Supporting Information

DDQ Promoted Metal-Free Oxidative Cascade Synthesis of Acridinyl Ketones and 4-Benzoylacridinones from C4-Functionalized 1,2,3,4-Tetrahydroacridines

Thangellapally Shirisha,[a]* Ankita Parida,[b]* Subir Majhi,[b]* Sagar Ghosh,[b] Dhurke Kashinath[b]**

[a]*Department of Physical Sciences, Kakatiya Institute of Technology and Science (Autonomous), Warangal-506015, India.*

[b]*Department of Chemistry, National Institute of Technology, Warangal-506 004, India.*

E-mail: kashinath@nitw.ac.in, kashinath.dhurke@gmail.com; Tel: +91-870-2462677.

Contents

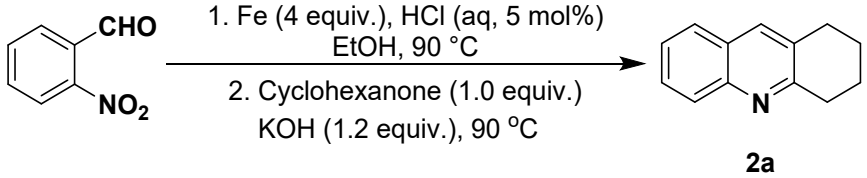
1. General information

Unless otherwise stated, all commercials were used as received. All reagents and solvents were commercially available and used without further purification unless specified. All the solvents were dried and distilled according to standard procedures. Column chromatography was performed using silica gel (100-200 mesh). Analytical thin-layer chromatography (TLC) was performed on pre-coated 0.2 mm thick Merk 90 F_{245} silica plates, and various combinations of ethyl acetate and petroleum ether were used as eluent. All reactions were carried out with magnetic stirring and in dried glassware. Nuclear magnetic resonance (NMR) spectra are recorded in parts per million from internal tetramethyl silane on a d scale. ^{1}H NMR and ^{13}C NMR spectra were recorded in $CDCl_3$ on a Bruker 400 MHz, respectively. All chemical shift values are quoted in ppm and coupling constants in Hz. The solvent peak was used as a reference value for ^{1}H NMR: TMS = 0.00 ppm, $CDCl_3$ = 7.26 or DMSO-d_6 = 2.50 ppm; for ^{13}C NMR: $CDCl_3$ = 77.00 ppm or DMSO-d_6 = 39.52 ppm. The following was used to explain multiplicities: s = singlet, d = doublet, dd = doublet of doublet, t = triplet, td = triplet of doublet, q = quartet, m = multiplet, and br = broad. High-resolution mass spectra (HRMS) were obtained on an Agilent mass spectrometer using ESI-TOF (electrospray ionization-time of flight).

2. General procedure for the synthesis of the product 2a-2q

All the 1,2,3,4-Tetrahydroacridine derivatives were synthesized according to the literature reports.[1]

Procedure for the synthesis of compound 2a

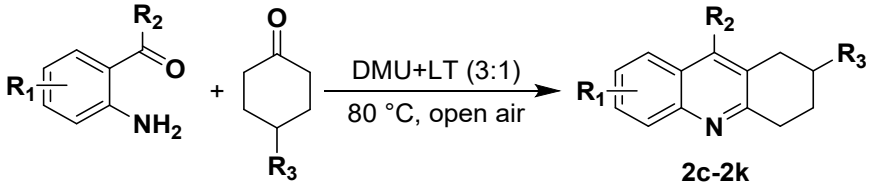


2a

To a solution of *o*-nitro benzaldehyde (604 mg. 4.0 mmol, 1 equiv.) in ethanol (12 mL) was added iron powder (4.0 equiv.), followed by 0.1 N aq. HCl (5 mol%) and the resulting mixture was vigorously stirred

at 90 °C in an oil bath for 1 h. After checking the TLC for the completion of the reduction reaction cyclohexanone (1 equiv.) and powdered KOH (1.0 equiv.) were added. (***Caution!*** Potential exotherm; add KOH slowly). Then the reaction mixture was stirred at 90 °C in an oil bath for 4-8 h. After completion of the reaction, the reaction mixture was cooled to rt, diluted with CH_2Cl_2 (50 mL), and filtered through a celite pad. The filtrate was washed with water (20 mL) and the aqueous phase was back-extracted with CH_2Cl_2 (3 x 15 mL). The combined organic layer was dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude material was purified by isocratic column chromatography over silica gel to afford the desired 1,2,3,4-tetrahydroacridine product in 95% yield.[1a]

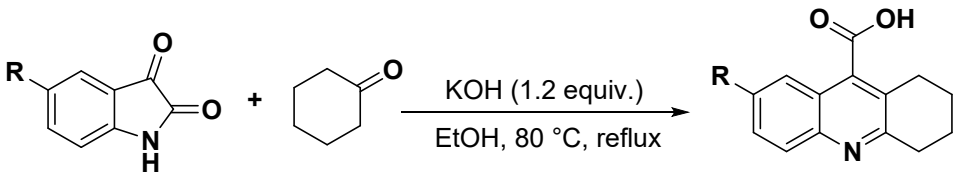
Procedure for the synthesis of compound 2c-2k



2c-2k

In a round-bottom flask, 0.75g of Deep Eutectic Solvent (DES) was prepared by heating *N,N'*-dimethyl urea (0.488g) + L-(+)-tartaric acid (0.278g) in a heating mantle at 80 °C for 30 min. To this melt, substituted 2-aminoacetophenone (0.231g, 1 mmol, 1 equiv.), and cyclohexanone or its derivatives (1 equiv.) were added and heating was continued for another 1-2 h at 80 °C in an oil bath. After completion of the reaction (monitoring by TLC), washed with water (20 mL), and the aqueous phase was back-extracted with CH_2Cl_2 (3 x 15 mL). The combined organic layer was dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude material was purified by column chromatography over silica gel to afford the desired products **2c-2k** in 80-96% of yield.[1b]

Procedure for the synthesis of 1,2,3,4-tetrahydroacridine-9-carboxylic acids

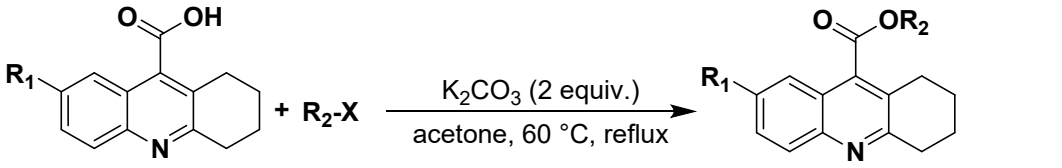


R = H or Cl

A mixture of isatin (1.47g, 0.01mol, 1 equiv.) and cyclohexanone (1.0 equiv.) in 50% EtOH (15 mL) containing KOH (1.2 equiv.) was heated in an oil bath at 80 °C under reflux for 4h. The resulting mixture was diluted with 50% aqueous EtOH to obtain a homogeneous mixture and acidified with AcOH. The

resulting precipitate was collected and washed with aq. EtOH, recrystallized from DMF to give the corresponding acid derivative as a pale-yellow solid in 87% yield.[1c]

Procedure for the synthesis of compounds 2l, 2o and 2q

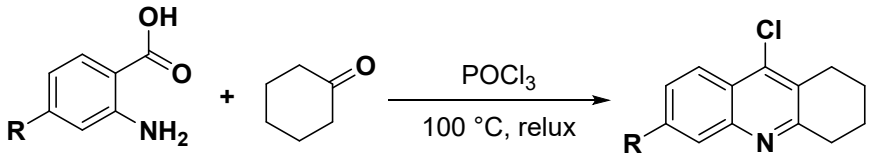


R_1 = H or Cl
R_2 = -CO_2Me, -CO_2CH_2Ph

R_1 = H, R_2 = -CO_2Me; 2l
R_1 = Cl, R_2 = -CO_2Me; 2o
R_1 = H, R_2 = -CO_2CH_2Ph; 2q

The corresponding 1,2,3,4-Tetrahydroacridine-9-carboxylic acid (682 mg, 3 mmol, 1 equiv.) and potassium carbonate (2 equiv.) were weighed into a round-bottom flask, followed by the addition of the corresponding alkyl halide (1.1 equiv.) and acetone (5 mL). The reaction mixture was refluxed with magnetic stirring in an oil bath at 60 °C and continued until the completion of the reaction. The solvent was evaporated in vacuo and water was added to the reaction mixture. The aqueous phase was back-extracted with CH_2Cl_2 (3 x 15 mL) and dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude material was purified by column chromatography over silica gel to afford the desired products **2l**, **2o**, and **2q** in 78-82% yield.[1d]

Procedure for the synthesis of compounds 5a and 5b



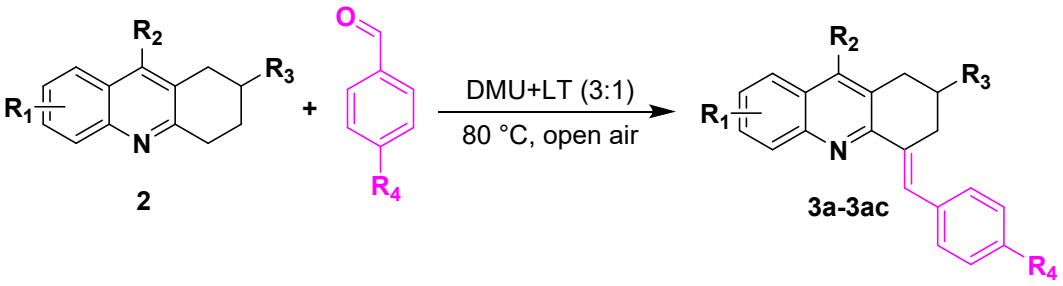
R = H, Br

R = H; 5a
R = Br; 5b

$POCl_3$ (25 mL) was added dropwise using a constant pressure dropping funnel to an ice-cooled mixture of anthranilic acid (3.2 g, 23.3 mmol, 1 equiv.) and cyclohexanone (1.2 equiv.). Then, the reaction mixture was heated in an oil bath at 100 °C for 3 h. After completion of the reaction, the reaction mixture was

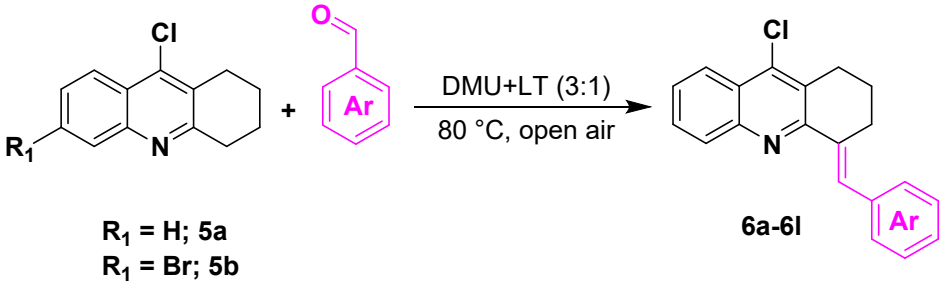
cooled to rt. Then, the solvent was reduced in a vacuum and the ethyl acetate was added to the residue and neutralized with 1(N) K_2CO_3 solution, and brine, and the organic layer was dried over anhydrous Na_2SO_4. The crude material was purified by column chromatography over silica gel (eluent: hexane/ethyl acetate, 8:2, v/v) to afford the desired products in 75-87% yield.[1e]

General procedure for the synthesis of compounds (3a-3ac):



In a round-bottom flask, 0.75g of Deep Eutectic Solvent (DES) was prepared by heating *N,N'*-dimethyl urea (0.488g) + L-(+)-tartaric acid (0.278g) in a heating mantle at 80 °C for 30 min. To this, various substituted 1,2,3,4-tetrahydroacridines (1 mmol) and the corresponding aromatic aldehyde (1.0 mmol) were added and heating continued for another 2-3 hours at 80 °C in an oil bath. The completion of the reaction was monitored by TLC. After completion of the reaction, the crude products obtained were purified by column chromatography on silica gel using petroleum ether-ethyl acetate as eluent to give the final compounds **3a-3ac**.[2a]

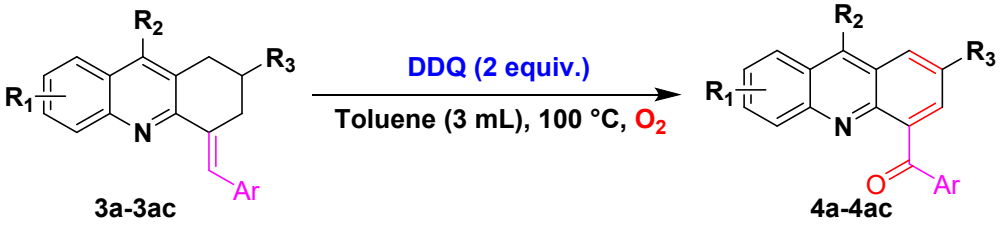
General procedure for the synthesis of compounds (6a-6l):



In a round-bottom flask, 0.75g of Deep Eutectic Solvent (DES) was prepared by heating *N,N'*-dimethyl urea (0.488g) + L-(+)-tartaric acid (0.278g) in a heating mantle at 80 °C for 30 min. To this, **5a** or **5b** (1.0 mmol) and aromatic aldehyde (1.0 mmol) were added and heating continued for another 2-3 hours at 80

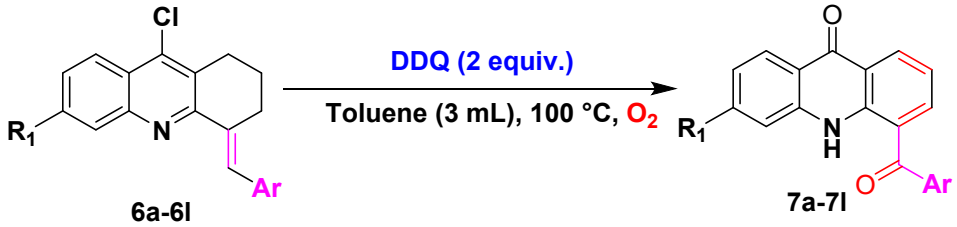
°C in an oil bath. The completion of the reaction was monitored by TLC. After completion of the reaction, the crude products obtained were purified by column chromatography on silica gel using petroleum ether-ethyl acetate as eluent to give the final compounds **6a-6l**.[2b]

General procedure for the synthesis of compounds (4a-4ac):



To a solution of various substituted (*E*)-4-benzylidene-1,2,3,4-tetrahydroacridines in 3mL of toluene was treated with 2 equiv. of DDQ. The mixture was stirred under a molecular O_2 atmosphere (O_2 balloon) for 1-2 h at 100 °C. Upon completion (monitored by TLC), the solvent was removed under reduced pressure. The residue was washed with water, (20 mL) and the aqueous phase was back-extracted with CH2Cl2 (3 x 15 mL). The combined organic layer was dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude material was purified by column chromatography over silica gel to afford the desired products 4a-4u in 64-85% of yield.

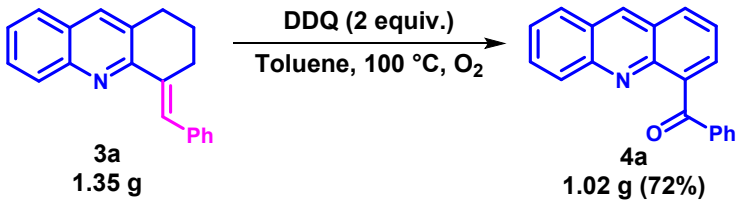
General procedure for the synthesis of compounds (7a-7l):



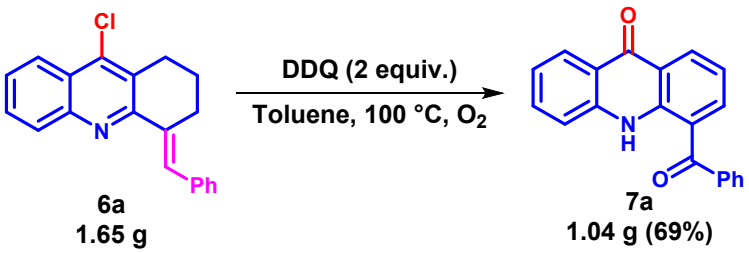
To a solution of various substituted (*E*)-4-benzylidene-9-chloro-1,2,3,4-tetrahydroacridine (0.5 mmol) in 3mL of toluene was treated with 2 equiv. of DDQ. The mixture was stirred under a molecular O_2 atmosphere (O_2 balloon) for 1-2 h at 100 °C. Upon completion (monitored by TLC), the solvent was removed under reduced pressure. The residue was washed with water (20 mL), and the aqueous phase was back-extracted with CH_2Cl_2 (3 x 15 mL). The combined organic layer was dried over Na_2SO_4, filtered,

and concentrated in vacuo. The crude material was purified by column chromatography over silica gel to afford the desired products 4a-4u in 64-85% of yield.

Gram-scale synthesis of compounds 4a and 7a



A 100 mL round-bottom flask was charged with **3a** (1.35 g, 5.0 mmol) and DDQ (2.27 g, 10.0 mmol). Toluene (30 mL) was added, and the mixture was stirred under a molecular O_2 atmosphere (O_2 balloon) at 100 °C and stirred vigorously for 16 h. After cooling to room temperature, the solvent was removed *in vacuo*. The crude residue was purified by flash column chromatography on silica gel to afford **4a** as a yellow solid (1.02 g, 72% yield).



A 100 mL round-bottom flask was charged with **6a** (1.65 g, 5.0 mmol) and DDQ (2.27 g, 10.0 mmol). Toluene (30 mL) was added, and the mixture was stirred under a molecular O_2 atmosphere (O_2 balloon) at 100 °C and stirred vigorously for 15 h. Upon completion, the reaction mixture was cooled and the solvent was removed under reduced pressure. The crude material was purified by flash column chromatography on silica gel to afford the acridone product (**7a**) as a pale-yellow solid (1.04 g, 69% yield).

Table 1: Detailed Optimization Screening and Additive Studies

S. No.	Oxidant (2 equiv.)	Additive (20 mol%)	Solvent	Temp (°C)	Time (h)	Yield (%)[b]
1	DDQ		Toluene	80	6	30
2	DDQ		ACN	80	6	10
3	DDQ		DCE	80	6	20
4	DDQ		THF	80	6	Trace
5	DDQ		1,4-Dioxane	80	6	ND[c]

6	DDQ		DMSO	100	6	ND
7	DDQ		DMF	100	6	ND
8	DDQ[d]		Toluene	100	2	40
9	DDQ (4 equiv.)		Toluene	100	2	40
10	DDQ (6 equiv.)		Toluene	100	2	40
11	DDQ (O_2 atm)		Toluene	100	1	78[e]±2
12	DDQ (N_2 atm)		Toluene	100	2	Trace
13	DDQ (O_2 atm)	TBN	Toluene	100	3	ND
14	DDQ (O_2 atm)	$NaNO_2$	Toluene	100	4	ND
15	DDQ (O_2 atm)	*m*-CPBA	Toluene	100	4	ND
16	DDQ (O_2 atm)	TBHP	Toluene	100	4	ND
17	DDQ (O_2 atm)	DMP	Toluene	100	4	ND
18	DDQ (O_2 atm)	$PhI(OAc)_2$	Toluene	100	5	ND

[a]Reaction conditions: The reaction was carried out with **3a** (0.5 mmol) and DDQ (2 equiv.) in 3 mL toluene under molecular O_2 atmosphere and conditions mentioned in the table. [b]Isolated yield. [c]Not detected. [d]Open air. [e]Isolated yield is the average of three runs (n = 3).

Experimental Details for the $AgNO_3$ Test

This section provides the precise method used for the control experiment that confirms Cl^- release.

Control Experiment for Chloride Release:

The reaction mixture containing the 9-chloro substrate **6a** (1 mmol) and DDQ (2 mmol) in Toluene (5 mL) was heated at 100 °C under O_2. After 15 min, a small aliquot of the solution was extracted, cooled, and immediately diluted with MeOH (1 mL). This solution was then added dropwise to an aqueous solution of silver nitrate ($AgNO_3$, 0.1 M). The instantaneous formation of a heavy, white, curdy precipitate was observed. This precipitate was identified as silver chloride (AgCl), confirming the release of chloride ions (Cl^-) from the C9 position during the oxidative cascade.

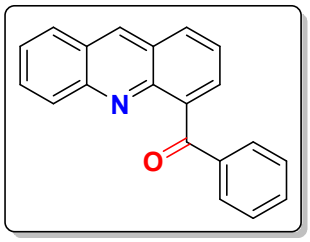
References

1. (a) A.-H. Li, E. Ahmed, X. Chen, M. Cox, A. P. Crew, H.-Q. Dong, M. Jin, L. Ma, B. Panicker, K. W. Siu, A. G. Steinig, K. M. Stolz, P. A. R. Tavares, B. Volk, Q. Weng, D. Werner, M. J. A. Mulvihill, *Org. Biomol. Chem.*, 2007, **5**, 61–64. (b) N. Satyanarayana, K. Sathish, S. Nagaraju, R. Pawar, M. Faizan, M. Arumugavel, T. Shirisha, D. Kashinath, *New J. Chem*., 2022, **46***,* 1637-1642. (c) A. Sharma, S. Jain, R. Sirohi, D. Kishore, *Org. Chem. Int.,* 2011, 1–5. (d) Y. Wu, Z. Chen, Y. Liu, L. Yu, L. Zhou, S. Yang, L. Lai, *Bioorg. Med. Chem.,* 2011, **19**, 3361–3366. (e) D. Wang, M.

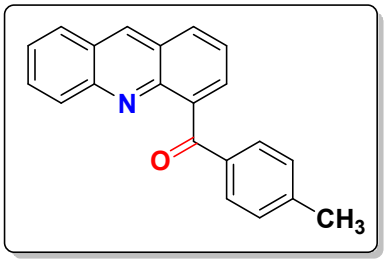
Hu, X. Li, D. Zhang, C. Chen, J. Fu, S. Shao, G. Shi, Y. Zhou, S. Wu, T. Zhang, *Eur. J. Med. Chem*., 2019, **168**, 207-220.

2. (a) T. Shirisha, S. Majhi, K. Divakar, D. Kashinath, *New J. Chem.*, 2025, **49**, 1072–1082; (b) T. Shirisha, S. Majhi, K. Divakar, D. Kashinath, *Org. Biomol. Chem.*, 2024, **22**,790–804.

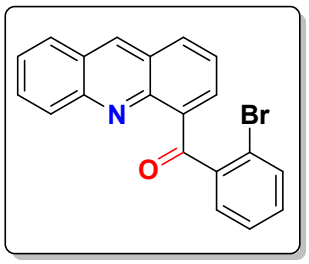
Characterization data



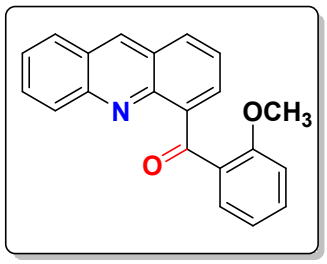
Acridin-4-yl(phenyl)methanone (4a): Yellow solid; yield: 78%; mp: 130.5 °C; **FT-IR (KBr) ν (cm^{-1});** 3064, 2864, 1727, 1664,1520, 1413, 1217, 1023, 990;**^{1}H NMR (400 MHz, CDCl$_3$) δ** 8.84 (s, 1H), 8.25 – 8.16 (m, 1H), 8.04 – 7.98 (m, 2H), 7.91 – 7.88 (m, 1H), 7.87 – 7.82 (m, 1H), 7.66 – 7.61 (m, 2H), 7.59 – 7.53 (m, 2H), 7.46 (d, *J* = 7.2 Hz, 1H), 7.44 (s, 1H), 7.38 – 7.35 (m, 1H). **^{13}C{^{1}H} NMR δ** 197.66, 148.35, 148.20, 147.15, 136.12, 133.48, 131.47, 129.55, 129.16, 128.84, 128.75, 128.38, 125.85. **HRMS** (ESI) calculated for $C_{20}H_{14}NO^+$ $[M+H]^+$ 284.1070, found. 284.1082.



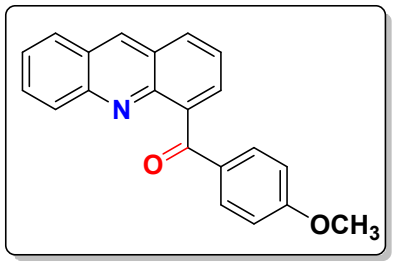
Acridin-4-yl(p-tolyl)methanone (4b): Light yellow solid; yield: 80%; mp: 154.9 °C; **FT-IR (KBr) ν (cm^{-1})** 3034, 2991, 2853, 1725, 1644, 1605, 1549, 1526, 1425, 1345, 1270, 1220, 1039, 985; **^{1}H NMR (400 MHz, CDCl$_3$) δ** 8.82 (d, *J* = 5.6 Hz, 1H), 8.23 (d, *J* =9.2 Hz, 1H), 8.03 – 7.99 (m, 1H), 7.95 – 7.89 (m, 1H), 7.83 – 7.80 (m, 1H), 7.54 – 7.49 (m, 2H), 7.46 (d, *J* = 5.6 Hz, 2H), 7.18 (d, *J* = 8.0 Hz, 2H), 6.52 (s, 1H), 2.35 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$) δ** 197.81, 147.64, 147.19, 140.71, 140.10, 137.00, 136.68, 135.81, 130.65, 129.26, 129.00, 128.89, 128.06, 127.75, 126.86, 126.05, 125.44, 21.14; **HRMS** (ESI) calculated for $C_{21}H_{16}NO^+$ $[M+H]^+$ 298.1226, found 298.1230.



Acridin-4-yl(2-bromophenyl)methanone (4c): Yellow solid; yield: 84% ; mp: 201.4 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 3021, 2981, 1728, 1621, 1601, 1523, 1422, 1312, 1220, 1001, 923; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.83 (s, 1H), 8.28 (d, *J* = 8.8 Hz, 1H), 8.03 (dd, *J* = 8.8, 1.6 Hz, 1H), 7.92 (ddd, *J* = 7.6, 5.6, 1.2 Hz, 2H), 7.86 – 7.82 (m, 1H), 7.62 (dd, *J* = 8.4, 1.2 Hz, 1H), 7.61 – 7.57 (m, 1H), 7.41 – 7.36 (m, 2H), 7.22 (dd, *J* = 5.6, 1.6 Hz, 1H), 7.04 (s, 1H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 199.14, 147.40, 141.58, 138.61, 137.16, 132.60, 130.82, 129.62, 129.27, 128.97, 128.76, 128.12, 128.05, 127.79, 127.00, 126.46, 126.13, 125.45, 123.41. **HRMS** (ESI) calculated for $C_{20}H_{13}BrNO^+$ $[M+H]^+$ 362.0175, found: 364.0324.

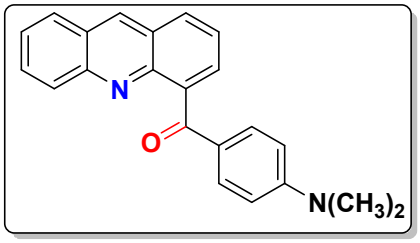


Acridin-4-yl(2-methoxyphenyl)methanone (4d): Yellow solid; yield: 80% ; mp: 195.6 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 2991, 2853, 1738, 1605, 1526, 1425, 1270, 1005, 885; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.78 (d, *J* = 8.0 Hz, 1H), 8.49 (d, *J* = 8.4 Hz, 1H), 8.11 (d, *J* = 7.6 Hz, 1H), 7.75 (t, *J* = 8.8 Hz, 2H), 7.54 – 7.50 (m, 2H), 7.41 (m, 3H), 7.32 (m, 1H), 7.03 (d, *J* = 8.8 Hz, 1H), 3.92 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 198.06, 163.32, 152.88, 151.64, 141.78, 140.24, 139.64, 134.26, 133.66, 132.27, 131.09, 129.31, 129.14, 128.81, 127.12, 122.75, 120.87, 119.56, 117.84, 113.88, 55.62. **HRMS** (ESI) calculated for $C_{21}H_{16}NO_2^+$ $[M+H]^+$ 314.1176, found 314.1183.

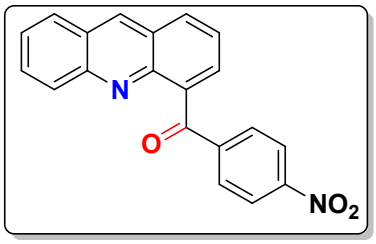


Acridin-4-yl(4-methoxyphenyl)methanone (4e): Yellow solid; yield: 82% ; mp: 203.7 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 2968, 2921, 1738, 1618, 1285, 1175, 1008, 753; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.78 (dt, *J* = 8.0, 2.0 Hz, 1H), 8.49 (dd, *J* = 8.0, 2.0 Hz, 1H), 8.11 (dd, *J* = 7.6, 2.0 Hz, 1H), 7.77 (d, *J* = 6.8 Hz, 1H),

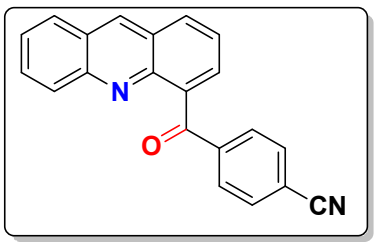
7.51 (m, 3H), 7.41 (m, 4H), 7.03 (d, J = 6.8 Hz, 1H), 3.93 (s, 3H); **$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ** 198.08, 163.32, 152.25, 151.85, 139.60, 134.20, 133.68, 132.26, 129.37, 129.16, 128.83, 127.14, 122.72, 119.52, 117.82, 113.88, 112.18, 111.74, 109.73, 101.34, 55.62. **HRMS** (ESI) calculated for $C_{21}H_{16}NO_2^+$ $[M+H]^+$ 314.1176, found 314.1183.



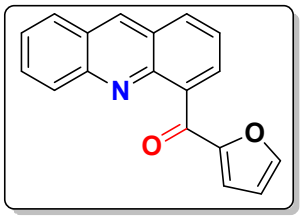
Acridin-4-yl(4-(dimethylamino)phenyl)methanone (4f): Yellow solid; yield: 81%; mp: 182.4 °C; **FT-IR (KBr) ν (cm^{-1});** 2928, 2889, 1715, 1659, 1452, 1165, 1067, 819; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.79 (s, 1H), 8.09 (dt, J = 8.8, 2.0 Hz, 2H), 7.97 (d, J = 8.4 Hz, 1H), 7.81 – 7.77 (m, 2H), 7.75 (dd, J = 6.8, 1.6 Hz, 1H), 7.69 – 7.65 (m, 1H), 7.60 – 7.56 (m, 1H), 7.52 – 7.49 (m, 1H), 6.62 – 6.58 (m, 2H), 3.04 (s, 6H); **$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ** 196.08, 153.55, 149.20, 147.08, 140.50, 135.72, 132.67, 131.07, 130.44, 129.96, 129.34, 128.47, 127.87, 126.60, 126.20, 126.03, 124.81, 121.73, 110.48, 40.03. **HRMS** (ESI) calculated for $C_{22}H_{19}N_2O^+$ $[M+H]^+$ 327.1492, found 327.1504.



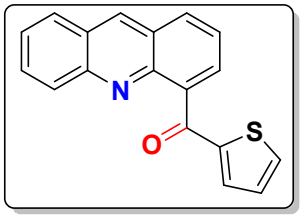
Acridin-4-yl(4-nitrophenyl)methanone (4g): Yellow solid; yield: 64%; mp: 138.5 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 2968, 2921, 1738, 1618, 1285, 1175, 1008, 753; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.43 (s, 1H), 8.26 – 8.22 (m, 1H), 8.13 (t, J = 8.8 Hz, 2H), 7.82 (d, J = 6.2 Hz, 1H), 7.76 (d, J = 8.4 Hz, 1H), 7.69 – 7.64 (m, 1H), 7.61 (d, J = 7.2 Hz, 1H), 7.54 – 7.50 (m, 1H), 7.50 – 7.47 (m, 1H), 7.47 – 7.43 (m, 2H). **$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ** 191.43, 153.01, 146.69, 146.41, 144.40, 138.99, 137.79, 135.03, 130.38, 129.86, 129.43, 128.80, 127.74, 127.57, 127.47, 124.08, 123.66, 123.53. **HRMS** (ESI) calculated for $C_{20}H_{13}N_2O^+$ $[M+H]^+$ 329.0921, found 329.0901.



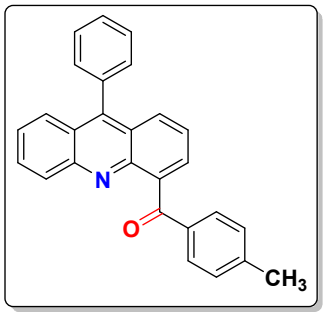
4-(Acridine-4-carbonyl)benzonitrile (4h): Yellow solid; yield: 67% ; mp: 158.7 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 2975, 2923, 2219, 1742, 1610, 1275, 1184, 1007, 841; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.79 (s, 1H), 8.45 (s, 1H), 8.08 (dd, *J* = 8.4, 1.6 Hz, 1H), 7.99 (d, *J* = 6.8 Hz, 1H), 7.94 (dd, *J* = 8.8, 1.2 Hz, 1H), 7.85 (d, *J* = 8.4 Hz, 2H), 7.80 (dd, *J* = 7.2, 1.6 Hz, 1H), 7.75 – 7.73 (m, 2H), 7.35 (m, 2H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 194.68, 154.19, 148.17, 146.42, 144.62, 136.47, 135.46, 134.05, 132.29, 131.73, 130.86, 130.23, 129.27, 128.85, 128.73, 128.32, 127.87, 126.32, 125.75, 118.65, 112.03. **HRMS** (ESI) calculated for $C_{21}H_{13}N_2O^+$ $[M+H]^+$ 309.1022, found 309.1011.



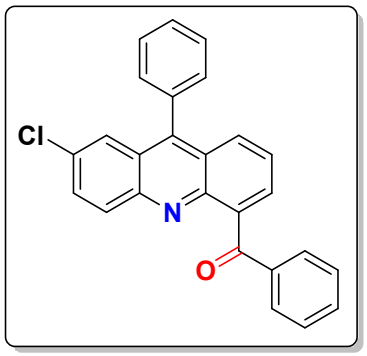
Acridin-4-yl(furan-2-yl)methanone (4i): Yellow solid; yield: 78%; mp: 201.4 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 2924, 2850, 1725, 1654, 1530, 1451, 1265, 1165, 1067, 819; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.77 (t, *J* = 4.8 Hz, 2H), 8.27 (d, *J* = 8.8 Hz, 1H), 8.04 – 7.98 (m, 3H), 7.81 (ddd, *J* = 8.8, 6.4, 1.6 Hz, 1H), 7.75 (d, *J* = 5.2 Hz, 1H), 7.62 (t, *J* = 8.0 Hz, 1H), 7.59 – 7.55 (m, 1H), 6.28 (d, *J* = 5.2 Hz, 1H);**^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 170.71, 149.54, 148.57, 146.68, 145.99, 136.57, 133.22, 130.68, 130.59, 129.74, 129.64, 128.11, 126.69, 126.47, 126.12, 125.95, 117.85, 109.63. **HRMS** (ESI) calculated for $C_{18}H_{12}NO_2^+$ $[M+H]^+$ 274.0863, found 274.0873.



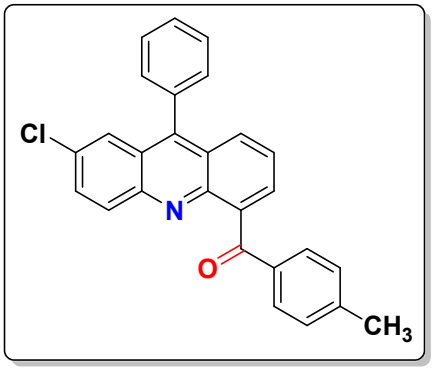
Acridin-4-yl(thiophen-2-yl)methanone (4j): Yellow solid; yield: 75% ; mp: 196.7 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 2932, 2857, 1745, 1632, 1452, 1252, 1135, 1073, 823; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.79 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.47 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.38 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.81 (m, 1H), 7.76 – 7.62 (m, 3H), 7.41 (d, *J* = 8.0 Hz, 1H), 7.32 (d, *J* = 7.6 Hz, 2H), 7.24 – 7.22 (m, 1H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** ^{13}C NMR (101 MHz, $CDCl_3$) δ 177.87, 143.65, 141.38, 140.13, 138.03, 135.05, 134.62, 134.11, 133.84, 128.16, 127.12, 122.65, 121.90, 120.97, 119.60, 117.71. **HRMS** (ESI) calculated for $C_{18}H_{12}NOS^+$ $[M+H]^+$ 290.0634, found 290.0635.



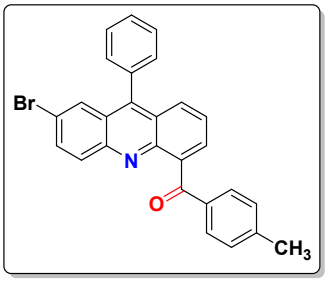
(9-Phenylacridin-4-yl)(p-tolyl)methanone (4k): Yellow solid; yield: 74%; mp: 168.9 °C; **FT-IR (KBr) ν (cm^{-1})** 3040, 2918, 2854,1725, 1645, 1605, 1554, 1513, 1421, 1348, 1273, 1219, 1039, 981, 920, 810; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.03 (d, *J* = 8.8 Hz, 1H), 7.83 – 7.80 (m, 2H), 7.76 (dd, *J* = 6.4, 1.2 Hz, 1H), 7.64 (m, 5H), 7.50 – 7.45 (m, 3H), 7.41 – 7.32 (m, 2H), 7.22 (d, *J* = 8.0 Hz, 2H), 2.41 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 198.09, 148.76, 146.97, 146.72, 143.85, 139.85, 135.91, 135.81, 130.49, 130.44, 130.38, 129.81, 128.99, 128.64, 128.54, 128.49, 126.59, 126.07, 125.12, 124.90, 124.65, 21.77; **HRMS** (ESI) calculated for $C_{27}H_{20}NO^+$ $[M+H]^+$ 374.1539, found 374.1553.



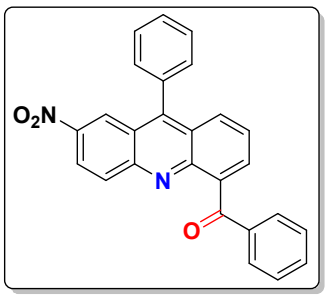
(7-Chloro-9-phenylacridin-4-yl)(phenyl)methanone (4l): Pale yellow solid; **yield:** 65%; **mp:** 163.7 °C; **FT-IR (KBr) ν (cm^{-1});** 2924, 2850, 1725, 1654, 1530, 1451, 1265, 1165, 1067, 819; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 7.98 (d, *J* = 9.2 Hz, 1H), 7.93 (dt, *J* = 7.2, 1.2 Hz, 2H), 7.87 – 7.81 (m, 2H), 7.70 – 7.63 (m, 4H), 7.62 – 7.57 (m, 2H), 7.54 (dd, *J* = 8.8, 6.8 Hz, 1H), 7.50 – 7.42 (m, 4H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 198.12, 146.98, 146.71, 146.30, 139.68, 138.28, 133.10, 132.11, 131.20, 130.40, 130.16, 129.01, 128.84, 128.78, 128.30, 125.78, 128.30, 125.47, 125.36, 125.15, 124.83**; HRMS** (ESI) calculated for $C_{26}H_{17}ClNO^+$ $[M+H]^+$ 394.0993, found 394.1007.



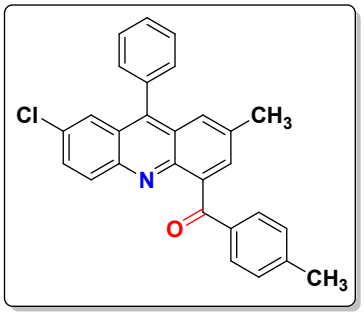
(7-chloro-9-phenylacridin-4-yl)(p-tolyl)methanone (4m): Yellow solid; yield: 70%; mp: 132.4 °C; FT-IR (KBr) ν (cm^{-1}) ; 3033, 2963, 1728, 1662, 1567, 1439, 1223, 1141, 1051, 958,761; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.00 (d, *J* = 9.2 Hz, 1H), 7.83 – 7.77 (m, 4H), 7.67 – 7.61 (m, 4H), 7.57 (dd, *J* = 9.2, 2.4 Hz, 1H), 7.50 (dd, *J* = 8.8, 6.8 Hz, 1H), 7.46 – 7.42 (m, 2H), 7.22 (d, *J* = 8.0 Hz, 2H), 2.41 (s, 3H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 197.91, 146.42, 145.74, 145.17, 144.04, 139.58, 135.75, 135.41, 135.32, 132.06, 131.95, 130.70, 130.39, 129.04, 128.71, 126.59, 125.63, 125.24, 124.74, 22.02, 21.79; **HRMS** (ESI) calculated for $C_{27}H_{19}ClNO^+$ $[M+H]^+$ 408.1150, found 408.1153.



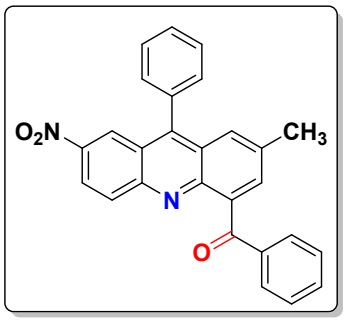
(7-Bromo-9-phenylacridin-4-yl)(p-tolyl)methanone (4n): Pale yellow solid; yield: 71%; mp: 106.8 °C; **FT-IR (KBr) ν (cm^{-1})** 2920, 2845, 1720, 1645, 1531, 1450, 1268, 1156, 1057, 823; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 7.90 (d, *J* = 9.2 Hz, 1H), 7.80 (d, *J* = 8.8 Hz, 3H), 7.70 – 7.61 (m, 4H), 7.56 – 7.48 (m, 2H), 7.47 – 7.40 (m, 3H), 7.23 – 7.20 (m, 2H), 2.41 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 197.71, 147.08, 146.80, 146.20, 144.03, 139.93, 135.75, 135.09, 133.47, 132.19, 130.40, 130.35, 129.06, 128.83, 128.77, 128.58, 128.32, 126.00, 125.37, 125.14, 120.51, 21.79. **HRMS** (ESI) calculated for $C_{27}H_{19}BrNO^+$ $[M+H]^+$ 452.0645, found 452.0637.



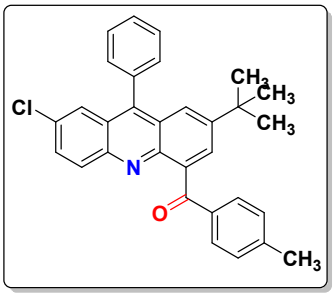
(7-Nitro-9-phenylacridin-4-yl)(phenyl)methanone (4o): Yellow solid; yield: 64%; mp: 141.5 °C; **FT-IR (KBr) ν (cm^{-1})** 3044, 2921, 2857,1727, 1654, 1559, 1516, 1429, 1350, 1277, 1221, 1040, 980; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.69 (m, 1H), 8.37 (dd, *J* = 9.2, 2.4 Hz, 1H), 8.13 (d, *J* = 9.6 Hz, 1H), 7.93 – 7.91 (m, 2H), 7.91 – 7.89 (m, 2H), 7.71 – 7.70 (m, 1H), 7.69 (m, 2H), 7.63 – 7.58 (m, 2H), 7.50 – 7.48 (m, 2H), 7.47 – 7.43 (m, 2H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 197.57, 151.16, 149.27, 148.61, 145.20, 139.85, 138.05, 134.10, 133.34, 132.39, 130.78, 130.40, 130.14, 129.53, 129.01, 128.41, 126.14, 125.43, 124.64, 123.43, 122.82; **HRMS** (ESI) calculated for $C_{26}H_{17}N_2O_3^+$ $[M+H]^+$ 405.1234, found 405.1245.



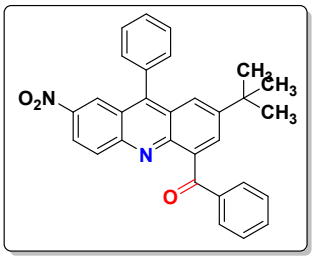
(7-Chloro-2-methyl-9-phenylacridin-4-yl)(p-tolyl)methanone (4p): Light yellow solid; yield: 76%; mp: 188.8 °C; **FT-IR (KBr) ν (cm^{-1});** 2920, 2855, 1730, 1659, 1533, 1454, 1070; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 7.97 (d, *J* = 8.8 Hz, 1H), 7.79 (d, *J* = 8.4 Hz, 2H), 7.67 – 7.62 (m, 4H), 7.58 (s, 1H), 7.55 – 7.51 (m, 2H), 7.43 (dd, *J* = 7.6, 2.4 Hz, 2H), 7.22 (d, *J* = 8.4 Hz, 2H), 2.48 (s, 3H), 2.41 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 197.91, 146.42, 145.74, 145.17, 144.04, 139.58, 135.75, 135.41, 135.32, 132.06, 131.95, 130.70, 130.39, 129.04, 128.71, 126.59, 125.63, 125.24, 124.74, 22.02, 21.79; **HRMS** (ESI) calculated for $C_{28}H_{21}ClNO^+$ $[M+H]^+$ 422.1306, found 422.1318.



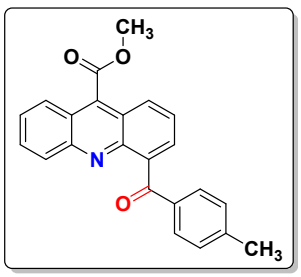
(2-Methyl-7-nitro-9-phenylacridin-4-yl)(phenyl)methanone (4q): Yellow solid; yield: 78%; mp: 175.4 °C; **FT-IR (KBr) ν (cm^{-1});** 3064, 2919, 2855, 1981, 1918, 1663, 1625, 1507, 1383, 1273, 907, 867, 827; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.64 (d, *J* = 2.8 Hz, 1H), 8.32 (dd, *J* = 9.6, 2.8 Hz, 1H), 8.08 (d, *J* = 9.5 Hz, 1H), 7.94 – 7.86 (m, 2H), 7.77 (m, 1H), 7.70 (m, 3H), 7.63 – 7.56 (m, 2H), 7.50 – 7.41 (m, 4H), 2.53 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 197.66, 149.82, 148.72, 147.67, 145.13, 139.66, 138.07, 136.43, 134.32, 133.54, 133.31, 132.31, 130.39, 130.14, 129.39, 129.00, 128.39, 127.01, 125.50, 124.55, 123.56, 122.32, 22.07; **HRMS** (ESI) calculated for $C_{27}H_{19}N_2O_3^+$ $[M+H]^+$ 419.1390, found 419.1399.



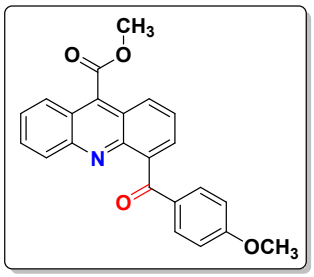
(2-(Tert-butyl)-7-chloro-9-phenylacridin-4-yl)(p-tolyl)methanone (4r): Yellow solid; yield: 75%; mp: 144.4 °C; **FT-IR (KBr) ν (cm^{-1})**; 3060, 2920, 2859, 1735, 1661, 1622, 1570, 1510, 1172, 870; **^{1}H NMR (400 MHz, CDCl$_3$) δ** 7.96 (d, *J* = 9.2 Hz, 1H), 7.87 (d, *J* = 2.4 Hz, 1H), 7.84 – 7.79 (m, 2H), 7.68 (m, 1H), 7.65 (m, 1H), 7.62 (m, 3H), 7.53 (dd, *J* = 9.2, 2.4 Hz, 1H), 7.47 – 7.42 (m, 2H), 7.25 – 7.20 (m, 2H), 2.41 (s, 3H), 1.31 (s, 9H); **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$) δ** 197.97, 148.01, 146.66, 145.81, 145.73, 143.98, 139.44, 135.82, 135.32, 132.15, 131.79, 130.61, 130.42, 130.40, 129.06, 128.73, 128.70, 128.51, 125.59, 124.89, 124.76, 122.62, 35.28, 30.76, 21.79; **HRMS** (ESI) calculated for $C_{31}H_{27}ClNO^+$ $[M+H]^+$ 464.1776, found 464.1787.



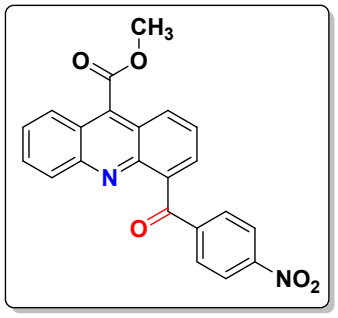
(2-(Tert-butyl)-7-nitro-9-phenylacridin-4-yl)(phenyl)methanone (4s): Yellow solid; yield: 72%; mp: 228.8 °C; **FT-IR (KBr) ν (cm^{-1})**; 3065, 2921, 2860, 1731, 1662, 1460, 1344, 1073, 833; **^{1}H NMR (400 MHz, CDCl$_3$) δ** 8.68 (d, *J* = 2.8 Hz, 1H), 8.34 (dd, *J* = 9.2, 2.4 Hz, 1H), 8.03 (d, *J* = 2.4 Hz, 1H), 7.92 (m, 1H), 7.90 (m,1H), 7.78 (m, 1H), 7.70 (dd, *J* = 5.2, 2.4 Hz, 3H), 7.62 – 7.58 (m, 1H), 7.50 (s, 1H), 7.48 (m, 1H), 7.46 (s, 1H), 1.34 (s, 9H); **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$) δ** 197.94, 150.65, 149.02, 148.95, 147.67, 145.09, 138.11, 134.26, 133.33, 132.26, 130.90, 130.38, 130.22, 129.47, 128.96, 128.42, 125.24, 124.60, 123.56, 123.30, 122.43, 35.41, 30.68; **HRMS** (ESI) calculated for $C_{30}H_{25}N_2O_3^+$ $[M+H]^+$ 461.1860, found 461.1873.



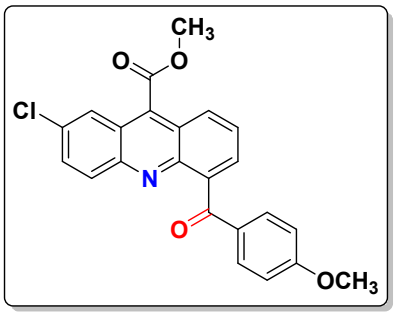
Methyl 4-(4-methylbenzoyl)acridine-9-carboxylate (4t): Light yellow solid; yield: 81%; mp: 131.1 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 3064, 2922, 1728, 1605, 1567, 1284, 1174, 989, 838; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.17 (dd, *J* = 8.8, 1.2 Hz, 1H), 8.05 – 8.00 (m, 2H), 7.84 (dd, *J* = 6.8, 1.2 Hz, 1H), 7.76 (d, *J* = 8.4 Hz, 2H), 7.69 (dd, *J* = 8.8, 6.8 Hz, 2H), 7.62 – 7.57 (m, 1H), 7.21 (d, *J* = 8.4 Hz, 2H), 4.25 (s, 3H), 2.41 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 197.35, 167.84, 148.64, 146.49, 144.05, 140.15, 136.65, 135.67, 130.70, 130.30, 130.26, 129.04, 128.82, 127.68, 126.87, 126.30, 124.89, 122.40, 122.06, 53.12, 21.76; **HRMS** (ESI) calculated for $C_{23}H_{18}NO_3^+$ $[M+H]^+$ 356.1281, found 356.1287.



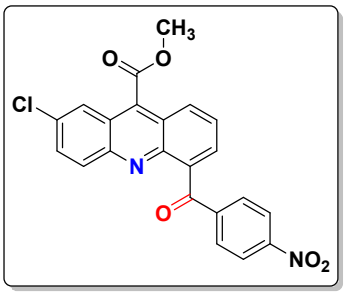
Methyl 4-(4-methoxybenzoyl)acridine-9-carboxylate (4u): Pale yellow solid; yield: 82%; mp: 132.2 °C; **FT-IR (KBr) ν (cm^{-1})**; 3024, 2978, 2832, 1742, 1652, 1349, 1224, 1112, 1054, 920; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.15 (d, *J* = 8.8 Hz, 2H), 7.99 (d, *J* = 8.4 Hz, 1H), 7.86 (d, *J* = 6.8 Hz, 1H), 7.82 (d, *J* = 8.8 Hz, 2H), 7.75 (d, *J* = 6.8 Hz, 1H), 7.68 (m, 1H), 7.60 (t, *J* = 7.6 Hz, 1H), 6.88 (d, *J* = 9.2 Hz, 2H), 4.23 (s, 3H), 3.85 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 196.63, 167.69, 163.85, 148.68, 146.37, 132.77, 131.14, 130.69, 130.48, 127.32, 126.24, 124.97, 122.47, 122.15, 113.62, 55.51, 53.16; **HRMS** (ESI) calculated for $C_{23}H_{18}NO_4^+$ $[M+H]^+$ 372.1230, found 372.1234.



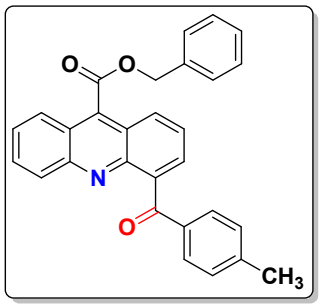
Methyl 4-(4-nitrobenzoyl)acridine-9-carboxylate (4v): Yellow solid; yield: 85%; mp: 232.3 °C; **FT-IR (KBr) ν (cm^{-1})**; 3074, 2923, 2854, 1719, 1630, 1349, 1278, 1175, 1129, 1075, 879**; ^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.28 – 8.26 (m, 1H), 8.25 (d, *J* = 4.8 Hz, 2H), 8.03 (d, *J* = 2.4 Hz, 1H), 8.03 – 8.00 (m, 1H), 7.95 – 7.92 (m, 2H), 7.79 (d, *J* = 6.8 Hz, 1H), 7.78 (s, 1H), 7.64 (dd, *J* = 9.2, 2.0 Hz, 1H), 4.28 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 196.28, 166.84, 148.29, 147.12, 138.84, 134.76, 132.18, 131.78, 130.19, 130.03, 128.98, 128.88, 128.86, 125.16, 124.11; **HRMS** (ESI) calculated for $C_{22}H_{15}N_2O_5^+$ $[M+H]^+$ 387.0975, found 387.0978.



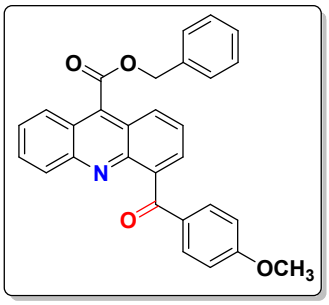
Methyl 2-chloro-5-(4-methoxybenzoyl)acridine-9-carboxylate (4w): Yellow solid; yield: 74%; mp: 182.9 °C; **FT-IR (KBr) ν (cm^{-1});** 3081, 2931, 2874, 1735, 1278, 1175, 1129, 1045, 817; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.07 (dd, *J* = 8.8, 1.3 Hz, 1H), 7.92 (d, *J* = 0.7 Hz, 1H), 7.90 (d, *J* = 0.6 Hz, 1H), 7.75 (d, *J* = 1.3 Hz, 1H), 7.74 – 7.71 (m, 2H), 7.62 (dd, *J* = 8.7, 6.8 Hz, 1H), 7.55 (dd, *J* = 9.3, 2.3 Hz, 1H), 6.82 – 6.79 (m, 2H), 4.17 (s, 3H), 3.78 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 195.86, 167.27, 163.74, 146.90, 146.50, 140.32, 135.63, 133.85, 132.51, 132.32, 131.61, 131.10, 128.94, 126.98, 126.69, 123.34, 122.67, 122.42, 113.60, 55.48, 53.28; **HRMS** (ESI) calculated for $C_{23}H_{17}ClNO_4^+$ $[M+H]^+$ 406.0841, found 406.0849.



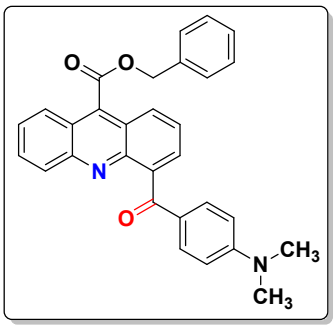
Methyl 2-chloro-5-(4-nitrobenzoyl)acridine-9-carboxylate (4x): Yellow solid; yield: 82%; mp: 239.8 °C; **FT-IR (KBr) ν (cm^{-1});** 3068, 2925, 2867, 1735, 1662, 1630, 1349, 1278, 1129, 1075, 910; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.28 – 8.26 (m, 1H), 8.25 (d, *J* = 4.8 Hz, 2H), 8.03 (d, *J* = 2.4 Hz, 1H), 8.03 – 8.00 (m, 1H), 7.95 – 7.92 (m, 2H), 7.79 (d, *J* = 6.8 Hz, 1H), 7.78 (s, 1H), 7.64 (dd, *J* = 9.2, 2.0 Hz, 1H), 4.28 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 196.04, 166.97, 150.09, 146.73, 146.13, 143.24, 138.45, 135.97, 134.27, 132.23, 131.79, 130.57, 130.53, 128.35, 127.09, 123.50, 122.79, 122.40, 53.41; **HRMS** (ESI) calculated for $C_{22}H_{14}ClN_2O_5^+$ $[M+H]^+$ 421.0586, found 421.0590.



Benzyl 4-(4-methylbenzoyl)acridine-9-carboxylate (4y) : Light yellow solid; yield: 74%; mp: 122.3 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 3032, 2921, 1727, 1654, 1413, 1138, 1053, 820, 753; **^{1}H NMR (400 MHz, $CDCl_3$) δ ;** 8.10 (d, *J* = 8.8 Hz, 1H), 8.02 (d, *J* = 8.8 Hz, 1H), 7.95 (d, *J* = 8.8 Hz, 1H), 7.83 (d, *J* = 6.8 Hz, 1H), 7.76 (d, *J* = 8.0 Hz, 2H), 7.70 – 7.63 (m, 2H), 7.60 – 7.54 (m, 3H), 7.49 – 7.44 (m, 3H), 7.21 (d, *J* = 8.4 Hz, 2H), 5.72 (s, 2H), 2.41 (s, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 197.34, 167.28, 148.62, 146.47, 144.03, 140.15, 136.55, 135.68, 135.00, 130.68, 130.31, 130.23, 129.03, 128.92, 128.89, 128.85, 128.82, 127.67, 126.76, 126.29, 124.78, 122.36, 122.03, 68.18, 21.76; **HRMS** (ESI) calculated for $C_{29}H_{22}NO_3^+$ $[M+H]^+$ 432.1594, found 432.1621.

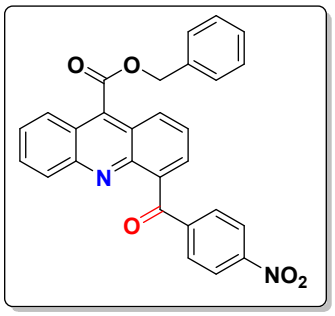


Benzyl 4-(4-methoxybenzoyl) acridine-9-carboxylate (4z): Light yellow solid; yield: 70%; mp: 123.6°C; **FT-IR (KBr) ν (cm^{-1});** 3025, 2954, 2878,1758, 1626, 1559, 1429, 1350, 1277, 1054, 980; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.05 (dd, *J* = 8.8, 1.2 Hz, 1H), 8.01 (dt, *J* = 8.8, 1.2 Hz, 1H), 7.93 – 7.90 (m, 1H), 7.82 – 7.78 (m, 3H), 7.70 – 7.65 (m, 1H), 7.63 – 7.59 (m, 1H), 7.57 – 7.52 (m, 3H), 7.47 – 7.44 (m, 1H), 7.44 – 7.41 (m, 2H), 6.88 – 6.85 (m, 2H), 5.69 (s, 2H), 3.84 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 196.23, 167.29, 163.63, 148.63, 146.43, 140.22, 136.55, 134.99, 132.54, 131.26, 130.70, 130.20, 128.91, 128.87, 128.83, 128.73, 127.64, 126.64, 126.29, 124.75, 122.34, 122.02, 113.53, 68.16, 55.47; **HRMS** (ESI) calculated for $C_{29}H_{22}NO_4^+$ $[M+H]^+$ 448.1543, found 448.1548.

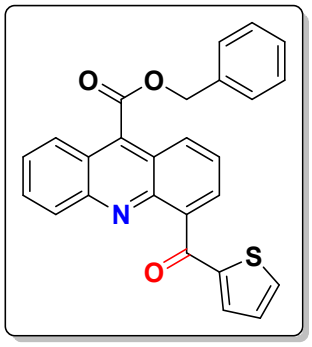


Benzyl 4-(4-(dimethylamino)benzoyl)acridine-9-carboxylate (4aa): Yellow solid; yield: 72%; mp: 162.9 °C; **FT-IR (KBr) ν (cm^{-1})**; 3021, 2934, 2821,1724, 1608, 1559, 1277, 1221, 1040, 921, 815 **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.10 (d, *J* = 9.2 Hz, 1H), 8.04 (dt, *J* = 8.8, 1.6 Hz, 1H), 7.93 (d, *J* = 8.8 Hz, 1H), 7.78 – 7.75 (m, 3H), 7.71 – 7.67 (m, 1H), 7.63 (dd, *J* = 7.2, 1.6 Hz, 1H), 7.58 (dd, *J* = 8.8, 2.4 Hz, 3H), 7.46 (dd, *J* = 7.6, 1.6 Hz, 3H), 6.61 (d, *J* = 8.0 Hz, 2H), 5.72 (s, 2H), 3.05 (s, 6H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 195.54, 190.35, 167.43, 153.58, 148.66, 146.61, 140.96, 136.42, 135.05, 132.61,

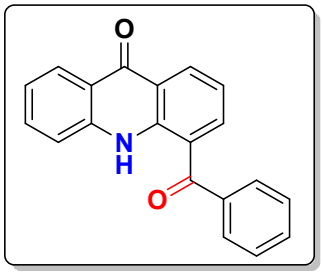
130.88, 129.96, 128.86, 128.80, 128.34, 127.50, 126.33, 126.03, 124.70, 122.29, 122.07, 68.09, 40.03, 14.15; **HRMS** (ESI) calculated for $C_{30}H_{25}N_2O_3^+$ $[M+H]^+$ 461.1860, found 461.1873.



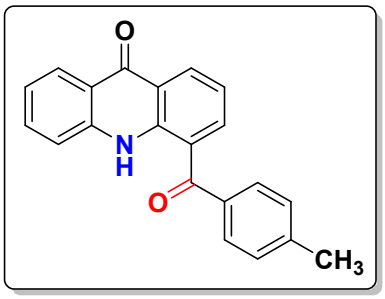
Benzyl 4-(4-nitrobenzoyl)acridine-9-carboxylate (4ab): Yellow solid; yield: 82%; mp: 118.6 °C; FT-IR (KBr) ν (cm^{-1}); 3064, 2985, 2866,1730, 1645, 1022, 921; **^{1}H NMR (400 MHz, $CDCl_3$) δ ;** 8.65 (s, 1H), 8.41 (ddd, *J* = 8.0, 2.4, 1.2 Hz, 1H), 8.18 (dd, *J* = 8.8, 1.2 Hz, 1H), 8.09 (dt, *J* = 8.0, 1.2 Hz, 1H), 8.00 – 7.94 (m, 2H), 7.84 (d, *J* = 8.8 Hz, 1H), 7.72 – 7.68 (m, 2H), 7.61 – 7.55 (m, 4H), 7.49 – 7.44 (m, 3H), 5.73 (s, 2H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 195.73, 166.98, 148.50, 148.28, 146.08, 140.14, 138.16, 136.94, 135.39, 134.89, 130.75, 130.36, 130.19, 128.99, 128.91, 128.88, 128.30, 127.93, 127.00, 126.39, 124.94, 124.36, 122.47, 122.05, 68.31; **HRMS** (ESI) calculated for $C_{28}H_{19}N_2O_5^+$ $[M+H]^+$ 463.1288, found 463.3031.



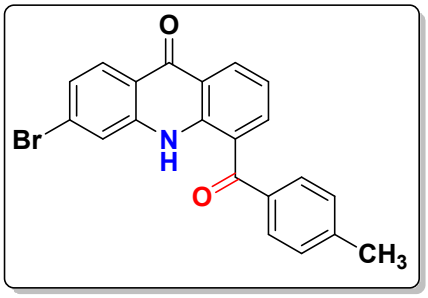
Benzyl 4-(thiophene-2-carbonyl)acridine-9-carboxylate (4ac): Light yellow solid; yield: 82%; mp: 194.4 °C; **FT-IR (KBr) ν (cm^{-1});** 3044, 2921, 2857,1727, 1654, 1608, 1559, 1516, 1429, 1350, 1277, 1221, 1040, 980, 921, 815, 749, 629, 546; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 8.11 (dt, *J* = 8.8, 1.2 Hz, 1H), 8.07 (dd, *J* = 8.8, 1.2 Hz, 1H), 7.94 – 7.91 (m, 1H), 7.87 (dd, *J* = 6.8, 1.2 Hz, 1H), 7.73 – 7.69 (m, 2H), 7.62 – 7.59 (m, 1H), 7.57 – 7.56 (m, 1H), 7.54 (dt, *J* = 2.4, 1.2 Hz, 2H), 7.45 – 7.42 (m, 2H), 7.33 (dd, *J* = 3.6, 1.2 Hz, 1H), 7.03 (dd, *J* = 5.2, 3.6 Hz, 1H), 5.69 (s, 2H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 189.25, 167.20, 148.75, 146.12, 145.45, 139.43, 136.62, 135.41, 134.98, 134.56, 130.72, 130.38, 128.96, 128.92, 128.87, 128.83, 128.00, 127.75, 127.23, 126.06, 124.81, 122.44, 122.13, 68.18; **HRMS** (ESI) calculated for $C_{26}H_{18}NO_3S^+$ $[M+H]^+$ 424.1002, found 424.1007.



4-Benzoylacridin-9(10*H*)-one (7a); Pale yellow solid; yield: 73% ; mp: 134.4 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 3428, 2922, 1730, 1643, 1591,1258,1006, 759; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 12.17 (s, 1H), 8.79 (d, *J* = 7.6 Hz, 1H), 8.48 (d, *J* = 8.4 Hz, 1H), 8.07 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.71 (d, *J* = 7.2 Hz, 3H), 7.62 (d, *J* = 7.6 Hz, 1H), 7.54 (t, *J* = 7.6 Hz, 2H), 7.44 (d, *J* = 8.0 Hz, 1H), 7.34 (d, *J* = 8.0 Hz, 1H), 7.31 – 7.23 (m, 2H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 199.70, 177.92, 142.03, 140.27, 140.17, 138.82, 134.38, 134.16, 132.23, 129.47, 128.52, 127.17, 122.77, 122.64, 121.99, 120.24, 119.47, 117.82; **HRMS** (ESI) calculated for $C_{20}H_{14}NO_2^+$ $[M+H]^+$ 300.1019, found 300.1020.

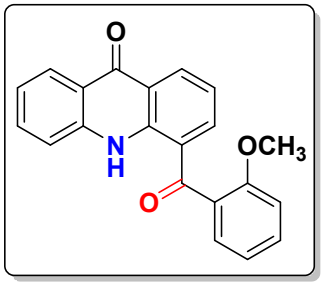


4-(4-Methylbenzoyl)acridin-9(10*H*)-one (7b): Light yellow solid; yield: 70%; mp: 90.2 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 3441, 2922, 2853,1738, 1590, 1280, 1006, 786; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 12.12 (s, 1H), 8.79 (d, *J* = 8.0 Hz, 1H), 8.50 (d, *J* = 8.0 Hz, 1H), 8.09 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.72 (m, 1H), 7.67 – 7.61 (m, 2H), 7.45 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.37 – 7.32 (m, 3H), 7.28 (d, *J* = 7.6 Hz, 1H), 2.48 (s, 3H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 199.42, 177.99, 162.27, 143.19, 142.00, 136.09, 134.10, 134.06, 129.81, 129.20, 127.15, 122.67, 122.01, 120.53, 119.40, 117.81, 21.68; **HRMS** (ESI) calculated for $C_{21}H_{16}NO_2^+$ $[M+H]^+$ 314.1176, found 314.1185.

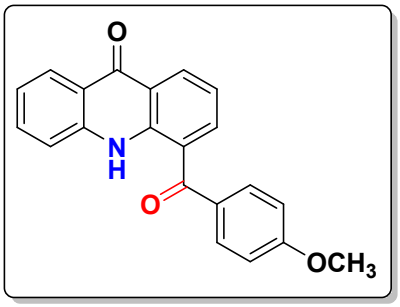


3-Bromo-5-(4-methylbenzoyl)acridin-9(10*H*)-one (7c): Yellow solid; yield: 71%; **mp:** 180.3 °C**; FT-IR (KBr) ν (cm^{-1}) ;** 3455, 2957, 2862, 1738, 1660, 1272, 1178, 845, 768; **^{1}H NMR (400 MHz,**

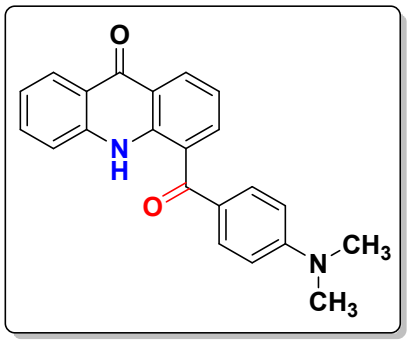
$CDCL_3$+DMSO-d_6) δ 12.00 (s, 1H), 8.70 – 8.67 (m, 1H), 8.27 (d, *J* = 8.4 Hz, 1H), 8.07 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.72 (d, *J* = 2.0 Hz, 1H), 7.66 – 7.63 (m, 2H), 7.40 (dd, *J* = 8.4, 1.6 Hz, 1H), 7.35 (d, *J* = 7.8 Hz, 2H), 7.31 (d, *J* = 8.0 Hz, 1H), 2.48 (s, 3H); **$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$+DMSO) δ** 198.85, 177.12, 143.36, 141.64, 140.93, 139.75, 135.68, 133.32, 129.81, 129.18, 128.65, 125.91, 122.59, 121.04, 120.46, 119.97, 21.64; **HRMS** (ESI) calculated for $C_{21}H_{15}BrNO_2^+$ $[M+H]^+$ 392.0281, found 392.0282.



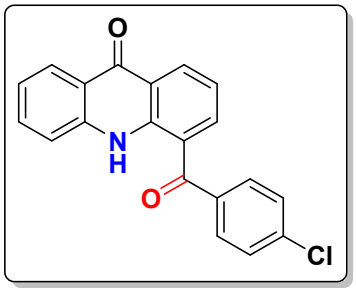
4-(2-Methoxybenzoyl)acridin-9(10H)-one (7d): Yellow solid; yield: 63% ; mp: 185.7 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 3472, 2986, 2934, 1745, 1624, 1253, 1180, 1004, 749; **^1H NMR (400 MHz, $CDCl_3$) δ** 12.68 (s, 1H), 8.77 (d, *J* = 8.0 Hz, 1H), 8.48 (d, *J* = 8.0 Hz, 1H), 7.94 (d, *J* = 7.2 Hz, 1H), 7.74 (d, *J* = 7.2 Hz, 1H), 7.51 (m, 2H), 7.40 (m, 2H), 7.22 (d, *J* = 7.6 Hz, 1H), 7.08 (m, 2H), 3.77 (s, 3H); **$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ**200.21, 178.18, 156.64, 153.59, 151.29, 141.86, 141.16, 140.31, 134.75, 134.35, 132.11, 129.12, 128.93, 128.79, 127.11, 122.95, 120.74, 119.92, 118.05, 111.53, 55.69. **HRMS** (ESI) calculated for $C_{21}H_{16}NO_3^+$ $[M+H]^+$ 330.1125, found 330.1138.



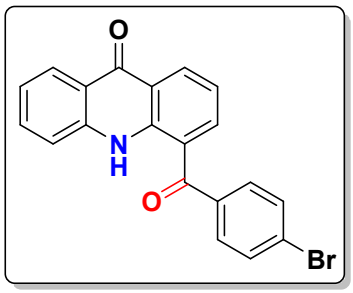
4-(4-Methoxybenzoyl)acridin-9(10*H*)-one (7e): Yellow solid; yield: 65% ; mp: 188.7 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 3451, 2968, 2921, 1738, 1618, 1285, 1175, 1008, 753; **^1H NMR (400 MHz, $CDCl_3$) δ** ^1H NMR (400 MHz, $CDCl_3$) δ 11.86 (s, 1H), 8.70 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.42 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.01 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.72 – 7.67 (m, 2H), 7.64 (ddd, *J* = 8.4, 7.2, 1.6 Hz, 1H), 7.36 (d, *J* = 7.6 Hz, 1H), 7.26 (ddd, *J* = 8.0, 6.8, 1.2 Hz, 1H), 7.21 (d, *J* = 7.6 Hz, 1H), 3.85 (s, 3H); **$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ** 198.05, 177.95, 163.26, 141.85, 140.22, 139.41, 134.03, 133.66, 132.23, 131.20, 127.13, 122.56, 121.95, 120.82, 119.33, 117.74, 113.85, 55.60; **HRMS** (ESI) calculated for $C_{21}H_{16}NO_3^+$ $[M+H]^+$ 330.1125, found 330.1133.



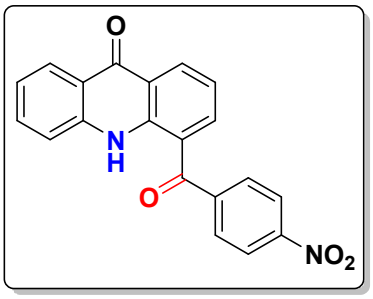
4-(4-(Dimethylamino)benzoyl)acridin-9(10*H*)-one (7f): Pale yellow solid; yield: 77% ; mp: 132.1 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 3458, 2922, 2862, 1742, 1594, 1280, 1179, 1019, 766; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 11.74 (s, 1H), 8.72 (dd, *J* = 8.0, 2.4 Hz, 1H), 8.48 (dd, *J* = 8.4, 1.6 Hz, 1H), 8.06 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.75 – 7.72 (m, 2H), 7.69 – 7.65 (m, 1H), 7.40 (dd, *J* = 8.4, 1.6 Hz, 1H), 7.32 – 7.26 (m, 2H), 6.72 – 6.69 (m, 2H), 3.09 (s, 6H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 196.70, 178.10, 153.45, 141.50, 140.26, 138.55, 133.88, 132.75, 132.46, 127.06, 125.43, 122.52, 122.25, 121.79, 121.74, 119.29, 117.70, 110.71, 40.08; **HRMS** (ESI) calculated for $C_{22}H_{19}N_2O_2^+$ $[M+H]^+$ 343.1441, found 343.1446.



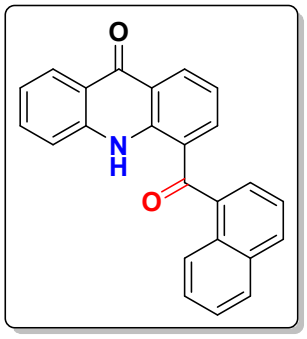
4-(4-Chlorobenzoyl)acridin-9(10*H*)-one (7g): Light yellow solid; yield: 74%; mp: 216.9 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 3454, 2923, 2863, 1742, 1647, 1592, 1280, 1154, 826, 754; **^{1}H NMR (400 MHz, $CDCl_3$) δ** 12.05 (s, 1H), 8.79 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.48 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.03 (dd, *J* = 7.6, 2.0 Hz, 1H), 7.74 – 7.70 (m, 1H), 7.70 – 7.67 (m, 2H), 7.55 – 7.51 (m, 2H), 7.45 (d, *J* = 7.6 Hz, 1H), 7.37 – 7.33 (m, 1H), 7.28 (t, *J* = 7.6 Hz, 1H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 198.34, 177.79, 142.06, 140.13, 139.82, 138.75, 137.13, 134.63, 134.16, 130.90, 128.88, 127.17, 122.83, 122.10, 120.00, 119.42, 117.81; **HRMS** (ESI) calculated for $C_{20}H_{13}ClNO_2^+$ $[M+H]^+$ 334.0629, found 334.0629.



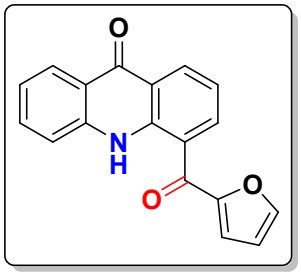
4-(4-Bromobenzoyl)acridin-9(10*H*)-one (7h): Yellow solid; yield: 72% ; **mp:** 204.5 °C**; FT-IR (KBr) ν (cm^{-1}) ;** 3424, 3024, 2922, 2852, 1739, 1649, 1592, 1318, 1279, 1108, 1067, 696; ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.05 (s, 1H), 8.81 – 8.78 (m, 1H), 8.49 – 8.47 (m, 1H), 8.04 – 8.01 (m, 1H), 7.75 – 7.72 (m, 1H), 7.69 (d, *J* = 6.4 Hz, 2H), 7.61 – 7.59 (m, 2H), 7.45 (dd, *J* = 6.4, 1.6 Hz, 1H), 7.36 – 7.33 (m, 1H), 7.27 (d, *J* = 7.6 Hz, 1H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$+DMSO-d6) δ** 198.85, 177.12, 143.36, 141.64, 140.93, 139.75, 135.68, 133.32, 129.81, 129.18, 128.65, 125.91, 122.59, 121.04, 120.46, 119.97, 21.64; **HRMS** (ESI) calculated for $C_{20}H_{13}BrNO_2^+$ $[M+H]^+$ 378.0124, found 378.0126.



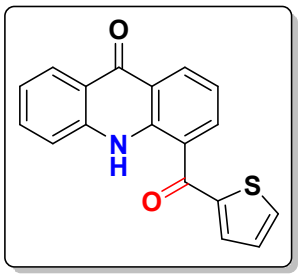
4-(4-Nitrobenzoyl)acridin-9(10*H*)-one (7i): Yellow solid**;** yield: 65%; mp: 209.4 °C; **FT-IR (KBr) ν (cm^{-1});** 3423, 2935, 2841, 1749, 1647, 1398, 1178, 1088, 754, 695; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 12.13 (s, 1H), 8.85 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.50 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.43 – 8.40 (m, 1H), 7.96 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.87 (d, *J* = 6.8 Hz, 1H), 7.75 (ddd, *J* = 8.4, 6.8, 1.6 Hz, 1H), 7.49 (d, *J* = 7.6 Hz, 1H), 7.41 – 7.35 (m, 1H), 7.29 (d, *J* = 7.6 Hz, 3H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$)** δ 196.70, 178.10, 153.45, 141.50, 140.26, 138.55, 133.88, 132.75, 132.46, 127.06, 125.43, 122.52, 122.25, 121.79, 121.74, 119.29, 117.70, 110.71. **HRMS** (ESI) calculated for $C_{20}H_{13}N_2O_4^+$ $[M+H]^+$ 345.0870, found 345.0874.



4-(1-Naphthoyl)acridin-9(10*H*)-one (7j): Pale yellow solid; yield: 67%; mp: 160.5 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 3492, 3057, 2921, 1738, 1618, 1520,1250, 1060, 777; **^{1}H NMR (400 MHz, $CDCl_3$)** δ ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.65 (s, 1H), 8.79 (dd, *J* = 8.0, 2.0 Hz, 1H), 8.51 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.05 (dd, *J* = 7.2, 2.8 Hz, 1H), 7.97 (dd, *J* = 8.8, 1.2 Hz, 1H), 7.93 – 7.87 (m, 2H), 7.77 – 7.73 (m, 1H), 7.59 – 7.52 (m, 5H), 7.39 – 7.35 (m, 1H), 7.14 (t, *J* = 8.0 Hz, 1H); **^{13}C{^{1}H} (100 MHz, $CDCl_3$) δ** 201.79, 177.83, 142.30, 141.09, 140.25, 136.77, 135.18, 134.18, 133.69, 131.02, 130.59, 128.62, 127.44, 127.20, 126.73, 126.54, 125.25, 124.56, 122.91, 122.73, 122.28, 121.27, 119.64, 117.97; **HRMS** (ESI) calculated for $C_{24}H_{16}NO_2^+$ $[M+H]^+$ 350.1176, found 350.1179.



4-(Furan-2-carbonyl)acridin-9(10*H*)-one (7k): Yellow solid ; yield: 63% ; **mp**: 205.7 °C; **FT-IR (KBr) ν (cm^{-1})** ; 3438, 2923, 2863, 1785, 1748, 1524, 1109, 021, 877, 830; ^{1}H NMR (400 MHz, $CDCL_3$+DMSO-d_6) δ 8.74 (d, *J* = 7.2 Hz, 1H), 8.46 – 8.42 (m, 2H), 8.26 (d, *J* = 9.2 Hz, 1H), 7.97 (s, 1H), 7.89 – 7.84 (m, 2H), 6.34 (d, *J* = 5.6 Hz, 1H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$+DMSO) δ** 172.65, 170.35, 149.76, 148.15, 146.30, 132.99, 130.95, 130.11, 127.51, 127.07, 125.71, 124.55, 124.26, 124.10, 118.16, 109.11; **HRMS** (ESI) calculated for $C_{18}H_{12}NO_3^+$ $[M+H]^+$ 290.0812, found 290.0825.



4-(Thiophene-2-carbonyl)acridin-9(10*H*)-one (7l): Yellow solid; yield: 75% ; mp: 207.6 °C; **FT-IR (KBr) ν (cm^{-1}) ;** 3488, 2922, 2862, 1740, 1647, 1289, 847, 761; **^{1}H NMR (400 MHz, $CDCl_3$) δ** ^{1}H NMR (400 MHz, $CDCl_3$) δ 11.59 (s, 1H), 8.75 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.43 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.37 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.83 (d, *J* = 5.2 Hz, 1H), 7.72 – 7.68 (m, 2H), 7.44 (d, *J* = 8.4 Hz, 1H), 7.35 – 7.30 (m, 2H), 7.24 (t, *J* = 5.2, 1H); **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ** 189.25, 177.58, 143.43, 141.08, 140.04, 137.80, 135.06, 134.68, 133.98, 133.35, 128.14, 126.76, 122.45, 121.66, 121.09, 119.55, 117.73; **HRMS** (ESI) calculated for $C_{18}H_{12}NO_2S^+$ $[M+H]^+$ 306.0583, found 306.0610.

Control experiment and Mechanistic probing studies

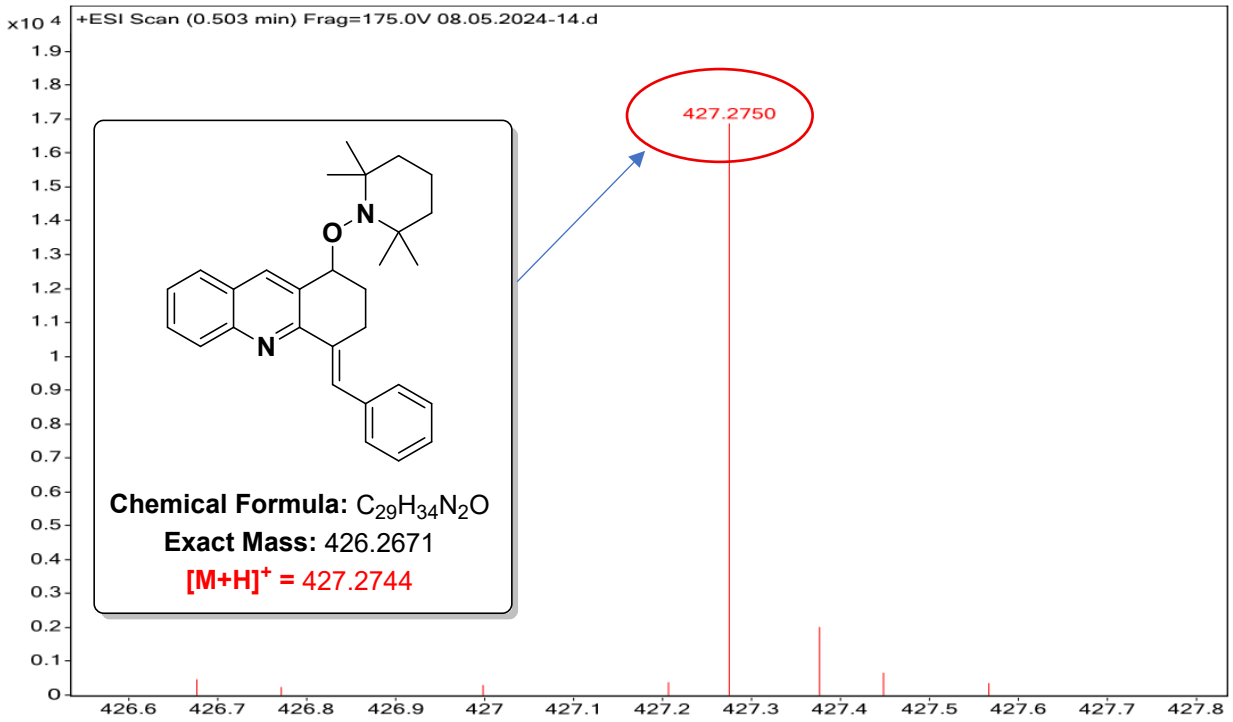


Figure-1. Detection of **8**-TEMPO-adduct product through HRMS

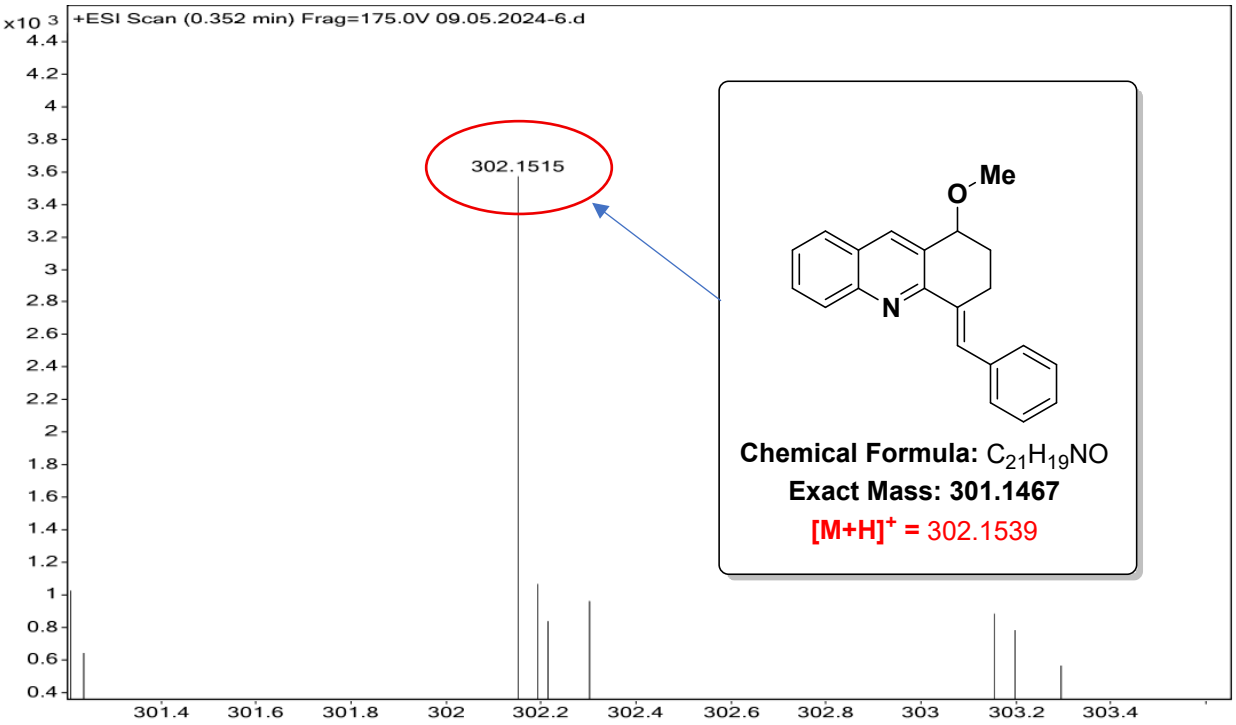


Figure-2. Detection of **9**-Methoxy-attached product through HRMS

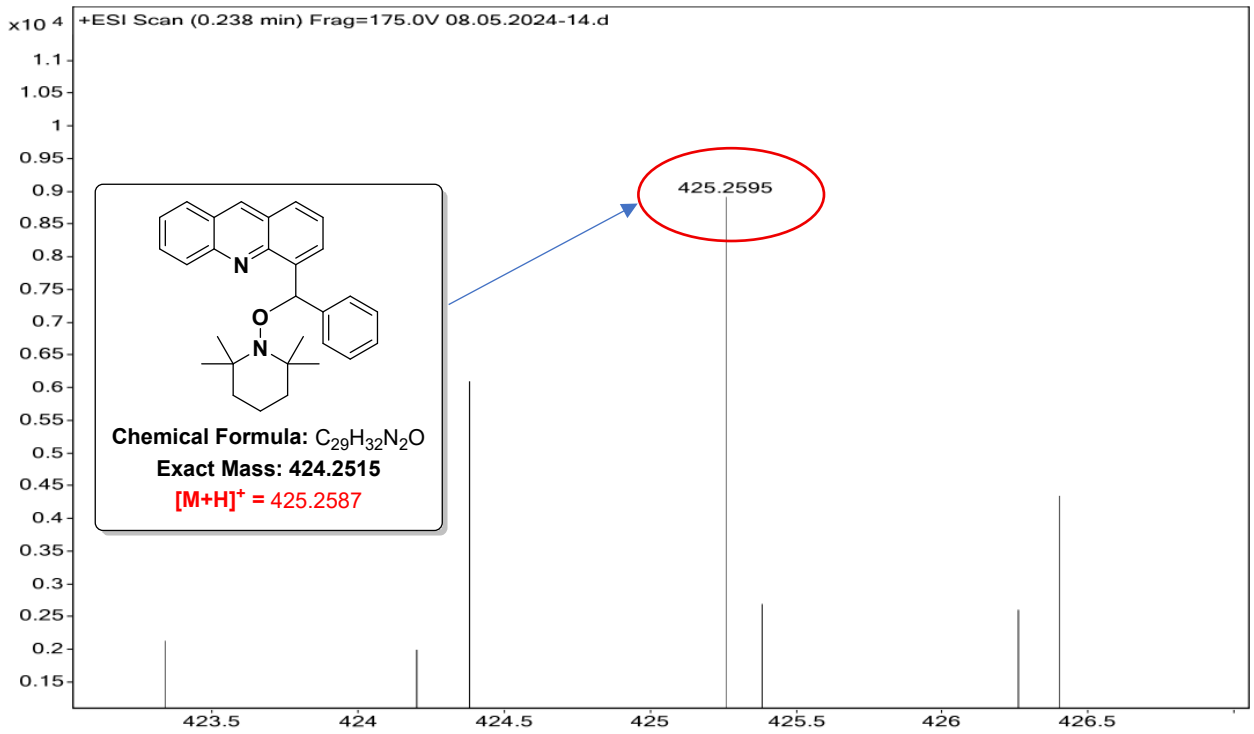


Figure-3. Detection of **10**-TEMPO-addduct product through HRMS

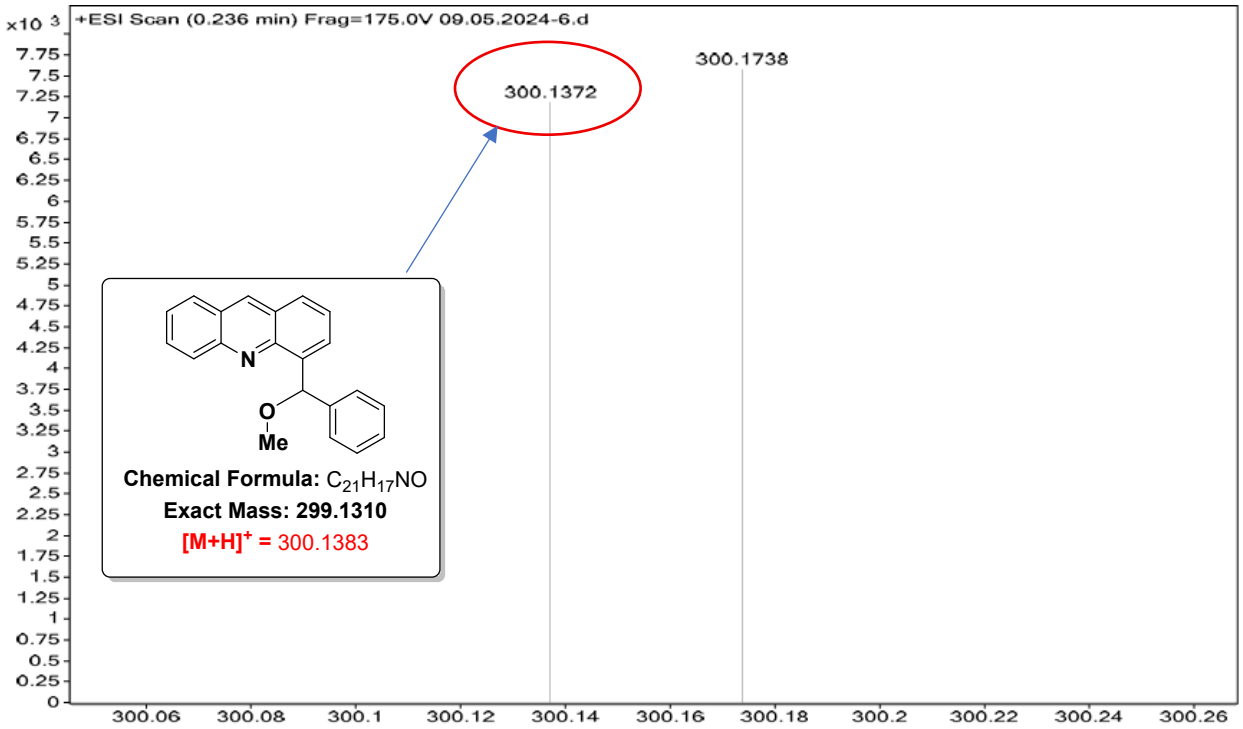


Figure-4. Detection of **11**- Methoxy-attached product through HRMS

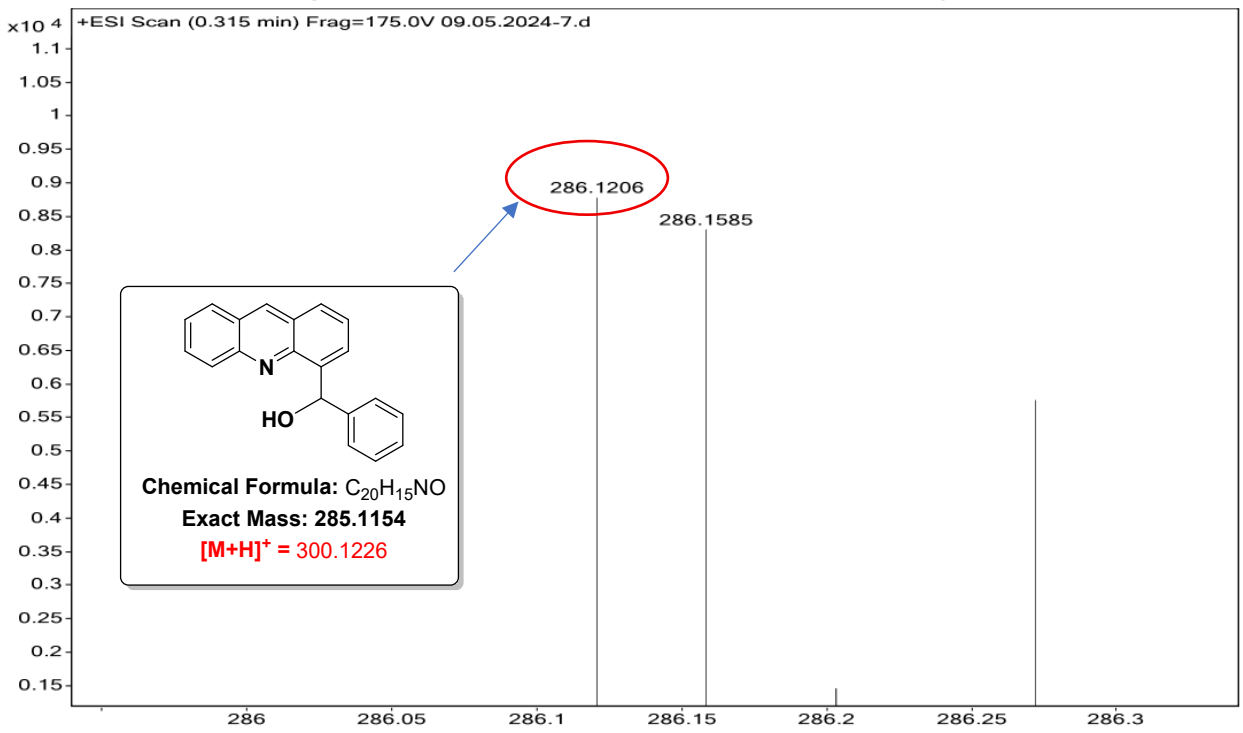


Figure-5. Detection of **12**-hydroxylated intermediate through HRMS

Copies of ^{1}H, ^{13}C and HRMS spectrums

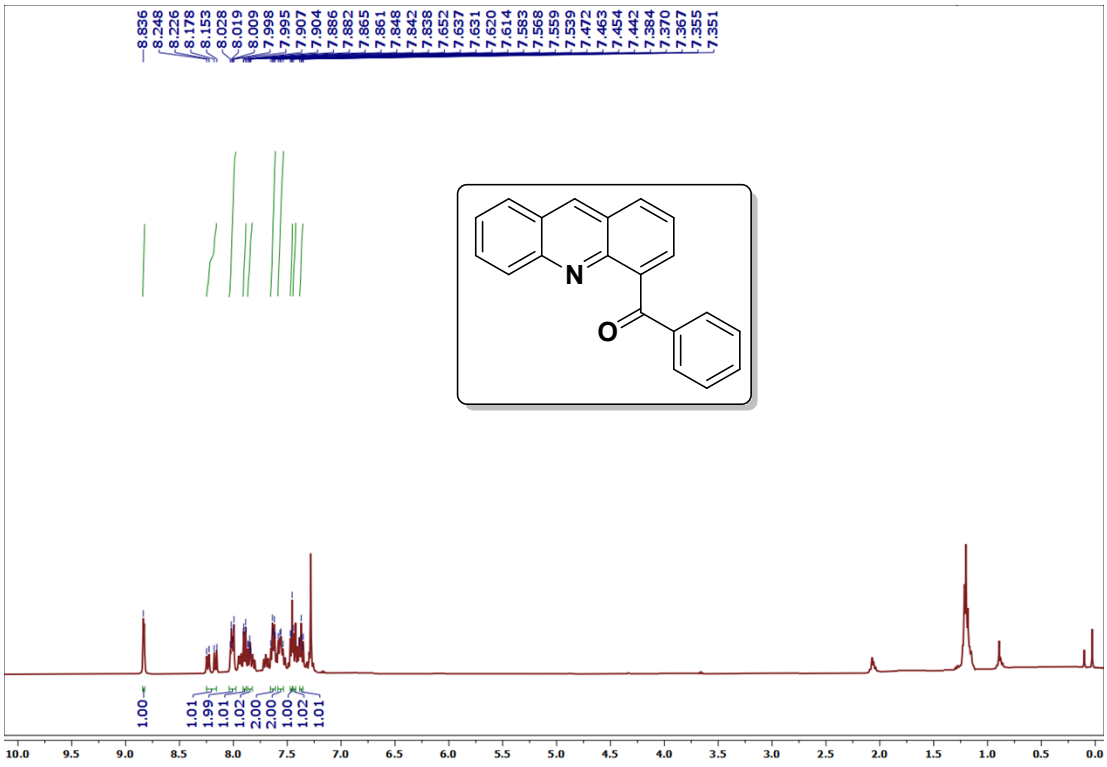


Figure-6. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4a**

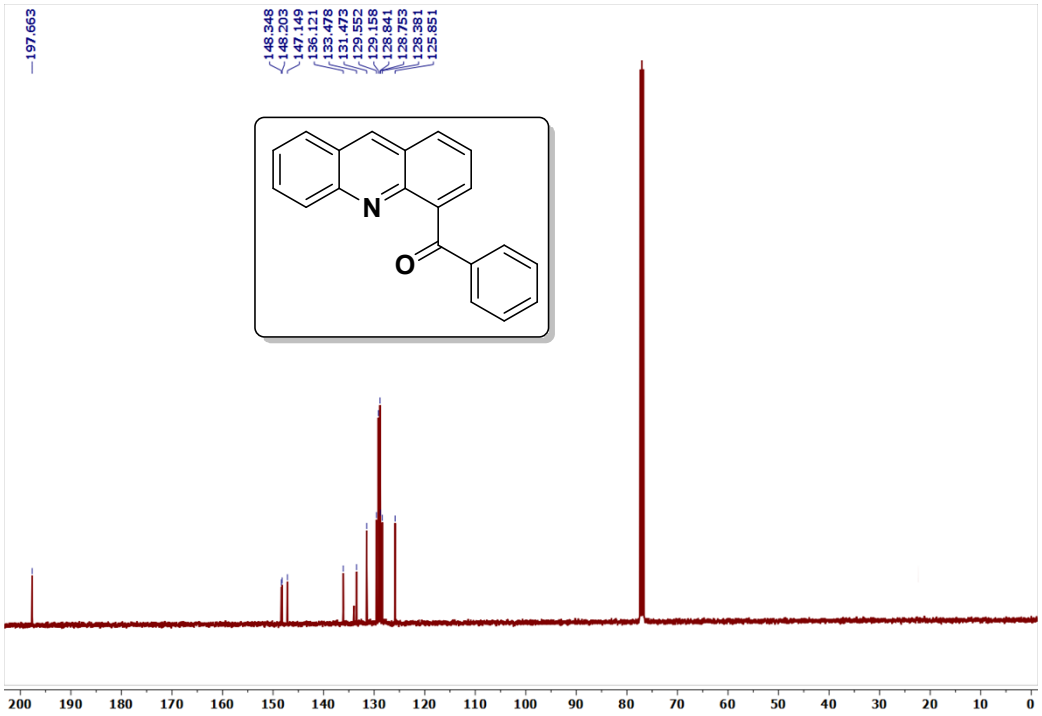


Figure-7. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4a**

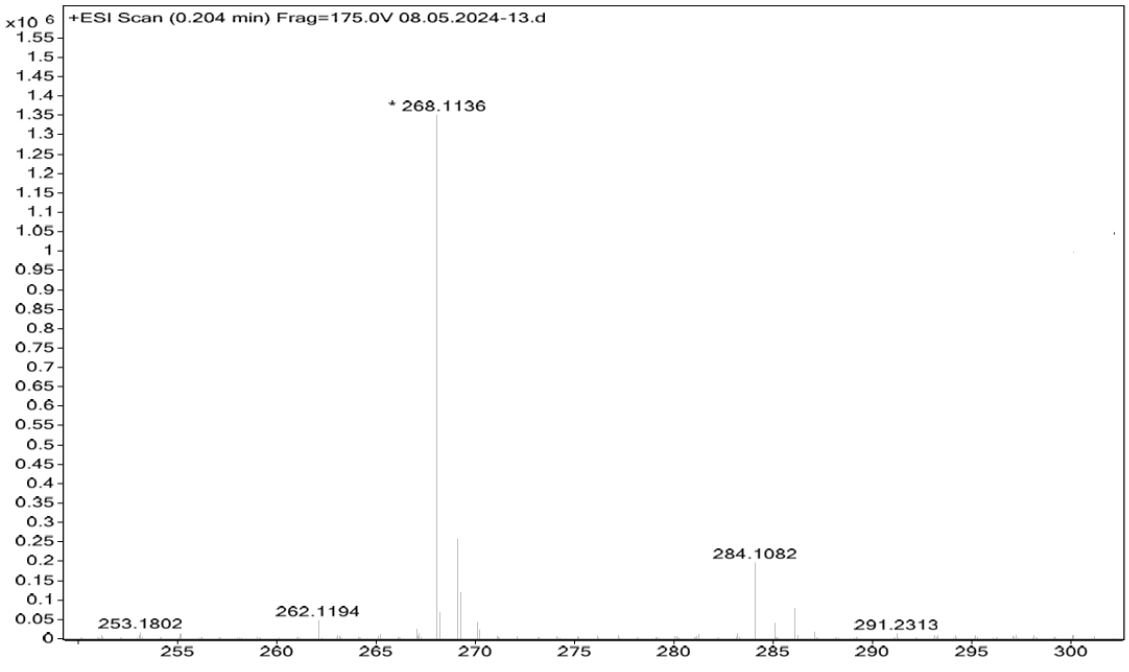


Figure-8. HR-MS(ESI^{+}) spectrum of compound **4a**

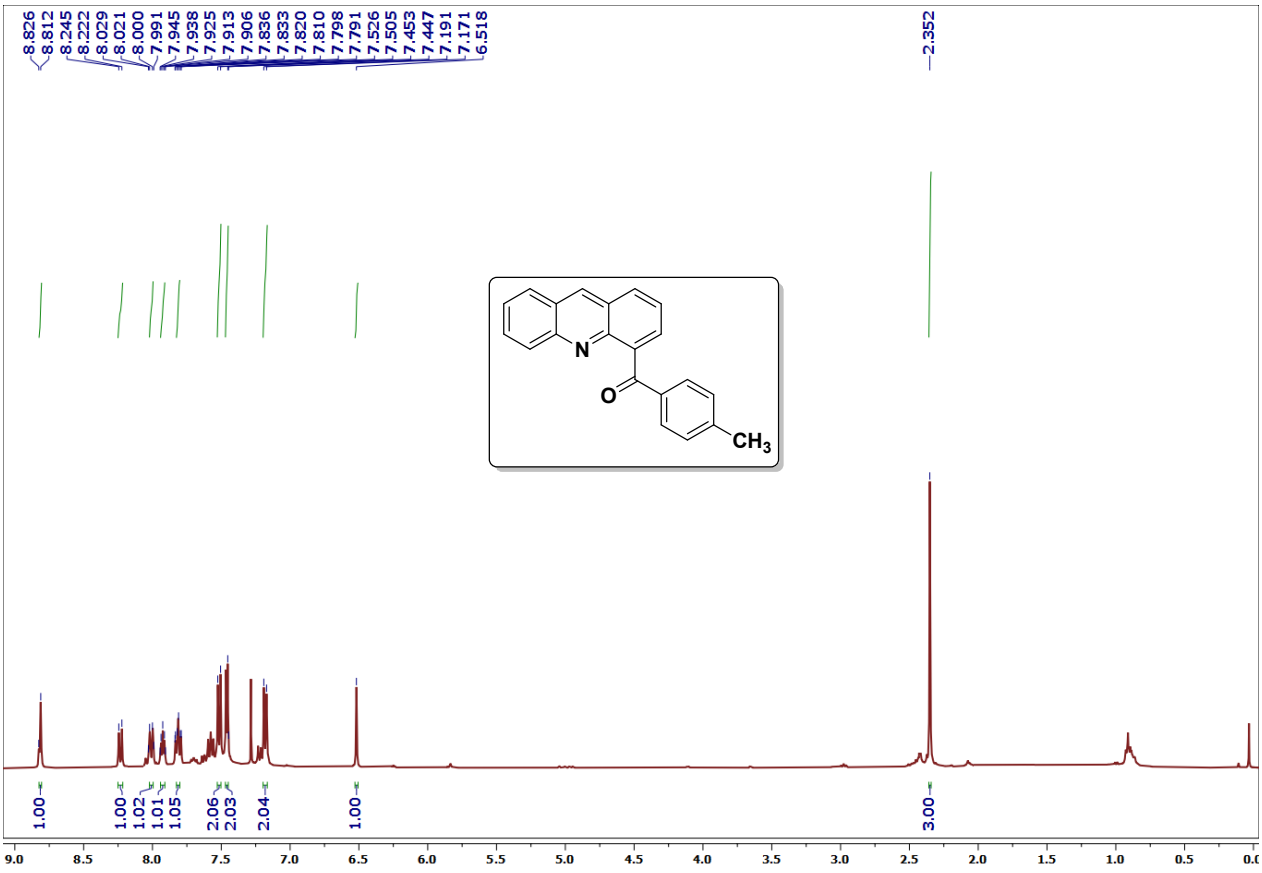


Figure-9. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4b**

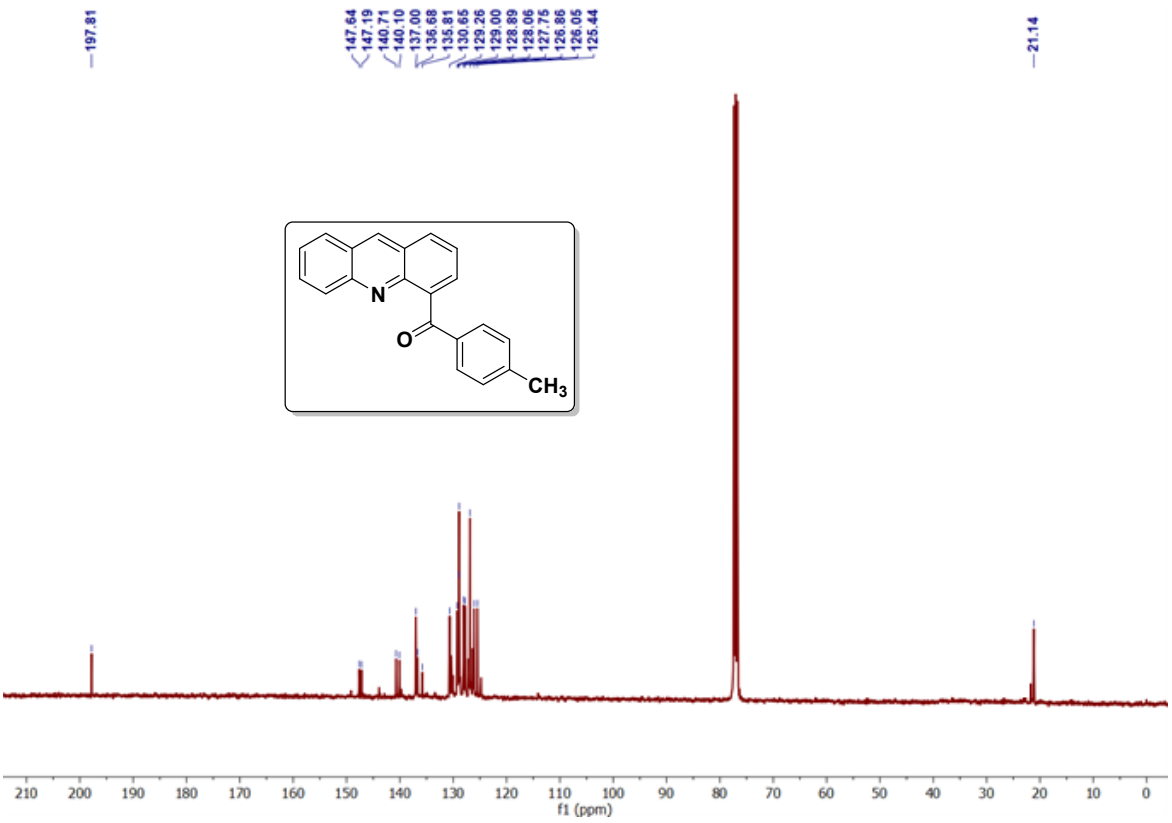


Figure-10. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4b**

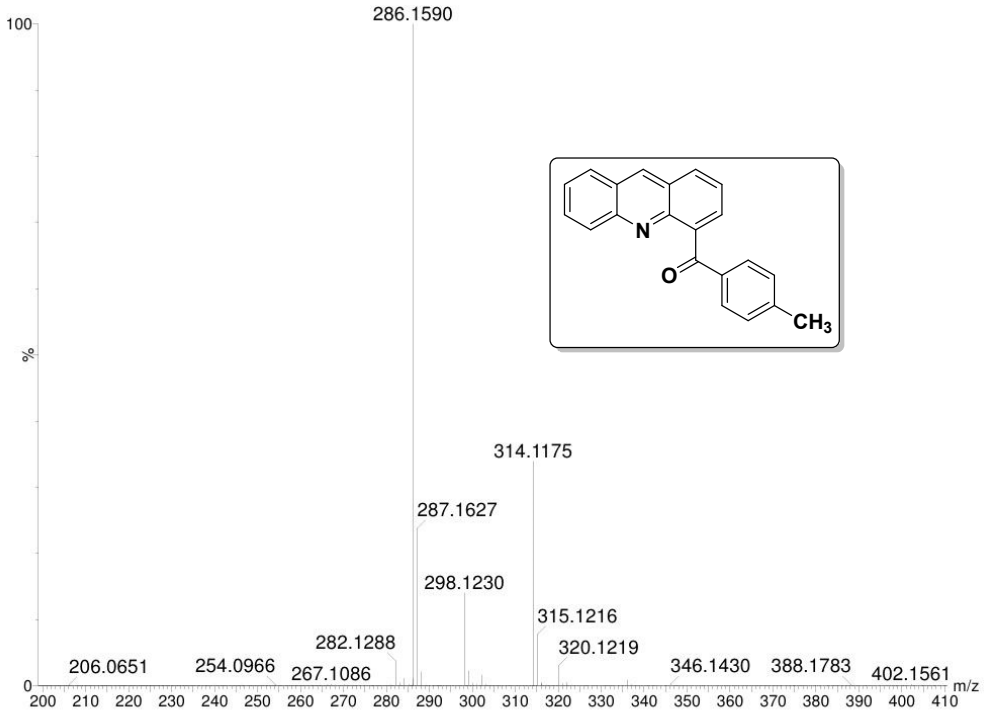


Figure-11. HR-MS(ESI^{+}) spectrum of compound **4b**

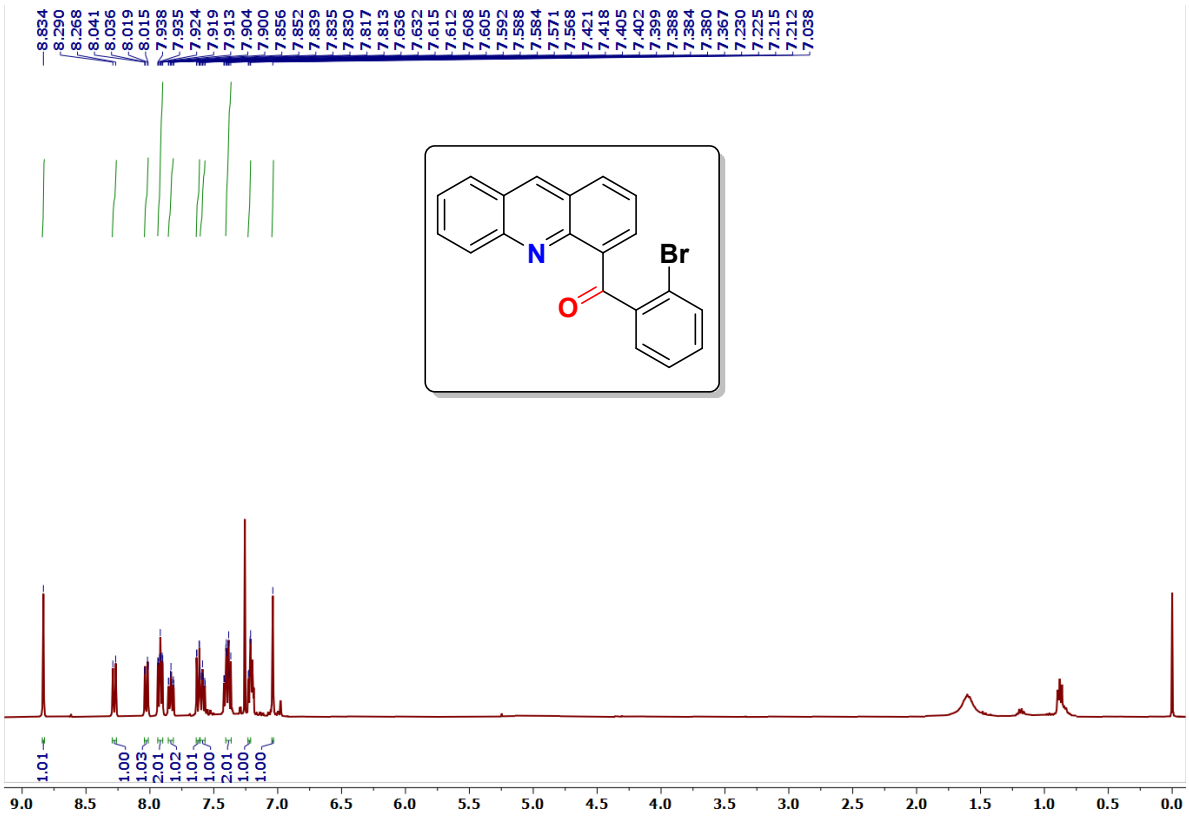


Figure-12. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4c**

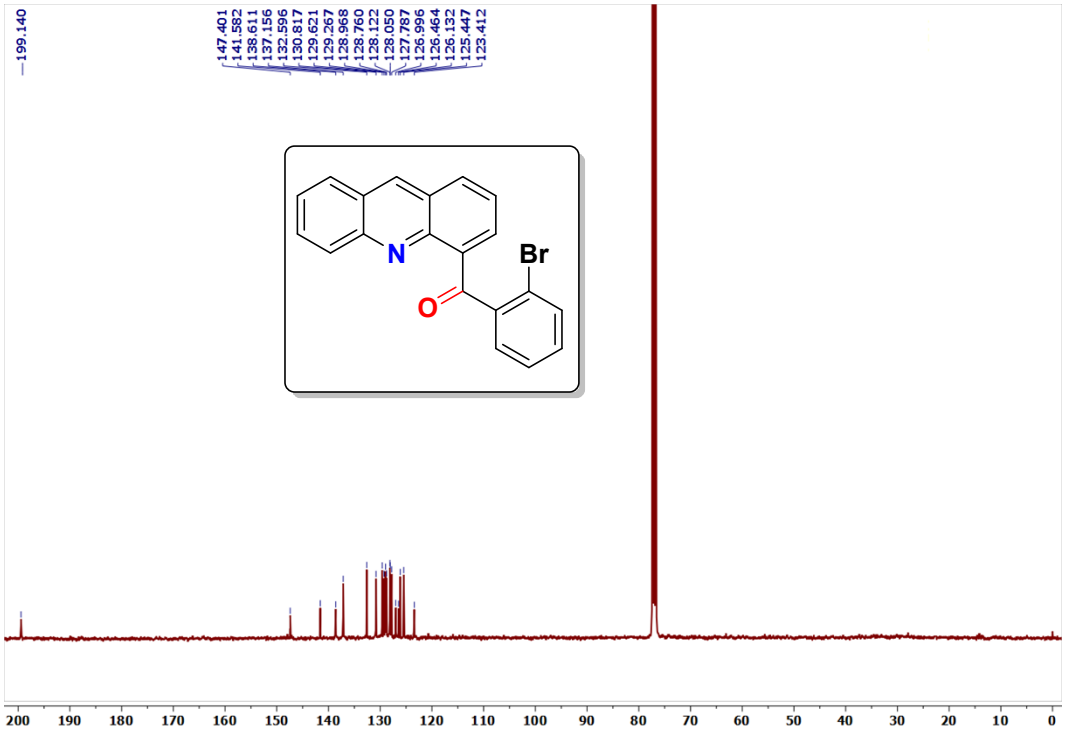


Figure-13. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4c**

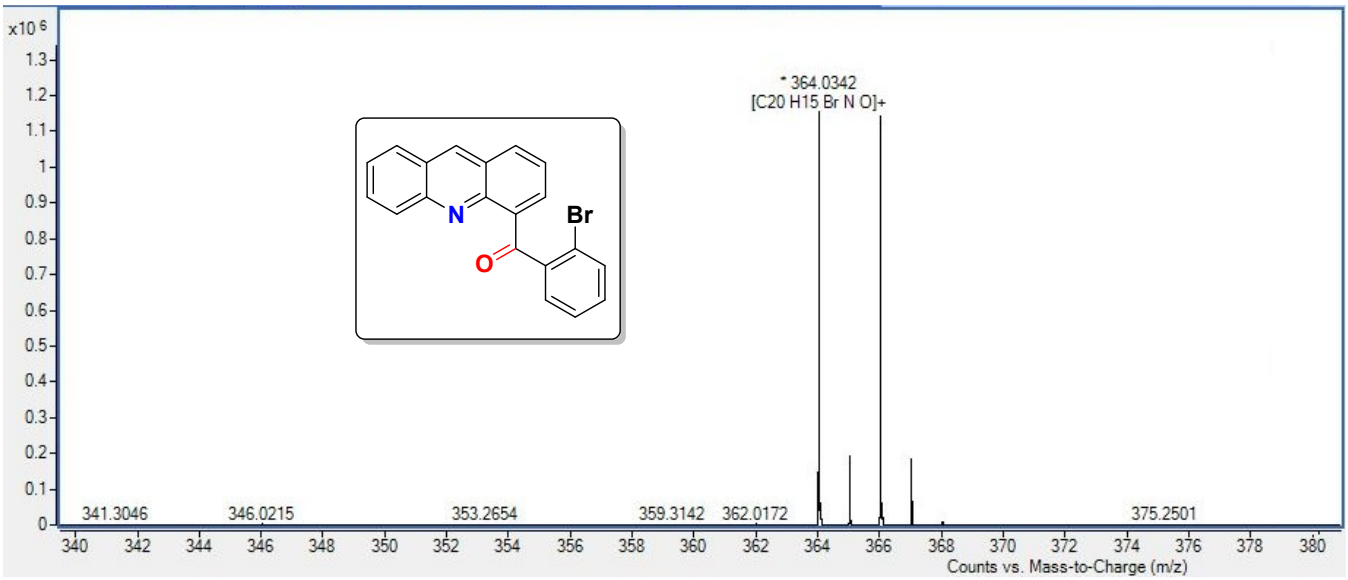


Figure-14. HR-MS(ESI^{+}) spectrum of compound **4c**

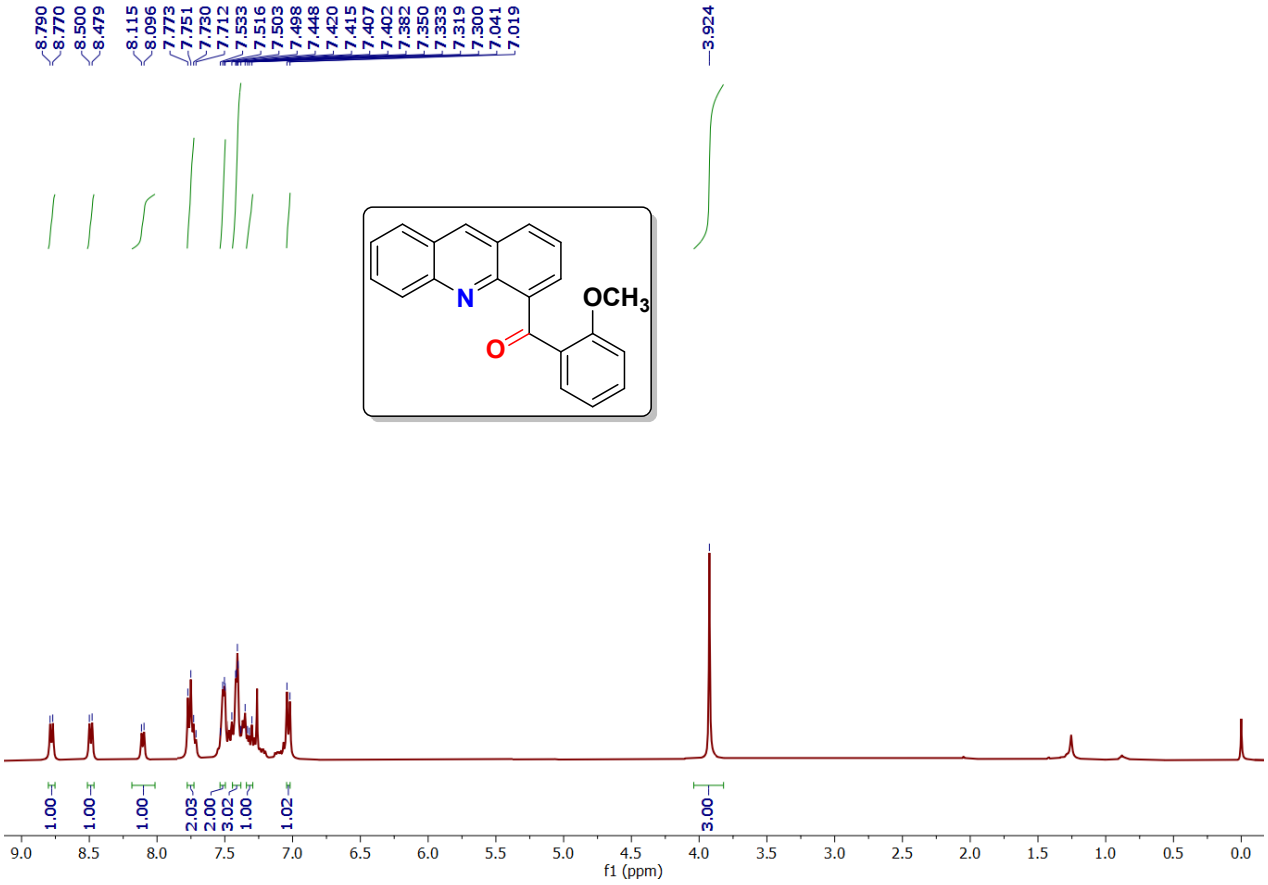


Figure-15. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4d**

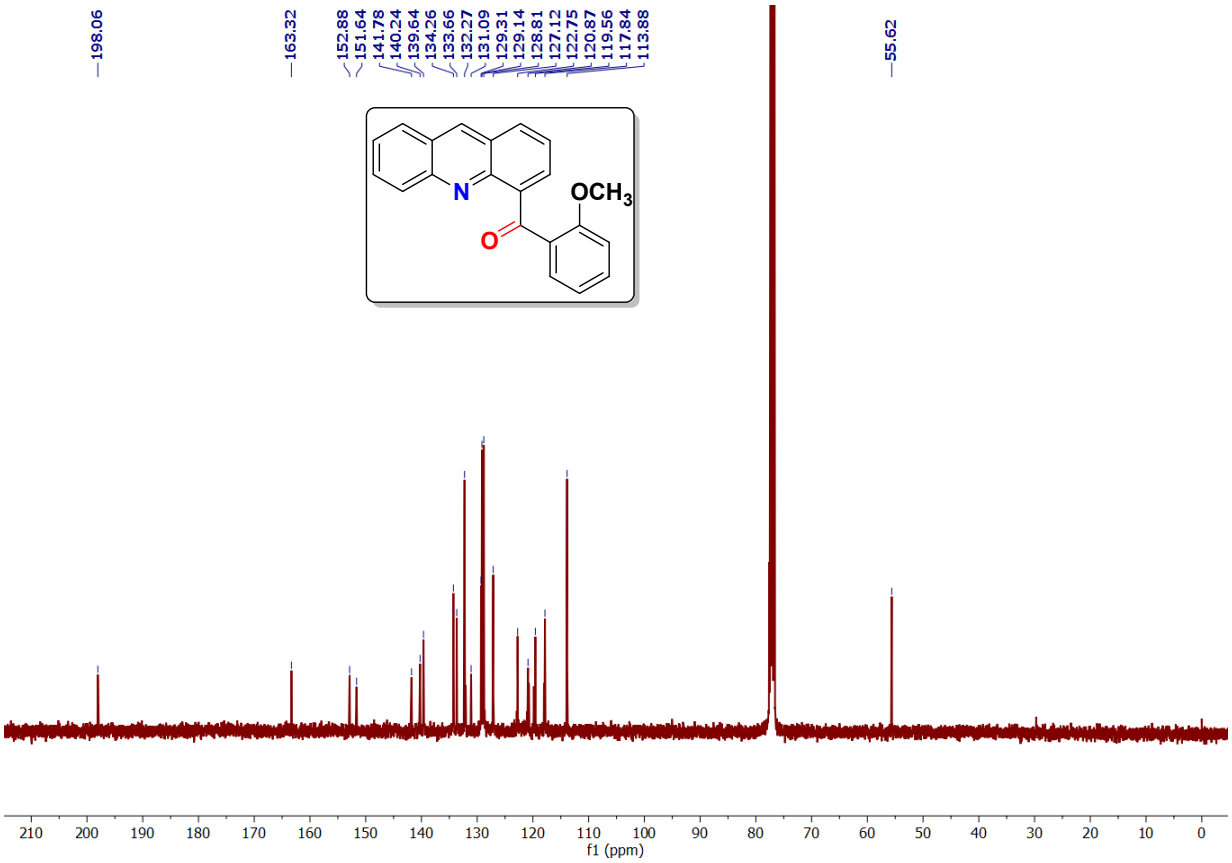


Figure-16. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4d**

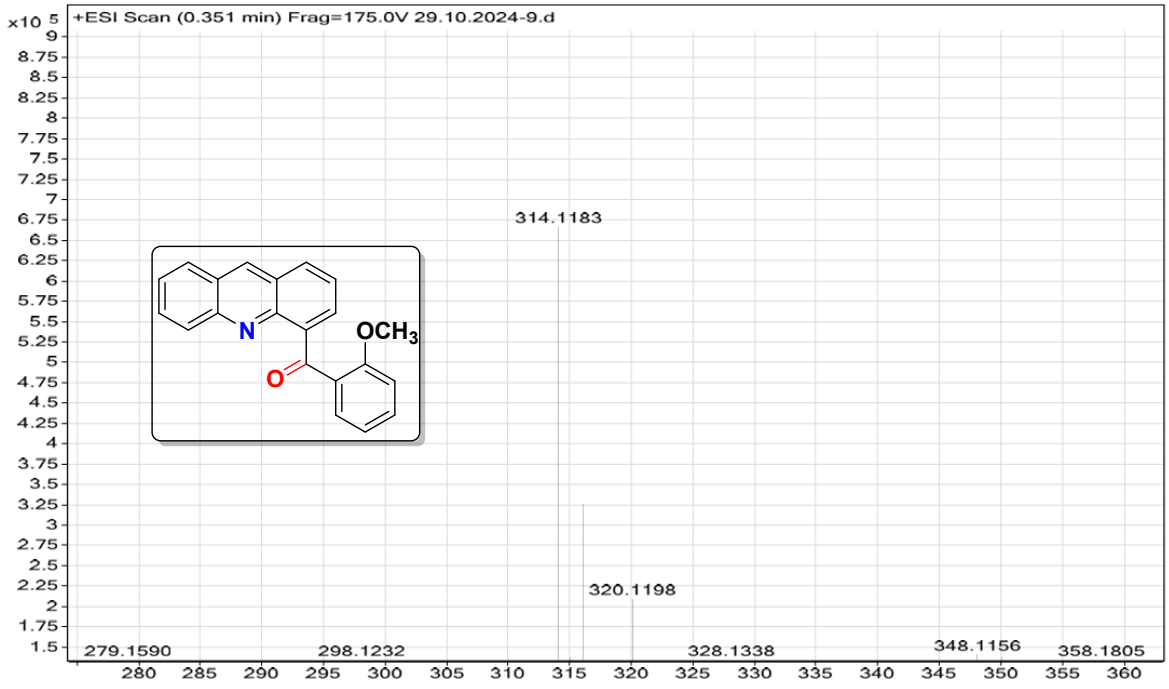


Figure-17. HR-MS(ESI^{+}) spectrum of compound **4d**

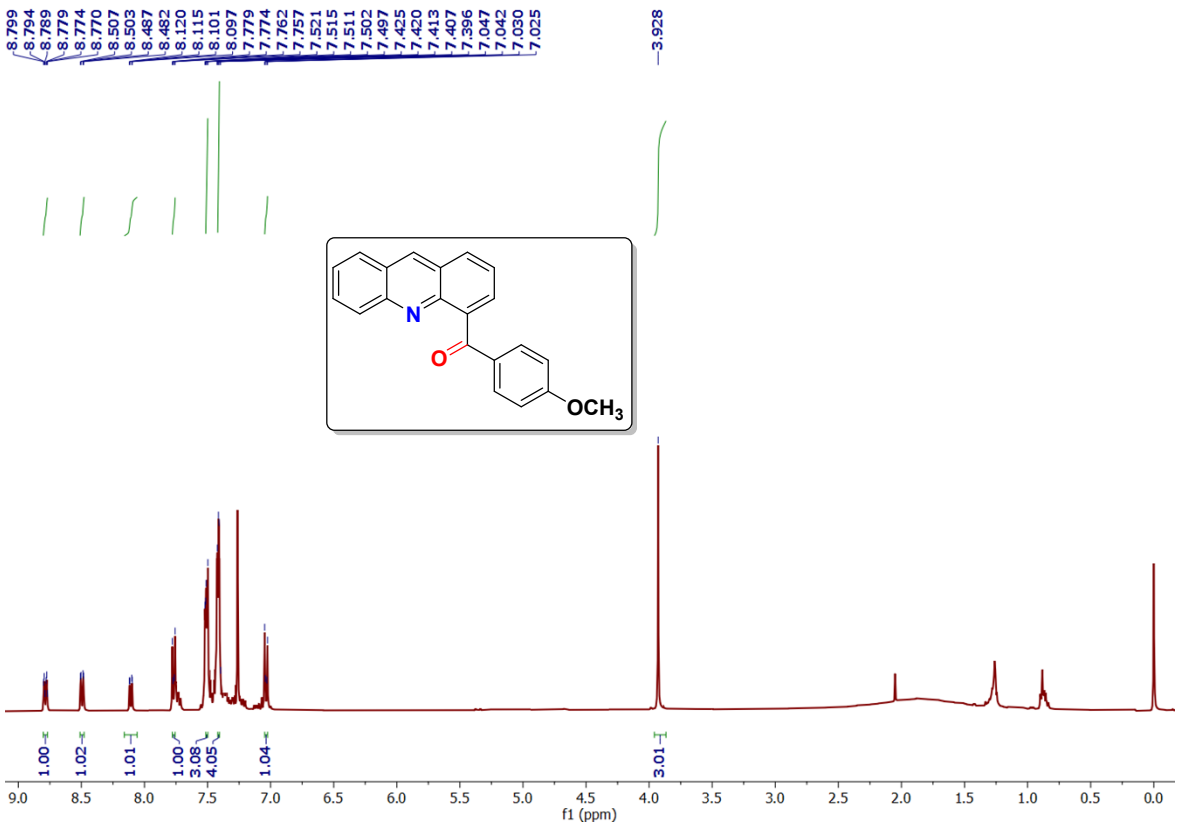


Figure-18. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4e**

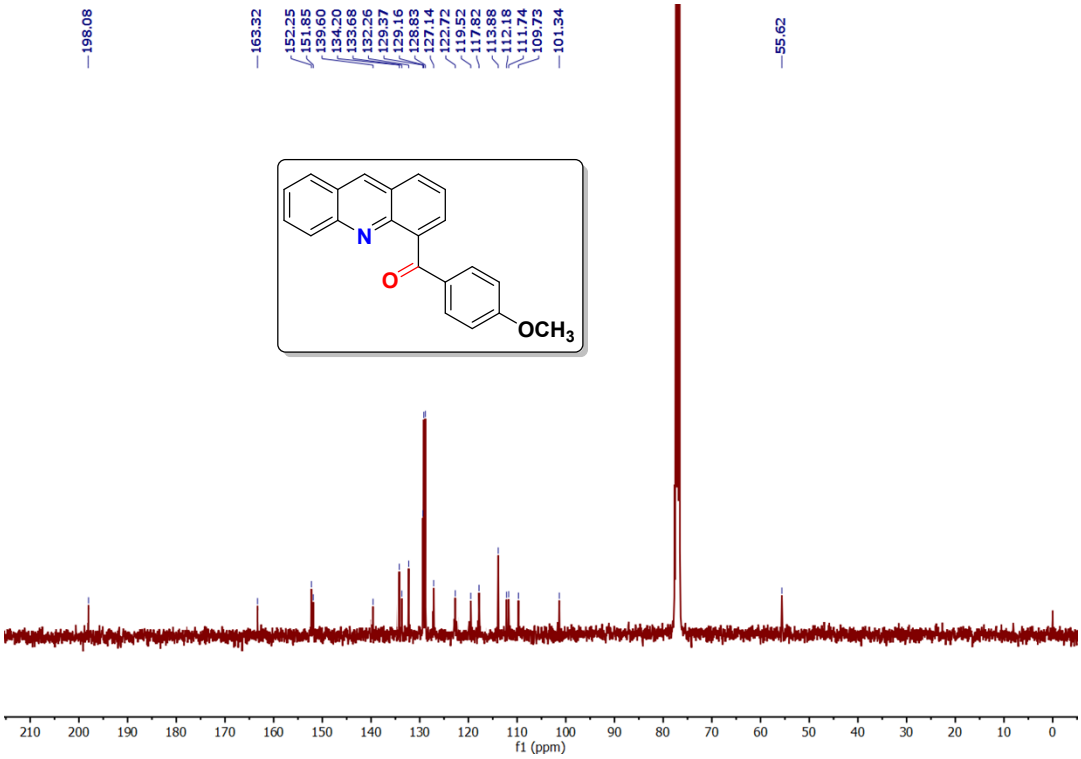


Figure-19. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4e**

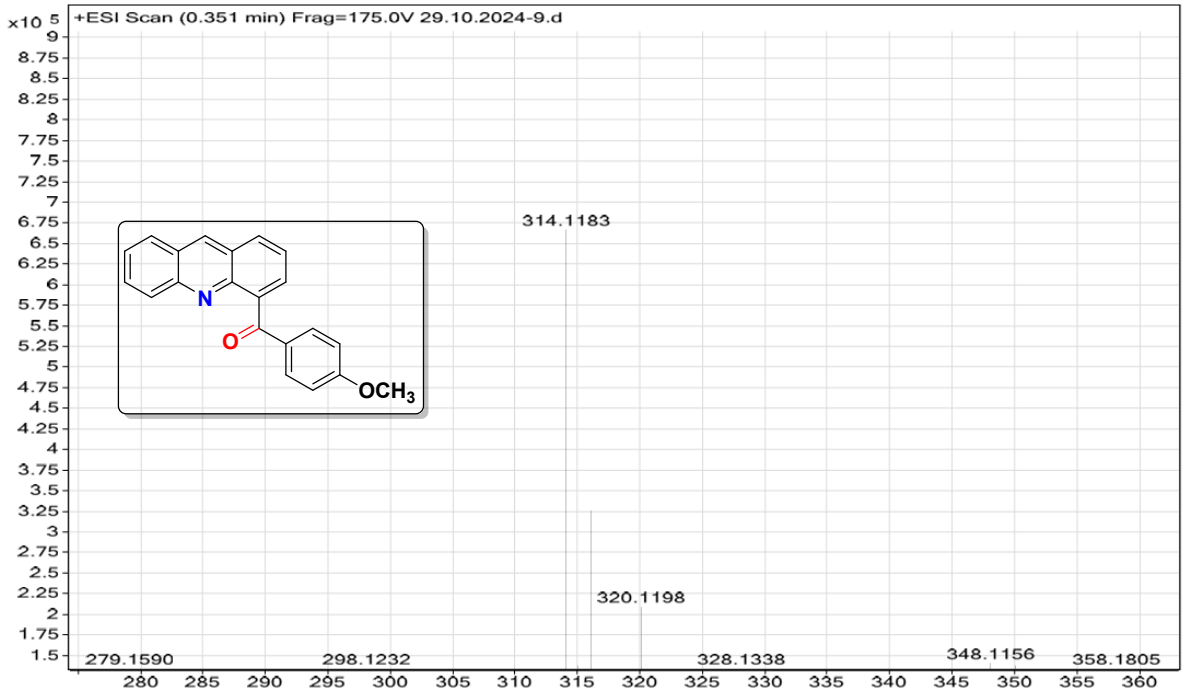


Figure-20. HR-MS(ESI$^+$) spectrum of compound **4e**

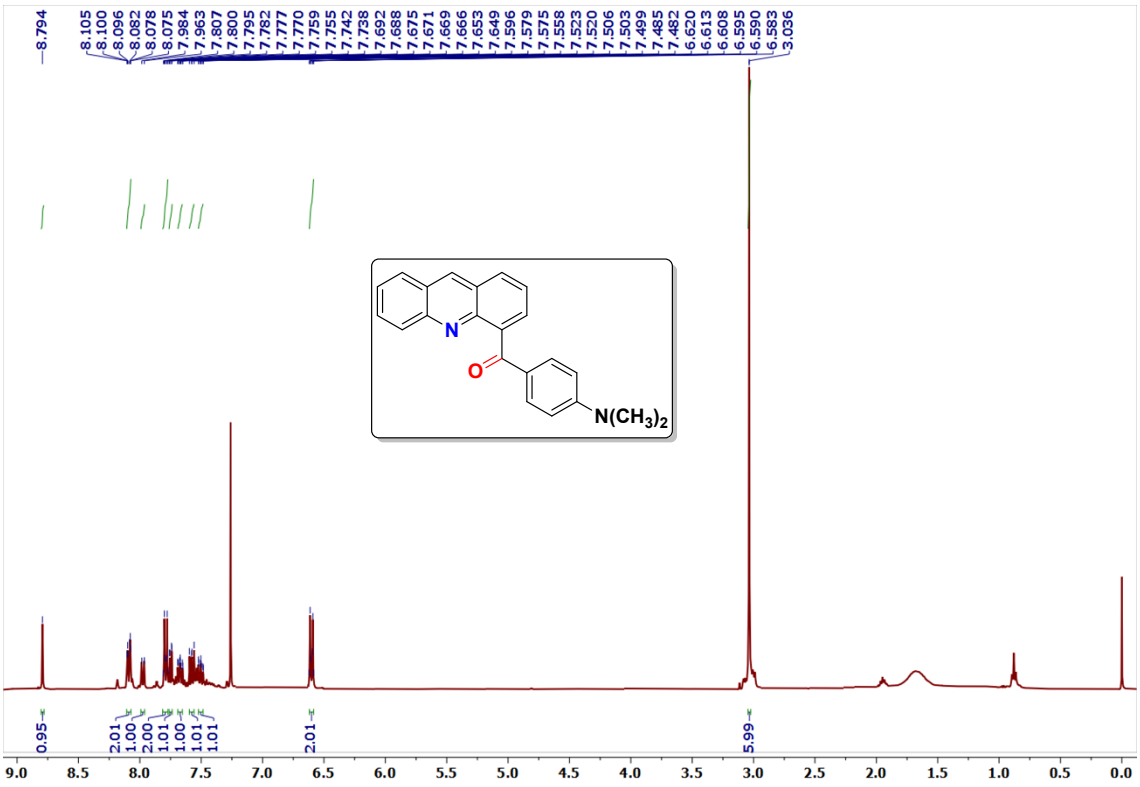


Figure-21. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4f**

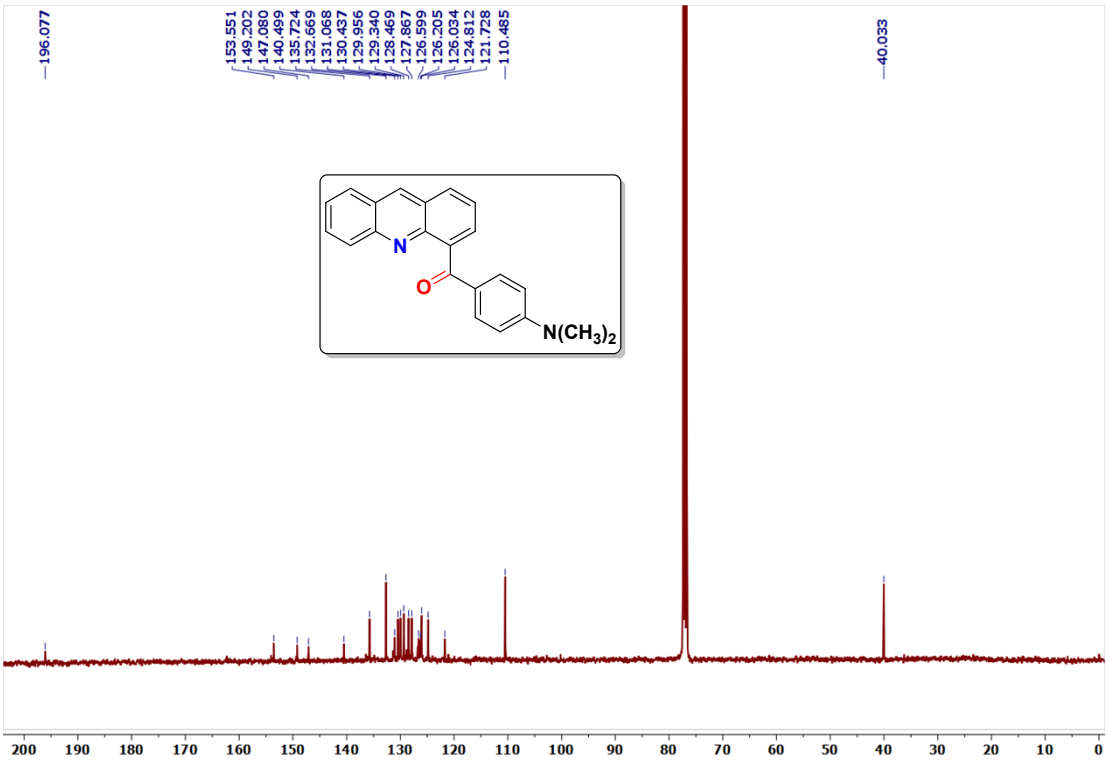


Figure-22. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4f**

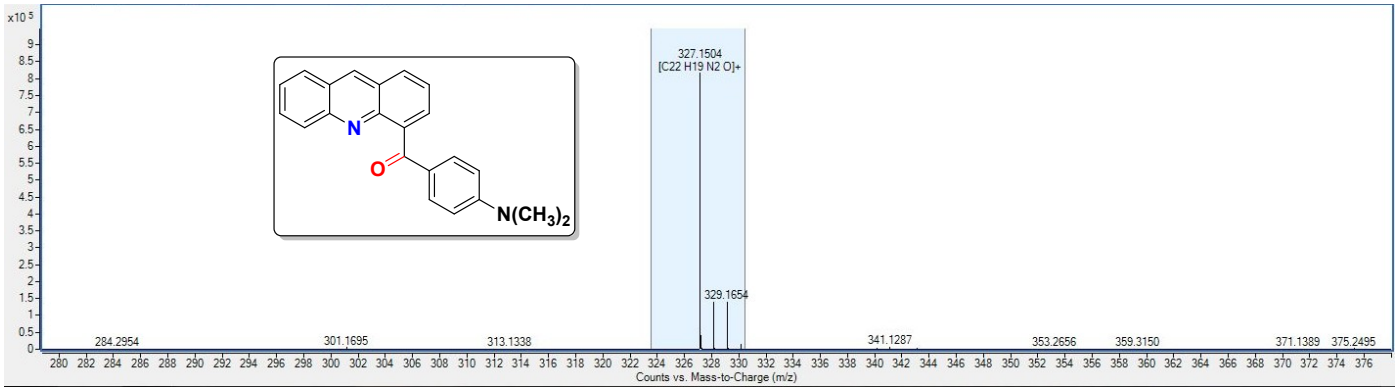


Figure-23. HR-MS(ESI^{+}) spectrum of compound **4f**

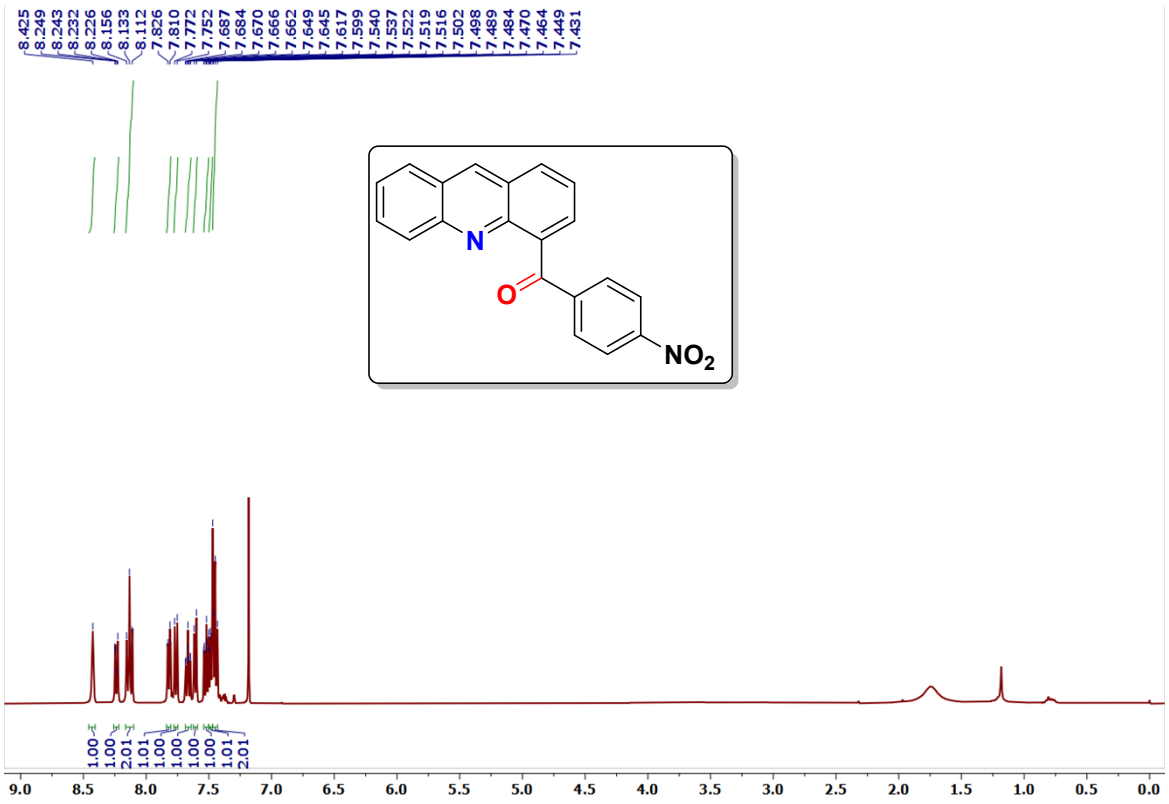


Figure-24. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4g**

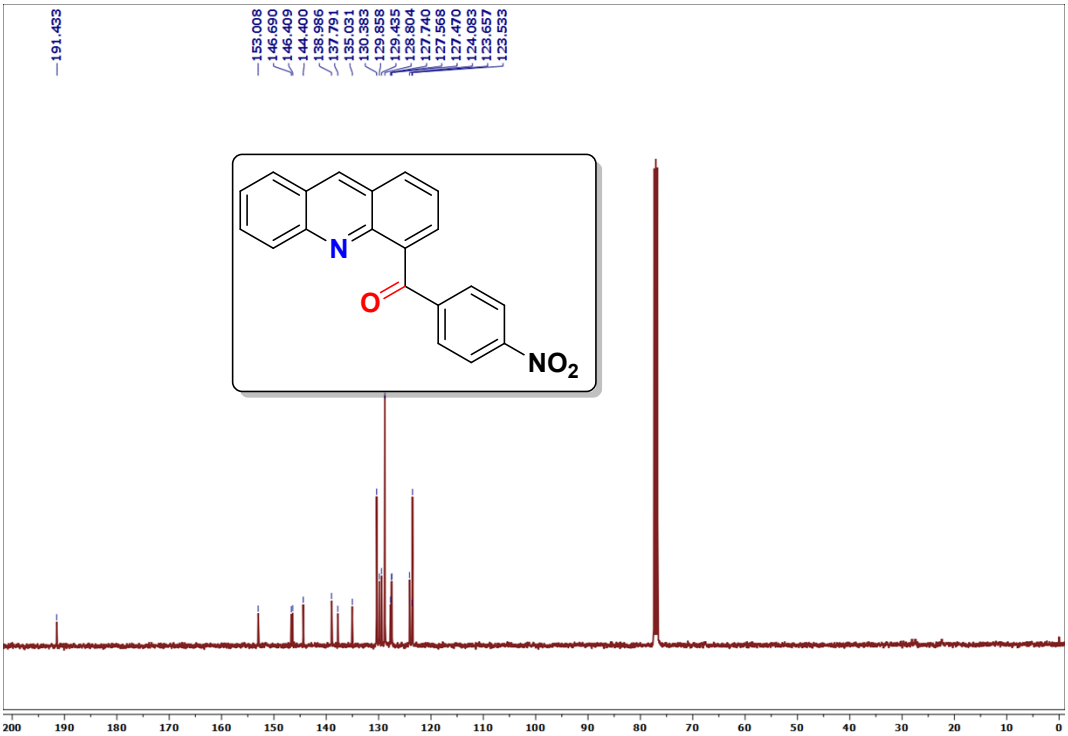


Figure-25. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4g**

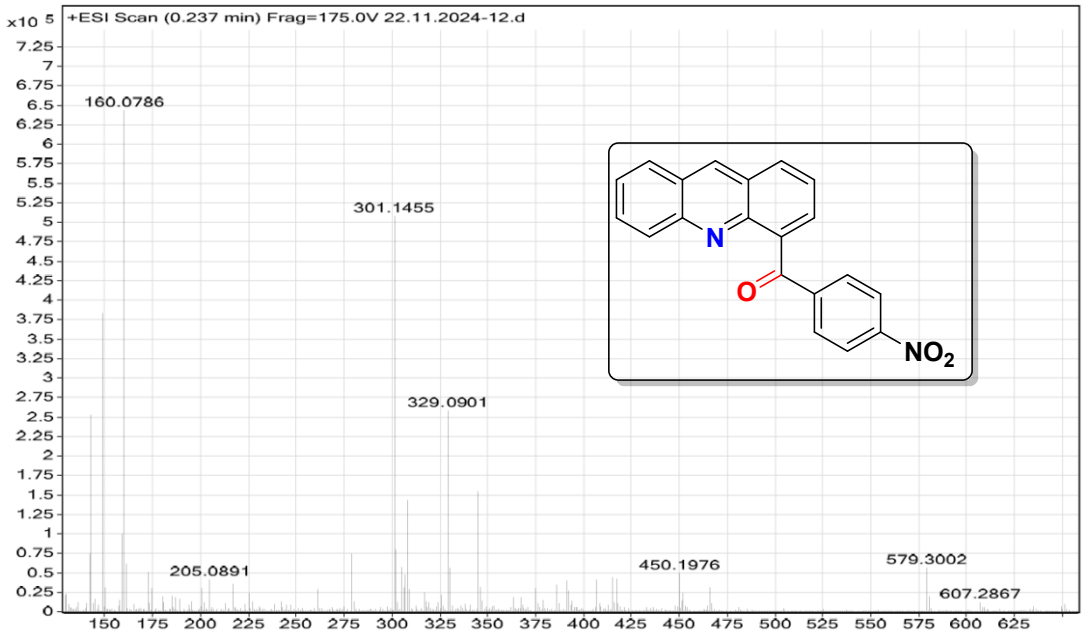


Figure-26. HR-MS(ESI$^+$) spectrum of compound **4g**

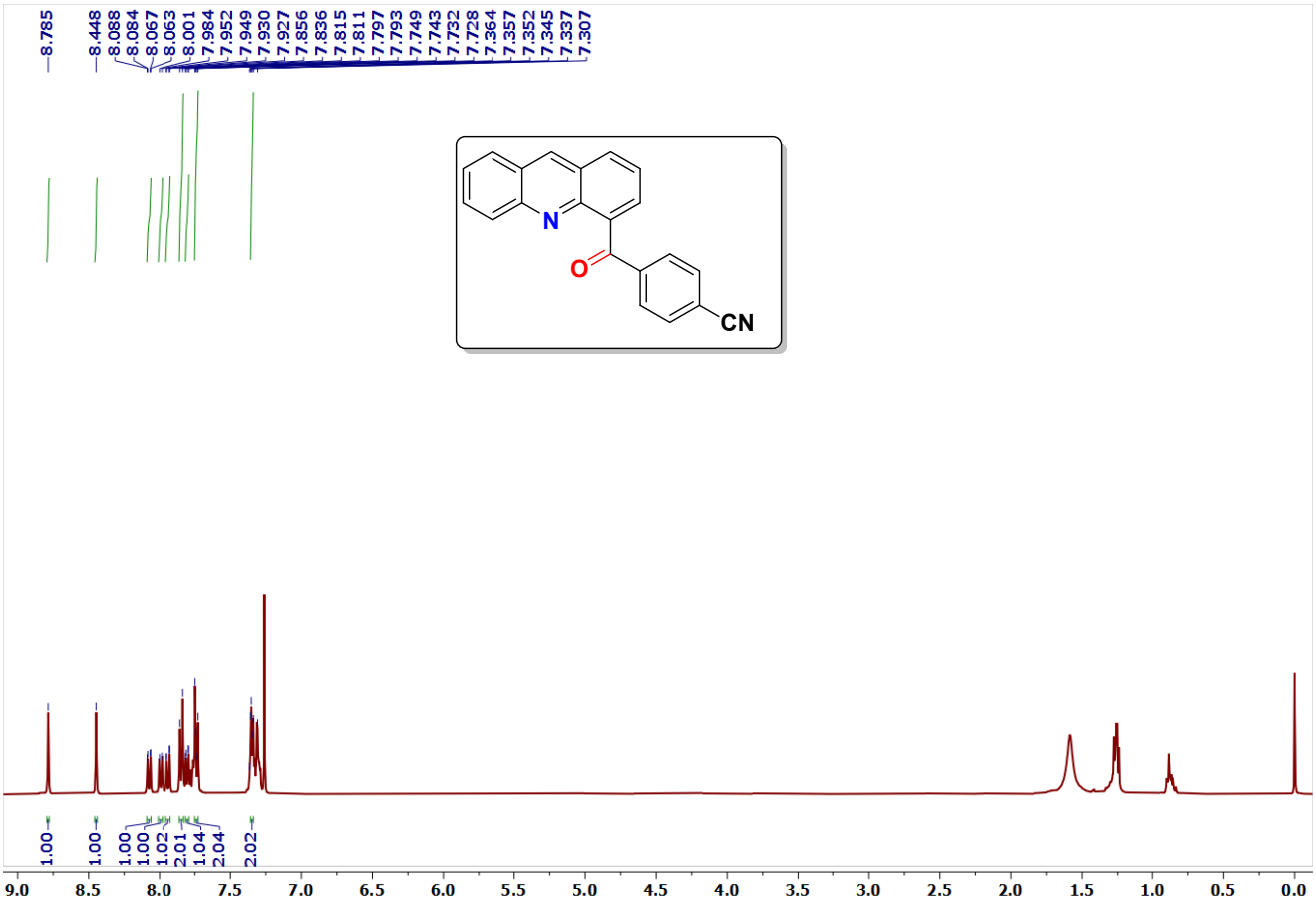


Figure-27. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4h**

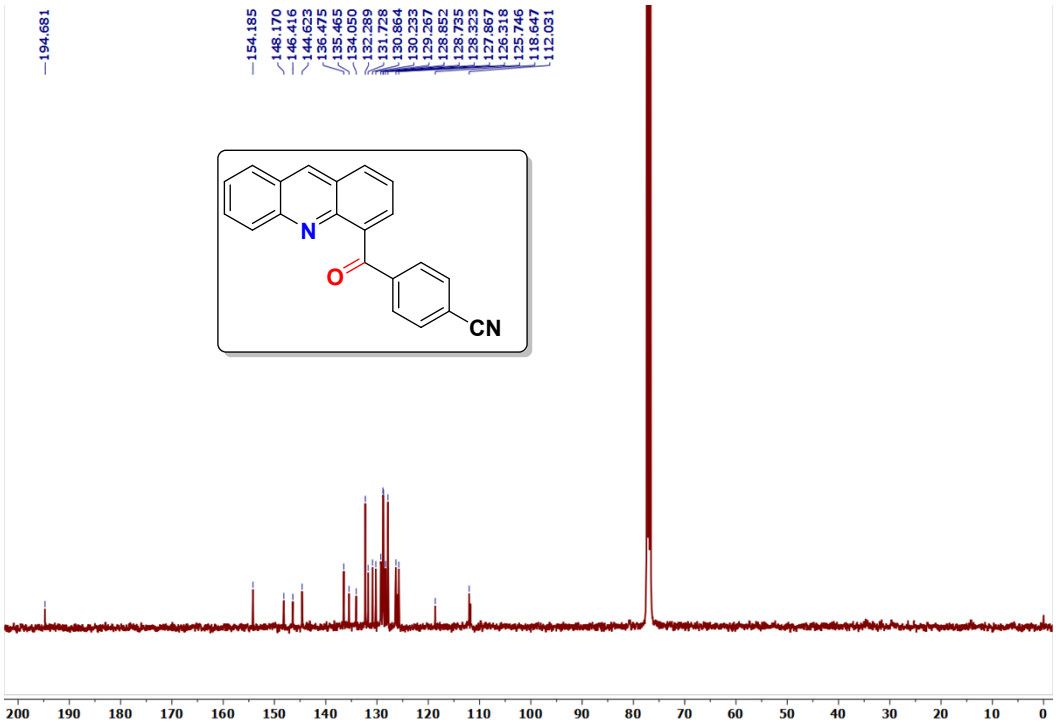


Figure-28. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4h**

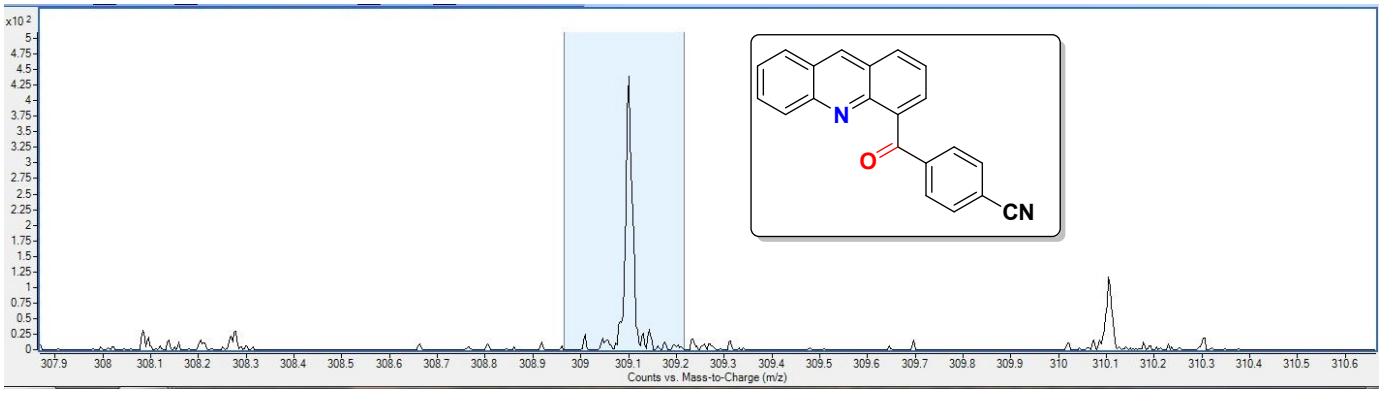


Figure-29. HR-MS(ESI^+) spectrum of compound **4h**

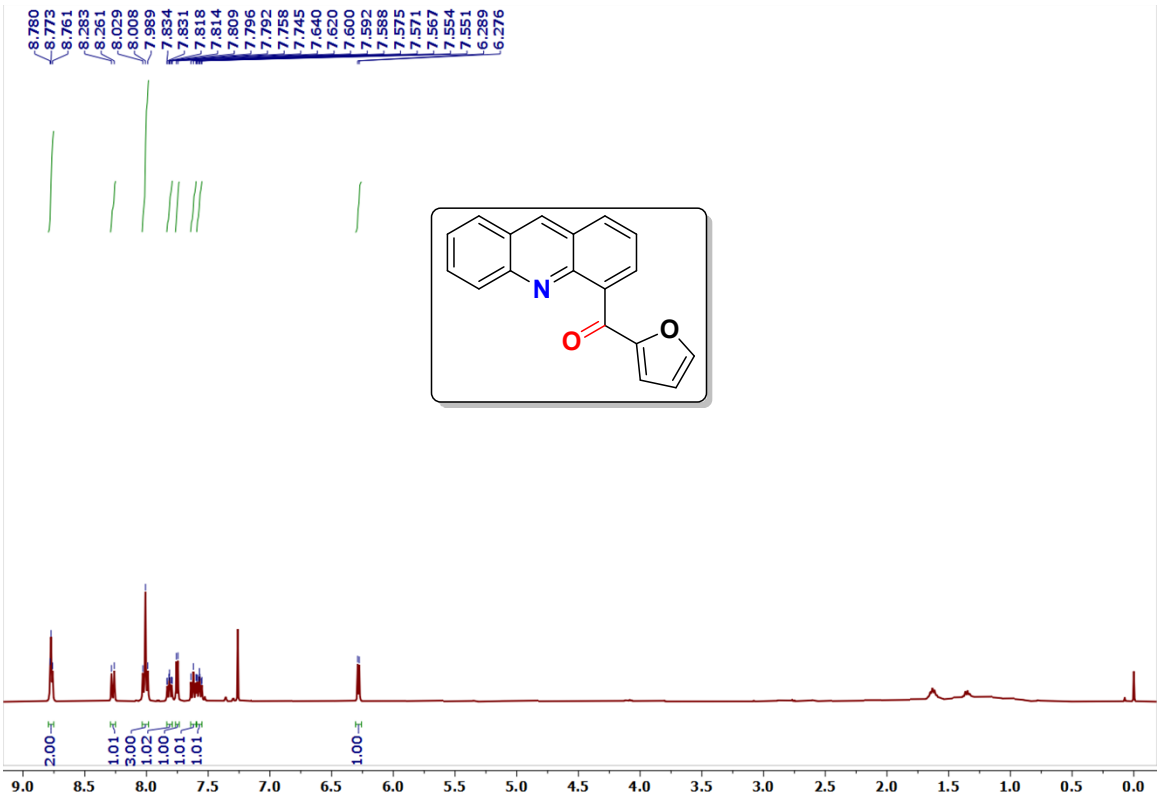


Figure-30. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4i**

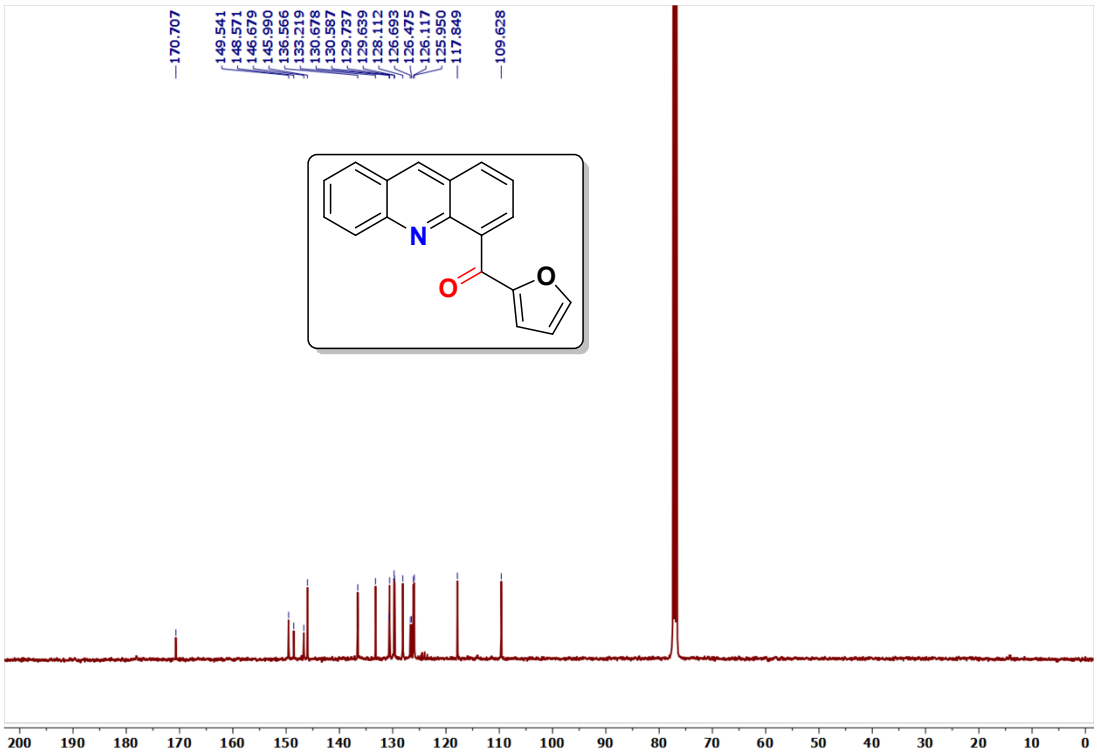


Figure-31. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4i**

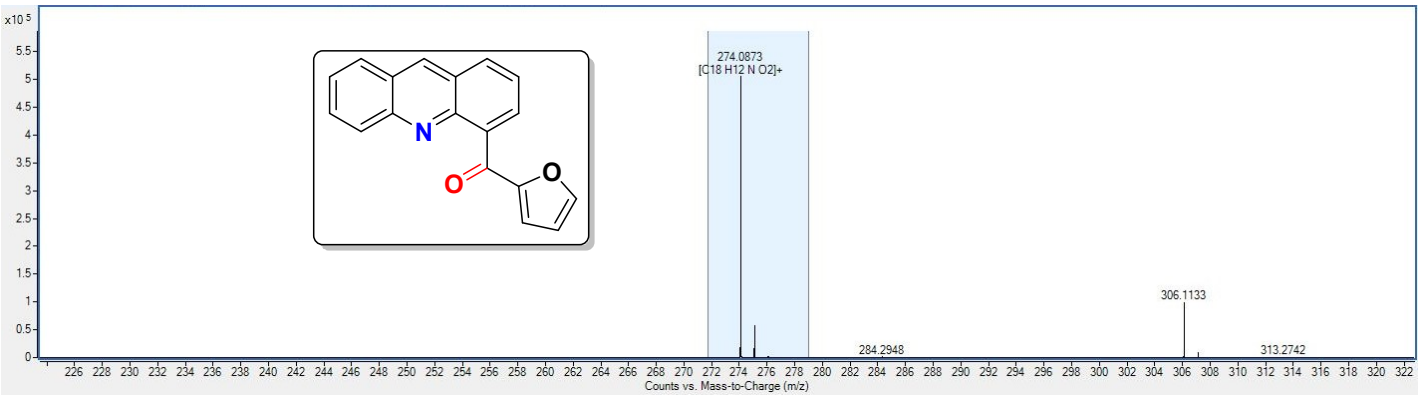


Figure-32. HR-MS(ESI$^+$) spectrum of compound **4i**

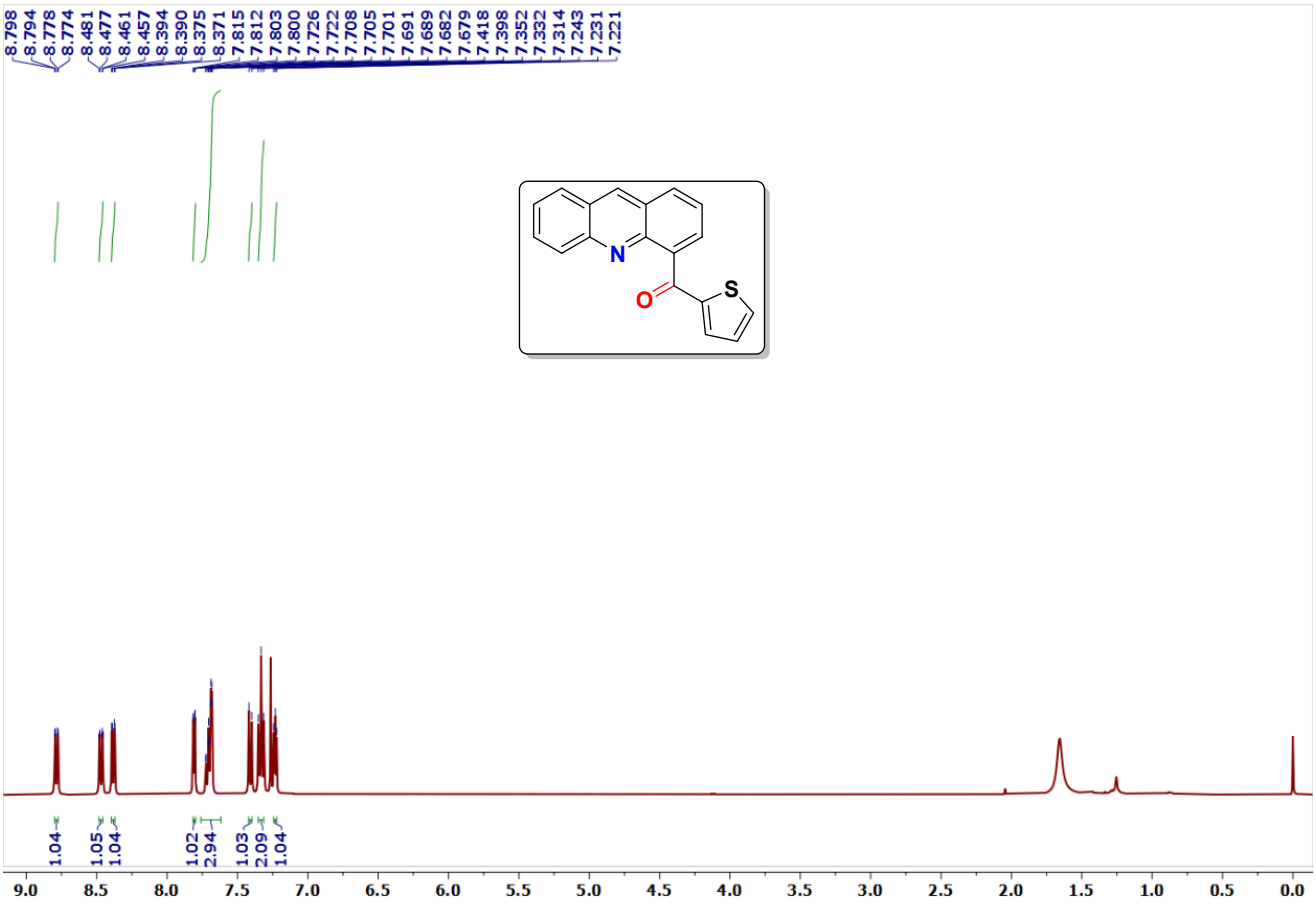


Figure-33. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4j**

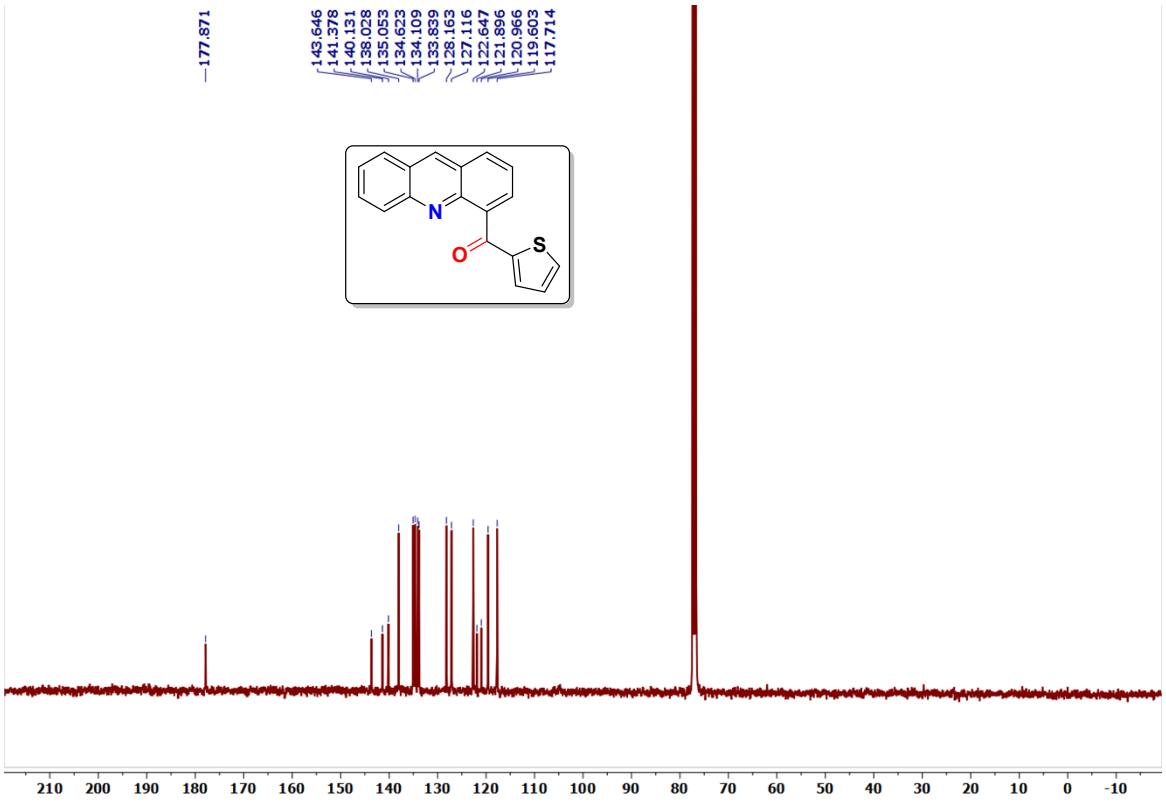


Figure-34. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4j**

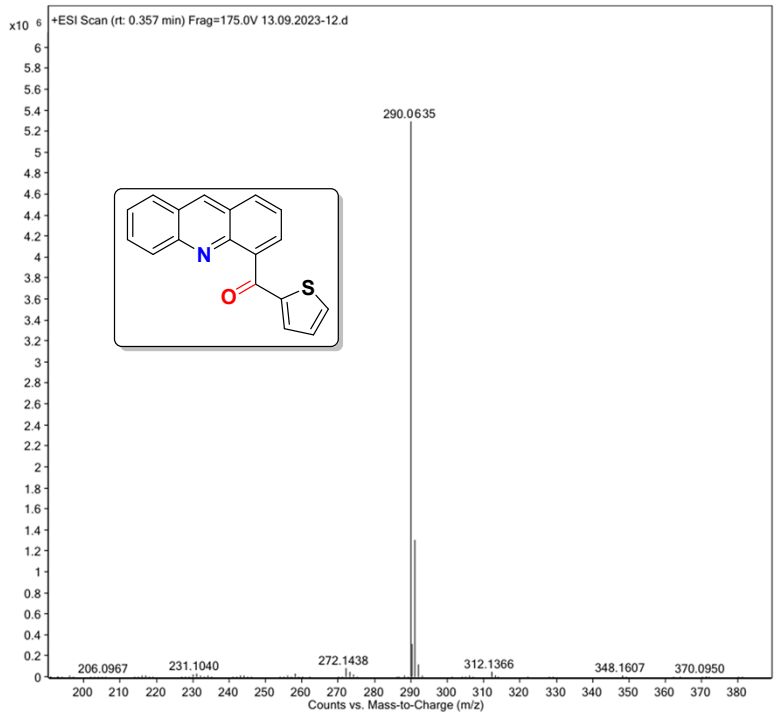


Figure-35. HR-MS(ESI^+) spectrum of compound **4j**

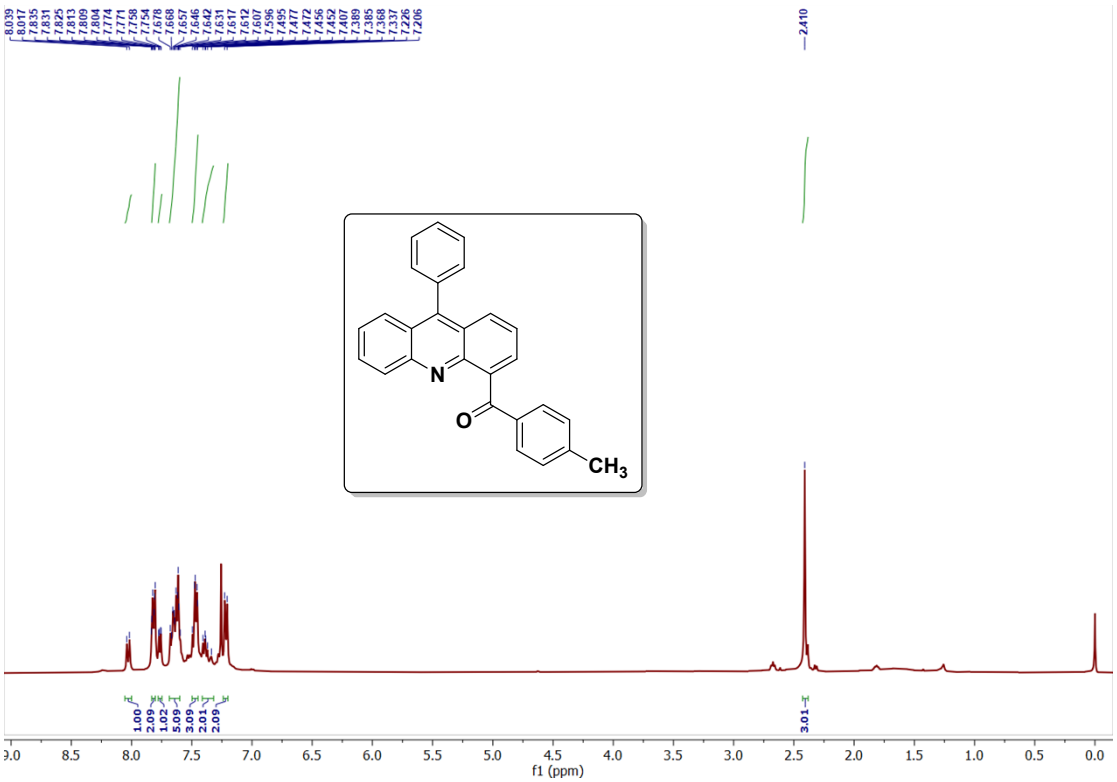


Figure-36. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4k**

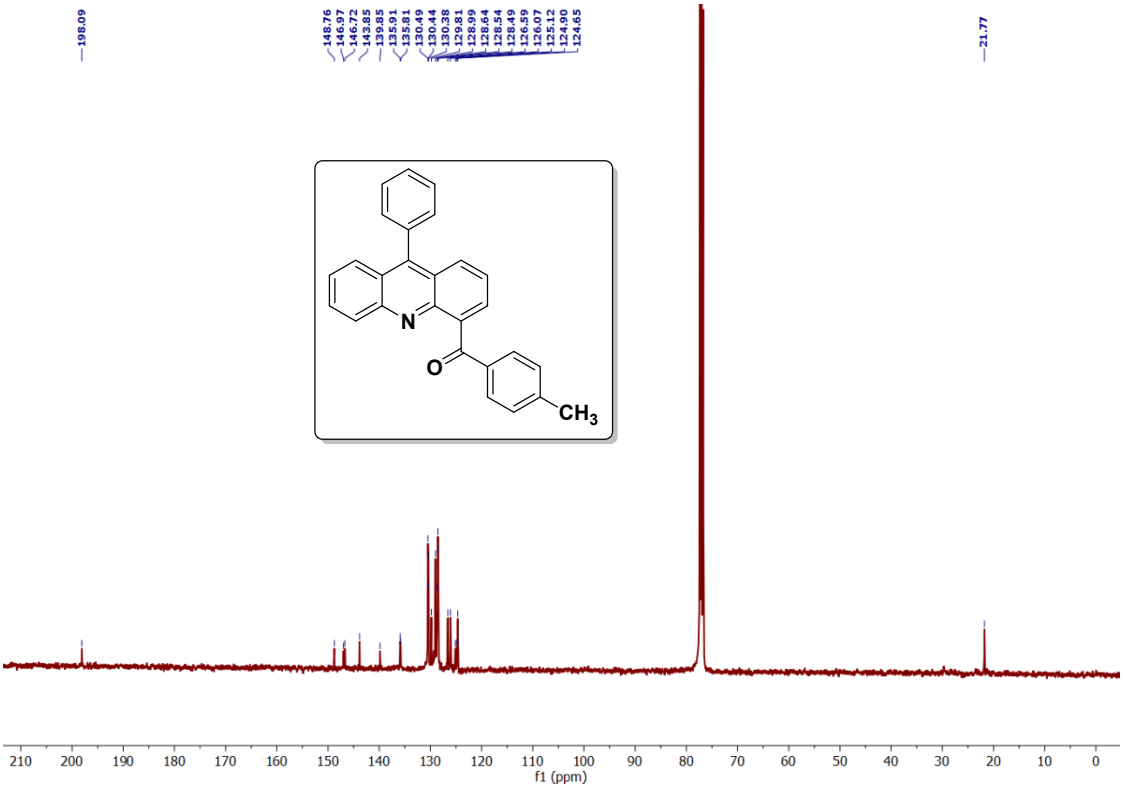


Figure-37. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4k**

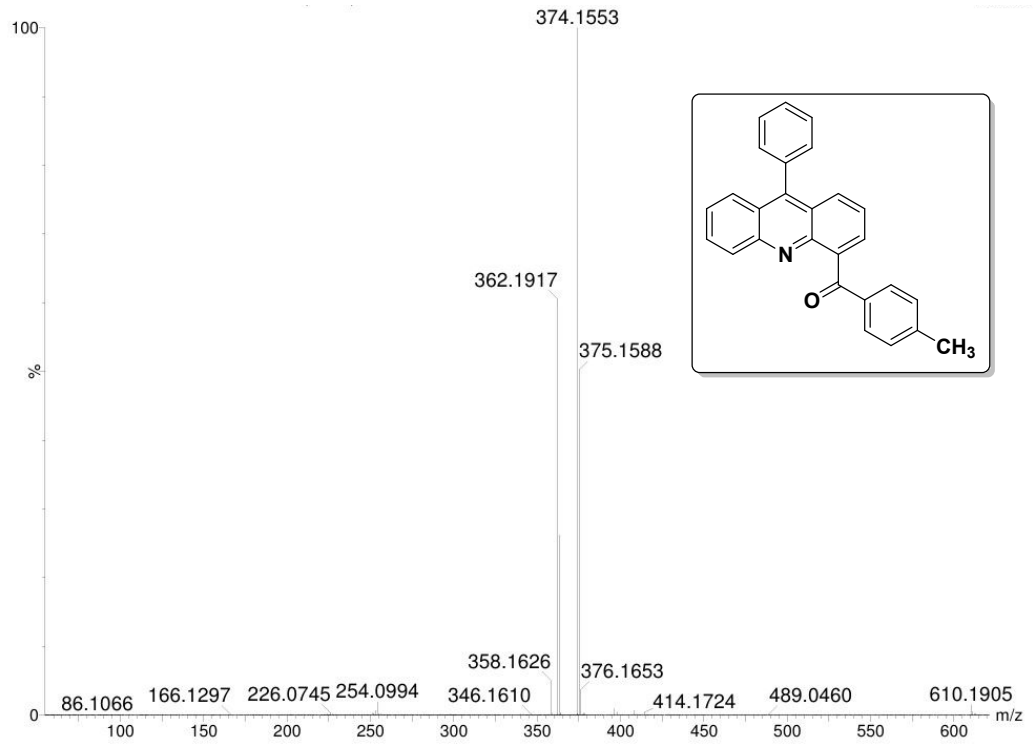


Figure-38. HR-MS(ESI$^+$) spectrum of compound **4k**

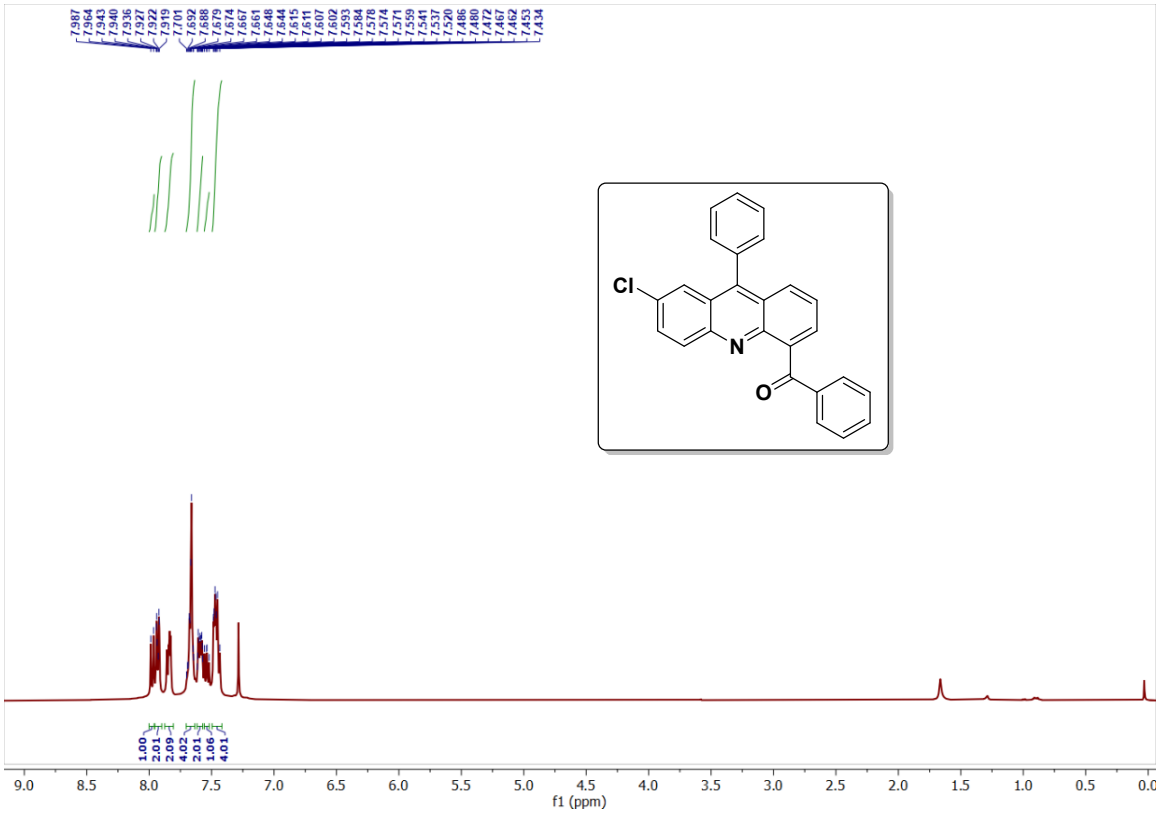


Figure-39. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4l**

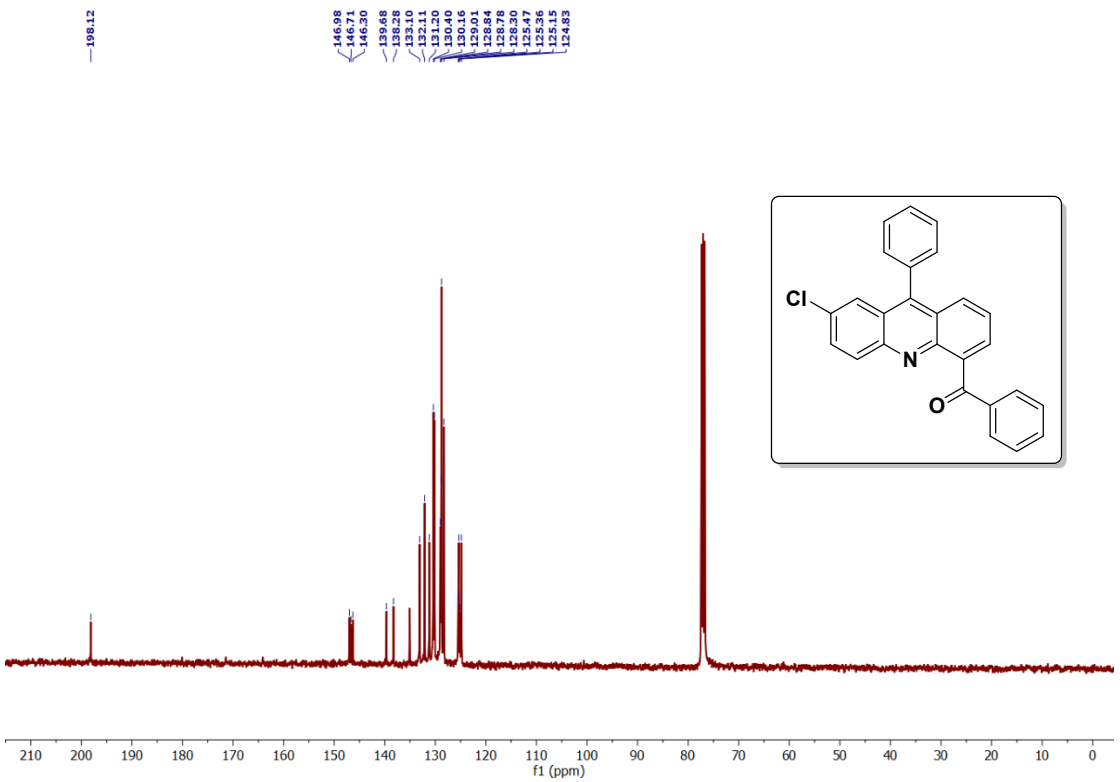


Figure-40. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4l**

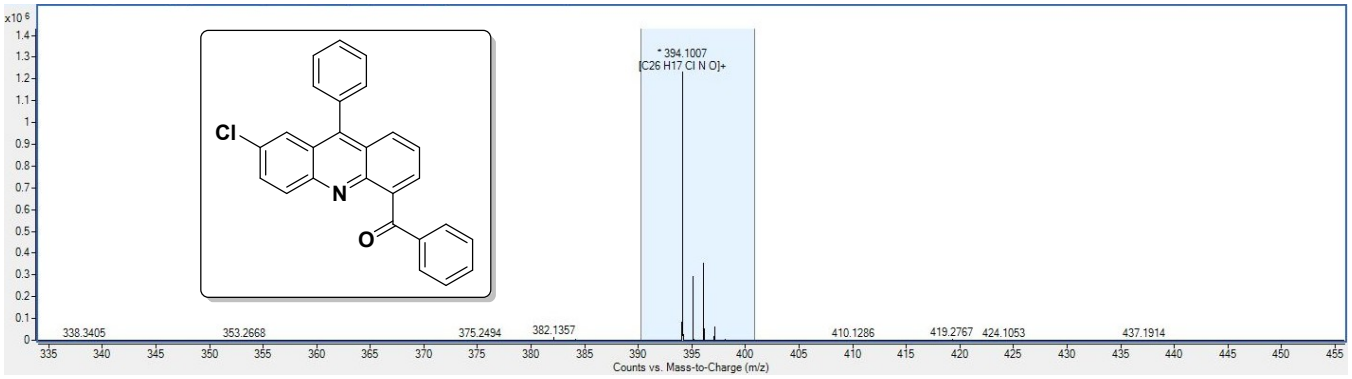


Figure-41. HR-MS(ESI^{+}) spectrum of compound **4l**

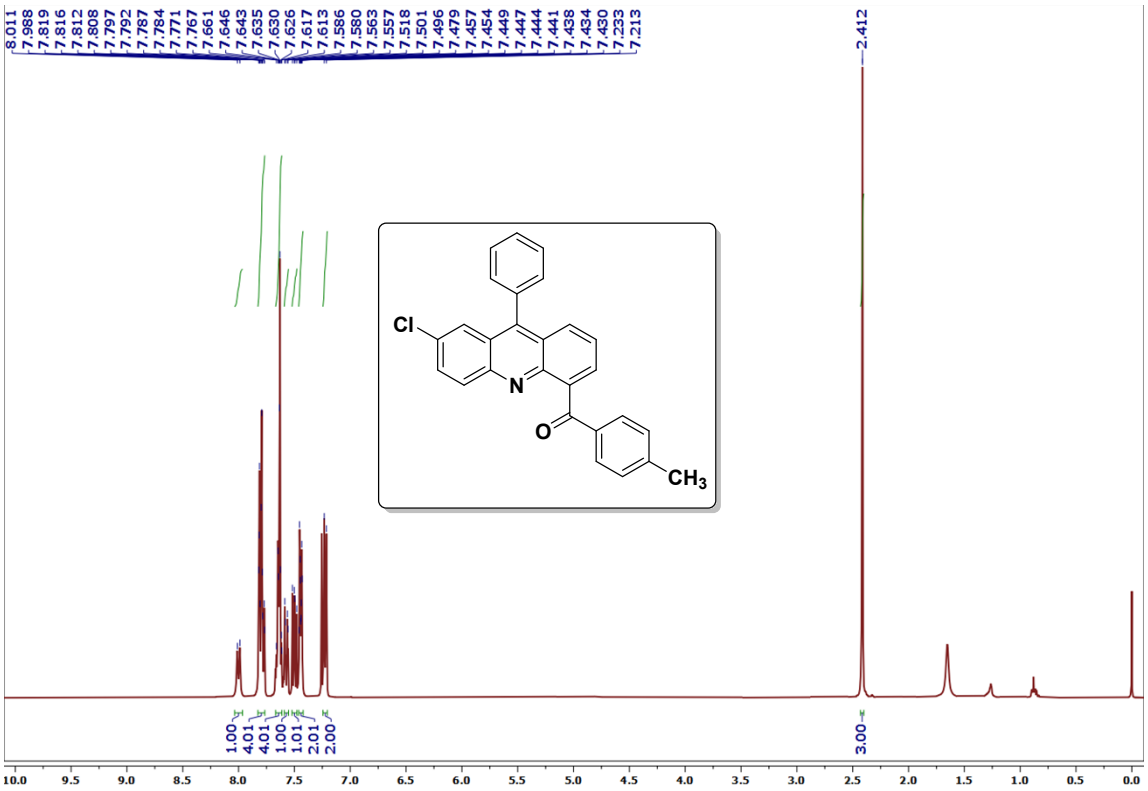


Figure-42. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4m**

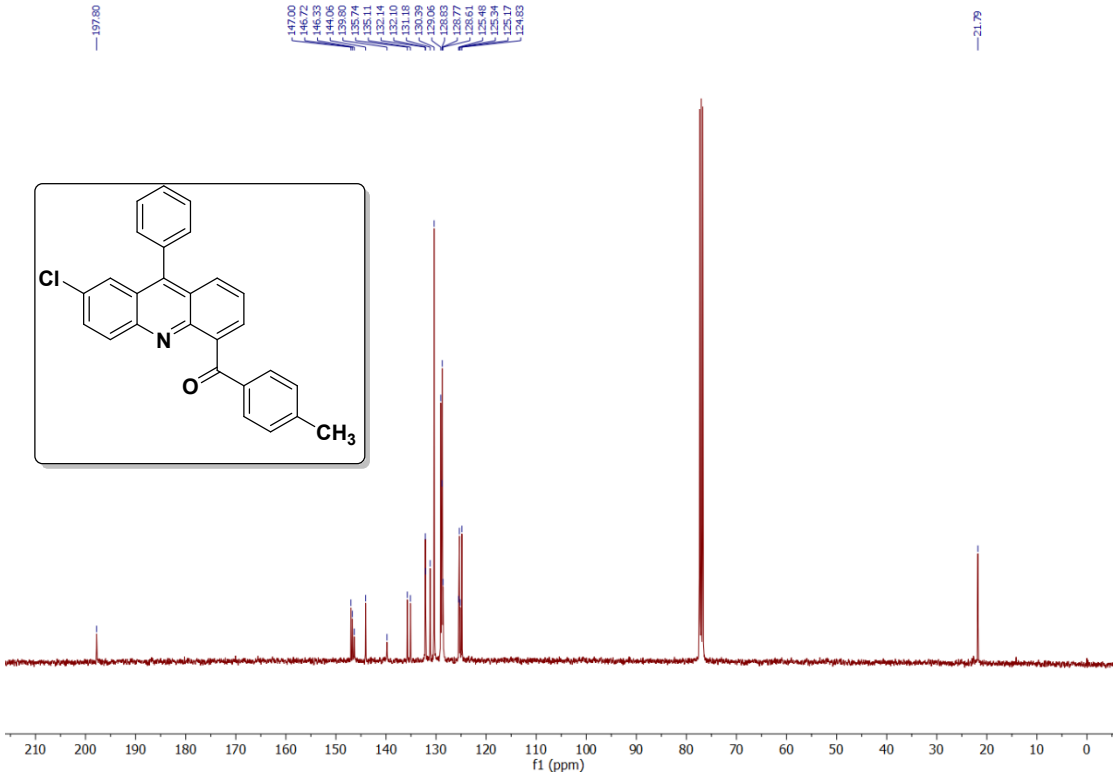


Figure-43. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4m**

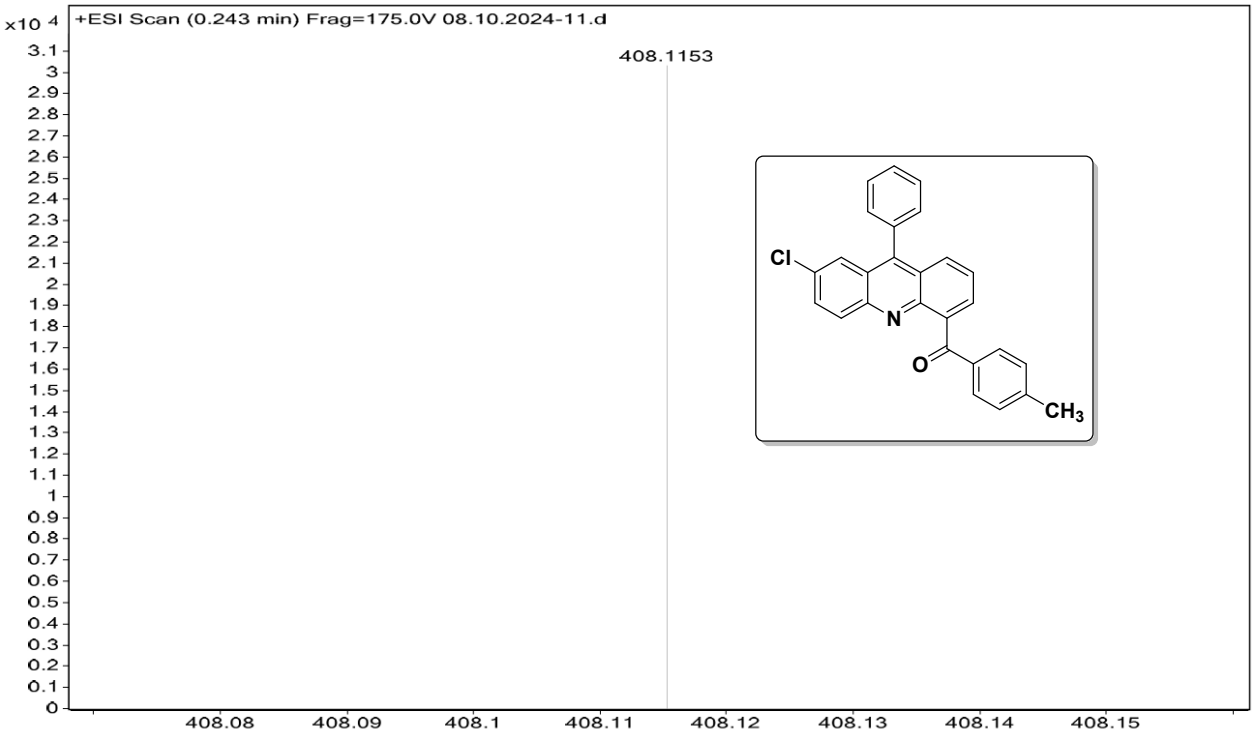


Figure-44. HR-MS(ESI^{+}) spectrum of compound **4m**

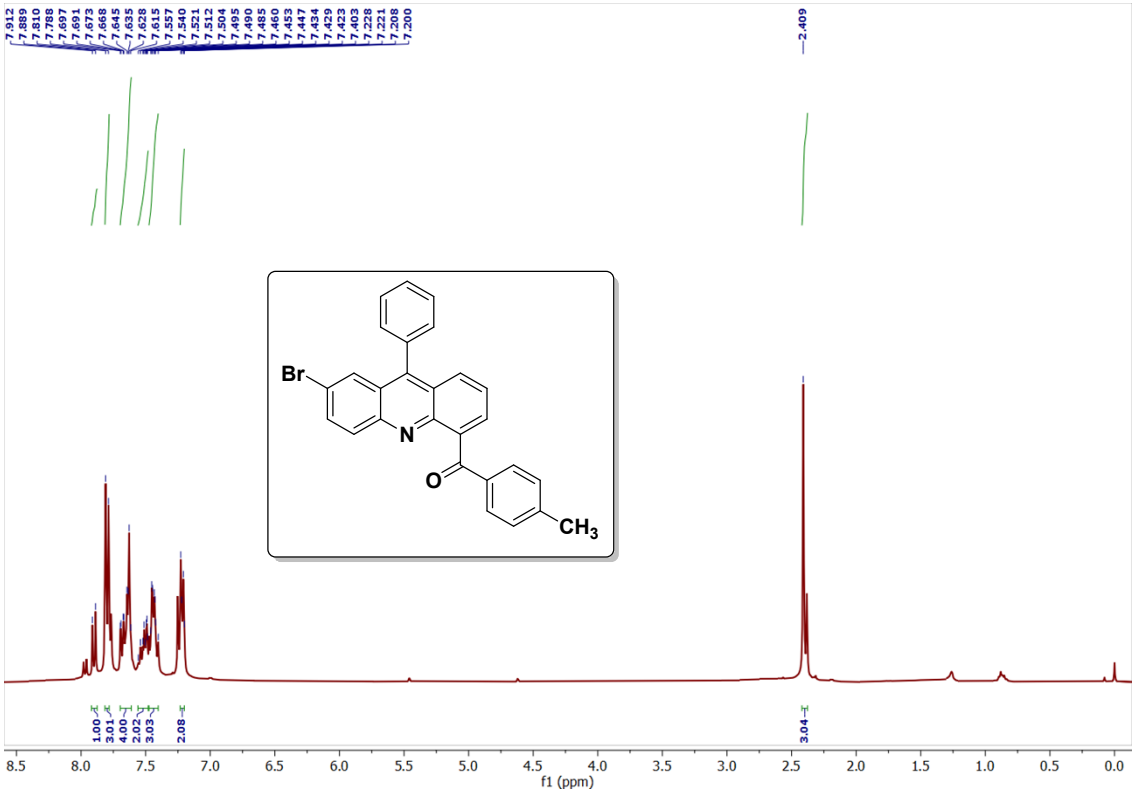


Figure-45. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4n**

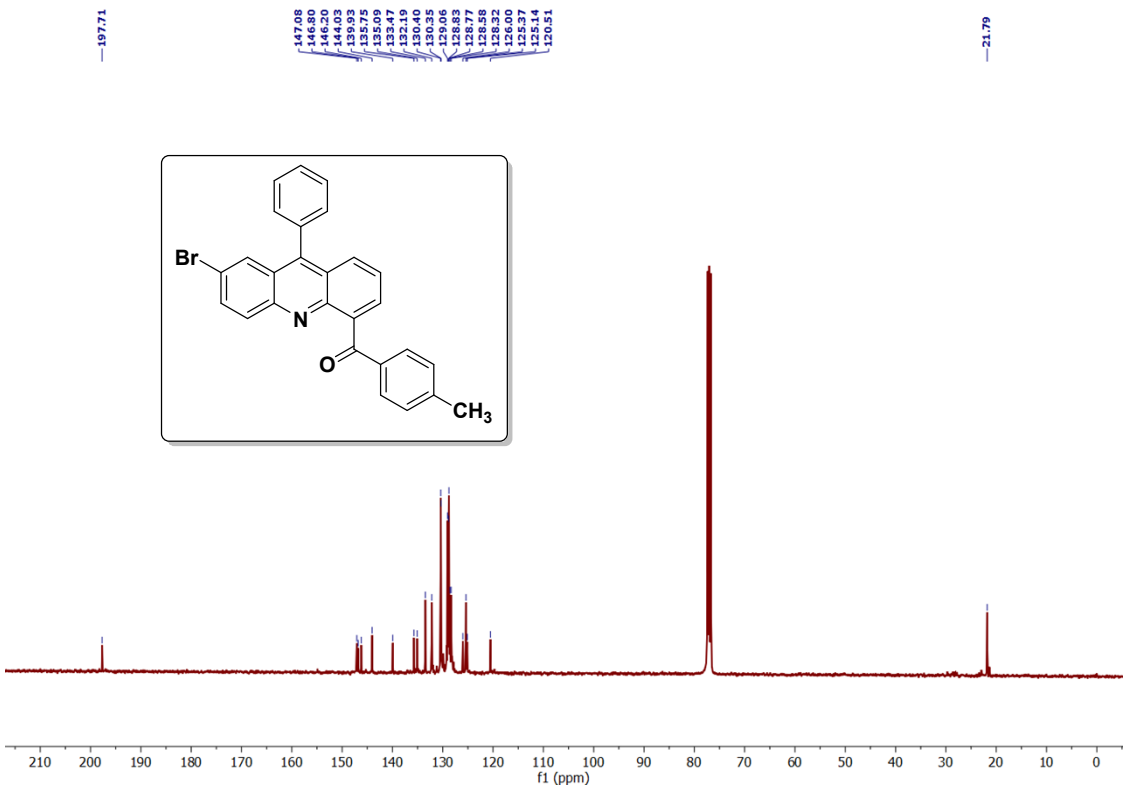


Figure-46. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4n**

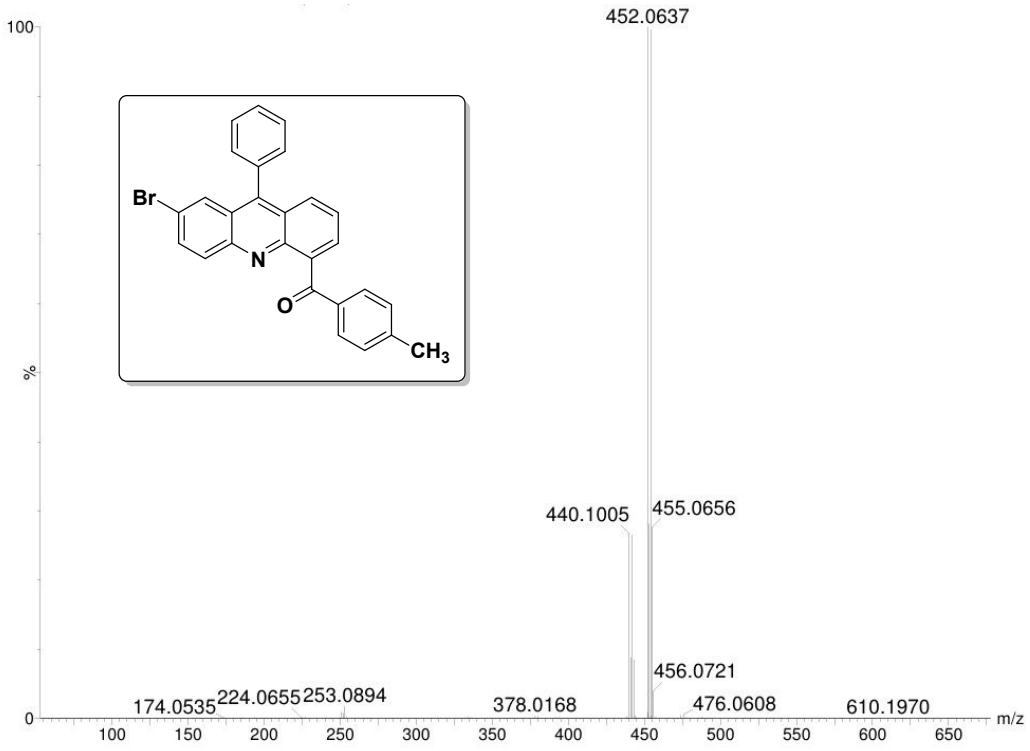


Figure-47. HR-MS(ESI^{+}) spectrum of compound **4n**

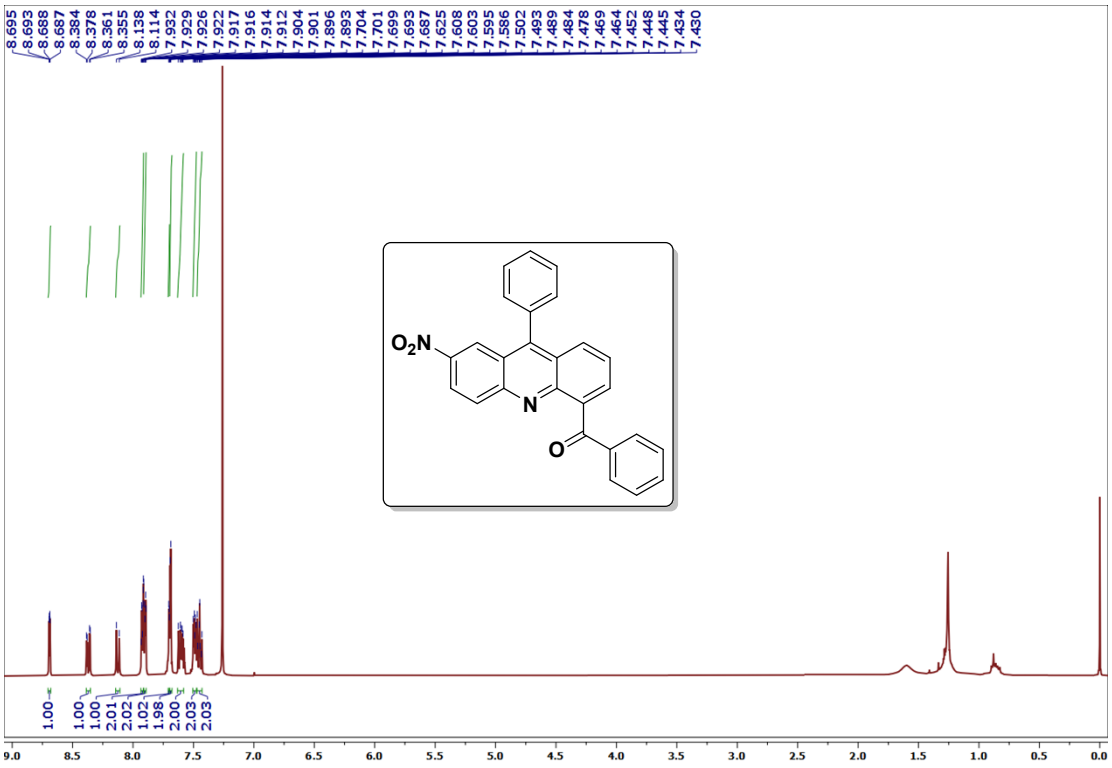


Figure-48. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4o**

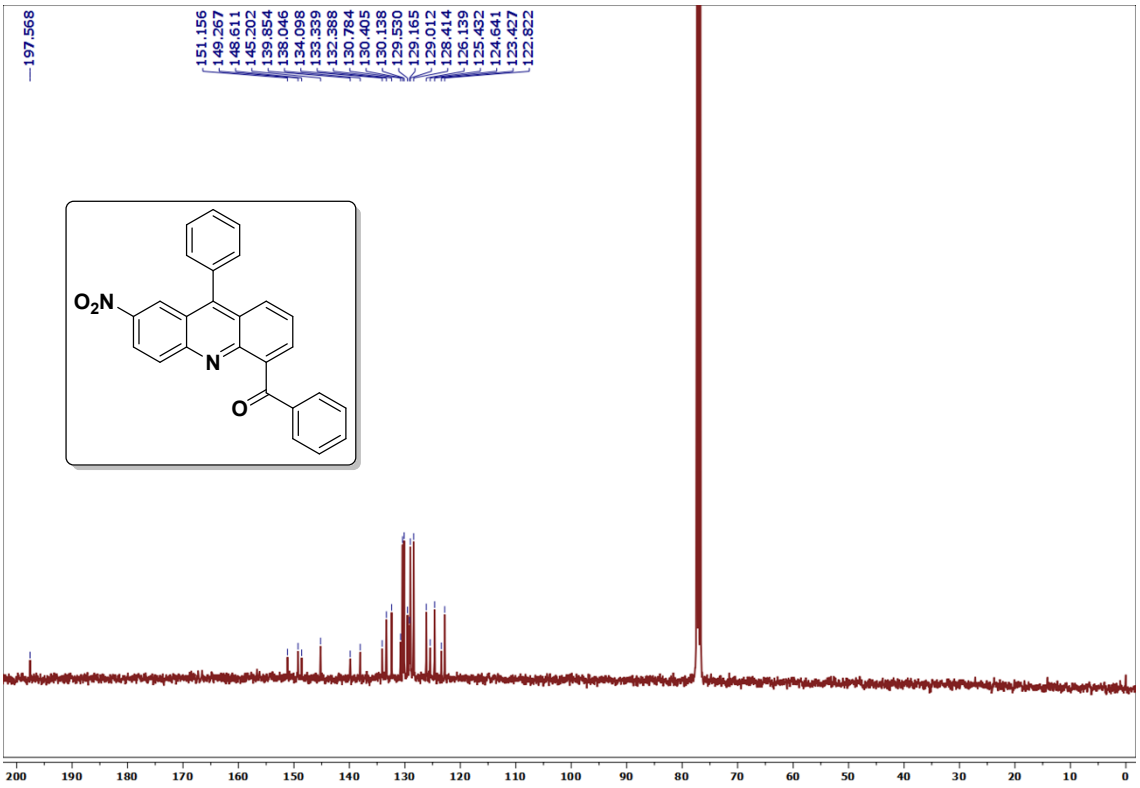


Figure-49. $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of compound **4o**

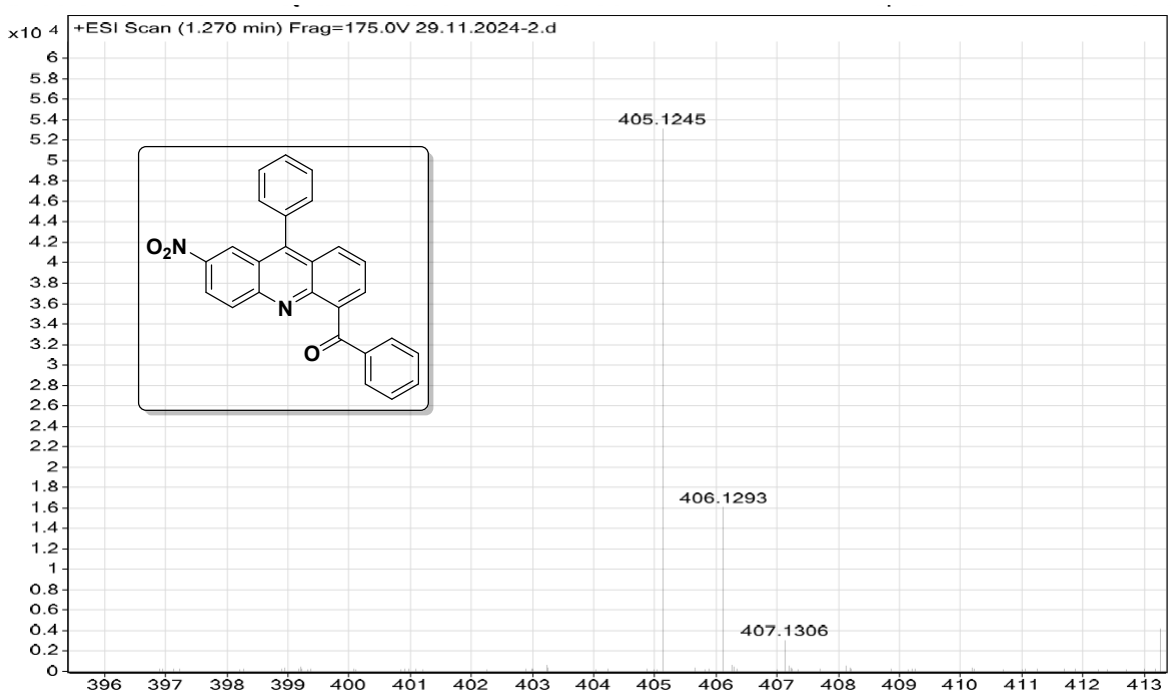


Figure-50. HR-MS(ESI$^+$) spectrum of compound **4o**

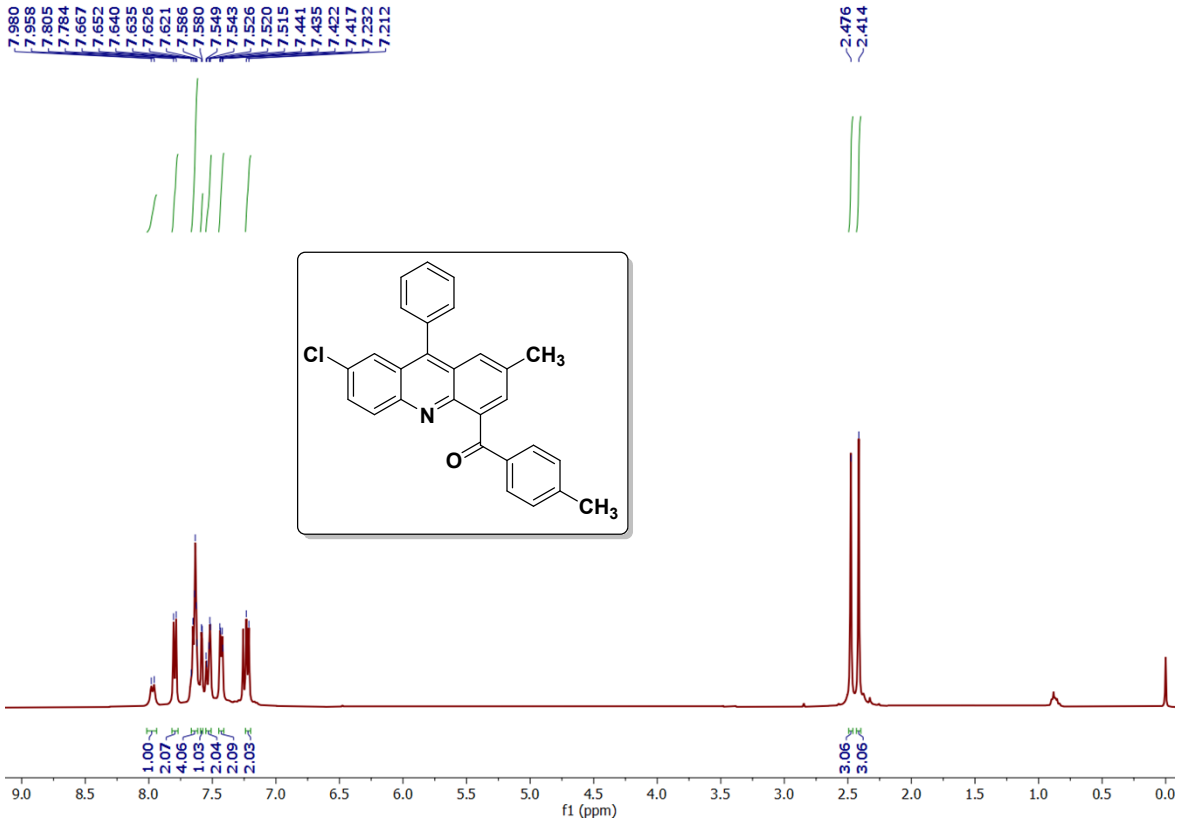


Figure-51. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4p**

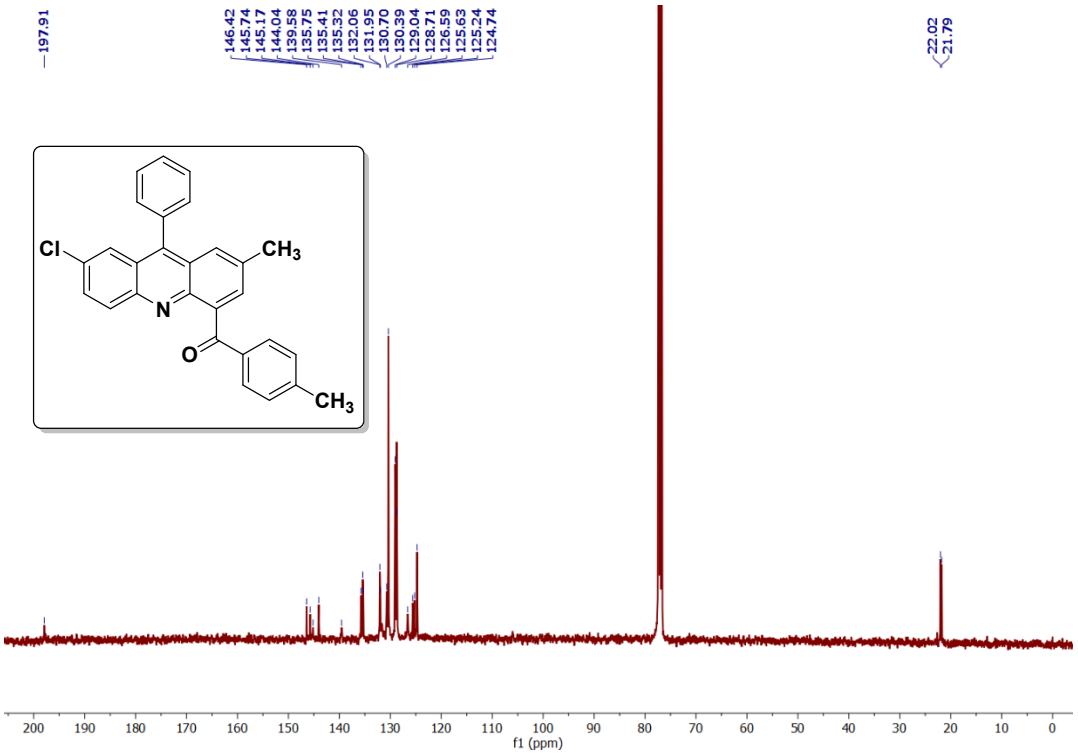


Figure-52. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4p**

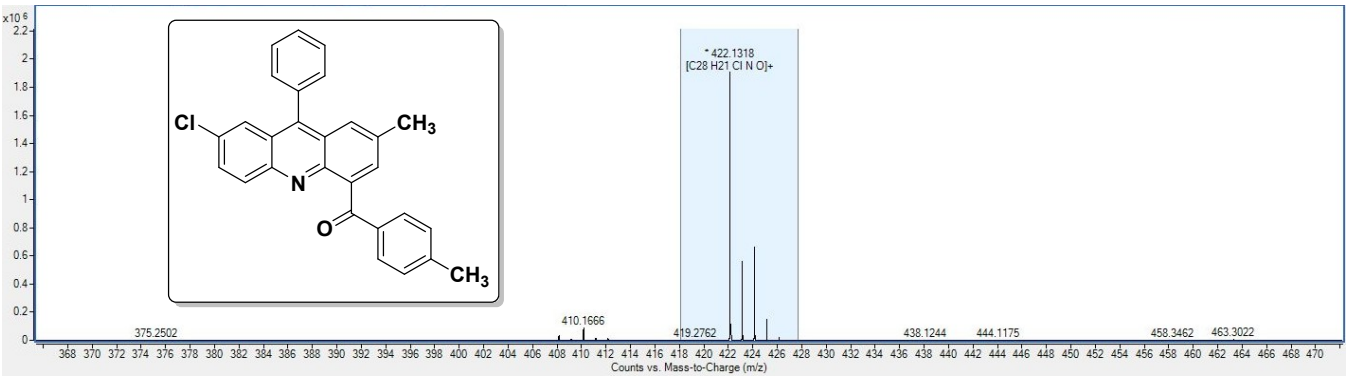


Figure-53. HR-MS(ESI^+) spectrum of compound **4p**

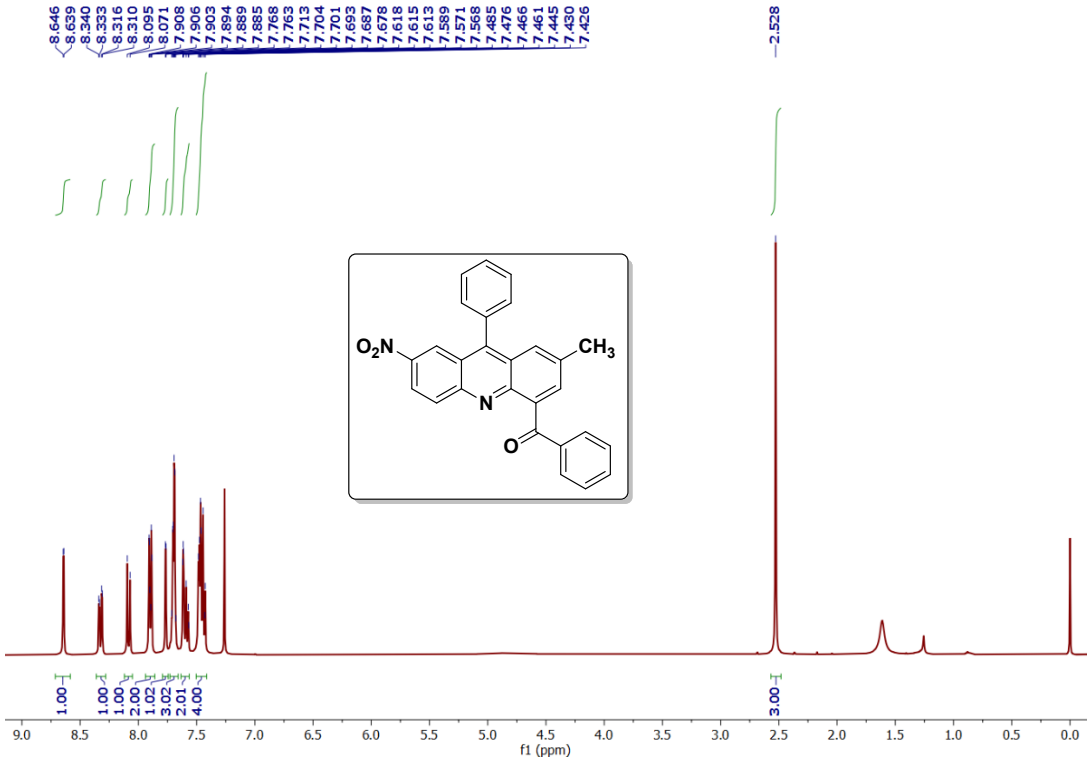


Figure-54. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4q**

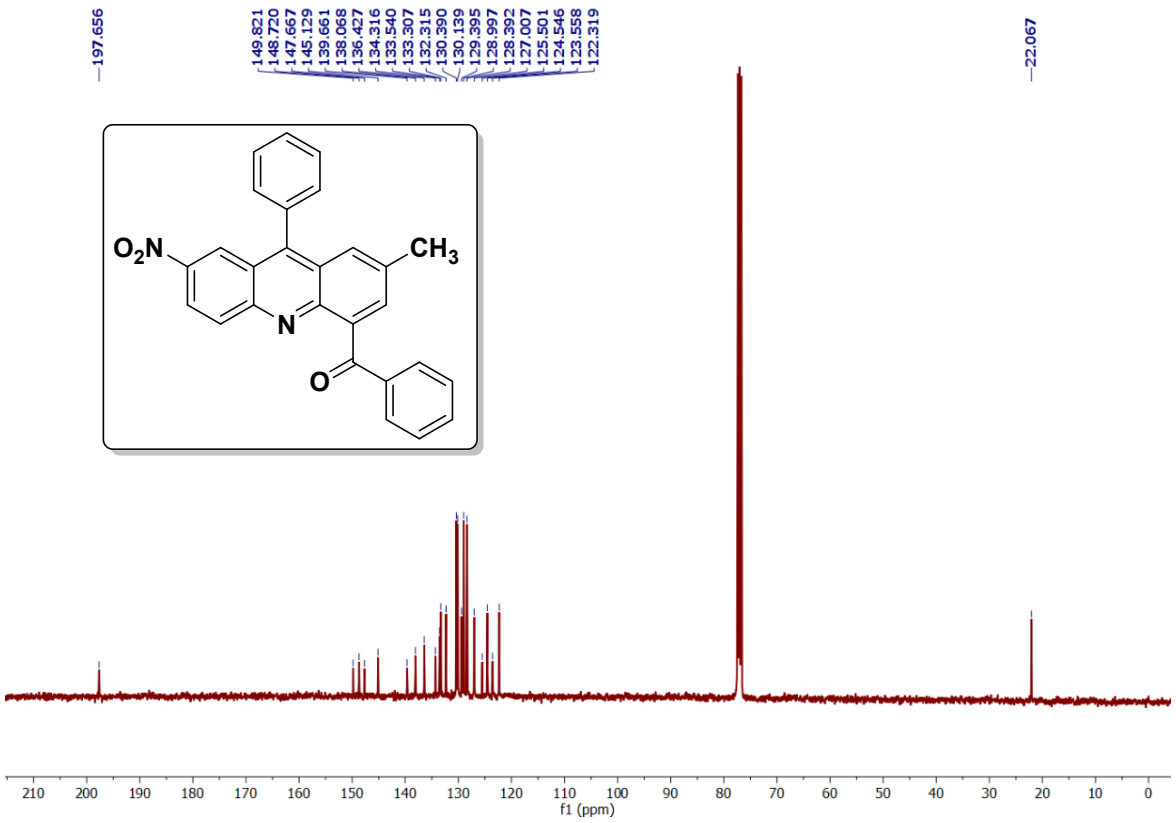


Figure-55. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4q**

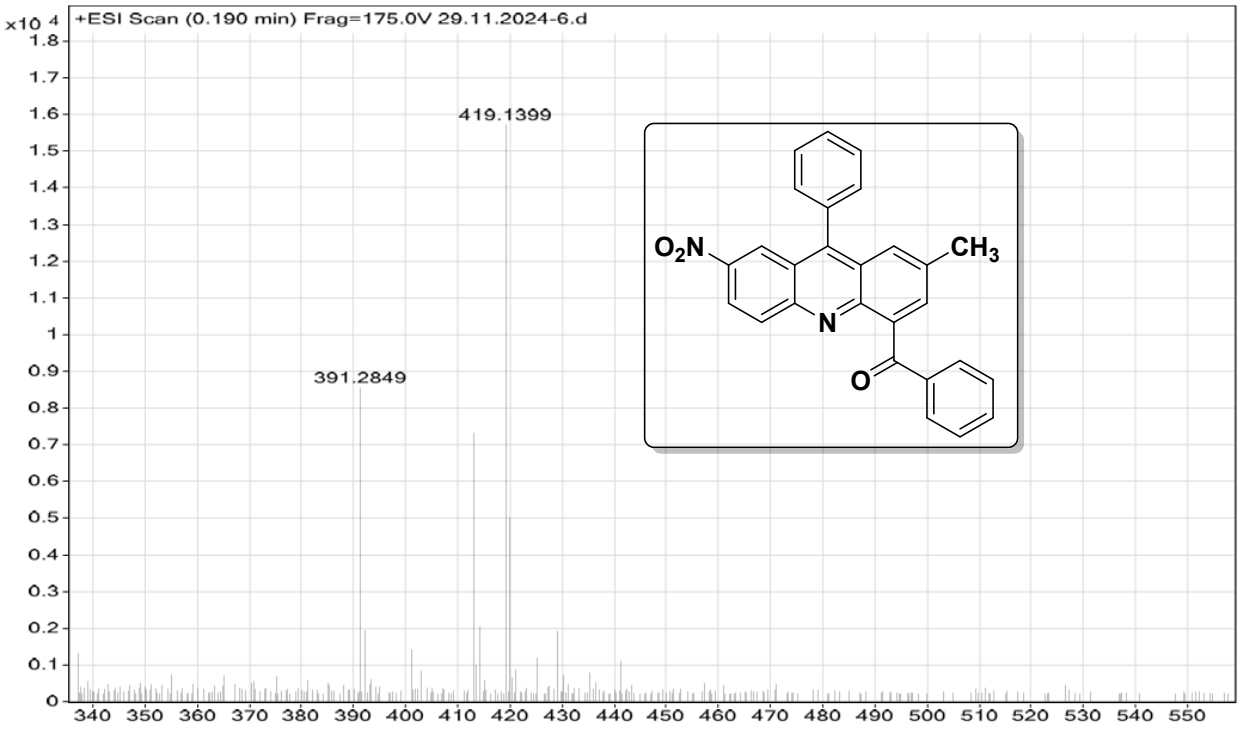


Figure-56. HR-MS(ESI$^+$) spectrum of compound **4q**

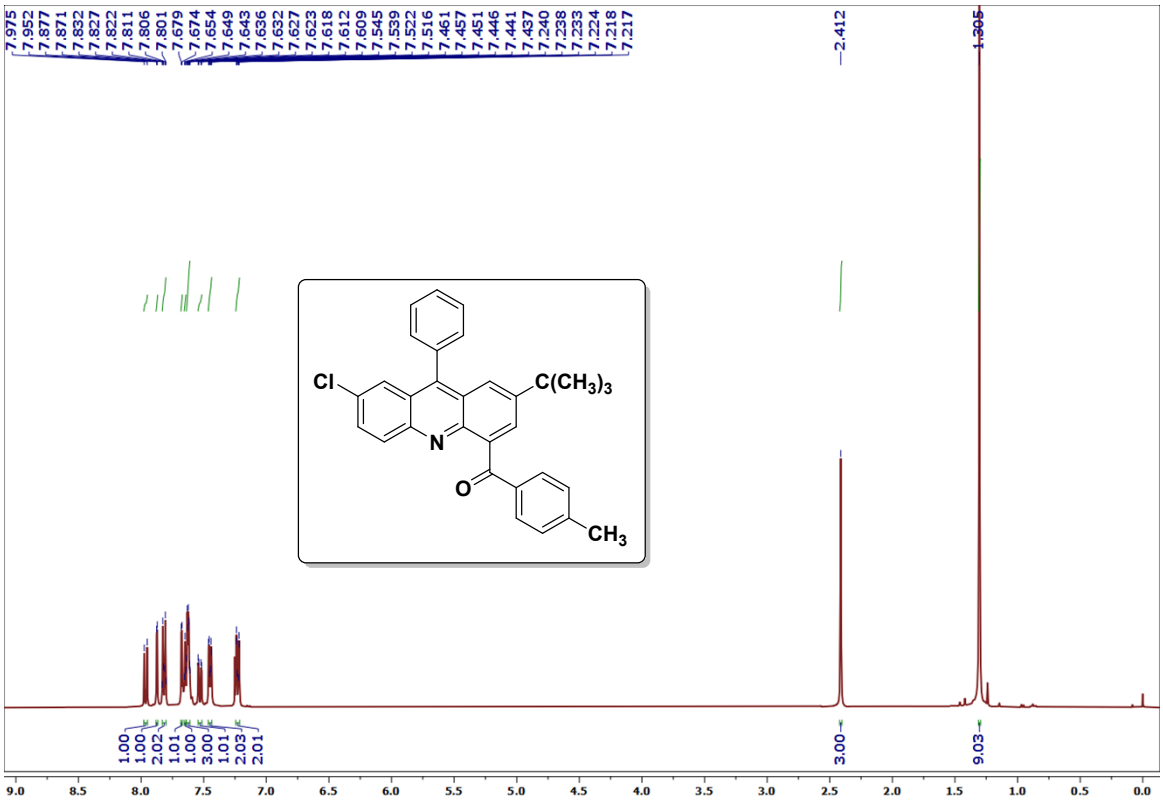


Figure-57. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4r**

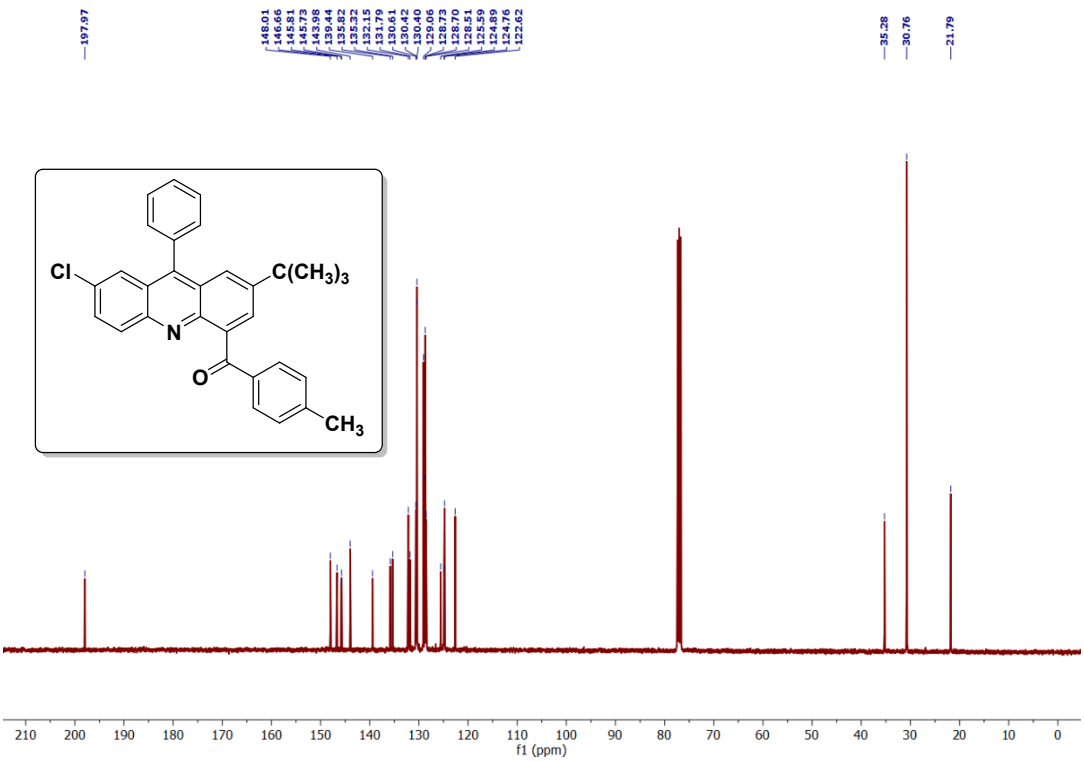


Figure-58. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4r**

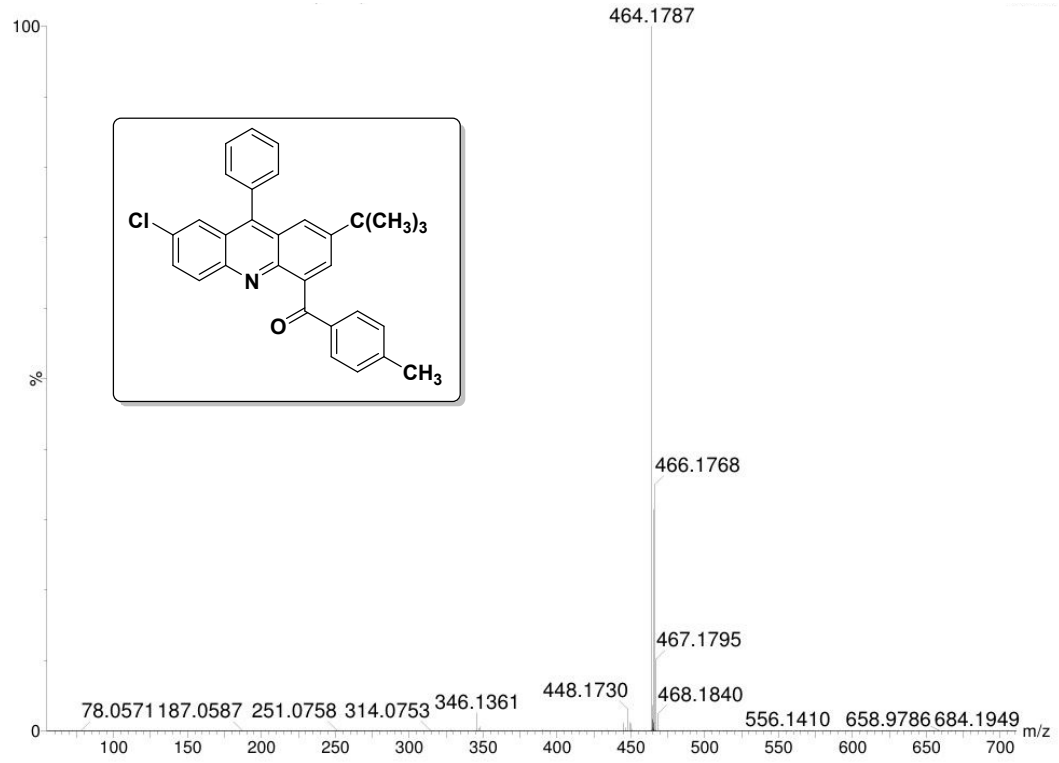


Figure-59. HR-MS(ESI^{+}) spectrum of compound **4r**

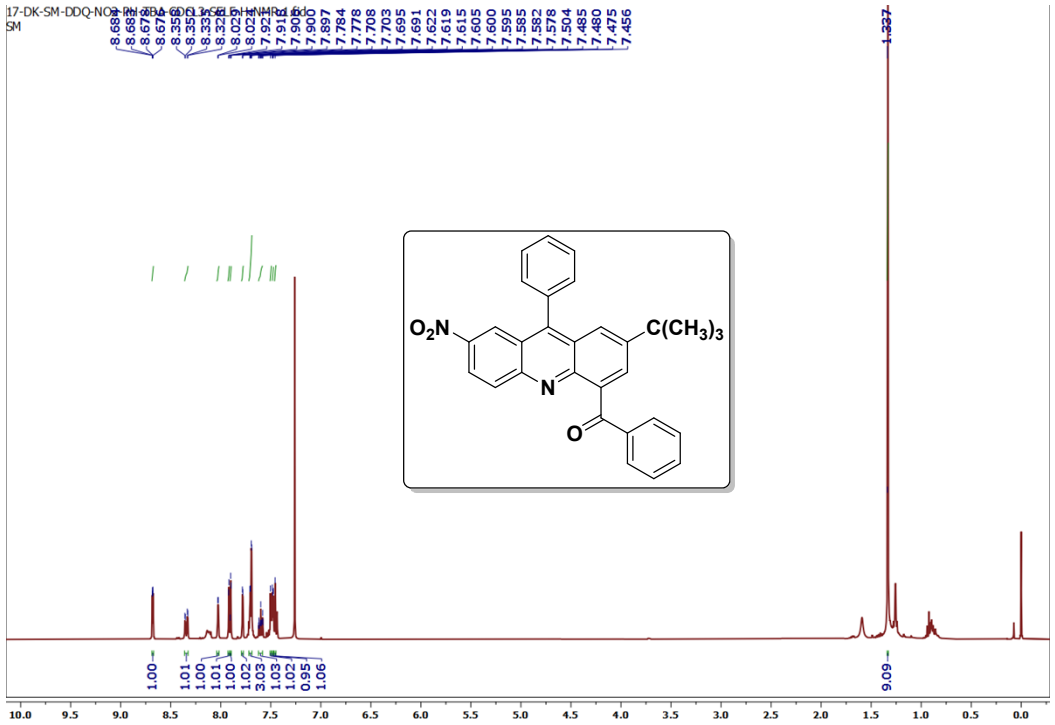


Figure-60. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4s**

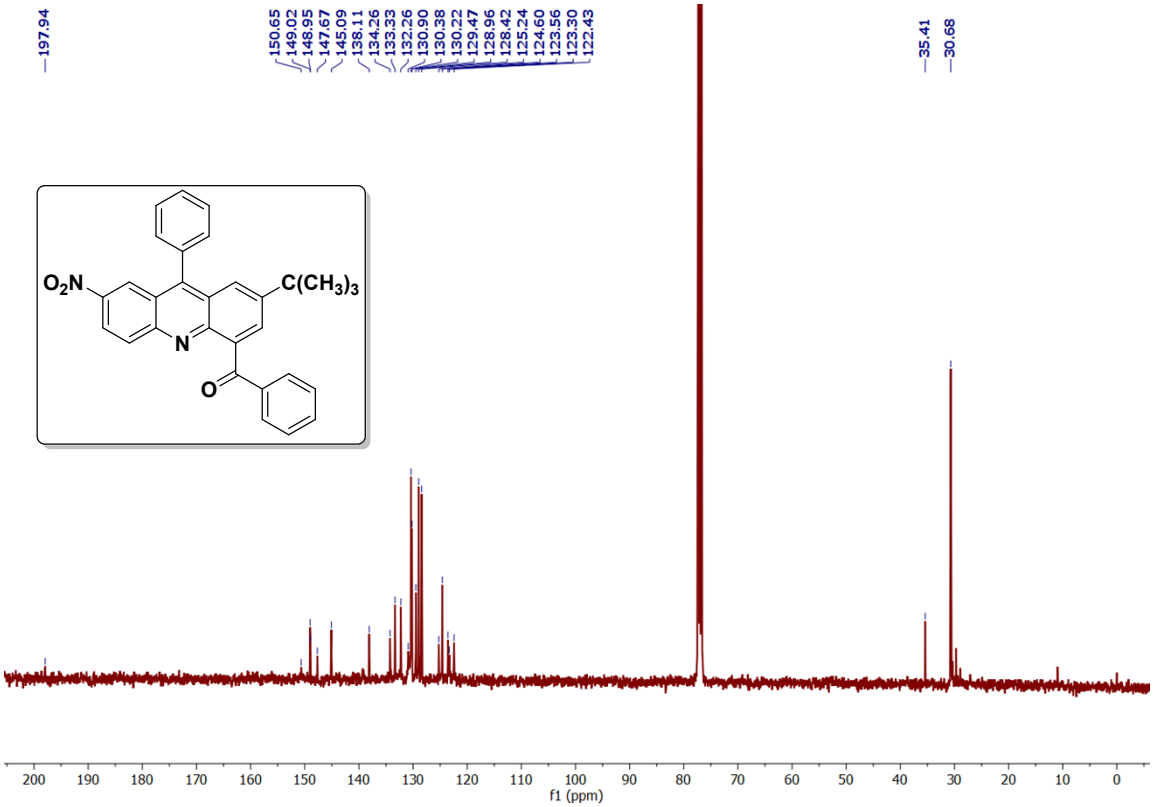


Figure-61. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4s**

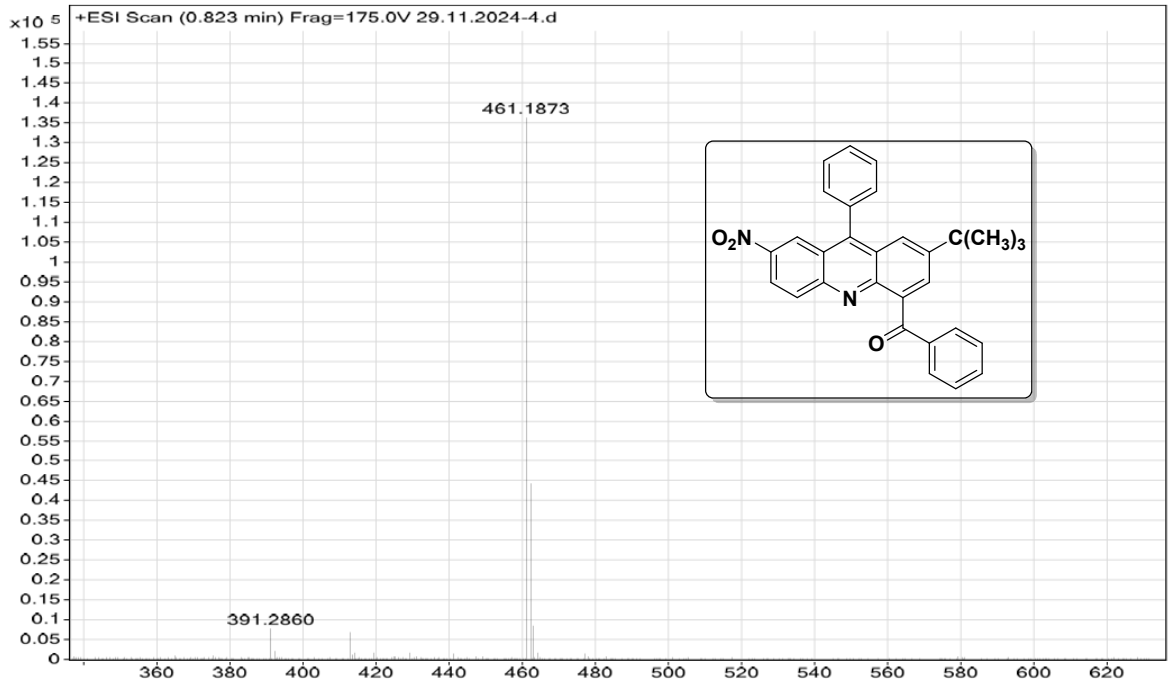


Figure-62. HR-MS(ESI$^+$) spectrum of compound **4s**

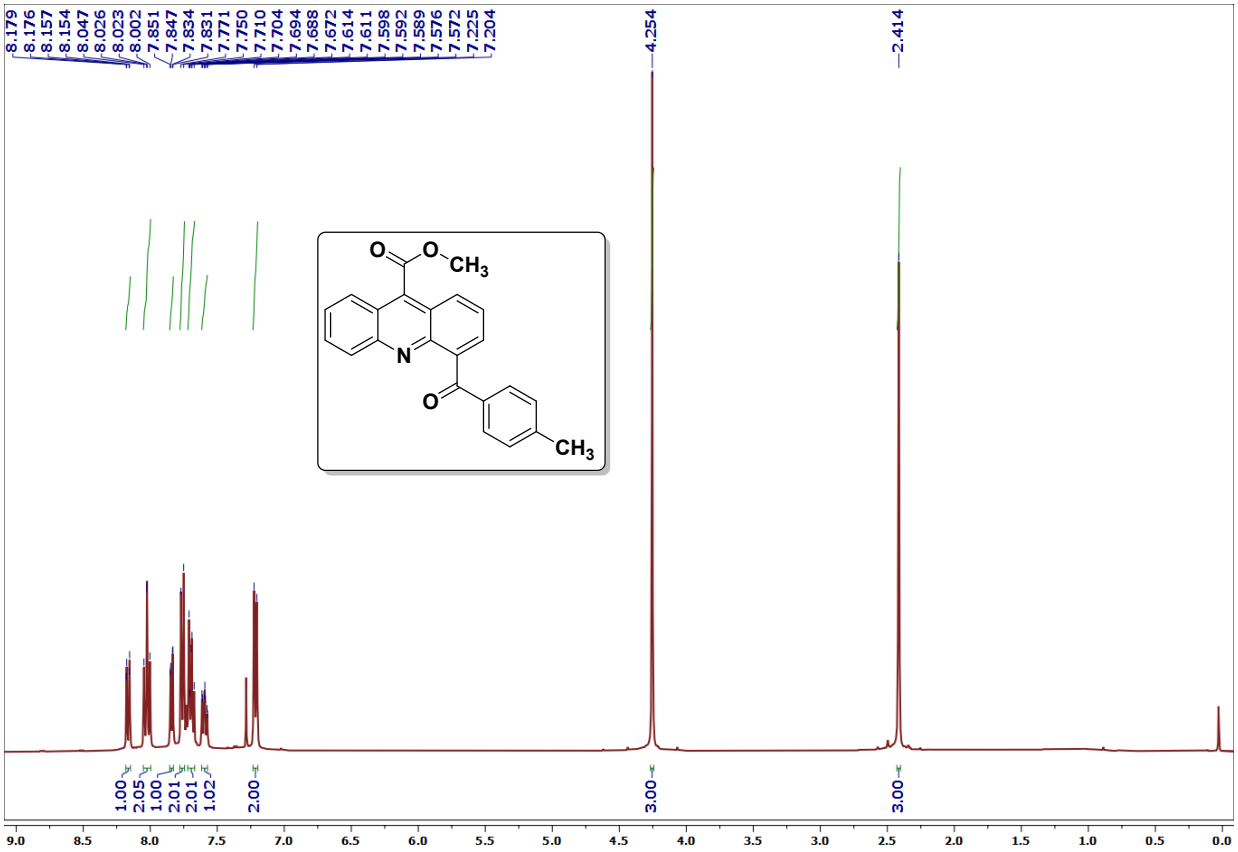


Figure-63. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4t**

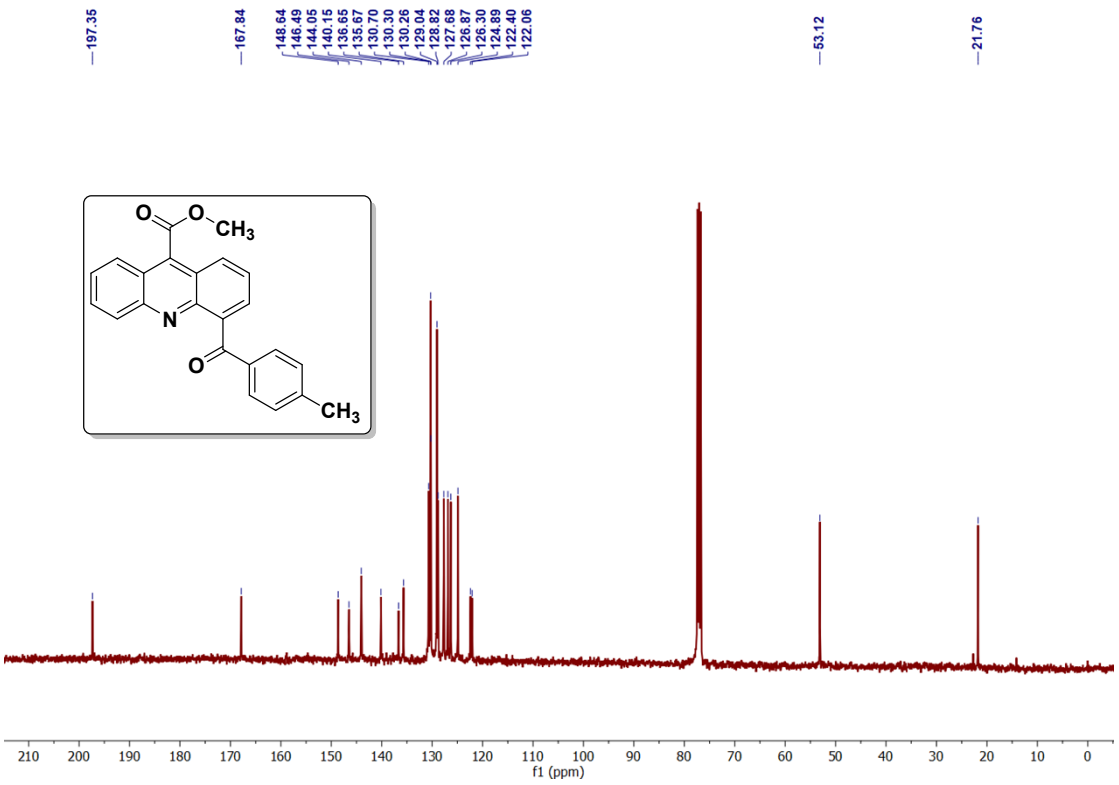


Figure-64. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4t**

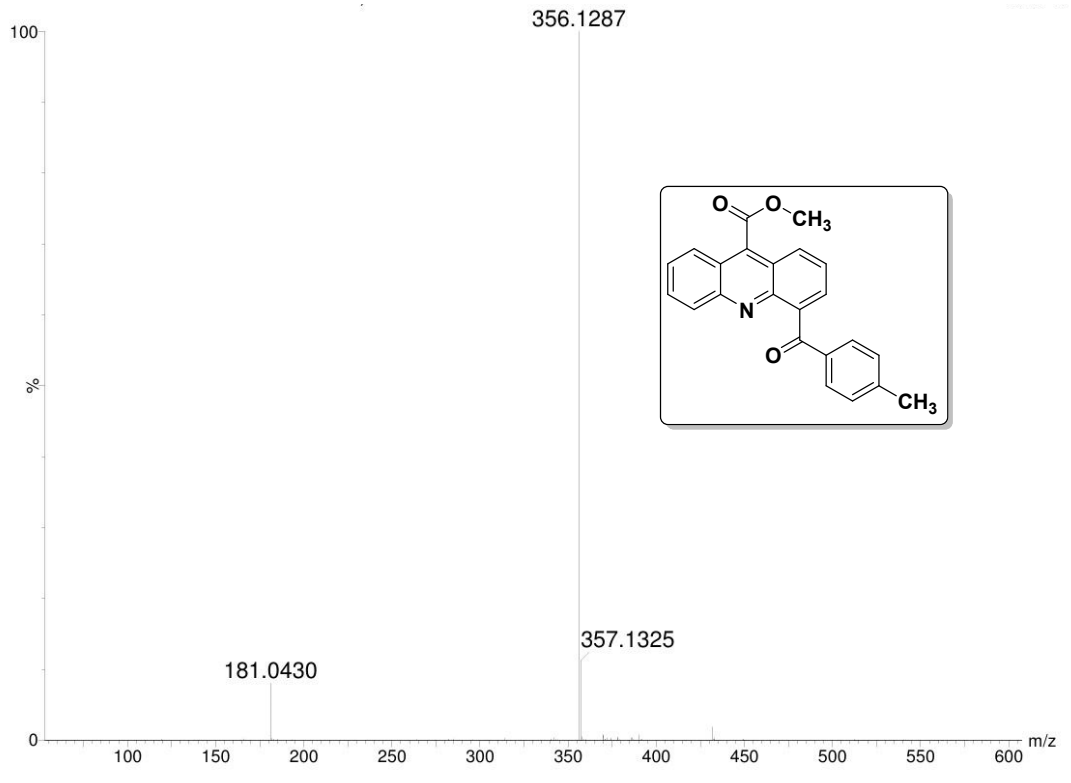


Figure-65. HR-MS(ESI^{+}) spectrum of compound **4t**

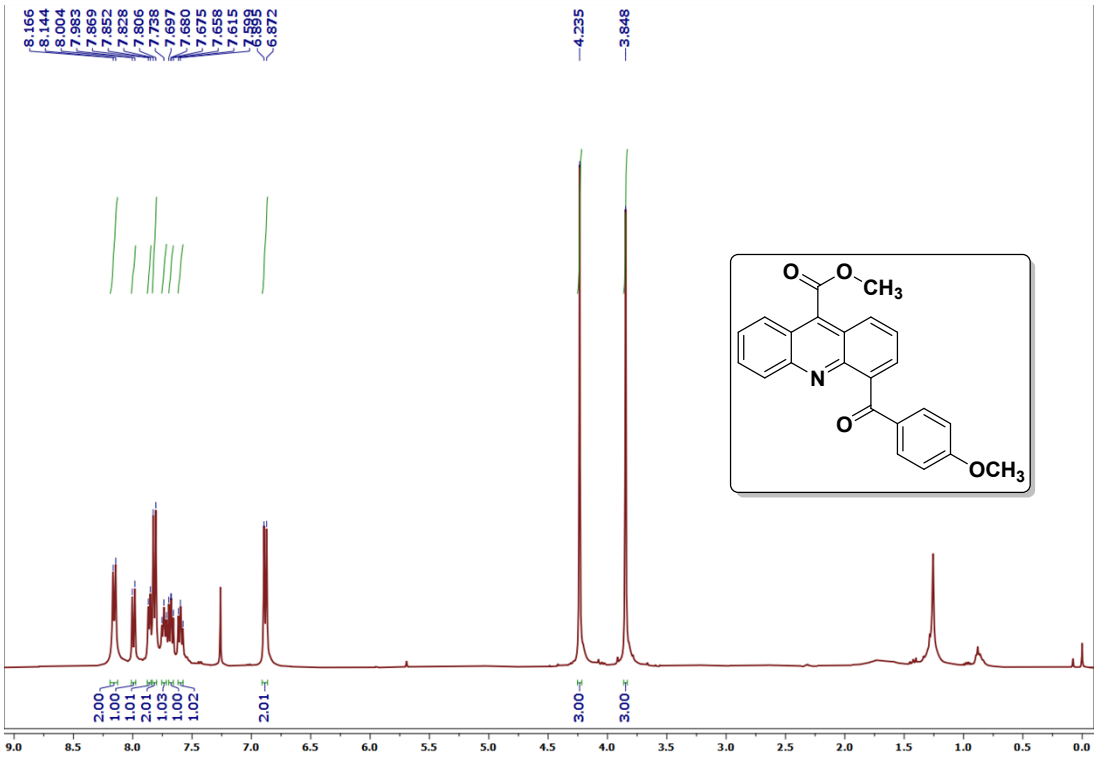


Figure-66. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4u**

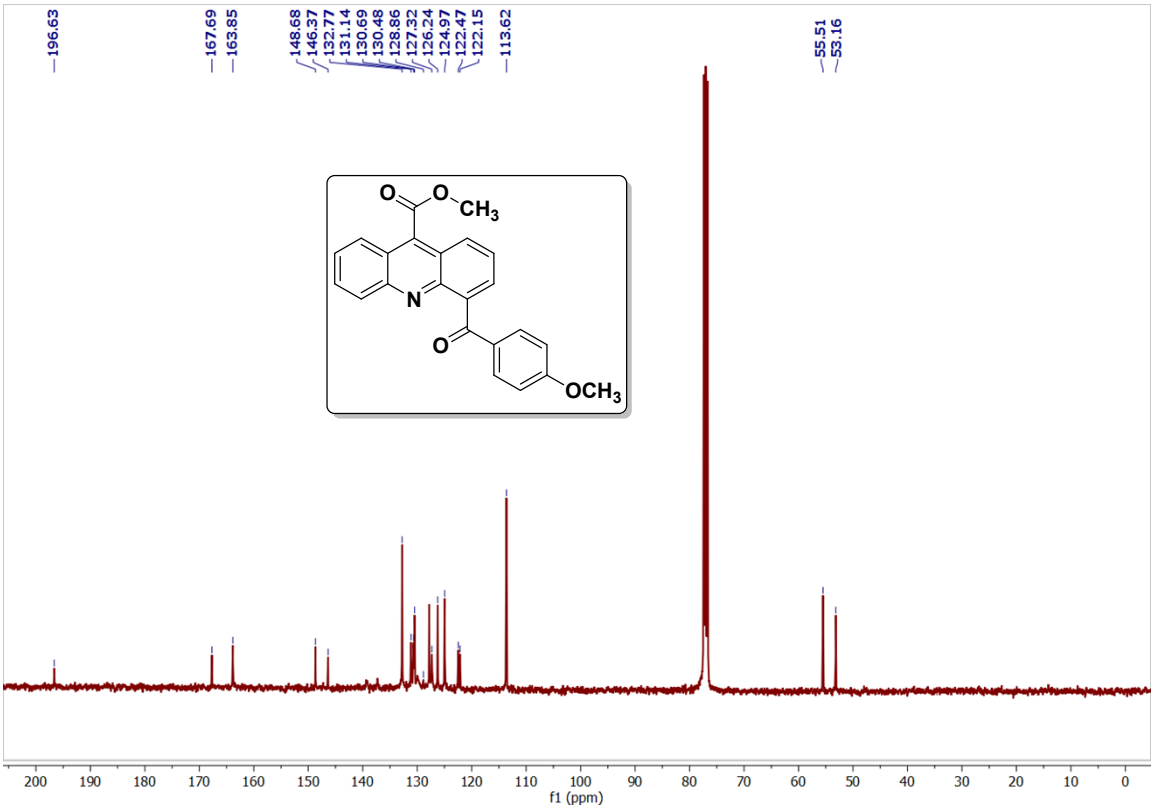


Figure-67. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4u**

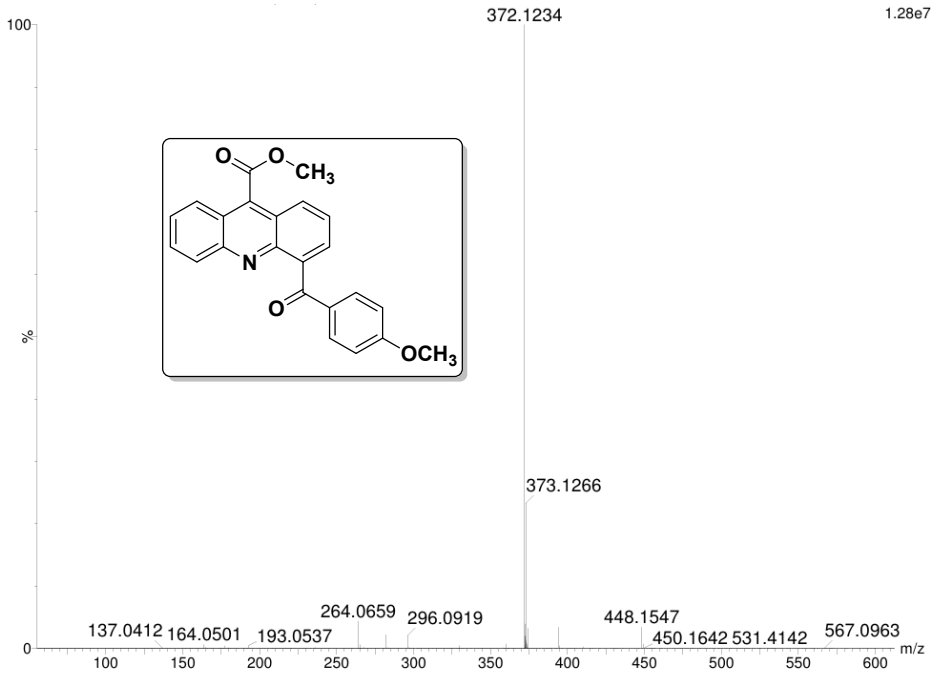


Figure-68. HR-MS(ESI^{+}) spectrum of compound **4u**

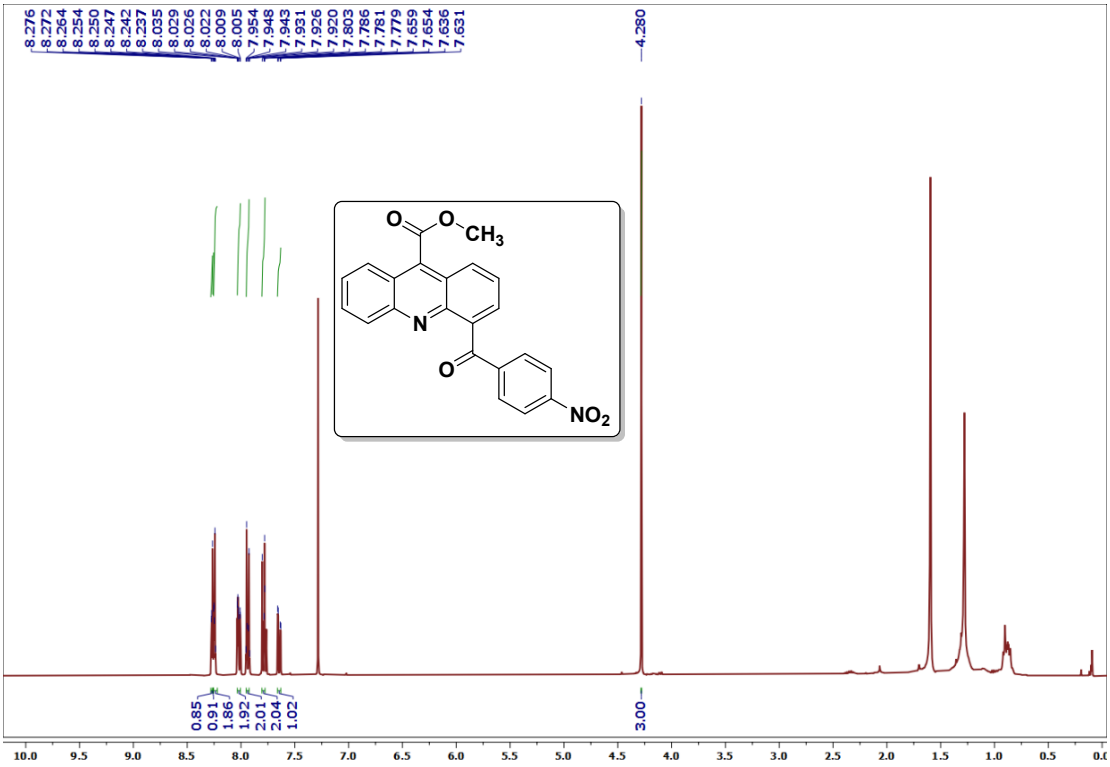


Figure-69. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4v**

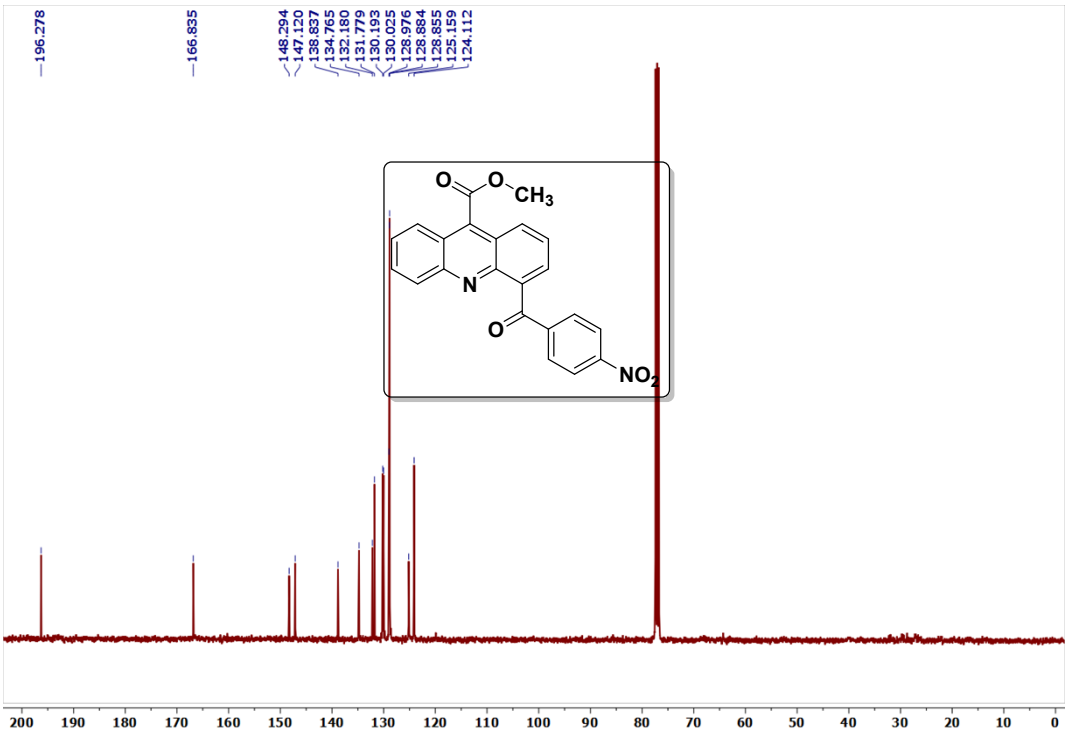


Figure-70. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4v**

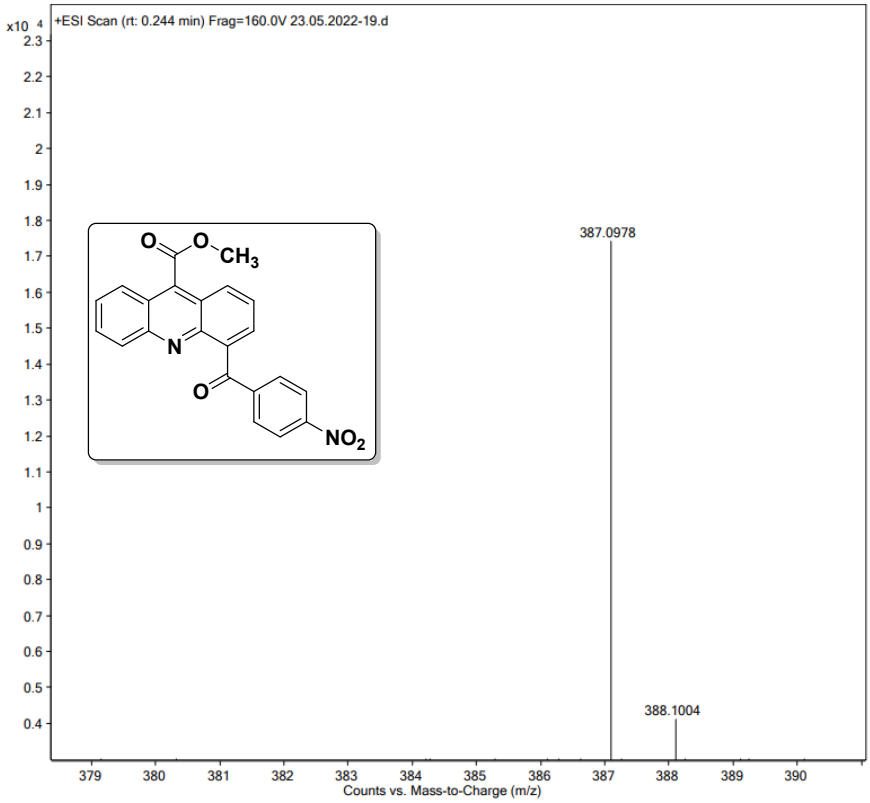


Figure-71. HR-MS(ESI^+) spectrum of compound **4v**

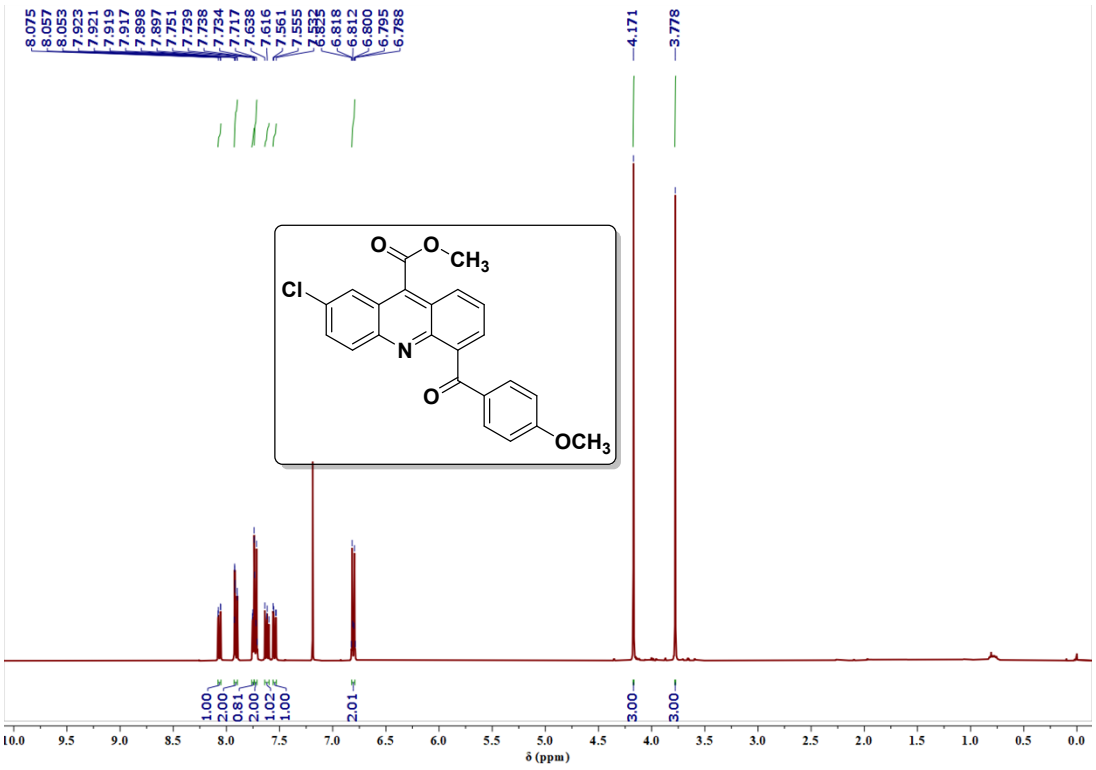


Figure-22. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4w**

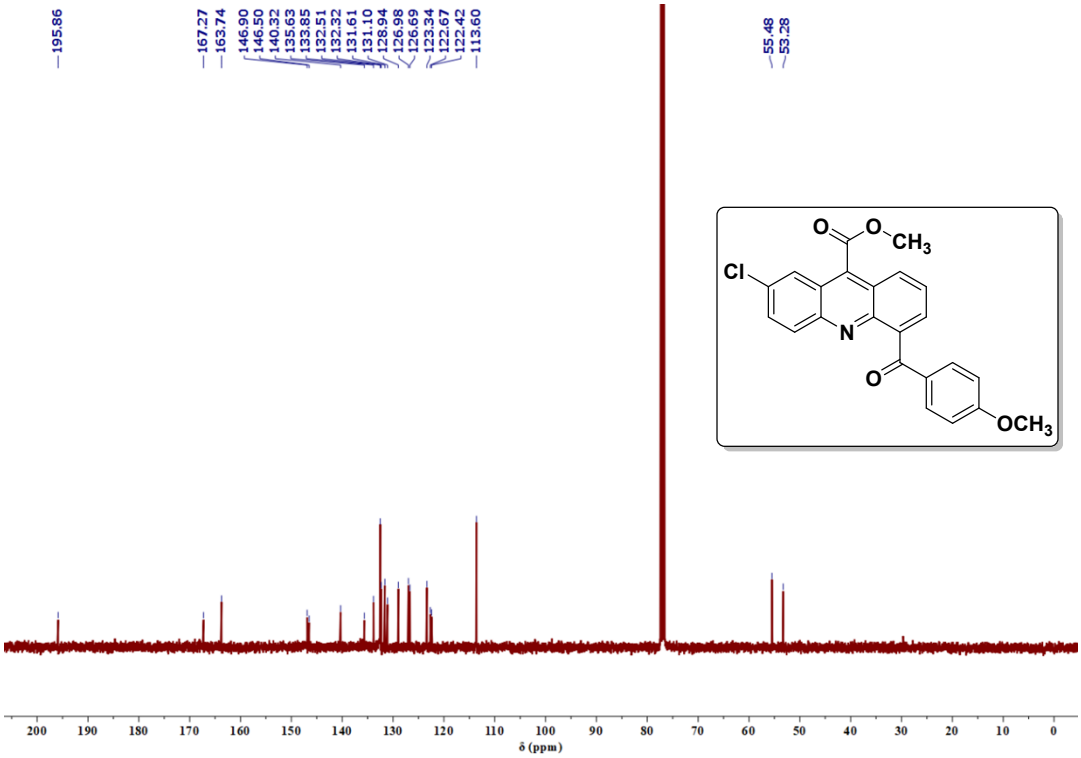


Figure-73. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4w**

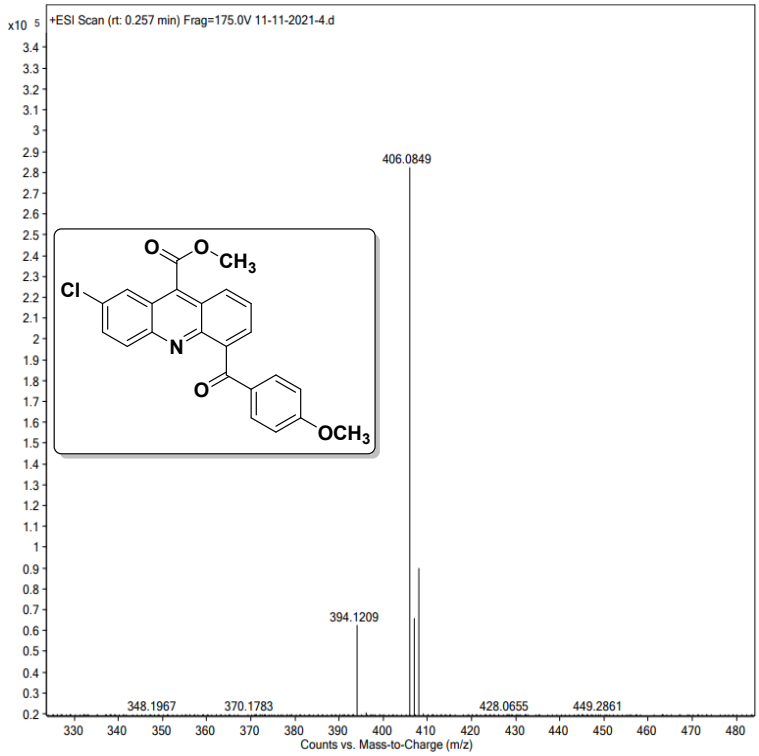


Figure-74. HR-MS(ESI^{+}) spectrum of compound **4w**

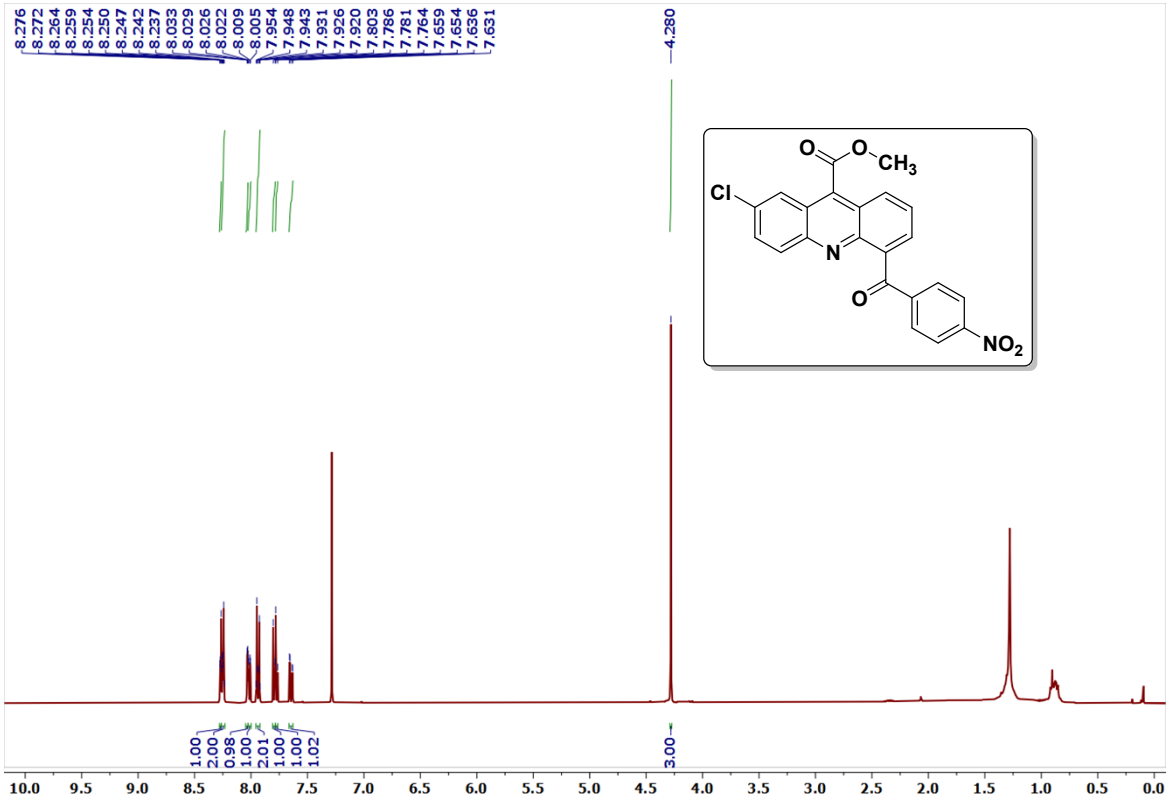


Figure-75. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4x**

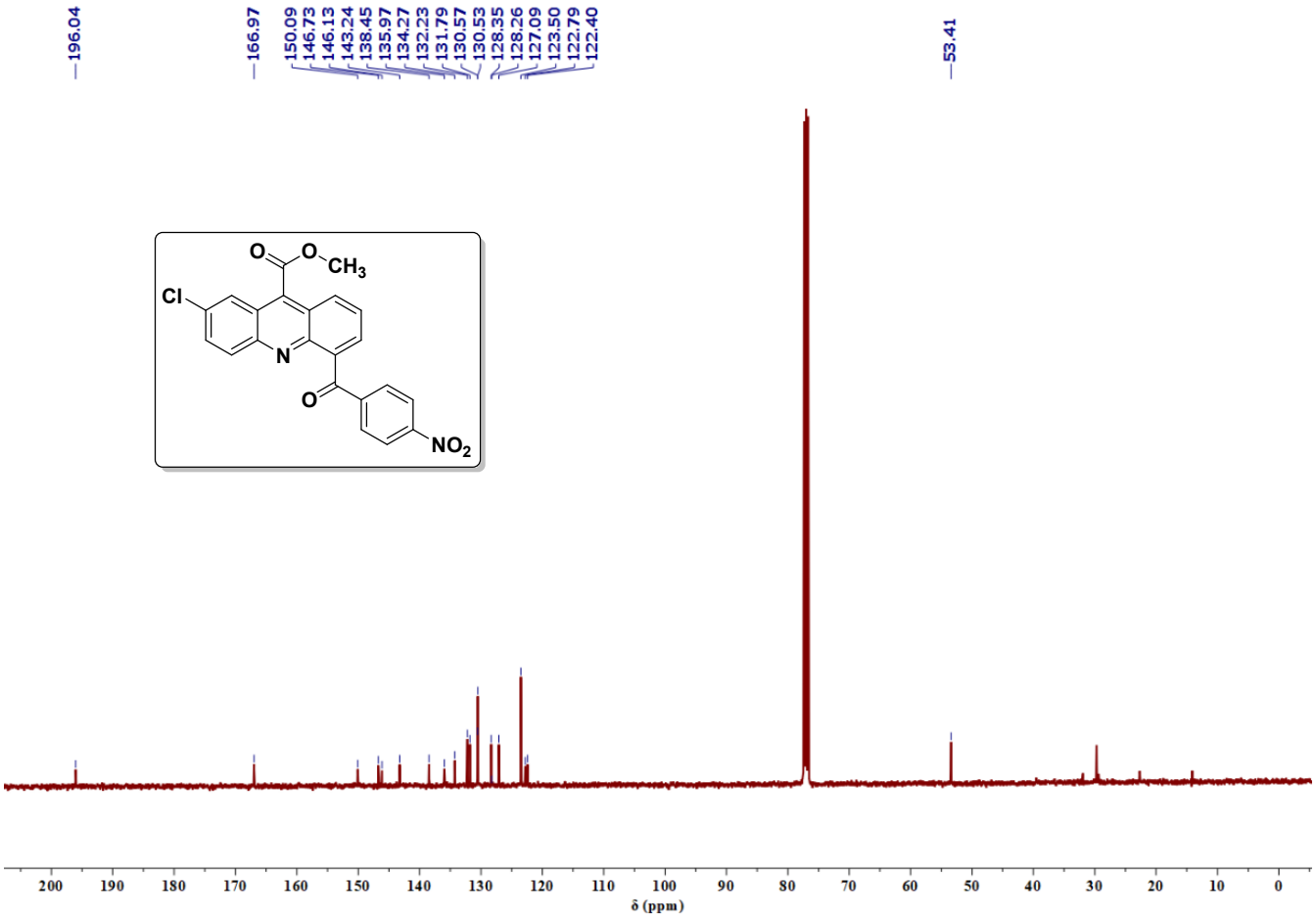


Figure-76. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4x**

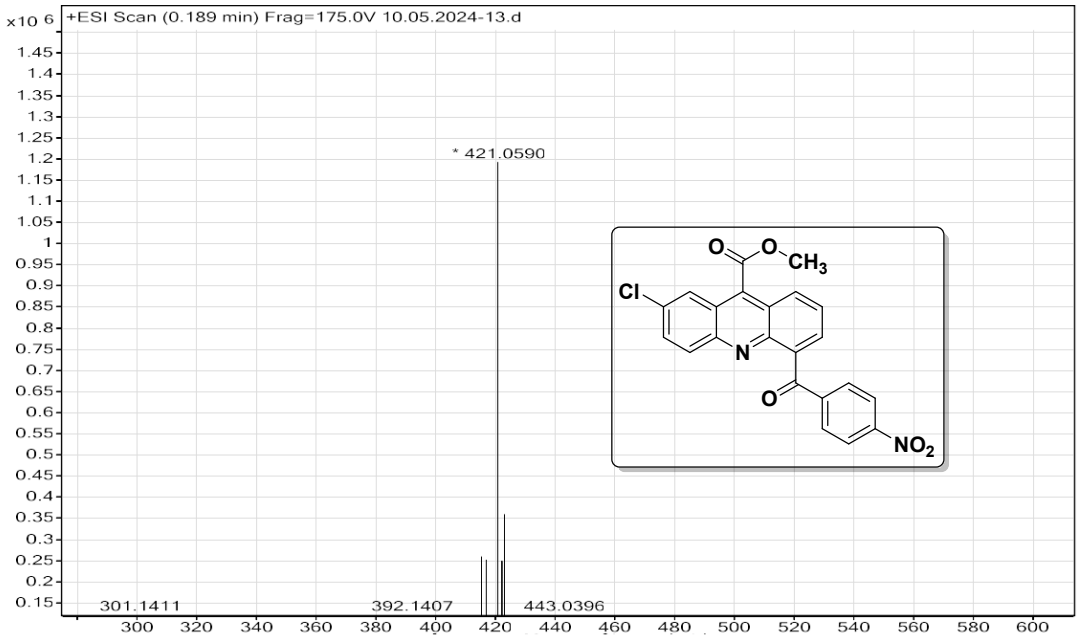


Figure-77. HR-MS(ESI^{+}) spectrum of compound **4x**

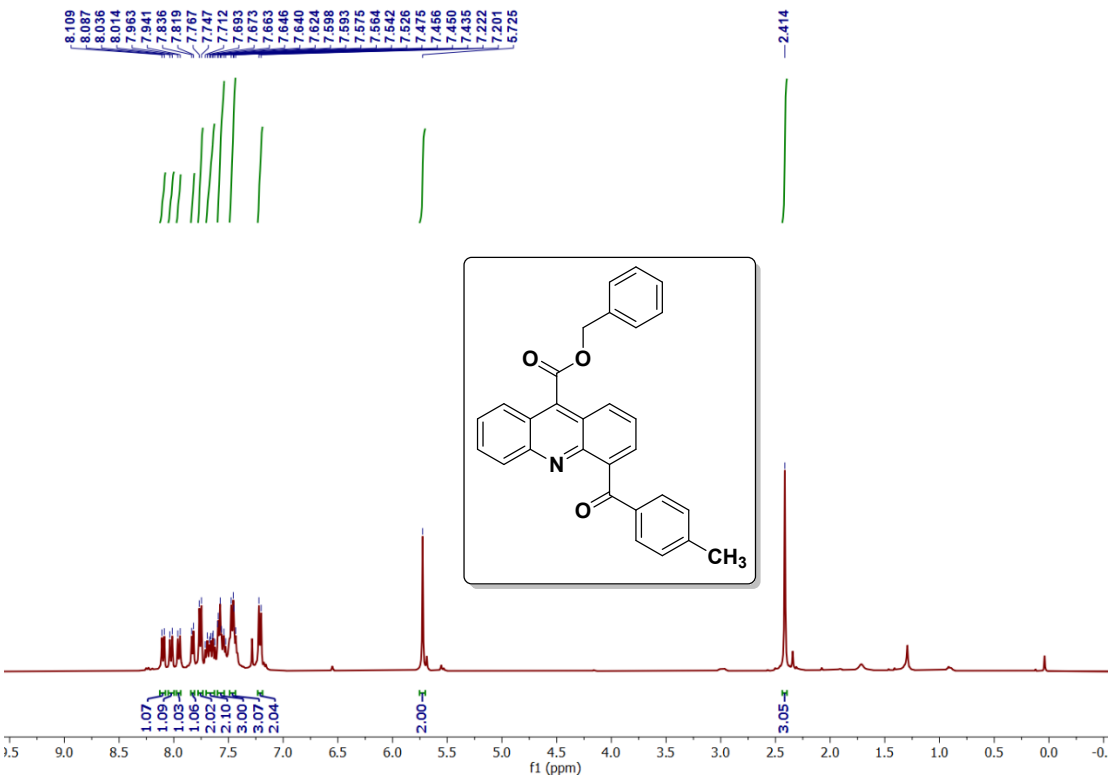


Figure-78. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4y**

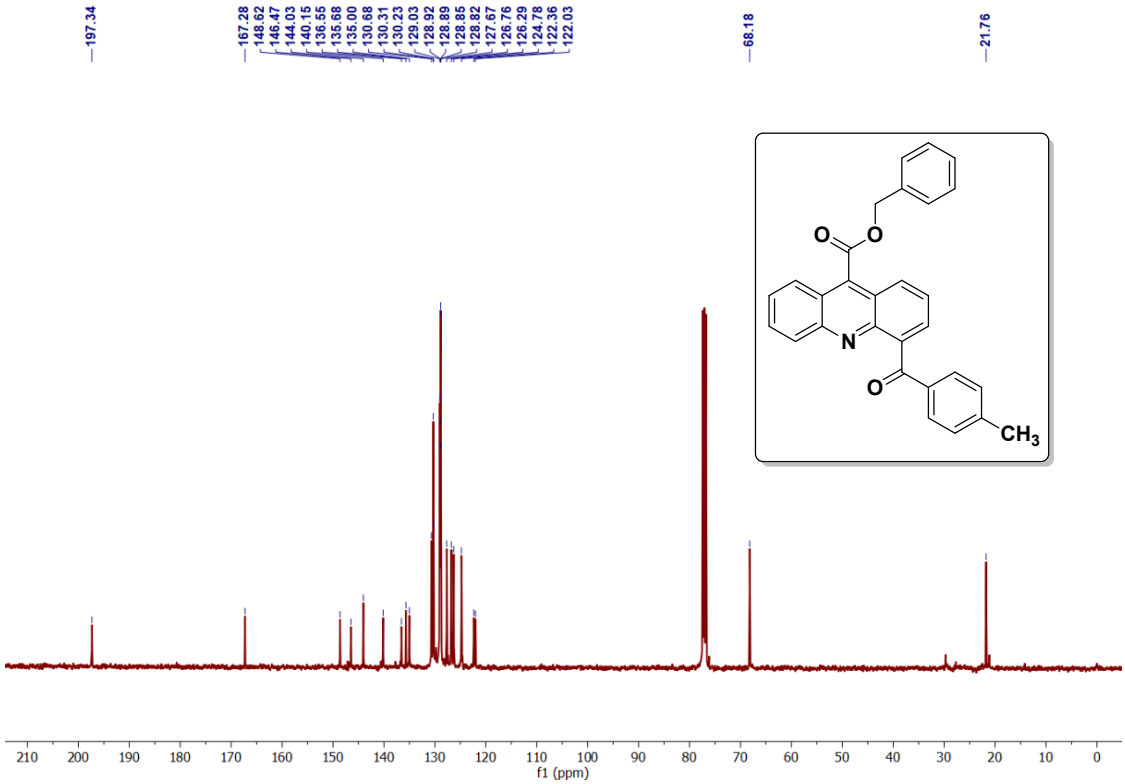


Figure-79. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4y**

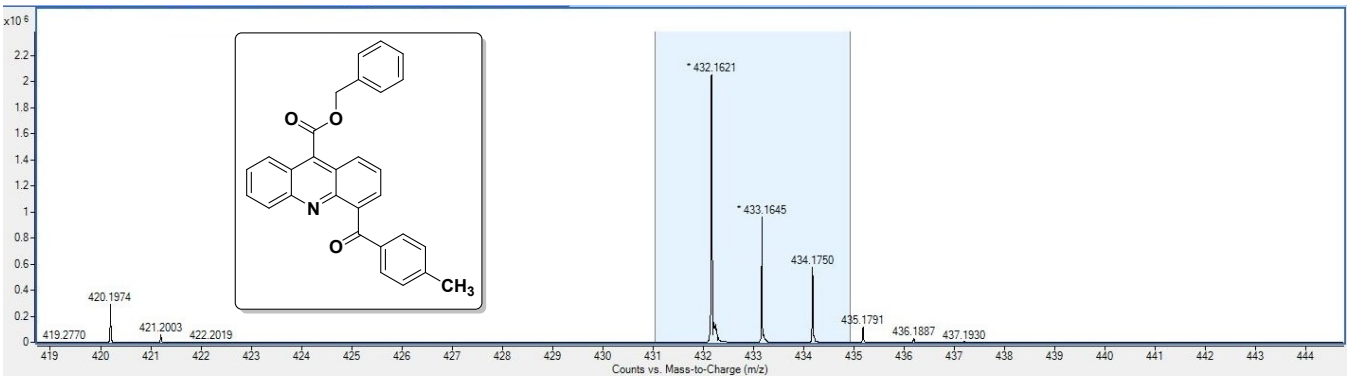


Figure-80. HR-MS(ESI^{+}) spectrum of compound **4y**

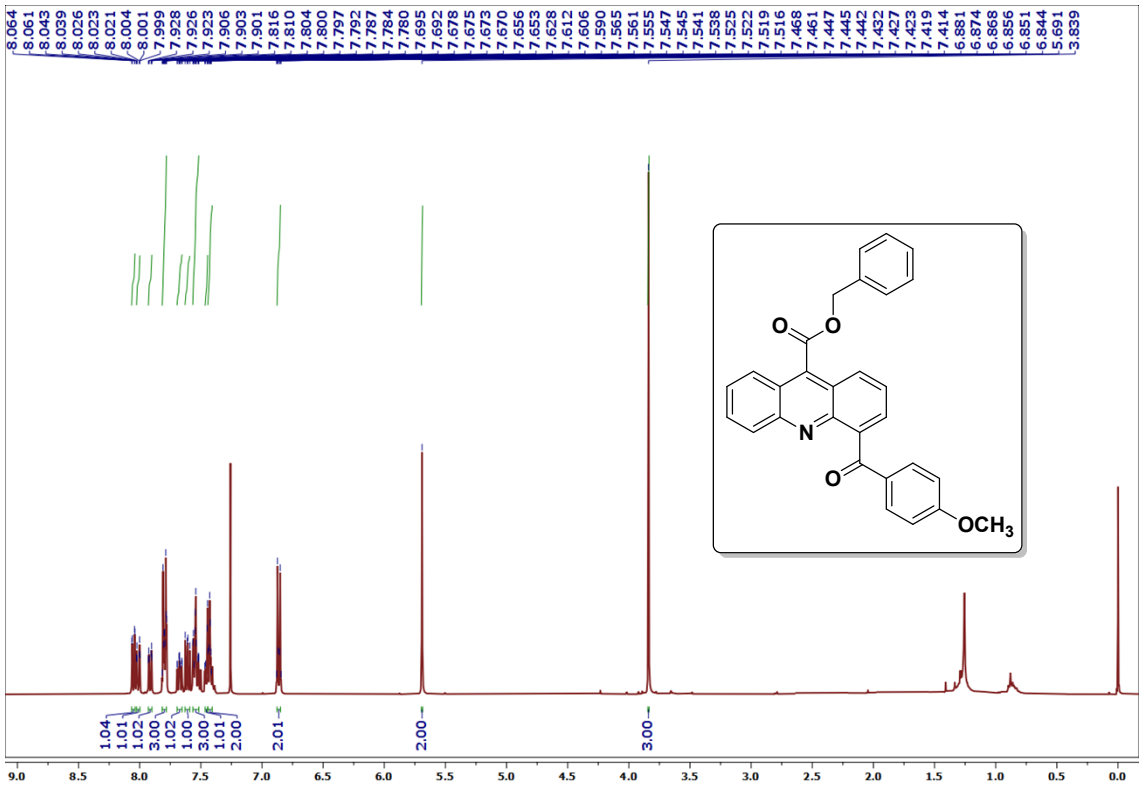


Figure-81. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4z**

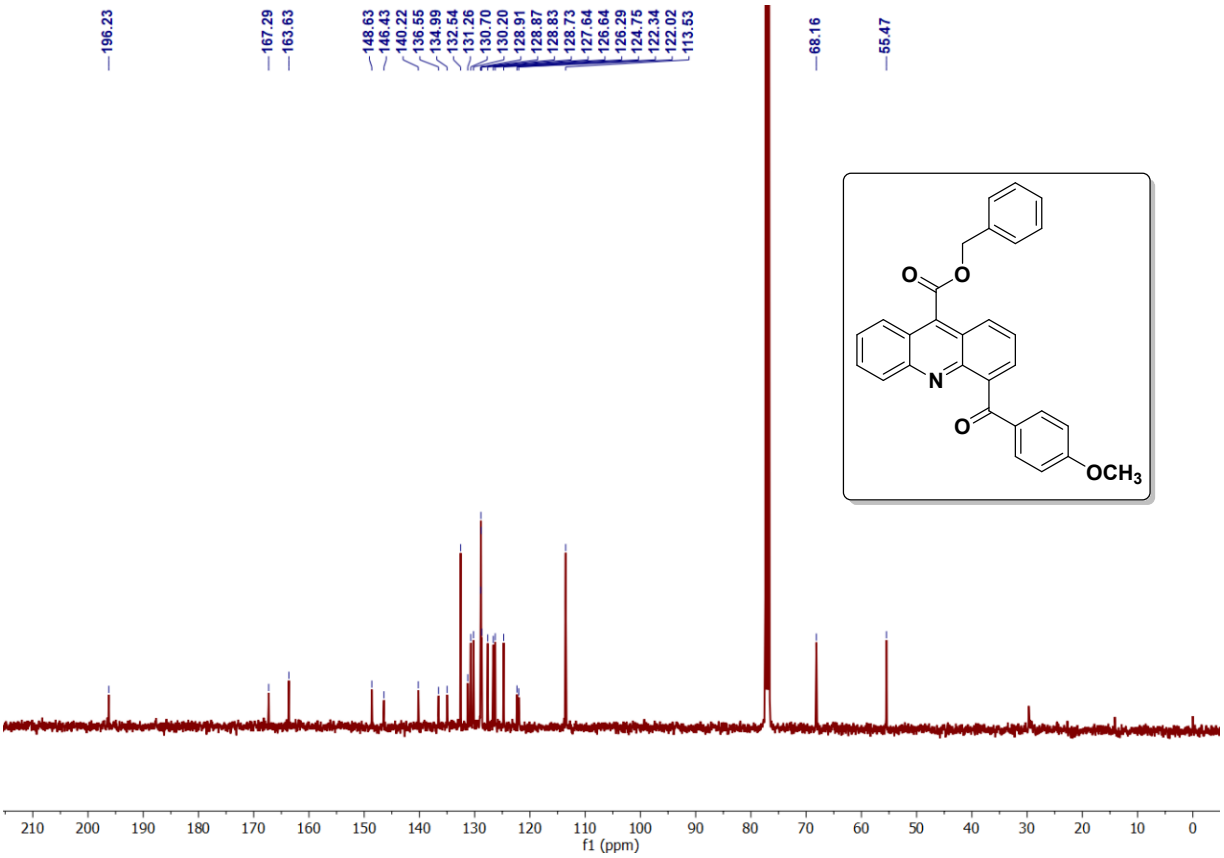


Figure-82. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4z**

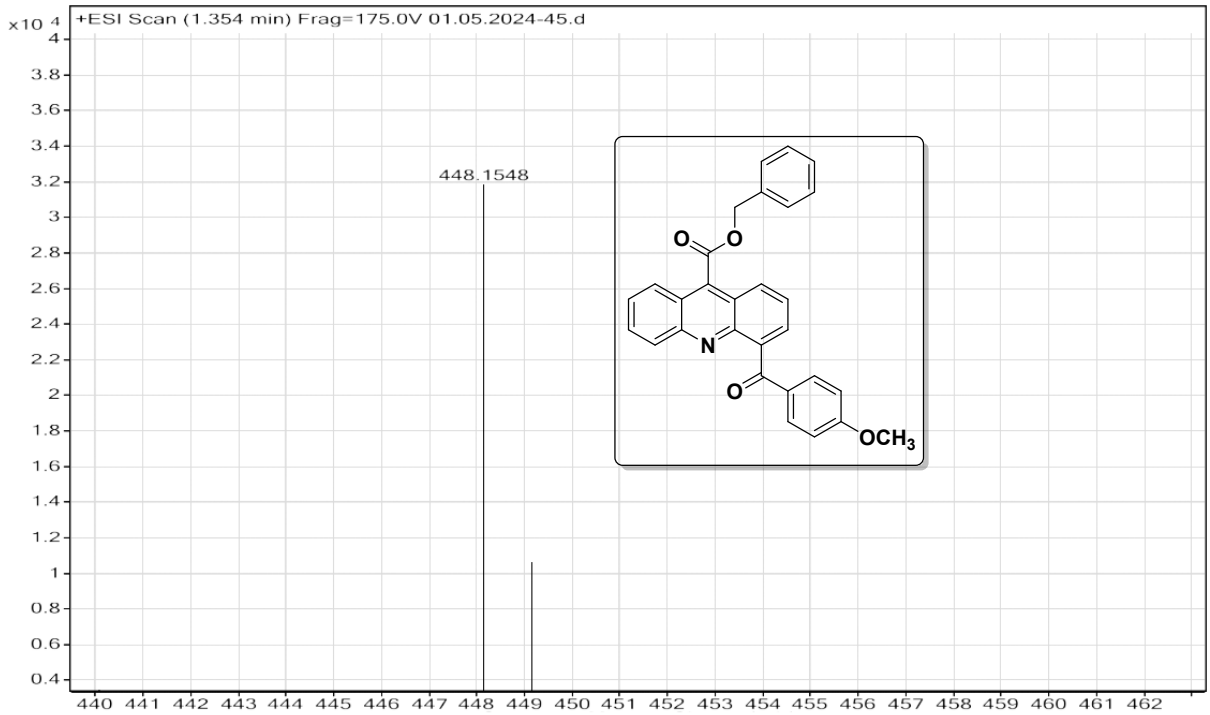


Figure-83. HR-MS(ESI^{+}) spectrum of compound **4z**

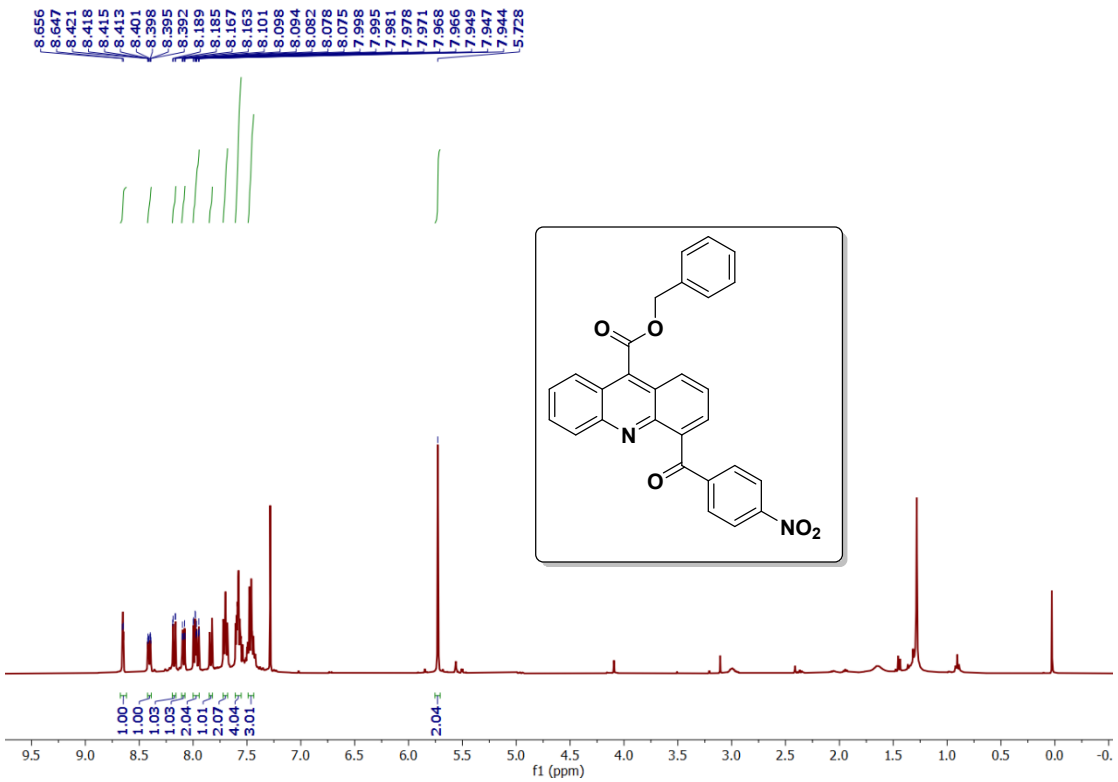


Figure-84. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4aa**

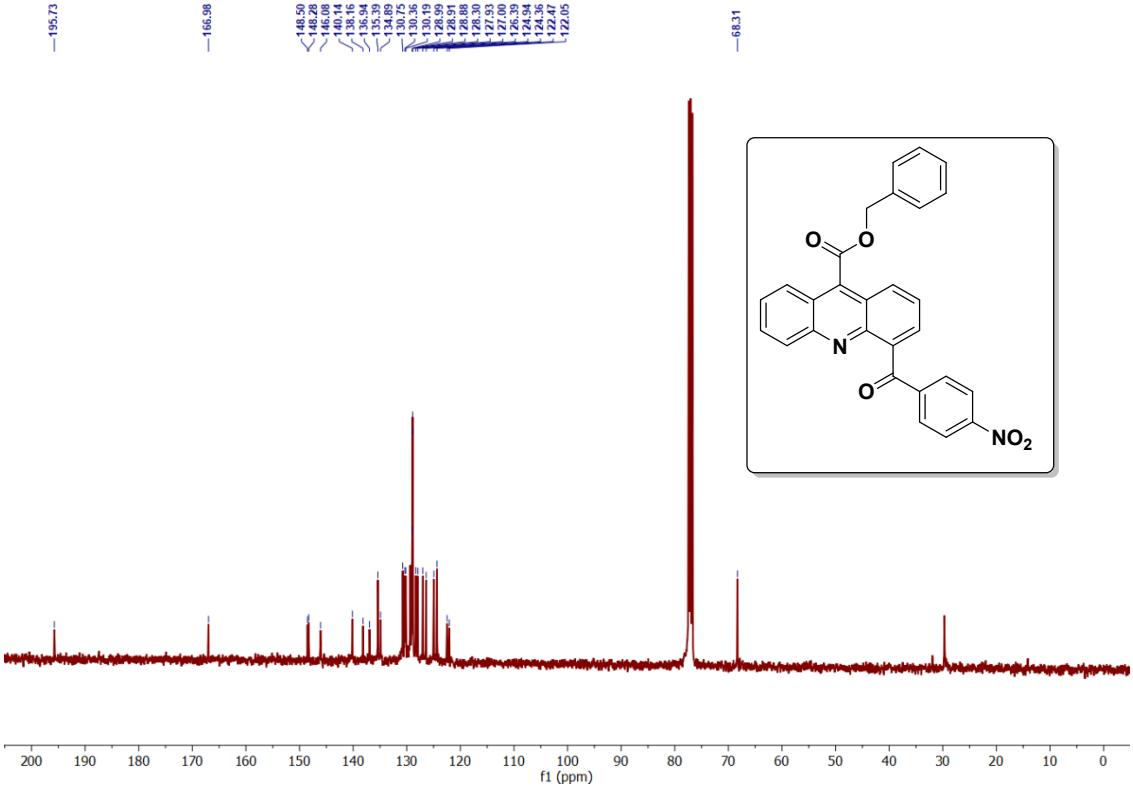


Figure-85. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4aa**

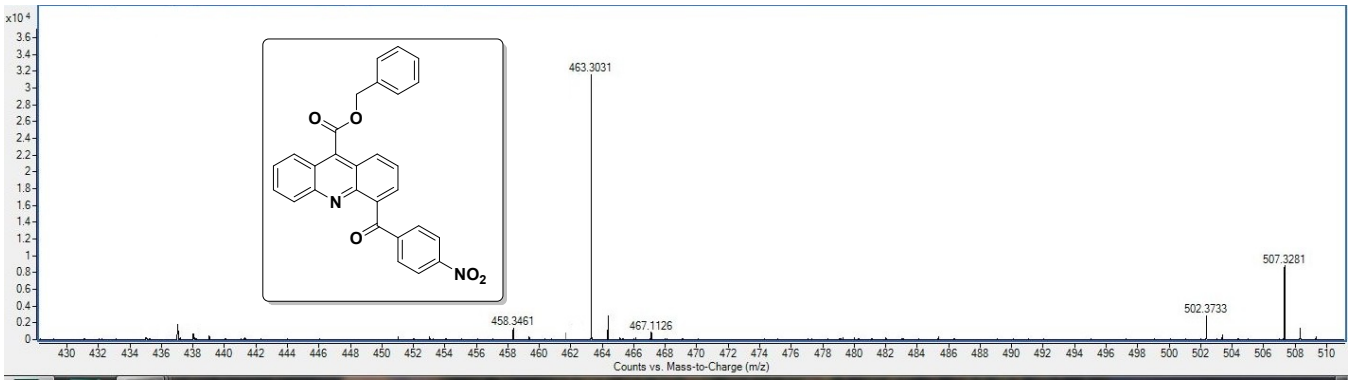


Figure-86. HR-MS(ESI$^+$) spectrum of compound **4aa**

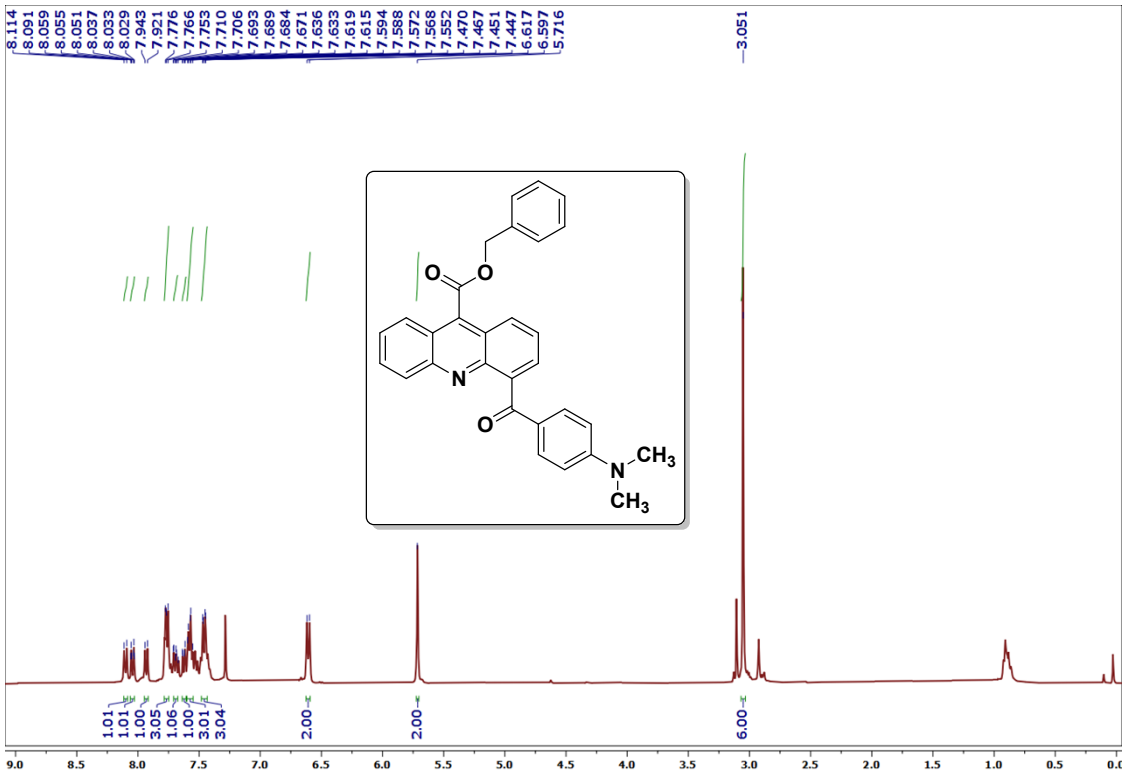


Figure-87. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4ab**

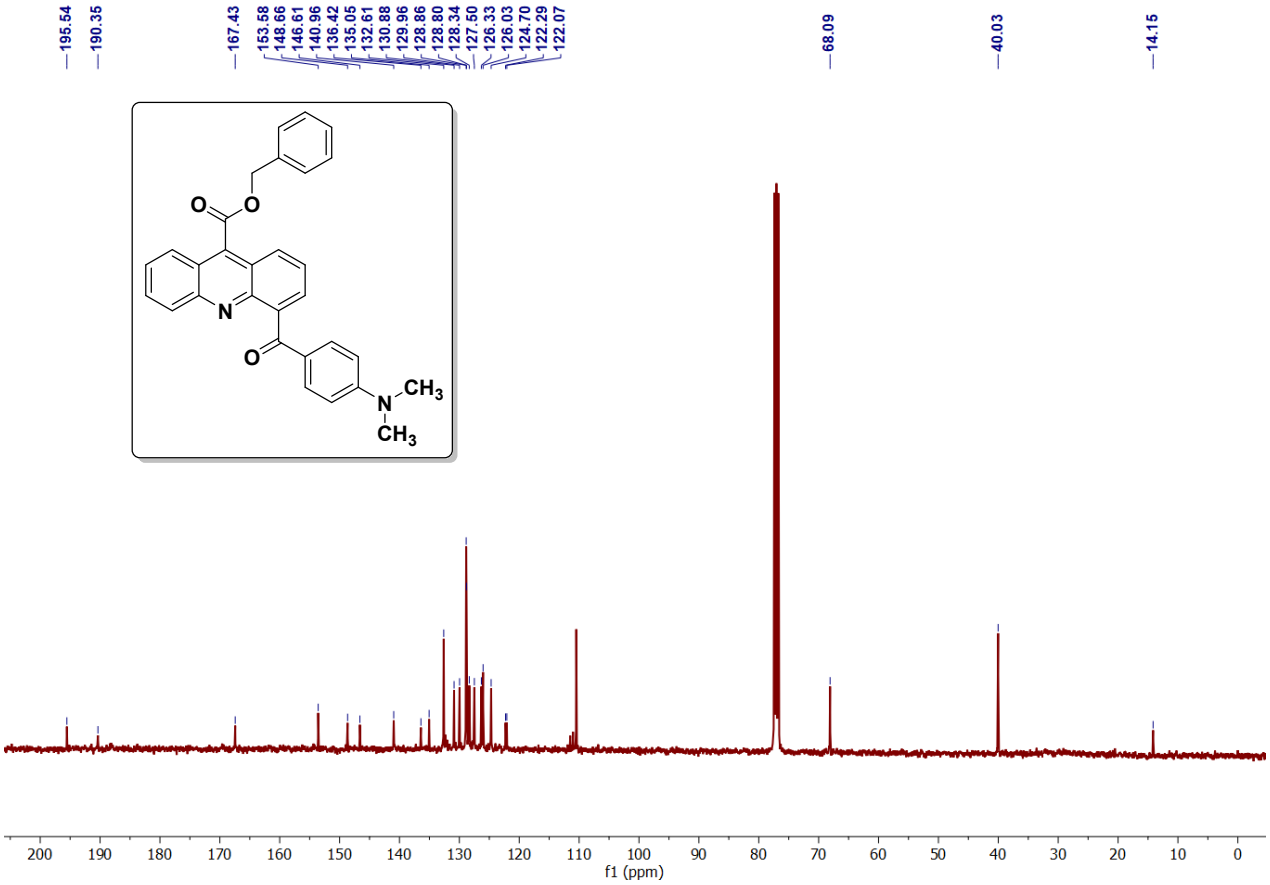


Figure-88. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4ab**

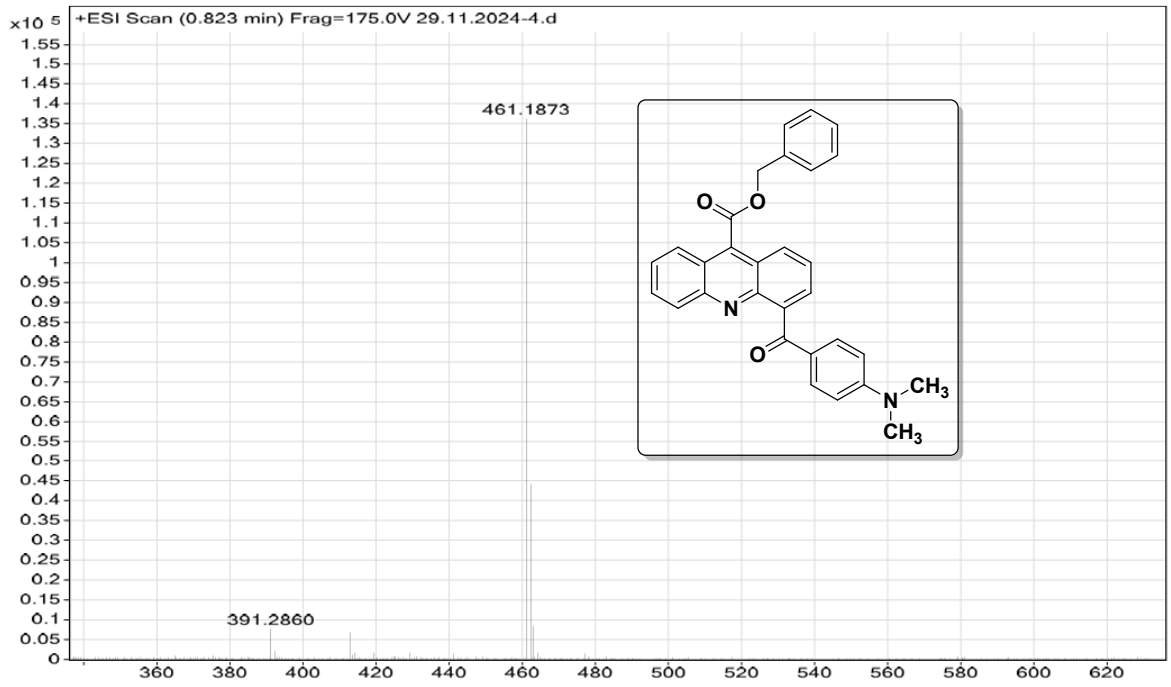


Figure-89. HR-MS(ESI^{+}) spectrum of compound **4ab**

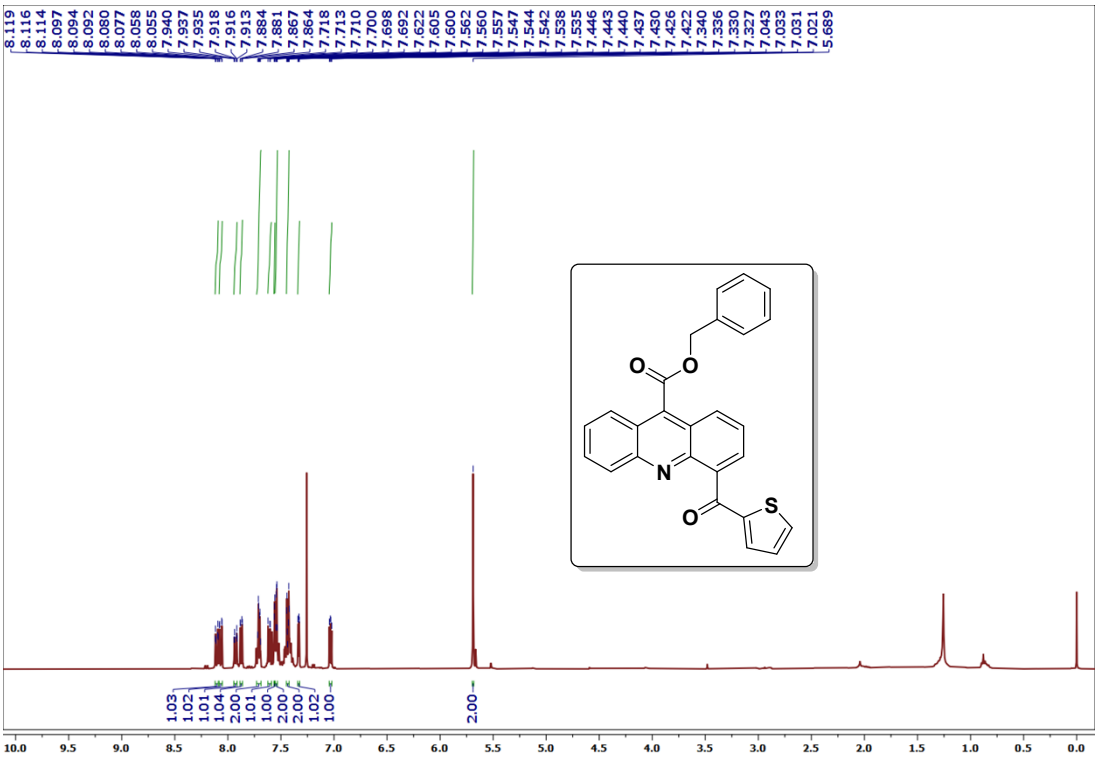


Figure-90. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **4ac**

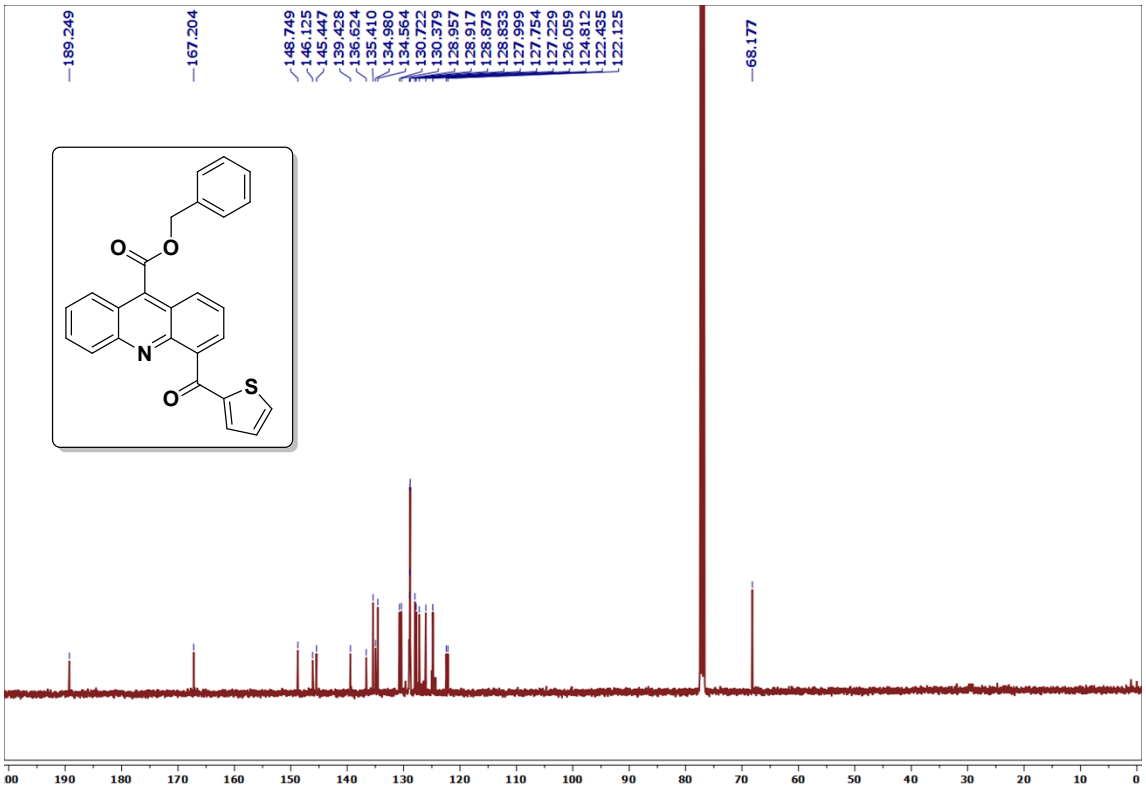


Figure-91. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **4ac**

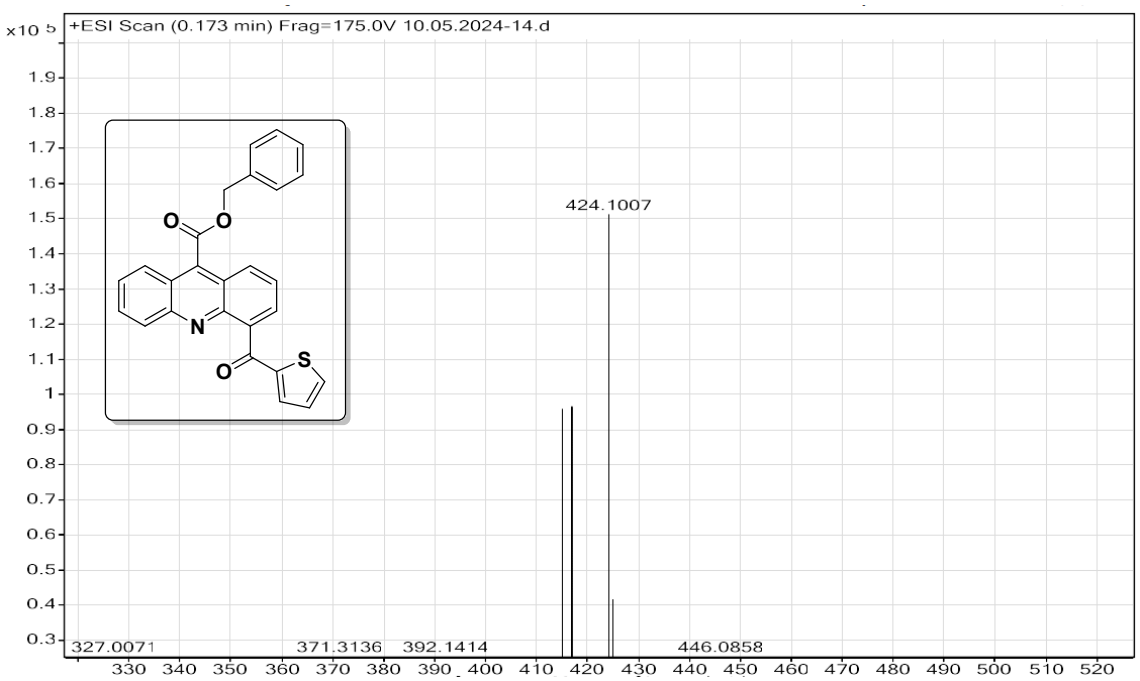


Figure-92. HR-MS(ESI^{+}) spectrum of compound **4ac**

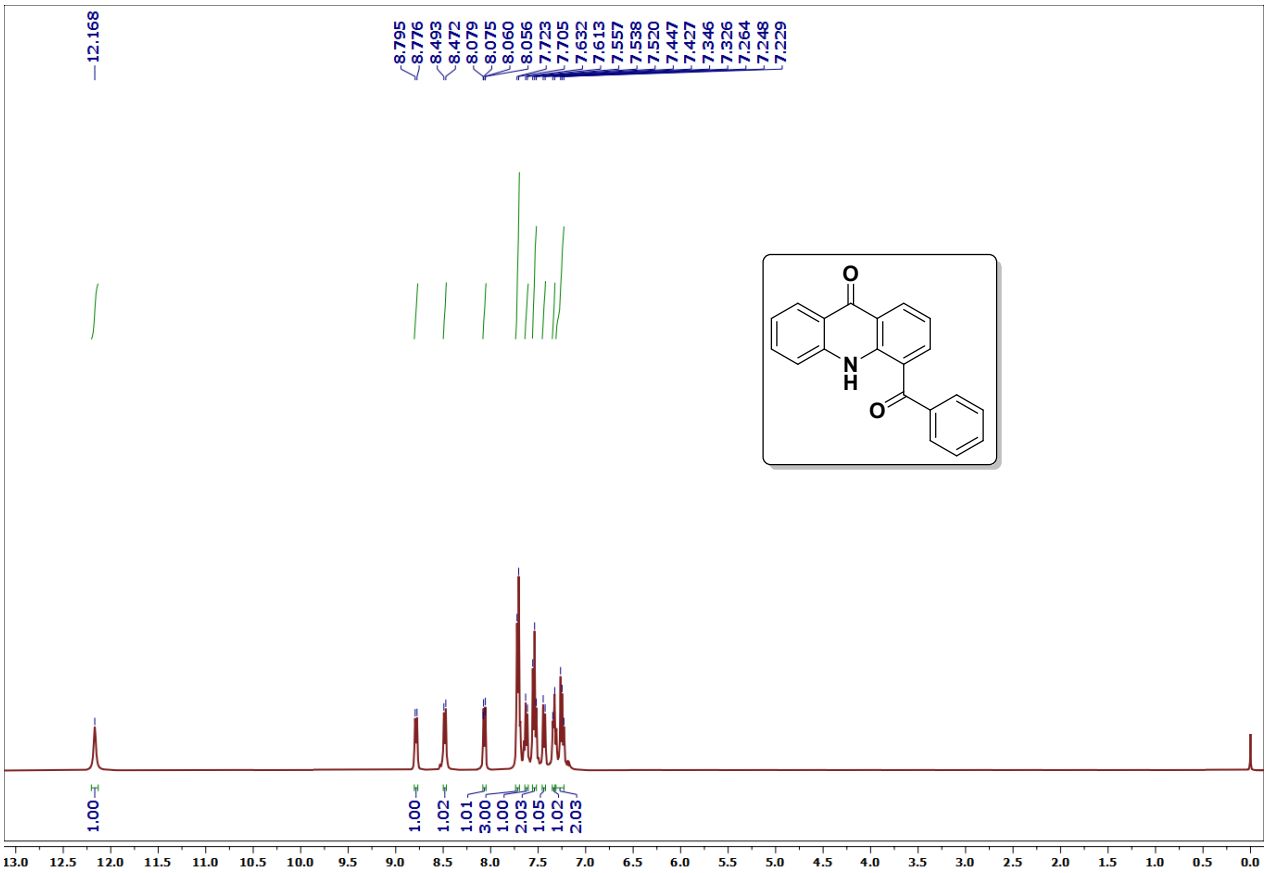


Figure-93. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **7a**

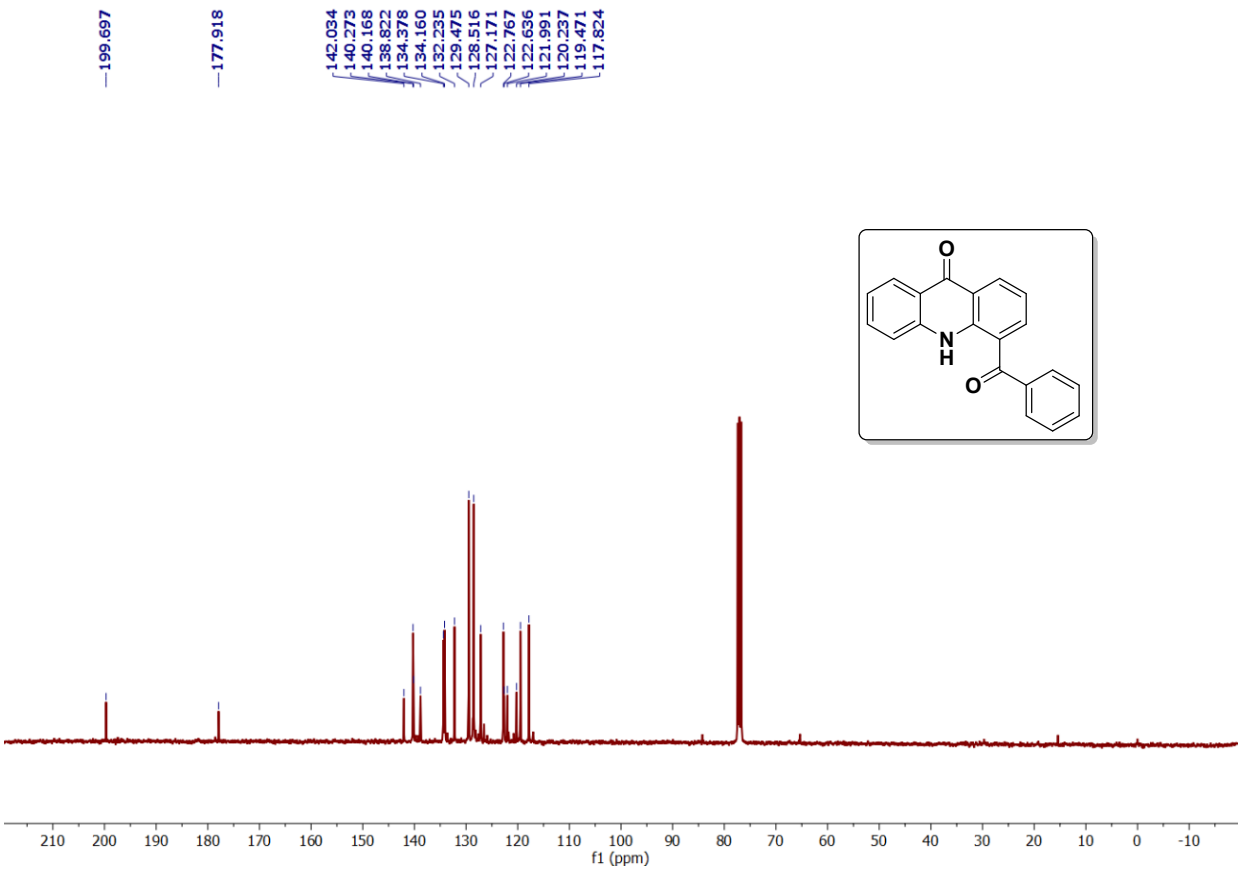


Figure-94. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **7a**

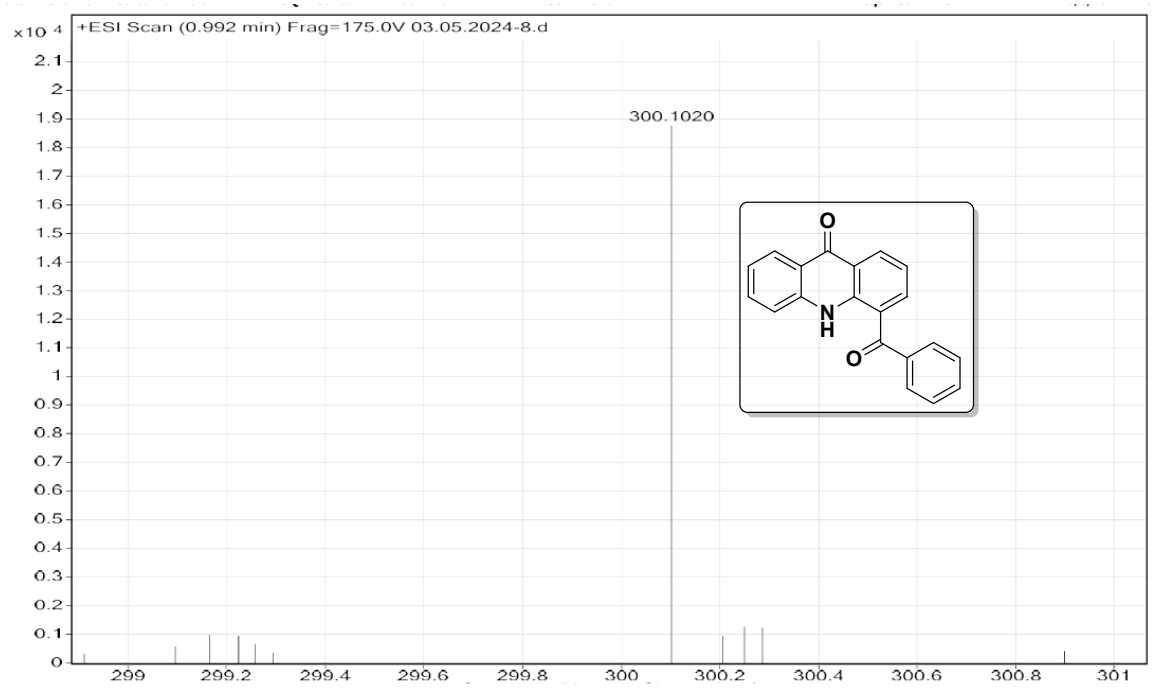


Figure-95. HR-MS(ESI^+) spectrum of compound **7a**

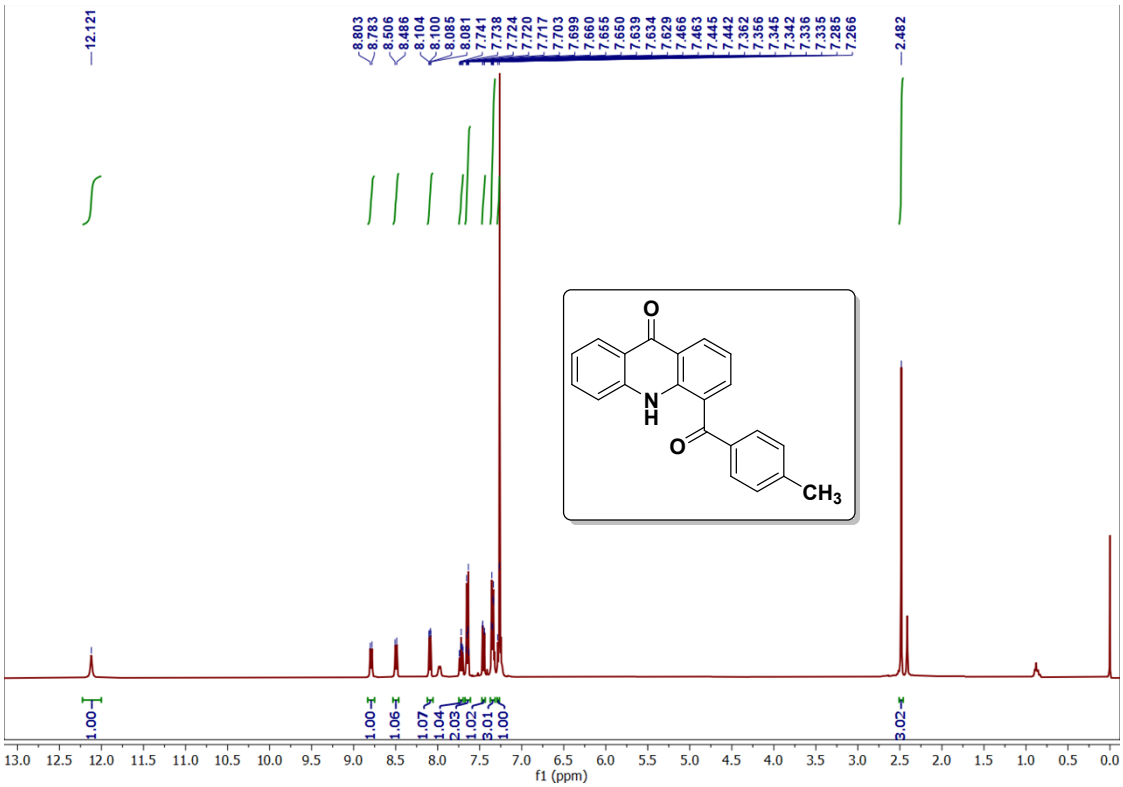


Figure-96. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **7b**

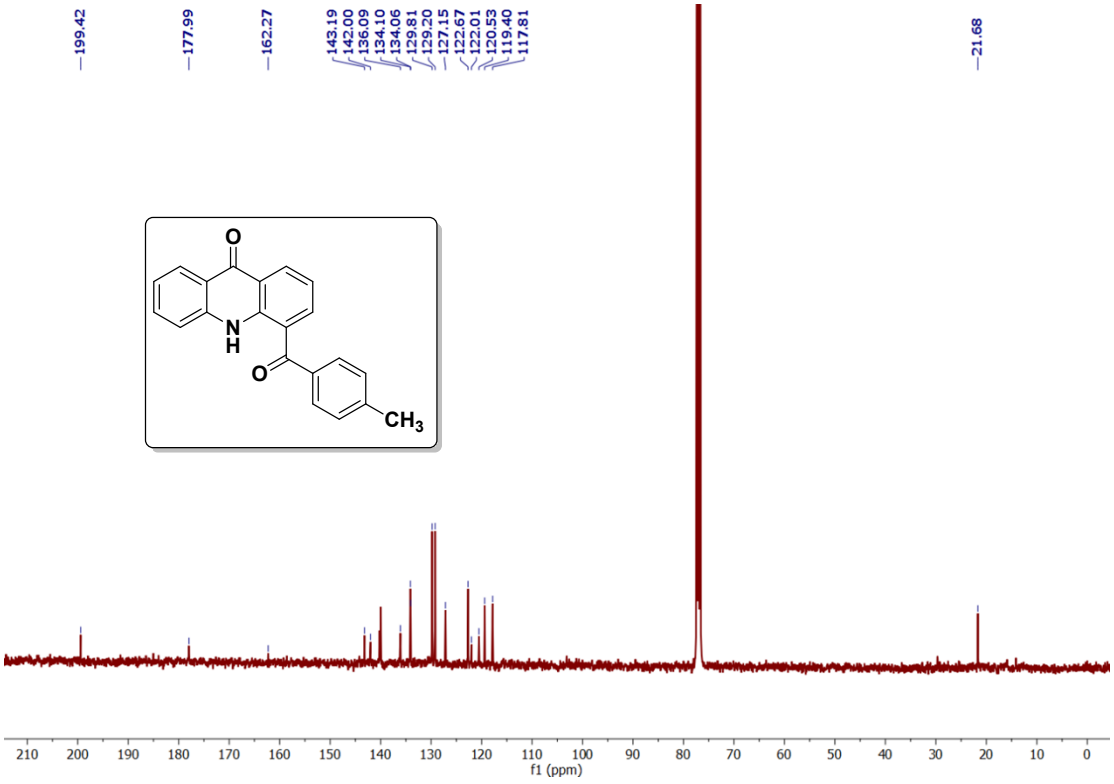


Figure-97. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **7b**

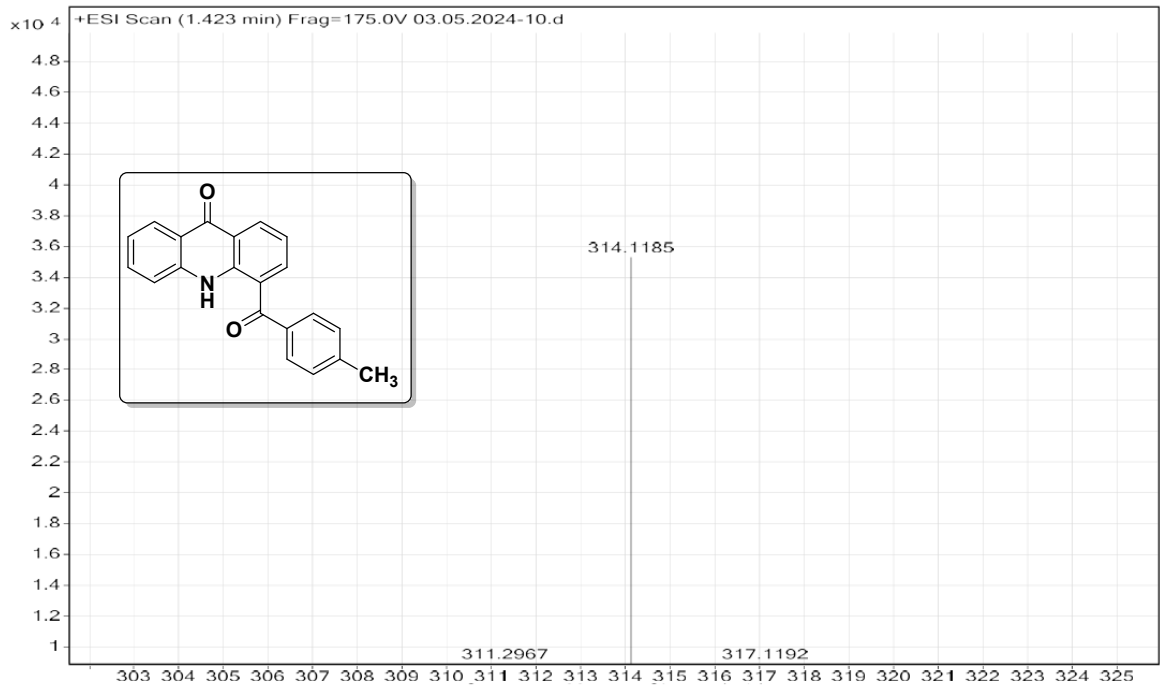


Figure-98. HR-MS(ESI$^+$) spectrum of compound **7b**

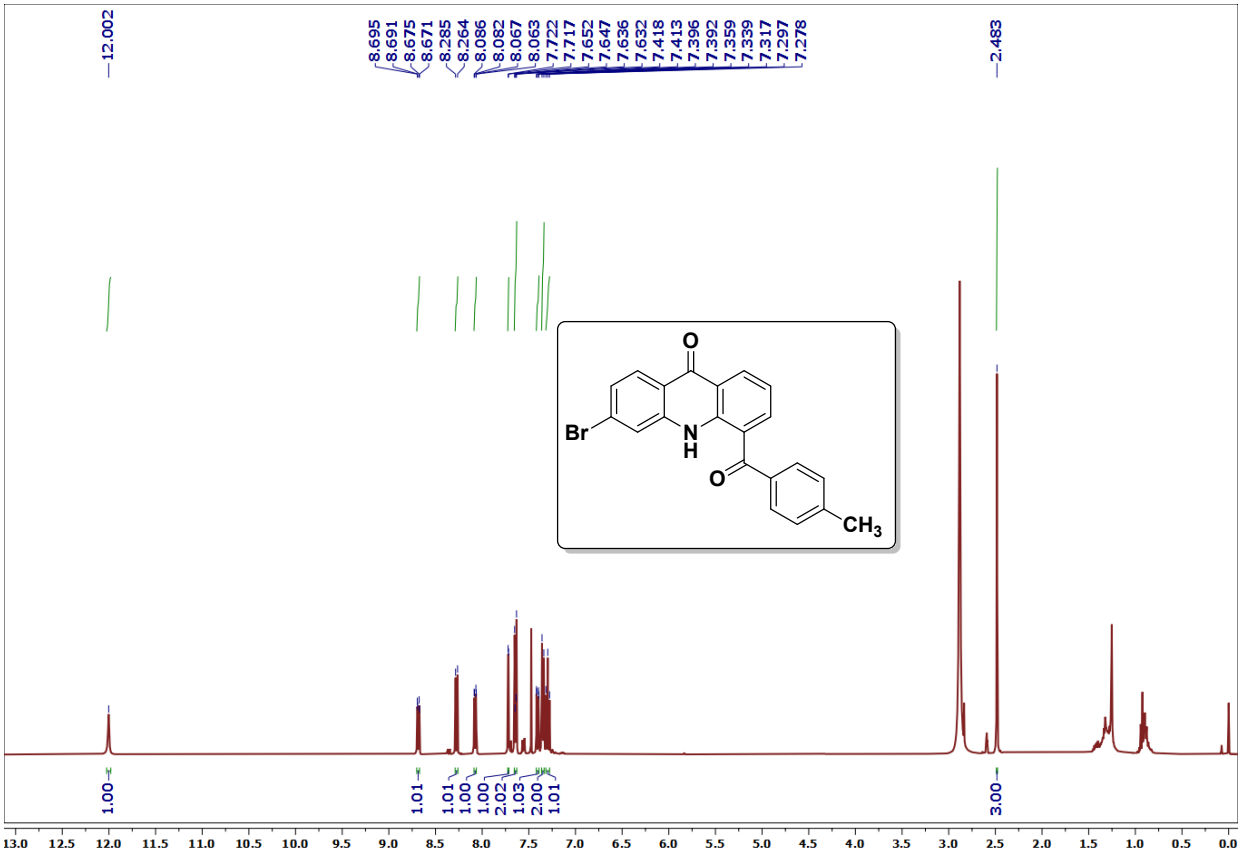


Figure-99. ^{1}H NMR (400 MHz, $CDCl_3$ and DMSO-d_6 mix) spectrum of compound **7c**

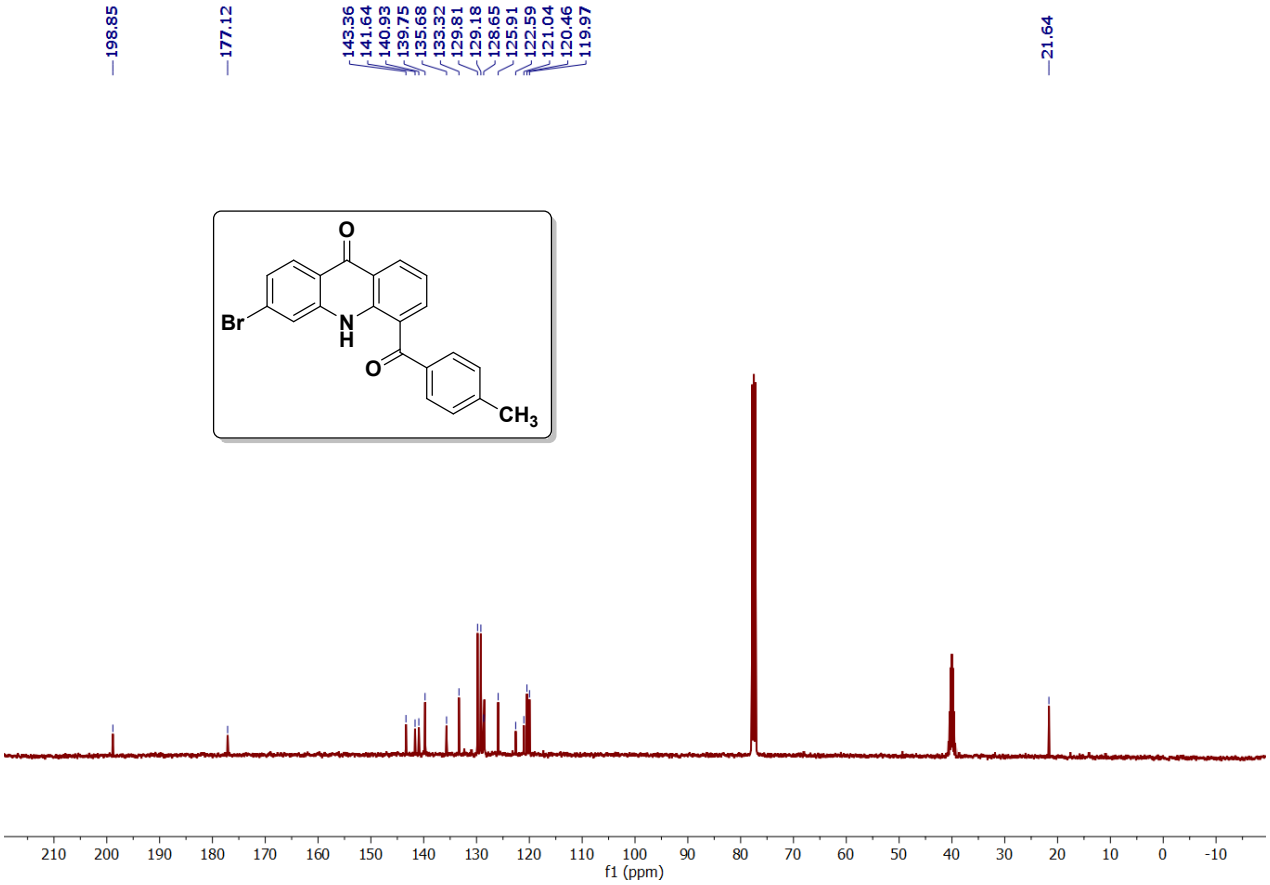


Figure-100. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$ and DMSO-d_6 mix) NMR spectrum of compound **7c**

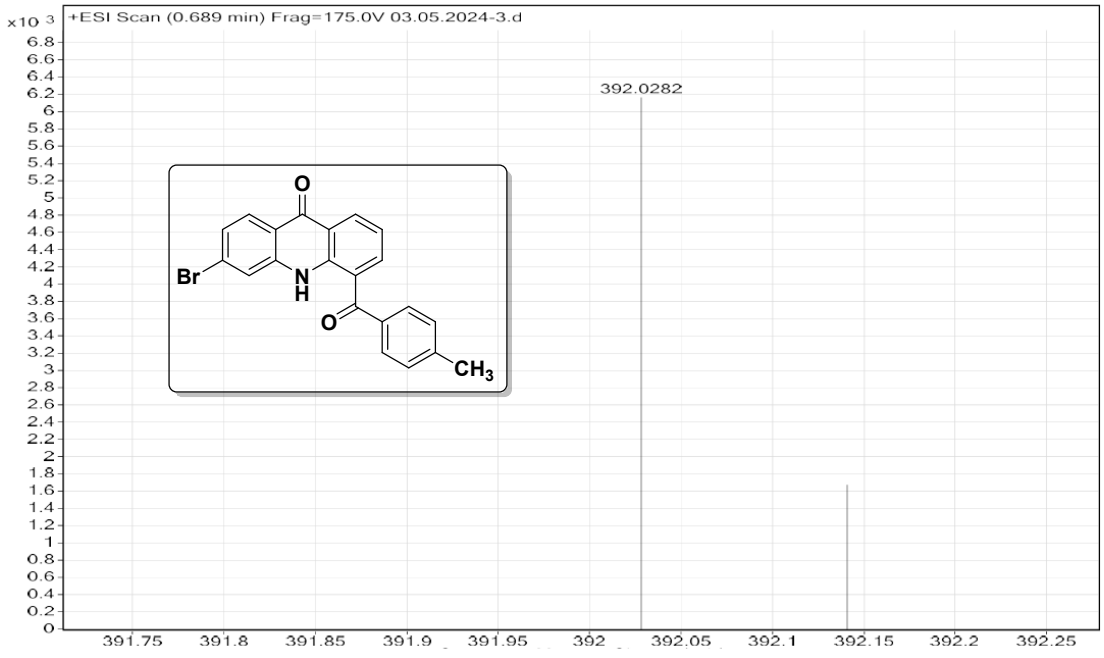


Figure-101. HR-MS(ESI^{+}) spectrum of compound **7c**

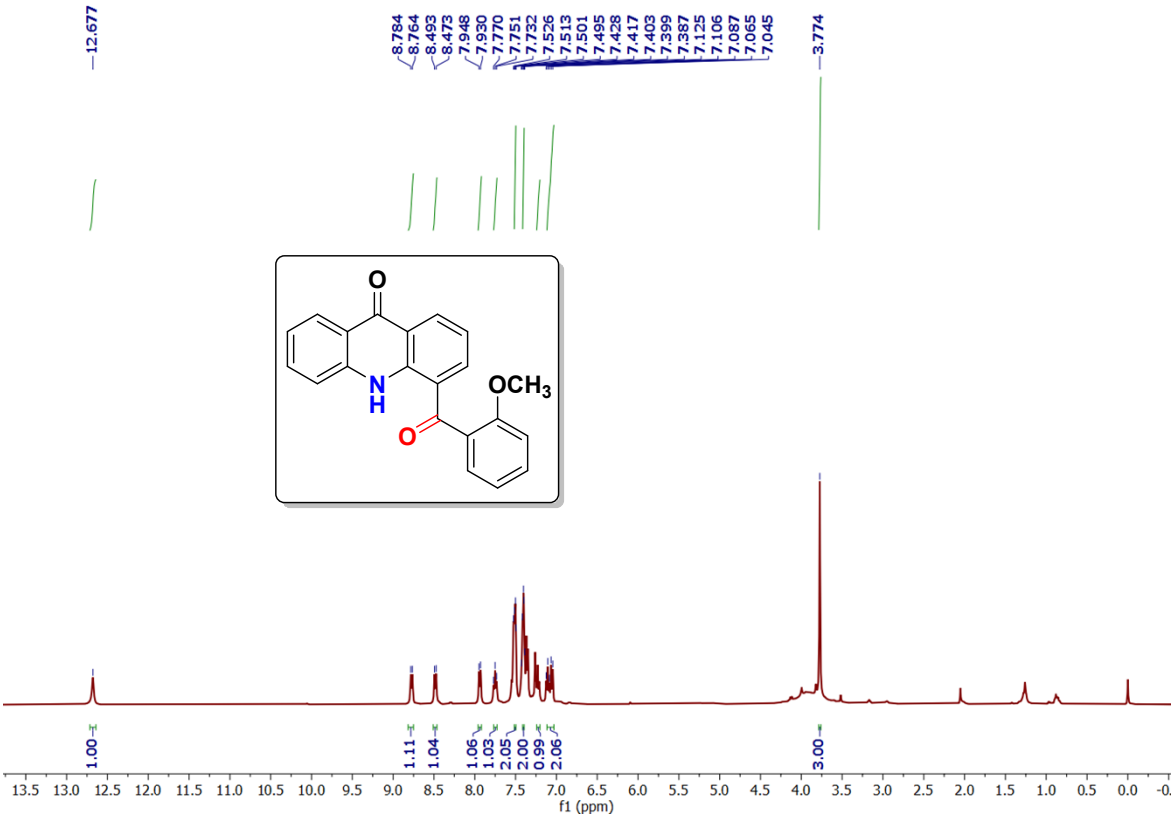


Figure-102. ^{1}H NMR (400 MHz, $CDCl_3$ and DMSO-d_6 mix) spectrum of compound **7d**

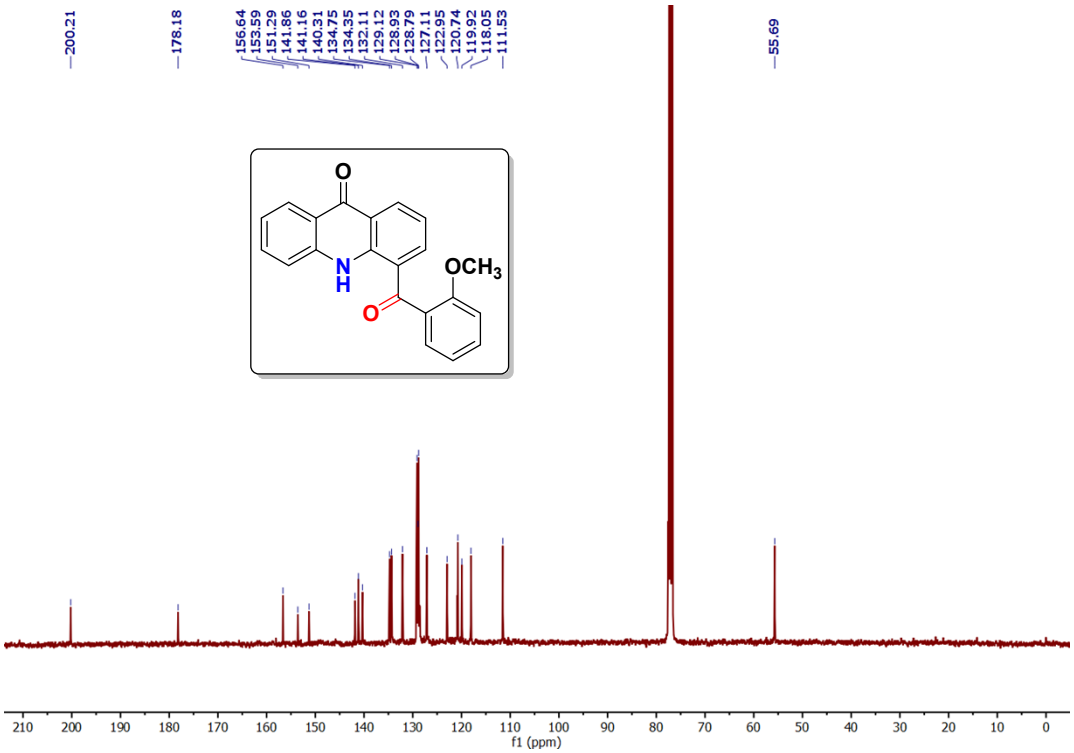


Figure-103. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **7d**

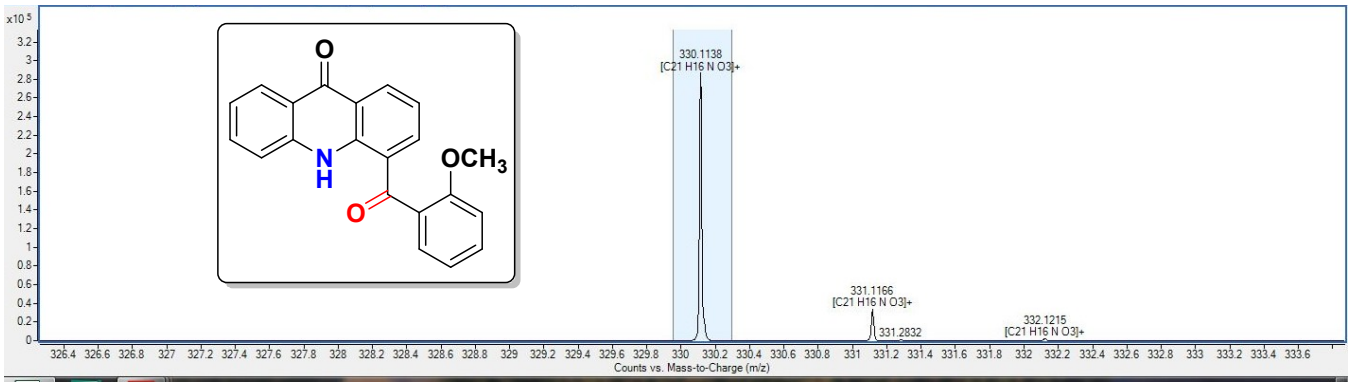


Figure-104. HR-MS(ESI$^+$) spectrum of compound **7d**

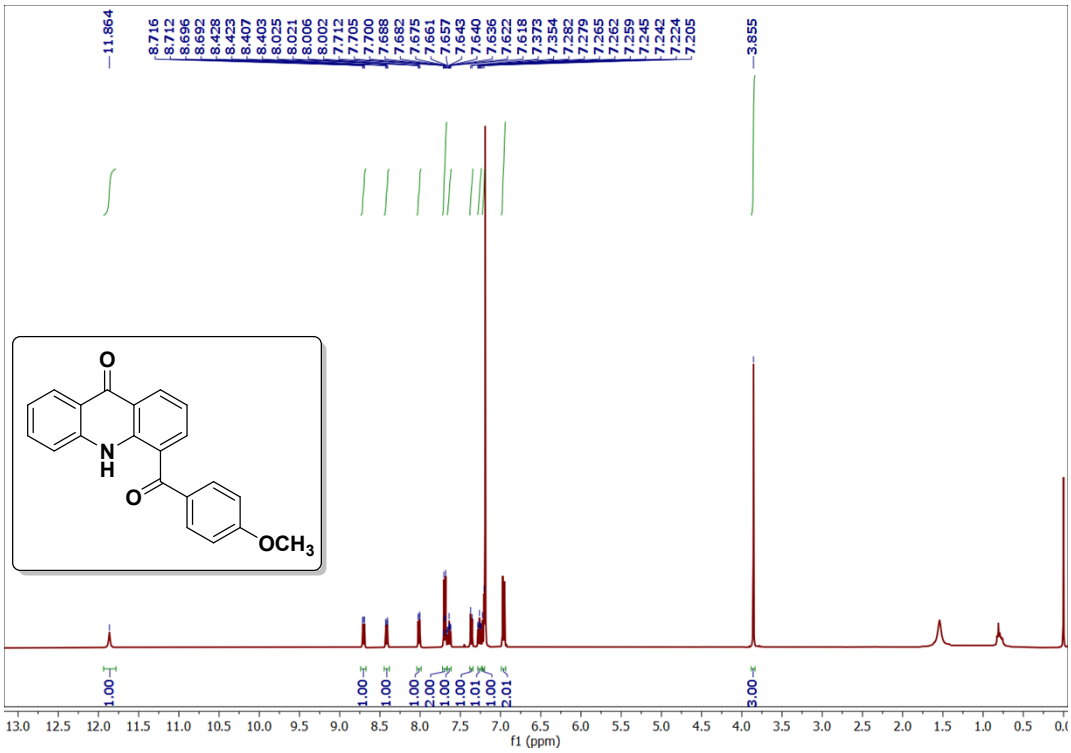


Figure-105. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **7e**

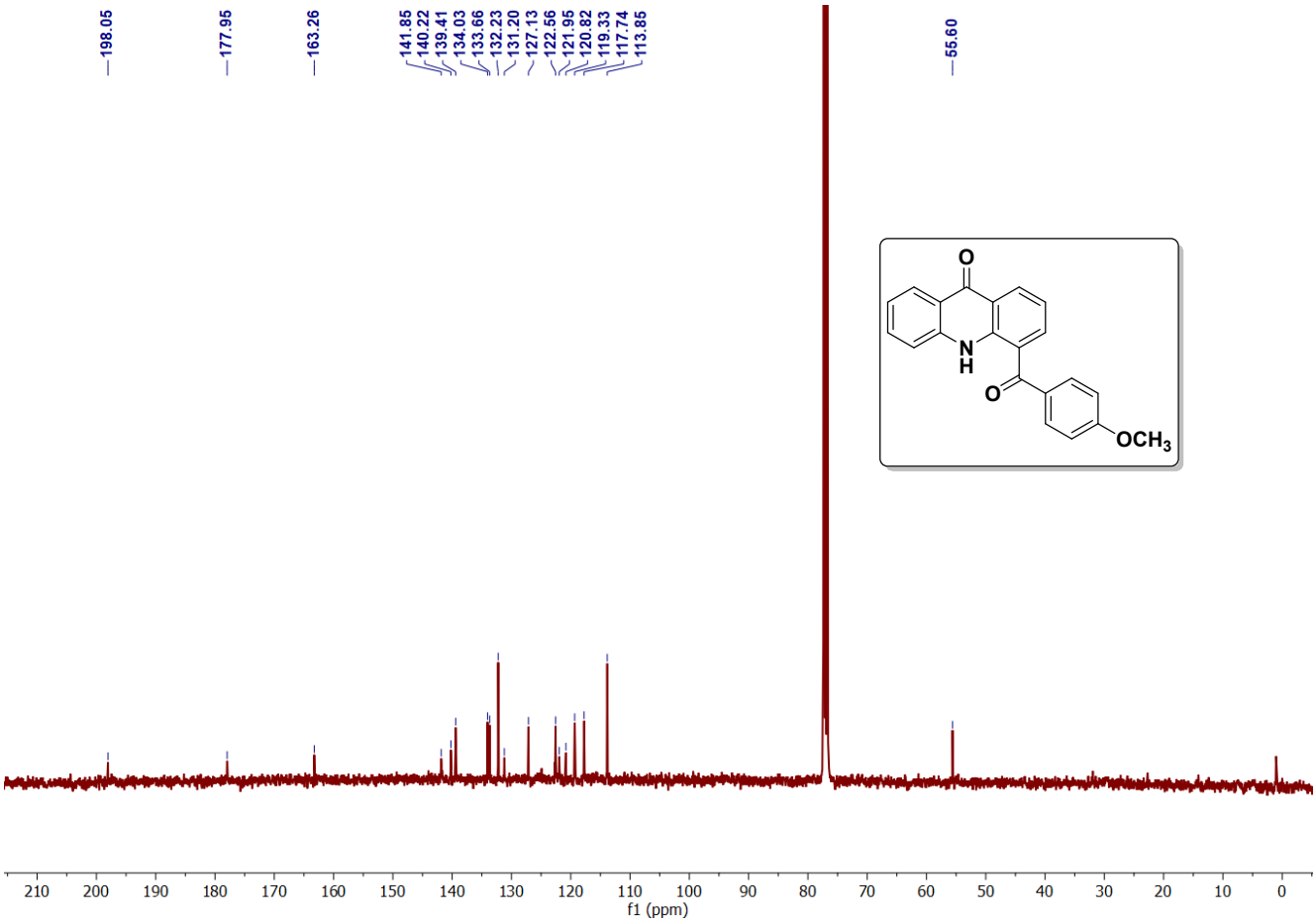


Figure-106. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **7e**

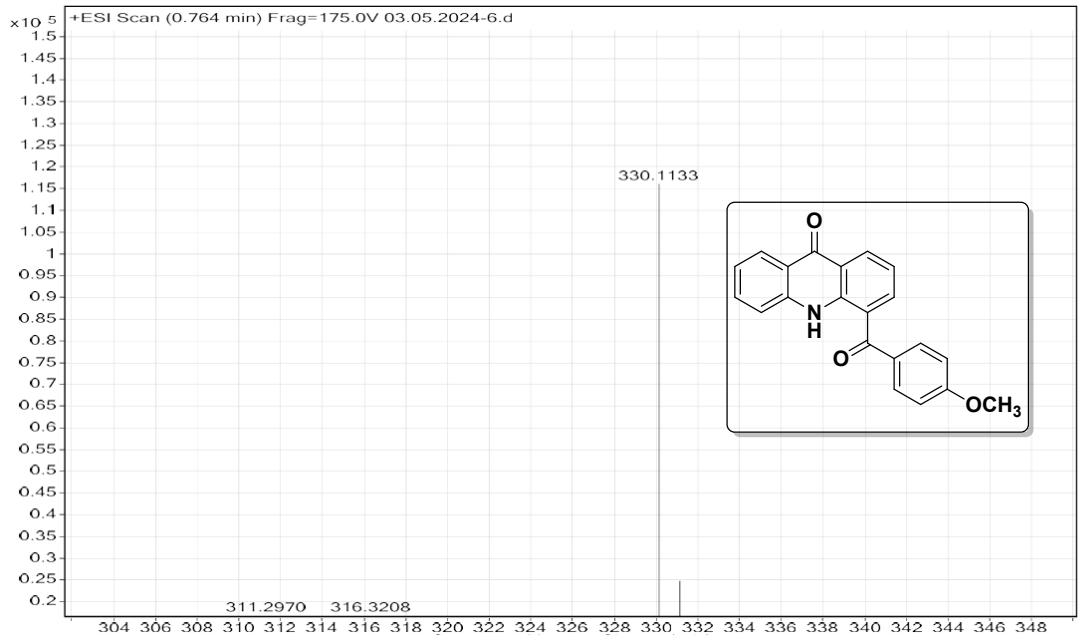


Figure-107. HR-MS(ESI^{+}) spectrum of compound **7e**

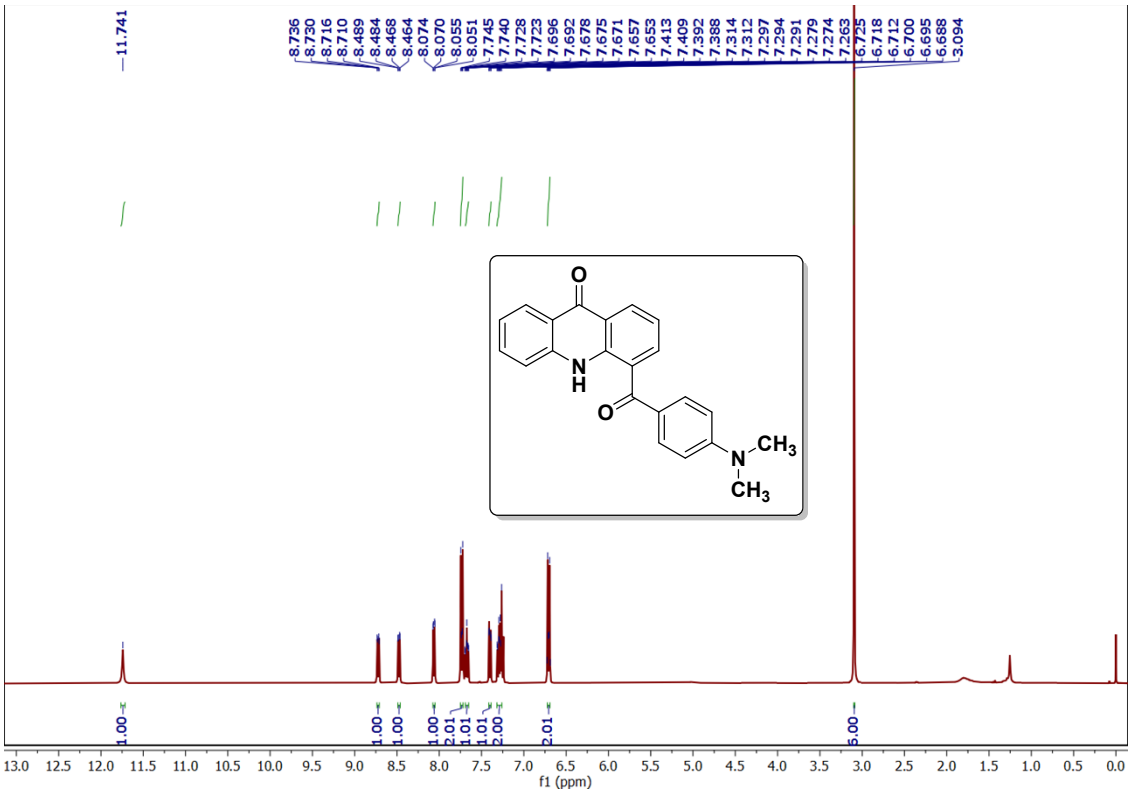


Figure-108. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **7f**

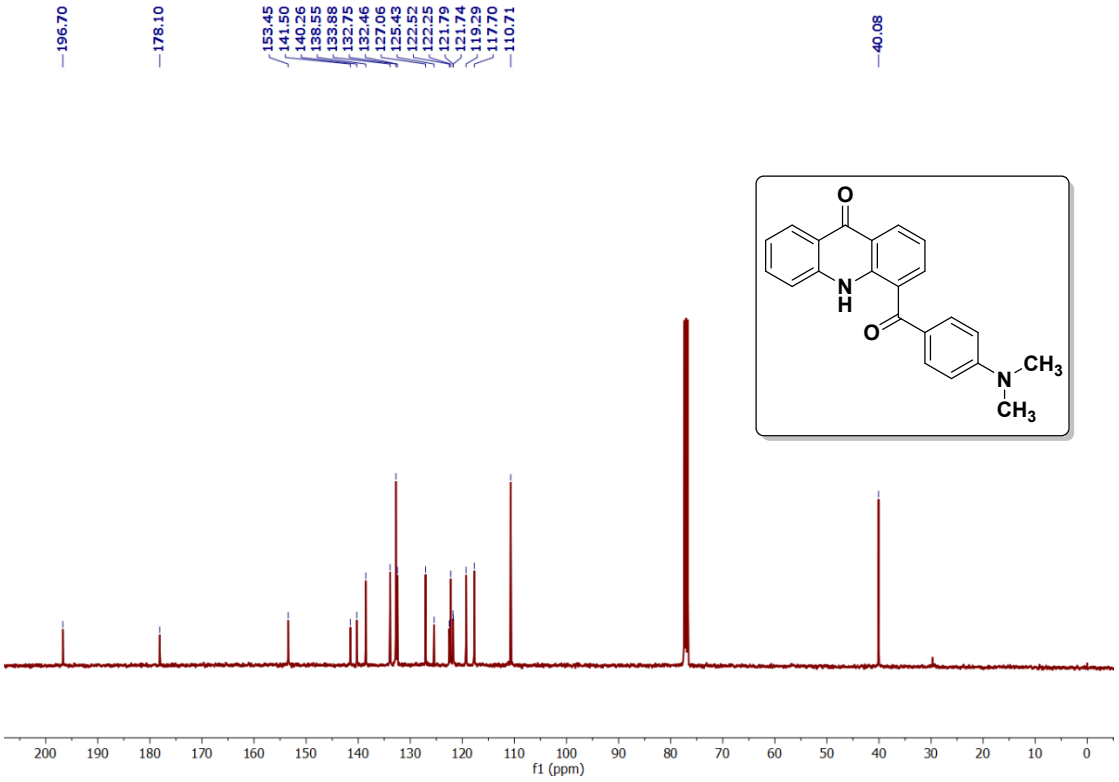


Figure-109. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **7f**

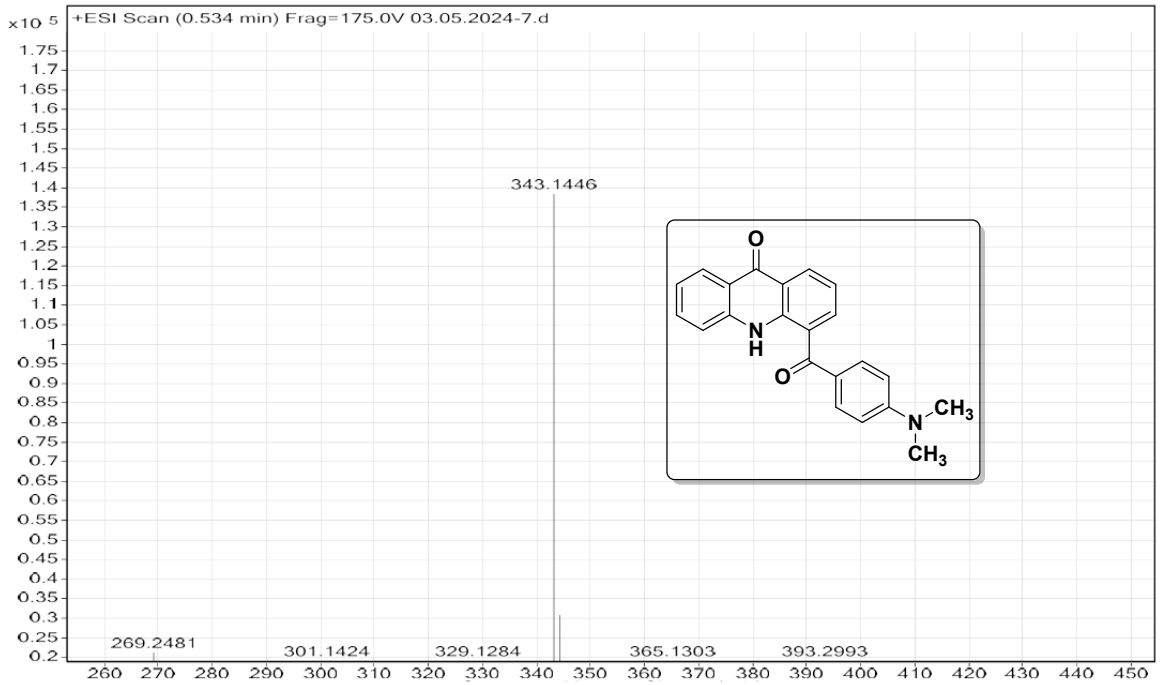


Figure-110. HR-MS(ESI^{+}) spectrum of compound **7f**

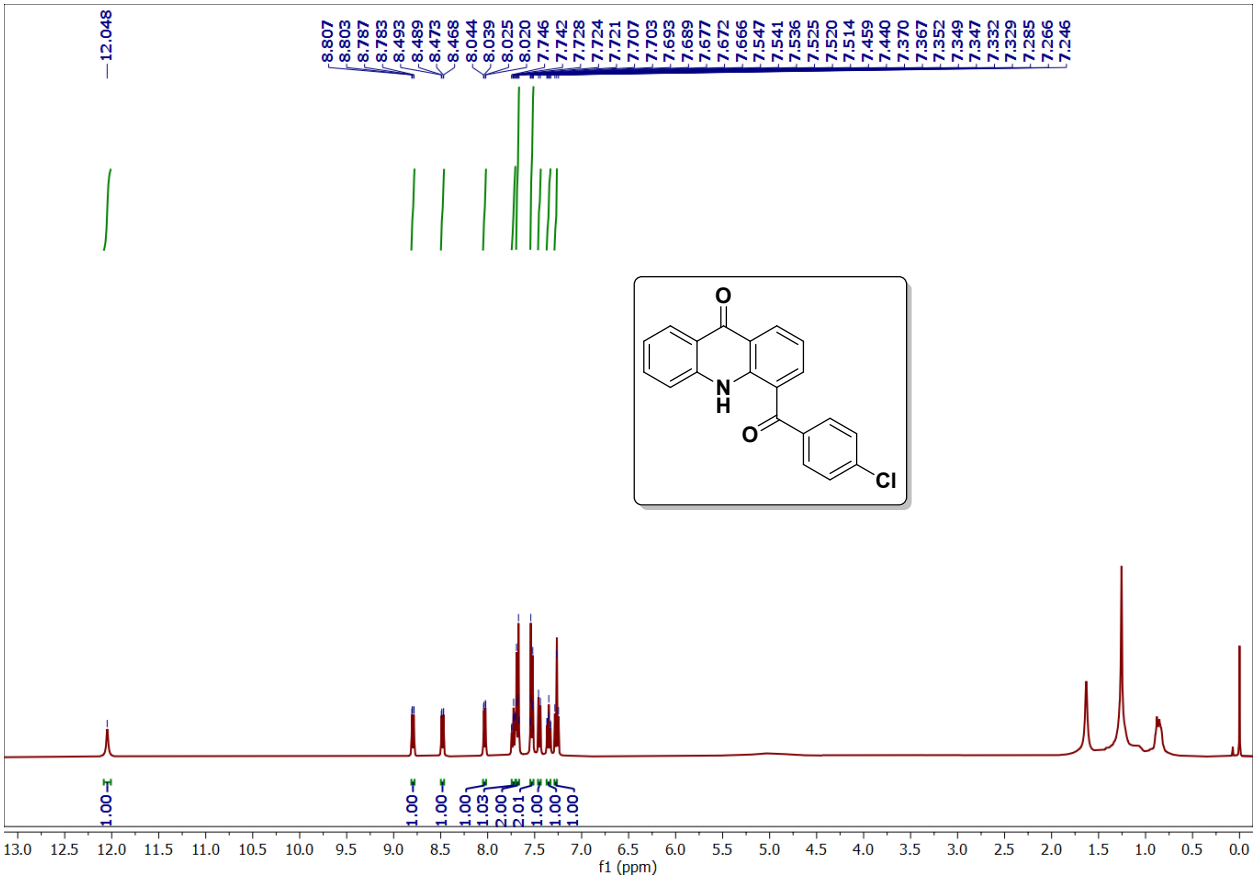


Figure-111. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **7g**

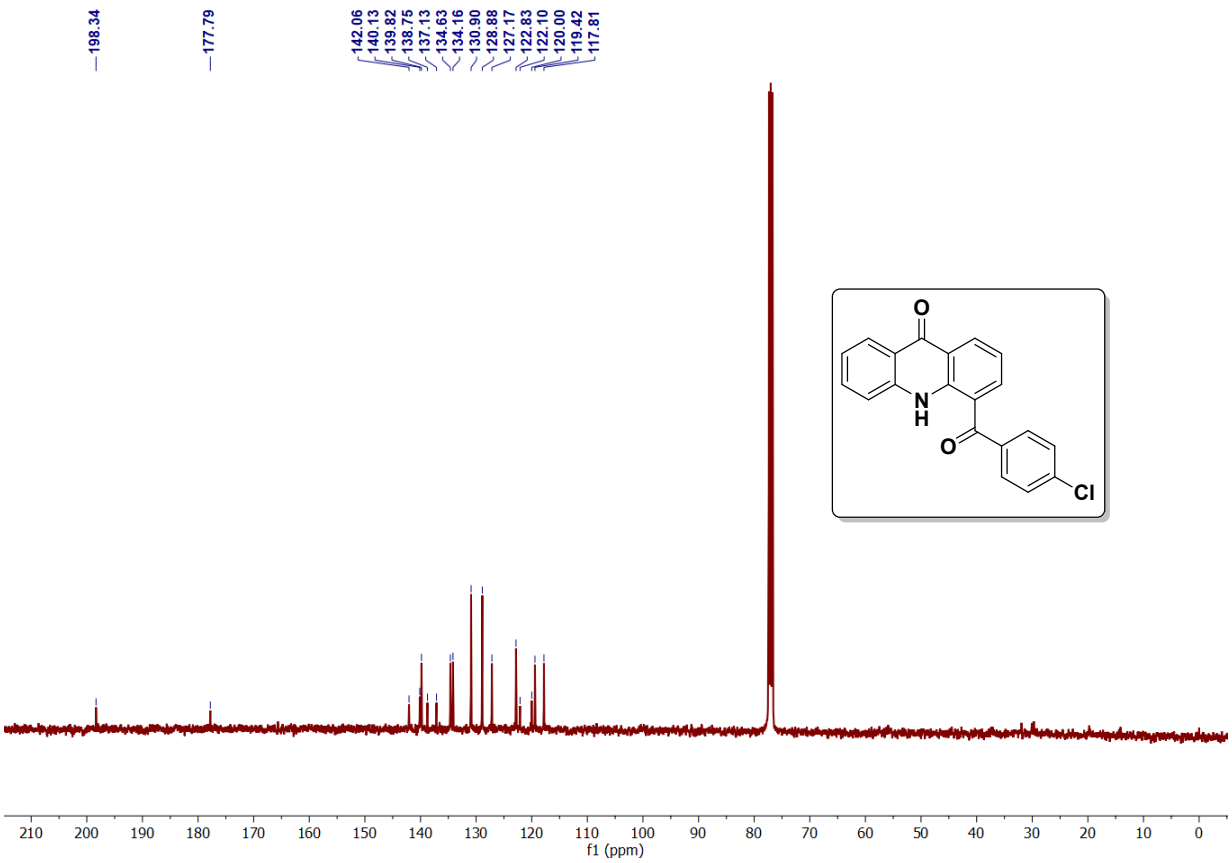


Figure-112. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **7g**

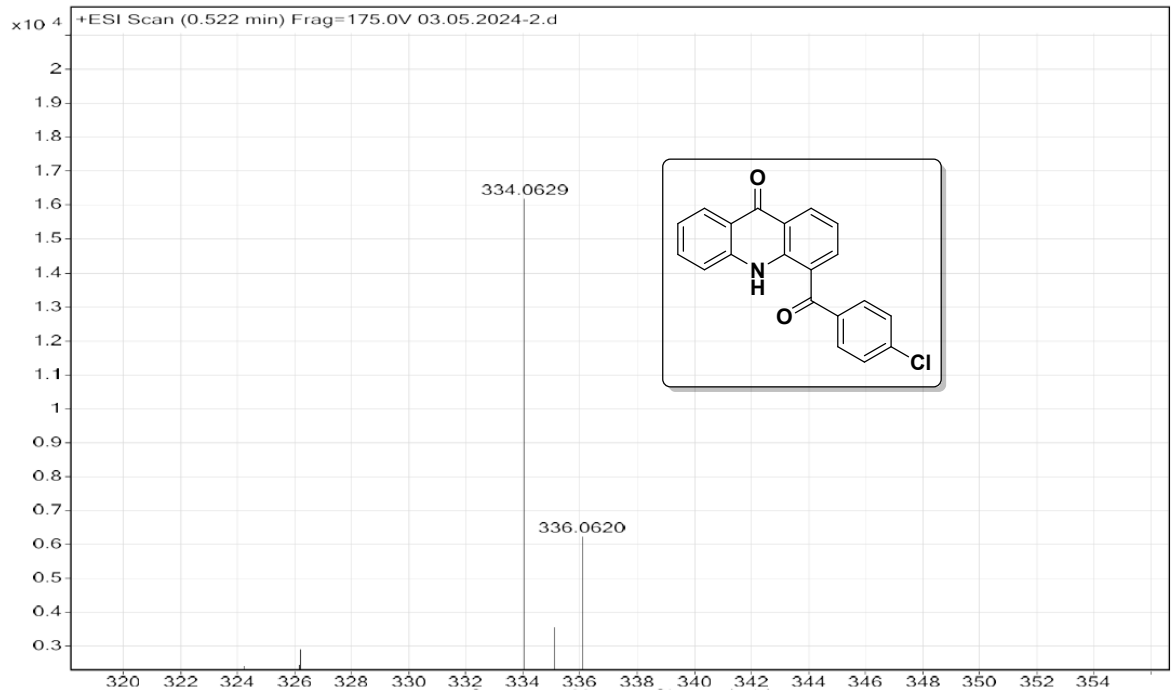


Figure-113. HR-MS(ESI^{+}) spectrum of compound **7g**

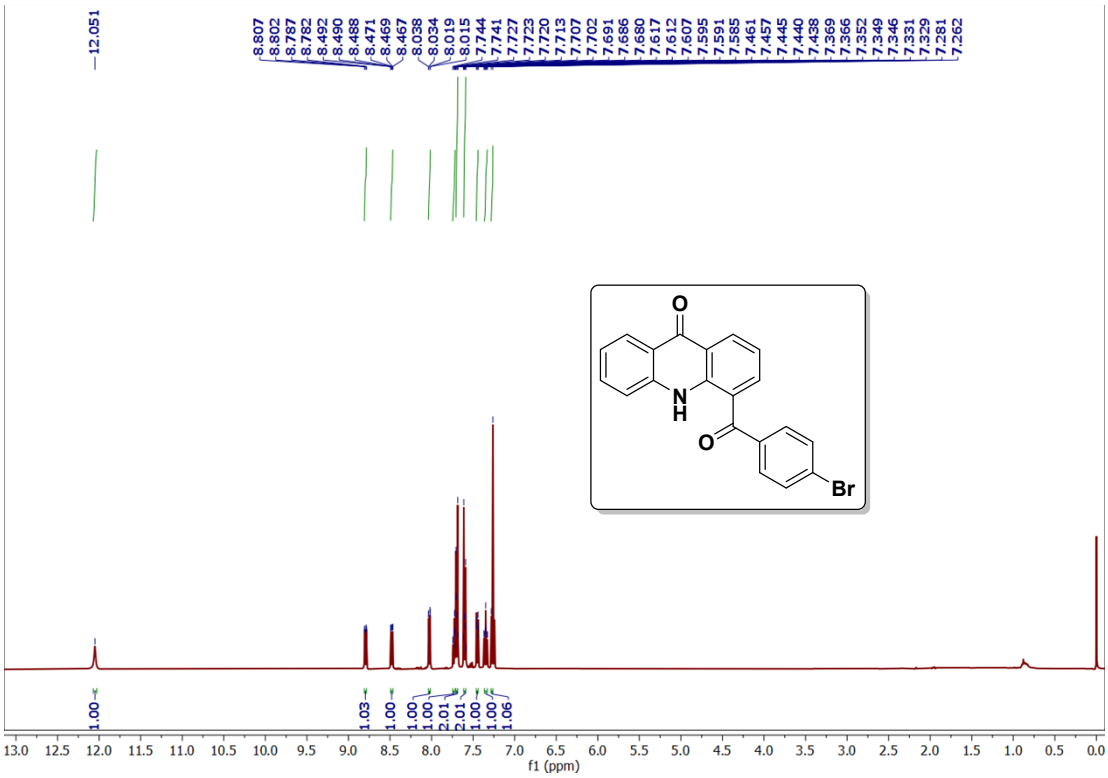


Figure-114. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **7h**

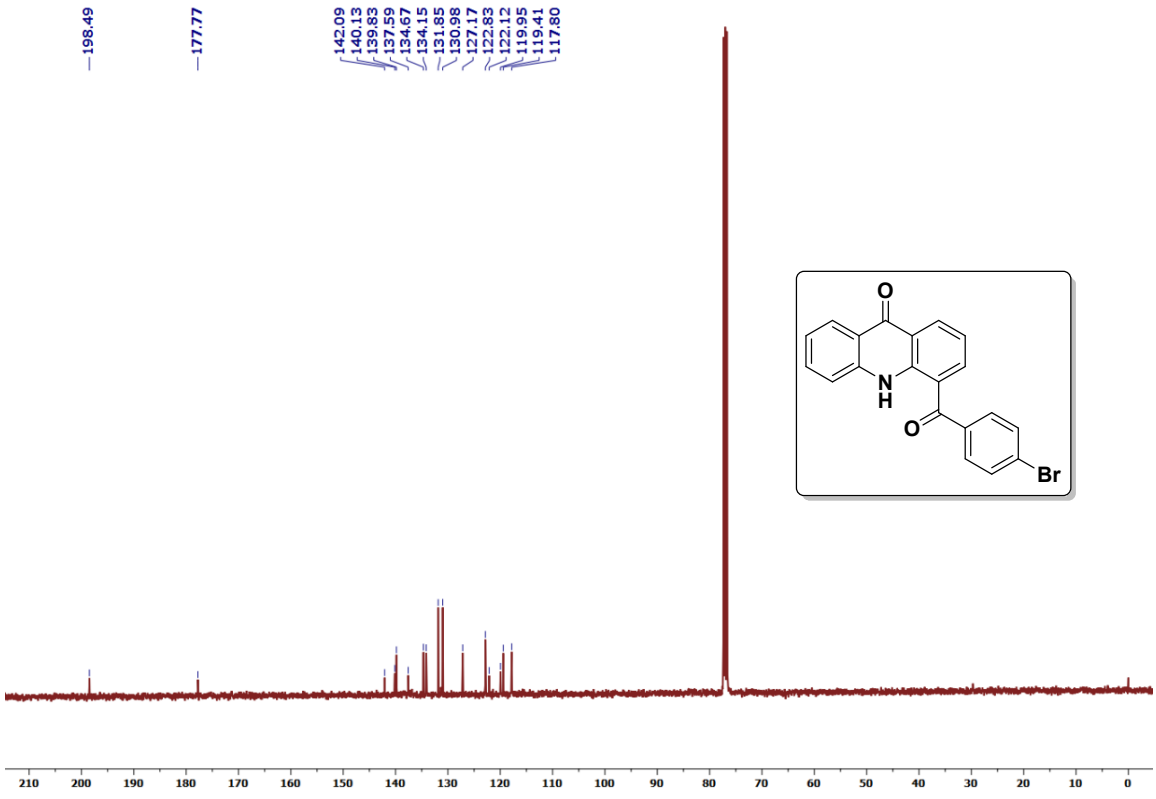


Figure-115. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **7h**

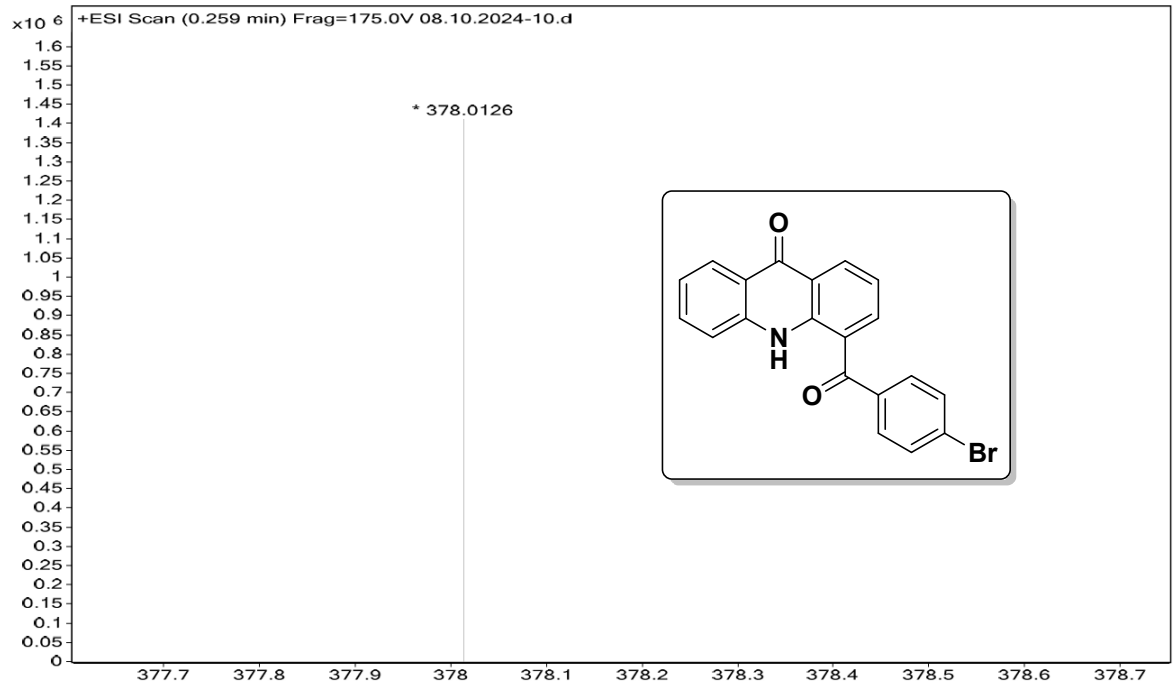


Figure-116. HR-MS(ESI$^+$) spectrum of compound **7h**

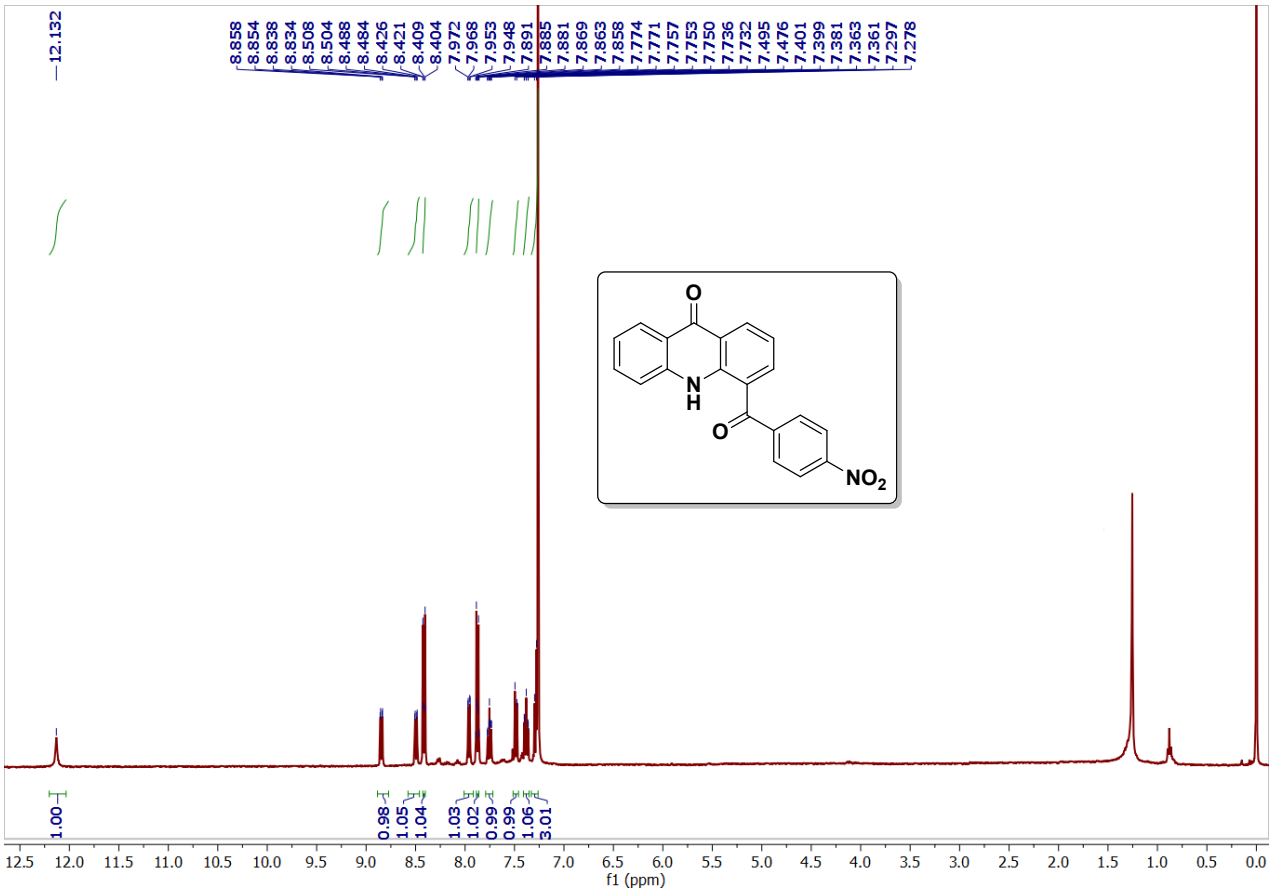


Figure-117. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **7i**

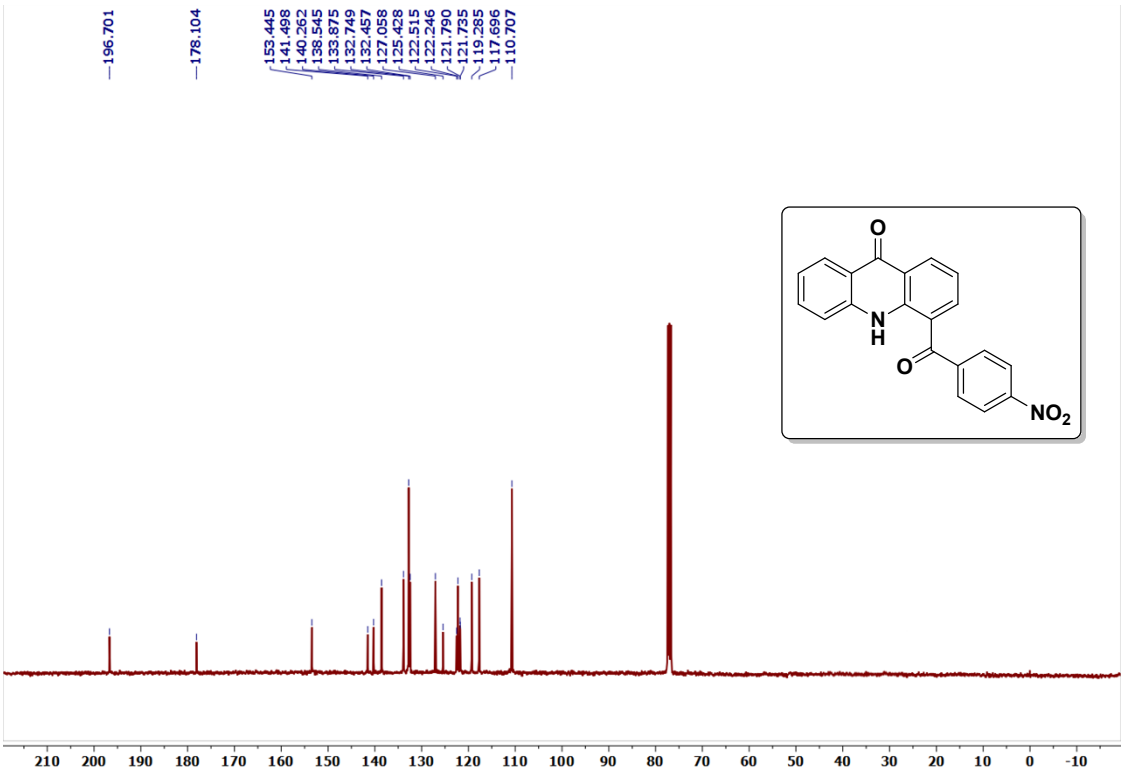


Figure-118. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **7i**

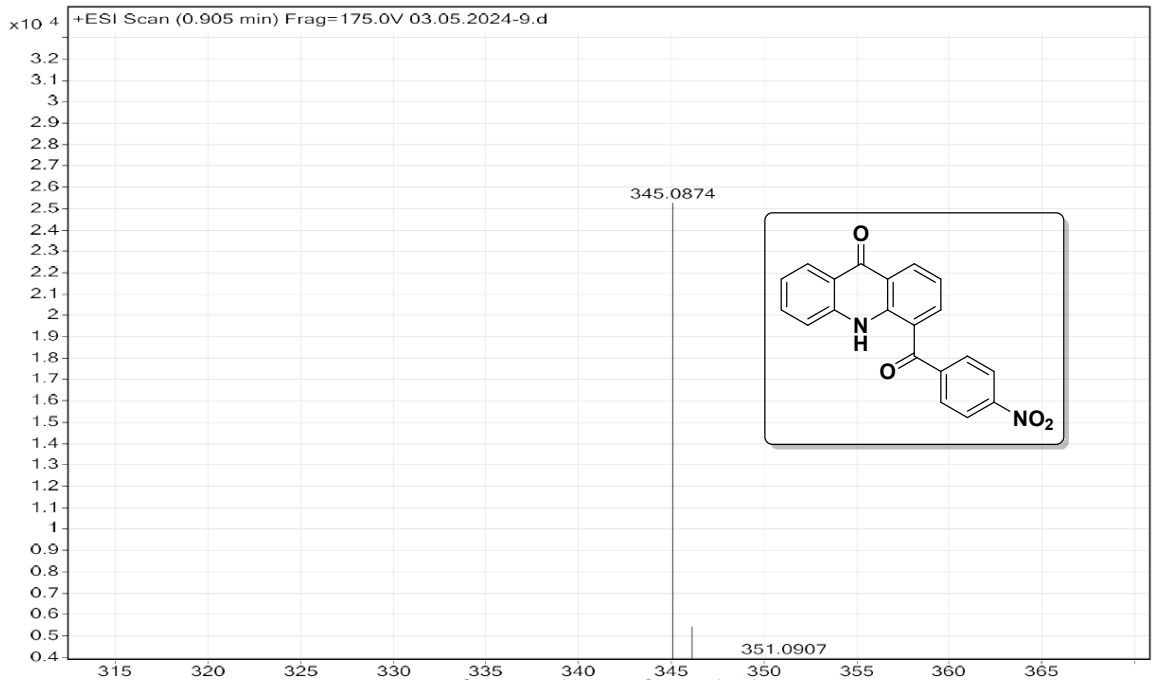


Figure-119. HR-MS(ESI^{+}) spectrum of compound **7i**

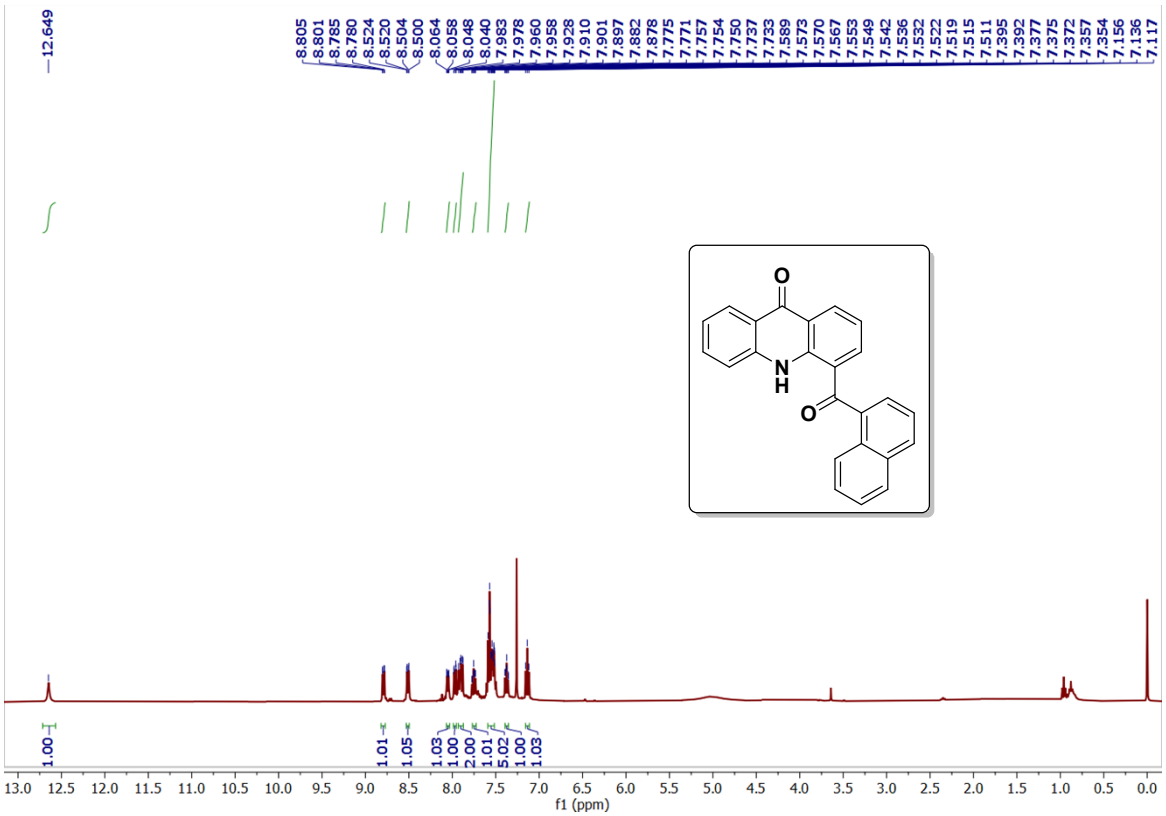


Figure-120. ^{1}H NMR (400 MHz, $CDCl_3$) spectrum of compound **7j**

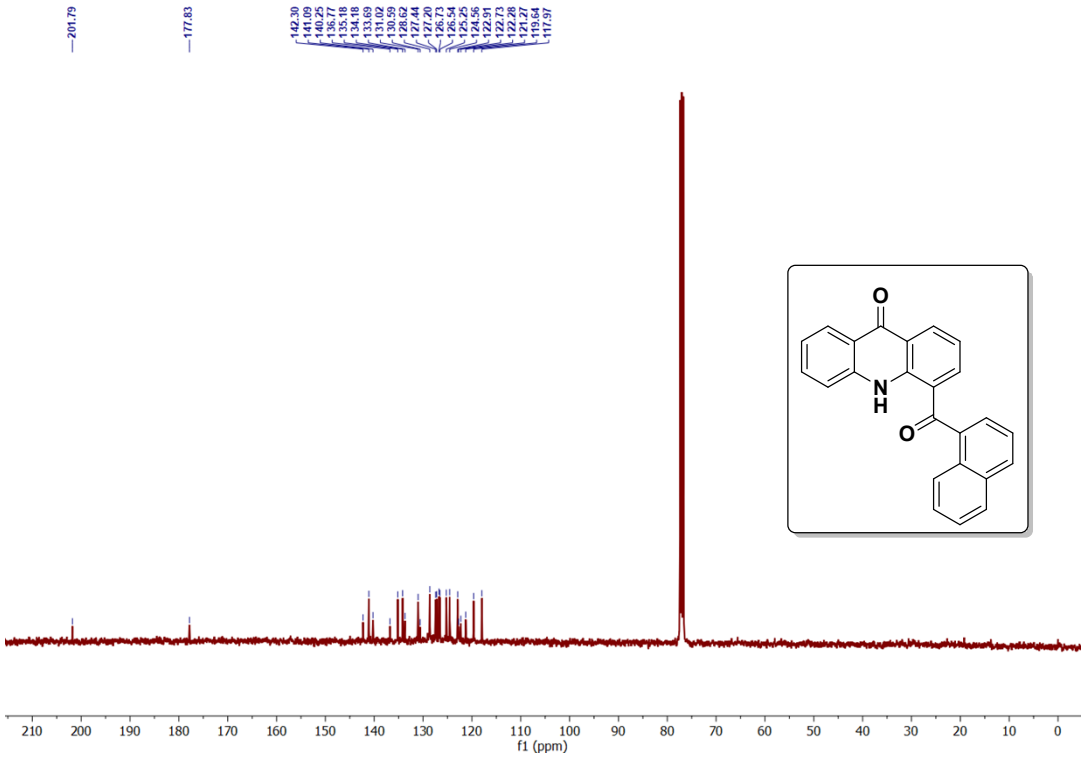


Figure-121. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **7j**

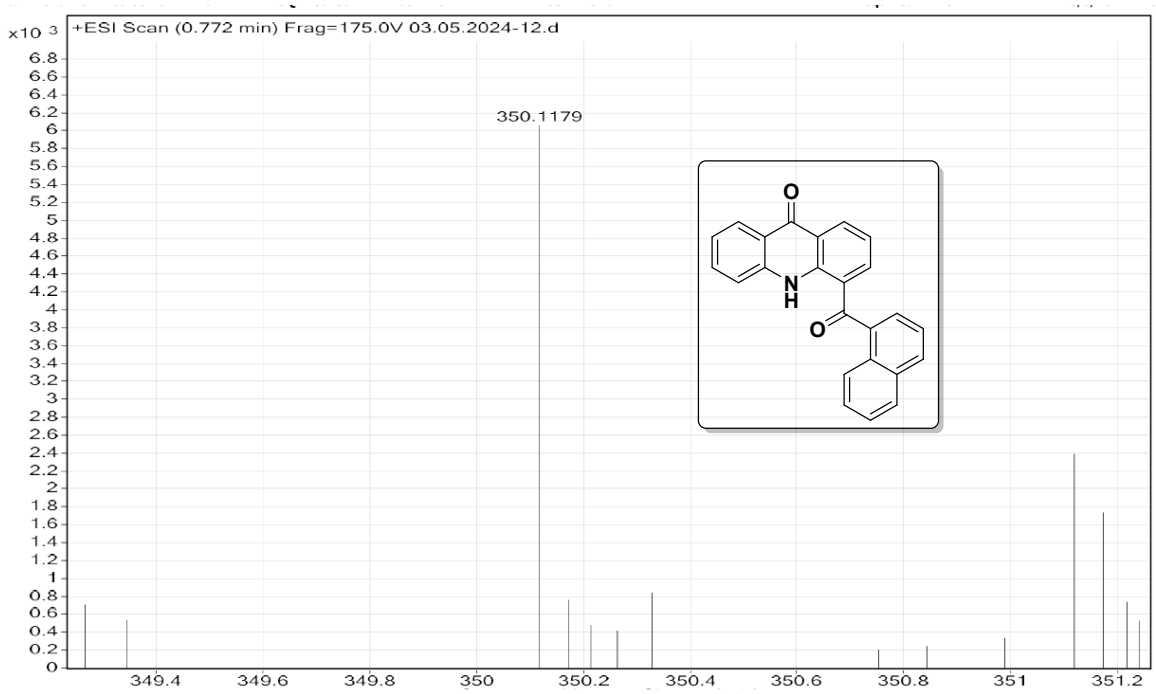


Figure-122. HR-MS(ESI^{+}) spectrum of compound **7j**

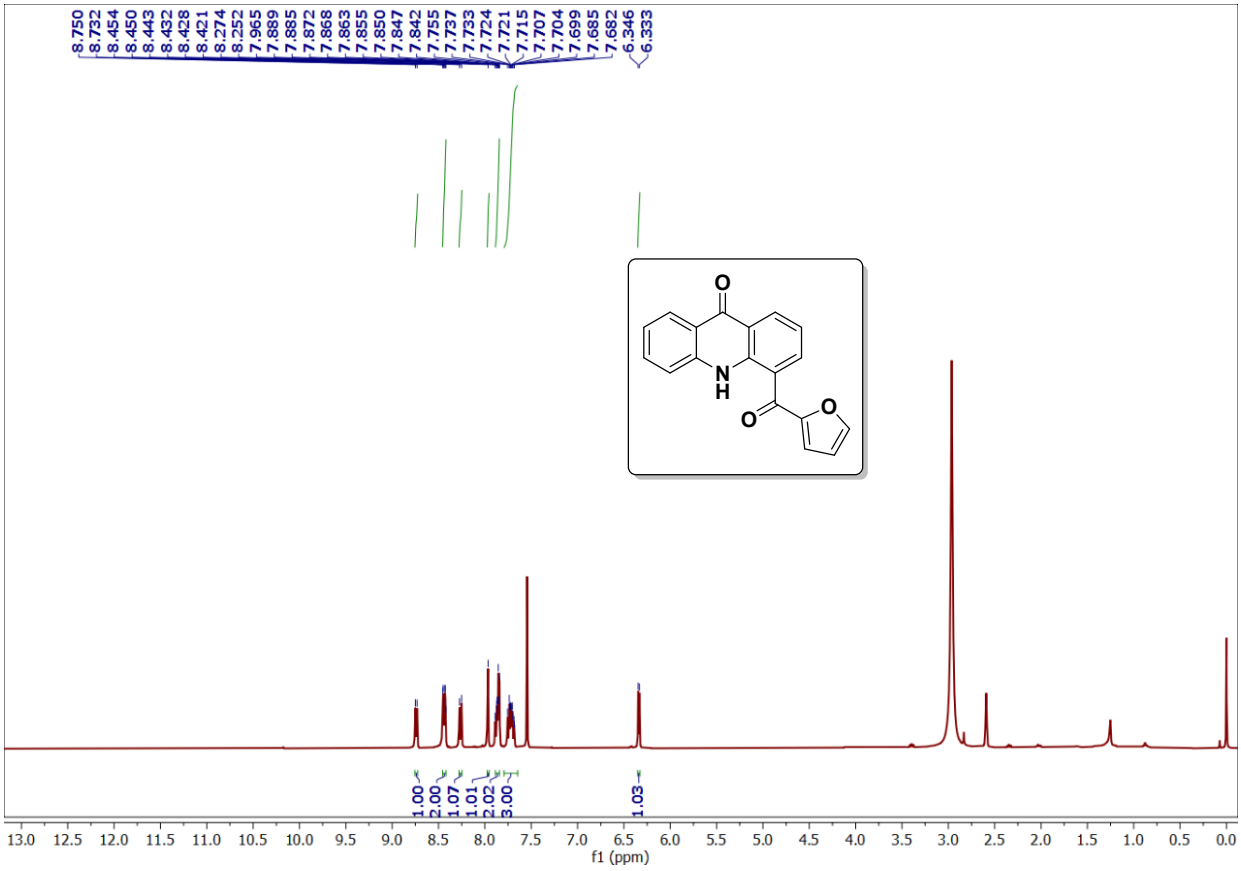


Figure-123. ^{1}H NMR (400 MHz, $CDCl_3$ and DMSO-d_6 mix) spectrum of compound **7k**

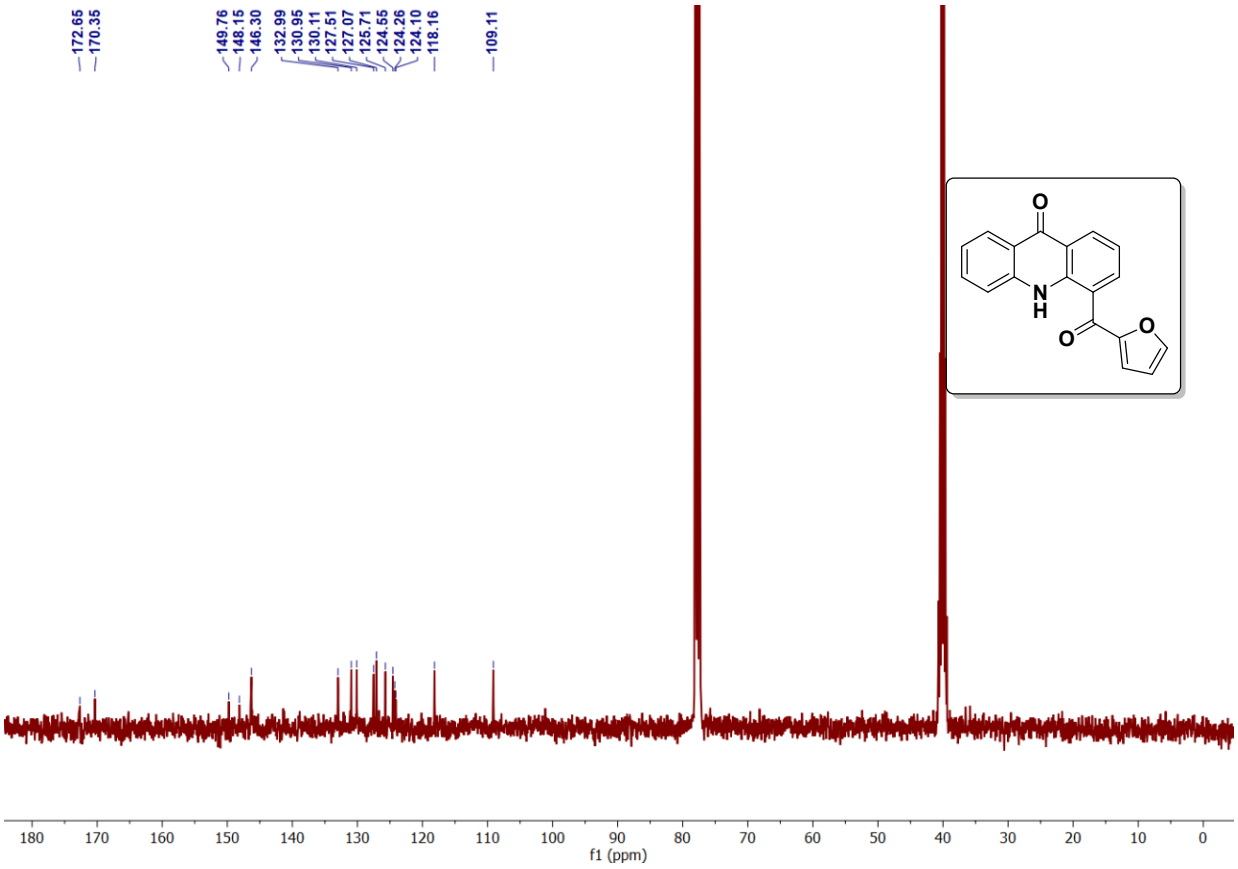


Figure-124. $^{13}C\{^{1}H\}$ (100 MHz, $CDCl_3$) NMR spectrum of compound **7k**

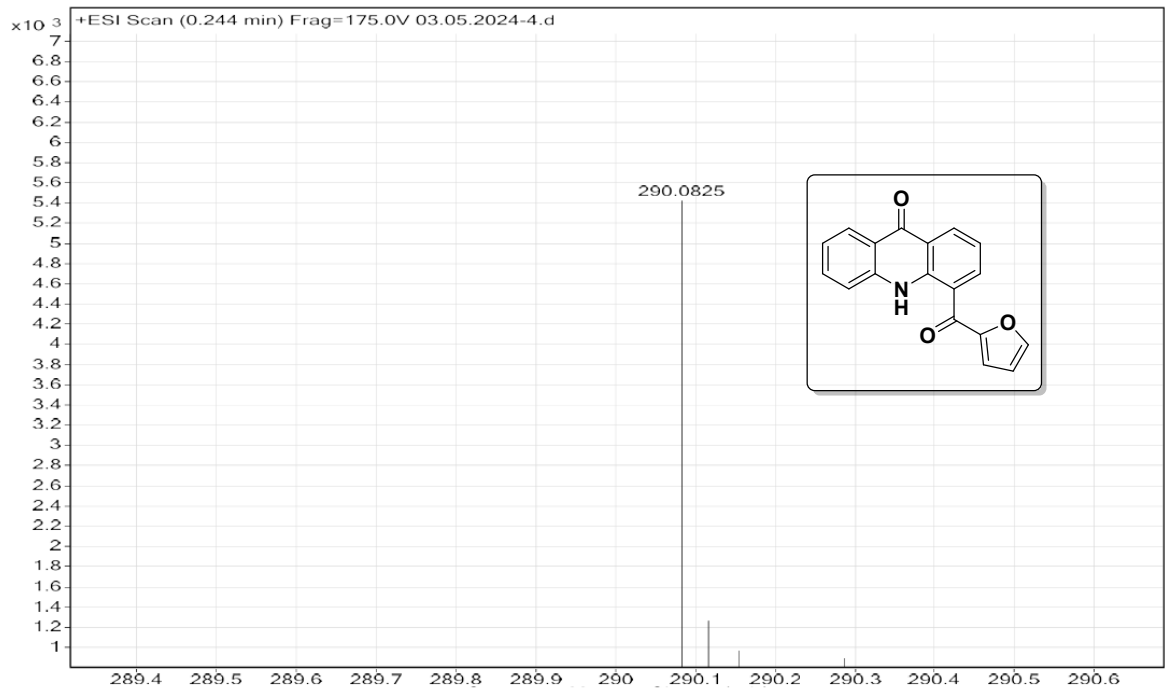


Figure-125. HR-MS(ESI^{+}) spectrum of compound **7k**

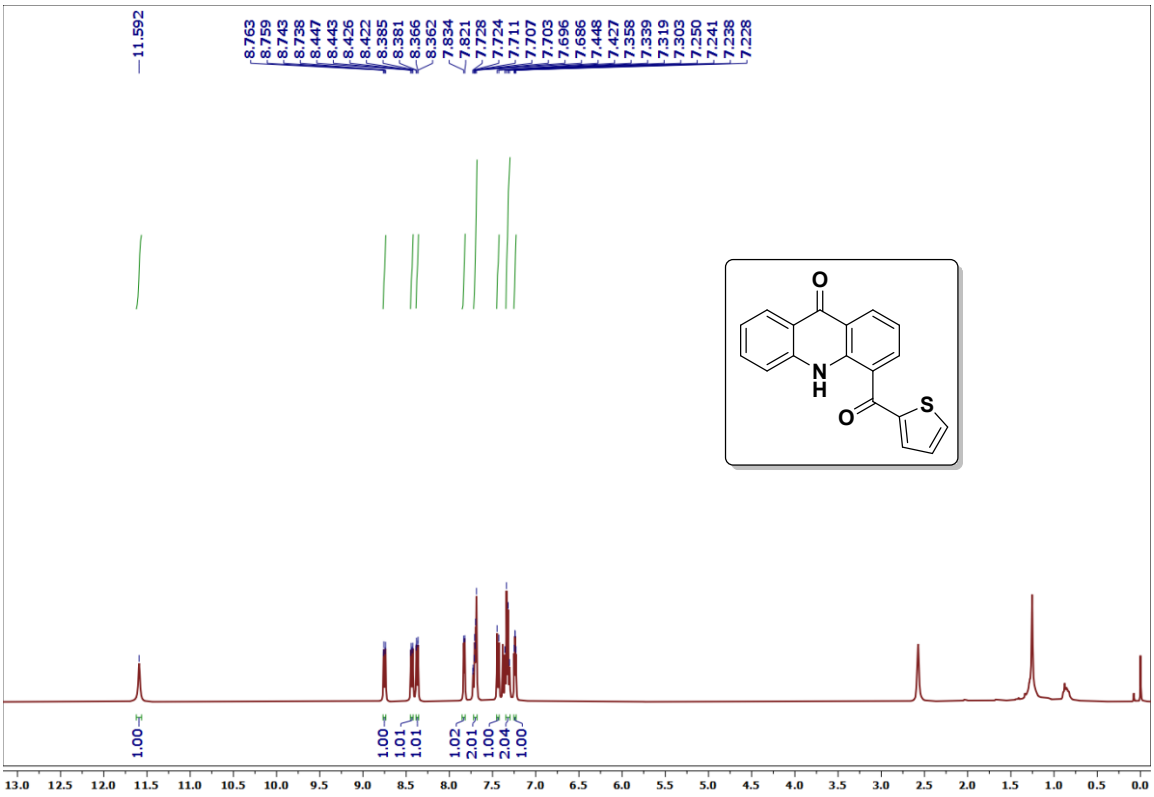


Figure-126. ^{1}H NMR (400 MHz, $CDCl_3$ and DMSO-d_6 mix) spectrum of compound **7l**

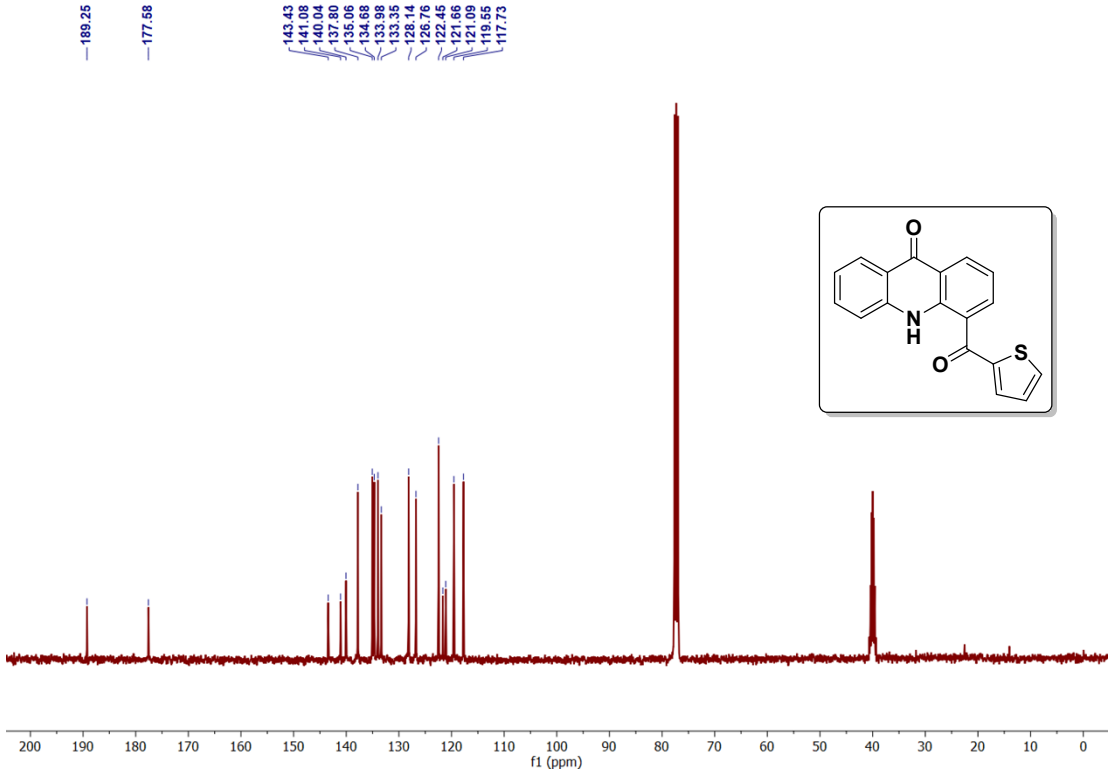


Figure-127. $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$ and DMSO-d_6 mix) spectrum of compound **7l**

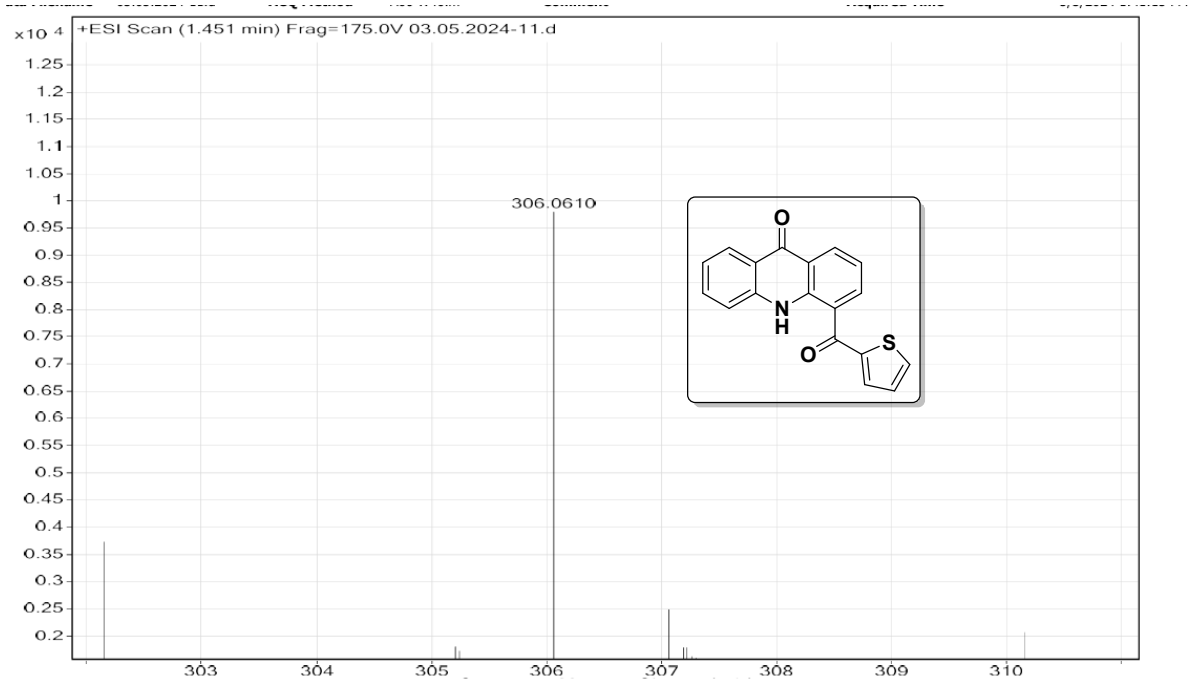


Figure-128. HR-MS(ESI^{+}) spectrum of compound **7l**