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Supporting Information

for

Phosphine-Promoted Intramolecular Rauhut-Currier/Wittig Reaction Cascade to Access (Hetero)arene-Fused Diquinanes

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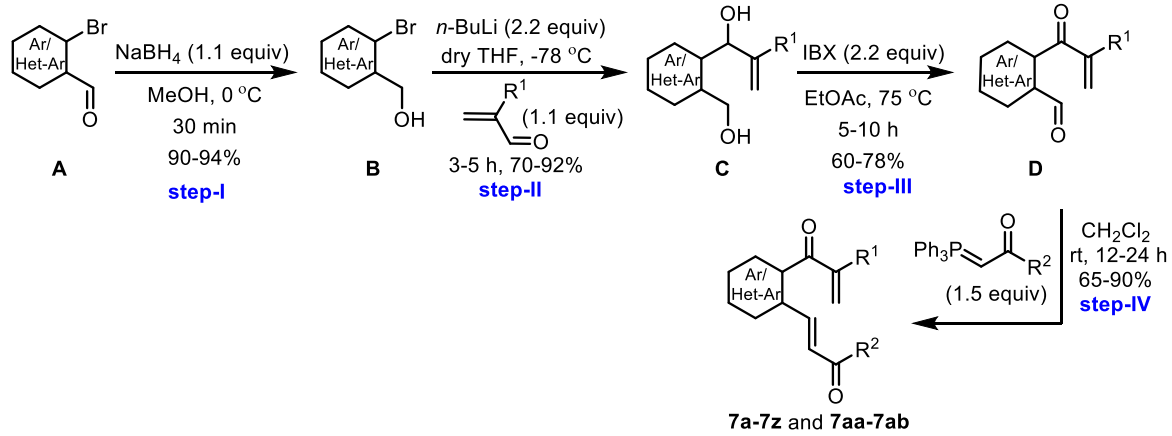
General experimental methods

All the reagents, solvents and catalysts employed in this study were procured from Sigma-Aldrich, BLD pharma, TCI, Avra, GLR, and Spectrochem were used without further purification. For thin-layer chromatography (TLC), silica aluminium foils with fluorescent indicator 254 nm (from Merck) were used and compounds were visualized by irradiation with UV light and/or by treatment with a solution of *p*-anisaldehyde (23 mL), conc. H_2SO_4 (35 mL), and acetic acid (10 mL) in ethanol (900 mL) followed by heating (using a hot air gun). Column chromatography was performed using SD Fine silica gel 60-120 mesh (approximately 15–20 g per 1 g of the crude product). Dry THF and toluene were obtained by distillation over sodium and stored over sodium wire. Dry DCM was obtained by distillation over calcium hydride and stored on 4 Å molecular sieves. IR spectra were recorded on a Perkin–Elmer FT IR spectrometer as thin films or KBr pellets, as indicated, with ν_{max} in inverse centimeters. Melting points were recorded on a digital melting point apparatus Stuart SMP30. ^{1}H NMR and ^{13}C NMR spectra were recorded on a 400 Bruker Biospin Avance III FT-NMR spectrometer. NMR shifts are reported as delta (δ) units in parts per million (ppm) and coupling constants (*J*) are reported in Hertz (Hz). The following abbreviations are utilized to describe peak patterns when appropriate: br=broad, s=singlet, d=doublet, t=triplet, q=quartet, quint=quintet, and m=multiplet. Proton chemical shifts are given in δ relative to tetramethylsilane (δ 0.00 ppm) in $CDCl_3$ (δ 7.26 ppm) or in $(CD_3)_2SO$ (δ 2.50 ppm). Carbon chemical shifts are internally referenced to the deuterated solvent signals in $CDCl_3$ (δ 77.1 ppm) or $(CD_3)_2SO$ (δ 39.5 ppm). Single crystal X-ray analysis was carried out on a Rigaku XtaLAB mini. High-resolution mass spectra were recorded on a Waters QTOF mass spectrometer.

General procedure-1: Synthesis of bis-enones 7a-7z and 7aa-7ab

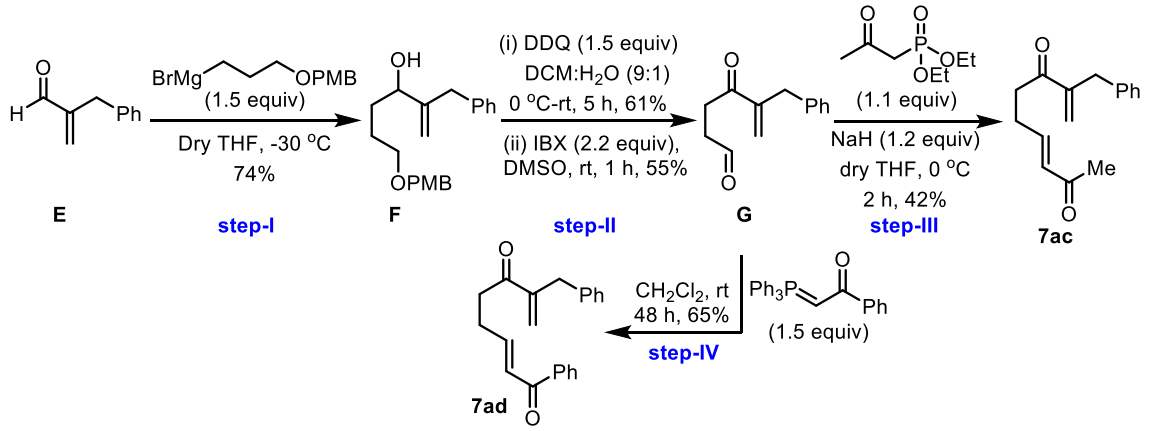


Scheme 1S: Synthesis of bis-enones **7a-7z** and **7aa-7ab**

Representative procedure for step-I, II, and III: Compounds **D** were synthesized according to reported literature.[1]

Representative procedure for step-IV: Enone-aldehyde **D** (1.0 equiv) was taken in an oven-dried round bottom flask (RBF) and dissolved in DCM (10 mL). Then the Wittig salt (1.5 equiv) was introduced and the reaction mixture was stirred at room temperature until the reactant **D** disappeared (as monitored by TLC). The reaction mixture was quenched with saturated aqueous NH_4Cl solution (~5 mL) and extracted with DCM (2×5 mL). The organic extracts were combined, dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The crude product was purified by silica gel column chromatography using hexane/ethyl acetate (5:1 to 3:1) as eluent to obtain **7a-7z** and **7aa-7ab** (65-90% yield).

Synthesis of bis-enones 7ac and 7ad



Scheme 2S: Synthesis of aliphatic substrates **7ac** and **7ad**

[1] a) Satpathi, B.; Ramasastry, S. S. V. *Angew. Chem. Int. Ed.* **2016**, *55*, 1777. b) Maurya, J. P.; Ramasastry, S. S. V. *J. Org. Chem*. **2021**, *86*, 525-537.

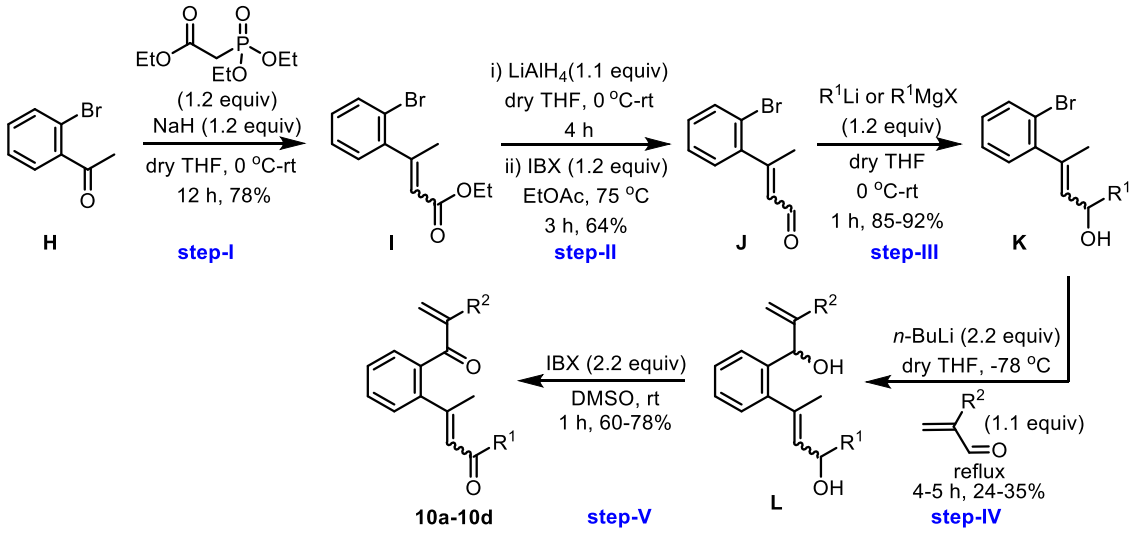
Step I: Allyl alcohol **F** was synthesised by literature procedure.[2]

Step II: An oven-dried 25 mL RB flask was charged with **F** (350 mg, 1.07 mmol) and 5 mL DCM/H_2O (9:1). Then DDQ (365 mg, 1.61 mmol) was added to the reaction mixture at 0 °C and warmed to room temperature. Upon completion, the reaction mixture was quenched with aqueous $NaHCO_3$ (2-3 mL) and extracted with DCM (2×5 mL). The organic extracts were dried over Na_2SO_4 and concentrated under reduced pressure. The crude mixture product was purified by silica gel column chromatography by using ethyl acetate/hexane (9:1 to 8:2) as an eluent to obtain diol.

The diol (132 mg, 0.65 mmol) was dissolved in DMSO (3 mL) and IBX (2.2 equiv) was added. The reaction mixture was stirred at room temperature until the starting material disappeared (as monitored by TLC). The reaction was quenched by water (1-2 mL) and the precipitate was filtered by a Buchner funnel. The solution was treated with aqueous $NaHCO_3$ solution and extracted with EtOAc (2×3 mL). The organic extracts were dried over Na_2SO_4 and concentrated under reduced pressure. The crude mixture was purified by silica gel column chromatography by using ethyl acetate/hexane (9:1 to 8:2) as an eluent to afford **G**.

Step III&IV: The bis-enone **7ac** was synthesised by the literature procedure[3] and **7ad** was synthesised by following the procedure described in Scheme 1S.

General procedure-2: Synthesis of bis-enones 10a-10d and 7ae



Scheme 3S: Synthesis of bis-enones **10a-10d**

[2] Komine, K.; Lambert, K. M.; Savage, Q. R.; Cox, J. B.; Wood, J. L. *Chem. Sci.* **2020**, *11*, 9488–9493. [3] Yadav, V. K.; Ganesh Babu, K. *Tetrahedron* **2003**, *59*, 9111–9116.

Step-I: Compound **I** was synthesized according to reported literature.[4]

Step-II: Compound **I** (1.0 equiv, 10 mmol) was dissolved in dry THF (10 mL) under the nitrogen atmosphere at 0 ^{o}C and $LiAlH_4$ (1.1 equiv, 10.5 mmol) was added to it. The reaction mixture was stirred at room temperature for 4 h. After completion, the reaction was quenched with a slow addition of water and the white precipitate was filtered using the Buchner funnel and washed with EtOAc (2×5 mL). The organic extracts were dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The crude allylic alcohols were used for the next step without further purification.

The allylic alcohol was dissolved in EtOAc (5 mL) and IBX (1.2 equiv, 12 mmol) was added. The reaction mixture was stirred at reflux temperature until the starting material disappeared (as monitored by TLC). The reaction was cooled at room temperature and filtered by a Buchner funnel. The solution was treated with aqueous $NaHCO_3$ solution and extracted with EtOAc (2×4 mL). The organic extracts were dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The crude product was purified by silica gel column chromatography using hexane/ethyl acetate (9:1 to 8:2) as eluent to afford **J** in 64% yield.

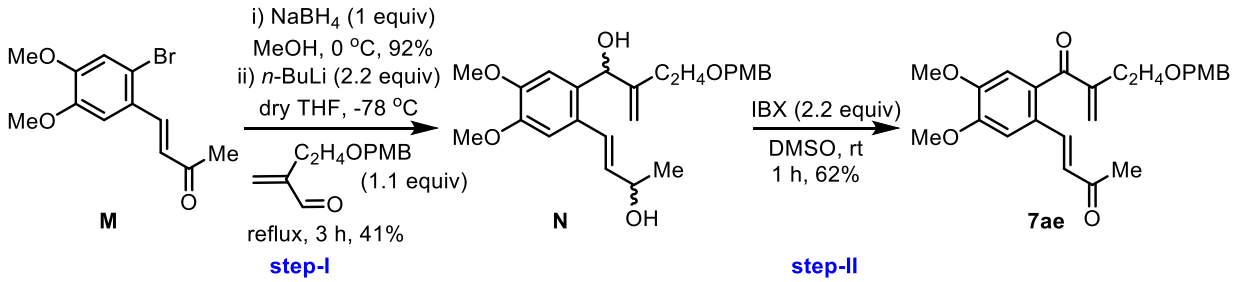
Representative procedure for step-III: To a solution of **J** (1.0 equiv, 7 mmol) in dry THF (10 mL) at 0 $^{\circ}$C under nitrogen atmosphere, R^1Li or R^1MgX (1.2 equiv) was added dropwise over 3-5 min and the reaction mixture was stirred for an additional 45 min at the same temperature. Upon completion, the reaction mixture was quenched with saturated aqueous NH_4Cl solution and extracted with EtOAc (2×5 mL). The organic extracts were dried over Na_2SO_4 and concentrated under reduced pressure. The crude product was purified by silica gel column chromatography using hexanes/ethyl acetate (8:2 to 7:3) as eluent to afford alcohol **K** (85-90% yield).

Representative procedure for step-IV: To a solution of **K** (1.0 equiv, 5 mmol) in dry THF (10 mL) at -78 $^{\circ}$C was added *n*-BuLi (2.5 M in hexane, 4.4 mL, 2.2 equiv, 11 mmol). After 1 h, enal (1.1 equiv, 5 mmol) was introduced at the same temperature. The reaction mixture was warmed to reflux temperature and continued stirring for an additional 4-5 h. Upon completion, the reaction was quenched with saturated aqueous NH_4Cl solution and extracted with EtOAc (2×5 mL). The organic extracts were dried over Na_2SO_4 and concentrated under reduced pressure. The crude product was purified by silica gel column chromatography using hexane/ethyl acetate (7:3 to 6:4) as eluent to afford the respective diol **L** (24-35% yield).

Representative procedure for step-V: See the procedure described in Scheme 2S.

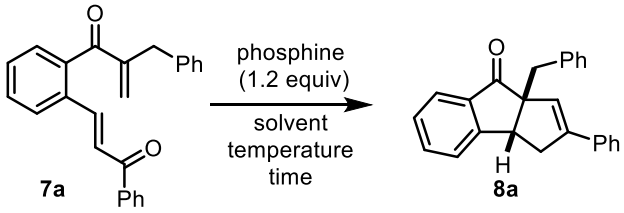
[4] Narczyk, A.; Pieczykolan, M.; Stecko, S. *Org. Biomol. Chem.* **2018**, *16*, 3921–3946.

Compound **7ae** was synthesized by following the protocol described for **10a-10d**, starting from **M**.[5]



Scheme 4S: Synthesis of bis-enone **7ae**

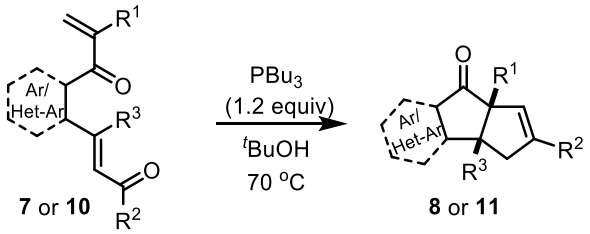
General procedure-3: Optimization of reaction parameters for 8a



Scheme 5S: Optimization of reaction parameters for **8a**

An oven-dried 5 mL glass vial was charged with **7a** (40 mg, 0.11 mmol), then appropriate phosphine (1.2 equiv) and a solvent (1-2 mL) were added sequentially. The reactions were carried out at different temperatures until **7a** disappeared (as monitored by TLC). After completion, the reaction mixture was quenched with aqueous NH_4Cl (~2 mL) and extracted with EtOAc (2×3 mL). The organic extracts were combined, dried over anhydrous Na_2SO_4, and the solvent was evaporated under reduced pressure. The crude product was purified by silica gel column chromatography using hexane/ethyl acetate (15:1 to 9:1) as eluent to afford **8a**.

General procedure-4: Evaluating the substrate scope for 8 and 11



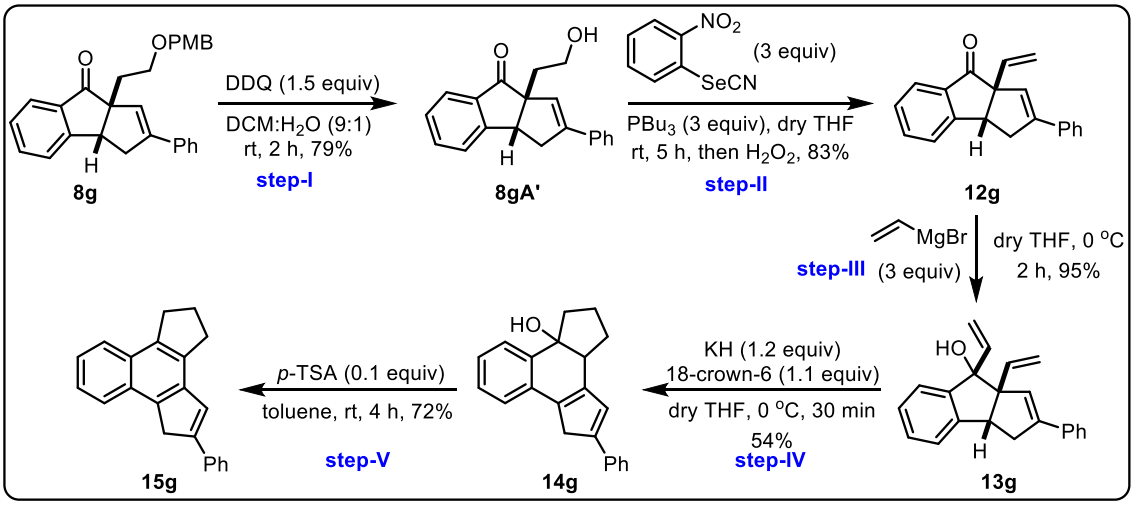
Scheme 6S: Synthesis of diquinanes and benzo-fused diquinanes **8** and **11**

[5] Bayrak, Ç.; Taslimi, P.; Gülçin, İ.; Menzek, A. *Bioorg. Chem.* **2017**, *72*, 359–366.

An oven-dried 5 mL glass vial was charged with **7** or **10** (1.0 equiv), ^{t}BuOH (1-2 mL), and tributylphosphine (1.2 equiv) at room temperature. Then the reaction mixture was shifted to 70 °C and stirred at the same temperature for 1 h. Then the reaction mixture was quenched with aqueous NH_4Cl (~2 mL) and extracted with EtOAc (2×3 mL). The organic extracts were combined, dried over anhydrous Na_2SO_4, and the solvent was evaporated under reduced pressure. The crude product was purified by silica gel column chromatography using hexane/ethyl acetate (10:1 to 8:2) as eluent to afford **8** (34-90% yield) or **11** (67-90% yield).

Synthetic elaborations

(a) Transformation of 8g to indacene derivative 15g



Scheme 7S: Synthesis of Indacene derivative **15g**

Step I: See the procedure described in Scheme 2S.

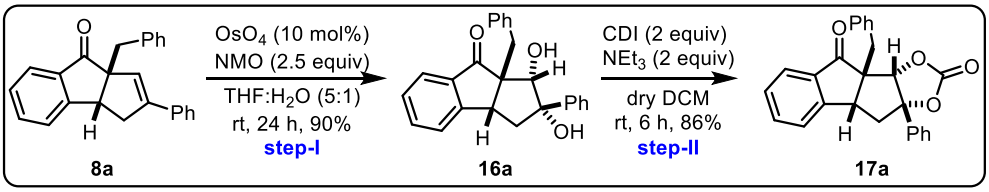
Step II: Then primary alcohol (140 mg, 0.51 mmol) was taken in 5 mL RB flask and dissolved in dry THF. Then, 2-nitrophenylselenocyanate (352 mg, 1.55 mmol) and tributyphosphine (0.38 mL, 1.55 mmol) were added in a sequence and the resulting mixture was stirred at room temperature for 4 h (monitored by TLC). Then, $NaHCO_3$ (430 mg, 5.1 mmol) was added and stirred for another 5 min. After 5 min, H_2O_2 (1.3 mL, 30% in H_2O) was added and continued stirring for another 2 h. Upon complete conversion, the reaction mixture was quenched with aqueous $NaHCO_3$ (2-3 mL) and extracted with EtOAc (2x3 mL). The organic extracts were combined and dried over anhydrous Na_2SO_4, and concentrated under reduced pressure. The crude mixture product was purified by silica gel column chromatography by using ethyl acetate/hexane (10:1 to 5:1) as an eluent to afford 108 mg of **12g** (83% yield).

Step III: See the procedure described in Scheme 3S.

Step IV: The allylic alcohol **13g** (40 mg, 0.13 mmol) was dissolved in 2 mL dry THF and placed at 0 °C under N_2 atmosphere. 18-crown-6 (39 mg, 0.14 mmol, 1.1 equiv) and KH (22 mg, 0.16 mmol, 1.2 equiv, 30 wt% dispersion in mineral oil) were added and stirred for 15-20 min at room temperature until the allylic alcohol disappeared as monitored by TLC. The reaction mixture was quenched with aqueous NH_4Cl (2-3 mL) and extracted with EtOAc (2x5 mL). The combined organic layers were dried over anhydrous Na_2SO_4, and concentrated under reduced pressure. The residue was purified by silica gel column chromatography using hexane/ethyl acetate (10:1) as eluent to afford 22 mg of **14g** (54% yield).

Step V: The tertiary alcohol **14g** (22 mg, 0.07 mmol, 1 equiv) was dissolved in 1 mL toluene and *p*-TSA (2.5 mg, 0.014 mmol, 0.2 equiv) was added at room temperature. The reaction mixture was stirred for 5 h at the same temperature. After complete conversion, the reaction was quenched with saturated aq. $NaHCO_3$ (2 mL) and extracted with EtOAc (2x3 mL). The combined organic layers were dried over anhydrous Na_2SO_4, and concentrated under reduced pressure. The residue was purified by neutral alumina column chromatography using hexane as eluent to afford 15 mg of **15g** (72% yield).

(b) Elaboration of 8a to cyclic carbonate 17a



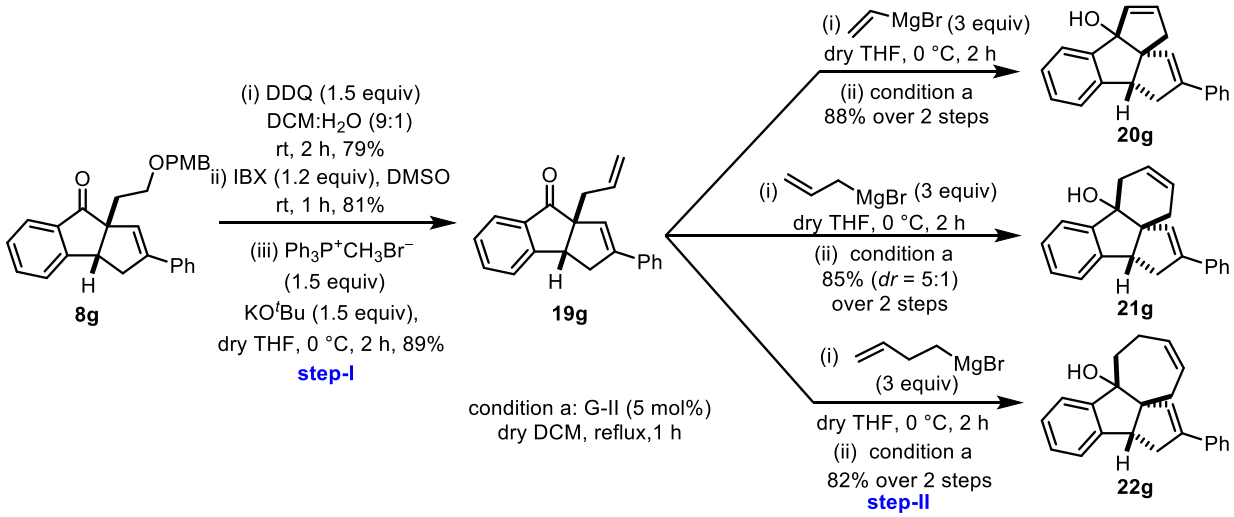
Scheme 8S: Synthesis of cyclic carbonate **17a**

Step-I: An oven-dried 25 mL RBF was charged with **8a** (150 mg, 0.44 mmol) in 5 mL THF/H_2O (5/1). Then OsO_4 (4% in water, 150 µL, 10 mol%) and NMO (130 mg, 1.11 mmol) were added and the reaction mixture was stirred at room temperature. Upon completion, the reaction mixture was quenched with aqueous $NaHSO_3$ (2-3 mL) and extracted with ethyl acetate (2x5 mL). The organic extracts were combined and dried over anhydrous Na_2SO_4, and concentrated under reduced pressure. The crude mixture product was purified by silica gel column chromatography by using ethyl acetate/hexane (5:1 to 8:2) as an eluent to afford 148 mg of **16a** (90% yield).

Step-II: An oven-dried 25 mL RB flask was charged with **16a** (70 mg, 0.189 mmol) and dissolved in dry DCM (3 mL) under N_2 atmosphere. Then carbonyl diimidazole (CDI) (61 mg, 0.37 mmol) and NEt_3 (52 µL, 0.37 mmol) were introduced at room temperature and stirred the

resulting mixture for 6 h. After complete conversion, the reaction mixture was quenched with aqueous NH_4Cl (3 mL) and extracted with DCM (2×3 mL) The organic extracts were combined, dried over anhydrous Na_2SO_4, and concentrated under reduced pressure. The crude product was purified by silica gel column chromatography using hexane/ethyl acetate (5:1 to 8:2) as eluent to afford 65 mg of **17a** (86% yield).

(c) Conversion of 8g to different tetracyclic structures



Scheme 9S: Synthesis of different tetracyclic structures

Step-I: See Scheme 2S for step-I(i) and step-I(ii).

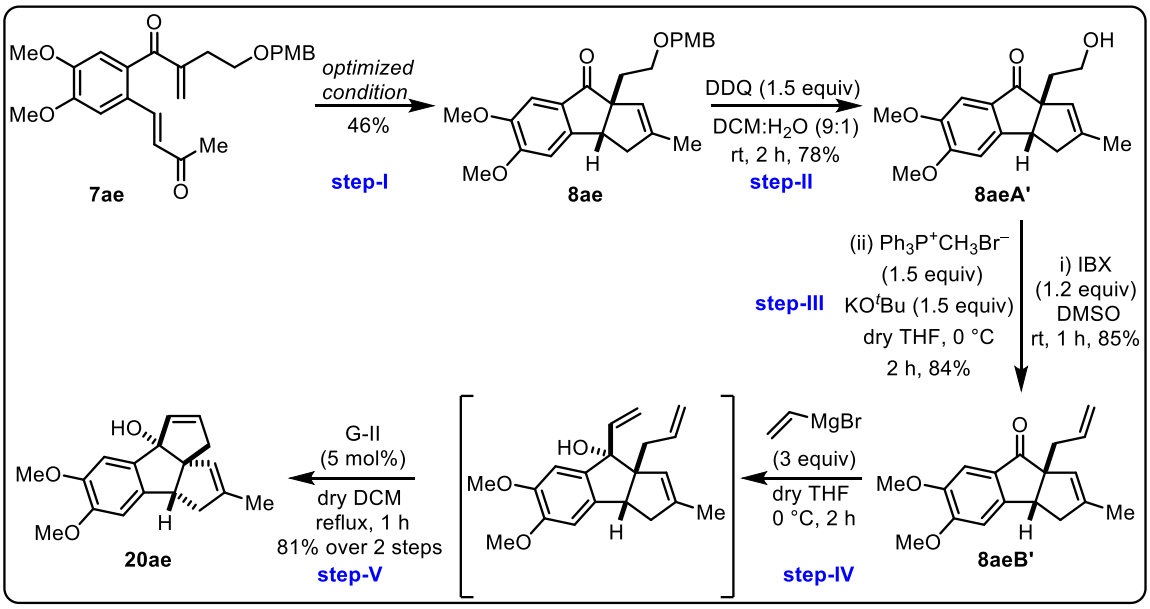
Step-I(iii): An oven-dried 25 mL RBF was charged with methyltriphenylphosphonium bromide (305 mg, 0.85 mmol, 1.5 equiv) in dry THF (5 mL) and the resultant solution was placed at 0 °C under N_2 atmosphere. Then KO^{t}Bu (100 mL, 0.85 mmol, 1.5 equiv) was added and stirred at the same temperature for 1 h. After 1 h, the keto-aldehyde (160 mg, 0.57 mmol, 1 equiv) was added to the reaction mixture and continued stirring for another 1 h. After completion, the reaction mixture was quenched with aqueous NH_4Cl (2-3 mL) and extracted with EtOAc (2x5 mL). The organic extracts were combined and dried over anhydrous Na_2SO_4, and concentrated under reduced pressure. The crude mixture product was purified by silica gel column chromatography by using ethyl acetate/hexane (10:1 to 5:1) as an eluent to afford 140 mg of **19g** (89% yield).

Representative procedure for step-II: See Scheme 3S for step-II(i).

Step-II(ii): The crude product obtained after Grignard addition was dissolved in dry DCM under N_2 atmosphere. The Grubbs second generation catalyst (5 mol%) was introduced at the room temperature and reaction shifted to reflux temperature. Upon completion, the reaction mixture was quenched with aqueous $NaHCO_3$ (2-3 mL) and extracted with DCM (2x2 mL).

The organic extracts were combined and dried over anhydrous Na_2SO_4, and concentrated under reduced pressure. The crude mixture product was purified by silica gel column chromatography by using ethyl acetate/hexane (5:1 to 8:2) as an eluent to afford **20g-22g** in 82-88% yield.

(d) Synthesis of advanced intermediate 20ae for the synthesis of sativamide A



Scheme 10S: Synthesis of tetracyclic core of sativamide A

Step-I: See Scheme 6S.

Step-II & III: See Scheme 2S for step-II and step-III(i). For step-III(ii) see Scheme 9S.

Step-IV & V: See Scheme 9S.

Crystal structure of 8m (CCDC 2325678): The structure of **8m** was confirmed by single-crystal X-ray diffraction analysis.

Crystallization procedure of 8m: In a 5 mL glass vial, 10 mg of **8m** was dissolved in MeOH (2 mL) and the solution was kept at room temperature for slow evaporation. After 3-5 days, suitable single crystals were obtained.

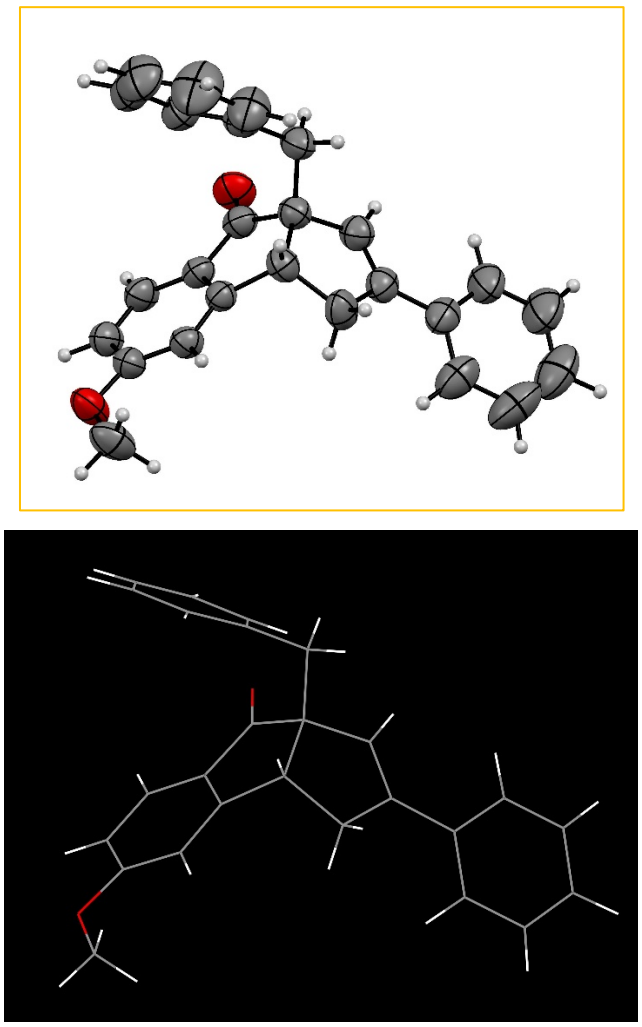


Figure 1: ORTEP diagram of **8m** with 50% ellipsoidal probability.

Crystal Data for $C_{26}H_{22}O_2$ (M =366.44 g/mol): orthorhombic, space group $P2_12_12_1$ (no. 19), *a* = 10.3208(6) Å, *b* = 12.3275(7) Å, *c* = 16.0767(12) Å, *V* = 2045.4(2) Å^3, Z = 4, *T* = 293(2) K, μ(Mo Kα) = 0.074 mm-1, D*calc* = 1.190 g/cm3, 5365 reflections measured (5.14° ≤ 2Θ ≤ 50.1°), 3599 unique (Rint = 0.0187, Rsigma = 0.0257) which were used in all calculations. The final *R*1 was 0.0398 (>2sigma(I)) and *wR*2 was 0.1057 (all data).

Table 1S: Crystal data and structure refinement for 8m

Identification code	8m
Empirical formula	$C_{26}H_{22}O_2$
Formula weight	366.44
Temperature/K	293(2)
Crystal system	orthorhombic
Space group	$P2_12_12_1$
a/Å	10.3208(6)
b/Å	12.3275(7)
c/Å	16.0767(12)
α/°	90.00
β/°	90.00
γ/°	90.00
Volume/Å^3	2045.4(2)
Z	4
ρcalcg/cm^3	1.190
μ/mm^{-1}	0.074
F(000)	776.0
Crystal size/mm^3	0.3 × 0.2 × 0.12
Radiation	Mo Kα (λ = 0.71073)
2Θ range for data collection/°	5.14 to 50.1
Index ranges	$-12 \leq h \leq 9$, $-7 \leq k \leq 14$, $-19 \leq l \leq 3$
Reflections collected	5365
Independent reflections	3599 [Rint = 0.0187, Rsigma = 0.0257]
Data/restraints/parameters	3599/0/341
Goodness-of-fit on F^2	1.063
Final R indexes [I>=2σ (I)]	R1 = 0.0398, wR2 = 0.0967
Final R indexes [all data]	R1 = 0.0476, wR2 = 0.1057
Largest diff. peak/hole / e Å^{-3}	0.10/-0.16
Flack parameter	0.3(15)

Crystal structure of 17a (CCDC 2327817): The structure of **17a** was confirmed by single-crystal X-ray diffraction analysis.

Crystallization procedure of 17a: In a 5 mL glass vial, 10 mg of **17a** was dissolved in EtOH:DCM (5:1) in 2 mL and the solution was kept at room temperature for slow evaporation. After 2-3 days, suitable single crystals were obtained.

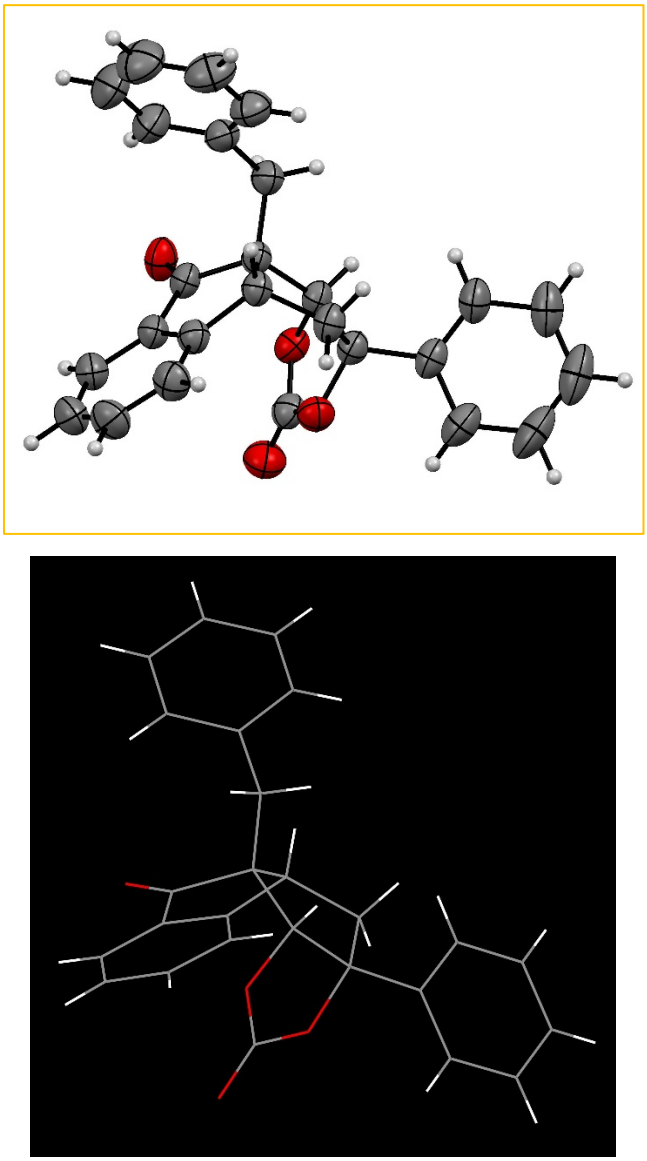


Figure 2: ORTEP diagram of **17a** with 50% ellipsoidal probability.

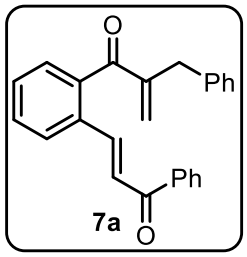
Crystal Data for $C_{26}H_{20}O_4$ (M =396.42 g/mol): monoclinic, space group $P2_1/c$ (no. 14), a = 8.5179(4) Å, b = 10.2457(5) Å, c = 23.2567(10) Å, β = 93.088(4)°, V = 2026.71(16) Å^3, Z = 4, T = 293(2) K, μ(Mo Kα) = 0.087 mm^{-1}, D*calc* = 1.299 g/cm^3, 31399 reflections measured (5.3° ≤ 2Θ ≤ 65.6°), 7201 unique (Rint = 0.0442, Rsigma = 0.0344) which were used in all calculations. The final $R1$ was 0.0620 (>2sigma(I)) and $wR2$ was 0.2108 (all data).

Table 2S: Crystal data and structure refinement for 17a

Identification code	17a
Empirical formula	$C_{26}H_{20}O_4$
Formula weight	396.42
Temperature/K	293(2)
Crystal system	monoclinic
Space group	$P2_1/c$
a/Å	8.5179(4)
b/Å	10.2457(5)
c/Å	23.2567(10)
α/°	90.00
β/°	93.088(4)
γ/°	90.00
Volume/Å^3	2026.71(16)
Z	4
ρcalcg/cm^3	1.299
μ/mm-1	0.087
F(000)	832.0
Crystal size/mm^3	0.25 × 0.2 × 0.19
Radiation	Mo Kα (λ = 0.71073)
2Θ range for data collection/°	5.3 to 65.6
Index ranges	$-12 \leq h \leq 11$, $-14 \leq k \leq 14$, $-34 \leq l \leq 34$
Reflections collected	31399
Independent reflections	7201 [Rint = 0.0442, Rsigma = 0.0344]
Data/restraints/parameters	7201/36/271
Goodness-of-fit on F^2	1.040
Final R indexes [I>=2σ (I)]	R1 = 0.0620, wR2 = 0.1665
Final R indexes [all data]	R1 = 0.1014, wR2 = 0.2108
Largest diff. peak/hole / e Å^{-3}	0.29/-0.22

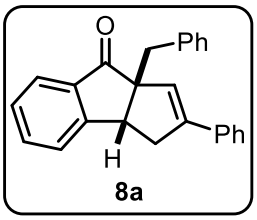
Spectral data of all the new compounds reported during this study

(*E*)-2-Benzyl-1-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)prop-2-en-1-one (7a).



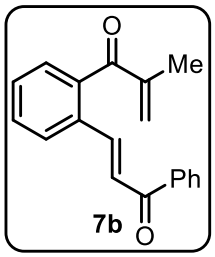
This compound was prepared by following the general procedure-1 and isolated as pale-yellow solid. 300 mg of **D** (Ar = C_6H_4, R^1 = CH_2Ph, R^2 = Ph) afforded 300 mg of **7a** (71% yield). R_f = 0.6 (hexane/EtOAc = 8/2). M.P = 96-98 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3060, 2925, 1654, 1608, 1457, 1217, 985, 757. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.97 (d, *J* = 7.4 Hz, 2H), 7.81– 7.74 (m, 2H), 7.57 (t, *J* = 7.3 Hz, 1H), 7.48 (t, *J* = 7.6 Hz, 3H), 7.41 – 7.37 (m, 2H), 7.33 – 7.13 (m, 6H), 5.80 (s, 1H), 5.67 (s, 1H), 3.78 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.5, 190.3, 149.1, 142.1, 140.1, 138.4, 137.8, 134.0, 132.9, 131.3, 130.4, 129.31, 129.30 (2C), 128.8, 128.67 (4C), 128.61 (2C), 127.3, 126.4, 124.8, 36.9. **HRMS (ESI):** *m/z* calcd for $C_{25}H_{20}NaO_2$ $(M+Na)^+$: 375.1361. Found: 375.1370.

8a-Benzyl-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8a).



This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 30 mg of **7a** afforded 25 mg of **8a** (87% yield). R_f = 0.6 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3027, 2912, 1704, 1602, 1494, 1279, 962, 750. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.72 (d, *J* = 7.8 Hz, 1H), 7.58 (t, *J* = 7.2 Hz, 1H), 7.44 (d, *J* = 7.6 Hz, 1H), 7.35 (t, *J* = 7.4 Hz, 1H), 7.31 – 7.21 (m, 5H), 7.19 – 7.11 (m, 5H), 6.10 (s, 1H), 3.79 (d, *J* = 9.3 Hz, 1H), 3.21 (s, 2H), 2.97 (ddd, *J* = 16.4, 9.5, 2.4 Hz, 1H), 2.72 (d, *J* = 16.4 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.0, 157.1, 142.7, 137.9, 135.3, 135.2, 135.2, 129.9 (2C), 128.3 (2C), 128.1 (2C), 127.9, 127.8, 127.3, 126.3, 125.9, 125.8 (2C), 124.1, 70.4, 44.9, 39.6, 39.0. **HRMS (ESI):** *m/z* calcd for $C_{25}H_{21}O$ $(M+H)^+$: 337.1592. Found: 337.1599.

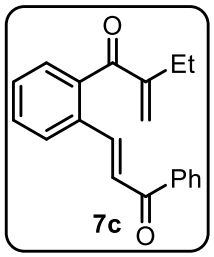
(*E*)-3-(2-Methacryloylphenyl)-1-phenylprop-2-en-1-one (7b).



This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 350 mg of **D** (Ar = C_6H_4, R^1 = Me, R^2 = Ph) afforded 290 mg of **7b** (60% yield). R_f = 0.5 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3062, 2932, 1662, 1603, 1276, 1076, 743. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.97 (d, *J* = 8.3 Hz, 2H), 7.78 – 7.72 (m, 2H), 7.58 – 7.54 (m, 1H), 7.50 – 7.46 (m, 3H), 7.44 – 7.35 (m, 3H), 6.01 (s, 1H), 5.58 (s, 1H), 2.05 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 199.4, 190.4, 145.2, 142.1, 140.4, 137.8, 133.7, 132.8, 131.2,

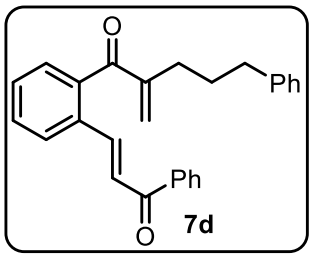
130.1, 129.3, 128.64 (2C), 128.61 (2C), 128.5, 127.2, 124.6, 17.3. **HRMS (ESI):** *m/z* calcd for $C_{19}H_{16}NaO_2$ $(M+Na)^+$: 299.1048. Found: 299.1048.

(*E*)-2-Methylene-1-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)butan-1-one (7c).



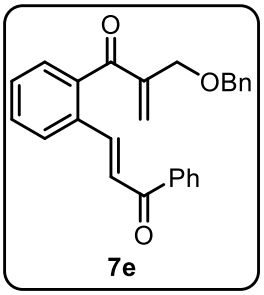
This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 150 mg of **D** (Ar = C_6H_4, R^1 = Et, R^2 = Ph) afforded 160 mg of **7c** (69% yield). R_f = 0.5 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3061, 2969, 1659, 1603, 1475, 1213, 976, 662. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.96 (d, *J* = 7.0 Hz, 2H), 7.79 – 7.74 (m, 2H), 7.58 – 7.55 (m, 1H), 7.51 – 7.46 (m, 3H), 7.42 (t, *J* = 7.4 Hz, 1H), 7.39 – 7.35 (m, 2H), 5.96 (s, 1H), 5.59 (s, 1H), 2.48 (q, *J* = 7.4 Hz, 2H), 1.13 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 199.3, 190.5, 151.1, 142.2, 140.7, 137.8, 133.7, 132.8, 130.2, 129.3 (2C), 128.6 (5C), 127.1, 124.6, 23.7, 12.4. **HRMS (ESI):** *m/z* calcd for $C_{20}H_{18}NaO_2$ $(M+Na)^+$: 313.1204. Found: 313.1207.

(*E*)-2-Methylene-1-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)-5-phenylpentan-1-one (7d).



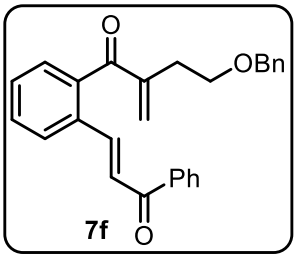
This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 110 mg of **D** (Ar = C_6H_4, R^1 = C_3H_6Ph, R^2 = Ph) afforded 120 mg of **7d** (79% yield). R_f = 0.5 (hexane/EtOAc = 9/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3060, 2929, 1659, 1604, 1450, 1214, 977, 748. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.96 – 7.94 (m, 2H), 7.78 – 7.74 (m, 2H), 7.57 – 7.51 (m, 1H), 7.49 – 7.40 (m, 4H), 7.38 – 7.33 (m, 2H), 7.30 – 7.25 (m, 2H), 7.20 – 7.16 (m, 3H), 5.97 (s, 1H), 5.61 (s, 1H), 2.69 (t, *J* = 7.6 Hz, 2H), 2.50 (t, *J* = 7.4 Hz, 2H), 1.88 – 1.80 (m, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 199.1, 190.5, 149.4, 142.2, 142.0, 140.5, 137.8, 133.9, 132.8, 130.5, 130.3, 129.3, 128.69, 128.65 (2C), 128.6 (2C), 128.5 (2C), 128.3 (2C), 127.2, 125.8, 124.8, 35.7, 30.4, 29.9. **HRMS (ESI):** *m/z* calcd for $C_{27}H_{24}NaO_2$ $(M+Na)^+$: 403.1674. Found: 403.1681.

(*E*)-2-((Benzyloxy)methyl)-1-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)prop-2-en-1-one (7e).



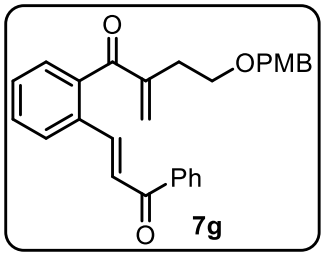
This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 220 mg of **D** (Ar = C_6H_4, R^1 = CH_2OBn, R^2 = Ph) afforded 200 mg of **7e** (66% yield). R_f = 0.5 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3061, 2922, 1659, 1605, 1476, 1277, 981, 758. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.98 – 7.95 (m, 2H), 7.81 – 7.77 (m, 2H), 7.57 – 7.51 (m, 2H), 7.49 – 7.43 (m, 3H), 7.41 – 7.39 (m, 2H), 7.37 – 7.34 (m, 4H), 7.30 – 7.26 (m, 2H), 6.32 (s, 1H), 5.79 (s, 1H), 4.61 (s, 2H), 4.42 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.0, 190.4, 145.9, 142.0, 139.7, 137.9, 137.8, 134.0, 132.9, 130.6, 129.3, 128.8, 128.6 (2C), 128.6 (3C), 128.4 (2C), 127.7, 127.7 (2C), 127.4, 125.0, 73.1, 67.9. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{23}O_3$ $(M+H)^+$: 383.1647. Found: 383.1649.

(*E*)-4-(Benzyloxy)-2-methylene-1-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)butan-1-one (7f). This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 130 mg of **D** (Ar = C_6H_4, R^1 = C_2H_4OBn, R^2 = Ph) afforded 150 mg of **7f** (85% yield). R_f = 0.5 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3060, 2862, 1657, 1605, 1475, 1275, 978, 734. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.97 – 7.95 (m, 2H), 7.81 – 7.76 (m, 2H), 7.57 – 7.53 (m, 1H), 7.50 – 7.44 (m, 3H), 7.41 – 7.35 (m, 3H), 7.31 – 7.30 (m, 4H), 7.27 – 7.22 (m, 1H), 6.08 (s, 1H), 5.66 (s, 1H), 4.51 (s, 2H), 3.68 (t, *J* = 6.3 Hz, 2H), 2.79 (t, *J* = 6.6 Hz, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.9, 190.5, 146.5, 142.2, 140.2, 138.3, 137.8, 134.0, 132.8, 131.9, 130.4, 129.3, 129.0, 128.67 (2C), 128.65 (2C), 128.3 (2C), 127.7 (2C), 127.5, 127.2, 124.7, 72.8, 68.5, 31.3. **HRMS (ESI):** *m/z* calcd for $C_{27}H_{24}NaO_3$ $(M+Na)^+$: 419.1623. Found: 419.1614.



(*E*)-4-((4-Methoxybenzyl)oxy)-2-methylene-1-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)butan-1-one (7g).

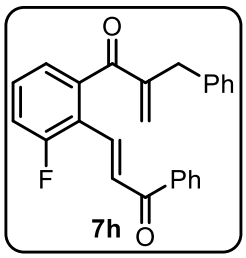
This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 370 mg of **D** (Ar = C_6H_4, R^1 = C_2H_4OPMB, R^2 = Ph) afforded 410 mg of **7g** (84% yield). R_f = 0.4 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3031, 2856, 1705, 1606, 1463, 1246, 821. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.98 – 7.96 (m, 2H), 7.81 – 7.76 (m, 2H), 7.57 – 7.54 (m, 1H), 7.48 (q, *J* = 7.7 Hz, 3H), 7.41 – 7.34 (m, 3H), 7.23 (d, *J* = 8.6 Hz, 2H), 6.84 (d, *J* = 8.6 Hz, 2H), 6.07 (s, 1H), 5.65 (s,



1H), 4.43 (s, 2H), 3.76 (s, 3H), 3.65 (t, J = 6.4 Hz, 2H), 2.77 (t, J = 6.4 Hz, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.9, 190.4, 159.1, 146.6, 142.2, 140.2, 137.8, 134.0, 132.8, 131.8, 130.4, 130.4, 129.39 (2C), 129.30, 129.0, 128.6 (4C), 127.2, 124.7, 113.7 (2C), 72.5, 68.1, 55.2, 31.2. **HRMS (ESI):** *m/z* calcd for $C_{28}H_{26}NaO_4$ $(M+Na)^+$: 449.1729. Found: 449.1716.

(*E*)-2-Benzyl-1-(3-fluoro-2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)prop-2-en-1-one (7h)

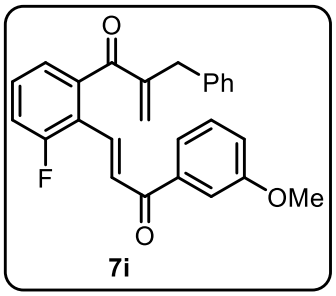
This compound was prepared by following the general procedure-1 and isolated as pale-yellow semi-solid. 150 mg of **D** (Ar = 3-FC_6H_3, R^1 = CH_2Ph, R^2 = Ph) afforded 140 mg of **7h**(67% yield). R_f = 0.7 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3062, 2931, 1664, 1600, 1494, 1280, 1074, 698. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.97 – 7.95 (m, 2H), 7.66 – 7.54 (m, 2H), 7.50 – 7.47 (m, 3H), 7.38 – 7.33 (m, 1H), 7.26 – 7.24 (m, 2H), 7.22 – 7.14 (m, 4H), 7.09 (dd, J = 7.5, 0.9 Hz, 1H), 5.81 (s, 1H), 5.68 (s, 1H), 3.76 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 197.6 (d, J = 2.6 Hz, 1C), 189.9, 161.4 (d, J = 253.6 Hz, 1C), 148.9, 142.2 (d, J = 1.8 Hz, 1C), 138.1, 137.6, 135.1, 133.0, 131.9, 130.3 (d, J = 9.1 Hz, 1C), 129.2 (2C), 128.7 (2C), 128.66 (2C), 128.62 (2C), 128.5, 126.4, 124.1 (d, J = 3.7 Hz, 1C), 121.9 (d, J = 12.4 Hz, 1C), 117.7 (d, J = 22.9 Hz, 1C), 36.7. **^{19}F NMR (376.4 MHz, $CDCl_3$):** δ –110.09. **HRMS (ESI):** *m/z* calcd for $C_{25}H_{19}FNaO_2$ $(M+Na)^+$: 393.1267. Found: 393.1273.



7h

(*E*)-2-Benzyl-1-(3-fluoro-2-(3-(3-methoxyphenyl)-3-oxoprop-1-en-1-yl)phenyl)prop-2-en-1-one (7i).

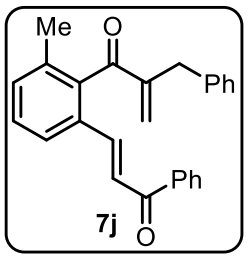
This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 100 mg of **D** (Ar = 3-FC_6H_3, R^1 = CH_2Ph, R^2 = 3-$OMeC_6H_4$) afforded 120 mg of **7i** (89% yield). R_f = 0.4 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3062, 2939, 1663, 1593, 1452, 1256, 1026, 738. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.63 (d, J = 15.9 Hz, 1H), 7.54 – 7.47 (m, 3H), 7.41 – 7.33 (m, 2H), 7.26 – 7.16 (m, 6H), 7.15 – 7.11 (m, 1H), 7.08 (d, J = 7.6 Hz, 1H), 5.81 (s, 1H), 5.68 (s, 1H), 3.87 (s, 3H), 3.76 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 197.6 (d, J = 2.5 Hz, 1C), 189.7, 161.3 (d, J = 253.8 Hz, 1C), 159.9, 148.9, 142.2 (d, J = 1.8 Hz, 1C), 139.0, 138.1, 135.1, 131.9, 130.3 (d, J = 9.3 Hz, 1C), 129.6, 129.2 (2C), 128.7, 128.6 (2C), 126.4, 124.1 (d, J = 3.5 Hz, 1C), 121.9 (d, J = 12.5 Hz, 1C), 121.2, 119.7,



7i

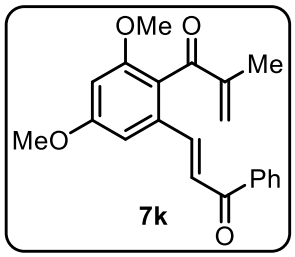
117.6 (d, J = 23.0 Hz, 1C), 112.8, 55.4, 36.7. **^{19}F NMR (376.4 MHz, $CDCl_3$):** δ –110.07. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{21}FNaO_3$ $(M+Na)^+$: 423.1372. Found: 423.1374.

(*E*)-2-Benzyl-1-(2-methyl-6-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)prop-2-en-1-one (7j). This compound was prepared by following the general procedure-1 and isolated as white crystalline solid. 150 mg of **D** (Ar = 2-MeC_6H_3, R^1 = CH_2Ph, R^2 = Ph) afforded 130 mg of **7j** (62% yield). R_f = 0.5 (hexane/EtOAc = 9/1). M.P = 124-126 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3028, 2922, 1660, 1597, 1448, 1221, 978, 765. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.95 – 7.93 (m, 2H), 7.60 – 7.56 (m, 3H), 7.48 (t, J = 7.7 Hz, 2H), 7.37 – 7.31 (m, 2H), 7.29 – 7.26 (m, 2H), 7.22 –7.16 (m, 4H), 5.77 (s, 1H), 5.66 (s, 1H), 3.77 (s, 2H), 2.10 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 200.6, 190.1, 149.4, 141.7, 140.5, 138.4, 137.9, 135.3, 132.9, 132.5, 131.97, 131.92, 129.3 (2C), 129.0, 128.6 (2C), 128.59 (2C), 128.56 (2C), 126.4, 124.6, 124.1, 36.0, 19.1. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{22}NaO_2$ $(M+Na)^+$: 389.1517. Found: 389.1519.



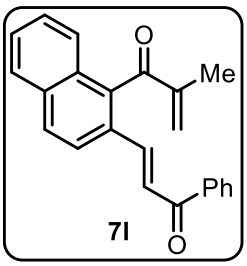
(*E*)-1-(2,4-Dimethoxy-6-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)-2-methylprop-2-en-1-one (7k).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow solid. 220 mg of **D** (Ar = 2,4-$(OMe)_2C_6H_2$, R^1 = Me, R^2 = Ph) afforded 215 mg of **7k** (68% yield). R_f = 0.4 (hexane/EtOAc = 8/2). M.P = 146-148 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3063, 2941, 1650, 1601, 1452, 1283, 974, 783. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.93 (d, J = 7.7 Hz, 2H), 7.57 – 7.54 (m, 1H), 7.50 – 7.44 (m, 3H), 7.33 (d, J = 15.6 Hz, 1H), 6.82 (d, J = 1.84 Hz, 1H), 6.52 (s, 1H), 5.92 (s, 1H), 5.60 (s, 1H), 3.88 (s, 3H), 3.74 (s, 3H), 2.02 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.8, 190.4, 161.1, 158.2, 146.0, 141.5, 137.7, 134.7, 132.9, 129.7, 128.6 (2C), 128.5 (2C), 125.0, 123.6, 102.5, 100.3, 55.9, 55.5, 16.7. **HRMS (ESI):** *m/z* calcd for $C_{21}H_{21}O_4$ $(M+H)^+$: 337.1440. Found: 337.1445.



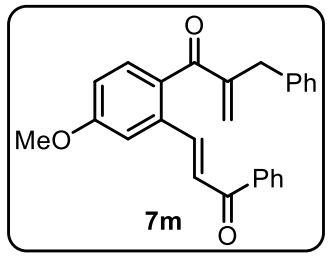
(*E*)-3-(1-Methacryloylnaphthalen-2-yl)-1-phenylprop-2-en-1-one (7l).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow solid. 150 mg of **D** (Ar = Naphthyl, R^1 = Me, R^2 = Ph) afforded 160 mg of **7l** (73% yield). R_f = 0.7 (hexane/EtOAc = 8/2). M.P = 106-108 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3060, 2956, 1657, 1599, 1448, 1217, 737. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.99 – 7.97 (m, 2H), 7.91 – 7.82 (m, 3H), 7.71 (d, *J* = 15.5 Hz, 1H), 7.60 – 7.56 (m, 2H), 7.54 – 7.45 (m, 5H), 6.04 (s, 1H), 5.55 (s, 1H), 2.16 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 201.2, 190.2, 146.1, 141.3, 139.7, 137.8, 133.8, 132.9, 132.4, 130.8, 129.5, 129.4, 128.67 (2C), 128.60 (2C), 128.2, 127.5, 127.4, 126.0, 124.5, 122.6, 16.7. **HRMS (ESI):** *m/z* calcd for $C_{23}H_{18}NaO_2$ $(M+Na)^+$: 349.1204. Found: 349.1209.



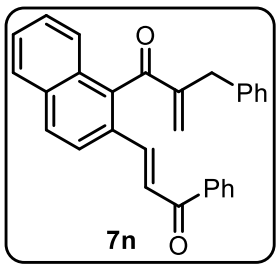
(*E*)-2-Benzyl-1-(4-methoxy-2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)prop-2-en-1-one (7m).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow solid. 250 mg of **D** (Ar = 4-$OMeC_6H_3$, R^1 = CH_2Ph, R^2 = Ph) afforded 250 mg of **7m** (73% yield). R_f = 0.4 (hexane/EtOAc = 8/2). M.P = 111-113 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3059, 2929, 1646, 1598, 1424, 1229, 735. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 8.00 – 7.97 (m, 2H), 7.87 (d, *J* = 15.6 Hz, 1H), 7.58 – 7.54 (m, 1H), 7.50 – 7.46 (m, 2H), 7.35 (d, *J* = 8.5 Hz, 1H), 7.31 – 7.24 (m, 3H), 7.23 – 7.16 (m, 4H), 6.89 (dd, *J* = 8.5 Hz, 2.5 Hz, 1H), 5.74 (s, 1H), 5.64 (s, 1H), 3.87 (s, 3H), 3.76 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 197.6, 190.7, 161.3, 149.3, 143.0, 138.5, 137.8, 137.0, 132.8, 132.2, 131.7, 129.2 (2C), 128.7 (2C), 128.6 (3C), 128.5 (2C), 126.3, 125.1, 114.2, 112.8, 55.6, 37.6. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{22}NaO_3$ $(M+Na)^+$: 405.1467. Found: 405.1459.



(*E*)-2-Benzyl-1-(2-(3-oxo-3-phenylprop-1-en-1-yl)naphthalen-1-yl)prop-2-en-1-one (7n).

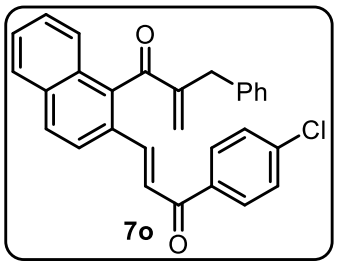
This compound was prepared by following the general procedure-1 and isolated as pale-yellow solid. 220 mg of **D** (Ar = Naphthyl, R^1 = CH_2Ph, R^2 = Ph) afforded 210 mg of **7n** (71% yield). R_f = 0.7 (hexane/EtOAc = 8/2). M.P = 108-110 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3060, 2912, 1658, 1600, 1449, 1297, 970, 772. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 8.00 – 7.98 (m, 2H), 7.89 – 7.74 (m, 4H), 7.60 – 7.56 (m, 1H), 7.53 – 7.47 (m, 4H), 7.39 –



7.38 (m, 2H), 7.34 – 7.28 (m, 4H), 7.24 – 7.20 (m, 1H), 5.82 (s, 1H), 5.64 (s, 1H), 3.89 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 200.4, 190.1, 149.8, 141.2, 139.3, 138.3, 137.9, 133.8, 133.0, 132.9, 130.8, 129.6, 129.5, 129.4 (2C), 128.7 (2C), 128.66 (2C), 128.63 (2C), 128.2, 127.5, 127.4, 126.5, 125.8, 124.7, 122.6, 36.2. **HRMS (ESI):** *m/z* calcd for $C_{29}H_{22}NaO_2$ $(M+Na)^+$: 425.1517. Found: 425.1517.

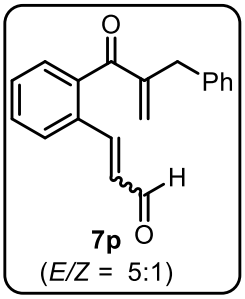
(*E*)-2-Benzyl-1-(2-(3-(4-chlorophenyl)-3-oxoprop-1-en-1-yl)naphthalen-1-yl)prop-2-en-1-one (7o).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow crystalline solid. 140 mg of **D** (Ar = Naphthyl, $R^1 = CH_2Ph$, R^2 = 4-ClC_6H_4) afforded 155 mg of **7o** (84% yield). R_f = 0.7 (hexane/EtOAc = 8/2). M.P = 145-147 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3061, 2953, 1657, 1588, 1483, 1266, 987, 1232, 733. **^{1}H NMR (400 MHz, DMSO-*d*$_6$):** δ 8.34 (d, *J* = 8.8 Hz, 1H), 8.22 (d, *J* = 8.6 Hz, 2H), 8.12 – 8.08 (m, 2H), 8.03 (d, *J* = 8.1 Hz, 1H), 7.67 (d, *J* = 8.6 Hz, 2H), 7.62 – 7.56 (m, 2H), 7.47 – 7.43 (m, 1H), 7.38 – 7.34 (m, 4H), 7.29 – 7.24 (m, 2H), 6.10 (s, 1H), 5.60 (s, 1H), 3.89 (s, 2H). **^{13}C NMR (100 MHz, DMSO-*d*$_6$):** δ 200.5, 188.1, 149.5, 140.2, 139.6, 139.0, 138.8, 136.3, 134.4, 133.9, 131.0 (2C), 130.4, 129.9, 129.44 (4C), 129.41, 128.9 (2C), 128.8, 128.2, 127.9, 126.8, 125.7, 124.5, 123.6, 36.0. **HRMS (ESI):** *m/z* calcd for $C_{29}H_{22}ClO_2$ $(M+H)^+$: 437.1308. Found: 437.1318.



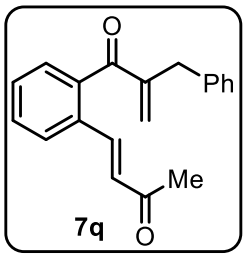
3-(2-(2-Benzylacryloyl)phenyl)acrylaldehyde (7p).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 100 mg of **D** (Ar = C_6H_4, $R^1 = CH_2Ph$, R^2 = H) afforded 80 mg of **7p** (72% yield). R_f = 0.5 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3062, 2929, 1676, 1494, 1212, 980, 829. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 9.42 (d, *J* = 7.7 Hz, 1H), 7.67 (d, *J* = 7.7 Hz, 1H), 7.49 (t, *J* = 7.5 Hz, 1H), 7.43 (t, *J* = 7.5 Hz, 1H), 7.35 – 7.21 (m, 7H), 6.58 (dd, *J* = 15.9, 7.7 Hz, 1H), 5.96 (s, 1H), 5.65 (s, 1H), 3.81 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.3, 193.8, 149.4, 149.2, 139.6, 138.5, 132.9, 130.7, 130.3, 130.0, 129.4, 129.1 (2C), 128.9, 128.6 (2C), 127.1, 126.6, 37.3. **HRMS (ESI):** *m/z* calcd for $C_{19}H_{17}O_2$ $(M+H)^+$: 277.1229. Found: 277.1216.



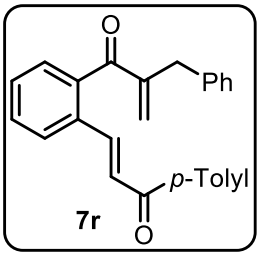
(*E*)-4-(2-(2-Benzylacryloyl)phenyl)but-3-en-2-one (7q).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 100 mg of **D** (Ar = C_6H_4, R^1 = CH_2Ph, R^2 = Me) afforded 110 mg of **7q** (94% yield). R_f = 0.7 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3062, 2925, 1665, 1611, 1493, 1253, 955, 754. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.66 (d, *J* = 8.0 Hz, 1H), 7.51 – 7.44 (m, 2H), 7.39 (td, *J* = 7.5, 0.9 Hz, 1H), 7.34 – 7.26 (m, 5H), 7.24 – 7.20 (m, 1H), 6.56 (d, *J* = 16.2 Hz, 1H), 5.91 (s, 1H), 5.67 (s, 1H), 3.80 (s, 2H), 2.23 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.54, 198.51, 149.1, 140.7, 139.5, 138.5, 133.6, 131.2, 130.6, 129.6, 129.3, 129.1 (2C), 128.9, 128.6 (2C), 127.0, 126.5, 37.2, 27.0. **HRMS (ESI):** *m/z* calcd for $C_{20}H_{18}NaO_2$ $(M+Na)^+$: 313.1204. Found: 313.1207.



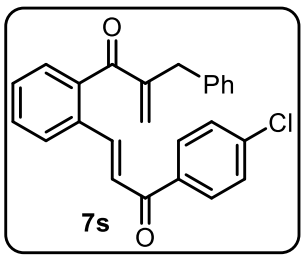
(*E*)-2-Benzyl-1-(2-(3-oxo-3-(*p*-tolyl)prop-1-en-1-yl)phenyl)prop-2-en-1-one (7r).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 200 mg of **D** (Ar = C_6H_4, R^1 = CH_2Ph, R^2 = *p*-Tolyl) afforded 195 mg of **7r** (66% yield). R_f = 0.6 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3060, 2923, 1659, 1605, 1325, 1275, 980, 734. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.89 (d, *J* = 7.9 Hz, 2H), 7.80 – 7.74 (m, 2H), 7.47 (t, *J* = 7.4 Hz, 1H), 7.40 – 7.36 (m, 2H), 7.32 (d, *J* = 4.8 Hz, 1H), 7.30 – 7.26 (m, 4H), 7.24 – 7.16 (m, 3H), 5.79 (s, 1H), 5.66 (s, 1H), 3.78 (s, 2H), 2.42 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.6, 189.8, 149.2, 143.7, 141.6, 140.0, 138.5, 135.3, 134.2, 131.2, 130.3, 129.36 (2C), 129.30 (2C), 129.1, 128.8 (2C), 128.7, 128.5 (2C), 127.3, 126.4, 124.9, 36.9, 21.7. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{23}O_2$ $(M+H)^+$: 367.1698. Found: 367.1689.



(*E*)-2-Benzyl-1-(2-(3-(4-chlorophenyl)-3-oxoprop-1-en-1-yl)phenyl)prop-2-en-1-one (7s).

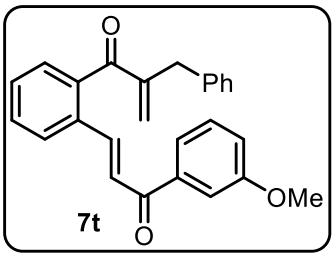
This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 200 mg of **D** (Ar = C_6H_4, R^1 = CH_2Ph, R^2 = 4-ClC_6H_4) afforded 180 mg of **7s** (58% yield). R_f = 0.7 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3063, 2926, 2856, 1707, 1652, 1457, 1212, 921, 740.**^{1}H NMR (400 MHz, DMSO-*d*$_6$):** δ 8.22 (d, *J* = 7.8 Hz, 1H), 8.16 (d, *J* = 8.4 Hz, 2H), 7.89 (d, *J* = 15.4 Hz, 1H), 7.67 – 7.60 (m, 4H), 7.55 – 7.51 (m, 1H), 7.36 (d, *J* = 7.5 Hz, 1H), 7.33 – 7.30 (m, 2H), 7.26 – 7.19



(m, 3H), 6.03 (s, 1H), 5.65 (s, 1H), 3.76 (s, 2H). **^{13}C NMR (100 MHz, DMSO-*d*$_6$):** δ 198.6, 188.3, 148.7, 141.3, 140.4, 139.1, 138.7, 136.4, 133.3, 132.6, 131.0, 130.9 (2C), 130.3, 129.4 (2C), 129.2 (2C), 128.9 (3C), 127.9, 126.7, 124.1, 36.7. **HRMS (ESI):** *m/z* calcd for $C_{25}H_{19}ClNaO_2$ $(M+Na)^+$: 409.0971. Found: 409.0968.

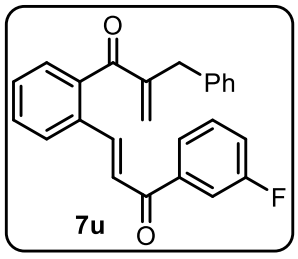
(*E*)-2-Benzyl-1-(2-(3-(3-methoxyphenyl)-3-oxoprop-1-en-1-yl)phenyl)prop-2-en-1-one (7t).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow solid. 220 mg of **D** (Ar = C_6H_4, R^1 = CH_2Ph, R^2 = 3-$OMeC_6H_4$) afforded 216 mg of **7t** (64% yield). R_f = 0.5 (hexane/EtOAc = 8/2). M.P = 79-81 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3027, 2945, 1657, 1588, 1458, 1271, 1029, 980, 758. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.84 – 7.77 (m, 2H), 7.59 – 7.49 (m, 3H), 7.42 (t, *J* = 7.6 Hz, 2H), 7.38 – 7.30 (m, 4H), 7.28 – 7.20 (m, 3H), 7.16 – 7.12 (m, 1H), 5.83 (s, 1H), 5.70 (s, 1H), 3.90 (s, 3H), 3.81 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.5, 190.2, 159.9, 149.1, 142.1, 140.1, 139.2, 138.4, 134.1, 131.2, 130.4, 129.6, 129.3, 129.2 (2C), 128.8, 128.6 (2C), 127.3, 126.4, 124.9, 121.2, 119.5, 112.9, 55.5, 37.0. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{23}O_3$ $(M+H)^+$: 383.1647. Found: 383.1662.



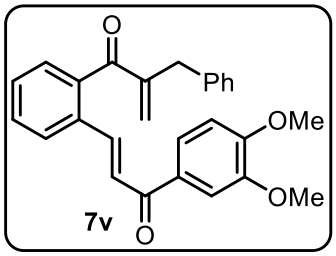
(*E*)-2-Benzyl-1-(2-(3-(3-fluorophenyl)-3-oxoprop-1-en-1-yl)phenyl)prop-2-en-1-one (7u).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 200 mg of **D** (Ar = C_6H_4, R^1 = CH_2Ph, R^2 = 3-FC_6H_4) afforded 205 mg of **7u** (69% yield). R_f = 0.7 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3064, 2922, 1662, 1584, 1440, 1244, 921, 736. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.81 (d, *J* = 15.6 Hz, 1H), 7.76 – 7.73 (m, 2H), 7.67 – 7.64 (m, 1H), 7.51 – 7.45 (m, 2H), 7.43 – 7.39 (m, 1H), 7.34 – 7.30 (m, 2H), 7.28 – 7.27 (m, 2H), 7.25 – 7.16 (m, 4H), 5.82 (s, 1H), 5.68 (s, 1H), 3.78 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.4, 189.0, 162.8 (d, *J* = 246.4 Hz, 1C), 149.1, 142.9, 140.1, 139.9 (d, *J* = 6.2 Hz, 1C), 138.4, 133.9, 131.3, 130.5, 130.3 (d, *J* = 7.6 Hz, 1C), 129.5, 129.2 (2C), 128.9, 128.6 (2C), 127.3, 126.4, 124.25 (d, *J* = 2.9 Hz, 1C), 124.29, 119.9 (d, *J* = 21.3 Hz, 1C), 115.4 (d, *J* = 22.2 Hz, 1C), 37.0. **^{19}F NMR (376.4 MHz, $CDCl_3$):** δ –111.67. **HRMS (ESI):** *m/z* calcd for $C_{25}H_{19}FNaO_2$ $(M+Na)^+$: 393.1267. Found: 393.1276.



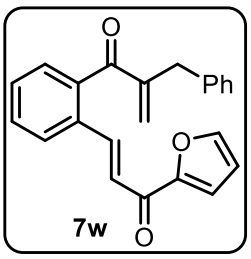
(*E*)-2-Benzyl-1-(2-(3-(3,4-dimethoxyphenyl)-3-oxoprop-1-en-1-yl)phenyl)prop-2-en-1-one (7v).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 170 mg of **D** (Ar = C_6H_4, R^1 = CH_2Ph, R^2 = 3,4-$(OMe)_2C_6H_3$) afforded 160 mg of **7v** (57% yield). R_f = 0.4 (hexane/EtOAc = 6/4). **IR (thin film, neat):** ν_{max}/cm^{-1} 3062, 2937, 1657, 1595, 1457, 1267, 983, 763. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.79 – 7.74 (m, 2H), 7.64 – 7.58 (m, 2H), 7.48 (t, *J* = 7.4 Hz, 1H), 7.40 – 7.36 (m, 2H), 7.34 – 7.30 (m, 2H), 7.27 – 7.26 (m, 1H), 7.23 – 7.18 (m, 3H), 6.91 (d, *J* = 8.3 Hz, 1H), 5.80 (s, 1H), 5.68 (s, 1H), 3.97 (s, 3H), 3.95 (s, 3H), 3.78 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.6, 188.6, 153.2, 149.1, 149.1, 141.2, 139.9, 138.4, 134.3, 131.2, 130.9, 130.4, 129.2 (2C), 129.1, 128.7, 128.5 (2C), 127.3, 126.4, 124.7, 123.2, 110.8, 110.0, 56.1, 56.0, 36.9. **HRMS (ESI):** *m/z* calcd for $C_{27}H_{24}NaO_4$ $(M+Na)^+$: 435.1572. Found: 435.1584.

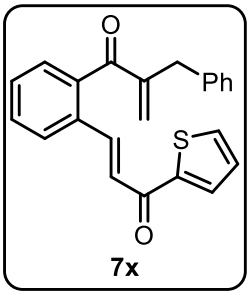


(*E*)-2-Benzyl-1-(2-(3-(furan-2-yl)-3-oxoprop-1-en-1-yl)phenyl)prop-2-en-1-one (7w).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow solid. 250 mg of **D** (Ar = C_6H_4, R^1 = CH_2Ph, R^2 = 2-Furyl) afforded 150 mg of **7w** (43% yield). R_f = 0.4 (hexane/EtOAc = 8/2). M.P = 134-136 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3098, 2894, 1647, 1603, 1460, 1276, 926, 817. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.86 (d, *J* = 15.7 Hz, 1H), 7.76 (d, *J* = 7.8 Hz, 1H), 7.63 (s, 1H), 7.47 (t, *J* = 8.6 Hz, 1H), 7.39 (t, *J* = 7.5 Hz, 1H), 7.33 – 7.28 (m, 4H), 7.26 – 7.21 (m, 4H), 6.58 – 6.56 (m, 1H), 5.80 (s, 1H), 5.66 (s, 1H), 3.80 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.5, 177.6, 153.4, 149.1, 146.7, 141.1, 140.1, 138.4, 133.8, 131.3, 130.3, 129.38, 129.32 (2C), 128.7, 128.6 (2C), 127.3, 126.41, 123.9, 117.9, 112.6, 36.9. **HRMS (ESI):** *m/z* calcd for $C_{23}H_{18}NaO_3$ $(M+Na)^+$: 365.1154. Found: 365.1133.

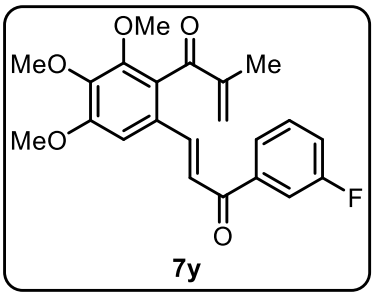


(*E*)-2-Benzyl-1-(2-(3-oxo-3-(thiophen-2-yl)prop-1-en-1-yl)phenyl)prop-2-en-1-one (7x).



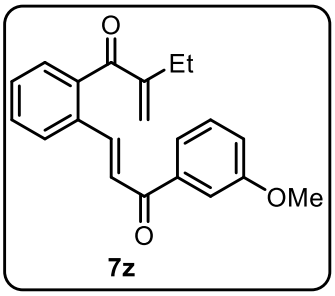
This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 150 mg of **D** (Ar = C_6H_4, R^1 = CH_2Ph, R^2 = 2-thiophenyl) afforded 127 mg of **7x** (59% yield). R_f = 0.5 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3055, 2887, 1650, 1600, 1461, 1255, 916, 815. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.84 (d, *J* = 15.5 Hz, 1H), 7.78 (d, *J* = 3.8 Hz, 1H), 7.73 (d, *J* = 7.8 Hz, 1H), 7.63 – 7.62 (m, 1H), 7.45 (t, *J* = 7.5 Hz, 1H), 7.37 (t, *J* = 7.5 Hz, 1H), 7.31 – 7.22 (m, 6H), 7.19 – 7.11 (m, 2H), 5.79 (s, 1H), 5.65 (s, 1H), 3.78 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.5, 181.8, 149.1, 145.2, 141.2, 140.1, 138.4, 134.2, 133.8, 132.28, 132.26, 131.4, 130.4, 129.4, 129.3 (2C), 128.6 (2C), 128.4, 127.3, 126.4, 124.4, 37.0. **HRMS (ESI):** *m/z* calcd for $C_{23}H_{18}NaO_2S$ $(M+Na)^+$: 381.0925. Found: 381.0904.

(*E*)-1-(3-Fluorophenyl)-3-(2-methacryloyl-3,4,5-trimethoxyphenyl)prop-2-en-1-one (7y).



This compound was prepared by following the general procedure-1 and isolated as dark-yellow liquid. 150 mg of **D** (Ar = 3,4,5-$(OMe)_3C_6H$, R^1 = Me, R^2 = 3-FC_6H_4) afforded 145 mg of **7y** (66% yield). R_f = 0.4 (hexane/EtOAc = 7/3). **IR (thin film, neat):** ν_{max}/cm^{-1} 3071, 2939, 1722, 1661, 1485, 1292, 1127, 822. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.70 (d, *J* = 7.7 Hz, 1H), 7.60 (d, *J* = 9.3 Hz, 1H), 7.49 – 7.42 (m, 2H), 7.29 – 7.24 (m, 1H), 7.20 (d, *J* = 15.5 Hz, 1H), 7.01 (s, 1H), 6.00 (s, 1H), 5.61 (s, 1H), 3.96 (s, 3H), 3.93 (s, 3H), 3.82 (s, 3H), 2.05 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 197.9, 189.1, 162.7 (d, *J* = 246.4 Hz, 1C), 154.1, 150.7, 146.3, 143.9, 141.9, 139.9 (d, *J* = 6.2 Hz, 1C), 130.3 (d, *J* = 7.5 Hz, 1C), 130.0, 129.2, 127.8, 124.2 (d, *J* = 2.9 Hz, 1C), 123.4, 119.8 (d, *J* = 21.4 Hz, 1C), 115.3 (d, *J* = 22.2 Hz, 1C), 105.5, 61.6, 60.9, 56.2, 16.7. **^{19}F NMR (376.4 MHz, $CDCl_3$):** δ –111.74. **HRMS (ESI):** *m/z* calcd for $C_{22}H_{21}NaFO_5$ $(M+Na)^+$: 407.1271. Found: 407.1254.

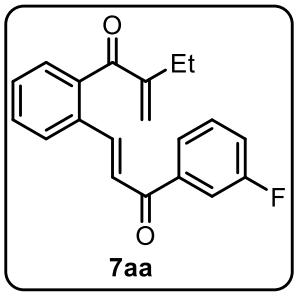
(*E*)-1-(2-(3-(3-Methoxyphenyl)-3-oxoprop-1-en-1-yl)phenyl)-2-methylenebutan-1-one (7z).



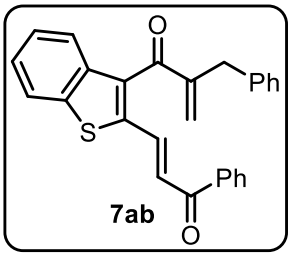
This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 300 mg of **D** (Ar = C_6H_4, R^1 = Et, R^2 = 3-$OMeC_6H_4$) afforded 285 mg of **7z** (55% yield). R_f = 0.4 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3067, 2967, 1657, 1587, 1430, 1254, 976, 758. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.78 – 7.75 (m, 2H), 7.55 – 7.53 (m, 1H), 7.51 – 7.47 (m, 2H), 7.44 – 7.40 (m, 1H), 7.38 – 7.33 (m, 3H), 7.11 (dd, *J* = 8.2 Hz, 2.6 Hz, 1H), 5.96 (s, 1H), 5.59 (s, 1H), 3.86 (s, 3H), 2.49 (q, *J* = 7.4 Hz, 2H), 1.14 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 199.3, 190.2, 159.8, 151.0, 142.2, 140.6, 139.2, 133.7, 130.2, 129.5, 129.44, 129.40, 128.6, 127.1, 124.6, 121.1, 119.4, 112.8, 55.4, 23.7, 12.4. **HRMS (ESI):** *m/z* calcd for $C_{21}H_{20}NaO_3$ $(M+Na)^+$: 343.1310. Found: 343.1315.

(*E*)-1-(2-(3-(3-Fluorophenyl)-3-oxoprop-1-en-1-yl)phenyl)-2-methylenebutan-1-one (7aa).

This compound was prepared by following the general procedure-1 and isolated as pale-yellow liquid. 300 mg of **D** (Ar = C_6H_4, R^1 = Et, R^2 = 3-FC_6H_4) afforded 250 mg of **7aa** (50% yield). R_f = 0.6 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3071, 2970, 1657, 1584, 1440, 1244, 976, 759. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.81 – 7.74 (m, 3H), 7.66 – 7.64 (m, 1H), 7.52 – 7.42 (m, 3H), 7.37 (d, *J* = 7.3 Hz, 1H), 7.33 (d, *J* = 15.7 Hz, 1H), 7.28 – 7.24 (m, 1H), 5.98 (s, 1H), 5.60 (s, 1H), 2.49 (q, *J* = 7.4 Hz, 2H), 1.14 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 199.2, 189.1, 162.8 (d, *J* = 246.3 Hz, 1C), 151.0, 142.9, 140.7, 139.9 (d, *J* = 6.2 Hz, 1C), 133.5, 130.3 (d, *J* = 7.5 Hz, 1H), 130.3, 129.5, 129.4, 128.7, 127.1, 124.3 (d, *J* = 2.9 Hz, 1C), 124.0, 119.8 (d, *J* = 21.3 Hz, 1C), 115.3 (d, *J* = 22.2 Hz, 1C), 23.7, 12.4. **^{19}F NMR (376.4 MHz, $CDCl_3$):** δ –111.70. **HRMS (ESI):** *m/z* calcd for $C_{20}H_{17}FNaO_2$ $(M+Na)^+$: 331.1110. Found: 331.1119.

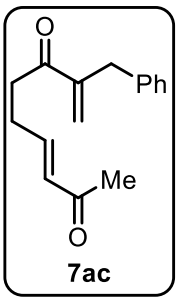


(*E*)-2-Benzyl-1-(2-(3-oxo-3-phenylprop-1-en-1-yl)benzo[*b*]thiophen-3-yl)prop-2-en-1-one (7ab). This compound was prepared by following the general procedure-1 and isolated as pale-yellow solid. 280 mg of **D** (Ar = Thianaphthene, R^1 = CH_2Ph, R^2 = Ph) afforded 310 mg of **7ab** (83% yield). R_f = 0.5 (hexane/EtOAc = 9/1). M.P = 114-116 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 2924, 1737, 1653, 1457, 1205, 758. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.99 – 7.97 (m, 2H),



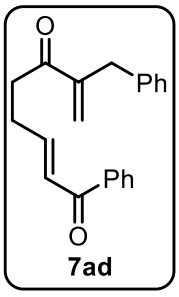
7.90 (dd, *J* = 15.3, 1.0 Hz, 1H), 7.77 (d, *J* = 8.0 Hz, 1H), 7.60 – 7.48 (m, 4H), 7.40 – 7.38 (m, 1H), 7.36 – 7.28 (m, 6H), 7.24 – 7.20 (m, 1H), 5.88 (s, 1H), 5.84 (s, 1H), 3.86 (s, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 193.8, 189.2, 149.9, 140.5, 138.7, 138.7, 138.6, 138.2, 137.6, 135.2, 133.1, 131.7, 129.4 (2C), 128.7 (2C), 128.7 (2C), 128.5 (2C), 127.0, 126.5, 125.4, 125.1, 124.1, 122.2, 37.0. **HRMS (ESI):** *m/z* calcd for $C_{27}H_{20}NaO_2S$ $(M+Na)^+$: 431.1082. Found: 431.1095.

(*E*)-8-Benzylnona-3,8-diene-2,7-dione (7ac).



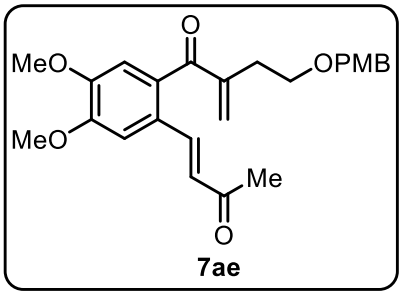
This compound was prepared by following the procedure described in Scheme 2S and isolated as colourless liquid. 100 mg of **G** afforded 50 mg of **7ac** (42% yield). R_f = 0.4 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3028, 2923, 1671, 1626, 1508, 1430, 1361, 1254, 1076, 975, 700. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.31 – 7.28 (m, 2H), 7.23 – 7.21 (m, 1H), 7.19 – 7.17 (m, 2H) 6.83 – 6.75 (m, 1H), 6.10 (s, 1H), 6.06 (d, *J* = 15.9 Hz, 1H), 5.69 (s, 1H), 3.62 (s, 2H), 2.89 (t, *J* = 7.1 Hz, 2H), 2.53 (qd, *J* = 6.9, 1.6 Hz, 2H), 2.23 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 199.3, 198.5, 148.0, 146.6, 138.8, 131.7, 129.0 (2C), 128.4 (2C), 126.3, 125.7, 37.1, 35.9, 26.9, 26.6. **HRMS (ESI):** *m/z* calcd for $C_{16}H_{18}NaO_2$ $(M+Na)^+$: 265.1204. Found: 265.1198.

(*E*)-7-Benzyl-1-phenylocta-2,7-diene-1,6-dione (7ad).



This compound was prepared by following the procedure described in Scheme 2S and isolated as colourless liquid. 40 mg of **G** afforded 40 mg of **7ad** (65% yield). R_f = 0.6 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3028, 2926, 1669, 1619, 1578, 1448, 1285, 1076, 694. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.90 – 7.88 (m, 2H), 7.55 (t, *J* = 7.2 Hz, 1H), 7.45 (t, *J* = 7.7 Hz, 2H), 7.28 – 7.25 (m, 2H), 7.20 – 7.15 (m, 3H), 7.04 – 6.96 (m, 1H), 6.87 (d, *J* = 15.4 Hz, 1H), 6.10 (s, 1H), 5.66 (s, 1H), 3.61 (s, 2H), 2.91 (t, *J* = 7.1 Hz, 2H), 2.62 (q, *J* = 6.6 Hz, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 199.3, 190.7, 148.1, 147.8, 138.9, 137.7, 132.7, 129.0 (2C), 128.57 (2C), 128.56 (2C), 128.4 (2C), 126.6, 126.3, 125.7, 37.1, 36.0, 27.0. **HRMS (ESI):** *m/z* calcd for $C_{21}H_{20}NaO_2$ $(M+Na)^+$: 337.1361. Found: 337.1352.

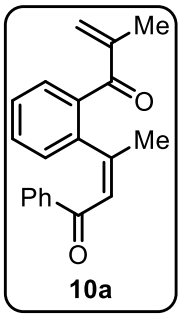
(*E*)-4-(4,5-Dimethoxy-2-(4-((4-methoxybenzyl)oxy)-2-methylenebutanoyl)phenyl)but-3-en-2-one (7ae).



7ae

This compound was prepared by following the general procedure-2 and isolated as pale-yellow solid. 280 mg of **N** (Ar = 4,5-$(OMe)_2CH_2$, $R^1 = C_2H_4OPMB$, R^2 = Me) afforded 310 mg of **7ae** (83% yield). R_f = 0.3 (hexane/EtOAc = 6/4). M.P = 114-116 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3000, 2854, 1734, 1654, 1562, 1357, 1246, 818. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.66 (d, *J* = 16.2 Hz, 1H), 7.22 (d, *J* = 8.6 Hz, 2H), 7.14 (s, 1H), 6.95 (s, 1H), 6.84 (d, *J* = 8.5 Hz, 2H), 6.52 (d, *J* = 16.2 Hz, 1H), 6.03 (s, 1H), 5.64 (s, 1H), 4.45 (s, 2H), 3.95 (s, 3H), 3.789 (s, 3H), 3.783 (s, 3H), 3.70 (t, *J* = 6.2 Hz, 2H), 2.81 (t, *J* = 6.2 Hz, 2H), 2.31 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.8, 198.1, 159.1, 150.8, 149.7, 147.1, 141.4, 132.9, 130.2, 130.1, 129.2 (2C), 127.9, 127.4, 113.7 (2C), 112.6, 108.6, 72.5, 68.0, 56.1, 56.0, 55.2, 31.8, 26.7. **HRMS (ESI):** *m/z* calcd for $C_{25}H_{28}NaO_6$ $(M+Na)^+$: 447.1784. Found: 447.1784.

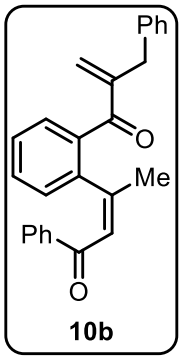
(*Z*)-3-(2-Methacryloylphenyl)-1-phenylbut-2-en-1-one (10a).



10a

This compound was prepared by following the general procedure-2 and isolated as pale-yellow liquid. 200 mg of **L** (R^1 = Ph, R^2 = Me) afforded 150 mg of **10a** (72% yield). R_f = 0.4 (hexane/EtOAc = 9/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3051, 2760, 1687, 1655, 1448, 1261, 823. **^{1}H NMR (400 MHz, DMSO-*d*$_6$):** δ 7.90 (d, *J* = 6.7 Hz, 2H), 7.69 – 7.50 (m, 6H), 7.46 (d, *J* = 7.4 Hz, 1H), 6.77 (q, *J* = 1.3 Hz, 1H), 6.05 (s, 1H), 5.49 (s, 1H), 2.41 (d, *J* = 1.3 Hz, 3H), 1.88 (s, 3H). **^{13}C NMR (100 MHz, DMSO-*d*$_6$):** δ 199.9, 190.4, 155.7, 145.2, 143.2, 138.6, 138.3, 133.4, 130.7, 129.70, 129.2 (2C), 128.7, 128.5, 128.4, 128.3 (2C), 124.8, 21.3, 17.5. **HRMS (ESI):** *m/z* calcd for $C_{20}H_{18}NaO_2(M+Na)^+$: 313.1204. Found: 313.1176.

(*Z*)-3-(2-(2-Benzylacryloyl)phenyl)-1-phenylbut-2-en-1-one (10b).

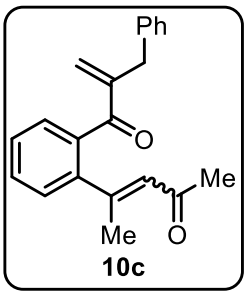


10b

This compound was prepared by following the general procedure-2 and isolated as pale-yellow liquid. 220 mg of **L** (R^1 = Ph, R^2 = CH_2Ph) afforded 170 mg of **10b** (74% yield). R_f = 0.6 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3061, 2853, 1689, 1659, 1494, 1283, 757. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.74 – 7.72 (m, 2H), 7.40 (tt, *J* = 7.3 Hz, 1.1 Hz, 1H), 7.36 – 7.29 (m, 3H), 7.26 – 7.24 (m, 1H), 7.20 – 7.13 (m, 3H), 7.11 – 7.07 (m, 2H), 7.04 – 7.02 (m, 2H), 6.75 (q, *J* = 1.3 Hz, 1H), 5.72 (s, 1H), 5.57 (s, 1H), 3.54

(s, 2H), 2.18 (d, J = 1.2 Hz, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.4, 190.1, 155.4, 147.5, 141.8, 138.8, 138.3, 137.1, 132.4, 131.0, 130.4, 129.17 (2C), 129.12, 128.4 (2C), 128.38 (2C), 128.35 (2C), 127.7, 126.3, 126.2, 122.9, 37.2, 28.2. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{23}O_2(M+H)^+$: 367.1698. Found: 367.1687.

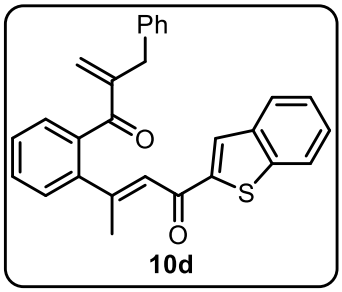
4-(2-(2-Benzylacryloyl)phenyl)pent-3-en-2-one (10c).



10c

This compound was prepared by following the general procedure-2 and isolated as pale-yellow liquid. 300 mg of **L** (R^1 = Me, R^2 = CH_2Ph) afforded 250 mg of **10c** (80% yield). R_f = 0.5 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3063, 2915, 1686, 1658, 1430, 1210, 983, 832. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.47 – 7.41 (m, 1H), 7.37 – 7.36 (m, 2H), 7.31 – 7.26 (m, 3H), 7.22 – 7.17 (m, 3H), 6.03 (q, J = 1.3 Hz, 1H), 5.64 (s, 1H), 5.53 (s, 1H), 3.67 (s, 2H), 2.36 (d, J = 1.3 Hz, 3H), 2.12 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 199.2, 198.1, 154.5, 149.4, 143.3, 138.3, 137.9, 130.2, 129.3 (2C), 129.1, 128.6, 128.6 (2C), 127.8, 127.7, 127.6, 126.4, 37.1, 32.0, 21.0. **HRMS (ESI):** *m/z* calcd for $C_{21}H_{19}O_2(M-H)^+$: 303.1385. Found: 303.1367.

(*E*)-1-(Benzo[*b*]thiophen-2-yl)-3-(2-(2-benzylacryloyl)phenyl)but-2-en-1-one (10d).

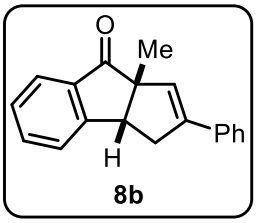


10d

This compound was prepared by following the general procedure-2 and isolated as pale-yellow liquid. 170mg of **L** (Ar = C_6H_4, R^1 = CH_2Ph, R^2 = 2-Thianaphthene) afforded 310 mg of **10d** (83% yield). R_f = 0.5 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3060, 2939, 1643, 1596, 1454, 1173, 823. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.85 (d, J = 9.0 Hz, 2H), 7.80 (s, 1H), 7.52 – 7.48 (m, 1H), 7.45 – 7.35 (m, 5H), 7.19 – 7.13 (m, 2H), 7.10 – 7.04 (m, 3H), 6.75 (q, J = 1.2 Hz, 1H), 5.63 (s, 1H), 5.56 (s, 1H), 3.63 (s, 2H), 2.52 (d, J = 1.2 Hz, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 199.6, 184.0, 156.7, 149.8, 146.4, 143.3, 142.6, 139.4, 138.2, 138.0, 130.2, 129.24 (2C), 129.20, 128.57, 128.54 (3C), 128.1, 127.7, 127.3, 126.3, 126.1, 124.9, 124.0, 122.9, 37.1, 21.3. **HRMS (ESI):** *m/z* calcd for $C_{28}H_{22}NaO_2S$ $(M+Na)^+$: 445.1238. Found: 445.1225.

8a-Methyl-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8b).

This compound was prepared by following the general procedure-4 and isolated as white solid.

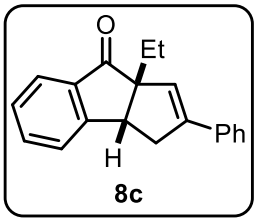


8b

30 mg of **7b** afforded 15 mg of **8b** (53% yield). R_f = 0.7 (hexane/EtOAc = 19/1). M.P = 76-78 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3028, 2922, 1712, 1651, 1508, 1286, 979, 755. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.74 (d, *J* = 7.6 Hz, 1H), 7.63 (t, *J* = 7.5 Hz, 1H), 7.53 (d, *J* = 7.6 Hz, 1H), 7.40 – 7.36 (m, 3H), 7.29 – 7.19 (m, 3H), 6.04 (s, 1H), 3.66 (d, *J* = 9.6 Hz, 1H), 3.52 (ddd, *J* = 16.3, 9.7, 2.3 Hz, 1H), 2.89 (d, *J* = 16.4 Hz, 1H), 1.48 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.7, 157.0, 141.1, 135.3 (2C), 135.1, 128.5, 128.3 (2C), 127.9, 127.8, 126.0, 125.8 (2C), 124.3, 65.0, 48.7, 38.9, 20.2. **HRMS (ESI):** *m/z* calcd for $C_{19}H_{17}O$ $(M+H)^+$: 261.1279. Found: 261.1277.

8a-Ethyl-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8c).

This compound was prepared by following the general procedure-4 and isolated as pale-yellow

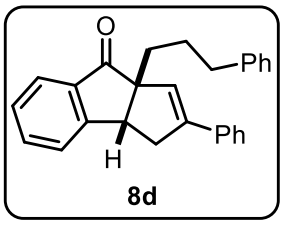


8c

liquid. 40 mg of **7c** afforded 24 mg of **8c** (63% yield). R_f = 0.6 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3057, 2962, 1704, 1603, 1493, 1279, 992, 793. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.73 (d, *J* = 7.6 Hz, 1H), 7.62 (t, *J* = 7.4 Hz, 1H), 7.54 (d, *J* = 7.6 Hz, 1H), 7.38 – 7.35 (m, 3H), 7.29 – 7.19 (m, 3H), 6.00 (s, 1H), 3.77 (d, *J* = 9.4 Hz, 1H), 3.47 (ddd, *J* = 16.5, 9.8, 2.2 Hz, 1H), 2.87 (d, *J* = 16.5 Hz, 1H), 1.98 – 1.86 (m, 2H), 0.92 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.7, 157.5, 141.8, 135.7, 135.3, 135.2, 128.3 (2C), 127.8 (2C), 127.3, 126.0, 125.8 (2C), 124.1, 70.1, 45.5, 39.4, 26.9, 9.4. **HRMS (ESI):** *m/z* calcd for $C_{20}H_{19}O$ $(M+H)^+$: 275.1436. Found: 275.1433.

2-Phenyl-8a-(3-phenylpropyl)-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8d).

This compound was prepared by following the general procedure-4 and isolated as pale-yellow



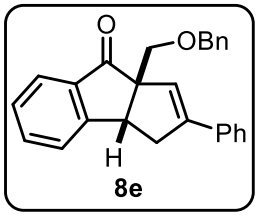
8d

solid. 32 mg of **7d** afforded 19 mg of **8d** (62% yield). R_f = 0.6 (hexane/EtOAc = 19/1). M.P = 115-117 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3027, 2852, 1706, 1603, 1452, 1281, 963, 751. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.71 (d, *J* = 7.6 Hz, 1H), 7.61 (td, *J* = 7.7, 1.1 Hz, 1H), 7.51 (d, *J* = 7.6 Hz, 1H), 7.38 – 7.34 (m, 3H), 7.28 – 7.18 (m, 5H), 7.16 – 7.13 (m, 3H), 6.00 (s, 1H), 3.75 (d, *J* = 8.6 Hz, 1H), 3.45 (ddd, *J* = 16.5, 9.8, 2.4 Hz, 1H), 2.85 (dt, *J* = 16.5, 1.6 Hz, 1H), 2.63 (t, *J* = 7.6 Hz, 2H), 2.01 – 1.88 (m, 2H), 1.73 – 1.54 (m, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.6, 157.4, 142.1, 141.7, 135.5, 135.3, 135.2,

128.44 (2C), 128.40 (2C), 128.3 (2C), 127.9, 127.8, 127.2, 126.0, 125.8 (3C), 124.2, 69.4, 45.9, 39.4, 36.4, 33.9, 27.3. **HRMS (ESI):** *m/z* calcd for $C_{27}H_{24}NaO$ $(M+Na)^+$: 387.1725. Found: 387.1725.

8a-((Benzyloxy)methyl)-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8e).

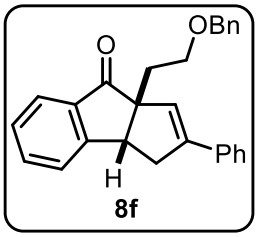
This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 49 mg of **7e** afforded 21 mg of **8e** (46% yield). R_f = 0.5 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3057, 2855, 1708, 1604, 1494, 1283, 958, 750. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.75 (d, *J* = 7.6 Hz, 1H), 7.64 – 7.61 (m, 1H), 7.55 (d, *J* = 7.6 Hz, 1H), 7.39 – 7.35 (m, 3H), 7.31 – 7.19 (m, 8H), 5.93 (s, 1H), 4.55 (d, J_{AB} = 12.3 Hz, 1H), 4.50 (d, J_{AB} = 12.3 Hz, 1H), 4.10 – 4.06 (m, 2H), 3.65 (d, *J* = 9.2 Hz, 1H), 3.51 (ddd, *J* = 16.5, 9.8, 2.4 Hz, 1H), 2.90 (d, *J* = 16.5 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 205.7, 157.8, 143.7, 138.2, 135.6, 135.3, 135.1, 128.4 (2C), 128.3 (2C), 128.0, 127.8, 127.57 (2C), 127.55, 126.0, 125.8 (2C), 124.2, 123.7, 73.4, 71.1, 70.5, 44.4, 39.0. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{23}O_2$ $(M+H)^+$: 367.1698. Found: 367.1694.



8e

8a-(2-(Benzyloxy)ethyl)-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8f).

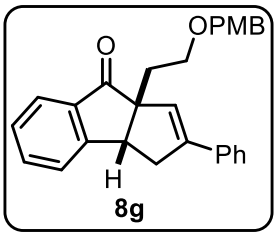
This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 40 mg of **7f** afforded 25 mg of **8f** (65% yield). R_f = 0.4 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3030, 2916, 1706, 1604, 1455, 1219, 963, 750. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.73 (d, *J* = 7.6 Hz, 1H), 7.63 (td, *J* = 7.6, 1.1 Hz, 1H), 7.51 (d, *J* = 7.6 Hz, 1H), 7.39 – 7.35 (m, 3H), 7.30 – 7.20 (m, 6H), 7.14 – 7.12 (m, 2H), 5.99 (s, 1H), 4.41 – 4.34 (m, 2H), 3.99 (d, *J* = 9.2 Hz, 1H), 3.60 (t, *J* = 6.3 Hz, 2H), 3.47 (ddd, *J* = 16.5, 9.8, 2.4 Hz, 1H), 2.83 (d, *J* = 16.4, 1.4 Hz, 1H), 2.27 – 2.23 (m, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.2, 157.7, 142.3, 138.2, 135.3, 135.2 (2C), 128.3 (2C), 128.2 (2C), 127.9, 127.7, 127.5 (2C), 127.4, 126.8, 126.0, 125.8 (2C), 124.2, 73.2, 68.0, 67.6, 46.4, 39.3, 33.6. **HRMS (ESI):** *m/z* calcd for $C_{27}H_{25}O_2$ $(M+H)^+$: 403.1674. Found: 403.1663.



8f

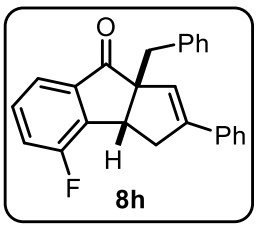
8a-(2-((4-Methoxybenzyl)oxy)ethyl)-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8g).

This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 50 mg of **7g** afforded 38 mg of **8g** (78% yield). R_f = 0.4 (hexane/EtOAc = 9/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3052, 2854, 1705, 1606, 1463, 1279, 896, 735. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.72 (d, *J* = 7.6 Hz, 1H), 7.60 – 7.60 (m, 1H), 7.50 (d, *J* = 7.6 Hz, 1H), 7.38 – 7.35 (m, 3H), 7.29 – 7.19 (m, 3H), 7.05 (d, *J* = 8.5 Hz, 2H), 6.75 (d, *J* = 8.6 Hz, 2H), 5.98 (s, 1H), 4.32 (d, J_{AB} = 11.4 Hz, 1H), 4.28 (d, J_{AB} = 11.4 Hz, 1H), 3.97 (d, *J* = 9.2 Hz, 1H), 3.76 (s, 3H), 3.56 (t, *J* = 6.2 Hz, 2H), 3.45 (ddd, *J* = 16.4, 9.7, 2.3 Hz, 1H), 2.82 (d, *J* = 16.4 Hz, 1H), 2.27 – 2.18 (m, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.2, 159.0, 157.8, 142.2, 135.32, 135.30, 135.2, 130.3, 129.2 (2C), 128.3 (2C), 127.8, 127.7, 126.9, 126.0, 125.8 (2C), 124.2, 113.6 (2C), 72.8, 68.0, 67.3, 55.2, 46.4, 39.3, 33.6. **HRMS (ESI):** *m/z* calcd for $C_{28}H_{26}NaO_3$ $(M+Na)^+$: 433.1780. Found: 433.1764.



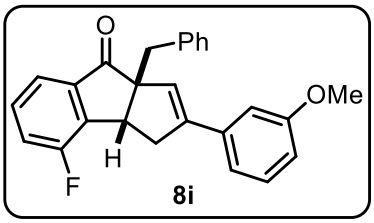
8a-Benzyl-4-fluoro-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8h).

This compound was prepared by following the general procedure-4 and isolated as white solid. 30 mg of **7h** afforded 26 mg of **8h** (90% yield). R_f = 0.5 (hexane/EtOAc = 20/1). M.P = 118-120 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3029, 2852, 1714, 1616, 1479, 1265, 914, 752. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.53 (d, *J* = 7.4 Hz, 1H), 7.36 – 7.31 (m, 3H), 7.28 – 7.21 (m, 4H), 7.20 – 7.12 (m, 5H), 6.08 (s, 1H), 3.92 (d, *J* = 7.5 Hz, 1H), 3.23 (d, J_{AB} = 13.7 Hz, 1H), 3.18 (d, J_{AB} = 13.7 Hz, 1H), 2.99 (ddd, *J* = 16.9, 9.6, 2.5 Hz, 1H), 2.84 (d, *J* = 16.7 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 205.7 (d, *J* = 2.7 Hz, 1C), 160.1 (d, *J* = 248.9 Hz, 1C), 143.0, 142.2 (d, *J* = 17.2 Hz, 1C), 138.2 (d, *J* = 14.7 Hz, 1C), 137.5, 135.0, 129.9 (2C), 129.89, 129.82, 128.4 (2C), 128.2 (2C), 128.0, 126.4 (d, *J* = 4.3 Hz, 1C), 125.9 (2C), 121.5 (d, *J* = 20.0 Hz, 1C), 120.0 (d, *J* = 3.8 Hz, 1C), 70.6, 41.8, 39.6, 37.6. **^{19}F NMR (376.4 MHz, $CDCl_3$):** δ –118.94. **HRMS (ESI):** *m/z* calcd for $C_{25}H_{19}FNaO$ $(M+Na)^+$: 377.1318. Found: 377.1315.



8a-Benzyl-4-fluoro-2-(3-methoxyphenyl)-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8i).

This compound was prepared by following the general procedure-4 and isolated as white solid. 40 mg of **7i** afforded 32 mg of **8i** (83% yield). R_f = 0.4 (hexane/EtOAc = 19/1). M.P = 125-127 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3029, 2848, 1711, 1601, 1478, 1264, 1045, 758. **^{1}H NMR**

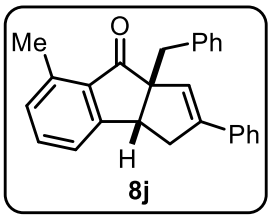


8i

(400 MHz, $CDCl_3$): δ 7.53 (d, *J* = 7.4 Hz, 1H), 7.35 – 7.30 (m, 1H), 7.24 – 7.13 (m, 7H), 6.91 (d, *J* = 7.7 Hz, 1H), 6.84 (s, 1H), 6.77 (dd, *J* = 8.1, 2.1 Hz, 1H), 6.07 (s, 1H), 3.91 (d, *J* = 8.6 Hz, 1H), 3.77 (s, 3H), 3.22 (d, J_{AB} = 12.3 Hz, 1H), 3.18 (d, J_{AB} = 12.3 Hz, 1H), 2.98 (ddd, *J* = 16.9, 9.6, 2.3 Hz, 1H), 2.82 (d, *J* = 16.8 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 205.7 (d, *J* = 2.6 Hz, 1C), 160.1 (d, *J* = 249.0 Hz, 1C), 159.5, 142.9, 142.2 (d, *J* = 17.1 Hz, 1C), 138.2 (d, *J* = 4.6 Hz, 1C), 137.4, 136.4, 129.9 (2C), 129.8, 129.3, 128.2 (2C), 126.8, 126.5, 121.5 (d, *J* =20.1 Hz, 1C), 120.0 (d, *J* = 3.7 Hz, 1C), 118.4, 113.6, 111.4, 70.5, 55.2, 41.8, 39.6, 37.6. **^{19}F NMR (376.4 MHz, $CDCl_3$):** δ –118.91. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{21}FO_2$ $(M)^+$: 384.1526. Found: 384.1505.

8a-Benzyl-7-methyl-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8j).

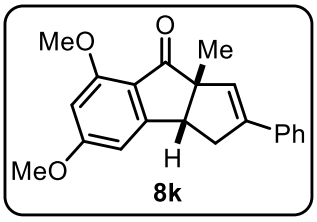
This compound was prepared by following the general procedure-4 and isolated as pale-yellow solid. 30 mg of **7j** afforded 22 mg of **8j** (76% yield). R_f = 0.6 (hexane/EtOAc = 19/1). M.P = 121-123 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3028, 2922, 1702, 1594, 1494, 1260, 937, 757. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.41 (t, *J* = 7.5 Hz, 1H), 7.31 – 7.29 (m, 2H), 7.26 – 7.22 (m, 3H), 7.21 – 7.16 (m, 5H), 7.15 – 7.11 (m, 1H), 7.07 (d, *J* = 7.3 Hz, 1H), 6.10 (s, 1H), 3.73 (d, *J* = 9.0 Hz, 1H), 3.18 (q, *J* = 13.6 Hz, 2H), 2.90 (ddd, *J* = 16.4, 9.4, 2.4 Hz, 1H), 2.69 (d, *J* = 16.4 Hz, 1H), 2.64 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.9, 158.0, 142.6, 139.2, 138.1, 135.3, 134.4, 132.7, 129.9 (2C), 129.6, 128.3 (2C), 128.0 (2C), 127.8, 127.7, 126.2, 125.8 (2C), 123.2, 70.2, 44.4, 39.8, 39.3, 18.4. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{23}O$ $(M+H)^+$: 351.1749. Found: 351.1740.



8j

5,7-Dimethoxy-8a-methyl-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8k).

This compound was prepared by following the general procedure-4 and isolated as pale-yellow solid. 50 mg of **7k** afforded 24 mg of **8k** (55% yield). R_f = 0.4 (hexane/EtOAc = 8/2). M.P = 103-105 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3053, 2844, 1692, 1587, 1458, 1215, 968, 755. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.37 – 7.35 (m, 2H), 7.29 – 7.25 (m, 2H), 7.22 – 7.18 (m, 1H), 6.55 (s, 1H), 6.30 (s, 1H), 6.09 (s, 1H), 3.89 (s, 3H), 3.88 (s, 3H), 3.55 – 3.43 (m, 2H), 2.86 (d, *J* = 15.8 Hz, 1H), 1.43 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 204.1, 167.4, 162.2, 159.7, 140.4, 135.5, 129.3, 128.3 (2C), 127.6, 125.7 (2C), 117.1, 101.2, 97.7, 65.3,

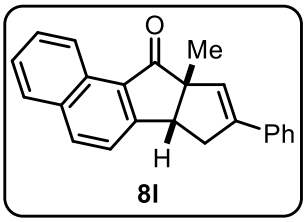


8k

55.79, 55.76, 48.6, 39.0, 20.5. **HRMS (ESI):** *m/z* calcd for $C_{21}H_{21}O_3$ $(M+H)^+$: 321.1491. Found: 321.1508.

9a-Methyl-8-phenyl-7,9a-dihydropentaleno[2,1-*a*]naphthalen-10(6*bH*)-one (8l).

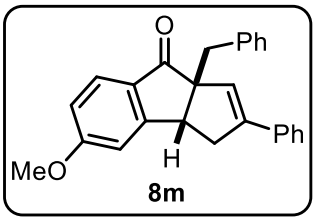
This compound was prepared by following the general procedure-4 and isolated as pale-yellow solid. 30 mg of **7l** afforded 20 mg of **8l** (70% yield). R_f = 0.5 (hexane/EtOAc = 19/1). M.P = 129-131 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 2957, 2869, 1695, 1461, 1150, 968. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 9.16 (d, *J* = 8.4 Hz, 1H), 8.08 (d, *J* = 8.4 Hz, 1H), 7.86 (d, *J* = 8.1 Hz, 1H), 7.68 – 7.64 (m, 1H), 7.59 – 7.51 (m, 2H), 7.37 – 7.35 (m, 2H), 7.27 – 7.17 (m, 3H), 6.13 (s, 1H), 3.74 (dd, *J* = 10.0, 2.1 Hz, 1H), 3.54 (ddd, *J* = 16.5, 10.0, 2.3 Hz, 1H), 2.93 (dt, *J* = 16.5, 2.0 Hz, 1H), 1.54 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 208.5, 159.4, 140.6, 136.4, 135.3, 133.0, 129.6, 129.05, 129.01, 128.8, 128.3 (2C), 128.1, 127.8, 126.6, 125.7 (2C), 124.1, 123.2, 65.2, 48.7, 38.2, 20.4. **HRMS (ESI):** *m/z* calcd for $C_{23}H_{18}NaO$ $(M+Na)^+$: 333.1255. Found: 333.1253.



8l

8a-Benzyl-5-methoxy-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8m).

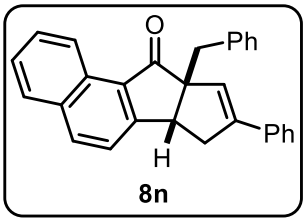
This compound was prepared by following the general procedure-4 and isolated as white solid. 30 mg of **7m** afforded 22 mg of **8m** (76% yield). R_f = 0.5 (hexane/EtOAc = 9/1). M.P = 124-126 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3028, 2921, 1697, 1596, 1447, 1252, 971, 752. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.66 (d, *J* = 8.1 Hz, 1H), 7.32 – 7.30 (m, 2H), 7.27 – 7.23 (m, 2H), 7.22 – 7.20 (m, 1H), 7.18 – 7.16 (m, 4H), 7.15 – 7.11 (m, 1H), 6.88 – 6.86 (m, 2H), 6.13 (s, 1H), 3.84 (s, 3H), 3.74 (d, *J* = 9.2 Hz, 1H), 3.21 (d, J_{AB} = 13.6 Hz, 1H), 3.16 (d, J_{AB} = 13.6 Hz, 1H), 2.95 (ddd, *J* = 16.4, 9.6, 2.4 Hz, 1H), 2.71 (d, *J* = 16.4 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 205.3, 165.8, 160.1, 142.2, 138.0, 135.3, 129.9 (2C), 128.5, 128.3 (2C), 128.0 (2C), 127.8, 127.7, 126.2, 125.9, 125.8 (2C), 115.6, 109.2, 70.7, 55.6, 44.9, 39.7, 38.9. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{22}NaO_2$ $(M+Na)^+$: 389.1517. Found: 389.1518.



8m

9a-Benzyl-8-phenyl-7,9a-dihydropentaleno[2,1-*a*]naphthalen-10(6*bH*)-one (8n).

This compound was prepared by following the general procedure-4 and isolated as white solid.

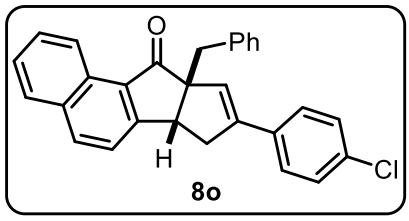


8n

40 mg of **7n** afforded 27 mg of **8n** (70% yield). R_f = 0.7 (hexane/EtOAc = 19/1). M.P = 136-138 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3028, 2849, 1691, 1626, 1439, 1210, 933, 757. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 9.18 (d, *J* = 8.3 Hz, 1H), 8.03 (d, *J* = 8.4 Hz, 1H), 7.83 (d, *J* = 8.1 Hz, 1H), 7.66 (t, *J* = 8.1 Hz, 1H), 7.54 – 7.48 (m, 2H), 7.31 – 7.29 (m, 2H), 7.25 – 7.15 (m, 7H), 7.14 – 7.10 (m, 1H), 6.20 (s, 1H), 3.87 (dd, *J* = 9.7, 1.6 Hz, 1H), 3.30 (d, J_{AB} = 13.7 Hz, 1H), 3.25 (d, J_{AB} = 13.7 Hz, 1H), 3.01 (ddd, *J* = 16.5, 9.8, 2.4 Hz, 1H), 2.78 (d, *J* = 16.5 Hz, 1H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 207.7, 159.6, 142.1, 138.1, 136.4, 135.3, 132.9, 129.9 (2C), 129.5, 129.1, 129.0, 128.3 (2C), 128.1 (3C), 127.9, 127.8, 126.6, 126.2, 125.8 (2C), 124.2, 123.2, 70.6, 45.0, 39.8, 38.3. **HRMS (ESI):** *m/z* calcd for $C_{29}H_{22}NaO$ $(M+Na)^+$: 409.1568. Found: 409.1566.

9a-Benzyl-8-(4-chlorophenyl)-7,9a-dihydropentaleno[2,1-*a*]naphthalen-10(6*bH*)-one (8o).

This compound was prepared by following the general procedure-4 and isolated as white solid.

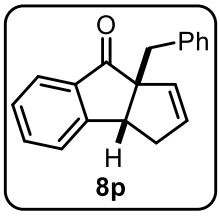


8o

40 mg of **7o** afforded 24 mg of **8o** (62% yield). R_f = 0.7 (hexane/EtOAc = 19/1). M.P = 121-123 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3029, 2849, 1691, 1626, 1492, 1265, 931, 736. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 9.17 (d, *J* = 8.3 Hz, 1H), 8.04 (d, *J* = 8.4 Hz, 1H), 7.84 (d, *J* = 8.1 Hz, 1H), 7.69 – 7.65 (m, 1H), 7.55 – 7.48 (m, 2H), 7.22 – 7.10 (m, 9H), 6.18 (s, 1H), 3.88 (dd, *J* = 9.8, 1.8 Hz, 1H), 3.27 (s, 2H), 2.96 (ddd, *J* = 16.5, 9.8, 2.4 Hz, 1H), 2.73 (dt, *J* = 16.4, 1.6 Hz, 1H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 207.4, 159.5, 141.0, 138.0, 136.5, 133.8, 133.5, 132.9, 129.9 (2C), 129.5, 129.1, 129.0, 128.6, 128.4 (2C), 128.18, 128.15 (2C), 127.0 (2C), 126.7, 126.3, 124.1, 123.1, 70.6, 45.0, 39.8, 38.3. **HRMS (ESI):** *m/z* calcd for $C_{29}H_{21}ClNaO$ $(M+Na)^+$: 443.1179. Found: 443.1187.

8a-Benzyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8p).

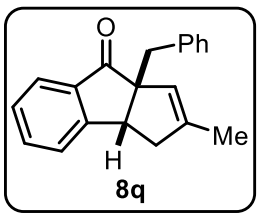
This compound was prepared by following the general procedure-4 and isolated as pale-yellow solid. 40 mg of **7p** afforded 7 mg of **8p** (18% yield). R_f = 0.6 (hexane/EtOAc = 19/1). M.P = 81-83 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 2925, 1712, 1651, 1458, 1283, 762. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 7.71 (d, *J* = 7.6 Hz, 1H), 7.57 (t, *J* = 7.6 Hz, 1H), 7.40 – 7.33 (m, 2H), 7.23



– 7.15 (m, 5H), 5.68 – 5.66 (m, 1H), 5.55 – 5.53 (m, 1H), 3.69 (d, J = 9.2 Hz, 1H), 3.15 (d, J_{AB} = 13.6 Hz, 1H), 3.10 (d, J_{AB} = 13.6 Hz, 1H), 2.62 – 2.55 (m, 1H), 2.37 – 2.31 (m, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.4, 157.3, 138.0, 135.2, 135.1, 133.1, 131.5, 130.0 (2C), 128.0 (2C), 127.7, 126.2, 125.9, 124.0, 70.2, 45.2, 39.4, 38.7. **HRMS (ESI):** *m/z* calcd for $C_{19}H_{16}NaO$ $(M+Na)^+$: 283.1099. Found: 283.1095.

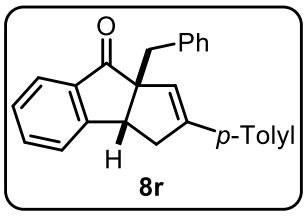
8a-Benzyl-2-methyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8q).

This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 25 mg of **7q** afforded 14 mg of **8q** (59% yield). R_f = 0.7 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3031, 2913, 1709, 1605, 1328, 940, 702. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.70 (d, J = 7.6 Hz, 1H), 7.56 (td, J = 7.7, 1.0 Hz, 1H), 7.38 – 7.32 (m, 2H), 7.21 – 7.12 (m, 5H), 5.30 (s, 1H), 3.64 (d, J = 9.1 Hz, 1H), 3.10 (d, J_{AB} =13.6 Hz, 1H), 3.06 (d, J_{AB} =13.6 Hz, 1H), 2.50 (dd, J = 16.8, 9.5 Hz, 1H), 2.17 (d, J = 16.8 Hz, 1H), 1.56 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.9, 157.3, 141.7, 138.2, 135.4, 135.0, 130.0 (2C), 127.9 (2C), 127.6, 127.0, 126.1, 125.8, 123.9, 70.0, 45.8, 42.6, 39.5, 16.5. **HRMS (ESI):** *m/z* calcd for $C_{20}H_{18}NaO$ $(M+Na)^+$: 297.1255. Found: 297.1253.



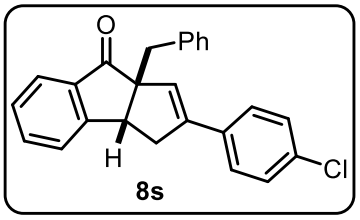
8a-Benzyl-2-(*p*-tolyl)-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8r).

This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 30 mg of **7r** afforded 21 mg of **8r** (72% yield). R_f = 0.7 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3029, 2850, 1705, 1603, 1494, 1280, 937, 738. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.72 (d, J = 7.6 Hz, 1H), 7.56 (t, J = 7.4 Hz, 1H), 7.43 (d, J = 7.6 Hz, 1H), 7.34 (t, J = 7.4 Hz, 1H), 7.24 – 7.20 (m, 1H), 7.17 – 7.18 (m, 5H), 7.14 – 7.10 (m, 1H), 7.05 (d, J = 7.8 Hz, 2H), 6.04 (s, 1H), 3.77 (d, J = 9.3 Hz, 1H), 3.19 (s, 2H), 2.96 – 2.90 (m, 1H), 2.69 (d, J = 16.4 Hz, 1H), 2.29 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.1, 157.2, 142.6, 138.0, 137.7, 135.4, 135.2, 132.5, 129.9 (2C), 129.0 (2C), 128.0 (2C), 127.8, 126.4, 126.2, 125.9, 125.7 (2C), 124.1, 70.3, 45.0, 39.6, 39.1, 21.1. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{23}O$ $(M+H)^+$: 351.1749. Found: 351.1747.



8a-Benzyl-2-(4-chlorophenyl)-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8s).

This compound was prepared by following the general procedure-4 and isolated as white solid.

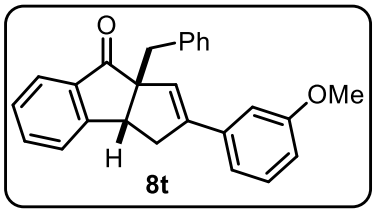


8s

40 mg of **7s** afforded 31 mg of **8s** (80% yield). R_f = 0.7 (hexane/EtOAc = 19/1). M.P = 146-148 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3030, 2849, 1707, 1651, 1493, 1281, 963, 757. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.73 (d, *J* = 7.6 Hz, 1H), 7.58 (td, *J* = 7.6, 1.0 Hz, 1H), 7.43 (d, *J* = 7.7 Hz, 1H), 7.35 (t, *J* = 7.4 Hz, 1H), 7.22 (s, 4H), 7.19 – 7.13 (m, 5H), 6.08 (s, 1H), 3.80 (d, *J* = 9.2 Hz, 1H), 3.20 (s, 2H), 2.92 (ddd, *J* = 16.4, 9.5, 2.6 Hz, 1H), 2.67 (d, *J* = 16.4 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 206.7, 157.0, 141.6, 137.8, 135.39, 135.31, 133.7, 133.6, 129.9 (2C), 128.5 (2C), 128.1 (2C), 128.0, 127.9, 127.0 (2C), 126.3, 125.9, 124.2, 70.5, 45.0, 39.6, 39.0. **HRMS (ESI):** *m/z* calcd for $C_{25}H_{19}ClNaO$ $(M+Na)^+$: 393.1022. Found: 393.1012.

8a-Benzyl-2-(3-methoxyphenyl)-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8t).

This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid.

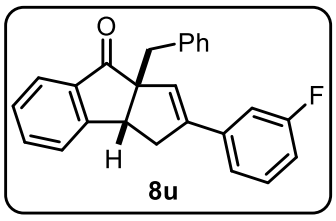


8t

29 mg of **7t** afforded 21 mg of **8t** (74% yield). R_f = 0.5 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3027, 2852, 1706, 1603, 1494, 1281, 963, 751. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.72 (d, *J* = 7.6 Hz, 1H), 7.57 (t, *J* = 7.4 Hz, 1H), 7.43 (d, *J* = 7.6 Hz, 1H), 7.34 (t, *J* = 7.4 Hz, 1H), 7.19 – 7.18 (m, 5H), 7.16 – 7.13 (m, 1H), 6.89 (d, *J* = 7.7 Hz, 1H), 6.83 (s, 1H), 6.77 – 6.74 (m, 1H), 6.10 (s, 1H), 3.78 (d, *J* = 8.6 Hz, 1H), 3.76 (s, 3H), 3.20 (s, 2H), 2.95 (ddd, *J* = 16.4, 9.5, 2.1 Hz, 1H), 2.70 (d, *J* = 16.4 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.0, 159.5, 157.1, 142.6, 137.9, 136.7, 135.37, 135.30, 129.9 (2C), 129.3, 128.1 (2C), 127.8, 127.7, 126.3, 125.95, 124.1, 118.4, 113.4, 111.4, 70.4, 55.2, 44.9, 39.6, 39.1. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{22}NaO_2$ $(M+Na)^+$: 389.1517. Found: 389.1514.

8a-Benzyl-2-(3-fluorophenyl)-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8u).

This compound was prepared by following the general procedure-4 and isolated as pale-yellow solid.



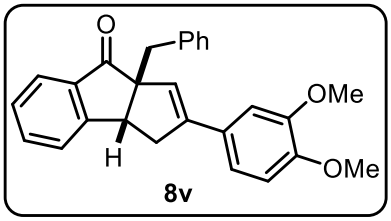
8u

40 mg of **7u** afforded 29 mg of **8u** (75% yield). R_f = 0.6 (hexane/EtOAc = 19/1). M.P = 109-111 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3064, 2849, 1706, 1605, 1491, 1222, 965, 755. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.73 (d, *J* = 7.6 Hz, 1H), 7.58 (td, *J* = 7.6, 1.1 Hz, 1H), 7.44 (d, *J* = 8.4 Hz, 1H), 7.35 (t, *J* = 7.4 Hz, 1H), 7.23

– 7.12 (m, 6H), 7.08 – 7.06 (m, 1H), 6.98 – 6.94 (m, 1H), 6.91 – 6.86 (m, 1H), 6.12 (s, 1H), 3.80 (d, *J* = 9.0 Hz, 1H), 3.20 (s, 2H), 2.93 (ddd, *J* = 16.4, 9.5, 2.4 Hz, 1H), 2.68 (dt, *J* = 16.4, 1.5 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 206.7, 162.8, 157.0, 141.7 (d, *J* = 2.4 Hz, 1C), 137.7, 137.5 (d, *J* = 7.5 Hz, 1C), 135.4, 135.3, 129.9 (2C), 129.8 (d, *J* = 8.2 Hz, 1C), 128.7, 128.1 (2C), 128.0, 126.4, 125.9, 124.2, 121.5 (d, *J* = 2.8 Hz, 1C), 114.6 (d, *J* = 20.4 Hz, 1C), 112.7 (d, *J* = 21.8 Hz, 1C), 70.4, 44.9, 39.6, 39.0. **^{19}F NMR (376.4 MHz, $CDCl_3$):** δ –113.25. **HRMS (ESI):** *m/z* calcd for $C_{25}H_{20}FO$ $(M+H)^+$: 355.1498. Found: 355.1498.

8a-Benzyl-2-(3,4-dimethoxyphenyl)-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8v).

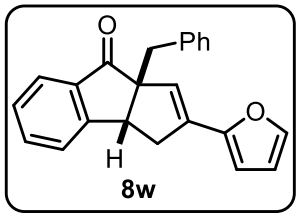
This compound was prepared by following the general procedure-4 and isolated as pale-yellow solid. 19 mg of **7v** afforded 10 mg of **8v** (54% yield). R_f = 0.3 (hexane/EtOAc = 8/2). M.P = 106-108 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3058, 2838, 1704, 1602, 1461, 1262, 938, 757. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.72 (d, *J* = 7.6 Hz, 1H), 7.56 (td, *J* = 8.0, 1.0 Hz, 1H), 7.43 (d, *J* = 8.3 Hz, 1H), 7.33 (t, *J* = 7.4 Hz, 1H), 7.19 – 7.17 (m, 4H), 7.15 – 7.10 (m, 1H), 6.88 (d, *J* = 1.8 Hz, 1H), 6.81 (dd, *J* = 8.3, 1.9 Hz, 1H), 6.73 (d, *J* = 8.4 Hz, 1H), 5.99 (s, 1H), 3.84 (s, 3H), 3.82 (s, 3H), 3.78 (d, *J* = 9.1 Hz, 1H), 3.24 (d, J_{AB} = 13.6 Hz, 1H), 3.18 (d, J_{AB} = 13.6 Hz, 1H), 2.97 (ddd, *J* = 16.3, 9.5, 2.4 Hz, 1H), 2.68 (d, *J* = 16.3 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.2, 157.2, 149.0, 148.7, 142.3, 138.0, 135.4, 135.2, 129.9 (2C), 128.3, 128.1 (2C), 127.8, 126.3, 125.9, 125.6, 124.1, 118.5, 110.7, 108.8, 70.3, 55.9, 55.8, 44.9, 39.6, 39.2. **HRMS (ESI):** *m/z* calcd for $C_{27}H_{25}O_3$ $(M+H)^+$: 397.1804. Found: 397.1811.



8v

8a-Benzyl-2-(furan-2-yl)-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8w).

This compound was prepared by following the general procedure-4 and isolated as brown liquid. 50 mg of **7w** afforded 30 mg of **8w** (62% yield). R_f = 0.7 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3061, 2922, 1700, 1604, 1495, 1373, 1245, 846. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.71 (d, *J* = 7.6 Hz, 1H), 7.56 (td, *J* = 7.5, 1.1 Hz, 1H), 7.41 (d, *J* = 8.4 Hz, 1H), 7.34 (t, *J* = 7.4 Hz, 1H), 7.29 (d, *J* = 1.4 Hz, 1H), 7.22 – 7.16 (m, 4H), 7.15 – 7.11 (m, 1H), 6.29 (dd, *J* = 3.3, 1.8 Hz, 1H), 6.13 (d, *J* = 3.3 Hz, 1H), 5.99 (s, 1H), 3.76 (d, *J* = 9.0 Hz, 1H), 3.22 (d, J_{AB} = 13.7 Hz, 1H), 3.16 (d, J_{AB} = 13.7 Hz, 1H), 2.87 (ddd, *J* = 16.3, 9.4, 2.4 Hz, 1H), 2.62 (dt, *J* = 16.3, 1.5 Hz, 1H). **^{13}C NMR (100 MHz,**

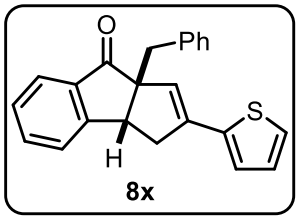


8w

$CDCl_3$): δ 206.6, 156.8, 150.8, 142.3, 137.9, 135.3, 135.2, 132.8, 129.9 (2C), 128.1 (2C), 127.9, 126.3, 125.9, 125.8, 124.2, 111.0, 107.5, 70.4, 45.0, 39.5, 38.1. **HRMS (ESI):** *m/z* calcd for $C_{23}H_{19}O_2$ $(M+H)^+$: 327.1385. Found: 327.1362.

8a-Benzyl-2-(thiophen-2-yl)-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8x).

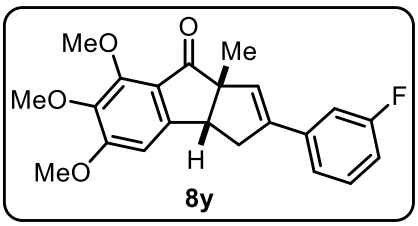
This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 50 mg of **7x** afforded 23 mg of **8x** (51% yield). R_f = 0.7 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3065, 2919, 2849, 1705, 1602, 1462, 1326, 1213, 851. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.72 (d, *J* = 7.6 Hz, 1H), 7.57 (t, *J* = 7.5 Hz, 1H), 7.42 (d, *J* = 7.7 Hz, 1H), 7.34 (t, *J* = 7.3 Hz, 1H), 7.21 – 7.12 (m, 6H), 6.89 (t, *J* = 3.8 Hz, 1H), 6.84 (d, *J* = 3.5 Hz, 1H), 5.94 (s, 1H), 3.77 (d, *J* = 9.2 Hz, 1H), 3.19 (s, 2H), 2.94 (ddd, *J* = 16.3, 9.5, 2.2 Hz, 1H), 2.70 (d, *J* = 16.3 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 206.6, 156.8, 139.4, 137.8, 136.8, 135.3 (2C), 129.9 (2C), 128.1 (2C), 127.9, 127.2, 126.6, 126.3, 125.9, 125.0, 124.6, 124.2, 70.4, 45.1, 39.9, 39.6. **HRMS (ESI):** *m/z* calcd for $C_{23}H_{19}OS$ $(M+H)^+$: 343.1157. Found: 343.1133.



8x

2-(3-Fluorophenyl)-5,6,7-trimethoxy-8a-methyl-3a,8a-dihydrocyclopenta[*a*]inden-8(*3H*)-one (8y).

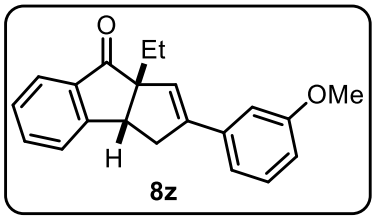
This compound was prepared by following the general procedure-4 and isolated as pale-yellow solid. 48 mg of **7y** afforded 25 mg of **8y** (54% yield). R_f = 0.6 (hexane/EtOAc = 7/3). M.P = 142-144 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3067, 2866, 1697, 1481, 1149, 914, 819. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.25 – 7.21 (m, 1H), 7.17 – 7.13 (m, 1H), 7.06 – 7.03(m, 1H), 6.94 – 6.87 (m, 1H), 6.73 (s, 1H), 6.10 (s, 1H), 4.04 (s, 3H), 3.96 (s, 3H), 3.83 (s, 3H), 3.56 – 3.53 (m, 1H), 3.44 (ddd, *J* = 16.0, 9.7, 2.2 Hz, 1H), 2.83 (dt, *J* = 16.1, 1.48 Hz, 1H), 1.44 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 203.7, 162.8 (d, *J* = 243.6 Hz, 1C), 160.2, 154.9, 151.8, 141.1, 139.5 (d, *J* = 2.5 Hz, 1C), 137.6 (d, *J* = 7.5 Hz, 1C), 130.5, 129.8 (d, *J* = 7.5 Hz, 1C), 121.4 (d, *J* = 2.7 Hz, 1C), 120.6, 114.5 (d, *J* = 21.2 Hz, 1C), 112.6 (d, *J* = 21.8 Hz, 1C), 103.0, 65.5, 61.9, 61.4, 56.3, 48.2, 39.0, 20.4. **^{19}F NMR (376.4 MHz, $CDCl_3$):** δ –113.34. **HRMS (ESI):** *m/z* calcd for $C_{22}H_{21}FNaO_4$ $(M+Na)^+$: 391.1322. Found: 391.1300.



8y

8a-Ethyl-2-(3-methoxyphenyl)-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8z).

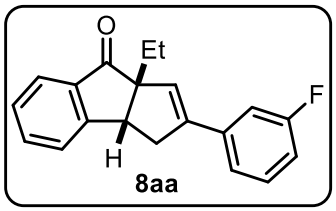
This compound was prepared by following the general procedure-4 and isolated as pale-yellow solid. 40 mg of **7z** afforded 23 mg of **8z** (61% yield). M.P = 94-96 °C. R_f = 0.4 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3068, 2852, 1705, 1606, 1488, 1275, 965, 778. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.73 (d, *J* = 7.6 Hz, 1H), 7.63 (td, *J* = 7.7, 1.1 Hz, 1H), 7.55 – 7.53 (m, 1H), 7.37 (t, *J* = 7.4 Hz, 1H), 7.19 (t, *J* = 7.9 Hz, 1H), 6.97 (d, *J* = 7.8 Hz, 1H), 6.90 (t, *J* = 2.3 Hz, 1H), 6.77 (dd, *J* = 8.2, 2.4 Hz, 1H), 5.99 (s, 1H), 3.78 (s, 3H), 3.76 (d, *J* = 9.6 Hz, 1H), 3.46 (ddd, *J* = 16.5, 9.8, 2.4 Hz, 1H), 2.86 (dt, *J* = 16.5, 1.6 Hz, 1H), 1.93 (qd, *J* = 7.4, 3.1 Hz, 2H), 0.92 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.7, 159.5, 157.5, 141.7, 136.7, 135.7, 135.2, 129.3, 127.8, 127.7, 126.0, 124.1, 118.4, 113.4, 111.3, 70.1, 55.2, 45.4, 39.5, 26.9, 9.4. **HRMS (ESI):** *m/z* calcd for $C_{21}H_{21}O_2$ $(M+H)^+$: 305.1542. Found: 305.1546.



8z

8a-Ethyl-2-(3-fluorophenyl)-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8aa).

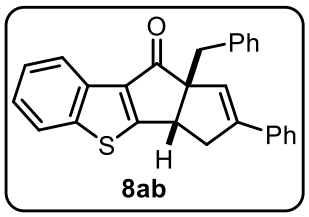
This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 40 mg of **7aa** afforded 24 mg of **8aa** (62% yield). R_f = 0.7 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3068, 2852, 1705, 1606, 1488, 1275, 965, 738. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.73 (d, *J* = 7.6 Hz, 1H), 7.64 (td, *J* = 8.0, 1.1 Hz, 1H), 7.54 (d, *J* = 8.4 Hz, 1H), 7.38 (t, *J* = 7.3 Hz, 1H), 7.25 – 7.20 (m, 1H), 7.15 (dt, *J* = 7.8, 1.2 Hz, 1H), 7.06 – 7.02 (m, 1H), 6.93 – 6.88 (m, 1H), 6.02 (s, 1H), 3.78 (d, *J* = 9.6 Hz, 1H), 3.44 (ddd, *J* = 16.4, 9.8, 2.4 Hz, 1H), 2.85 (dt, *J* = 16.6, 1.7 Hz, 1H), 1.93 (qd, *J* = 7.5, 1.7 Hz, 2H), 0.92 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.4, 162.8 (d, *J* = 243.8 Hz, 1C), 157.4, 140.8 (d, *J* = 2.3 Hz, 1C), 137.5 (d, *J* = 7.6 Hz, 1C), 135.6, 135.3, 129.8 (d, *J* = 8.2 Hz, 1C), 128.7, 127.9, 126.0, 124.2, 121.5 (d, *J* = 2.9 Hz, 1C), 114.5 (d, *J* = 21.1 Hz, 1C), 112.6 (d, *J* = 21.9 Hz, 1C), 70.1, 45.4, 39.4, 26.9, 9.4. **^{19}F NMR (376.4 MHz, $CDCl_3$):** δ –113.30. **HRMS (ESI):** *m/z* calcd for $C_{20}H_{18}FO$ $(M+H)^+$: 293.1342. Found: 293.1363.



8aa

9a-Benzyl-2-phenyl-3a,9a-dihydrobenzo[*b*]pentaleno[2,1-*d*]thiophen-9(3*H*)-one (8ab).

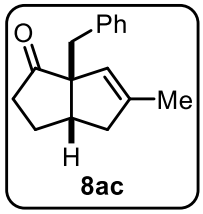
This compound was prepared by following the general procedure-4 and isolated as pale-yellow solid. 30 mg of **7ab** afforded 10 mg of **8ab** (34% yield). R_f = 0.7 (hexane/EtOAc = 19/1). M.P = 138-140 °C**. IR (thin film, neat):** ν_{max}/cm^{-1} 3058, 2849, 1693, 1494, 1268, 1054, 758. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 8.23 (d, *J* = 7.8 Hz, 1H), 7.76 (d, *J* = 8.1 Hz, 1H), 7.44 (td, *J* = 7.2, 1.0 Hz, 1H), 7.37 – 7.31 (m, 3H), 7.29 – 7.23 (m, 3H), 7.21 – 7.12 (m, 5H), 6.24 (s, 1H), 3.99 (dd, *J* = 9.9, 2.3 Hz, 1H), 3.32 (d, J_{AB} = 13.8 Hz, 1H), 3.21 (d, J_{AB} = 13.8 Hz, 1H), 2.96 (ddd, *J* = 16.6, 10.0, 2.5 Hz, 1H), 2.79 (dt, *J* = 16.1, 1.9 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 198.9, 176.6, 144.1, 141.6, 137.6, 137.1, 135.1, 131.5, 129.8 (2C), 128.4 (2C), 128.2 (2C), 128.0, 127.2, 126.4, 125.9, 125.8 (2C), 125.6, 123.2, 123.2, 76.6, 44.1, 39.8, 38.1. **HRMS (ESI):** *m/z* calcd for $C_{27}H_{20}SNaO$ $(M+Na)^+$: 415.1133. Found: 415.1134.



8ab

6a-Benzyl-5-methyl-3,3a,4,6a-tetrahydropentalen-1(2*H*)-one (8ac).

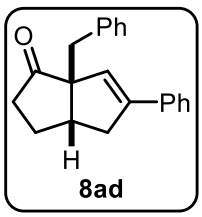
This compound was prepared by following the general procedure-4 and isolated as colourless liquid. 37 mg of **7ac** afforded 15 mg of **8ac** (41% yield). R_f = 0.5 (hexane/EtOAc = 40/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 2957, 2930, 1732, 1622, 1495, 1454, 1159, 1030, 702. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.24 – 7.15 (m, 3H), 7.10 – 7.08 (m, 2H), 5.12 (s, 1H), 3.01 (d, *J* = 13.2 Hz, 1H), 2.69 – 2.64 (m, 2H), 2.30 – 2.23 (m, 2H), 1.96 – 1.87 (m, 2H), 1.82 – 1.77 (m, 1H), 1.66 (s, 3H) 1.46 – 1.41 (m, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 220.7, 142.8, 137.9, 130.1 (2C), 127.9 (2C), 126.1 (2C), 68.5, 43.9, 42.3, 40.8, 38.3, 26.9, 16.5. **HRMS (ESI):** *m/z* calcd for $C_{16}H_{17}O$ $(M-H)^+$: 225.1279. Found: 225.1264.



8ac

6a-Benzyl-5-phenyl-3,3a,4,6a-tetrahydropentalen-1(2*H*)-one (8ad).

This compound was prepared by following the general procedure-4 and isolated as colourless liquid. 40 mg of **7ad** afforded 20 mg of **8ad** (52% yield). R_f = 0.5 (hexane/EtOAc = 9/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3028, 2927, 1732, 1599, 1494, 1454, 1163, 1029, 754, 693. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.41 – 7.39 (m, 2H), 7.35 – 7.32 (m, 2H), 7.29 – 7.25 (m, 2H), 7.24 – 7.20 (m, 2H), 7.16 – 7.14 (m, 2H), 5.96 (s, 1H), 3.16 (d, *J* = 13.3 Hz, 1H), 2.87 – 2.75 (m, 3H), 2.46 (d, *J* = 15.9 Hz, 1H), 2.38 – 2.31 (m, 1H), 2.04 – 1.88 (m, 2H), 1.55 – 1.48 (m, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 219.8, 143.8, 137.5, 135.5, 130.0 (2C), 128.4 (2C), 128.1 (2C), 127.8,

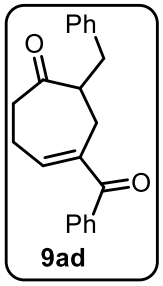


8ad

126.6, 126.3, 125.8 (2C), 69.0, 41.5, 40.9, 40.0, 38.4, 26.9. **HRMS (ESI):** *m/z* calcd for $C_{21}H_{21}O$ $(M+H)^+$: 289.1592. Found: 289.1591.

4-Benzoyl-2-benzylcyclohept-4-en-1-one (9ad).

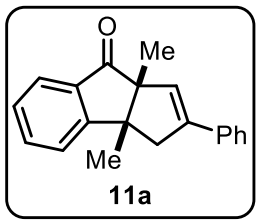
This compound was prepared by following the general procedure-4 and isolated as colourless liquid. 40 mg of **7ad** afforded 7 mg of **9ad** (17% yield). R_f = 0.3 (hexane/EtOAc = 9/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3027, 2924, 2853, 1704, 1647, 1495, 1447, 1271, 701, 693. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.61 (d, *J* = 7.2 Hz, 2H), 7.51 (t, *J* = 7.3 Hz, 1H), 7.43 – 7.37 (m, 2H), 7.30 – 7.26 (m, 2H), 7.21 – 7.19 (m, 3H), 6.61 (t, *J* = 5.3 Hz, 1H), 3.21 – 3.05 (m, 2H), 2.96 (dd, *J* = 16.2, 3.1 Hz, 1H), 2.81 – 2.65 (m, 3H), 2.62 – 2.46 (m, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 212.5, 197.9, 143.6, 141.0, 139.2, 137.8, 131.8, 129.3, 129.2, 128.4, 128.2, 126.3, 53.1, 40.6, 37.0, 28.6, 25.3. **HRMS (ESI):** *m/z* calcd for $C_{21}H_{20}NaO_2$ $(M+Na)^+$: 337.1361. Found: 337.1352.



9ad

3a,8a-Dimethyl-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (11a).

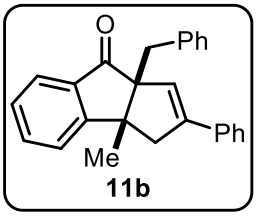
This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 30 mg of **10a** afforded 19 mg of **11a** (67% yield). R_f = 0.7 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3031, 2868, 1710, 1604, 1494, 1289, 863. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.72 (d, *J* = 7.6 Hz, 1H), 7.64 – 7.57 (m, 2H), 7.38 – 7.32 (m, 3H), 7.28 – 7.24 (m, 2H), 7.21 – 7.18 (m, 1H), 5.99 (s, 1H), 3.13 (s, 2H), 1.46 (s, 3H), 1.35 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.7, 162.2, 140.4, 135.2 (2C), 134.0, 130.0, 128.3 (2C), 127.8, 127.8, 125.6 (2C), 124.2, 124.0, 66.9, 50.9, 47.3, 24.5, 16.6. **HRMS (ESI):** *m/z* calcd for $C_{20}H_{19}O$ $(M+H)^+$: 275.1436. Found: 275.1431.



11a

8a-Benzyl-3a-methyl-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (11b).

This compound was prepared by following the general procedure-4 and isolated as white solid. 30 mg of **10b** afforded 26 mg of **11b** (90% yield). R_f = 0.6 (hexane/EtOAc = 19/1). M.P = 137-139 °C **IR (thin film, neat):** ν_{max}/cm^{-1} 3029, 2842, 1705, 1602, 1494, 1284, 932, 749. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.73 (d, *J* = 7.6 Hz, 1H), 7.60 (td, *J* = 7.8, 1.1 Hz, 1H), 7.54 (d, *J* = 7.7 Hz, 1H), 7.38 – 7.34 (m, 1H), 7.31 – 7.26 (m, 4H), 7.24- 7.14

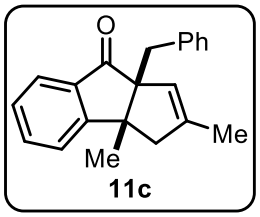


11b

(m, 6H), 6.04 (s, 1H), 3.43 (d, *J* = 14.5 Hz, 1H), 3.08 – 3.01 (m, 2H), 2.87 (dd, *J* = 16.4, 2.4 Hz, 1H), 1.51 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 206.6, 162.2, 141.6, 138.3, 135.2, 135.2, 133.9, 130.6 (2C), 129.2, 128.3 (2C), 127.9, 127.8 (3C), 126.0, 125.7 (2C), 124.0, 124.0, 70.8, 52.2, 47.5, 37.1, 25.0. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{23}O$ $(M+H)^+$: 351.1749. Found: 351.1742.

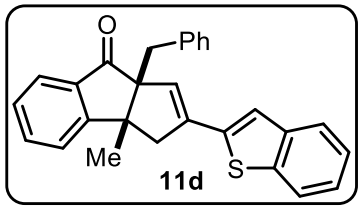
8a-Benzyl-2,3a-dimethyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (11c).

This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 40 mg of **10c** afforded 28 mg of **11c** (71% yield). R_f = 0.5 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3062, 2870, 1706, 1602, 1495, 1218, 817. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.72 (d, *J* = 7.6 Hz, 1H), 7.60 (td, *J* = 7.7, 1.2 Hz, 1H), 7.47 (d, *J* = 7.7 Hz, 1H), 7.36 (td, *J* = 7.6, 1.0 Hz, 1H), 7.28 – 7.21 (m, 4H), 7.19 – 7.15 (m, 1H), 5.24 (s, 1H), 3.29 (d, *J* = 14.6 Hz, 1H), 2.93 (d, *J* = 14.6 Hz, 1H), 2.52 – 2.38 (m, 2H), 1.55 (s, 3H), 1.41 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.4, 162.4, 140.6, 138.7, 135.0, 133.9, 130.6 (2C), 128.9, 127.7, 127.6 (2C), 125.8, 123.9, 123.8, 70.7, 53.0, 51.2, 36.8, 24.9, 16.6. **HRMS (ESI):** *m/z* calcd for $C_{21}H_{20}NaO$ $(M+Na)^+$: 311.1412. Found: 311.1411.



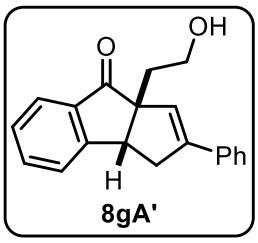
2-(Benzo[*b*]thiophen-2-yl)-8a-benzyl-3a-methyl-3a,8a dihydrocyclopenta[*a*]inden-8(3*H*)-one (11d).

This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 33 mg of **10d** afforded 22 mg of **11d** (69% yield). R_f = 0.5 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3061, 2843, 1708, 1603, 1558, 1433, 1205, 827. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.75 (d, *J* = 7.6 Hz, 1H), 7.70 – 7.68 (m, 1H), 7.64 – 7.60 (m, 2H), 7.55 (d, *J* = 7.9 Hz, 1H), 7.37 (t, *J* = 7.4 Hz, 1H), 7.31 – 7.29 (m, 2H), 7.26 – 7.14 (m, 5H), 6.99 (s, 1H), 6.00 (s, 1H), 3.46 (d, *J* = 14.6 Hz, 1H), 3.12 (d, *J* = 16.2 Hz, 1H), 3.02 (d, *J* = 14.6 Hz, 1H), 2.87 (dd, *J* = 16.1, 2.4 Hz, 1H), 1.53 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 205.9, 161.9, 139.8, 139.36, 139.31, 138.0, 136.4, 135.4, 133.8, 131.4, 130.6 (2C), 128.1, 127.9 (2C), 126.1, 124.8, 124.4, 124.1, 124.0, 123.5, 122.1, 121.4, 71.1, 52.6, 47.9, 37.0, 25.0. **HRMS (ESI):** *m/z* calcd for $C_{28}H_{23}OS$ $(M+H)^+$: 407.1470. Found: 407.1455.



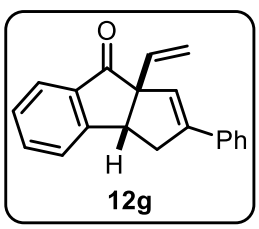
8a-(2-Hydroxyethyl)-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8gA').

This compound was prepared by following the procedure described in Scheme 7S and isolated as colourless liquid. 250 mg of **8g** afforded 140 mg of **8gA'** (79% yield). R_f = 0.4 (hexane/EtOAc = 7/3). **IR (thin film, neat):** ν_{max}/cm^{-1} 3419, 3054, 2921, 1700, 1603, 1493, 1280, 964, 748. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.73 (d, *J* = 7.6 Hz, 1H), 7.65 – 7.61 (m, 1H), 7.54 – 7.52 (d, *J* = 7.7 Hz, 1H), 7.39 – 7.36 (m, 3H), 7.29 – 7.20 (m, 3H), 6.08 (s, 1H), 3.90 – 3.83 (m, 2H), 3.78 – 3.72 (m, 1H), 3.52 (ddd, *J* = 16.5, 9.6, 2.4 Hz, 1H), 2.89 (d, *J* = 16.5 Hz, 1H), 2.59 (brs, 1H), 2.24 – 2.17 (m, 1H), 2.14 – 2.08 (m, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 208.0, 157.4, 142.6, 135.6, 135.0, 128.4 (2C), 128.1, 128.0, 126.3, 125.9, 125.9 (3C), 124.4, 68.1, 60.0, 47.1, 39.0, 36.6. **HRMS (ESI):** *m/z* calcd for $C_{20}H_{18}NaO_2$ $(M+Na)^+$: 313.1204. Found: 313.1179.



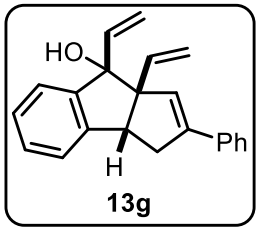
2-Phenyl-8a-vinyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (12g).

This compound was prepared by following the procedure described in Scheme 7S and isolated as pale-yellow liquid. 140 mg of **8gA'** afforded 106 mg of **12g** (83% yield). R_f = 0.4 (hexane/EtOAc = 19/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 2954, 2852, 1712, 1604, 1449, 1280, 902, 754. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.75 (d, *J* = 7.6 Hz, 1H), 7.66 – 7.62 (m, 1H), 7.54 (d, *J* = 7.6 Hz, 1H), 7.40 – 7.37 (m, 3H), 7.30 – 7.20 (m, 3H), 6.19 – 6.12 (m, 2H), 5.35 – 5.27 (m, 2H), 3.92 (d, *J* = 9.2 Hz, 1H), 3.52 (ddd, *J* = 16.5, 9.6, 2.4 Hz, 1H), 2.91 (dt, *J* = 16.5, 1.4 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 205.4, 156.9, 142.6, 137.1, 135.5, 135.1, 134.9, 128.4 (2C), 128.1 (2C), 125.9, 125.9 (2C), 125.6, 124.5, 116.2, 71.7, 47.6, 38.9. **HRMS (ESI):** *m/z* calcd for $C_{20}H_{16}NaO$ $(M+Na)^+$: 295.1099. Found: 295.1076.



2-Phenyl-8,8a-divinyl-3,3a,8,8a-tetrahydrocyclopenta[*a*]inden-8-ol (13g).

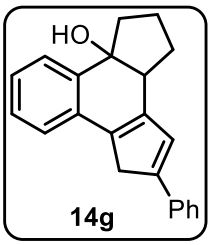
This compound was prepared by following the procedure described in Scheme 7S and isolated as colourless liquid. 55 mg of **12g** afforded 58 mg of **13g** (95% yield). R_f = 0.3 (hexane/EtOAc = 10/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3397, 3047, 2909, 1599, 1494, 1361, 1232, 1057, 965, 767. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.43 – 7.41 (m, 2H), 7.29 – 7.18 (m, 7H), 6.30 (s, 1H), 6.21 – 6.14 (m, 1H), 5.98 – 5.91 (m, 1H), 5.17 – 5.02 (m, 4H), 3.69 (d, *J* = 7.2 Hz, 1H), 3.27 – 3.20 (m, 1H), 2.99 (d, *J* = 16.6 Hz, 1H), 2.30 – 2.28 (m, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 145.4, 144.6, 142.09, 142.05, 139.2, 135.8, 128.5, 128.3 (2C), 127.7, 127.6, 126.6, 125.9 (2C),



124.3, 123.8, 113.7, 112.1, 87.4, 72.0, 49.0, 39.7. **HRMS (ESI):** *m/z* calcd for $C_{22}H_{19}O$ $(M-H)^+$: 299.1436. Found: 299.1421.

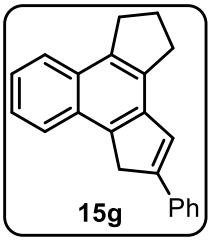
2-Phenyl-3b,4,5,6-tetrahydrobenzo[*e*]-as-indacen-6a(1*H*)-ol (14g).

This compound was prepared by following the procedure described in Scheme 7S and isolated as dark brown liquid. 40 mg of **13g** afforded 22 mg of **14g** (54% yield). R_f = 0.5 (hexane/EtOAc = 7/3). **IR (thin film, neat):** ν_{max}/cm^{-1} 3516, 3044, 2907, 1605, 1502, 1462, 1263, 1014, 959, 774. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.64 – 7.62 (m, 1H), 7.57 – 7.55 (m, 2H), 7.34 (t, *J* = 7.5 Hz, 2H), 7.28 – 7.25 (m, 2H), 7.23 – 7.18 (m, 2H), 6.88 (s, 1H), 3.78 – 3.65 (m, 2H), 3.05 (brs, 1H), 2.52 – 2.41 (m, 1H), 2.05 – 2.01 (m, 1H), 1.92 – 1.82 (m, 3H), 1.64 -1.59 (m, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 145.9, 144.9, 139.8, 135.8, 134.6, 130.5, 128.7 (2C), 128.0, 127.5, 126.9, 126.4, 125.5, 124.9 (2C), 122.0, 82.6, 48.0, 42.7, 38.8, 31.2, 21.8. **HRMS (ESI):** *m/z* calcd for $C_{22}H_{19}O$ $(M-H)^+$: 299.1436. Found: 299.1414.



5-Phenyl-1,2,3,6-tetrahydrobenzo[*e*]-*as*-indacene (15g). (NMR data of 15g was compared with the reported part structure in the literature) [6]

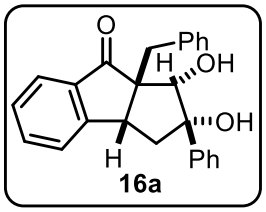
This compound was prepared by following the procedure described in Scheme 7S and isolated as pale-yellow solid. 22 mg of **14g** afforded 15 mg of **15g** (72% yield). R_f = 0.5 (hexane/EtOAc = 99/1). M.P = 146-148 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 2953, 2924, 2852, 1456, 1263, 1023, 895, 735. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.99 (d, *J* = 8.2 Hz, 1H), 7.82 (d, *J* = 7.8 Hz, 1H), 7.75 – 7.71 (m, 2H), 7.45 – 7.39 (m, 4H), 7.34 (s, 1H), 7.29 (d, *J* = 7.3 Hz, 1H), 4.11 (s, 2H), 3.30 (t, *J* = 7.4 Hz, 2H), 3.23 (t, *J* = 7.3 Hz, 2H), 2.32 (quint, *J* = 7.5 Hz, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 146.4, 139.9, 139.1, 138.0, 136.2, 135.1, 129.1, 128.7 (2C), 128.6, 127.3, 125.59, 125.55 (2C), 125.4, 125.1, 124.4, 123.9, 38.0, 32.0, 31.3, 24.6. **HRMS (ESI):** *m/z* calcd for $C_{22}H_{17}$ $(M-H)^+$: 281.1330. Found: 281.1316.



8a-Benzyl-1,2-dihydroxy-2-phenyl-2,3,3a,8a-tetrahydrocyclopenta[*a*]inden-8(*1H*)-one (16a).

[6] (a) Mahecha-Mahecha, C.; Lecornué, F.; Akinari, S.; Charote, T.; Gamba-Sánchez, D.; Ohwada, T.; Thibaudeau, S. *Org. Lett.* **2020**, *22*, 6267–6271. (b) Zhou, Q.; Li, S.; Zhang, Y.; Wang, J. *Angew. Chem. Int. Ed.* **2017**, *56*, 16013–16017.

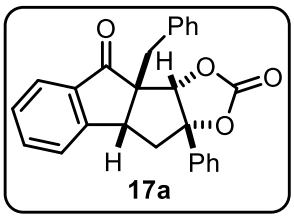
This compound was prepared by following the procedure described in Scheme 8S and isolated as colourless liquid. 150 mg of **8a** afforded 148 mg of **16a** (90% yield). R_f = 0.3 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3443, 3059, 2938, 1687, 1604, 1464, 1265, 929, 782. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.66 (d, *J* = 7.6 Hz, 1H), 7.56 (t, *J* = 7.6 Hz, 1H), 7.37 (d, *J* = 7.6 Hz, 1H), 7.33 – 7.25 (m, 5H), 7.23 – 7.16 (m, 6H), 4.62 (d, J_{AB} = 6.1 Hz, 1H), 4.55 (d, *J* = 6.1 Hz, 1H), 3.69 (t, *J* = 5.7 Hz, 1H), 3.17 (d, J_{AB} = 13.6 Hz, 1H), 3.13 (d, J_{AB} = 13.7 Hz, 1H), 2.35 – 2.31 (m, 1H), 2.14 – 2.13 (m, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 212.3, 158.5, 143.2, 136.5, 136.3, 135.5, 130.2 (2C), 128.39 (2C), 128.34 (2C), 127.6, 127.3, 126.9, 125.5, 125.3 (2C), 123.5, 83.8, 82.5, 59.7, 44.3, 42.0, 40.3. **HRMS (ESI):** *m/z* calcd for $C_{25}H_{22}NaO_3$ $(M+Na)^+$: 393.1467. Found: 393.1467.



16a

3b-Benzyl-9a-phenyl-3b,8b,9,9a-tetrahydrobenzo[4,5]pentaleno[1,2-*d*][1,3]dioxole-2,4(3*aH*)-dione (17a).

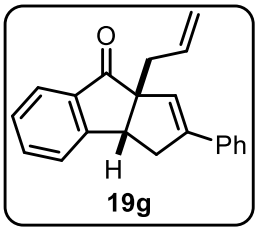
This compound was prepared by following the procedure described in Scheme 8S and isolated as colourless crystalline solid. 70 mg of **16a** afforded 65 mg of **17a** (86% yield). R_f = 0.4 (hexane/EtOAc = 8/2). M.P = 187-189 °C. **IR (thin film, neat):** ν_{max}/cm^{-1} 3061, 1797, 1715, 1602, 1495, 1289, 1047, 756. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.82 (d, *J* = 7.6 Hz, 1H), 7.66 (t, *J* = 7.2 Hz, 1H), 7.48 (d, *J* = 7.6 Hz, 1H), 7.43 (t, *J* = 7.5 Hz, 1H), 7.35 – 7.28 (m, 8H), 6.92 – 6.90 (m, 2H), 4.95 (s, 1H), 3.96 (d, *J* = 8.0 Hz, 1H), 3.54 (d, J_{AB} = 13.9 Hz, 1H), 3.19 (d, J_{AB} = 13.9 Hz, 1H), 2.96 (d, *J* = 15.5 Hz, 1H), 2.63 (dd, *J* = 15.5, 8.2 Hz, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 201.7, 154.0, 152.4, 138.6, 136.3, 136.0, 135.8, 130.3 (2C), 129.1 (2C), 129.0 (3C), 128.9, 128.7, 127.4, 125.0, 124.4, 124.1, 95.7, 92.4, 65.9, 42.1, 38.6. **HRMS (ESI):** *m/z* calcd for $C_{26}H_{20}NaO_4$ $(M+Na)^+$: 419.1259. Found: 419.1252.



17a

8a-Allyl-2-phenyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (19g).

This compound was prepared by following the procedure described in Scheme 9S and isolated as pale-yellow liquid. 150 mg of **8g** afforded 60 mg of **19g** (57% yield, after 3 steps). R_f = 0.6 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3072, 2868, 1711, 1521, 1493, 1261, 858. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.73 (d, *J* = 7.6 Hz, 1H), 7.63 (td, *J* = 7.6, 1.0 Hz, 1H), 7.53 (d, *J* = 7.6 Hz, 1H), 7.40 – 7.36 (m, 3H), 7.30 – 7.120 (m, 3H), 6.03 (s,

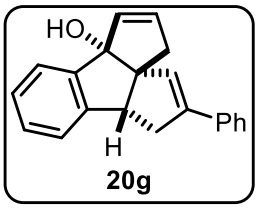


19g

1H), 5.80 – 5.70 (m, 1H), 5.13 (dd, *J* = 16.9, 1.6 Hz, 1H), 5.03 (d, *J* = 11.9 Hz, 1H), 3.80 (d, *J* = 8.7 Hz, 1H), 3.44 (ddd, *J* = 16.5, 9.8, 2.4 Hz, 1H), 2.87 (dt, *J* = 16.5, 1.6 Hz, 1H), 2.71 – 2.59 (m, 2H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 206.9, 157.3, 142.3, 135.4, 135.3, 135.1, 134.1, 128.4 (2C), 127.95, 127.91, 126.7, 126.0, 125.8 (2C), 124.2, 118.1, 69.1, 45.3, 39.3, 38.5. **HRMS (ESI):** *m/z* calcd for $C_{21}H_{19}O$ $(M+H)^+$: 287.1436. Found: 287.1434.

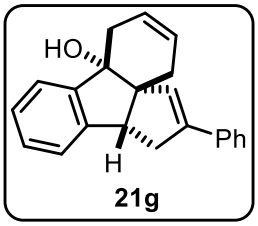
2-phenyl-1,10b-dihydrodicyclopenta[*a,b*]inden-6a(4*H*)-ol (20g).

This compound was prepared by following the procedure described in Scheme 9S and isolated as pale-yellow semi-solid. 45 mg of **19g** afforded 40 mg of **20g** (88% yield, over 2 steps). R_f = 0.3 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3397, 3047, 2841, 1599, 1494, 1264, 918, 725. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.45 – 7.39 (m, 3H), 7.30 – 7.19 (m, 6H), 6.22 (s, 1H), 5.96 – 5.88 (m, 2H), 3.48 – 3.39 (m, 2H), 2.93 (d, *J* = 14.9 Hz, 1H), 2.75 (d, J_{AB} = 17.6 Hz, 1H), 2.63 (d, *J* = 17.6 Hz, 1H), 2.07 (brs, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 146.8, 145.3, 142.5, 135.8, 134.7, 133.2, 128.5, 128.3 (2C), 127.7, 127.5, 127.0, 125.9 (2C), 124.4, 123.5, 96.3, 70.2, 54.1, 42.9, 40.4. **HRMS (ESI):** *m/z* calcd for $C_{21}H_{17}$ $(M-OH)^+$: 269.1330. Found: 269.1329.

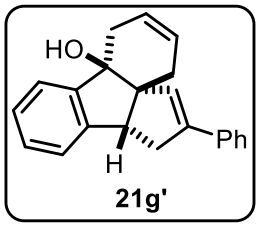


2-Phenyl-1,4,7,11b-tetrahydro-7a*H*-cyclopenta[*k*]fluoren-7a-ol (21g).

This compound was prepared by following the procedure described in Scheme 9S and isolated as pale-yellow liquid. 33 mg of **19g** afforded 24 mg of **21g** (70% yield, over 2 steps). R_f = 0.4 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3400, 3039, 2839, 1598, 1494, 1264, 1036, 862. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.42 (d, *J* = 7.3 Hz, 2H), 7.35 – 7.33 (d, *J* = 8.8 Hz, 1H), 7.29 – 7.18 (m, 6H), 6.23 (s, 1H), 6.01 – 5.96 (m, 1H), 5.83 – 5.77 (m, 1H), 3.44 (d, *J* = 9.0 Hz, 1H), 3.34 (ddd, *J* = 16.0, 9.0, 2.1 Hz, 1H), 2.84 (d, *J* = 16.0 Hz, 1H), 2.70 – 2.64 (m, 1H), 2.59 – 2.53 (m, 1H), 2.47 – 2.41 (m, 1H), 2.32 – 2.27 (m, 1H), 1.97 (brs, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 148.5, 146.3, 141.5, 135.8, 129.2, 128.79, 128.73, 128.3 (2C), 127.6, 127.5, 127.3, 125.8 (2C), 124.1, 123.5, 85.0, 66.8, 52.4, 40.3, 38.3, 33.5. **HRMS (ESI):** *m/z* calcd for $C_{22}H_{19}$ $(M-OH)^+$: 283.1487. Found: 283.1480.

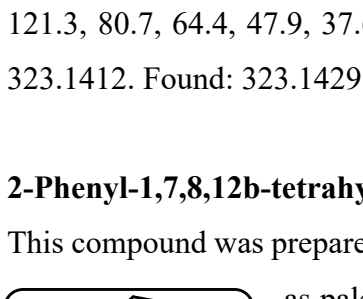


21g' (minor): This compound was prepared by following the procedure described in Scheme 9S and isolated as pale-yellow liquid. 33 mg of **19g** afforded 5.5 mg of **21g'** (15% yield, over 2 steps). R_f = 0.3 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3415, 3038, 2842, 1595, 1490, 1270, 1055, 864. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.34 – 7.32 (m, 3H), 7.30 – 7.25 (m, 2H), 7.25 – 7.19 (m, 3H), 7.17 – 7.14 (m, 1H), 6.06 (s, 1H), 5.95 – 5.85 (m, 2H), 3.58 (d, *J* = 6.6 Hz, 1H), 3.22 (ddd, *J* = 15.8, 6.7, 2.1 Hz, 1H), 2.96 – 2.87 (m, 3H), 2.79 – 2.73 (m, 1H), 2.24 – 2.19 (m, 1H), 1.86 (s, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 147.8, 145.4, 140.1, 136.2, 132.0, 128.7, 128.2 (2C), 128.0, 127.3, 127.1, 125.6 (2C), 124.8, 124.4, 121.3, 80.7, 64.4, 47.9, 37.6, 34.1, 31.6. **HRMS (ESI):** *m/z* calcd for $C_{22}H_{20}NaO$ $(M+Na)^+$: 323.1412. Found: 323.1429.



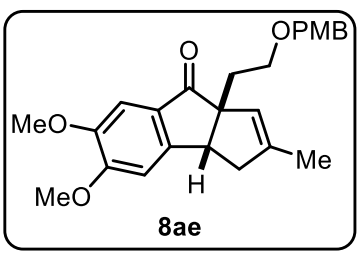
2-Phenyl-1,7,8,12b-tetrahydrobenzo[*a*]cyclopenta[*c*]azulen-8a(4*H*)-ol (22g).

This compound was prepared by following the procedure described in Scheme 9S and isolated as pale-yellow liquid. 31 mg of **19g** afforded 27 mg of **22g** (82% yield, over 2 steps). R_f = 0.3 (hexane/EtOAc = 9/1). **IR (thin film, neat):** ν_{max}/cm^{-1} 3423, 3020, 2918, 2838, 1667, 1598, 1494, 1254, 862. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.42 – 7.39 (m, 2H), 7.29 – 7.24 (m, 6H), 7.21 – 7.18 (m, 1H), 6.30 (s, 1H), 5.60 – 5.53 (m, 2H), 3.76 (d, *J* = 8.2 Hz, 1H), 3.27 (ddd, *J* = 16.2, 8.4, 2.1 Hz, 1H), 2.91 – 2.82 (m, 2H), 2.54 – 2.48 (m, 1H), 2.27 – 2.06 (m, 4H), 1.73 – 1.61 (m, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 146.8, 146.0, 140.4, 135.9, 131.0, 130.3, 128.7, 128.3 (2C), 127.6, 127.5, 126.3, 125.8 (2C), 124.3, 123.5, 86.8, 70.4, 49.5, 40.3, 37.7, 33.4, 25.9. **HRMS (ESI):** *m/z* calcd for $C_{23}H_{19}$ $(M-OH)^+$: 297.1640. Found: 297.1640.



5,6-Dimethoxy-8a-(2-((4-methoxybenzyl)oxy)ethyl)-2-methyl-3a,8a-dihydrocyclopenta[a]inden-8(3*H*)-one (8ae).

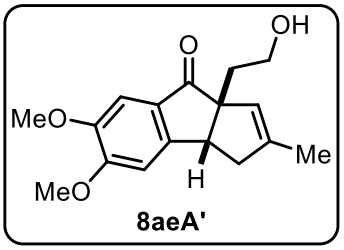
This compound was prepared by following the general procedure-4 and isolated as pale-yellow liquid. 50 mg of **7ae** afforded 22 mg of **8ae** (46% yield). R_f = 0.5 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 3000, 2910, 1693, 1606, 1462, 1245, 1014, 820. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.12 – 7.09 (m, 3H), 6.85 (s, 1H), 6.81 (d, *J* = 8.6 Hz, 2H), 5.19 (s, 1H), 4.30 (s, 2H), 3.97 (s, 3H), 3.89 (s, 3H), 3.78 (s,



3H), 3.74 (dd, *J* = 9.6, 1.6 Hz, 1H), 3.50 (t, *J* = 6.3 Hz, 2H), 2.92 (dd, *J* = 17.5, 10.6 Hz, 1H), 2.25 (d, *J* = 16.8 Hz, 1H), 2.09 (t, *J* = 6.6 Hz, 2H), 1.64 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 206.9, 158.9, 155.7, 153.0, 149.5, 140.6, 130.4, 129.2 (2C), 127.8, 126.8, 113.6 (2C), 106.7, 104.3, 72.7, 68.0, 67.4, 56.2, 56.1, 55.2, 47.0, 42.5, 33.6, 16.6. **HRMS (ESI):** *m/z* calcd for $C_{25}H_{28}NaO_5$ $(M+Na)^+$: 431.1834. Found: 431.1820.

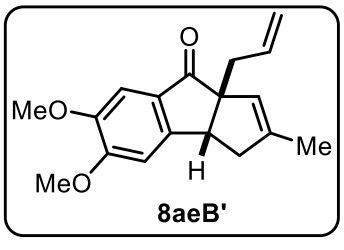
8a-(2-Hydroxyethyl)-5,6-dimethoxy-2-methyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8aeA').

This compound was prepared by following the procedure described in Scheme 10S and isolated as pale-red liquid. 180 mg of **8ae** afforded 100 mg of **8aeA'** (78% yield). R_f = 0.3 (hexane/EtOAc = 6/4). **IR (thin film, neat):** ν_{max}/cm^{-1} 3404, 2936, 1679, 1588, 1499, 1311, 1262, 1048, 757. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.10 (s, 1H), 6.85 (s, 1H), 5.31 (s, 1H), 3.96 (s, 3H), 3.87 (s, 3H), 3.79 – 3.75 (m, 1H), 3.70 – 3.66 (m, 1H), 3.60 (d, *J* = 9.4 Hz, 1H), 2.99 – 2.93 (m, 2H), 2.30 (d, *J* = 16.8 Hz, 1H), 2.07 – 2.01 (m, 1H), 1.96 – 1.89 (m, 1H), 1.63 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 207.7, 156.1, 152.8, 149.7, 141.2, 127.5, 126.3, 106.6, 104.5, 68.3, 59.9, 56.2, 56.1, 48.0, 42.1, 36.8, 16.7. **HRMS (ESI):** *m/z* calcd for $C_{17}H_{20}NaO_4$ $(M+Na)^+$: 311.1259. Found: 311.1235.



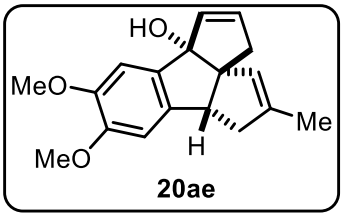
8a-Allyl-5,6-dimethoxy-2-methyl-3a,8a-dihydrocyclopenta[*a*]inden-8(3*H*)-one (8aeB').

This compound was prepared by following the procedure described in Scheme 10S and isolated as pale-yellow liquid. 67 mg of **8aeA'** afforded 52 mg of **8aeB'** (71% yield, after 2 steps). R_f = 0.5 (hexane/EtOAc = 8/2). **IR (thin film, neat):** ν_{max}/cm^{-1} 2959, 2720, 1694, 1589, 1500, 1361, 1165, 913, 834. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.14 (s, 1H), 6.87 (s, 1H), 5.74 – 5.74 (m, 1H), 5.24 (s, 1H), 5.08 (d, *J* = 16.1 Hz, 1H), 4.99 (d, *J* = 10.1 Hz, 1H), 3.98 (s, 3H), 3.90 (s, 3H), 3.57 (d, *J* = 11.4 Hz, 1H), 2.94 – 2.87 (m, 1H), 2.51 (d, *J* = 7.2 Hz, 2H), 2.30 (d, *J* = 16.8 Hz, 1H), 1.65 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 206.8, 155.8, 152.7, 149.6, 140.7, 134.5, 127.9, 126.7, 117.5, 106.7, 104.4, 69.1, 56.2, 56.1, 45.9, 42.5, 38.6, 16.6. **HRMS (ESI):** *m/z* calcd for $C_{18}H_{21}O_3$ $(M+H)^+$: 285.1491. Found: 285.1472.



8,9-Dimethoxy-2-methyl-1,10b-dihydrodicyclopenta[*a*,*b*]inden-6a(4*H*)-ol (20ae).

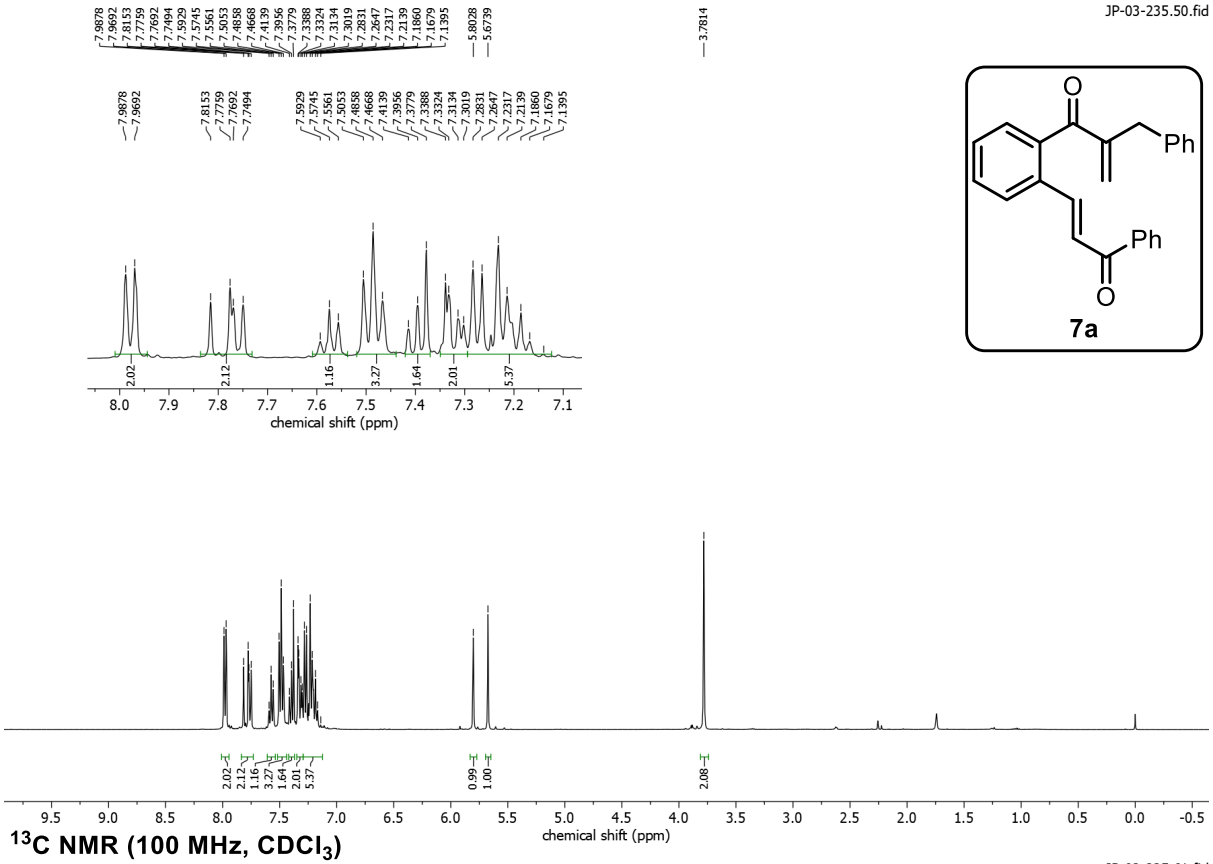
This compound was prepared by following the procedure described in Scheme 10S and isolated as pale-yellow liquid. 52 mg of **8aeB'** afforded 42 mg of **20ae** (81% yield, over 2 steps). R_f = 0.3 (hexane/EtOAc = 6/4). **IR (thin film, neat):** ν_{max}/cm^{-1} 3405, 3048, 2916, 1607, 1464, 1265, 1118, 735. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 6.90 (s, 1H), 6.68 (s, 1H), 5.89 (s, 2H), 5.34 (s, 1H), 3.87 (s, 3H), 3.86 (s, 3H), 3.28 (d, *J* = 8.4 Hz, 1H), 2.93 (dd, *J* = 16.4, 8.7 Hz, 1H), 2.63 – 2.52 (m, 2H), 2.36 (d, *J* = 16.4 Hz, 1H), 1.94 (brs, 1H), 1.73 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 149.7, 149.2, 141.4, 138.7, 136.9, 134.5, 132.9, 126.1, 106.9, 105.8, 95.9, 70.1, 56.0, 56.02, 55.07, 44.1, 43.0, 16.9. **HRMS (ESI):** *m/z* calcd for $C_{18}H_{19}O_2$ $(M\text{-}OH)^+$: 267.1385. Found: 267.1387.



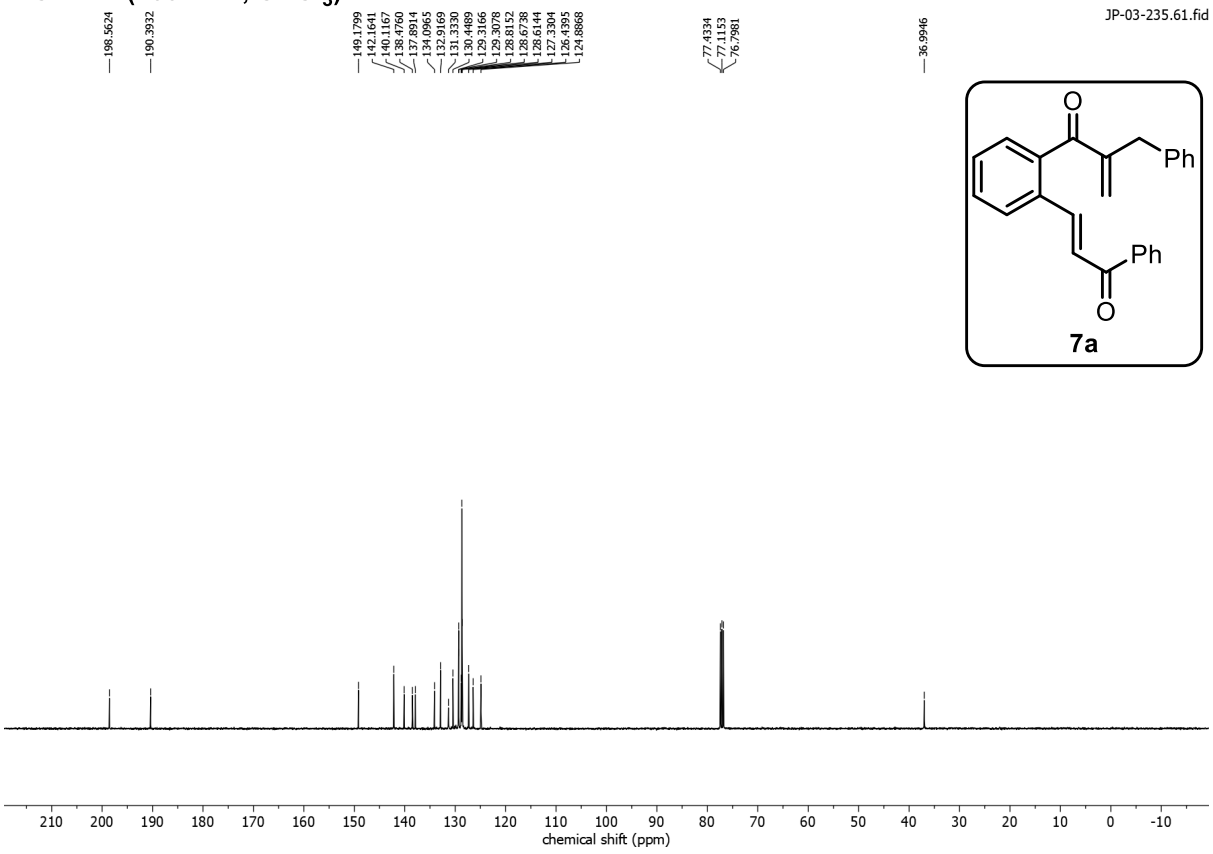
20ae

Copies of ^{1}H and ^{13}C-NMR spectra of all new compounds reported in this study

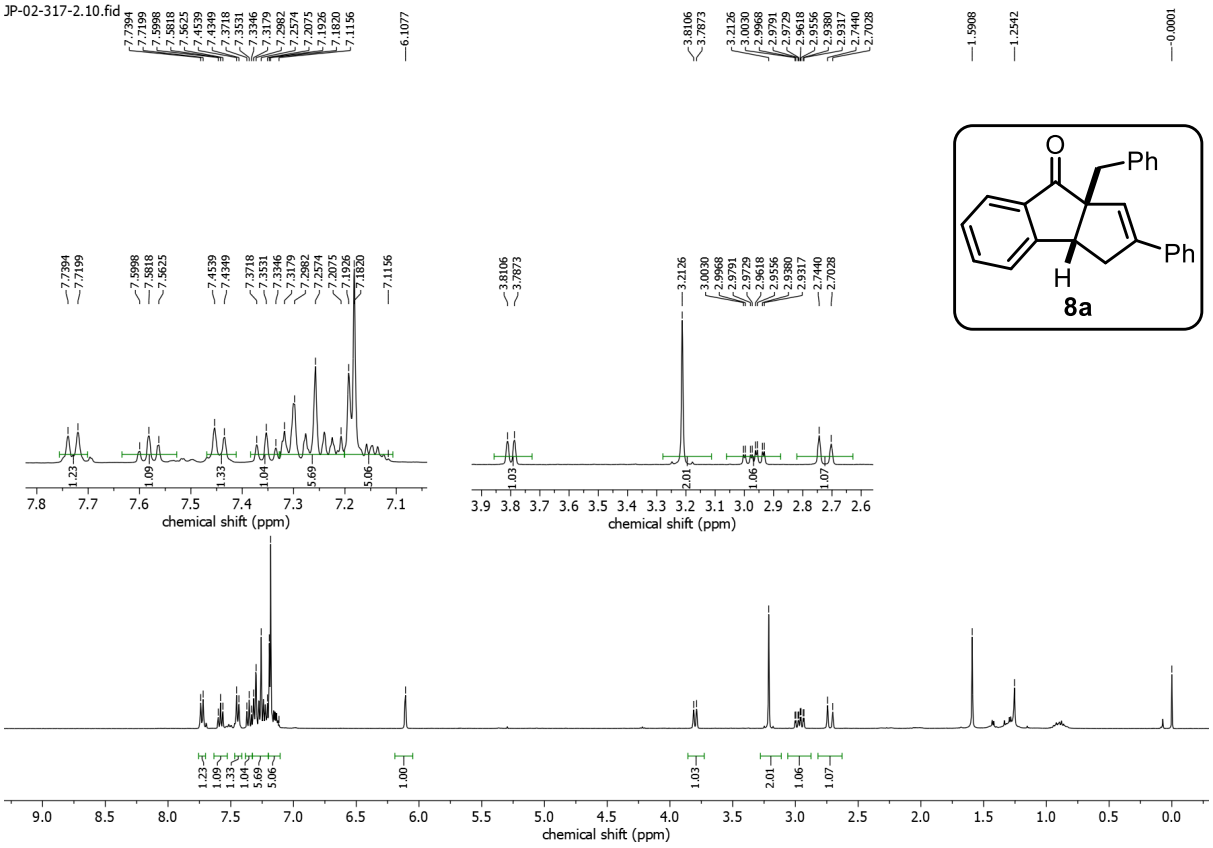
^{1}H NMR (400 MHz, $CDCl_3$)



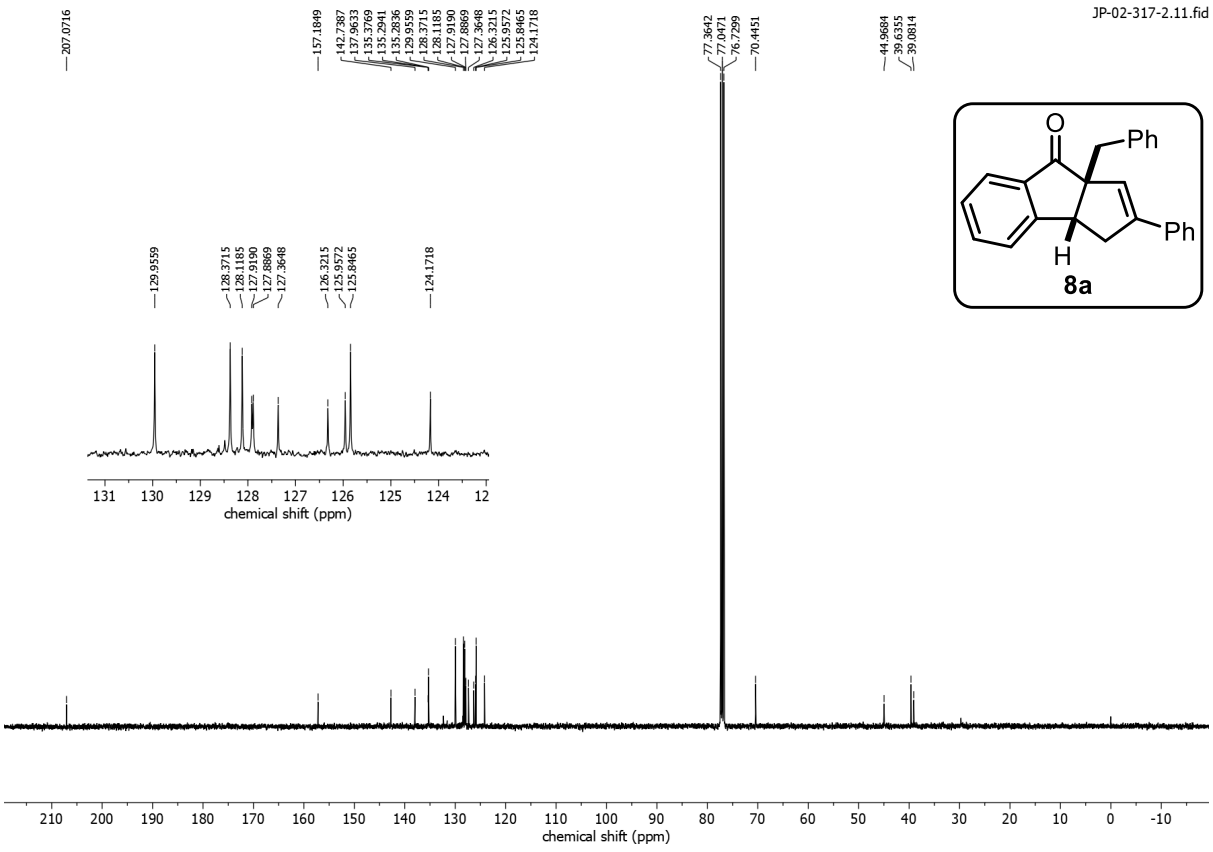
^{13}C NMR (100 MHz, $CDCl_3$)



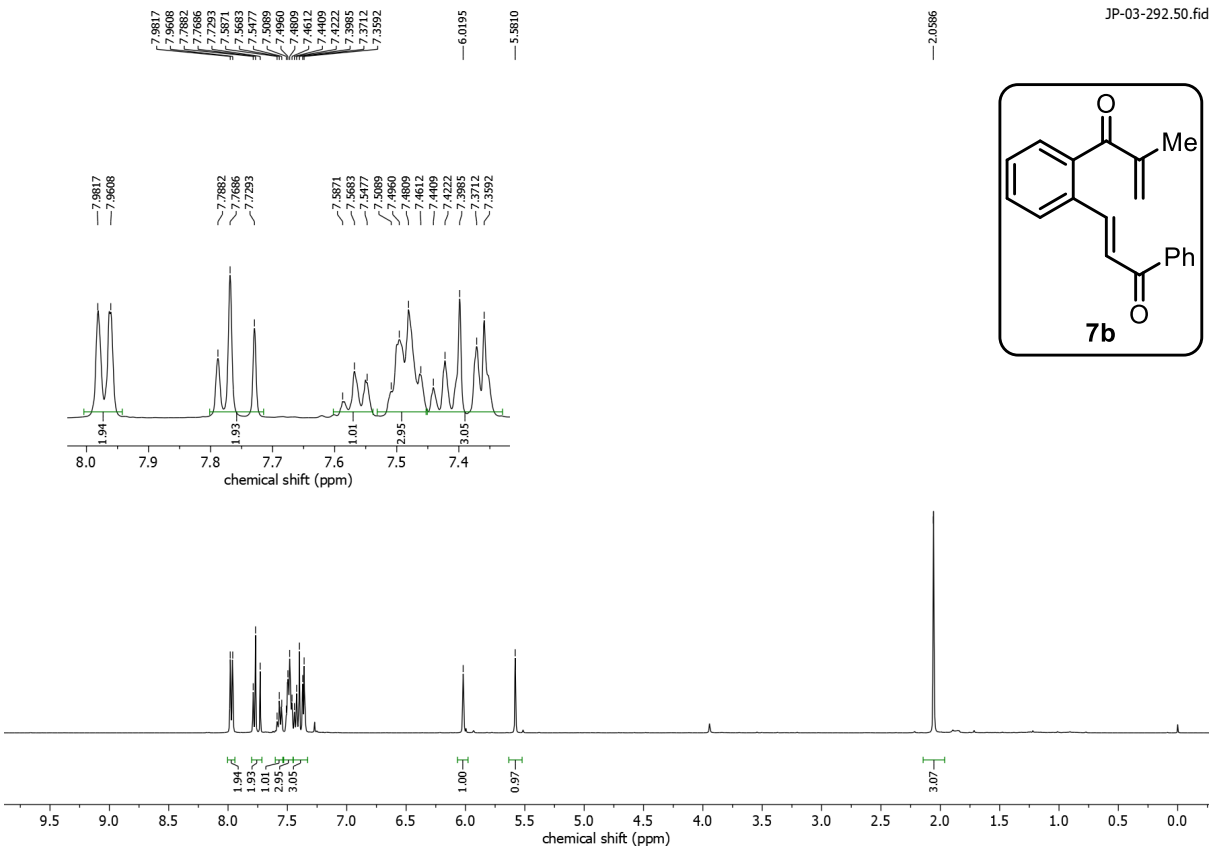
^{1}H NMR (400 MHz, $CDCl_3$)



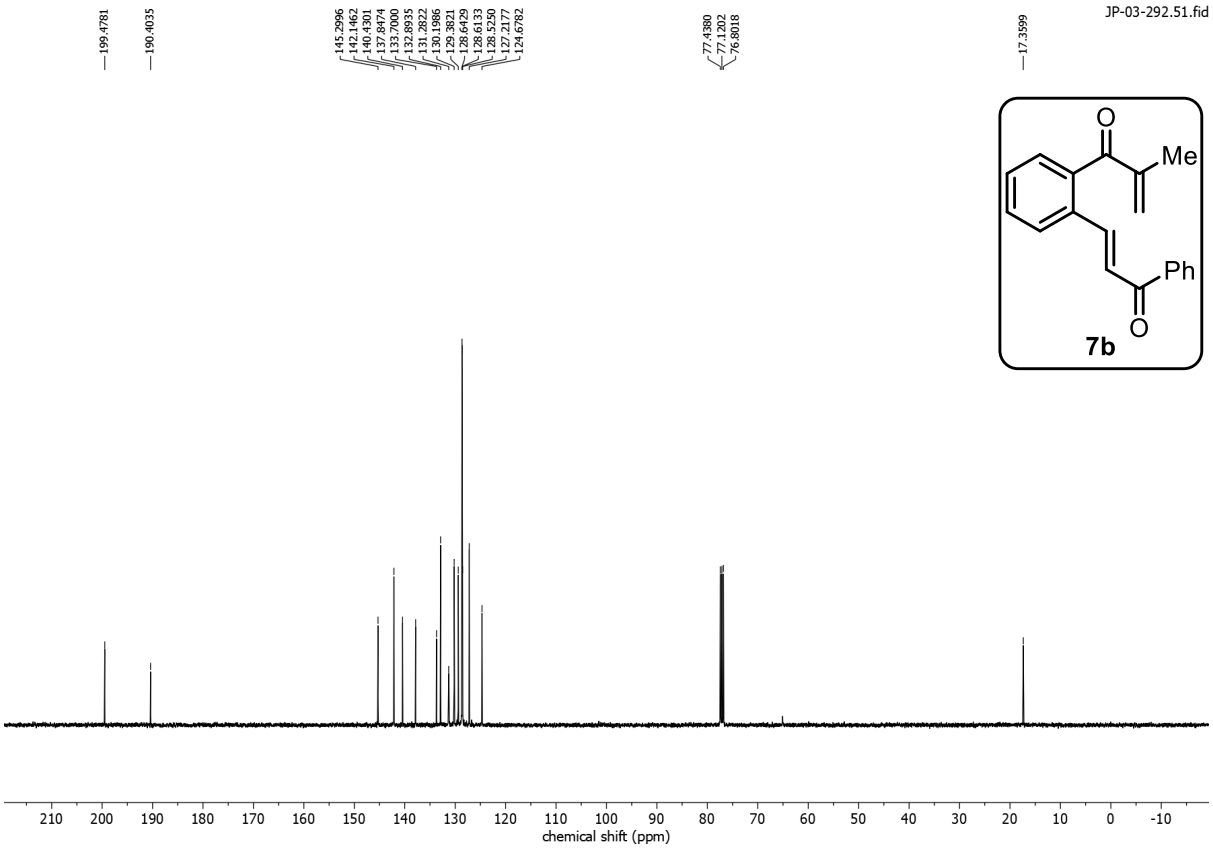
^{13}C NMR (100 MHz, $CDCl_3$)



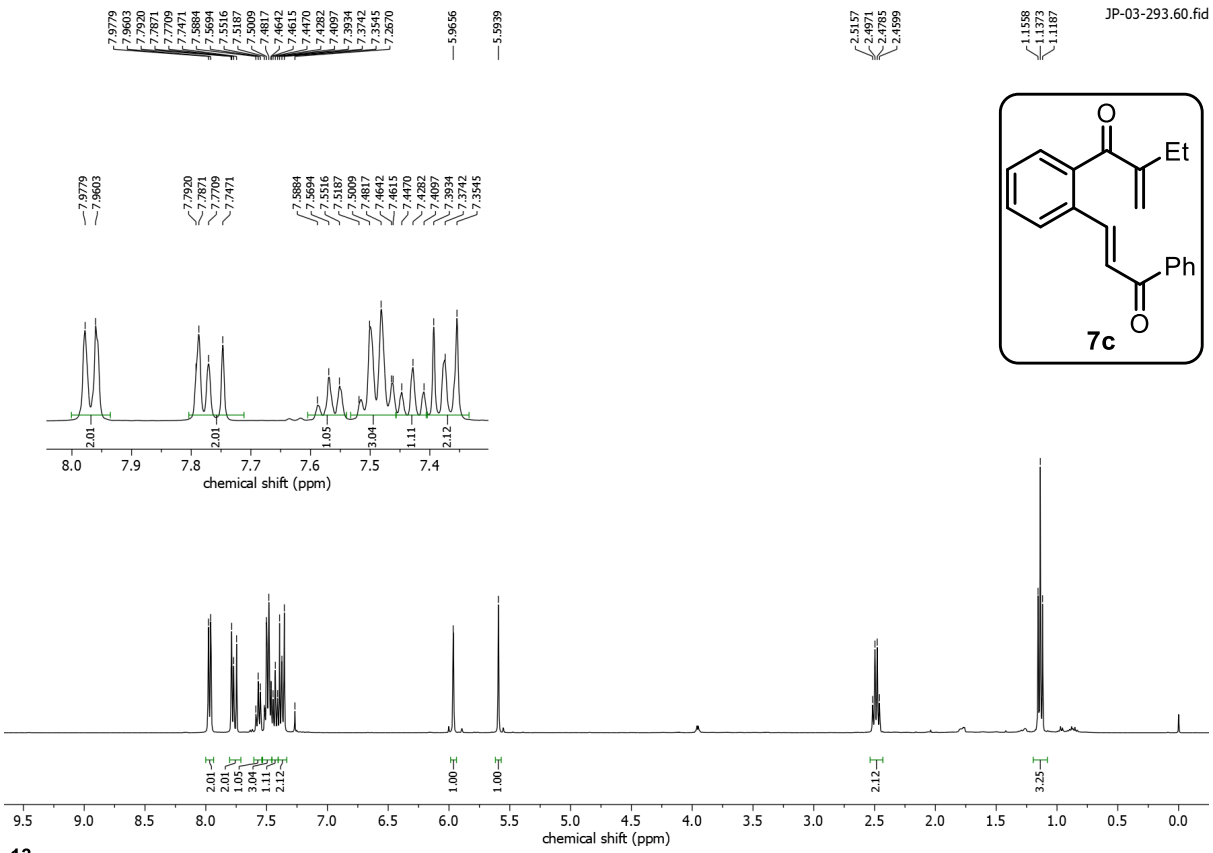
^{1}H NMR (400 MHz, $CDCl_3$)



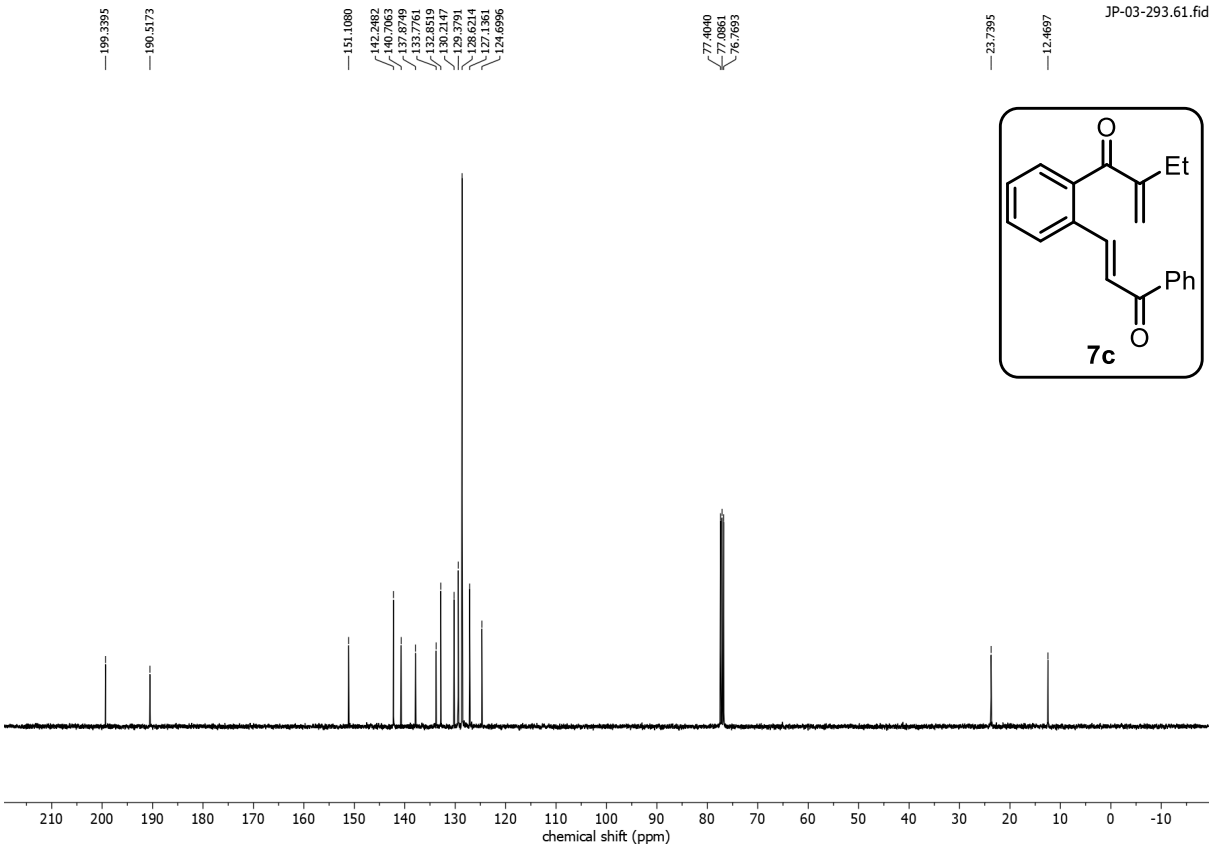
^{13}C NMR (100 MHz, $CDCl_3$)



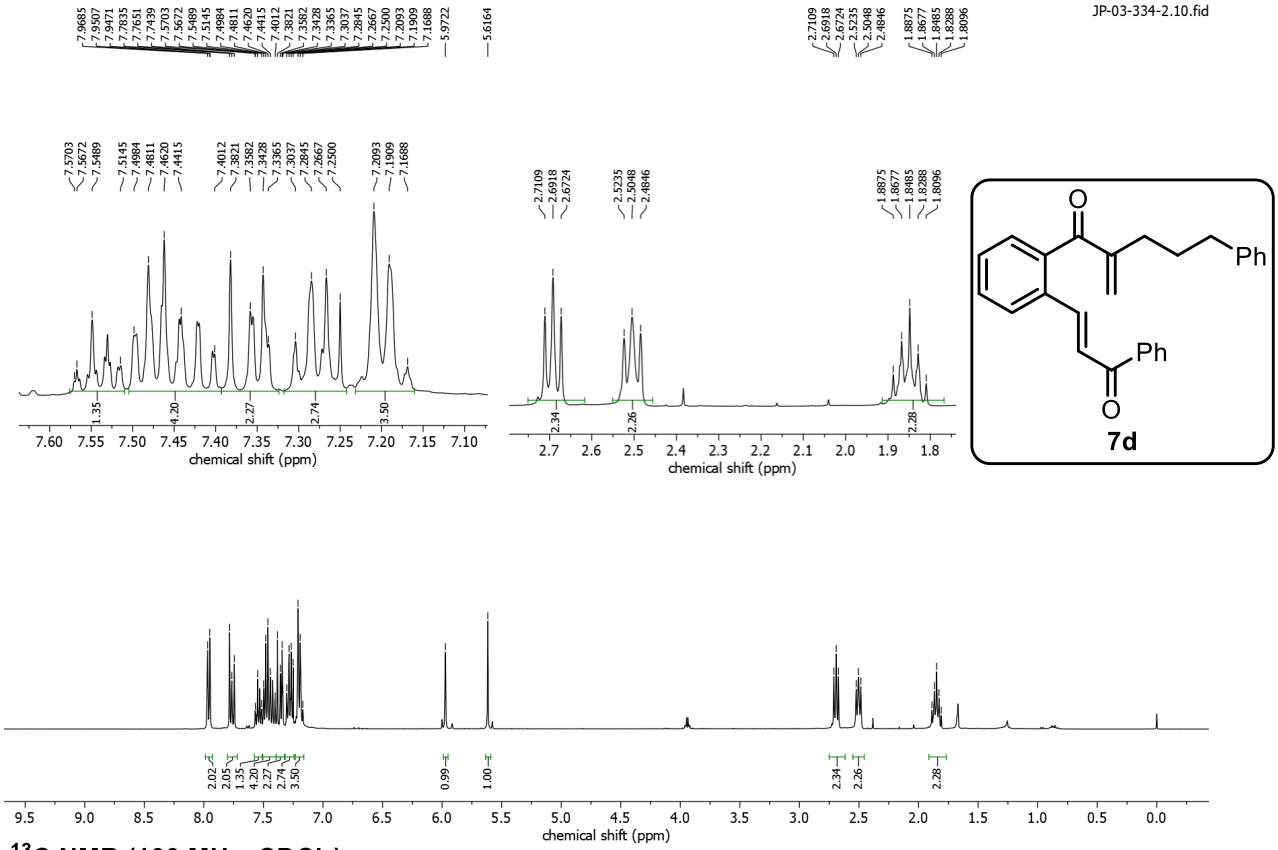
^{1}H NMR (400 MHz, $CDCl_3$)



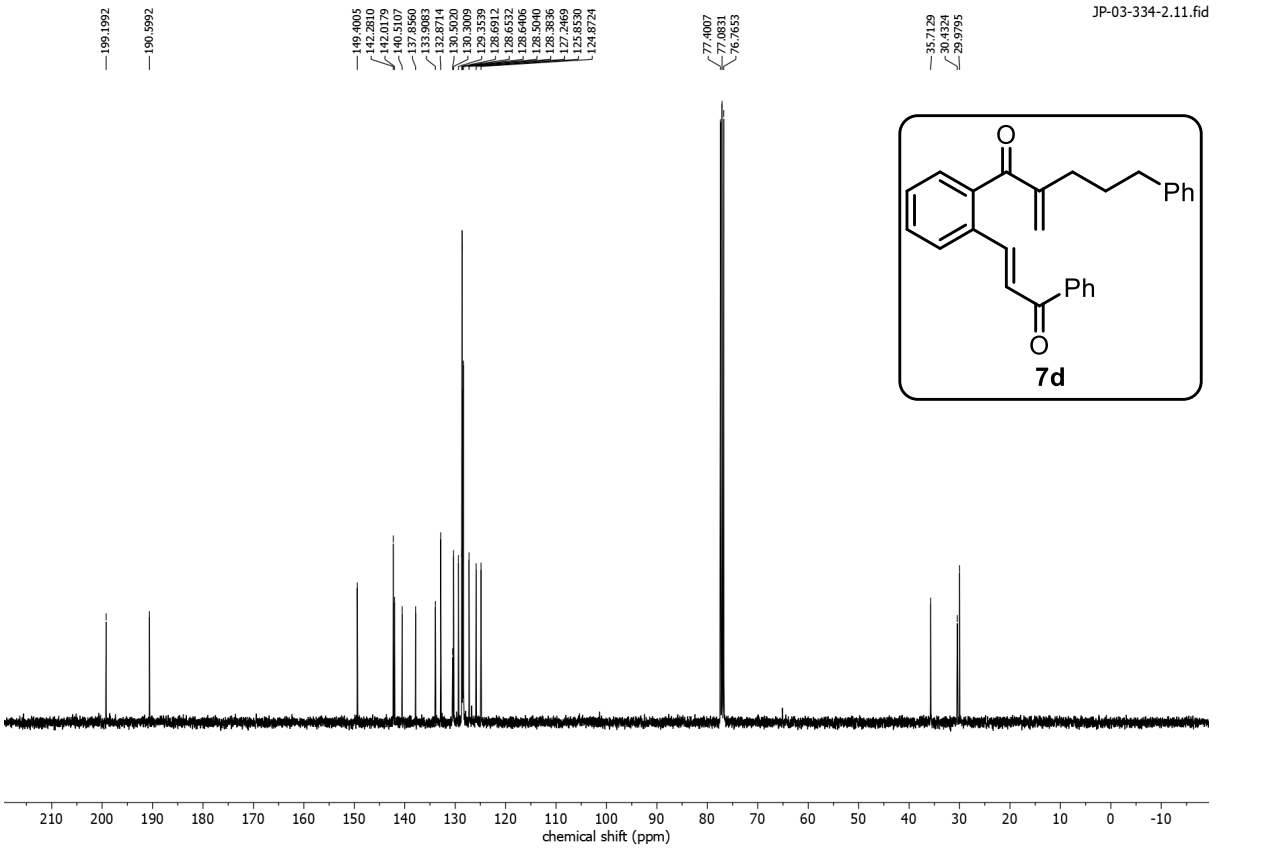
^{13}C NMR (100 MHz, $CDCl_3$)



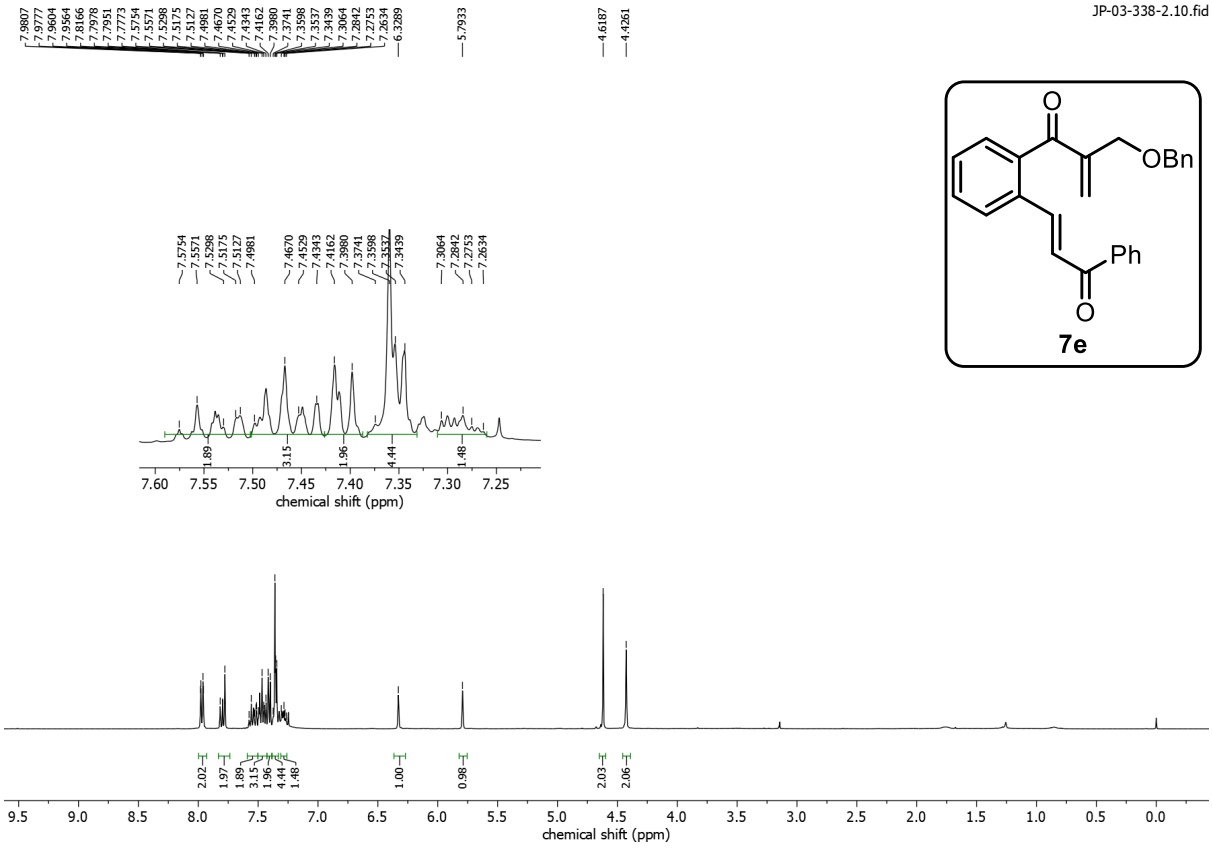
^{1}H NMR (400 MHz, $CDCl_3$)



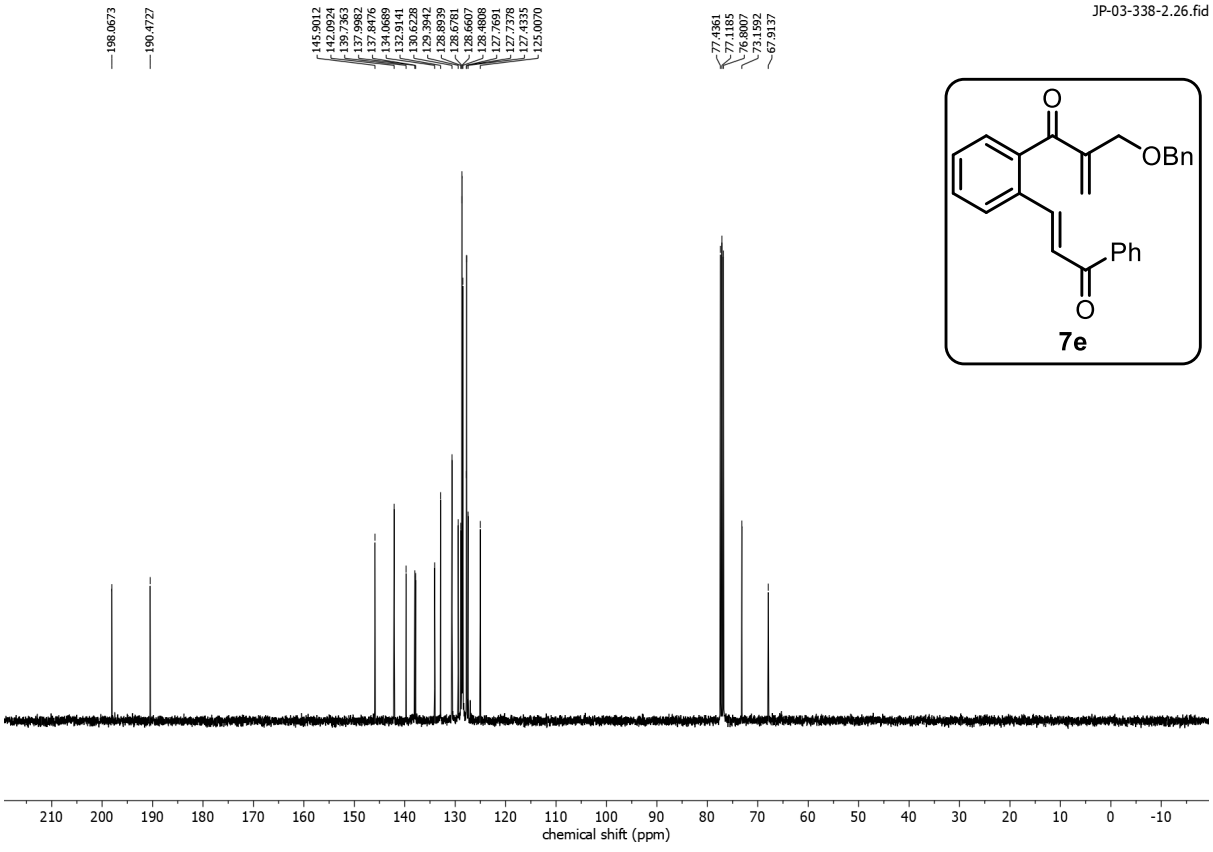
^{13}C NMR (100 MHz, $CDCl_3$)



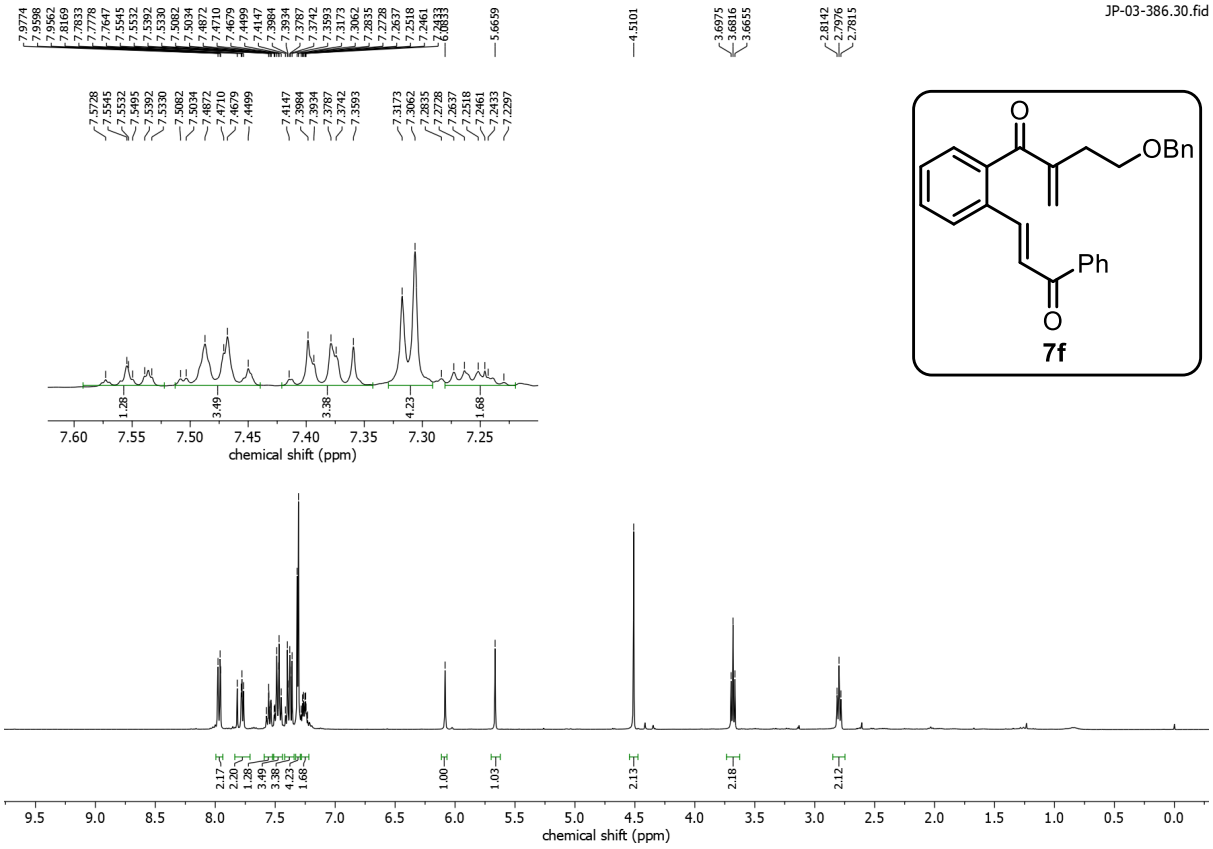
^{1}H NMR (400 MHz, $CDCl_3$)



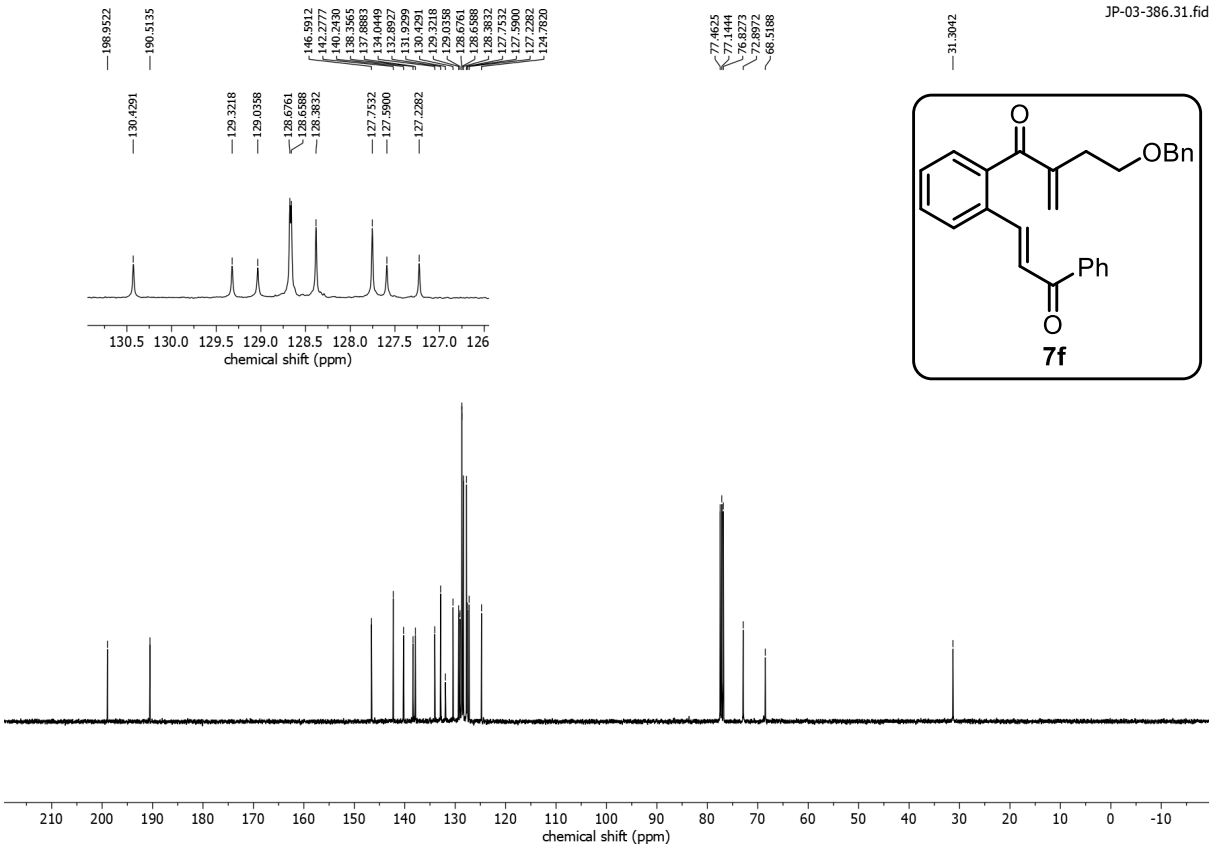
^{13}C NMR (100 MHz, $CDCl_3$)



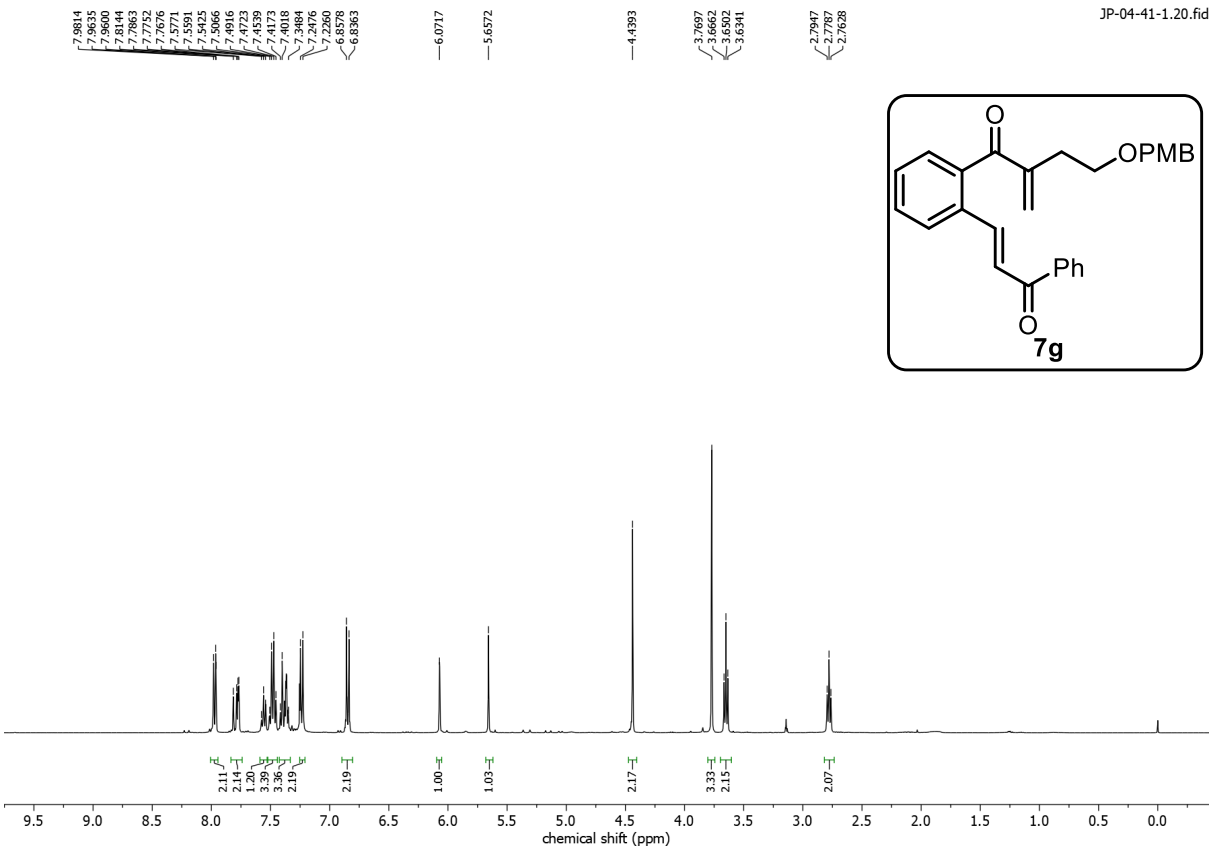
^{1}H NMR (400 MHz, $CDCl_3$)



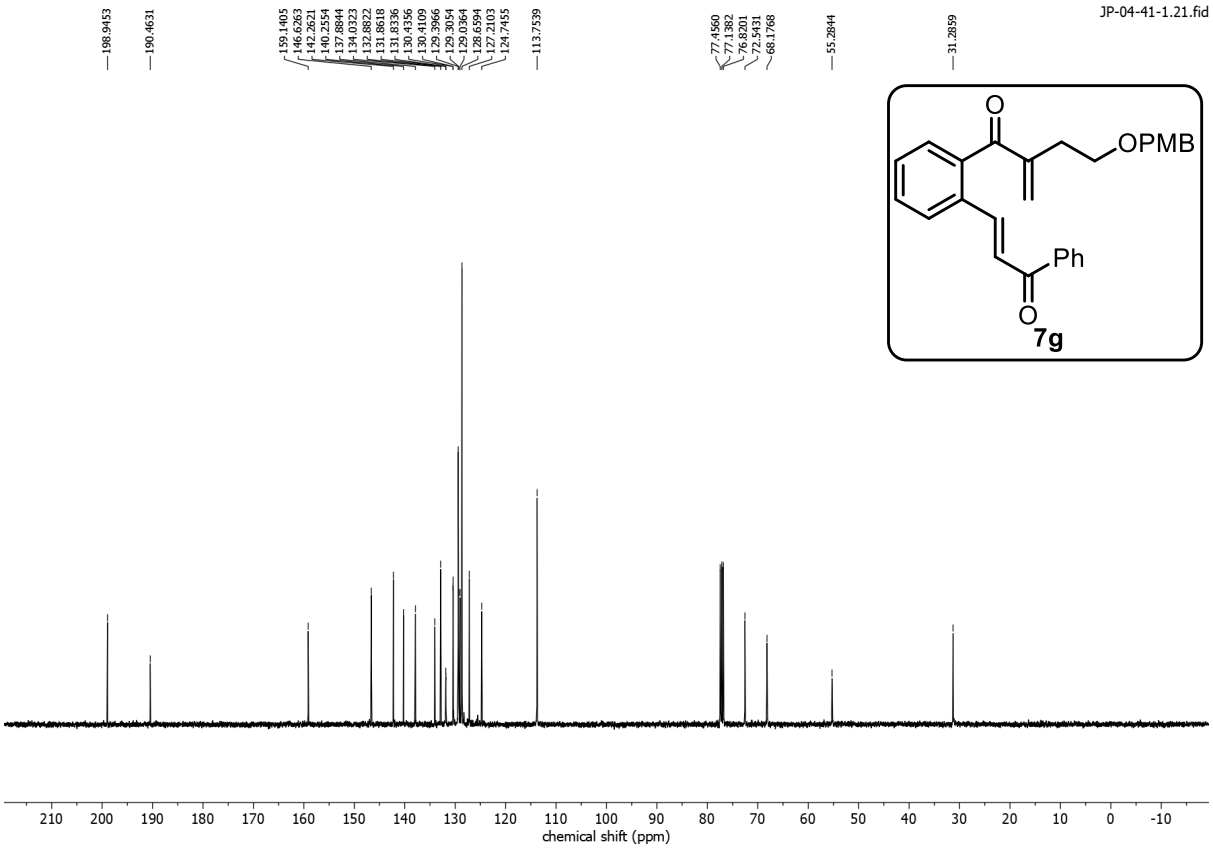
^{13}C NMR (100 MHz, $CDCl_3$)



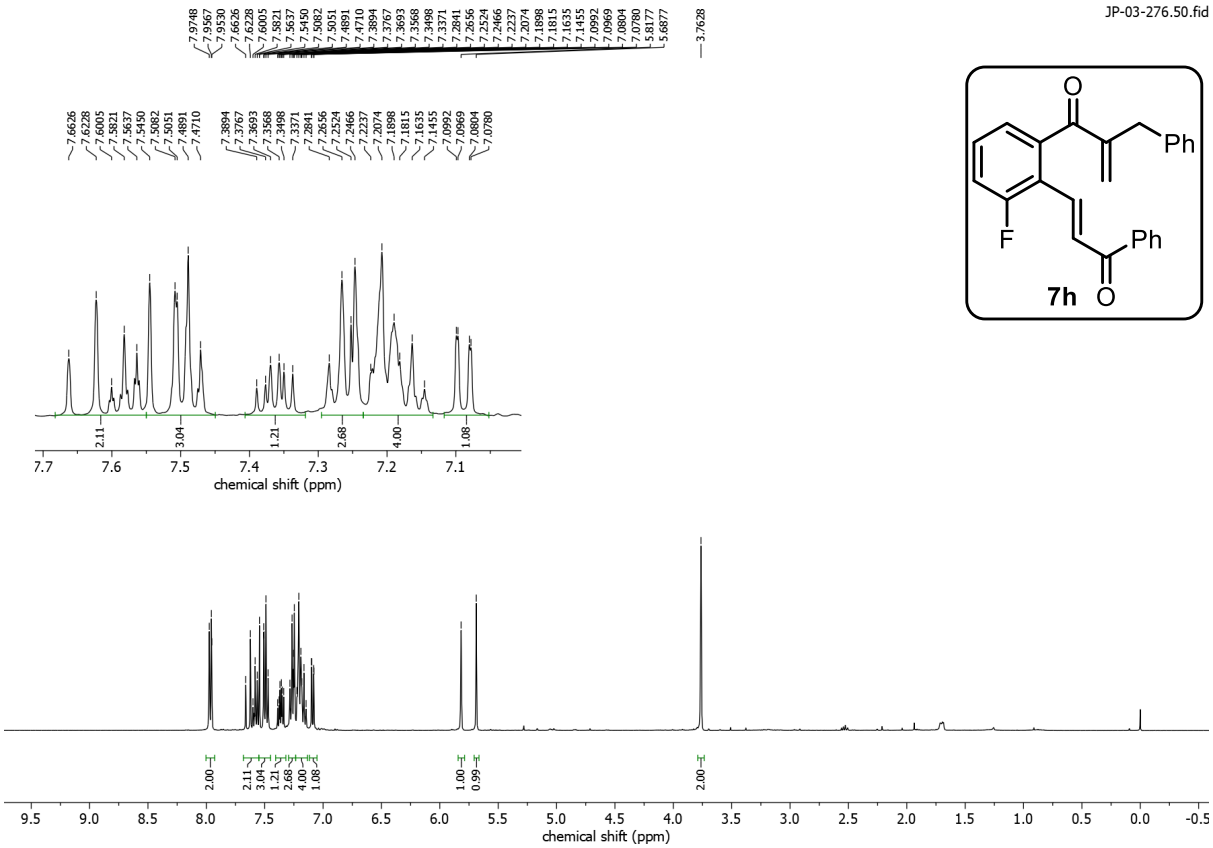
^{1}H NMR (400 MHz, $CDCl_3$)



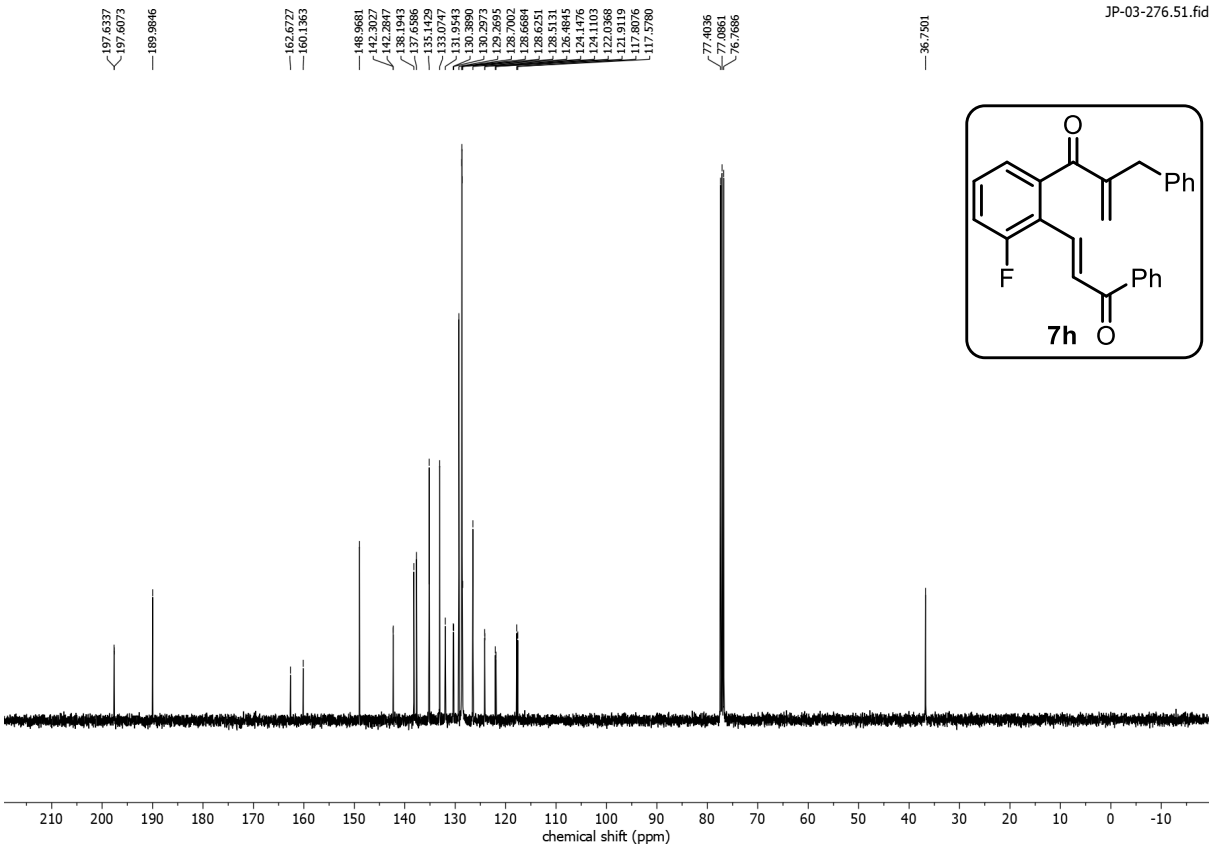
^{13}C NMR (100 MHz, $CDCl_3$)



^{1}H NMR (400 MHz, $CDCl_3$)

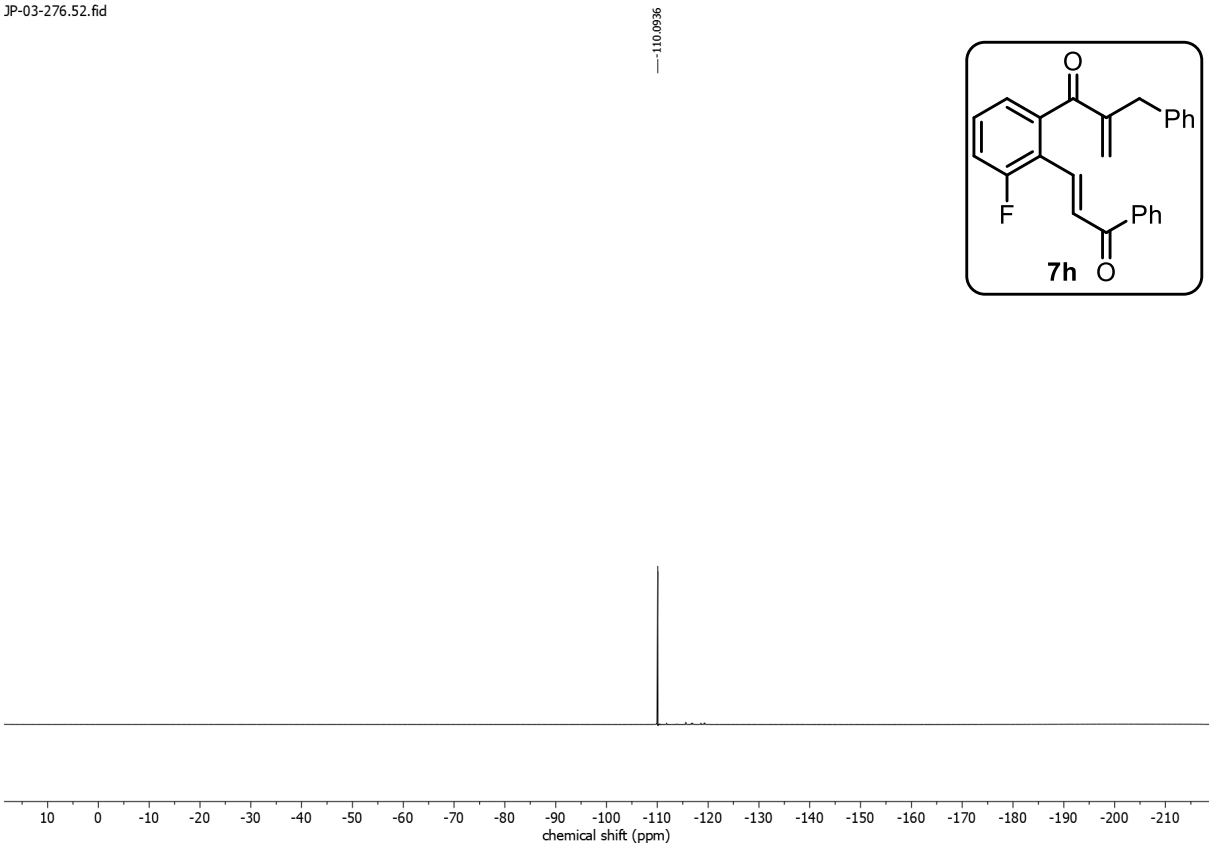


^{13}C NMR (100 MHz, $CDCl_3$)



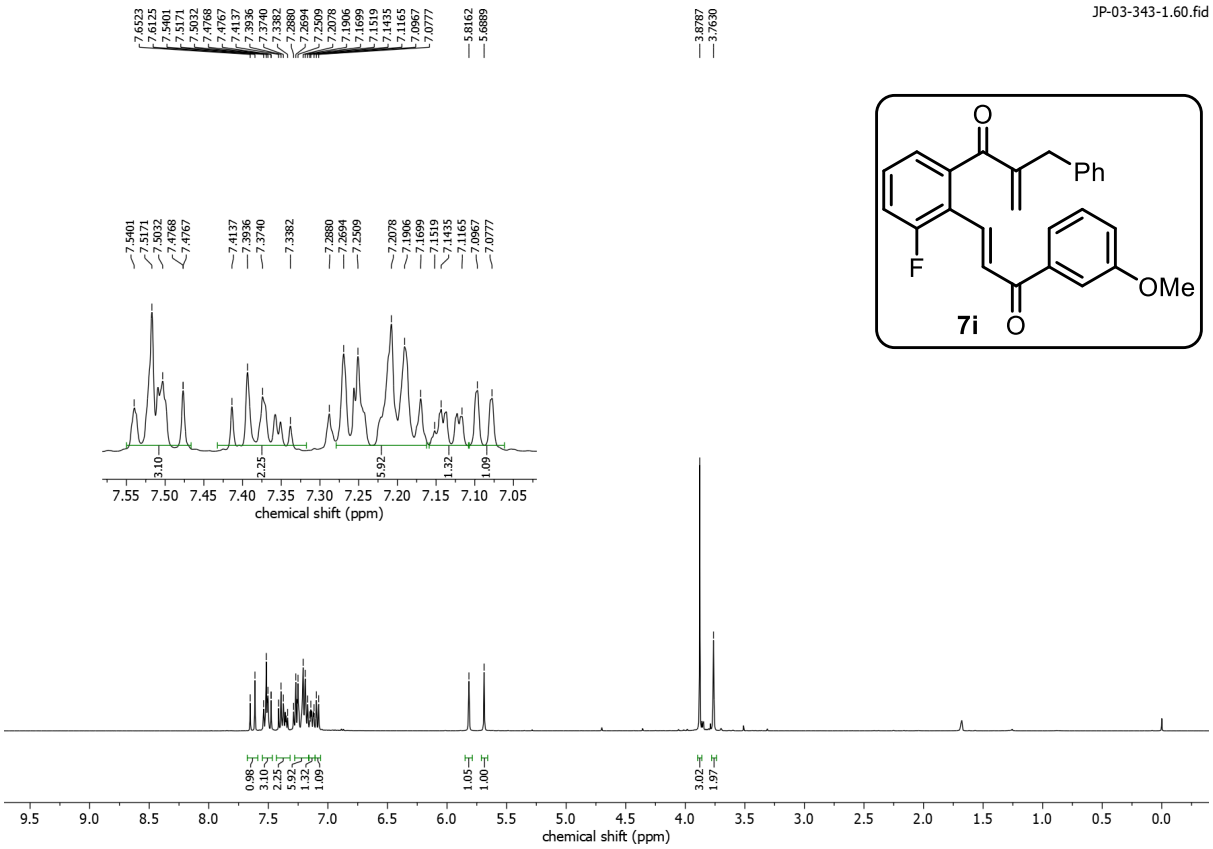
^{19}F NMR (376.4 MHz, $CDCl_3$)

JP-03-276.52.fid

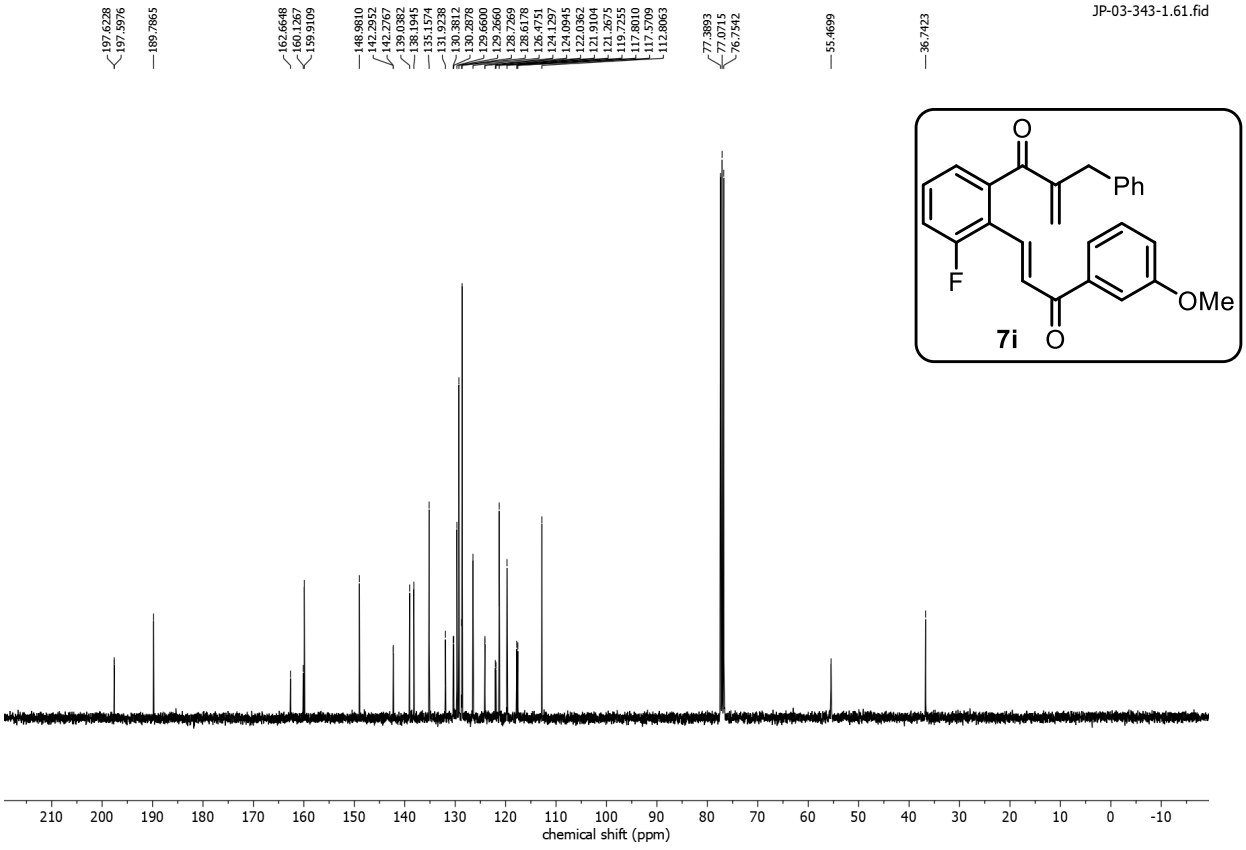


^{1}H NMR (400 MHz, $CDCl_3$)

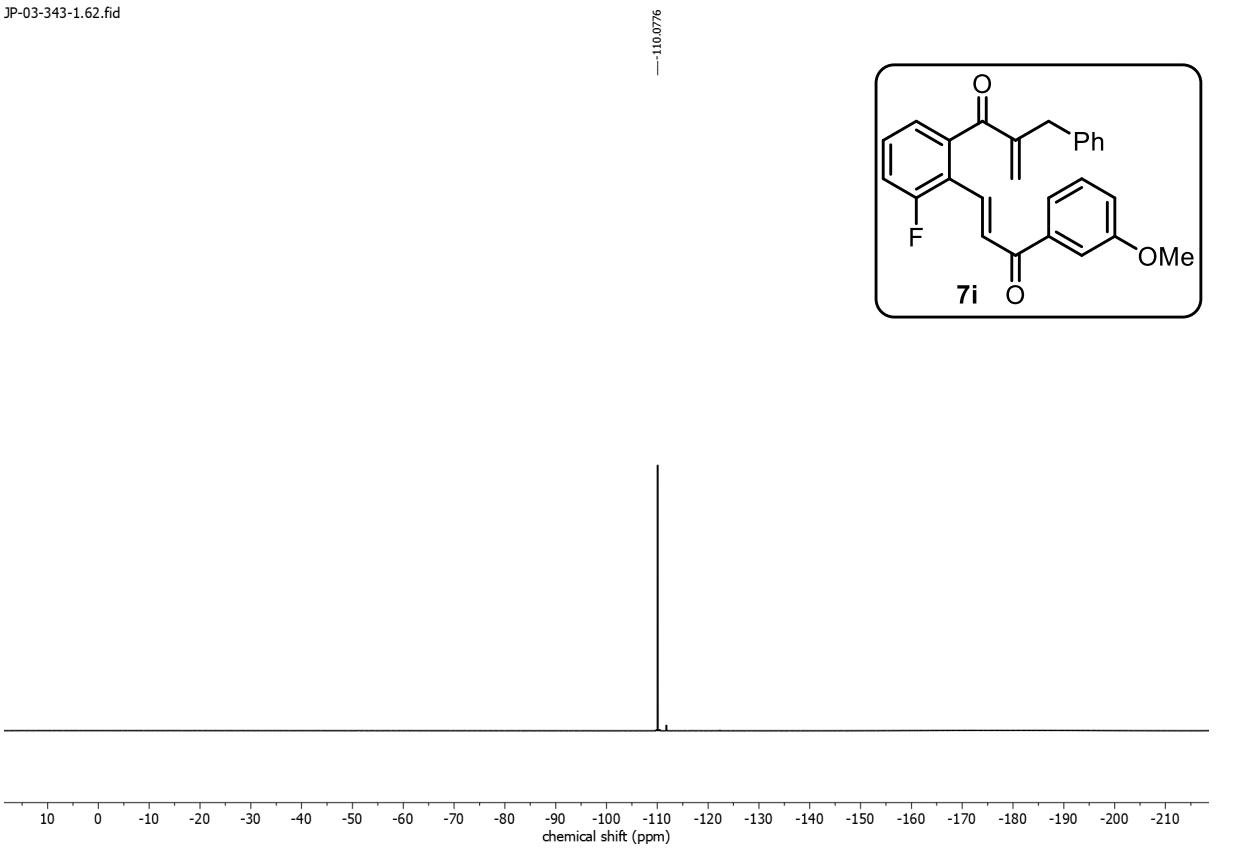
JP-03-343-1.60.fid



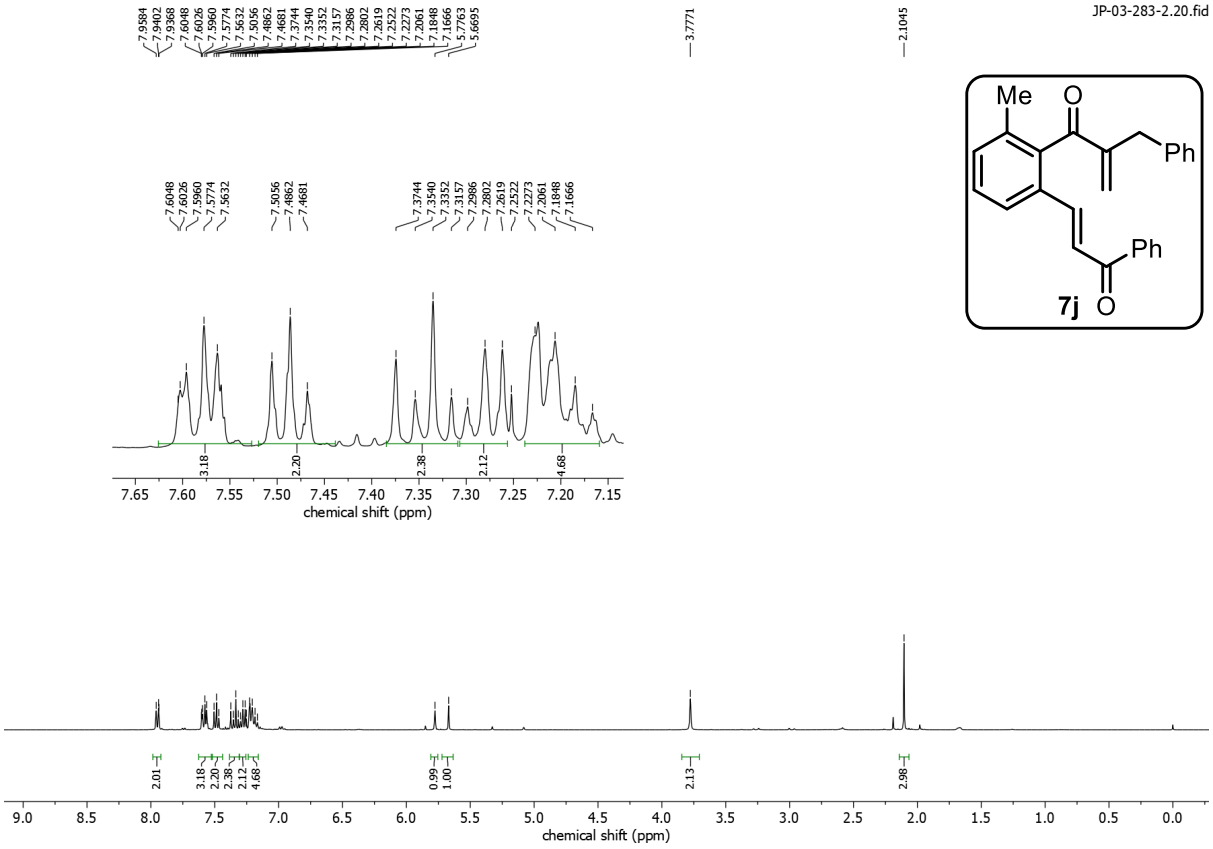
^{13}C NMR (100 MHz, $CDCl_3$)



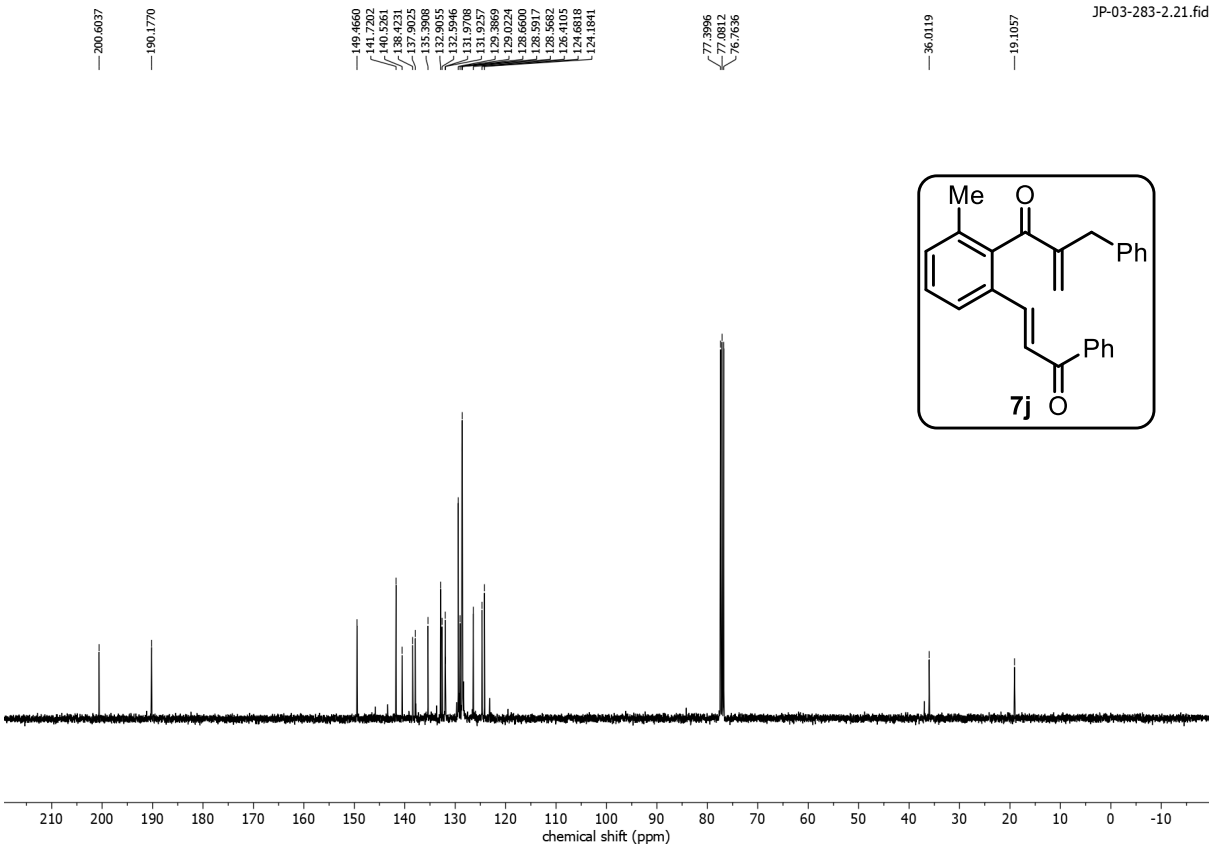
^{19}F NMR (376.4 MHz, $CDCl_3$)



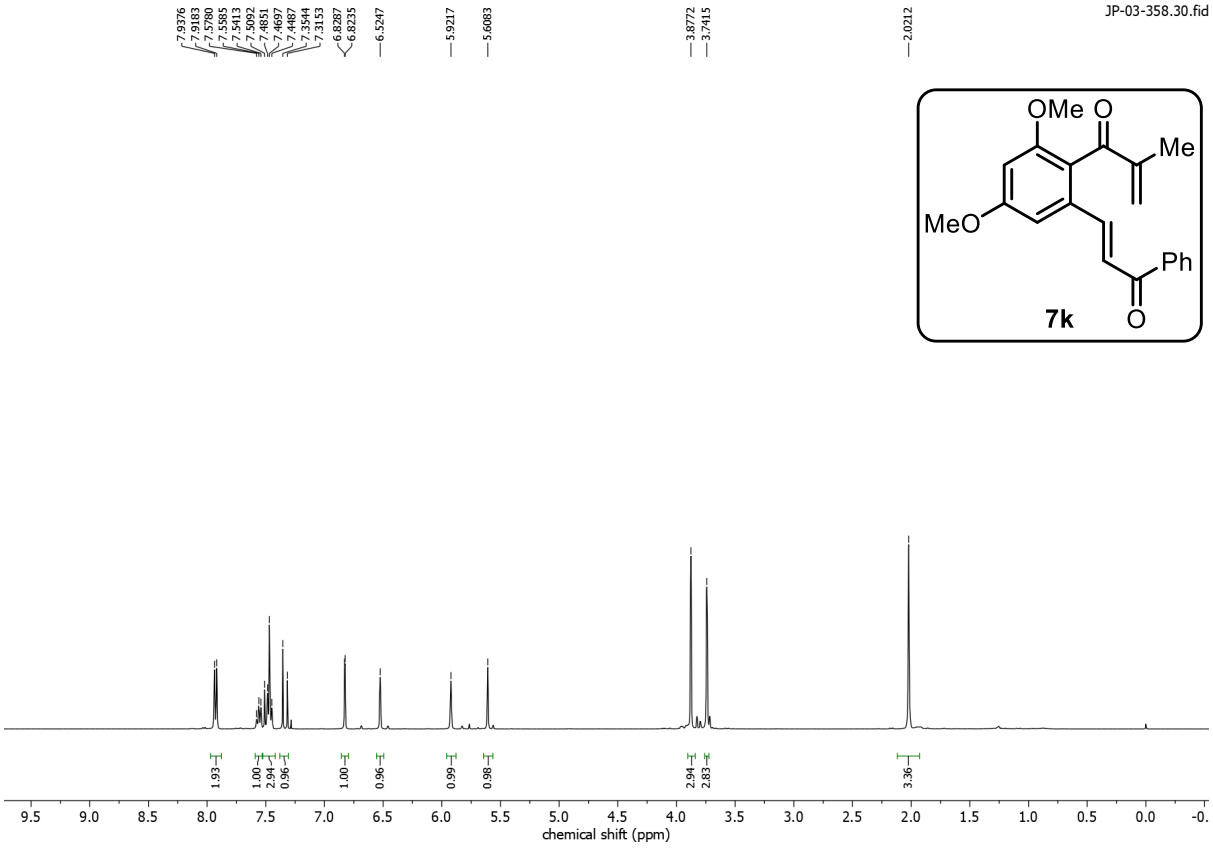
^{1}H NMR (400 MHz, $CDCl_3$)



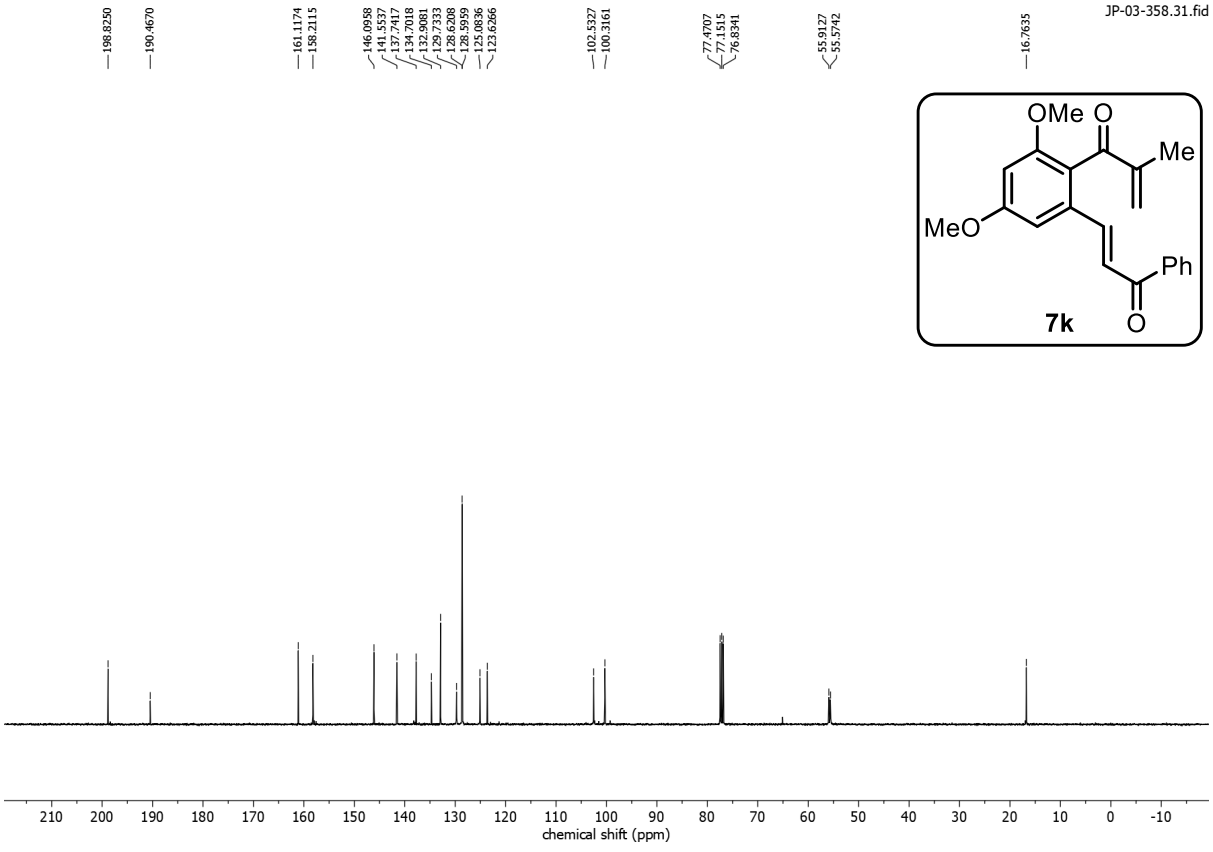
^{13}C NMR (100 MHz, $CDCl_3$)



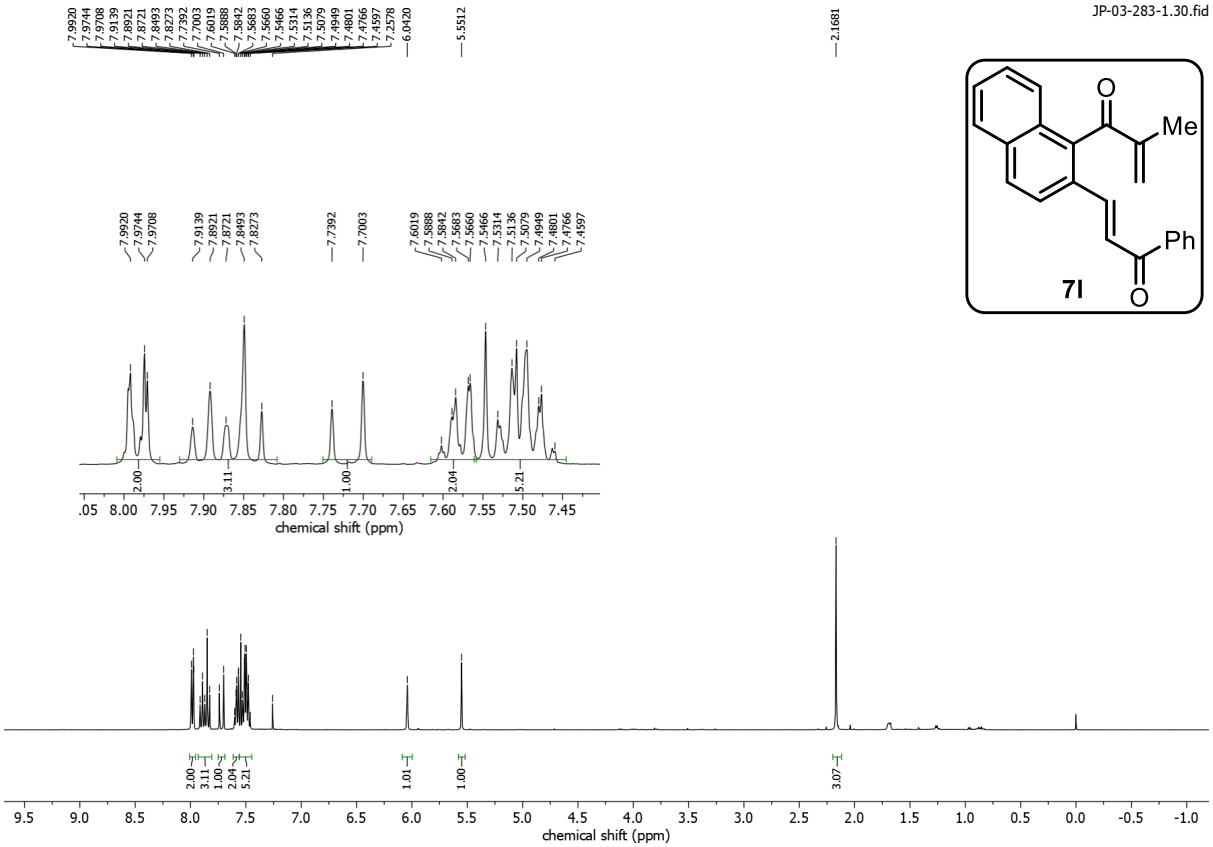
^{1}H NMR (400 MHz, $CDCl_3$)



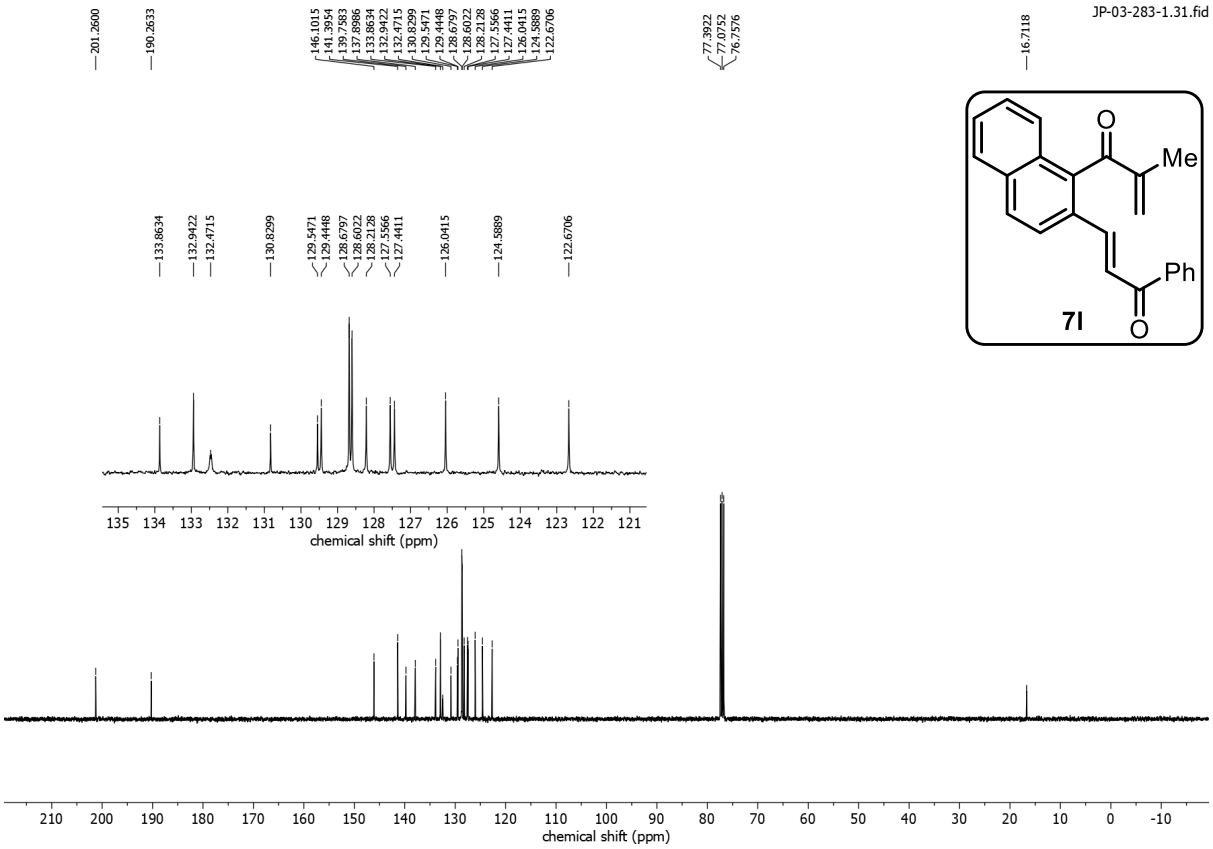
^{13}C NMR (100 MHz, $CDCl_3$)



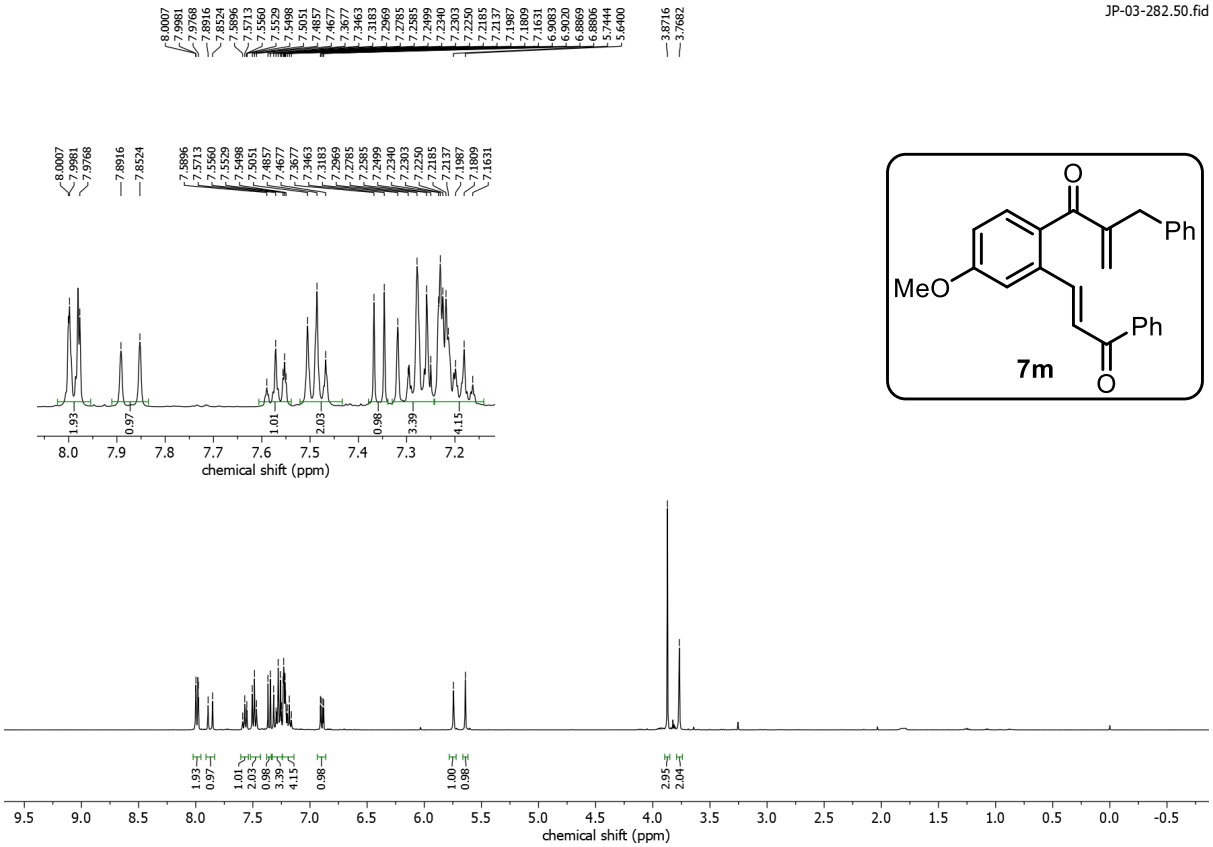
^{1}H NMR (400 MHz, $CDCl_3$)



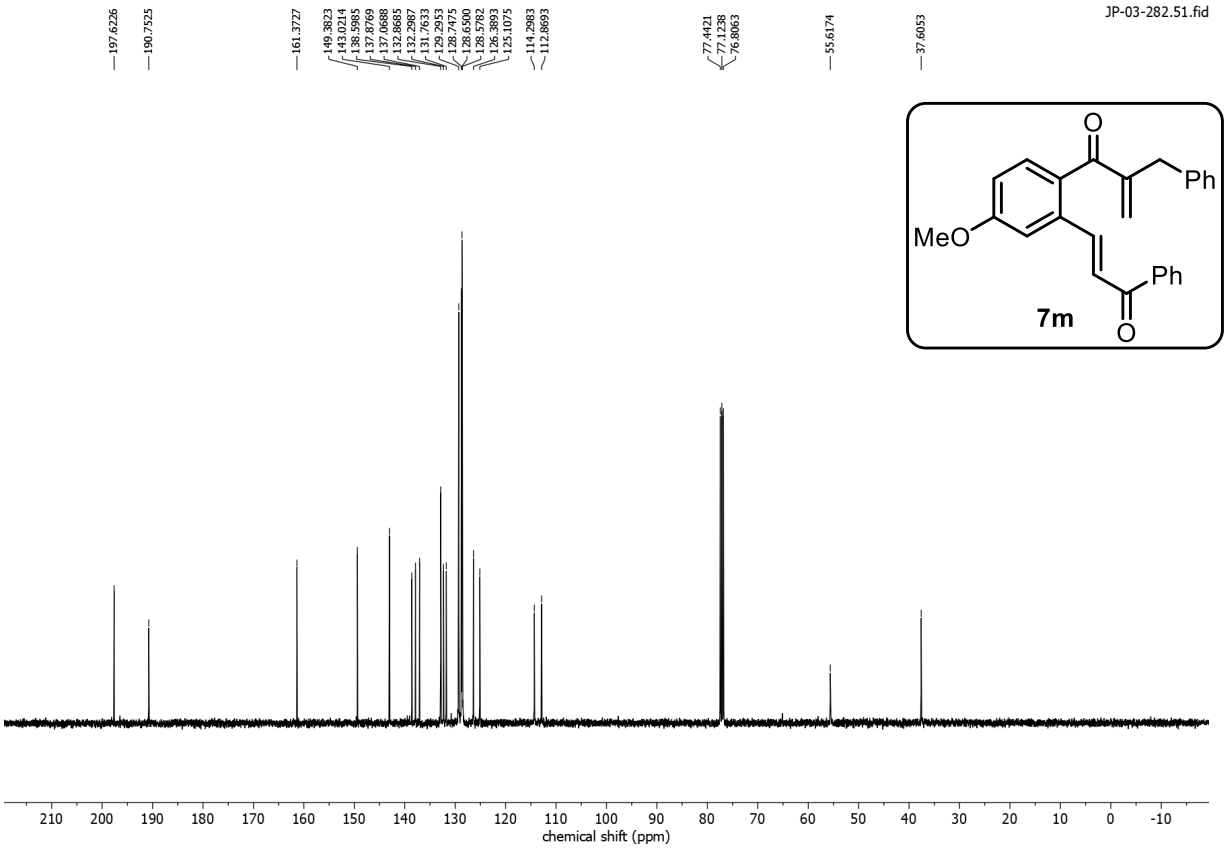
^{13}C NMR (100 MHz, $CDCl_3$)



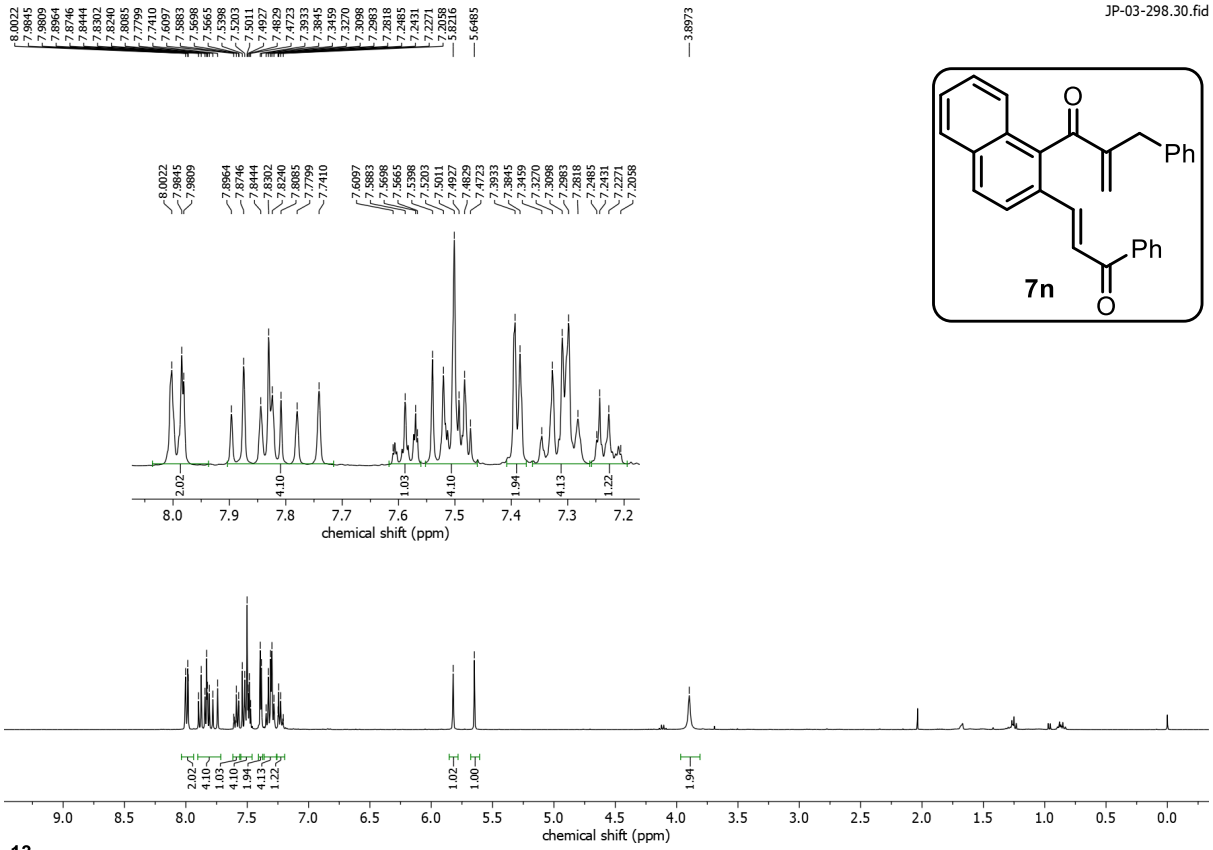
^{1}H NMR (400 MHz, $CDCl_3$)



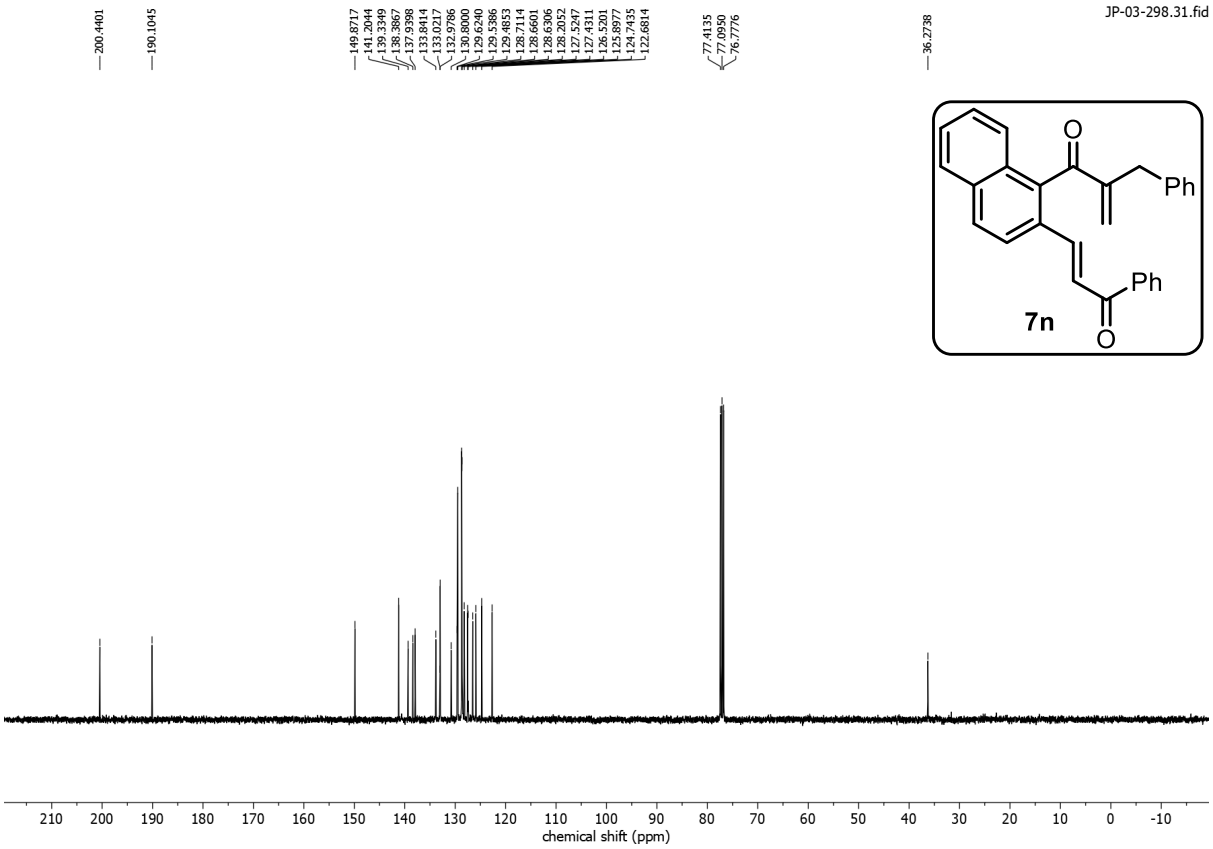
^{13}C NMR (100 MHz, $CDCl_3$)



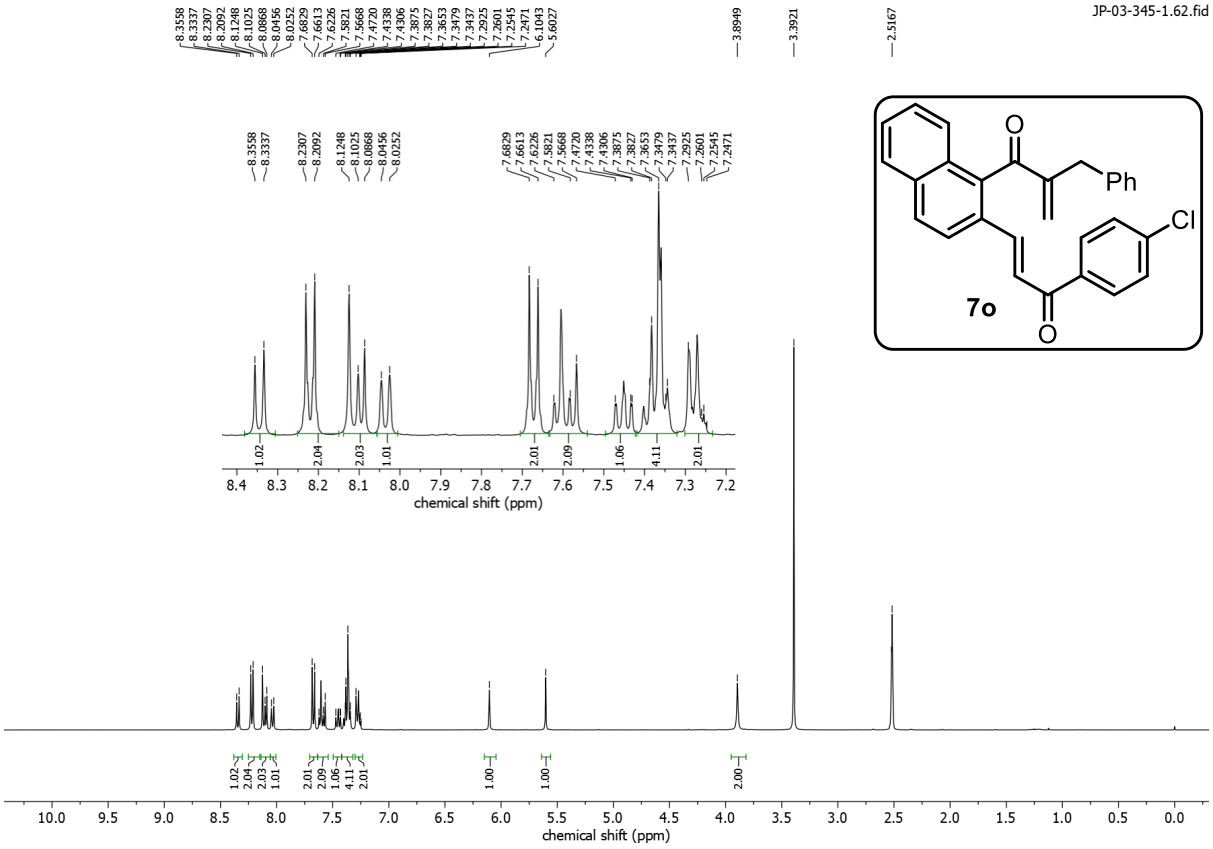
^{1}H NMR (400 MHz, $CDCl_3$)



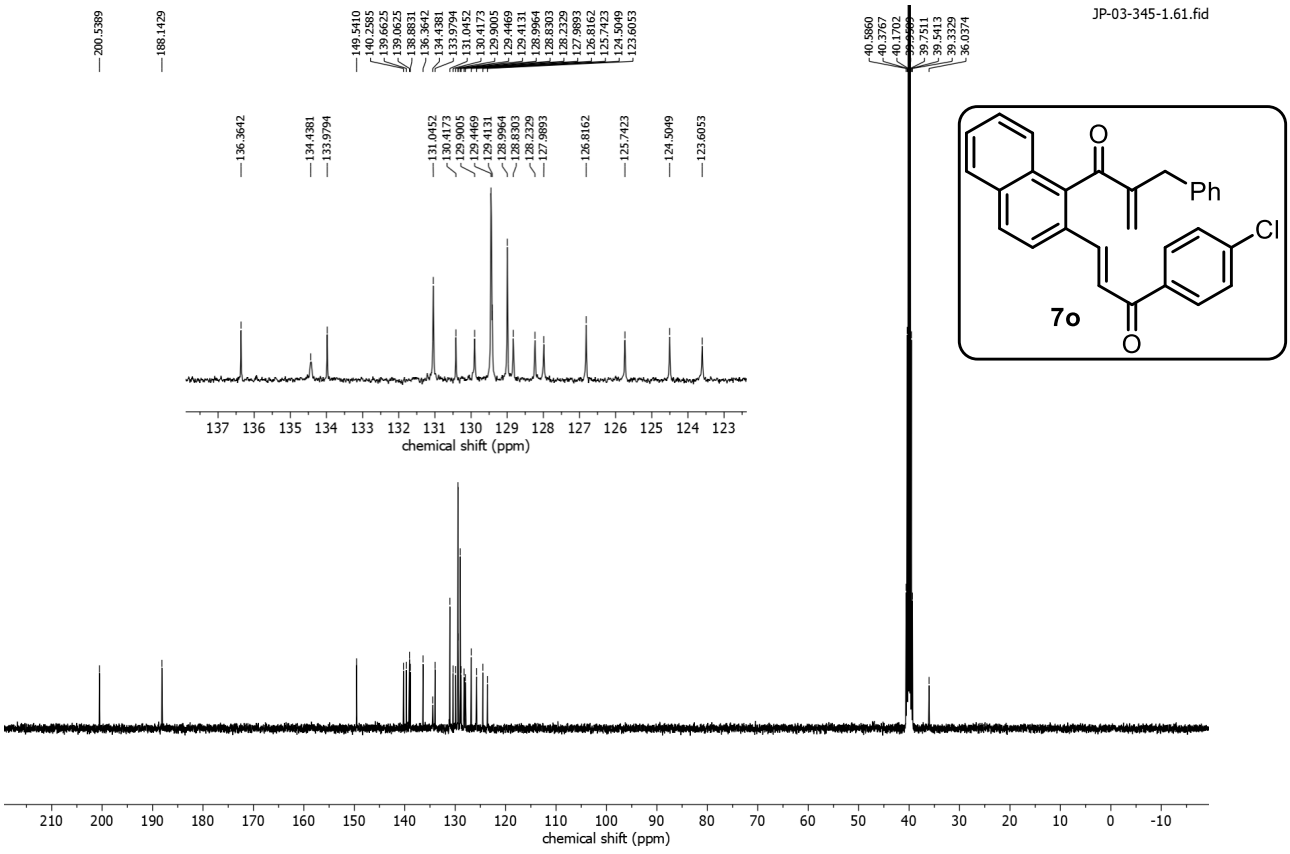
^{13}C NMR (100 MHz, $CDCl_3$)



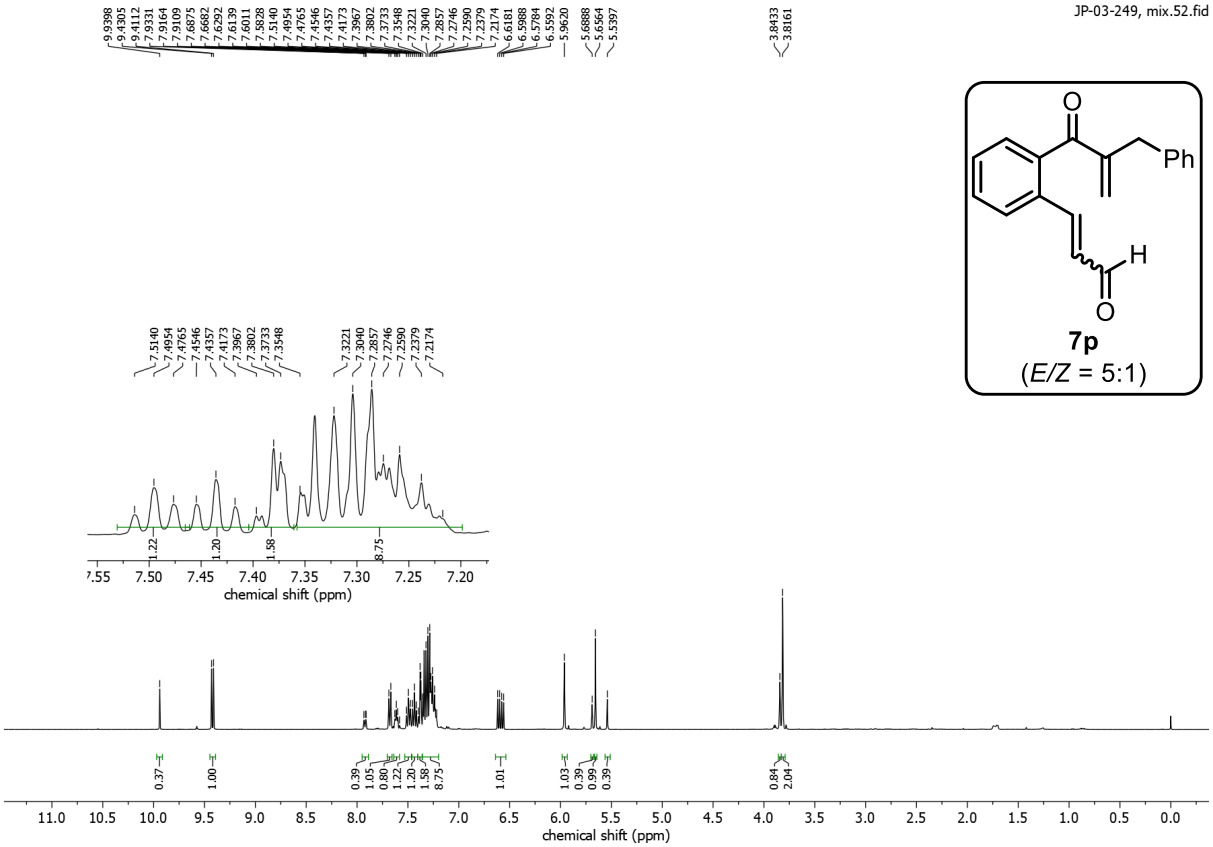
^{1}H NMR (400 MHz, DMSO-d_6)



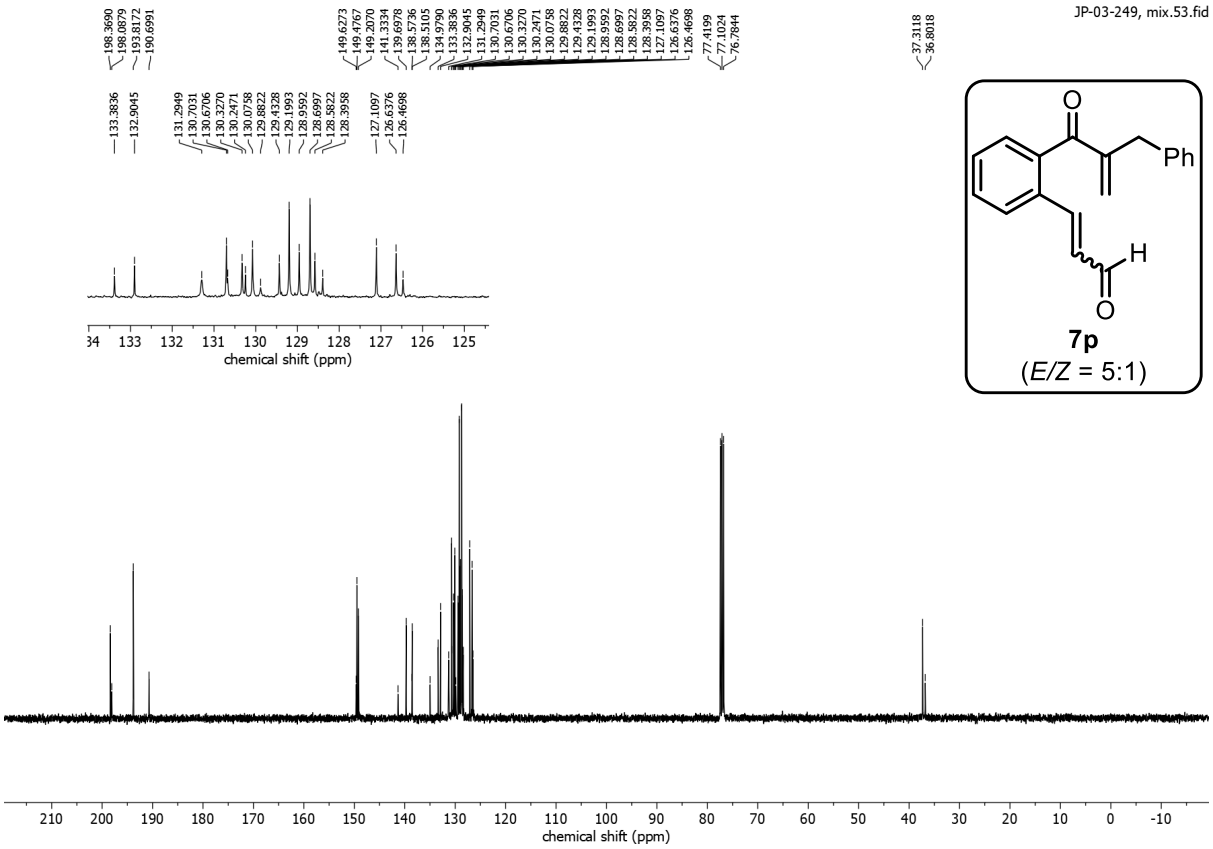
^{13}C NMR (100 MHz, DMSO-d_6)



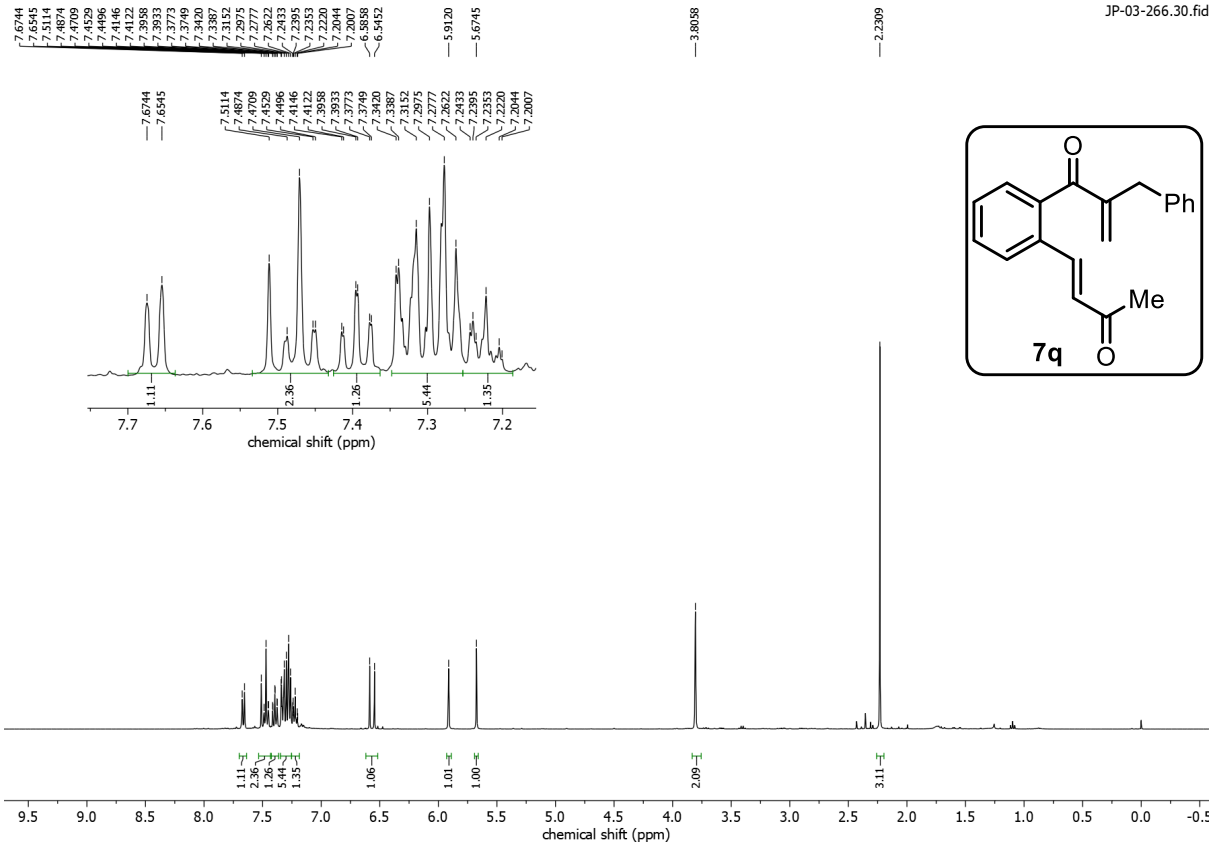
^{1}H NMR (400 MHz, $CDCl_3$)



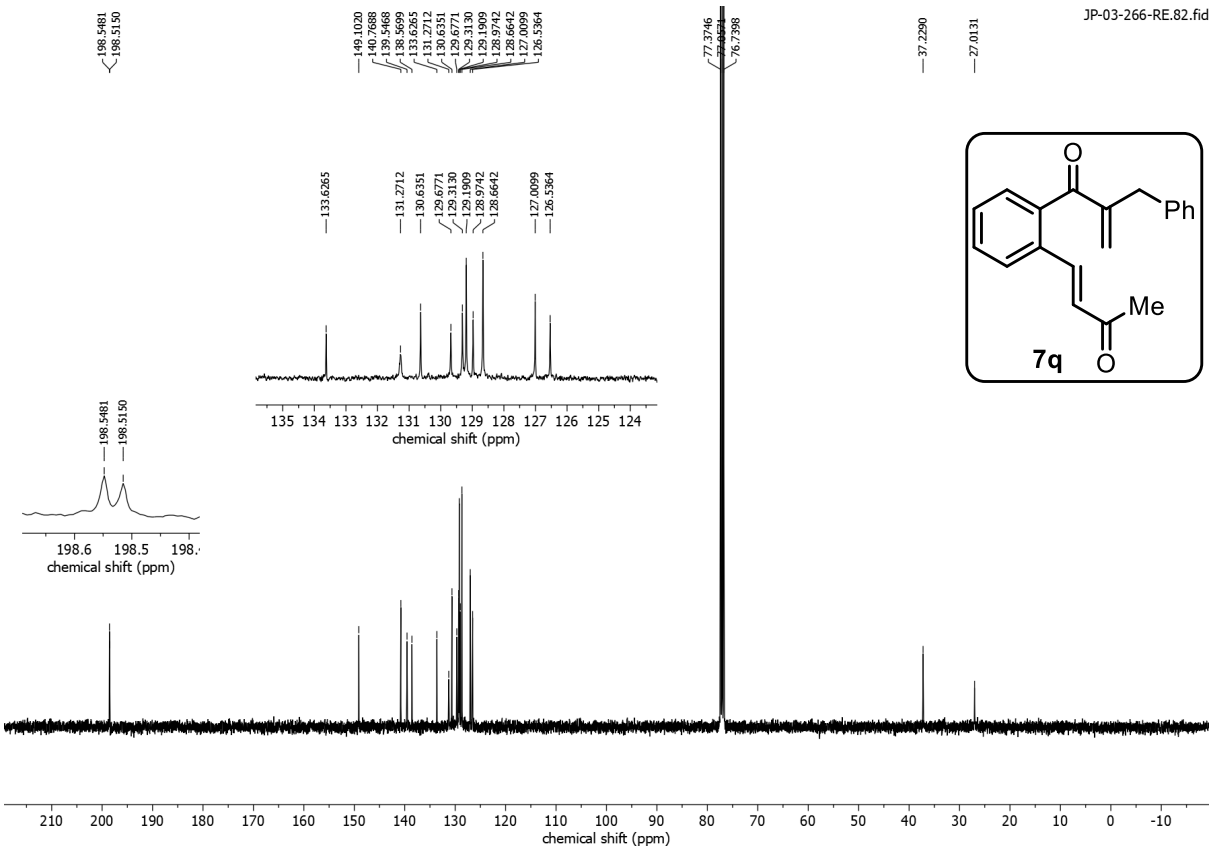
^{13}C NMR (100 MHz, $CDCl_3$)



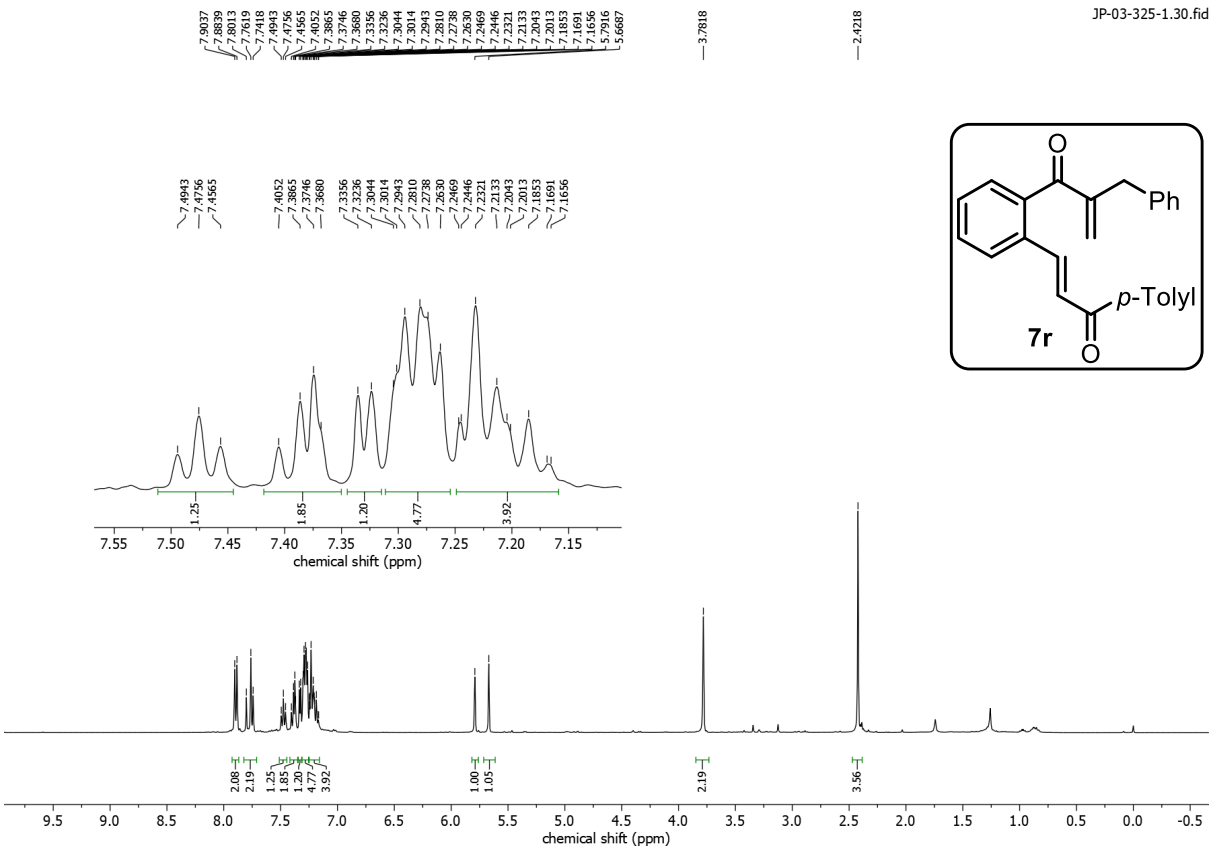
^{1}H NMR (400 MHz, $CDCl_3$)



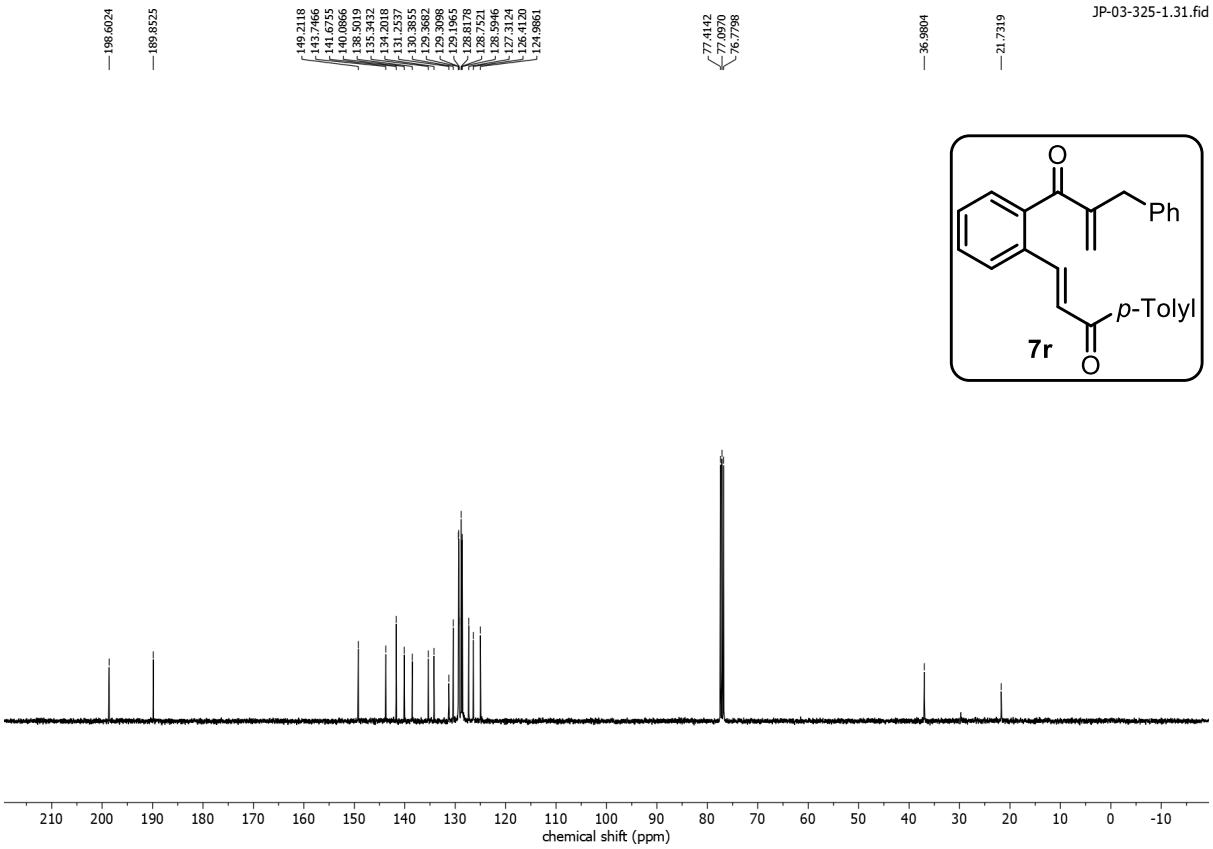
^{13}C NMR (100 MHz, $CDCl_3$)



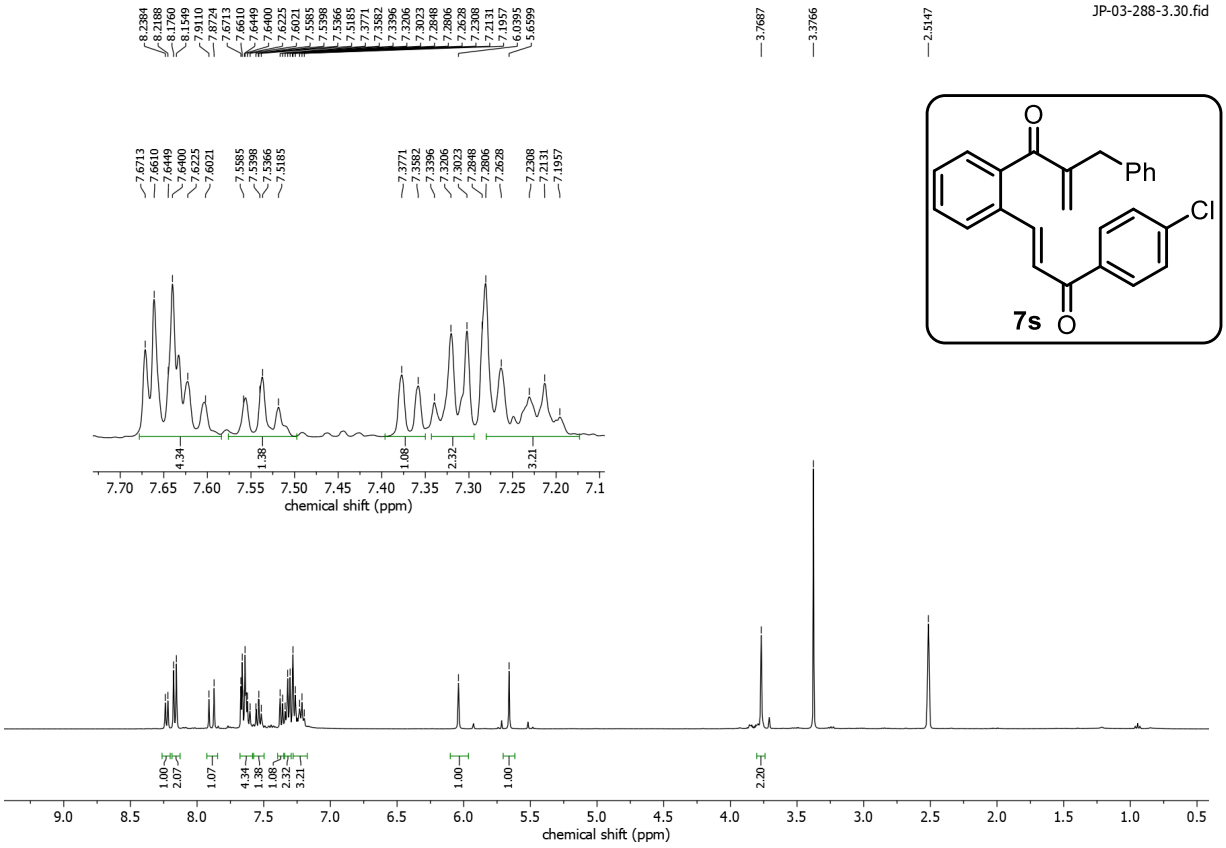
^{1}H NMR (400 MHz, $CDCl_3$)



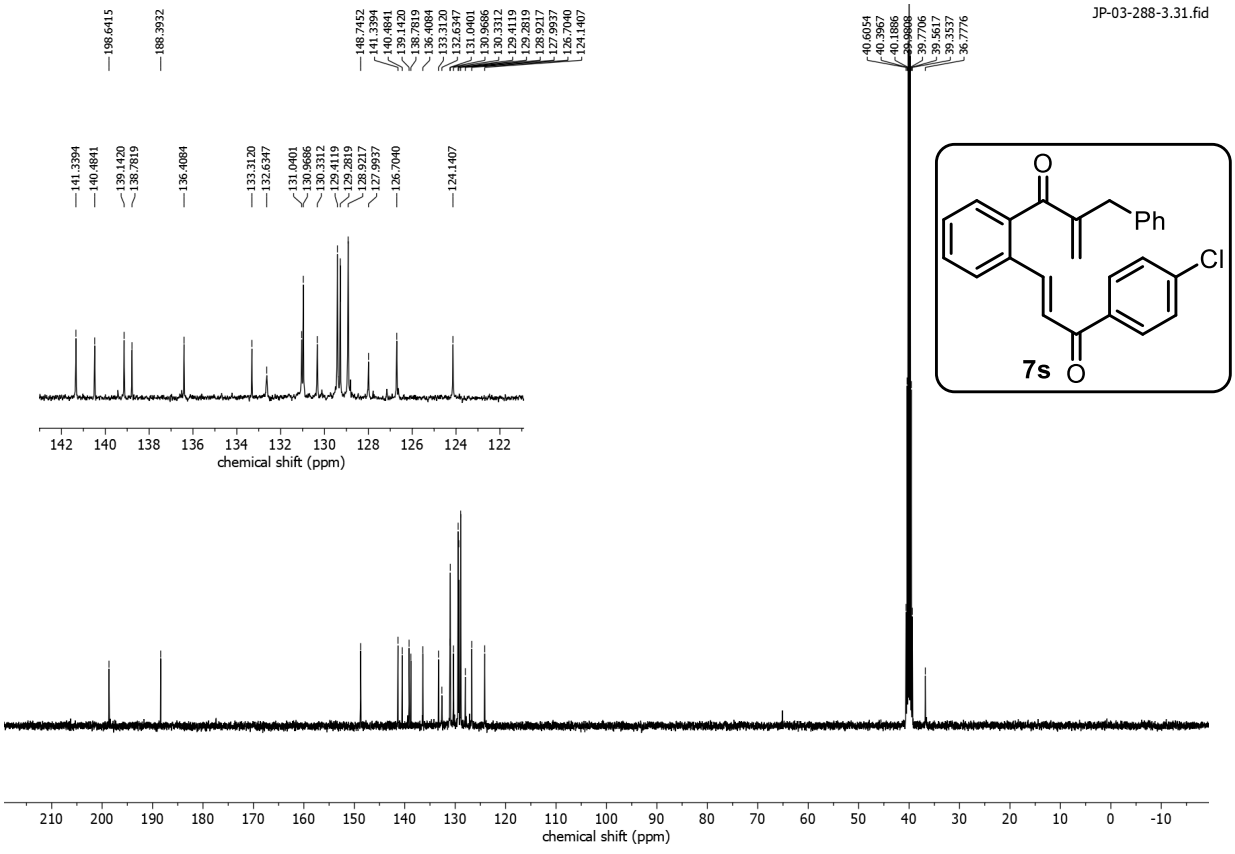
^{13}C NMR (100 MHz, $CDCl_3$)



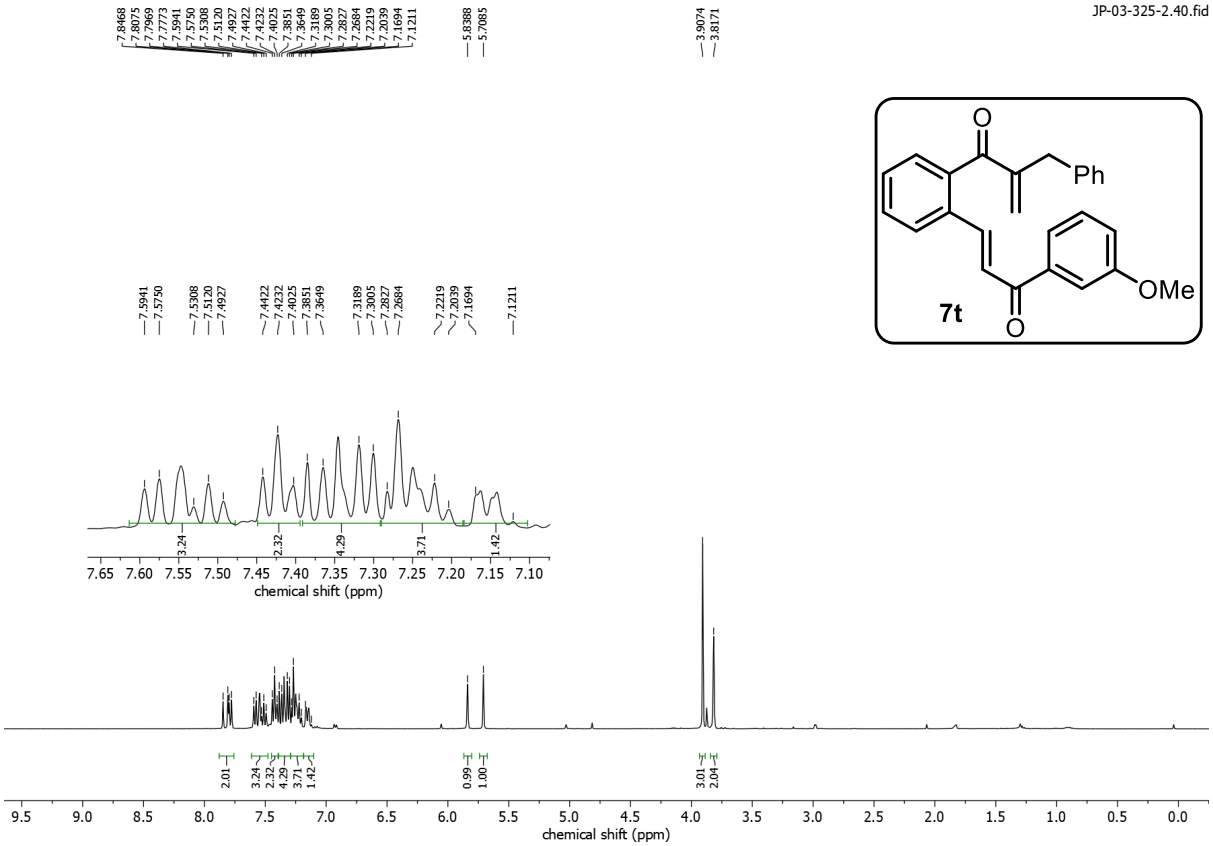
^{1}H NMR (400 MHz, DMSO-d_6)



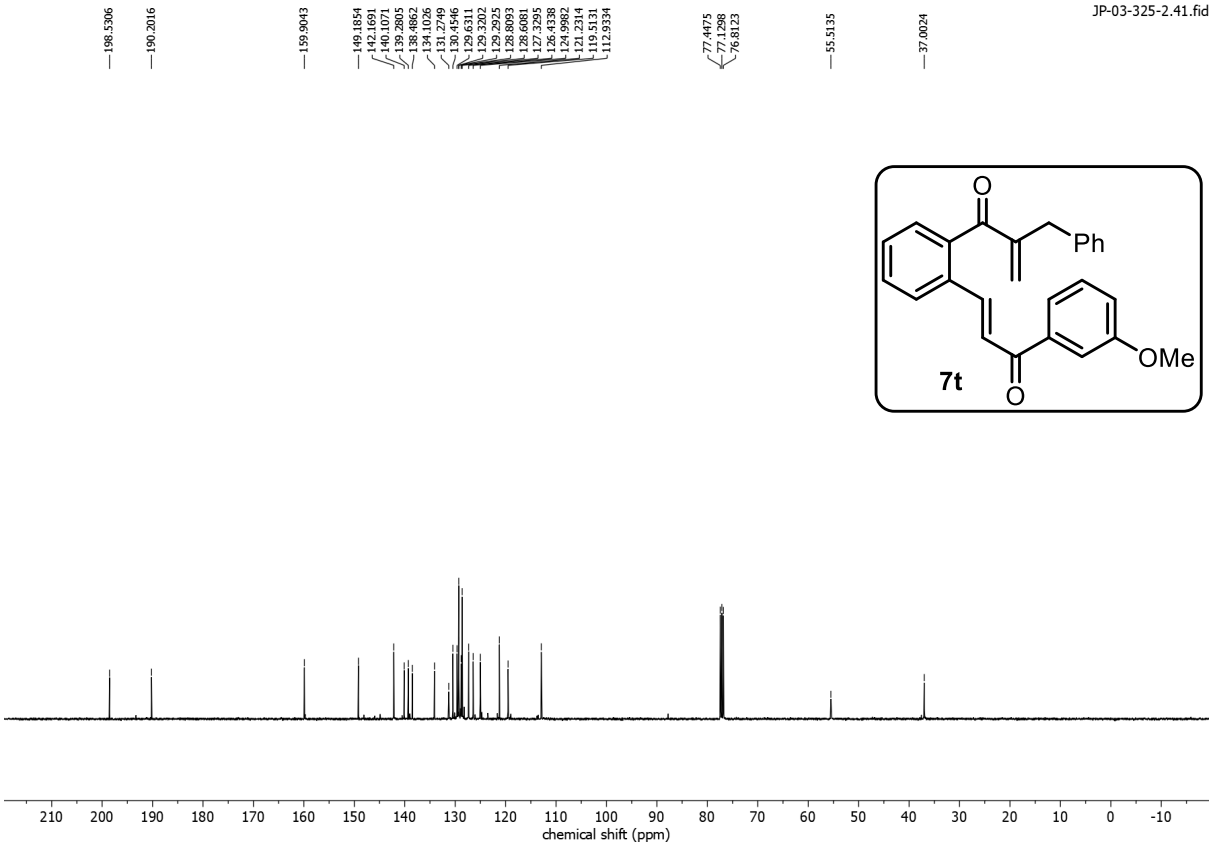
^{13}C NMR (100 MHz, DMSO-d_6)



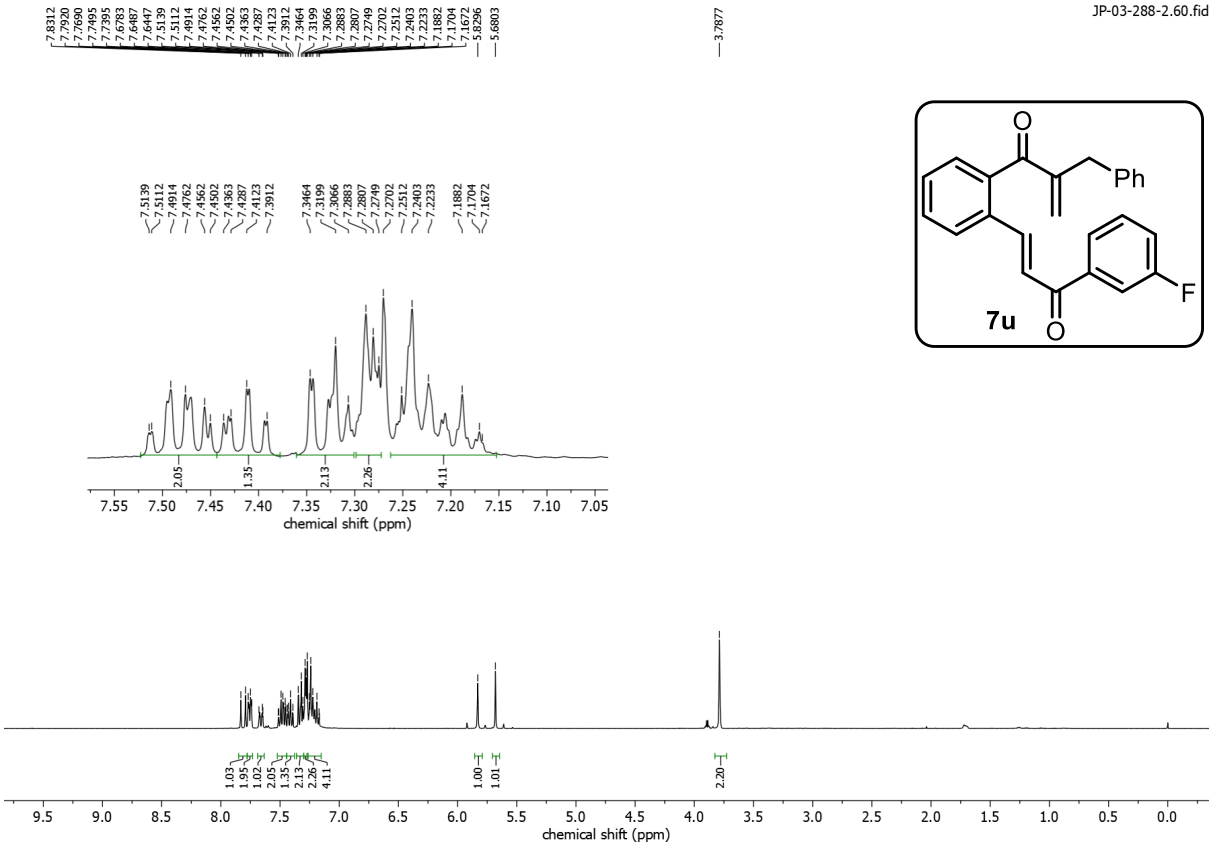
^{1}H NMR (400 MHz, $CDCl_3$)



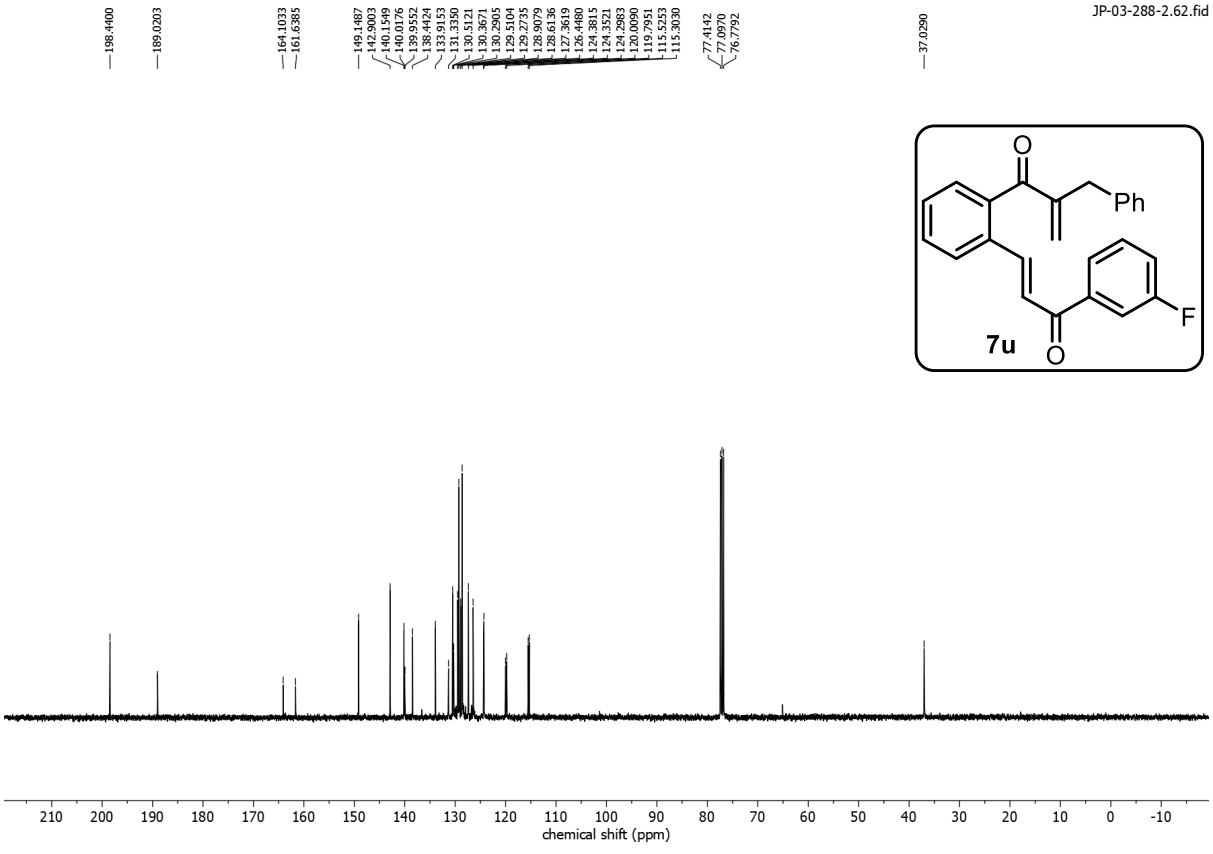
^{13}C NMR (100 MHz, $CDCl_3$)



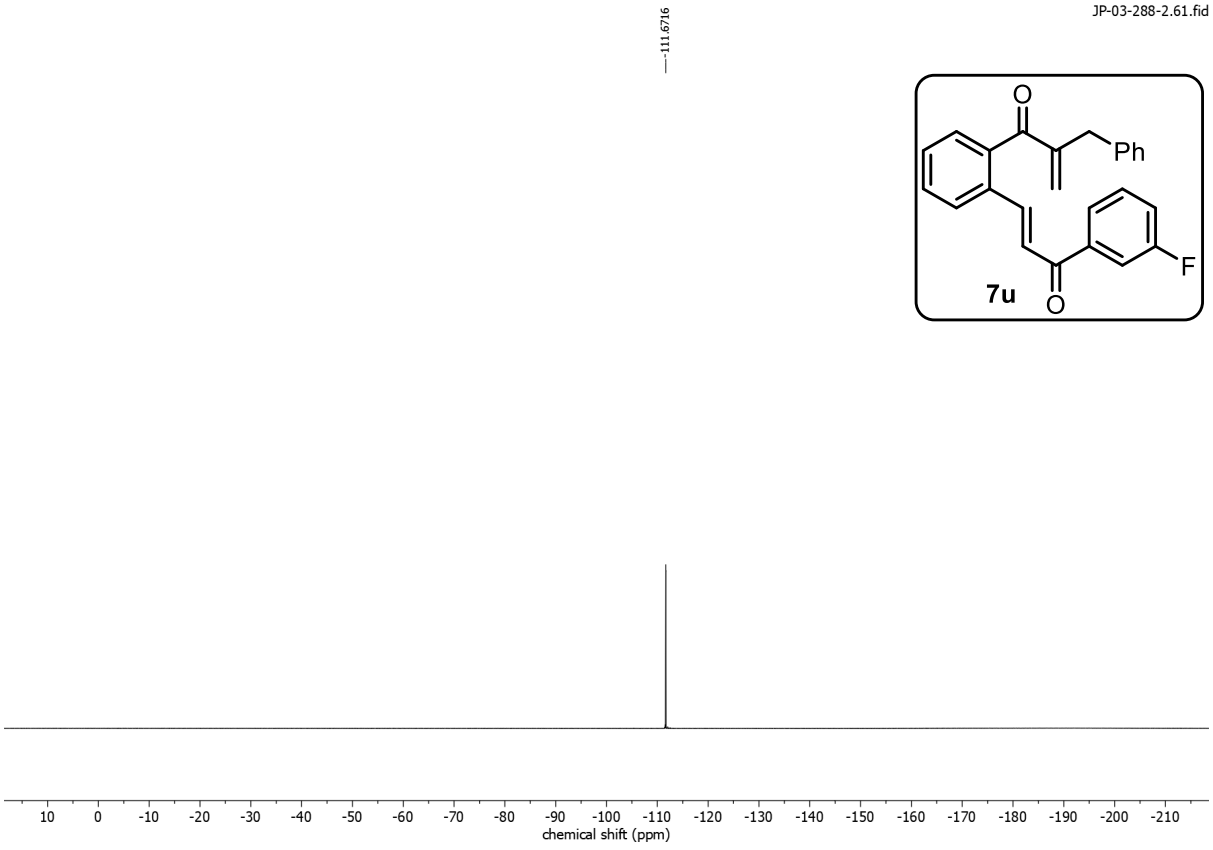
^{1}H NMR (400 MHz, $CDCl_3$)



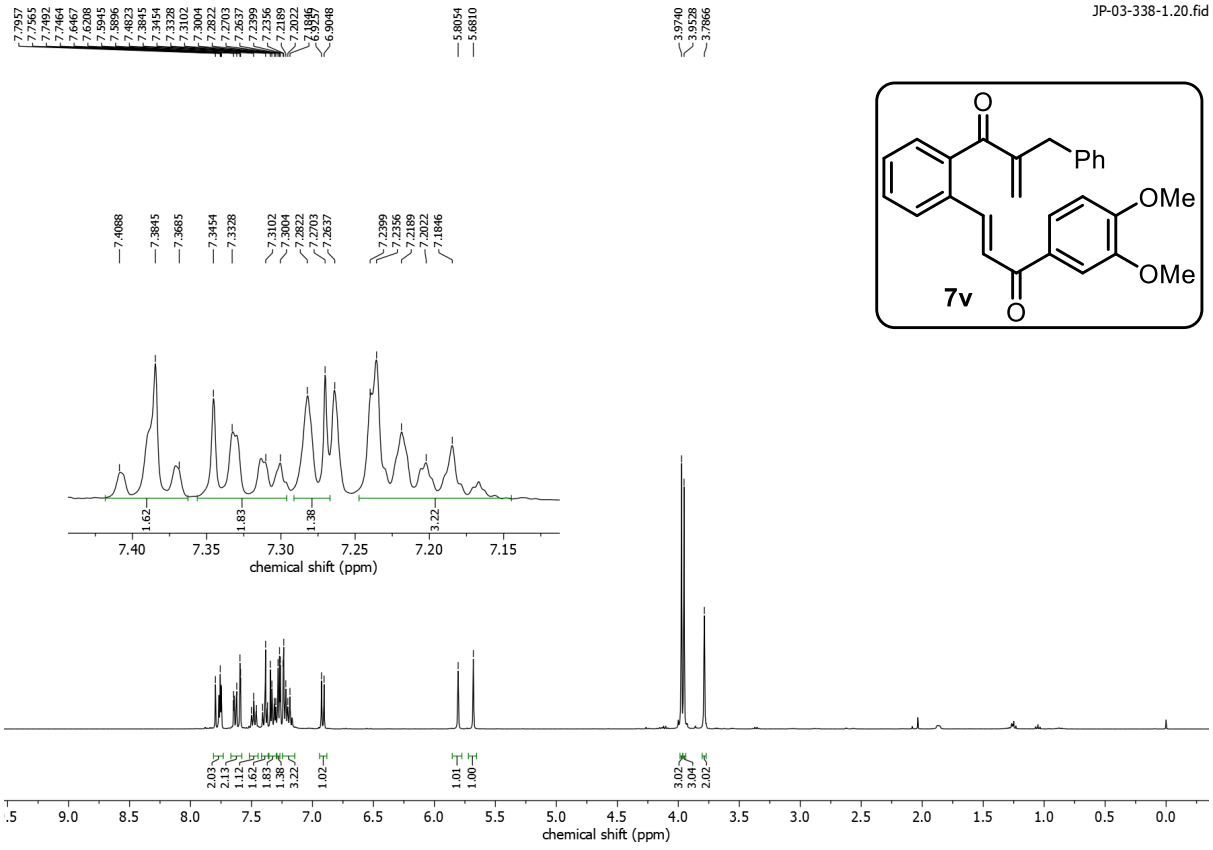
^{13}C NMR (100 MHz, $CDCl_3$)



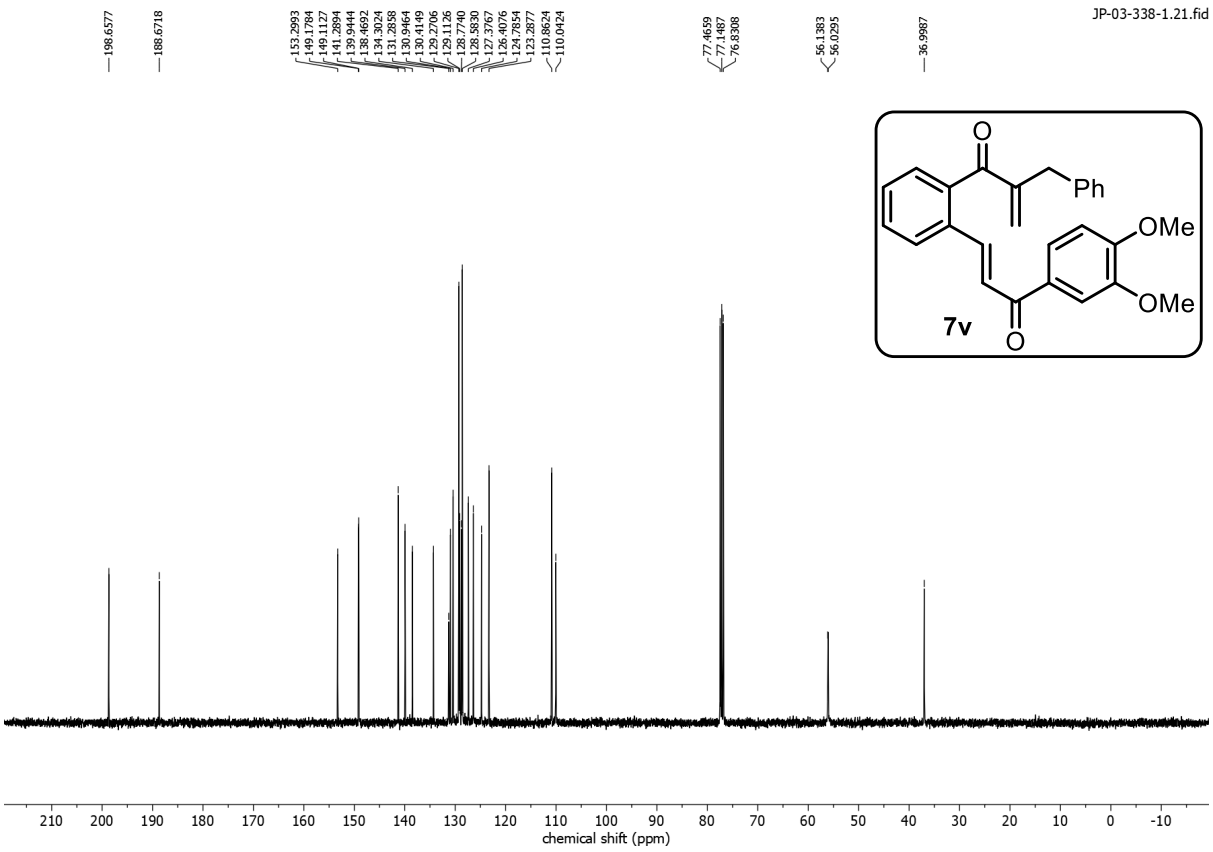
^{19}F NMR (376.4 MHz, $CDCl_3$)



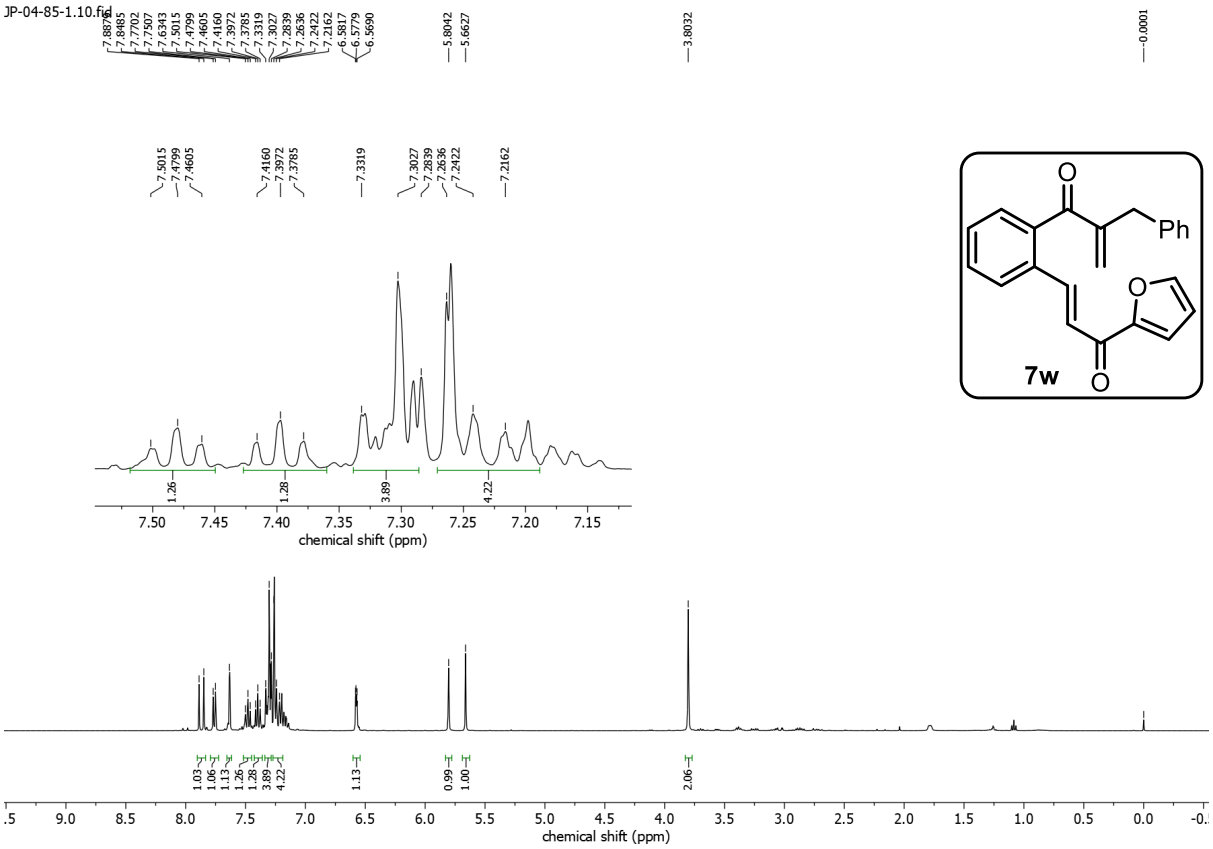
^{1}H NMR (400 MHz, $CDCl_3$)



^{13}C NMR (100 MHz, $CDCl_3$)



^{1}H NMR (400 MHz, $CDCl_3$)



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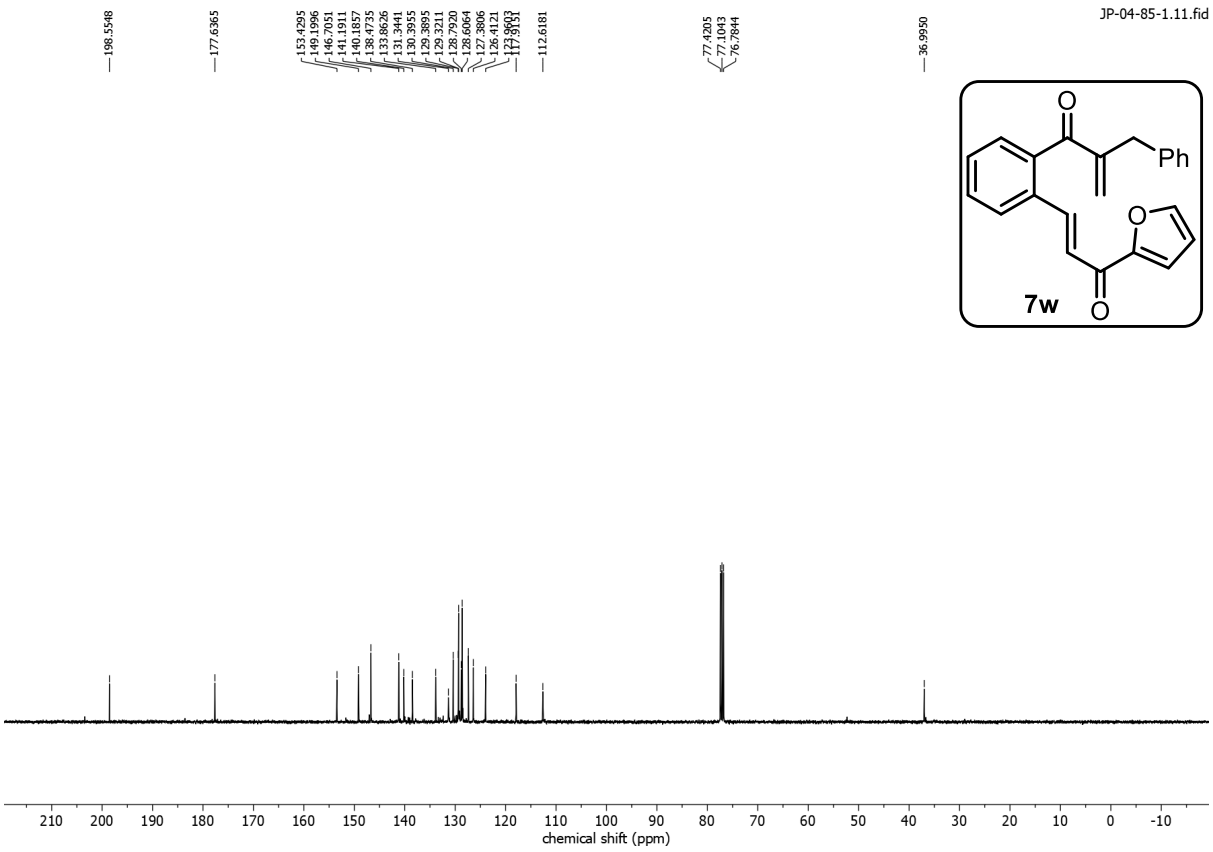

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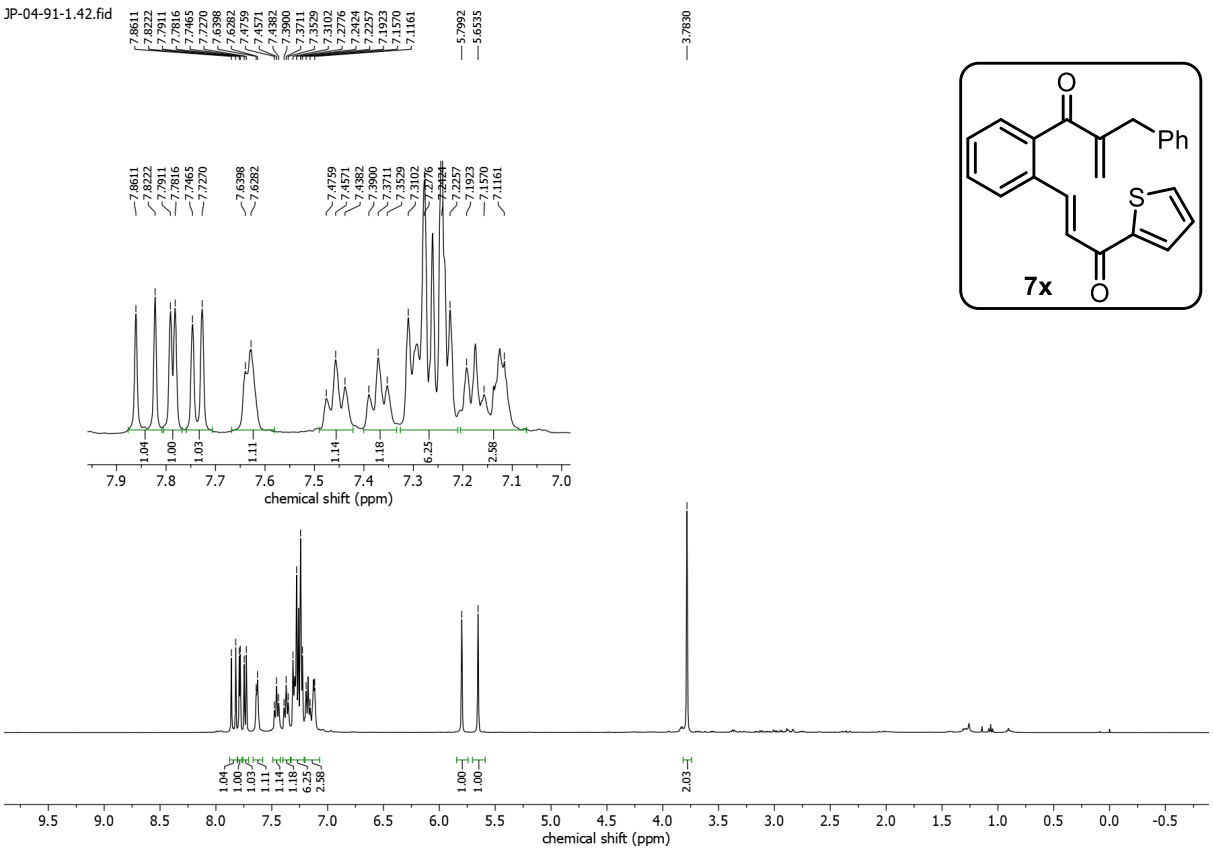

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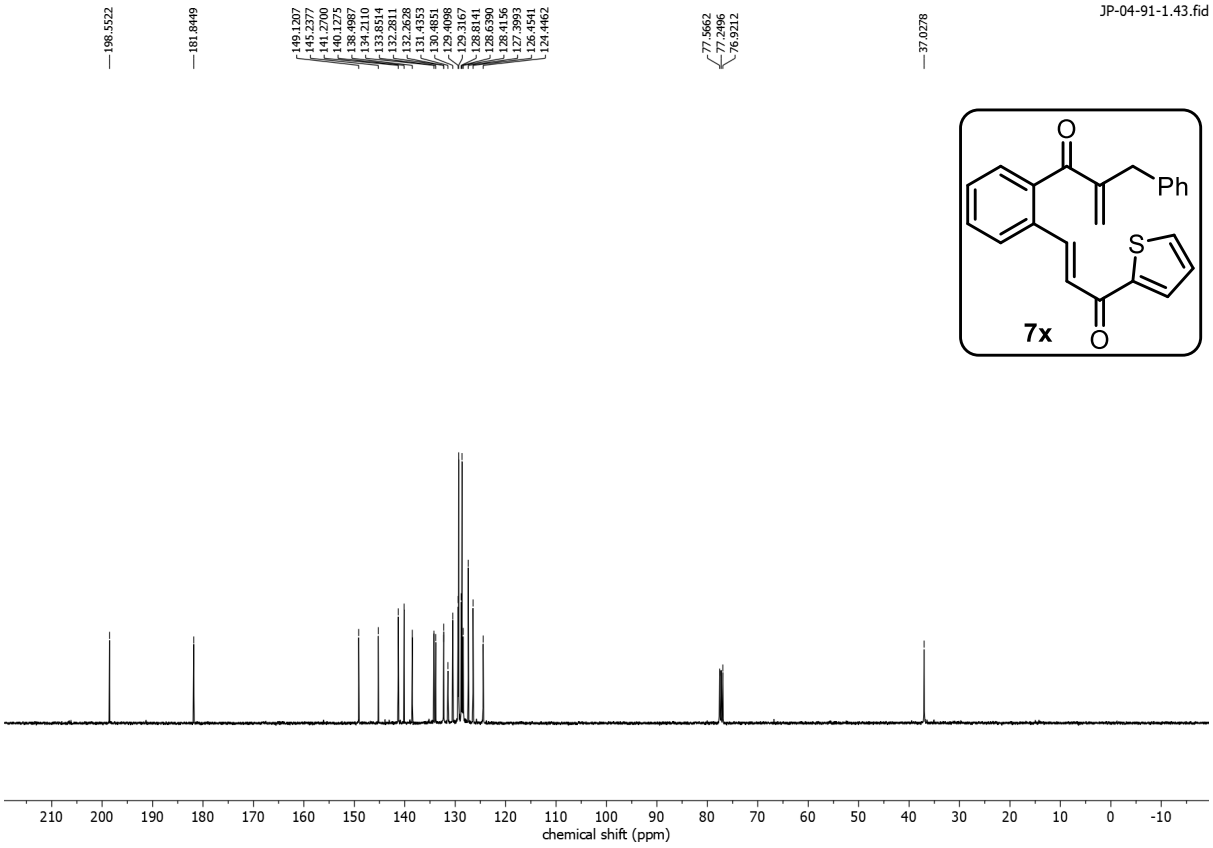

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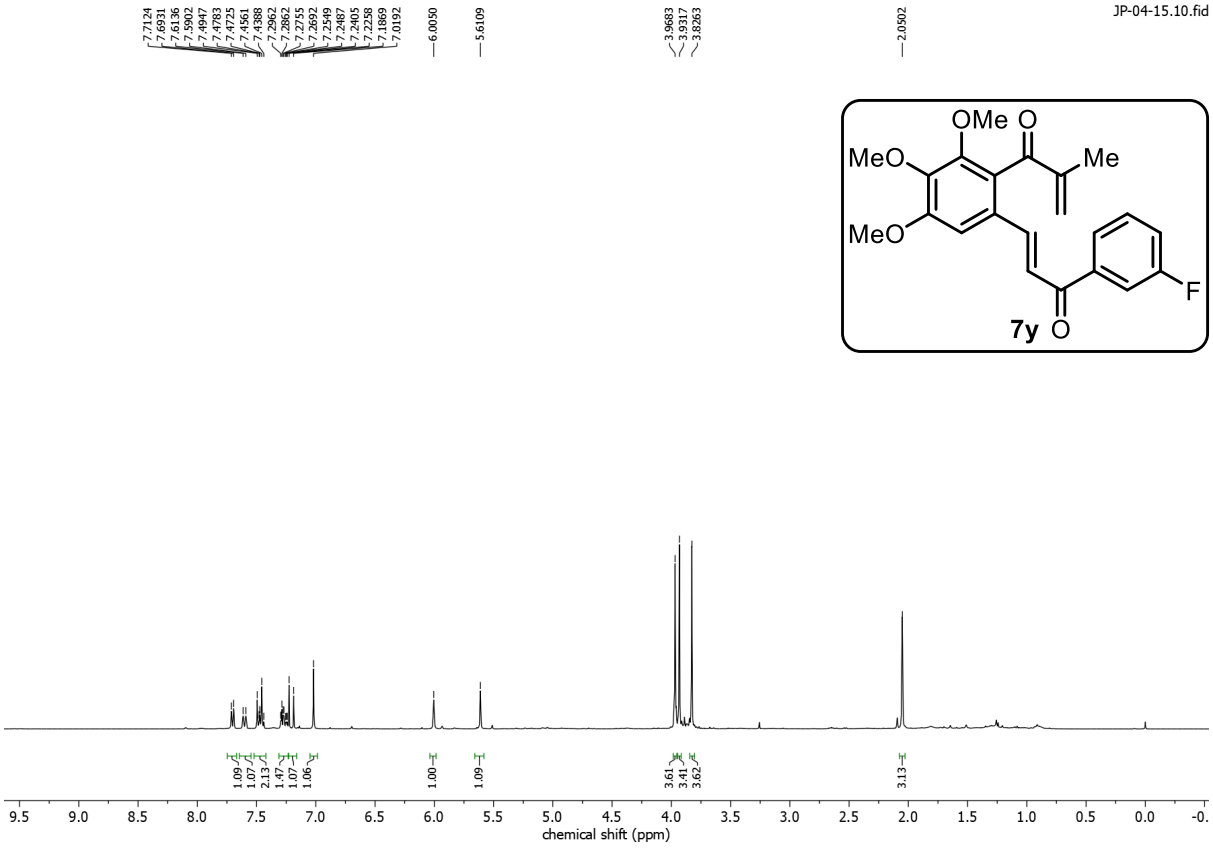
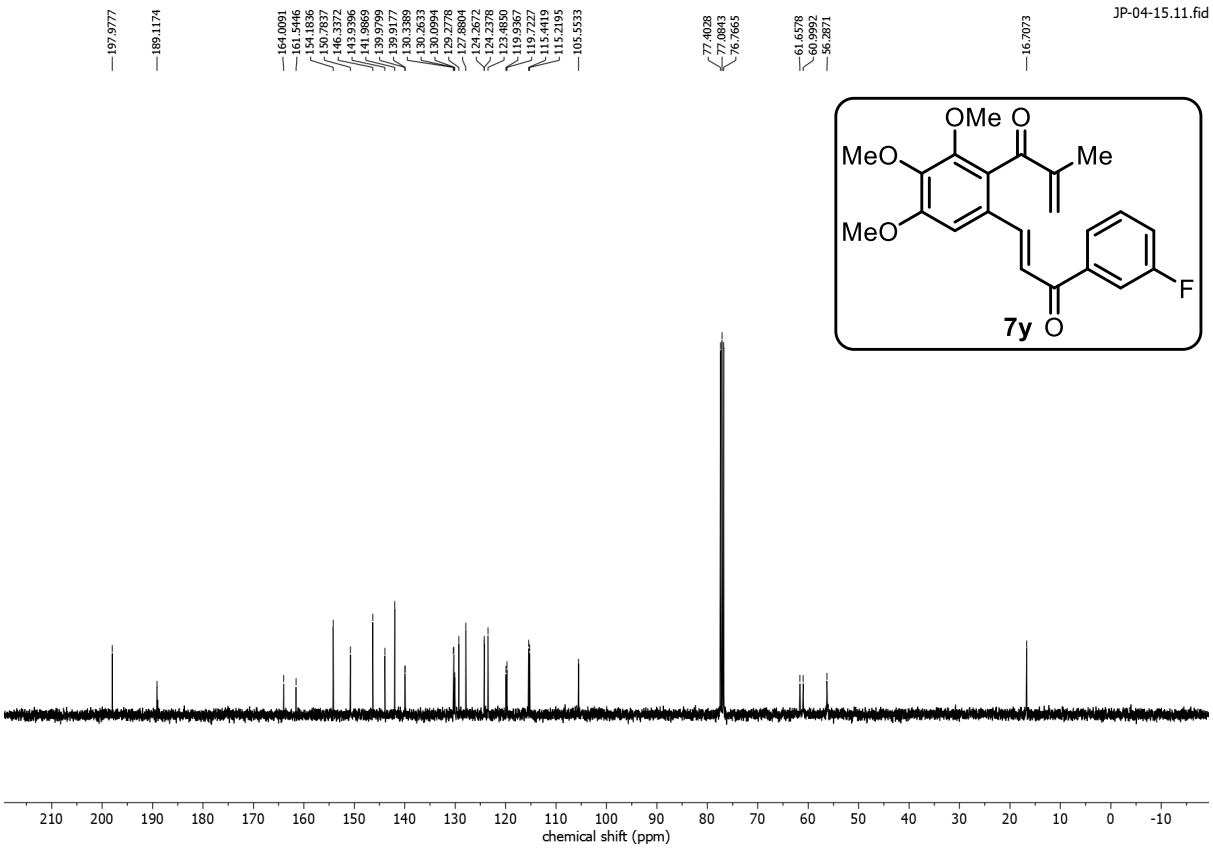
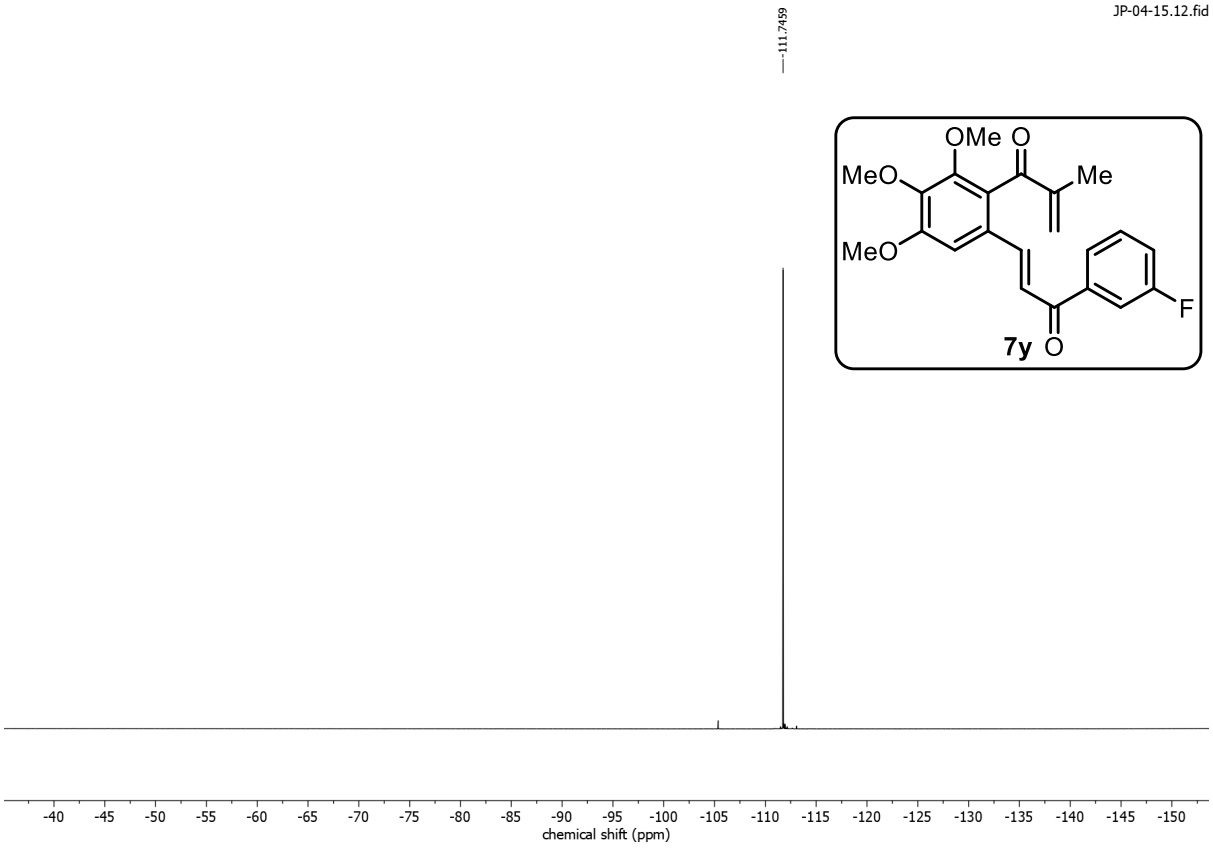


^{13}C NMR (100 MHz, $CDCl_3$)



^{19}F NMR (376.4 MHz, $CDCl_3$)



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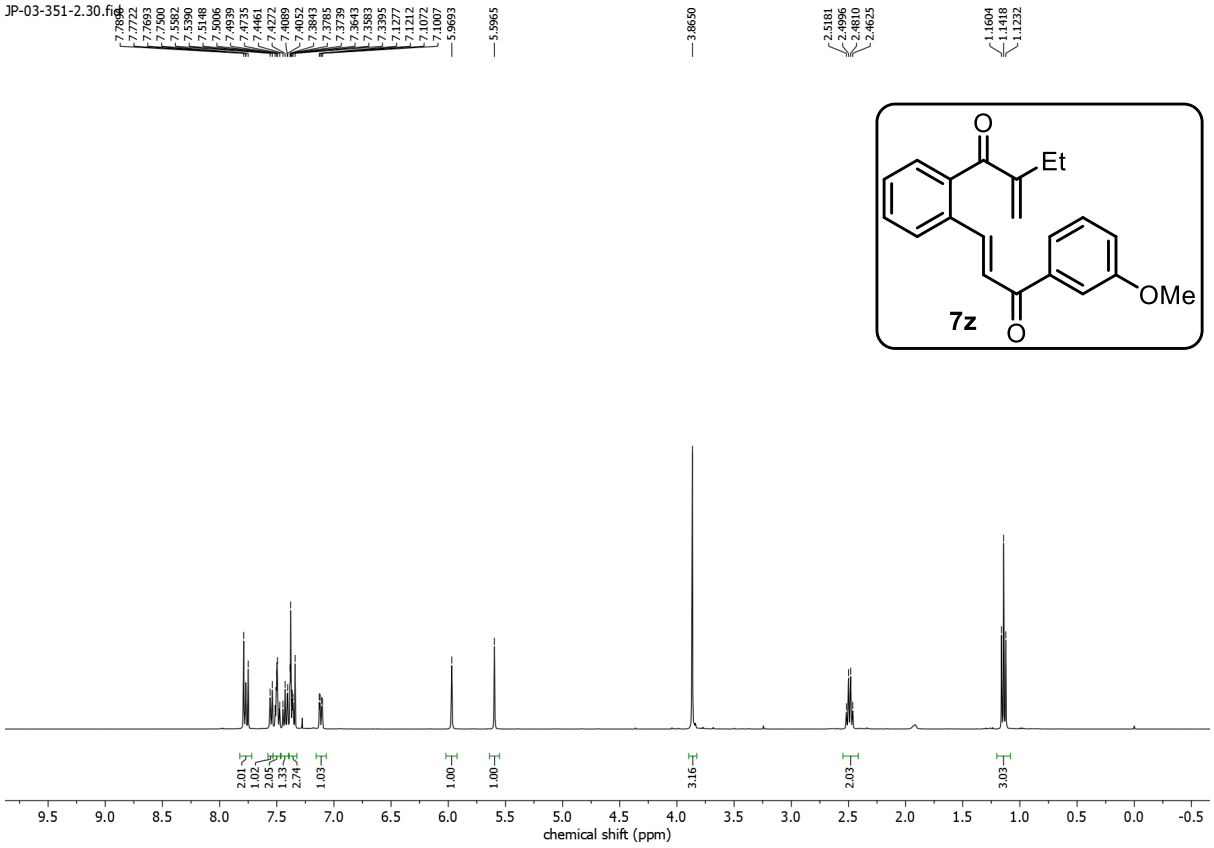
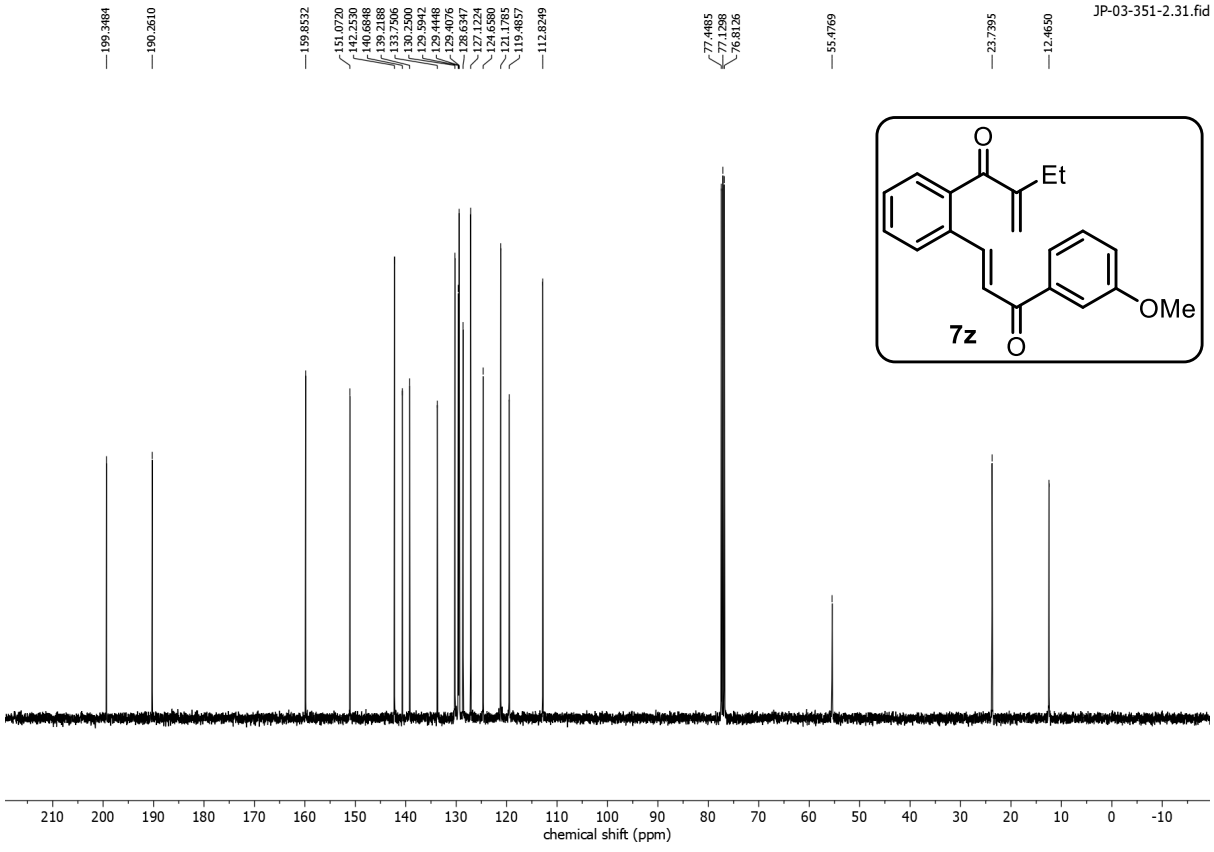


^{13}C NMR (100 MHz, $CDCl_3$)



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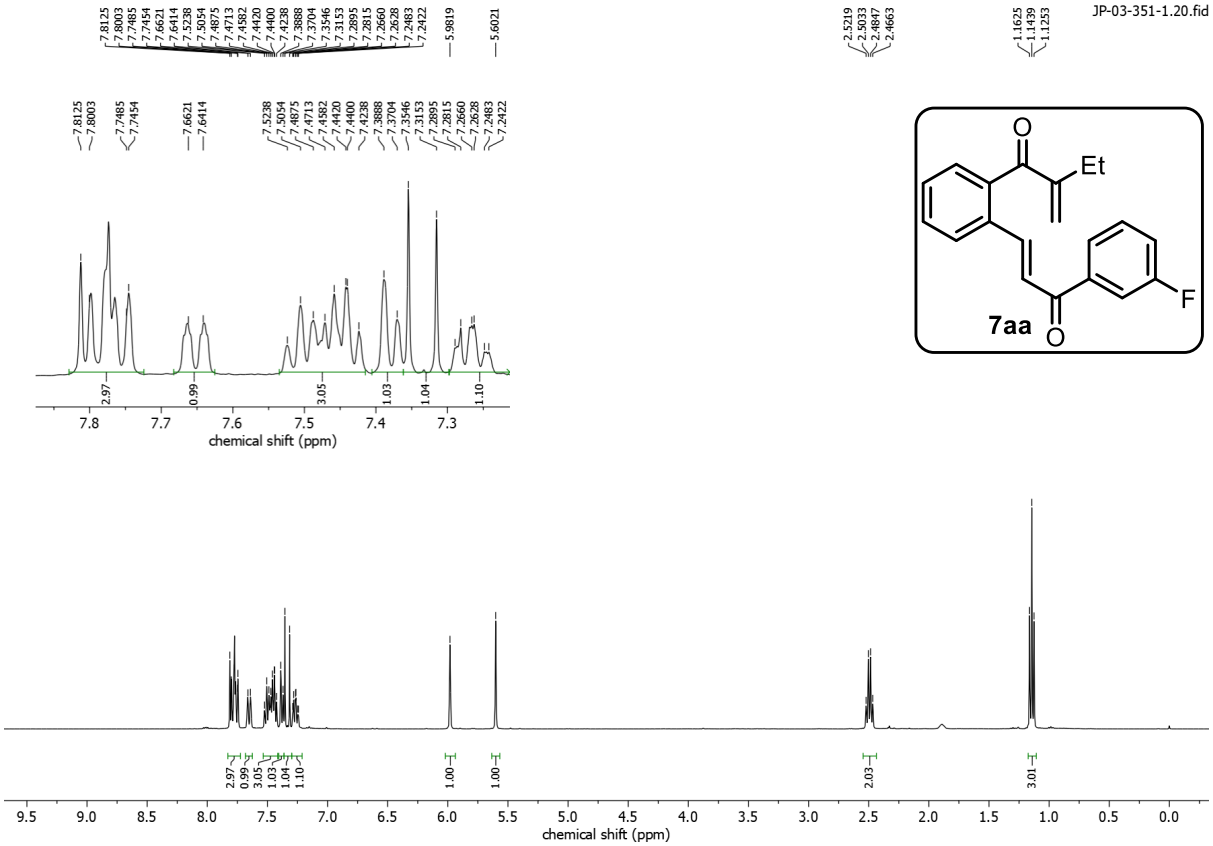
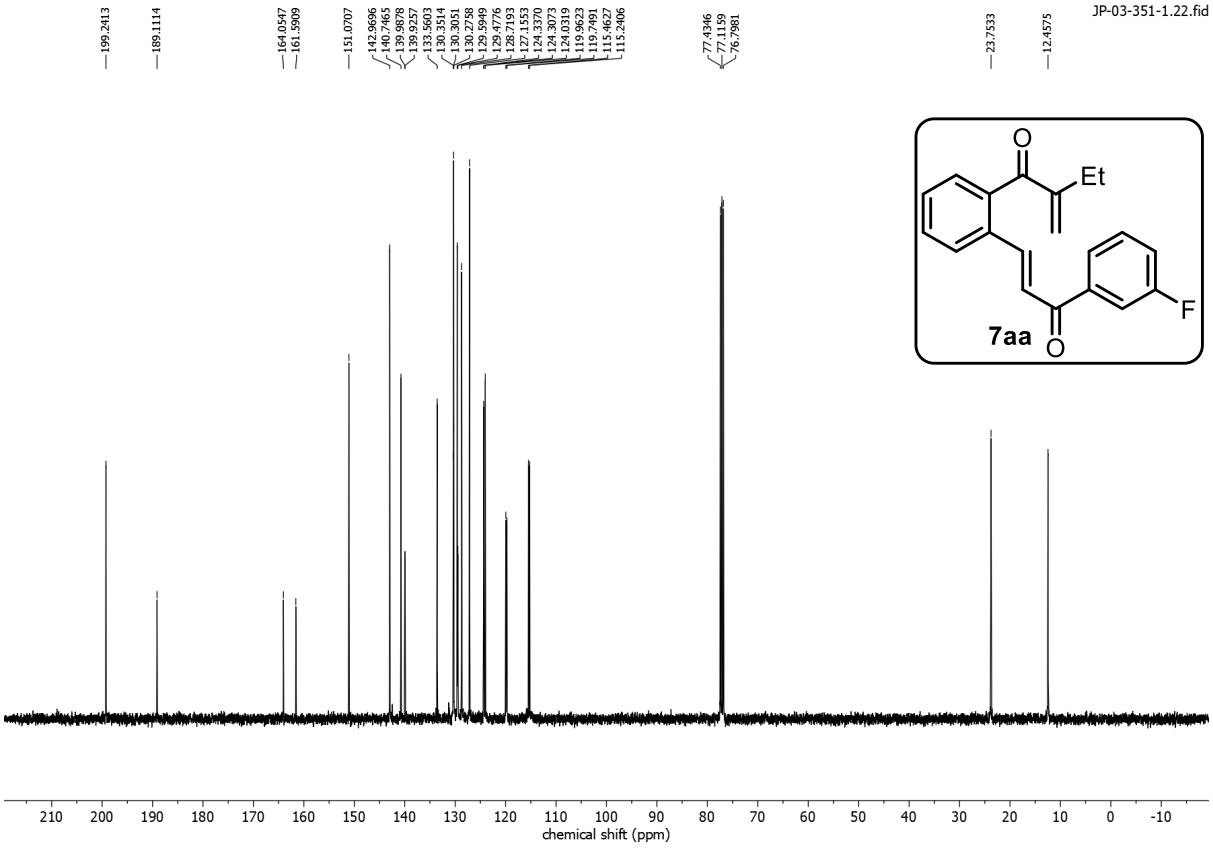
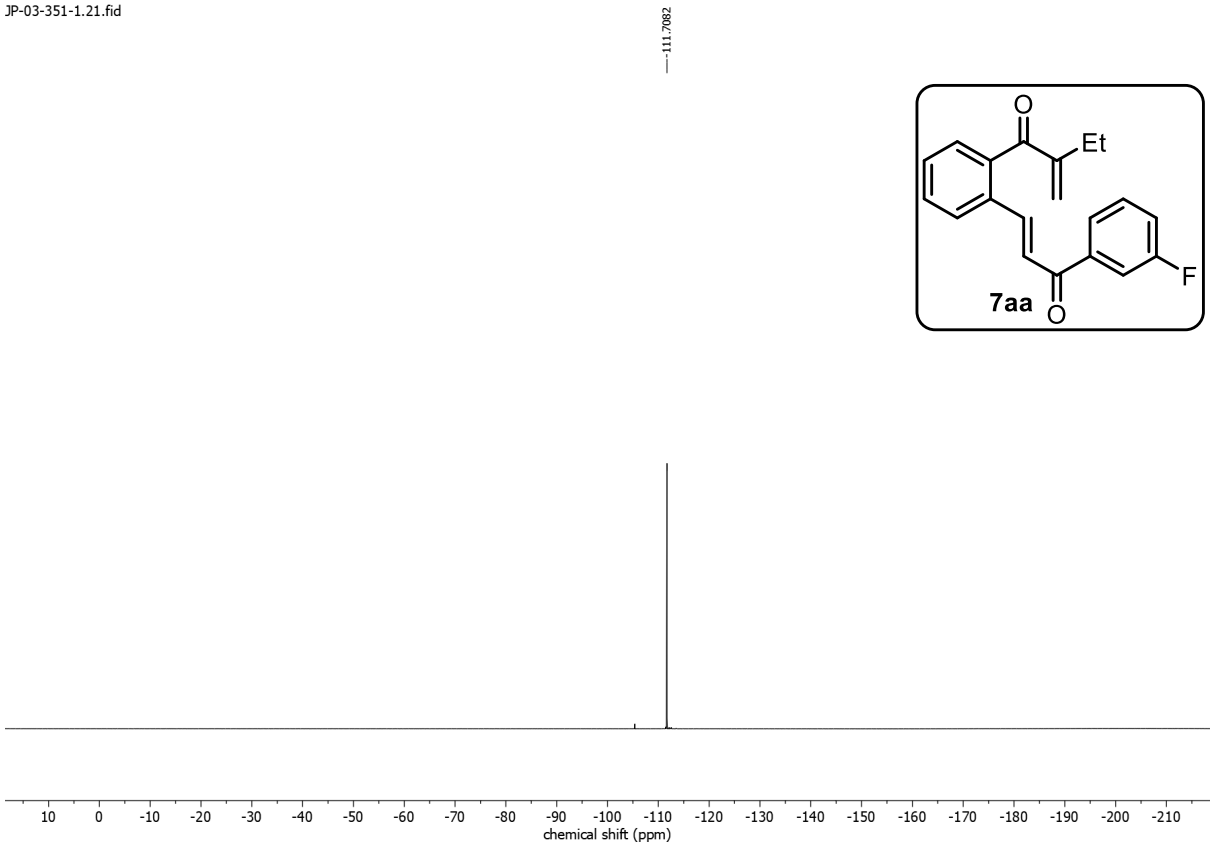


^{13}C NMR (100 MHz, $CDCl_3$)



^{19}F NMR (376.4 MHz, $CDCl_3$)



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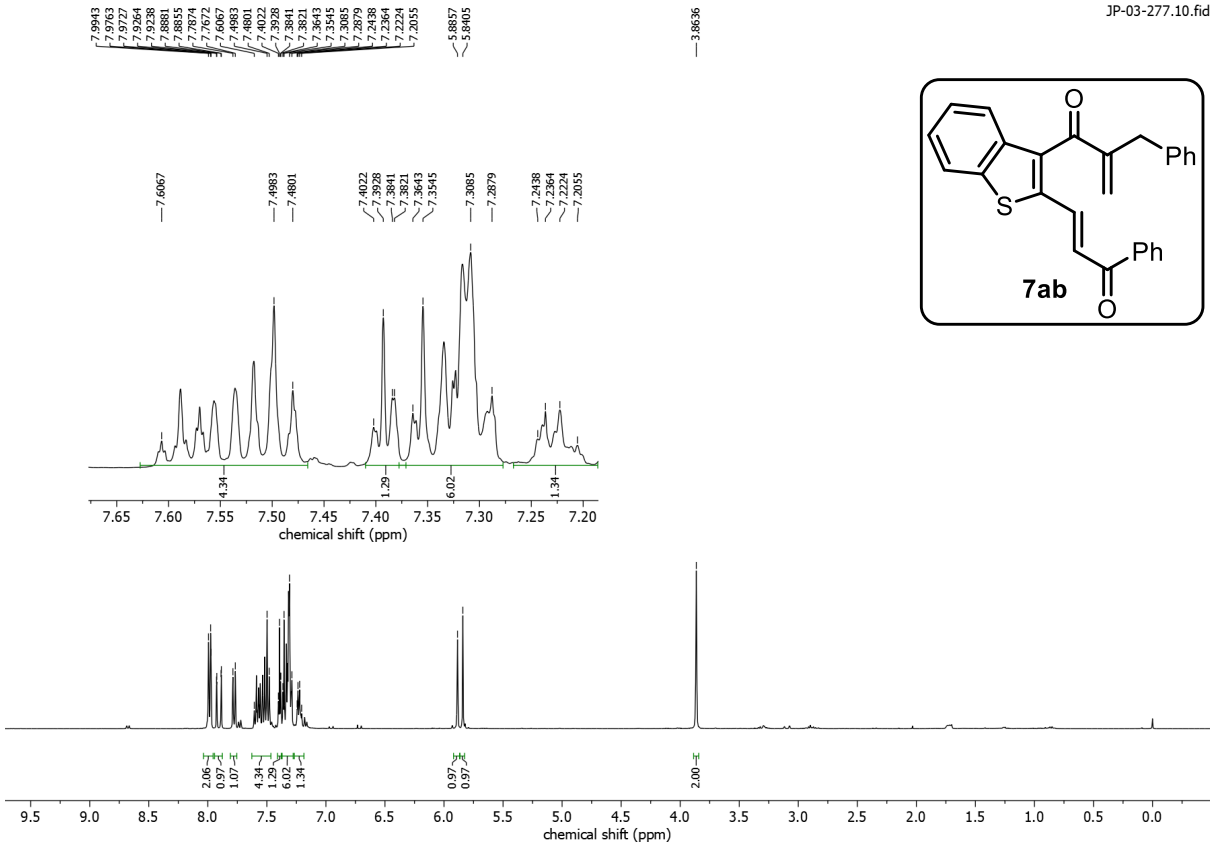

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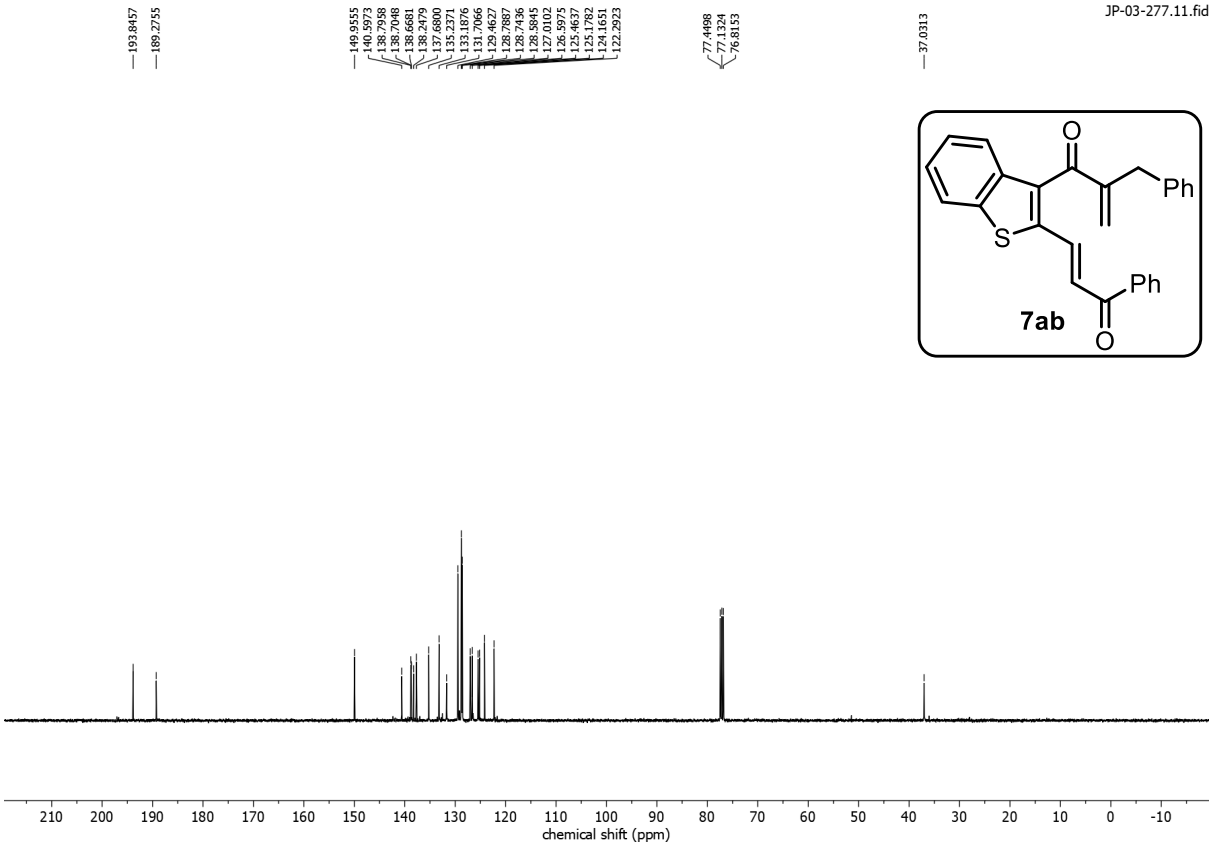

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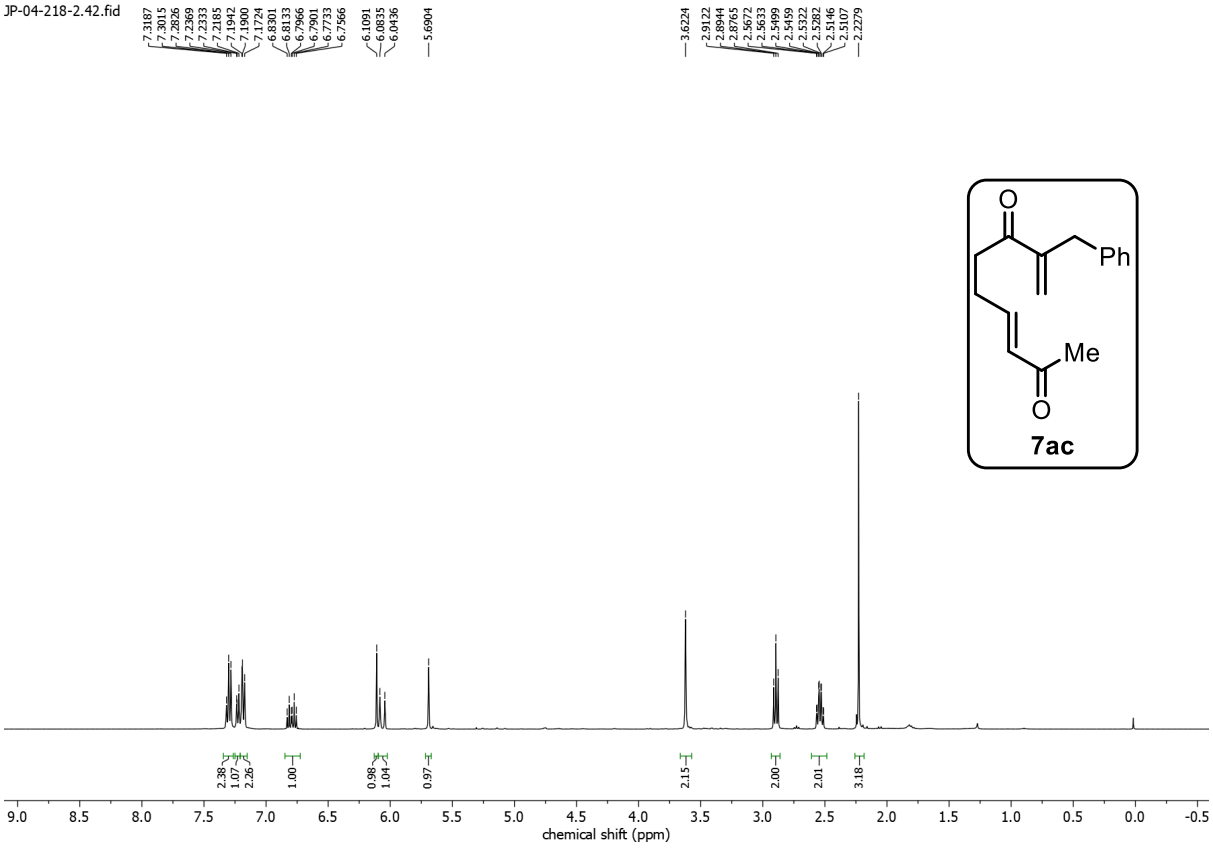

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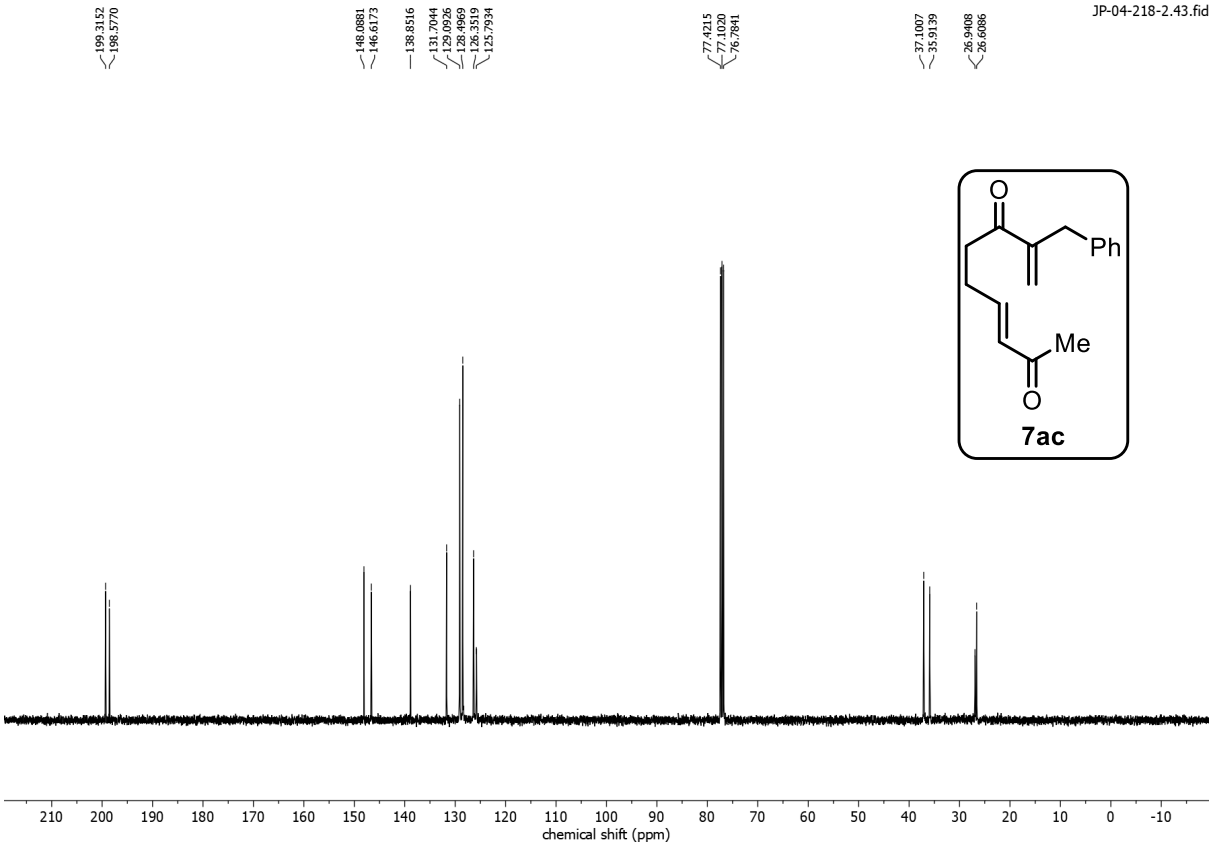

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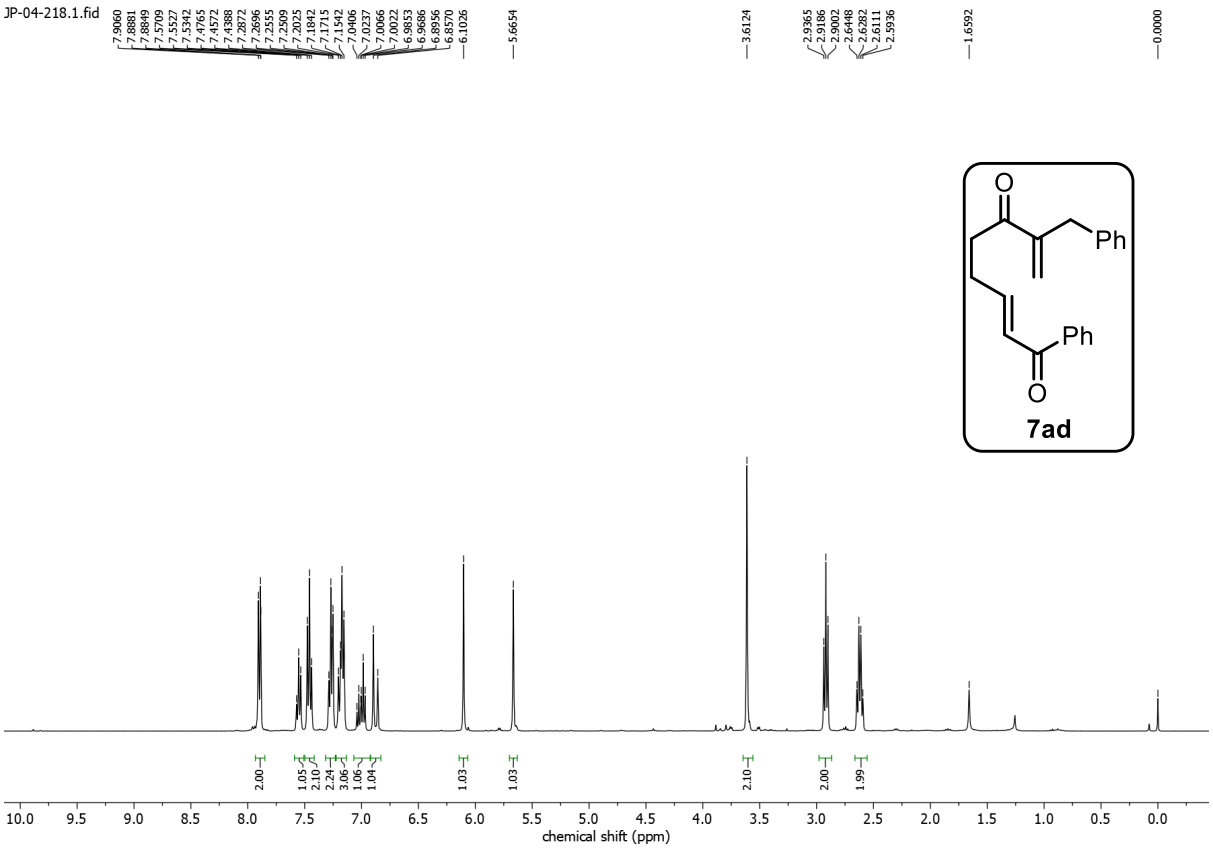

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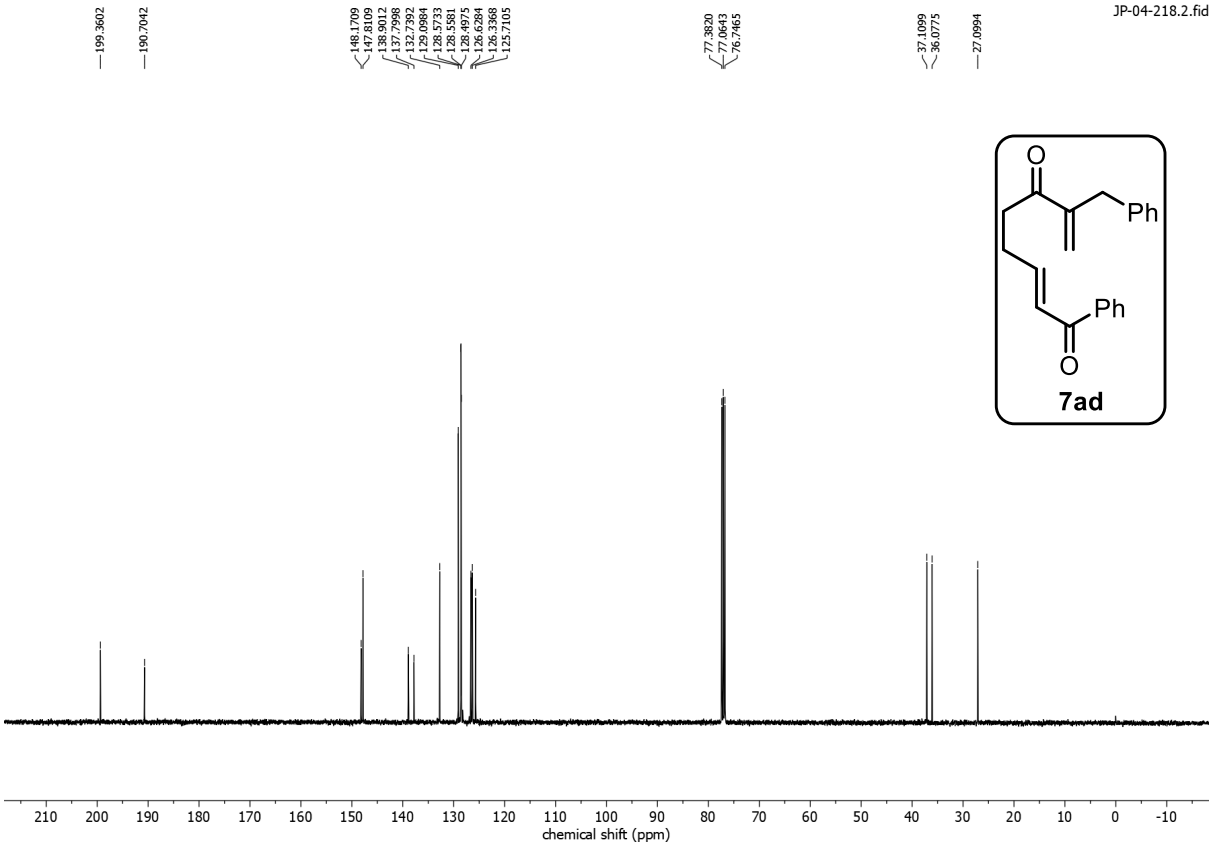

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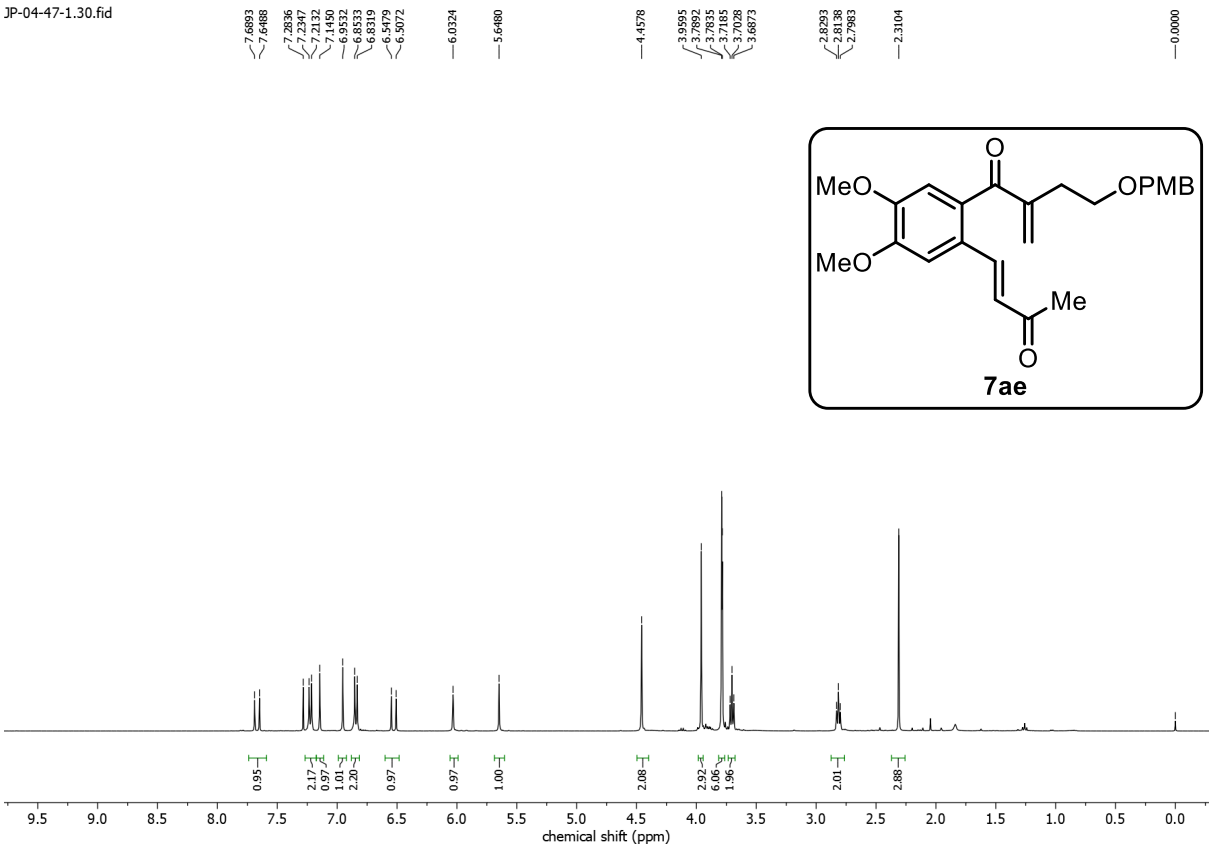

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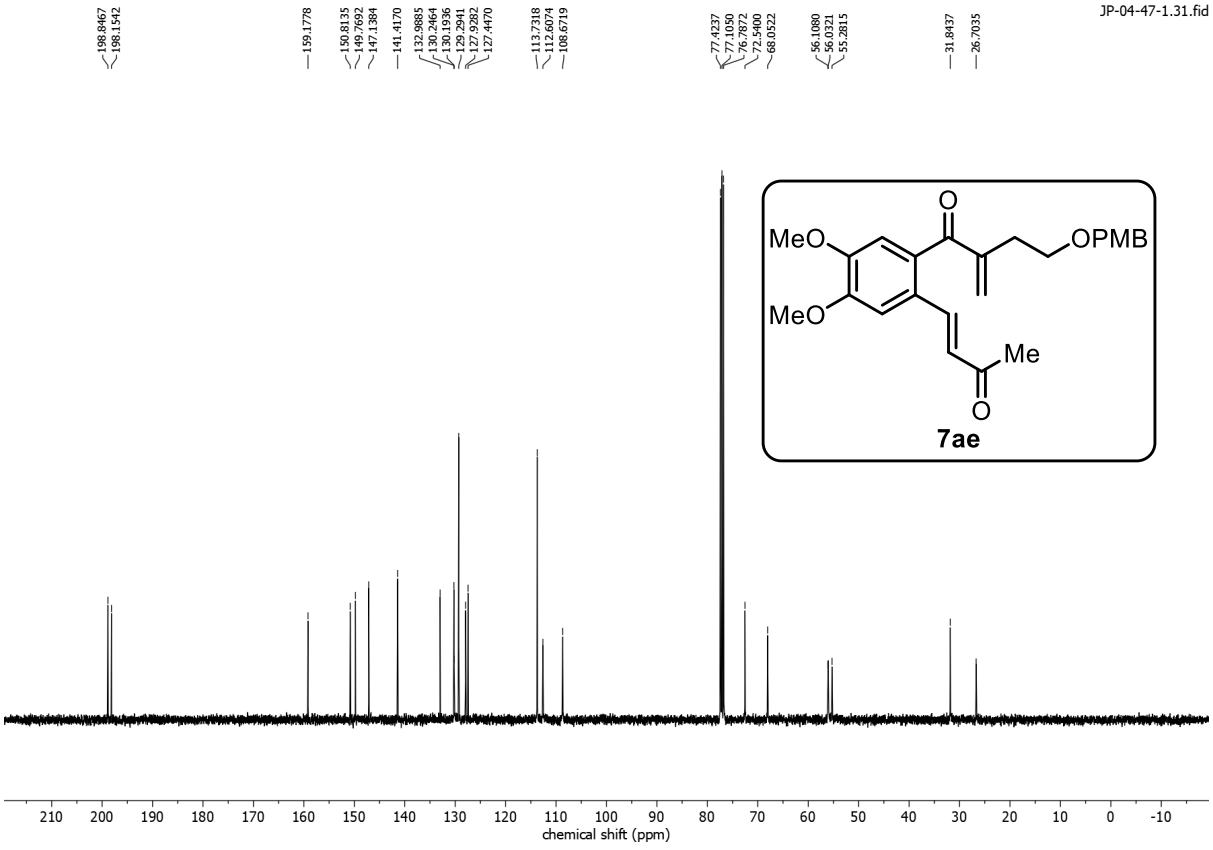
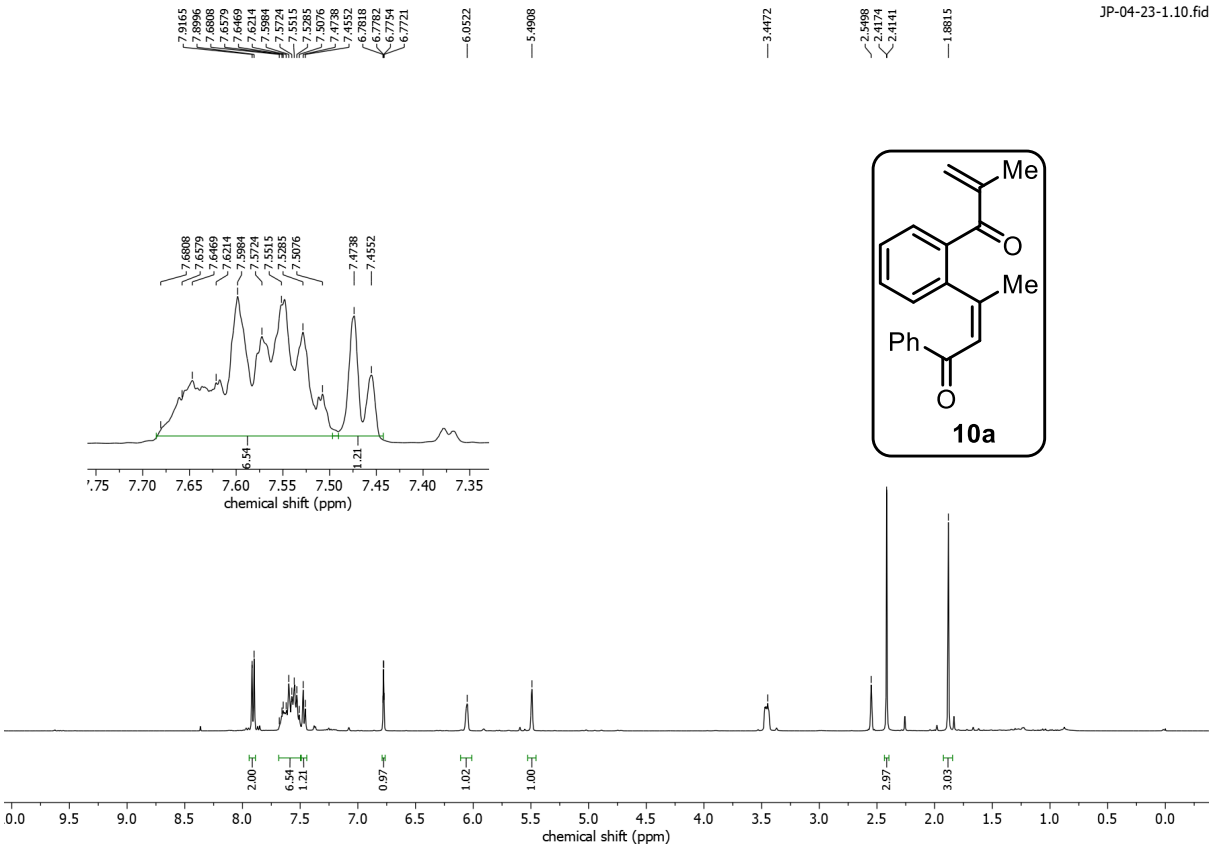
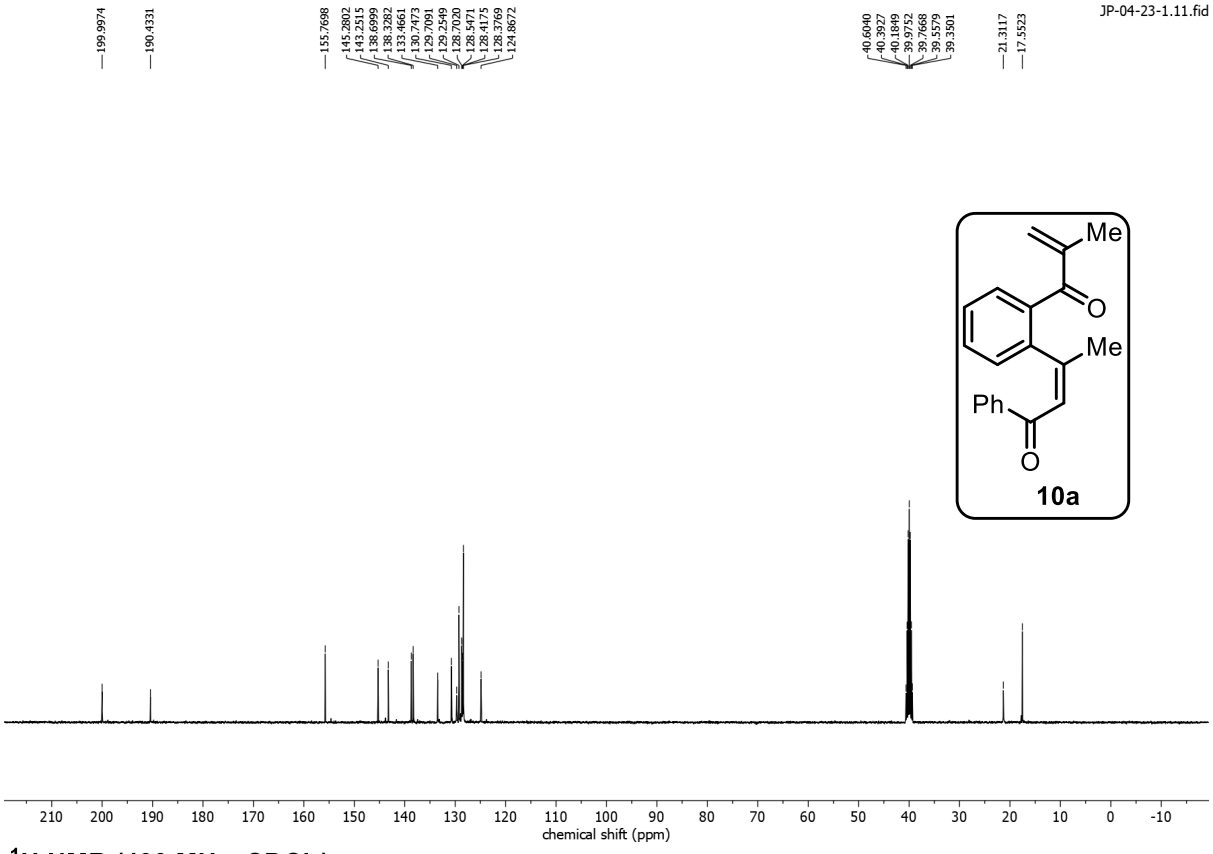


^{1}H NMR (400 MHz, DMSO-d_6)



^{13}C NMR (100 MHz, DMSO-d_6)



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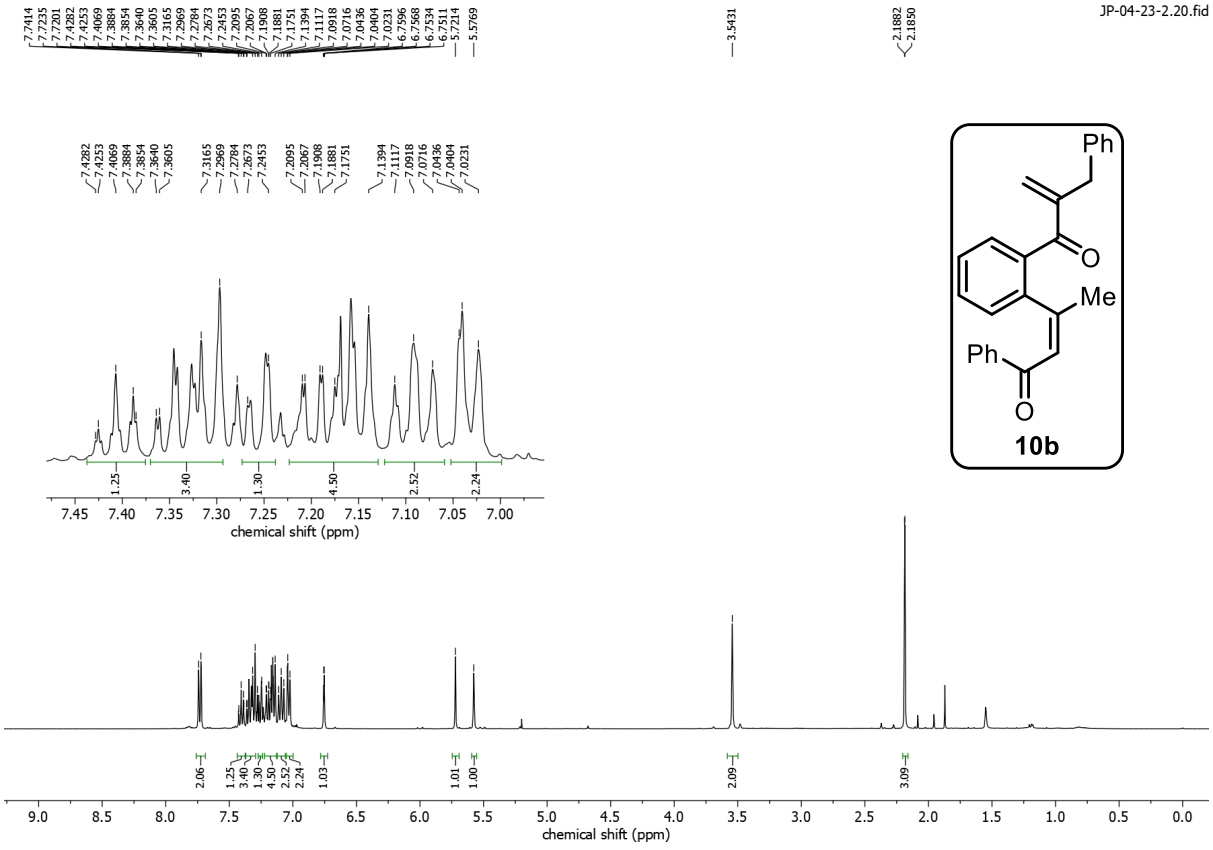

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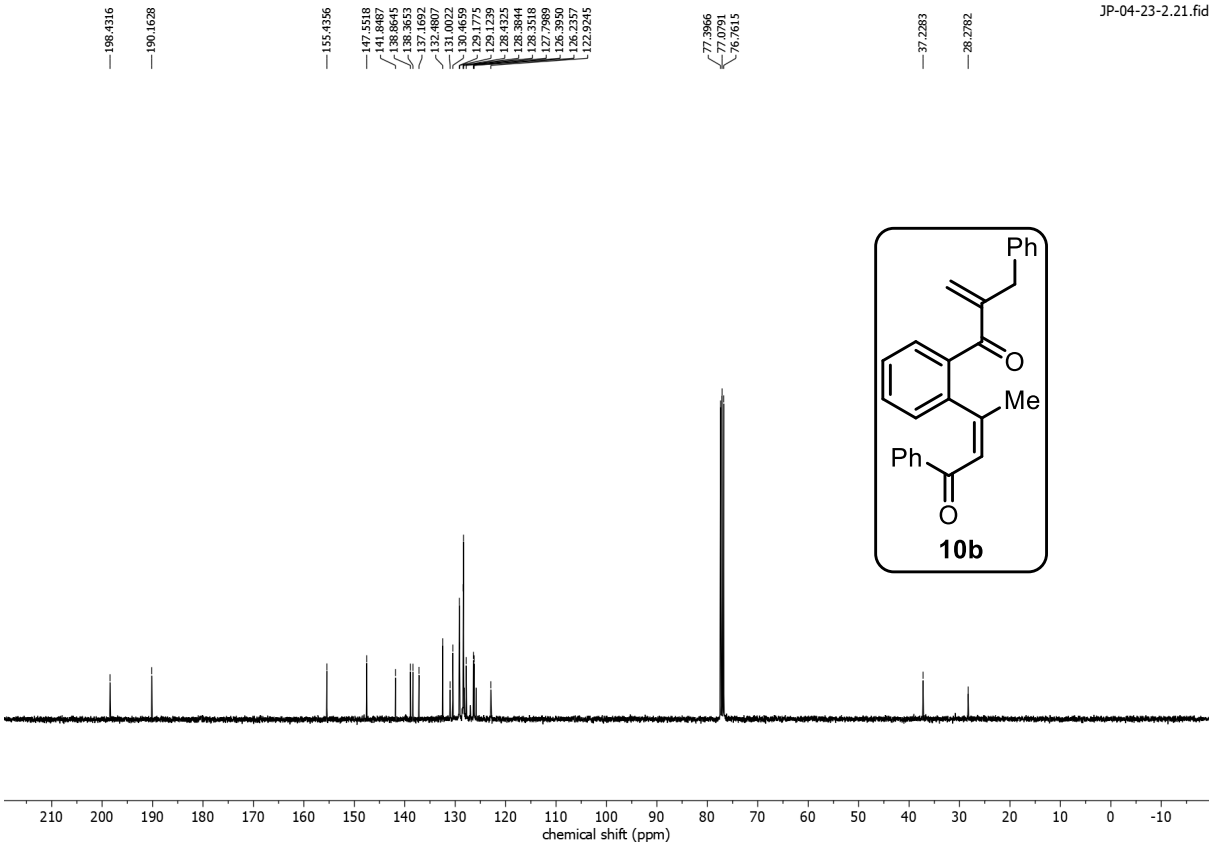

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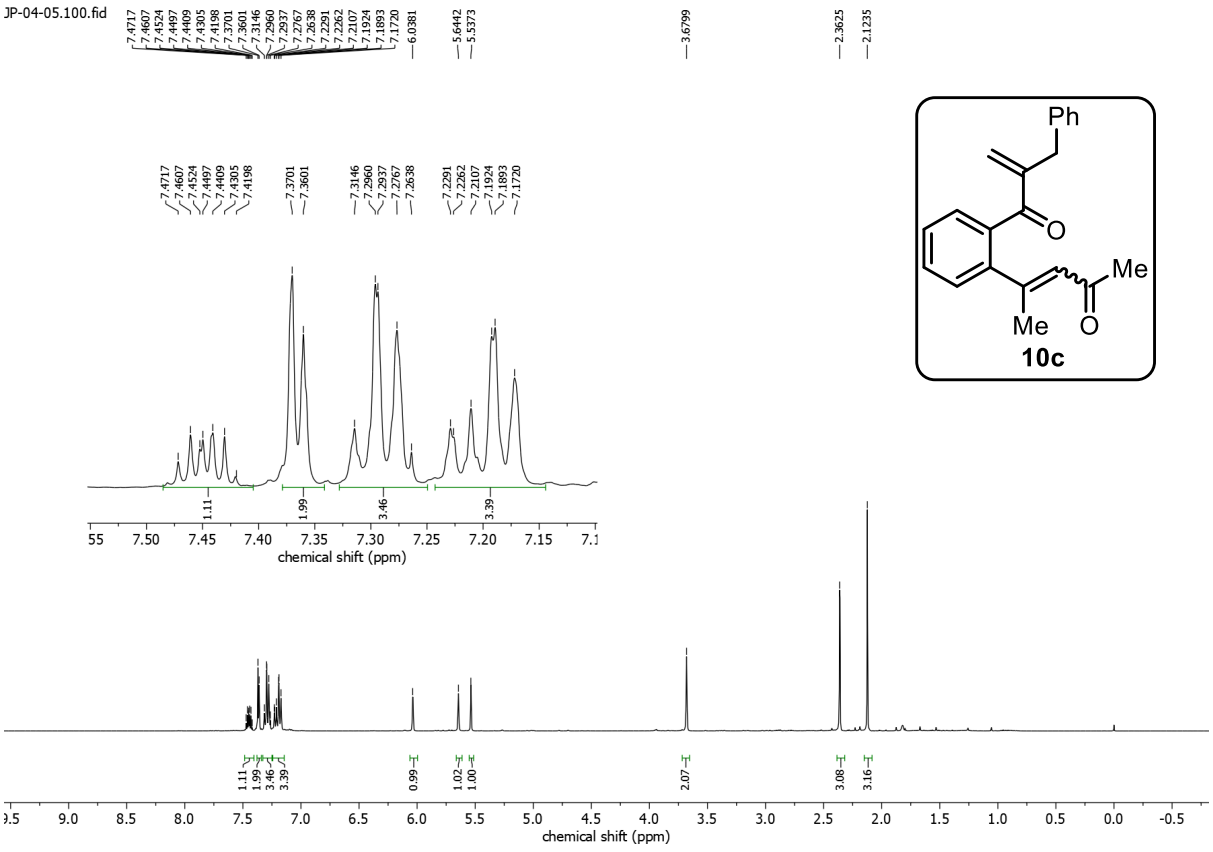

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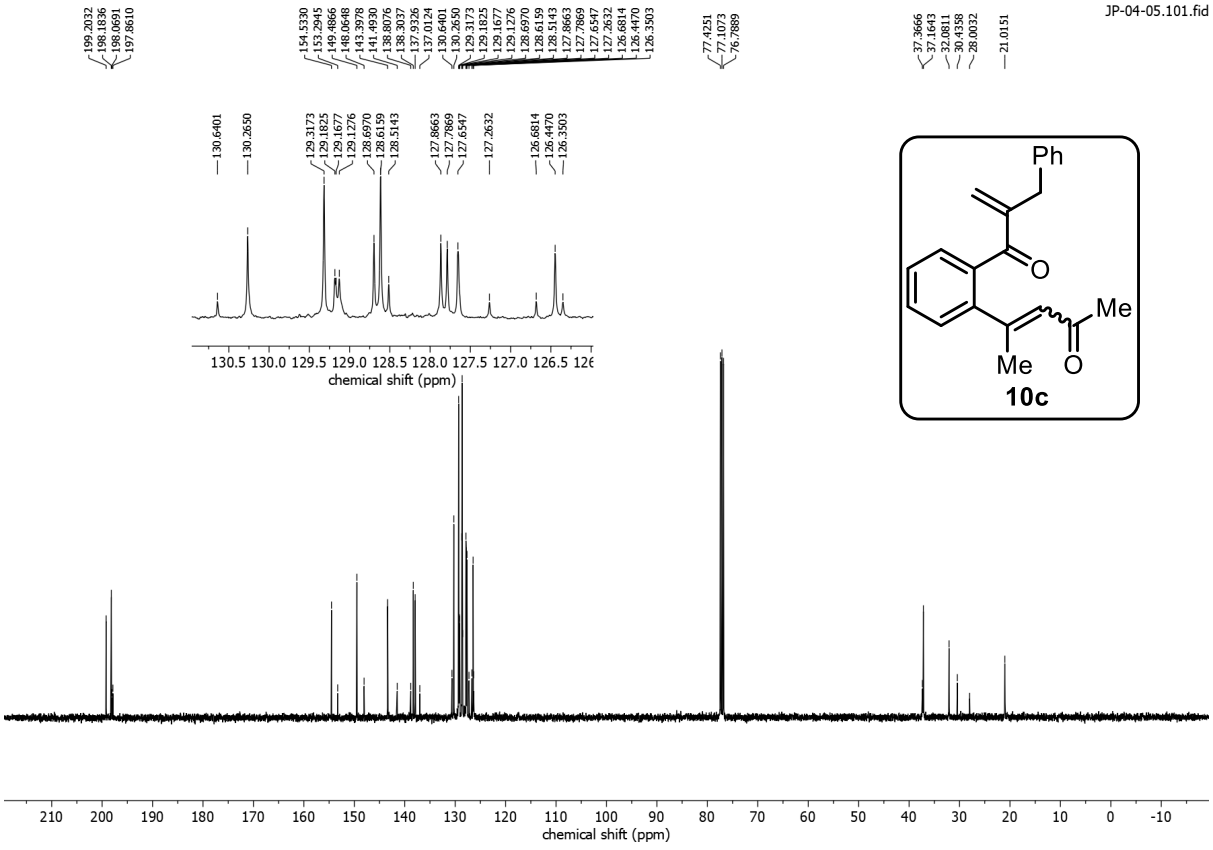

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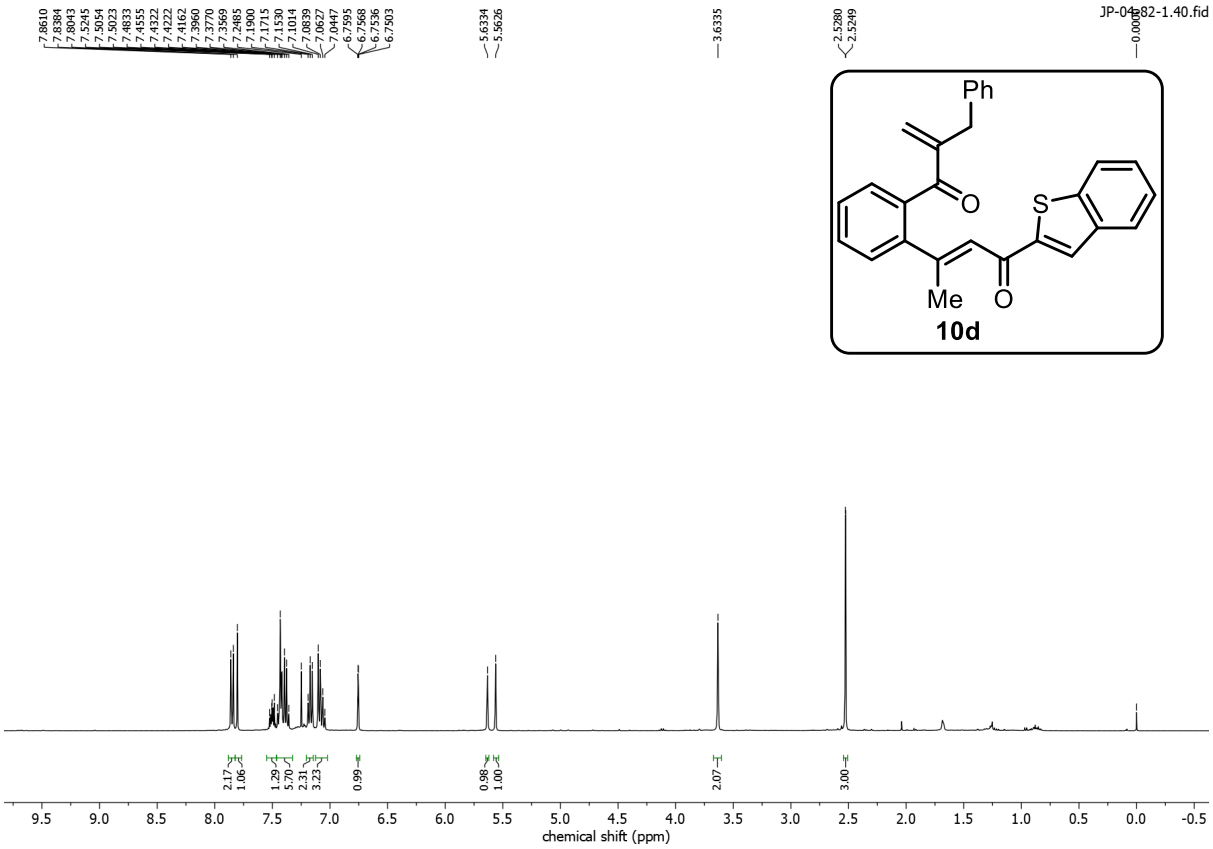

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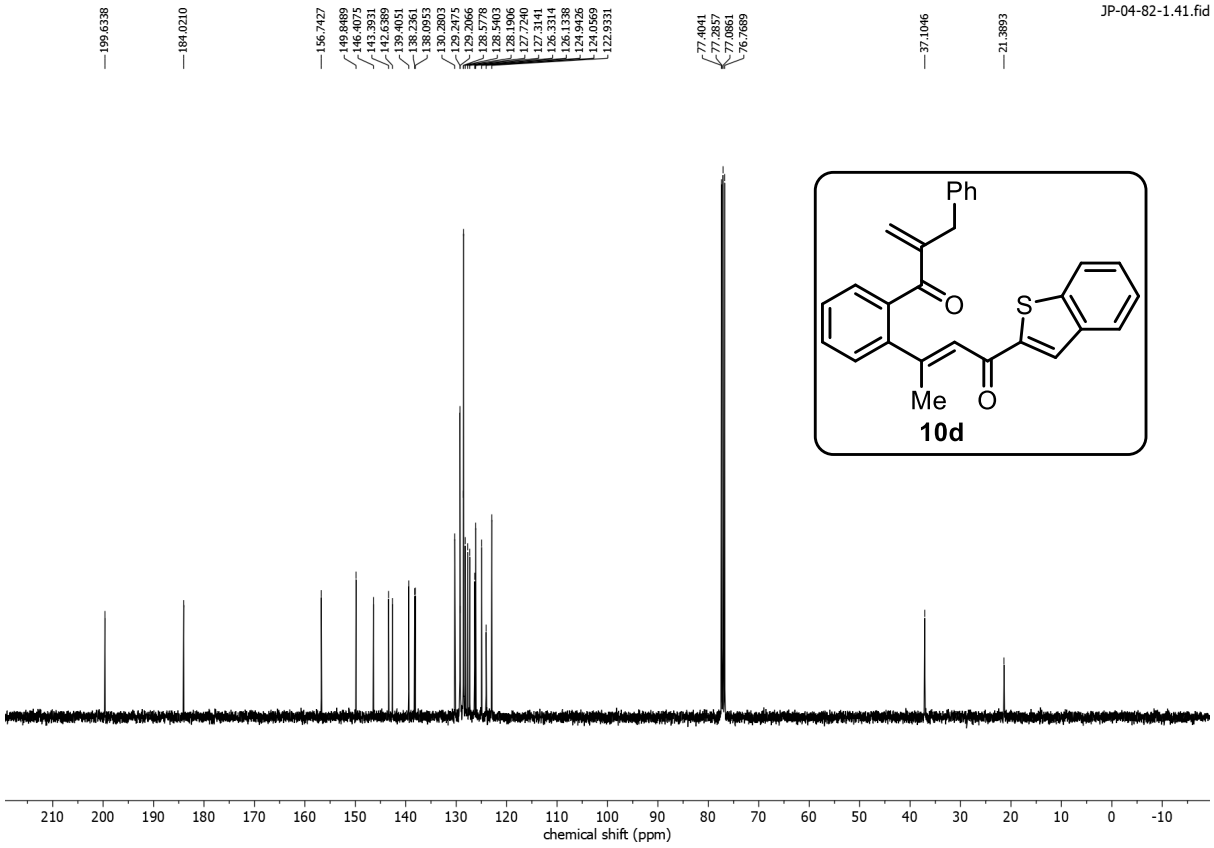

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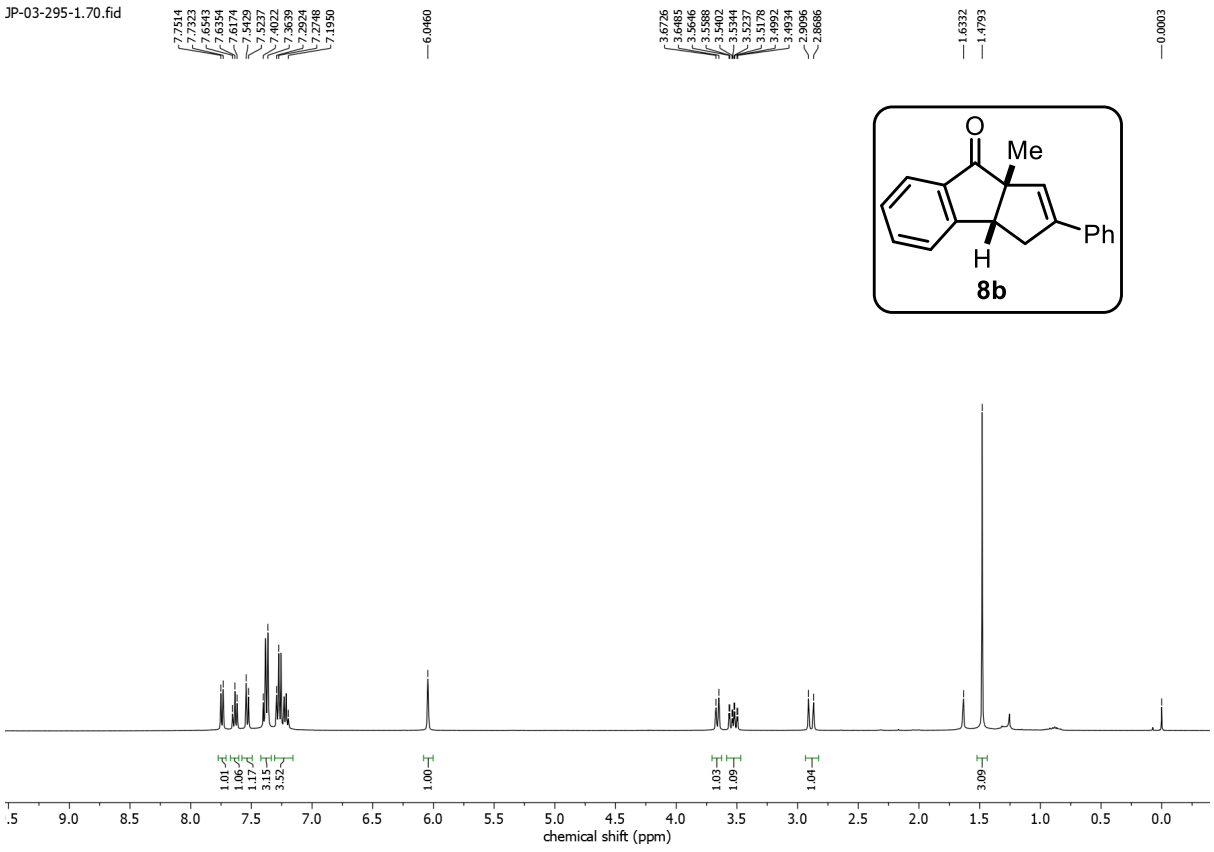

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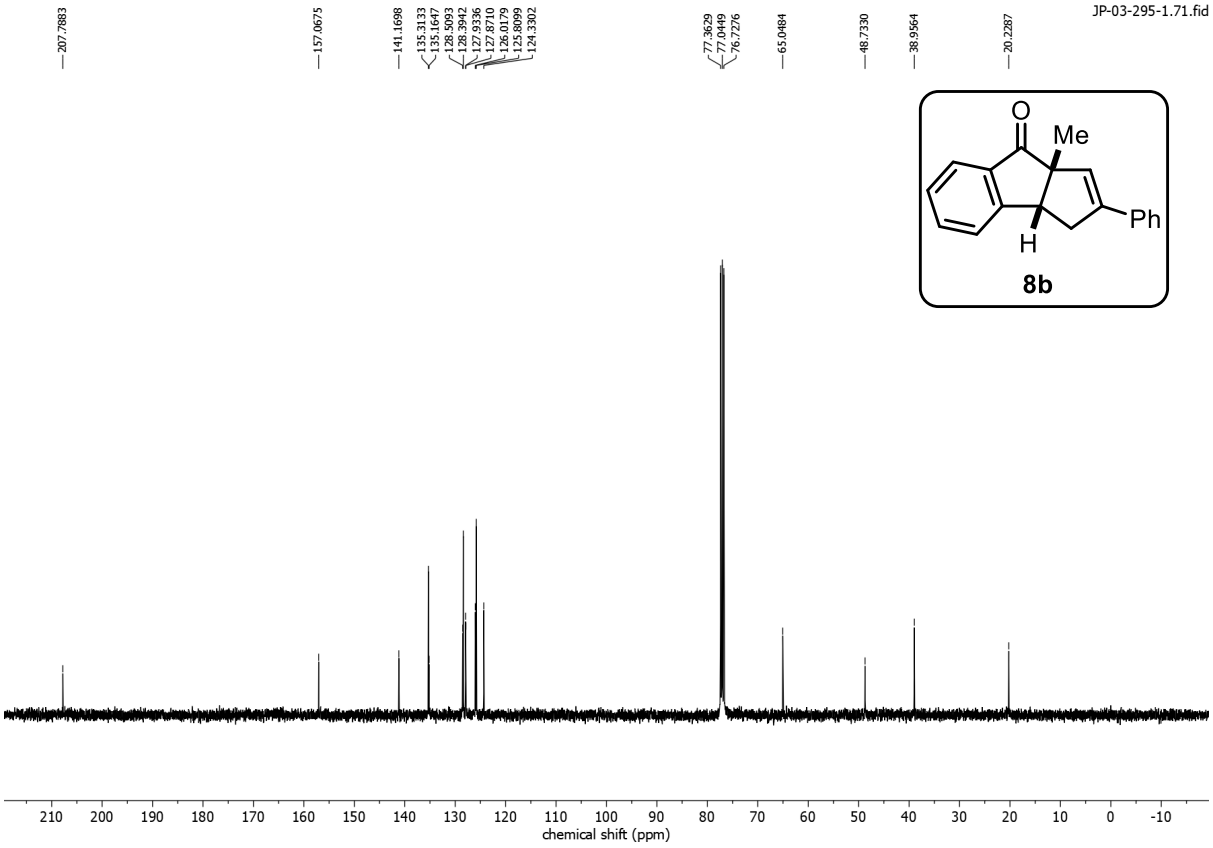

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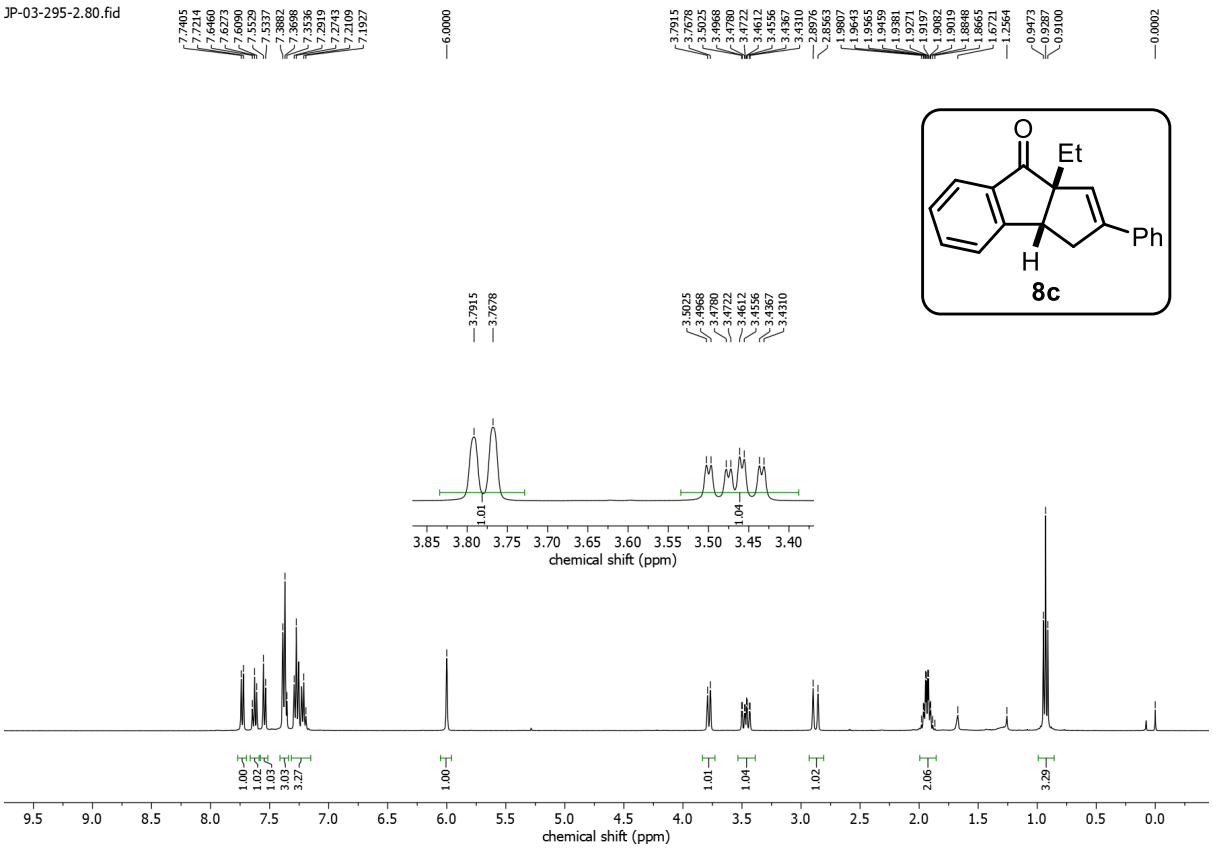

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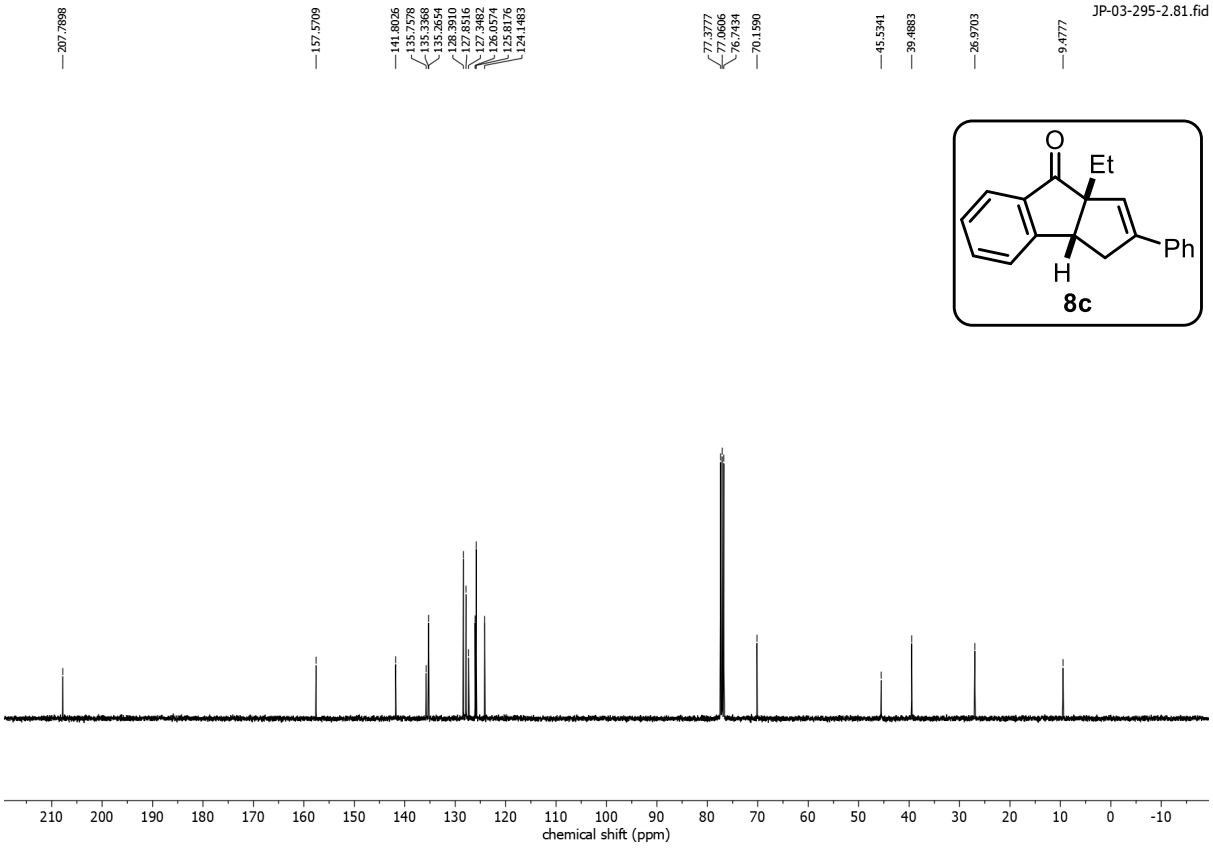

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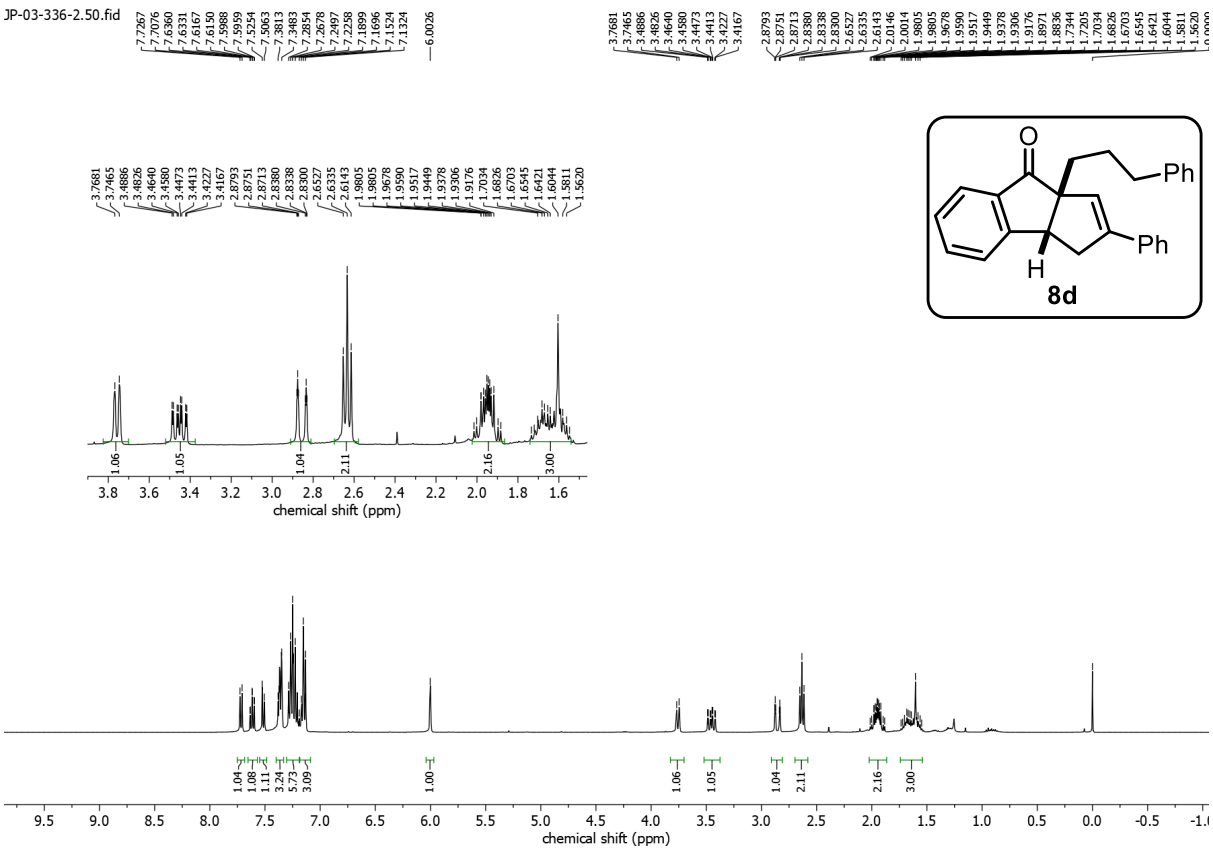

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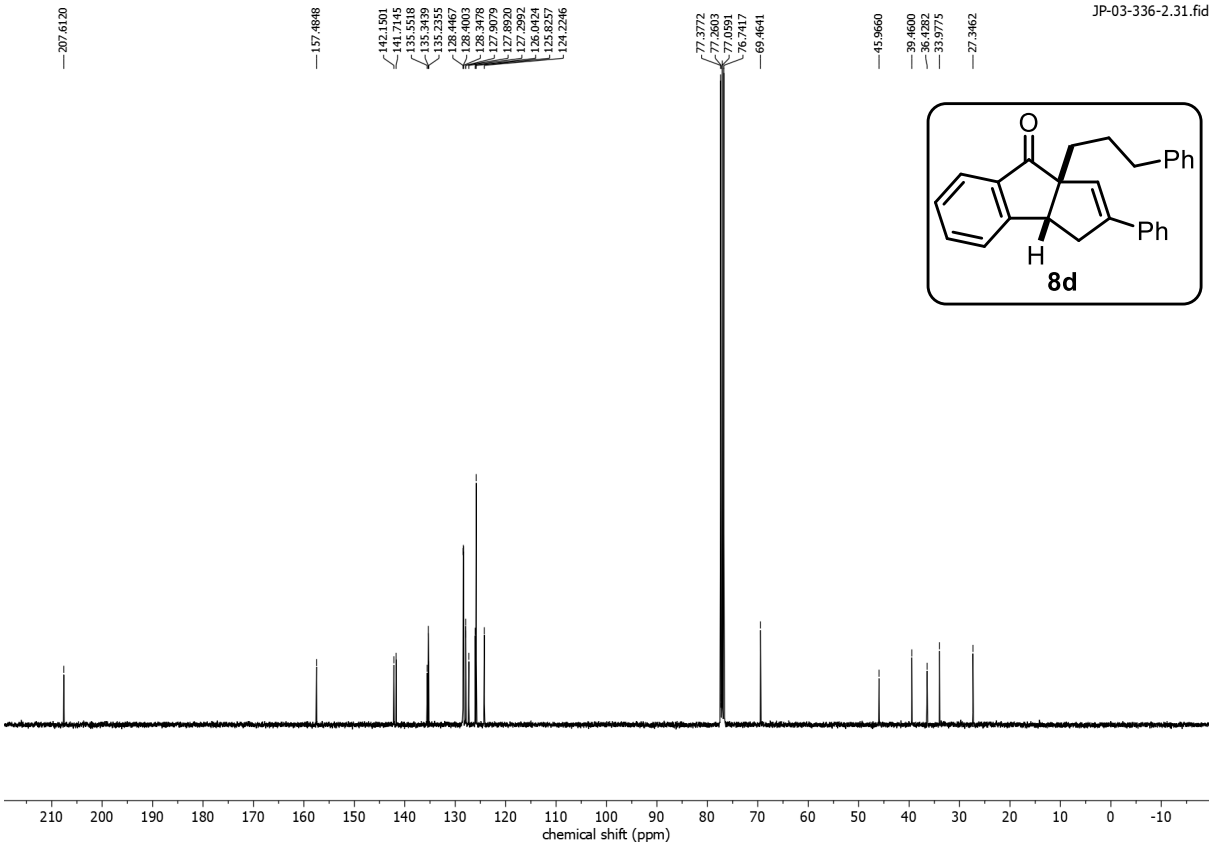

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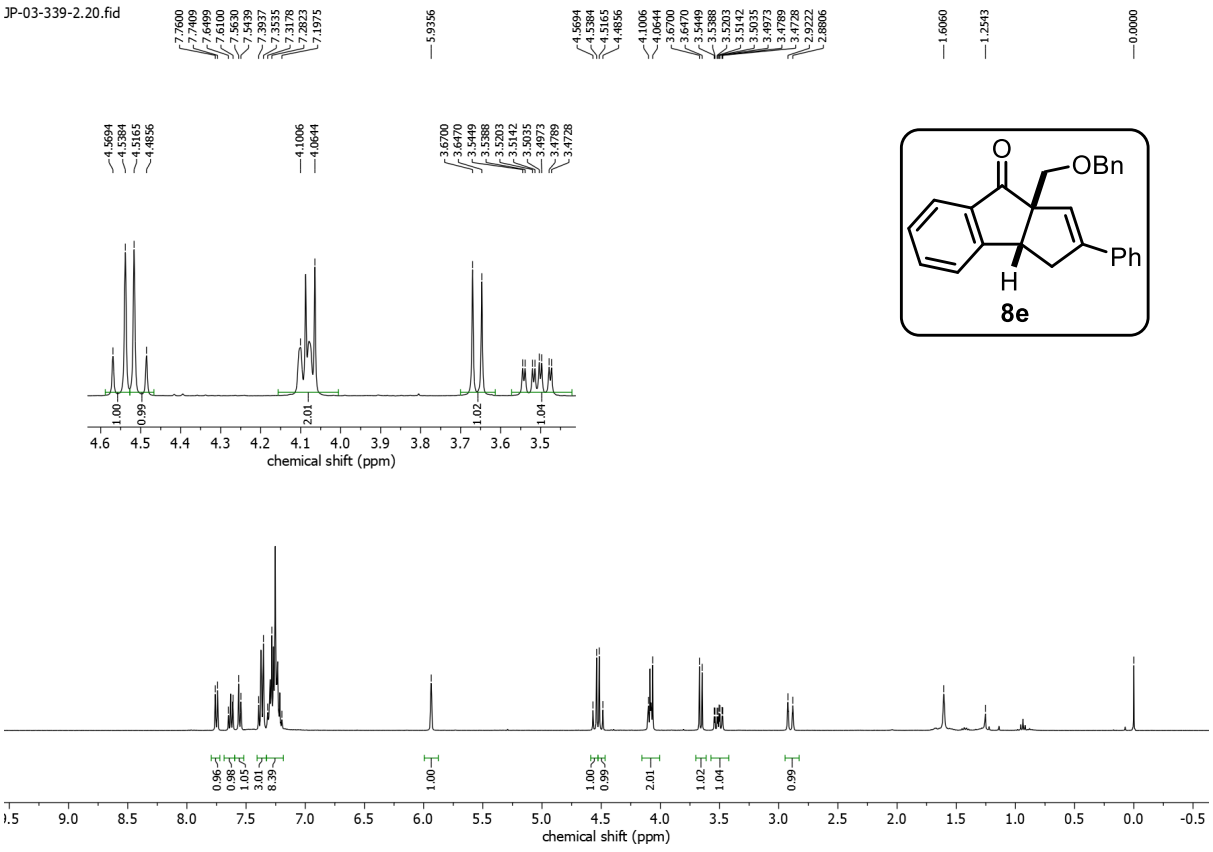

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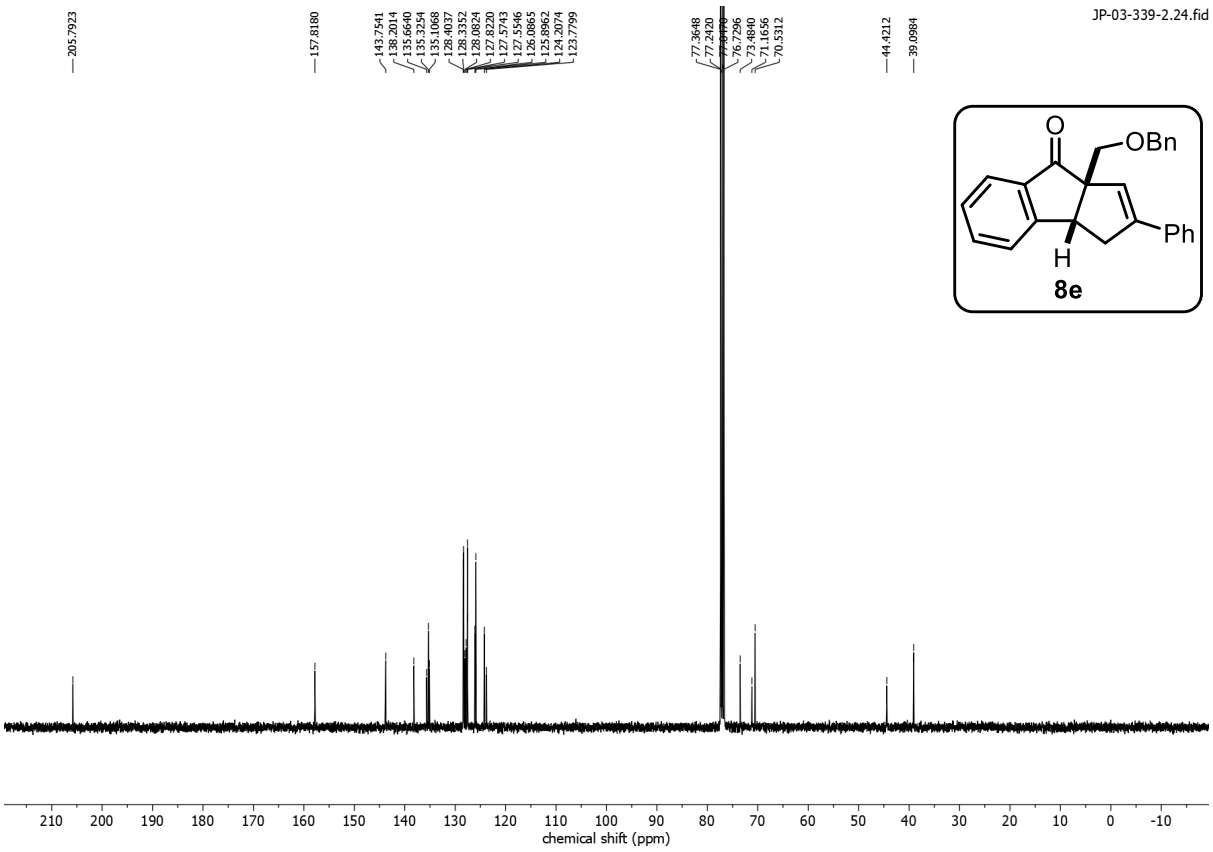

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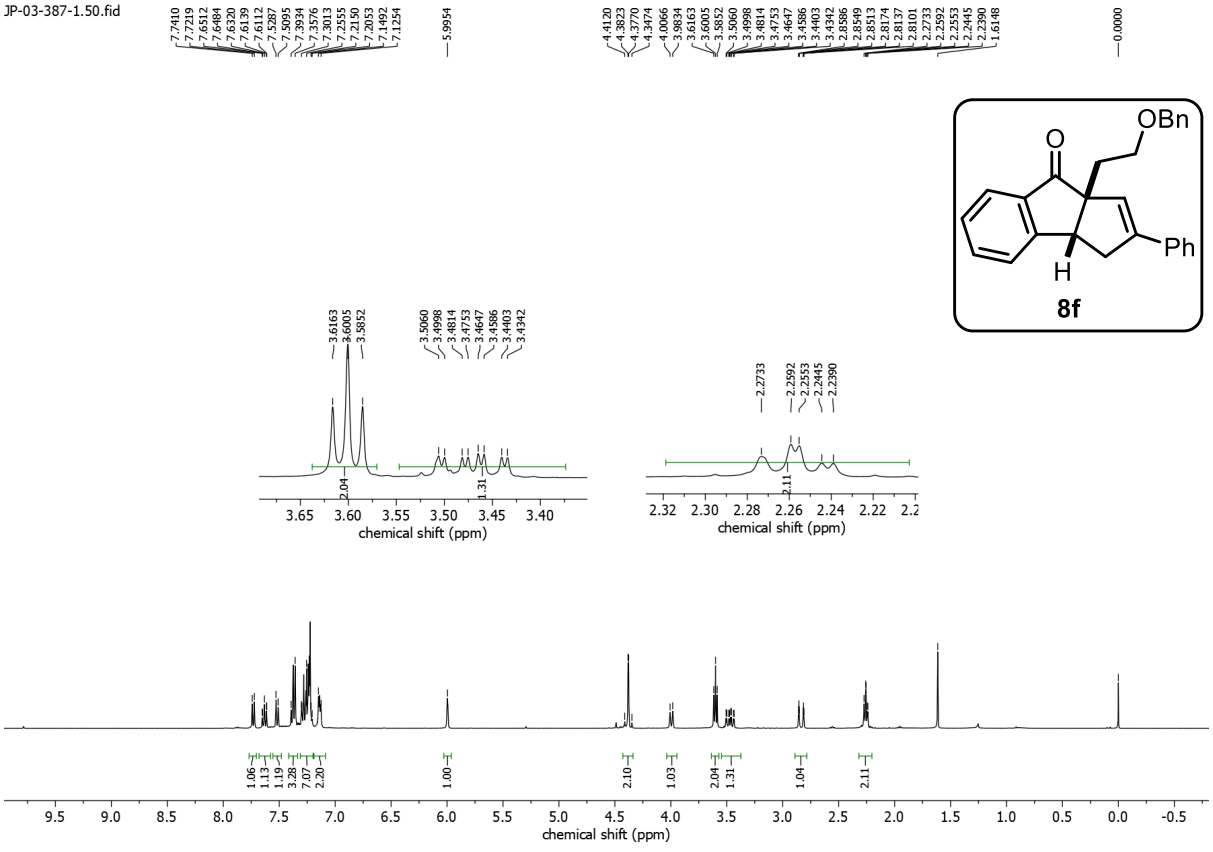
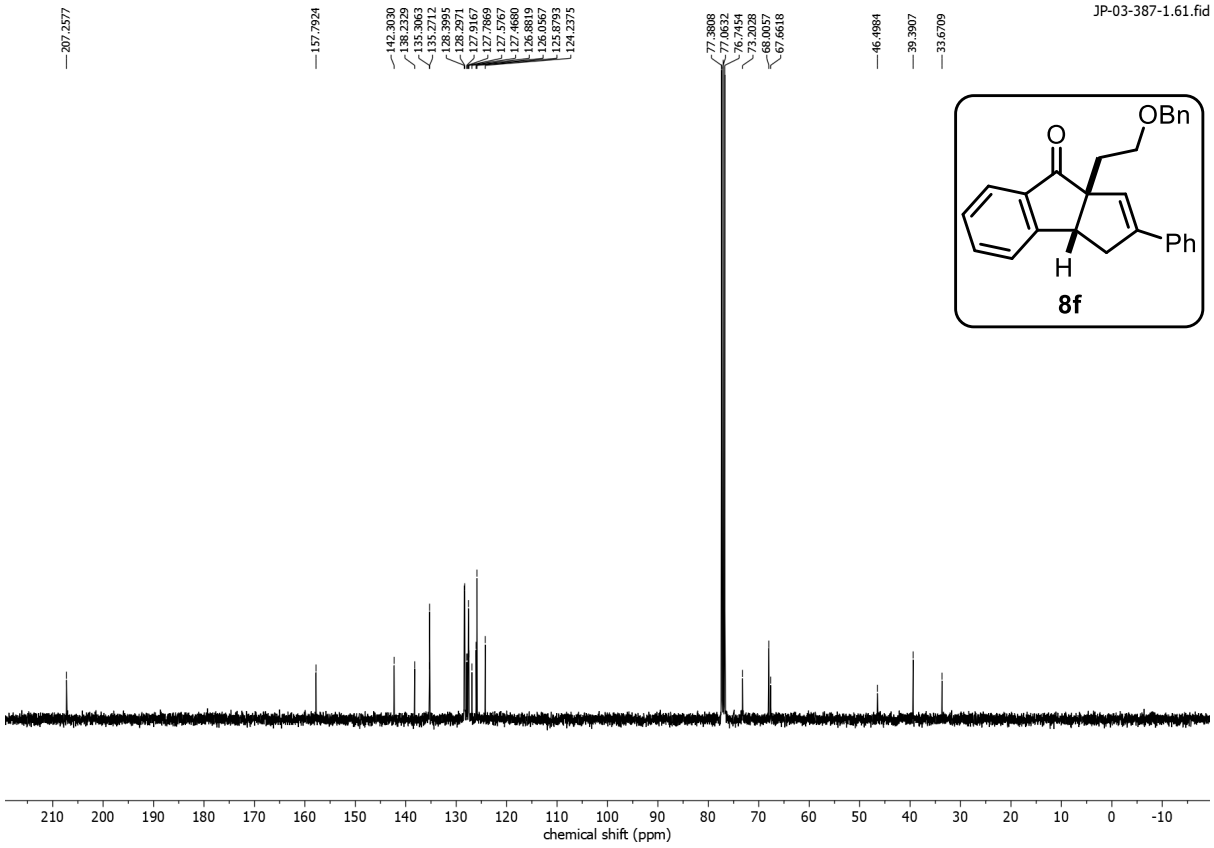


^{13}C NMR (100 MHz, $CDCl_3$)



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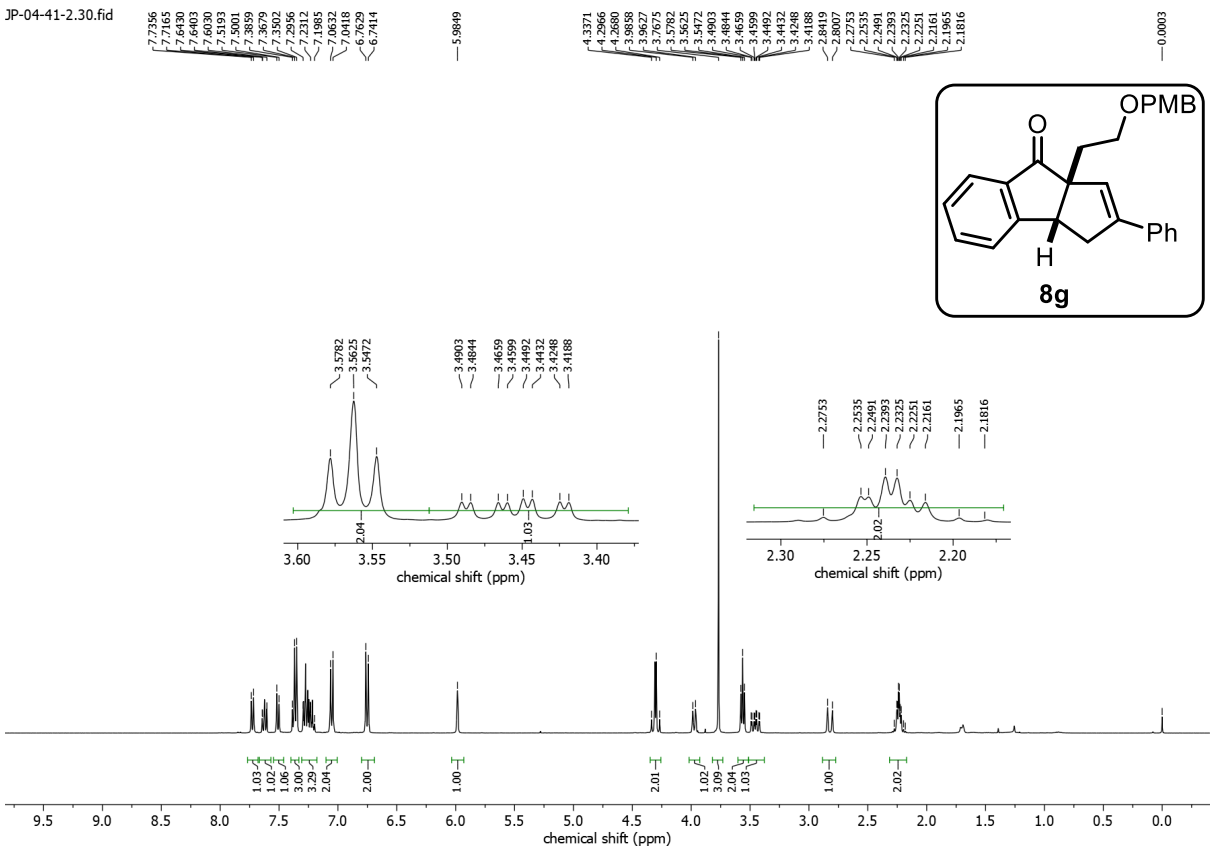

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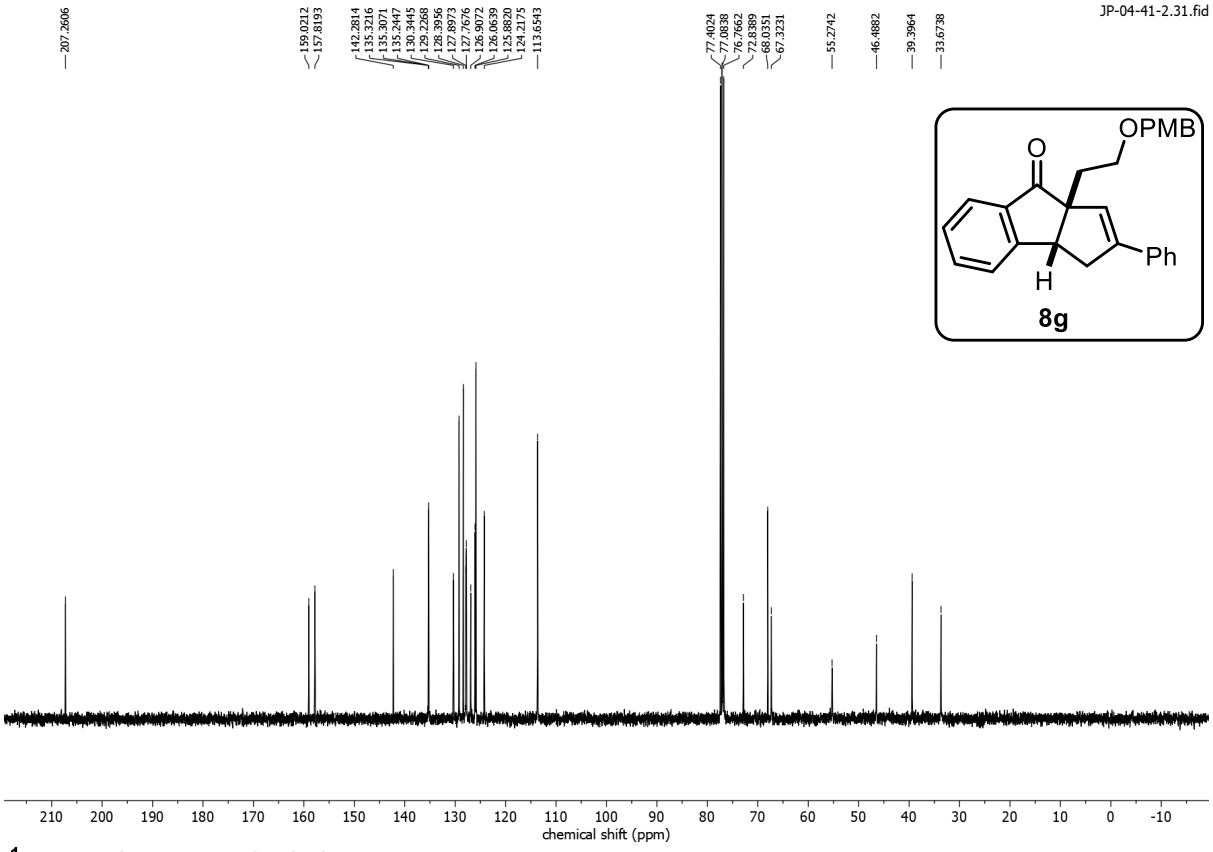

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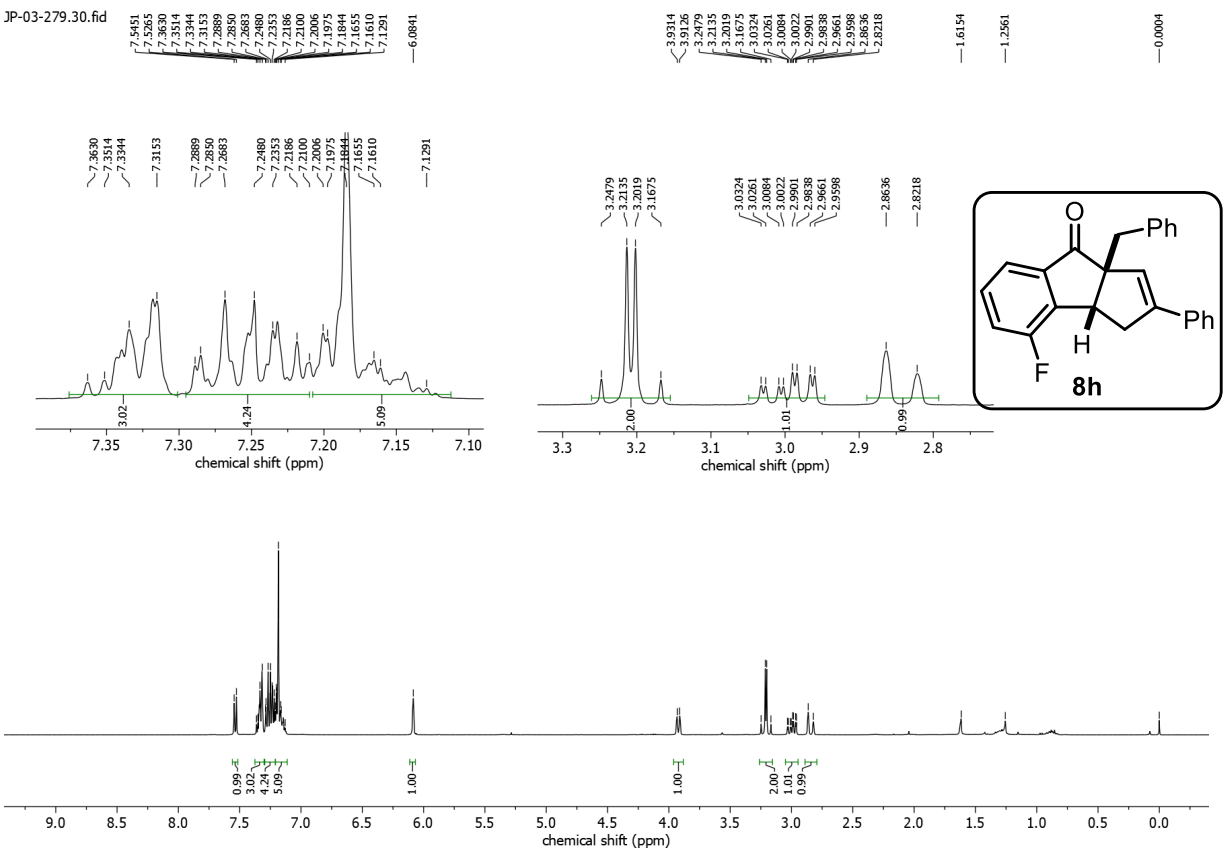

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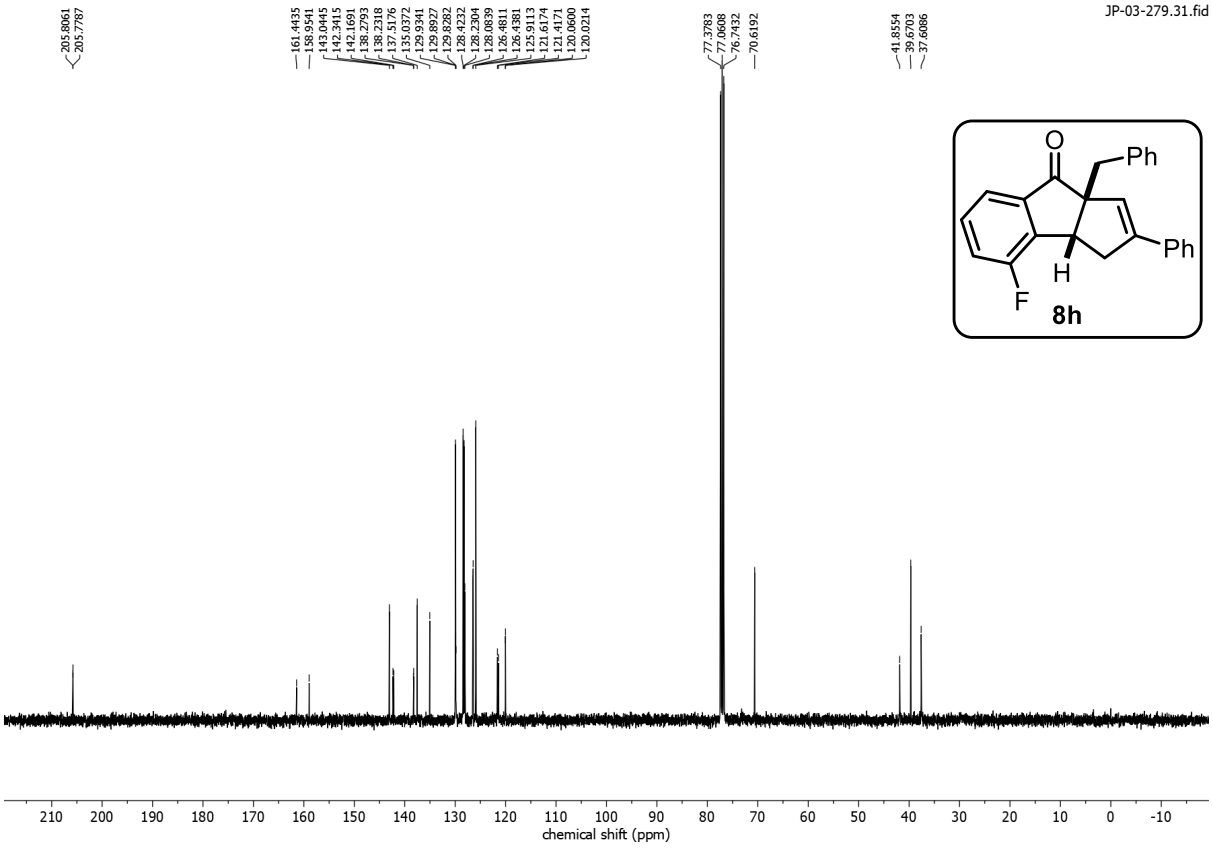
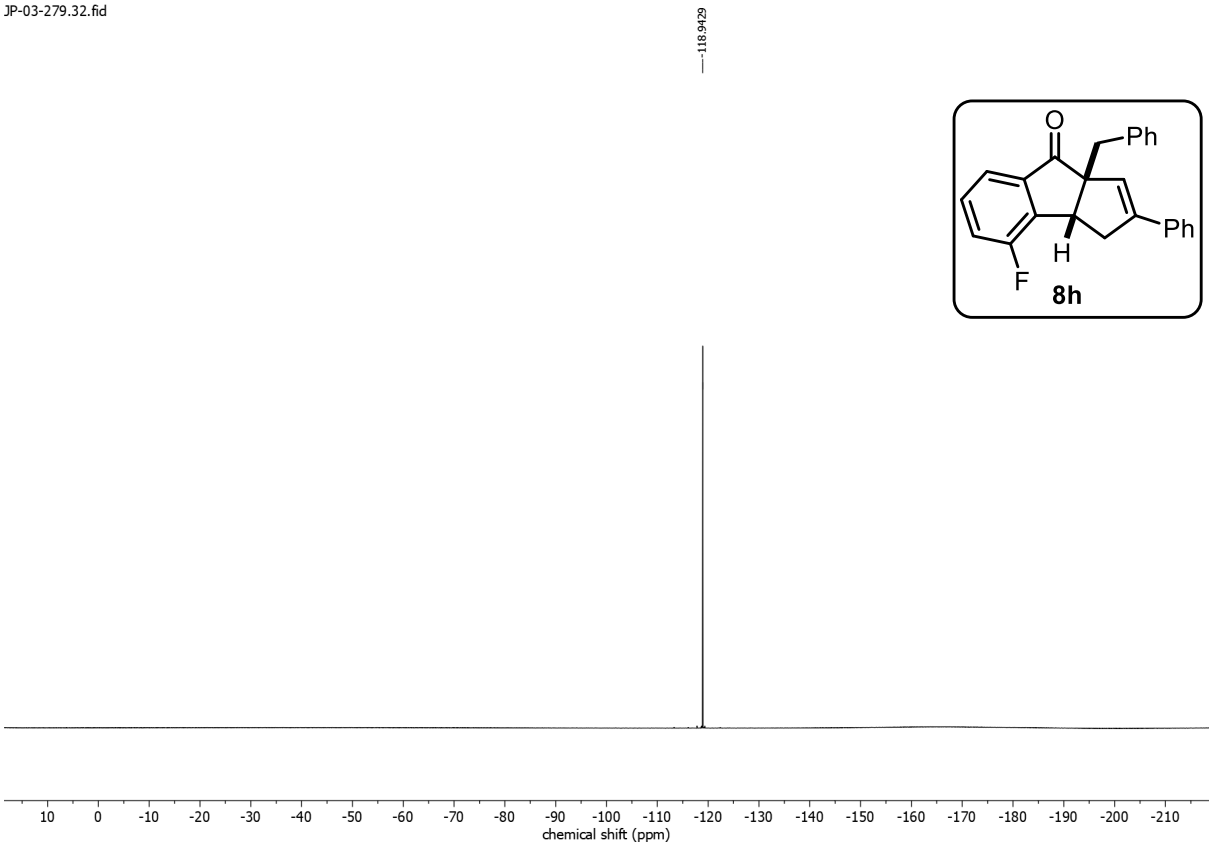


^{19}F NMR (376.4 MHz, $CDCl_3$)



^{1}H NMR (400 MHz, $CDCl_3$)

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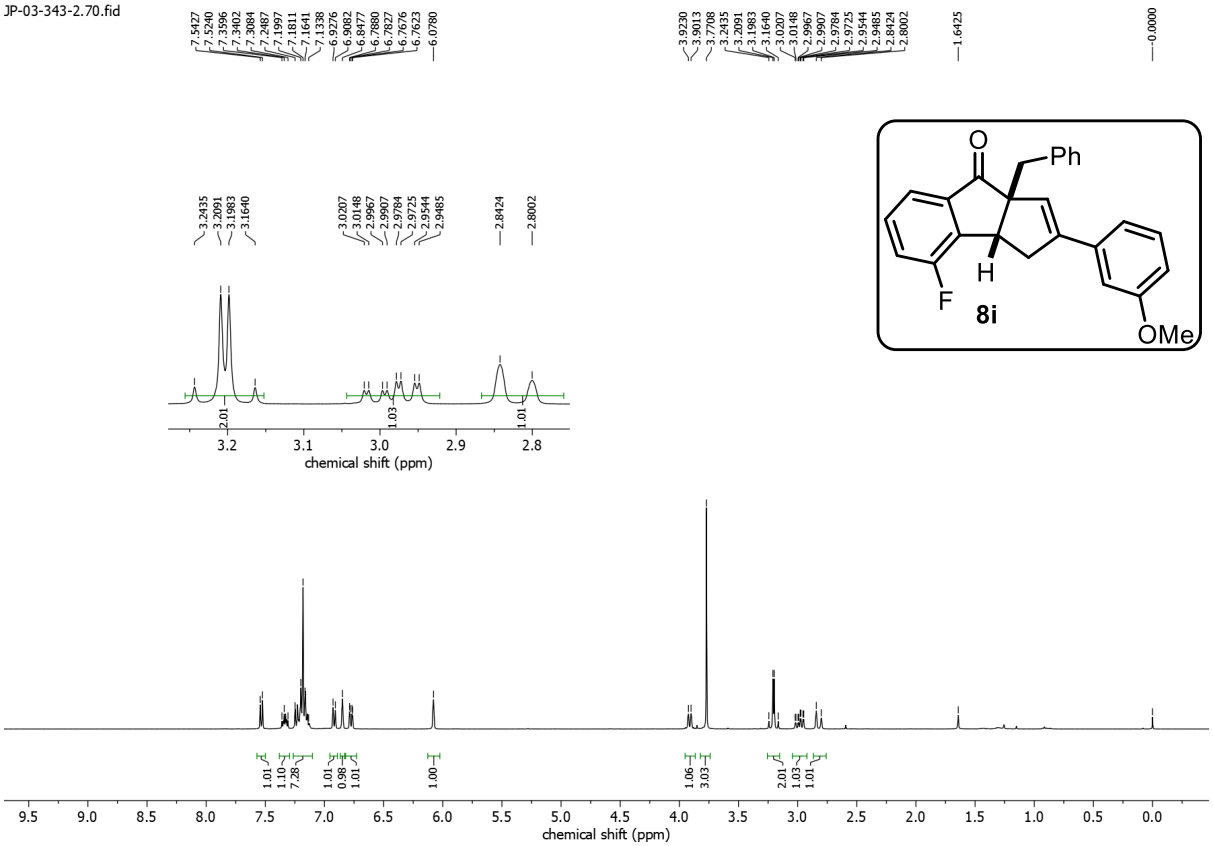
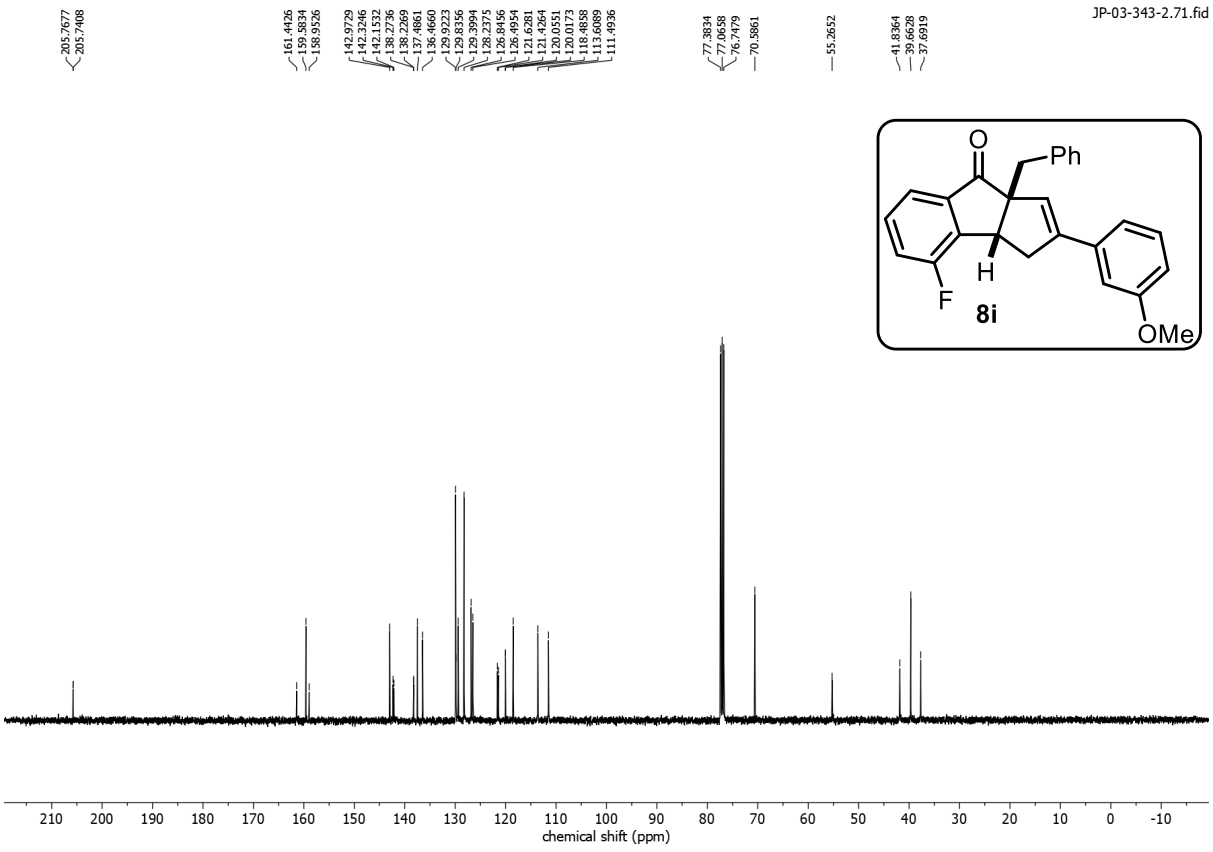


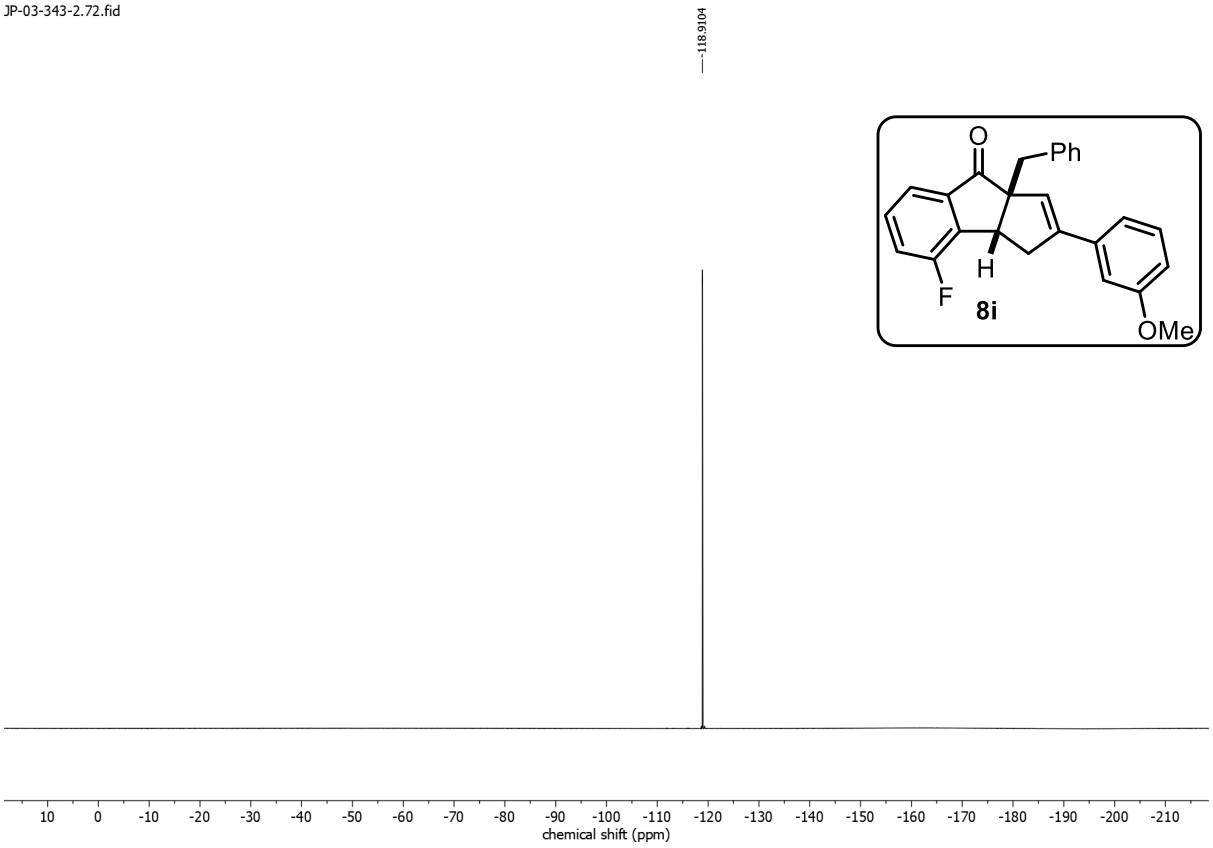
^{13}C NMR (100 MHz, $CDCl_3$)

JP-03-343-2.71.fid



^{19}F NMR (376.4 MHz, $CDCl_3$)

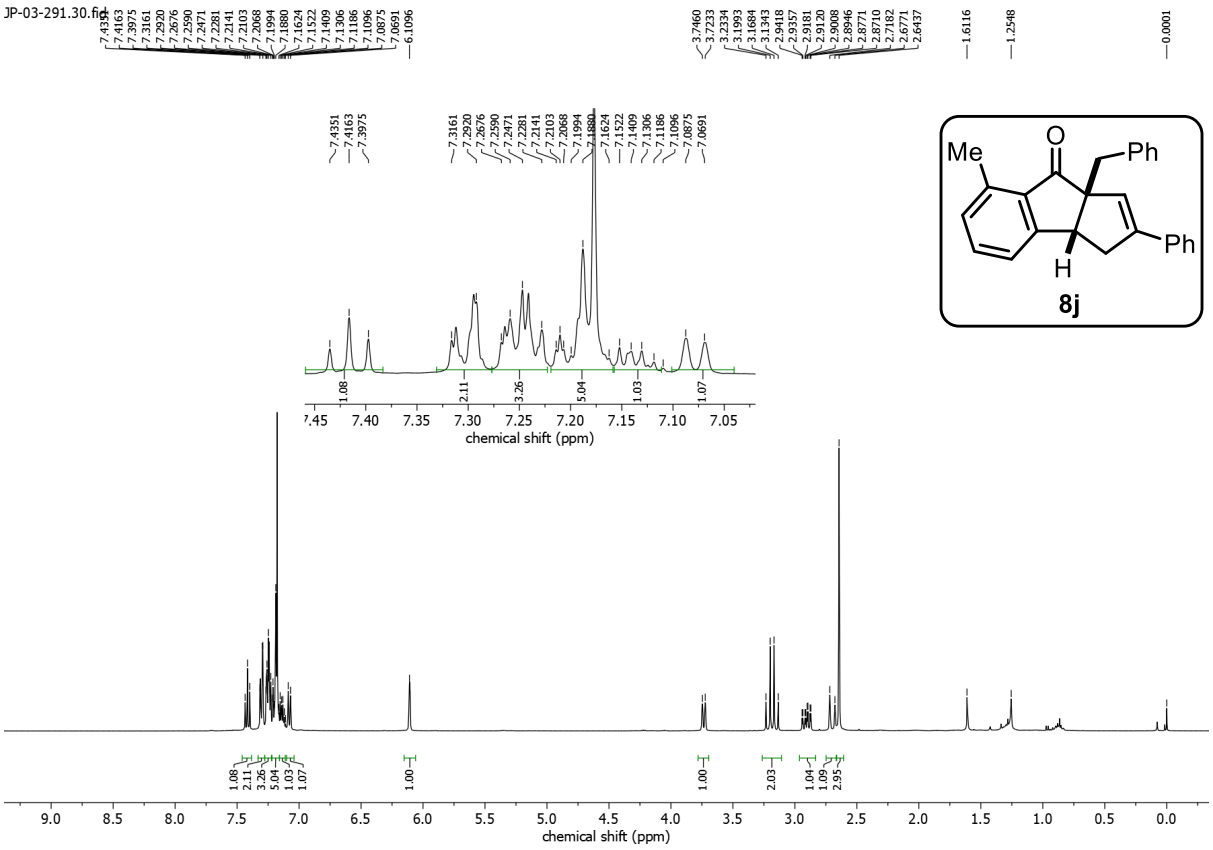
JP-03-343-2.72.fid



8i

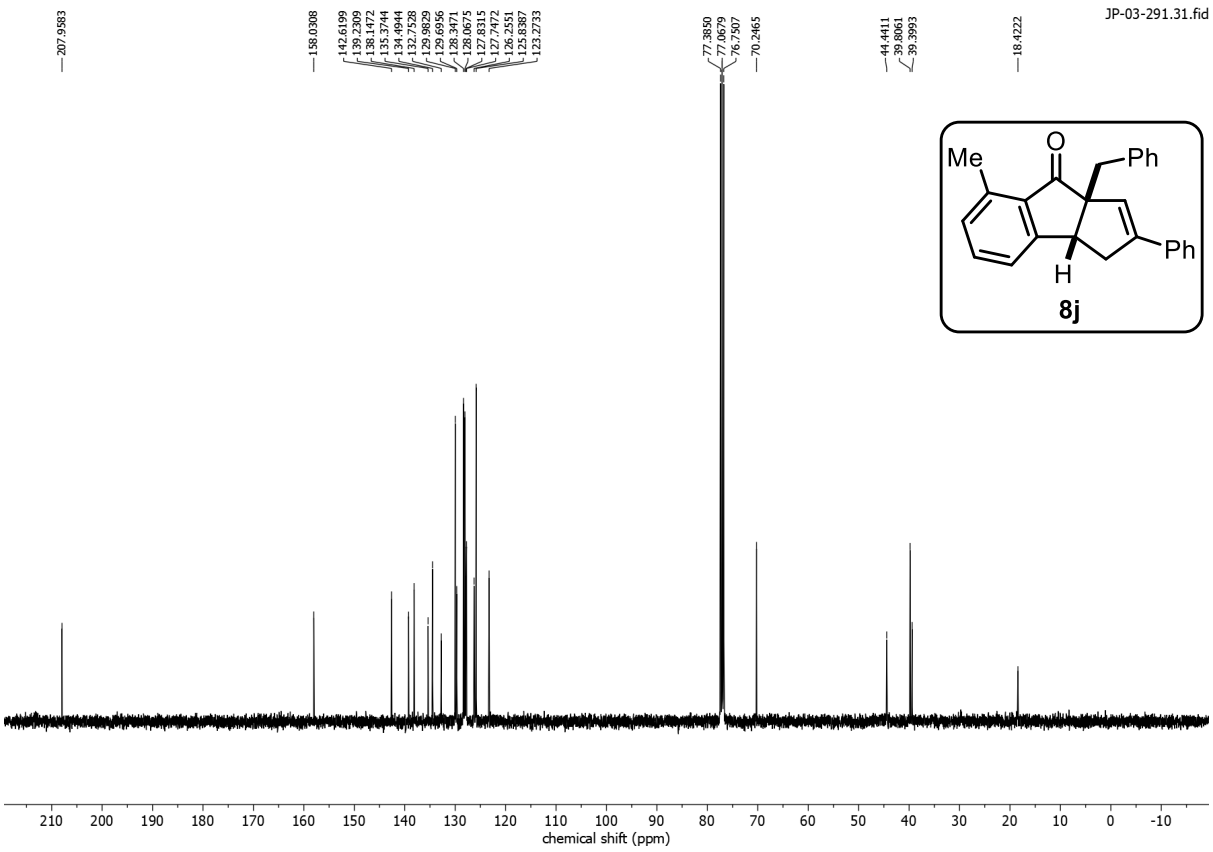
^{1}H NMR (400 MHz, $CDCl_3$)

JP-03-291.30.fid

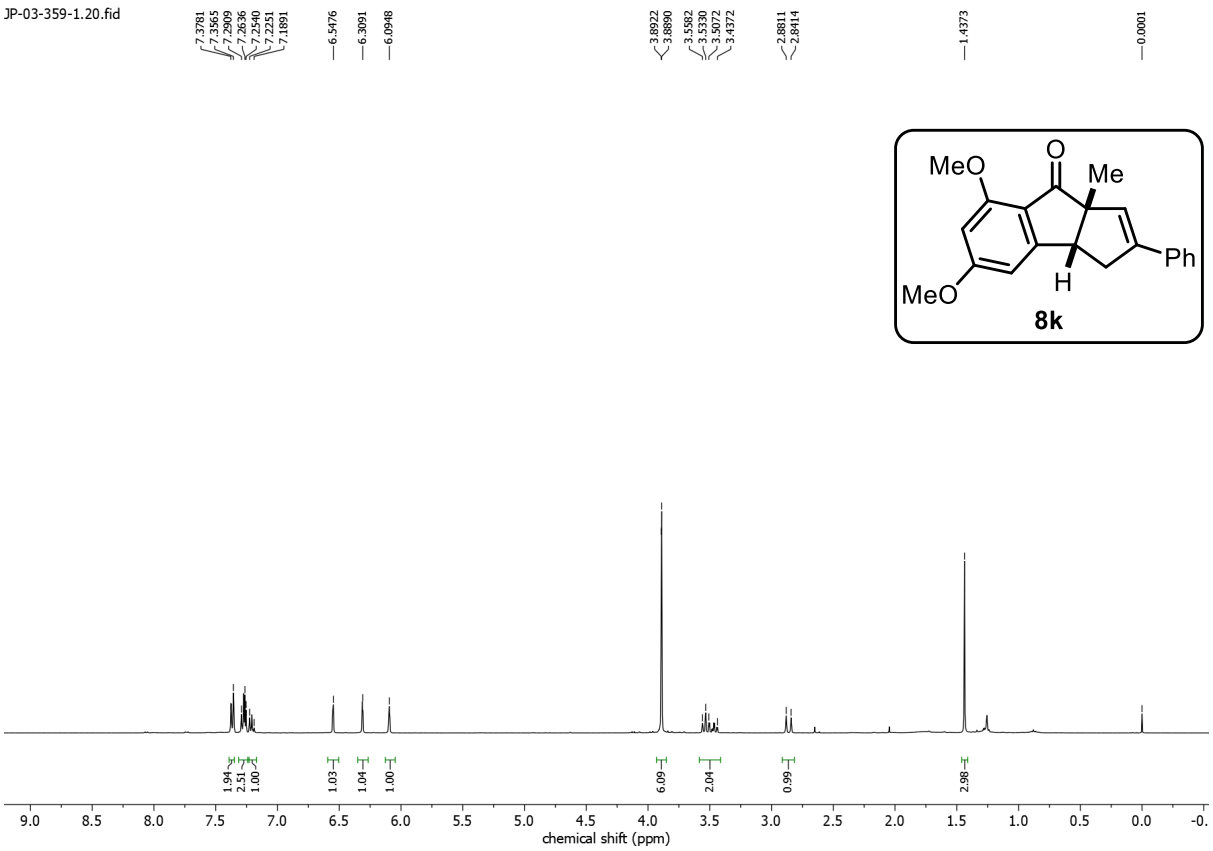


8j

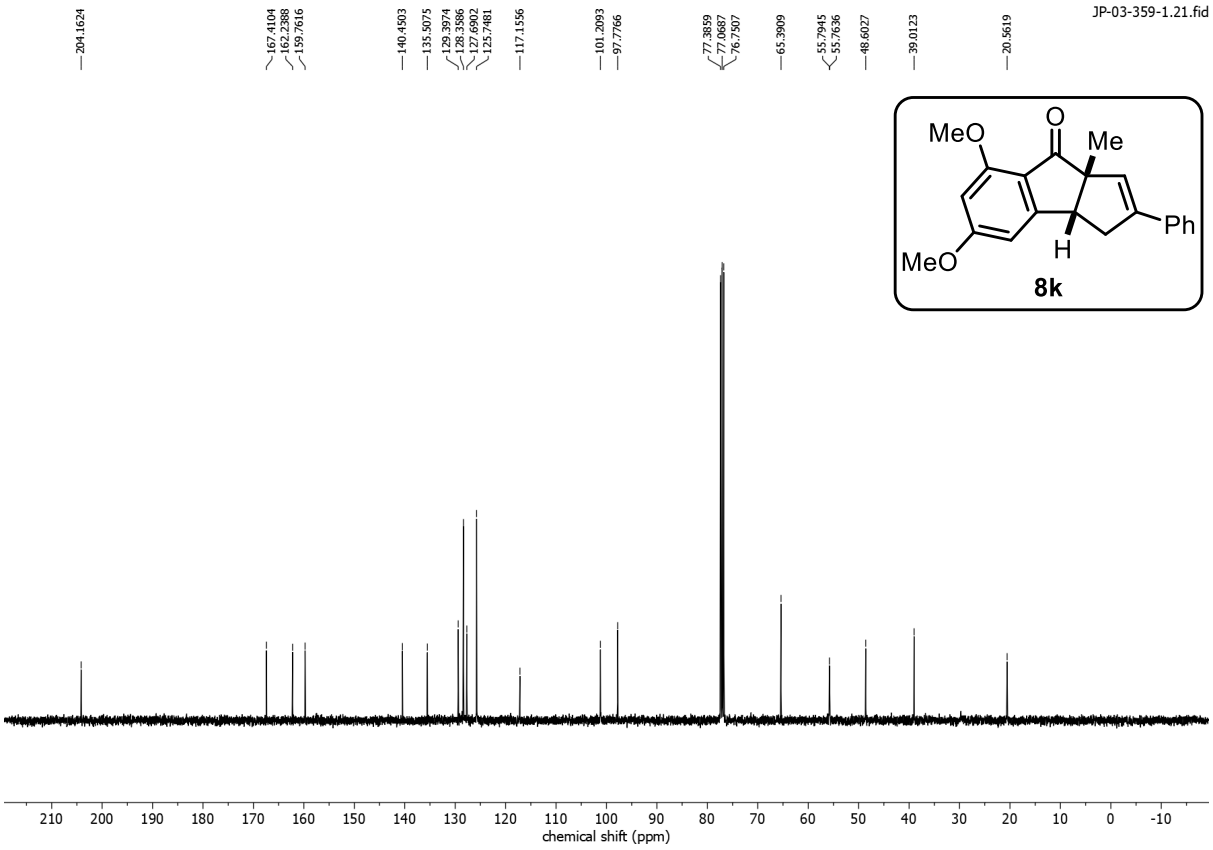
^{13}C NMR (100 MHz, $CDCl_3$)



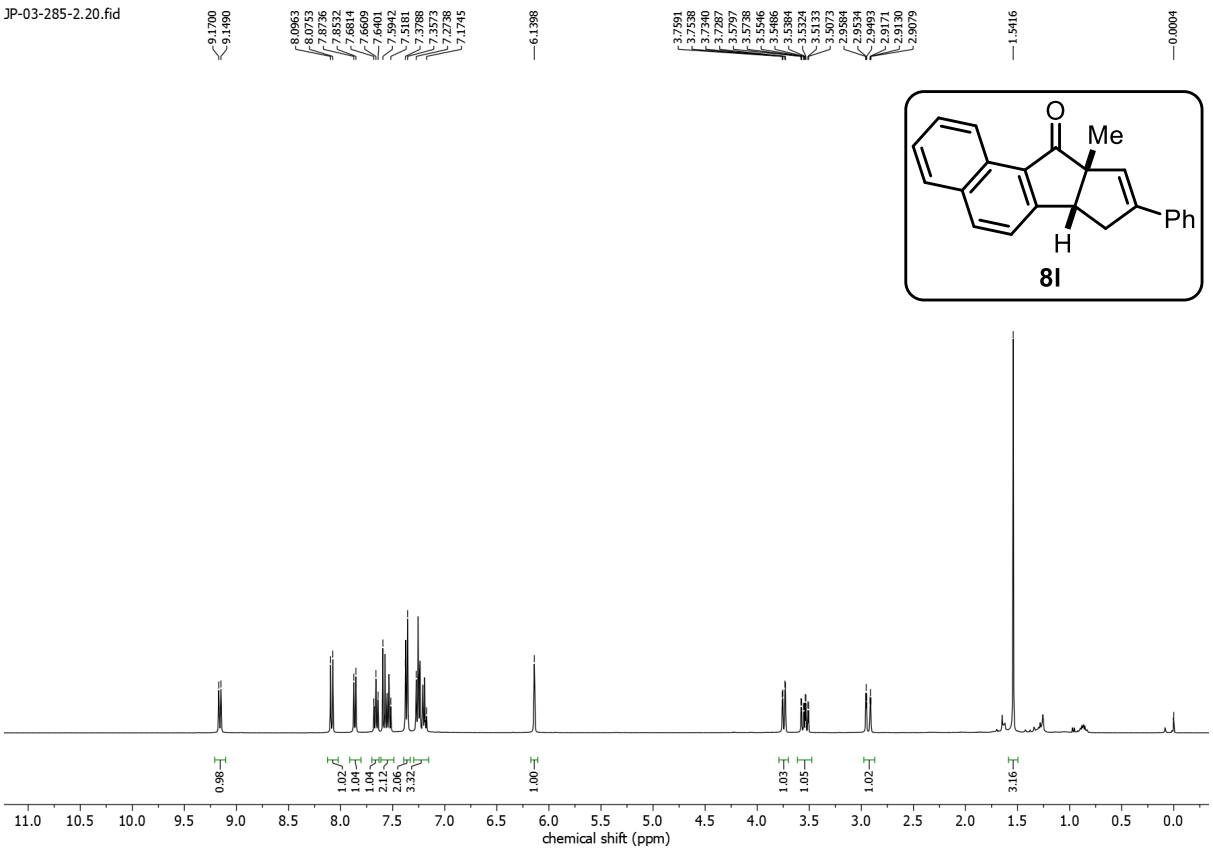
^{1}H NMR (400 MHz, $CDCl_3$)



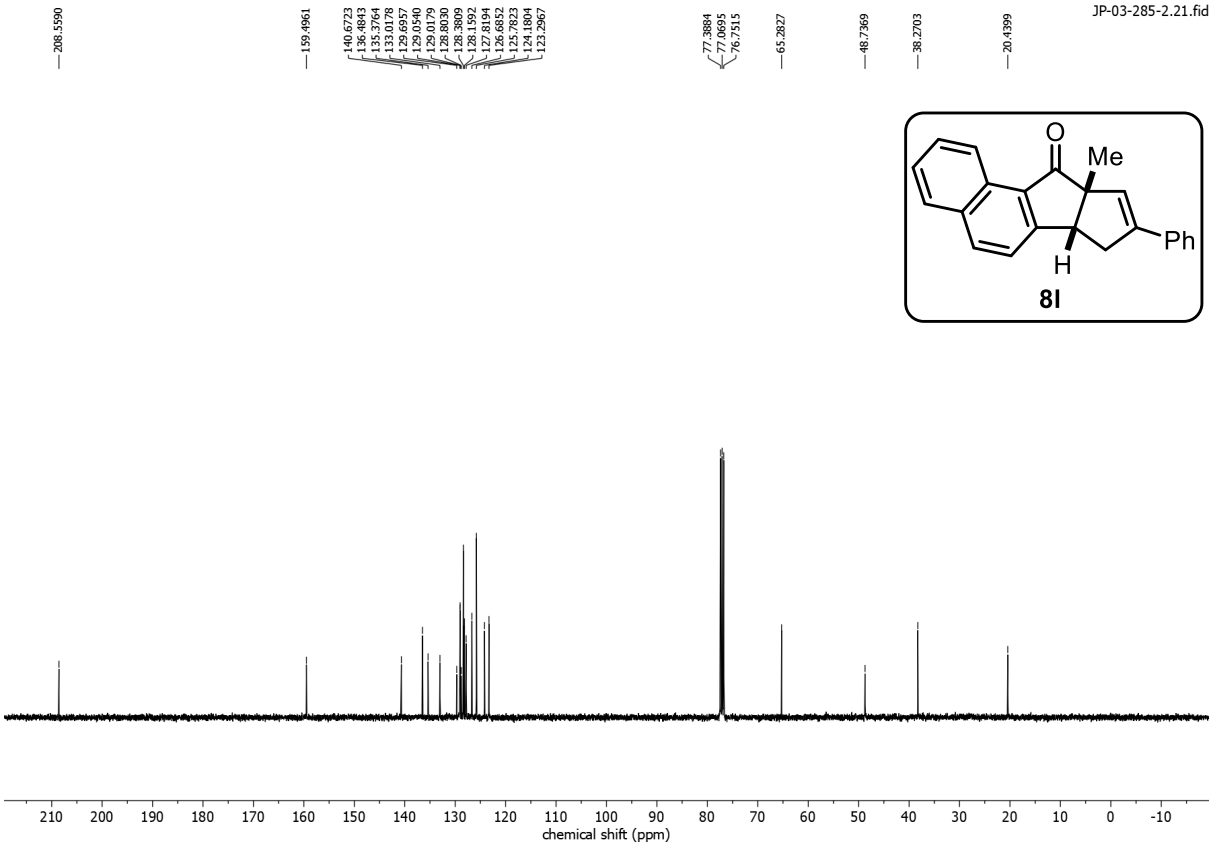
^{13}C NMR (100 MHz, $CDCl_3$)



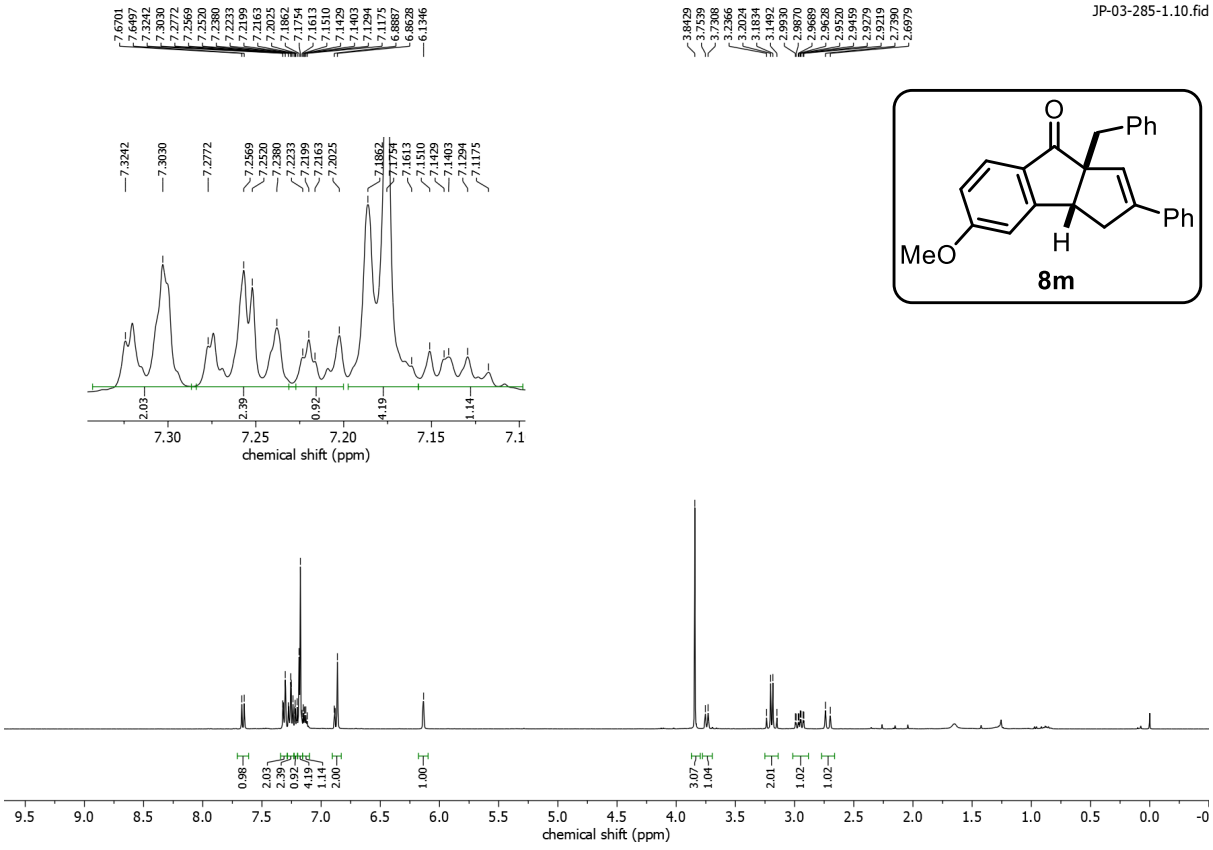
^{1}H NMR (400 MHz, $CDCl_3$)



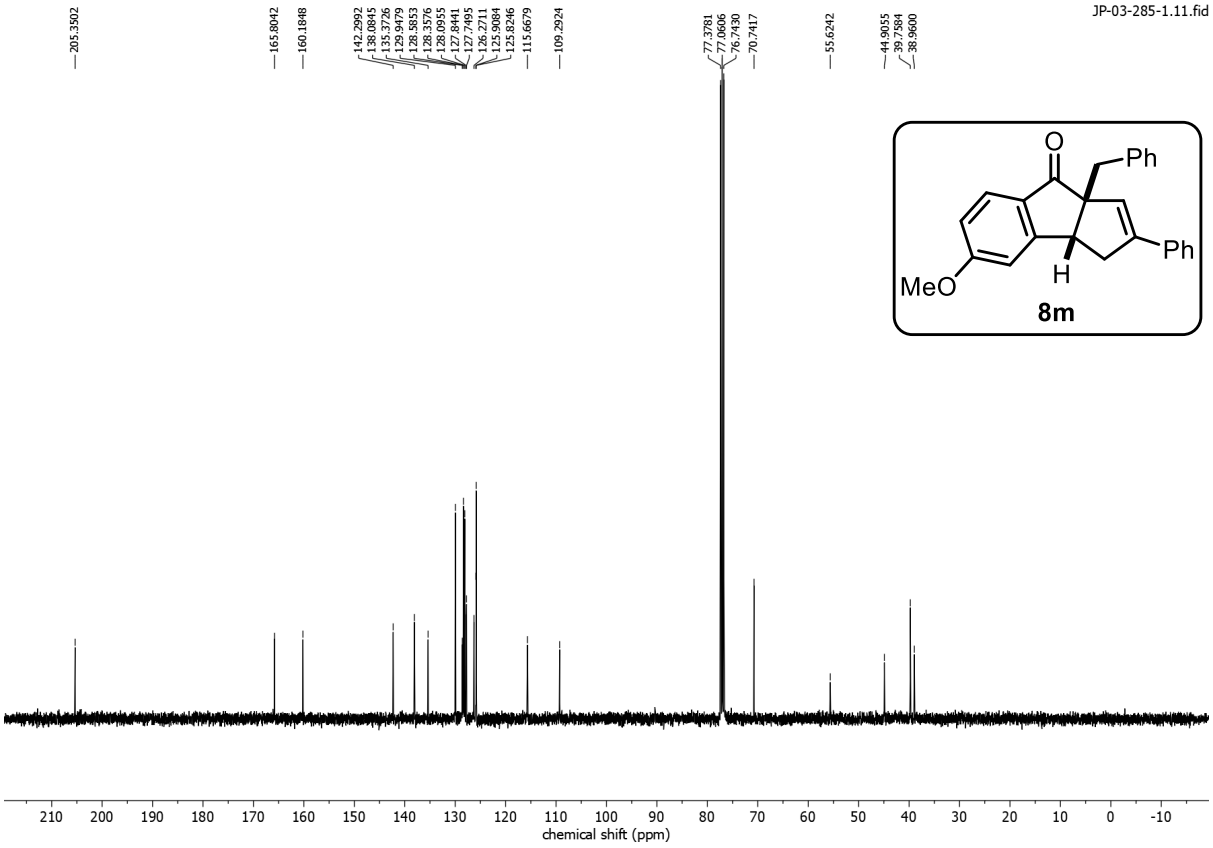
^{13}C NMR (100 MHz, $CDCl_3$)



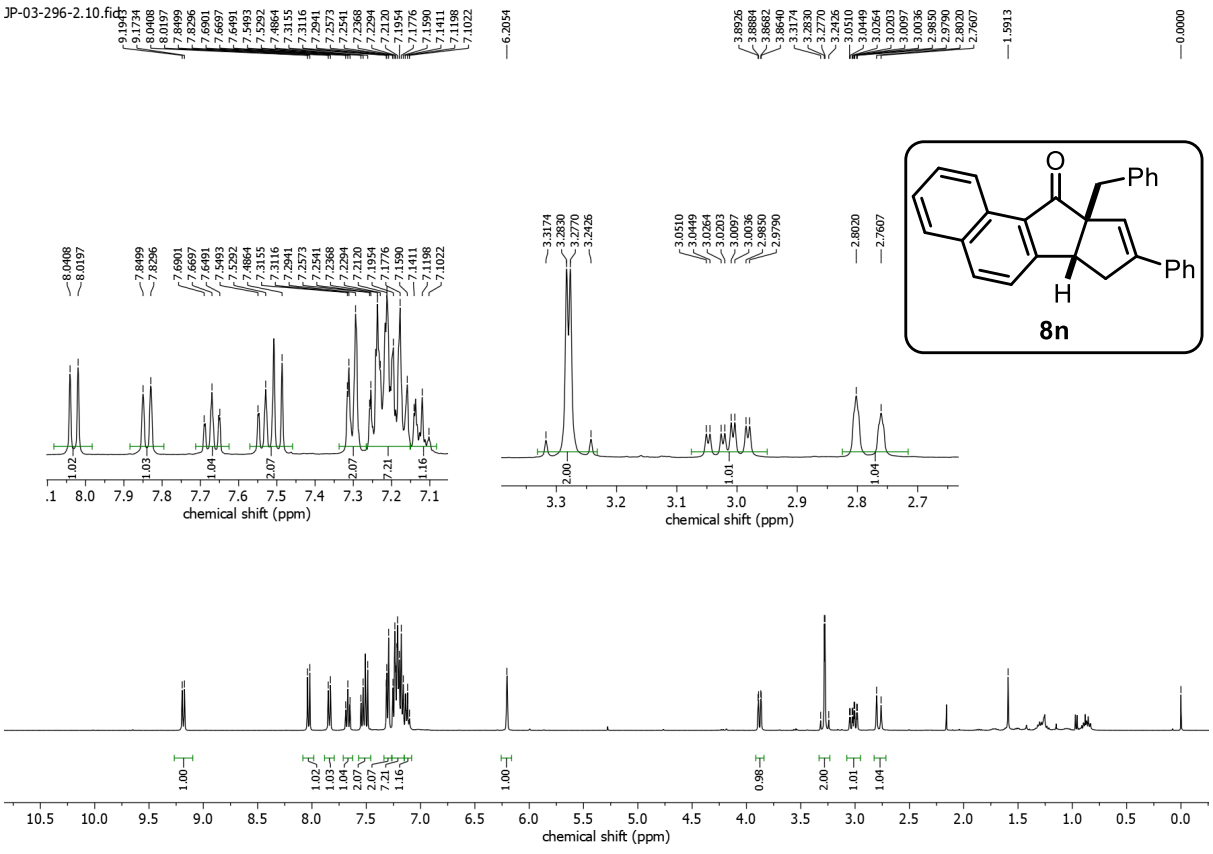
^{1}H NMR (400 MHz, $CDCl_3$)



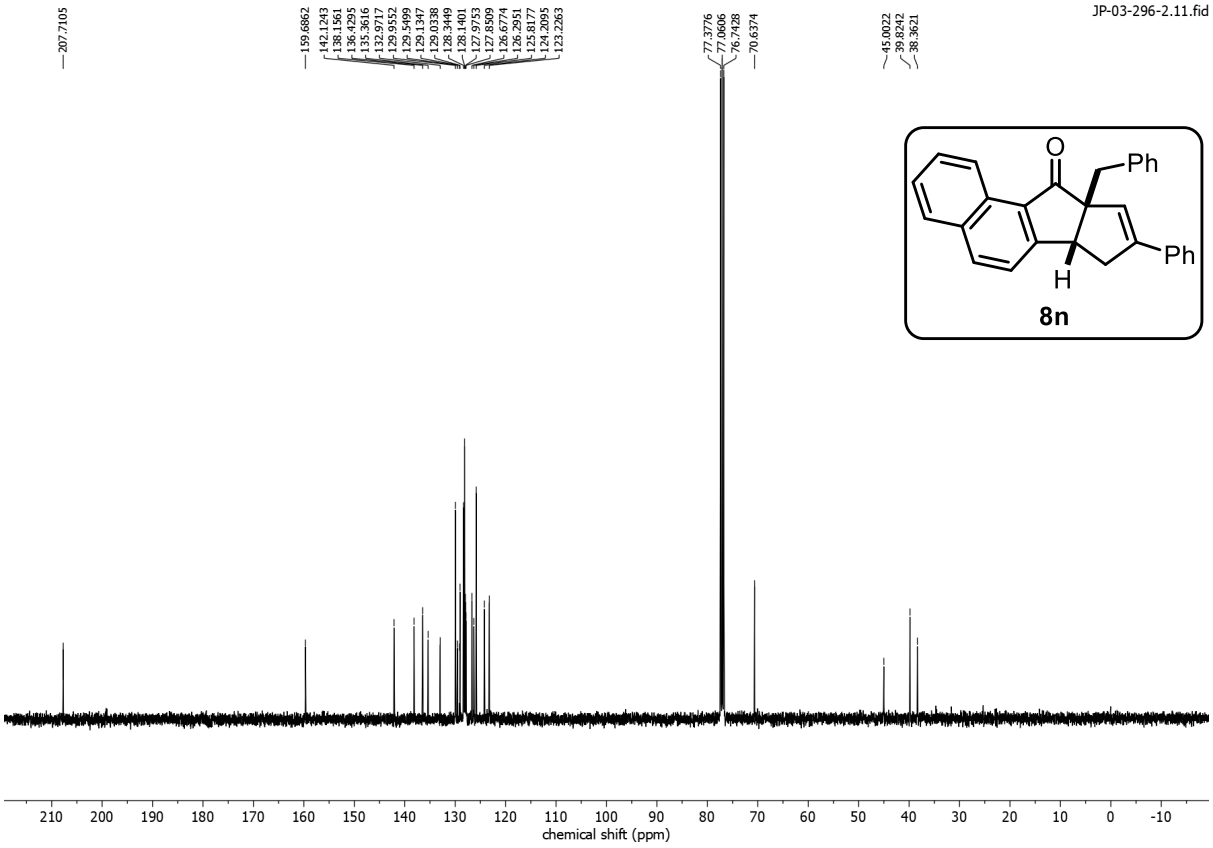
^{13}C NMR (100 MHz, $CDCl_3$)



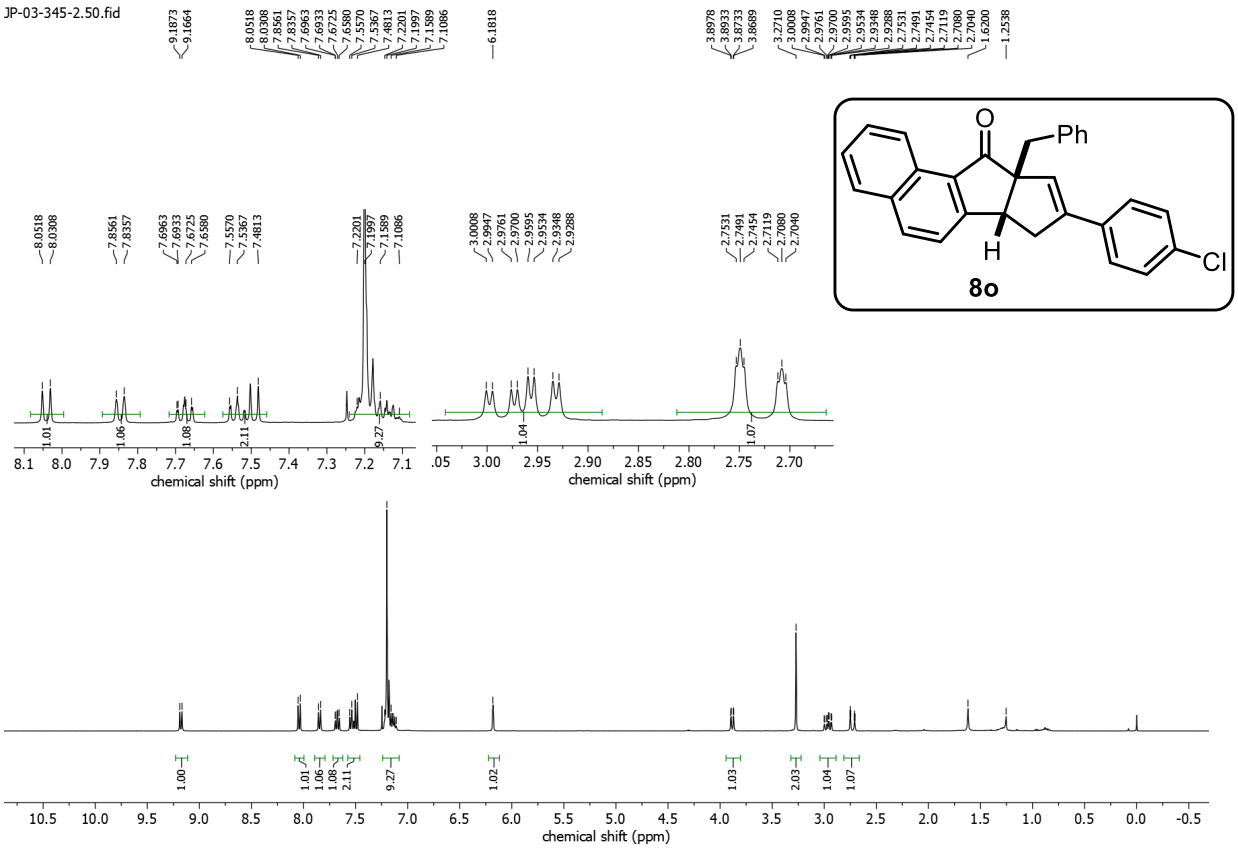
^{1}H NMR (400 MHz, $CDCl_3$)



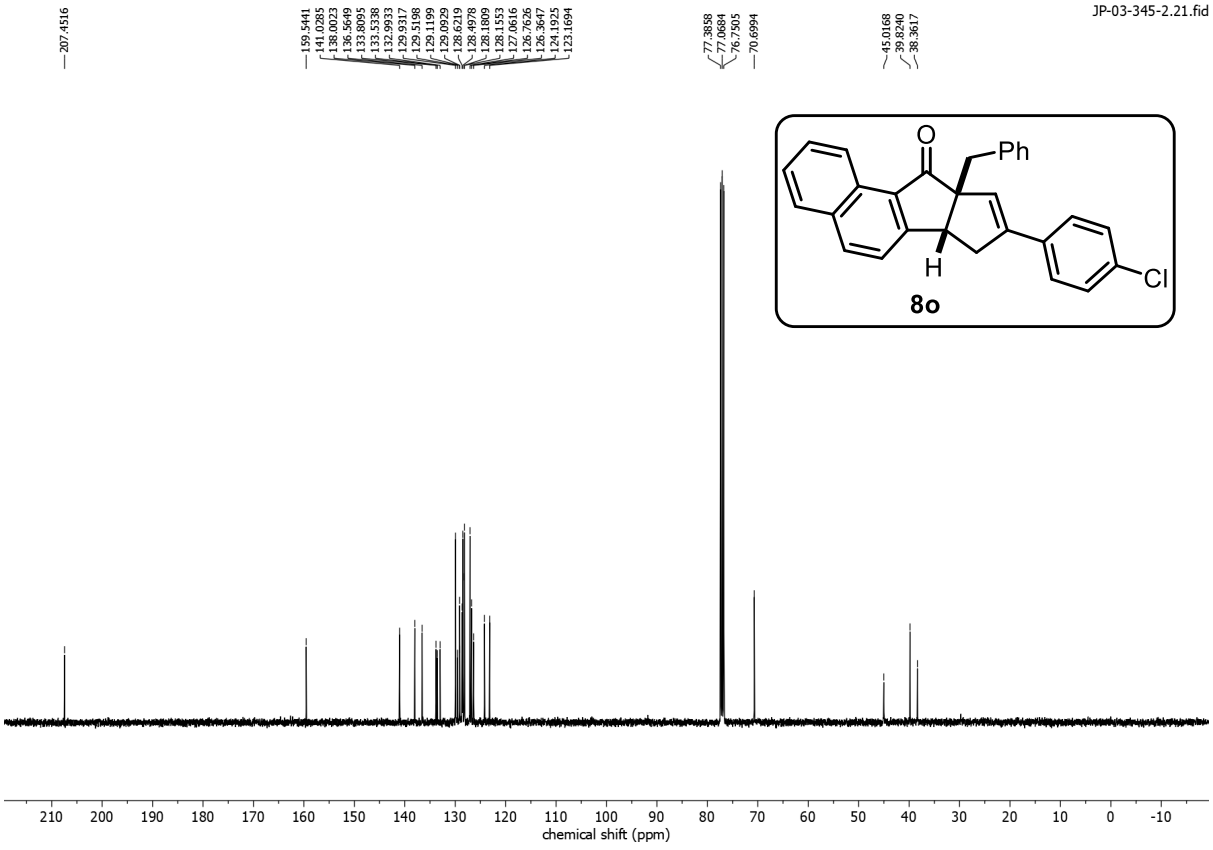
^{13}C NMR (100 MHz, $CDCl_3$)



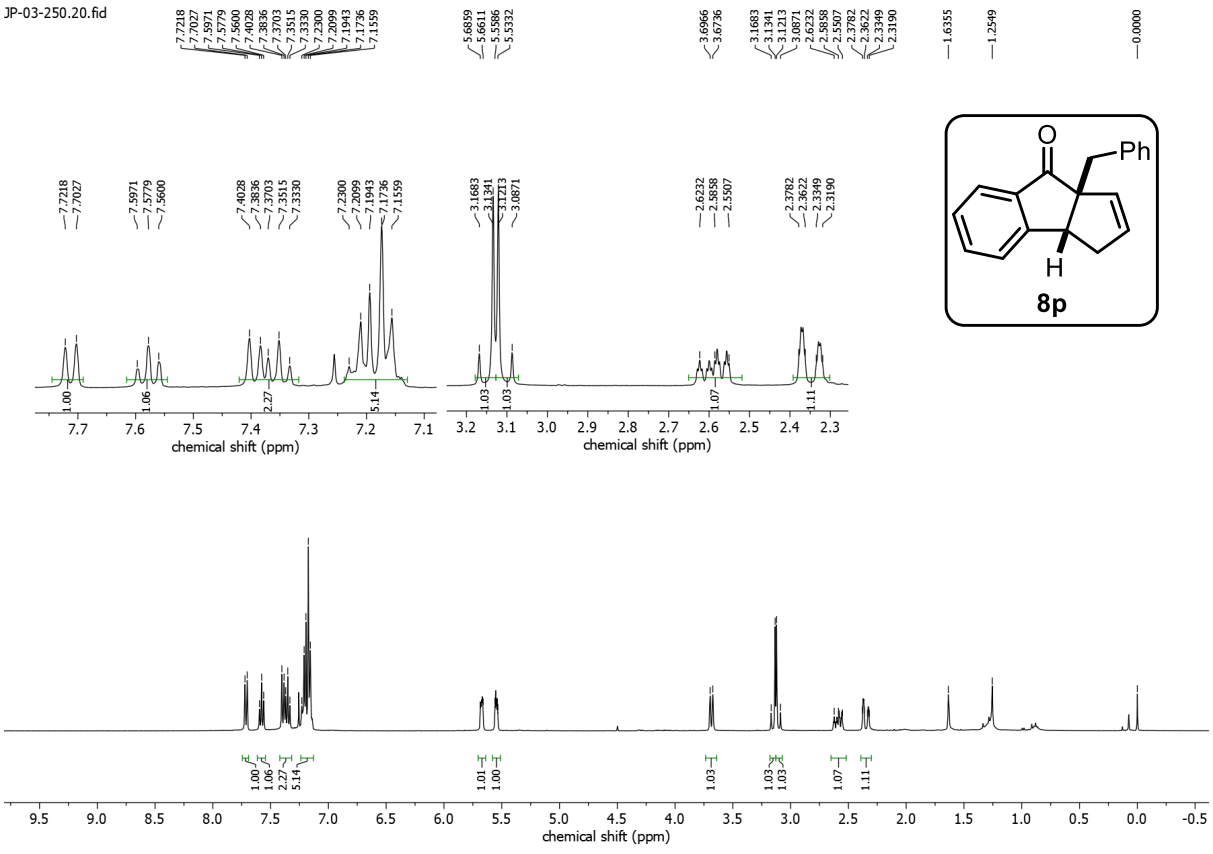
^{1}H NMR (400 MHz, $CDCl_3$)



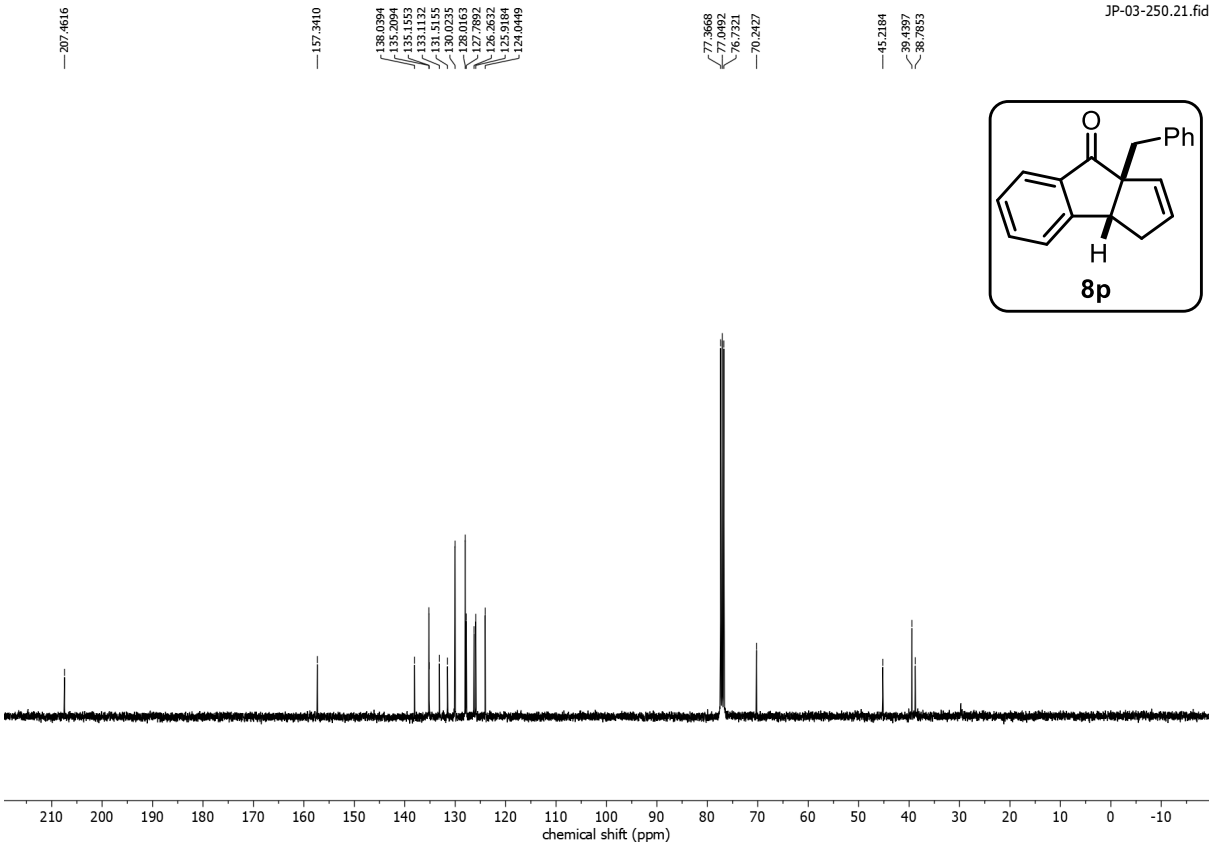
^{13}C NMR (100 MHz, $CDCl_3$)



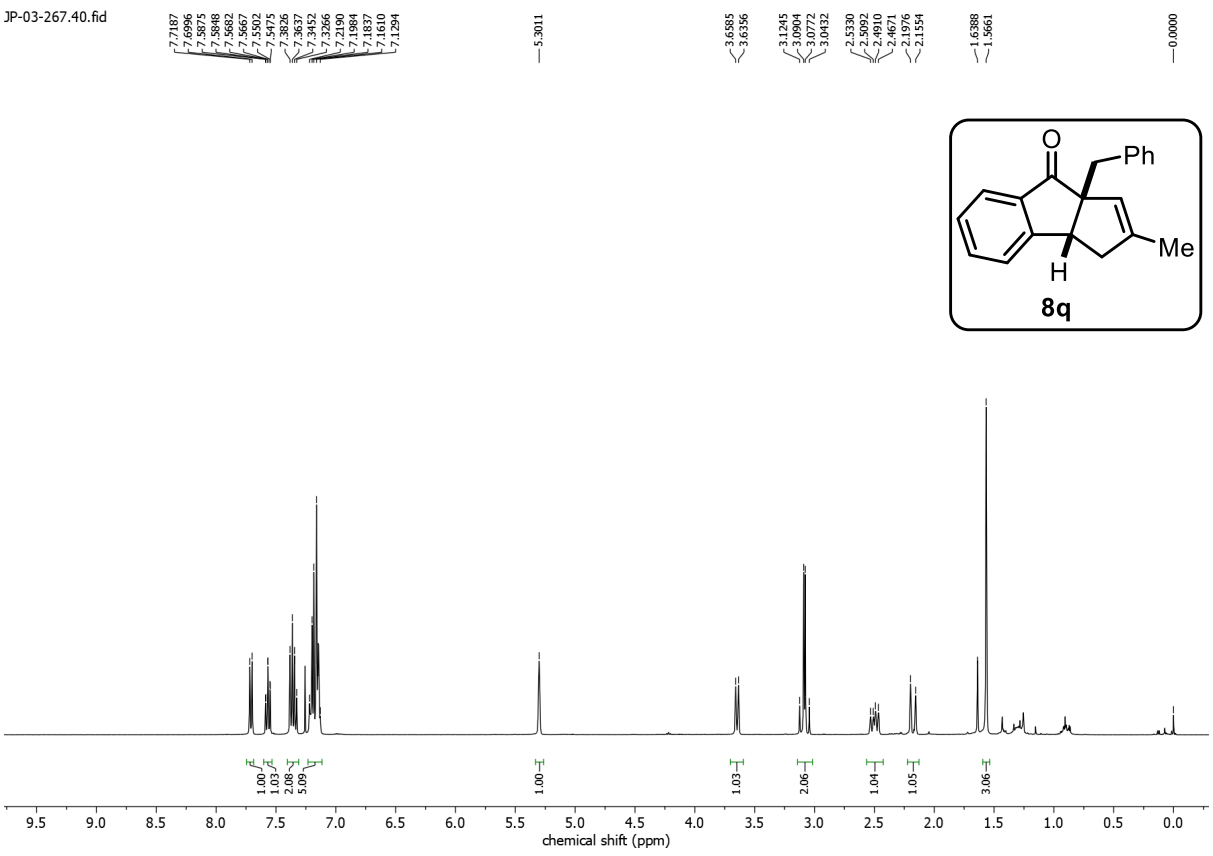
^{1}H NMR (400 MHz, $CDCl_3$)



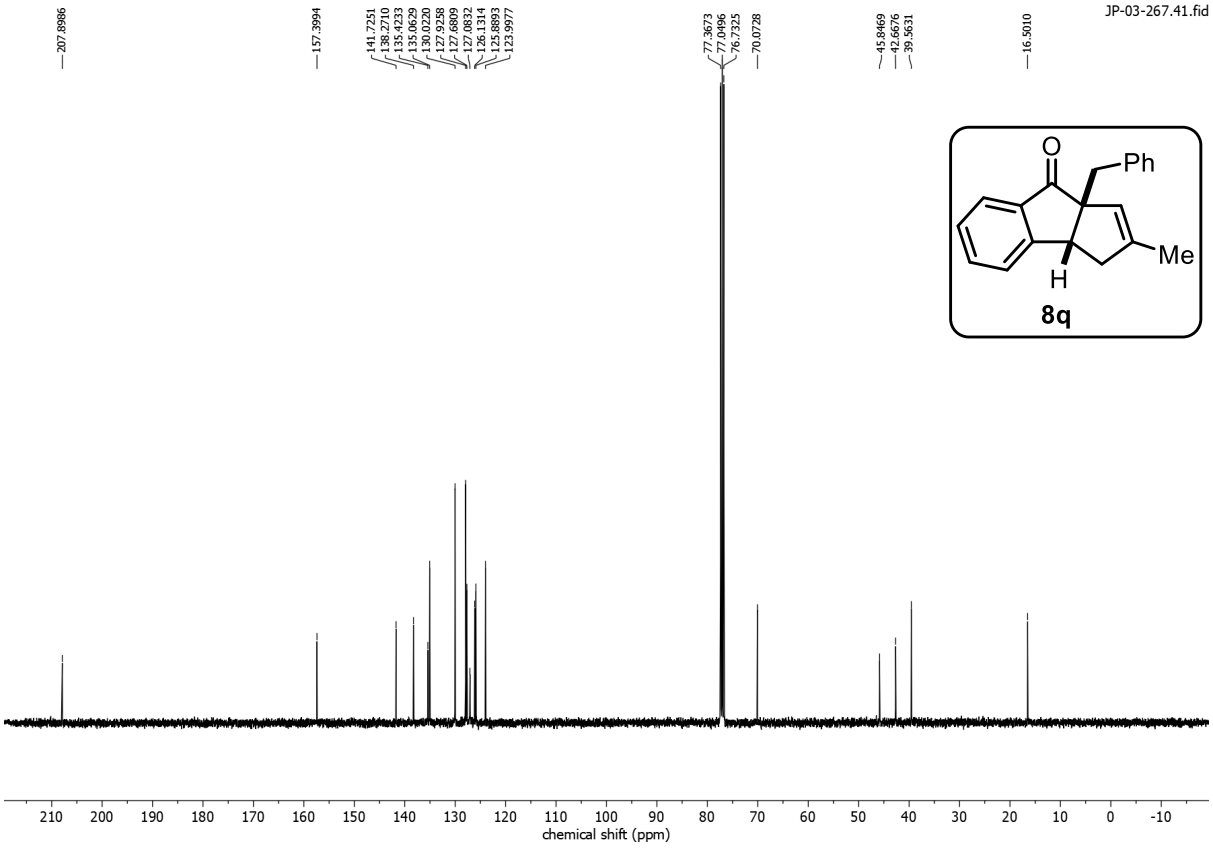
^{13}C NMR (100 MHz, $CDCl_3$)



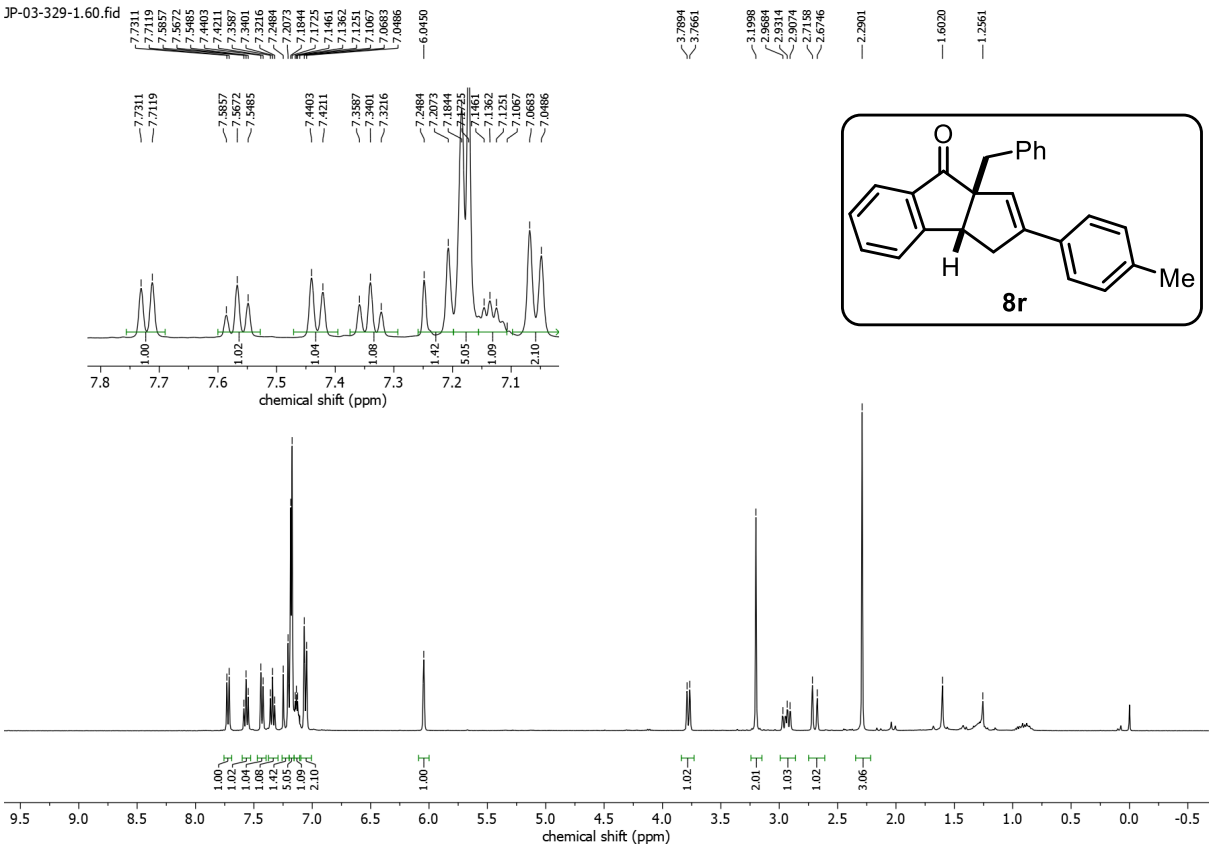
^{1}H NMR (400 MHz, $CDCl_3$)



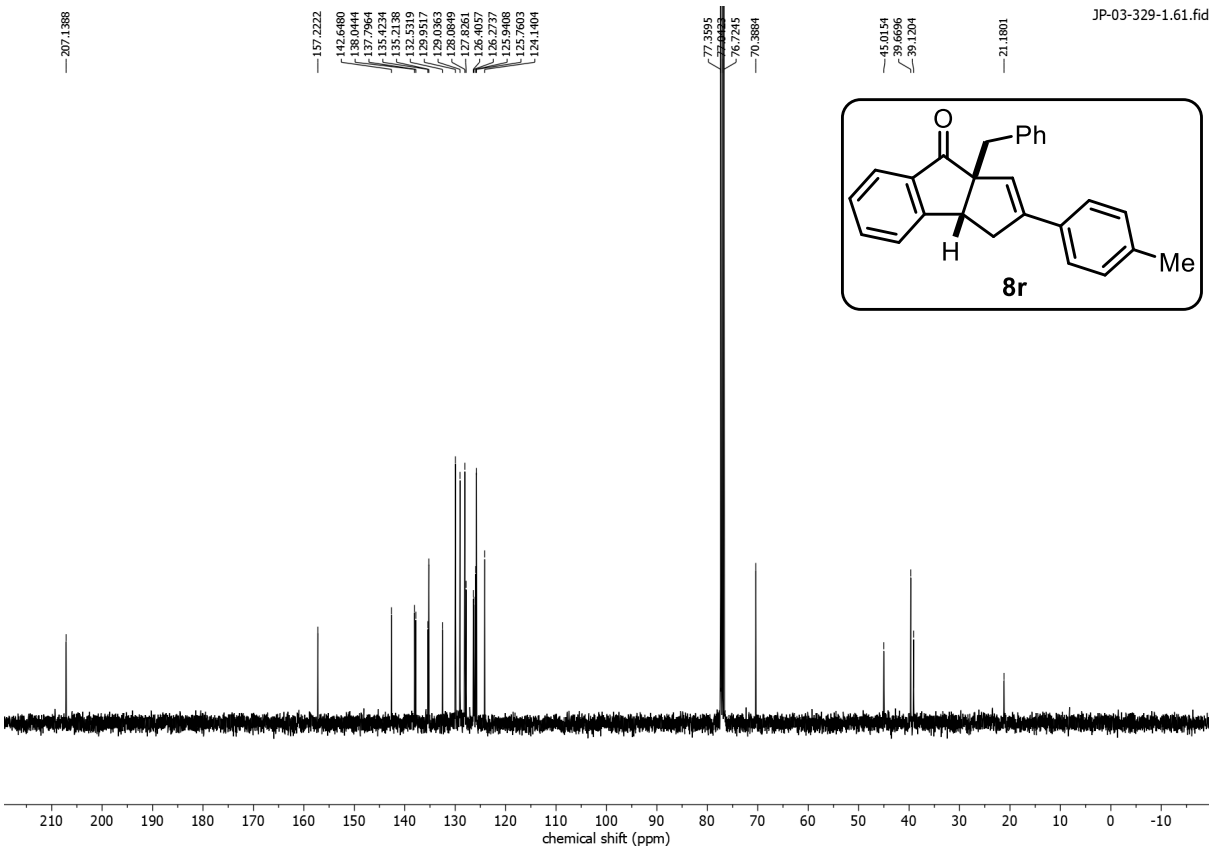
^{13}C NMR (100 MHz, $CDCl_3$)



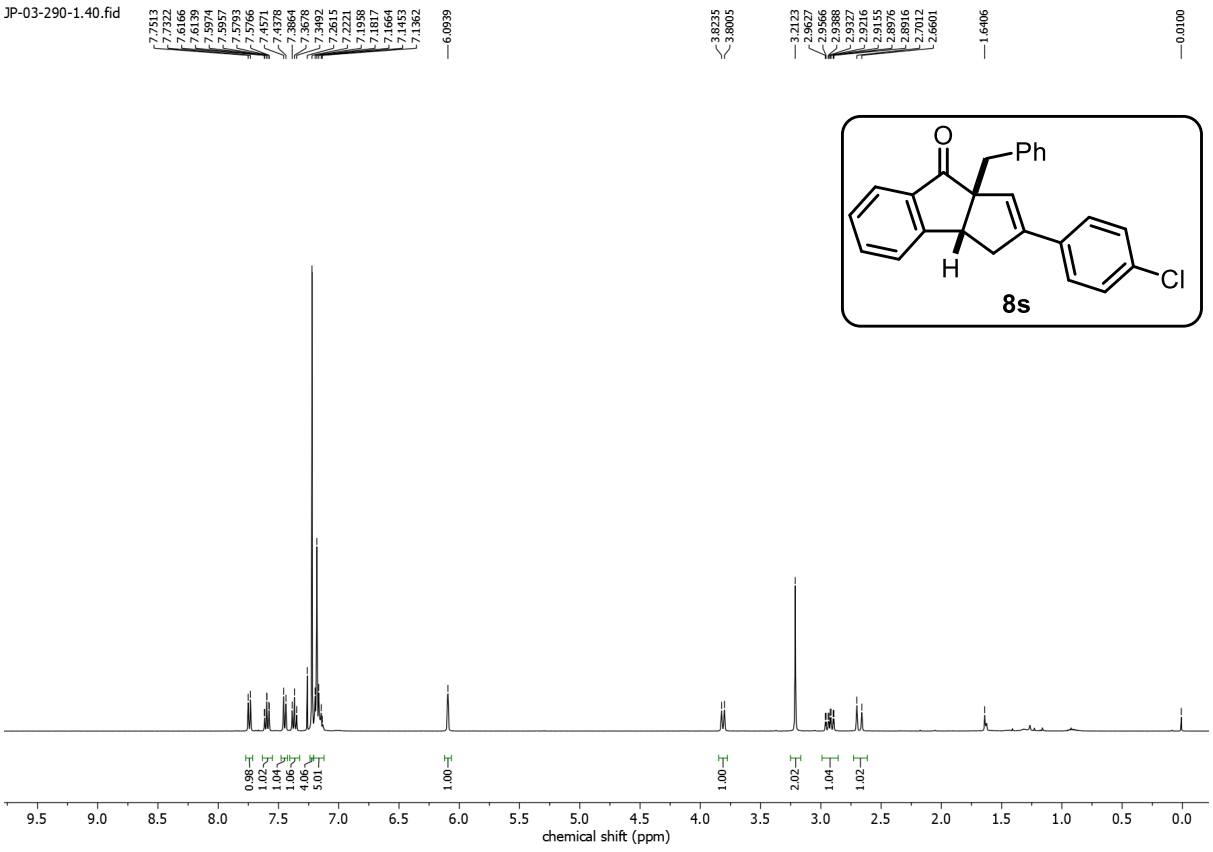
^{1}H NMR (400 MHz, $CDCl_3$)



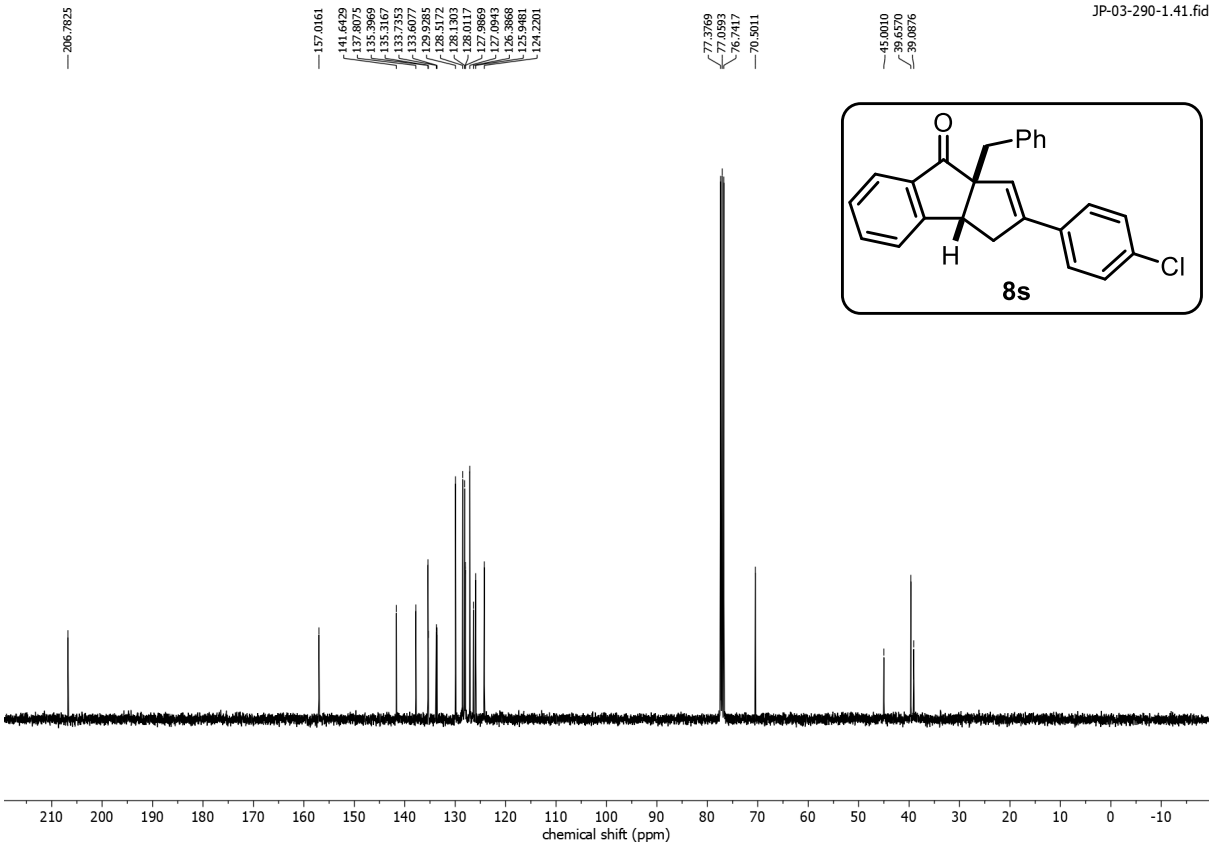
^{13}C NMR (100 MHz, $CDCl_3$)



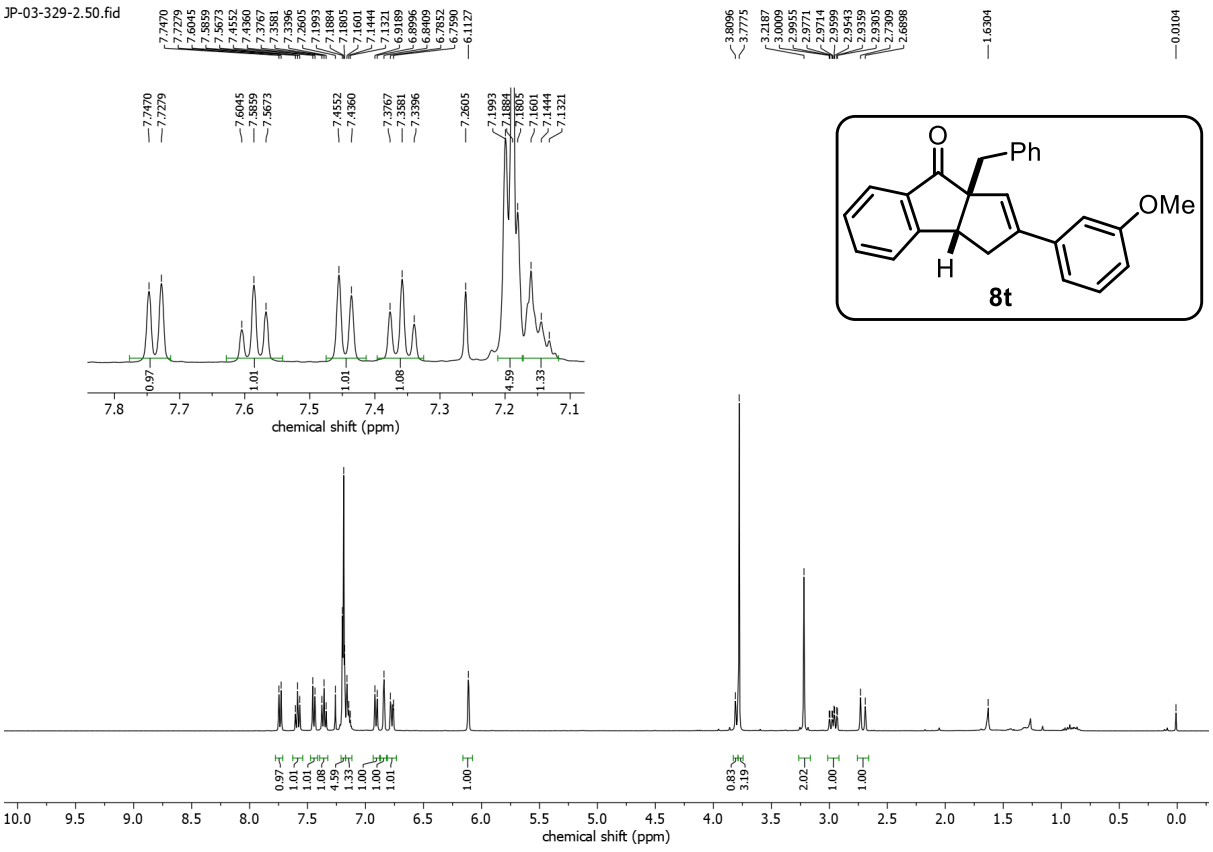
^{1}H NMR (400 MHz, $CDCl_3$)



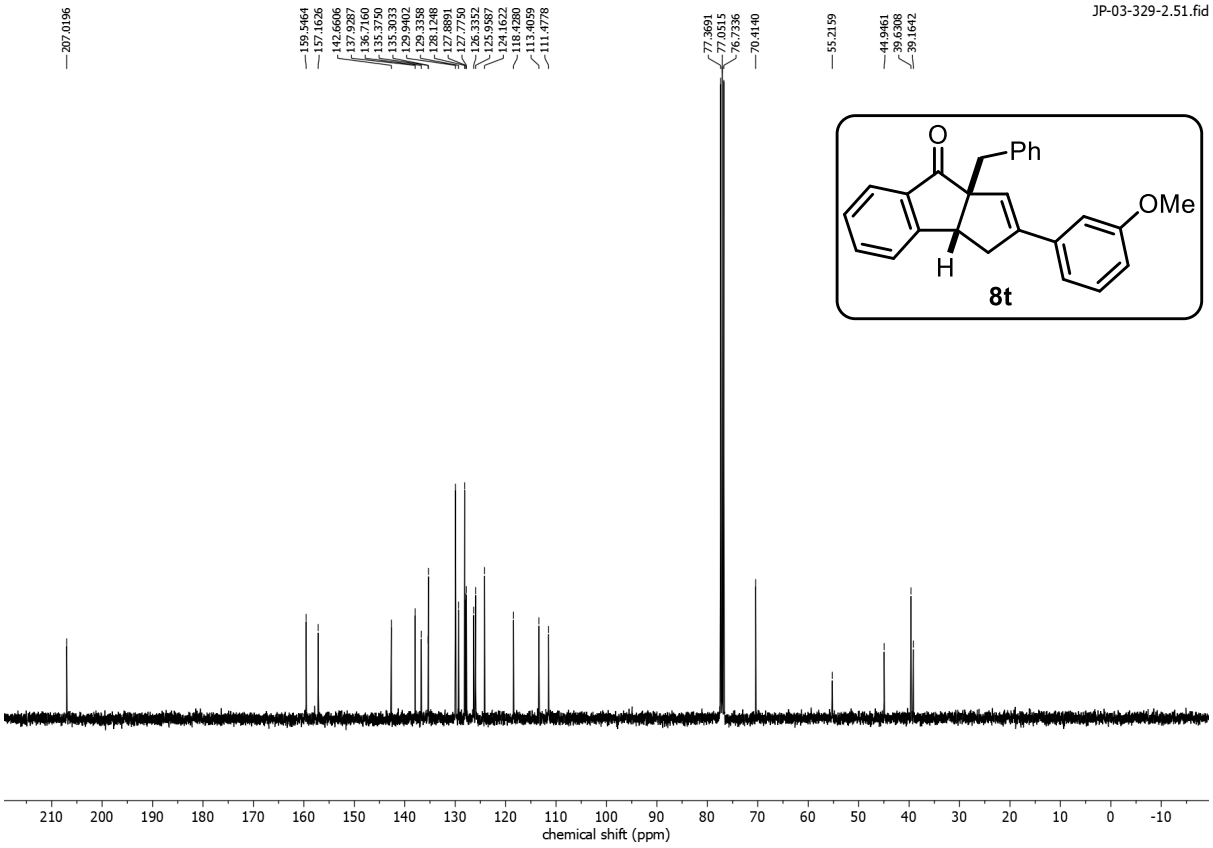
^{13}C NMR (100 MHz, $CDCl_3$)



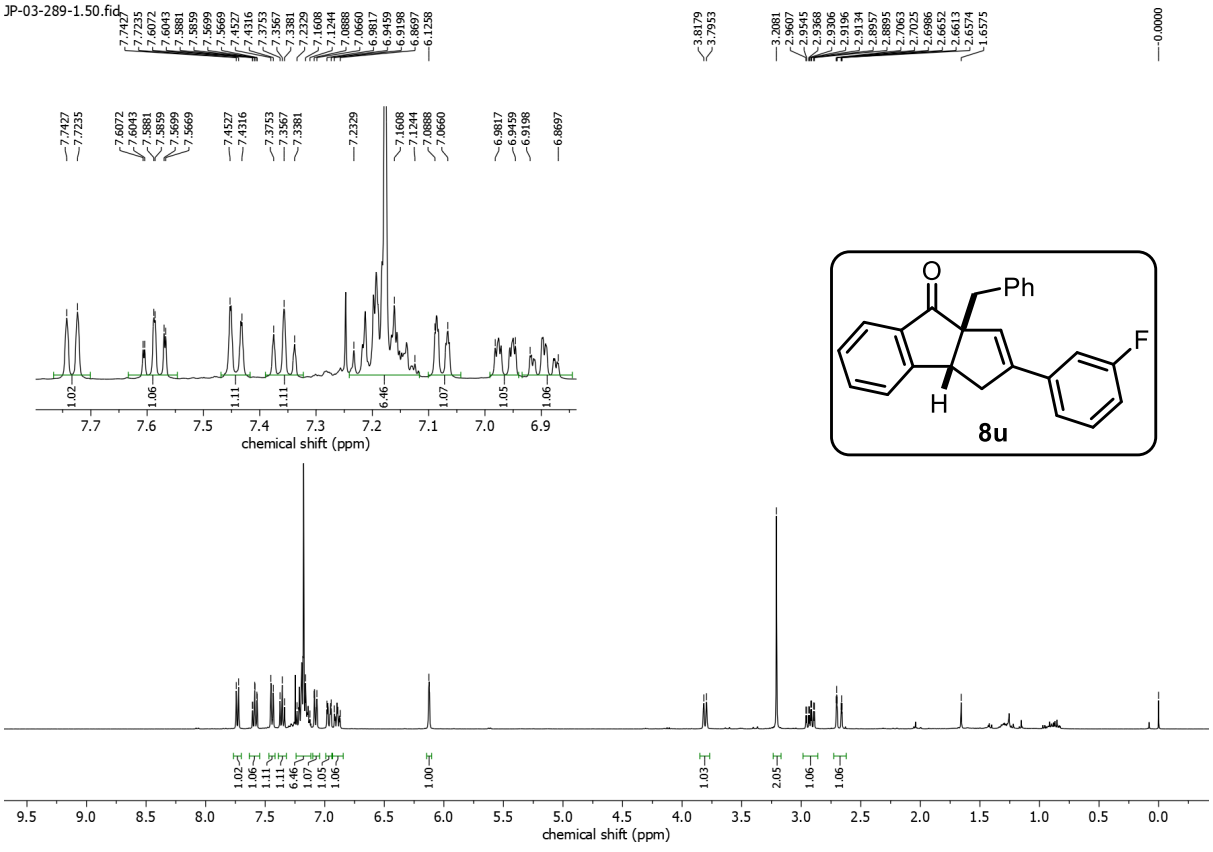
^{1}H NMR (400 MHz, $CDCl_3$)



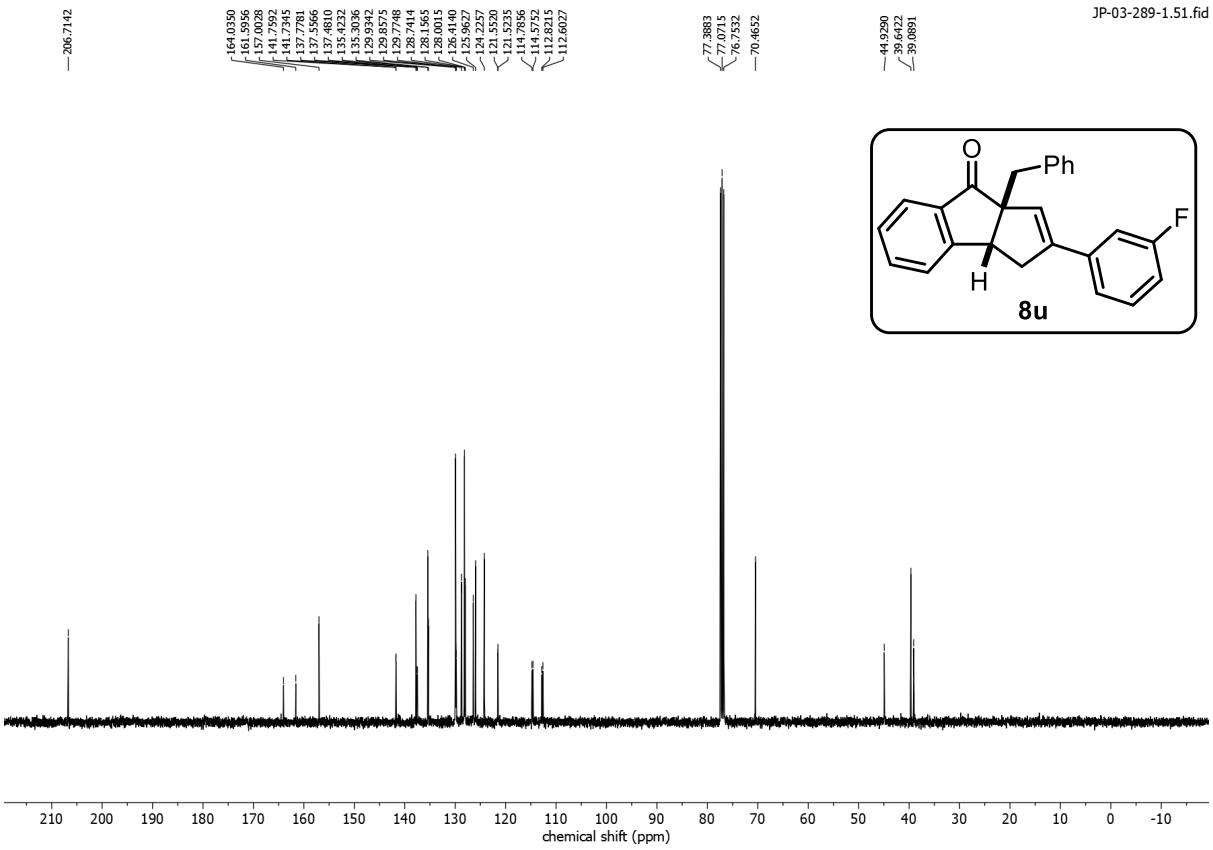
^{13}C NMR (100 MHz, $CDCl_3$)



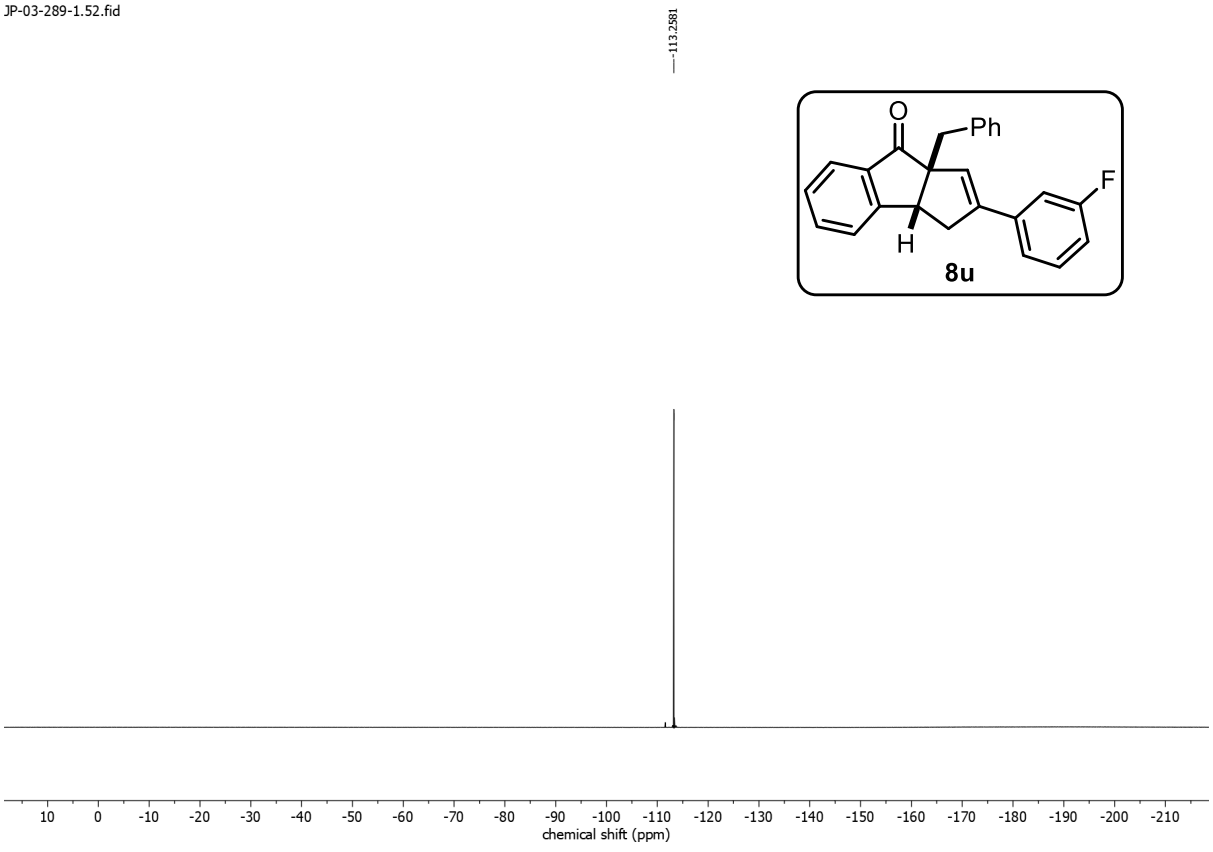
^{1}H NMR (400 MHz, $CDCl_3$)



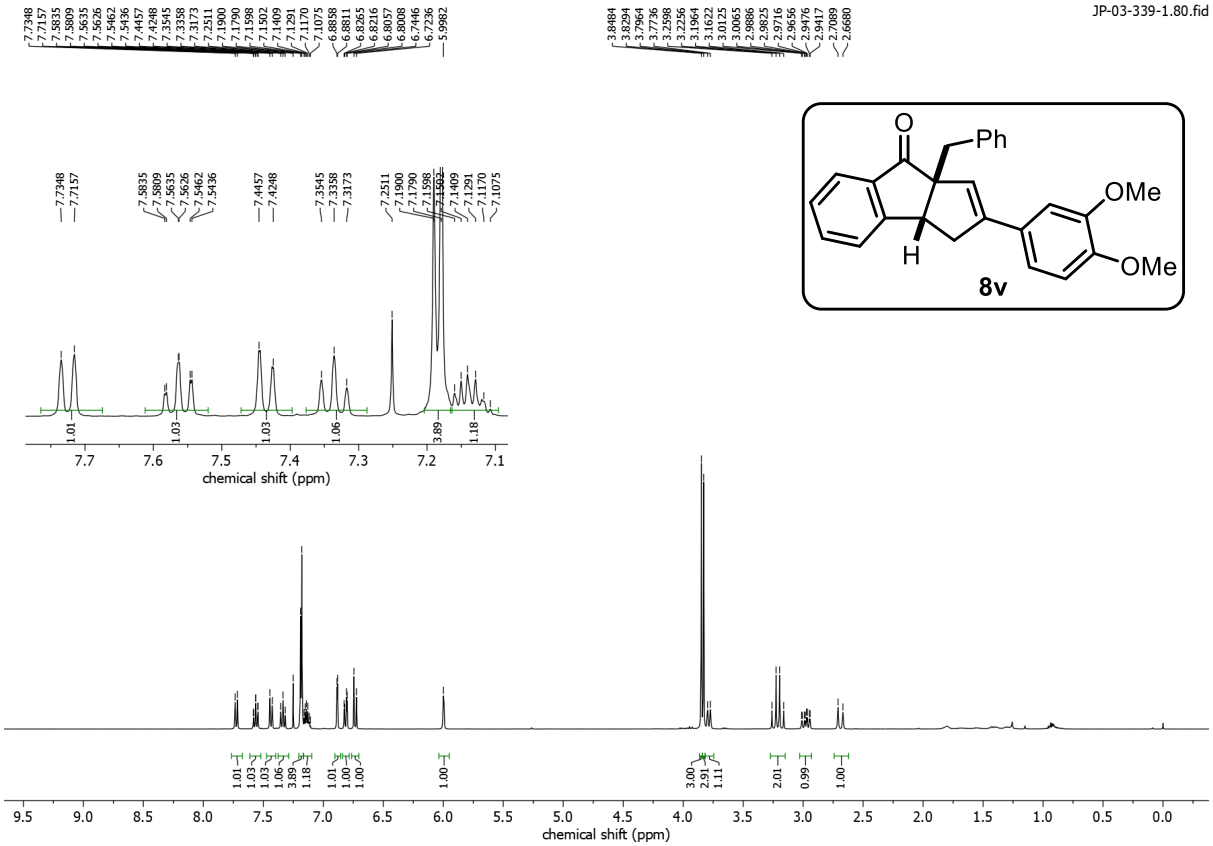
^{13}C NMR (100 MHz, $CDCl_3$)



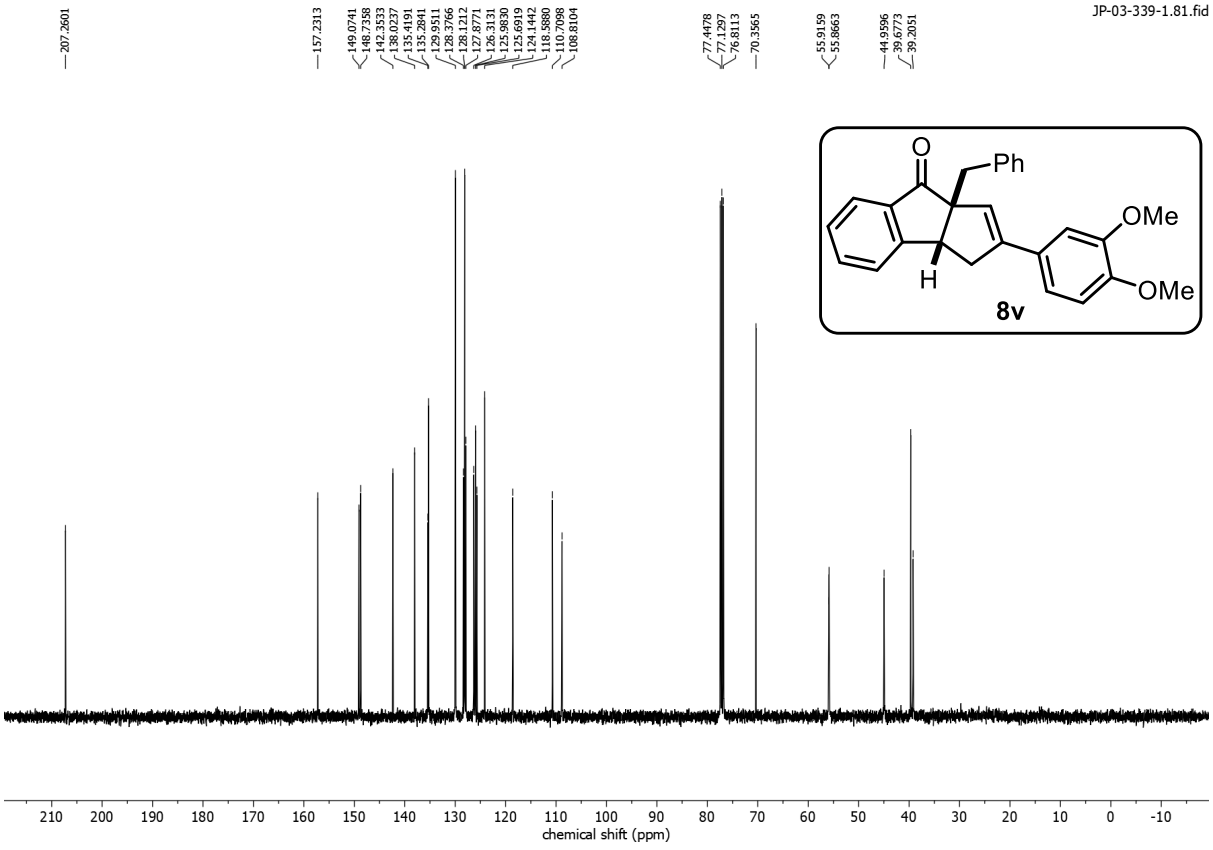
^{19}F NMR (376.4 MHz, $CDCl_3$)



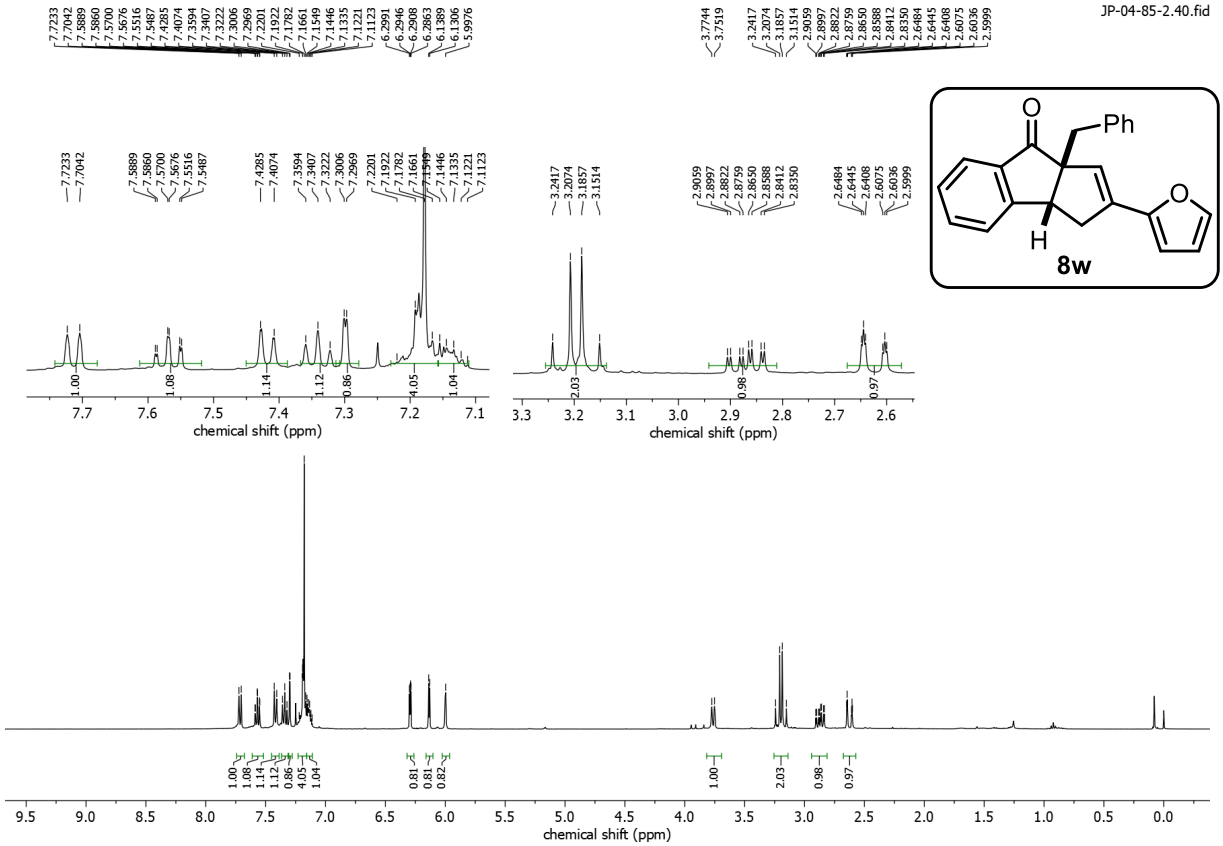
^{1}H NMR (400 MHz, $CDCl_3$)



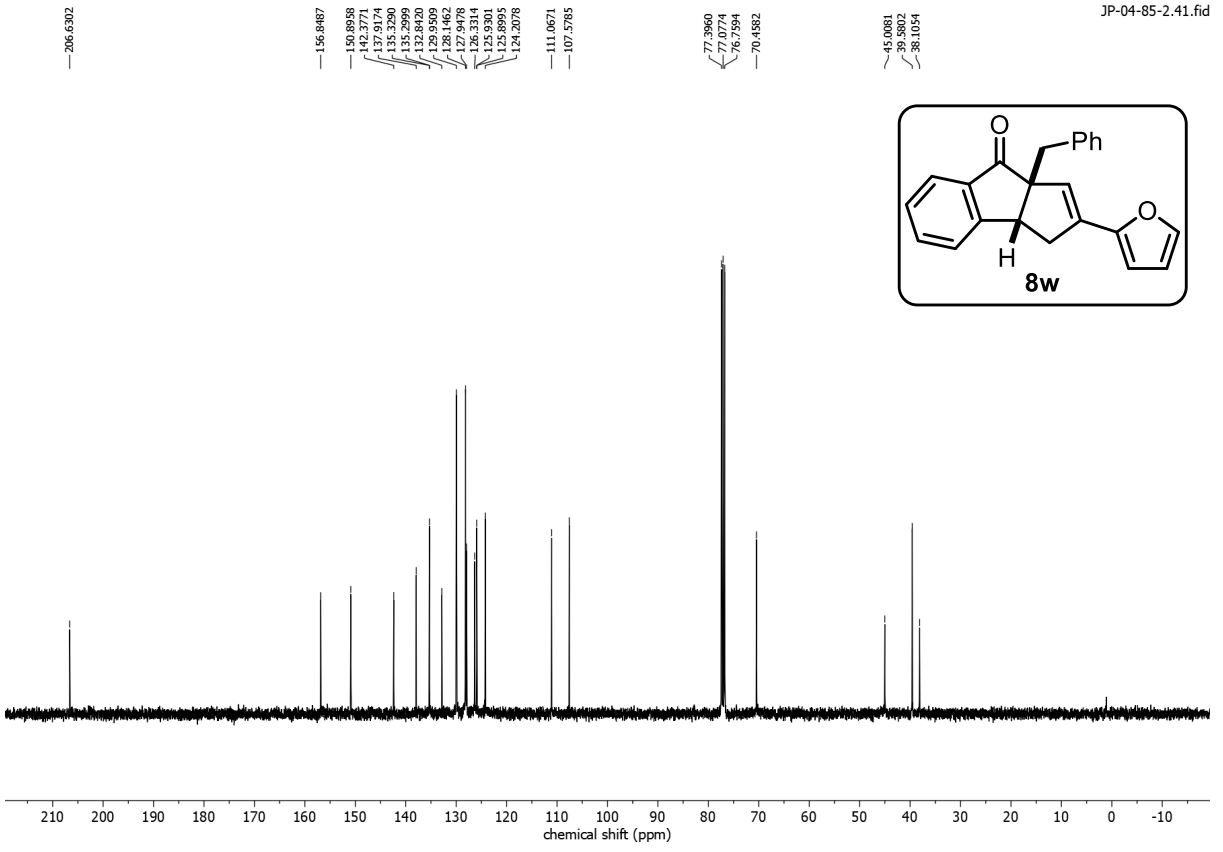
^{13}C NMR (100 MHz, $CDCl_3$)



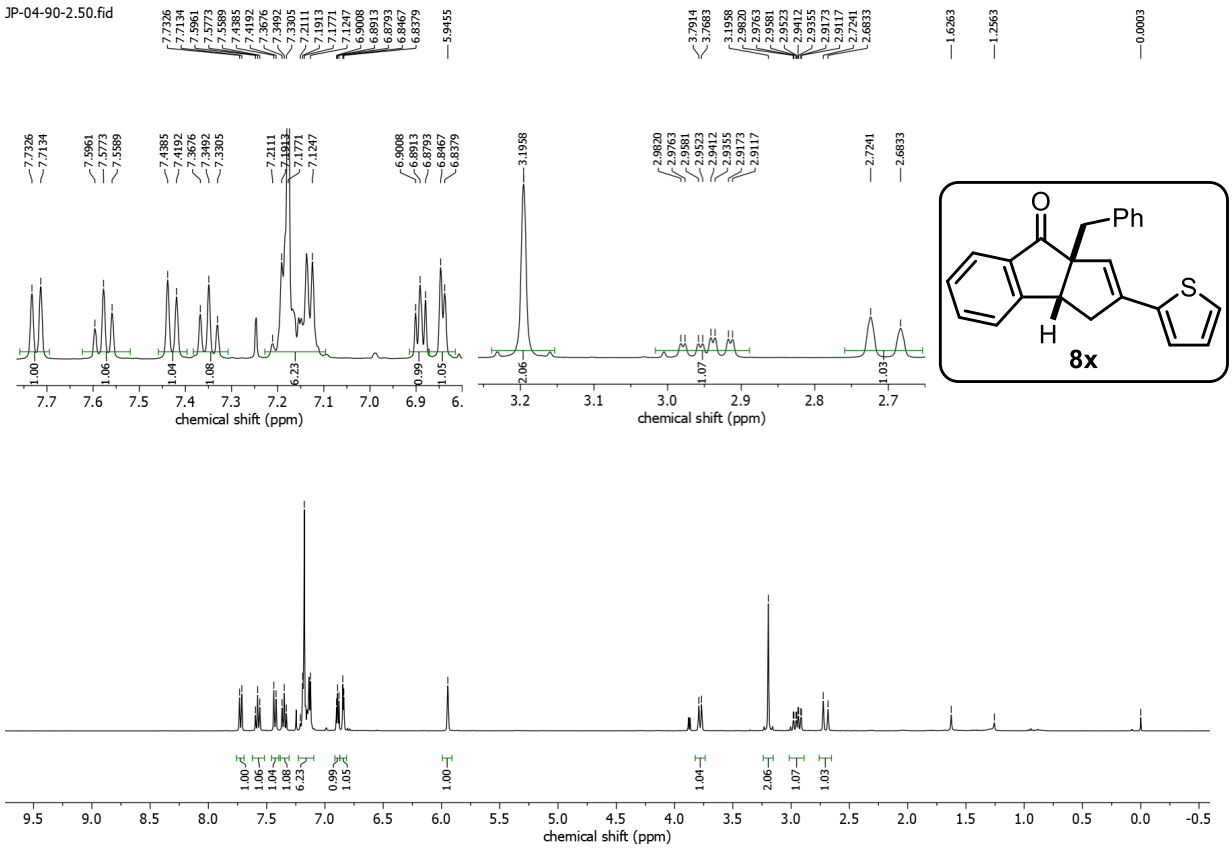
^{1}H NMR (400 MHz, $CDCl_3$)



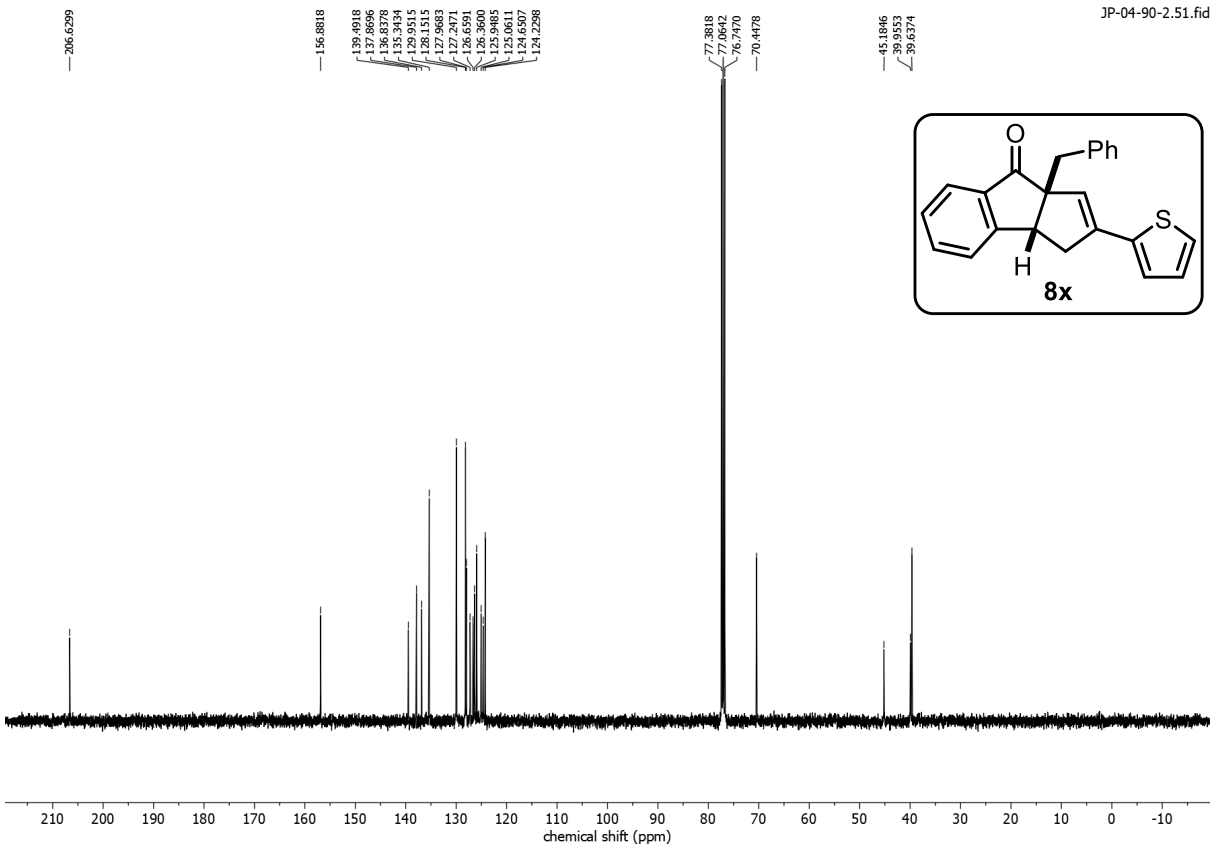
^{13}C NMR (100 MHz, $CDCl_3$)



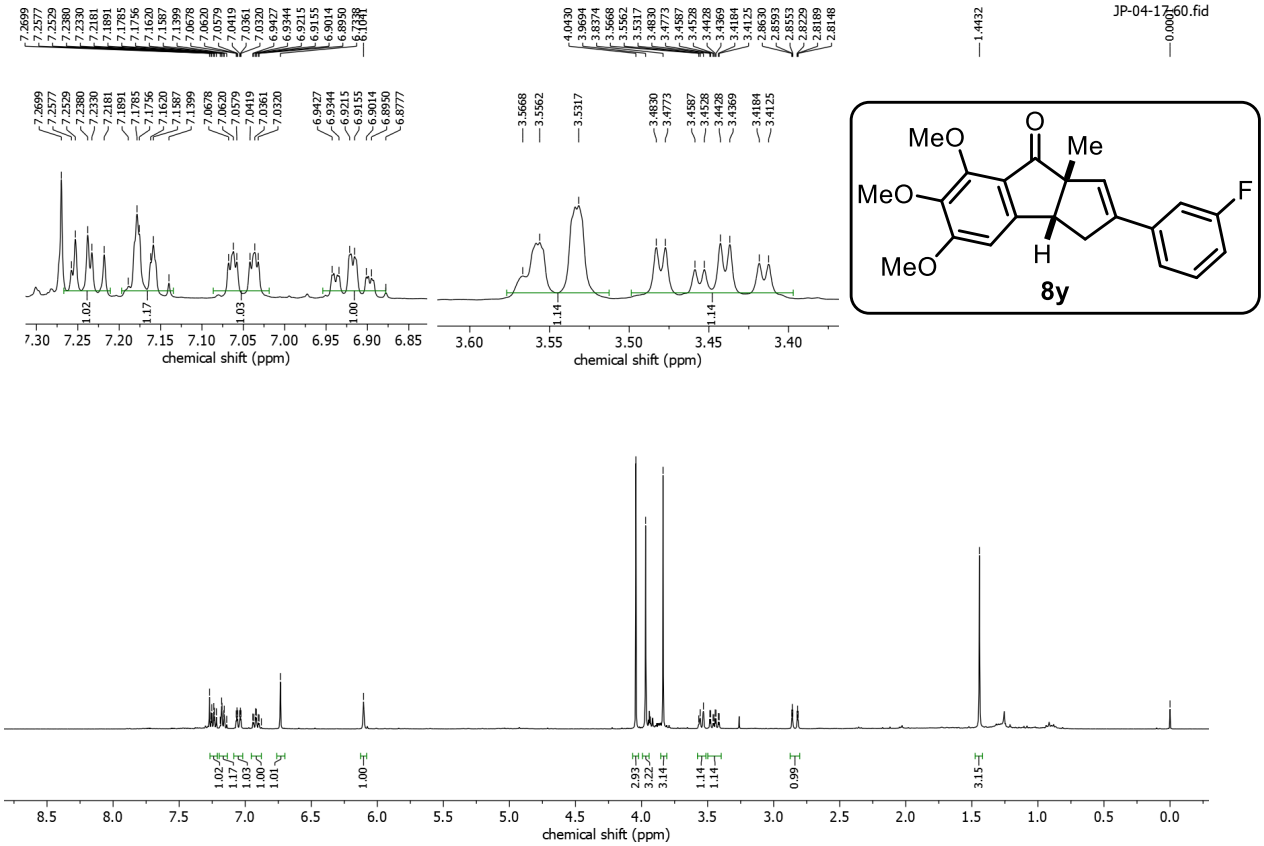
^{1}H NMR (400 MHz, $CDCl_3$)



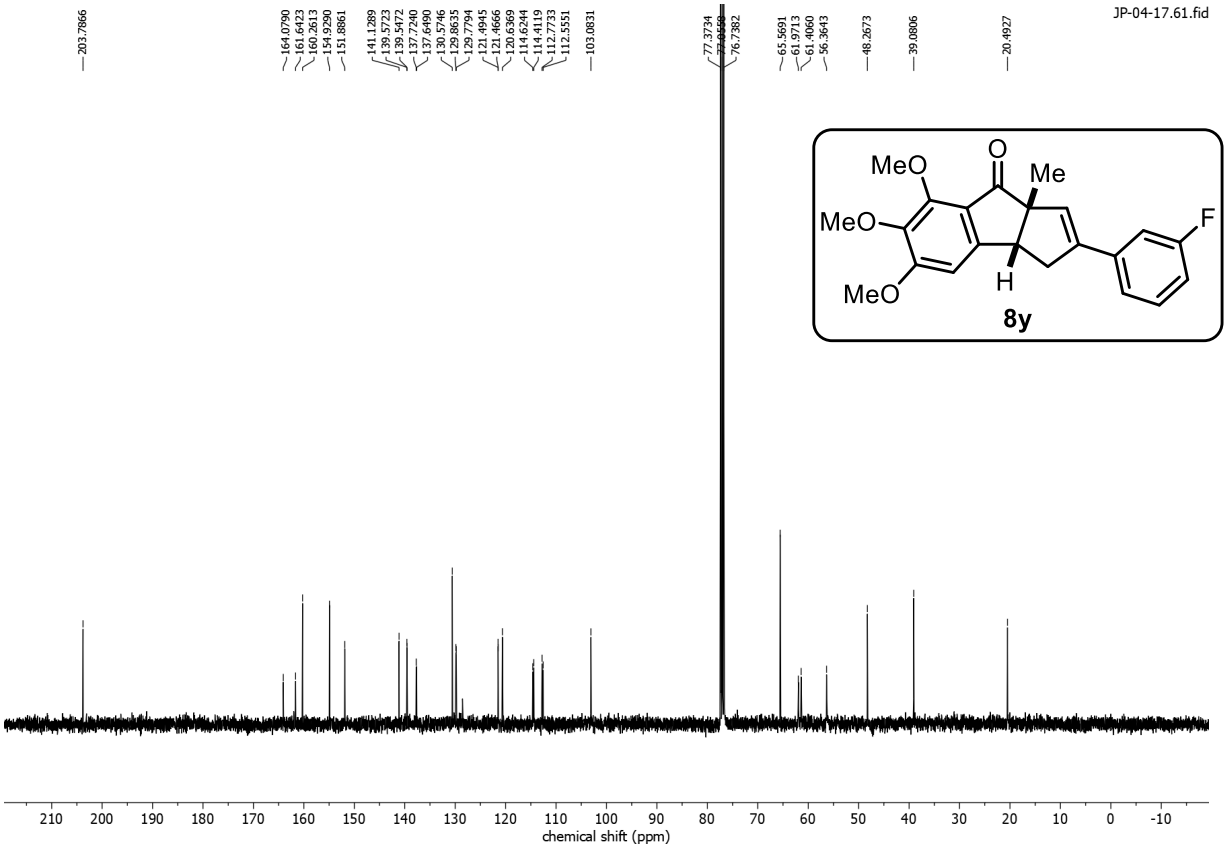
^{13}C NMR (100 MHz, $CDCl_3$)



^{1}H NMR (400 MHz, $CDCl_3$)

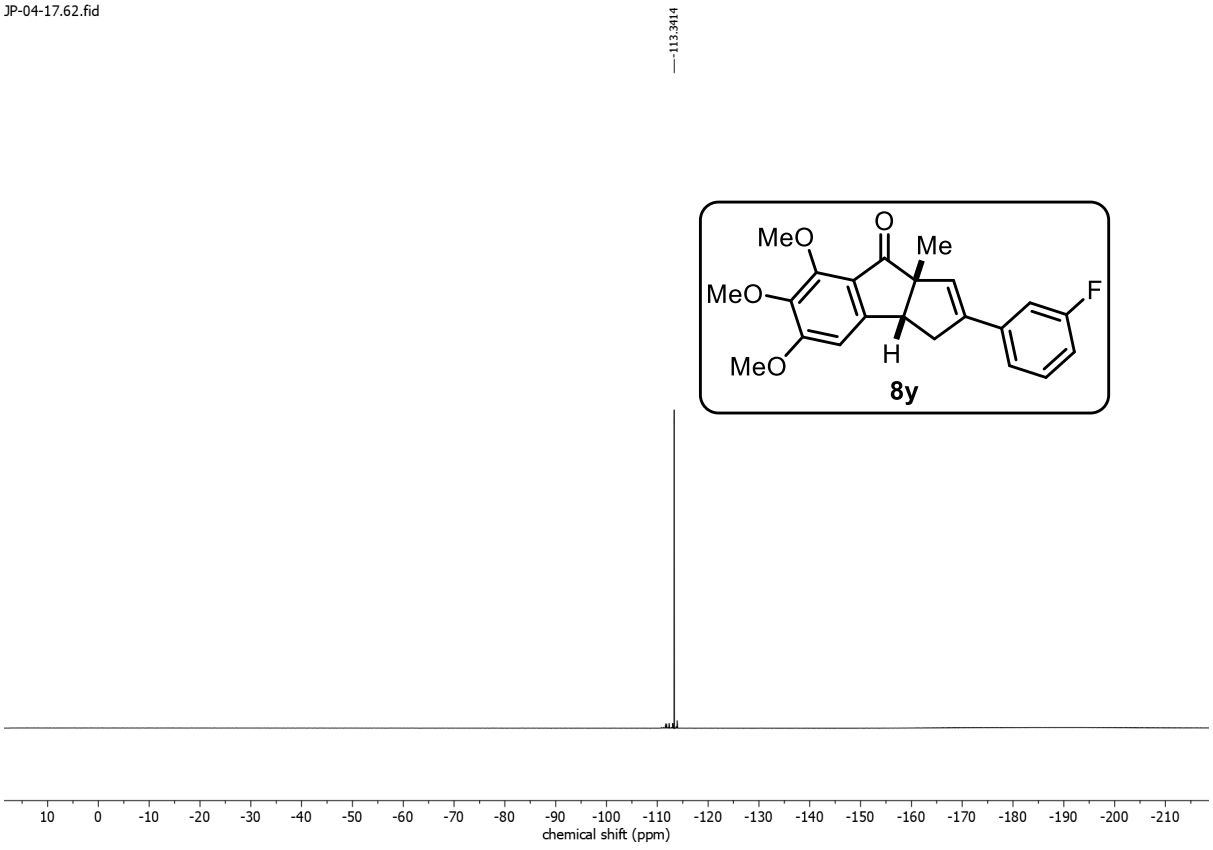


^{13}C NMR (100 MHz, $CDCl_3$)



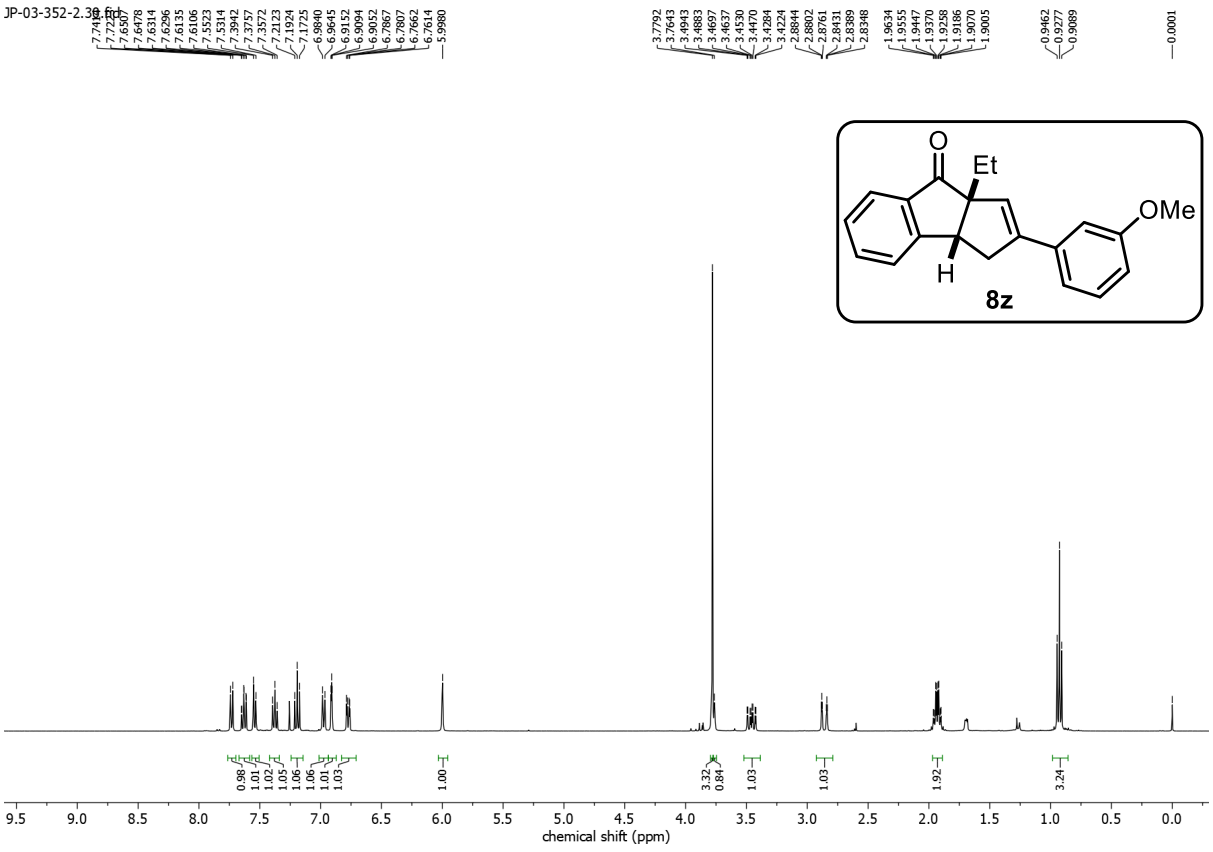
^{19}F NMR (376.4 MHz, $CDCl_3$)

JP-04-17.62.fid

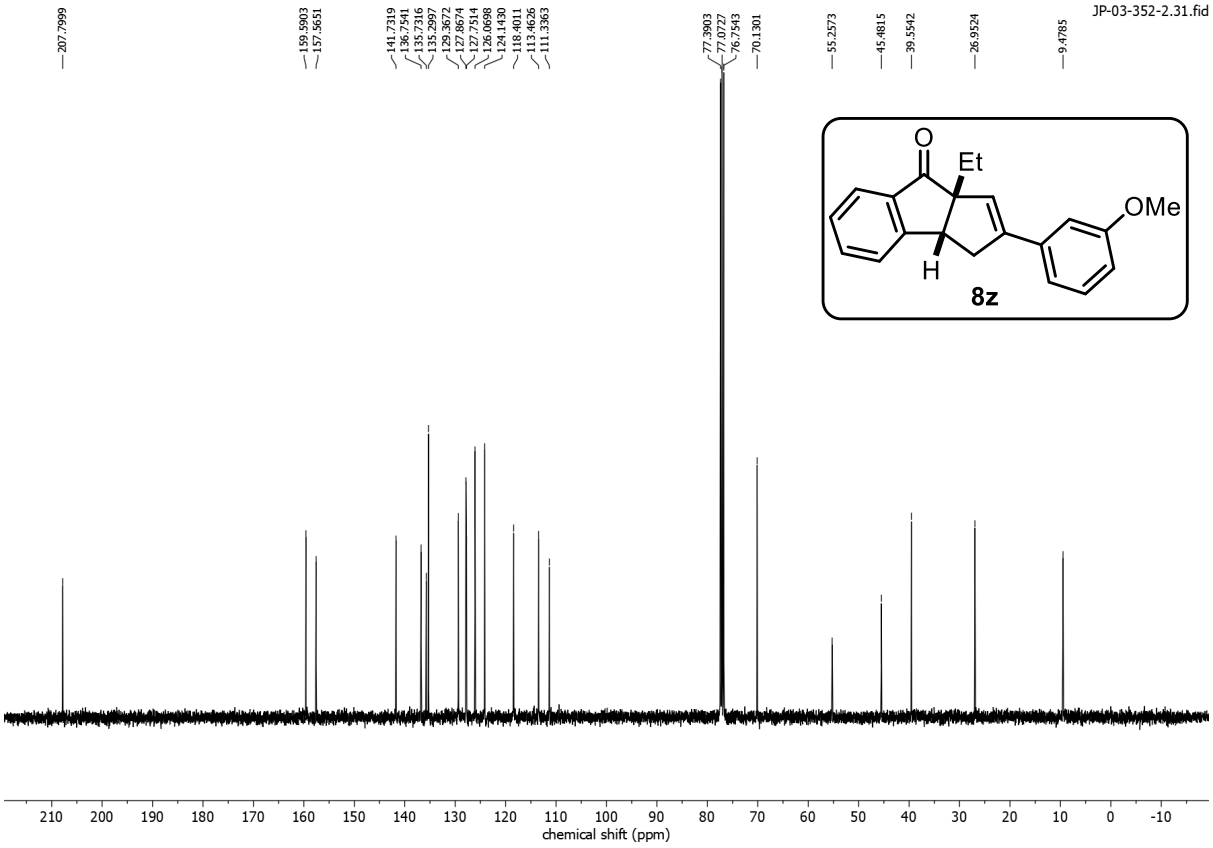


^{1}H NMR (400 MHz, $CDCl_3$)

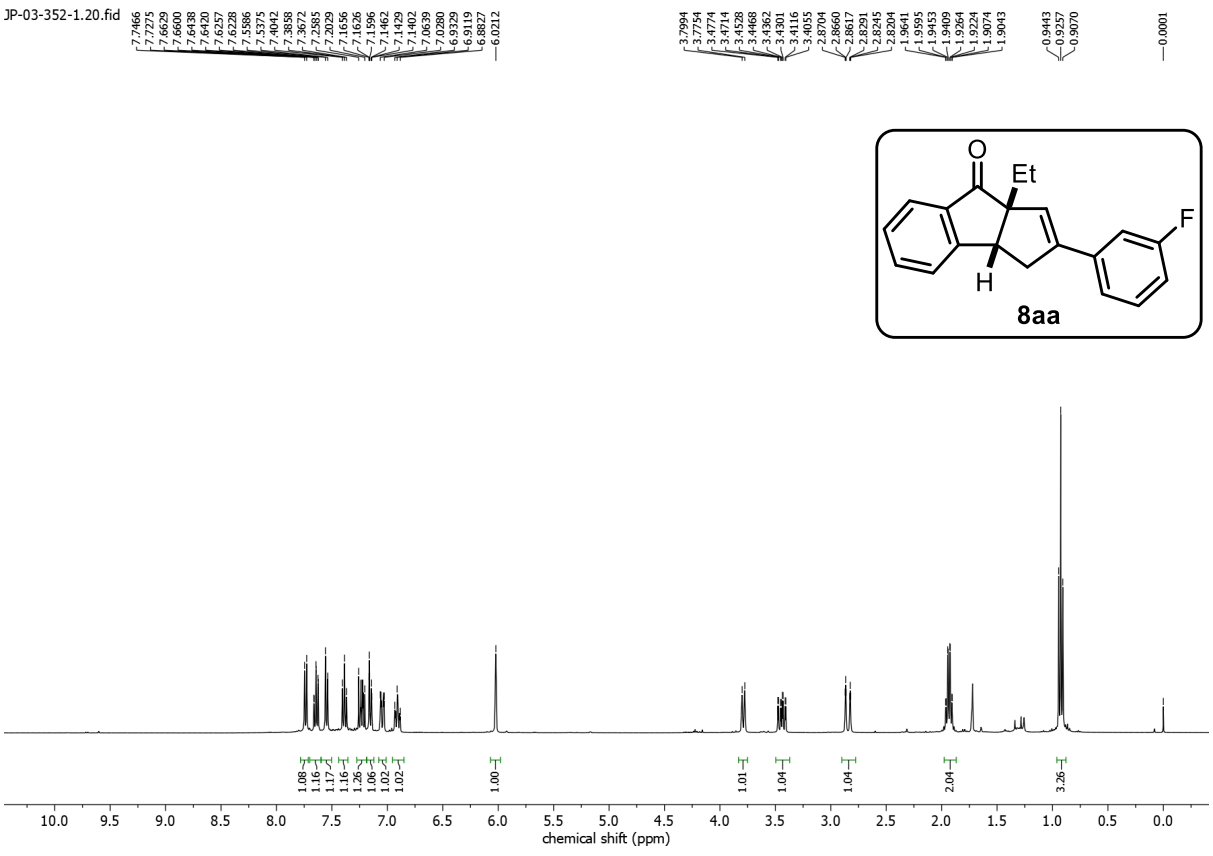
JP-03-352-2.39.fid



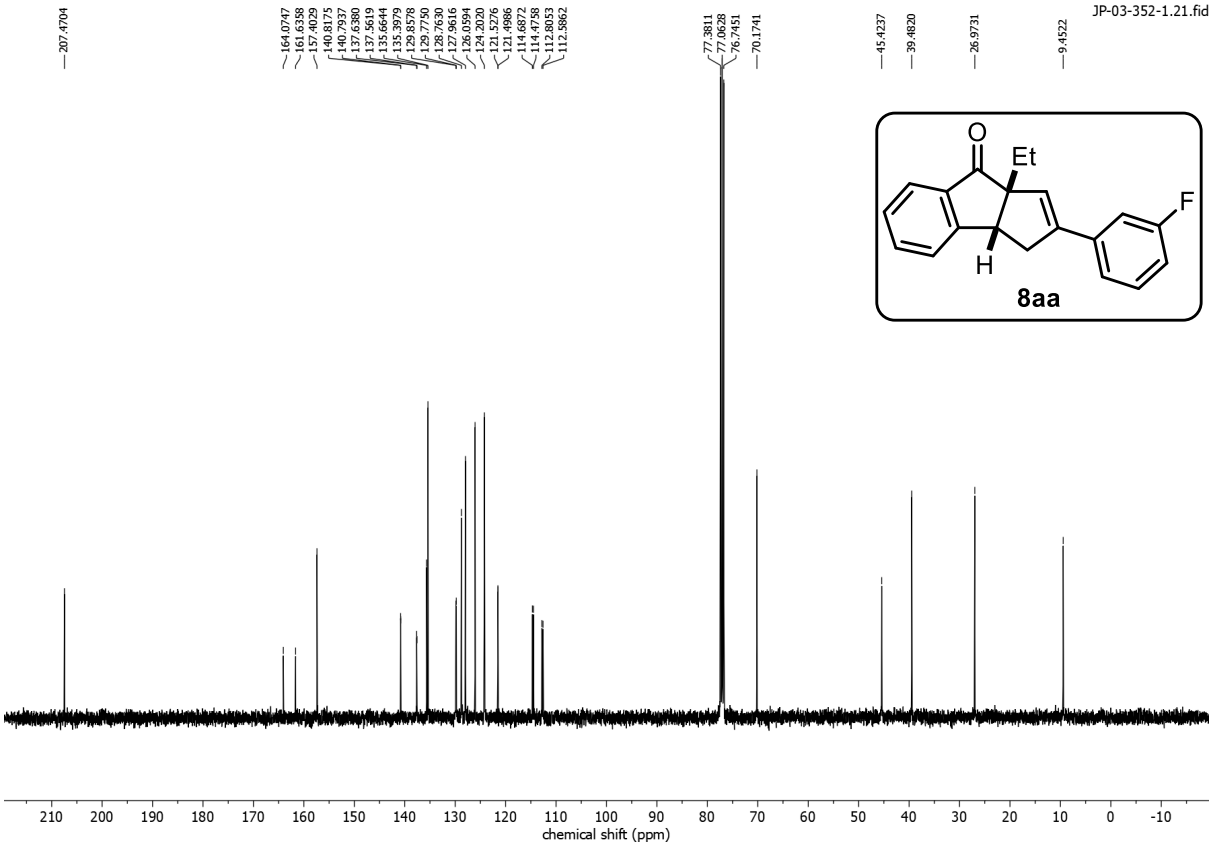
^{13}C NMR (100 MHz, $CDCl_3$)



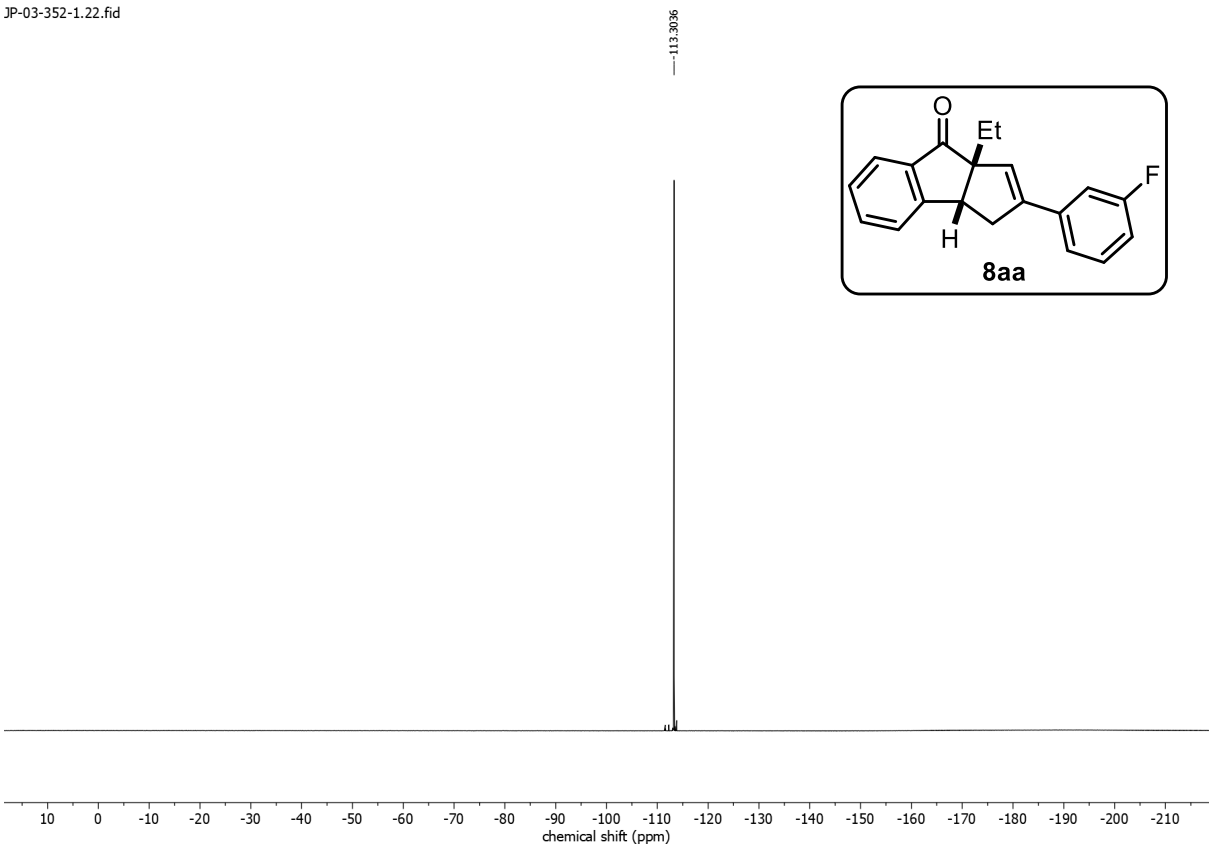
^{1}H NMR (400 MHz, $CDCl_3$)



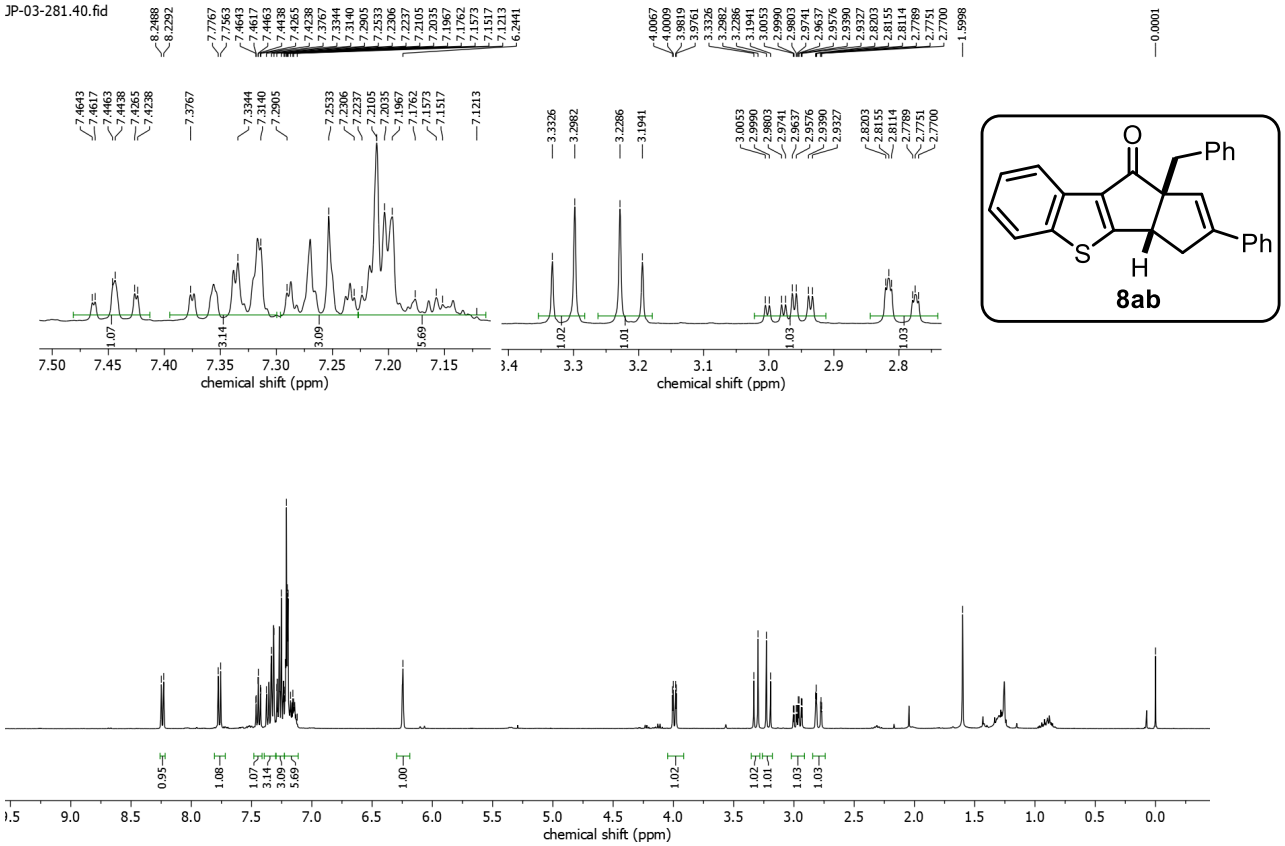
^{13}C NMR (100 MHz, $CDCl_3$)



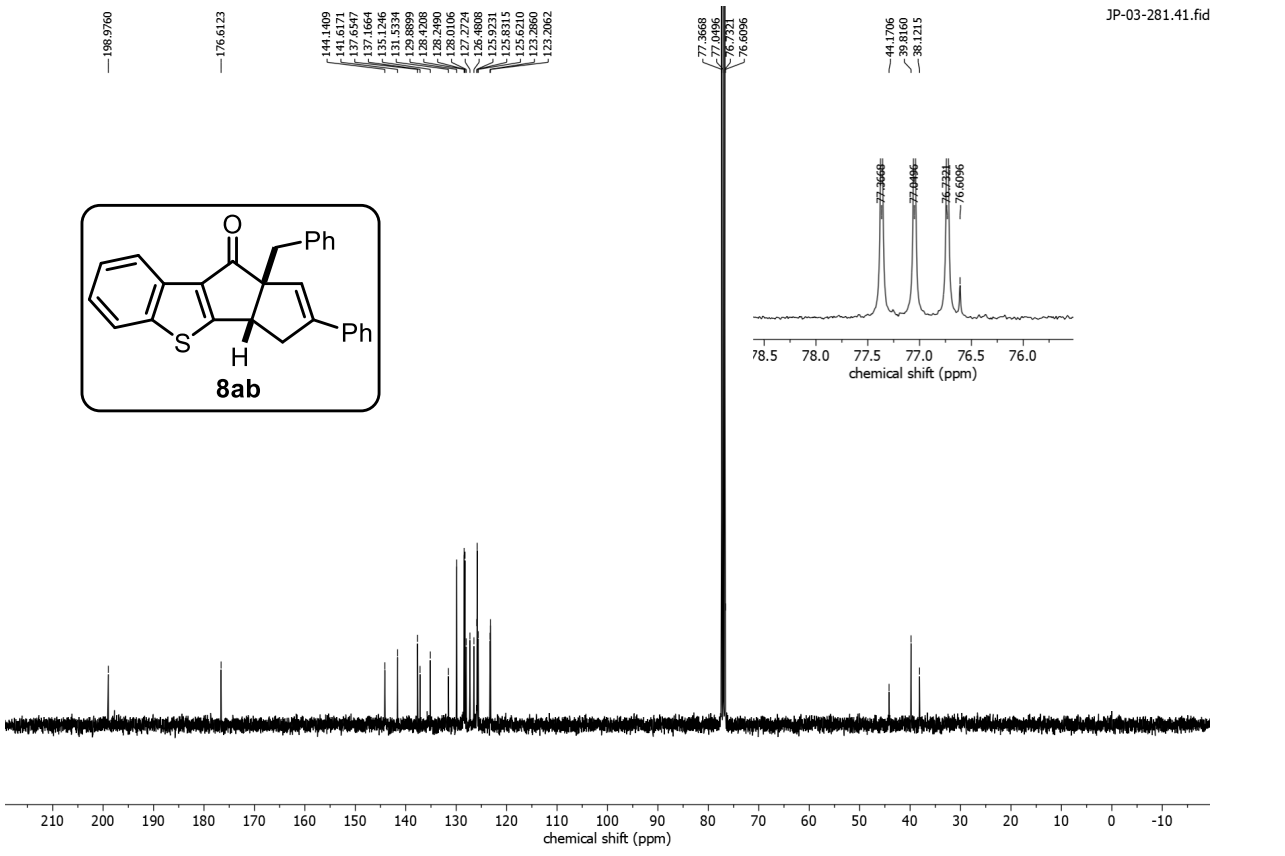
^{19}F NMR (376.4 MHz, $CDCl_3$)



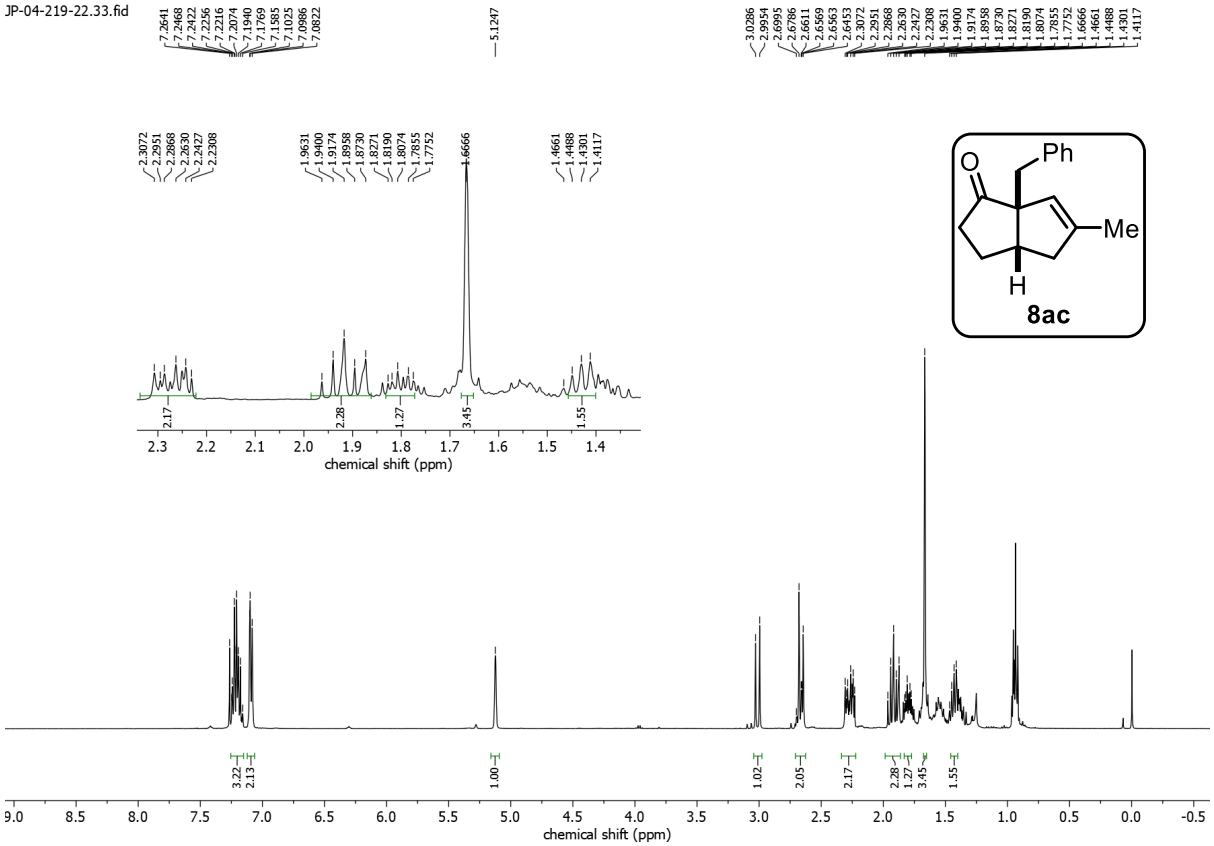
^{1}H NMR (400 MHz, $CDCl_3$)



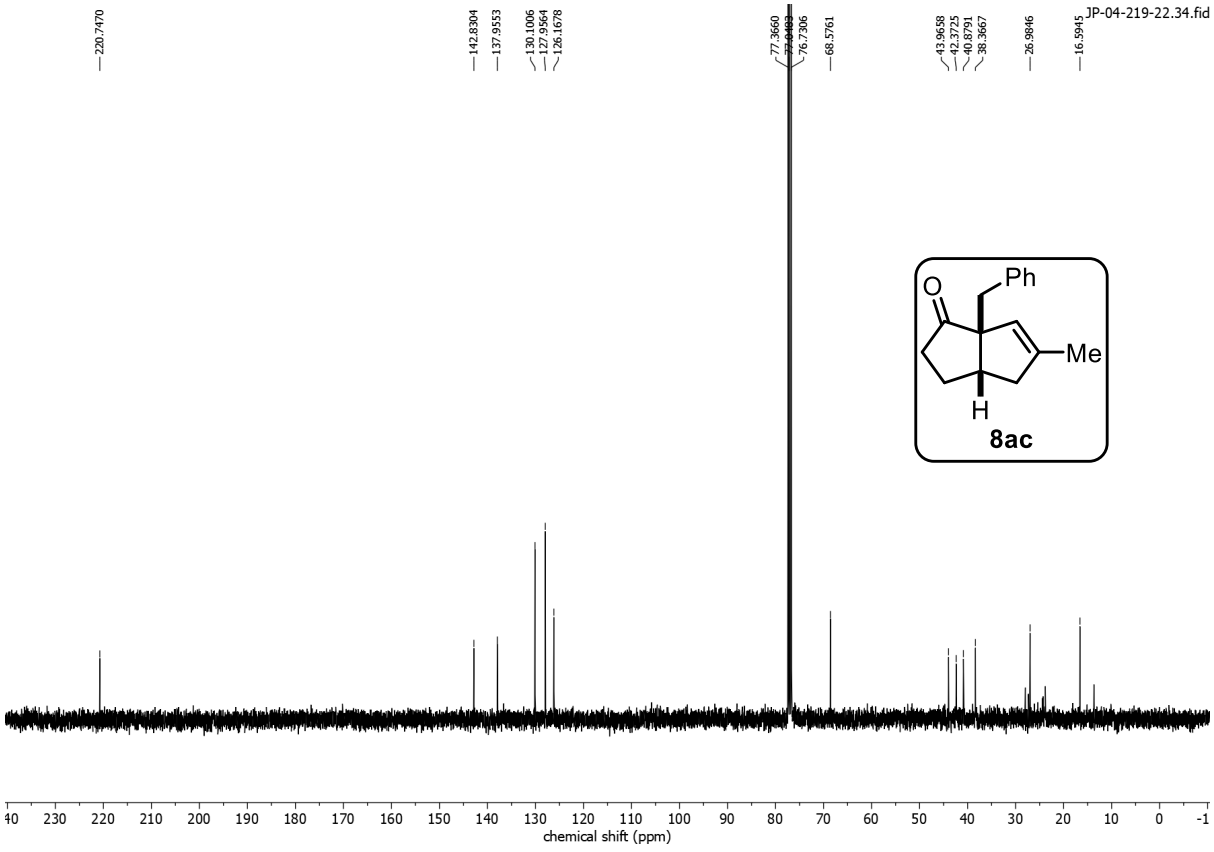
^{13}C NMR (100 MHz, $CDCl_3$)



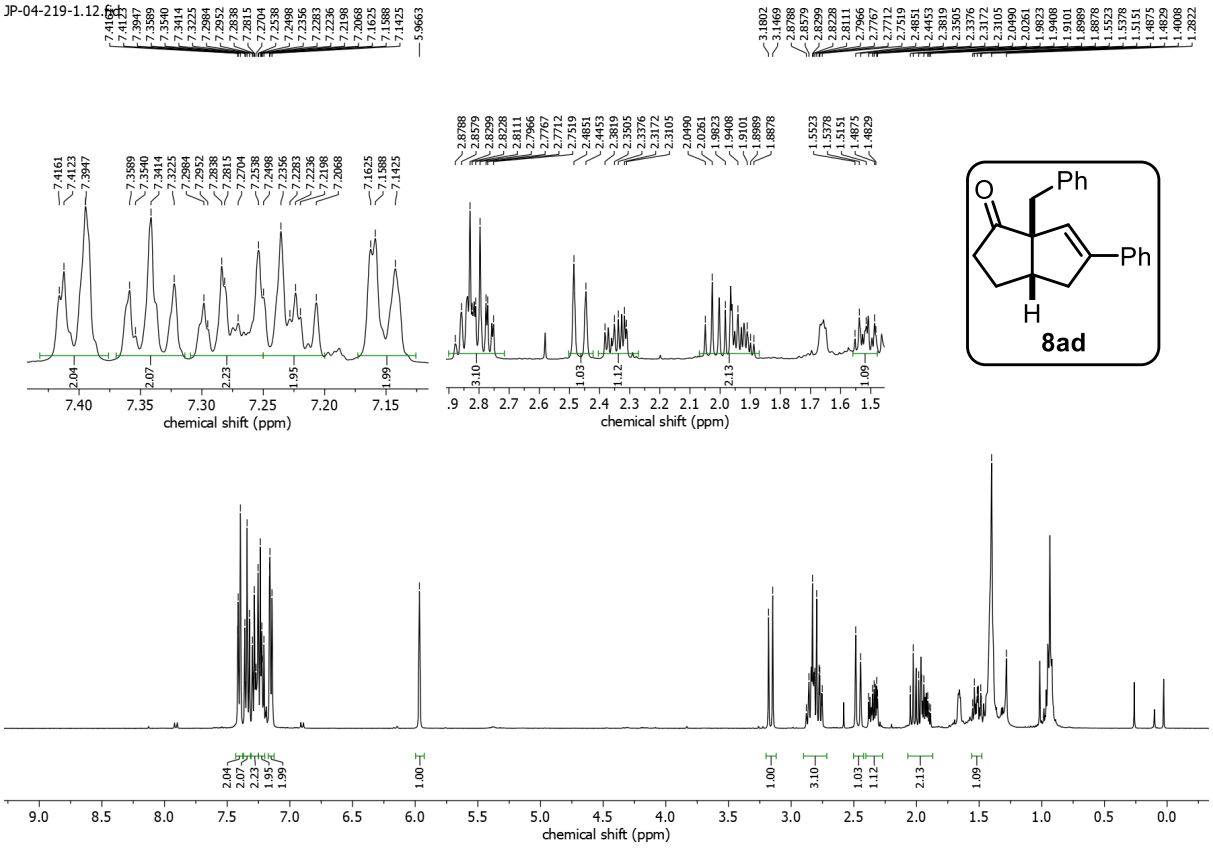
^{1}H NMR (400 MHz, $CDCl_3$)



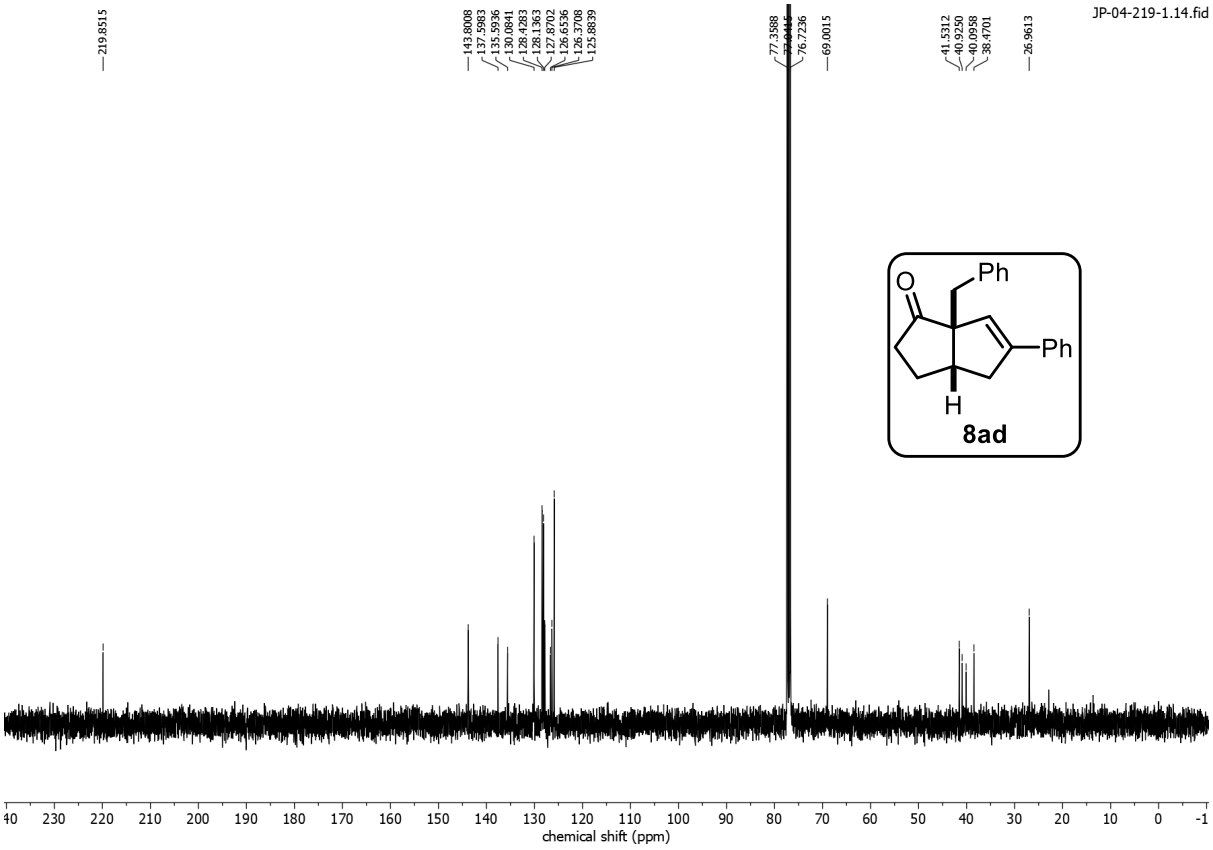
^{13}C NMR (100 MHz, $CDCl_3$)



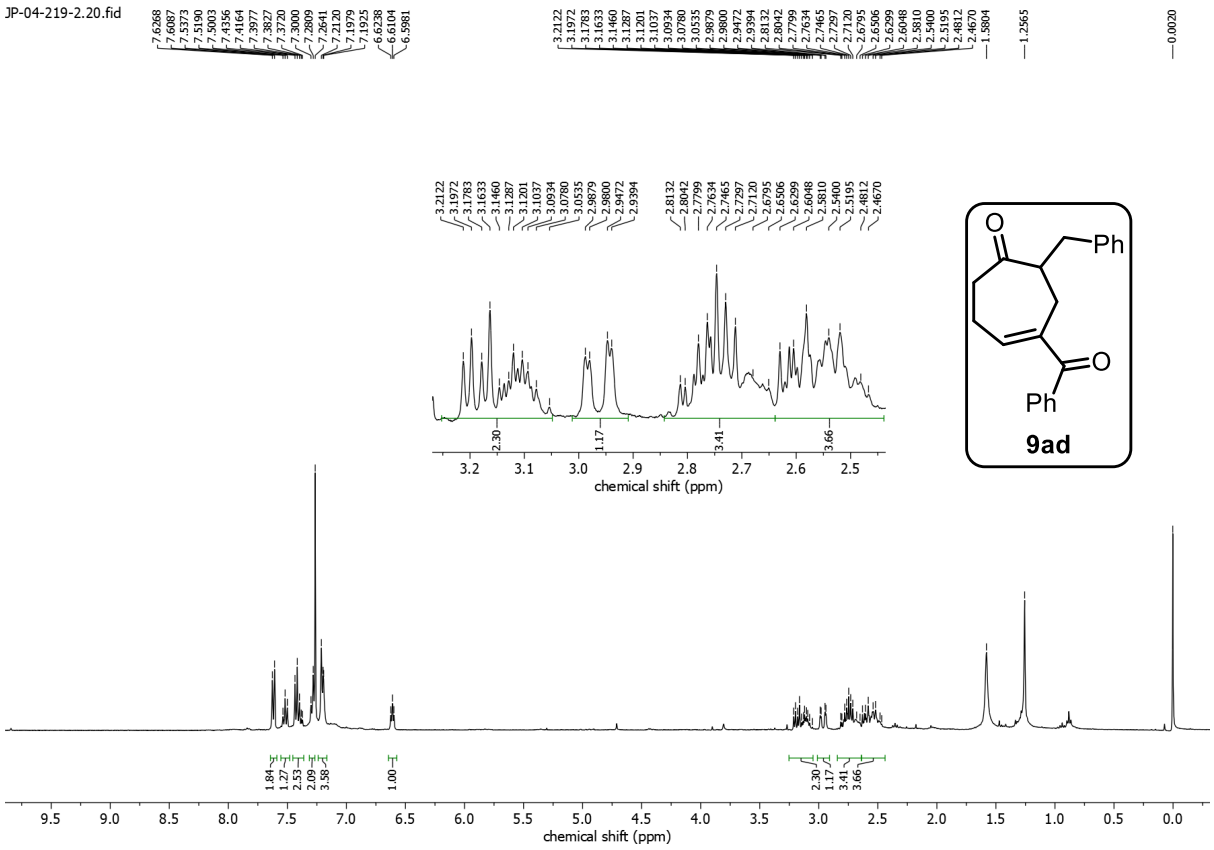
^{1}H NMR (400 MHz, $CDCl_3$)



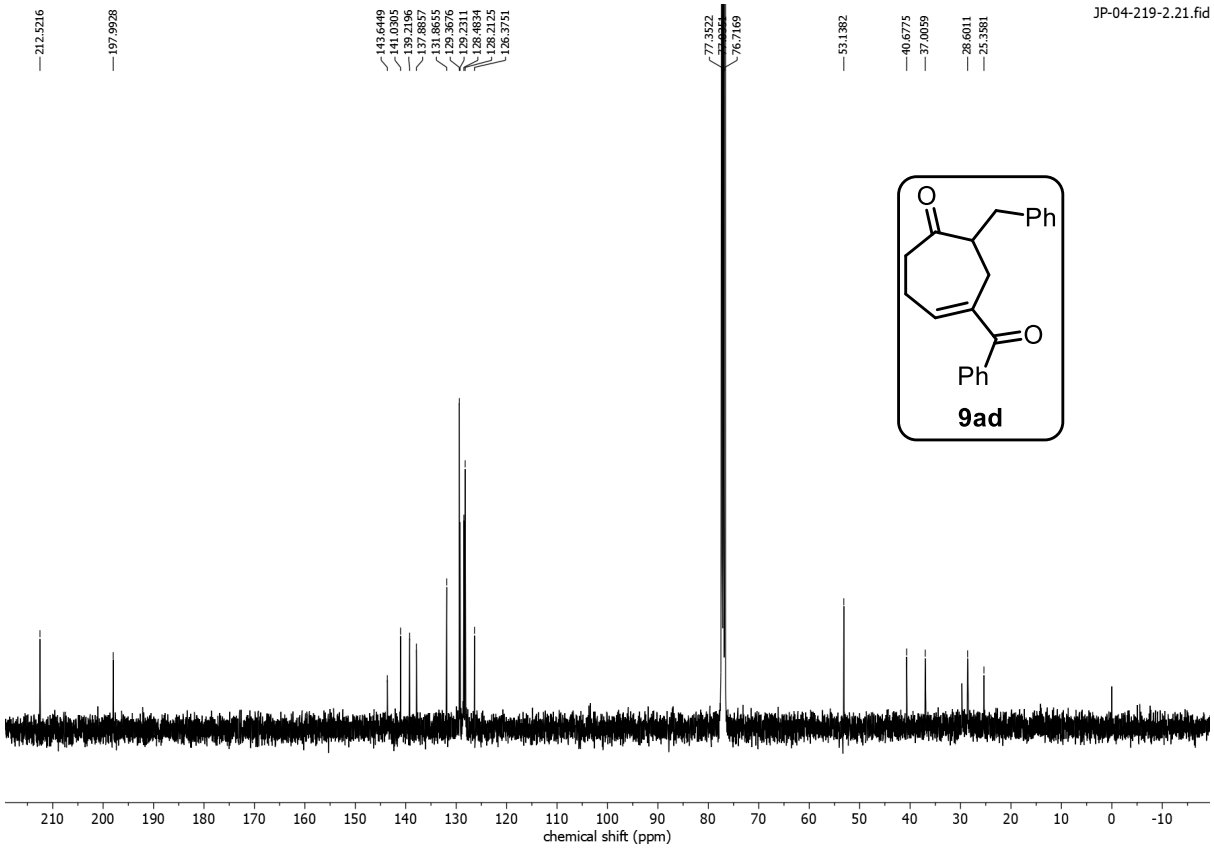
^{13}C NMR (100 MHz, $CDCl_3$)



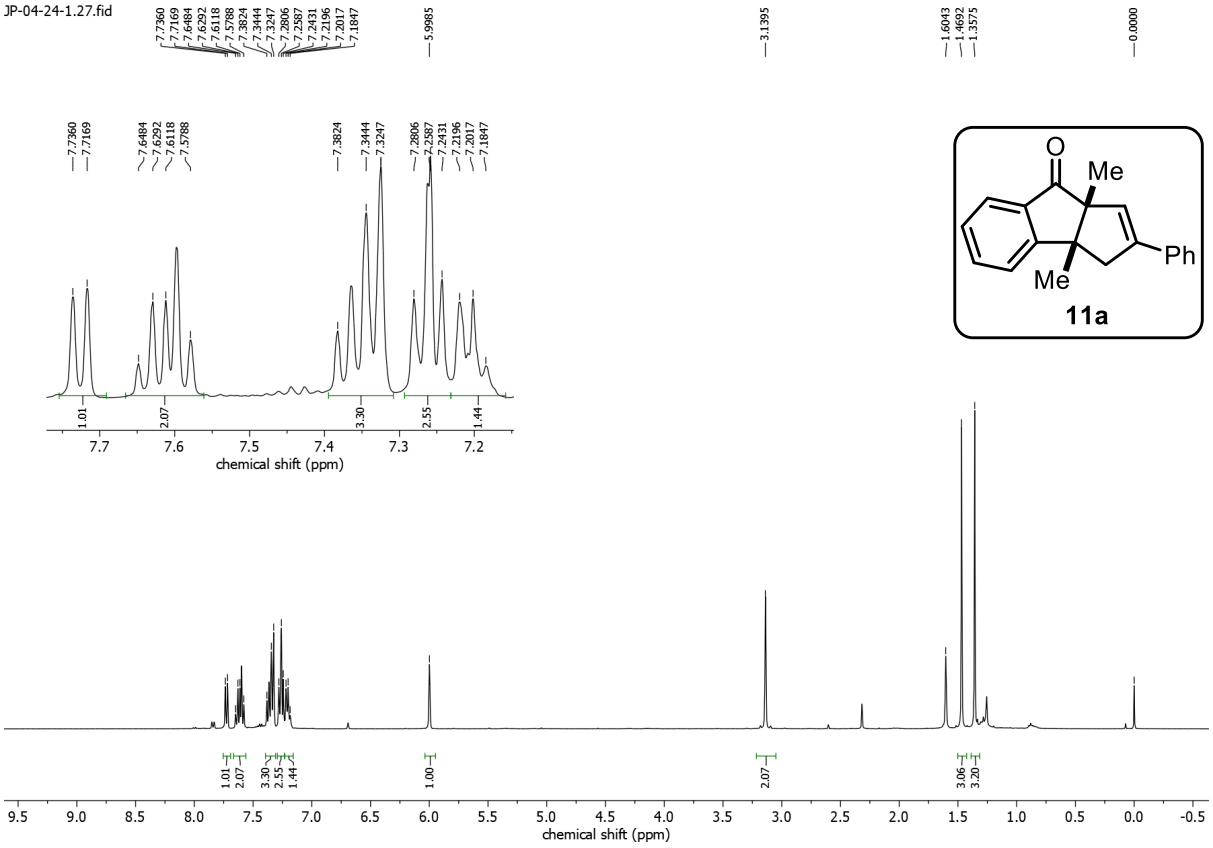
^{1}H NMR (400 MHz, $CDCl_3$)



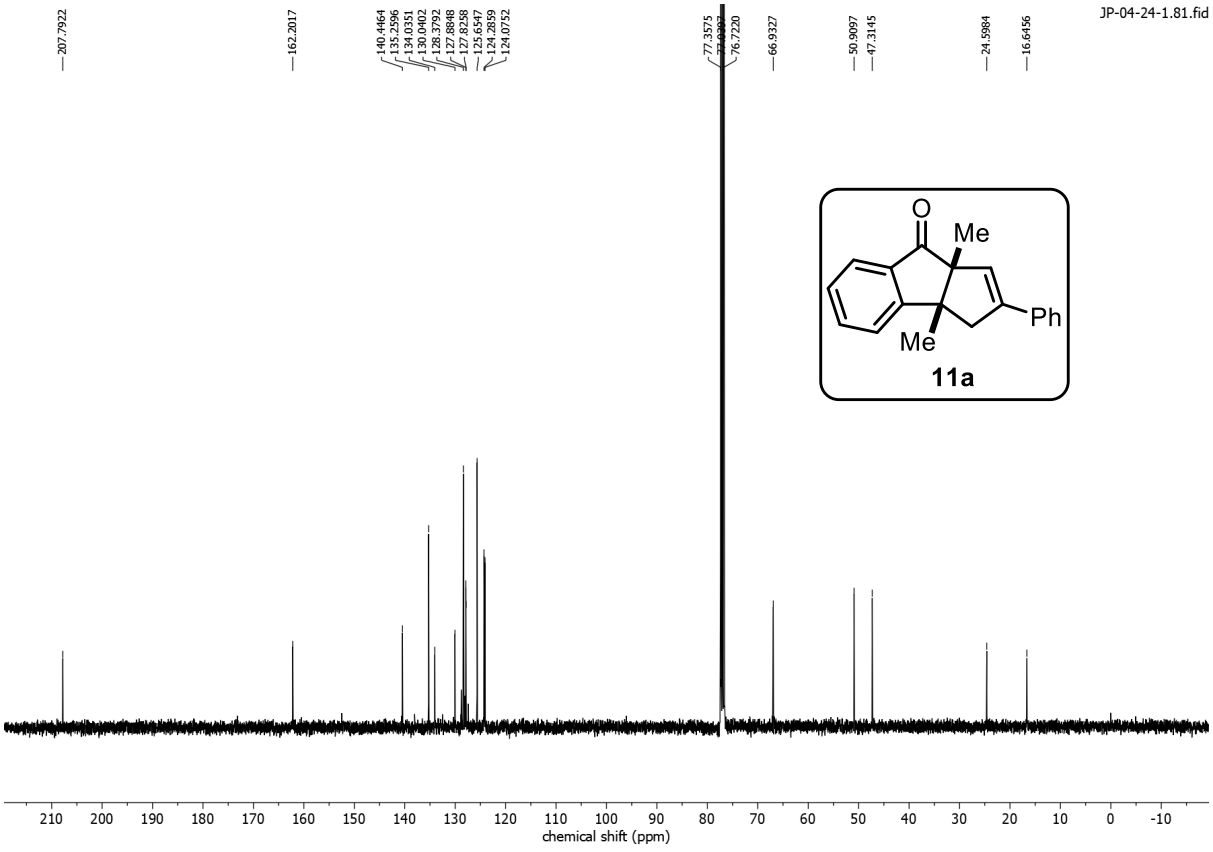
^{13}C NMR (100 MHz, $CDCl_3$)



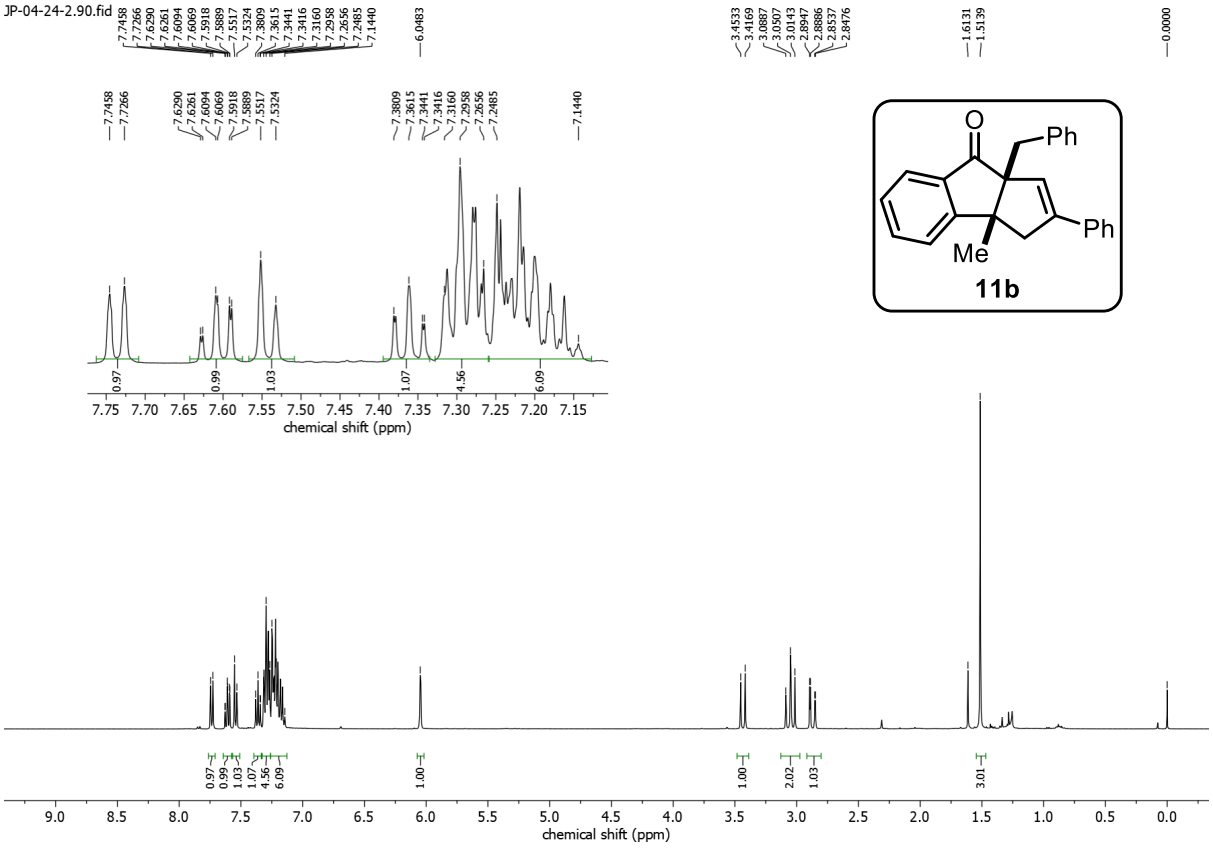
^{1}H NMR (400 MHz, $CDCl_3$)



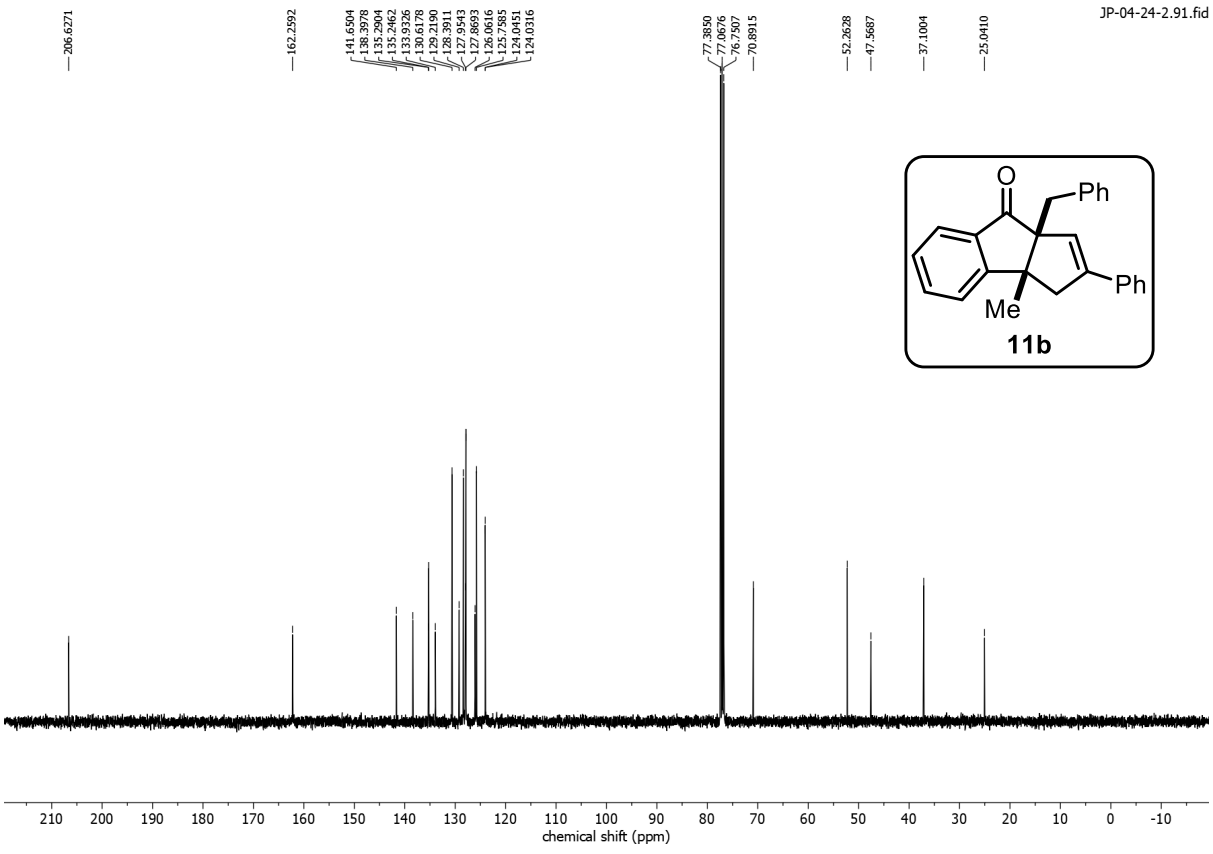
^{13}C NMR (100 MHz, $CDCl_3$)



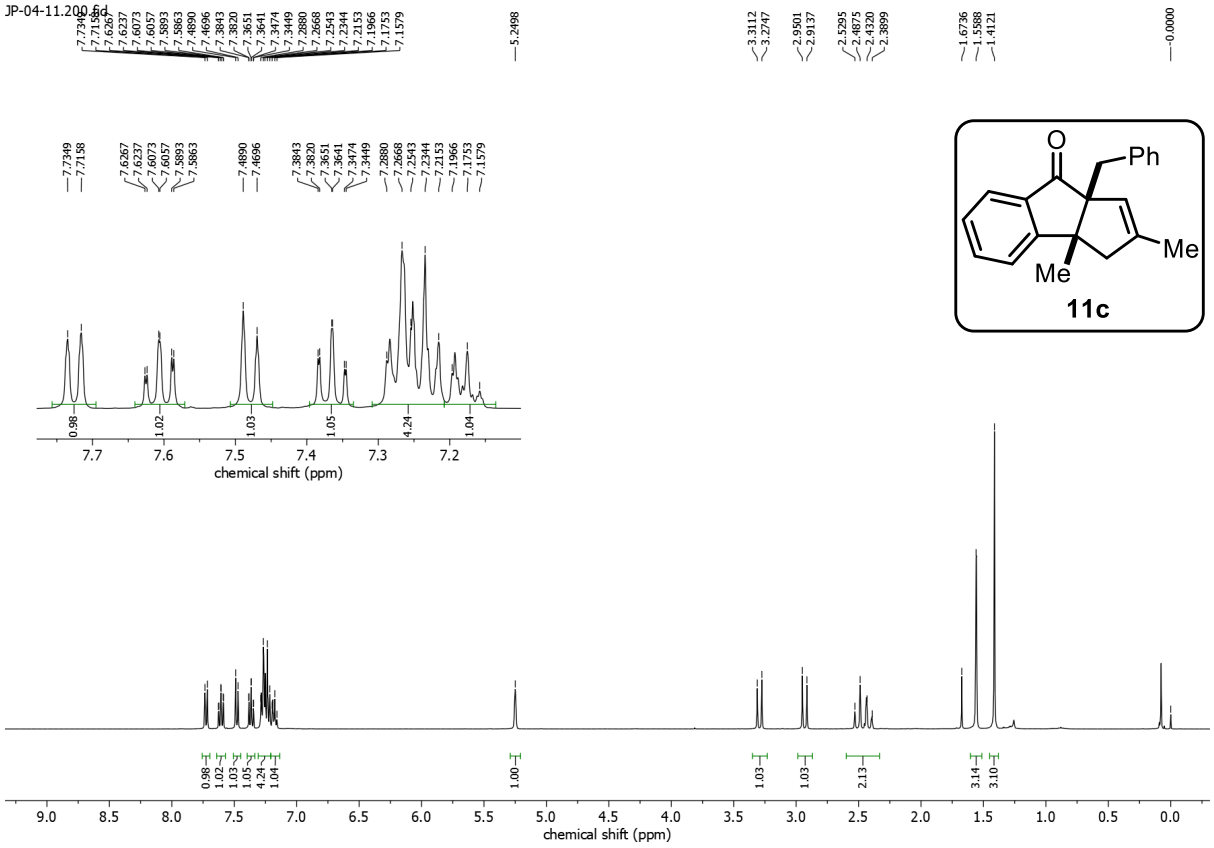
^{1}H NMR (400 MHz, $CDCl_3$)



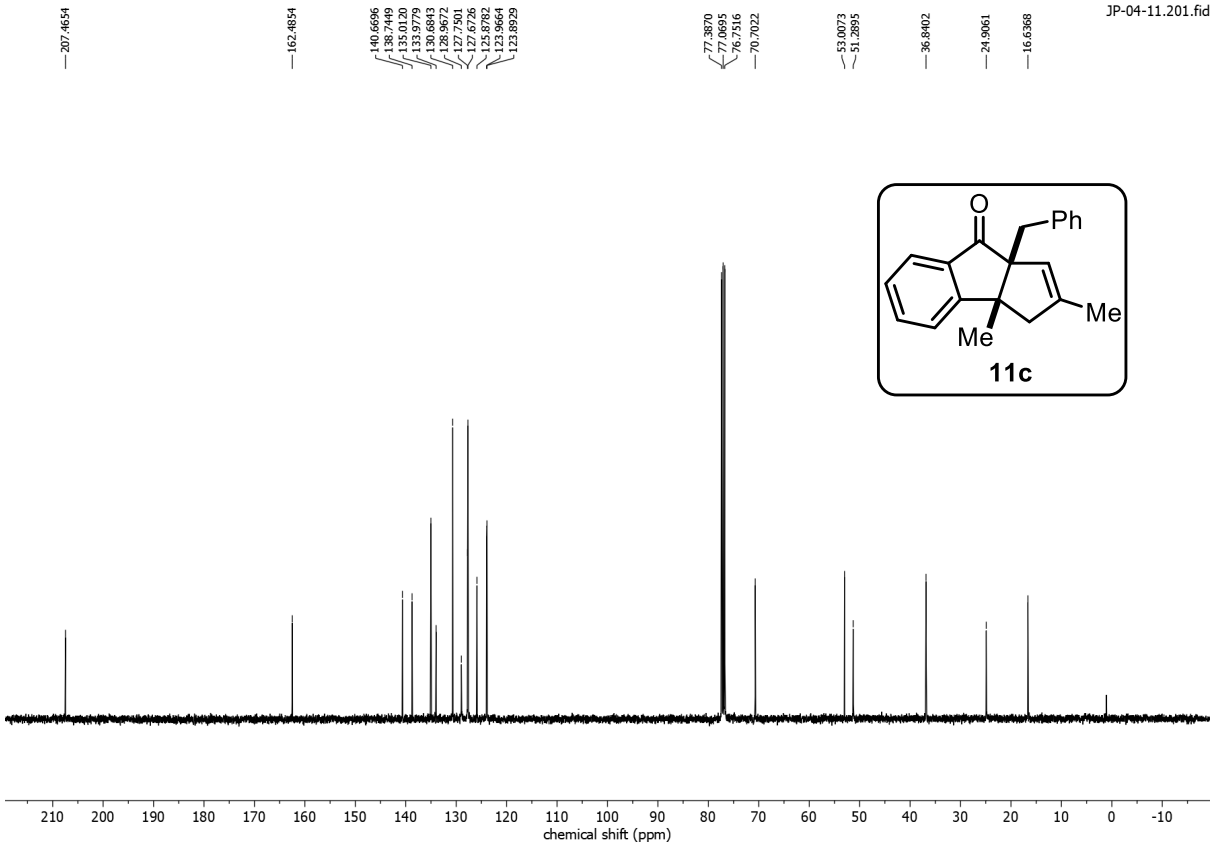
^{13}C NMR (100 MHz, $CDCl_3$)



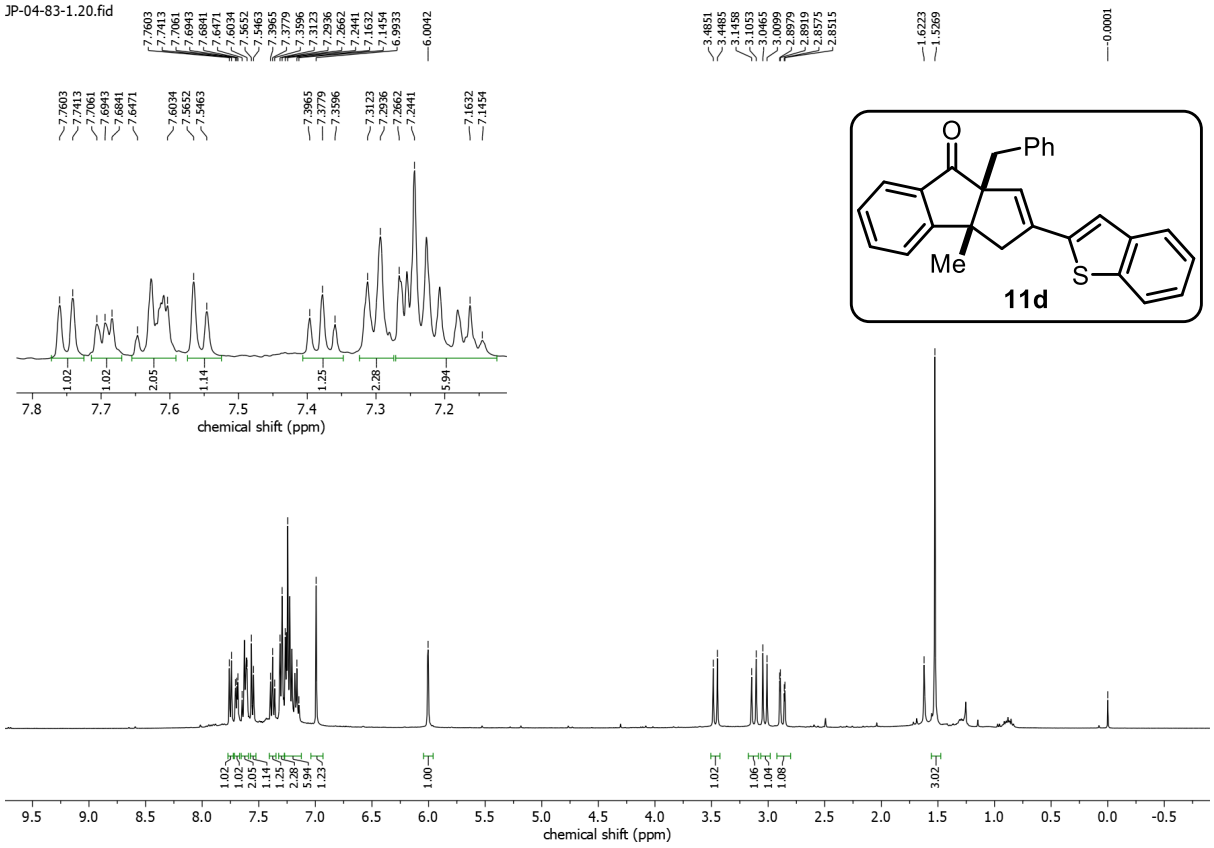
^{1}H NMR (400 MHz, $CDCl_3$)



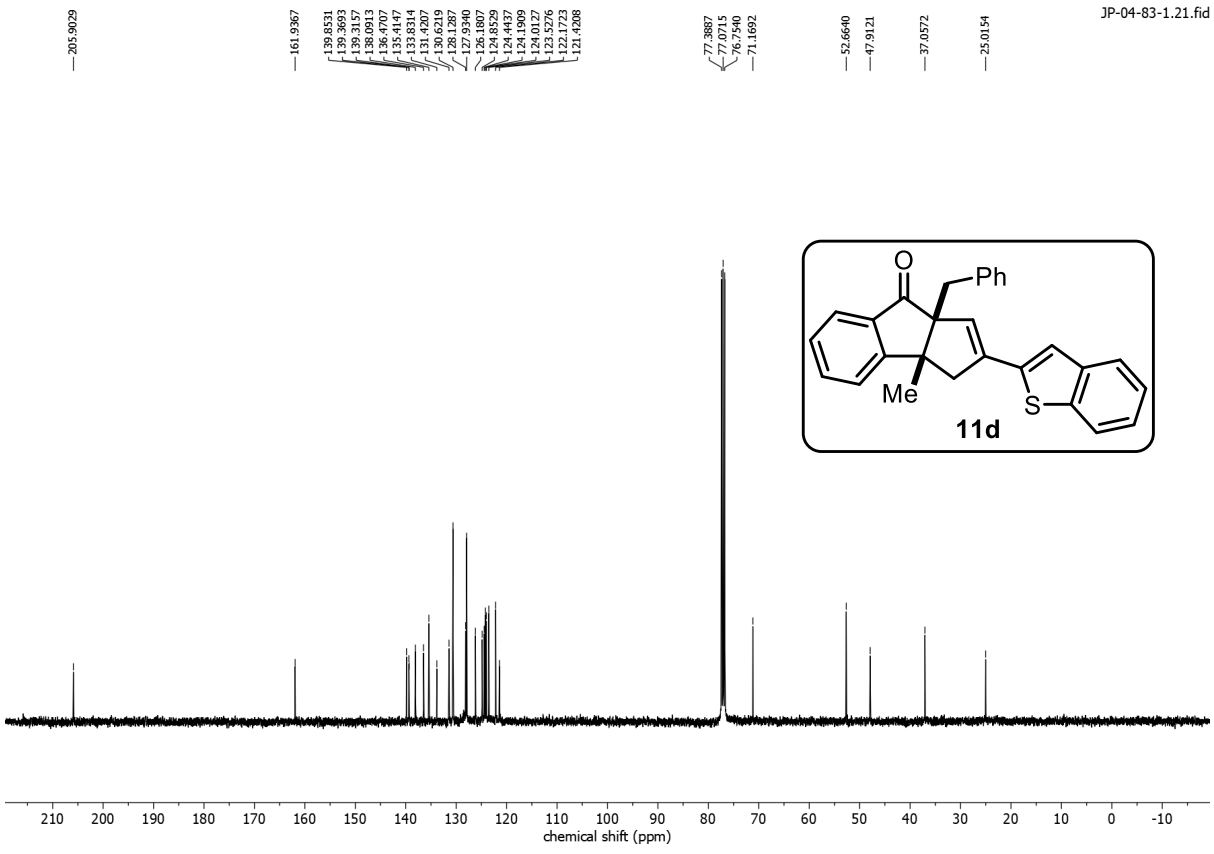
^{13}C NMR (100 MHz, $CDCl_3$)



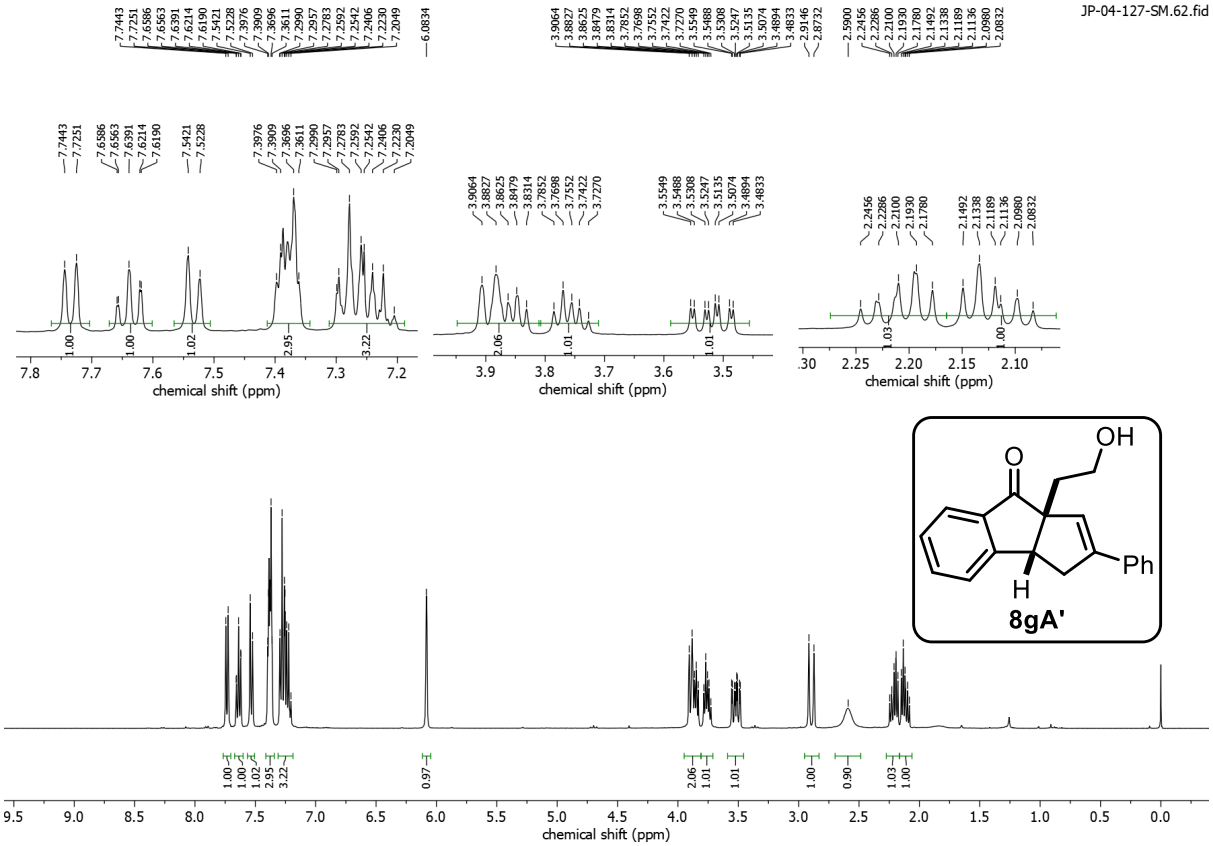
^{1}H NMR (400 MHz, $CDCl_3$)



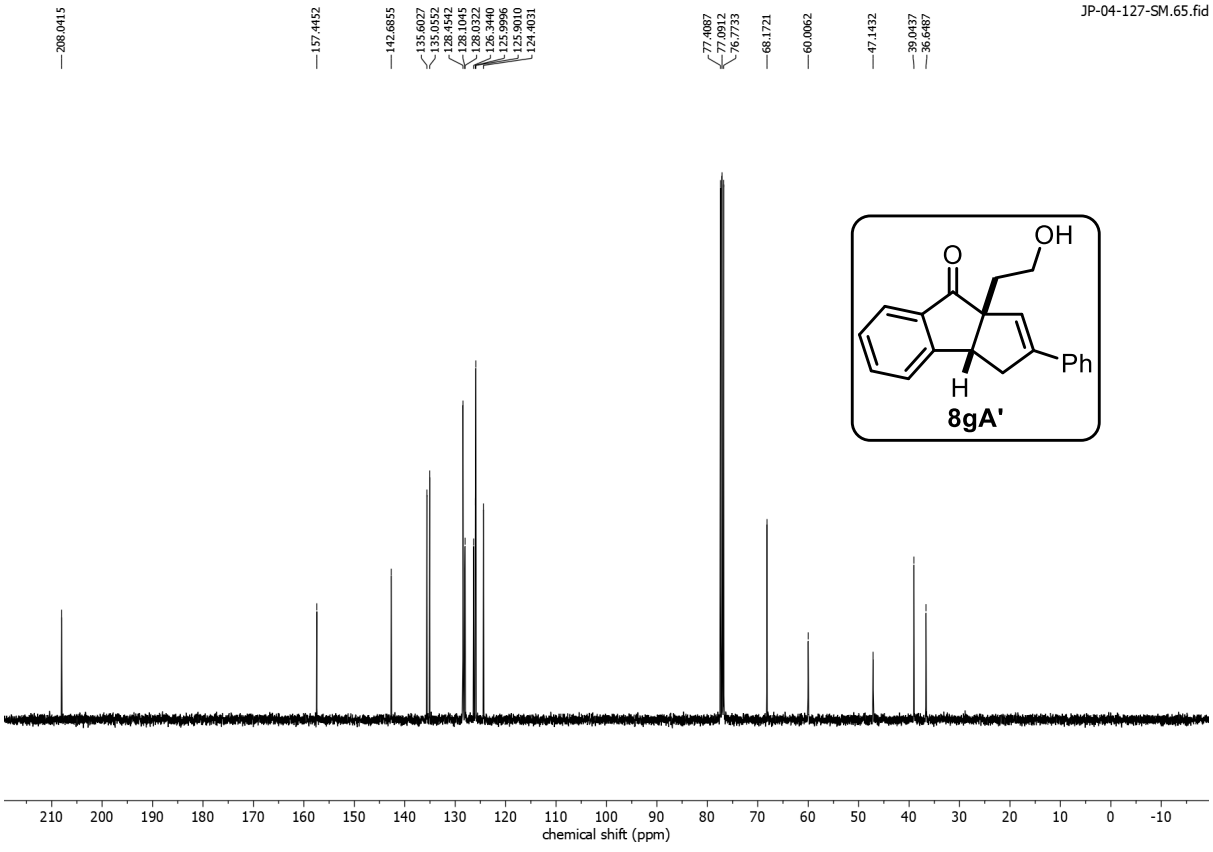
^{13}C NMR (100 MHz, $CDCl_3$)



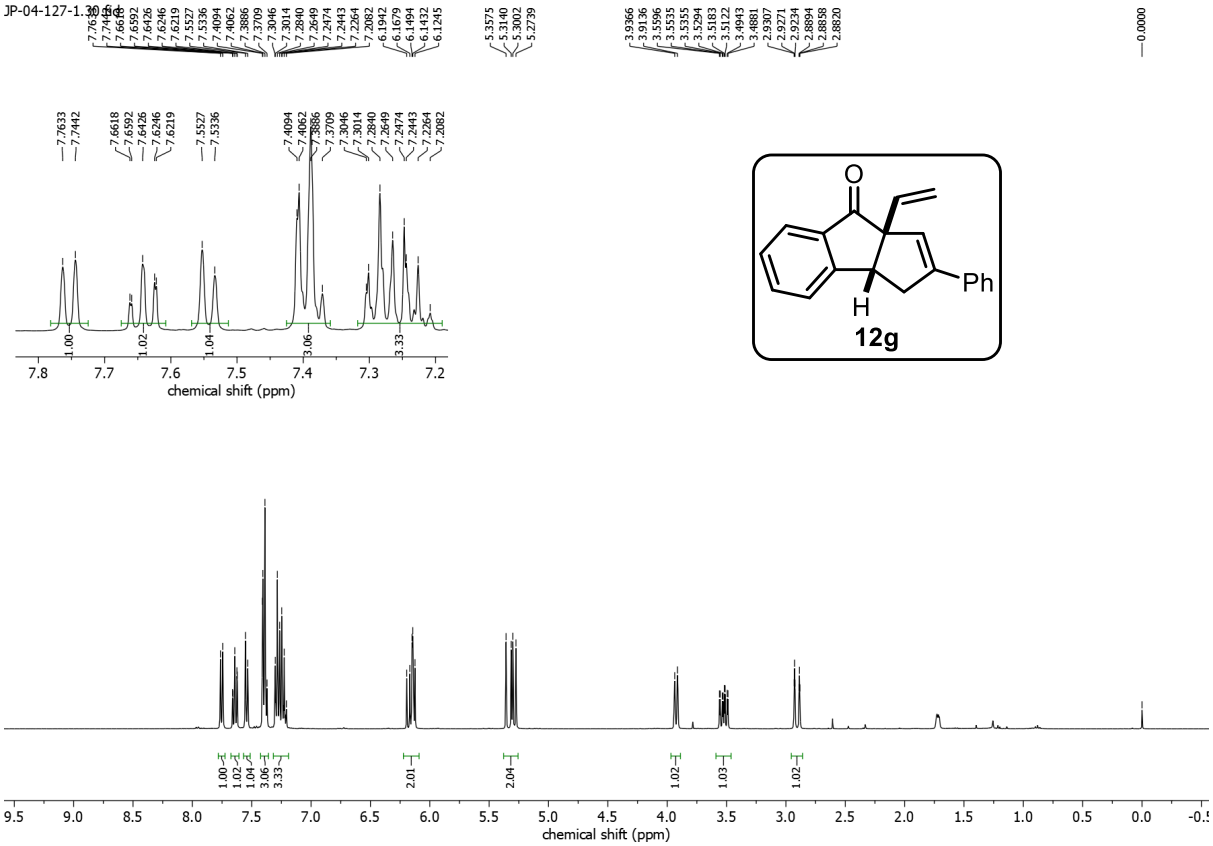
^{1}H NMR (400 MHz, $CDCl_3$)



^{13}C NMR (100 MHz, $CDCl_3$)



^{1}H NMR (400 MHz, $CDCl_3$)



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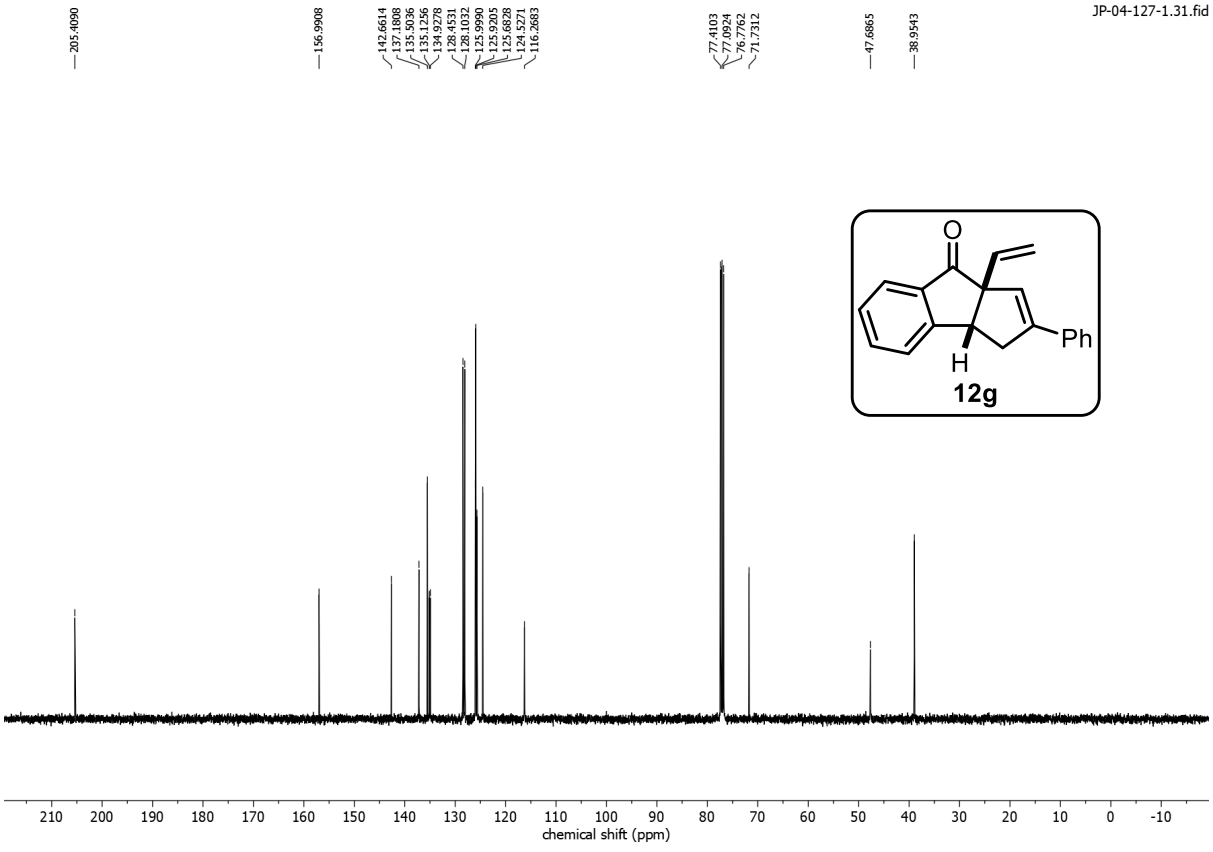
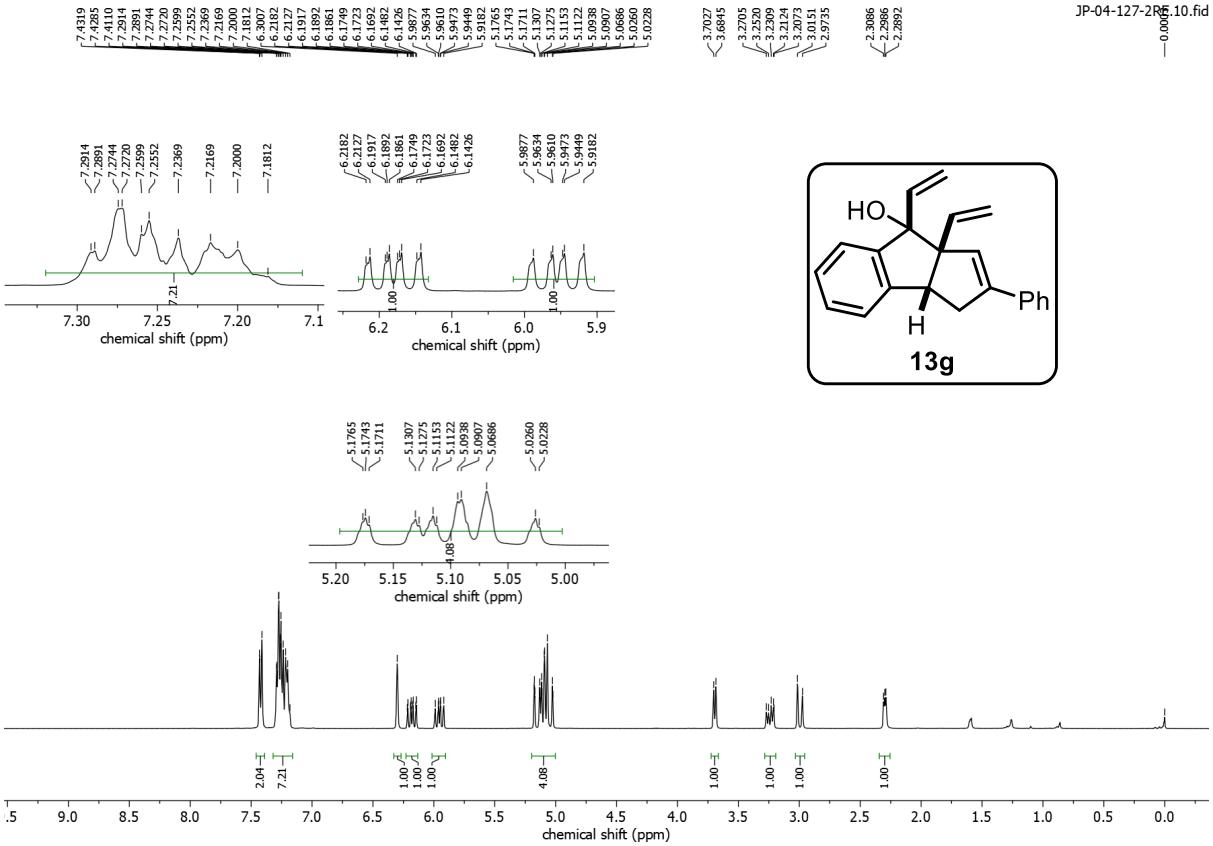
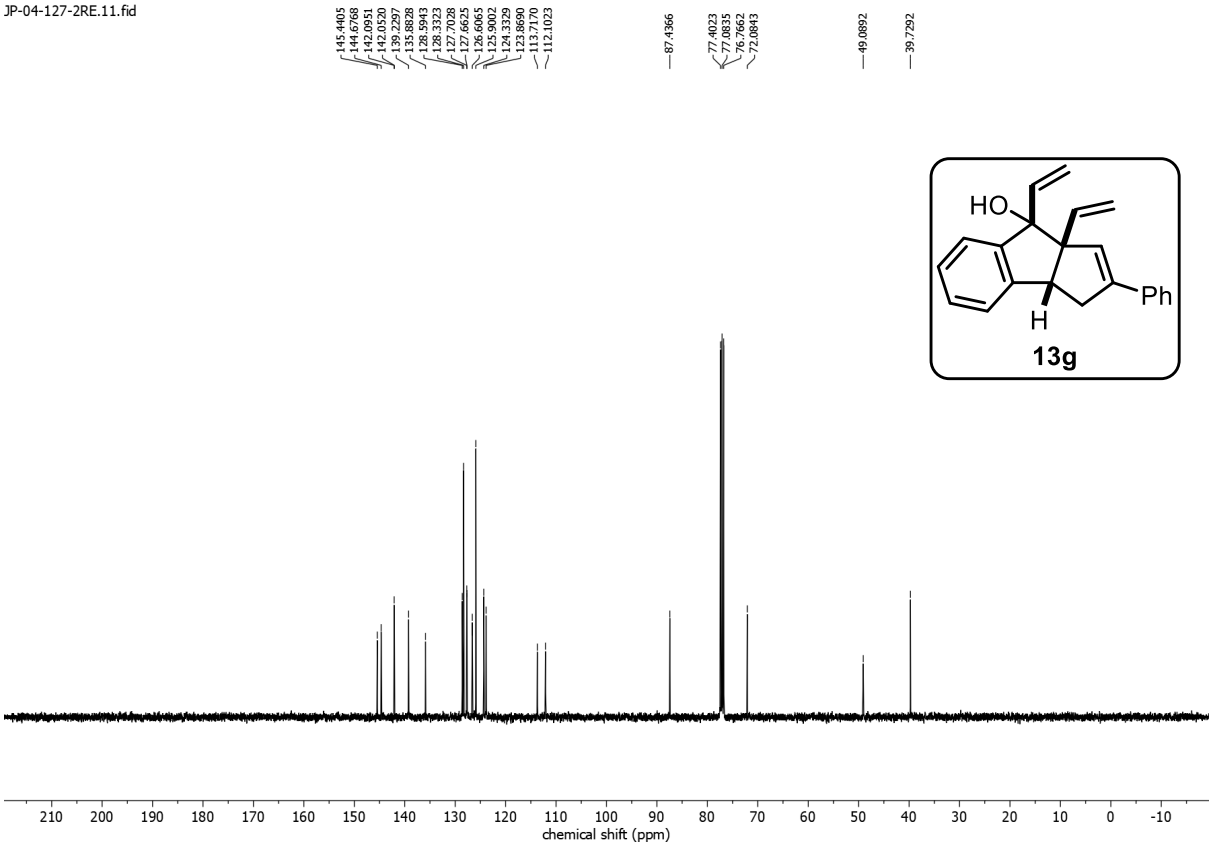


^{1}H NMR (400 MHz, $CDCl_3$)



^{13}C NMR (100 MHz, $CDCl_3$)



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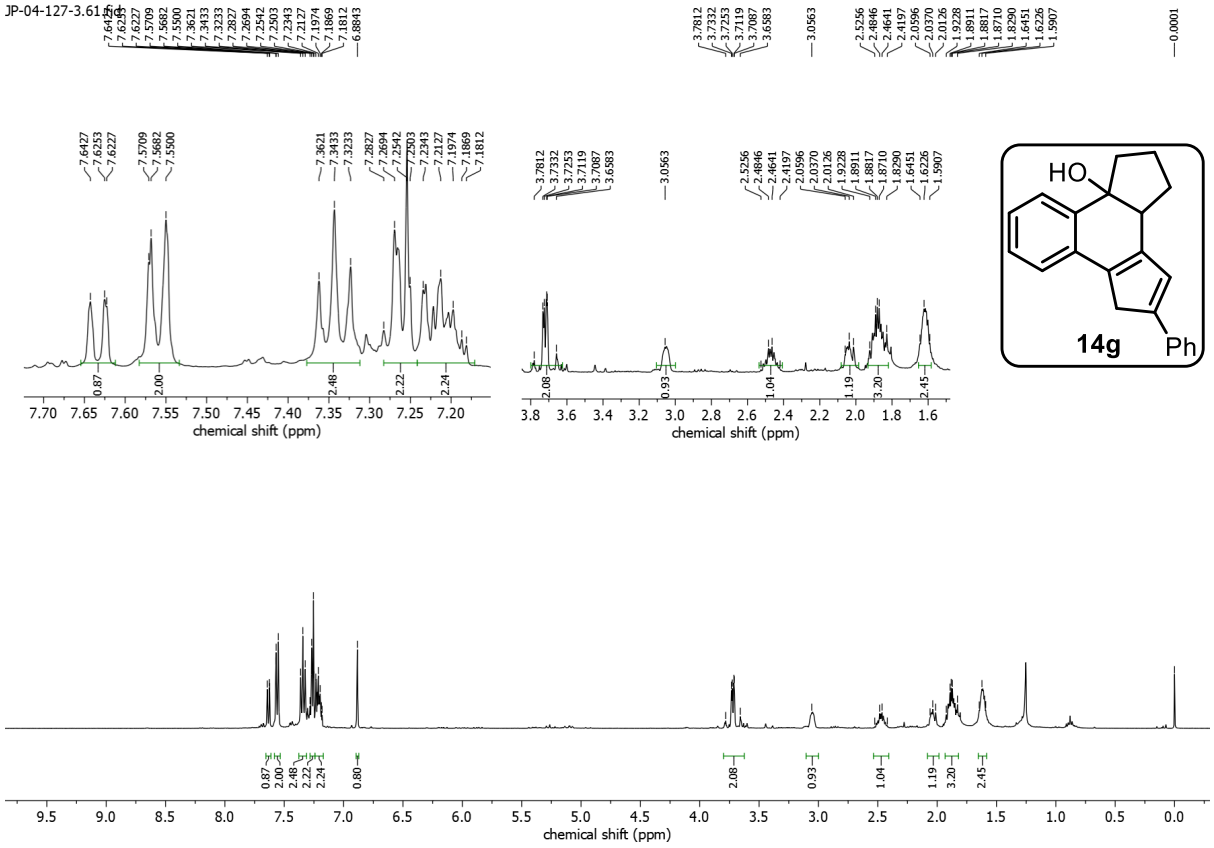

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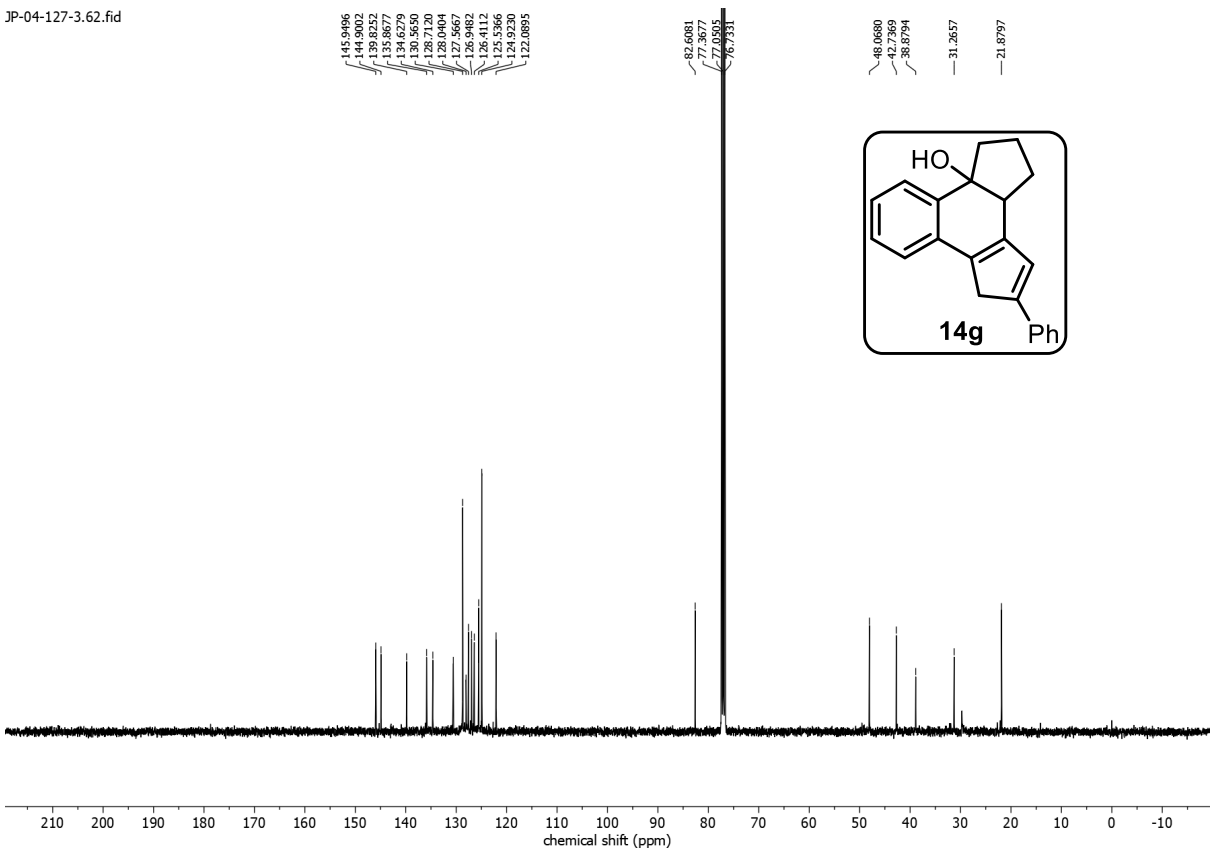
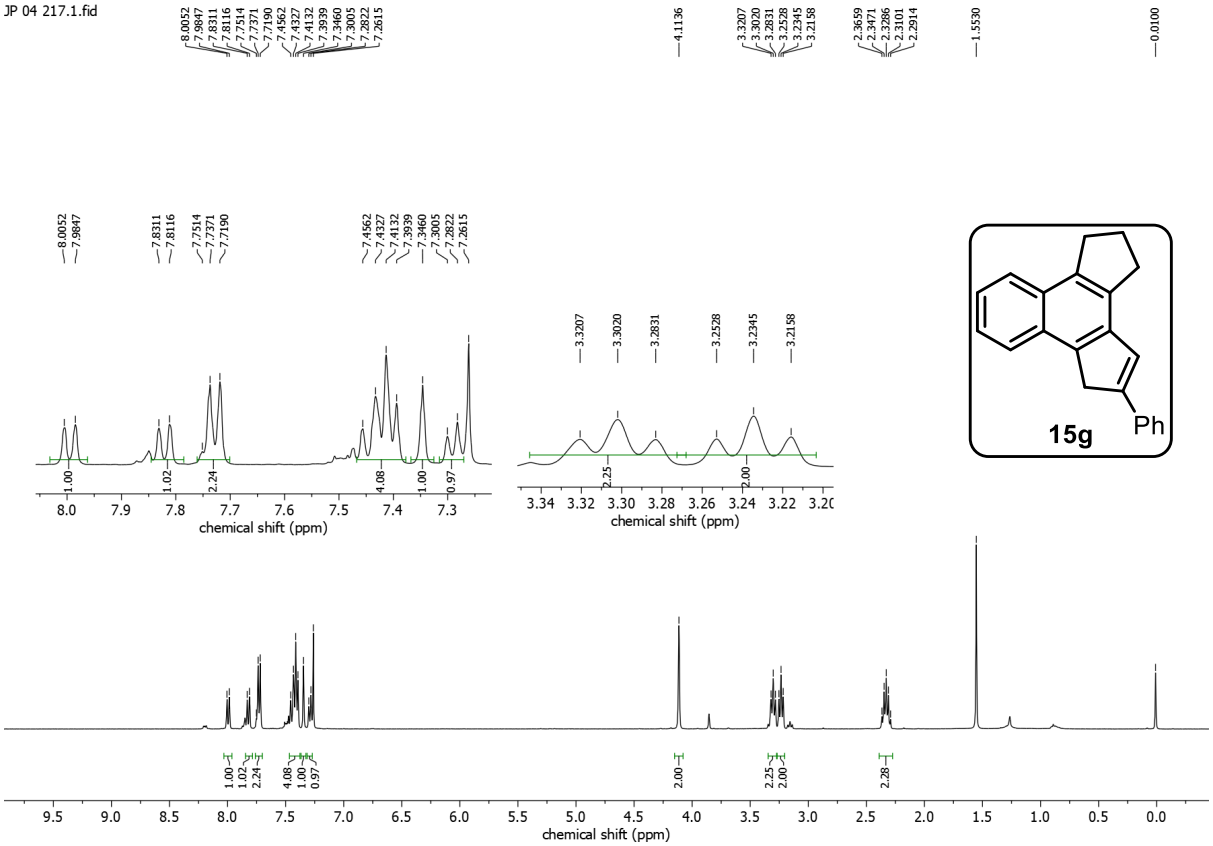
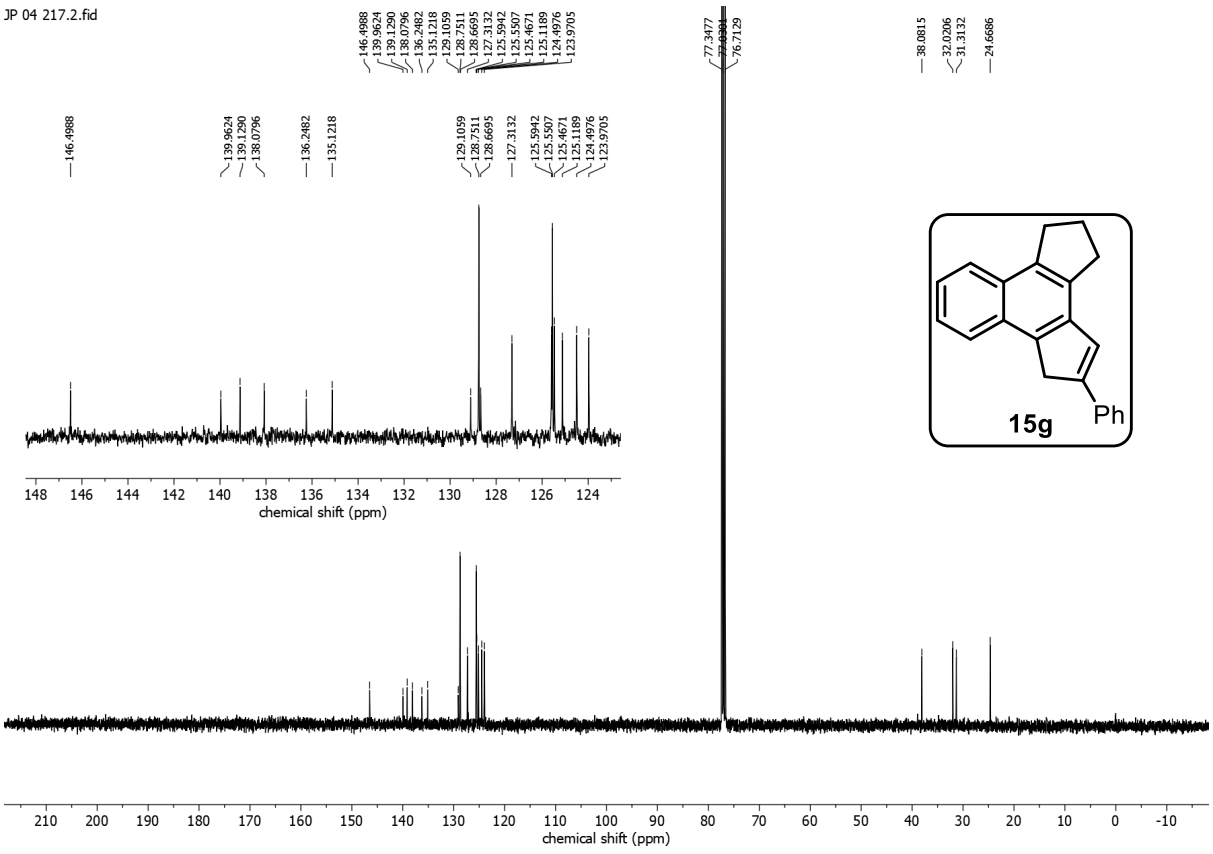


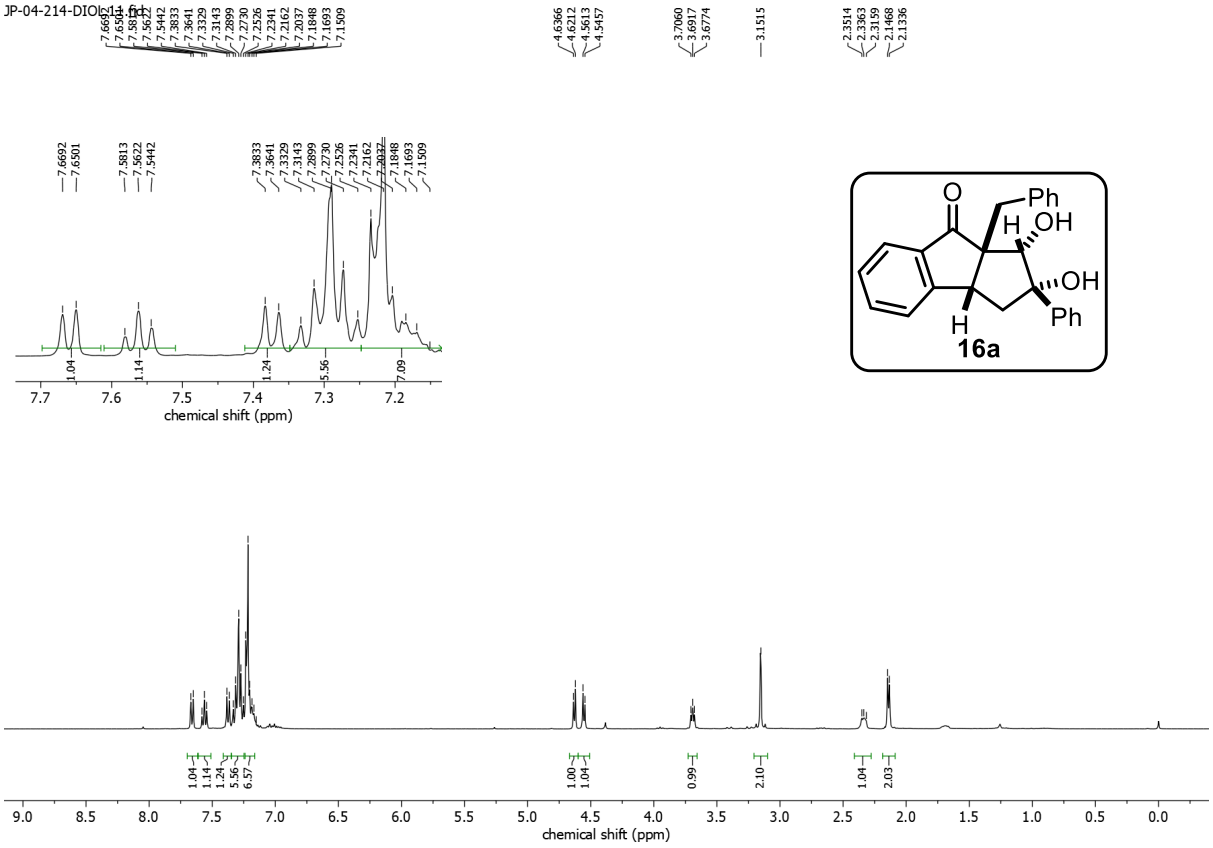
^{1}H NMR (400 MHz, $CDCl_3$)



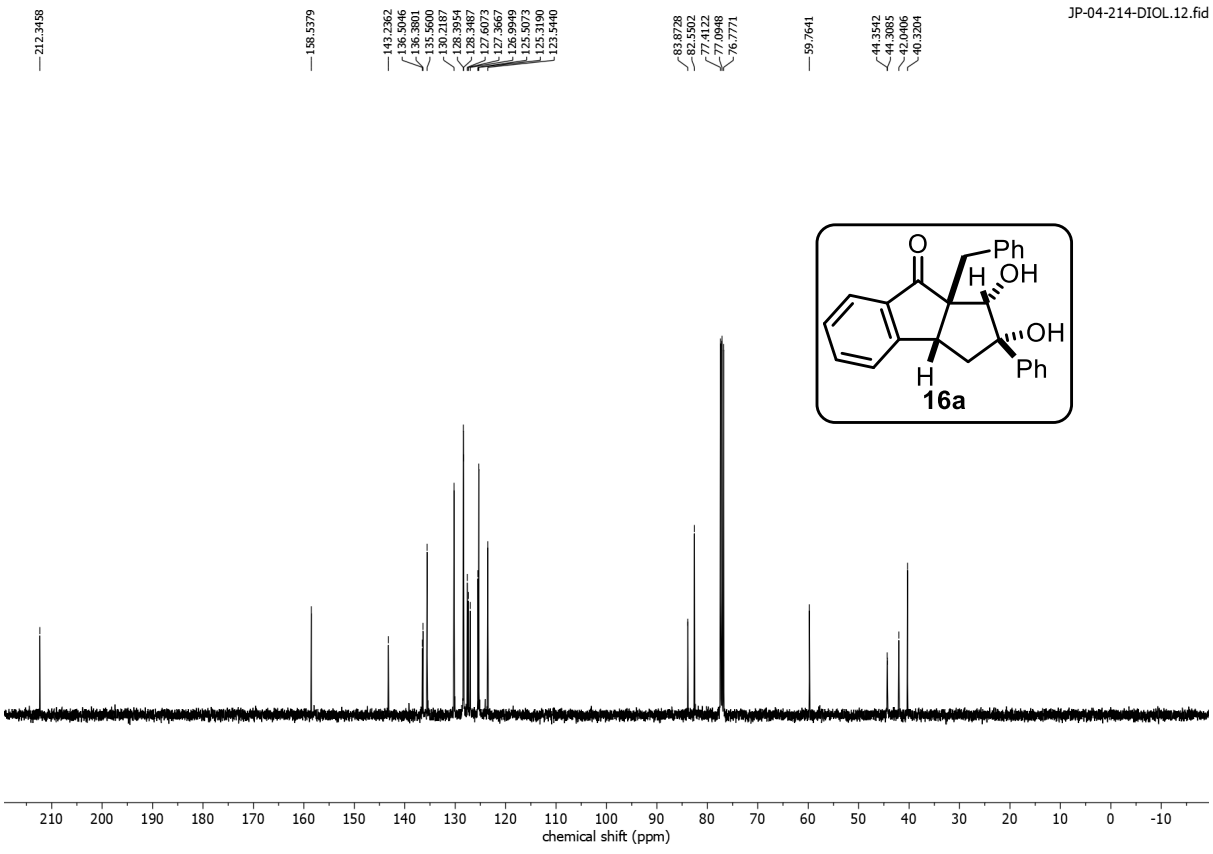
^{13}C NMR (100 MHz, $CDCl_3$)



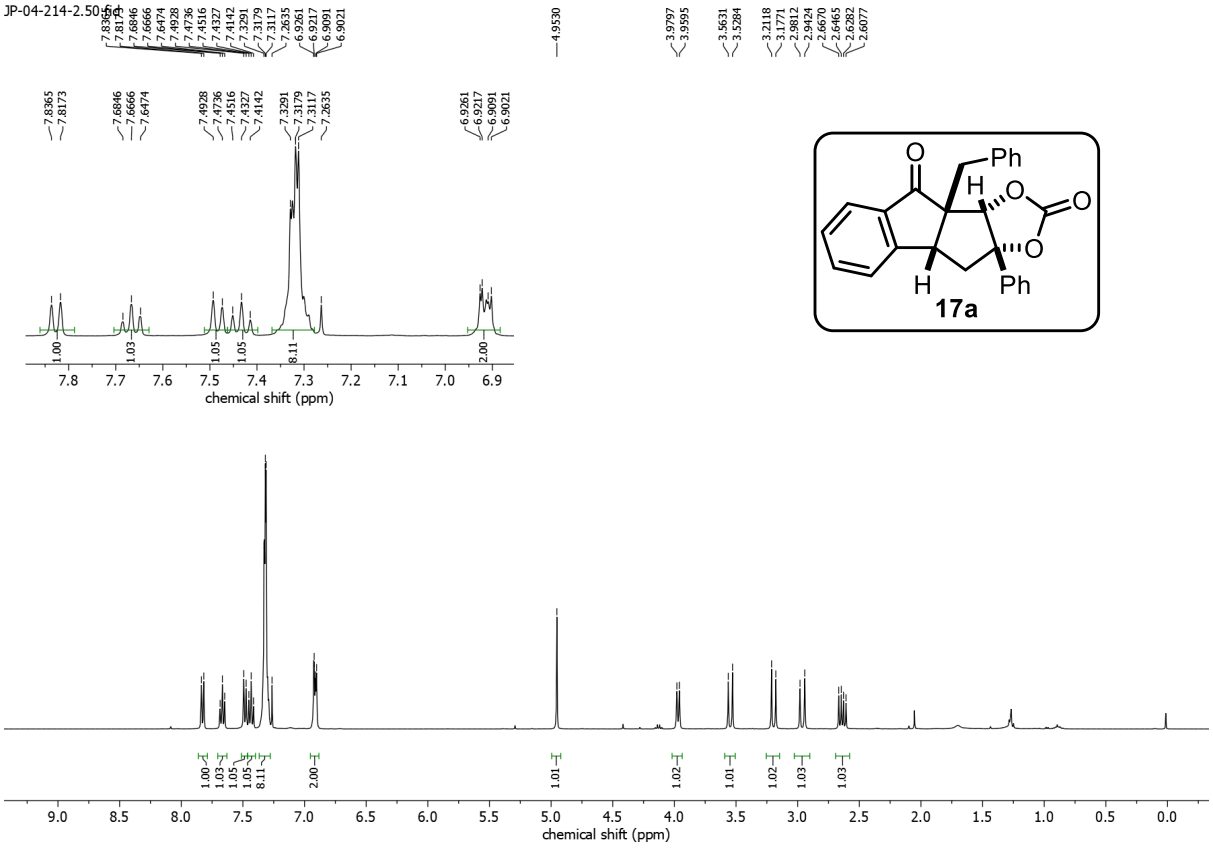
^{1}H NMR (400 MHz, $CDCl_3$)



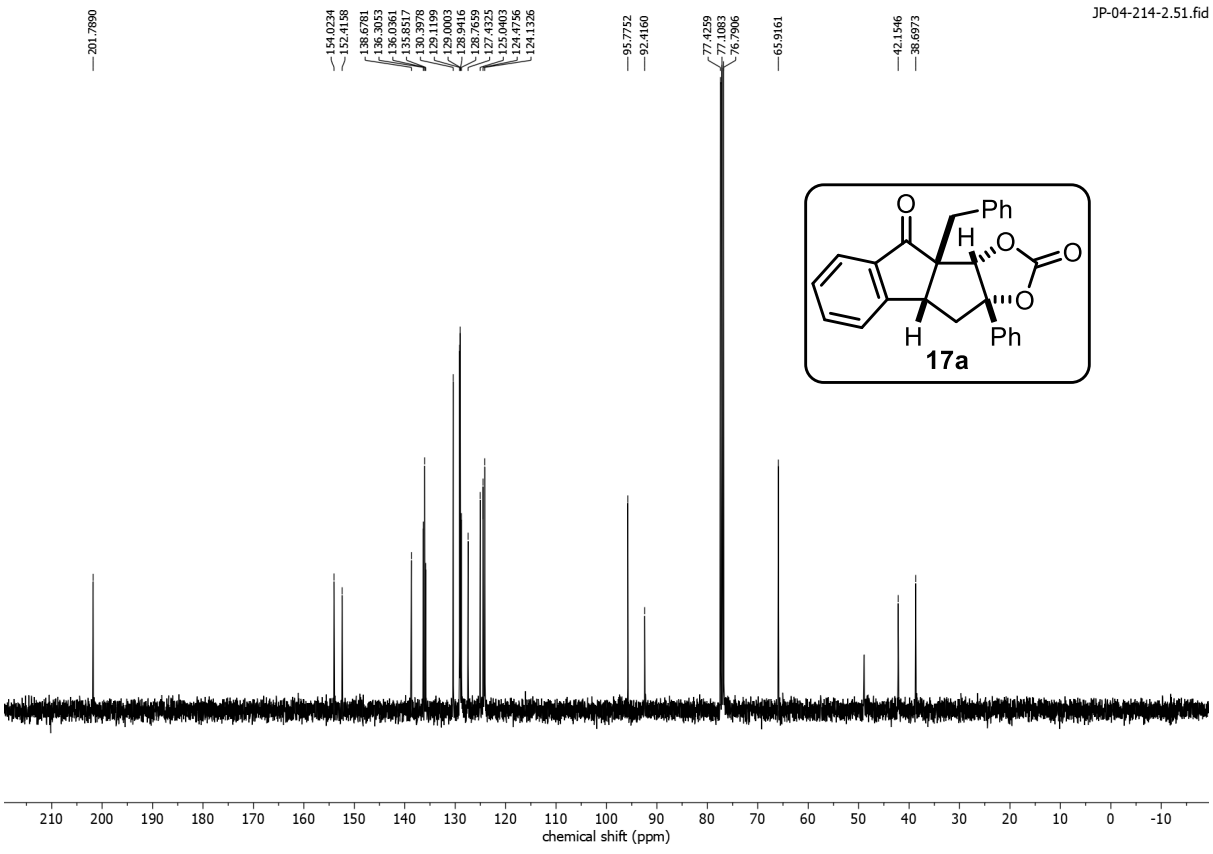
^{13}C NMR (100 MHz, $CDCl_3$)



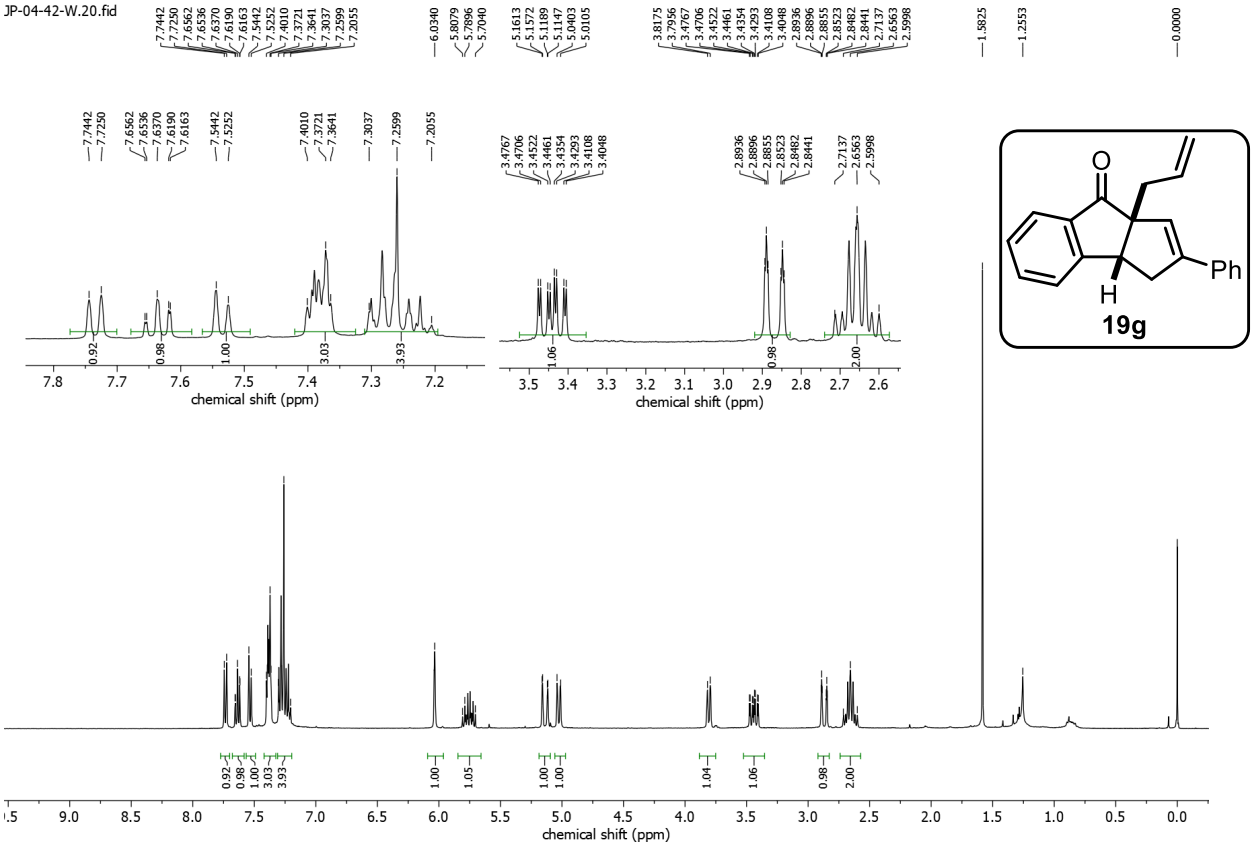
^{1}H NMR (400 MHz, $CDCl_3$)



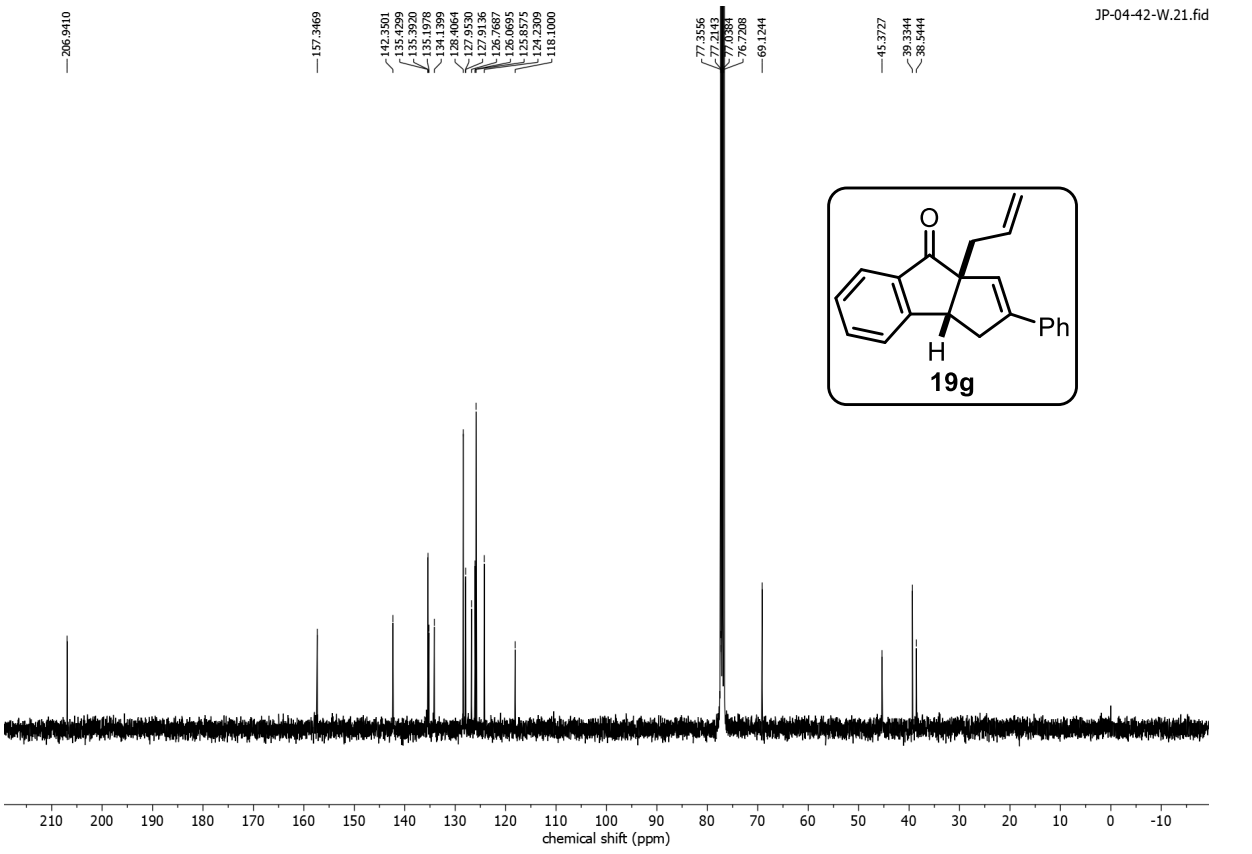
^{13}C NMR (100 MHz, $CDCl_3$)



^{1}H NMR (400 MHz, $CDCl_3$)

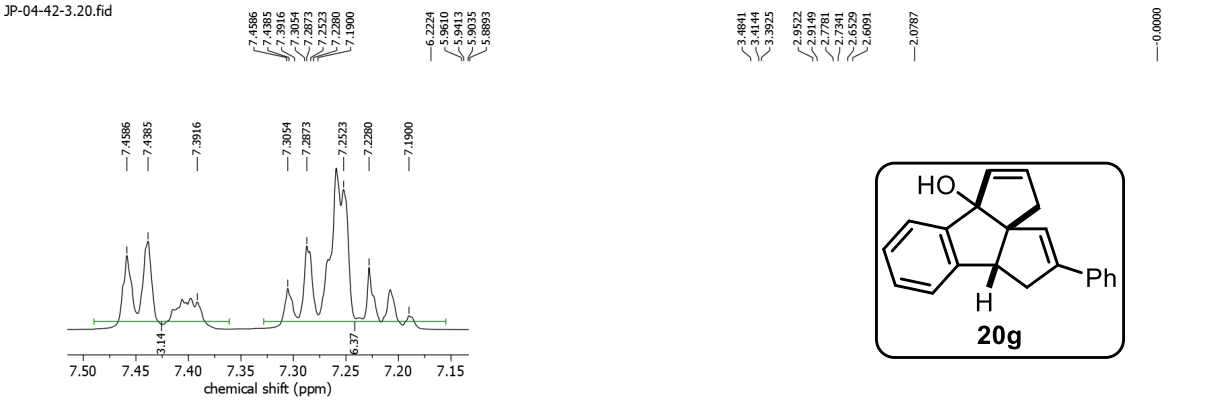


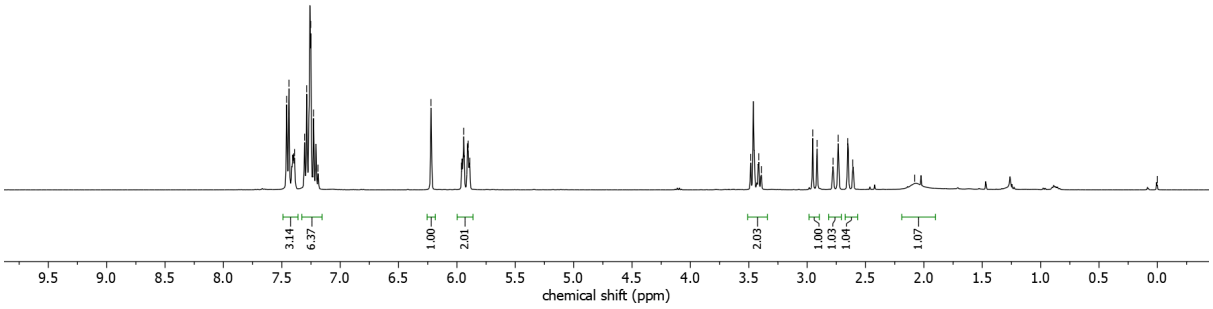
^{13}C NMR (100 MHz, $CDCl_3$)



^{1}H NMR (400 MHz, $CDCl_3$)

JP-04-42-3.20.fid





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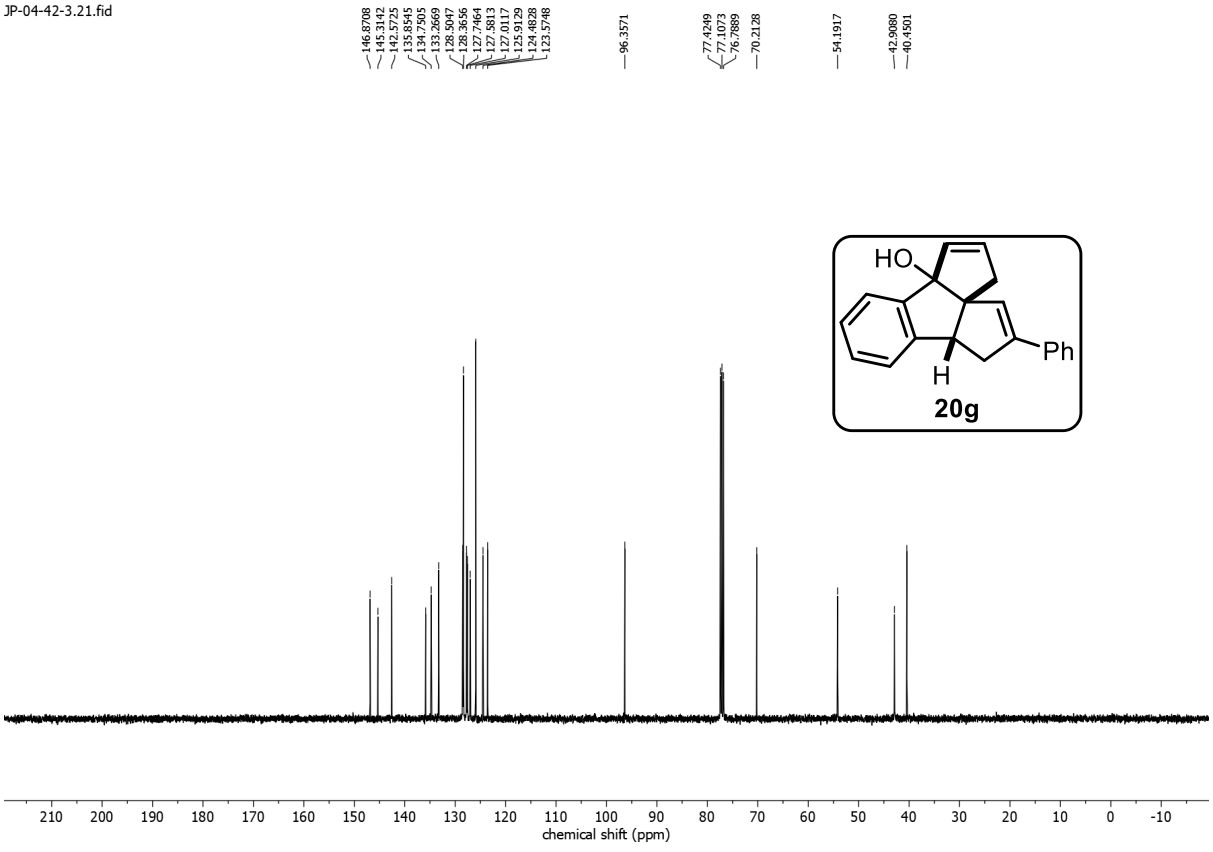
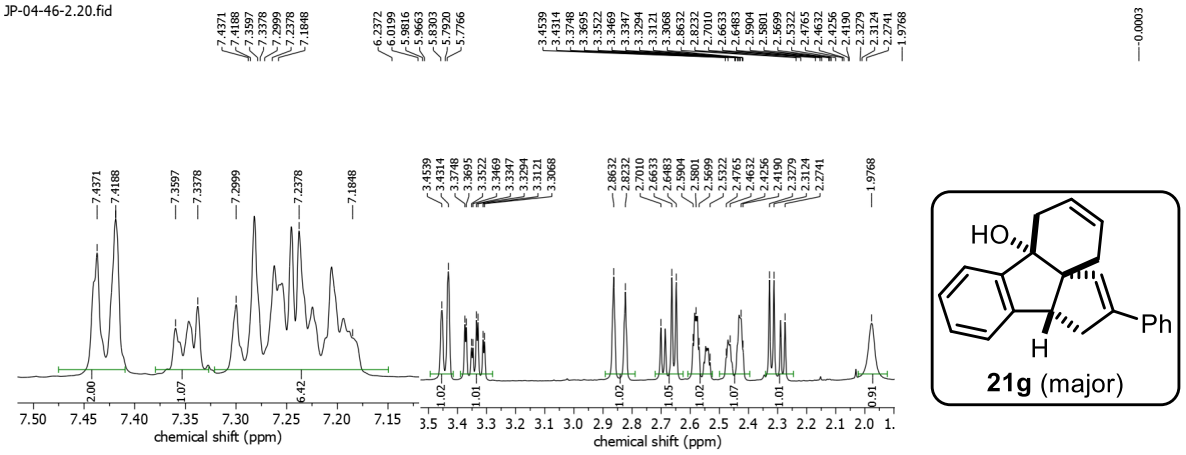


^{1}H NMR (400 MHz, $CDCl_3$)

JP-04-46-2.20.fid



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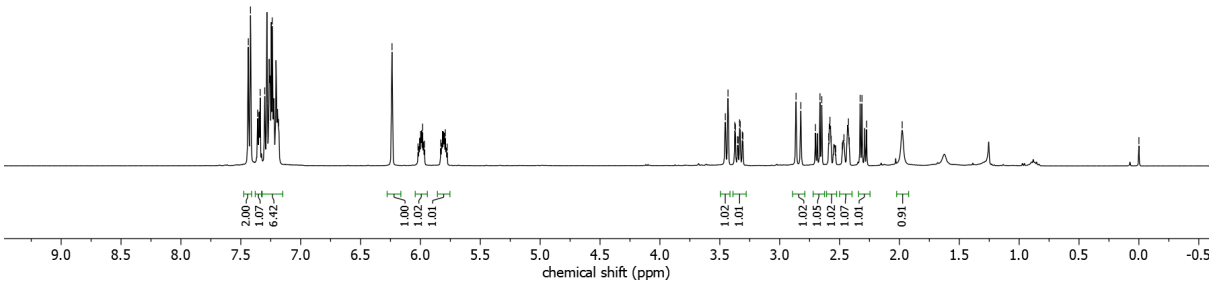
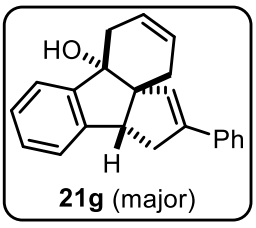


^{13}C NMR (100 MHz, $CDCl_3$)

JP-04-46-2.21.fid



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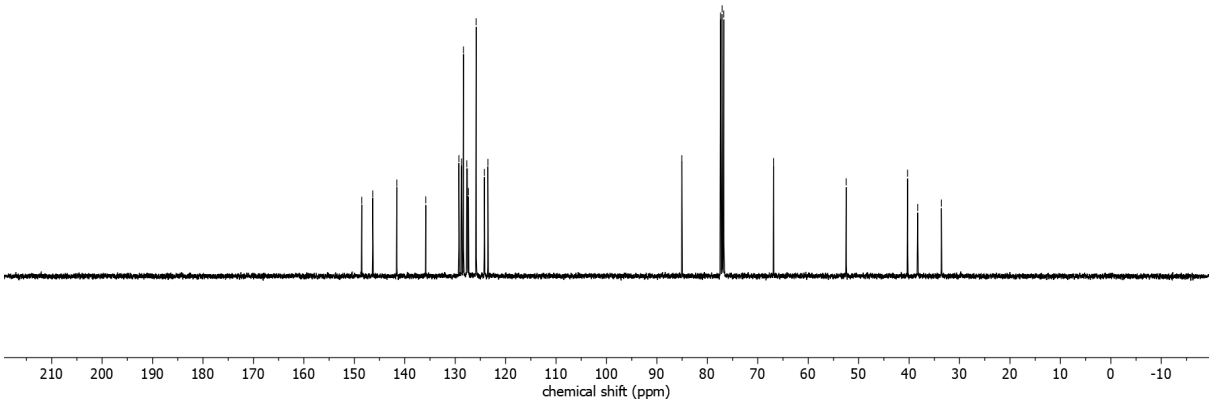

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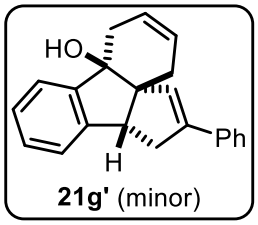
JP-04-46-22.10.fid



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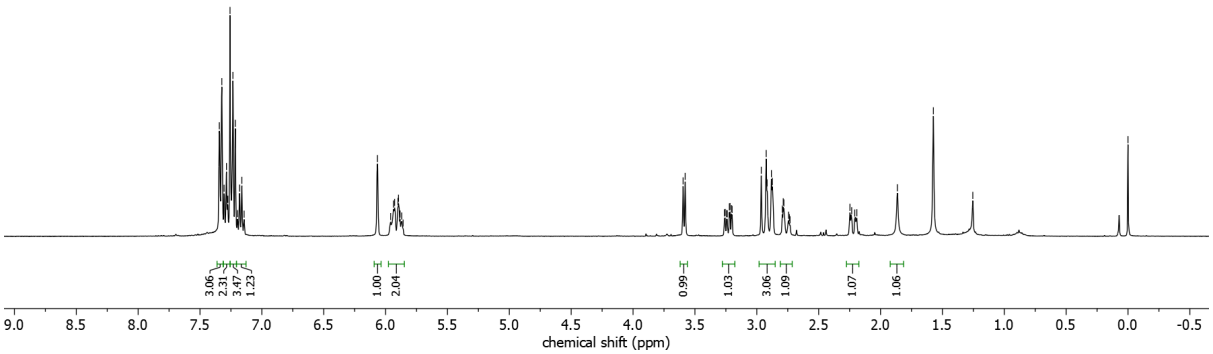
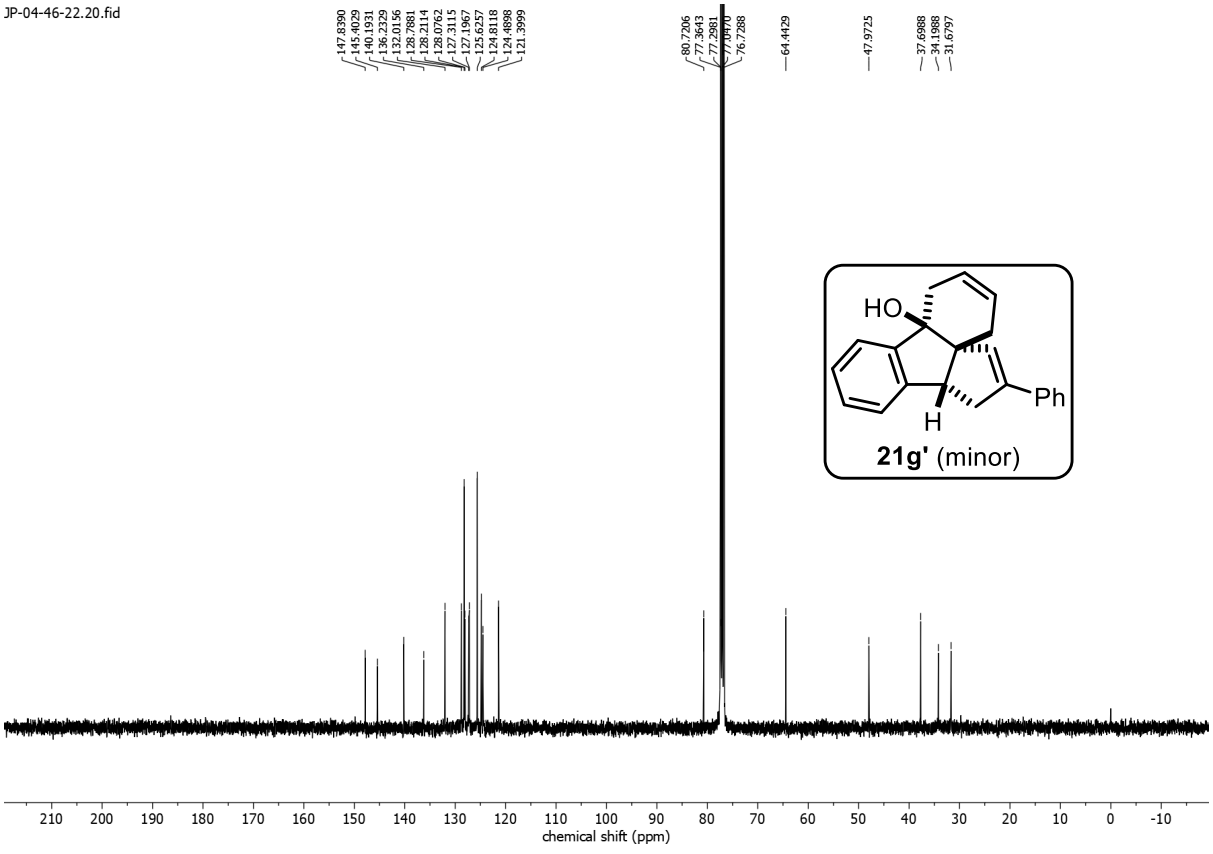


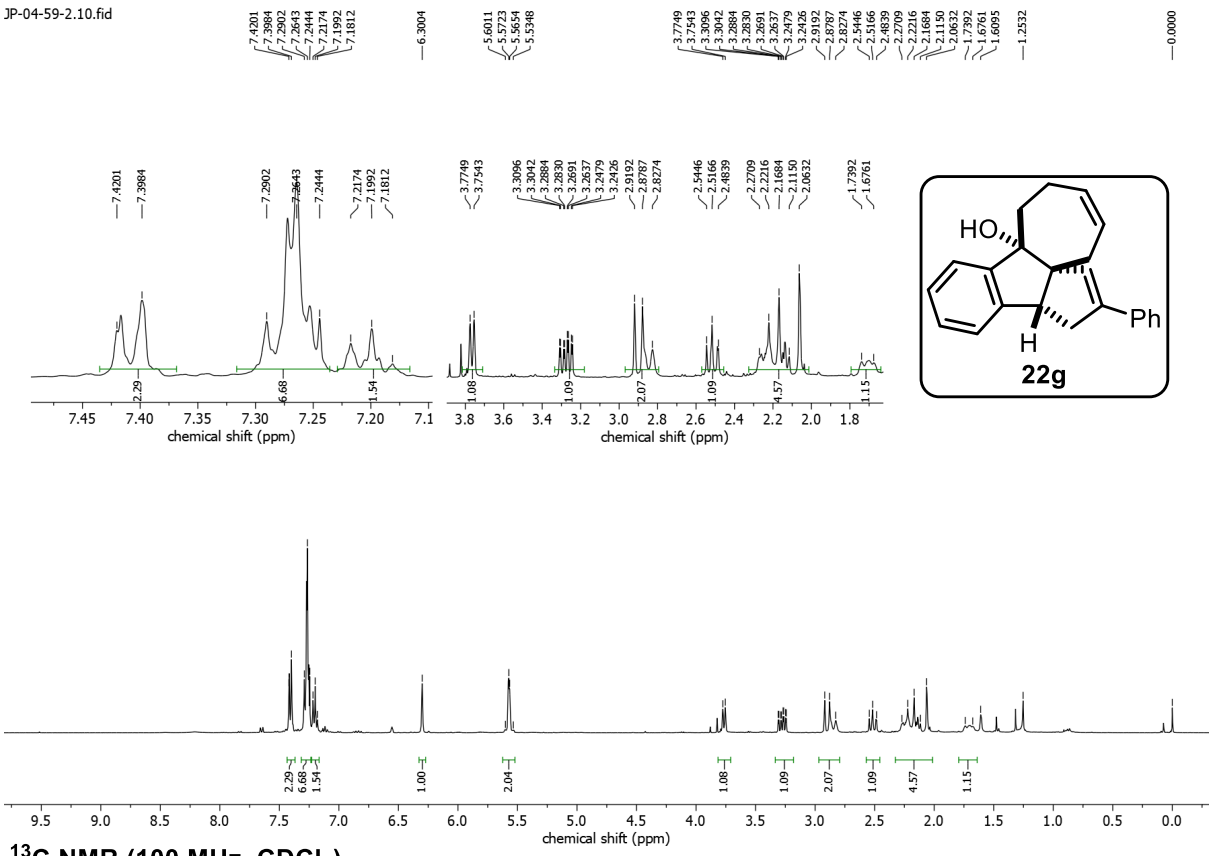
^{13}C NMR (100 MHz, $CDCl_3$)

JP-04-46-22.20.fid

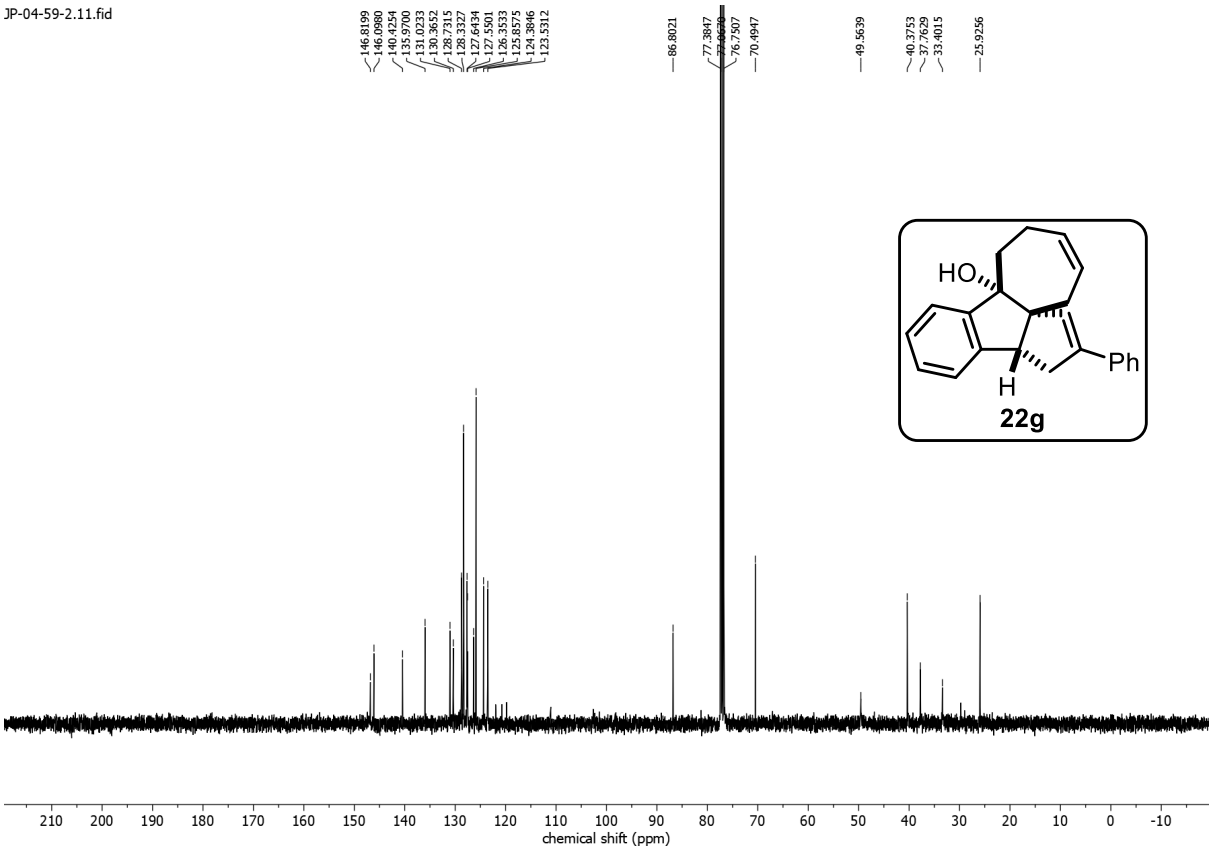


21g' (minor)

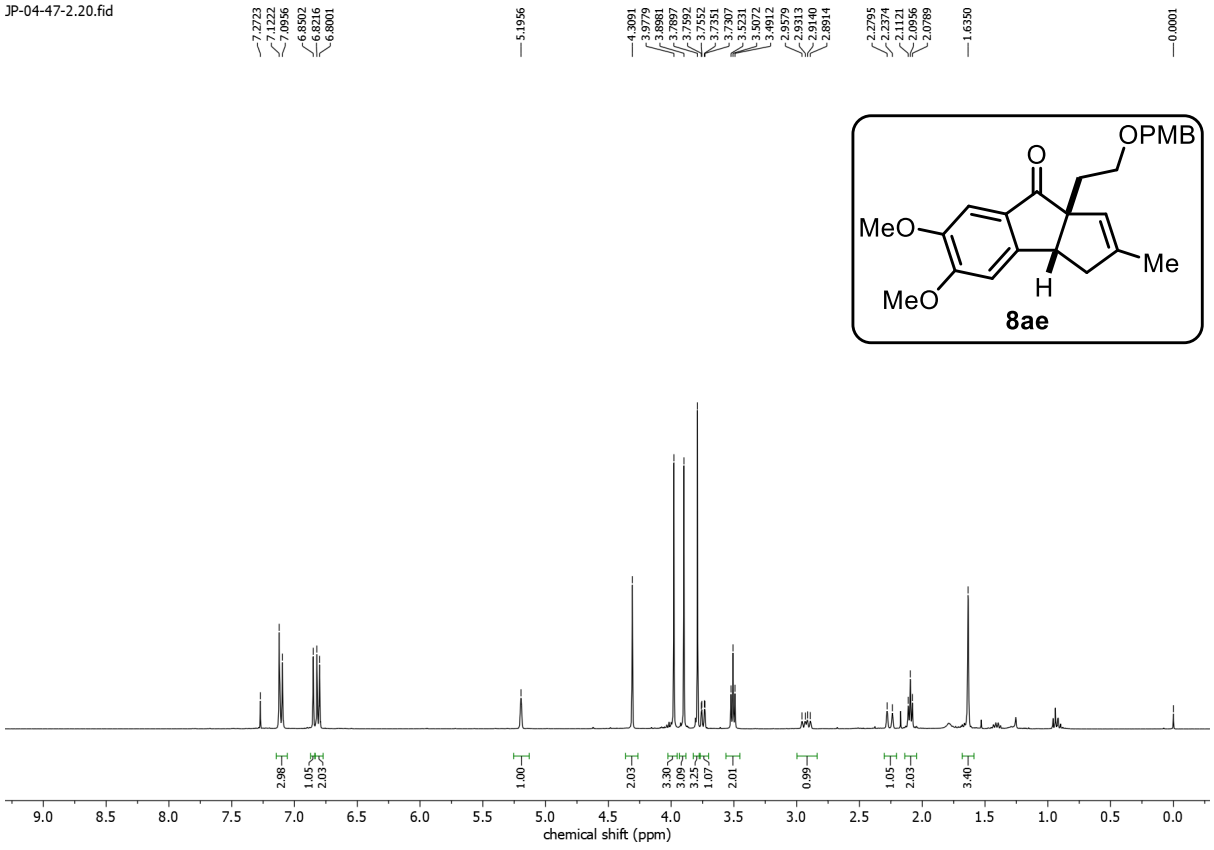
^{1}H NMR (400 MHz, $CDCl_3$)



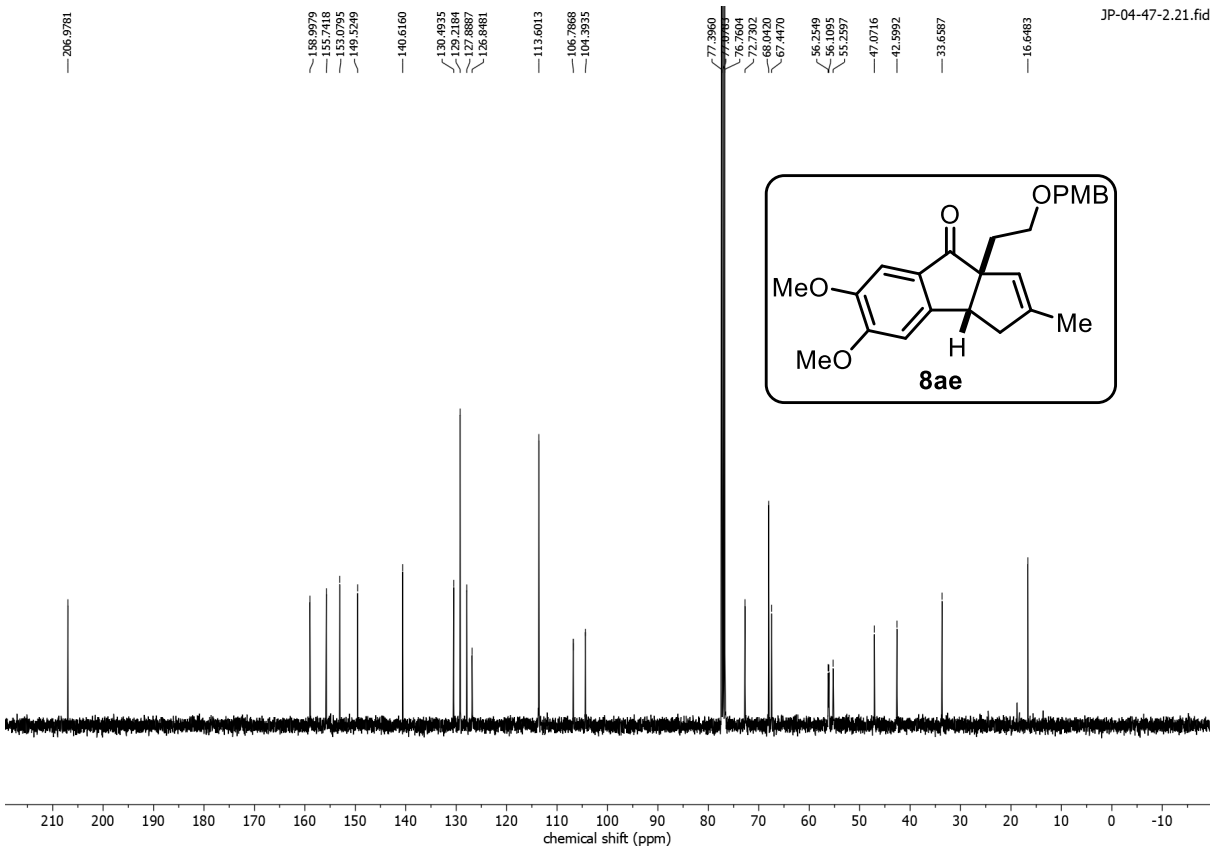
^{13}C NMR (100 MHz, $CDCl_3$)



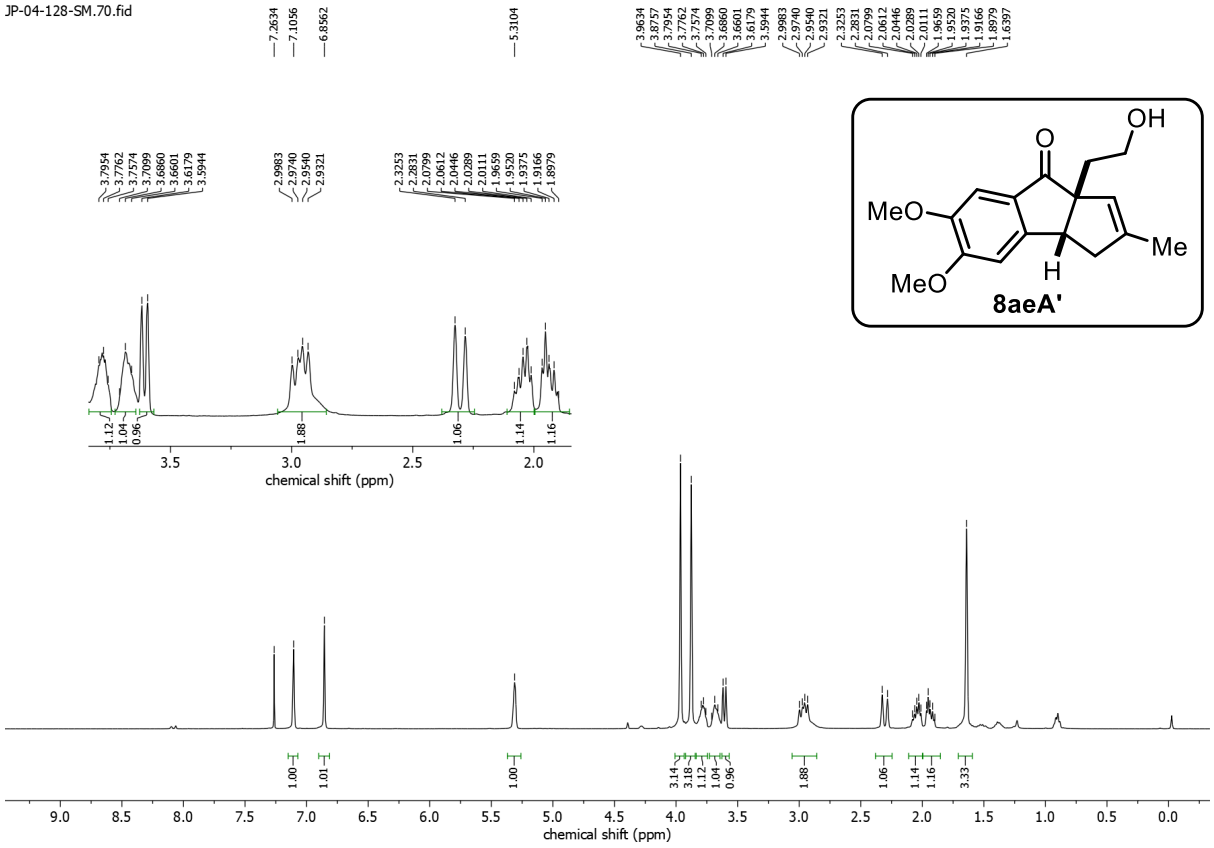
^{1}H NMR (400 MHz, $CDCl_3$)



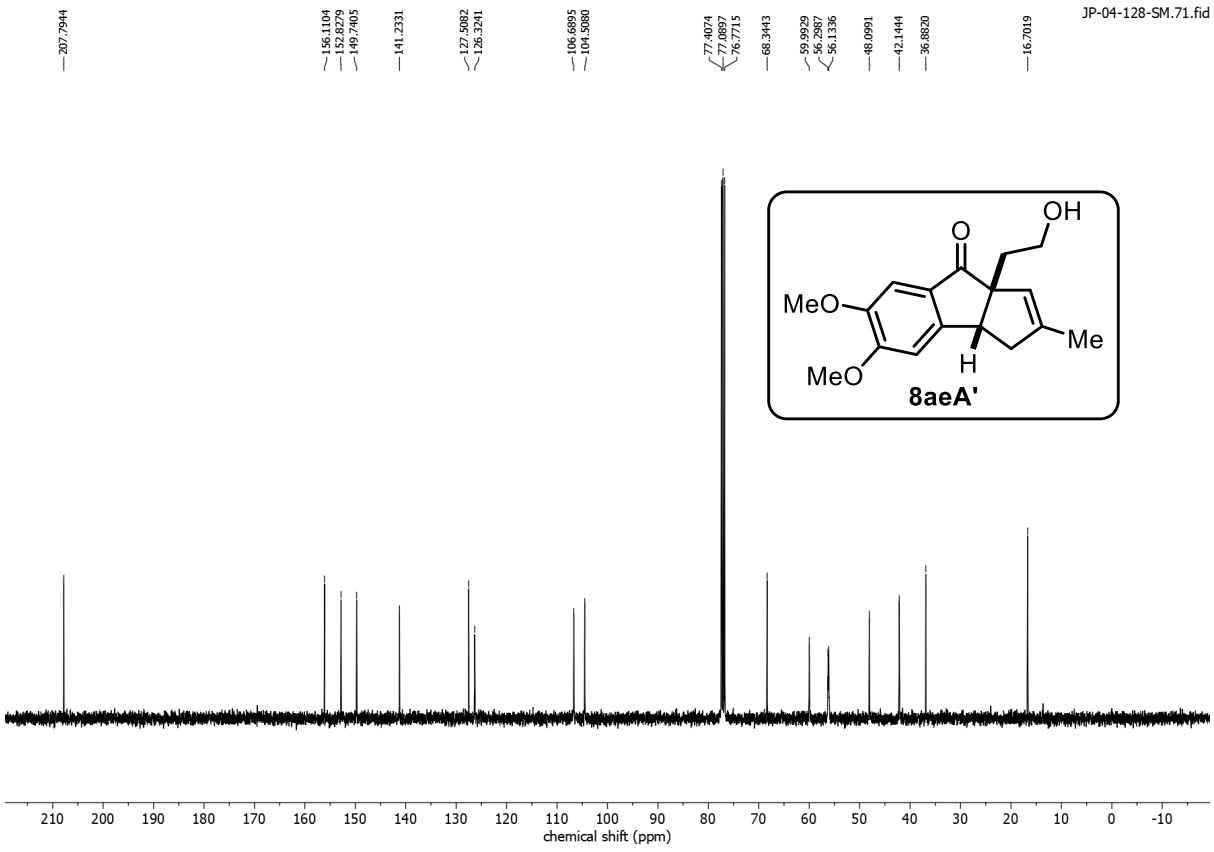
^{13}C NMR (100 MHz, $CDCl_3$)



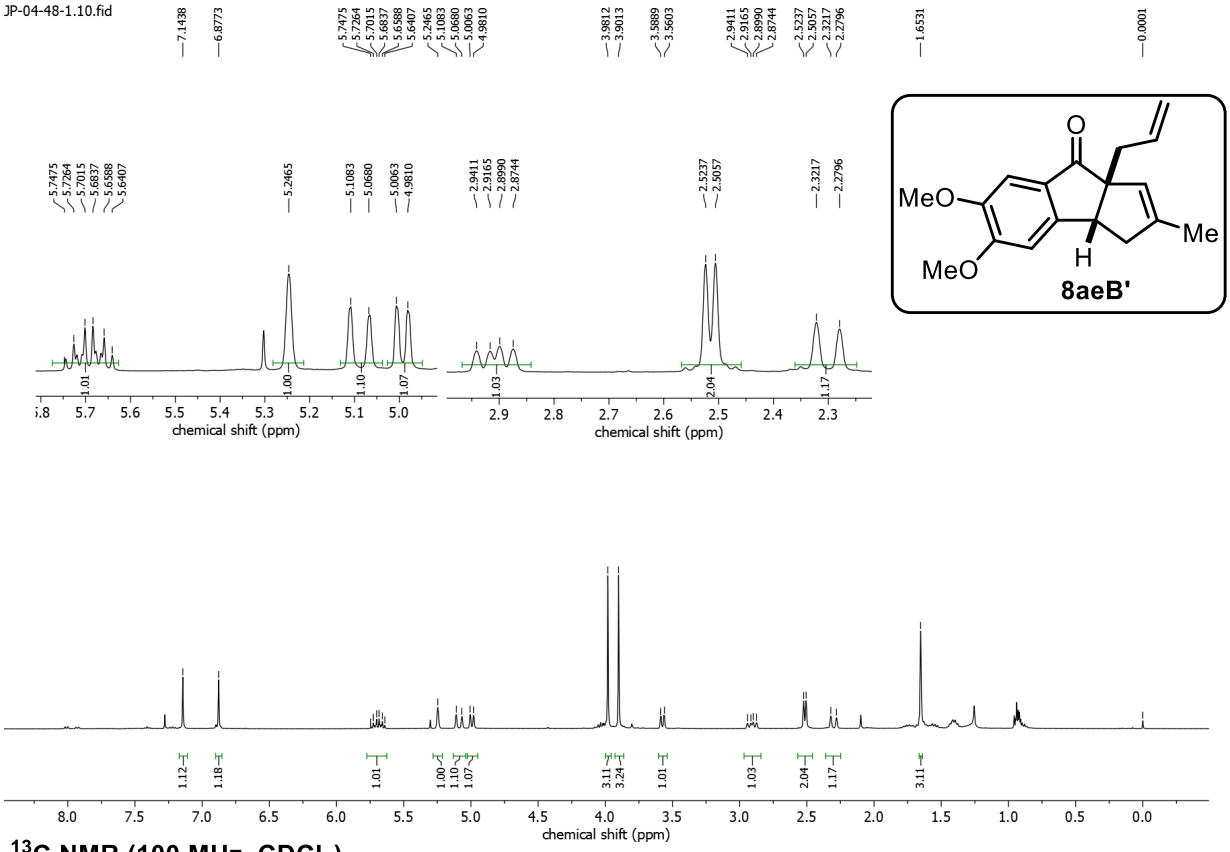
^{1}H NMR (400 MHz, $CDCl_3$)



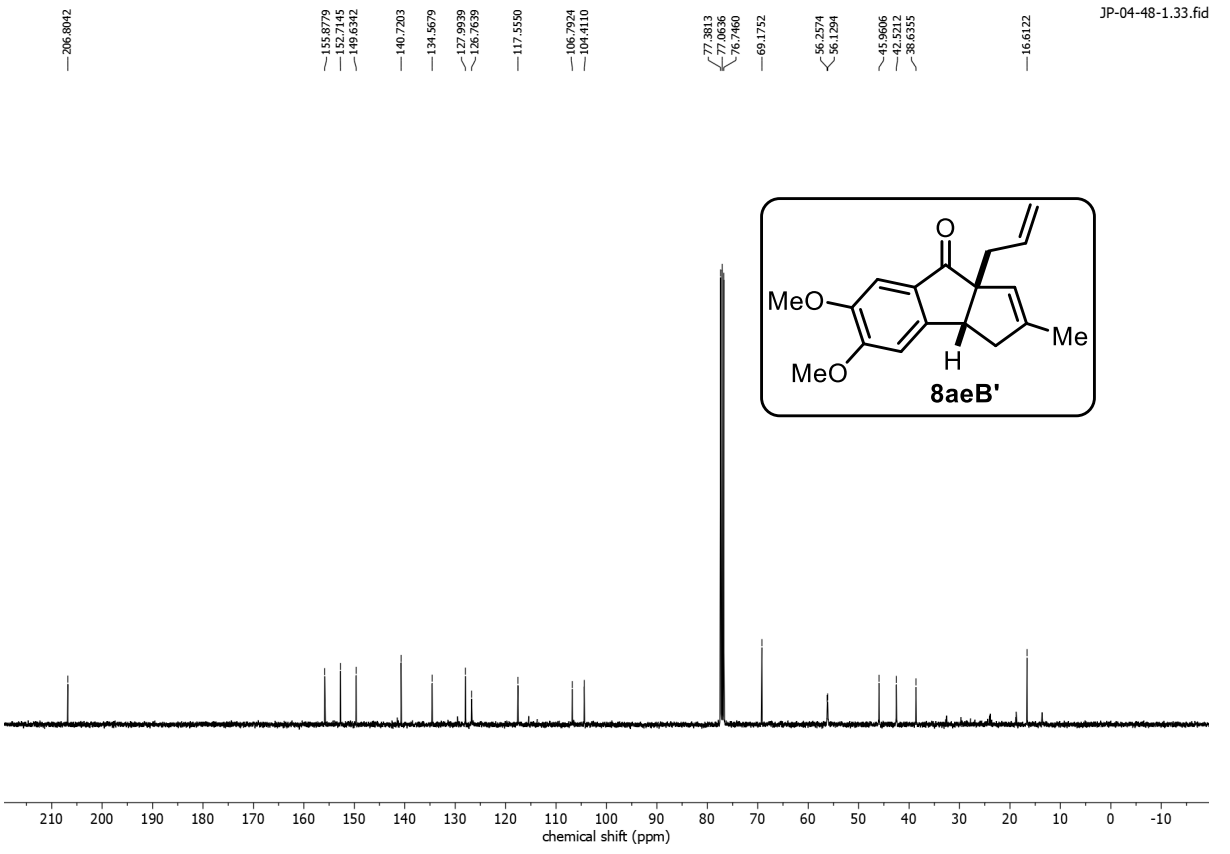
^{13}C NMR (100 MHz, $CDCl_3$)



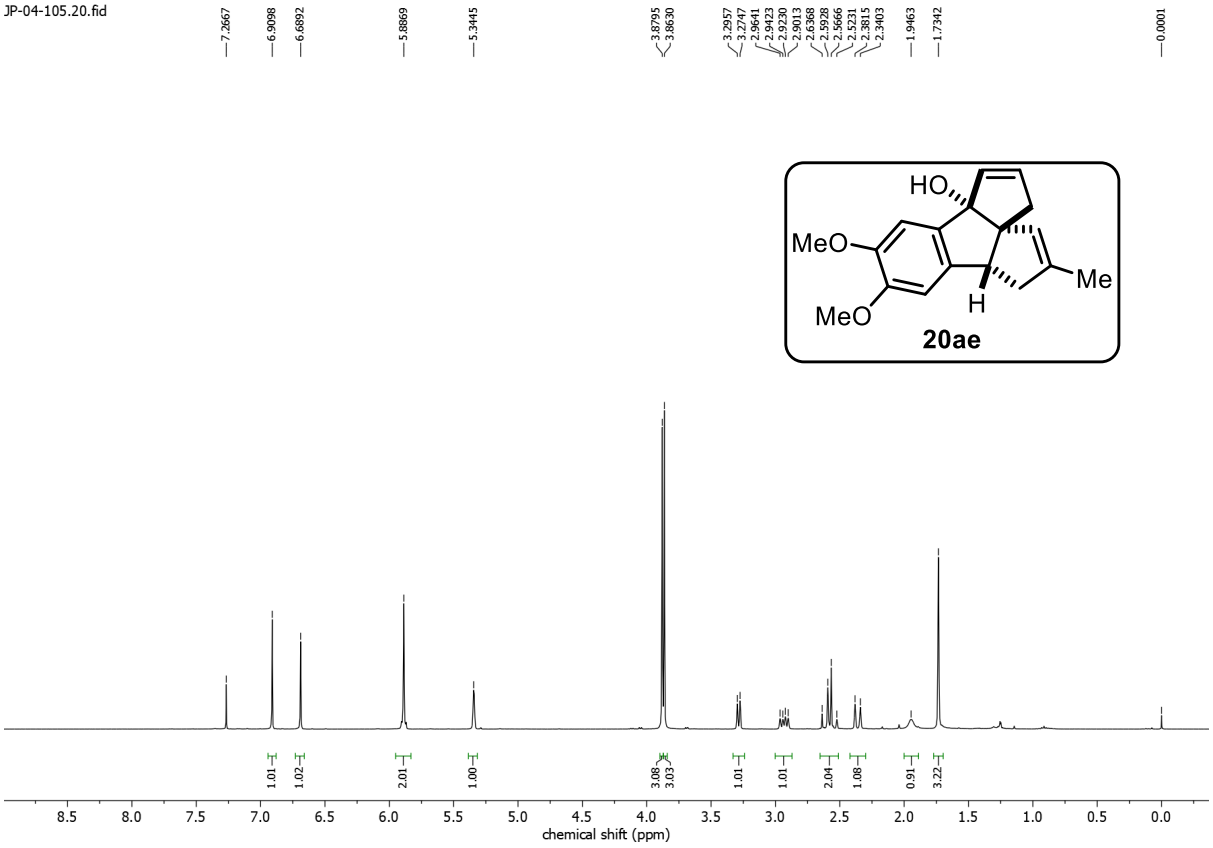
^{1}H NMR (400 MHz, $CDCl_3$)



^{13}C NMR (100 MHz, $CDCl_3$)



^{1}H NMR (400 MHz, $CDCl_3$)



^{13}C NMR (100 MHz, $CDCl_3$)