Supporting Information

Metal-Free Synthesis of Activated Ynesulfonamides and Tertiary Enesulfonamides

Lucile ANDNA, Laurence MIESCH*****

Equipe de Synthèse Organique et Phytochimie, Institut de Chimie,
Université de Strasbourg, CNRS-UdS UMR 7177,
4, rue Blaise Pascal CS 90032, 67081 Strasbourg, France

Corresponding author**: lmiesch@unistra.fr**

Contents

General remarks

All reactions were carried under argon atmosphere. DMF, acetone, THF, toluene, MeCN and acetic acid were used as received from Sigma Aldrich. CH_2Cl_2 was dried using a dry solvent station GT S100 system.

NMR Spectra (^1H, ^{13}C) were performed at 298 K. ^1H (500 MHz or 300 MHz) and ^{13}C (125 MHz) NMR chemical shifts are reported relative to internal TMS (δ = 0.00 ppm) or to residual protiated solvent. Data are presented as follows: chemical shift (ppm), multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, sept = septet, m = multiplet, br = broad), coupling constant *J* (Hz) and integration.

HRMS data were recorded on a microTOF spectrometer equipped with an orthogonal electrospray (ESI) interface.

Thin layer chromatography was performed using Merck TLC silica gel 60 F_{254} aluminium sheets using petroleum ether/EtOAc or CH_2Cl_2/acetone as eluant and visualized using permanganate stain, ninhydrin stain, vanillin stain and/or UV light. Merck Geduran® 40-63 µm silica gel was used for column chromatography.

Infrared spectra were reported in frequency of absorption using Alpha Bruker Optics spectrometer.

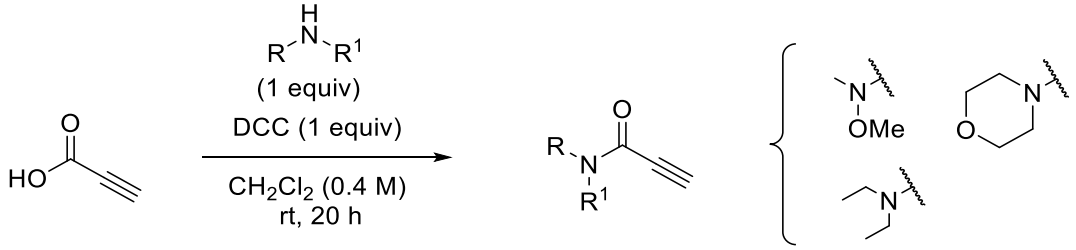
Melting points were recorded with a SMP3 Stuart Scientific microscope in open capillary tubes and are uncorrected.

Ethyl propiolate, (*S*)-4-phenyloxazolidin-2-one were purchased from Fluorochem and *N*,4-dimethylbenzenesulfonamide from Sigma-Aldrich. All these compounds were used without any precautions.

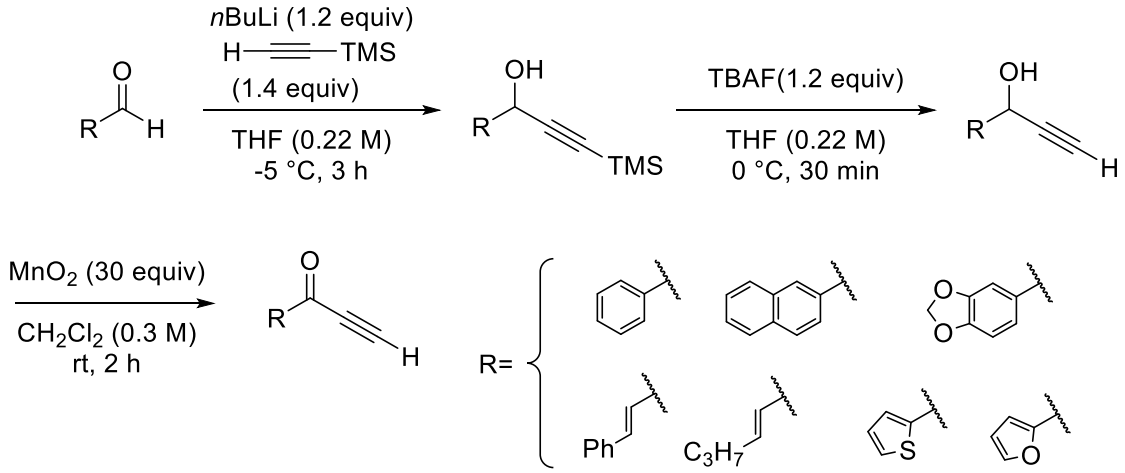
Experimental procedure and characterization data for terminal alkynes SI-a

Synthetic routes of terminal alkynes were summarized in the following schemes.

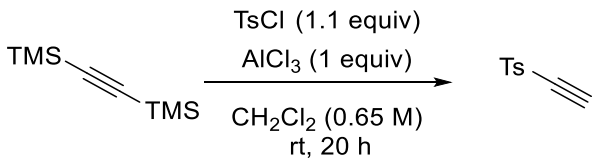
For amides precursors: [1]



For ketones precursors: [2]

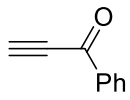


For Ts: [3]



[1] Schlepphorst, C.; Wiesenfeldt, M. P.; Glorius, F. *Chem. Eur. J*. **2018**, *24*, 356.
[2] a) Beltran, F.; Fabre, I.; Ciofini, I.; Miesch, L. *Org. Lett.*, **2017**, *19*, 5042. (and references in the supporting information therein), b) Shen, Y.; Cai, S.; He, C.; Lin, X.; Lu, P.; Wang, Y. *Tetrahedron*, **2011**, *67*, 8338.
[3] Dai, H.; Li, C.-X.; Yu, C.; Wang, Z.; Yan, H.; Lu, C. *Org. Chem. Front.*, **2017**, *4*, 2008.

1-phenylprop-2-yn-1-one (SI-a2)

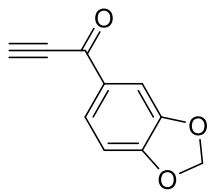


C_9H_6O
MW : 130.15 g.mol^{-1}
White solid
42% (601 mg, 4.62 mmol)

The reaction was performed on 11 mmol scale, following ketones precursors' method. Characterization data match those of the literature.[2b]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 8.20 – 8.14 (m, 2 H), 7.69 – 7.58 (m, 1 H), 7.55 - 7.47 (m, 2 H), 3.43 (s, 1 H) ppm.

1-(benzo[*d*][1,3]dioxol-5-yl)prop-2-yn-1-one (SI-a3)

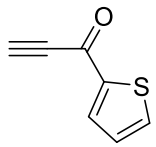


$C_{10}H_6O_3$
MW : 174.15 g.mol^{-1}
White solid
66% (1.26 g, 7.26 mmol)

The reaction was performed on 11 mmol scale, following ketones precursors' method. Characterization data match those of the literature.[4]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 7.84 (dd, 1 H, *J* = 8.2 Hz, 1.7 Hz), 7.56 (d, 1 H, *J* = 1.7 Hz), 6.89 (d, 1 H, *J* = 8.2 Hz), 6.08 (s, 2 H), 3.37 (s, 1 H) ppm.

1-(thiophen-2-yl)prop-2-yn-1-one (SI-a4)

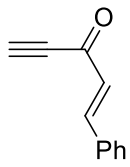


C_7H_4OS
MW : 136.17 g.mol^{-1}
Orange solid
60% (899 mg, 6.6 mmol)

The reaction was performed on 11 mmol scale, following ketones precursors' method. Characterization data match those of the literature.[4]

^{1}H NMR ($CDCl_3$, 400 MHz): δ = 7.97 (dd, 1 H, *J* = 3.9 Hz, 1.1 Hz), 7.74 (dd, 1 H, *J* = 4.9 Hz, 1.1 Hz), 7.17 (dd, 1 H, *J* = 4.9 Hz, 3.9 Hz), 3.35 (s, 1 H) ppm.

(*E*)-1-phenylpent-1-en-4-yn-3-one (SI-a5)



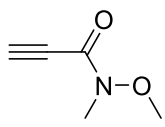
$C_{11}H_8O$
MW : 156.18 g.mol^{-1}
Orange solid
81% (1.39 g, .8.91 mmol)

The reaction was performed on 11 mmol scale, following ketones precursors' method. Characterization data match those of the literature.[2b]

[4] Oakdale, J. S.; Sit, R. K.; Fokin, V. V. *Chem. Eur. J*. **2014**, *20*, 11101.

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 7.89 (d, 1 H, *J* = 16.1 Hz), 7.62 -7.55 (m, 2 H), 7.47 – 7.39 (m, 3 H), 6.81 (d, 1 H, *J* = 16.1 Hz), 3.32 (s, 1 H) ppm.

<u>*N*-methoxy-*N*-methylpropiolamide (SI-a6)</u>

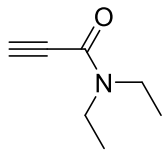


$C_7H_7NO_2$
MW : 113.12 g.mol^{-1}
Orange oil
68% (846 mg, 7.48 mmol)

The reaction was performed on 11 mmol scale, following amides precursors' method. Characterization data match those of the literature.[4]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 3.79 (s, 3 H), 3.24 (br, 3 H), 3.12 (s, 1 H) ppm.

<u>*N*,*N*-diethylpropiolamide (SI-a7)</u>

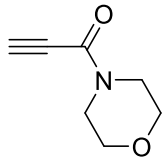


$C_7H_{11}NO$
MW : 125.17 g.mol^{-1}
Colorless oil
53% (730 mg, 5.83 mmol)

The reaction was performed on 11 mmol scale, following amides precursors' method. Characterization data match those of the literature.[1]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 3.60 (q, 2 H, *J* = 7.2 Hz), 3.42 (q, 2 H, *J* = 7.2 Hz), 3.03 (s, 1 H), 1.22 (t, 3 H, *J* = 7.2 Hz), 1.14 (t, 3 H, *J* = 7.2 Hz) ppm.

<u>1-morpholinoprop-2-yn-1-one (SI-a8)</u>

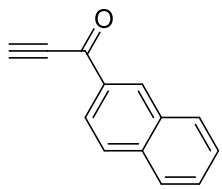


$C_7H_9NO_2$
MW : 139.15 g.mol^{-1}
Colorless oil
48% (734 mg, 5.28 mmol)

The reaction was performed on 11 mmol scale, following amides precursors' method. Characterization data match those of the literature.[4]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 3.78 – 3.73 (m, 2H), 3.72 – 3.68 (m, 2H), 3.67-3.61 (m, 4H), 3.13 (s, 1 H) ppm.

<u>1-(naphthalen-2-yl)prop-2-yn-1-one (SI-a9)</u>



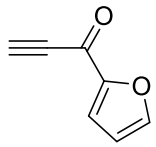
$C_{13}H_8O_2$
MW : 180.21 g.mol^{-1}
White solid
60% (1.19 g, 6.60 mmol)

The reaction was performed on 11 mmol scale, following ketones

precursors' method. Characterization data match those of the literature.[5]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 8.76 (s, 1 H), 8.14 (dd, 1 H, *J* = 8.6 Hz, 1.7 Hz), 8.10 (dd, 1 H, *J* = 8.0 Hz, 1.7 Hz), 7.91 (dd, 2 H, *J* = 8.7 Hz, 3.3 Hz), 7.69 – 7.56 (m, 2 H), 3.50 (s, 1 H) ppm.

1-(furan-2-yl)prop-2-yn-1-one (SI-a10)

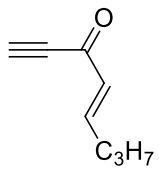


$C_7H_4O_2$
MW : 120.11 g.mol^{-1}
Yellow solid
67% (885 mg, 7.37 mmol)

The reaction was performed on 11 mmol scale, following ketones precursors' method. Characterization data match those of the literature.[2b]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 7.69 (dd, 1 H, *J* = 1.7 Hz, 0.6 Hz), 7.41 (dd, 1 H, *J* = 3.5 Hz, 0.6 Hz), 6.60 (dd, 1 H, *J* = 3.5 Hz, 1.7 Hz), 3.31 (s, 1 H) ppm.

(*E*)-oct-4-en-1-yn-3-one (SI-a11)



$C_8H_{10}O$
MW : 122.16 g.mol^{-1}
Colorless oil
69% (927.2 mg, 7.59 mmol)

The reaction was performed on 11 mmol scale.

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 7.24 (dt, 1 H, *J* = 15.8 Hz, 6.9 Hz), 6.17 (dt, 1 H, *J* = 15.8 Hz, 1.5 Hz), 3.21 (s, 1 H), 7.29 (qd, 2 H, *J* = 7.2 Hz, 1.5Hz), 1.61 – 1.48 (m, 2 H), 0.96 (t, 3 H, *J* = 7.2 Hz) ppm.

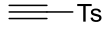
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 177.8 (C), 155.6 (CH), 131.9 (CH), 79.7 (C), 78.8 (CH), 34.6 (CH_2), 21.0 (CH_2), 13.6 (CH_3) ppm.

IR (neat): ν = 2963, 2097, 1647, 1230 cm^{-1}

ESI-HRMS: $[M+H]^+$ calc: 123.0804; found: 123.0807

R_f: 0.45 (Petroleum ether/EtOAc 90:10 *v/v*, UV, vanillin stain)

1-(ethynylsulfonyl)-4-methylbenzene (SI-a12)



$C_9H_8O_2S$
MW : 180.22 g.mol^{-1}
White solid
63% (1.25 g, 6.93 mmol)

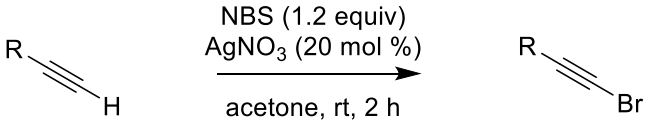
[5] Maeda, Y.; Kakiuchi, N.; Matsumura, S.; Nishimura, T.; Kawamura, T.; Uemura, S. *J. Org. Chem.* **2002**, *67*, 6718.

The reaction was performed on 11 mmol scale, following Ts precursors' method. Characterization data match those of the literature.[6]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 7.90 (d, 2 H, *J* = 8.2 Hz), 7.40 (d, 2 H, *J* = 8.2 Hz), 3.44 (s, 1 H), 2.48 (s, 3 H) ppm.

[6] Waykole, L.; Paquette, L. A. *Org. Synth*. **1989**, *67*, 149.

Experimental procedure and characterization data for bromoalkynes SI-b



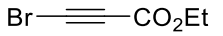
Bromoalknes were synthesized following literature procedure using $AgNO_3$ catalysis.[7]

General procedure: To a solution of the acetylenic (5 mmol, 1 equiv) in acetone (conc = 0.30 M) were added *N*-bromosuccinimide (6 mmol, 1.2 equiv) and $AgNO_3$ (0.5 mmol, 10 mol %). After 1 h at room temperature, the same quantity of $AgNO_3$ (0.5 mmol, 10 mol %) was added and the mixture was stirred at room temperature for 1 h. The resulting mixture was then filtrated and the filtrate was extracted with hexane (3 x 30 mL). The combined organic layers were washed with a 10% aqueous solution of HCl (2 x 40 mL), brine (30 mL), dried (Na_2SO_4) and concentrated under vacuum (25°C, 200 mbar) to afford the title compounds.

Note: this reaction is carried out away from light.

Detailed procedure for SI-b1: To a solution of ethyl propiolate (500 mg, 5 mmol, 1 equiv) in anhydrous acetone (17 mL, conc = 0.30 M) were added *N*-bromosuccinimide (1.09 g, 6 mmol, 1.2 equiv) and $AgNO_3$ (87 mg, 0.5 mmol, 10 mol %). After 1 h at room temperature, the same quantity of $AgNO_3$ (87 mg, 0.5 mmol, 10 mol %) was added and the mixture was stirred at room temperature for 1 h. The resulting mixture was then filtrated and the filtrate was extracted with hexane (3 x 30 mL). The combined organic layers were washed with a 10% aqueous solution of HCl (2 x 40 mL), brine (30 mL), dried (Na_2SO_4) and concentrated under vacuum (25°C, 200 mbar) to afford **SI-b1** (91%, 4.55 mmol, 805 mg).

ethyl 3-bromopropiolate (SI-b1)



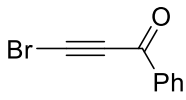
$C_5H_5BrO_2$
MW : 177.00 g.mol^{-1}
Colorless crystalline solid
91% (805 mg, 4.55 mmol)

Characterization data match those of the literature.[4]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 4.24 (q, 2 H, *J* = 7.2 Hz), 1.31 (t, 3 H, *J* = 7.2 Hz) ppm.

[7] Hofmeister, H.; Annen, K.; Laurent, H.; Wiechert, R. *Angew. Chemie Int. Ed. English* **1984**, *23*, 727–729.

3-bromo-1-phenylprop-2-yn-1-one (SI-b2)

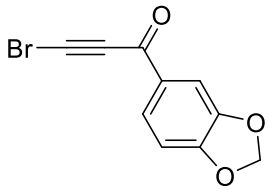


C_9H_5BrO
MW : 209.04 g.mol^{-1}
White solid
78% (815 mg, 3.9 mmol)

Characterization data match those of the literature.[8]

^{1}H NMR ($CDCl_3$, 400 MHz): δ = 8.12 (d, 2 H, *J* = 7.9 Hz), 7.63 (t, 1 H, *J* = 7.4 Hz), 7.49 (t, 2 H, *J* = 8.0 Hz) ppm.

1-(benzo[*d*][1,3]dioxol-5-yl)-3-bromoprop-2-yn-1-one (SI-b3)

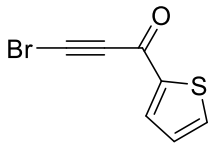


$C_{10}H_5BrO_2$
MW : 253.05 g.mol^{-1}
Light pink solid
71% (898 mg, 3.55 mmol)

Characterization data match those of the literature.[4]

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.79 (dd, 1 H, *J* = 8.2 Hz, 1.7 Hz), 7.53 (d, 1 H, *J* = 1.7 Hz), 6.89 (d, 1 H, *J* = 8.2 Hz), 6.08 (s, 2 H) ppm.

3-bromo-1-(thiophen-2-yl)prop-2-yn-1-one (SI-b4)

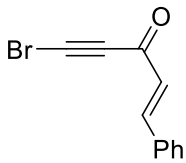


C_7H_3BrOS
MW : 215.06 g.mol^{-1}
Orange solid
88% (946 mg, 4.40 mmol)

Characterization data match those of the literature.[4]

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.94 (dd, 1 H, *J* = 3.8 Hz, 0.8 Hz), 7.74 (dd, 1 H, *J* = 4.9 Hz, 0.8 Hz), 7.17 (dd, 1 H, *J* = 4.9 Hz, 3.8 Hz) ppm.

(*E*)-5-bromo-1-phenylpent-1-en-4-yn-3-one (SI-b5)



$C_{11}H_7BrO$
MW : 235.08 g.mol^{-1}
Yellow solid
mp = 88 °C – 90 °C
97% (1.14 g, 4.85 mmol)

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.83 (d, 1 H, *J* = 16.1 Hz), 7.63 -7.57 (m, 2 H), 7.49 – 7.39 (m, 3 H), 6.79 (d, 1 H, *J* = 16.1 Hz) ppm.

[8] Poulsen, T. B.; Bernardi, L.; Alemán, J.; Overgaard, J.; Jørgensen, K. A. *J. Am. Chem. Soc.* **2007**, *129*, 441–449.

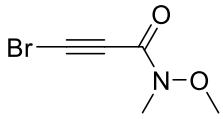
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 176.6 (C), 149.4 (CH), 133.4 (C), 131.4 (CH), 129.1 (2 CH), 128.7 (2 CH), 127.8 (CH), 78.5 (C), 57.2 (C) ppm.

ESI-HRMS: $[M+H]^+$ calc: 234.9753; found: 234.9768

IR (neat): ν = 2186, 1624, 1448, 1252, 1200 cm^{-1}

R_f: 0.73 (Petroleum ether/EtOAc 70:30 *v/v*, UV, vanillin stain)

3-bromo-*N*-methoxy-*N*-methylpropiolamide (SI-b6)

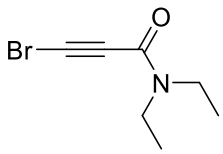


$C_5H_6BrNO_2$
MW : 190.01 $g.mol^{-1}$
Colorless oil
98% (838 mg, 4.41 mmol)

Characterization data match those of the literature.[4]

^{1}H NMR ($CDCl_3$, 400 MHz): δ = 3.78 (s, 3 H), 3.23 (br, 3 H) ppm

3-bromo-*N*,*N*-diethylpropiolamide (SI-b7)



$C_7H_{10}BrNO$
MW : 204.07 $g.mol^{-1}$
Colorless oil
85% (867 mg, 4.25 mmol)

^{1}H NMR ($CDCl_3$, 400 MHz): δ = 3.57 (q, 2 H, *J* = 7.2 Hz), 3.41 (q, 2 H, *J* = 7.2 Hz), 1.22 (t, 3 H, *J* = 7.2 Hz), 1.13 (t, 3 H, *J* = 7.2 Hz) ppm.

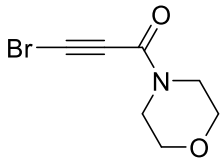
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 152.4 (C), 73.9 (C), 53.9 (C), 43.3 (CH_2), 39.2 (CH_2), 14.3 (CH_3), 12.6 (CH_3) ppm.

ESI-HRMS: $[M+H]^+$ calc: 205.0019; found: 204.0007

IR (neat): ν = 2976, 2196, 1618, 1426, 1278 cm^{-1}

R_f: 0.66 (Petroleum ether/EtOAc 60:40 *v/v*, UV, vanillin stain)

3-bromo-1-morpholinoprop-2-yn-1-one (SI-b8)



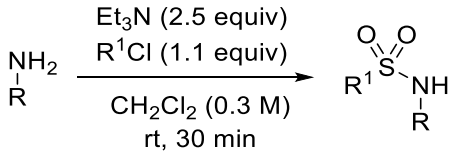
$C_7H_8BrNO_2$
MW : 218.05 $g.mol^{-1}$
Yellow solid
100% (1.10 g, 5.00 mmol)

Characterization data match those of the literature.[4]

^{1}H NMR ($CDCl_3$, 400 MHz): δ 3.67-3.61 (m, 4H), 3.59-3.53 (m, 4H) ppm.

Experimental procedure and characterization data for sulfonamides 1 and SI-c

- **Method A**

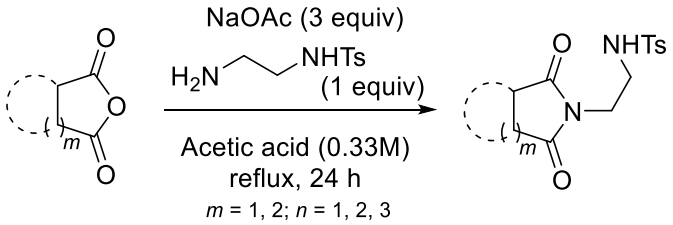


General procedure: SI-c1 (= 1), SI-c2, SI-c3, SI-c5, SI-c6, SI-c7, SI-c8 were prepared according to the literature with minors modifications. [9]

The primary amine (4.5 mmol, 1 equiv) was dissolved in CH_2Cl_2 (0.3 M), TsCl (4.95 mmol, 1.1 equiv) and Et_3N (11.25 mmol, 2.5 equiv) were added successively. After stiring at room temperature for 30 minutes, the mixture was diluted with aqueous HCl (10 wt%, 10 mL). The aqueous layer was extracted with CH_2Cl_2 (3 x 15 mL) and then once with Et_2O (5 mL). The combined organic extracts were washed with brine (40 mL), dried (Na_2SO_4), concentrated under reduce pressure (15 mbar, 25 °C) and purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford the desired product **SI-c**.

Detailed procedure for 1: The primary amine (4.5 mmol, 482 mg, 1 equiv) was dissolved in CH_2Cl_2 (0.3 M), TsCl (4.95 mmol, 940 mg, 1.1 equiv) and Et_3N (11.25 mmol, 1.56 mL, 2.5 equiv) were added successively. After stiring at room temperature for 30 minutes, the mixture was diluted with aqueous HCl (10 wt%, 10 mL). The aqueous layer was extracted with CH_2Cl_2 (3 x 15 mL) and then once with Et_2O (5 mL). The combined organic extracts were washed with brine (40 mL), dried (Na_2SO_4), concentrated under reduce pressure (15 mbar, 25 °C) and purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford the desired product **1** as a white powder (85%, 3.83 mmol, 999.94 mg).

- **Method B**

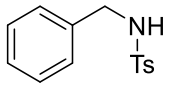


[9] Huang, W.; Shen, Q.; Wang, J.; Zhou, X. *J. Org. Chem.* **2008**, *73*, 1586.

General procedure: SI-c4 and SI-c9 were prepared according to the literature without modifications. [10]

A mixture of the mono tosylated diamine (5 mmol, 1 equiv), sodium acetate (15 mmol, 3 equiv) and appropriate anhydride (5 mmol, 1 equiv) were taken in glacial acetic acid (0.33 M) and refluxed for 24 h. The mixture was cooled to rt and evaporated to dryness under vacuum. The corresponding residue was diluted with sat. $NaHCO_3$ (20 mL) and extracted with EtOAc (3 x 25 mL). The combined organic extracts were dried (Na_2SO_4), concentrated under reduce pressure (15 mbar, 25 °C) and purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAc, CH_2Cl_2/MeOH or CH_2Cl_2/acetone as eluent to afford the desired product **SI-c4 or SI-c9**.

***N*-benzyl-4-methylbenzenesulfonamide (SI-c1 = 1)**

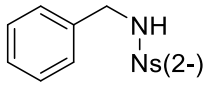


$C_{14}H_{15}NO_2S$
MW : 261.08 g.mol^{-1}
White solid
85% (999.94 mg, 3.83 mmol)

For clarity reason in the manuscript, **SI-c1** is referred to compound **1. SI-c1** was prepared according to method A. Characterization data match those of the literature.[9]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 7.76 (d, 2 H, *J* = 8.2 Hz), 7.33 – 7.24 (m, 5 H), 7.23 – 7.17 (m, 2 H), 4.62 (t, 1 H, *J* = 5.6 Hz), 4.12 (d, 2 H, *J* = 6.1 Hz), 2.44 (s, 3 H) ppm.

***N*-benzyl-2-nitrobenzenesulfonamide (SI-c2)**

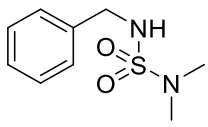


$C_{13}H_{12}N_2O_4S$
MW : 292.05 g.mol^{-1}
White solid
66% (867.39 mg, 2.97 mmol)

SI-c2 was prepared according to method A. Characterization data match those of the literature.[11]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 8.00 (dd, 1 H, *J* = 7.6 Hz, 1.6 Hz), 7.82 (dd, 1 H, *J* = 7.6 Hz, 1.6 Hz), 7.66 (dtd, 2 H, *J* = 23.1 Hz, 7.6 Hz, 1.6 Hz), 7.25 – 7.19 (m, 5 H), 5.73 (t, 1 H, *J* = 6.1 Hz), 4.32 (d, 2 H, *J* = 6.1 Hz) ppm.

***N*,*N*-dimethyl-*N*-(phenylmethyl) sulfamide (SI-c3)**



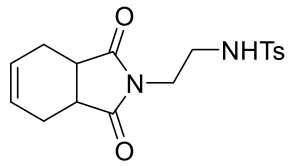
$C_9H_{14}N_2O_2S$
MW : 214.08 g.mol^{-1}
White solid
94% (905.6 mg, 4.23 mmol)

[10] Maity, A. K.; Roy, S. *Adv. Synth. Catal*. **2014**, *356*, 2627.
[11] Baslé, E.; Jean, M.; Gouault, N.; Renault, J.; Uriac, P. *Tetrahedron Lett.* **2007**, *48*, 8138.

SI-c3 was prepared according to method A. Characterization data match those of the literature.[12]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 7.39 – 7.28 (m, 5 H), 4.52 (t, 1 H, *J* = 5.6 Hz), 4.22 (d, 2 H, *J* = 6.1 Hz), 2.77 (s, 6 H) ppm.

<u>*N*-(2-(1,3-dioxo-1,3,3a,4,7,7a-hexahydro-2*H*-isoindol-2-yl)ethyl)-4-methylbenzene sulfonamide (SI-c4)</u>

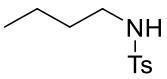


$C_{17}H_{20}N_2O_4S$
MW : 348.42 g.mol^{-1}
White solid
80% (1.39 g, 3.99 mmol)

SI-c4 was prepared according to method B. The product was obtained by column chromatography on silica gel using a step gradient of acetone in CH_2Cl_2 (0 to 5%). Characterization data match those of the literature.[13]

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.69 (d, 2 H, *J* = 8.1 Hz), 7.28 (d, 2 H, *J* = 8.1 Hz), 5.86 (t, 2 H, *J* = 3.0 Hz), 5.33 (t, 1 H, *J* = 6.3 Hz, NH), 3.57 (dt, 2 H, *J* = 5.8 Hz, 3.0 Hz), 3.13 – 3.05 (m, 4 H), 2.58 – 2.50 (m, 2 H), 2.40 (s, 3 H), 2.25 – 2.17 (m, 2 H) ppm.

<u>*N*-butyl-4-methylbenzenesulfonamide (SI-c5)</u>

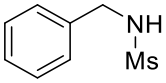


$C_{11}H_{17}NO_2S$
MW : 227.32 g.mol^{-1}
White solid
93% (952.5 mg, 4.19 mmol)

SI-c5 was prepared according to method A. Characterization data match those of the literature.[14]

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.75 (d, 2 H, *J* = 8.2 Hz), 7.31 (d, 2 H, *J* = 8.2 Hz), 4.27 (t, 1 H, *J* = 6.1 Hz), 2.94 (q, 2 H, *J* = 6.7 Hz), 2.43 (s, 3 H), 1.50 – 1.38 (m, 2 H), 1.36 – 1.22 (m, 2 H), 0.85 (t, 3 H, *J* = 7.3 Hz) ppm.

<u>*N*-benzylmethanesulfonamide (SI-c6)</u>



$C_8H_{11}NO_2S$
MW : 185.05 g.mol^{-1}
White solid
100% (832.7 mg, 4.50 mmol)

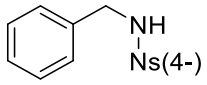
SI-c6 was prepared according to method A. Characterization data match those of the literature.[15]

[12] Unterhalt, B.; Seebach, E. *Arch. Pharm.* **1980**, *314*, 51.

[13] Andna, L.; Miesch, L. *Org. Lett.* **2018**, *20*, 3430.
[14] Das, B.; Reddy, P. R.; Sudhakar, C.; Lingaiah, M. *Tetrahedron Lett.* **2011**, *52*, 3521.

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 7.38 – 7.29 (m, 5 H), 5.00 (t, 1 H, *J* = 5.4 Hz), 4.30 (d, 2 H, *J* = 6.2 Hz), 2.83 (s, 3 H) ppm.

***N*-benzyl-4-nitrobenzenesulfonamide (SI-c7)**

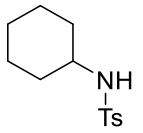


$C_{13}H_{12}N_2O_4S$
MW : 292.05 g.mol^{-1}
White solid
97% (1.28 g, 4.38 mmol)

SI-c7 was prepared according to method A. Characterization data match those of the literature.[15]

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 8.29 (d, 2 H, *J* = 8.8 Hz), 7.97 (d, 2 H, *J* = 8.8 Hz), 7.26 – 7.22 (m, 3 H), 7.17 – 7.14 (m, 2 H), 5.03 (t, 1 H, *J* = 5.4 Hz), 4.21 (d, 2 H, *J* = 5.4 Hz) ppm.

***N*-cyclohexyl-4-methylbenzenesulfonamide (SI-c8)**

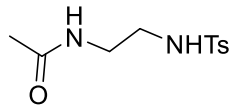


$C_{13}H_{19}NO_2S$
MW : 253.36 g.mol^{-1}
White solid
100% (1.14 g, 4.5 mmol)

SI-c8 was prepared according to method A. Characterization data match those of the literature.[16]

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.76 (d, 2 H, *J* = 8.2 Hz), 7.29 (d, 2 H, *J* = 8.2 Hz), 4.54 (d, 1 H, *J* = 7.7 Hz), 3.19 – 3.05 (m, 1 H), 2.41 (s, 3 H), 1.78 – 1.70 (m, 2 H), 1.68 – 1.57 (m, 2 H), 1.55 – 1.45 (m, 1 H), 1.29 – 1.06 (m, 5 H) ppm.

***N*-(2-((4-methylphenyl)sulfonamido)ethyl)acetamide (SI-c9)**



$C_{11}H_{16}N_2O_3S$
MW : 256.32 g.mol^{-1}
White solid
87% (1.11 g, 4.35 mmol)

SI-c9 was prepared according to method B starting from glutaric anhydride. The product was obtained by column chromatography on silica gel using a step gradient of acetone in CH_2Cl_2 (0 to 5%). Characterization data match those of the literature.[17]

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.72 (d, 2 H, *J* = 8.2 Hz), 7.29 (d, 2 H, *J* = 8.2 Hz), 6.56 (t, 1 H, *J* = 5.3 Hz, NH), 5.93 (t, 1 H, *J* = 5.7 Hz, NH), 3.34 (q, 2 H, *J* = 5.7 Hz), 3.04 (q, 2 H, *J* = 5.3 Hz), 2.41 (s, 3 H), 1.93 (s, 3 H) ppm.

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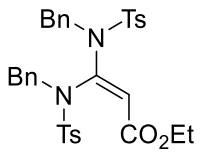
[15] Hamid, M. H. S. A.; Allen, C. L.; Lamb, G. W.; Maxwell, A. C.; Maytum, H C.; Watson, A. J. A.; Williams, J. M. J. *J. Am. Chem. Soc.* **2009**, *131*, 1766.
[16] Shaabani, A.; Soleimani, E.; Rezayan, A. H. *Tetrahedron Lett.* **2007**, *48*, 2185.
[17] Liu, Q.; Liu, Z.; Zhou, Y.-L.; Zhang, W.; Yang, L.; Liu, Z.-L.; Yu, W. *Synlett* **2005**, *16*, 2510.

Characterization data for Michael double addition product 3

3 was obtained with some bases when screening was done.

ethyl 3,3-bis((*N*-benzyl-4-methylphenyl)sulfonamido)acrylate (3)



$C_{33}H_{34}N_2O_6S_2$
MW : 618.76 g.mol^{-1}
Colorless oil

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.51 (d, 2 H, *J* = 8.2 Hz), 7.543 (d, 2 H, *J* = 8.2 Hz), 7.29 – 7.24 (m, 4 H), 7.16 – 7.09 (m, 10 H), 6.84 (d, 2 H, *J* = 8.2 Hz), 5.76 (s, 1 H), 4.63 – 4.54 (m, 2 H), 3.98 (q, 2 H, *J* = 7.1 Hz), 2.38 (s, 3 H), 2.36 (s, 3 H), 1.18 (t, 3 H, *J* = 7.1 Hz) ppm.

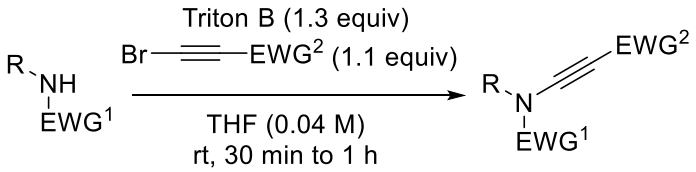
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 163.9 (C), 144.2 (C), 144.1 (C), 144.0 (C), 136.8 (C), 135.9 (C), 135.8 (C), 135.1 (C), 129.4 (2 CH), 129.3 (2 CH), 129.1 (2 CH), 128.8 (2 CH), 128.2 (2 CH), 128.1 (4 CH), 127.9 (CH), 127.6 (2 CH), 127.1 (CH), 108.5 (CH), 60.2 (CH_2), 53.2 (CH_2), 50.7 (CH_2), 21.5 (CH_3), 21.5 (CH_3), 14.1 (CH_3) ppm.

IR (neat): ν = 2925, 1715, 1597, 13757, 1161, 1085 cm^{-1}

ESI-HRMS: $[M+Na]^+$ calc: 641.1750; found: 641.1753

R_f: 0.38 (Petroleum ether/EtOAc 80:20 *v/v*, UV, ninhydrin stain)

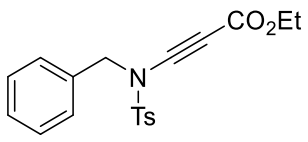
Experimental procedure and characterization data for ynesulfonamides 2, 4 - 14



General procedure: The secondary amine **SI-c** (0.8 mmol, 1 equiv) was dissolved in THF (0.04 M). The bromoalkyne **SI-b** (0.88 mmol, 1.1 equiv), followed by Triton B 40%wt in water (1.04 mmol, 1.3 equiv) were added at room temperature. Reaction was monitored by TLC and once judge completed by the full consumption of the starting material, the mixture was diluted with sat. NH_4Cl (10 mL). The aqueous layer was extracted with Et_2O (3 x 15 mL). The combined organic extracts were dried (Na_2SO_4), concentrated under reduce pressure (15 mbar, 25 °C) and purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford the desired product.

Detailed procedure for 11 on 8 mmol scale: The secondary amine **SI-c1** (8 mmol, 2.1 g, 1 equiv) was dissolved in THF (0.04 M). The bromoalkyne **SI-b5** (8.8 mmol, 2.07 g, 1.1 equiv), followed by Triton B 40%wt in water (10.4 mmol, 4.70 mL, 1.3 equiv) were added at room temperature. Reaction was monitored by TLC and once judge completed by the full consumption of the starting material, the mixture was diluted with sat. NH_4Cl (100 mL). The aqueous layer was extracted with Et_2O (3 x 50 mL). The combined organic extracts were dried (Na_2SO_4), concentrated under reduce pressure (15 mbar, 25 °C) and purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford **2** as a yellow oil (100%, 8.0 mmol, .3.33 g).

ethyl 3-((*N*-benzyl-4-methylphenyl)sulfonamido)propiolate (2)



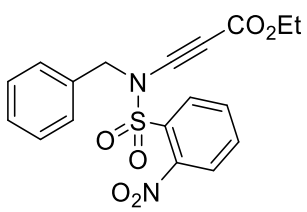
$C_{19}H_{19}NO_4S$
MW : 357.42 g.mol^{-1}
Yellow oil
90% (3.45 g, 9.64 mmol)

2 was prepared starting from **SI-c1** and **SI-b1**, starting from 10.71 mmol of **SI-c1**. Characterization data match those of the literature.[18]

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.65 (d, 2 H, *J* = 8.2 Hz), 7.28 – 7.20 (m, 7 H), 4.57 (s, 2 H), 4.14 (q, 2 H, *J* = 7.2 Hz), 2.9 (s, 3 H), 1.23 (t, 3 H, *J* = 7.2 Hz), ppm.

[18] Villeneuve, K.; Riddell, N.; Tam, W. *Tetrahedron* **2006**, *62*, 3823.

ethyl 3-((*N*-benzyl-2-nitrophenyl)sulfonamido)propiolate (4)



$C_{18}H_{16}N_2O_6S$
MW : 388.39 g.mol^{-1}
Orange solid
mp = 71 °C – 73 °C
69% (213.6 mg, 0.55 mmol)

4 was prepared starting from **SI-c2** and **SI-b1**.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.21 (dd, 1 H, *J* = 7.8 Hz, 1.3 Hz), 7.86 – 7.65 (m, 3 H), 7.43 – 7.34 (m, 5 H), 4.85 (s, 2 H), 4.15 (q, 2 H, *J* = 7.1 Hz), 1.25 (t, 3 H, *J* = 7.1 Hz), ppm.

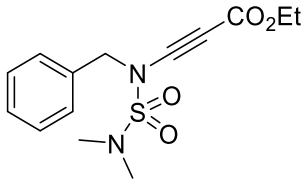
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 153.6 (C), 147.7 (C), 135.3 (CH), 133.6 (C), 132.8 (CH), 132.2 (CH), 130.1 (C), 128.8 (3 CH), 128.7 (2 CH), 124.1 (CH), 80.7 (C), 69.1 (C), 61.6 (CH_2), 56.2 (CH_2), 14.0 (CH_3) ppm.

IR (neat): ν = 2221, 1703, 1544, 1377, 1176, 1150 cm^{-1}

ESI-HRMS: $[M+Na]^+$ calc: 411.0621; found: 411.0633

R_f: 0.57 (Petroleum ether/EtOAc 70:30 *v/v*, UV, ninhydrin stain)

ethyl 3-(benzyl(*N*,*N*-dimethylsulfamoyl)amino)propiolate (5)



$C_{14}H_{18}N_2O_4S$
MW : 310.37 g.mol^{-1}
Yellow oil
51% (127.3 mg, 0.41 mmol)

5 was prepared starting from **SI-c3** and **SI-b1**. 27% of the starting sulfonamide **SI-c3** was recovered.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.45 – 7.34 (m, 5 H), 4.64 (s, 2 H), 4.19 (q, 2 H, *J* = 7.2 Hz), 2.92 (s, 6 H), 1.27 (t, 3 H, *J* = 7.2 Hz), ppm.

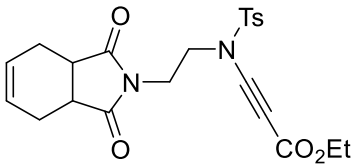
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 154.2 (C), 134.6 (C), 128.7 (2 CH), 128.7 (3 CH), 83.9 (C), 68.4 (C), 61.4 (CH_2), 556.6 (CH_2), 38.7 (2 CH_3), 14.1 (CH_3) ppm.

IR (neat): ν = 2210, 1699, 1376, 1163, 1147 cm^{-1}

ESI-HRMS: $[M+Na]^+$ calc: 333.0879; found: 333.0888

R_f: 0.45 (Petroleum ether/EtOAc 80:20 *v/v*, UV, vanillin stain)

ethyl 3-((*N*-(2-(1,3-dioxo-1,3,3a,4,7,7a-hexahydro-2*H*-isoindol-2-yl)ethyl)-4-methylphenyl)sulfonamido)propiolate (6)

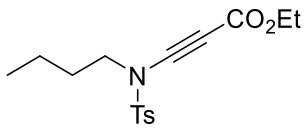


$C_{22}H_{24}N_2O_6S$
MW : 444.50 g.mol^{-1}
Orange oil
93% (328.9 mg, 0.74 mmol)

6 was prepared starting from **SI-c4** and **SI-b1**. Characterization data match those of the literature.[13]

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.78 (d, 2 H, *J* = 8.3 Hz), 7.37 (d, 2 H, *J* = 8.3 Hz), 5.88 (dd, 2 H, *J* = 4.2 Hz, 2.3 Hz), 4.20 (q, 2 H, *J* = 7.2 Hz), 3.74 (dd, 2 H, *J* = 6.5 Hz, 4.7 Hz), 3.61 (dd, 2 H, *J* = 6.5 Hz, 4.7 Hz), 3.15 (dd, 2 H, *J* = 5.3 Hz, 2.3 Hz), 2.62 – 2.52 (m, 2 H), 2.45 (s, 3 H), 2.28 – 2.20 (m, 2 H), 1.29 (t, 3 H, *J* = 7.2 Hz), ppm.

ethyl 3-((*N*-butyl-4-methylphenyl)sulfonamido)propiolate (7)



$C_{16}H_{21}NO_4S$
MW : 323.41 g.mol^{-1}
Colorless oil
50% (129.4 mg, 0.40 mmol)

7 was prepared starting from **SI-c5** and **SI-b1**.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.81 (d , 2 H, *J* = 8.2 Hz), 7.37 (d, 2 H, *J* = 8.2 Hz), 4.22 (q, 2 H, *J* = 7.2 Hz), 3.41 (t, 2 H, *J* = 7.4 Hz), 2.46 (s, 3 H), 1.68 – 1.59 (m, 2 H), 1.35 – 1.26 (m, 5 H) , 0.90 (t, 3 H, *J* = 7.4 Hz) ppm.

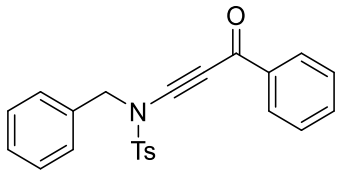
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 154.1 (C), 145.3 (C), 134.2 (C), 130.0 (2 CH), 127.7 (2 CH), 82.5 (C), 67.6 (C), 61.5 (CH_2), 51.1 (CH_2), 29.9 (CH_2), 21.6 (CH_3), 19.3 (CH_2), 14.1 (CH_3), 13.4 (CH_3) ppm.

IR (neat): ν = 2873, 2216, 1704, 1365, 1168 cm^{-1}

ESI-HRMS: $[M+Na]^+$ calc: 346.1083; found: 346.1088

R_f: 0.52 (Petroleum ether/EtOAc 80:20 *v/v*, UV, vanillin stain)

***N*-benzyl-4-methyl-*N*-(3-oxo-3-phenylprop-1-yn-1-yl)benzenesulfonamide (8)**



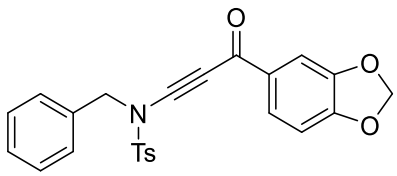
$C_{23}H_{19}NO_3S$
MW : 389.47 g.mol^{-1}
Yellow solid
100% (311.6 mg, 0.80 mmol)

8 was prepared starting from **SI-c1** and **SI-b2**. Characterization

data match those of the literature. [19]

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.91 (d, 2 H, *J* = 8.2 Hz), 7.45 – 7.41 (m, 3 H), 7.35 – 7.32 (m, 3 H); 7.29 (d, 2 H, *J* = 8.2 Hz), 7.25 – 7.21 (m, 2 H), 7.20 – 7.16 (m, 2 H), 5.05 (s, 2 H), 2.41 (s, 3 H) ppm.

<u>*N*-(3-(benzo[d][1,3]dioxol-5-yl)-3-oxoprop-1-yn-1-yl)-*N*-benzyl-4-methylbenzenesulfonamide (9)</u>



$C_{24}H_{19}NO_5S$
MW : 433.48 g.mol^{-1}
Yellow solid
mp = 125 °C – 127 °C
90% (312.1 mg, 0.72 mmol)

9 was prepared starting from **SI-c1** and **SI-b3**.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.76 (d, 2 H, *J* = 8.2 Hz), 7.48 (dd, 1 H, *J* = 8.2 Hz, 1.3 Hz), 7.38 (d, 1 H, *J* = 1.3 Hz), 7.36 – 7.29 (m, 7 H), 6.79 (d, 1 H, *J* = 8.2 Hz), 6.04 (s, 2 H), 4.66 (s, 2 H), 2.43 (s, 3 H) ppm.

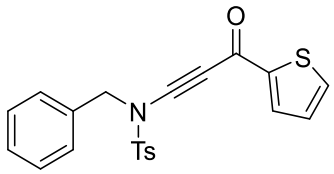
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 175.2 (C), 152.5 (C), 148.2 (C), 145.8 (C), 134.4 (C), 133.5 (C), 132.0 (C), 130.3 (2 CH), 129.1 (2 CH), 129.0 (3 CH), 127.9 (2 CH), 126.5 (CH), 108.1 (2 CH), 102.1 (CH_2), 89.6 (C), 76.5 (C), 55.6 (CH_2), 21.9 (CH_3) ppm.

IR (neat): ν = 2215, 1628, 1598, 1144, 1256, 1143 cm^{-1}

ESI-HRMS: $[M+H]^+$ calc: 434.1057; found: 434.1082

R_f: 0.44 (Petroleum ether/EtOAc 70:30 *v/v*, UV, vanillin stain)

<u>*N*-benzyl-4-methyl-*N*-(3-oxo-3-(thiophen-2-yl)prop-1-yn-1-yl)benzenesulfonamide (10)</u>



$C_{21}H_{17}NO_3S_2$
MW: 395.49 g.mol^{-1}
Orange solid
mp = 86 °C – 88 °C
92% (292.6 mg, 0.74 mmol)

10 was prepared starting from **SI-c1** and **SI-b4**.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.76 (d, 2 H, *J* = 8.3 Hz), 7.64 (ddd, 2 H, *J* = 13.6 Hz, 4.5 Hz, 1.3 Hz), 7.34 – 7.28 (m, 7 H), 7.09 (dd, 1 H, *J* = 4.8 Hz, 4.0 Hz), 4.66 (s, 2 H), 2.43 (s, 3 H) ppm.

^{13}C NMR ($CDCl_3$, 125 MHz): δ = 168.7 (C), 145.6 (C), 144.6 (C), 134.4 (CH), 134.2 (C), 134.0 (CH), 133.2 (C), 130.0 (2 CH), 128.8 (2 CH), 128.7 (3 CH), 128.2 (CH), 127.7 (2 CH), 88.9 (C), 75.4 (C), 55.5 (CH_2), 21.6 (CH_3) ppm.

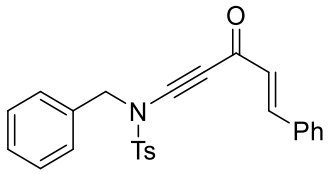
[19] Al-Rashid, Z. F.; Johnson, W. L.; Hsung, R. P.; Wei, Y.; Yao, P.-Y.; Liu, R.; Zhao, K. *J. Org. Chem.* **2008**, *73*, 8780.

IR (neat): ν = 2180, 1616, 1413, 1180 cm^{-1}

ESI-HRMS: $[M+H]^+$ calc: 396.0723; found: 396.0749

R_f: 0.51 (Petroleum ether/EtOAc 70:30 *v/v*, UV, vanillin stain)

(*E*)-*N*-benzyl-4-methyl-*N*-(3-oxo-5-phenylpent-4-en-1-yn-1-yl)benzenesulfonamide (11)



$C_{25}H_{21}NO_3S$
MW : 415.51 $g.mol^{-1}$
Yellow oil
100% (3.33 g, 8.0 mmol)

11 was prepared starting from **SI-c1** and **SI-b5,** starting from 8 mmol of **SI-c1**.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.76 (d, 2 H, *J* = 8.2 Hz), 7.73 (d, 1 H, *J* = 16.3 Hz), 7.58 – 7.52 (m, 2 H), 7.44 – 7.39 (m, 3 H), 7.36 – 7.27 (m, 7 H), 6.67 (d, 1 H, *J* = 16.3 Hz), 4.65 (s, 2 H), 2.43 (s, 3 H) ppm.

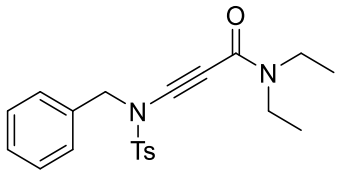
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 177.2 (C), 147.6 (CH), 145.5 (C), 134.3 (C), 134.2 (C), 133.4 (C), 130.8 (CH), 130.1 (2 CH), 128.9 (2 CH), 128.8 (2 CH), 128.7 (CH), 128.7 (2 CH), 128.5 (2 CH), 128.2 (CH), 127.6 (2 CH), 89.0 (C), 75.5 (C), 55.3 (CH_2), 21.6 (CH_3) ppm.

IR (neat): ν = 2923, 2192, 1596, 1328, 1156 cm^{-1}

ESI-HRMS: $[M+Na]^+$ calc: 438.1134; found: 438.1128

R_f: 0.60 (Petroleum ether/EtOAc 70:30 *v/v*, UV, ninhydrin stain)

3-((*N*-benzyl-4-methylphenyl)sulfonamido)-*N*,*N*-diethylpropiolamide (12)



$C_{21}H_{24}N_2O_3S$
MW : 384.50 $g.mol^{-1}$
Yellow oil
57% (176.9 mg, 0.46 mmol)

12 was prepared starting from **SI-c1** and **SI-b7**. 31% of the sulfonamide **SI-c1** was recovered.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.68 (d, 2 H, *J* = 8.3 Hz), 7.29 – 7.24 (m, 7 H), 4.55 (s, 2 H), 3.32 (qd, 4 H, *J* = 7.4 Hz, 6.7 Hz), 2.40 (s, 3 H), 1.05 (td, 6 H, *J* = 7.4 Hz, 4.0 Hz), ppm.

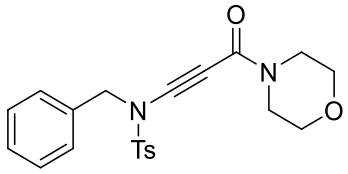
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 153.7 (C), 145.2 (C), 134.5 (C), 133.7 (C), 129.9 (2 CH), 128.6 (4 CH), 128.5 (CH), 127.5 (2 CH), 84.0 (C), 68.1 (C), 55.2 (CH_2), 42.9 (CH_2), 38.8 (CH_2), 21.6 (CH_3), 14.2 (CH_3), 12.8 (CH_3) ppm.

IR (neat): ν = 2216, 1618, 1365, 1168 cm^{-1}

ESI-HRMS: $[M+H]^+$ calc: 385.1580; found: 385.1584

R_f: 0.53 (Petroleum ether/EtOAc 60:40 *v/v*, UV, vanillin stain)

_N_-benzyl-4-methyl-_N_-(3-morpholino-3-oxoprop-1-yn-1-yl)benzenesulfonamide (13)



$C_{21}H_{22}N_2O_4S$
MW : 398.48 g.mol^{-1}
Colorless oil
54% (171.3 mg, 0.43 mmol)

13 was prepared starting from **SI-c1** and **SI-b8**.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.73 (d, 2 H, *J* = 8.3 Hz), 7.36 – 7.23 (m, 7 H), 4.57 (s, 2 H), 3.66 – 3.48 (m, 6 H), 3.35 (dd, 2 H, *J* = 5.4 Hz, 4.5 Hz), 2.45 (s, 3 H) ppm.

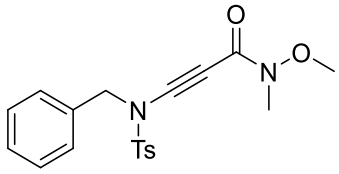
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 153.1 (C), 145.6 (C), 134.3 (C), 133.6 (C), 130.1 (2 CH), 129.9 (2 CH), 128.8 (2 CH), 128.7 (CH), 127.7 (2 CH), 86.1 (C), 67.8 (C), 66.8 (CH_2), 68.4 (CH_2), 55.1 (CH_2), 46.6 (CH_2), 41.6 (CH_2), 21.7 (CH_3) ppm.

IR (neat): ν = 2215, 1620, 1368, 1168, 1112 cm^{-1}

ESI-HRMS: $[M+Na]^+$ calc: 421.1192; found: 421.1190

R_f: 0.46 (Petroleum ether/EtOAc 50:50 *v/v*, UV, vanillin stain)

3-((_N_-benzyl-4-methylphenyl)sulfonamido)-_N_-methoxy-_N_-methylpropiolamide (14)



$C_{19}H_{20}N_2O_4S$
MW : 372.44 g.mol^{-1}
White solid
mp = 102 °C – 104 °C
76% (227.2 mg, 0.61 mmol)

14 was prepared starting from **SI-c1** and **SI-b6**.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.73 (d, 2 H, *J* = 8.2 Hz), 7.32 – 7.27 (m, 7 H), 4.61 (s, 2 H), 3.67 (s, 3 H), 3.18 (s, 3 H), 2.44 (s, 3 H) ppm.

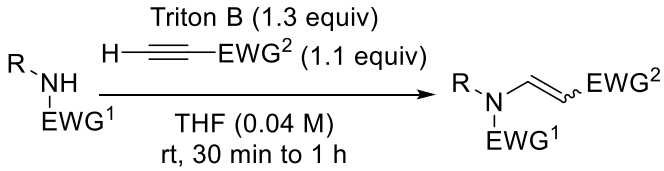
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 154.9 (C), 145.2 (C), 134.4 (C), 133.7 (C), 129.8 (2 CH), 128.6 (4 CH), 128.5 (CH), 127.6 (2 CH), 86.1 (C), 77.1 (C), 62.0 (CH_3), 55.4 (CH_2), 32.3 (CH_3), 21.5 (CH_3) ppm.

IR (neat): ν = 2218, 1638, 1370, 1171 cm^{-1}

ESI-HRMS: $[M+H]^+$ calc: 373.1217; found: 373.1236

R_f: 0.55 (Petroleum ether/EtOAc 50:50 *v/v*, UV, vanillin stain)

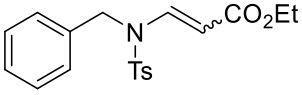
Experimental procedure and characterization data for enesulfonamides 15/15' - 29/29'



General procedure: The secondary amine **SI-c** (0.8 mmol, 1 equiv) was dissolved in THF (0.04 M). The alkyne **SI-a** (0.88 mmol, 1.1 equiv), followed by Triton B 40%wt in water (1.04 mmol, 1.3 equiv) were added at room temperature. Reaction was monitored by TLC and once judge completed by the full consumption of the starting material, the mixture was diluted with sat. NH_4Cl (10 mL). The aqueous layer was extracted with Et_2O (3 x 15 mL). The combined organic extracts were dried (Na_2SO_4), concentrated under reduce pressure (15 mbar, 25 °C) and purified, if needed, by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford the desired product.

Detailed procedure for 25 on larger scale: The secondary amine **SI-c1** (8.42 mmol, 2.2 g, 1 equiv) was dissolved in THF (0.04 M). The alkyne **SI-a10** (9.26 mmol, 1.11 g, 1.1 equiv), followed by Triton B 40%wt in water (10.94 mmol, 4.95 mL, 1.3 equiv) were added at room temperature. Reaction was monitored by TLC and once judge completed by the full consumption of the starting material, the mixture was diluted with sat. NH_4Cl (100 mL). The aqueous layer was extracted with Et_2O (3 x 50 mL). The combined organic extracts were dried (Na_2SO_4), concentrated under reduce pressure (15 mbar, 25 °C) and purified, if needed, by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford the desired product **25** as a yellow solid (100%, 8.42 mmol, 3.21 g)

ethyl 3-((*N*-benzyl-4-methylphenyl)sulfonamido)acrylate (15/15')

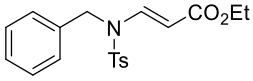


$C_{19}H_{21}NO_4S$
MW : 359.44 g.mol^{-1}
Yellow oil
100% (3.58 g, 9.95 mmol)
15/15' 73/27

15/15' were prepared starting from **SI-c1** and commercially available ethyl propiolate, starting from 9.95 mmol of **SI-c1**.

ESI-HRMS: $[M+K]^+$ calc: 398.0823; found: 398.0838

Full characterization of E isomer 15



Yellow oil

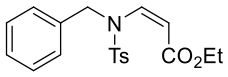
^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.16 (d, 1 H, J = 14.0 Hz), 7.71 (d, 2 H, *J* = 8.4 Hz), 7.35 – 7.27 (m, 5 H), 7.21 (dd, 2 H, J = 6.9 Hz, 2.0 Hz), 4.96 (d, 1 H, J = 14.0 Hz), 4.59 (s, 2 H), 4.12 (q, 2 H, *J* = 7.2 Hz), 2.44 (s, 3 H), 1.23 (t, 3 H, *J* = 7.2 Hz), ppm.

^{13}C NMR ($CDCl_3$, 125 MHz): δ = 166.8 (C), 144.8 (C), 141.5 (CH), 135.2 (C), 133.8 (C), 130.1 (2 CH), 128.7 (2 CH), 127.7 (CH), 127.1 (2 CH), 126.6 (2 CH), 99.7 (CH), 60.1 (CH_2), 49.7 (CH_2), 21.6 (CH_3), 14.2 (CH_3) ppm.

IR (neat): ν = 2980, 1707, 1624, 1355, 1154 cm^{-1}

R_f: 0.42 (Petroleum ether/EtOAc 80:20 *v/v*, UV, vanillin stain)

Full characterization of Z isomer 15'



Colorless oil

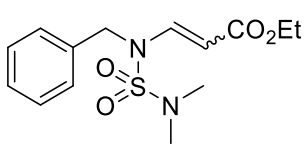
^{1}H NMR ($CDCl_3$, 300 MHz): δ = 7.70 (d, 2 H, *J* = 8.2 Hz), 7.31 (d, 2 H, *J* = 8.2 Hz), 7.25 – 7.18 (m, 3 H), 7.13 (dd, 2 H, *J* = 6.8 Hz, 1.5 Hz), 6.93 (d, 1 H, *J* = 10.4 Hz), 5.16 (s, 2 H), 5.03 (d, 1 H, *J* = 10.4 Hz), 3.97 (q, 2 H, *J* = 7.2 Hz), 2.43 (s, 3 H), 1.12 (t, 3 H, *J* = 7.2 Hz) ppm.

^{13}C NMR ($CDCl_3$, 125 MHz): δ = 164.8 (C), 144.4 (C), 136.0 (C), 135.4 (CH), 135.2 (C), 129.9 (2 CH), 128.2 (2 CH), 127.5 (2 CH), 127.3 (CH), 127.0 (2 CH), 101.8 (CH), 60.1 (CH_2), 50.6 (CH_2), 21.6 (CH_3), 14.0 (CH_3) ppm.

IR (neat): ν = 2979, 1705, 1629, 1161, 1045 cm^{-1}

R_f: 0.46 (Petroleum ether/EtOAc 80:20 *v/v*, UV, vanillin stain)

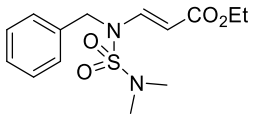
ethyl 3-(benzyl(*N*,*N*-dimethylsulfamoyl)amino)acrylate (16/16')



$C_{14}H_{20}N_2O_4S$
MW : 312.38 $g.mol^{-1}$
88% (218.7 mg, 0.70 mmol)
16/16' 70/30

16/16' were prepared starting from **SI-c3** and commercially available ethyl propiolate.

Full characterization of E isomer 16



White solid
mp = 78 - 79 °C

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.00 (d, 1 H, *J* = 14.1 Hz), 7.33 – 7.29 (m, 2 H), 7.27 – 7.21 (m, 3 H), 4.97 (d, 1 H, *J* = 14.1 Hz), 4.71 (s, 2 H), 4.09 (q, 2 H, *J* = 7.2 Hz), 2.78 (s, 6 H), 1.20 (t, 3 H, *J* = 7.2 Hz) ppm.

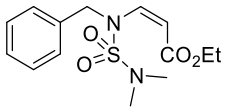
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 167.3 (C), 143.2 (CH), 134.7 (C), 129.0 (2 CH), 128.0 (CH), 126.8 (2 CH), 97.7 (CH), 60.3 (CH_2), 50.6 (CH_2), 38.2 (2 CH_3), 14.5 (CH_3) ppm.

IR (neat): ν = 1704, 1622, 1372, 1148 cm^{-1}

ESI-HRMS: $[M+Na]^+$ calc: 335.1036; found: 335.1024

R_f: 0.45 (Petroleum ether/EtOAc 70:30 *v/v*, UV, vanillin stain)

Full characterization of Z isomer 16'



Colorless oil

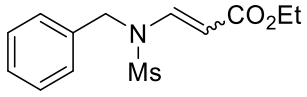
^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.30 – 7.18 (m, 5 H), 6.81 (d, 1 H, *J* = 10.1 Hz), 5.20 (s, 2 H), 4.99 (d, 1 H, *J* = 10.1 Hz), 4.08 (q, 2 H, *J* = 7.2 Hz), 2.85 (s, 6 H), 1.20 (t, 3 H, *J* = 7.2 Hz) ppm.

^{13}C NMR ($CDCl_3$, 125 MHz): δ = 165.3 (C), 137.9 (CH), 135.8 (C), 128.5 (2 CH), 128.0 (2 CH), 127.7 (CH), 101.4 (CH), 60.3 (CH_2), 52.0 (CH_2), 38.4 (2 CH_3), 14.4 (CH_3) ppm.

IR (neat): ν = 1707, 1626, 1362, 1150 cm^{-1}

R_f: 0.68 (Petroleum ether/EtOAc 70:30 *v/v*, UV, vanillin stain)

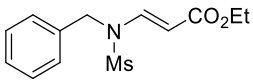
<u>ethyl 3-(*N*-benzylmethylsulfonamido)acrylate (17/17')</u>



$C_{13}H_{17}NO_4S$
MW : 283.34 $g.mol^{-1}$
100% (226.7 mg, 0.80 mmol)
17/17' 72/28

17/17' were prepared starting from **SI-c6** and commercially available ethyl propiolate.

Full characterization of E isomer 17



White solid
mp = 103 – 105 °C

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.00 (d, 1 H, *J* = 14.0 Hz), 7.39 – 7.34 (m, 2 H), 7.33 – 7.28 (m, 3 H), 5.16 (d, 1 H, *J* = 14.0 Hz), 4.79 (s, 2 H), 4.15 (q, 2 H, *J* = 7.2 Hz), 2.97 (s, 3 H), 1.25 (t, 3 H, *J* = 7.2 Hz) ppm.

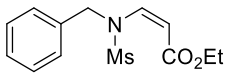
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 166.9 (C), 141.5 (CH), 134.2 (C), 129.2 (2 CH), 128.3 (CH), 127.1 (2 CH), 100.0 (CH), 60.5 (CH_2), 49.9 (CH_2), 41.2 (CH_3), 14.5 (CH_3) ppm.

IR (neat): ν = 1702, 1624, 1357, 1148 cm^{-1}

ESI-HRMS: $[M+Na]^+$ calc: 306.0770; found: 306.0782

R_f: 0.51 (Petroleum ether/EtOAc 60:40 *v/v*, UV, vanillin stain)

Characteristic signal for Z isomer 17'



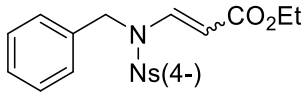
Colorless oil

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 6.77 (d, 1 H, *J* = 10.4 Hz), 5.26 (s, 2 H), 5.14 (d, 1 H, *J* = 10.4 Hz), 4.08 (q, 2 H, *J* = 7.2 Hz), 2.95 (s, 3 H), 1.20 (t, 3 H, *J* = 7.2 Hz) ppm.

^{13}C NMR ($CDCl_3$, 125 MHz): δ = 165.2 (C), 136.1 (CH), 135.7 (C), 128.7 (CH), 128.0 (CH), 127.9 (CH), 103.2 (CH), 60.5 (CH_2), 51.2 (CH_2), 41.4 (CH_3), 14.3 (CH_3) ppm.

R_f: 0.67 (Petroleum ether/EtOAc 60:40 *v/v*, UV, vanillin stain)

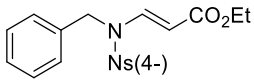
ethyl 3-((*N*-benzyl-4-nitrophenyl)sulfonamido)acrylate (18/18')



$C_{18}H_{18}N_2O_2S$
MW : 390.41 g.mol^{-1}
91% (284.99 mg, 0.73 mmol)
18/**18'**: 75/25

18/18' were prepared starting from **SI-c7** and commercially available ethyl propiolate.

Full characterization of E isomer 18



Yellow solid
mp = 109 – 111 °C

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.33 (d, 2 H, *J* = 8.8 Hz), 8.12 (d, 1 H, *J* = 14.0 Hz), 7.96 (d, 2 H, *J* = 8.8 Hz), 7.31 – 7.26 (m, 3 H), 7.20 – 7.16 (m, 2 H), 5.13 (d, 1 H, *J* = 14.0 Hz), 4.69 (s, 2 H), 4.14 (q, 2 H, *J* = 7.2 Hz), 1.25 (t, 3 H, *J* = 7.2 Hz), ppm.

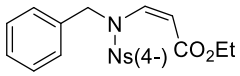
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 166.6 (C), 150.6 (C), 144.0 (C), 140.8 (CH), 133.3 (C), 129.1 (2 CH), 128.6 (2 CH), 128.4 (CH), 127.0 (2 CH), 124.9 (2 CH), 101.8 (CH), 60.7 (CH_2), 50.2 (CH_2), 14.5 (CH_3) ppm.

IR (neat): ν = 1704, 1624, 1531, 1348, 1151 cm^{-1}

ESI-HRMS: $[M+H]^+$ calc: 391.0958; found: 391.0960

R_f: 0.43 (Petroleum ether/EtOAc 80:20 *v/v*, UV, vanillin stain)

Characteristic signal for Z isomer 18'



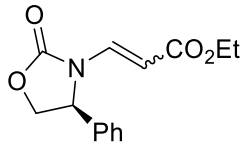
Colorless oil

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.97 (d, 2 H, *J* = 8.8 Hz), 6.85 (d, 1 H, *J* = 10.3 Hz), 5.22 (d, 1 H, *J* = 10.3 Hz), 5.16 (s, 2 H), 4.03 (q, 2 H, *J* = 7.2 Hz), 1.17 (t, 3 H, *J* = 7.2 Hz) ppm.

^{13}C NMR ($CDCl_3$, 125 MHz): δ = 164.7 (C), 150.4 (C), 145.0 (C), 134.8 (C), 133.3 (CH), 128.1 (CH), 124.7 (CH), 106.2 (CH), 60.7 (CH_2), 51.7 (CH_2), 14.3 (CH_3) ppm.

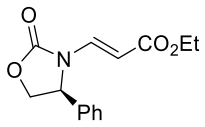
R_f: 0.59 (Petroleum ether/EtOAc 80:20 *v/v*, UV, vanillin stain)

ethyl (*S*)-3-(2-oxo-4-phenyloxazolidin-3-yl)acrylate (19/19')



$C_{14}H_{15}NO_4$
MW : 261.28 g.mol^{-1}
53% (109.7 mg, 0.42 mmol)
19/**19'**: 30/70
19/19' were prepared starting from commercially available (*S*)-4-phenyloxazolidin-2-one and commercially available ethyl propiolate.

Full characterization of E isomer 19



Colorless oil

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.93 (d, 1 H, *J* = 14.4 Hz), 7.45 – 7.36 (m, 3 H), 7.25 – 7.21 (m, 2 H), 5.04 (dd, 1 H, *J* = 8.8 Hz, 5.1 Hz), 4.95 (d, 1 H, *J* = 14.4 Hz), 4.79 (t, 1 H, *J* = 8.9 Hz), 4.21 (dd, 1 H, *J* = 8.9 Hz, 5.0 Hz), 4.17 – 4.07 (m, 2 H), 1.23 (t, 3 H, *J* = 7.2 Hz), ppm.

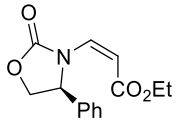
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 166.3 (C), 154.9 (C), 137.2 (CH), 136.6 (C), 129.6 (2 CH), 129.3 (CH), 125.7 (2 CH), 102.2 (CH), 70.9 (CH_2), 60.2 (CH_2), 58.2 (CH), 14.2 (CH_3) ppm.

IR (neat): ν = 2982, 1774, 1704, 1300, 1205 cm^{-1}

ESI-HRMS: $[M+Na]^+$ calc: 284.0893; found: 284.0893

R_f: 0.69 (Petroleum ether/EtOAc 50:50 *v/v*, UV, ninhydrin stain)

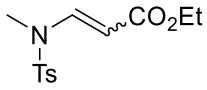
^{1}H NMR characterization of Z isomer 19'



Colorless oil
Characterization data of **17'** match those of the literature. [20]

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.36 – 7.29 (m, 3 H), 7.16 – 7.10 (m, 2 H), 6.91 (d, 1 H, *J* = 10.4 Hz), 6.09 (dd, 1 H, *J* = 9.1 Hz, 3.6 Hz), 5.09 (d, 1 H, *J* = 10.4 Hz), 4.75 (t, 1 H, *J* = 8.7 Hz), 4.20 (dd, 1 H, *J* = 8.7 Hz, 3.6 Hz), 4.06 – 3.91 (m, 2 H), 1.12 (t, 3 H, *J* = 7.2 Hz), ppm.

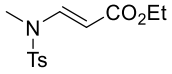
ethyl 3-((*N*,4-dimethylphenyl)sulfonamido)acrylate (20/20')



$C_{13}H_{17}NO_4S$
MW : 283.34 $g.mol^{-1}$
White oil
100% (226.7 mg, 0.80 mmol)
20/**20'**: 50/50

20/20' were prepared starting from commercially available *N*,4-dimethylbenzenesulfonamide and commercially available ethyl propiolate. Characterization data match of **20** and **20'** those of the literature. [21]

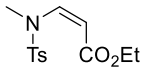
^{1}H NMR characterization of E isomer 20



^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.14 (d, 1 H, *J* = 13.9 Hz), 7.68 (d, 2 H, *J* = 8.2 Hz), 7.33 (d, 2 H, *J* = 8.2 Hz), 5.03 (d, 1 H, *J* = 13.9 Hz), 4.18 (q, 2 H, *J* = 7.2 Hz), 2.94 (s, 3 H), 2.43 (s, 3 H), 1.28 (t, 3 H, *J* = 7.2 Hz) ppm.

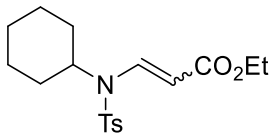
[20] Pan, X.; Cai, Q.; Ma, D. *Org. Lett.* **2004**, *6*, 1809.
[21] Hu, H.; Tian, J.; Liu, Y.; Liu, Y.; Shi, F.; Wang, X.; Kan, Y.; Wang, C. *J. Org. Chem*. **2015**, *80*, 2842.

^{1}H NMR characterization of Z isomer 20'



^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.68 (d, 2 H, *J* = 8.2 Hz), 7.33 (d, 2 H, *J* = 8.2 Hz), 7.05 (d, 1 H, *J* = 10.5 Hz), 5.04 (d, 1 H, *J* = 10.5 Hz), 4.08 (q, 2 H, *J* = 7.2 Hz), 3.23 (s, 3 H), 2.43 (s, 3 H), 1.283 (t, 3 H, *J* = 7.2 Hz) ppm.

ethyl 3-((*N*-cyclohexyl-4-methylphenyl)sulfonamido)acrylate (21/21')



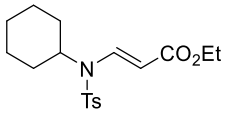
$C_{18}H_{25}NO_4S$
MW : 351.46 g.mol^{-1}
Colorless oil
62% (174.3 mg, 0.49 mmol)
21/21' 50/50

21/21' were prepared starting from **SI-c8** and commercially available ethyl propiolate. 30% of the sulfonamide **SI-c8** was recovered.

IR (neat): ν = 2933, 1708, 1619, 11357, 1157 cm^{-1}

ESI-HRMS: $[M+H]^+$ calc: 352.1577; found: 352.1572

Full characterization of E isomer 21



^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.87 (d, 1 H, *J* = 14.5 Hz), 7.72 (d, 2 H, *J* = 8.2 Hz), 7.31 (d, 2 H, *J* = 8.2 Hz), 5.50 (d, 1 H, *J* = 14.5 Hz), 4.18 (q, 2 H, *J* = 7.2 Hz), 3.90 (tt, 1 H, *J* = 12.2 Hz, 3.7 Hz), 2.43 (s, 3 H), 1.85 – 1.73 (m, 4 H), 1.65 – 1.58 (m, 1 H), 1.55 – 1.50 (m, 2 H), 1.43 (t, 1 H, *J* = 7.2 Hz), 1.26 – 1.23 (m, 1 H), 1.14 – 1.05 (m, 1 H), 1.29 (t, 3 H, *J* = 7.2 Hz) ppm.

^{13}C NMR ($CDCl_3$, 125 MHz): δ = 167.5 (C), 144.5 (C), 140.0 (CH), 136.3 (C), 129.9 (2 CH), 127.1 (2 CH), 99.3 (CH), 60.0 (CH_2), 59.3 (CH), 29.6 (2 CH_2), 26.0 (2 CH_2), 24.9 (CH_2), 21.5 (CH_3), 14.3 (CH_3) ppm.

R_f: 0.36 (Petroleum ether/EtOAc 80:20 *v/v*, UV, vanillin stain)

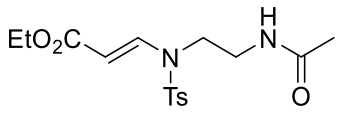
Characteristic signals of Z isomer 21'

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.68 (d, 2 H, *J* = 8.2 Hz), 7.27 (d, 2 H, *J* = 8.2 Hz), 6.30 (d, 1 H, *J* = 9.0 Hz), 5.68 (d, 1 H, *J* = 9.0 Hz), 4.18 (q, 2 H, *J* = 7.2 Hz), 3.79 (tt, 1 H, *J* = 12.2 Hz, 3.7 Hz), 2.41 (s, 3 H), 1.29 (t, 3 H, *J* = 7.2 Hz) ppm.

^{13}C NMR ($CDCl_3$, 125 MHz): δ = 164.9 (C), 144.3 (C), 138.2 (C), 133.5 (CH), 129.5 (2 CH), 126.9 (2 CH), 117.5 (CH), 60.9 (CH), 60.4 (CH_2), 30.9 (2 CH_2), 25.9 (2 CH_2), 25.1 (CH_2), 21.5 (CH_3), 14.0 (CH_3) ppm.

R_f: 0.36 (Petroleum ether/EtOAc 80:20 *v/v*, UV, vanillin stain)

ethyl (*E*)-3-((*N*-(2-acetamidoethyl)-4-methylphenyl)sulfonamido)acrylate (22)



$C_{16}H_{22}N_2O_5S$
MW : 354.42 g.mol^{-1}
White solid
mp = 107 °C – 108 °C
74% (209.8 mg, 0.59 mmol)

22 was prepared starting from **SI-c9** and commercially available ethyl propiolate.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.07 (d, 1 H, *J* = 14.1 Hz), 7.67 (d, 2 H, *J* = 8.2 Hz), 7.33 (d, 2 H, *J* = 8.2 Hz), 6.05 (t, 1 H, *J* = 5.1 Hz), 5.27 (d, 1 H, *J* = 14.1 Hz), 4.18 (q, 2 H, *J* = 7.2 Hz), 3.51 – 3.41 (m, 4 H), 2.43 (s, 3 H), 1.99 (s, 3 H), 1.27 (t, 3 H, *J* = 7.2 Hz) ppm.

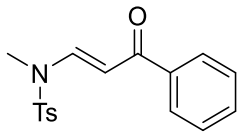
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 170.9 (C), 166.9 (C), 145.0 (C), 141.3 (CH), 134.5 (C), 130.2 (2 CH), 127.1 (2 CH), 98.7 (CH), 60.2 (CH_2), 44.7 (CH_2), 36.7 (CH_2), 23.0 (CH_3), 21.6 (CH_3), 14.3 (CH_3) ppm.

IR (neat): ν = 3373, 1709, 1621, 1523, 1366, 1154 cm^{-1}

ESI-HRMS: $[M+Na]^+$ calc: 377.1142; found: 377.1145

R_f: 0.31 (CH_2Cl_2/acetone 80:20 *v/v*, UV, ninhydrin stain)

(*E*)-*N*,4-dimethyl-*N*-(3-oxo-3-phenylprop-1-en-1-yl)benzenesulfonamide (23)

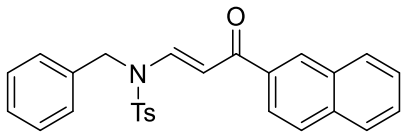


$C_{17}H_{17}NO_3S$
MW : 315.39 g.mol^{-1}
White solid
100% (252.3 mg, 0.80 mmol)

23 was prepared starting from commercially available *N*,4-dimethylbenzenesulfonamide and **SI-a2**. Characterization data match those of the literature. [22]

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.35 (d, 1 H, *J* = 13.5 Hz), 7.88 (d, 2 H, *J* = 8.2 Hz), 7.72 (d, 2 H, *J* = 8.2 Hz), 7.56 – 7.51 (m, 1 H), 7.45 (t, 2 H, *J* = 7.6 Hz), 7.34 (d, 2 H, *J* = 8.4 Hz), 6.13 (d, 1 H, *J* = 13.5 Hz), 3.10 (s, 3 H), 2.43 (s, 3 H) ppm.

***(E)*-*N*-benzyl-4-methyl-*N*-(3-(naphthalen-2-yl)-3-oxoprop-1-en-1-yl)benzenesulfonamide (24)**



$C_{27}H_{23}NO_3S$
MW : 441.55 g.mol^{-1}
Yellow solid
mp = 178 – 180 °C
100% (356.24 mg, 0.80 mmol)

24 was prepared starting from **SI-c1** and **SI-a9**.

[22] Liang, X.; Huang, X.; Xiong, M.; Shen, K.; Pan, Y. *Chem. Commun.* **2018**, *54*, 8403.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.38 (d, 1 H, *J* = 13.6 Hz), 8.03 (s, b, 1 H), 7.86 – 7.80 (m, 4 H), 7.77 (d, 2 H, *J* = 8.2 Hz), 7.59 – 7.47 (m, 2 H), 7.42 – 7.28 (m, 7 H), 6.24 (d, 1 H, *J* = 13.6 Hz), 4.80 (s, 2 H), 2.44 (s, 3 H) ppm.

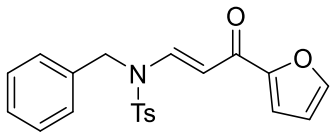
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 189.3 (C), 145.2 (C), 142.4 (CH), 135.9 (C), 135.4 (C), 135.4 (C), 134.4 (C), 132.6 (C), 130.4 (2 CH), 129.5 (CH), 129.4 (CH), 129.1 (2 CH), 128.5 (CH), 128.3 (CH), 128.2 (CH), 127.9 (CH), 127.5 (2 CH), 127.0 (2 CH), 126.8 (CH), 124.3 (CH), 105.0 (CH), 50.5 (CH_2), 21.6 (CH_3) ppm.

IR (neat): ν = 1658, 1580, 1365, 1166 cm^{-1}

ESI-HRMS: $[M+H]^+$ calc: 442.1471; found: 442.1485

R_f: 0.58 (Petroleum ether/EtOAc 70:30 *v/v*, UV, vanillin stain)

(*E*)-*N*-benzyl-*N*-(3-(furan-2-yl)-3-oxoprop-1-en-1-yl)-4-methylbenzenesulfonamide (25)



$C_{21}H_{19}NO_4S$
MW : 381.45 $g.mol^{-1}$
Yellow solid
mp .= 165 - 166 °C
100% (3.21 g, 8.42 mmol)

25 was prepared starting from **SI-c1** and **SI-a10**, starting from 8.42 mmol of **SI-c1**.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.38 (d, 1 H, *J* = 13.9 Hz), 7.73 (d, 2 H, *J* = 8.3 Hz), 7.49 (dt, 1 H, *J* = 1.4 Hz, 0.4 Hz), 7.34 – 7.29 (m, 4 H), 7.29 – 7.26 (m, 3 H), 7.00 (dd, 1 H, *J* = 3.5 Hz, 0.4 Hz), 6.46 (dd, 1 H, *J* = 3.5 Hz, 1.4 Hz), 6.03 (d, 1 H, *J* = 13.9 Hz), 4.73 (s, 2 H), 2.43 (s, 3 H) ppm.

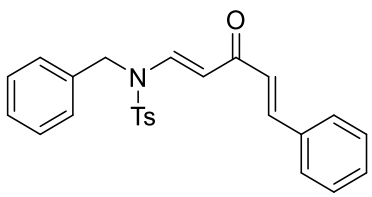
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 177.3 (C), 153.4 (C), 145.7 (CH), 144.9 (C), 141.9 (CH), 135.1 (C), 134.0 (C), 130.1 (2 CH), 128.8 (2 CH), 127.8 (CH), 127.2 (2 CH), 126.7 (2 CH), 116.2 (CH), 112.2 (CH), 103.7 (CH), 50.1(CH_2), 21.6 (CH_3) ppm.

IR (neat): ν = 1649, 1588, 1359, 1161 cm^{-1}

ESI-HRMS: $[M+H]^+$ calc: 382.1108; found: 382.1097

R_f: 0.36 (Petroleum ether/EtOAc 70:30 *v/v*, UV, vanillin stain)

***N*-benzyl-4-methyl-*N*-((1*E*,4*E*)-3-oxo-5-phenylpenta-1,4-dien-1-yl)benzenesulfonamide (26)**



$C_{25}H_{23}NO_3S$
MW : 417.52 $g.mol^{-1}$
Orange solid
mp = 167 – 169 °C
100% (334.02 mg, 0.80 mmol)

26 was prepared starting from **SI-c1** and **SI-a5**.

^{1}H NMR ($CDCl_3$, 300 MHz): δ = 8.29 (d, 1 H, *J* = 13.8 Hz), 7.74 (d, 2 H, *J* = 8.2 Hz), 7.52 – 7.42 (m, 3 H), 7.39 – 7.29 (m, 8 H), 7.25 – 7.22 (m, 2 H), 6.73 (d, 1 H, *J* = 15.9 Hz), 5.64 (d, 1 H, *J* = 13.8 Hz), 4.70 (s, 2 H), 2.44 (s, 3 H) ppm.

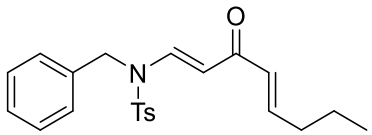
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 187.7 (C), 145.2 (C), 142.4 (CH), 141.6 (CH), 135.4 (C), 134.9 (C), 134.2 (C), 130.4 (3 CH), 129.0 (4 CH), 128.4 (2 CH), 128.1 (CH), 127.5 (2 CH), 126.9 (2 CH), 125.9 (CH), 108.2 (CH), 50.2 (CH_2), 21.8 (CH_3) ppm.

IR (neat): ν = 2924, 1612, 1576, 1365, 1166 cm^{-1}

ESI-HRMS: $[M+H]^+$ calc: 418.1471; found: 418.1480

R_f: 0.27 (Petroleum ether/EtOAc 80:20 *v/v*, UV, vanillin stain)

***N*-benzyl-4-methyl-*N*-((4*E*)-3-oxoocta-1,4-dien-1-yl)benzenesulfonamide (27)**



$C_{22}H_{25}NO_3S$
MW : 383.51 $g.mol^{-1}$
Orange solid
mp = 101 – 102 °C
84% (256.95 mg, 0.67 mmol)

27 was prepared starting from **SI-c1** and **SI-a11**.

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.19 (d, 1 H, *J* = 14.0 Hz), 7.71 (d, 2 H, *J* = 8.2 Hz), 7.32 – 7.25 (m, 5 H), 7.22 (d, 2 H, *J* = 8.2 Hz), 6.69 (dt, 1 H, *J* = 15.6 Hz, 7.3 Hz), 6.12 (dt, 1 H, *J* = 15.6 Hz, 1.4 Hz), 5.52 (d, 1 H, *J* = 14.0 Hz), 4.65 (s, 2 H), 2.43 (s, 3 H), 2.14 (qd, 2 H, *J* = 7.3 Hz, 1.4 Hz), 1.48 – 1.40 (m, 2 H), 0.90 (t, 3 H, *J* = 7.3 Hz) ppm.

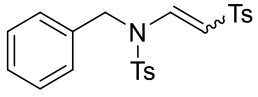
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 118.1 (C), 147.1 (CH), 145.1 (C), 141.3 (CH), 135.4 (C), 134.2 (C), 130.4 (2 CH), 129.6 (CH), 129.0 (2 CH), 128.0 (CH), 127.4 (2 CH), 126.9 (2 CH), 107.7 (CH), 50.1 (CH_2), 34.7 (CH_2), 21.8 (CH_3), 21.6 (CH_2), 13.9 (CH_3) ppm.

IR (neat): ν = 1653, 1564, 1291, 1160 cm^{-1}

ESI-HRMS: $[M+H]^+$ calc: 384.1628; found: 384.1642

R_f: 0.41 (Petroleum ether/EtOAc 80:20 *v/v*, UV, vanillin stain)

***N*-benzyl-4-methyl-*N*-(2-tosylvinyl)benzenesulfonamide (28/28')**



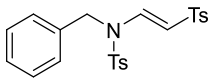
$C_{23}H_{23}NO_4S_2$
MW : 411.56 g.mol-1
86% (284.0 mg, 0.69 mmol)
28/**28'**: 50/50

28/28' were prepared starting from **SI-c1** and **SI-a12**.

ESI-HRMS: $[M+Na]^+$ calc: 464.0961; found: 464.0934

IR (neat): ν = 2924, 1608, 1360, 1290, 1166, 1141, 1083 cm^{-1}

Full characterization of E isomer 28



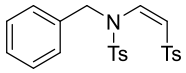
White solid
mp = 174 - 175 °C

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.15 (d, 1 H, *J* = 13.6 Hz), 7.71 (d, 2 H, *J* = 8.3 Hz), 7.55 (d, 2 H, *J* = 8.2 Hz), 7.34 (d, 2 H, *J* = 8.3 Hz), 7.24 – 7.19 (m, 5 H), 7.11 – 7.07 (m, 2 H), 5.41 (d, 1 H, *J* = 13.6 Hz), 4.57 (s, 2 H), 2.46 (s, 3 H), 2.39 (s, 3 H) ppm.

^{13}C NMR ($CDCl_3$, 125 MHz): δ = 145.3 (C), 143.5 (C), 140.4 (CH), 139.0 (C), 134.7 (C), 133.1 (C), 130.3 (2 CH), 129.6 (2 CH), 128.8 (2 CH), 127.9 (CH), 127.2 (2 CH), 126.6 (2 CH), 126.5 (2 CH), 109.0 (CH), 50.2 (CH_2), 21.6 (CH_3), 21.5 (CH_3) ppm.

R_f: 0.45 (Petroleum ether/EtOAc 70:30 *v/v*, UV, vanillin stain)

Full characterization of Z isomer 28'



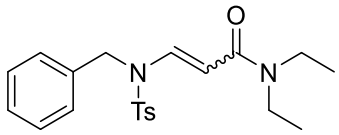
Colorless oil

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.62 (d, 2 H, *J* = 8.2 Hz), 7.40 (d, 2 H, *J* = 8.2 Hz), 7.29 (d, 2 H, *J* = 8.2 Hz), 7.22 – 7.17 (m, 3 H), 7.16 – 7.10 (m, 4 H), 7.07 (d, 1 H, *J* = 10.9 Hz), 5.48 (d, 1 H, *J* = 10.9 Hz), 5.29 (s, 2 H), 2.44 (s, 3 H), 2.36 (s, 3 H) ppm.

^{13}C NMR ($CDCl_3$, 125 MHz): δ = 144.8 (C), 143.9 (C), 138.6 (C), 135.6 (C), 135.3 (C), 134.2 (CH), 129.9 (2 CH), 129.5 (2 CH), 128.2 (2 CH), 127.3 (2 CH), 127.2 (CH), 127.1 (2 CH), 126.8 (2 CH), 110.4 (CH), 52.6 (CH_2), 21.6 (CH_3), 21.5 (CH_3) ppm.

R_f: 0.45 (Petroleum ether/EtOAc 70:30 *v/v*, UV, vanillin stain)

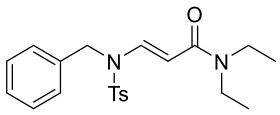
3-((*N*-benzyl-4-methylphenyl)sulfonamido)-*N*,*N*-diethylacrylamide (29/29')



$C_{21}H_{26}N_2O_3S$
MW : 386.51 g.mol^{-1}
93% (286.0 mg, 0.74 mmol)
27/**27'**: 63/37

29/29' were prepared starting from **SI-c1** and **SI-a7**.

Full characterization of E isomer 29



White solid
mp = 111 - 113 °C

^{1}H NMR ($CDCl_3$, 500 MHz): δ = 8.05 (d, 1 H, *J* = 13.5 Hz), 7.72 (d, 2 H, *J* = 8.3 Hz), 7.31 – 7.25 (m, 4 H), 7.24 – 7.20 (m, 3 H), 5.22 (d, 1 H, *J* = 13.5 Hz), 4.60 (s, 2 H), 3.29 (q, 2 H, *J* = 7.2 Hz), 3.14 (q, 2 H, *J* = 7.2 Hz), 2.40 (s, 3 H), 1.02 (t, 3 H, *J* = 7.2 Hz), 0.76 (t, 3 H, *J* = 7.2 Hz) ppm.

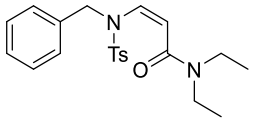
^{13}C NMR ($CDCl_3$, 125 MHz): δ = 165.2 (C), 144.4 (C), 139.2 (CH), 135.5 (C), 134.7 (C), 130.0 (2 CH), 128.7 (2 CH), 127.7 (CH), 127.1 (2 CH), 126.5 (2 CH), 100.5 (CH), 50.3 (CH_2), 42.0 (CH_2), 40.7 (CH_2), 21.5 (CH_3), 14.3 (CH_3), 13.2 (CH_3) ppm.

IR (neat): ν = 2976, 1651, 1594, 1360, 1167 cm^{-1}

ESI-HRMS: $[M+Na]^+$ calc: 409.1556; found: 409.1538

R_f: 0.21 (Petroleum ether/EtOAc 60:40 *v/v*, UV, vanillin stain)

Full characterization of Z isomer 29'



Yellow oil

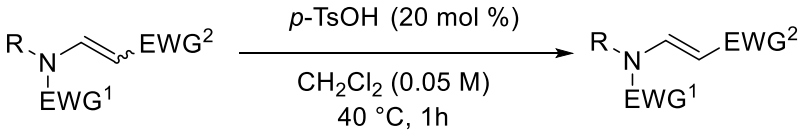
^{1}H NMR ($CDCl_3$, 500 MHz): δ = 7.75 (d, 2 H, *J* = 8.3 Hz), 7.32 (d, 2 H, *J* = 8.3 Hz), 7.25 – 7.13 (m, 5 H), 6.90 (d, 1 H, *J* = 10.7 Hz), 5.06 (d, 1 H, *J* = 10.7 Hz), 5.00 (s, 2 H), 3.14 (q, 2 H, *J* = 7.2 Hz), 2.66 (q, 2 H, *J* = 7.2 Hz), 2.41 (s, 3 H), 0.97 (t, 3 H, *J* = 7.2 Hz), 0.76 (t, 3 H, *J* = 7.2 Hz) ppm.

^{13}C NMR ($CDCl_3$, 125 MHz): δ = 165.3 (C), 144.1 (C), 136.3 (C), 135.8 (C), 130.2 (CH), 129.9 (2 CH), 128.0 (2 CH), 127.0 (CH), 127.0 (2 CH), 126.8 (2 CH), 103.6 (CH), 49.3 (CH_2), 42.7 (CH_2), 39.7 (CH_2), 21.5 (CH_3), 13.2 (CH_3), 12.9 (CH_3) ppm.

IR (neat): ν = 2975, 1641, 1346, 1164 cm^{-1}

R_f: 0.43 (Petroleum ether/EtOAc 60:40 *v/v*, UV, vanillin stain)

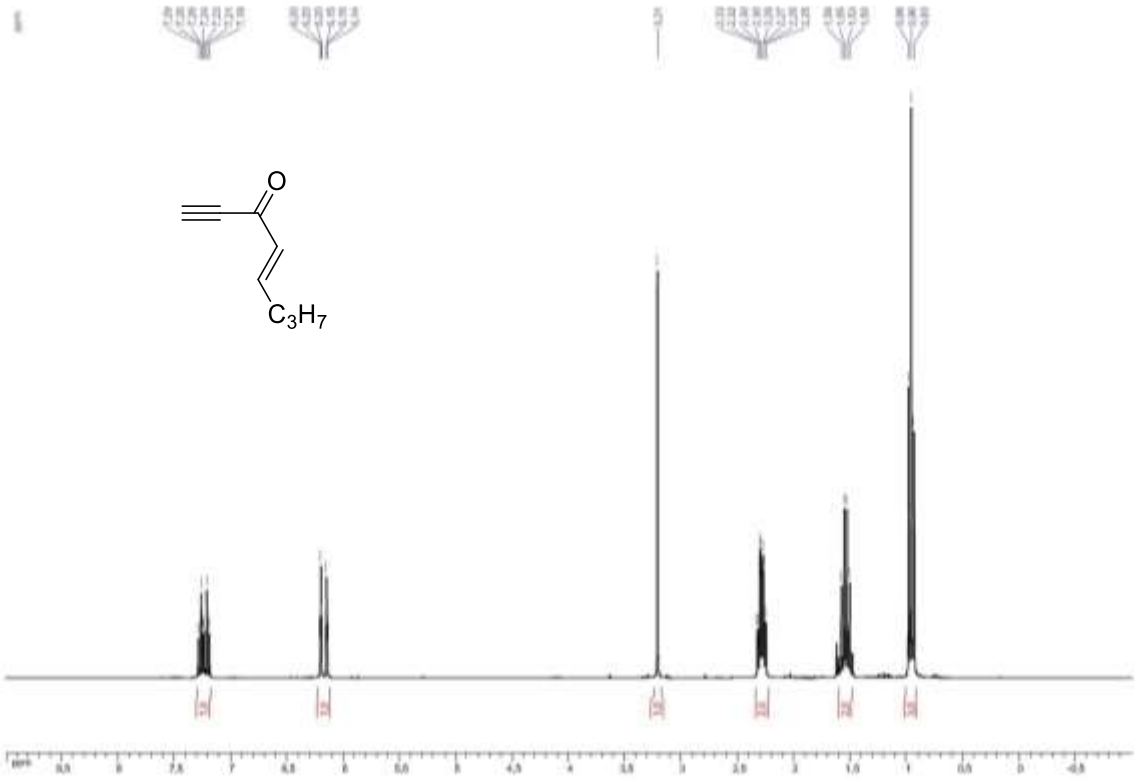
Experimental procedure for isomerization



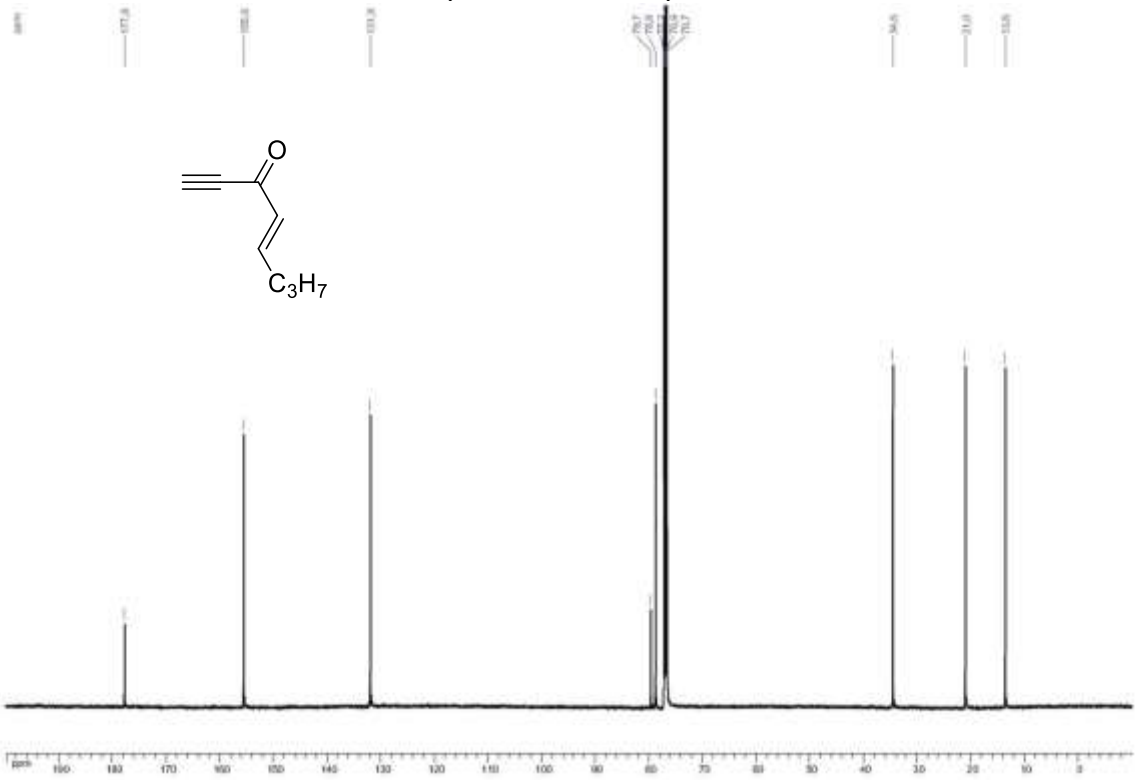
General procedure: The mixture of *E*/*Z* enesulfonamide or the *Z* enamide (0.5 mmol, 1 equiv) was dissolved in CH_2Cl_2 (0.05 M). Para-toluenesulfonic acid (0.1 mmol, 20 mol %) was then added and the reaction was heated to 40 °C. Reaction was monitored by TLC and once judge completed by the full consumption of the starting material, the mixture was diluted with sat. $NaHCO_3$ (10 mL). The aqueous layer was extracted with AcOEt (3 x 15 mL). The combined organic extracts were dried (Na_2SO_4), concentrated under reduce pressure (15 mbar, 25 °C) and purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford the desired product.

Detailed procedure for 29 on 1 mmol: The The *Z* enamide **29'** (1 mmol, 386.5 mg, 1 equiv) was dissolved in CH_2Cl_2 (0.05 M). Para-toluenesulfonic acid (0.2 mmol, 35 mg, 20 mol %) was then added and the reaction was heated to 40 °C. Reaction was monitored by TLC and once judge completed by the full consumption of the starting material, the mixture was diluted with sat. $NaHCO_3$ (10 mL). The aqueous layer was extracted with AcOEt (3 x 15 mL). The combined organic extracts were dried (Na_2SO_4), concentrated under reduce pressure (15 mbar, 25 °C) and purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford **29** as a white solid (85%, 0.85 mmol, 328.5 mg)

^{1}H and ^{13}C spectra for SI-a11

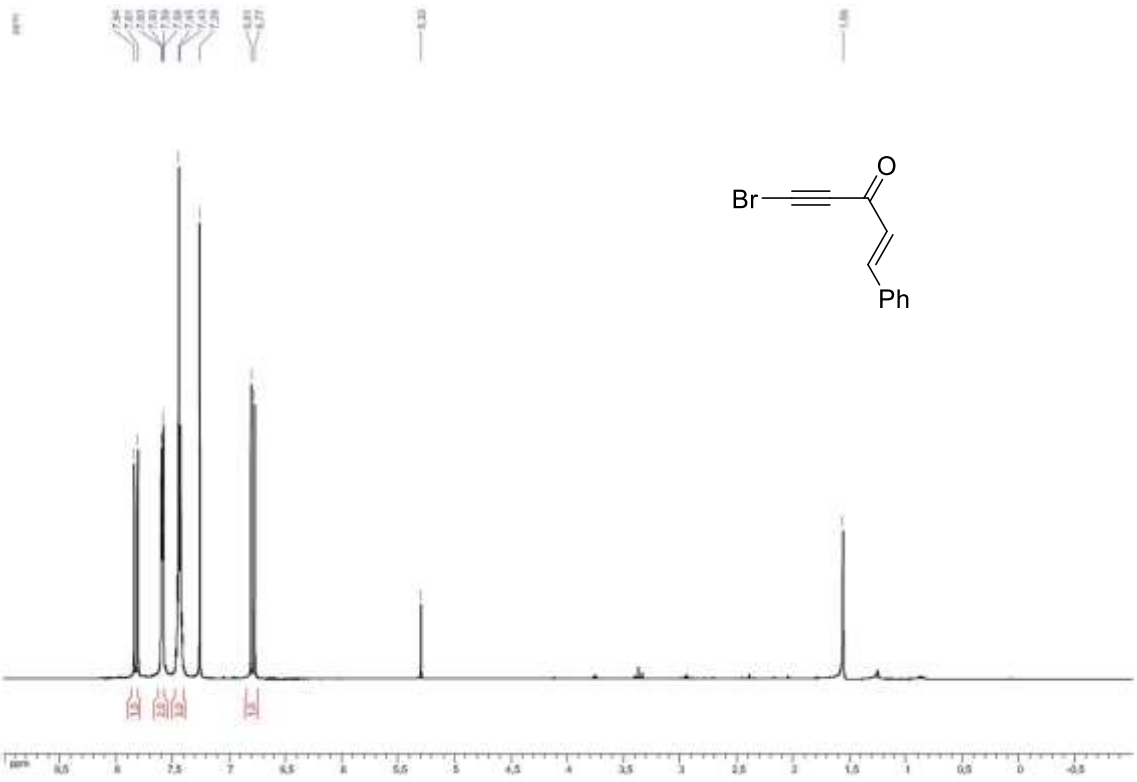


^{1}H NMR ($CDCl_3$, 500 MHz) of **SI-a11**

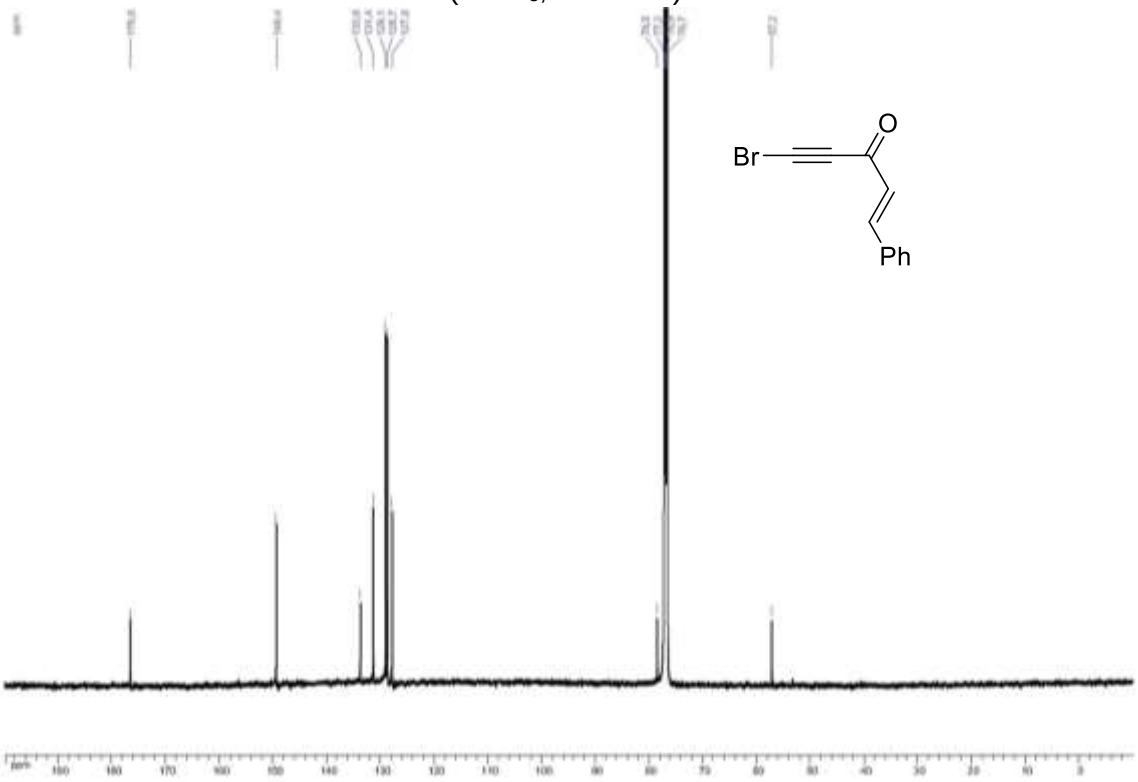


^{13}C NMR ($CDCl_3$, 125 MHz) of **SI-a11**

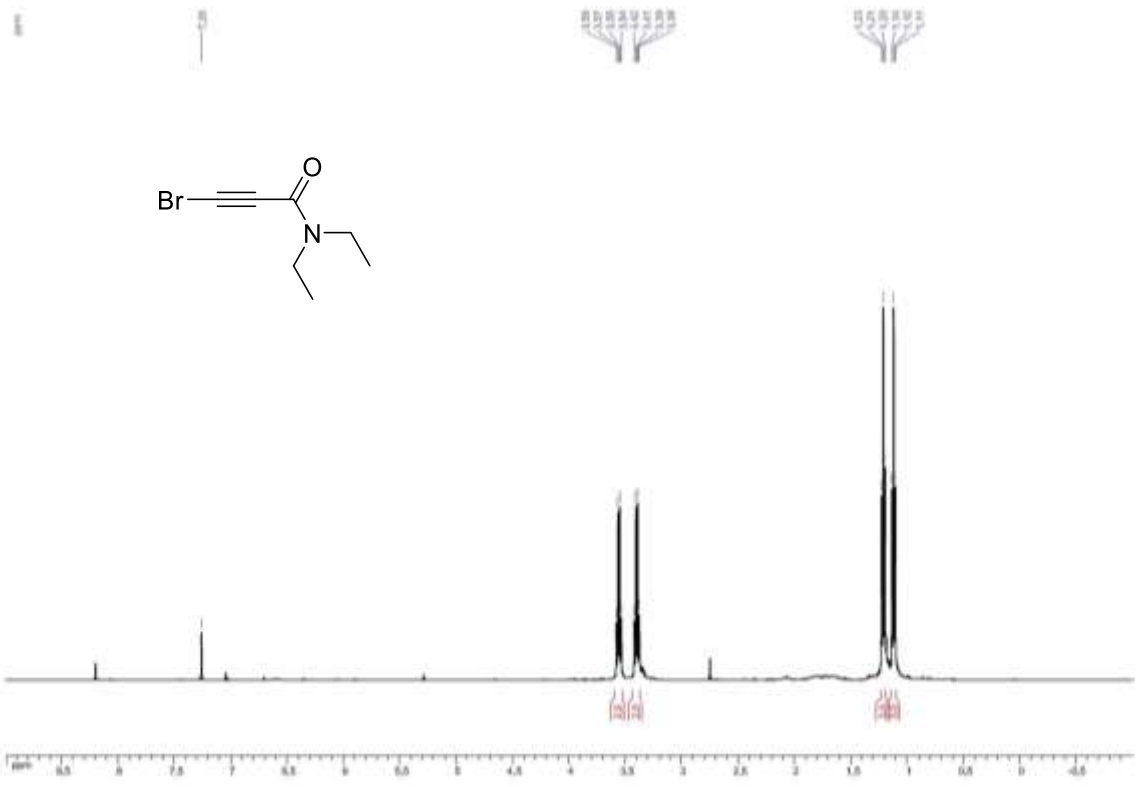
^{1}H and ^{13}C spectra for SI-b



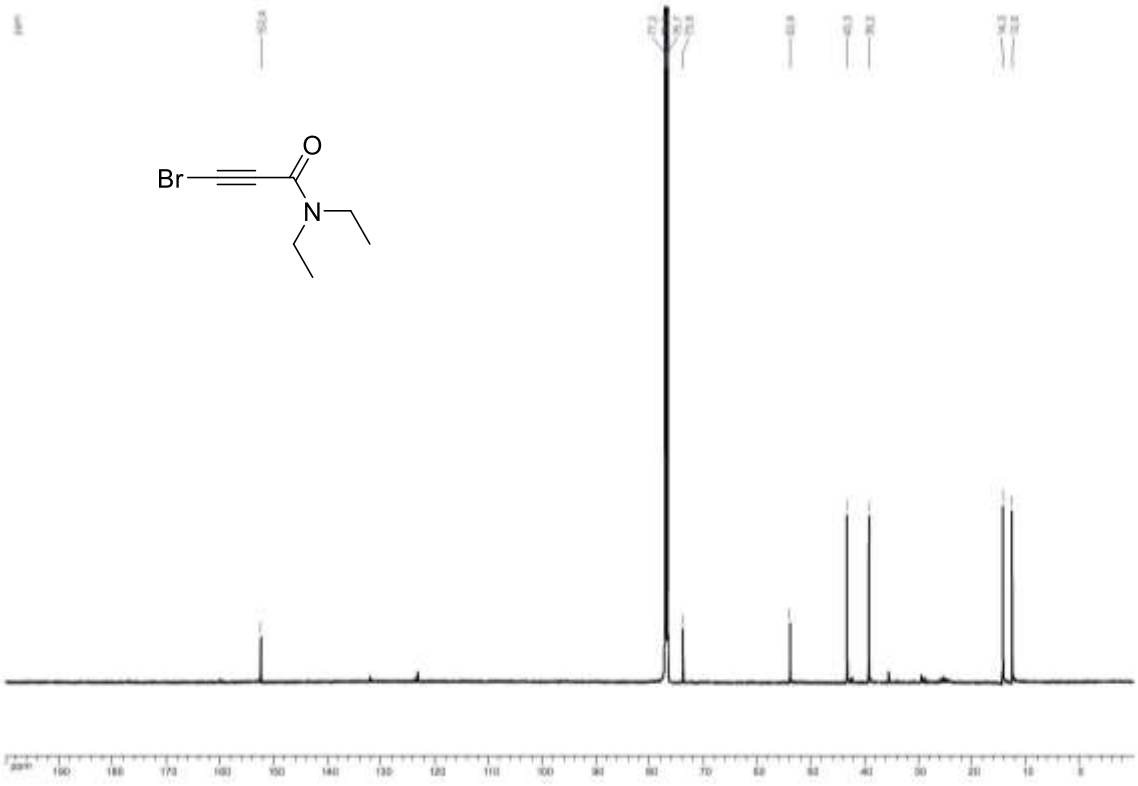
^{1}H NMR ($CDCl_3$, 500 MHz) of **SI-b5**



^{13}C NMR ($CDCl_3$, 125 MHz) of **SI-b5**

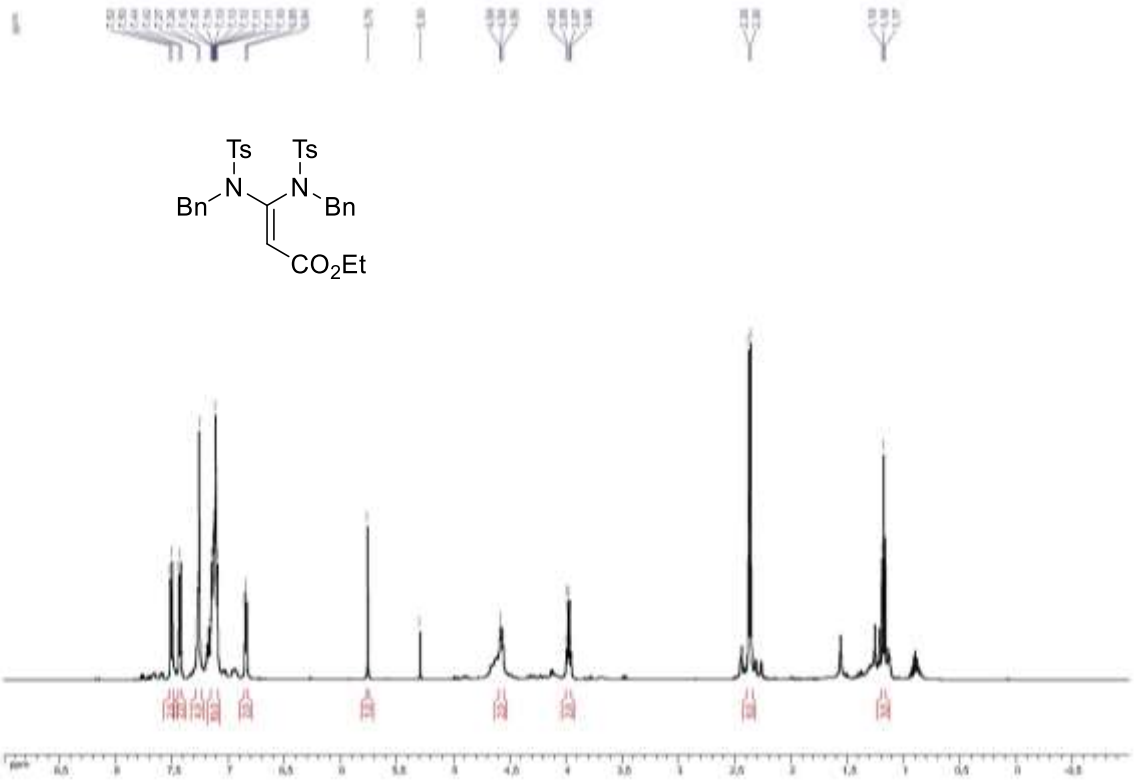


^{1}H NMR ($CDCl_3$, 500 MHz) of **SI-b7**

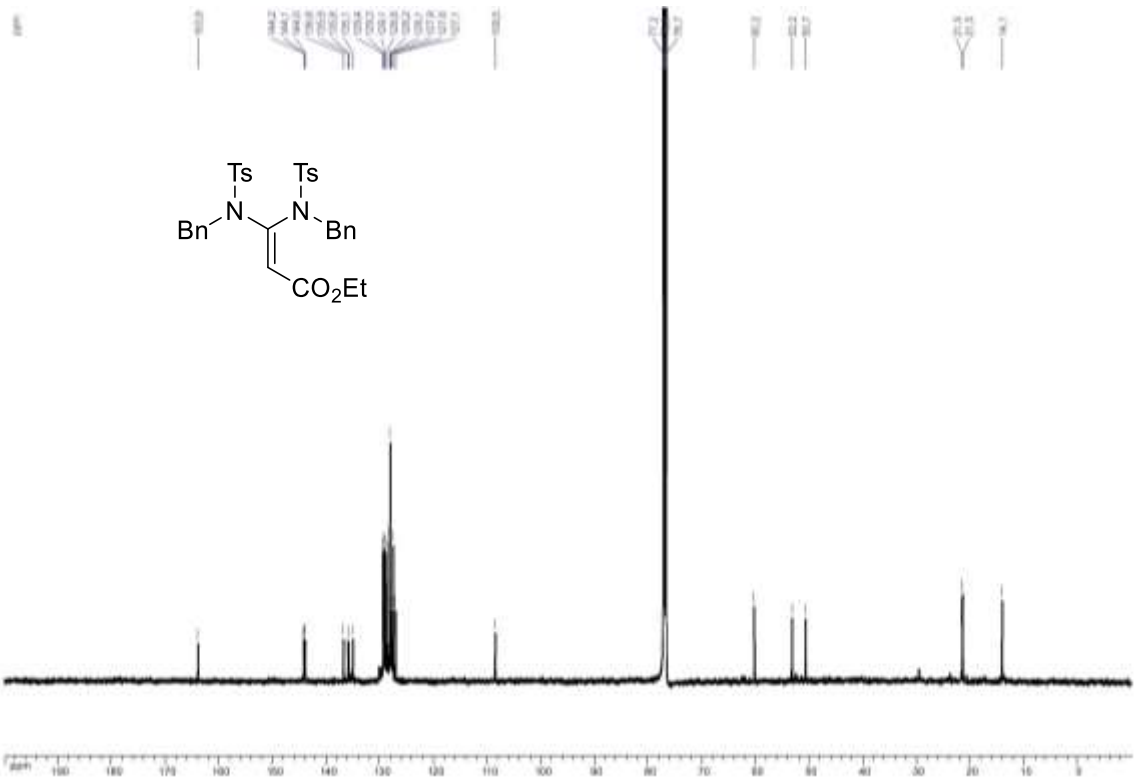


^{13}C NMR ($CDCl_3$, 125 MHz) of **SI-b7**

^{1}H and ^{13}C spectra for 3

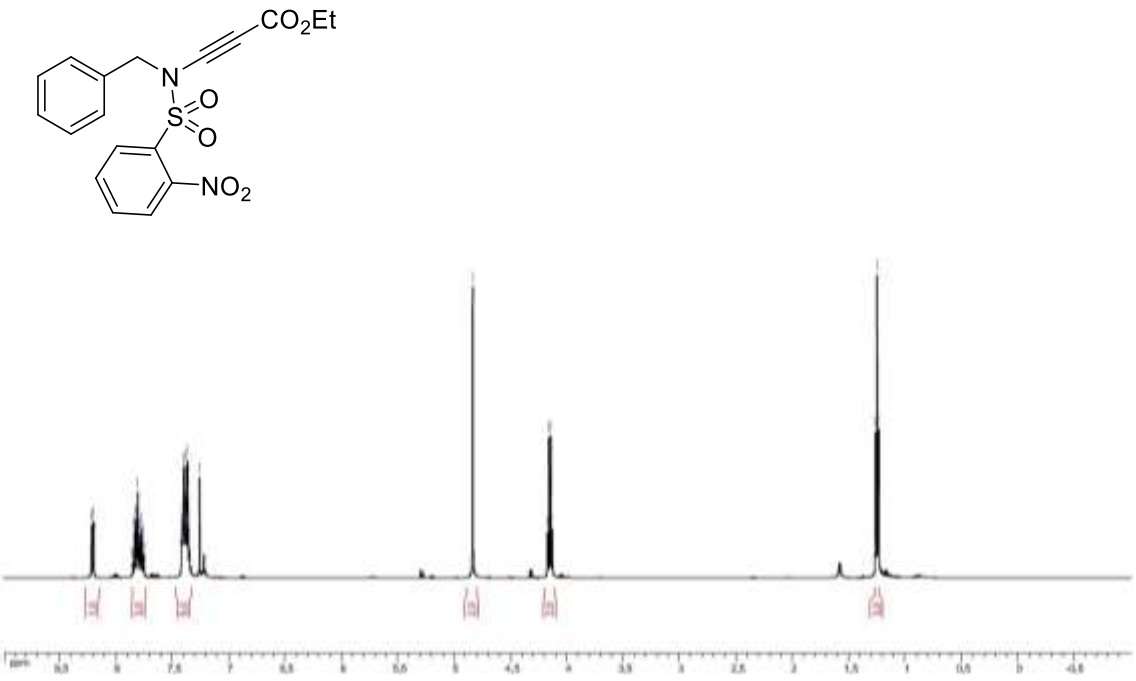


^{1}H NMR ($CDCl_3$, 500 MHz) of **3**

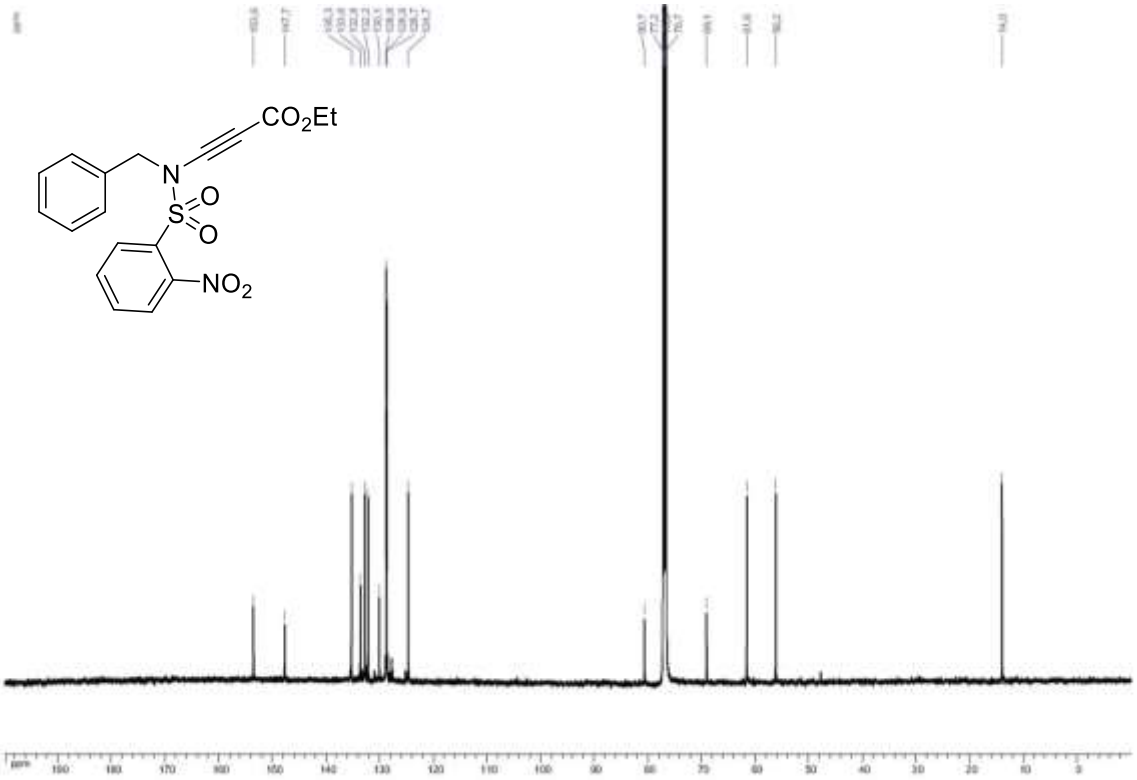


^{13}C NMR ($CDCl_3$, 125 MHz) of **3**

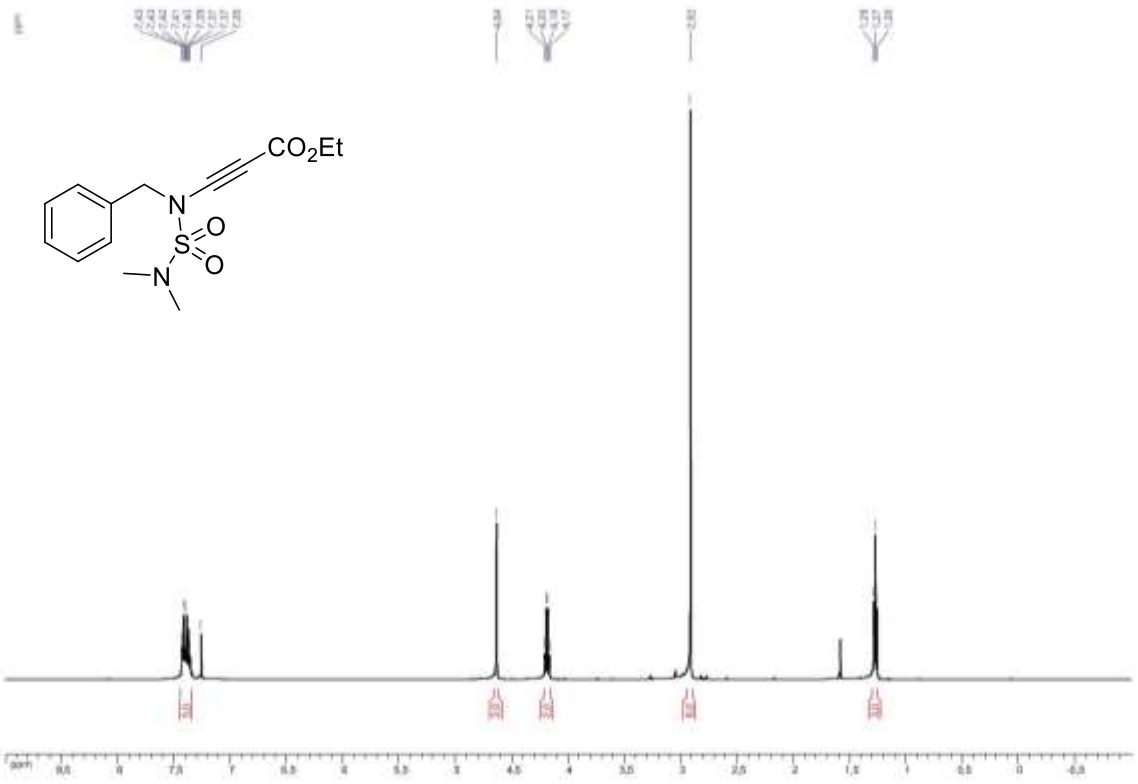
^{1}H and ^{13}C spectra for ynesulfonamides 4 - 14



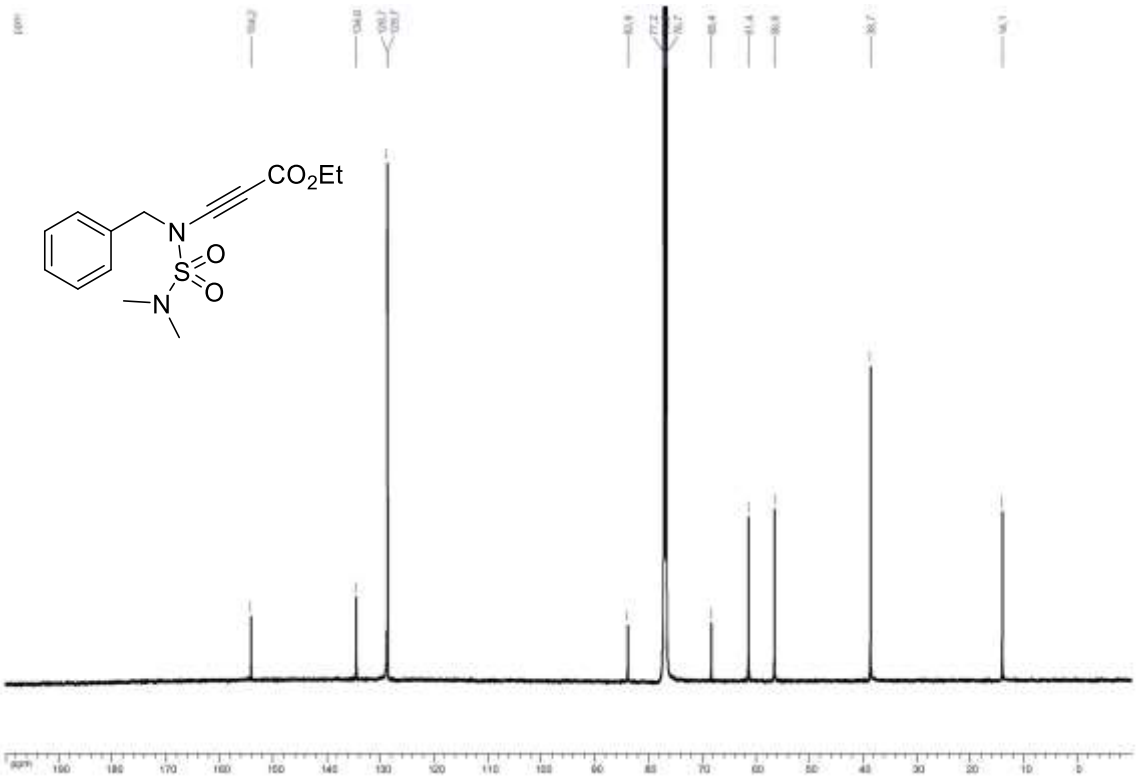
^{1}H NMR ($CDCl_3$, 500 MHz) of **4**



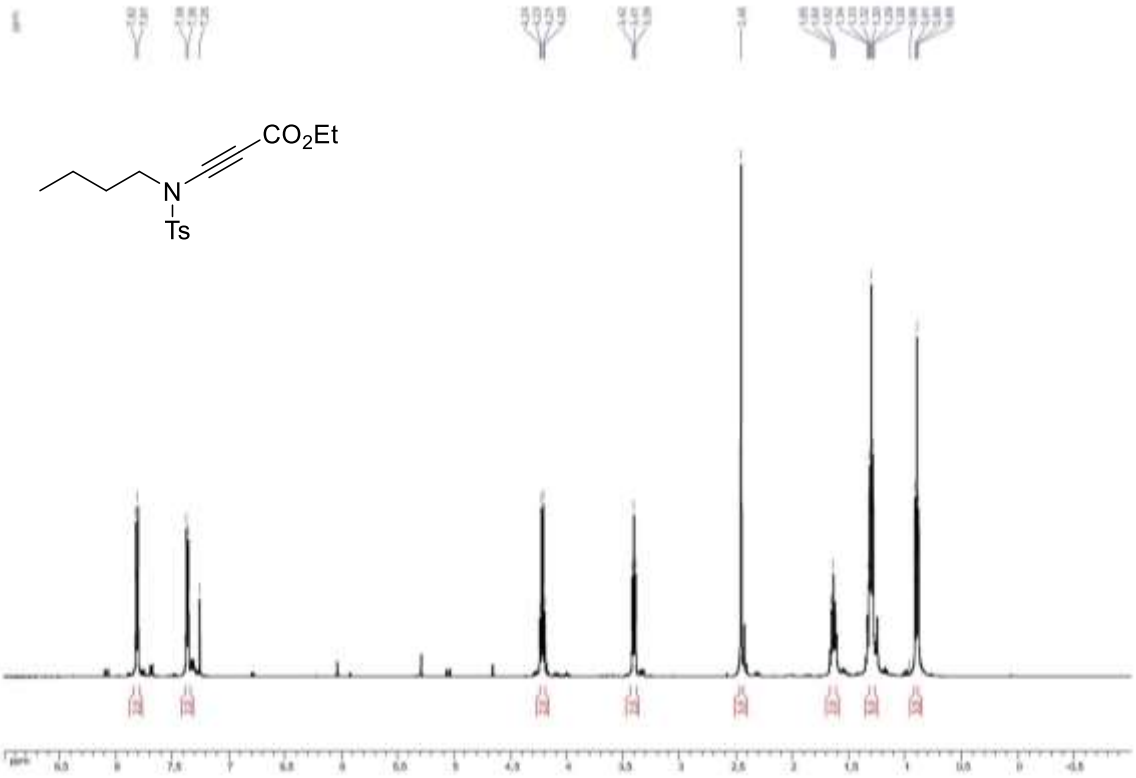
^{13}C NMR ($CDCl_3$, 125 MHz) of **4**



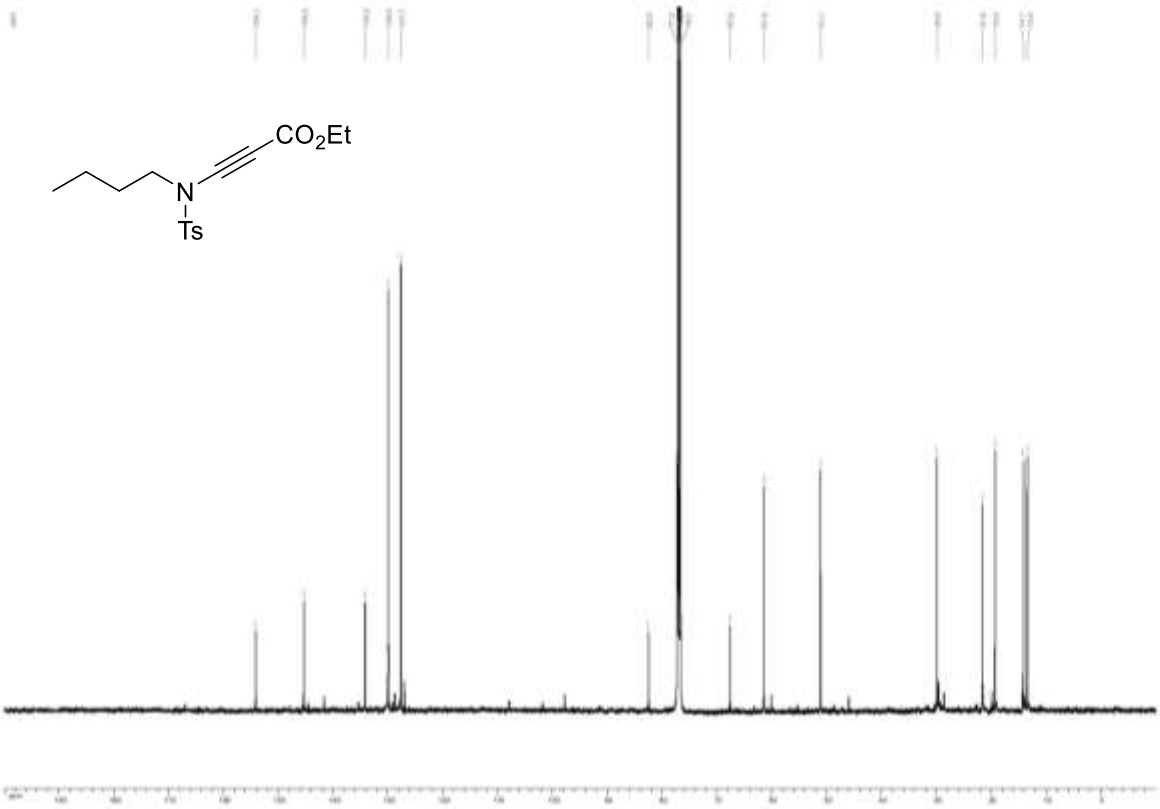
^{1}H NMR ($CDCl_3$, 500 MHz) of **5**



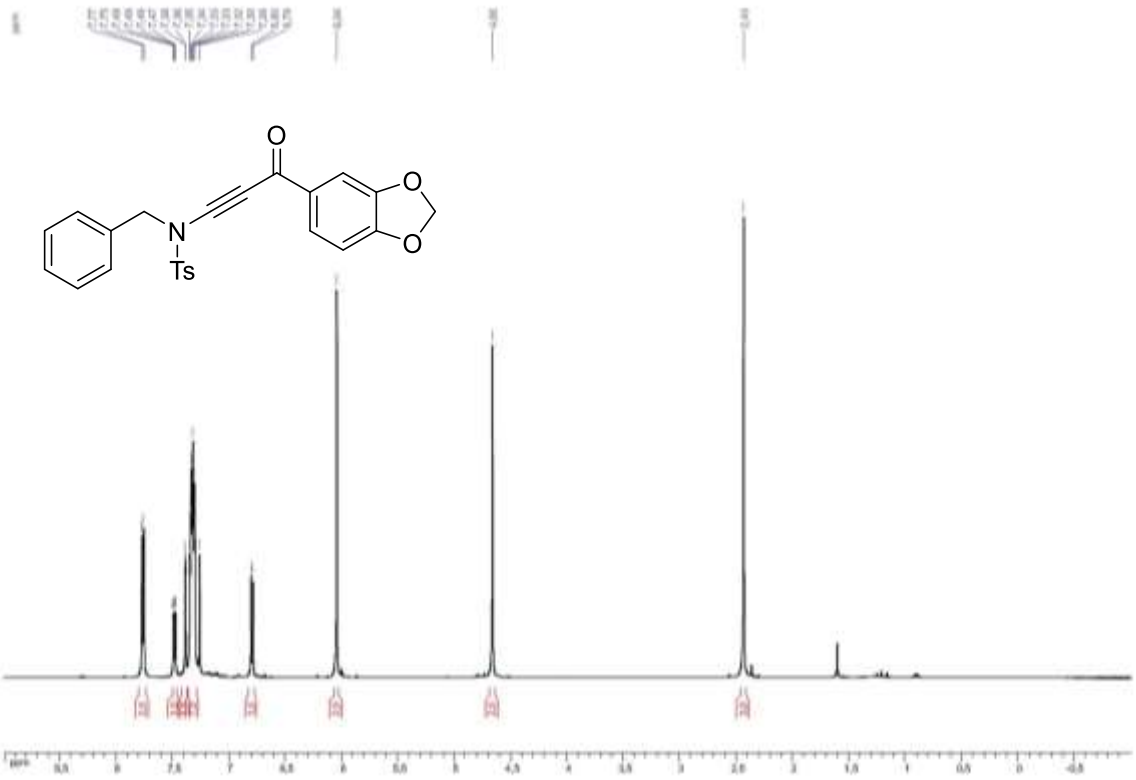
^{13}C NMR ($CDCl_3$, 125 MHz) of **5**



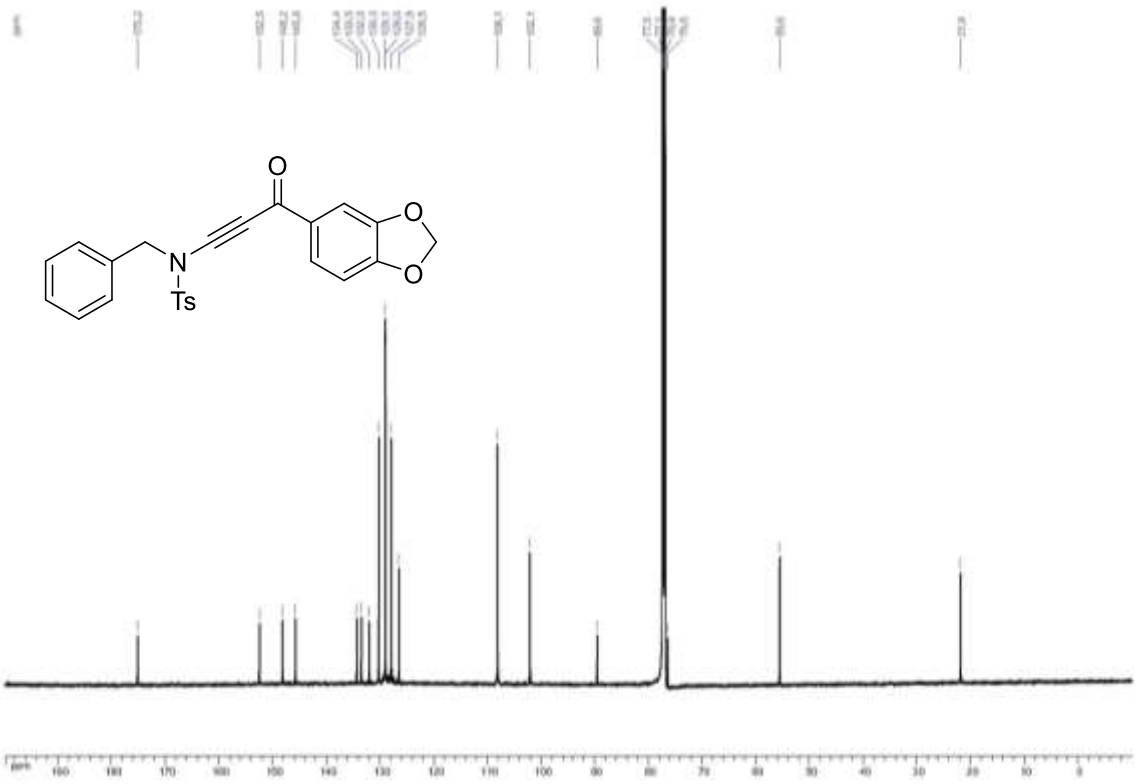
^{1}H NMR ($CDCl_3$, 500 MHz) of **7**



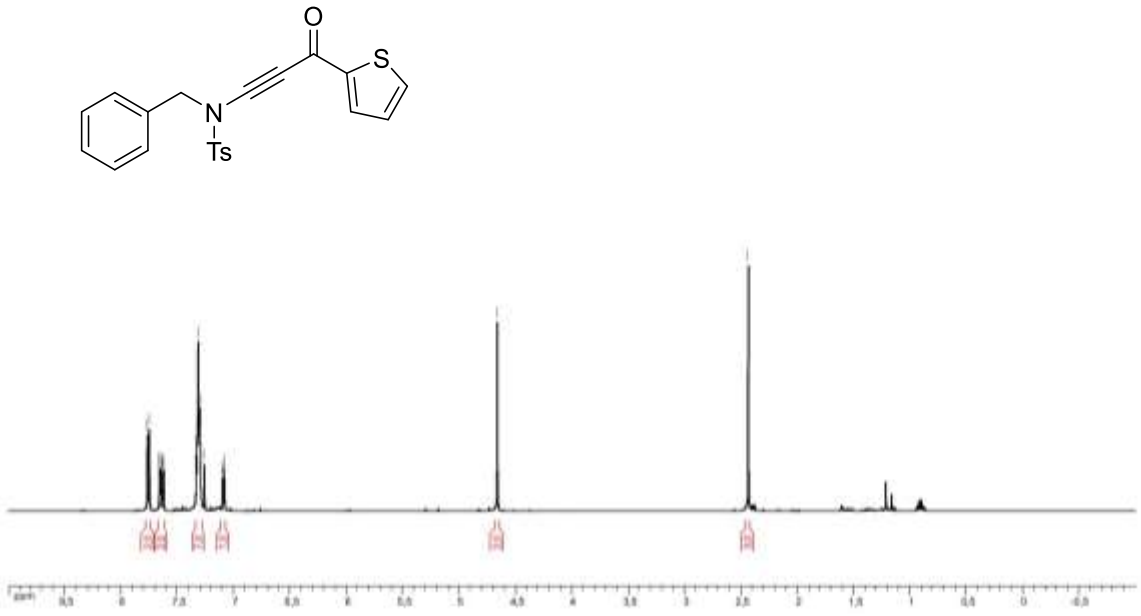
^{13}C NMR ($CDCl_3$, 125 MHz) of **7**



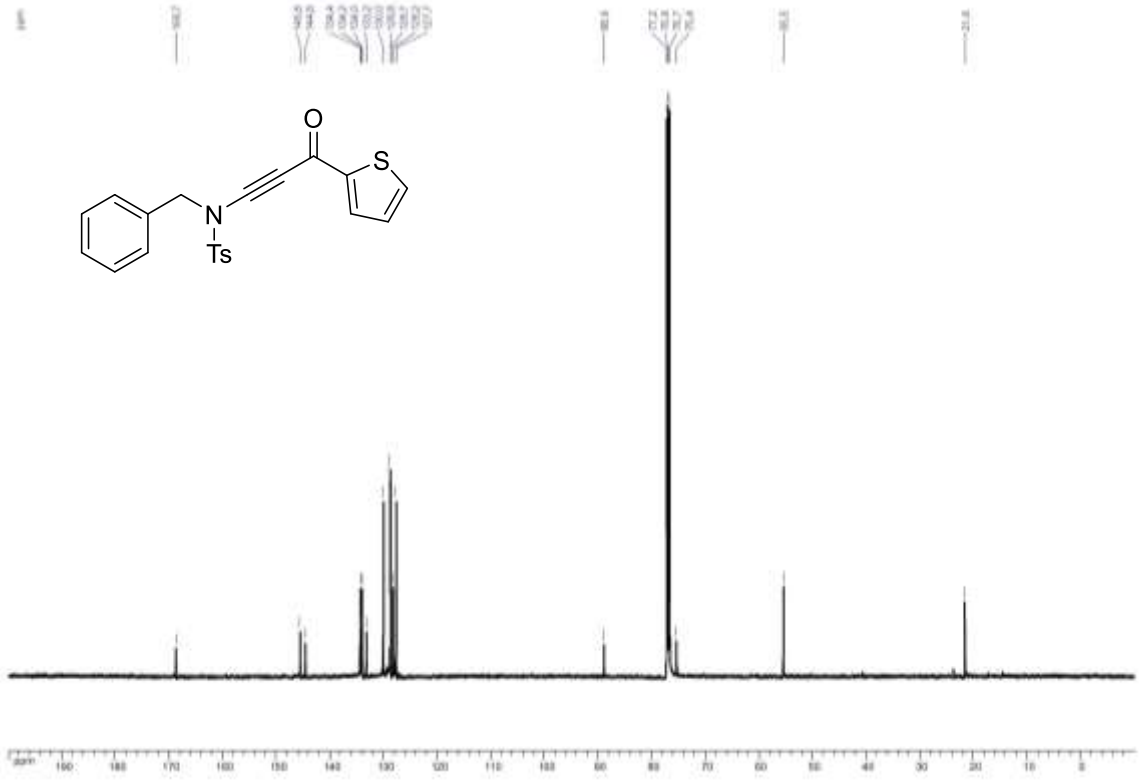
^{1}H NMR ($CDCl_3$, 500 MHz) of **9**



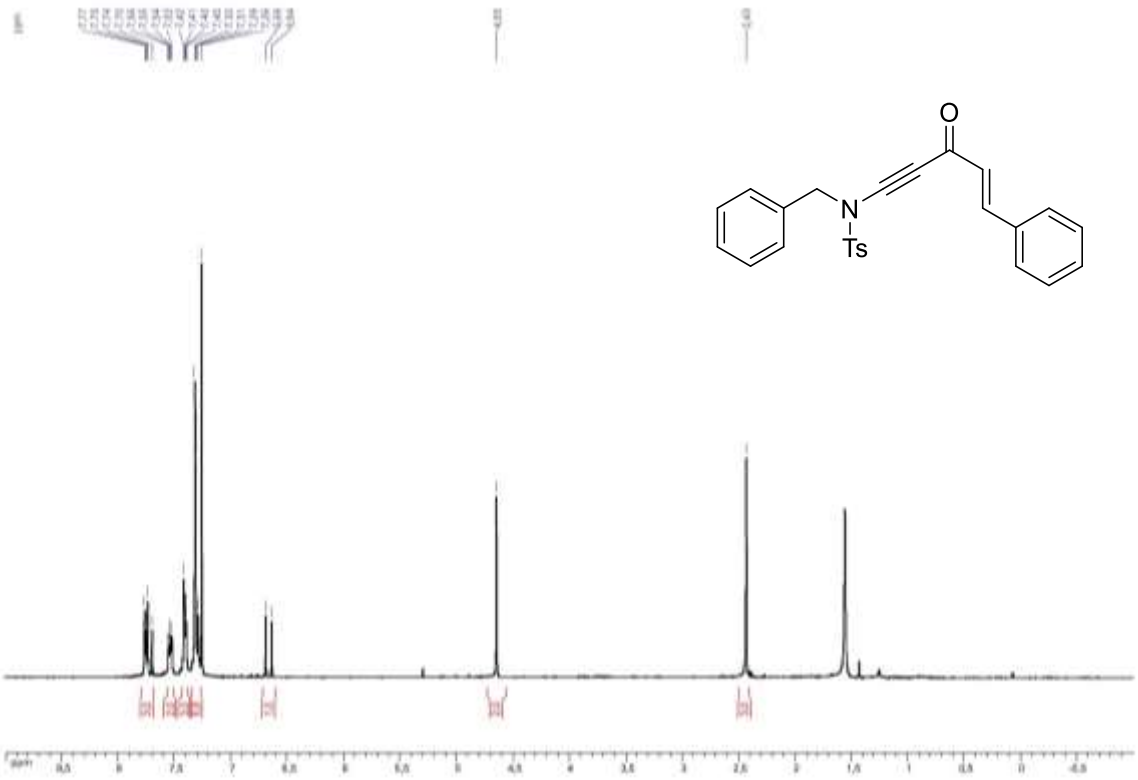
^{13}C NMR ($CDCl_3$, 125 MHz) of **9**



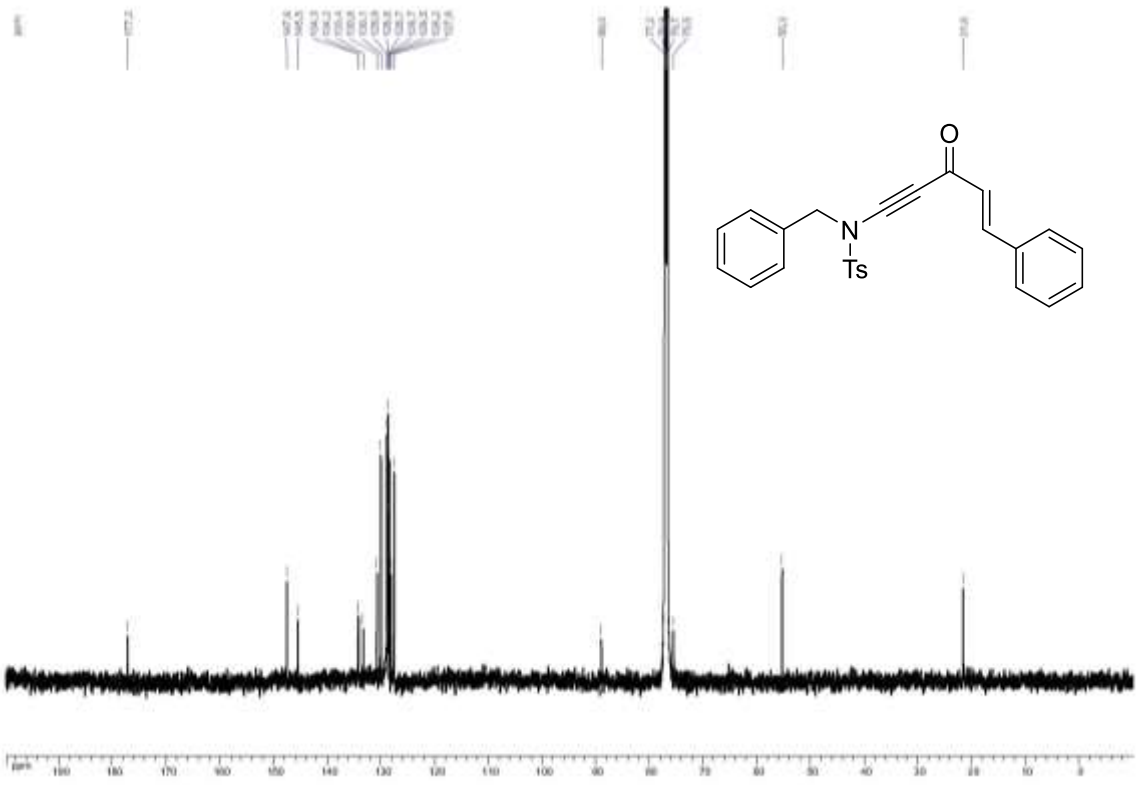
^{1}H NMR ($CDCl_3$, 500 MHz) of **10**



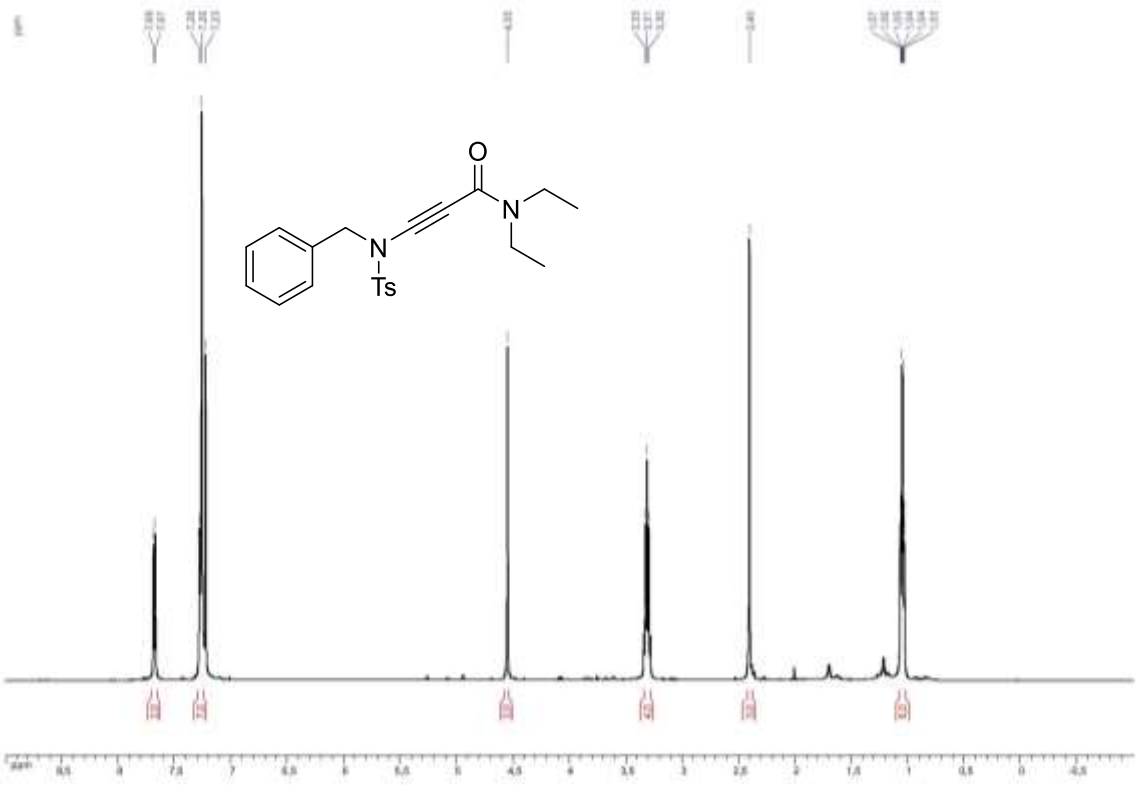
^{13}C NMR ($CDCl_3$, 125 MHz) of **10**



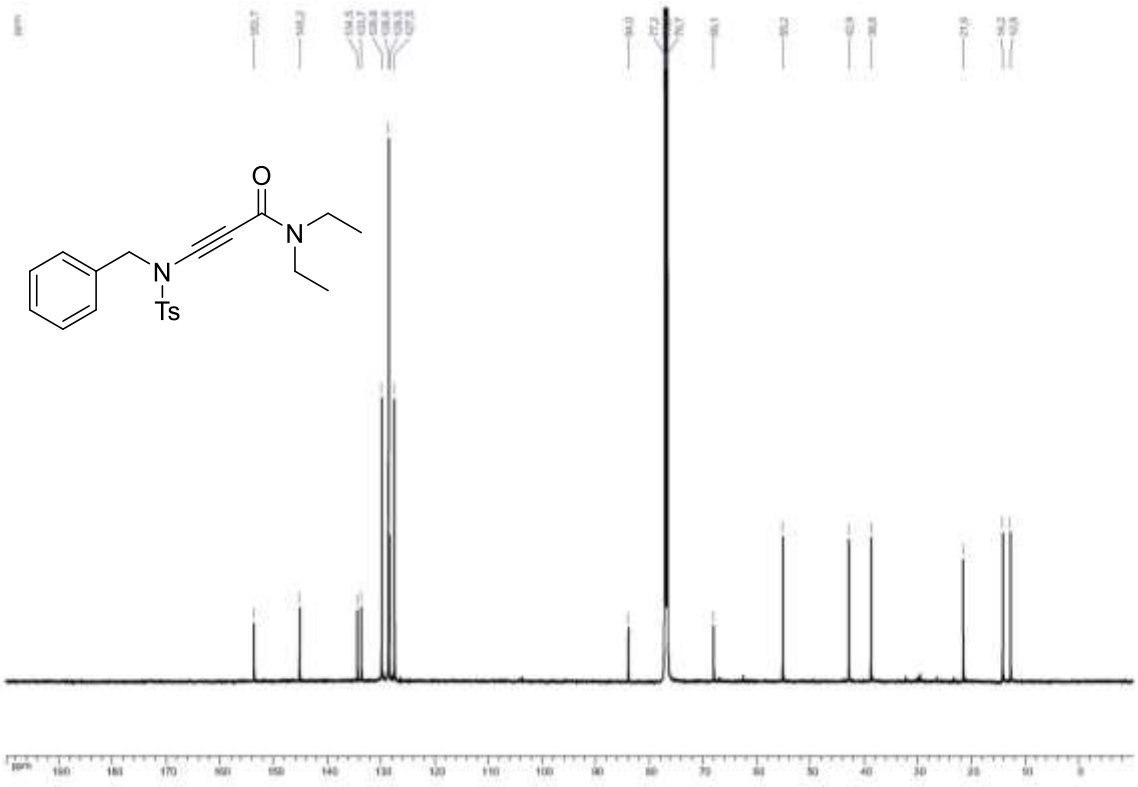
^{1}H NMR ($CDCl_3$, 500 MHz) of **11**



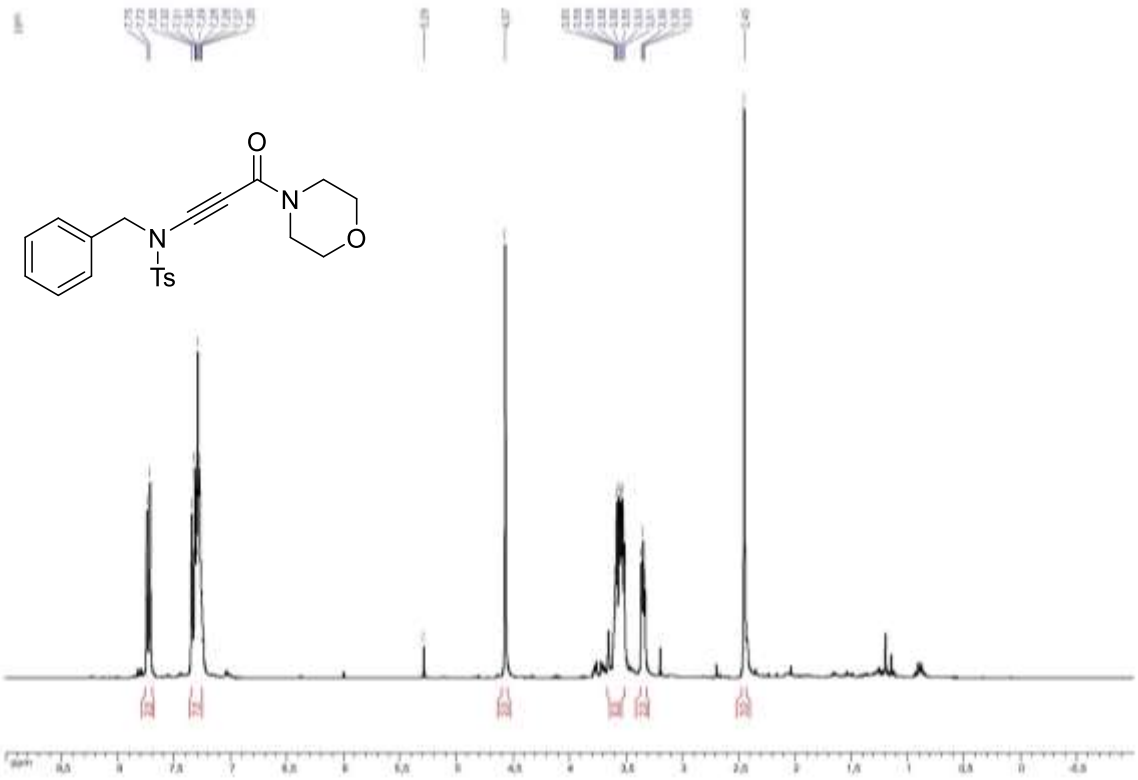
^{13}C NMR ($CDCl_3$, 125 MHz) of **11**



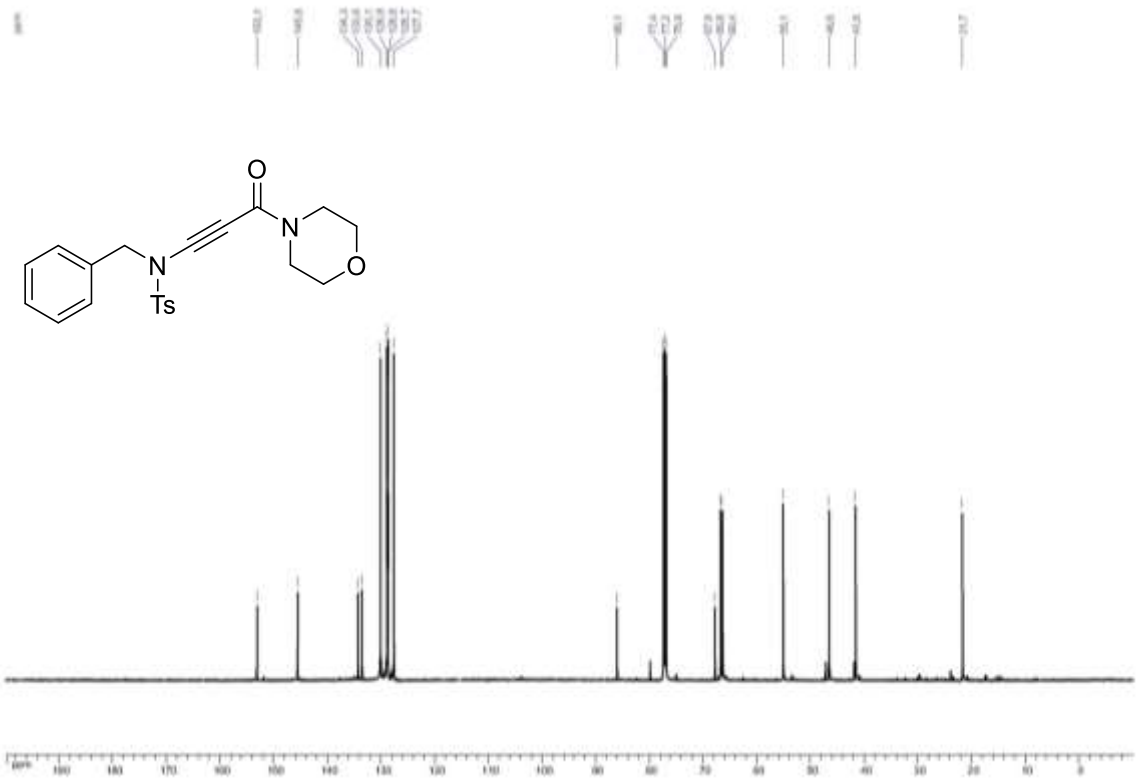
^{1}H NMR ($CDCl_3$, 500 MHz) of **12**



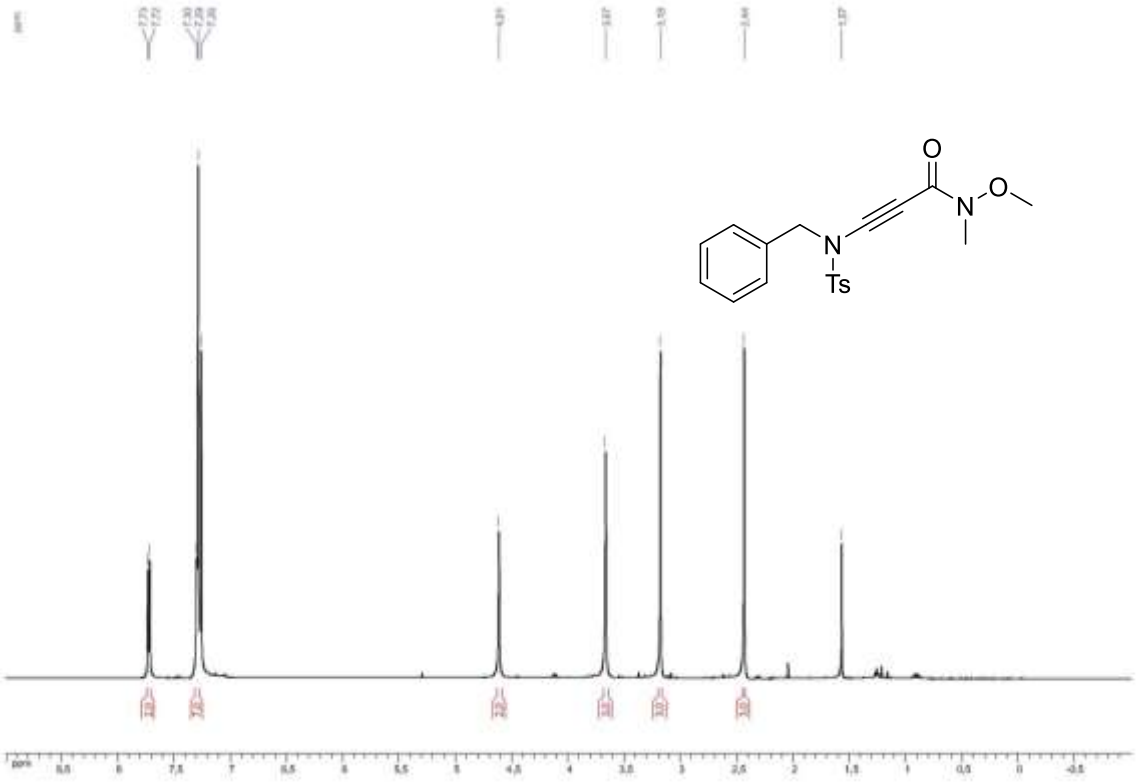
^{13}C NMR ($CDCl_3$, 125 MHz) of **12**



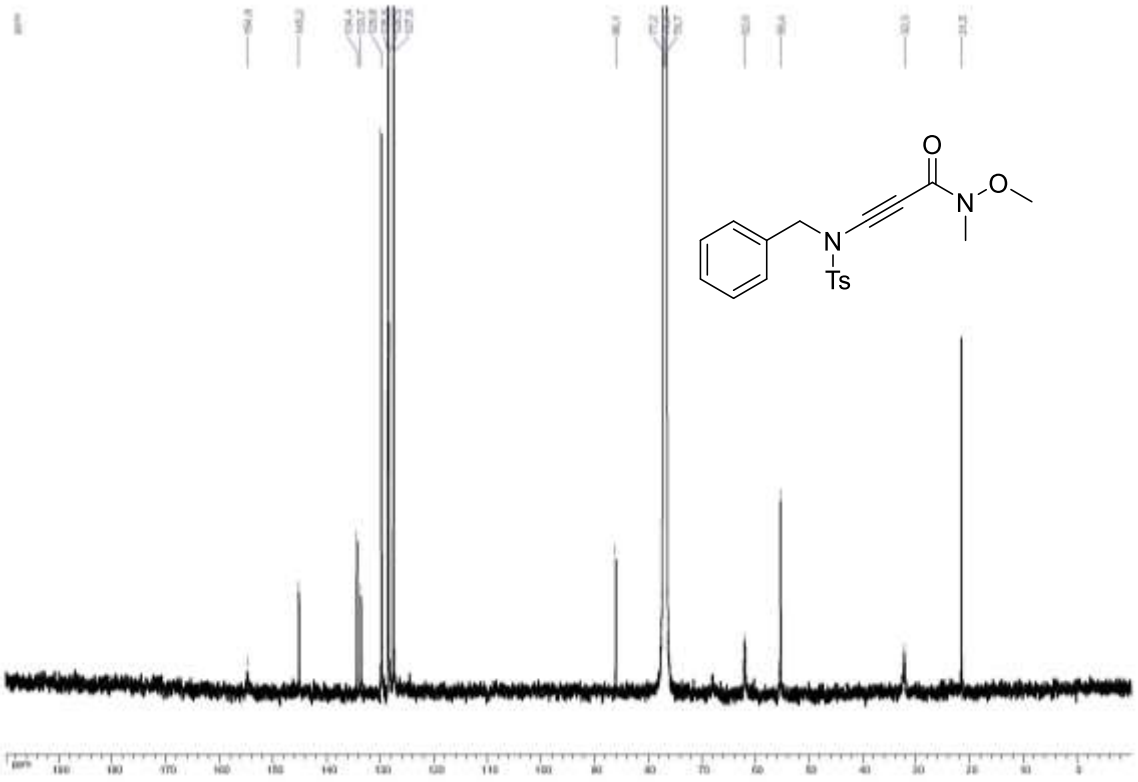
^{1}H NMR ($CDCl_3$, 500 MHz) of **13**



^{13}C NMR ($CDCl_3$, 125 MHz) of **13**

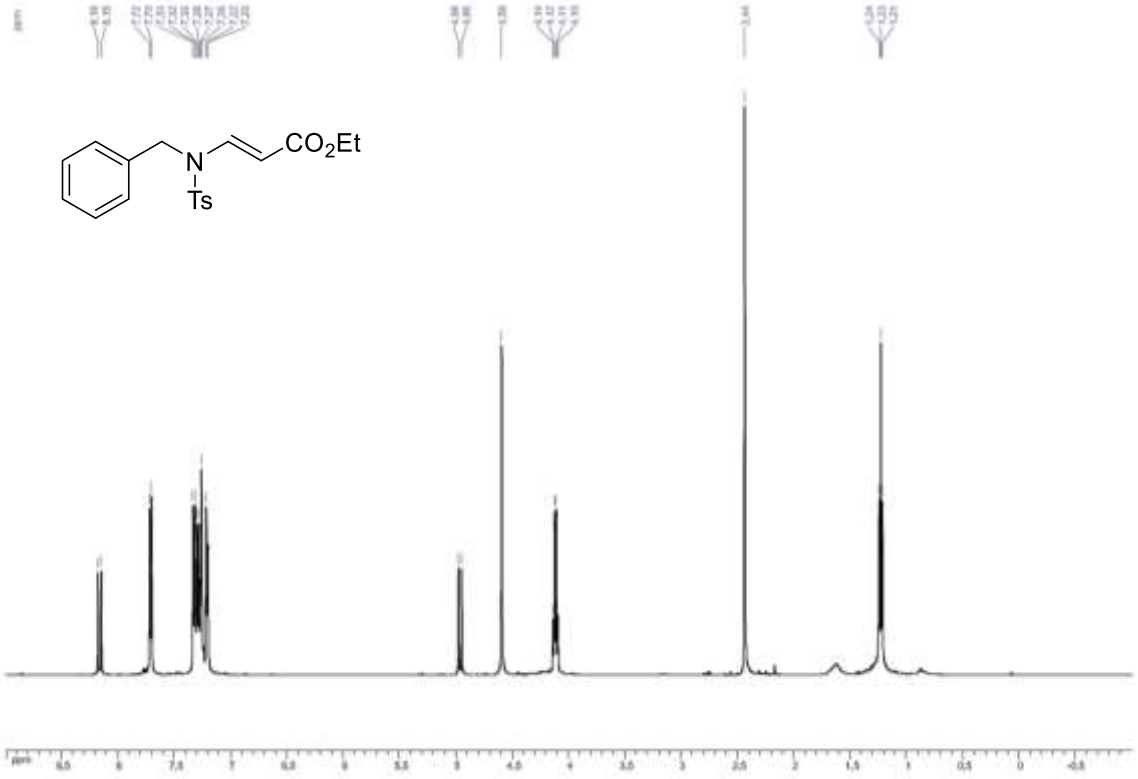


^{1}H NMR ($CDCl_3$, 500 MHz) of **14**

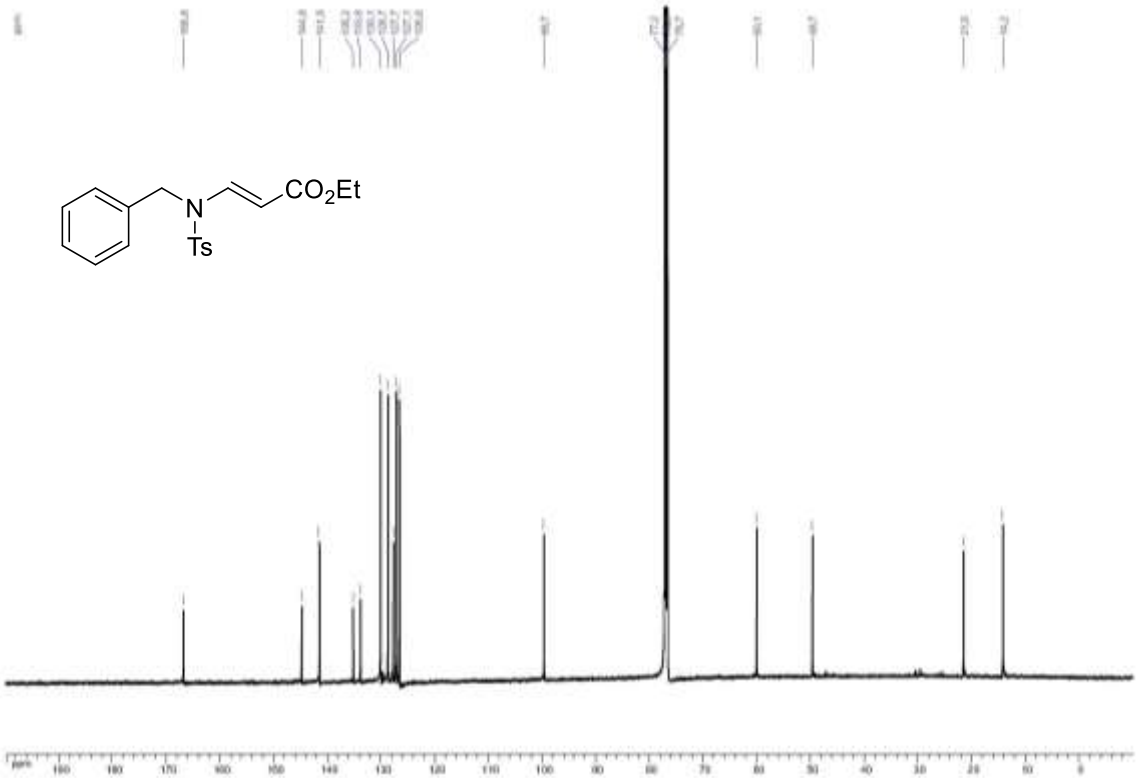


^{13}C NMR ($CDCl_3$, 125 MHz) of **14**

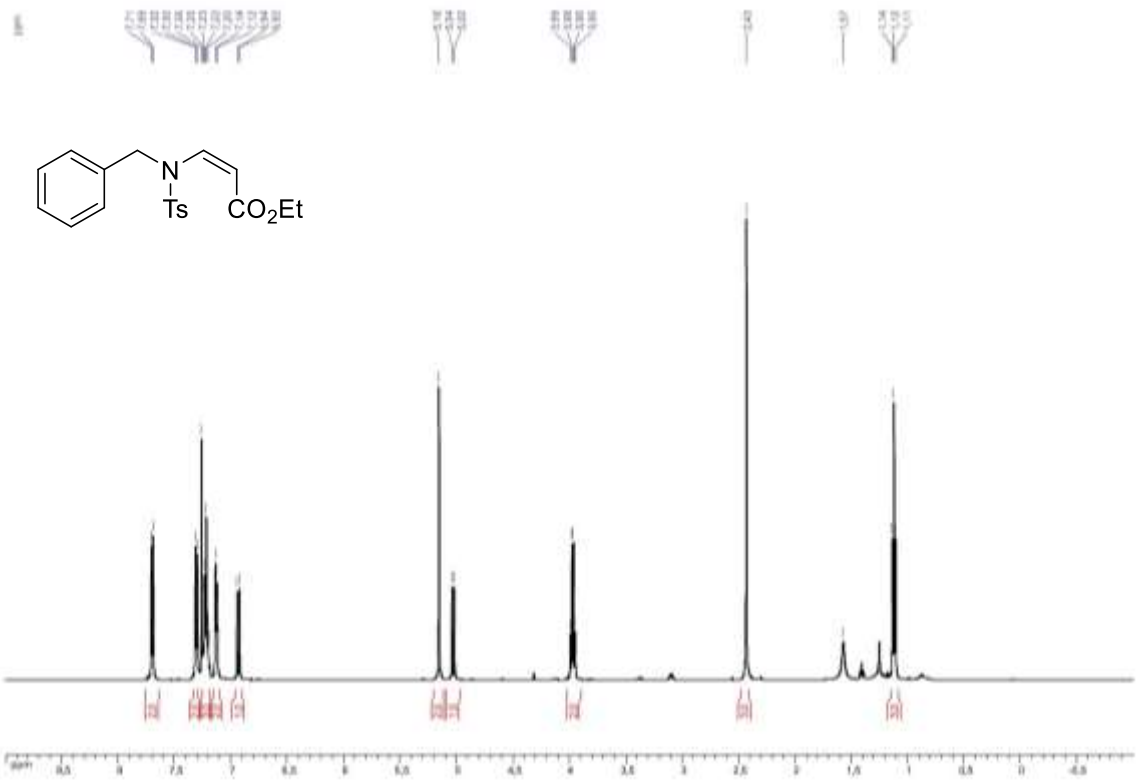
^{1}H and ^{13}C spectra for enesulfonamides 15/15' – 29/29'



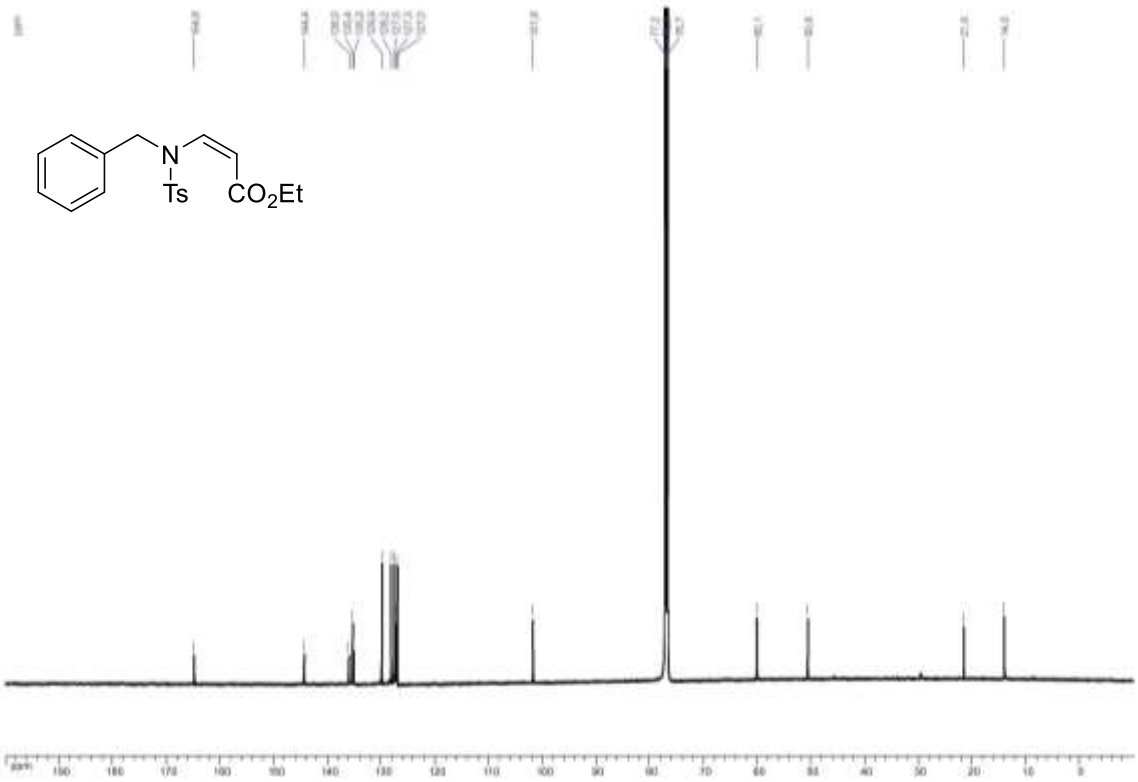
^{1}H NMR ($CDCl_3$, 500 MHz) of **15**



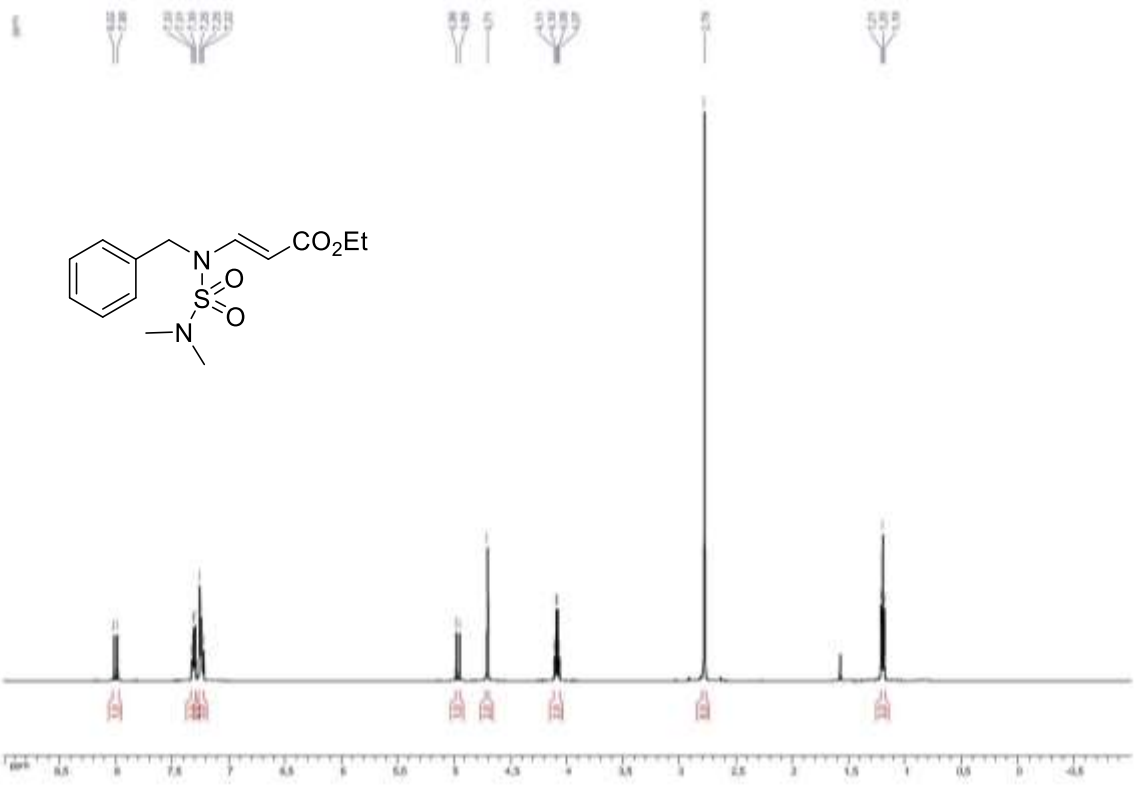
^{13}C NMR ($CDCl_3$, 125 MHz) of **15**



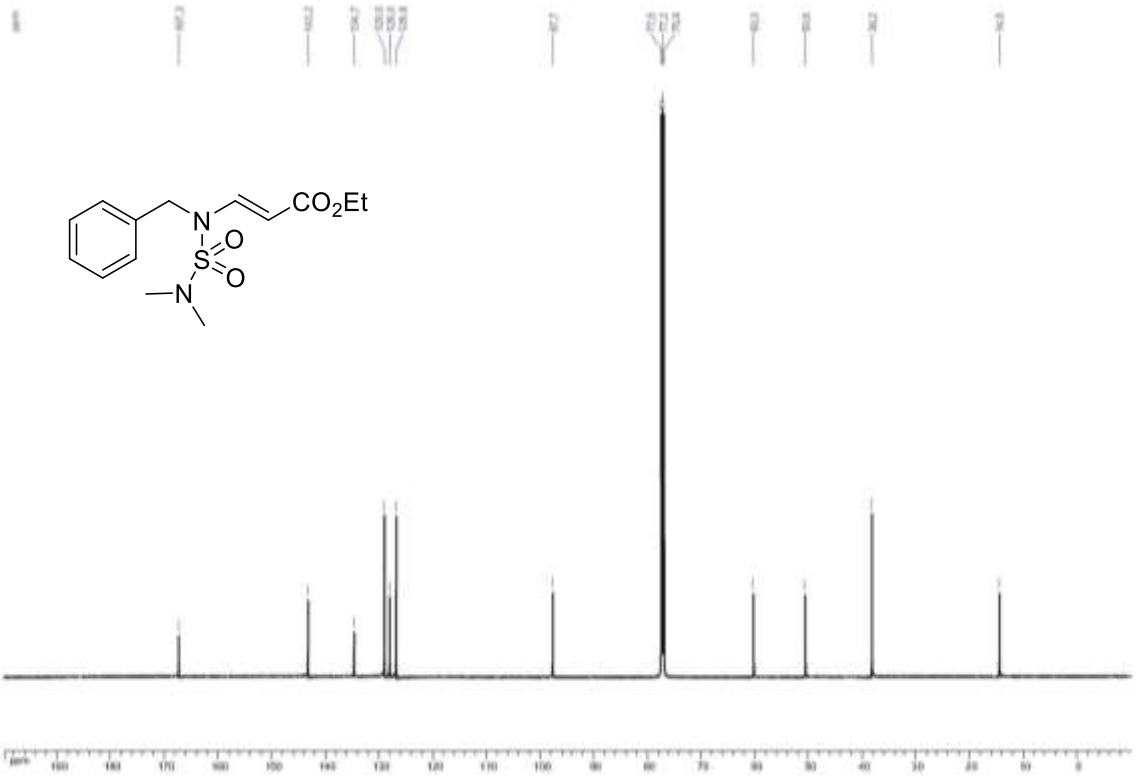
^{1}H NMR ($CDCl_3$, 500 MHz) of **15'**



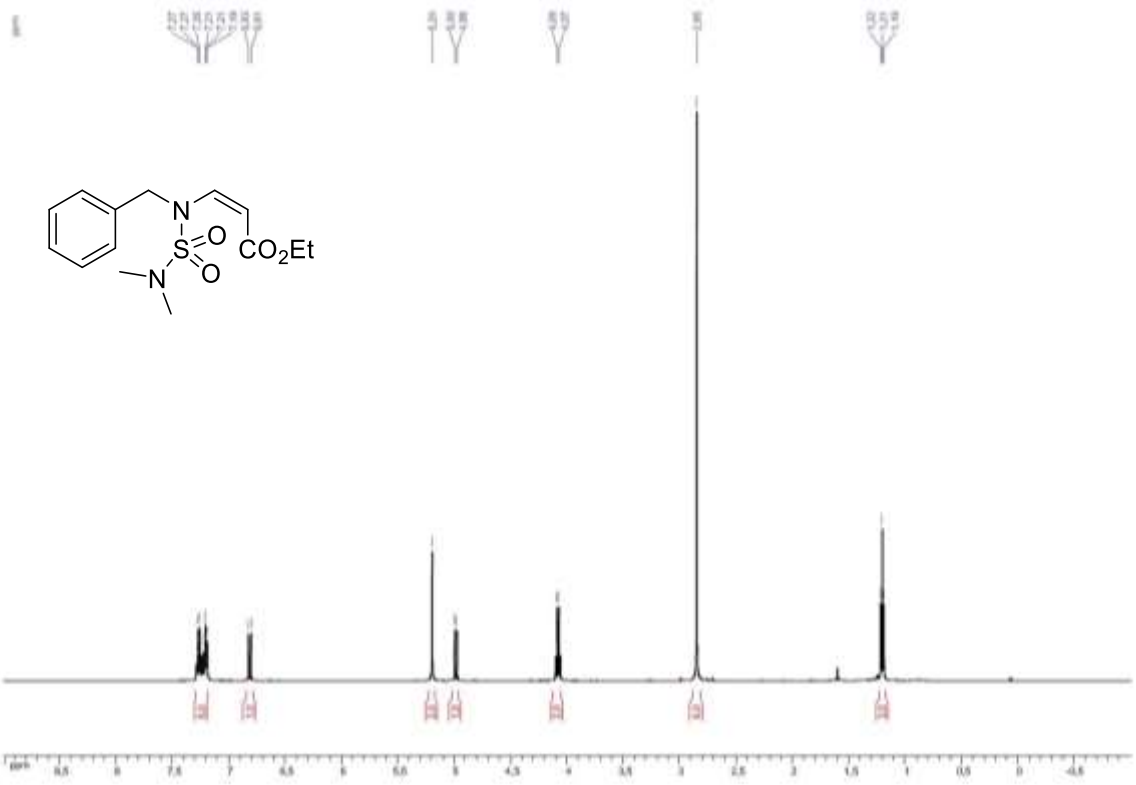
^{13}C NMR ($CDCl_3$, 125 MHz) of **15'**



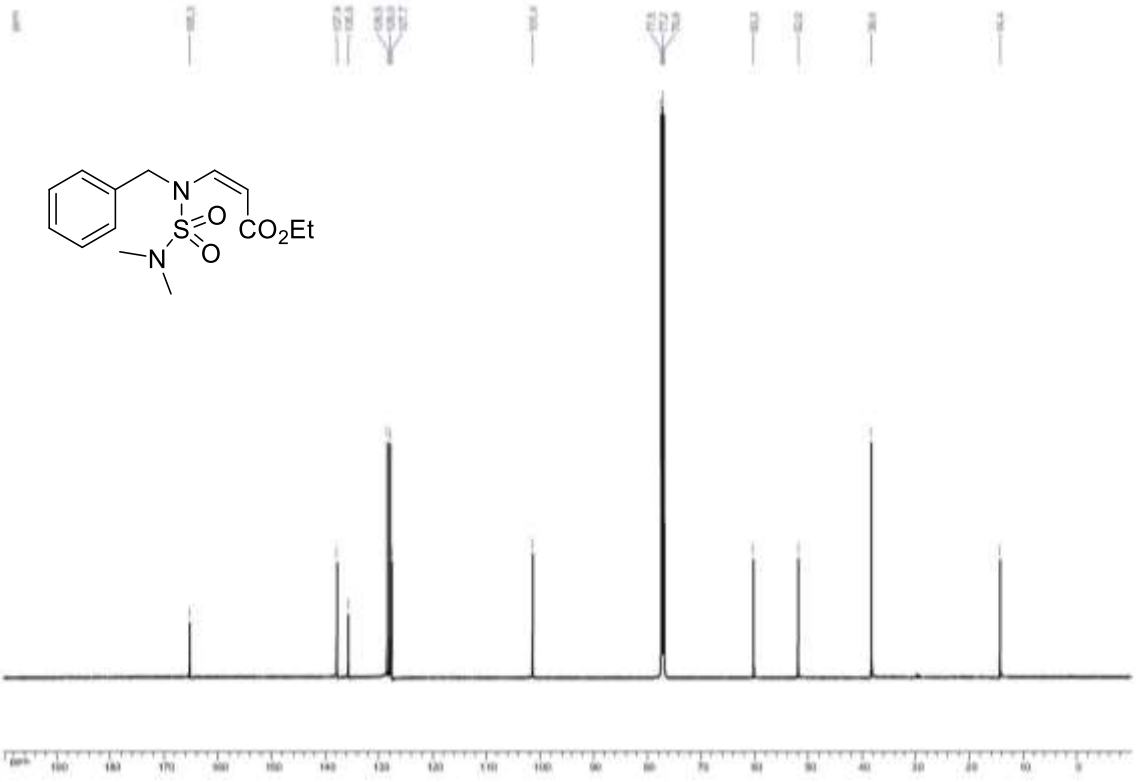
^{1}H NMR ($CDCl_3$, 500 MHz) of **16**



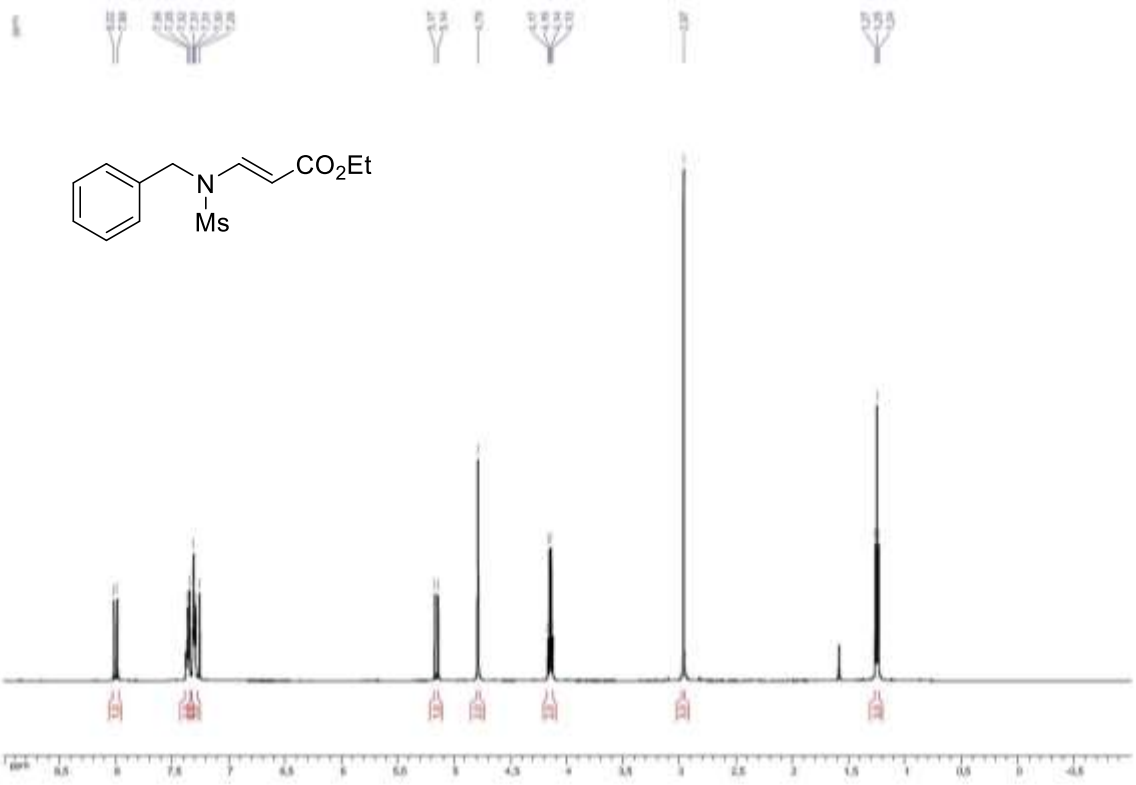
^{13}C NMR ($CDCl_3$, 125 MHz) of **16**



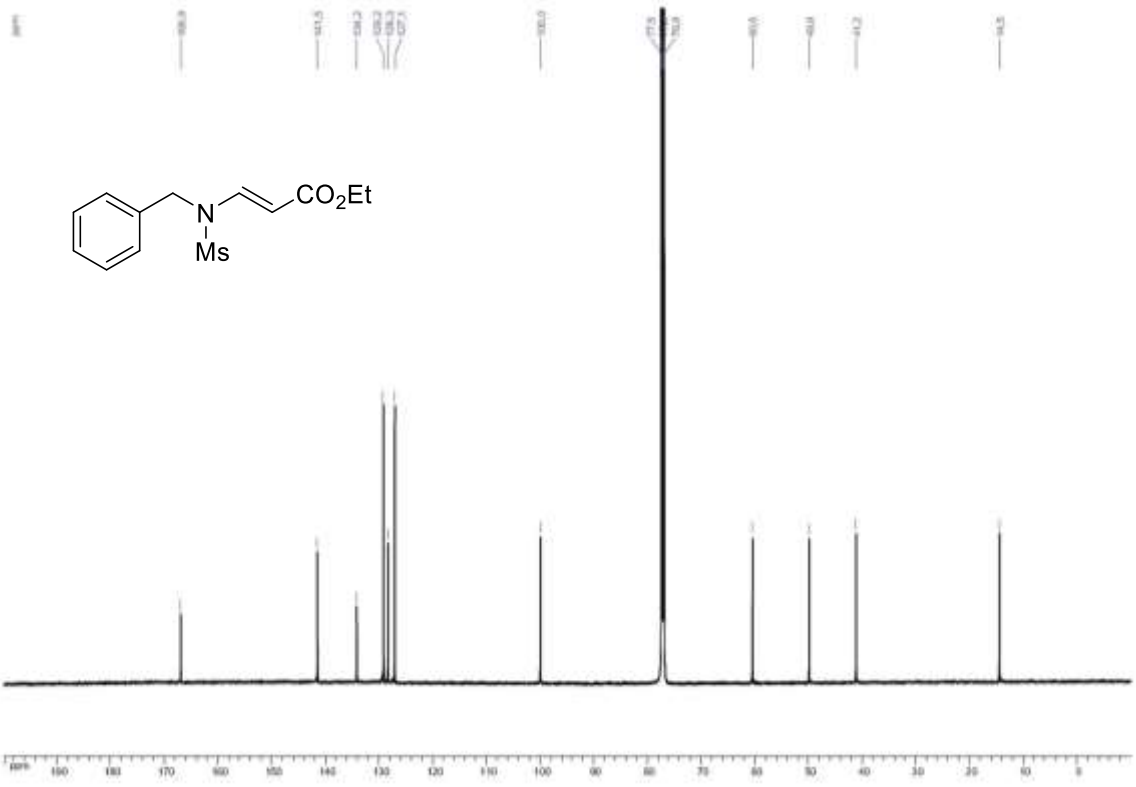
^{1}H NMR ($CDCl_3$, 500 MHz) of **16'**



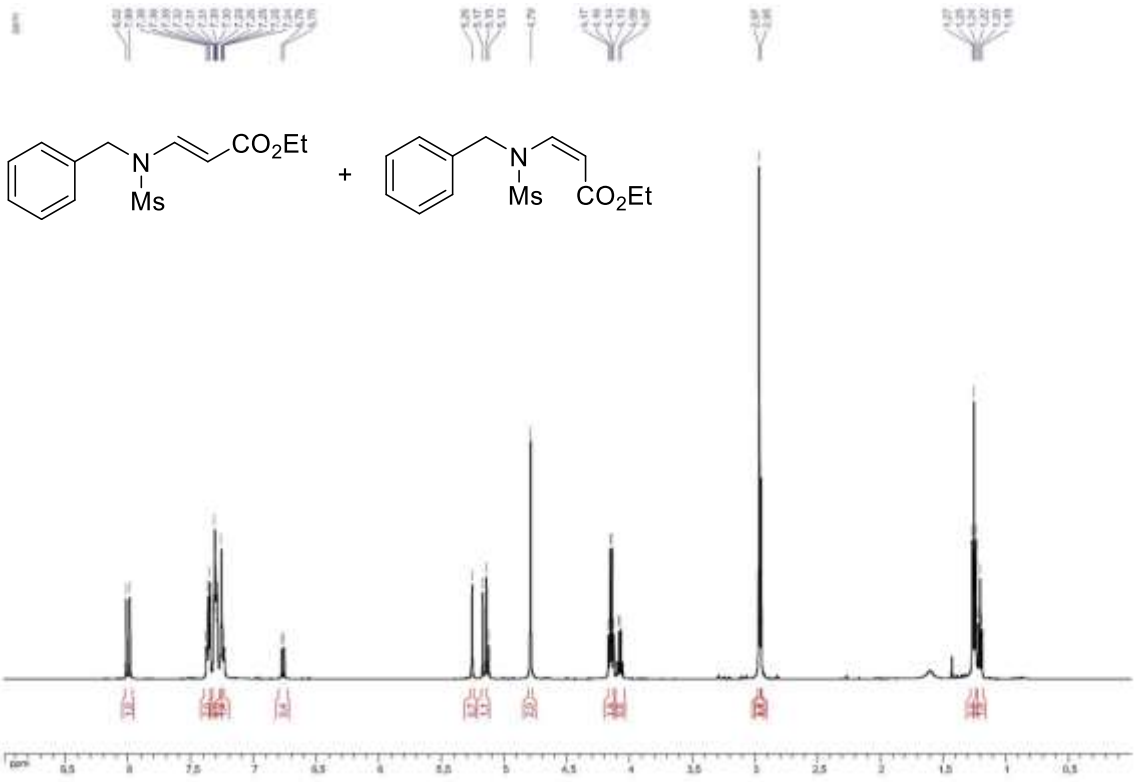
^{13}C NMR ($CDCl_3$, 125 MHz) of **16'**



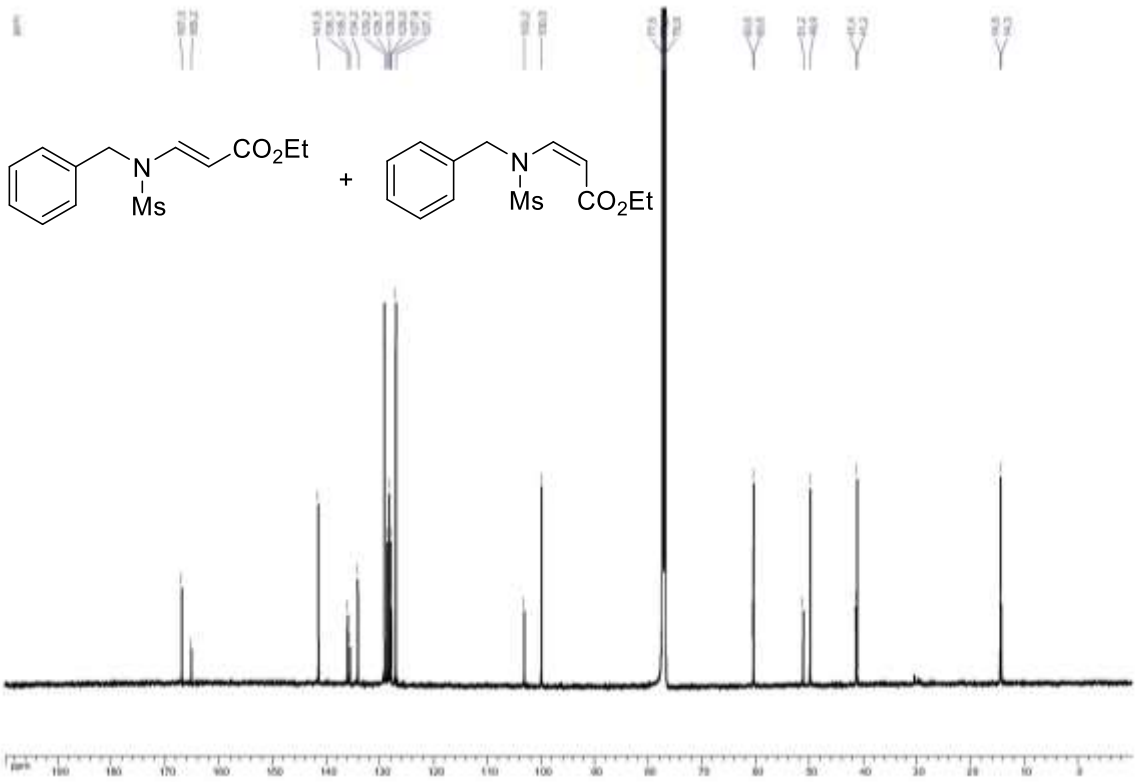
^{1}H NMR ($CDCl_3$, 500 MHz) of **17**



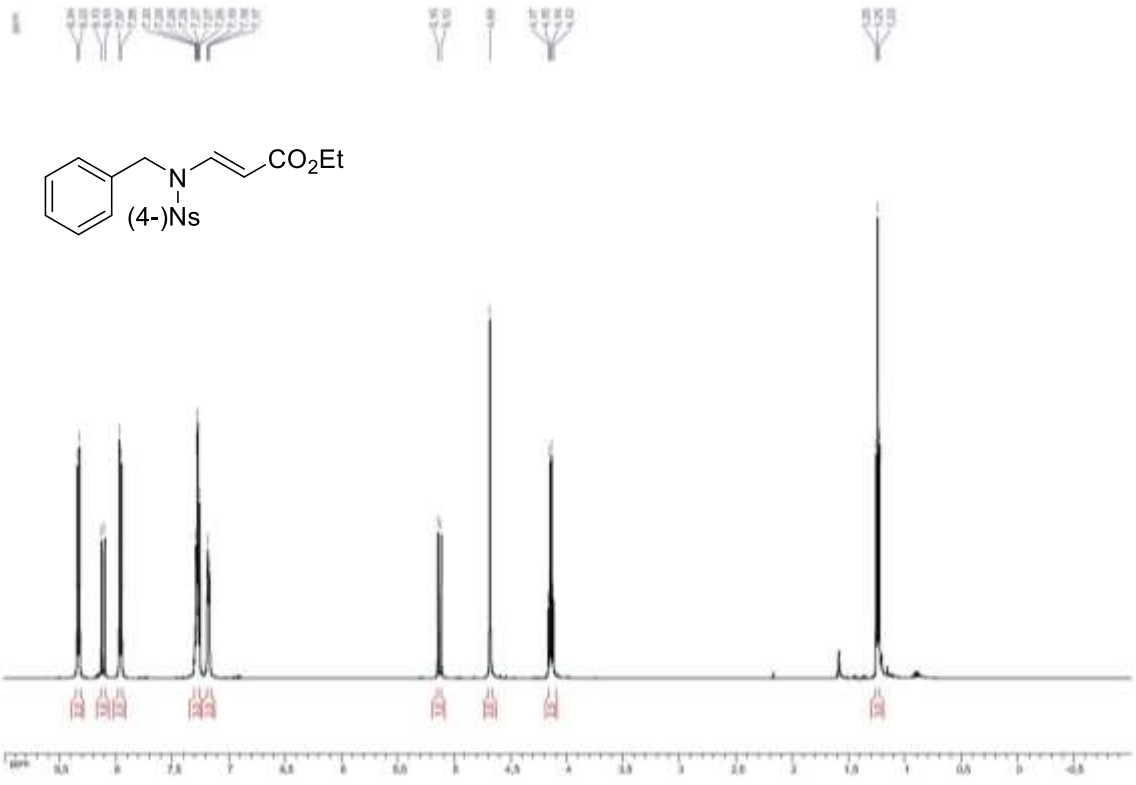
^{13}C NMR ($CDCl_3$, 125 MHz) of **17**



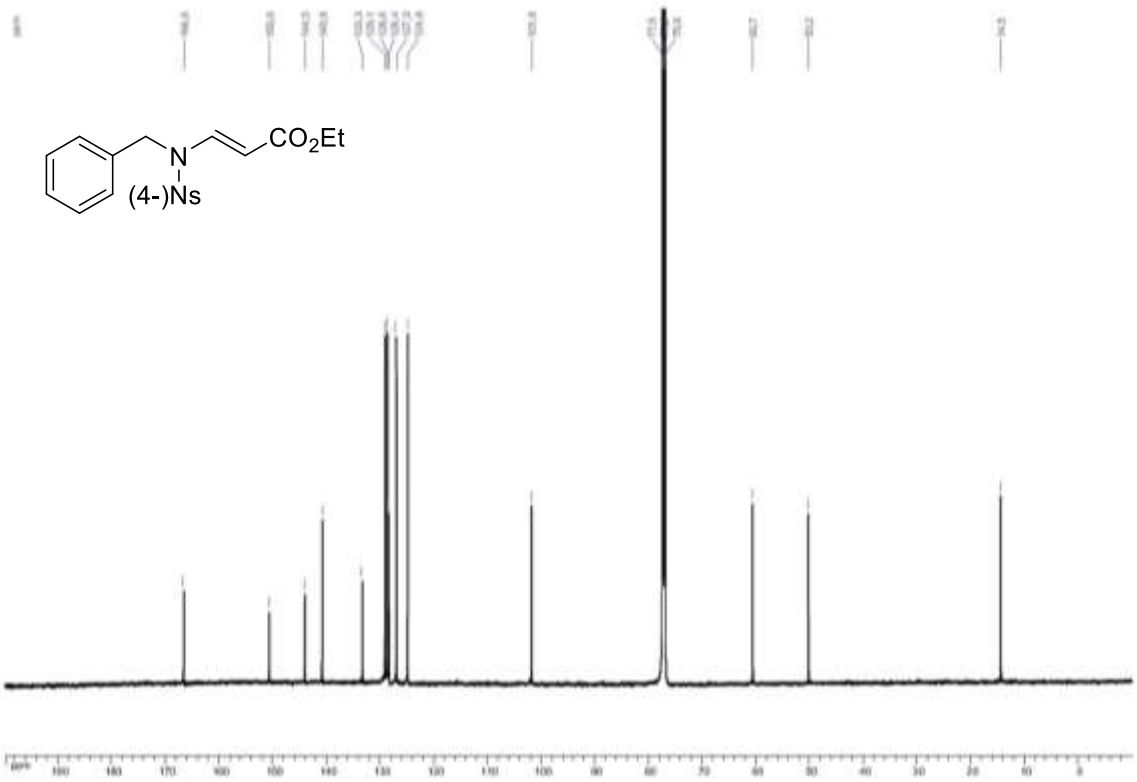
^{1}H NMR ($CDCl_3$, 500 MHz) of **17/17'**



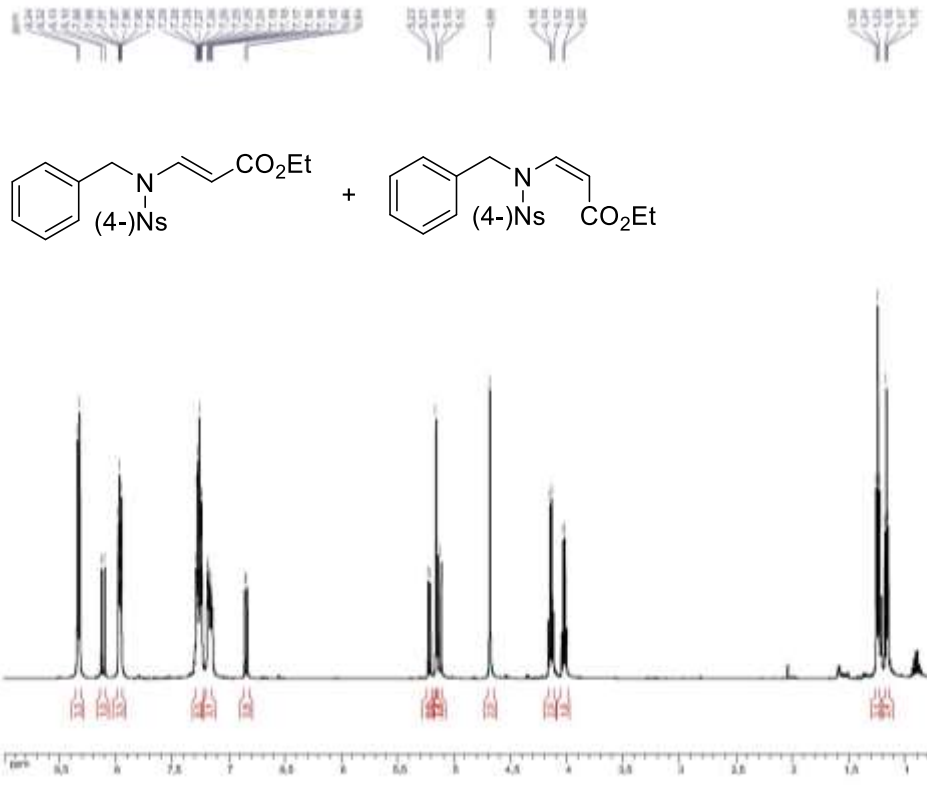
^{13}C NMR ($CDCl_3$, 125 MHz) of **17/17'**



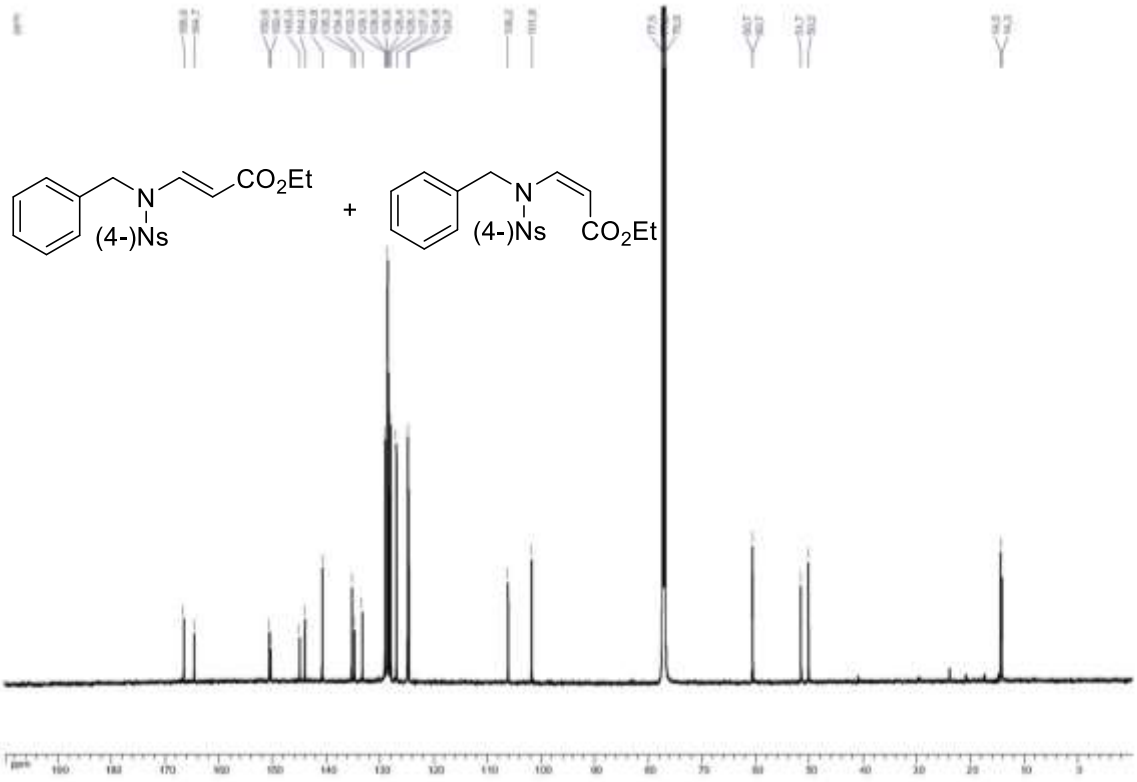
^{1}H NMR ($CDCl_3$, 500 MHz) of **18**



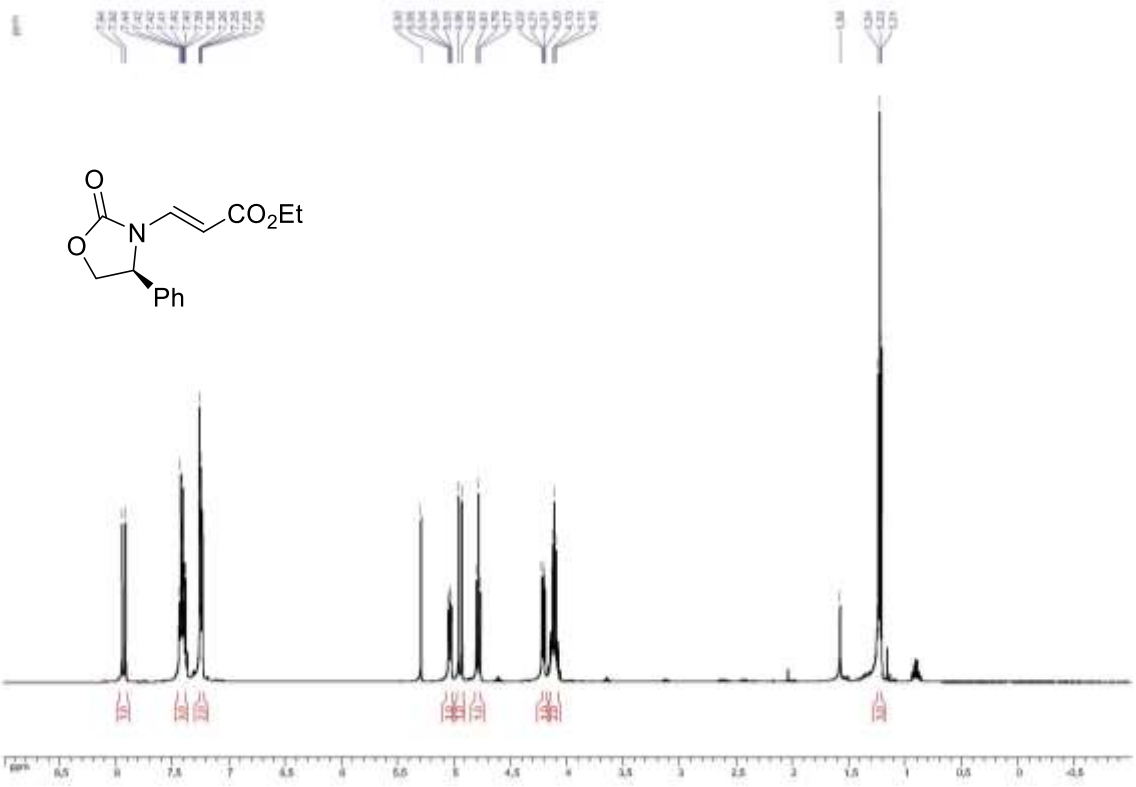
^{13}C NMR ($CDCl_3$, 125 MHz) of **18**



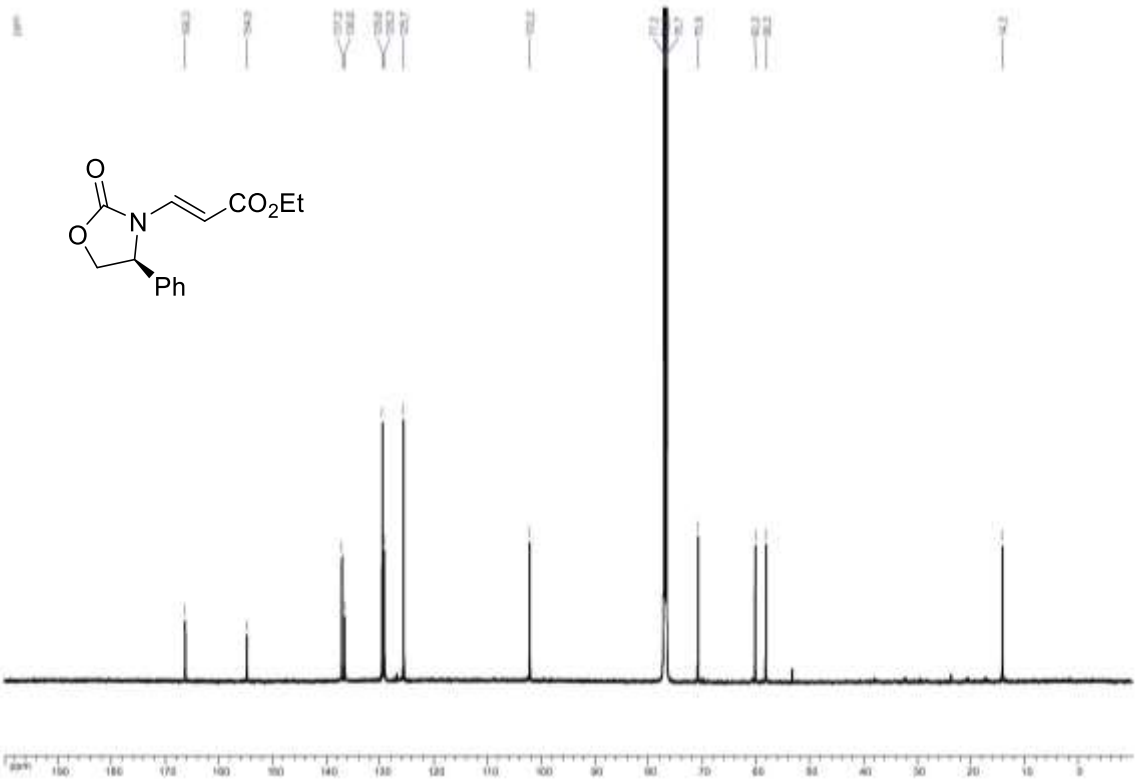
^{1}H NMR ($CDCl_3$, 500 MHz) of **18/18'**



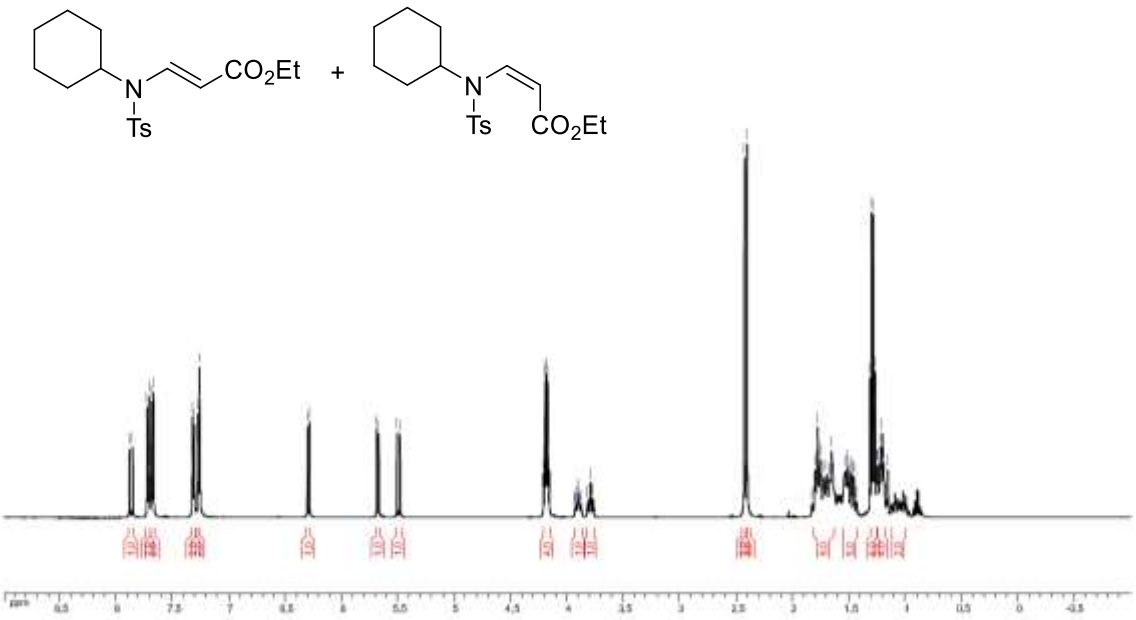
^{13}C NMR ($CDCl_3$, 125 MHz) of **18/18'**



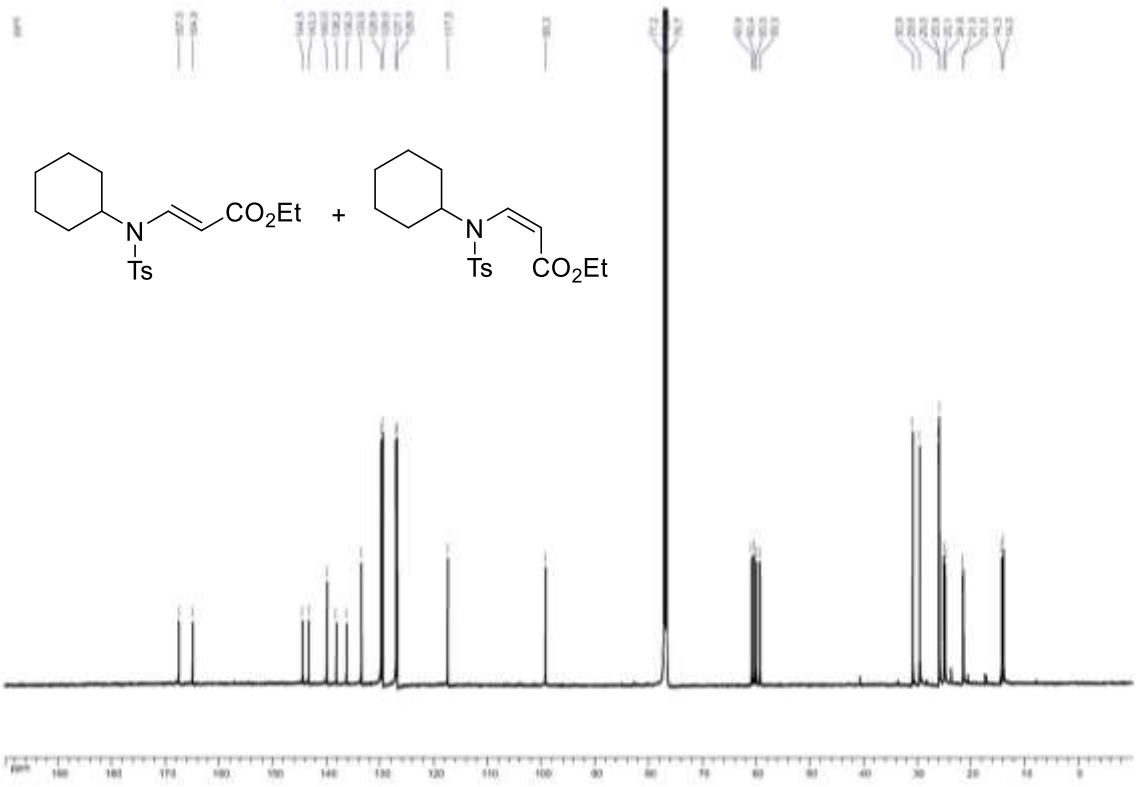
^{1}H NMR ($CDCl_3$, 500 MHz) of **19**



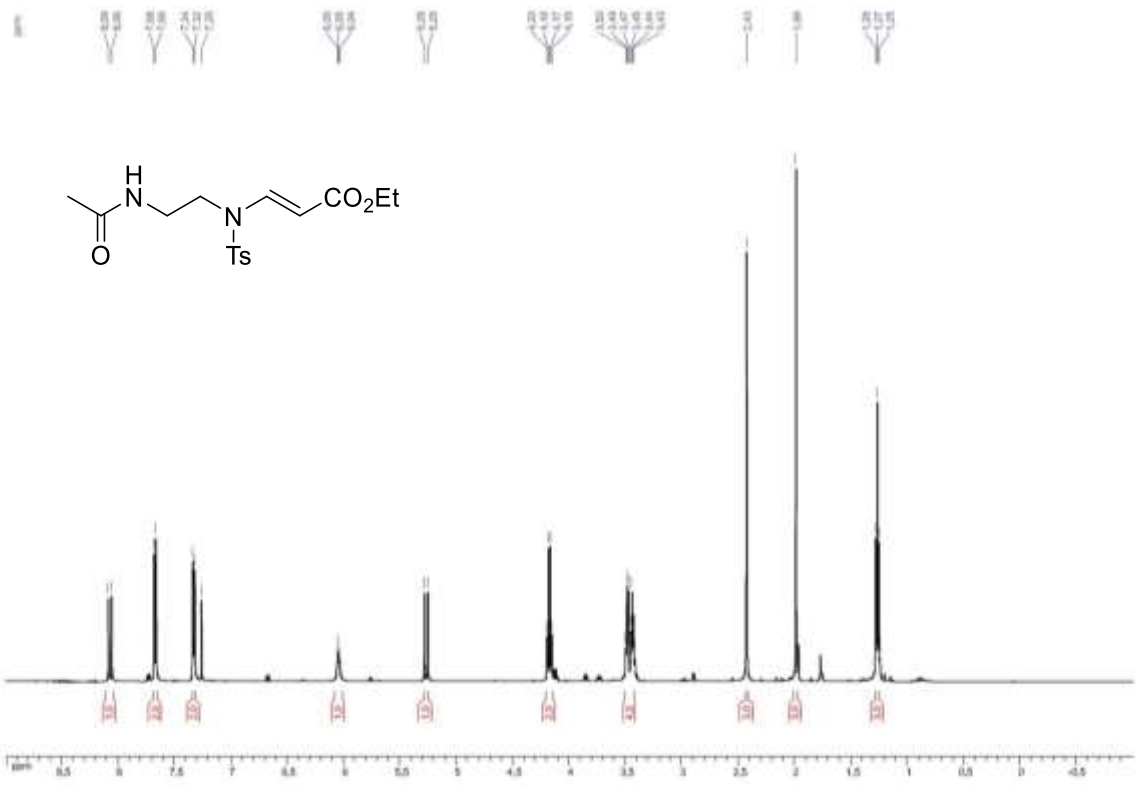
^{13}C NMR ($CDCl_3$, 125 MHz) of **19**



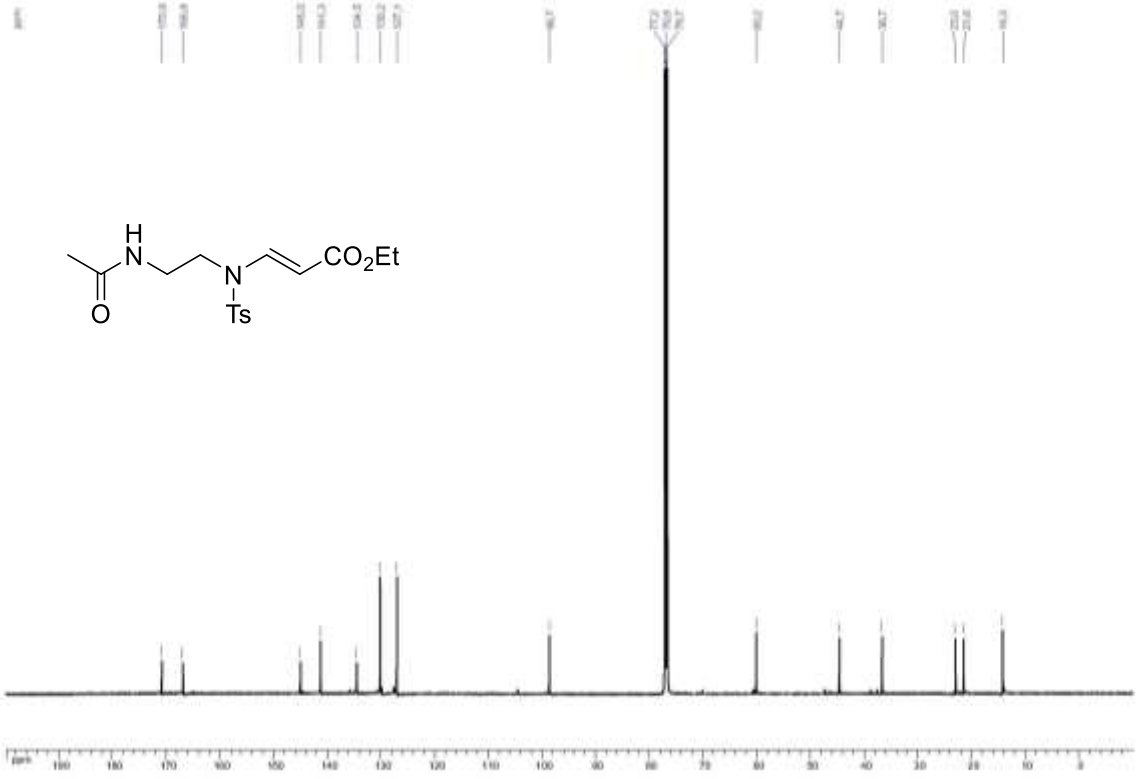
^{1}H NMR ($CDCl_3$, 500 MHz) of **21/21'**



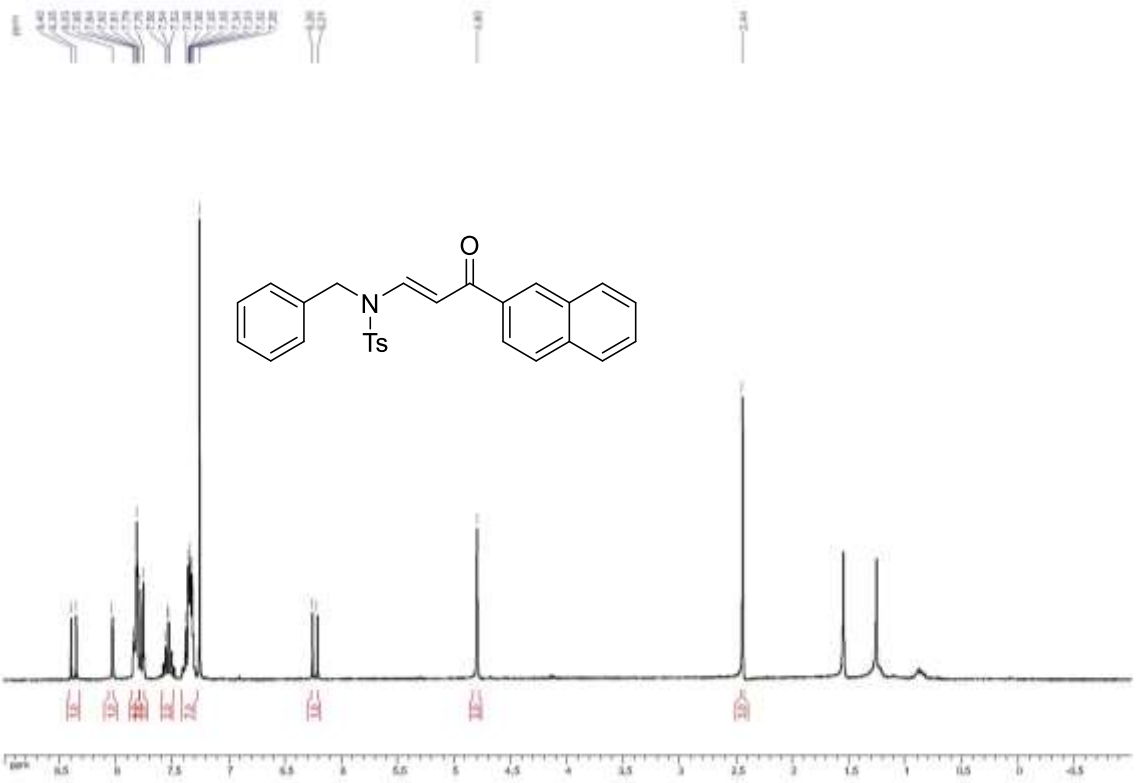
^{13}C NMR ($CDCl_3$, 125 MHz) of **21/21'**



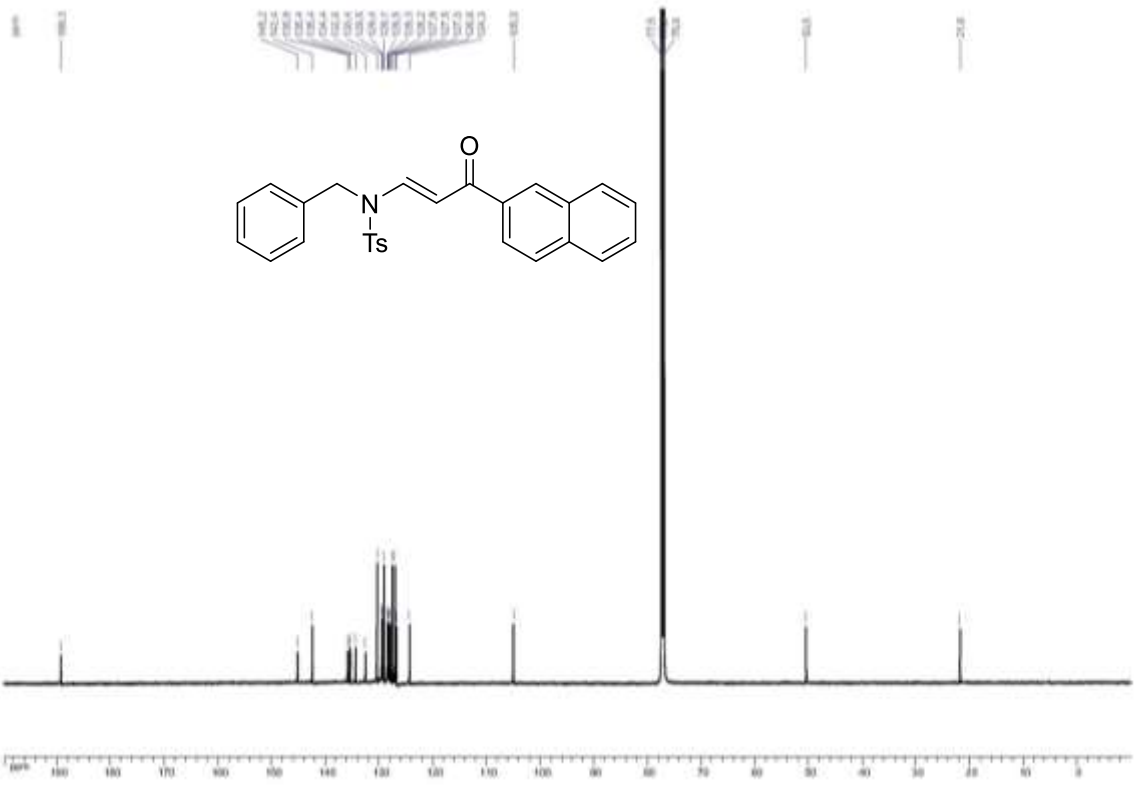
^{1}H NMR ($CDCl_3$, 500 MHz) of **22**



^{13}C NMR ($CDCl_3$, 125 MHz) of **22**

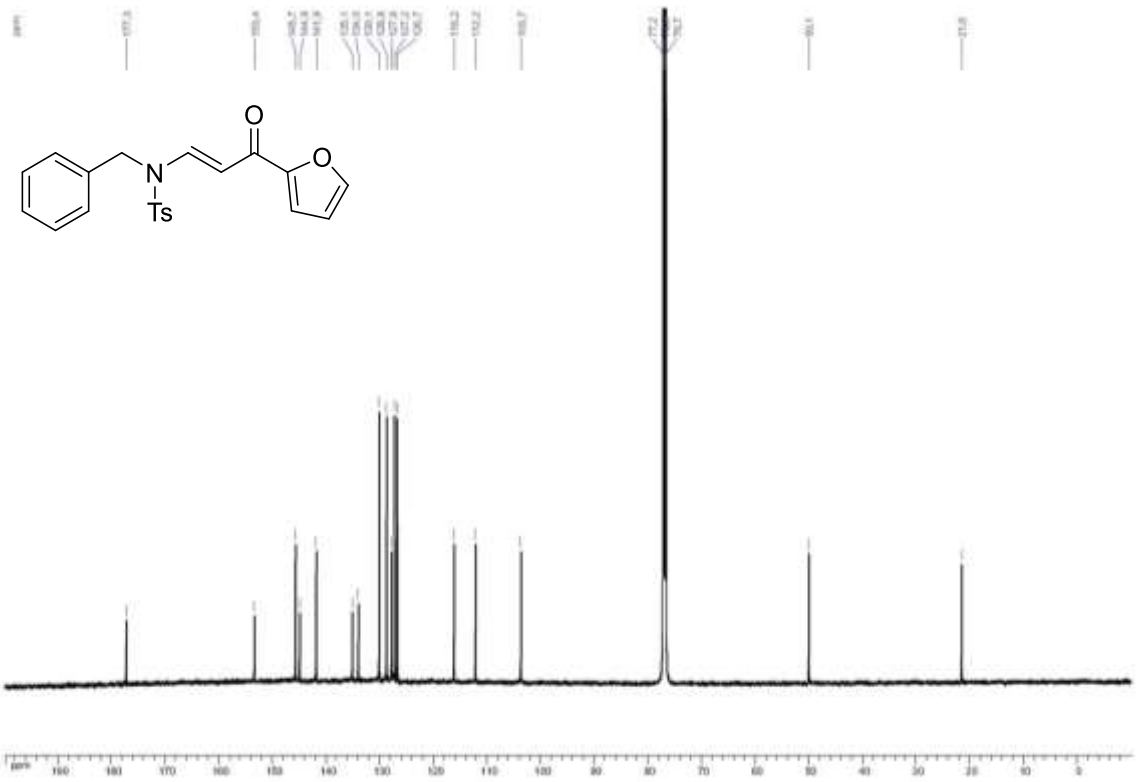


^{1}H NMR ($CDCl_3$, 500 MHz) of **24**

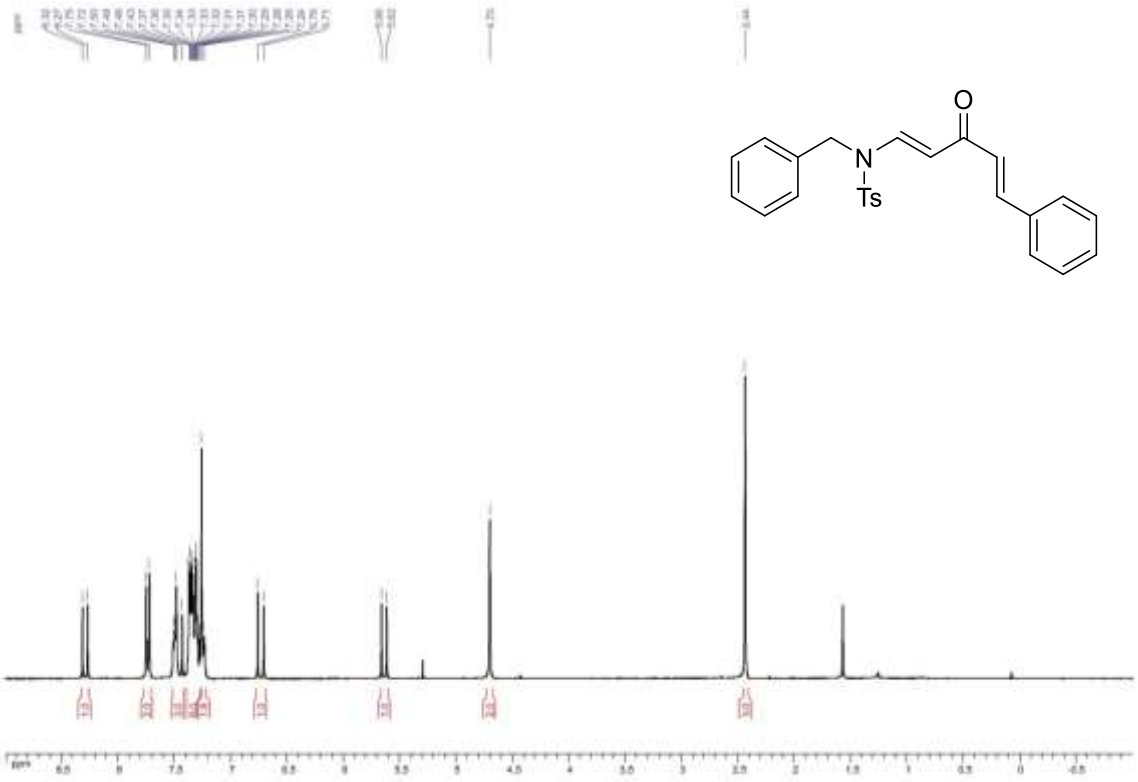


^{13}C NMR ($CDCl_3$, 125 MHz) of **24**

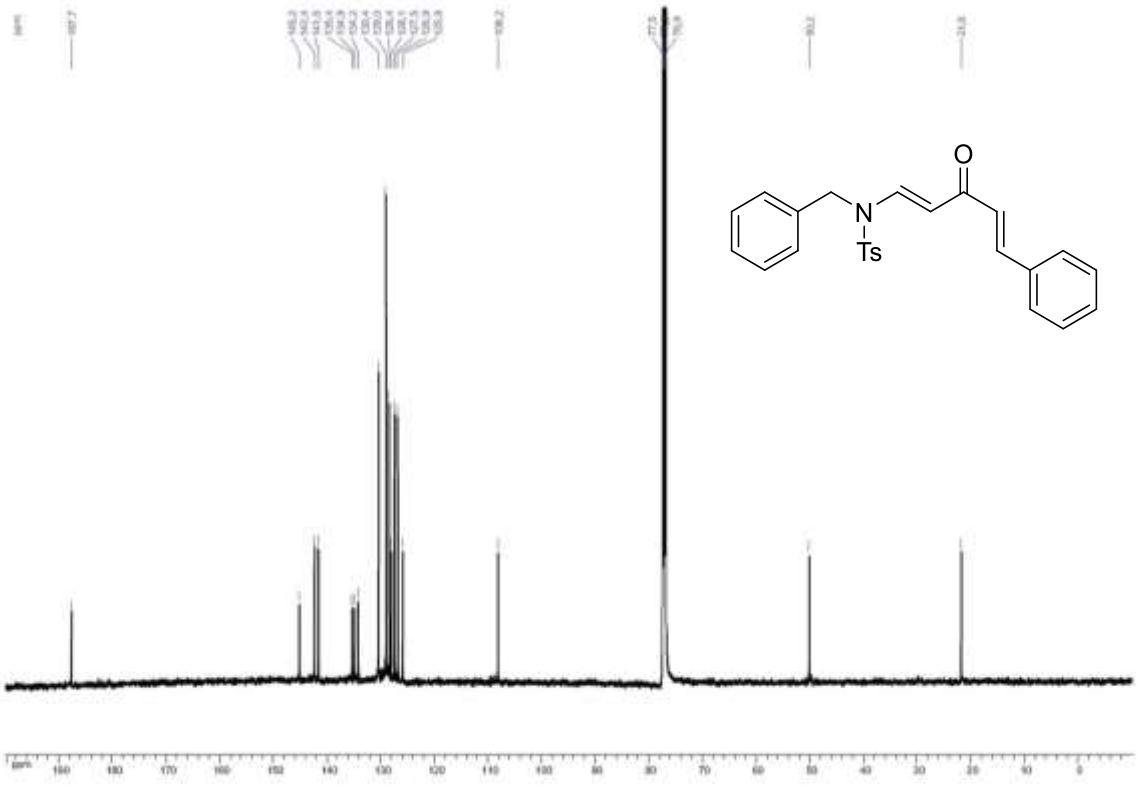
^{1}H NMR ($CDCl_3$, 500 MHz) of **25**



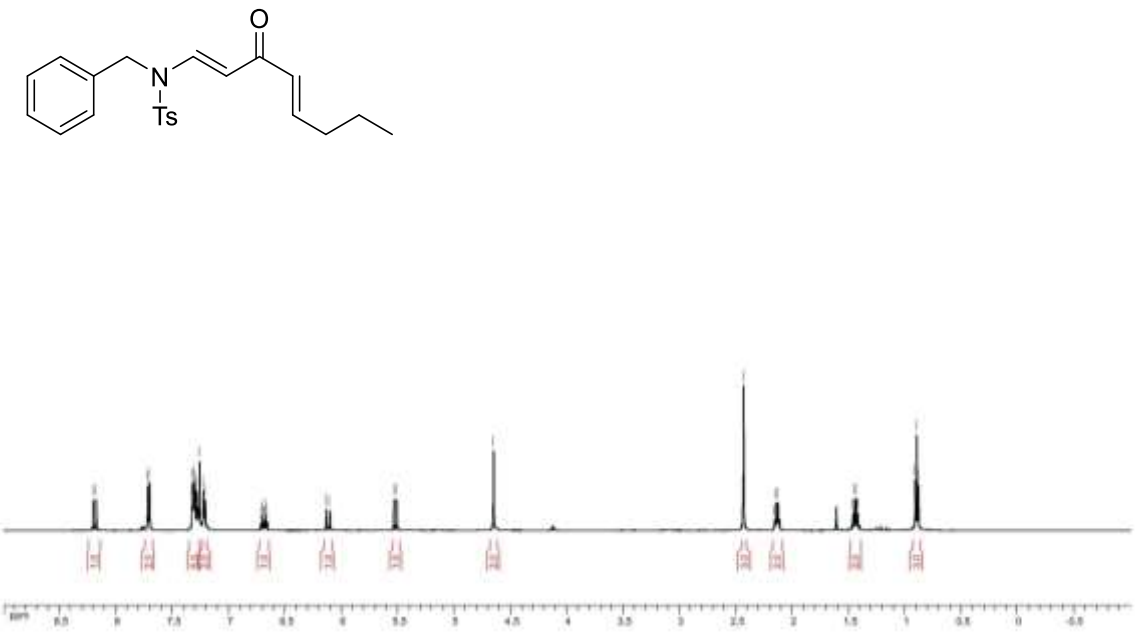
^{13}C NMR ($CDCl_3$, 125 MHz) of **25**



^{1}H NMR ($CDCl_3$, 500 MHz) of **26**

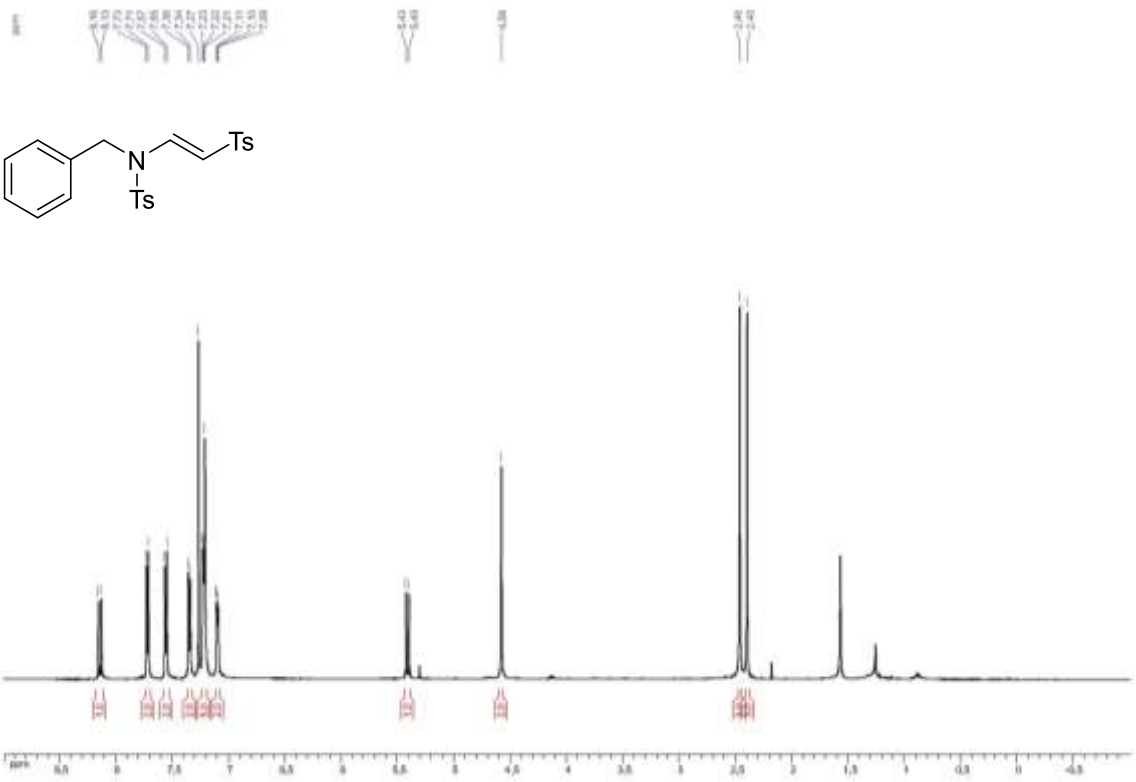


^{13}C NMR ($CDCl_3$, 125 MHz) of **26**

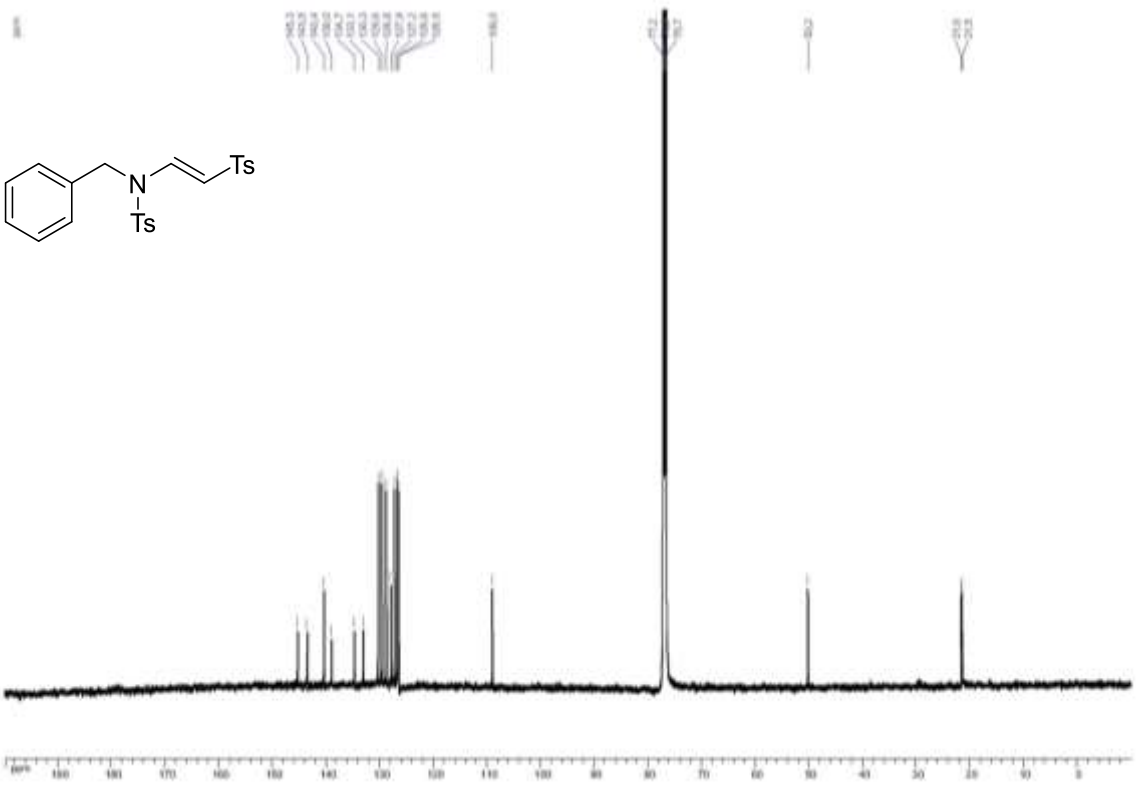


^{1}H NMR ($CDCl_3$, 500 MHz) of **27**

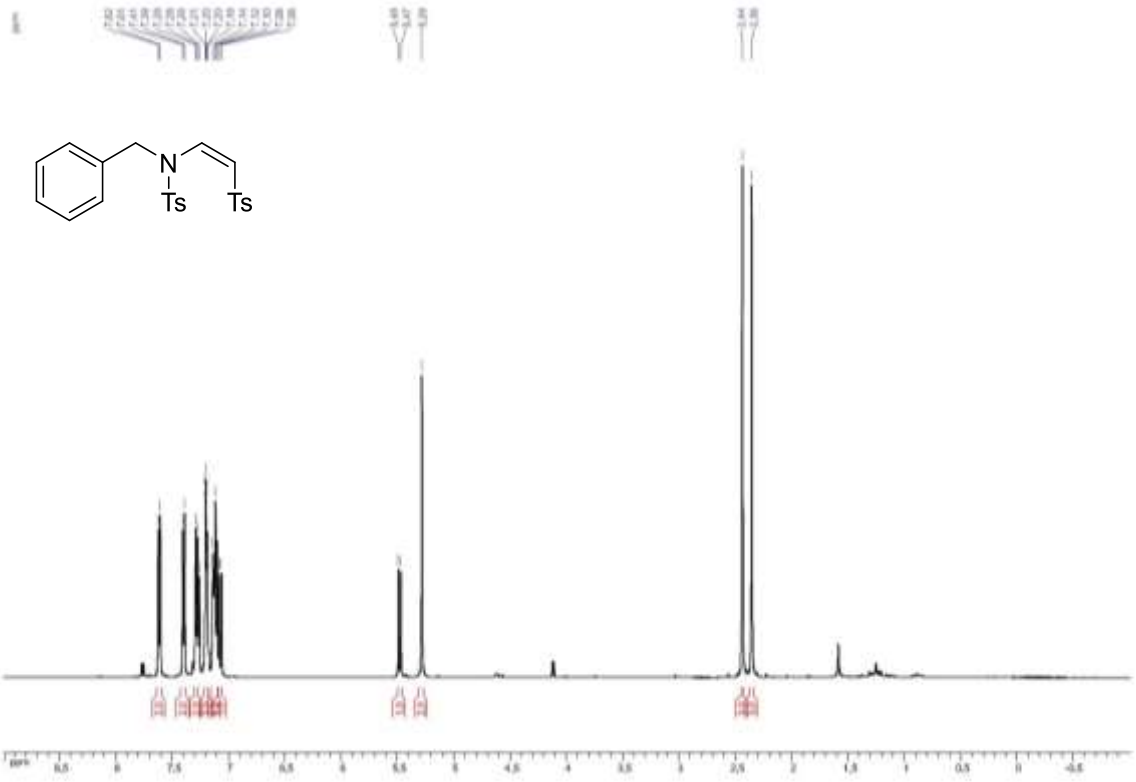
^{13}C NMR ($CDCl_3$, 125 MHz) of **27**



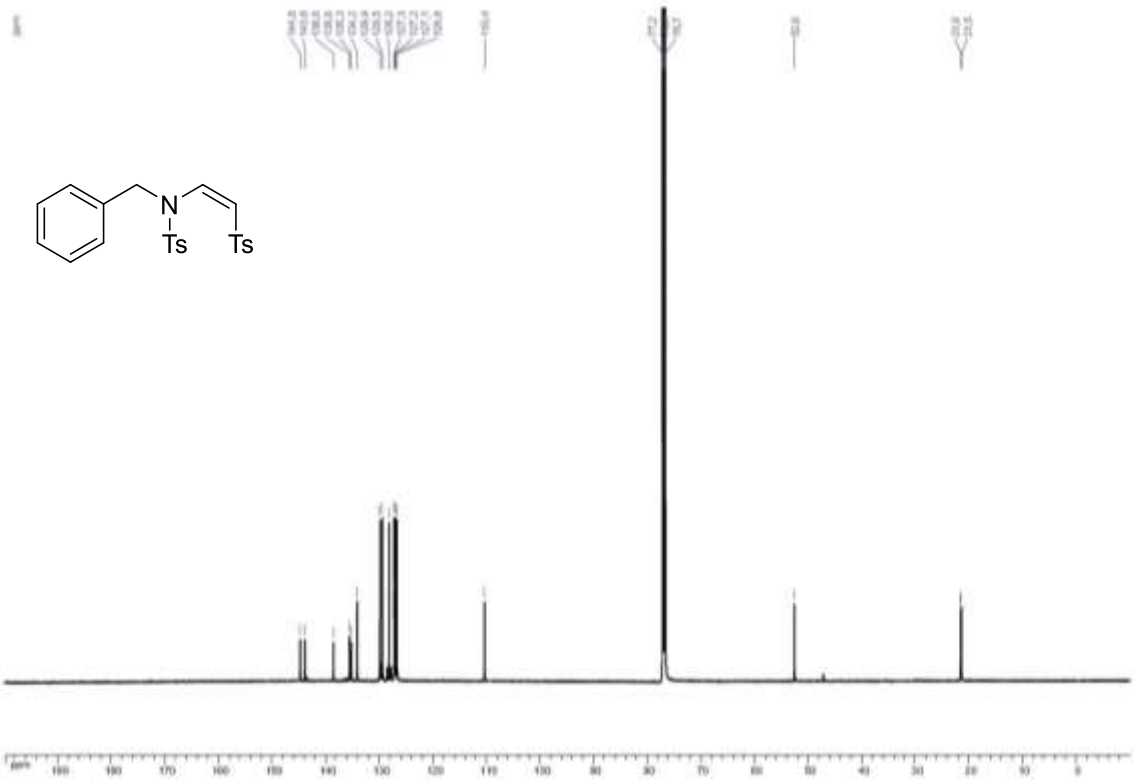
^{1}H NMR ($CDCl_3$, 500 MHz) of **28**



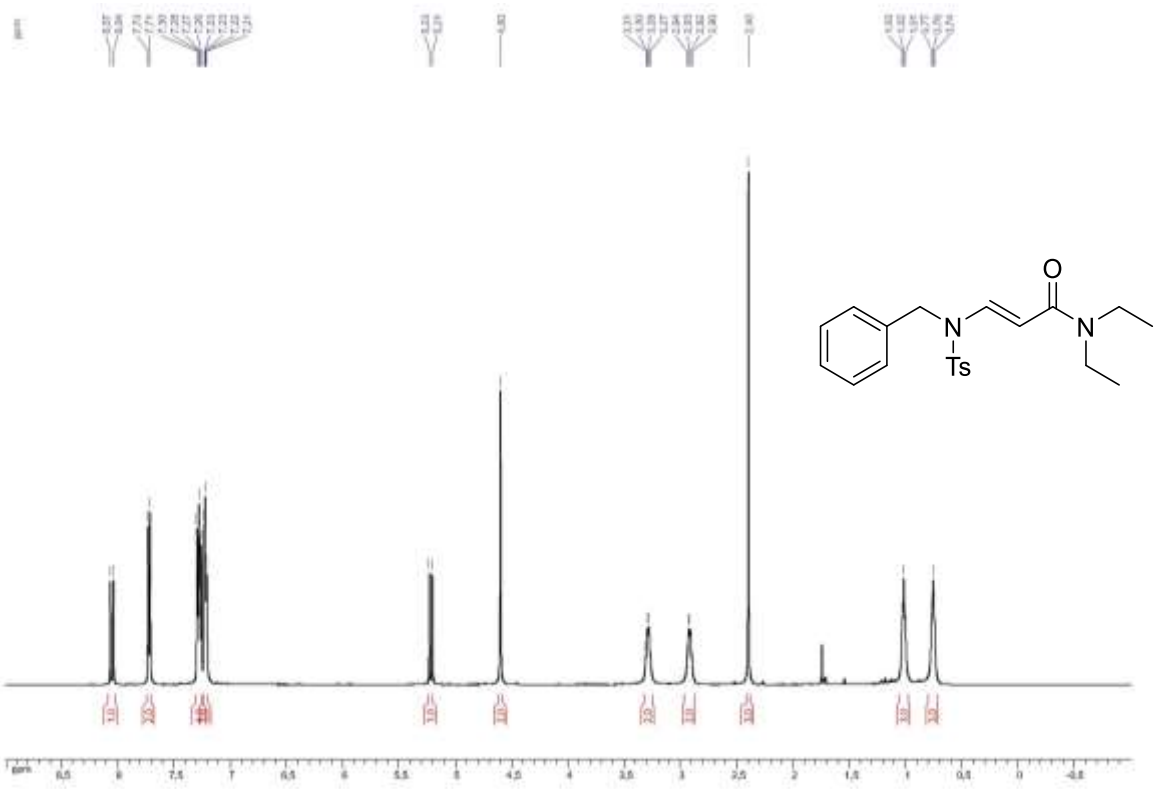
^{13}C NMR ($CDCl_3$, 125 MHz) of **28**



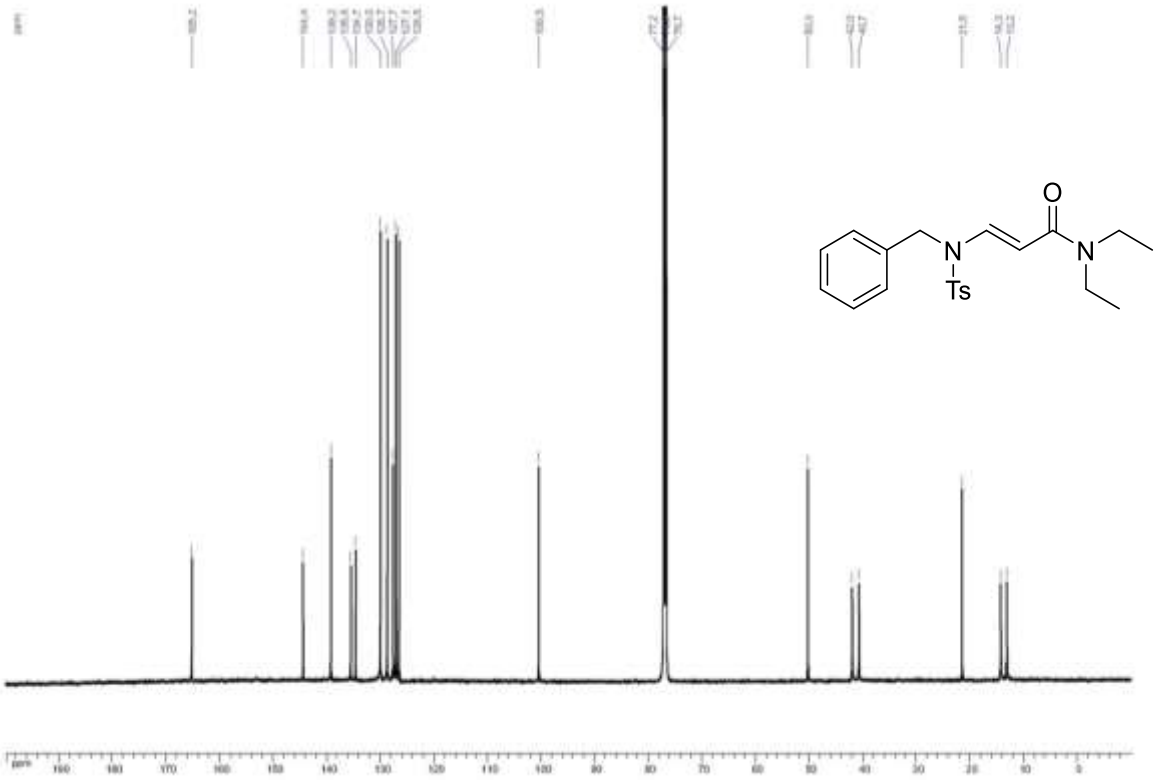
^{1}H NMR ($CDCl_3$, 500 MHz) of **28'**



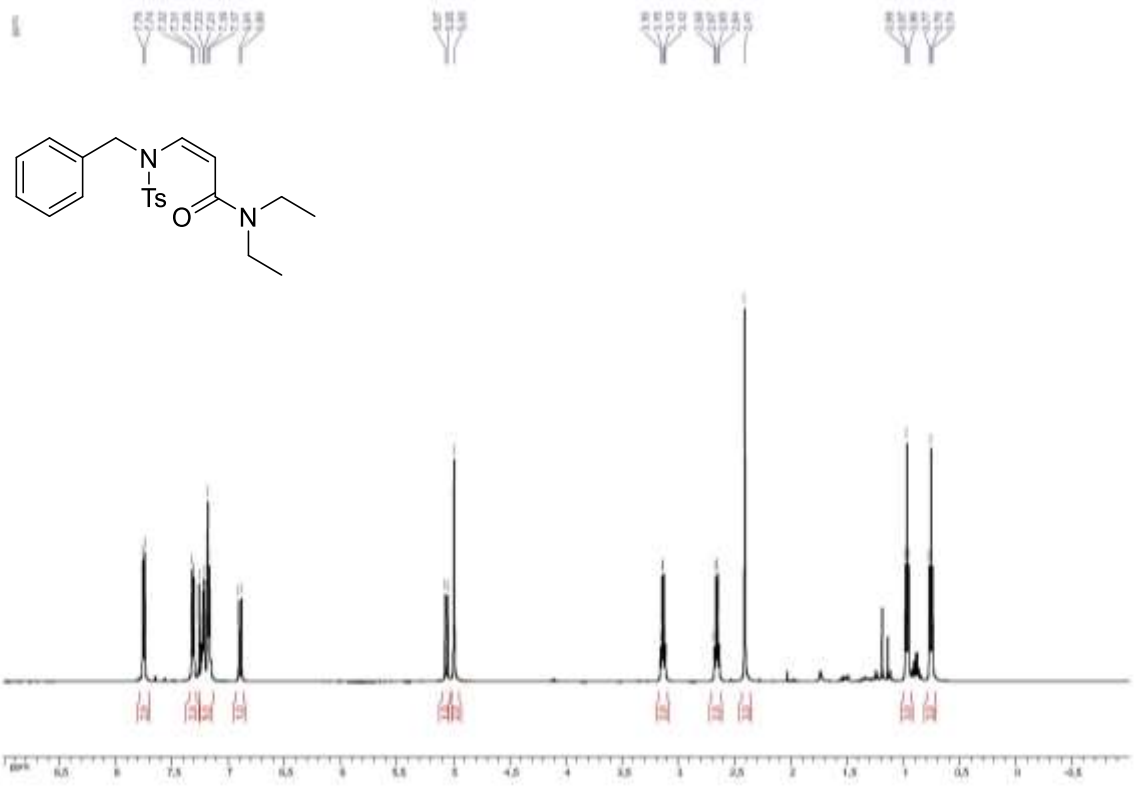
^{13}C NMR ($CDCl_3$, 125 MHz) of **28'**



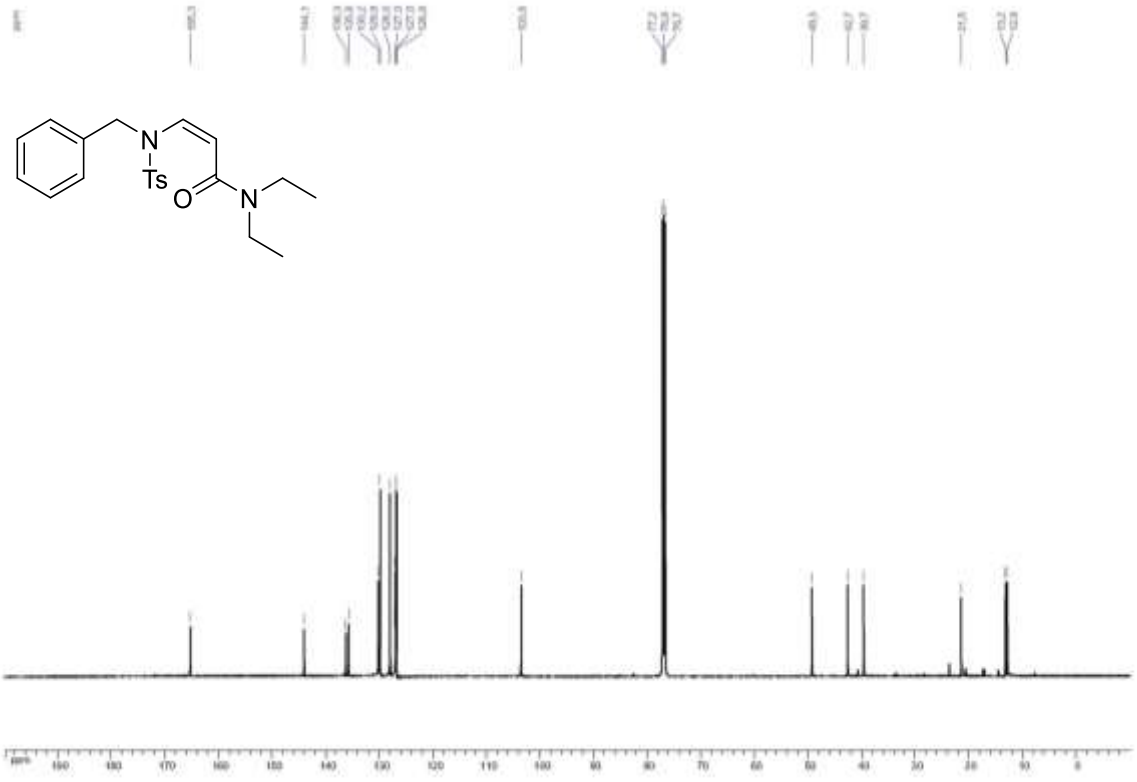
^{1}H NMR ($CDCl_3$, 500 MHz) of **29**



^{13}C NMR ($CDCl_3$, 125 MHz) of **29**



^{1}H NMR ($CDCl_3$, 500 MHz) of **29'**



^{13}C NMR ($CDCl_3$, 125 MHz) of **29'**