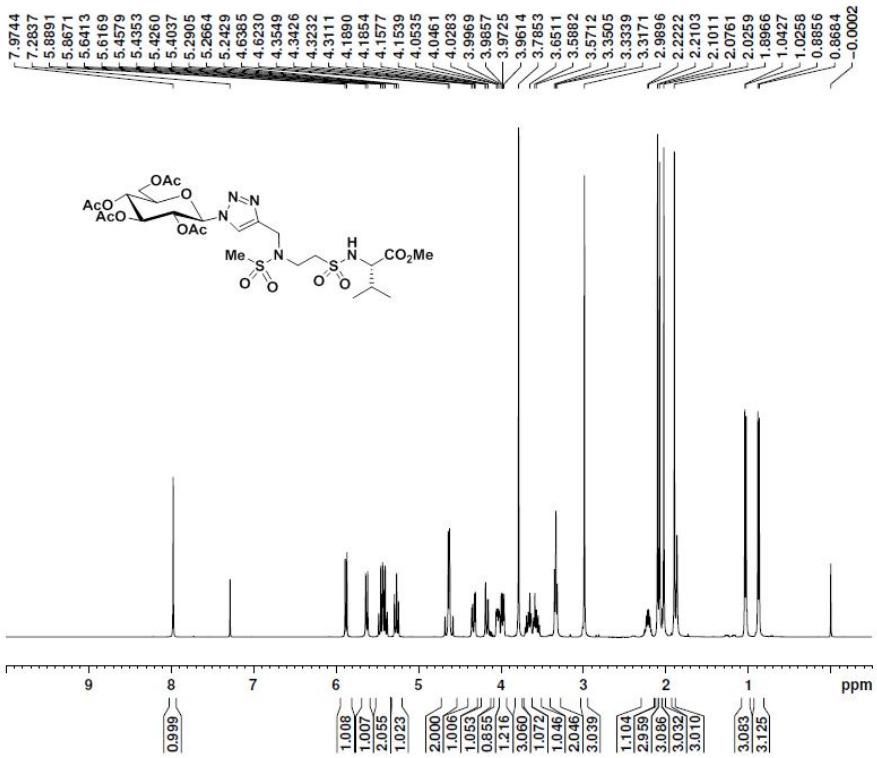

**Figure S63** $^{1}$H NMR (400 MHz, $CDCl_3$) spectrum of compound **40**

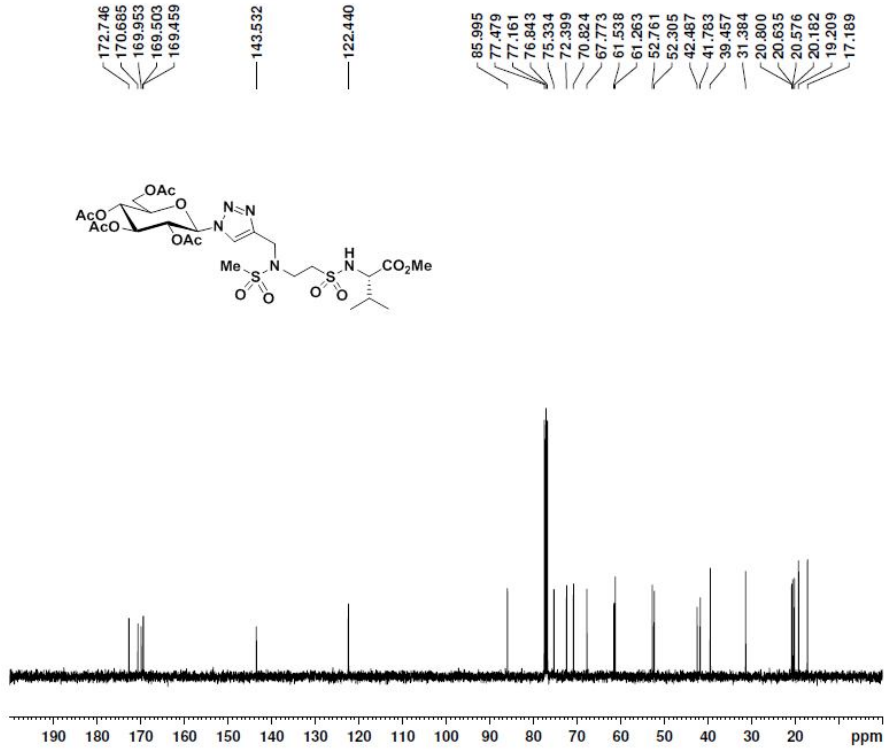

**Figure S64** $^{13}$C NMR (100 MHz, $CDCl_3$) spectrum of compound **40**

**X-Ray crystallographic analysis of *N*-propargylated sulfonamides (3, 4, 28 and 29)**

Compound **3**, **4**, **28** and **29** were recrystallized from a mixture of ethyl acetate and hexane at room temperature. The relevant details of data collection and refinement are given in the **Table S1**. The structures were solved by direct methods using **SHELXS-97** and the refinement was done by full matrix least-square method using **SHELXL-97**.

**Table S1** Data collection and refinement parameters for the compound **3**, **4**, **28** and **29**

| | Compound **3** | Compound **4** | Compound **28** | Compound **29** |
|---|---|---|---|---|
| Formula | $C_{19}H_{22}N_2O_6S$ | $C_{20}H_{24}N_2O_6S$ | $C_{14}H_{17}NO_4S$ | $C_{14}H_{17}NO_4S$ |
| Formula weight | 406.45 | 420.47 | 295.35 | 295.35 |
| Crystal system space group | *Triclinic*, *P-1* | *Monoclinic*, *Cc* | *Orthorhombic*, *$P2_12_12_1$* | *Orthorhombic*, *$P2_12_12_1$* |
| Color of crystal | Colorless | Colorless | Colorless | Colorless |
| Unit cell parameters | a = 8.4767(8) Å<br>α = 75.243(5)°<br>b = 8.8960(8) Å<br>β = 84.666(5)°<br>c = 15.3032(14) Å<br>γ = 65.095(5)° | a = 19.9851(13) Å<br>α = 90°<br>b = 13.9008(8) Å<br>β = 113.968(3)°<br>c = 8.3536(5) Å<br>γ = 90° | a = 6.53780(10) Å<br>α = 90°<br>b = 12.7943(3) Å<br>β = 90°<br>c = 17.9426(4) Å<br>γ = 90° | a = 6.5396(2) Å<br>α = 90°<br>b = 12.8007(6) Å<br>β = 90°<br>c = 17.9487(9) Å<br>γ = 90° |
| Temperature of data collection | 298(2) K | 298(2) K | 298(2) K | 298(2) K |
| *Z* | 2 | 4 | 4 | 4 |
| *R* | R1 = 0.0998,<br>wR2 = 0.1806 | R1 = 0.0449,<br>wR2 = 0.0771 | R1 = 0.0290,<br>wR2 = 0.0775 | R1 = 0.0310,<br>wR2 = 0.0797 |
| Goodness-of-fit on $F^2$ | 1.037 | 1.020 | 1.064 | 1.077 |
| Refinement method | Full-matrix least-squares on $F^2$ | Full-matrix least-squares on $F^2$ | Full-matrix least-squares on $F^2$ | Full-matrix least-squares on $F^2$ |

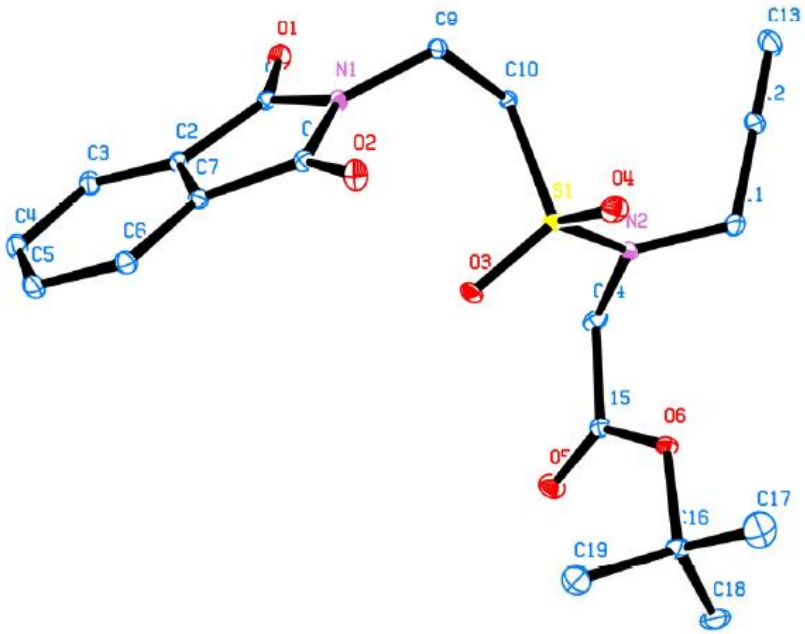


**Figure S65** ORTEP representation diagram in the crystal of compound **3**

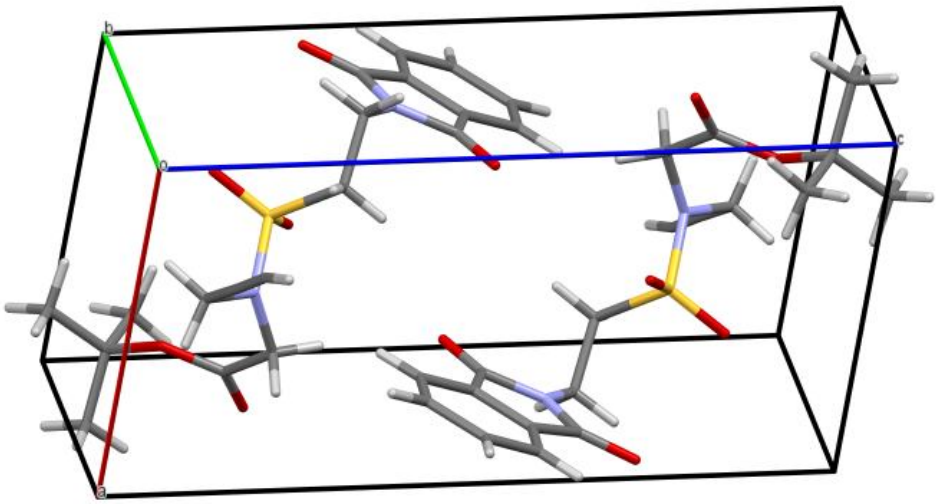

**Figure S66** Unit cell packing diagram of compound **3**

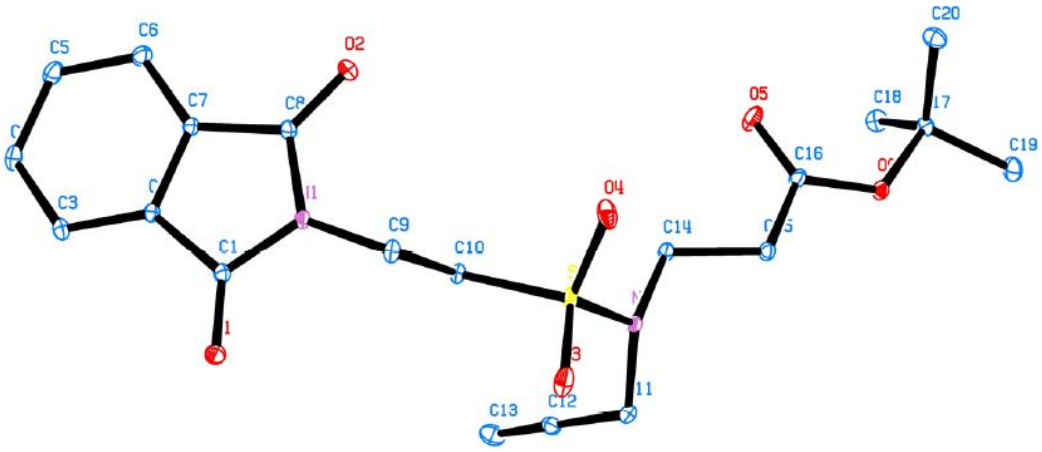


**Figure S67** ORTEP representation diagram in the crystal of compound **4**

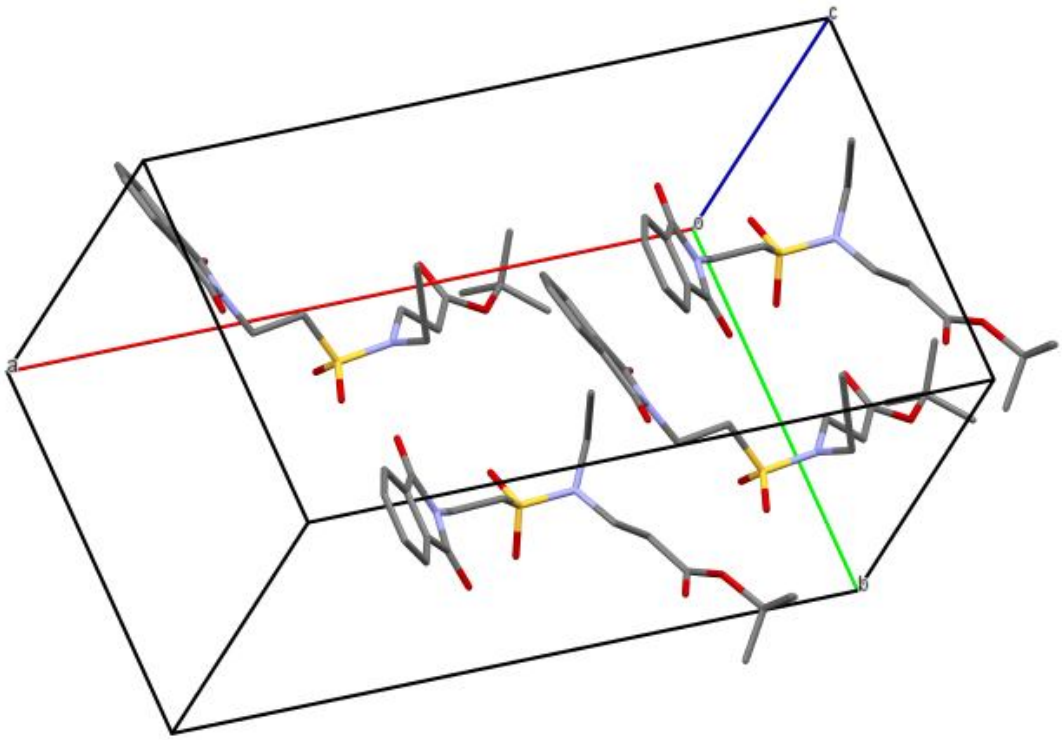


**Figure S68** Unit cell packing diagram of compound **4**

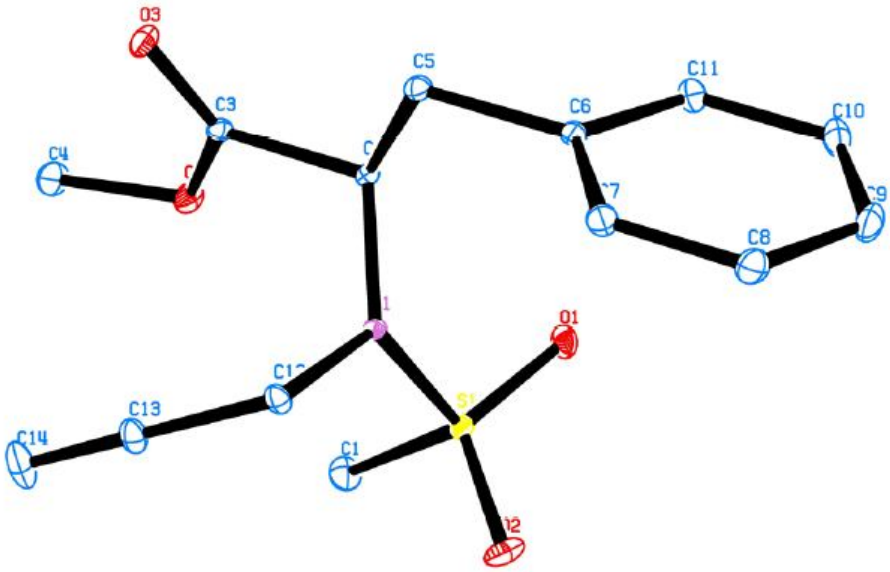


**Figure S69** ORTEP representation diagram in the crystal of compound **28**

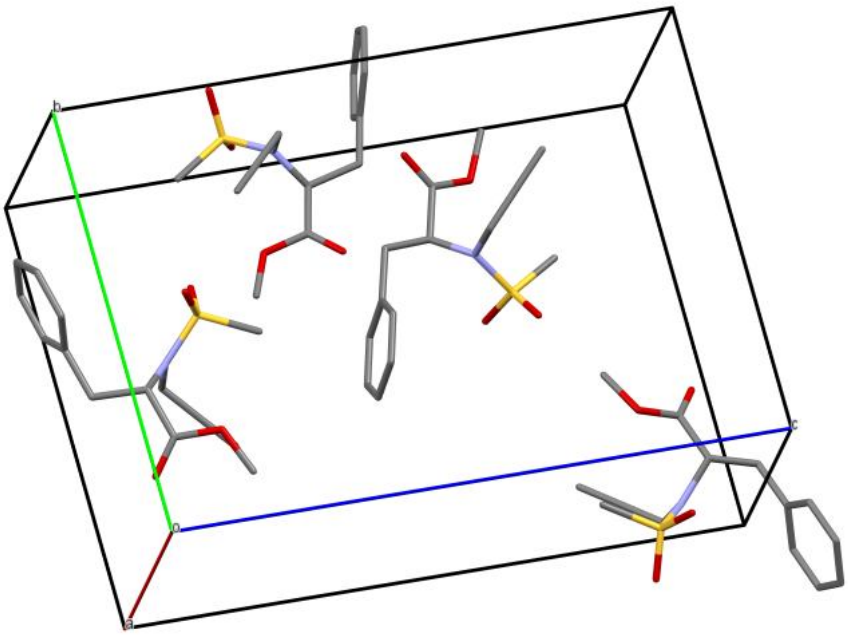

**Figure S70** Unit cell packing diagram of compound **28**

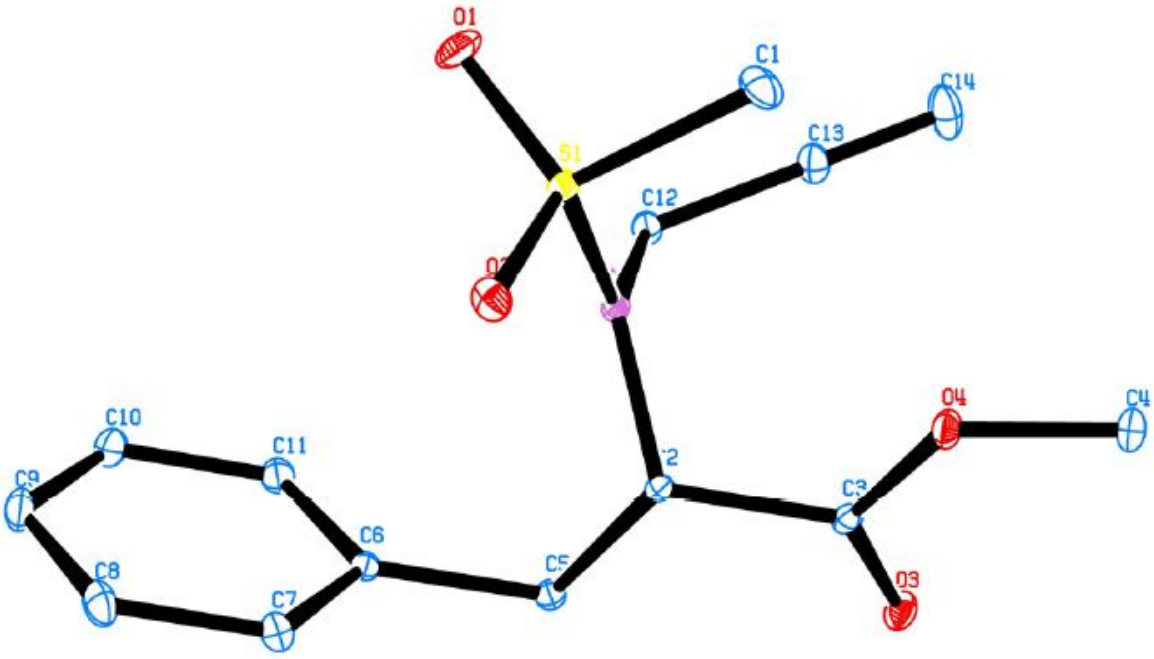


**Figure S71** ORTEP representation diagram in the crystal of compound **29**

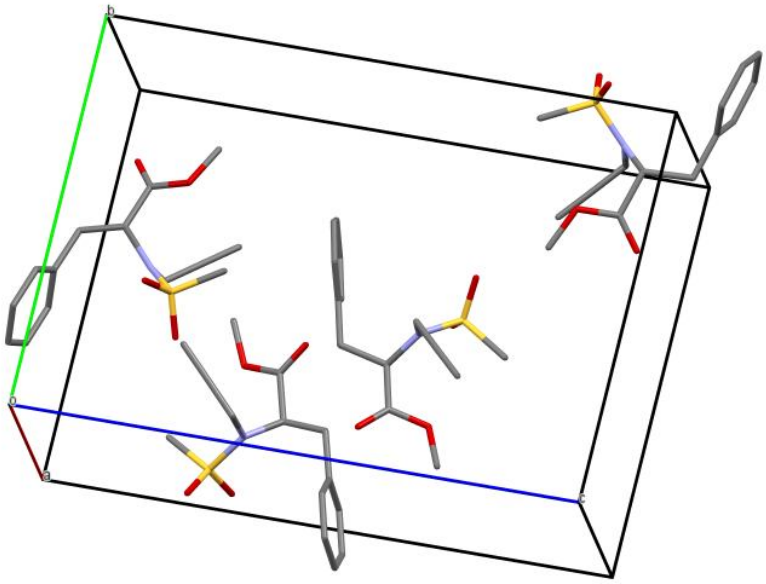

**Figure S72** Unit cell packing diagram of compound **29**

**Table S1** Comparative torsion angles in the crystal structure of compound **3** and **4**

| Torsion angle | Compound 3 | Compound 4 |
|---|---|---|
| N1-C9-C10-S1 | -69.87˚ | 172.77˚ |
| C10-S1-N2-C14 | -103.60˚ | 75.25˚ |
| O3-S1-N2-C11 | -153.50˚ | 36.58˚ |
| O4-S1-N2-C11 | -22.50˚ | 165.58˚ |
| N2-C14-C15-C16 | - | -177.34˚ |

**Table S2** Comparative torsion angles in the crystal structure of compound **28** and **29**

| Torsion angle | Compound 28 | Compound 29 |
|---|---|---|
| C1-S1-N1-C2 | 89.85˚ | -90.23˚ |
| O1-S1-N1-C12 | 36.49˚ | -165.24˚ |
| O2-S1-N1-C12 | 165.30˚ | -36.56˚ |
| C12-N1-C2-C5 | -65.15˚ | 64.80˚ |

**Table S3** Parameters of C-H…O interactions in compounds **3**, **4**, **28** and **29**

| Compound | C-H…O | Distance C-O (˚) | Angle C-H-O (˚) |
|---|---|---|---|
| **3** | C4-H4…O3 | 3.364 | 166.20 |
| **3** | C18-H18A…O4 | 3.459 | 137.99 |
| **3** | C17-H17B…O4 | 3.607 | 144.05 |
| **4** | C13-H13…O4 | 3.204 | 137.54 |
| **28** | C14-H14…O1 | 3.157 | 153.84 |
| **28** | C12-H12B…O2 | 3.219 | 119.72 |
| **29** | C14-H14…O2 | 3.157 | 152.08 |
| **29** | C12-H12A…O1 | 3.222 | 120.11 |

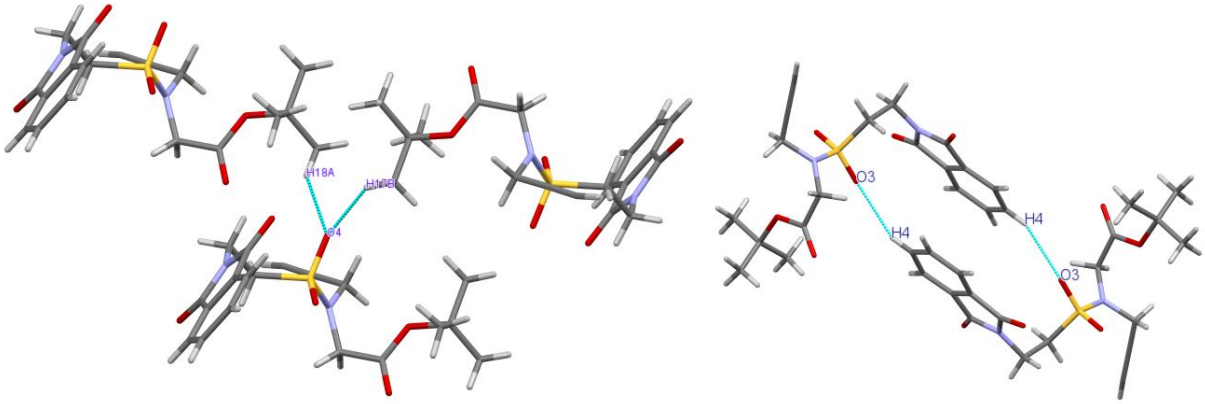


**Figure S73** C-H…O interactions of the sulfonamide oxygen in compound **3**

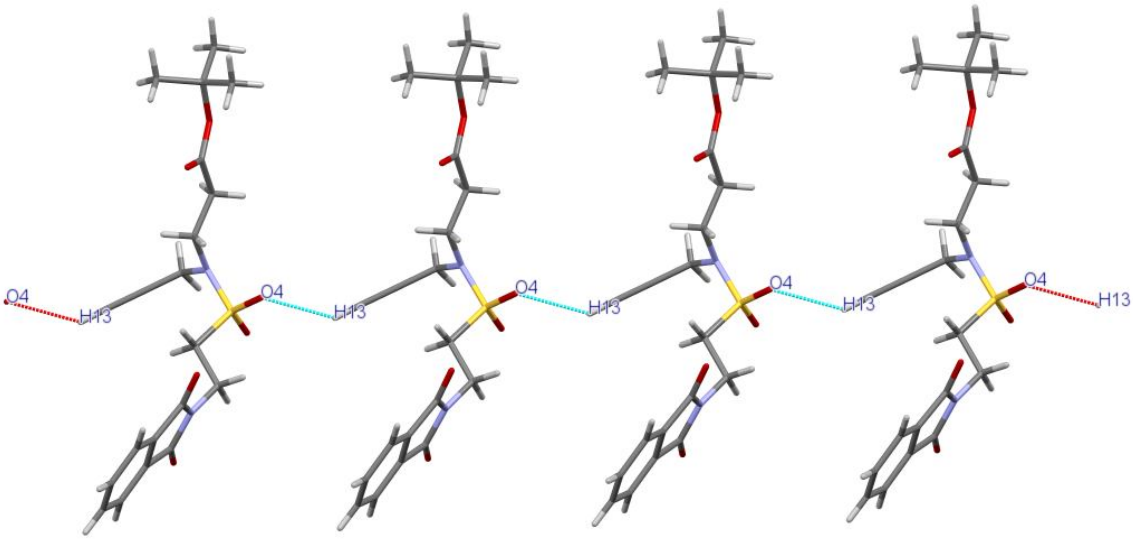


**Figure S74** Infinite chain of C-H…O interactions of the sulfonamide oxygen in compound **4**

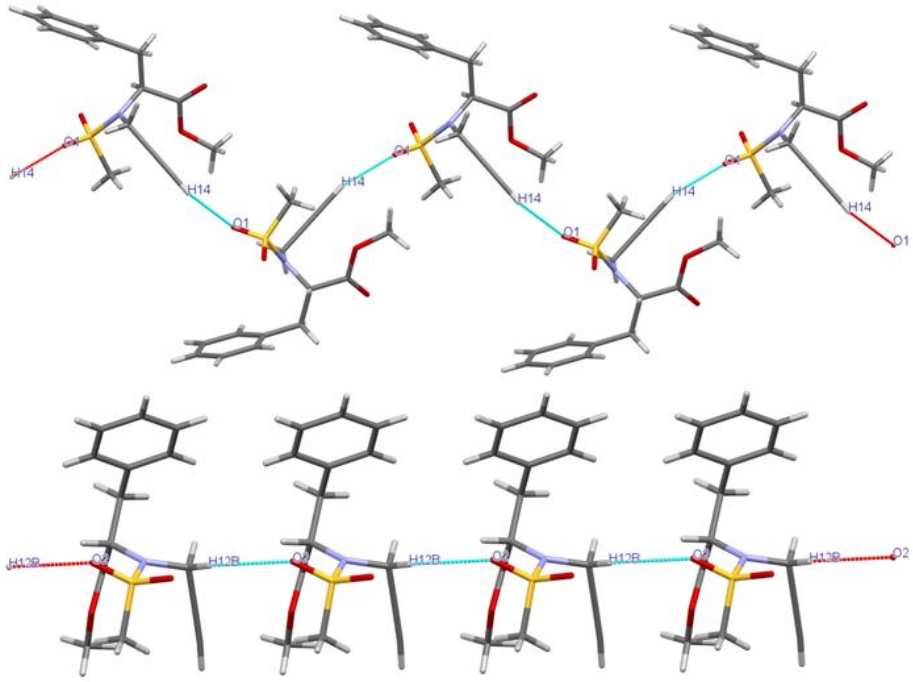


**Figure S75** Infinite chain of C-H…O interactions in the crystal structure of compound **28**

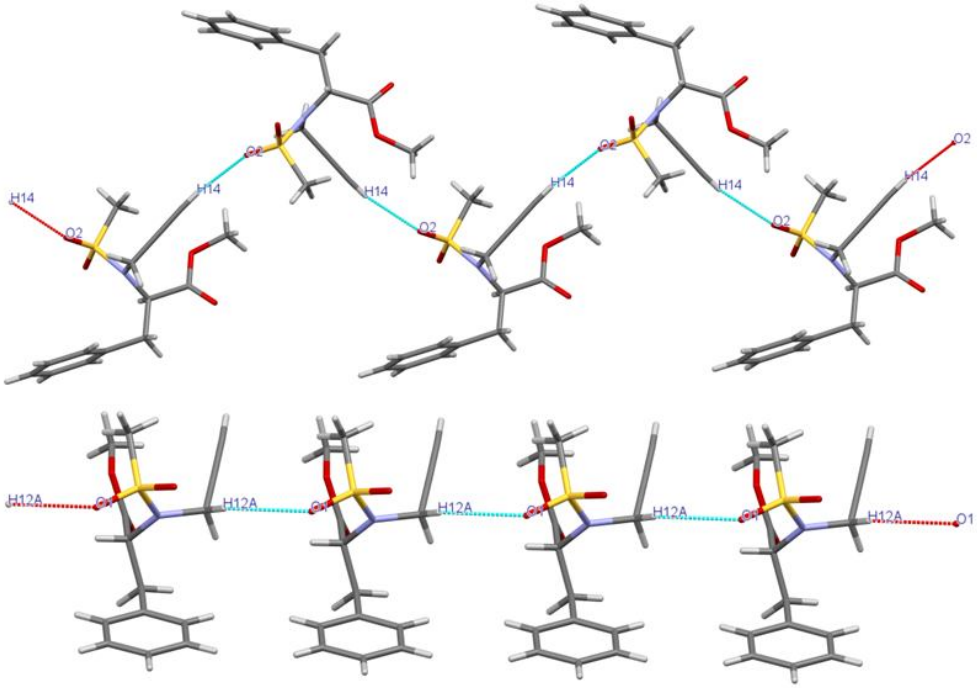


**Figure S76** Infinite chain of C-H…O interactions in the crystal structure of compound **29**