Supporting Information

Metal-free synthesis of dihydrofuran derivatives as anti-vicinal amino alcohol isosteric equivalents

Bhargav Gupta Nangunuri[a], Rajendra P. Shirke[a] and Mi-hyun Kim[a,*]

[a]Gachon Institute of Pharmaceutical Science and Department of Pharmacy, College of Pharmacy, Gachon University, 191 Hambakmoeiro, Yeonsu-gu, Incheon, Republic of Korea

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EXPERIMENTAL SECTION

1. General Information

All purchased reactants and reagents were used without further purification. BRUKER NMR instruments used for ^{1}H NMR (600 MHz) and ^{13}C NMR (150 MHz) spectra were recorded in $CDCl_3$ with regard to tetramethylsilane (TMS) as a reference for chemical shift values. Chemical shifts (δ) were described in parts per million (ppm) and coupling constants (J) are referenced in hertz (Hz). Data are reported as follows: chemical shift [multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, br = broad)]. Organic solvents were concentrated on EYELA SB-1200. Rotary evaporator and vacuum pump EYELA CCA-1111. Silica gel (60-120 mesh) was used for the purification of crude products by column chromatography. Thin-layer chromatography (TLC) was presented on precoated silica gel 60 F254 MERCK and visualized by exposing UV light. Melting points were recorded on OptiMelt automatic melting point system.

2. Experimental section: General procedures and characterization data

2.1. Synthesis of hypervalent iodine reagent

Acetoxy((4-methyl)-N-tosylbenzenesulfonamidyl)iodosobenzene (1a):

Synthesized according to the reported literature [1].

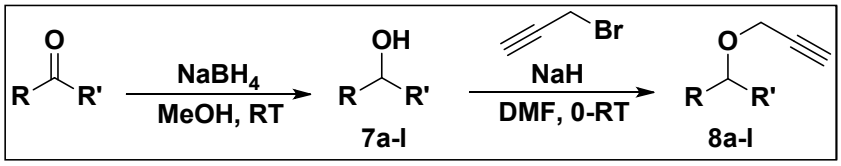
To a solution of Iodobenzene diacetate (1.0 g, 3.1 mmol) in CH_2Cl_2 (20 mL) was added 4-methyl-N-tosylbenzensulfonamide (1.0 g, 3.1 mmol) and the reaction mixture stirred at room temperature during 0.5 h. The solvent was removed under the reduced pressure obtaining the title compound **1a** as a white solid in quantitative yield.

Analytical data is in accordance with the literature [1].

^{1}H NMR (600 MHz, DMSO-d6) δ 8.22 (dd, *J* = 8.3, 1.0 Hz, 2H), 7.70 (t, *J*= 1.1 Hz, 1H), 7.65 – 7.58 (m, 2H), 7.52 (d, *J* = 8.2 Hz, 4H), 7.15 (d, *J* = 7.9 Hz, 4H), 2.32 (s, 6H), 1.91 (s, 3H).

^{13}C NMR (151 MHz, DMSO-d6) δ 172.49, 144.02, 140.21, 135.01, 132.97, 131.68, 128.71, 126.65, 123.91, 21.53, 21.32.

2.2. General procedure for the synthesis of starting materials (8a-l)

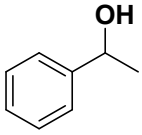


General Procedure for the synthesis of 7a-l:

To a stirred solution of ketone/aldehyde (1.0 mmol) in MeOH (2 mL) was added $NaBH_4$ (37 mg, 1.0 mmol) in single portion. The reaction mixture was stirred until full consumption of the starting material (TLC analysis). The solvent was removed under reduced pressure and diluted the reaction mixture with ice water (5 mL) and extracted into ether (3*10 mL). Combined extracts were washed with brine (1*10 mL), dried over Na_2SO_4 and evaporated under reduced pressure. The residue was used without any further purification.

***** Compound **7a**, **7e**, **7j**, **7k** and **7l** were commercially available and used without further purification.

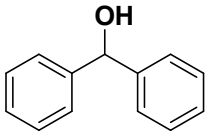
1-phenylethanol (7b):



Isolated as colorless oil; 98% Yield (119 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.40 – 7.33 (m, 4H), 7.31 – 7.26 (m, 1H), 4.88 (d, *J* = 15.2 Hz, 1H), 2.51 (s, 1H), 1.60 – 1.39 (m, 3). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 145.90, 145.84, 128.50, 127.49, 127.45, 125.45, 125.41, 70.42, 70.33, 25.17.

Analytical data is in accordance with the literature [2].

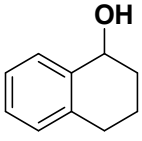
Diphenylmethanol (7c):



Isolated as white solid; 98% Yield (180 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.40 (d, *J* = 7.6 Hz, 4H), 7.35 (t, *J* = 7.4 Hz, 4H), 7.32 – 7.25 (m, 2H), 5.85 (s, 1H), 2.36 – 2.23 (m, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 143.82, 128.53, 127.61, 126.57, 76.29.

Analytical data is in accordance with the literature [3].

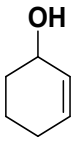
1,2,3,4-tetrahydronaphthalen-1-ol (7d):



Isolated as colorless liquid; 98% Yield (145 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.43 (dd, *J* = 6.2, 2.8 Hz, 1H), 7.23 – 7.17 (dd, 2H), 7.14 – 7.08 (m, 1H), 4.78 (t, 1H), 2.88 – 2.69 (m, 2H), 2.03 – 1.94 (m, 2H), 1.94 – 1.88 (m, 1H), 1.78 (ddd, *J* = 12.6, 6.4, 3.4 Hz, 1H), 1.70 (s, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 138.81, 137.14, 129.04, 128.67, 127.61, 126.21, 68.18, 32.29, 29.26, 18.80.

Analytical data is in accordance with the literature [4].

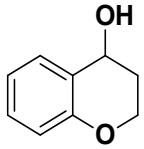
Cyclohex-2-enol (7f):



Isolated as colorless oil; 92% Yield (90 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 1.54-1.64 (m, 2H), 1.69-1.74 (m, 1H), 1.84-1.89 (m, 1H), 1.93-1.95 (m, 1H), 1.99-2.04 (m, 1H), 4.16-4.21 (m, 1H), 5.74 (dq, J 10.0, 2.4 Hz, 1H), 5.83 (dtd, J 10.2, 3.7, 1.3 Hz, 1H). **^{13}C NMR (151 MHz, CDCl3)** δ 18.92, 25.04, 32.02, 65.51, 129.82, 130.60.

Analytical data is in accordance with the literature [5].

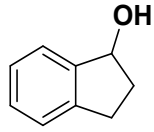
Chroman-4-ol (7g):



Isolated as white solid; 95% Yield (142 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.30 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.24 – 7.18 (m, 1H), 6.92 (td, *J* = 7.5, 1.1 Hz, 1H), 6.84 (dd, *J* = 8.3, 0.9 Hz, 1H), 4.76 (s, 1H), 4.29 – 4.22 (m, 2H), 2.16 (s, 1H), 2.14 – 2.07 (m, 1H), 2.04 – 1.97 (m, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 154.58, 129.72, 129.71, 124.33, 120.60, 117.08, 63.21, 61.94, 30.82.

Analytical data is in accordance with the literature [6].

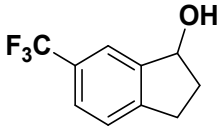
2,3-dihydro-1H-inden-1-ol (7h):



Isolated as colorless oil; 90% Yield (120 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.42 (d, *J* = 6.9 Hz, 1H), 7.30 – 7.20 (m, 3H), 5.23 (s, 1H), 3.06 (ddd, *J* = 15.9, 8.5, 4.8 Hz, 5H), 2.86 – 2.76 (m, 1H), 2.48 (dddd, *J* = 13.1, 8.3, 6.9, 4.8 Hz, 1H), 2.18 (d, *J* = 9.8 Hz, 1H), 1.94 (dddd, *J* = 13.7, 8.5, 6.6, 5.4 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 145.01, 143.34, 128.32, 126.71, 124.91, 124.24, 76.40, 35.89, 29.81.

Analytical data is in accordance with the literature [4].

6-(trifluoromethyl)-2,3-dihydro-1H-inden-1-ol (7i):



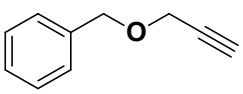
Isolated as colorless oil; 80% Yield (161 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.61 (s, 1H), 7.48 (d, *J* = 7.9 Hz, 1H), 7.30 (d, *J* = 7.9 Hz, 1H), 5.16 (t, *J* = 6.3 Hz, 1H), 3.47 (dd, *J* = 14.1, 7.0 Hz, 1H), 3.02 (ddd, *J* = 16.2, 8.6, 4.4 Hz, 1H), 2.85 – 2.75 (m, 1H), 2.45 (dddd, *J* = 12.9, 8.3, 7.0, 4.5 Hz, 1H), 1.90 (dddd, *J* = 13.1, 8.6, 7.2, 5.8 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 147.36, 145.69, 129.11 (q, *J* = 32.0 Hz), 125.2 (q, *J* = 3.7 Hz), 125.17, 124.40, 121.25 (q, *J* = 3.8 Hz), 75.55, 35.71, 29.67.

Analytical data is in accordance with the literature [7].

General Procedure for the synthesis of 8a-l:

To a stirred solution of **7a-l** (1.0 mmol) in DMF (2mL) at 0°C was added NaH (28.8 mg, 1.2 mmol) in a single portion. The reaction mixture was stirred for 30 minutes at the same temperature. Propargyl bromide (1.2 mmol) was added slowly to the above reaction mixture. Stirred until the full completion of starting material (TLC analysis). Reaction quenched with sat. NH_4Cl and extracted into ethyl acetate (3*10 mL). Combined extracts were washed with brine (1*10 mL), dried over Na_2SO_4 and evaporated under reduced pressure. The desired compound was obtained after purification by column chromatography (Hexane: EtOAc = 99:1 to 80:20).

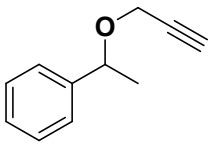
((prop-2-yn-1-yloxy)methyl)benzene (8a):



Column Chromatography (Hexane: EtOAc = 9:1); Isolated as colorless liquid; 80% yield (118 mg) **. ^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.50 – 7.28 (m, 5H), 4.73 – 4.58 (m, 2H), 4.28 – 4.14 (m, 2H), 2.53 (dd, *J* = 2.1, 1.4 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 137.39, 128.54, 128.19, 127.99, 79.78, 74.78, 71.57, 57.13.

Analytical data is in accordance with the literature [8].

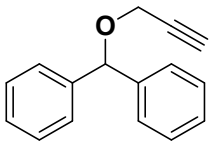
(1-(prop-2-yn-1-yloxy)ethyl)benzene (8b):



Column Chromatography (Hexane: EtOAc = 9:1); Isolated as colorless liquid; 85% yield (136 mg)**. ^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.38-7.31 (m, 5 H), 4.68 (q, J = 6.5 Hz, 1 H), 4.10 (dd, J = 2.4, 15.7 Hz, 1 H), 3.90 (dd, J = 2.4, 15.7 Hz, 1 H), 2.43 (t, J = 2.4 Hz, 1 H), 1.50 (d, J = 6.5 Hz, 3 H); **^{13}C NMR (125 MHz, $CDCl_3$)** δ 142.62, 128.70, 128.01, 126.63, 80.21, 76.84, 74.26, 55.73, 23.90.

Analytical data is in accordance with the literature [9] .

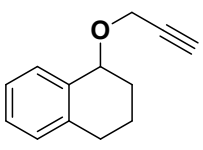
((prop-2-yn-1-yloxy)methylene)dibenzene (8c):



Column Chromatography (Hexane: EtOAc = 9:1); Isolated as colorless liquid; 65% yield (145 mg)**. ^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.50 (dd, *J* = 8.4, 1.3 Hz, 4H), 7.47 – 7.41 (m, 4H), 7.40 – 7.34 (m, 2H), 5.81 (s, 1H), 4.27 (d, *J* = 2.5 Hz, 2H), 2.56 (t, *J* = 2.4 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 141.42, 128.65, 127.89, 127.48, 81.81, 79.97, 74.95, 55.94.

Analytical data is in accordance with the literature [10].

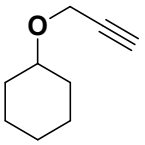
1-(prop-2-yn-1-yloxy)-1,2,3,4-tetrahydronaphthalene (8d):



Column Chromatography (Hexane: EtOAc = 95:5); Isolated as colorless liquid; 65% yield (145 mg)**. ^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.50 (dd, *J* = 8.4, 1.3 Hz, 4H), 7.47 – 7.41 (m, 4H), 7.40 – 7.34 (m, 2H), 5.81 (s, 1H), 4.27 (d, *J* = 2.5 Hz, 2H), 2.56 (t, *J* = 2.4 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 141.42, 128.65, 127.89, 127.48, 81.81, 79.97, 74.95, 55.94.

HRMS (EI^+ mode): Calculated for $C_{13}H_{14}O$: 186.1045, found: 186.1045.

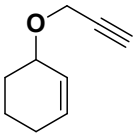
(prop-2-yn-1-yloxy)cyclohexane (8e):



Column Chromatography (Hexane: EtOAc = 99:1); Isolated as colorless liquid; 85% yield (117 mg)**. ^{1}H NMR (600 MHz, $CDCl_3$)** δ 4.17 (d, *J* = 2.3 Hz, 2H), 3.49-3.46 (m, 1H), 2.39 (t, *J* = 2.3 Hz, 1H), 1.93-1.91 (m, 2H), 1.74-1.73 (m, 2H), 1.55-1.53 (m, 1H), 1.33-1.19 (m, 5H); **^{13}C NMR (151 MHz, $CDCl_3$)** δ 80.6, 73.6, 54.9, 31.8, 25.7, 24.0.

Analytical data is in accordance with the literature [9].

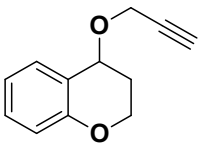
3-(prop-2-yn-1-yloxy)cyclohex-1-ene (8f):



Column Chromatography (Hexane: EtOAc = 99:1); Isolated as colorless liquid; 55% yield (76 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 5.83-5.87 (m, 1H), 5.74-5.77 (m, 1H), 4.16-4.18 (m, 2H), 4.05-4.06 (m, 1H), 2.37-2.39 (m, 1H), 2.00-2.02 (m, 1H), 1.94-1.96 (m, 1H), 1.77-1.81 (m, 1H), 1.66-1.74 (m, 2H), 1.52-1.55 (m, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 131.20, 126.95, 73.58, 71.34, 54.82, 24.71, 18.55.

Analytical data is in accordance with the literature [11].

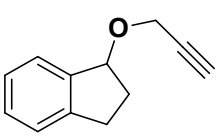
4-(prop-2-yn-1-yloxy)chroman (8g):



Column Chromatography (Hexane: EtOAc = 8:2); Isolated as colorless liquid; 70% yield (131 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.30 (dd, *J* = 7.6, 1.7 Hz, 1H), 7.25 – 7.20 (m, 1H), 6.91 (td, *J* = 7.4, 1.1 Hz, 1H), 6.85 (dd, *J* = 8.3, 1.0 Hz, 1H), 4.69 (t, *J* = 3.4 Hz, 1H), 4.35 – 4.18 (m, 4H), 2.51 (s, 1H), 2.19 – 2.03 (m, 2H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 155.00, 130.85, 129.96, 120.64, 119.96, 117.10, 80.14, 74.70, 68.46, 61.96, 54.96, 27.54.

HRMS (EI^+ mode): Calculated for $C_{12}H_{12}O_2$: 188.0837, found: 188.0835.

1-(prop-2-yn-1-yloxy)-2,3-dihydro-1H-indene (8h):

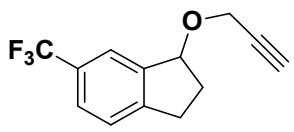


Column Chromatography (Hexane: EtOAc = 95:5); Isolated as colorless liquid; 90% yield (155 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.45 (d, *J* = 7.4 Hz, 1H), 7.30 – 7.20 (m, 3H), 5.17 (dd, *J* = 6.5, 3.6 Hz, 1H), 4.24 (d, *J* = 2.4 Hz, 2H), 3.17 – 3.07 (m, 1H), 2.84 (ddd, *J* = 15.8, 8.5, 4.7 Hz, 1H), 2.48 (t, *J* = 2.4 Hz, 1H), 2.38 (ddt, *J* = 13.2, 8.5, 6.5 Hz, 1H), 2.16

(dddd, *J* = 13.1, 8.3, 4.6, 3.7 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 144.34, 141.94, 128.63, 126.32, 125.29, 125.01, 81.99, 80.29, 74.26, 55.69, 32.37, 30.25.

HRMS (EI^+ mode): Calculated for $C_{12}H_{12}O$: 172.0888, found: 172.0886.

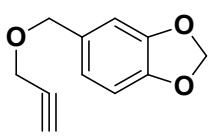
1-(prop-2-yn-1-yloxy)-6-(trifluoromethyl)-2,3-dihydro-1H-indene (8i):



Column Chromatography (Hexane: EtOAc = 9:1); Isolated as pale yellow liquid; 40% yield (96 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.69 (s, 1H), 7.52 (d, *J* = 7.9 Hz, 1H), 7.35 (d, *J* = 7.9 Hz, 1H), 5.21 – 5.12 (m, 1H), 4.31 – 4.20 (m, 2H), 3.18 – 3.06 (m, 1H), 2.92 – 2.78 (m, 1H), 2.51 (d, *J* = 1.9 Hz, 1H), 2.46 – 2.37 (m, 1H), 2.17 (tdd, *J* = 8.4, 4.9, 3.6 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 148.18, 143.07, 128.95 (q, *J* = 32.0 Hz), 125.63 (q, *J* = 3.7 Hz), 123.55, 122.16 (q, *J* = 3.8 Hz), 81.47, 79.85, 74.68, 56.15, 32.36, 30.13.

HRMS (EI^+ mode): Calculated for $C_{13}H_{11}F_3O$: 240.0762, found: 240.0761.

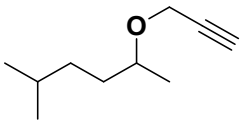
5-((prop-2-yn-1-yloxy)methyl)benzo[d][1,3]dioxole (8j):



Column Chromatography (Hexane: EtOAc = 8:2); Isolated as colorless liquid; 50% yield (95 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 6.86 (d, *J* = 1.6 Hz, 1H), 6.81 (dd, *J* = 7.9, 1.6 Hz, 1H), 6.77 (d, *J* = 7.9 Hz, 1H), 5.93 (s, 2H), 4.49 (s, 2H), 4.13 (d, *J* = 2.5 Hz, 2H), 2.48 (t, *J* = 2.4 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 147.81, 147.37, 131.10, 121.87, 108.83, 108.09, 101.06, 79.75, 74.74, 71.30, 56.70.

Analytical data is in accordance with the literature [12].

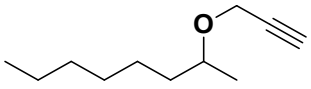
2-methyl-5-(prop-2-yn-1-yloxy)hexane (8k):



Column Chromatography (Hexane: EtOAc = 99:1); Isolated as pale yellow liquid; 40% yield (61 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 4.15 (qd, *J* = 15.8, 2.4 Hz, 2H), 3.59 (h, *J* = 6.1 Hz, 1H), 2.38 (t, *J* = 2.4 Hz, 1H), 1.56 – 1.52 (m, 2H), 1.44 – 1.39 (m, 2H), 1.18 (dd, *J* = 4.3, 2.6 Hz, 1H), 1.15 (d, *J* = 6.1 Hz, 3H), 0.89 (d, *J* = 2.1 Hz, 6H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 80.57, 74.99, 73.50, 55.48, 34.47, 34.20, 31.61, 28.13, 22.62, 19.27.

HRMS: (EI^+ mode): Calculated for $C_{10}H_{18}O$: 154.1358, found: 154.1356.

2-(prop-2-yn-1-yloxy)octane (8l):

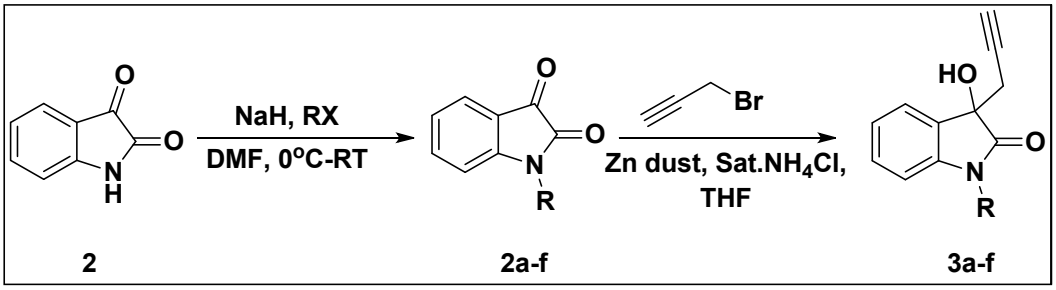


Column Chromatography (Hexane: EtOAc = 99:1); Isolated as pale yellow liquid; 50% yield (84 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 4.15 – 4.09 (m, 2H), 3.61 – 3.54 (m, 1H), 2.36 (t, *J* = 2.4 Hz, 1H), 1.52 (dt, *J* = 15.8, 6.0 Hz, 1H), 1.36 (dt, *J* = 9.7, 6.2 Hz, 2H), 1.29 (d, *J* = 6.9 Hz, 2H), 1.27 – 1.24 (m, 4H), 1.23 (t, *J* = 7.2 Hz, 2H),

1.12 (d, *J* = 6.2 Hz, 3H), 0.86 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 80.54, 74.63, 73.47, 55.42, 36.37, 31.81, 29.34, 25.32, 22.60, 19.21, 14.05.

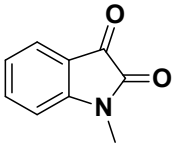
HRMS: (EI^+ mode): Calculated for $C_{11}H_{20}O$: 168.1514, found: 168.1511.

2.3. General synthetic procedure for isatin substituents (3a-f):



To a solution of **2** (1.0 mmol, 1.0 equiv.) in DMF (3 mL) was added NaH (1.5 mmol, 1.5 equiv.) at 0°C and stirred for 30 minutes, **R** substituted halogenated hydrocarbon (1.5 mmol, 1.5 equiv.) was added slowly and the reaction mixture was stirred at 0°C until the starting material was completely consumed. The reaction was quenched with saturated NH_4Cl and extracted with ethyl acetate (3*20 mL). Combined organic phase washed with brine, dried over anhydrous Na_2SO_4, filtered and concentrated under reduced pressure. The crude product was purified by flash column chromatography (Hexane: Ethyl Acetate = 9:1 – 1:1).

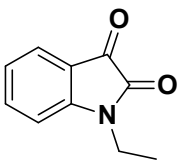
1-methylindoline-2,3-dione (2a):



Isolated as red color solid; 98% yield (157 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.60-7.54 (m, 1H), 7.53-7.28 (m, 1H), 7.08 (t, J = 7.5 Hz, 1H), 6.87 (d, J = 7.9 Hz, 1H), 3.20 (s, 3H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 144.34, 141.94, 128.63, 126.32, 125.29, 125.01, 81.99, 80.29, 74.26, 55.69, 32.37, 30.25.

Analytical data is in accordance with the literature [13] .

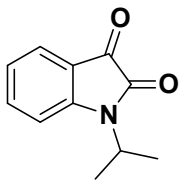
1-ethylindoline-2,3-dione (2b):



Isolated as red color solid; 69% yield (121 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.63-7.57 (m, 2H), 7.12 (t, J = 7.2 Hz, 1H), 6,92 (d, J = 7.6 Hz, 1H), 3.80 (q, J = 6.8 Hz, 2H), 1.32 (t, J = 6.8 Hz, 3H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 183.7, 157.9, 150.7, 138.4, 125.5, 123.7, 117.7, 110.1, 35.0, 12.6.

Analytical data is in accordance with the literature [13].

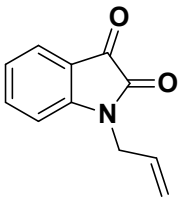
1-isopropylindoline-2,3-dione (2c):



Isolated as red color solid; 85% yield (160 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.60-7.53 (m, 2H), 7.09-7.01 (m, 2H), 4.55-4.48 (m, 1H), 1.51 (d, J = 6.8 Hz, 6H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 183.8, 157.8, 150.5, 138.1, 125.5, 123.2, 117.9, 111.3, 44.8, 19.3.

Analytical data is in accordance with the literature [14].

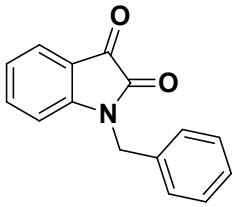
1-allylindoline-2,3-dione (2d):



Isolated as orange color solid; 75% yield (140 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.62-7.55 (m, 2H), 7.15-7.10 (m, 1H), 6.91 (d, J = 7.7 Hz, 1H), 5.92-5.82 (m, 1H), 5.34-5.26 (m, 1H), 4.37-4.32 (m, 2H); **^{13}C NMR (151 MHz, $CDCl_3$)** δ 183.80, 158.31, 151.29, 138.68, 130.98, 125.42, 124.06, 118.42, 118.00, 111.32, 42.80.

Analytical data is in accordance with the literature [15].

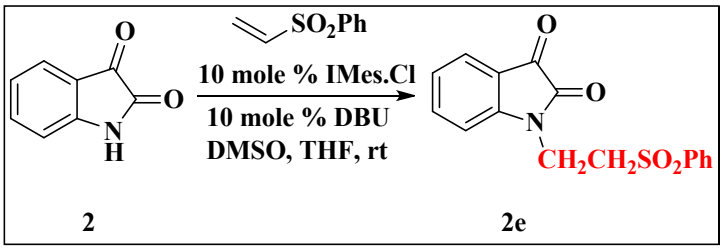
1-benzylindoline-2,3-dione (2f):



Isolated as orange color solid; 75% yield (140 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ7.63-7.59 (m, 1H), 7.50-7.45 (m, 1H), 7.36-7.29 (m, 5H), 7.12-7.07 (m, 1H), 6.78 (d, J = 8.0 Hz, 1H), 4.94 (s, 2H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 183.24, 158.28, 150.73, 138.31, 134.50, 129.06, 128.17, 127.43, 125.43, 123.87, 117.69, 111.00, 44.06.

Analytical data is in accordance with the literature [13].

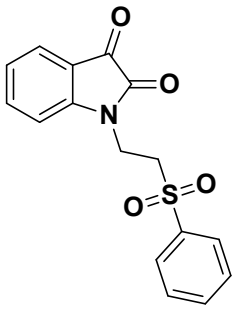
Synthesis of 2e:



A dried round-bottomed flask was charged with IMes·Cl salt (10 mol %) and DBU (10 mol %) in dry THF (1 mL) under an N_2 atmosphere. To this, the addition of DMSO (0.1 mL), (vinylsulfonyl)benzene (1.2 mmol), and dropwise addition of N-unsubstituted 2-oxindole (1 mmol) solution in dry THF (1 mL) at room temperature by using a syringe were carried out. When the reaction was completed as observed by TLC, the mixture was diluted with water (5 mL) and extracted using

EtOAc (15 mL), dried over anhydrous Na_2SO_4, and evaporated under reduced pressure. The crude residue was purified by column chromatography (5% EtOAc/hexane).

1-(2-(phenylsulfonyl)ethyl)indoline-2,3-dione (2f):



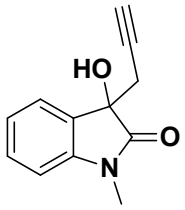
Isolated as orange color solid; 93% yield (292 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.84 (dd, J = 8.3, 1.1 Hz, 2H), 7.67 – 7.61 (m, 2H), 7.55 (dd, J = 7.4, 0.6 Hz, 1H), 7.51 (t, J = 7.9 Hz, 2H), 7.15 (t, J = 7.5 Hz, 1H), 7.04 (d, J = 8.0 Hz, 1H), 4.15 (t, J = 6.8 Hz, 2H), 3.58 (t, J = 6.8 Hz, 2H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 182.1, 158.0, 149.6, 138.6, 138.5, 134.2, 129.4, 127.7, 125.5, 124.2, 117.5, 110.3, 52.1, 34.4.

Analytical data is in accordance with the literature [16].

General Synthetic procedure for 3a-f:

Substrates **2a-f** were prepared according to the reported procedure from [17]. To a solution of **7** (1.0 mmol, 1.0 equiv.) in THF (3mL) added Zn dust (5.0 mmol, 5.0 equiv.), propargyl bromide (3.0 mmol, 3.0 equiv.) at 0^{o}C. Added saturated NH_4Cl (37.0 mmol) dropwise and stirred the reaction mixture for 20 minutes. The reaction was quenched with ice pieces and extracted with ethyl acetate (3*20 mL). Combined organic phase washed with brine, dried over anhydrous Na_2SO_4, filtered and concentrated under reduced pressure. The crude product was purified by flash column chromatography (Hexane: Ethyl acetate = 9:1 – 1:1).

3-hydroxy-1-methyl-3-(prop-2-yn-1-yl)indolin-2-one (3a)

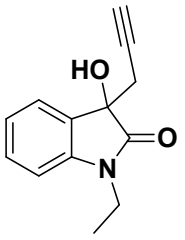


Isolated as white color solid; 60% yield (120 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.55 (d, J = 7.2 Hz, 1 H), 7.34 (t, J = 7.6 Hz, 1 H), 7.11 (t, J = 7.5 Hz, 1 H), 6.83 (d, J = 7.8 Hz, 1 H), 3.92 (s, 1 H), 2.90 (dd, J = 16.3, 2.1 Hz, 1 H), 2.72 (dd, J = 16.3, 2.1 Hz, 1 H), 1.97 (t, J = 21.7 Hz, 1 H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 177.02, 143.42, 130.17, 129.26, 124.26, 123.43, 108.57, 77.79, 74.64, 71.4, 28.83, 26.38.

HRMS: (EI^+ mode): Calculated for $C_{12}H_{11}NO_2$: 201.0790, found: 201.0790.

Analytical data is in accordance with the literature [18].

1-ethyl-3-hydroxy-3-(prop-2-yn-1-yl)indolin-2-one (3b)

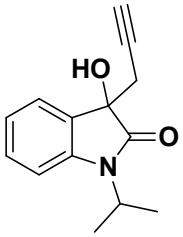


Isolated as white color solid; 80% yield (172 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.57 (dd, *J* = 7.4, 0.7 Hz, 1H), 7.36 (td, *J* = 7.8, 1.2 Hz, 1H), 7.12 (td, *J* = 7.6, 0.9 Hz, 1H), 6.88 (d, *J* = 7.8 Hz, 1H), 3.86 – 3.64 (m, 2H), 3.20 (s, 1H), 2.91 (dd, *J* = 16.5, 2.7 Hz,

1H), 2.74 (dd, *J* = 16.5, 2.7 Hz, 1H), 1.97 (t, *J* = 2.7 Hz, 1H), 1.28 (t, *J* = 7.3 Hz, 3H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 176.16, 142.51, 130.11, 129.18, 124.29, 123.08, 108.63, 77.60, 74.31, 71.44, 34.89, 30.95, 28.90, 12.56.

HRMS: (EI^+ mode): Calculated for $C_{13}H_{13}NO_2$: 215.0946, found: 215.0946.

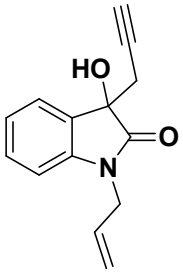
3-hydroxy-1-isopropyl-3-(prop-2-yn-1-yl)indolin-2-one (3c)



Isolated as white color solid; 75% yield (171 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.56 (dd, *J* = 7.4, 0.9 Hz, 1H), 7.34 (td, *J* = 7.8, 1.3 Hz, 1H), 7.11 (td, *J* = 7.6, 0.8 Hz, 1H), 7.01 (d, *J* = 7.9 Hz, 1H), 4.58 (dt, *J* = 14.1, 7.0 Hz, 1H), 2.99 (s, 1H), 2.88 (dd, *J* = 16.4, 2.7 Hz, 1H), 2.74 (dd, *J* = 16.4, 2.7 Hz, 1H), 1.95 (s, 1H), 1.49 (dd, *J* = 7.0, 4.9 Hz, 5H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 176.68, 142.14, 129.77, 129.61, 124.31, 122.79, 110.12, 77.78, 74.41, 71.07, 44.29, 29.03, 19.46, 19.19.

HRMS: (EI^+ mode): Calculated for $C_{14}H_{15}NO_2$: 229.1103, found: 229.1101.

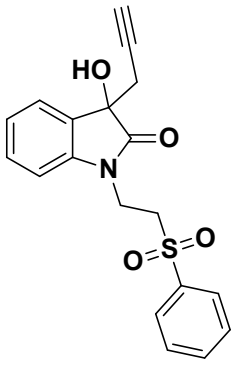
1-allyl-3-hydroxy-3-(prop-2-yn-1-yl)indolin-2-one (3d):



Isolated as white color solid; 85% yield (170 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.56 (d, *J* = 7.4 Hz, 1H), 7.33 (td, *J* = 7.8, 1.1 Hz, 1H), 7.12 (t, *J* = 7.5 Hz, 1H), 6.85 (d, *J* = 7.8 Hz, 1H), 5.83 (ddd, *J* = 22.3, 10.4, 5.2 Hz, 1H), 5.25 (ddd, *J* = 13.8, 11.3, 0.9 Hz, 2H), 4.44 (ddd, *J* = 16.4, 3.3, 1.7 Hz, 1H), 4.22 (dd, *J* = 16.4, 5.4 Hz, 1H), 3.37 (s, 1H), 2.94 (dd, *J* = 16.4, 2.6 Hz, 1H), 2.78 (dd, *J* = 16.4, 2.6 Hz, 1H). **^{13}C NMR (151 MHz, CDCl3)** δ 176.80, 142.70, 130.98, 130.08, 129.21, 124.26, 123.40, 117.93, 109.54, 77.81, 74.70, 71.50, 42.59, 28.87.

Analytical data is in accordance with the literature [18].

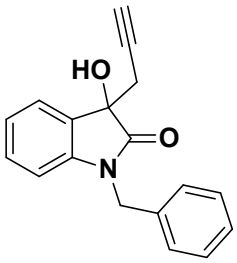
3-hydroxy-1-(2-(phenylsulfonyl)ethyl)-3-(prop-2-yn-1-yl)indolin-2-one (3e)



Isolated as white color solid; 55% yield (195 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.95 – 7.88 (m, 2H), 7.68 (dd, *J* = 10.6, 4.3 Hz, 1H), 7.60 – 7.55 (m, 2H), 7.53 (dd, *J* = 7.4, 0.8 Hz, 1H), 7.37 (td, *J* = 7.8, 1.2 Hz, 1H), 7.14 (td, *J* = 7.7, 0.8 Hz, 1H), 6.90 (d, *J* = 7.8 Hz, 1H), 4.12 – 4.04 (m, 2H), 3.53 – 3.43 (m, 2H), 3.30 (s, 1H), 2.81 (dd, *J* = 16.5, 2.6 Hz, 1H), 2.65 (dd, *J* = 16.5, 2.7 Hz, 1H), 1.95 (t, *J* = 2.6 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 176.55, 141.33, 138.57, 134.25, 130.34, 129.55, 129.01, 128.03, 124.51, 123.75, 108.60, 77.41, 74.10, 71.63, 52.25, 34.11, 28.57.

HRMS: (EI$^+$ mode): Calculated for $C_{19}H_{17}NO_4S$: 355.0878, found: 355.0878.

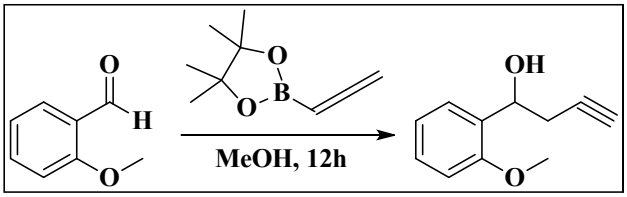
1-benzyl-3-hydroxy-3-(prop-2-yn-1-yl)indolin-2-one (3f)



Isolated as white color solid; 75% yield (277 mg). **^{1}H NMR (600 MHz, $CDCl_3$)** δ 7.58 – 7.51 (m, 1H), 7.37 – 7.17 (m, 6H), 7.10 – 7.03 (m, 1H), 6.70 (d, *J* = 7.9 Hz, 1H), 5.03 (d, *J* = 15.7 Hz, 1H), 4.70 (d, *J* = 15.7 Hz, 1H), 4.33 (s, 1H), 2.93 (ddd, *J* = 68.8, 16.3, 2.6 Hz, 2H), 1.88 (t, *J* = 2.6 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 177.33, 142.57, 135.25, 129.98, 129.26, 128.76, 127.76, 127.43, 124.21, 123.41, 109.60, 77.83, 74.86, 71.45, 44.01, 28.74.

Analytical data is in accordance with the literature [17].

General synthetic procedure for homopropargyl alcohols (5c)

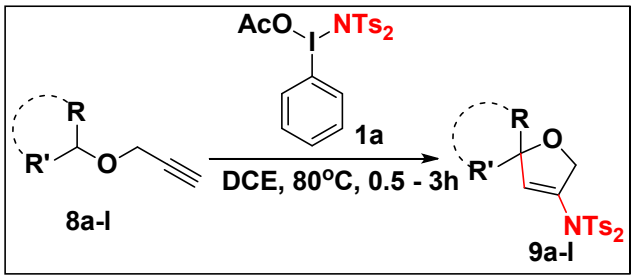


To a solution of 2-methoxybenzaldehyde (61.1 mg, 53 µL, 0.5 mmol) in methanol (0.5 mL) was added pinacolallenylboronate (83.1 mg, 90 µL, 0.5 mmol, 1 equiv) and the mixture was stirred at room temperature for 12 h and then evaporated. The crude product was purified by column chromatography on silica gel eluting with 15:85 EtOAc/Hexane to afford the title compound **5c** as a pale pink oil (64.4 mg, 79%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.73 (s, 1H), 7.19 (td, J = 7.8, 1.7 Hz, 1H), 7.03 (dd, J = 7.6, 1.7 Hz, 1H), 6.93 – 6.80 (m, 2H), 5.02 (ddd, J = 9.3, 4.4, 2.1 Hz, 1H), 3.17 (s, 1H), 2.81 (ddd, J = 16.9, 9.0, 2.7 Hz, 1H), 2.68 (ddd, J = 16.9, 4.5, 2.6 Hz, 1H), 2.14 (t, J = 2.6 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 155.51, 129.63, 127.30, 125.42, 120.21, 117.64, 80.43, 73.82, 71.80, 28.21.

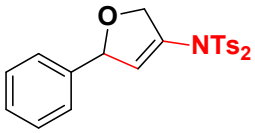
Analytical data is in accordance with the literature [19].

3.1. General Procedure for the synthesis of spiro-2,5-dihydrofuran products (9a-l):



To a solution of PhI(OAc)(NTs_2) **1a** (0.076 g, 0.13 mmol) in DCE (1.0 mL) was added the corresponding alkyne**8a-l** (0.10 mmol) and the reaction mixture was stirred at 80ºC. The reaction mixture was stirred until the full consumption of the starting material (TLC analysis). The solution was quenched by addition of ice cold water (5mL) and extracted with DCM (3*10 mL). Combined extracts washed with brine (1*10 mL), dried over Na_2SO_4 and concentrated under reduced pressure. Residue was purified by column chromatography (Hexane: EtOAc = 8:2).

4-methyl-N-(5-phenyl-2,5-dihydrofuran-3-yl)-N-tosylbenzenesulfonamide (9a):



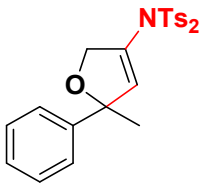
Synthesized according to the general procedure described above. Isolated as white color solid; 70% yield (32.8 mg)

M.P: 110-112°C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.86 (d, *J* = 8.4 Hz, 4H), 7.39 – 7.36 (m, 2H), 7.35 – 7.32 (m, 1H), 7.30 (d, *J* = 8.2 Hz, 6H), 5.82 (ddd, *J* = 5.8, 3.9, 1.6 Hz, 1H), 5.76 (dd, *J* = 3.9, 2.0 Hz, 1H), 4.68 (ddd, *J* = 11.6, 6.0, 2.1 Hz, 1H), 4.61 (ddd, *J* = 11.6, 3.9, 2.3 Hz, 1H), 2.44 (s, 6H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 145.51, 140.25, 136.01, 134.06, 132.62, 129.77, 128.70, 128.53, 128.50, 126.77, 86.82, 73.74, 21.75.

HRMS: (EI^+ mode): Calculated for $C_{24}H_{23}NO_5S_2$: 469.1018, found: 469.1016.

4-methyl-N-(5-methyl-5-phenyl-2,5-dihydrofuran-3-yl)-N-tosylbenzenesulfonamide (9b):



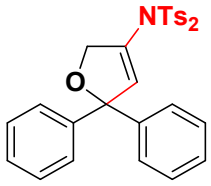
Synthesized according to the general procedure described above**.** Isolated as white color solid; 93% yield (44.7 mg)

M.P: 115-117°C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.77 (d, *J* = 8.4 Hz, 4H), 7.36 (d, *J* = 7.2 Hz, 2H), 7.34 – 7.29 (m, 3H), 7.27 (t, *J* = 4.0 Hz, 5H), 5.87 (t, *J* = 2.1 Hz, 1H), 4.64 (dd, *J* = 11.8, 2.1 Hz, 1H), 4.51 (dd, *J* = 11.7, 2.2 Hz, 1H), 2.45 (s, 6H), 1.67 (s, 3H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 145.39, 144.35, 138.22, 135.83, 130.80, 129.67, 128.54, 128.41, 127.43, 124.93, 89.80, 72.90, 27.04, 21.75.

HRMS: (EI^+ mode): Calculated for $C_{25}H_{25}NO_5S_2$: 483.1174, found: 483.1178.

N-(5,5-diphenyl-2,5-dihydrofuran-3-yl)-4-methyl-N-tosylbenzenesulfonamide (9c):



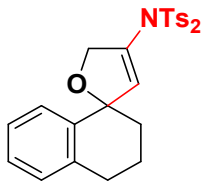
Synthesized according to the general procedure described above. Isolated as white color solid; 90% yield (49.5 mg)

M.P: 140-142°C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.71 (d, *J* = 8.3 Hz, 4H), 7.36 (t, *J* = 7.4 Hz, 4H), 7.32 (d, *J* = 7.1 Hz, 2H), 7.27 (d, *J* = 5.6 Hz, 4H), 7.21 (d, *J* = 8.1 Hz, 4H), 6.11 (t, *J* = 1.9 Hz, 1H), 4.66 (d, *J* = 1.9 Hz, 2H), 2.43 (s, 6H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 145.37, 143.35, 137.09, 135.62, 131.64, 129.74, 129.66, 128.53, 128.32, 127.74, 126.67, 93.86, 73.16, 21.73.

HRMS: **(**EI^+ mode): Calculated for $C_{30}H_{27}NO_5S_2$: 545.1331, found: 545.1330.

N-(3',4'-dihydro-2'H,5H-spiro[furan-2,1'-naphthalen]-4-yl)-4-methyl-N-tosylbenzenesulfonamide (9d):



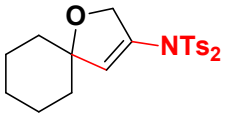
Synthesized according to the general procedure described above. Isolated as pale yellow solid, 90% Yield (45.8 mg)

M.P: 90-92°C

^{1}H NMR (600 MHz, $CDCl_3$) δ = 7.91 (d, *J* = 8.4 Hz, 4H), 7.40 (dd, *J* = 7.7, 1.3 Hz, 1H), 7.35 – 7.32 (m, 4H), 7.22 (dd, *J* = 7.6, 1.3 Hz, 1H), 7.19 (dt, *J* = 7.3, 3.7 Hz, 1H), 7.10 – 7.06 (m, 1H), 5.67 (t, *J* = 2.1 Hz, 1H), 4.71 (dd, *J* = 11.8, 2.1 Hz, 1H), 4.55 (dd, *J* = 11.8, 2.3 Hz, 1H), 2.82 (dt, *J* = 16.8, 5.1 Hz, 1H), 2.73 – 2.64 (m, 1H), 2.45 (s, 6H), 2.10 (ddd, *J* = 12.8, 7.0, 2.3 Hz, 1H), 2.02 – 1.94 (m, 1H), 1.83 (ddd, *J* = 13.3, 10.7, 2.8 Hz, 1H), 1.79 – 1.74 (m, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ = 145.48, 138.33, 137.53, 136.89, 136.12, 131.91, 129.75, 128.96, 128.56, 128.09, 126.49, 88.19, 72.59, 35.11, 29.70, 29.40, 21.74, 19.60.

HRMS: (EI^+ mode): Calculated for $C_{27}H_{27}NO_5S_2$: 509.1331, found: 509.1331.

4-methyl-N-(1-oxaspiro[4.5]dec-3-en-3-yl)-N-tosylbenzenesulfonamide (9e):

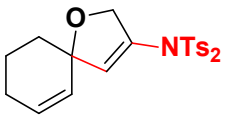


Synthesized according to the general procedure described above. Isolated as colorless liquid; 75% yield (34.5 mg)

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.87 (d, *J* = 8.4 Hz, 4H), 7.35 (d, *J* = 8.0 Hz, 4H), 5.75 (t, *J* = 1.9 Hz, 1H), 4.46 (d, *J* = 2.1 Hz, 2H), 2.47 (s, 6H), 1.69 – 1.62 (m, 4H), 1.60 – 1.56 (m, 2H), 1.40 – 1.32 (m, 4H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 145.38, 138.12, 136.10, 131.09, 129.67, 128.57, 88.91, 71.95, 36.32, 29.71, 25.15, 22.97, 21.76.

HRMS: **(**EI^+ mode): Calculated for $C_{23}H_{27}NO_5S_2$: 461.1331, found: 461.1326.

4-methyl-N-(1-oxaspiro[4.5]deca-3,6-dien-3-yl)-N-tosylbenzenesulfonamide (9f):



Synthesized according to the general procedure described above. Isolated as white color solid; 93% yield (42.6 mg)

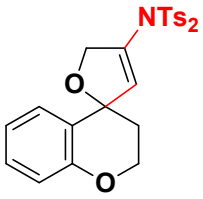
M.P: 95-97°C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.88 (d, *J* = 8.3 Hz, 4H), 7.36 (d, *J* = 8.1 Hz, 4H), 5.89 (dt, *J* = 9.9, 3.7 Hz, 1H), 5.64 (t, *J* = 2.1 Hz, 1H), 5.58 (d, *J* = 10.0 Hz, 1H), 4.45 (ddd, *J* = 25.8, 11.6, 2.1 Hz, 2H), 2.47 (s,

6H), 1.96 – 1.85 (m, 2H), 1.83 – 1.57 (m, 4H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 145.44, 137.62, 136.09, 131.77, 131.41, 129.71, 128.55, 128.17, 86.02, 72.06, 33.94, 24.63, 21.76, 19.40.

HRMS: (EI$^+$ mode): Calculated for $C_{23}H_{25}NO_5S_2$: 459.1174, found: 459.1176.

4-methyl-N-(5'H-spiro[chroman-4,2'-furan]-4'-yl)-N-tosylbenzenesulfonamide (9g):



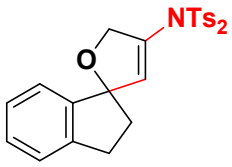
Synthesized according to the general procedure described above. Isolated as white color solid, 80% yield (40.8 mg)

M.P: 120-122^{o}C

^{1}H NMR (600 MHz, $CDCl_3$) δ = 7.94 (d, *J* = 8.3 Hz, 4H), 7.36 (d, *J* = 8.2 Hz, 4H), 7.32 (dd, *J* = 7.8, 1.4 Hz, 1H), 7.23 – 7.19 (m, 1H), 6.95 (t, *J* = 7.1 Hz, 1H), 6.84 (d, *J* = 8.2 Hz, 1H), 5.63 (t, *J* = 1.9 Hz, 1H), 4.72 (dd, *J* = 12.0, 1.9 Hz, 1H), 4.57 (dd, *J* = 12.0, 2.1 Hz, 1H), 4.27 (dd, *J* = 7.9, 2.9 Hz, 2H), 2.47 (s, 6H), 2.13 (dd, *J* = 10.1, 7.0 Hz, 1H), 2.08 (d, *J* = 7.6 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ = 154.99, 130.84, 129.95, 120.62, 119.95, 117.09, 80.12, 74.67, 68.45, 61.96, 54.95, 27.54.

HRMS: (EI$^+$ mode): Calculated for $C_{26}H_{25}NO_6S_2$: 511.1123, found: 511.1121.

N-(2',3'-dihydro-5H-spiro[furan-2,1'-inden]-4-yl)-4-methyl-N-tosylbenzenesulfonamide (9h):



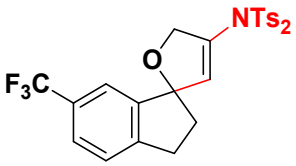
Synthesized according to the general procedure described above. Isolated as white color solid; 95% yield (47.0 mg)

M.P: 115-117^{o}C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.93 (d, *J* = 8.4 Hz, 4H), 7.35 (d, *J* = 8.0 Hz, 5H), 7.29 (dd, *J* = 6.9, 1.8 Hz, 2H), 7.25 – 7.23 (m, 1H), 5.71 (t, *J* = 2.1 Hz, 1H), 4.67 (d, *J* = 2.1 Hz, 1H), 4.54 (d, *J* = 2.2 Hz, 1H), 3.10 (dd, *J* = 15.6, 7.5 Hz, 1H), 2.86 – 2.80 (m, 1H), 2.46 (s, 6H), 2.37 (ddd, *J* = 13.7, 8.3, 4.5 Hz, 1H), 2.25 (ddd, *J* = 13.8, 8.6, 6.6 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 145.50, 143.78, 143.00, 136.13, 135.93, 132.36, 129.77, 129.10, 128.58, 127.12, 124.99, 124.30, 98.08, 76.50, 72.83, 37.81, 29.72, 21.75.

HRMS: (EI$^+$ mode): Calculated for $C_{26}H_{25}NO_5S_2$: 495.1174, found: 495.1172.

4-methyl-N-tosyl-N-(6'-(trifluoromethyl)-2',3'-dihydro-3H-spiro[furan-2,1'-inden]-4-yl)benzenesulfonamide (9i) :

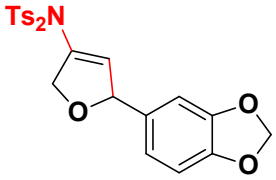


Synthesized according to the general procedure described above. Isolated as pale yellow oil; 60% yield (33.7 mg)

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.93 (d, *J* = 8.4 Hz, 4H), 7.54 (d, *J* = 7.9 Hz, 1H), 7.50 (s, 1H), 7.36 (d, *J* = 8.1 Hz, 4H), 7.34 (s, 1H), 5.71 (t, *J* = 2.1 Hz, 1H), 4.63 (d, *J* = 2.1 Hz, 1H), 4.61 (d, *J* = 2.2 Hz, 1H), 3.16 – 3.12 (m, 1H), 2.90 – 2.86 (m, 1H), 2.46 (s, 6H), 2.38 – 2.34 (m, 1H), 2.25 – 2.21 (m, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 145.64, 144.72, 135.97, 135.14, 133.01, 129.82 (q, *J* = 32.0 Hz), 128.53, 125.46 (q, *J* = 3.8 Hz), 97.46, 72.99, 37.89, 29.71, 21.75.

HRMS: (EI$^+$ mode): Calculated for $C_{27}H_{24}F_3NO_5S_2$: 563.1048, found: 563.1046.

N-(5-(benzo[d][1,3]dioxol-5-yl)-2,5-dihydrofuran-3-yl)-4-methyl-N-tosylbenzenesulfonamide (9j):



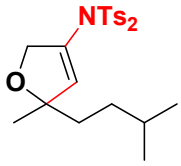
Synthesized according to the general procedure described above. Isolated as white color solid; 75% yield (35.4 mg)

M.P: 92-94^{o}C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.89 (d, *J* = 8.4 Hz, 4H), 7.34 (d, *J* = 8.1 Hz, 4H), 6.82 – 6.75 (m, 3H), 5.97 (dd, *J* = 5.1, 1.3 Hz, 2H), 5.75 – 5.74 (m, 1H), 4.66 – 4.55 (m, 2H), 2.46 (s, 6H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 148.04, 147.80, 145.54, 136.06, 134.18, 133.86, 132.85, 129.81, 128.52, 120.56, 108.23, 107.40, 101.18, 86.63, 73.51, 21.76.

HRMS: (EI$^+$ mode): Calculated for $C_{25}H_{23}NO_7S_2$: 513.0916, found: 513.0916

N-(5-isopentyl-5-methyl-2,5-dihydrofuran-3-yl)-4-methyl-N-tosylbenzenesulfonamide (9k):



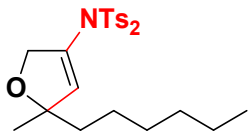
Synthesized according to the general procedure described above. Isolated as white color solid; 93% yield (44.3 mg)

M.P: 90-92°C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.88 (d, *J* = 8.4 Hz, 4H), 7.35 (d, *J* = 8.0 Hz, 4H), 5.62 (t, *J* = 2.1 Hz, 1H), 4.44 (ddd, *J* = 26.1, 11.7, 2.2 Hz, 2H), 2.47 (s, 6H), 1.62 – 1.58 (m, 1H), 1.54 – 1.48 (m, 2H), 1.28 (s, 3H), 1.24 – 1.19 (m, 2H), 0.89 (t, *J* = 6.4 Hz, 6H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 145.36, 138.55, 136.21, 130.79, 129.71, 128.50, 89.76, 72.84, 38.66, 33.27, 29.71, 28.34, 25.93, 22.67, 22.58, 21.75.

HRMS:(EI$^+$ mode): Calculated for $C_{24}H_{31}NO_5S_2$: 477.1644, found: 477.1644

N-(5-hexyl-5-methyl-2,5-dihydrofuran-3-yl)-4-methyl-N-tosylbenzenesulfonamide (9l):



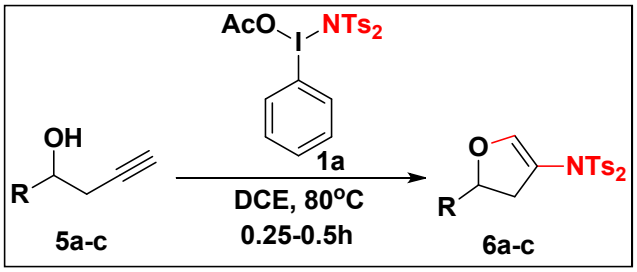
Synthesized according to the general procedure described above. Isolated as white color solid; 89% yield (43.6 mg)

M.P: 95-97°C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.88 (d, *J* = 8.4 Hz, 4H), 7.34 (d, *J* = 8.0 Hz, 4H), 5.62 (t, *J* = 2.1 Hz, 1H), 4.44 (dd, *J* = 4.3, 2.2 Hz, 2H), 2.47 (s, 6H), 1.60 (s, 6H), 0.88 (q, *J* = 7.0 Hz, 10H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 145.36, 138.53, 136.21, 130.79, 129.70, 128.51, 89.73, 72.84, 40.85, 31.89, 29.63, 25.92, 24.31, 22.63, 21.75, 14.13.

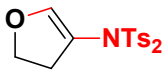
HRMS: (EI$^+$ mode): Calculated for $C_{25}H_{33}NO_5S_2$: 495.1800, found: 495.1802

3.2. General Procedure for the synthesis of 2,3-dihydrofuran products:



To a solution of PhI(OAc)(NTs_2) **1a** (0.076 g, 0.13 mmol) in DCE (1.0 mL) was added the corresponding alkyne (0.10 mmol) and the reaction mixture was stirred at 80ºC. The reaction mixture was stirred until the full consumption of starting material (TLC analysis). The solution was quenched by the addition of ice-cold water (5mL) and extracted with DCM (3*10 mL). The combined extract was washed with brine (1*10 mL), dried over Na_2SO_4 and concentrated under reduced pressure. The residue was purified by column chromatography (Hexane: EtOAc = 9:1).

N-(4,5-dihydrofuran-3-yl)-4-methyl-N-tosylbenzenesulfonamide (6a):



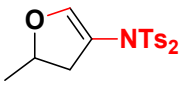
Synthesized according to the general procedure described above. Isolated as white color solid; 85% yield (33.4mg)

M.P: 110-112°C

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.88 (d, *J* = 8.4 Hz, 4H), 7.34 (d, *J* = 8.3 Hz, 4H), 6.22 (t, *J* = 1.9 Hz, 1H), 4.48 (t, *J* = 9.8 Hz, 2H), 2.65 (td, *J* = 9.9, 1.9 Hz, 2H), 2.45 (s, 6H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 150.32, 145.02, 136.44, 129.61, 128.31, 111.33, 71.50, 30.20, 21.66.

HRMS: (EI$^+$ mode): Calculated for $C_{18}H_{19}NO_5S_2$: 393.0705, found: 393.0709.

4-methyl-N-(5-methyl-4,5-dihydrofuran-3-yl)-N-tosylbenzenesulfonamide (6b):



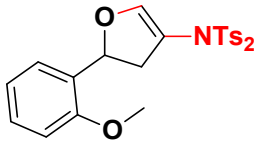
Synthesized according to the general procedure described above. Isolated as white color solid; 93% yield (37.8 mg)

M.P: 120-122°C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.88 (d, *J* = 8.3 Hz, 4H), 7.34 (d, *J* = 8.2 Hz, 4H), 6.21 – 6.11 (m, 1H), 4.82 (ddd, *J* = 10.1, 6.9, 3.8 Hz, 1H), 2.78 (ddd, *J* = 13.5, 10.1, 2.0 Hz, 1H), 2.46 (s, 6H), 2.22 (ddd, *J* = 13.6, 7.2, 1.8 Hz, 1H), 1.35 (d, *J* = 6.3 Hz, 3H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 149.68, 145.05, 136.51, 129.65, 129.62, 128.43, 128.36, 110.08, 80.16, 37.26, 22.05, 21.72.

HRMS: (EI$^+$ mode): Calculated for $C_{19}H_{21}NO_5S_2$: 407.0861, found: 407.0860.

N-(5-(2-methoxyphenyl)-4,5-dihydrofuran-3-yl)-4-methyl-N-tosylbenzenesulfonamide (6c):



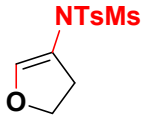
Synthesized according to the general procedure described above **(Reaction was completed in room temperature)**. Isolated as white color solid; 75% yield (37.4mg)

M.P: 92-94^{o}C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.85 (d, *J* = 8.3 Hz, 4H), 7.38 (dd, *J* = 7.6, 1.4 Hz, 1H), 7.32 (dd, *J* = 7.8, 1.3 Hz, 1H), 7.29 (t, *J* = 6.3 Hz, 4H), 7.03 (td, *J* = 7.5, 0.6 Hz, 1H), 6.89 (d, *J* = 8.2 Hz, 1H), 6.39 (s, 1H), 5.97 (dd, *J* = 11.0, 8.2 Hz, 1H), 3.82 (s, 3H), 3.16 (ddd, *J* = 13.9, 11.1, 2.0 Hz, 1H), 2.44 (s, 6H), 2.40 (dd, *J* = 8.2, 1.9 Hz, 1H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 155.95, 149.86, 144.97, 136.43, 129.61, 129.58, 129.11, 128.38, 126.02, 120.69, 110.48, 110.38, 79.80, 55.37, 37.44, 21.71.

HRMS: (EI$^+$ mode): Calculated for $C_{25}H_{25}NO_6S_2$: 499.1123, found: 499.1121.

N-(4,5-dihydrofuran-3-yl)-4-methyl-N-(methylsulfonyl)benzenesulfonamide (6ab):

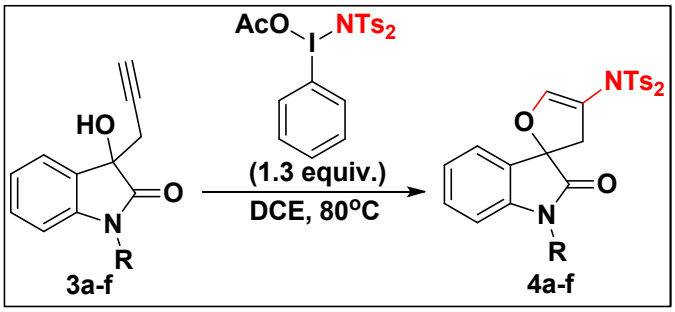


Synthesized according to the general procedure described above. Isolated as white color solid; 50% yield (15.8 mg).

M.P: 104-106^{o}C

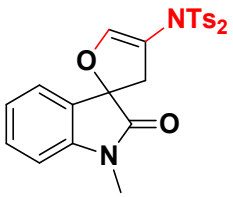
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.91 (d, *J* = 8.3 Hz, 2H), 7.34 (d, *J* = 8.3 Hz, 2H), 6.30 (t, *J* = 1.9 Hz, 1H), 4.52 (t, *J* = 9.8 Hz, 2H), 3.45 (s, 3H), 2.72 (td, *J* = 10.0, 1.8 Hz, 2H), 2.46 (s, 3H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 150.09, 145.47, 143.29, 142.81, 135.32, 129.72, 128.58, 110.87, 71.52, 44.13, 30.35, 21.73.

3.3. General Procedure for the synthesis of 4a-f:



To a solution of PhI(OAc)(NTs_2) **1a** (0.076 g, 0.13 mmol) in DCE (1.0 mL) was added the corresponding alkyne **3a-f** (0.10 mmol) and the reaction mixture was stirred at 80ºC. The reaction mixture was stirred until the full consumption of starting material (TLC analysis). The solution was quenched by addition of ice cold water (5mL) and extracted with DCM (3*10 mL). Combined extracts washed with brine (1*10 mL), dried over Na_2SO_4 and concentrated under reduced pressure. Residue was purified by column chromatography (Hexanes: Ethyl acetate = 9:1 – 6:4).

4-methyl-N-(1'-methyl-2'-oxo-3H-spiro[furan-2,3'-indolin]-4-yl)-N-tosylbenzenesulfonamide (4a):



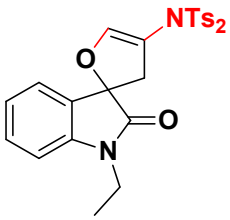
Synthesized according to the general procedure described above. Isolated as white color solid; 84% yield (44 mg)

M.P: 180-182°C

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.04 – 7.89 (m, 4H), 7.56 (d, *J* = 7.3 Hz, 2H), 7.36 (d, *J* = 7.8 Hz, 4H), 7.13 (t, *J* = 7.4 Hz, 1H), 6.82 (d, *J* = 7.7 Hz, 1H), 6.41 (d, *J* = 1.7 Hz, 1H), 3.20 (s, 3H), 3.14 (d, *J* = 14.3 Hz, 1H), 2.90 (d, *J* = 14.3 Hz, 1H), 2.46 (s, 6H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 173.59, 148.93, 145.25, 143.34, 130.89, 129.78, 128.52, 124.31, 123.79, 110.35, 108.49, 85.39, 38.81, 29.71, 26.39, 21.75.

HRMS: (EI$^+$ mode): Calculated for $C_{26}H_{24}N_2O_6S_2$: 524.1076, found: 524.1076.

N-(1'-ethyl-2'-oxo-3H-spiro[furan-2,3'-indolin]-4-yl)-4-methyl-N-tosylbenzenesulfonamide (4b):



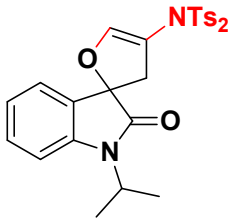
Synthesized according to the general procedure described above. Isolated as white color solid; 85% yield (45 mg)

M.P: 176-178°C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.96 (d, *J* = 8.0 Hz, 4H), 7.91 (d, *J* = 8.0 Hz, 1H), 7.56 (d, *J* = 7.2 Hz, 1H), 7.36 (d, *J* = 8.2 Hz, 4H), 7.12 (t, *J* = 7.4 Hz, 1H), 6.84 (d, *J* = 7.8 Hz, 1H), 6.40 (s, 1H), 3.74 (td, *J* = 14.1, 7.1 Hz, 2H), 3.14 (d, *J* = 14.3 Hz, 1H), 2.90 (d, *J* = 14.3 Hz, 1H), 2.46 (s, 6H), 1.35 – 1.30 (m, 3H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 173.25, 148.95, 145.25, 130.84, 129.78, 129.62, 128.73, 128.52, 124.51, 123.59, 110.31, 108.63, 85.40, 38.81, 34.99, 29.71, 21.75, 12.54.

HRMS: (EI$^+$ mode): Calculated for $C_{27}H_{26}N_2O_6S_2$: 538.1232, found: 538.1234.

N-(1'-isopropyl-2'-oxo-3H-spiro[furan-2,3'-indolin]-4-yl)-4-methyl-N-tosylbenzenesulfonamide (4c):



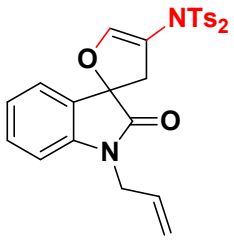
Synthesized according to the general procedure described above. Isolated as white color solid; 90% yield (49 mg)

M.P: 175-177°C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.96 (d, *J* = 8.4 Hz, 4H), 7.56 (dd, *J* = 7.4, 0.9 Hz, 1H), 7.36 (d, *J* = 8.0 Hz, 4H), 7.33 (d, *J* = 1.3 Hz, 1H), 7.10 (d, *J* = 0.6 Hz, 1H), 6.97 (d, *J* = 8.0 Hz, 1H), 6.38 (t, *J*= 2.0 Hz, 1H), 4.56 – 4.53 (m, 1H), 3.16 (dd, *J* = 14.3, 2.3 Hz, 1H), 2.88 (dd, *J* = 14.3, 1.8 Hz, 1H), 2.46 (s, 6H), 1.49 (dd, *J* = 7.0, 1.2 Hz, 6H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 171.45, 148.94, 145.21, 142.12, 136.25, 130.61, 129.77, 129.61, 128.52, 124.62, 123.24, 110.15, 85.23, 60.56, 44.29, 31.94, 29.71, 22.71, 21.74.

HRMS: **(**EI^+ mode): Calculated for $C_{28}H_{28}N_2O_6S_2$: 552.1389, found: 552.1391.

N-(1'-allyl-2'-oxo-3H-spiro[furan-2,3'-indolin]-4-yl)-4-methyl-N-tosylbenzenesulfonamide (4d):



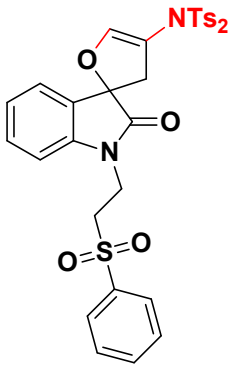
Synthesized according to the general procedure described above. Isolated as white color solid; 65% yield (35 mg)

M.P: 166-168°C

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96 (d, *J* = 8.4 Hz, 4H), 7.56 (d, *J* = 7.3 Hz, 1H), 7.36 (d, *J* = 8.2 Hz, 4H), 7.31 (d, *J* = 7.8 Hz, 1H), 7.12 (t, *J* = 7.5 Hz, 1H), 6.81 (d, *J* = 8.0 Hz, 1H), 6.40 (s, 1H), 5.87 – 5.79 (m, 13H), 5.24 (d, *J* = 11.3 Hz, 2H), 4.31 (t, *J* = 5.2 Hz, 2H), 3.16 (dd, *J* = 14.4, 2.2 Hz, 1H), 2.95 – 2.89 (m, 1H), 2.46 (s, 6H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 173.37, 148.94, 145.26, 142.55, 130.79, 129.79, 128.52, 124.40, 123.76, 118.05, 109.40, 85.33, 42.52, 29.71, 21.75.

HRMS: **(**EI^+ mode): Calculated for $C_{28}H_{26}N_2O_6S_2$: 550.1232, found: 550.1232.

4-methyl-N-(2'-oxo-1'-(2-(phenylsulfonyl)ethyl)-3H-spiro[furan-2,3'-indolin]-4-yl)-N-tosylbenzenesulfonamide (4e):



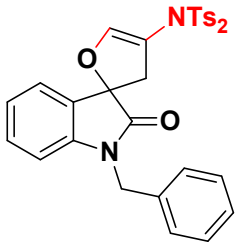
Synthesized according to the general procedure described above. Isolated as white color solid; 75% yield (50 mg)

M.P: 180-182°C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.96 – 7.91 (m, 4H), 7.91 – 7.89 (m, 2H), 7.65 (dd, *J* = 10.6, 4.3 Hz, 1H), 7.55 (dd, *J* = 7.1, 1.1 Hz, 2H), 7.54 – 7.51 (m, 2H), 7.39 (dd, *J* = 7.8, 1.2 Hz, 1H), 7.36 (dd, *J* = 6.9, 4.7 Hz, 4H), 7.15 (td, *J* = 7.7, 0.8 Hz, 1H), 6.90 (d, *J* = 7.9 Hz, 1H), 6.35 (s, 1H), 3.55 (dt, *J* = 14.3, 7.2 Hz, 2H), 3.50 – 3.42 (m, 2H), 3.00 (dd, *J* = 14.5, 2.2 Hz, 1H), 2.78 (dd, *J* = 14.5, 1.9 Hz, 1H), 2.46 (s, 6H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 173.63, 148.75, 145.31, 141.40, 138.68, 136.19, 134.22, 131.06, 129.78, 129.50, 128.49, 127.93, 124.70, 124.26, 110.36, 108.70, 84.94, 52.38, 38.95, 31.60, 22.67, 21.75.

HRMS: (EI$^+$ mode): Calculated for $C_{33}H_{30}N_2O_8S_3$: 678.1164, found: 678.1166.

N-(1'-benzyl-2'-oxo-3H-spiro[furan-2,3'-indolin]-4-yl)-4-methyl-N-tosylbenzenesulfonamide (4f):

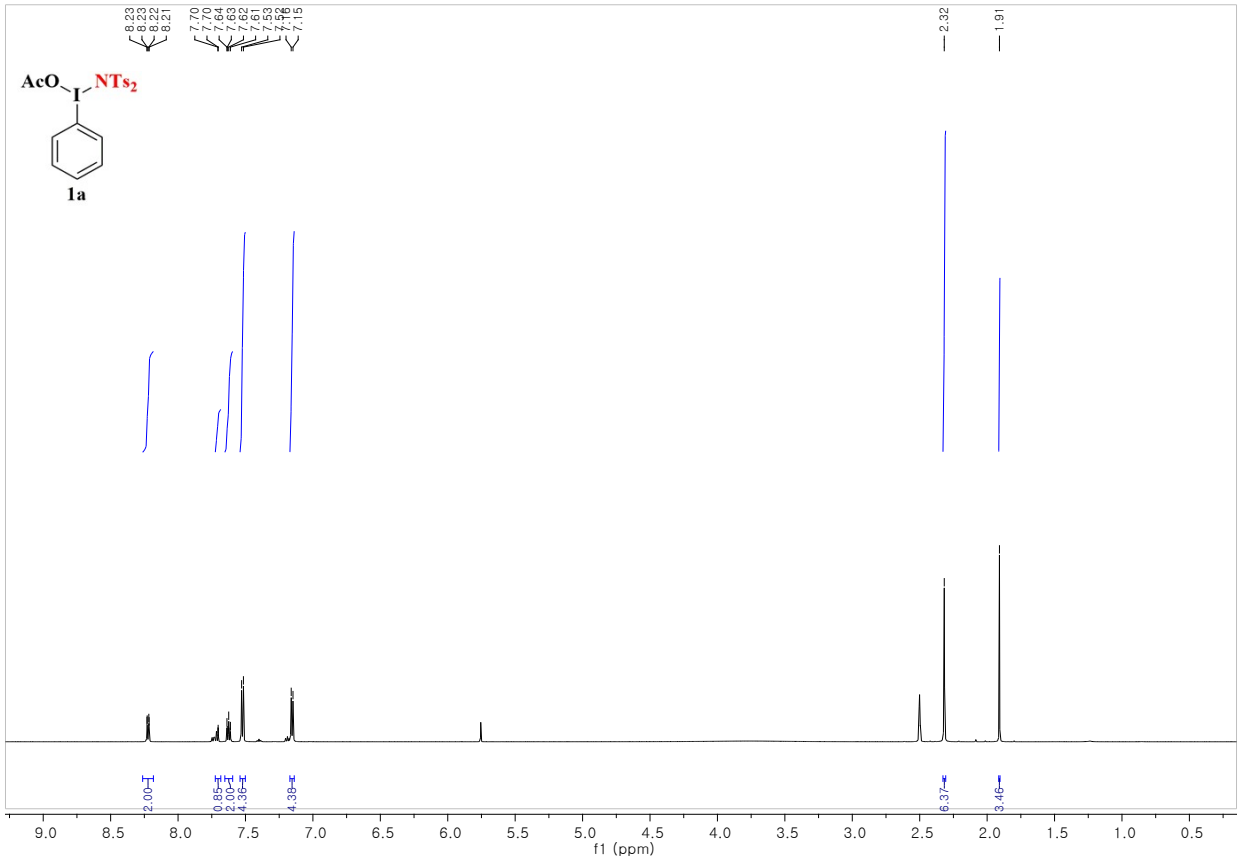


Synthesized according to the general procedure described above. Isolated as white color solid; 91% yield (54 mg)

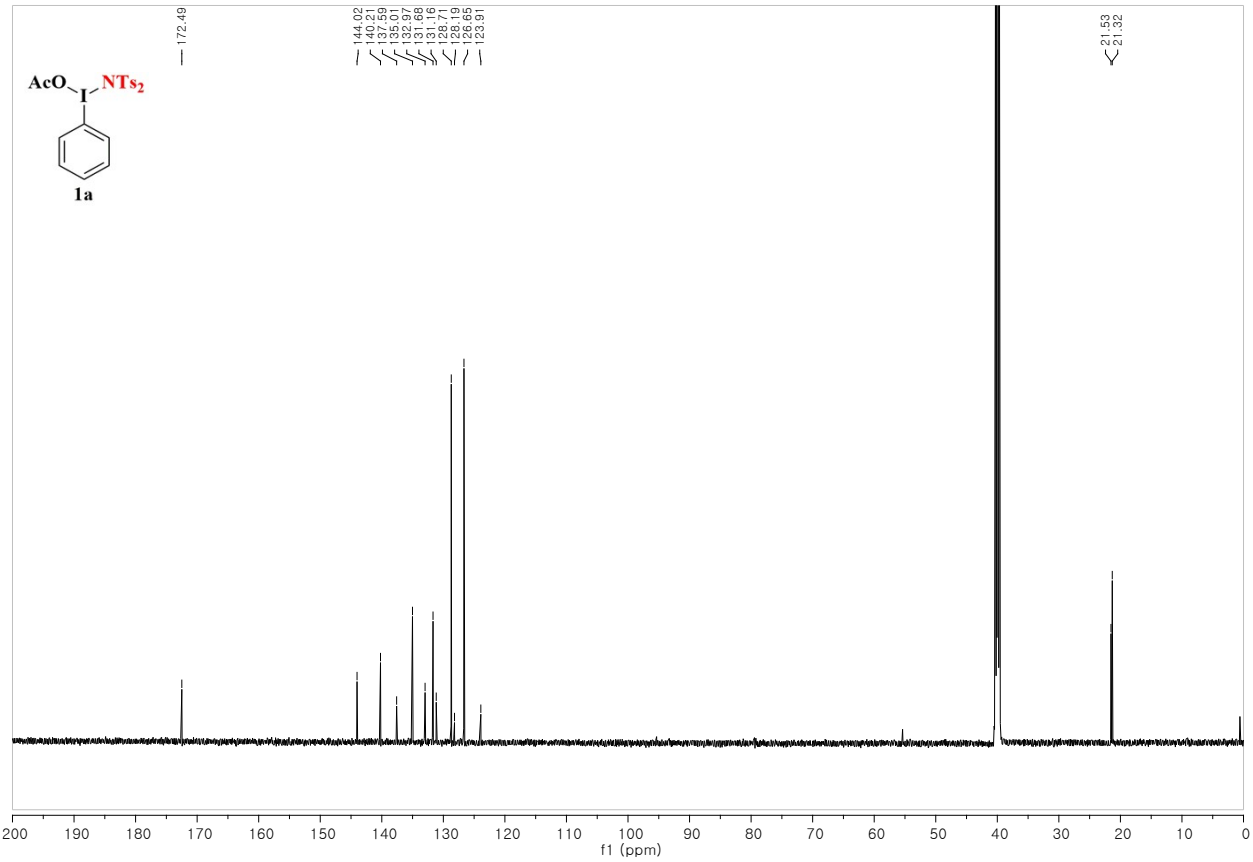
M.P: 180-182^{o}C

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.97 (d, *J* = 8.3 Hz, 4H), 7.56 (d, *J* = 6.8 Hz, 1H), 7.37 (d, *J* = 8.1 Hz, 3H), 7.31 (dt, *J* = 20.2, 7.4 Hz, 4H), 7.26 – 7.22 (m, 1H), 7.09 (t, *J* = 7.2 Hz, 1H), 6.70 (d, *J* = 7.9 Hz, 1H), 6.43 (s, 1H), 4.92 (d, *J* = 15.6 Hz, 1H), 4.85 (d, *J* = 15.6 Hz, 1H), 3.21 (dd, *J* = 14.3, 2.2 Hz, 1H), 2.95 (dd, *J* = 14.3, 1.7 Hz, 1H), 2.47 (s, 6H). **^{13}C NMR (151 MHz, $CDCl_3$)** δ 173.80, 148.99, 145.27, 142.45, 136.24, 135.13, 130.80, 129.80, 129.07, 128.91, 128.53, 127.86, 127.29, 124.40, 123.83, 110.33, 109.54, 85.42, 43.94, 38.98, 21.75.

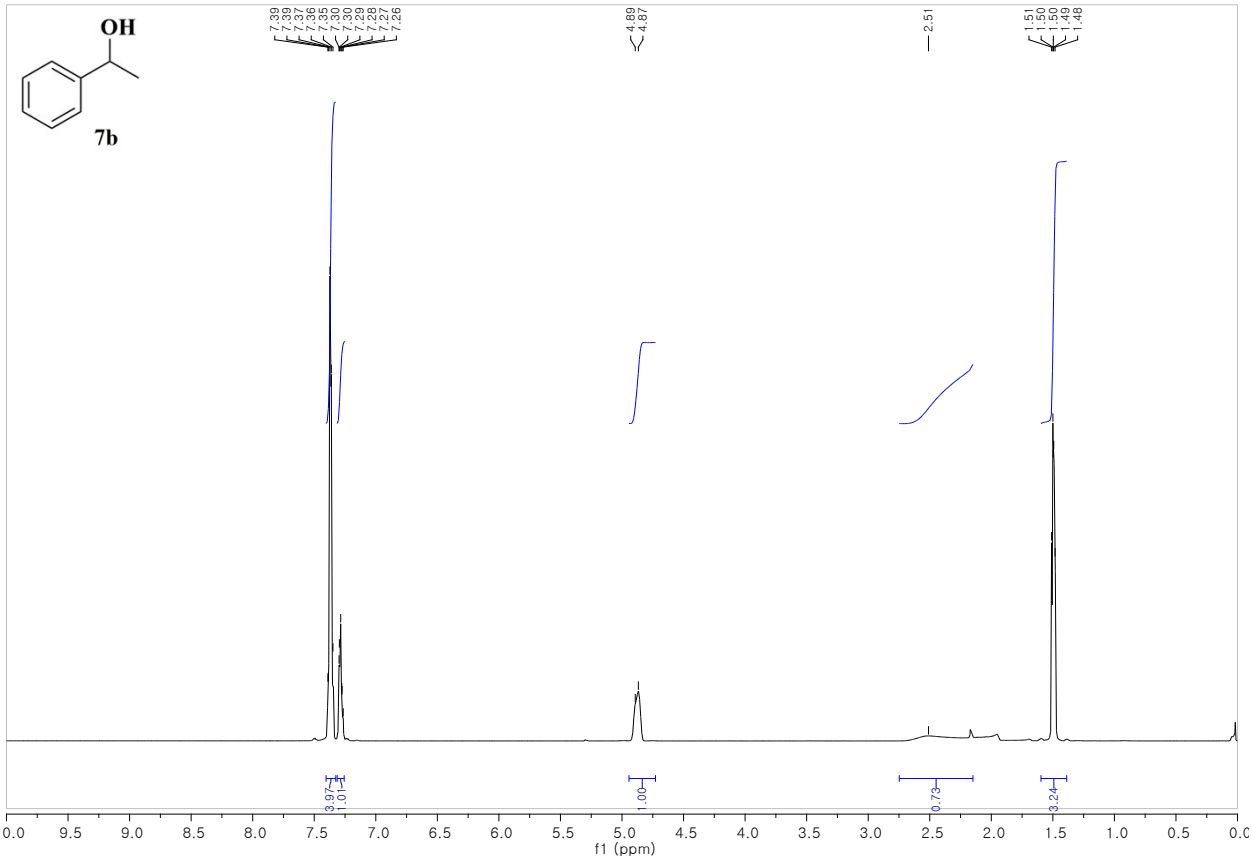
HRMS: (EI$^+$ mode): Calculated for $C_{32}H_{28}N_2O_6S_2$: 600.1389, found: 600.1392.


8.23
8.23
8.22
8.21
7.70
7.70
7.64
7.63
7.62
7.61
7.53
7.52
7.16
7.15
2.32
1.91
AcO
I
NTs2
Ia
2.00
0.85
2.00
4.36
4.38
6.37
3.46
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)

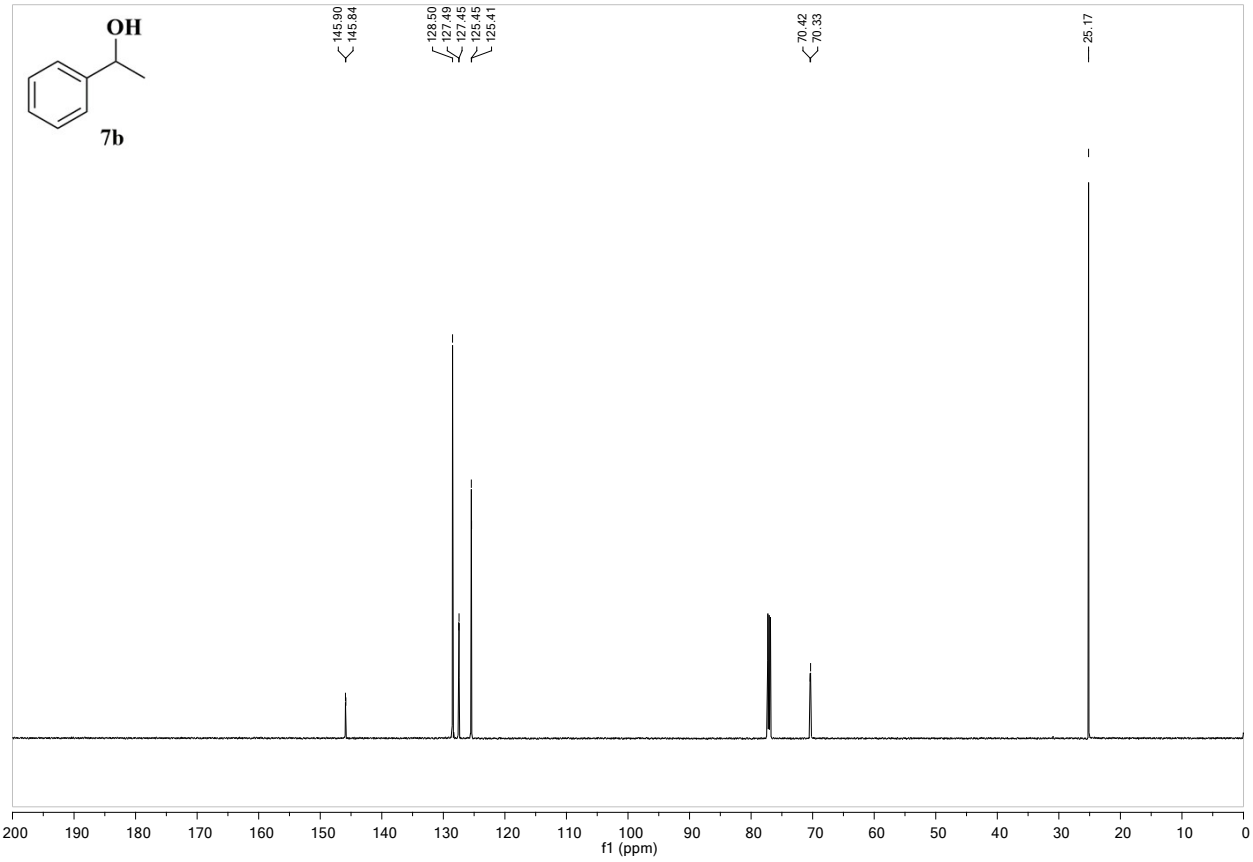
617


172.49
144.02
140.21
137.59
135.01
132.97
131.68
131.16
128.71
128.19
126.65
123.91
21.53
21.32
AcO
I
NTs2
Ia
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

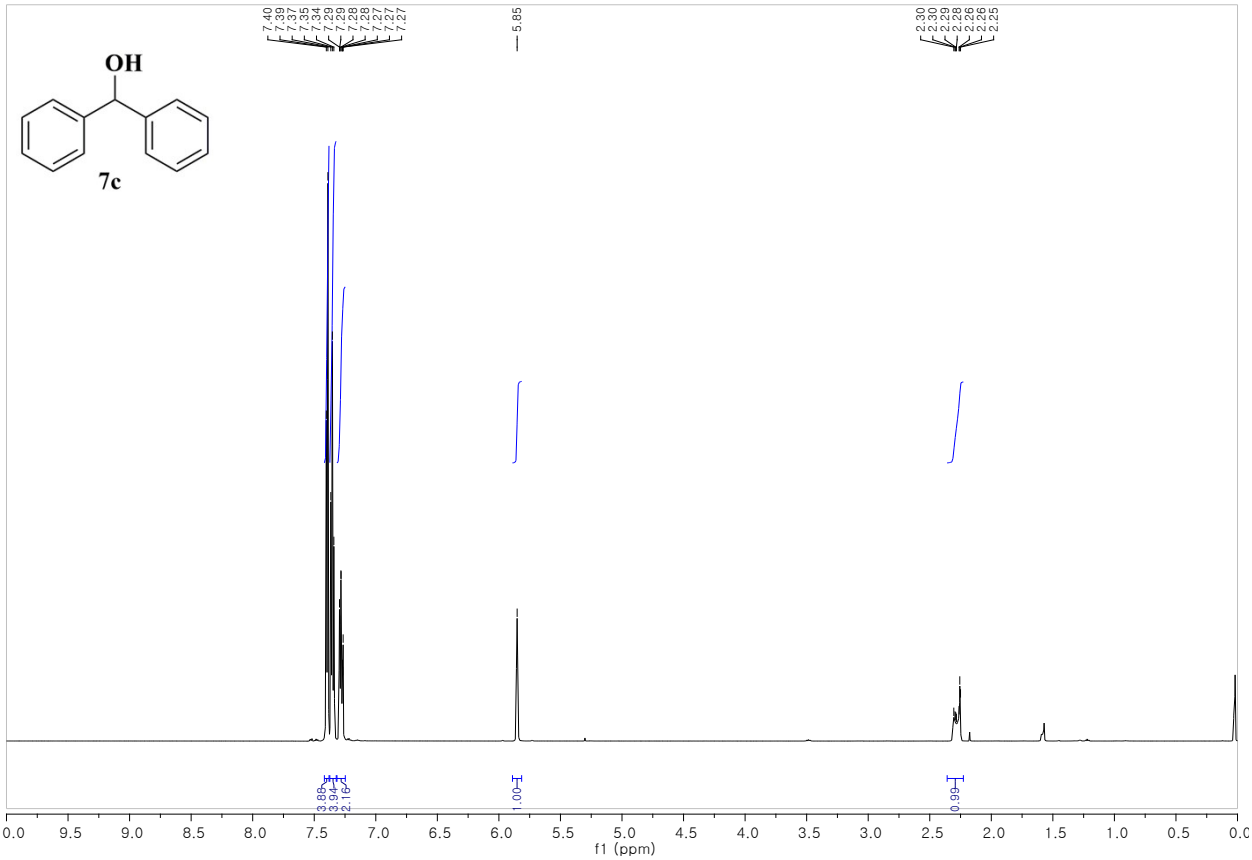
618


OH
7b
7.39
7.39
7.37
7.36
7.35
7.30
7.29
7.28
7.27
7.26
4.89
4.87
2.51
1.51
1.50
1.50
1.49
1.48
3.97
1.01
1.00
0.73
3.24
f1 (ppm)

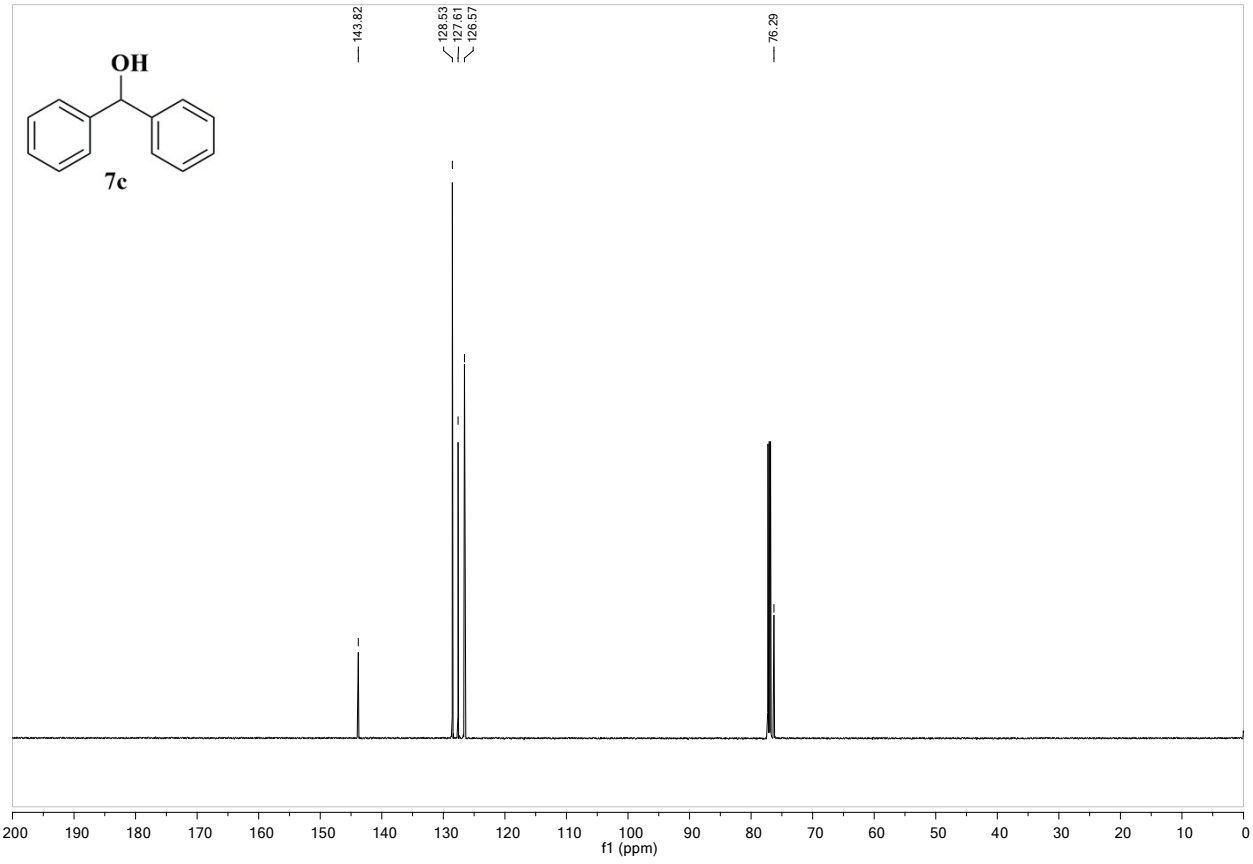
619


OH
7b
145.90
145.84
128.50
127.49
127.45
125.45
125.41
70.42
70.33
25.17
f1 (ppm)

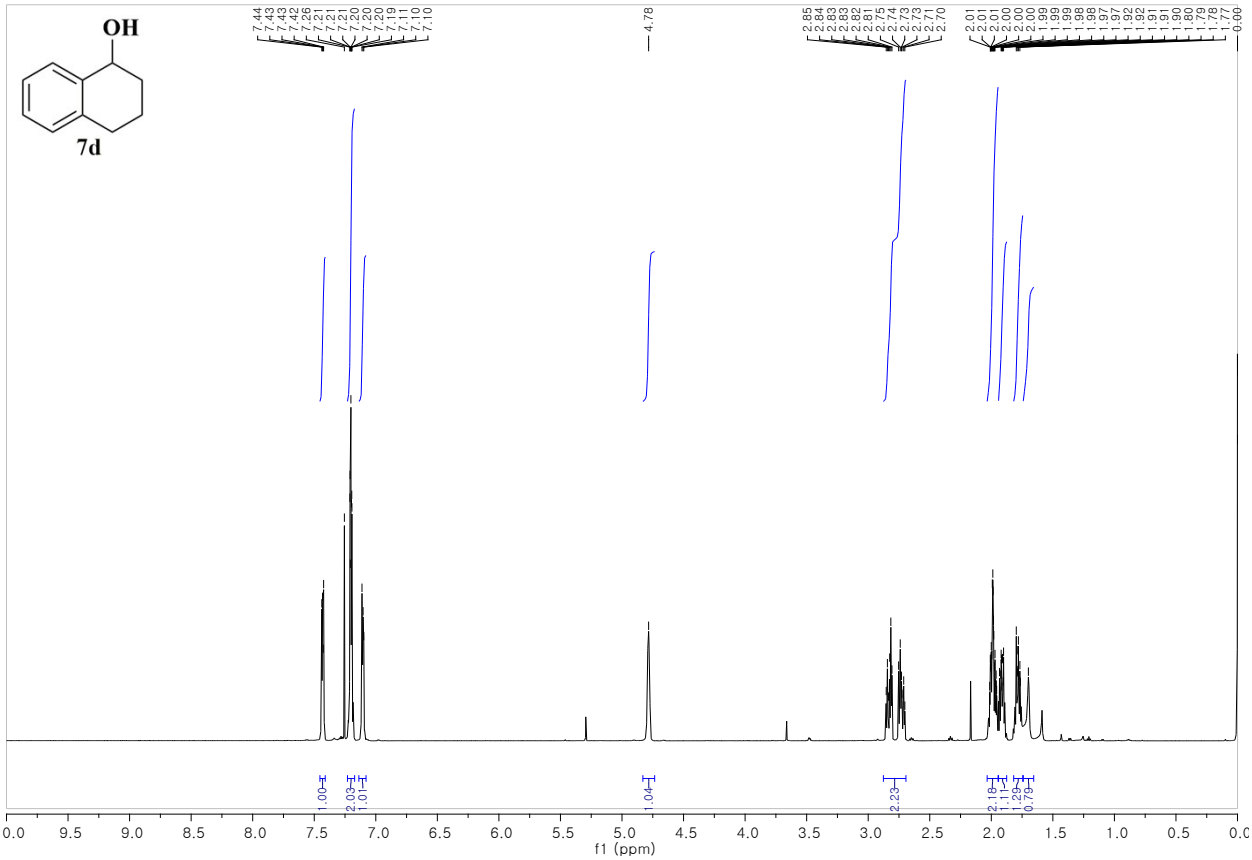
620


OH
7c
7.40
7.39
7.37
7.35
7.34
7.29
7.29
7.28
7.28
7.27
7.27
7.27
5.85
2.30
2.30
2.29
2.28
2.26
2.26
2.25
3.88
3.94
2.16
1.00
0.99
f1 (ppm)

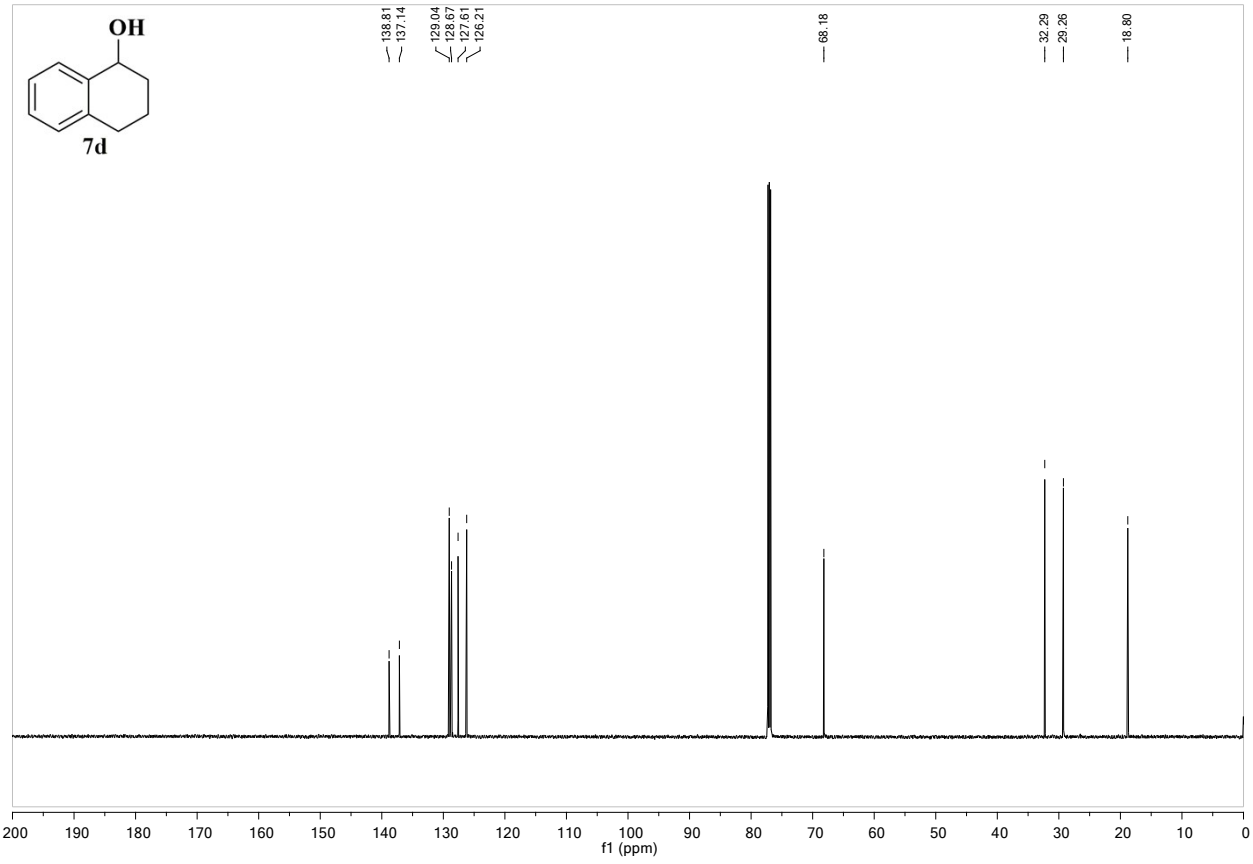
621


OH
7c
143.82
128.53
127.61
126.57
76.29
f1 (ppm)

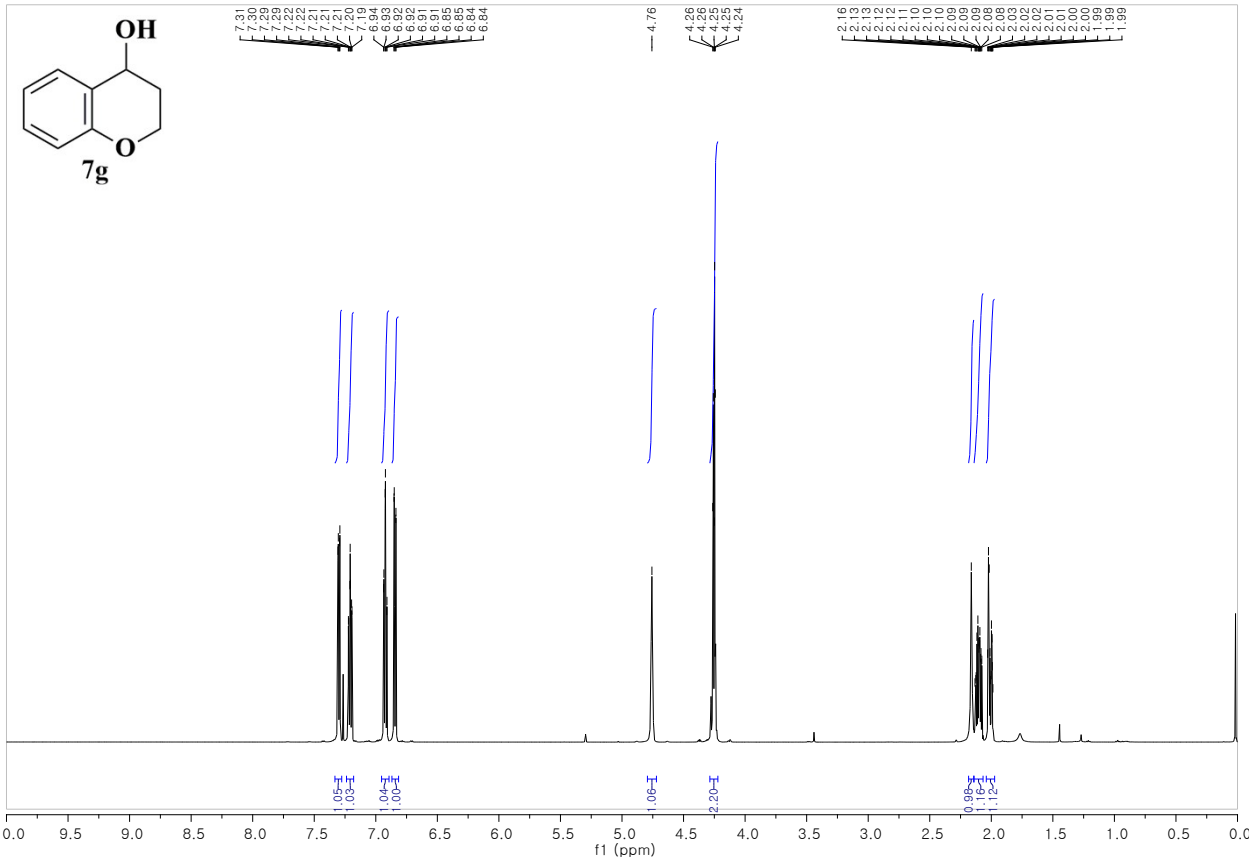
622


OH
7d
7.44
7.43
7.43
7.42
7.26
7.21
7.21
7.20
7.20
7.19
7.11
7.10
7.10
4.78
2.85
2.84
2.83
2.82
2.81
2.75
2.74
2.73
2.73
2.71
2.70
2.01
2.01
2.01
2.00
2.00
2.00
1.99
1.99
1.99
1.98
1.98
1.97
1.97
1.92
1.92
1.91
1.91
1.90
1.90
1.80
1.79
1.78
1.77
0.00
1.00
2.03
1.01
1.04
2.23
2.18
1.11
1.29
0.79
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

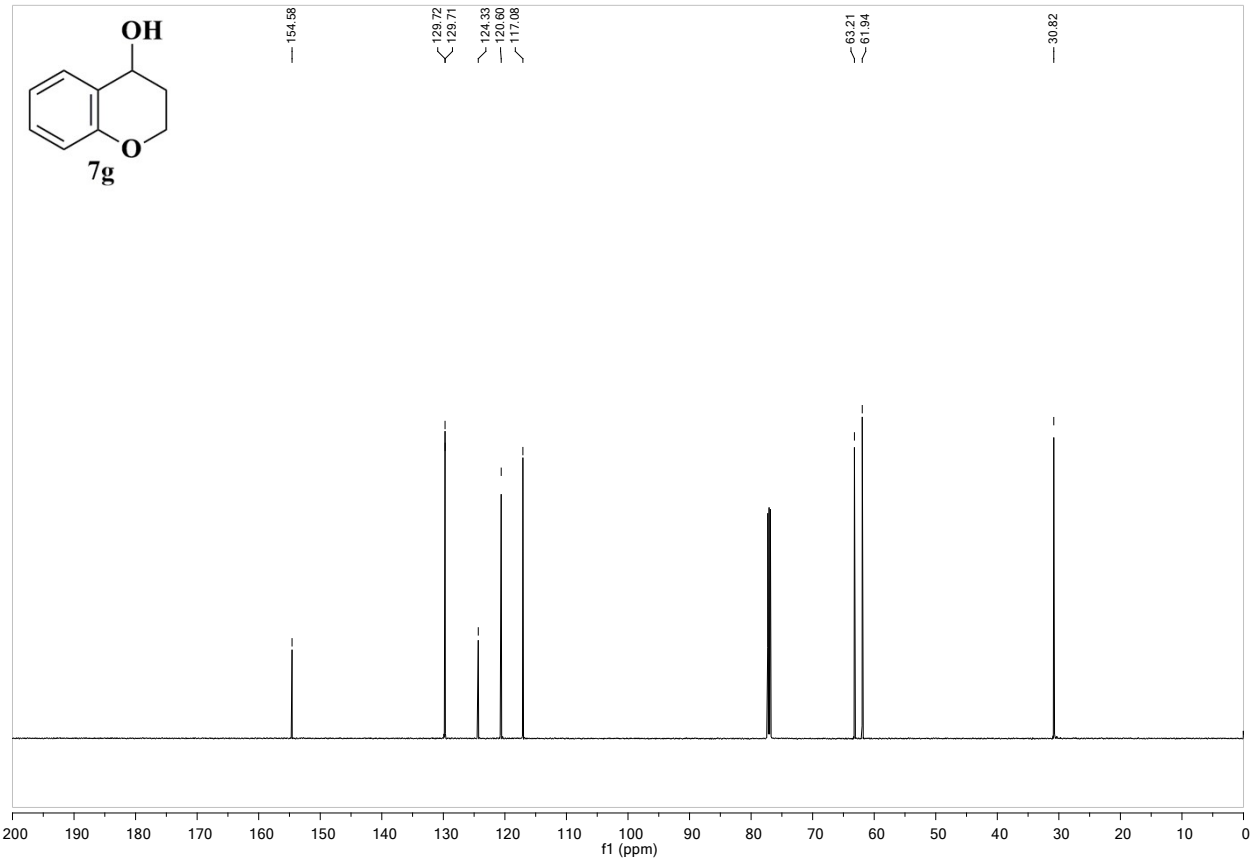
623


OH
7d
138.81
137.14
129.04
128.67
127.61
126.21
68.18
32.29
29.26
18.80
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

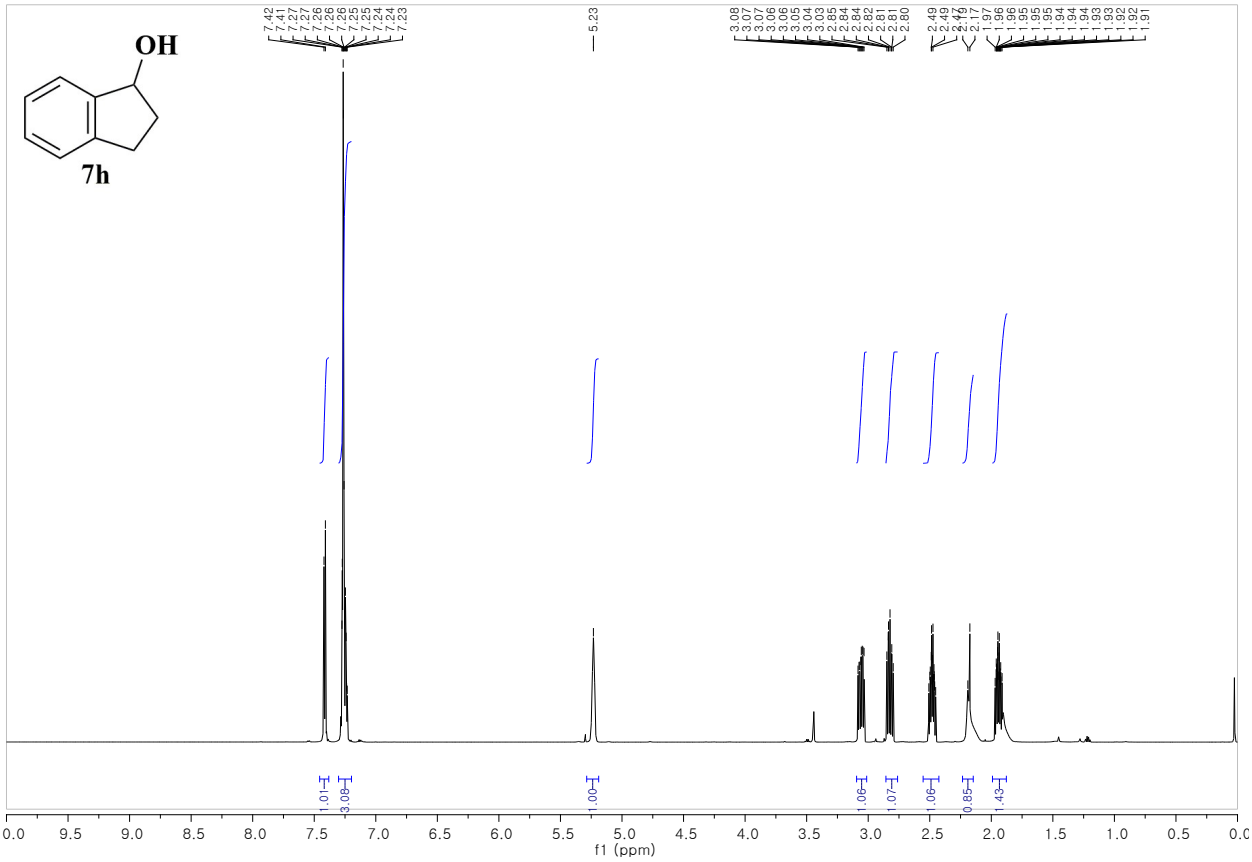
624


OH
O
7g
7.31
7.30
7.29
7.29
7.22
7.22
7.21
7.21
7.21
7.20
7.19
6.94
6.93
6.92
6.92
6.91
6.91
6.85
6.85
6.84
6.84
4.76
4.26
4.26
4.25
4.25
4.24
2.16
2.13
2.13
2.12
2.12
2.11
2.10
2.10
2.10
2.09
2.09
2.09
2.08
2.08
2.08
2.03
2.02
2.02
2.01
2.01
2.00
2.00
1.99
1.99
1.98
1.05
1.03
1.04
1.00
1.06
2.20
0.98
1.15
1.12
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

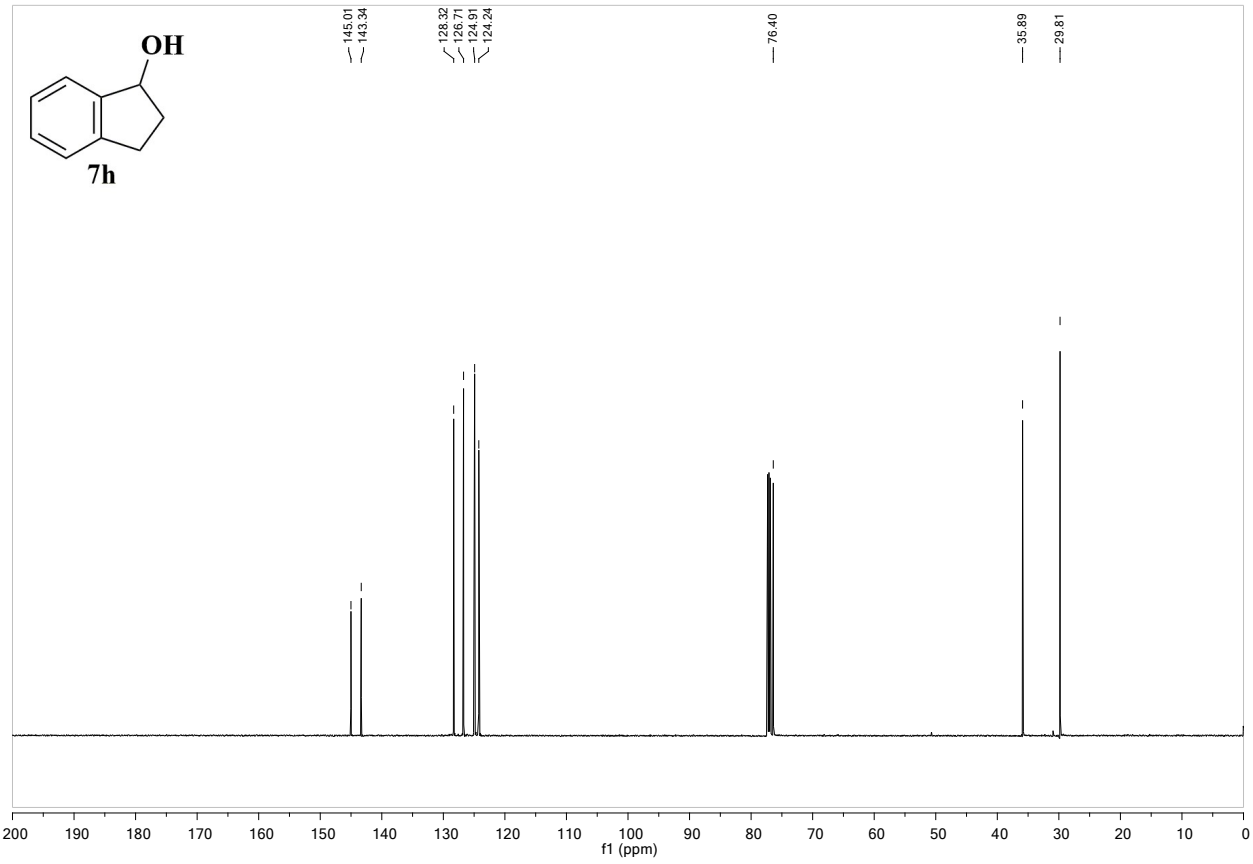
625


OH
O
7g
154.58
129.72
129.71
124.33
120.60
117.08
63.21
61.94
30.82
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

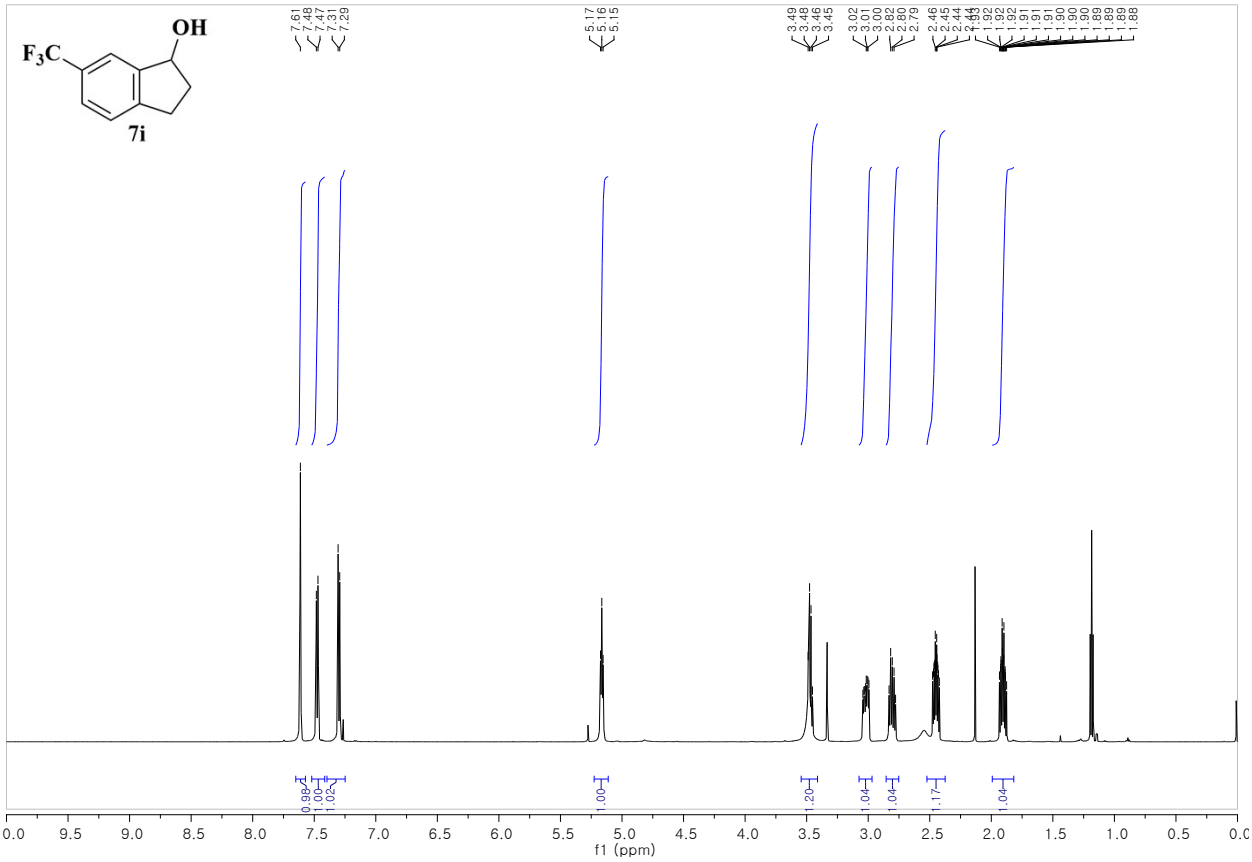
626


OH
7h
7.42
7.41
7.27
7.27
7.26
7.26
7.25
7.24
7.24
7.23
5.23
3.08
3.07
3.07
3.06
3.06
3.05
3.04
3.03
2.85
2.84
2.82
2.81
2.81
2.80
2.49
2.49
2.17
2.17
1.97
1.96
1.96
1.95
1.95
1.94
1.94
1.93
1.93
1.92
1.91
1.01
3.08
1.00
1.06
1.07
1.06
0.85
1.43
f1 (ppm)

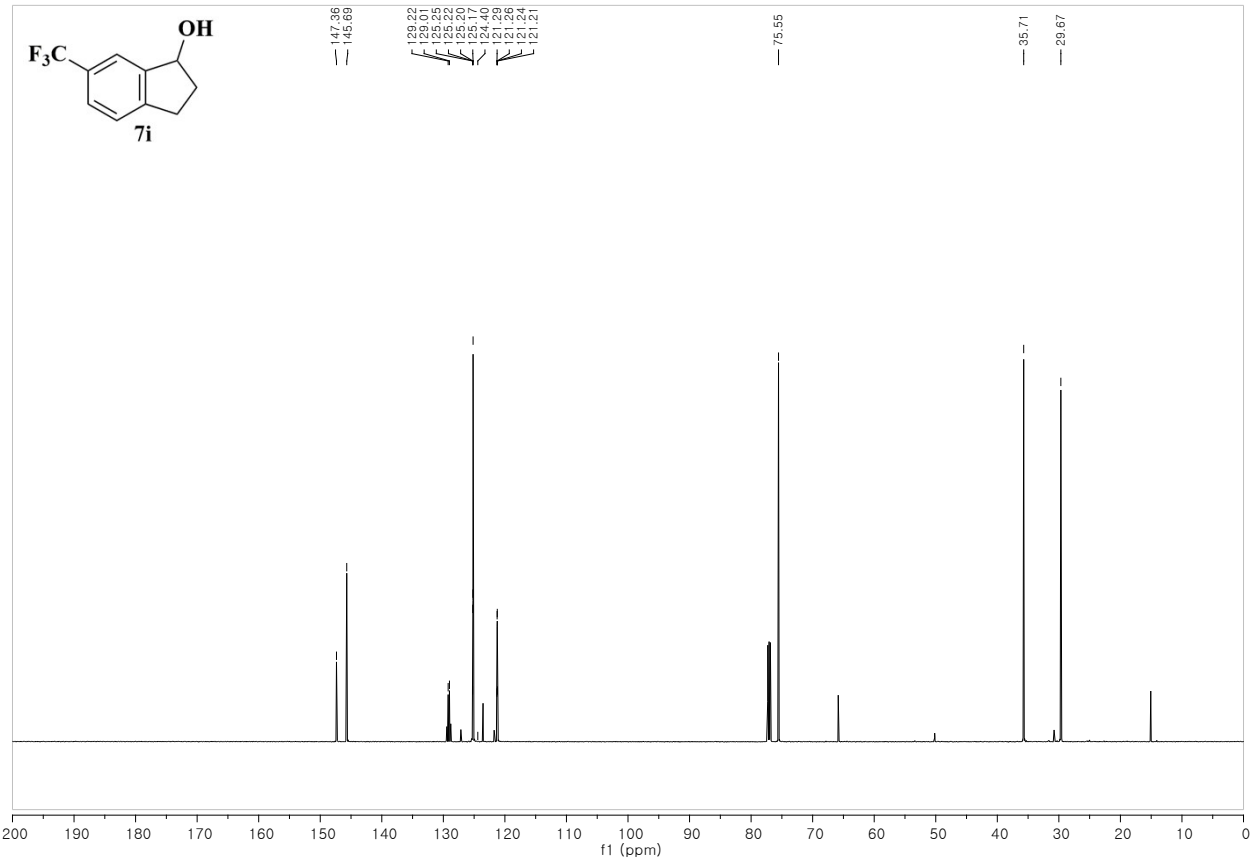
627


OH
7h
145.01
143.34
128.32
126.71
124.91
124.24
76.40
35.89
29.81
f1 (ppm)

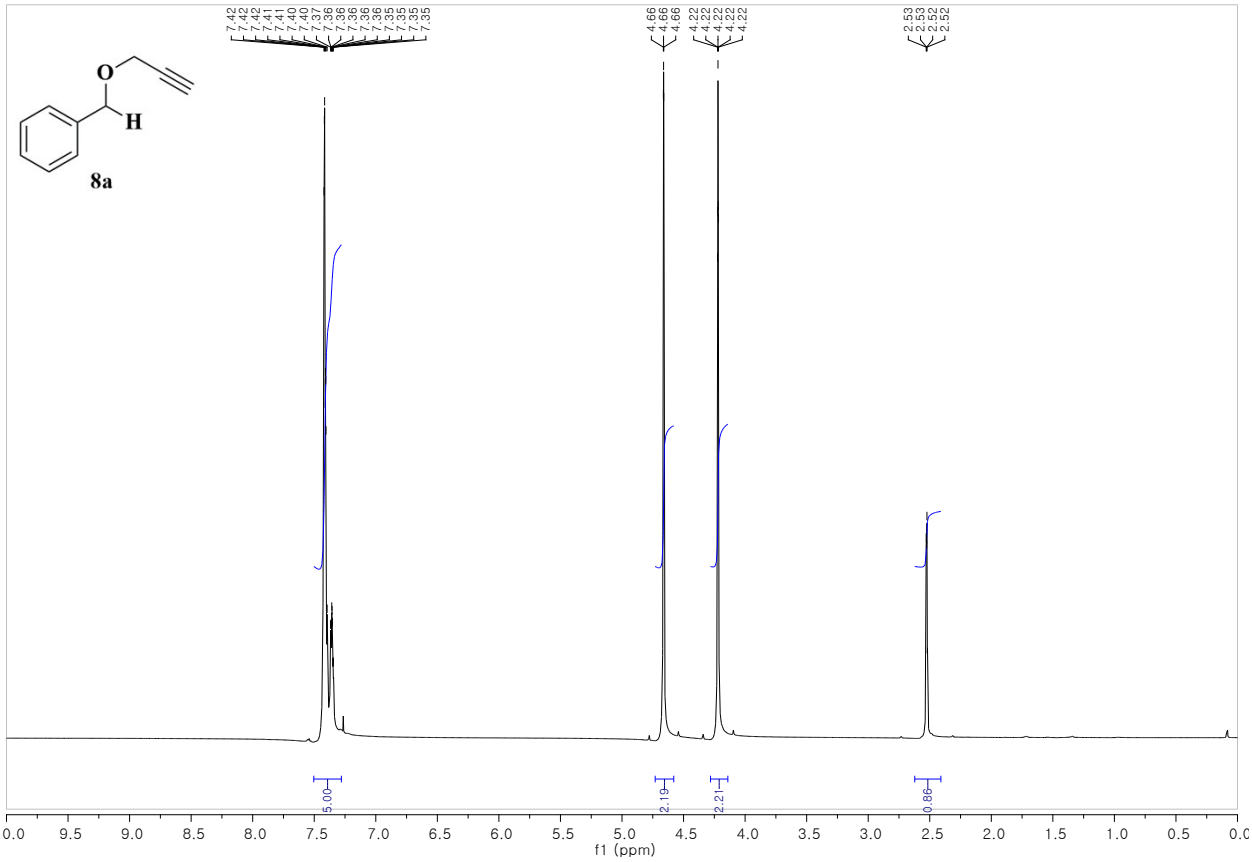
628


OH
F3C
7i
7.61
7.48
7.47
7.31
7.29
5.17
5.16
5.15
3.49
3.48
3.46
3.45
3.02
3.01
3.00
2.82
2.80
2.79
2.46
2.45
2.44
1.92
1.92
1.91
1.91
1.91
1.90
1.90
1.90
1.89
1.89
1.89
1.88
0.98
1.00
1.02
1.00
1.20
1.04
1.04
1.17
1.04
f1 (ppm)

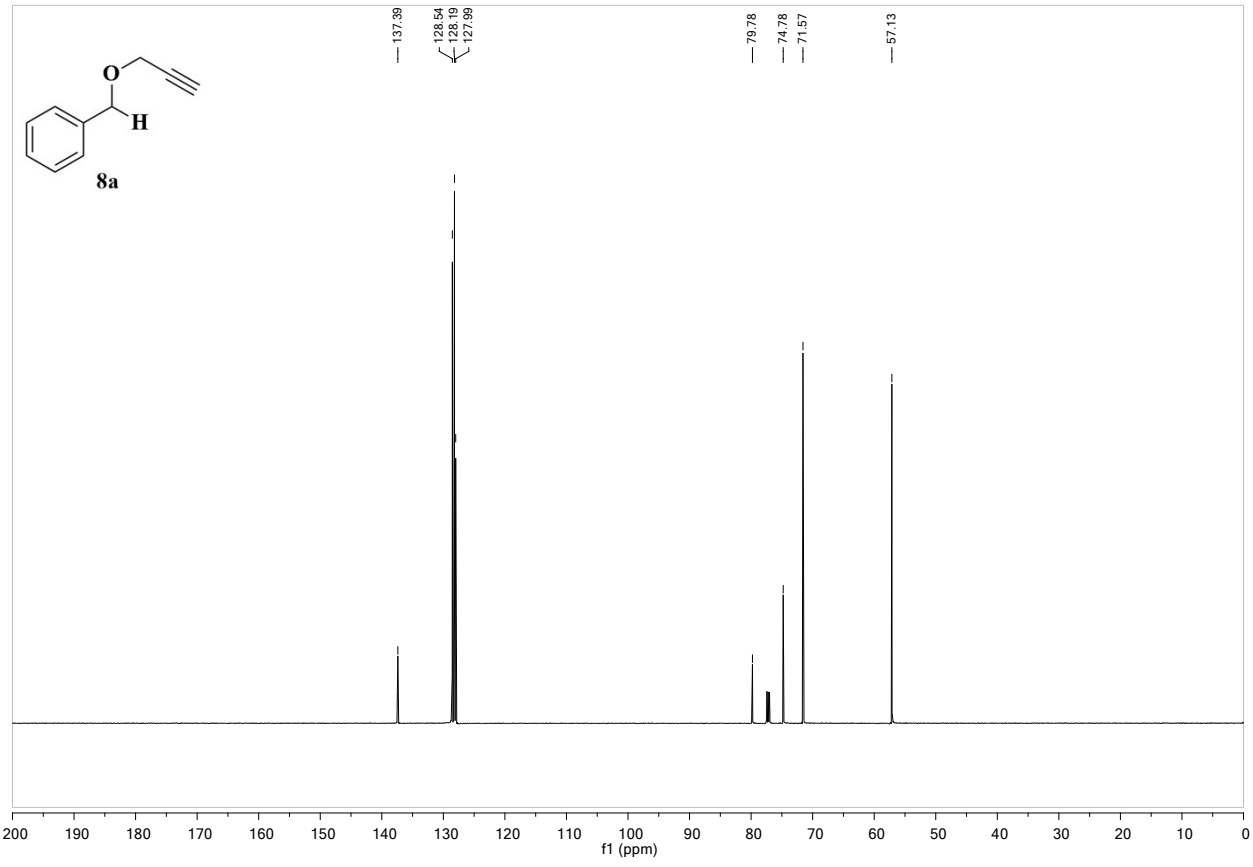
629


OH
F3C
7i
147.36
145.69
129.22
129.01
125.25
125.22
125.20
125.17
124.40
121.28
121.24
121.21
75.55
35.71
29.67
f1 (ppm)

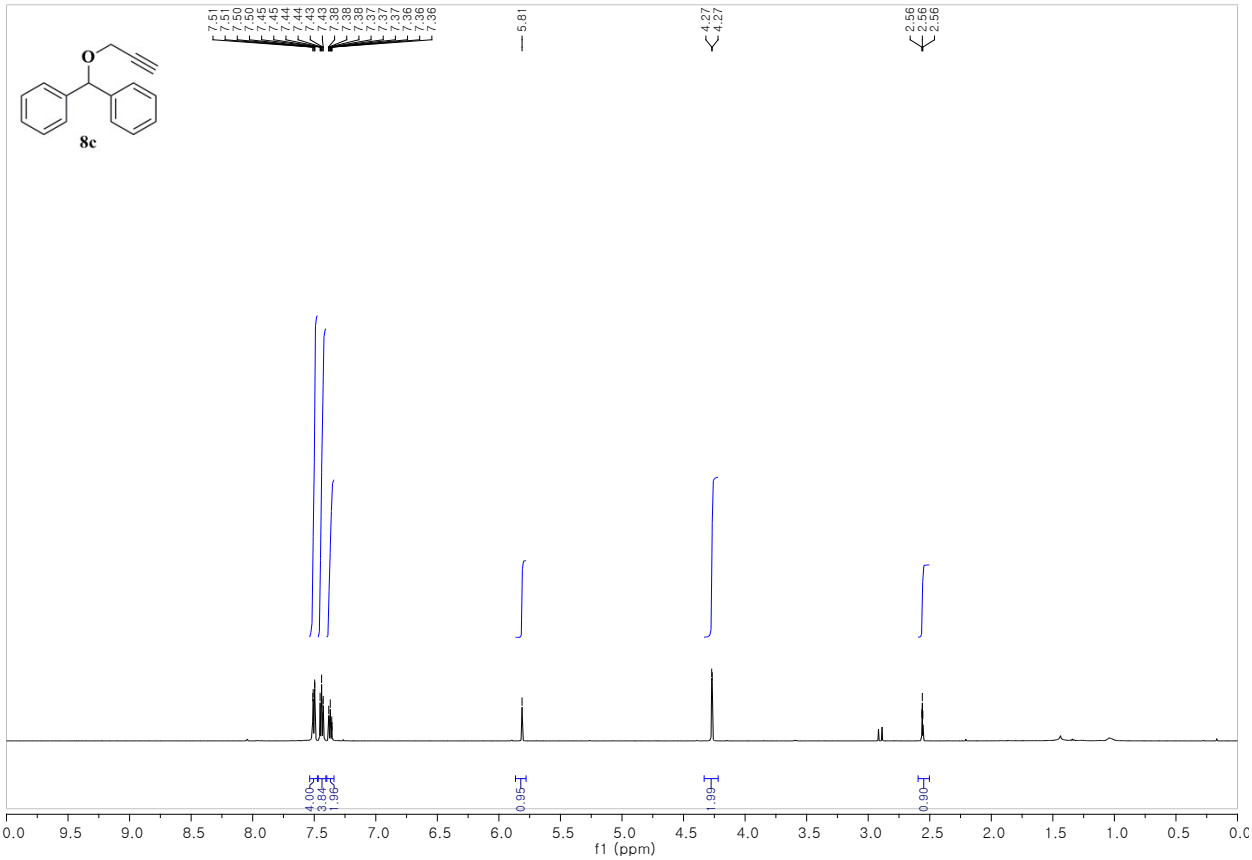
630


7.42
7.42
7.42
7.41
7.41
7.40
7.40
7.37
7.36
7.36
7.36
7.36
7.36
7.35
7.35
7.35
7.35
4.66
4.66
4.66
4.22
4.22
4.22
4.22
4.22
2.53
2.53
2.52
2.52
O
H
8a
5.00
2.19
2.21
0.86
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

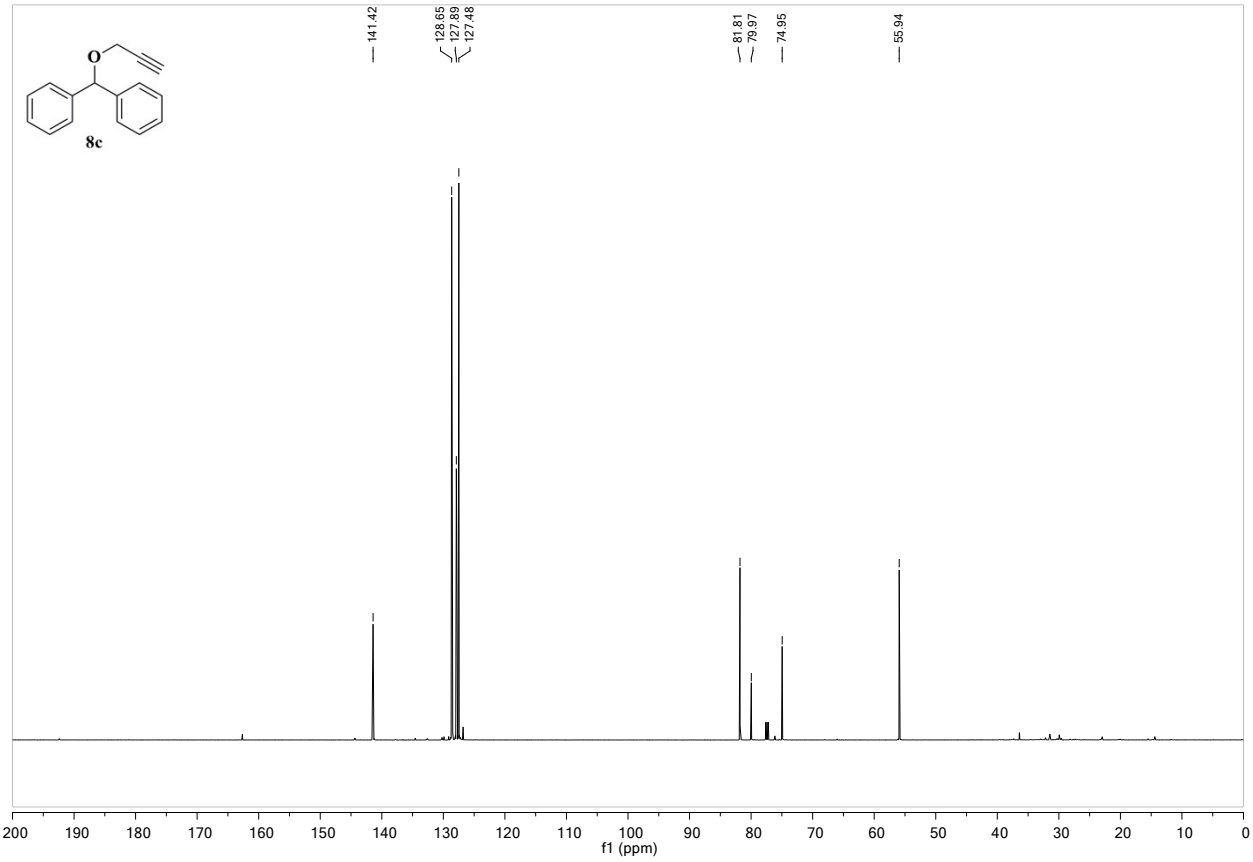
631


137.39
128.54
128.19
127.99
79.78
74.78
71.57
57.13
O
H
8a
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

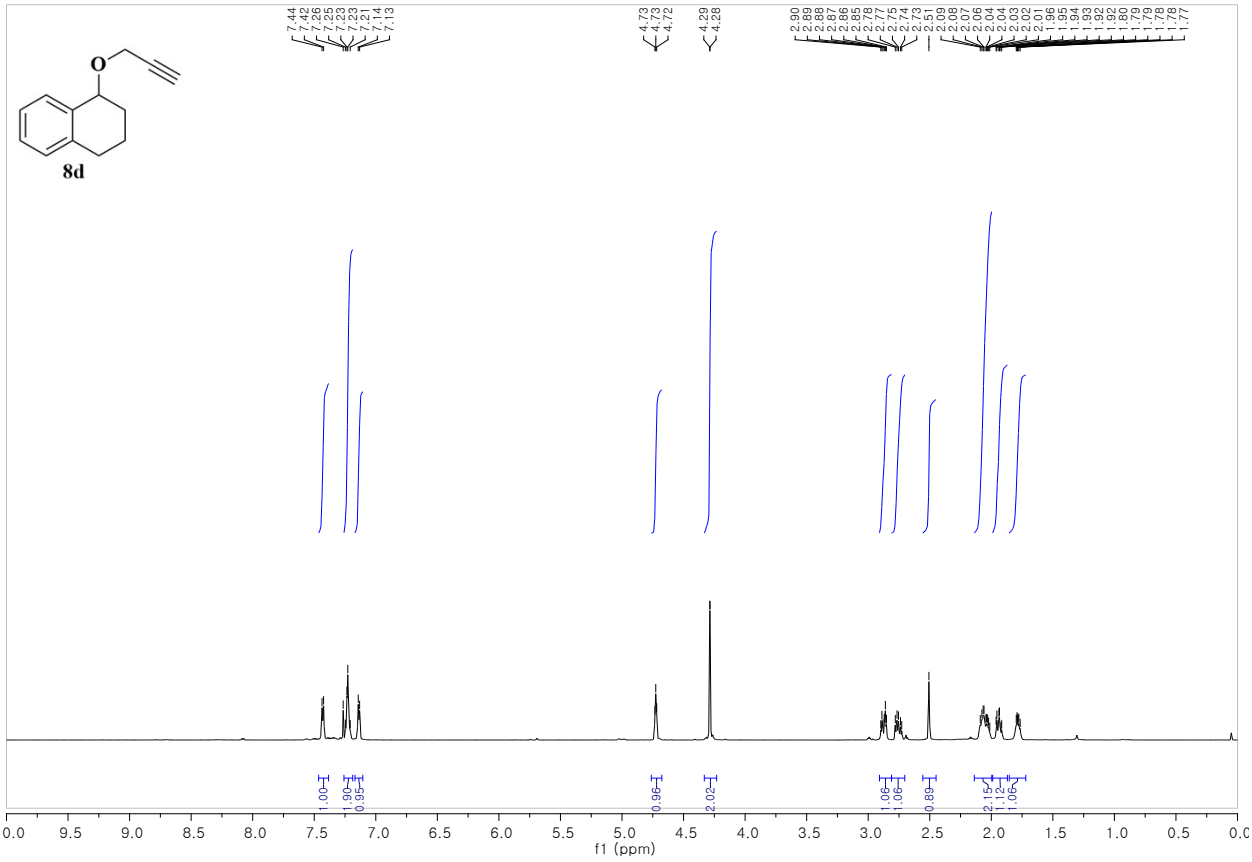
632


7.51
7.51
7.50
7.50
7.45
7.44
7.44
7.43
7.38
7.38
7.37
7.37
7.37
7.36
7.36
7.36
5.81
4.27
4.27
2.56
2.56
2.56
O
8c
4.00
3.84
1.96
0.95
1.99
0.90
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

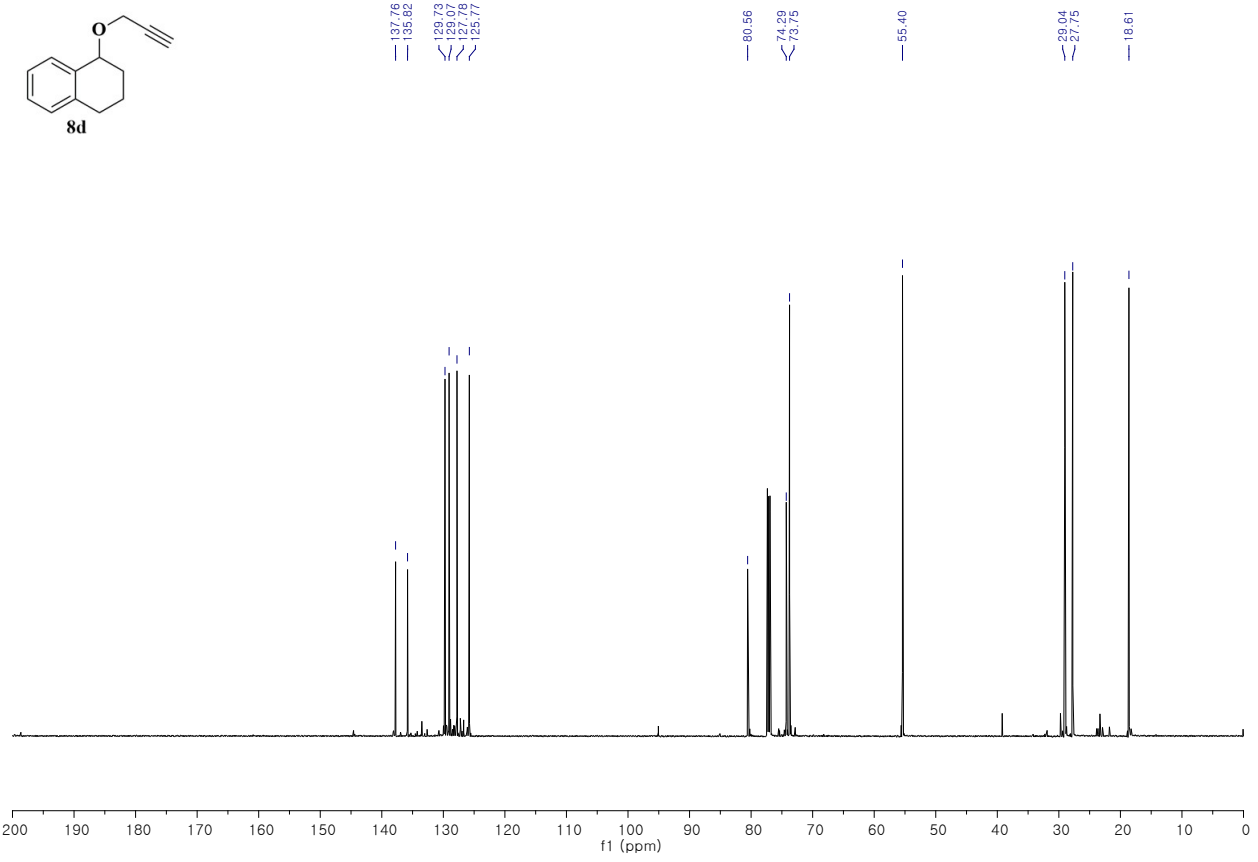
633


141.42
128.65
127.89
127.48
81.81
79.97
74.95
55.94
O
8c
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

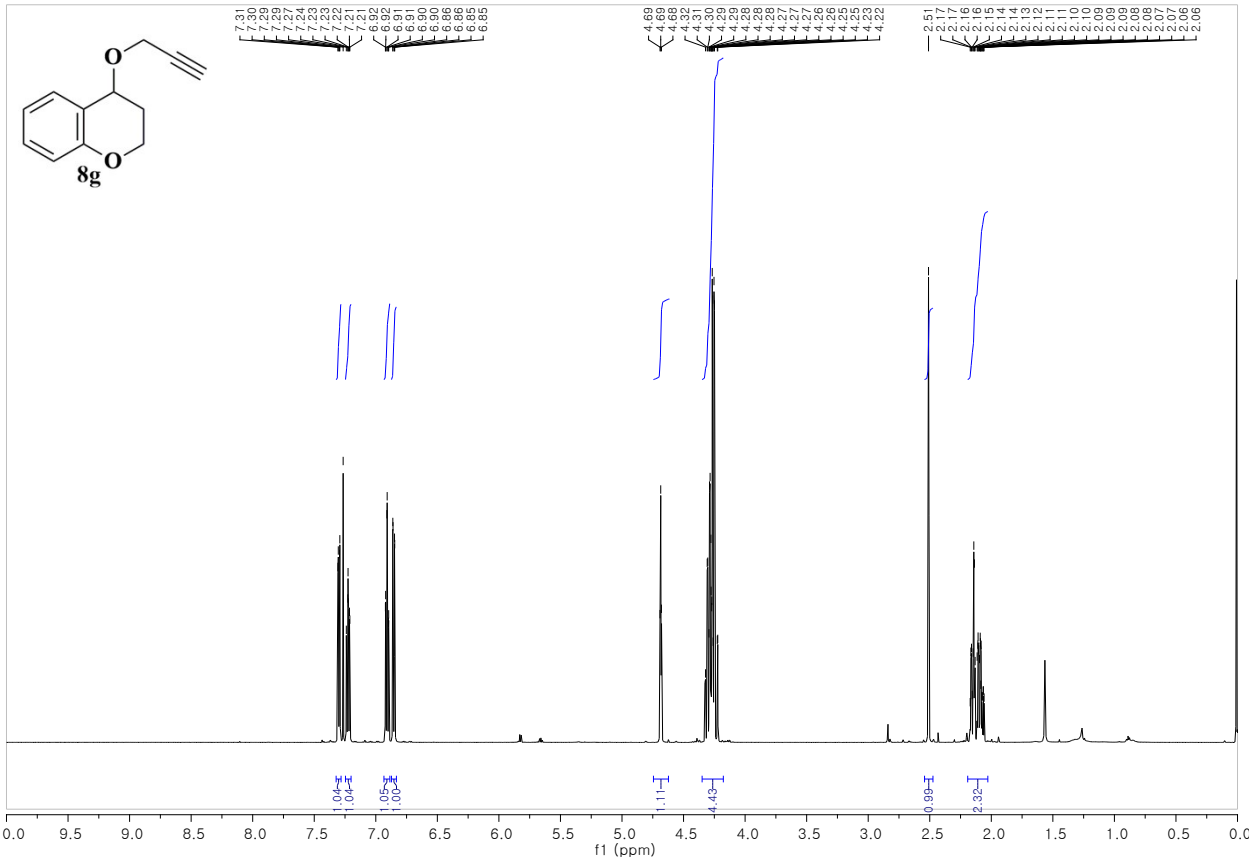
634



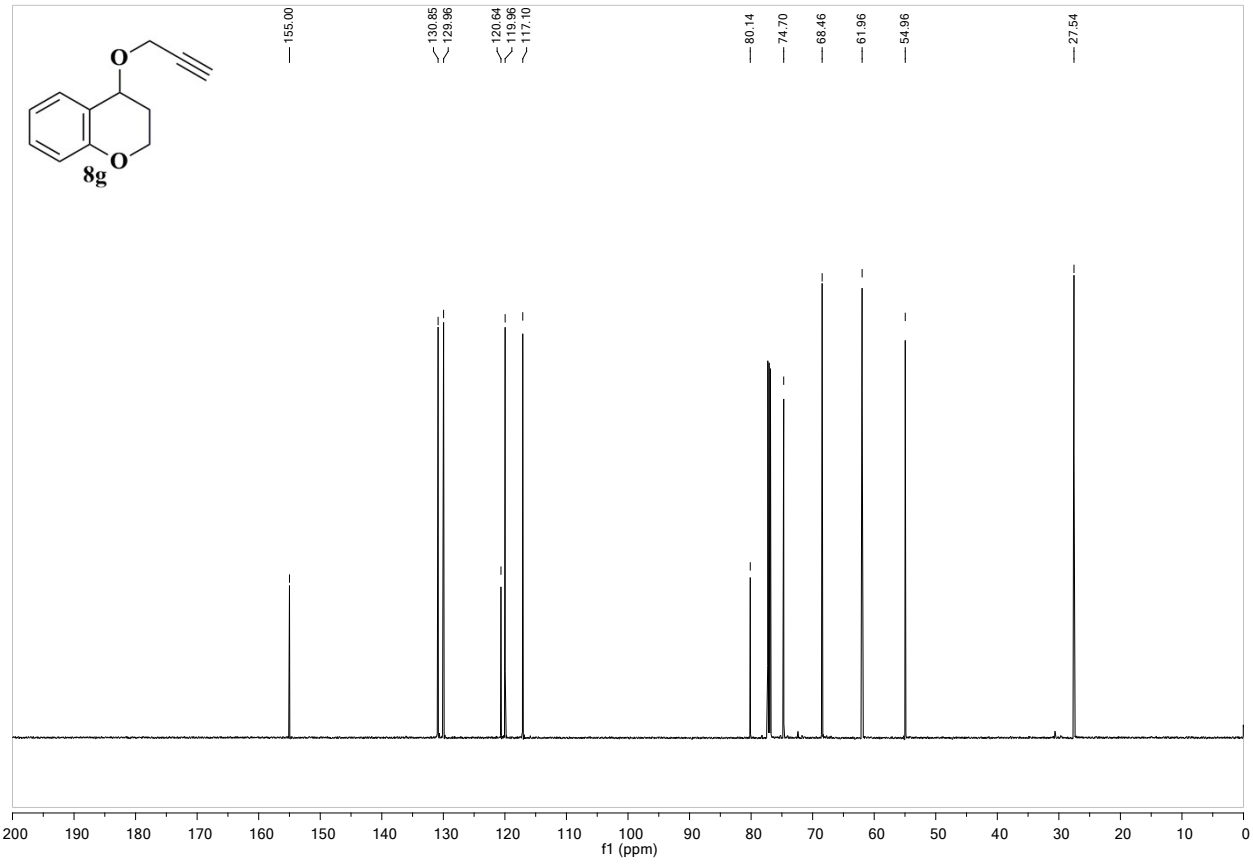
635



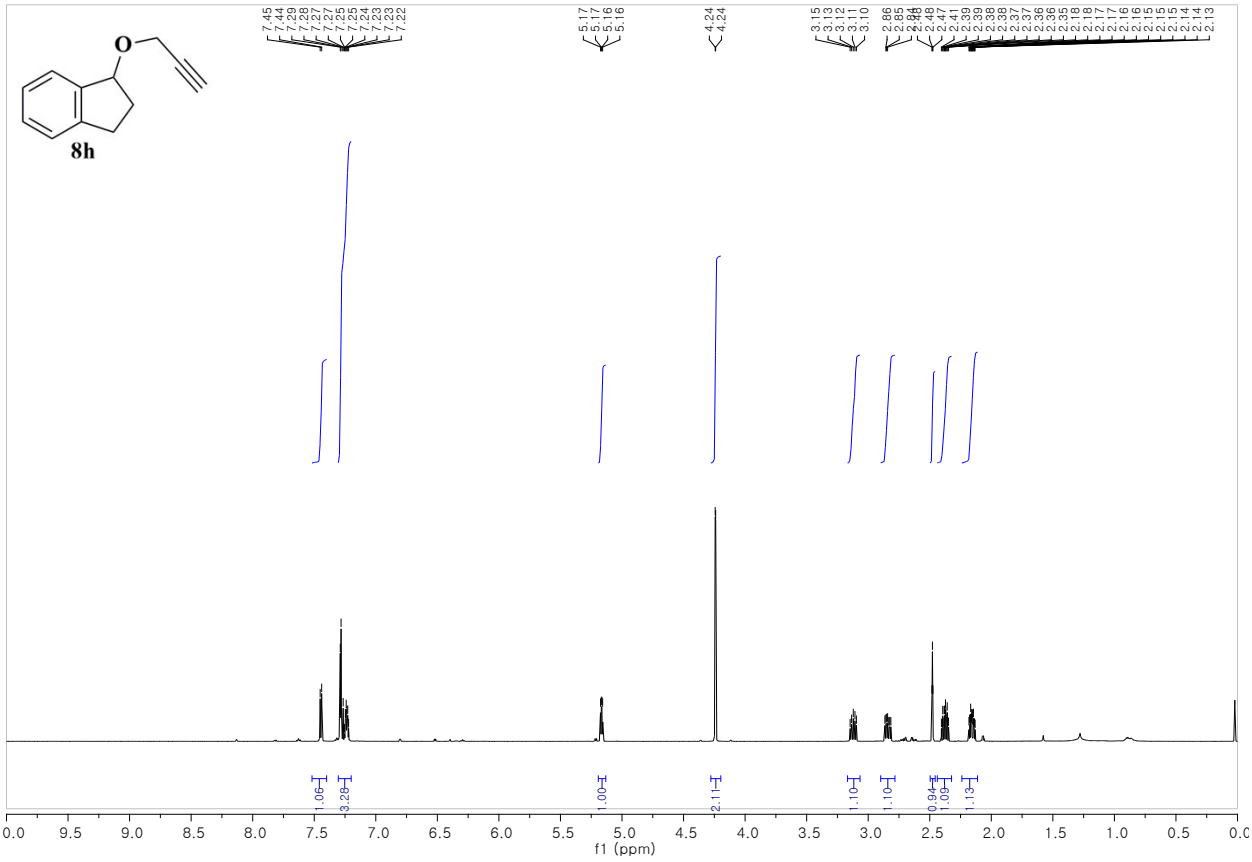
636


8g
f1 (ppm)

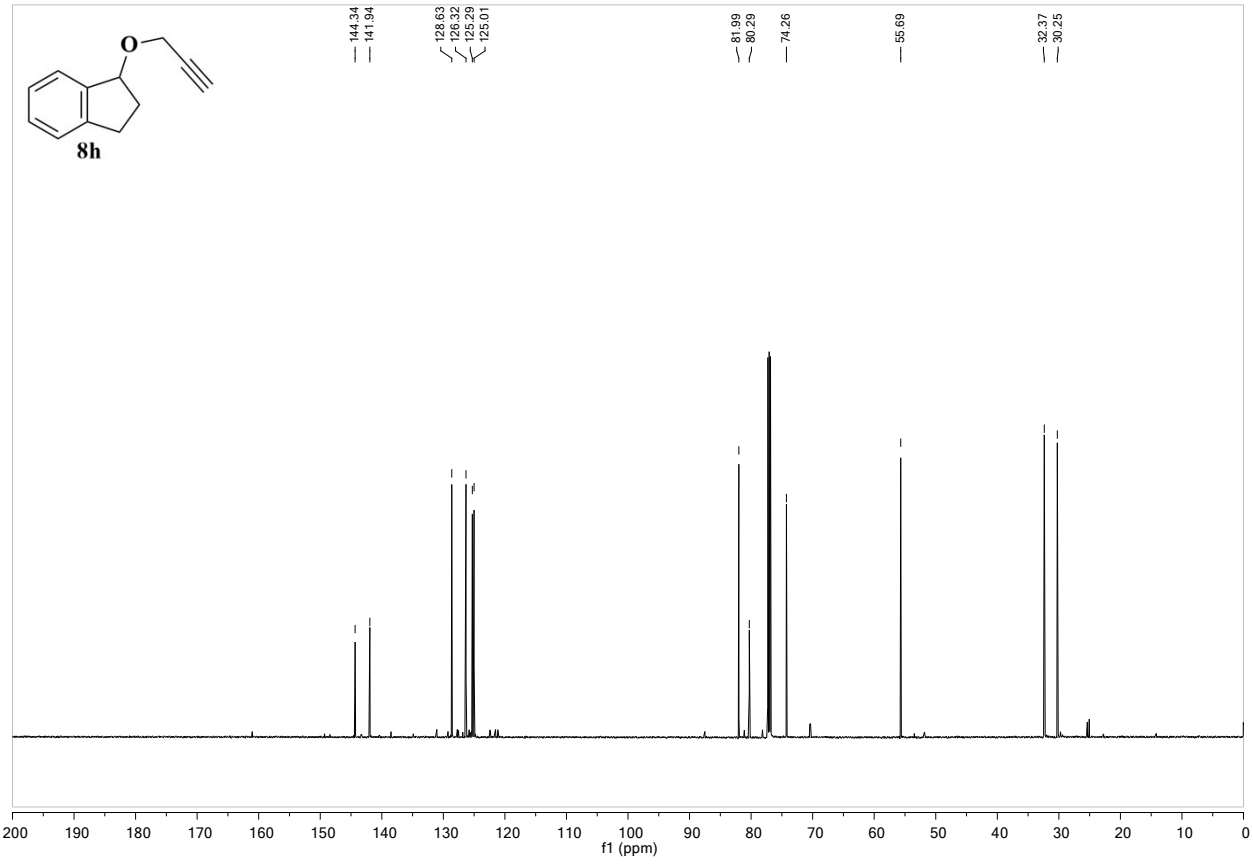
637


8g
155.00
130.85
129.96
120.64
119.96
117.10
80.14
74.70
68.46
61.96
54.96
27.54
f1 (ppm)

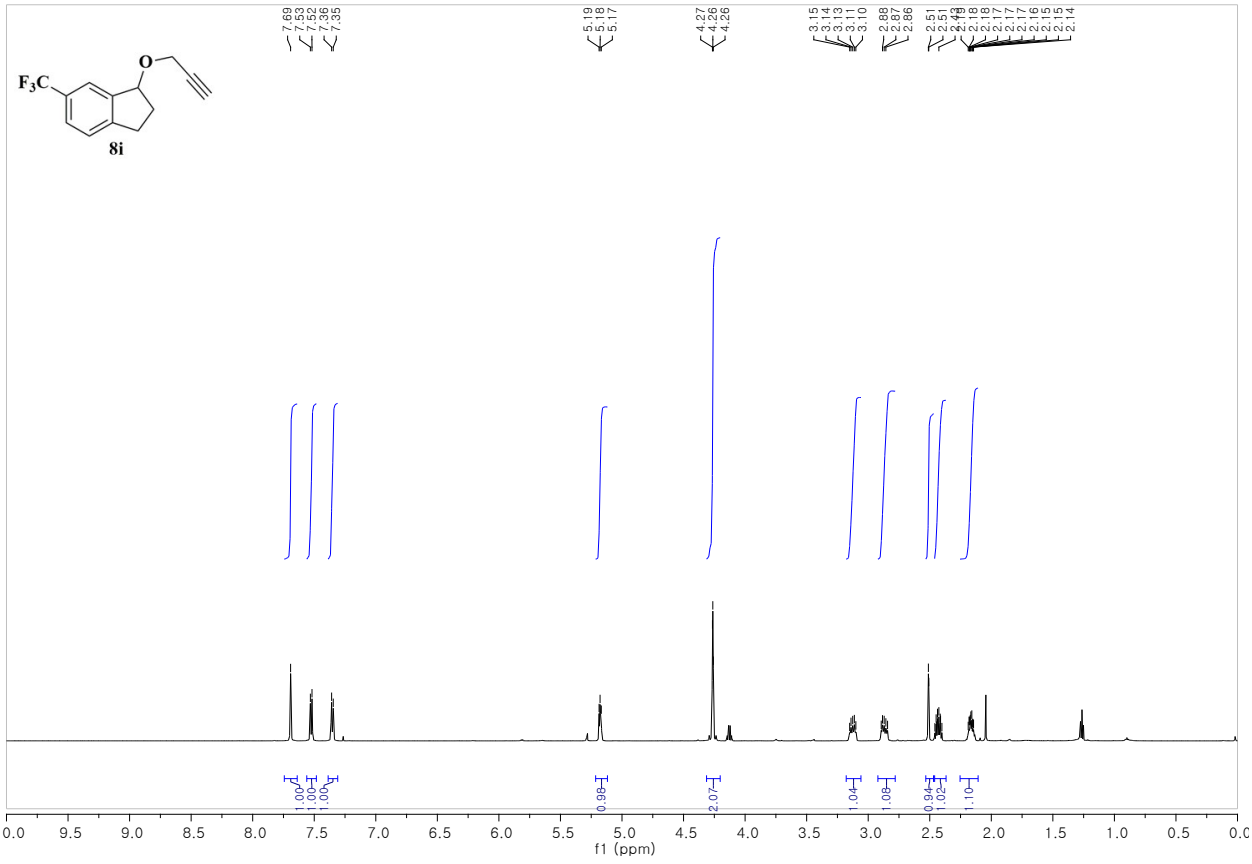
638



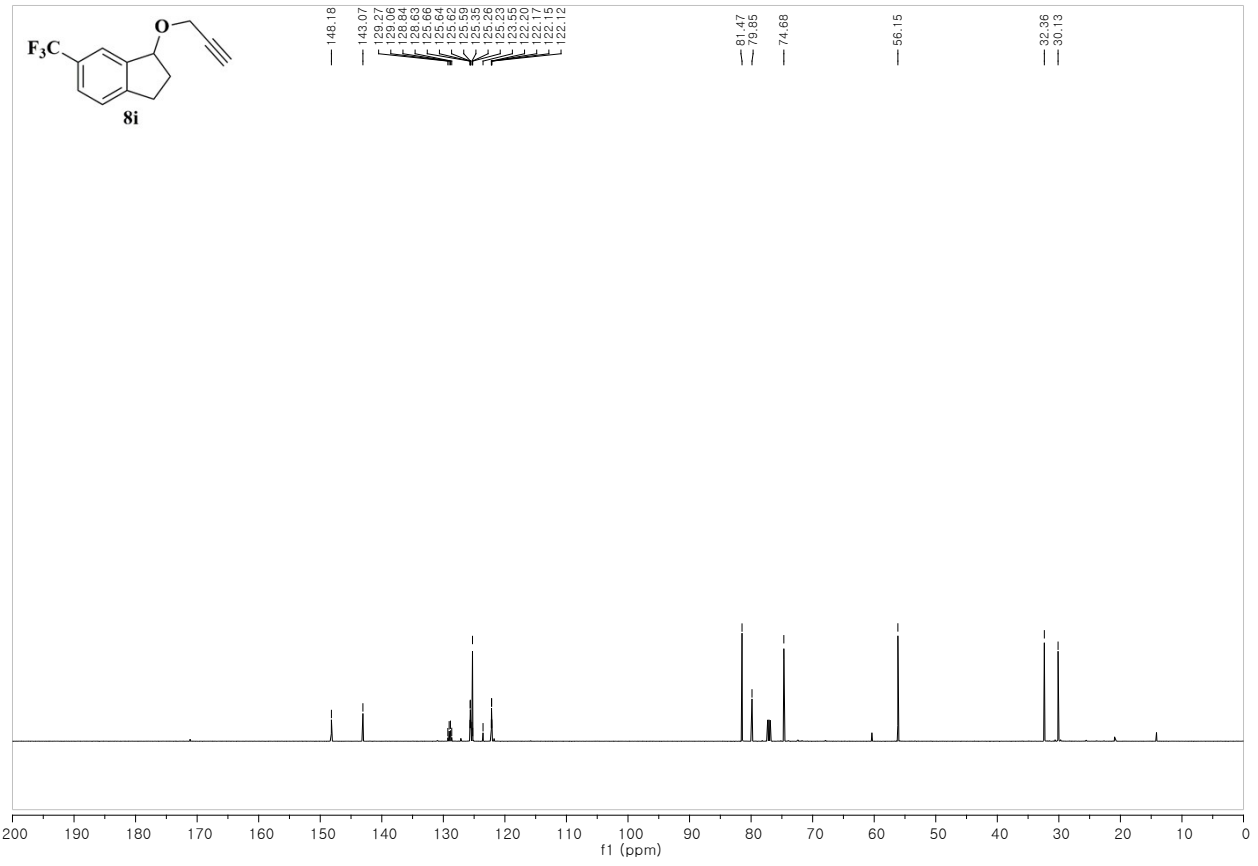
639



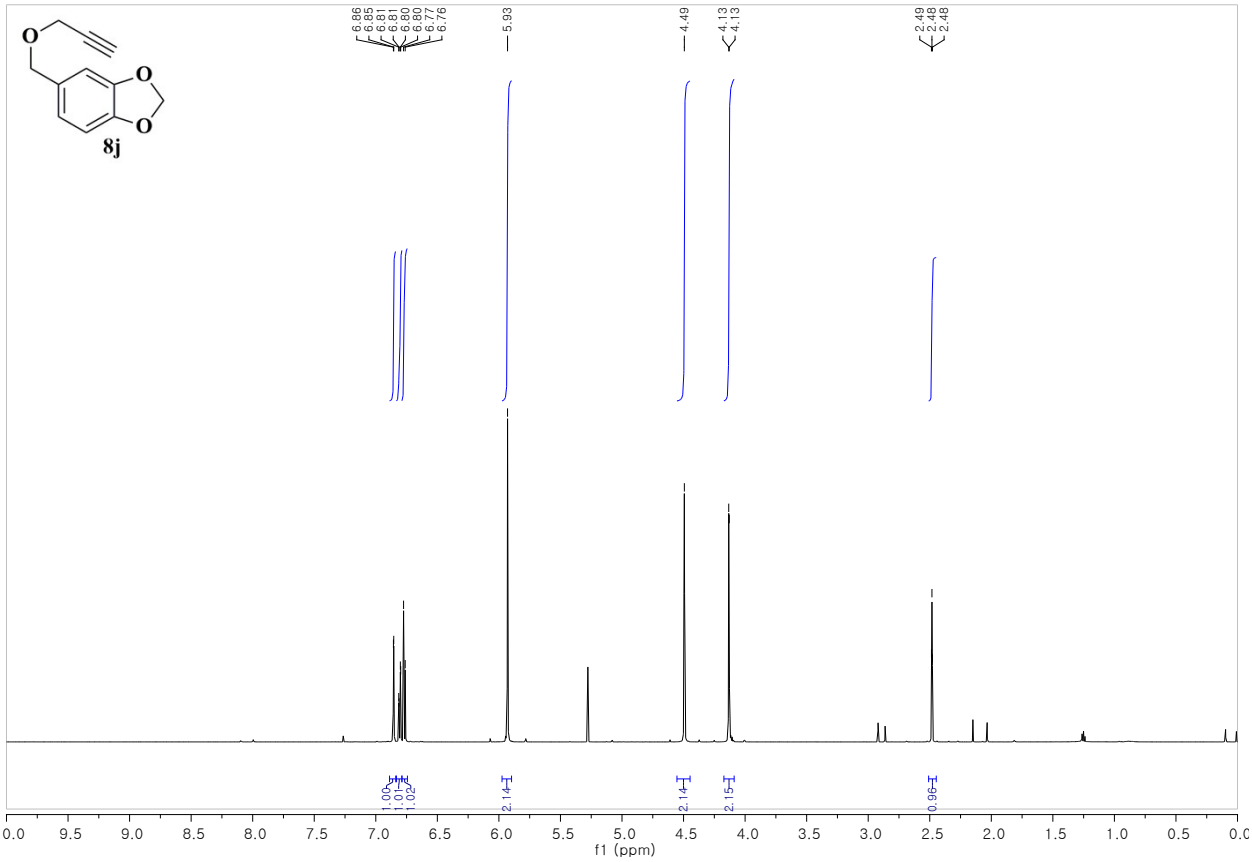
640


F3C
O
8i
7.69
7.53
7.52
7.36
7.35
5.19
5.18
5.17
4.27
4.26
4.26
3.15
3.14
3.13
3.11
3.10
2.88
2.87
2.86
2.51
2.51
2.18
2.18
2.17
2.17
2.17
2.16
2.15
2.15
2.14
1.00
1.00
1.00
0.98
2.07
1.04
1.08
0.94
1.02
1.10
f1 (ppm)

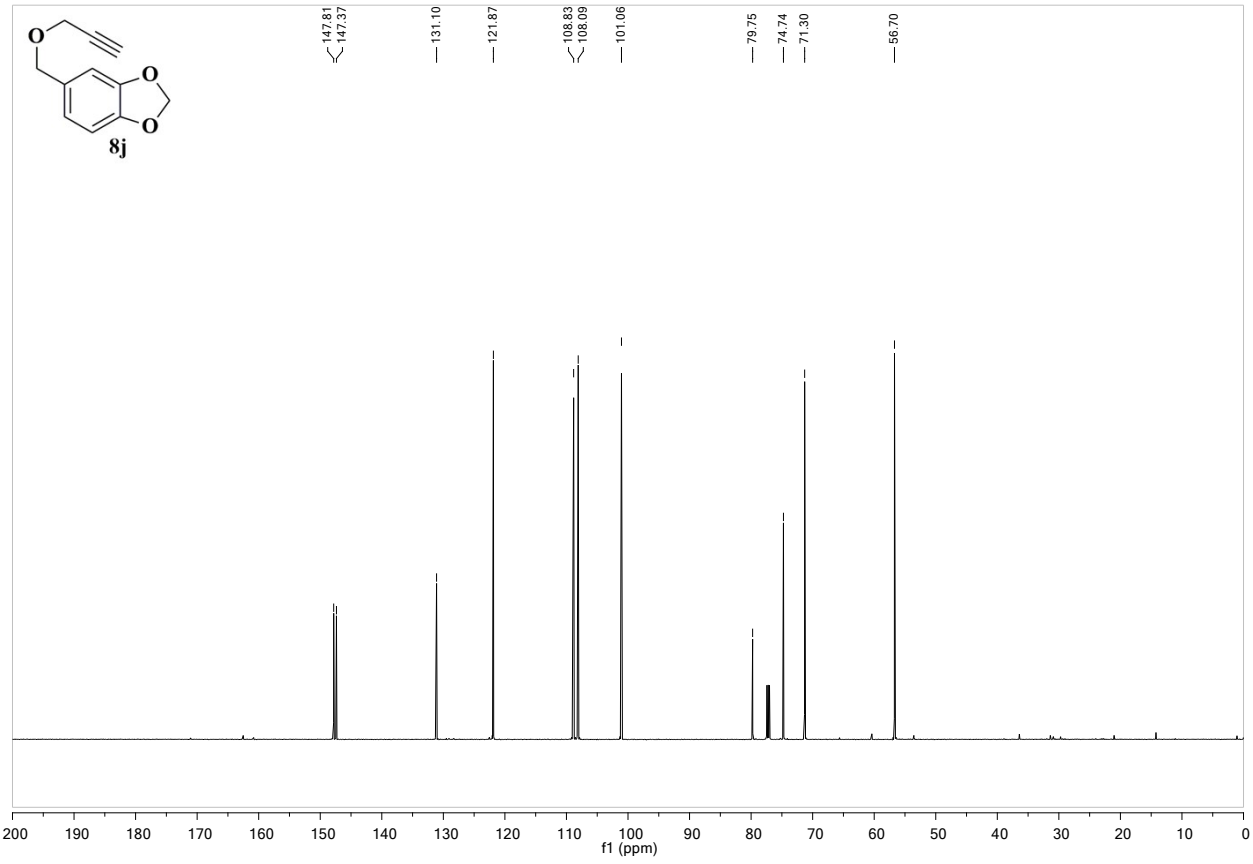
641


F3C
O
8i
148.18
143.07
129.27
129.06
128.84
128.63
125.66
125.64
125.62
125.59
125.35
125.26
123.23
123.05
122.20
122.17
122.15
122.12
81.47
79.85
74.68
56.15
32.36
30.13
f1 (ppm)

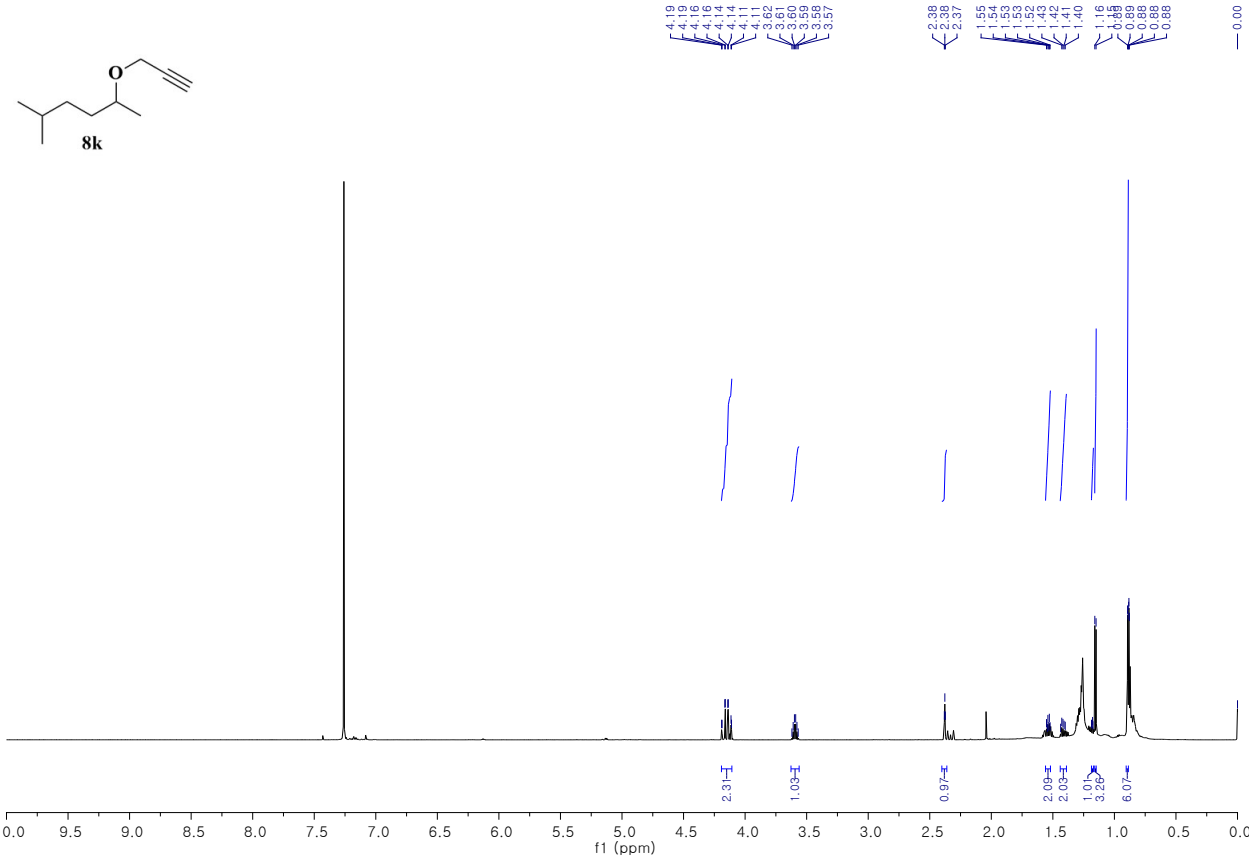
642


8j
6.86
6.85
6.81
6.81
6.80
6.80
6.77
6.76
5.93
4.49
4.13
4.13
2.49
2.48
2.48
1.00
1.01
1.02
2.14
2.14
2.15
0.96
f1 (ppm)

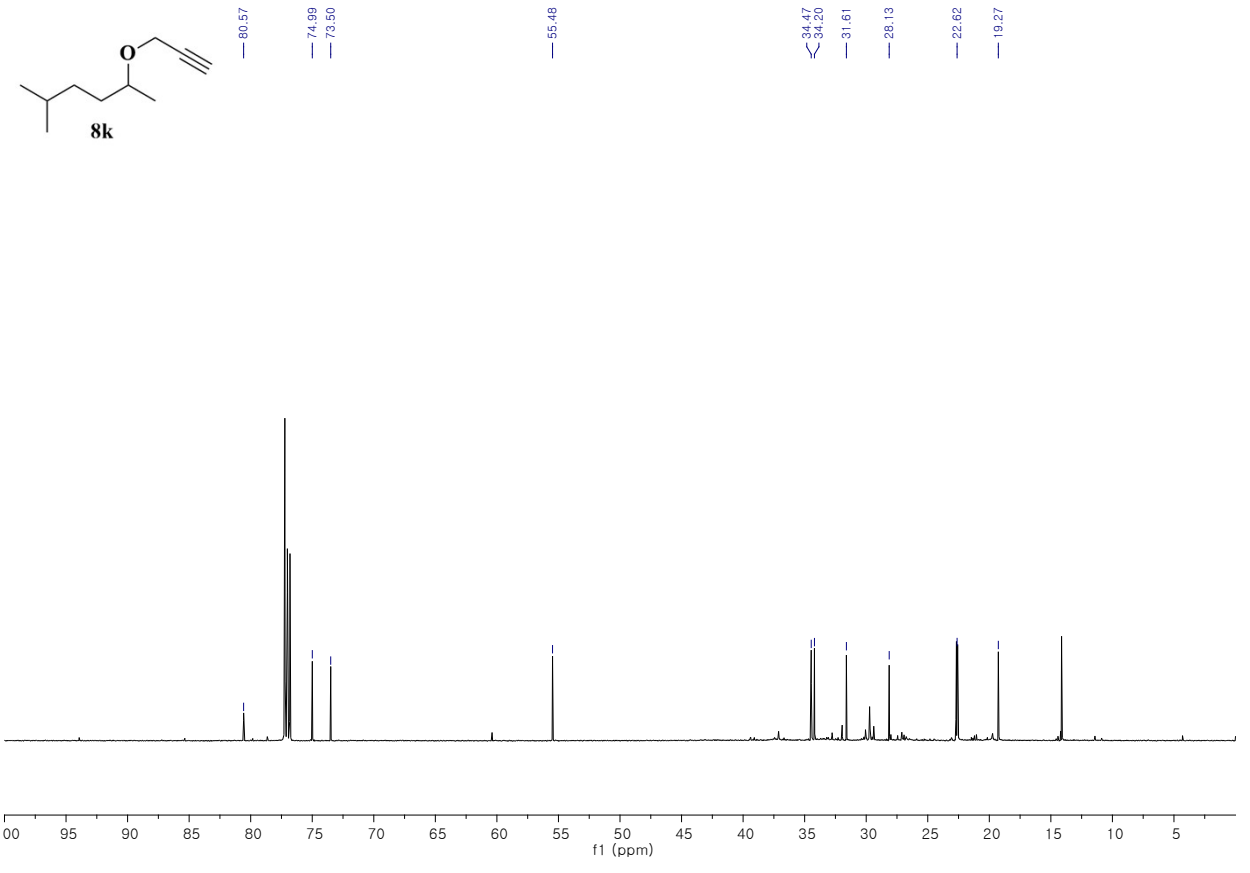
643


8j
147.81
147.37
131.10
121.87
108.83
108.09
101.06
79.75
74.74
71.30
56.70
f1 (ppm)

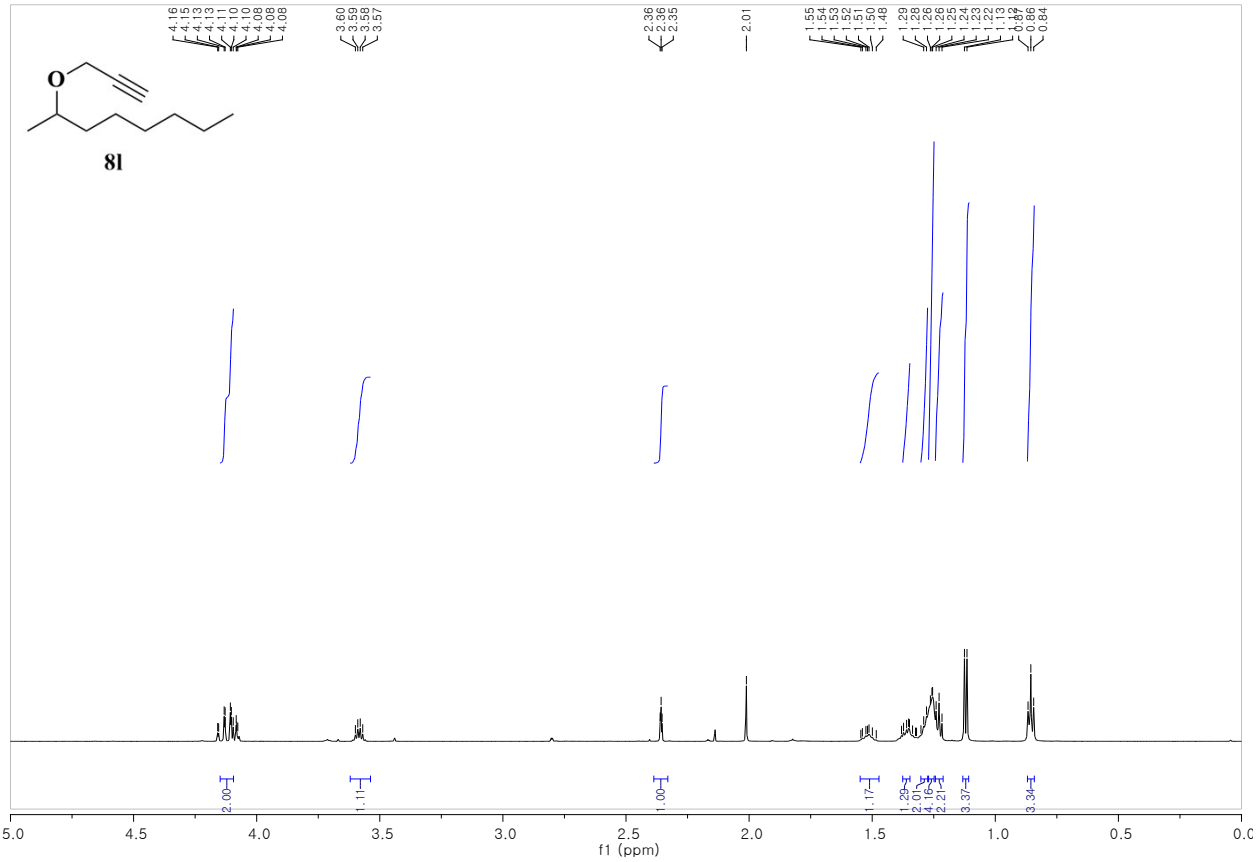
644


8k
4.19
4.19
4.16
4.16
4.14
4.14
4.11
4.11
3.62
3.61
3.60
3.59
3.58
3.57
2.38
2.38
2.37
1.55
1.54
1.53
1.53
1.52
1.43
1.42
1.41
1.40
1.16
0.89
0.89
0.88
0.88
0.88
0.00
2.31
1.03
0.97
2.09
2.03
1.01
3.26
6.07
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

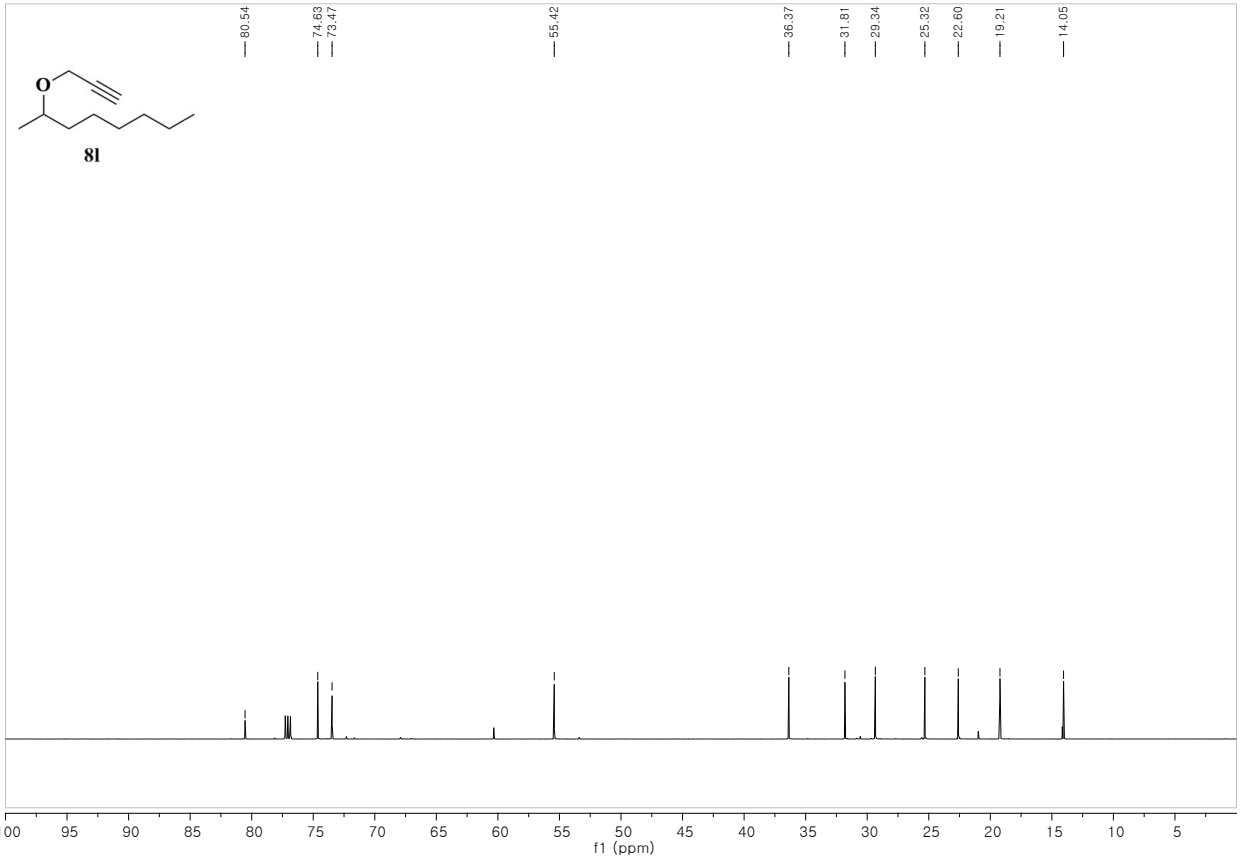
645


8k
80.57
74.99
73.50
55.48
34.47
34.20
31.61
28.13
22.62
19.27
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5
f1 (ppm)

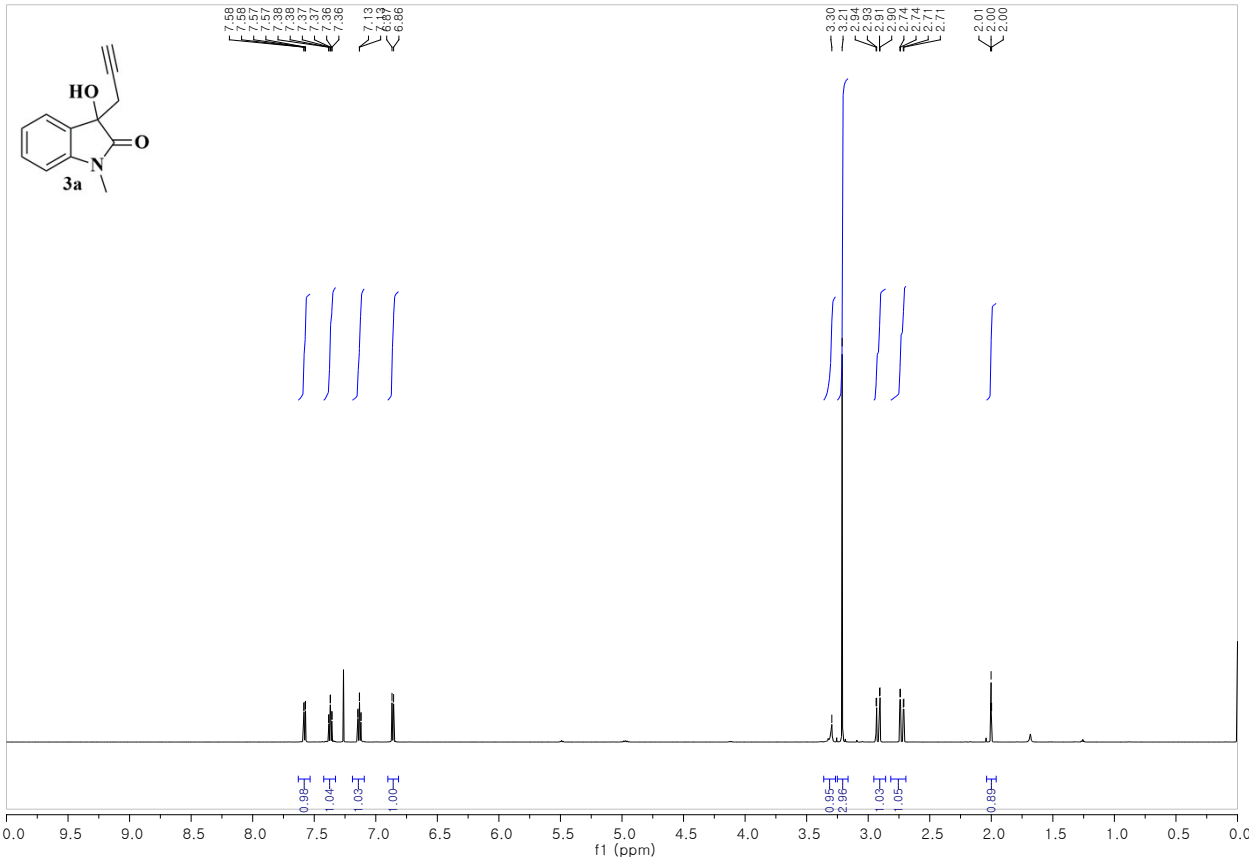
646


4.16
4.15
4.13
4.11
4.10
4.09
4.08
4.08
3.60
3.59
3.58
3.57
2.36
2.36
2.35
2.01
1.55
1.54
1.53
1.52
1.51
1.50
1.48
1.29
1.28
1.26
1.26
1.25
1.24
1.23
1.22
1.13
0.87
0.86
0.84
O
8l
2.00
1.11
1.00
1.17
3.37
3.34
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)

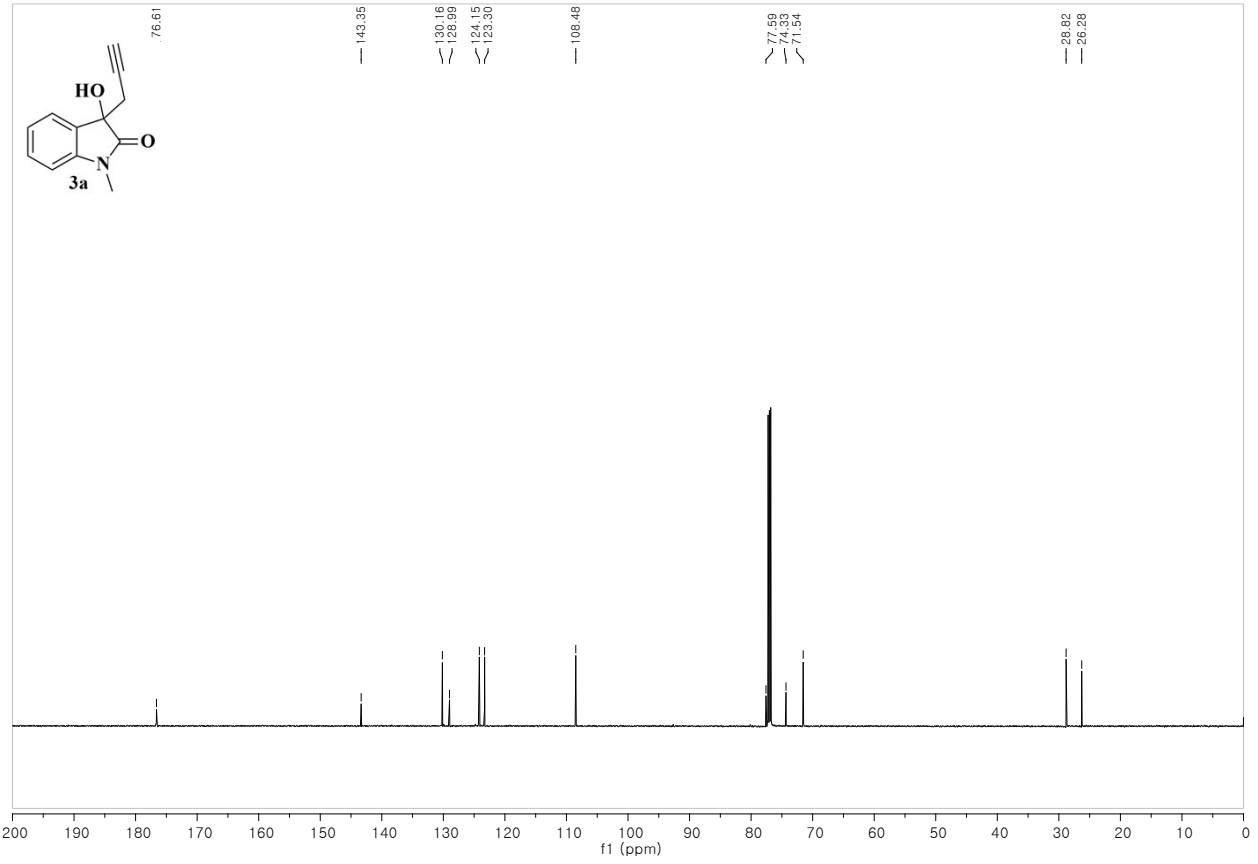
647


80.54
74.63
73.47
55.42
36.37
31.81
29.34
25.32
22.60
19.21
14.05
O
8l
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
f1 (ppm)

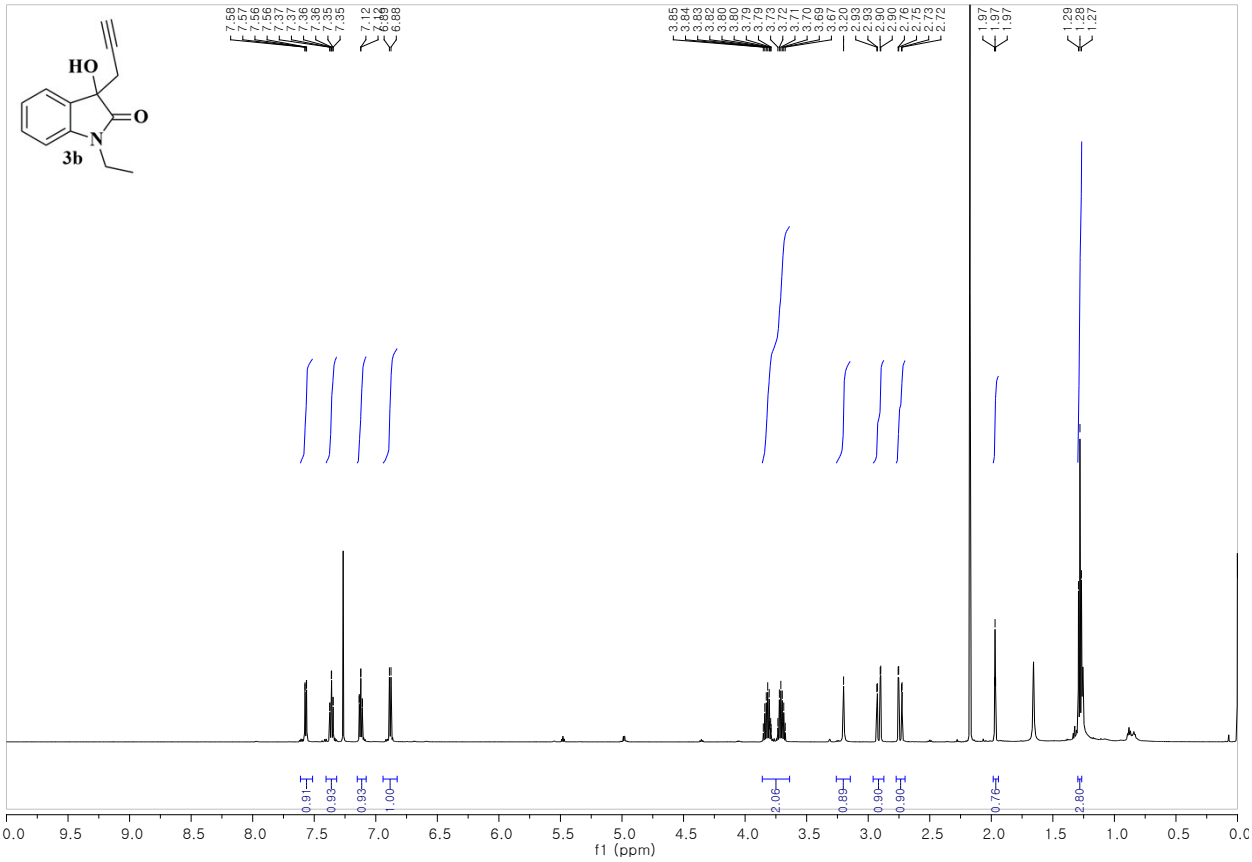
648


7.58
7.58
7.57
7.57
7.38
7.38
7.37
7.37
7.36
7.36
7.13
7.13
6.87
6.86
3.30
3.21
2.94
2.93
2.91
2.90
2.74
2.74
2.71
2.71
2.01
2.00
2.00
HO
O
N
3a
0.98
1.04
1.03
1.00
0.95
2.96
1.03
1.05
0.89
f1 (ppm)

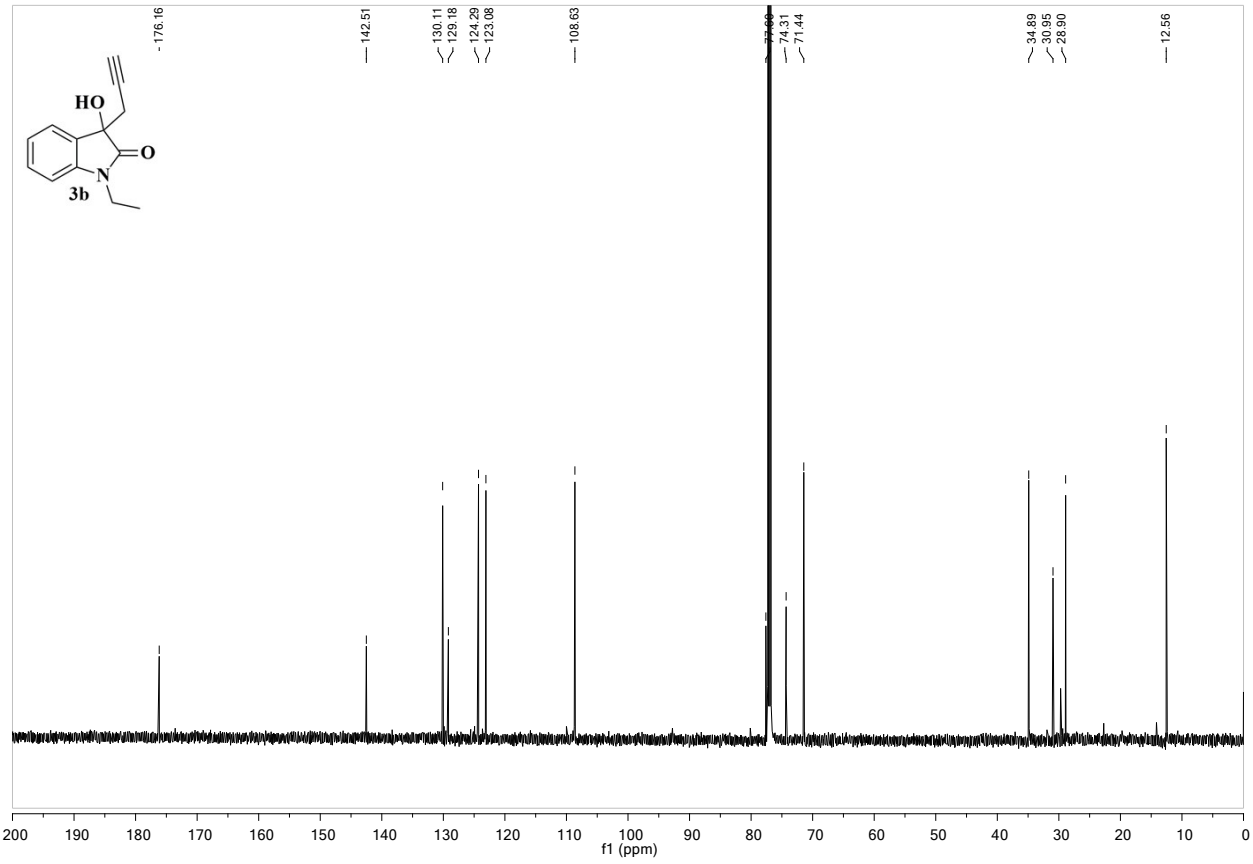
649


76.61
143.35
130.16
128.99
124.15
123.30
108.48
77.59
74.33
71.54
28.82
26.28
HO
O
N
3a
f1 (ppm)

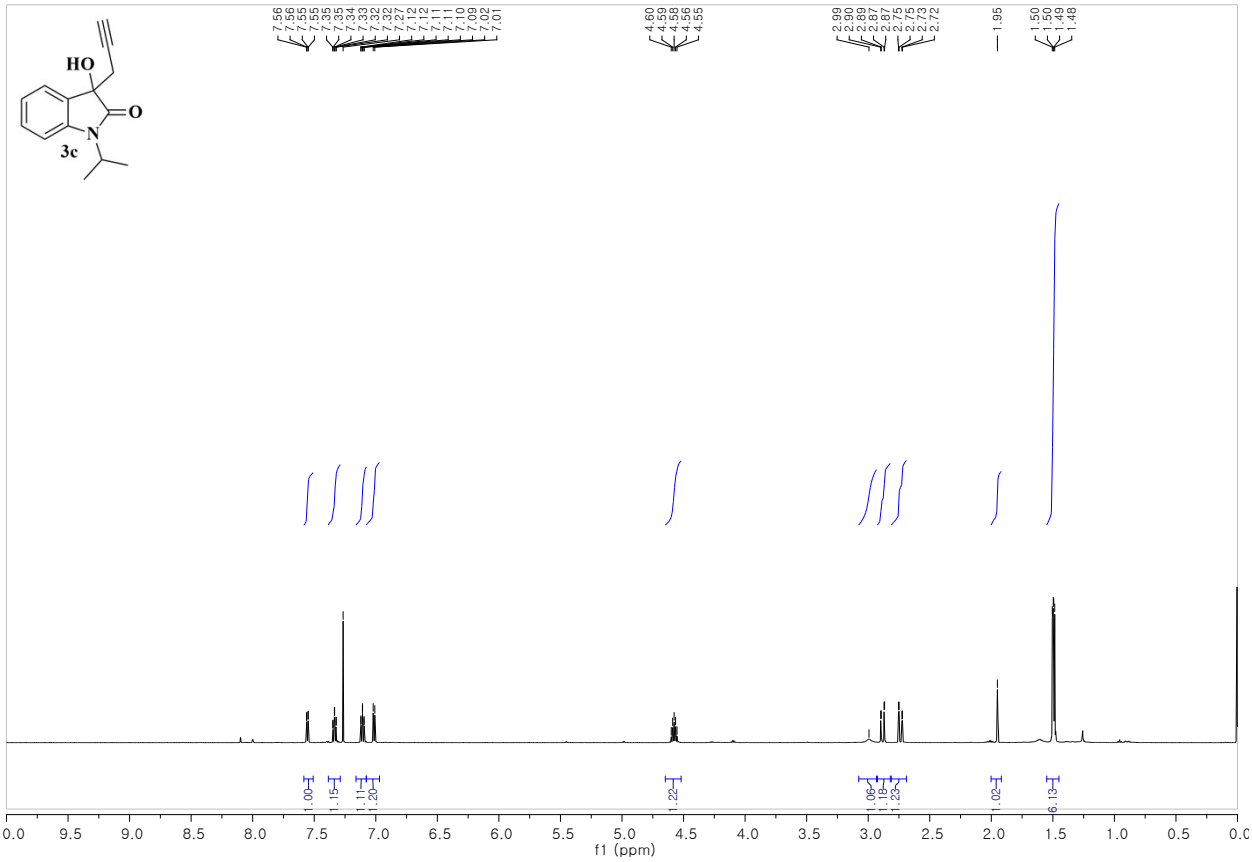
650


HO
O
N
3b
7.58
7.57
7.56
7.56
7.37
7.36
7.36
7.35
7.35
7.12
7.12
6.89
6.88
3.85
3.84
3.83
3.82
3.80
3.80
3.79
3.79
3.73
3.72
3.71
3.70
3.69
3.67
3.20
2.93
2.90
2.90
2.76
2.75
2.73
2.72
1.97
1.97
1.97
1.29
1.28
1.27
0.91
0.93
0.93
1.00
2.06
0.89
0.90
0.90
0.76
2.80
f1 (ppm)

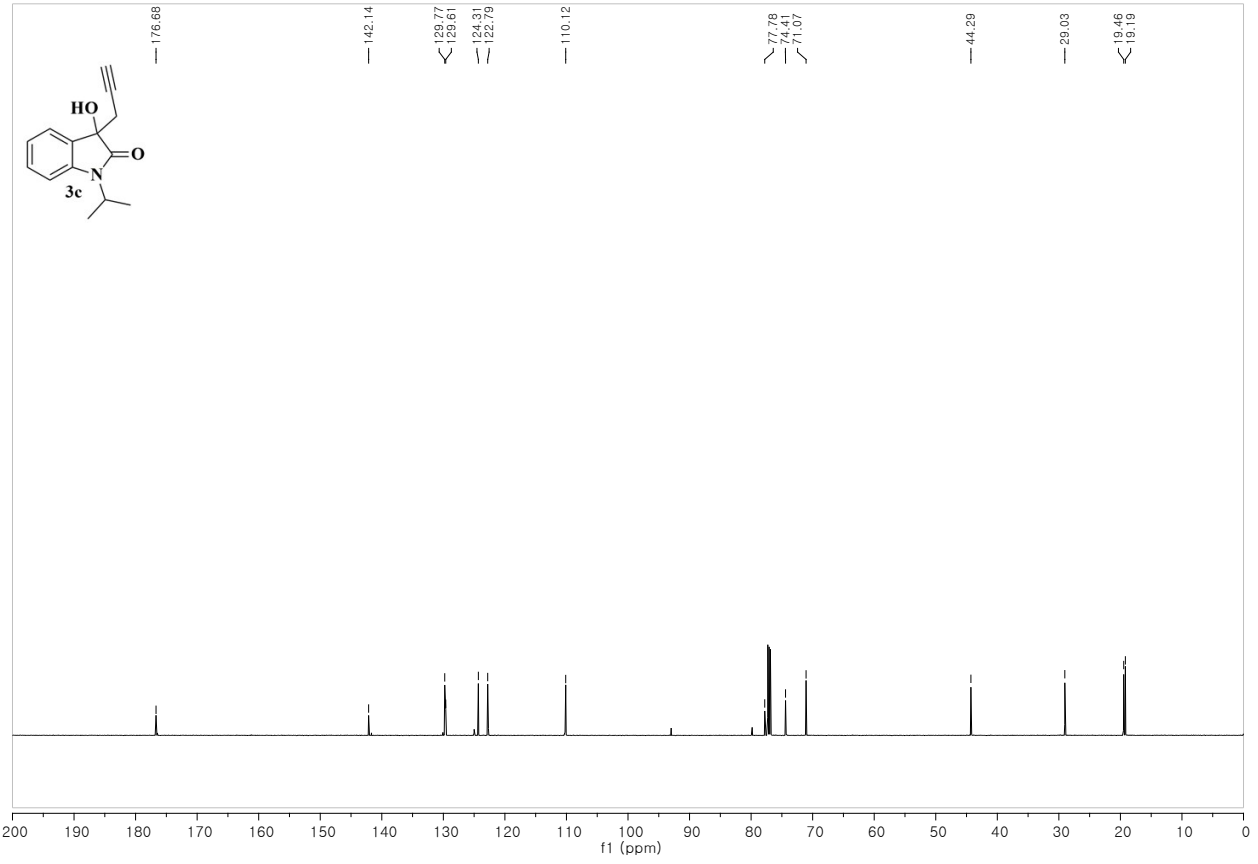
651


HO
O
N
3b
176.16
142.51
130.11
129.18
124.29
123.08
108.63
77.00
74.31
71.44
34.89
30.95
28.90
12.56
f1 (ppm)

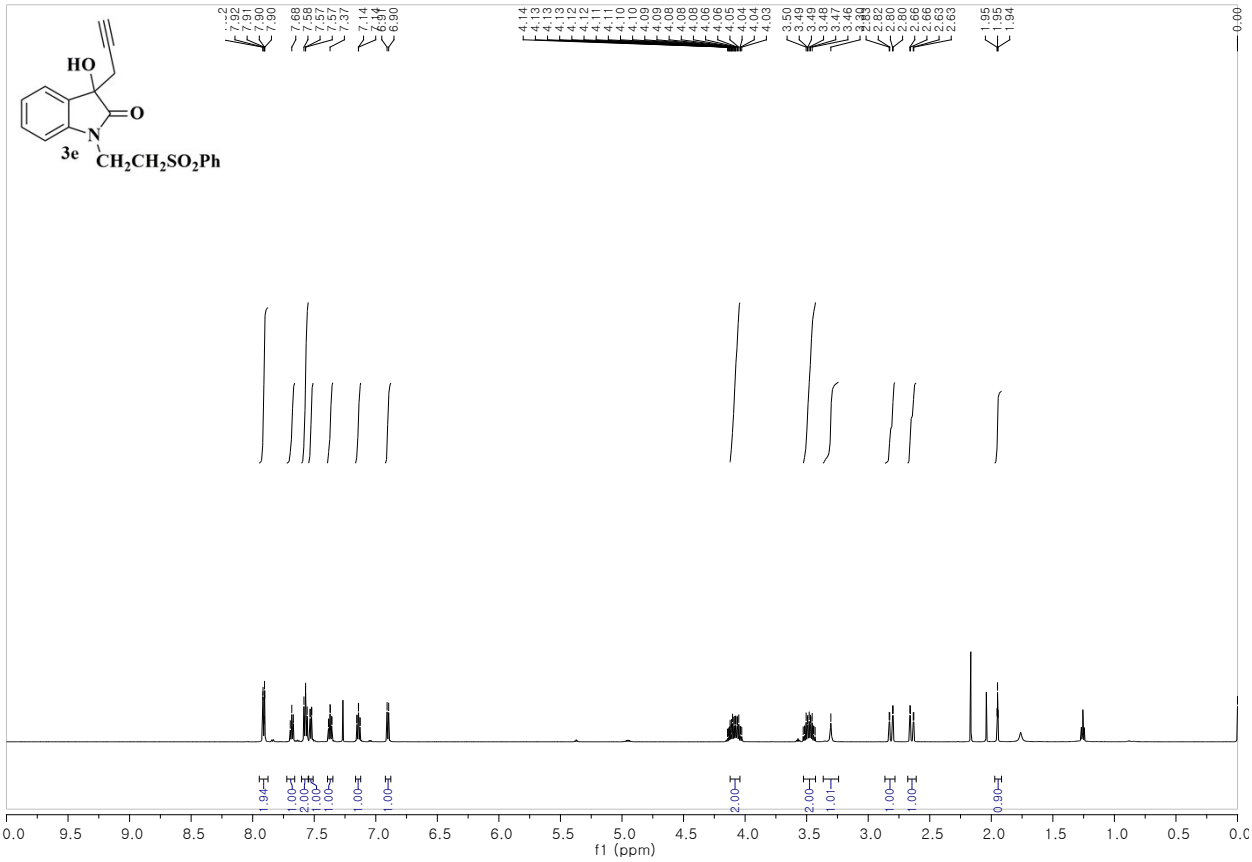
652


HO
O
N
3c
7.56
7.56
7.55
7.55
7.35
7.35
7.34
7.33
7.32
7.32
7.27
7.12
7.12
7.11
7.11
7.10
7.09
7.02
7.01
4.60
4.59
4.58
4.56
4.55
2.99
2.90
2.89
2.87
2.75
2.75
2.73
2.72
1.95
1.50
1.50
1.49
1.48
1.00
1.15
1.11
1.20
1.22
1.06
1.19
1.23
1.02
6.13
f1 (ppm)

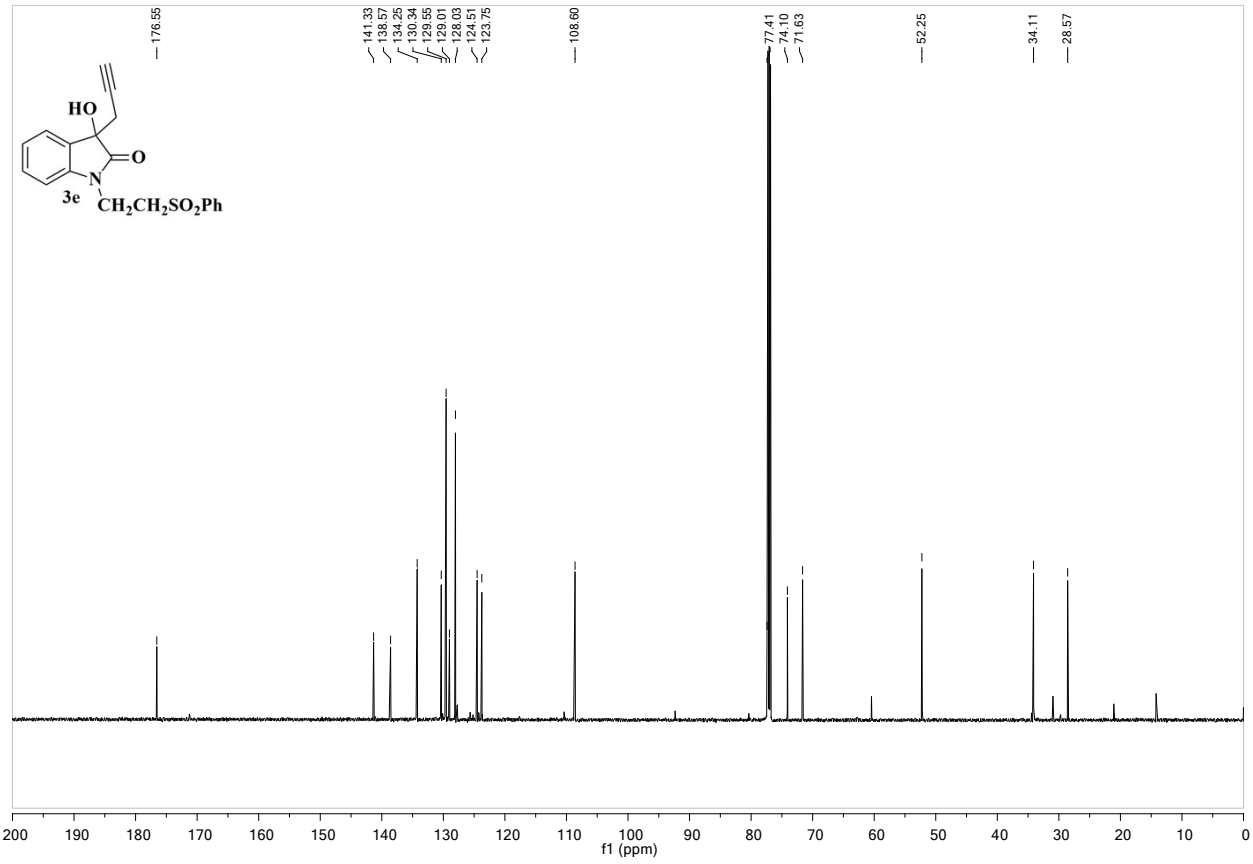
653


HO
O
N
3c
176.68
142.14
129.77
129.61
124.31
122.79
110.12
77.78
74.41
71.07
44.29
29.03
19.46
19.19
f1 (ppm)

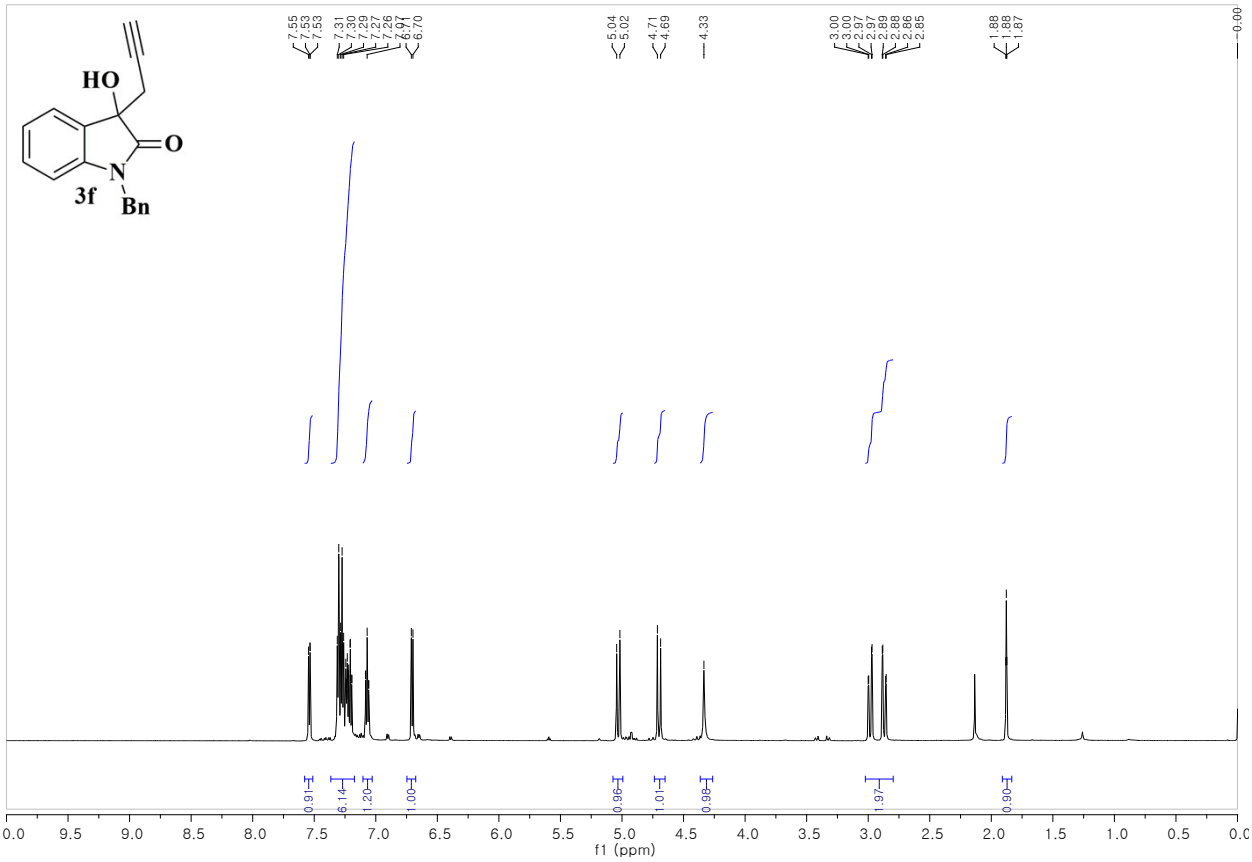
654



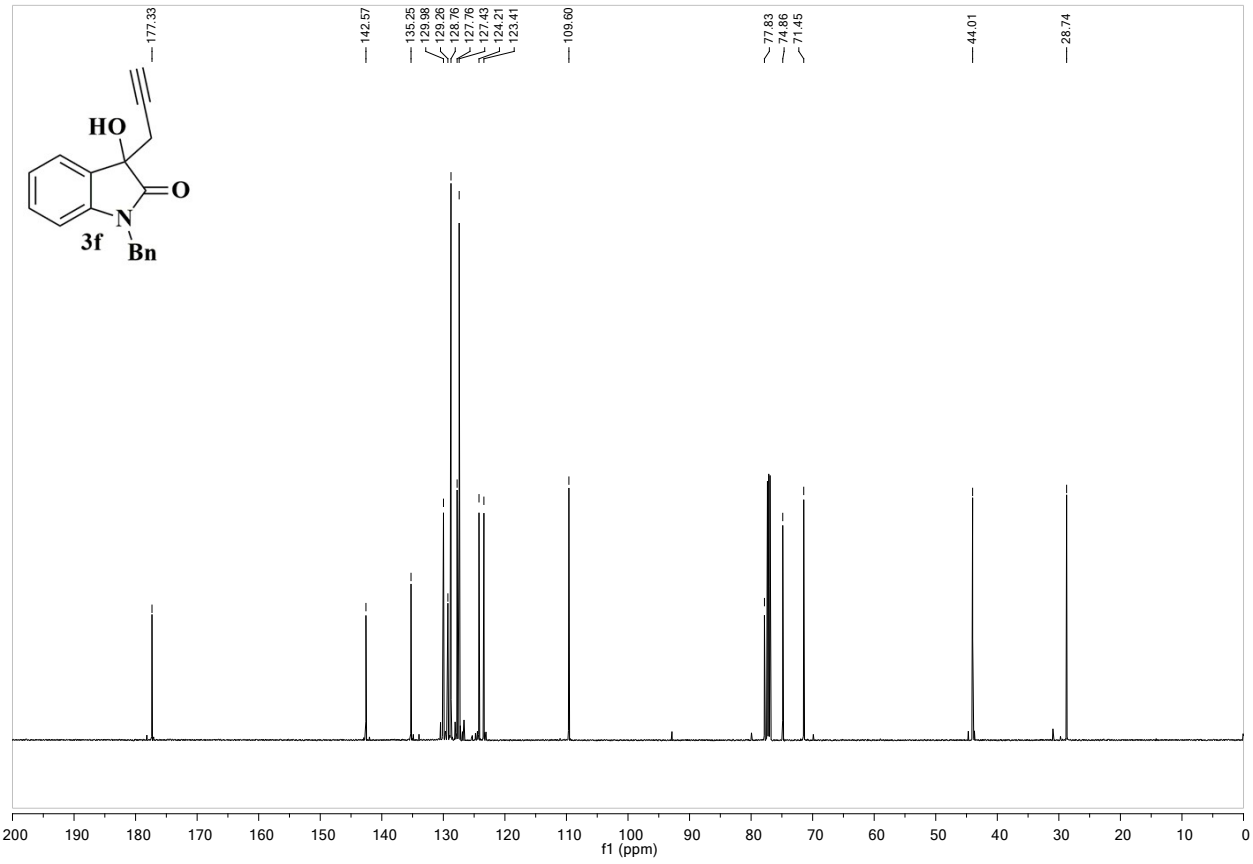
655



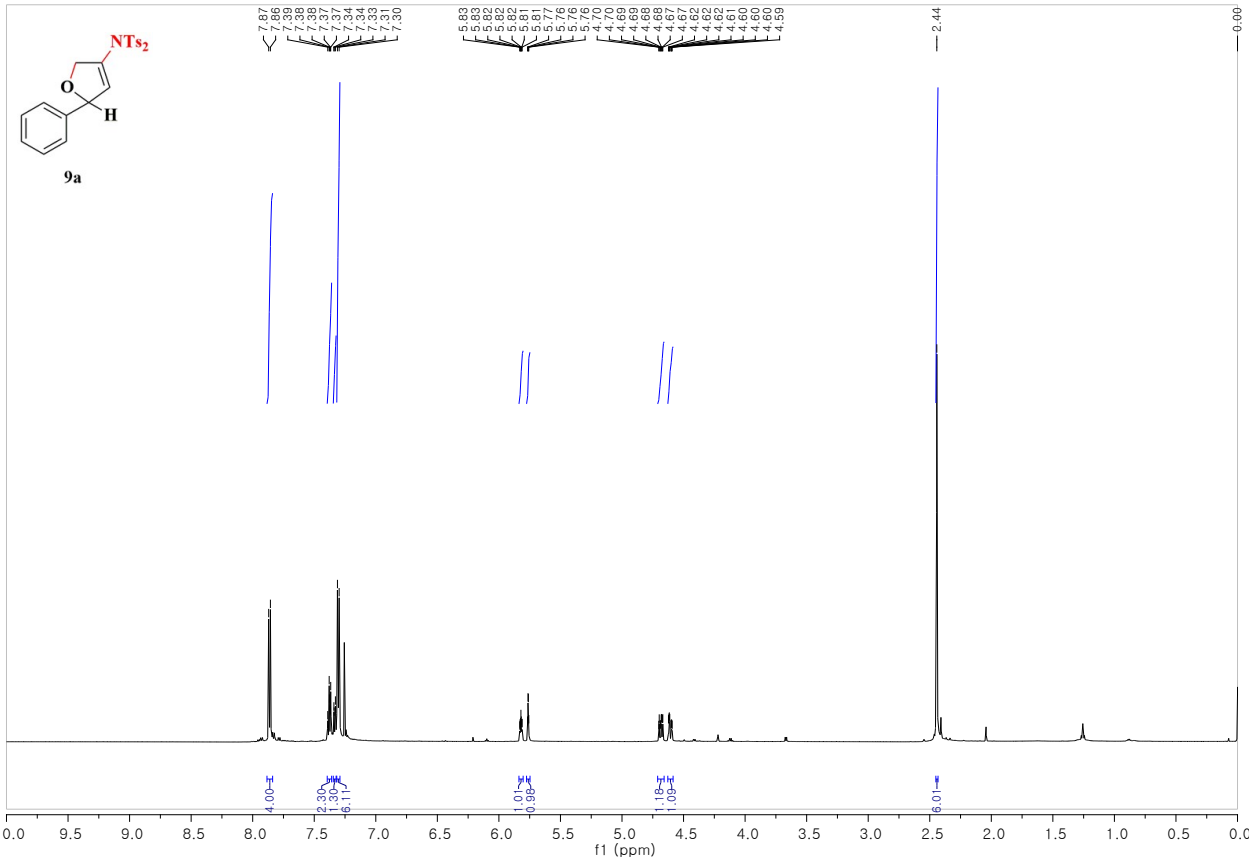
656


HO
O
N
3f
Bn
7.55
7.53
7.53
7.31
7.30
7.29
7.27
7.26
6.71
6.70
5.04
5.02
4.71
4.69
4.33
3.00
3.00
2.97
2.97
2.88
2.88
2.86
2.85
1.88
1.88
1.87
0.00
0.91
6.14
1.20
1.00
0.96
1.01
0.98
1.97
0.90
f1 (ppm)

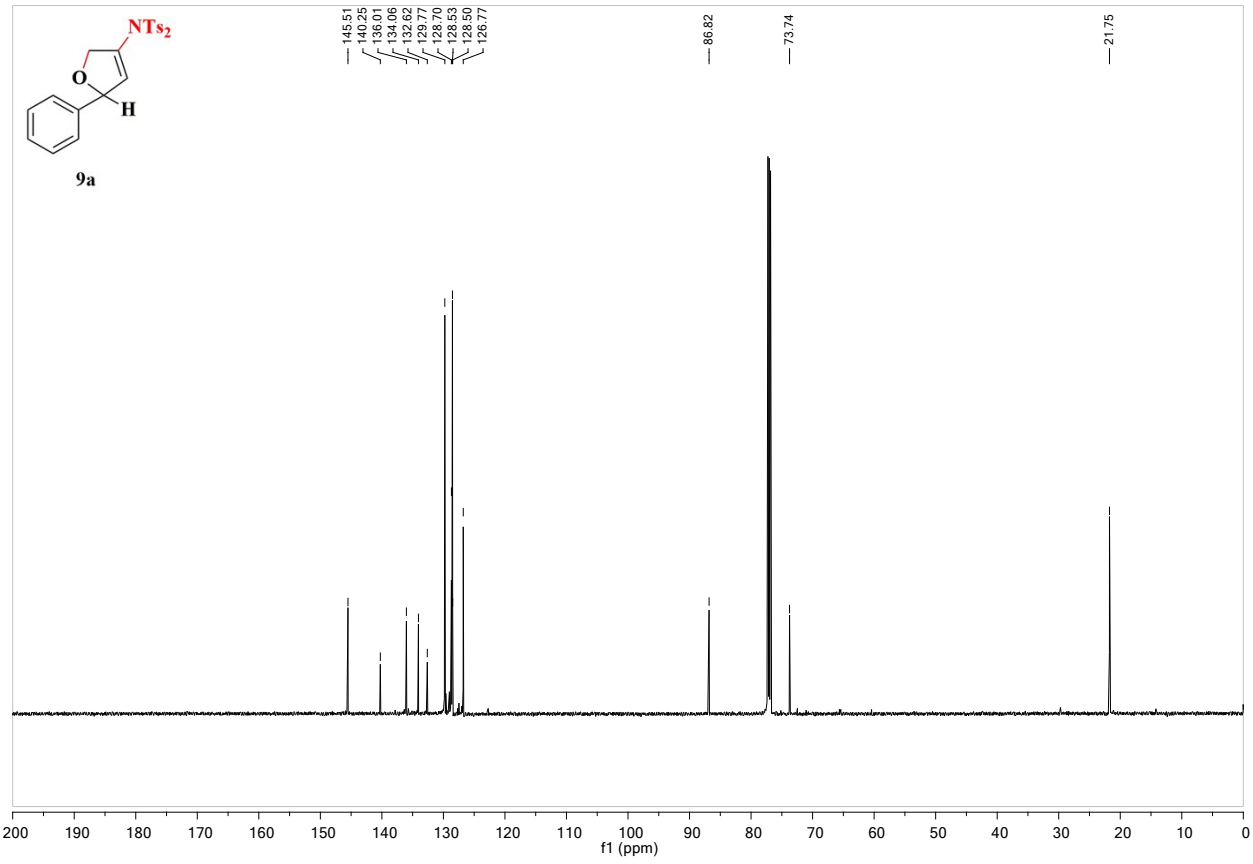
657


HO
O
N
3f
Bn
177.33
142.57
135.25
129.98
129.26
128.76
127.76
127.43
124.21
123.41
109.60
77.83
74.86
71.45
44.01
28.74
f1 (ppm)

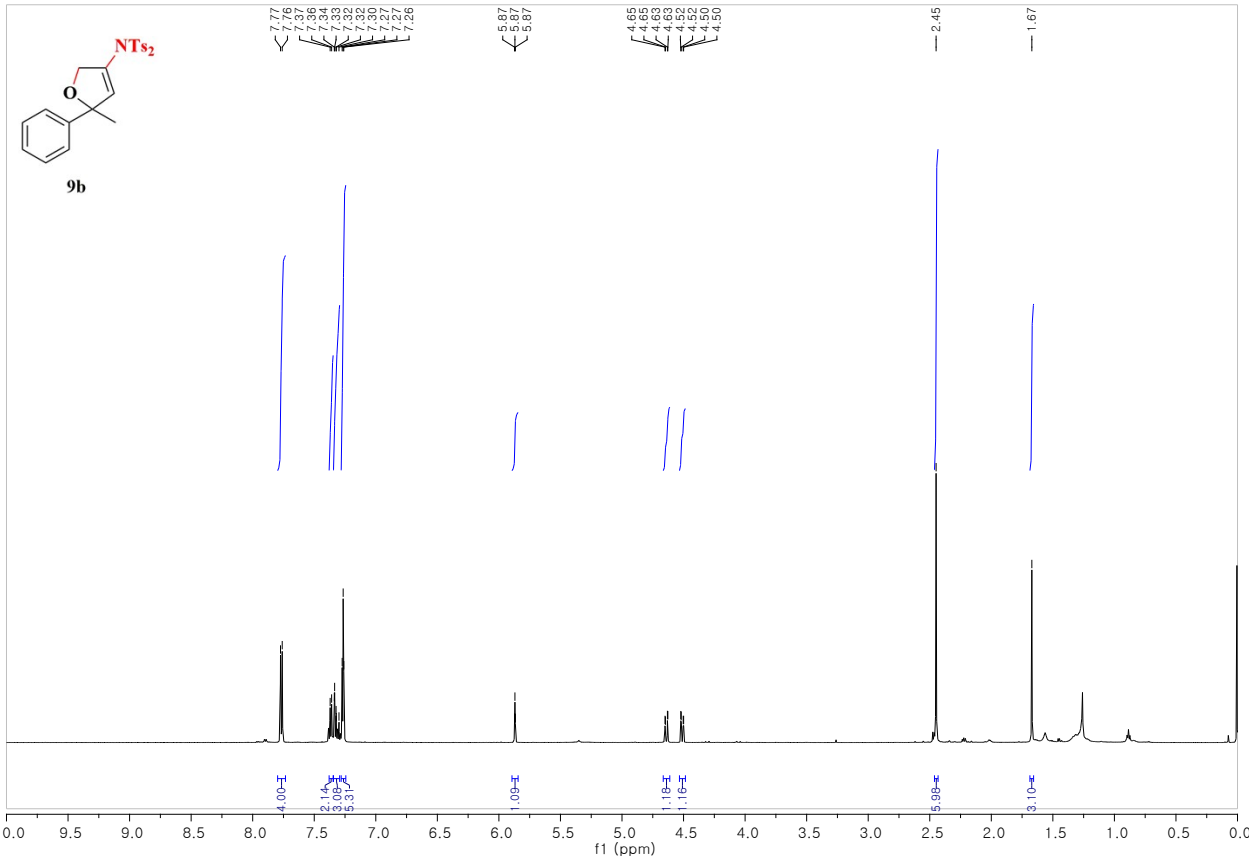
658


NTs2
O
H
9a
7.87
7.86
7.39
7.38
7.38
7.38
7.37
7.37
7.34
7.34
7.33
7.31
7.30
5.83
5.83
5.82
5.82
5.82
5.81
5.81
5.77
5.76
5.76
4.70
4.70
4.69
4.69
4.68
4.68
4.67
4.67
4.62
4.62
4.62
4.61
4.61
4.60
4.60
4.60
4.59
2.44
0.00
4.00
2.30
1.30
6.11
1.01
0.98
1.18
1.05
6.01
f1 (ppm)

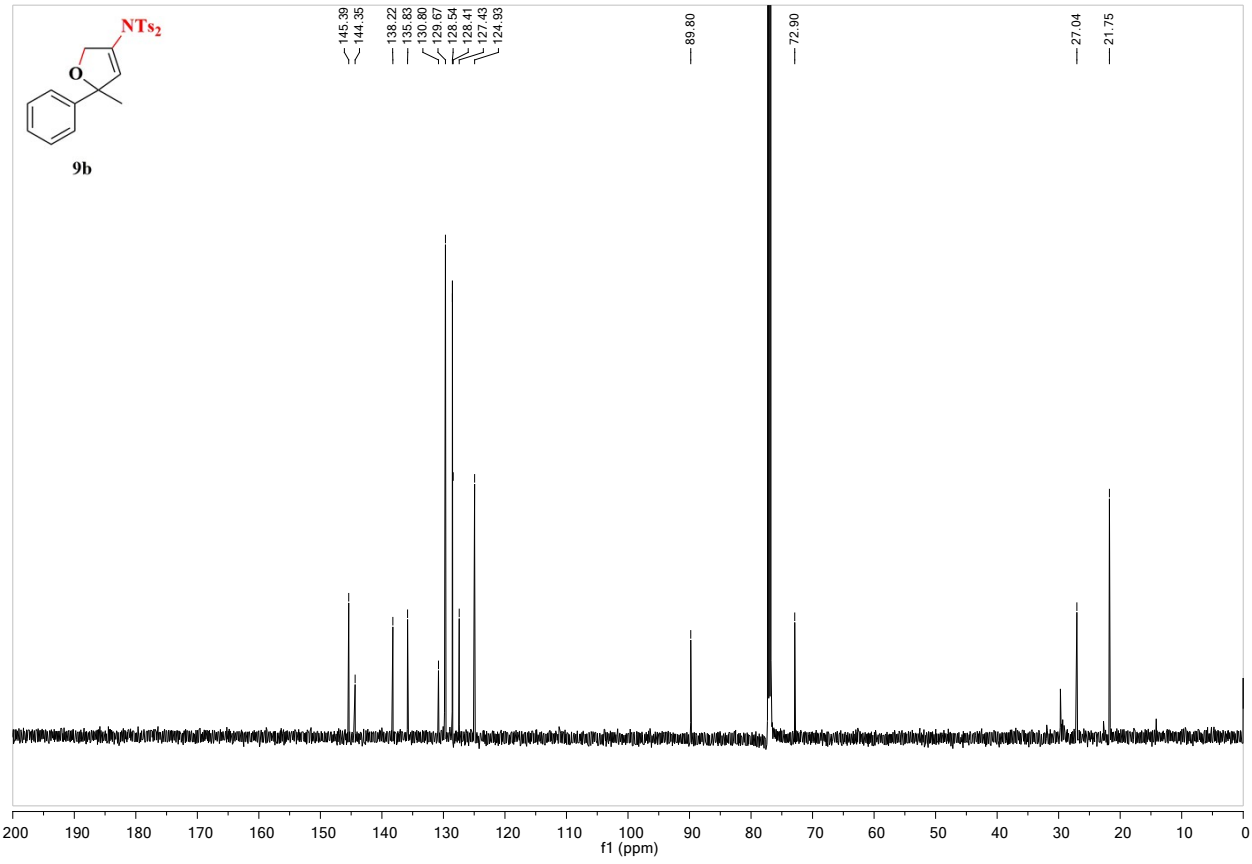
659


NTs2
O
H
9a
145.51
140.25
136.01
134.06
132.62
129.77
128.70
128.53
128.50
126.77
86.82
73.74
21.75
f1 (ppm)

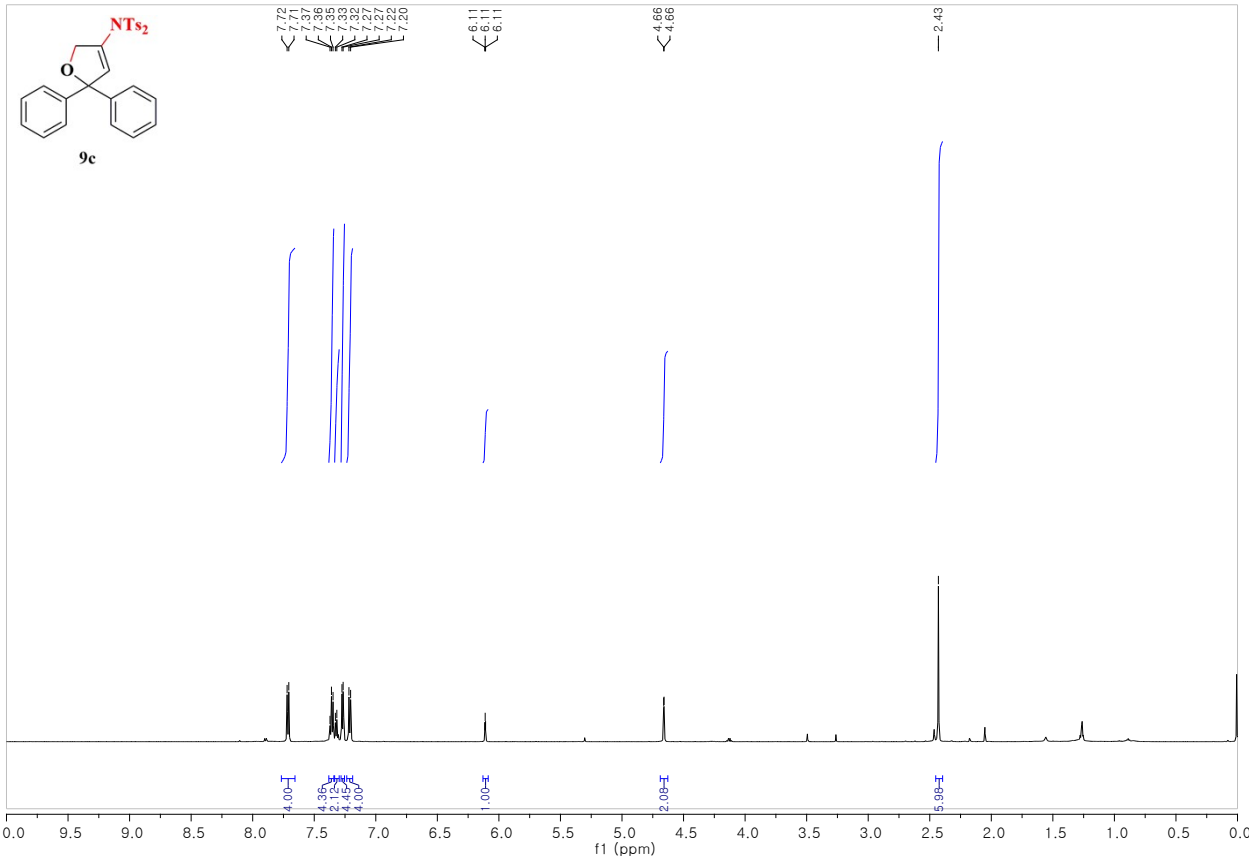
660


NTs2
O
9b
7.77
7.76
7.37
7.36
7.34
7.33
7.32
7.32
7.30
7.27
7.27
7.26
5.87
5.87
5.87
4.65
4.65
4.63
4.63
4.52
4.52
4.50
4.50
2.45
1.67
4.00
2.14
2.05
5.31
1.09
1.18
1.16
5.98
3.10
f1 (ppm)

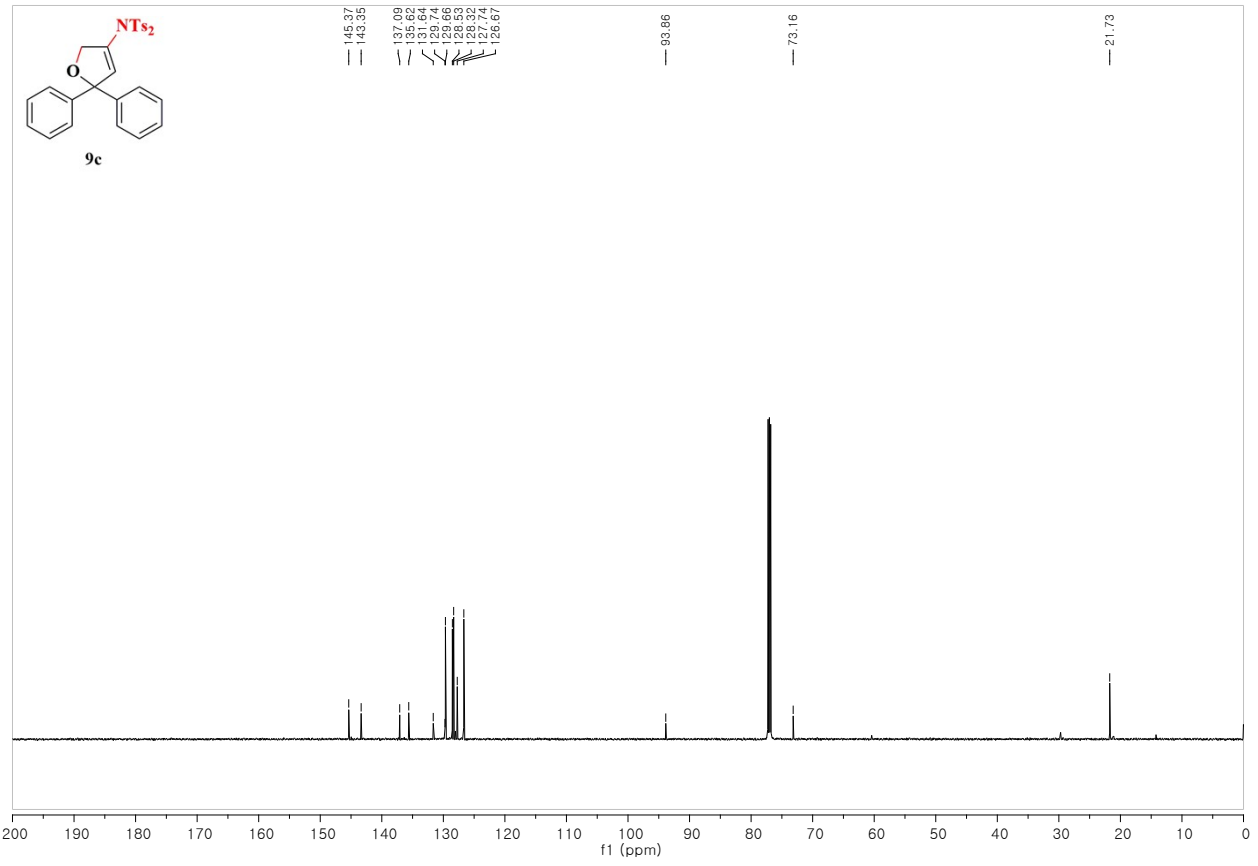
661


NTs2
O
9b
145.39
144.35
138.22
135.83
130.80
129.67
128.54
128.41
127.43
124.93
89.80
72.90
27.04
21.75
f1 (ppm)

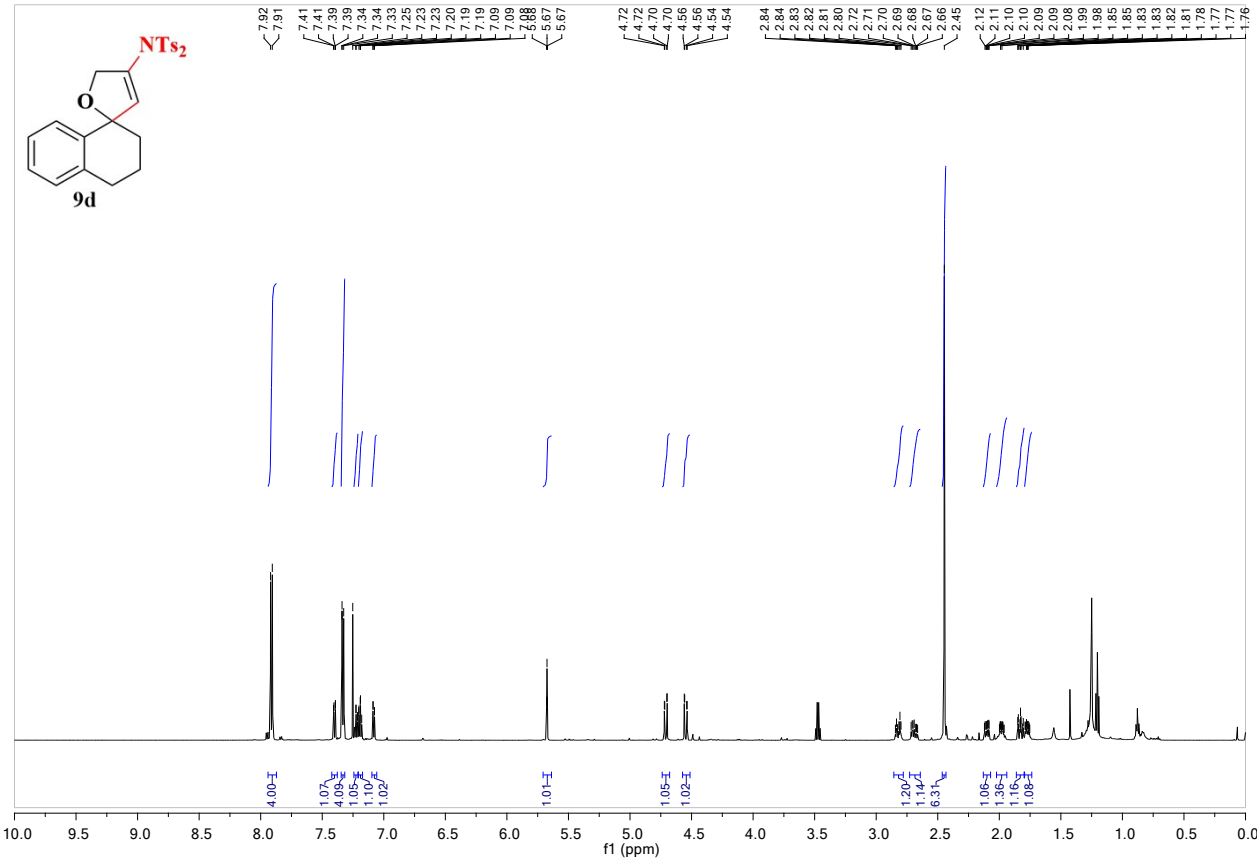
662


NTs2
O
9c
7.72
7.71
7.37
7.36
7.35
7.33
7.32
7.27
7.27
7.22
7.20
6.11
6.11
6.11
4.66
4.66
2.43
4.00
4.36
2.12
4.45
4.00
1.00
2.08
5.98
f1 (ppm)

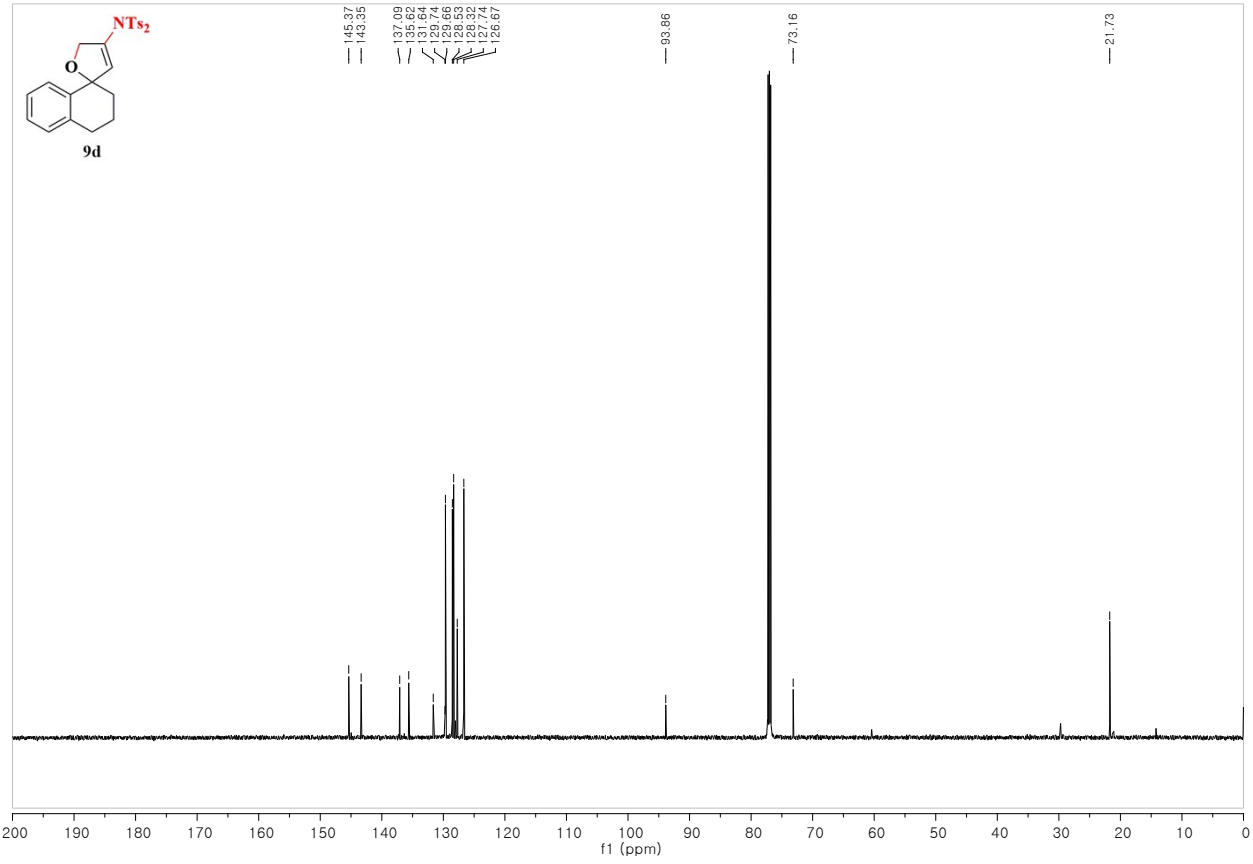
663


NTs2
O
9c
145.37
143.35
137.09
135.62
131.64
129.74
129.66
128.53
127.32
127.24
126.67
93.86
73.16
21.73
f1 (ppm)

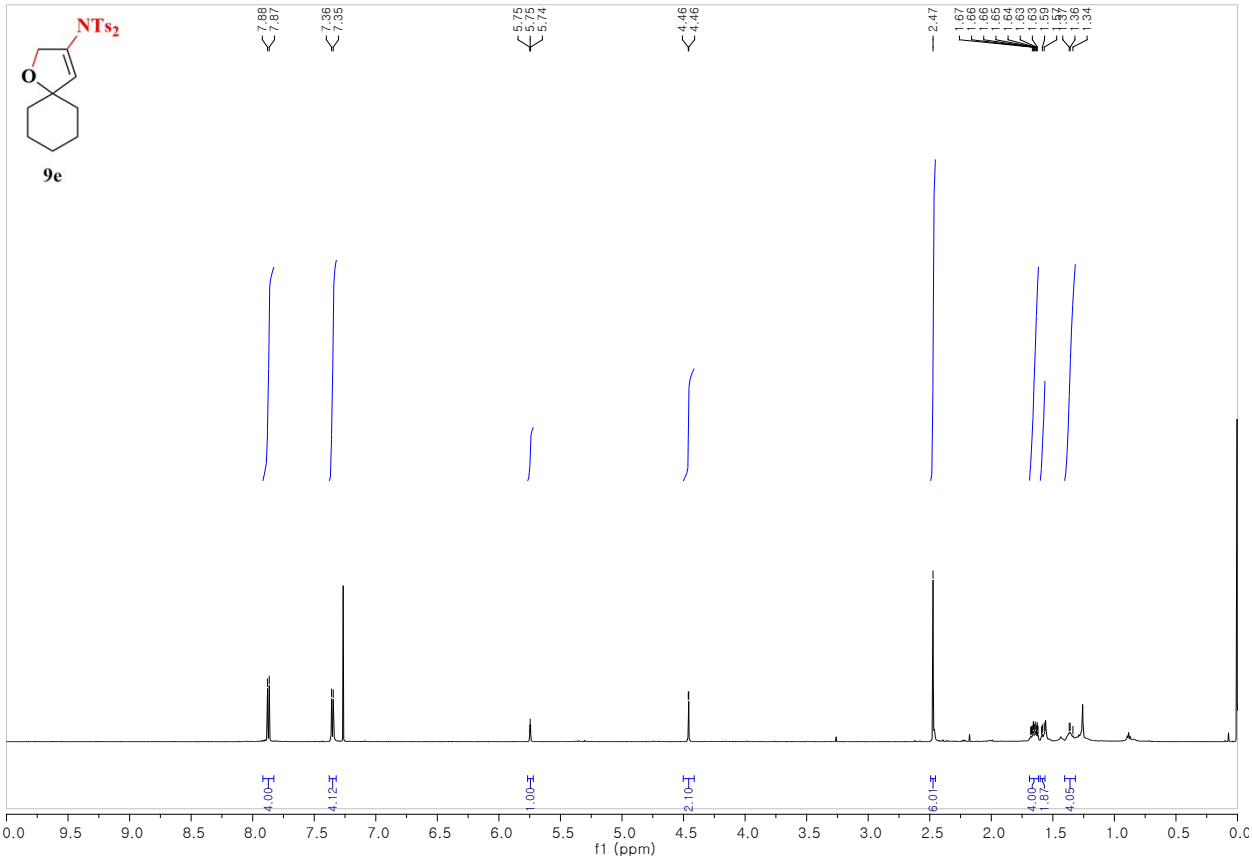
664


NTs2
O
9d
f1 (ppm)

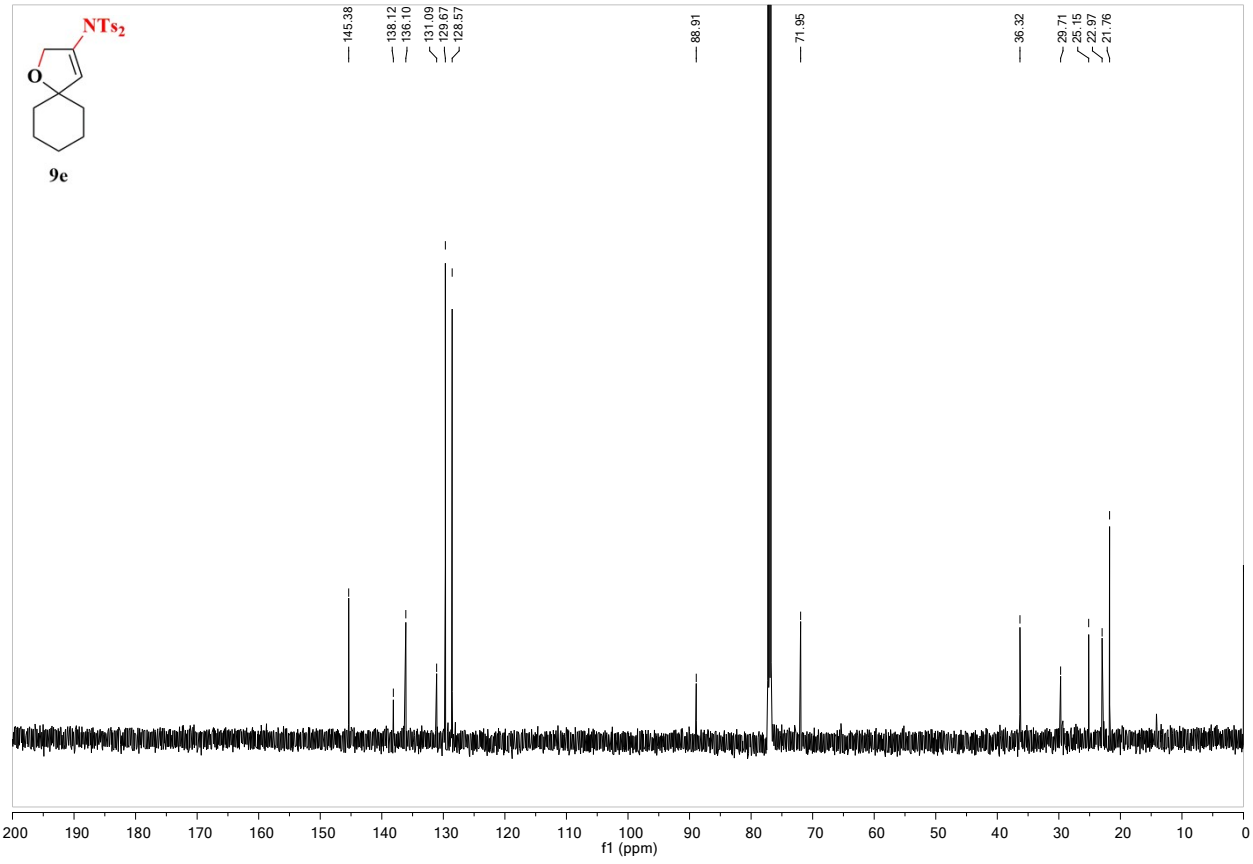
665


NTs2
O
9d
145.37
143.35
137.09
135.62
131.64
129.74
129.66
128.53
127.32
127.14
126.67
93.86
73.16
21.73
f1 (ppm)

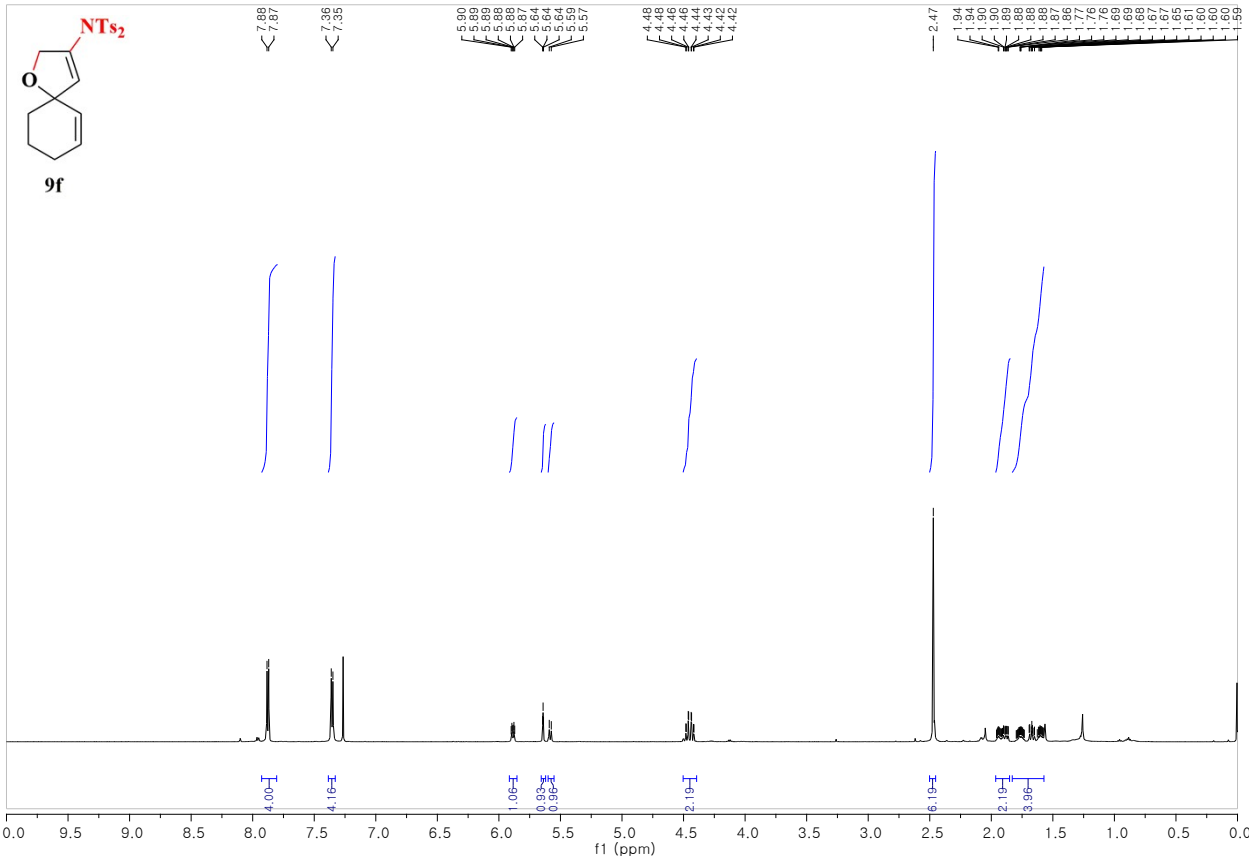
666


NTs2
O
9e
7.88
7.87
7.36
7.35
5.75
5.75
5.74
4.46
4.46
2.47
1.67
1.66
1.66
1.65
1.64
1.63
1.63
1.59
1.57
1.36
1.34
4.00
4.12
1.00
2.10
6.01
4.00
1.87
4.05
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

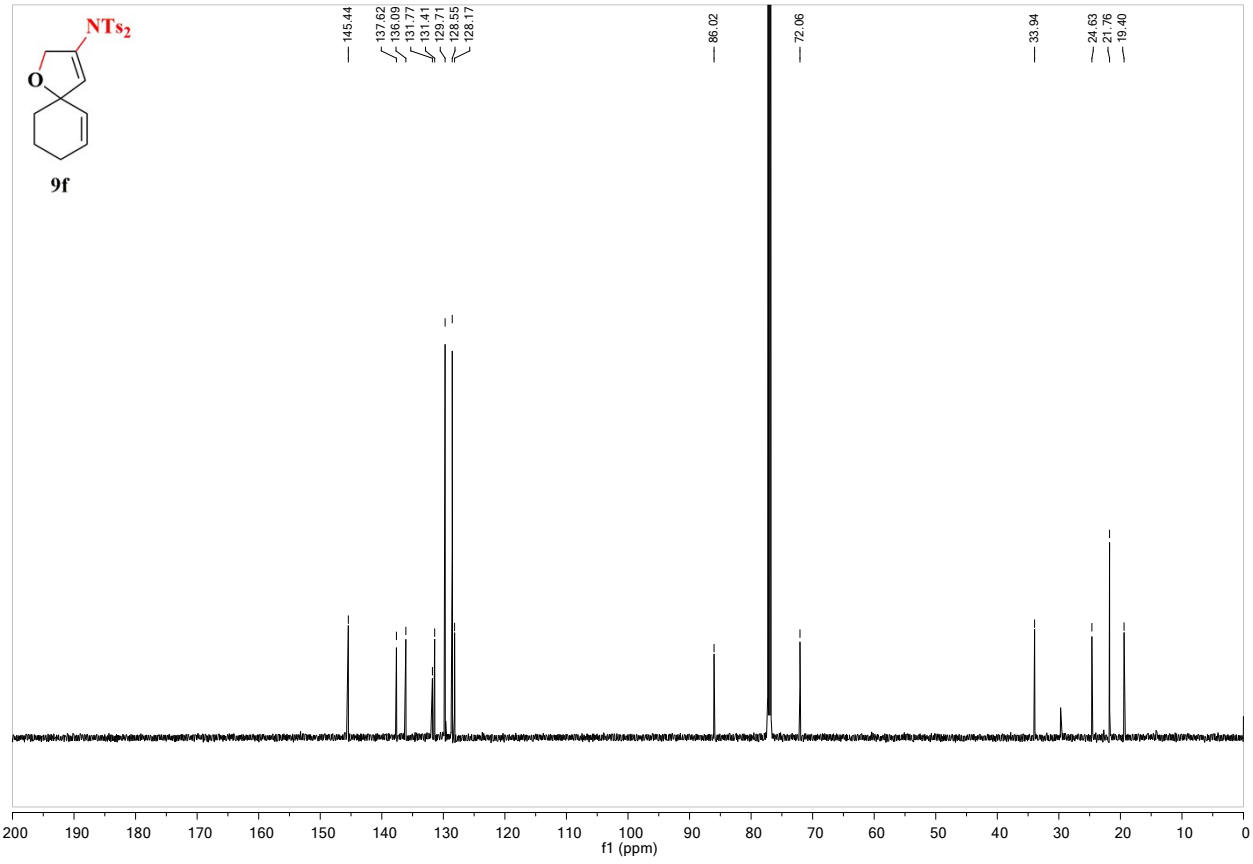
667


NTs2
O
9e
145.38
138.12
136.10
131.09
129.67
128.57
88.91
71.95
36.32
29.71
25.15
22.97
21.76
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

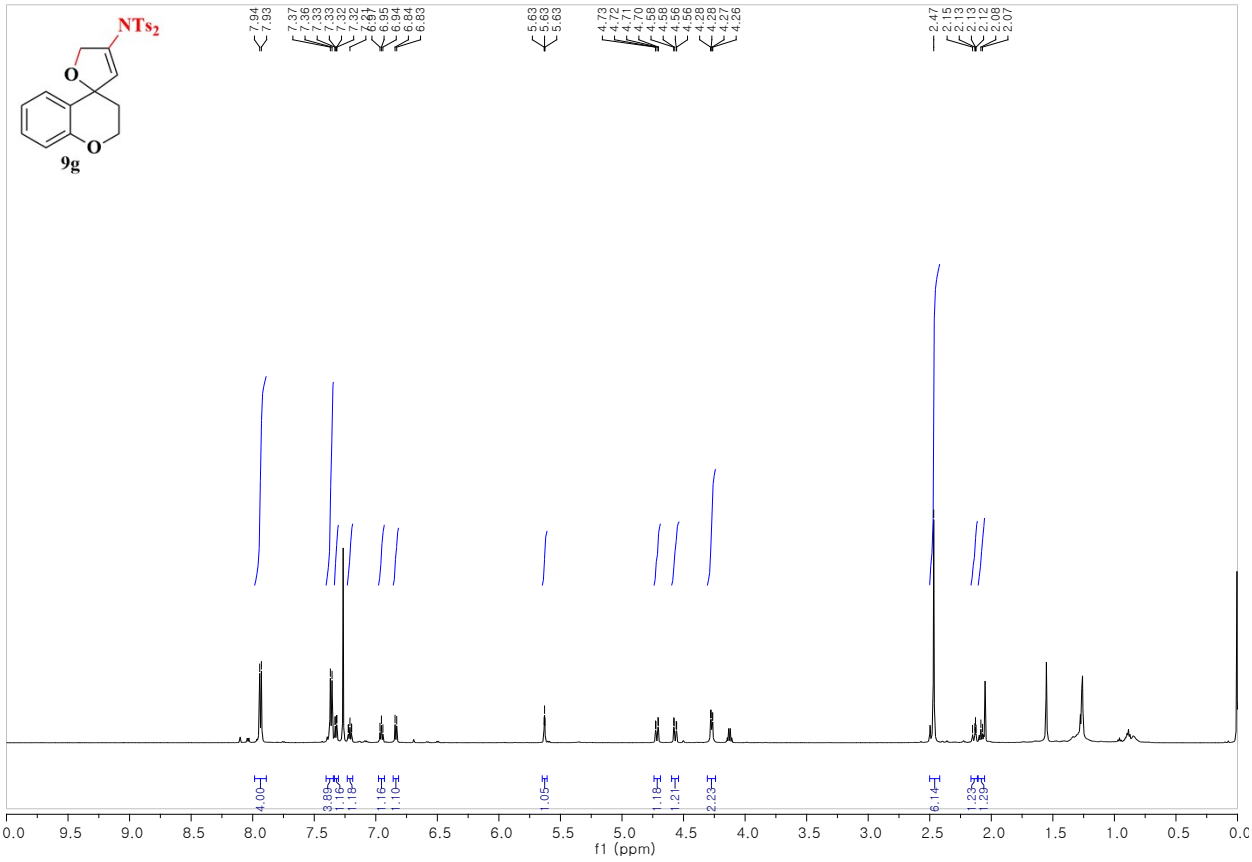
668


NTs2
O
9f
7.88
7.87
7.36
7.35
5.90
5.89
5.89
5.88
5.88
5.87
5.64
5.64
5.64
5.59
5.57
4.48
4.48
4.46
4.46
4.44
4.43
4.42
4.42
2.47
1.94
1.94
1.90
1.90
1.89
1.88
1.88
1.88
1.87
1.86
1.77
1.76
1.76
1.69
1.69
1.68
1.67
1.67
1.65
1.61
1.60
1.60
1.60
1.59
4.00
4.16
1.06
0.93
0.96
2.19
6.19
2.19
3.96
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

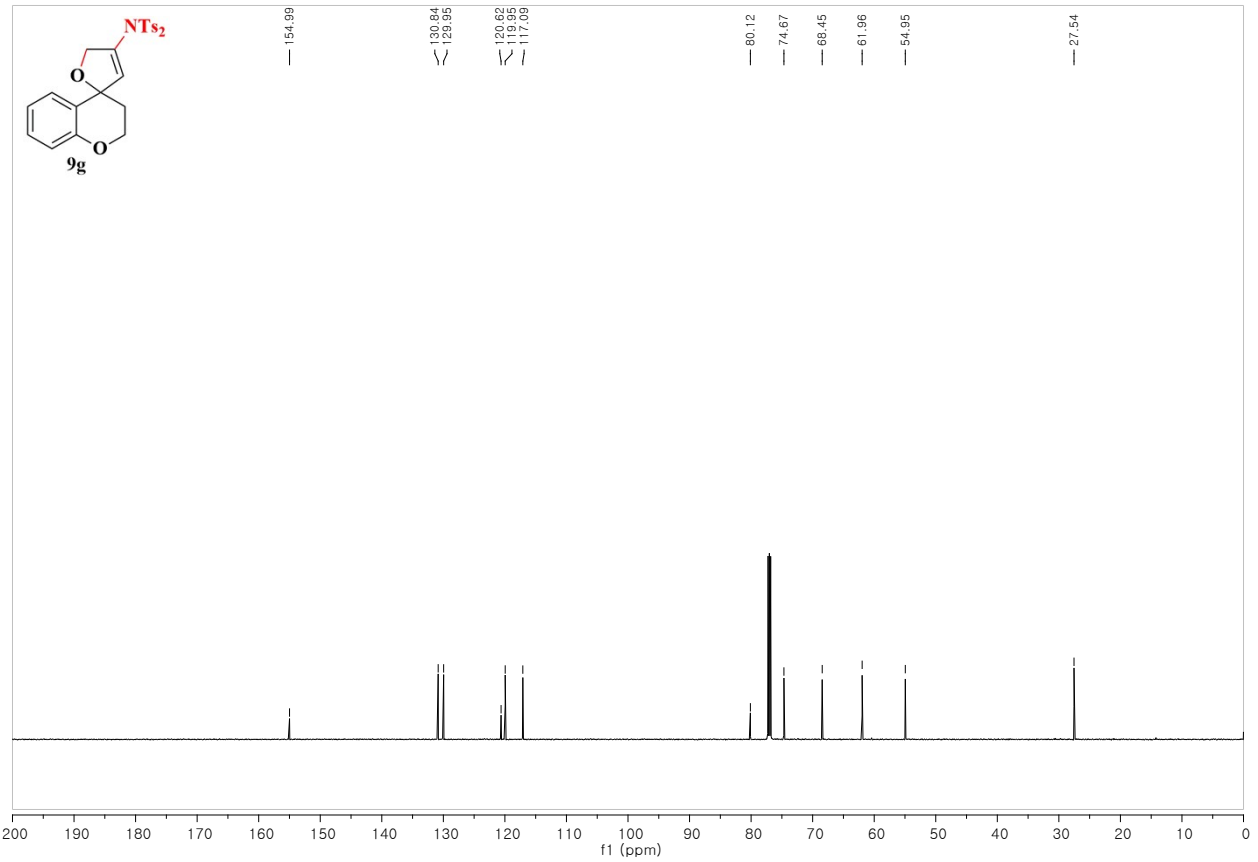
669


NTs2
O
9f
145.44
137.62
136.09
131.77
131.41
129.71
128.55
128.17
86.02
72.06
33.94
24.63
21.76
19.40
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

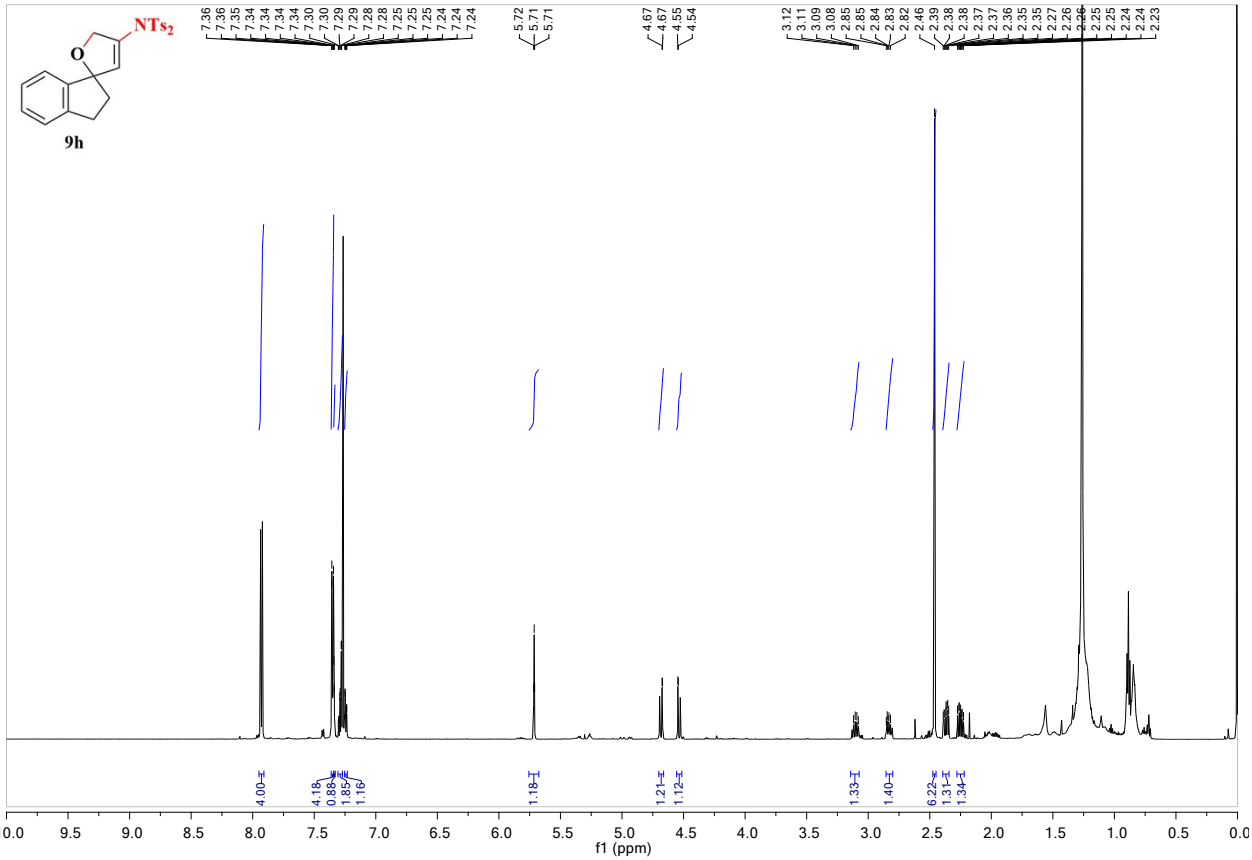
670


NTs2
O
O
9g
7.94
7.93
7.37
7.36
7.33
7.33
7.32
7.32
6.97
6.95
6.94
6.84
6.83
5.63
5.63
5.63
4.73
4.72
4.71
4.70
4.58
4.58
4.56
4.56
4.28
4.28
4.27
4.26
2.47
2.15
2.13
2.13
2.12
2.09
2.08
2.07
4.00
3.85
1.16
1.18
1.16
1.10
1.05
1.19
1.21
2.23
6.14
1.25
1.29
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

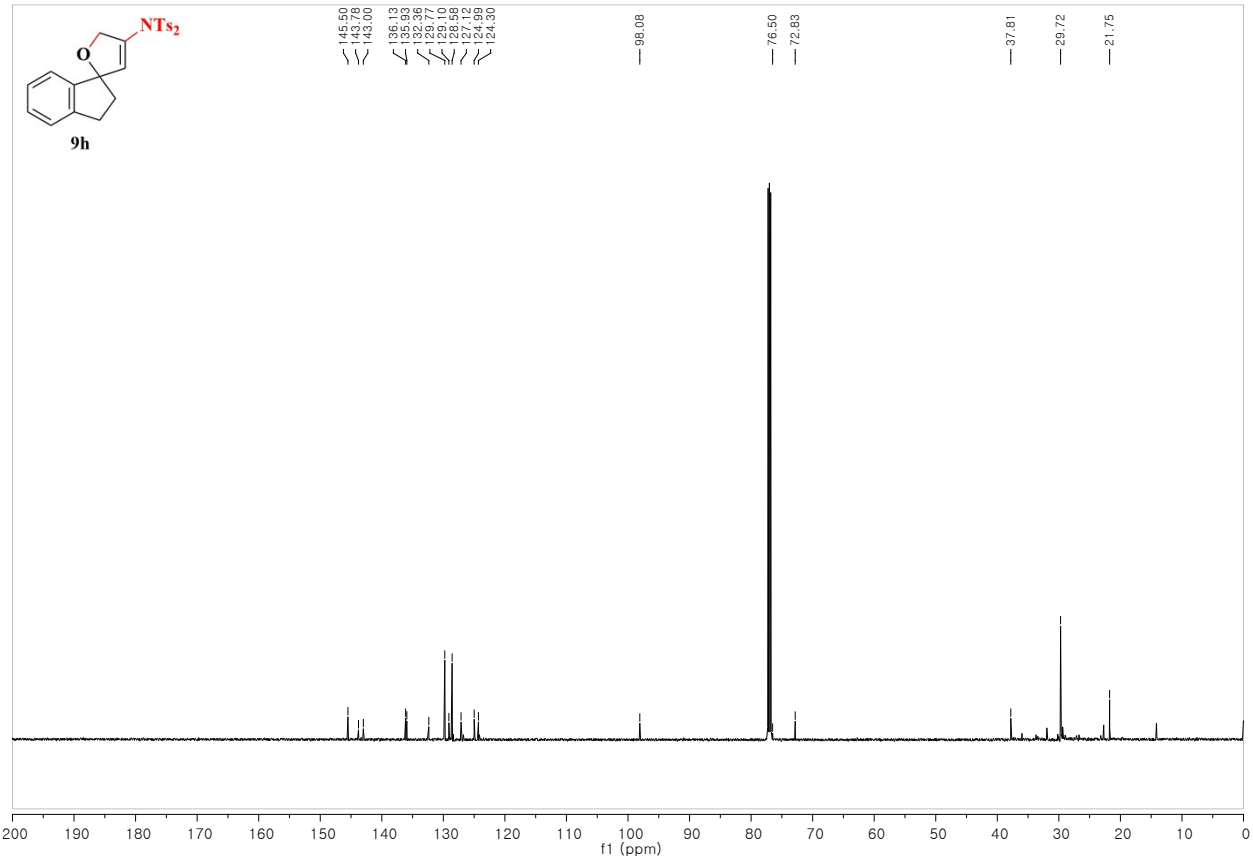
671


NTs2
O
O
9g
154.99
130.84
129.95
120.62
119.85
117.09
80.12
74.67
68.45
61.96
54.95
27.54
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

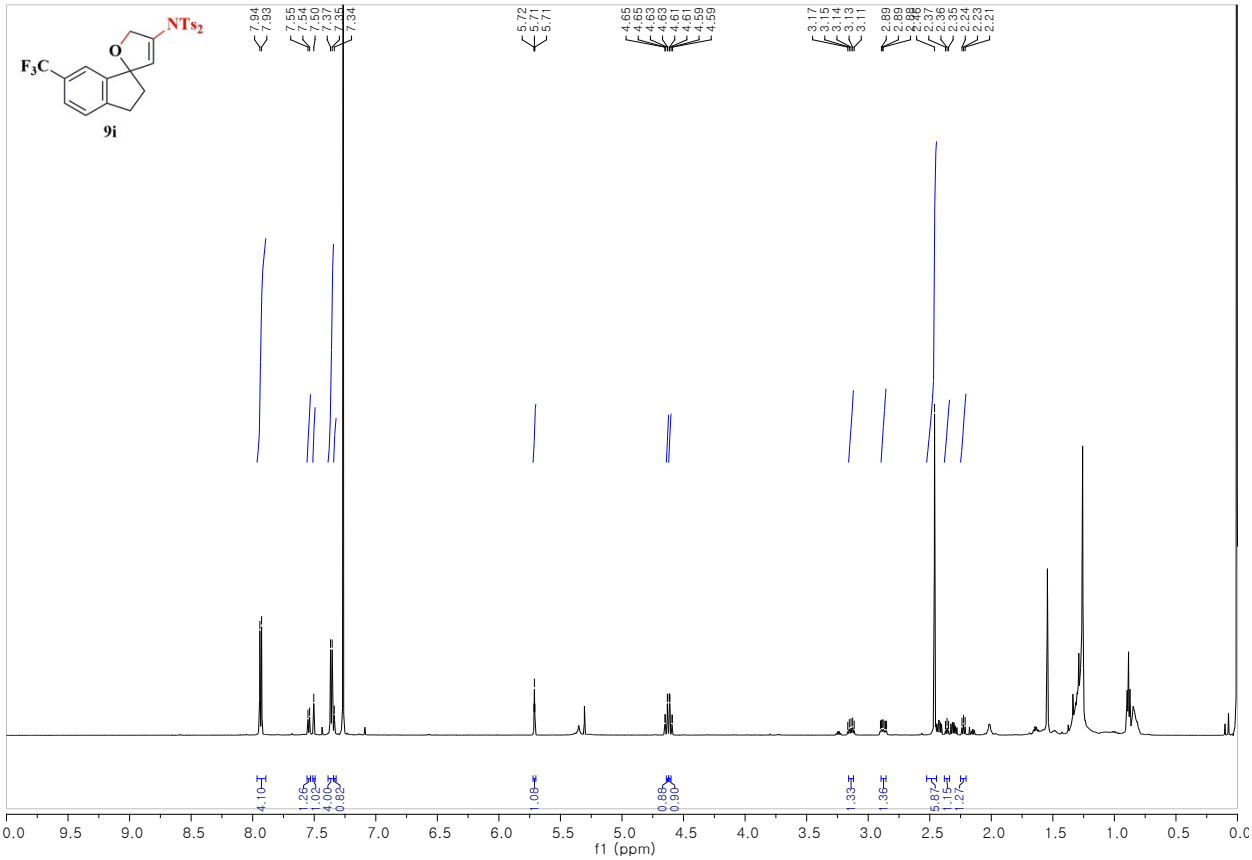
672



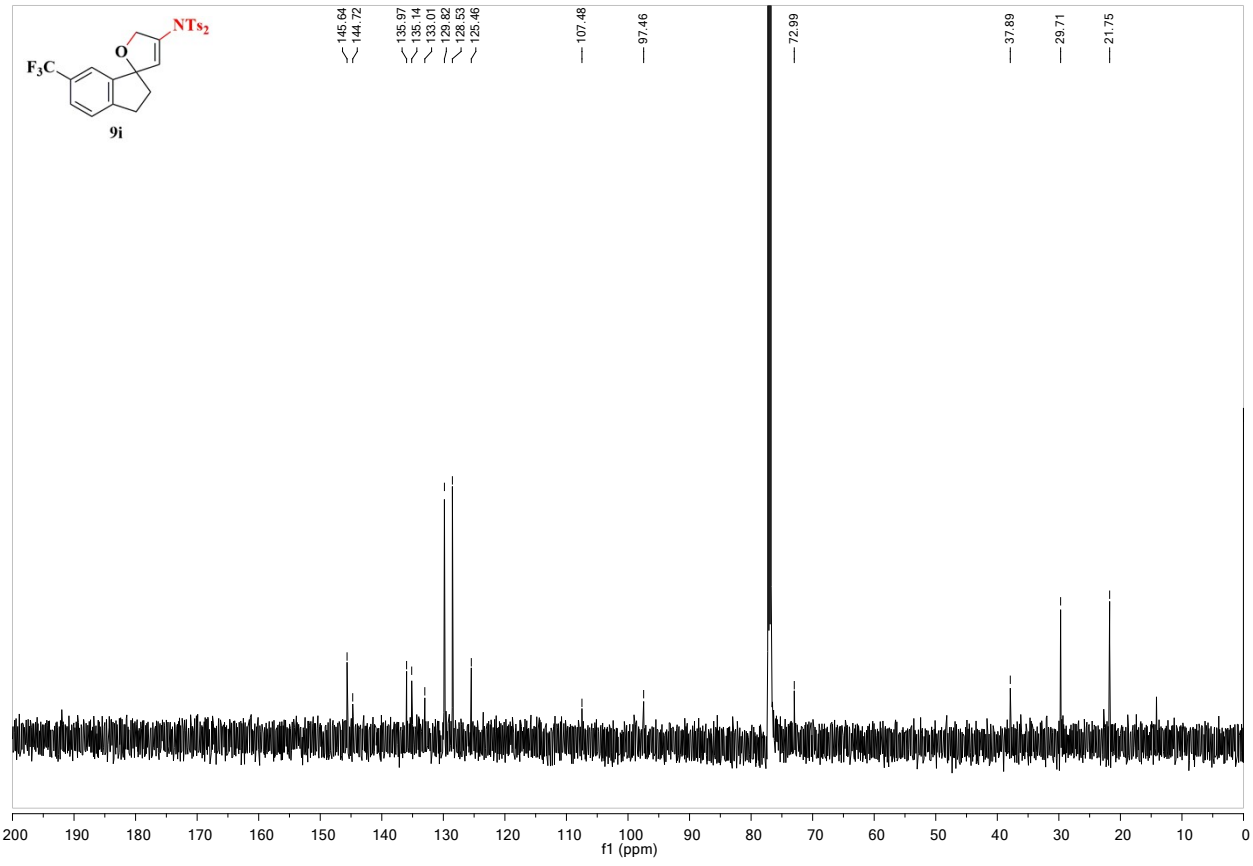
673



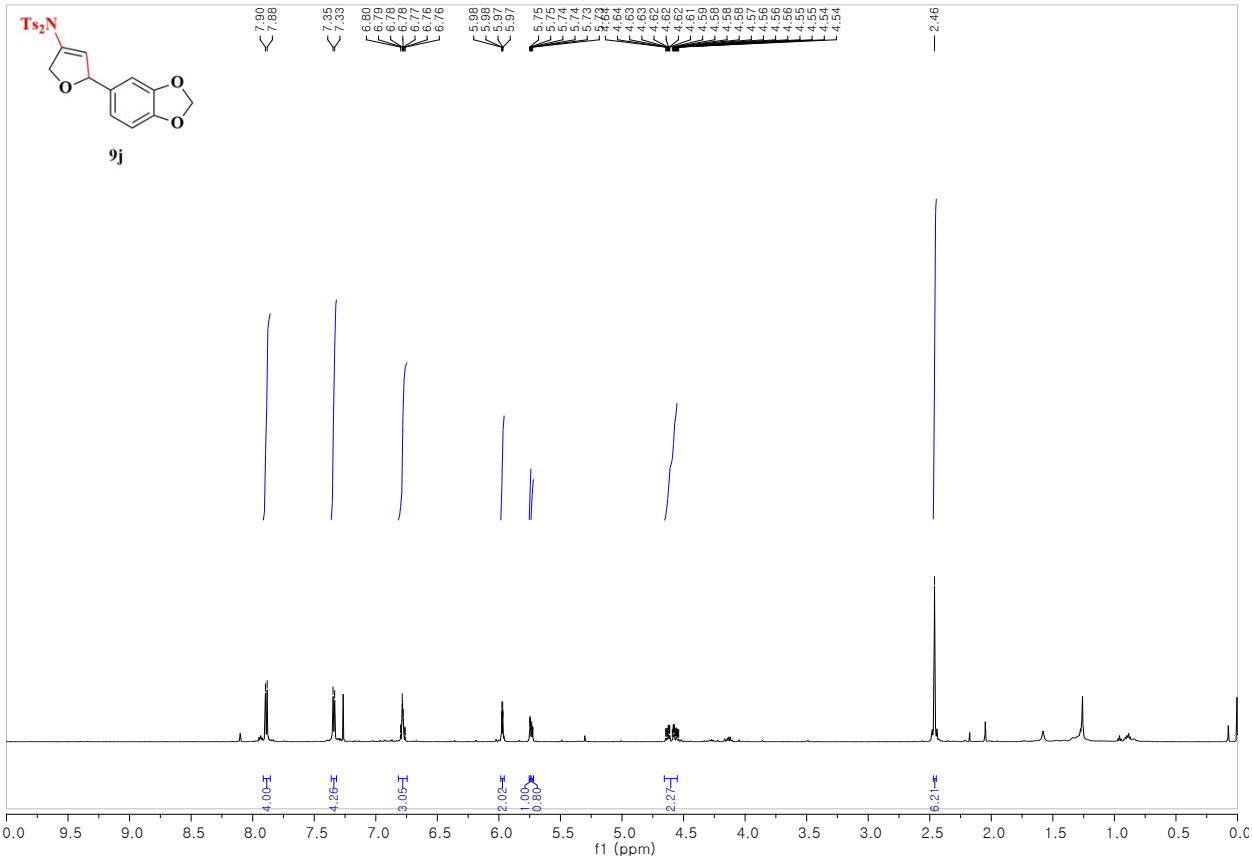
674


NTs2
O
F3C
9i
7.94
7.93
7.55
7.54
7.50
7.37
7.36
7.34
5.72
5.71
5.71
4.65
4.65
4.63
4.63
4.61
4.61
4.59
4.59
3.17
3.15
3.14
3.13
3.11
2.89
2.88
2.48
2.37
2.36
2.35
2.24
2.23
2.21
4.10
1.26
1.02
4.00
0.82
1.08
0.88
0.90
1.33
1.36
5.87
1.15
1.27
f1 (ppm)

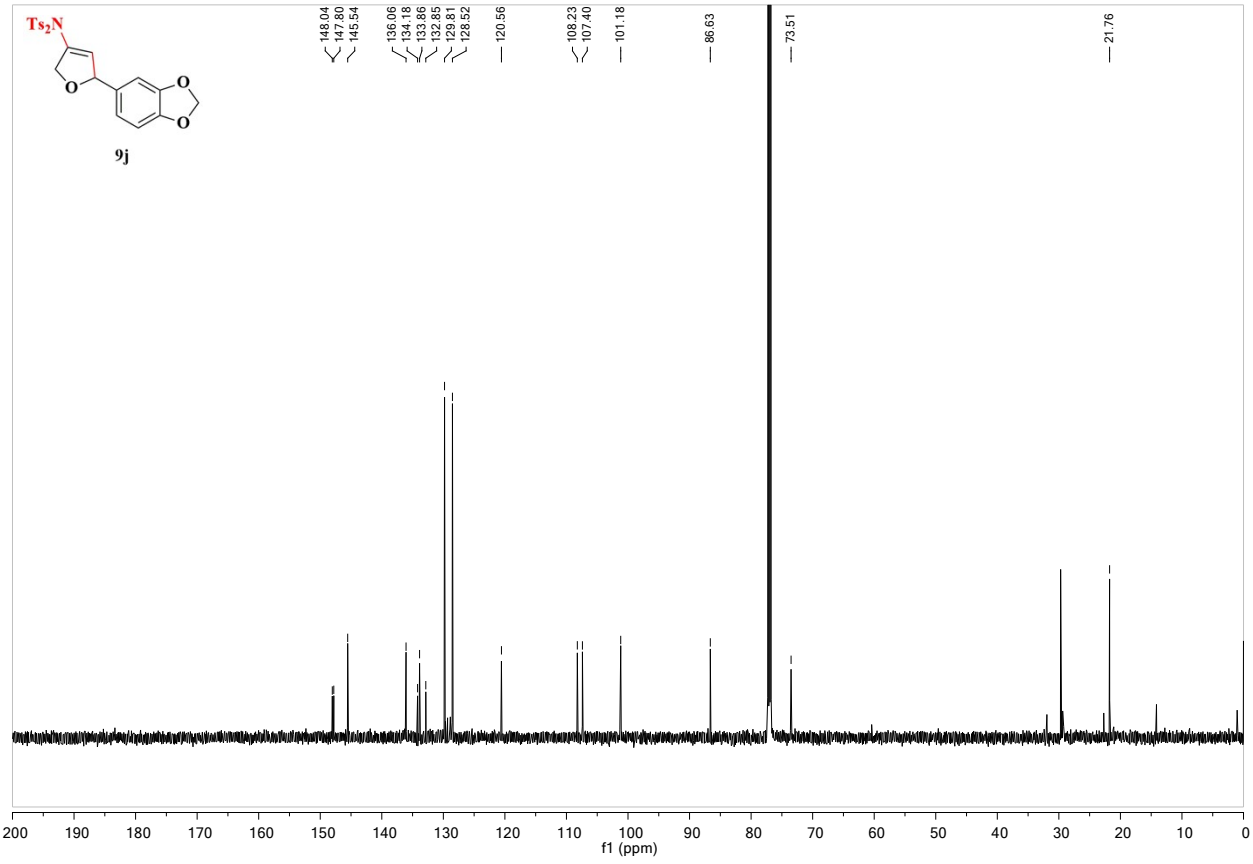
675


NTs2
O
F3C
9i
145.64
144.72
135.97
135.14
133.01
129.82
128.53
125.46
107.48
97.46
72.99
37.89
29.71
21.75
f1 (ppm)

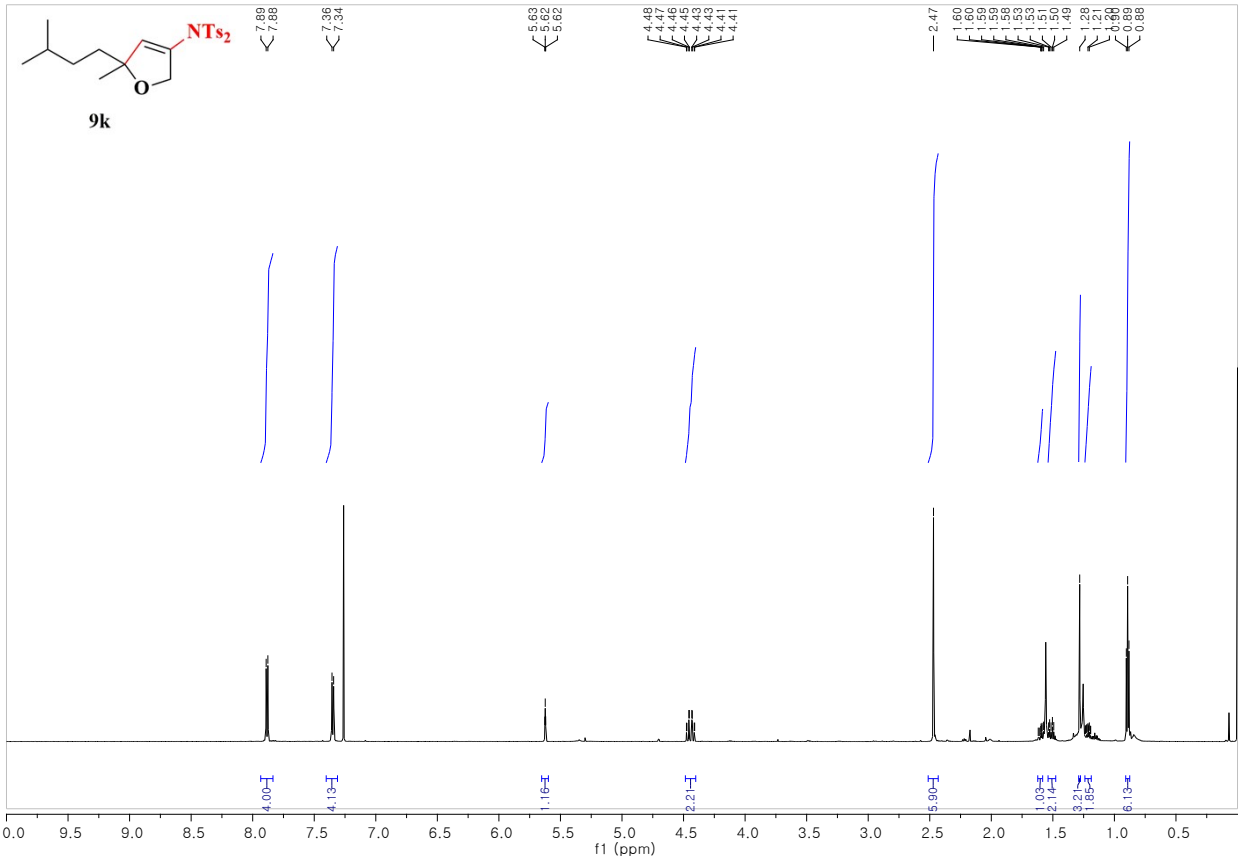
676


Ts2N
9j
7.90
7.88
7.35
7.33
6.80
6.79
6.78
6.78
6.77
6.76
6.76
5.98
5.98
5.97
5.97
5.75
5.75
5.74
5.74
5.73
5.73
4.64
4.64
4.63
4.63
4.62
4.62
4.62
4.61
4.59
4.59
4.58
4.58
4.57
4.56
4.56
4.56
4.55
4.55
4.54
4.54
2.46
4.00
4.26
3.05
2.02
1.00
0.80
2.27
6.21
f1 (ppm)

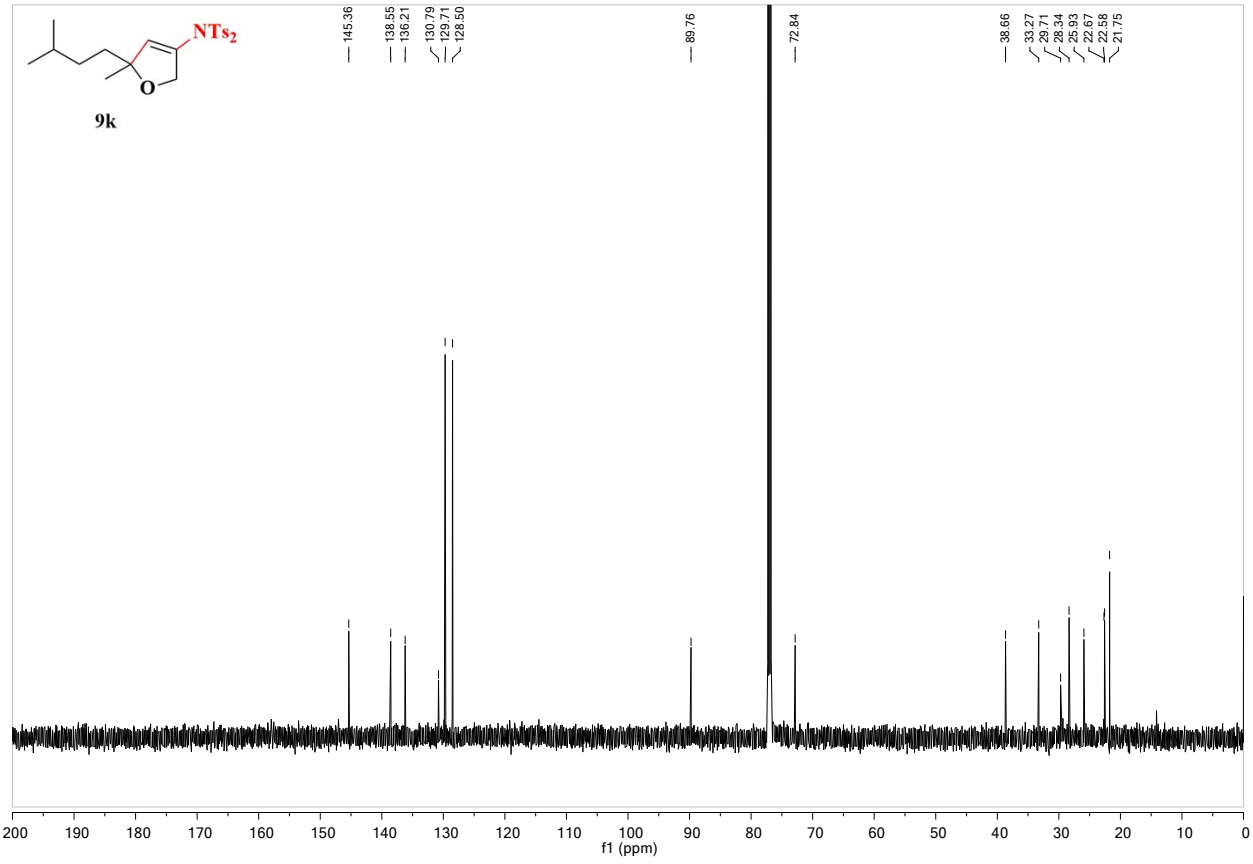
677


Ts2N
9j
148.04
147.80
145.54
136.06
134.18
133.86
132.85
129.81
128.52
120.56
108.23
107.40
101.18
86.63
73.51
21.76
f1 (ppm)

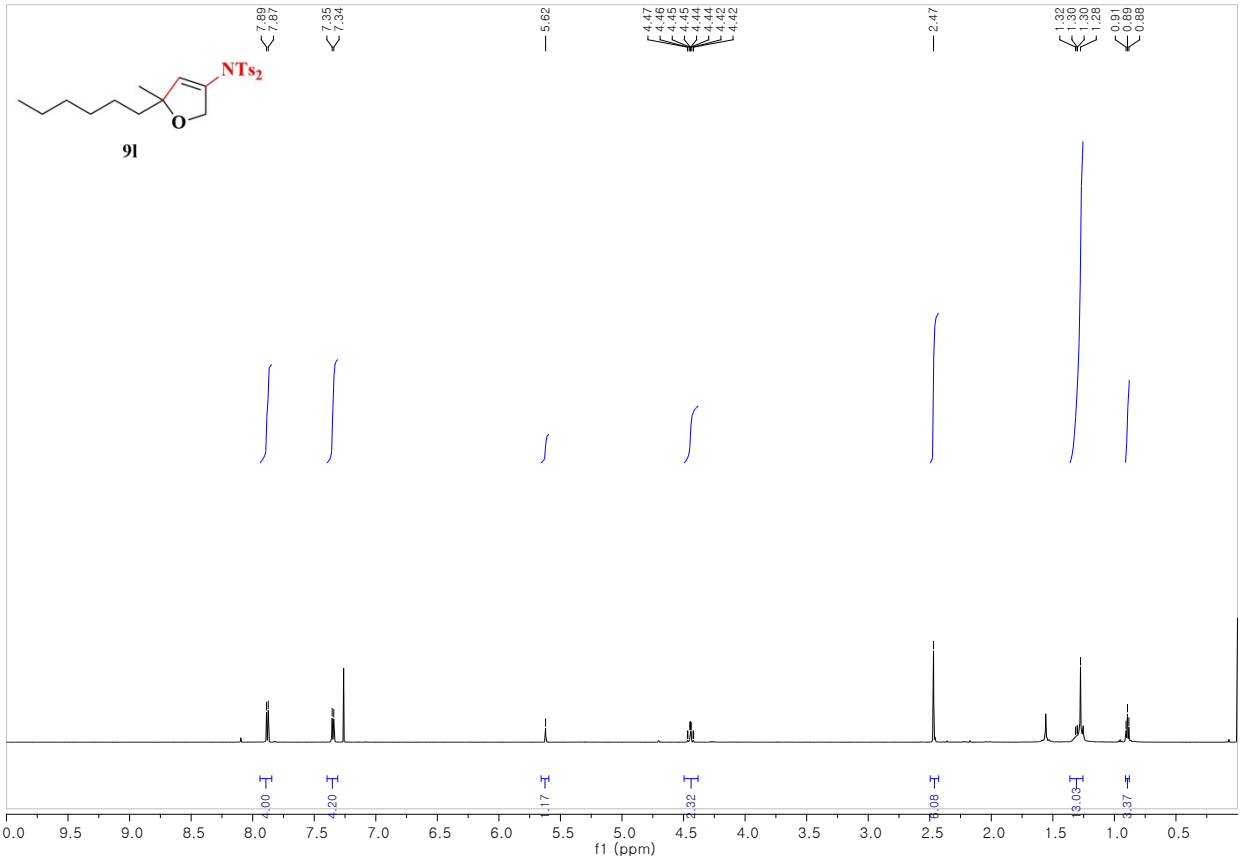
678


NTs2
O
9k
7.89
7.88
7.36
7.34
5.63
5.62
5.62
4.48
4.47
4.46
4.45
4.43
4.43
4.41
4.41
2.47
1.60
1.60
1.59
1.59
1.58
1.53
1.53
1.51
1.50
1.49
1.28
1.21
0.90
0.89
0.88
4.00
4.13
1.16
2.21
5.90
1.03
2.14
3.21
1.85
6.13
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)

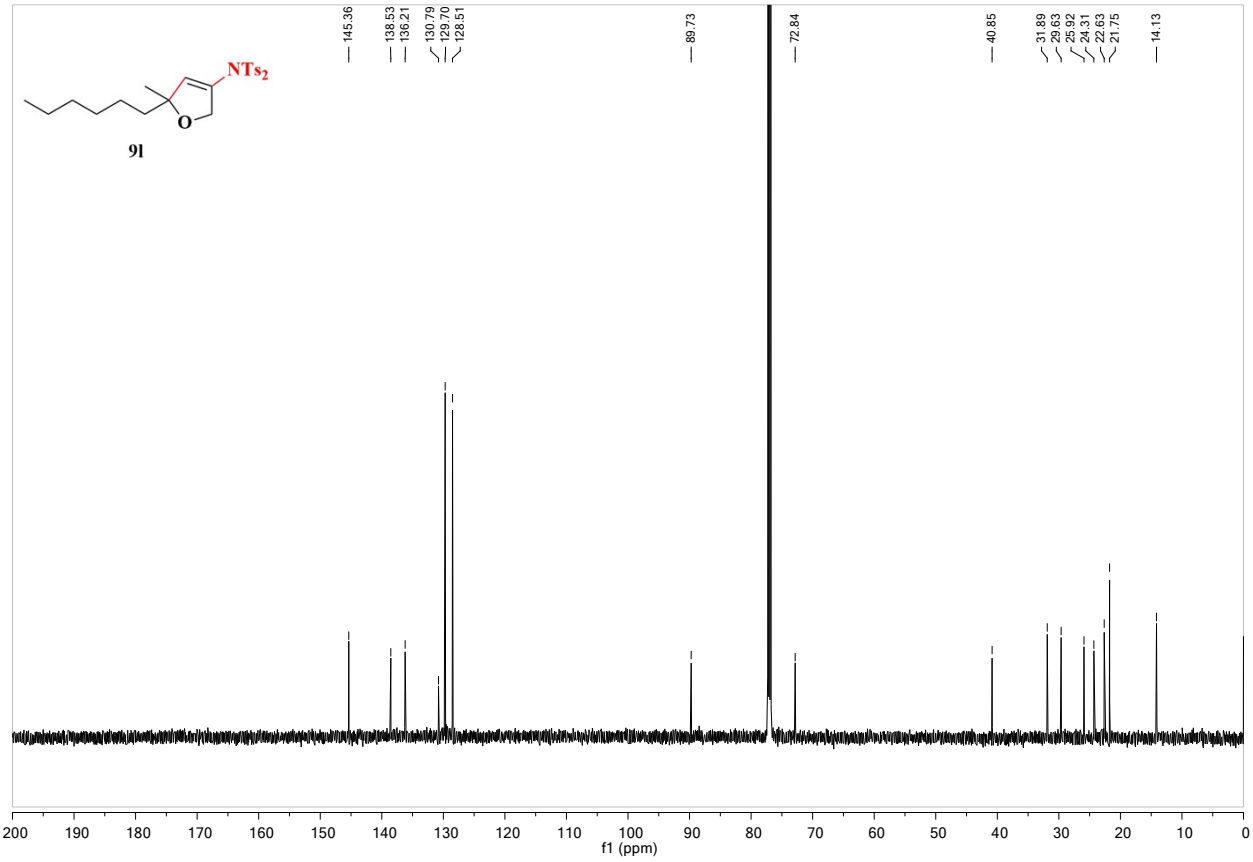
679


NTs2
O
9k
145.36
138.55
136.21
130.79
129.71
128.50
89.76
72.84
38.66
33.27
29.71
28.34
25.93
22.67
22.58
21.75
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

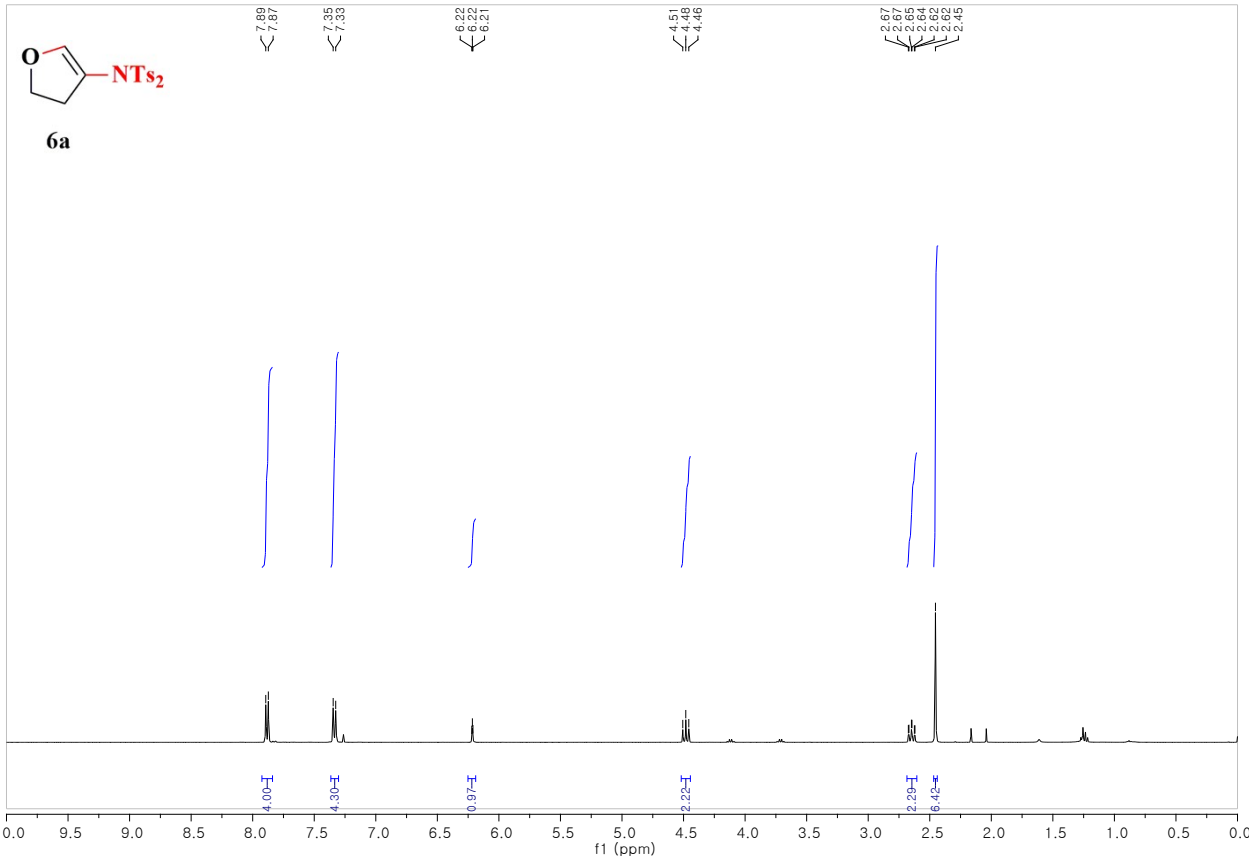
680


7.89
7.87
7.35
7.34
5.62
4.47
4.46
4.45
4.44
4.42
2.47
1.32
1.30
1.28
0.91
0.89
0.88
NTs2
O
9l
4.00
4.20
1.17
2.32
6.08
13.03
3.37
f1 (ppm)

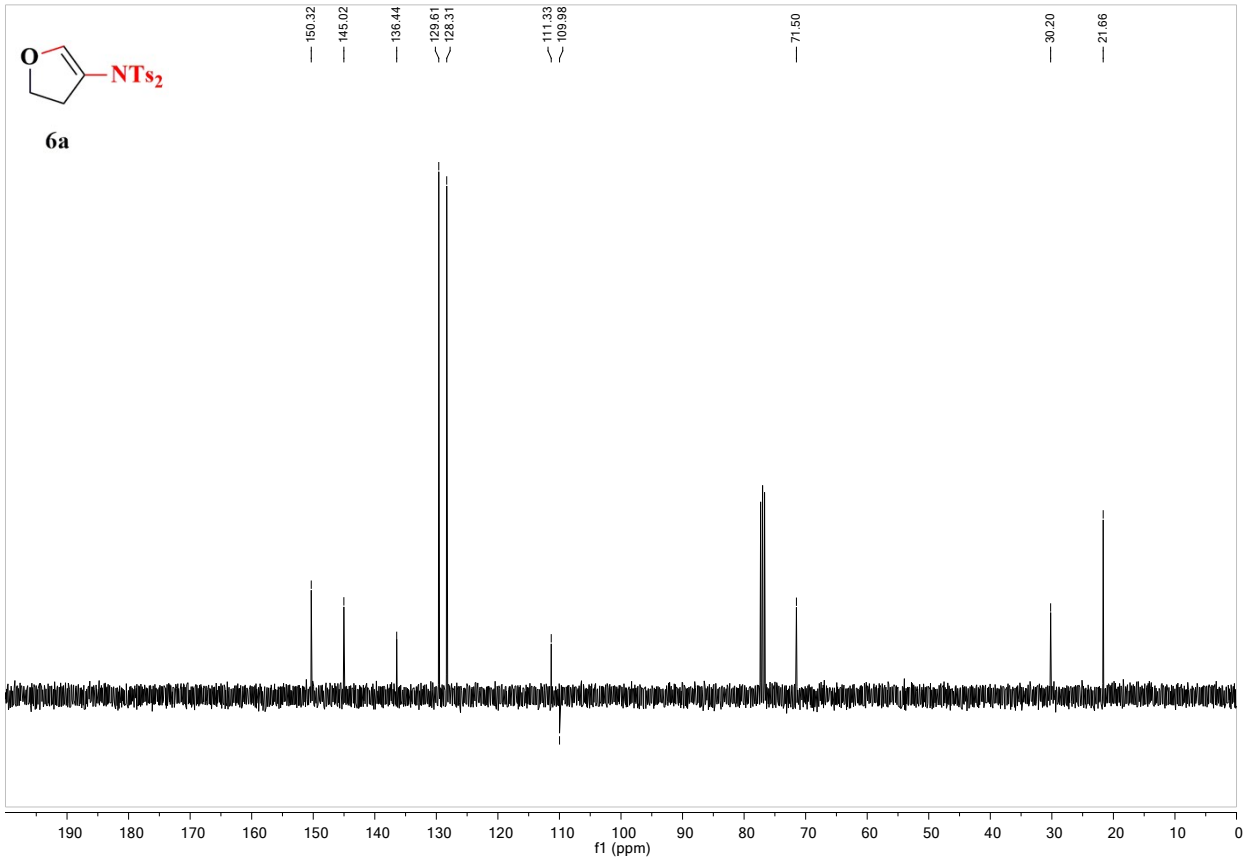
681


145.36
138.53
136.21
130.79
129.70
128.51
89.73
72.84
40.85
31.89
29.63
25.92
24.31
22.63
21.75
14.13
NTs2
O
9l
f1 (ppm)

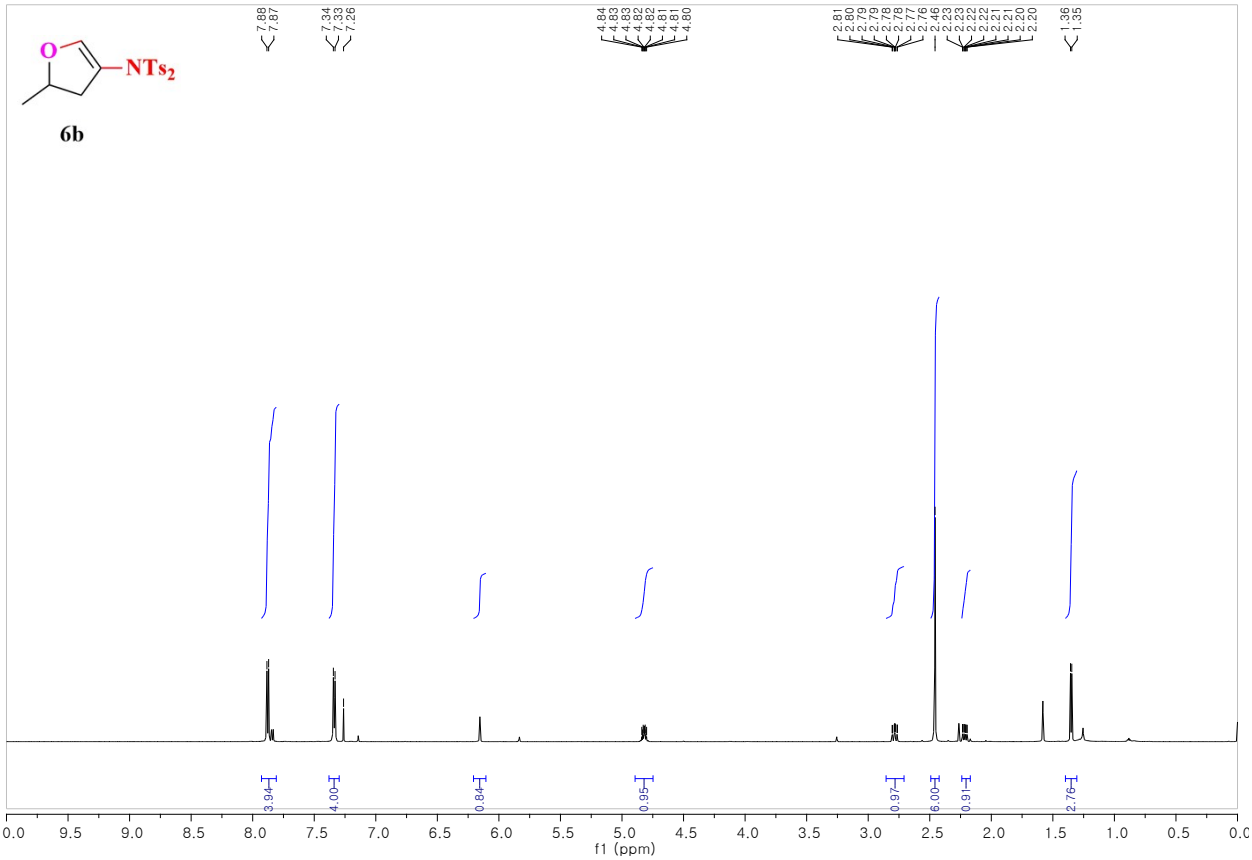
682


7.89
7.87
7.35
7.33
6.22
6.22
6.21
4.51
4.48
4.46
2.67
2.67
2.65
2.64
2.62
2.62
2.45
O
NTs2
6a
4.00
4.30
0.97
2.22
2.29
6.42
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

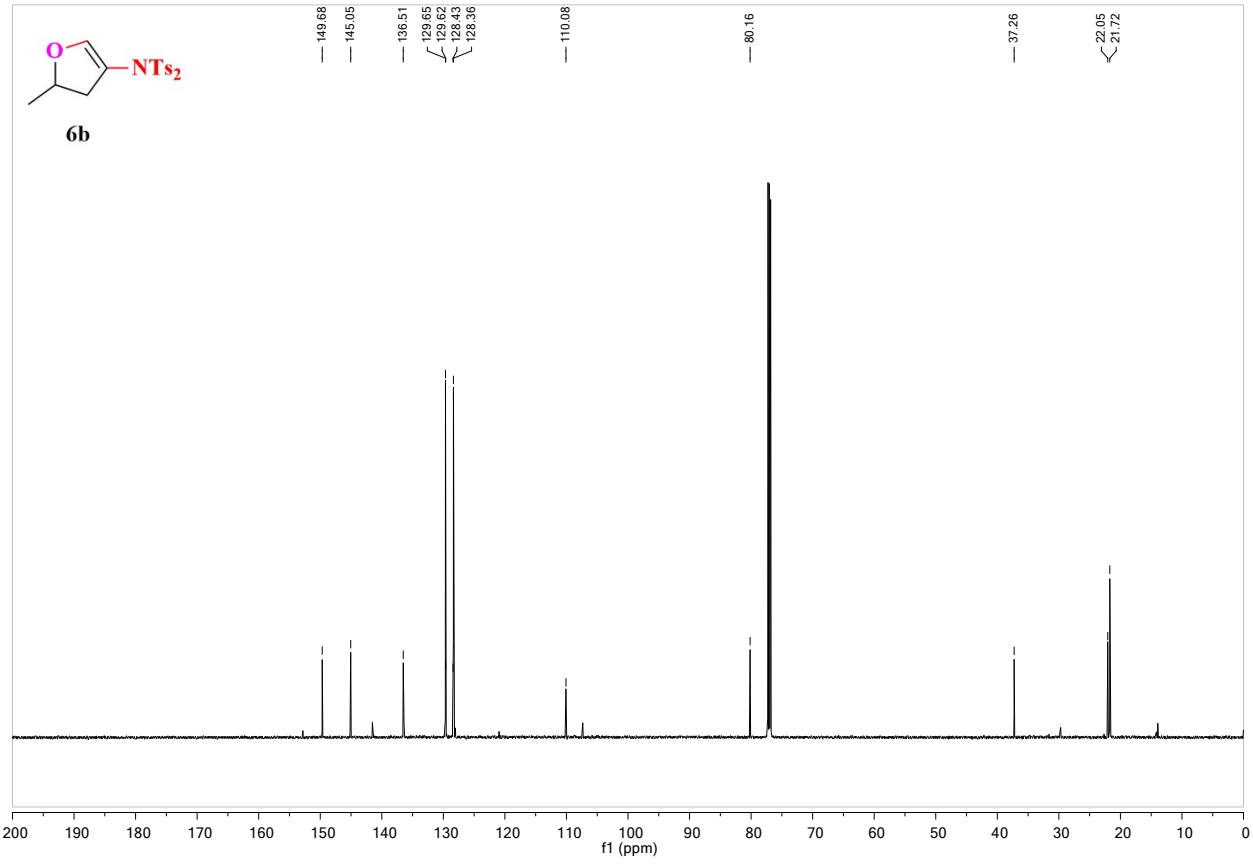
683


150.32
145.02
136.44
129.61
128.31
111.33
109.98
71.50
30.20
21.66
O
NTs2
6a
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

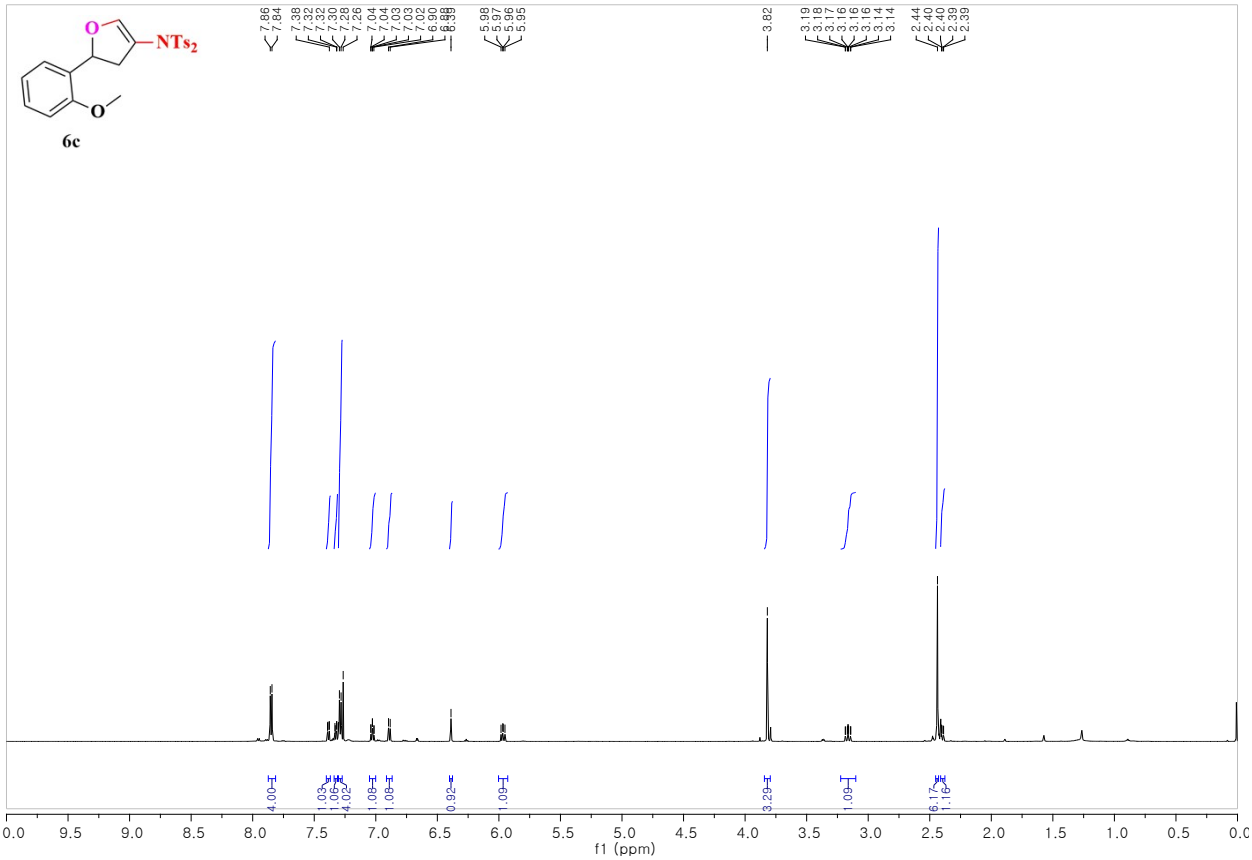
684


O
NTs2
6b
7.88
7.87
7.34
7.33
7.28
4.84
4.83
4.82
4.81
4.81
4.80
2.81
2.80
2.79
2.78
2.78
2.77
2.76
2.46
2.23
2.22
2.22
2.21
2.21
2.20
1.36
1.35
3.94
4.00
0.84
0.95
0.97
6.00
0.91
2.76
f1 (ppm)

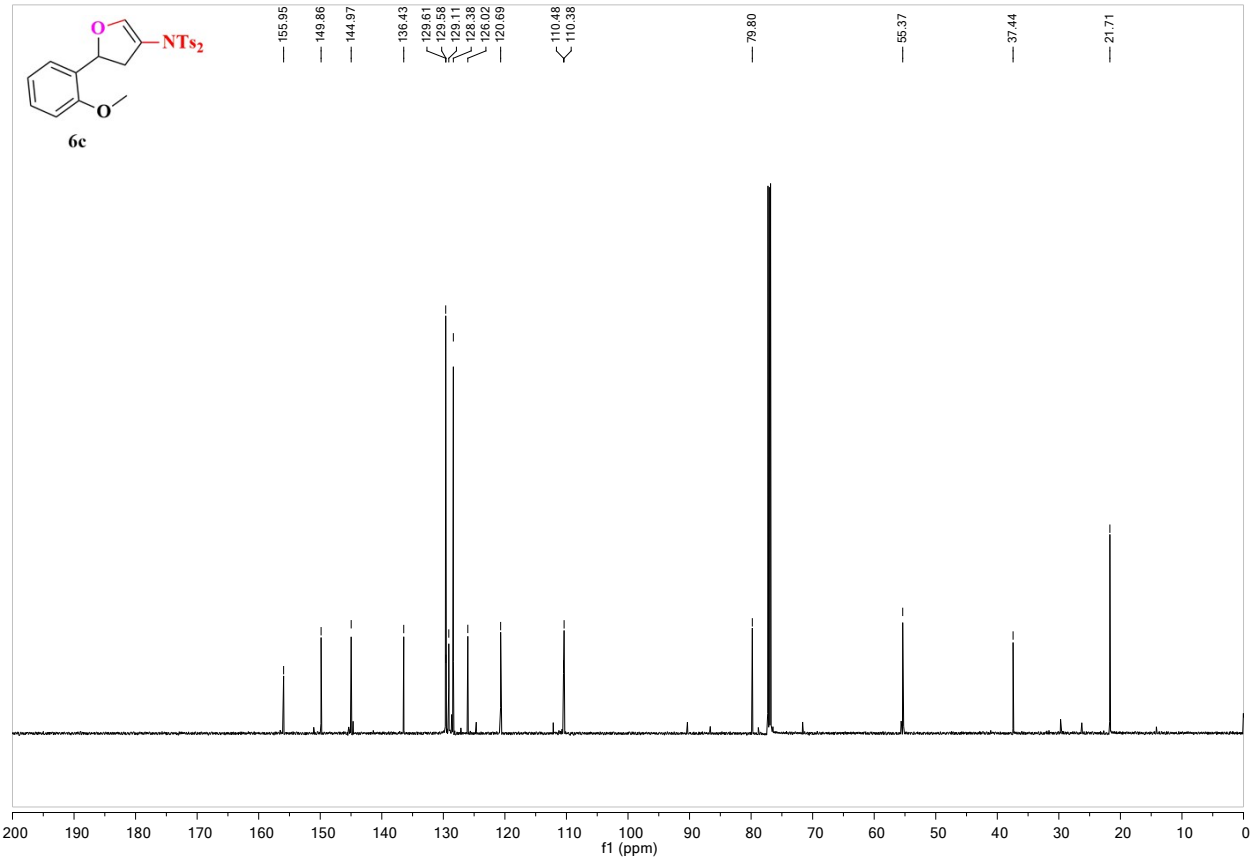
685


O
NTs2
6b
149.68
145.05
136.51
129.65
129.62
128.43
128.36
110.08
80.16
37.26
22.05
21.72
f1 (ppm)

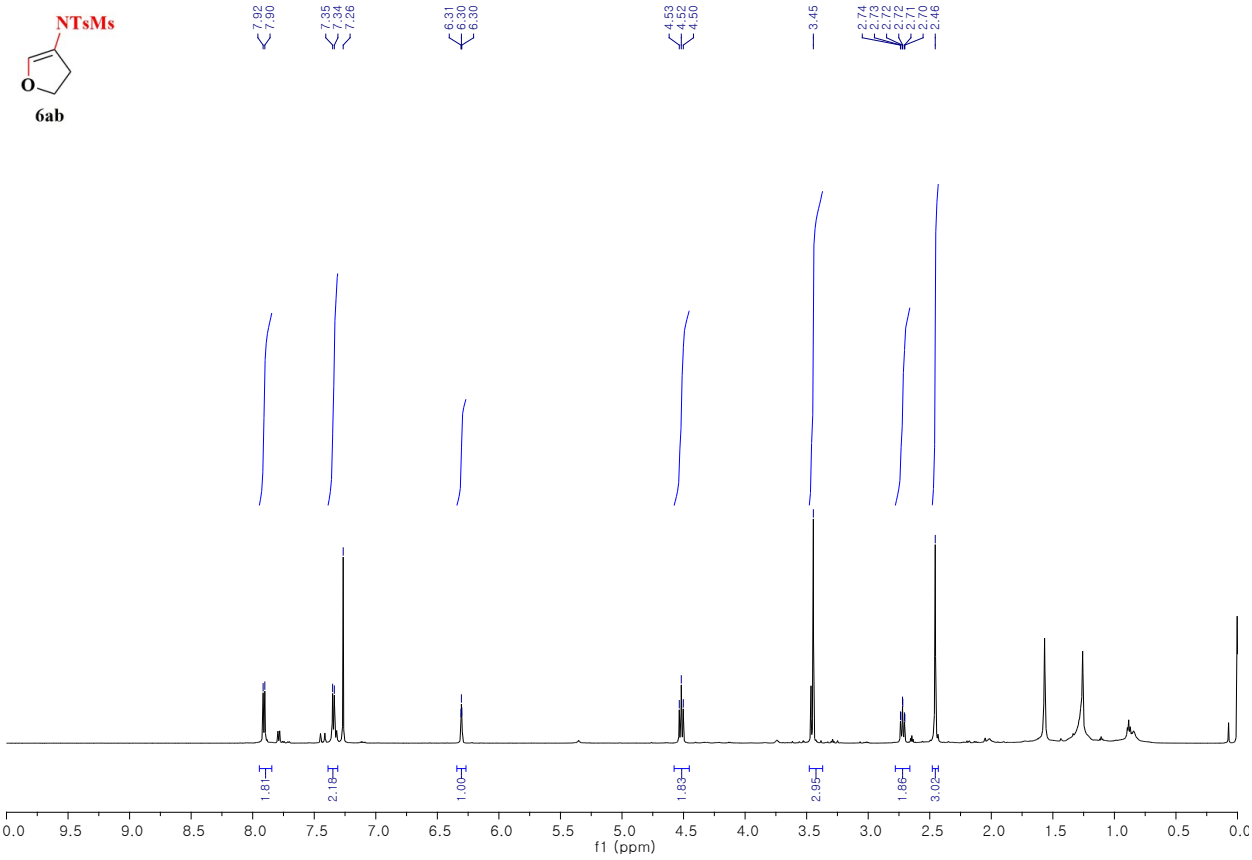
686


NTs2
O
O
6c
7.86
7.84
7.38
7.32
7.32
7.30
7.28
7.26
7.04
7.04
7.03
7.03
7.02
6.90
6.88
6.88
5.98
5.97
5.96
5.95
3.82
3.19
3.18
3.17
3.16
3.16
3.16
3.14
3.14
2.44
2.40
2.40
2.39
2.39
2.39
4.00
1.03
1.06
4.02
1.08
1.08
0.92
1.09
3.29
1.09
6.17
1.16
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

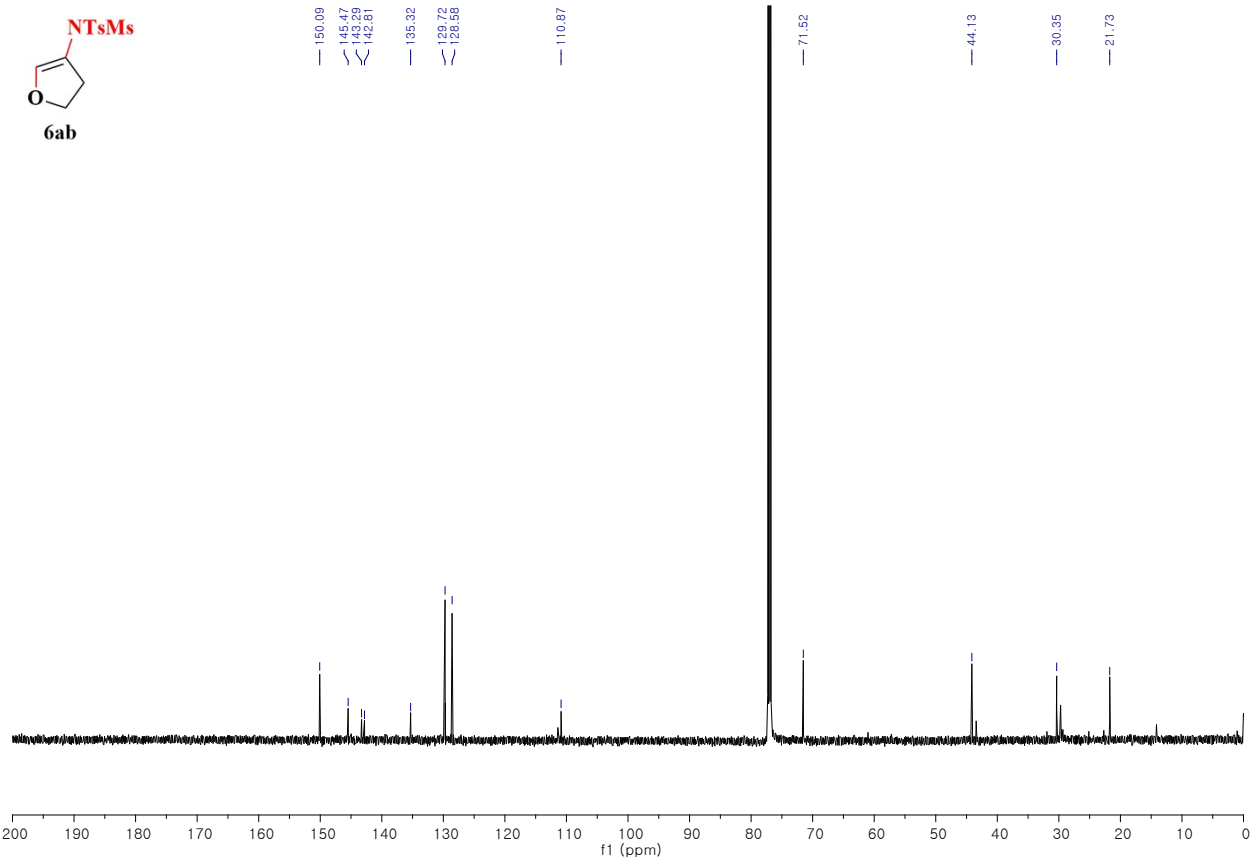
687


NTs2
O
O
6c
155.95
149.86
144.97
136.43
129.61
129.58
129.11
128.38
126.02
120.69
110.48
110.38
79.80
55.37
37.44
21.71
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

688


NTsMs
O
6ab
7.92
7.90
7.35
7.34
7.26
6.31
6.30
6.30
4.53
4.52
4.50
3.45
2.74
2.73
2.72
2.72
2.71
2.70
2.46
1.81
2.18
1.00
1.83
2.95
1.86
3.02
f1 (ppm)

689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O
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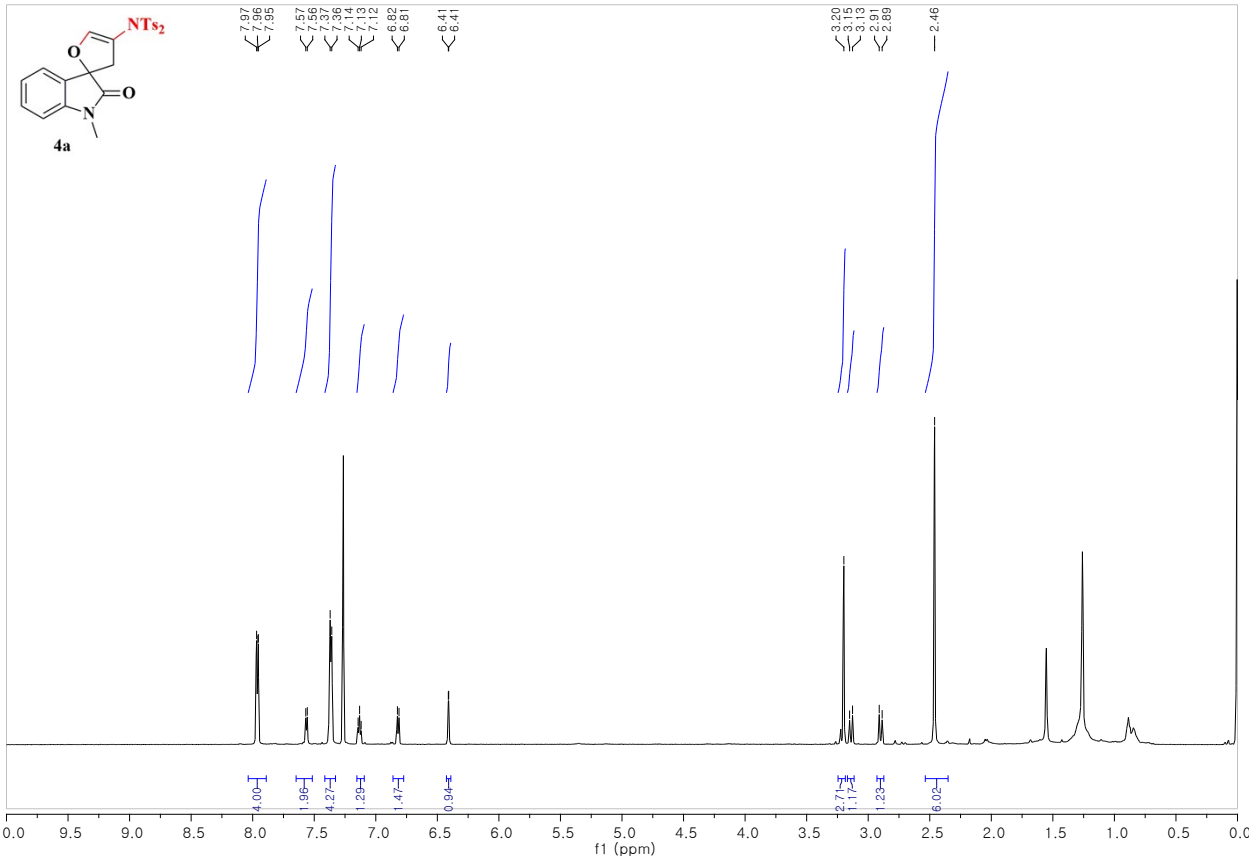
21.73
f1 (ppm)

690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6.41
3.20
3.15
3.13
2.91
2.89
2.46
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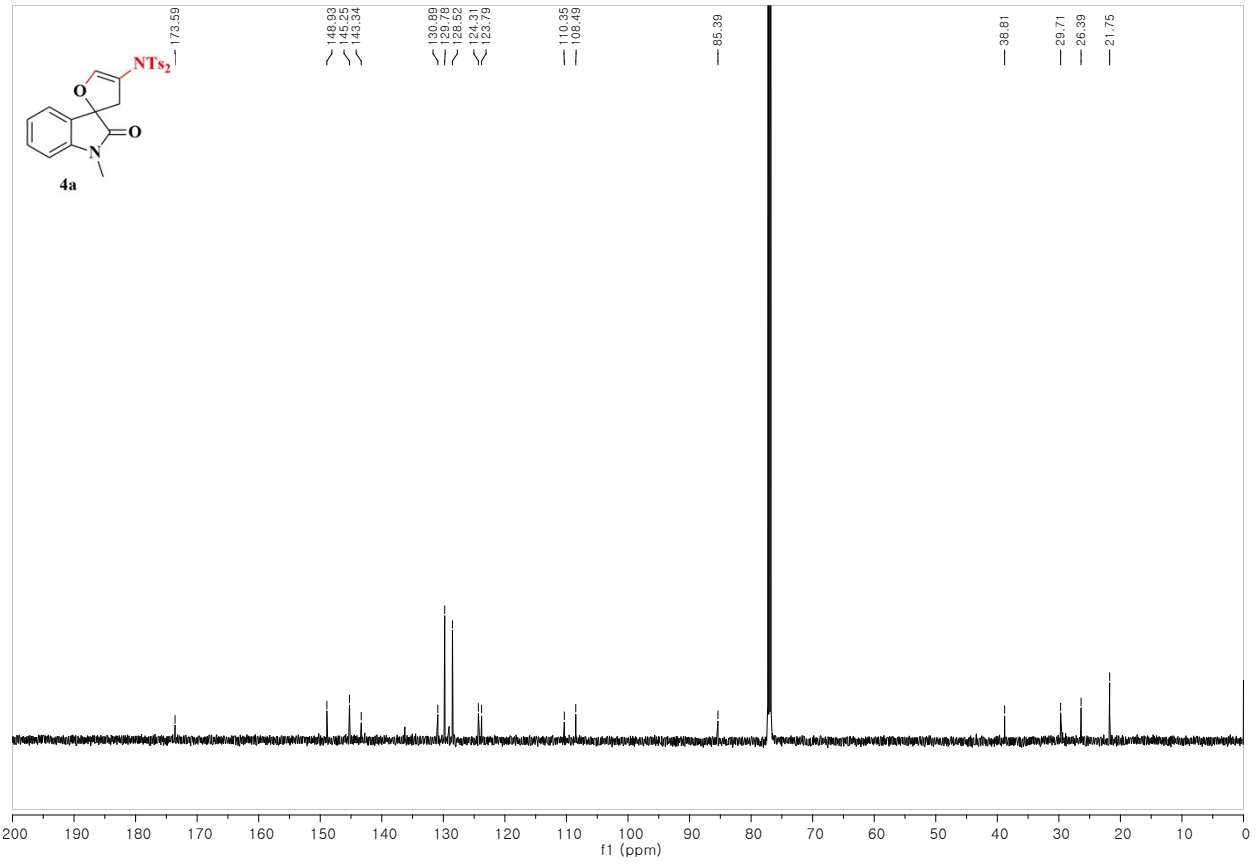
6.02
f1 (ppm)

691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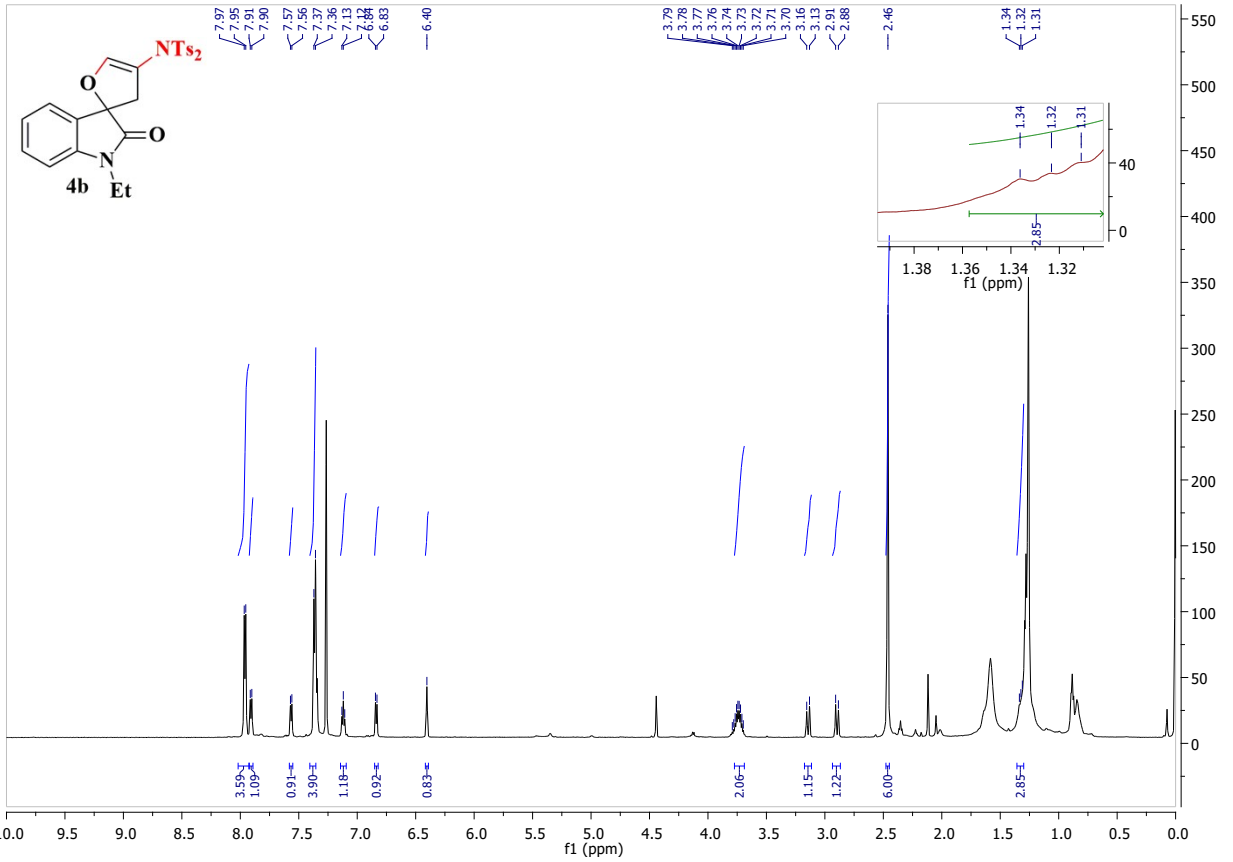
29.71
26.39
21.75
f1 (ppm)

692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7.37
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7.13
7.12
6.84
6.83
6.40
3.79
3.78
3.77
3.76
3.74
3.73
3.72
3.71
3.70
3.16
3.13
2.91
2.88
2.46
1.34
1.32
1.31
3.59
1.09
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0.92
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1.15
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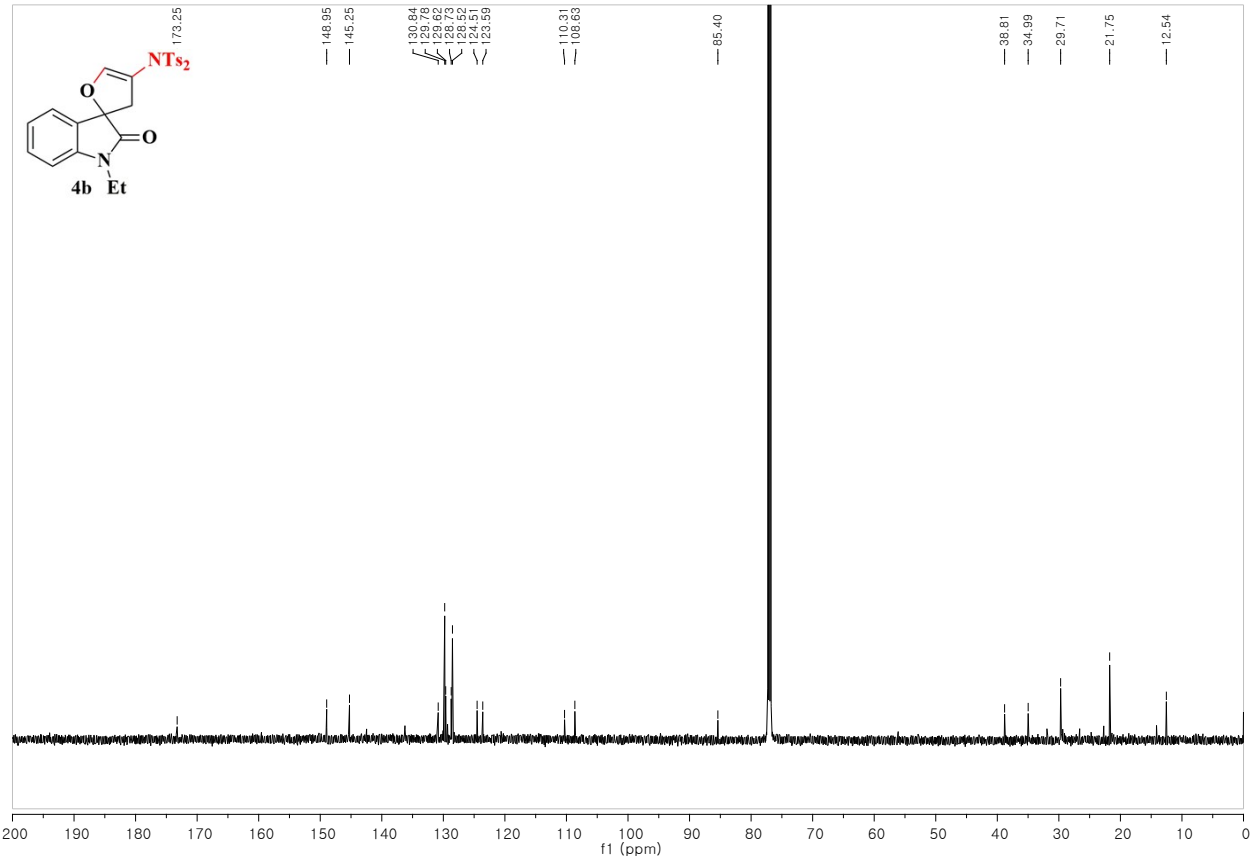
2.85
f1 (ppm)

693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O
O
N
Et
4b
173.25
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145.25
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129.78
129.62
128.73
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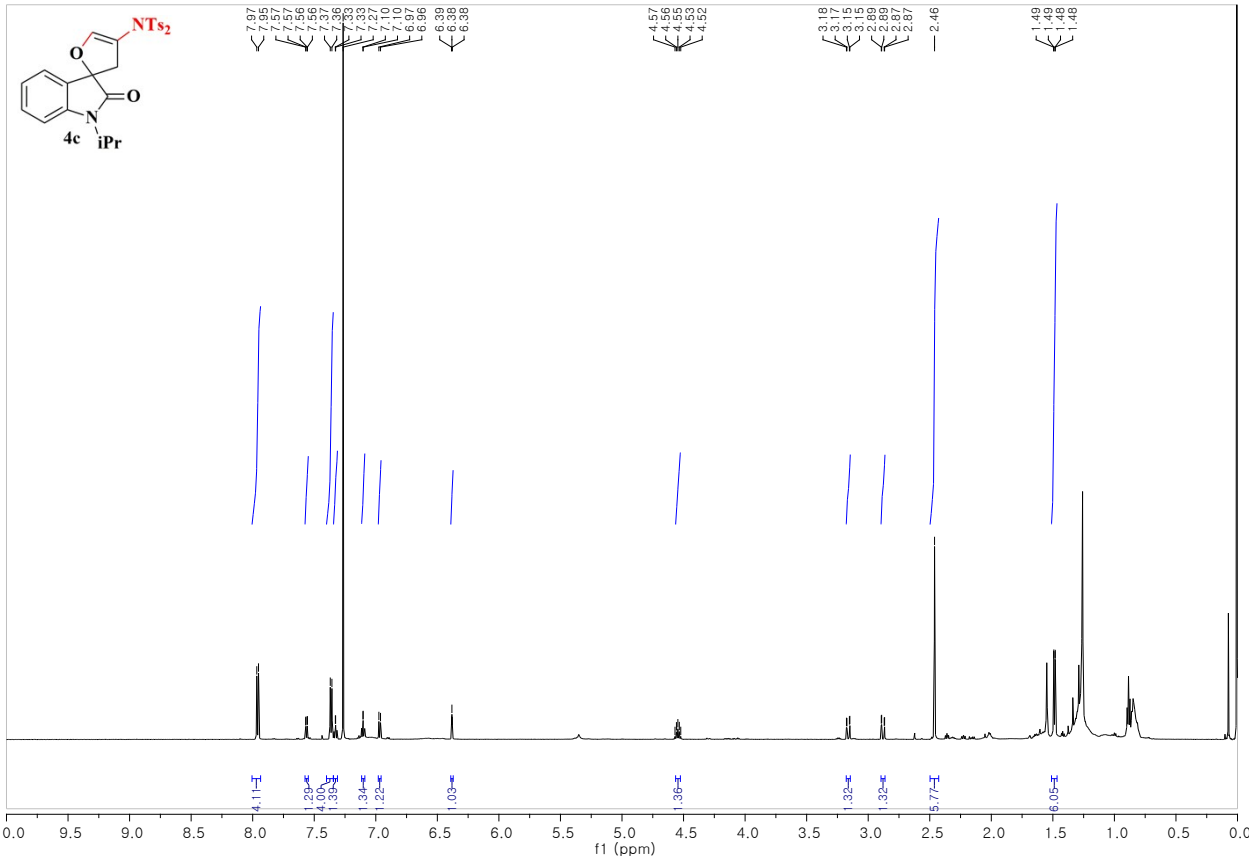
694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O
N
4c
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7.95
7.57
7.57
7.56
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7.37
7.36
7.33
7.33
7.27
7.10
7.10
6.97
6.96
6.39
6.38
6.38
4.57
4.56
4.55
4.53
4.52
3.18
3.17
3.15
3.15
2.89
2.89
2.87
2.87
2.46
1.49
1.49
1.48
1.48
4.11
1.29
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1.22
1.03
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1.32
1.32
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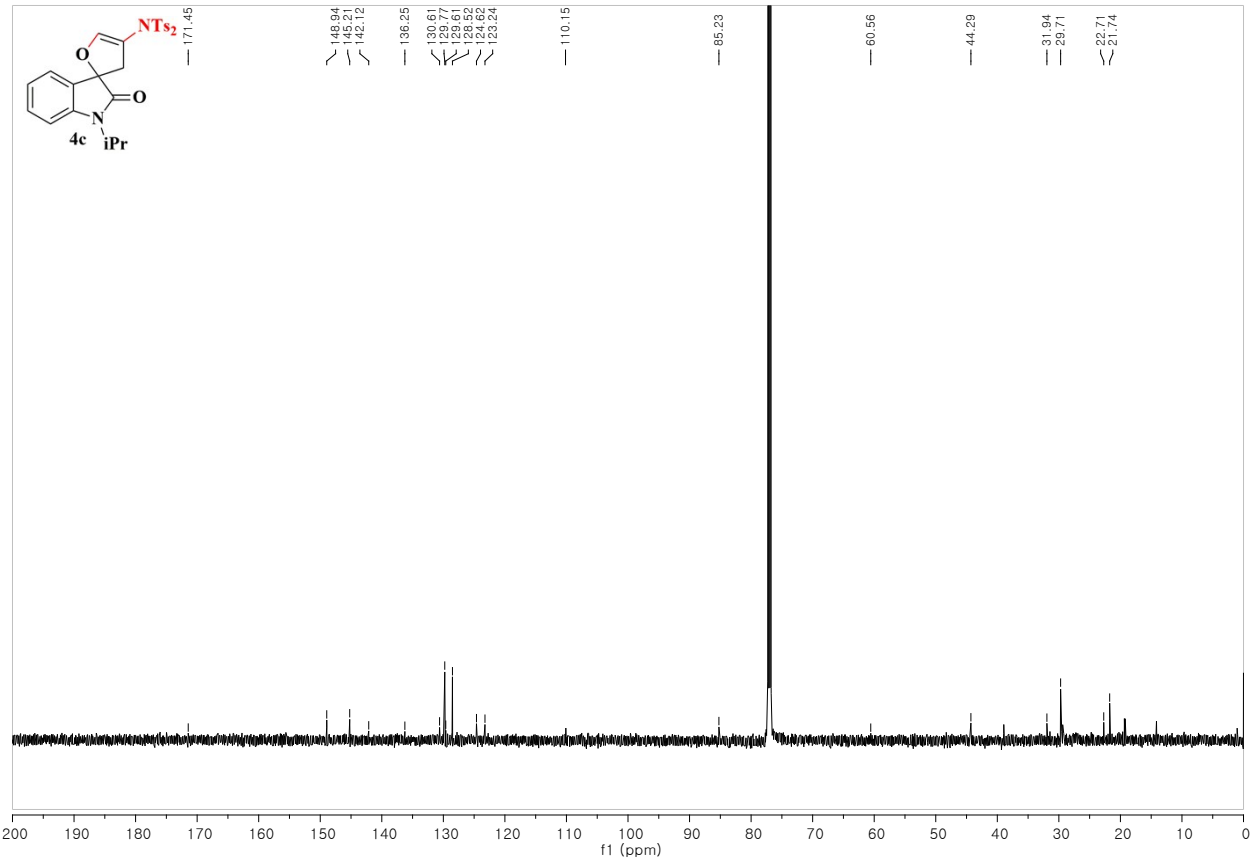
6.05
f1 (ppm)

695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N
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136.25
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128.52
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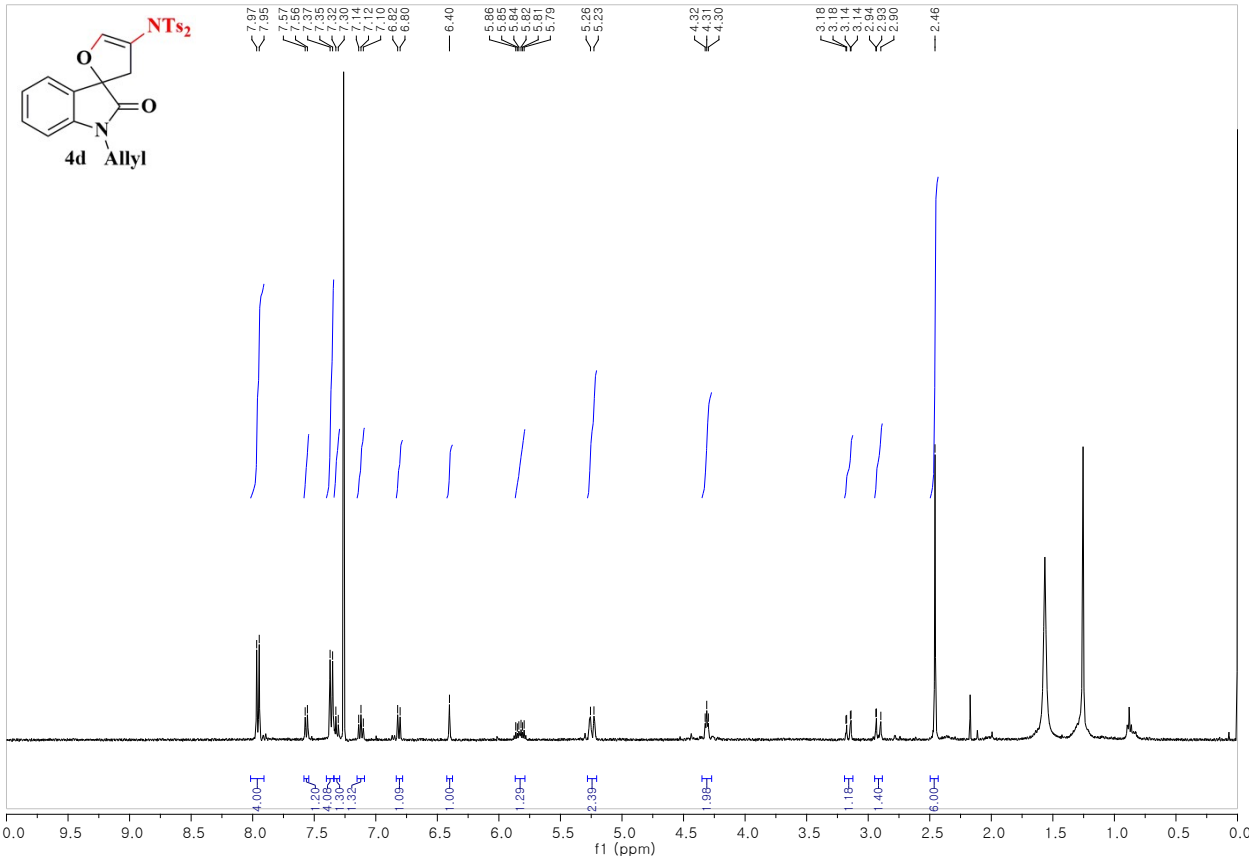
31.94
29.71
22.71
21.74
f1 (ppm)

696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N
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7.56
7.37
7.35
7.32
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7.12
7.10
6.82
6.80
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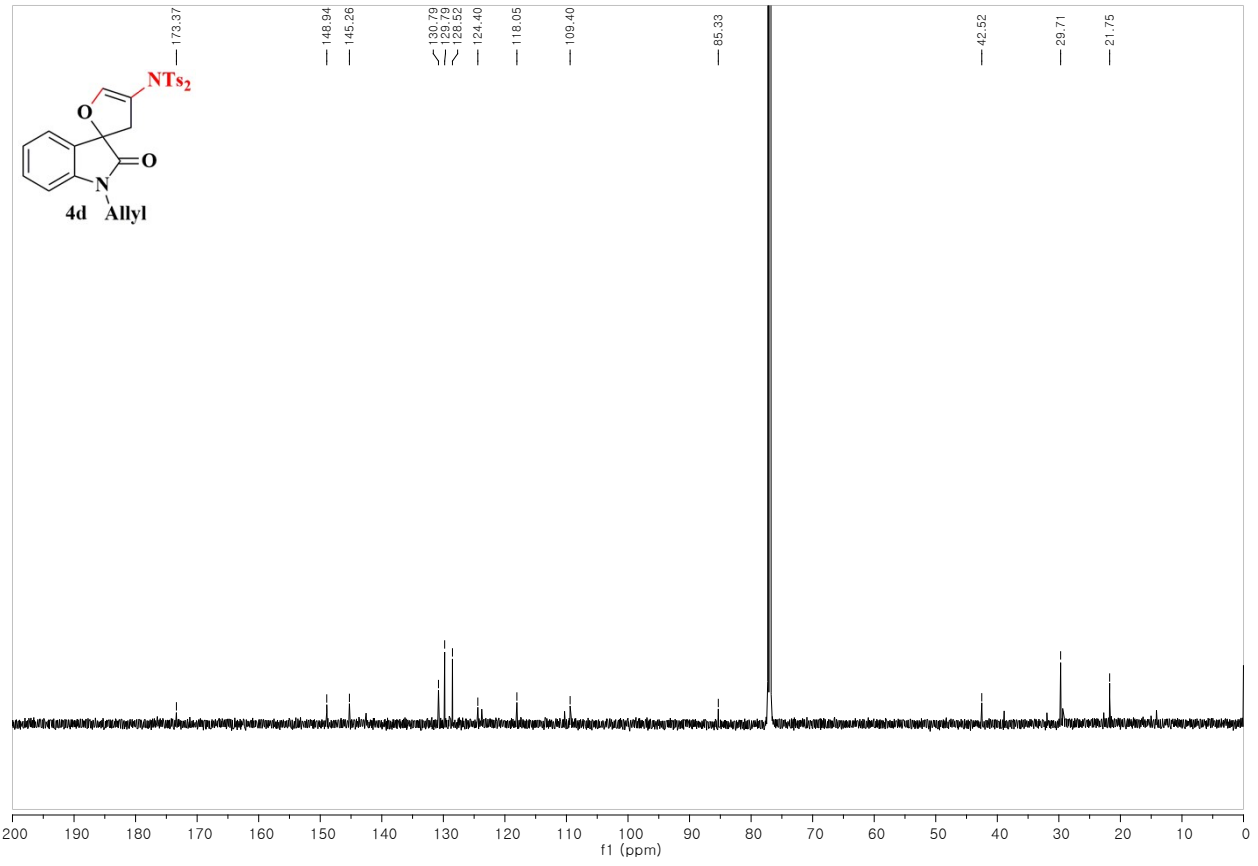
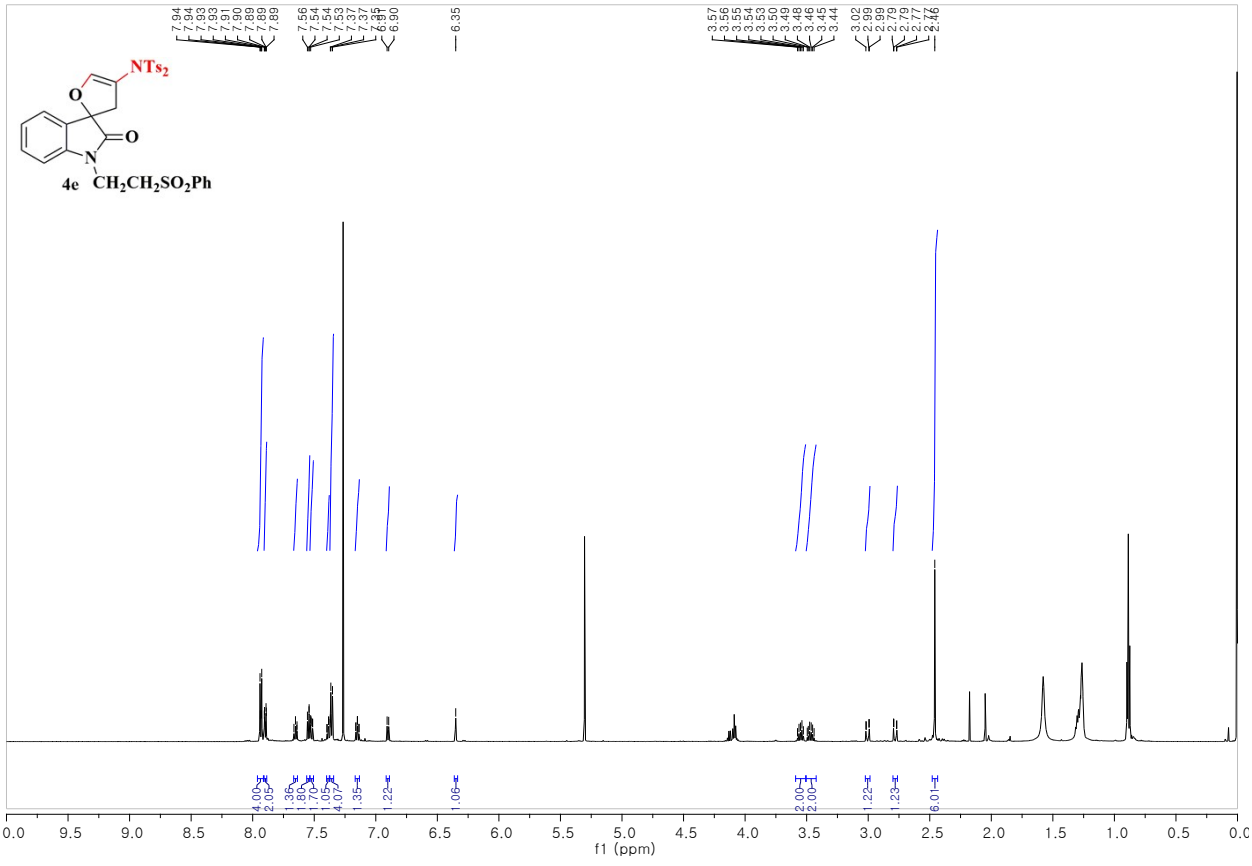
5.85
5.84
5.82
5.81
5.79
5.26
5.23
4.32
4.31
4.30
3.18
3.18
3.14
3.14
3.04
2.93
2.90
2.46
4.00
1.20
4.08
1.30
1.32
1.09
1.00
1.29
2.39
1.98
1.18
1.40
6.00
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

697


NTs2
O
O
N
4d Allyl
173.37
148.94
145.26
130.79
129.79
128.52
124.40
118.05
109.40
85.33
42.52
29.71
21.75
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

698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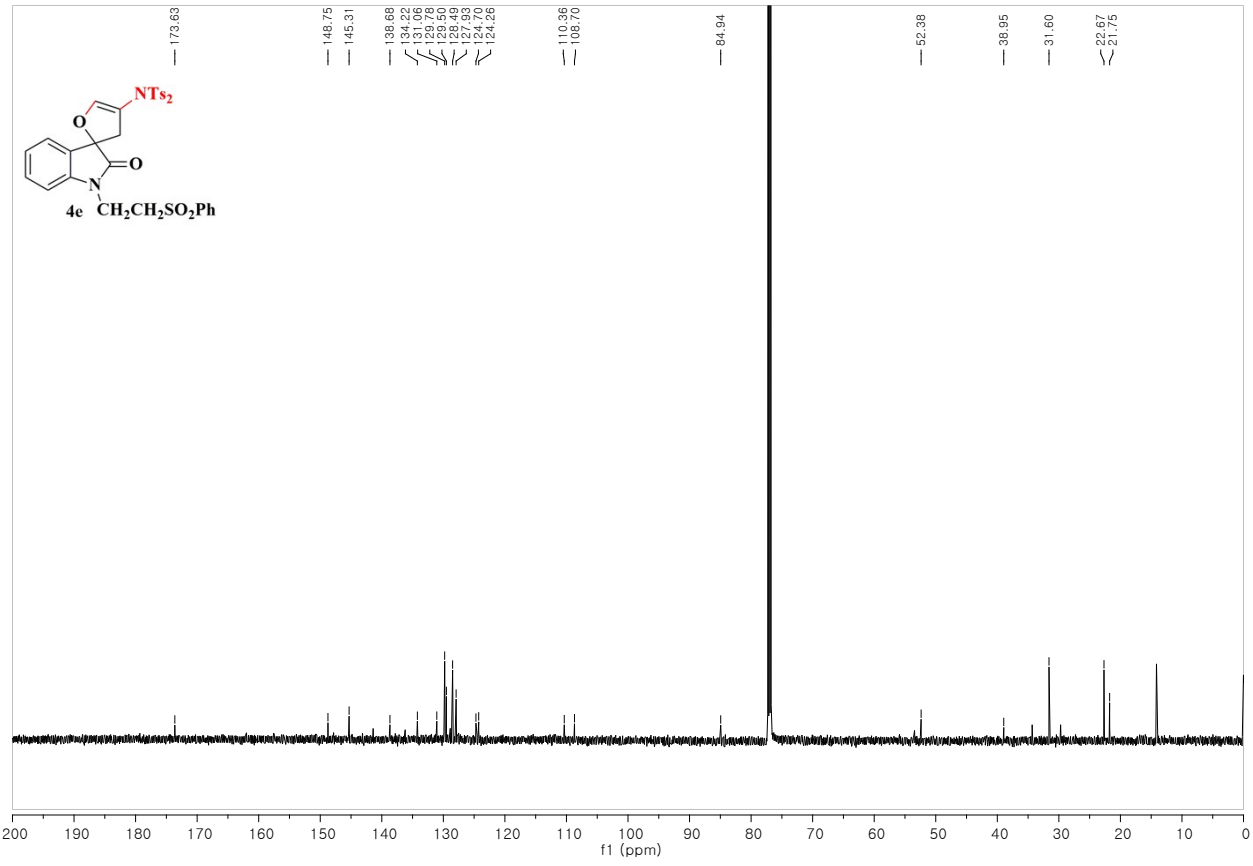
O
O
N
4e CH2CH2SO2Ph
f1 (ppm)

699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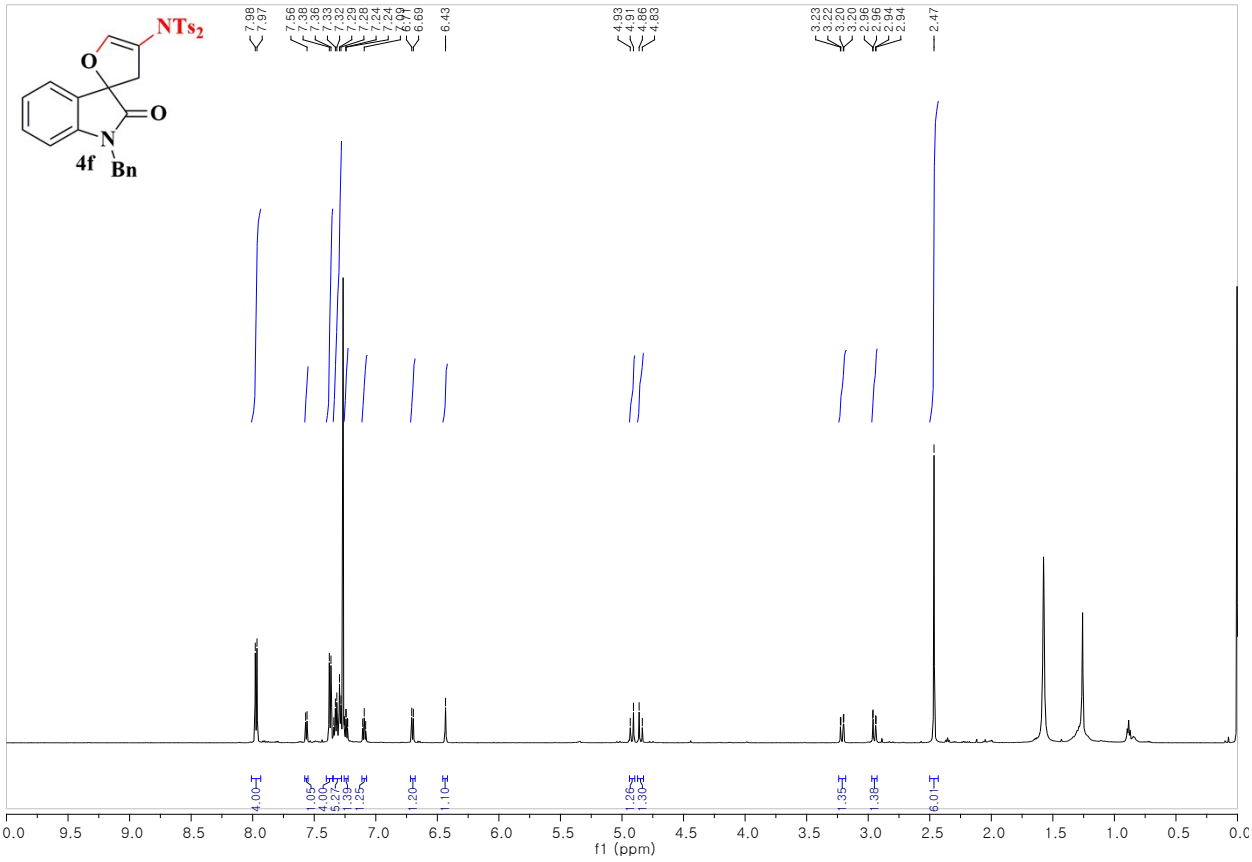
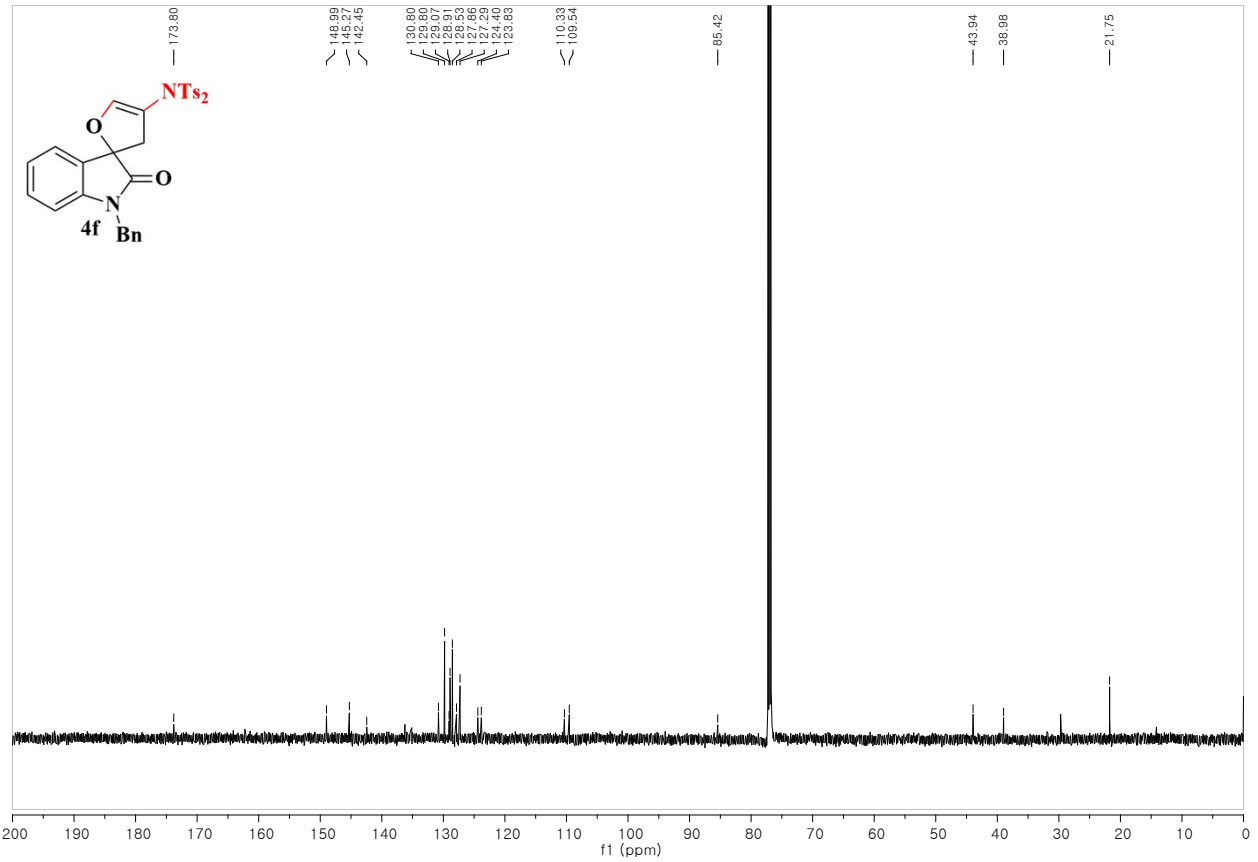
O
O
N
4e CH2CH2SO2Ph
f1 (ppm)

700


NTs2
O
O
N
Bn
4f
7.98
7.97
7.56
7.38
7.36
7.33
7.32
7.29
7.28
7.24
7.24
6.91
6.69
6.43
4.93
4.91
4.86
4.83
3.23
3.22
3.21
3.20
2.96
2.96
2.94
2.94
2.47
4.00
1.05
4.05
5.27
1.39
1.25
1.20
1.10
1.26
1.30
1.35
1.38
6.01
f1 (ppm)

701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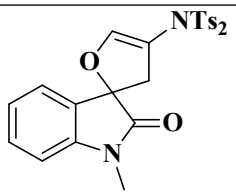
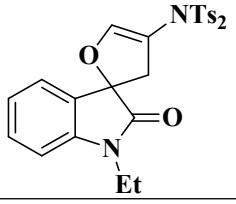
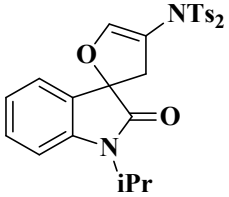
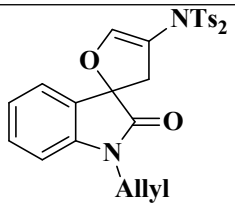
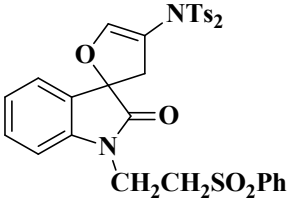
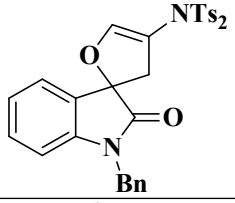
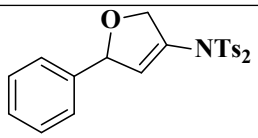
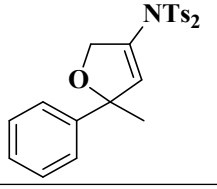
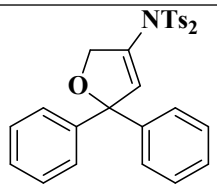
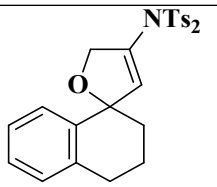
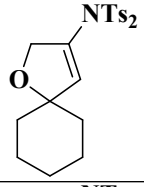
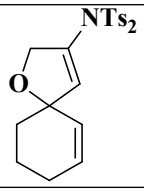
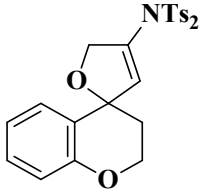
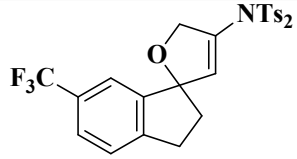
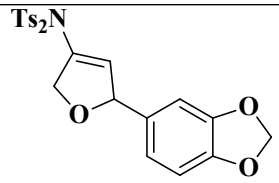
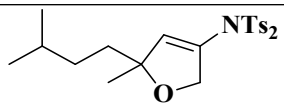
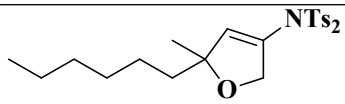
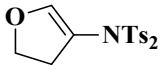
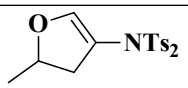
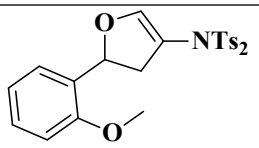
O
O
N
Bn
4f
173.80
148.99
145.27
142.45
130.80
129.80
129.07
128.91
126.53
127.86
127.29
124.40
123.83
110.33
109.54
85.42
43.94
38.98
21.75
f1 (ppm)

702

4. MTT Assay result:

Compound No:	Product	Cell Viability %		
		500µM	50µM	5µM
4a		75.42 ± 19.45	103.81 ± 20.38	94.84 ± 8.90
4b		81.10 ± 17.49	99.76 ± 12.60	101.66 ± 3.51
4c		94.64 ± 2.05	114.38 ± 6.80	117.16 ± 2.41
4d		87.19 ± 4.49	102.80 ± 3.44	101.71 ± 3.50
4e		91.08 ± 1.09	105.79 ± 0.52	96.82 ± 7.99
4f		75.42 ± 0.02	69.93 ± 12.64	70.59 ± 11.60
9a		86.57 ± 0.00	76.54 ± 5.95	82.05 ± 0.47
9b		94.73 ± 6.26	115.59 ± 13.34	109.27 ± 10.46

9c		85.73 ± 24.03	101.56 ± 15.13	105.25 ± 1.55
9d		103.04 ± 3.20	82.71 ± 5.55	91.21 ± 5.29
9e		86.84 ± 15.96	91.03 ± 42.48	94.14 ± 44.90
9f		83.30 ± 4.62	80.56 ± 0.27	81.77 ± 0.87
9g		89.30 ± 1.35	82.18 ± 10.64	81.44 ± 6.51
9i		79.14 ± 4.09	76.80 ± 3.40	75.01 ± 2.89
9j		103.40 ± 3.72	81.74 ± 4.17	87.06 ± 0.59
9k		105.24 ± 12.93	122.76 ± 5.06	126.85 ± 11.29
9l		83.20 ± 8.44	106.47 ± 16.62	101.20 ± 0.10
6a		103 ± 3.20	82.71 ± 5.55	91.21 ± 5.29
6b		77.48 ± 2.73	67.77 ± 9.59	68.66 ± 8.86

6c		82.85 ± 9.33	75.32 ± 1.31	77.21 ± 0.22

704

705 **Material and Method**

706 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-tetrazolium bromide (MTT) assay was
707 performed to evaluate the cell viability according to the method described by Hwang et.al
708 (Hwang et al, 2016). SH-S5Y5 cells at the density of $1*10^4$cells /wall were seeded in the 96 well-
709 cultured plates and incubated in a CO_2 incubator for 24 Hours. Seeded cells were pre-treated with
710 different concentrations of the samples. Treated plates were incubated for 24 hours in the
711 incubator and a cell viability assay was performed. Treated cell's conditioned medium was used
712 to evaluate the attached cells were used to evaluate cell viability assay. Cells were incubated for
713 1h after adding 50 µL MTT solution to each well. After incubation MTT was removed from the
714 well and dimethyl sulfoxide (DMSO, 100µM/ well) was added and the solution get changed to
715 purple/formazan colour. The absorbance was measured spectrophotometrically at 570 nM.

716 MTT reagent converts the formazan by mitochondrial dehydrogenase. The survival rate is
717 increased by using the principle that the amount formed is reduced and the color development is
718 weakened.

719 It is calculated as follows

720 First calculation OD_{570} of each well

721 Second calculation Viability (%) = [$OD_{(570)\,e}$ / $OD_{(570)\,b}$] * 100

722 $OD_{(570)\,e}$ Absorbance of test substance-treated wells

723 $OD_{(570)\,b}$ Absorbance of wells treated with blank test solution

724

725

5. References and Notes

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