

SUPPORTING INFORMATION

Photoredox Mediated Synthesis of Functionalized Sulfoxides from Terminal Alkynes

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1. General Information

All reactions were carried out in oven-dried glassware. The solvents used were purified by distillation. The reactions were irradiated using a regular blue light-emitting diode (LED) strip purchased from market (Manufacturer: GM Modular, Model: Zodion 5050SMD; 60 LEDs per meter, 14 Lumens per LED, 12V strip Light at 460 nm). Irradiation occurred along the sides at a uniform distance of 5 cm. ¹H and ¹³C NMR spectra were recorded on FT-NMR 500 and 400 MHz instruments. Chemical data for protons are reported in parts per million (ppm) downfield from tetramethylsilane and are referenced to the residual proton in the NMR solvent (CDCl₃, 7.26 ppm). Carbon nuclear magnetic resonance spectra (¹³C NMR) were recorded at 125 MHz or 100 MHz: chemical data for carbons are reported in parts per million (ppm, δ scale) downfield from tetramethylsilane and are referenced to the carbon resonance of the solvent. Coupling constants (J) are quoted in Hz. Mass spectra were obtained using Q-TOF-LC/MS spectrometer using electron spray ionization.

Abbreviations: TEMPO = 2,2,6,6-tetramethylpiperidine-1-oxyl, TLC = thin layer chromatography, DIPEA = N,N-diisopropylethylamine, EA = ethyl acetate, MeOH = methanol.

2. General Synthetic Procedures:

Method A: Synthesis of α -alkoxysulfoxides and α,β -dialkoxysulfoxides

To the oven dried 5 mL glass vial was added phenylacetylene (100 μ L, 1 mmol) in 1 mL MeOH followed by addition of Ru(bpy)₃Cl₂ (7.33 mg, 1 mol %), 1-octanethiol (215 μ L, 1.5 mmol) and DIPEA (63.3 μ L, 0.5 mmol). The reaction mixture was then irradiated under an air atmosphere under blue light sourced from blue LED strips for 4 h. After the completion of reaction, as monitored by TLC, the reaction mixture was extracted with ethyl acetate and water. The aqueous layers were then washed with sodium bicarbonate (NaHCO₃) and again extracted with ethyl acetate. The combined organic layers were dried over Na₂SO₄ and concentrated under vacuum. The crude mixture was purified by silica gel column chromatography using (hexane/EA = 97:3) as solvent system to obtain pure product **3** as colourless oily liquid (217 mg, 70% yield).

Method B: Synthesis of β -ketosulfoxides and vinyl sulfoxides

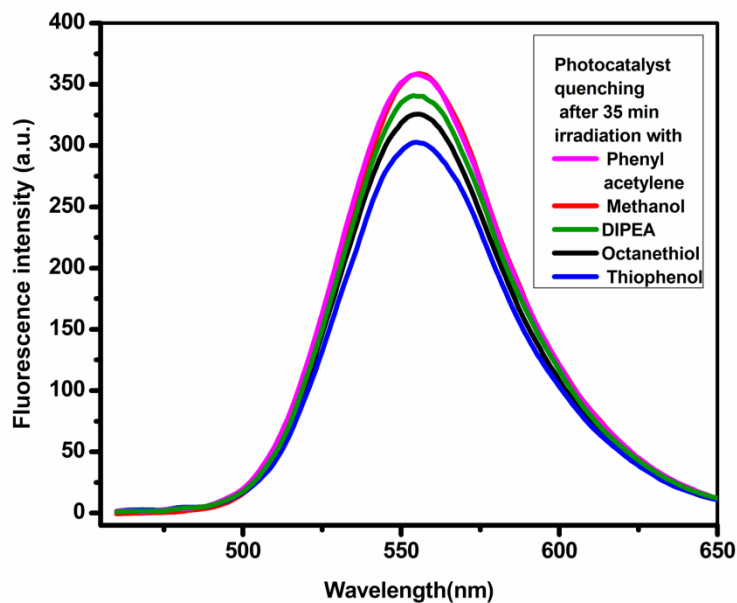
To the oven dried 5 mL glass vial was added phenylacetylene (100 μ L, 1 mmol) in 1 mL MeCN followed by addition of Ru(bpy)₃Cl₂ (7.33 mg, 1 mol %), thiophenol (161.7 μ L, 1.5 mmol) and DIPEA (63.3 μ L, 0.5 mmol). The reaction mixture was then irradiated under an air atmosphere under blue light sourced from blue LED strips for 4 h. After the completion of reaction, as monitored by TLC, the reaction mixture was extracted with ethyl acetate and water. The aqueous layers were then washed with sodium bicarbonate (NaHCO₃) and again extracted with ethyl acetate. The combined organic layers were dried over Na₂SO₄ and concentrated under vacuum. The crude mixture was purified by silica gel column chromatography using (hexane/EA = 78:22) as solvent system to obtain pure product **37** as yellow oily liquid (163 mg, 67% yield).

Note: For the synthesis of vinyl sulfoxides, H₂O was taken as a solvent.

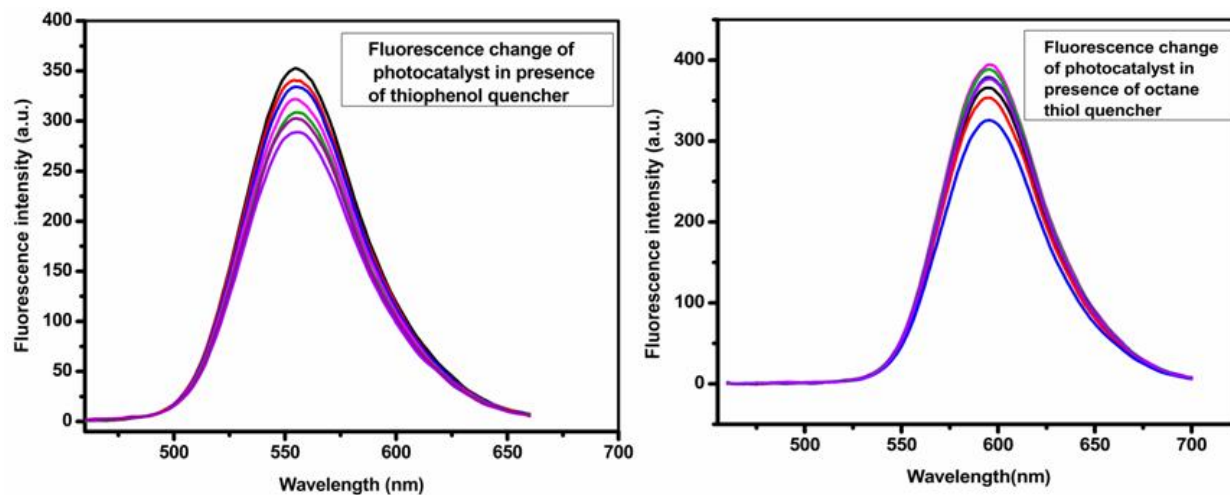
3. Luminescence quenching experiments and Stern-Volmer plots

Photo luminescence quenching studies are important descriptors for mechanistic investigation of synthetic reactions involving photoredox catalysis. Stern-Volmer analysis of Fluorescence quenching experiment is a vital parameter in the elucidation of rate with which photocatalyst interacts with reaction ingredients. In order to arrive at the plausible mechanism of current photocatalytic reaction, we attempted comparative fluorescence quenching experiments of [Ru(bpy)₃]²⁺ photocatalyst with reaction ingredients. The fluorescence profile of [Ru(bpy)₃]²⁺ photocatalyst in methanol solvent and in presence of equimolar quantity of reaction ingredients

{thiophenol, 1-octanethiol, diisopropylethylamine and phenylacetylene} as quenchers was monitored after 5 minutes irradiation cycle with 12 W Blue LEDs for 35 minutes at 25 °C using Shimadzu-RF5301PC, Spectrofluorometer.



The emission was recorded in the range of 460 to 700 nm with an observed maximum at 590 nm after excitation of photo catalyst in methanol solvent at 450 nm in presence of equimolar quantity of quenchers and is shown in Figure S1.



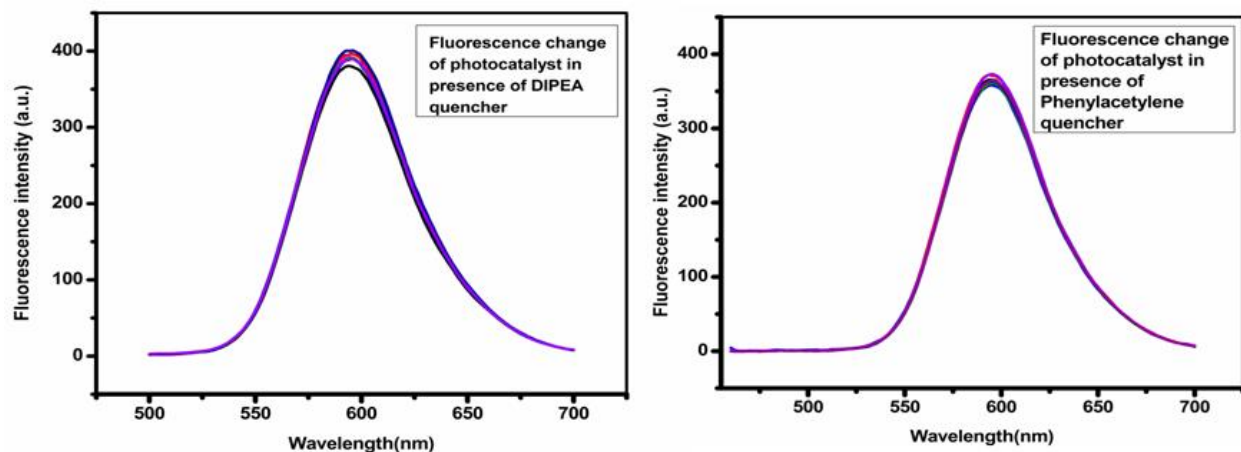


Figure S1: The fluorescence profile of $[\text{Ru}(\text{bpy})_3]^{2+}$ photocatalyst in presence of equimolar concentrations of reaction ingredients as quenchers at 25°C in methanol solvent.

The Stern Volmer equation: $I_0/I = 1 + K [Q]$ was used to compute quenching constants of $[\text{Ru}(\text{bpy})_3]^{2+}$ photocatalyst under experimental conditions of equimolar concentration, 25°C and methanol solvent. The quenching constants of reaction ingredients were calculated from their corresponding Stern Volmer plots and are summarized in table 1.

Table 1: Stern Volmer quenching constants of reaction ingredients.

Quencher	Stern Volmer constant (Ksv)
Thiophenol	$2.9 \cdot 10^3$
1-octanethiol	$2.57 \cdot 10^3$
DIPEA	$1.16 \cdot 10^3$
Phenylacetylene	$8.264 \cdot 10^2$
Methanol	$5.823 \cdot 10^2$

The observed fluorescence profiles and computed quenching constants (table 1) of the reaction ingredients, indicate these to be in following quenching order: thiophenol > 1-octanethiol > diisopropylethylamine > phenylacetylene > methanol Figure S2

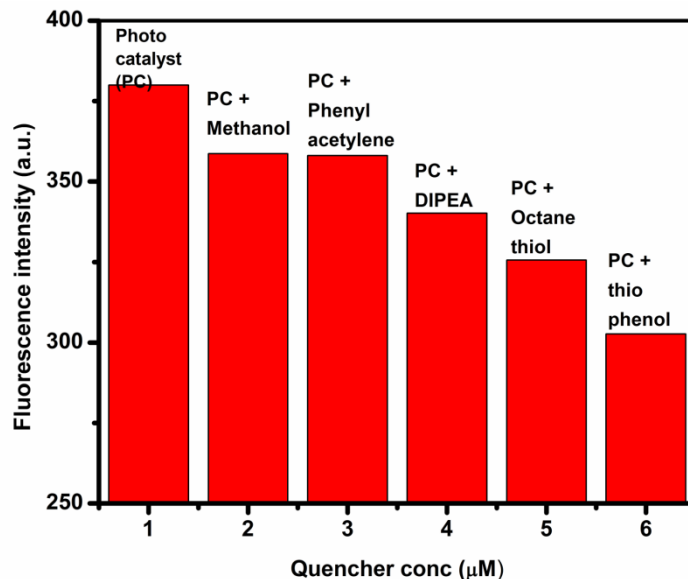


Figure S2: Relative quenching propensities of reaction ingredients (equimolar quantity) towards $[\text{Ru}(\text{bpy})_3]^{2+}$ photocatalyst in methanol solvent.

Thus, Stern Volmer analysis predict thiophenol as effective quencher of the photocatalyst which suggests a possible single electron transfer reaction between photoexcited $[\text{Ru}(\text{bpy})_3]^{2+}$ catalyst as depicted in the plausible reaction mechanism Scheme 4.

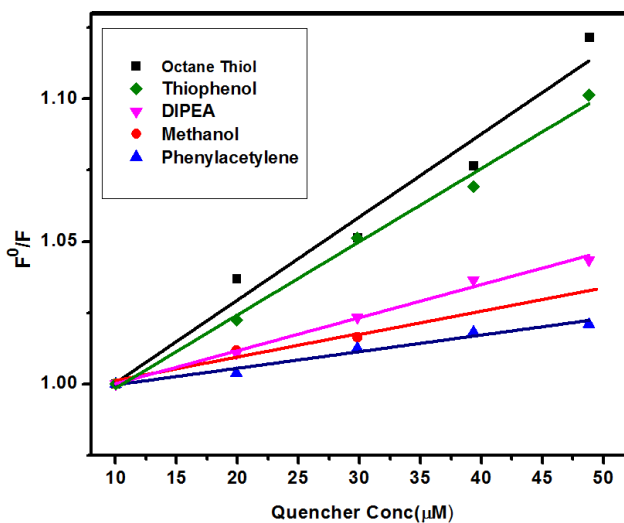


Figure S3: Stern-Volmer plots presenting concentration dependent quenching of photocatalyst $[\text{Ru}(\text{bpy})_3]^{2+}$ for the reaction ingredients.

The proposed single electron transfer (SET) reaction between photoexcited $[\text{Ru}(\text{bpy})_3]^{2+}$ catalyst and thiophenol (scheme 4) was explored from a parallel experiment using UV-Visible

absorbance Spectrophotometry. The absorbance of photoexcited $[\text{Ru}(\text{bpy})_3]^{2+}$ was observed to decrease with increasing concentration of thiophenol under first order kinetics FigureS4.

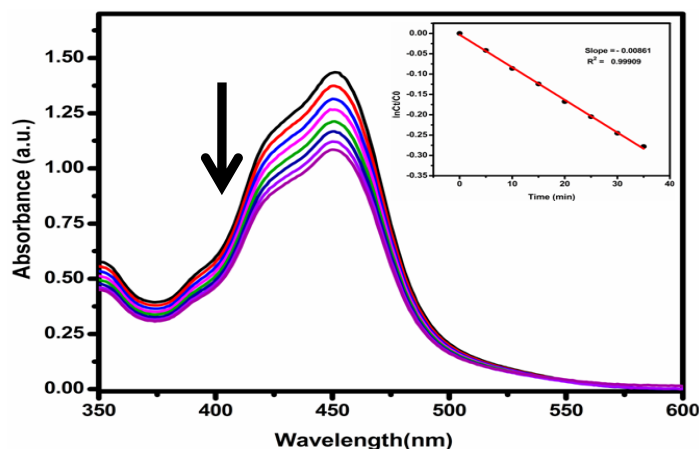
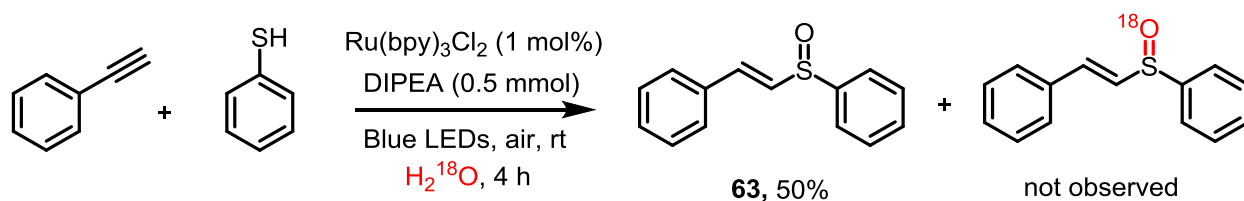


Figure S4: Absorption changes in photo-excited $[\text{Ru}(\text{bpy})_3]^{2+}$ photocatalyst with increasing thiophenol concentration. Inset: First order kinetic fitting of absorbance changes.

As is seen from Figure S3, with increasing addition of thiophenol to photoexcited $[\text{Ru}(\text{bpy})_3]^{2+}$ a steady decrease in absorbance at λ 470nm (corresponding to $[\text{Ru}(\text{bpy})_3]^{2+}$ complex) occurs indicating a possible redox reaction with thiophenol. Besides the possibility of a single electron redox reaction between the photoexcited $[\text{Ru}(\text{bpy})_3]^{2+}$ and thiophenol can be predicted from their corresponding redox potentials. $\{E(\text{Ru}^{2+*}/\text{Ru}^+) = 0.84 \text{ V}$ and $E(\text{PhS-SPh}/\text{PhSH}) = 0.4 \text{ V}$. Thus, thermodynamically thiophenol is capable of the single electron transfer reaction with photoexcited $[\text{Ru}(\text{bpy})_3]^{2+}$ in which thiophenol gets oxidized to thiyl radical with the reductive quenching of $[\text{Ru}^{\text{II}}(\text{bpy})_3]^{2+*}$ to $[\text{Ru}^{\text{I}}(\text{bpy})_3]^+$ which is also in confirmation to literature reports.¹ Moreover, isolation of the diphenyl disulfide as the oxidized side product in the reaction mixture confirms the redox reaction. Thus, fluorescence, absorption studies and redox potentials are in agreement to plausible reaction mechanism (Scheme 4) of the manuscript.

4. The ^{18}O -isotope labeling experiment using H_2^{18}O :

Experiment 4a:



To an oven dried 5 mL glass vial equipped with a magnetic stir bar was added $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol %) in H_2^{18}O (200 μl , 97 atom % ^{18}O). It was followed by addition of phenylacetylene (10 μl , 0.095 mmol), thiophenol (15.4 μL , 0.14 mmol), DIPEA (6 μL , 0.045 mmol). The reaction mixture was then irradiated under blue LEDs at room temperature for a period of 4 hours. The crude reaction mixture was used for LC-MS analysis without purification. The results showed no incorporation of ^{18}O in the final product, indicating the oxygen is sourced from air.

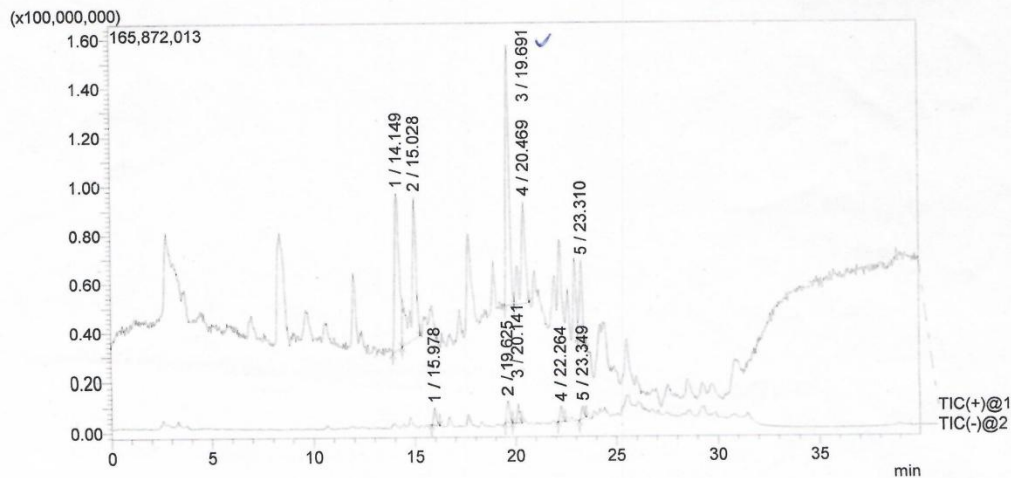
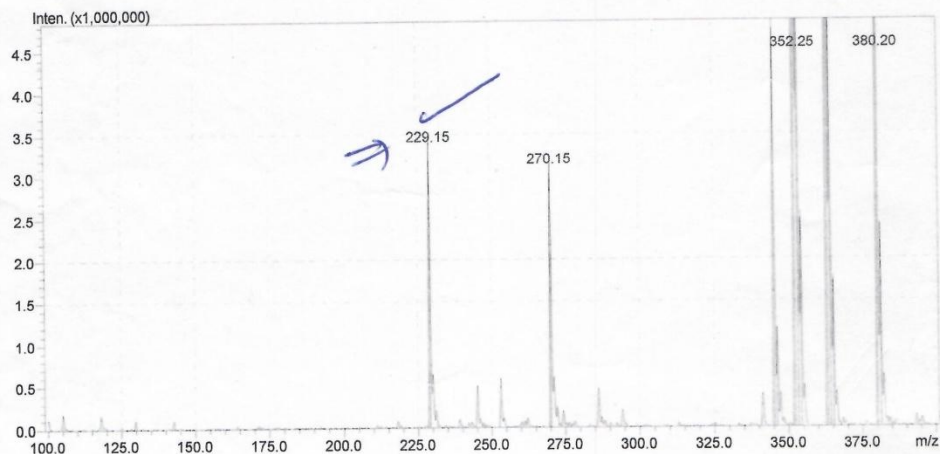


Analysis Report

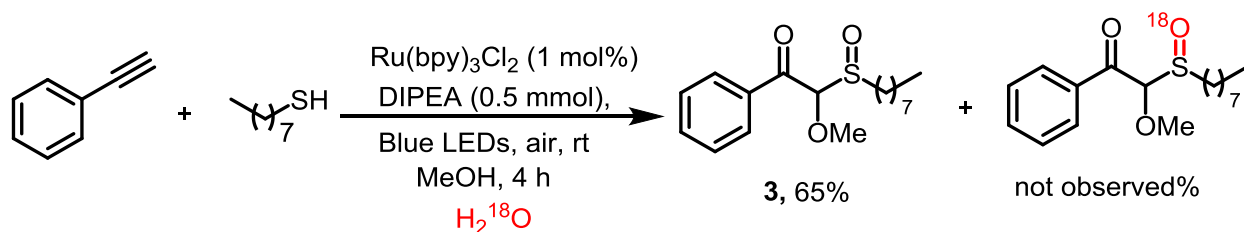
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Experiment 4b:



To an oven dried 5 mL glass vial equipped with a magnetic stir bar was added $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol%) in dry methanol (1 ml). This was followed by addition of phenylacetylene (20 μl , 0.19 mmol), 1-octanethiol (41 μl , 0.28 mmol), DIPEA (17.5 μl , 0.09 mmol). 10 μl of H_2^{18}O (97 atom % ^{18}O) was added to the mixture through microsyringe. The reaction mixture was then irradiated under blue LEDs at room temperature for a period of 4 hours. The crude reaction mixture was used for LC-MS analysis without purification. The results again showed no incorporation of ^{18}O in the final product, indicating the oxygen is sourced from air.



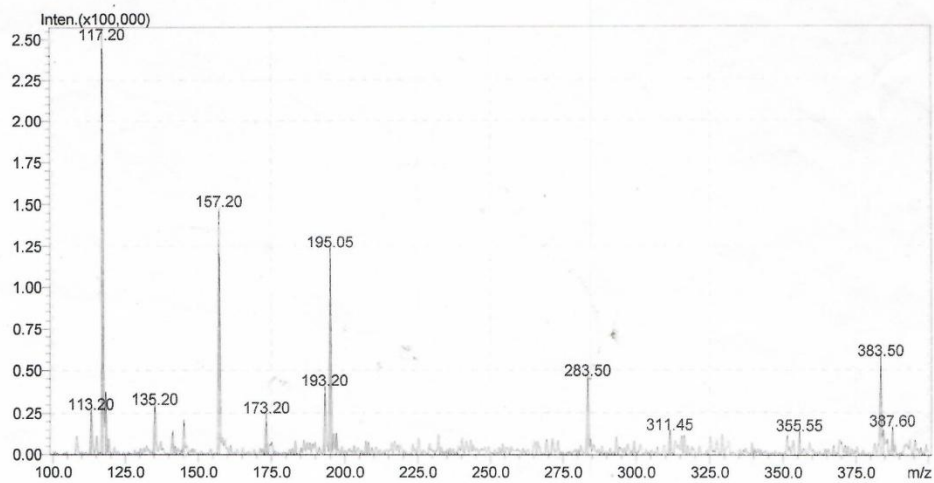
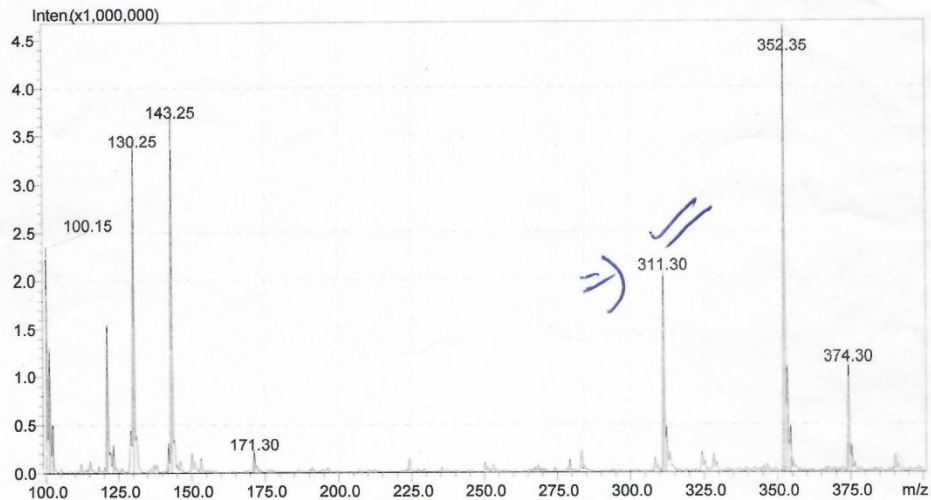
Analysis Report

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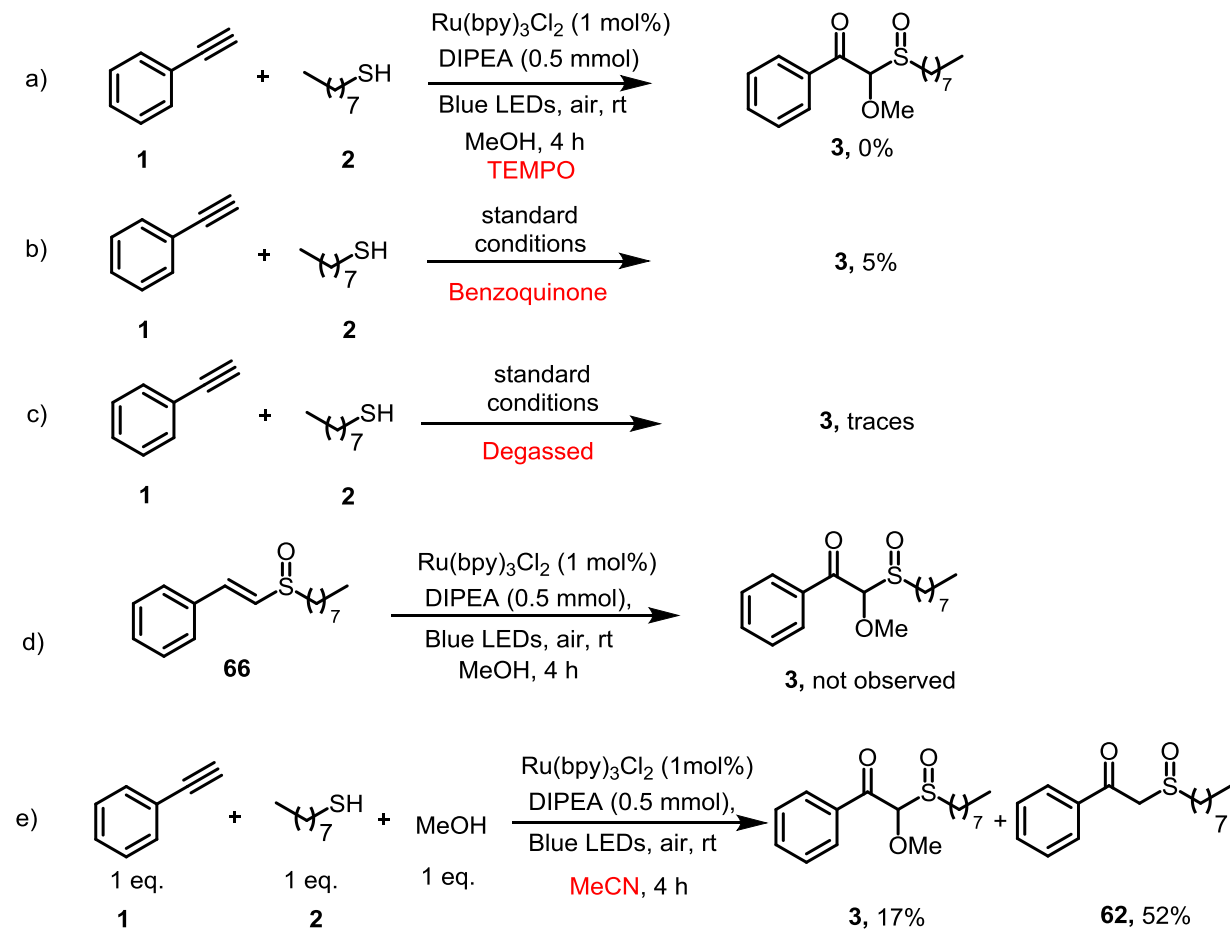
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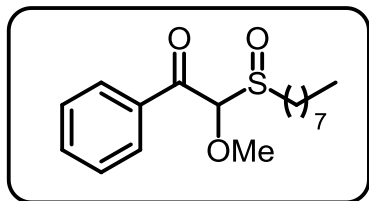
4. Control Experiments:



Reference

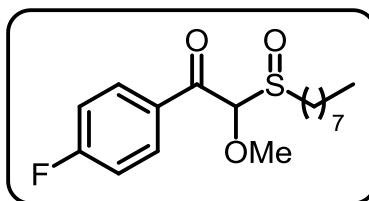
- (1) Tyson, E. L.; Ament, M. S.; Yoon, T. P. *J. Org. Chem.* **2013**, *78*, 2046.
- (2) Keshari, T.; Yadav, V. K.; Srivastava, V. P.; Yadav, L. D. S. *Green Chem.* **2014**, *16*, 3986.
- (3) Zhang, Y.; Wong, Z. R.; Wu, X.; Lauw, S. J. L.; Huang, X.; Webstera, R. D.; Chi, Y. R. *Chem. Commun.* **2017**, *53*, 184.

2-methoxy-2-(octylsulfinyl)-1-phenylethan-1-one (3).



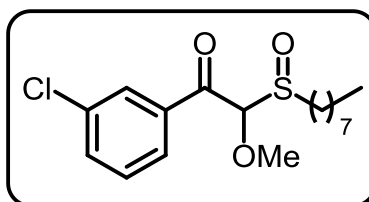
The title compound was prepared according to the method A by taking phenylacetylene (20 μ l, 0.19 mmol), 1-octanethiol (41 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol%) and methanol (1 ml) as solvent and purified by column chromatography (hexane: EA= 97:3) as colourless oily liquid (42 mg, 70%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.86 (t, 3H, *J* = 6.9 Hz), 1.20–1.32 (m, 10H), 1.44–1.57 (m, 2H), 2.45 (ddd, 1H, *J* = 12.5, 8.1, 6.8 Hz), 2.58 (ddd, 1H, *J* = 12.5, 8.2, 6.7 Hz), 3.55 (s, 3H), 5.65 (s, 1H), 7.41–7.48 (m, 2H), 7.49–7.61 (m, 1H), 7.82–8.13 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.1, 22.6, 28.3, 28.9, 29.1, 29.1, 29.4, 31.8, 55.9, 84.7, 128.5, 128.7, 133.3, 134.3, 190.7. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₇H₂₇O₃S, 311.1675; found: 311.1668.

1-(4-fluorophenyl)-2-methoxy-2-(octylsulfinyl)ethan-1-one (4).



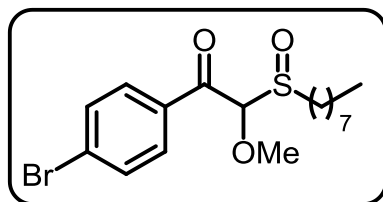
The title compound was prepared according to the method A by taking 4-fluorophenylacetylene (20 μ l, 0.16 mmol), 1-octanethiol (35 μ L, 0.24 mmol), DIPEA (14.7 μ L, 0.08 mmol), Ru(bpy)₃Cl₂ (1.2 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 98:2) as colourless oily liquid (32 mg, 59%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.86 (t, 3H, *J* = 6.9 Hz), 1.22 (s, 6H), 1.29 (dd, 4H, *J* = 17.9, 6.8 Hz), 1.47–1.57 (m, 2H), 2.45 (ddd, 1H, *J* = 12.5, 8.0, 6.9 Hz), 2.54–2.61 (m, 1H), 3.55 (s, 3H), 5.57 (s, 1H), 7.06–7.18 (m, 2H), 7.96–8.14 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 100 MHz): δ - 14.0, 22.6, 28.8, 28.9, 29.0, 29.1, 29.4, 31.8, 55.9, 85.4, 115.6, 115.8, 131.5 (d, *J* = 9.3 Hz), 165.8 (d, *J* = 255.5 Hz), 189.4. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₇H₂₆FO₃S, 329.1581; found: 329.1578.

1-(3-chlorophenyl)-2-methoxy-2-(octylsulfinyl)ethan-1-one (5).



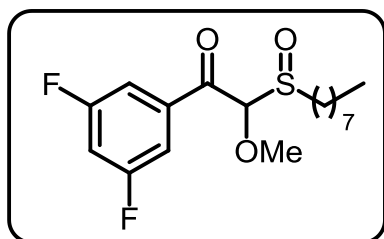
The title compound was prepared according to the method A by taking 3-chlorophenylacetylene (20 μ l, 0.14 mmol), 1-octanethiol (30.7 μ l, 0.21 mmol), DIPEA (13 μ L, 0.07 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 97:3) as colourless liquid (28 mg, 55%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.89 (t, 3H, *J* = 6.9 Hz); 1.23–1.32 (m, 10H), 1.52 (dt, 2H, *J* = 13.7, 7.1 Hz), 2.45 (ddd, 1H, *J* = 12.5, 8.1, 6.9 Hz), 2.58 (ddd, 1H, *J* = 12.5, 8.2, 6.7 Hz), 3.59 (s, 3H), 5.62 (s, 1H), 8.01 (t, 1H, *J* = 1.8 Hz), 7.42 (t, 1H, *J* = 7.9 Hz), 7.56 (ddd, 1H, *J* = 8.0, 2.0, 0.9 Hz), 7.90 (d, 1H, *J* = 7.8 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.1, 22.6, 28.2, 28.9, 29.1, 29.1, 29.3, 31.8, 55.1, 84.7, 126.8, 128.8, 129.9, 133.3, 134.9, 135.9, 189.3. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₇H₂₆ClO₃S, 345.1286; found: 345.1289.

1-(4-bromophenyl)-2-methoxy-2-(octylsulfinyl)ethan-1-one (6).



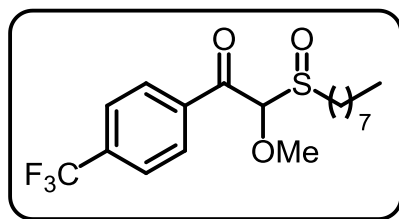
The title compound was prepared according to the method A by taking 4-bromophenylacetylene (20 μ l, 0.11 mmol), 1-octanethiol (24 μ L, 0.16 mmol), DIPEA (10 μ L, 0.05 mmol), Ru(bpy)₃Cl₂ (0.8 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 97:3) as colourless oily liquid (27 mg, 62%). ¹H NMR (CDCl₃, 400 MHz) δ - 0.87 (t, 3H, *J* = 6.9 Hz), 1.22–1.32 (m, 10H), 1.51 (td, 2H, *J* = 14.4, 6.8 Hz), 2.43 (ddd, 1H, *J* = 12.5, 8.0, 6.8 Hz), 2.56 (ddd, 1H, *J* = 12.5, 8.2, 6.7 Hz), 3.55 (s, 3H), 7.82–7.91 (m, 2H), 5.57 (s, 1H) 7.56–7.63 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz) δ - 14.1, 22.6, 28.5, 28.9, 29.0, 29.1, 29.4, 31.8, 55.1, 84.1, 128.5, 130.3, 131.9, 132.1, 189.8. HRMS (ESI) (*m/z*): [M+Na]⁺ calculated for C₁₇H₂₅BrNaO₃S, 411.0600; found: 411.0576.

1-(3,5-difluorophenyl)-2-methoxy-2-(octylsulfinyl)ethan-1-one (7).



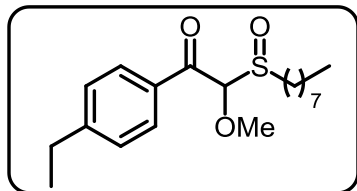
The title compound was prepared according to the method A by taking 3,5-difluorophenylacetylene (20 μ l, 0.14 mmol), 1-octanethiol (30.7 μ L, 0.21 mmol), DIPEA (13 μ L, 0.07 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 96:4) as colourless oily liquid (26 mg, 53%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.87 (t, 3H, *J* = 6.9 Hz), 1.22–1.33 (m, 10H), 1.51 (dd, 2H, *J* = 14.4, 6.8 Hz), 2.40–2.47 (m, 1H), 2.52–2.60 (m, 1H), 3.56 (s, 3H), 5.50 (s, 1H), 7.01 (tt, 1H, *J* = 8.4, 2.3 Hz), 7.47–7.59 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.9, 22.6, 28.7, 29.0, 29.1, 29.3, 31.8, 56.0, 85.1, 108.7 (t, *J* = 25.4 Hz), 111.8 (dd, *J* = 20.3, 6.5 Hz), 128.0 (d, *J* = 56.7 Hz), 137.1 (t, *J* = 7.9 Hz), 162.9 (dd, *J* = 250.7, 11.8 Hz), 188.0. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₇H₂₅F₂O₃S, 347.1487; found: 347.1488.

2-methoxy-2-(octylsulfinyl)-1-(4-(trifluoromethyl)phenyl)ethan-1-one (8).



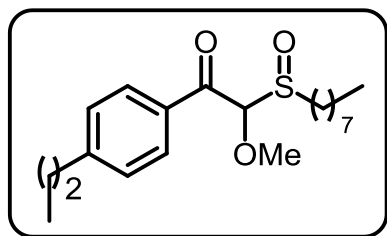
The title compound was prepared according to the method A by taking 4-(trifluoromethyl)phenylacetylene (20 μ l, 0.11 mmol), 1-octanethiol (24 μ L, 0.16 mmol), DIPEA (10 μ L, 0.05 mmol), Ru(bpy)₃Cl₂ (0.8 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 96:4) as colourless oily liquid (22 mg, 51%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.88 (t, 3H, *J* = 6.8 Hz), 1.24–1.39 (m, 10H), 1.56–1.68 (m, 2H), 2.45–2.52 (m, 1H), 2.58–2.66 (m, 1H), 3.54 (s, 3H), 5.26 (s, 1H), 7.58 (dt, 3H, *J* = 26.4, 13.9 Hz), 7.68–7.74 (m, 1H). ¹³C{¹H} NMR (CDCl₃, 100 MHz): δ - 14.0, 22.6, 28.7, 28.9, 29.0, 29.1, 29.4, 31.7, 56.0, 85.5, 125.5 (dd, *J* = 7.4, 3.7 Hz), 129.1, 134.4, 134.7, 137.2, 189.6. HRMS (ESI) (*m/z*): [M+Na]⁺ calculated for C₁₈H₂₅F₃NaO₃S, 401.1369; found: 401.1354.

1-(4-ethylphenyl)-2-methoxy-2-(octylsulfinyl)ethan-1-one (9).



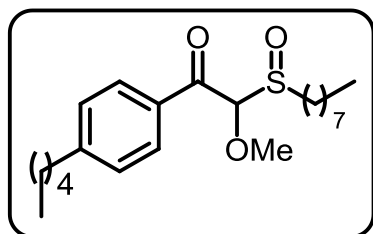
The title compound was prepared according to the method A by taking 4-ethylphenylacetylene (20 μ L, 0.15 mmol), 1-octanethiol (33 μ L, 0.22 mmol), DIPEA (13.8 μ L, 0.07 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 97:3) as colourless oily liquid (29 mg, 56%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.85 (d, 3H, J = 7.0 Hz), 1.21–1.28 (m, 13H), 1.52 (dd, 2H, J = 14.6, 7.6 Hz), 2.41–2.49 (m, 1H), 2.57 (ddd, 1H, J = 12.4, 6.2, 2.3 Hz), 2.67–2.73 (m, 2H), 3.55 (s, 3H), 5.63 (s, 1H), 7.25–7.28 (m, 2H), 7.93 (d, 2H, J = 8.3 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.1, 15.1, 22.6, 28.3, 28.9, 29.0, 29.1, 29.1, 29.4, 31.8, 55.9, 84.7, 128.1, 128.9, 131.9, 150.4, 190.4. HRMS (ESI) (m/z): [M+H]⁺ calculated for C₁₉H₃₁O₃S, 339.1988; found: 339.1982.

2-methoxy-2-(octylsulfinyl)-1-(4-propylphenyl)ethan-1-one (10).



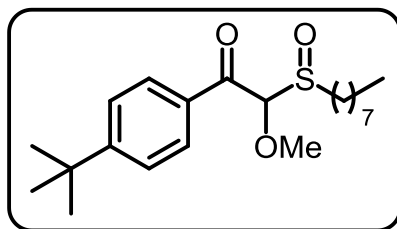
The title compound was prepared according to the method A by taking 4-n-propylphenylacetylene (20 μ L, 0.14 mmol), 1-octanethiol (30.7 μ L, 0.21 mmol), DIPEA (13 μ L, 0.07 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 97:3) as colourless oily liquid (29 mg, 59%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.86 (t, 3H, J = 6.9 Hz), 0.95 (t, 3H, J = 7.4 Hz), 1.22–1.35 (m, 10H), 1.48–1.56 (m, 2H), 1.64–1.70 (m, 2H), 2.42–2.50 (m, 1H), 2.57 (td, 1H, J = 6.2, 2.6 Hz), 2.62–2.66 (m, 2H), 3.55 (s, 3H), 5.63 (s, 1H), 7.25 (d, 2H, J = 7.6 Hz), 7.92 (d, 2H, J = 8.3 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 13.8, 14.1, 22.6, 24.1, 28.3, 28.9, 29.1, 29.1, 29.4, 31.8, 38.1, 55.9, 84.7, 128.7, 128.8, 131.9, 148.9, 190.4. HRMS (ESI) (m/z): [M-H]⁻ calculated for C₂₀H₃₁O₃S, 351.1988; found: 351.2002.

2-methoxy-2-(octylsulfinyl)-1-(4-pentylphenyl)ethan-1-one (11).



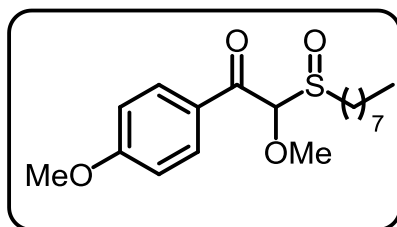
The title compound was prepared according to the method A by taking 4-n-pentylphenylacetylene (20 μ L, 0.11 mmol), 1-octanethiol (24 μ L, 0.16 mmol), DIPEA (10 μ L, 0.05 mmol), Ru(bpy)₃Cl₂ (0.8 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 97:5) as colourless oily liquid (23 mg, 54%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.88 (dt, 6H, J = 13.3, 6.7 Hz), 1.24 (d, 7H, J = 12.6 Hz), 1.29–1.37 (m, 7H), 1.50 (dd, 2H, J = 14.7, 6.9 Hz), 1.61–1.67 (m, 2H), 2.42–2.49 (m, 1H), 2.54–2.60 (m, 1H), 2.63–2.68 (m, 2H), 3.55 (s, 3H), 5.63 (s, 1H), 7.25 (d, 2H, J = 7.0 Hz), 7.92 (d, 2H, J = 8.3 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.0, 14.1, 22.5, 22.6, 28.3, 28.9, 29.1, 29.1, 29.4, 31.5, 30.7, 31.8, 36.0, 55.9, 84.6, 128.6, 128.8, 131.9, 149.2, 190.4. HRMS (ESI) (m/z): [M+Na]⁺ calculated for C₂₂H₃₆NaO₃S, 403.2277; found: 403.2269.

1-(4-(tert-butyl)phenyl)-2-methoxy-2-(octylsulfinyl)ethan-1-one (12).



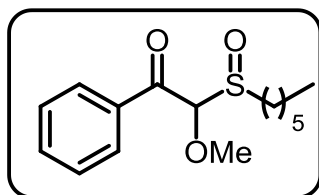
The title compound was prepared according to the method A by taking 4-*tert*-butylphenylacetylene (20 μ l, 0.12 mmol), 1-octanethiol (26 μ L, 0.18 mmol), DIPEA (11 μ L, 0.06 mmol), Ru(bpy)₃Cl₂ (0.9 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 96:4) as colourless oily liquid (28 mg, 61%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.86 (t, 3H, J = 6.9 Hz), 1.22–1.32 (m, 10H), 1.34 (s, 9H), 1.48–1.56 (m, 2H), 2.45 (ddd, 1H, J = 12.4, 8.1, 6.8 Hz), 2.59 (ddd, 1H, J = 12.5, 8.3, 6.7 Hz), 3.55 (s, 3H), 5.63 (s, 1H), 7.46 (d, 2H J = 6.8 Hz), 7.94 (d, 2H, J = 6.8 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.1, 22.6, 28.4, 28.9, 29.1, 29.1, 29.4, 31.1, 31.8, 35.2, 55.9, 84.8, 125.5, 128.6, 131.6, 157.1, 190.4. HRMS (ESI) (m/z): [M+Na]⁺ calculated for C₂₁H₃₄NaO₃S, 389.2121; found: 389.2128.

2-(ethylsulfinyl)-2-methoxy-1-(4-methoxyphenyl)ethan-1-one (13).



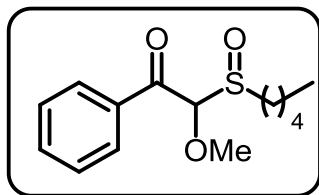
The title compound was prepared according to the method A by taking p-tolylacetylene (20 μ l, 0.15 mmol), 1-octanethiol (32 μ l, 0.22 mmol), DIPEA (13.8 μ l, 0.07 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol%) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 96:4) as colourless oily liquid (28 mg, 55%). ¹H NMR (400 MHz, CDCl₃): δ - 0.86 (d, 3H, J = 5.4 Hz), 1.24 (d, 10H, J = 13.1 Hz), 1.52 (dd, 2H, J = 14.5, 7.4 Hz), 2.41–2.51 (m, 1H), 2.55–2.65 (m, 1H), 3.52 (d, 3H, J = 21.3 Hz), 3.85 (d, 3H, J = 17.7 Hz), 5.60 (s, 1H), 6.93 (d, 2H, J = 8.9 Hz), 8.01 (d, 2H, J = 8.9 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.1, 22.6, 28.4, 28.9, 29.1, 29.5, 29.7, 31.8, 55.5, 55.9, 84.8, 113.8, 127.0, 131.1, 163.8, 189.7. HRMS (ESI) (m/z): [M+Na]⁺ calculated for C₁₈H₂₈NaO₄S, 363.1601; found: 363.1623.

2-(hexylsulfinyl)-2-methoxy-1-phenylethan-1-one (14).



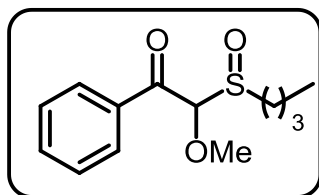
The title compound was prepared according to the method A by taking phenylacetylene (20 μ l, 0.19 mmol), 1-hexanethiol (33.6 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 96:4) as colourless oily liquid (38 mg, 69%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.84 (t, 3H, J = 6.9 Hz), 1.21–1.35 (m, 6H), 1.46–1.57 (m, 2H), 2.44 (ddd, 1H, J = 12.5, 8.1, 6.8 Hz), 2.58 (ddd, 1H, J = 12.5, 8.3, 6.6 Hz), 3.56 (s, 3H), 5.65 (s, 1H), 7.45 (t, 2H, J = 7.7 Hz), 7.56 (dd, 1H, J = 10.5, 4.2 Hz), 7.89–8.09 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.0, 22.5, 28.2, 28.6, 29.4, 31.3, 55.9, 84.6, 128.6, 128.7, 133.4, 134.3, 190.6. HRMS (ESI) (m/z): [M-H]⁻ calculated for C₁₅H₂₁O₃S, 281.1206; found: 281.1193.

2-methoxy-2-(pentylsulfinyl)-1-phenylethan-1-one (15).



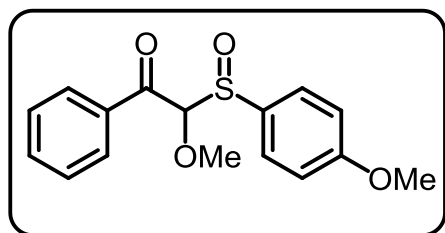
The title compound was prepared according to the method A by taking phenylacetylene (20 μ l, 0.19 mmol), 1-pentanethiol (29.6 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 96:4) as colourless oily liquid (34 mg, 66%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.81–0.88 (m, 3H), 1.24–1.32 (m, 4H), 1.47–1.58 (m, 2H), 2.44 (ddd, 1H, J = 12.5, 8.1, 6.8 Hz), 2.49–2.65 (m, 1H), 3.56 (s, 3H), 5.65 (s, 1H), 7.44 (dd, 2H, J = 15.0, 7.5 Hz), 7.56 (t, 1H, J = 7.4 Hz), 7.89–8.16 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 13.9, 22.2, 28.2, 29.1, 31.1, 55.9, 84.6, 128.6, 128.7, 133.4, 134.3, 190.6. HRMS (ESI) (m/z): [M-H]⁻ calculated for C₁₄H₁₉O₃S, 267.1049; found: 267.1040.

2-(butylsulfinyl)-2-methoxy-1-phenylethan-1-one (16).



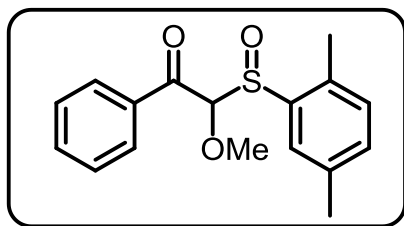
The title compound was prepared according to the method A by taking phenylacetylene (20 μ l, 0.19 mmol), 1-butanethiol (25 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 96:4) as colourless oily liquid (35 mg, 70%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.86 (t, 3H, J = 7.3 Hz), 1.35 (dt, 2H, J = 14.7, 7.3 Hz), 1.44–1.56 (m, 2H), 2.45 (ddd, 1H, J = 12.5, 8.2, 6.7 Hz), 2.58 (ddd, 1H, J = 12.5, 8.3, 6.6 Hz), 3.56 (s, 3H), 5.65 (s, 1H), 7.44 (dd, 2H, J = 14.4, 6.9 Hz), 7.57 (dd, 1H, J = 10.5, 4.3 Hz), 7.90–8.11 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 13.6, 22.1, 27.9, 31.5, 55.9, 84.6, 128.6, 128.7, 133.4, 134.3, 190.6. HRMS (ESI) (m/z): [M+Na]⁺ calculated for C₁₃H₁₈NaO₃S, 277.0869; found: 277.0853.

2-methoxy-2-((4-methoxyphenyl)sulfinyl)-1-phenylethan-1-one (17).



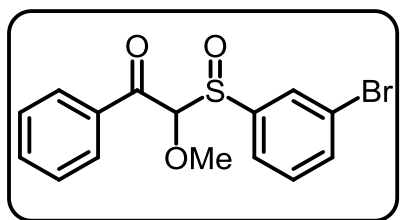
The title compound was prepared according to the method A by taking phenylacetylene (20 μ l, 0.19 mmol), 4-methoxythiophenol (39 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 94:6) as yellow oily liquid (37 mg, 63%). ¹H NMR (CDCl₃, 400 MHz): δ - 3.69 (s, 3H), 3.76–3.82 (m, 3H), 5.90 (s, 1H), 6.88 (dd, 1H, J = 8.2, 2.5 Hz), 6.91–6.99 (m, 1H), 7.03 (d, 1H, J = 7.6 Hz), 7.23 (t, 1H, J = 8.0 Hz), 7.48 (t, 2H, J = 7.7 Hz), 7.60 (t, 1H, J = 7.4 Hz), 7.92–8.07 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 55.3, 56.1, 90.4, 114.7, 119.0, 126.1, 128.5, 129.0, 129.8, 133.4, 159.7, 190.9. HRMS (ESI) (m/z): [M+H]⁺ calculated for C₁₆H₁₇O₄S, 305.0842; found: 305.0847.

2-((2,5-dimethylphenyl)sulfinyl)-2-methoxy-1-phenylethan-1-one (18).



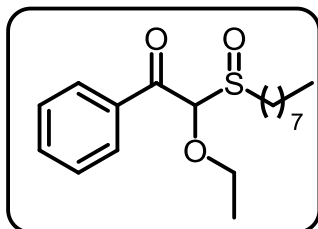
The title compound was prepared according to the method A by taking phenylacetylene (20 μ l, 0.19 mmol), 2,5-dimethylthiophenol (39.3 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 94:6) as yellow oily liquid (39 mg, 66%). ¹H NMR (CDCl₃, 400 MHz) δ - 2.21 (s, 3H), 2.29 (s, 3H), 3.66 (s, 3H), 5.81 (s, 1H), 7.03 (dd, 2H, J = 17.1, 7.7 Hz), 7.25 (s, 1H), 7.44 (t, 2H, J = 7.6 Hz), 7.58 (t, 1H, J = 7.3 Hz), 7.99 (t, 2H, J = 10.0 Hz). ¹³C{¹H} NMR (CDCl₃, 100 MHz) δ - 20.4, 20.8, 56.3, 91.1, 91.2, 128.4, 129.1, 129.6, 130.3, 131.0, 133.4, 134.3, 135.5, 136.1, 138.2. HRMS (ESI) (m/z): [M+H]⁺ calculated for C₁₇H₁₉O₃S, 303.1049; found: 303.1053.

2-((3-bromophenyl)sulfinyl)-2-methoxy-1-phenylethan-1-one (19).



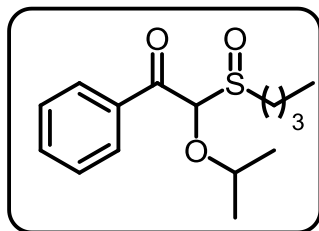
The title compound was prepared according to the method A by taking phenylacetylene (20 μ l, 0.19 mmol), 3-bromothiophenol (52.6 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 94:6) as yellow oily liquid (44 mg, 64%). ¹H NMR (CDCl₃, 400 MHz): δ - 3.65 (d, 3H, J = 18.6 Hz), 5.97 (s, 1H), 7.17 (td, 1H, J = 7.7, 1.6 Hz), 7.29–7.33 (m, 1H), 7.48 (t, 2H, J = 7.7 Hz), 7.60 (ddt, 3H, J = 13.4, 11.2, 5.8 Hz), 7.99–8.14 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 56.2, 90.2, 127.6, 127.9, 128.5, 129.2, 129.5, 133.3, 133.6, 133.6, 134.0, 134.9, 191.1. HRMS (ESI) (m/z): [M-H]⁻ calculated for C₁₅H₁₂BrO₃S, 350.9685; found: 350.9689.

2-ethoxy-2-(octylsulfinyl)-1-phenylethan-1-one (20).



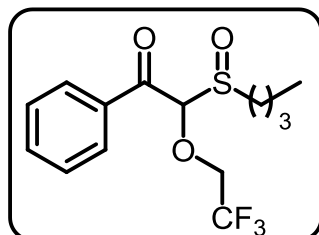
The title compound was prepared according to the method A by taking phenylacetylene (20 μ L, 0.19 mmol), 1-octanethiol (41 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and ethanol (1ml) as solvent and purified by column chromatography (hexane:EA= 99:1) as yellow oily liquid (37 mg, 58%). ¹H NMR (400 MHz, CDCl₃): δ - 0.89 (t, 3H, J = 7.0 Hz), 1.26–1.36 (m, 11H), 1.55 (dt, 4H, J = 14.3, 6.9 Hz), 2.47–2.55 (m, 1H), 2.60–2.73 (m, 1H), 3.56–3.69 (m, 1H), 4.00 (dq, 1H, J = 9.3, 7.1 Hz), 5.75 (s, 1H), 8.02–8.07 (m, 2H), 7.48 (t, 2H, J = 7.7 Hz), 7.58 (dd, 1H, J = 11.7, 4.2 Hz). ¹³C{¹H} NMR (CDCl₃, 100 MHz): δ - 14.1, 14.8, 22.6, 28.7, 28.9, 29.1, 29.1, 29.5, 31.8, 64.0, 83.4, 128.5, 128.8, 133.2, 134.5, 191.0. HRMS (ESI) (m/z): [M+H]⁺ calculated for C₁₈H₂₉O₃S, 325.1832; found: 325.1842.

2-(butylsulfinyl)-2-isopropoxy-1-phenylethan-1-one (21).



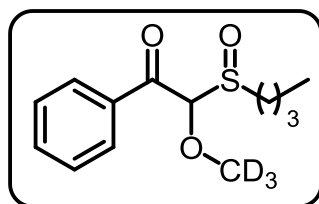
The title compound was prepared according to the method A by taking phenylacetylene (20 μ L, 0.19 mmol), 1-butanethiol (25 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and iso-propyl alcohol (1 ml) as solvent and purified by column chromatography (hexane:EA= 99:1) as yellow oily liquid (29 mg, 53%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.88 (t, 3H, *J* = 7.3 Hz), 1.20 (t, 3H, *J* = 7.5 Hz), 1.28 (d, 3H, *J* = 13.1 Hz), 1.36 (d, 2H, *J* = 7.3 Hz), 1.56 (d, 2H, *J* = 8.1 Hz), 2.51 (dd, 2H, *J* = 8.1, 5.8 Hz), 2.69–2.76 (m, 1H), 6.85 (s, 1H), 7.48 (t, 2H, *J* = 7.7 Hz), 7.59 (t, 1H, *J* = 7.4 Hz), 8.03 (d, 2H, *J* = 7.5 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 8.9, 13.5, 21.8, 27.4, 29.4, 31.4, 76.1, 128.7, 128.8, 133.7, 173.8, 189.6. HRMS (ESI) (*m/z*): [M+Na]⁺ calculated for C₁₅H₂₂NaO₃S, 305.1182; found: 305.1174.

2-(butylsulfinyl)-1-phenyl-2-(2,2,2-trifluoroethoxy)ethan-1-one (22).



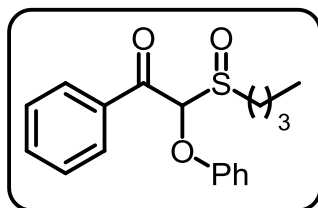
The title compound was prepared according to the method A by taking phenylacetylene (20 μ L, 0.19 mmol), 1-butanethiol (25 μ L, 0.28 mmol), DIPEA (17.5, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and 2,2,2-trifluoroethanol (1 ml) as solvent and purified by column chromatography (hexane:EA=99:1) as colourless oily liquid (31mg, 49%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.85 (d, 3H, *J* = 6.5 Hz), 1.32 (d, 2H, *J* = 7.3 Hz), 1.51 (d, 2H, *J* = 7.5 Hz), 2.47–2.55 (m, 1H), 2.60–2.67 (m, 1H), 4.19 (tdd, 2H, *J* = 12.4, 8.6, 3.7 Hz), 5.98 (s, 1H), 7.46 (t, 2H, *J* = 7.7 Hz), 7.58 (t, 1H, *J* = 7.4 Hz), 7.97 (d, 2H, *J* = 7.5 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 13.5, 22.0, 28.7, 29.7, 31.3, 64.1, 83.4, 128.7, 128.7, 133.8 (q, *J* = 3.75 Hz), 134.0, 190.2. HRMS (ESI) (*m/z*): [M+Na]⁺ calculated for C₁₄H₁₇F₃NaO₃S, 345.0743; found: 345.0758.

2-(butylsulfinyl)-2-(methoxy-d₃)-1-phenylethan-1-one (23).



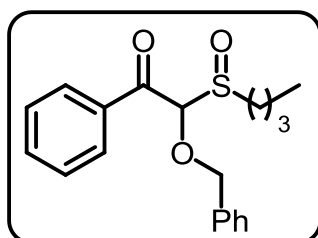
The title compound was prepared according to the method A by taking phenylacetylene (20 μ L, 0.19 mmol), 1-butanethiol (25 μ L, 0.28 mmol), DIPEA (17.5, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and methanol-d₄ (1 ml) as solvent and purified by column chromatography (hexane:EA= 99:4) as colourless oily liquid (27 mg, 54%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.82 (dd, 3H, *J* = 9.6, 4.8 Hz), 1.29 (dd, 2H, *J* = 13.2, 5.9 Hz), 1.43–1.48 (m, 2H), 2.41 (d, 1H, *J* = 6.8 Hz), 2.53 (dd, 1H, *J* = 11.8, 7.5 Hz), 5.61 (s, 1H), 7.38–7.44 (m, 2H), 7.51 (d, 1H, *J* = 7.2 Hz), 7.95 (d, 2H, *J* = 7.1 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 13.6, 22.1, 27.9, 27.9, 31.5, 84.6, 128.6, 128.7, 133.4, 134.3, 190.7. HRMS (ESI) (*m/z*): [M+Na]⁺ calculated for C₁₃H₁₅D₃NaO₃S, 280.1057; found: 280.1055.

2-(butylsulfinyl)-2-phenoxy-1-phenylethan-1-one (24).



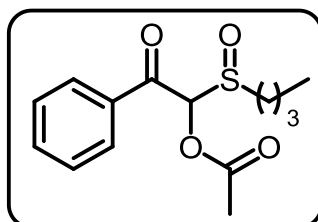
The title compound was prepared according to the method A by taking phenylacetylene (20 μ L, 0.19 mmol), 1-butanethiol (25 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), phenol (17.9 mg, 0.4 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and water (1 ml) as solvent and purified by column chromatography (hexane:EA= 99:1) as brown liquid (29 mg, 48%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.85 (t, 3H, *J* = 7.3 Hz), 1.32–1.37 (m, 2H), 1.53 (d, 2H, *J* = 7.3 Hz), 2.59–2.66 (m, 1H), 2.73–2.81 (m, 1H), 6.38 (s, 1H), 7.04 (dd, 3H, *J* = 11.9, 7.6 Hz), 7.28–7.33 (m, 2H), 7.49 (t, 2H, *J* = 7.7 Hz), 7.60 (t, 1H, *J* = 7.4 Hz), 8.12 (d, 2H, *J* = 8.0 Hz). ¹³C NMR (CDCl₃, 125 MHz): δ - 13.6, 22.0, 29.7, 31.3, 81.5, 116.8, 122.6, 128.7, 128.9, 129.6, 133.7, 133.9, 156.5, 190.1. HRMS (ESI) (*m/z*): [M+Na]⁺ calculated for C₁₈H₂₀NaO₃S, 339.1025; found: 339.1034.

2-(benzyloxy)-2-(butylsulfinyl)-1-phenylethan-1-one (25).



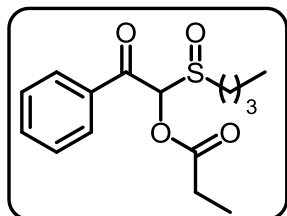
The title compound was prepared according to the method A by taking phenylacetylene (20 μ L, 0.19 mmol), 1-butanethiol (25 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %), and benzyl alcohol (1 ml) as solvent and purified by column chromatography (hexane:EA= 99:1) as yellow oily liquid (28 mg, 44%). ¹H NMR (CDCl₃, 400 MHz) δ - 0.84 (dd, 3H, *J* = 9.4, 5.2 Hz) 1.31–1.36 (m, 2H), 1.48–1.53 (m, 2H), 2.45–2.52 (m, 1H), 2.59–2.66 (m, 1H), 4.76 (d, 1H, *J* = 12.1 Hz), 4.90 (d, 1H, *J* = 12.1 Hz), 5.72 (s, 1H), 7.27–7.37 (m, 5H), 7.38–7.42 (m, 2H), 7.53 (t, 1H, *J* = 7.4 Hz), 7.93 (d, 2H, *J* = 7.4 Hz). ¹³C {¹H} NMR (CDCl₃, 125 MHz) δ - 13.6, 22.1, 28.3, 31.5, 69.4, 81.8, 128.1, 128.3, 128.5, 128.6, 128.7, 133.3, 134.4, 136.6, 190.8. HRMS (ESI) (*m/z*): [M+Na]⁺ calculated for C₁₉H₂₂NaO₃S, 353.1182; found: 353.1174.

1-(butylsulfinyl)-2-oxo-2-phenylethyl acetate (26).



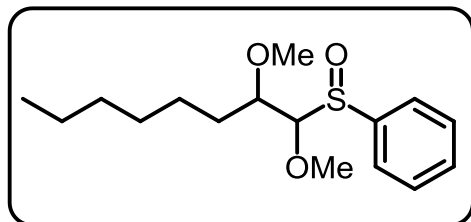
The title compound was prepared according to the method A by taking phenylacetylene (20 μ L, 0.19 mmol), 1-butanethiol (25 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and acetic anhydride (1 ml) as solvent and purified by column chromatography (hexane:EA =99:1) as colourless oily liquid (37 mg, 67%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.88 (td, 3H, *J* = 7.3, 2.4 Hz), 1.36 (dd, 2H, *J* = 14.5, 7.2 Hz), 1.55 (dd, 2H, *J* = 11.0, 7.5 Hz), 2.21 (d, 3H, *J* = 2.5 Hz), 2.53 (ddd, 1H, *J* = 12.3, 8.9, 2.3 Hz), 2.67–2.77 (m, 1H), 6.84 (d, 1H, *J* = 2.3 Hz), 7.48 (t, 2H, *J* = 6.8 Hz), 7.59 (dd, 1H, *J* = 8.2, 6.5 Hz), 8.03 (d, 2H, *J* = 7.2 Hz). ¹³C {¹H} NMR (CDCl₃, 125 MHz) δ - 13.5, 20.8, 21.8, 29.4, 31.4, 76.2, 128.7, 128.8, 133.7, 133.9, 170.3, 189.5. HRMS (ESI) (*m/z*): [M+Na]⁺ calculated for C₁₄H₁₈NaO₄S, 305.0818; found: 305.0826.

1-(butylsulfinyl)-2-oxo-2-phenylethyl propionate (27).



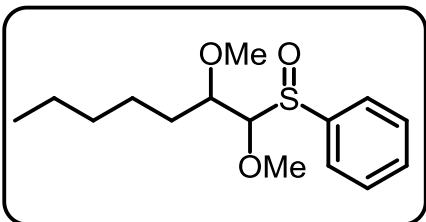
The title compound was prepared according to the method A by taking phenylacetylene (20 μ L, 0.19 mmol), 1-butanethiol (25 μ L, 0.28 mmol), DIPEA (12.3 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol %) and propionic anhydride (1 ml) as solvent and purified by column chromatography (hexane:EA = 99:1) as yellow oily liquid (37 mg, 64%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.90 (t, 3H, *J* = 7.3 Hz), 1.22 (t, 3H, *J* = 7.6 Hz), 1.36–1.44 (m, 2H), 1.59 (d, 2H, *J* = 6.0 Hz), 2.49–2.59 (m, 3H), 2.75 (ddd, 1H, *J* = 12.5, 8.3, 6.4 Hz), 6.87 (s, 1H), 7.50 (t, 2H, *J* = 7.7 Hz), 7.61 (t, 1H, *J* = 7.4 Hz), 8.00–8.09 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 8.9, 13.5, 21.8, 27.5, 29.5, 31.4, 76.1, 128.7, 128.8, 133.7, 134.0, 173.8, 189.6. HRMS (ESI) (*m/z*): [M+Na]⁺ calculated for C₁₅H₂₀NaO₄S, 319.0975; found: 319.0988.

((1,2-dimethoxyoctyl)sulfinyl)benzene (28).



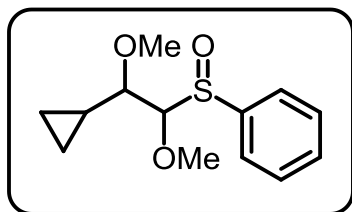
The title compound was prepared according to the method A by taking 1-octyne (20 μ L, 0.18 mmol), thiophenol (29.7 μ L, 0.28 mmol), DIPEA (16.6 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.3 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 97:3) as colourless oily liquid (34 mg, 64%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.87 (t, 3H, *J* = 6.7 Hz), 1.27 (s, 6H), 1.48 (ddd, 2H, *J* = 22.2, 12.9, 5.1 Hz), 1.60 (dt, 1H, *J* = 17.1, 6.7 Hz), 1.80 (ddd, 1H, *J* = 12.0, 8.9, 4.8 Hz), 3.17 (dt, 1H, *J* = 8.9, 4.4 Hz), 3.37 (s, 3H), 3.43 (s, 3H), 4.32 (d, 1H, *J* = 4.9 Hz), 7.21 (dd, 1H, *J* = 8.5, 6.0 Hz), 7.28 (dd, 2H, *J* = 9.9, 4.6 Hz), 7.42–7.52 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.1, 22.6, 27.0, 29.2, 29.4, 31.7, 52.2, 55.4, 55.8, 107.2, 126.7, 128.8, 131.9, 135.8. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₆H₂₇O₃S, 299.1675; found: 299.1680.

((1,2-dimethoxyheptyl)sulfinyl)benzene (29).



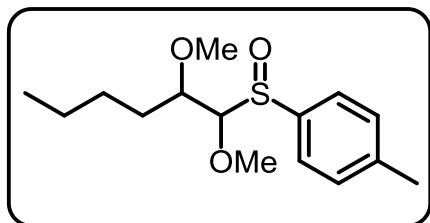
The title compound was prepared according to the method A by taking 1-heptyne (20 μ L, 0.20 mmol), thiophenol (33 μ L, 0.3 mmol), DIPEA (13 μ L, 0.1 mmol), Ru(bpy)₃Cl₂ (1.5 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 97:3) as colourless oily liquid (36 mg, 62%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.90 (t, 3H, *J* = 7.0 Hz), 1.28–1.37 (m, 4H), 1.45–1.59 (m, 2H), 1.66 (ddd, 1H, *J* = 13.5, 8.8, 6.7 Hz), 1.78–1.88 (m, 1H), 3.20 (dt, 1H, *J* = 8.9, 4.3 Hz), 3.40 (s, 3H), 3.46 (s, 3H), 4.34 (d, 1H, *J* = 4.9 Hz), 7.21–7.28 (m, 1H), 7.28–7.34 (m, 2H), 7.48 (dt, 2H, *J* = 14.0, 6.1 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.1, 22.5, 26.7, 29.4, 31.7, 52.2, 55.4, 55.8, 107.2, 126.8, 128.8, 131.9, 135.8. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₅H₂₅O₃S, 285.1519; found: 285.1512.

((2-cyclopropyl-1,2-dimethoxyethyl)sulfinyl)benzene (30).



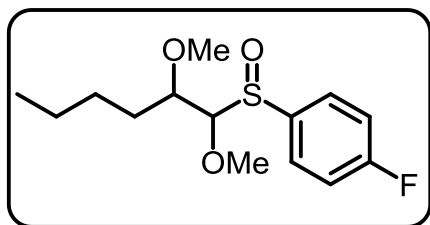
The title compound was prepared according to the method A by taking cyclopropylacetylene (20 μ L, 0.30 mmol), thiophenol (49.5 μ L, 0.45 mmol), DIPEA (27.7 μ L, 0.15 mmol), Ru(bpy)₃Cl₂ (2.2 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 97:3) as colourless oily liquid (46 mg, 60%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.11–0.27 (m, 1H), 0.42 (td, 1H, *J* = 9.8, 4.9 Hz), 0.51 (ddd, 1H, *J* = 17.1, 8.5, 5.1 Hz), 0.59–0.66 (m, 1H), 1.01–1.13 (m, 1H), 2.68 (dd, 1H, *J* = 9.2, 4.2 Hz), 3.45 (s, 3H), 3.49 (s, 3H), 4.41 (d, 1H, *J* = 4.2 Hz), 7.24 (ddd, 1H, *J* = 7.4, 3.3, 1.4 Hz), 7.26–7.32 (m, 2H), 7.51 (dt, 2H, *J* = 8.6, 2.1 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 3.9, 5.5, 12.2, 55.9, 56.2, 57.4, 107.8, 127.1, 128.7, 132.9, 135.3. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₃H₁₉O₃S, 255.1049; found: 255.1038.

1-((1,2-dimethoxyhexyl)sulfinyl)-4-methylbenzene (31).



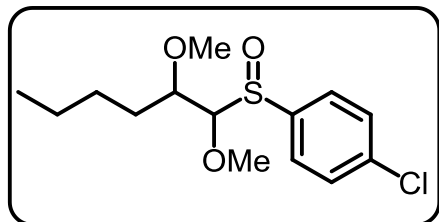
The title compound was prepared according to the method A by taking 1-hexyne (20 μ L, 0.24 mmol), 4-methylthiophenol (44.6 μ L, 0.36 mmol), DIPEA (22 μ L, 0.12 mmol), Ru(bpy)₃Cl₂ (1.8 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 97:3) as colourless oily liquid (47 mg, 68%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.92 (t, 3H, *J* = 7.3 Hz), 1.29–1.38 (m, 2H), 1.49 (ddt, 2H, *J* = 11.6, 8.7, 3.6 Hz), 1.61–1.68 (m, 1H), 1.79–1.88 (m, 1H), 2.35 (s, 3H), 3.20 (td, 1H, *J* = 8.5, 4.3 Hz), 3.40 (d, 3H, *J* = 5.4 Hz), 3.46 (d, 3H, *J* = 6.1 Hz), 4.35 (d, 1H, *J* = 4.9 Hz), 7.05 (d, 1H, *J* = 7.5 Hz), 7.17–7.22 (m, 1H), 7.26–7.31 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.0, 21.3, 22.7, 29.2, 52.0, 55.4, 55.9, 107.2, 127.6, 128.8, 132.5, 135.5, 138.5. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₅H₂₅O₃S, 285.1519; found: 285.1496.

1-((1,2-dimethoxyhexyl)sulfinyl)-4-fluorobenzene (32).



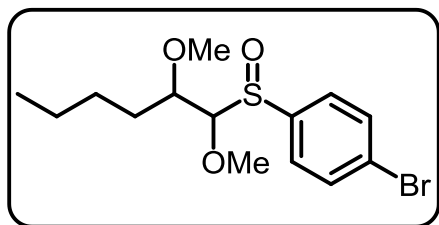
The title compound was prepared according to the method A by taking 1-hexyne (20 μ L, 0.24 mmol), 4-fluorothiophenol (46 μ L, 0.36 mmol), DIPEA (22 μ L, 0.12 mmol), Ru(bpy)₃Cl₂ (1.8 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 97:3) as colourless oily liquid (41 mg, 59%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.92 (t, 3H, *J* = 7.3 Hz), 1.28–1.35 (m, 2H), 1.45 (tdd, 2H, *J* = 10.1, 8.1, 4.3 Hz), 1.57–1.66 (m, 1H), 1.75–1.84 (m, 1H), 3.06 (dt, 1H, *J* = 9.1, 4.5 Hz), 3.38 (d, 3H, *J* = 6.1 Hz), 3.42 (d, 3H, *J* = 5.5 Hz), 4.30 (d, 1H, *J* = 5.2 Hz), 6.89–7.10 (m, 2H), 7.38–7.57 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.0, 22.6, 29.2, 53.0, 55.2, 55.4, 107.0, 115.8, 116.0, 130.4 (d, *J* = 3.3 Hz), 135.0 (d, *J* = 8.1 Hz), 162.3 (d, *J* = 247.1 Hz). HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₄H₂₂FO₃S, 289.1268; found: 289.1249.

1-chloro-4-((1,2-dimethoxyhexyl)sulfinyl)benzene (33).



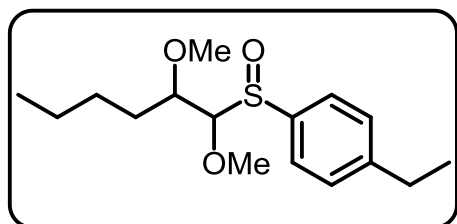
The title compound was prepared according to the method A by taking 1-hexyne (20 μ l, 0.24 mmol), 4-chlorothiophenol (52 μ L, 0.36 mmol), DIPEA (22 μ L, 0.12 mmol), Ru(bpy)₃Cl₂ (1.8 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (hexane:EA = 97:3) as colourless oily liquid (42 mg, 57%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.91 (t, 3H, J = 7.3 Hz), 1.27–1.36 (m, 2H), 1.46 (ddd, 1H, J = 11.9, 8.8, 3.9 Hz), 1.56–1.66 (m, 2H), 1.82–1.92 (m, 1H), 3.37 (s, 3H), 3.38–3.43 (m, 1H), 3.48 (d, 3H, J = 8.8 Hz), 4.39 (d, 1H, J = 4.8 Hz), 7.13–7.25 (m, 2H), 7.36–7.44 (m, 1H), 7.50–7.57 (m, 1H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.0, 22.7, 29.1, 50.7, 55.6, 55.9, 107.3, 126.9, 127.6, 129.8, 132.4, 135.2, 135.7. HRMS (ESI) (m/z): [M+H]⁺ calculated for C₁₄H₂₂ClO₃S, 305.0973; found: 305.0961.

1-bromo-4-((1,2-dimethoxyhexyl)sulfinyl)benzene (34).



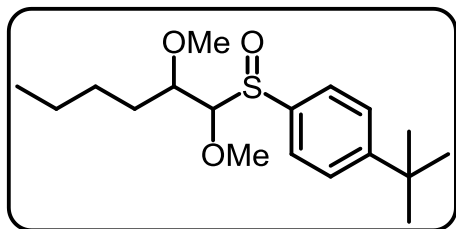
The title compound was prepared according to the method A by taking 1-hexyne (20 μ l, 0.24 mmol), 4-bromothiophenol (67.6 μ L, 0.36 mmol), DIPEA (22 μ L, 0.12 mmol), Ru(bpy)₃Cl₂ (1.8 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (Hexane:EA = 97:3) as colourless oily liquid (55 mg, 65%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.91 (t, 3H, J = 7.3 Hz), 1.27–1.37 (m, 2H), 1.47 (tdd, 1H, J = 8.2, 5.9, 2.9 Hz), 1.55–1.65 (m, 2H), 1.81–1.94 (m, 1H), 3.37 (d, 3H, J = 4.6 Hz), 3.38–3.45 (m, 1H), 3.47 (s, 3H), 4.40 (d, 1H, J = 4.8 Hz), 7.07 (td, 1H, J = 7.9, 1.6 Hz), 7.27 (td, 1H, J = 7.7, 1.4 Hz), 7.52 (dd, 1H, J = 7.9, 1.5 Hz), 7.58 (dt, 1H, J = 12.6, 6.3 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 13.9, 22.7, 29.1, 51.1, 55.7, 56.0, 107.3, 126.1, 127.6, 132.0, 133.1, 137.3. HRMS (ESI) (m/z): [M+H]⁺ calculated for C₁₄H₂₂BrO₃S, 349.0468; found: 349.0457.

1-((1,2-dimethoxyhexyl)sulfinyl)-4-ethylbenzene (35).



The title compound was prepared according to the general procedure by taking 1-hexyne (20 μ l, 0.24 mmol), 4-ethylthiophenol (49.7 μ L, 0.36 mmol), DIPEA (22 μ L, 0.12 mmol), Ru(bpy)₃Cl₂ (1.8 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (Hexane:EA = 97:3) as colourless oily liquid (37 mg, 52%). ¹H NMR (CDCl₃, 400 MHz) δ - 0.83 (t, 3H, J = 7.3 Hz), 1.17 (t, 3H, J = 7.6 Hz), 1.20 (s, 1H), 1.24 (s, 1H), 1.36–1.43 (m, 2H), 1.55 (dd, 1H, J = 16.0, 5.9 Hz), 1.69–1.77 (m, 1H), 2.57 (q, 2H, J = 7.6 Hz), 3.03 (dt, 1H, J = 8.8, 4.3 Hz), 3.31 (s, 3H), 3.37 (s, 3H), 4.24 (d, 1H, J = 5.0 Hz), 7.06 (d, 2H, J = 7.9 Hz), 7.32 (d, 2H, J = 8.0 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz) δ - 14.0, 15.5, 22.7, 28.5, 29.2, 29.7, 52.4, 55.2, 55.7, 107.1, 128.4, 131.9, 132.7, 143.3. HRMS (ESI) (m/z): [M+Na]⁺ calculated for C₁₆H₂₆NaO₃S, 321.1495; found: 321.1488.

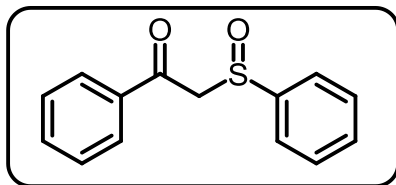
1-(tert-butyl)-4-((1,2-dimethoxyhexyl)sulfinyl)benzene (36).



The title compound was prepared according to the method A by taking 1-hexyne (20 μ l, 0.24 mmol), 4-*tert*-butylthiophenol (59.8 μ L, 0.36 mmol), DIPEA (22 μ L, 0.12 mmol), Ru(bpy)₃Cl₂ (1.8 mg, 1 mol %) and methanol (1 ml) as solvent and purified by column chromatography (Hexane:EA = 97:3) as colourless oily liquid (50 mg, 63%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.87 (t, 3H, *J* = 6.2 Hz), 1.27 (s, 2H), 1.31 (s, 9H), 1.48 (dt, 2H, *J* = 19.0, 7.3

Hz), 1.58 (s, 1H), 1.75–1.83 (m, 1H), 3.12 (dt, 1H, *J* = 8.9, 4.5 Hz), 3.38 (s, 3H), 3.43 (d, 3H, *J* = 10.5 Hz), 4.34 (t, 1H, *J* = 12.3 Hz), 7.30 (d, 2H, *J* = 8.4 Hz), 7.39 (d, 2H, *J* = 8.4 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.1, 22.6, 26.9, 29.2, 31.3, 31.7, 34.5, 52.3, 55.2, 55.7, 107.2, 125.8, 132.1, 150.1. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₈H₃₁O₃S, 327.1988; found: 327.1995.

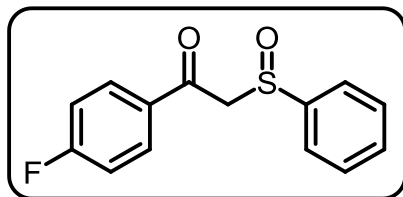
1-phenyl-2-(phenylsulfinyl)ethan-1-one (37).



The title compound was prepared according to the method B by taking phenylacetylene (20 μ L, 0.19 mmol), thiophenol (31 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 78:22) as yellow oily liquid (32 mg, 67%). ¹H NMR (CDCl₃, 400 MHz): δ - 4.30 (d,

1H, *J* = 14.1 Hz), 4.58 (d, 1H, *J* = 14.1 Hz), 7.46 (t, 2H, *J* = 7.8 Hz), 7.49–7.54 (m, 3H), 7.59 (t, 1H, *J* = 7.4 Hz), 7.67–7.74 (m, 2H), 7.85–7.92 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 100 MHz): δ - 66.1, 124.3, 128.8, 129.4, 130.1, 131.6, 134.1, 136.1, 143.4, 191.3. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₄H₁₃O₂S, 245.0631; found: 245.0621. The observed characterization data (¹H & ¹³C) was consistent with that previously reported in the literature.²

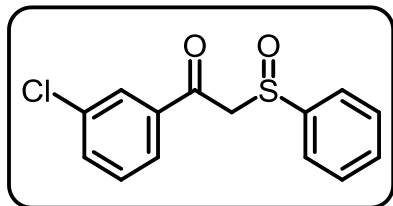
1-(4-fluorophenyl)-2-(phenylsulfinyl)ethan-1-one (38).



The title compound was prepared according to the method B by taking 4-fluorophenylacetylene (20 μ L, 0.16 mmol), thiophenol (26.4 μ L, 0.24 mmol), DIPEA (14.7 μ L, 0.08 mmol), Ru(bpy)₃Cl₂ (1.2 mg, 1 mol %) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 75:25) as yellow liquid (29 mg, 66%). ¹H NMR (CDCl₃, 400

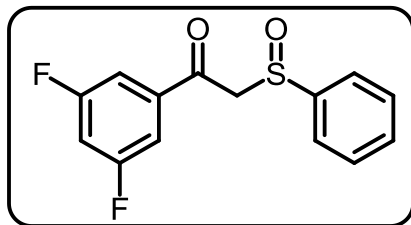
MHz): δ - 4.28 (d, 1H, *J* = 14.0 Hz), 4.53 (d, 1H, *J* = 14.0 Hz), 7.14 (dt, 3H, *J* = 14.5, 7.2 Hz), 7.50–7.53 (m, 2H), 7.69 (dd, 1H, *J* = 6.6, 2.9 Hz), 7.81–8.01 (m, 2H), 8.12 (dd, 1H, *J* = 8.8, 5.4 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 65.7, 116.0, 116.2, 124.3, 129.5, 131.7, 131.8, 143.0, 167.4, 189.8. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₄H₁₂FO₂S, 263.0537; found: 263.0542.

1-(3-chlorophenyl)-2-(phenylsulfinyl)ethan-1-one (39).



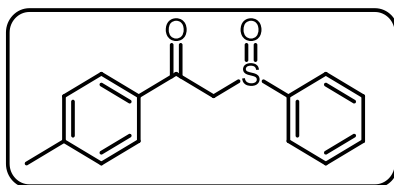
The title compound was prepared according to the method B by taking 3-chlorophenylacetylene (20 μ L, 0.15 mmol), thiophenol (24.7 μ L, 0.22 mmol), DIPEA (14 μ L, 0.07 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol %) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 75:25) as yellow liquid (28 mg, 68%). ¹H NMR (CDCl₃, 400 MHz): δ - 4.30 (d, 1H, *J* = 14.0 Hz), 4.53 (d, 1H, *J* = 14.0 Hz), 7.43 (t, 1H, *J* = 7.9 Hz), 7.54 (dd, 3H, *J* = 6.5, 3.9 Hz), 7.59 (dd, 1H, *J* = 8.0, 1.1 Hz), 7.71 (dd, 2H, *J* = 6.7, 2.9 Hz), 7.79 (d, 1H, *J* = 7.8 Hz), 7.85 (t, 1H, *J* = 1.8 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 65.7, 124.3, 127.1, 128.8, 129.5, 130.2, 131.8, 134.1, 135.2, 137.6, 142.9, 190.2. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₄H₁₂ClO₂S, 279.0241; found: 279.0243.

1-(3,5-difluorophenyl)-2-(phenylsulfinyl)ethan-1-one (40).



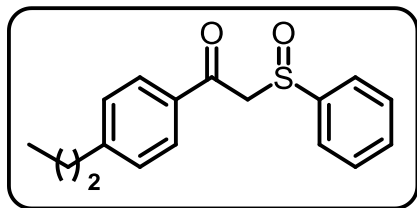
The title compound was prepared according to the method B by taking 3,5-difluorophenylacetylene (20 μ L, 0.14 mmol), thiophenol (23 μ L, 0.21 mmol), DIPEA (13 μ L, 0.07 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol %) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 76:24) as yellow liquid (26 mg, 65%). ¹H NMR (CDCl₃, 400 MHz): δ - 4.30 (d, 1H, *J* = 14.0 Hz), 4.50 (d, 1H, *J* = 14.0 Hz), 7.07 (ddd, 1H, *J* = 8.3, 6.1, 2.3 Hz), 7.42 (dd, 2H, *J* = 7.6, 2.1 Hz), 7.55–7.57 (m, 2H), 7.58–7.66 (m, 1H), 7.71 (dd, 2H, *J* = 6.6, 3.0 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 65.3, 109.3 (dt, *J* = 65.8, 25.2 Hz), 111.9 (dd, *J* = 20.1, 6.7 Hz), 113.2 (dd, *J* = 20.5, 6.6 Hz), 124.3, 129.6, 132.1, 142.2, 162.8 (dd, *J* = 250, 37.5 Hz), 189.1. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₄H₁₁F₂O₂S, 281.0442; found: 281.0463.

2-(phenylsulfinyl)-1-(p-tolyl)ethan-1-one (41).



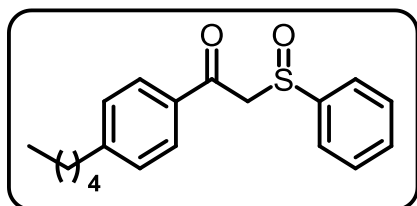
The title compound was prepared according to the method B by taking p-tolylacetylene (20 μ L, 0.17 mmol), thiophenol (28 μ L, 0.25 mmol), DIPEA (15.7 μ L, 0.08 mmol), Ru(bpy)₃Cl₂ (1.3 mg, 1 mol %) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 77:23) as yellow liquid (28 mg, 63%). ¹H NMR (CDCl₃, 400 MHz): δ - 2.44 (s, 3H), 4.29 (d, 1H, *J* = 14.1 Hz), 4.58 (d, 1H, *J* = 14.1 Hz), 7.29 (s, 2H), 7.50–7.57 (m, 3H), 7.70–7.75 (m, 2H), 7.81 (d, 2H, *J* = 8.2 Hz). ¹³C{¹H} NMR (CDCl₃, 100 MHz): δ - 21.8, 66.2, 124.3, 129.0, 129.4, 129.5, 131.6, 133.7, 143.5, 145.3, 190.9. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₅H₁₅O₂S, 259.0787; found: 259.0781.

2-(phenylsulfinyl)-1-(4-propylphenyl)ethan-1-one (42).



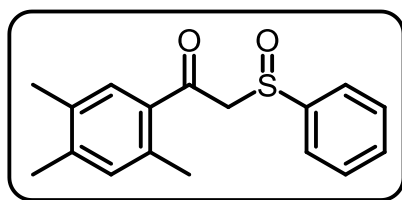
The title compound was prepared according to the method B by taking 4-n-propylphenylacetylene (20 μ L, 0.14 mmol), thiophenol (23 μ L, 0.21 mmol), DIPEA (13 μ L, 0.07 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol %) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 77:23) as yellow liquid (24 mg, 61%). ¹H NMR (CDCl₃, 400 MHz) δ - 0.96 (t, 3H, *J* = 7.3 Hz), 1.66–1.71 (m, 2H), 2.64–2.69 (m, 2H), 4.30 (d, 1H, *J* = 14.1 Hz), 4.59 (d, 1H, *J* = 14.1 Hz), 7.27 (s, 2H), 7.50–7.57 (m, 3H), 7.73 (dd, 2H, *J* = 6.5, 3.2 Hz), 7.83 (d, 2H, *J* = 8.3 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz) δ - 13.8, 24.2, 38.1, 66.1, 124.3, 129.0, 129.0, 129.4, 131.6, 133.8, 143.4, 150.0, 191.0. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₇H₁₉O₂S, 287.1100; found: 287.1088.

1-(4-pentylphenyl)-2-(phenylsulfinyl)ethan-1-one (43).



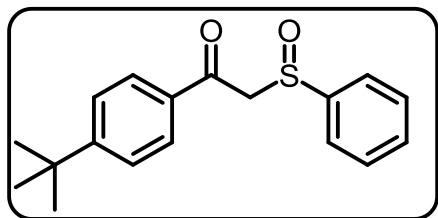
The title compound was prepared according to the method B by taking 4-n-pentylphenylacetylene (20 μ L, 0.12 mmol), thiophenol (20 μ L, 0.18 mmol), DIPEA (11 μ L, 0.06 mmol), Ru(bpy)₃Cl₂ (4.3 mg, 1 mol %) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 78:28) as yellow liquid (25 mg, 70%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.92 (t, 3H, *J* = 6.9 Hz), 1.33 (dt, 4H, *J* = 8.0, 3.4 Hz), 1.63–1.67 (m, 2H), 2.65–2.70 (m, 2H), 4.30 (d, 1H, *J* = 14.1 Hz), 4.59 (d, 1H, *J* = 14.1 Hz), 7.28 (d, 2H, *J* = 8.7 Hz), 7.48–7.57 (m, 3H), 7.68–7.77 (m, 2H), 7.82 (d, 2H, *J* = 8.3 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.0, 22.5, 30.7, 31.4, 36.0, 66.1, 124.3, 128.9, 129.0, 129.4, 131.6, 133.8, 143.4, 150.3, 190.9. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₉H₂₃O₂S, 315.1413; found: 315.1409.

2-(phenylsulfinyl)-1-(2,4,5-trimethylphenyl)ethan-1-one (44).



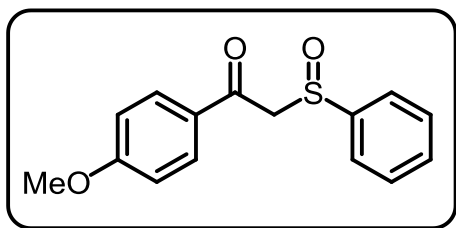
The title compound was prepared according to the method B by taking 2,4,5-trimethylphenylacetylene (20 μ L, 0.14 mmol), thiophenol (23 μ L, 0.21 mmol), DIPEA (13 μ L, 0.07 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol %) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 77:23) as yellow liquid (25 mg, 64%). ¹H NMR (CDCl₃, 400 MHz): δ - 2.26 (s, 3H), 2.28 (s, 3H), 2.44 (s, 3H), 4.26 (d, 1H, *J* = 14.3 Hz), 4.60 (d, 1H, *J* = 14.4 Hz), 7.03 (s, 1H), 7.38 (s, 1H), 7.51–7.55 (m, 3H), 7.72 (dd, 2H, *J* = 6.5, 2.9 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 19.3, 19.8, 21.3, 68.4, 124.4, 129.3, 131.5, 131.5, 133.1, 133.8, 134.1, 137.6, 142.5, 143.6, 193.3. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₇H₁₉O₂S, 287.1100; found: 287.1092.

1-(4-(tert-butyl)phenyl)-2-(phenylsulfinyl)ethan-1-one (45).



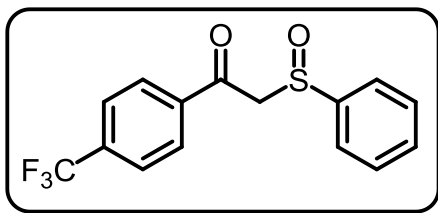
The title compound was prepared according to the method B by taking 4-*tert*-butylphenylacetylene (20 μ L, 0.13 mmol), thiophenol (21.4 μ L, 0.19 mmol), DIPEA (12 μ L, 0.06 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol %) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 77:27) as yellow liquid (26 mg, 68%). ¹H NMR (CDCl₃, 400 MHz): δ - 1.22 (s, 9H), 4.17 (d, 1H, *J* = 14.0 Hz), 4.47 (d, 1H, *J* = 14.0 Hz), 7.15 (s, 1H), 7.37 (d, 3H, *J* = 8.0 Hz), 7.59 (s, 2H), 7.71 (d, 2H, *J* = 7.7 Hz), 7.91 (d, 1H, *J* = 7.8 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 31.0, 35.3, 66.1, 124.4, 125.5, 125.9, 128.9, 129.4, 130.1, 131.6, 158.3, 191.0. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₈H₂₁O₂S, 301.1257; found: 301.1259.

1-(4-methoxyphenyl)-2-(phenylsulfinyl)ethan-1-one (46).



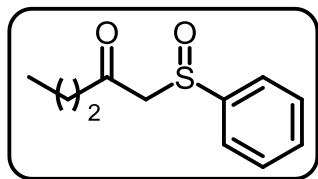
The title compound was prepared according to the method B by taking *p*-tolylacetylene (20 μ L, 0.15 mmol), thiophenol (24 μ L, 0.22 mmol), DIPEA (14 μ L, 0.07 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol %) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 76:24) as yellow solid (30 mg, 72%), mp (89-91 °C). ¹H NMR (CDCl₃, 400 MHz): δ - 3.84 (s, 3H), 4.28 (d, 1H, *J* = 14.1 Hz), 4.56 (d, 1H, *J* = 14.1 Hz), 7.14 (dd, 1H, *J* = 8.1, 1.8 Hz), 7.36 (t, 1H, *J* = 7.9 Hz), 7.43 (dd, 2H, *J* = 13.2, 5.0 Hz), 7.47-7.56 (m, 3H), 7.67-7.74 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 55.6, 65.9, 114.1, 124.3, 129.2, 129.4, 131.4, 131.6, 143.3, 164.4, 189.7. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₅H₁₅O₃S, 275.0736; found: 275.0743. The observed characterization data (¹H & ¹³C) was consistent with that previously reported in the literature.²

2-(phenylsulfinyl)-1-(4-(trifluoromethyl)phenyl)ethan-1-one (47).



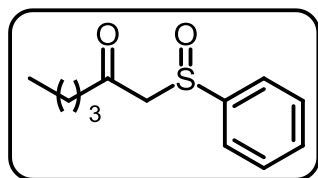
The title compound was prepared according to the method B by taking 4-trifluoromethylphenylacetylene (20 μ L, 0.12 mmol), thiophenol (19.8 μ L, 0.18 mmol), DIPEA (11 μ L, 0.06 mmol), Ru(bpy)₃Cl₂ (1 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 76:24) as yellow solid (22 mg, 62%), mp (129-131 °C). ¹H NMR (CDCl₃, 400 MHz): δ - 4.19 (d, 1H, *J* = 14.5 Hz), 4.41 (d, 1H, *J* = 14.5 Hz), 7.50-7.58 (m, 4H), 7.58-7.65 (m, 2H), 7.68-7.76 (m, 3H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 69.3, 124.2, 126.8 (q, *J* = 5.0 Hz), 127.9, 129.5, 131.2, 131.8, 132.2, 138.2, 143.1, 194.7. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₅H₁₂F₃O₂S, 313.0505; found: 313.0514. The observed characterization data (¹H & ¹³C) was consistent with that previously reported in the literature.²

1-(phenylsulfinyl)pentan-2-one (48).



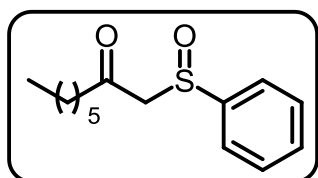
The title compound was prepared according to the method B by taking 1-pentyne (20 μ L, 0.3 mmol), thiophenol (49.5 μ L, 0.45 mmol), DIPEA (27.6 μ L, 0.15 mmol), Ru(bpy)₃Cl₂ (2.2 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 81:21) as yellow liquid (36 mg, 58%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.91 (t, 3H, *J* = 7.4 Hz), 1.58 (d, 2H, *J* = 7.4 Hz), 2.43–2.55 (m, 2H), 3.78 (d, 1H, *J* = 13.6 Hz), 3.91 (d, 1H, *J* = 13.6 Hz), 7.52–7.61 (m, 3H), 7.68 (dt, 2H, *J* = 5.0, 3.0 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 13.5, 16.6, 46.9, 68.1, 124.1, 129.5, 131.6, 143.1, 201.7. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₁H₁₅O₂S, 211.0787; found: 211.0779.

1-(phenylsulfinyl)hexan-2-one (49).



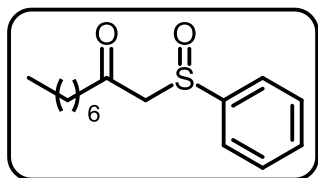
The title compound was prepared according to the method B by taking 1-hexyne (20 μ L, 0.24 mmol), thiophenol (39.6 μ L, 0.36 mmol), DIPEA (22 μ L, 0.12 mmol), Ru(bpy)₃Cl₂ (1.8 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 80:20) as yellow liquid (29 mg, 54%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.90 (t, 3H, *J* = 7.3 Hz), 1.30 (dd, 2H, *J* = 14.9, 7.4 Hz), 1.53–1.58 (m, 2H), 2.42–2.58 (m, 2H), 3.79 (d, 1H, *J* = 13.6 Hz), 3.91 (d, 1H, *J* = 13.6 Hz), 7.45–7.63 (m, 3H), 7.63–7.78 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 13.8, 22.1, 25.1, 29.2, 44.8, 68.1, 124.1, 129.5, 131.6, 201.9. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₂H₁₇O₂S, 225.0944; found: 225.0933.

1-(phenylsulfinyl)octan-2-one (50).



The title compound was prepared according to the method B by taking 1-octyne (20 μ L, 0.18 mmol), thiophenol (29.7 μ L, 0.27 mmol), DIPEA (16.6 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.3 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 80:20) as yellow liquid (26 mg, 57%). ¹H NMR (CDCl₃, 400 MHz): δ - 0.90 (t, 3H, *J* = 6.9 Hz), 1.26–1.31 (m, 6H), 1.53–1.58 (m, 2H), 2.41–2.58 (m, 2H), 3.79 (d, 1H, *J* = 13.6 Hz), 3.91 (d, 1H, *J* = 13.6 Hz), 7.45–7.62 (m, 3H), 7.69 (dd, 2H, *J* = 6.6, 3.0 Hz). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.0, 22.5, 23.0, 28.6, 31.5, 45.1, 68.1, 124.1, 129.5, 131.7, 143.0, 201.9. HRMS (ESI) (*m/z*): [M+H]⁺ calculated for C₁₄H₂₁O₂S, 253.1257; found: 253.1245.

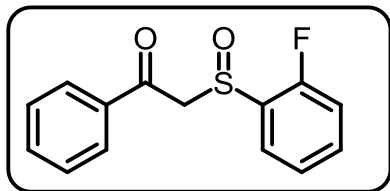
1-(phenylsulfinyl)nonan-2-one (51).



The title compound was prepared according to the method B by taking 1-nonyne (20 μ L, 0.16 mmol), thiophenol (26.4 μ L, 0.24 mmol), DIPEA (14.7 μ L, 0.08 mmol), Ru(bpy)₃Cl₂ (1.2 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 81:19) as yellow liquid (26 mg, 61%). ¹H NMR

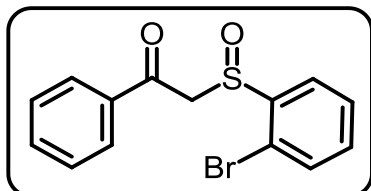
(CDCl₃, 400 MHz): δ - 0.90 (t, 3H, J = 6.9 Hz), 1.24–1.32 (m, 8H), 1.56 (dd, 2H, J = 13.0, 6.0 Hz), 2.41–2.57 (m, 2H), 3.79 (d, 1H, J = 13.6 Hz), 3.92 (d, 1H, J = 13.6 Hz), 7.47–7.62 (m, 3H), 7.62–7.84 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 14.0, 22.6, 23.1, 28.9, 28.9, 31.6, 45.0, 68.1, 124.1, 129.5, 131.6, 143.1, 201.8. HRMS (ESI) (m/z): [M+H]⁺ calculated for C₁₅H₂₃O₂S, 267.1413; found: 267.1411.

2-((2-fluorophenyl)sulfinyl)-1-phenylethan-1-one (52).



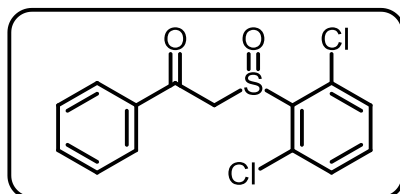
The title compound was prepared according to the method B by taking phenylacetylene (20 μ L, 0.19 mmol), 2-fluorothiophenol (35.8 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 77:24) as yellow liquid (32 mg, 63%). ¹H NMR (CDCl₃, 400 MHz): δ - 4.45 (d, 1H, J = 14.0 Hz), 4.58 (d, 1H, J = 14.0 Hz), 7.16 (t, 1H, J = 9.0 Hz), 7.40 (td, 1H, J = 7.7, 0.9 Hz), 7.48–7.57 (m, 3H), 7.63 (t, 1H, J = 7.4 Hz), 7.81–7.87 (m, 1H), 7.92–7.98 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 62.8, 115.8 (d, J = 20.2 Hz), 125.5, 126.3, 128.9 (d, J = 14.5 Hz), 130.1, 133.2, 133.3, 134.2, 136.2, 158.8, 190.8. HRMS (ESI) (m/z): [M+H]⁺ calculated for C₁₄H₁₂FO₂S, 263.0537; found: 263.0526.

2-((2-bromophenyl)sulfinyl)-1-phenylethan-1-one (53).



The title compound was prepared according to the method B by taking phenylacetylene (20 μ L, 0.19 mmol), 2-bromothiophenol (53.5 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 74:24) as yellow liquid (38 mg, 60%). ¹H NMR (CDCl₃, 400 MHz): δ - 4.35 (d, 1H, J = 14.2 Hz), 4.64 (d, 1H, J = 14.2 Hz), 7.39 (td, 1H, J = 7.7, 1.7 Hz), 7.47 (t, 2H, J = 7.7 Hz), 7.53–7.63 (m, 3H), 7.89 (dd, 1H, J = 7.8, 1.6 Hz), 7.92–7.97 (m, 2H). ¹³C{¹H} NMR (CDCl₃, 125 MHz): δ - 62.5, 118.7, 126.9, 128.5, 128.7, 128.8, 128.9, 132.7, 133.0, 134.1, 142.7, 191.0. HRMS (ESI) (m/z): [M+H]⁺ calculated for C₁₄H₁₂BrO₂S, 322.9736; found: 322.9729.

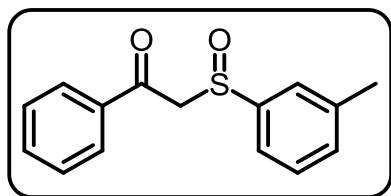
2-((2,6-dichlorophenyl)sulfinyl)-1-phenylethan-1-one (54).



The title compound was prepared according to the method B by taking phenylacetylene (20 μ L, 0.19 mmol), 2,6-dichlorobenzenethiol (49.8 μ L, 0.28 mmol), DIPEA (17.5 μ L, 0.09 mmol), Ru(bpy)₃Cl₂ (1.4 mg, 1 mol%) and MeCN (1 ml)

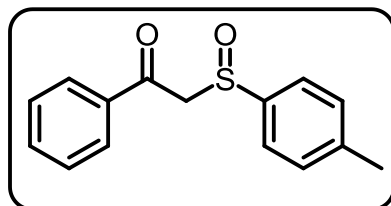
as solvent and purified by column chromatography (hexane:EA = 76:24) as yellow liquid (30 mg, 49%). ^1H NMR (CDCl_3 , 400 MHz): δ - 4.82 (d, 1H, J = 14.0 Hz), 5.17 (d, 1H, J = 14.0 Hz), 7.38 (q, 3H, J = 5.1 Hz), 7.52 (t, 2H, J = 7.8 Hz), 7.64 (d, 1H, J = 7.4 Hz), 7.97–8.03 (m, 2H). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 13.4, 18.2, 59.5, 128.9, 128.9, 130.4, 132.8, 134.4, 135.8, 191.1. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{14}\text{H}_{11}\text{Cl}_2\text{O}_2\text{S}$, 312.9851; found: 312.9847.

1-phenyl-2-(*m*-tolylsulfinyl)ethan-1-one (55).



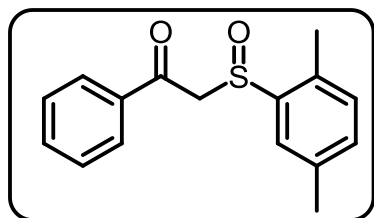
The title compound was prepared according to the method B by taking phenylacetylene (20 μL , 0.19 mmol), 3-methylthiophenol (34.7 μL , 0.28 mmol), DIPEA (17.5 μL , 0.09 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 75:25) as yellow liquid (29 mg, 58%). ^1H NMR (CDCl_3 , 400 MHz): δ - 2.42 (s, 3H), 4.30 (d, 1H, J = 14.1 Hz), 4.59 (d, 1H, J = 14.1 Hz), 7.32 (d, 1H, J = 7.5 Hz), 7.40 (t, 1H, J = 7.6 Hz), 7.48 (t, 3H, J = 7.8 Hz), 7.54 (s, 1H), 7.62 (dd, 1H, J = 10.5, 4.3 Hz), 7.87–7.95 (m, 2H). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 21.4, 66.1, 121.4, 124.5, 128.8, 129.2, 130.1, 132.5, 134.2, 136.1, 139.7, 143.1, 191.4. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{15}\text{H}_{15}\text{O}_2\text{S}$, 259.0787; found: 259.0782.

1-phenyl-2-(*p*-tolylsulfinyl)ethan-1-one (56).



The title compound was prepared according to the method B by taking phenylacetylene (20 μL , 0.19 mmol), 4-methylthiophenol (34.7 μL , 0.28 mmol), DIPEA (17.5 μL , 0.09 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 75:25) as yellow solid, (31 mg, 62%), mp (88–90 $^\circ\text{C}$). ^1H NMR (CDCl_3 , 400 MHz): δ - 2.42 (s, 3H), 4.30 (d, 1H, J = 14.1 Hz), 4.59 (d, 1H, J = 14.1 Hz), 7.33 (d, 2H, J = 8.0 Hz), 7.48 (t, 2H, J = 7.8 Hz), 7.61 (dd, 3H, J = 11.6, 5.1 Hz), 7.85–7.97 (m, 2H). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 21.4, 66.1, 124.4, 128.8, 128.8, 130.1, 134.1, 136.1, 140.1, 142.3, 191.4. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{15}\text{H}_{15}\text{O}_2\text{S}$, 259.0787; found: 259.0779. The observed characterization data (^1H & ^{13}C) was consistent with that previously reported in the literature.²

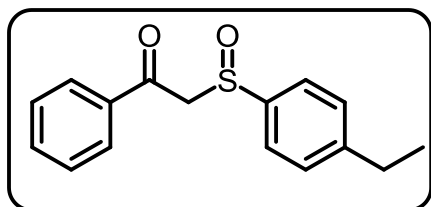
2-((2,5-dimethylphenyl)sulfinyl)-1-phenylethan-1-one (57).



The title compound was prepared according to the method B by taking phenylacetylene (20 μL , 0.19 mmol), 2,5-dimethylthiophenol (38.6 μL , 0.28 mmol), DIPEA (17.5 μL , 0.09 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol%) and MeCN (1 ml) as

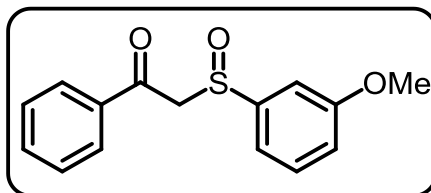
solvent and purified by column chromatography (hexane:EA = 76:24) as yellow liquid (30 mg, 56%). ^1H NMR (CDCl_3 , 400 MHz): δ - 2.38 (d, 6H, J = 2.2 Hz), 4.28 (d, 1H, J = 13.8 Hz), 4.46 (d, 1H, J = 13.8 Hz), 7.11 (d, 1H, J = 7.7 Hz), 7.20 (d, 1H, J = 7.6 Hz), 7.49 (t, 2H, J = 7.7 Hz), 7.63 (t, 1H, J = 7.4 Hz), 7.73 (s, 1H), 7.91–7.96 (m, 2H). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 17.8, 21.0, 64.1, 124.1, 128.8, 128.9, 130.8, 131.7, 132.2, 134.1, 136.2, 136.3, 137.4, 191.4. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{16}\text{H}_{17}\text{O}_2\text{S}$, 273.0944; found: 273.0929.

2-((4-ethylphenyl)sulfinyl)-1-phenylethan-1-one (58).



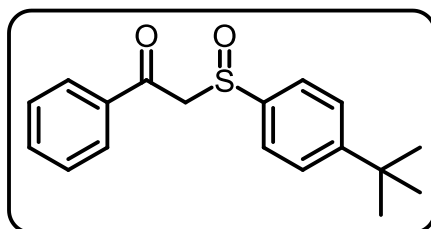
The title compound was prepared according to the method B by taking phenylacetylene (20 μL , 0.19 mmol), 4-ethylthiophenol (38.6 μL , 0.28 mmol), DIPEA (17.5 μL , 0.09 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 75:25) as yellow liquid (33 mg, 63%). ^1H NMR (CDCl_3 , 400 MHz): δ - 1.27 (t, 3H, J = 7.6 Hz), 2.72 (q, 2H, J = 7.6 Hz), 4.32 (d, 1H, J = 14.1 Hz), 4.62 (d, 1H, J = 14.1 Hz), 7.34 (s, 1H), 7.49 (dd, 3H, J = 16.0, 8.1 Hz), 7.62 (dd, 3H, J = 14.5, 7.8 Hz), 7.89–7.92 (m, 1H), 8.09–8.17 (m, 1H). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 15.4, 28.8, 66.1, 124.5, 128.5, 128.8, 130.2, 133.7, 134.2, 136.0, 140.1, 148.5, 191.5. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{16}\text{H}_{17}\text{O}_2\text{S}$, 273.0944; found: 273.0934.

2-((3-methoxyphenyl)sulfinyl)-1-phenylethan-1-one (59):



The title compound was prepared according to the method B by taking phenylacetylene (20 μL , 0.19 mmol), 3-methoxythiophenol (39 μL , 0.28 mmol), DIPEA (17.5 μL , 0.09 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 75:25) as yellow liquid (29 mg, 55%). ^1H NMR (CDCl_3 , 400 MHz): δ - 3.85 (d, 3H, J = 8.6 Hz), 4.30 (d, 1H, J = 14.2 Hz), 4.58 (d, 1H, J = 14.1 Hz), 6.99–7.03 (m, 1H), 7.21 (d, 1H, J = 7.7 Hz), 7.27–7.29 (m, 1H), 7.40 (t, 1H, J = 7.9 Hz), 7.46 (dd, 2H, J = 10.7, 4.8 Hz), 7.60 (t, 1H, J = 7.4 Hz), 7.89 (dd, 2H, J = 8.3, 1.2 Hz). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 55.6, 66.1, 108.5, 116.3, 118.2, 128.4, 128.8, 130.4, 134.2, 136.1, 144.7, 160.5, 191.3. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{15}\text{H}_{15}\text{O}_3\text{S}$, 275.0736; found: 275.0736.

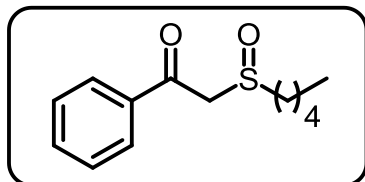
2-((4-(tert-butyl)phenyl)sulfinyl)-1-phenylethan-1-one (60).



The title compound was prepared according to the method B by taking phenylacetylene (20 μL , 0.19 mmol), 4-*tert*-butylthiophenol (46.5 μL , 0.28 mmol), DIPEA (17.5 μL , 0.09 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol%) and MeCN (1

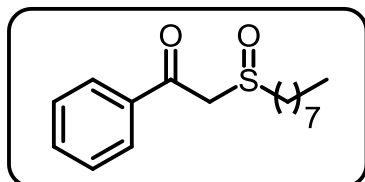
ml) as solvent and purified by column chromatography (hexane:EA 73:27) as yellow liquid (36 mg, 61%). ^1H NMR (CDCl_3 , 400 MHz): δ - 1.35 (d, 9H, J = 5.4 Hz), 4.31 (d, 1H, J = 14.1 Hz), 4.62 (d, 1H, J = 14.1 Hz), 7.47 (t, 2H, J = 7.8 Hz), 7.53 (d, 2H, J = 8.5 Hz), 7.59–7.67 (m, 3H), 7.90 (d, 2H, J = 7.4 Hz). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 31.2, 35.1, 66.1, 124.2, 126.5, 128.5, 128.8, 130.2, 134.1, 136.1, 155.4, 191.5. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{18}\text{H}_{21}\text{O}_2\text{S}$, 301.1257; found: 301.1244.

2-(pentylsulfinyl)-1-phenylethan-1-one (61).



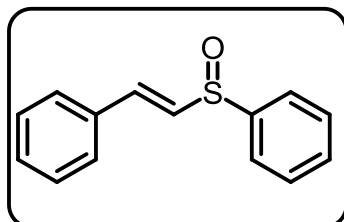
The title compound was prepared according to the method B by taking phenylacetylene (20 μL , 0.19 mmol), 1-pentanethiol (29 μL , 0.28 mmol), DIPEA (17.5 μL , 0.09 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EA = 83:27) as yellow liquid (26 mg, 56%). ^1H NMR (CDCl_3 , 400 MHz): δ - 0.92 (t, 3H, J = 7.0 Hz), 1.35–1.40 (m, 2H), 1.42–1.50 (m, 2H), 1.83 (dd, 2H, J = 15.4, 7.7 Hz), 2.87 (ddd, 2H, J = 20.3, 14.6, 7.7 Hz), 4.29 (d, 1H, J = 14.2 Hz), 4.44 (d, 1H, J = 14.1 Hz), 7.52 (t, 2H, J = 7.7 Hz), 7.65 (t, 1H, J = 7.3 Hz), 8.00 (d, 2H, J = 8.1 Hz). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 13.9, 22.2, 22.3, 30.8, 53.7, 60.2, 128.9, 129.6, 134.5, 136.0, 192.2. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{13}\text{H}_{19}\text{O}_2\text{S}$, 239.1100; found: 239.1090.

2-(octylsulfinyl)-1-phenylethan-1-one (62).



The title compound was prepared according to the method B by taking phenylacetylene (20 μL , 0.19 mmol), 1-octanethiol (41 μL , 0.28 mmol), DIPEA (17.5 μL , 0.09 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol%) and MeCN (1 ml) as solvent and purified by column chromatography (hexane:EtOAc = 79:21) as yellow liquid (32 mg, 58%). ^1H NMR (CDCl_3 , 400 MHz): δ - 0.91 (t, 3H, J = 6.8 Hz), 1.27–1.37 (m, 8H), 1.44–1.54 (m, 2H), 1.78–1.94 (m, 2H), 2.83–2.99 (m, 2H), 4.30 (d, 1H, J = 14.1 Hz), 4.46 (d, 1H, J = 14.1 Hz), 7.55 (t, 2H, J = 7.7 Hz), 7.67 (t, 1H, J = 7.4 Hz), 8.02 (d, 2H, J = 7.4 Hz). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 14.1, 22.5, 22.6, 28.7, 29.0, 29.2, 31.7, 53.1, 60.2, 128.9, 129.0, 134.5, 136.0, 192.2. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{16}\text{H}_{25}\text{O}_2\text{S}$, 281.1570; found: 281.1560.

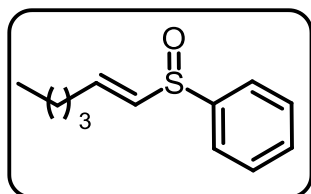
(E)-(2-(phenylsulfinyl)vinyl)benzene (63).



The title compound was prepared according to the method B by taking phenylacetylene (20 μL , 0.19 mmol), thiophenol (30.8 μL , 0.28 mmol), DIPEA (12 μL , 0.09 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol %) and H_2O (1 ml) as solvent and purified by column chromatography (hexane:EA = 80:20) as yellow oily liquid (23 mg, 52%). ^1H NMR (CDCl_3 , 400 MHz) δ - 6.43 (d, 1H, J = 10.6 Hz),

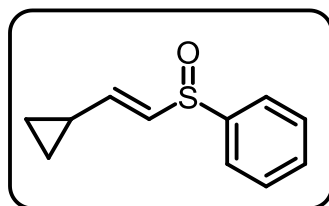
7.11 (d, 1H, $J = 10.6$ Hz), 7.41 (dd, 3H, $J = 7.3, 5.5$ Hz), 7.48 (t, 3H, $J = 6.3$ Hz), 7.55–7.59 (m, 2H), 7.64–7.67 (m, 1H), 8.08 (d, 1H, $J = 7.2$ Hz). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) δ - 124.4, 128.5, 128.7, 129.4, 129.6, 129.8, 131.0, 136.6, 139.1, 144.5. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{14}\text{H}_{13}\text{OS}$, 229.0682; found: 229.0673. The observed characterization data (^1H & ^{13}C) was consistent with that previously reported in the literature.³

(E)-(hex-1-en-1-ylsulfinyl)benzene (64).



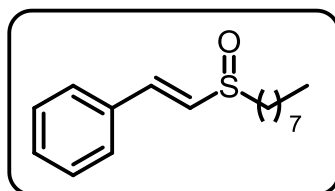
The title compound was prepared according to the method B by taking 1-hexyne (20 μL , 0.24 mmol), thiophenol (39.6 μL , 0.36 mmol), DIPEA (22 μL , 0.12 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.8 mg, 1 mol %) and H_2O (1 ml) as solvent and purified by column chromatography (hexane:EA = 75:25) as yellow oily liquid (26 mg, 51%). ^1H NMR (CDCl_3 , 400 MHz): δ - 0.93 (t, 3H, $J = 6.7$ Hz), 1.36–1.40 (m, 2H), 1.44–1.50 (m, 2H), 2.19–2.30 (m, 2H), 6.21–6.35 (m, 1H), 6.65 (dt, 1H, $J = 15.1, 6.8$ Hz), 7.48–7.57 (m, 3H), 7.64 (dd, 2H, $J = 8.0, 1.5$ Hz). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 13.8, 22.2, 30.2, 31.8, 124.5, 129.3, 130.8, 135.0, 141.6, 144.3. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{12}\text{H}_{17}\text{OS}$, 209.0995; found: 209.0982.

(E)-((2-cyclopropylvinyl)sulfinyl)benzene (65).



The title compound was prepared according to the method B by taking cyclopropylacetylene (20 μL , 0.30 mmol), thiophenol (49.5 μL , 0.45 mmol), DIPEA (28 μL , 0.15 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (2.2 mg, 1 mol%) and H_2O (1 ml) as solvent and purified by column chromatography (hexane:EA = 80:20) as yellow oily liquid (32 mg, 55%). ^1H NMR (CDCl_3 , 400 MHz): δ - 0.74–0.61 (m, 2H), 0.92–1.02 (m, 2H), 1.53–1.59 (m, 1H), 6.11 (dd, 1H, $J = 15.0, 9.7$ Hz), 6.31 (d, 1H, $J = 15.0$ Hz), 7.48–7.60 (m, 3H), 7.65 (dd, 2H, $J = 7.9, 1.3$ Hz). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 8.4, 8.4, 14.2, 124.5, 129.3, 130.8, 131.7, 144.5, 146.4. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{11}\text{H}_{13}\text{OS}$, 193.0682; found: 193.0675.

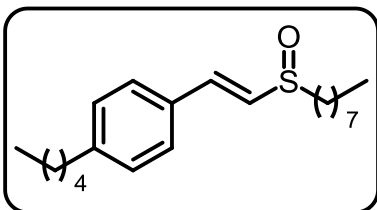
(E)-(2-(octylsulfinyl)vinyl)benzene (66).



The title compound was prepared according to the method B by taking phenylacetylene (20 μL , 0.19 mmol), 1-octanethiol (41 μL , 0.28 mmol), DIPEA (17 μL , 0.09 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1.4 mg, 1 mol%) and H_2O (1 ml) as solvent and purified by column chromatography (hexane:EA = 80:20) as yellow oily liquid (28 mg, 54%). ^1H NMR (CDCl_3 , 400 MHz): δ - 0.90 (t, 3H, $J = 6.9$ Hz), 1.30 (dd, 8H, $J = 7.6, 6.0$ Hz), 1.41–1.50 (m, 2H), 1.75–1.82 (m, 2H), 2.82–2.74 (m, 1H), 2.91–

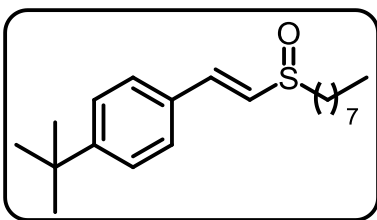
2.99 (m, 1H), 6.43 (d, 1H, $J = 10.9$ Hz), 7.11 (d, 1H, $J = 10.9$ Hz), 7.38–7.46 (m, 5H). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 14.1, 22.5, 22.6, 28.8, 29.0, 29.2, 31.7, 54.3, 128.7, 129.4, 129.7, 134.0, 135.6, 139.1. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{16}\text{H}_{25}\text{OS}$, 265.1621; found: 265.1615.

(E)-1-(2-(octylsulfinyl)vinyl)-4-pentylbenzene (67).



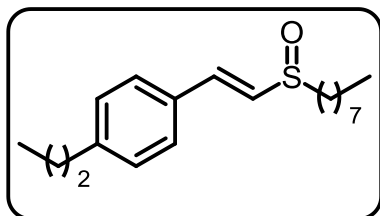
The title compound was prepared according to the method B by taking 4-*n*-pentylphenylacetylene (20 μl , 0.12 mmol), 1-octanethiol (26.3 μl , 0.18 mmol), DIPEA (11 μL , 0.06 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1 mg, 1 mol %) and H_2O (1 ml) as solvent and purified by column chromatography (hexane:EA = 80:20) as yellow oily liquid (19 mg, 50%). ^1H NMR (CDCl_3 , 400 MHz): δ - 0.86 (t, 6H, $J = 7.1$ Hz), 1.24–1.31 (m, 10H), 1.42 (dd, 2H, $J = 11.3, 6.1$ Hz), 1.57–1.62 (m, 4H), 1.74 (dd, 2H, $J = 15.1, 7.4$ Hz), 2.56–2.63 (m, 2H), 2.69–2.77 (m, 1H), 2.85–2.94 (m, 1H), 6.32 (d, 1H, $J = 10.9$ Hz), 7.01 (d, 1H, $J = 10.9$ Hz), 7.18 (d, 2H, $J = 8.1$ Hz), 7.31 (d, 2H, $J = 8.1$ Hz). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 14.0, 14.1, 22.5, 22.5, 22.6, 28.8, 29.0, 29.2, 30.9, 31.5, 31.7, 35.7, 54.3, 128.7, 128.7, 129.8, 129.8, 134.6, 139.0. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{21}\text{H}_{35}\text{OS}$, 335.2403; found: 335.2418.

(E)-1-(tert-butyl)-4-(2-(octylsulfinyl)vinyl)benzene (68).



The title compound was prepared according to the method B by taking 4-*tert*-butylphenylacetylene (20 μl , 0.13 mmol), 1-octanethiol (27.8 μL , 0.19 mmol), DIPEA (12 μL , 0.06 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1 mg, 1 mol %) and H_2O (1 ml) as solvent and purified by column chromatography (hexane:EA = 80:20) as yellow oily liquid (19 mg, 48%). ^1H NMR (CDCl_3 , 400 MHz): δ - 0.86 (t, 3H, $J = 6.9$ Hz), 1.03 (s, 2H), 1.26 (d, 8H, $J = 14.0$ Hz), 1.32 (d, 9H, $J = 7.3$ Hz), 1.74 (dd, 2H, $J = 15.4, 7.7$ Hz), 2.69–2.78 (m, 1H), 2.89 (dd, 1H, $J = 17.6, 10.3$ Hz), 6.32 (d, 1H, $J = 10.9$ Hz), 7.01 (d, 1H, $J = 10.9$ Hz), 7.33 (d, 2H, $J = 8.5$ Hz), 7.39 (d, 2H, $J = 8.5$ Hz). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 14.1, 22.6, 22.6, 22.6, 28.8, 29.1, 29.2, 31.2, 31.8, 54.3, 125.6, 129.7, 131.2, 134.6, 138.9, 152.8. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{20}\text{H}_{33}\text{OS}$, 321.2247; found: 321.2238.

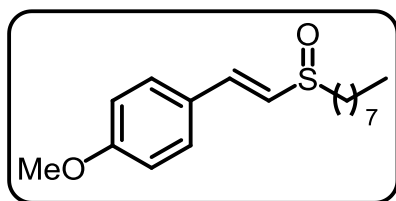
(E)-1-(2-(octylsulfinyl)vinyl)-4-propylbenzene (69).



The title compound was prepared according to the method B by taking 4-*n*-propylphenylacetylene (20 μl , 0.14 mmol), 1-octanethiol (30.7 μL , 0.21 mmol), DIPEA (13 μL , 0.07 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1 mg, 1 mol %) and H_2O (1 ml) as solvent and purified by column chromatography (hexane:EA = 80:20) as yellow oily liquid (18 mg, 43%). ^1H NMR (CDCl_3 , 400 MHz): δ

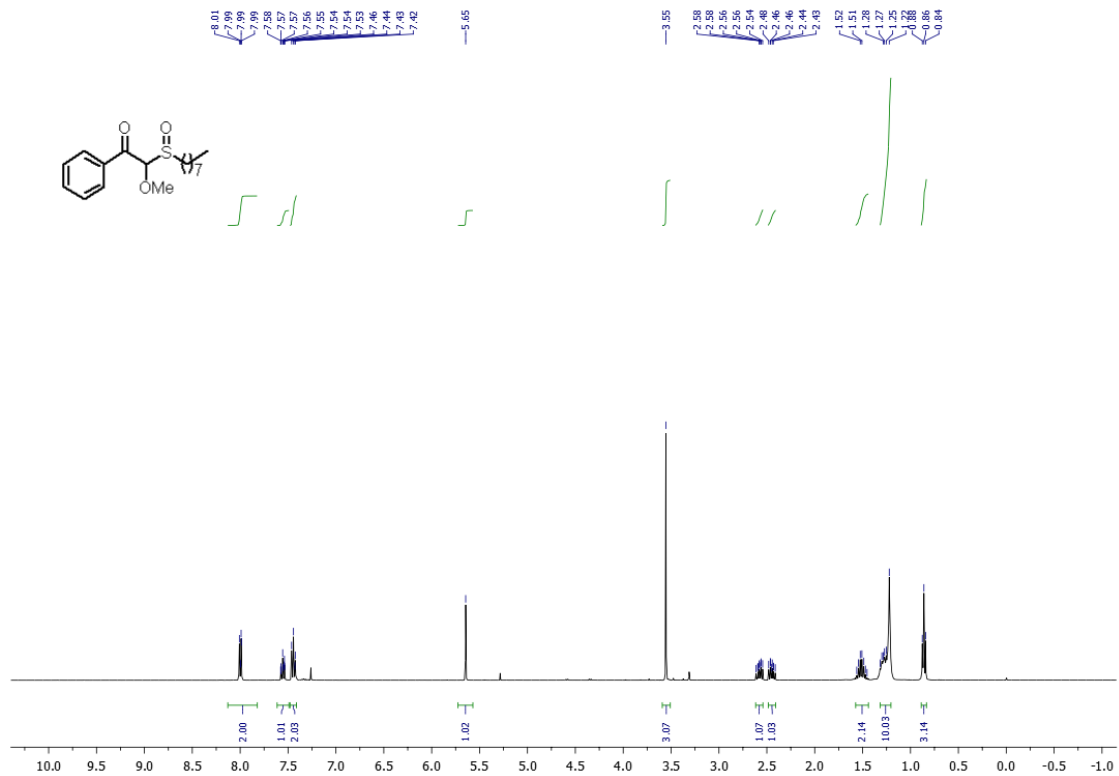
- 0.90 (t, 3H, $J = 7.1$ Hz), 0.97 (t, 3H, $J = 7.3$ Hz), 1.30 (dd, 8H, $J = 9.5, 4.2$ Hz), 1.43–1.51 (m, 2H), 1.67 (s, 2H), 1.78 (dd, 2H, $J = 15.4, 7.8$ Hz), 2.60–2.66 (m, 2H), 2.74–2.81 (m, 1H), 2.91–2.98 (m, 1H), 6.37 (d, 1H, $J = 10.9$ Hz), 7.06 (d, 1H, $J = 10.9$ Hz), 7.22 (d, 2H, $J = 8.1$ Hz), 7.35 (t, 2H, $J = 7.3$ Hz). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 13.8, 14.1, 22.6, 22.6, 24.3, 28.8, 29.0, 29.2, 31.7, 37.8, 54.3, 128.8, 129.8, 131.4, 134.5, 139.1, 144.4. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{19}\text{H}_{31}\text{OS}$, 307.2090; found: 307.2077.

(E)-1-methoxy-4-(2-(octylsulfinyl)vinyl)benzene (70).

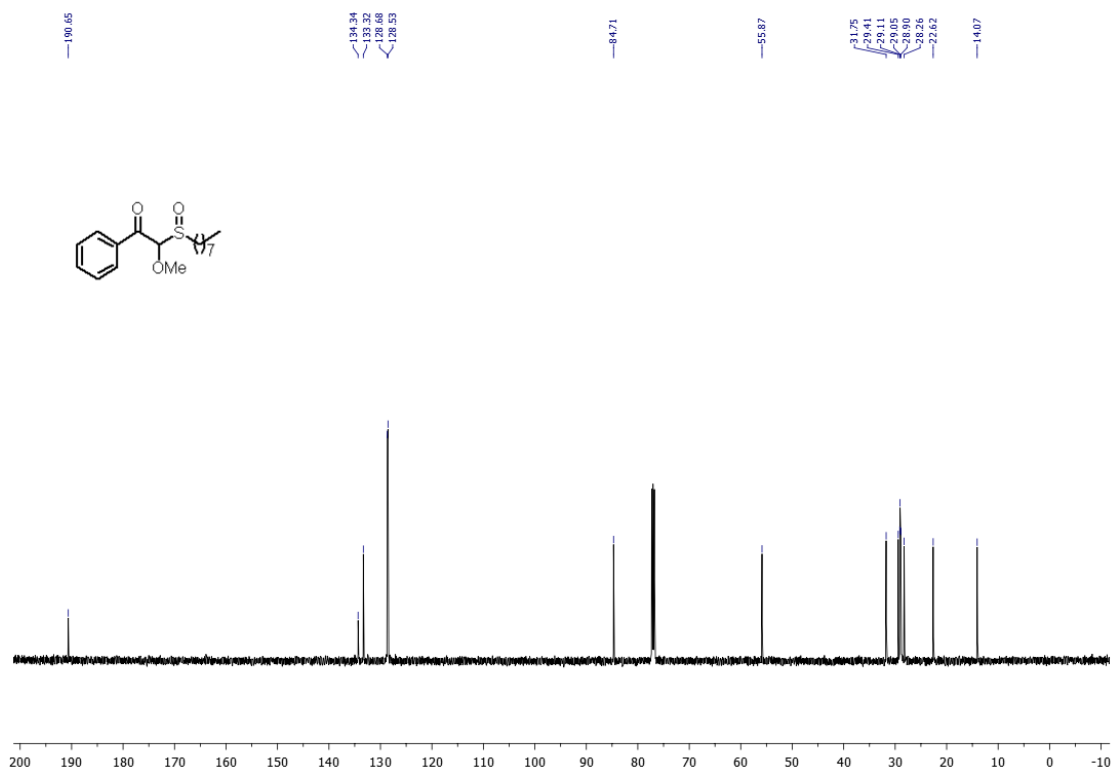


The title compound was prepared according to the method B by taking p-tolylacetylene (20 μl , 0.15 mmol), 1-octanethiol (33 μL , 0.22 mmol), DIPEA (14 μL , 0.07 mmol), $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (1 mg, 1 mol %) and H_2O (1 ml) as solvent and purified by column chromatography (hexane:EA = 76:24) as yellow oily liquid (22 mg, 49%). ^1H NMR (CDCl_3 , 400 MHz): δ - 0.86 (t, 3H, $J = 6.9$ Hz), 1.19–1.31 (m, 8H), 1.42 (dt, 2H, $J = 18.4, 6.7$ Hz), 1.70–1.79 (m, 2H), 2.68–2.77 (m, 1H), 2.85–2.94 (m, 1H), 3.82 (s, 3H), 6.25 (d, 1H, $J = 10.9$ Hz), 6.79–6.93 (m, 2H), 6.97 (d, 1H, $J = 10.9$ Hz), 7.37 (d, 2H, $J = 8.7$ Hz). $^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz): δ - 14.1, 22.6, 22.6, 28.9, 29.0, 29.2, 31.8, 54.3, 55.4, 114.1, 126.6, 131.6, 132.9, 138.8, 160.5. HRMS (ESI) (m/z): $[\text{M}+\text{H}]^+$ calculated for $\text{C}_{17}\text{H}_{27}\text{O}_2\text{S}$, 295.1726; found: 295.1696.

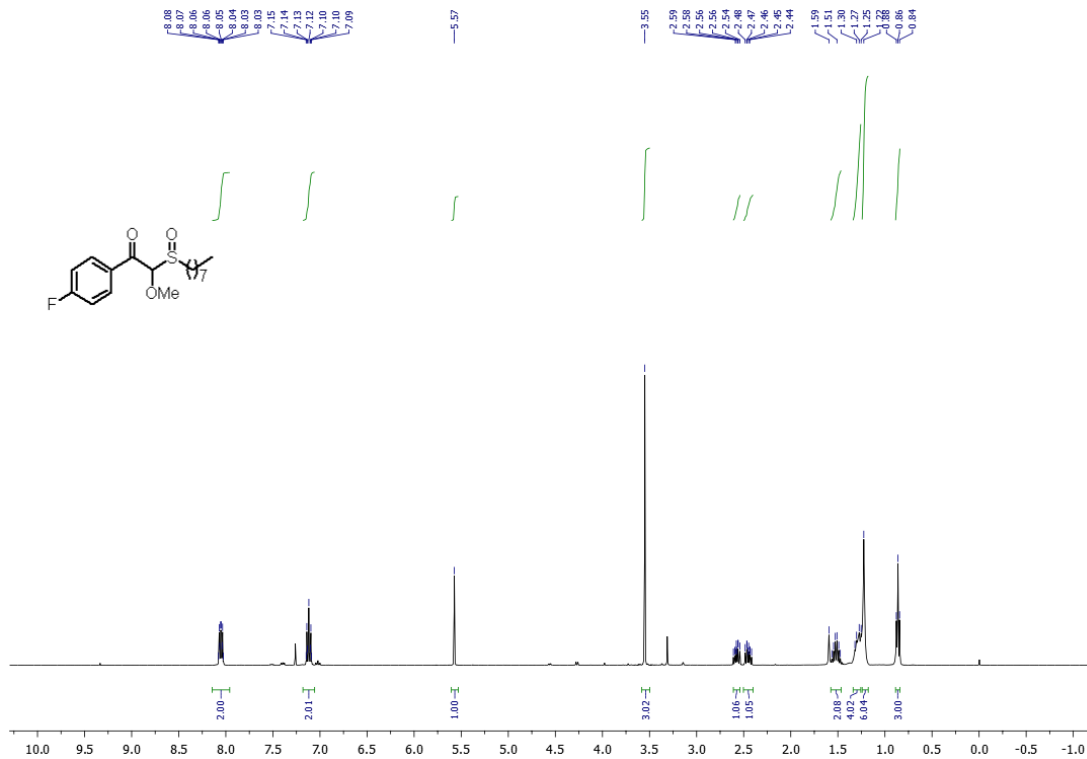
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) spectra of compound 3



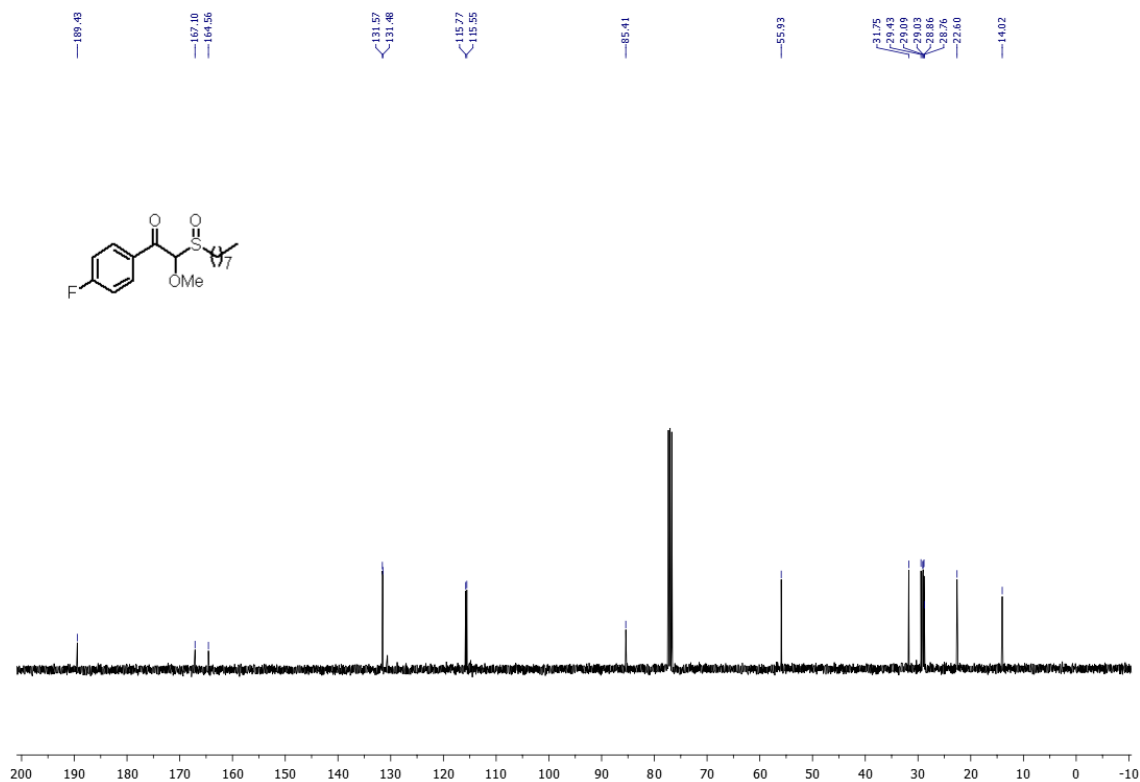
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) of compound 3



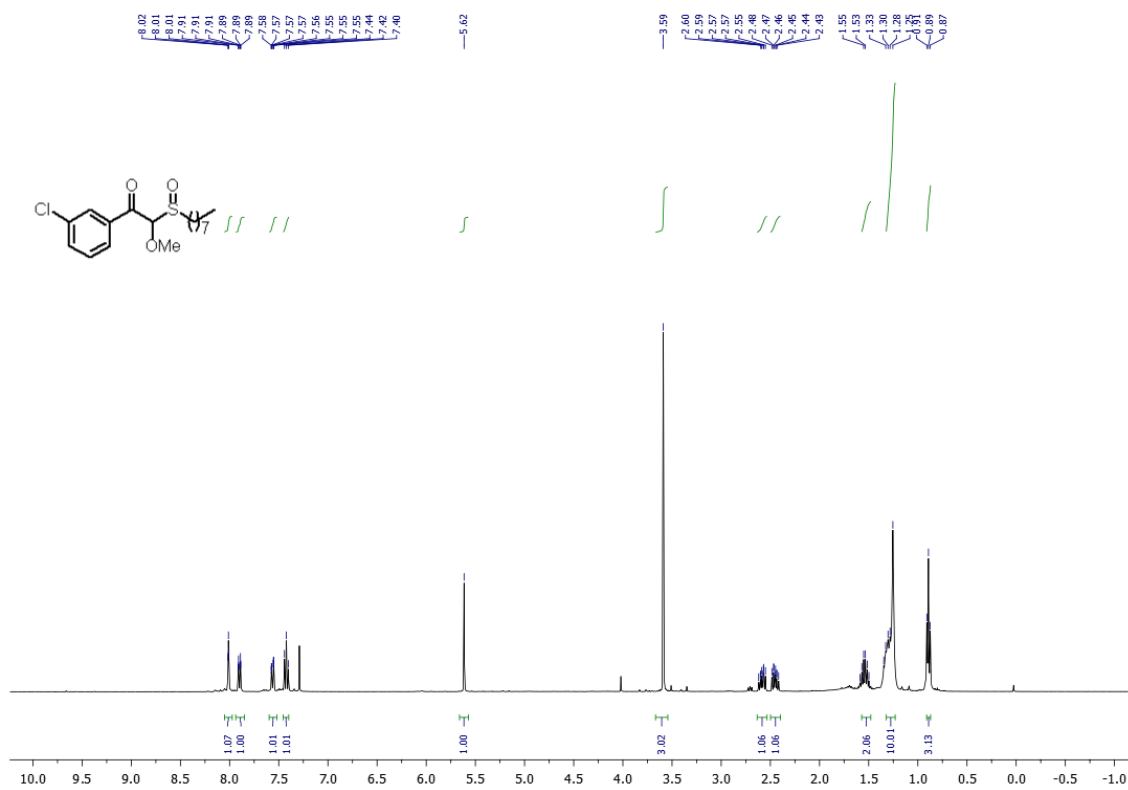
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) spectra of compound 4



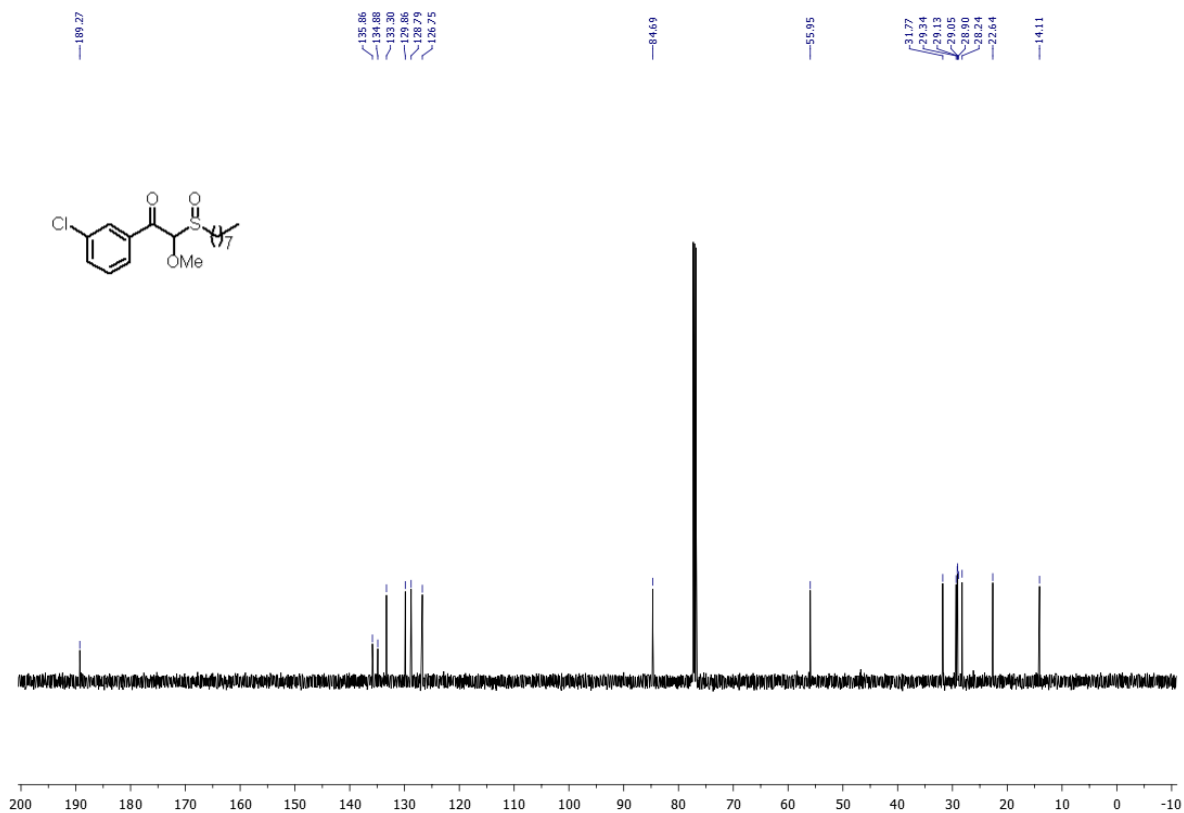
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 100 MHz) spectra of compound 4



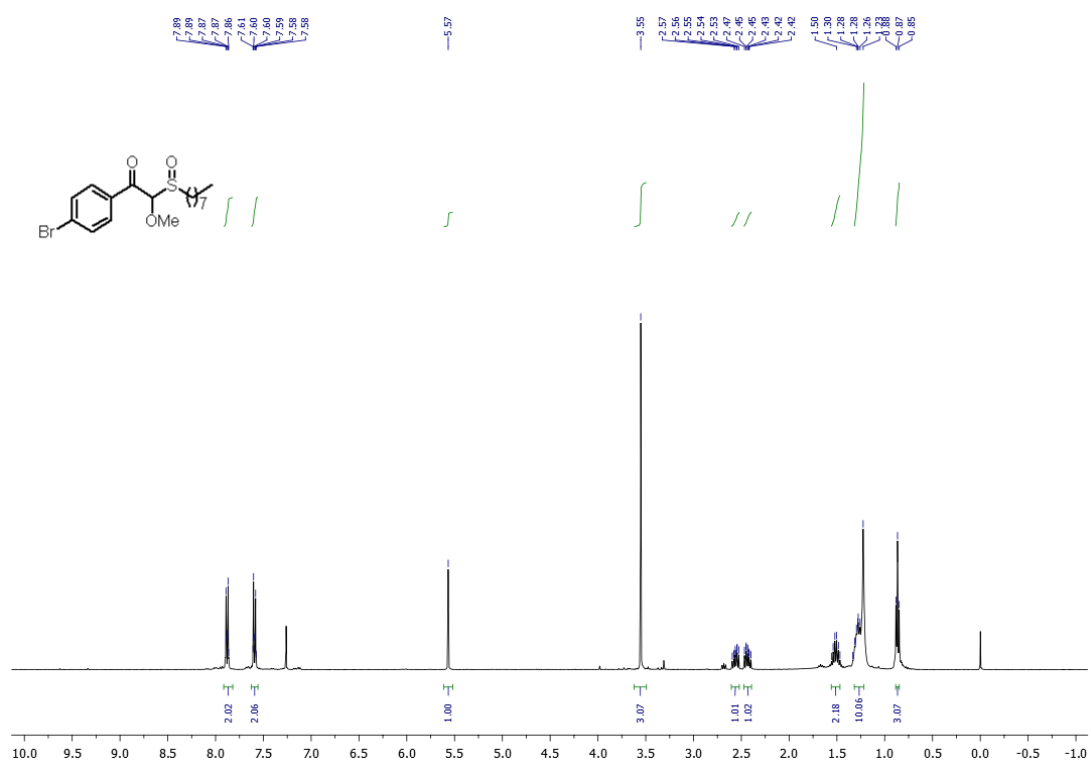
¹H-NMR (CDCl₃, 400 MHz) spectra of compound 5



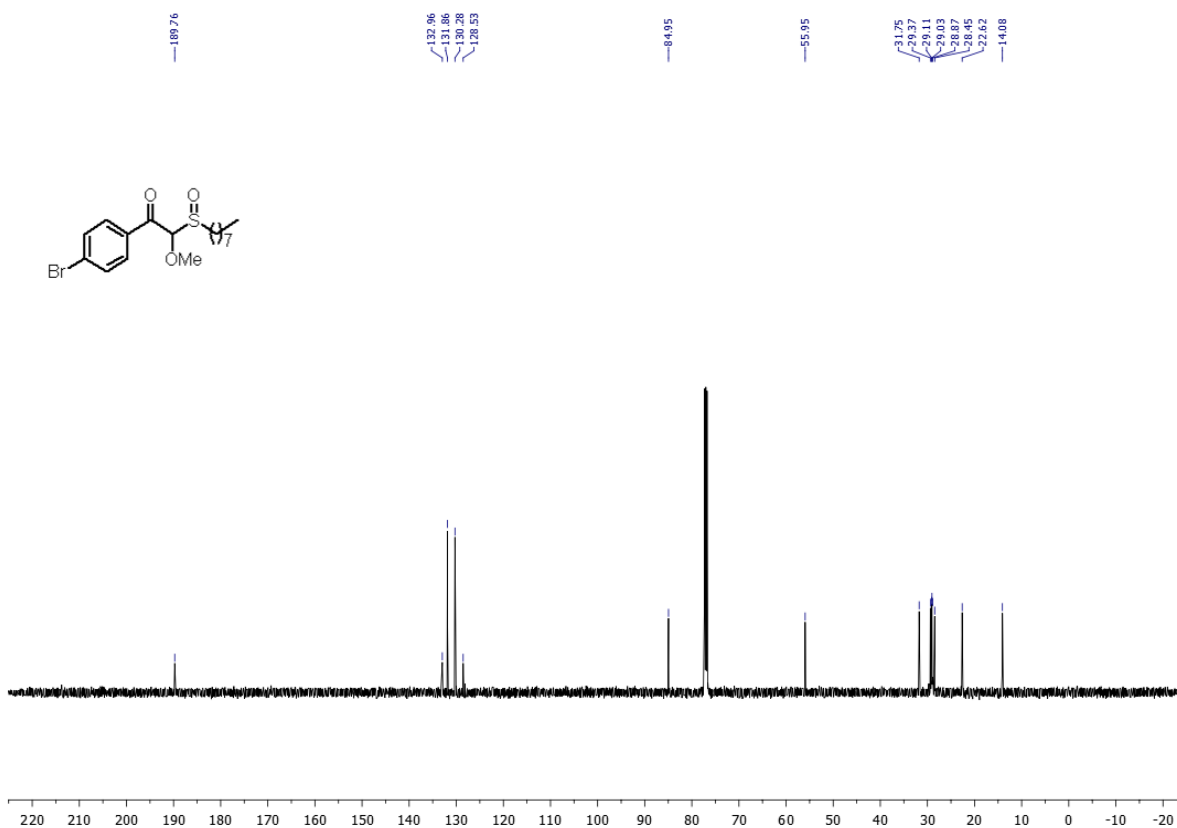
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 5



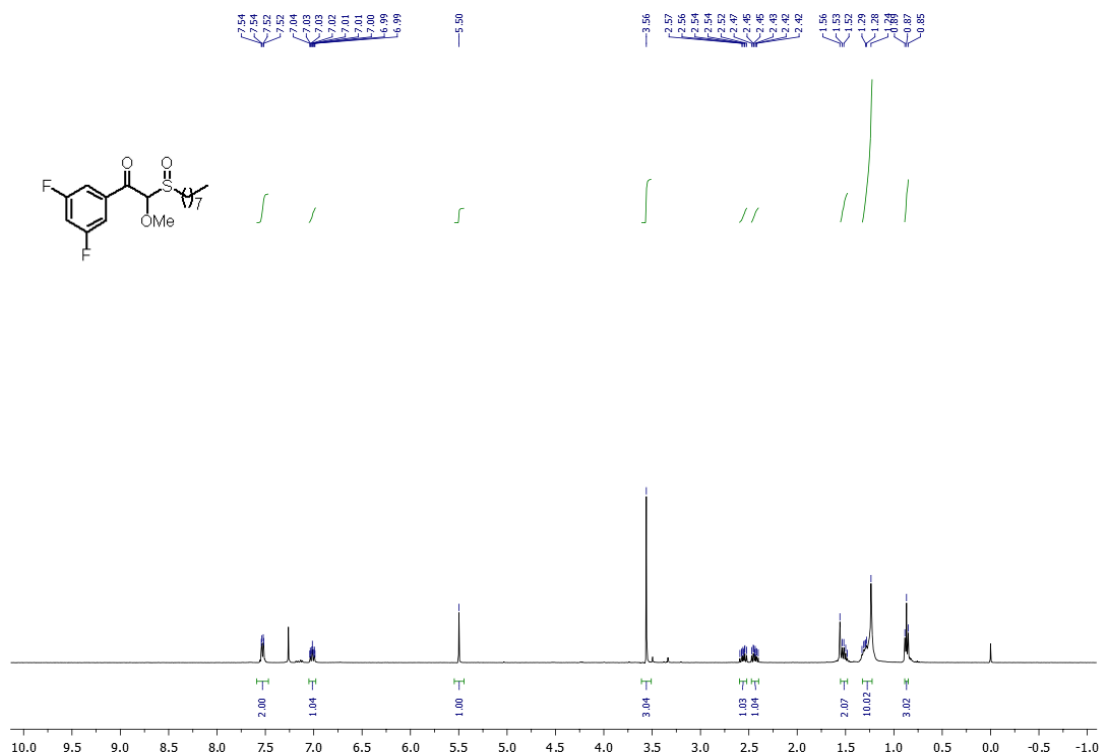
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) spectra of compound 6



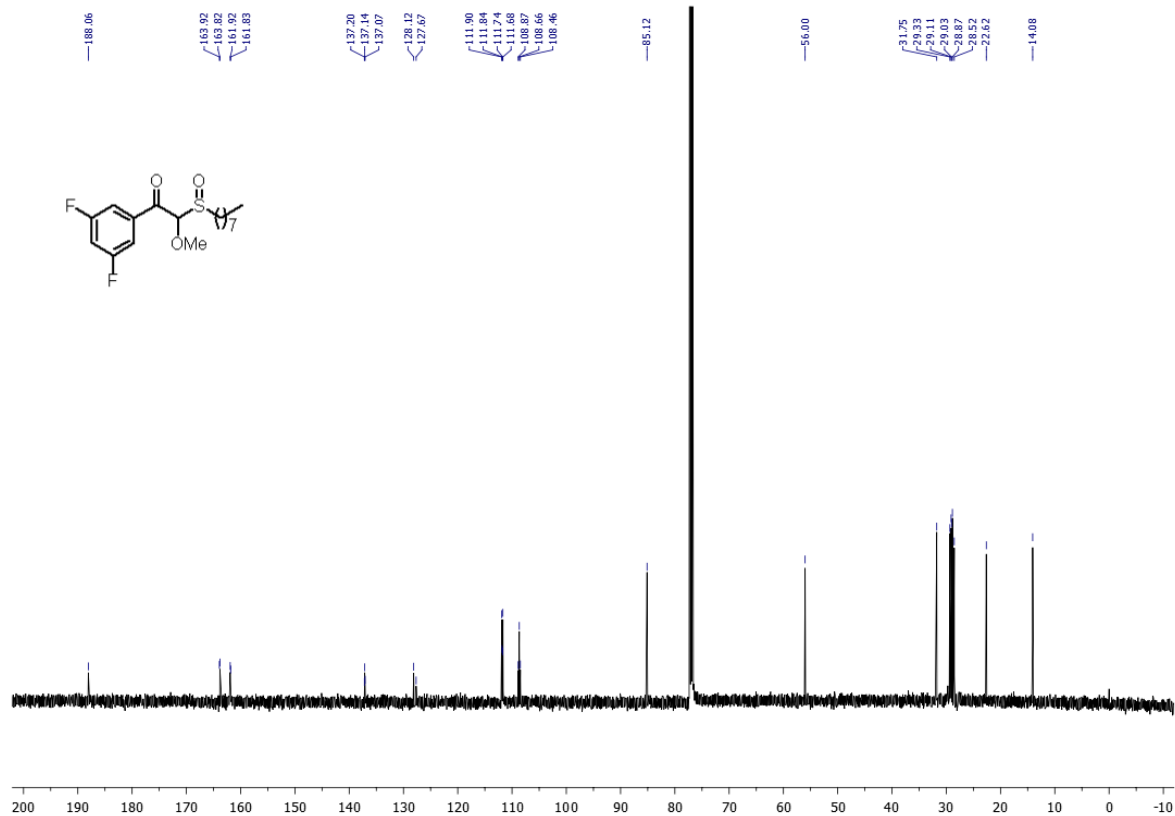
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 6



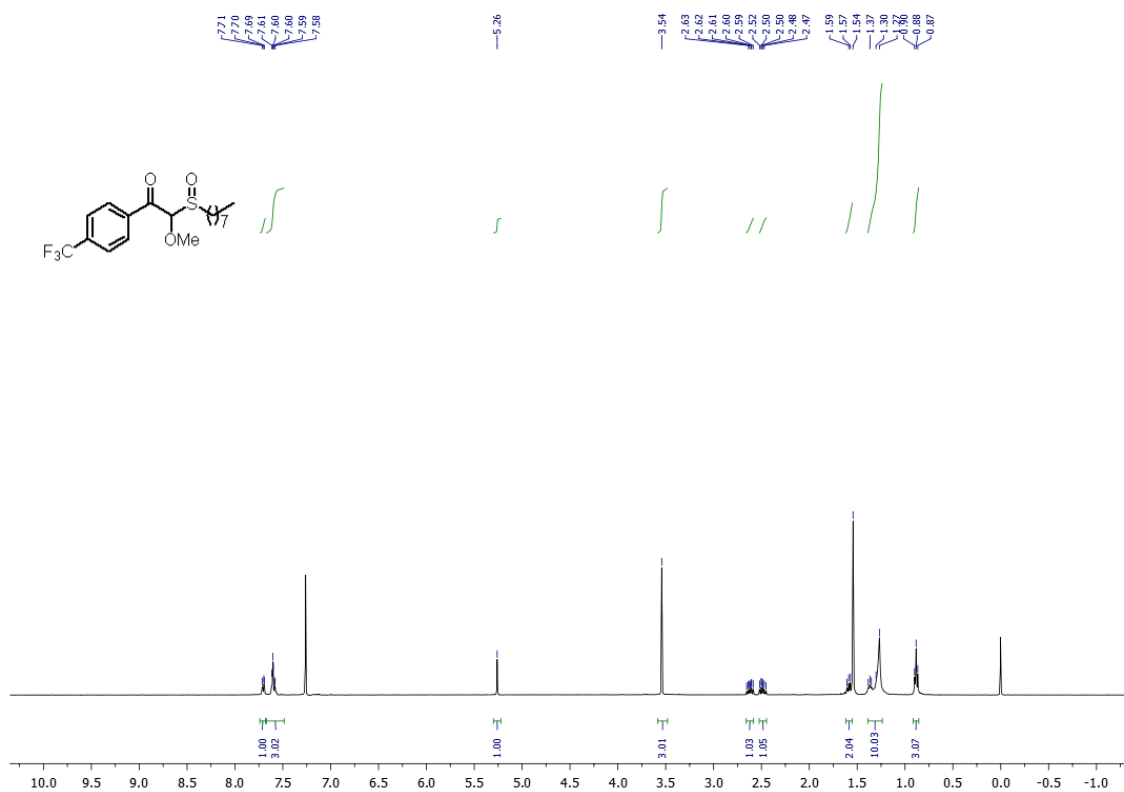
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) spectra of compound 7



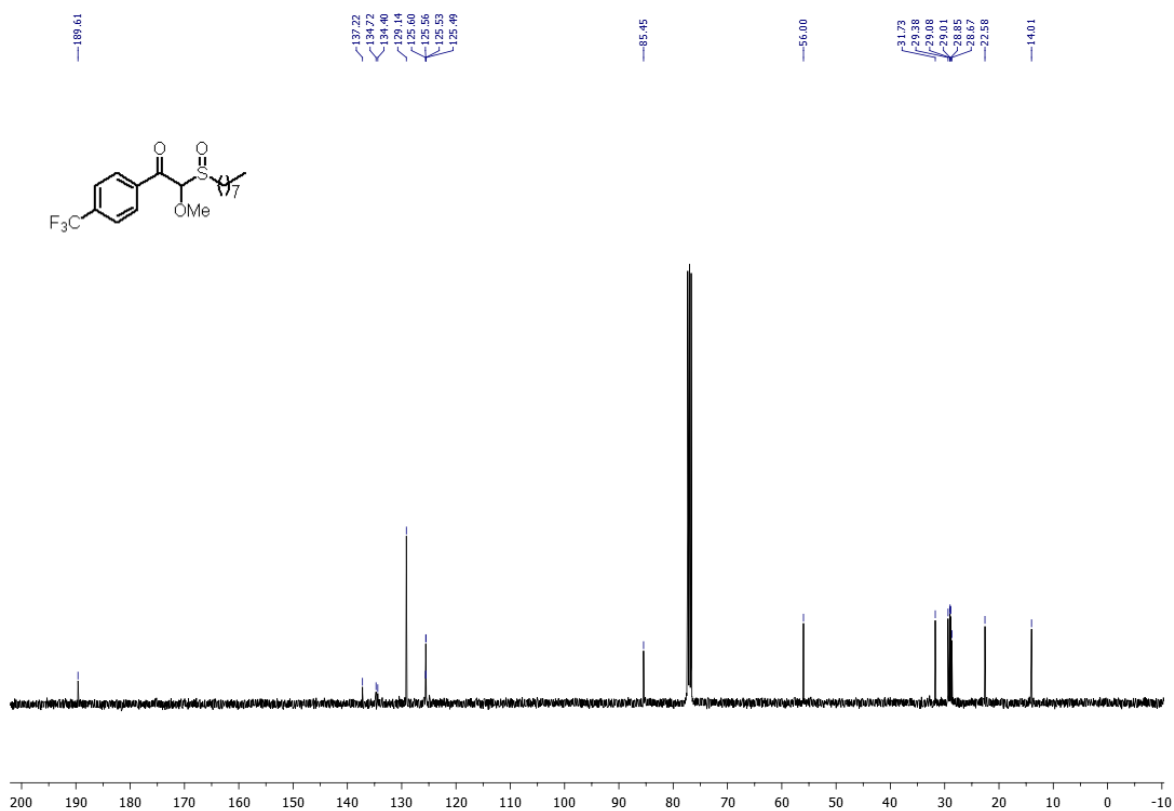
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 7



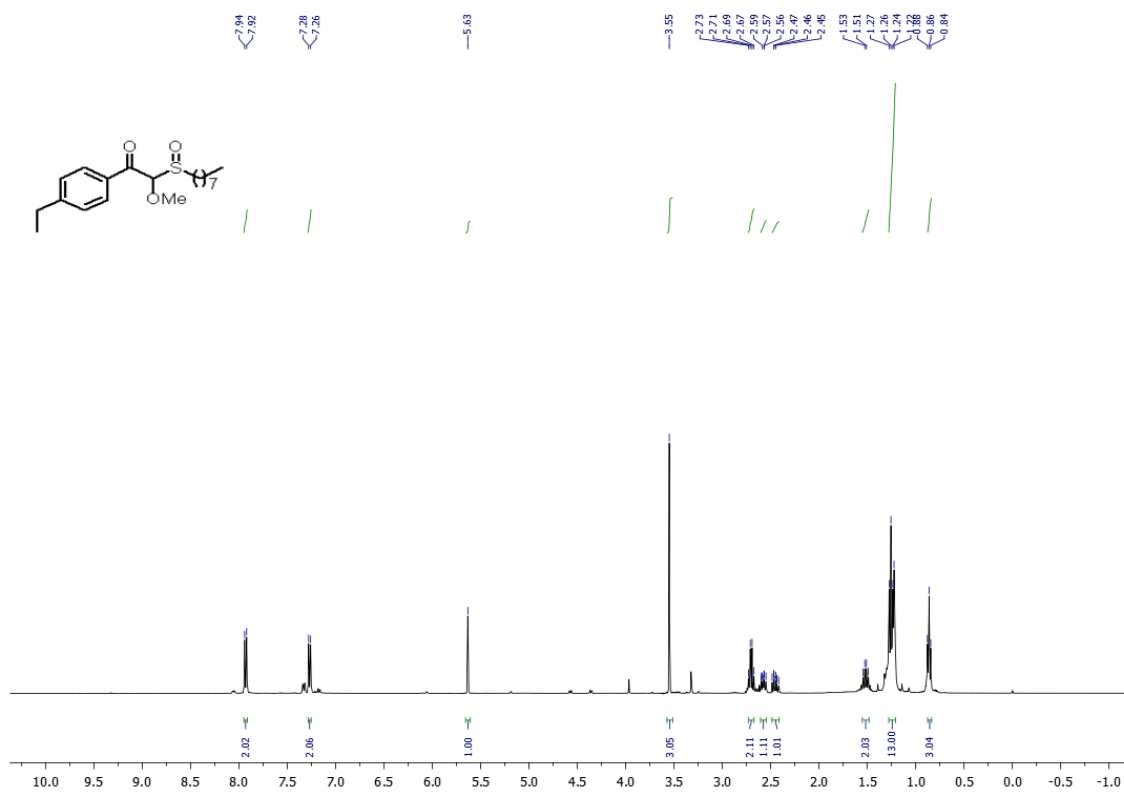
¹H-NMR (CDCl₃, 400 MHz) spectra of compound 8



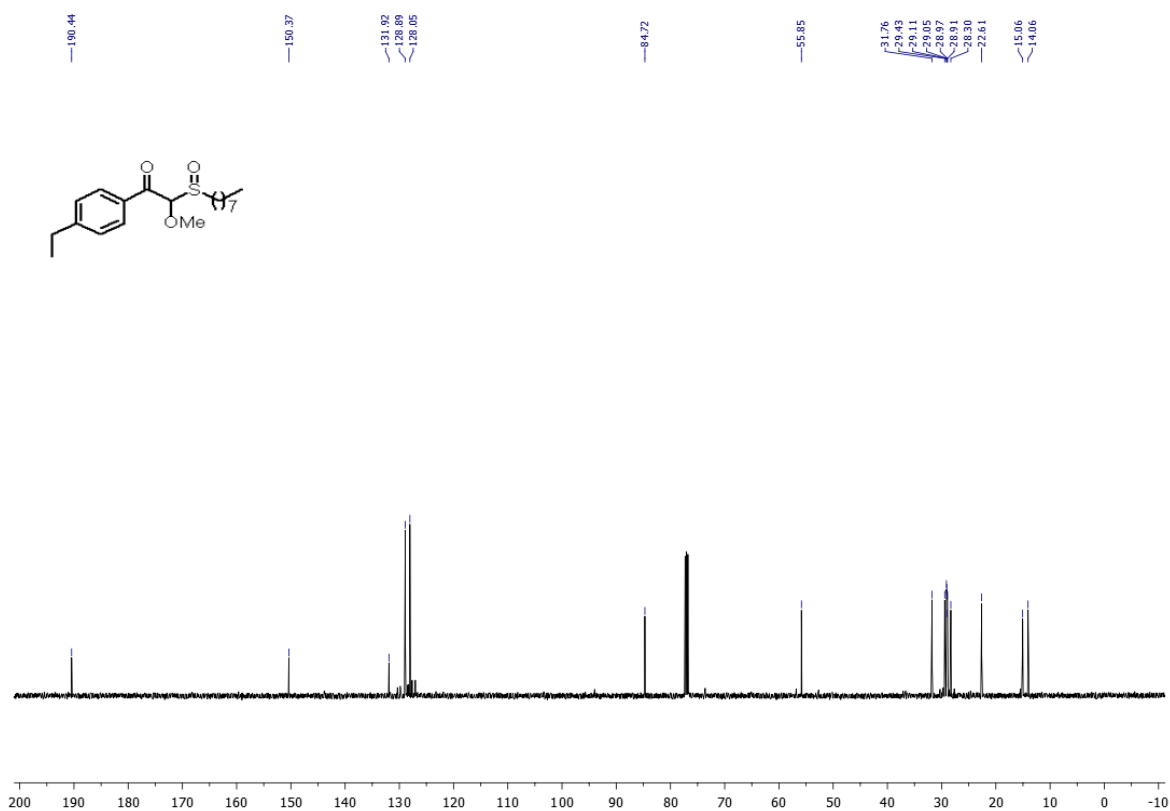
¹³C{¹H} NMR (CDCl₃, 100 MHz) spectra of compound 8



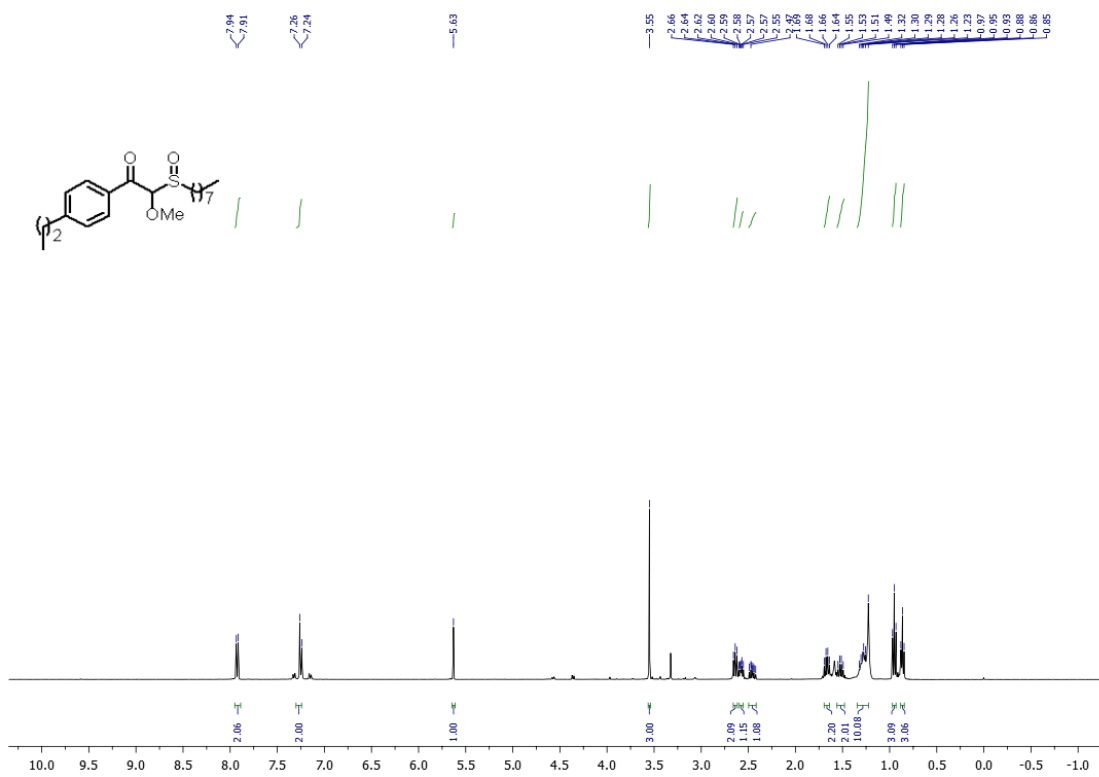
¹H-NMR (CDCl₃, 400 MHz) spectra of compound 9



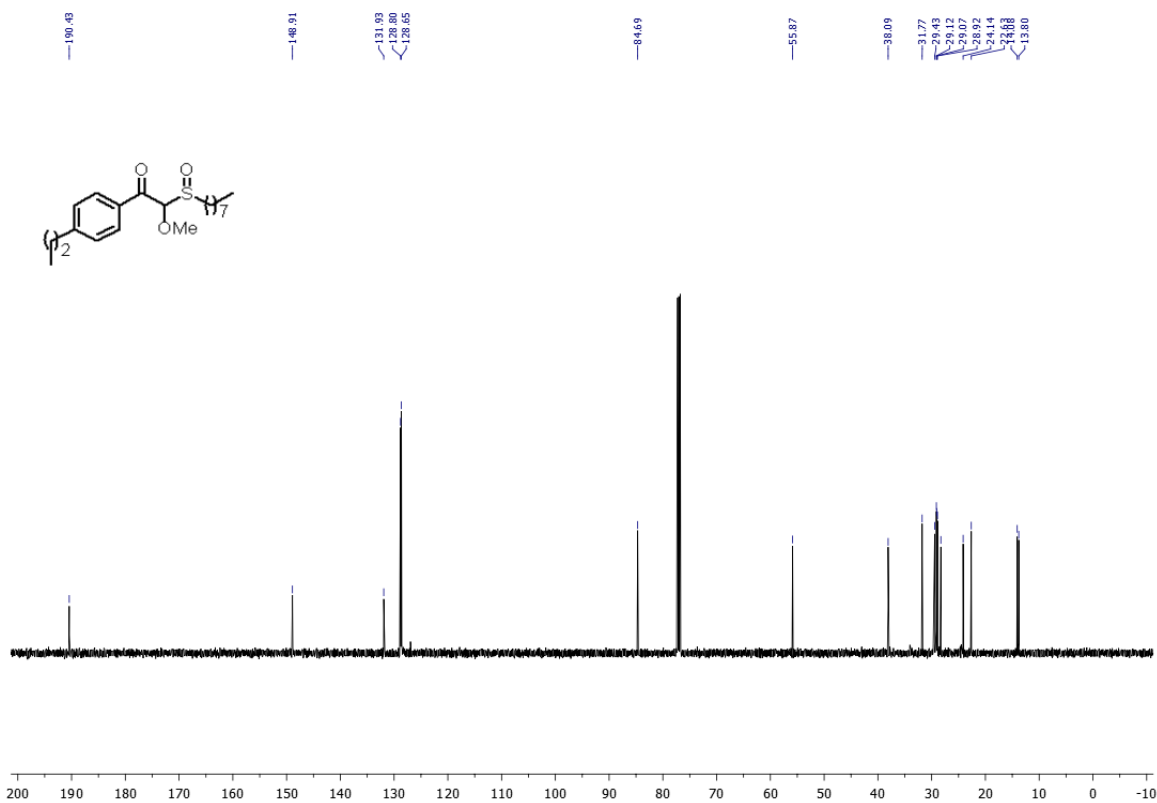
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 9



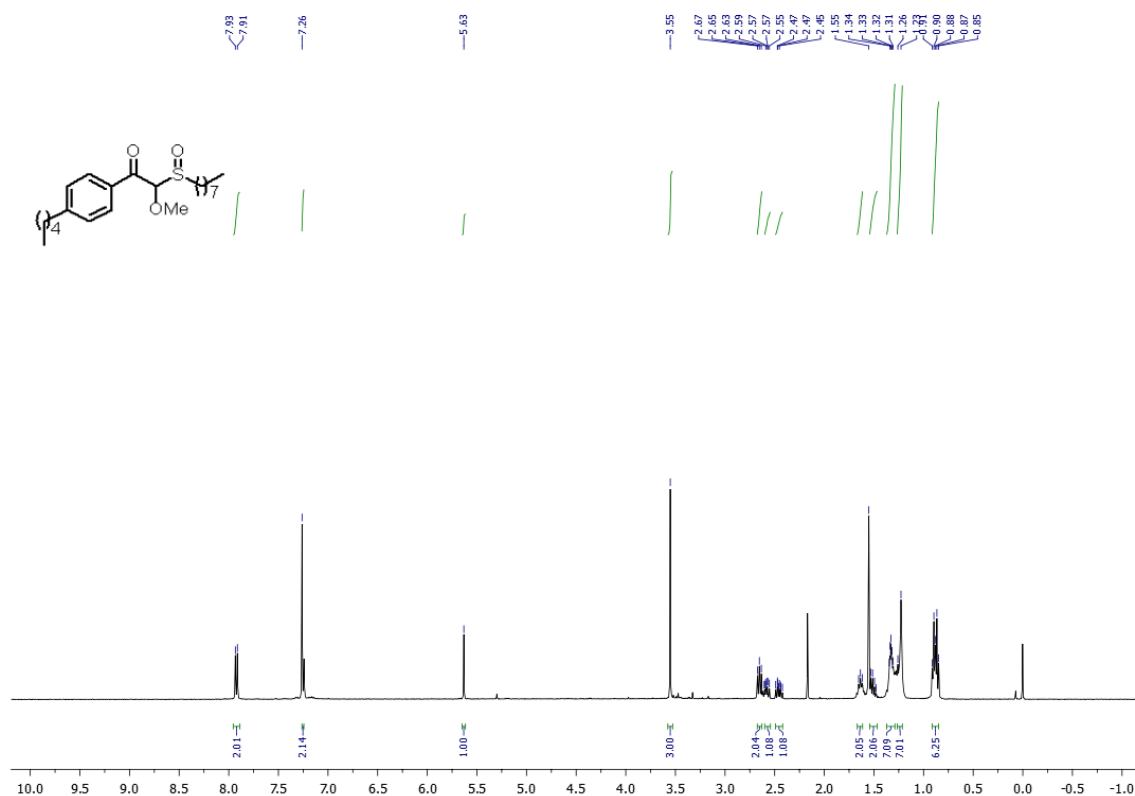
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) spectra of compound 10



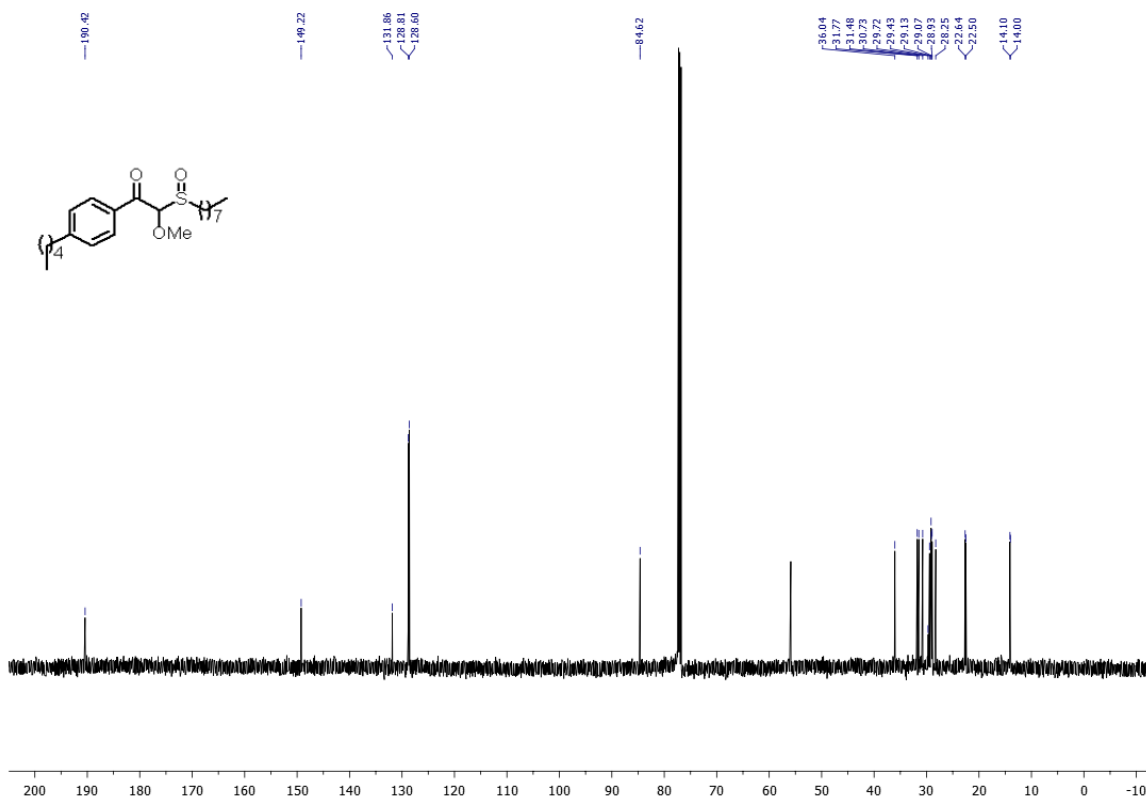
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 10



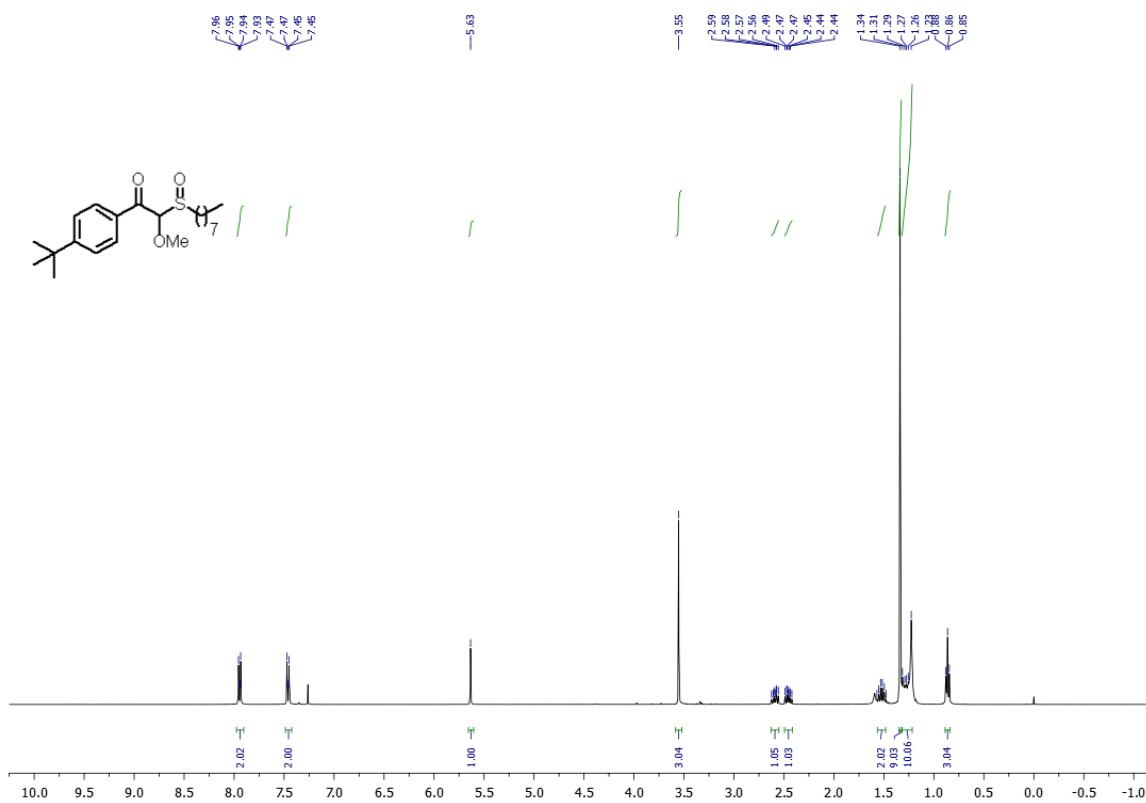
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 11



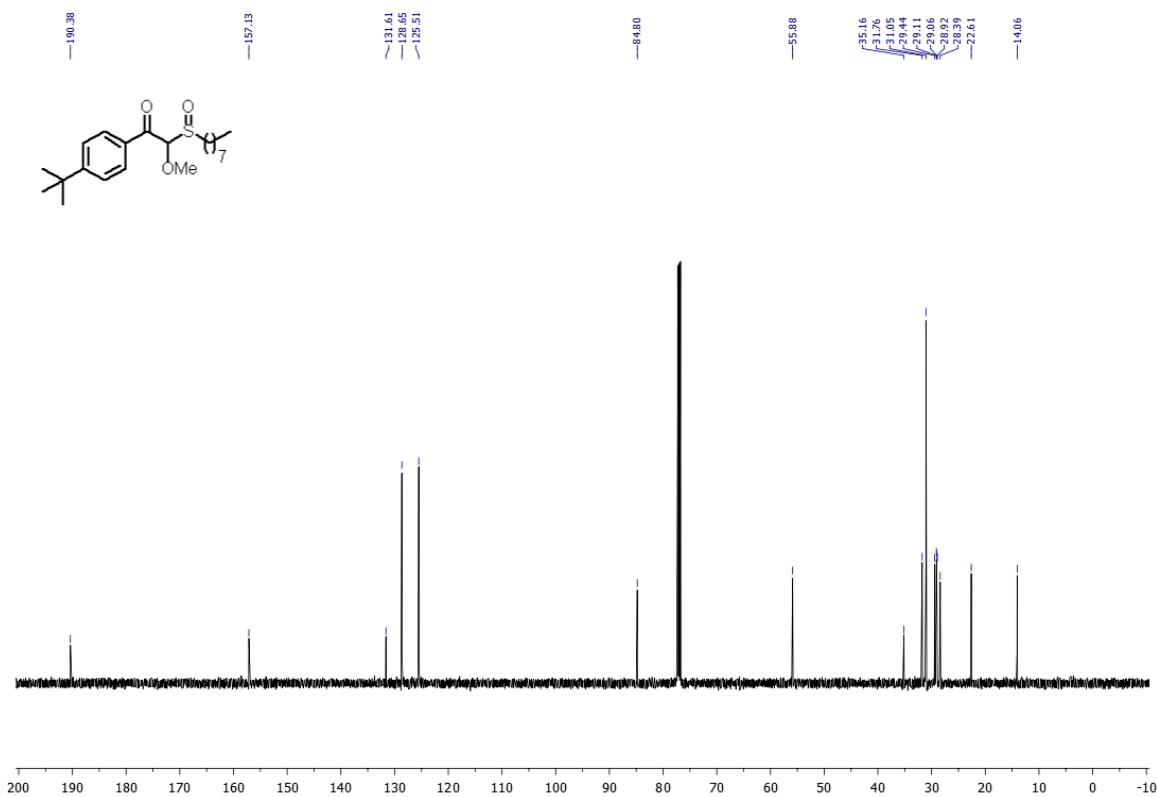
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 11



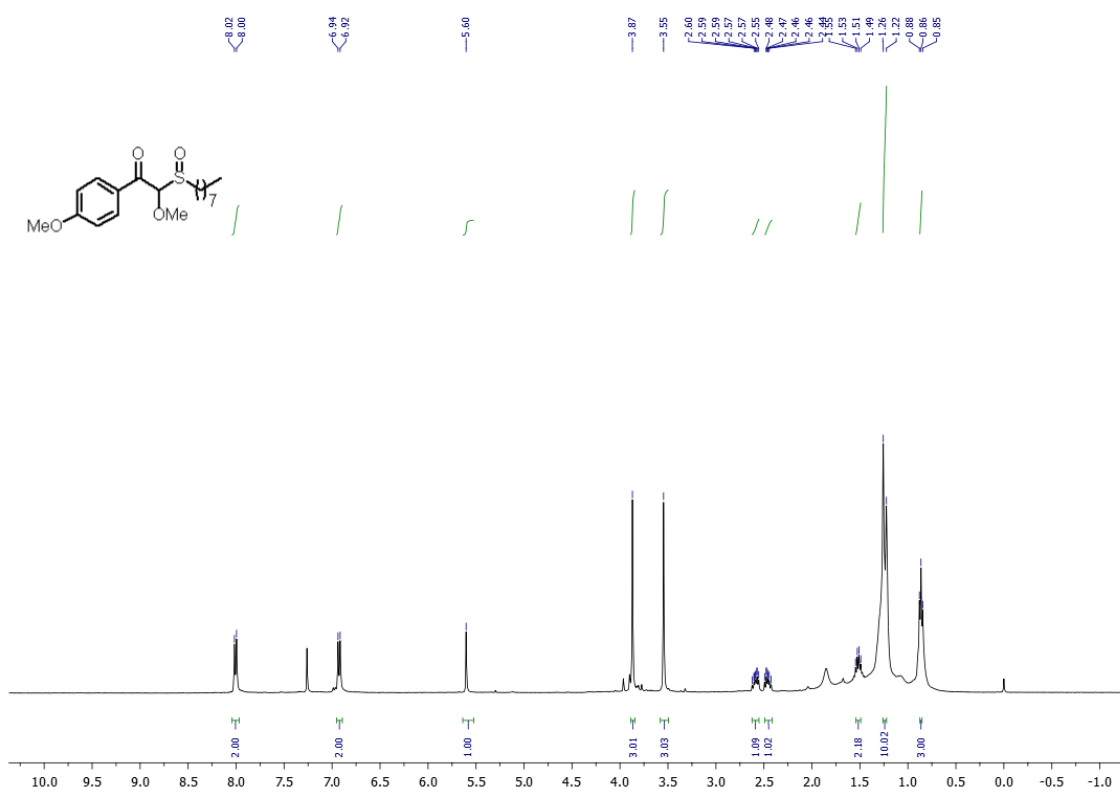
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 12



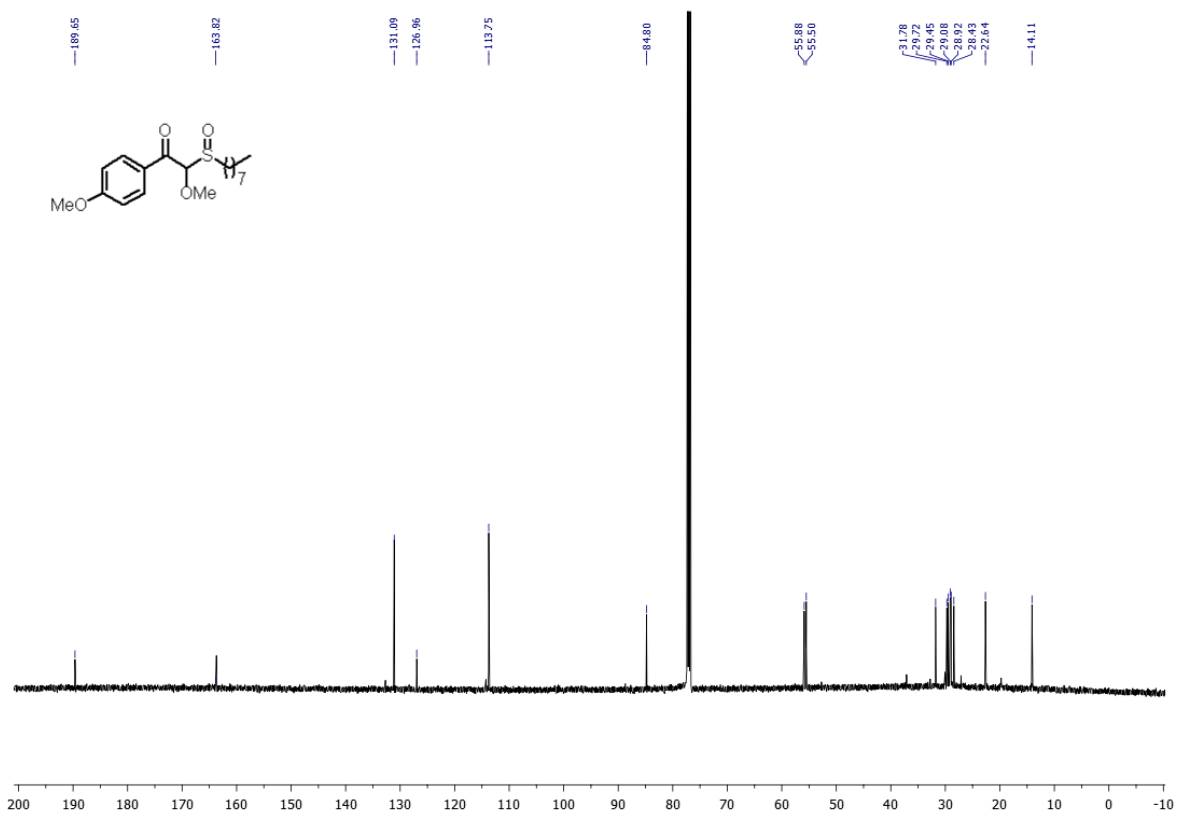
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 12



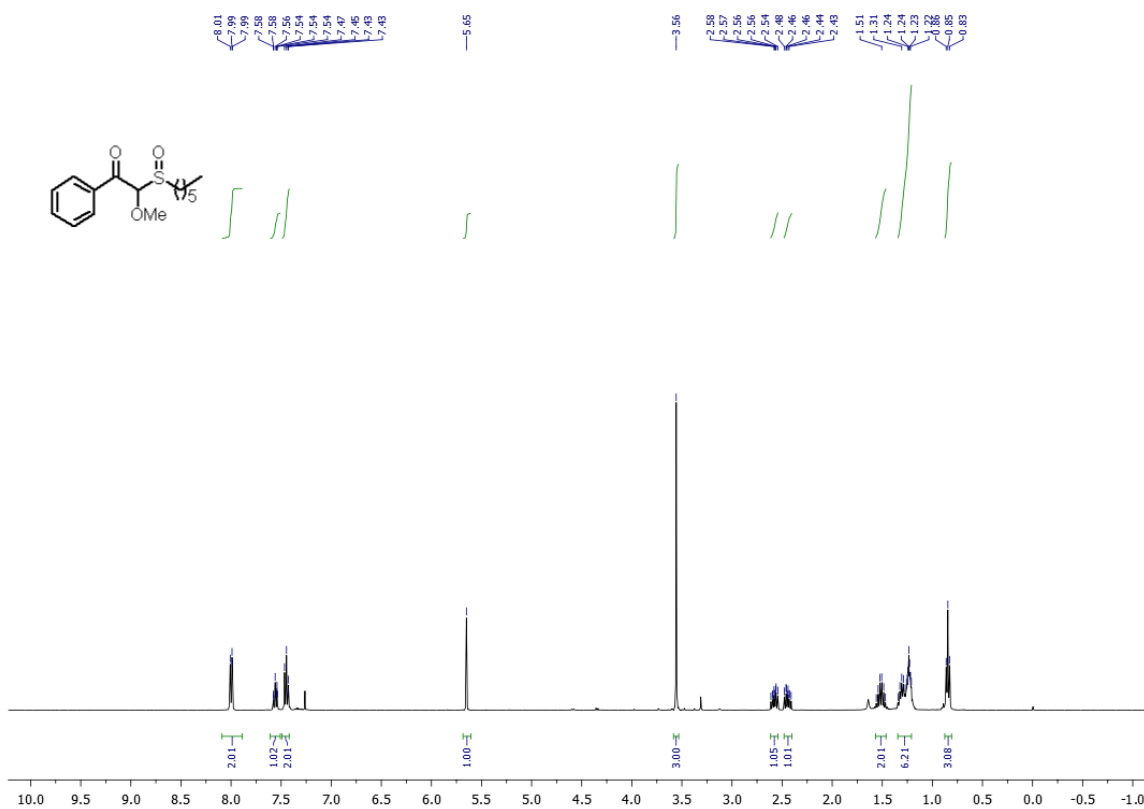
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 13



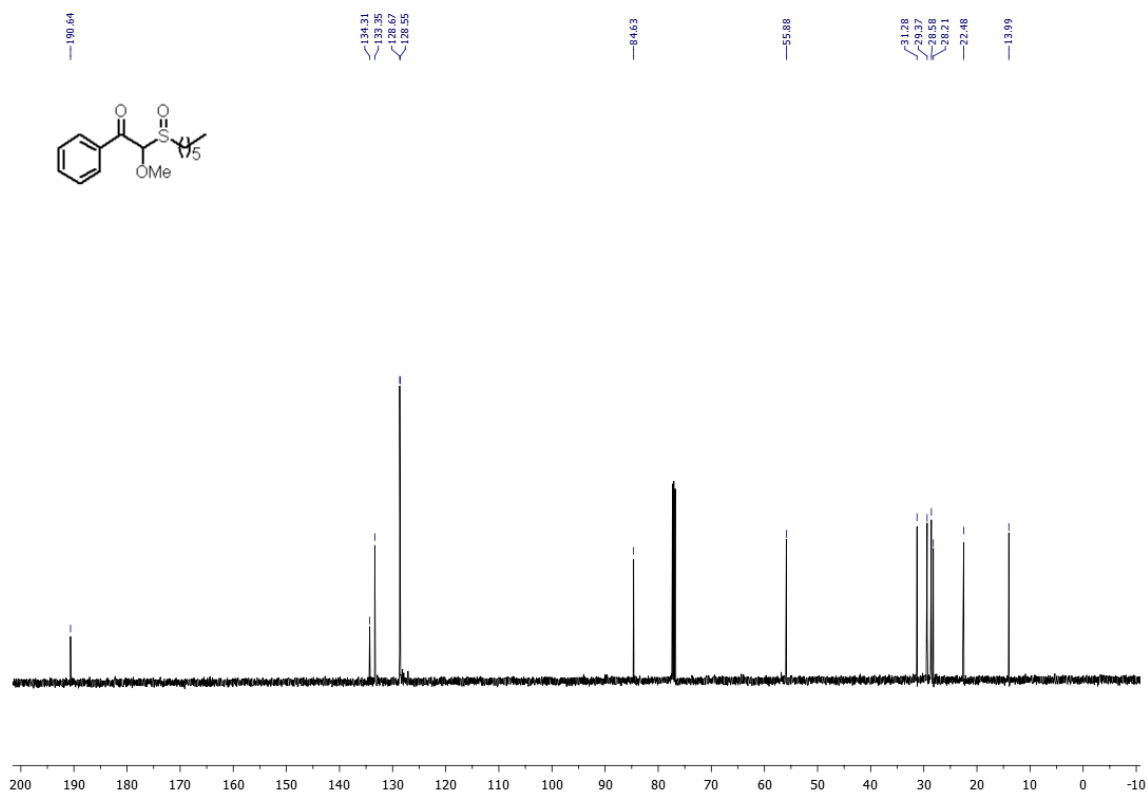
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 13



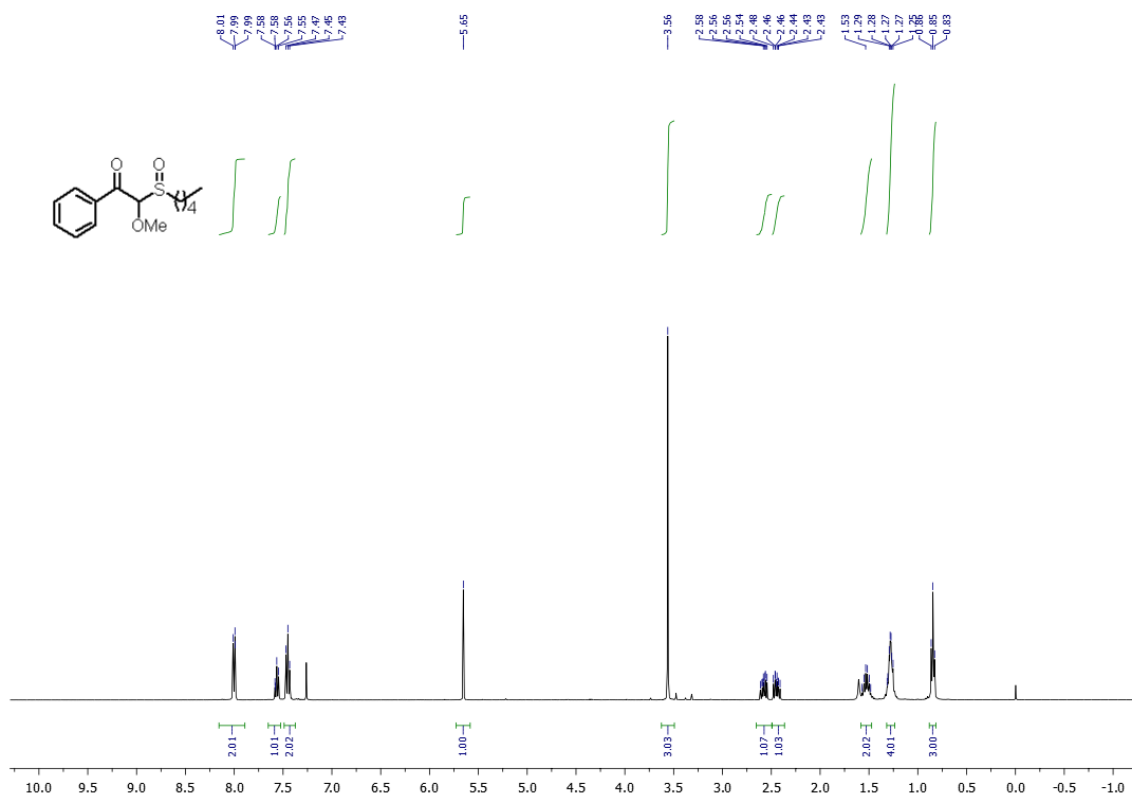
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 14



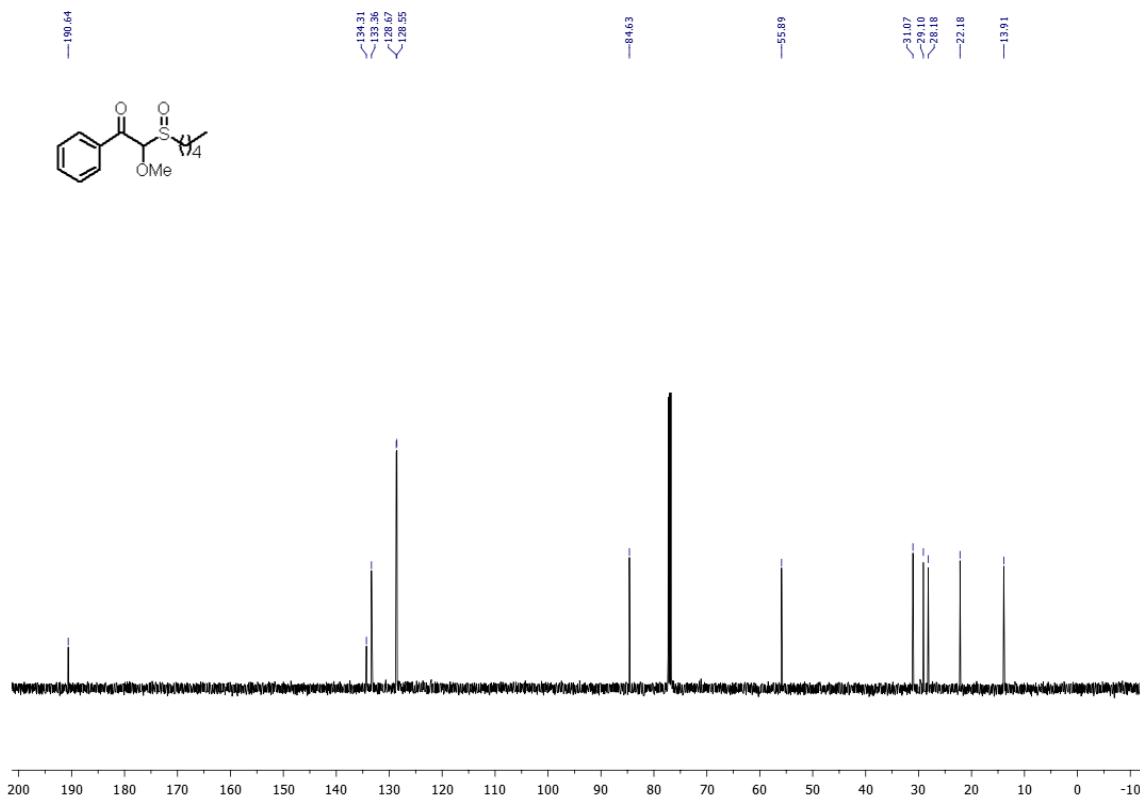
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 14



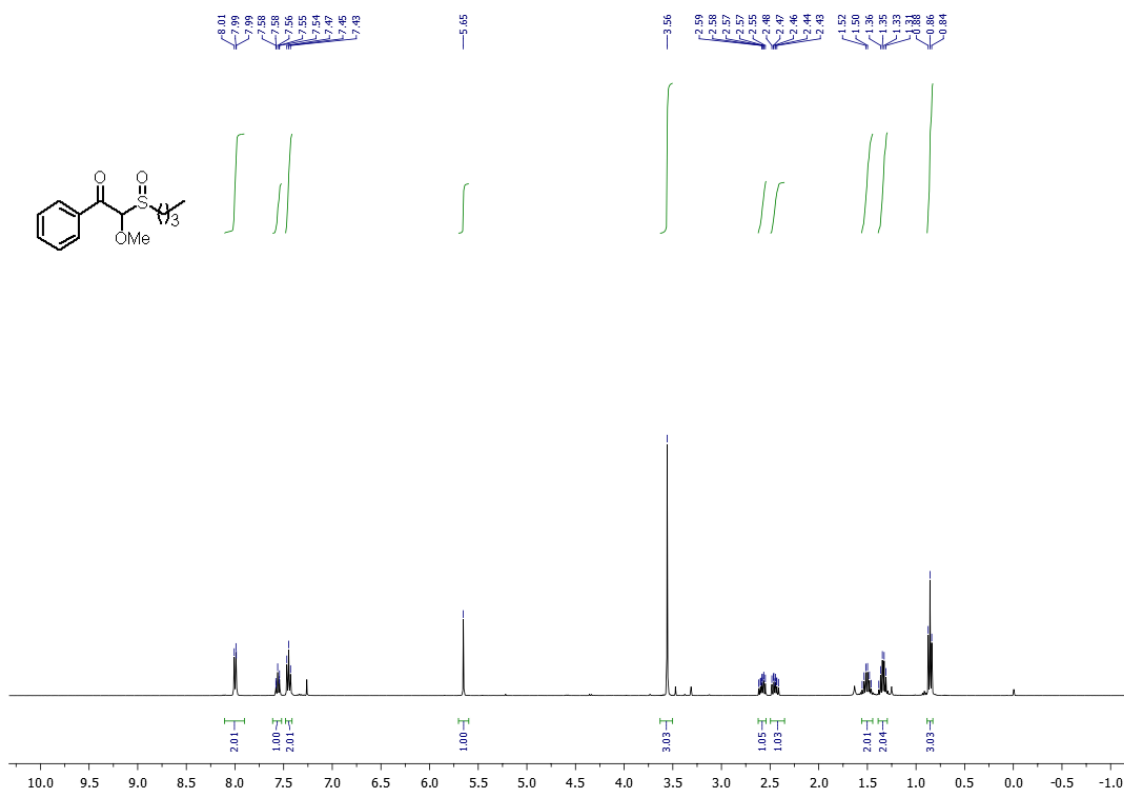
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 15



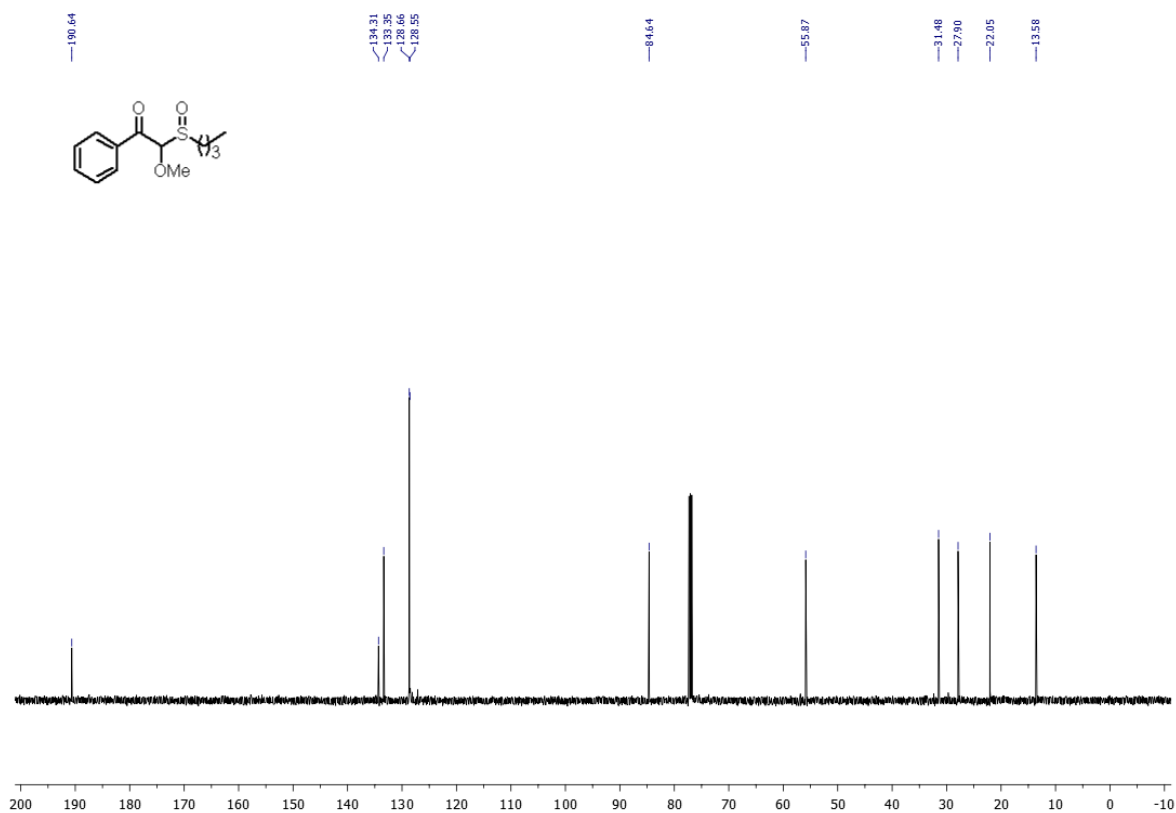
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 15



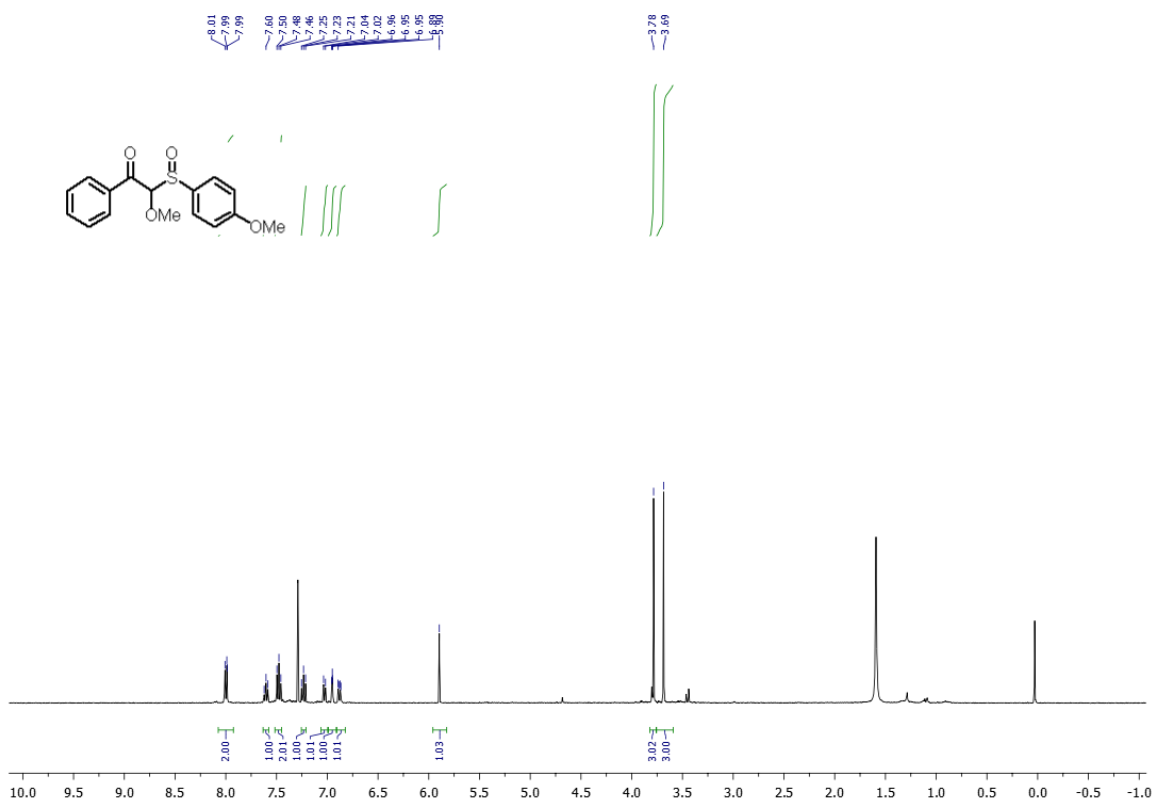
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 16



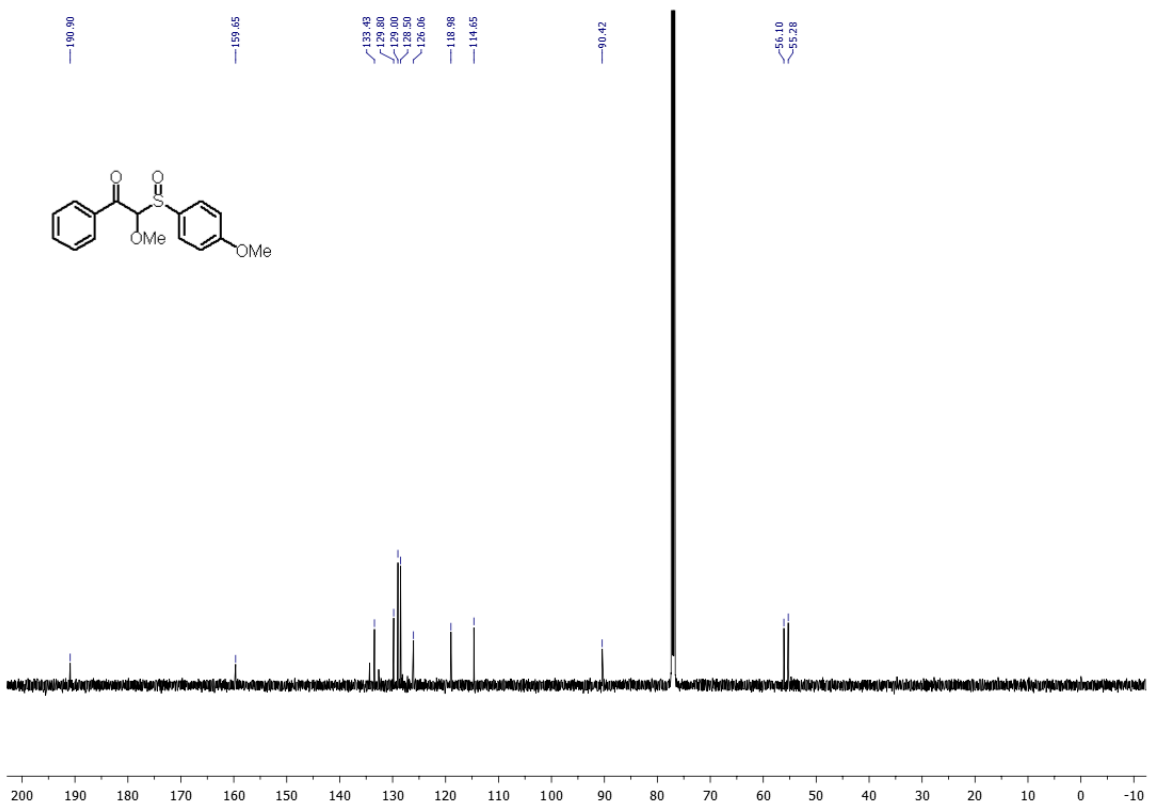
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 16



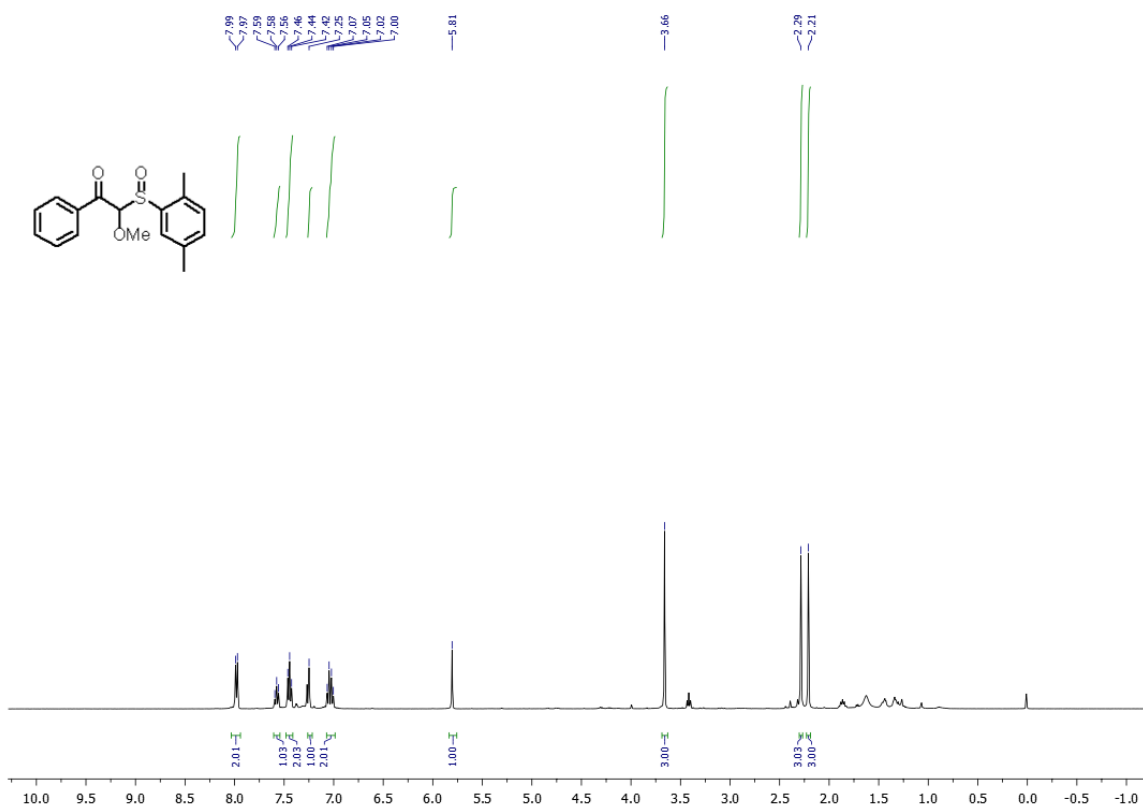
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 17



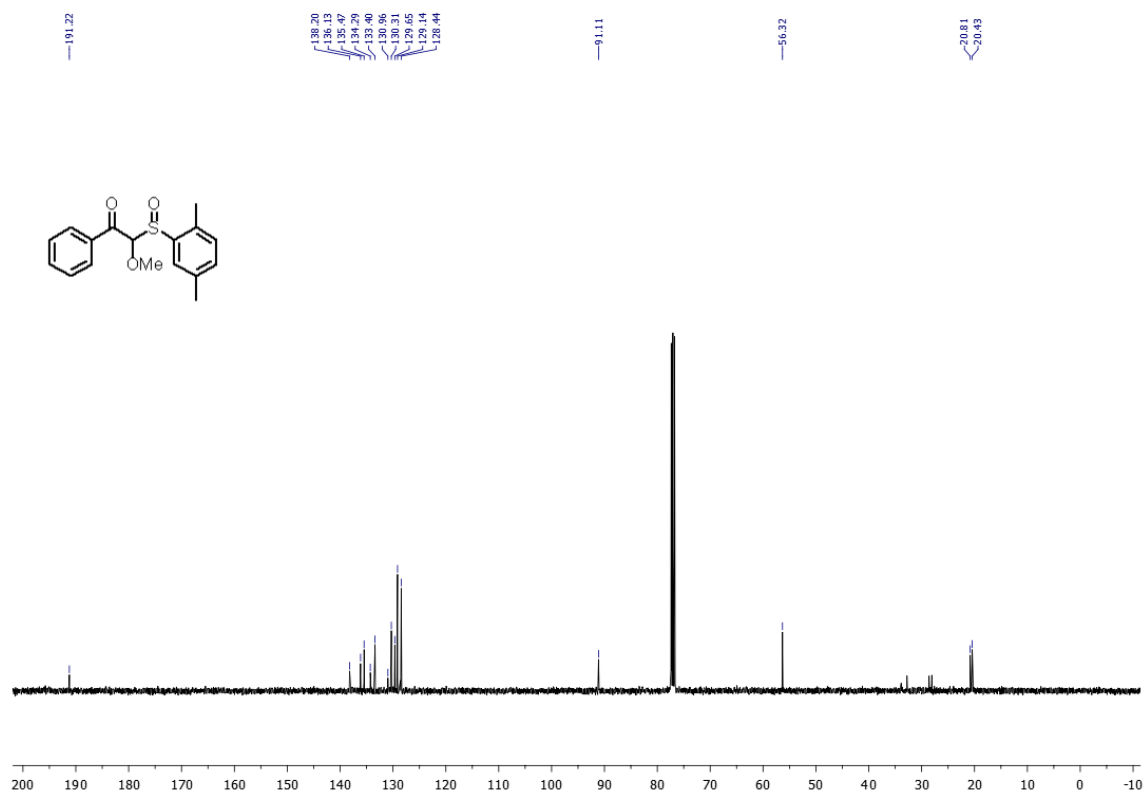
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 17



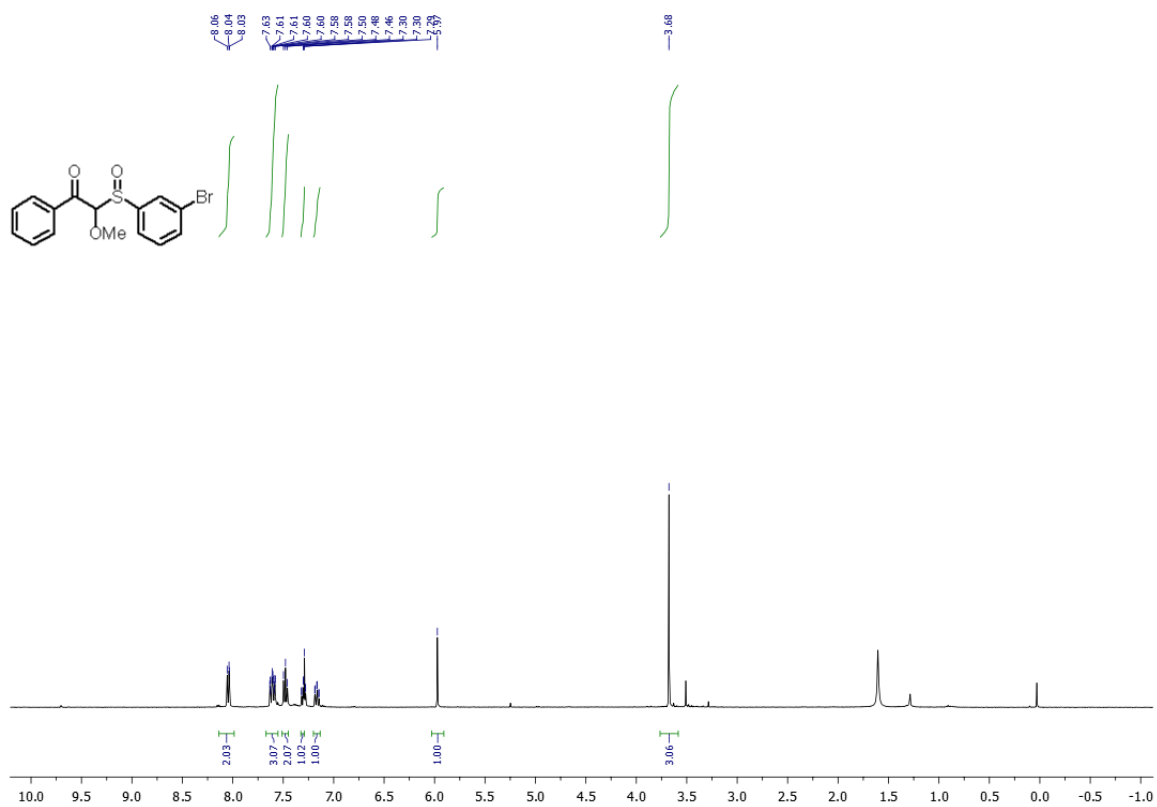
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 18



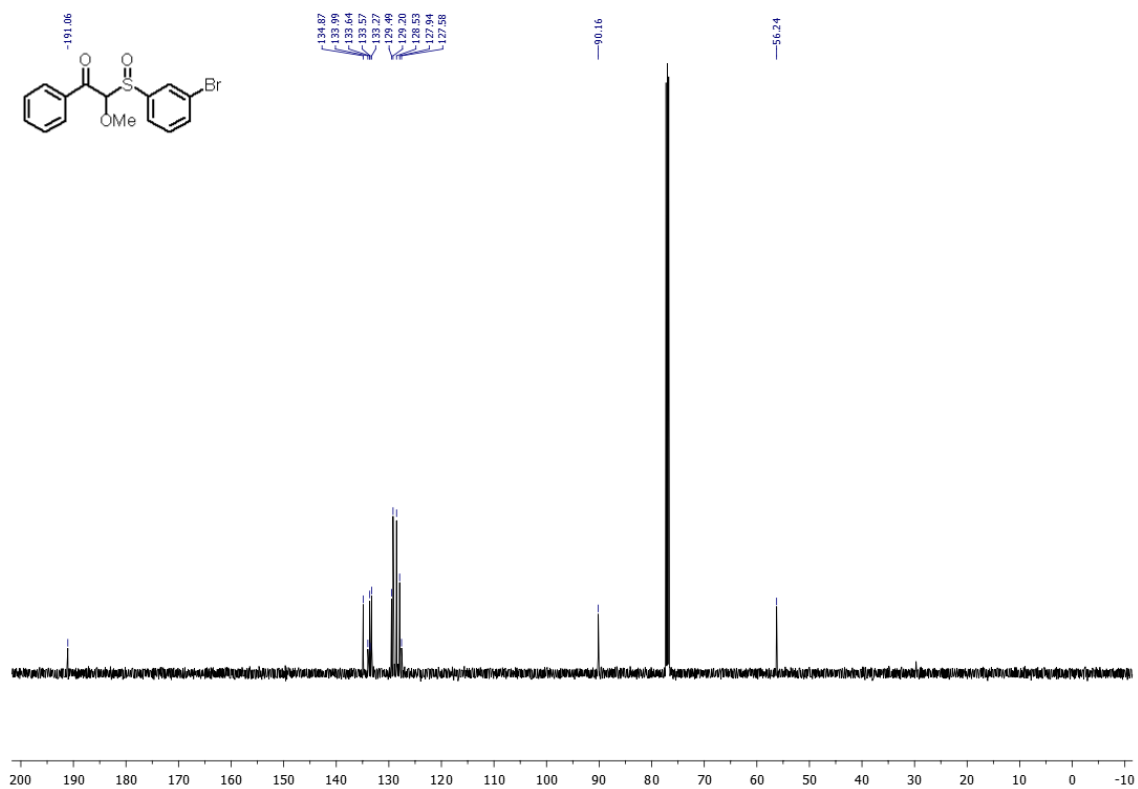
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 100 MHz) spectra of compound 18



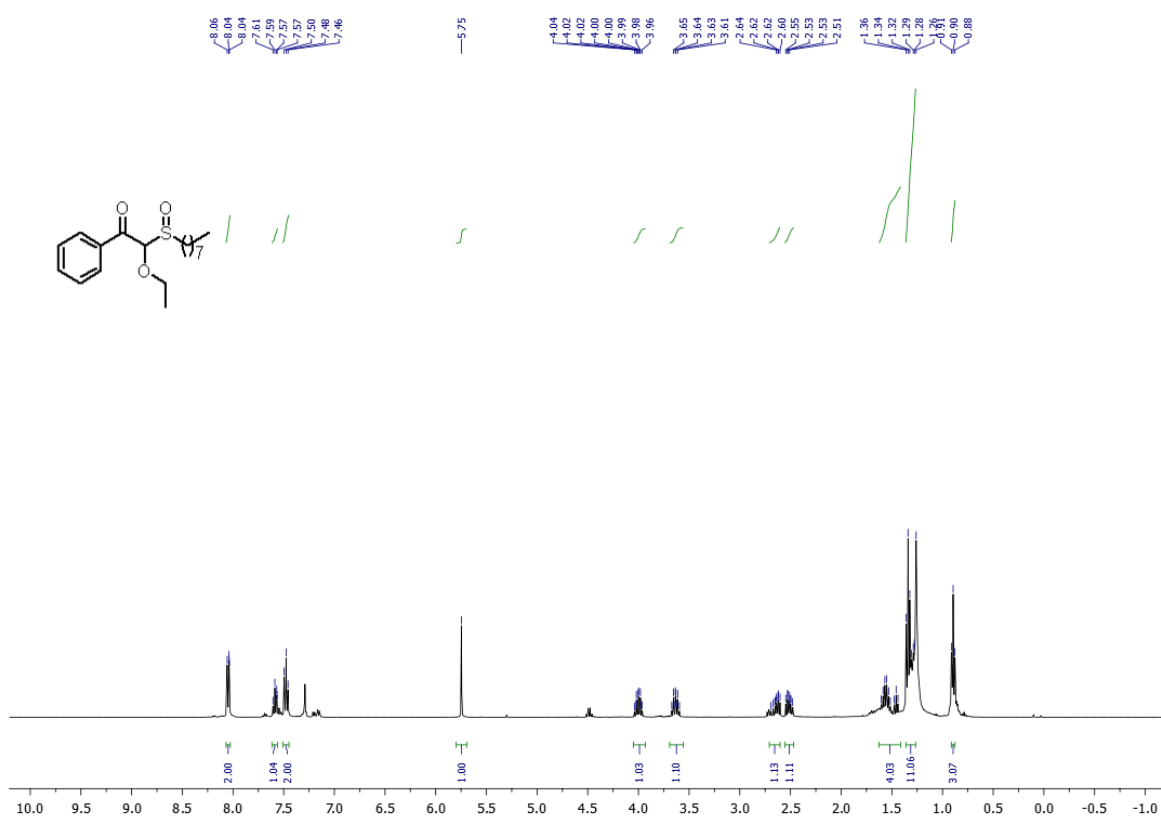
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 19



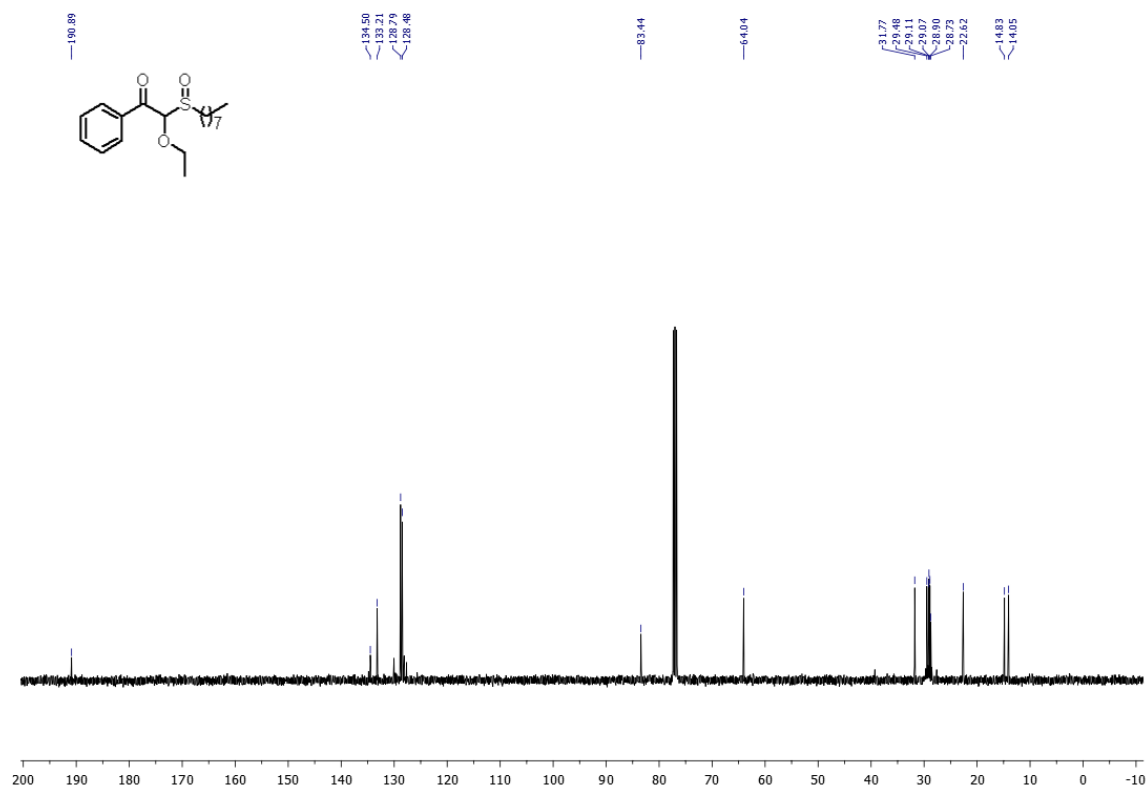
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 19



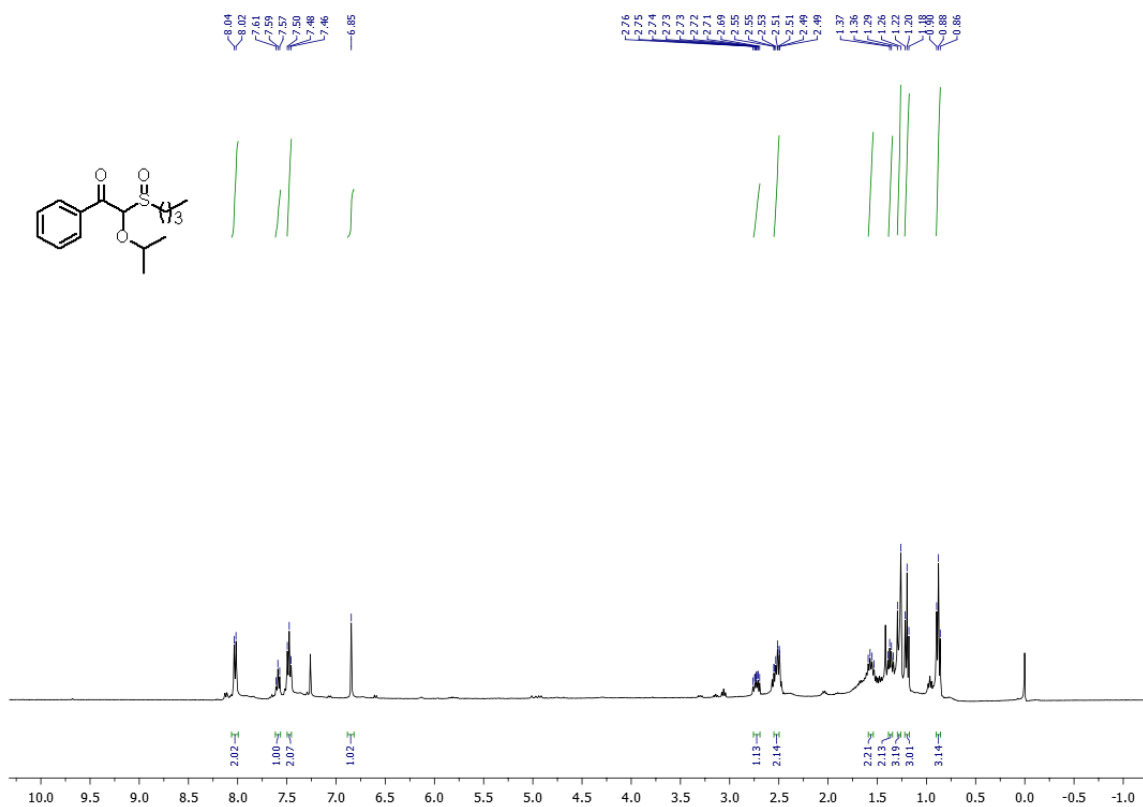
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 20



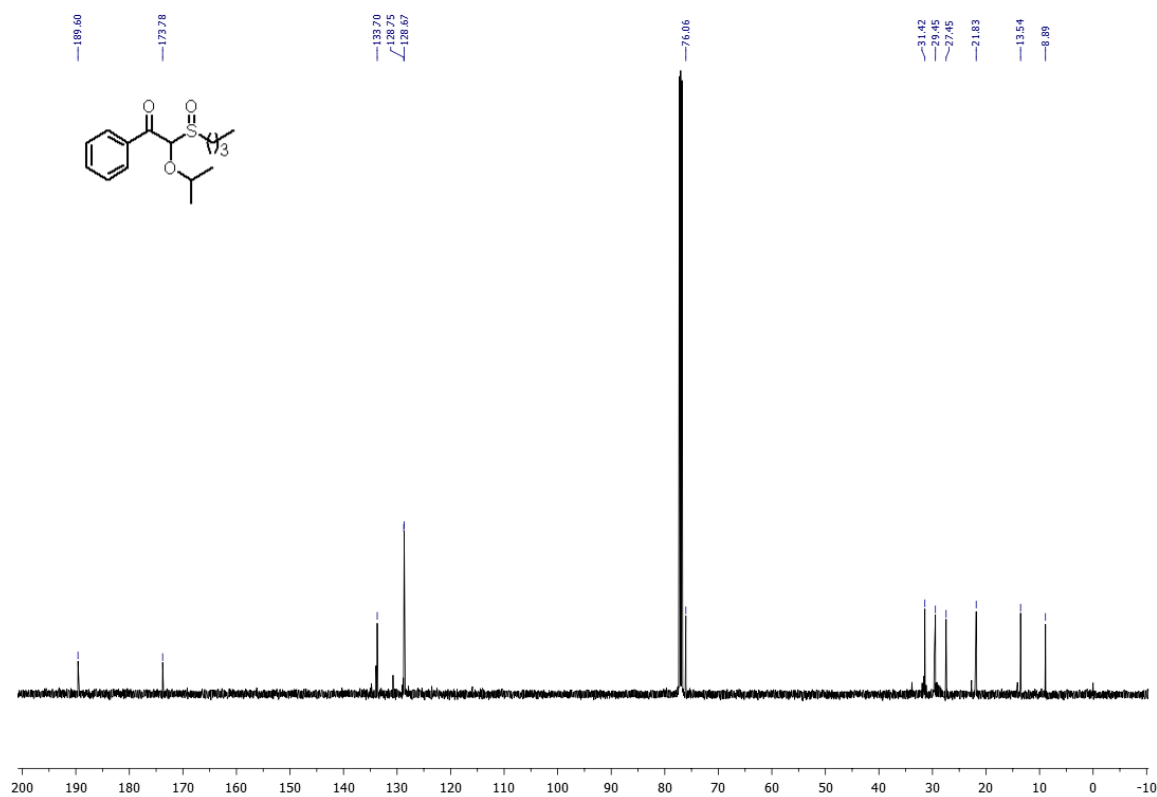
¹³C{¹H} NMR (CDCl₃, 100 MHz) spectra of compound 20



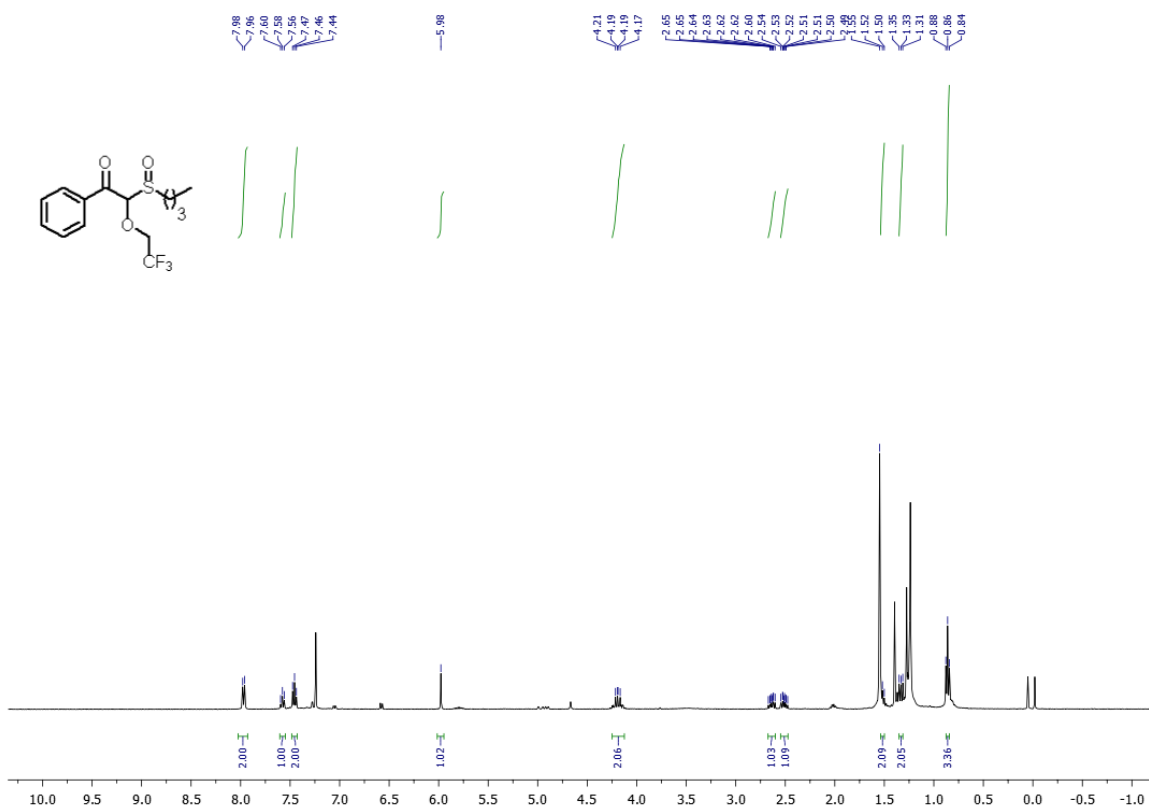
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 21



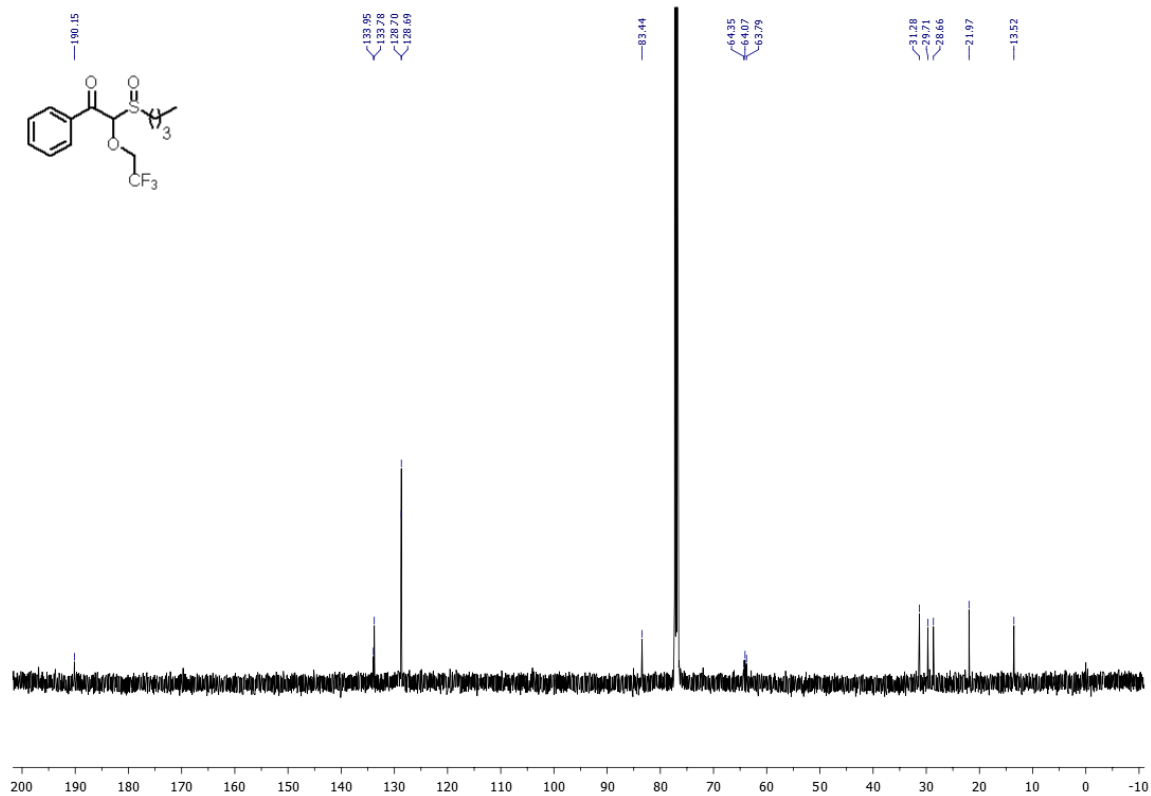
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 21



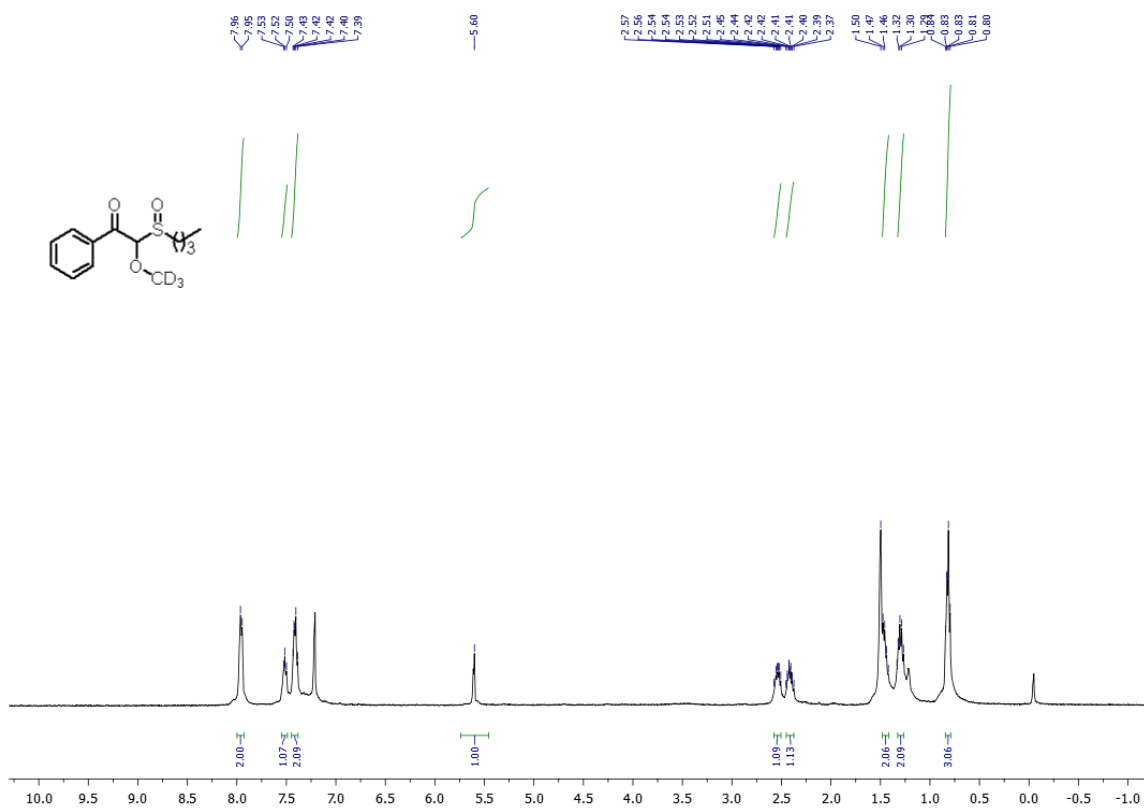
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 22



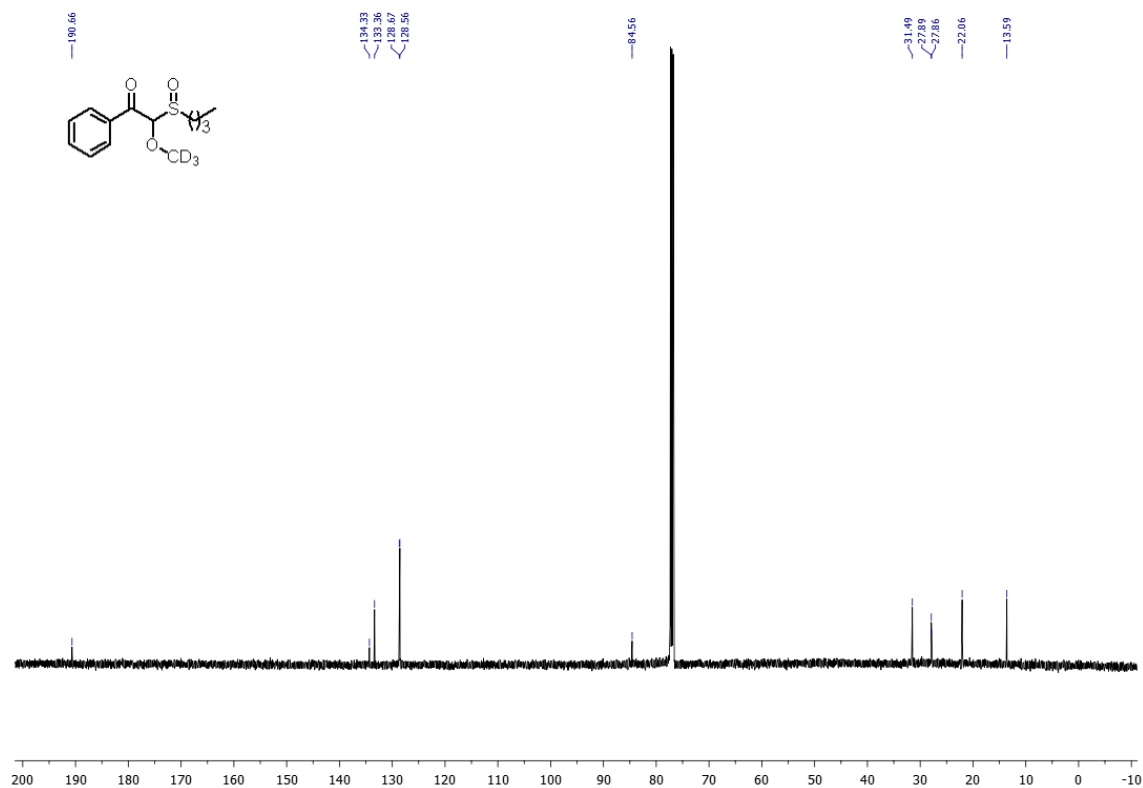
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 22



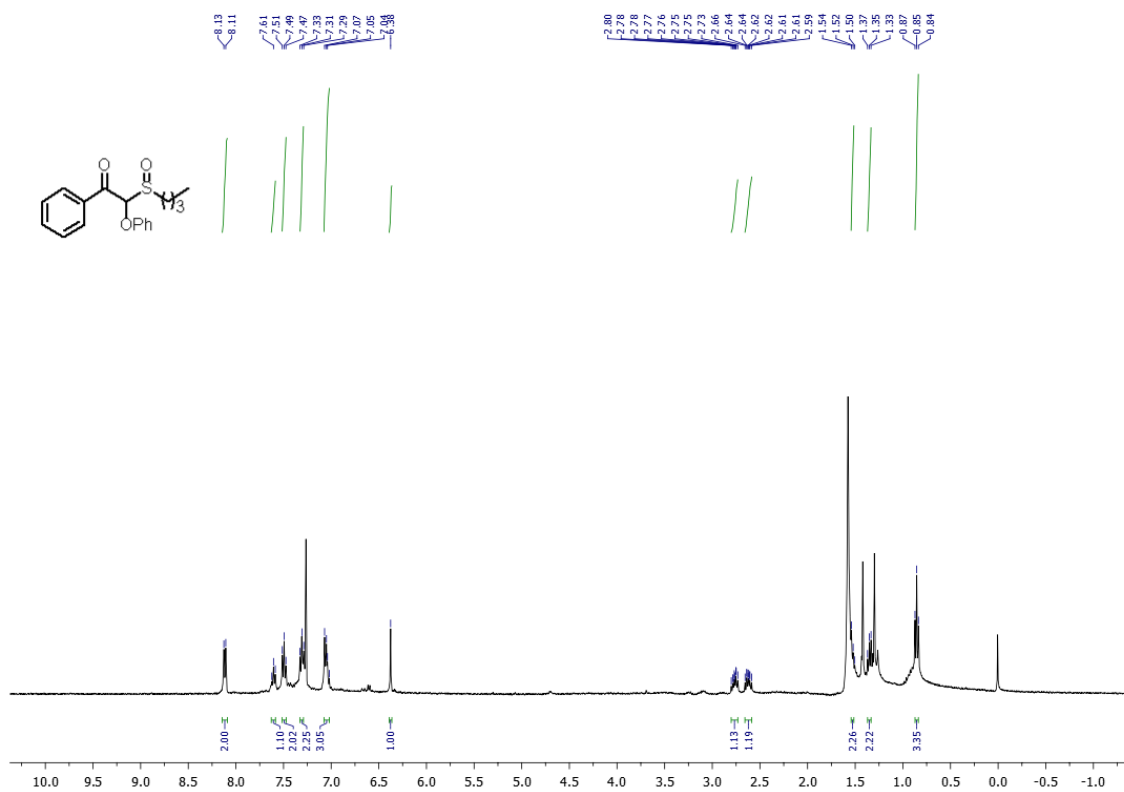
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 23



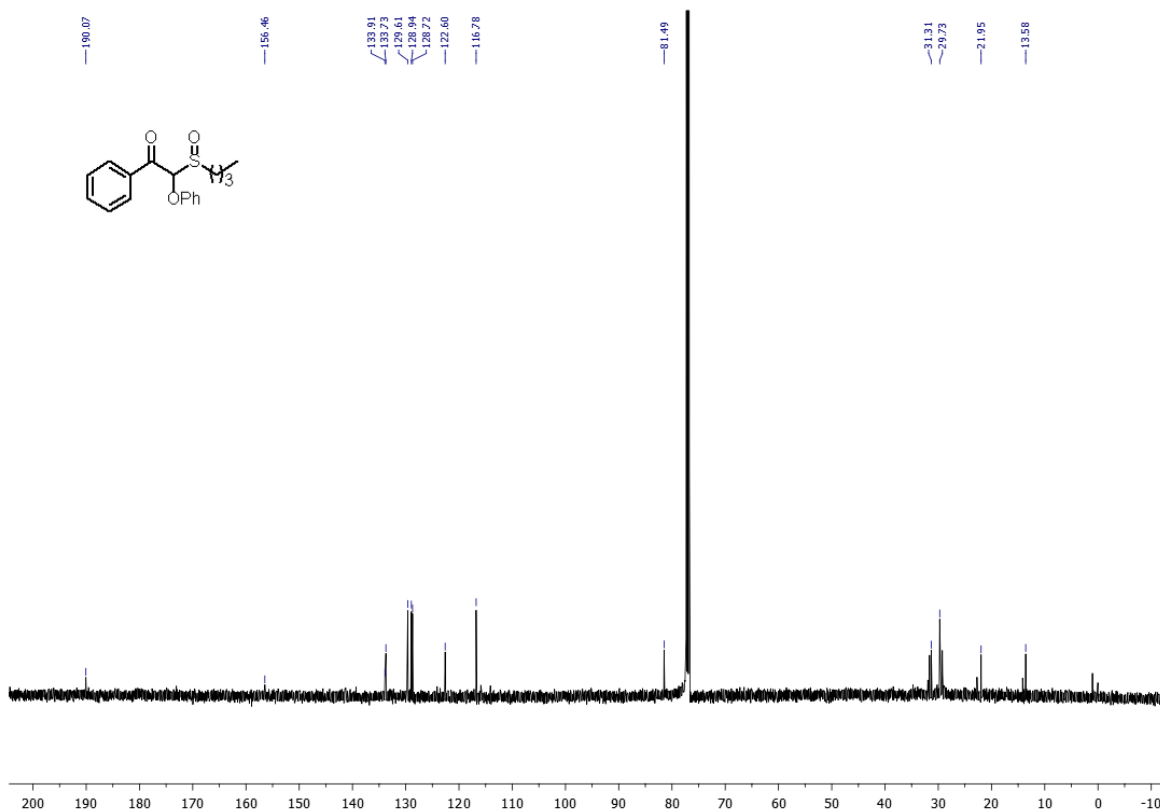
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 23



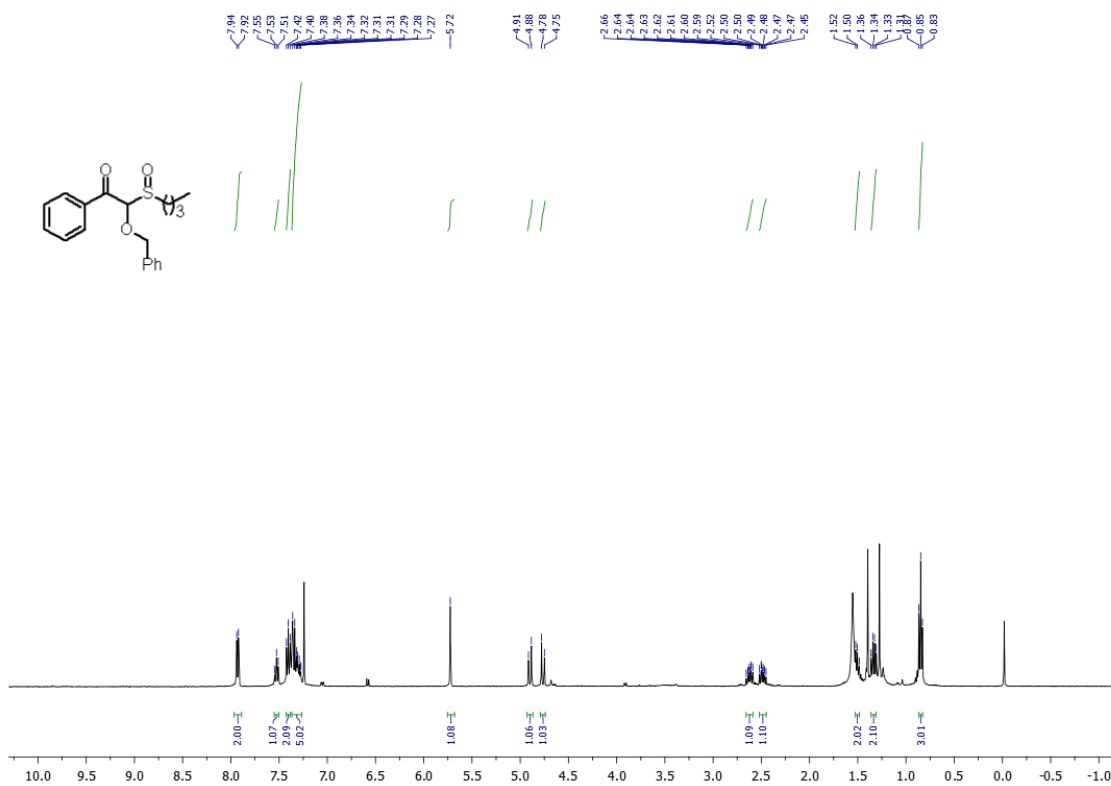
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 24



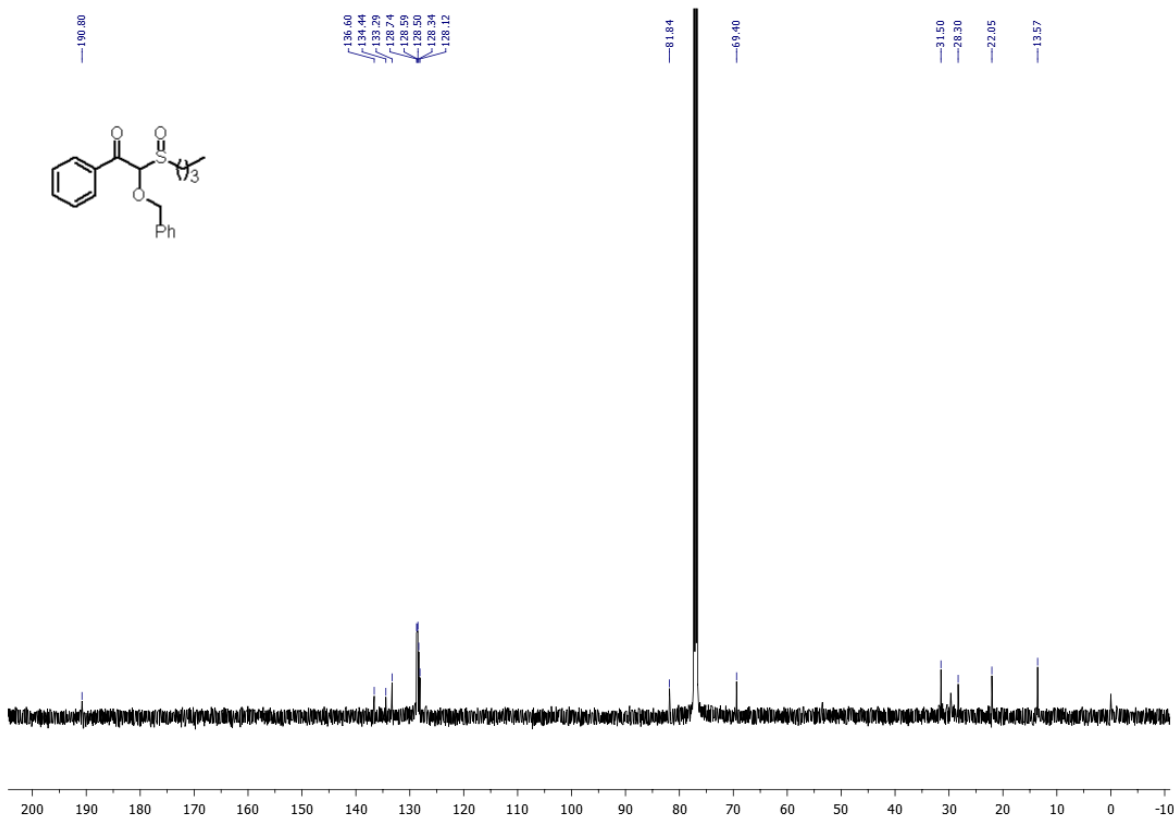
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 24



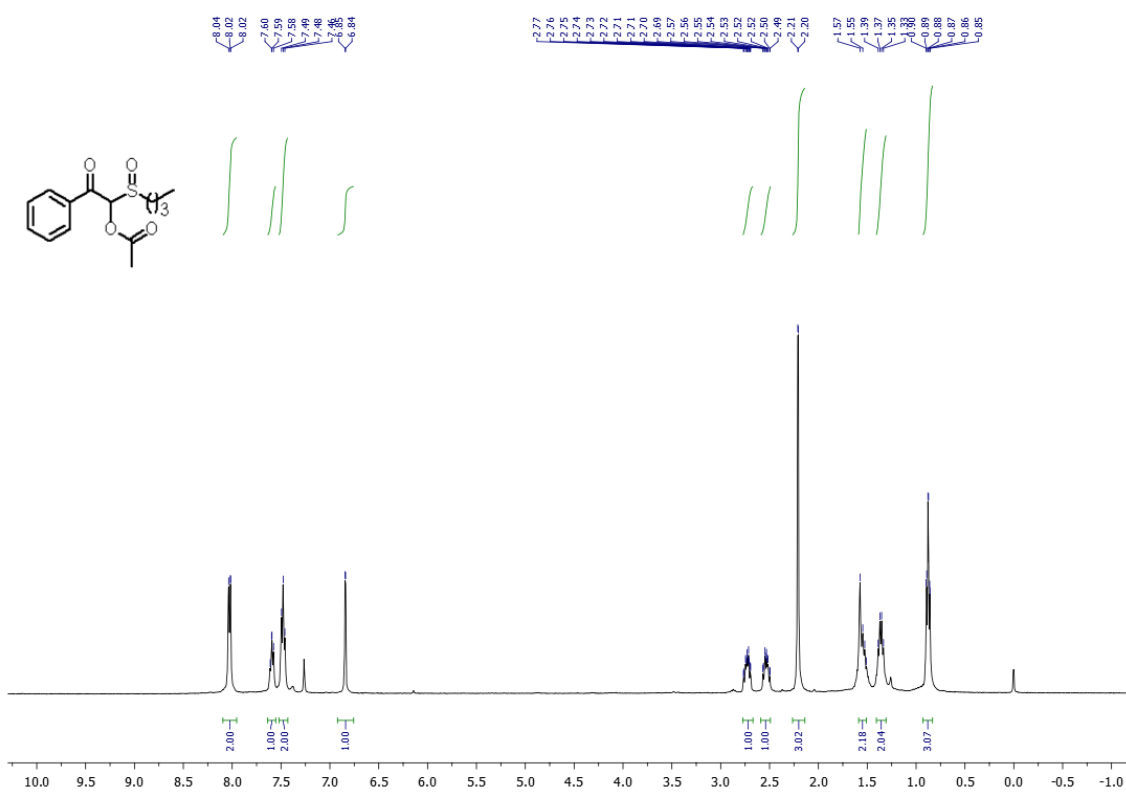
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 25



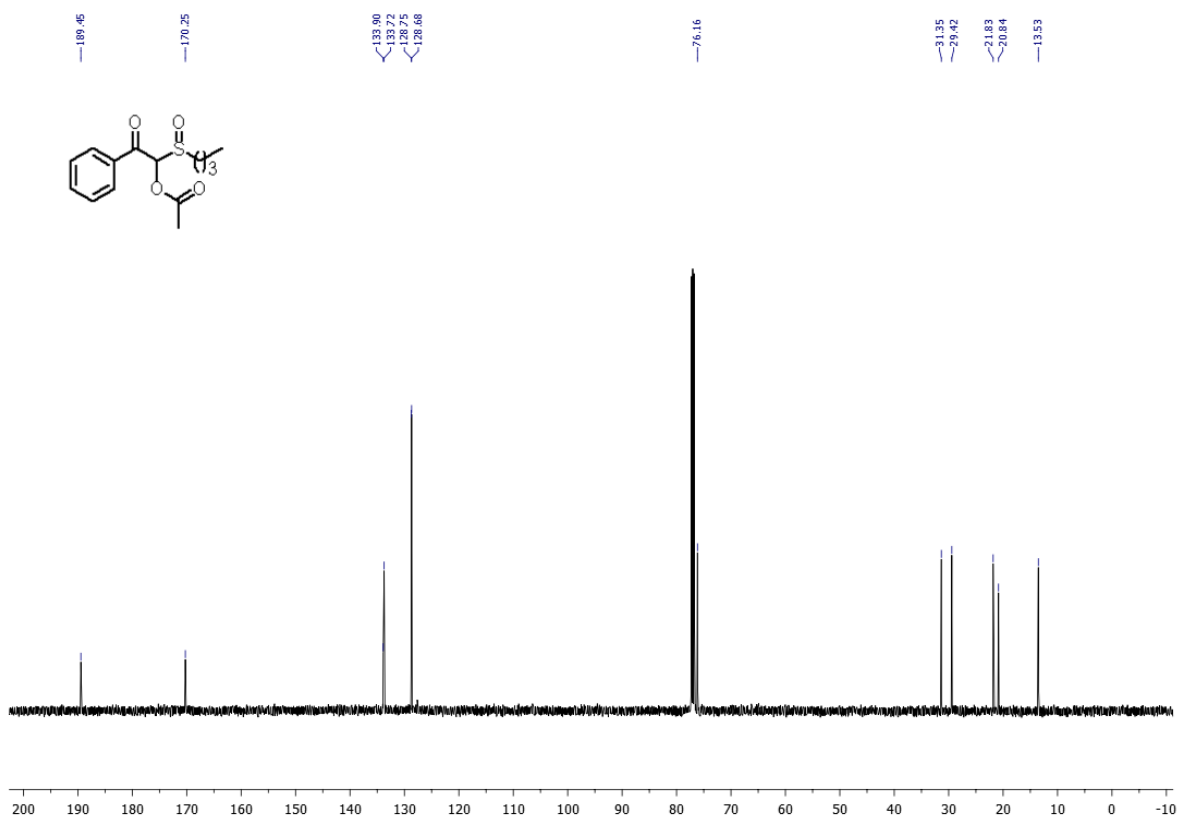
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 25



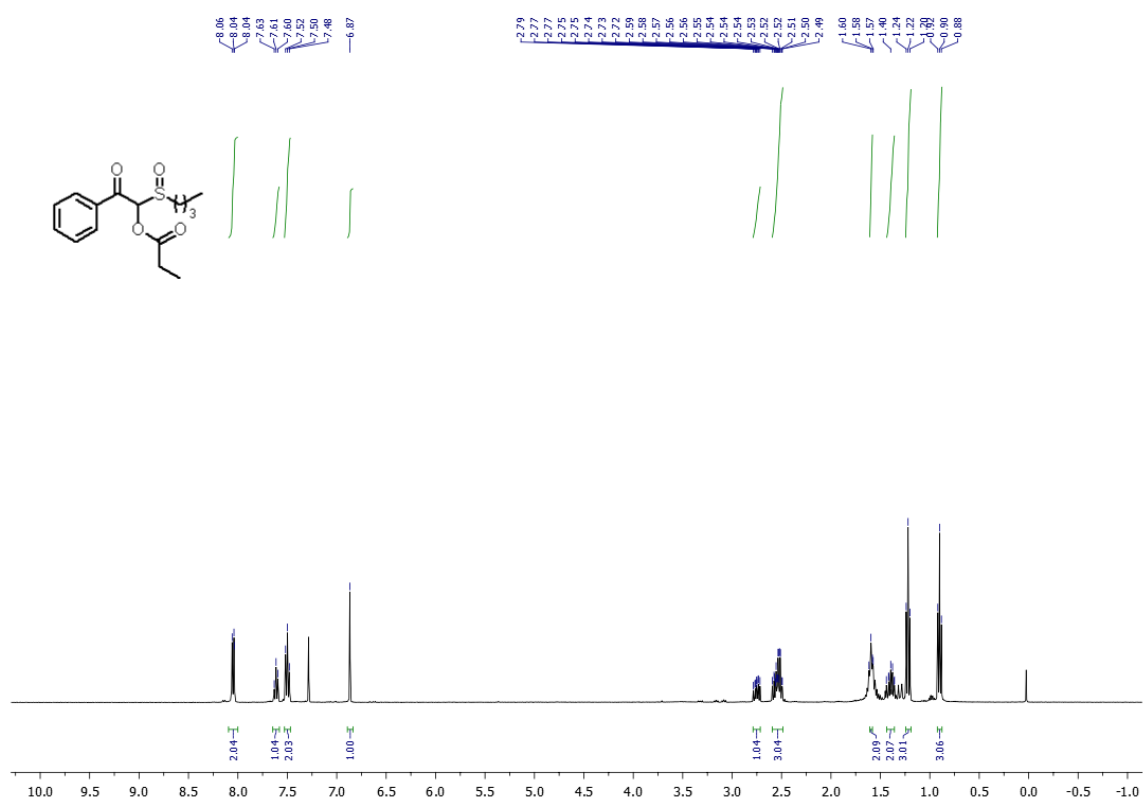
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 26



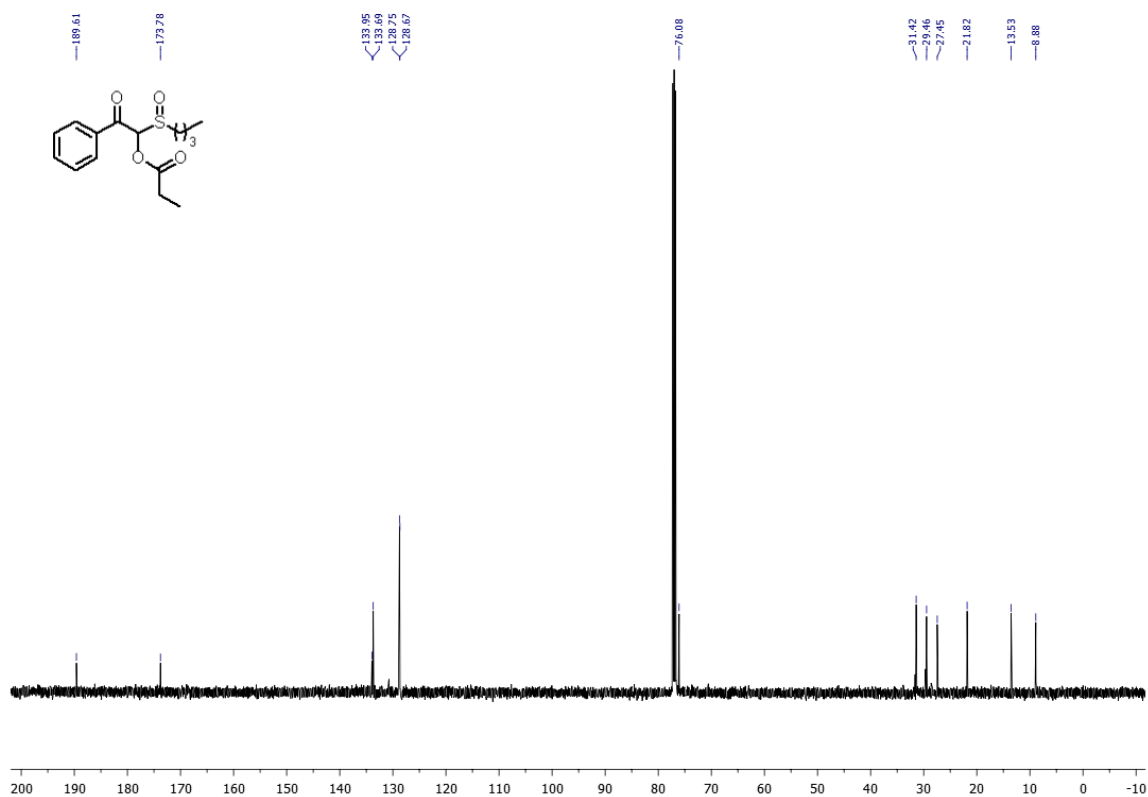
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 26



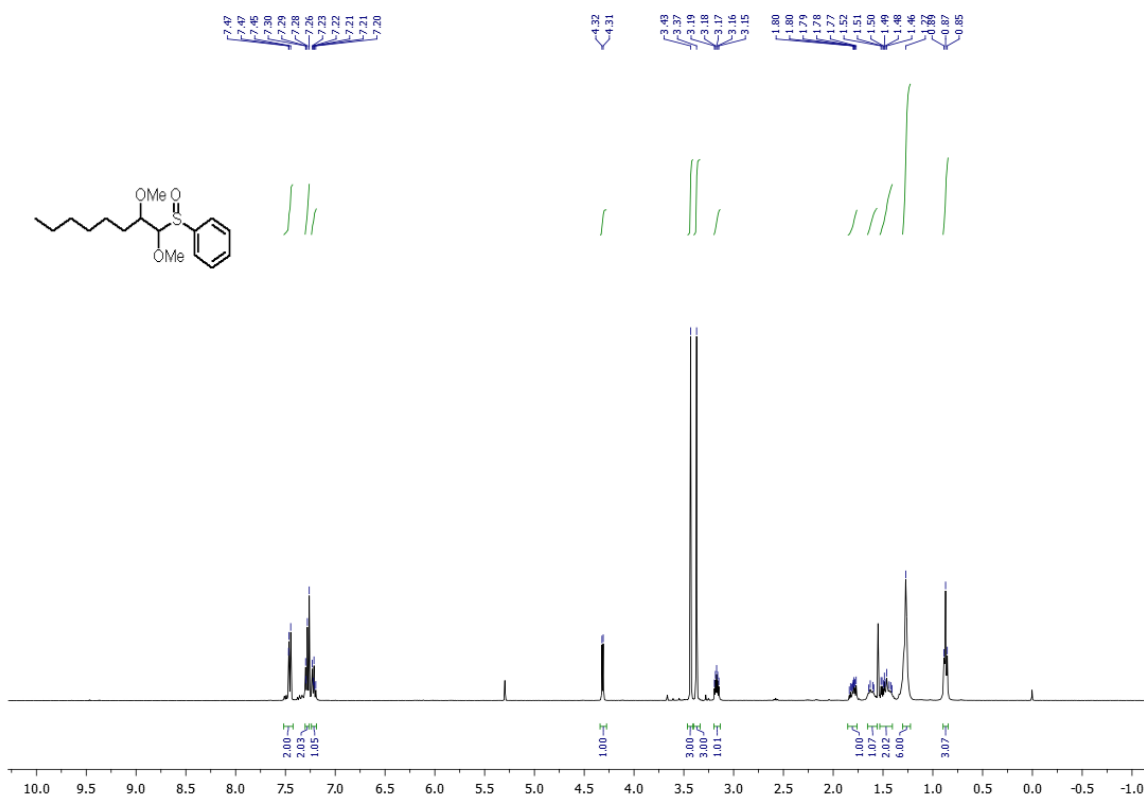
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 27



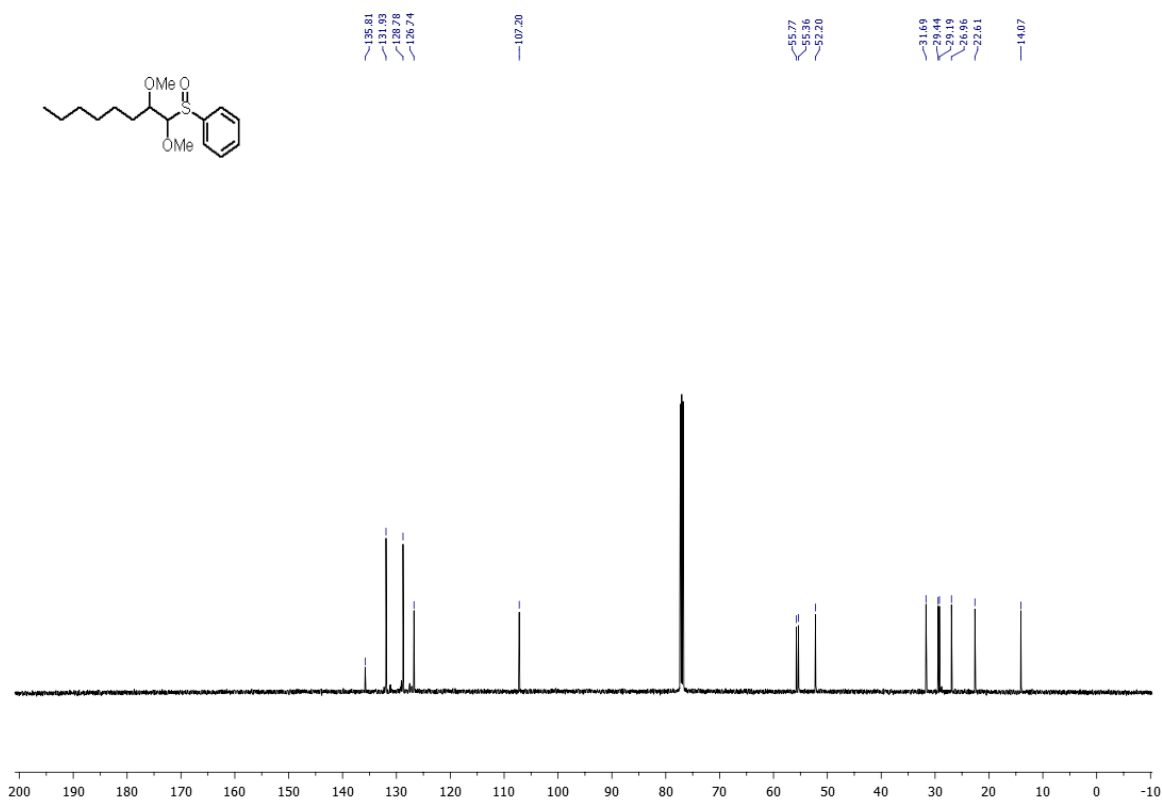
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 27



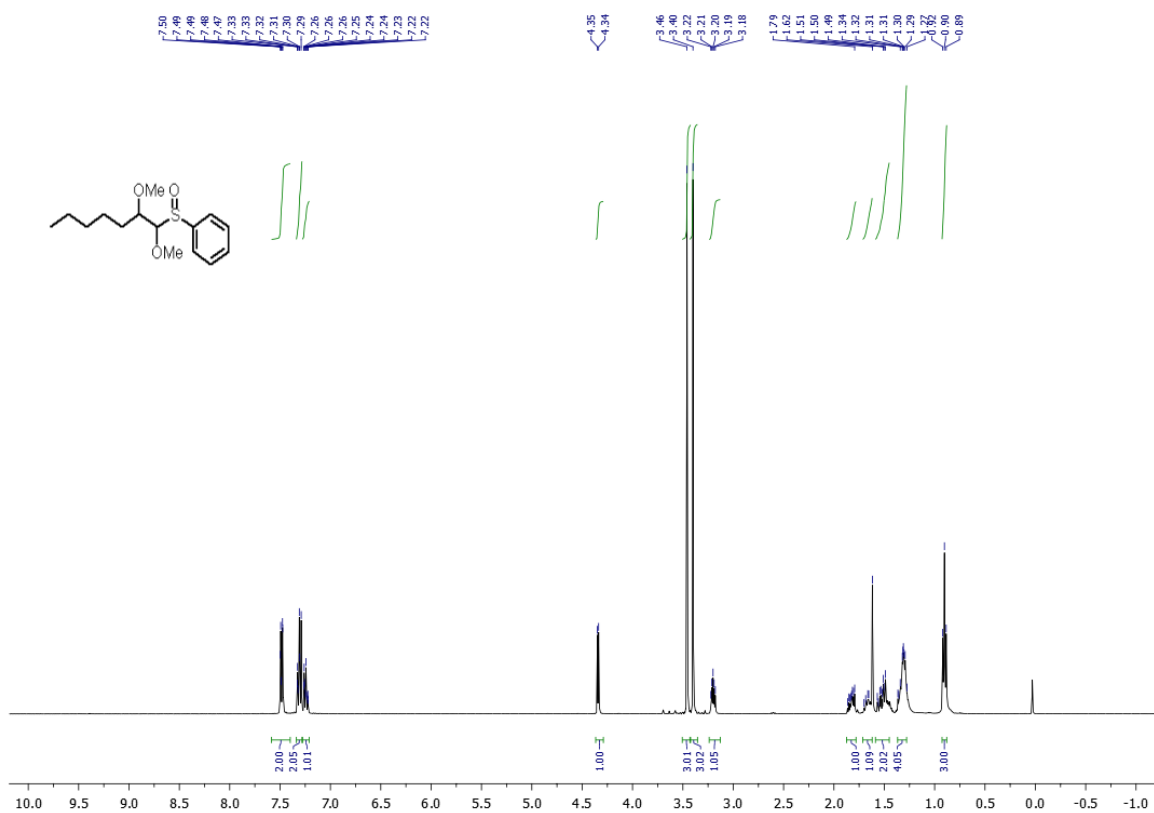
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 28



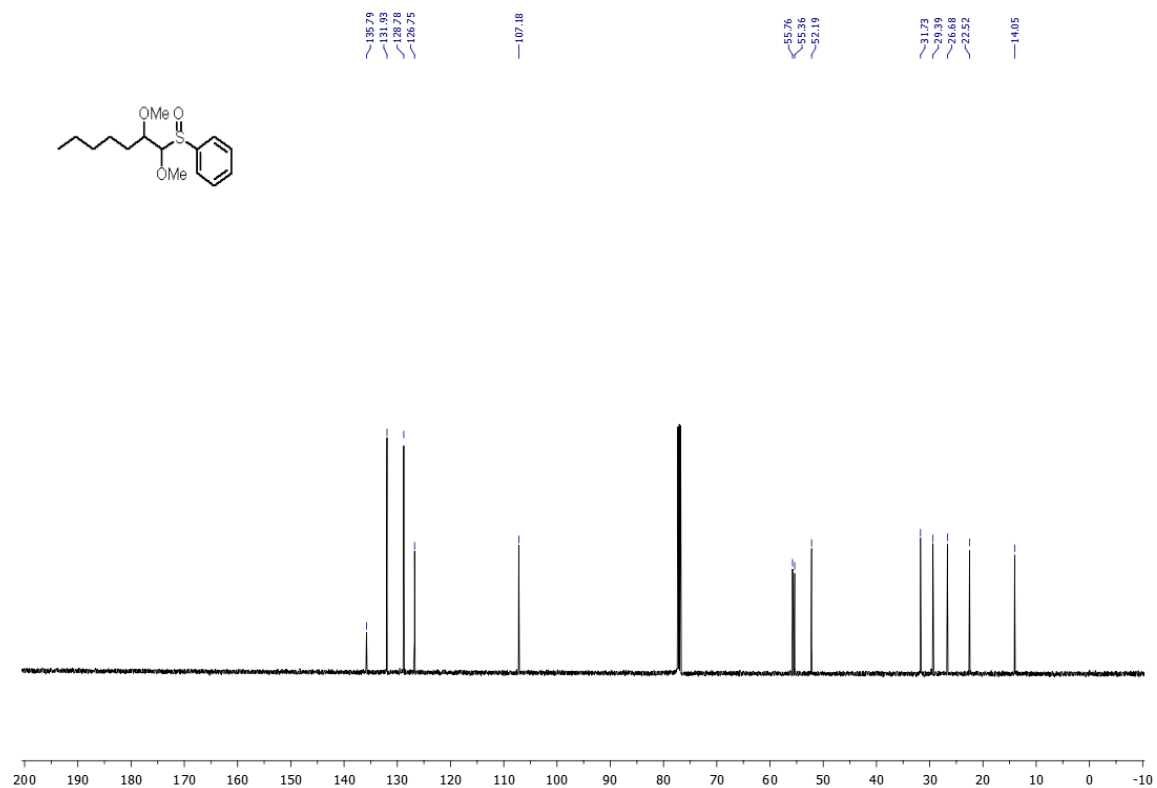
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 28



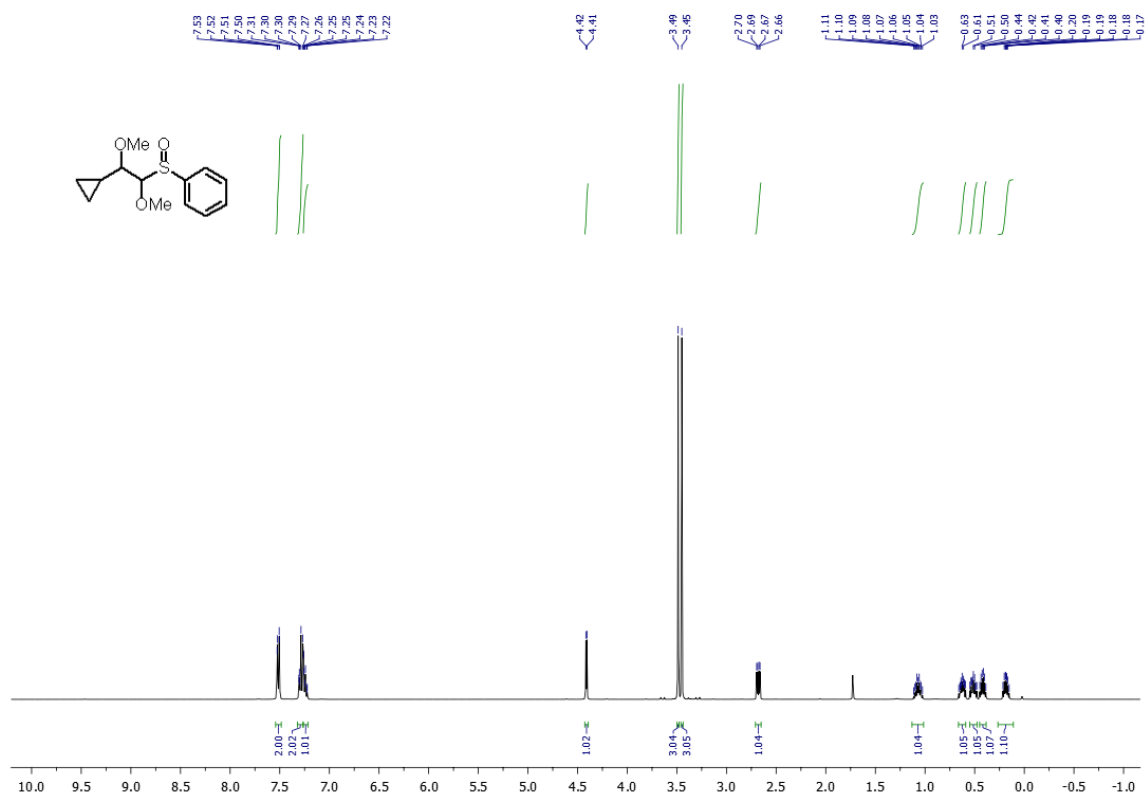
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 29



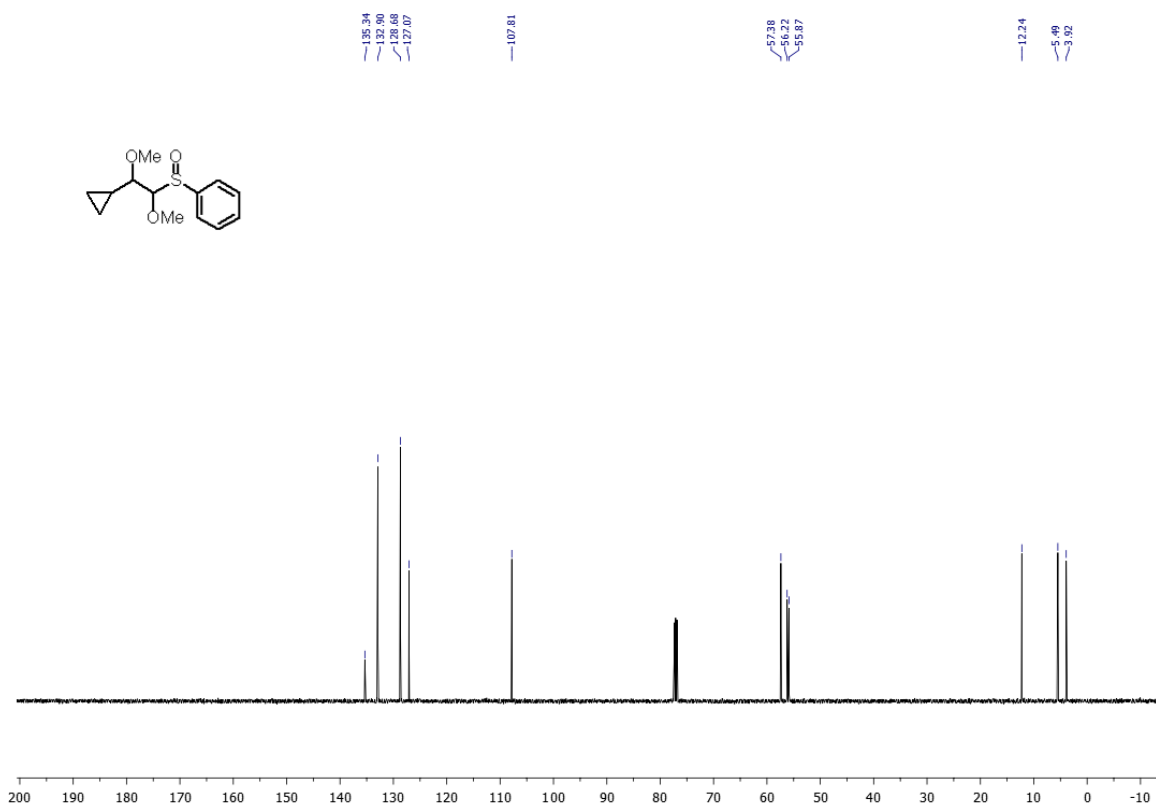
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 29



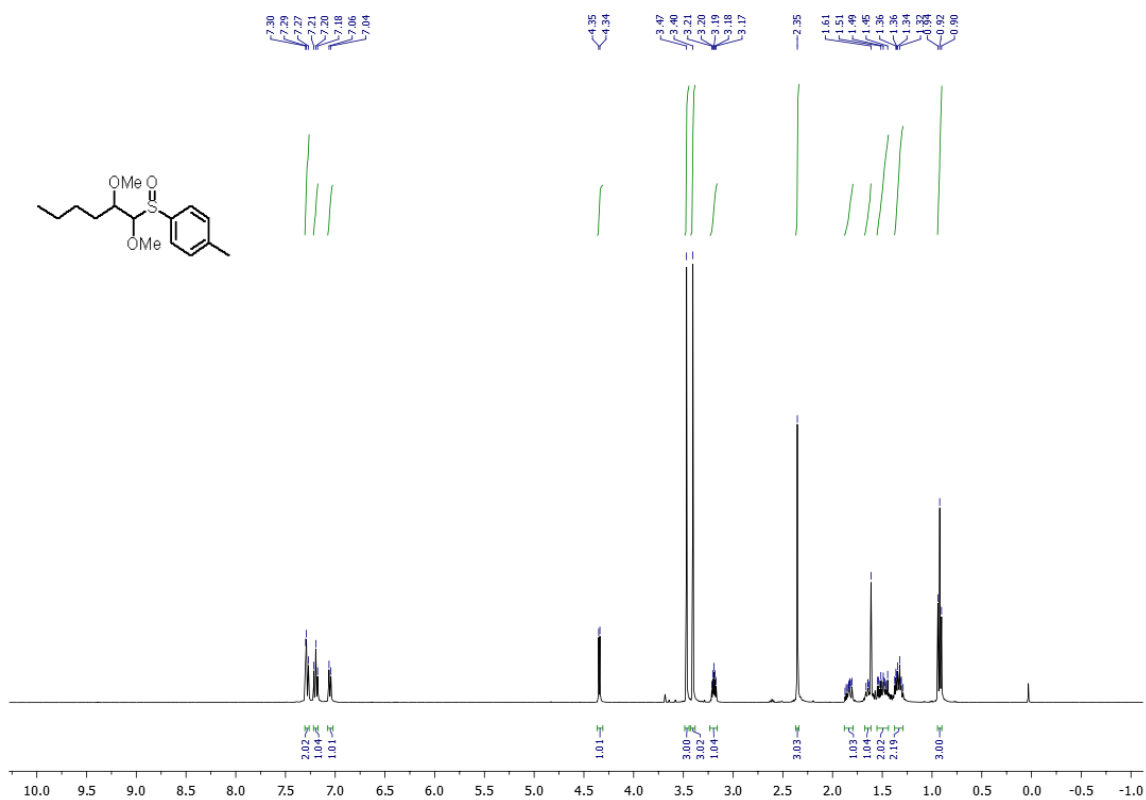
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 30



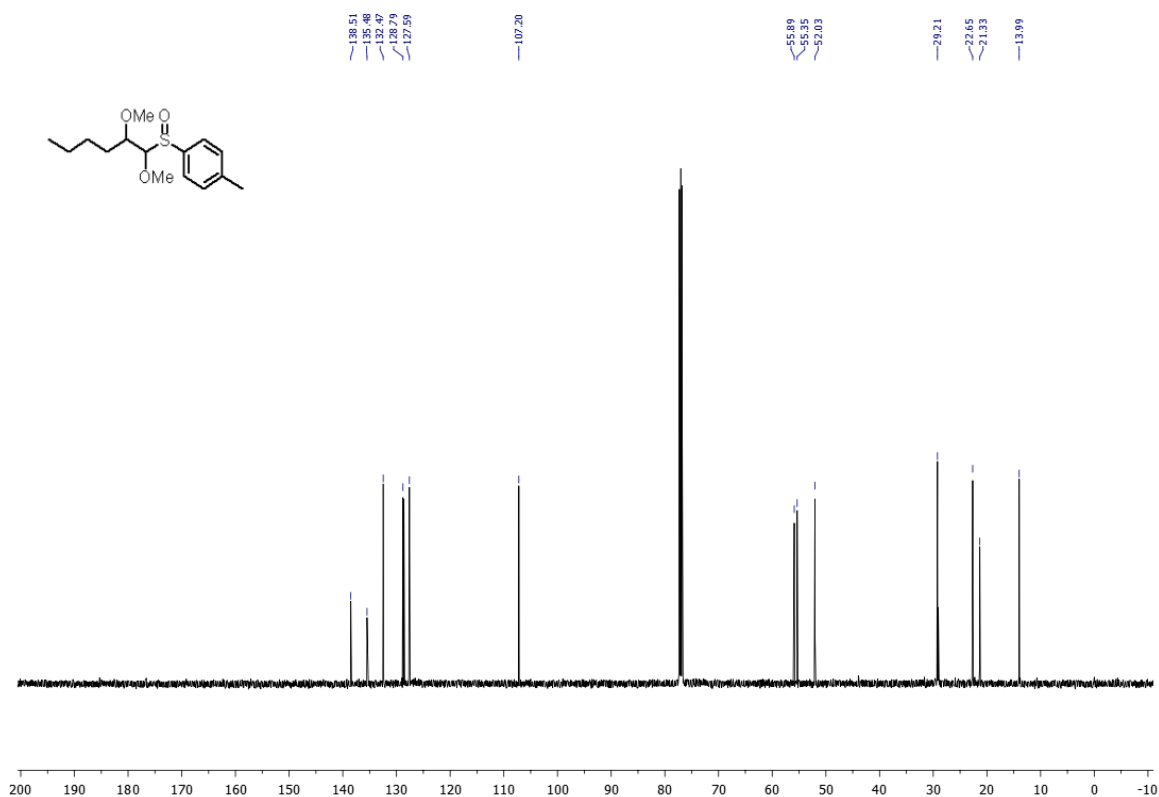
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 30



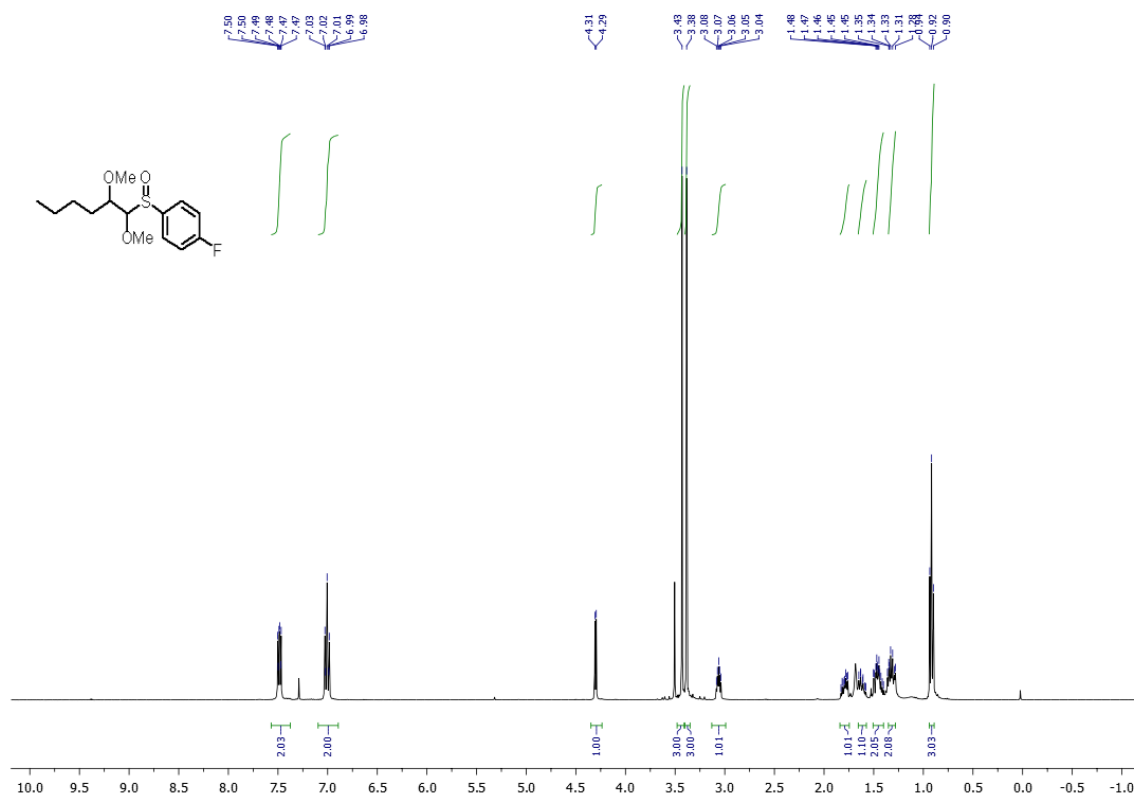
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 31



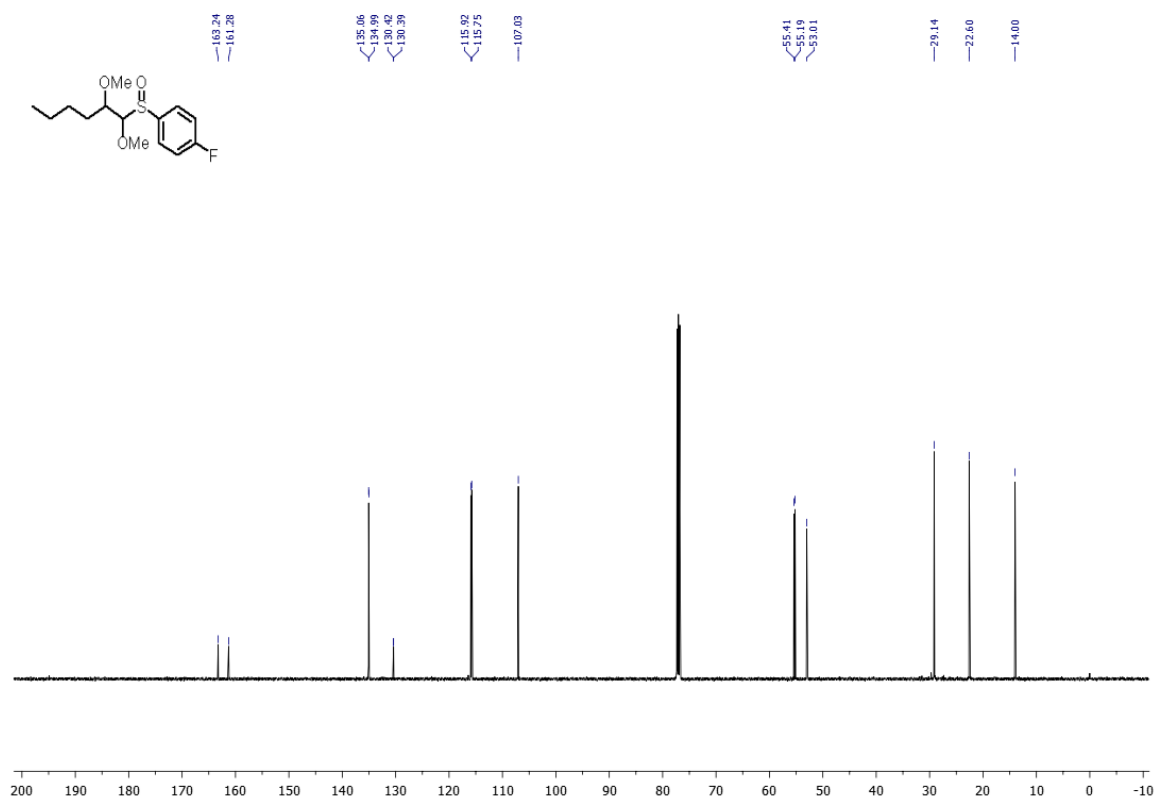
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 31



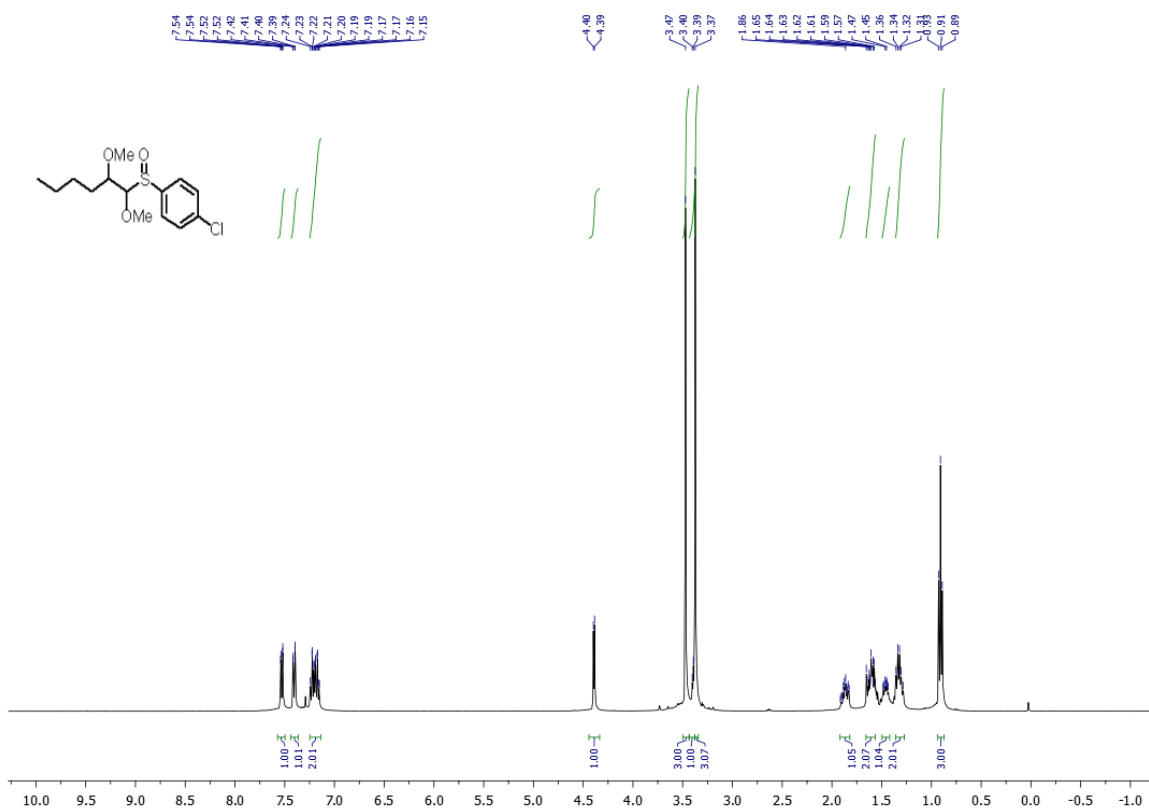
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 32



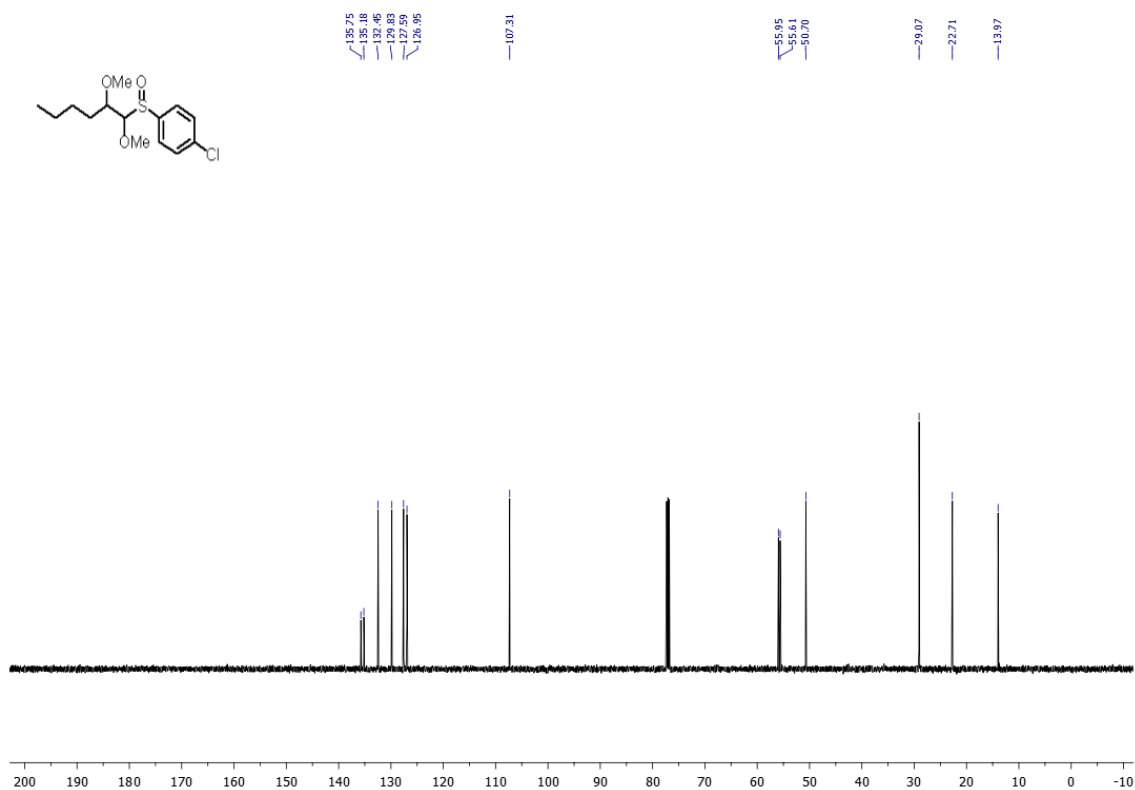
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 32



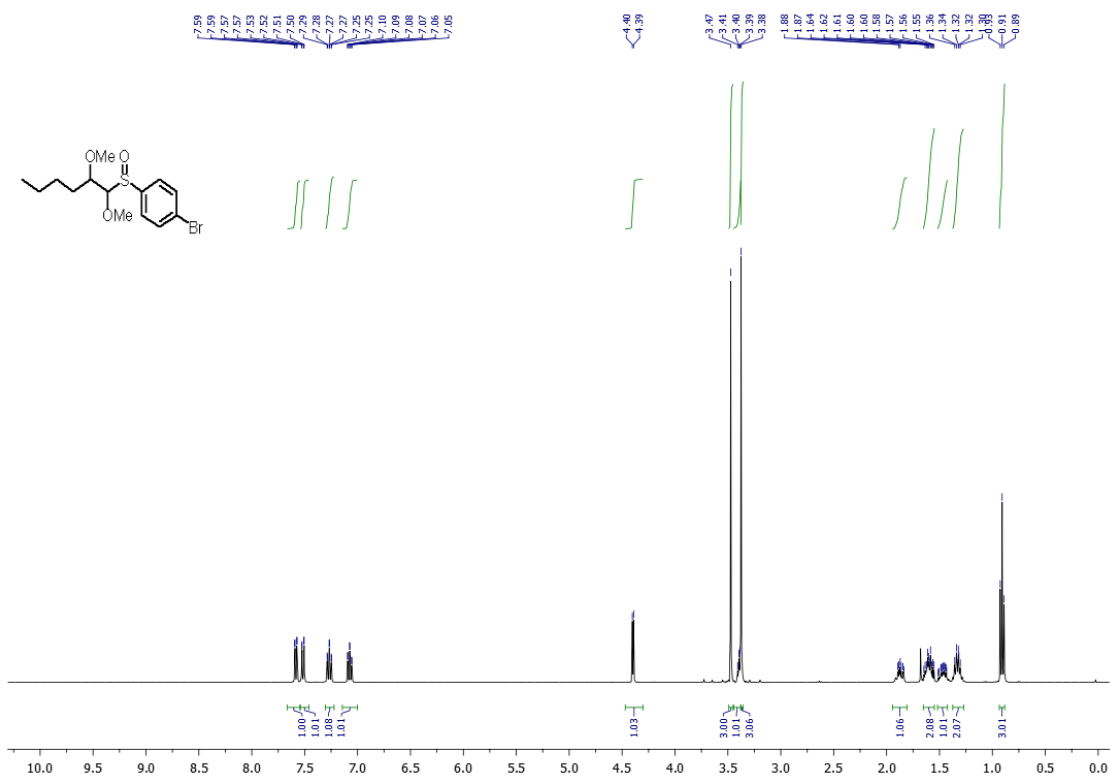
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 33



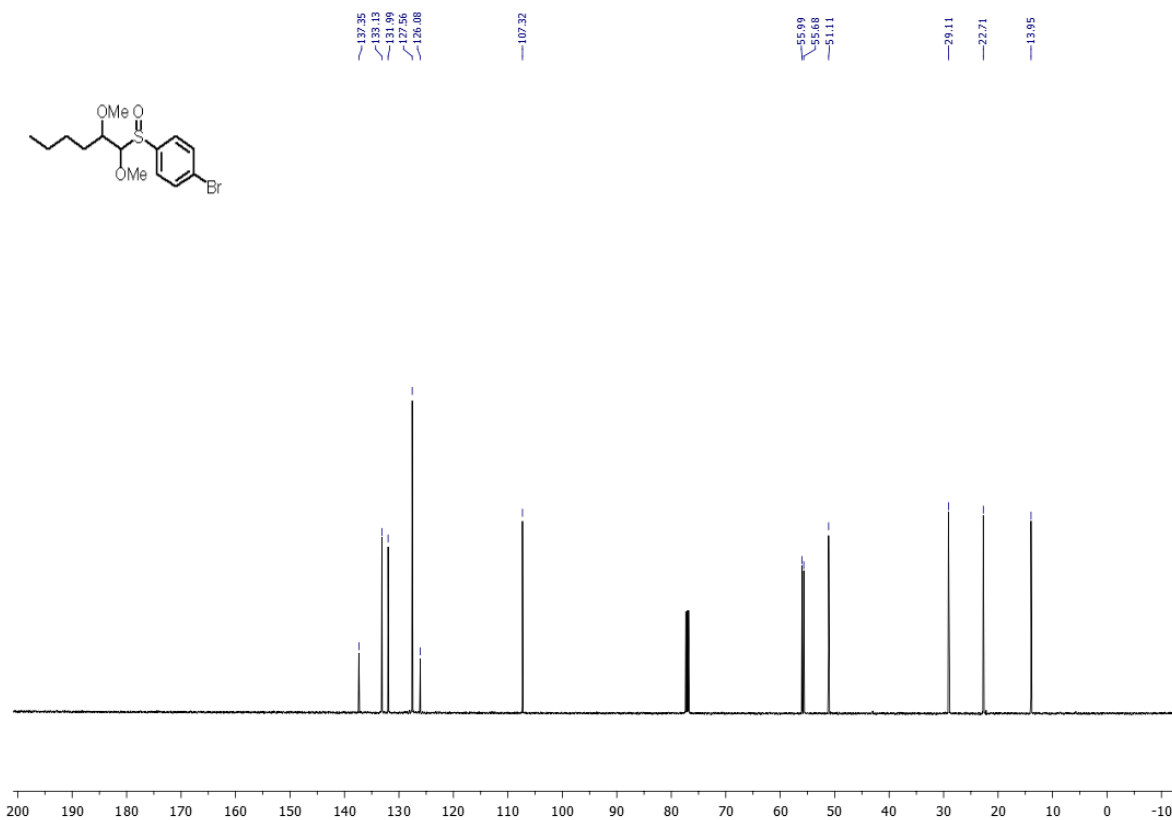
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 33



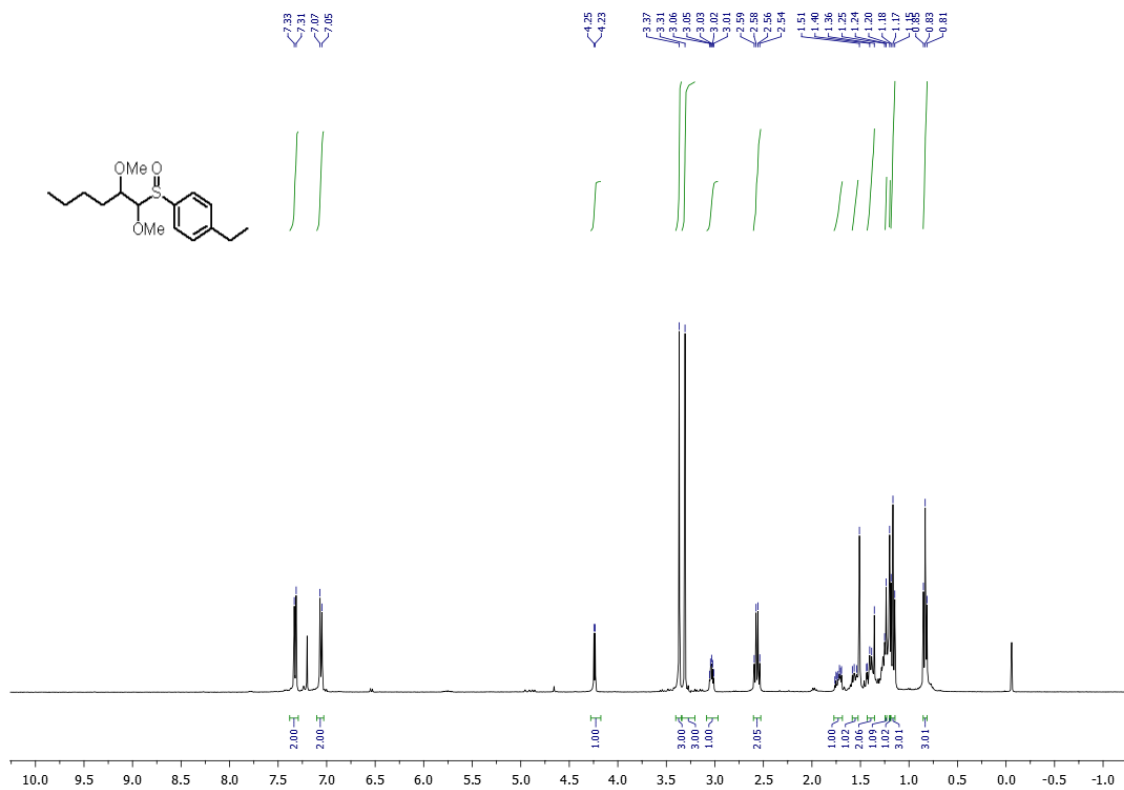
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 34



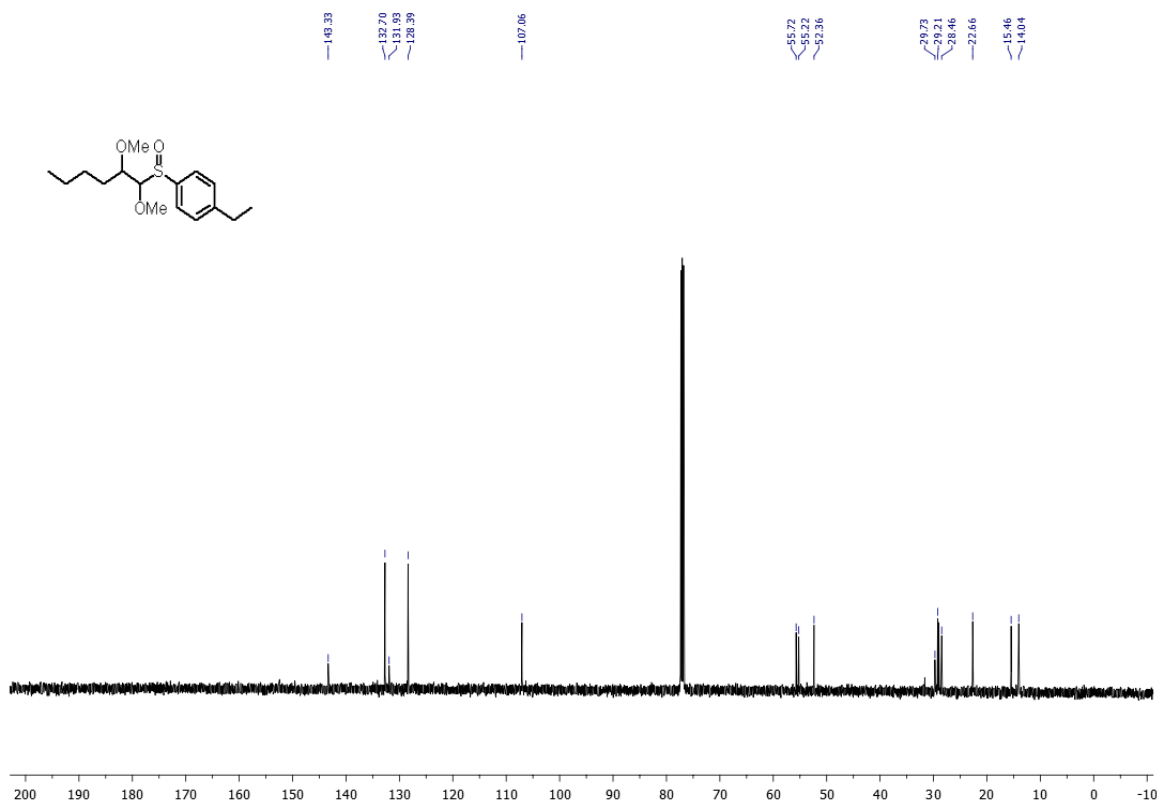
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 34



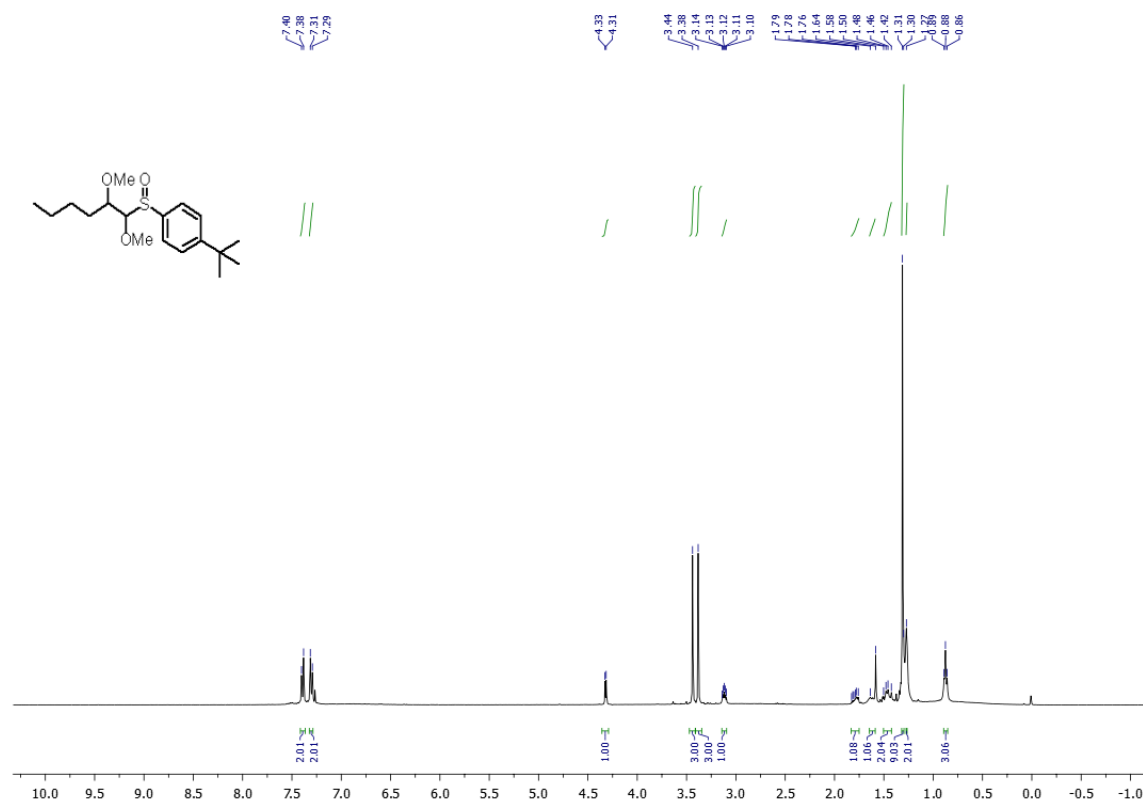
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 35



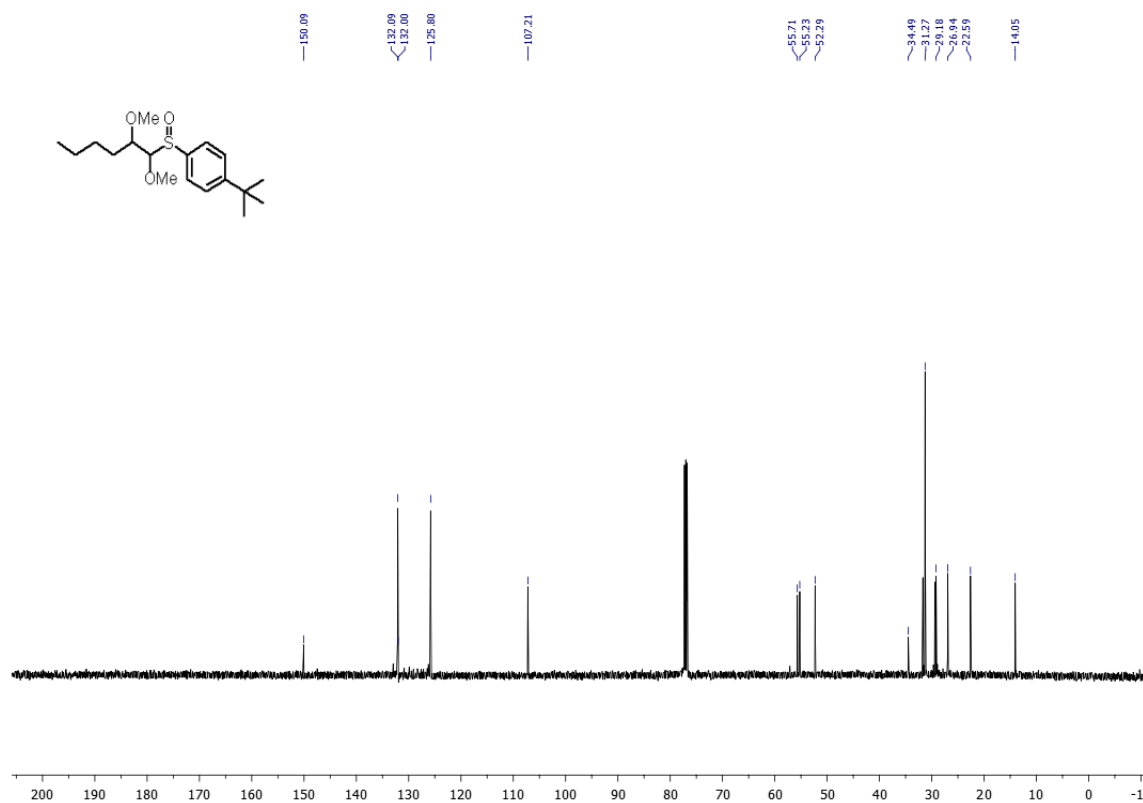
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 35



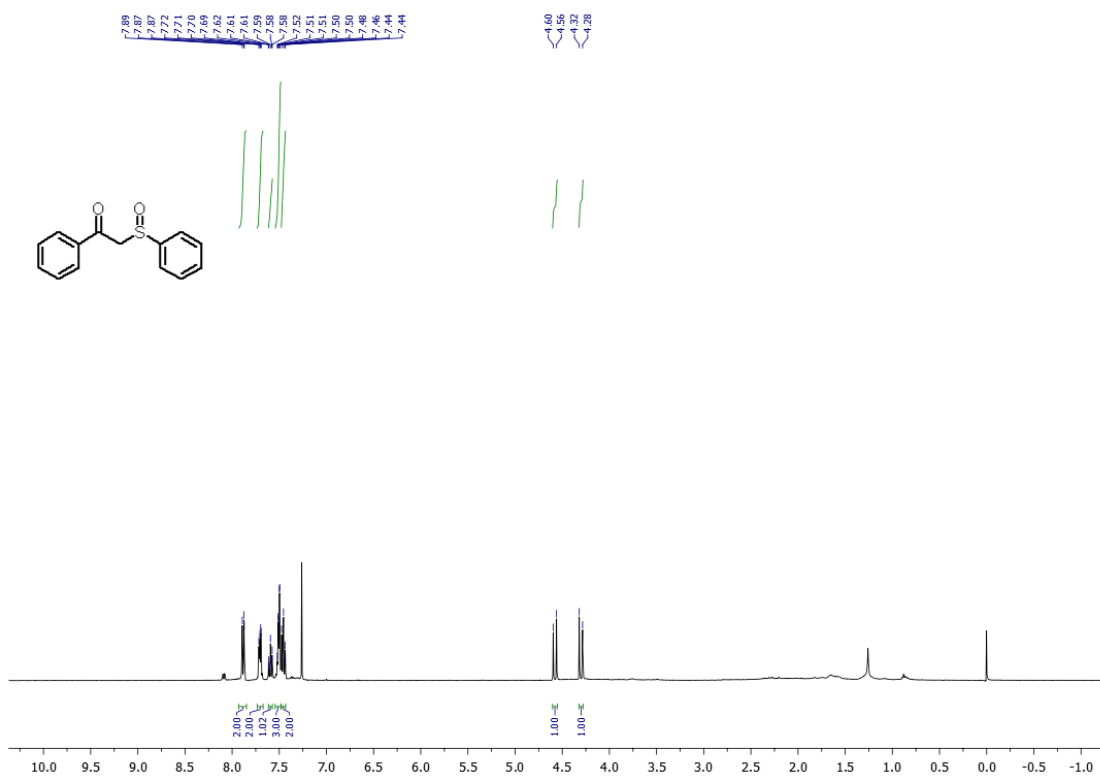
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 36



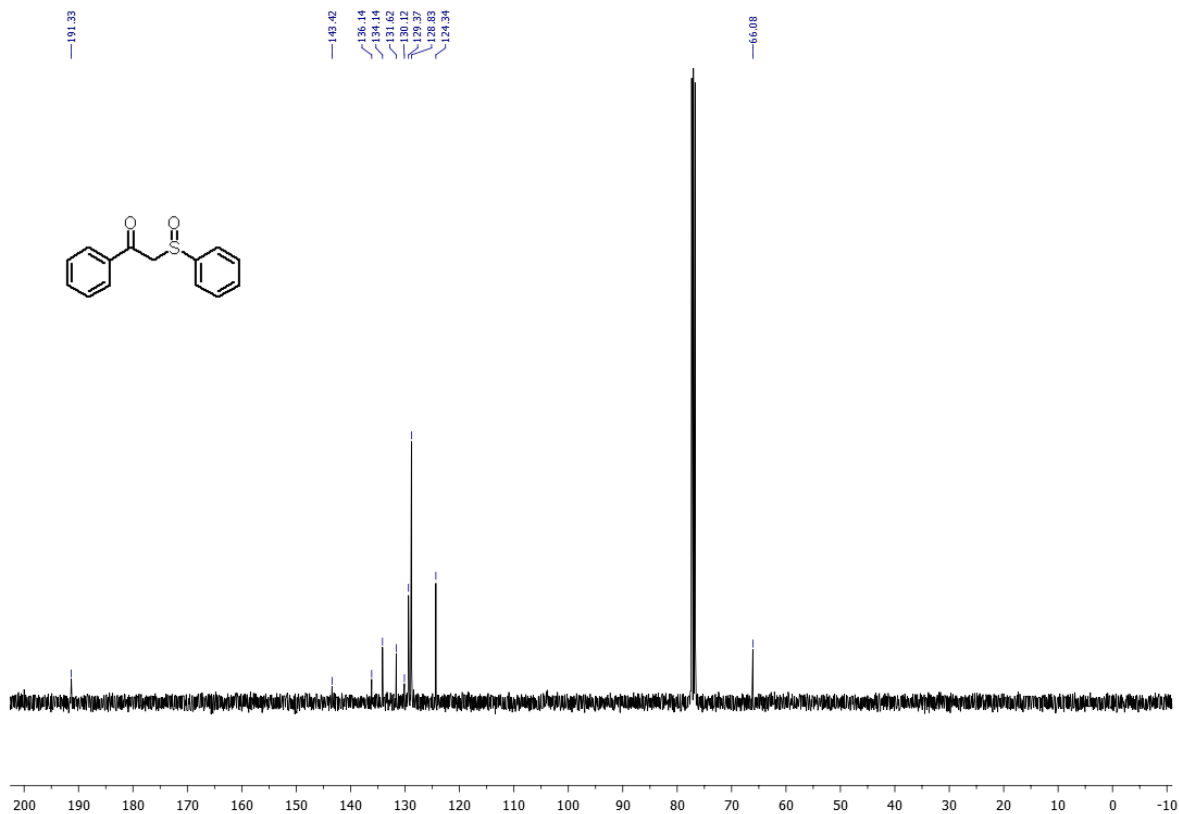
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 36



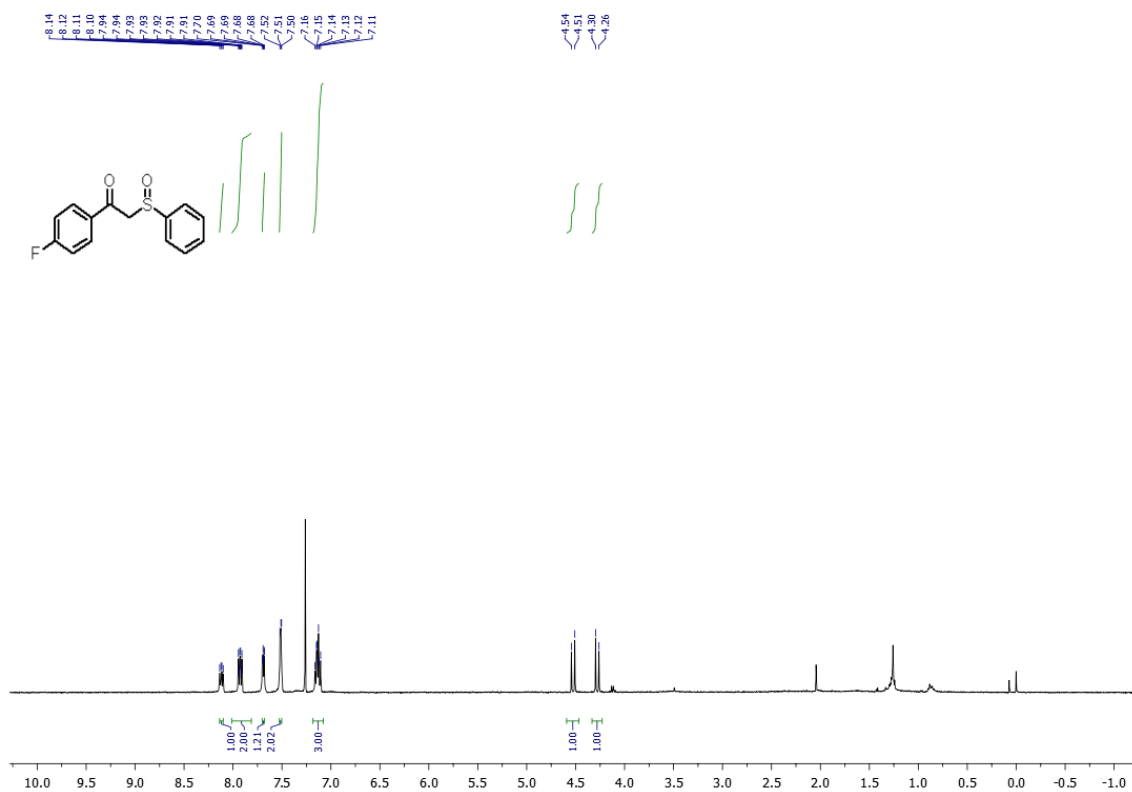
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 37



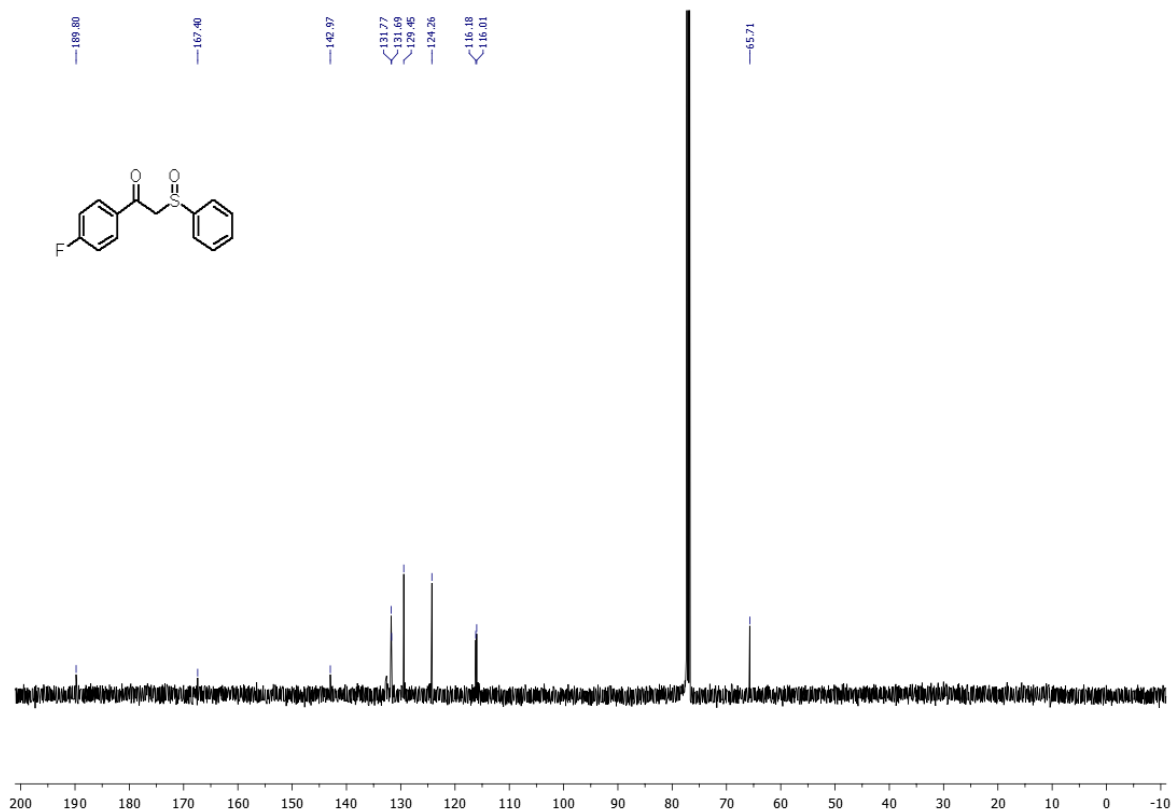
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 100 MHz) spectra of compound 37



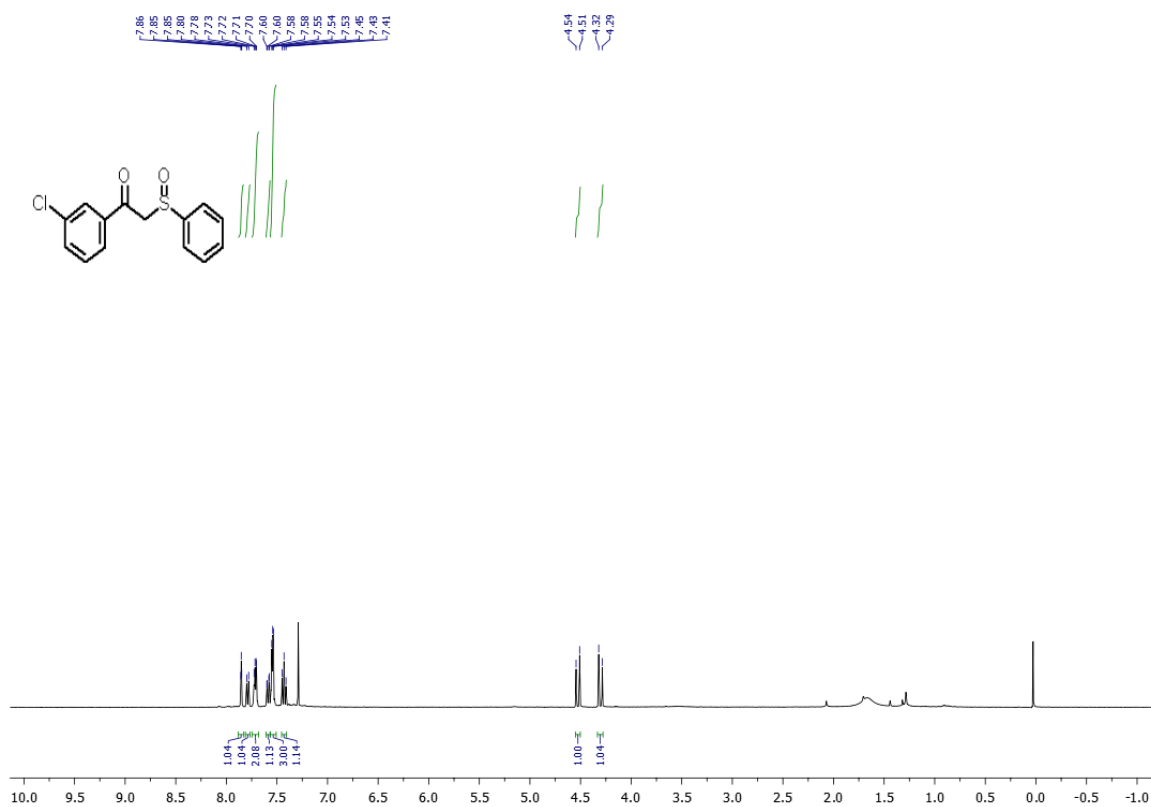
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 38



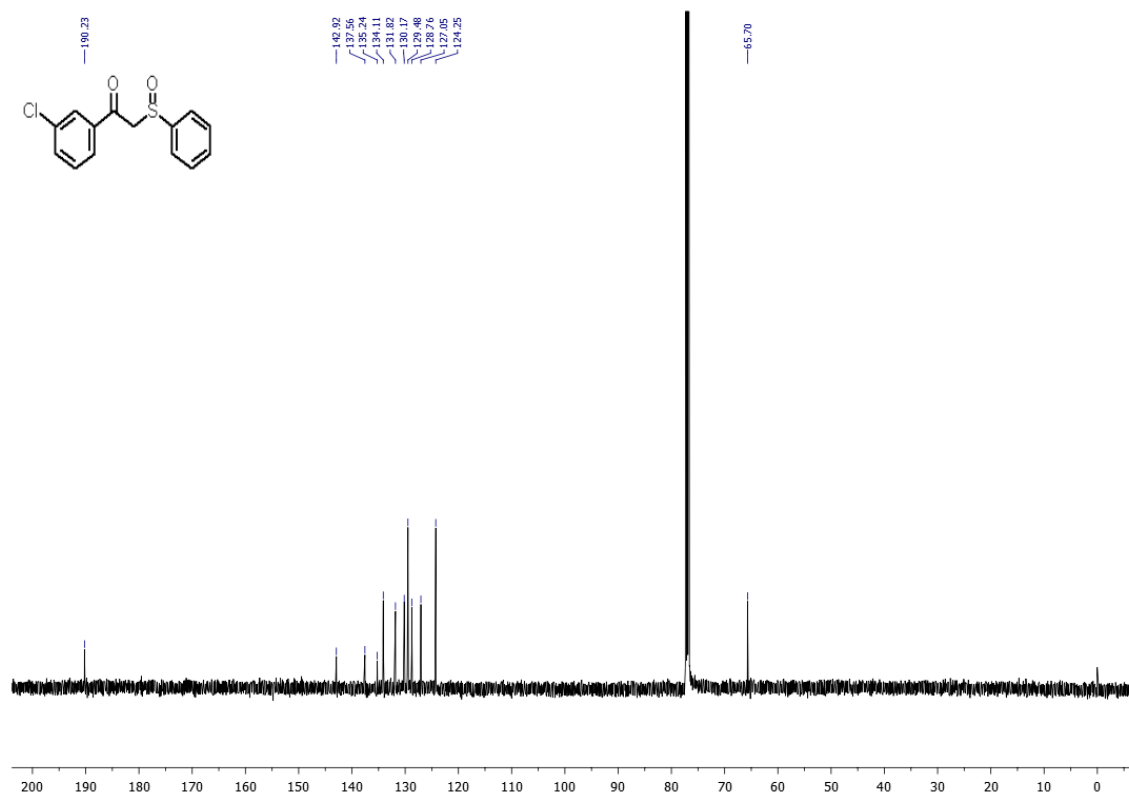
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 38



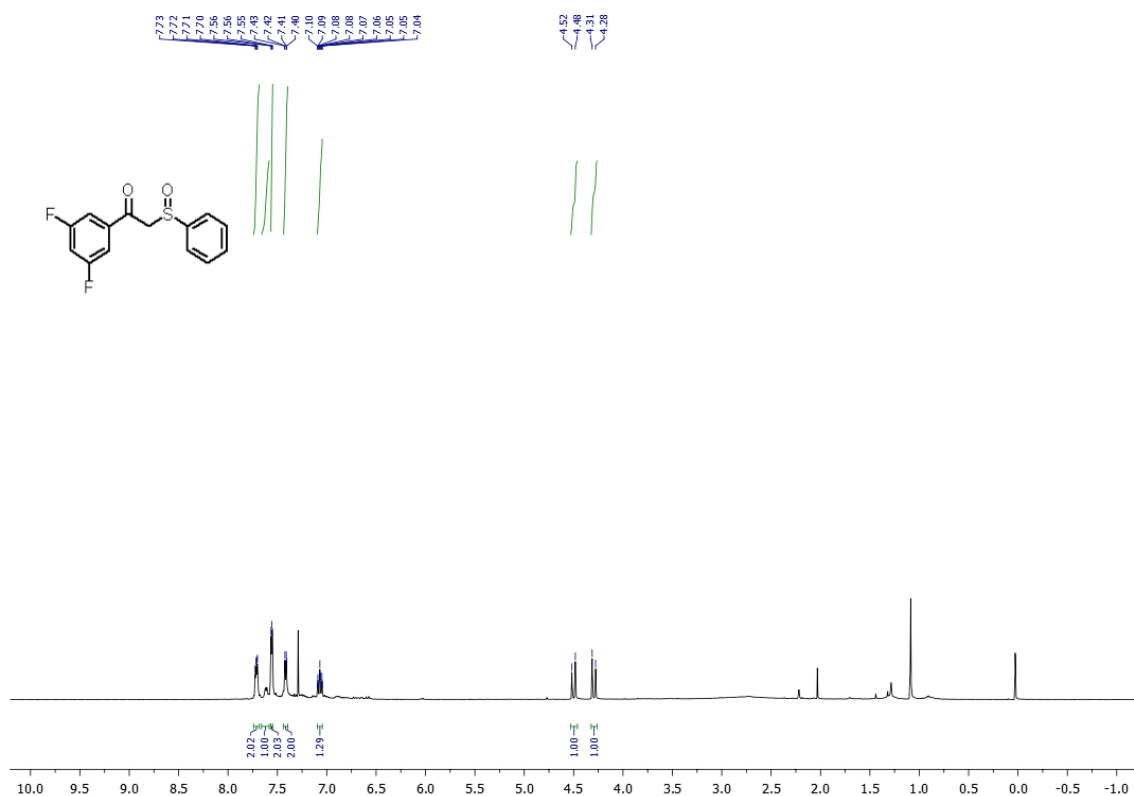
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 39



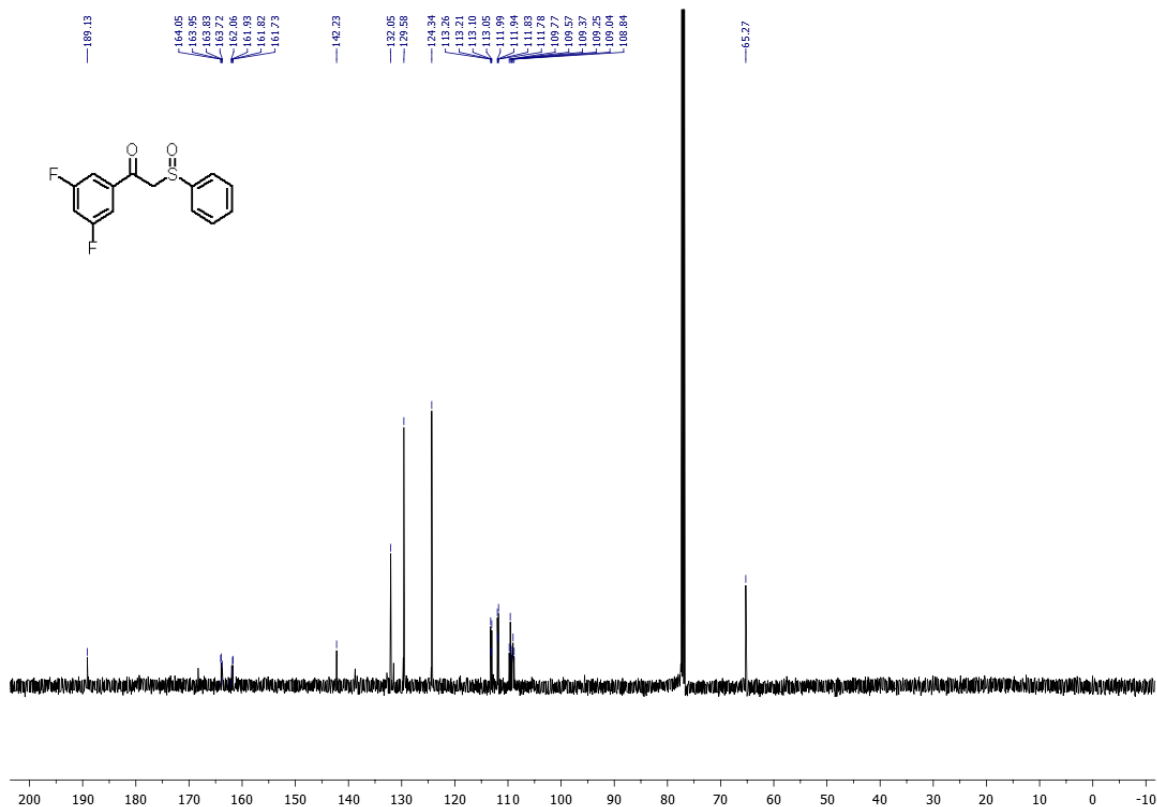
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 39



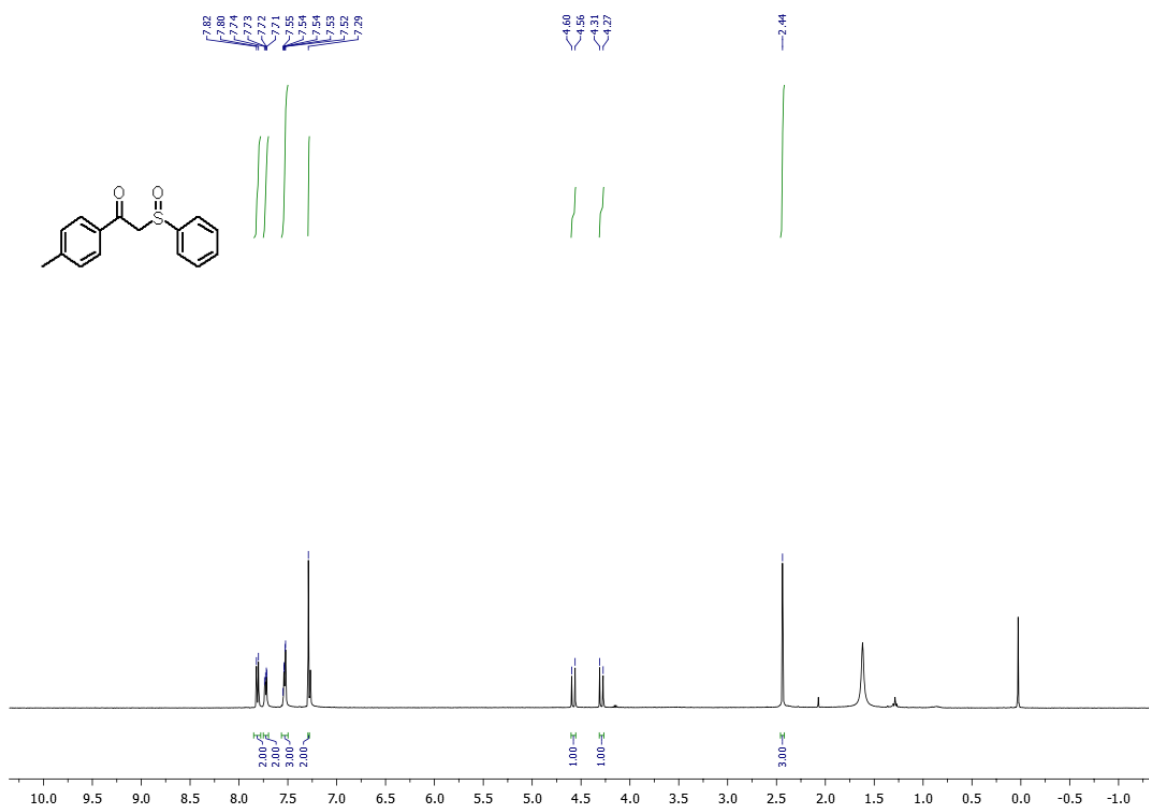
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 40



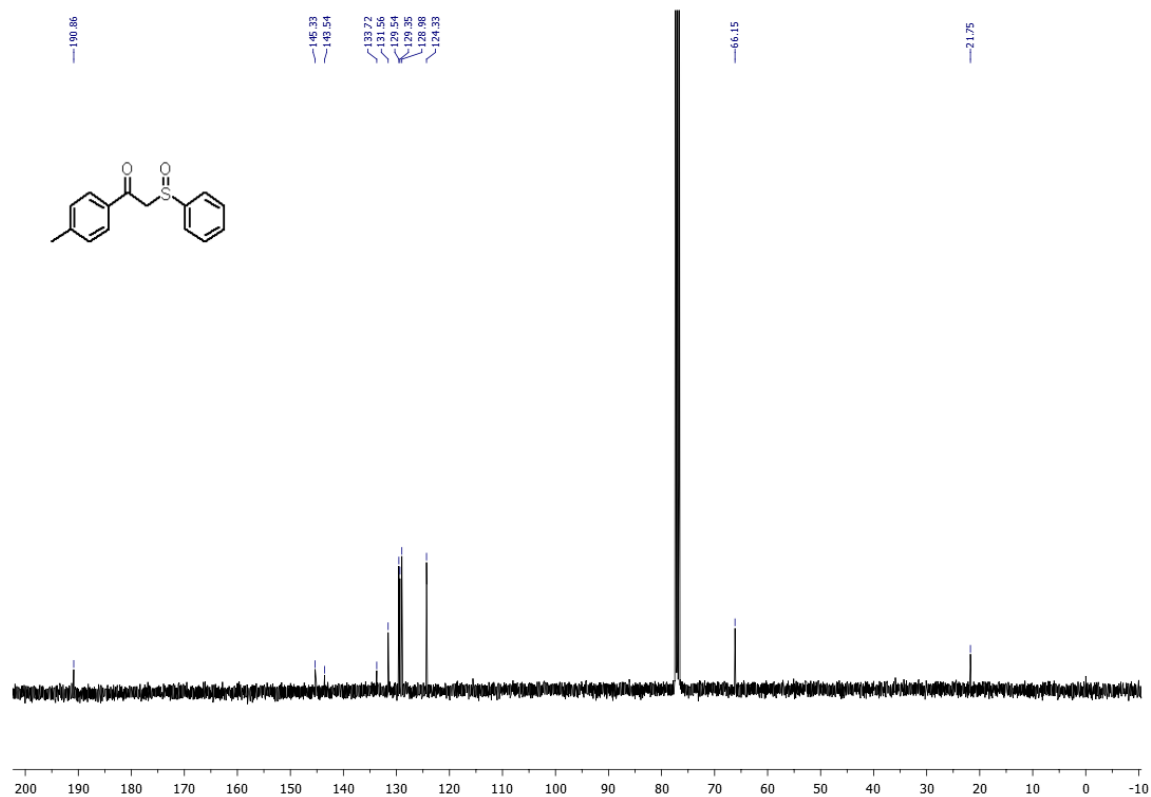
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 40



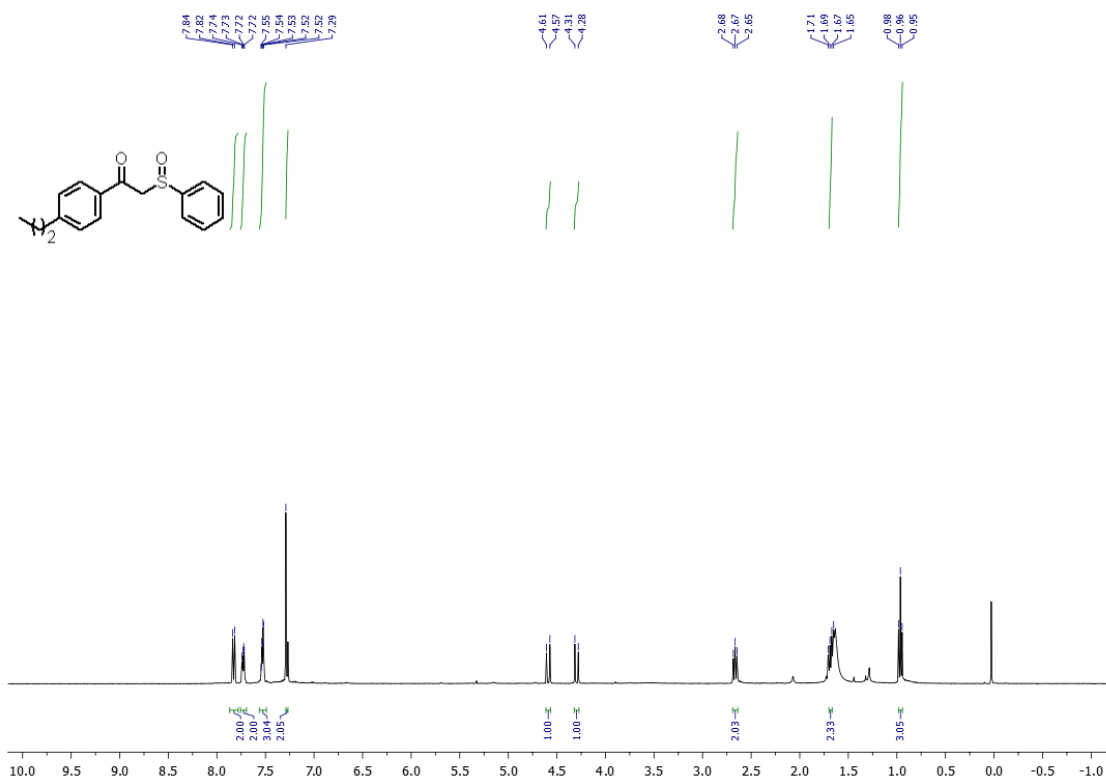
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 41



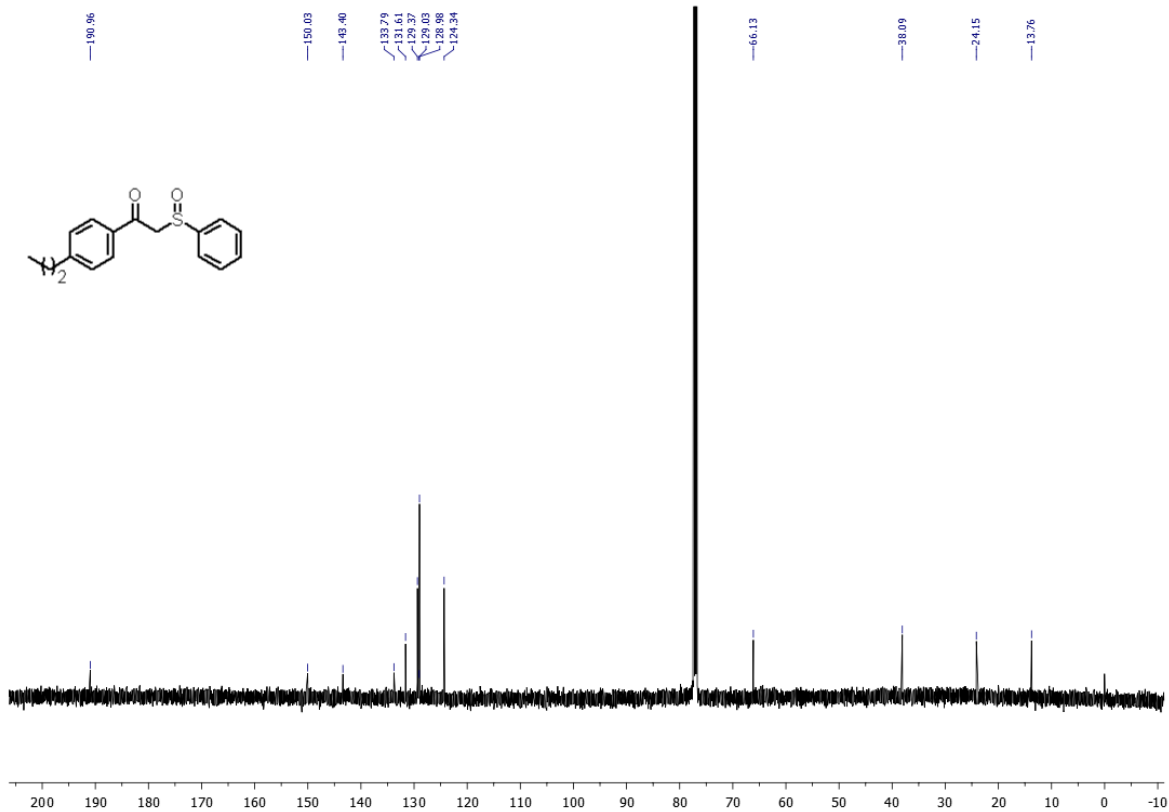
¹³C{¹H} NMR (CDCl₃, 100 MHz) spectra of compound 41



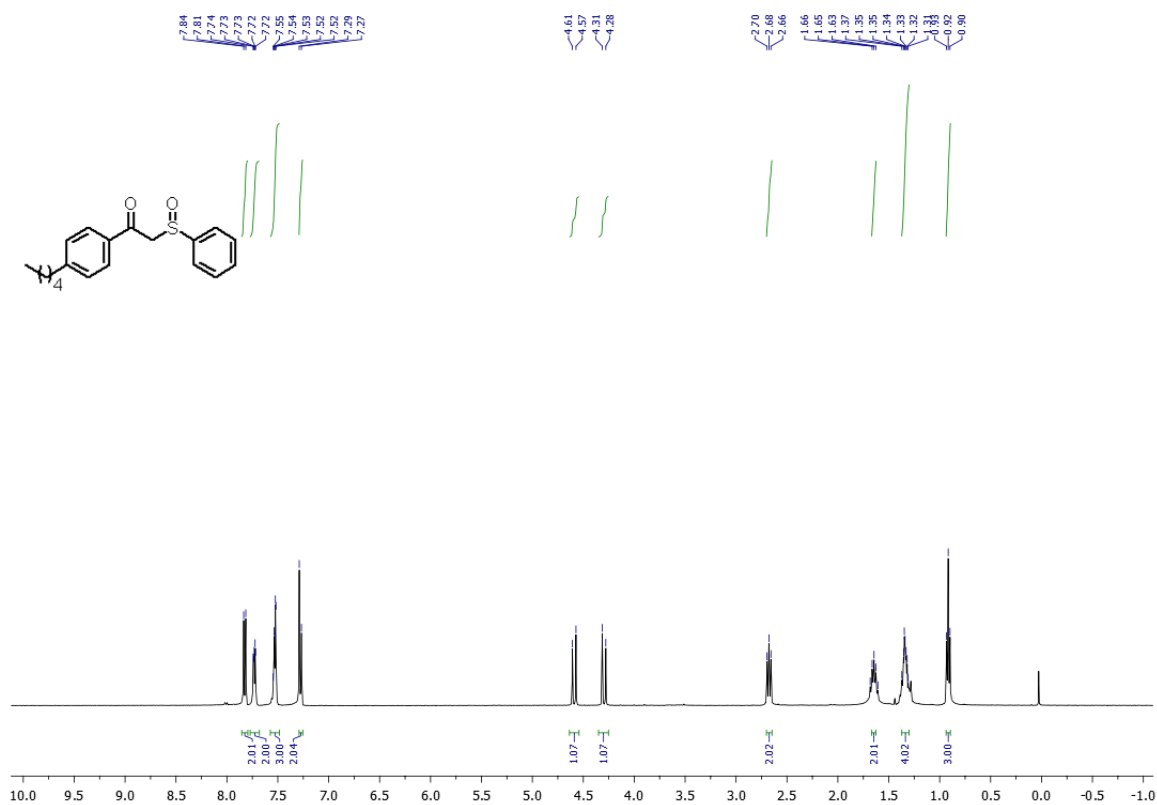
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 42



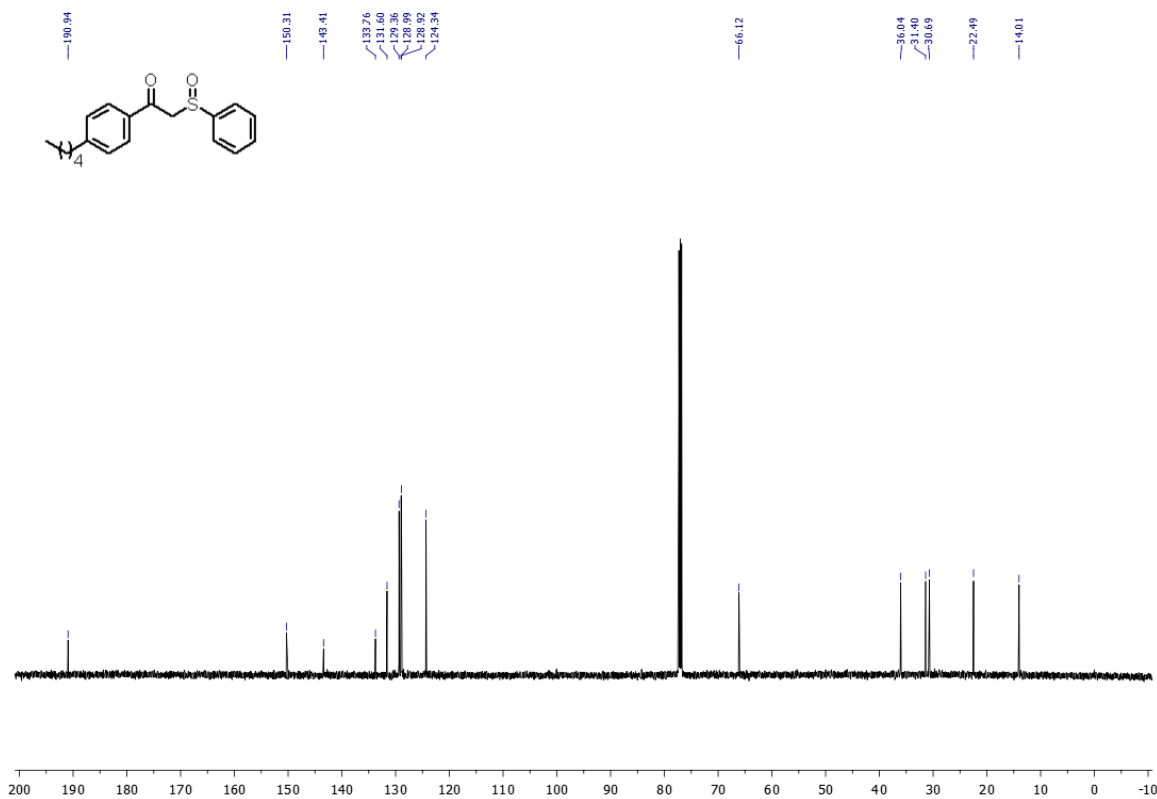
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 42



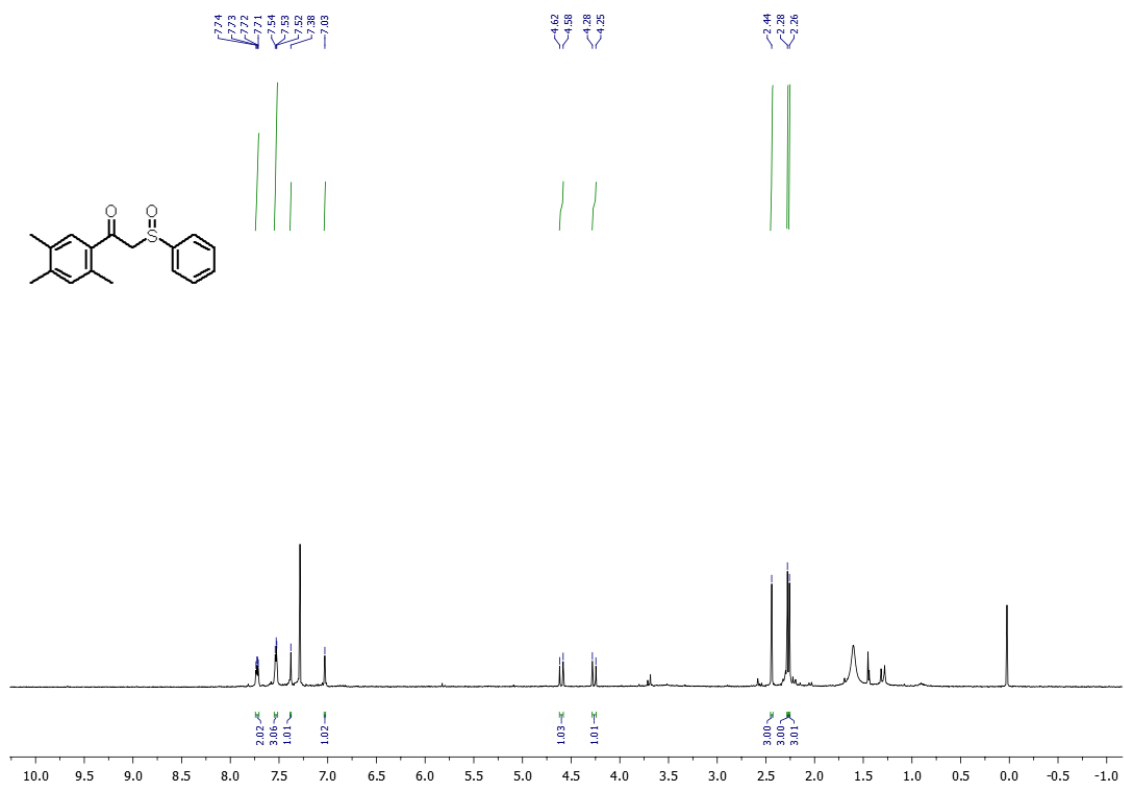
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 43



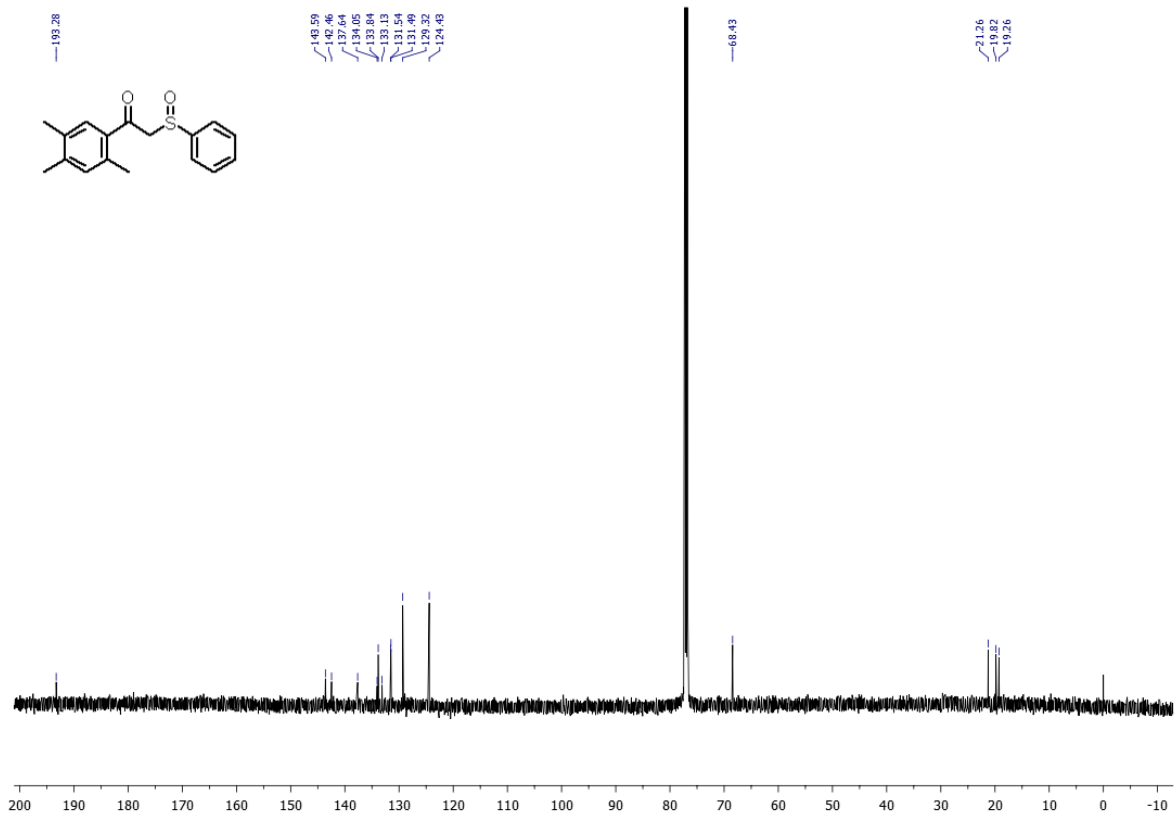
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 43



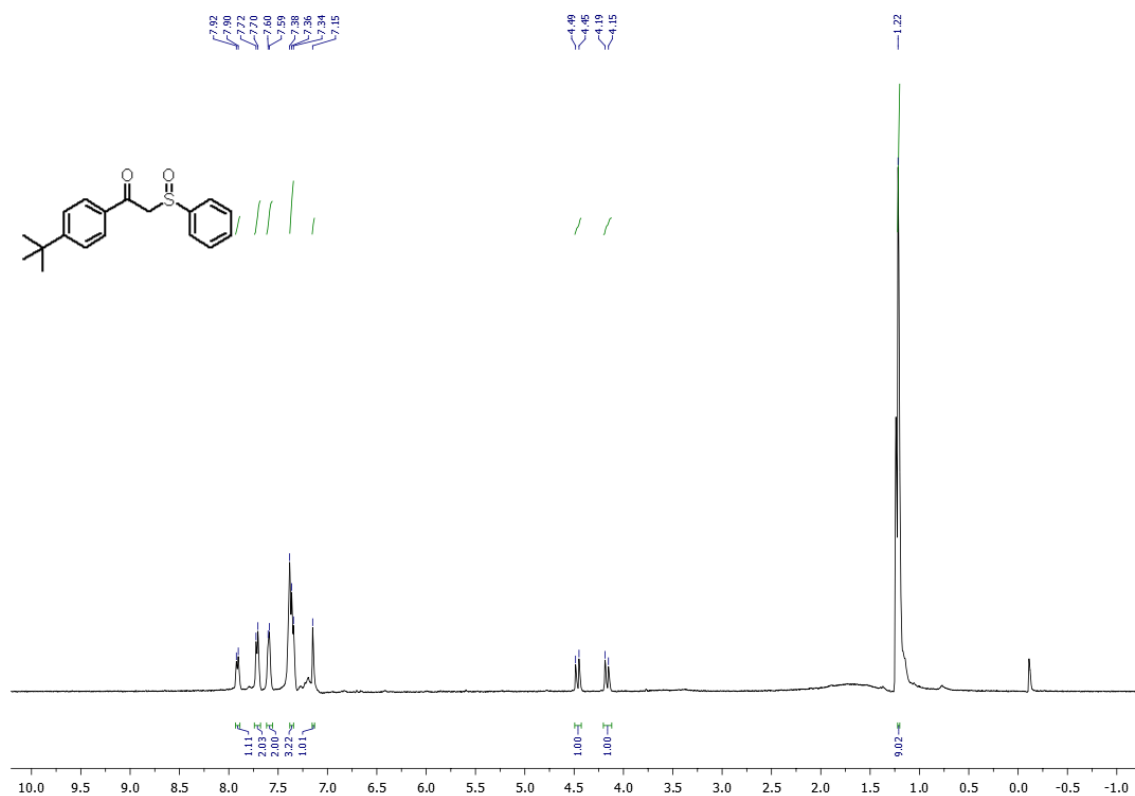
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 44



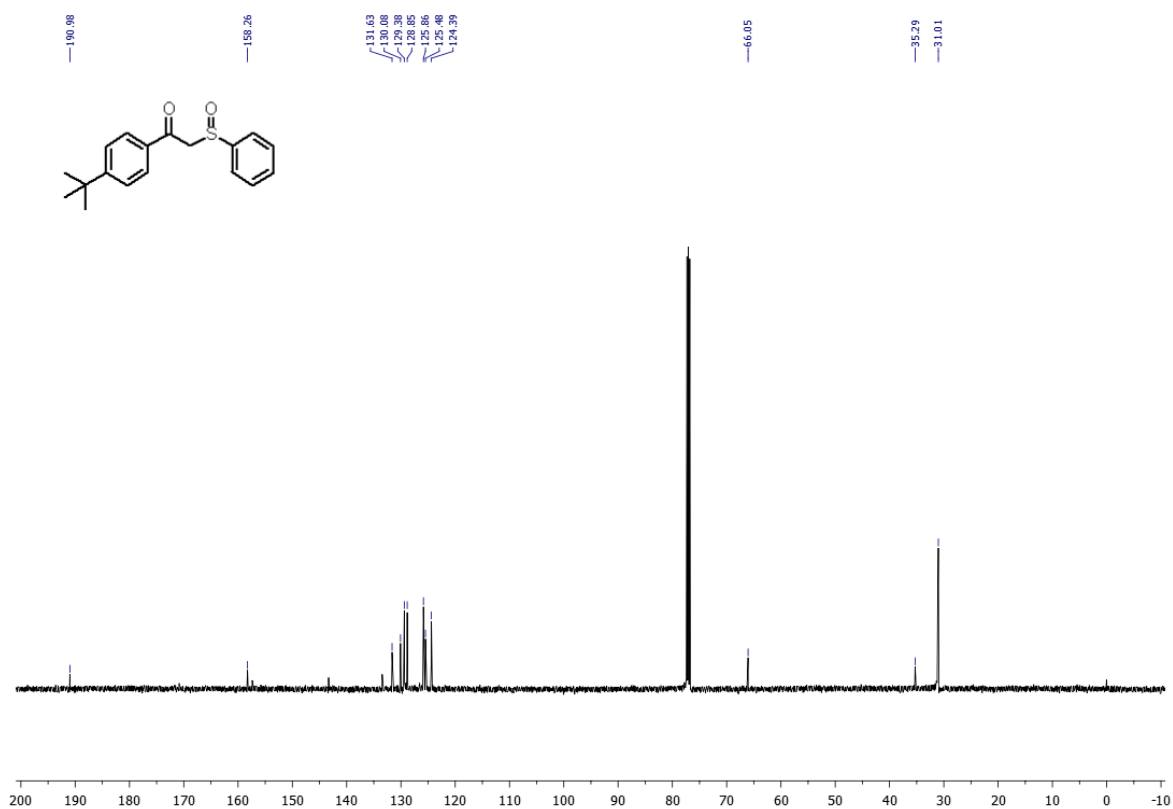
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 44



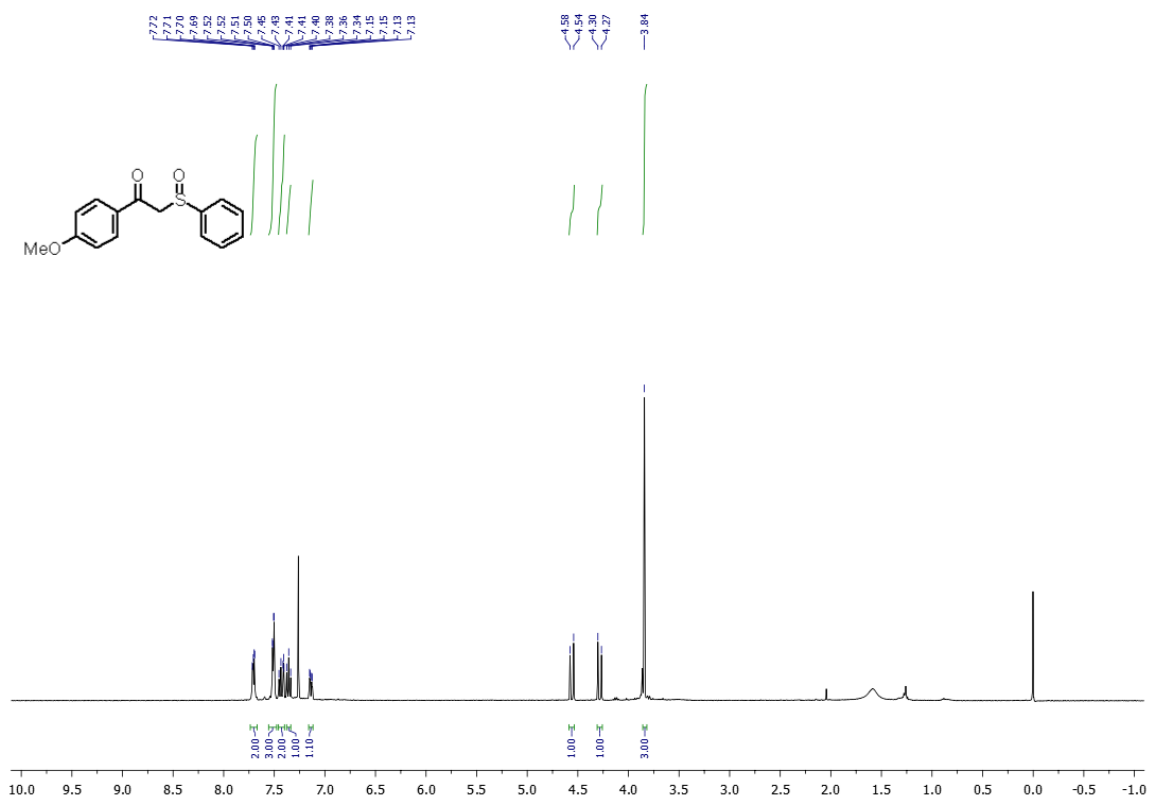
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 45



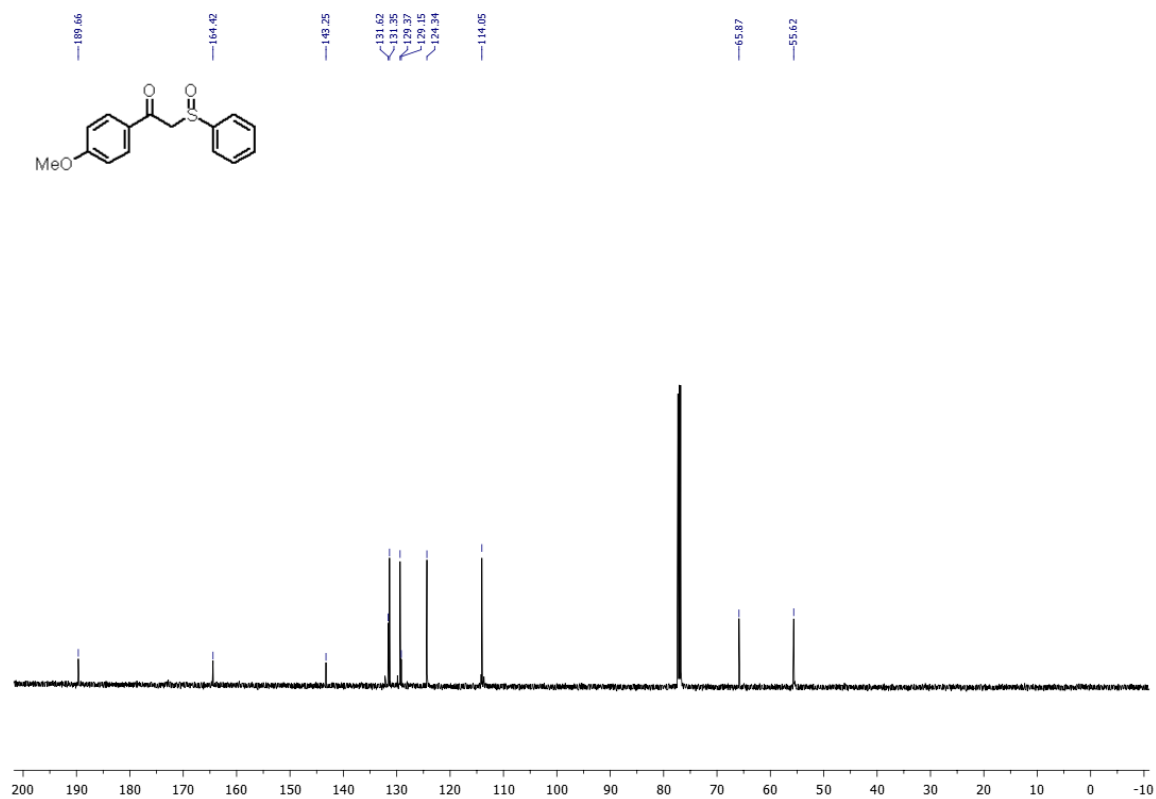
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 45



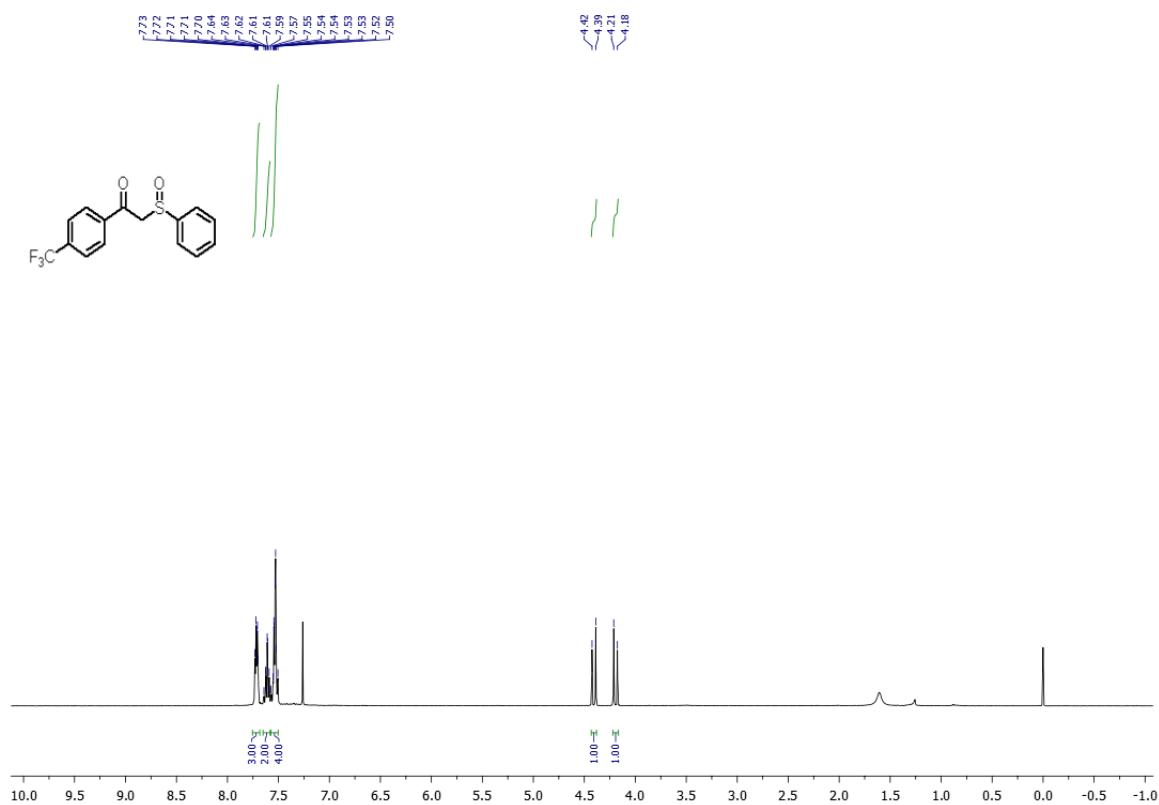
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 46



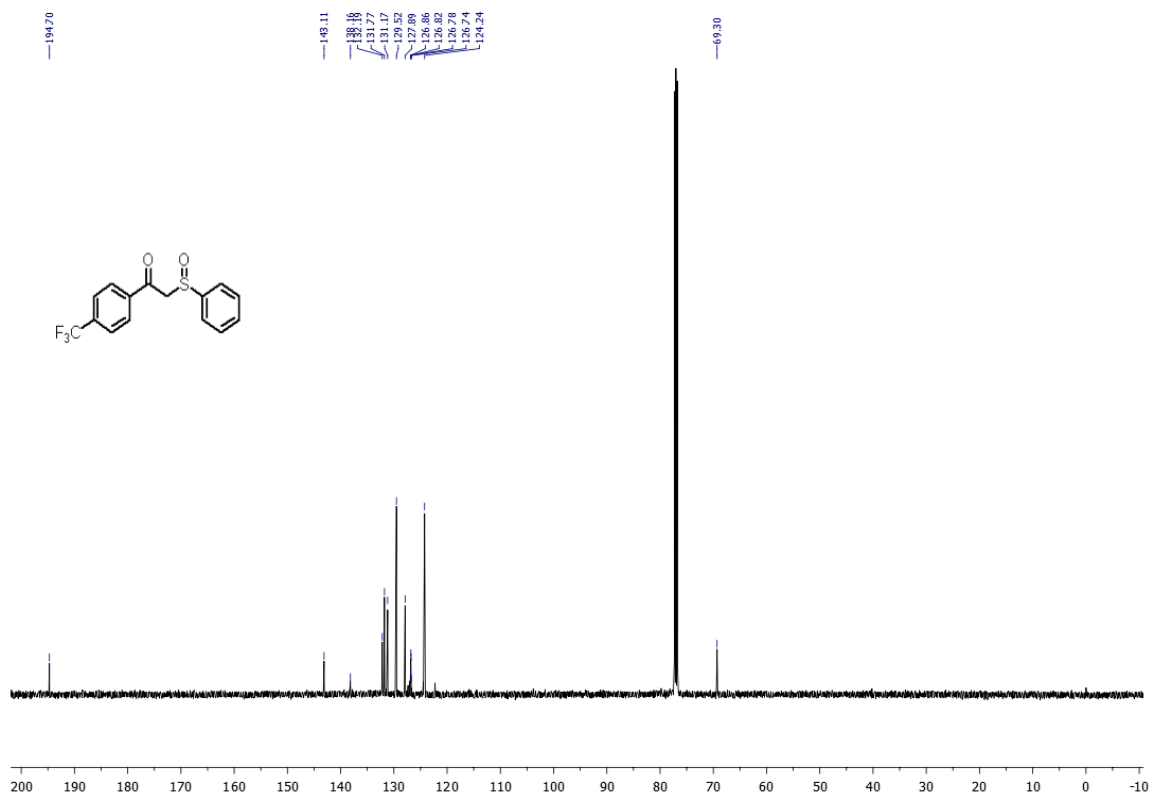
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 46



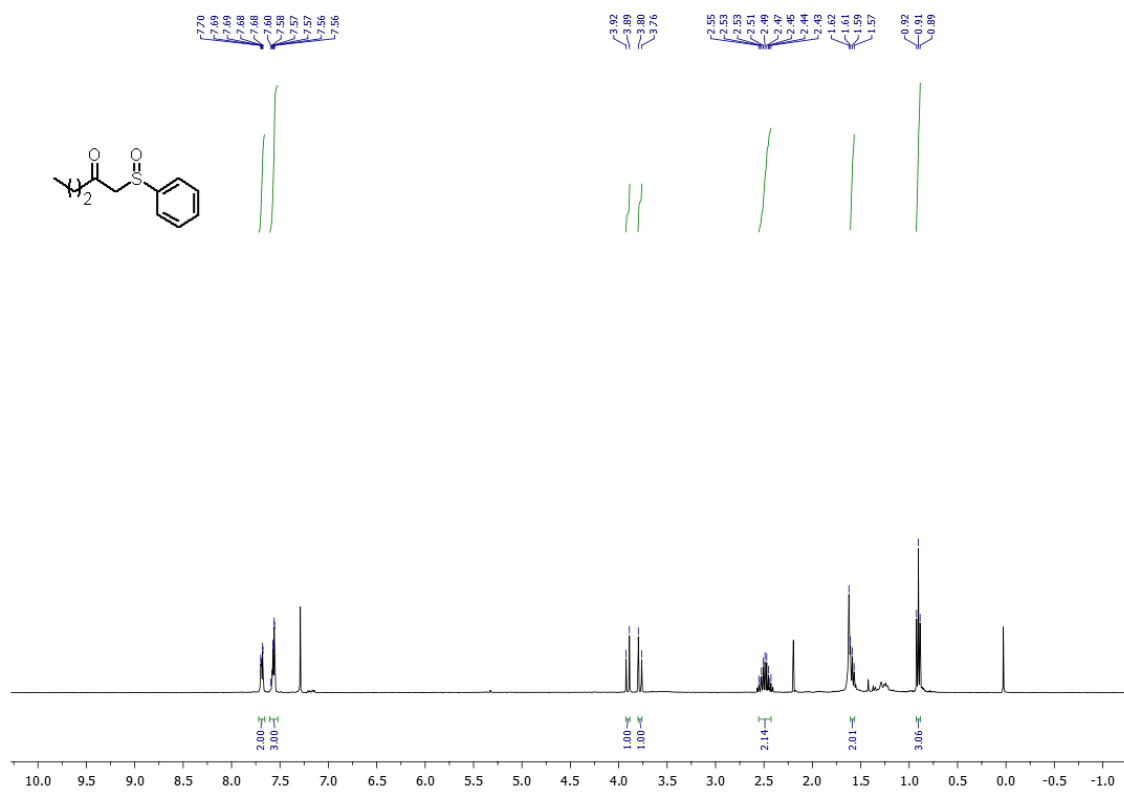
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 47



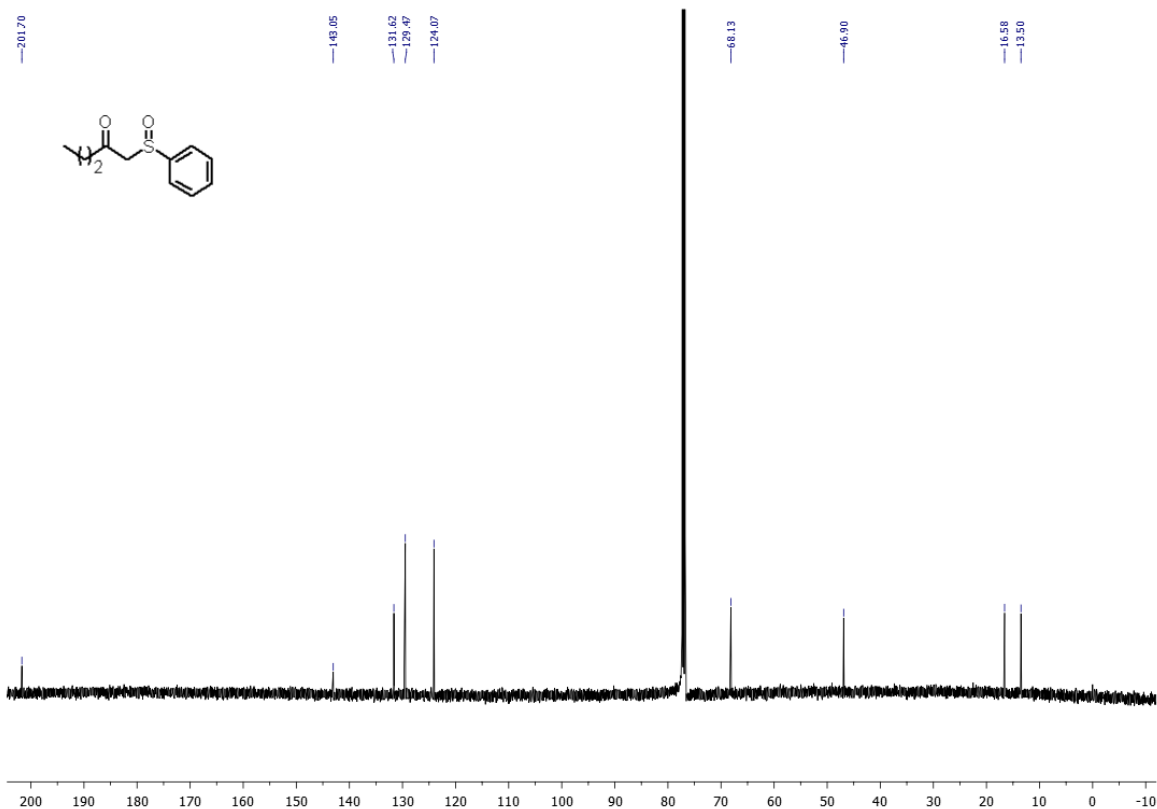
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 47



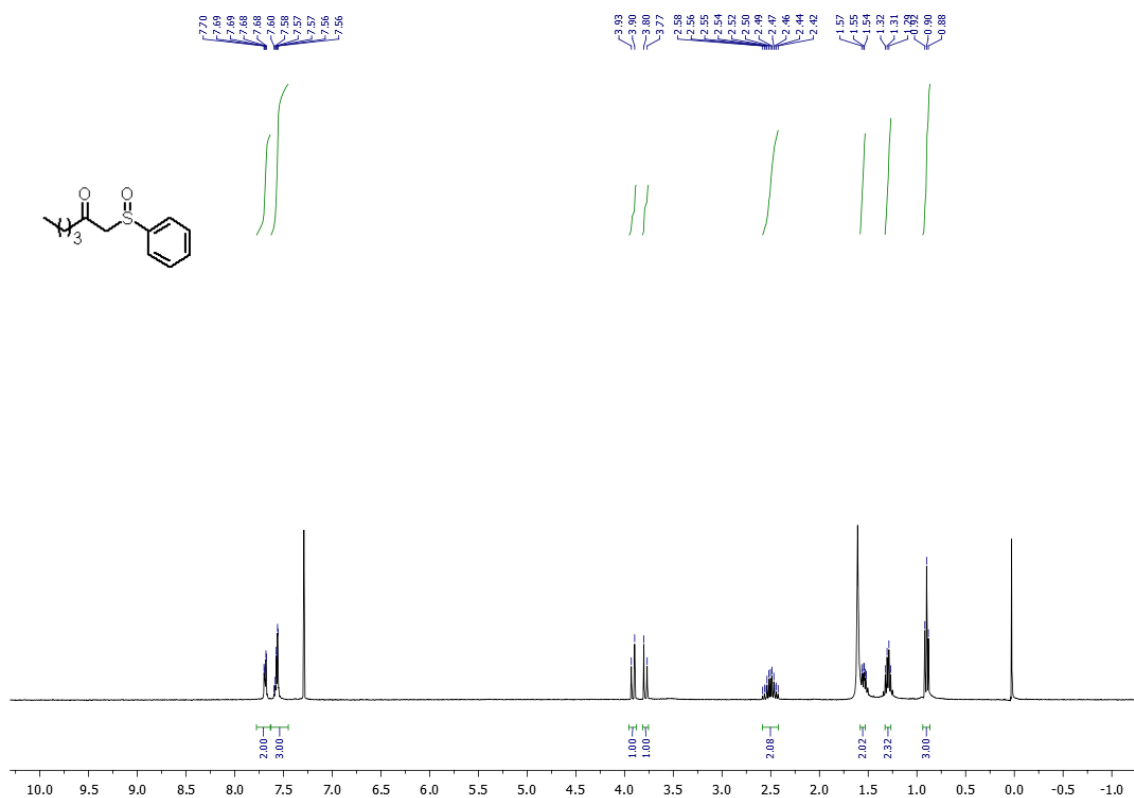
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 48



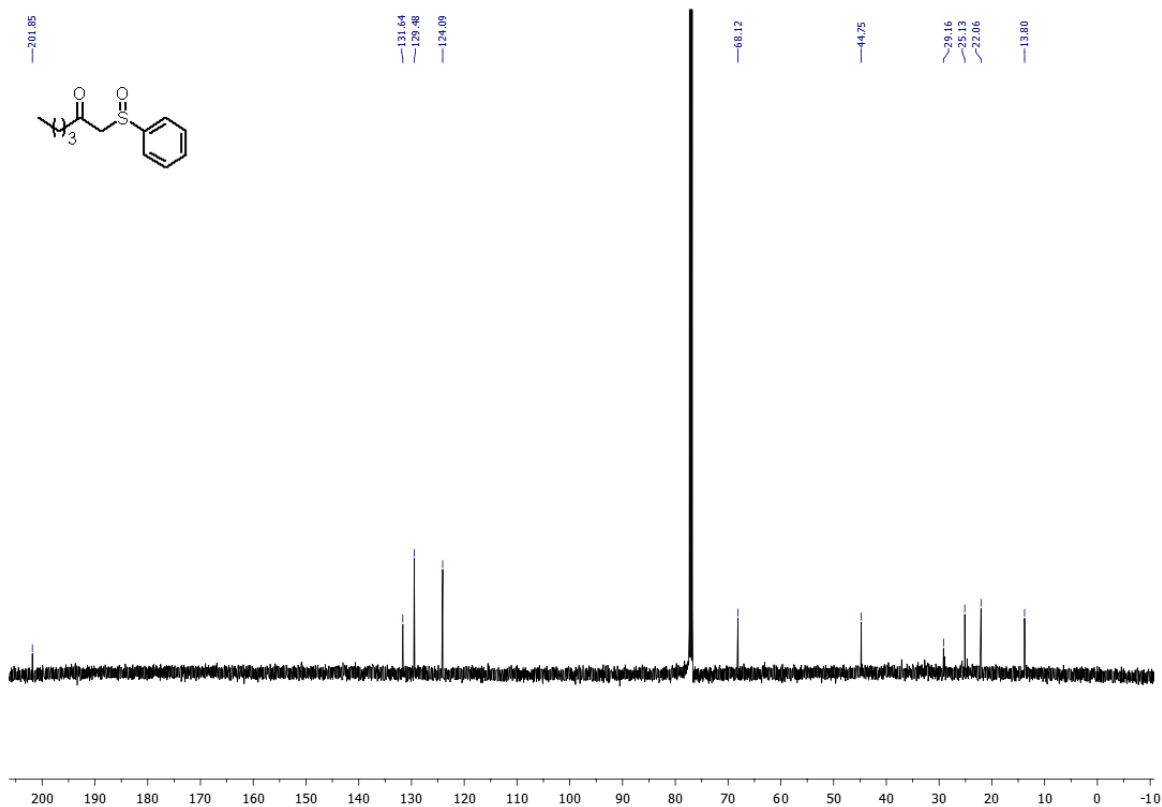
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 48



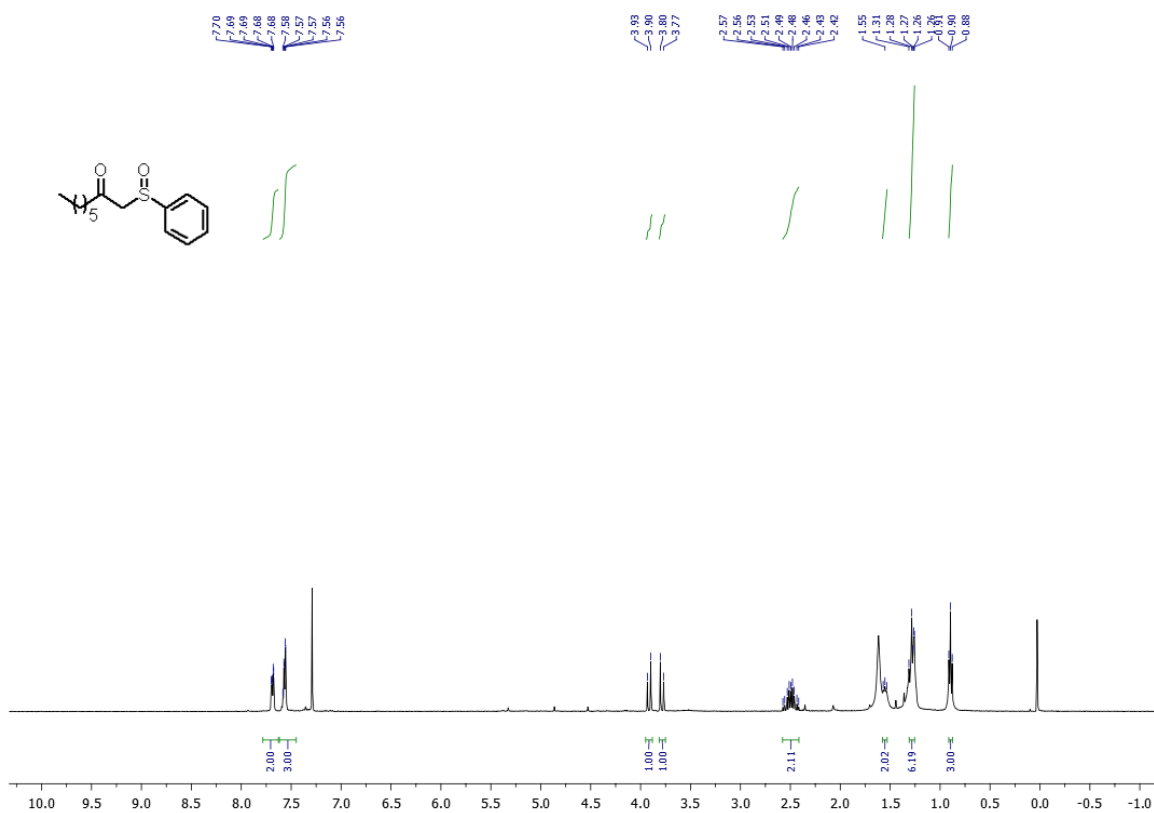
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 49



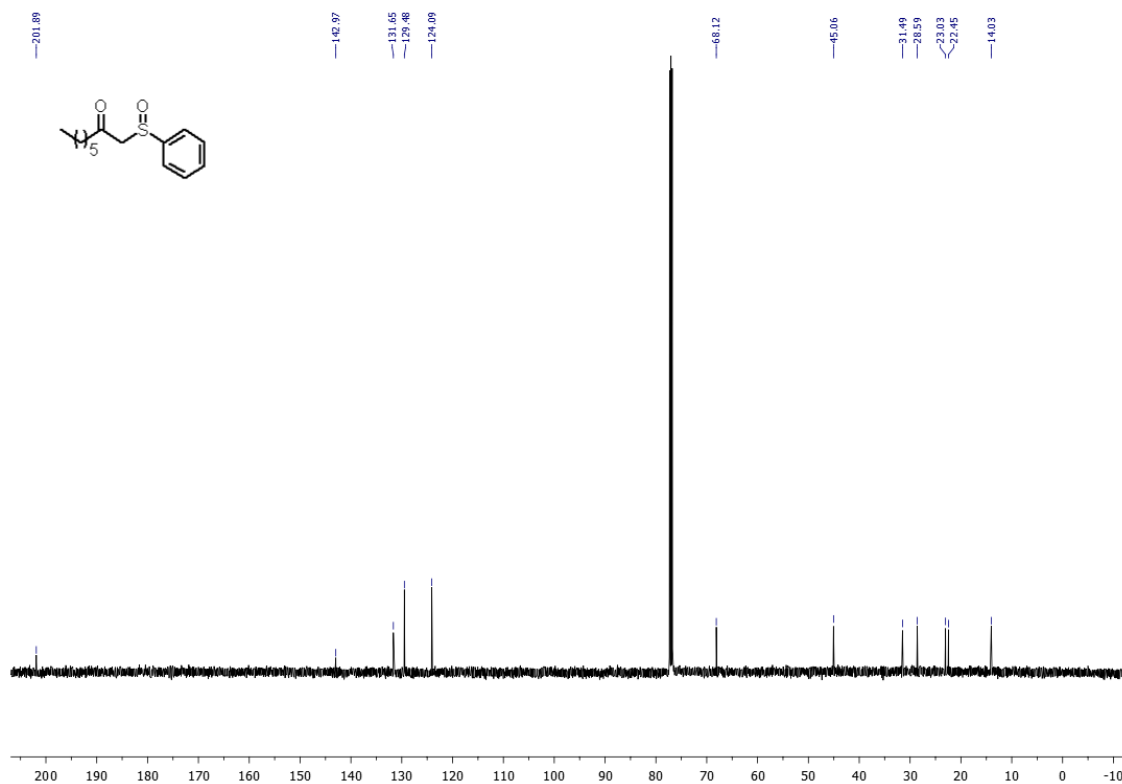
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 49



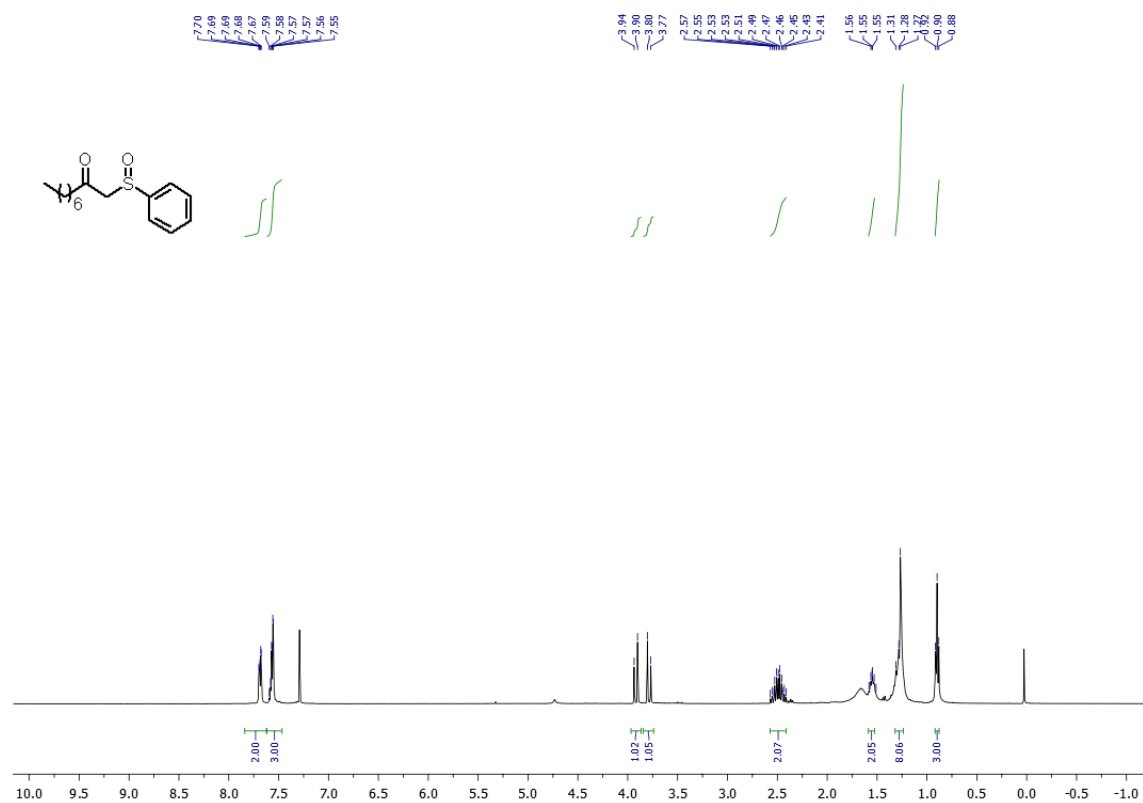
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 50



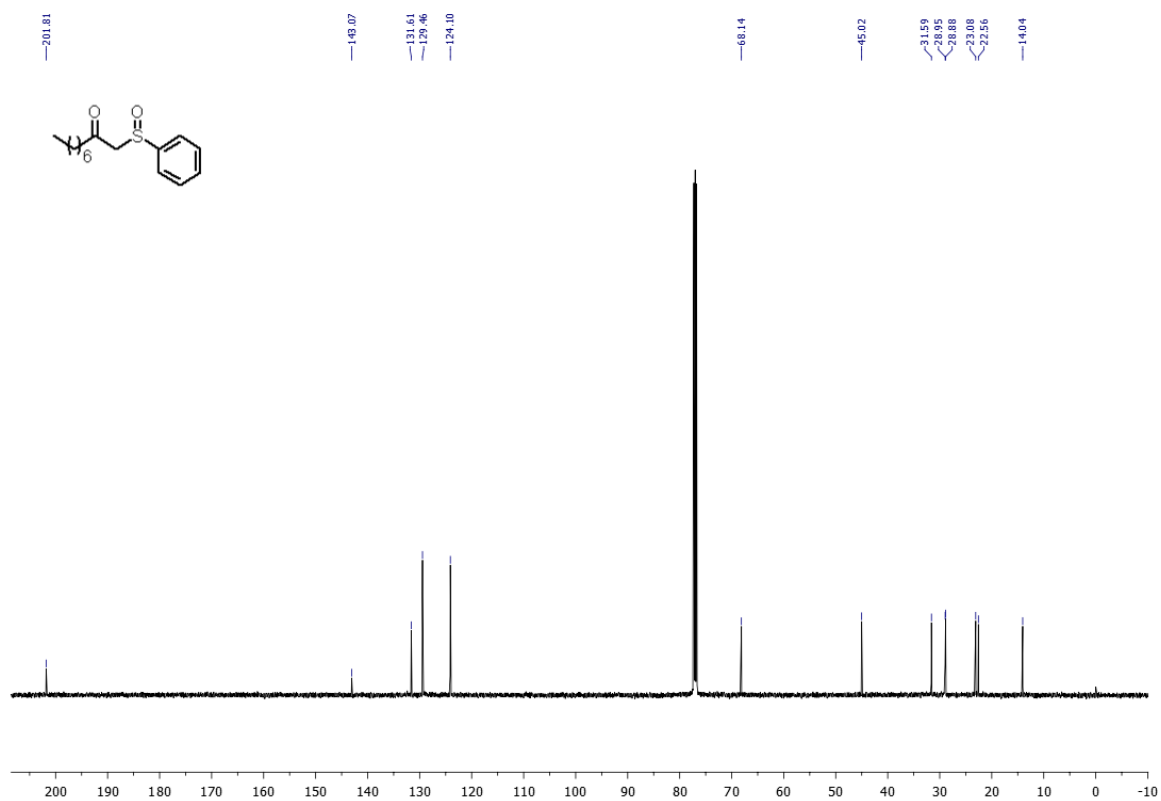
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 50



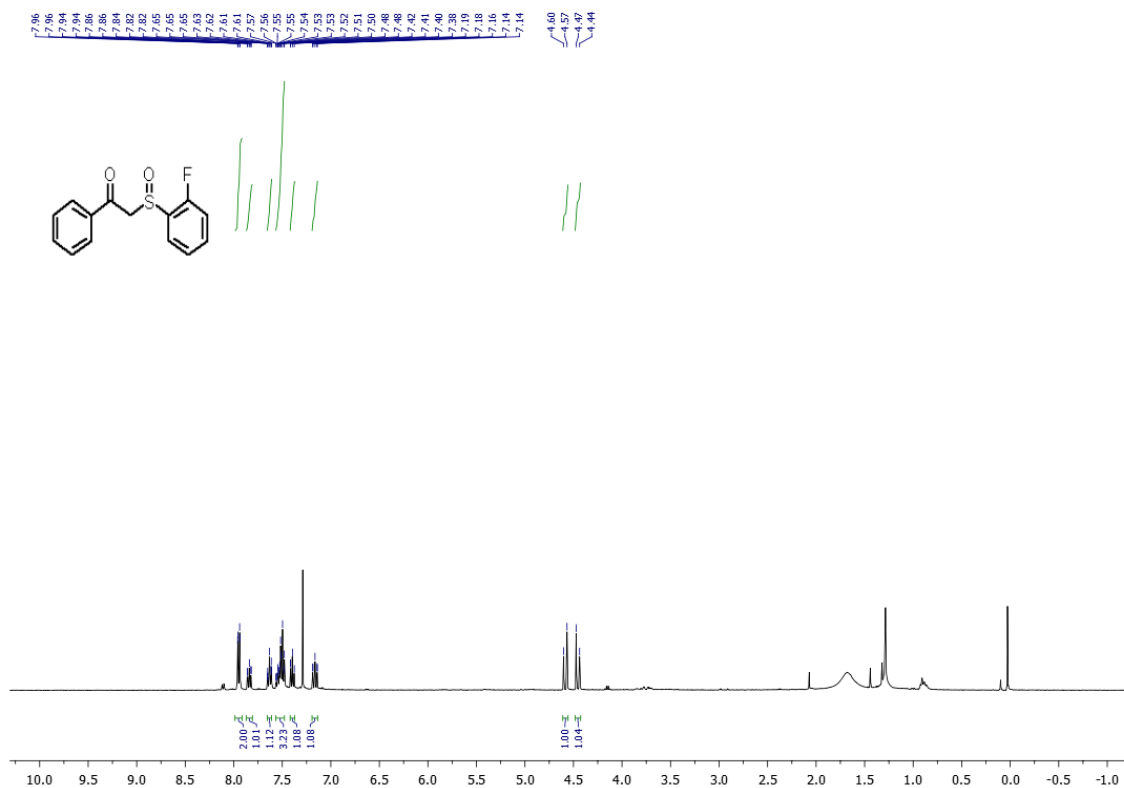
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 51



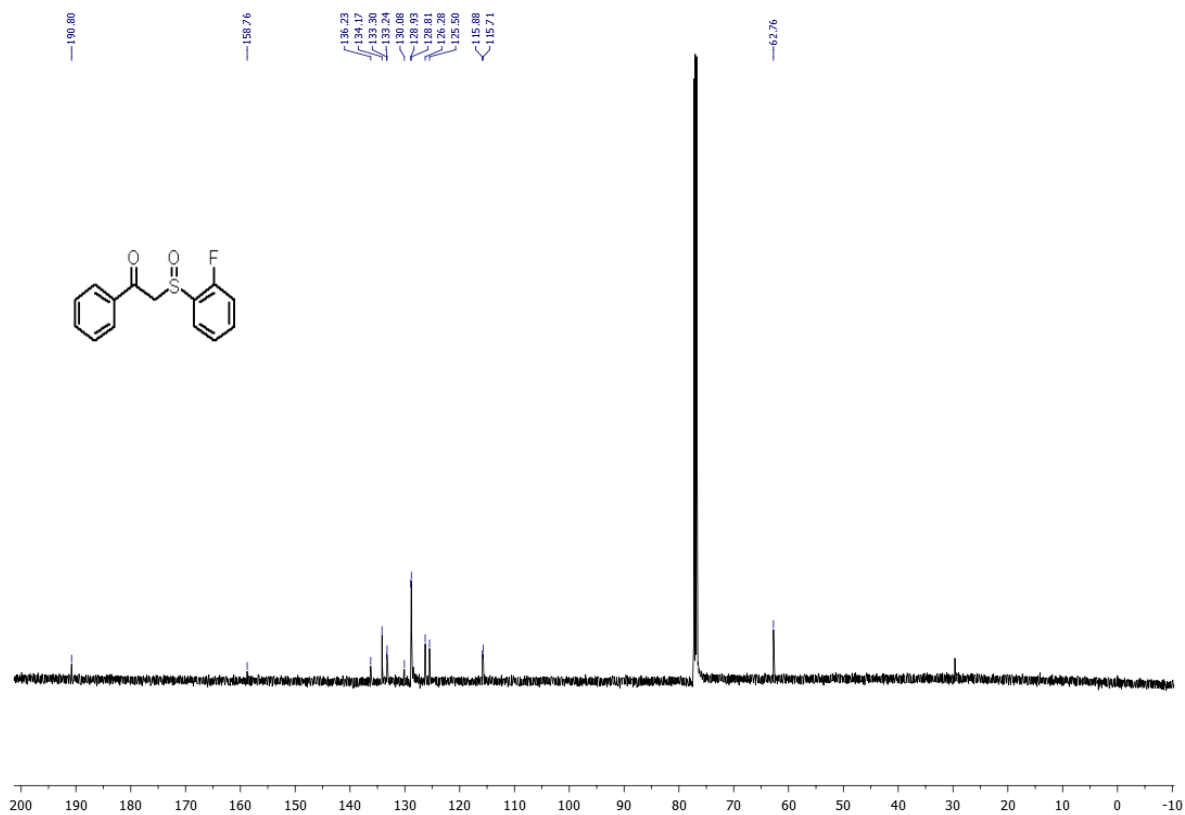
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 51



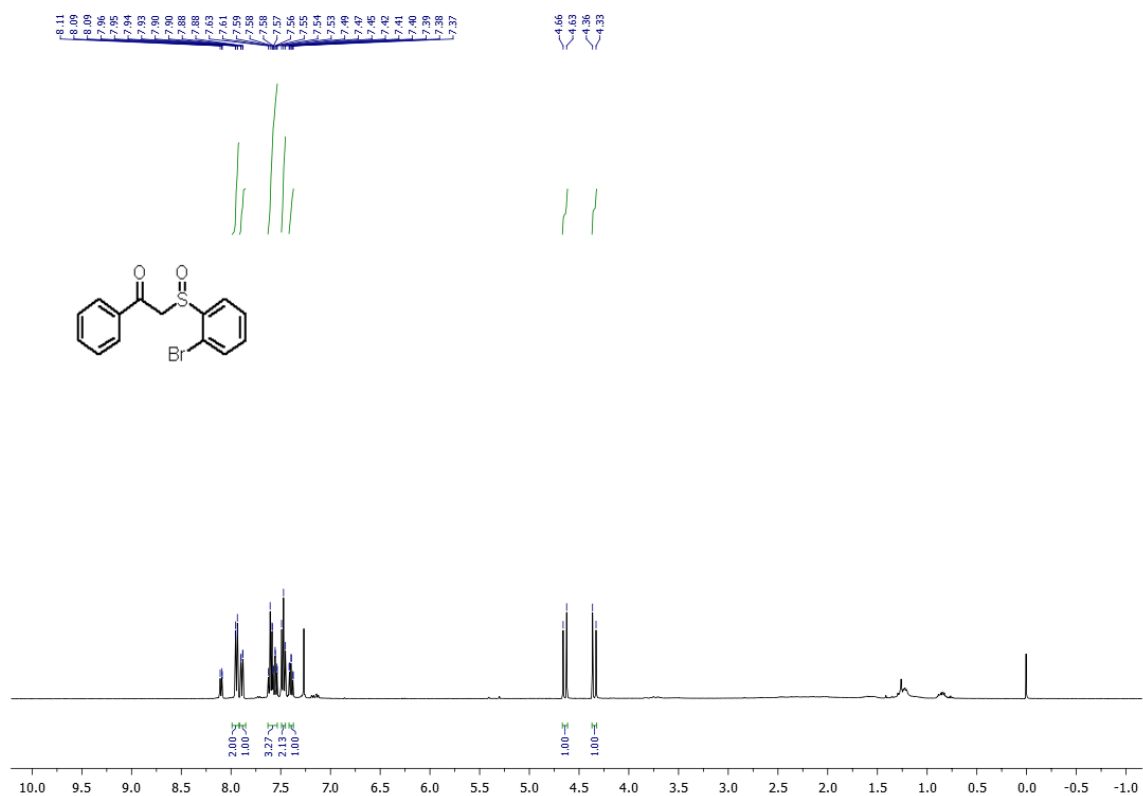
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 52



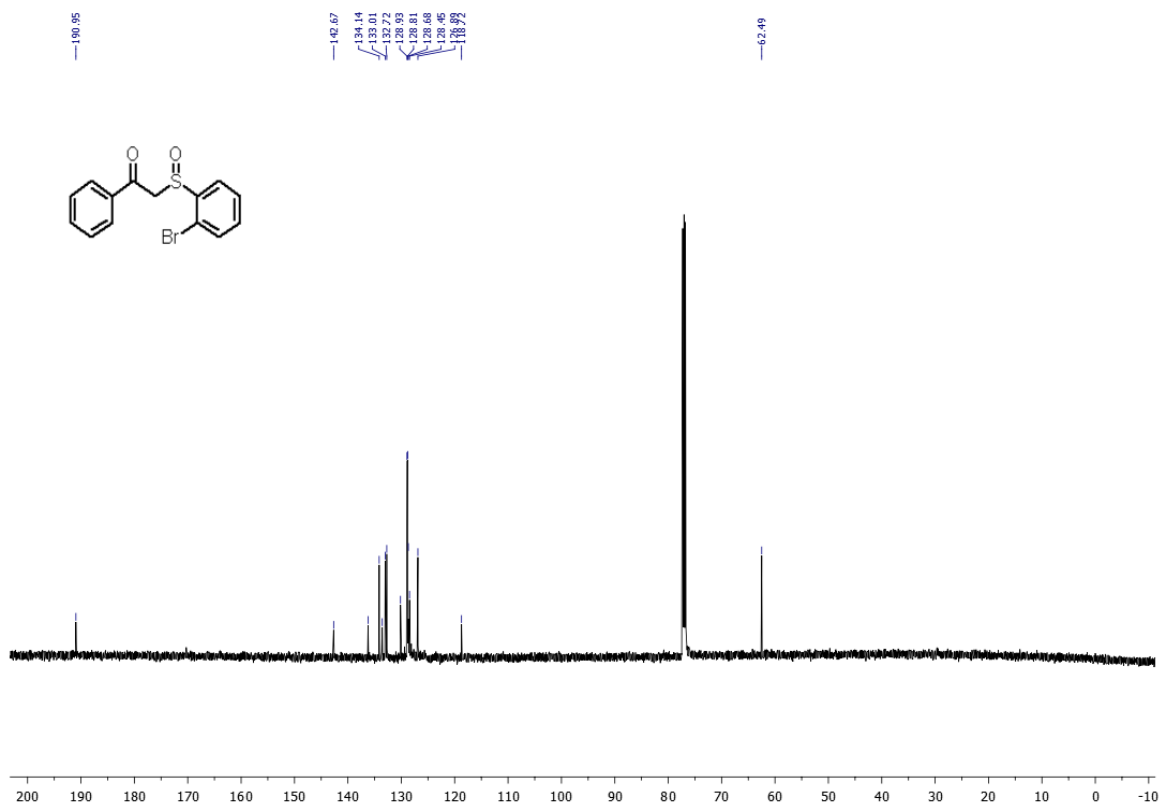
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 52



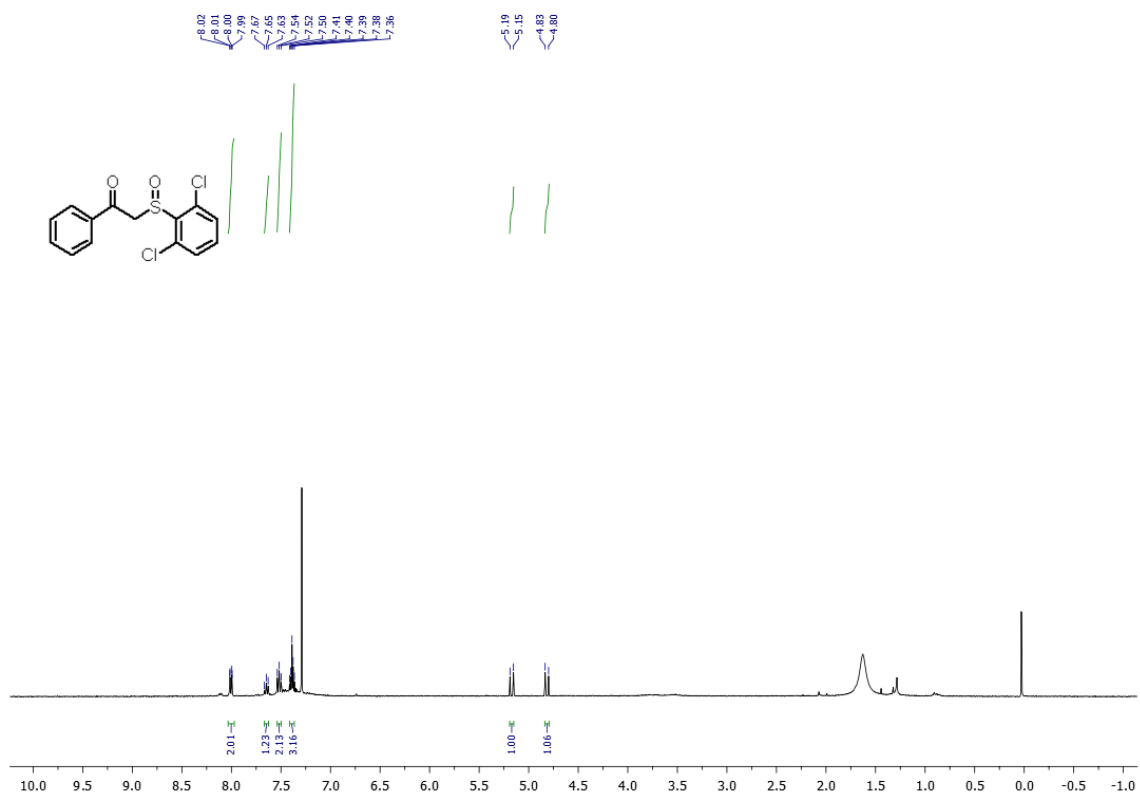
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 53



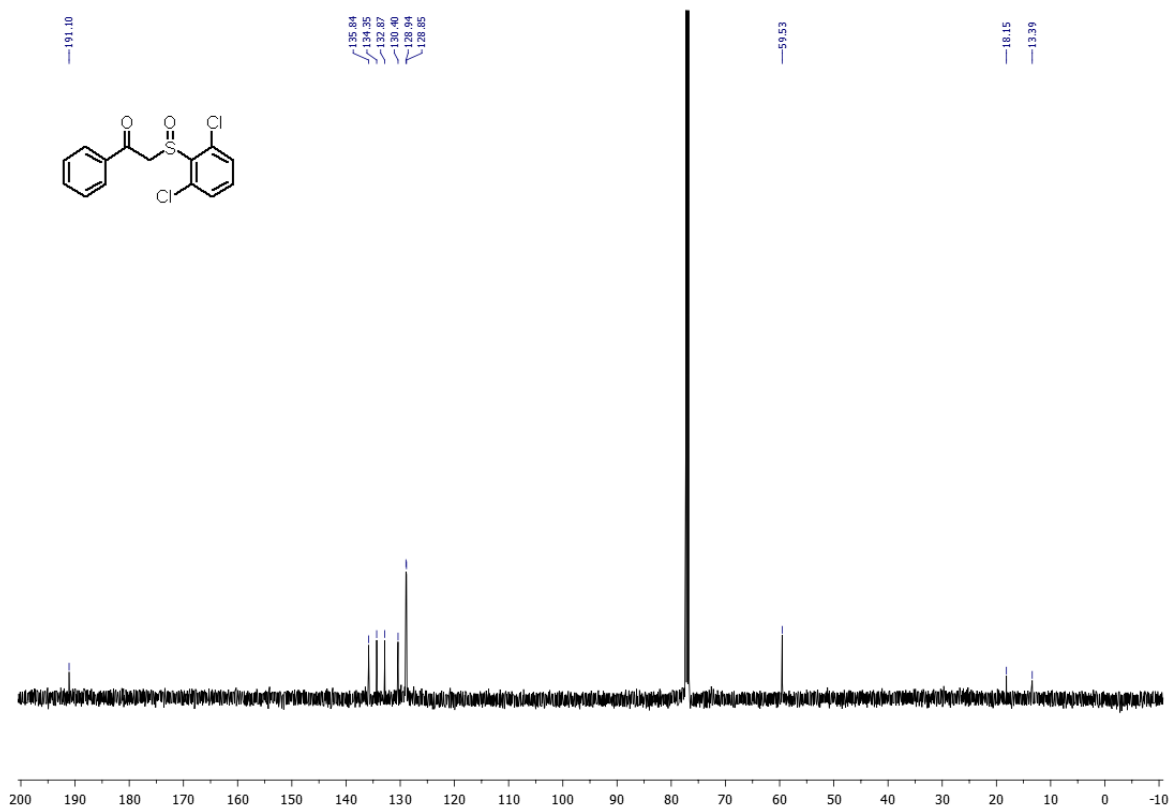
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 53



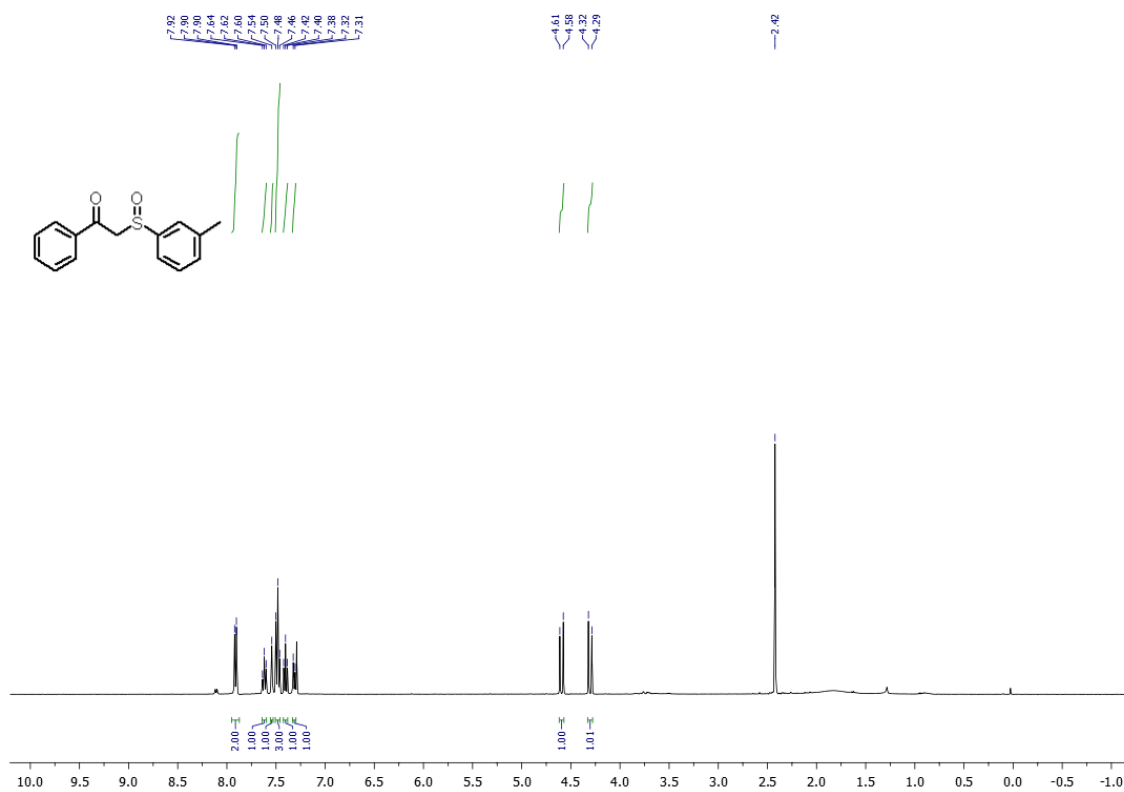
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 54



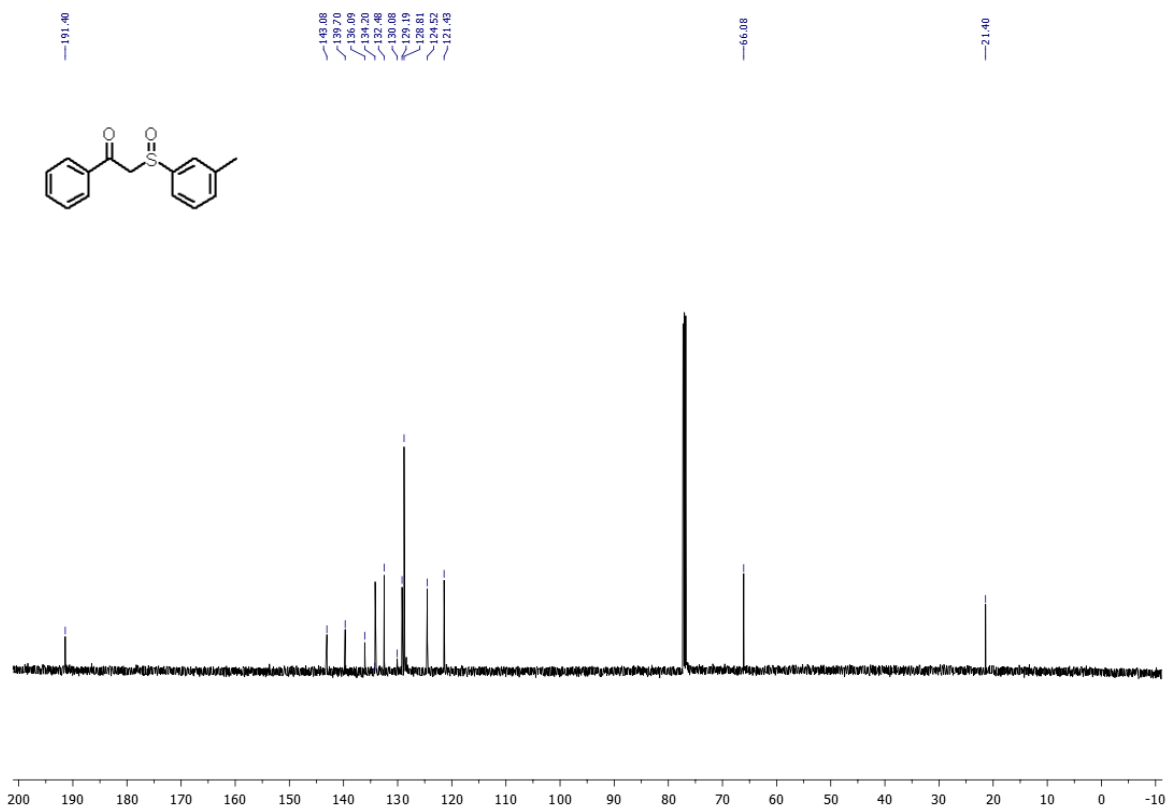
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 54



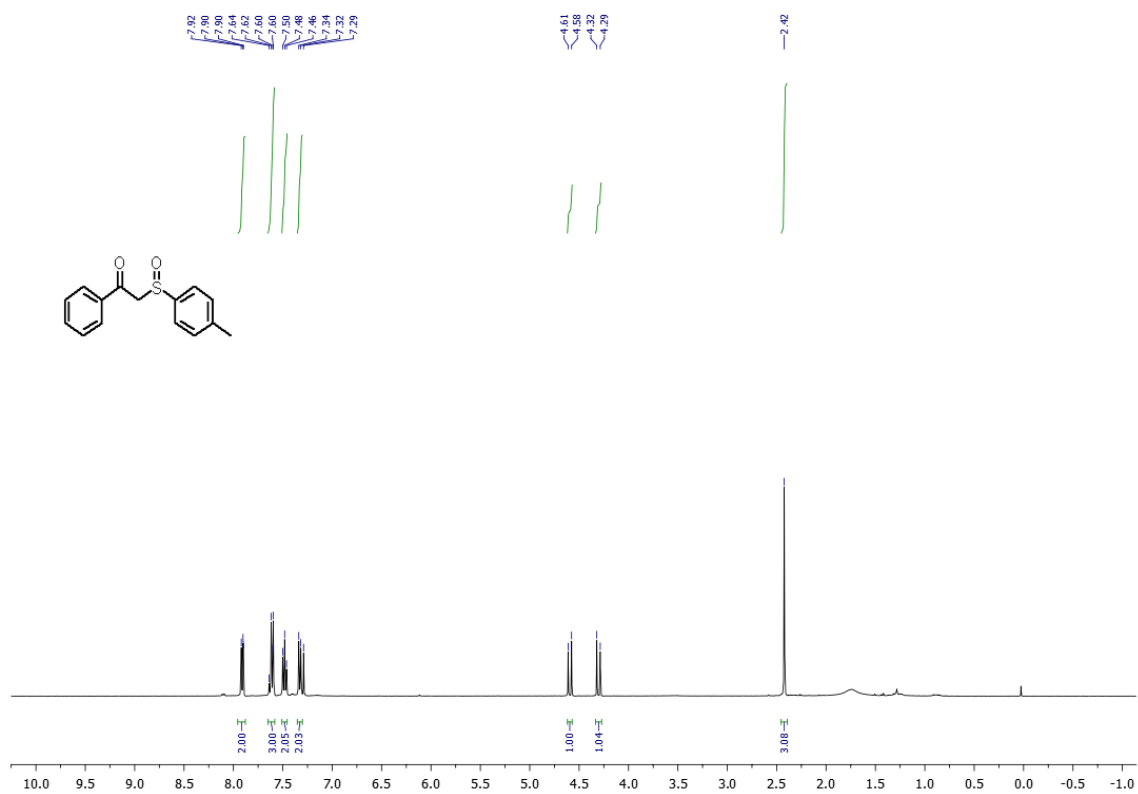
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 55



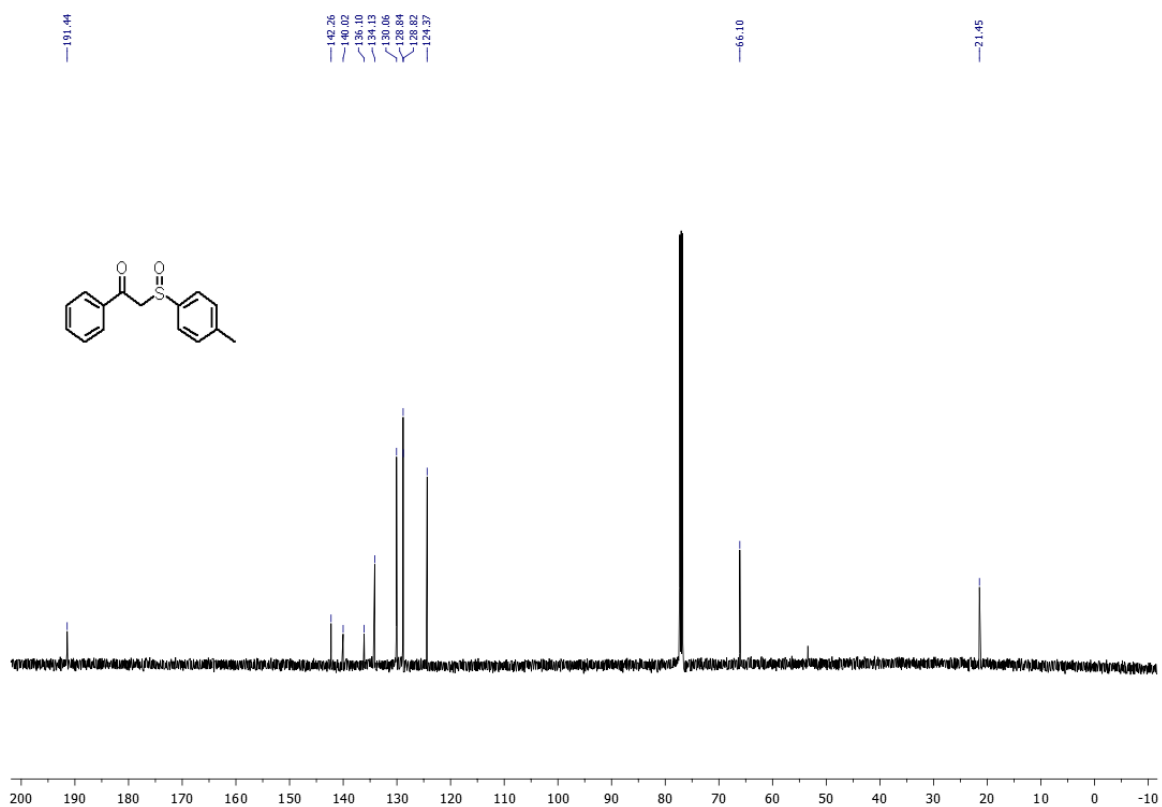
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 55



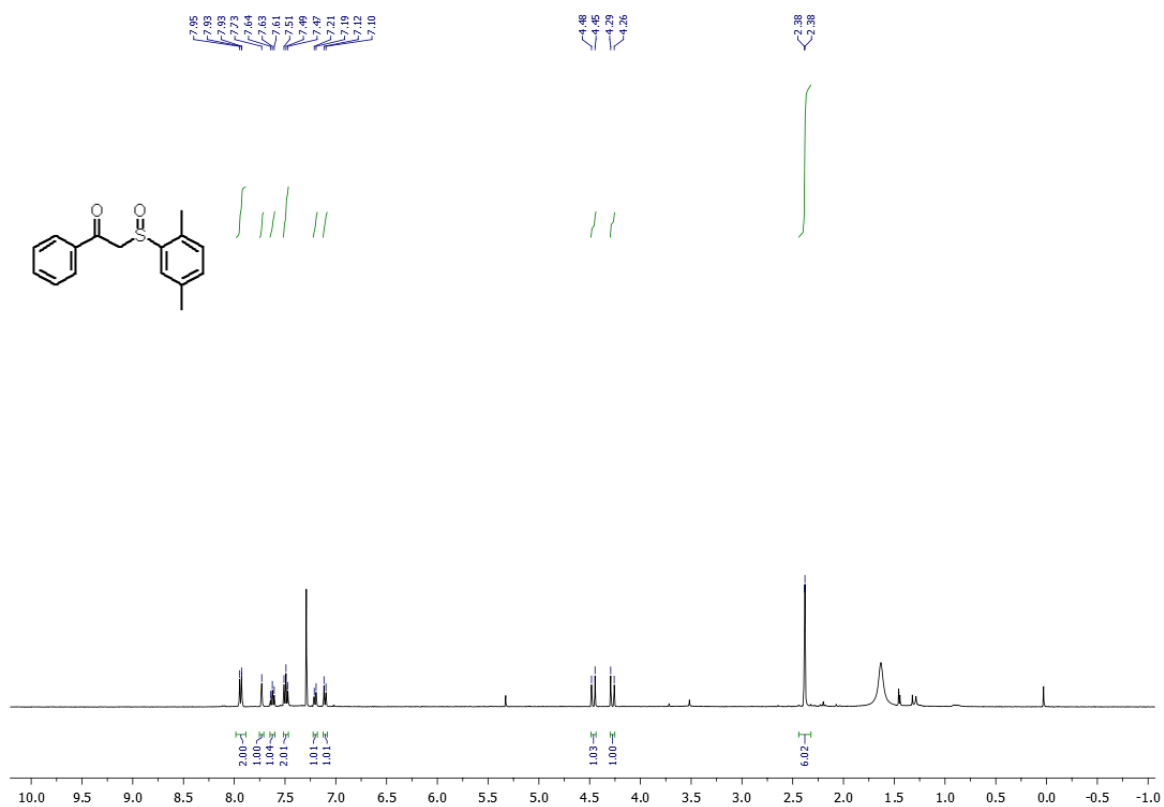
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 56



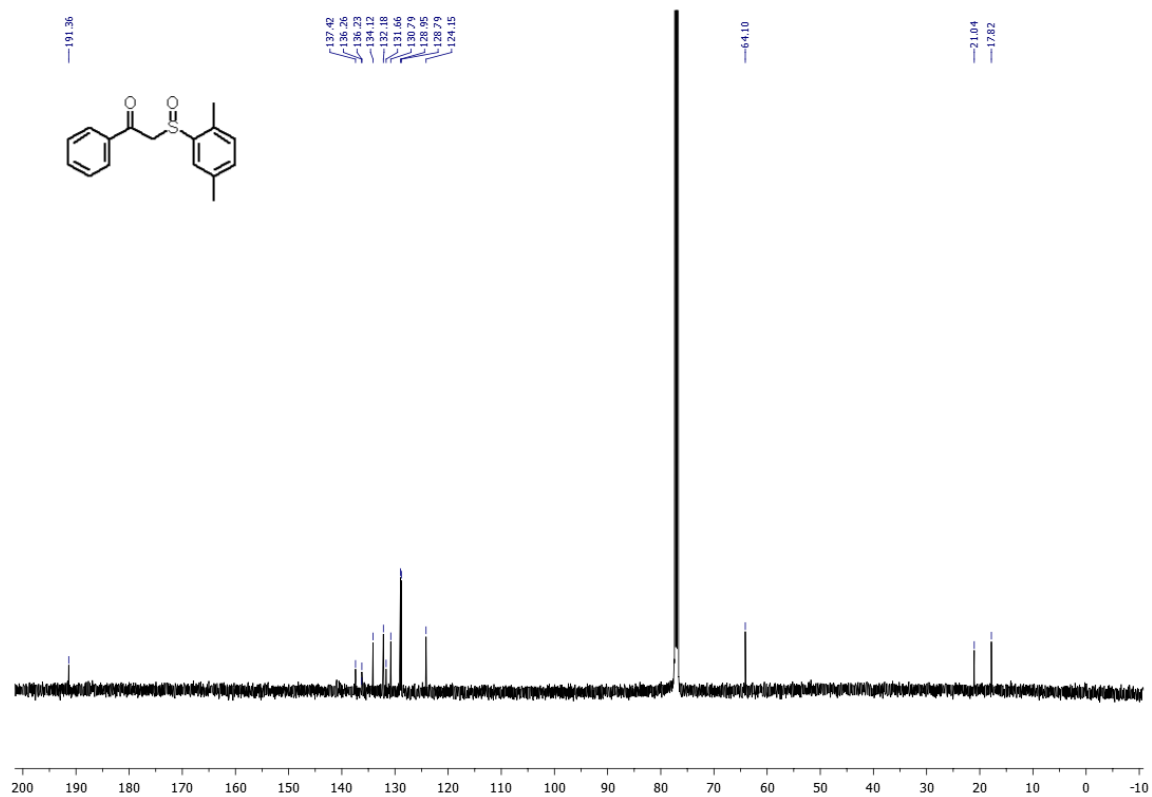
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 56



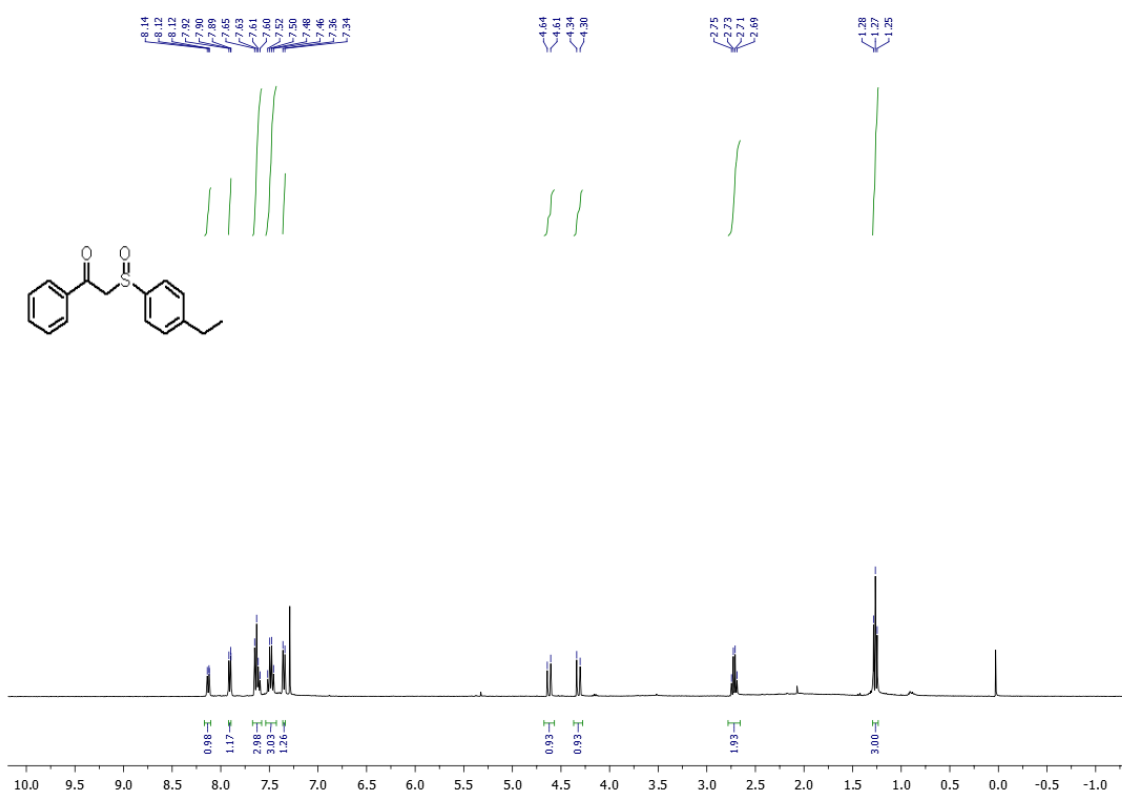
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 57



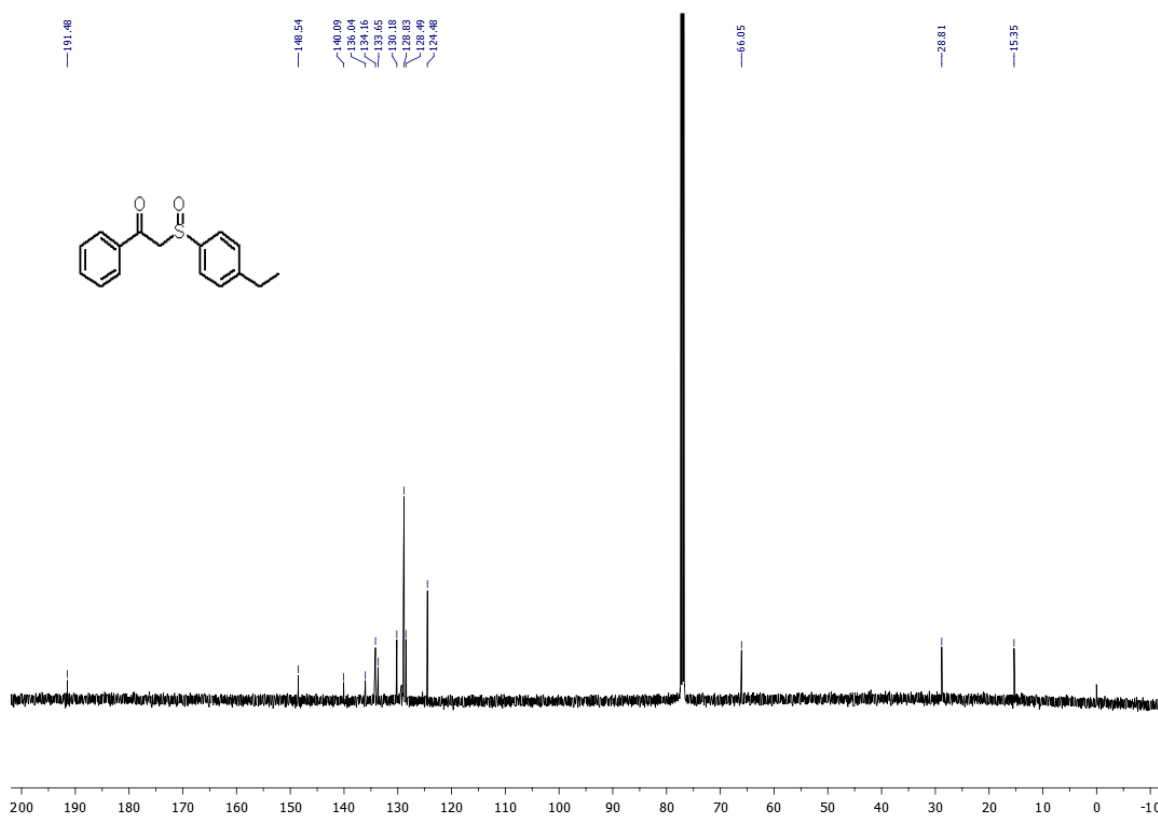
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 57



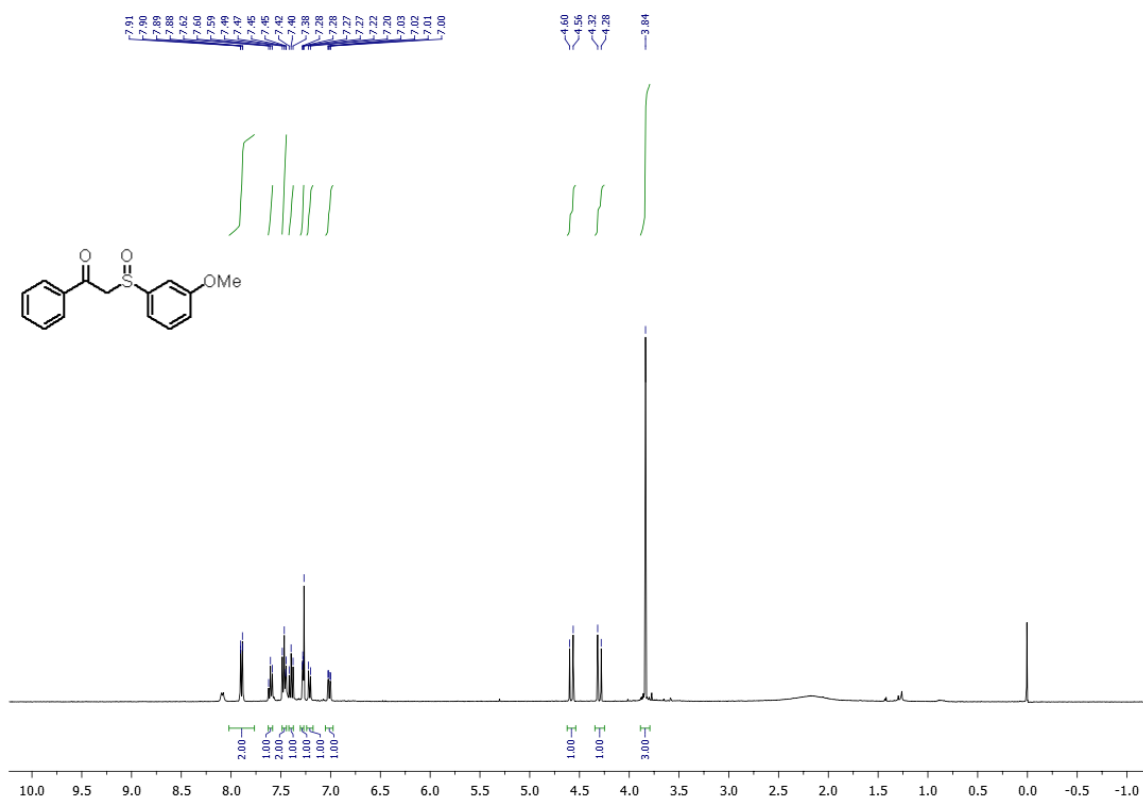
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 58



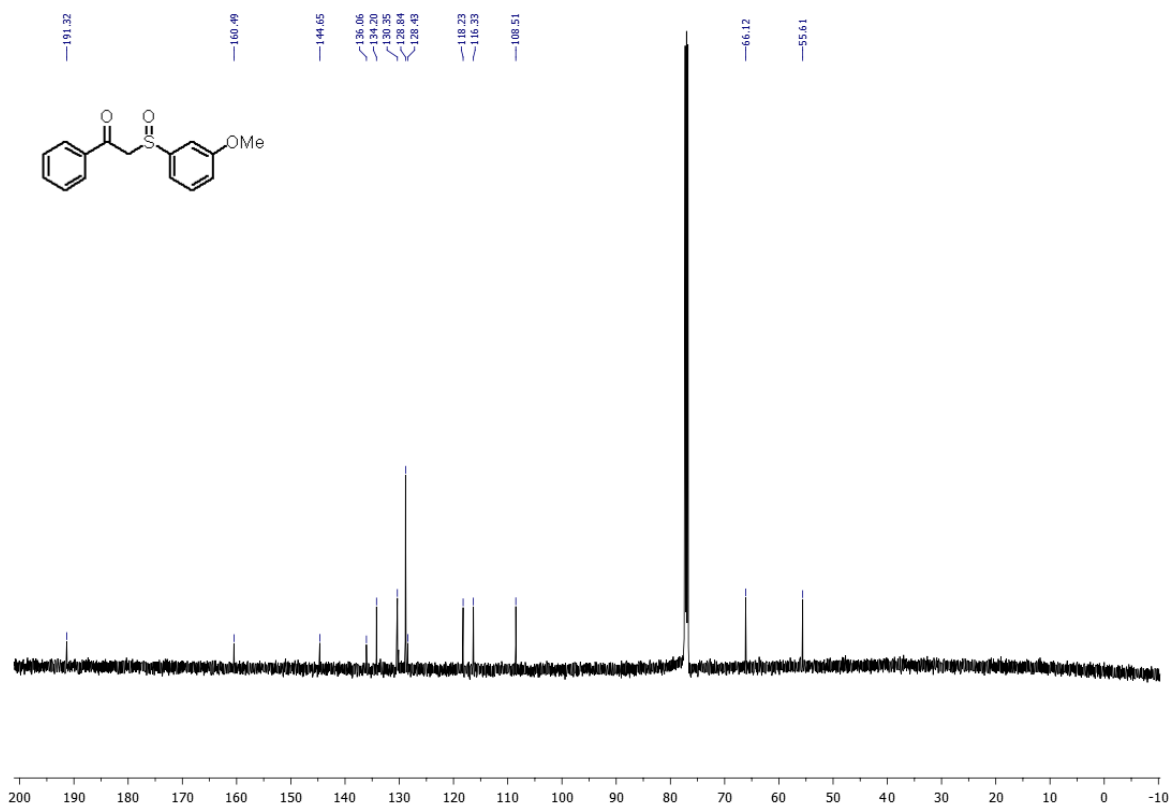
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 58



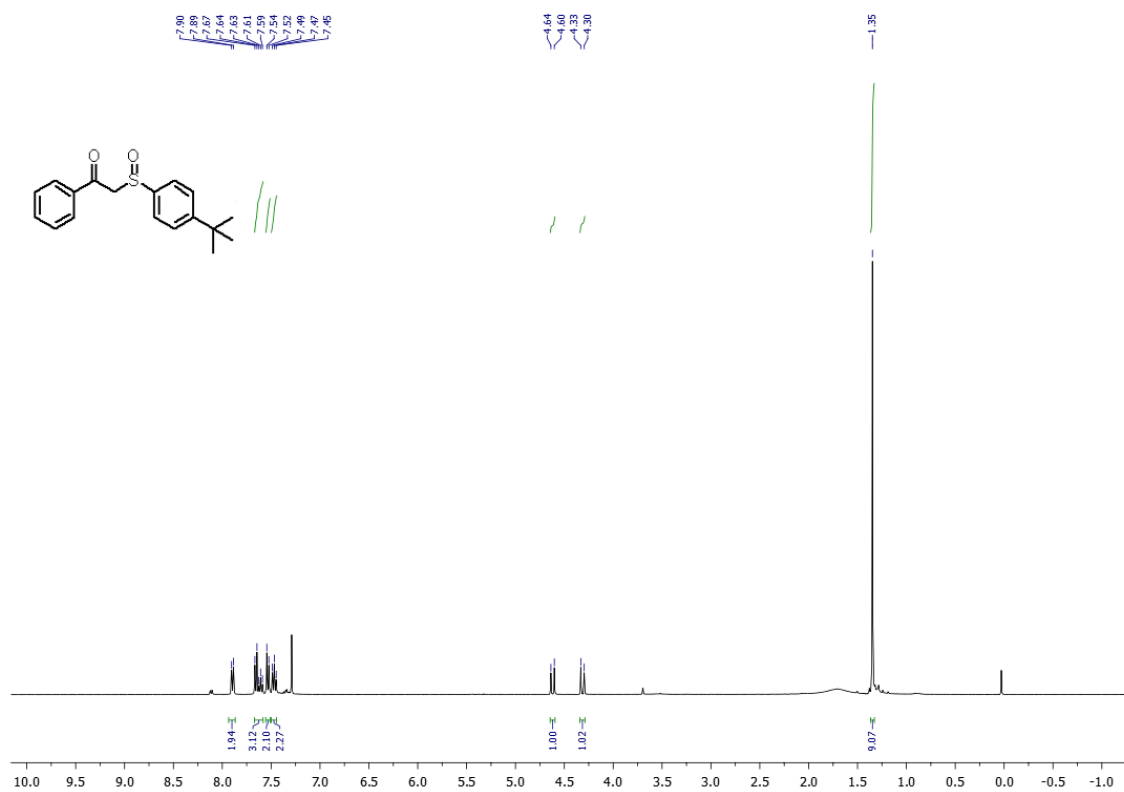
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 59



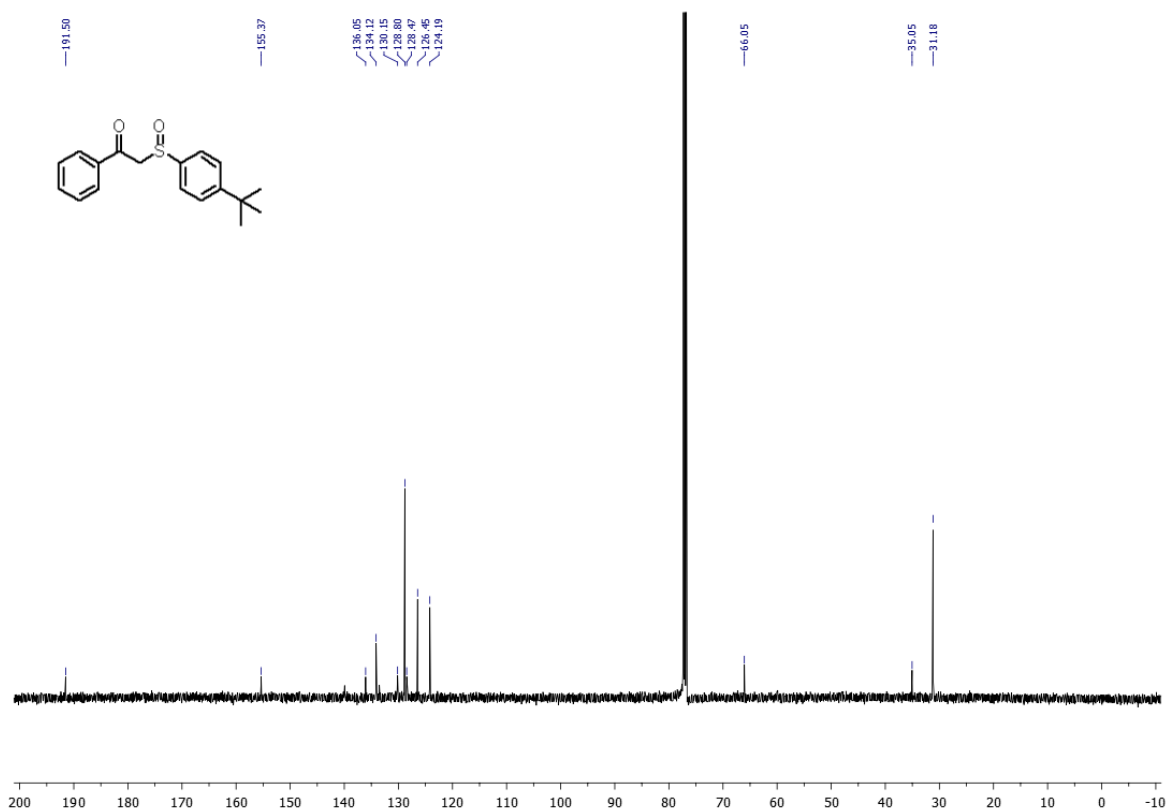
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 59



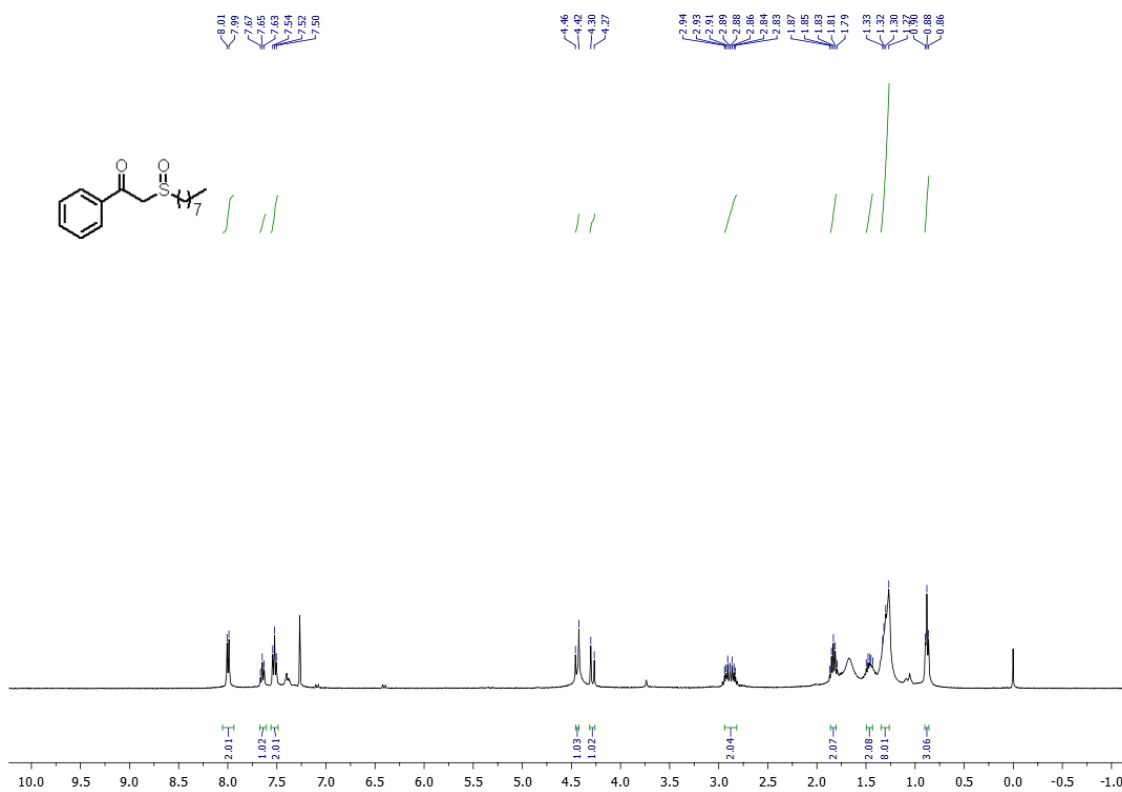
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 60



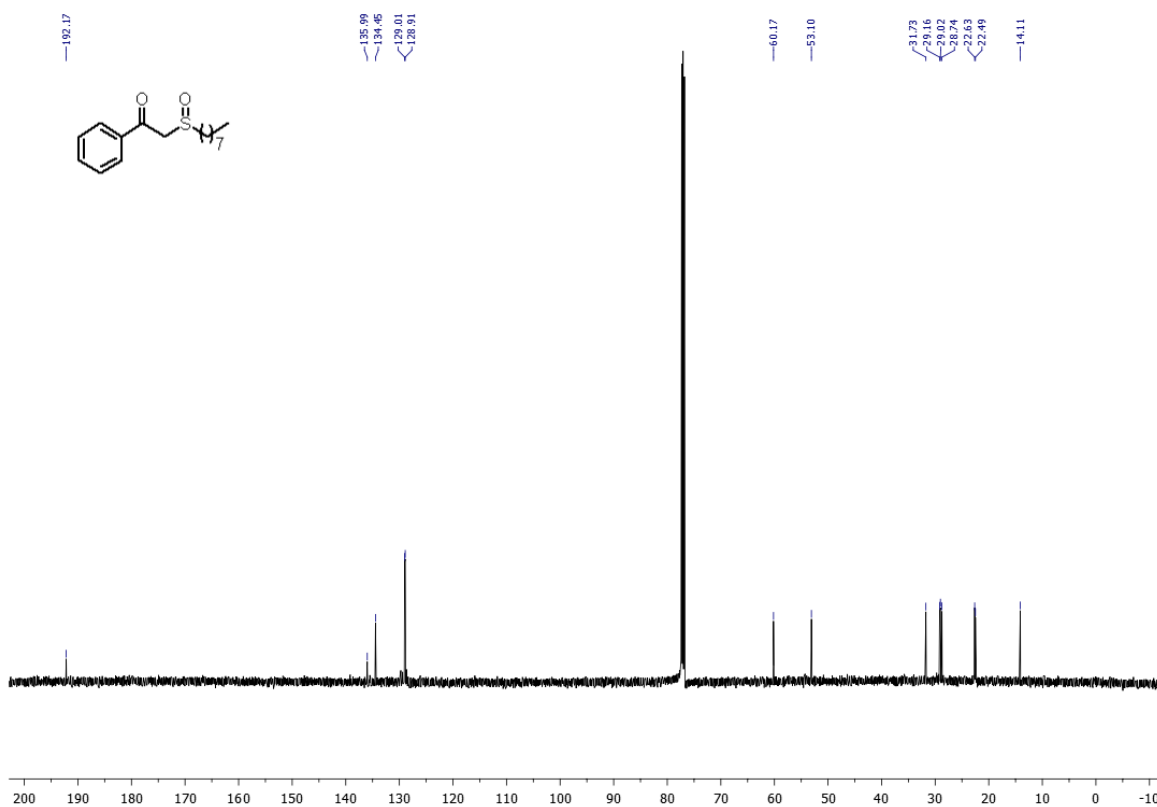
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 60



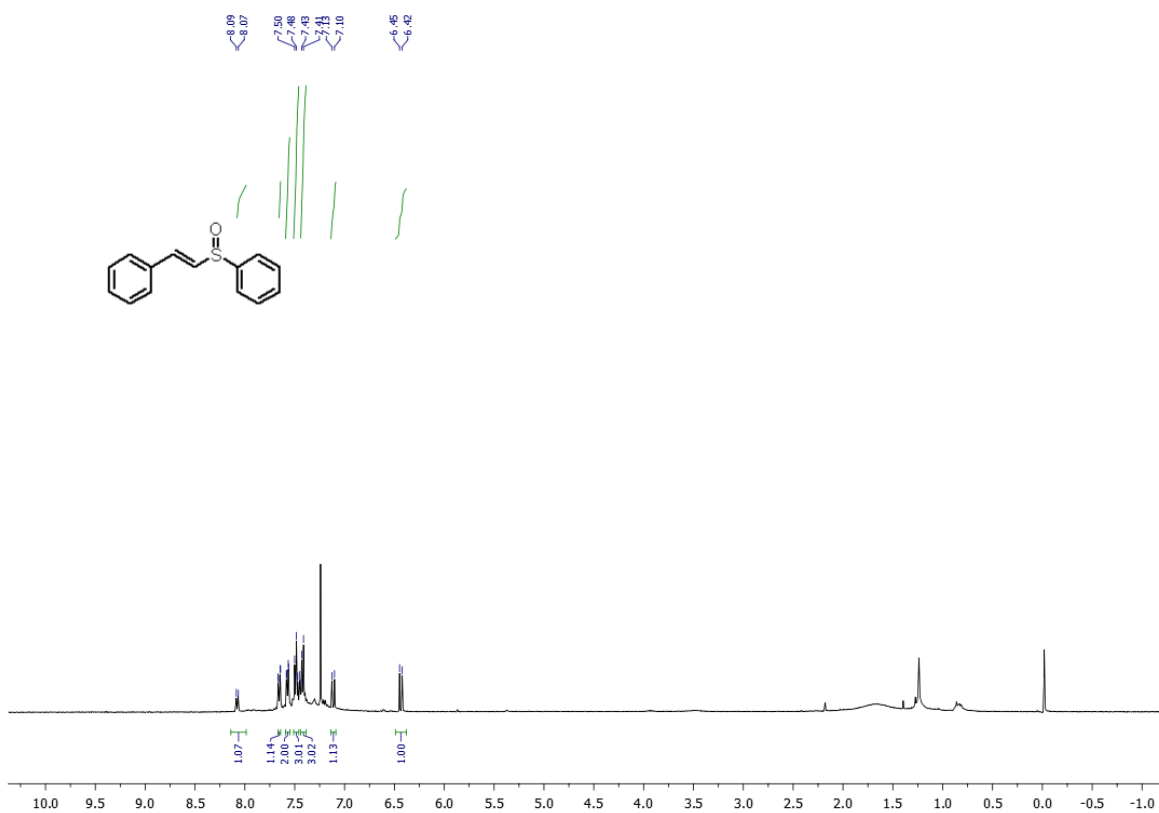
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 62



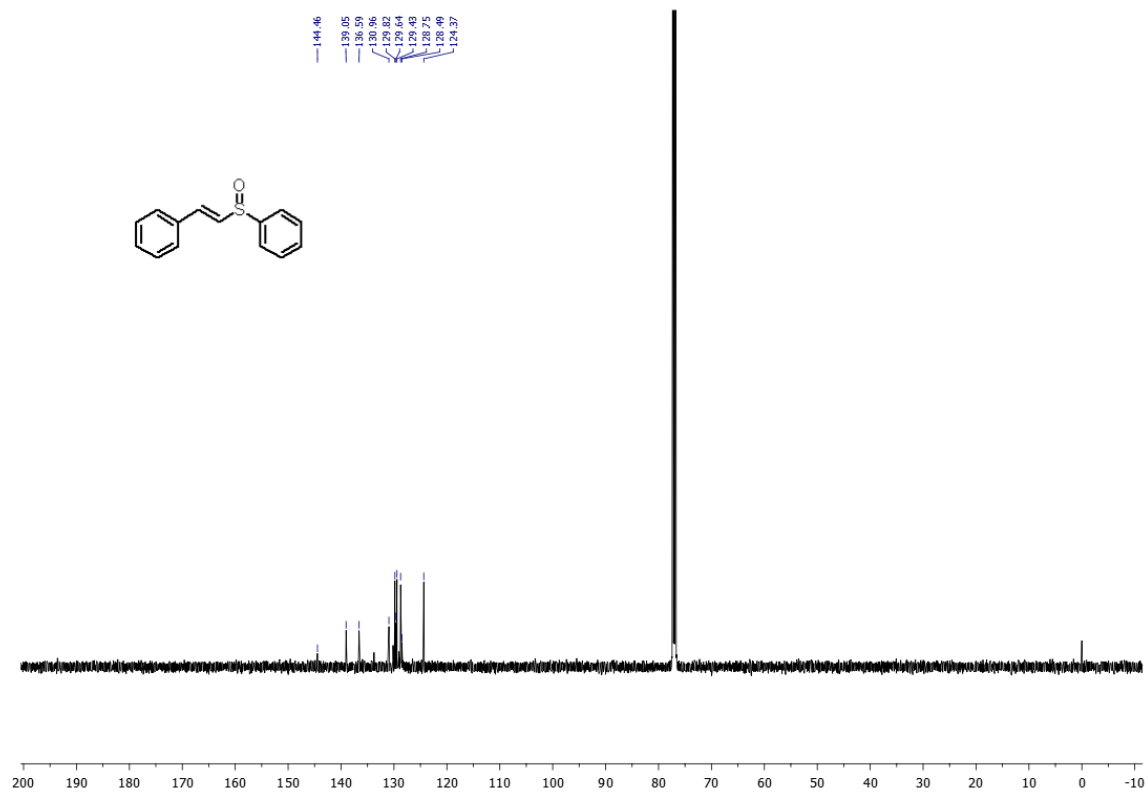
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 62



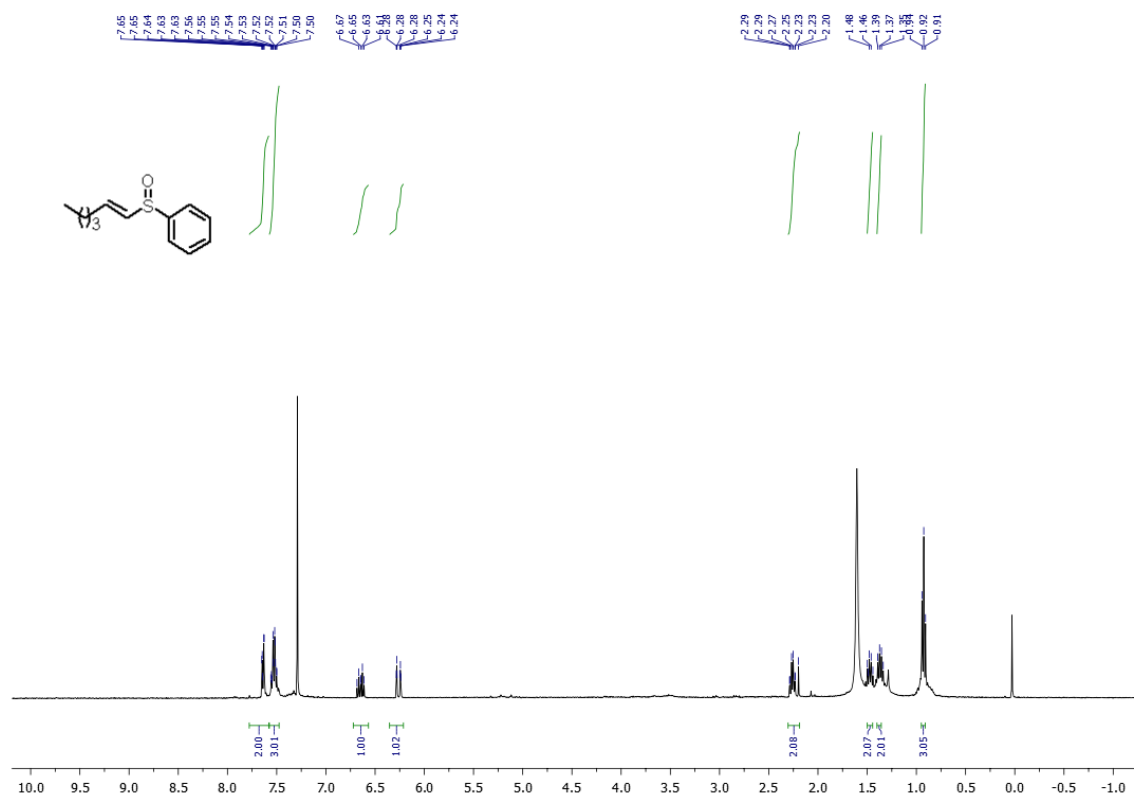
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 63



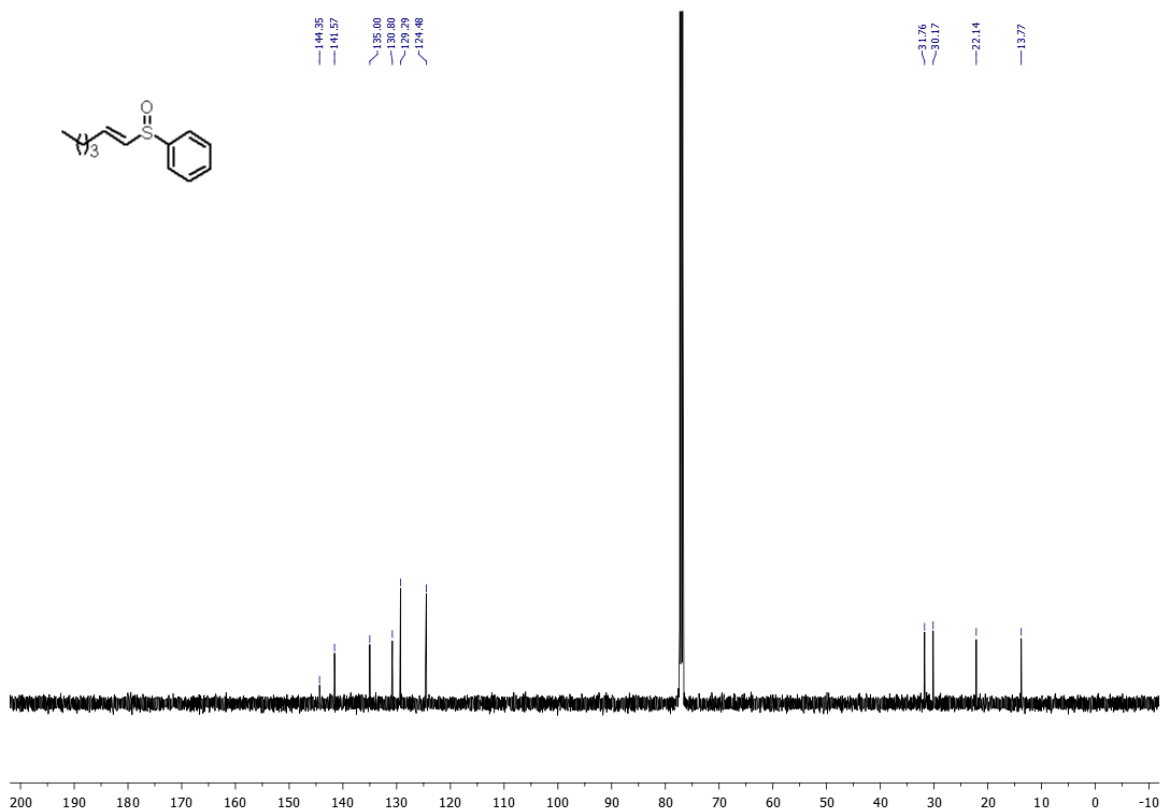
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 63



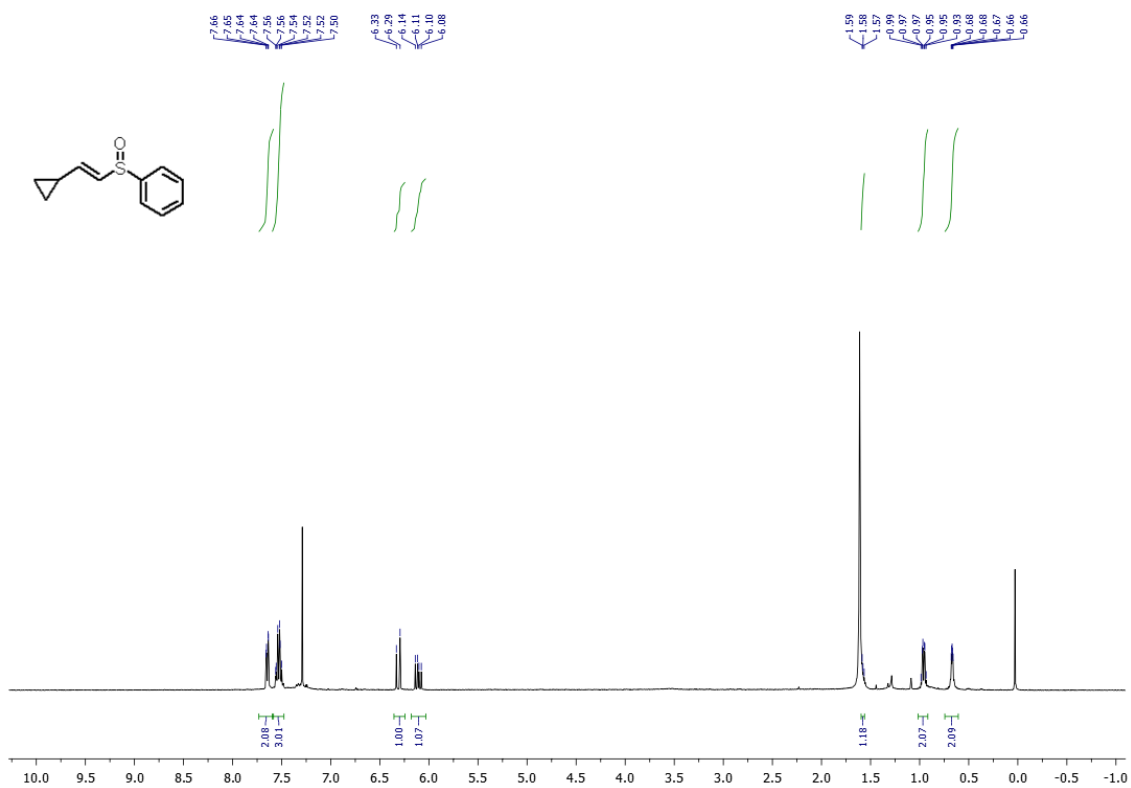
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 64



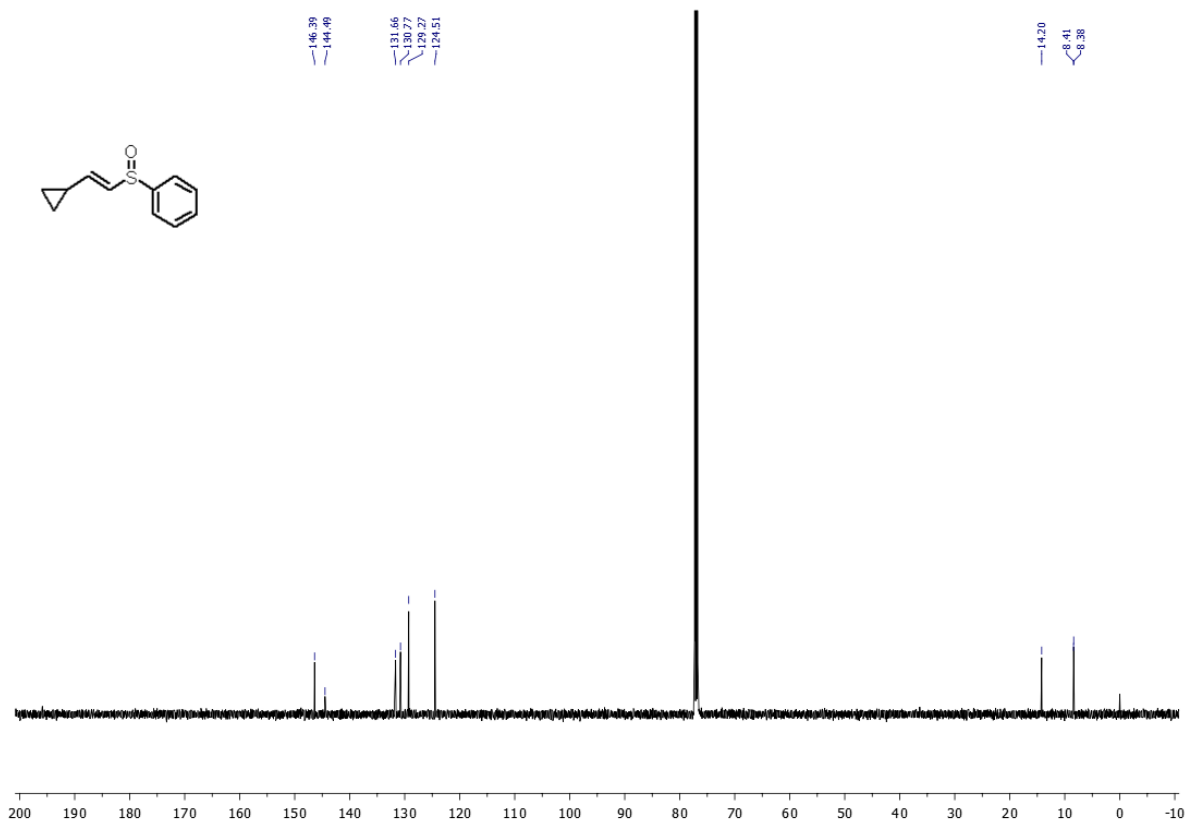
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 64



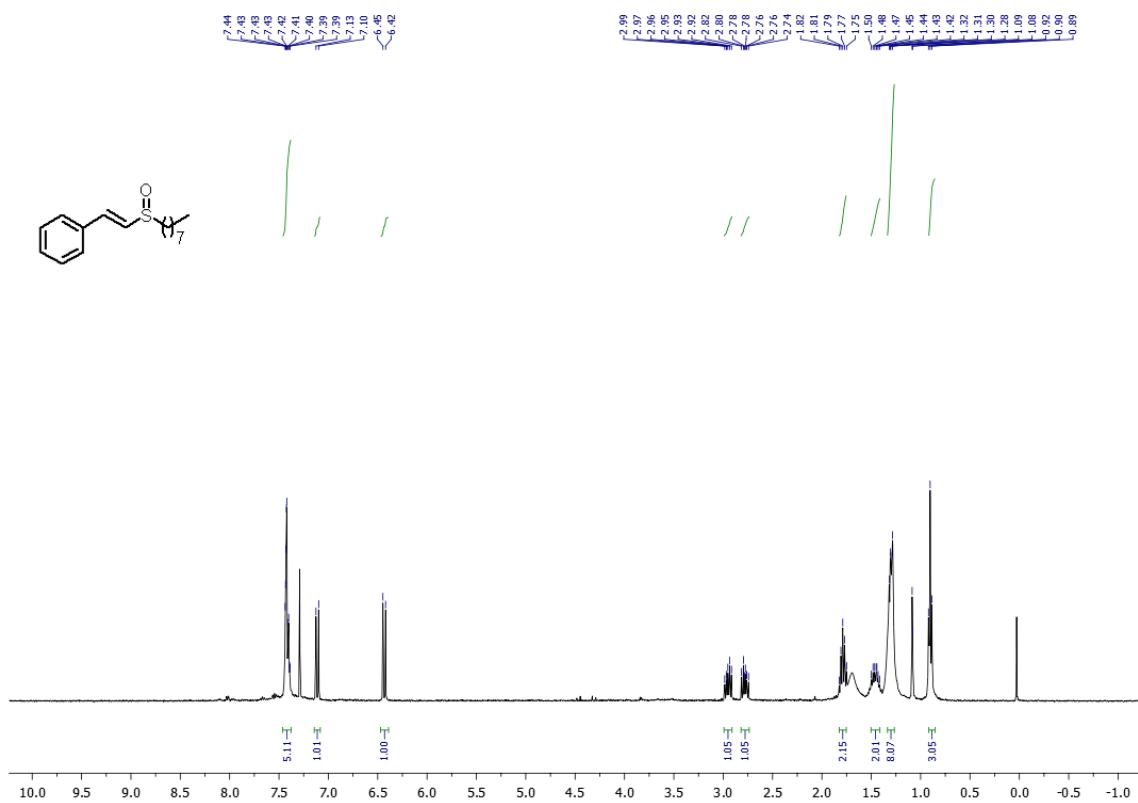
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 65



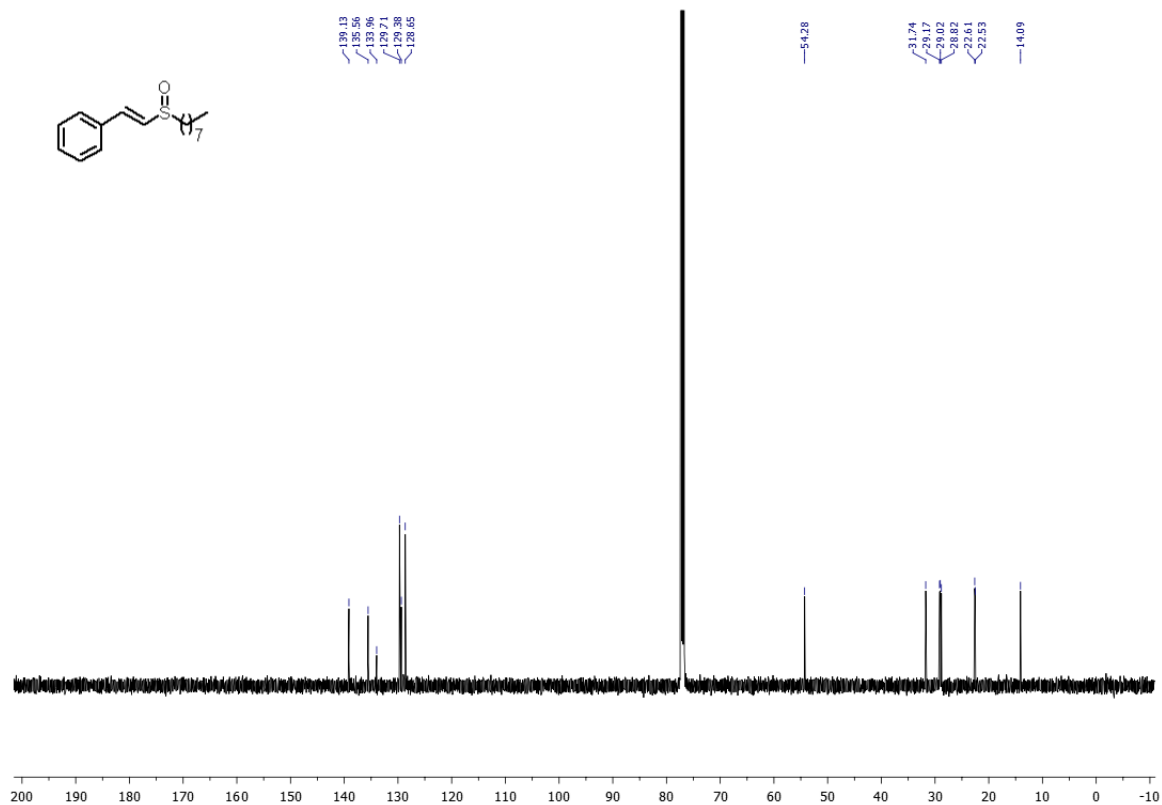
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 65



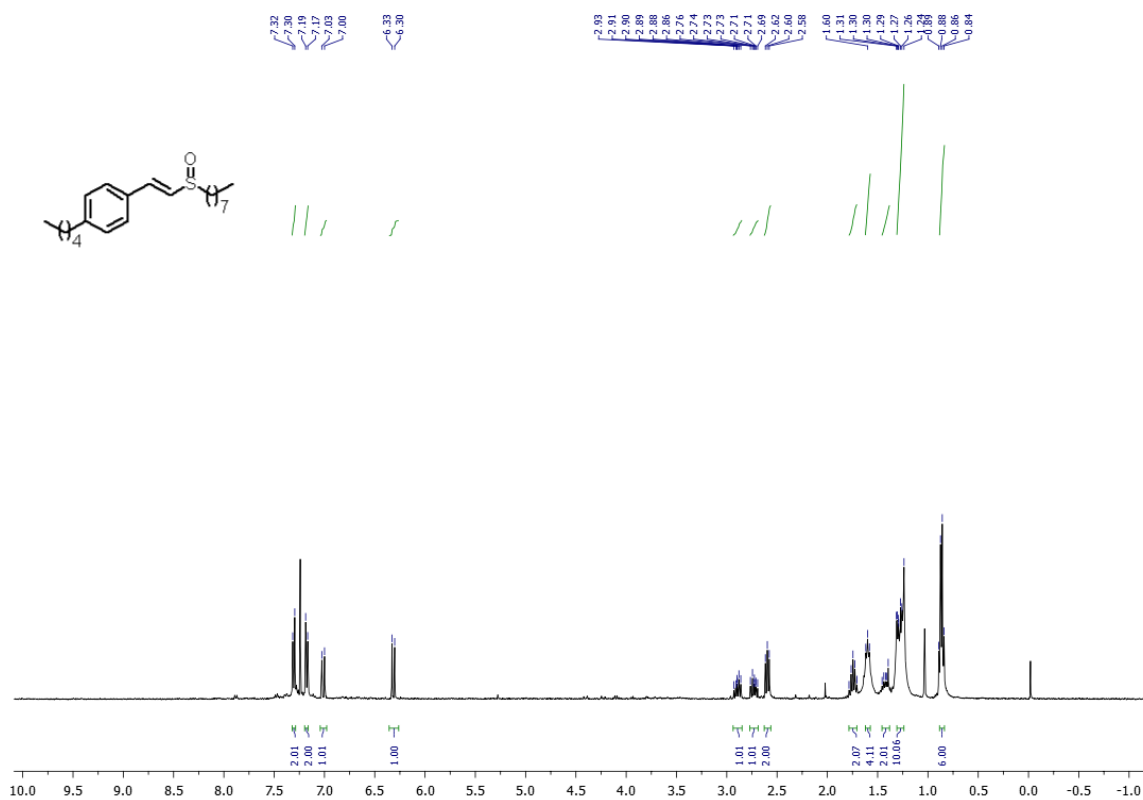
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 66



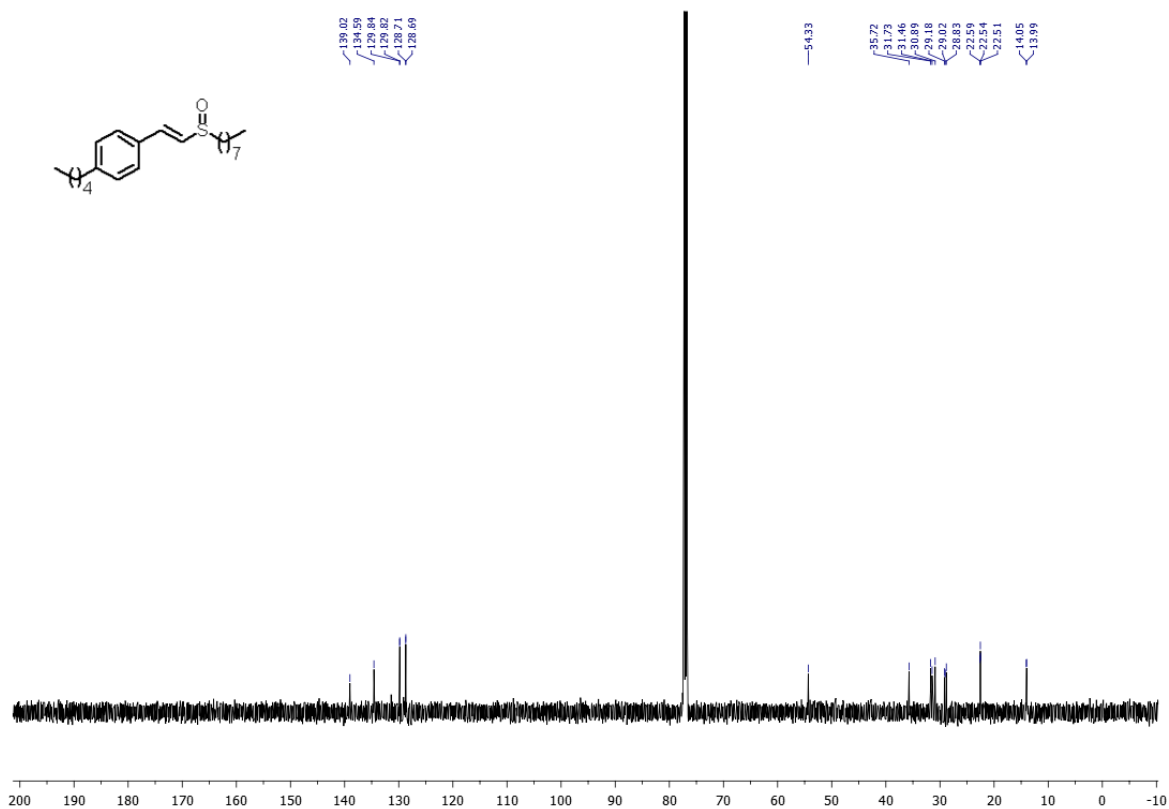
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 66



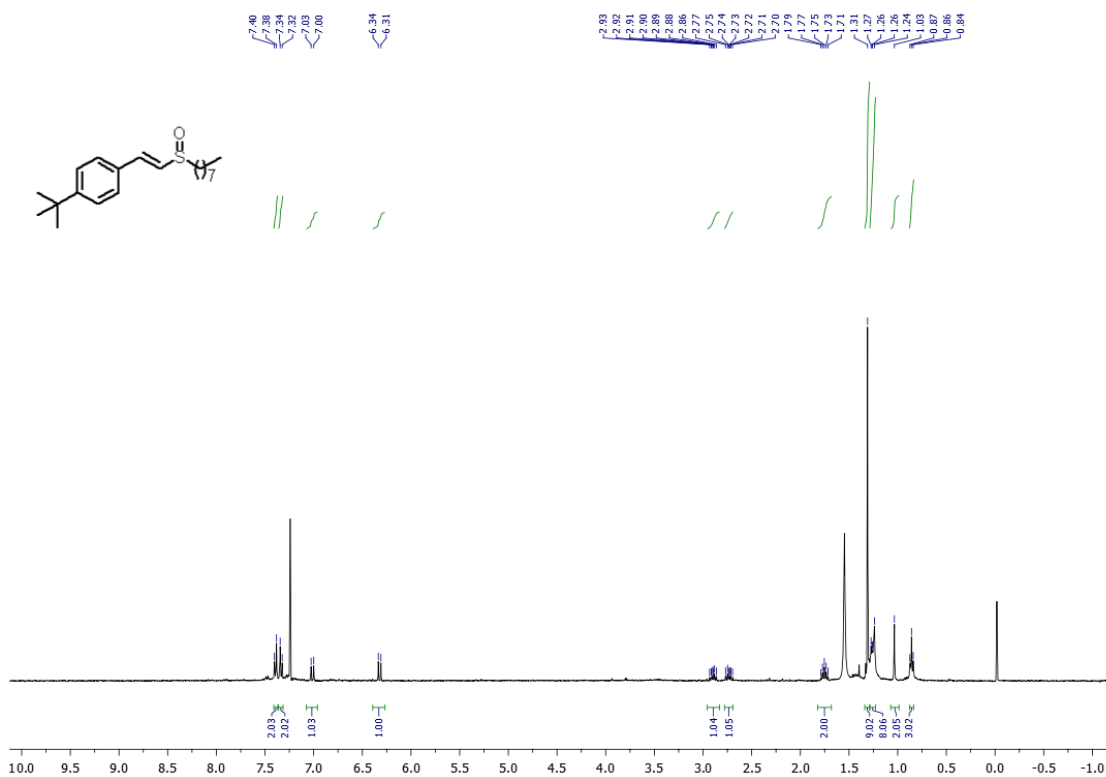
$^1\text{H-NMR}$ (CDCl_3 , 400 MHz) Spectra of compound 67



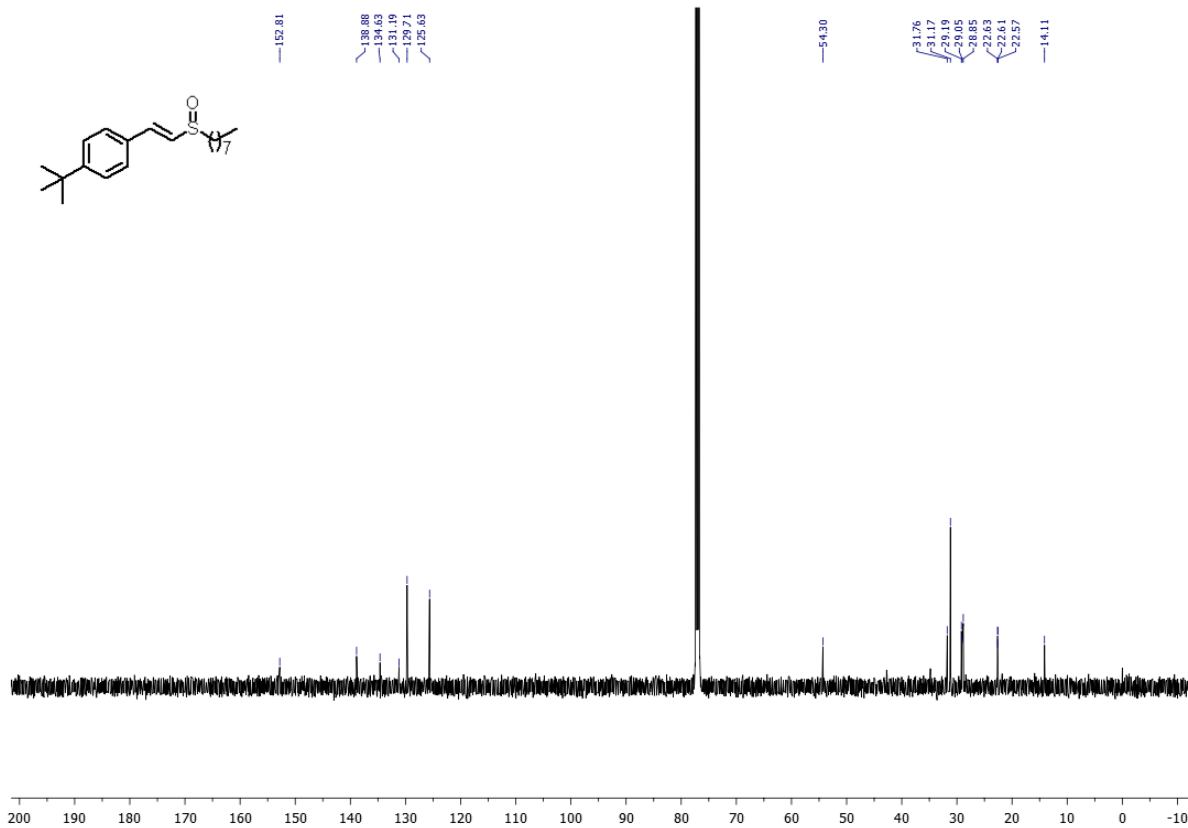
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 125 MHz) spectra of compound 67



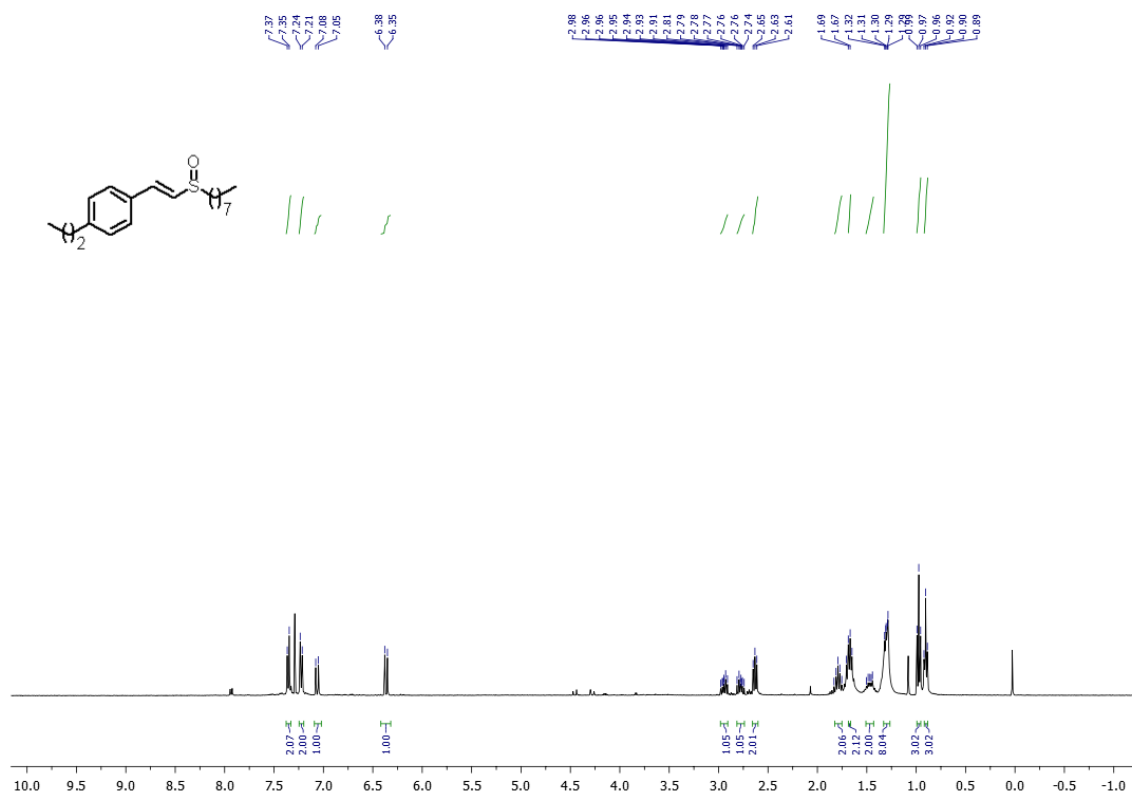
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 68



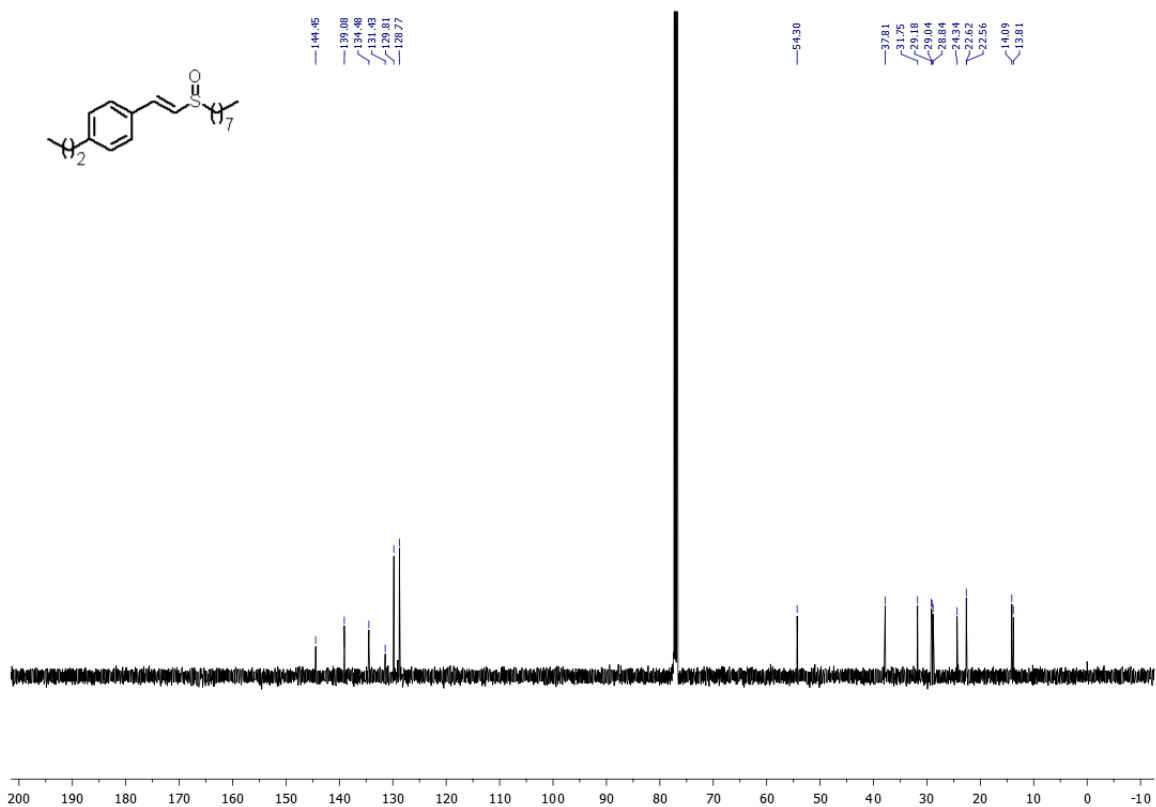
¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 68



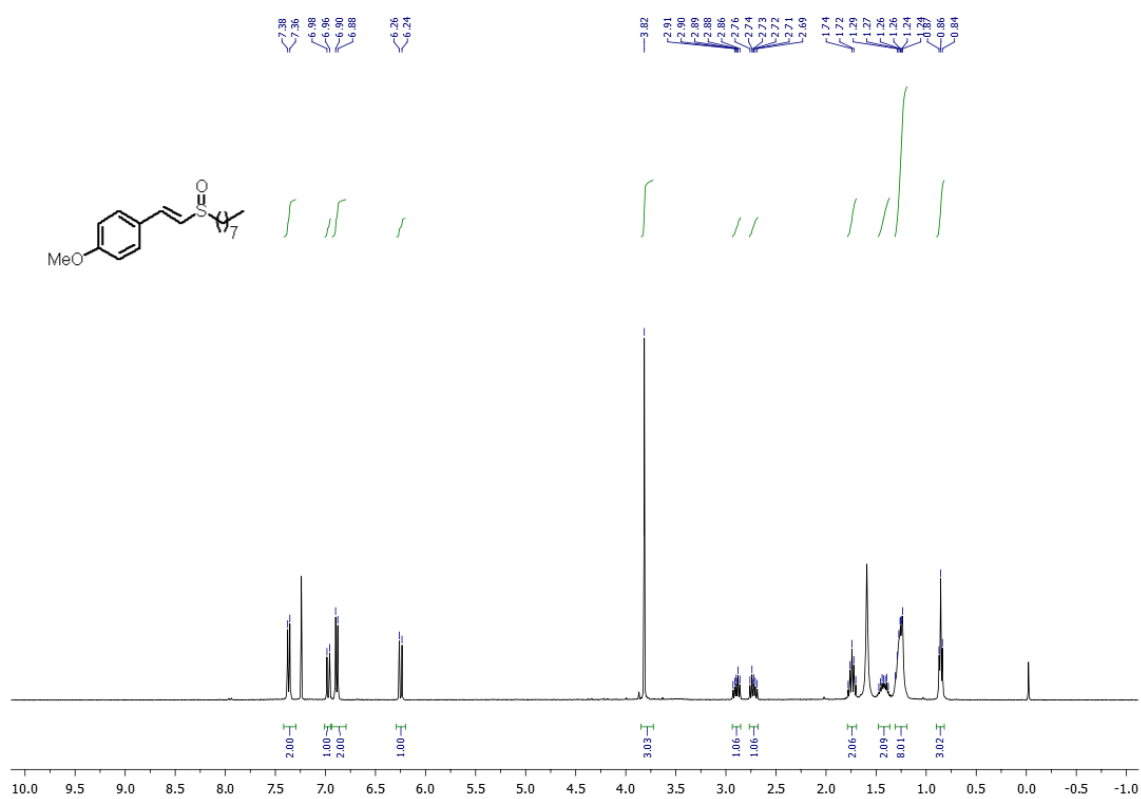
¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 69



¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 69



¹H-NMR (CDCl₃, 400 MHz) Spectra of compound 70



¹³C{¹H} NMR (CDCl₃, 125 MHz) spectra of compound 70

