Supplementary Information

Enzyme and photoredox sequential catalysis for the synthesis of 1,3-oxazine derivatives in one pot

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Table of contents

1. Materials

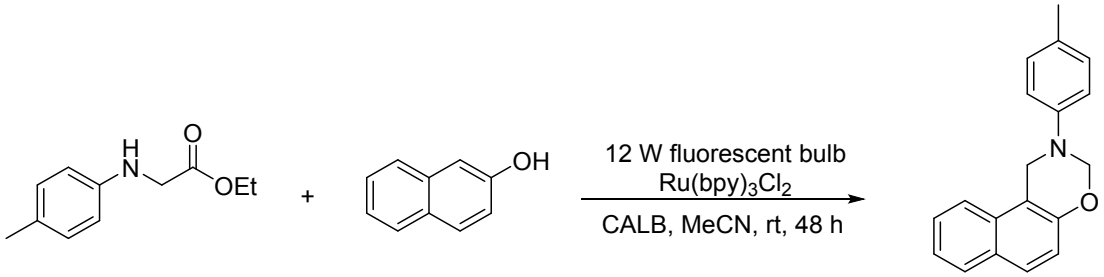
Lipase B *candida antarctica* immobilized on Immobead 150, recombinant from yeast (CALB) was purchased from Sigma-Aldrich [52583-50 G, Lot#BCBD1758, 3766 U/g solid. 1 U corresponds to the amount of enzyme which liberates 1 μmol butyric acid per minute at pH 7.5 and 40 °C (tributyrin as substrate)]. Ethyl *N*-aryl glycinates **1** were prepared according to the literature.[1] Unless otherwise noted, all reagents were purchased from commercial suppliers and used without further purification.

2. General methods

Reactions were monitored by thin-layer chromatography (TLC) with Haiyang GF254 silica gel plates (Qingdao Haiyang chemical industry Co Ltd. Qingdao, China) using UV light and vanillic aldehyde as visualizing agents. Flash column chromatography was performed using 200-300 mesh silica gel at increased pressure. ^{1}H NMR and ^{13}C NMR spectra were recorded on Bruker-AM 600 (600 MHz) (Bruker BioSpin AG Ltd., Beijing, China). Chemical shifts were reported in ppm from TMS with the solvent resonance as the internal standard. Data were reported as follows: chemical shifts (δ) in ppm, coupling constants (J) in Hz, and solvent ($CDCl_3$). High-resolution mass spectra were obtained by using ESI ionization sources (Varian QFT-ESI).

3. Extra information for optimization of the reaction conditions

Table S1 Screening of the enzyme loading [a]



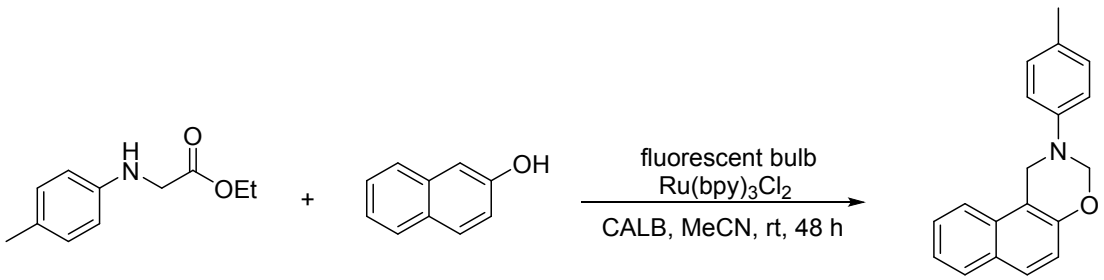
1a **2a** **3aa**

Entry	CALB (U)	Yield (%) [b]
1	113	58
2	151	61
3	**188**	**62**
4	226	63
5	264	57
6	301	56

[a] Reaction conditions: **1a** (0.6 mmol), **2a** (0.2 mmol), MeCN (1 mL, containing 1.6% water), $Ru(bpy)_3Cl_2$ (1 mol%) and CALB under irradiation of 12 W fluorescent bulb at rt for 48 h.

[b] Determined by HPLC.

Table S2 Screening of the fluorescent bulb [a]



1a **2a** **3aa**

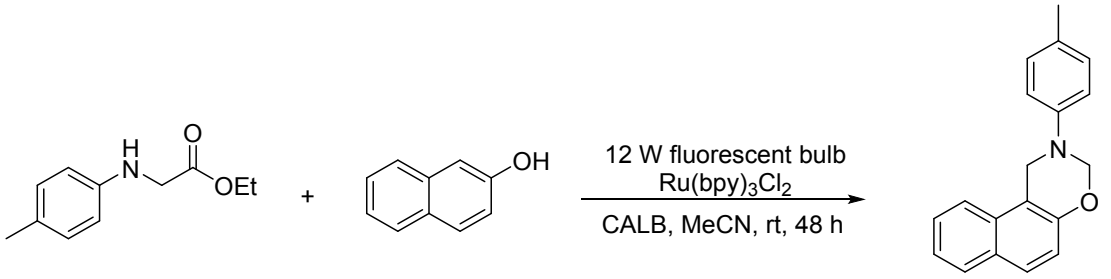
Entry	fluorescent bulb (W)	Yield (%) [b]
1	5	53
2	**12**	**62**
3	23	60
4	32	62

[a] Reaction conditions: **1a** (0.6 mmol), **2a** (0.2 mmol), MeCN (1 mL, containing 1.6% water), $Ru(bpy)_3Cl_2$ (1 mol%)

and CALB (188 U) under irradiation of fluorescent bulb at rt for 48 h.

[b] Determined by HPLC.

Table S3 Influence of water addition on the model reaction [a]



1a **2a** **3aa**

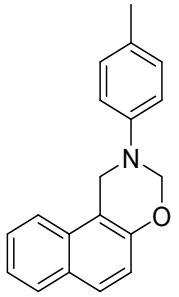
Entry	MeCN (mL) [c]	Water addition (mL)	Yield (%) [b]
1	**1.00**	**0**	**62**
2	0.975	0.025	60
3	0.950	0.050	59
4	0.925	0.075	59
5	0.900	0.100	42
6	0.850	0.150	28
7	0.800	0.200	28

[a] Reaction conditions: **1a** (0.6 mmol), **2a** (0.2 mmol), solvent (1 mL), $Ru(bpy)_3Cl_2$ (1 mol%) and CALB (188 U) under irradiation of 12 W fluorescent bulb at rt for 48 h.

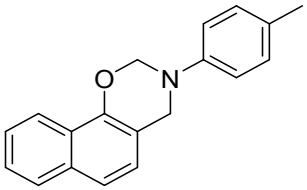
[b] Determined by HPLC.

[c] MeCN (containing 1.6% water).

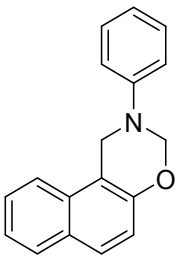
4. Characterization data of the products



2-(*p*-tolyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3aa)[2]: Yellowish liquid; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.82 (d, J = 8.1 Hz, 1H), 7.73 (d, J = 8.4 Hz, 1H), 7.68 (d, J = 8.9 Hz, 1H), 7.55 (t, J = 7.6 Hz, 1H), 7.42 (t, J = 7.5 Hz, 1H), 7.11 (s, 4H), 7.09 (d, J = 8.9 Hz, 1H), 5.44 (s, 2H), 4.97 (s, 2H), 2.30 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 152.4, 146.5, 131.3, 131.3, 129.8, 129.1, 128.7, 128.2, 126.7, 123.6, 121.0, 118.9, 118.8, 112.6, 80.1, 48.3, 20.6.

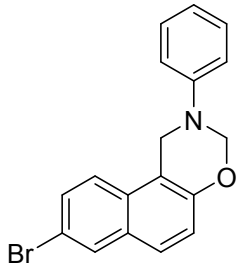


3-(*p*-tolyl)-3,4-dihydro-2*H*-naphtho[2,1-e][1,3]oxazine (4a)[3]: Yellowish liquid; ^{1}H NMR (600 MHz, $CDCl_3$): δ 8.16 (d, J = 7.5 Hz, 1H), 7.74 - 7.79 (m, 1H), 7.43 - 7.50 (m, 2H), 7.40 (d, J = 8.4 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 7.03 - 7.12 (m, 4H), 5.53 (s, 2H), 4.73 (s, 2H), 2.28 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 149.7, 146.4, 133.3, 131.2, 129.8, 127.5, 126.0, 125.4, 125.1, 124.5, 121.3, 120.2, 118.9, 114.6, 80.4, 50.9, 20.5.

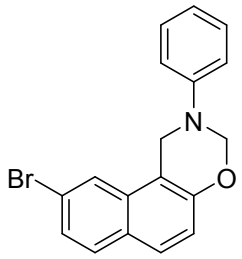


2-phenyl-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3ba)[2]: Yellowish liquid; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.82 (d, J = 8.1 Hz, 1H), 7.74 (d, J = 8.4 Hz, 1H), 7.68 (d, J = 8.9 Hz, 1H), 7.52 - 7.58 (m, 1H), 7.39 - 7.45 (m, 1H), 7.26 - 7.36 (m, 2H), 7.20 (d, J = 7.8 Hz, 2H), 7.09 (d, J = 8.9 Hz, 1H), 6.98 (t, J = 7.3 Hz, 1H), 5.47 (s, 2H), 5.00 (s, 2H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 152.4,

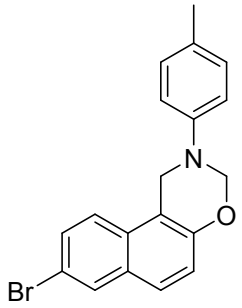
148.8, 131.3, 129.3, 129.1, 128.7, 128.3, 126.7, 123.7, 121.6, 120.9, 118.8, 118.6, 112.5, 79.6, 48.2.



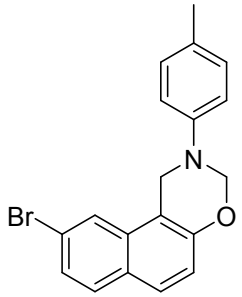
8-bromo-2-phenyl-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3bb): Yellowish liquid; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.94 (s, 1H), 7.44 - 7.69 (m, 3H), 7.31 (t, J = 7.9 Hz, 2H), 7.18 (d, J = 8.0 Hz, 2H), 7.09 (d, J = 9.0 Hz, 1H), 6.99 (t, J = 7.3 Hz, 1H), 5.45 (s, 2H), 4.95 (s, 2H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 152.65, 148.59, 130.65, 130.26, 129.87, 129.78, 129.35, 127.40, 122.64, 121.81, 119.98, 118.59, 117.30, 112.80, 79.64, 48.05. HRMS (ESI) m/z 340.0338 ($M + H^+$), Cal. $C_{18}H_{15}BrNO$, 340.0332.



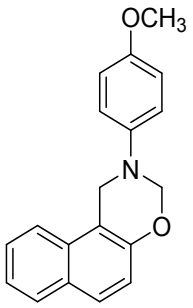
9-bromo-2-phenyl-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3bc): White solid; m.p. 110.0-111.8 ^{o}C; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.86 (s, 1H), 7.63 (dd, J = 17.0, 8.8 Hz, 2H), 7.47 (dd, J = 8.6, 1.4 Hz, 1H), 7.31 (t, J = 7.9 Hz, 2H), 7.19 (d, J = 8.0 Hz, 2H), 7.08 (d, J = 8.9 Hz, 1H), 6.99 (t, J = 7.3 Hz, 1H), 5.45 (s, 2H), 4.91 (s, 2H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 153.2, 148.5, 132.6, 130.3, 129.4, 128.2, 127.5, 127.0, 123.4, 121.8, 121.3, 119.3, 118.6, 111.9, 79.6, 48.1. HRMS (ESI) m/z 340.0336 ($M + H^+$), Cal. $C_{18}H_{15}BrNO$, 340.0332.



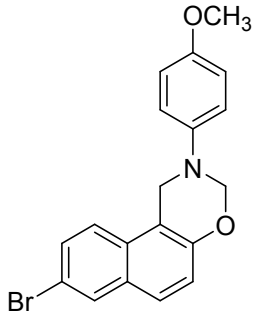
8-bromo-2-(*p*-tolyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3ab): White solid; m.p. 141.4-143.3 °C; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.94 (s, 1H), 7.58 (dd, J = 16.3, 10.3 Hz, 3H), 7.08 (dd, J = 15.2, 8.1 Hz, 5H), 5.42 (s, 2H), 4.91 (s, 2H), 2.29 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 152.6, 146.3, 131.5, 130.6, 130.2, 129.9, 129.8, 127.3, 122.7, 112.0, 119.0, 117.2, 112.8, 80.1, 48.2, 20.5. HRMS (ESI) m/z 354.0492 ($M + H^+$), Cal. $C_{19}H_{17}BrNO$, 354.0488.



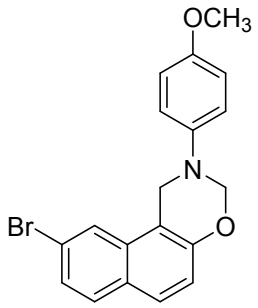
9-bromo-2-(*p*-tolyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3ac): White solid; m.p. 128.4-129.4 °C; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.85 (s, 1H), 7.63 (dd, J = 18.7, 8.8 Hz, 2H), 7.47 (dd, J = 8.6, 1.6 Hz, 1H), 7.06 - 7.11 (m, 5H), 5.42 (s, 2H), 4.88 (s, 2H), 2.30 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 153.2, 146.2, 132.6, 131.5, 130.3, 129.9, 128.2, 127.4, 127.0, 123.4, 121.2, 119.3, 118.9, 111.9, 80.1, 48.3, 20.5. HRMS (ESI) m/z 354.0492 ($M + H^+$), Cal. $C_{19}H_{17}BrNO$, 354.0488.



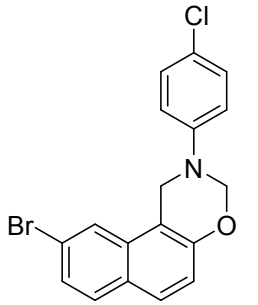
2-(4-methoxyphenyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3da)[2]: Yellowish liquid; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.82 (d, J = 8.1 Hz, 1H), 7.70 (dd, J = 12.6, 8.8 Hz, 2H), 7.54 (dd, J = 11.2, 4.1 Hz, 1H), 7.41 (t, J = 7.4 Hz, 1H), 7.14 (d, J = 9.0 Hz, 2H), 7.09 (d, J = 8.9 Hz, 1H), 6.84 (d, J = 9.0 Hz, 2H), 5.39 (s, 2H), 4.92 (s, 2H), 3.77 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 155.2, 152.4, 142.8, 131.3, 129.1, 128.7, 128.2, 126.7, 123.6, 121.1, 120.9, 118.8, 114.6, 112.6, 80.9, 55.5, 48.8.



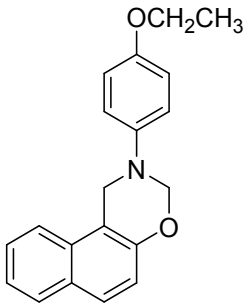
8-bromo-2-(4-methoxyphenyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3db): White solid; m.p. 160.2-161.0 ^{o}C; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.94 (s, 1H), 7.46 - 7.68 (m, 3H), 7.12 (d, J = 8.2 Hz, 2H), 7.08 (d, J = 8.9 Hz, 1H), 6.84 (d, J = 8.1 Hz, 2H), 5.37 (s, 2H), 4.86 (s, 2H), 3.76 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 155.3, 152.6, 142.6, 130.6, 130.3, 129.8, 127.3, 123.0, 121.1, 120.0, 117.2, 114.6, 112.8, 80.9, 55.5, 48.7. HRMS (ESI) m/z 370.0442 ($M + H^+$), Cal. $C_{19}H_{17}BrNO_2$, 370.0437.



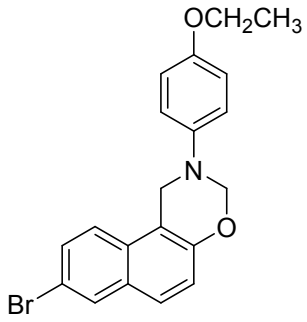
9-bromo-2-(4-methoxyphenyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3dc): White solid; m.p. 114.6-115.7 °C; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.83 (s, 1H), 7.63 (dd, J = 15.5, 8.8 Hz, 2H), 7.46 (dd, J = 8.6, 1.5 Hz, 1H), 7.12 (d, J = 8.9 Hz, 2H), 7.07 (d, J = 8.9 Hz, 1H), 6.84 (d, J = 8.9 Hz, 2H), 5.37 (s, 2H), 4.83 (s, 2H), 3.76 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 155.3, 153.1, 142.5, 132.6, 130.3, 128.1, 127.4, 126.9, 123.5, 121.1, 119.3, 114.6, 111.8, 80.8, 55.5, 48.7. HRMS (ESI) m/z 370.0442 ($M + H^+$), Cal. $C_{19}H_{17}BrNO_2$, 370.0437.



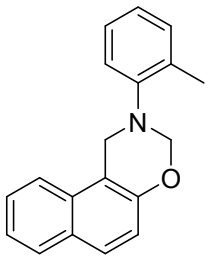
9-bromo-2-(4-chlorophenyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3ec): White solid; m.p. 129.3-129.8 °C; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.84 (s, 1H), 7.65 (dd, J = 15.0, 8.7 Hz, 2H), 7.48 (d, J = 8.6 Hz, 1H), 7.24 (d, J = 7.1 Hz, 2H), 7.10 (d, J = 7.1 Hz, 2H), 7.07 (d, J = 8.2 Hz, 1H), 5.41 (s, 2H), 4.88 (s, 2H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 153.0, 147.2, 132.5, 130.3, 129.3, 128.4, 127.5, 127.1, 126.9, 123.4, 121.4, 119.9, 119.2, 111.5, 79.5, 48.3. HRMS (ESI) m/z 373.9945 ($M + H^+$), Cal. $C_{18}H_{14}BrClNO$, 373.9942.



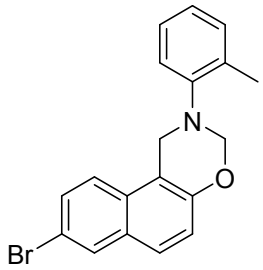
2-(4-ethoxyphenyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3fa)[2]: Yellowish liquid; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.75 (d, J = 8.1 Hz, 1H), 7.63 (dd, J = 12.7, 8.7 Hz, 2H), 7.47 (t, J = 7.6 Hz, 1H), 7.34 (t, J = 7.5 Hz, 1H), 7.07 (d, J = 9.0 Hz, 2H), 7.03 (d, J = 8.9 Hz, 1H), 6.77 (d, J = 9.0 Hz, 2H), 5.32 (s, 2H), 4.85 (s, 2H), 3.92 (q, J = 7.0 Hz, 2H), 1.34 (t, J = 7.0 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 154.5, 152.4, 142.6, 131.3, 129.1, 128.7, 128.2, 126.6, 123.6, 121.1, 120.9, 118.8, 115.3, 112.6, 80.8, 63.8, 48.8, 14.9.



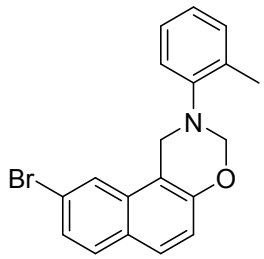
8-bromo-2-(4-ethoxyphenyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3fb): White solid; m.p. 108.8-110.4 ^{o}C; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.94 (s, 1H), 7.51 - 7.61 (m, 3H), 7.09 (t, J = 9.6 Hz, 3H), 6.82 (d, J = 8.8 Hz, 2H), 5.36 (s, 2H), 4.86 (s, 2H), 3.98 (q, J = 6.9 Hz, 2H), 1.39 (t, J = 7.0 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 154.6, 152.6, 142.4, 130.6, 130.3, 129.8, 127.3, 122.7, 121.1, 120.0, 117.2, 115.3, 112.8, 80.9, 77.2, 77.0, 76.8, 63.8, 48.7, 14.9. HRMS (ESI) m/z 384.0598 ($M + H^+$), Cal. $C_{20}H_{19}BrNO_2$, 384.0594.



2-(*o*-tolyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3ca)[2]: Yellowish liquid; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.84 (d, J = 8.0 Hz, 1H), 7.73 (d, J = 8.9 Hz, 1H), 7.67 (d, J = 8.3 Hz, 1H), 7.53 (t, J = 7.4 Hz, 1H), 7.42 (t, J = 7.4 Hz, 1H), 7.28 (t, J = 8.6 Hz, 2H), 7.16 (d, J = 8.9 Hz, 1H), 7.05 - 7.10 (m, 2H), 5.30 (s, 2H), 4.82 (s, 2H), 2.52 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 152.4, 148.7, 132.5, 131.3, 131.2, 129.1, 128.7, 128.2, 126.8, 126.6, 124.4, 123.6, 122.0, 121.0, 118.9, 112.8, 80.9, 48.9, 18.4.



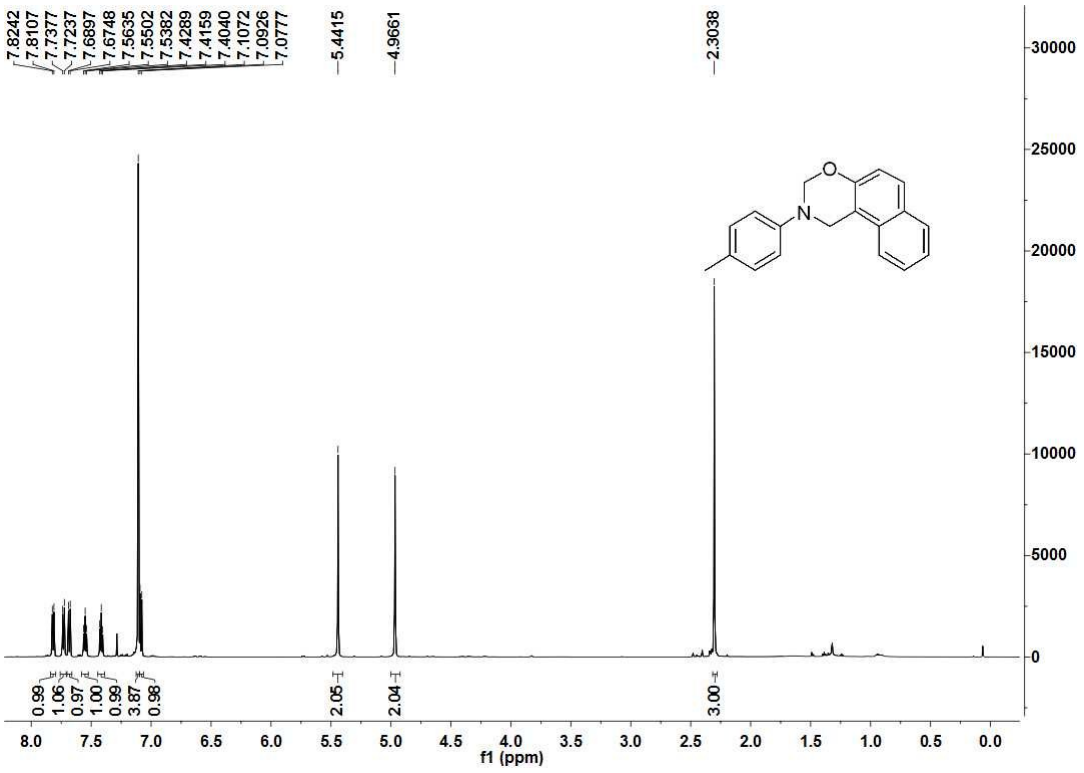
8-bromo-2-(*o*-tolyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3cb): White solid; m.p. 137.0-138.1 ^{o}C; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.97 (s, 1H), 7.54 - 7.65 (m, 2H), 7.51 (d, J = 8.7 Hz, 1H), 7.27 (s, 2H), 7.13 - 7.19 (m, 1H), 7.05 - 7.13 (m, 2H), 5.30 (s, 2H), 4.77 (s, 2H), 2.52 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$): δ 152.7, 148.5, 132.6, 131.3, 130.7, 130.3, 129.8, 127.3, 126.8, 124.6, 122.7, 121.9, 120.1, 117.2, 113.0, 81.0, 48.7, 18.4. HRMS (ESI) m/z 354.0493 ($M + H^+$), Cal. $C_{19}H_{17}BrNO$, 354.0488.



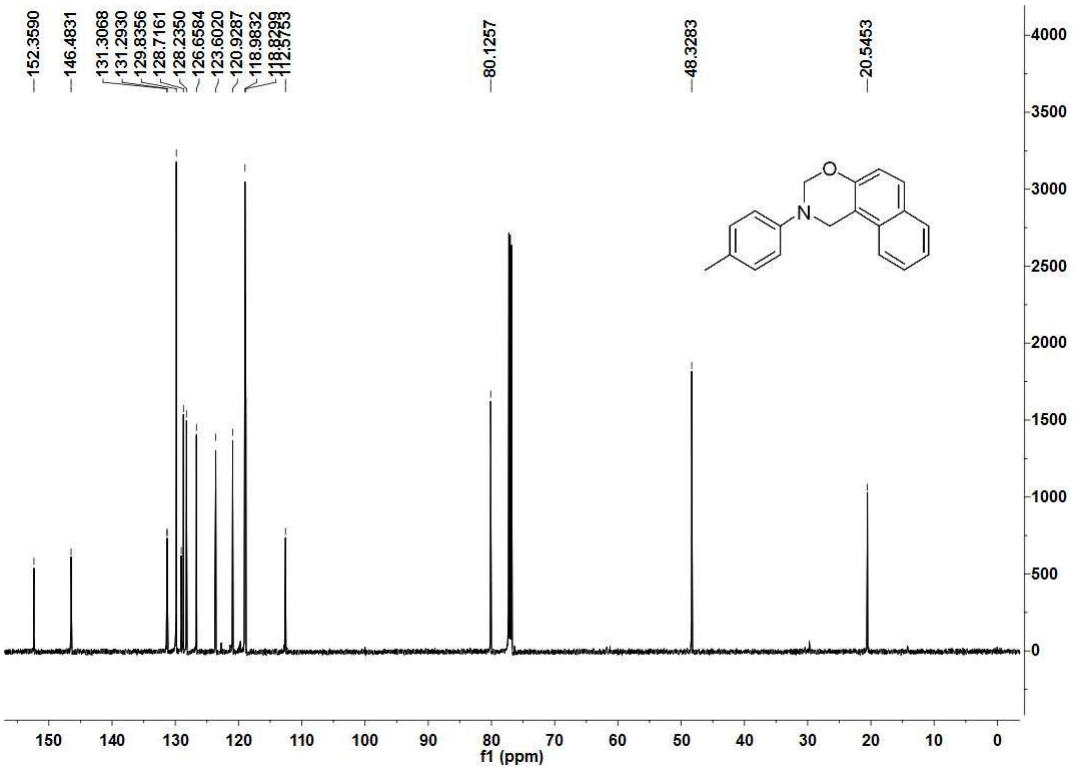
9-bromo-2-(*o*-tolyl)-2,3-dihydro-1*H*-naphtho[1,2-e][1,3]oxazine (3cc): White solid; m.p. 96.1-97.7 ^{o}C; ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.72 (s, 1H), 7.59 (dd, J = 8.8, 2.8 Hz, 2H), 7.40 (dd, J = 8.6, 1.4 Hz, 1H), 7.19 (dd, J = 4.9, 3.1 Hz, 2H), 7.07 (d, J = 8.9 Hz, 1H), 6.97 - 7.04 (m, 2H), 5.22 (s, 2H), 4.66 (s, 2H), 2.44 (s, 3H); ^{13}C NMR (151 MHz, CDCl3): δ 153.2, 148.5, 132.6, 132.5, 131.2, 130.3, 128.1, 127.5, 126.9, 126.8, 124.6, 123.5, 121.9, 121.2, 119.4, 112.0, 81.0, 48.6, 18.4. HRMS (ESI) m/z 354.0490 ($M + H^+$), Cal. $C_{19}H_{17}BrNO$, 354.0488.

5. ^{1}H NMR and ^{13}C NMR spectra of the products.

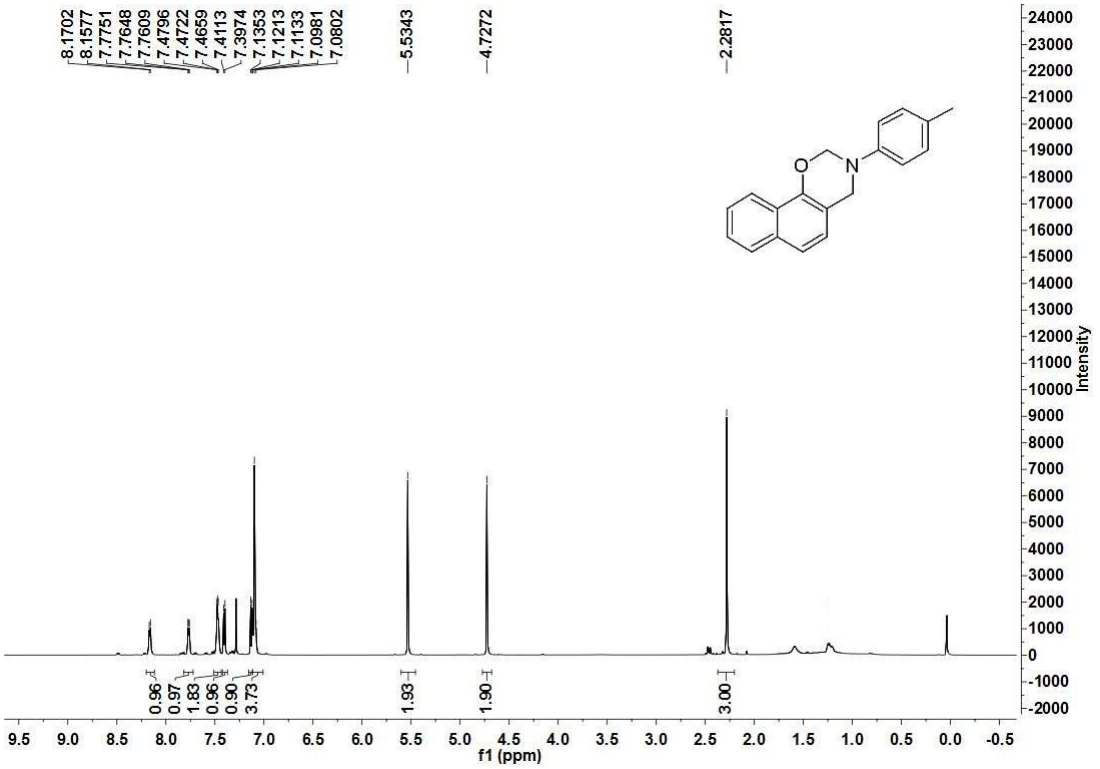
^{1}H NMR Spectrum ($CDCl_3$) of **3aa**



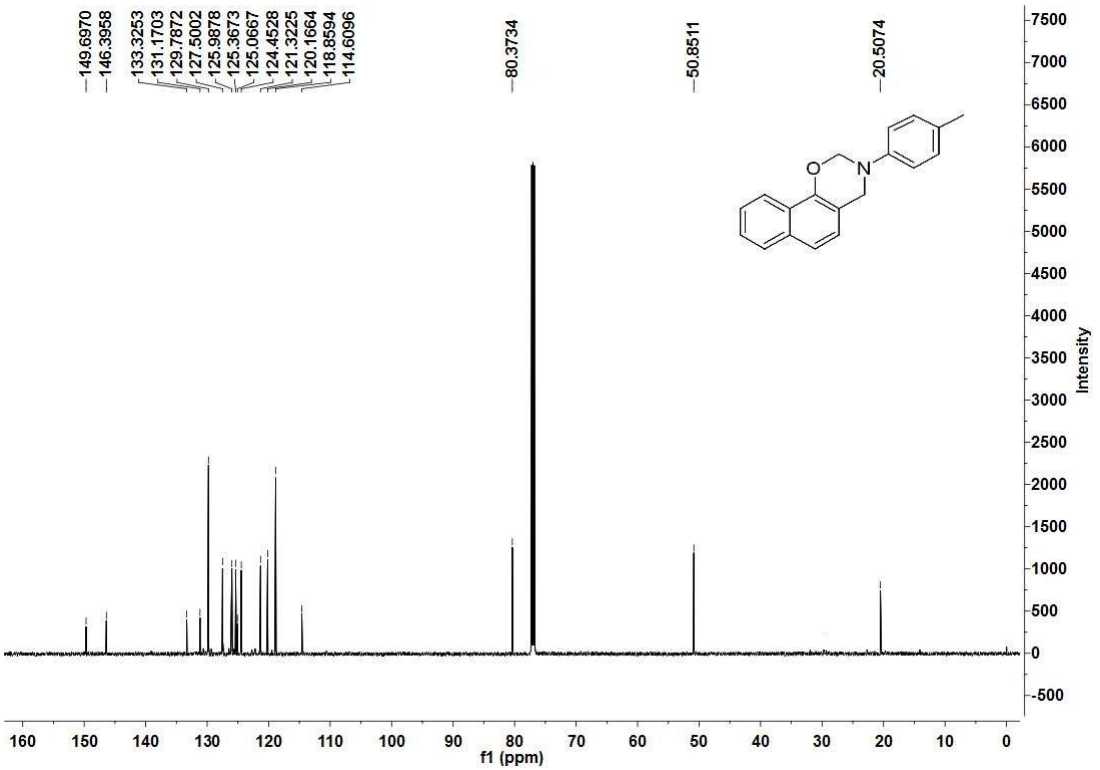
^{13}C NMR Spectrum ($CDCl_3$) of **3aa**



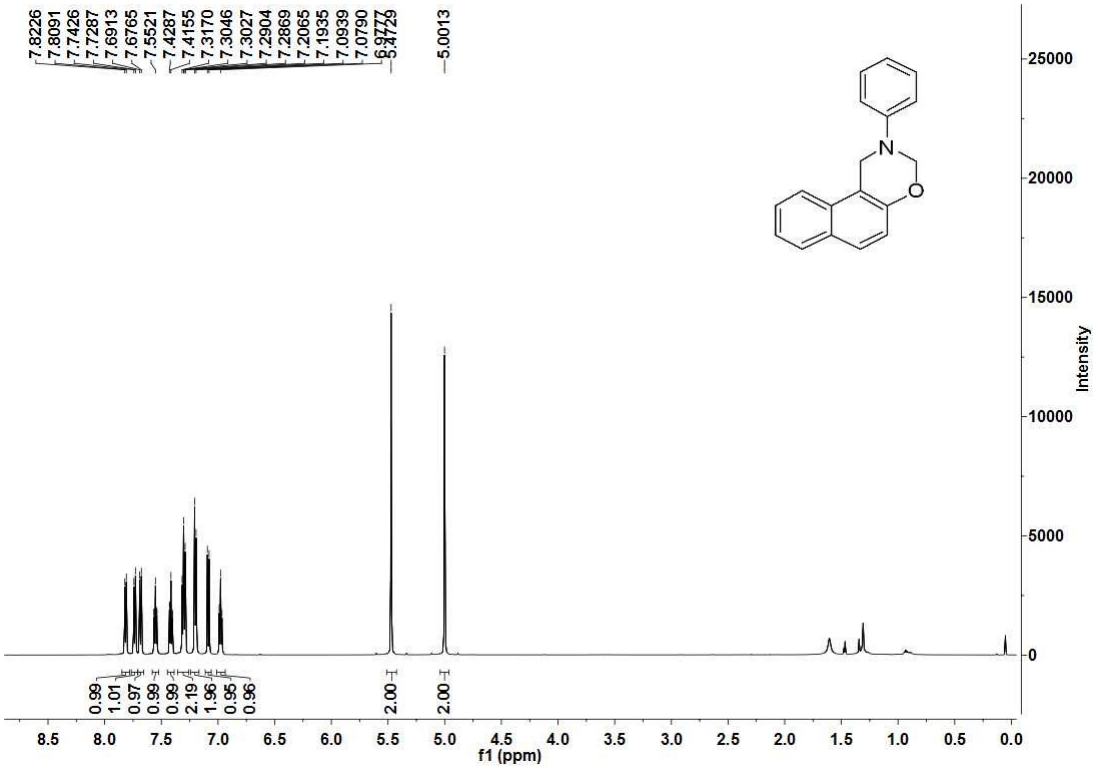
^{1}H NMR Spectrum ($CDCl_3$) of **4a**



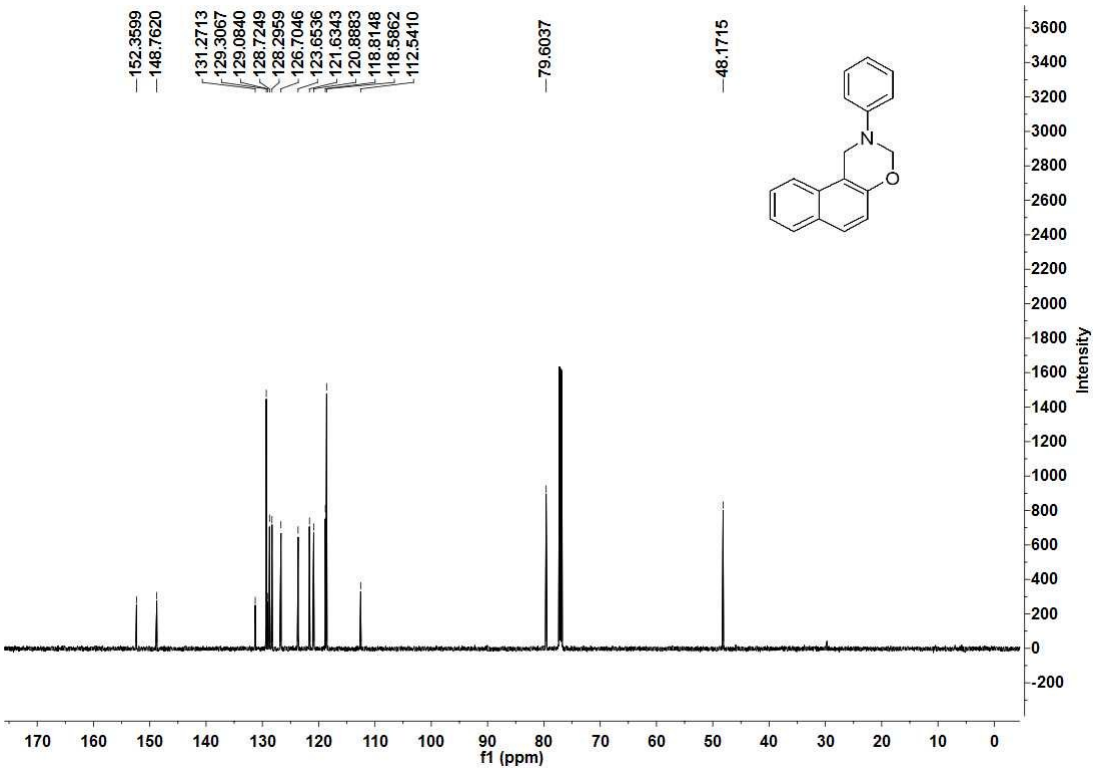
^{13}C NMR Spectrum ($CDCl_3$) of **4a**



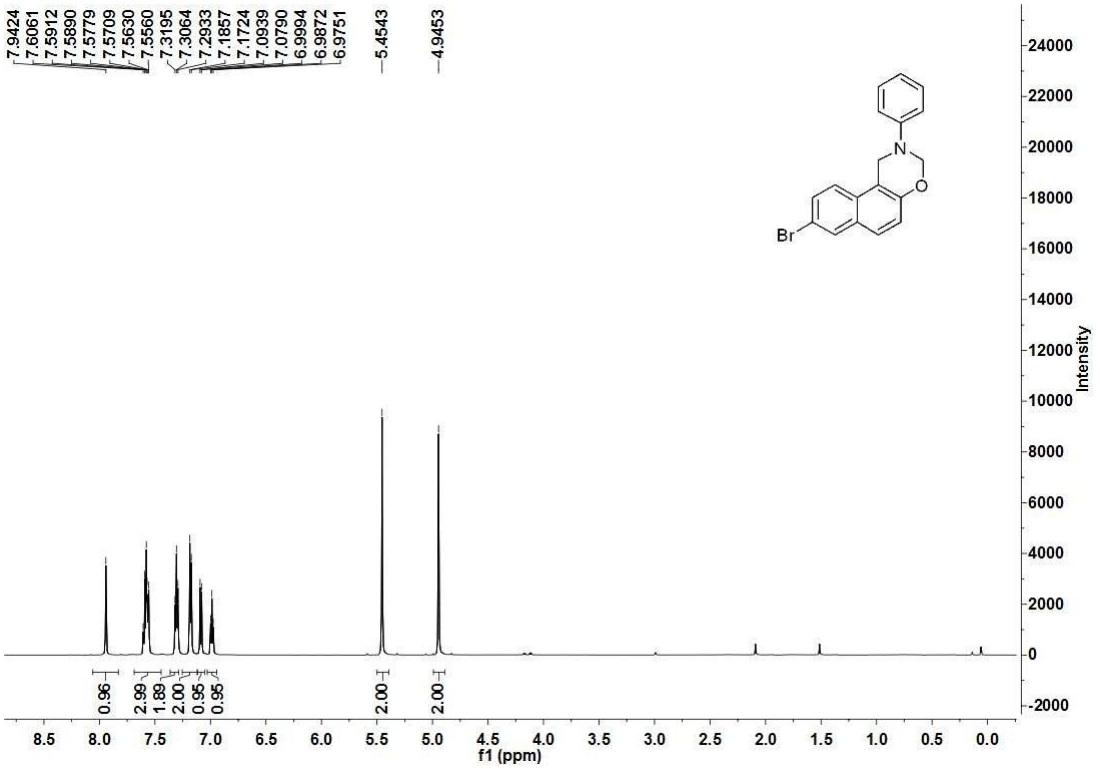
^{1}H NMR Spectrum ($CDCl_3$) of **3ba**



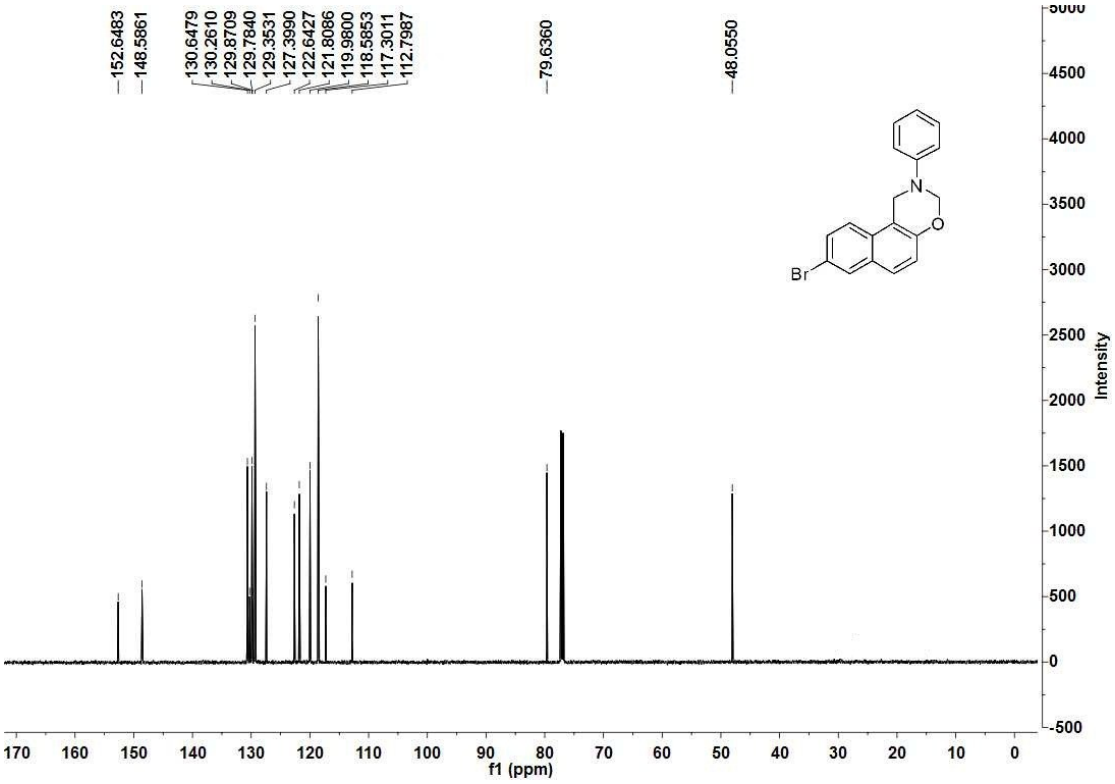
^{13}C NMR Spectrum ($CDCl_3$) of **3ba**



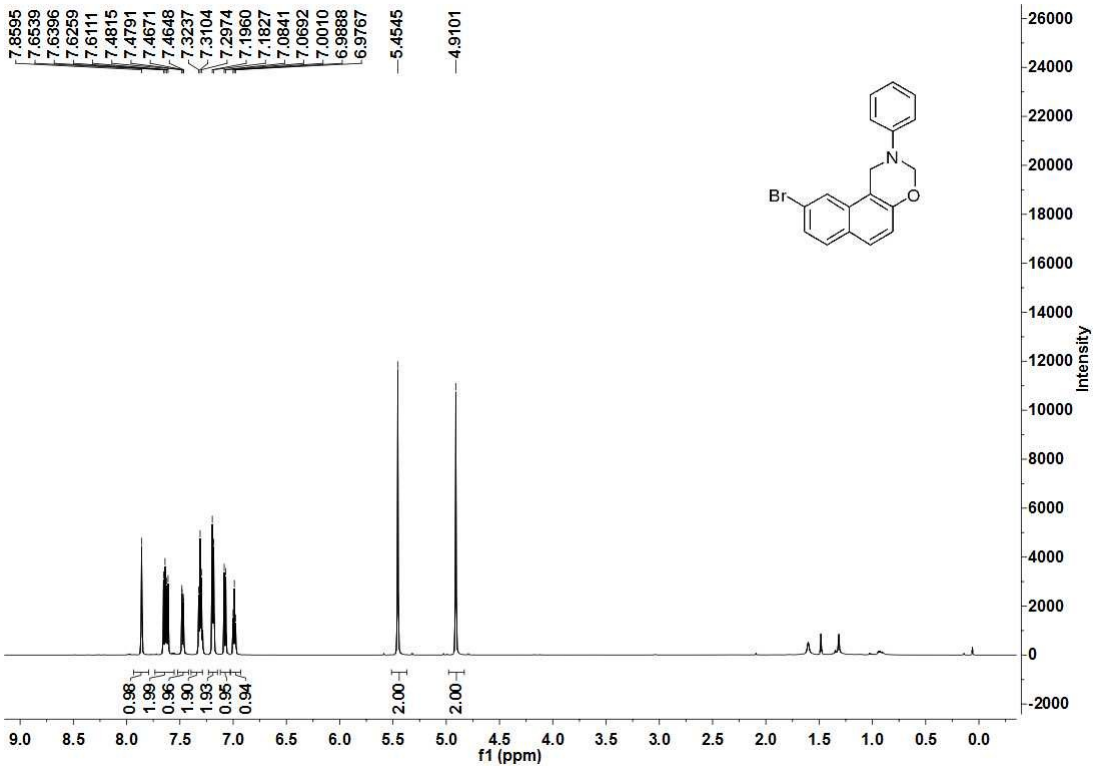
^{1}H NMR Spectrum ($CDCl_3$) of **3bb**



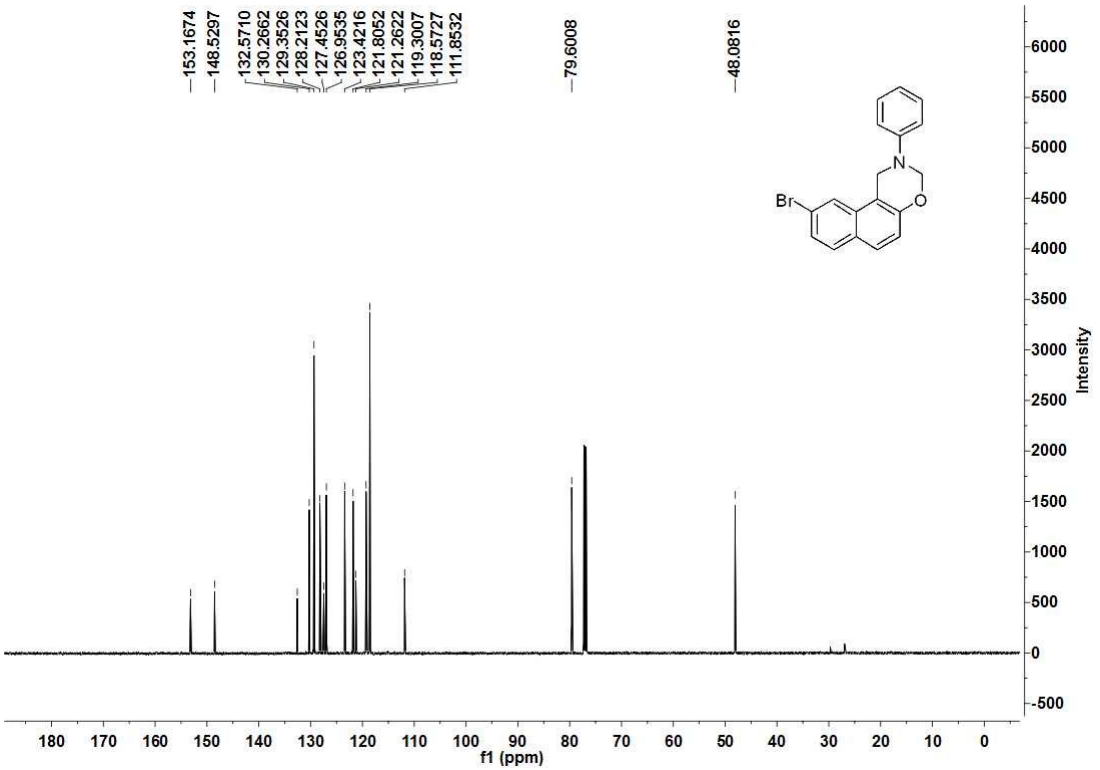
^{13}C NMR Spectrum ($CDCl_3$) of **3bb**



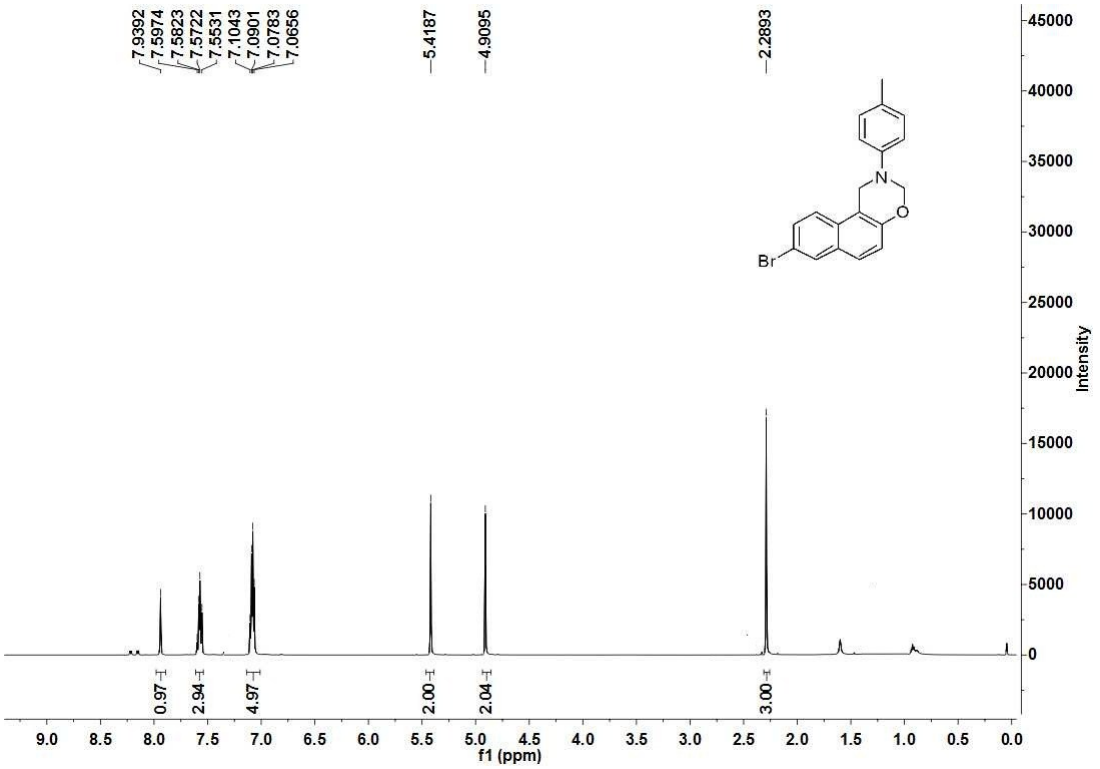
^{1}H NMR Spectrum ($CDCl_3$) of **3bc**



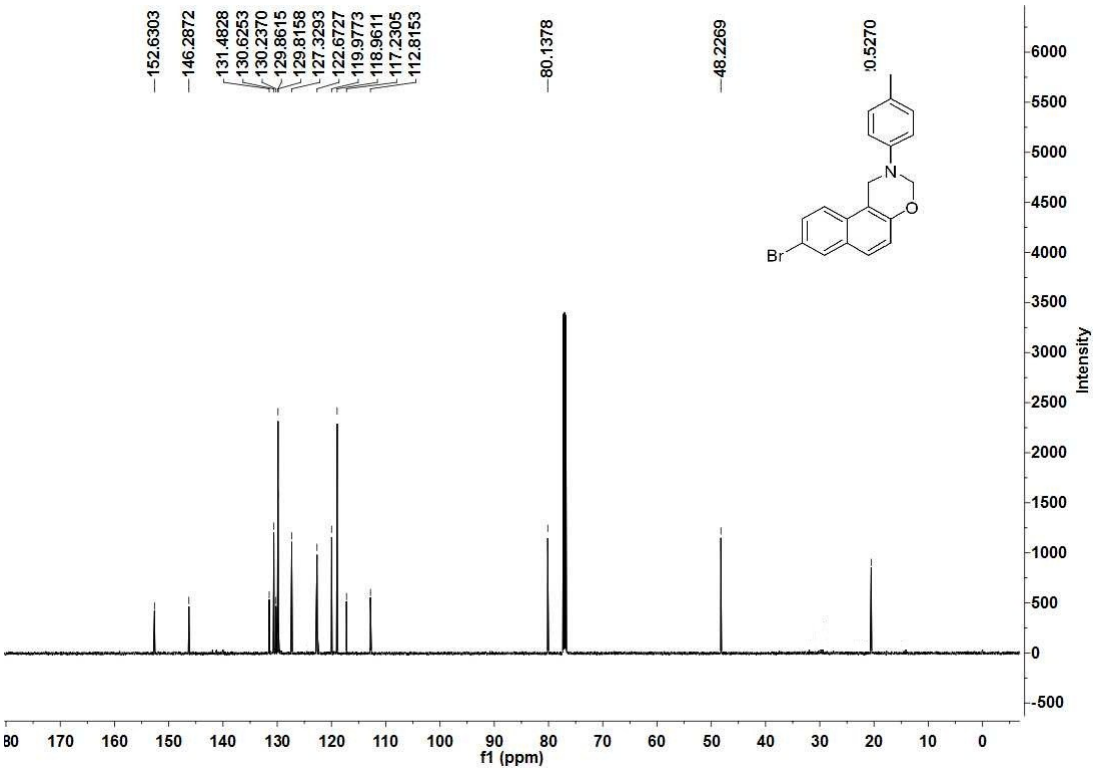
^{13}C NMR Spectrum ($CDCl_3$) of **3bc**



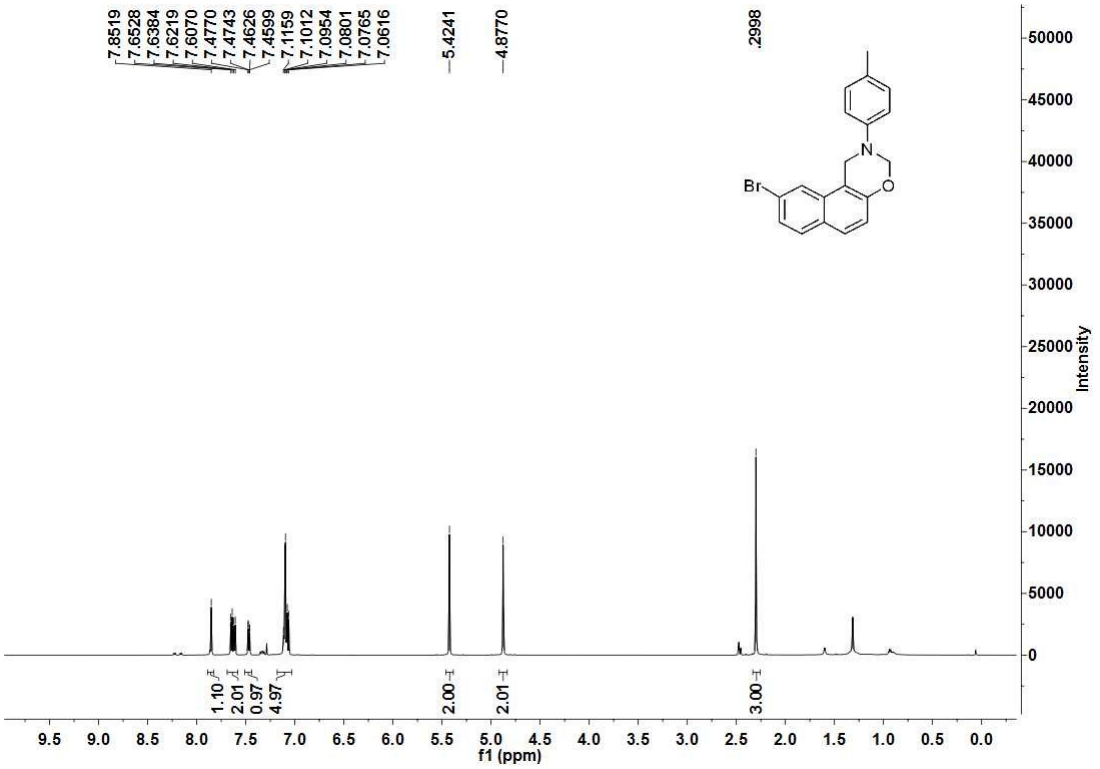
^{1}H NMR Spectrum ($CDCl_3$) of **3ab**



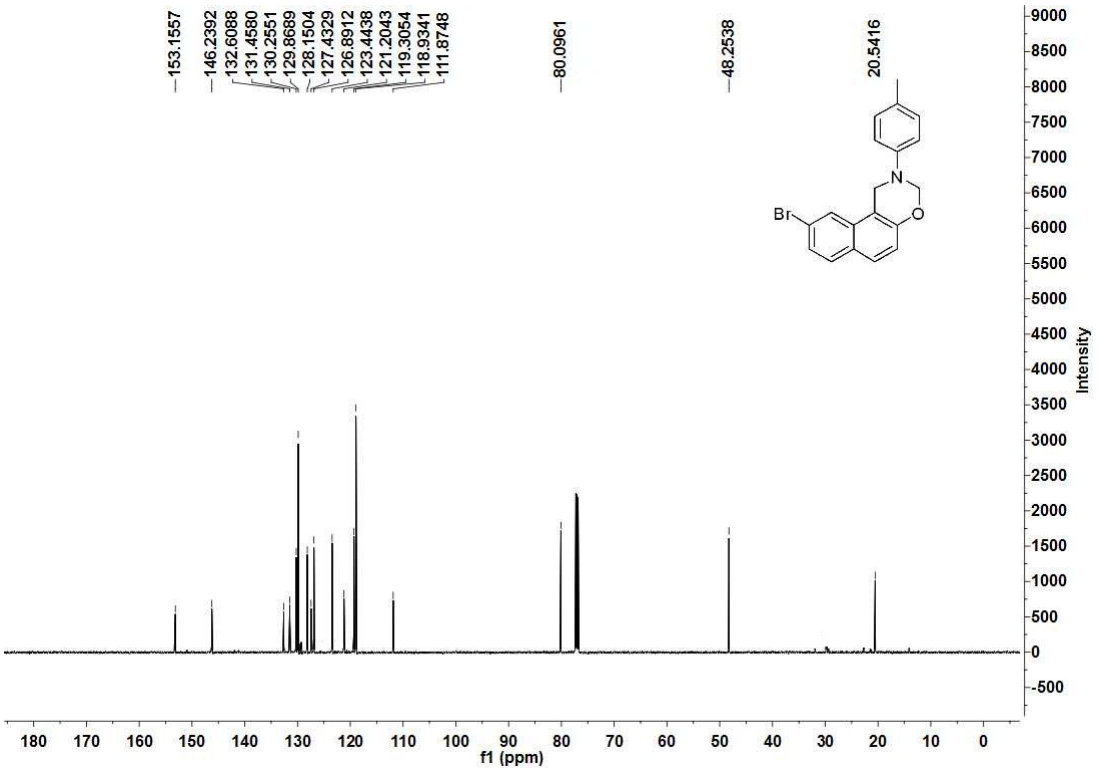
^{13}C NMR Spectrum ($CDCl_3$) of **3ab**



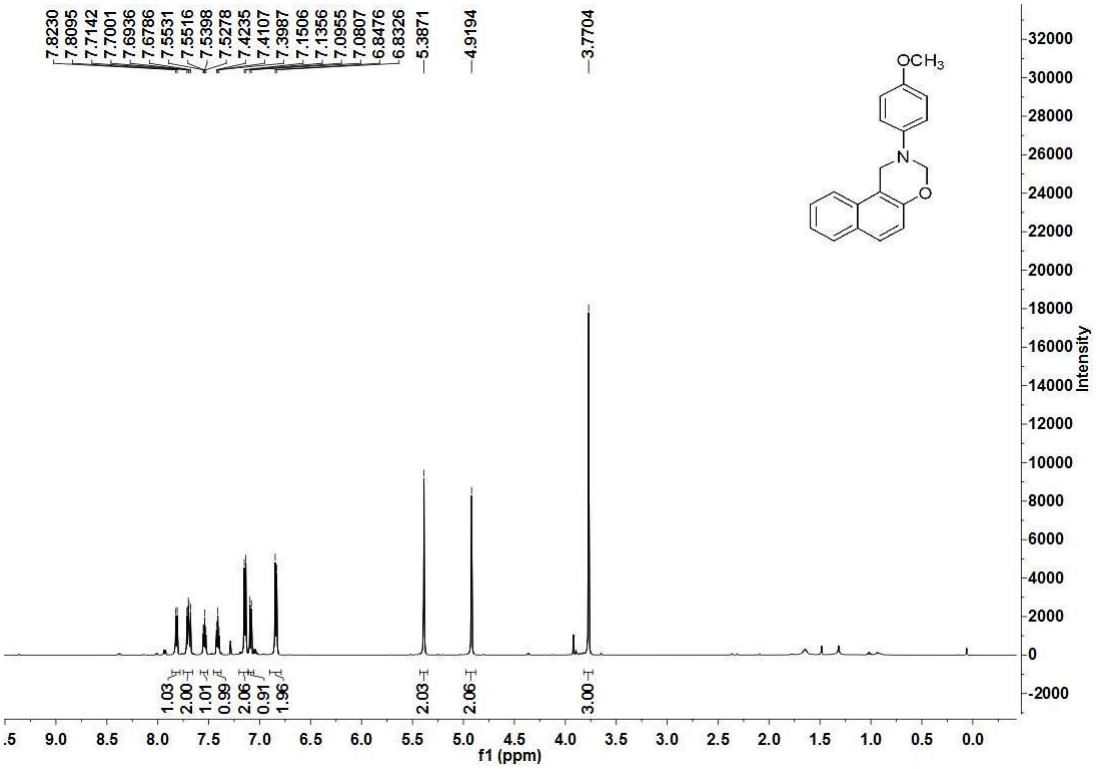
^{1}H NMR Spectrum ($CDCl_3$) of **3ac**



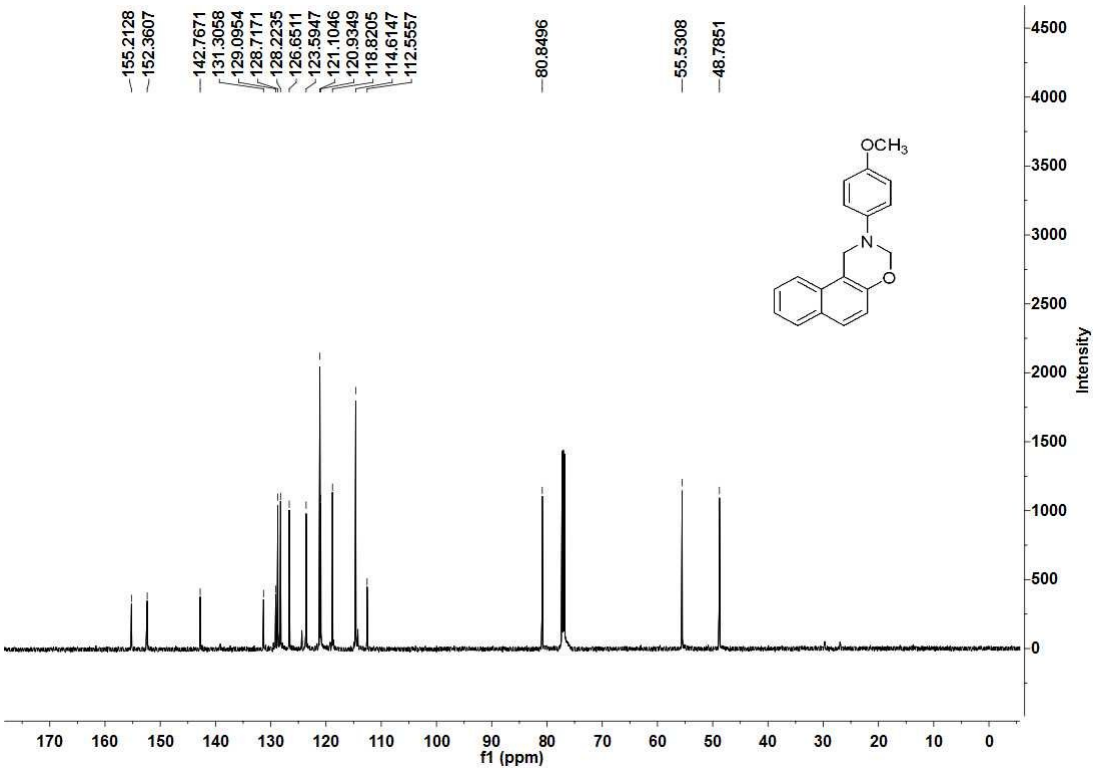
^{13}C NMR Spectrum ($CDCl_3$) of **3ac**



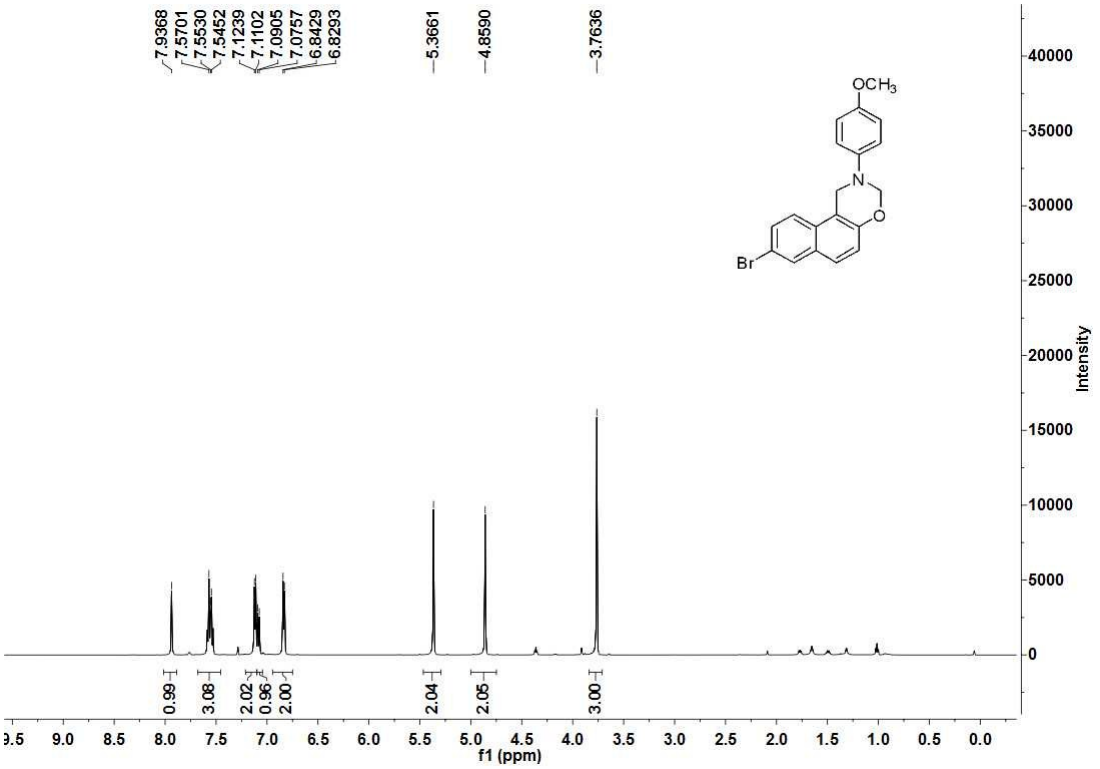
^{1}H NMR Spectrum ($CDCl_3$) of **3da**



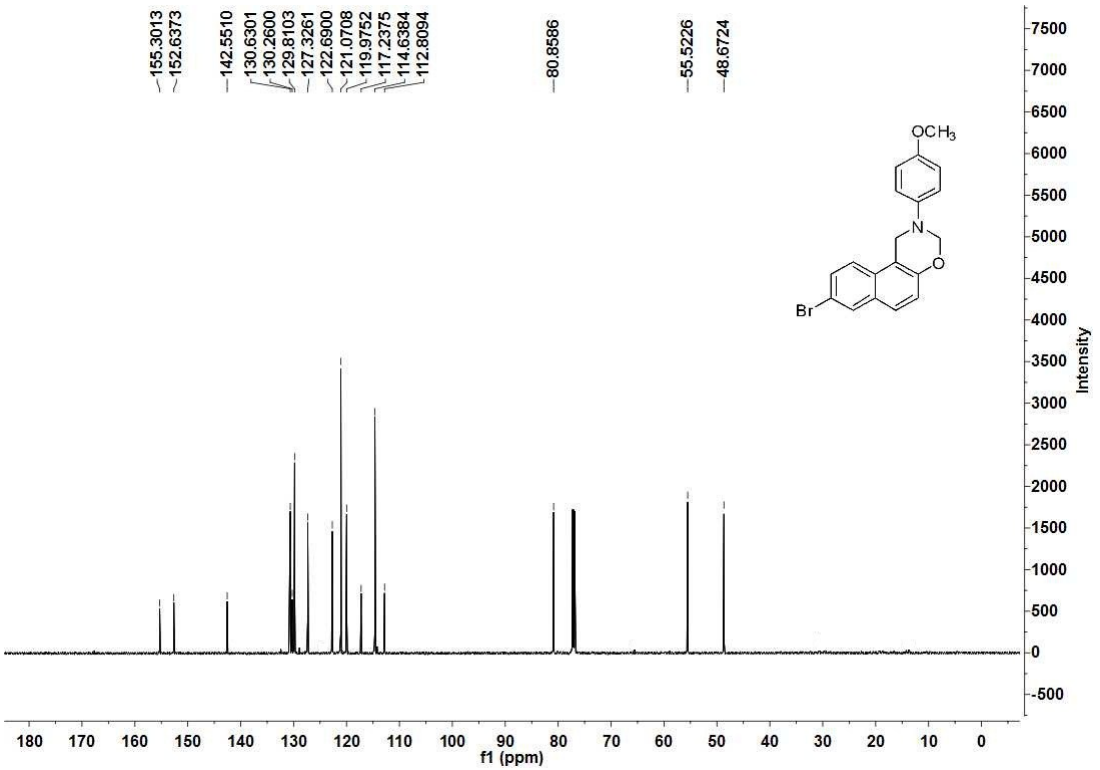
^{13}C NMR Spectrum ($CDCl_3$) of **3da**



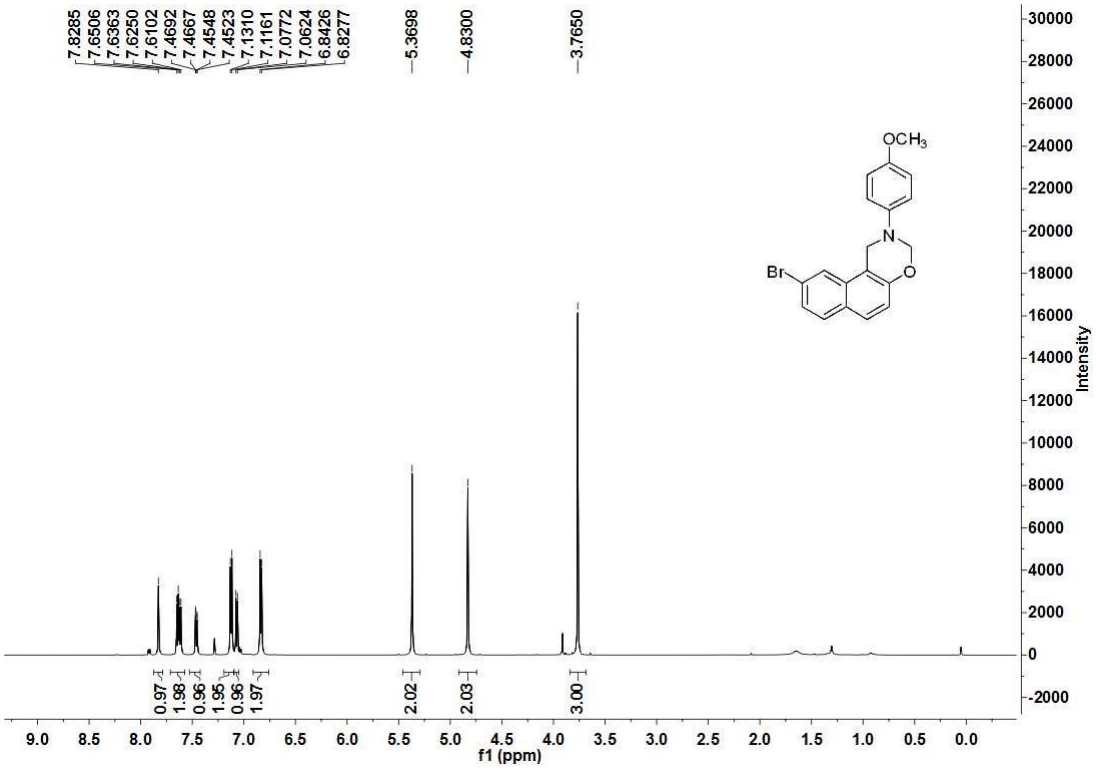
^{1}H NMR Spectrum ($CDCl_3$) of **3db**



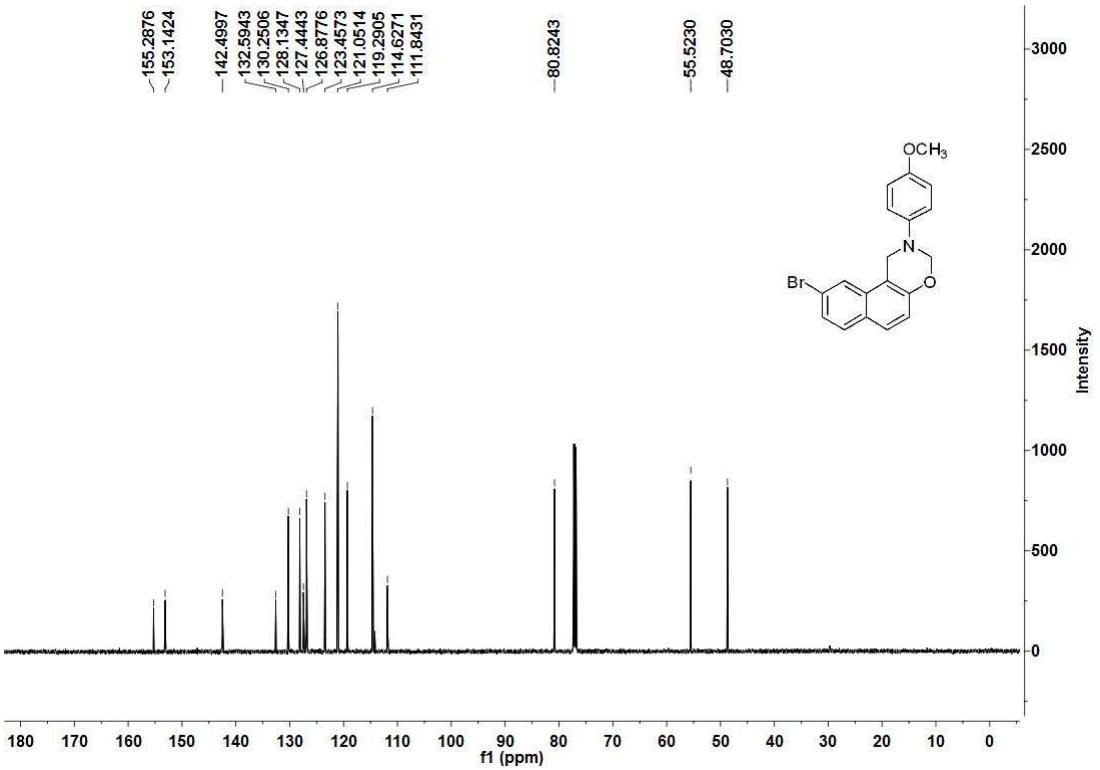
^{13}C NMR Spectrum ($CDCl_3$) of **3db**



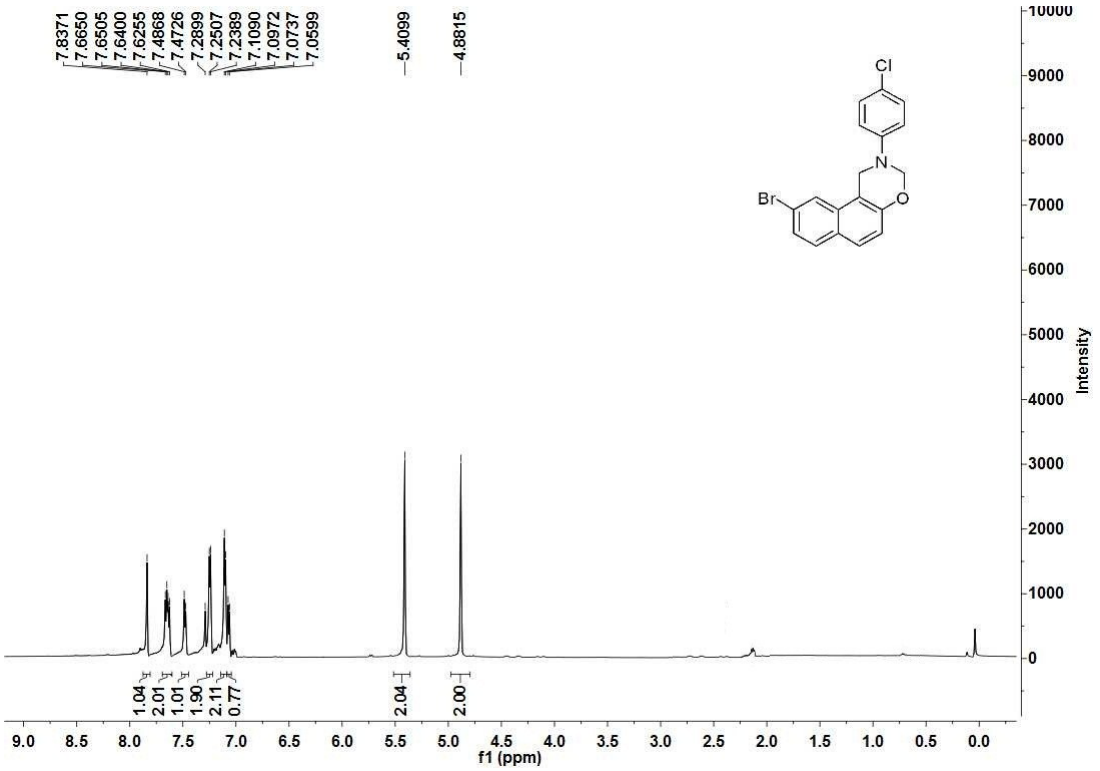
^{1}H NMR Spectrum ($CDCl_3$) of **3dc**



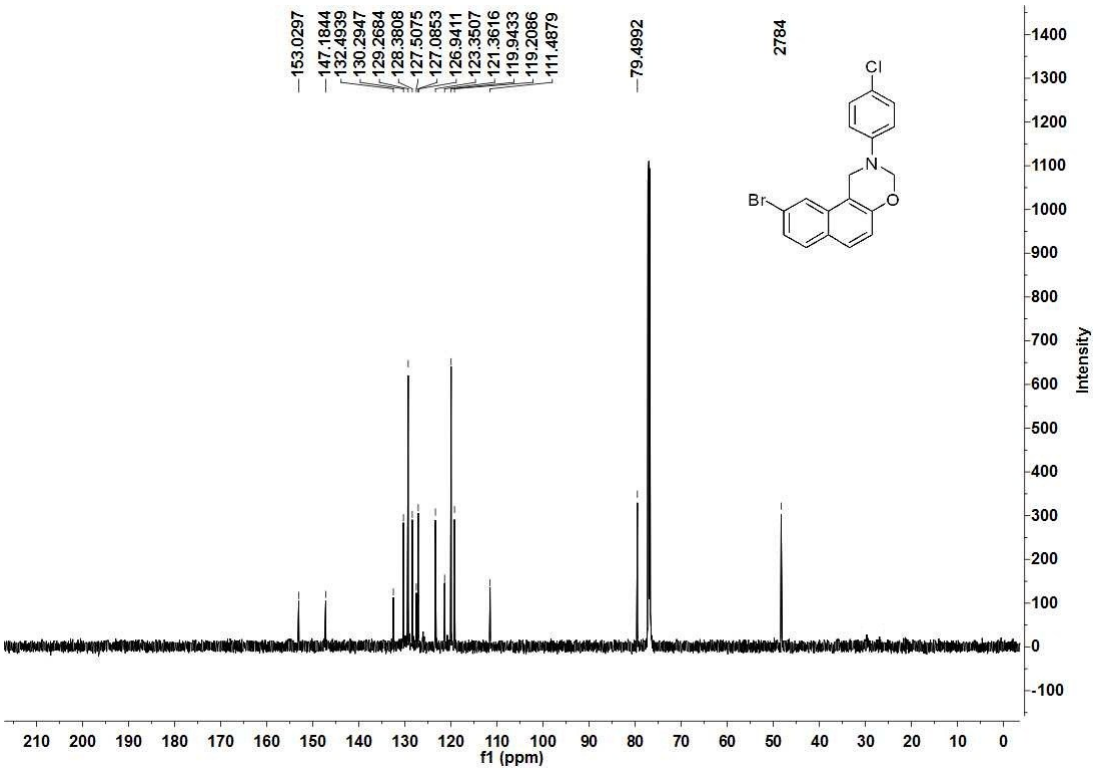
^{13}C NMR Spectrum ($CDCl_3$) of **3dc**



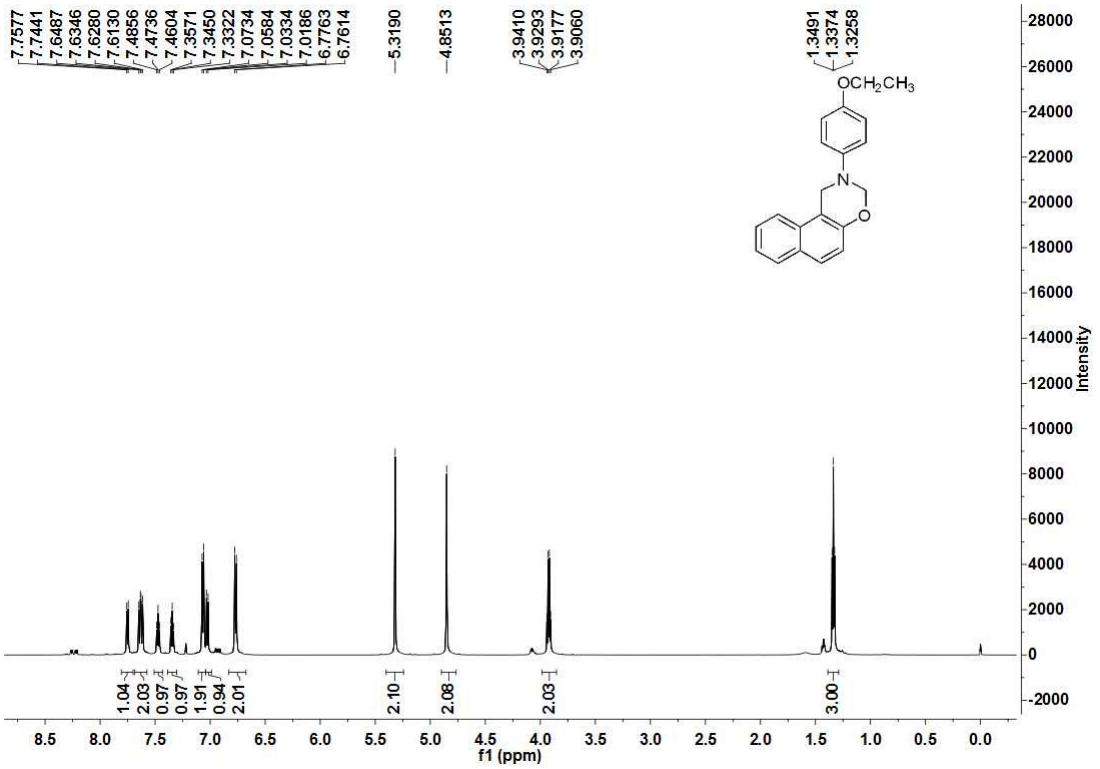
^{1}H NMR Spectrum ($CDCl_3$) of **3ec**



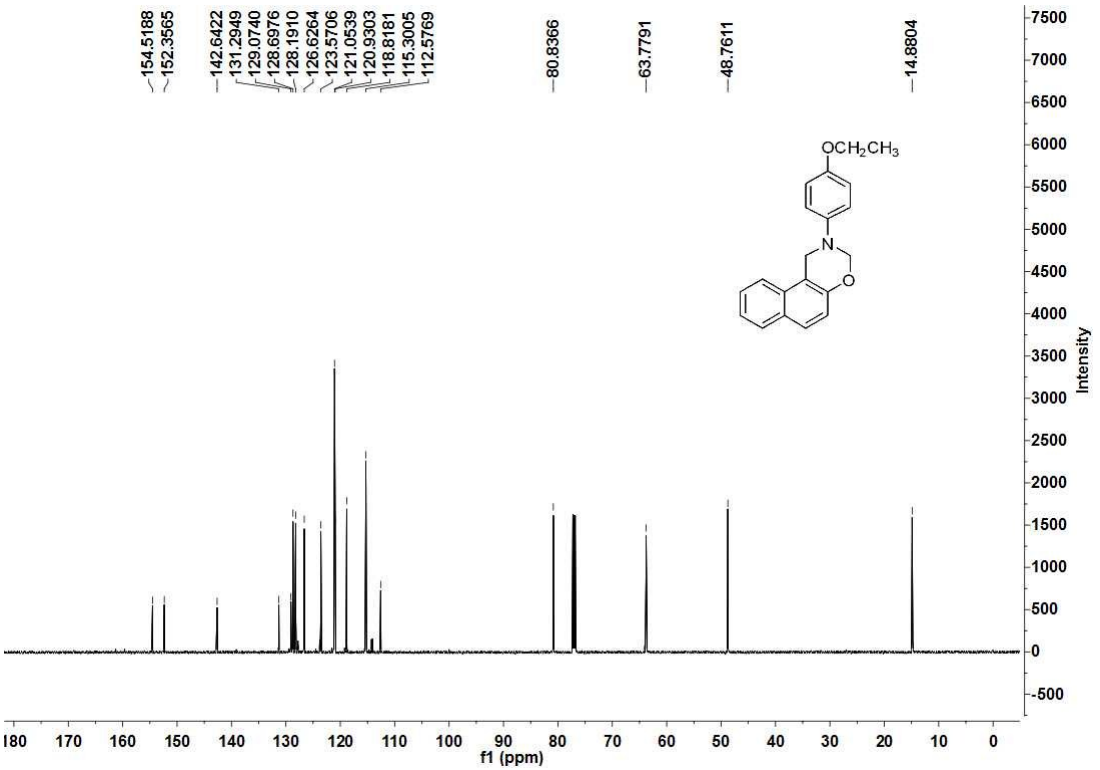
^{13}C NMR Spectrum ($CDCl_3$) of **3aa**



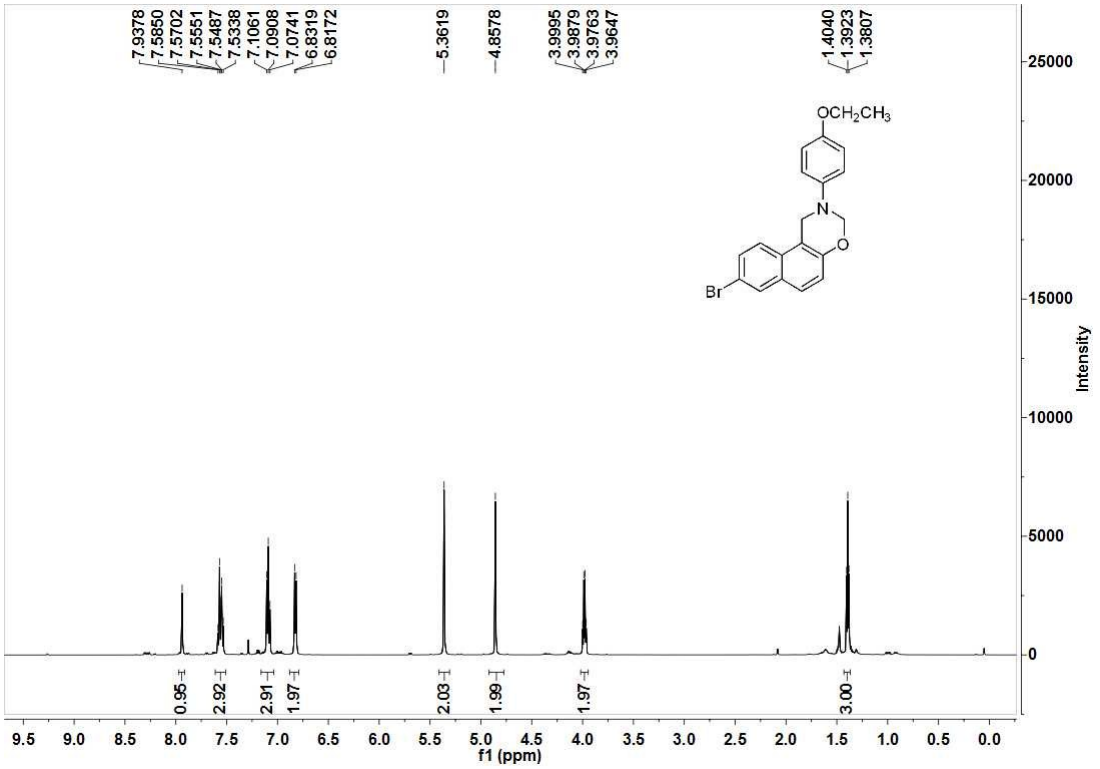
^{1}H NMR Spectrum ($CDCl_3$) of **3fa**



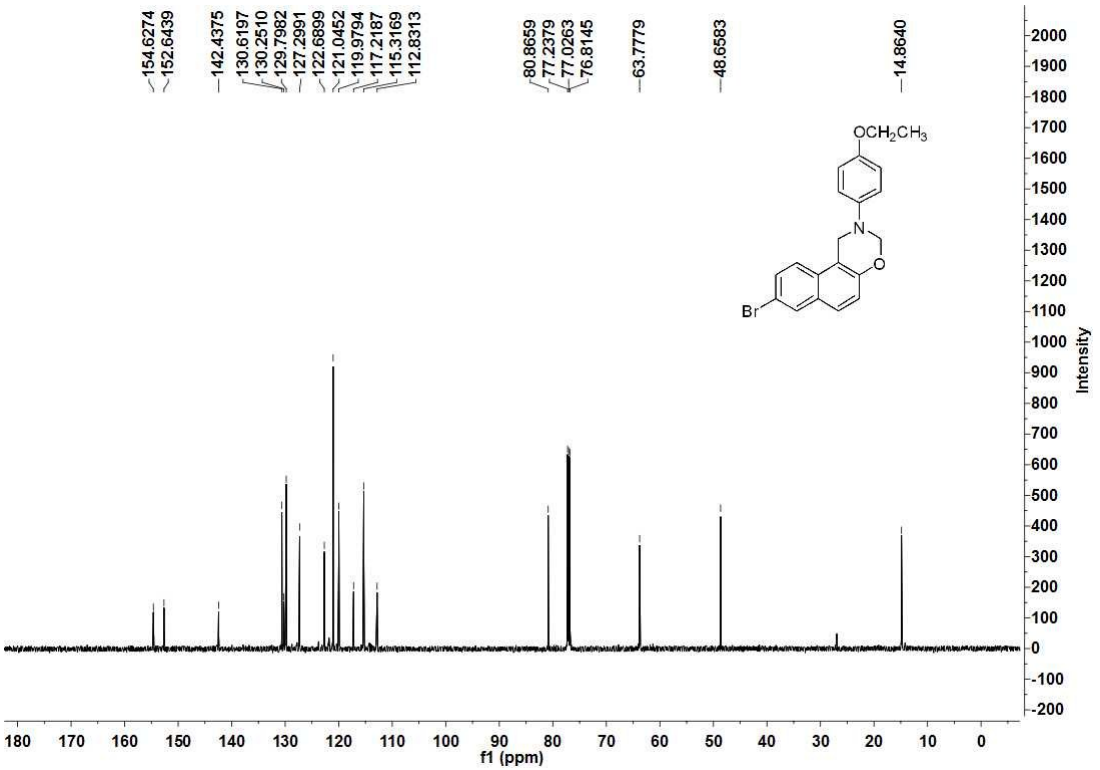
^{13}C NMR Spectrum ($CDCl_3$) of **3fa**



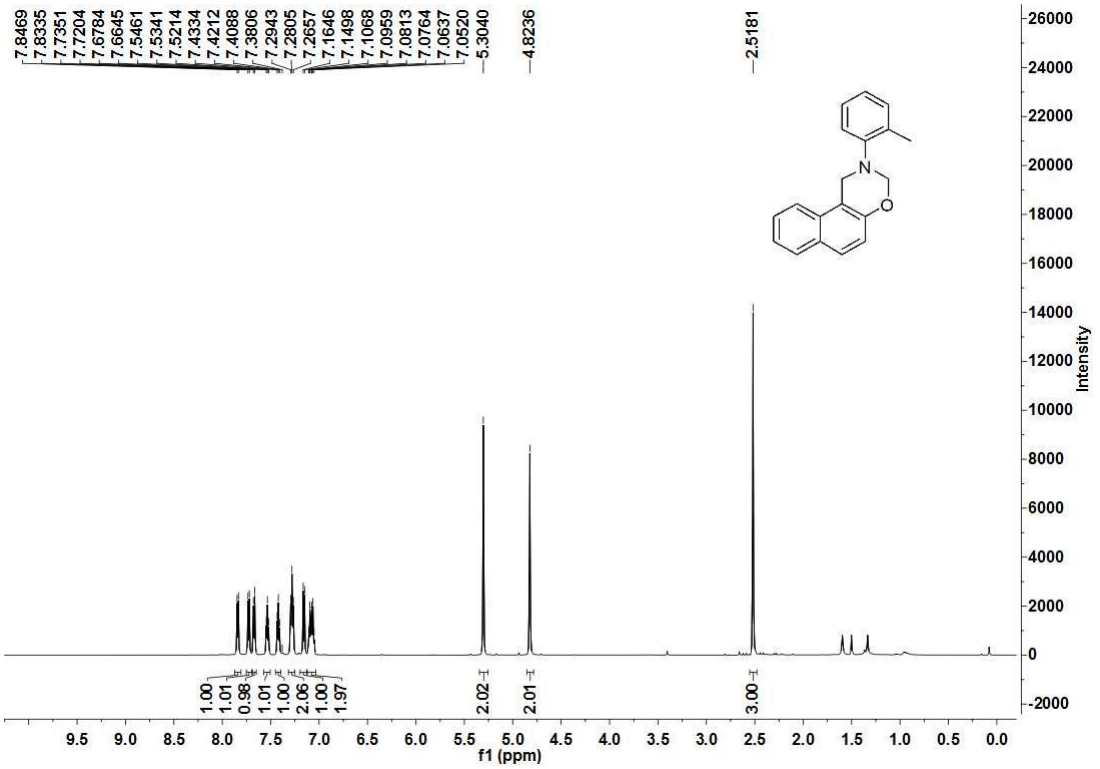
^{1}H NMR Spectrum ($CDCl_3$) of **3fb**



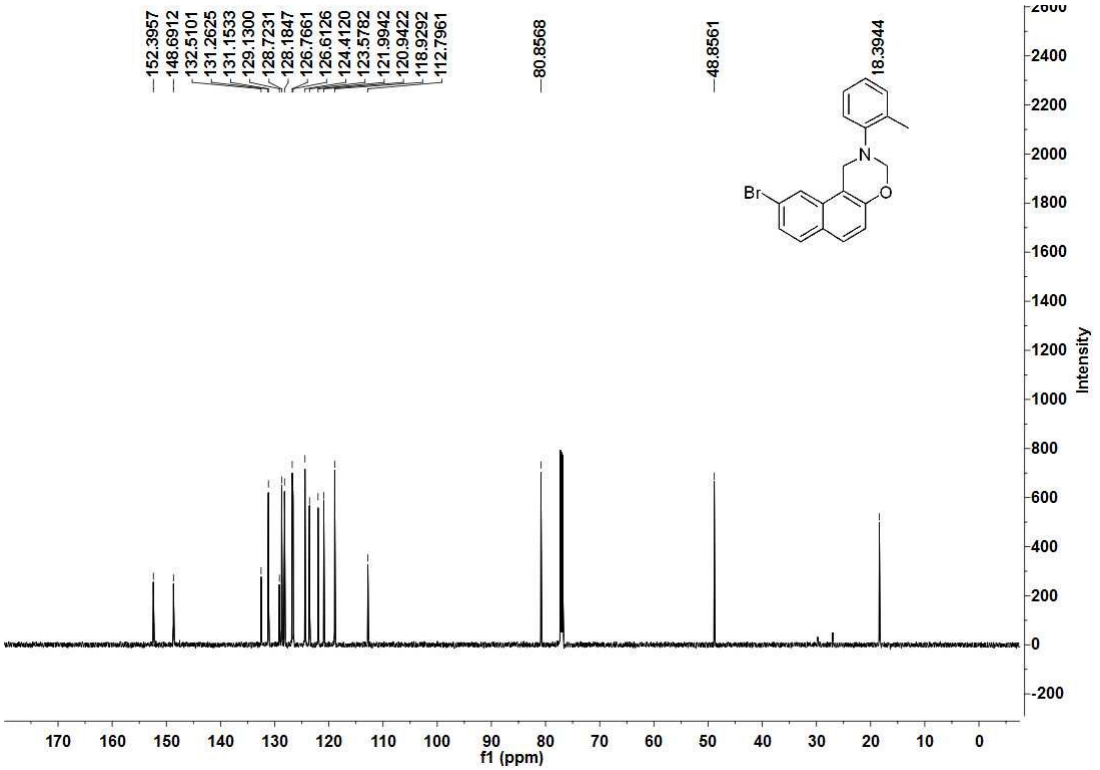
^{13}C NMR Spectrum ($CDCl_3$) of **3fb**



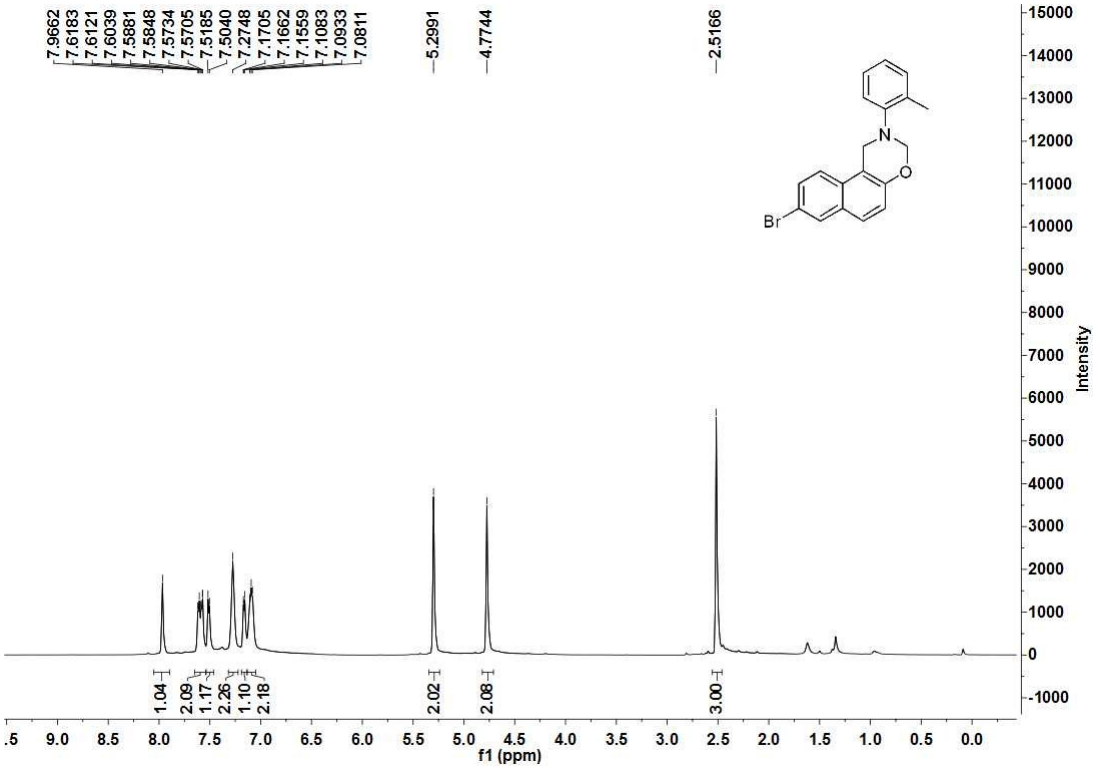
^{1}H NMR Spectrum ($CDCl_3$) of **3ca**



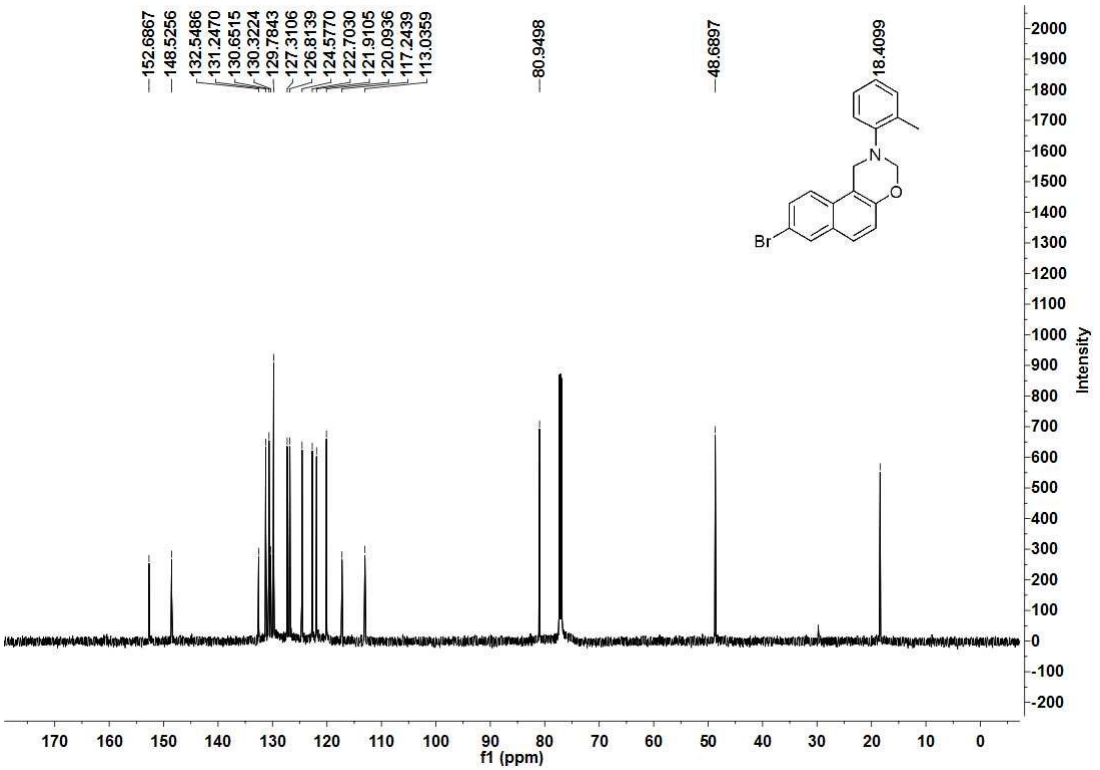
^{13}C NMR Spectrum ($CDCl_3$) of **3ca**



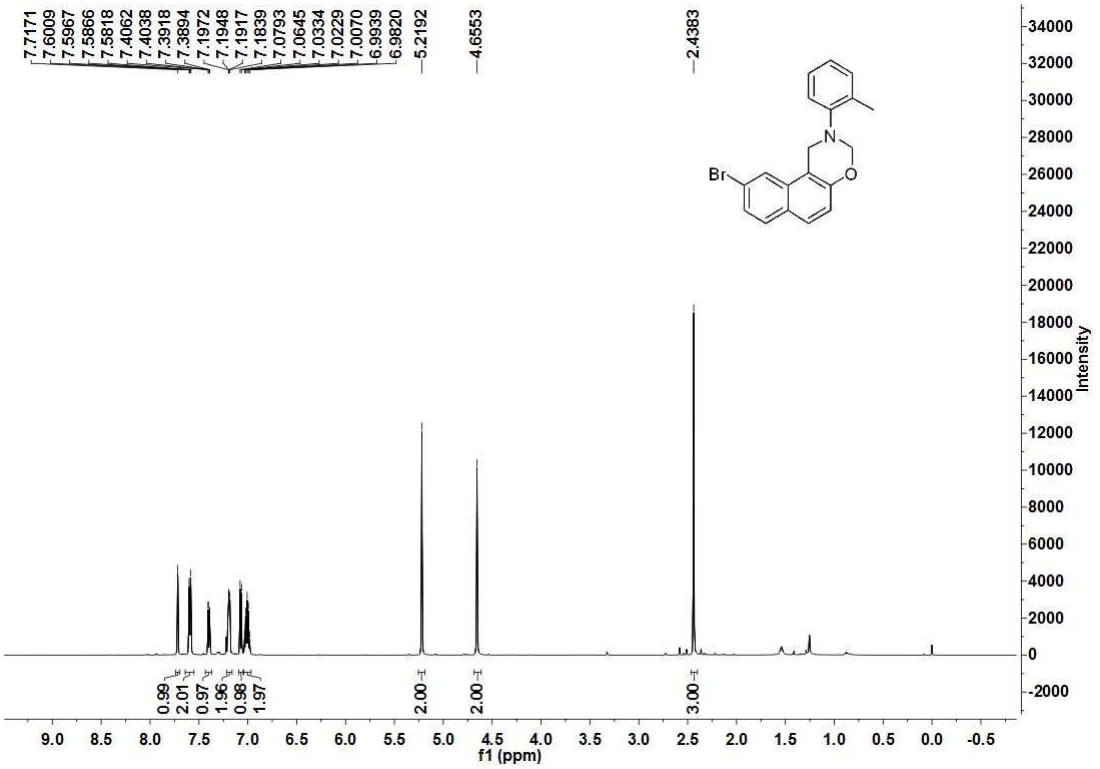
^{1}H NMR Spectrum ($CDCl_3$) of **3cb**



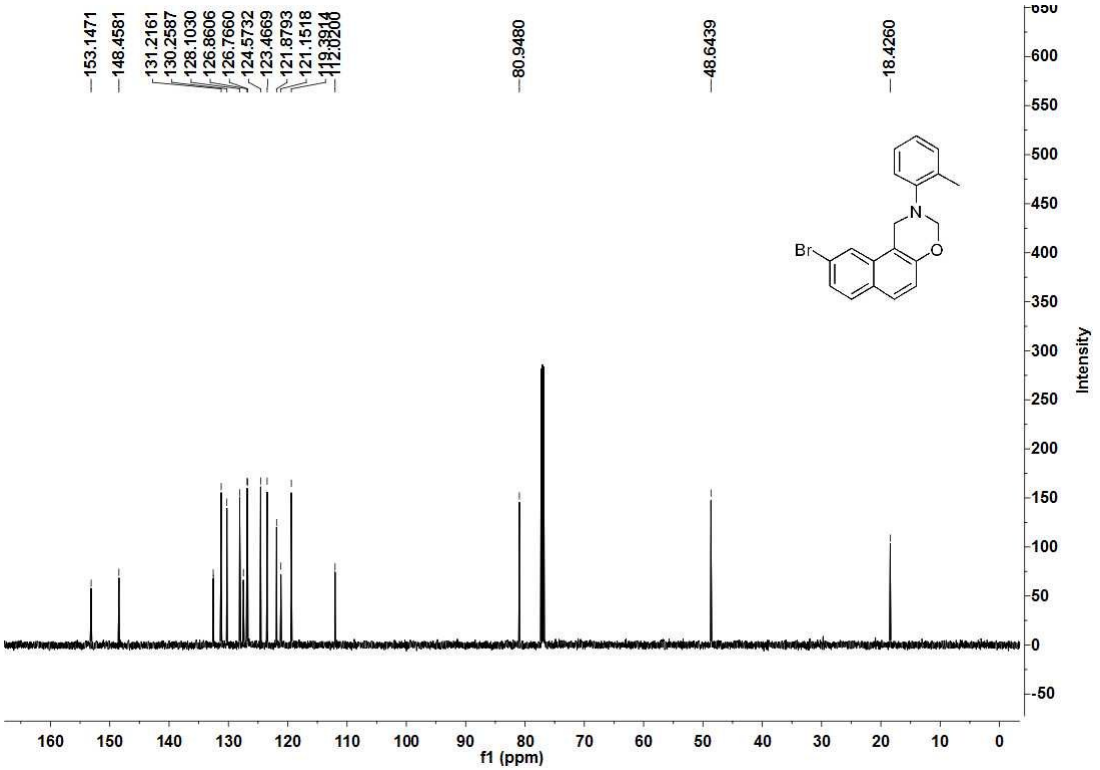
^{13}C NMR Spectrum ($CDCl_3$) of **3cb**



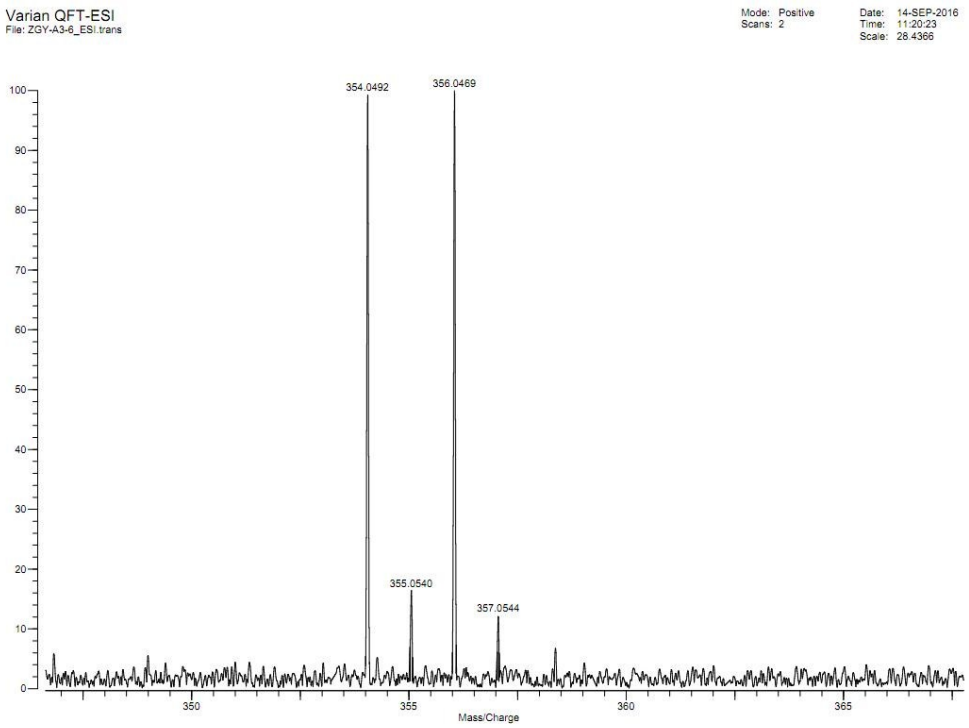
^{1}H NMR Spectrum ($CDCl_3$) of **3cc**



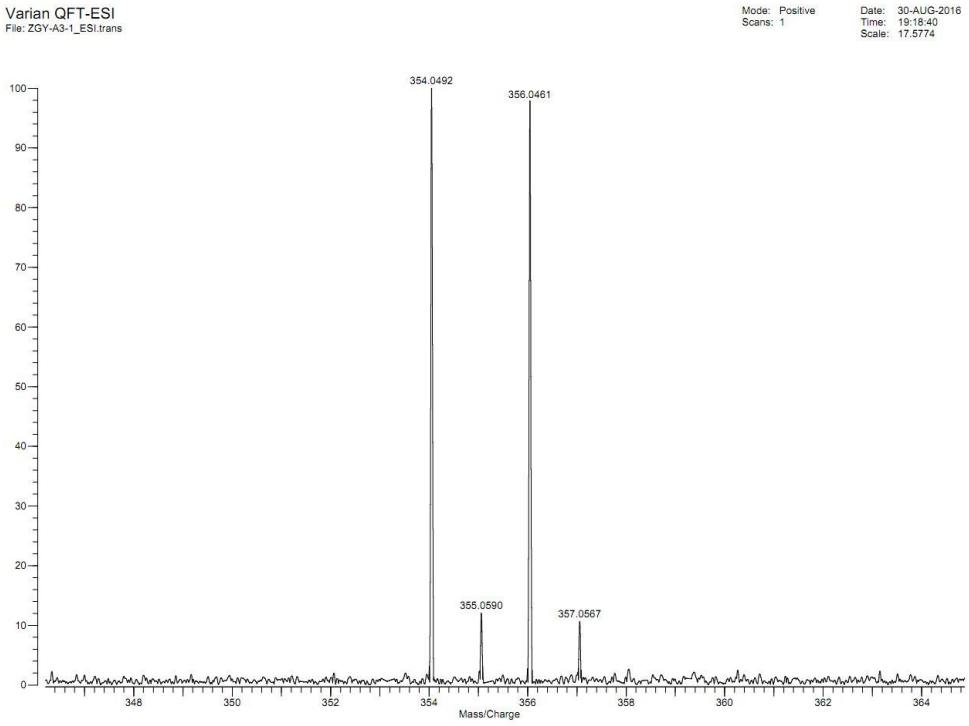
^{13}C NMR Spectrum ($CDCl_3$) of **3cc**



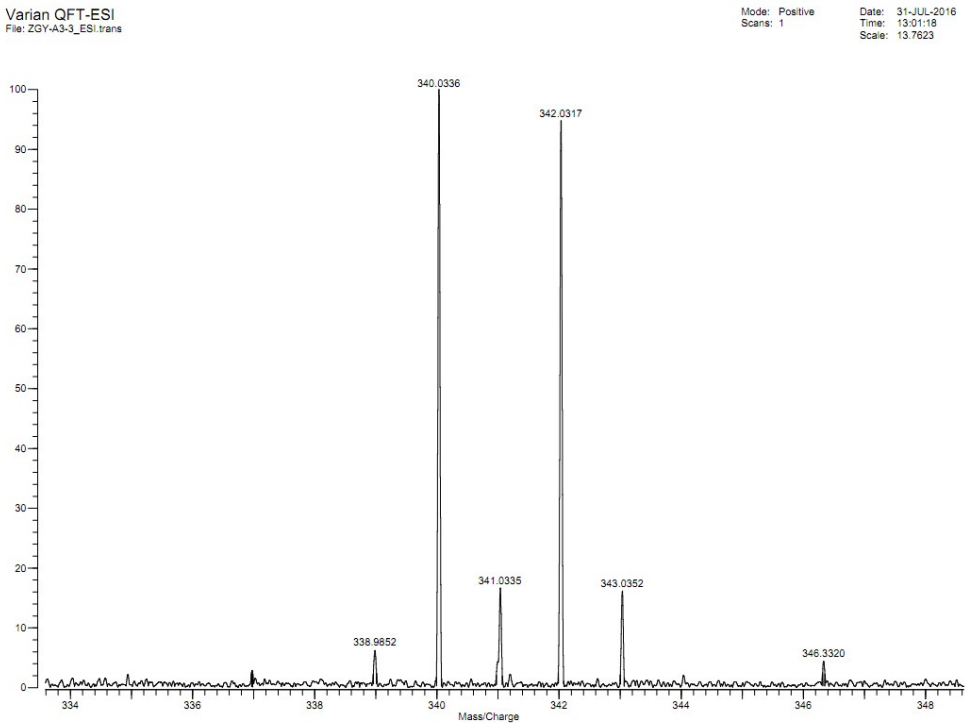
6. HRMS spectra of new compounds.



3ac



3bc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Scans: 1
Date: 31-JUL-2016
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Scale: 13.7623
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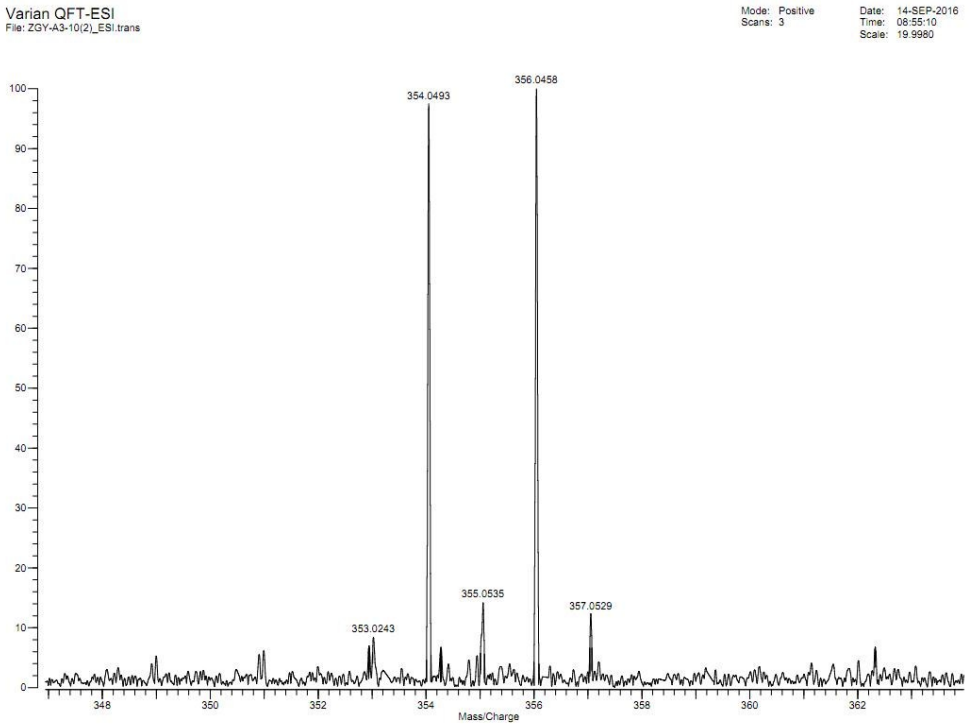
342.0317
341.0335
343.0352
338.9852
346.3320
Mass/Charge

3cb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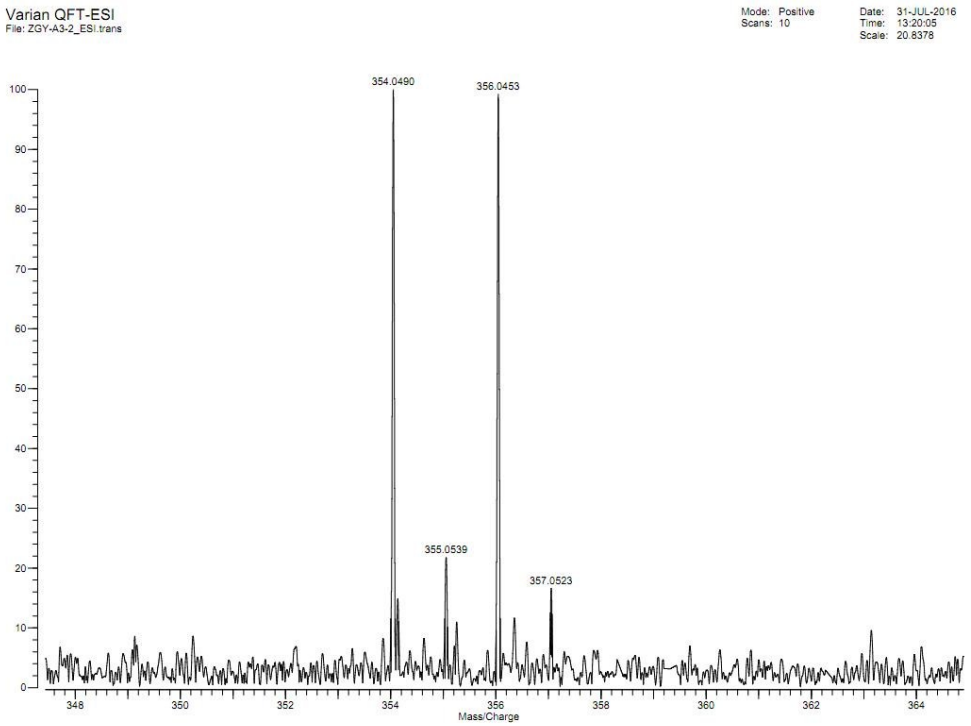
Mass/Charge

3cc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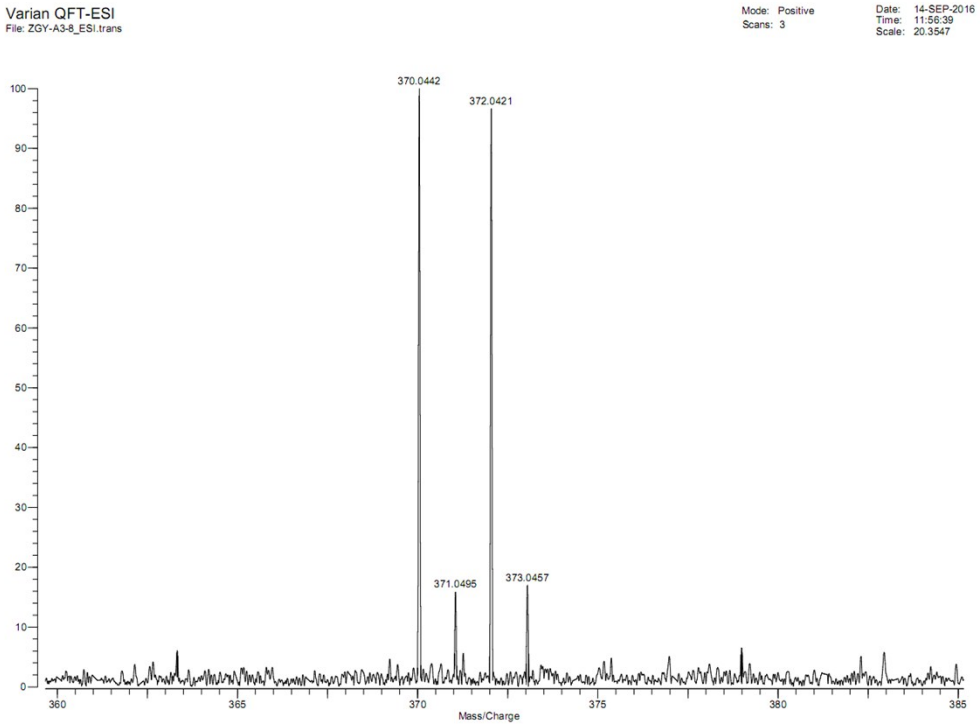
Mass/Charge

3db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371.0495
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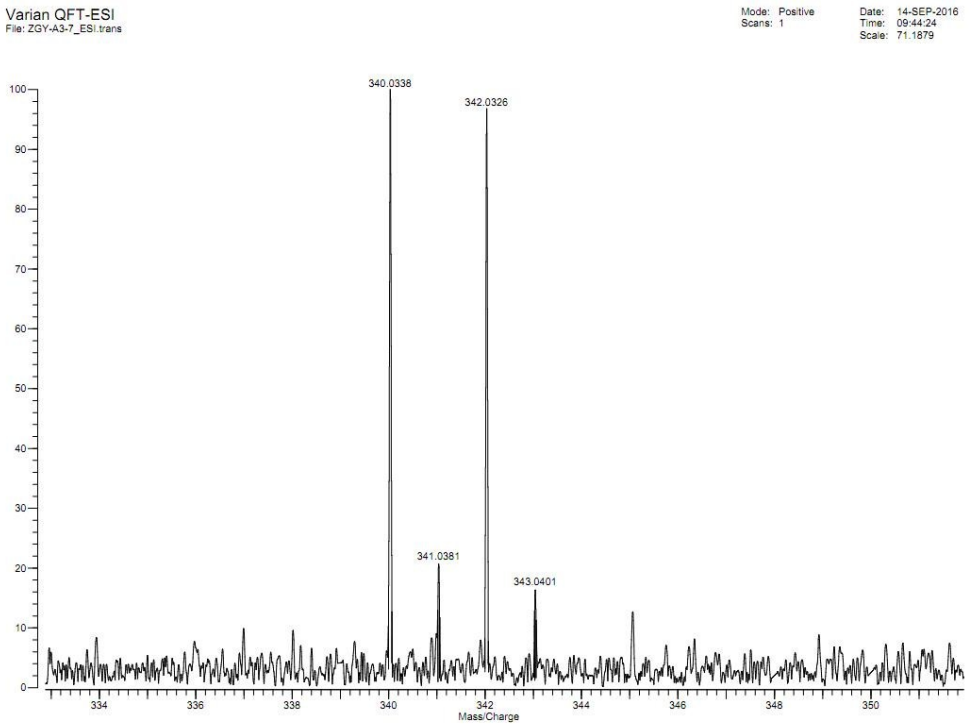
Mass/Charge

3bb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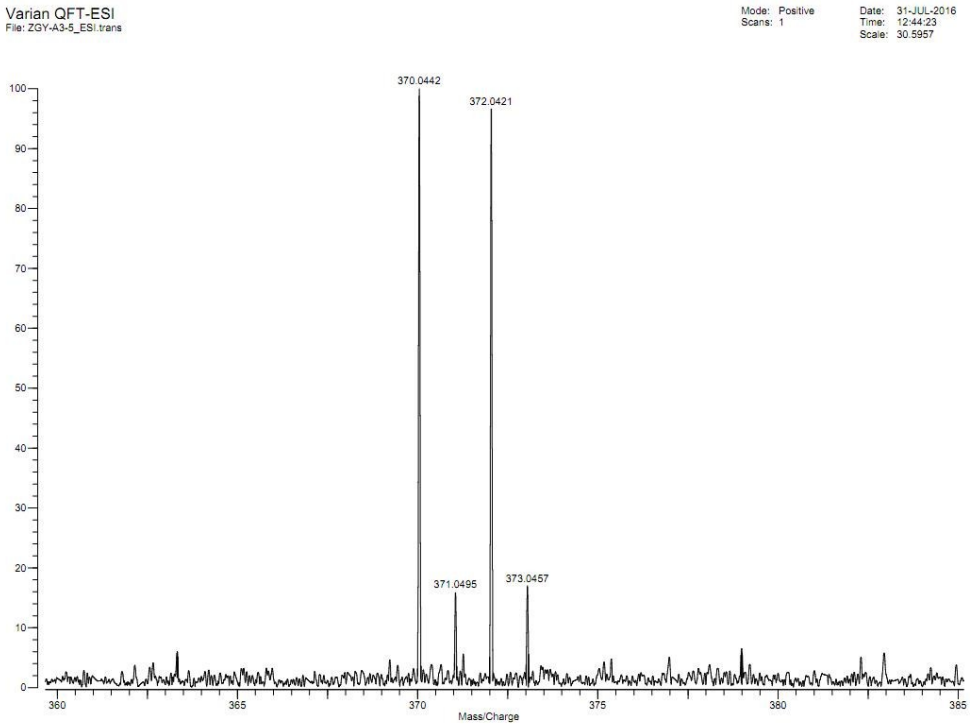
342.0326
341.0381
343.0401
Mass/Charge

3dc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Scans: 1
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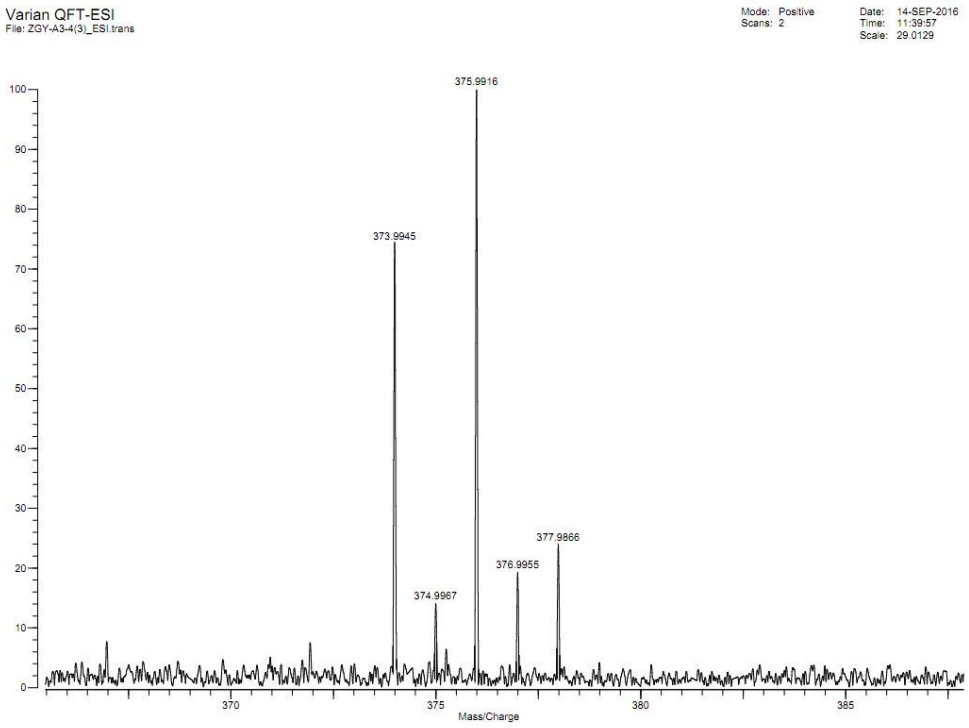
371.0495
373.0457
Mass/Charge

3ec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376.9955
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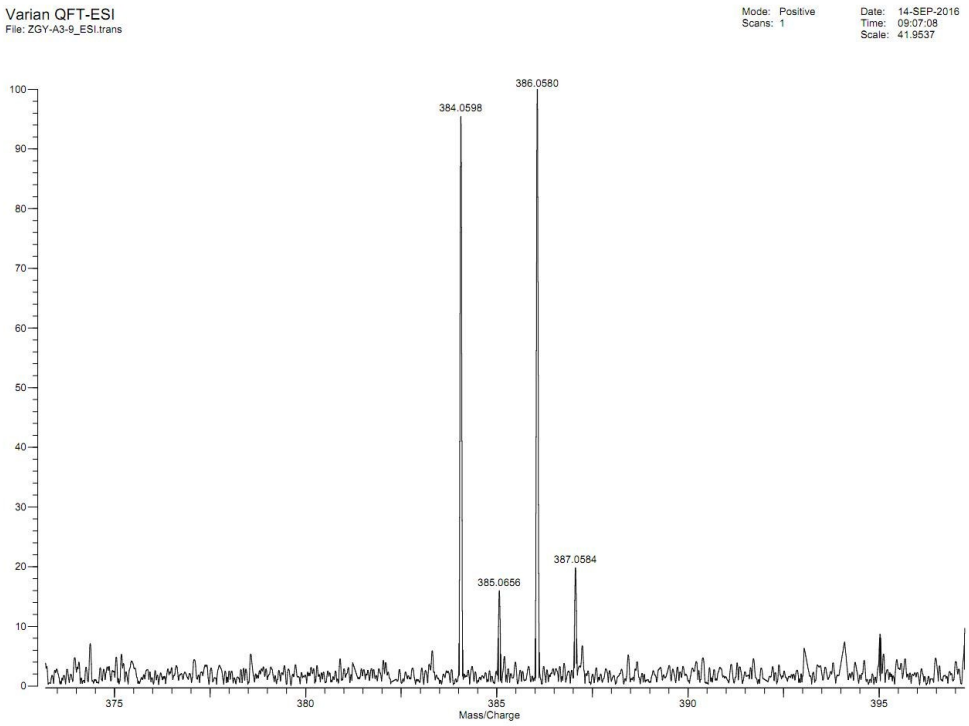
Mass/Charge

3fb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Scale: 41.9537
386.0580
384.0598
387.0584
385.0656
Mass/Charge

7. References.

[1] N. S. Rai, B. Kalluraya, B. Lingappa, S. Shenoy, V. G. Puranic, *European Journal of Medicinal Chemistry.;* **2008,** *43*, 1715-1720.

[2] A. H. Kategaonkar, S. S. Sonar, K. F. Shelke, B. B. Shingate, M. S. Shingare, ACG.*Org. Commun.;* **2010,** *3*, 1-7.

[3] V. D. Dhakane, S. S. Gholap, U. P. Deshmukh, H. V. Chavan, B. P. Bandgar, *C. R. Chimie.;* **2014,** *17*, 431–436.