Supporting Information for

Successive Addition of two Different Grignard Reagents to Nitriles: Access to α,α-Disubstituted Propargylamine Derivatives

Julien Caillé,[a] Fatma Boukattaya,[a,b] Fabien Boeda,[a] Morwenna S. M. Pearson-Long,[a] Houcine Ammar[b] and Philippe Bertus*[a]

[a] *Le Mans Université (Université du Maine), CNRS UMR 6283, Institut des Molécules et Matériaux du Mans (IMMM), 72085 Le Mans Cedex 09, France.*
[b] *Laboratoire de Chimie Appliquée: Hétérocycles, Corps Gras et Polymères, Faculty of Science of Sfax, University of Sfax, BP1171, Sfax, Tunisia*

E-mail: philippe.bertus@univ-lemans.fr

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I. General Information

Experiments involving Grignard reagents were carried out under N_2 atmosphere. THF was purified by passing through neutral alumina columns under nitrogen. The Grignard reagents were prepared in anhydrous THF using the conventional method from the appropriate bromide precursors and Mg turnings with the exception of methylmagnesium bromide, vinylmagnesium bromide and phenylmagnesium bromide which were purchased in solution in Et_2O or THF from Sigma-Aldrich. All Grignard reagents were titrated before use according to the B. E. Love method.[1]

Reactions carried out under microwave irradiation were performed with a CEM Discover SP apparatus using the Synergy software. Analytical TLC were performed on Alugram SIL G/UV254 silica gel sheets (Macherey-Nagel) by using potassium permanganate solution. Columns chromatography were carried out using silica gel 60 (0.040-0.063 mm) from Merck. Melting points were determined with a Büchi B-540 melting point apparatus and are uncorrected. ^{1}H and ^{13}C NMR spectra were recorded on a Bruker DPX-200 or Bruker AC-400 spectrometer. Chemical shifts (δ) are expressed in ppm units, relative to the residual solvent peak. Coupling constants are given in Hz. The multiplicities are reported as follows: singlet (s), doublet (d), triplet (t), quadruplet (q), multiplet (m), and broad signal (br s). IR spectra were obtained on a Perkin Elmer Spectrum One spectrometer on a single-reflection diamond ATR unit. High resolution mass spectra were recorded on a Waters Micromass GCT Premier spectrometer. Cyanoester **2a** and hydroxyamides **3aa**, **3bb**, **3cc** and **3dd** have been prepared according to previously reported procedures.[2,3]

[1] Love, B. E.; Jones, E. J. *J. Org. Chem.* **1999**, *64*, 3755-3756.

[2] Setzer, P.; Forcher, G.; Boeda, F.; Pearson-Long, M.S.M.; Bertus, P. *Eur. J. Org. Chem.*, **2014**, 171-180.

[3] Boukattaya, F.; Caille, J.; Ammar, H.; Rouzier, F.; Boeda, F.; Pearson-Long, M. S. M.; Bertus, P. *Synthesis* **2016**, *48*, 906-916.

II. Characteristic signals for ^{1}H NMR integration

Proportions of hydroxyamides 3aa : 3ab : 3bb

The proportions of hydroxyamides **3aa : 3ab : 3bb** were determined by ^{1}H NMR integration of characteristic signals that are the C*H*$_2$OH singulet for symmetrical hydroxyamides **3aa** and **3bb**, and C*H*$_2$OH doublets for unsymmetrical hydroxyamides **3ab** (two doublets with a AB system). A zoom on the region 3.80-4.70 ppm allowed the integration of these signals without significant overlapping for most compounds. A representative example is given in Figure 1.

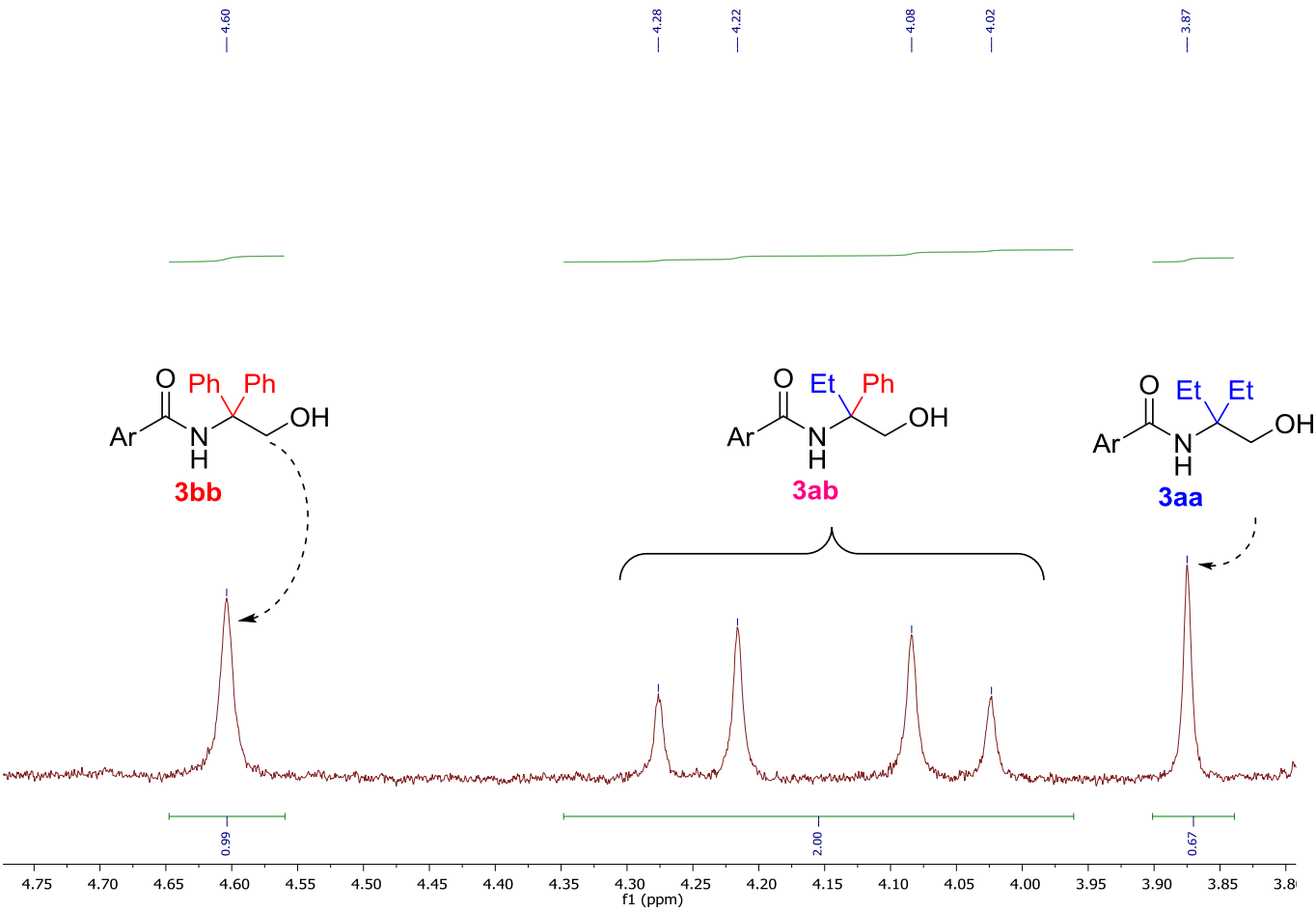


Figure 1 (results for entry 11, Table 1)

The integrations of the C*H*$_2$OH signals of symmetrical hydroxyamide **3aa** and unsymmetrical hydroxyamide **3ab** were consistent with the integration of the CH_3 triplets at 0.97 and 0.94 ppm respectively (Figure 2).

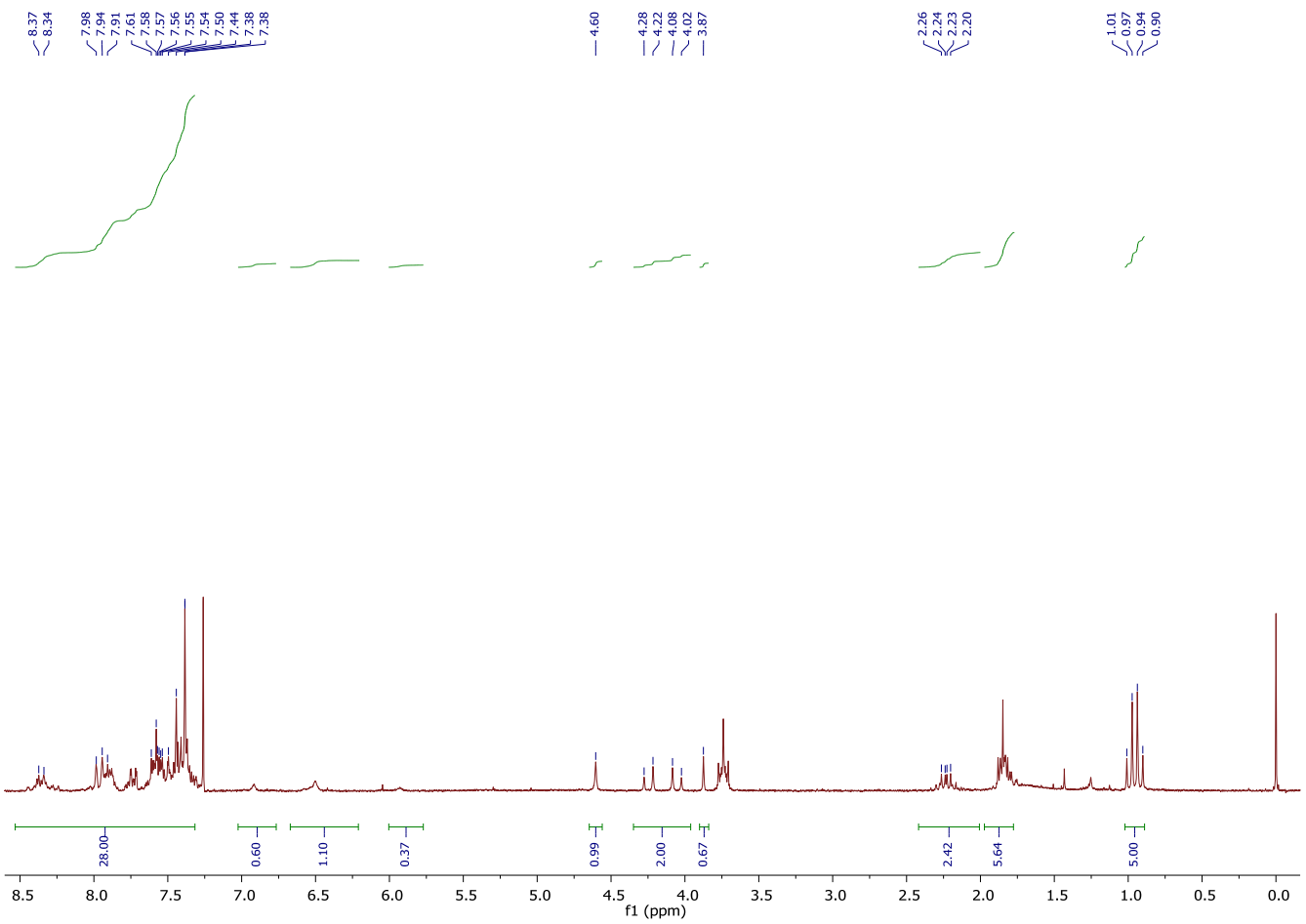


Figure 2 (results for entry 11, Table 1)

Proportions of hydroxyamides 3aa : 3ac : 3cc

In the case of hydroxyamides **3aa : 3ac : 3cc,** a slight overlapping can be seen for the CH_2OH singulets for symmetrical hydroxyamides **3aa** and **3cc**, and the CH_2OH doublets for unsymmetrical hydroxyamides **3ac** (two doublets with a AB system) in the region 3.70-3.90 ppm, as shown in Figure 3.

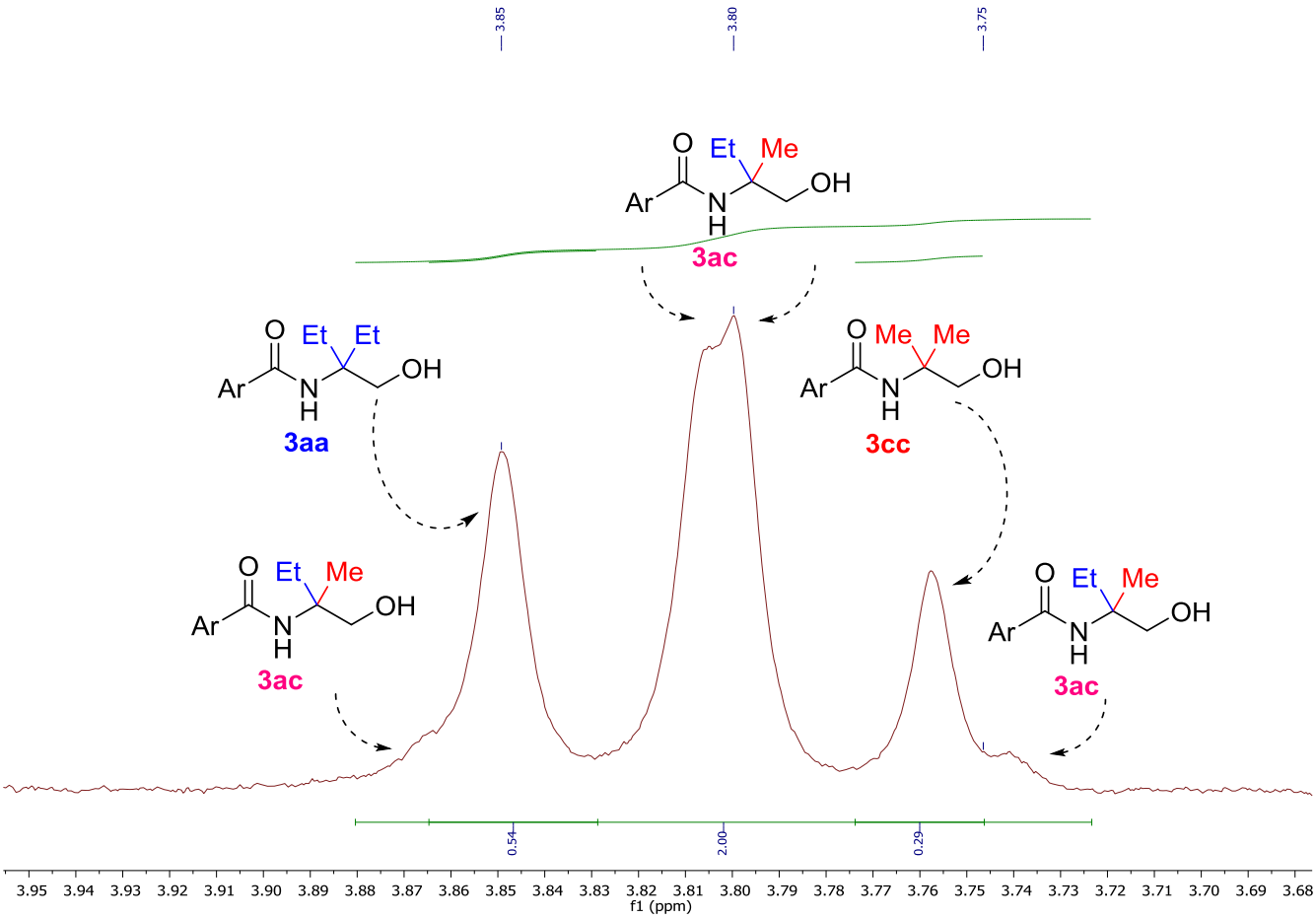


Figure 3 (results of entry 12, Table 1)

Therefore, another method was considered to evaluate the proportions of hydroxyamides, based on the combination of two separated integrations. The first step allowed to identify between the unsymmetrical compound **3ac** and the dimethyl compound **3cc**. Integrations of the C*H*$_3$ singulet signals at 1.33 and 1.45 ppm were used to evaluate the proportions of **3ac** and **3cc** respectively (Figure 4). The second step allowed to evaluate the proportion of diethyl compound **3aa**. The integration of the overlapped signals at 3.70-3.90 ppm was undertaken, setting the reference value to 2. The following formula was then used to estimate the proportion of diethyl compound **3aa**, where α refers to the integration value of the C*H*$_3$ singulet of compound **3ac**, β refers to the integration value of the C*H*$_3$ singulet of compound **3cc** and γ refers to the proportion of **3aa**.

$$\gamma = 1 - \frac{\alpha}{3} - \frac{\beta}{6}$$

The proportion found for the CH_3 signals for hydroxyamide **3cc** and the value calculated for γ were consistent with the integration of the C*H*$_2$OH singulets for **3aa** and **3cc** (Figure 3).

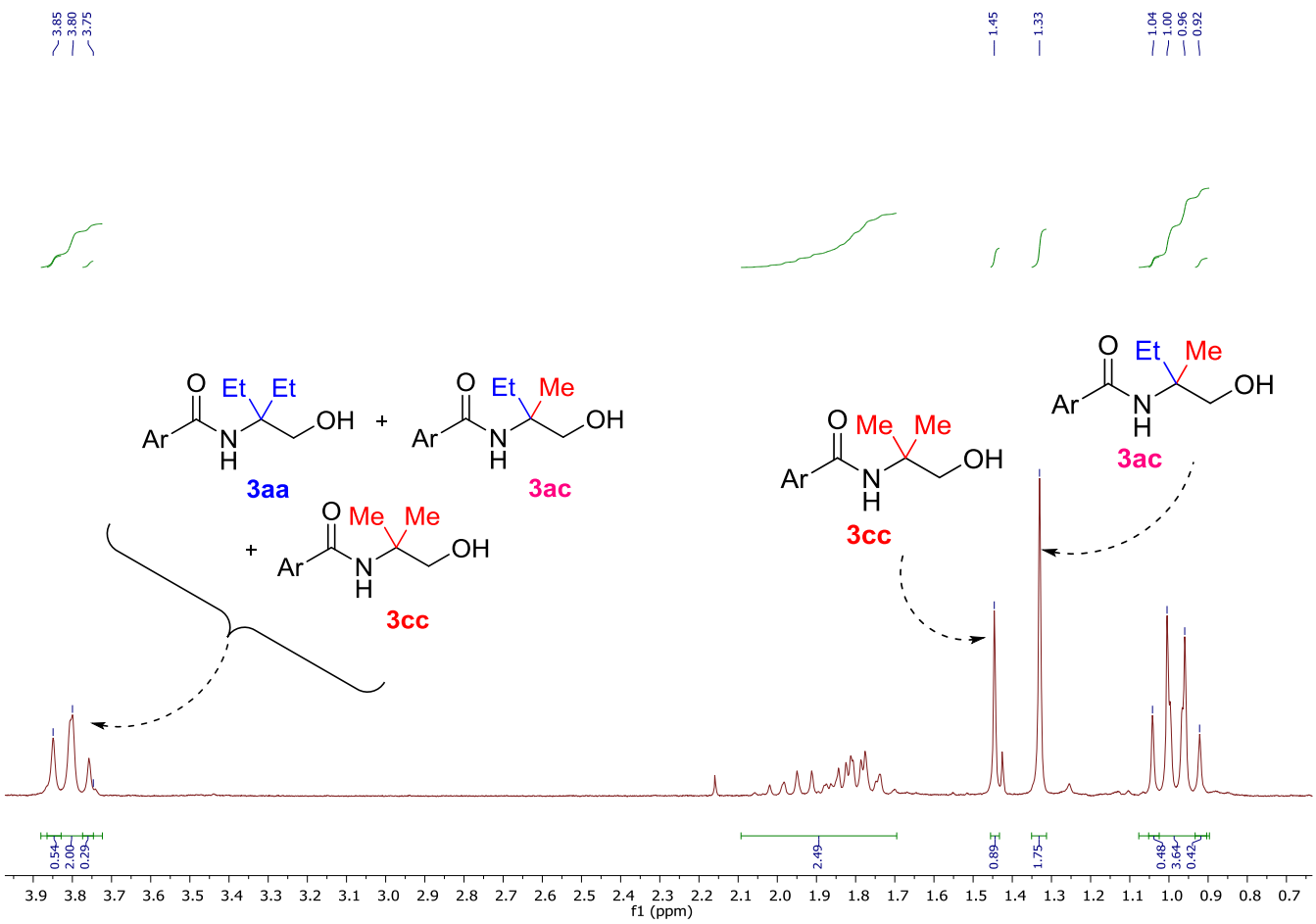


Figure 4 (results of entry 12, Table 1)

Proportions of hydroxyamides 3aa : 3ad : 3dd

Due to the complete overlapping of the C*H*$_2$OH signals of hydroxyamides **3aa**, **3ad** and **3dd** the previous method was also considered to evaluate the proportions of those hydroxyamides. The first step allowed to identify between the unsymmetrical compound **3ad** and the divinyl compound **3dd**. Integrations of the C*H*=CH$_2$ doublet of doublet signal around 5.90 and 6.05 ppm were used to evaluate the proportions of **3ad** and **3dd** respectively, as shown in Figure 5. Despite a slight overlapping, the integration of three of the four peaks was possible with consistency.

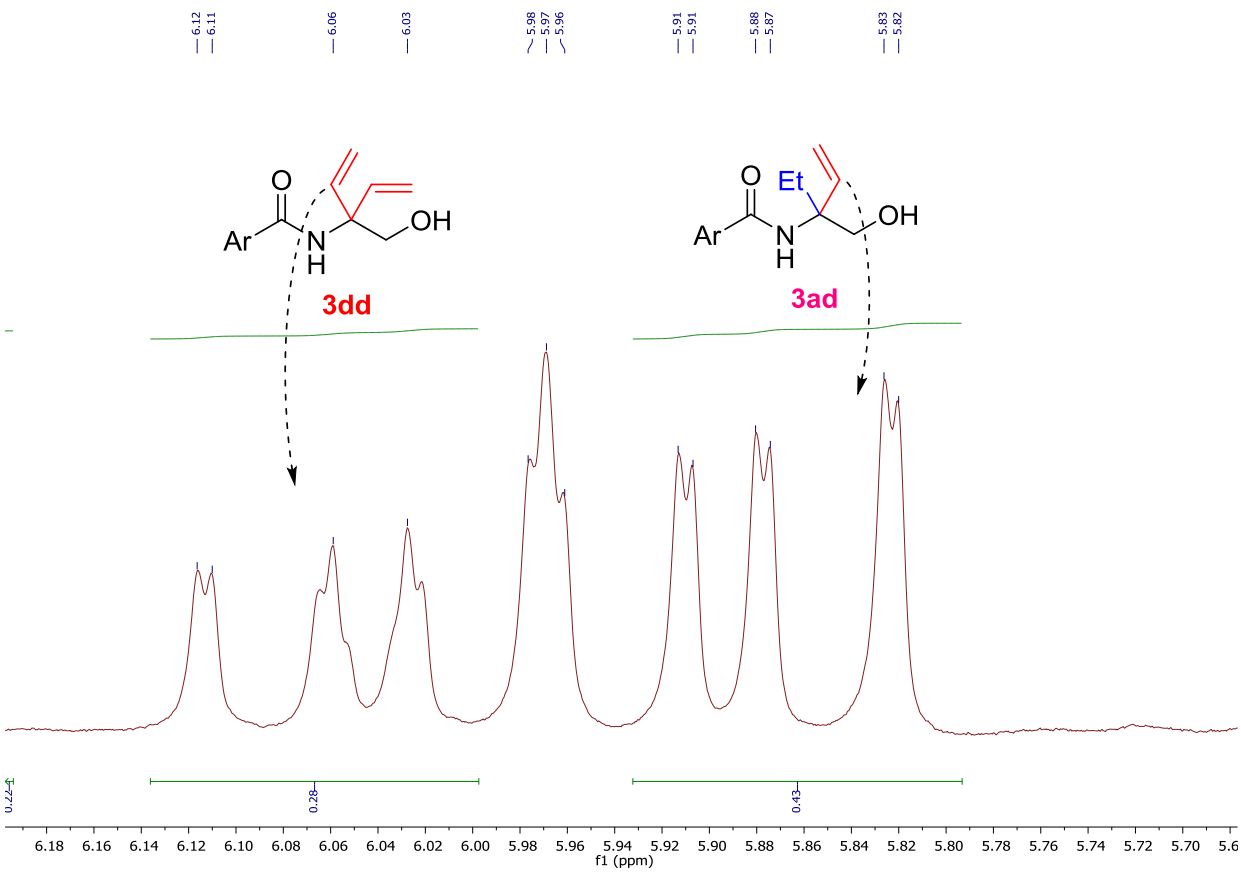


Figure 5 (results of entry 13, Table 1)

The second step allowed to evaluate the proportion of diethyl compound **3aa**. Once the proportion of unsymmetrical **3ad** and divinyl **3dd** known, the integration of the overlapped signals at 3.65-3.80 ppm was undertaken, setting the reference value to 2 (Figure 6). The following formula was finally used to estimate the proportion of diethyl compound **3aa**, where α refers to the integration value of the three peaks of compound **3ad**, β refers to the integration value of the three peaks of compound **3dd** and γ refers to the proportion of **3aa**.

$$\gamma = 1 - \frac{4}{3}\,\alpha - \frac{4}{6}\,\beta$$

The proportion found for the CH_3 signal for hydroxyamide **3ad** and the value calculated for γ were consistent with the integration of the CH_3 triplets at 0.93 and 0.97 ppm respectively (Figure 6).

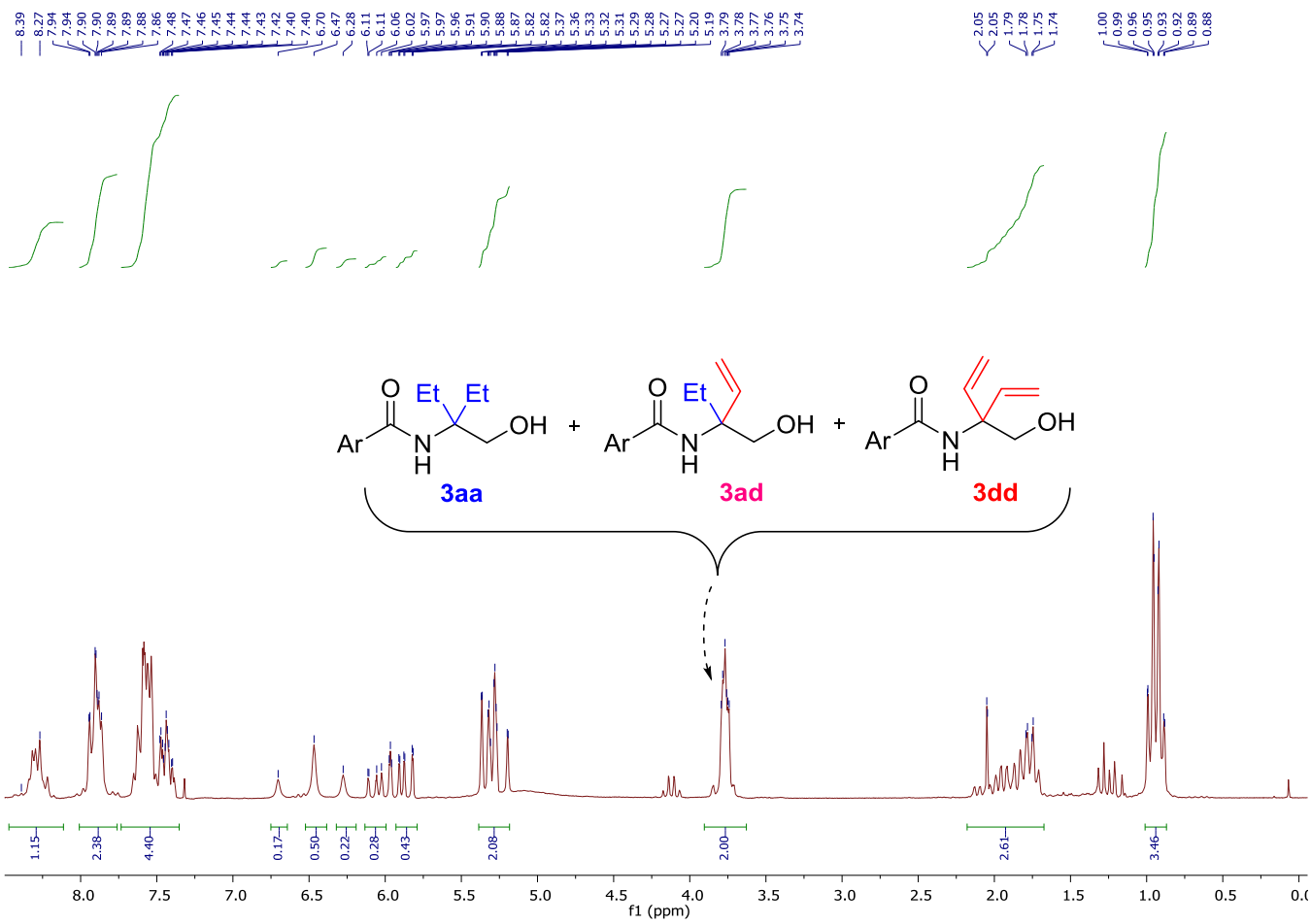


Figure 6 (results of entry 13, Table 1)

Proportions of hydroxyamides 3aa : 3ae : 3ee

The proportions of hydroxyamides **3aa : 3ae : 3ee** were determined by ^{1}H NMR integration of characteristic signals that are the C*H*$_2$OH singulet for symmetrical hydroxyamides **3aa** and **3ee**, and C*H*$_2$OH doublets for unsymmetrical hydroxyamide **3ae** (two doublets with a AB system) in the region of 3.80-4.20 ppm (Figure 7). The hydroxyamide **3ee** was never detected and the integration of the C*H*$_2$OH signal of unsymmetrical hydroxyamide **3ae** was consistent with the integration of the Si(CH$_3$)$_3$ signal at 0.18 ppm, and with the CH$_3$ triplet at 1.18 ppm (Figures 7 and 8).

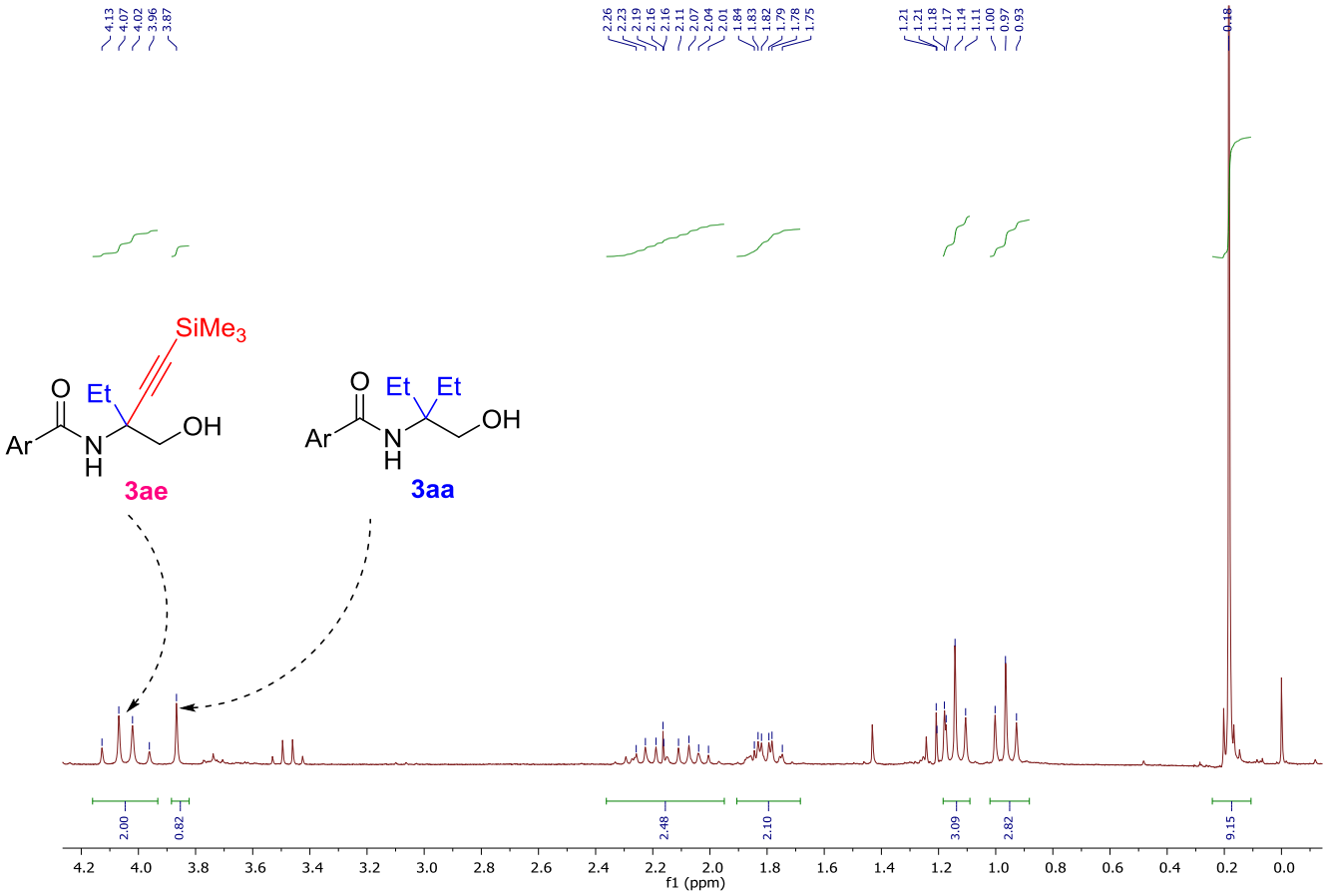


Figure 7 (results for entry 1, Table 2)

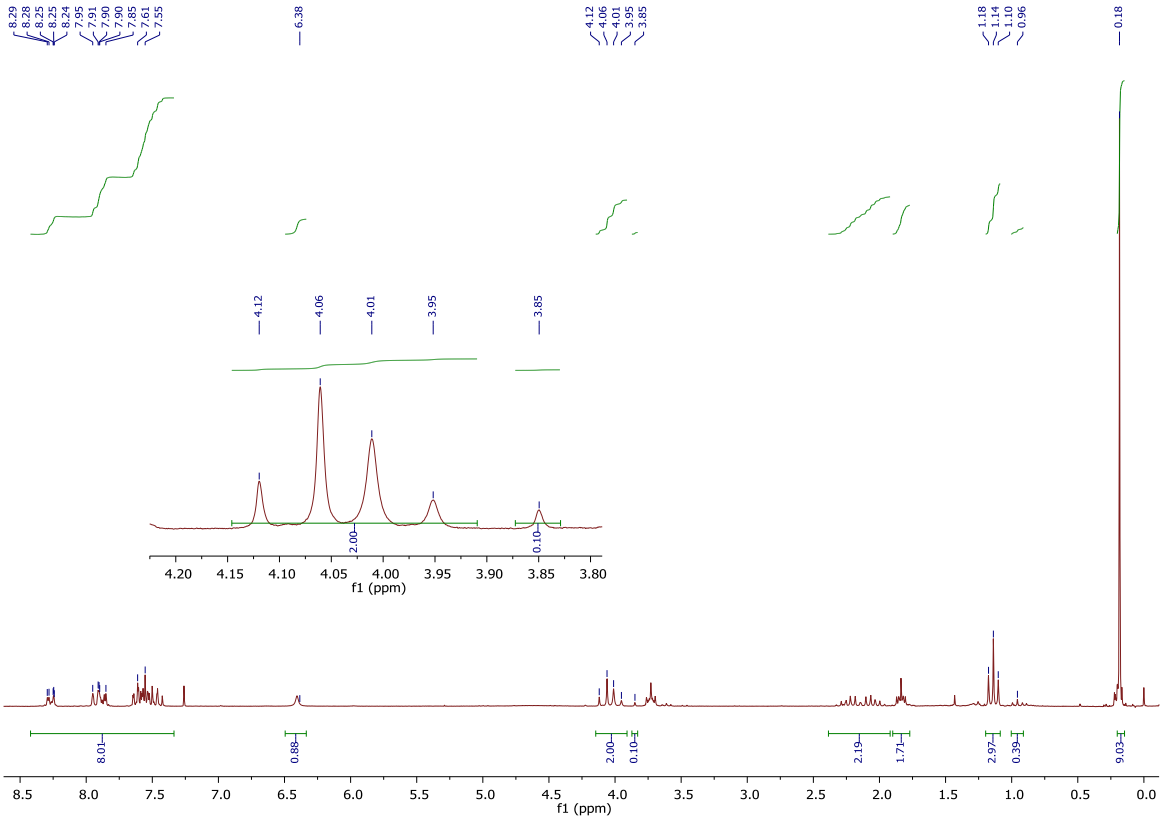
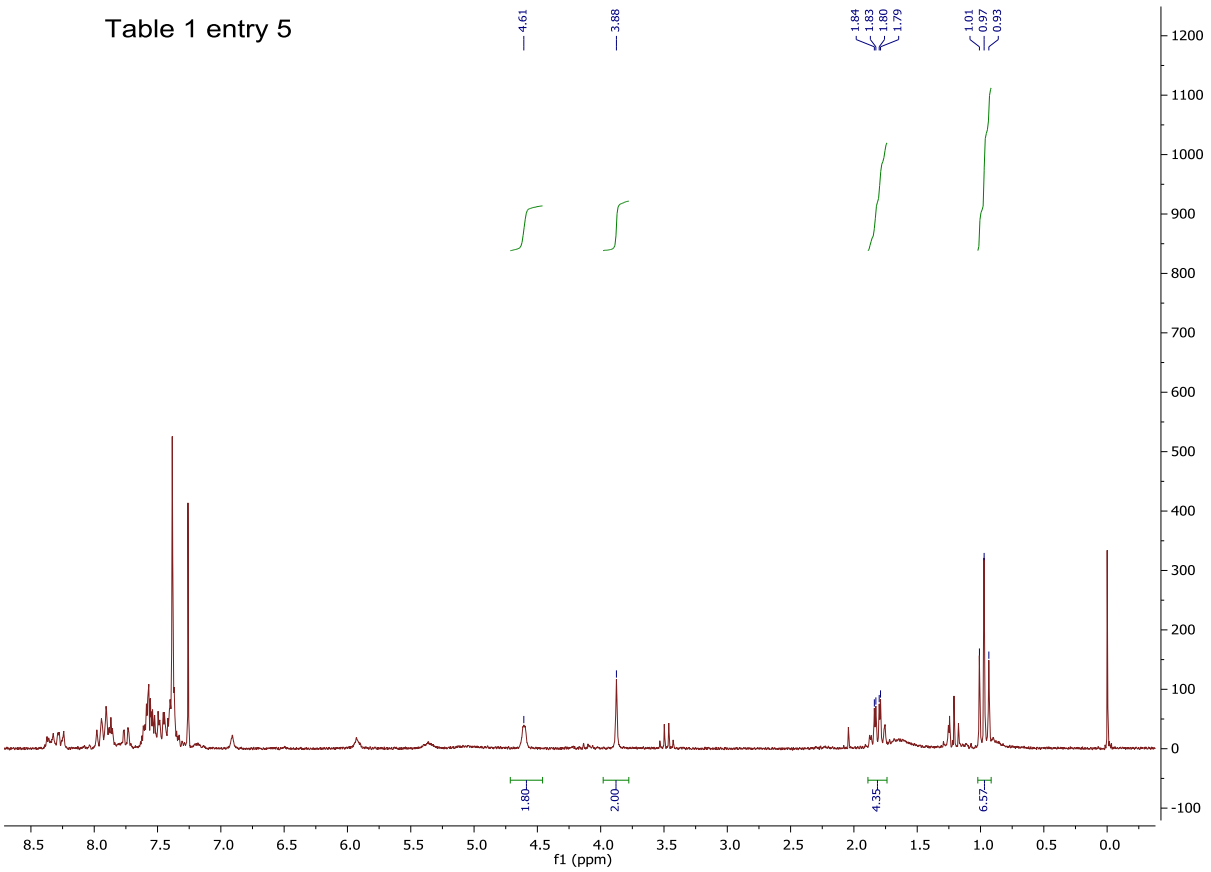


Figure 8 (results for entry 5, Table 2)

III. Copies of 1H NMR spectra of crudes of Table 1



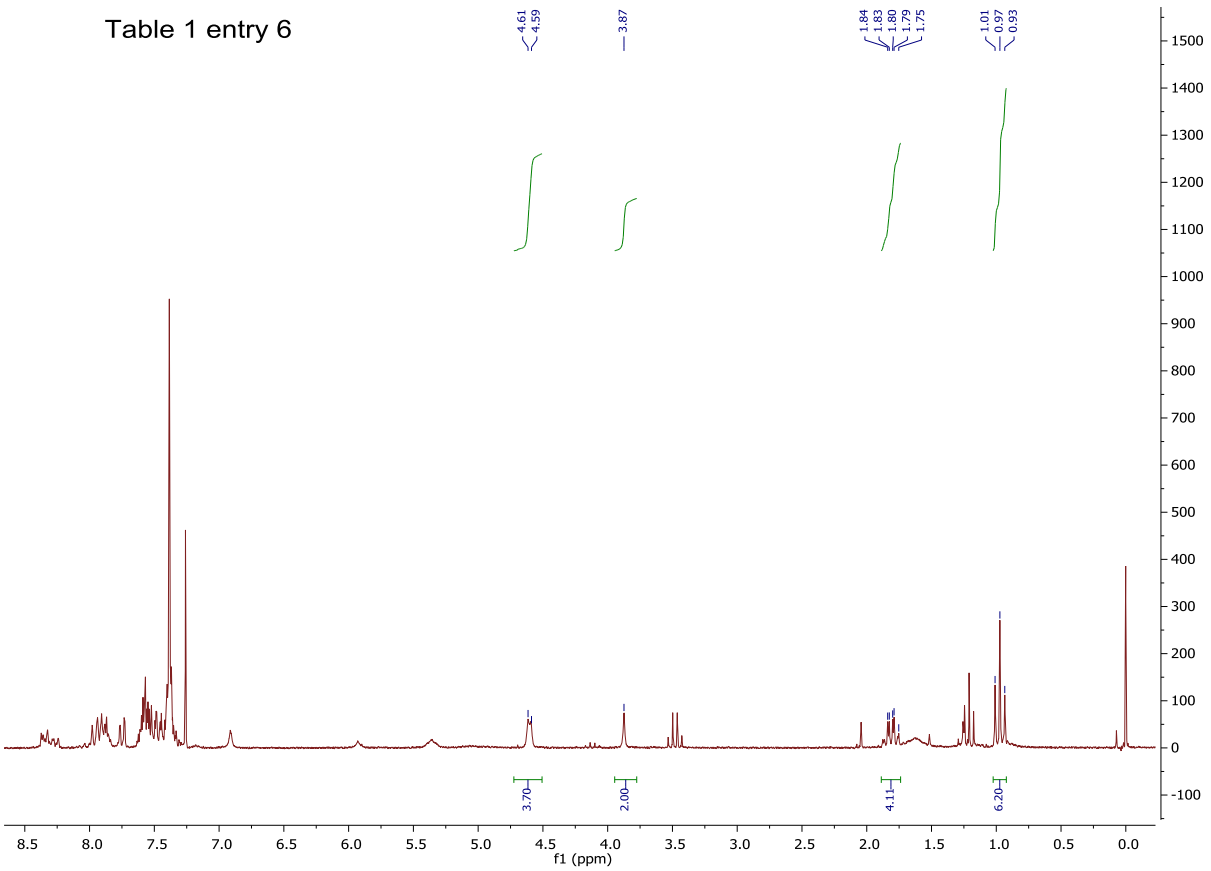


Table 1 entry 7

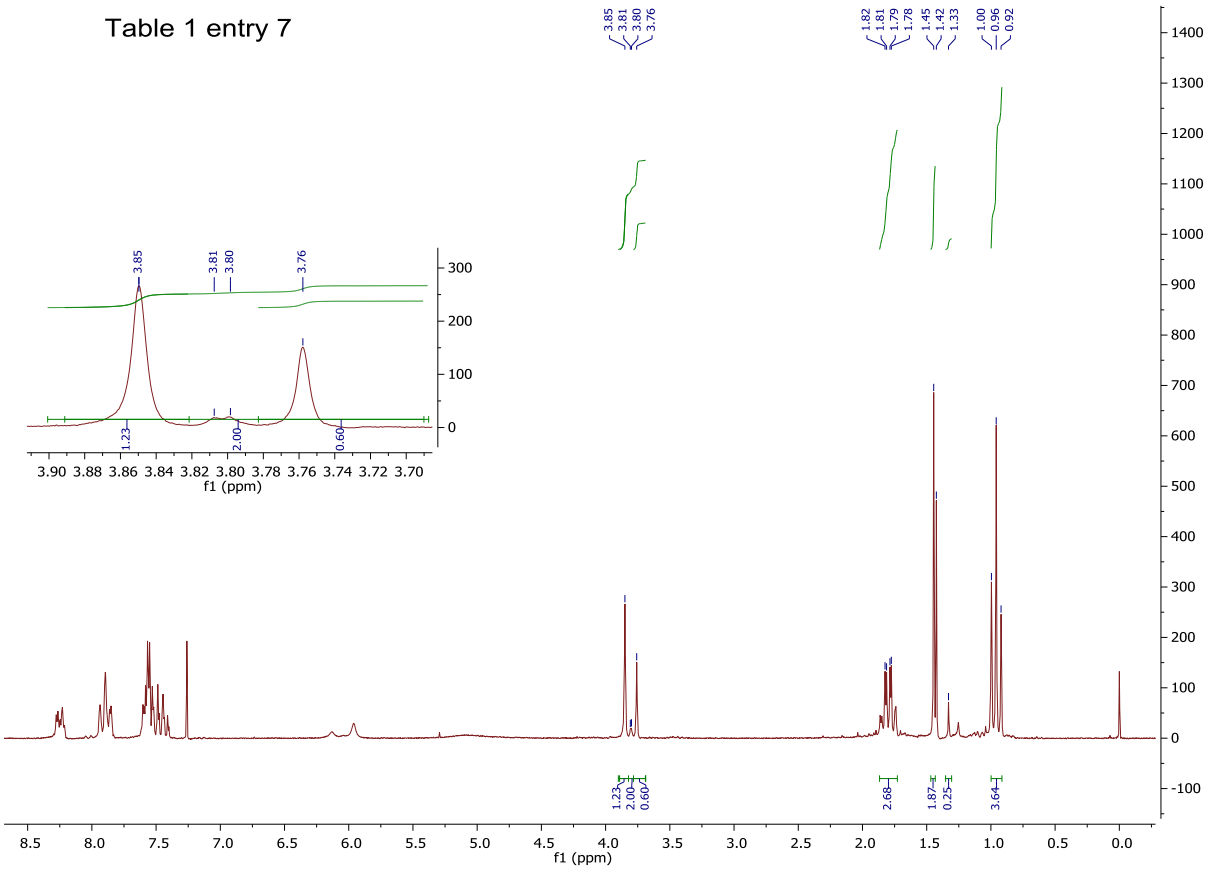


Table 1 entry 8

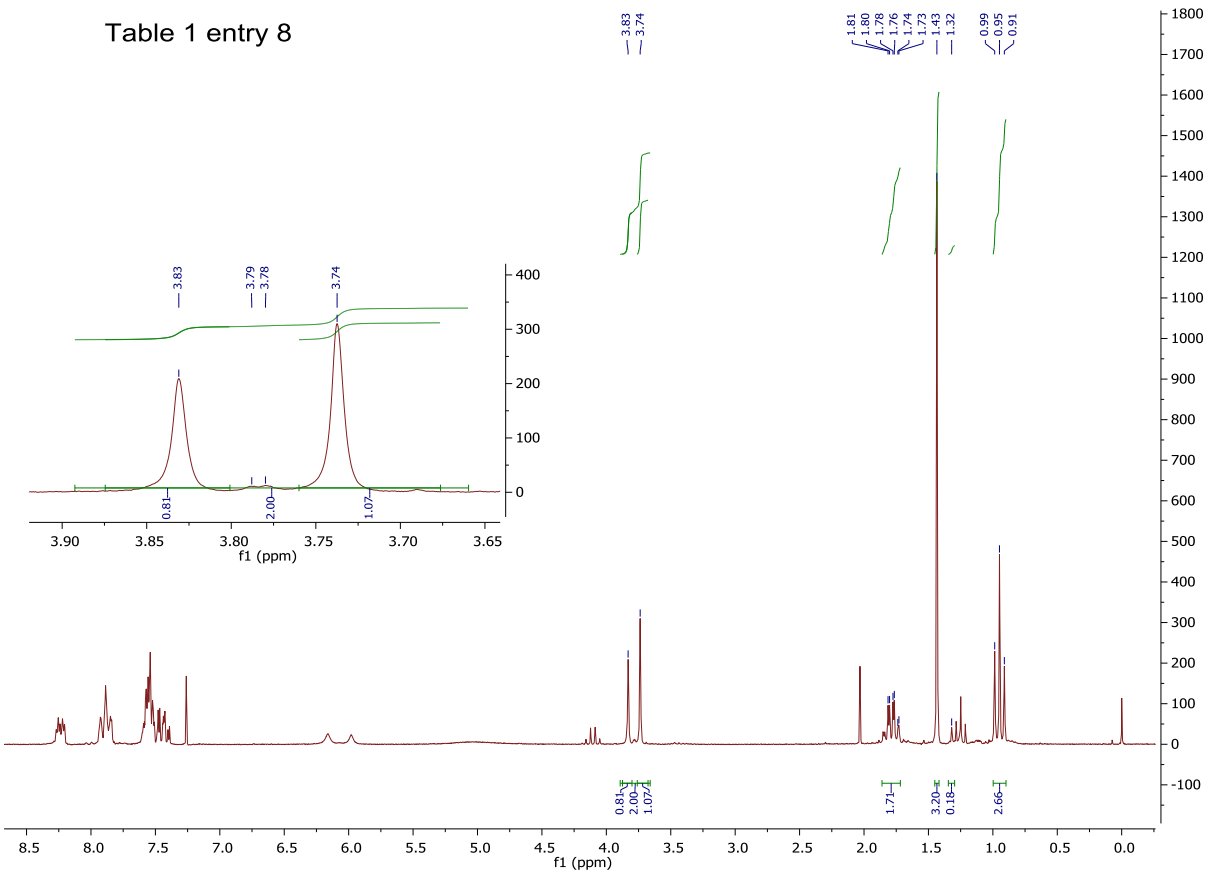


Table 1 entry 9

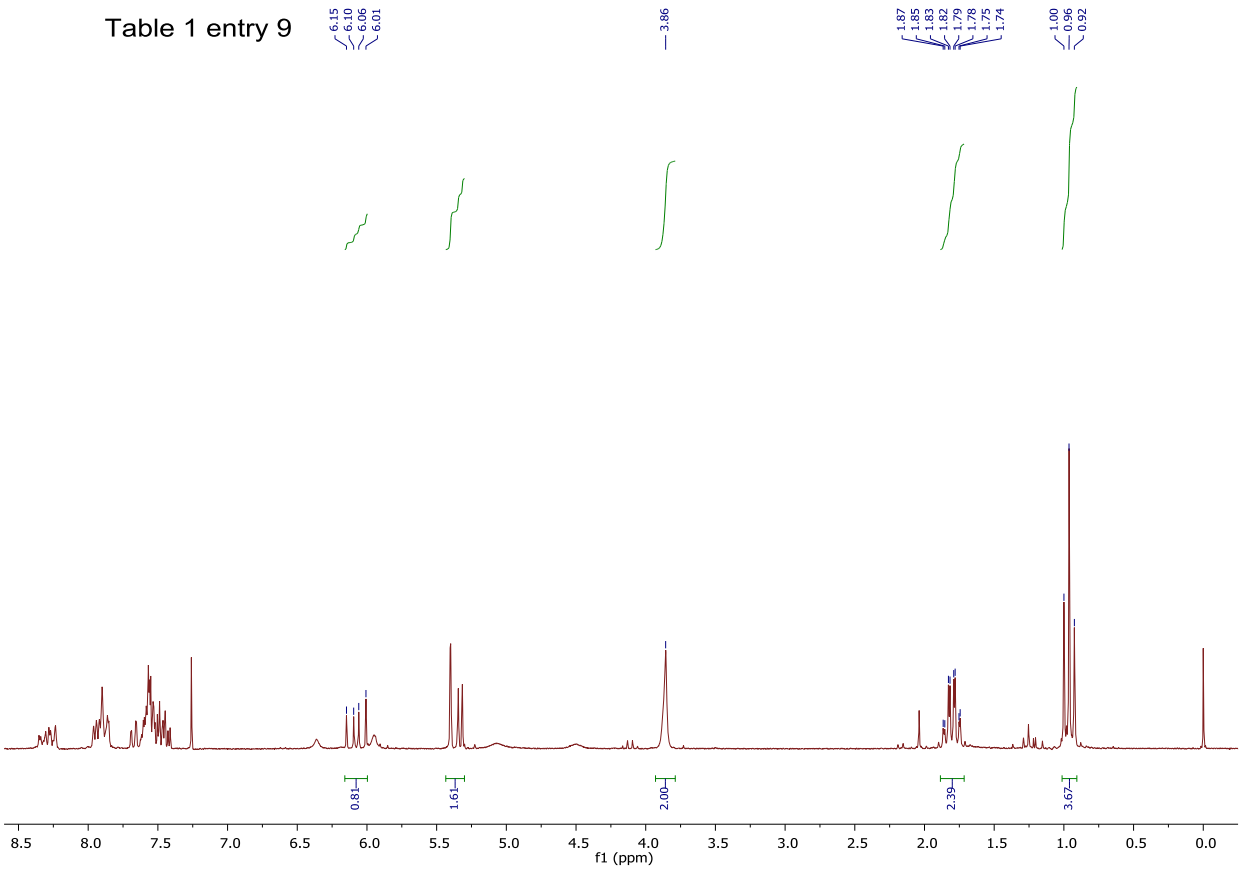


Table 1 entry 10

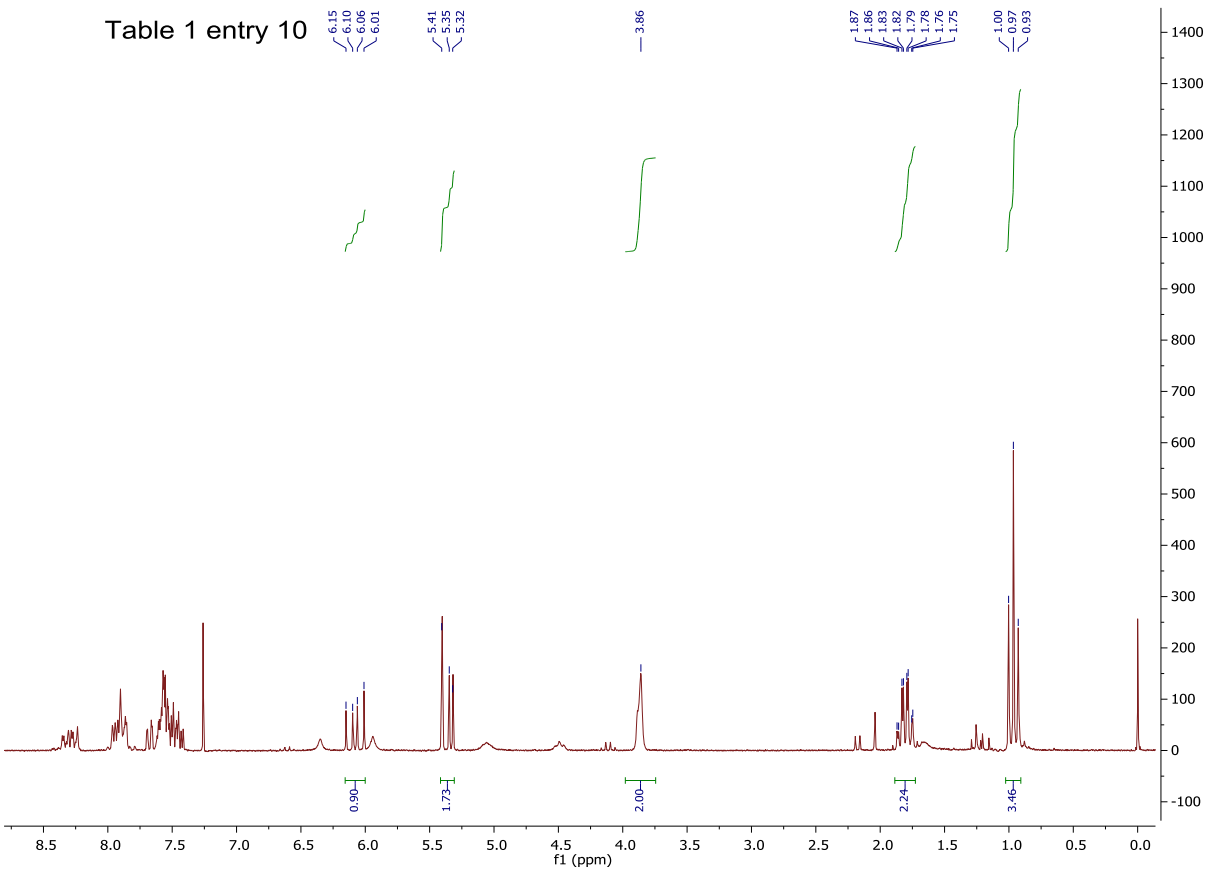


Table 1 entry 11

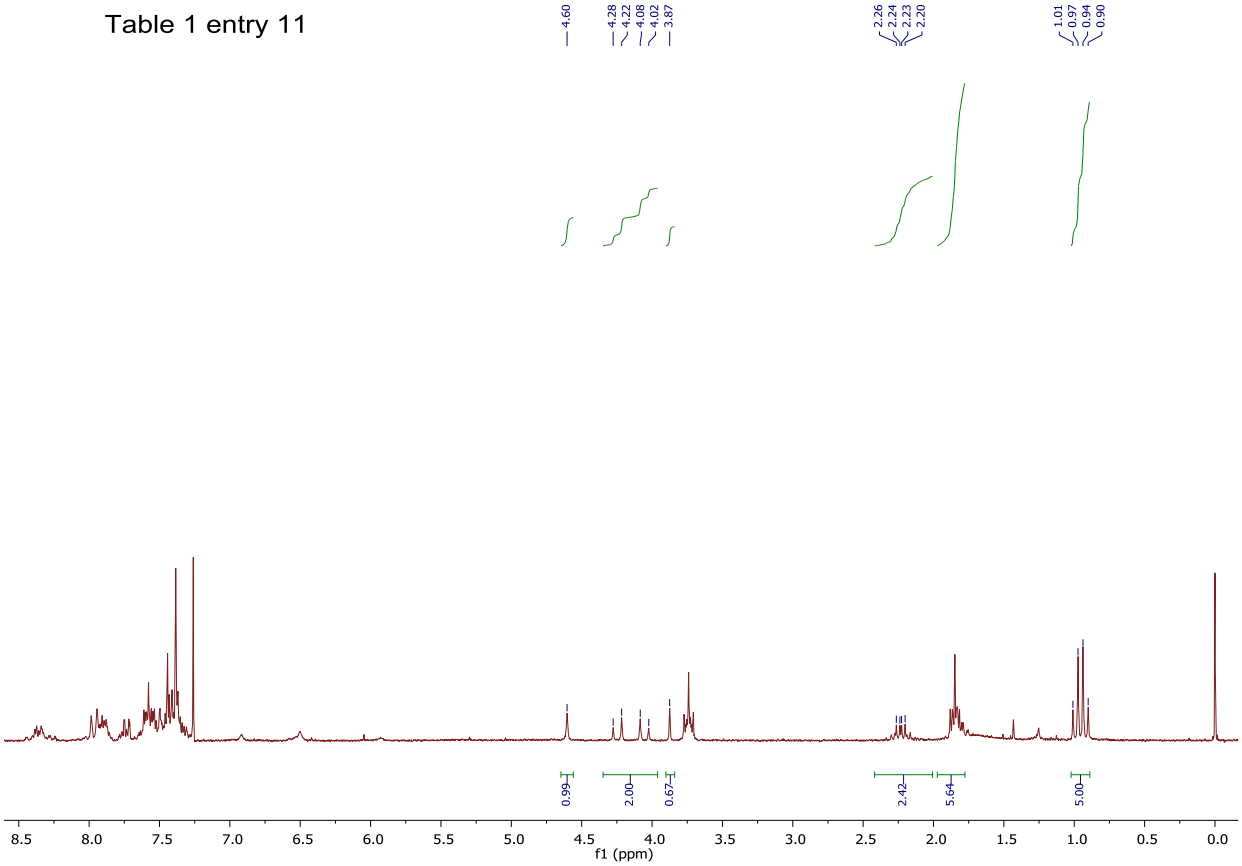


Table 1 entry 12

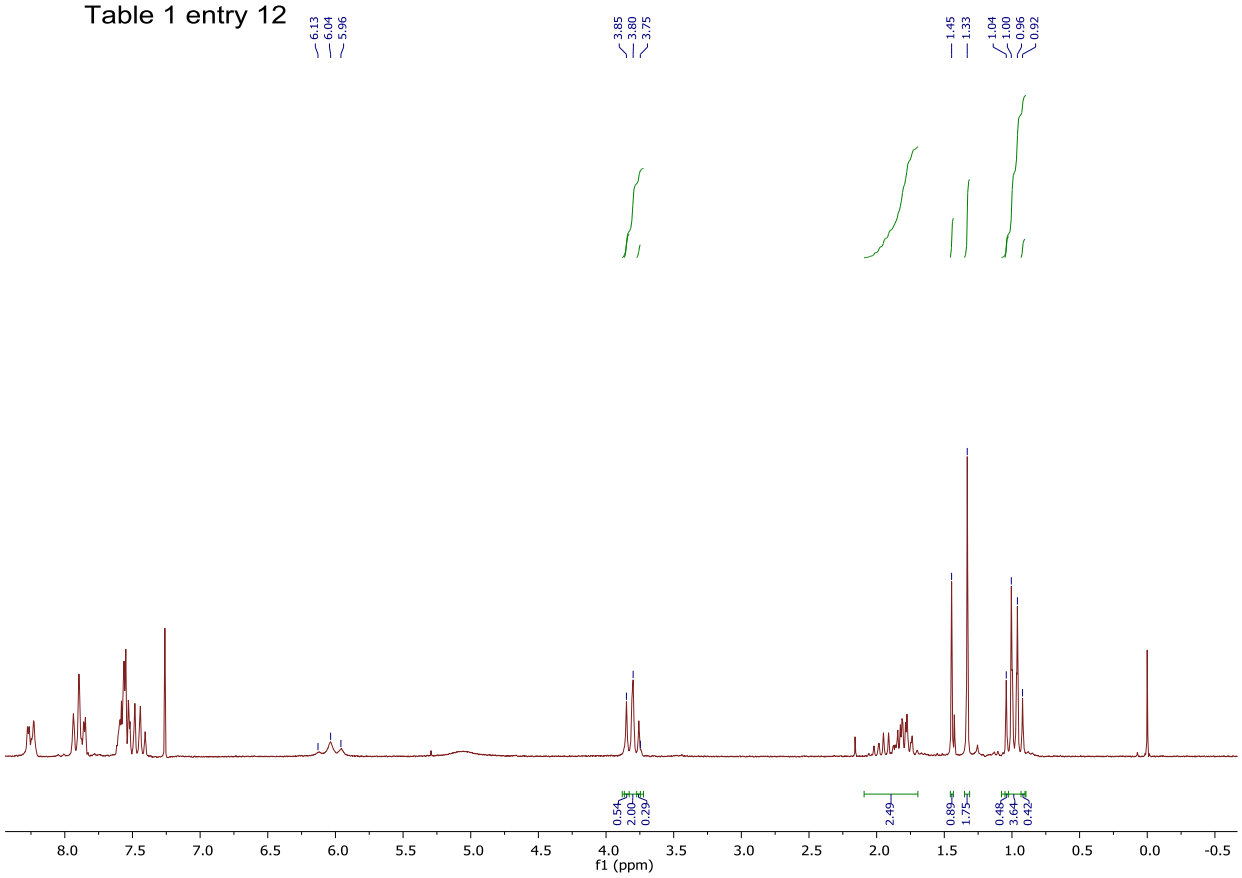
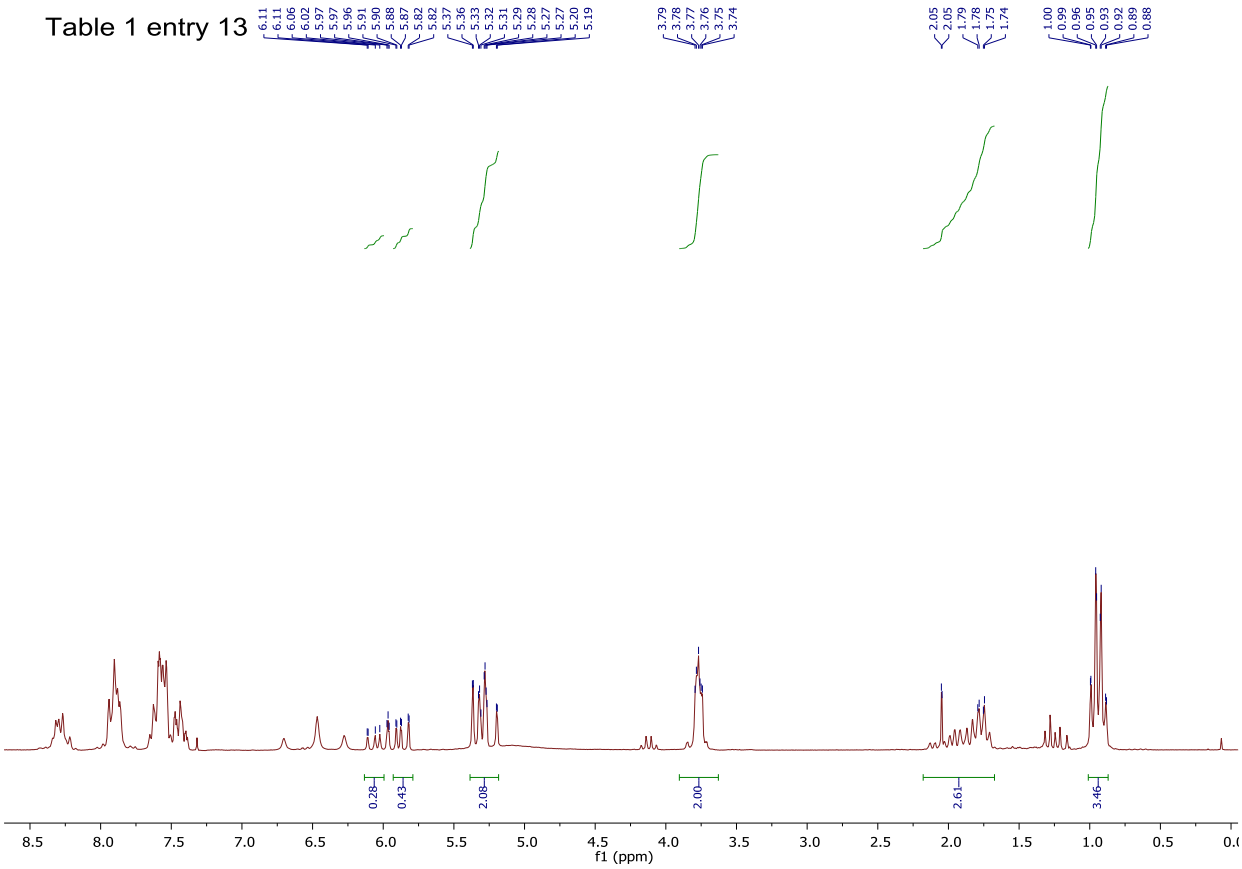
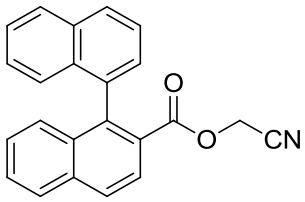


Table 1 entry 13



IV. Synthesis and analytical data of compound 2b

Cyanomethyl [1,1'-binaphthalene]-2-carboxylate (2b)



To a solution of [1,1'-binaphthalene]-2-carboxylic acid[4] (2.98 g, 10 mmol) in CH_2Cl_2 (10 mL) were successively added triethylamine (2.79 mL, 20 mmol) and chloroacetonitrile (0.95 mL, 15 mmol). The resulting mixture was stirred for 2 days at r.t. and water was added. The layers were separated and the aqueous phase was extracted with CH_2Cl_2 (2 x 10 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and the solvent was removed *in vacuo*. The crude residue was filtered through a silica gel, eluted with CH_2Cl_2 to afford **2b** as a colorless oil (2.46 g, 73%).

^{1}H NMR ($CDCl_3$, 400 MHz): δ (ppm) 8.09 (d, *J* = 8.7 Hz, 1H, H_{arom}), 8.03 (d, *J* = 8.7 Hz, 1H, H_{arom}), 8.00-7.94 (m, 3H, H_{arom}), 7.61-7.56 (m, 2H, H_{arom}), 7.49-7.44 (m, 1H, H_{arom}), 7.35-7.25 (m, 4H, H_{arom}), 7.16 (d, *J* = 8.16 Hz, 1H, H_{arom}), 4.47 (d, *J* = 15.7 Hz, 1H, C*H*$_2$), 4.41 (d, *J* = 15.7 Hz, 1H, C*H*$_2$).

^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 165.7 (*C*=O), 141.8 (C_{arom}), 136.3 (C_{arom}), 135.4 (C_{arom}), 133.3 (C_{arom}), 133.2 (C_{arom}), 132.8 (C_{arom}), 128.5 (C_{arom}), 128.4 (2 C_{arom}), 128.3 (2 C_{arom}), 128.0 (C_{arom}), 127.1 (C_{arom}), 127.0 (C_{arom}), 126.4 (C_{arom}), 126.2 (C_{arom}), 126.0 (C_{arom}), 125.7 (C_{arom}), 125.6 (C_{arom}), 125.3 (C_{arom}), 114.0 (*C*N), 48.4 (*C*H$_2$).

HRMS (ESI+): *m/z* (M+Na$^+$) calcd for $C_{23}H_{15}NO_2Na$: 360.0995, found: 360.0990.

V. Synthesis and analytical data of oxazoles

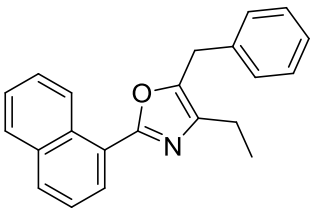
The conditions applied for the deprotection of hydroxynaphthamide derivatives in basic aqueous medium were used here.[3] Unfortunately, only oxazole-based compounds were obtained.

In a microwave tube, **3af** (343 mg, 1 mmol) was dissolved in EtOH (10 mL) and sodium hydroxide (120 mg, 3 mmol) was added. The tube was sealed, placed in a microwave oven and the following conditions were applied: T = 130 °C, t = 10 min. After release, water and EtOAc were added and the layers were separated. The aqueous phase was extracted with EtOAc (2 x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and the solvents were removed *in vacuo*. The crude residue consisted in a mixture of two oxazoles in a 65:35 proportion and a global yield of 95%. After

[4] Aissaoui, R.; Nourry, A.; Coquel, A.; Dao, T. T. H.; Derdour, A.; Helesbeux, J.-J.; Duval, O.; Castanet, A.-S.; Mortier, J. *J. Org. Chem.* **2012**, *77*, 718-724. The authors thank H. Guyon, A. Boussonnière and A.-S. Castanet for the generous gift of the carboxylic acid substrate.

successive separations by flash chromatography, the two compounds of close retention factor were partially separated for analytical purpose.

5-Benzyl-4-ethyl-2-(naphtalen-1-yl)oxazole



R_f = 0.75 (70/30 – Cyclohexane/EtOAc; UV)

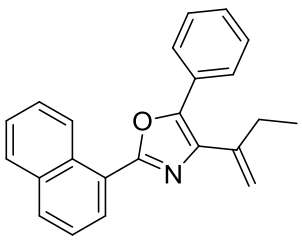
^{1}H NMR ($CDCl_3$, 400 MHz): δ (ppm) 9.14 (d, *J* = 8.2 Hz, 1H, H_{arom}), 8.03 (dd, *J* = 7.3, 1.2 Hz, 1H, H_{arom}), 7.81 (dd, *J* = 10.8, 8.2 Hz, 2H, H_{arom}), 7.52 (ddd, *J* = 8.5, 6.8, 1.4 Hz, 1H, H_{arom}), 7.44 (ddd, *J* = 15.7, 8.7, 4.7 Hz, 2H, H_{arom}), 7.29-7.14 (m, 5H, H_{arom}), 4.02 (s, 2H, C*H*$_2$Ph), 2.57 (q, *J* = 7.5 Hz, 2H, C*H*$_2$CH$_3$), 1.26 (t, *J* = 7.5 Hz, 2H, C*H*$_3$CH$_2$).

^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 159.9 (*C*=N), 144.6 (C_{arom}), 138.7 (C_{arom}), 137.9 (C_{arom}), 134.0 (C_{arom}), 130.7 (C_{arom}), 130.3 (C_{arom}), 128.8 (2 C_{arom}), 128.5 (2 C_{arom}), 128.4 (C_{arom}), 127.5 (C_{arom}), 127.4 (C_{arom}), 126.8 (C_{arom}), 126.5 (C_{arom}), 126.2 (C_{arom}), 125.0 (C_{arom}), 124.6 (C_{arom}), 31.2 (*C*H$_2$Ph), 19.5 (*C*H$_2$CH$_3$), 14.11 (*C*H$_3$CH$_2$).

IR (neat): ν = 3059, 2930, 1712, 1633, 1537, 1453, 1305, 1255 cm^1.

HRMS (CI+, NH_3/CH_4): *m/z* (M+H$^+$) calcd for $C_{22}H_{20}NO$: 314.1545, found: 314.1539.

4-(But-1-en-2-yl)-2-(naphthalen-1-yl)-5-phenyloxazole



R_f = 0.85 (70/30 – Cyclohexane/EtOAc; UV)

^{1}H NMR ($CDCl_3$, 400 MHz): δ (ppm) 9.30-9.28 (m, 1H, H_{arom}), 8.20 (dd, *J* = 7.3, 1.2 Hz, 1H, H_{arom}), 7.94 (d, *J* = 8.2 Hz, 2H, H_{arom}), 7.91-7.87 (m, 1H, H_{arom}), 7.63 (ddd, *J* = 8.5, 6.8, 1.4 Hz, 1H, H_{arom}), 7.57-7.54 (m, 1H, H_{arom}), 7.54-7.50 (m, 5H, H_{arom}), 5.73 (d, *J* = 1.2 Hz, 1H, C*H*$_2$=C), 5.52 (d, *J* = 1.2 Hz, 1H, C*H*$_2$=C), 2.37 (q, *J* = 7.5 Hz, 2H, C*H*$_2$CH$_3$), 1.22 (t, *J* = 7.5 Hz, 2H, C*H*$_3$CH$_2$).

^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 159.9 (*C*=N), 144.7 (C_{arom}), 141.3 (C_{arom}), 139.0 (C_{arom}), 137.7 (C_{arom}), 134.0 (C_{arom}), 131.0 (*C*H$_2$=C), 130.2 (C_{arom}), 128.8 (C_{arom}), 128.5 (2 C_{arom}), 128.4 (C_{arom}), 127.9

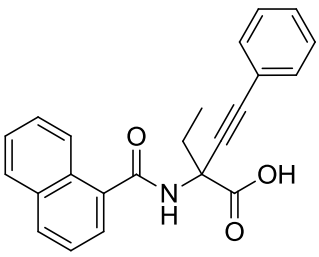
(2 C_{arom}), 127.8 (C_{arom}), 127.4 (C_{arom}), 126.3 (C_{arom}), 126.2 (C_{arom}), 124.9 (C_{arom}), 124.1 (C_{arom}), 115.9 (*C*=CH_2), 20.3 (*C*$H_2$$CH_3$), 13.4 (*C*$H_3$$CH_2$).

IR (neat): ν = 3053, 2968, 2932, 2873, 1951, 1807 1723, 1643, 1502, 1446, 1370, 1275 cm^1.

HRMS (ESI+): *m/z* ($M+Na^+$) calcd for $C_{23}H_{19}NONa$: 348.1364, found: 348.1360.

VI. Synthesis and analytical data of compounds 5-7

2-(1-naphthamido)-2-ethyl-4-phenylbut-3-ynoic acid[5,3] (5)



To a solution of **3af** (261 mg, 0.76 mmol) in CH_3CN (8 mL) were successively added periodic acid (349 mg, 1.53 mmol) and a solution of PCC (4 mg, 0.02 mmol) in CH_3CN (2 mL) at 0 °C. The resulting mixture was stirred for 1 h at 0 °C and EtOAc was added. The organic layer was successively washed with a brine/H_2O (1/1) mixture, a sat. aq. Na_2SO_3 solution and finally brine. The organic phase was dried over $MgSO_4$, filtered and the solvents were removed *in vacuo*. The crude residue was purified by flash chromatography (Cyclohexane/EtOAc – 70/30) to provide the expected aldehyde as a white solid (156 mg, 60%, m.p. = 145-147 °C). To a solution of the aldehyde intermediate (116 mg, 0.34 mmol) in CH_3CN (4 mL) and cooled to 0 °C were successively added a solution of $NaH_2PO_4.2H_2O$ (105 mg, 0.68 mmol) in water (1 mL), H_2O_2 (30% w/w in H_2O, 0.13 mL, 1.7 mmol) and sodium chlorite (57 mg, 0.51 mmol). The resulting mixture was stirred at r.t. for 2 h and sodium thiosulfate (43 mg, 0.34 mmol) was added at r.t. After another stirring for 1 h, the solvents were removed *in vacuo* then EtOAc and a sat. aq. $NaHCO_3$ solution were added to the residue. The layers were separated and the organic phase was washed with sat. aq. $NaHCO_3$ (2 x 5 mL). The combined aqueous layers were acidified by adding conc. HCl and extracted with EtOAc (3 x 10 mL). After drying over $MgSO_4$, the combined organic layers were concentrated *in vacuo* to provide **5** as a yellow solid (113 mg, 93%, m.p. = 79-81 °C).

^{1}H NMR ($CDCl_3$, 200 MHz): δ (ppm) 9.87 (br s, 1H, CO_2*H*), 8.34-8.29 (m, 1H, H_{arom}), 7.86-7.77 (m, 2H, H_{arom}), 7.62 (d, *J* = 7.0 Hz, 1H, H_{arom}), 7.54-7.22 (m, 8H, H_{arom}), 6.94 (br s, 1H, N*H*), 2.53-2.30 (m, 2H, CH_2), 1.09 (t, *J* = 7.6 Hz, 3H, CH_3).

^{13}C NMR ($CDCl_3$, 50 MHz): δ (ppm) 172.5 (*C*=O), 169.6 (*C*=O), 133.7 (C_{arom}), 133.0 (C_{arom}), 132.1 (2 C_{arom}), 131.2 (C_{arom}), 130.2 (C_{arom}), 128.8 (C_{arom}), 128.3 (C_{arom}), 128.2 (2 C_{arom}), 127.5 (C_{arom}), 126.6

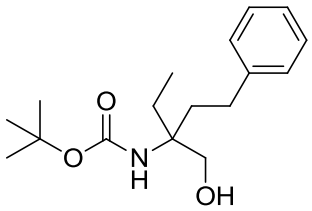
[5] Hunsen, M. *Synthesis* **2005**, *15*, 2487-2489.

(C_{arom}), 125.5 (C_{arom}), 125.3 (C_{arom}), 124.7 (C_{arom}), 122.0 (C_{arom}), 85.5 (C≡*C*-C), 85.2 (C≡*C*-Ph), 59.5 (*C*), 30.5 (*C*H_2), 8.8 (*C*H_3).

IR (neat): ν = 3269, 2977, 1718, 1639, 1621, 1579, 1487, 1305, 1255, 1159, 1087 cm^{-1}.

HRMS (CI+, NH_3/CH_4): *m/z* ($M+H^+$) calcd for $C_{23}H_{20}NO_2$: 358.1425, found: 358.1438.

***tert*-Butyl(3-(hydroxymethyl)-1-phenylpentan-3-yl) carbamate[6,3] (6)**



Compound **3af** (1.2 g, 3.49 mmol) in MeOH (40 mL) was hydrogenolyzed in the presence of 10% Pd/C at atmospheric pressure and r.t. overnight. The mixture was filtered through Celite 545 and the filtrate was concentrated *in vacuo* to provide a colorless oil. In a microwave tube, the crude residue (347 mg, 1 mmol) was dissolved in EtOH (10 mL) and sodium hydroxide (120 mg, 3 mmol) was added. The tube was sealed, placed in a microwave oven and the following conditions were applied: T = 130 °C, t = 10 min. After release, $(Boc)_2O$ (655 mg, 3 mmol) was added and the resulting mixture was stirred for 2 h at 40 °C. Water and EtOAc were added and the layers were separated. The aqueous phase was extracted with EtOAc (2 x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and the solvents were removed *in vacuo*. The crude residue was purified by silica gel chromatography (80:20 – Cyclohexane:EtOAc) affording **6** as a white solid (208 mg, 71%).

m.p. = 121-123 °C, R_f = 0.44 (80/20 – Cyclohexane/EtOAc; $KMnO_4$).

^{1}H NMR ($CDCl_3$, 200 MHz): δ (ppm) 7.33-7.14 (m, 5H, H_{arom}), 4.59 (br s, 1H, N*H*), 4.19 (br s, 1H, O*H*), 3.73 (d, *J* = 5.9 Hz, 2H, CH_2OH), 2.71-2.45 (m, 2H, CH_2), 2.02-1.81 (m, 2H, CH_2), 1.72-1.61 (m, 2H, CH_2), 1.44 (s, 9H, CH_3C), 0.92 (t, *J* = 7.5 Hz, 3H, CH_3CH_2).

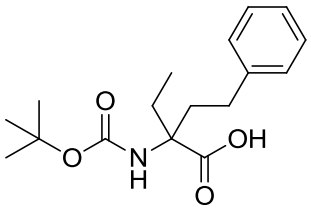
^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 156.3 (*C*=O), 142.1 (C_{arom}), 128.5 (2 C_{arom}), 128.4 (2 C_{arom}), 125.9 (C_{arom}), 79.9 (*C*CH_3), 67.4 (*C*H_2O), 59.5 (*C*), 35.7 (*C*H_2), 29.8 (*C*H_2), 28.4 (3 *C*H_3C), 27.3 (*C*H_2), 7.6 (*C*H_3CH_2).

IR (neat): ν = 3289, 3064, 2970, 2920, 1676, 1549, 1276, 1175, 1065, 981, 884, 747 cm^{-1}.

HRMS (ESI+): *m/z* ($M+Na^+$) calcd for $C_{17}H_{17}NO_3Na$: 316.1883, found: 316.1880.

2-((*tert*-Butoxycarbonyl)amino)-2-ethyl-4-phenylbutanoic acid[3] (7)

[6] Turcaud, S. ; Berhal, F. ; Royer, J. *J. Org. Chem.* **2007**, *72*, 7893-7897.



To a solution of **6** (124 mg, 0.42 mmol) in CH_2Cl_2 (5 mL) were successively added *N*-methyl morpholine oxide (149 mg, 1.27 mmol) and TPAP (7 mg, 0.02 mmol). The resulting mixture was stirred for 1 h at r.t. then filtered over a silica gel pad and eluted with CH_2Cl_2. After removal of the solvent *in vacuo*, the crude oil (93 mg, 0.32 mmol) was dissolved in CH_3CN (4 mL) and cooled to 0 °C. A solution of $NaH_2PO_4.2H_2O$ (99 mg, 0.64 mmol) in water (1 mL) was added followed by H_2O_2 (30% w/w in H_2O, 0.12 mL, 1.6 mmol) and sodium chlorite (54 mg, 0.48 mmol). The resulting mixture was stirred at r.t. for 2 h and sodium thiosulfate (40 mg, 0.32 mmol) was added at r.t. After another stirring for 1 h, the solvent were removed *in vacuo* then EtOAc and sat. aq. $NaHCO_3$ were added to the residue. The layers were separated and the organic phase was washed with sat. aq. $NaHCO_3$ (2 x 5 mL). The combined aqueous layers were acidified by adding conc. HCl and extracted with EtOAc (3 x 10 mL). After drying over $MgSO_4$, the combined organic layers were concentrated *in vacuo* to provide **7** as a colorless oil (72 mg, 56%, presence of rotamers).

^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.42 (br s, 1H, CO_2H), 7.25-7.21 (m, 2H, H_{arom}), 7.16-7.12 (m, 3H, H_{arom}), 5.58 (br s, 1H, N*H*), 2.74-2.07 (m, 5H, CH_2), 1.93-1.81 (m, 1H, CH_2), 1.46 (s, 9H, CCH_3), 0.86 (t, *J* = 7.4 Hz, 3H, CH_3CH_2).

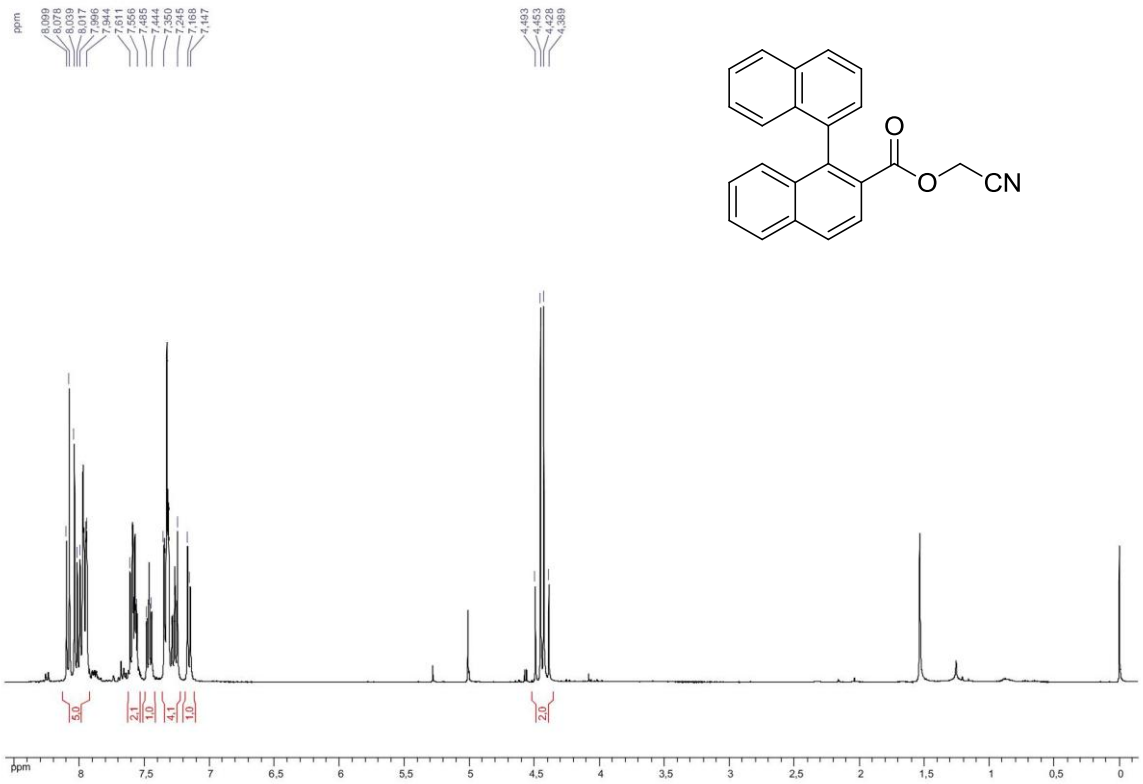
^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 178.1 (*C*=O), 154.5 (*C*=O), 141.5 (C_{arom}), 128.4 (2 C_{arom}), 128.3 (2 C_{arom}), 125.9 (C_{arom}), 79.9 (CCH_3), 64.1 (*C*), 37.1 (CH_2), 30.7 (CH_2), 28.8 (CH_2), 28.4 (3 CH_3C), 8.2 (CH_3CH_2).

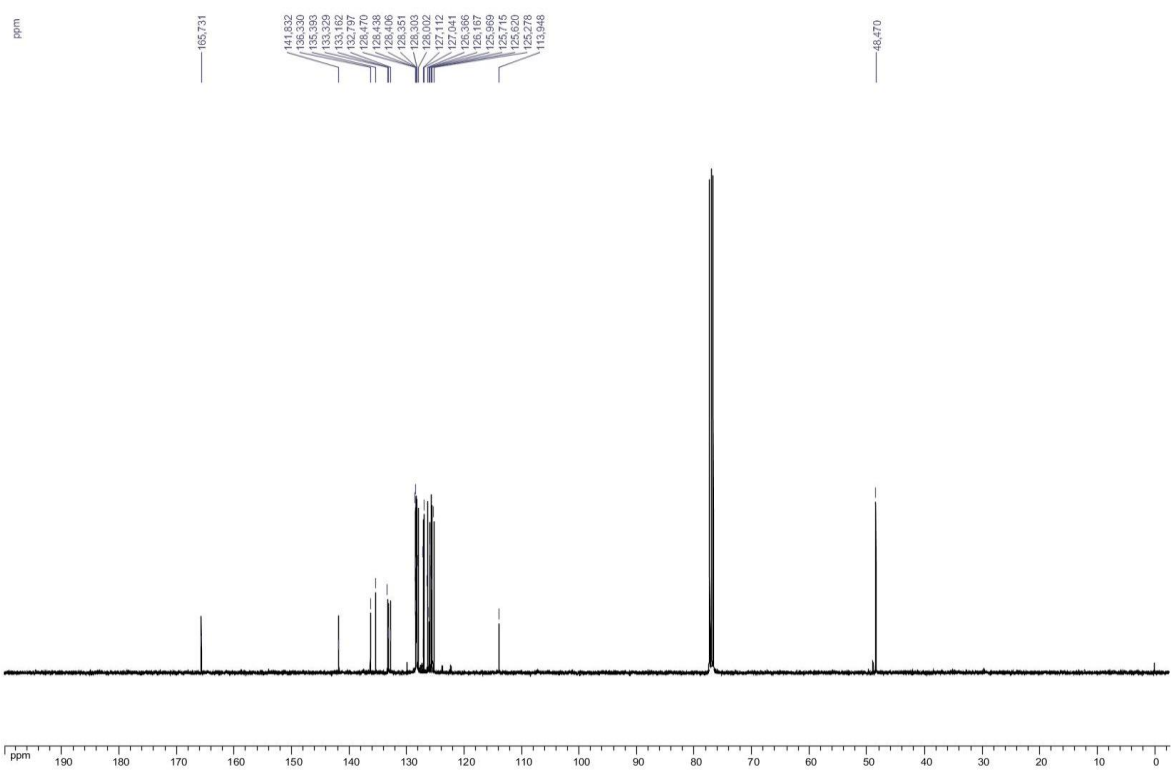
IR (neat): ν = 2976, 2935, 1704, 1499, 1397, 1369, 1248, 1164, 1071, 741, 700 cm^{-1}.

HRMS (ESI+): *m/z* ($M+Na^+$) calcd for $C_{17}H_{25}NO_4$: 330.1676, found: 330.1669.

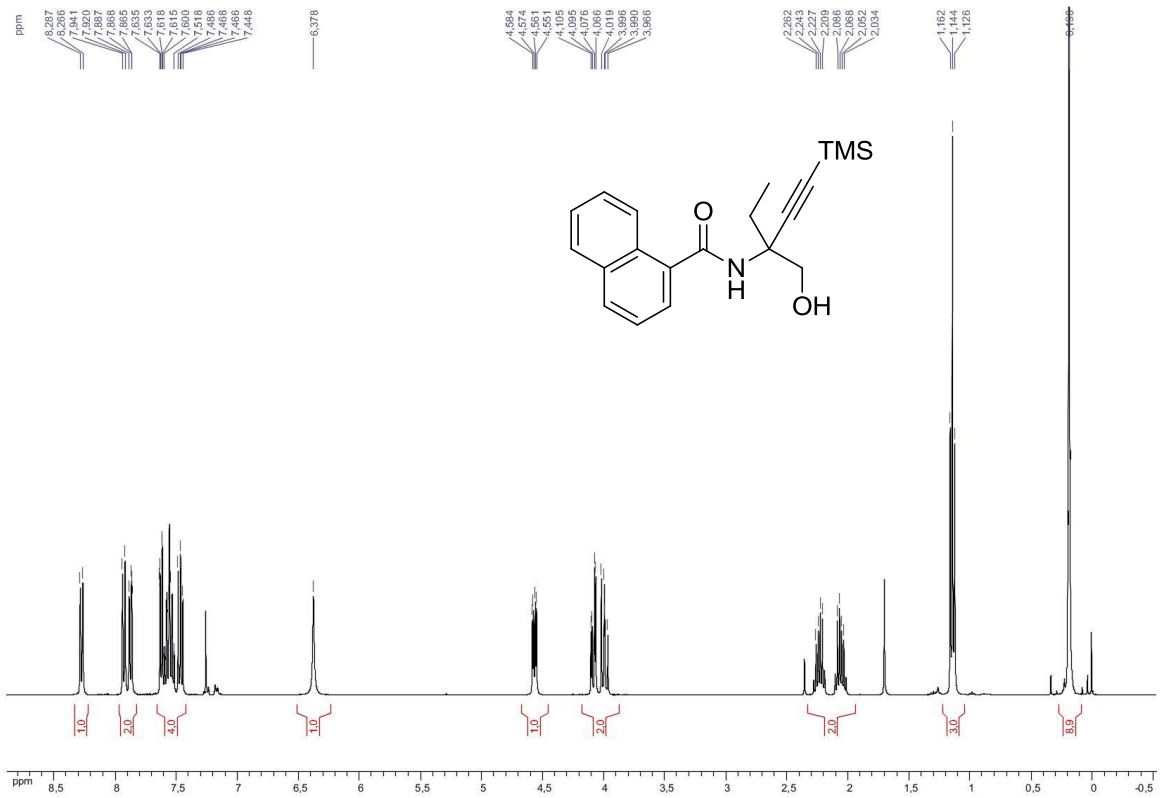
VII. Copies of ^{1}H and ^{13}C NMR spectra of pure compounds

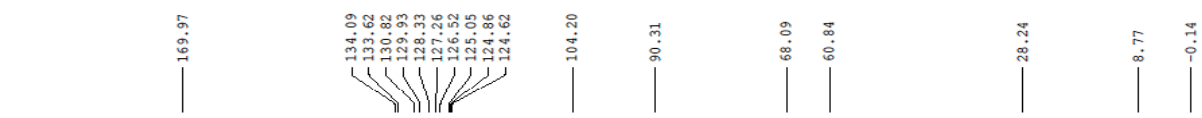
Cyanomethyl [1,1'-binaphthalene]-2-carboxylate (2b)

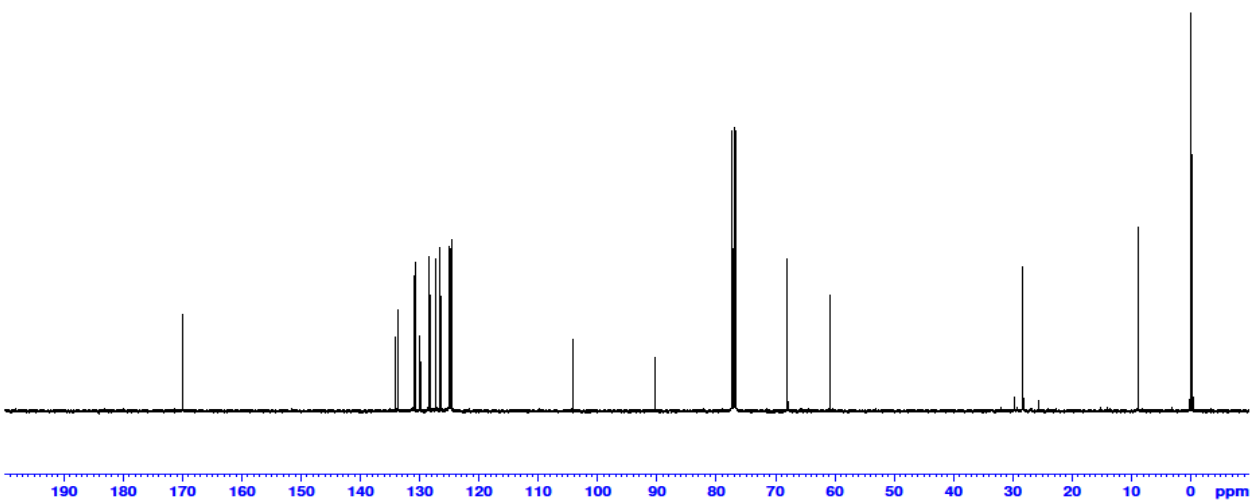




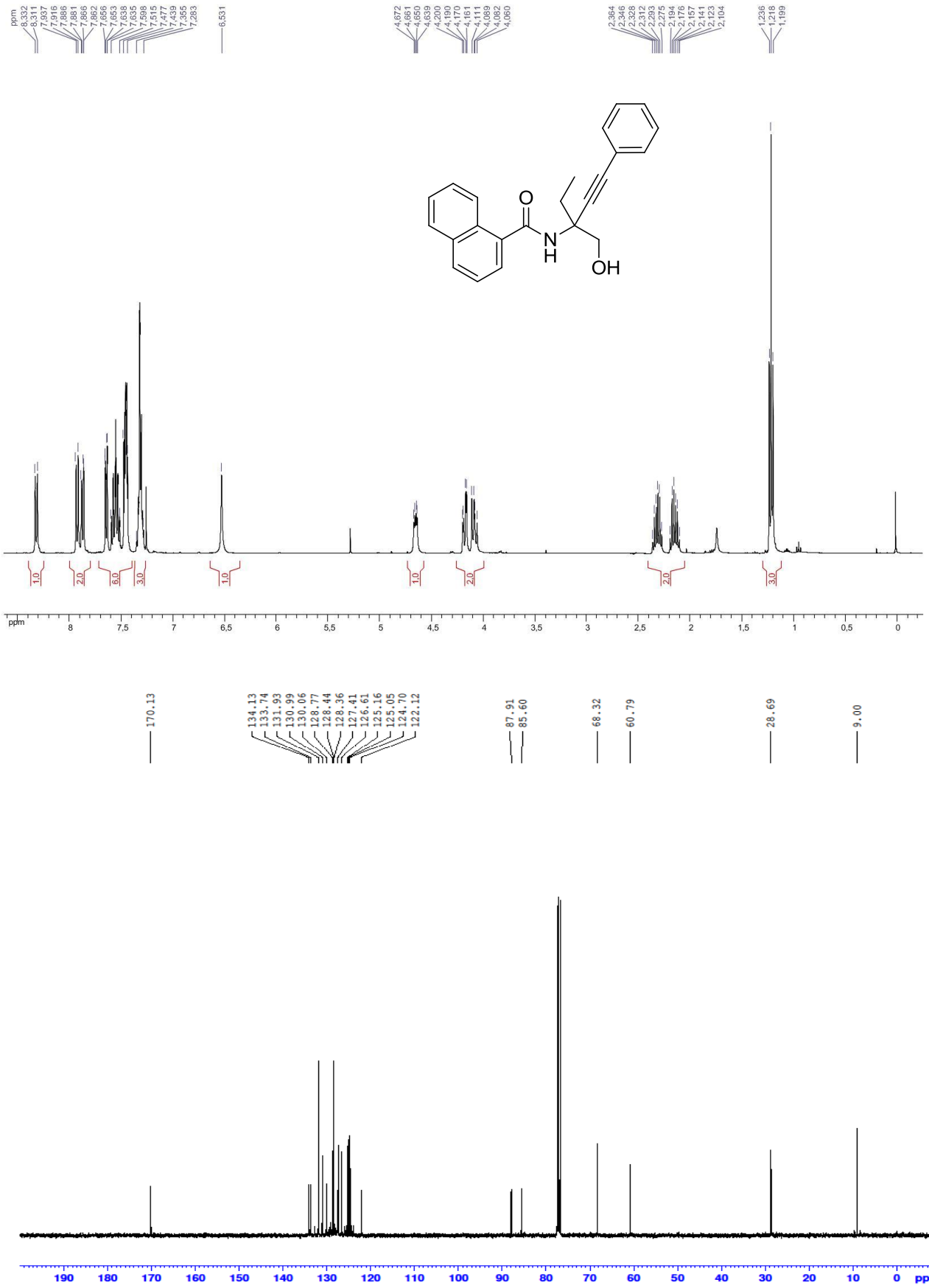
***N*-(3-(hydroxymethyl)-1-(trimethylsilyl)pent-1-yn-3-yl)-1-naphthamide (3ae)**



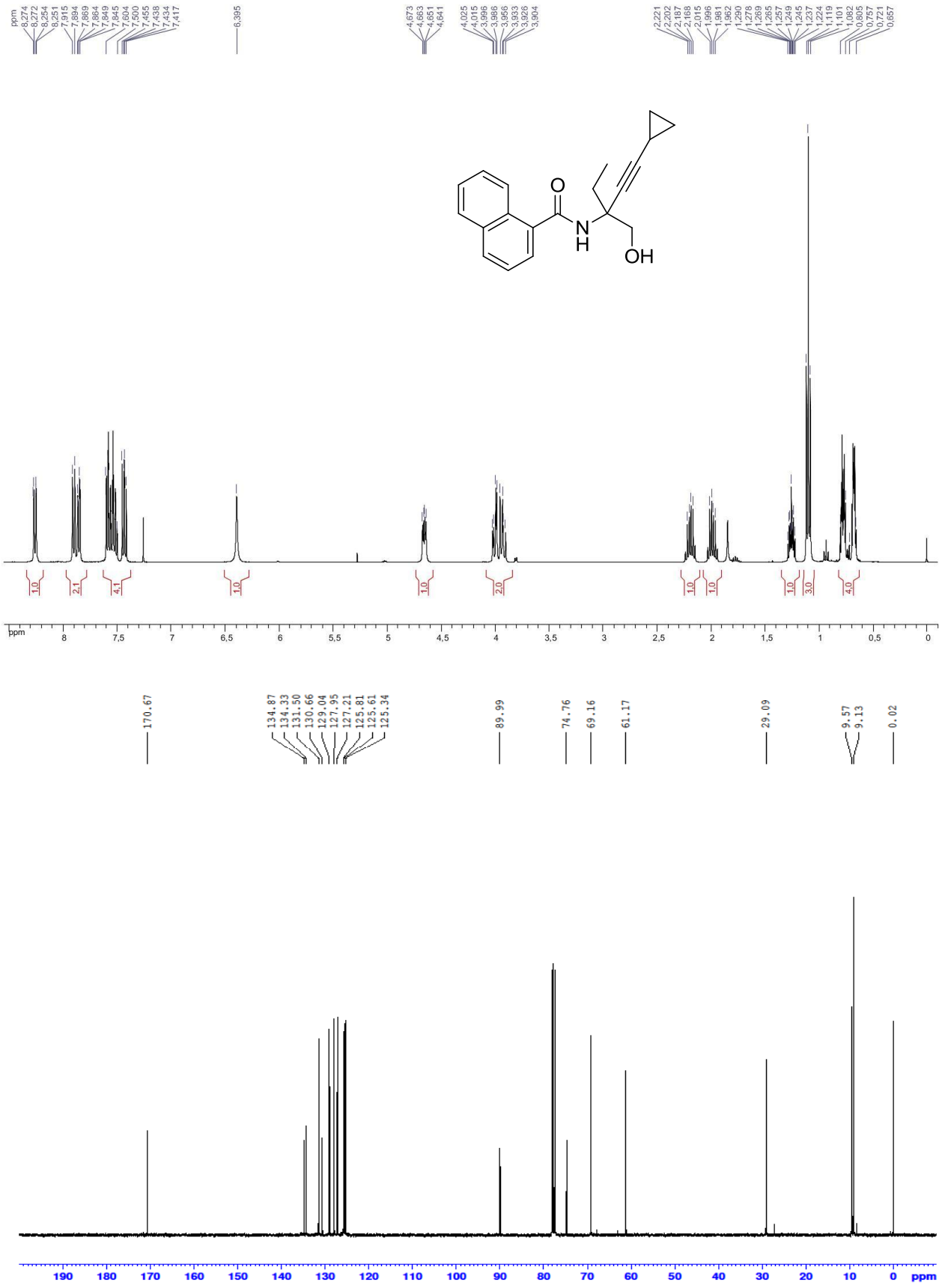




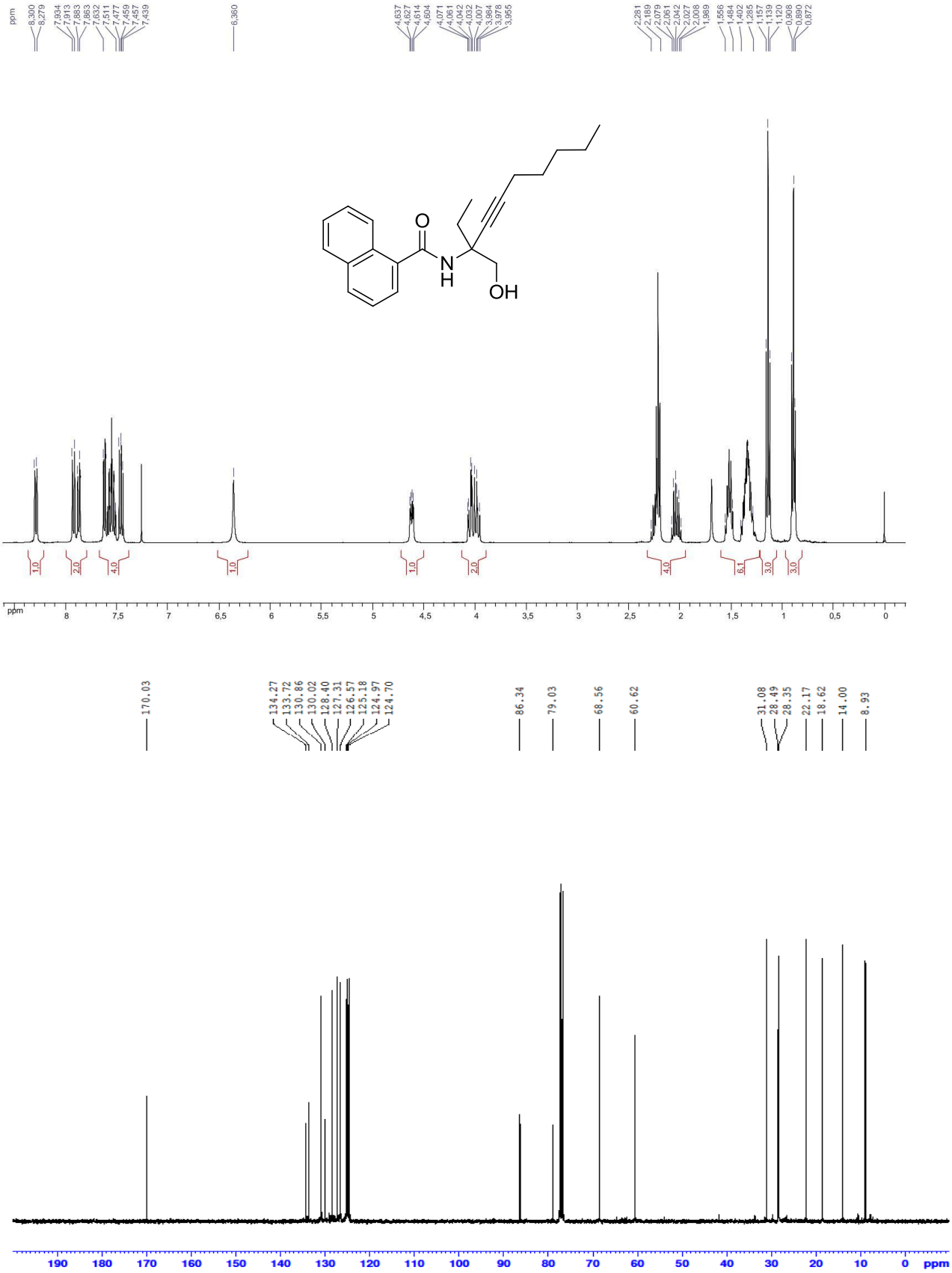
***N*-(3-(hydroxymethyl)-1-phenylpent-1-yn-3-yl)-1-naphthamide (3af)**



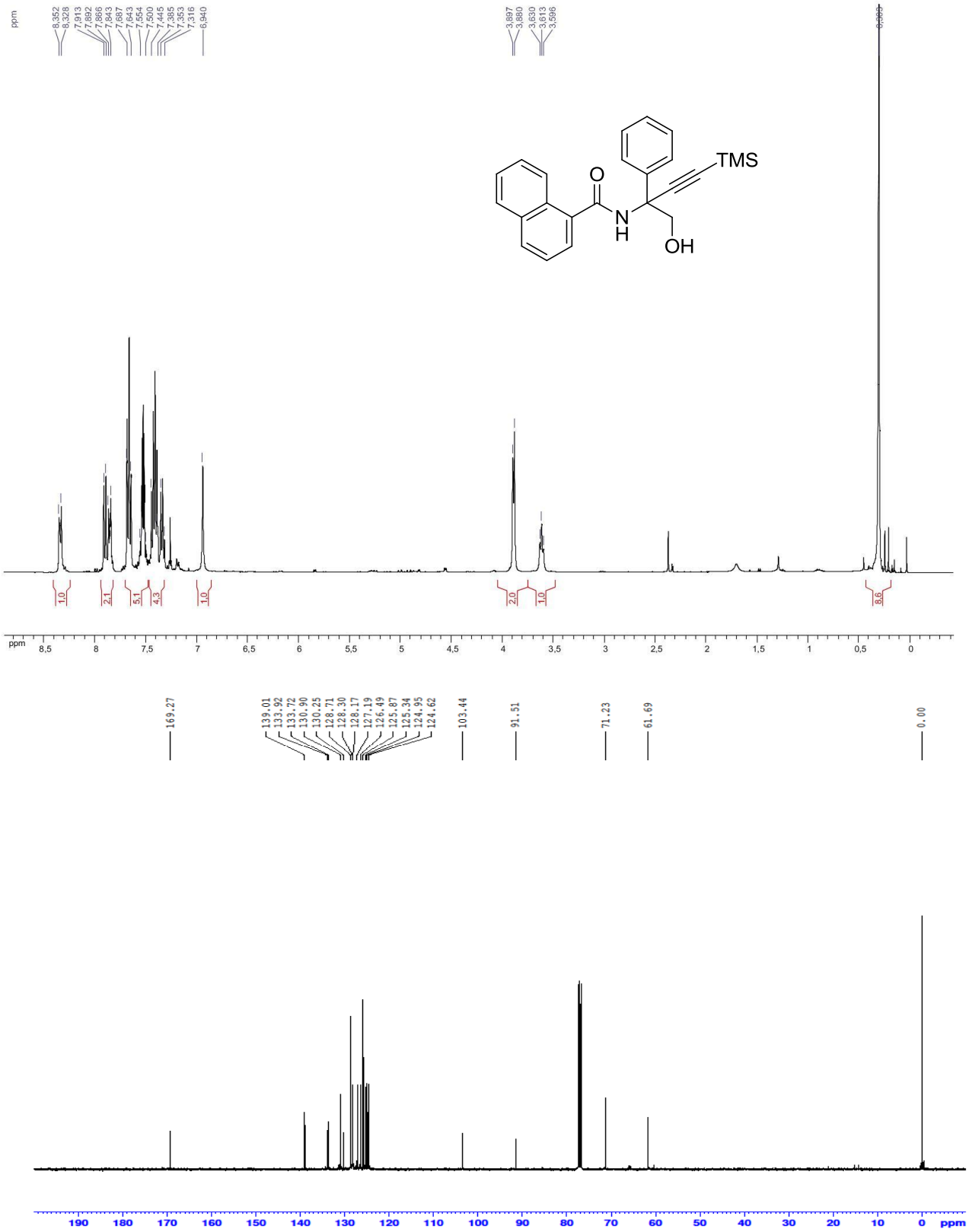
***N*-(1-cyclopropyl-3-(hydroxymethyl)pent-1-yne-3-yl)-1-naphthamide (3ag)**



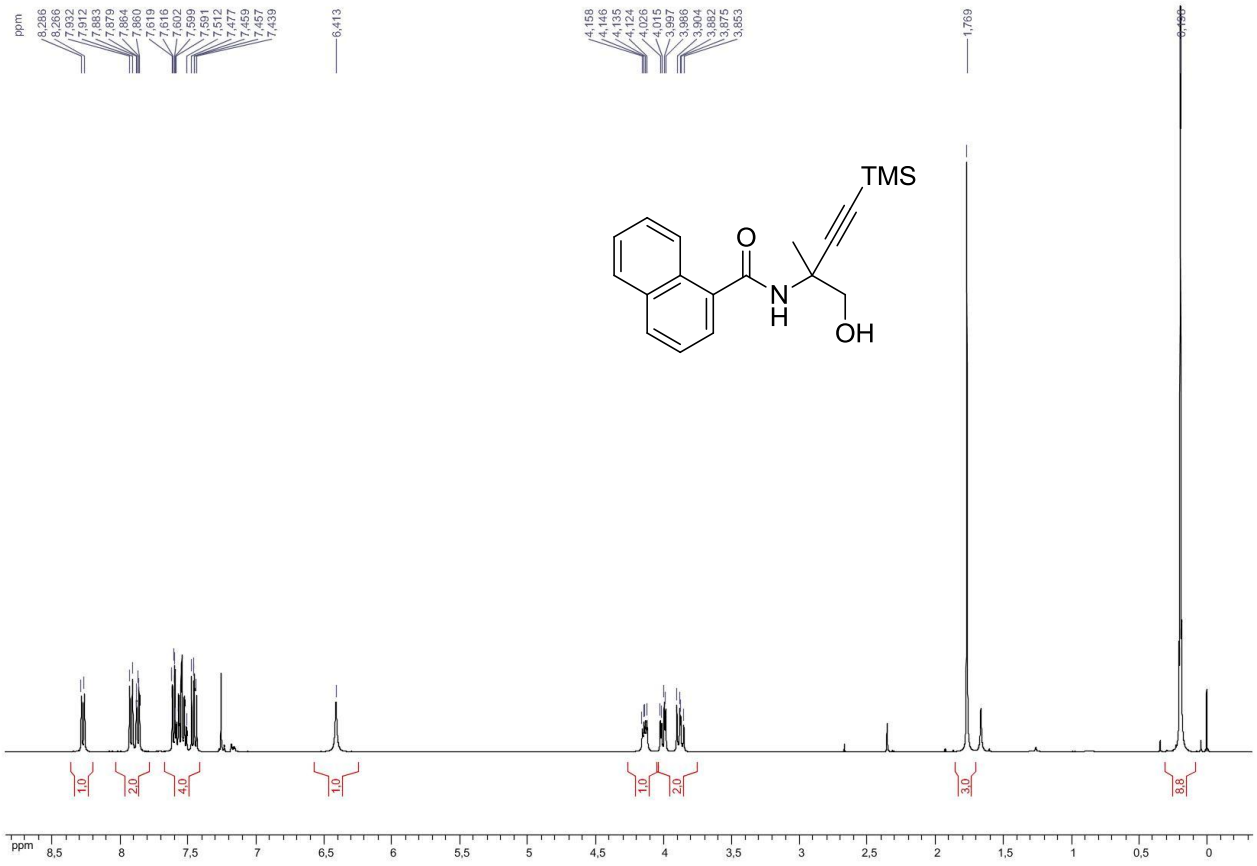
***N*-(3-(hydroxymethyl)dec-4-yn-3-yl)-1-naphthamide (3ah)**

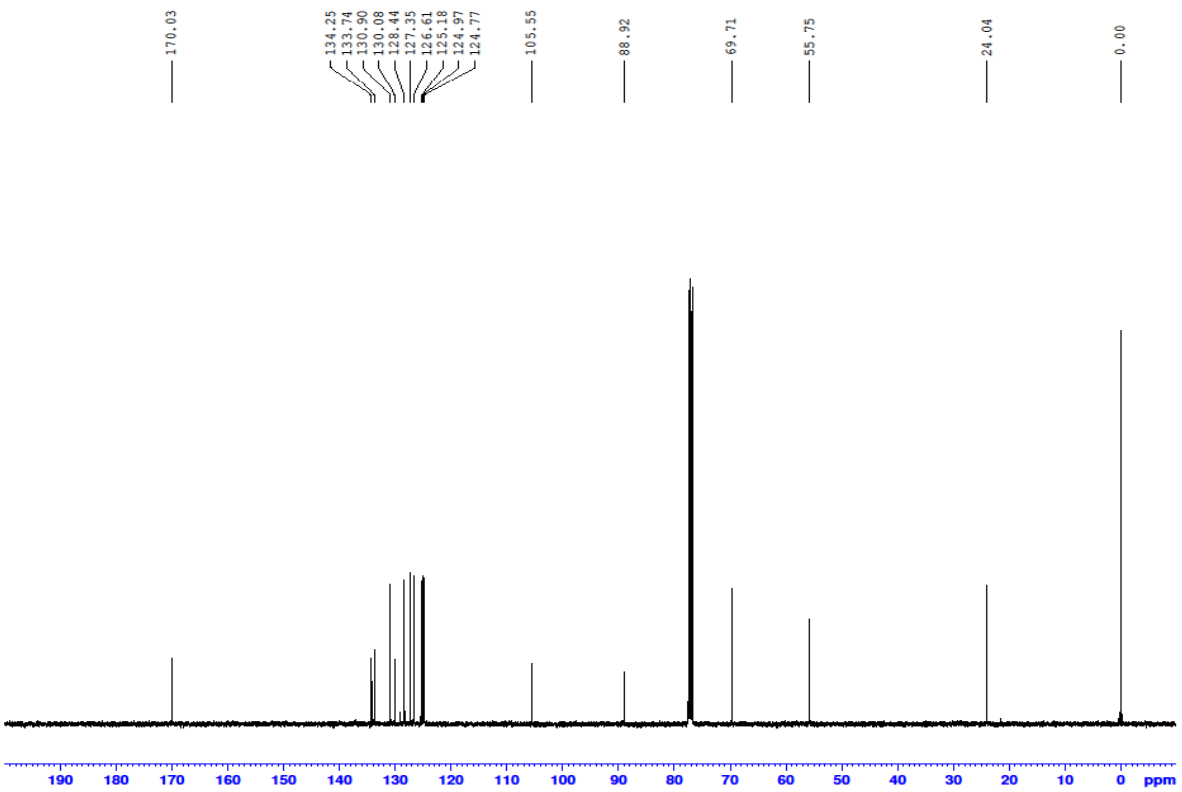


***N*-(1-hydroxy-2-phenyl-4-(trimethylsilyl)but-3-yn-2-yl)-1-naphthamide (3be)**

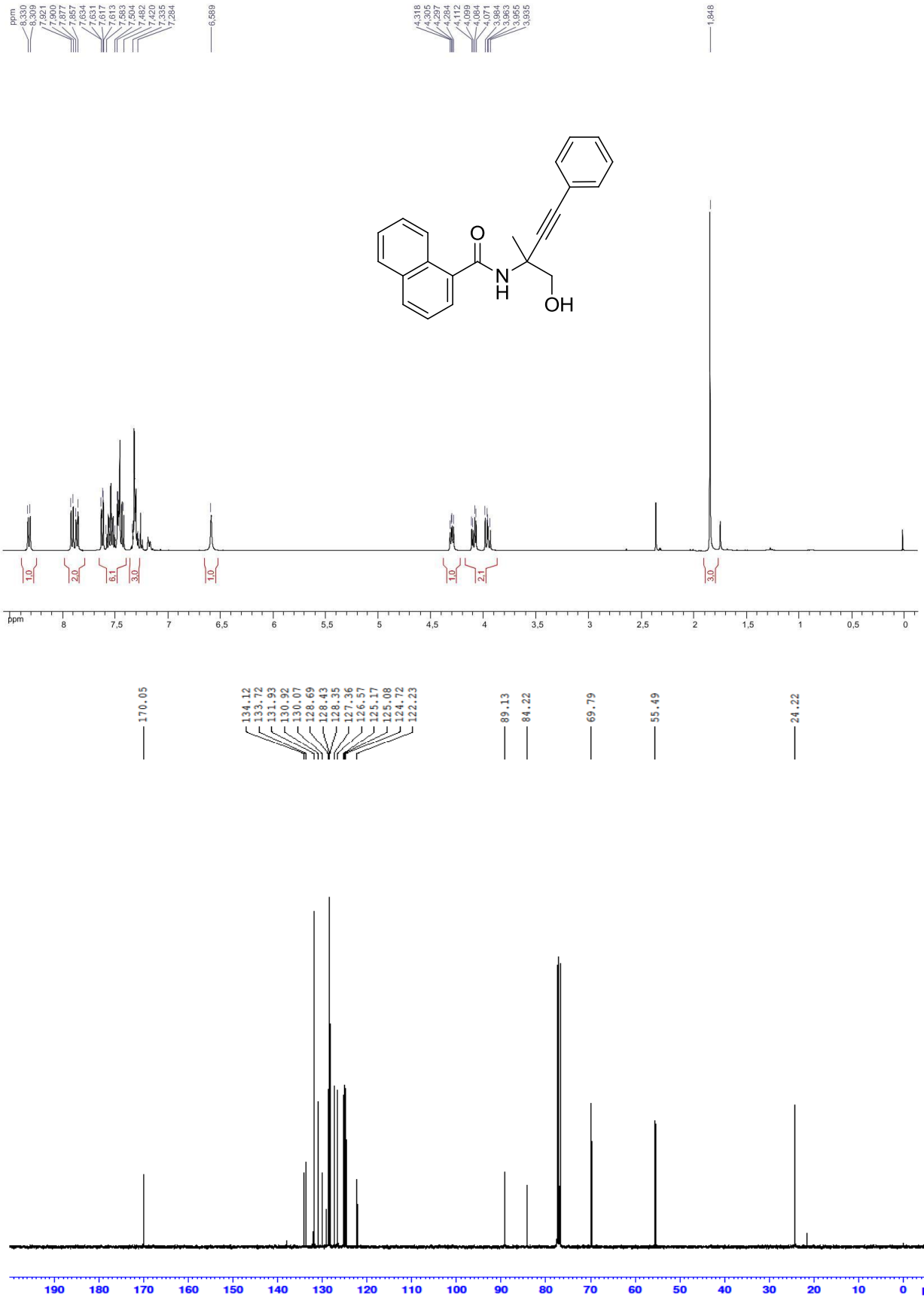


***N*-(1-hydroxy-2-methyl-4-(trimethylsilyl)but-3-yn-2-yl)-1-naphthamide (3ce)**

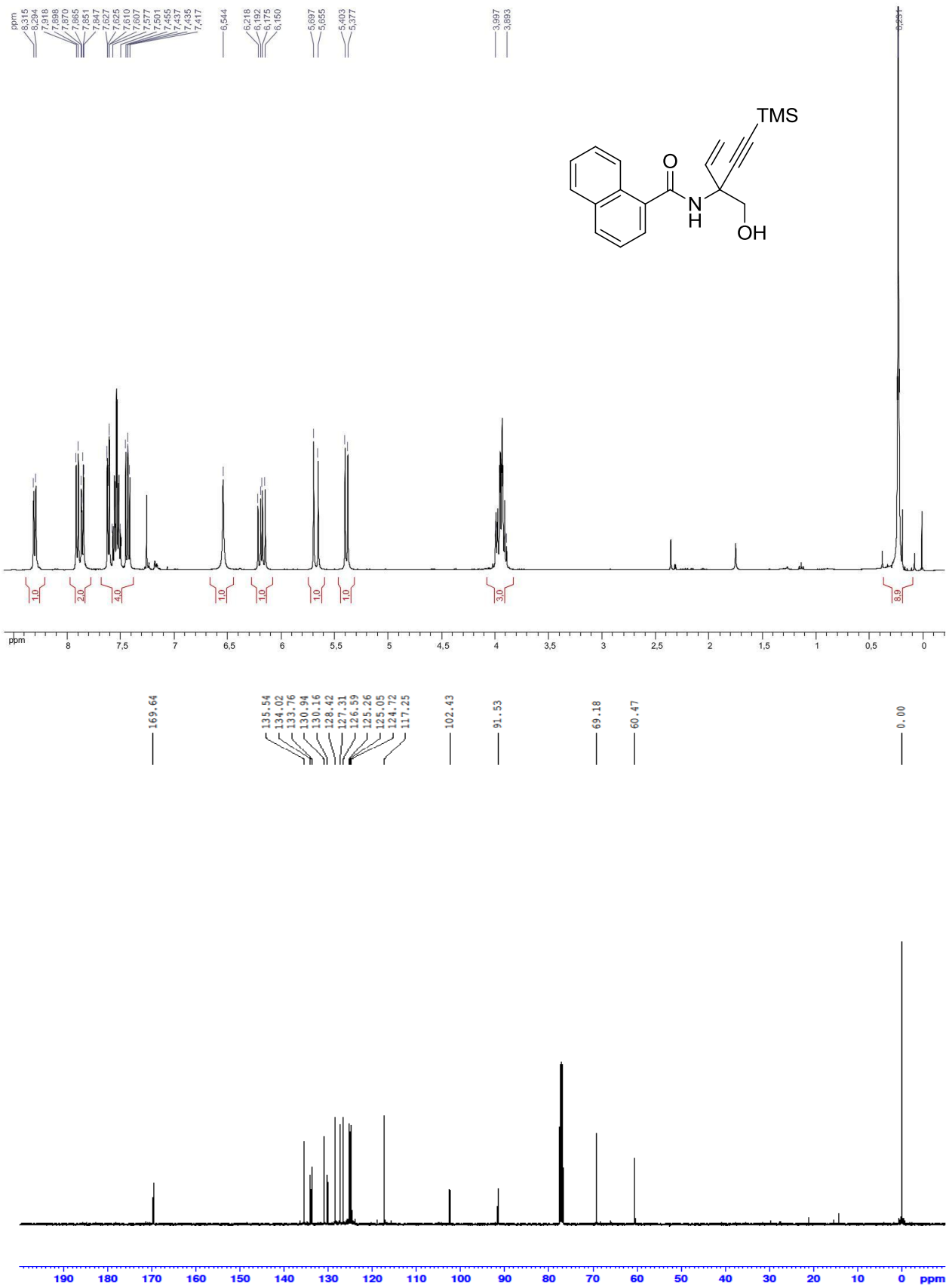




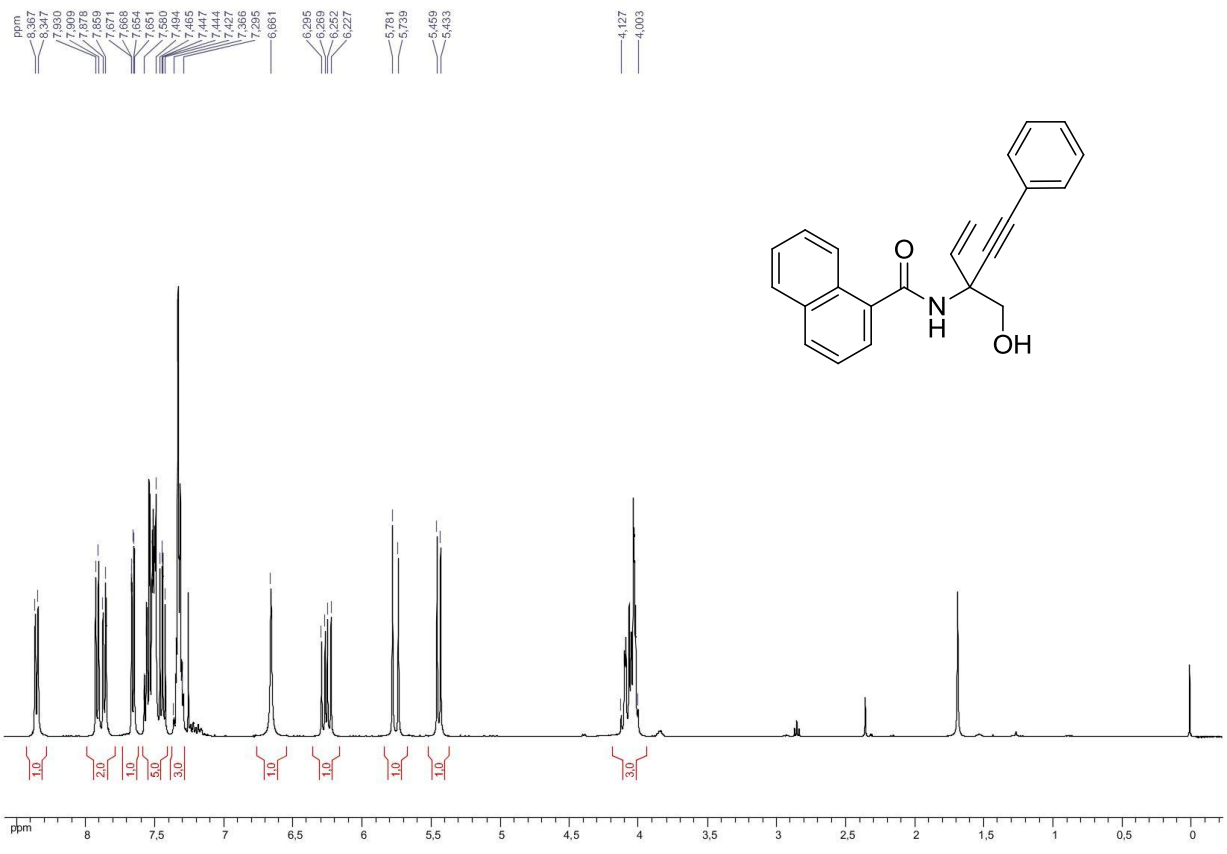
***N*-(1-hydroxy-2-methyl-4-phenylbut-3-yne-2-yl)-1-naphthamide (3cf)**

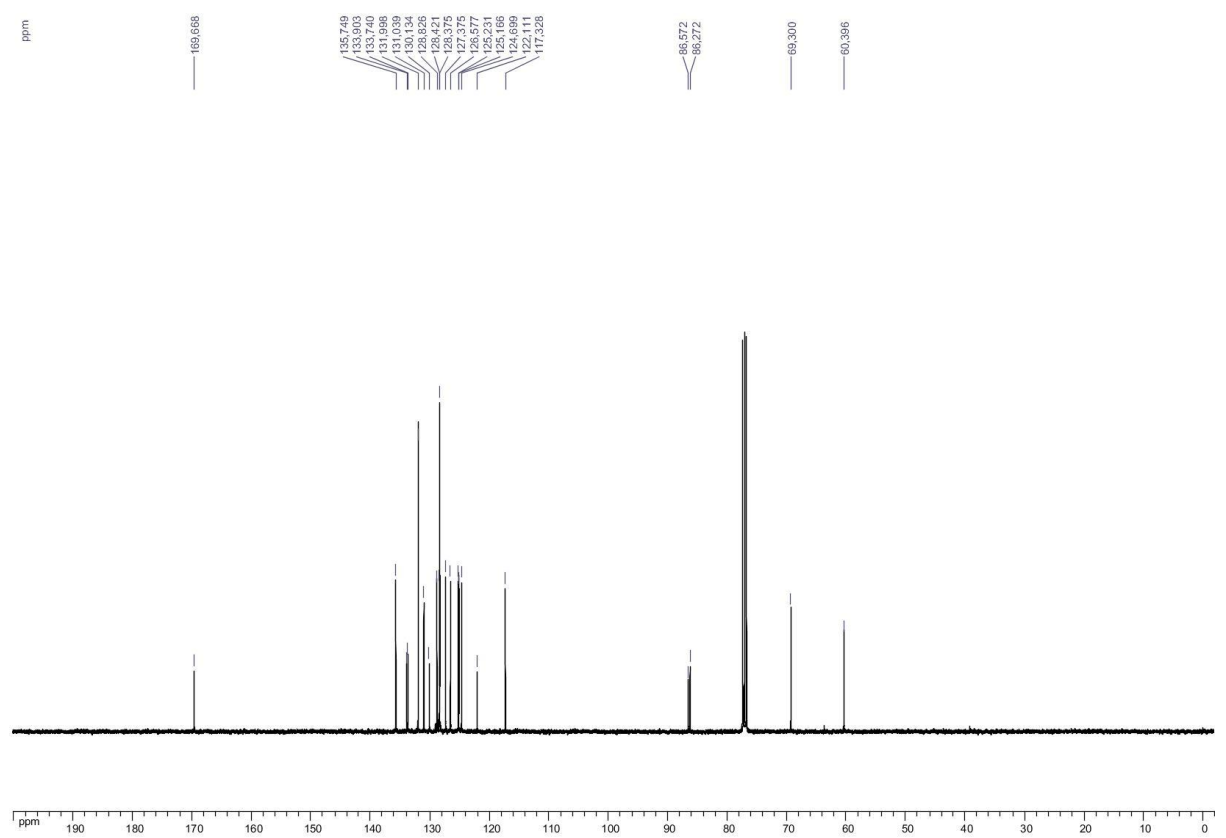


***N*-(3-(hydroxymethyl)-5-(trimethylsilyl)pent-1-en-4-yn-3-yl)-1-naphthamide (3de)**

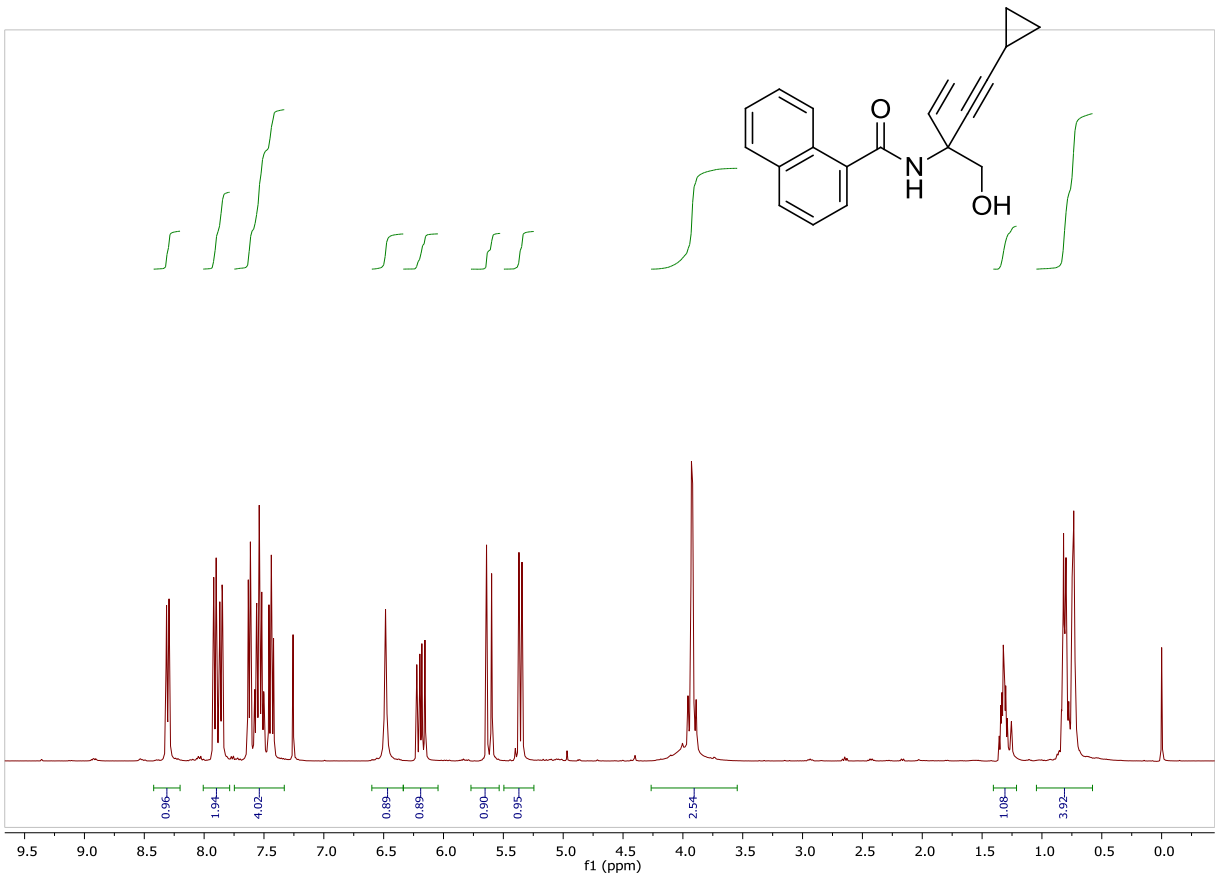


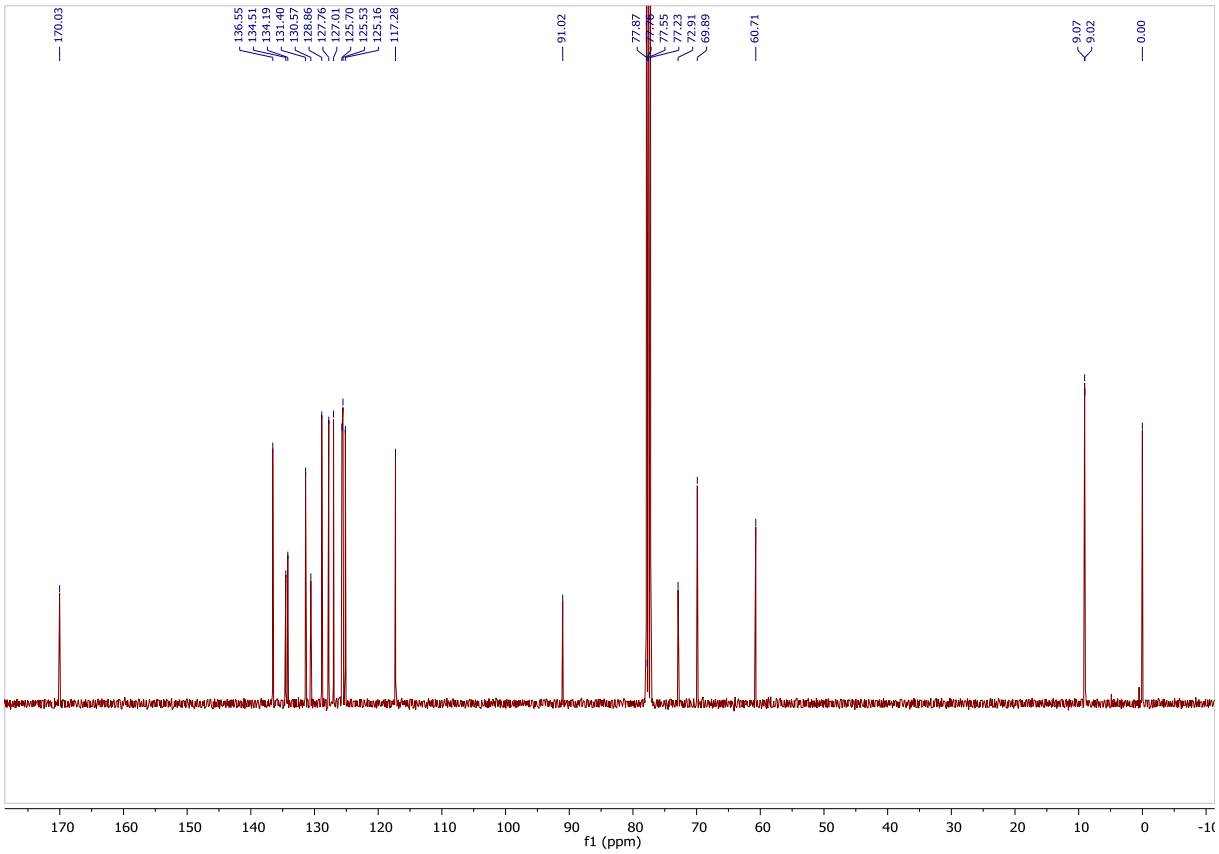
***N*-(3-(hydroxymethyl)-5-phenylpent-1-en-4-yn-3-yl)-1-naphthamide (3df)**



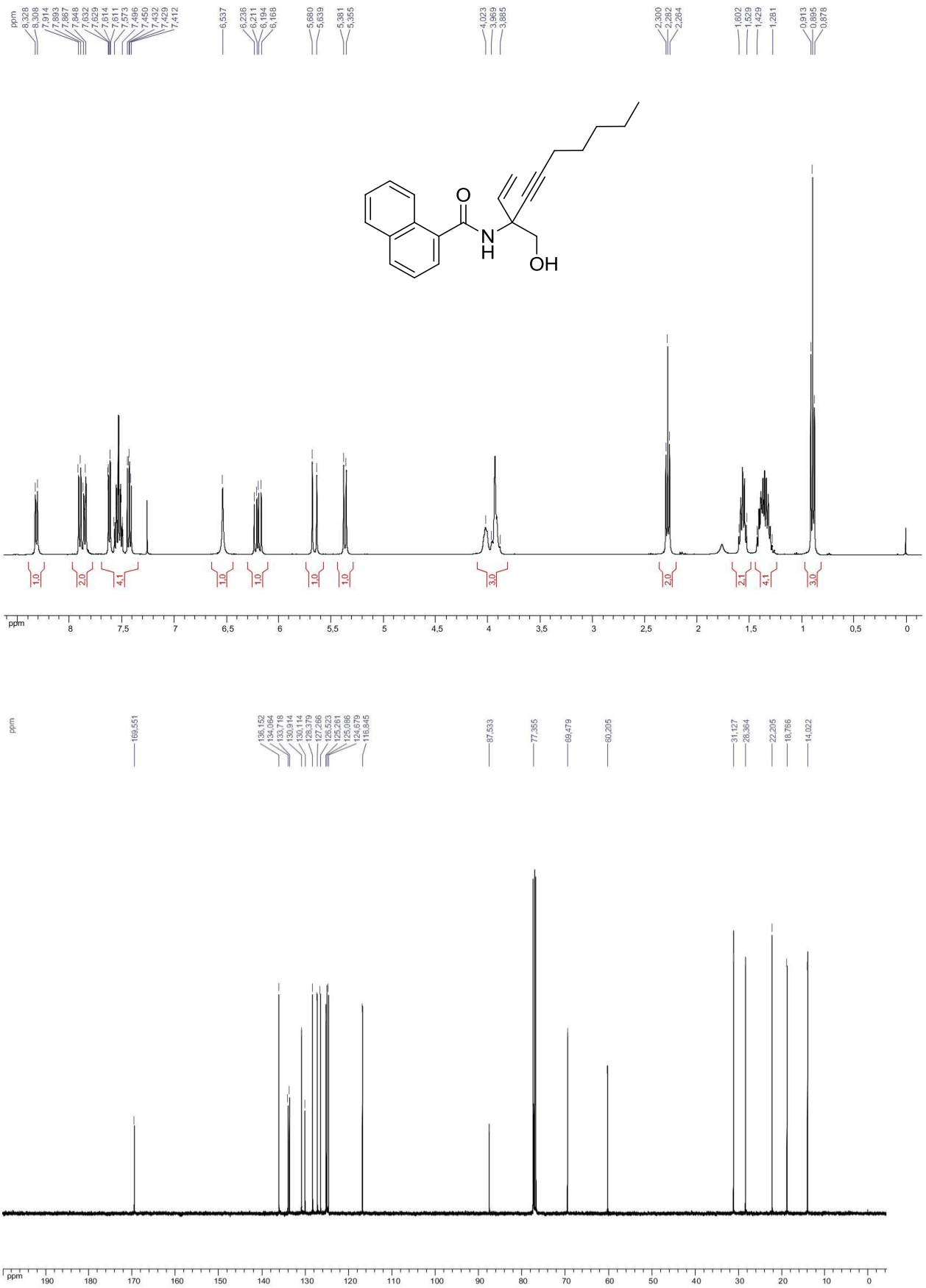


N-(5-Cyclopropyl-3-(hydroxymethyl)pent-1-en-4-yne-3-yl)-1-naphthamide (3dg)

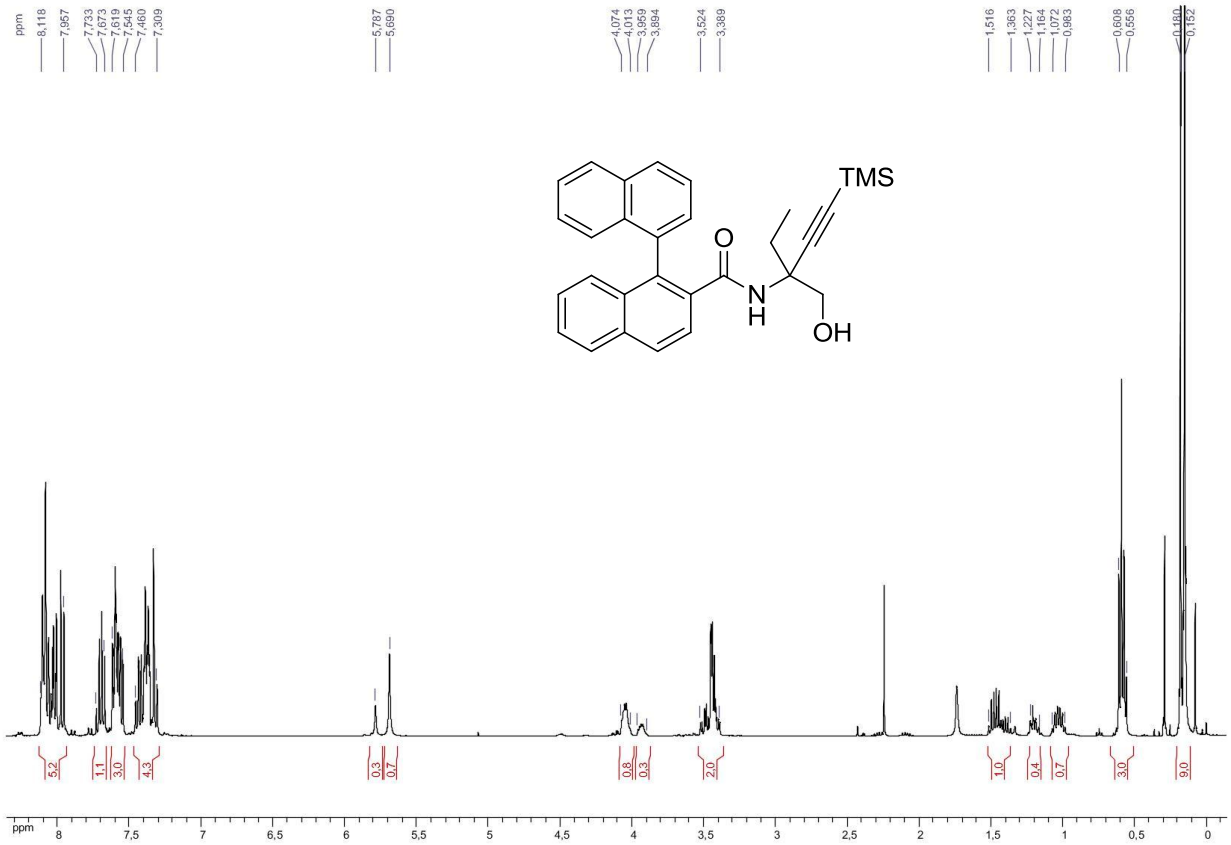


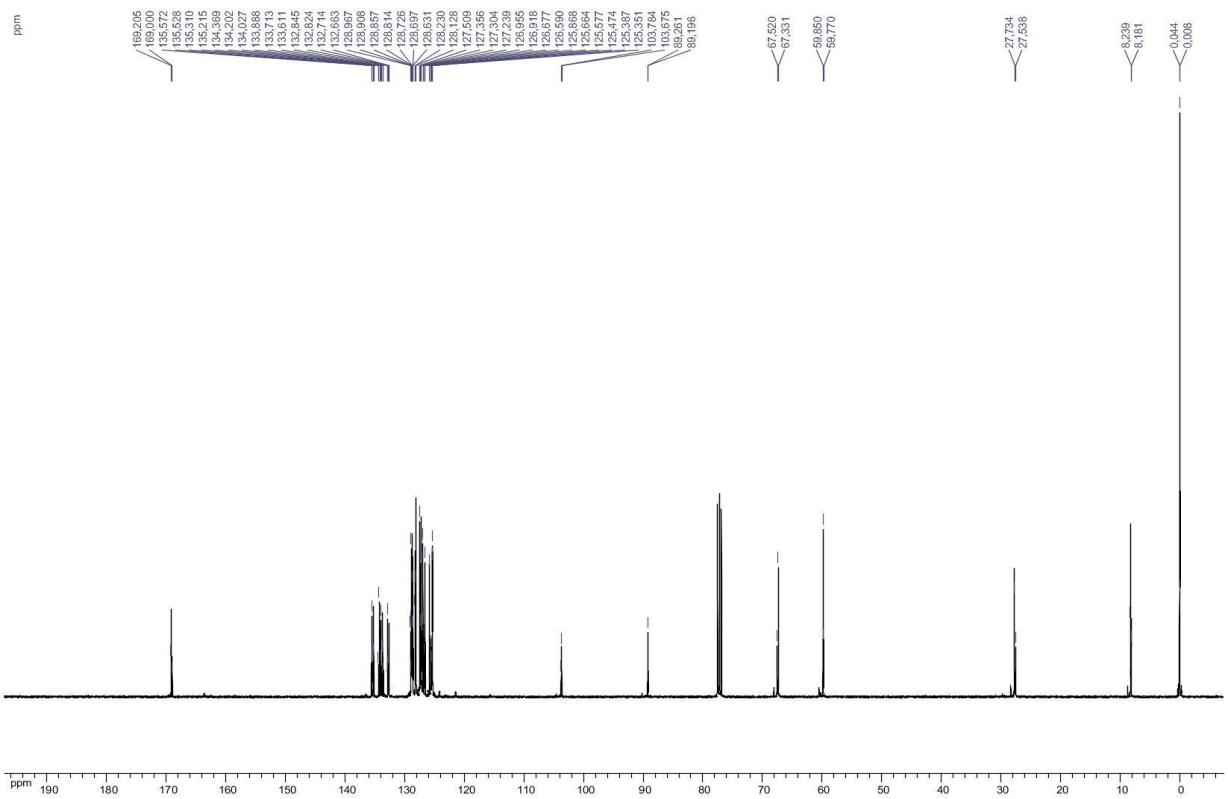


N-(3-(Hydroxymethyl)dec-1-en-4-yn-3-yl)-1-naphthamide (3dh)

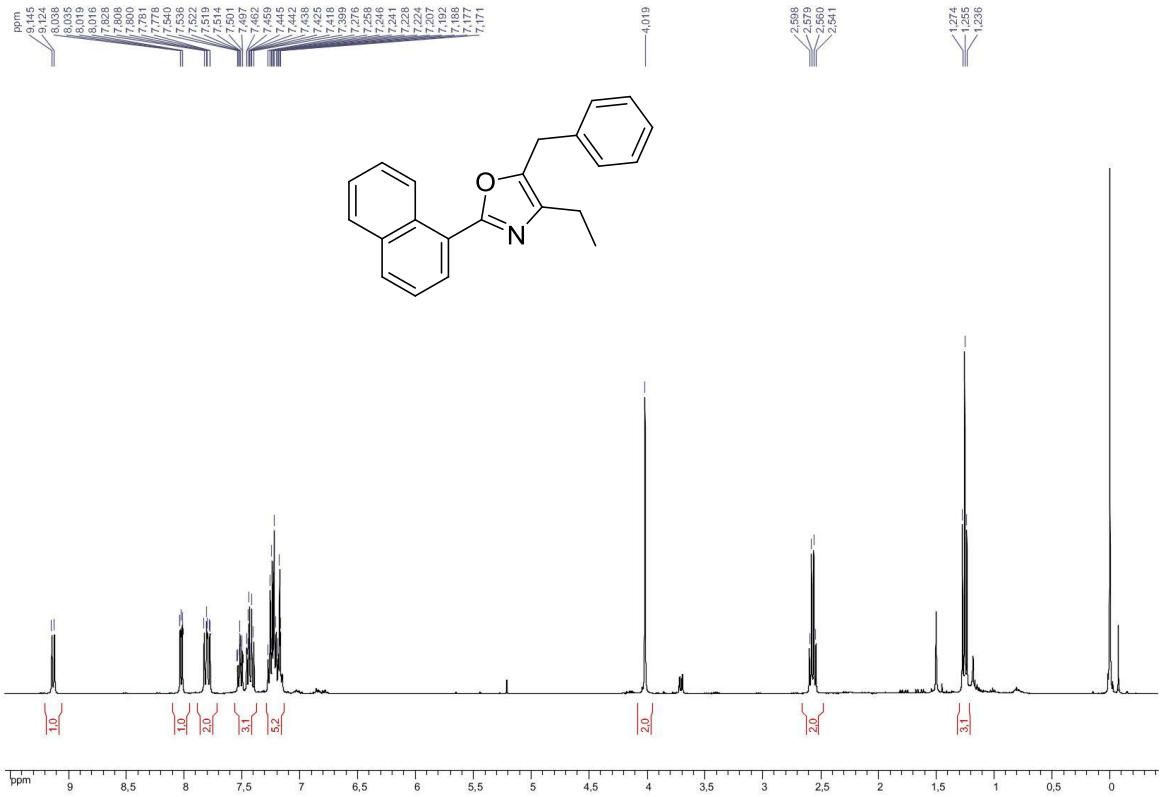


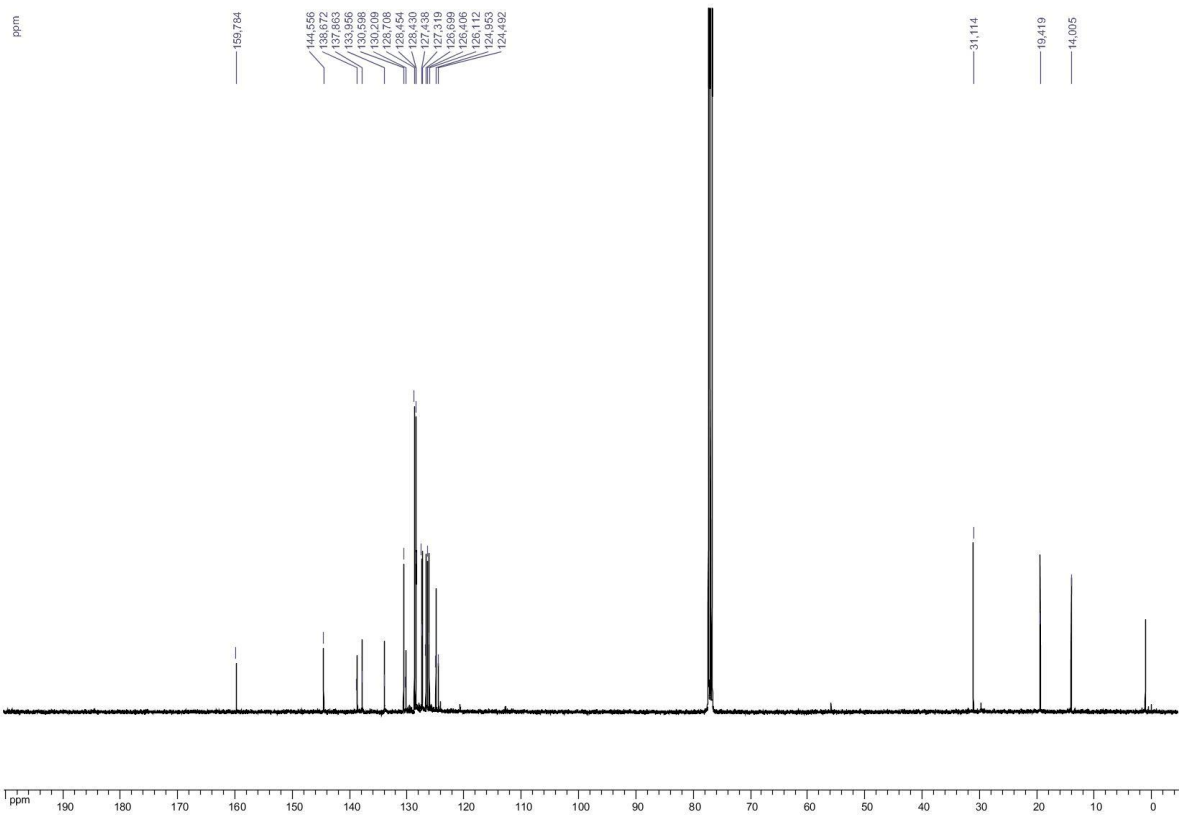
***N*-(3-(hydroxymethyl)-1-(trimethylsilyl)pent-1-yn-3-yl)-[1,1-binaphthalene]-2-carboxamide (4)**



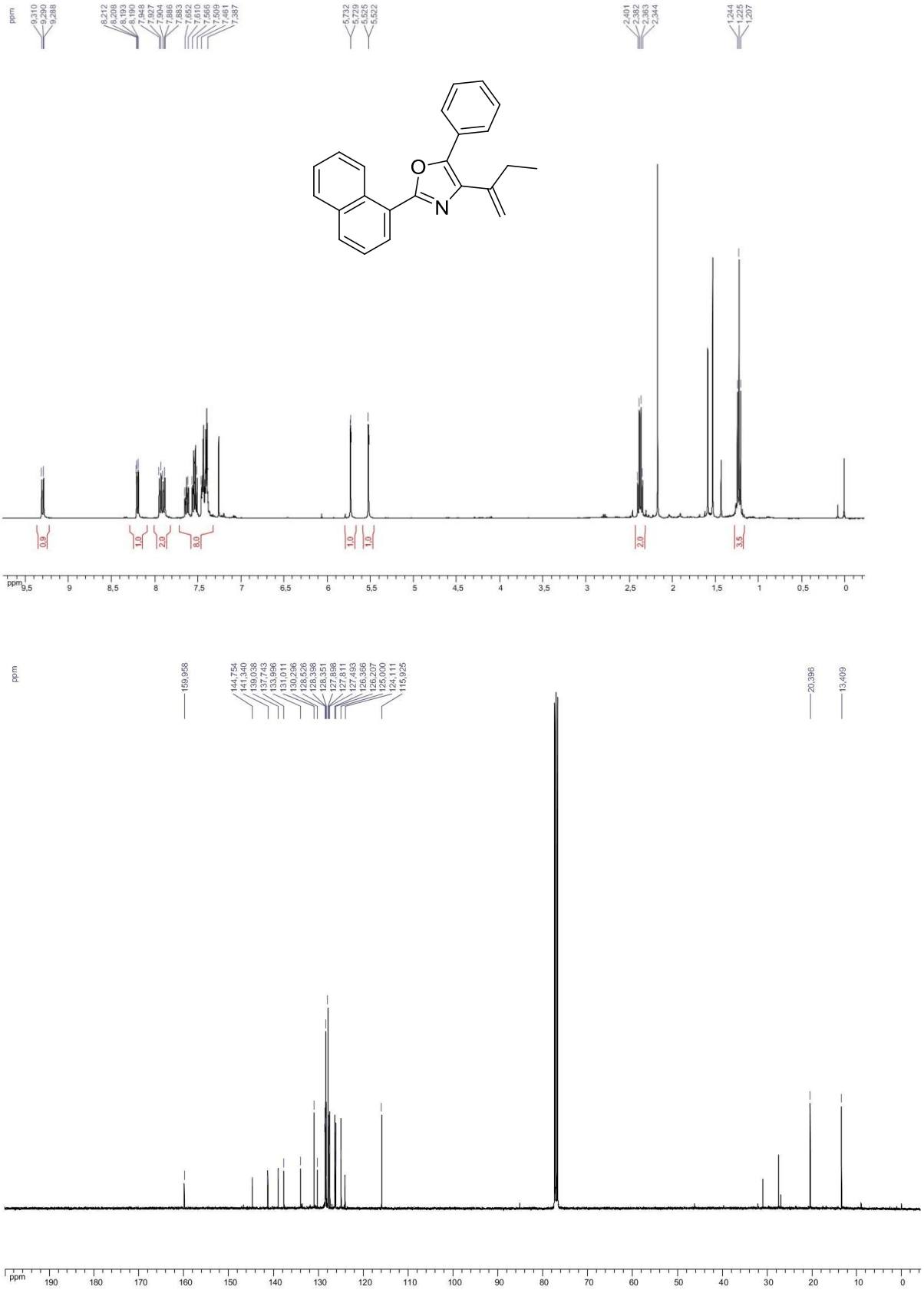


5-Benzyl-4-ethyl-2-(naphtalen-1-yl)oxazole

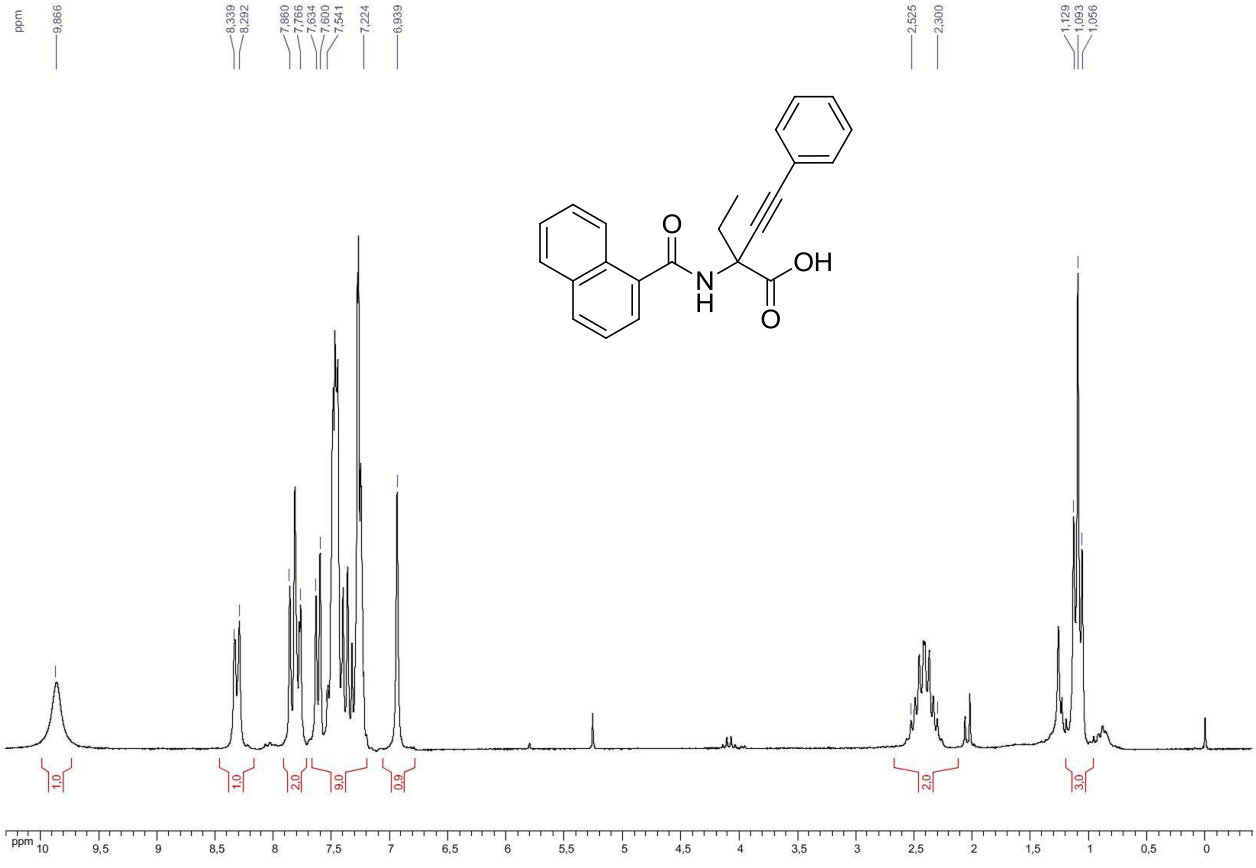


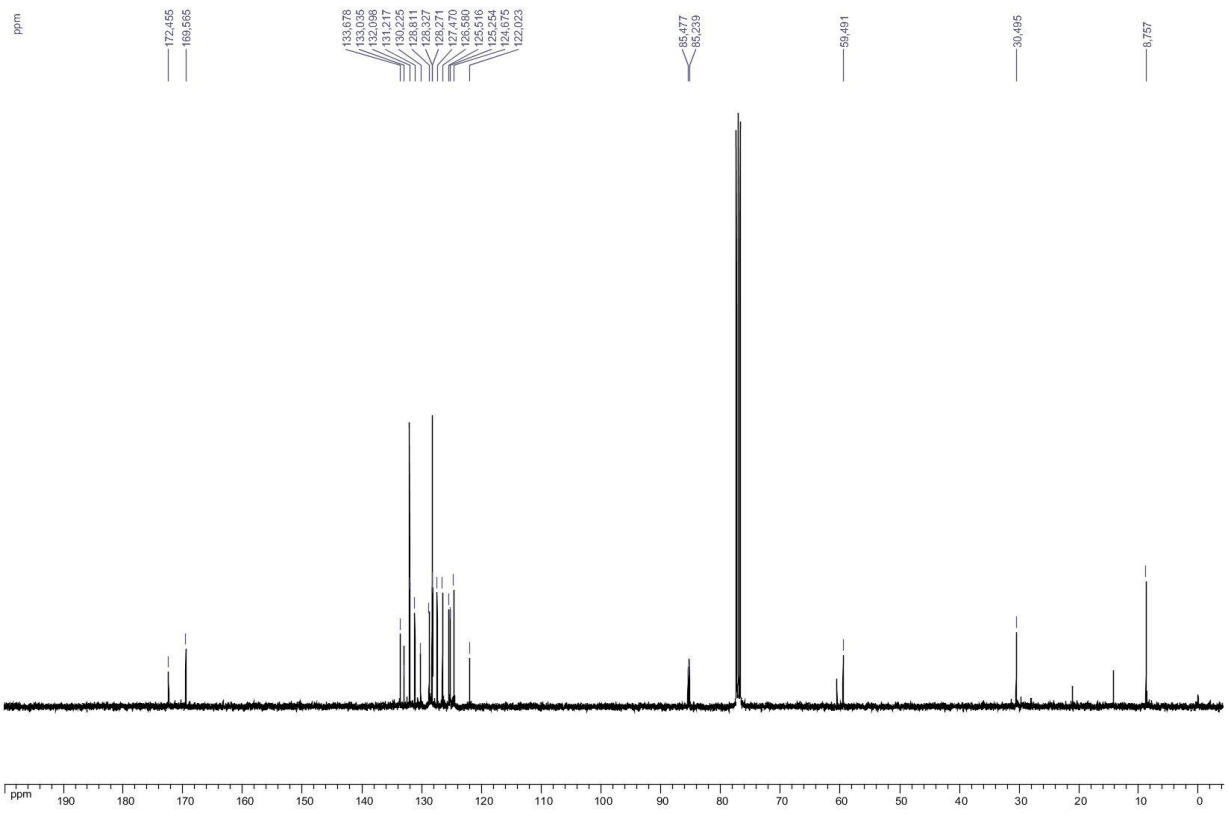


4-(But-1-en-2-yl)-2-(naphthalen-1-yl)-5-phenyloxazole

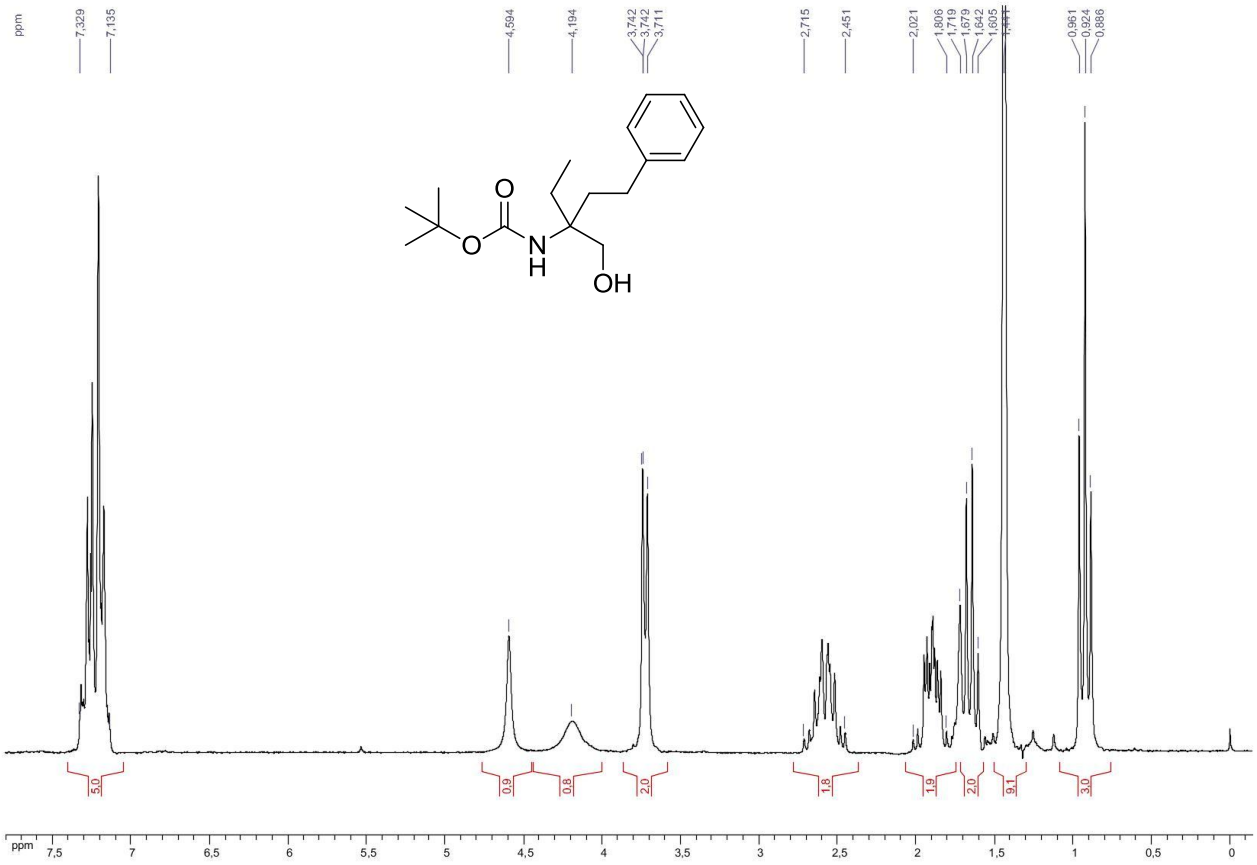


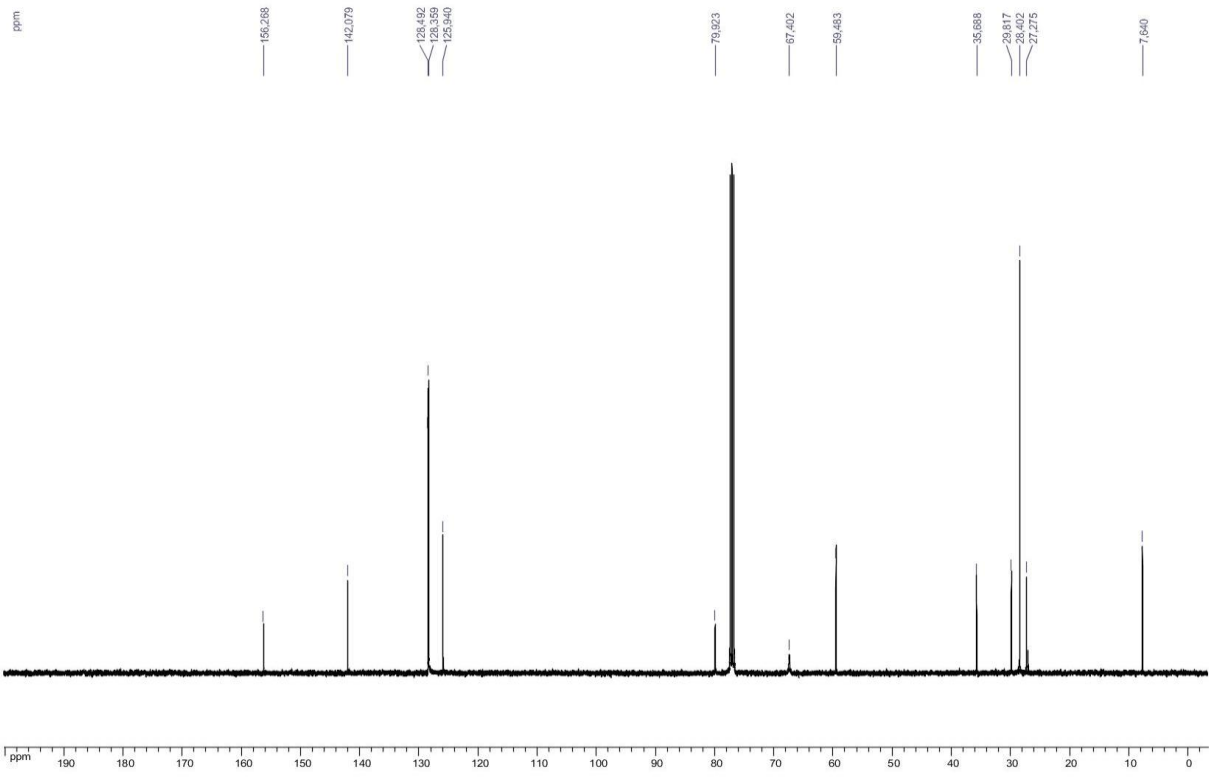
2-(1-naphthamido)-2-ethyl-4-phenylbut-3-ynoic acid (5)





tert-Butyl(3-(hydroxymethyl)-1-phenylpentan-3-yl) carbamate (6)





2-((*tert*-Butoxycarbonyl)amino)-2-ethyl-4-phenylbutanoic acid (7) in $CDCl_3$ (50 °C)