Supporting information

For

Oxidative annulation of L-phenylalanine using I_2/DMSO: An easy approach for chemoselective syntheses of 2,3,5-trisubstituted pyridines and 2,5-disubstituted oxazoles

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1.1 (3,5-diphenylpyridin-2-yl)(9H-fluoren-2-yl)methanone (3ae)

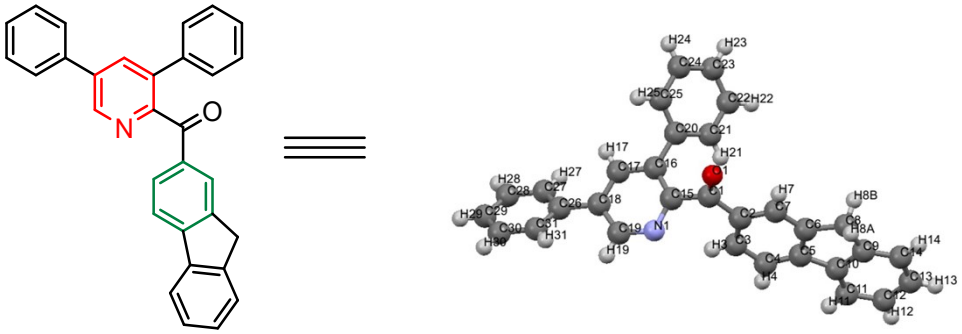


Figure 1: X-ray crystal structure of compound **3ae**

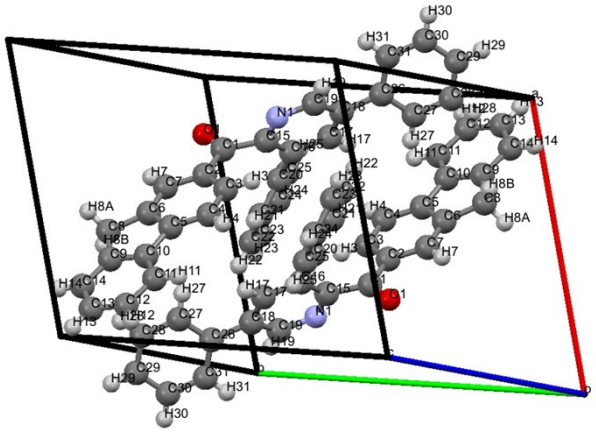


Figure 2: Crystal packing of compound **3ae** along b-axis

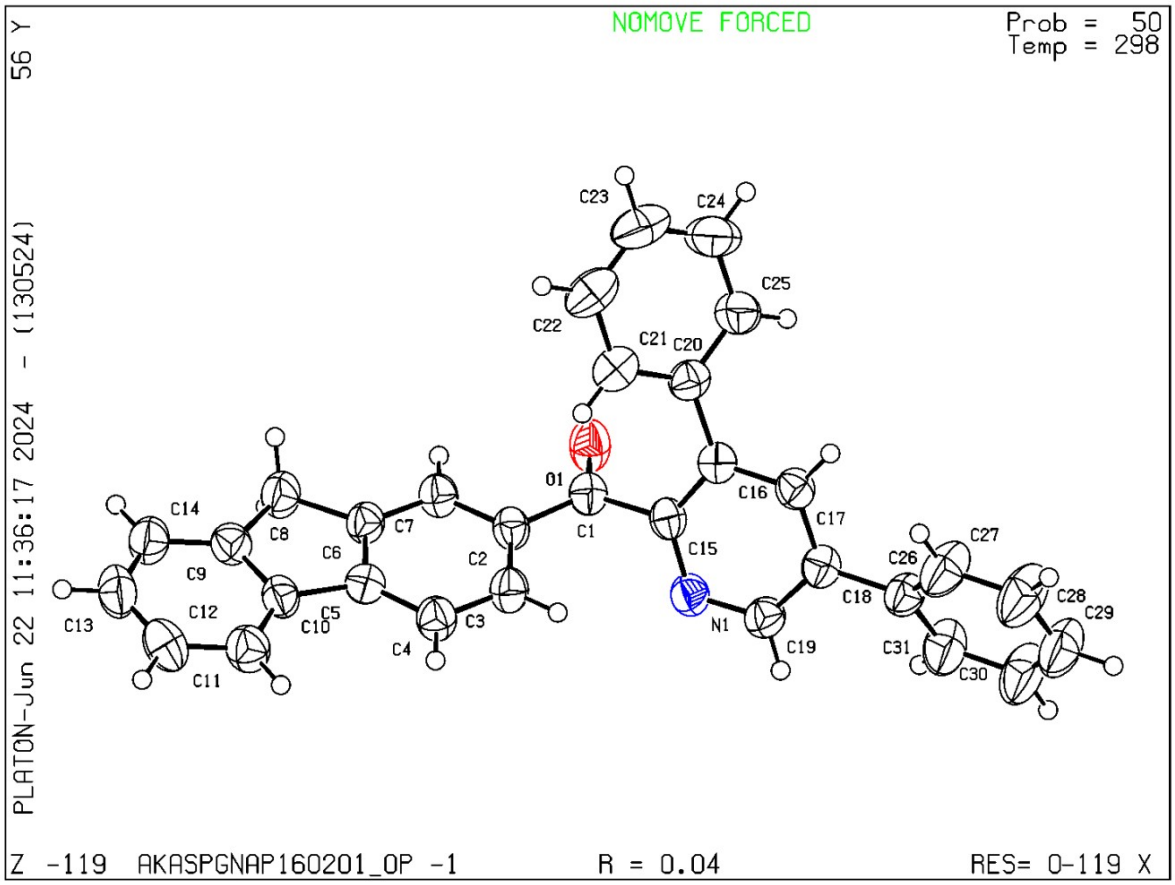


Figure 3: The molecular structure of **3ae** (Displacement ellipsoid are drawn at the 50% probability level)

Table 1. Crystal Data and structure refinement for compound **3ae**

CCDC No.	**2349633**
Identification code	AKASPGNAP160201_0m_a
Empirical formula	$C_{31}H_{21}NO$
Formula weight	423.49
Temperature/K	298(2)
Crystal system	triclinic
Space group	P-1
a/Å	10.5417(11)
b/Å	11.2513(12)
c/Å	11.7206(13)
α/°	63.057(3)
β/°	66.650(3)
γ/°	78.851(3)
Volume/Å^3	1137.6(2)
Z	2

ρ_{calc}g/cm^3	1.236
μ/mm^{-1}	0.074
F(000)	444.0
Crystal size/mm^3	0.21 × 0.18 × 0.16
Radiation	MoKα (λ = 0.71073)
2Θ range for data collection/°	4.21 to 49.992
Index ranges	-12 ≤ h ≤ 12, -13 ≤ k ≤ 13, -13 ≤ l ≤ 13
Reflections collected	26455
Independent reflections	3964 [R_{int} = 0.0218, R_{sigma} = 0.0140]
Data/restraints/parameters	3964/0/298
Goodness-of-fit on F^2	1.020
Final R indexes [I>=2σ (I)]	R_1 = 0.0448, wR_2 = 0.1387
Final R indexes [all data]	R_1 = 0.0523, wR_2 = 0.1552
Largest diff. peak/hole / e Å^{-3}	0.28/-0.18

1.2 (3, 5-diphenylpyridin-2-yl)(furan-2-yl)methanone (3an)

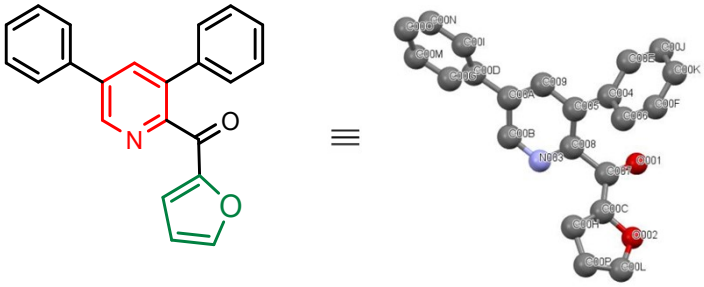


Figure 4: X-ray crystal structure of compound **3an**

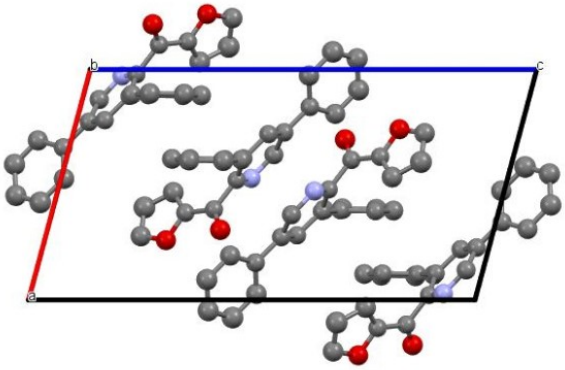


Figure 5: Crystal packing of compound **3an** along b-axis

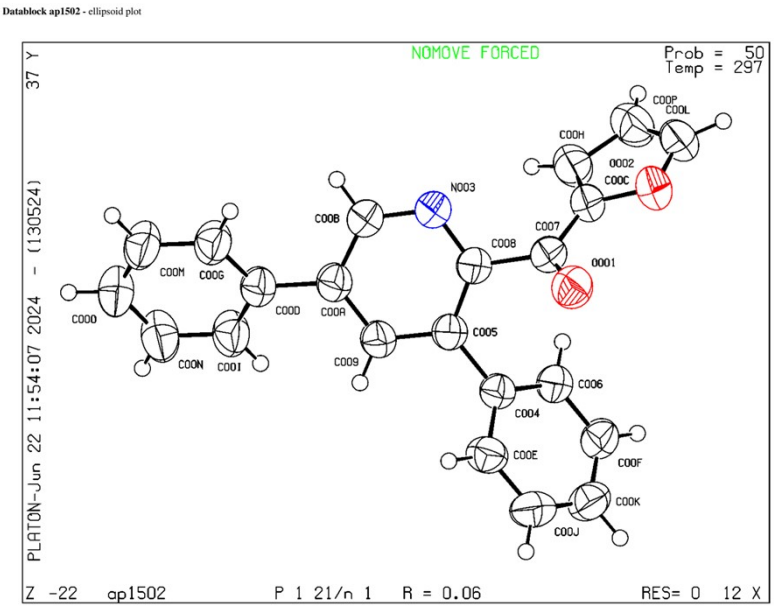


Figure 6: The molecular structure of **3an** (Displacement ellipsoid are drawn at the 50% probability level)

Table 2. Crystal Data and structure refinement for compound **3an**

CCDC No.	**2271607**
Identification code	AP1502
Empirical formula	$C_{22}H_{15}NO_2$
Formula weight	325.35
Temperature/K	297.15
Crystal system	monoclinic
Space group	$P2_1/n$
a/Å	9.5905(13)
b/Å	9.8247(13)
c/Å	17.961(2)
α/°	90
β/°	105.033(5)
γ/°	90
Volume/Å^3	1634.4(4)
Z	4
ρ_{calc}g/cm^3	1.322
μ/mm^{-1}	0.678
F(000)	680.0
Crystal size/mm^3	0.271 × 0.266 × 0.094
Radiation	CuKα (λ = 1.54178)
2Θ range for data collection/°	9.588 to 144.614
Index ranges	$-11 \le h \le 11$, $-12 \le k \le 12$, $-22 \le l \le 22$

Reflections collected	25224
Independent reflections	3215 [R_{int} = 0.0983, R_{sigma} = 0.0662]
Data/restraints/parameters	3215/0/227
Goodness-of-fit on F^2	1.055
Final R indexes [I>=2σ (I)]	R_1 = 0.0598, wR_2 = 0.1772
Final R indexes [all data]	R_1 = 0.0898, wR_2 = 0.1913
Largest diff. peak/hole / e $Å^{-3}$	0.25/-0.20

1.3 (5-(3,4-dimethoxyphenyl)oxazol-2-yl)(phenyl)methanone (4ac)

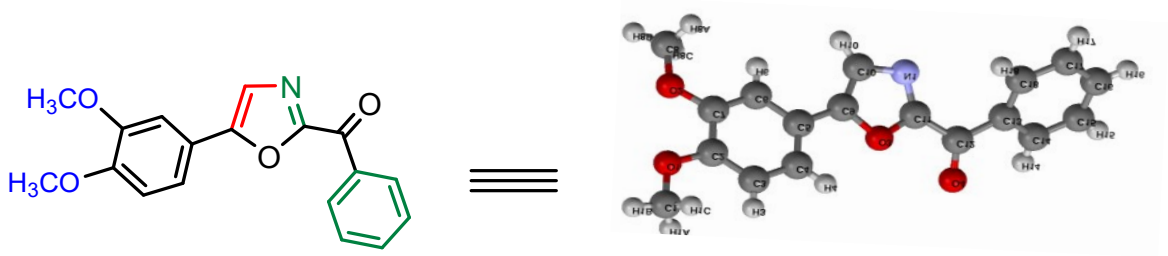


Figure 7: X-ray crystal structure of compound **4ac**

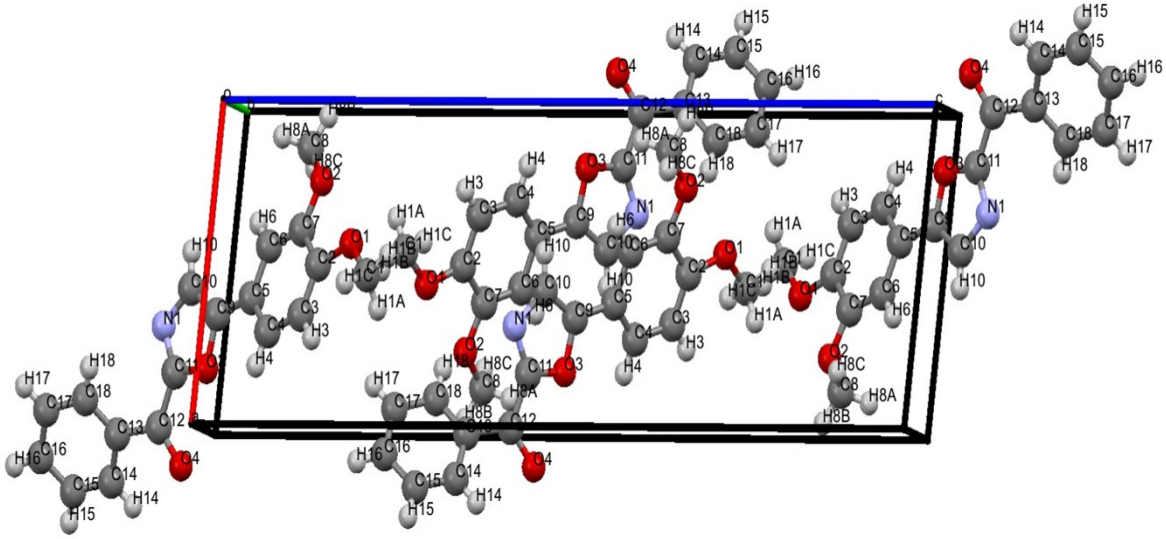


Figure 8: Crystal packing of compound **4ac** along b-axis

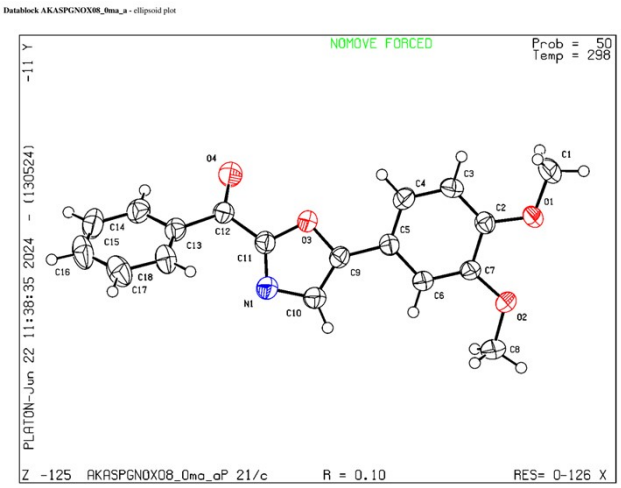
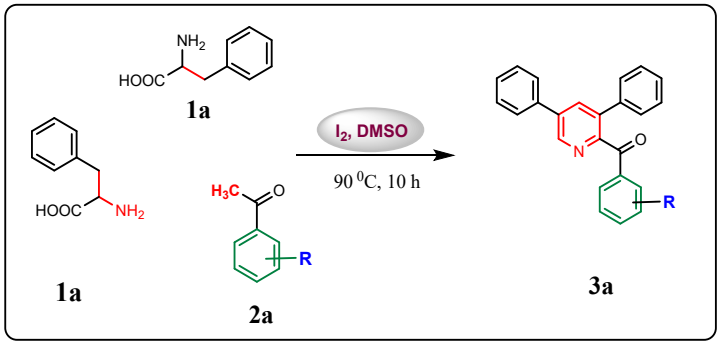


Figure 9: The molecular structure of **4ac** (Displacement ellipsoid are drawn at the 50% probability level)

Table 3. Crystal Data and structure refinement for compound **4ac**

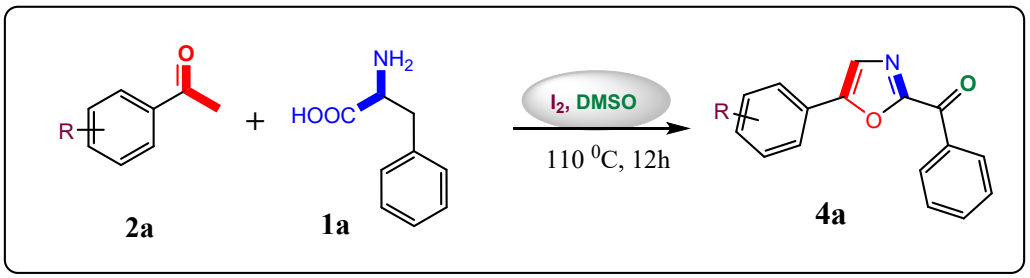
CCDC No.	**2349642**
Identification code	AKASPGNOX08_0ma_a
Empirical formula	$C_{18}H_{15}NO_4$
Formula weight	309.31
Temperature/K	298(2)
Crystal system	monoclinic
Space group	$P2_1/c$
a/Å	8.048(2)
b/Å	8.244(2)
c/Å	23.019(7)
α/°	90
β/°	96.925(7)
γ/°	90
Volume/Å^3	1516.2(7)
Z	4
ρ_{calc}g/cm^3	1.355
μ/mm^{-1}	0.097
F(000)	648.0
Crystal size/mm^3	0.22 × 0.18 × 0.15
Radiation	MoKα (λ = 0.71073)
2Θ range for data collection/°	5.098 to 49.996
Index ranges	$-9 \le h \le 9$, $-9 \le k \le 9$, $-27 \le l \le 27$
Reflections collected	31025
Independent reflections	2644 [R_{int} = 0.0422, R_{sigma} = 0.0191]
Data/restraints/parameters	2644/0/210
Goodness-of-fit on F^2	1.132
Final R indexes [I>=2σ (I)]	R_1 = 0.0996, wR_2 = 0.2551
Final R indexes [all data]	R_1 = 0.1037, wR_2 = 0.2573
Largest diff. peak/hole / e Å^{-3}	0.50/-0.31

2. Experimental procedure for the synthesis of 2, 3, 5-trisubstituted pyridine derivatives:



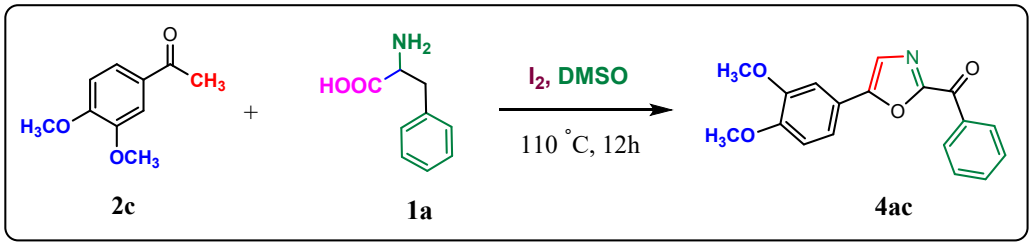
A well-dried round-bottomed flask was suspended with substituted acetophenone (**2a**, 1.0 mmol), Iodine (1.0 mmol) and DMSO (10 mL) heated at 90 °C for 3h. Then L-Phenylalanine (**1a**, 2.0 mmol) was added and continued the heating at the same temperature for 7h. The reaction completion was confirmed by TLC followed by the reaction mixture was quenched with saturated sodium thiosulfate solution and extracted the reaction mixture twice by using ethyl acetate. After the solvent evaporation by using a rotary evaporator, the obtained crude product was purified by column chromatography by using silica gel (60-120 mesh size) (eluting solvent hexane: ethyl acetate; 10:2).

Experimental procedure for the synthesis of 2,5-disubstituted oxazole derivatives



To a clean and dried round-bottomed flask was charged with substituted acetophenone (**2a**, 1.0 mmol), Iodine (1.2 mmol) and DMSO heated at 110 °C for 3h. Then L-Phenylalanine (**1a**, 1.0 mmol) was added and continued the heating at 110 °C for 9h. The reaction completion was confirmed by TLC followed by the reaction mixture was quenched with water and extracted twice by using ethyl acetate. After the solvent evaporation using a rotary evaporator, the obtained crude product was purified by column chromatography using silica gel (60-120 mesh size) (eluting solvent hexane: ethyl acetate; 10:1).

3. Table 4. **Optimization of Reaction Conditions for synthesis of 2,5-disubstituted oxazoles**



2c 1a 4ac

Sl No	Iodine Source (equiv)	Additives (equiv)	1a:2f (equiv)	Temp in °C	% yield (4f)
1	-	-	1:1	110(10h)	-
2	I_2 (0.5)	-	1:1	110(10h)	48
3	PIDA(1.0)	-	1:1	110(10h)	-
4	KI (1.0)	-	1:1	110(10h)	-
5	KI(1.0)+$K_2S_2O_8$(2.0)	-	1:1	110(10h)	-
6	NH_4I (1.0)	-	1:1	110(10h)	>30
7	TBAI (1.0)	-	1:1	110(10h)	-
8	I_2 (1.0)	-	1:1	110 (10h)	78
9	I_2 (1.2)	-	1:1	110 (10h)	80
10	I_2 (1.5)	-	1:1	110 (10h)	63
11	I_2 (1.2)	AcOH(0.5)	1:1	110 (10h)	35
12	I_2 (1.2)	TFA (0.5)	1:1	110 (10h)	41
13	I_2 (1.2)	Sulfanilic acid (0.5)	1:1	110 (10h)	38
14	I_2 (1.2)	-	1:1	110 (12h)	90
15	I_2 (1.2)	-	1:1	110 (14h)	73
16	I_2 (1.2)	-	1:1	90 (12h)	53
17	I_2 (1.2)	-	1:1	140 (12h)	38
18	I_2 (1.2)	-	Only 1a	110(12h)	63 (5a)
19	I_2 (1.2)	-	1.5:1	110(12h)	43

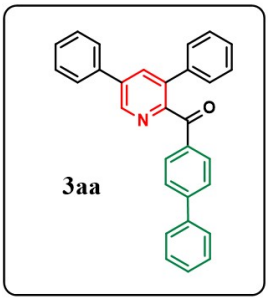
[a]Reaction conditions: 1a (1.0 mmol), 2a (1.0 mol), I_2 (1.2 equiv) in DMSO (10 mL) were added to the flask and heated for 12 h at 110°C. AcOH= Acetic acid, TFA= trifluoroacetic acid

We started the reaction of 3,4-dimethoxy acetophenone(2c)(1.0 equiv) and L-phenylalanine (1a)(1.0 equiv)in DMSO (10mL)without an iodine source, and we couldn't achieve the desired product 4ac(Table 4, entry 1). But we got a good amount of 4ac in the presence of iodine (0.5 equiv) in DMSO(10mL) (Table 4, entry 2). It confirms the essential role of the iodine/DMSO in this strategy. Other iodine sources like PIDA, KI, KI+$K_2S_2O_8$, NH_4I, and TBAI were failed to produce 4ac (Table 4, entries 3-7). By varying the iodine loading, we found that 1.2 equiv was sufficient for the conversion (Table 4 entries 8-10). Acid additives like AcOH, TFA, and sulfanilic acid did not help to increase the yield (Table 4, entries 11-13). Reaction time increased to 12h led to an increase in the

yield of up to 90%(Table 4, entry 14). But further increase of temperature to 14h led to decrease in the yield(Table 4, entry 15). Reaction temperature screening revealed that 110 °C is good for better yield (Table 4, entries 14,16,17). Further increase in temperature led to unwanted products, which could be due to the recycling of iodine by coproduct HI and DMSO. Reaction without the addition of acetophenone produced 3,5-disubstituted pyridine(5a,63%) might be due to homoconstruction of phenylalanine (Table-4, entry 18). Increasing the amount of phenylalanine up to 1.5 equiv produced 4ac with less yield(43%) than 1.0 equiv (Table-4, entry 18). The optimised conditions involve 1a(1.0 equiv), 2c(1.0 equiv), I_2(1.2 equiv) and DMSO (10mL), heated at 110 °C for 12h (Table-4, entry 14).

5(a) <u>Spectral data of 2,3,5-trisubstituted pyridine derivatives</u>

i) [1,1'-biphenyl]-4-yl(3,5-diphenylpyridin-2-yl)methanone (3aa)

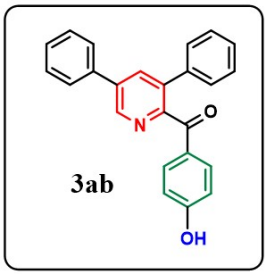


Yield: 365 mg, 89%; Colourless solid; m.p =132-136 °C;

^{1}H-NMR (400 MHz, DMSO-d_6) δ 9.02 (d, *J* = 2.1 Hz, 1H), 8.28 (d, *J* = 2.1 Hz, 1H), 7.95-7.91 (m, 4H), 7.83 (d, *J* = 8.6 Hz, 2H), 7.77-7.75 (m, 2H), 7.59-7.36 (m, 11H); **^{13}C-NMR** (101 MHz, DMSO-d_6) δ 194.1, 153.4, 145.4, 145.1, 138.7, 137.2, 136.7, 136.1, 134.8, 130.7, 130.1, 129.2, 129.1, 128.8, 128.6, 128.5, 128.1, 127.4, 127.1, 127.0, 126.6; **FT-IR** (KBr cm^{-1}): 3110 (=C-H), 1666 (C=O), 1633 (C=N), 1554 (C=C);

HRMS (ESI) Calcd for $C_{30}H_{21}NO$ $[M+H]^+$, 412.1696; found, 412.1537.

ii) **(3,5-diphenylpyridin-2-yl)(4-hydroxyphenyl)methanone(3ab)**



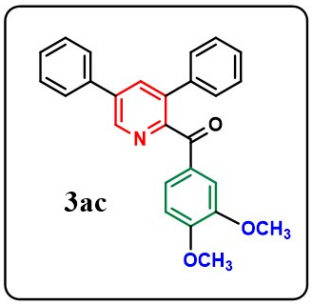
Yield: 270 mg, 77%; Colourless solid; m.p =128-132 °C;

^{1}H-NMR (400 MHz, DMSO-d_6) δ 10.60 (s, 1H), 9.00 (d, *J* = 2.1 Hz, 1H), 8.25 (d, *J* = 2.0 Hz, 1H), 7.95 (d, *J* = 5.5 Hz, 2H), 7.70 (d, *J* = 8.7 Hz, 2H), 7.62-7.53 (m, 3H), 7.47-7.37 (m, 5H), 6.89 (d, *J* = 8.9 Hz, 2H);

^{13}C-NMR (101 MHz, DMSO-d_6) δ 193.1, 162.7, 154.2, 145.4, 137.3, 136.3, 135.9, 135.5, 132.6, 129.2, 128.7, 128.6, 128.0, 127.6, 127.3, 115.5; **FT-IR** (KBr cm^{-1}): 3379 (O-H), 3070 (=C-H), 1697 (C=O), 1608 (C=N), 1550 (C=C),1253 (C-O);

HRMS (ESI) Calcd for $C_{24}H_{17}NO_2$ $[M+H]^+$, 352.1332; found, 352.1335.

iii) **(3,4-dimethoxyphenyl)(3,5-diphenylpyridin-2-yl)methanone (3ac)**



Yield: 359 mg, 91%; Colourless solid; m.p =138-140 °C;

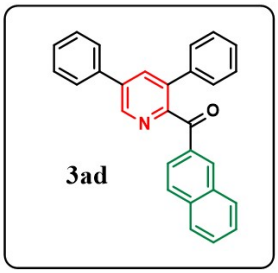
^{1}H-NMR (400 MHz, DMSO-d_6) δ 8.98 (s, 1H), 8.23 (s, 1H), 7.92 (d, *J* = 7.5 Hz, 2H), 7.58-7.30 (m, 10H), 7.03 (d, *J* = 8.4 Hz, 1H), 3.84 (s, 3H), 3.78 (s, 3H);**^{13}C NMR** (100 MHz, DMSO-d_6) δ 193.2, 153.8,

153.6, 148.7, 145.2, 136.2, 136.1, 135.8, 129.1, 128.8, 128.6, 128.5, 127.9, 127.2, 126.1, 110.8, 55.7, 55.4; **FT-IR** (KBr, cm-1): 3062(=C-H), 1639(C=O), 1552(C=N), 1502(C=C), 1245(C-O); HRMS (ESI) Calcd for $C_{26}H_{21}NO_3$ $[M+H]^+$, 396.1594; found,396.1535.

iv) **(3,5-diphenylpyridin-2-yl)(naphthalen-2-yl)methanone (3ad)**

Yield: 319 mg, 83%; Colourless solid; m.p =172-174 °C;

^{1}H-NMR (400 MHz, DMSO-d_6) δ 9.07 (d, *J* = 2.1 Hz, 1H), 8.45 (s, 1H), 8.32 (d, *J* = 2.0 Hz, 1H), 8.12-7.93 (m, 6H), 7.73-7.68 (m, 1H), 7.64-7.58 (m, 3H), 7.54-7.48 (m, 3H), 7.38-7.32 (m, 3H);



^{13}C-NMR (101 MHz, DMSO-d_6) δ 194.5, 153.4, 145.4, 137.1, 136.5, 136.0, 136.0, 135.9, 135.1, 133.2, 132.7, 131.8, 129.7, 129.1, 129.0, 128.6, 128.5, 128.4, 127.9, 127.6, 127.2, 126.9, 124.2 ;

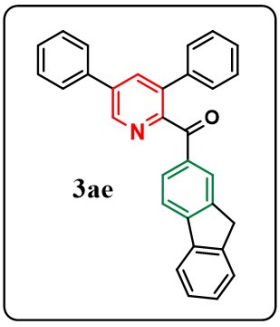
FT-IR (KBr cm^{-1}): 3136 (=C-H), 1701 (C=O), 1625 (C=N), 1562 (C=C), 1211 (C-O);

HRMS (ESI): Calcd for $C_{28}H_{19}NO$ $[M+H]^+$, 386.1540; found, 386.1551.

v) **(3,5-diphenylpyridin-2-yl)(9H-fluoren-2-yl)methanone (3ae)**

Yield: 376 mg, 89%; Colourless solid; m.p=186-188 °C;

^{1}H NMR (400 MHz, DMSO-d_6) δ 9.04 (d, *J* = 2.1 Hz, 1H), 8.29 (d, *J* = 2.1 Hz, 1H), 8.05-7.86 (m, 7H), 7.69-7.36 (m, 10H), 4.01 (s, 2H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 194.7, 154.1, 146.6, 145.6, 144.8, 143.4, 139.9, 137.4, 136.7, 136.3, 136.2, 134.6, 129.6, 129.5, 128.9, 128.8, 128.6, 128.3, 127.5, 127.3, 126.8, 125.6, 121.5, 120.2, 36.6;



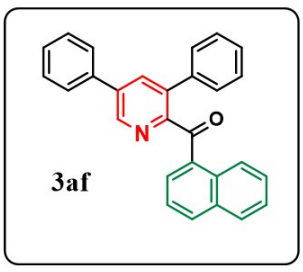
FT-IR (KBr cm^{-1}): 3110 (=C-H), 2952 (C-H), 1701 (C=O), 1658 (C=N), 1544 (C=C), 1357(-CH_2 bending), 1238 (C-O);

HRMS (ESI) Calcd for $C_{31}H_{21}NO$ $[M+H]^+$, 424.1696; found, 424.1641.

vi) **(3,5-diphenylpyridin-2-yl)(naphthalen-1-yl)methanone (3af)**

Yield: 304 mg, 79%; Colourless solid; mp =136-140 °C;

^{1}H NMR (400 MHz, DMSO-d_6) δ 8.95 (d, *J* = 2.0 Hz, 1H), 8.67 (d, *J* = 8.1 Hz, 1H), 8.23 (d, *J* = 2.1 Hz, 1H), 8.15 (d, *J* = 8.1 Hz, 1H), 8.01 (d, *J* = 7.9 Hz, 1H), 7.90 (d, *J* = 7.2 Hz, 2H), 7.75 (d, *J* = 7.2 Hz, 1H), 7.66-7.43 (m, 9H), 7.31-7.22 (m, 2H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 196.9, 154.6, 145.7, 137.5, 137.0, 136.6, 136.4, 136.2, 134.0, 133.3, 132.9, 130.5, 129.4, 129.0, 128.8, 128.7, 128.1, 127.5, 126.8, 125.3, 124.8;

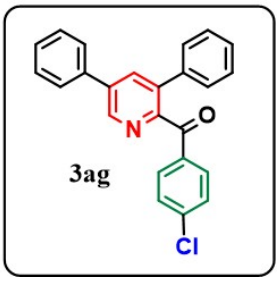


FT-IR (KBr cm^{-1}): 3120 (=C-H), 1712 (C=O), 1562 (C=N), 1485 (C=C), 1184 (C-O);

HRMS (ESI) Calcd for $C_{28}H_{19}NO$ $[M+H]^+$, 386.1540; found, 386.1542.

vii) **(4-chlorophenyl)(3,5-diphenylpyridin-2-yl)methanone (3ag)**

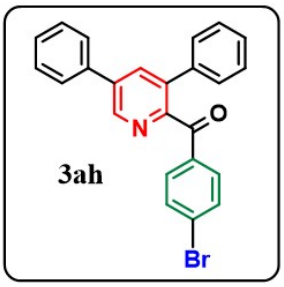
Yield: 236 mg, 64%; Colourless solid; mp =168-172 °C;



^{1}H NMR (400 MHz, DMSO-d_6) δ 8.97 (d, *J* = 2.1 Hz, 1H), 8.23 (d, *J* = 2.1 Hz, 1H), 7.89 (d, *J* = 7.2 Hz, 2H), 7.81 (d, *J* = 8.6 Hz, 2H), 7.57-7.32 (m, 10H);**^{13}C NMR** (101 MHz, DMSO-d_6) δ 193.6, 152.9, 145.6, 138.9, 137.1, 136.9, 136.4, 136.2, 136.1, 134.7, 131.9, 129.3, 129.0, 128.9, 128.8, 128.7, 128.2, 127.4; **FT-IR** (KBr, cm^{-1}): 3035(=C-H), 1668(C=O), 1589(C=N), 1421(C=C), 1299(C-O), 829(C-H out of plane bending), 717(C-Cl);
HRMS (ESI) Calcd for $C_{24}H_{16}ClNO$ $[M+H]^+$, 370.0993; found, 370.099.

viii) **(4-bromophenyl)(3,5-diphenylpyridin-2-yl)methanone (3ah)**

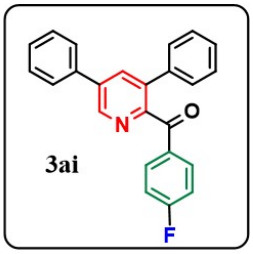
Yield: 289 mg, 70%; Colourless solid; mp =164-168 °C



^{1}H NMR (400 MHz, DMSO-d_6) δ 8.94 (d, *J* = 2.0 Hz, 1H), 8.19 (d, *J* = 2.1 Hz, 1H), 7.85 (d, *J* = 7.3 Hz, 2H), 7.69 (dd, *J* = 17.9, 8.6 Hz, 4H), 7.52-7.31 (m, 8H);**^{13}C NMR** (101 MHz, DMSO-d_6) δ 193.8, 152.9, 145.6, 137.2, 137.0, 136.5, 136.2, 136.1, 135.1, 132.0, 129.4, 128.8, 128.8, 128.3, 127.4; **FT-IR** (KBr, cm^{-1}): 3124(=C-H), 1645(C=O), 1573(C=N), 1490(C=C), 1157(C-O), 808(C-H out of plane bending), 673(C-Br);
HRMS (ESI) Calcd for $C_{24}H_{16}BrNO$ $[M+H]^+$, 414.0488; found, 414.0495.

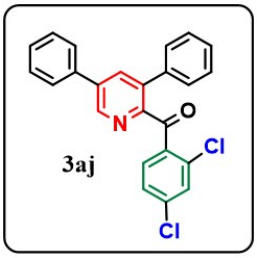
ix) **(3,5-diphenylpyridin-2-yl)(4-fluorophenyl)methanone(3ai)**

Yield: 215 mg, 61%; Colourless solid; mp =112-116 °C;



^{1}H NMR (400 MHz, DMSO-d_6) δ 8.98 (d, *J* = 2.1 Hz, 1H), 8.23 (d, *J* = 2.1 Hz, 1H), 7.91-7.87 (m, 4H), 7.56-7.30 (m, 10H);**^{13}C NMR** (101 MHz, DMSO-d_6) δ 193.2, 166.6, 164.1, 153.1, 145.5, 137.2, 136.8, 136.3, 136.2, 136.1, 133.1, 133.0, 132.8, 129.3, 129.2, 128.8, 128.7, 128.2, 127.4, 116.1, 115.9; **FT-IR** (KBr, cm^{-1}): 3095(=C-H), 1664(C=O), 1575(C=N), 1506(C=C), 1255 (C-F), 1236 (C-O);
HRMS (ESI) Calcd for $C_{24}H_{16}FNO$ $[M+H]^+$, 354.1289; found, 354.1299.

x**) (2,4-dichlorophenyl)(3,5-diphenylpyridin-2-yl)methanone (3aj)** Yield: 242 mg, 60%; Colourless solid; mp =156-158 °C;



^{1}H NMR (400 MHz, DMSO-d_6) δ 8.95 (d, *J* = 2.0 Hz, 1H), 8.18 (d, *J* = 1.8

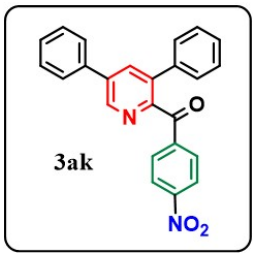
Hz, 1H), 7.87 (d, *J* = 7.2 Hz, 2H), 7.65-7.61 (m, 2H), 7.51-7.35 (m, 9H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 193.1, 151.4, 145.6, 137.7, 137.6, 137.4, 136.9, 136.8, 136.5, 135.7, 132.7, 132.7, 129.8, 129.3, 129.0, 128.9, 128.5, 128.0, 127.6, 127.4;**FT-IR** (KBr, cm^{-1}): 3058(=C-H), 1691(C=O), 1604(C=N), 1458(C=C), 1191(C-O), 754, 725(C-Cl);

HRMS (ESI) Calcd for $C_{24}H_{15}Cl_2NO$ $[M+H]^+$, 404.0604; found, 404.0610.

xi) **(3,5-diphenylpyridin-2-yl)(4-nitrophenyl)methanone (3ak)**

Yield: 258 mg, 68%; Colourless solid; mp= 156-158 °C;

^{1}H NMR (400 MHz, DMSO- d_6) δ 9.02 (d, *J* = 2.1 Hz, 1H), 8.28 (d, *J* = 2.1 Hz, 1H), 7.92 (d, *J* = 8.6 Hz, 2H), 7.83 (d, *J* = 8.6 Hz, 2H), 7.75 (d, *J* = 5.3 Hz, 1H), 7.60-7.36 (m, 9H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 193.2, 152.0, 150.0, 146.5, 145.5, 140.8, 137.3, 137.0, 136.4, 135.9, 131.3, 129.3, 128.8, 128.7, 128.2, 127.4, 127.2, 123.8; **FT-IR** (KBr, cm^{-1}): 3141(=C-H), 1691(C=O), 1627(C=N),1568 (asymmetric NO_2), 1471(C=C), 1301(symmetric NO_2),1238(C-O);

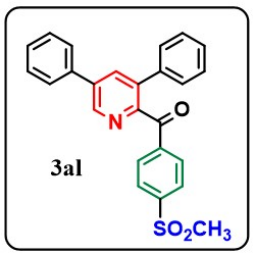


HRMS (ESI) Calcd for $C_{24}H_{16}N_2O_3$ $[M+H]^+$, 381.1254; found, 381.1252.

xii) **(3,5-diphenylpyridin-2-yl)(4-(methylsulfonyl)phenyl)methanone (3al)**

Yield: 293 mg, 71%; Colourless solid; mp =138-140 °C;

^{1}H NMR (400 MHz, DMSO-d_6) δ 9.04 (d, *J* = 2.0 Hz, 1H), 8.33 (d, *J* = 2.1 Hz, 1H), 8.12 (s, 2H), 7.97 (d, *J* = 7.0 Hz, 2H), 7.62-7.38 (m, 10H), 3.34 (s, 3H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 193.7, 152.3, 145.5, 144.6, 139.9, 137.2, 137.1, 137.0, 136.4, 135.9, 130.9, 129.3, 128.9, 128.9, 128.7, 128.2, 127.4, 127.4, 43.2; **FT-IR** (KBr, cm^{-1}): 3110(=C-H), 2923(-C-H), 1683(C=O), 1558(C=N), 1417(C=C), 1342 (asymmetric SO_2), 1253(C-O), 1193(symmetric SO_2);

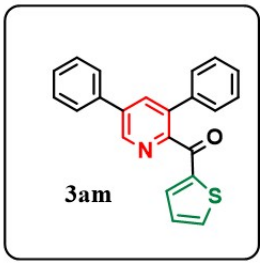


HRMS (ESI) Calcd for $C_{25}H_{19}NO_3S$ $[M+H]^+$, 414.1159; found, 414.1161.

xiii) **(3,5-diphenylpyridin-2-yl)(thiophen-2-yl)methanone (3am)**

Yield: 232 mg, 68%; Colourless solid; mp =128-130 °C;

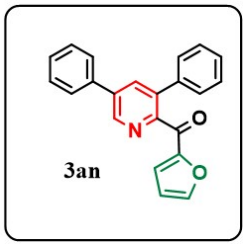
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.88 (d, *J* = 2.1 Hz, 1H), 7.98 (d, *J* = 2.1 Hz, 1H), 7.72 (dd, *J* = 3.8, 1.2 Hz, 1H), 7.69-7.66 (m, 3H), 7.53-7.42 (m, 3H), 7.38-7.32 (m, 5H), 7.10 (dd, *J* = 4.9, 3.8 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 186.4, 152.7, 145.6, 143.0, 137.9, 137.8, 137.4, 136.9, 136.7, 135.9, 135.4, 129.3, 128.8, 128.7, 128.6, 128.1, 128.1,



127.3; **FT-IR** (KBr, cm^{-1}): 3147(=C-H), 1627(C=O), 1587(C=N), 1483(C=C), 1259(C-O), 823(C-S); HRMS (ESI) Calcd for $C_{22}H_{15}NOS$ $[M+H]^+$, 342.0947; found, 342.0952.

xiv) **(3,5-diphenylpyridin-2-yl)(furan-2-yl)methanone (3an)**

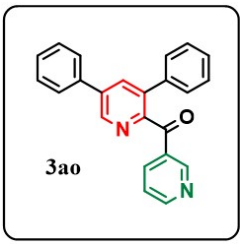
Yield: 201 mg, 62 %; Colourless solid; m.p =110-112 °C;



^{1}H-NMR (400 MHz, DMSO-d_6) δ 9.00 (d, *J* = 2.0 Hz, 1H), 8.22 (d, *J* = 2.0 Hz, 1H), 8.06 (d, *J* = 0.9 Hz, 1H), 7.92 (d, *J* = 7.2 Hz, 2H), 7.60-7.52 (m, 3H), 7.44 (d, *J* = 3.4 Hz, 5H), 7.32 (d, *J* = 3.5 Hz, 1H), 6.75 (q, *J* = 1.7 Hz, 1H);**^{13}C-NMR** (101 MHz, DMSO-d_6) δ 181.9, 152.4, 151.7, 149.3, 145.7, 137.3, 137.2, 136.4, 136.3, 136.2, 129.5, 129.0, 128.8, 128.3, 127.5, 123.0, 113.2; **FT-IR** (KBr, cm^{-1}): 3186(=C-H), 1668(C=O), 1625(C=N), 1404(C=C), 1217(C-O); HRMS (ESI) Calcd for $C_{22}H_{15}NO_2$ $[M+H]^+$, 326.1176; found, 326.1166.

xv)**(3,5-diphenylpyridin-2-yl)(pyridin-3-yl)methanone (3ao)**

Yield: 174 mg, 52%; Colourless solid; mp =132-134 °C;

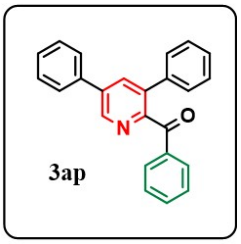


^{1}H NMR (400 MHz, DMSO-d_6) δ 8.89 (s, 1H), 8.83 (s, 1H), 8.67 (d, *J* = 3.8 Hz, 1H), 8.13 (d, *J* = 9.0 Hz, 1H), 7.80 (d, *J* = 7.3 Hz, 2H), 7.49-7.22 (m, 10H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 193.7, 153.7, 150.9, 146.2, 145.6, 137.3, 137.2, 136.9, 136.4, 134.1, 132.5, 130.5, 129.3, 128.9, 128.7, 128.6, 128.2, 127.5, 123.9; **FT-IR** (KBr, cm^{-1}): 3097, 3035(=C-H), 1704(C=O), 1558(C=N), 1469(C=C), 1369(C-N), 1261(C-O);

HRMS (ESI) Calcd for $C_{23}H_{16}N_2O$ $[M+H]^+$, 337.1336; found, 337.1344.

xvi) **(3,5-diphenylpyridin-2-yl)(phenyl)methanone (3ap)**[1]

Yield: 214 mg, 64%; Colourless solid; mp =124-126 °C;

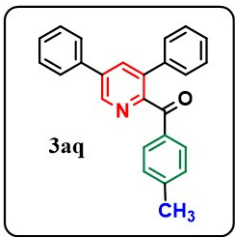


^{1}H NMR (400 MHz, DMSO-d_6) δ 8.98 (d, *J* = 2.1 Hz, 1H), 8.23 (d, *J* = 2.0 Hz, 1H), 7.90 (d, *J* = 7.2 Hz, 2H), 7.80 (d, *J* = 7.2 Hz, 2H), 7.65 (t, *J* = 7.4 Hz, 1H), 7.56-7.32 (m, 10H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 194.8, 153.5, 145.5, 137.2, 136.7, 136.2, 136.1, 136.1, 133.9, 130.0, 129.3, 129.2, 128.8, 128.7, 128.2, 127.4, 127.2; **FT-IR** (KBr, cm^{-1}): 3110(=C-H), 1689(C=O), 1591(C=N), 1494(C=C), 1244(C-O); HRMS (ESI) Calcd for $C_{24}H_{17}NO$ $[M+H]^+$, 336.1383; found, 336.1390.

xvii) **(3,5-diphenylpyridin-2-yl)(p-tolyl)methanone (3aq)**

Yield: 279 mg, 80%; Colourless solid; mp =160-164 °C ;

^{1}H NMR (400 MHz, DMSO-d_6) δ 8.95 (d, *J* = 2.1 Hz, 1H), 8.21 (d, *J* = 2.0 Hz, 1H), 7.89 (d, *J* = 7.2 Hz, 2H), 7.67 (d, *J* = 8.1 Hz, 2H), 7.55-7.52 (m, 2H), 7.48 (d, *J* = 7.3 Hz, 1H), 7.40-7.29 (m, 7H), 2.35 (s, 3H); **^{13}C NMR** (101 MHz, DMSO-d_6) 194.3, 153.7, 145.5, 144.5, 137.2, 136.5, 136.2, 136.0, 135.9, 133.5, 130.1, 129.4, 129.3, 128.7, 128.7, 128.1, 127.4, 21.3; **FT-IR** (KBr, cm^{-1}): 3164(=C-H), 2923(-C-H), 1662(C=O), 1604(C=N), 1469(C=C), 1298(C-O); HRMS (ESI) Calcd for $C_{25}H_{19}NO$ $[M+H]^+$, 350.1540; found, 350.1542.



δ

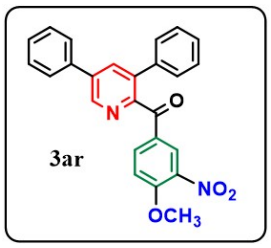
xviii) **(3,5-diphenylpyridin-2-yl)(4-methoxy-3-nitrophenyl)methanone(3ar)**

Yield: 291 mg, 71%; yellow solid; mp =176-180 °C ;

^{1}H-NMR (400 MHz, DMSO-d_6) δ 8.97 (d, *J* = 2.1 Hz, 1H), 8.29 (d, *J* = 2.1 Hz, 1H), 8.22 (d, *J* = 2.1 Hz, 1H), 8.09 (dd, *J* = 8.9, 2.3 Hz, 1H), 7.88 (d, *J* = 7.2 Hz, 1H), 7.57-7.34 (m, 10H), 3.99 (s, 3H);

^{13}C-NMR (101 MHz, DMSO-d_6) δ 191.8, 156.0, 152.5, 145.6, 139.1, 137.3, 137.2, 136.9, 136.5, 136.3, 136.1, 129.5, 129.1, 128.9, 128.9, 128.7, 128.4, 127.5, 127.1, 114.7, 57.6; **FT-IR** (KBr, cm^{-1}): 3035(=C-H), 2968(-C-H), 1668(C=O), 1589(C=N), 1548 (asymmetrc NO_2), 1421(C=C), 1299(symmetric NO_2), 1217(C-O);

MS (ESI) Calcd for $C_{25}H_{19}NO$ $[M+H]^+$, 411.134; found, 411.100.

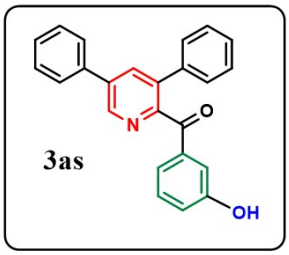


xix) **(3,5-diphenylpyridin-2-yl)(3-hydroxyphenyl)methanone(3as)**

Yield: 287 mg, 82%; yellow solid; mp =200-204 °C ;

^{1}H-NMR (400 MHz, DMSO-d_6) δ 9.88 (s, 1H), 8.95 (d, *J* = 2.1 Hz, 1H), 8.20 (d, *J* = 2.1 Hz, 1H), 7.88 (d, *J* = 7.2 Hz, 2H), 7.57-7.27 (m, 10H), 7.14 (d, *J* = 2.1 Hz, 1H);

^{13}C-NMR (101 MHz, DMSO-d_6) δ 194.8, 157.6, 145.5, 137.4, 137.2, 136.7, 136.2, 136.1, 135.9, 130.1, 129.4, 128.8, 128.8, 128.3, 127.5, 121.2, 116.0; **FT-IR** (KBr cm^{-1}): 3401 (O-H), 3053 (=C-H), 1668 (C=O), 1582 (C=N), 1493 (C=C), 1008 (C-O); MS (ESI) Calcd for $C_{24}H_{17}NO_2$ $[M+H]^+$, 352.1332; found, 352.15.

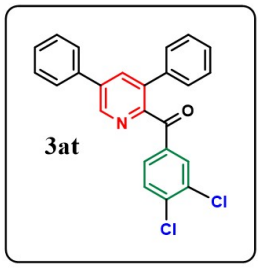


xx) **(3,4-dichlorophenyl)(3,5-diphenylpyridin-2-yl)methanone(3at)**

Yield: 315 mg, 78%; yellow solid; mp =172-176 °C ;

^{1}H-NMR (400 MHz, DMSO-d_6) δ 9.00 (d, *J* = 2.1 Hz, 1H), 8.25 (d, *J* 2.0 Hz, 1H), 7.97-7.94 (m, 2H), 7.71-7.37 (m, 11H);

^{13}C-NMR (101 MHz, DMSO-d_6) δ 193.7, 145.5, 144.6, 139.9, 137.2, 137.1, 137.0, 136.4, 135.9, 130.9, 129.3, 128.9, 128.9, 128.7, 128.2,



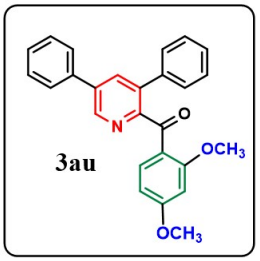
=

127.4, 127.4; **FT-IR** (KBr, cm^{-1}): 3213, 3001(=C-H), 1667(C=O), 1607(C=N), 1581(C=C), 1132(C-O), 851(C-Cl);

MS (ESI) Calcd for $C_{24}H_{15}Cl_2NO$ $[M+H]^+$, 404.0604; found, 404.10.

xxi) **(2,4-dimethoxyphenyl)(3,5-diphenylpyridin-2-yl)methanone (3au)**

Yield: 186 mg, 51%; yellow solid; mp =156-158 °C ;



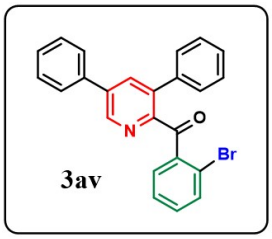
3au

^{1}H-NMR (400 MHz, DMSO-d_6) δ 8.98 (d, *J* = 2.1 Hz, 1H), 8.23 (d, *J* = 2.0 Hz, 1H), 7.90 (d, *J* = 7.2 Hz, 1H), 7.80 (d, *J* = 7.2 Hz, 2H), 7.66-7.33 (m, 8H), 6.82-6.80 (m, 2H), 3.92 (s, 3H), 3.80 (s, 3H); **^{13}C-NMR** (101 MHz, DMSO-d_6) δ 181.9, 166.4, 159.1, 145.7, 141.1, 140.3, 139.9, 137.3, 137.2, 136.4, 136.3, 136.2, 129.5, 129.0, 128.8, 128.3, 127.5, 108.2, 105.6, 98.4, 55.9, 55.3; **FT-IR** (KBr, cm^{-1}): 3062(=C-H), 2954(-C-H), 1678(C=O), 1571(C=N), 1610, 1444(C=C), 1239(C-O);

MS (ESI) Calcd for $C_{26}H_{21}NO_3$ $[M+H]^+$, 396.1594; found, 395.12.

xxii) **(2-bromophenyl)(3,5-diphenylpyridin-2-yl)methanone(3av)**

Yield: 231 mg, 56%; yellow solid; mp =126-130 °C ;



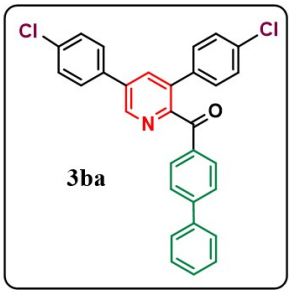
3av

^{1}H-NMR (400 MHz, DMSO-d_6) δ 8.95 (d, *J* = 2.0 Hz, 1H), 8.18 (d, *J* = 1.8 Hz, 1H), 7.87 (d, *J* = 7.2 Hz, 1H), 7.65-7.61 (m, 2H), 7.51-7.35 (m, 11H); **^{13}C-NMR** (101 MHz, DMSO-d_6) δ 193.6, 152.9, 145.6, 138.9, 137.1, 136.9, 136.4, 136.2, 136.1, 134.7, 131.9, 129.3, 129.0, 128.9, 128.8, 128.7, 128.2, 127.4, 121.6; **FT-IR** (KBr, cm^{-1}): 3093(=C-H), 1694(C=O), 1580(C=N), 1551(C=C), 1263(C-O), 575(C-Br), ;

MS (ESI) Calcd for $C_{24}H_{16}BrNO$ $[M+H]^+$, 414.0488; found, 414.10.

xxiii) **[1,1'-biphenyl]-4-yl(3,5-bis(4-chlorophenyl)pyridin-2-yl)methanone (3ba)**

Yield: 232 mg, 83%; Colourless solid; mp =188-192 °C



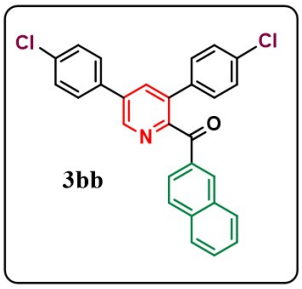
3ba

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.79 (d, *J* = 2.1 Hz, 1H), 7.88-7.86 (m, 3H), 7.58 (d, *J* = 8.3 Hz, 2H), 7.53 (d, *J* = 8.4 Hz, 4H), 7.43-7.17 (m, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 194.1, 153.9, 146.4, 145.8, 139.8, 136.5, 136.2, 135.9, 135.2, 135.1, 134.9, 134.6, 131.0, 130.0, 129.5, 129.0, 128.9, 128.5, 128.3, 127.3, 127.2; **FT-IR** (KBr, cm^{-1}): 3110(=C-H), 1701(C=O), 1544(C=N), 1483(C=C), 1236(C-O), 742(C-Cl);

HRMS (ESI) Calcd for $C_{30}H_{19}Cl_2NO$ $[M+H]^+$, 480.0922; found, 480.0927.

xxiv) **(3,5-bis(4-chlorophenyl)pyridin-2-yl)(naphthalen-2-yl)methanone (3bb)**

Yield: 339 mg, 75%; Colourless solid; mp =152-156 °C

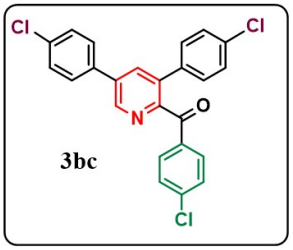


^{1}H NMR (400 MHz, DMSO-d_6) δ 9.00 (d, *J* = 2.0 Hz, 1H), 8.40 (s, 1H), 8.26 (d, *J* = 2.1 Hz, 1H), 8.03-7.87 (m, 6H), 7.67-7.63 (m, 1H), 7.56 (d, *J* = 8.4 Hz, 3H), 7.43 (d, *J* = 8.6 Hz, 2H), 7.35 (d, *J* = 8.4 Hz, 2H);**^{13}C NMR** (101 MHz, $CDCl_3$) δ 194.5, 171.1, 154.0, 145.8, 136.4, 136.1, 135.8, 135.1, 135.0, 134.5, 133.5, 133.2, 132.3, 130.2, 129.9, 129.7, 129.5, 129.1, 128.9, 128.9, 128.5, 127.8, 126.7, 124.9; **FT-IR** (KBr, cm^{-1}): 3039(=C-H), 1652(C=O), 1533(C=N), 1492(C=C), 1298(C-O), 750(C-Cl);

HRMS (ESI) Calcd for $C_{28}H_{17}Cl_2NO$ $[M+H]^+$, 454.076; found, 454.0766.

xxv) **(3,5-bis(4-chlorophenyl)pyridin-2-yl)(4-chlorophenyl)methanone (3bc)**

Yield: 297 mg, 68%; Colourless solid; mp =172-174 °C

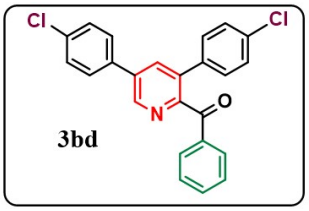


^{1}H NMR (400 MHz, $CDCl_3$) δ 8.77 (d, *J* = 2.0 Hz, 1H), 7.87 (d, *J* = 2.1 Hz, 1H), 7.74 (d, *J* = 8.7 Hz, 2H), 7.53 (d, *J* = 8.6 Hz, 2H), 7.42 (d, *J* = 8.6 Hz, 2H), 7.33 (d, *J* = 6.7 Hz, 2H), 7.21 (dd, *J* = 8.6 Hz, 4H);**^{13}C NMR** (101 MHz, $CDCl_3$) δ 193.2, 153.3, 145.8, 140.2, 136.7, 136.3, 136.2, 135.7, 135.3, 134.9, 134.7, 134.5, 131.7, 130.0, 129.5, 129.0, 128.9, 128.5; **FT-IR** (KBr, cm^{-1}): 3120(=C-H), 1712(C=O), 1562(C=N), 1485(C=C), 1184(C-O), 844(out of plane C-H bending for *p*-substituted), 748(C-Cl);

HRMS (ESI) Calcd for $C_{24}H_{14}Cl_3NO$ $[M+H]^+$, 438.0214; found, 438.0223.

xxvi) **(3,5-bis(4-chlorophenyl)pyridin-2-yl)(phenyl)methanone (3bd)**

Yield: 232 mg, 68%; Colourless solid; mp =156-158 °C



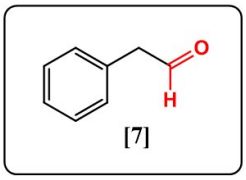
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.77 (d, *J* = 2.0 Hz, 1H), 7.85 (d, *J* = 2.1 Hz, 1H), 7.77 (d, *J* = 7.0 Hz, 2H), 7.52-7.46 (m, 3H), 7.41-7.32 (m, 4H), 7.23-7.16 (m, 4H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 194.5, 153.8, 145.7, 136.4, 136.1, 135.8, 135.1, 135.0, 134.5, 133.6, 130.3, 130.0, 129.5, 129.4, 128.9, 128.5;

FT-IR (KBr, cm-1): 3110, 3012 (=C-H), 1666(C=O), 1633(C=N), 1554(C=C), 1218(C-O), 844(out of plane C-H bending for *p*-substituted), 744(C-Cl);

HRMS (ESI) Calcd for $C_{24}H_{15}Cl_2NO$ $[M+H]^+$, 404.0604; found, 404.0609.

xxvii)**2-phenylacetaldehyde(7)**

Yield: 65 mg, 54%; Colourless liquid

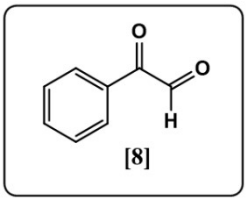


[7]

^{1}H NMR (400 MHz, DMSO-d_6) δ 9.49 (d, *J* = 3.5 Hz, 1H), 7.29 (t, *J* = 7.9 Hz, 2H), 7.19-7.13 (m, 3H), 3.61 (d, *J* = 3.5 Hz, 2H); **^{13}C-NMR** (101 MHz, DMSO-d_6) δ 199.3, 133.6, 129.0, 127.7, 125.9, 52.0; **FT-IR** (KBr, cm^{-1}): 3030(=C-H), 2922(-C-H), 2824, 2733(d, CHO), 1700(C=O), 1603(C=C), 1576 (CH_2 bending vibration), 1167(C-O); MS (ESI) Calcd for C_8H_8O $[M+H]^+$, 121.0648; found, 121.00.

xxviii)**2-oxo-2-phenylacetaldehyde(8)**

Yield: 121 mg, 91%; lightish yellow liquid;



[8]

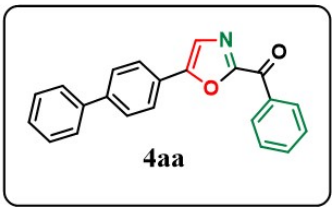
^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.88 (s, 1H), 7.80 (dd, J = 4.5, 1.6 Hz, 2H), 7.52-7.50 (m, 1H), 7.33-7.24 (m, 2H); **^{13}C-NMR** (101 MHz, DMSO-d_6) δ 198.3, 186.0, 138.2, 133.3, 129.5, 128.9; **FT-IR** (KBr, cm^{-1}): 3106(=C-H), 2639(d, -CHO), 1727(aldehydic C=O),1657(ketone C=O), 1449(C=C), 1089(C-O), 1500-400(finger print region);

MS (ESI) Calcd for $C_8H_6O_2$ $[M+H]^+$, 135.0441; found, 135.10.

5(b) <u>Spectral data of 2,5-disubstituted oxazole derivatives</u>

i) **(5-([1,1'-biphenyl]-4-yl)oxazol-2-yl)(phenyl)methanone(4aa)**

Yield: 266 mg, 82%; Colourless solid; mp =150-154 °C;



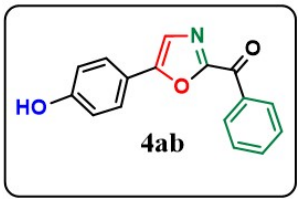
4aa

^{1}H NMR (400 MHz, DMSO-d_6) δ 8.37 (d, *J* = 7.2 Hz, 2H), 8.16 (s, 1H), 7.96 (d, *J* = 8.6 Hz, 2H), 7.86 (d, *J* = 8.6 Hz, 2H), 7.75-7.71 (m, 3H), 7.60 (t, *J* = 7.7 Hz, 2H), 7.49 (t, *J* = 7.6 Hz, 2H), 7.40 (t, *J* = 7.3 Hz, 1H);**^{13}C NMR** (101 MHz, DMSO-d_6) δ 178.0, 156.6, 153.1, 141.4, 138.9, 135.0, 133.8, 131.4, 131.1, 130.4, 129.8, 129.6, 129.0, 128.5, 127.5, 126.7, 125.7, 125.3, 125.1; **FT-IR** (KBr, cm-1): 3137(=C-H), 1685(C=O), 1575(C=N), 1475(C=C), 1186(C-O);

HRMS (ESI) Calcd for $C_{22}H_{15}NO_2$ $[M+H]^+$, 326.1176; found, 326.1173.

ii) **(5-(4-hydroxyphenyl)oxazol-2-yl)(phenyl)methanone(4ab)**

Yield: 193 mg, 73%; Colourless solid; mp =182-186 °C;



4ab

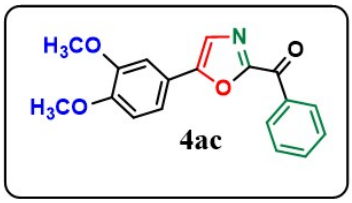
^{1}H NMR (400 MHz, DMSO-d_6) δ 10.31 (s, 1H), 8.41 (d, *J* = 7.3 Hz, 2H), 7.94 (s, 1H), 7.80-7.78 (m, 3H), 7.66 (t, *J* = 7.6 Hz, 2H), 7.00 (d, *J* = 8.6 Hz, 2H);

^{13}C NMR (101 MHz, DMSO- d_6) δ 177.8, 159.3, 155.9, 154.2, 135.2, 133.7, 130.3, 128.5, 127.1, 122.9, 117.3, 116.2; **FT-IR** (KBr, cm^{-1}): 3388(=C-H), 1614(C=O), 1560(C=N), 1485(C=C), 1245(C-O);

HRMS (ESI) Calcd for $C_{16}H_{11}NO_3$ $[M+H]^+$, 266.0812; found, 266.0809.

iii) **(5-(3,4-dimethoxyphenyl)oxazol-2-yl)(phenyl)methanone(4ac)**

Yield: 278 mg, 90%; Colourless solid; mp =134-136 °C;



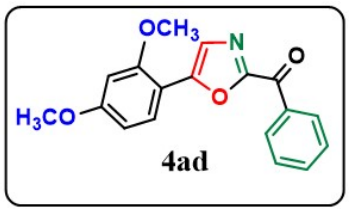
4ac

^{1}H NMR (400 MHz, DMSO-d_6) δ 8.42 (d, *J* = 7.3 Hz, 2H), 8.09 (s, 1H), 7.78 (t, *J* = 7.3 Hz, 1H), 7.66 (t, *J* = 7.6 Hz, 2H), 7.52-7.47 (m, 2H), 7.18 (d, *J* = 8.4 Hz, 1H), 3.92 (s, 3H), 3.88 (s, 3H) ; **^{13}C NMR** (101 MHz, DMSO-d_6) δ 178.1, 156.3, 154.0, 150.6, 149.4, 135.3, 134.0, 130.5, 128.7, 124.0, 119.0, 118.6, 112.4, 108.5, 55.9, 55.8; **FT-IR** (KBr, cm^{-1}): 3066(=C-H), 2964(-C-H) 1649(C=O), 1614(C=N), 1564(C=C), 1485(CH_3 bending), 1261(C-O);

HRMS (ESI) Calcd for $C_{18}H_{15}NO_4$ $[M+H]^+$, 310.1074; found, 310.1079.

ix) **(5-(2,4-dimethoxyphenyl)oxazol-2-yl)(phenyl)methanone (4ad)**

Yield: 250 mg, 81%; Colourless solid; mp =180-182 °C;



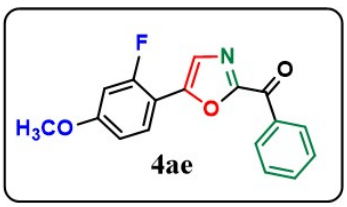
4ad

^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.40-8.38 (m, 2H), 8.25 (s, 1H), 7.60-7.55 (m, 2H), 7.43 (m, 3H), 6.42 (s, 1H), 3.95 (s, 3H), 3.88 (s, 3H);**^{13}C NMR** (101 MHz, $CDCl_3$) δ 177.6, 159.1, 157.4, 154.7, 148.8, 135.8, 134.5, 132.6, 129.7, 127.4, 125.7, 109.8, 94.2, 55.5, 54.9; **FT-IR** (KBr, cm-1): 3118(=C-H), 2829(-C-H), 1714(C=O), 1664(C=N), 1562(C=C), 1485(CH_3 bending), 1184(C-O);

HRMS (ESI) Calcd for $C_{18}H_{15}NO_4$ $[M+H]^+$, 310.1074; found, 310.1072.

v) **(5-(2-fluoro-4-methoxyphenyl)oxazol-2-yl)(phenyl)methanone(4ae)**

Yield: 198 mg, 67%; Colourless solid; mp =140-142 °C;



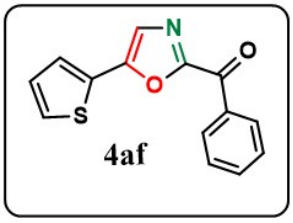
4ae

^{1}H NMR (400 MHz, DMSO- d_6) δ 8.27 (d, *J* = 8.6 Hz, 2H), 7.77-7.65 (m, 3H), 7.55-7.52 (m, 2H), 7.02-6.92 (m, 2H), 3.77 (s, 3H);**^{13}C NMR** (101 MHz, DMSO-d_6) δ 178.5, 162.5, 161.5, 158.9, 156.2, 148.8, 135.3, 134.4, 130.7, 129.0, 128.4, 128.3, 126.5, 126.4, 112.1, 107.4, 107.3, 102.9, 102.6, 56.4; **FT-IR** (KBr, cm^{-1}): 3093, 3053(=C-H), 2954(-C-H), 1668(C=O), 1571(C=N), 1481(CH_3 bending), 1425(C=C), 1253(C-O), 1018(C-F);

HRMS (ESI) Calcd for $C_{17}H_{12}FNO_3$ $[M+H]^+$, 298.0874; found, 298.0871.

vi) **phenyl(5-(thiophen-2-yl)oxazol-2-yl)methanone(4af)**

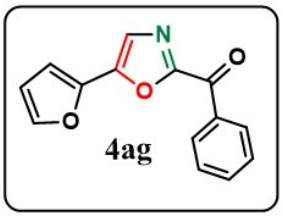
Yield: 173 mg, 68%; Colourless solid; mp =114-116 °C;



^{1}H NMR (400 MHz, $CDCl_3$) δ 8.40-8.36 (m, 2H), 7.75-7.72 (m, 1H), 7.57-7.52 (m, 2H), 7.47-7.42 (m, 4H), 7.35-7.35 (m, 1H), 7.04 (dd, *J* = 5.0, 3.7 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 173.7, 151.7, 145.1, 130.6, 129.1, 126.1, 125.3, 124.4, 123.8, 123.6, 123.2, 122.2, 120.7, 118.8; **FT-IR** (KBr, cm-1): 3099, 3049(=C-H), 1716(C=O), 1658(C=N), 1514(C=C), 1236(C-O), 850(C-S); HRMS (ESI) Calcd for $C_{14}H_9NO_2S$ $[M+H]^+$, 256.0444; found, 256.0441.

vii) **(5-(furan-2-yl)oxazol-2-yl)(phenyl)methanone (4ag)**

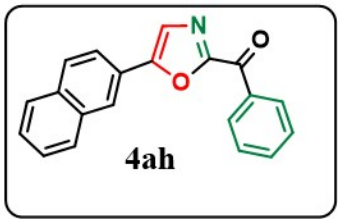
Yield: 143 mg, 60%; Colourless solid; mp =162-166 °C;



^{1}H NMR (400 MHz, DMSO-d_6) δ 8.25 (d, *J* = 7.3 Hz, 2H), 7.86 (s, 1H), 7.76 (d, *J* = 6.1 Hz, 1H), 7.62 (t, *J* = 7.2 Hz, 1H), 7.51-7.45 (m, 2H), 7.03 (d, *J* = 3.2 Hz, 1H), 6.64 (s, 1H);**^{13}C NMR** (101 MHz, DMSO-d_6) δ 177.8, 156.0, 145.6, 141.7, 134.9, 134.0, 130.5, 129.4, 128.6, 125.2, 125.0, 124.1, 112.7, 111.1; **FT-IR** (KBr, cm-1): 3062(=C-H), 1733(C=O), 1577(C=N), 1436(C=C), 1234(C-O); HRMS (ESI) Calcd for $C_{14}H_9NO_3$ $[M+H]^+$, 240.0645; found, 240.0662.

viii) **(5-(naphthalen-2-yl)oxazol-2-yl)(phenyl)methanone(4ah)**

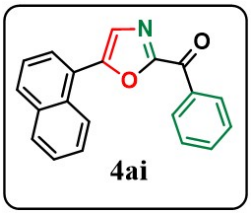
Yield: 218 mg, 73%; Colourless solid; mp =156-158 °C;



^{1}H NMR (400 MHz, DMSO-d_6) δ 8.42-8.40 (m, 3H), 8.20 (s, 1H), 8.09-8.06 (m, 2H), 7.98-7.96 (m, 2H), 7.78-7.74 (m, 1H), 7.65-7.59 (m, 4H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 178.1, 156.7, 153.6, 135.0, 134.0, 133.3, 132.9, 130.5, 129.1, 128.6, 127.9, 127.6, 127.5, 127.2, 125.5, 124.5, 123.7, 122.4; **FT-IR** (KBr, cm^{-1}): 3267, 3110 (=C-H), 1699(C=O), 1579(C=N), 1461(C=C), 1213(C-O); HRMS (ESI) Calcd for $C_{20}H_{13}NO_2$ $[M+H]^+$, 300.1019; found, 300.1017.

ix) **(5-(naphthalen-1-yl)oxazol-2-yl)(phenyl)methanone(4ai)**

Yield: 209 mg, 70%; Colourless solid; mp =172-174 °C;

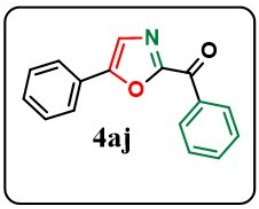


^{1}H NMR (400 MHz, DMSO-d_6) δ 8.47-8.44 (m, 3H), 8.16-8.10 (m, 3H), 8.02 (d, *J* = 7.3 Hz, 1H), 7.81-7.65 (m, 6H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 178.3, 157.0, 153.0, 135.0, 134.0, 133.5, 131.0, 130.5, 129.3, 129.0, 128.6, 127.9, 127.7, 126.7, 125.6, 124.6, 123.5;

FT-IR (KBr, cm^{-1}): 3109(=C-H), 1703(C=O), 1546(C=N), 1481(C=C), 1234(C-O); HRMS (ESI) Calcd for $C_{20}H_{13}NO_2$ $[M+H]^+$, 300.1019; found, 300.1025.

x) **phenyl(5-phenyloxazol-2-yl)methanone(4aj)**[5]

Yield: 161 mg, 65%; Colourless solid; mp =132-134 °C;

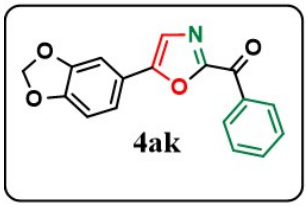


^{1}H NMR (400 MHz, DMSO-d_6) δ 8.40 (dd, *J* = 8.4, 1.2 Hz, 2H), 8.12 (s, 1H), 7.91-7.89 (m, 2H), 7.77-7.73 (m, 1H), 7.64-7.48 (m, 5H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 178.0, 156.5, 153.4, 135.0, 133.9, 130.4, 130.0, 129.3, 128.5, 126.3, 125.1, 125.0; **FT-IR** (KBr, cm^{-1}): 3035(=C-H), 1737(C=O), 1502(C=N), 1425(C=C), 1249(C-O);

HRMS (ESI) Calcd for $C_{16}H_{11}NO_2$ $[M+H]^+$, 250.0863; found, 250.0860.

xi) **(5-(benzo[d][1,3]dioxol-5-yl)oxazol-2-yl)(phenyl)methanone(4ak)**

Yield: 184 mg, 63%; Colourless solid; mp =120-124 °C;

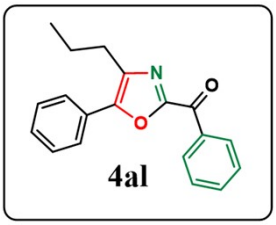


^{1}H NMR (400 MHz, DMSO-d_6) δ 8.36 (d, *J* = 7.2 Hz, 2H), 8.00 (s, 1H), 7.80-7.90 (1H), 7.69-7.78 (1H), 7.63-7.41 (m, 3H), 7.10 (d, *J* = 8.1 Hz, 1H), 6.14 (s, 2H);**^{13}C NMR** (101 MHz, DMSO-d_6) δ 177.9, 156.1, 153.5, 148.9, 148.2, 135.1, 133.8, 130.4, 128.5, 127.2, 124.0, 119.8, 109.2, 105.3, 101.8, 40.1; **FT-IR** (KBr, cm-1): 3068(=C-H), 2979 (-C-H), 1693(C=O), 1483(C=N), 1454(C=C), 1402(CH_2 bending) 1290(C-O);

HRMS (ESI) Calcd for $C_{17}H_{11}NO_4$ $[M+H]^+$, 294.0761; found, 294.0759.

xii**) phenyl(5-phenyl-4-propyloxazol-2-yl)methanone (4al)**

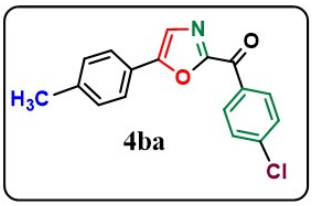
238 mg, 82% yield; colourless solid; mp 132-134 °C; **^{1}H NMR** (400 MHz, DMSO-d_6): δ 8.40 (dd, *J* = 8.4, 1.2 Hz, 2H), 7.91-7.89 (m, 2H), 7.77-7.73 (m, 1H), 7.64-7.48 (m, 4H), 7.52-7.48 (t, *J* = 7.2 Hz, 1H);**^{13}C NMR** (101 MHz, DMSO-d_6): δ 178.0, 156.5, 153.3, 134.9, 133.8, 130.4, 130.0, 129.3, 128.5, 126.3, 125.1, 31.2, 22.1, 14.0; **FT-IR** (KBr, cm^{-1}): 3099(=C-H), 2993, 2848 (-C-H), 1716(C=O), 1658(C=N), 1514(C=C), 1446(CH_2 bending), 1236(C-O);



HRMS (ESI) *m/z*: $[M+H]^+$ Calcd for $C_{19}H_{17}NO_2$, 292.1332; found, 292.1331.

xiii) **(4-chlorophenyl)(5-(p-tolyl)oxazol-2-yl)methanone (4ba)**

Yield: 207 mg, 70%; Colourless solid; mp =142-144 °C;

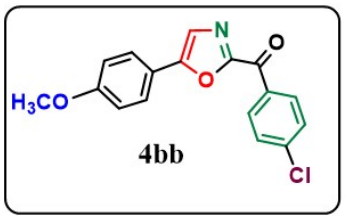


^{1}H NMR (400 MHz, DMSO-d_6) δ 8.38 (d, *J* = 8.6 Hz, 2H), 7.96 (s, 1H), 7.75 (d, *J* = 7.9 Hz, 2H), 7.64 (d, *J* = 8.4 Hz, 2H), 7.35 (d, *J* = 7.9 Hz, 2H), 2.37 (s, 3H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 177.5, 156.2, 153.5, 144.7, 140.0, 132.5, 130.6, 130.0, 129.2, 125.1, 124.3, 123.7,

21.3; **FT-IR** (KBr, cm^{-1}): 3051(=C-H), 2920(-C-H), 1672(C=O), 1606(C=N), 1500(C=C), 1450 (CH_3 bending), 1249(C-O), 767(C-Cl); HRMS (ESI) Calcd for $C_{17}H_{12}ClNO_2$ $[M+H]^+$, 298.0620; found, 298.0878.

xiv) **(4-chlorophenyl)(5-(4-methoxyphenyl)oxazol-2-yl)methanone (4bb)**

Yield: 197 mg, 63%; Colourless solid; mp =166-170 °C;

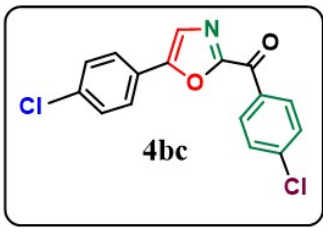


4bb

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.39 (d, *J* = 8.4 Hz, 2H), 7.68 (d, *J* = 8.6 Hz, 2H), 7.43 (d, *J* = 7.8 Hz, 3H), 6.92 (d, *J* = 8.7 Hz, 2H), 3.79 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 176.6, 160.8, 155.9, 154.3, 139.8, 133.4, 131.8, 128.4, 126.7, 122.4, 118.8, 114.3; **FT-IR** (KBr, cm^{-1}): 3018(=C-H), 2914(-C-H), 1697(C=O), 1650(C=N), 1593(C=C), 1492 (CH_3 bending), 1217(C-O), 811(C-Cl); HRMS (ESI) Calcd for $C_{17}H_{12}ClNO_3$ $[M+H]^+$, 314.0569; found, 314.0580.

xv)**(4-chlorophenyl)(5-(4-chlorophenyl)oxazol-2-yl)methanone (4bc)**[5]

Yield: 215 mg, 68%; Colourless solid; mp =148-150 °C;

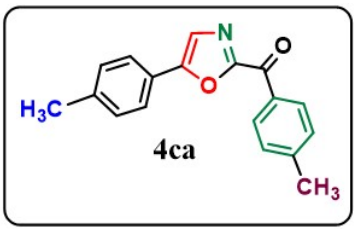


4bc

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.41 (d, *J* = 8.7 Hz, 2H), 7.69 (d, *J* = 8.7 Hz, 2H), 7.53 (s, 1H), 7.44 (d, *J* = 8.7 Hz, 2H), 7.39 (d, *J* = 8.6 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 177.1, 156.8, 153.4, 140.6, 136.2, 133.5, 132.2, 129.5, 128.9, 126.7, 125.0, 124.2; **FT-IR** (KBr, cm^{-1}): 3137(=C-H), 1685(C=O), 1575(C=N), 1475(C=C), 1186(C-O), 759(C-Cl); HRMS (ESI) Calcd for $C_{16}H_9Cl_2NO_2$ $[M+H]^+$, 318.0073; found,318.0084.

xvi) **p-tolyl(5-(p-tolyl)oxazol-2-yl)methanone (4ca)**[5]

Yield: 200 mg, 72%; Colourless solid; mp =136-140 °C;

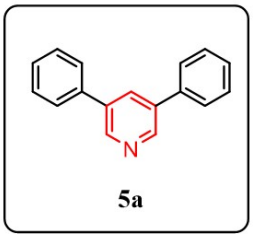


4ca

^{1}H NMR (400 MHz, DMSO-d_6) δ 8.24 (d, *J* = 8.3 Hz, 2H), 7.98 (s, 1H), 7.71 (d, *J* = 8.1 Hz, 2H), 7.35 (d, *J* = 8.1 Hz, 2H), 7.30 (d, *J* = 7.9 Hz, 2H), 2.36 (s, 3H), 2.31 (s, 3H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ 177.5, 153.5, 144.7, 140.0, 132.5, 130.6, 130.0, 129.2, 125.1, 124.3, 123.7, 21.3, 21.1; **FT-IR** (KBr, cm^{-1}): 3062(=C-H), 2914, 2885(-C-H), 1716(C=O), 1568(C=N), 1467(CH_3 bending), 1427(C=C), 1238(C-O); HRMS (ESI) Calcd for $C_{18}H_{15}NO_2$ $[M+H]^+$, 278.1166; found, 278.1185.

xvii**) 3,5-diphenylpyridine (5a)**[1]

Yield: 145 mg, 63%; Colourless solid; mp =137-138 °C;



5a

^{1}H NMR (400 MHz, DMSO-d_6) δ 8.94 (d, *J* = 2.1 Hz, 2H), 8.35 (t, *J* = 2.1 Hz, 1H), 7.91 (d, *J* = 7.3 Hz, 4H), 7.61-7.49 (m, 6H);

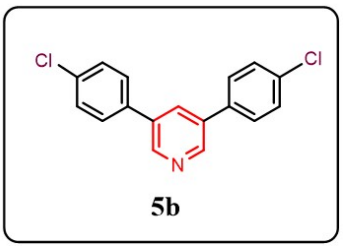
^{13}C NMR (101 MHz, DMSO-d_6) δ 146.1, 136.7, 135.6, 132.0, 128.9, 128.0, 126.9; **FT-IR** (KBr, cm^{-1}): 3109, 3058(=C-H), 1579(C=N), 1406(C=C), 1217(C-O); HRMS (ESI) Calcd for $C_{17}H_{13}N$ $[M+H]^+$, 232.1121; found, 232.1126.

xviii) **3,5-bis(4-chlorophenyl)pyridine (5b)**

Yield: 179 mg, 60%; Colourless solid; mp =162-166 °C;

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.55 (d, *J* = 2.0 Hz, 2H), 7.78 (t, *J* = 2.1 Hz, 1H), 7.36 (d, *J* = 8.4 Hz, 4H), 7.26-7.23 (m, 4H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 135.3, 134.9, 133.8, 131.9, 128.7, 127.9; **FT-IR** (KBr, cm^{-1}): 3112(=C-H), 1596 (C=N), 1508 (C=C), 1242(C-O), 790(C-Cl); **HRMS** (ESI) Calcd for $C_{17}H_{11}Cl_2N$ $[M+H]^+$, 300.0342; found, 300.0349.

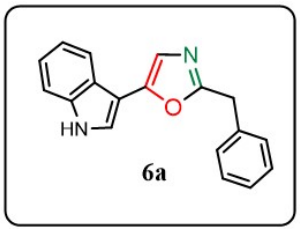


5b

xix) **2-benzyl-5-(1H-indol-3-yl)oxazole (6a)**

Yield: 198 mg, 72%; Colourless solid; mp =148-150 °C;

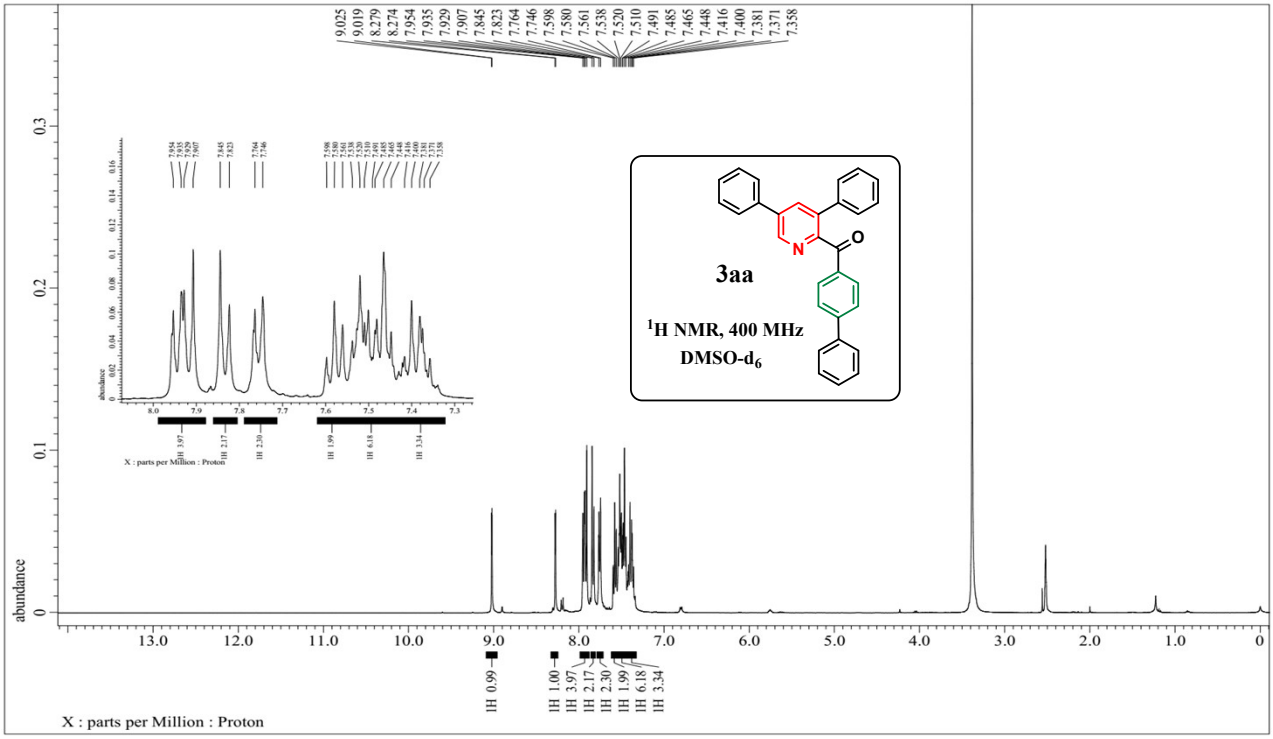
^{1}H NMR (400 MHz, DMSO-d_6) δ 11.54 (s, 1H), 7.82 (d, *J* = 7.8 Hz, 1H), 7.73 (d, *J* = 2.8 Hz, 1H), 7.47 (d, *J* = 8.1 Hz, 1H), 7.37-7.32 (m, 5H), 7.26-7.11 (m, 3H), 4.19 (s, 2H);**^{13}C NMR** (101 MHz, DMSO-d_6) δ 160.1, 147.9, 136.4, 136.3, 128.8, 128.7, 126.9, 123.6, 123.2, 122.2, 120.2, 119.5, 119.4, 112.2, 33.8;



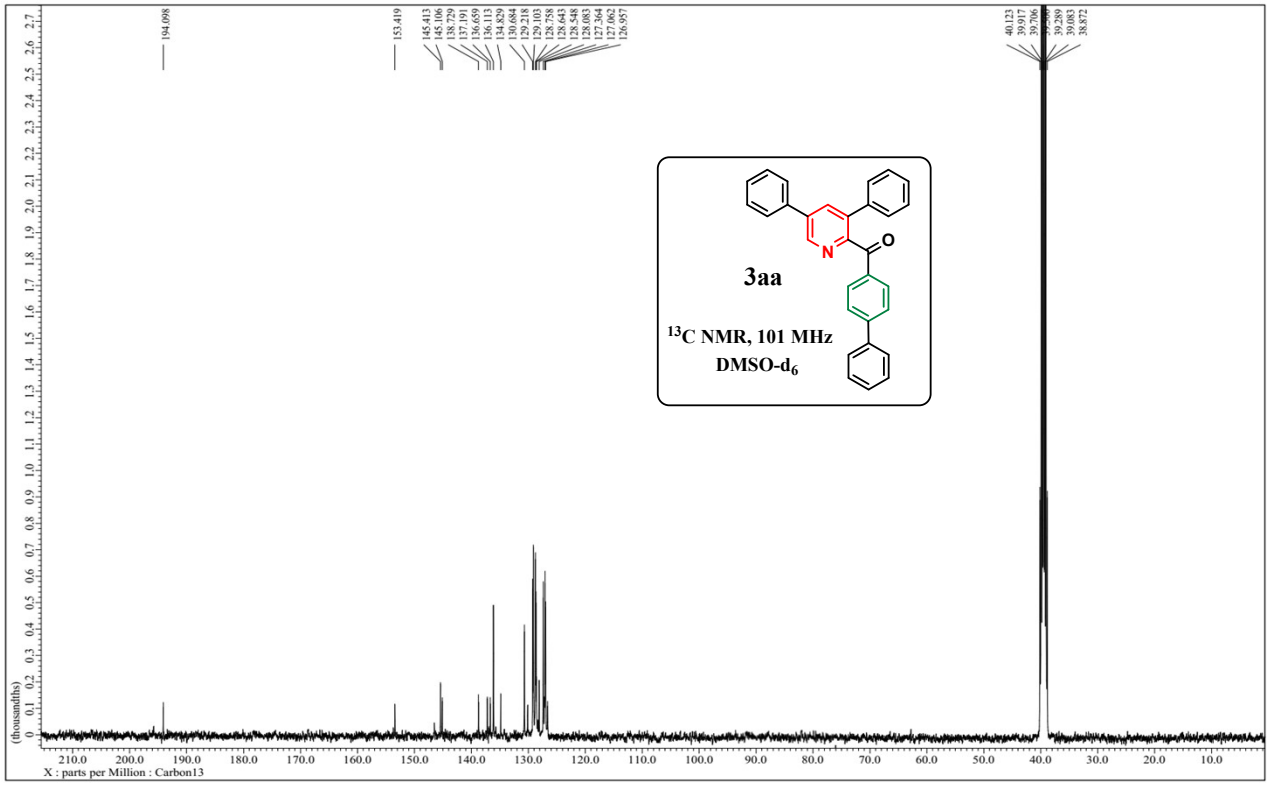
6a

FT-IR (KBr, cm^{-1}): 3338(-N-H), 3062(=C-H), 2914, 2829(-C-H), 1637(C=N), 1552(C=C), 1458(CH_2 bending), 1155(C-O); **HRMS** (ESI) Calcd for $C_{17}H_{10}N_2O_2$ $[M+H]^+$, 275.1179; found, 275.1179.

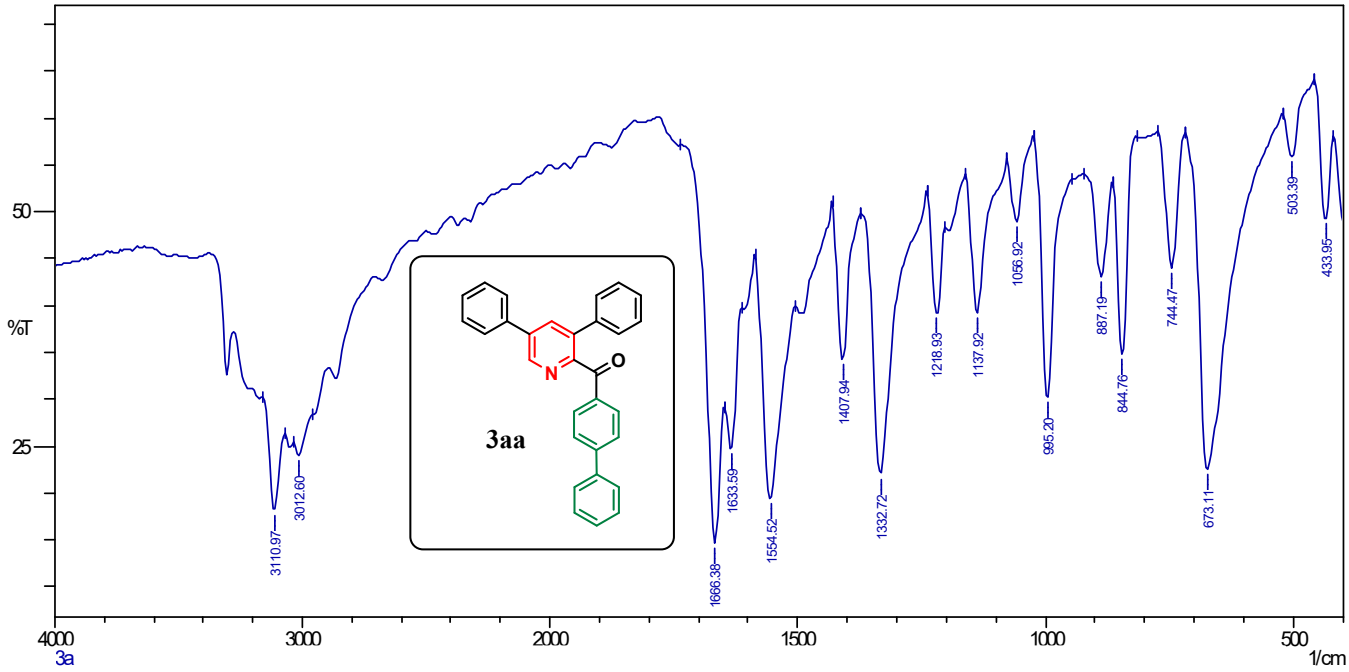
6. Copies of ^{1}H NMR, ^{13}C NMR and IR spectra of 2, 3, 5- trisubstituted pyridines and 2,5-disubstituted oxazoles

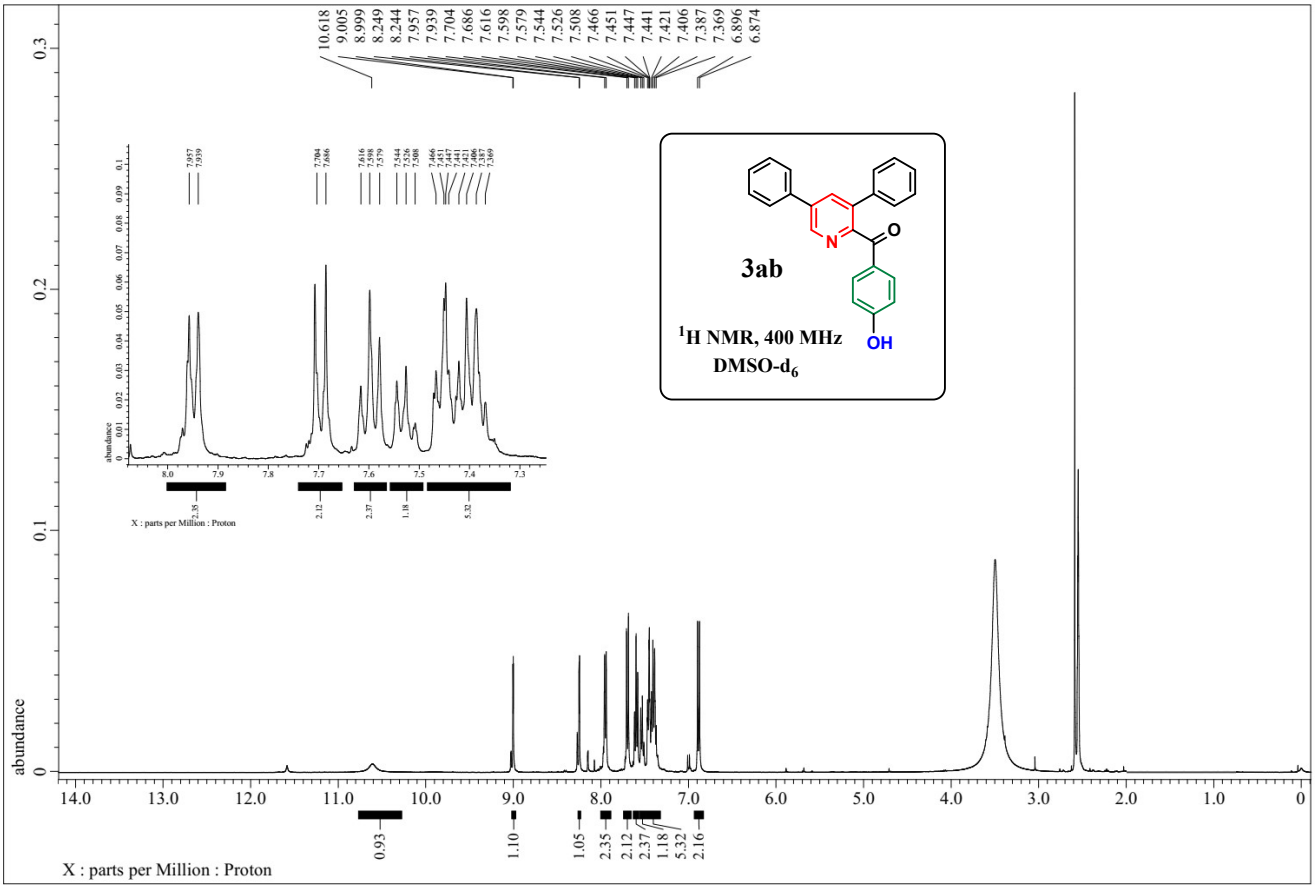


^{1}H-NMR spectrum of compound 3aa

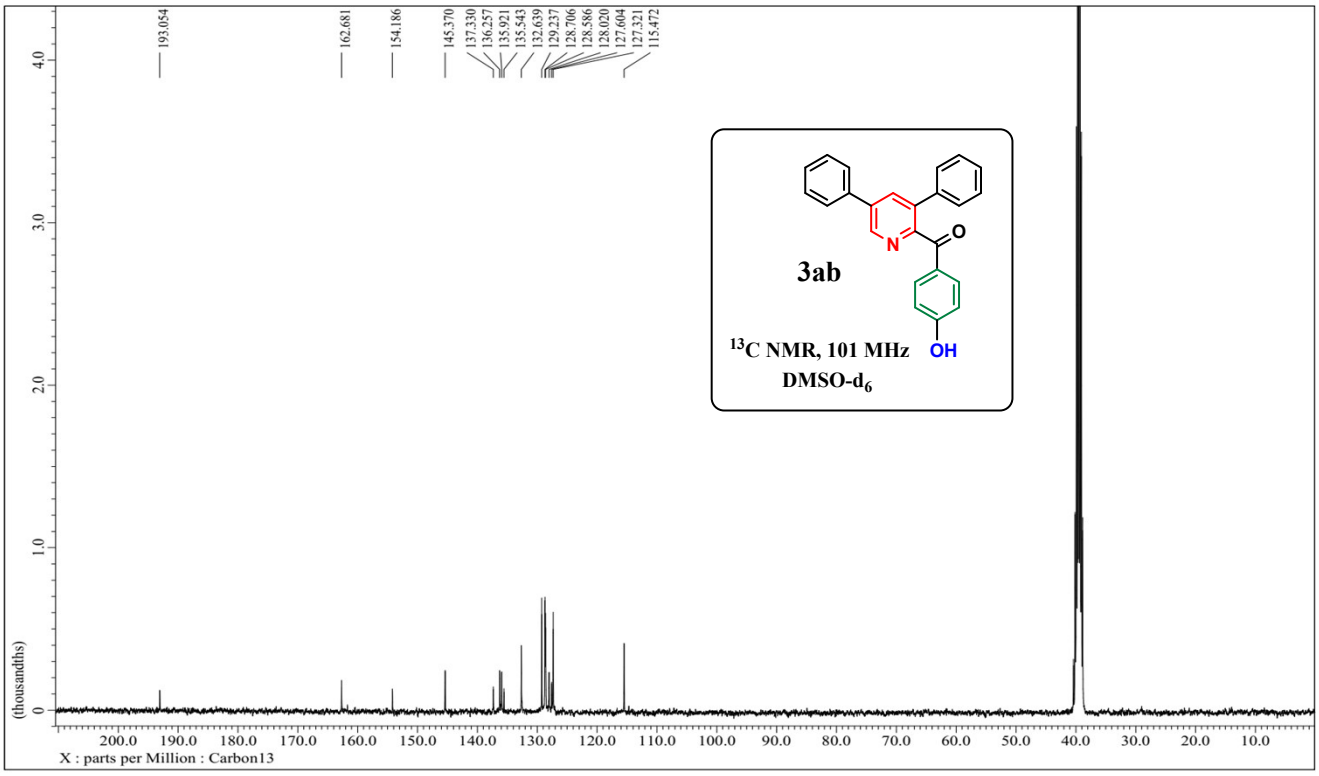


^{13}C-NMR spectrum of compound 3aa

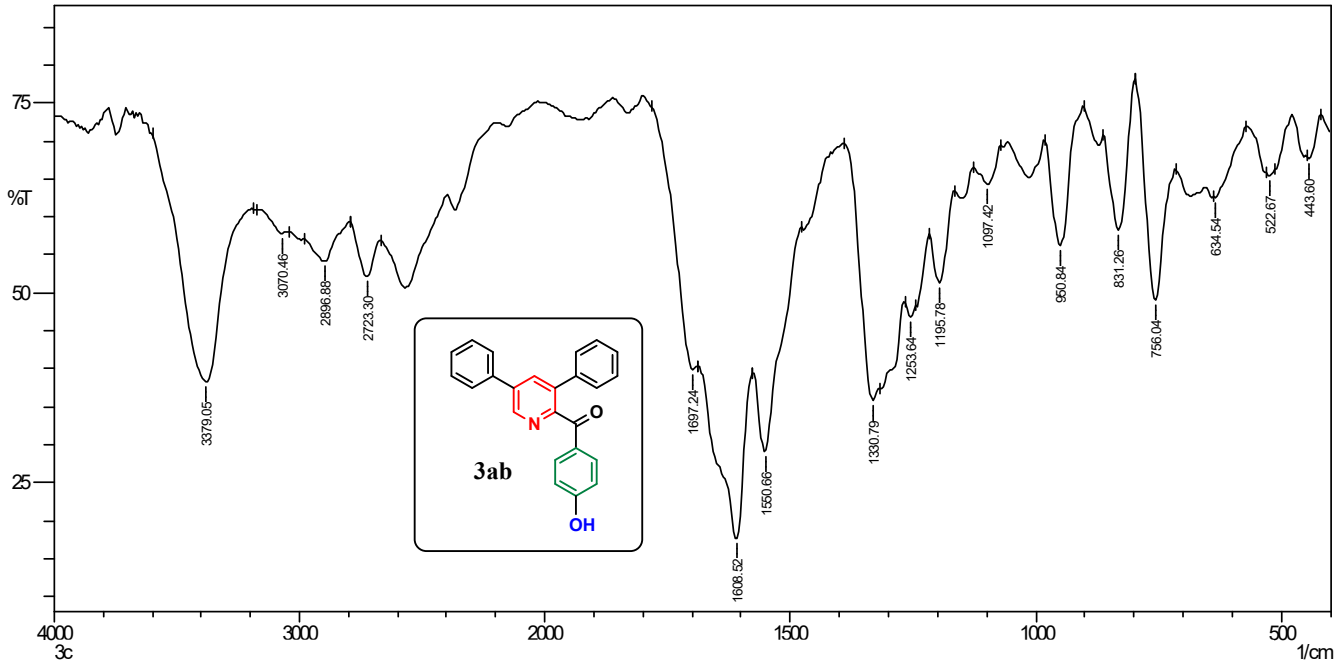




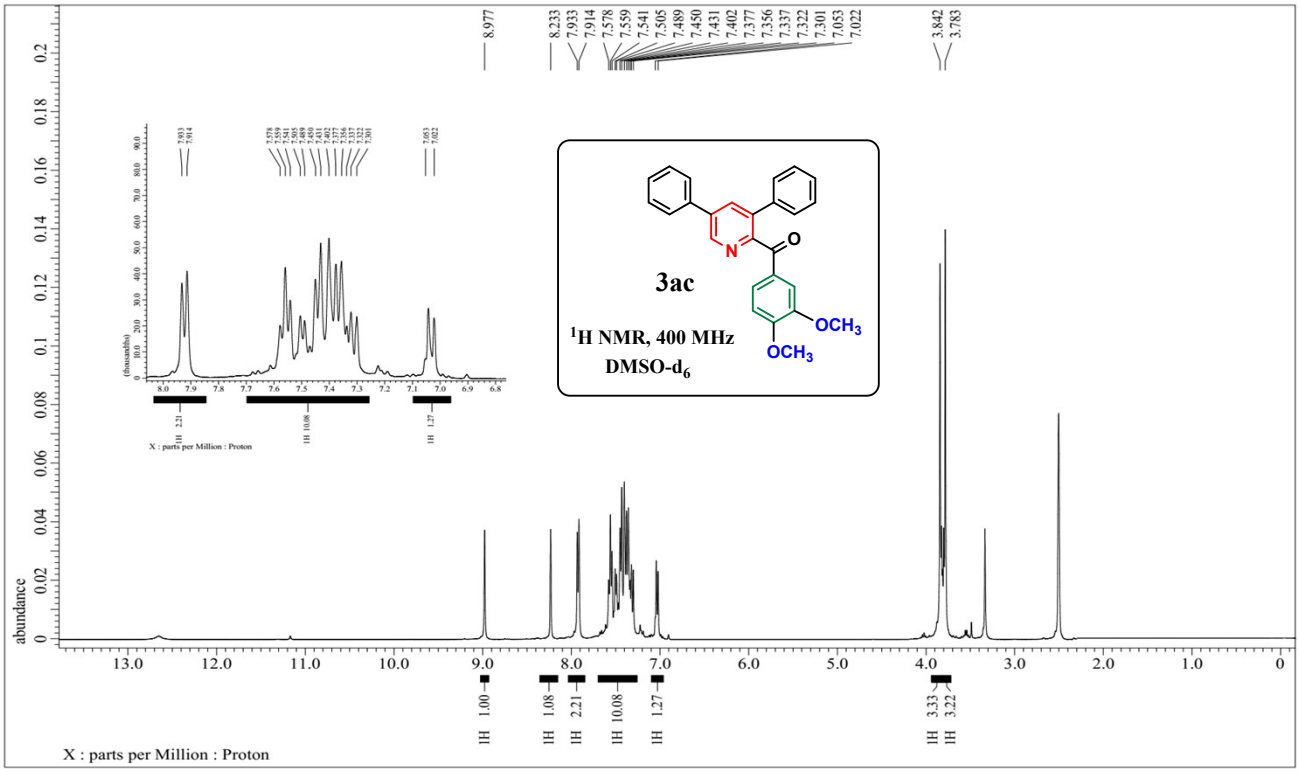
^{1}H-NMR spectrum of compound 3ab



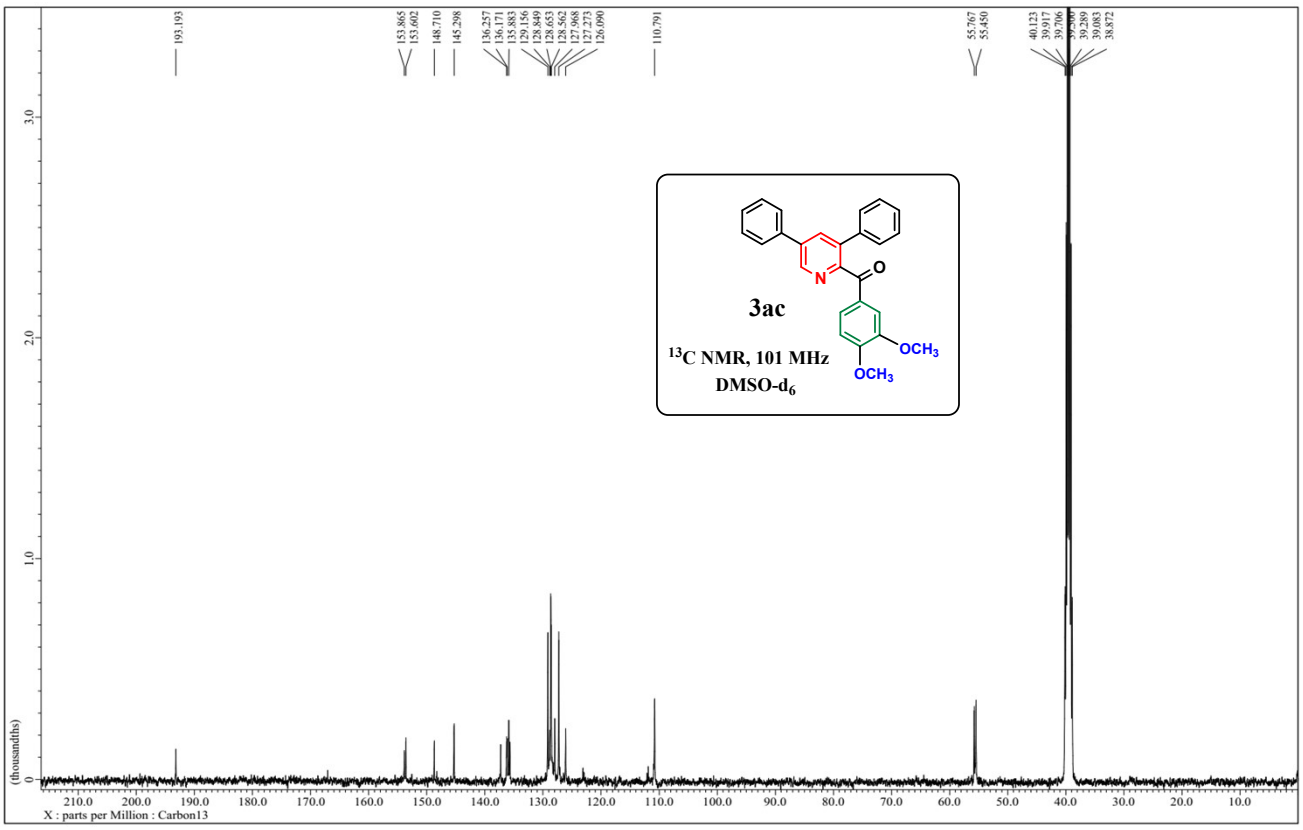
^{13}C-NMR spectrum of compound 3ab



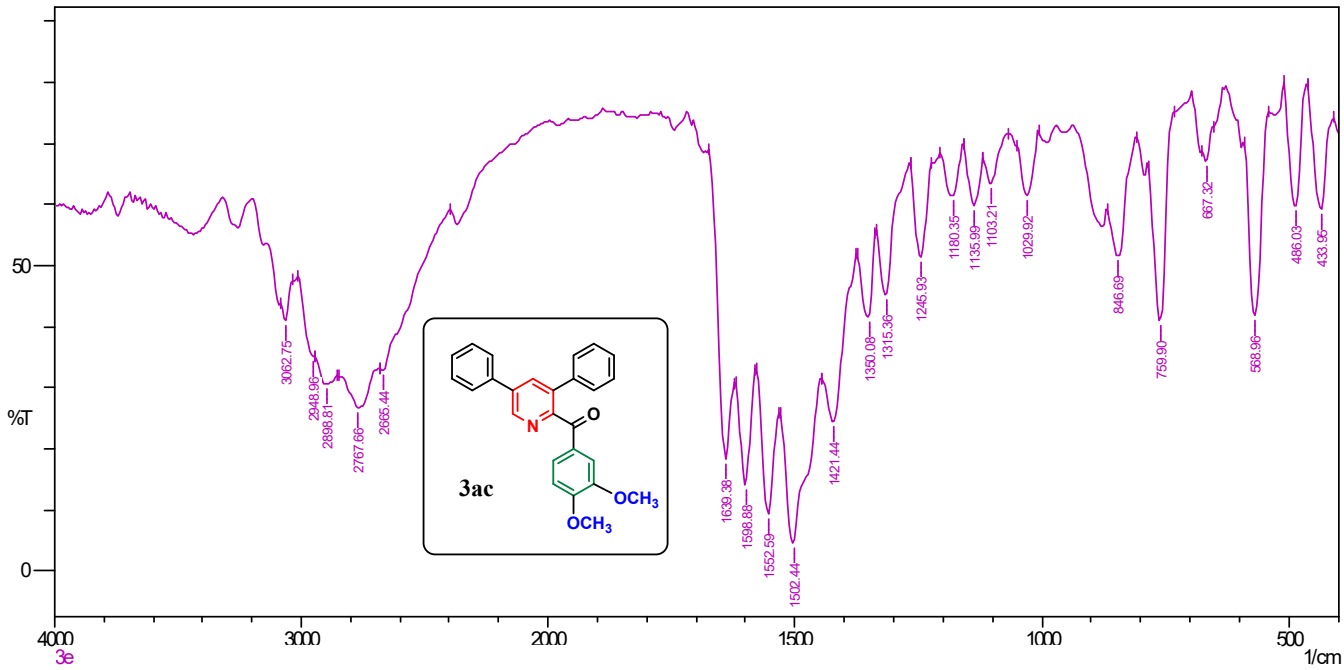
FT-IR spectrum of compound 3ab



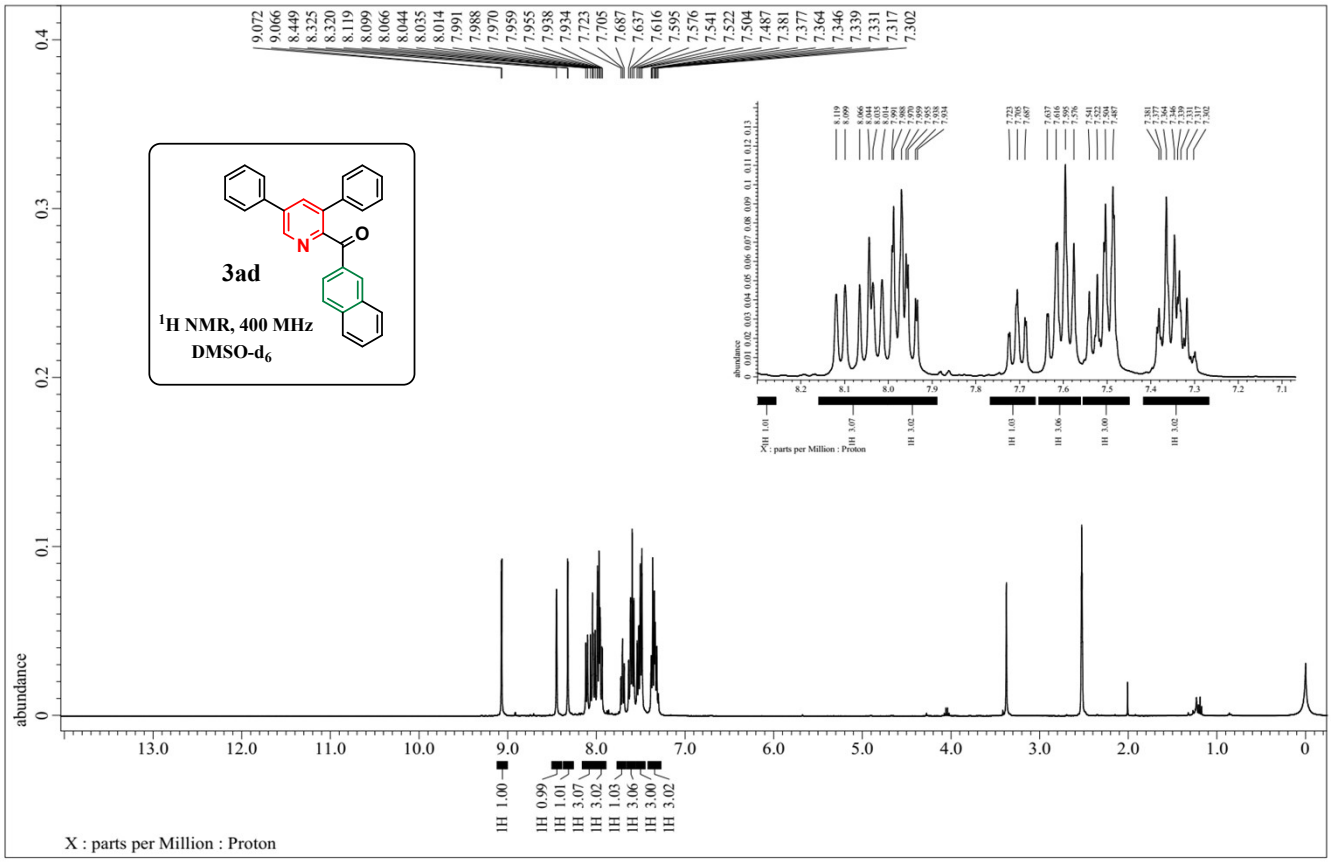
^{1}H-NMR spectrum of compound 3ac



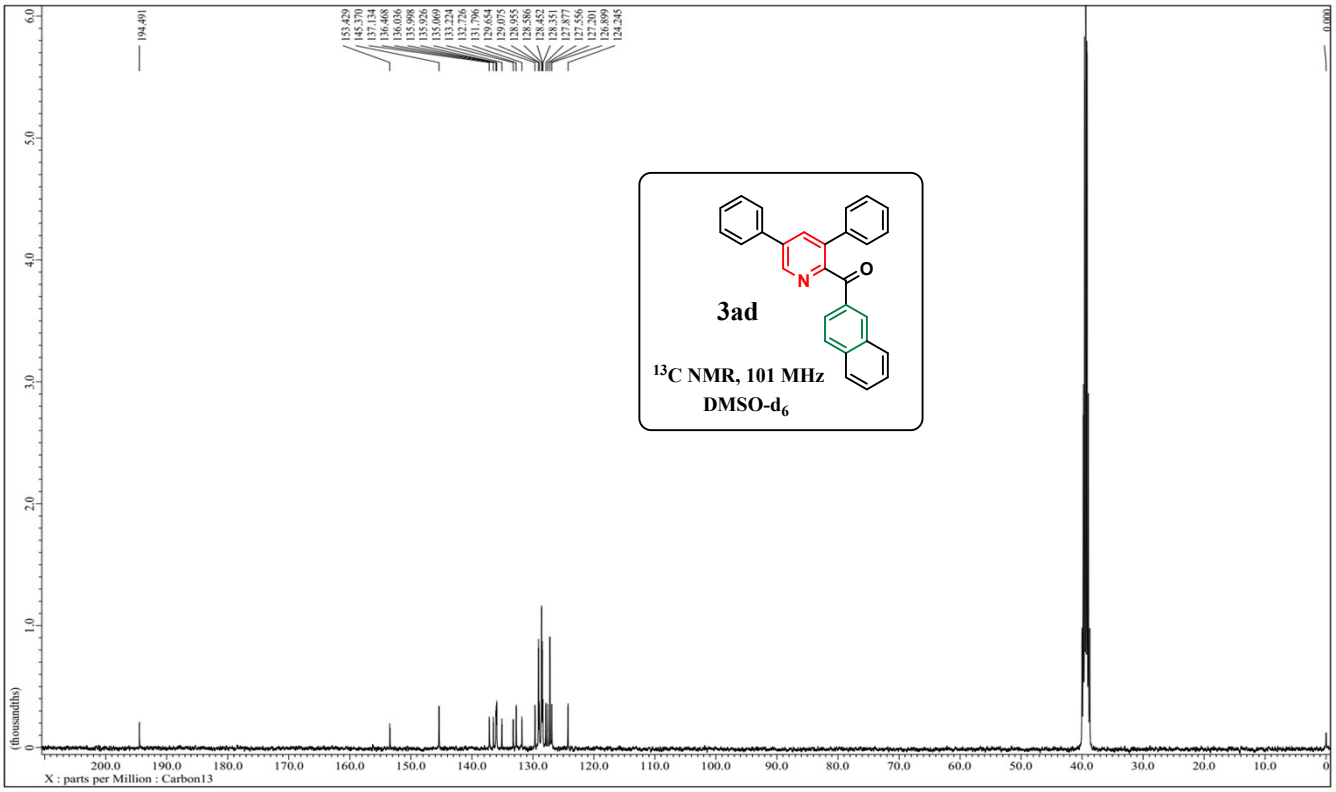
^{13}C-NMR spectrum of compound 3ac



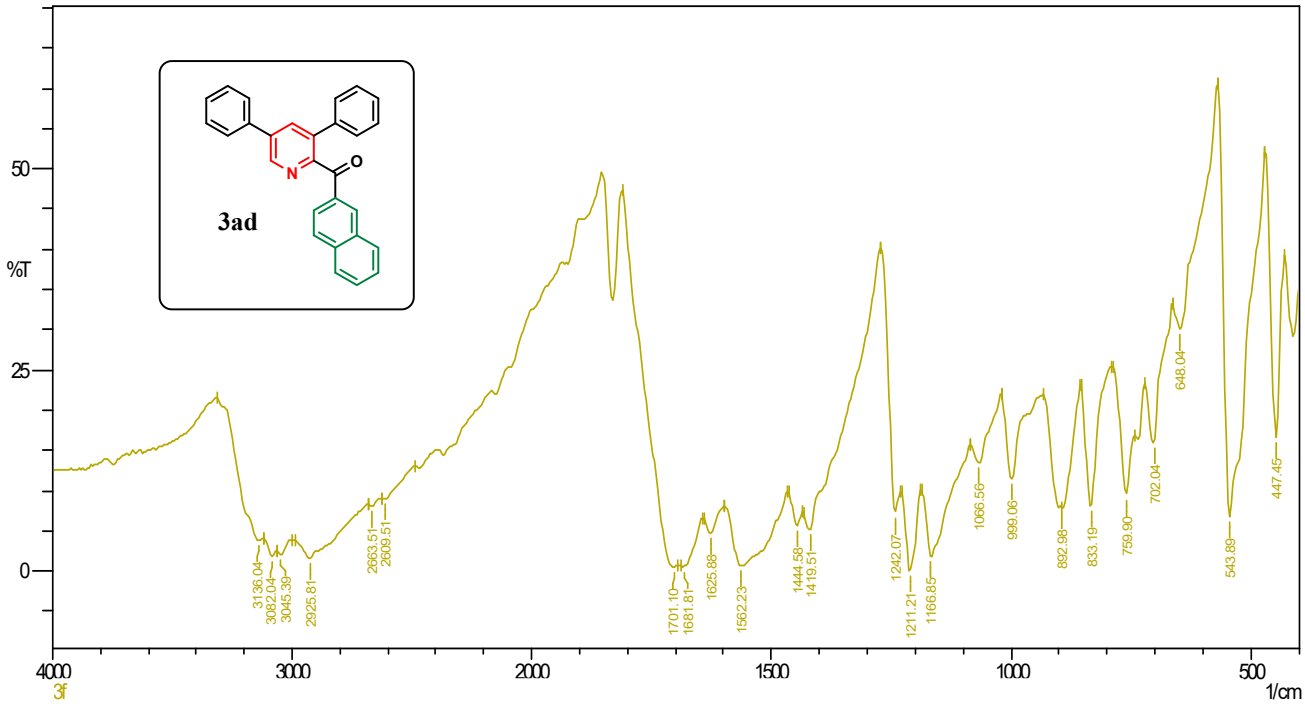
FT-IR spectrum of compound 3ac



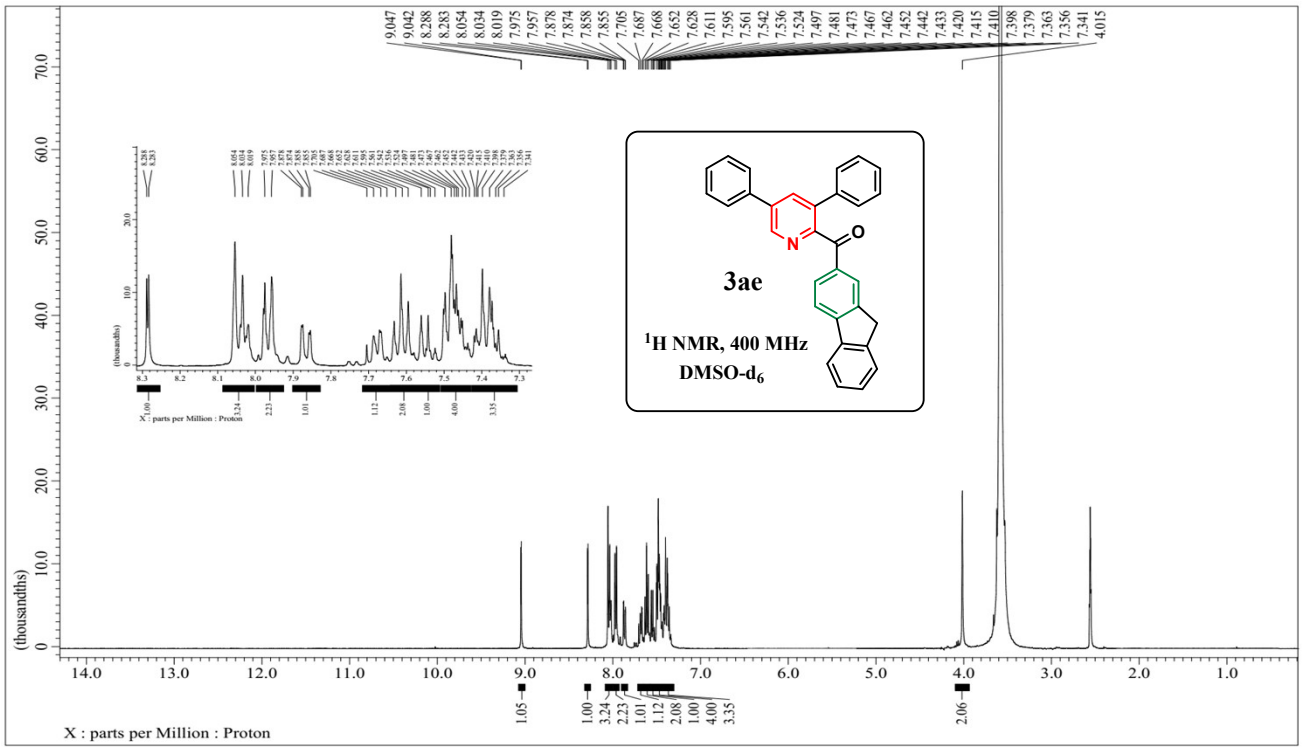
^{1}H-NMR spectrum of compound 3ad



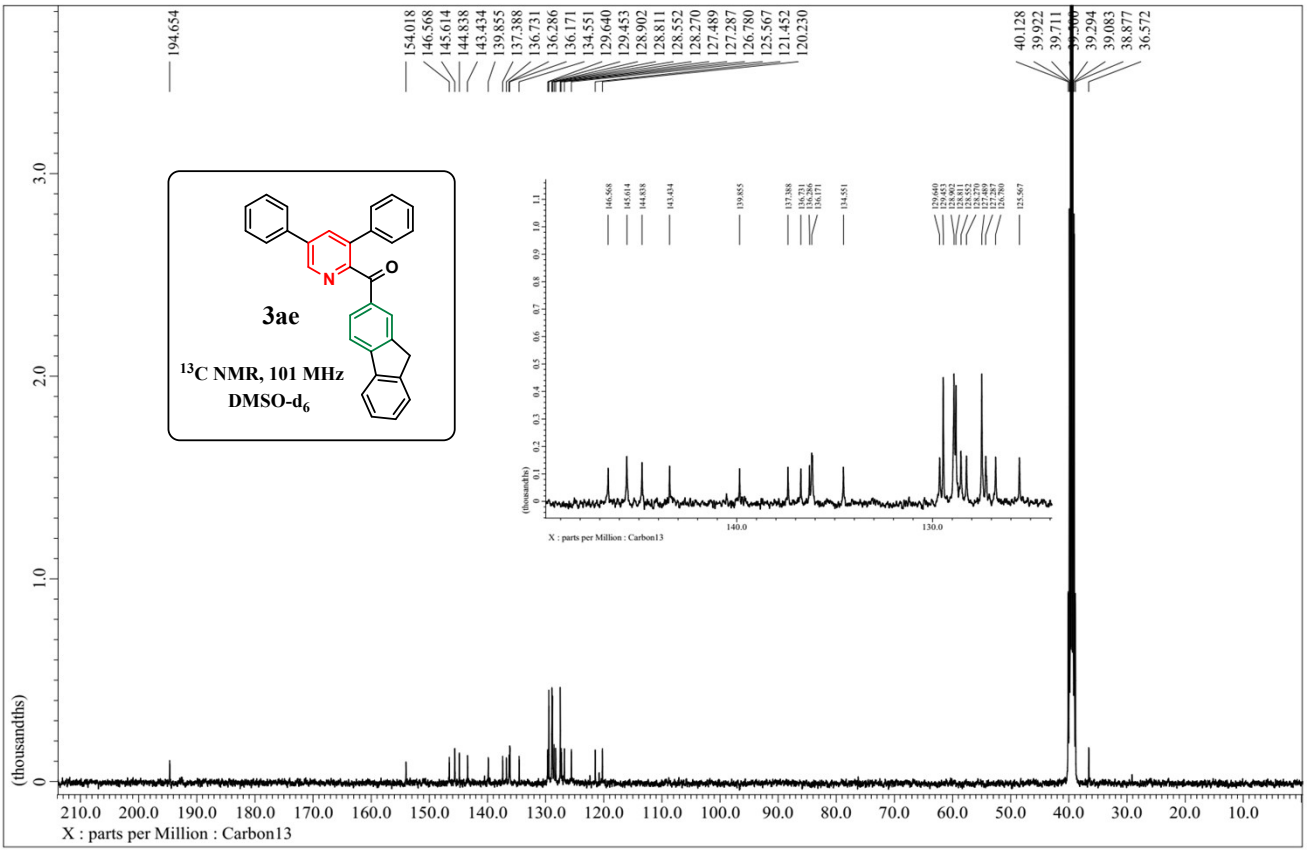
^{13}C-NMR spectrum of compound 3ad



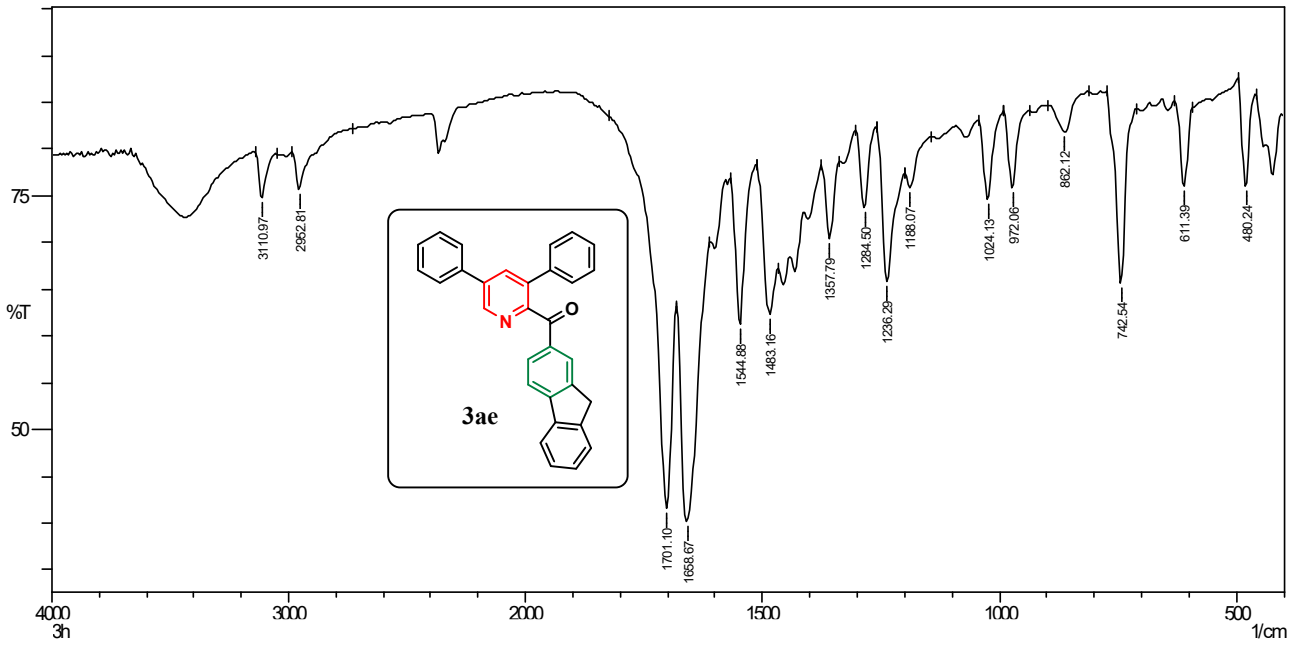
FT-IR spectrum of compound 3ad



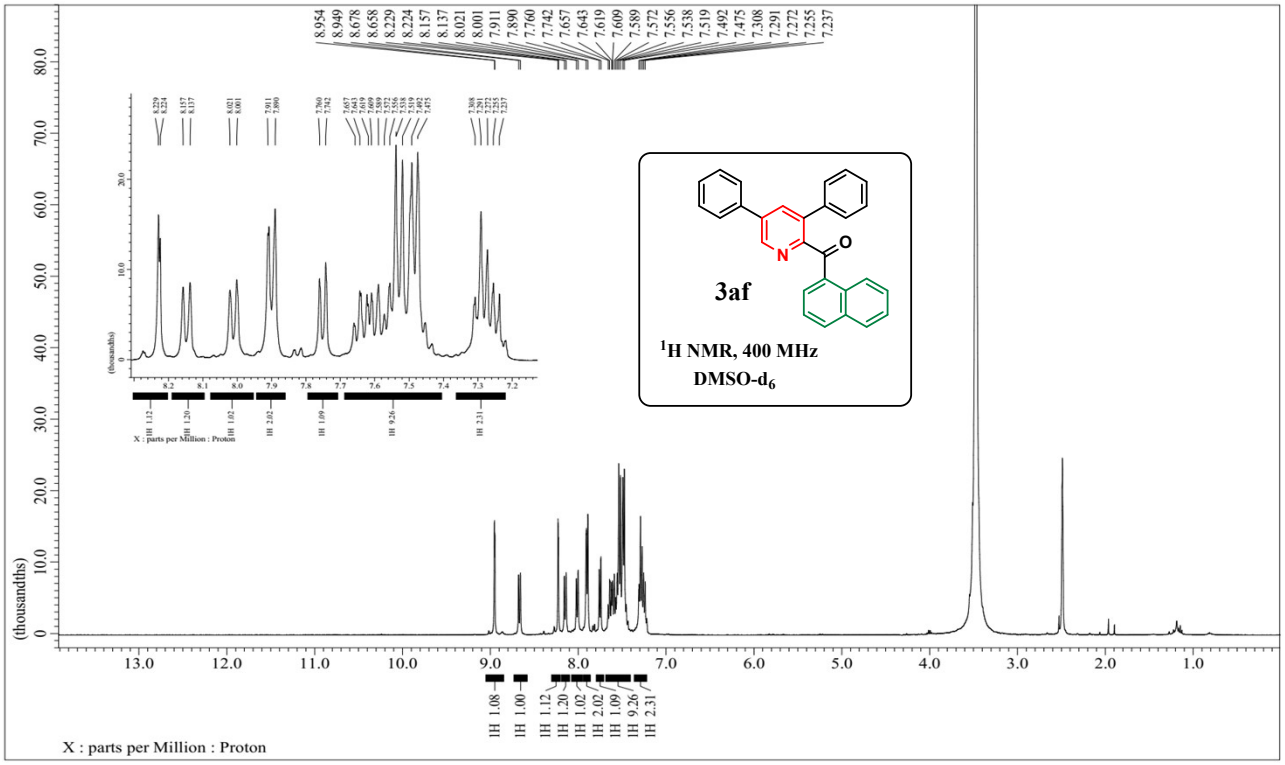
^{1}H-NMR spectrum of compound 3ae



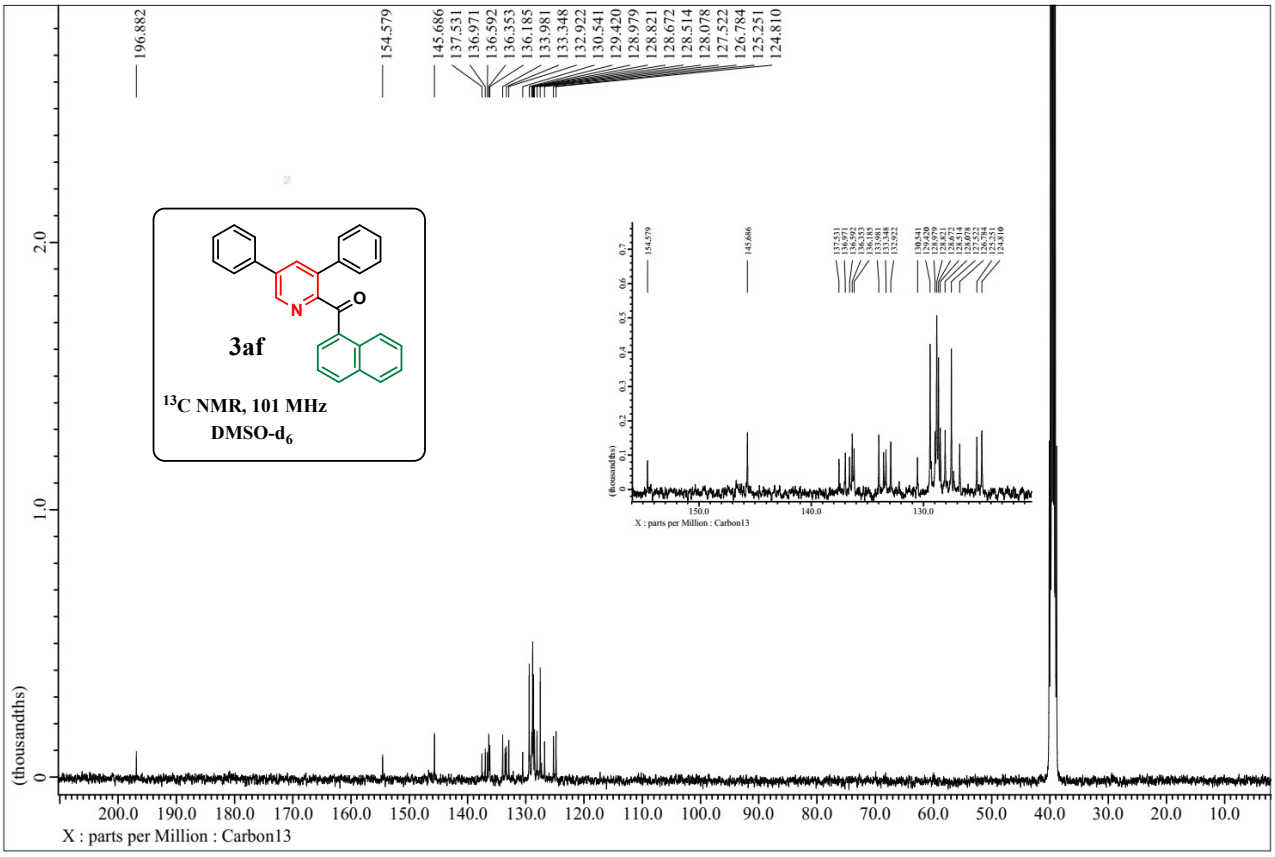
^{13}C-NMR spectrum of compound 3ae



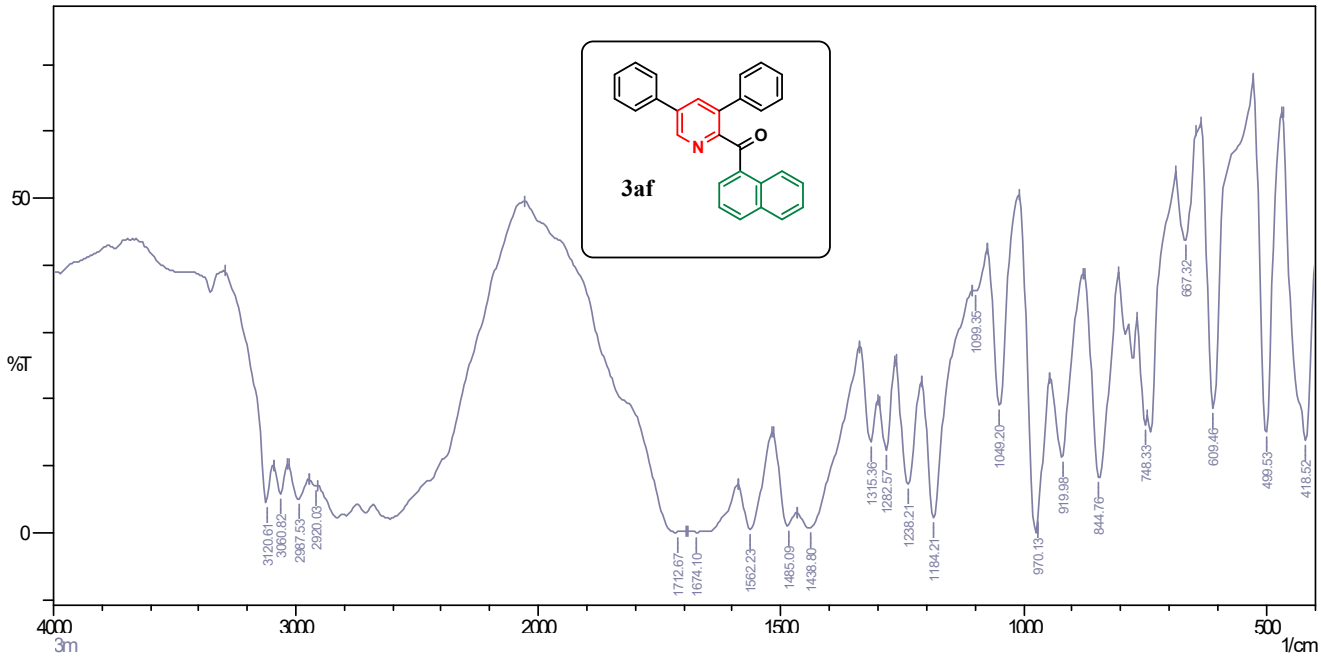
FT-IR spectrum of compound 3ae



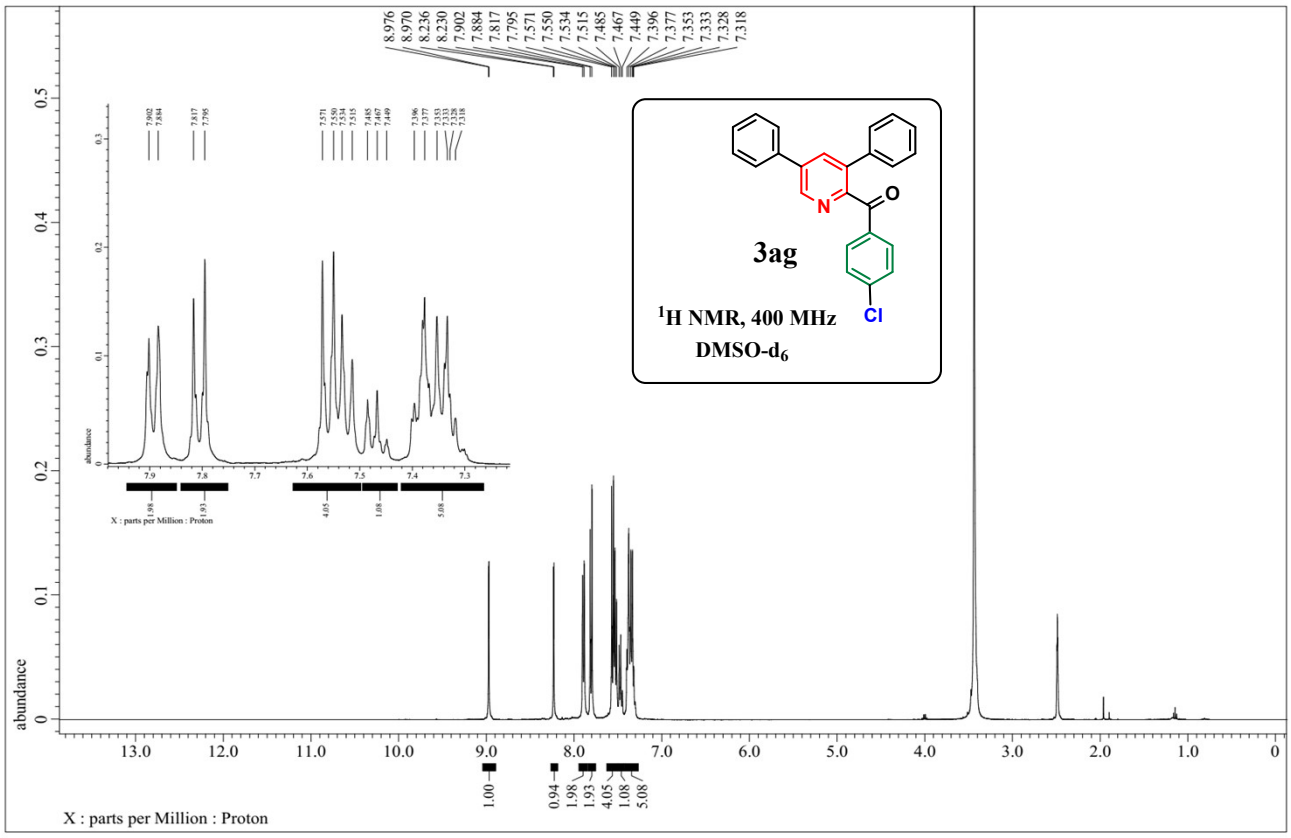
^{1}H-NMR spectrum of compound 3af



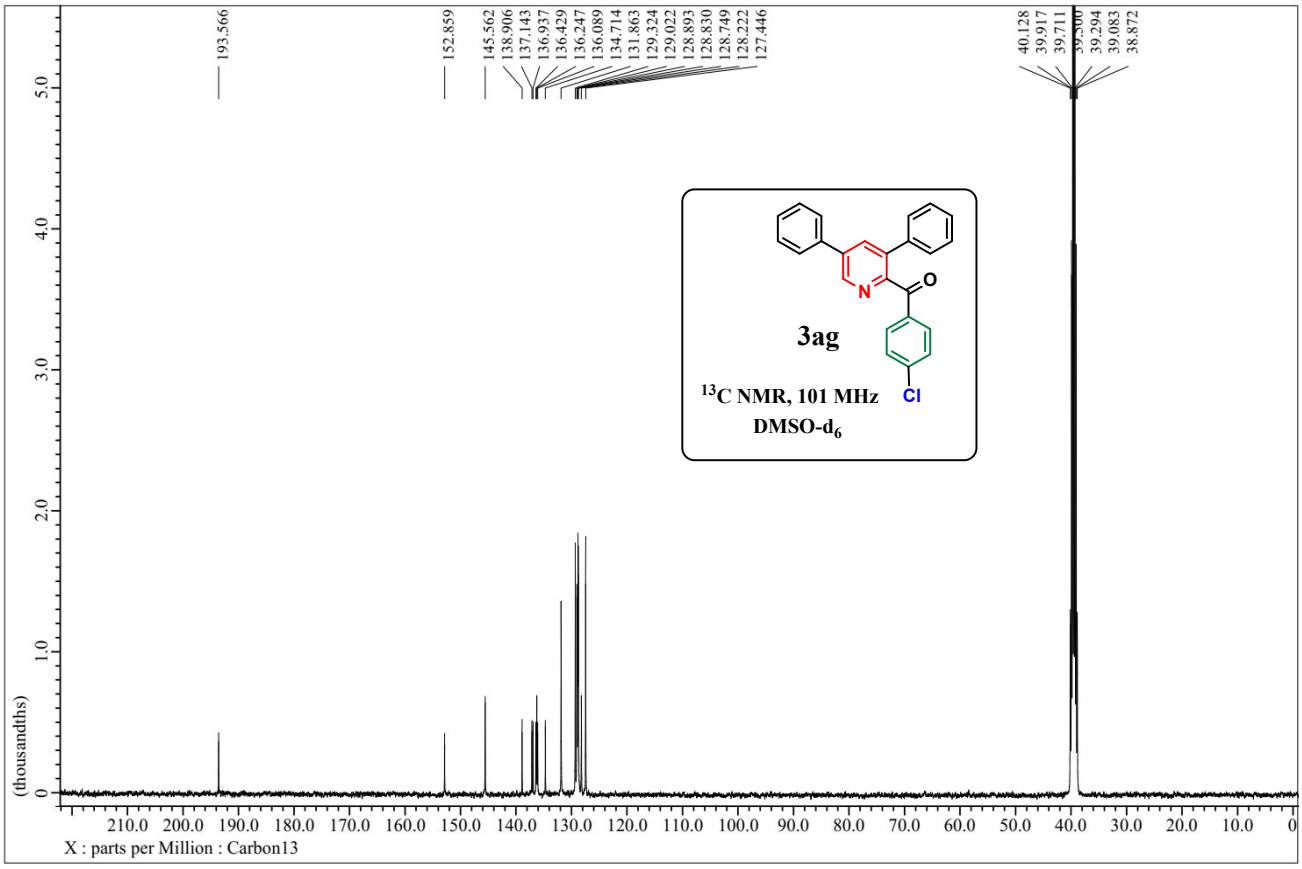
^{13}C-NMR spectrum of compound 3af



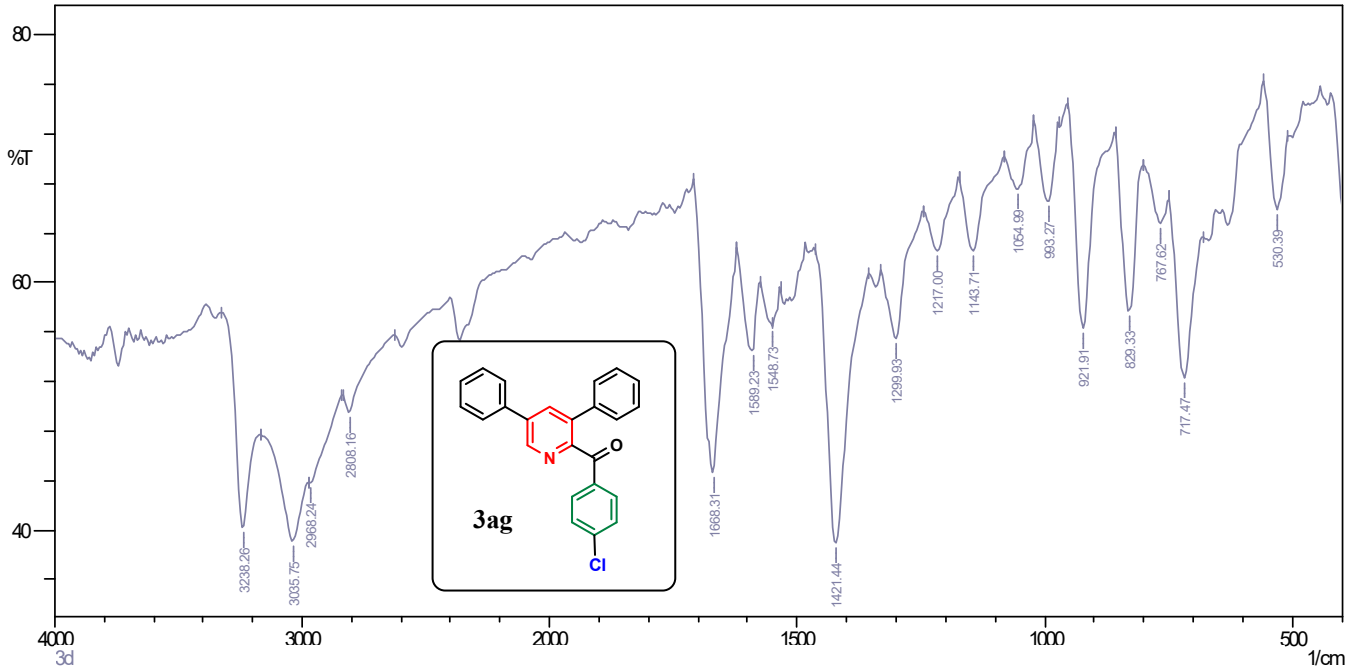
FT-IR spectrum of compound 3af



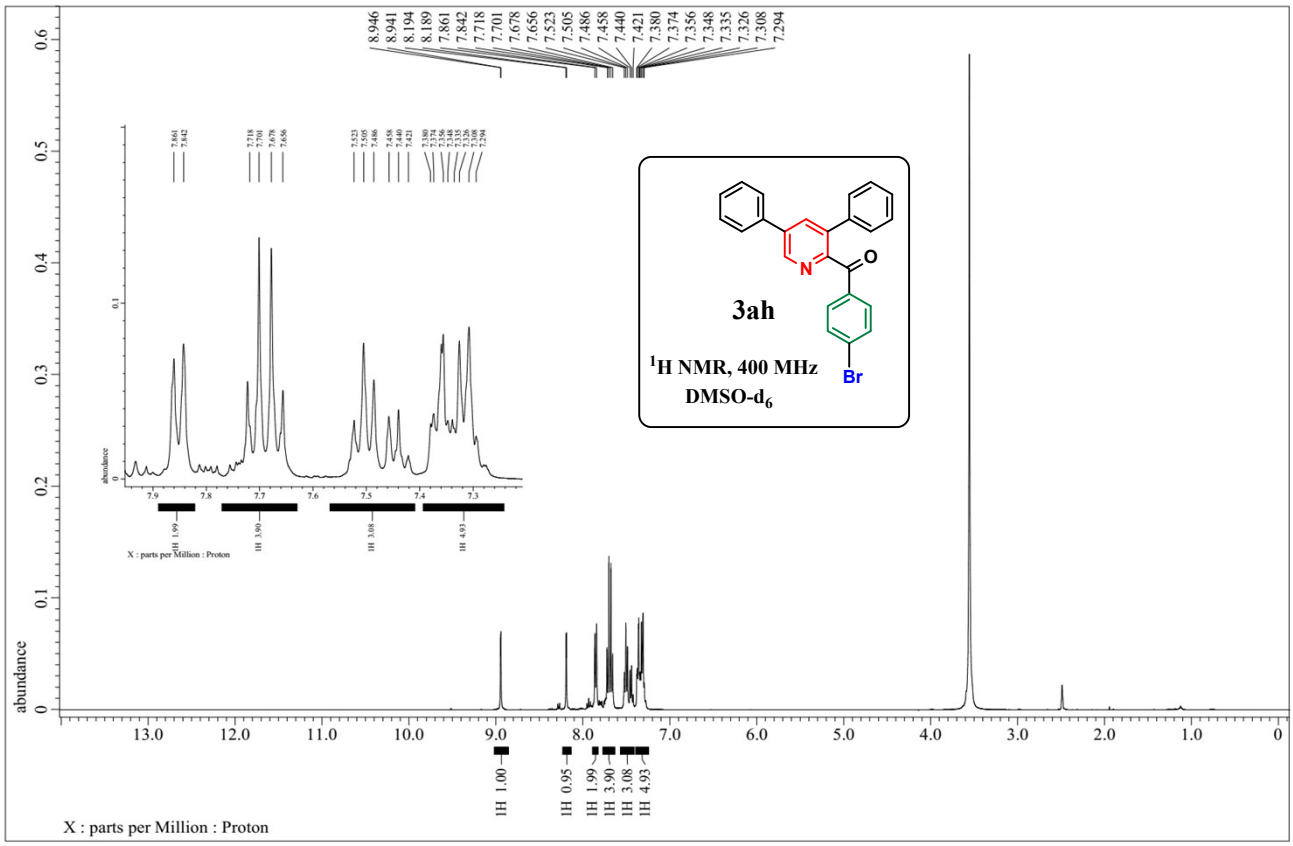
^{1}H-NMR spectrum of compound 3ag



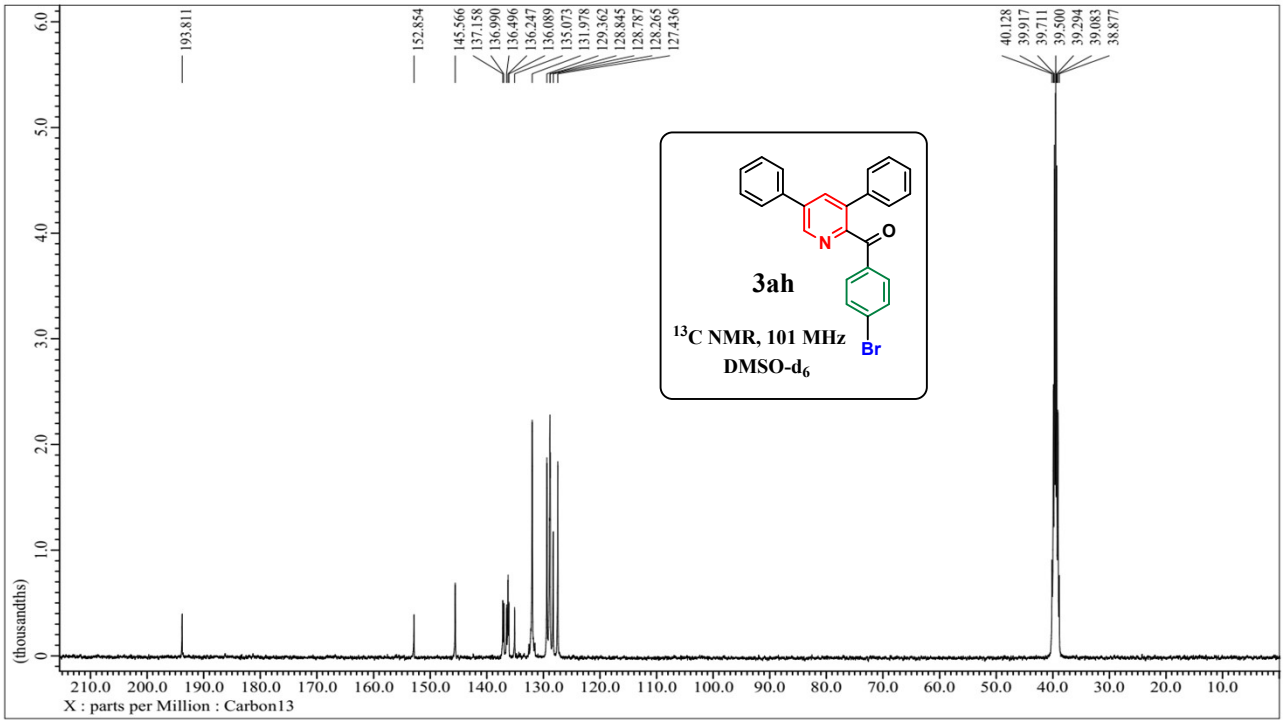
^{13}C-NMR spectrum of compound 3ag



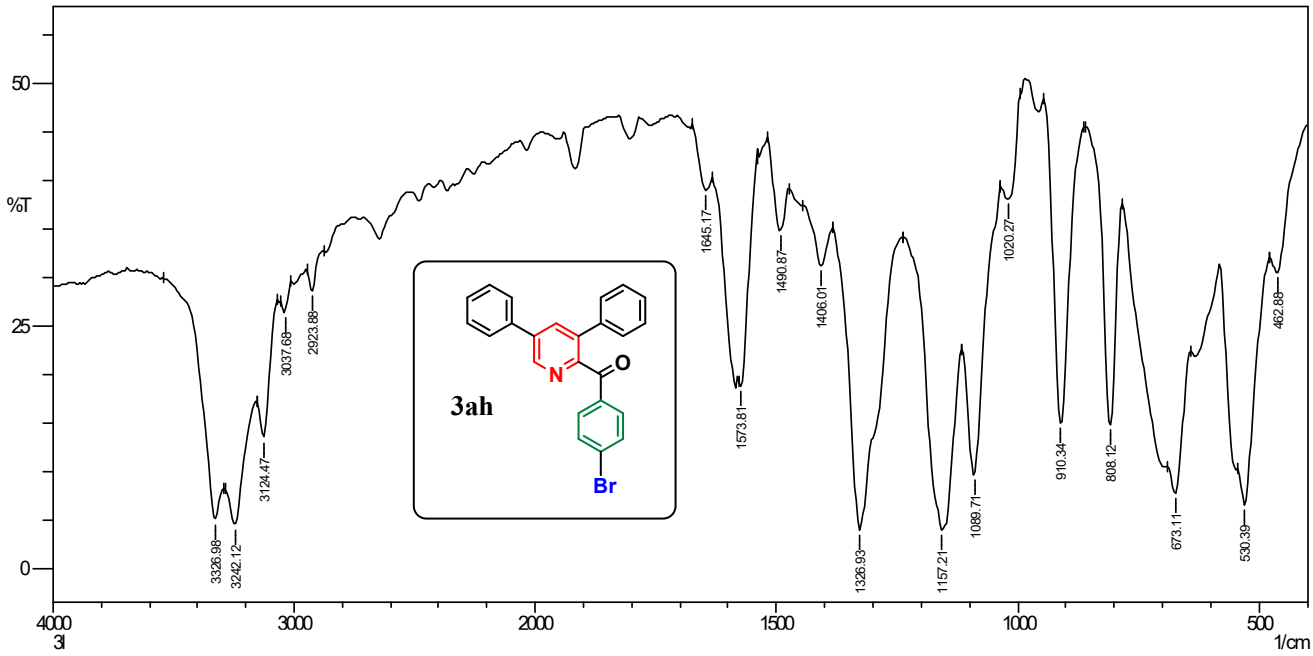
FT-IR spectrum of compound 3ag



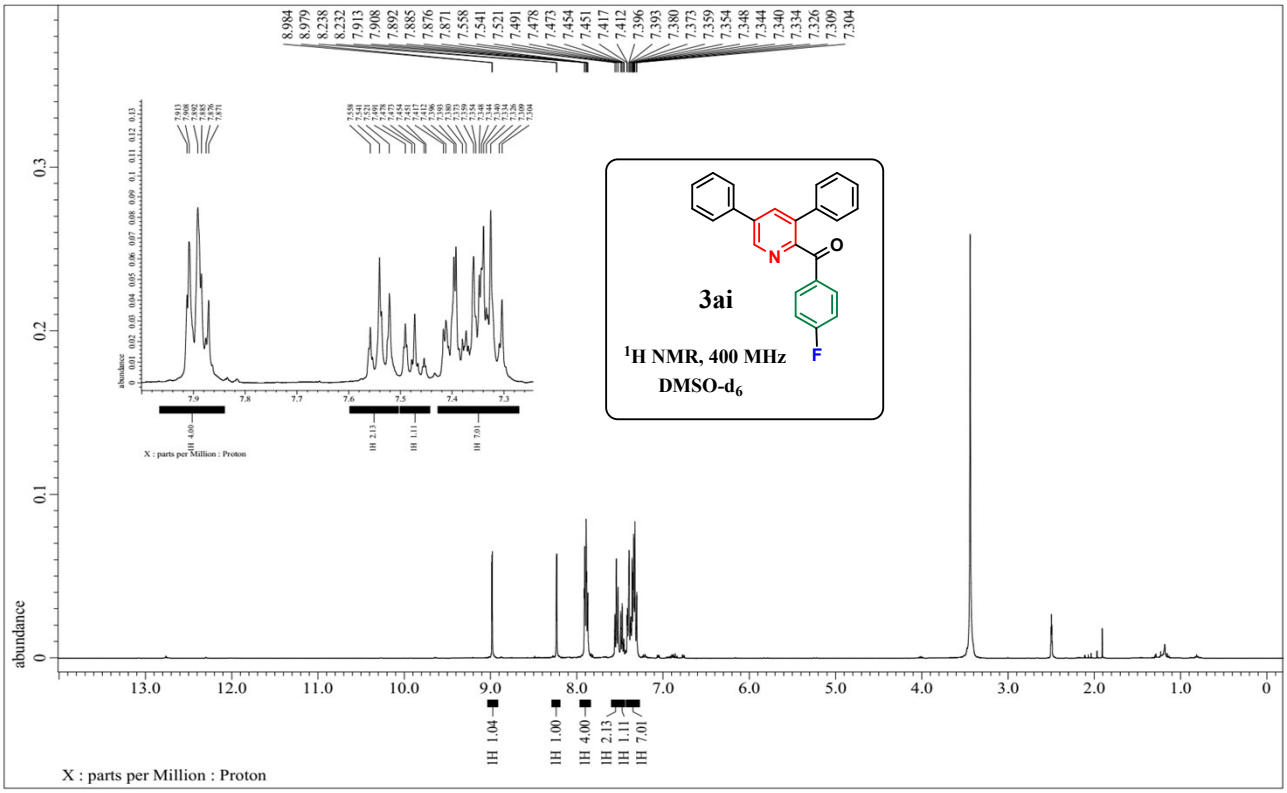
^{1}H-NMR spectrum of compound 3ah



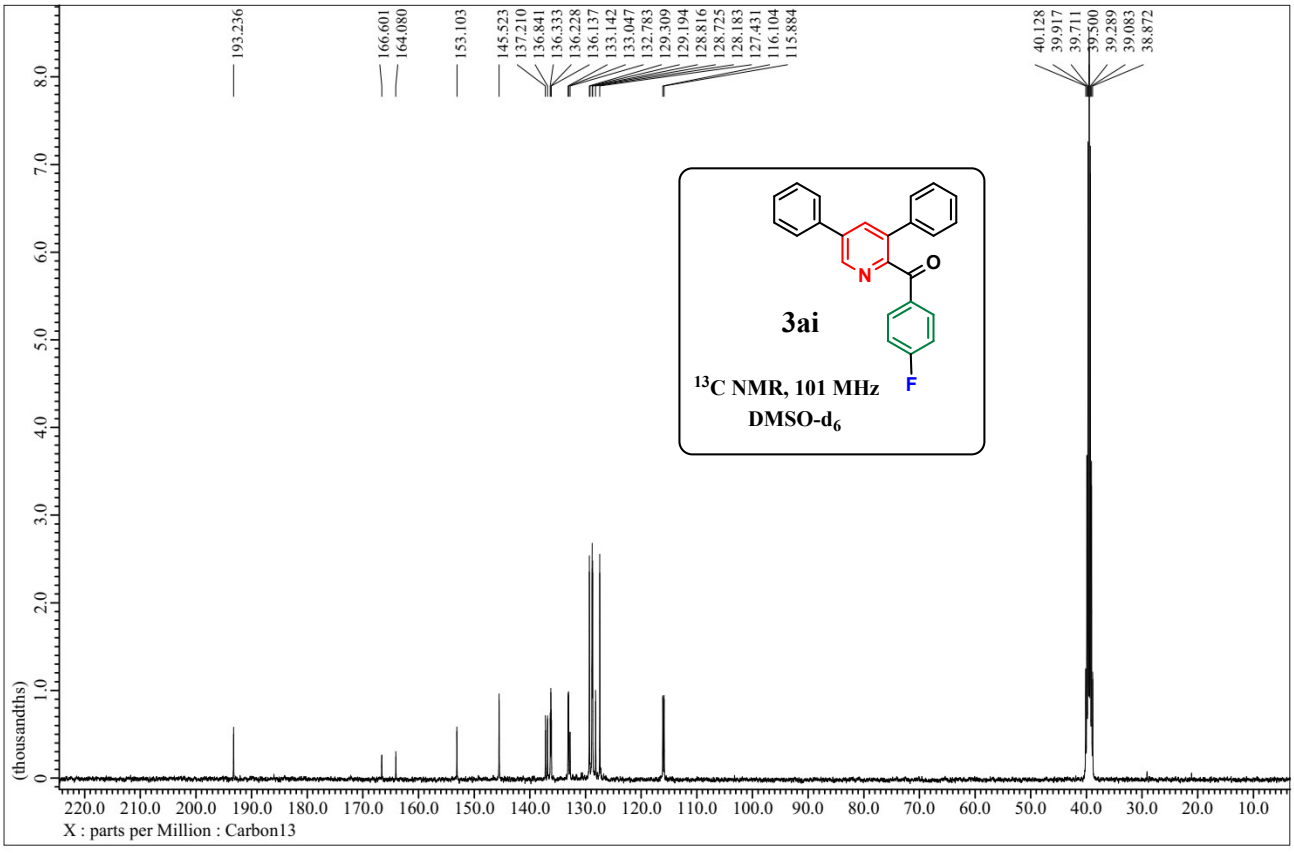
^{13}C-NMR spectrum of compound 3ah



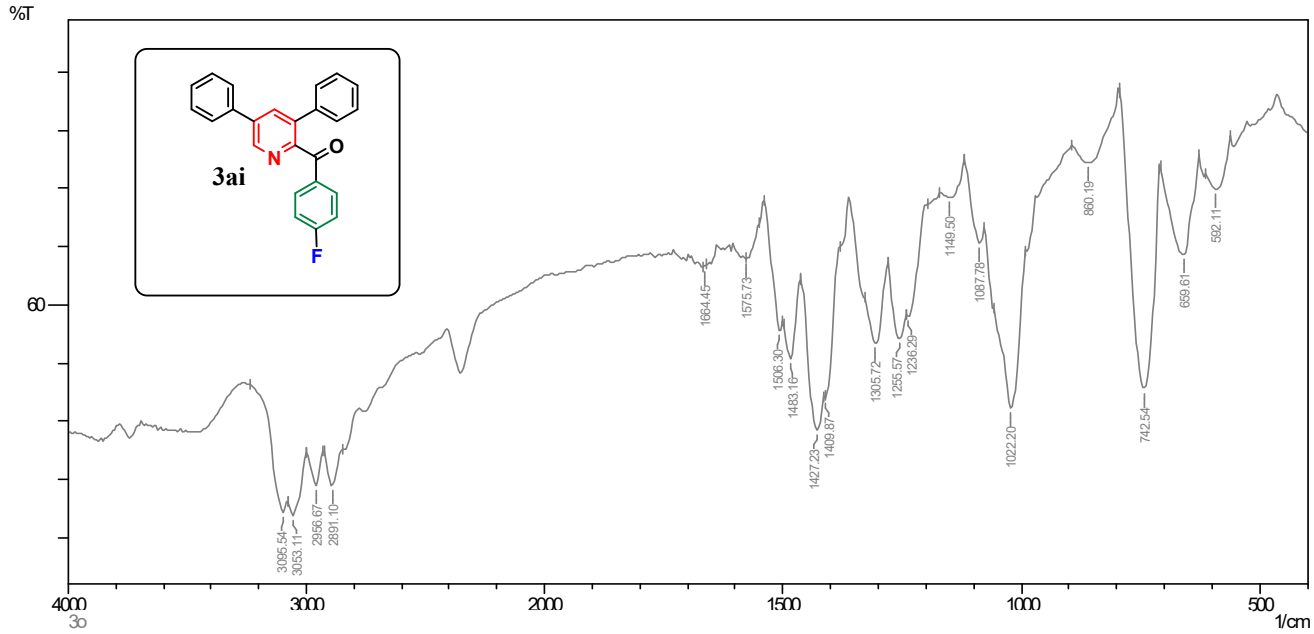
FT-IR spectrum of compound 3ah



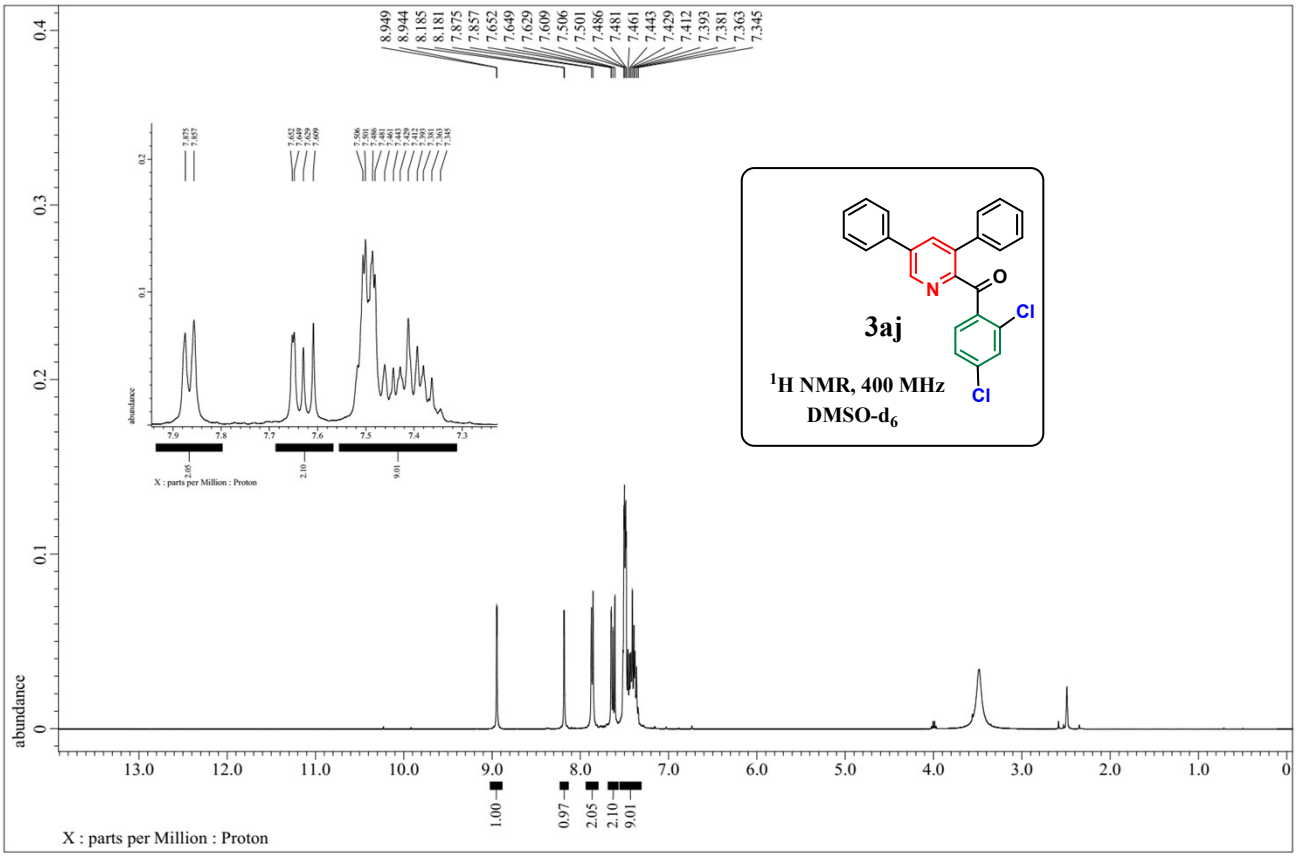
^{1}H-NMR spectrum of compound 3ai



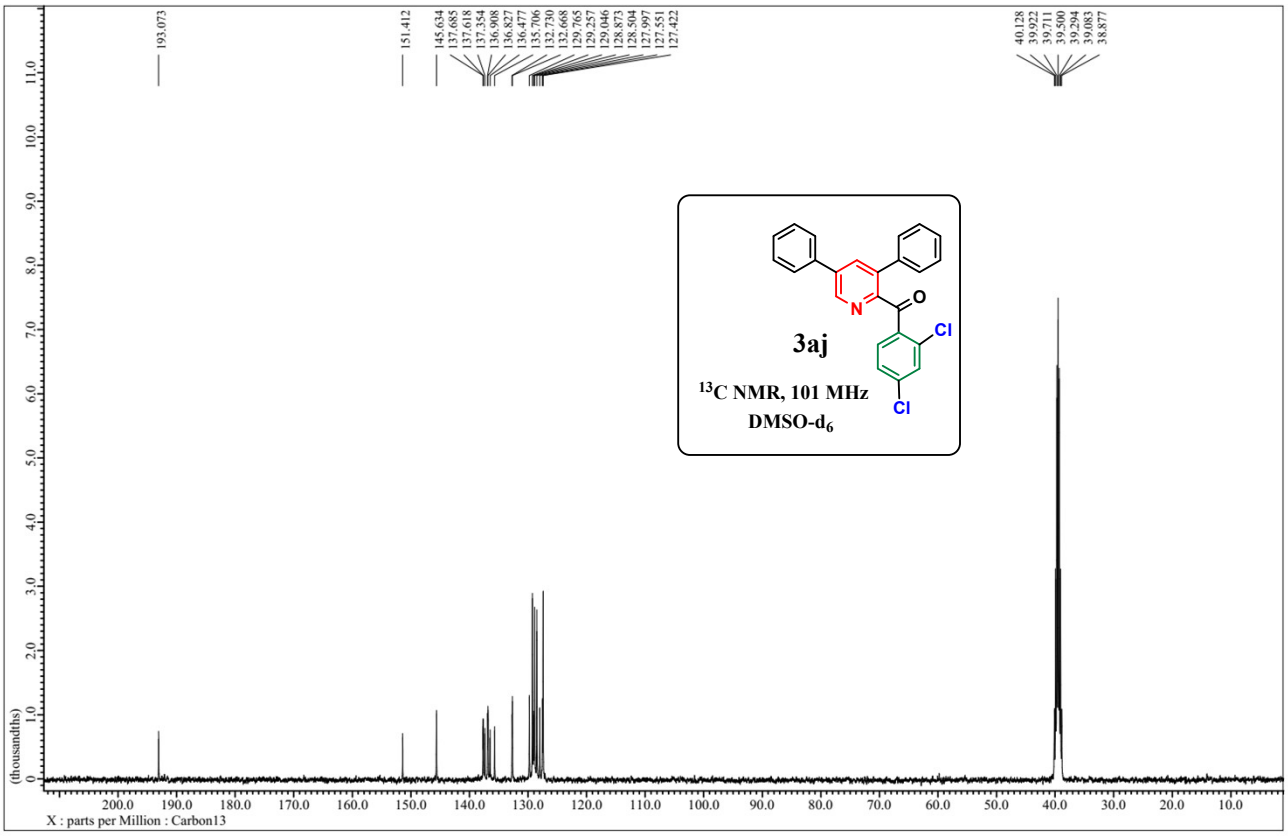
^{13}C-NMR spectrum of compound 3ai



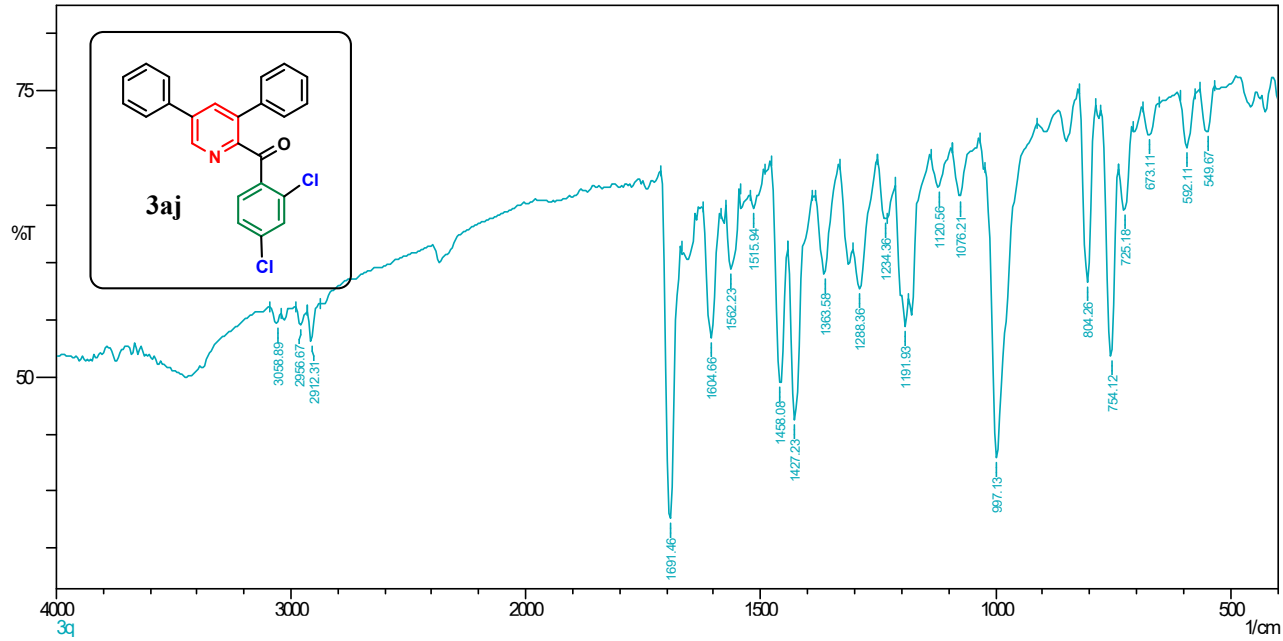
FT-IR spectrum of compound 3ai



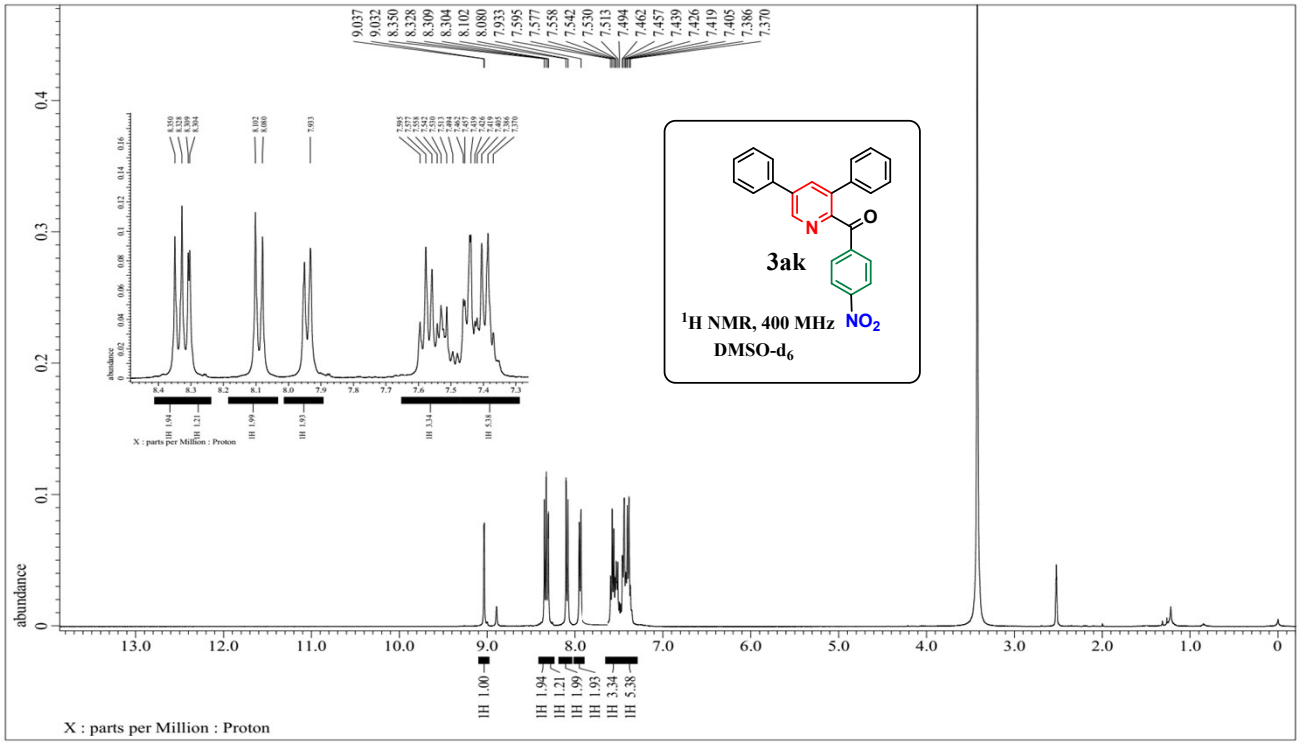
^{1}H-NMR spectrum of compound 3aj



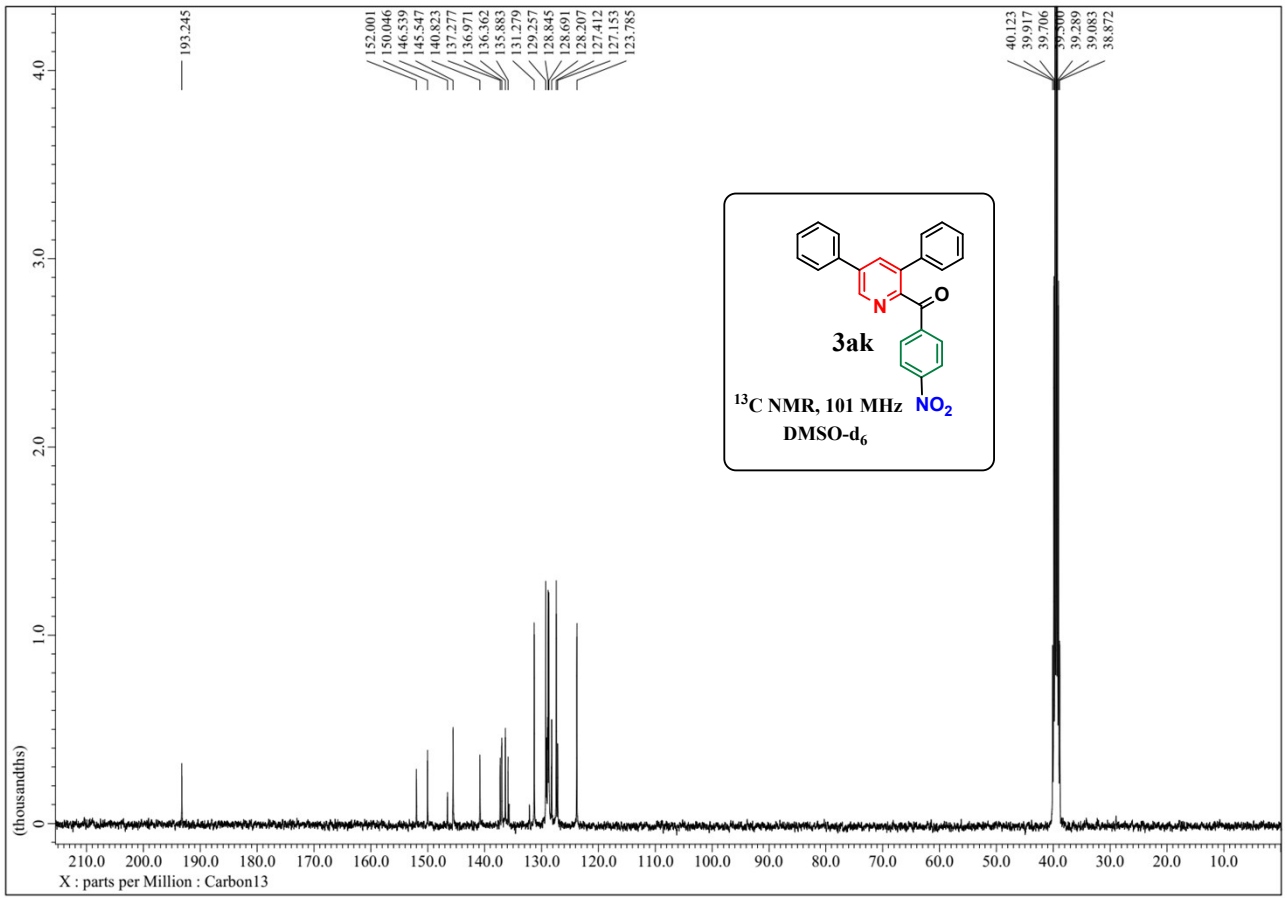
^{13}C-NMR spectrum of compound 3aj



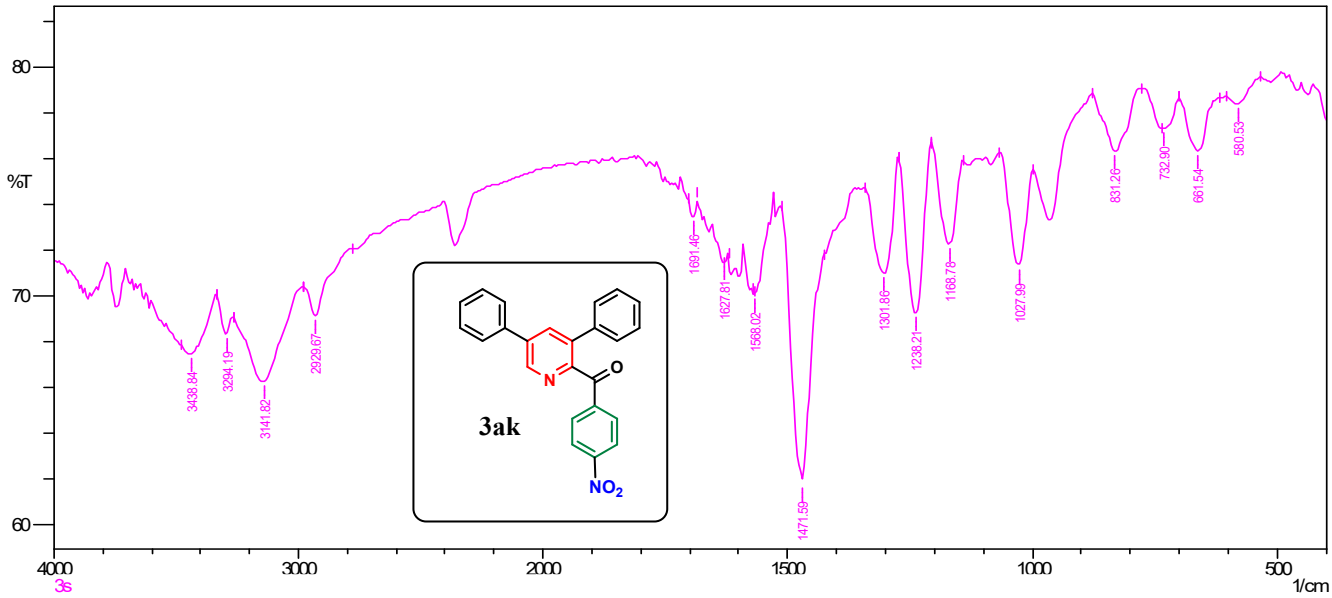
FT-IR spectrum of compound 3aj



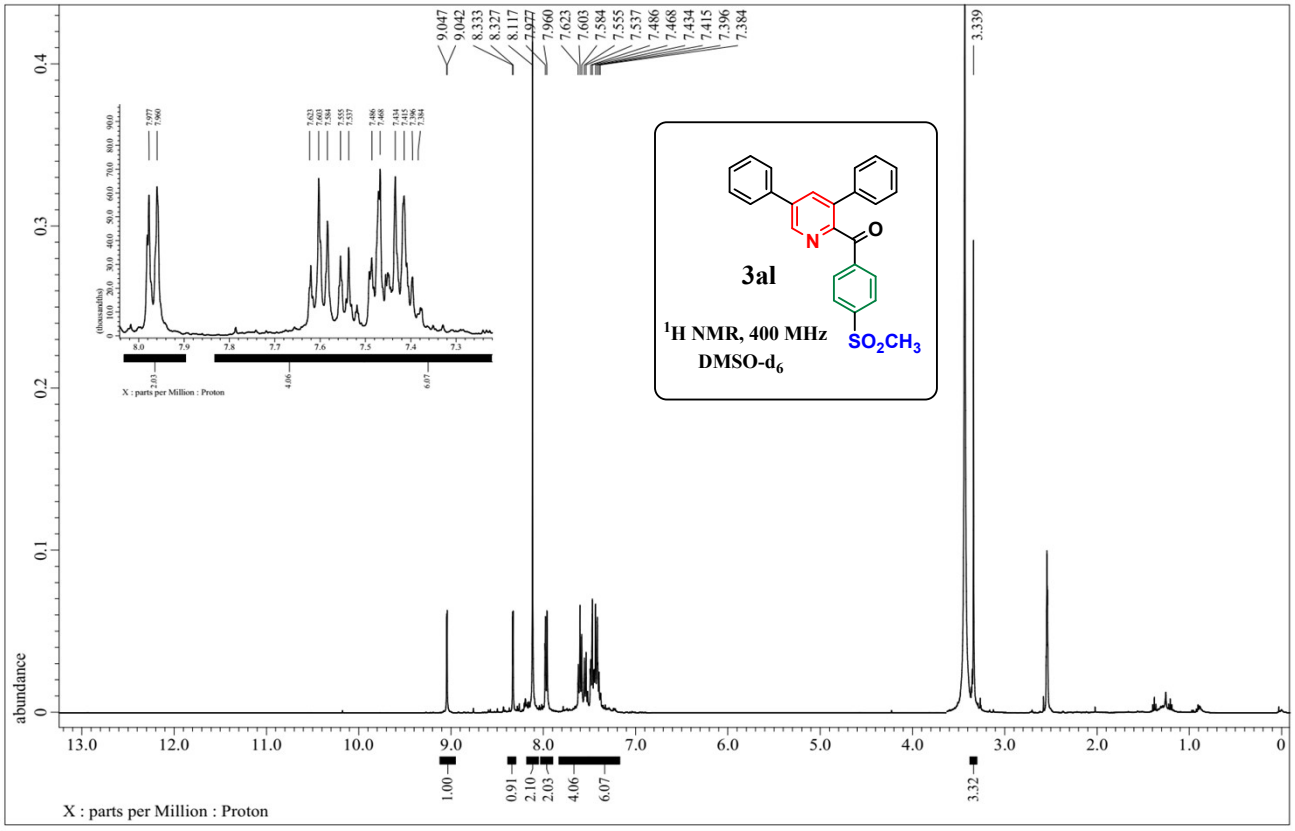
^{1}H-NMR spectrum of compound 3ak



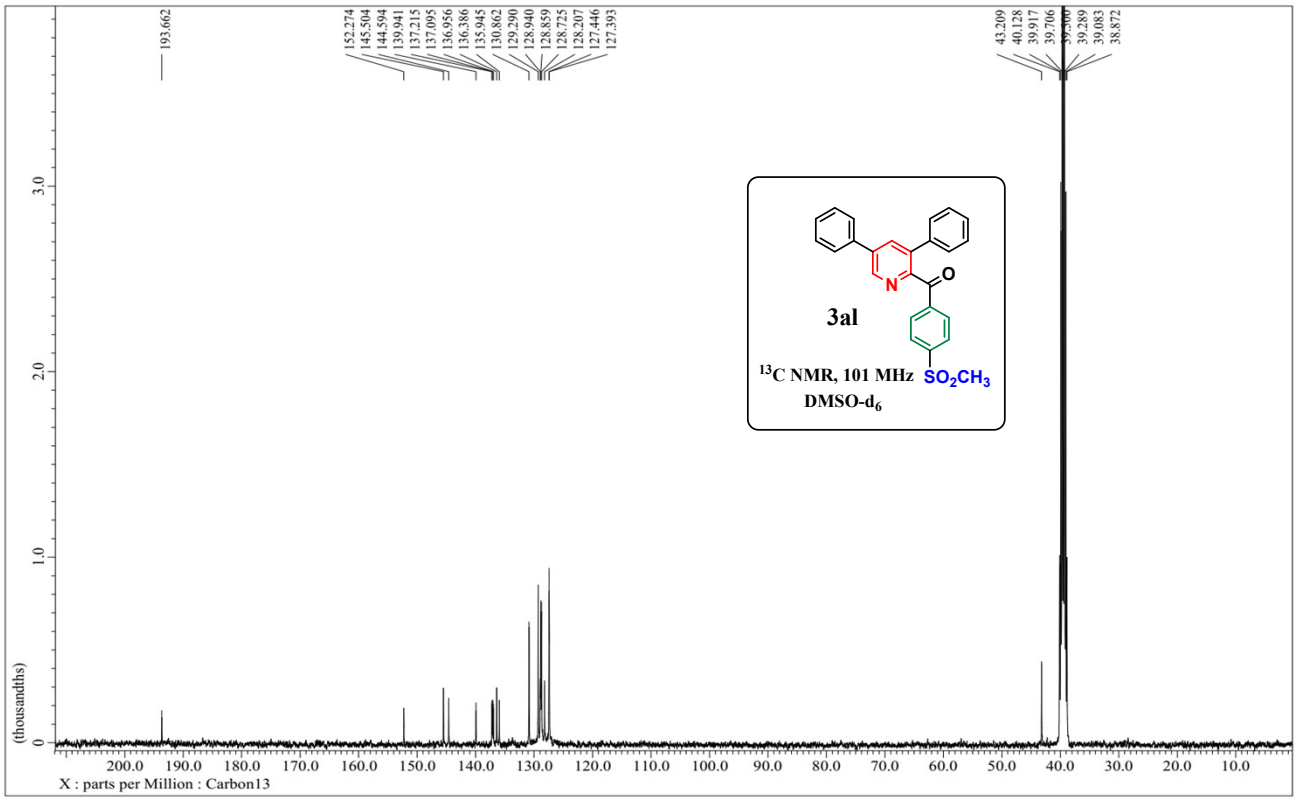
^{13}C-NMR spectrum of compound 3ak



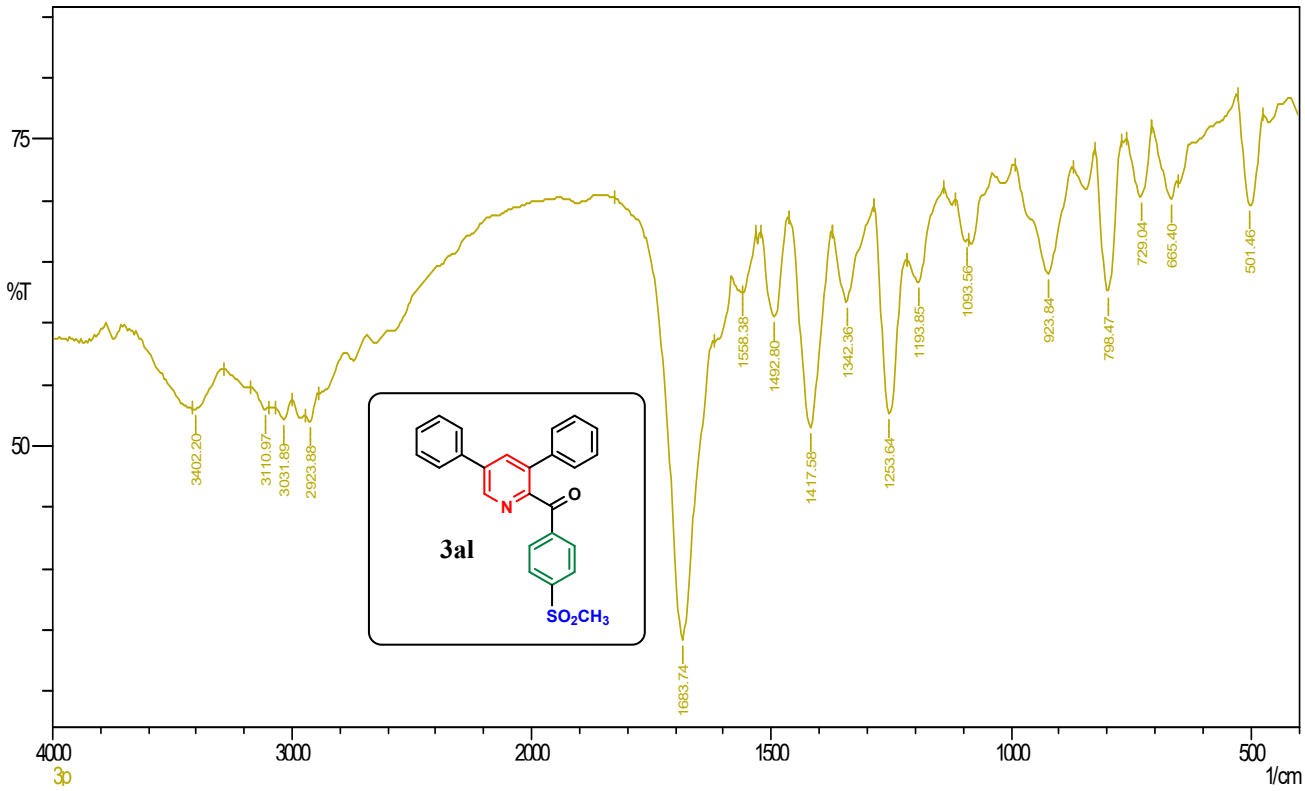
FT-IR spectrum of compound 3ak



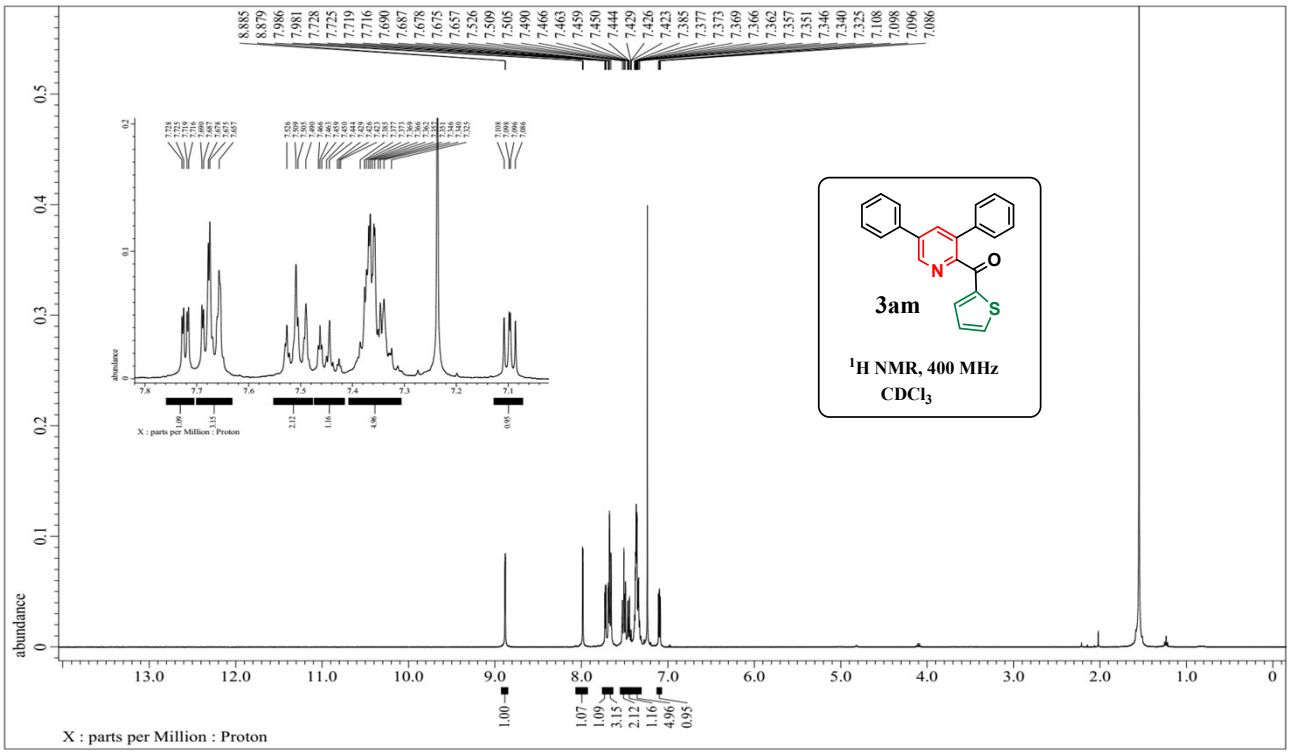
^{1}H-NMR spectrum of compound 3al



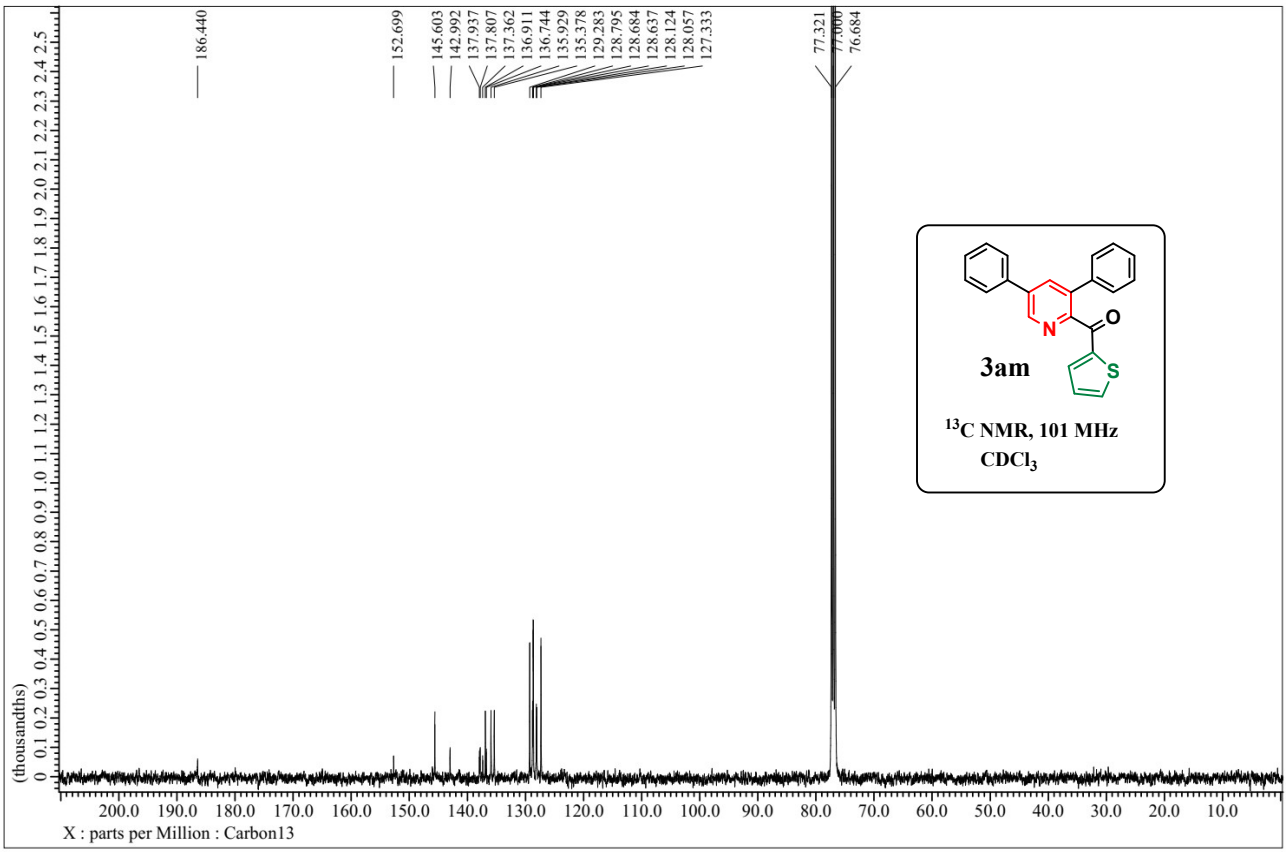
^{13}C-NMR spectrum of compound 3al



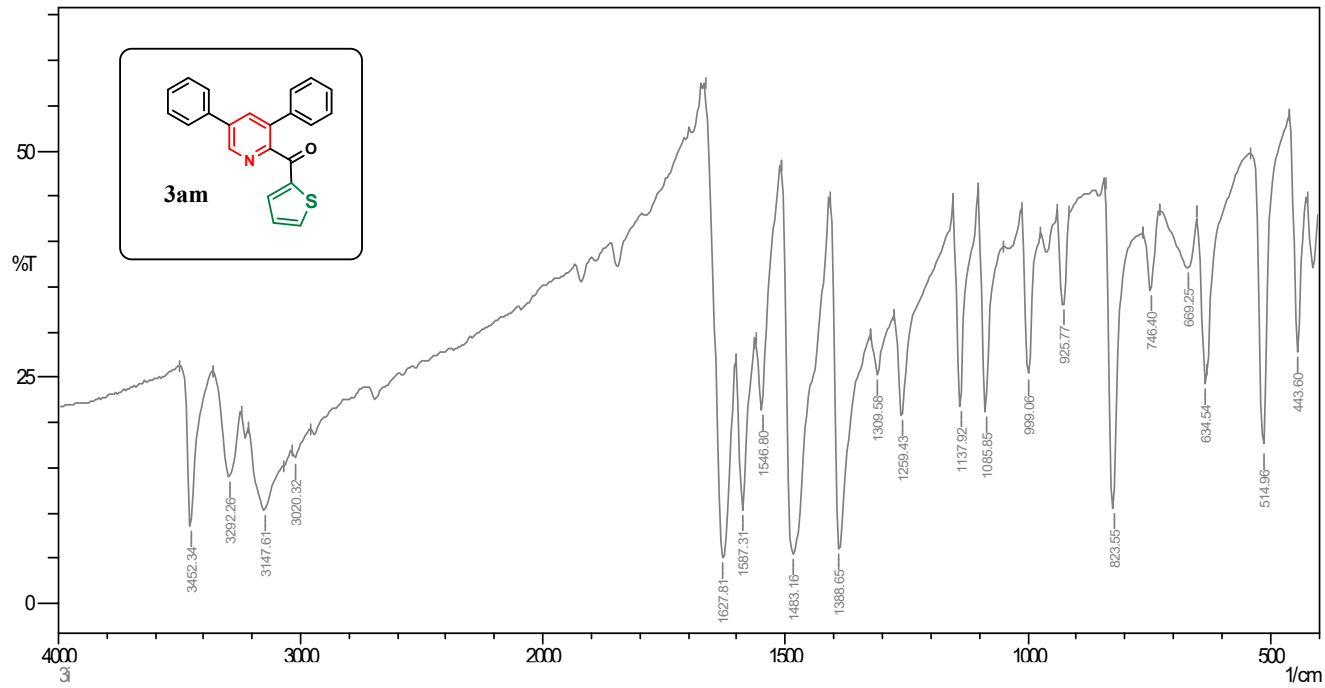
FT-IR spectrum of compound 3al



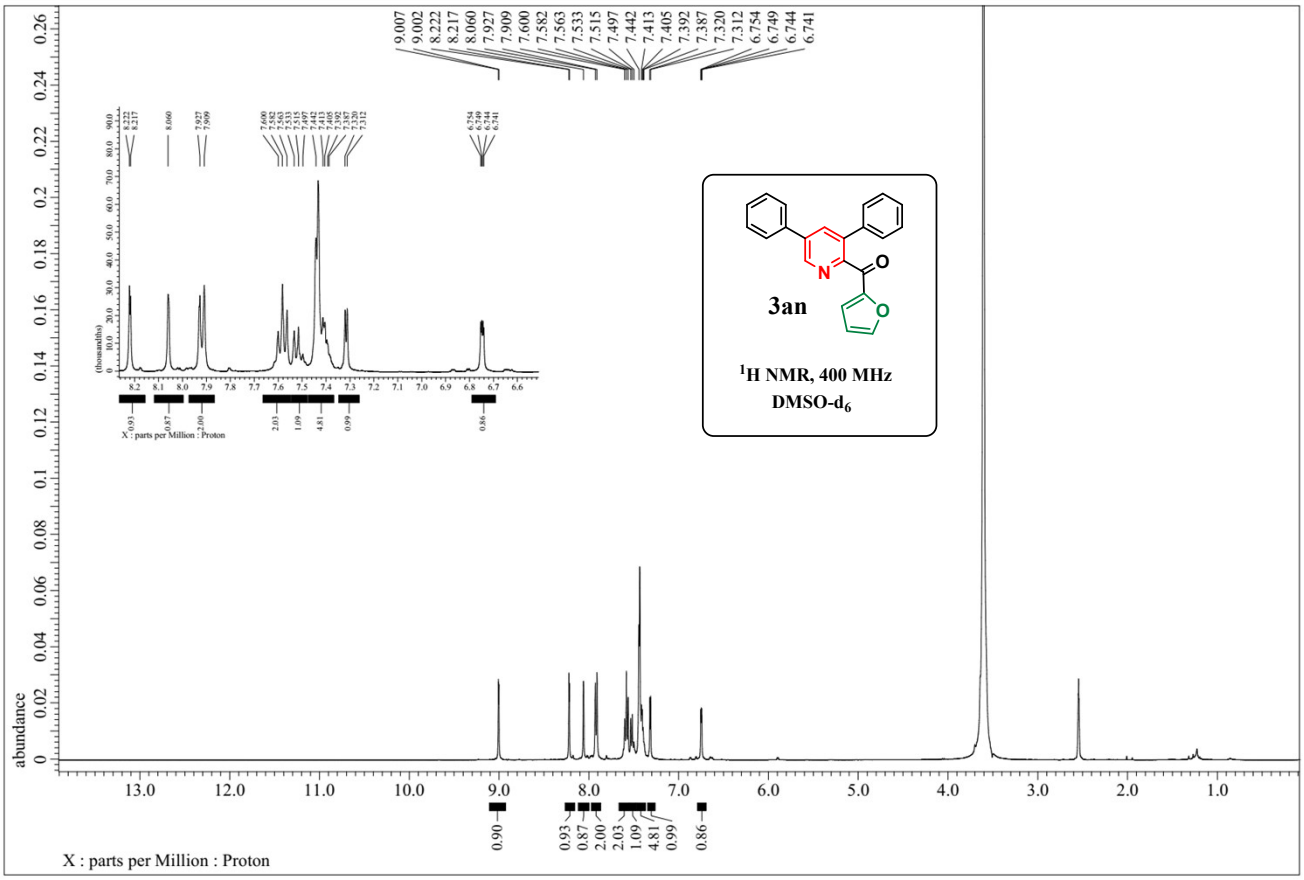
^{1}H-NMR spectrum of compound 3am



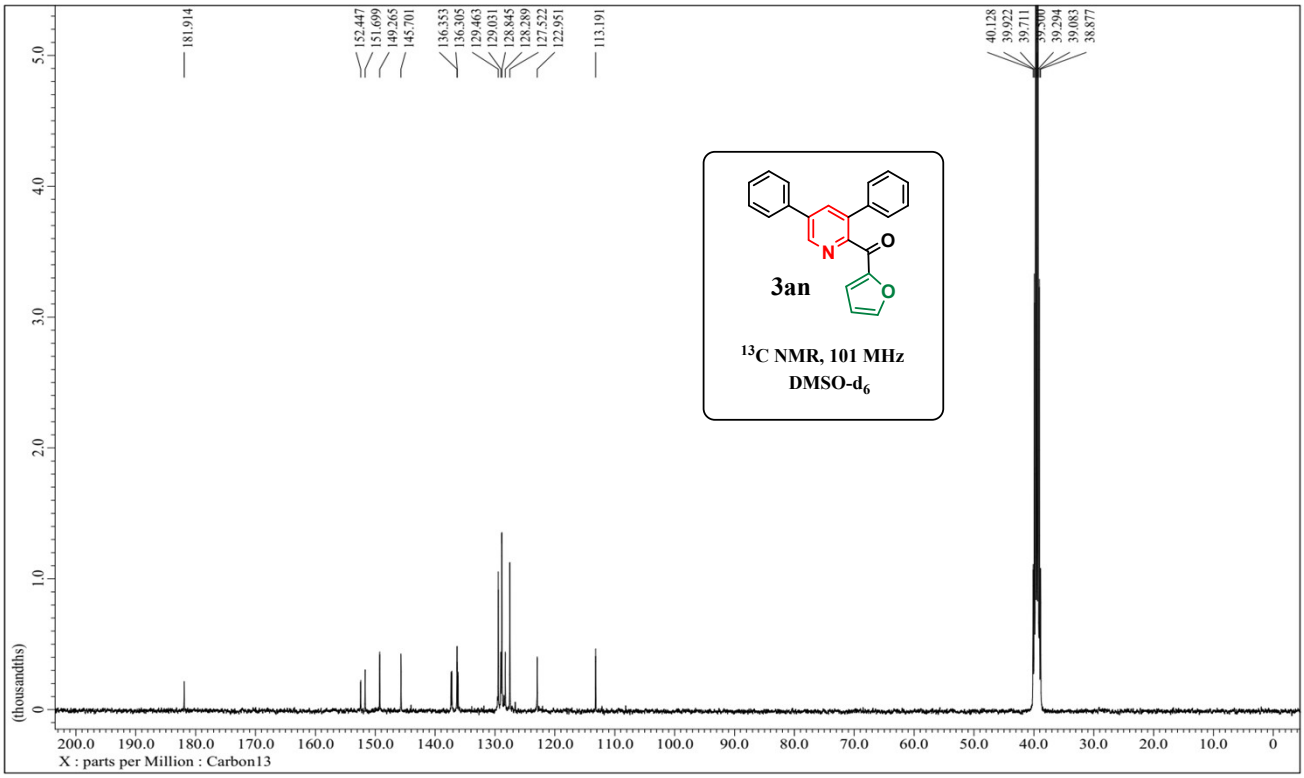
^{13}C-NMR spectrum of compound 3am



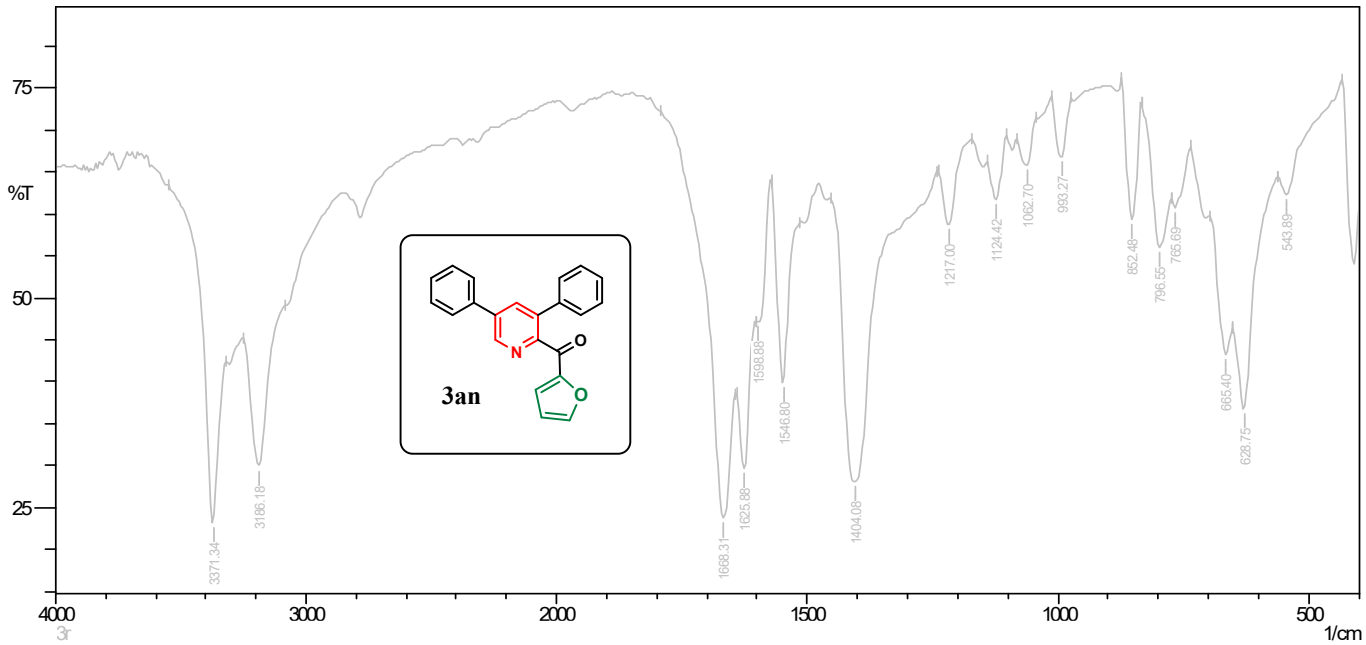
FT-IR spectrum of compound 3am



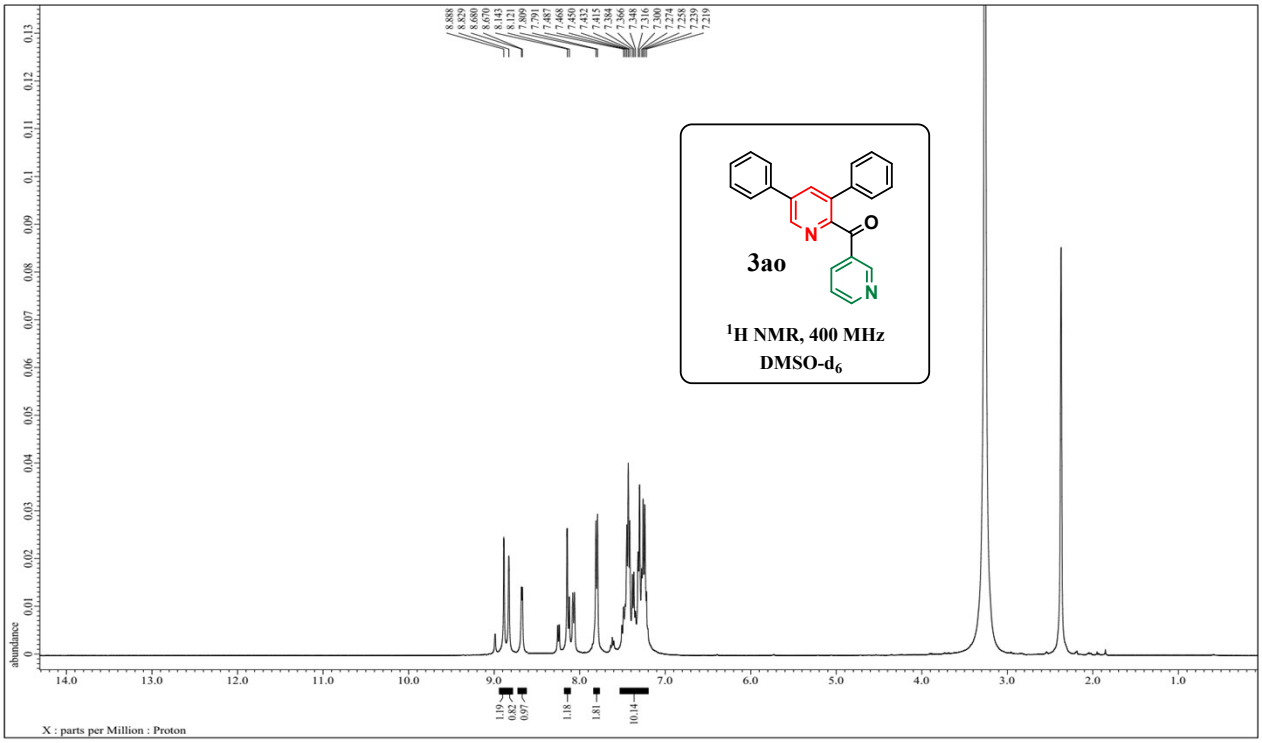
^{1}H-NMR spectrum of compound 3an



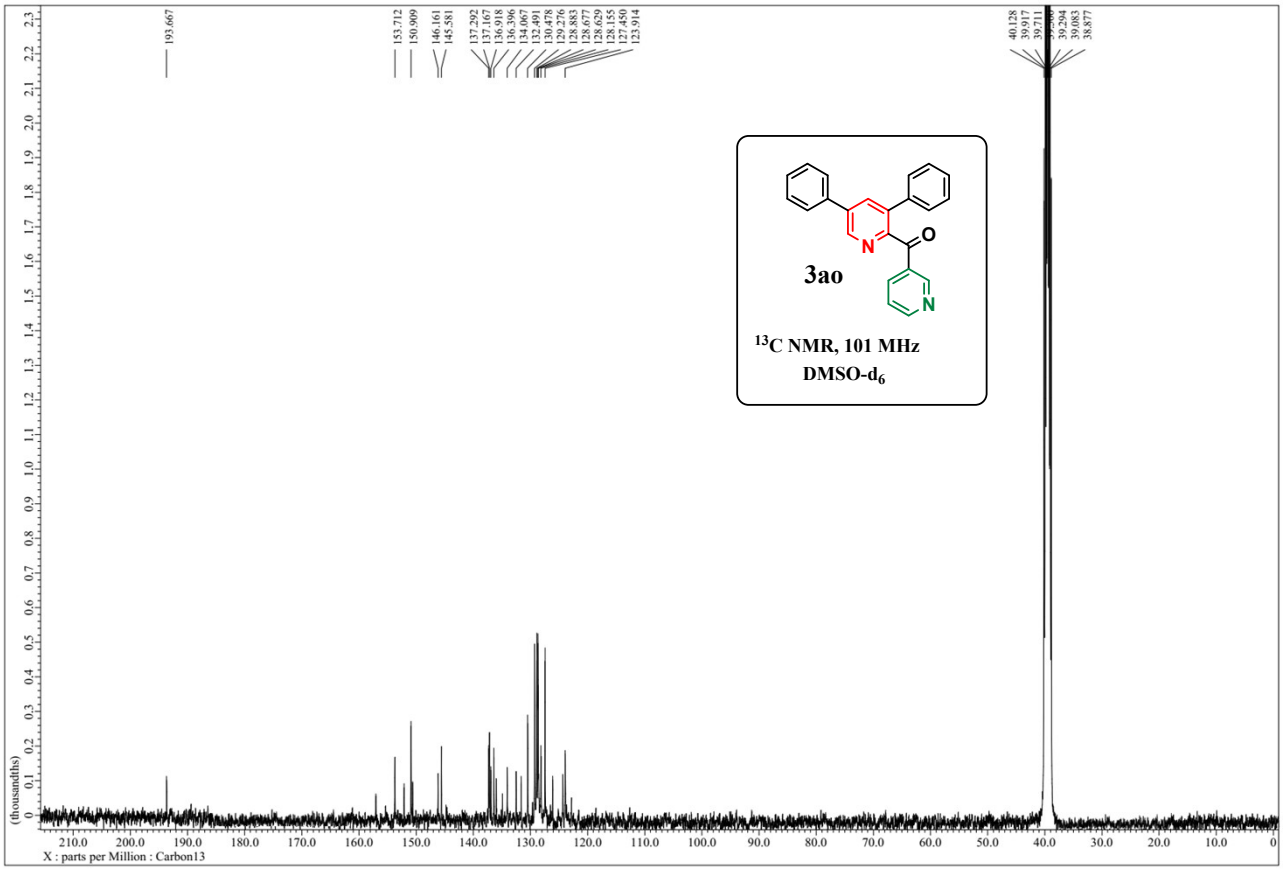
^{13}C-NMR spectrum of compound 3an



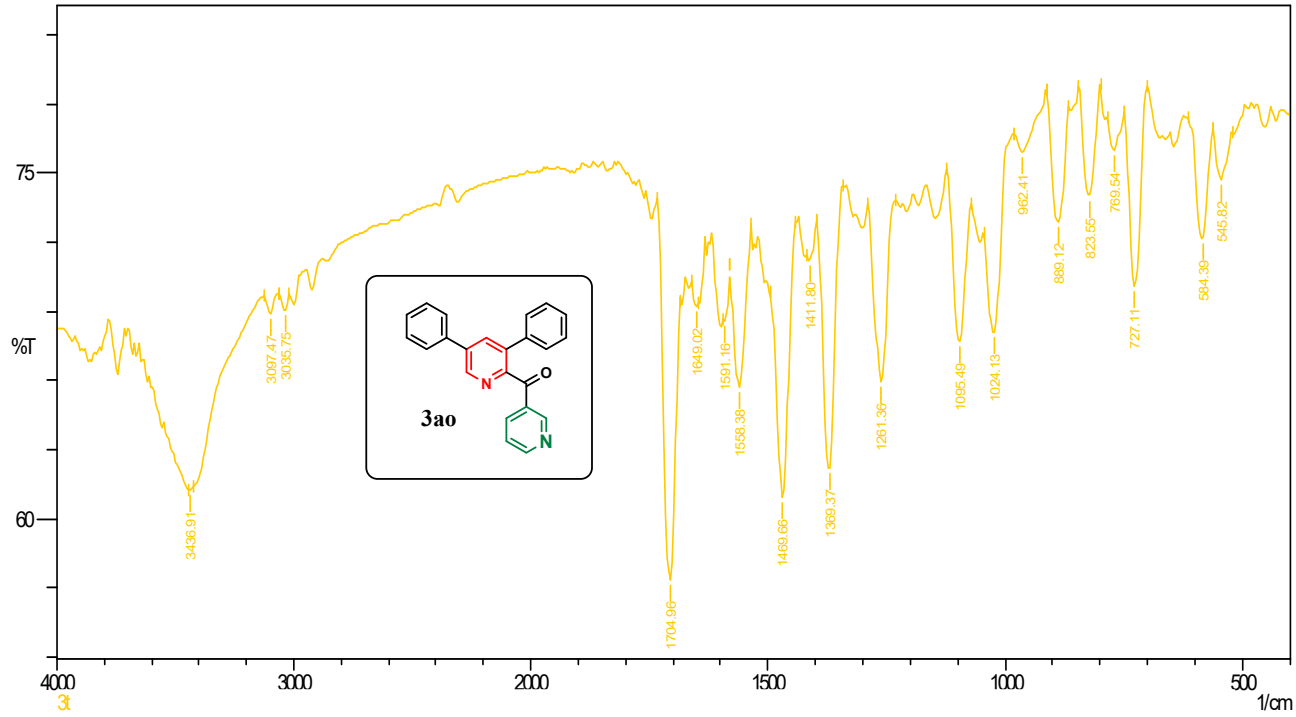
FT-IR spectrum of compound 3an



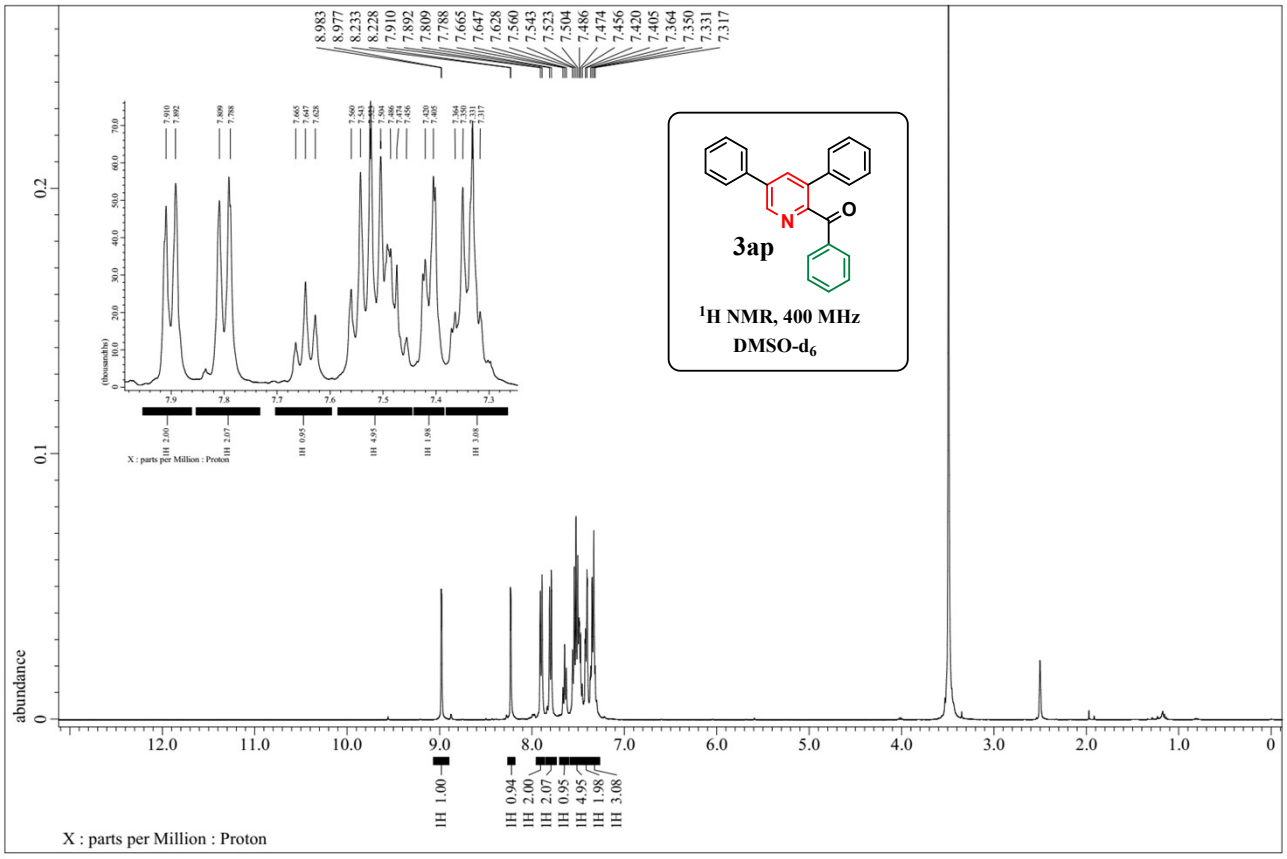
^{1}H-NMR spectrum of compound 3ao



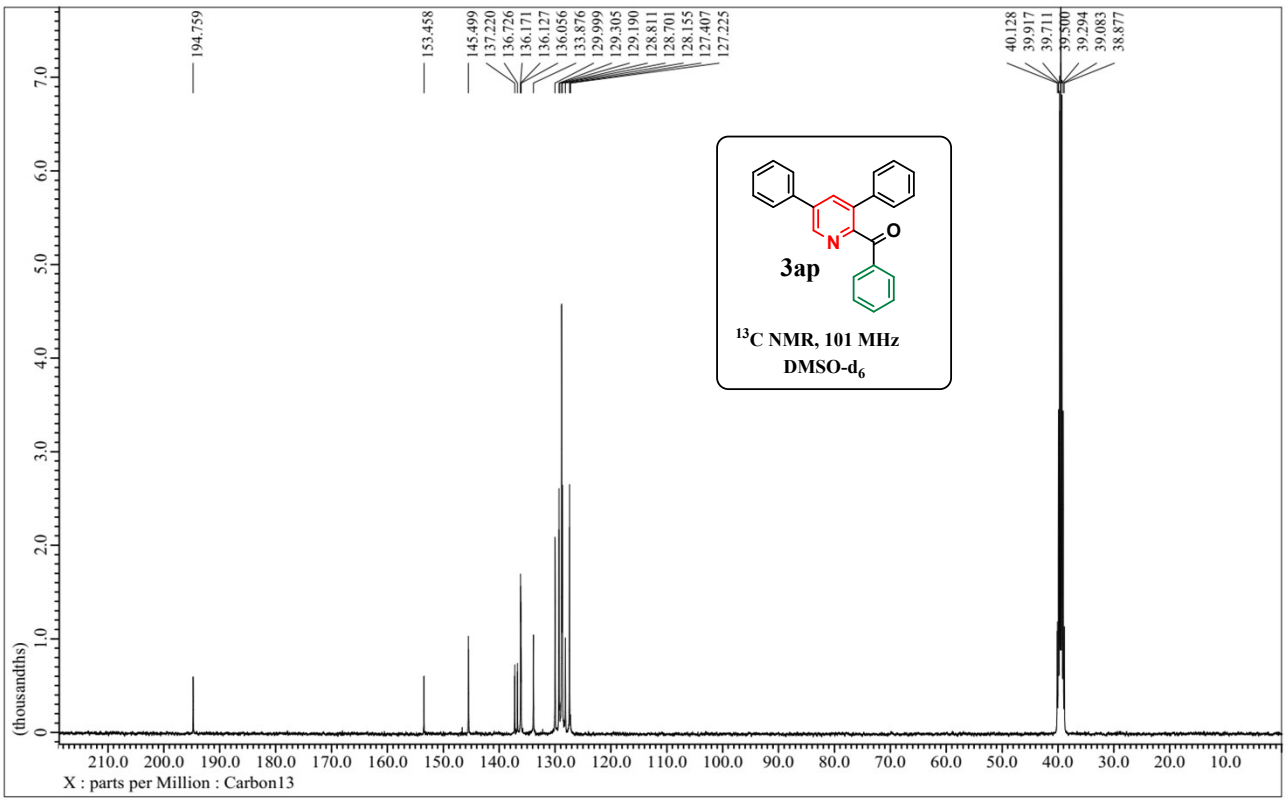
^{13}C-NMR spectrum of compound 3ao



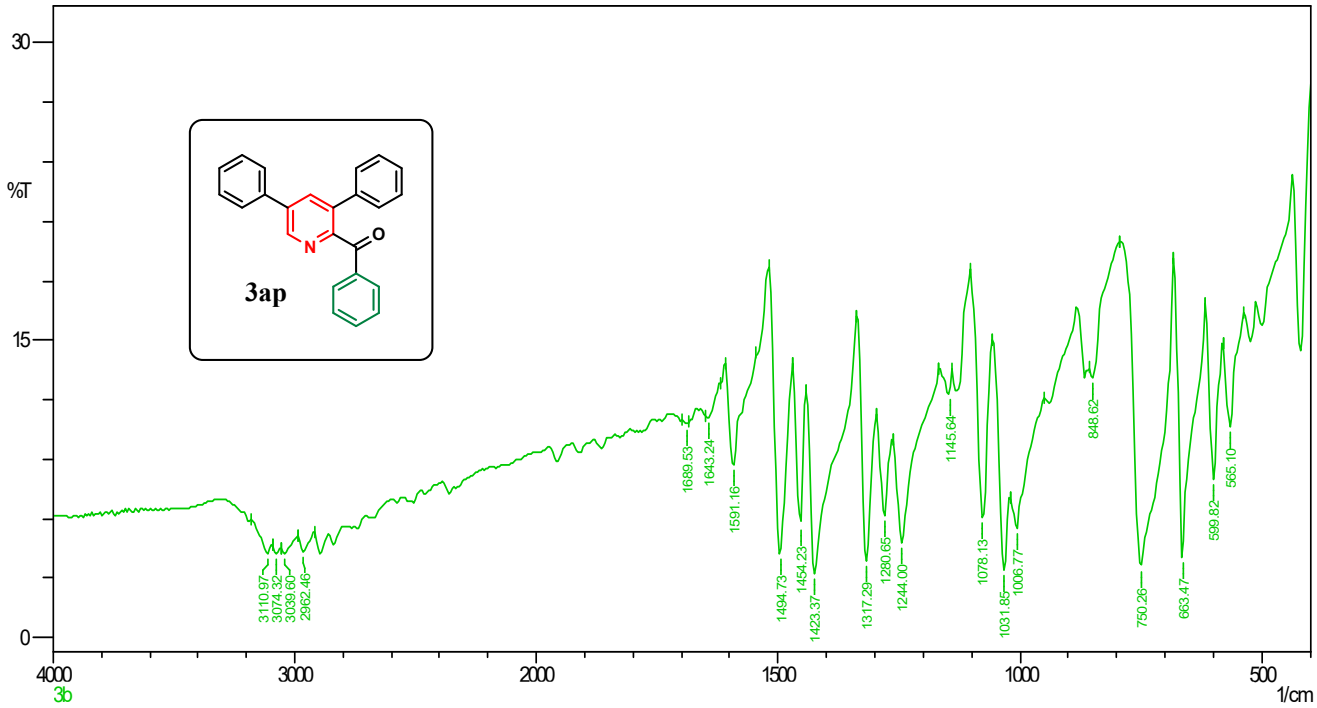
FT-IR spectrum of compound 3ao



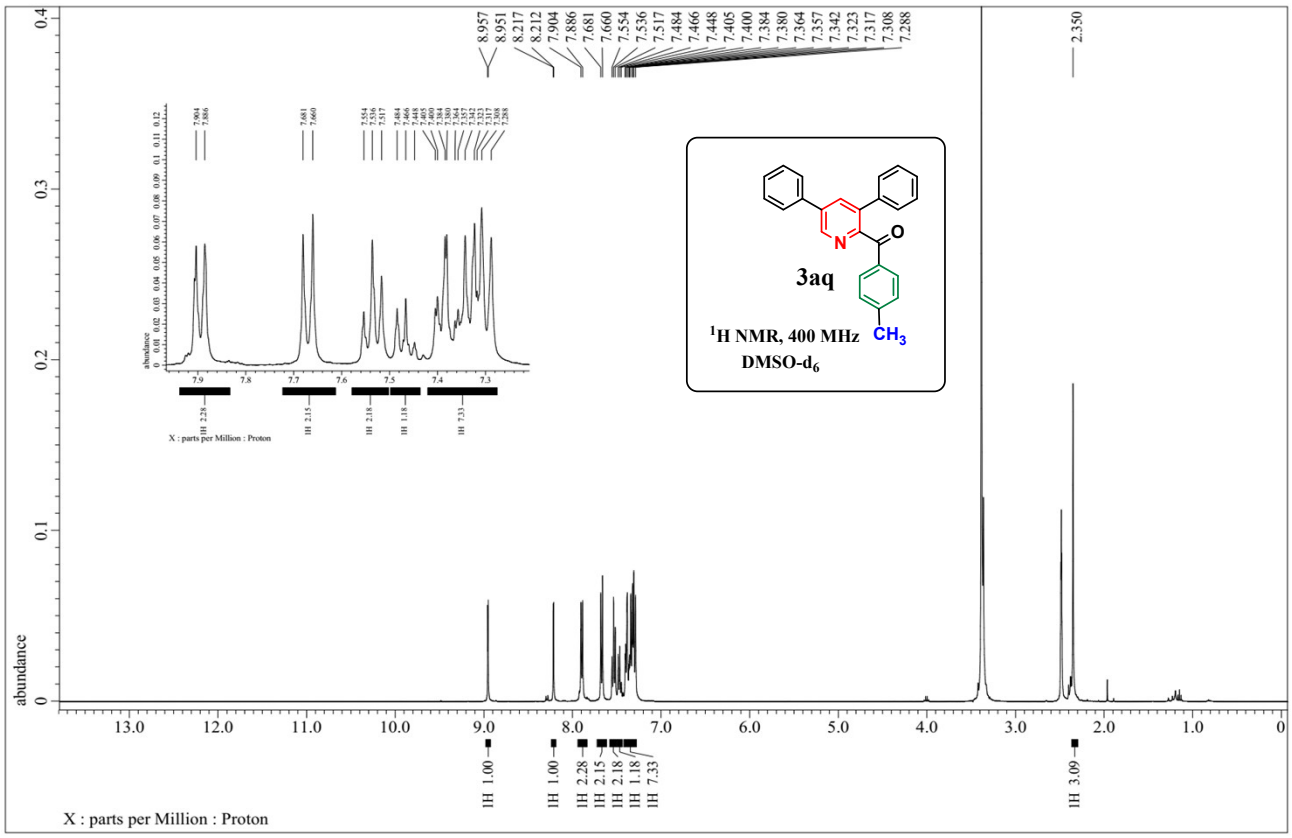
^{1}H-NMR spectrum of compound 3ap



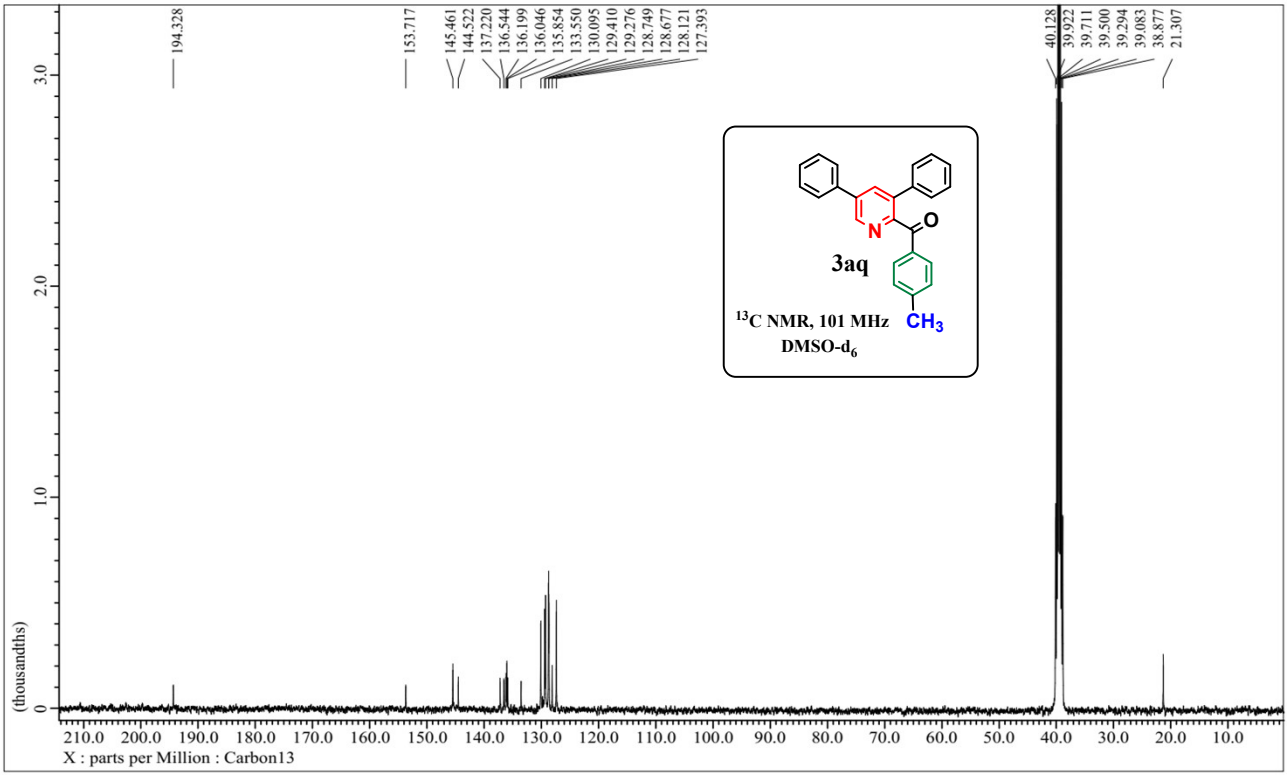
^{13}C-NMR spectrum of compound 3ap



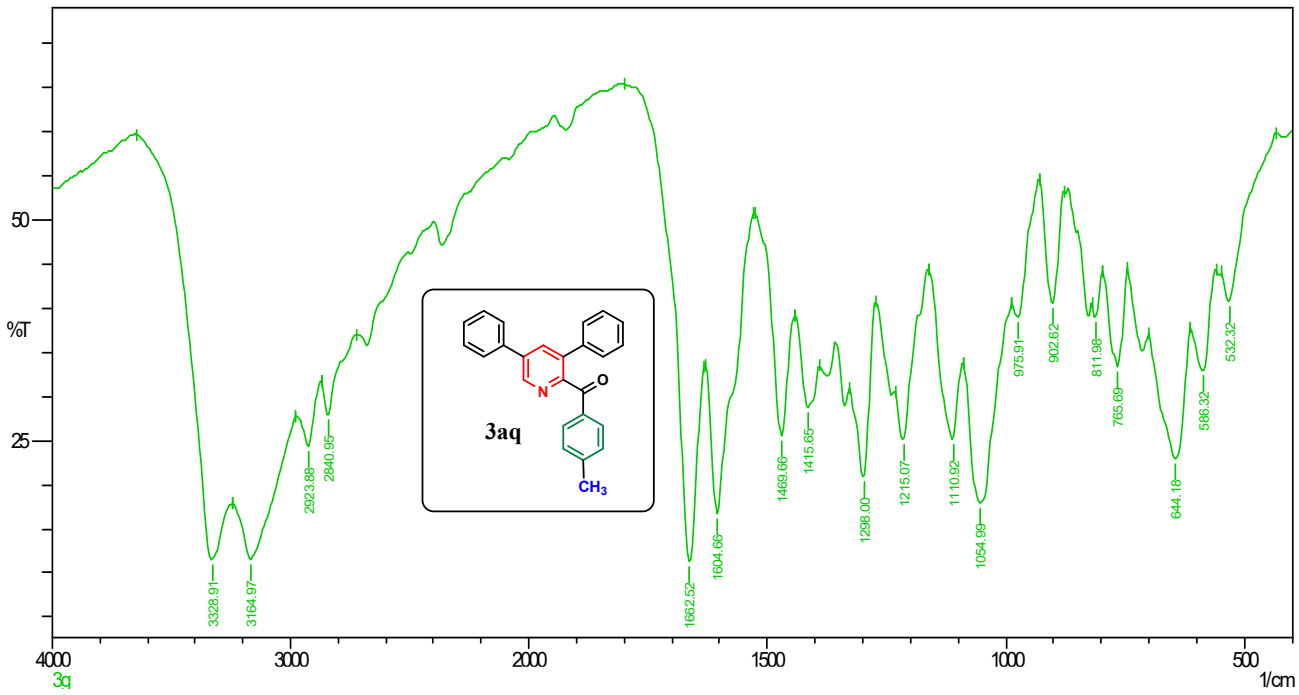
FT-IR spectrum of compound 3ap



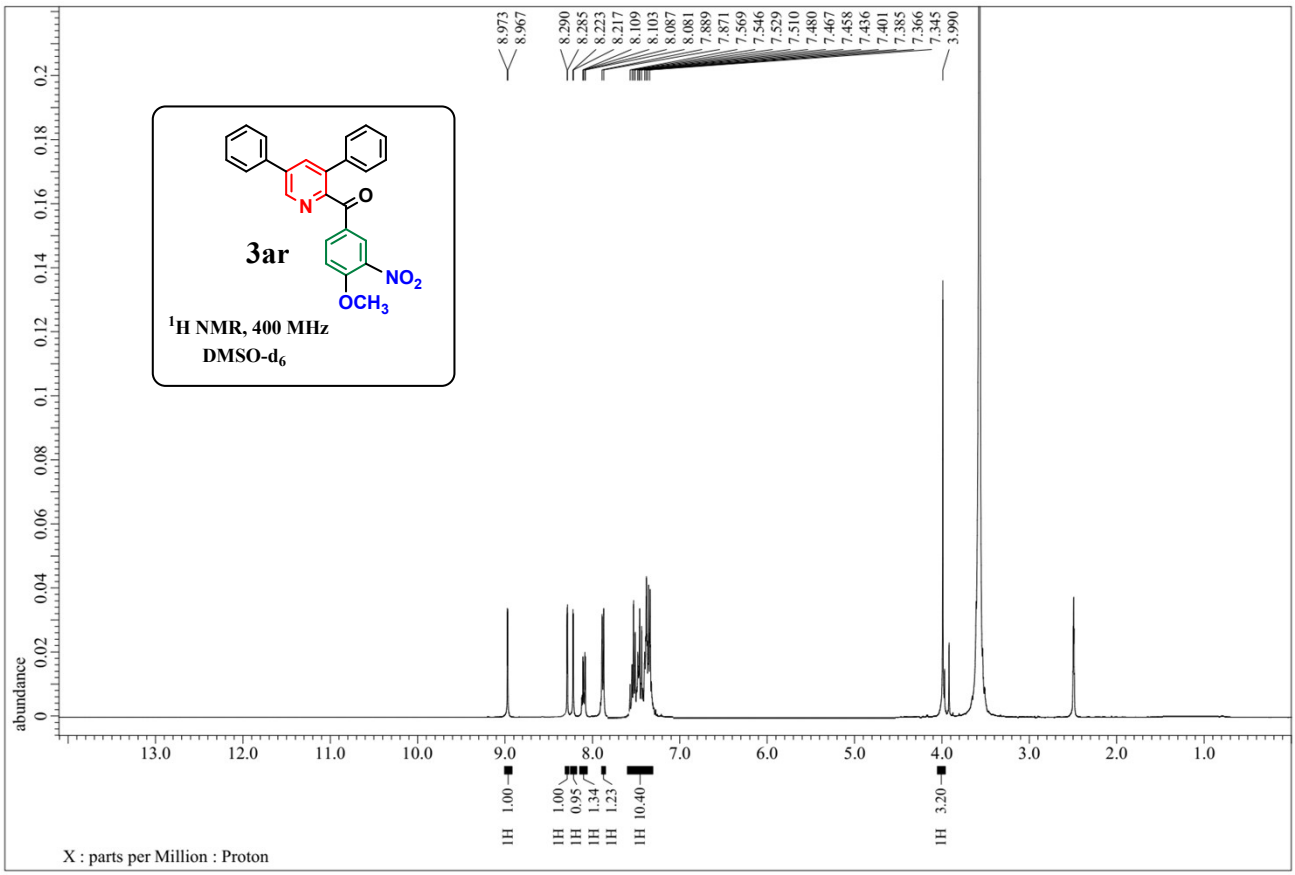
^{1}H-NMR spectrum of compound 3aq



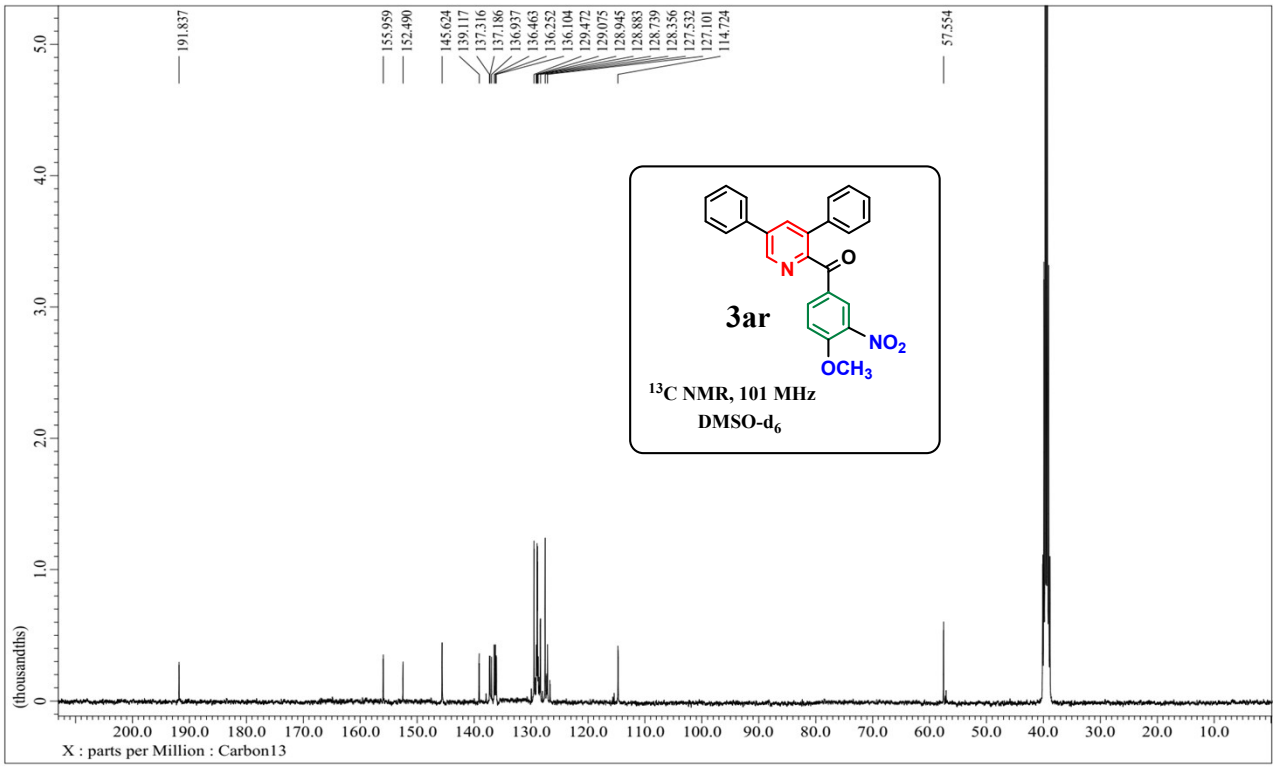
^{13}C-NMR spectrum of compound 3aq



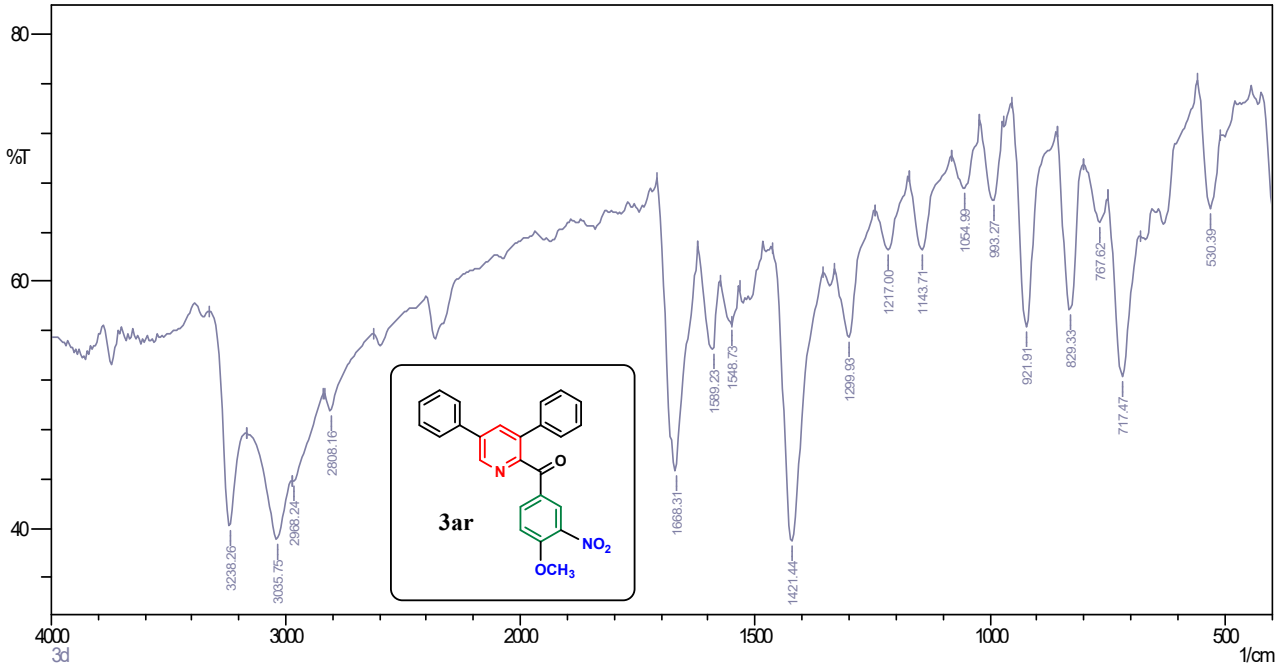
FT-IR spectrum of compound 3aq



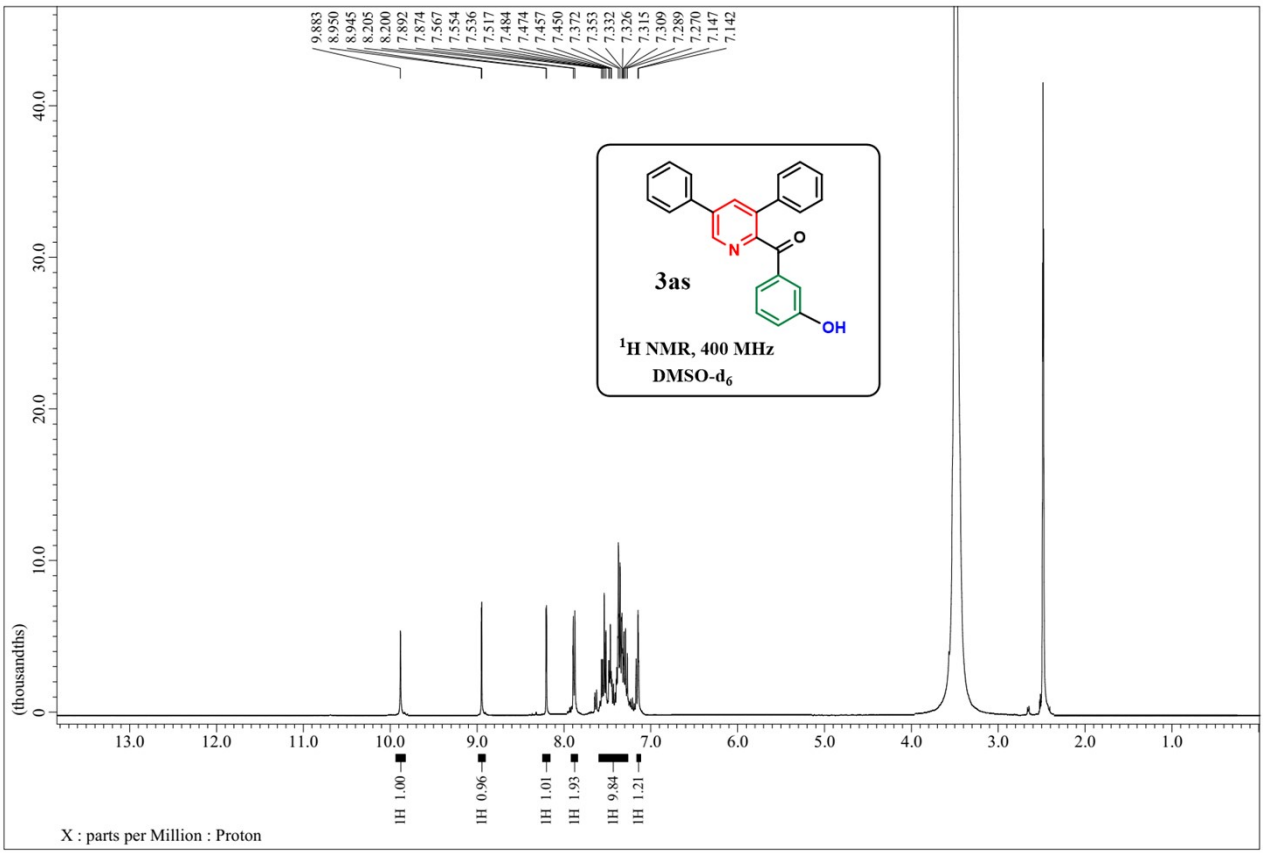
^{1}H-NMR spectrum of compound 3ar



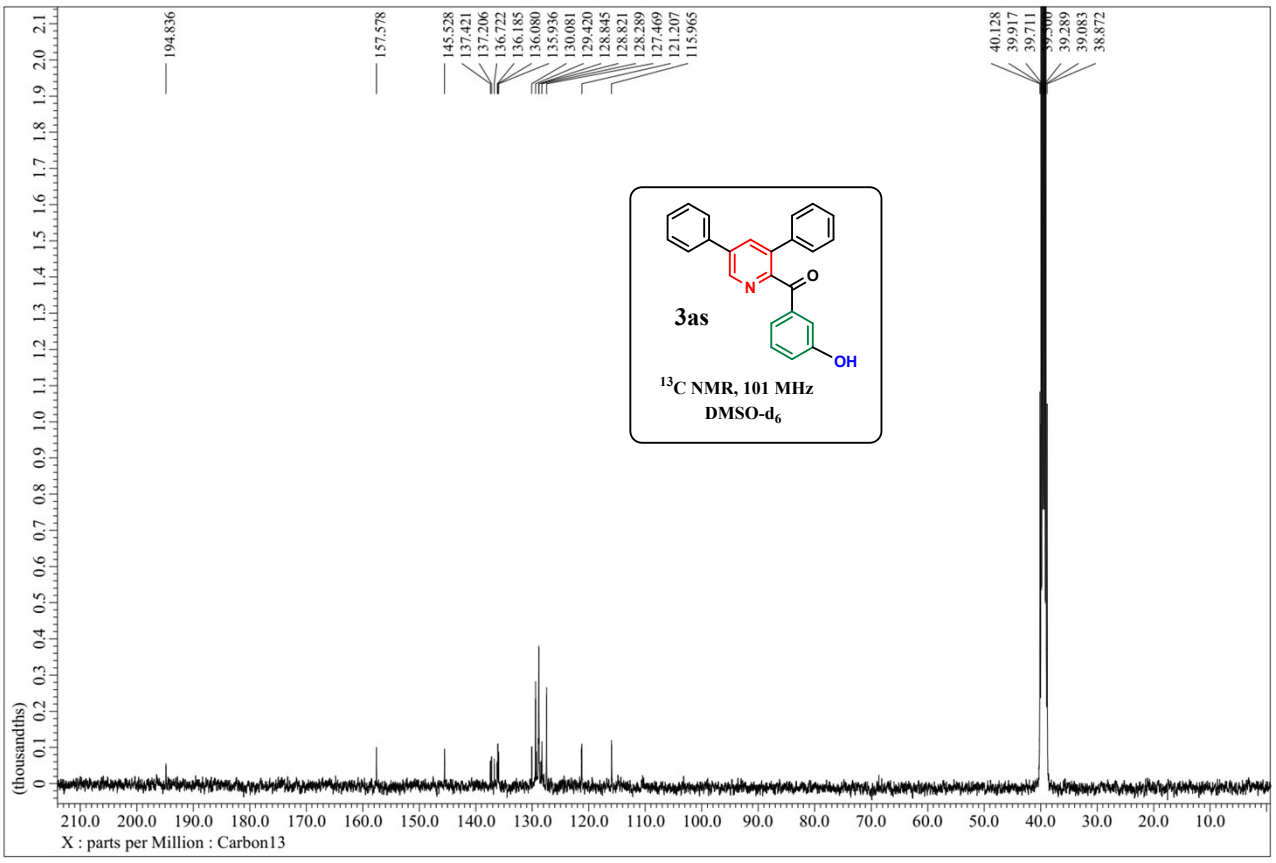
^{13}C-NMR spectrum of compound 3ar



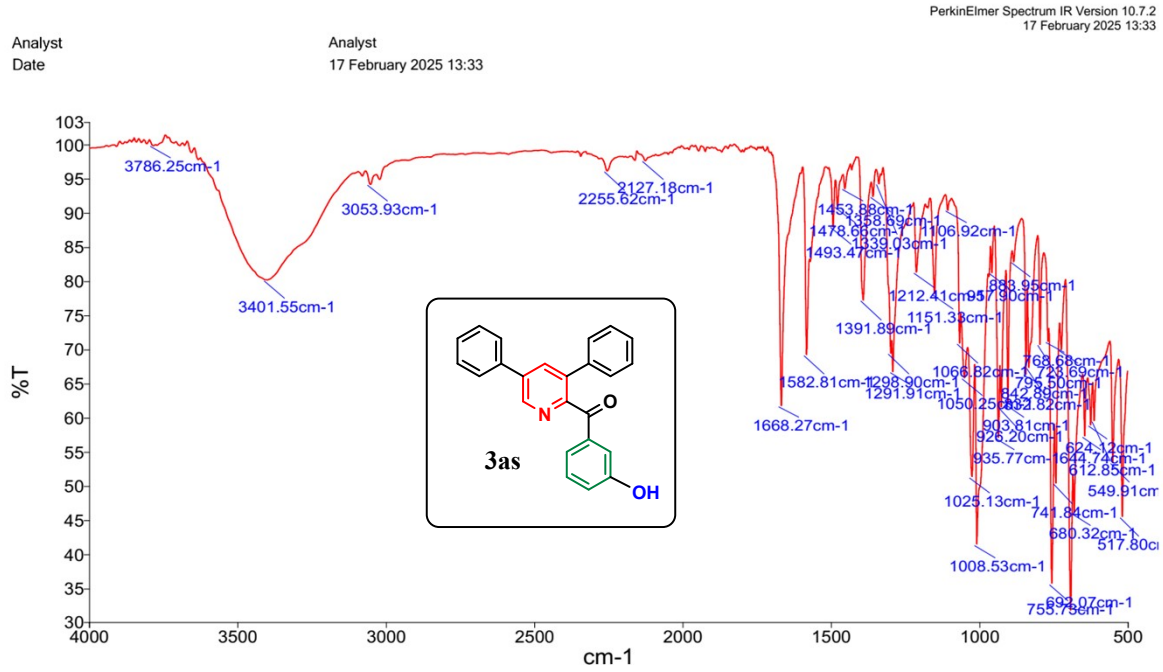
FT-IR spectrum of compound 3ar



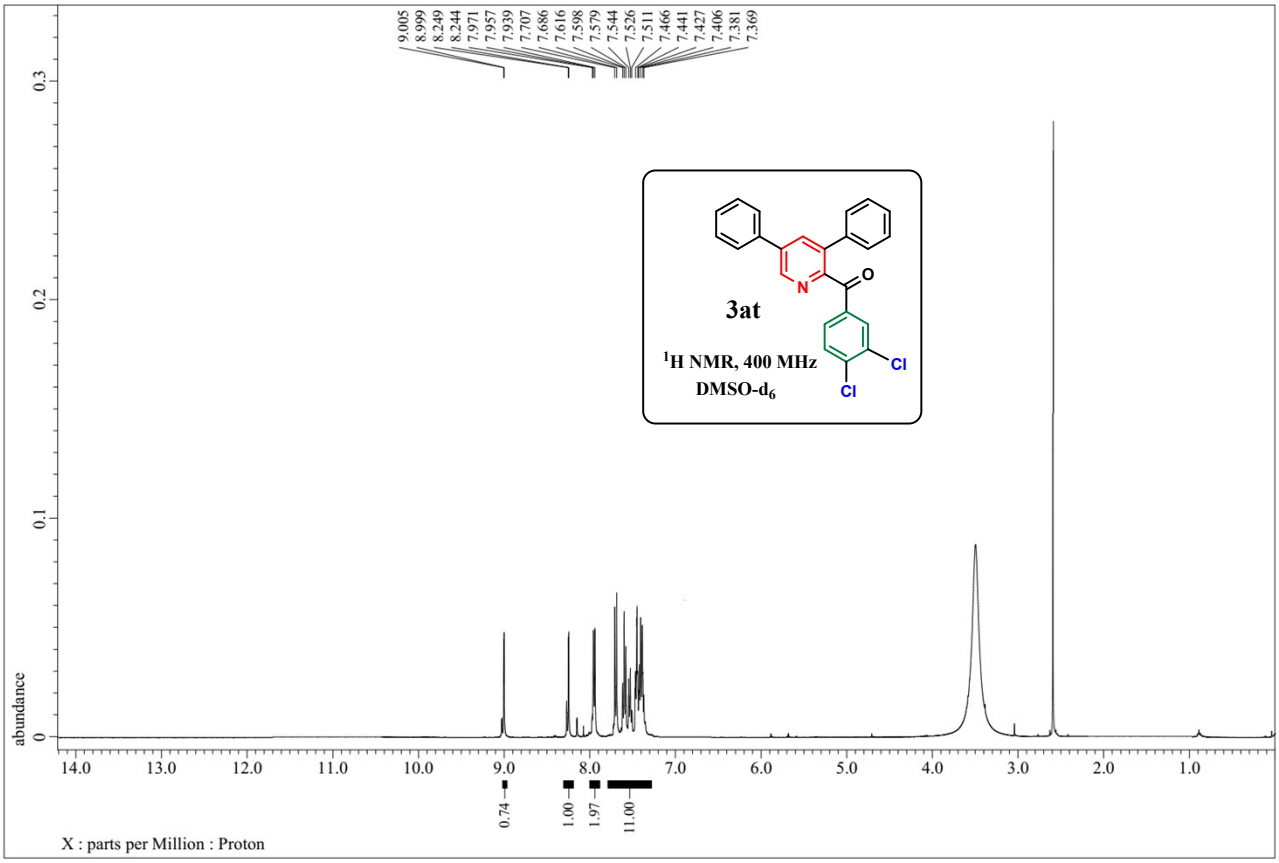
^{1}H-NMR spectrum of compound 3as



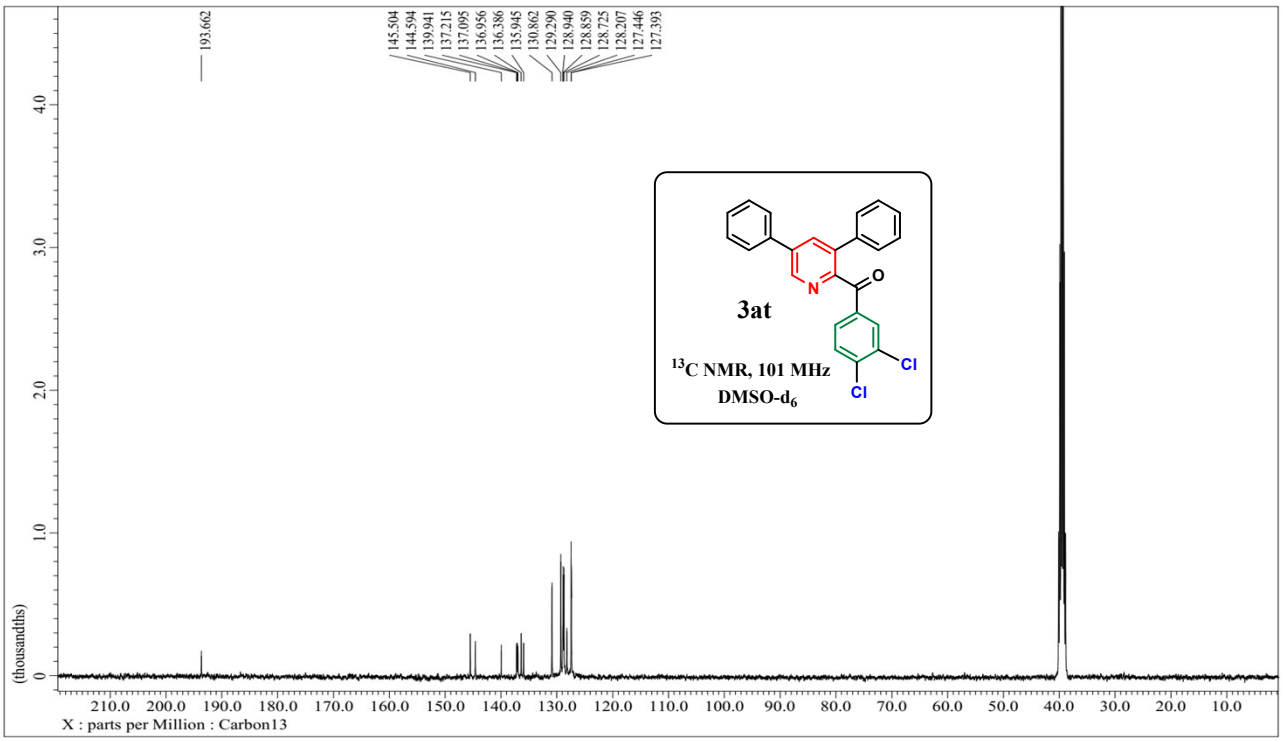
^{13}C-NMR spectrum of compound 3as



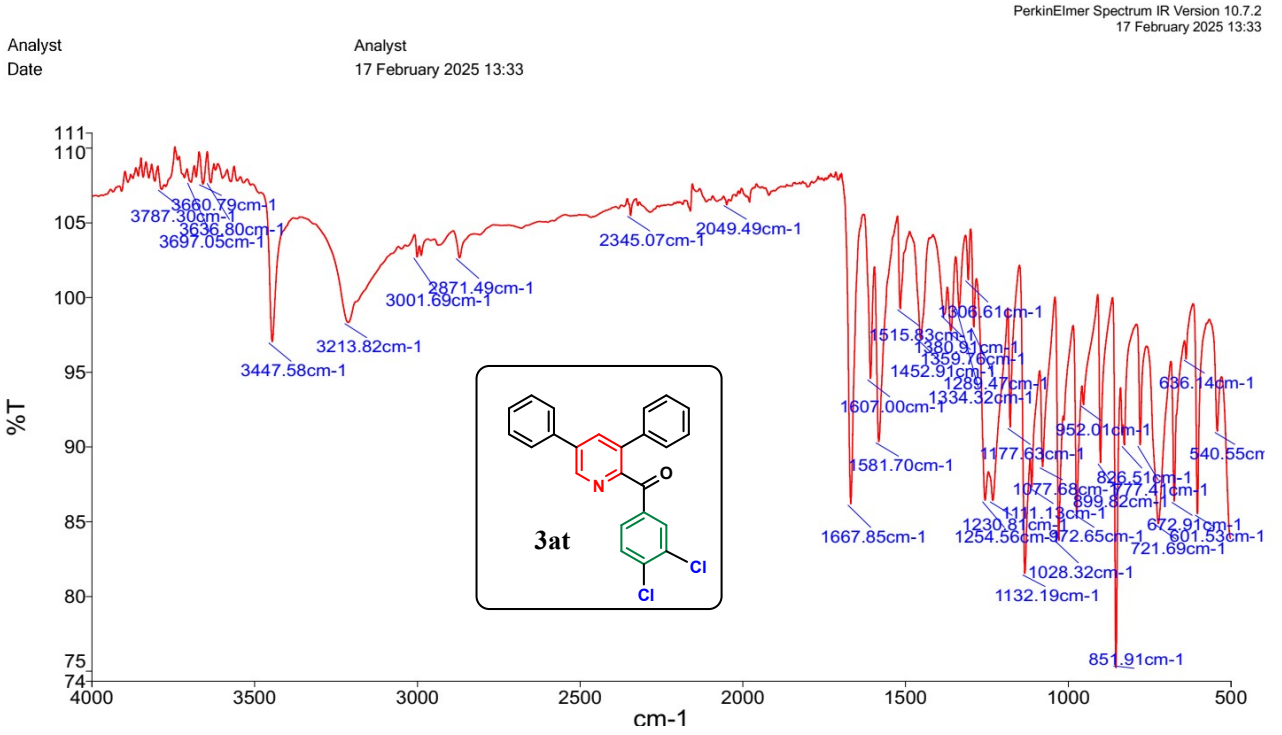
FT-IR spectrum of compound 3as



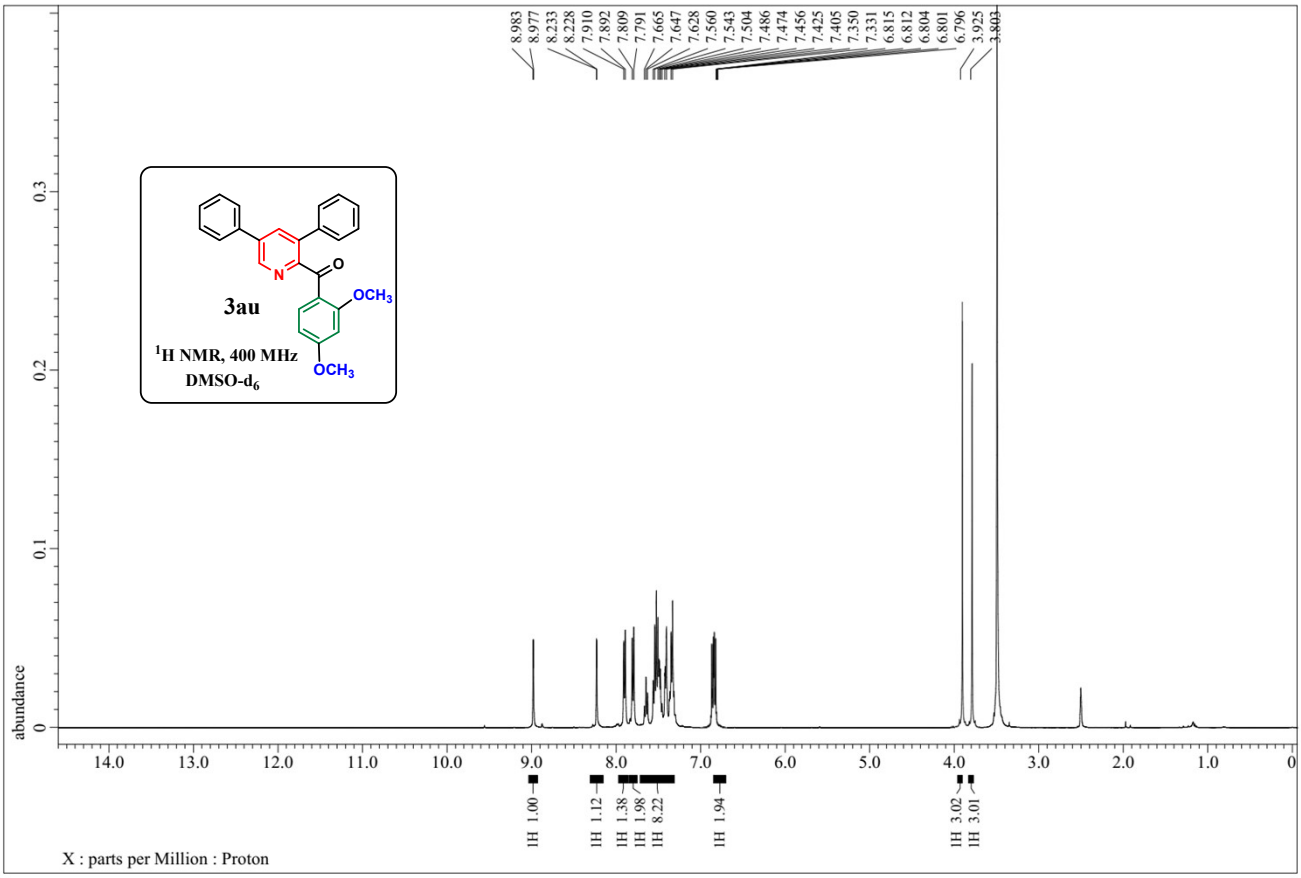
^{1}H-NMR spectrum of compound 3at



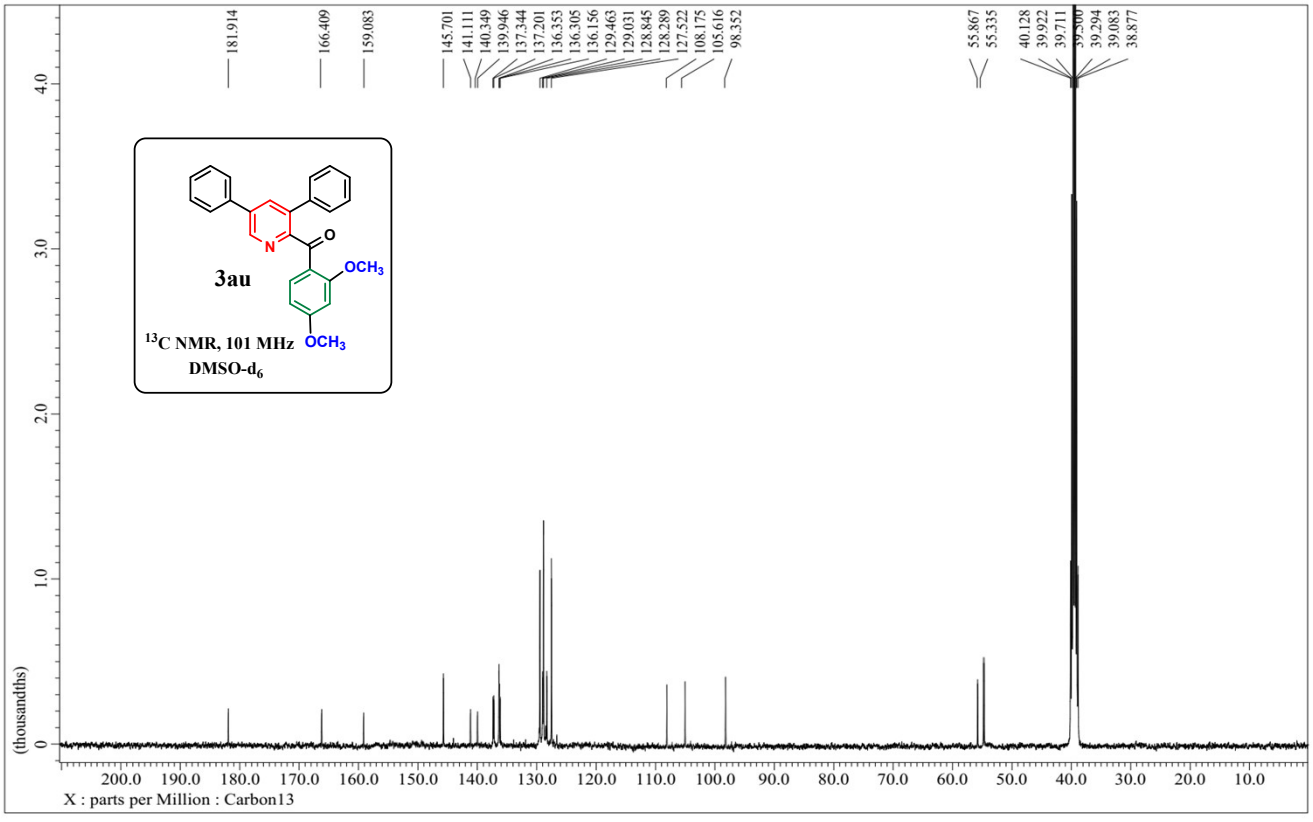
^{13}C-NMR spectrum of compound 3at



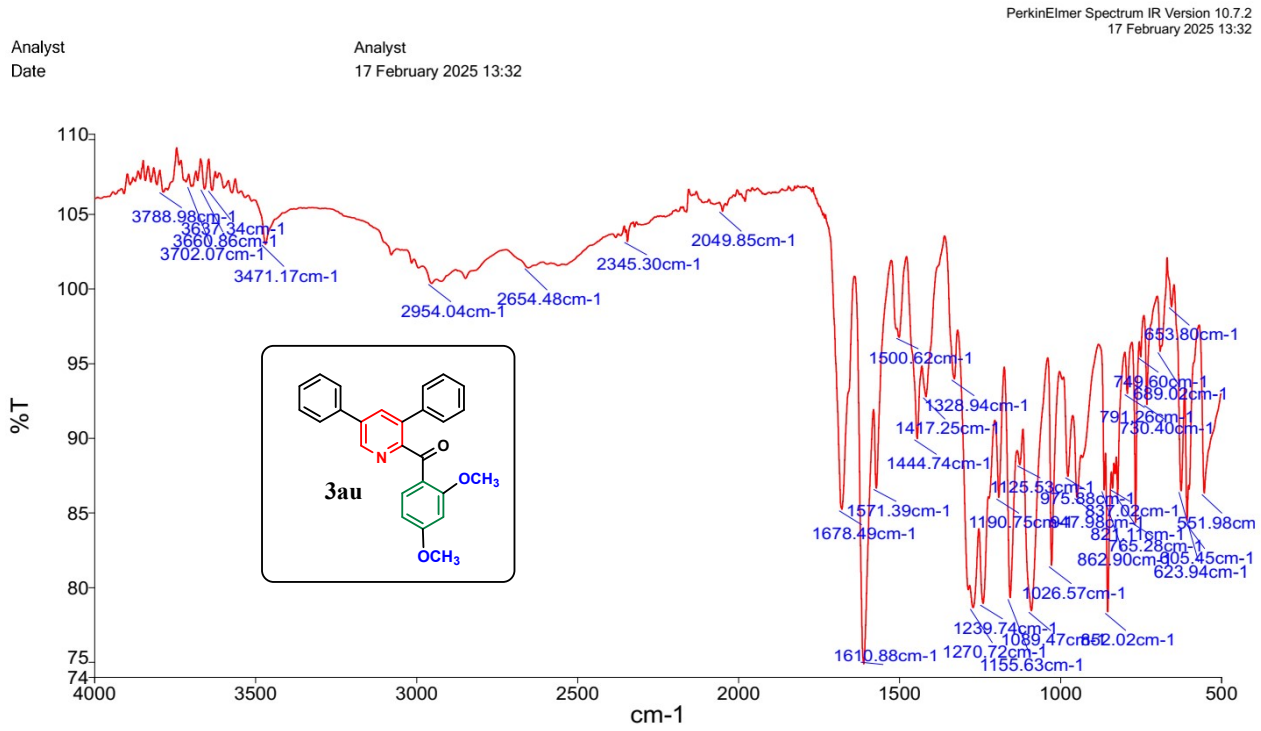
FT-IR spectrum of compound 3at



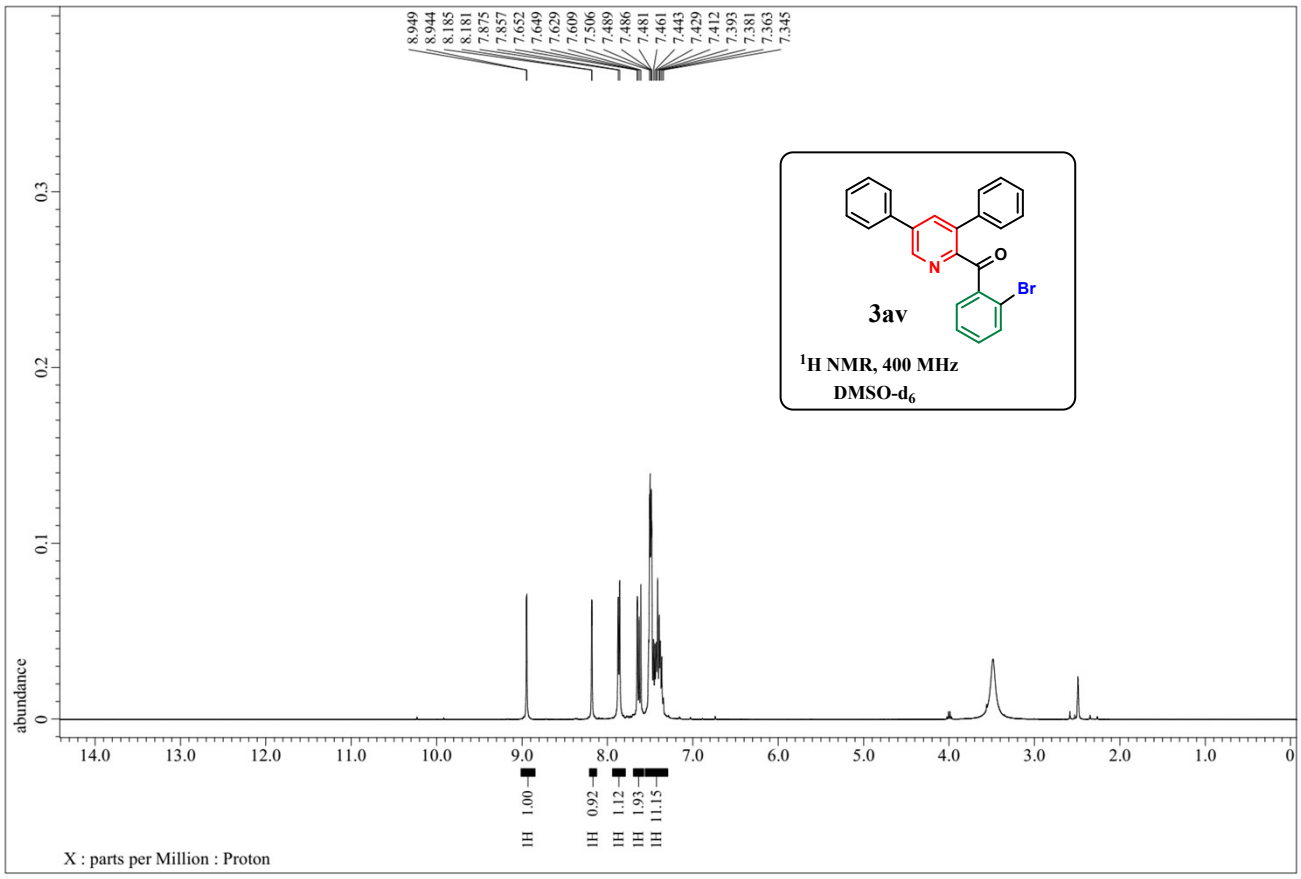
^{1}H-NMR spectrum of compound 3au



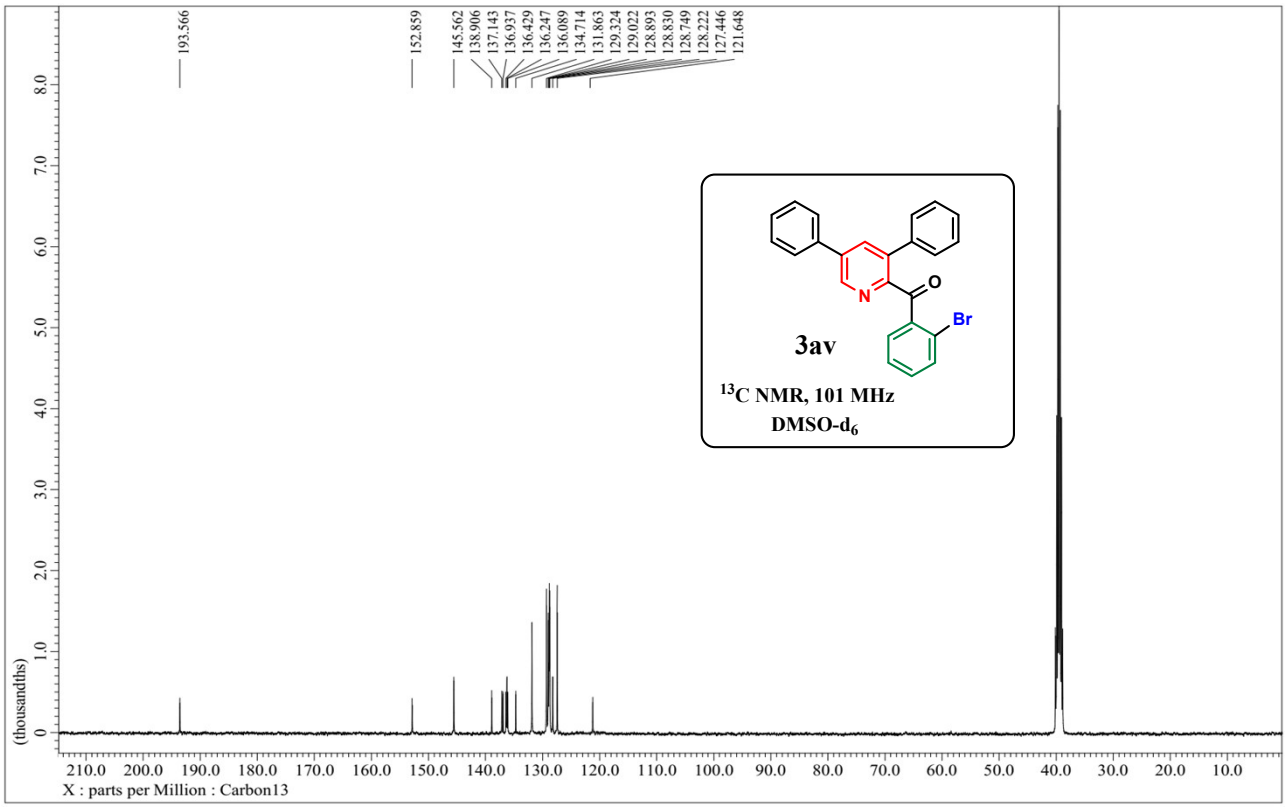
^{13}C-NMR spectrum of compound 3au



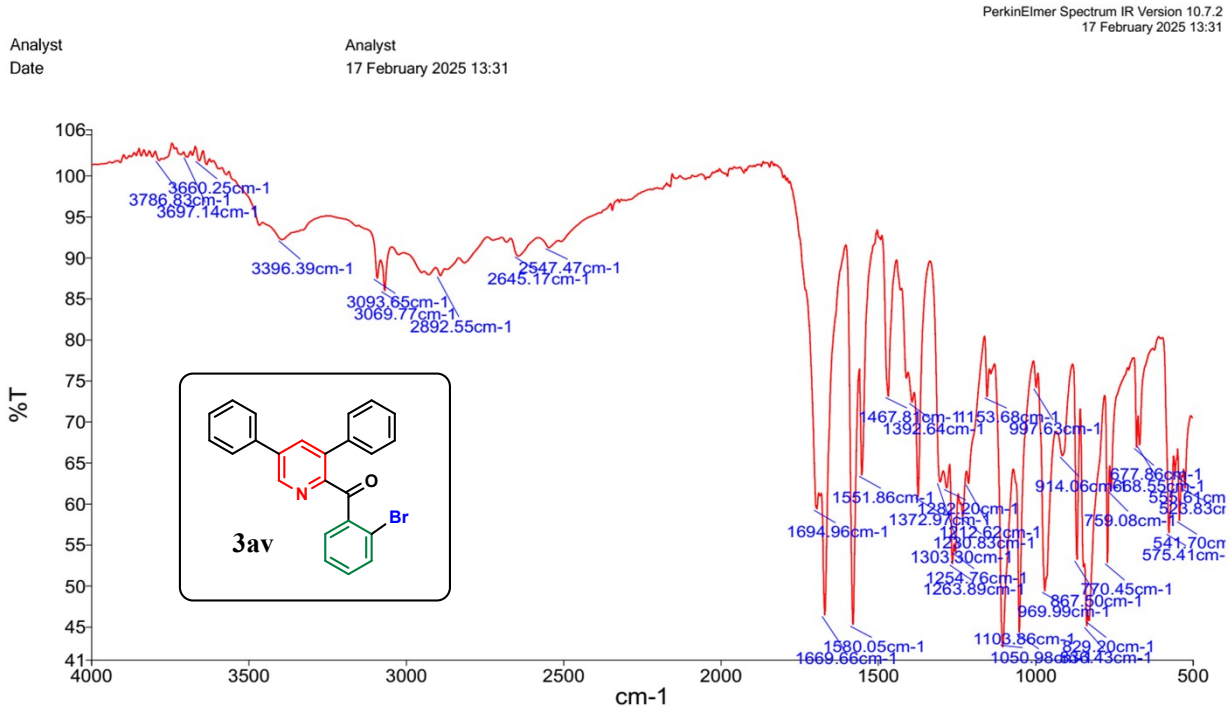
FT-IR spectrum of compound 3au



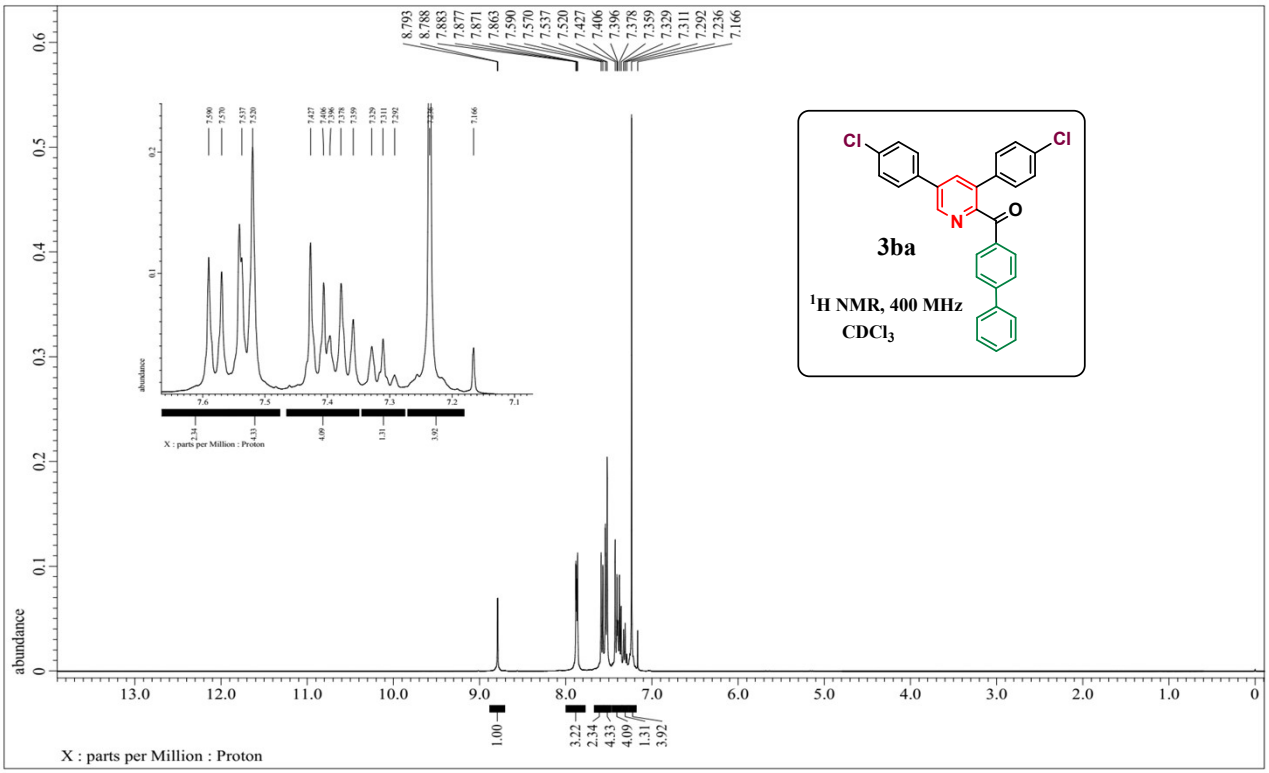
^{1}H-NMR spectrum of compound 3av



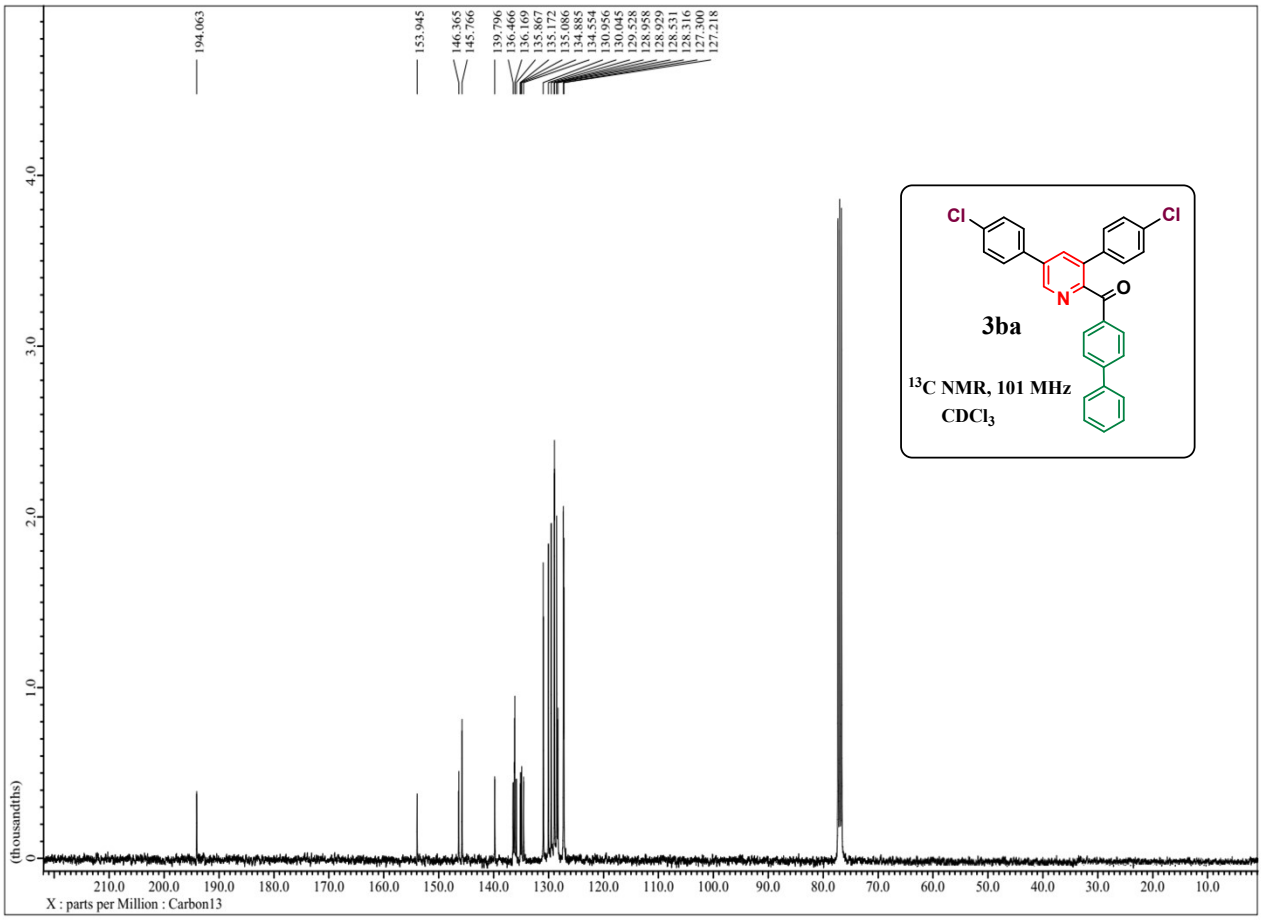
^{13}C-NMR spectrum of compound 3av



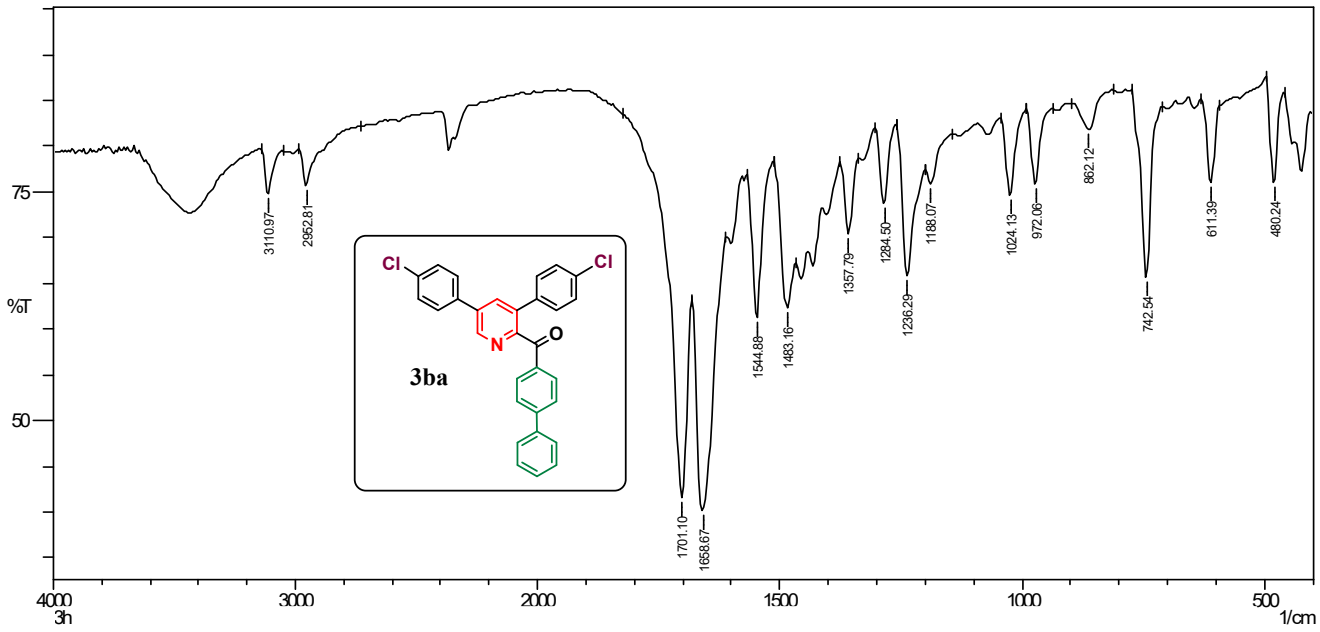
FT-IR spectrum of compound 3av



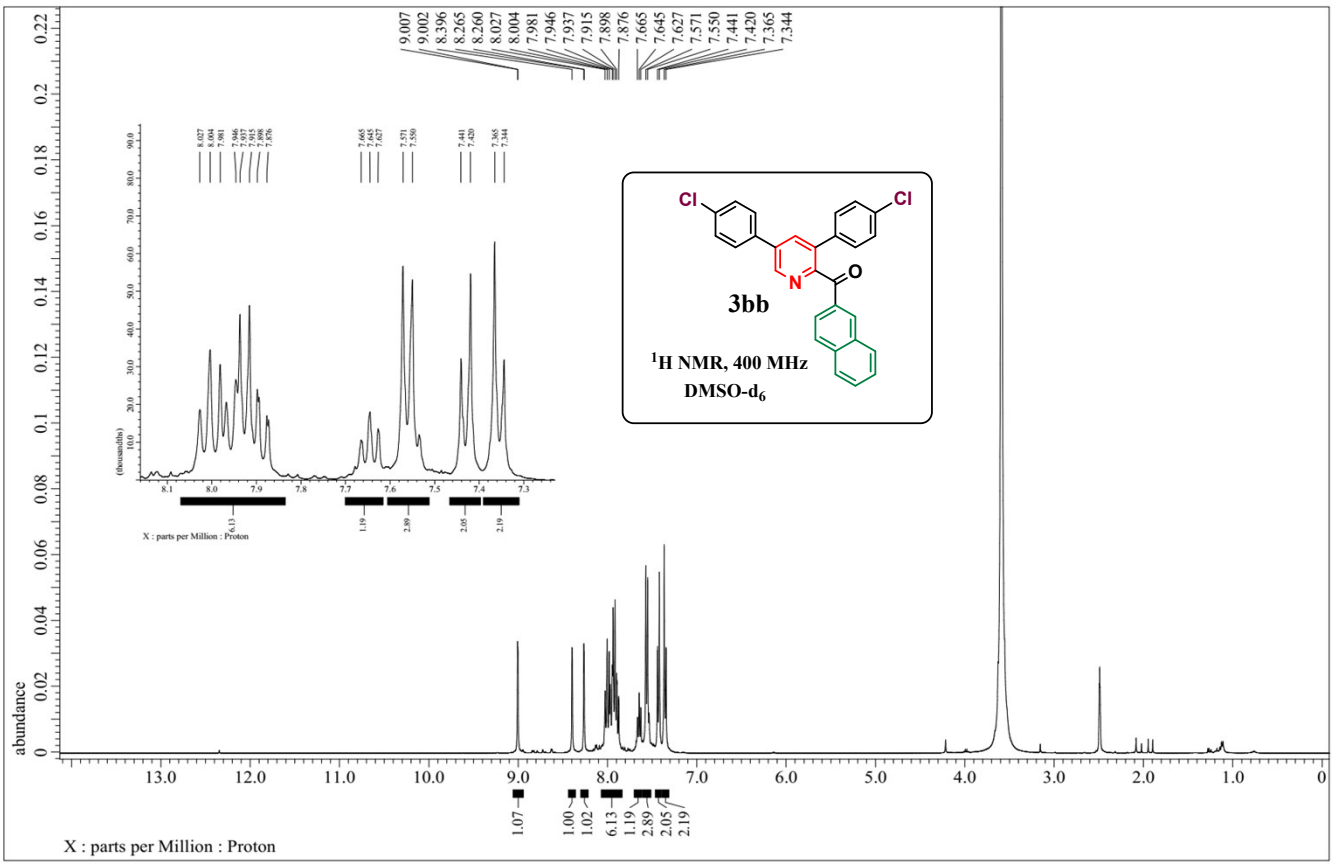
^{1}H-NMR spectrum of compound 3ba



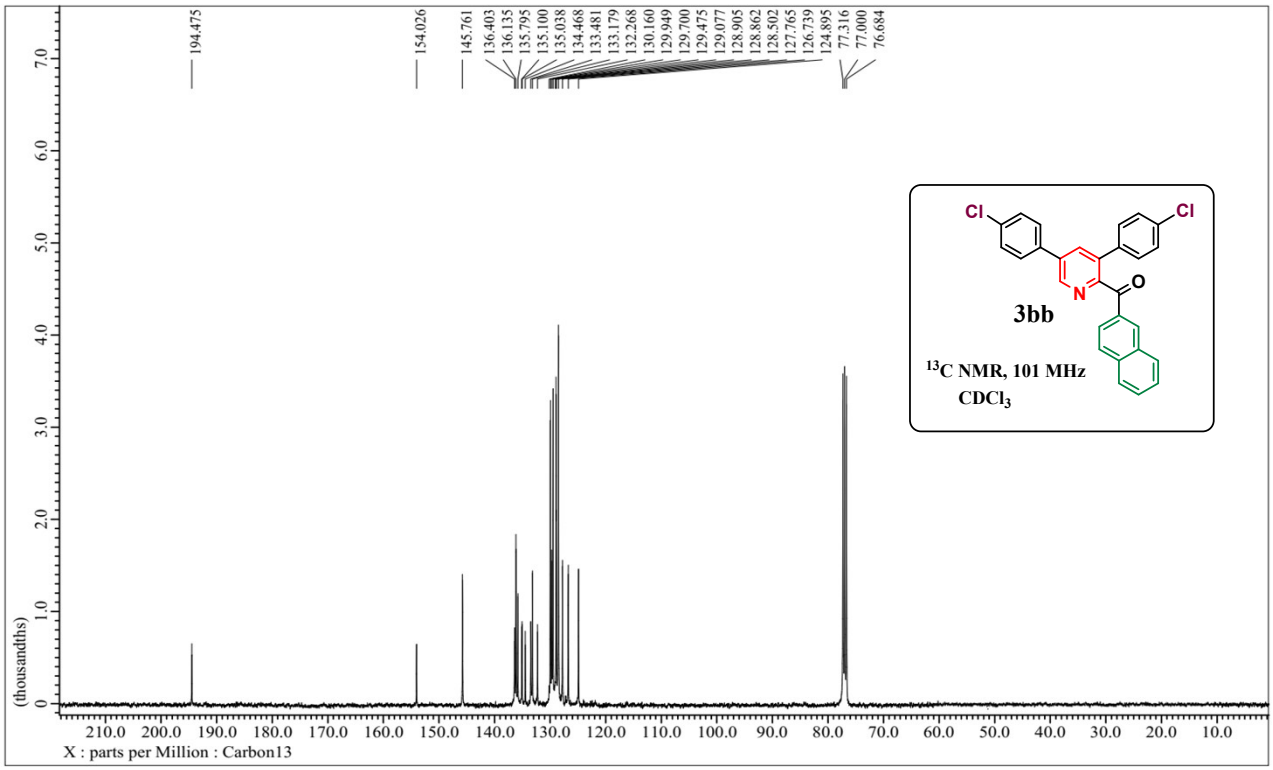
^{13}C-NMR spectrum of compound 3ba



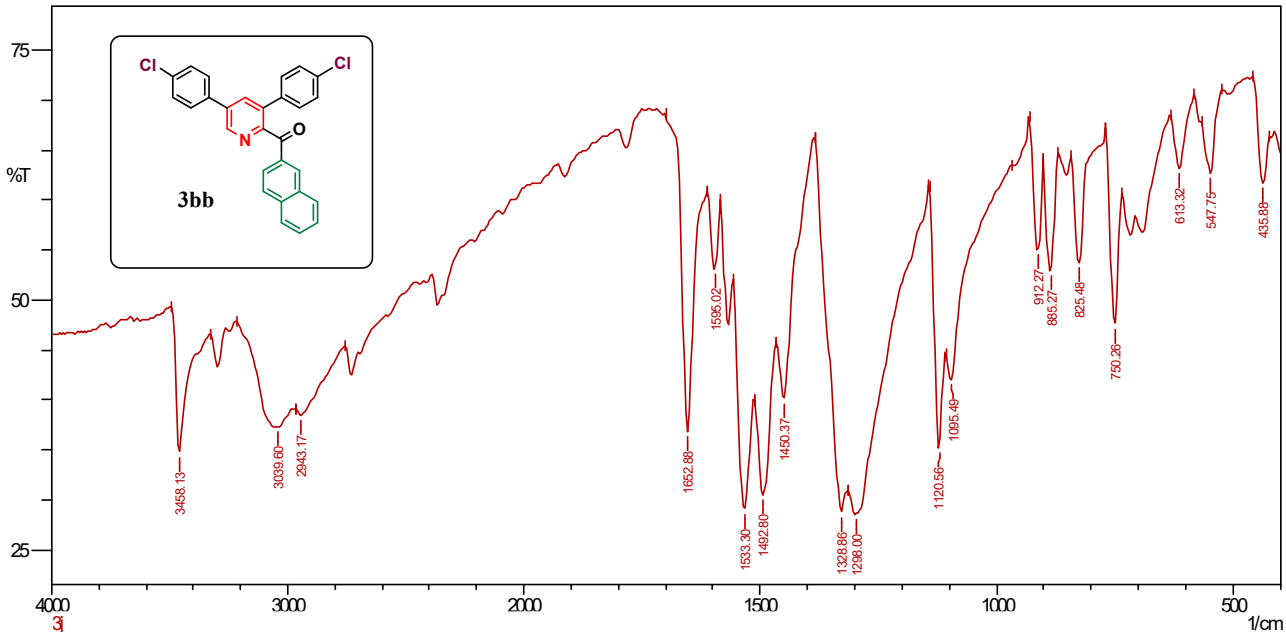
FT-IR spectrum of compound 3ba



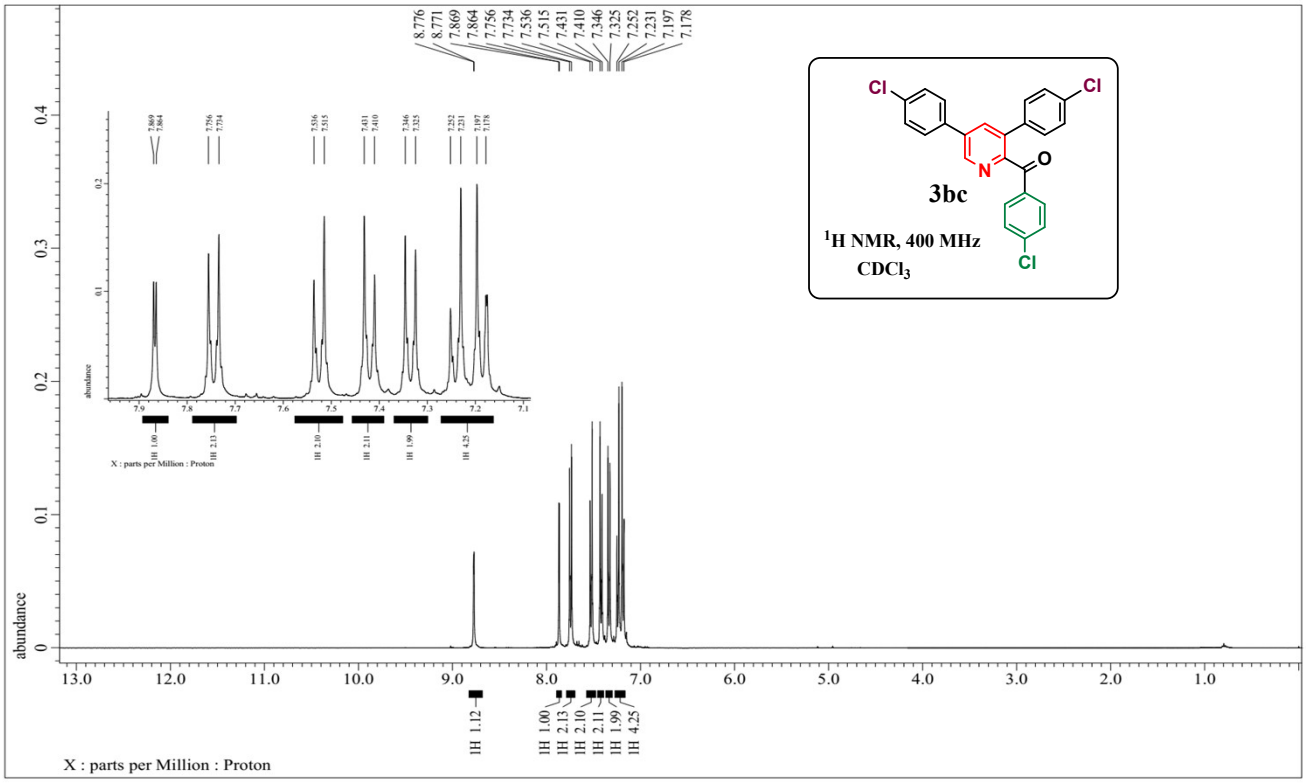
^{1}H-NMR spectrum of compound 3bb



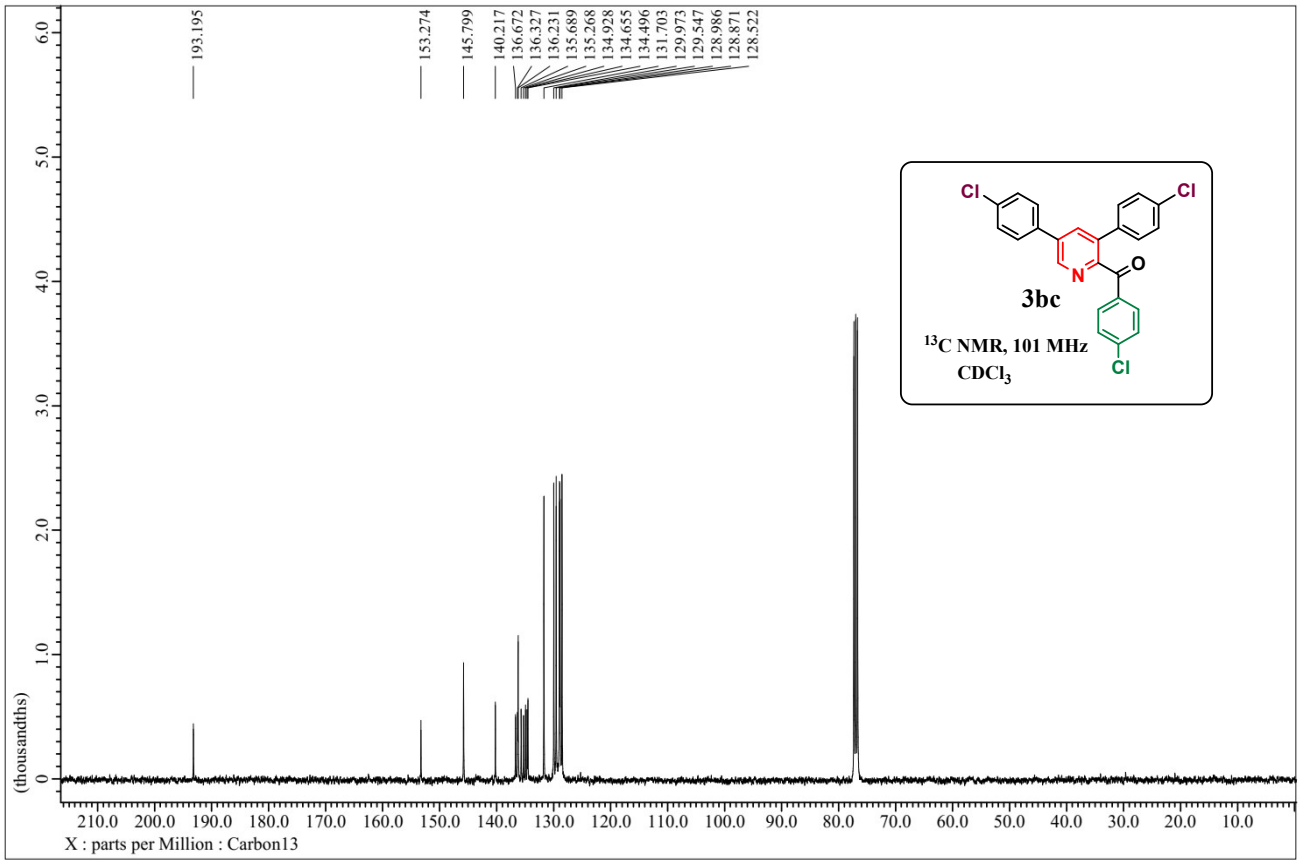
^{13}C-NMR spectrum of compound 3bb



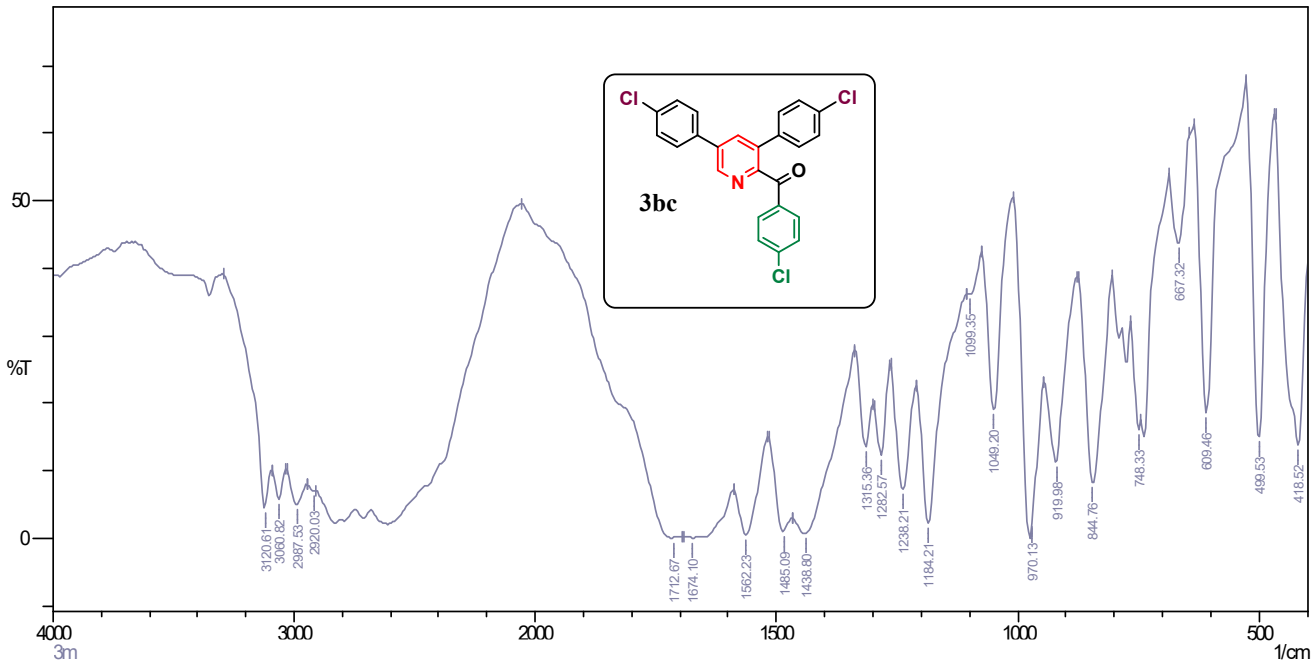
FT-IR spectrum of compound 3bb



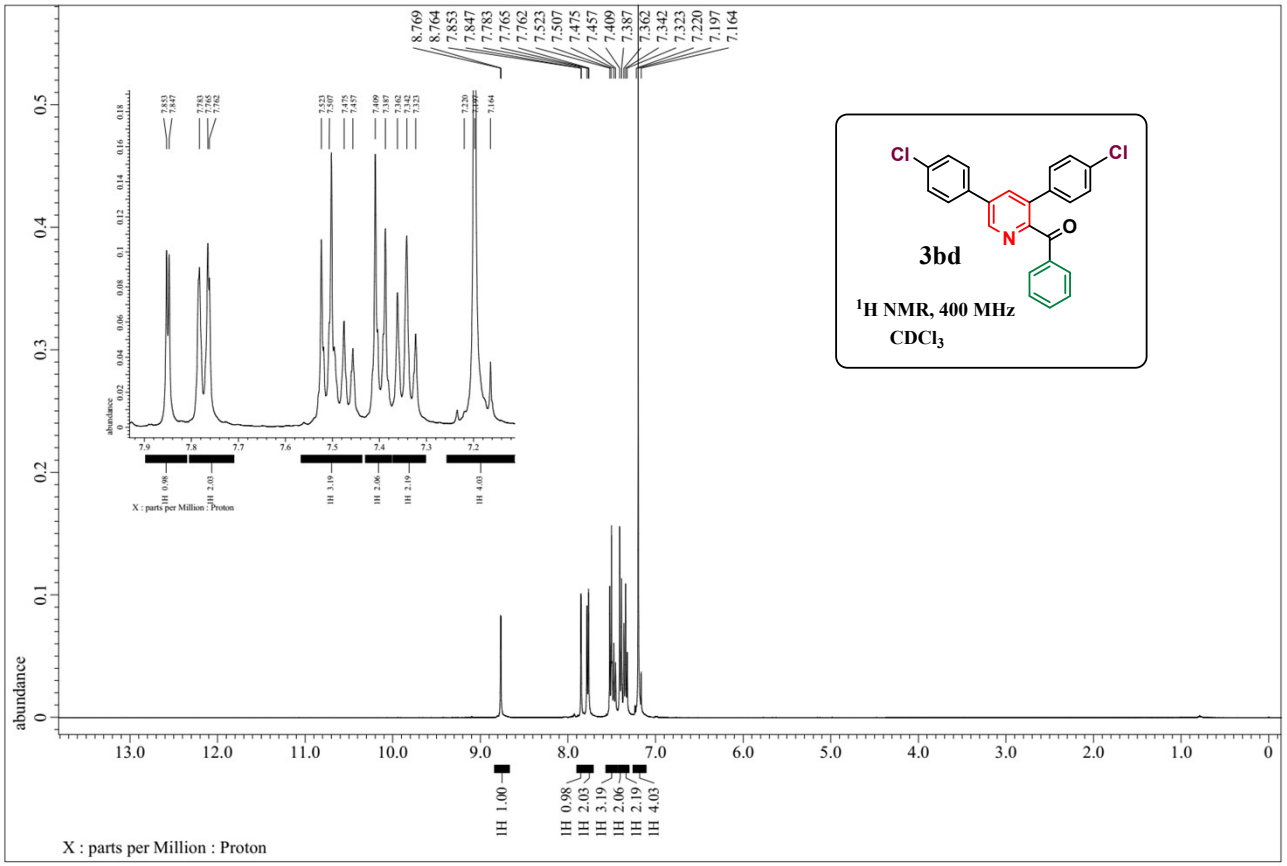
^{1}H-NMR spectrum of compound 3bc



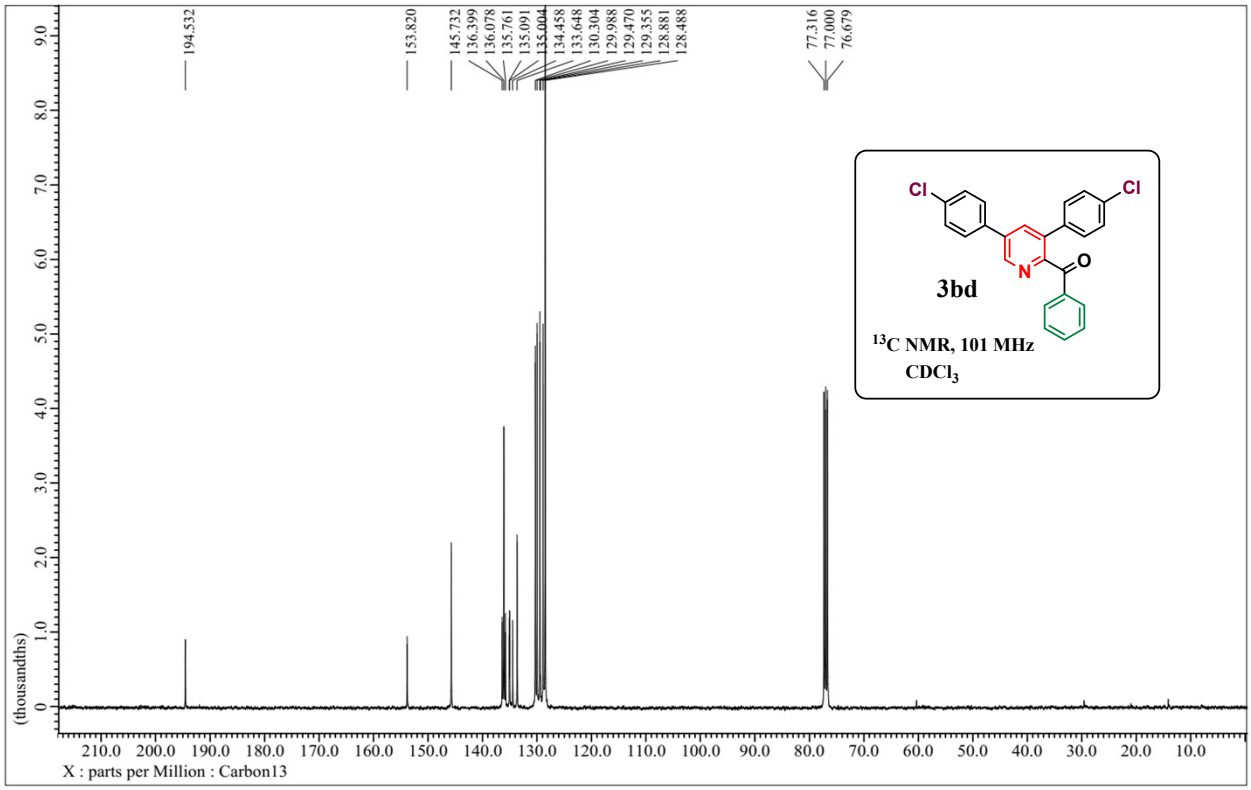
^{13}C-NMR spectrum of compound 3bc



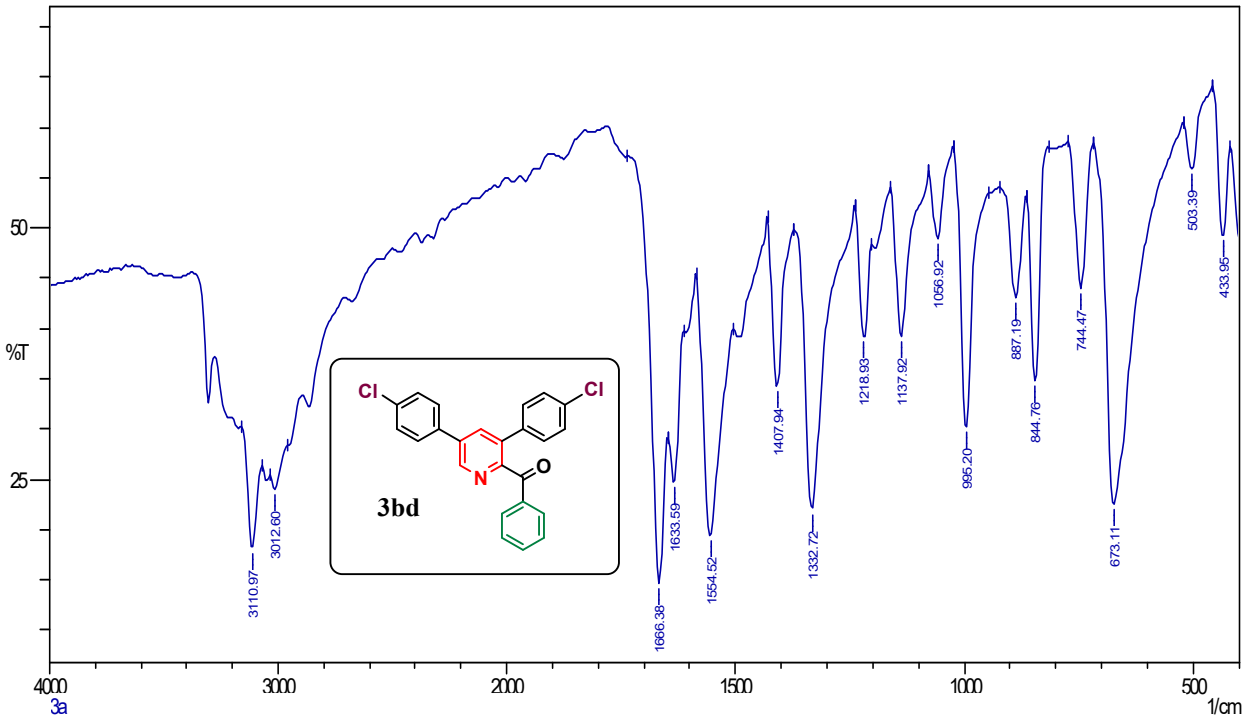
FT-IR spectrum of compound 3bc



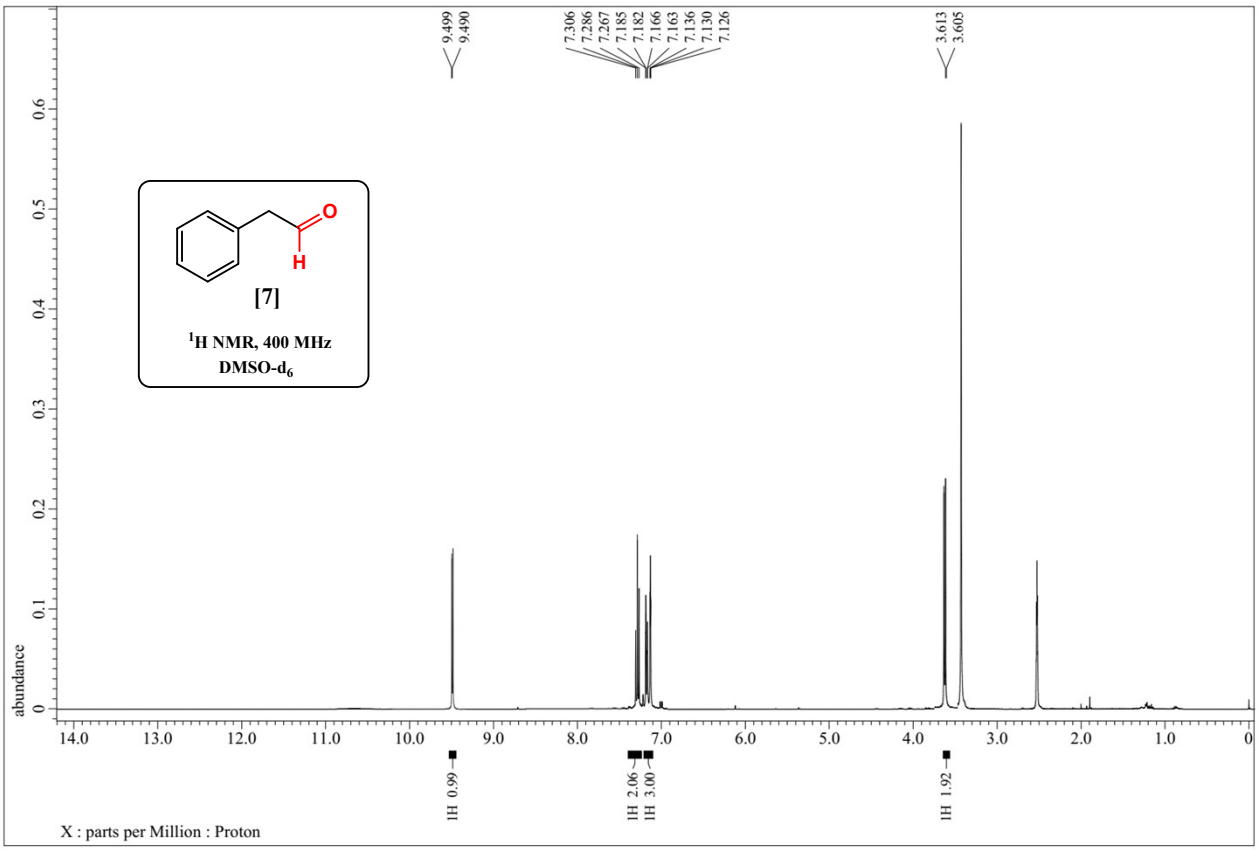
^{1}H-NMR spectrum of compound 3bd



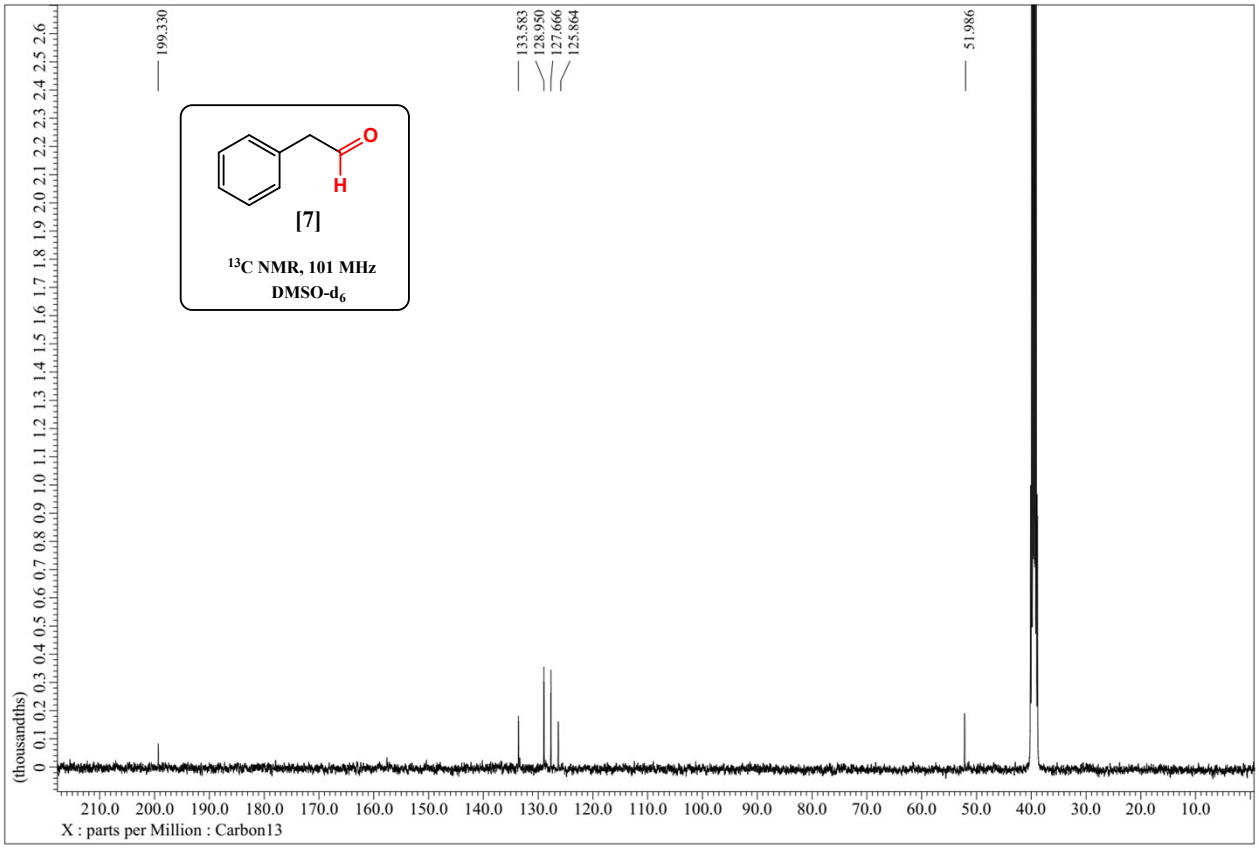
^{13}C-NMR spectrum of compound 3bd



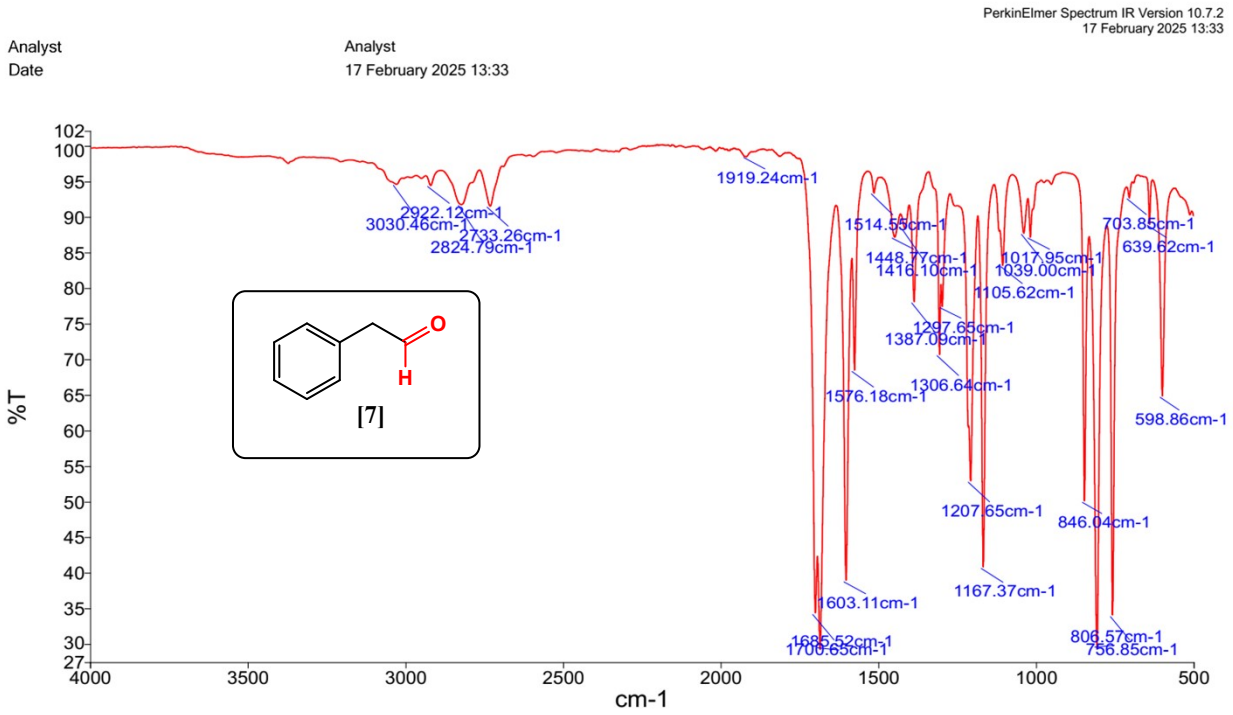
FT-IR spectrum of compound 3bd



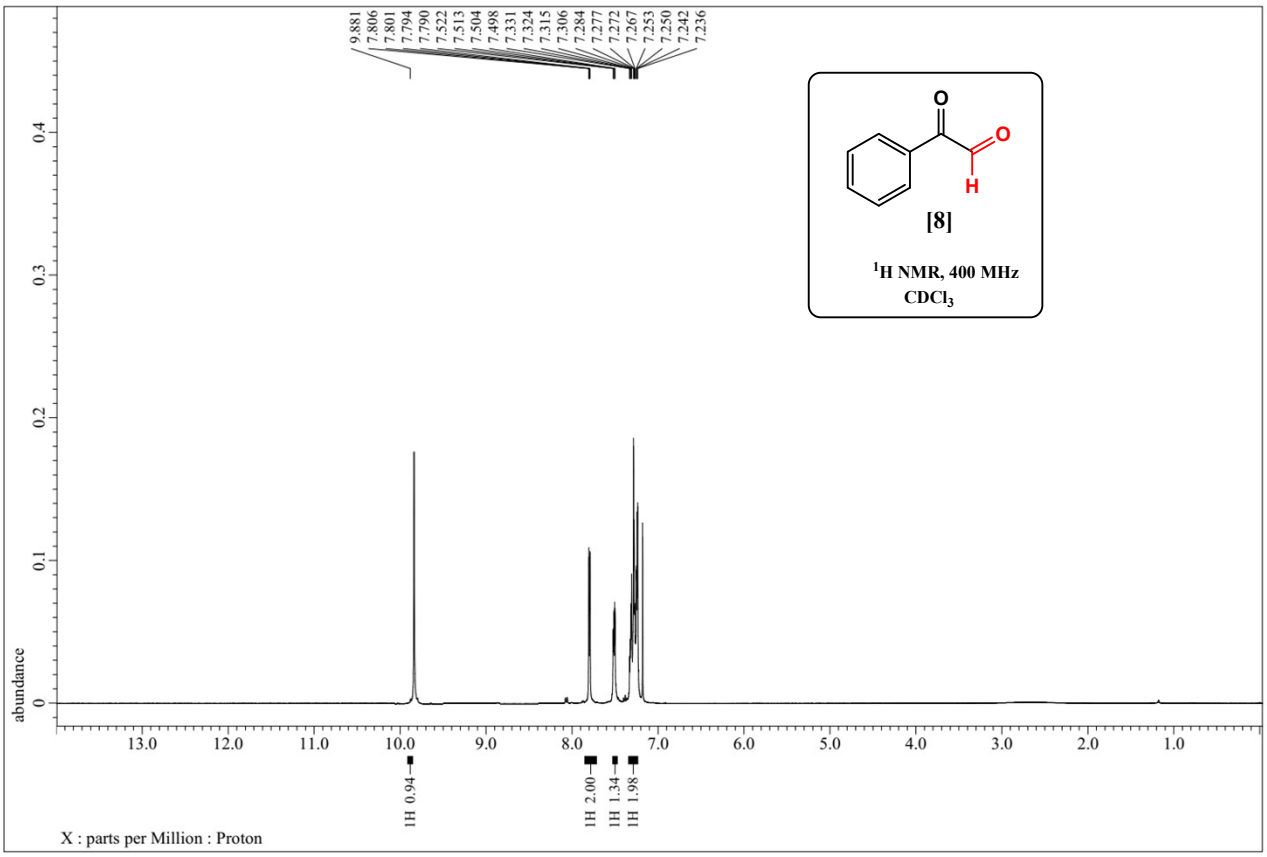
^{1}H-NMR spectrum of intermediate [7]



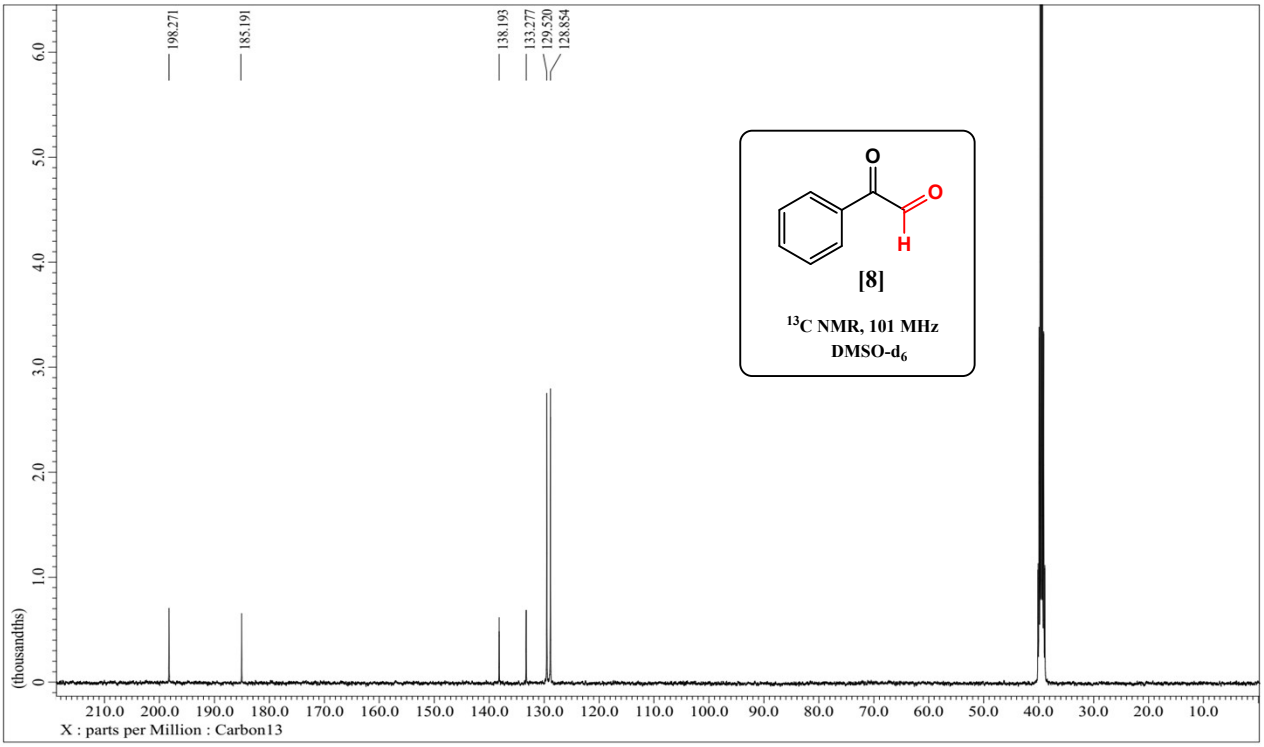
^{13}C-NMR spectrum of intermediate [7]



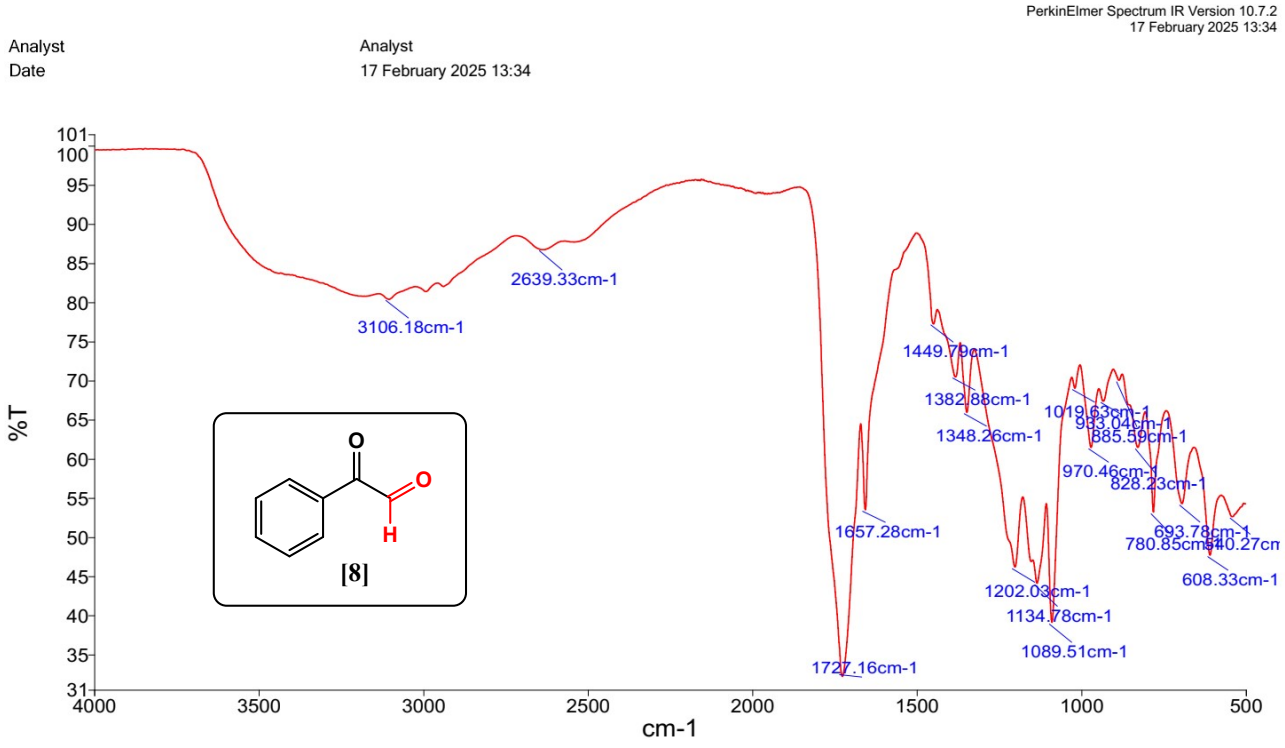
FT-IR spectrum of compound [7]



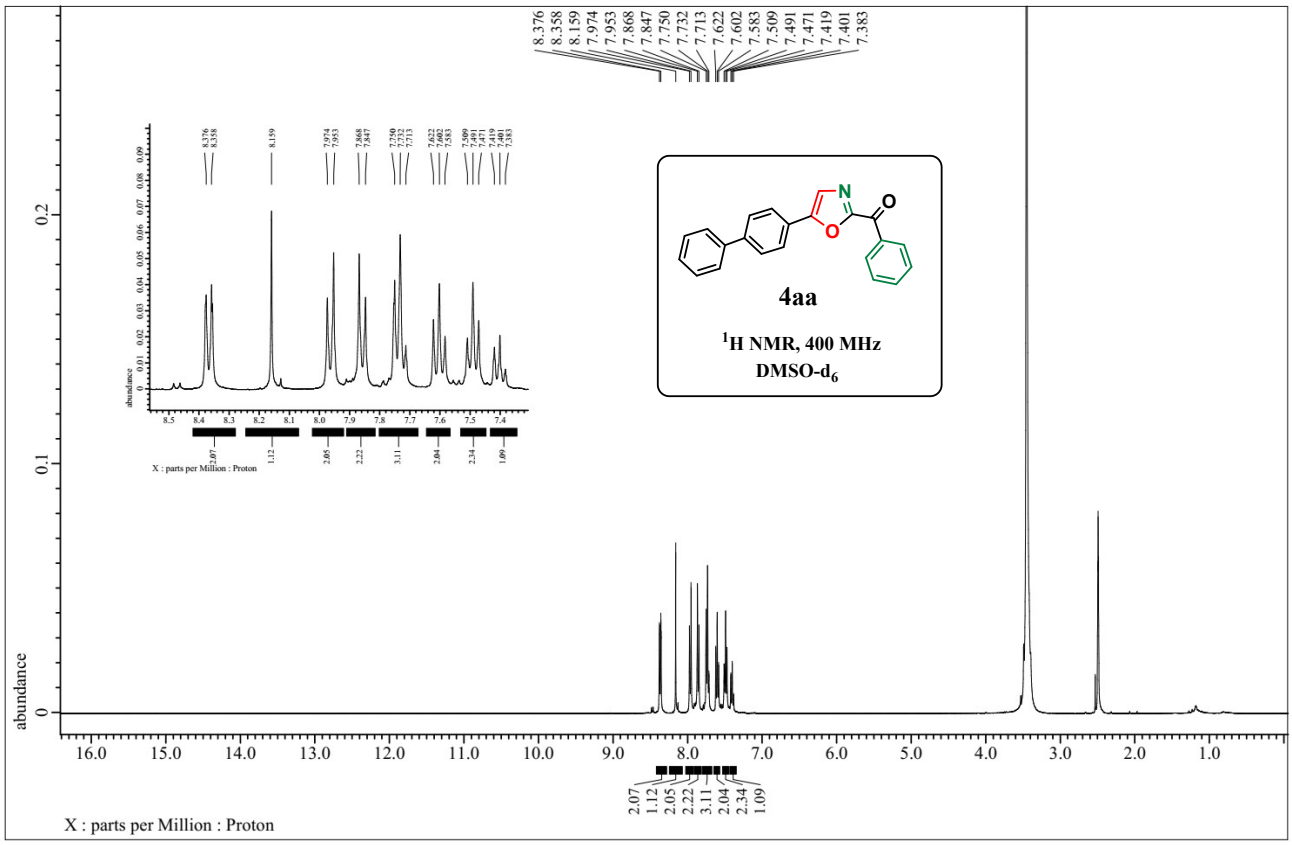
^{1}H-NMR spectrum of intermediate [8]



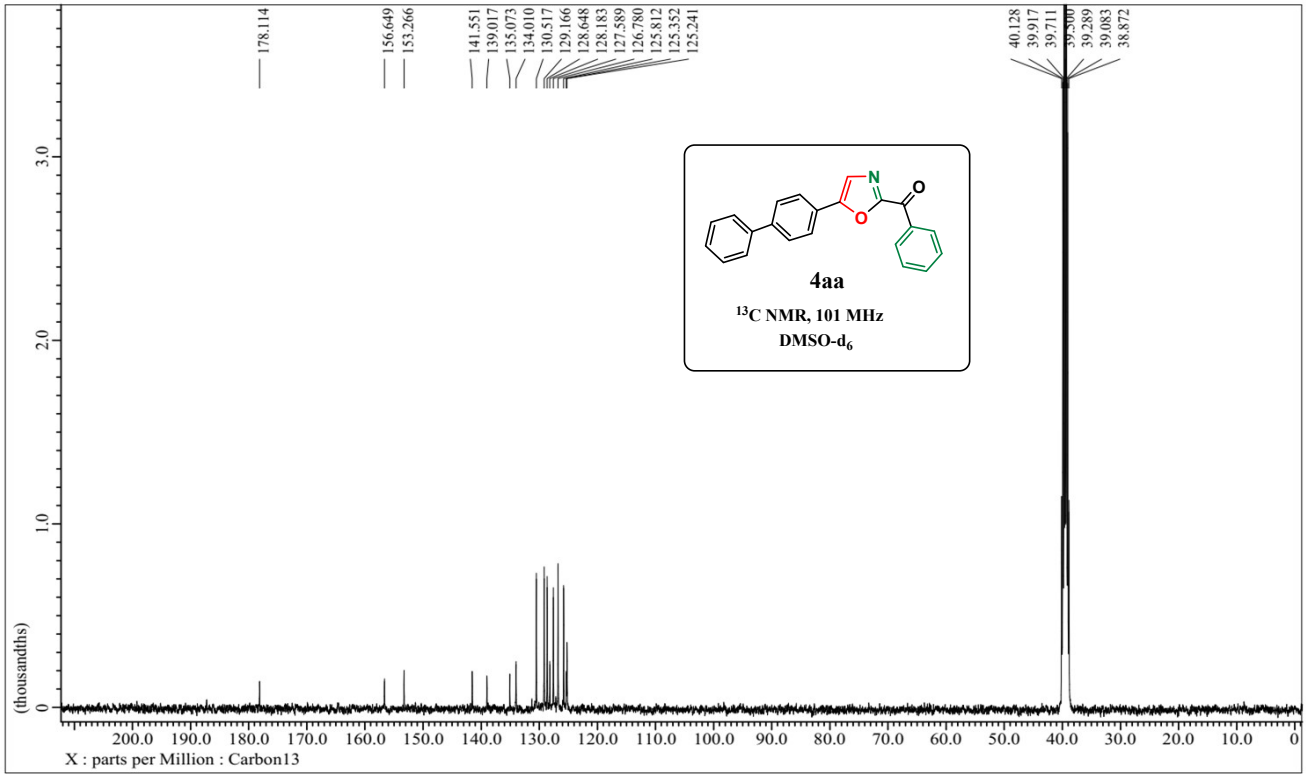
^{13}C-NMR spectrum of intermediate [8]



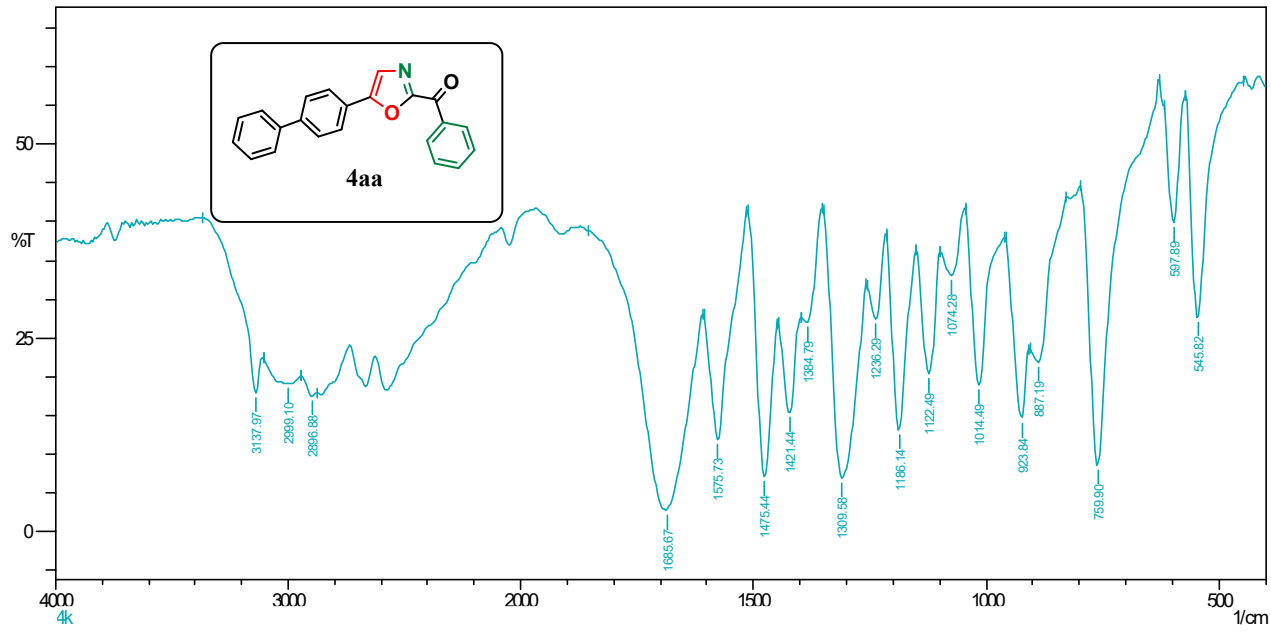
FT-IR spectrum of compound [8]



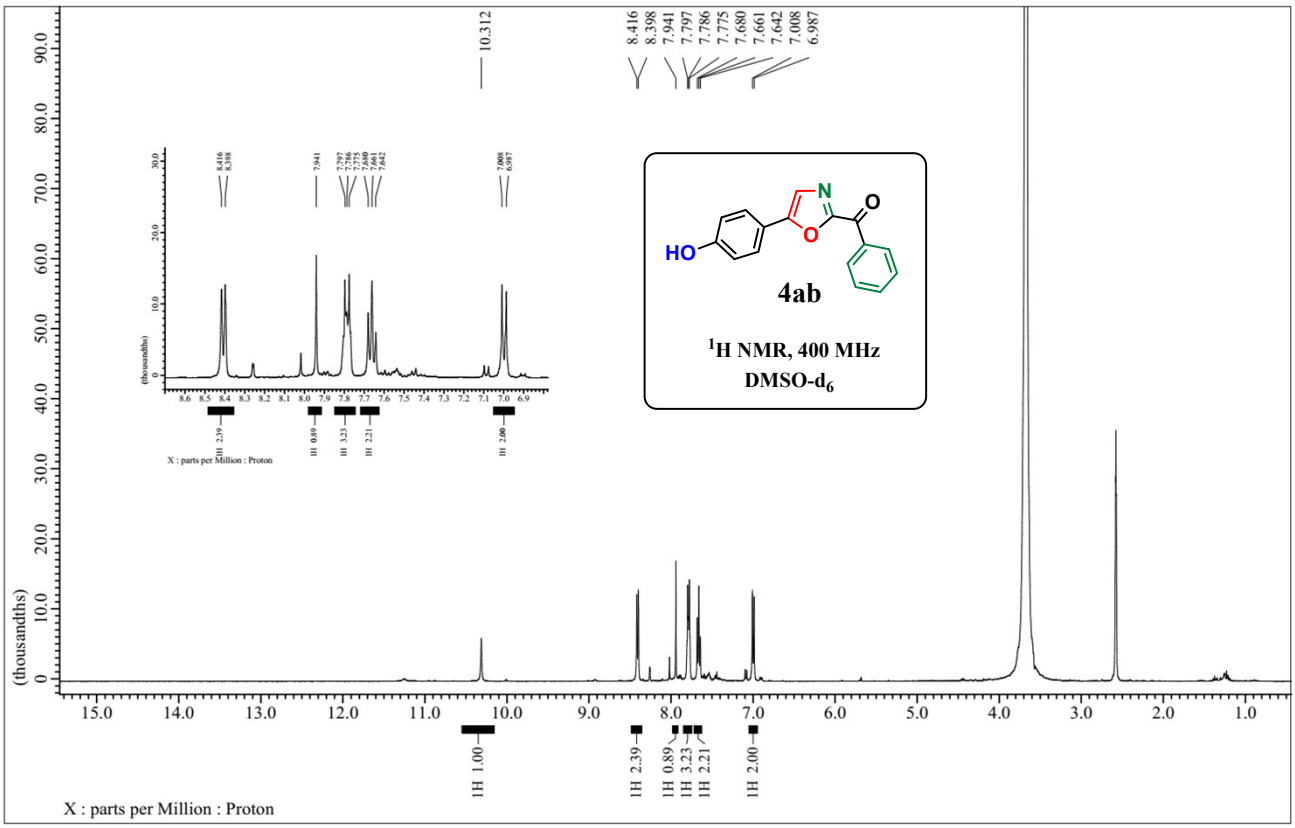
^{1}H-NMR spectrum of compound 4aa



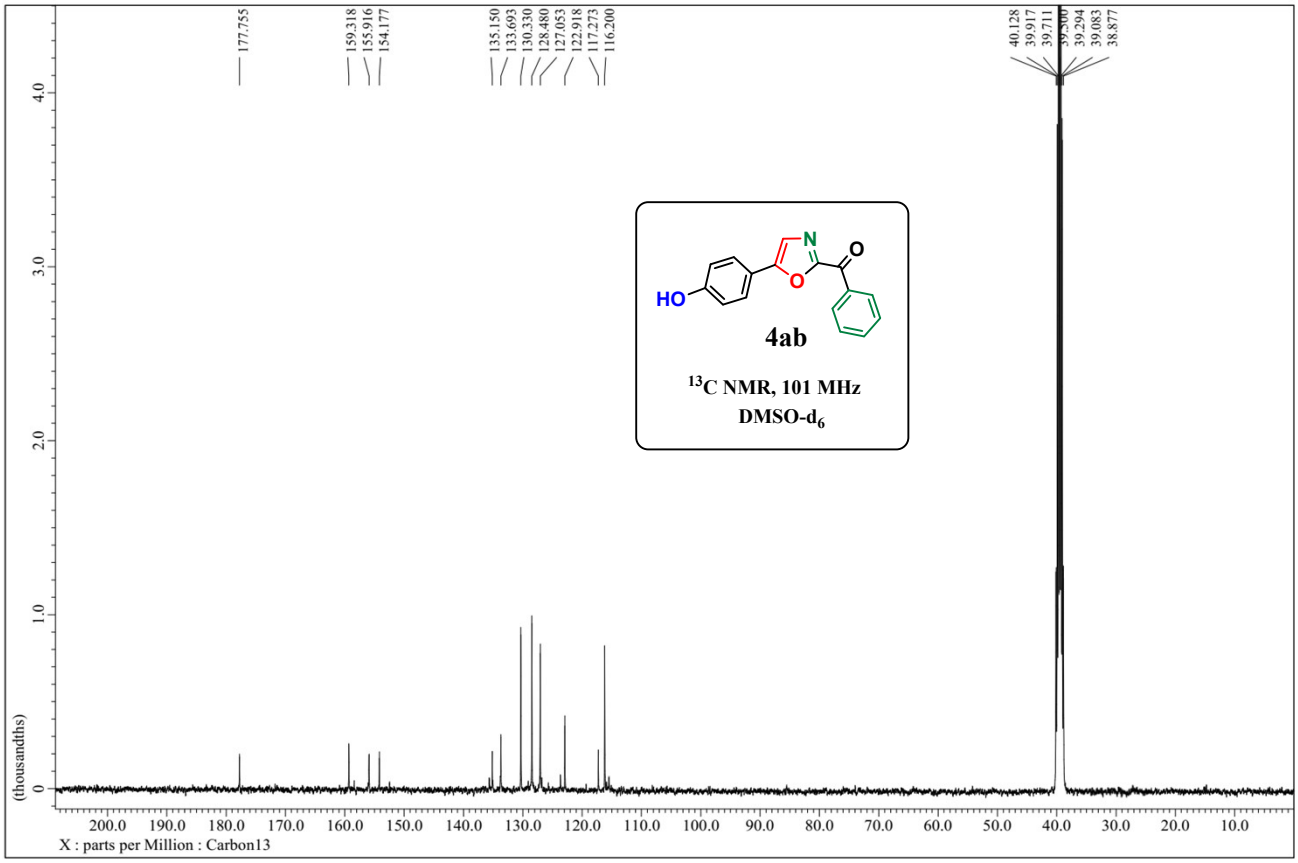
^{13}C-NMR spectrum of compound 4aa



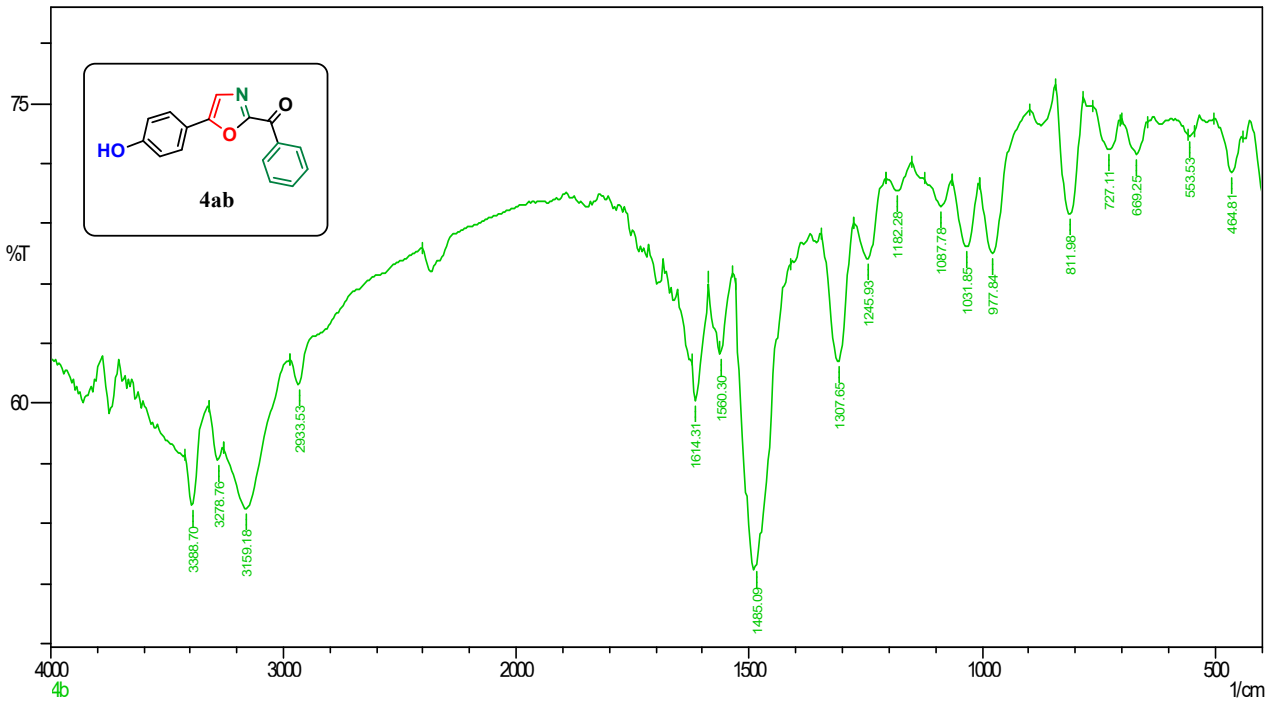
FT-IR spectrum of compound 4aa



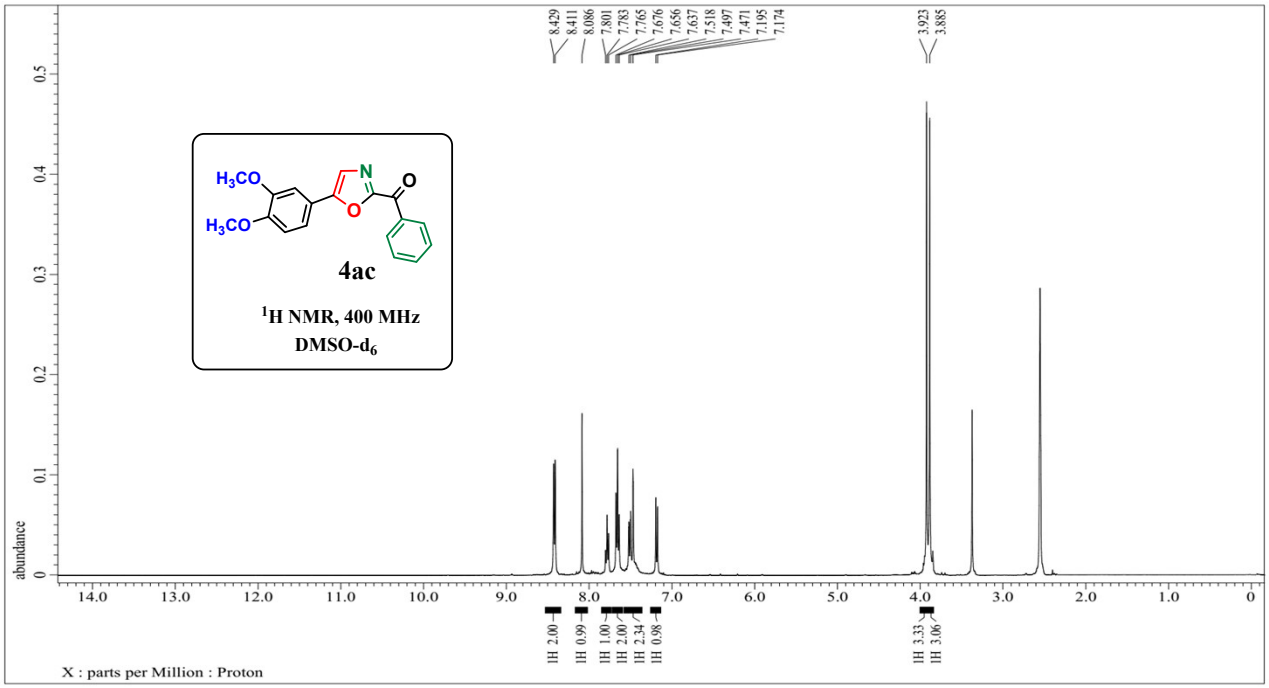
^{1}H-NMR spectrum of compound 4ab



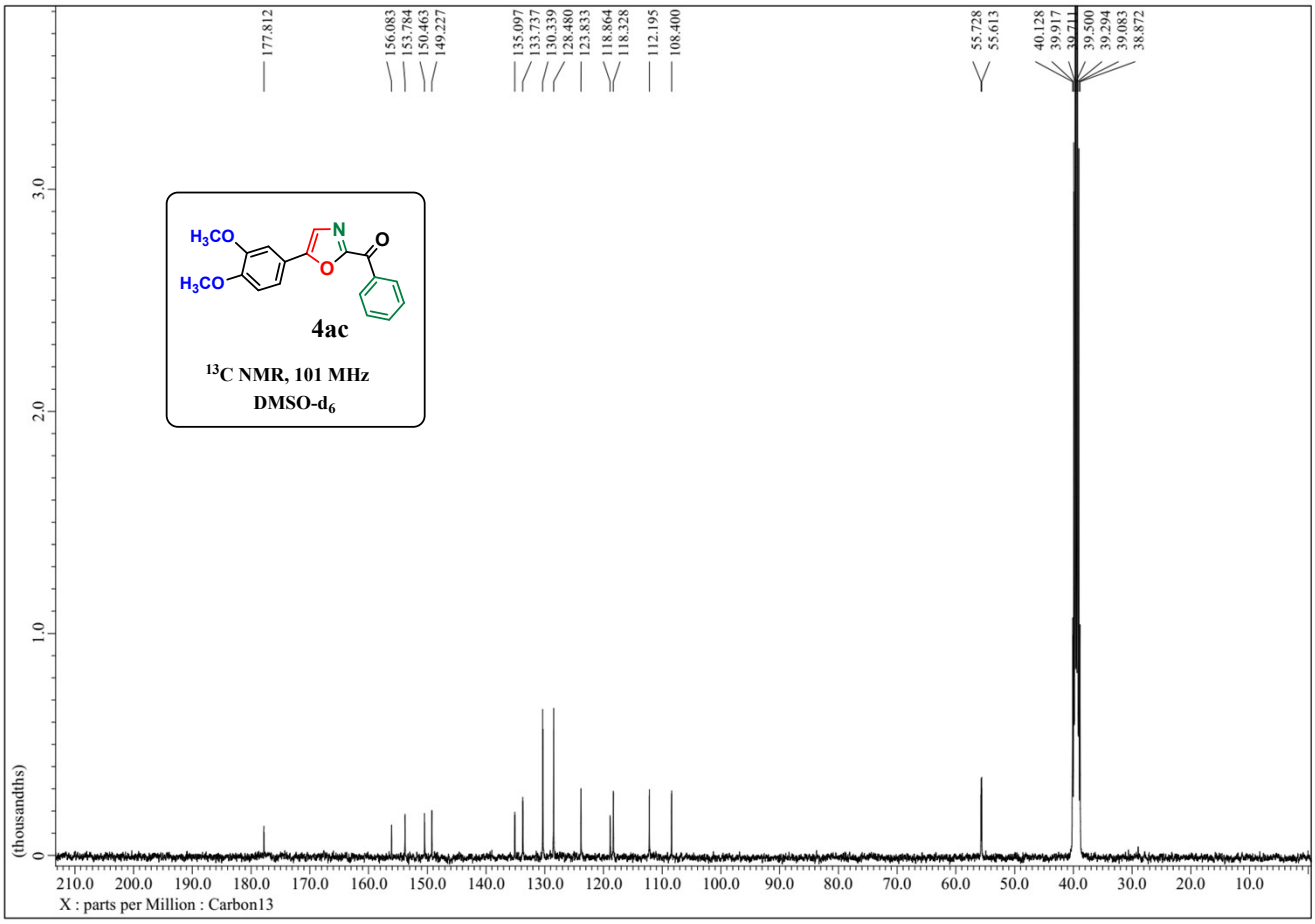
^{13}C-NMR spectrum of compound 4ab



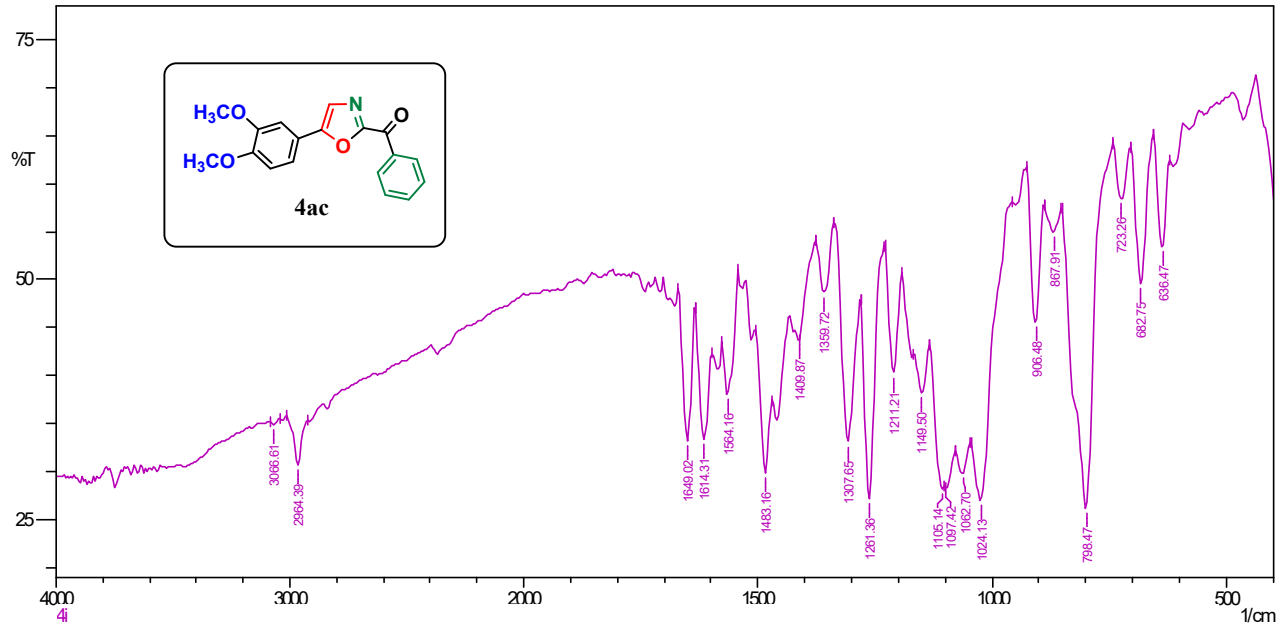
FT-IR spectrum of compound 4ab



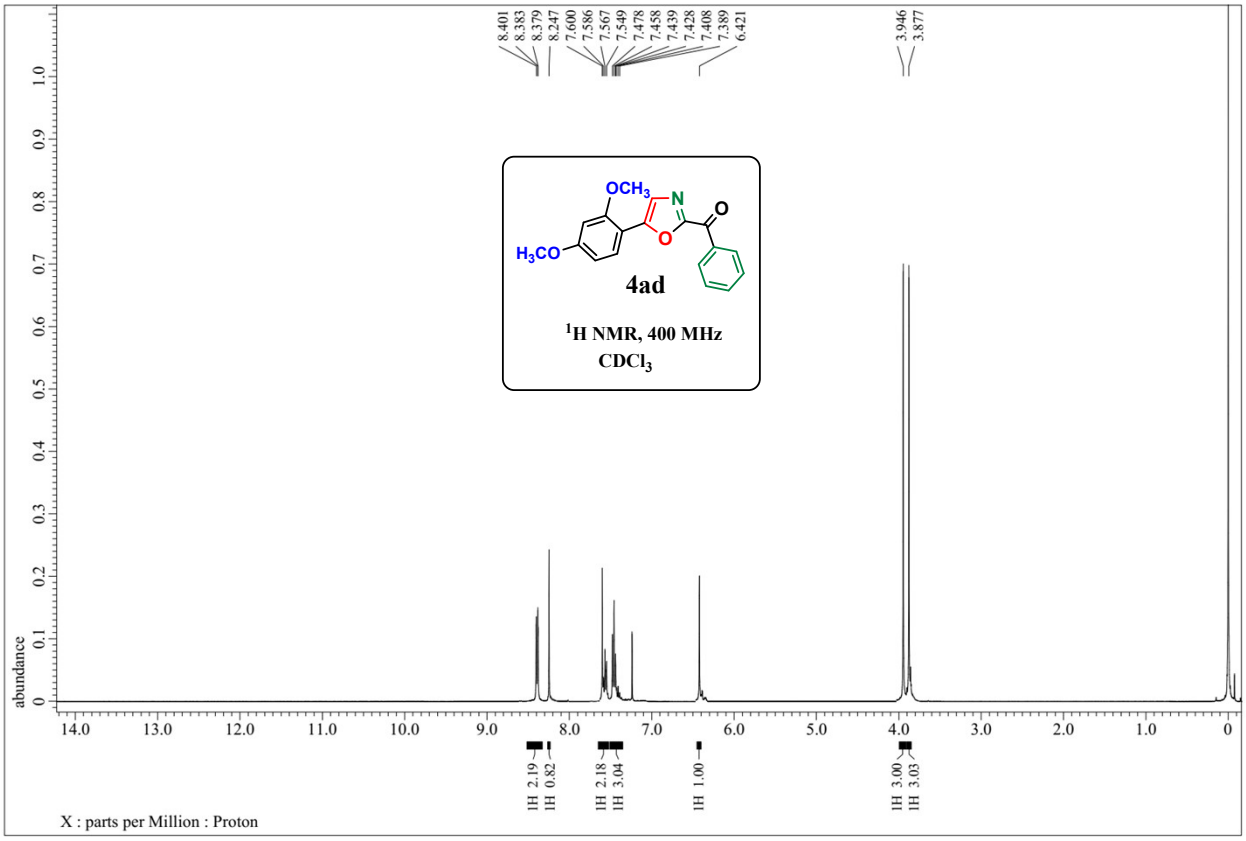
^{1}H-NMR spectrum of compound 4ac



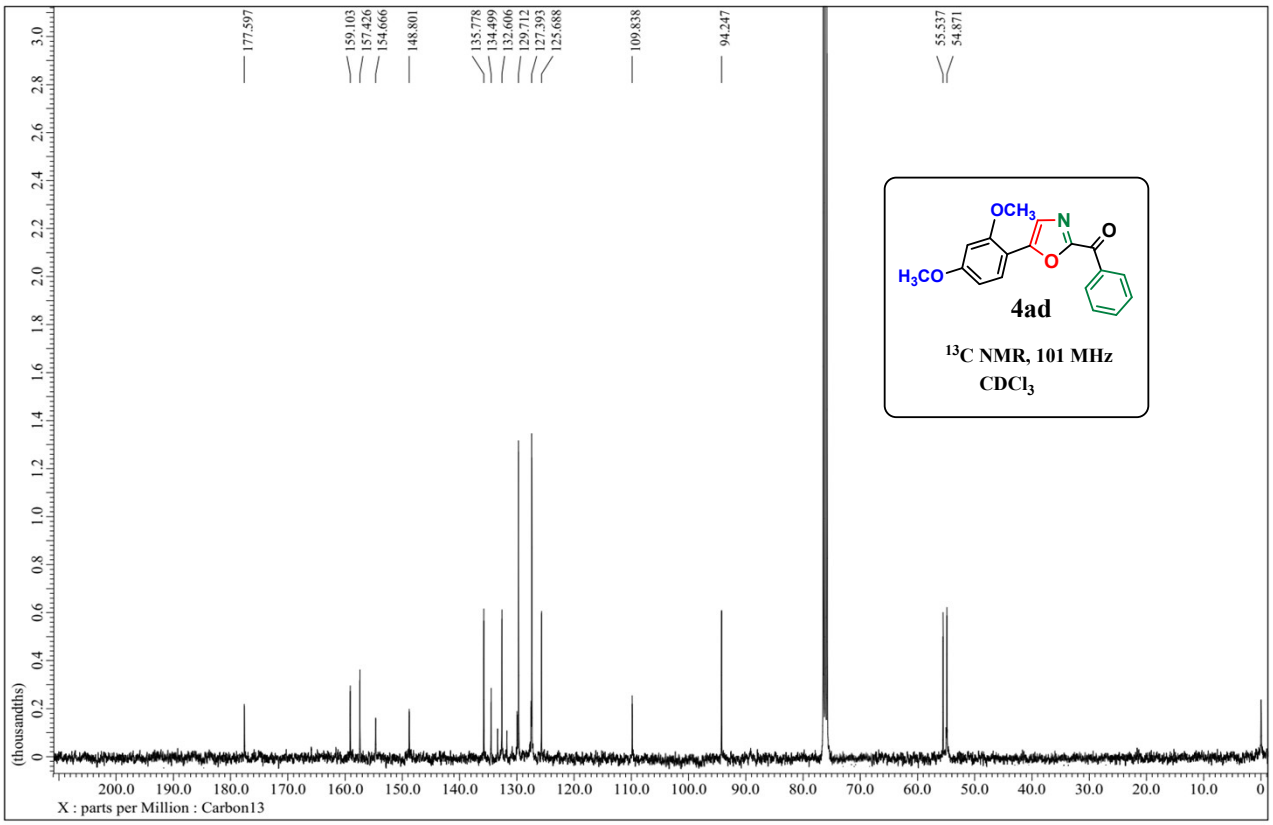
^{13}C-NMR spectrum of compound 4ac



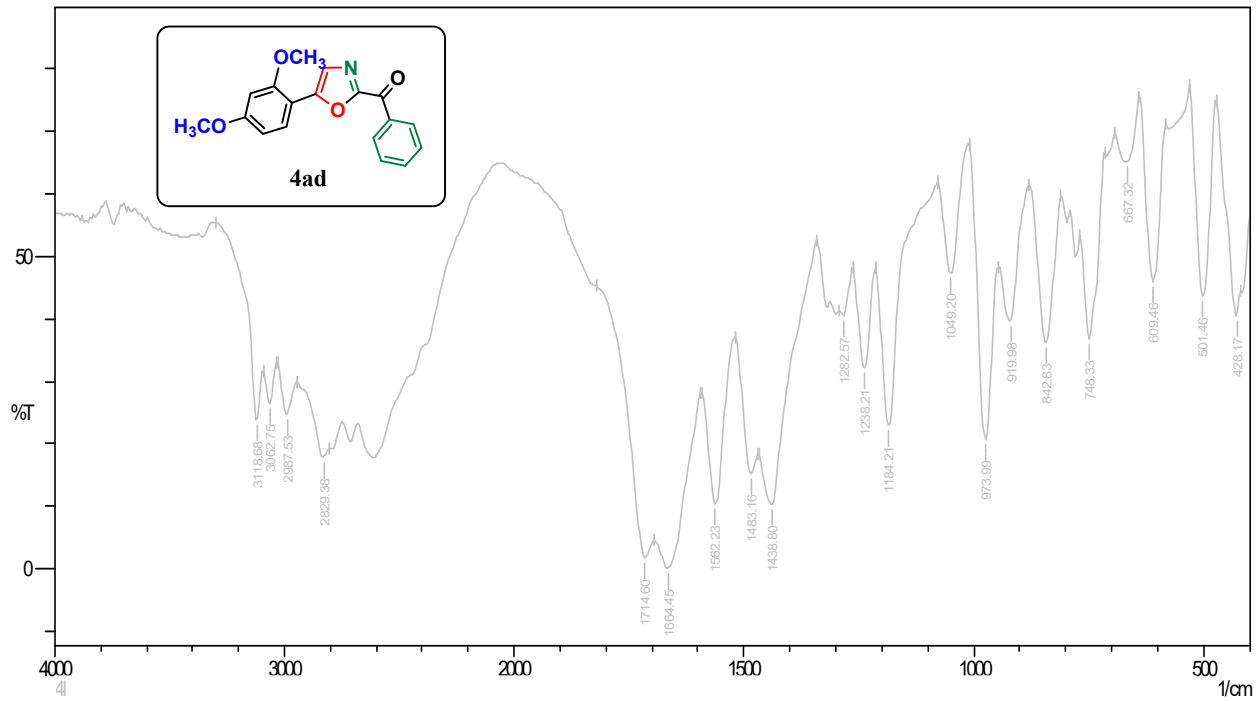
FT-IR spectrum of compound 4ac



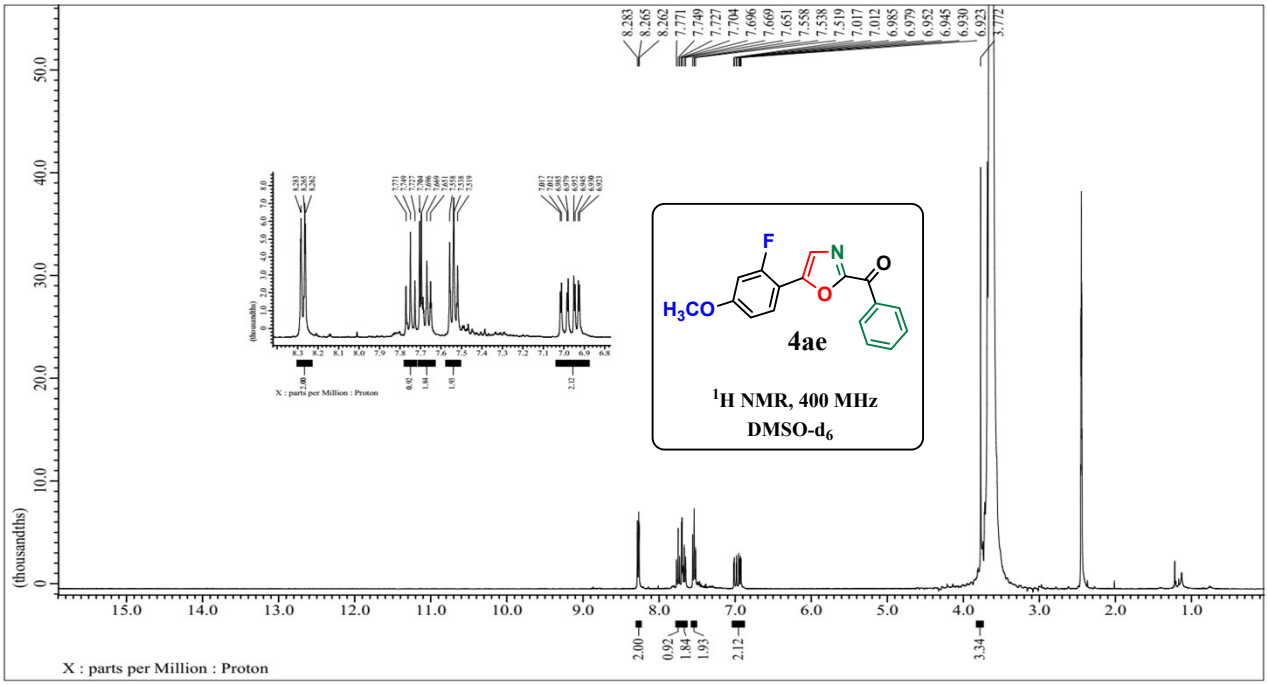
^{1}H-NMR spectrum of compound 4ad



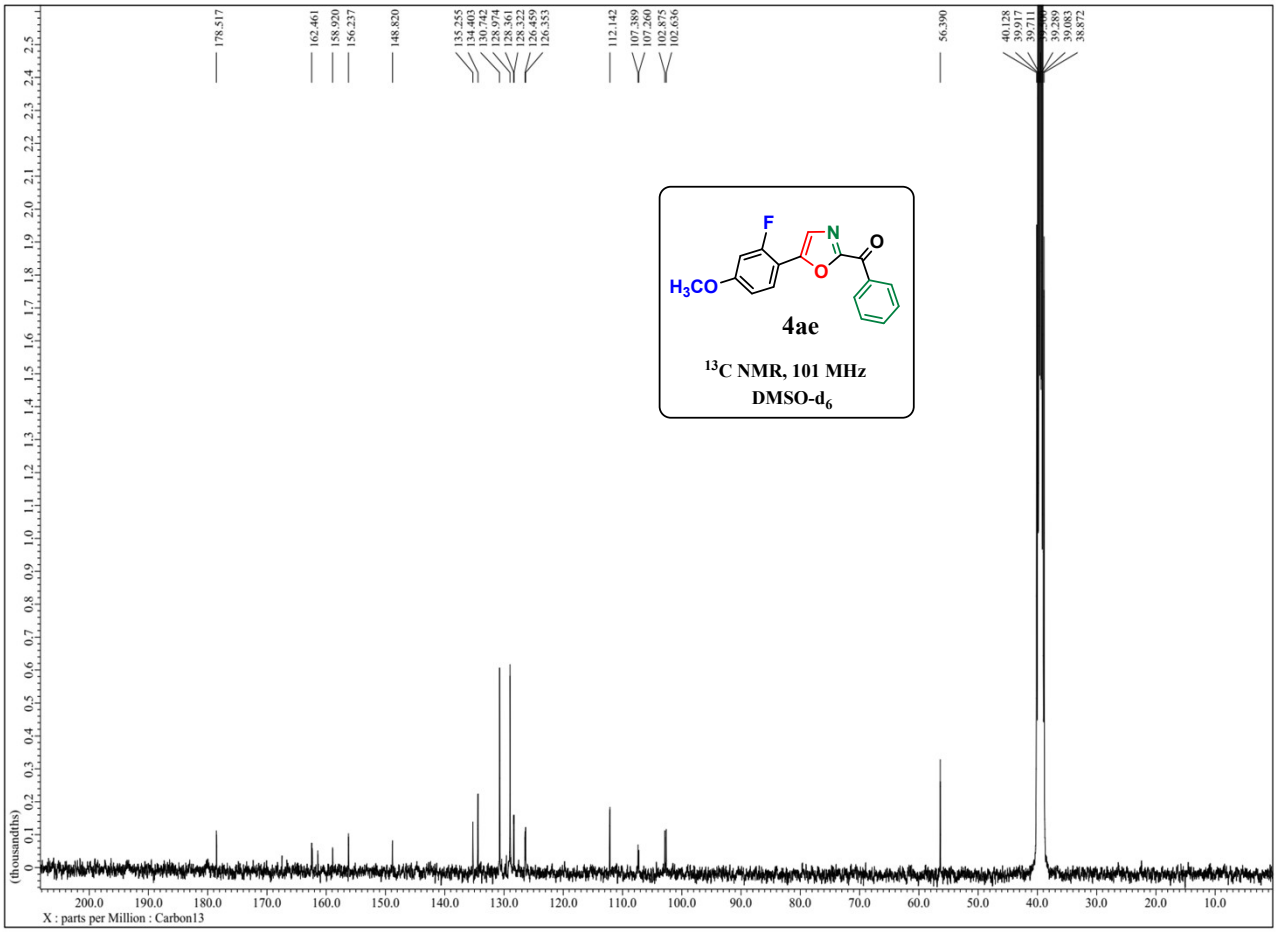
^{13}C-NMR spectrum of compound 4ad



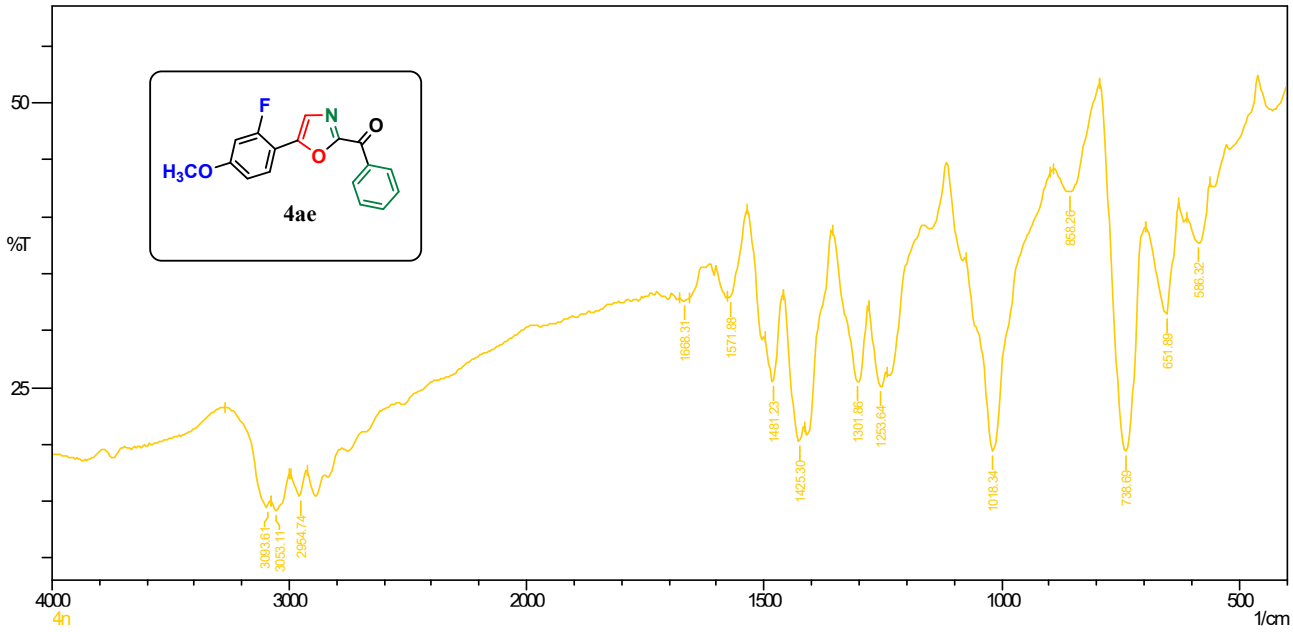
FT-IR spectrum of compound 4ad



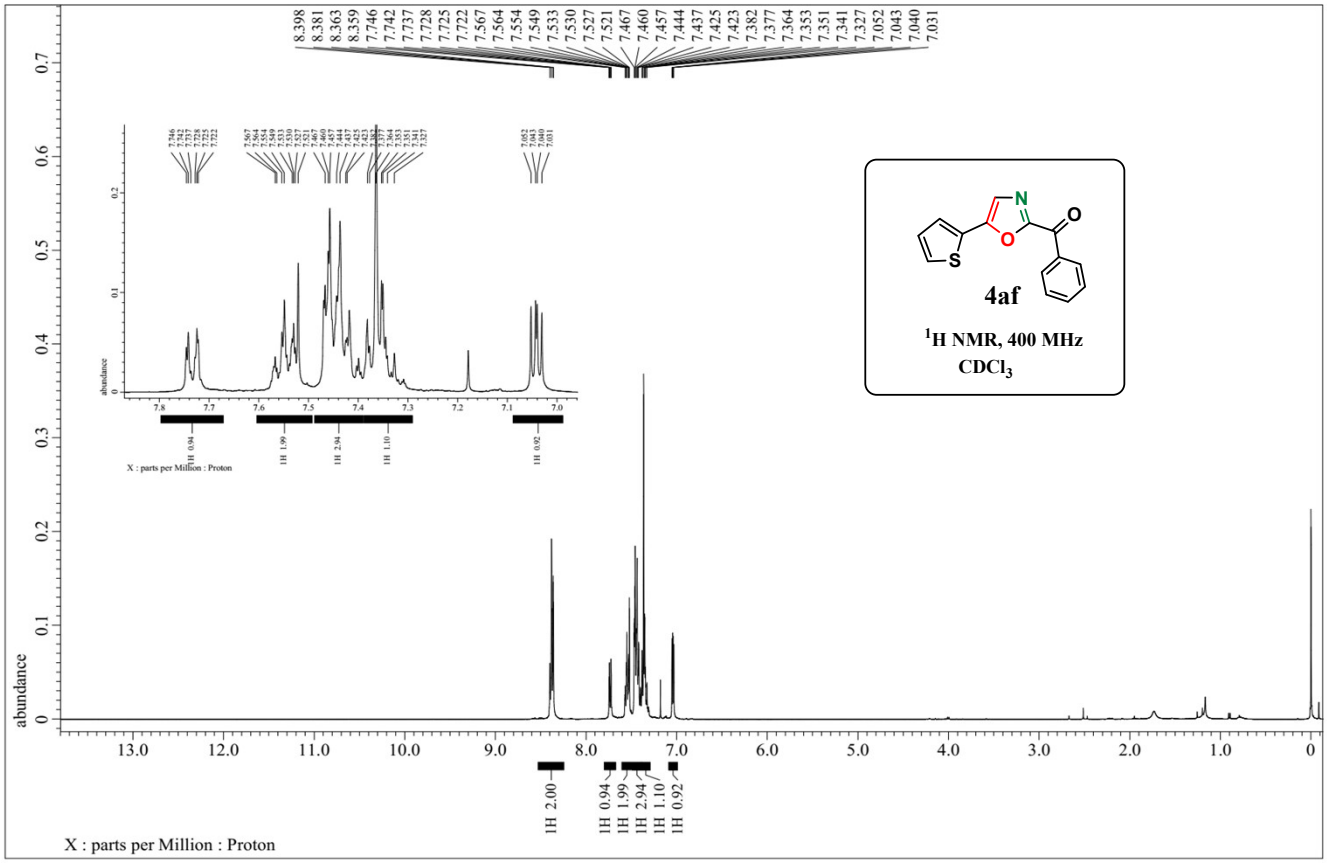
^{1}H-NMR spectrum of compound 4ae



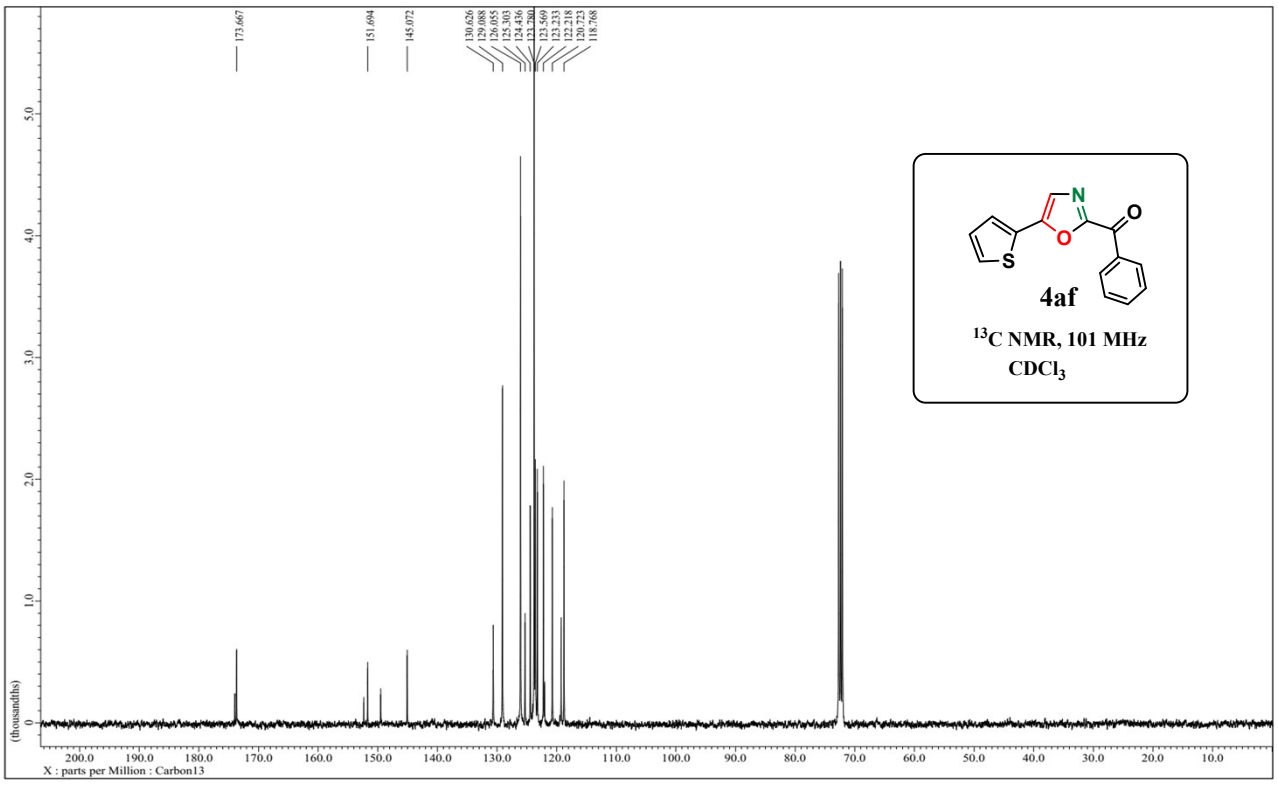
^{13}C-NMR spectrum of compound 4ae



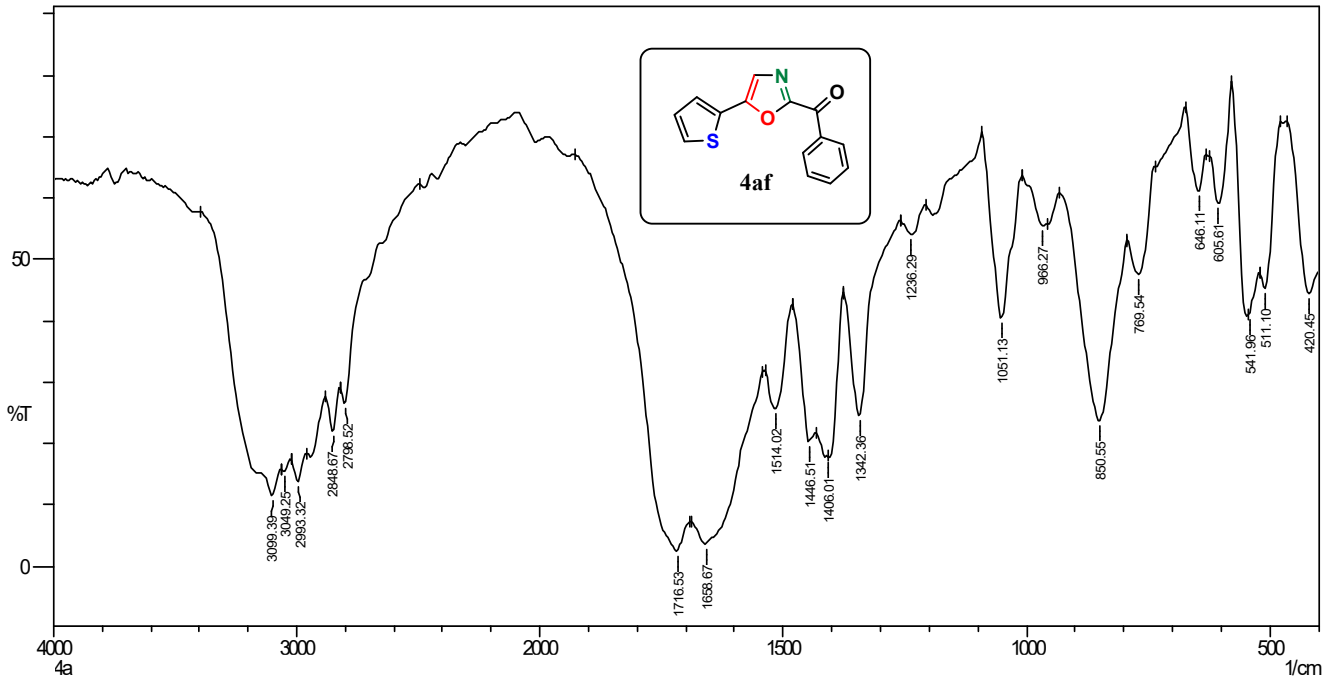
FT-IR spectrum of compound 4ae



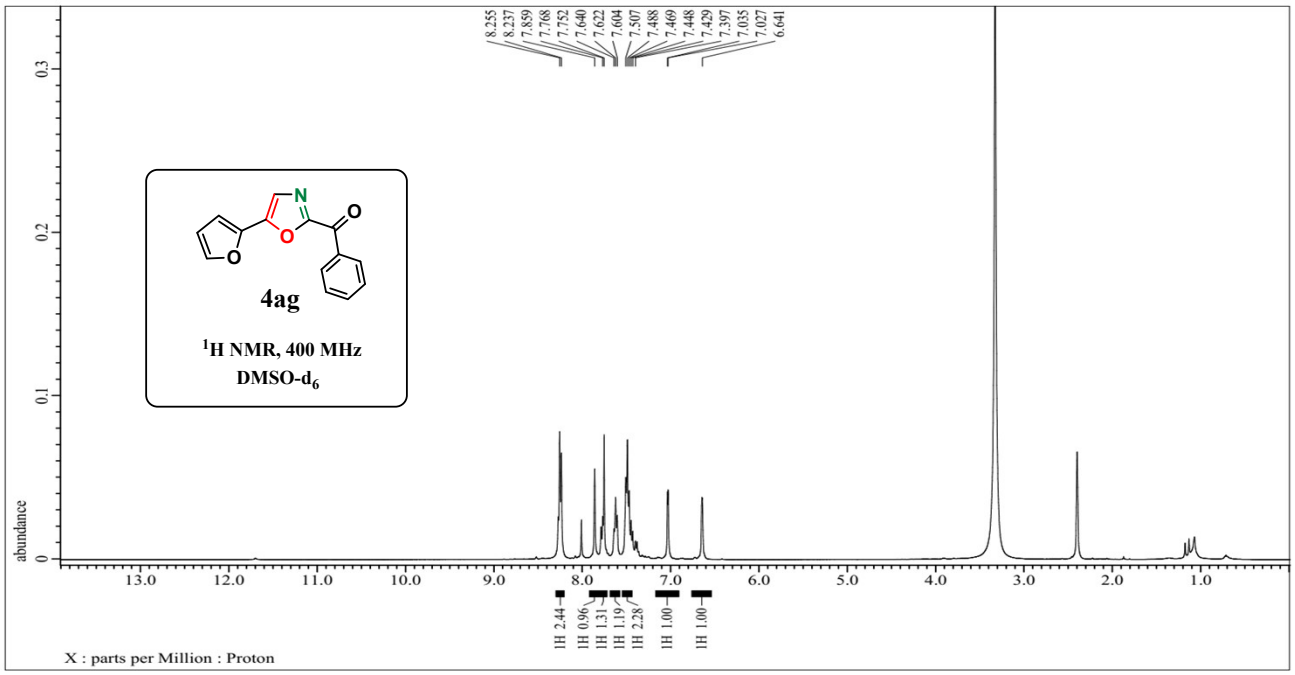
^{1}H-NMR spectrum of compound 4af



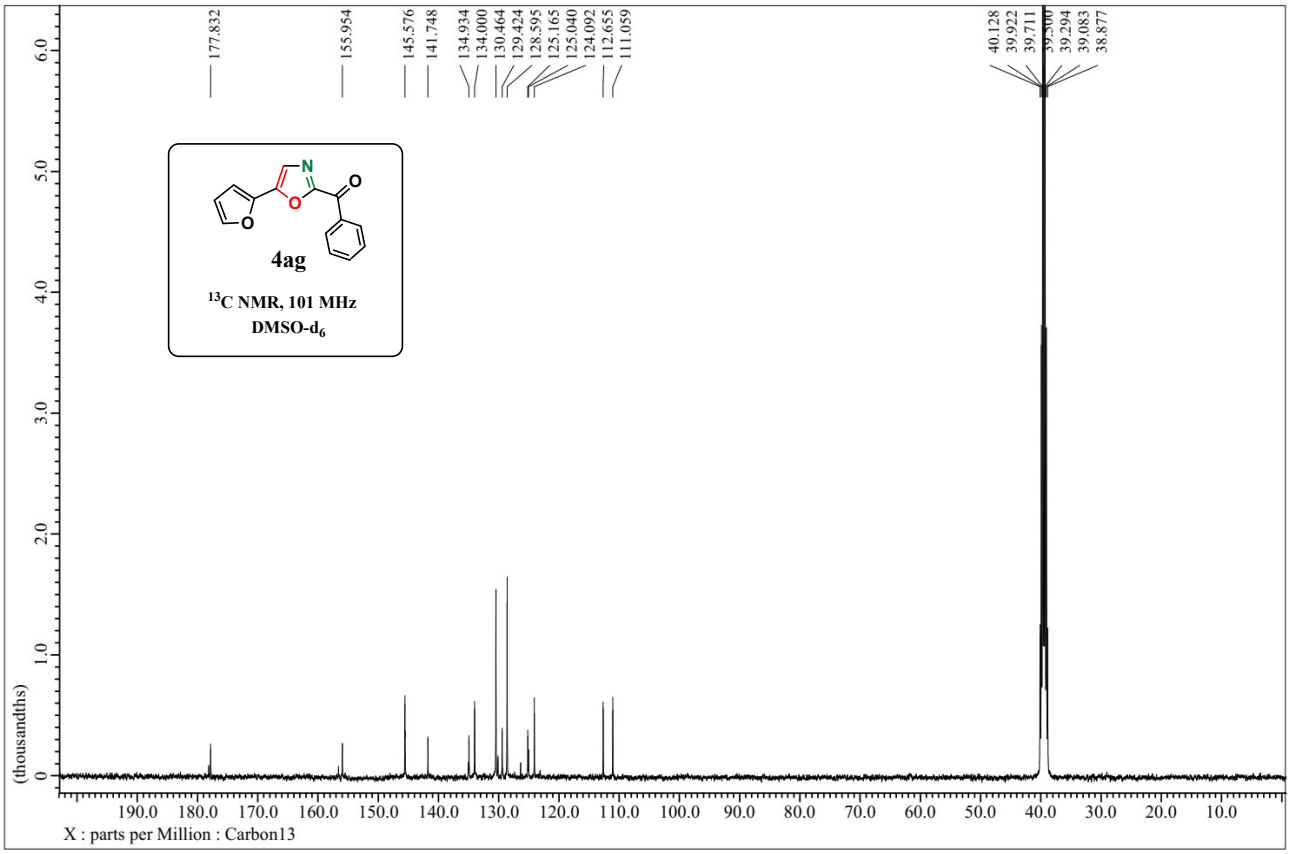
^{13}C-NMR spectrum of compound 4af



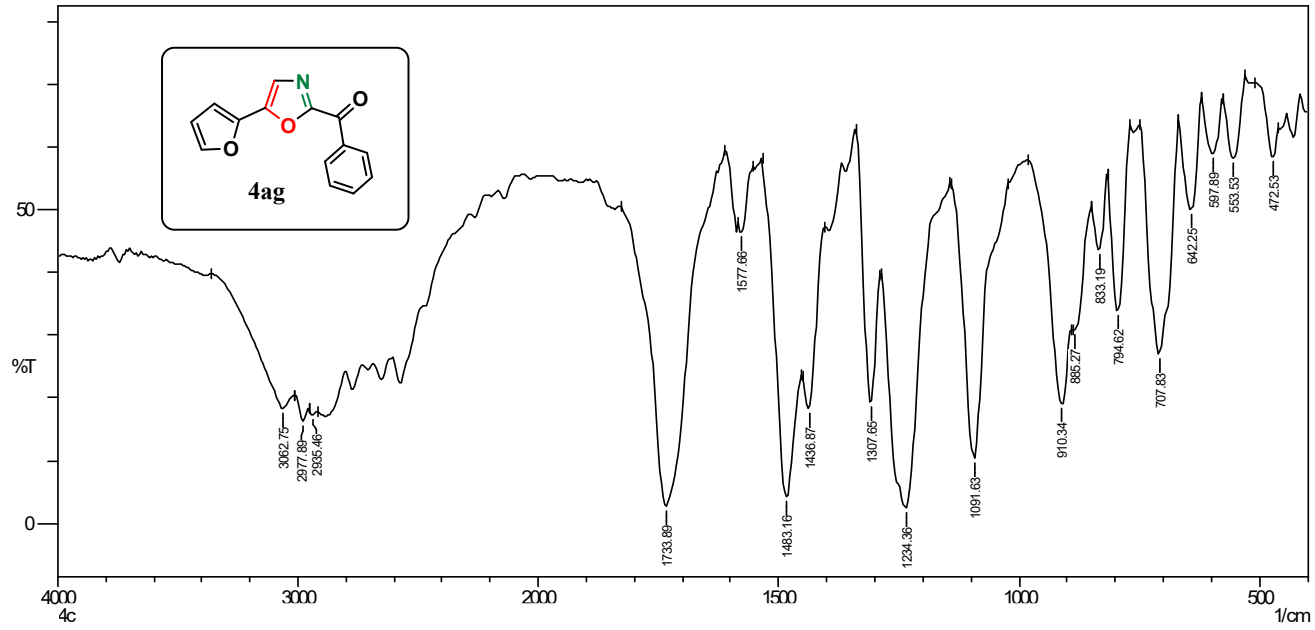
FT-IR spectrum of compound 4af



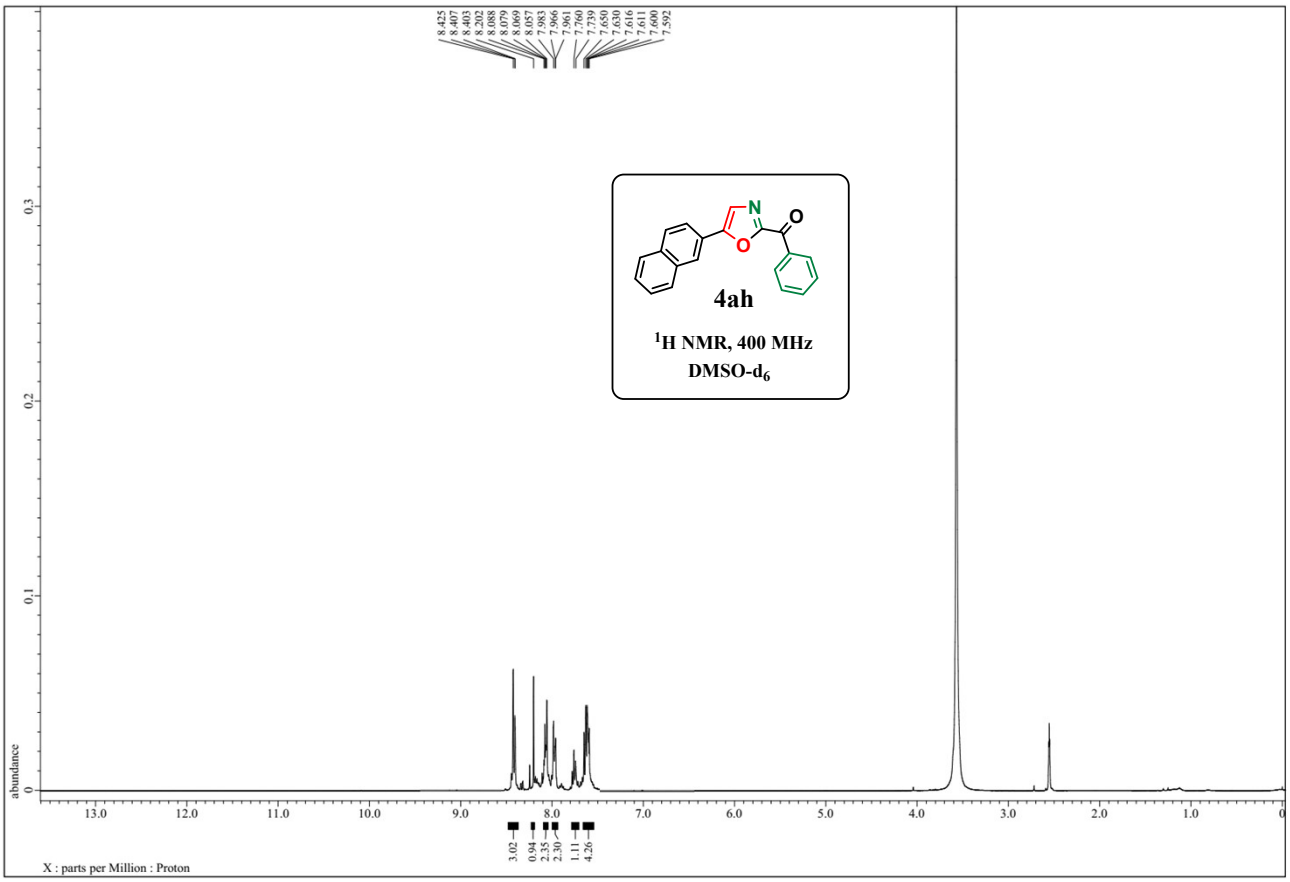
^{1}H-NMR spectrum of compound 4ag



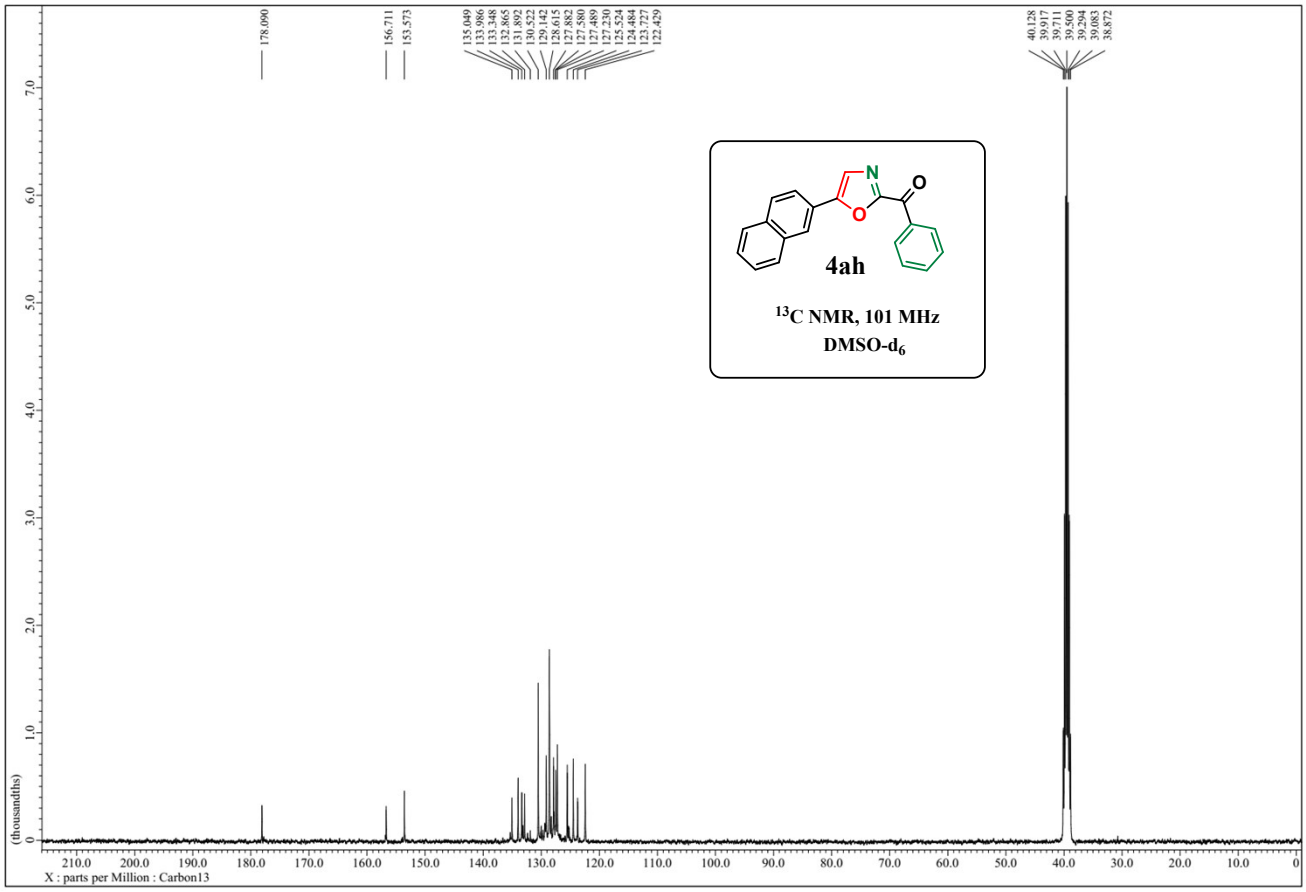
^{13}C-NMR spectrum of compound 4ag



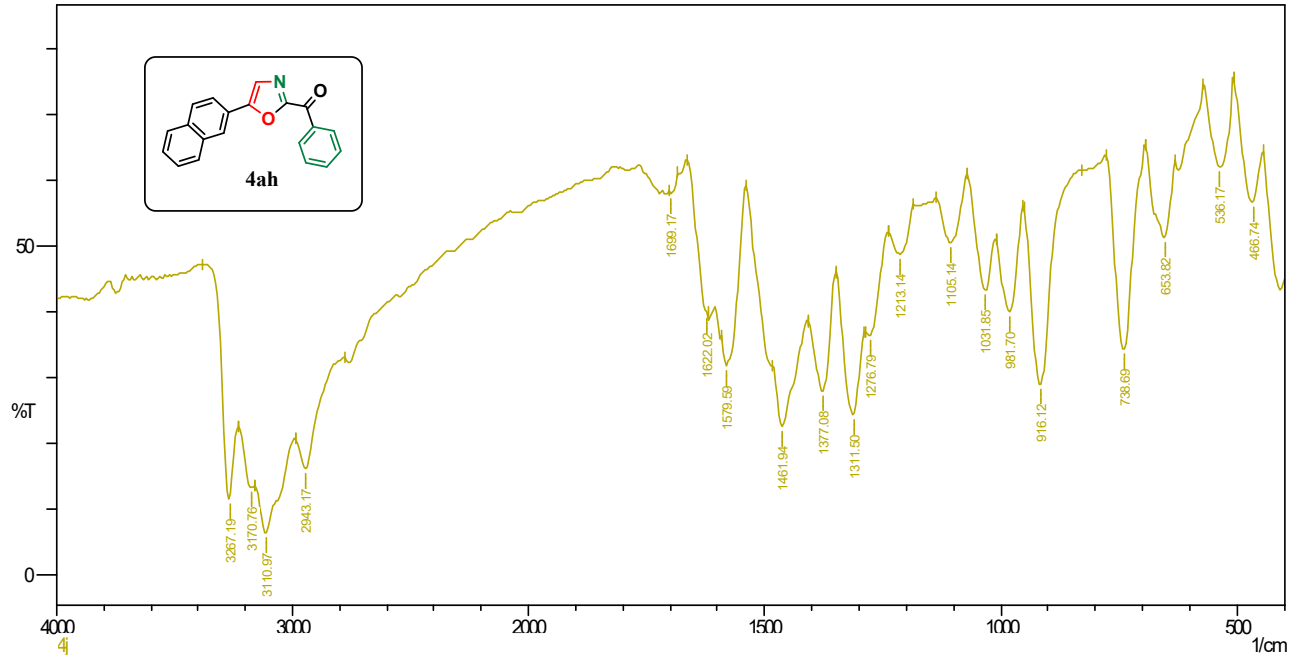
FT-IR spectrum of compound 4ag



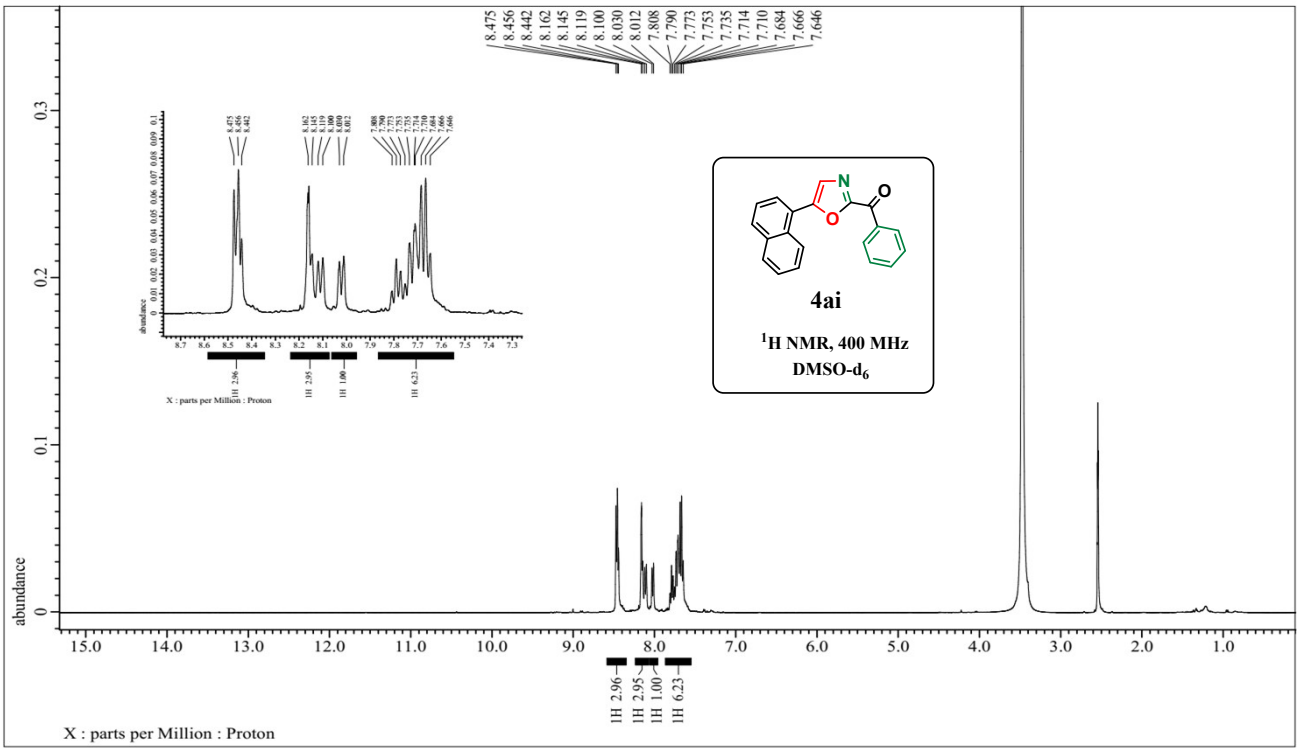
^{1}H-NMR spectrum of compound 4ah



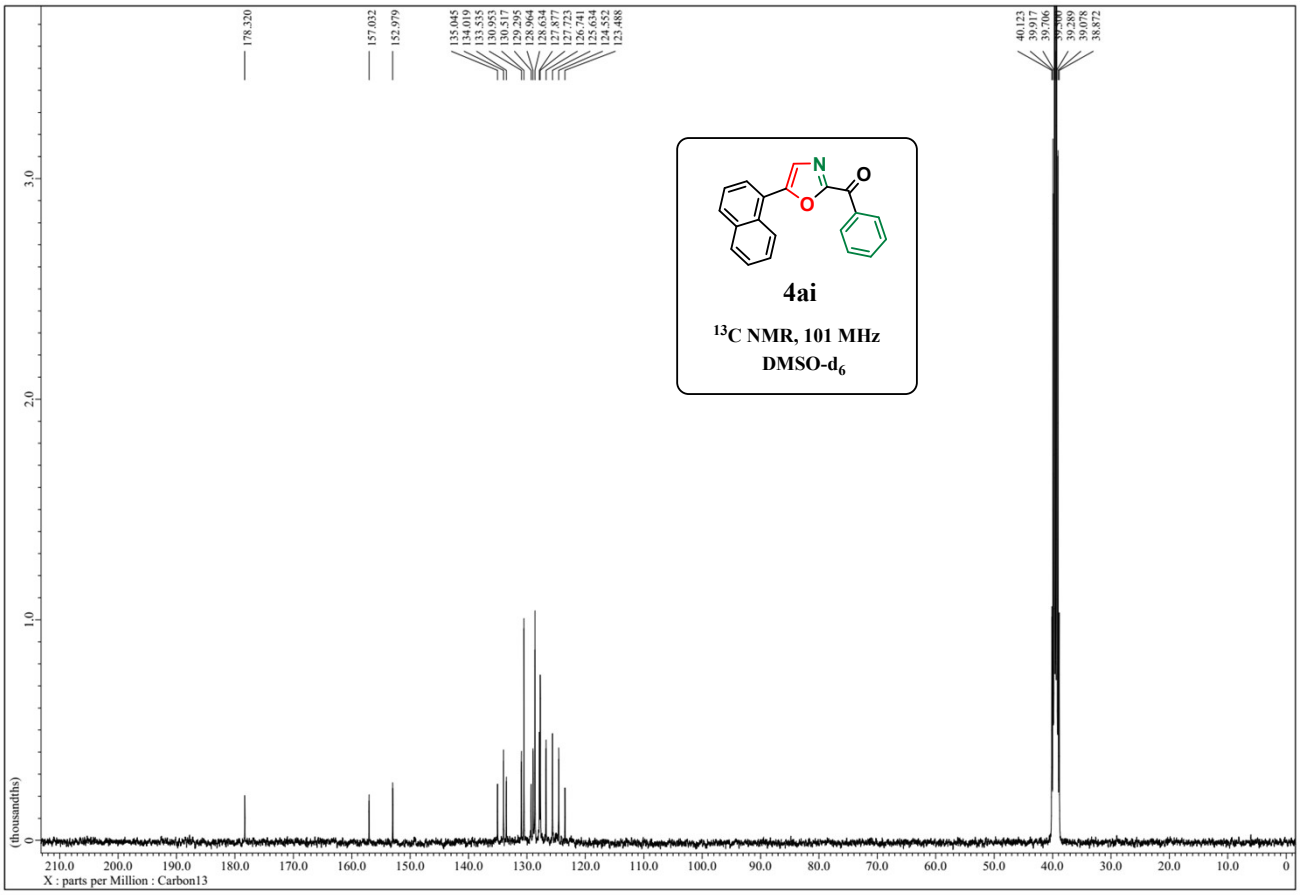
^{13}C-NMR spectrum of compound 4ah



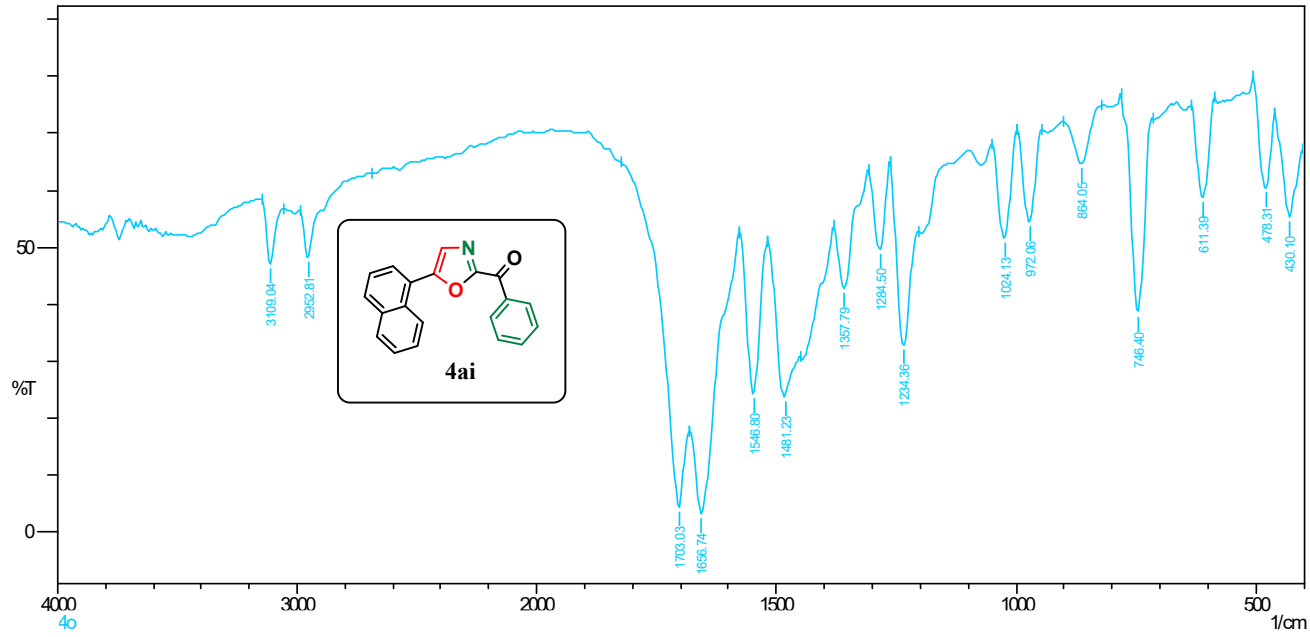
FT-IR spectrum of compound 4ah



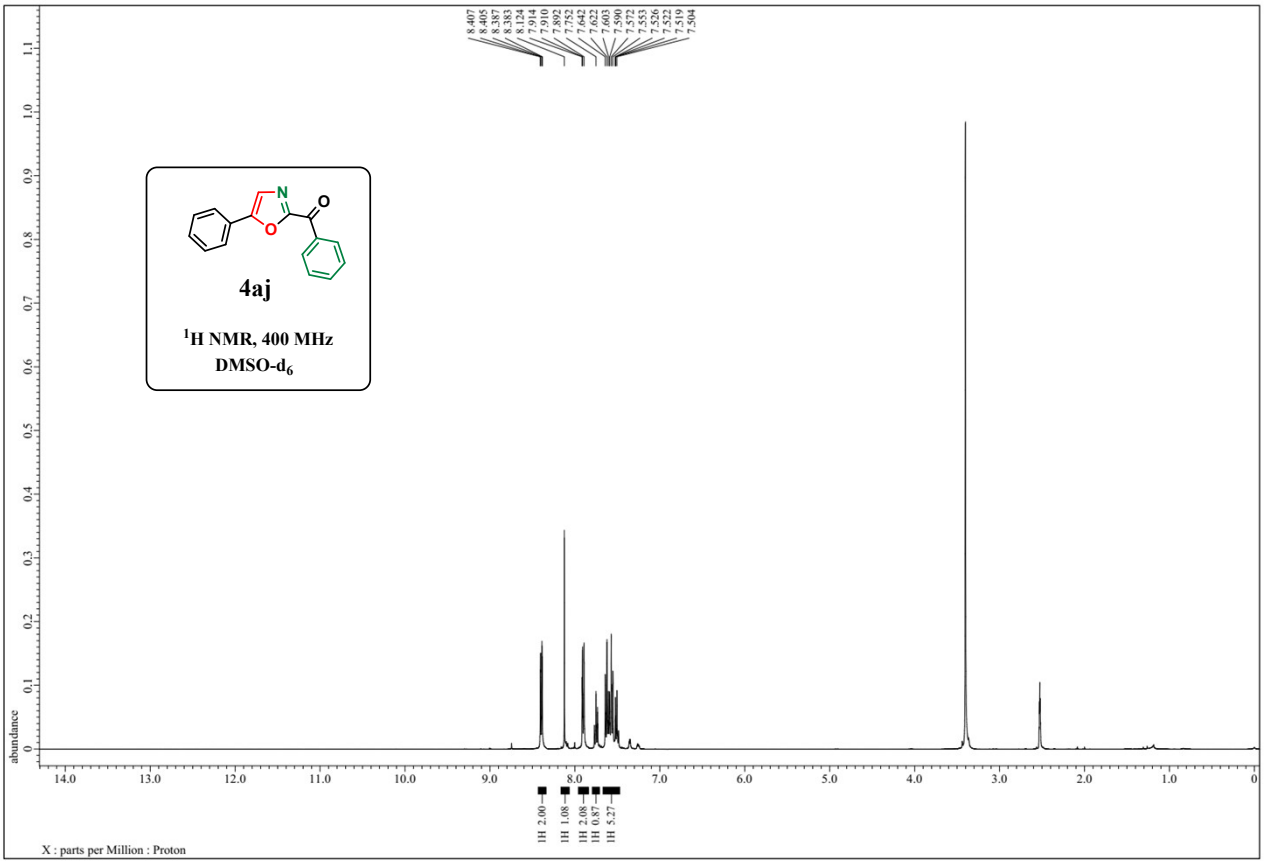
^{1}H-NMR spectrum of compound 4ai



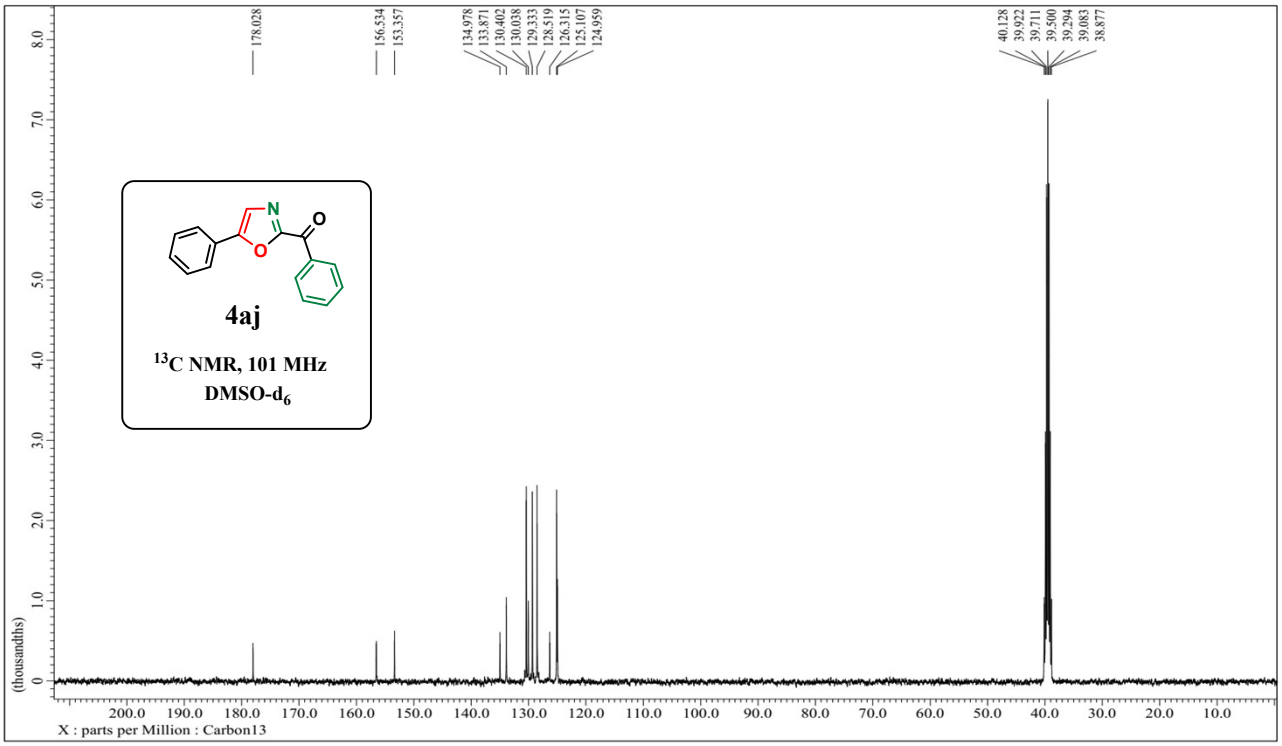
^{13}C-NMR spectrum of compound 4ai



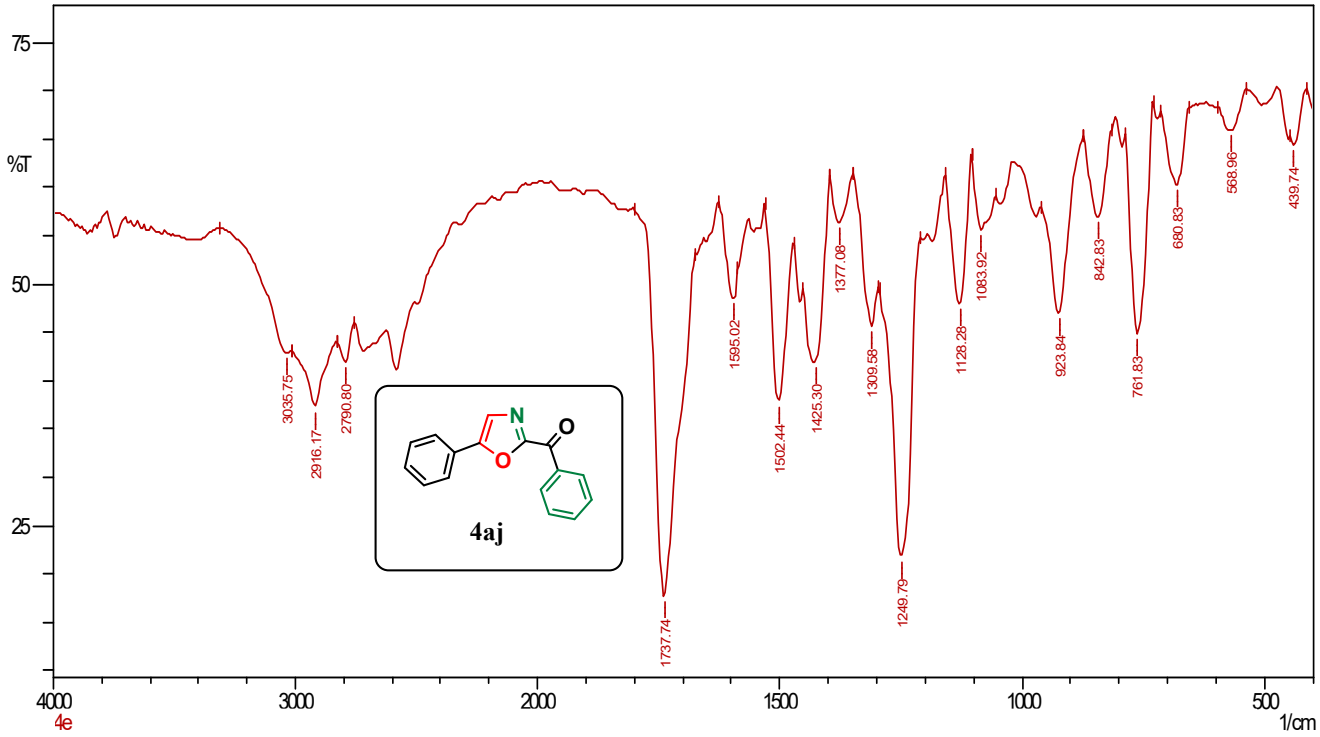
FT-IR spectrum of compound 4ai



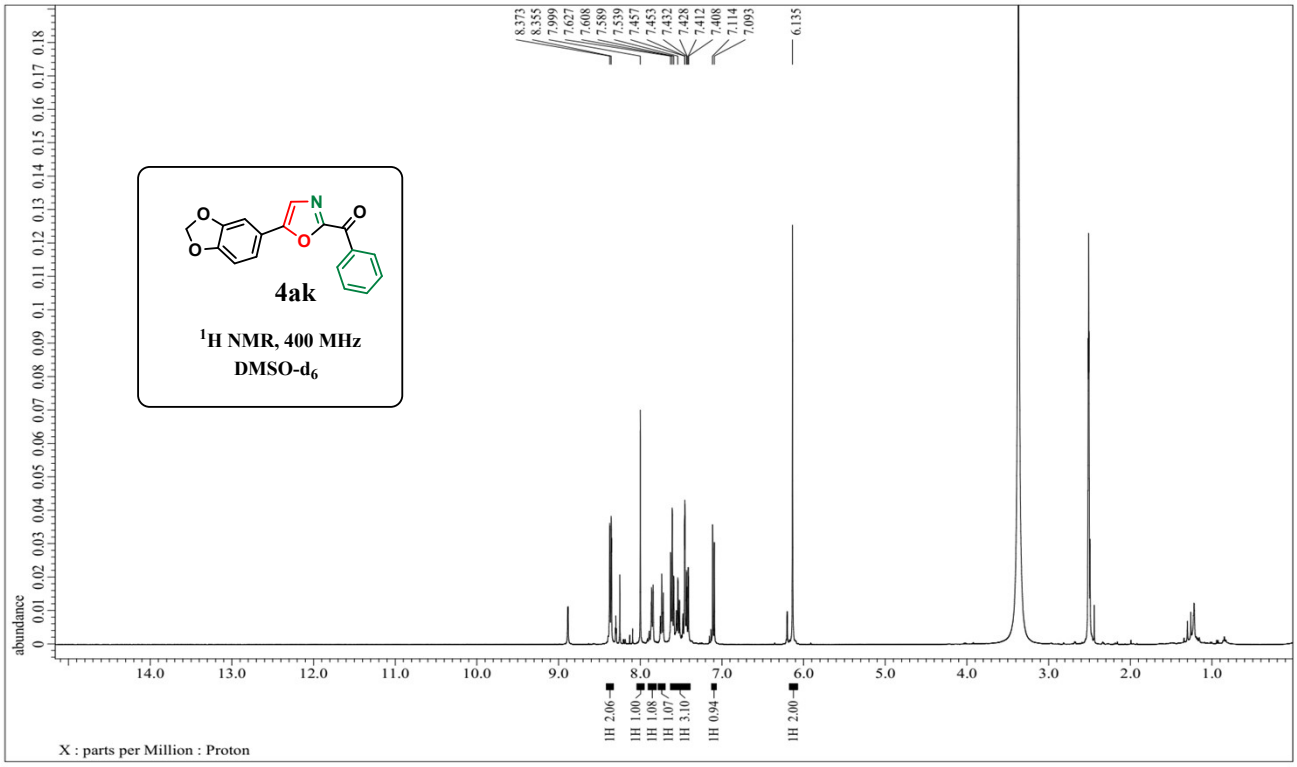
^{1}H-NMR spectrum of compound 4aj



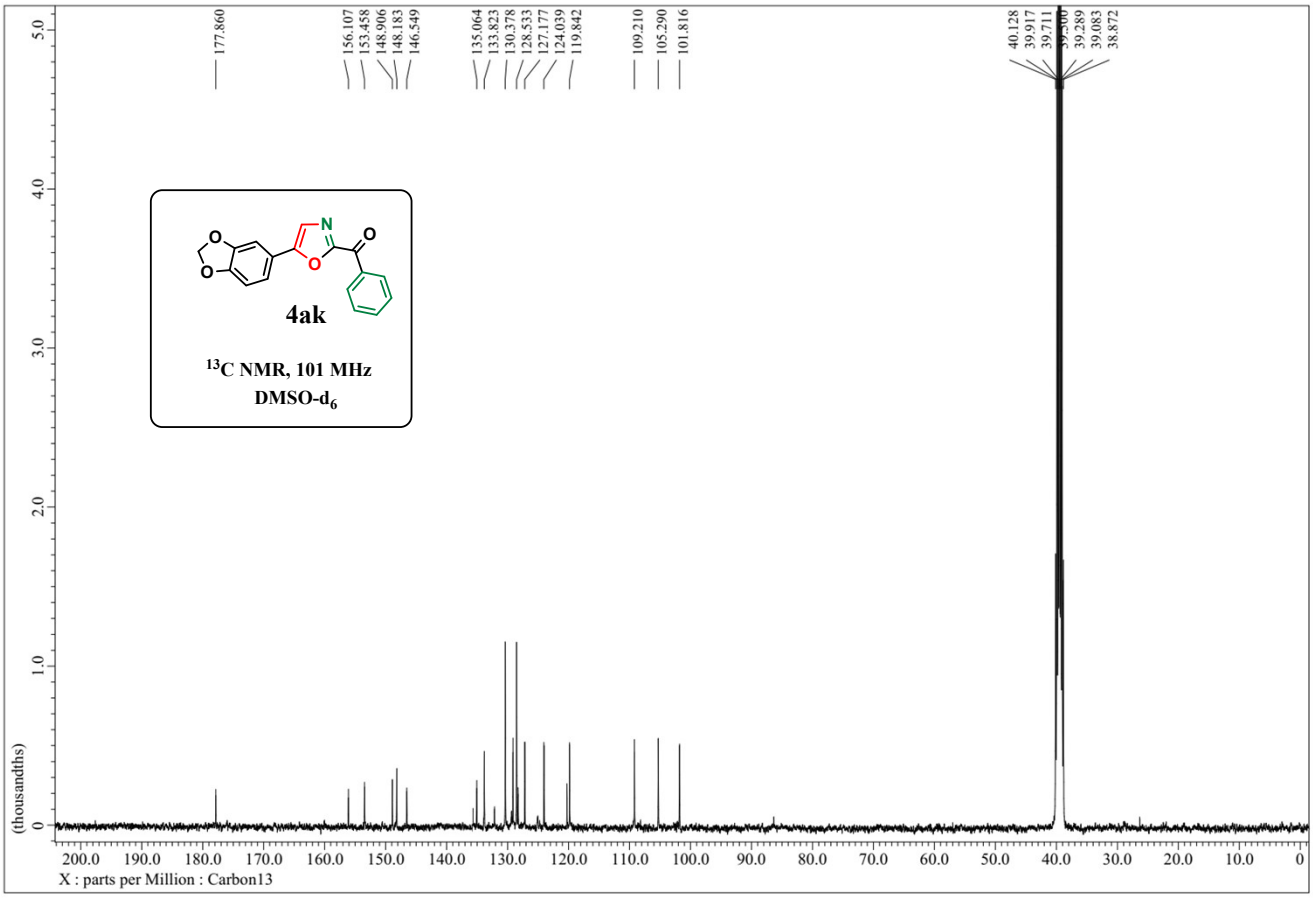
^{13}C-NMR spectrum of compound 4aj



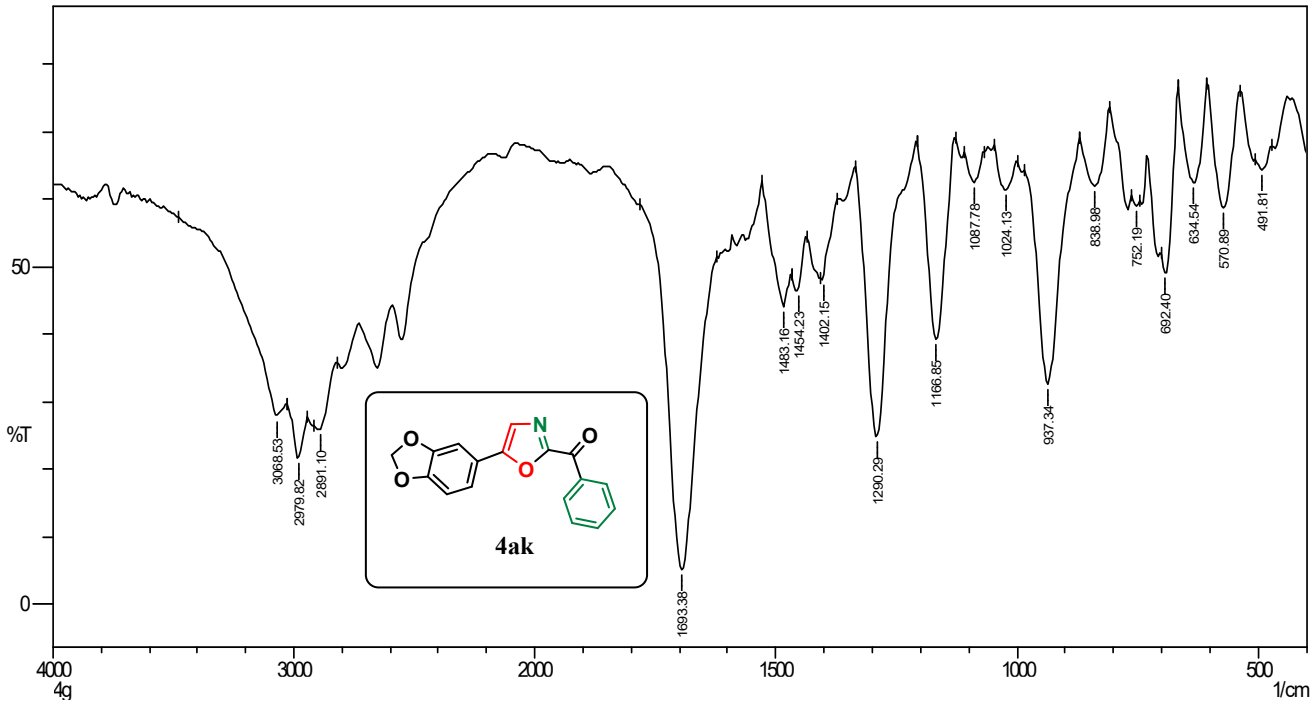
FT-IR spectrum of compound 4aj



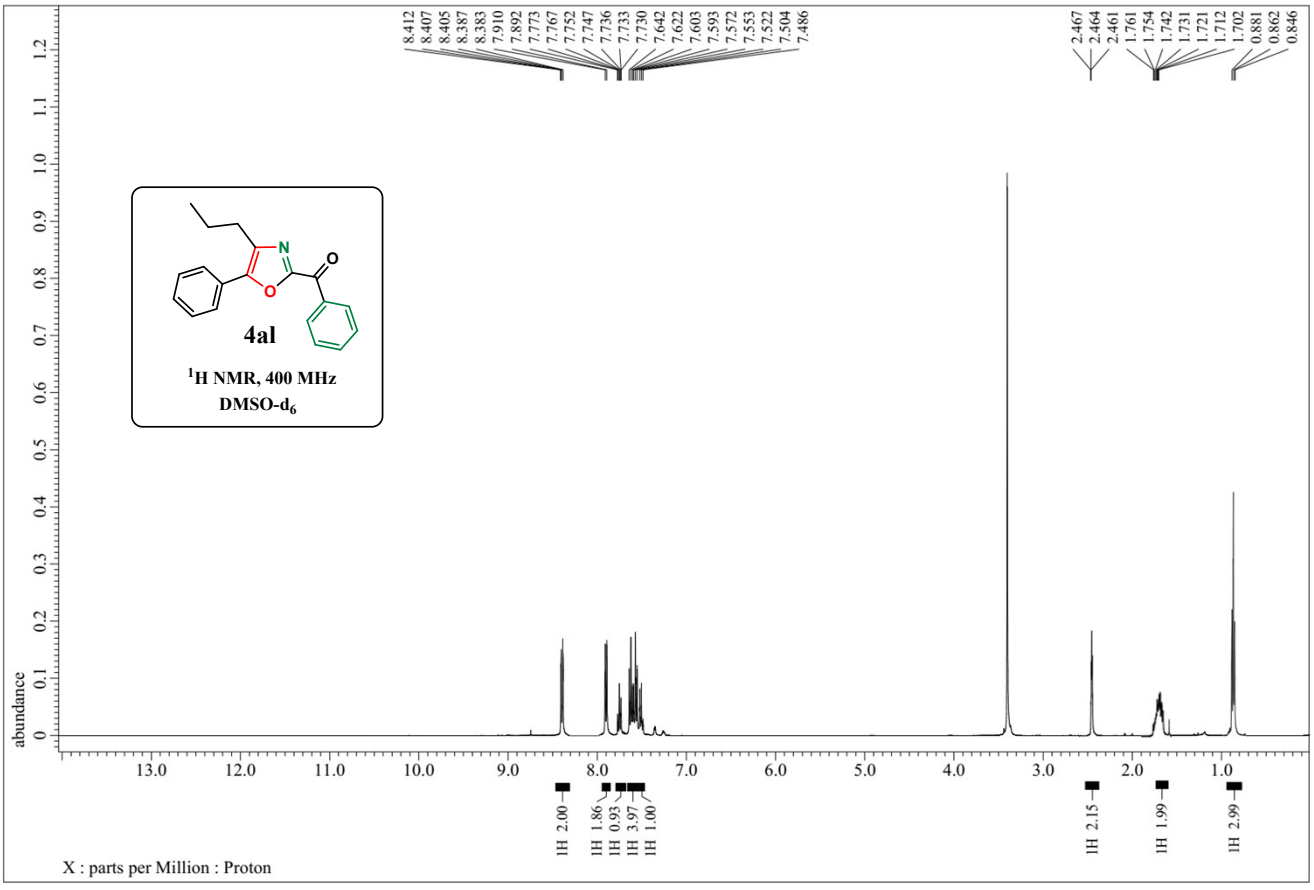
^{1}H-NMR spectrum of compound 4ak



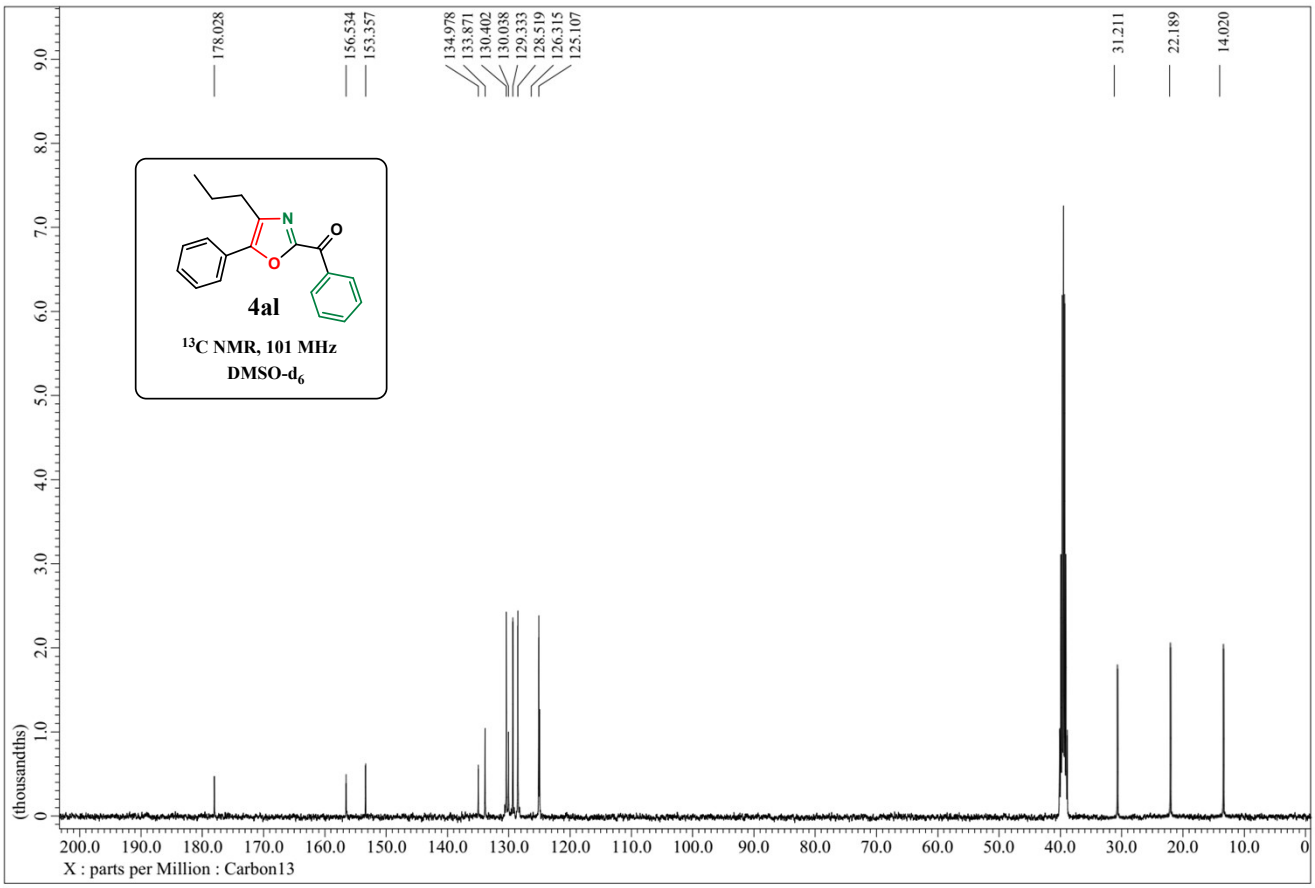
^{13}C-NMR spectrum of compound 4ak



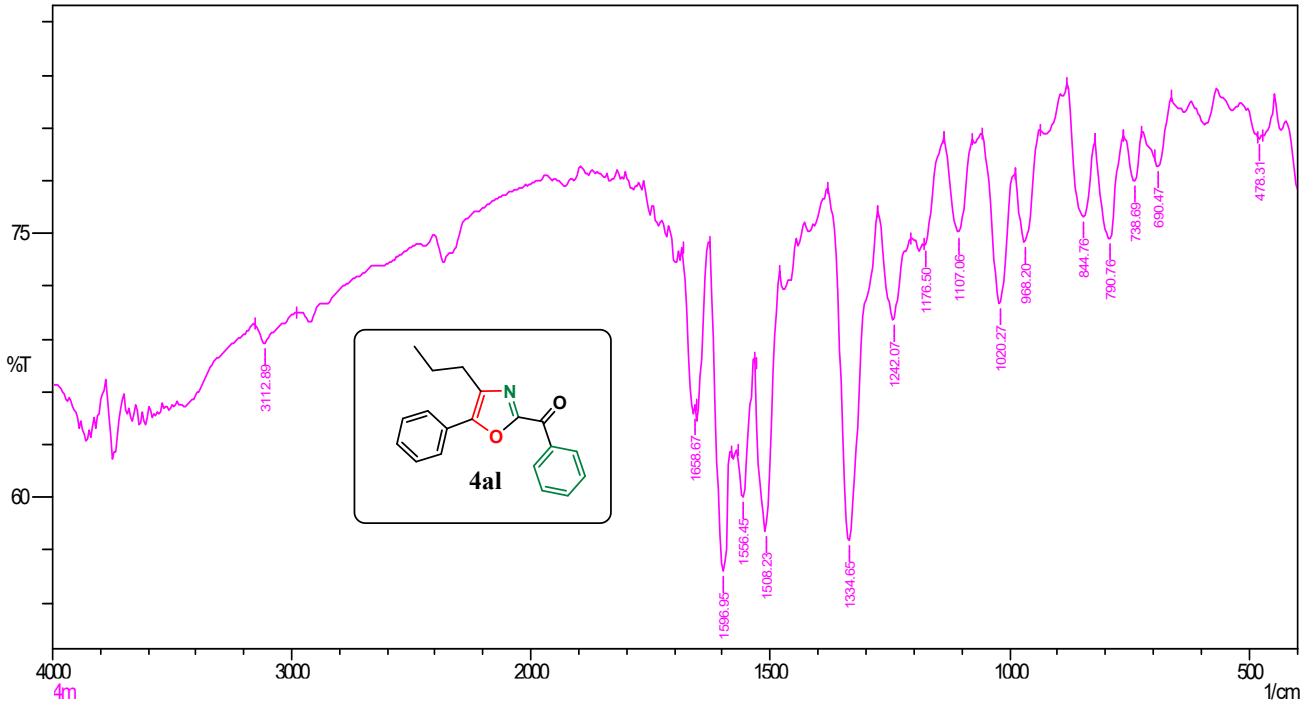
FT-IR spectrum of compound 4ak



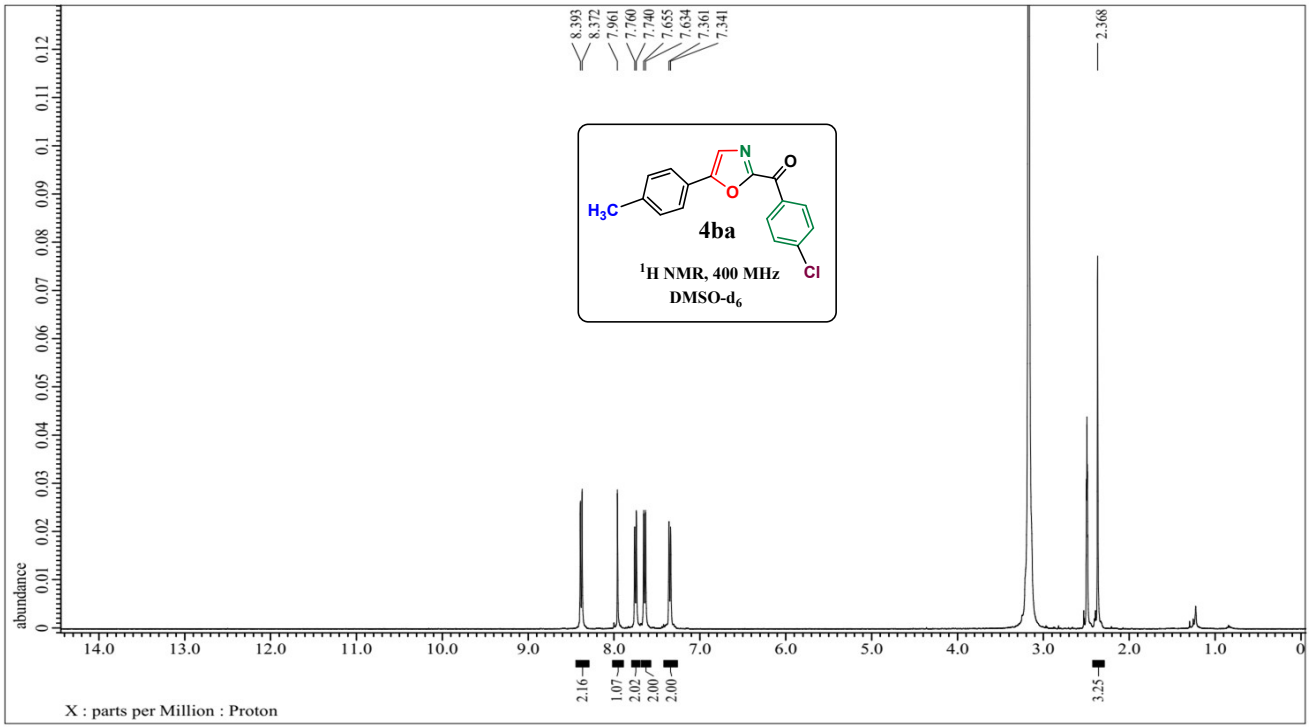
^{1}H-NMR spectrum of compound 4al



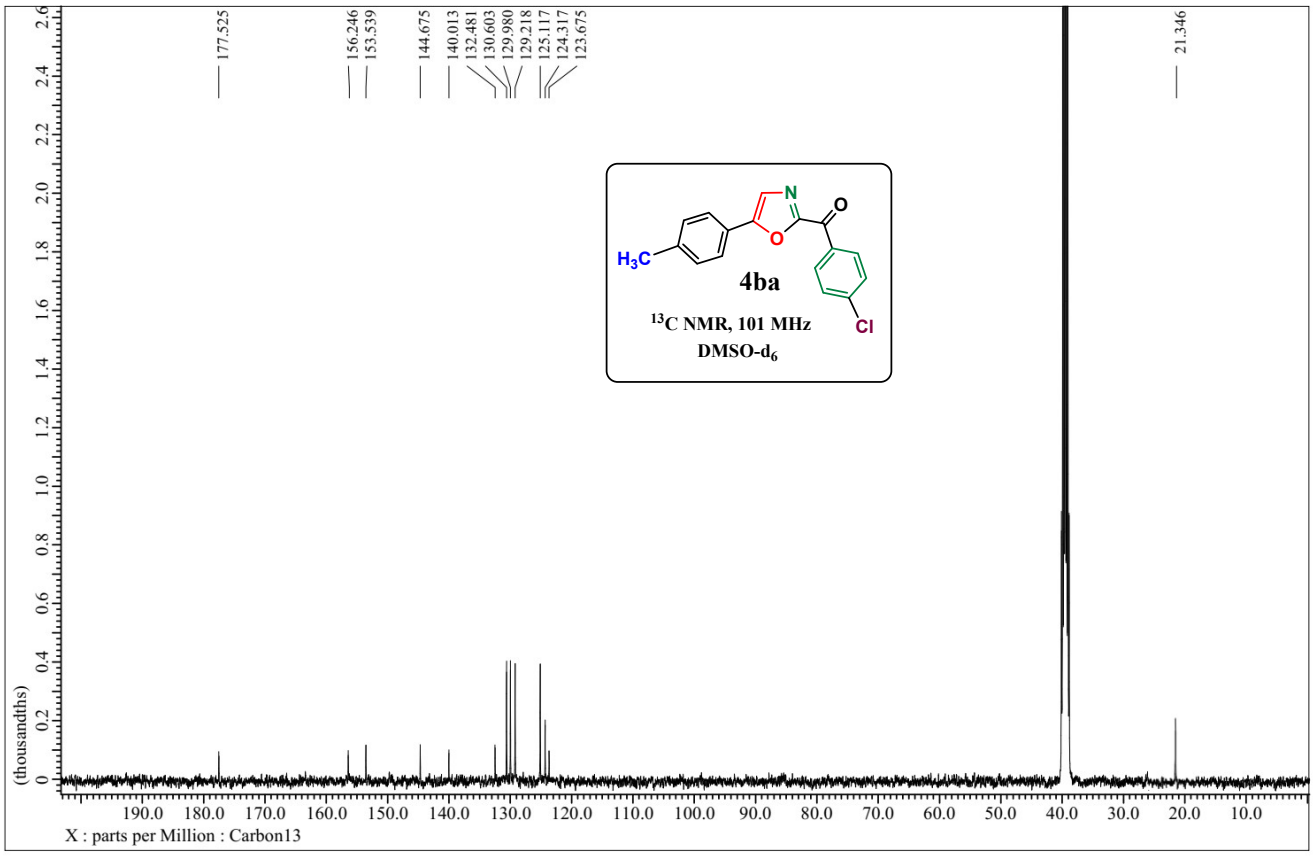
^{13}C-NMR spectrum of compound 4al



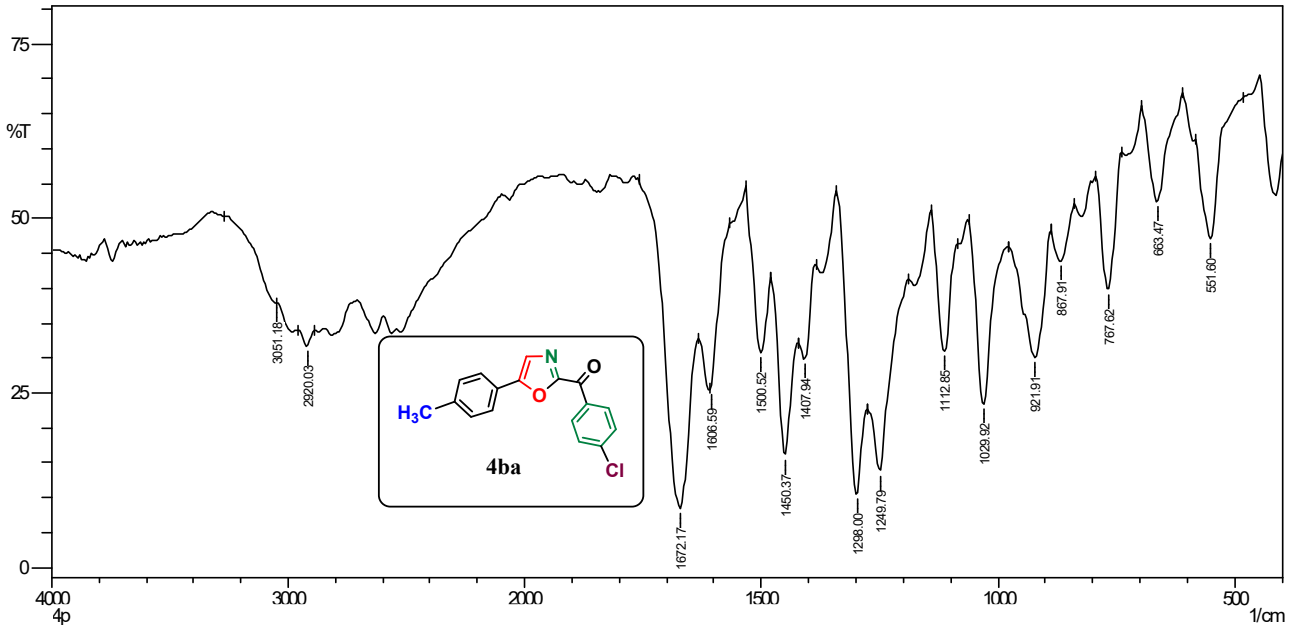
FT-IR spectrum of compound 4al



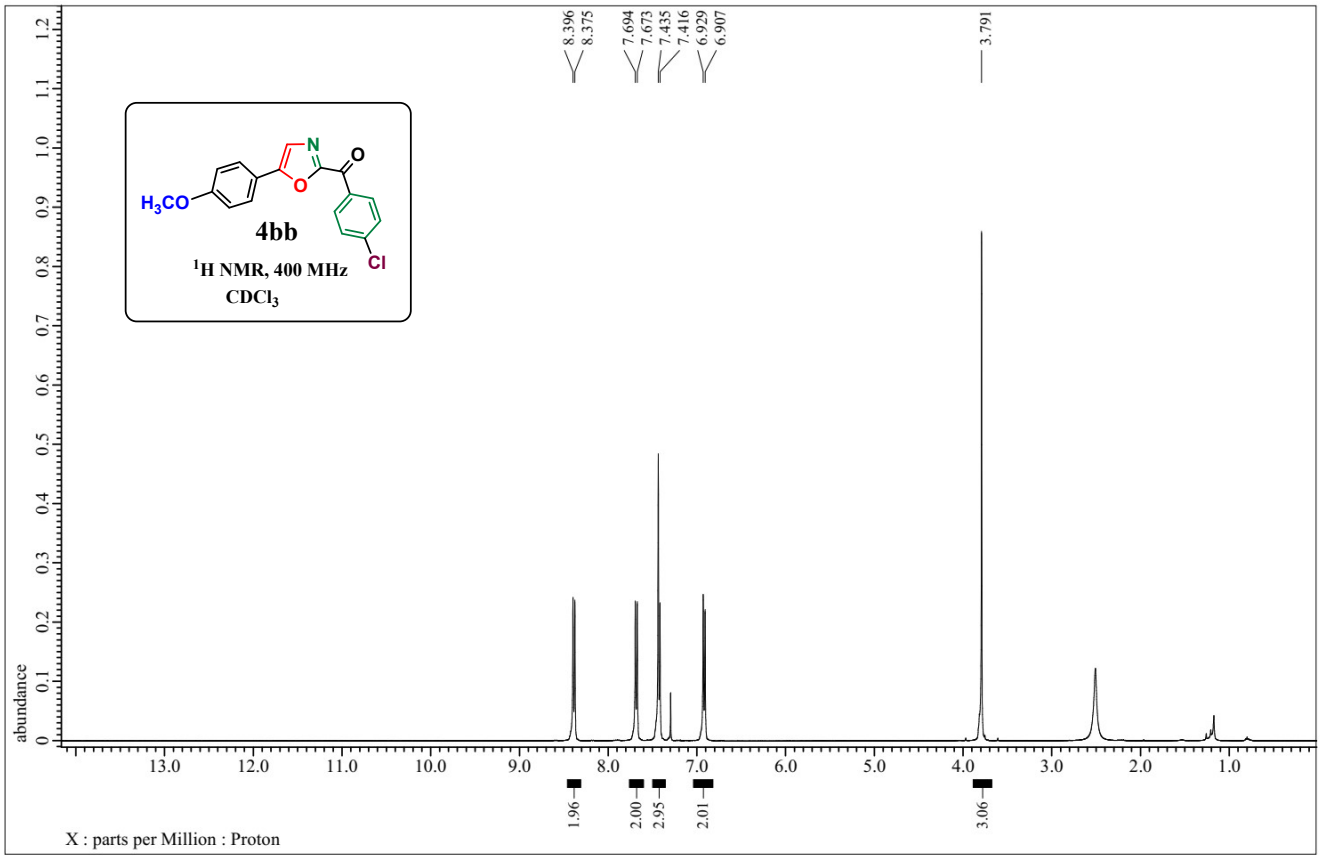
^{1}H-NMR spectrum of compound 4ba



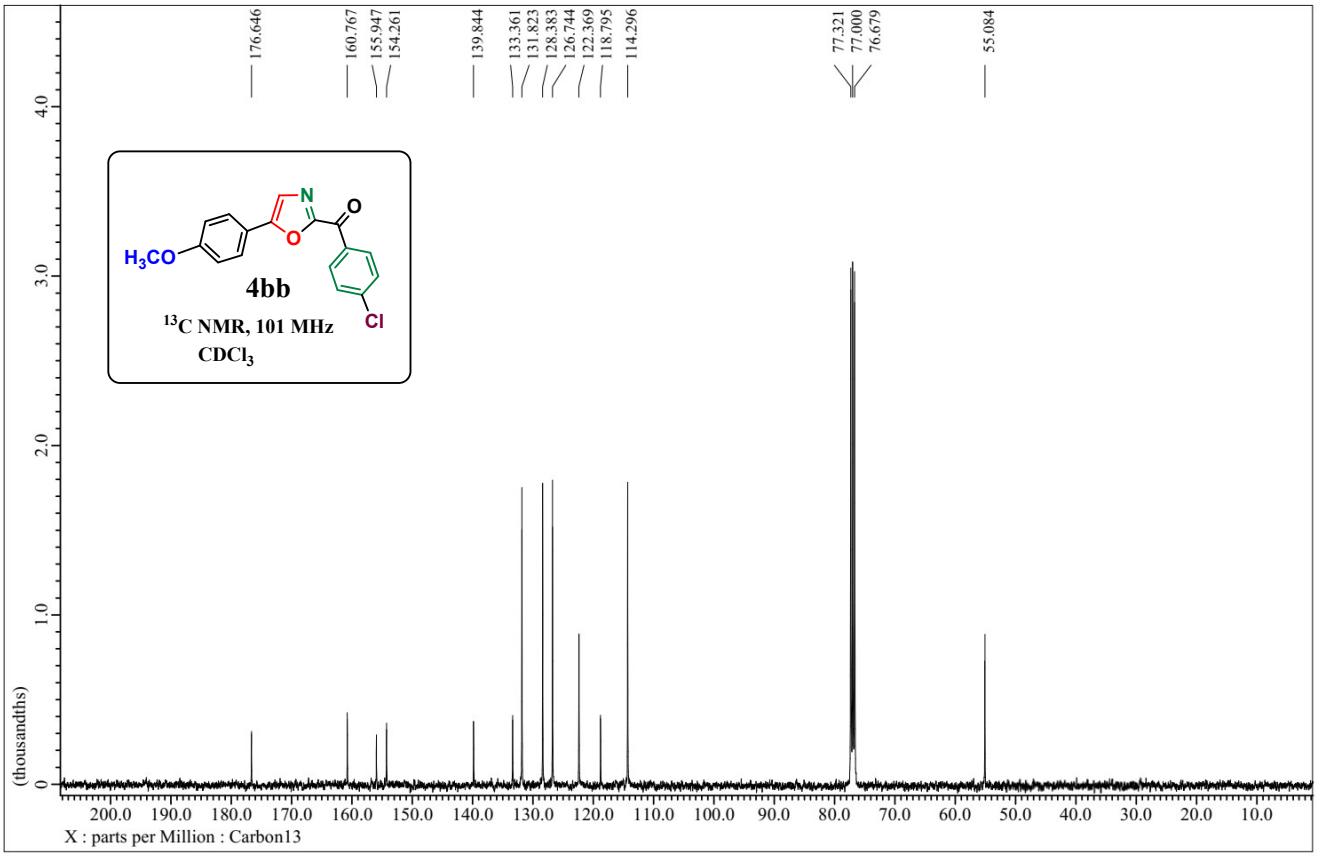
^{13}C-NMR spectrum of compound 4ba



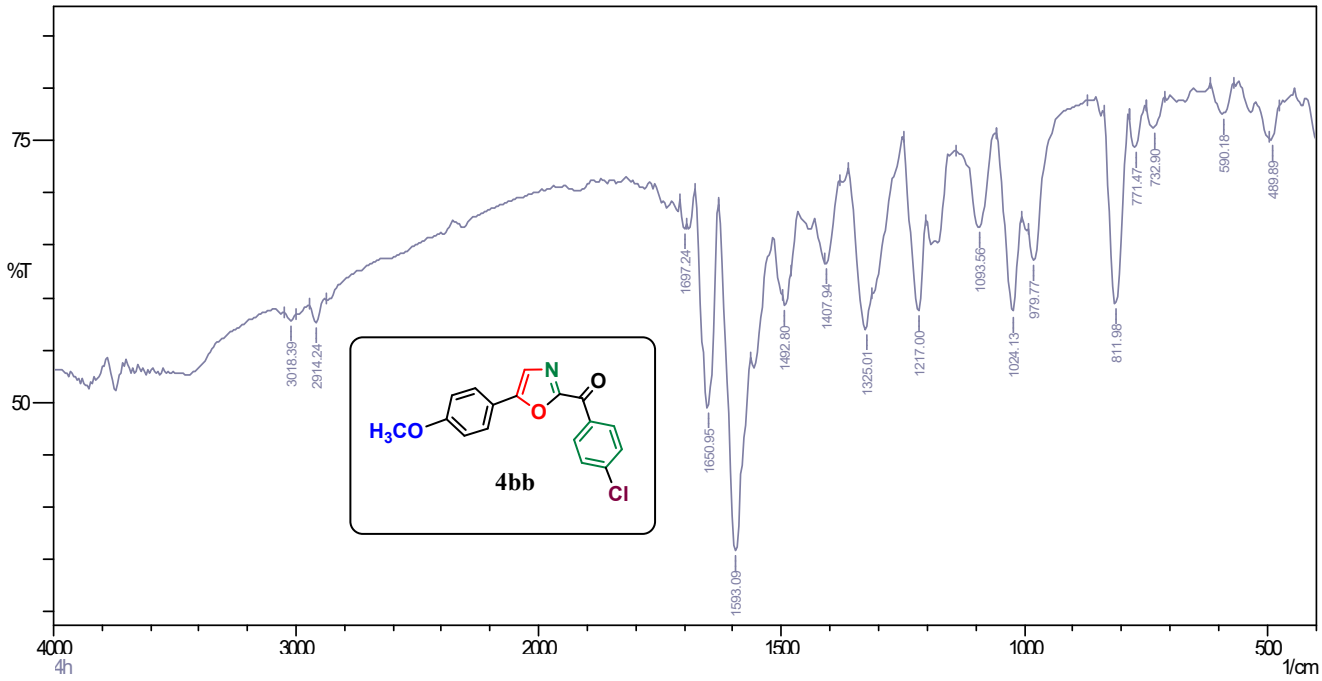
FT-IR spectrum of compound 4ba



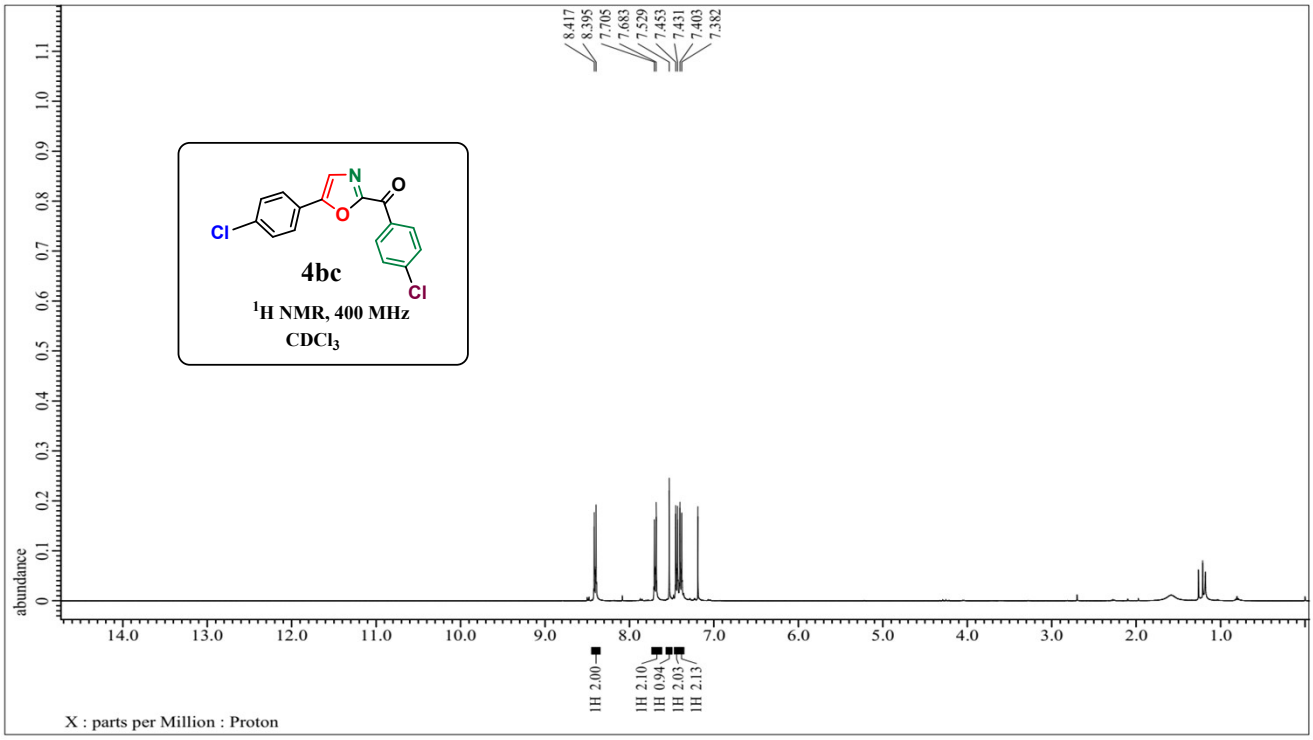
^{1}H-NMR spectrum of compound 4bb



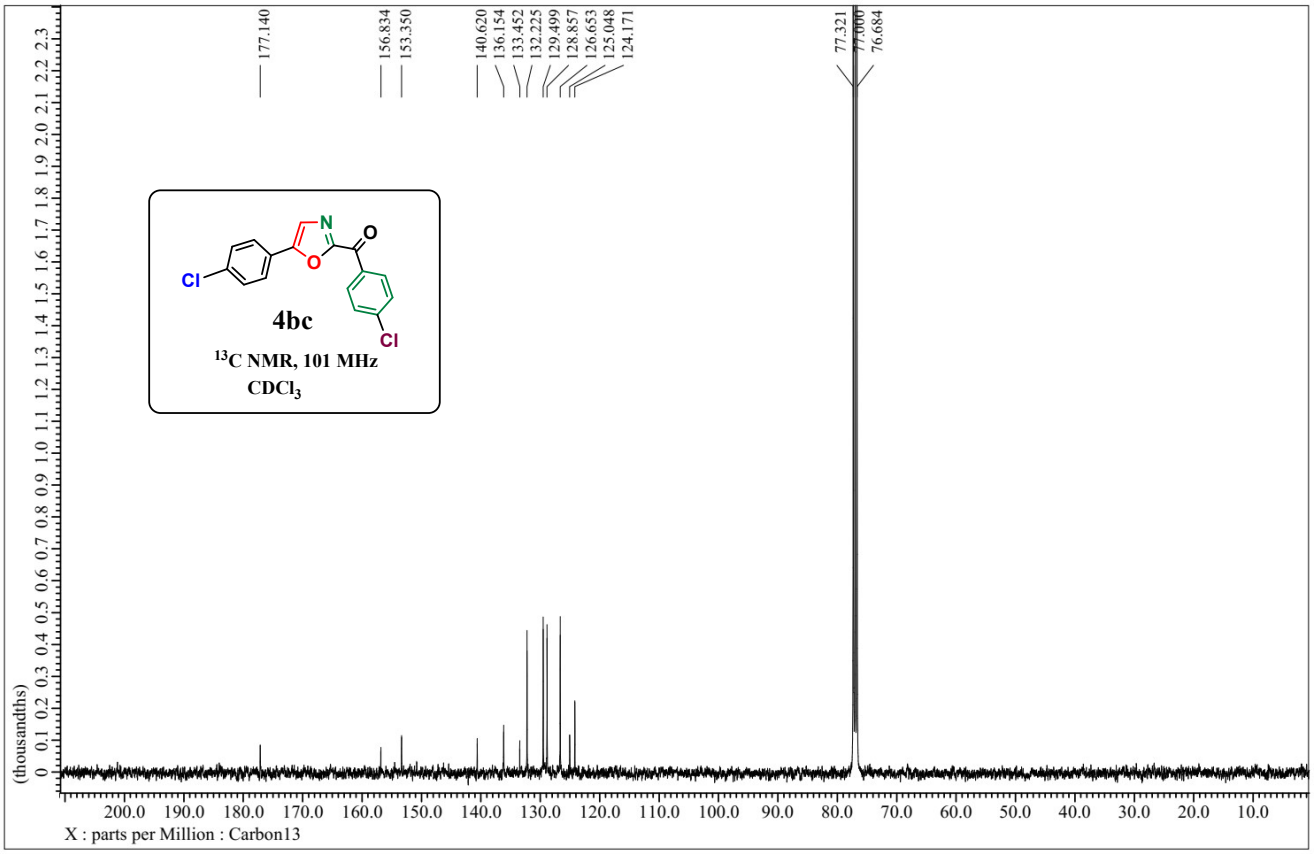
^{13}C-NMR spectrum of compound 4bb



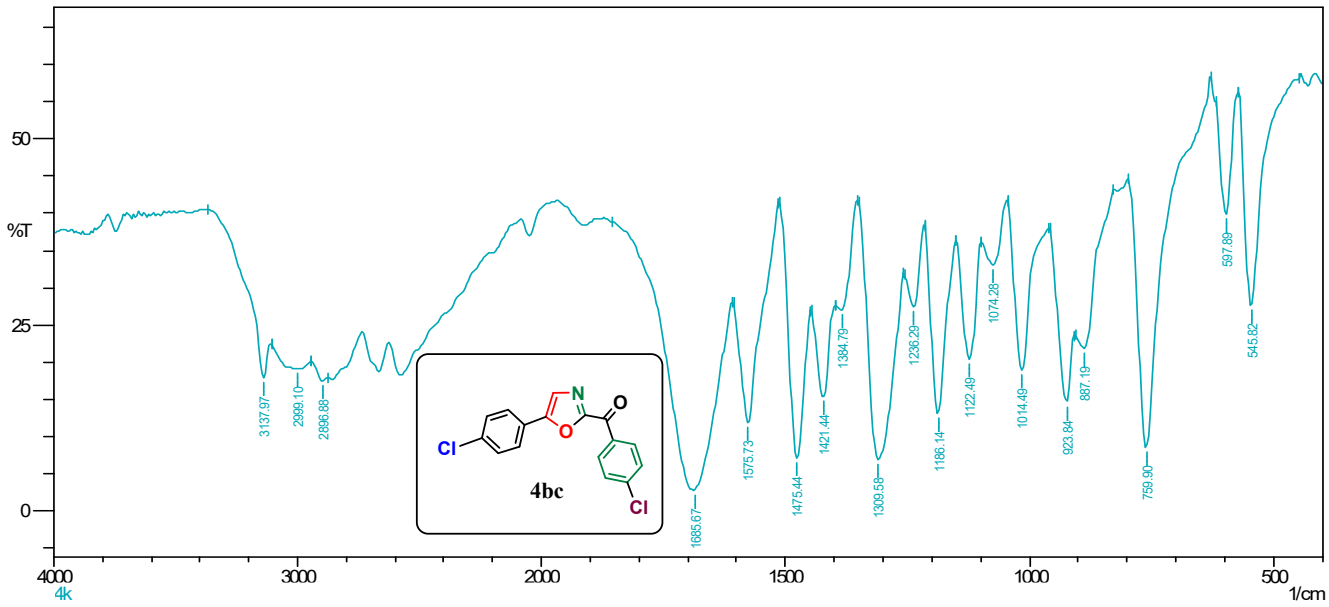
FT-IR spectrum of compound 4bb



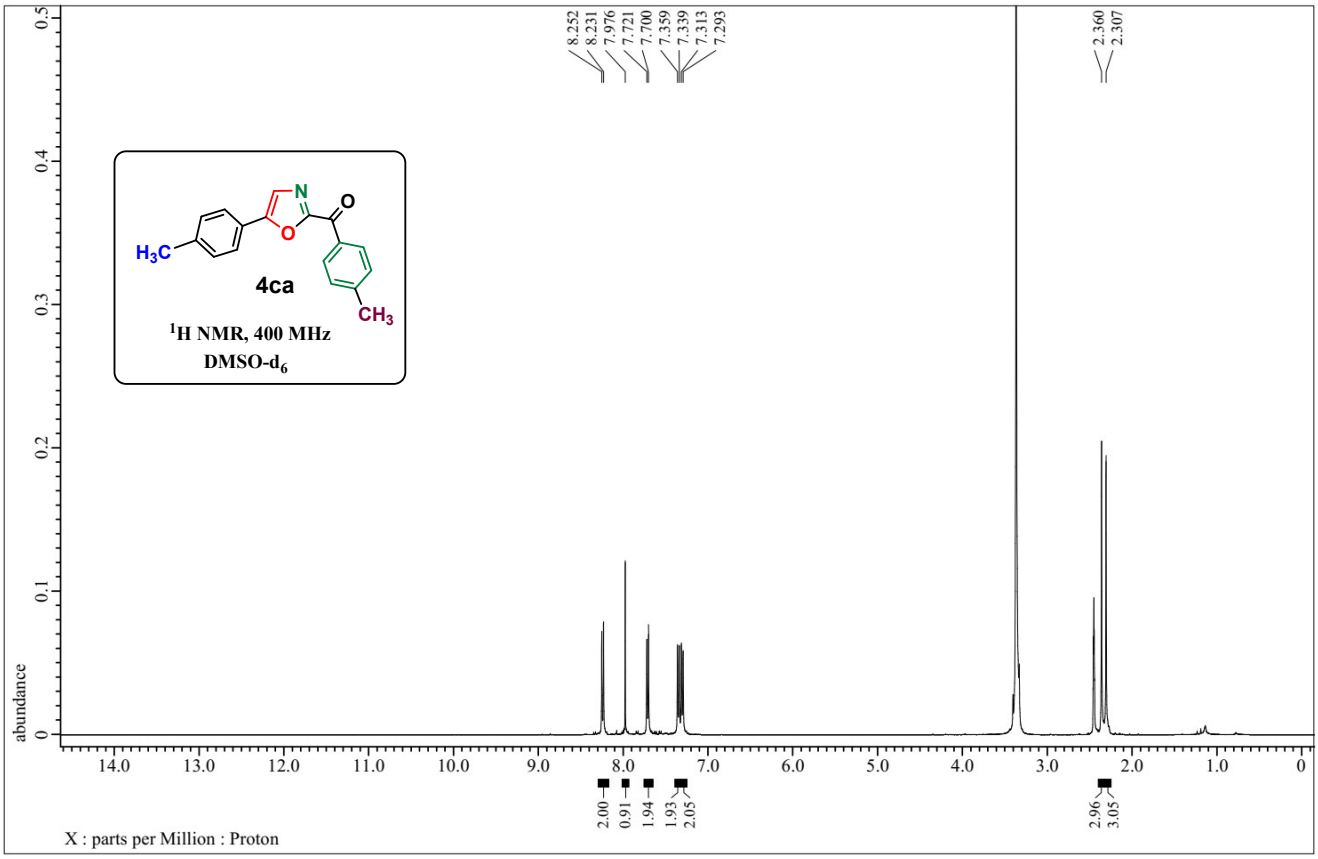
^{1}H-NMR spectrum of compound 4bc



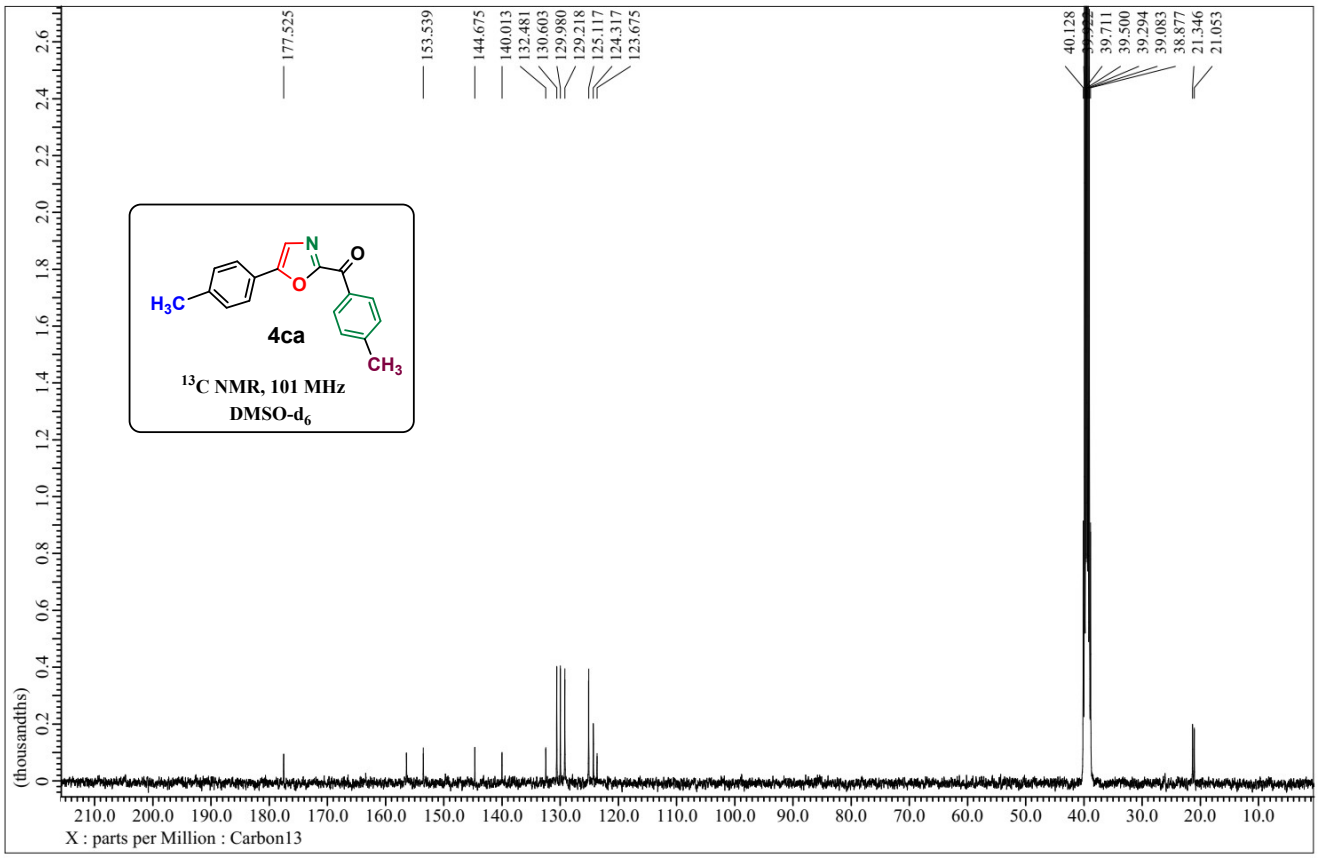
^{13}C-NMR spectrum of compound 4bc



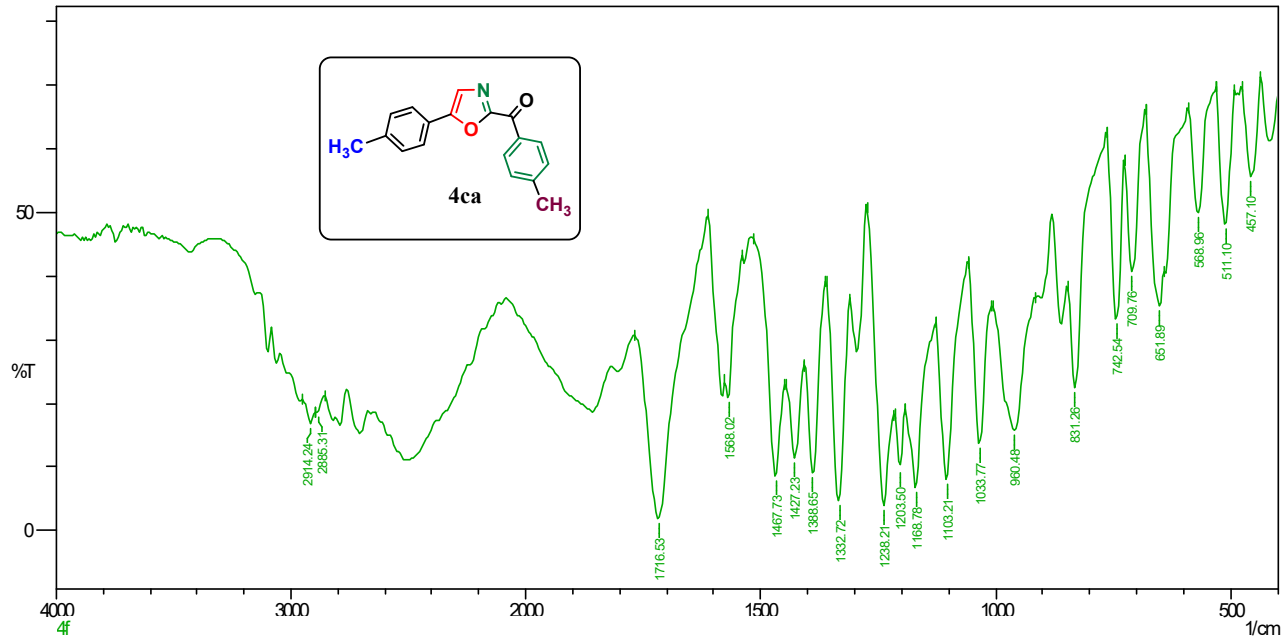
FT-IR spectrum of compound 4bc



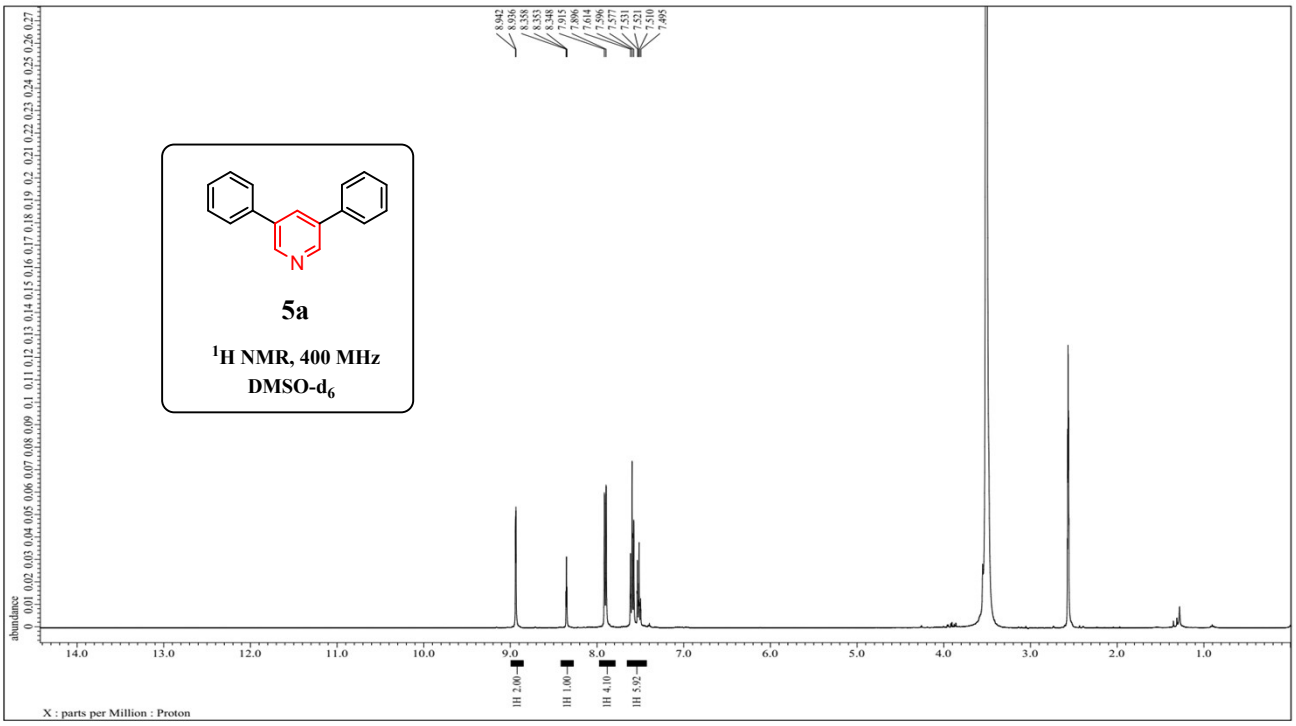
^{1}H-NMR spectrum of compound 4ca



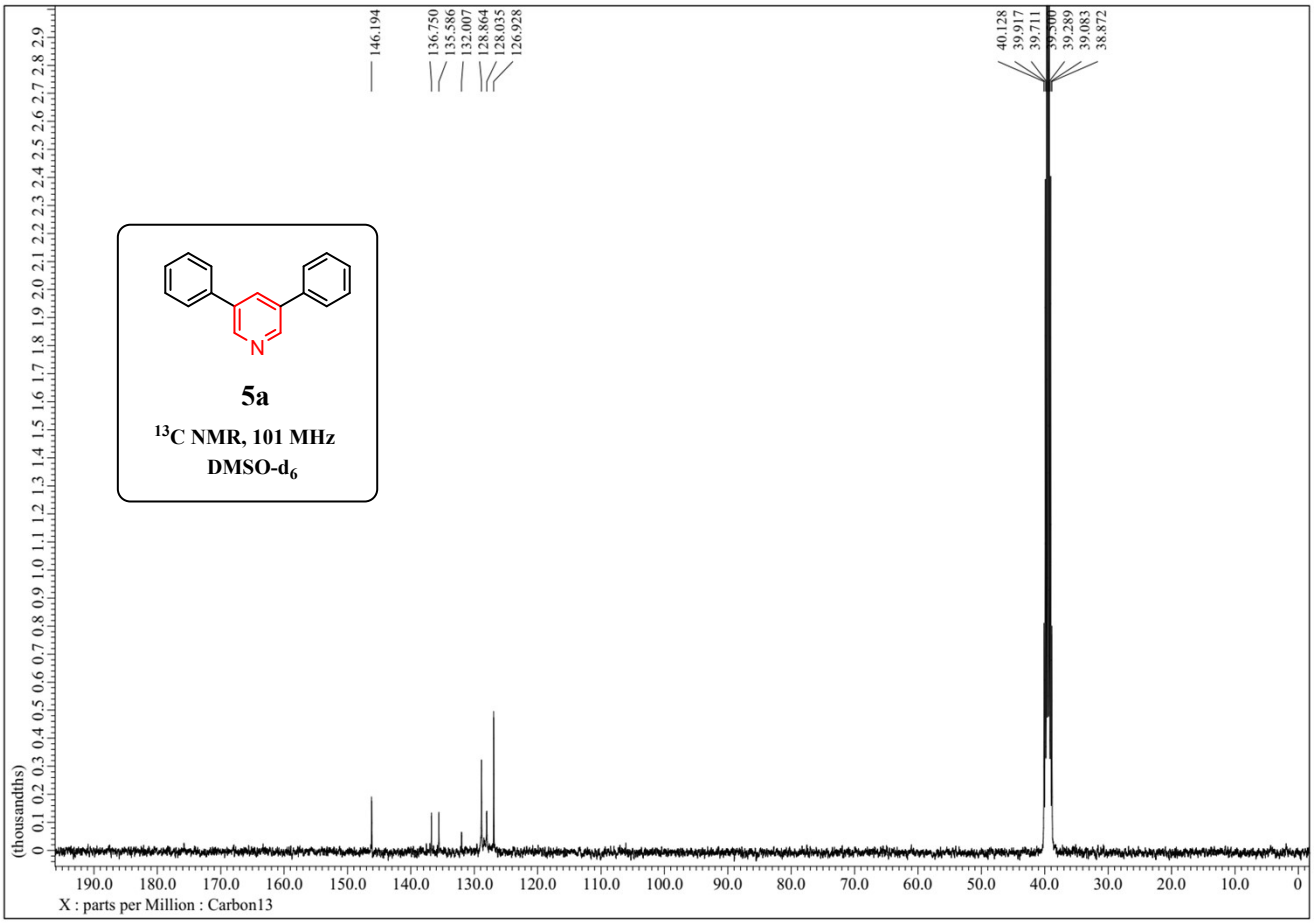
^{13}C-NMR spectrum of compound 4ca



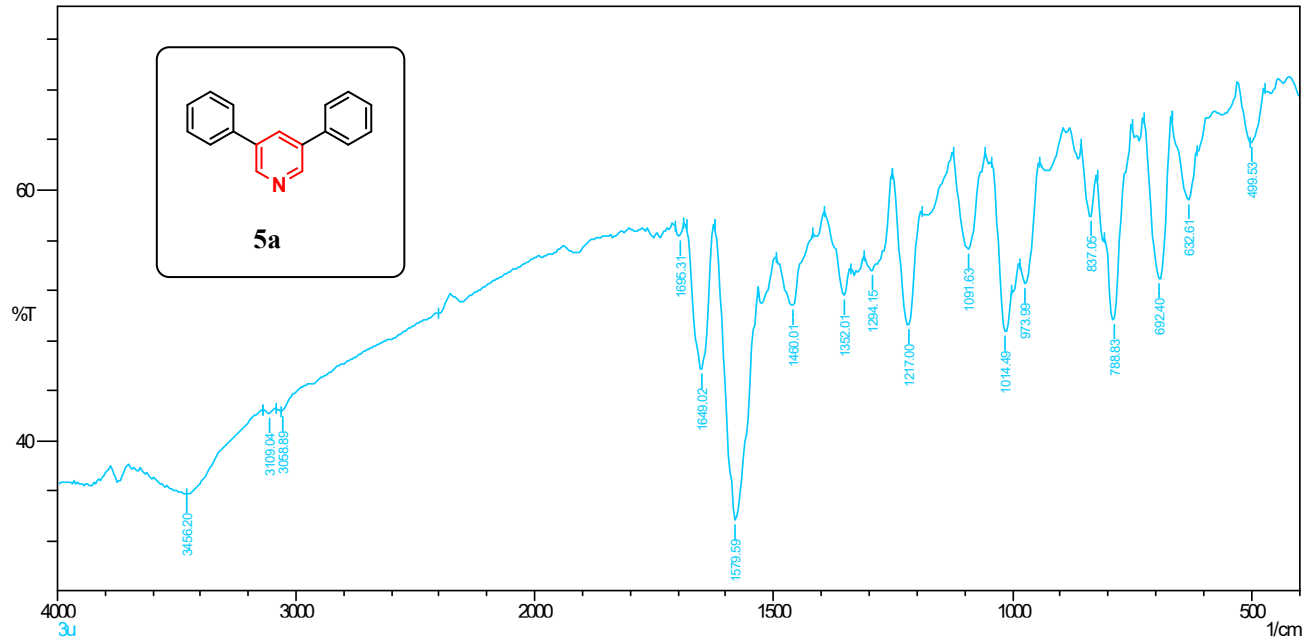
FT-IR spectrum of compound 4ca



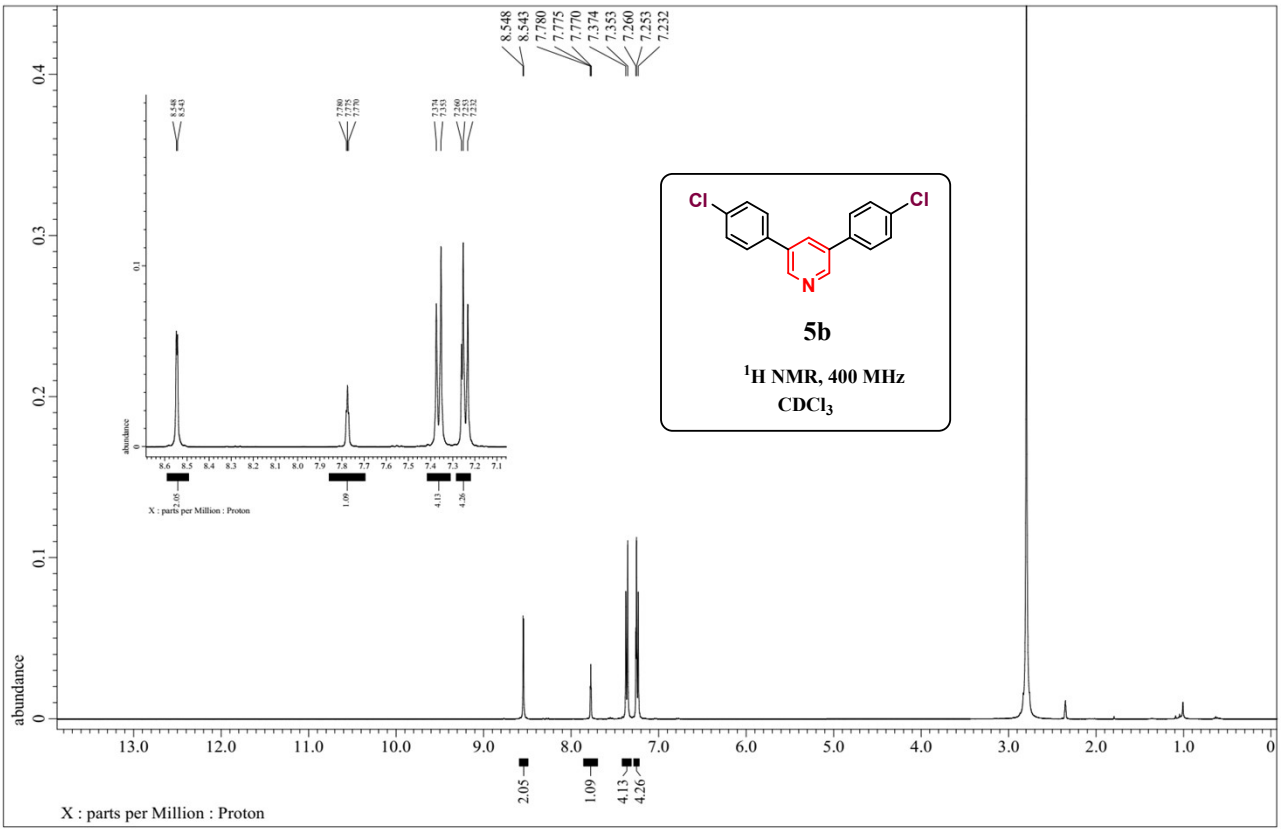
^{1}H-NMR spectrum of compound 5a



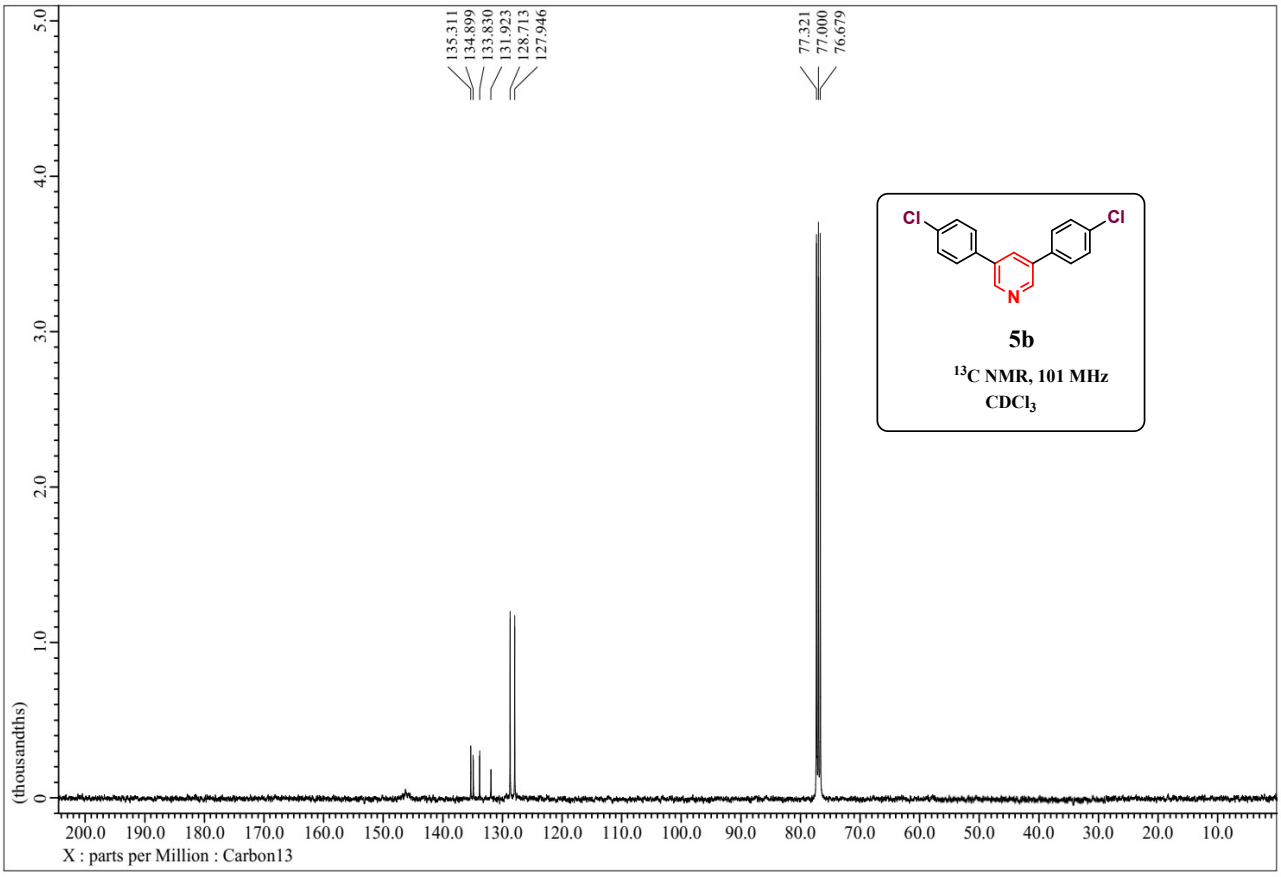
^{13}C-NMR spectrum of compound 5a



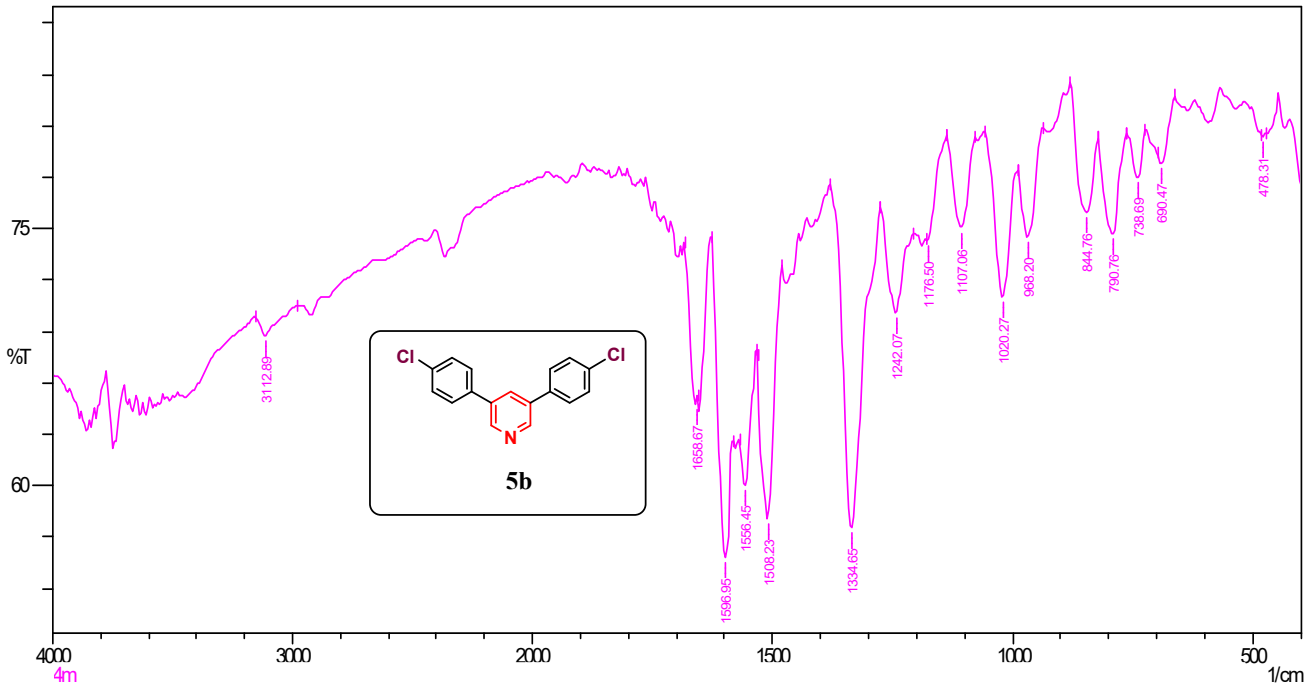
FT-IR spectrum of compound 5a



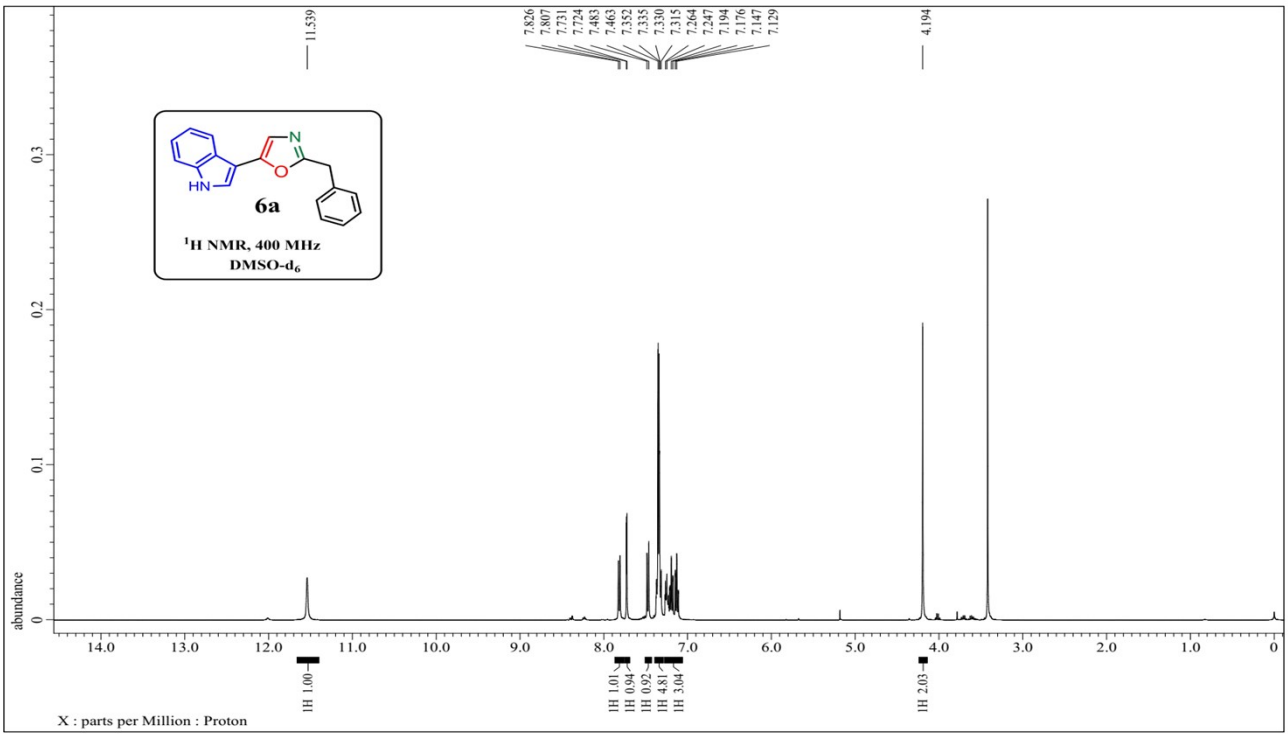
^{1}H-NMR spectrum of compound 5b



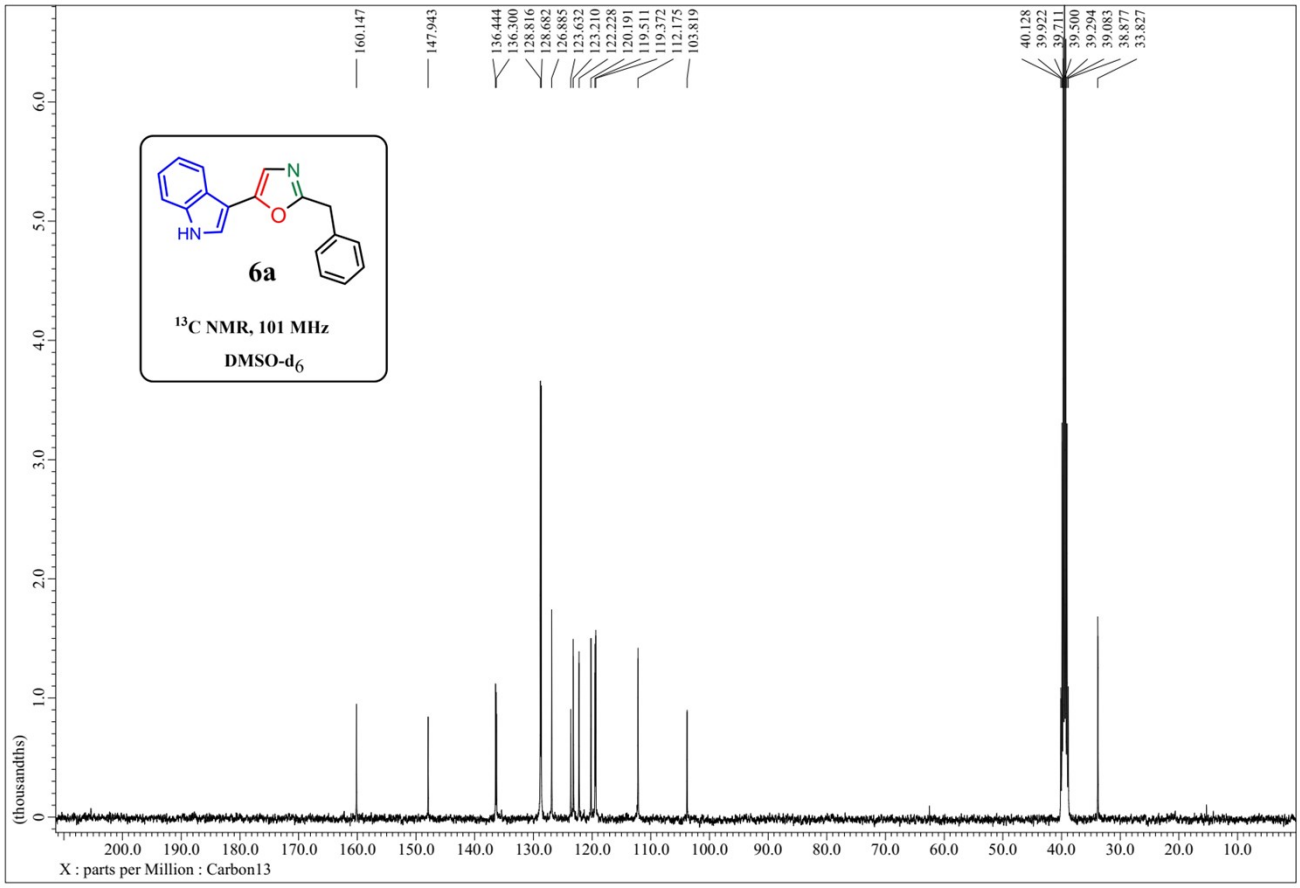
^{13}C-NMR spectrum of compound 5b



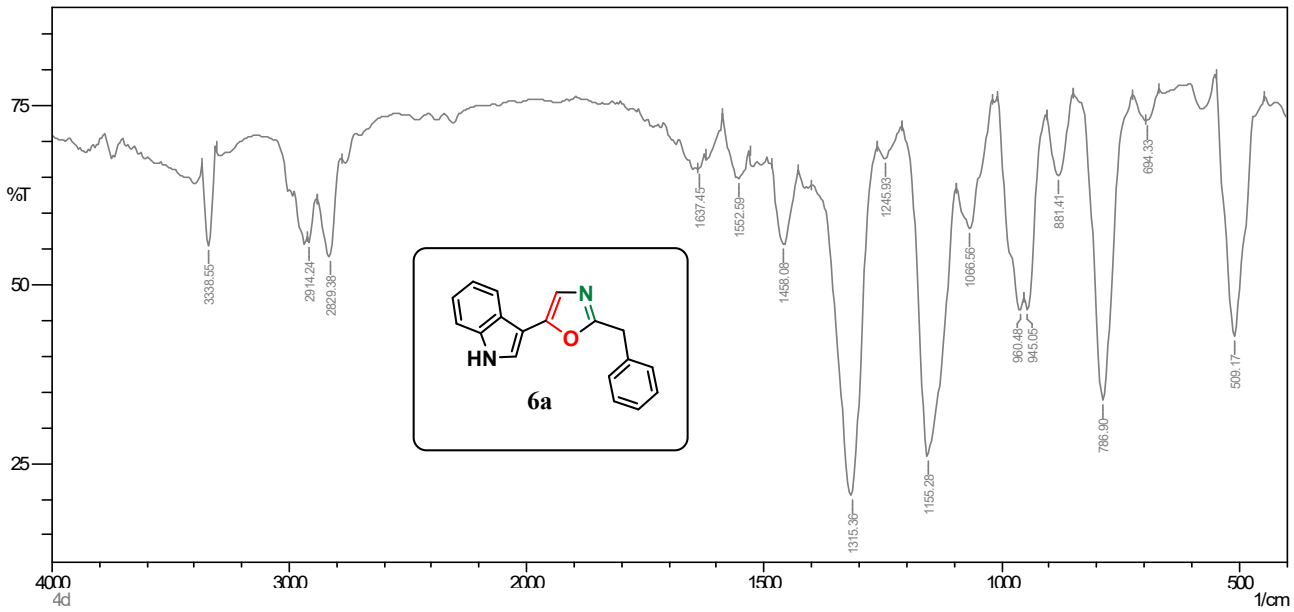
FT-IR spectrum of compound 5b



^{1}H-NMR spectrum of compound 6a



^{13}C-NMR spectrum of compound 6a



FT-IR spectrum of compound 6a

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