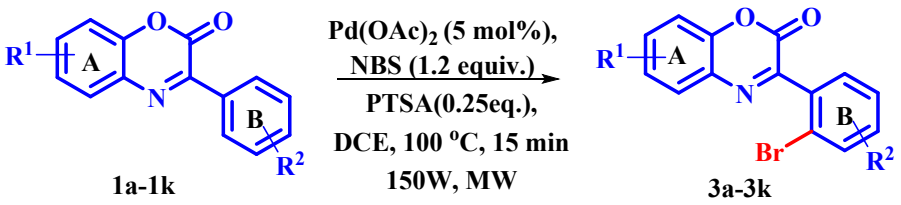
# Supporting Information

## Content

## General Consideration

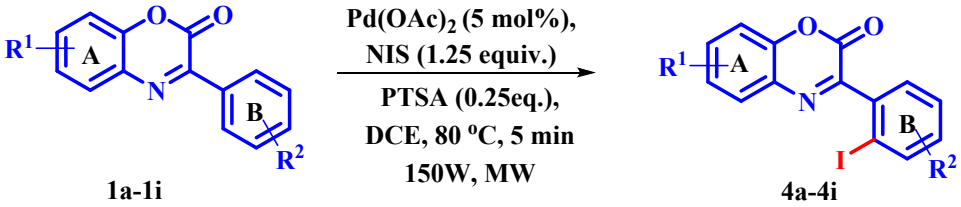
All microwave assisted experiments were performed in a closed vial reaction vial applying a dedicated CEM-Discover monomode microwave apparatus operating at a frequency of 2.45 GHz with continuous irradiation power from 0 to 300 W (CEM Corporation, P.O. Box 200, Matthews, NC 28106). Reactions were monitored by thin layer chromatography (TLC) on Merck gel 60 $F_{254}$ plates. The $^{1}H$ and $^{13}C$ NMR spectra ($CDCl_3$ and DMSO-$d_6$) were recorded on a JEOL ECX-400P NMR and Bruker NMR 400 MHz and 100 MHz, respectively using TMS as internal standard. The high-resolution mass spectral data were recorded on a Waters QTOF mass spectrometer. Melting point were recorded on a Büchi M-560 melting point apparatus and are uncorrected. All the chemicals and reagents were purchased from commercial sources and used as received. 3-phenyl-2*H*-benzo[*b*][1,4]oxazin-2-one derivatives were well known compounds and were prepared according to literature[1-3].

## General procedure for the synthesis of compounds 3(a-k)



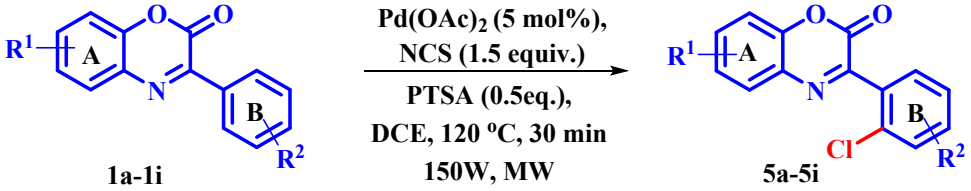

An oven dried 10 mL screw capped reaction vial with a small stirring bar was charged with a mixture of 3-phenyl-2*H*-benzo[*b*][1,4]oxazin-2-one **1** (1 mmol), NBS **2** (1.2 mmol), $Pd(OAc)_2$ (5 mol%), PTSA (0.25 mmol) and DCE (2mL). The resulting mixture was irradiated under microwave (150W) at 100 °C for 15 mins. The progress of the reaction was monitored by TLC. After Completion of the reaction, the reaction mixture was cooled up to ambient temperature and then diluted with water and extracted with EtOAc (3×10 mL). The organic layer was separated, dried over anhydrous $Na_2SO_4$ and concentrated on a rotary evaporator to obtain the crude product. The crude product thus obtained was further purified on a silica gel column using hexane/ethyl acetate (9:1) as eluent to afford the pure targeted products.

## General procedure for the synthesis of compounds 4(a-i)



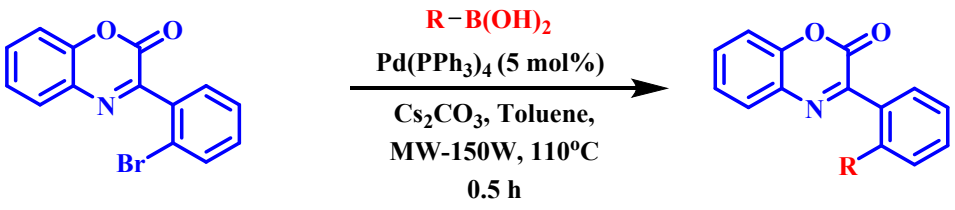
An oven dried 10 mL screw capped reaction vial with a small stirring bar was charged with a mixture of 3-phenyl-2*H*-benzo[*b*][1,4]oxazin-2-one **1** (1 mmol), NIS **2** (1.25 mmol), $Pd(OAc)_2$ (5 mol%), PTSA (0.25 mmol) and DCE (2mL). The resulting mixture was irradiated under microwave (150W) at 80 °C for 5 mins. The progress of the reaction was monitored by TLC. After Completion of the reaction, the reaction mixture was cooled up to ambient temperature and then diluted with water and extracted with EtOAc (3×10 mL). The organic layer was separated, dried over anhydrous $Na_2SO_4$ and concentrated on a rotary evaporator to obtain the crude product. The crude product thus obtained was further purified on a silica gel column using hexane/ethyl acetate (9:1) as eluent to afford the pure targeted products.

## General procedure for the synthesis of compounds 5(a-i)




An oven dried 10 mL screw capped reaction vial with a small stirring bar was charged with a mixture of 3-phenyl-2*H*-benzo[*b*][1,4]oxazin-2-one **1** (1 mmol), NCS **2** (1.5 mmol), $Pd(OAc)_2$ (5 mol%), PTSA (0.5 mmol) and DCE (2mL). The resulting mixture was irradiated under microwave (150W) at 120 °C for 30 mins. The progress of the reaction was monitored by TLC. After Completion of the reaction, the reaction mixture was cooled up to ambient temperature and then diluted with water and extracted with EtOAc (3×10 mL). The organic layer was separated, dried over anhydrous $Na_2SO_4$ and concentrated on a rotary evaporator to obtain the crude product. The crude product thus obtained was further purified on a silica gel column using hexane/ethyl acetate (9:1) as eluent to afford the pure targeted products.

## General procedure for the synthesis of compounds 8-12




An oven dried 10 mL screw capped reaction vial with a small stirring bar was charged with a mixture of 3-(2-bromophenyl)-2*H*-benzo[b][1,4]oxazin-2-one (1 mmol), Boronic acids (2.0 mmol), $Pd(PPh_3)_2$ (5 mol%), $Cs_2CO_3$ (1.5 mmol) and Toluene (2mL). The resulting mixture was irradiated under microwave (150W) at 110 °C for 30 mins. The progress of the reaction was monitored by TLC. After Completion of the reaction, the reaction mixture was cooled up

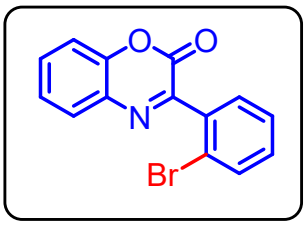
to ambient temperature and then diluted with water and extracted with EtOAc (3×10 mL). The organic layer was separated, dried over anhydrous $Na_2SO_4$ and concentrated on a rotary evaporator to obtain the crude product. The crude product thus obtained was further purified on a silica gel column using hexane/ethyl acetate (9:1) as eluent to afford the pure targeted products.

## References


1. S. Yan, L. Ye, M. Liu, J. Chen, J. Ding, W. Gao, X. Huang, H. Wu, *RSC Adv.* **2014**, 4, 16705-16709.
2. Z.-Y. Xue, Y. Jiang, X.-Z. Peng, W.-C. Yuan, X.-M. Zhang, *Adv. Syn. Catal.* **2010**, 352, 2132- 2136.
3. S. Nonell, L. R. Ferreras, A. Cañete, E. Lemp, G. Günther, N. Pizarro, A. L. Zanocco, *J. Org. Chem.* **2008**, 73, 5371-5378.

# Analytical Data

### 3-(2-bromophenyl)-2*H*-benzo[b][1,4]oxazin-2-one (3a)



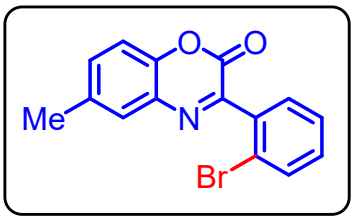

It was obtained as **White solid** having melting point **130-132 °C** with **84%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.86 (dd, *J* = 7.9, 1.6 Hz, 1H), 7.70 (dd, *J* = 8.1, 0.9 Hz, 1H), 7.61-7.56 (m, 1H), 7.53 (dd, *J* = 7.6, 1.8 Hz, 1H), 7.49-7.42 (m, 2H), 7.40 (d, *J* = 1.4 Hz, 1H), 7.38-7.35 (m, 1H).

**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 154.34, 151.76, 147.01, 135.91, 133.26, 132.09, 131.57, 131.28, 130.75, 129.83, 127.70, 125.90, 122.36, 116.74.

**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{14}H_8BrNO_2$: 301.9811; found: 301.9811.

### 3-(2-bromophenyl)-6-methyl-2*H*-benzo[b][1,4]oxazin-2-one (3b)



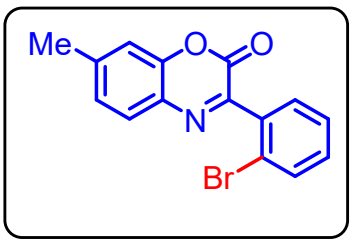

It was obtained as **White solid** having melting point **128-130 °C** with **80%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.69 (d, *J* = 9.2 Hz, 1H), 7.64 (s, 1H), 7.52 (dd, *J* = 7.6, 1.8 Hz, 1H), 7.45 (td, *J* = 7.5, 1.3 Hz, 1H), 7.40-7.33 (m, 2H), 7.27 (d, *J* = 8.4 Hz, 1H), 2.46 (s, 3H).

**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 154.17, 151.98, 144.95, 136.05, 135.87, 133.23, 132.99, 131.45, 131.02, 130.75, 129.64, 127.64, 122.39, 116.28, 20.94.

**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{15}H_{10}BrNO_2$: 315.9968; found: 315.9972.

### 3-(2-bromophenyl)-7-methyl-2*H*-benzo[b][1,4]oxazin-2-one (3c)



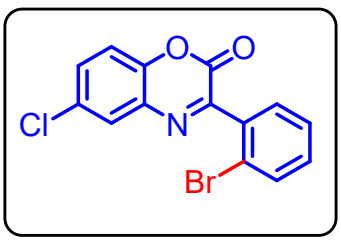

It was obtained as **White solid** having melting point **133-135 °C** with **82%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.72 (d, *J* = 8.1 Hz, 1H), 7.69 (d, *J* = 8.0 Hz, 1H), 7.52 (d, *J* = 7.6 Hz, 1H), 7.45 (t, *J* = 8.1 Hz, 1H), 7.36 (t, *J* = 8.6 Hz, 1H), 7.23 (d, *J* = 6.3 Hz, 1H), 7.19 (s, 1H), 2.51 (s, 3H).

**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 153.11, 152.05, 147.02, 143.63, 136.14, 133.28, 131.44, 130.82, 129.43, 127.69, 127.02, 122.52, 116.83, 21.97.

**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{15}H_{10}BrNO_2$: 315.9968; found: 315.9978.

### 3-(2-bromophenyl)-6-chloro-2*H*-benzo[b][1,4]oxazin-2-one (3d)

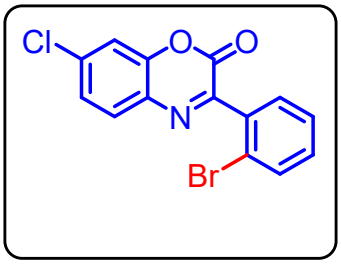



It was obtained as **White solid** having melting point **115-117 °C** with **76%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.84 (d, *J* = 2.5 Hz, 1H), 7.70 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.54 (d, *J* = 7.4 Hz, 1H), 7.51 (dd, *J* = 6.0, 2.2 Hz, 1H), 7.47 (td, *J* = 7.5, 1.2 Hz, 1H), 7.41-7.35 (m, 1H), 7.33 (d, *J* = 8.8 Hz, 1H).

**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 155.43, 151.17, 145.59, 135.54, 133.34, 131.94, 131.80, 131.77, 131.03, 130.75, 129.27, 127.71, 122.28, 117.87.
**HRMS (ESI$^+$):** m/z [M+H]$^+$ calculated for $C_{14}H_7BrClNO_2$: 335.9421; found: 335.9420.

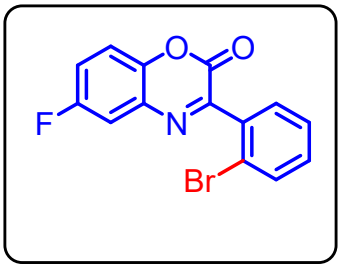
### 3-(2-bromophenyl)-7-chloro-2*H*-benzo[b][1,4]oxazin-2-one (3e)




It was obtained as **White solid** having melting point **130-132 °C** with **71%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.77 (d, *J* = 9.2 Hz, 1H), 7.69 (d, *J* = 7.9 Hz, 1H), 7.52 (d, *J* = 7.6 Hz, 1H), 7.46 (t, *J* = 7.5 Hz, 1H), 7.38 (d, *J* = 5.8 Hz, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 154.15, 150.99, 147.36, 137.90, 135.65, 133.32, 131.72, 130.76, 130.61, 129.96, 127.70, 126.45, 122.34, 117.04.
**HRMS (ESI$^+$):** m/z [M+H]$^+$ calculated for $C_{14}H_7BrClNO_2$: 335.9421; found: 335.9424.

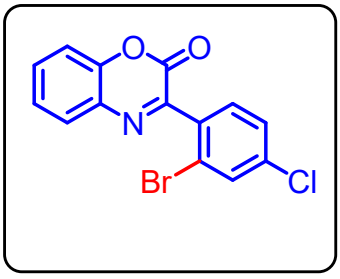
### 3-(2-bromophenyl)-6-fluoro-2*H*-benzo[b][1,4]oxazin-2-one (3f)




It was obtained as **White solid** having melting point **110-112 °C** with **61%** yield.

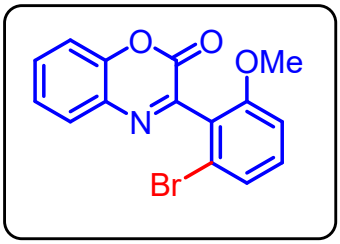
**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.70 (d, *J* = 8.0 Hz, 1H), 7.58-7.52 (m, 1H), 7.51 (d, *J* = 1.9 Hz, 1H), 7.49-7.44 (m, 1H), 7.42-7.34 (m, 2H), 7.31 (td, *J* = 9.2, 8.5, 2.8 Hz, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 160.80, 158.36, 155.48, 151.39, 143.38, 135.61, 133.34, 131.78, 131.62, 130.74, 127.71, 122.27, 119.54, 119.29, 117.84, 117.75, 115.67, 115.43.
**HRMS (ESI$^+$):** m/z [M+H]$^+$ calculated for $C_{14}H_7BrFNO_2$: 319.9717; found: 319.9713.

### 3-(2-bromo-4-chlorophenyl)-2*H*-benzo[b][1,4]oxazin-2-one (3g)




It was obtained as **White solid** having melting point **138-140 °C** with **77%** yield.
**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.85 (dd, *J* = 7.9, 1.6 Hz, 1H), 7.72 (d, *J* = 1.9 Hz, 1H), 7.60 (ddd, *J* = 8.2, 7.4, 1.6 Hz, 1H), 7.49 (d, *J* = 8.2 Hz, 1H), 7.46 (d, *J* = 1.9 Hz, 1H), 7.44-7.41 (m, 1H), 7.39 (dd, *J* = 8.2, 1.3 Hz, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 153.32, 151.66, 147.02, 136.98, 134.38, 133.11, 132.36, 131.70, 131.25, 129.91, 128.07, 126.03, 123.02, 116.81.
**HRMS (ESI$^+$):** m/z [M+H]$^+$ calculated for $C_{14}H_7BrClNO_2$: 335.9421; found: 335.9438.

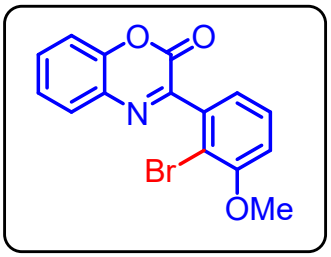
### 3-(2-bromo-6-methoxyphenyl)-2H-benzo[b][1,4]oxazin-2-one (3h)




It was obtained as **White solid** having melting point **140-142 °C** with **81%** yield.
**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.87 (dd, *J* = 7.9, 1.6 Hz, 1H), 7.58 (ddd, *J* = 8.2, 7.5, 1.6 Hz, 1H), 7.46-7.40 (m, 1H), 7.38 (dd, *J* = 8.4, 1.4 Hz, 1H), 7.34-7.27 (m, 2H), 6.96 (dd, *J* = 7.6, 1.7 Hz, 1H), 3.79 (s, 3H).

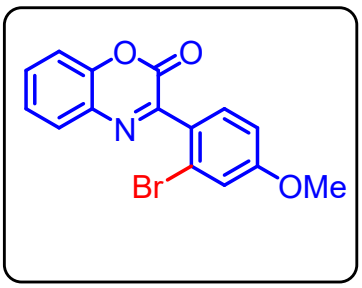
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 158.98, 153.17, 151.79, 146.92, 131.92, 131.88, 131.41, 129.82, 125.73, 125.08, 123.01, 116.76, 110.32, 56.33.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{15}H_{10}BrNO_3$: 331.9917; found: 331.9882.

### 3-(2-bromo-6-methoxyphenyl)-2H-benzo[b][1,4]oxazin-2-one (3i)




It was obtained as **White solid** having melting point **128-130 °C** with **65%** yield.
**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.86 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.61-7.53 (m, 2H), 7.42 (td, *J* = 7.6, 1.3 Hz, 1H), 7.38 (dd, *J* = 8.3, 1.3 Hz, 1H), 7.06 (d, *J* = 3.0 Hz, 1H), 6.92 (dd, *J* = 8.9, 3.0 Hz, 1H), 3.83 (s, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 159.12, 154.24, 151.67, 147.04, 136.49, 134.00, 132.13, 131.24, 129.84, 125.90, 117.79, 116.74, 116.06, 112.59, 55.79.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{15}H_{10}BrNO_3$: 331.9917; found: 331.9911.

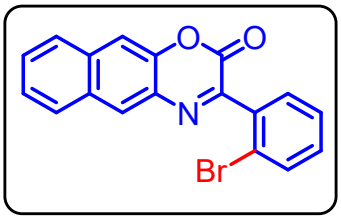
### 3-(2-bromo-4-methoxyphenyl)-2*H*-benzo[b][1,4]oxazin-2-one (3j)




It was obtained as **White solid** having melting point **118-120 °C** with **76%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.84 (dd, *J* = 7.9, 1.6 Hz, 1H), 7.61-7.52 (m, 1H), 7.49 (d, *J* = 8.6 Hz, 1H), 7.41 (td, *J* = 7.8, 1.5 Hz, 1H), 7.38-7.34 (m, 1H), 7.24 (d, *J* = 2.5 Hz, 1H), 6.98 (dd, *J* = 8.6, 2.5 Hz, 1H), 3.86 (s, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 161.55, 153.94, 152.07, 147.01, 131.86, 131.79, 131.44, 129.73, 128.18, 125.81, 123.21, 118.83, 116.67, 113.72, 55.88.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{15}H_{10}BrNO_3$: 331.9917; found: 331.9916.

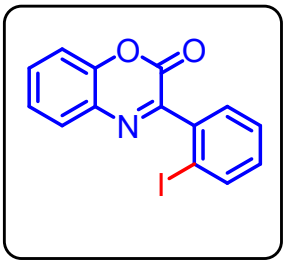
### 3-(2-bromophenyl)-2*H*-naphtho[2,3-b][1,4]oxazin-2-one (3k)




It was obtained as **yellow solid** having melting point **204-206 °C** with **63%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 8.36 (s, 1H), 8.00 (dd, *J* = 8.3, 1.1 Hz, 1H), 7.92 (d, *J* = 8.3 Hz, 1H), 7.74 (s, 1H), 7.71 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.63 (ddd, *J* = 8.4, 6.9, 1.3 Hz, 1H), 7.59 (d, *J* = 1.7 Hz, 1H), 7.57-7.52 (m, 1H), 7.48 (td, *J* = 7.6, 1.3 Hz, 1H), 7.42-7.35 (m, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 154.48, 151.69, 144.46, 136.04, 134.42, 133.31, 131.59, 130.99, 130.83, 130.41, 129.92, 129.15, 129.00, 127.69, 127.58, 126.40, 122.49, 112.96.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{18}H_{10}BrNO_2$: 351.9968; found: 351.9975.

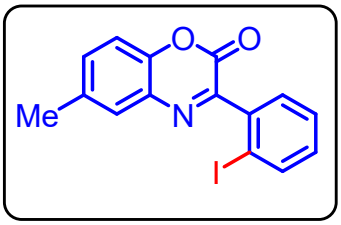
### 3-(2-iodophenyl)-2*H*-benzo[b][1,4]oxazin-2-one (4a)




It was obtained as **White solid** having melting point **126-128 °C** with **72%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.97 (d, *J* = 8.0 Hz, 1H), 7.87 (dd, *J* = 7.9, 1.7 Hz, 1H), 7.59 (td, *J* = 7.8, 1.7 Hz, 1H), 7.54-7.48 (m, 2H), 7.47-7.36 (m, 2H), 7.20 (ddd, *J* = 7.9, 5.4, 3.9 Hz, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 156.12, 151.59, 147.04, 139.69, 139.39, 132.07, 131.46, 131.24, 130.16, 129.81, 128.42, 125.94, 116.77, 96.02.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{14}H_8INO_2$: 349.9672; found: 349.9673.

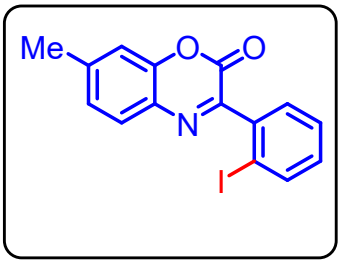
## 3-(2-iodophenyl)-6-methyl-2*H*-benzo[b][1,4]oxazin-2-one (4b)




It was obtained as **White solid** having melting point **120-122 °C** with **78%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.93 (d, *J* = 8.0 Hz, 1H), 7.62 (d, *J* = 2.1 Hz, 1H), 7.47 (d, *J* = 4.5 Hz, 2H), 7.36 (dd, *J* = 8.4, 2.1 Hz, 1H), 7.23 (d, *J* = 3.5 Hz, 1H), 7.20-7.12 (m, 1H), 2.44 (s, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 156.00, 151.87, 145.01, 139.71, 139.53, 135.96, 133.01, 131.39, 131.02, 130.16, 129.65, 128.39, 116.36, 96.10, 20.99.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{15}H_{10}INO_2$: 363.9829; found: 363.9823.

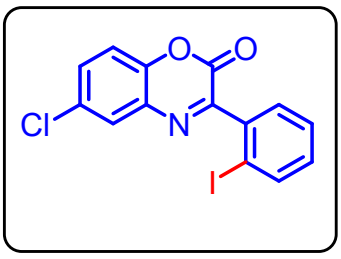
## 3-(2-iodophenyl)-7-methyl-2*H*-benzo[b][1,4]oxazin-2-one (4c)




It was obtained as **White solid** having melting point **148-150 °C** with **82%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.99-7.92 (m, 1H), 7.73 (d, *J* = 8.1 Hz, 1H), 7.50 (d, *J* = 0.6 Hz, 1H), 7.49-7.48 (m, 1H), 7.23 (dd, *J* = 8.1, 1.8 Hz, 1H), 7.21-7.15 (m, 2H), 2.51 (s, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 154.87, 151.85, 146.98, 143.61, 139.66, 139.55, 131.33, 130.18, 129.37, 129.31, 128.39, 127.05, 116.83, 96.20, 21.97.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{15}H_{10}INO_2$: 363.9829; found: 363.9828.

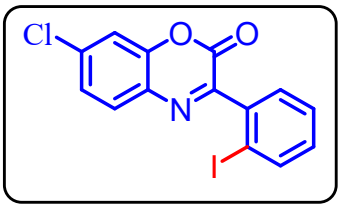
## 6-chloro-3-(2-iodophenyl)-2*H*-benzo[b][1,4]oxazin-2-one (4d)




It was obtained as **White solid** having melting point **98-100 °C** with **66%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.97 (d, *J* = 8.0 Hz, 1H), 7.85 (d, *J* = 2.5 Hz, 1H), 7.54 (dd, *J* = 8.9, 2.5 Hz, 1H), 7.50 (d, *J* = 2.9 Hz, 2H), 7.34 (d, *J* = 8.8 Hz, 1H), 7.24-7.18 (m, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 157.16, 151.03, 145.61, 139.79, 138.97, 131.94, 131.74, 131.70, 131.10, 130.17, 129.25, 128.44, 117.91, 95.84.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{14}H_7ClINO_2$: 383.9283; found: 383.9301.

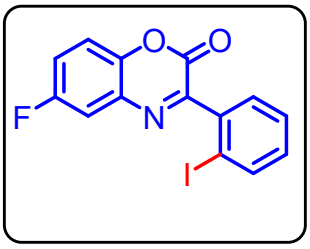
## 7-chloro-3-(2-iodophenyl)-2*H*-benzo[b][1,4]oxazin-2-one (4e)




It was obtained as **White solid** having melting point **132-134 °C** with **67%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.97 (d, *J* = 8.0 Hz, 1H), 7.78 (d, *J* = 9.1 Hz, 1H), 7.50 (d, *J* = 3.8 Hz, 2H), 7.40 (q, *J* = 4.0, 3.3 Hz, 2H), 7.21 (ddd, *J* = 7.9, 5.5, 3.7 Hz, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 155.92, 150.87, 147.38, 139.77, 139.10, 137.91, 131.62, 130.60, 130.17, 129.92, 128.45, 126.52, 117.10, 95.95.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{14}H_7ClINO_2$: 383.9283; found: 383.9286.

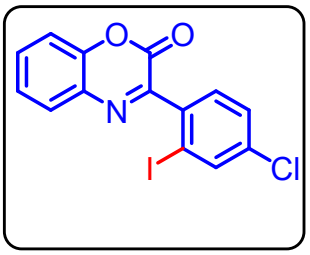
## 6-fluoro-3-(2-iodophenyl)-2H-benzo[b][1,4]oxazin-2-one (4f)



It was obtained as **White solid** having melting point **118-120 °C** with **59%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.97 (d, *J* = 8.0 Hz, 1H), 7.56 (dd, *J* = 8.1, 2.8 Hz, 1H), 7.50 (d, *J* = 3.4 Hz, 2H), 7.37 (dd, *J* = 9.1, 4.8 Hz, 1H), 7.32 (td, *J* = 9.2, 8.5, 2.8 Hz, 1H), 7.21 (ddd, *J* = 8.0, 5.7, 3.5 Hz, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 160.84, 158.40, 157.20, 151.24, 143.40, 143.37, 139.78, 139.05, 131.67, 130.16, 128.43, 119.52, 119.28, 117.87, 117.79, 115.65, 115.41, 95.82.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{14}H_7FINO_2$: 367.9578; found: 367.9576.

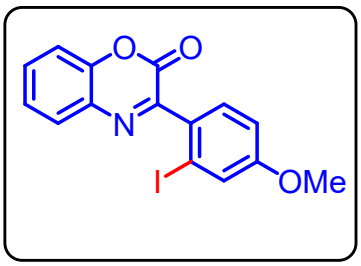
## 3-(4-chloro-2-iodophenyl)-2*H*-benzo[b][1,4]oxazin-2-one (4g)



It was obtained as **White solid** having melting point **149-151 °C** with **77%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.98 (d, *J* = 2.0 Hz, 1H), 7.86 (dd, *J* = 7.9, 1.6 Hz, 1H), 7.60 (td, *J* = 8.0, 1.6 Hz, 1H), 7.51-7.45 (m, 2H), 7.43 (d, *J* = 7.3 Hz, 1H), 7.40 (d, *J* = 8.3 Hz, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 155.06, 151.50, 147.07, 139.29, 137.80, 136.63, 132.32, 131.21, 130.97, 129.88, 128.72, 126.05, 116.83, 96.28.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{14}H_7ClINO_2$: 383.9283; found: 383.9308.

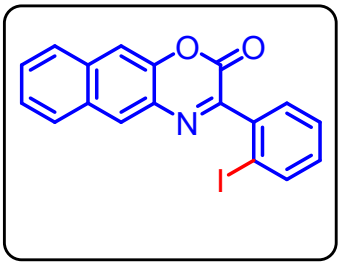
## 3-(2-iodo-4-methoxyphenyl)-2*H*-benzo[b][1,4]oxazin-2-one (4h)



It was obtained as **White solid** having melting point **116-118 °C** with **69%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.85 (dd, *J* = 7.9, 1.6 Hz, 1H), 7.57 (ddd, *J* = 8.2, 7.4, 1.6 Hz, 1H), 7.50 (d, *J* = 2.5 Hz, 1H), 7.47 (d, *J* = 8.6 Hz, 1H), 7.42 (td, *J* = 7.7, 1.4 Hz, 1H), 7.38 (dd, *J* = 8.2, 1.3 Hz, 1H), 7.02 (dd, *J* = 8.5, 2.5 Hz, 1H), 3.85 (s, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 161.03, 155.46, 151.96, 147.01, 131.79, 131.53, 131.33, 131.14, 129.68, 125.87, 125.36, 116.69, 114.32, 96.57, 55.82.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{15}H_{10}INO_3$: 379.9778; found: 379.9785.

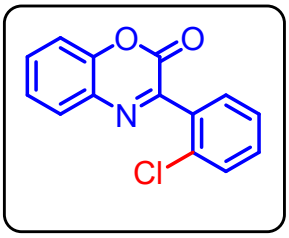
## 3-(2-iodophenyl)-2*H*-naphtho[2,3-b][1,4]oxazin-2-one (4i)



It was obtained as **Yellow solid** having melting point **198-200 °C** with **60%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 8.38 (s, 1H), 8.00 (t, *J* = 8.7 Hz, 2H), 7.93 (d, *J* = 8.4 Hz, 1H), 7.76 (s, 1H), 7.64 (ddd, *J* = 8.3, 6.7, 1.3 Hz, 1H), 7.60-7.46 (m, 3H), 7.22 (td, *J* = 7.6, 2.0 Hz, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 156.28, 151.55, 144.53, 139.76, 139.50, 134.45, 131.50, 131.06, 130.39, 130.25, 129.91, 129.17, 129.02, 128.42, 127.62, 126.43, 113.03, 96.17.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{18}H_{10}INO_2$: 399.9829; found: 399.9820.

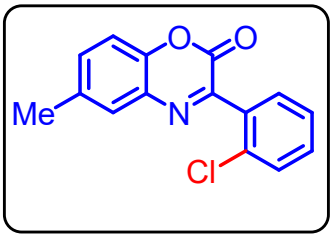
## 3-(2-chlorophenyl)-2*H*-benzo[b][1,4]oxazin-2-one (5a)




It was obtained as **White solid** having melting point **146-148 °C** with **74%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.86 (dd, *J* = 7.9, 1.3 Hz, 1H), 7.61-7.54 (m, 2H), 7.53-7.50 (m, 1H), 7.48-7.44 (m, 1H), 7.42 (ddd, *J* = 8.5, 4.6, 2.8 Hz, 2H), 7.39 (d, *J* = 8.1 Hz, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 153.32, 151.87, 147.03, 134.06, 133.46, 132.09, 131.51, 131.39, 130.80, 130.17, 129.86, 127.12, 125.88, 116.73.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{14}H_8ClNO_2$: 258.0316; found: 258.0308.

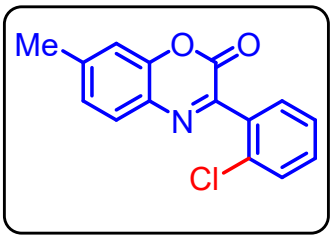
## 3-(2-chlorophenyl)-6-methyl-2*H*-benzo[b][1,4]oxazin-2-one (5b)




It was obtained as **White solid** having melting point **114-116 °C** with **77%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.64 (d, *J* = 2.1 Hz, 1H), 7.55 (dd, *J* = 7.2, 2.0 Hz, 1H), 7.51 (dd, *J* = 7.5, 1.6 Hz, 1H), 7.47-7.43 (m, 1H), 7.41 (dd, *J* = 7.2, 1.7 Hz, 1H), 7.38 (dd, *J* = 8.4, 2.2 Hz, 1H), 7.28 (s, 1H), 2.46 (s, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 153.11, 152.12, 144.92, 135.87, 134.14, 133.43, 133.02, 131.41, 131.09, 130.78, 130.14, 129.65, 127.08, 116.27, 20.96.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{15}H_{10}ClNO_2$: 272.0473; found: 272.0483.

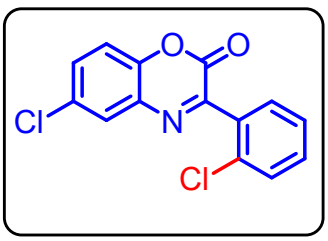
## 3-(2-chlorophenyl)-7-methyl-2*H*-benzo[b][1,4]oxazin-2-one (5c)




It was obtained as **White solid** having melting point **148-150 °C** with **82%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.72 (d, *J* = 8.1 Hz, 1H), 7.55 (dd, *J* = 7.2, 2.1 Hz, 1H), 7.50 (dd, *J* = 7.7, 1.6 Hz, 1H), 7.47-7.37 (m, 2H), 7.22 (dd, *J* = 8.2, 1.8 Hz, 1H), 7.18 (s, 1H), 2.51 (s, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 152.14, 152.02, 146.98, 143.63, 134.24, 133.52, 131.36, 130.84, 130.15, 129.49, 129.43, 127.09, 126.99, 116.79, 21.96.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{15}H_{10}ClNO_2$: 272.0473; found: 272.0489.

## 6-chloro-3-(2-chlorophenyl)-2*H*-benzo[b][1,4]oxazin-2-one (5d)

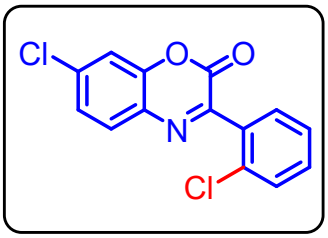



It was obtained as **White solid** having melting point **150-152 °C** with **65%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.84 (d, *J* = 2.6 Hz, 1H), 7.58-7.52 (m, 2H), 7.51-7.48 (m, 1H), 7.48-7.43 (m, 1H), 7.41 (dd, *J* = 7.4, 1.6 Hz, 1H), 7.33 (d, *J* = 8.9 Hz, 1H).

**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 154.39, 151.28, 145.55, 133.62, 133.40, 131.96, 131.82, 131.77, 131.01, 130.79, 130.23, 129.28, 127.14, 117.85.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{14}H_7Cl_2NO_2$: 291.9927; found: 291.9935.

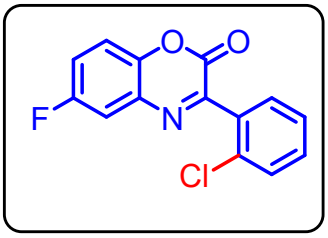
### 7-chloro-3-(2-chlorophenyl)-2*H*-benzo[b][1,4]oxazin-2-one (5e)




It was obtained as **White solid** having melting point **154-156 °C** with **67%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.78 (d, *J* = 9.1 Hz, 1H), 7.55 (dd, *J* = 7.3, 1.9 Hz, 1H), 7.51 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.48-7.44 (m, 1H), 7.42 (dd, *J* = 7.3, 1.6 Hz, 1H), 7.40-A7.37 (m, 2H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 153.11, 151.11, 147.35, 137.92, 133.76, 133.46, 131.68, 130.80, 130.63, 130.23, 130.04, 127.13, 126.44, 117.02.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{14}H_7Cl_2NO_2$: 291.9927; found: 291.9962.

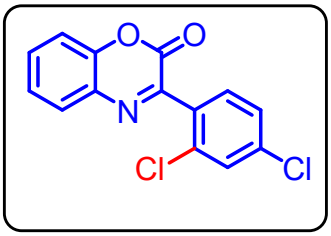
### 3-(2-chlorophenyl)-6-fluoro-2*H*-benzo[b][1,4]oxazin-2-one (5f)




It was obtained as **White solid** having melting point **95-97 °C** with **59%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.46 (dd, *J* = 7.8, 2.4 Hz, 2H), 7.41 (td, *J* = 7.9, 1.7 Hz, 1H), 7.34 (dtd, *J* = 14.5, 7.6, 1.7 Hz, 2H), 7.27 (dd, *J* = 9.1, 4.8 Hz, 1H), 7.21 (ddd, *J* = 14.5, 8.0, 4.1 Hz, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 160.73, 158.29, 154.39, 151.44, 143.29, 133.67, 133.35, 131.70, 130.75, 130.18, 127.10, 119.51, 119.26, 117.78, 117.69, 115.62, 115.38.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{14}H_7ClFNO_2$: 276.0222; found: 276.0234.

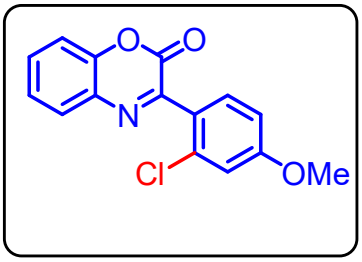
### 3-(2,4-dichlorophenyl)-2*H*-benzo[b][1,4]oxazin-2-one (5g)




It was obtained as **White solid** having melting point **145-147 °C** with **77%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.85 (dd, *J* = 7.9, 1.6 Hz, 1H), 7.60 (ddd, *J* = 9.0, 7.5, 1.6 Hz, 1H), 7.54 (d, *J* = 2.0 Hz, 1H), 7.51 (d, *J* = 8.3 Hz, 1H), 7.48-7.36 (m, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 152.24, 151.75, 146.98, 137.05, 134.44, 132.49, 132.37, 131.80, 131.31, 130.16, 129.91, 127.53, 126.01, 116.77.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{14}H_7Cl_2NO_2$: 291.9854; found: 291.9951.

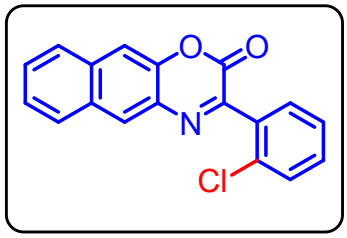
### 3-(2-chloro-4-methoxyphenyl)-2*H*-benzo[b][1,4]oxazin-2-one (5h)




It was obtained as **White solid** having melting point **121-123 °C** with **73%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.84 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.56 (dd, *J* = 7.7, 1.6 Hz, 1H), 7.52 (d, *J* = 8.6 Hz, 1H), 7.40 (td, *J* = 7.7, 1.3 Hz, 1H), 7.36 (dd, *J* = 8.2, 1.3 Hz, 1H), 7.05 (d, *J* = 2.5 Hz, 1H), 6.93 (dd, *J* = 8.6, 2.5 Hz, 1H), 3.86 (s, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 161.74, 152.88, 152.14, 146.94, 134.56, 131.96, 131.77, 131.48, 129.71, 126.30, 125.78, 116.63, 115.67, 113.19, 55.87.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{15}H_{10}ClNO_3$: 288.0442; found: 288.0431.

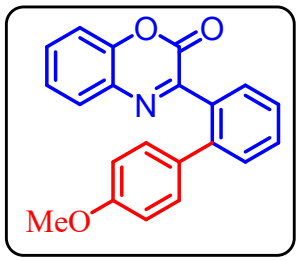
### 3-(2-chlorophenyl)-2*H*-naphtho[2,3-b][1,4]oxazin-2-one (5i)




It was obtained as **Yellow solid** having melting point **201-203 °C** with **71%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 8.35 (s, 1H), 7.99 (d, *J* = 8.1 Hz, 1H), 7.91 (d, *J* = 8.3 Hz, 1H), 7.73 (s, 1H), 7.65-7.59 (m, 2H), 7.57-7.51 (m, 2H), 7.45 (dtd, *J* = 14.8, 7.3, 1.9 Hz, 2H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 153.40, 151.78, 144.40, 134.40, 134.12, 133.51, 131.54, 130.86, 130.44, 130.19, 129.92, 129.14, 128.99, 127.56, 127.11, 126.37, 124.30, 112.91.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{18}H_{10}ClNO_2$: 308.0473; found: 308.0476.

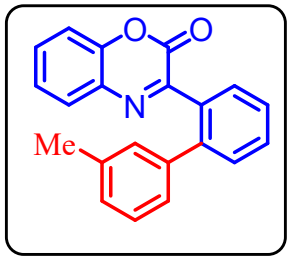
### 3-(4'-methoxy-[1,1'-biphenyl]-2-yl)-2*H*-benzo[b][1,4]oxazin-2-one (8)




It was obtained as **White solid** having melting point **123-125 °C** with **87%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.82 (dd, *J* = 8.0, 1.7 Hz, 1H), 7.67-7.63 (m, 1H), 7.60-7.54 (m, 1H), 7.53-7.45 (m, 3H), 7.39 (td, *J* = 7.7, 1.4 Hz, 1H), 7.27-7.20 (m, 3H), 6.83 (d, *J* = 8.7 Hz, 2H), 3.78 (s, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 159.12, 156.42, 151.66, 146.89, 141.77, 133.97, 133.61, 131.54, 131.22, 130.61, 130.04, 129.95, 129.49, 127.28, 125.57, 116.57, 114.13, 55.31.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{21}H_{15}NO_3$: 330.1125; found: 330.1127.

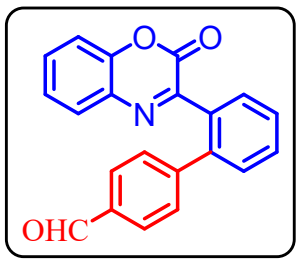
### 3-(3'-methyl-[1,1'-biphenyl]-2-yl)-2*H*-benzo[b][1,4]oxazin-2-one (9)




It was obtained as **White solid** having melting point **132-134 °C** with **85%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.81 (dd, *J* = 7.9, 1.6 Hz, 1H), 7.70-7.63 (m, 1H), 7.60-7.55 (m, 1H), 7.49 (ddt, *J* = 11.8, 8.0, 2.0 Hz, 3H), 7.37 (td, *J* = 7.7, 1.4 Hz, 1H), 7.24 (dd, *J* = 8.7, 1.5 Hz, 1H), 7.19-7.15 (m, 1H), 7.13 (d, *J* = 7.6 Hz, 1H), 7.09-7.06 (m, 1H), 7.03 (dd, *J* = 7.5, 1.6 Hz, 1H), 2.28 (s, 3H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 156.29, 151.71, 146.82, 142.17, 141.00, 138.41, 133.98, 131.49, 131.24, 130.60, 130.07, 129.94, 129.76, 129.46, 128.38, 128.34, 127.57, 126.02, 125.58, 116.49, 21.56.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{21}H_{15}NO_2$: 314.1176; found: 314.1196.

### 2'-(2-oxo-2*H*-benzo[b][1,4]oxazin-3-yl)-[1,1'-biphenyl]-4-carbaldehyde (10)

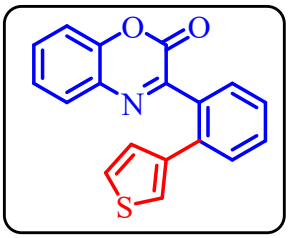



It was obtained as **White solid** having melting point **118-120 °C** with **50%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 10.08 (s, 1H), 8.00 (d, *J* = 8.3 Hz, 3H), 7.81 (dd, *J* = 8.4, 6.9 Hz, 4H), 7.76-7.71 (m, 1H), 7.65-7.55 (m, 1H), 7.54-7.49 (m, 1H), 7.47 (d, *J* = 8.1 Hz, 1H), 7.39 (ddd, *J* = 7.7, 5.6, 2.2 Hz, 1H).

**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 192.03, 191.89, 155.15, 151.78, 147.47, 146.78, 145.69, 140.90, 136.10, 135.23, 133.89, 131.68, 131.44, 130.81, 130.51, 130.06, 129.58, 128.55, 128.17, 125.82, 116.63.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{21}H_{13}NO_3$: 328.0968; found: 328.0976.

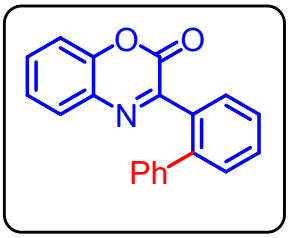
## 3-(2-(thiophen-3-yl)phenyl)-2*H*-benzo[b][1,4]oxazin-2-one (11)




It was obtained as **White solid** having melting point **148-150 °C** with **80%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.83 (dd, *J* = 7.8, 1.7 Hz, 1H), 7.67-7.62 (m, 1H), 7.59-7.54 (m, 2H), 7.52 (dd, *J* = 1.6, 0.8 Hz, 1H), 7.51-7.46 (m, 1H), 7.43-7.37 (m, 1H), 7.31 (dd, *J* = 5.0, 3.0 Hz, 1H), 7.29-7.27 (m, 1H), 7.11 (dd, *J* = 4.9, 1.4 Hz, 1H), 7.07 (dd, *J* = 3.0, 1.3 Hz, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 156.25, 151.75, 146.90, 141.82, 136.70, 134.03, 131.47, 131.39, 130.66, 129.84, 129.58, 129.51, 128.39, 127.75, 126.53, 125.67, 123.12, 116.65.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{18}H_{11}NO_2S$: 306.0583; found: 306.0579.

## 3-([1,1'-biphenyl]-2-yl)-2*H*-benzo[b][1,4]oxazin-2-one (12)




It was obtained as **White solid** having melting point **138-140 °C** with **91%** yield.

**$^1$H NMR (400 MHz, Chloroform-*d*)** δ 7.78 (dd, *J* = 7.9, 1.6 Hz, 1H), 7.69-7.65 (m, 1H), 7.60-7.55 (m, 1H), 7.52-7.45 (m, 3H), 7.36 (td, *J* = 7.7, 1.4 Hz, 1H), 7.29 (d, *J* = 4.7 Hz, 5H), 7.25-7.21 (m, 1H).
**$^{13}$C NMR (100 MHz, Chloroform-*d*)** δ 156.15, 151.71, 146.89, 142.19, 141.14, 134.04, 131.55, 131.27, 130.63, 130.17, 130.04, 129.51, 128.97, 128.64, 127.65, 127.55, 125.59, 116.56.
**HRMS (ESI$^+$):** m/z $[M+H]^+$ calculated for $C_{20}H_{13}NO_2$: 300.1019; found: 300.1020.

Copies of $^1$H NMR and $^{13}$C NMR Spectra

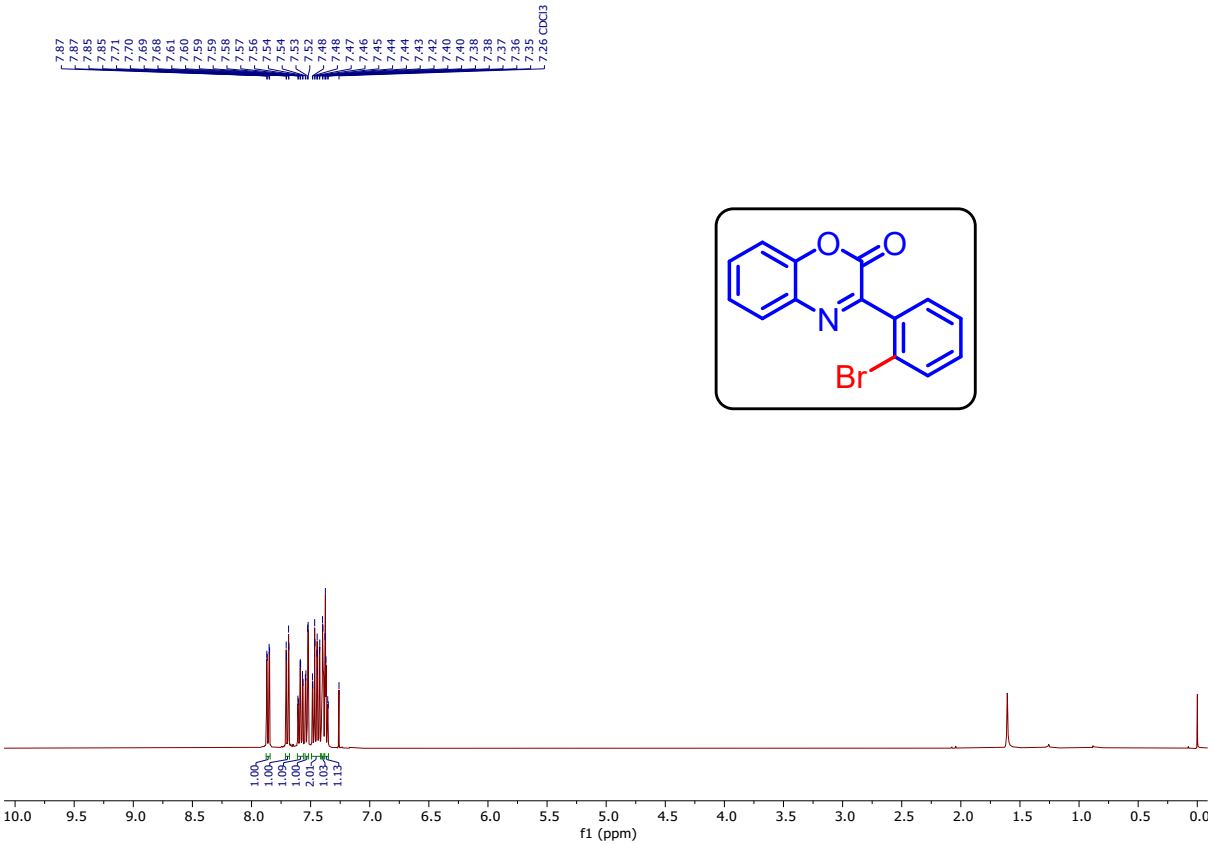



**Figure 1:** $^{1}$H NMR spectrum of compound **3a** (400 MHz, $CDCl_3$).

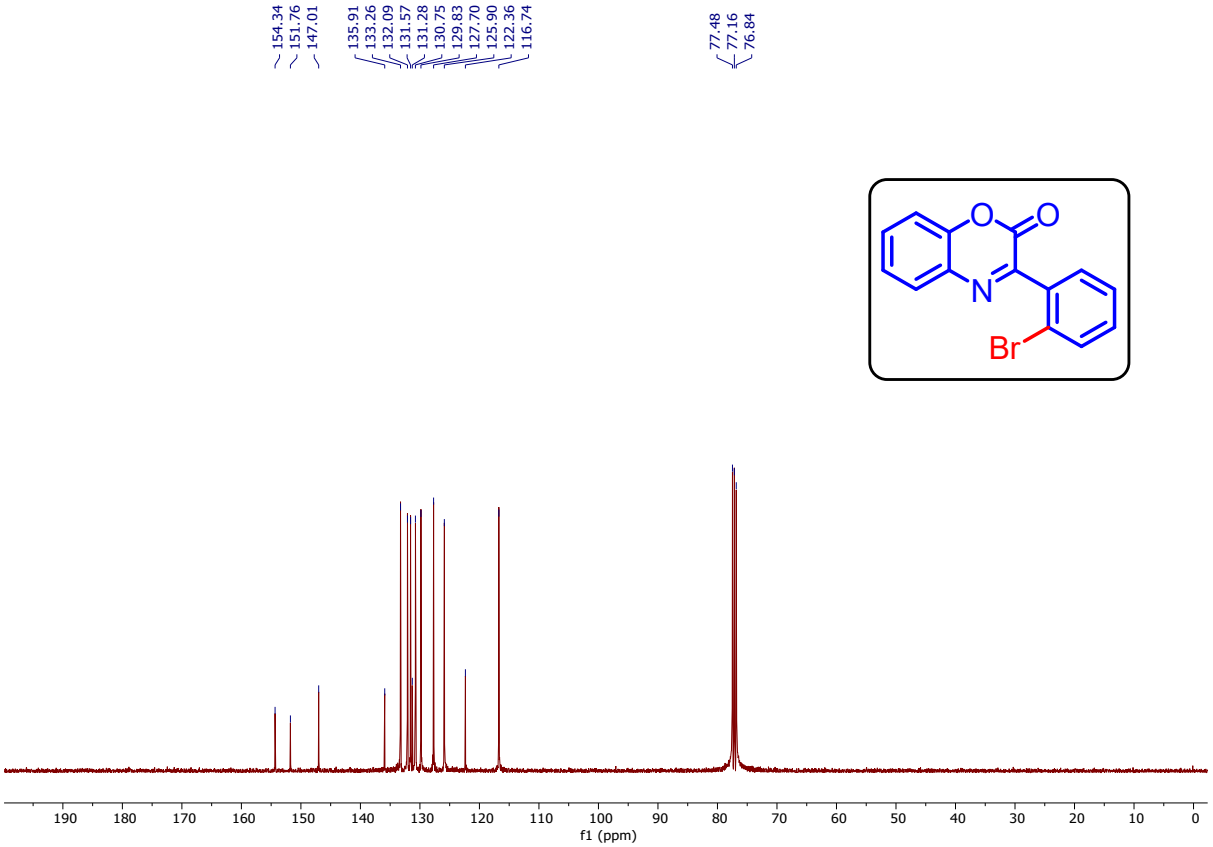



**Figure 2:** $^{13}$C NMR spectrum of compound **3a** (100 MHz, $CDCl_3$).

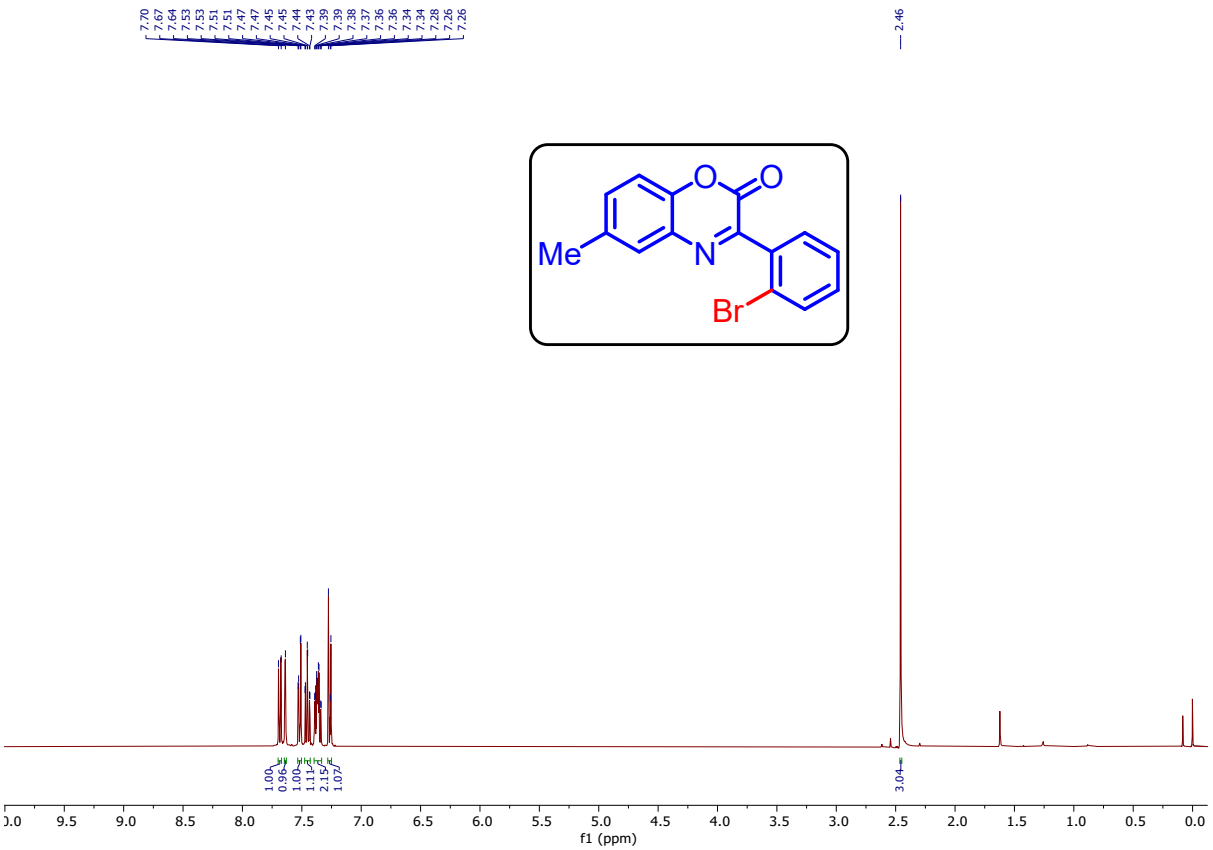



**Figure 3:** $^{1}$H NMR spectrum of compound **3b** (400 MHz, $CDCl_3$).

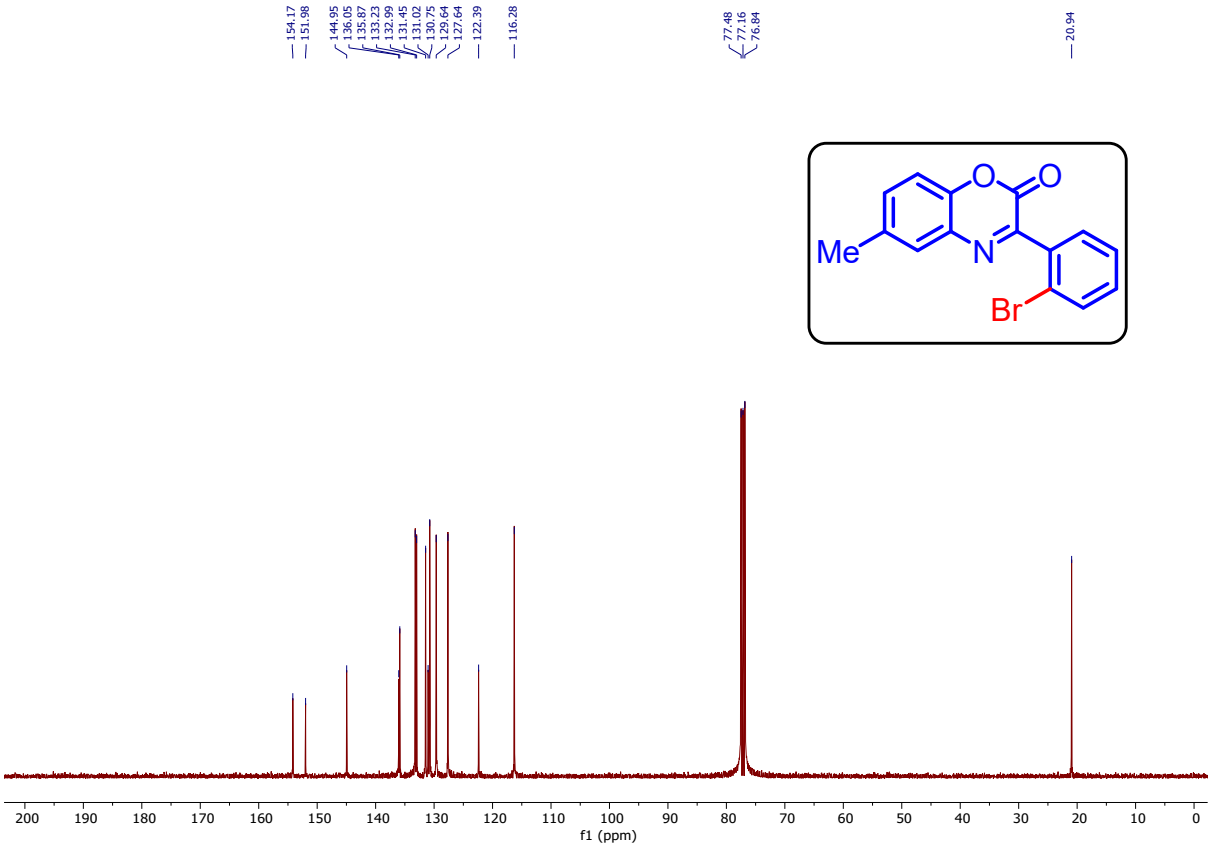



**Figure 4:** $^{13}$C NMR spectrum of compound **3b** (100 MHz, $CDCl_3$).

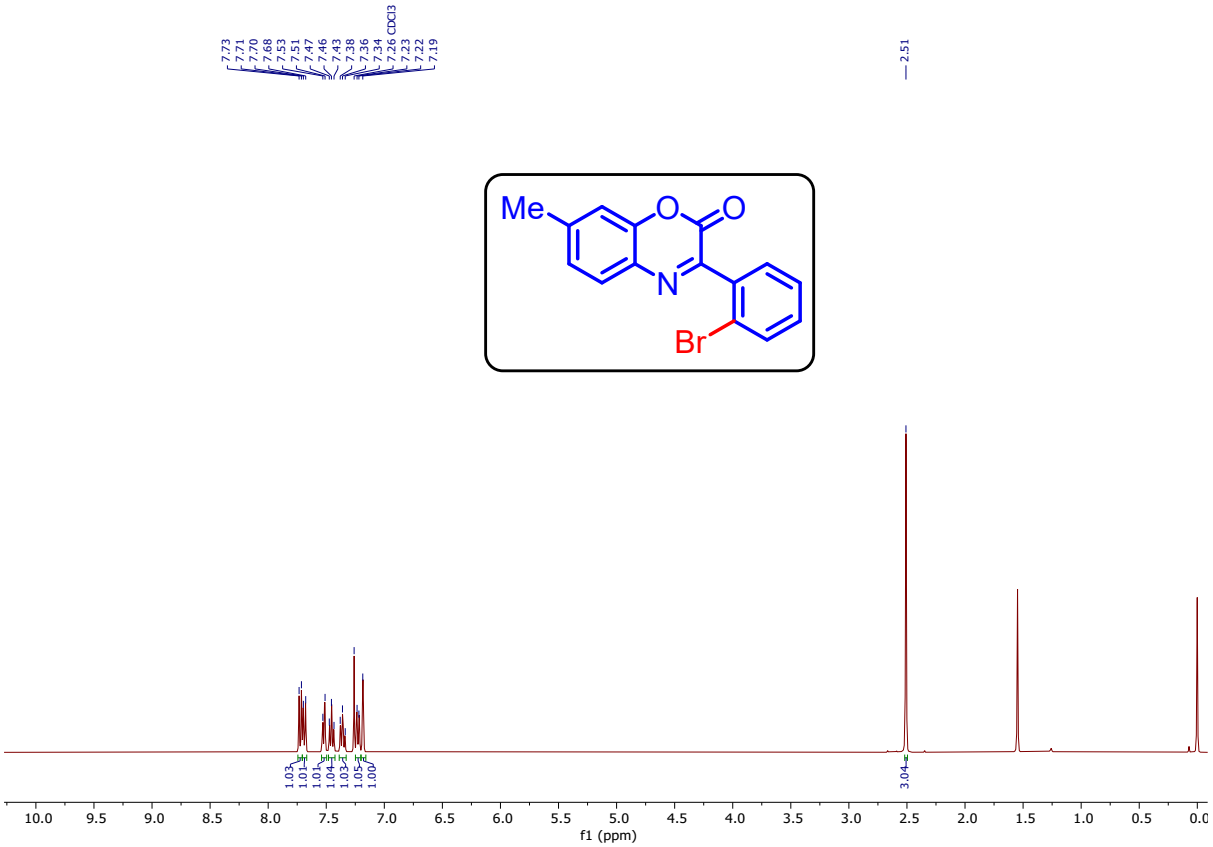



**Figure 5:** $^{1}$H NMR spectrum of compound **3c** (400 MHz, $CDCl_3$).

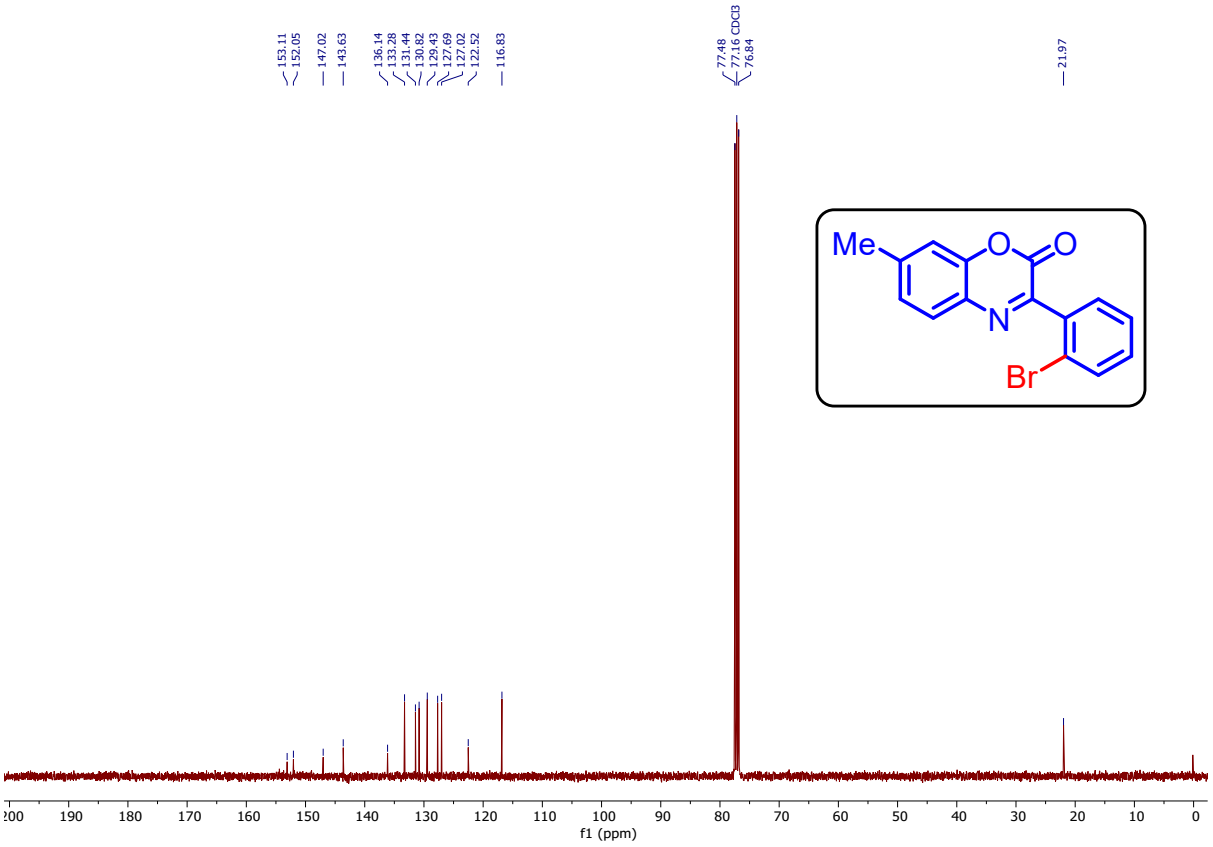



**Figure 6:** $^{13}$C NMR spectrum of compound **3c** (100 MHz, $CDCl_3$).

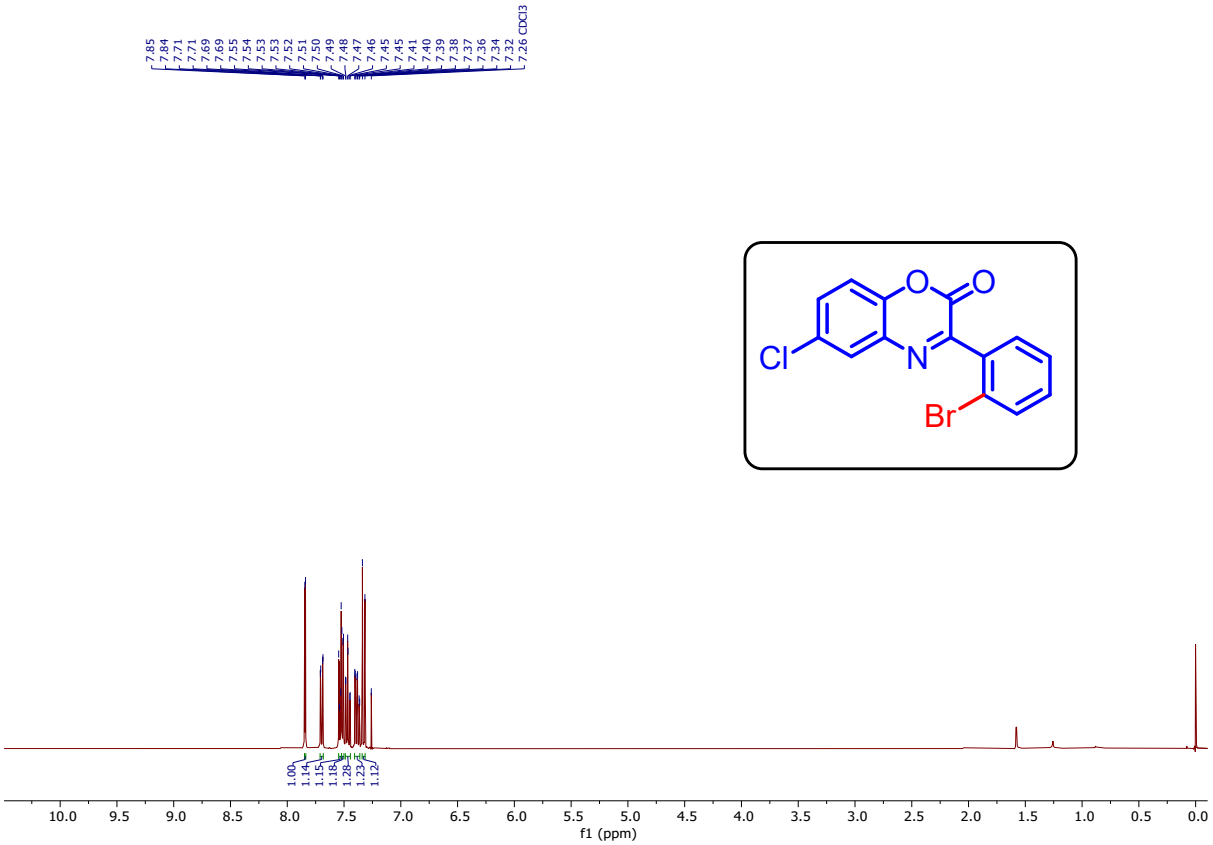



**Figure 7:** $^{1}$H NMR spectrum of compound **3d** (400 MHz, $CDCl_3$).

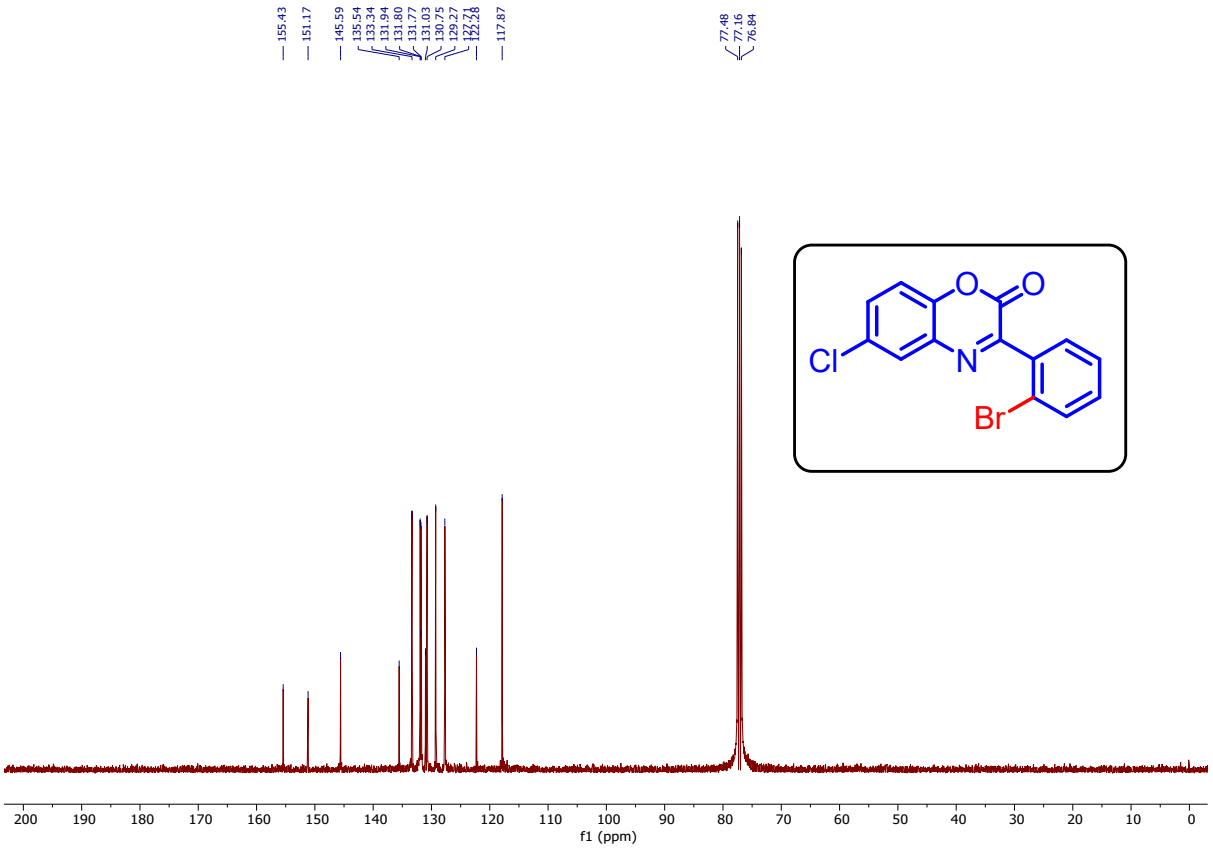



**Figure 8:** $^{13}$C NMR spectrum of compound **3d** (100 MHz, $CDCl_3$).

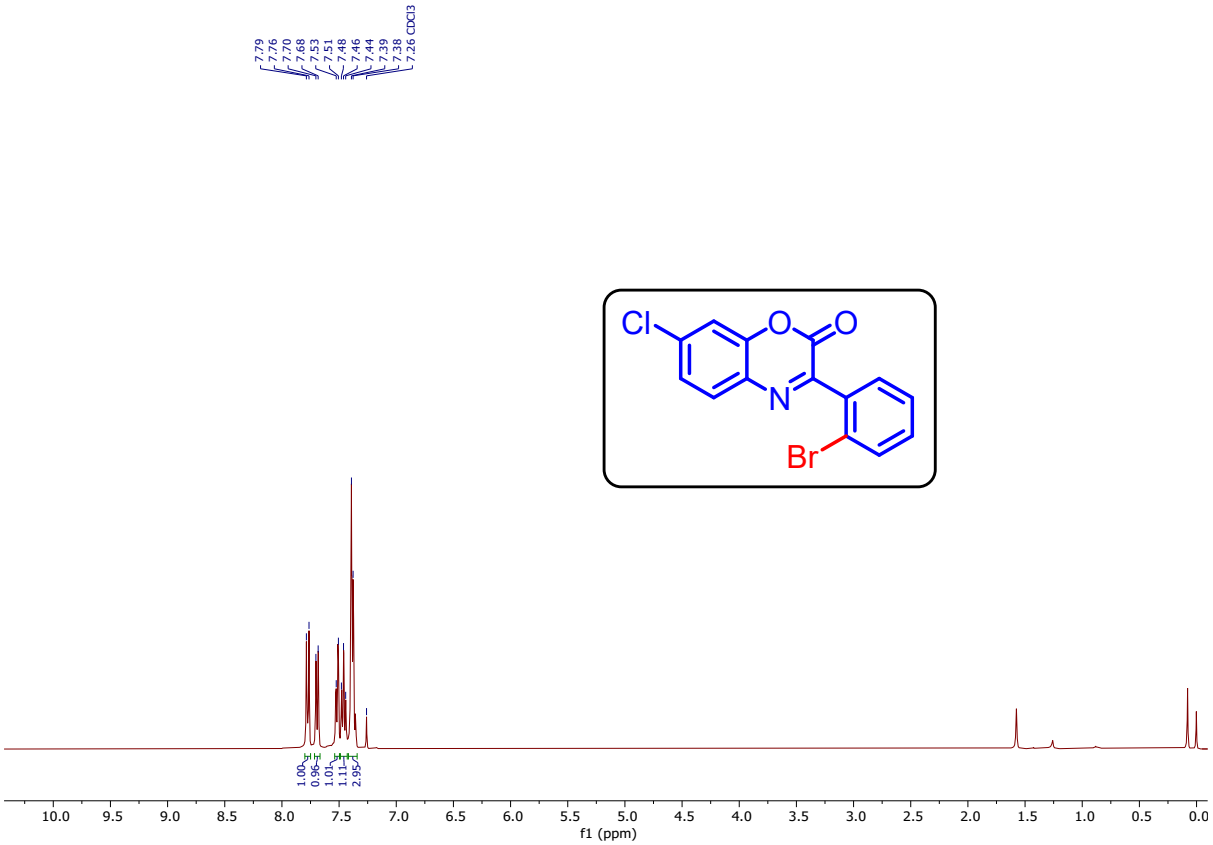



**Figure 9:** $^{1}$H NMR spectrum of compound **3e** (400 MHz, $CDCl_3$).

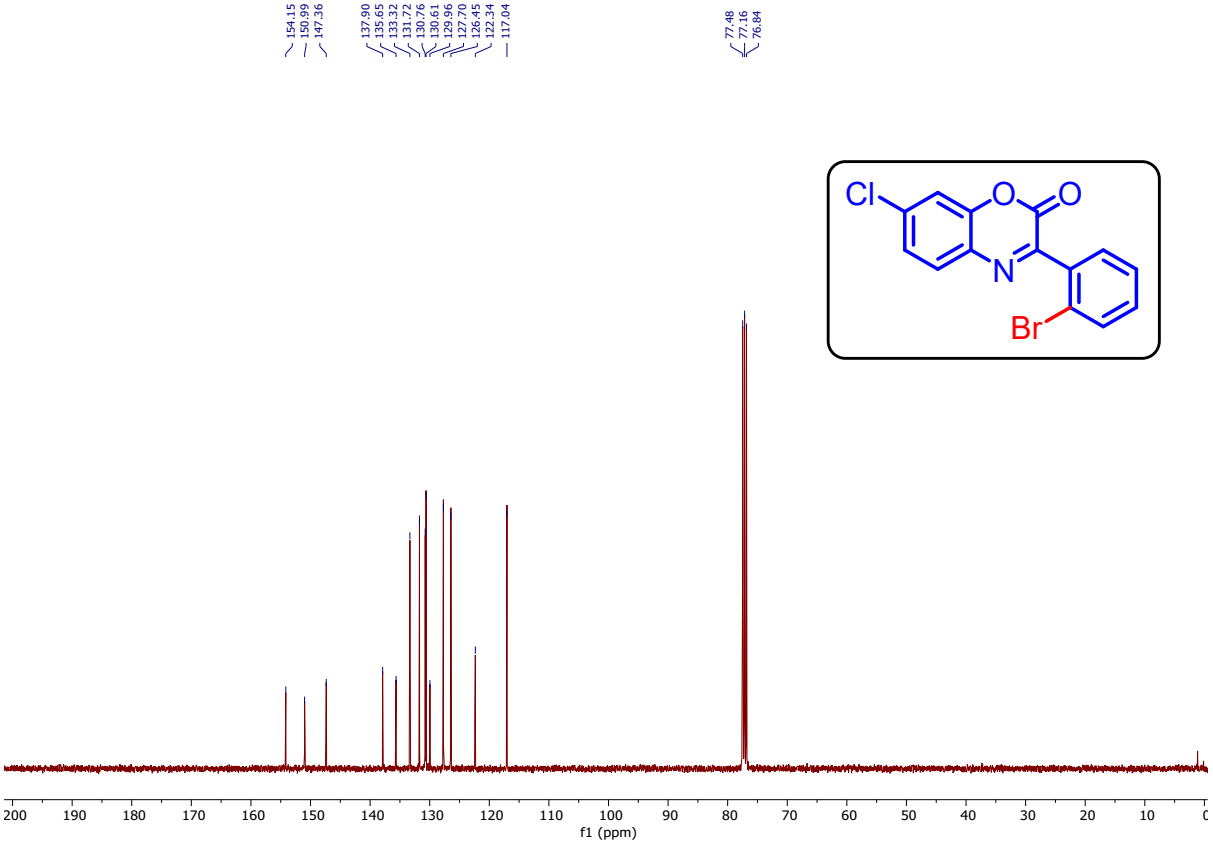



**Figure 10:** $^{13}$C NMR spectrum of compound **3e** (100 MHz, $CDCl_3$).

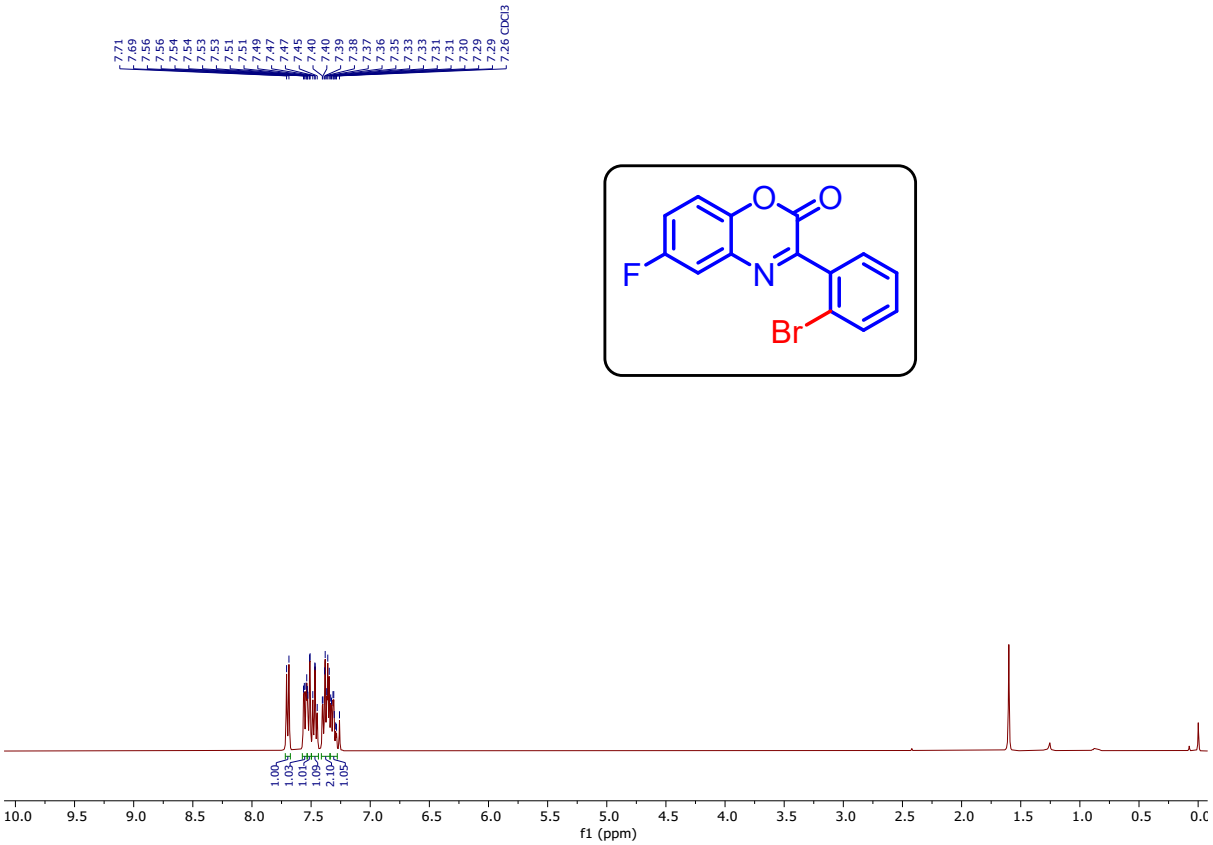



**Figure 11:** $^{1}$H NMR spectrum of compound **3f** (400 MHz, $CDCl_3$).

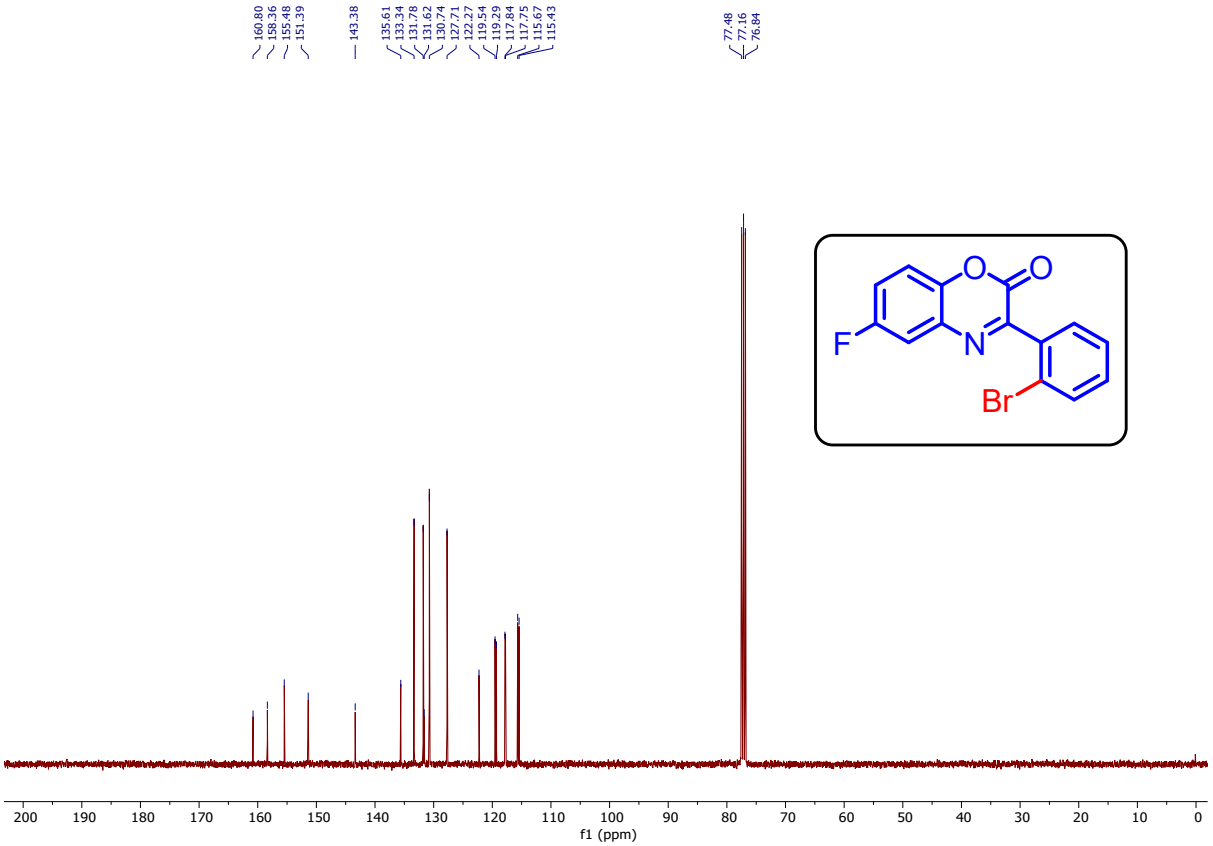



**Figure 12:** $^{13}$C NMR spectrum of compound **3f** (100 MHz, $CDCl_3$).

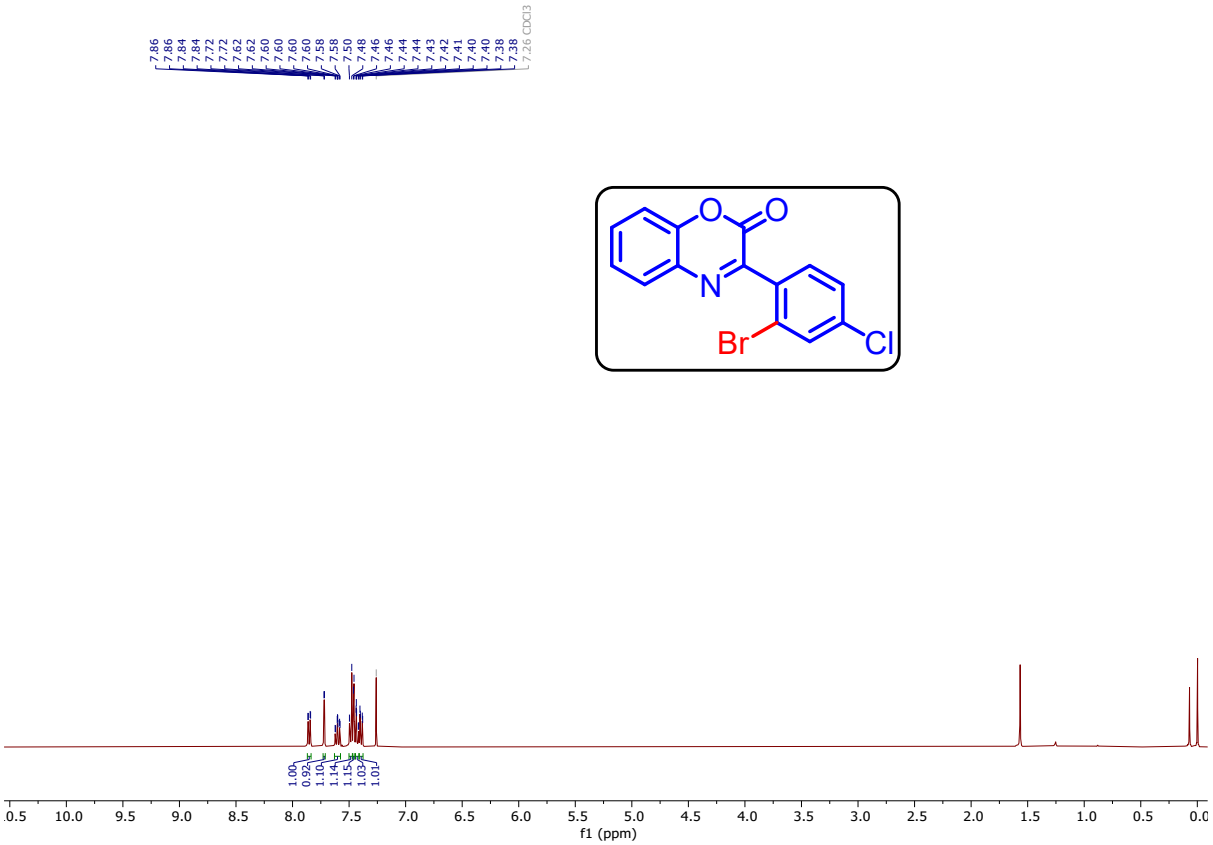



**Figure 13:** $^{1}$H NMR spectrum of compound **3g** (400 MHz, $CDCl_3$).

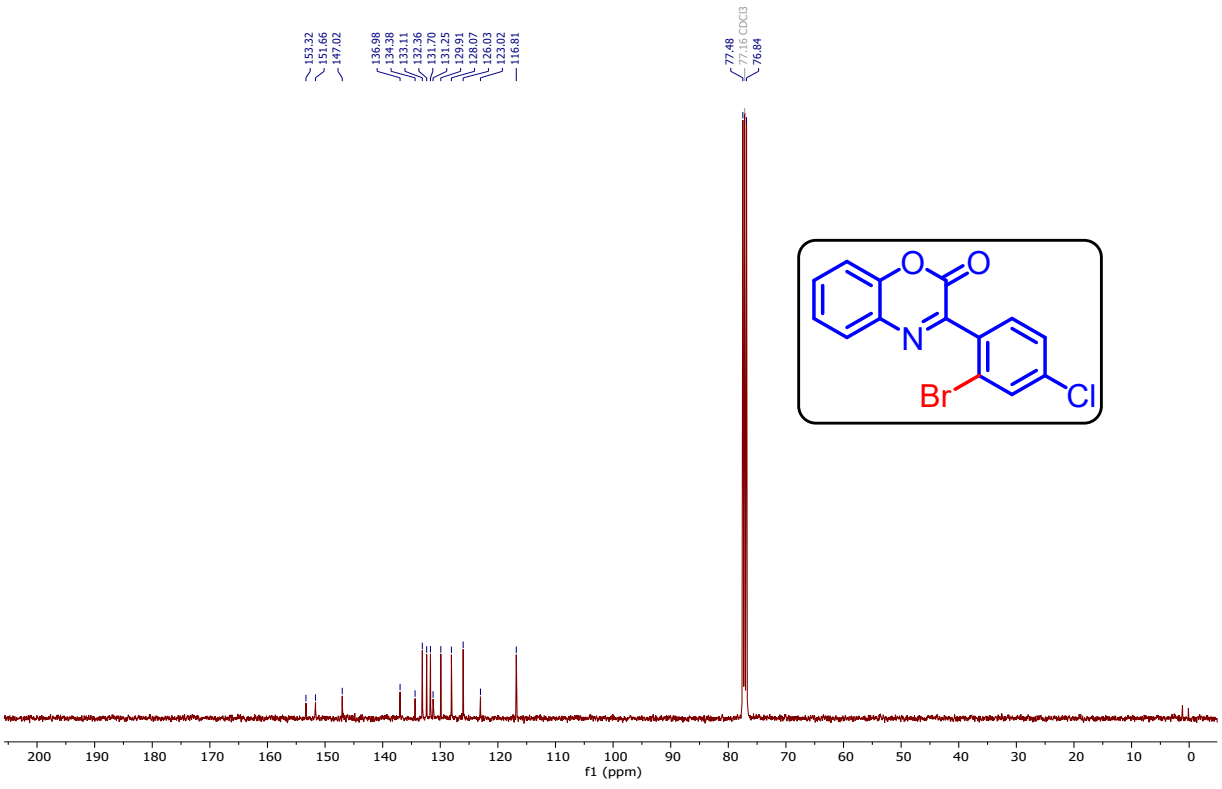


**Figure 14:** $^{13}C$ NMR spectrum of compound **3g** (100 MHz, $CDCl_3$).

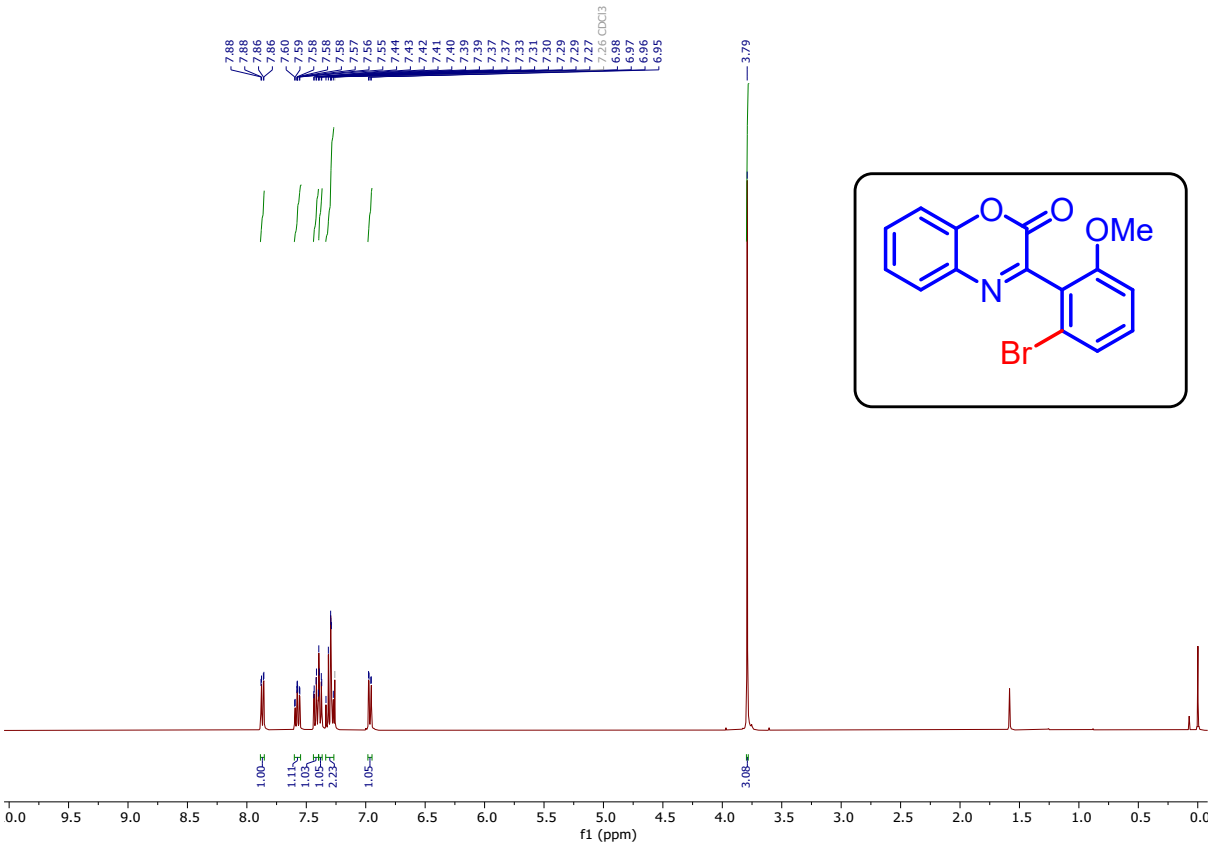



**Figure 15:** $^{1}H$ NMR spectrum of compound **3h** (400 MHz, $CDCl_3$).

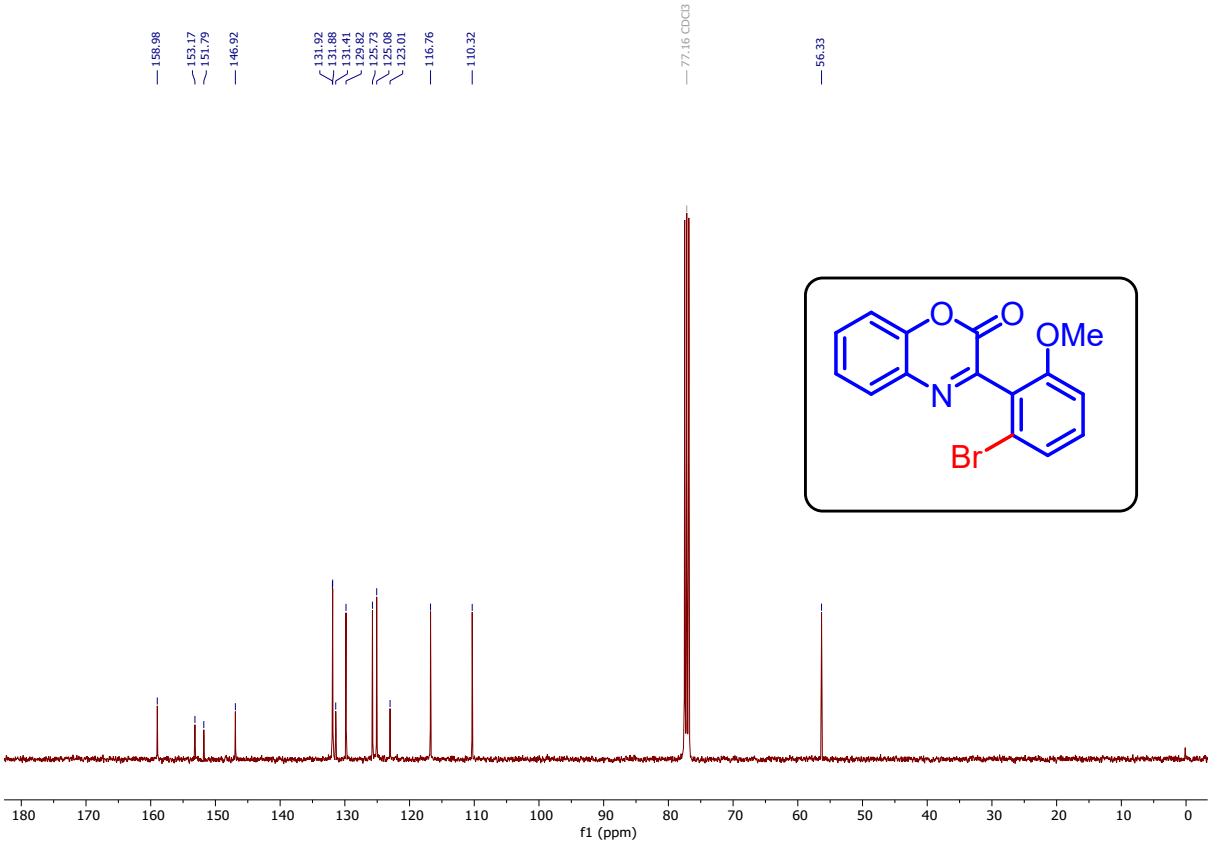



**Figure 16:** $^{13}C$ NMR spectrum of compound **3h** (100 MHz, $CDCl_3$).

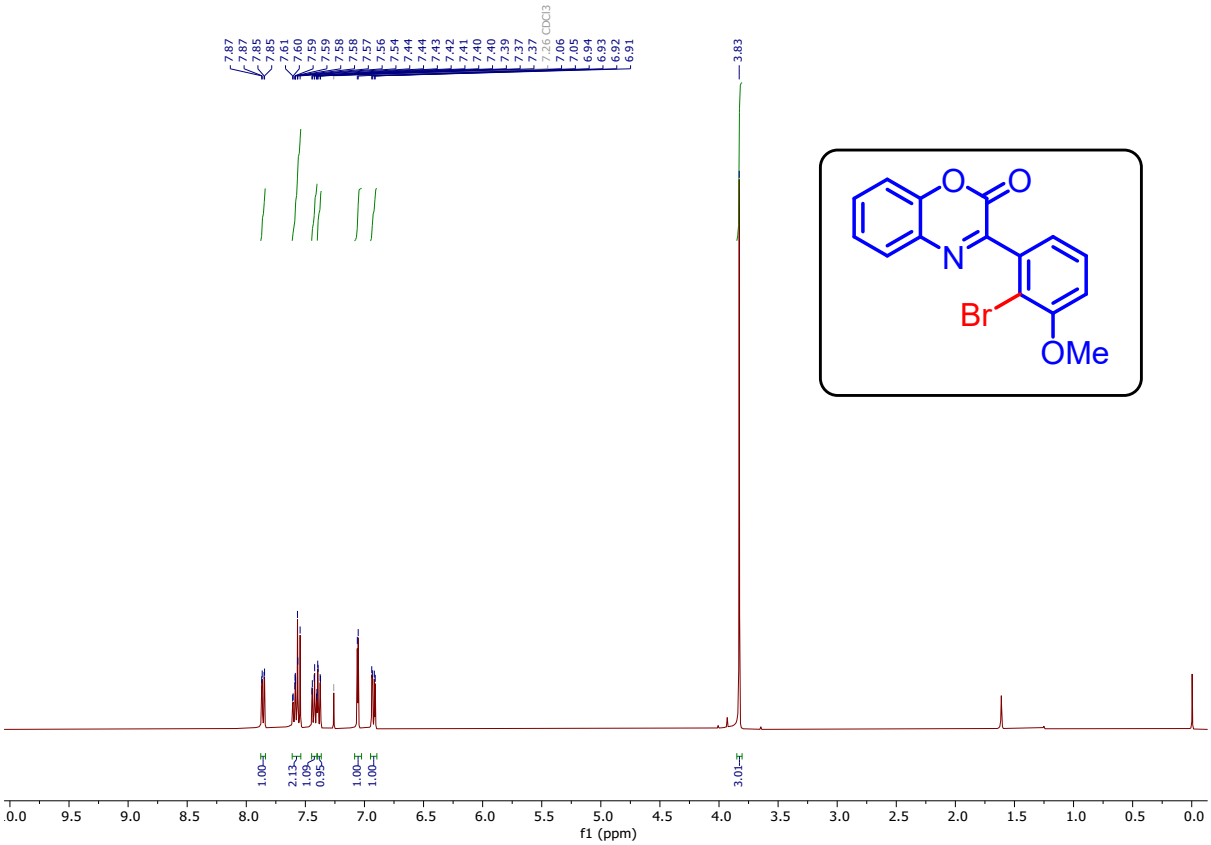



**Figure 17:** $^{1}$H NMR spectrum of compound **3i** (400 MHz, $CDCl_3$).

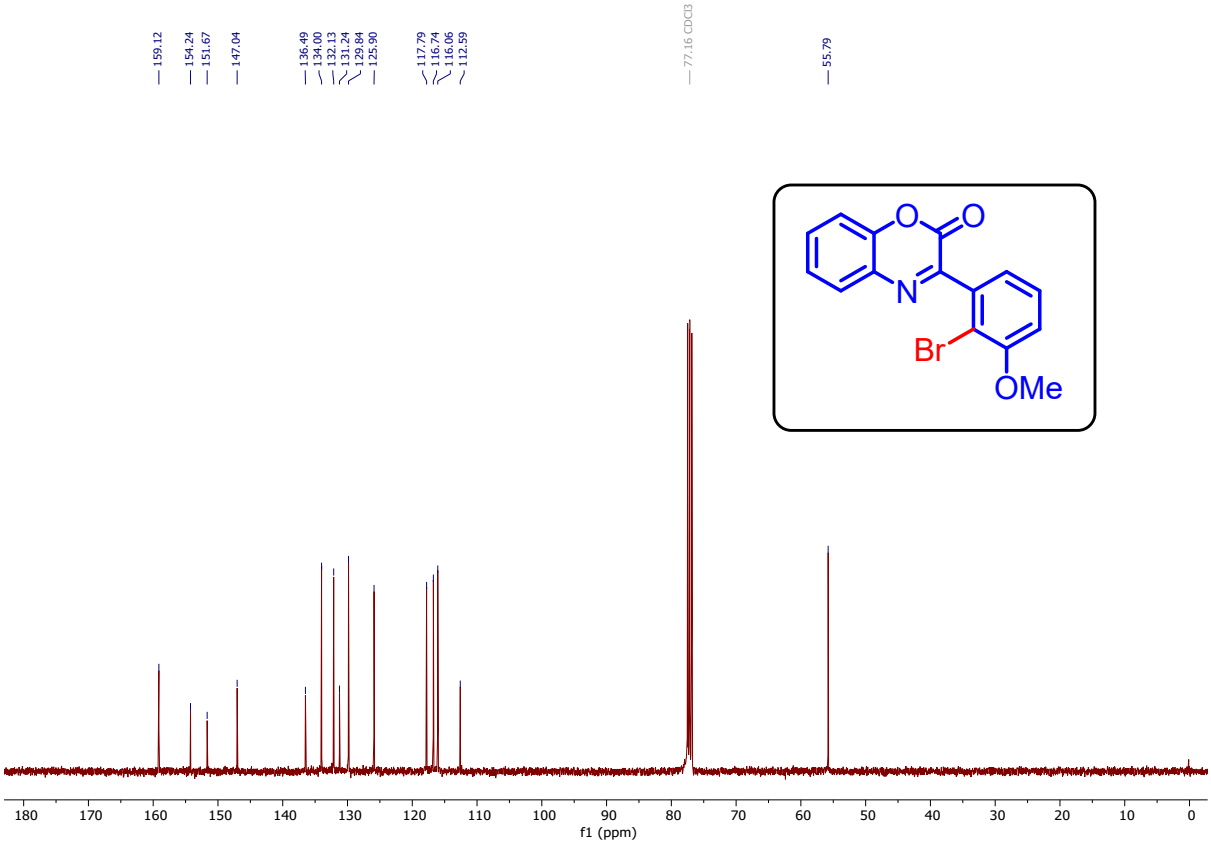



**Figure 18:** $^{13}$C NMR spectrum of compound **3i** (100 MHz, $CDCl_3$).

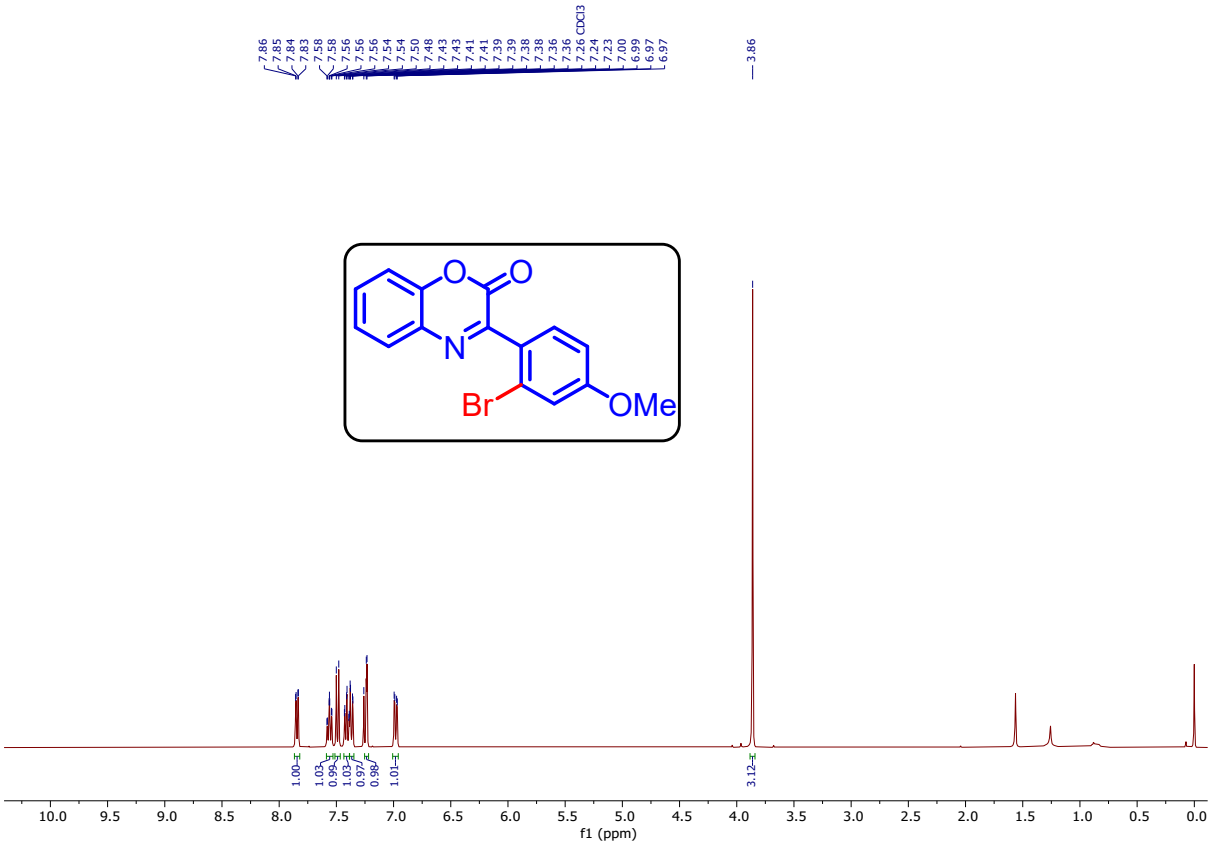



**Figure 19:** $^{1}$H NMR spectrum of compound **3j** (400 MHz, $CDCl_3$)

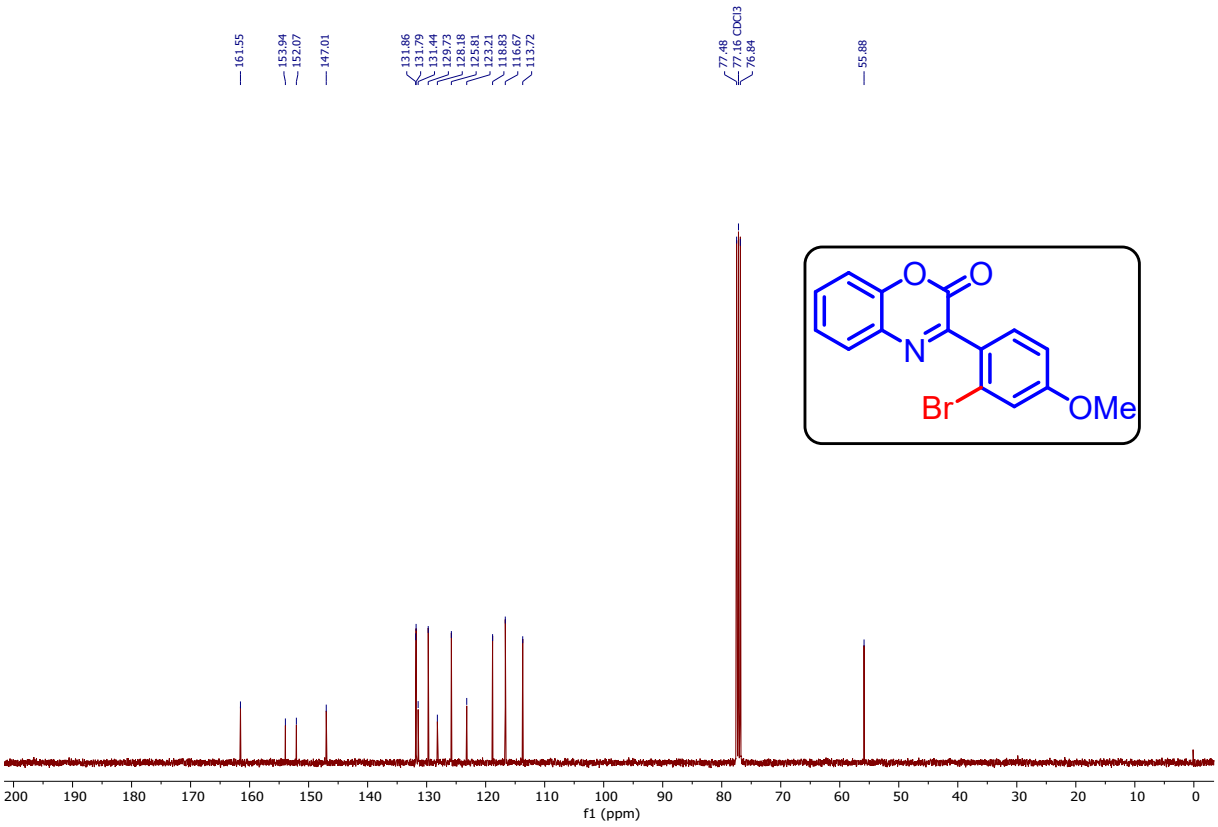



**Figure 20:** $^{13}$C NMR spectrum of compound **3j** (100 MHz, $CDCl_3$).

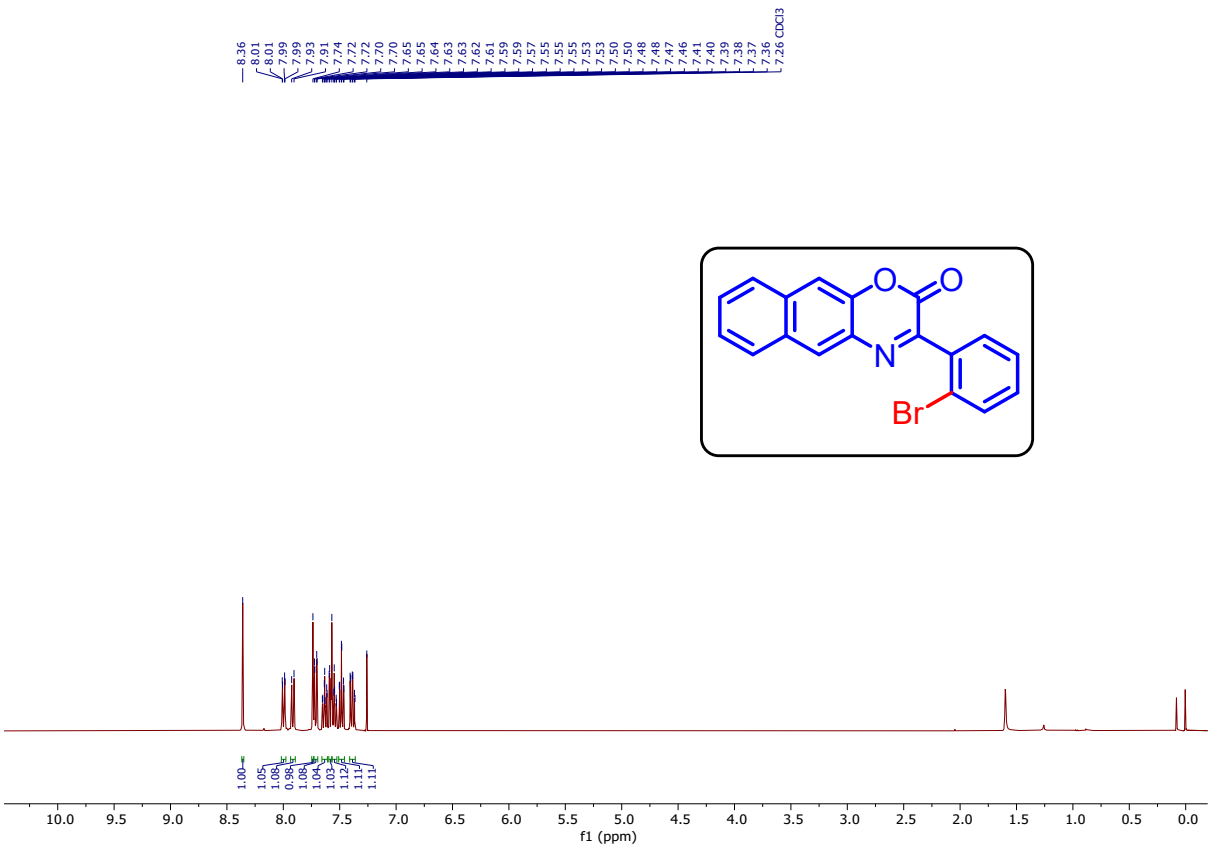



**Figure 21:** $^{1}$H NMR spectrum of compound **3k** (400 MHz, $CDCl_3$).

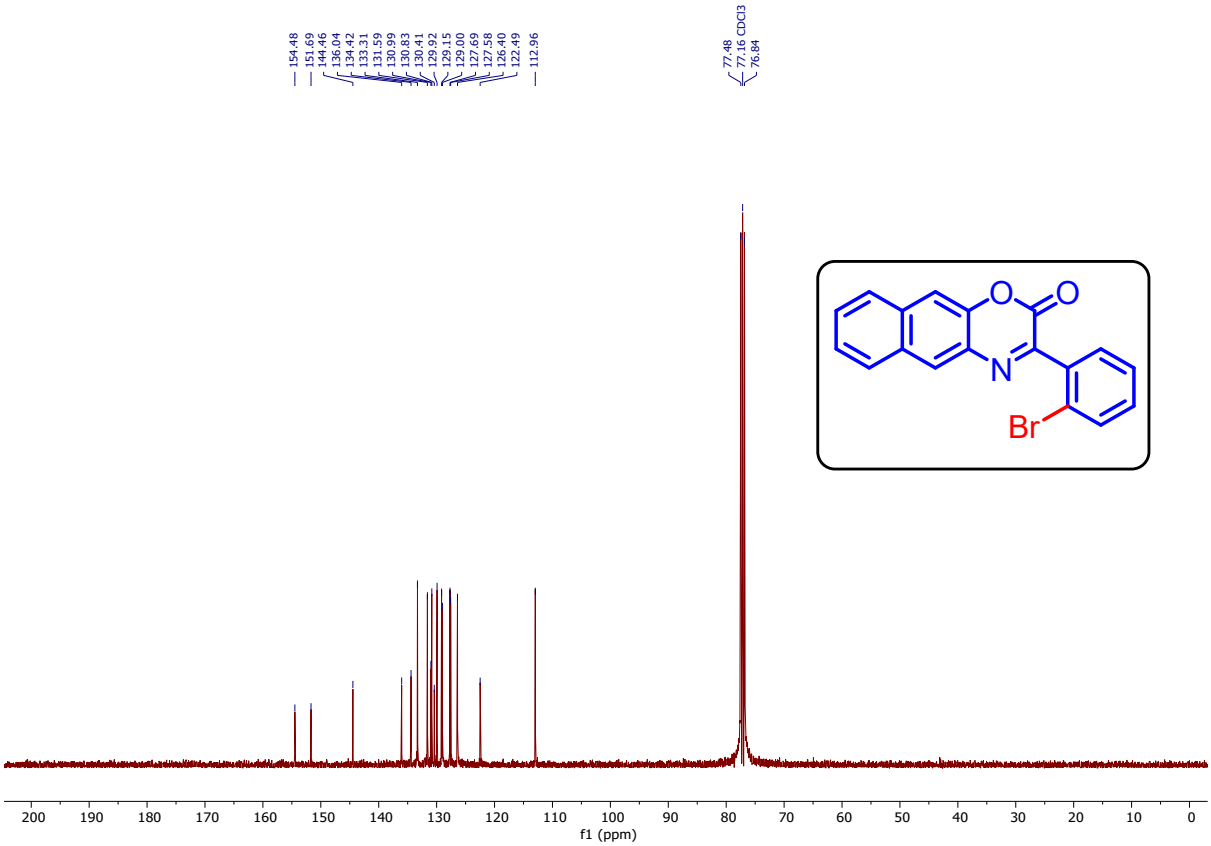



**Figure 22:** $^{13}$C NMR spectrum of compound **3k** (100 MHz, $CDCl_3$).

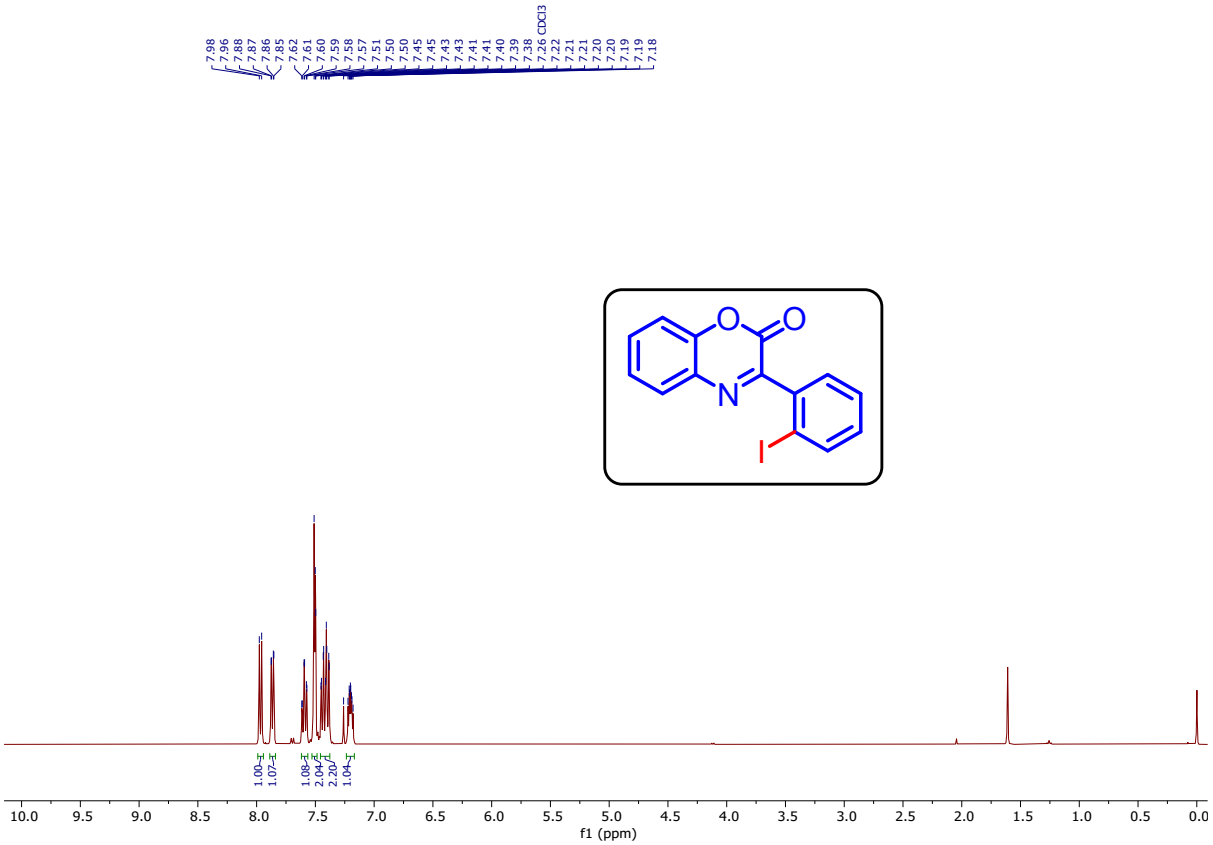



**Figure 23:** $^{1}$H NMR spectrum of compound **4a** (400 MHz, $CDCl_3$).

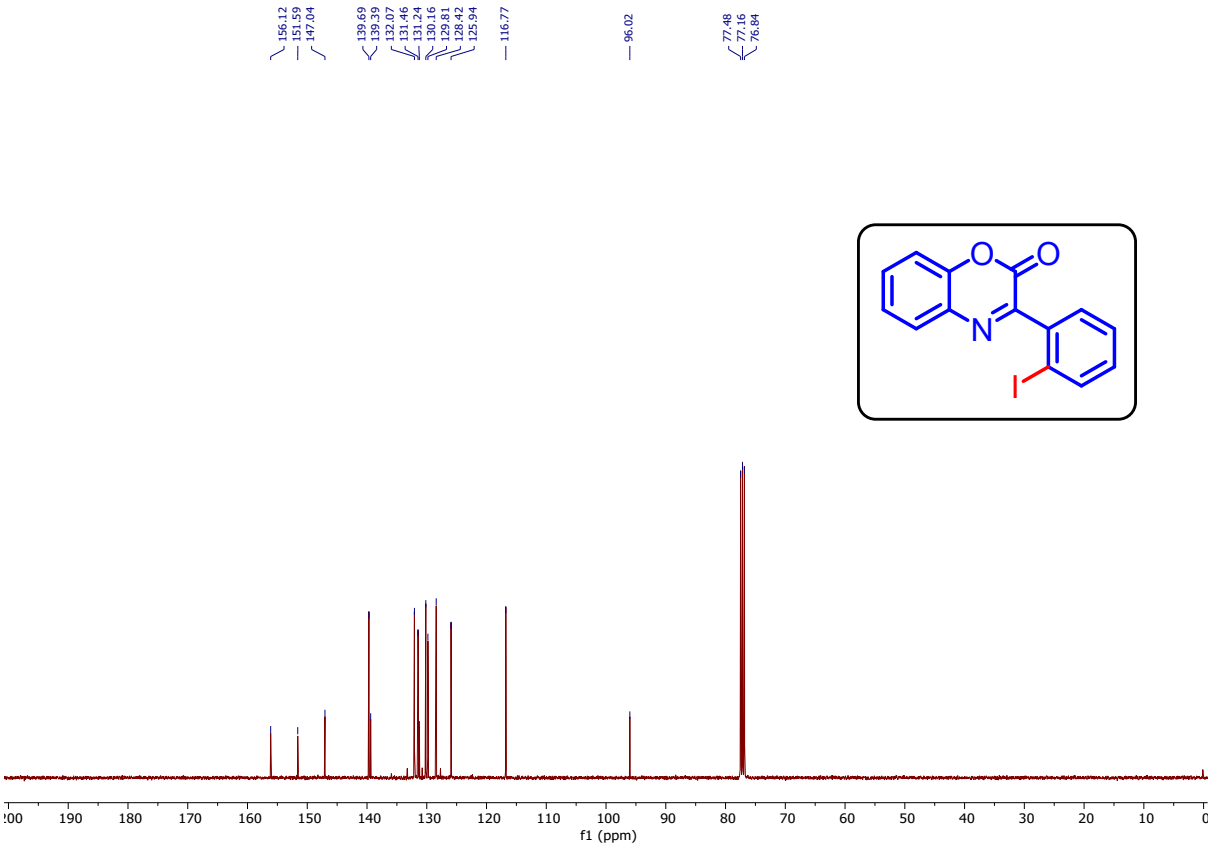



**Figure 24:** $^{13}$C NMR spectrum of compound **4a** (100 MHz, $CDCl_3$).

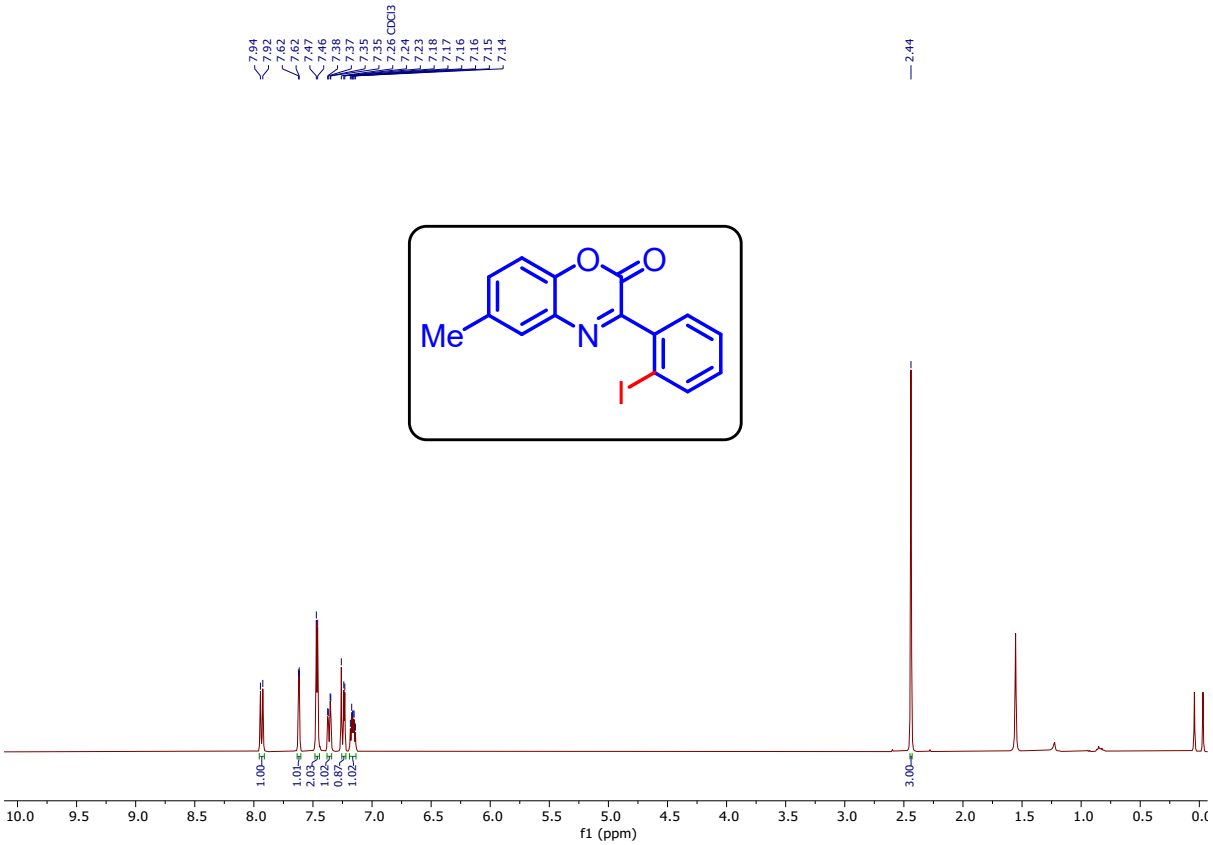



**Figure 25:** $^{1}$H NMR spectrum of compound **4b** (400 MHz, $CDCl_3$)

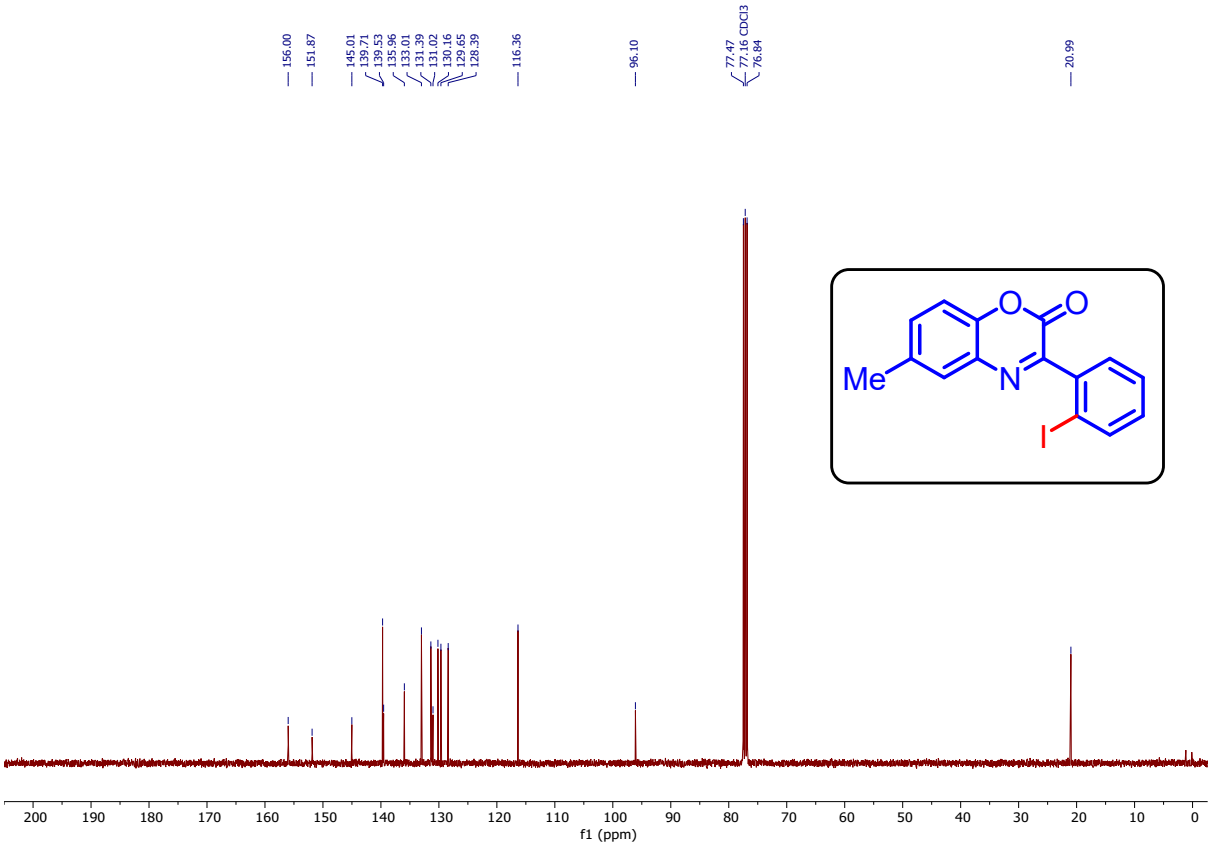



**Figure 26:** $^{13}$C NMR spectrum of compound **4b** (100 MHz, $CDCl_3$).

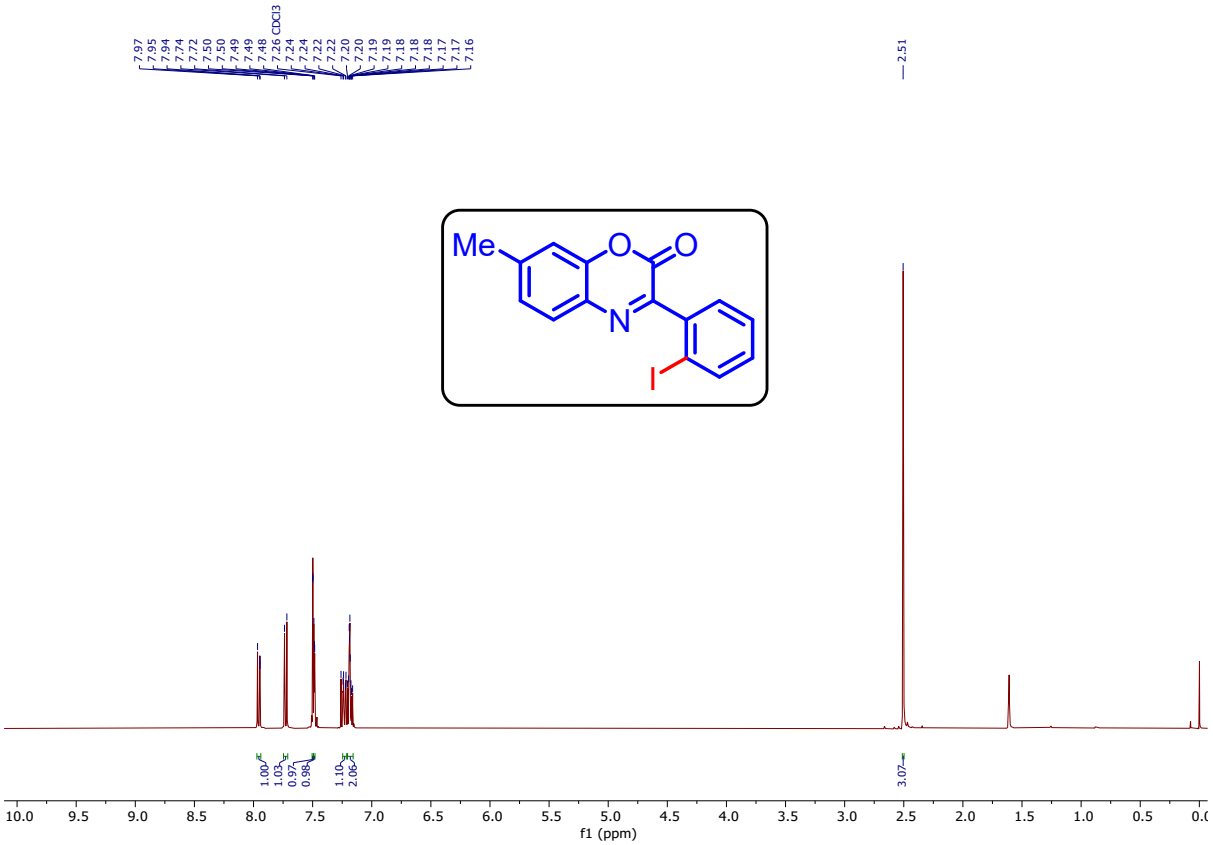



**Figure 27:** $^{1}$H NMR spectrum of compound **4c** (400 MHz, $CDCl_3$).

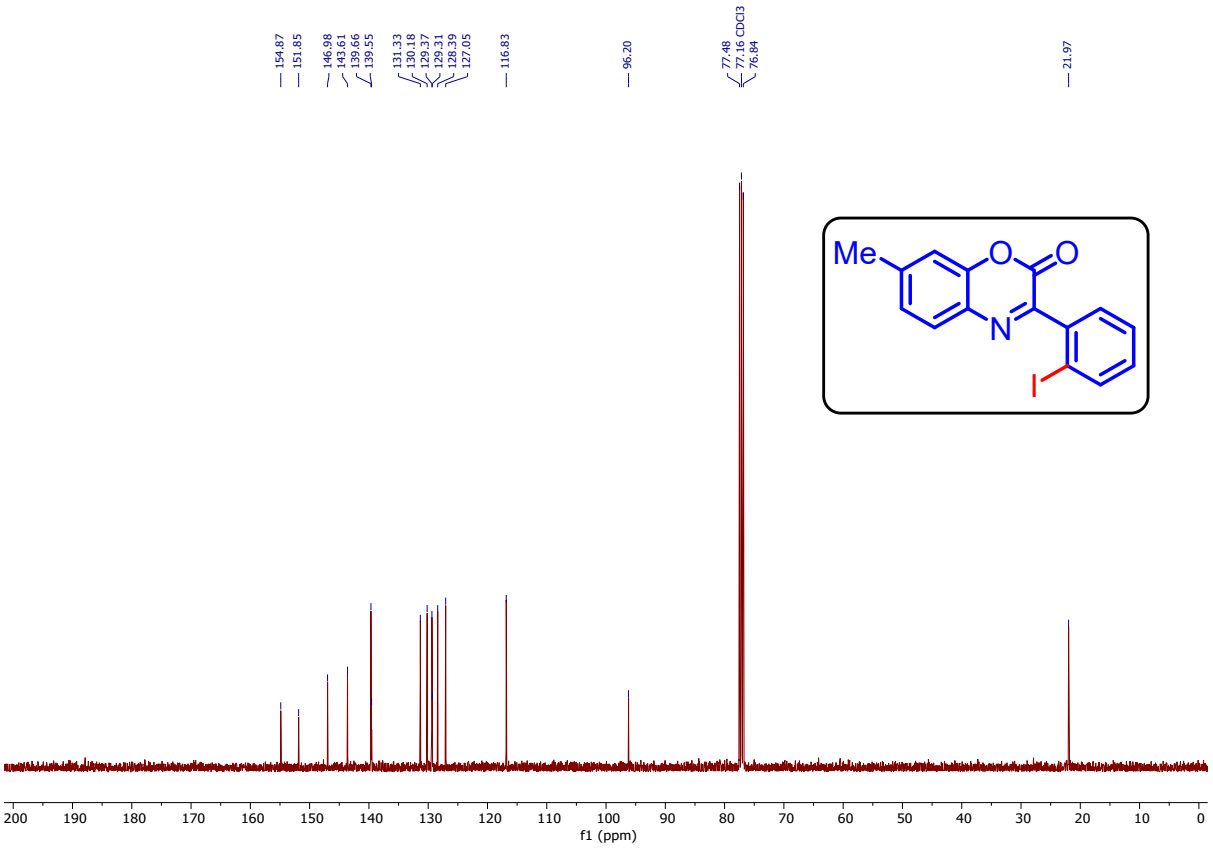



**Figure 28:** $^{13}$C NMR spectrum of compound **4c** (100 MHz, $CDCl_3$).

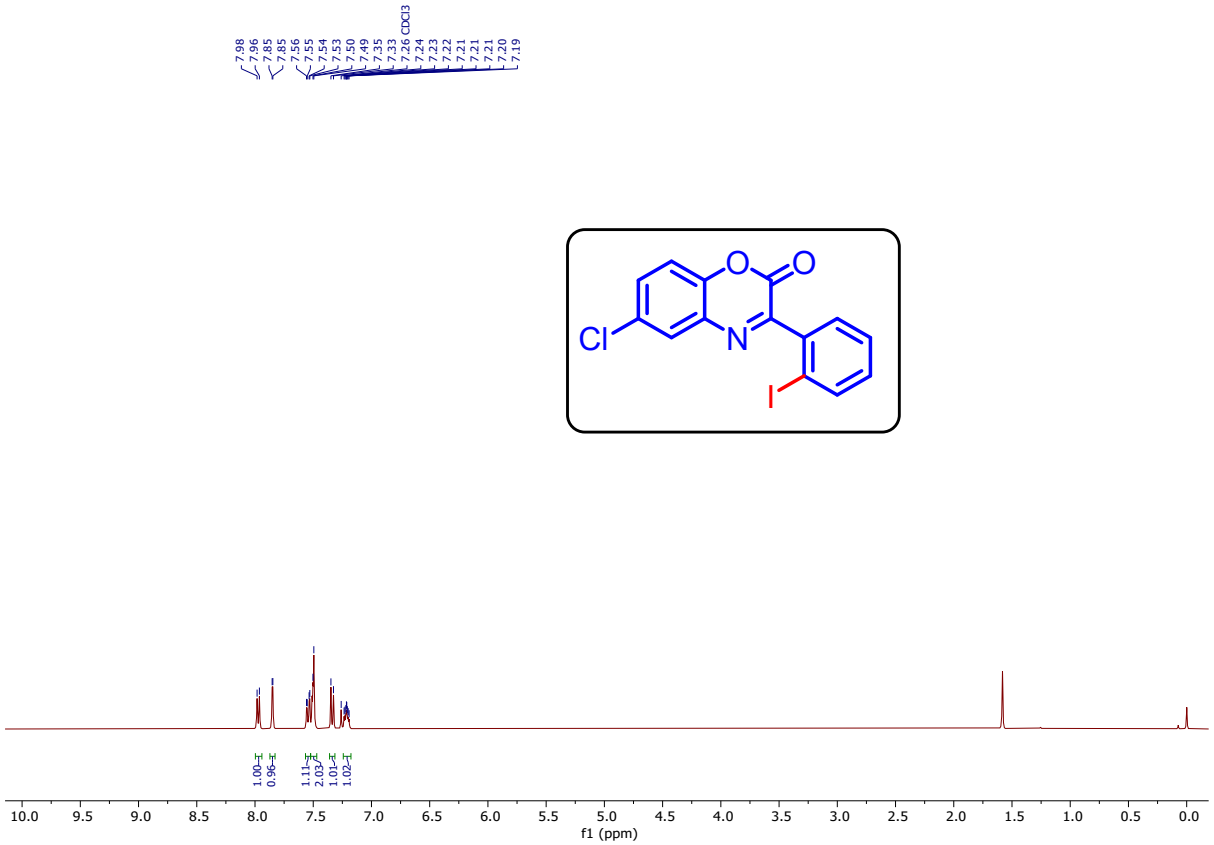



**Figure 29:** $^{1}$H NMR spectrum of compound **4d** (400 MHz, $CDCl_3$).

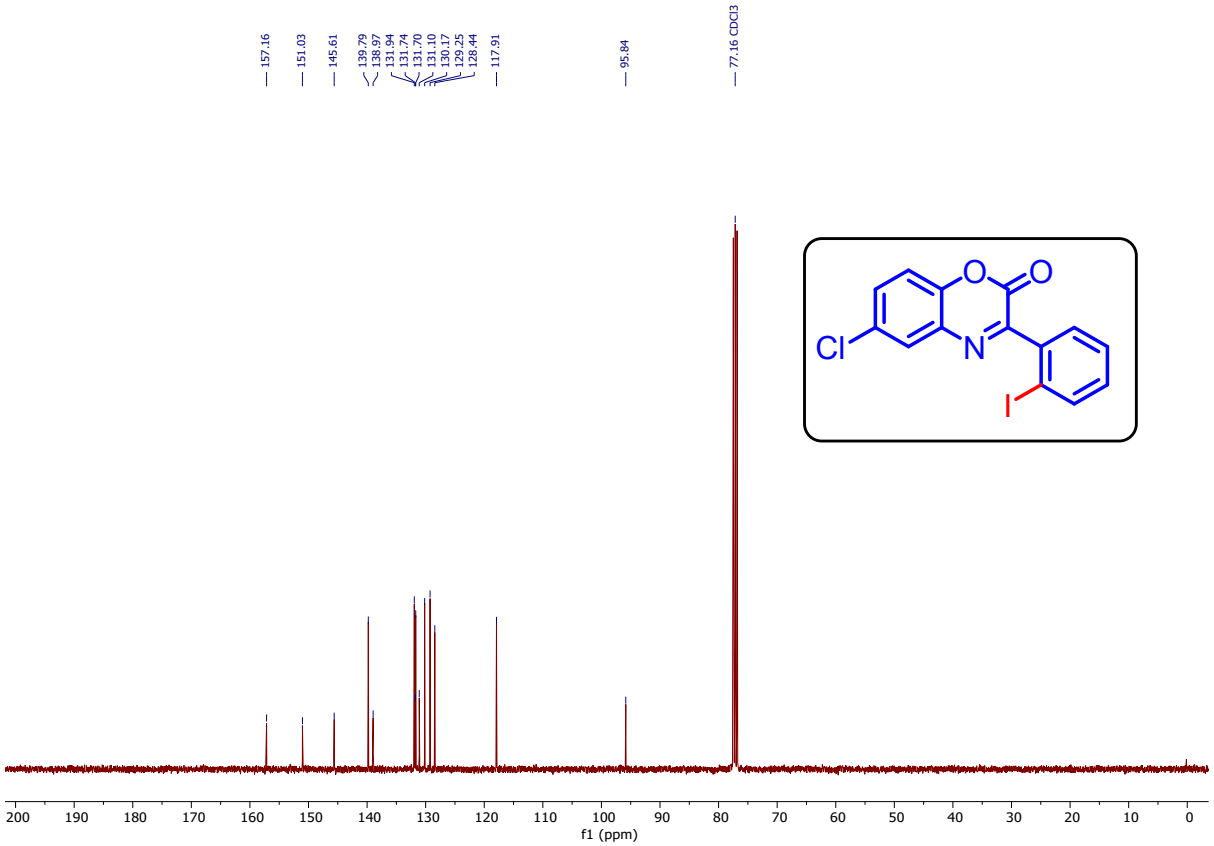



**Figure 30:** $^{13}$C NMR spectrum of compound **4d** (100 MHz, $CDCl_3$).

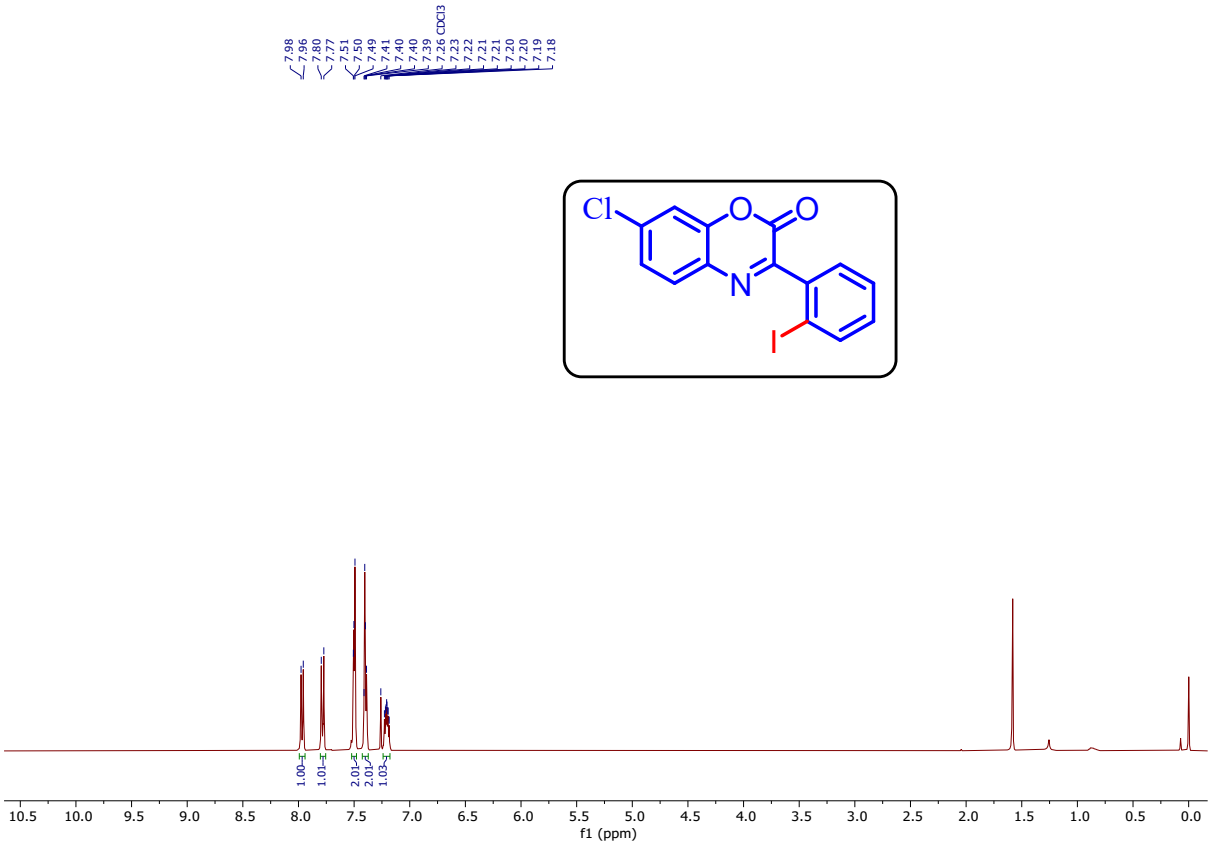



**Figure 31:** $^{1}$H NMR spectrum of compound **4e** (400 MHz, $CDCl_3$).

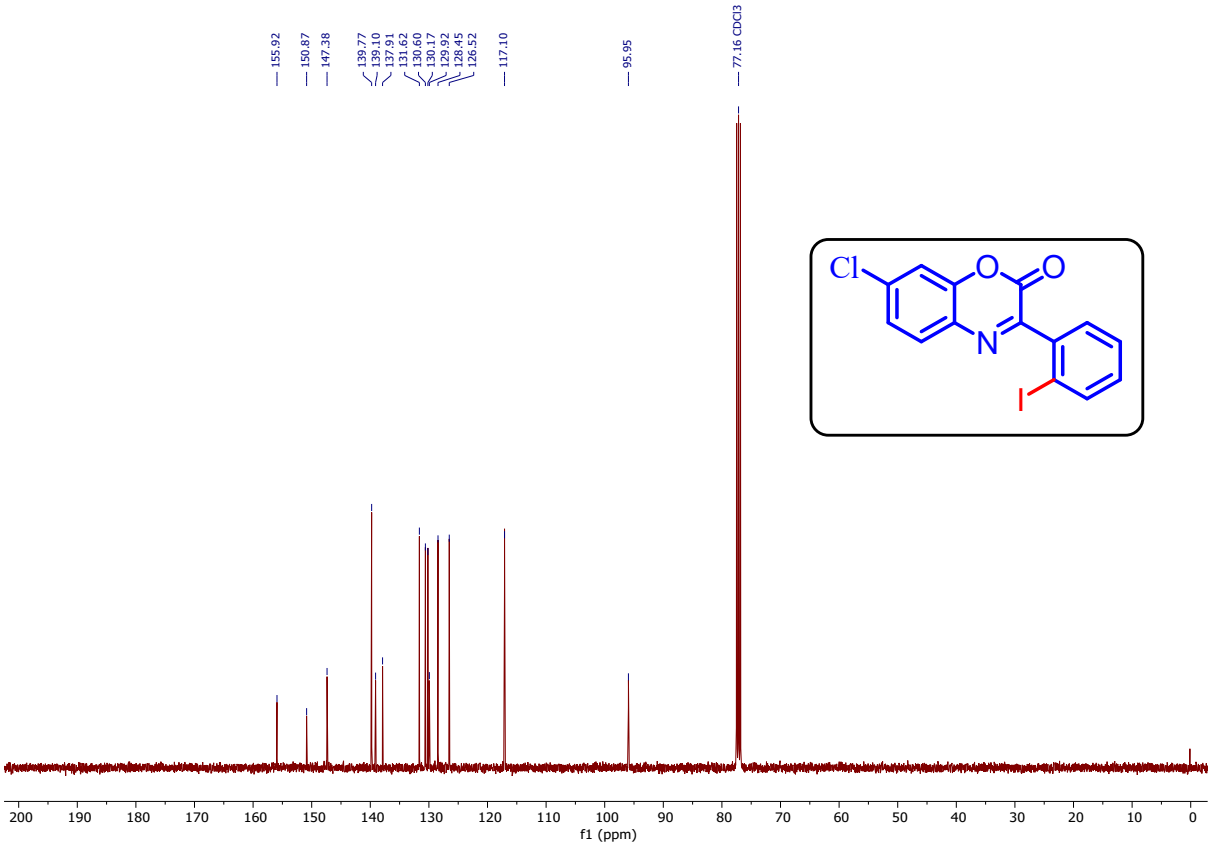



**Figure 32:** $^{13}$C NMR spectrum of compound **4e** (400 MHz, $CDCl_3$).

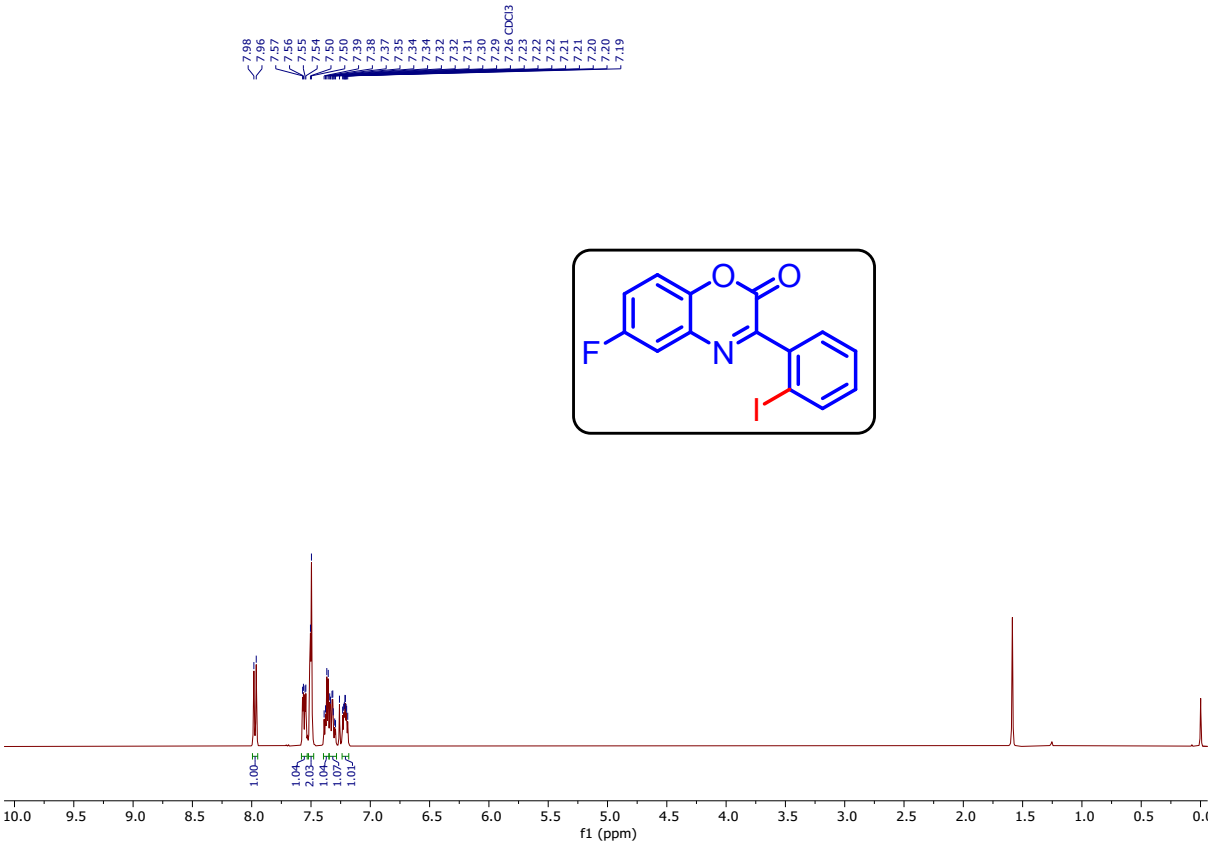



**Figure 33:** $^{1}$H NMR spectrum of compound **4f** (400 MHz, $CDCl_3$).

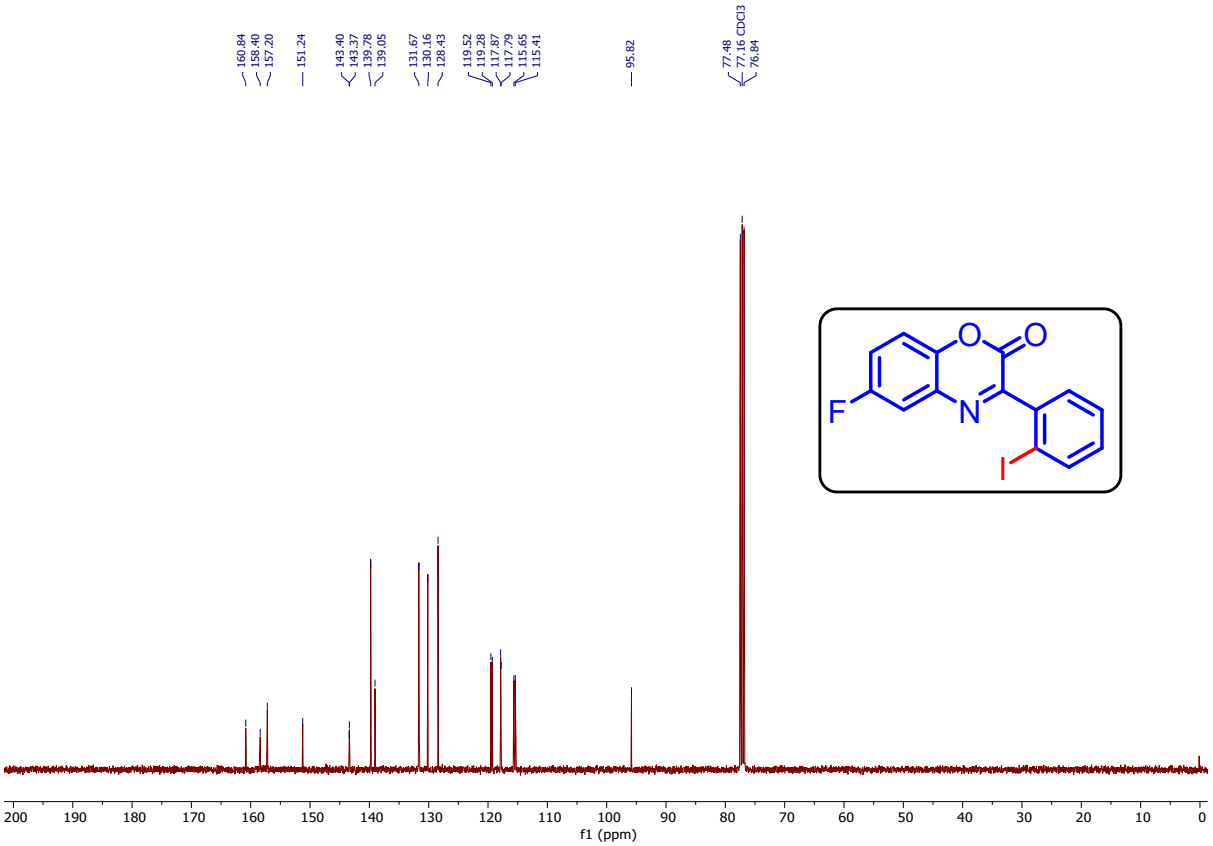



**Figure 34:** $^{13}$C NMR spectrum of compound **4f** (400 MHz, $CDCl_3$).

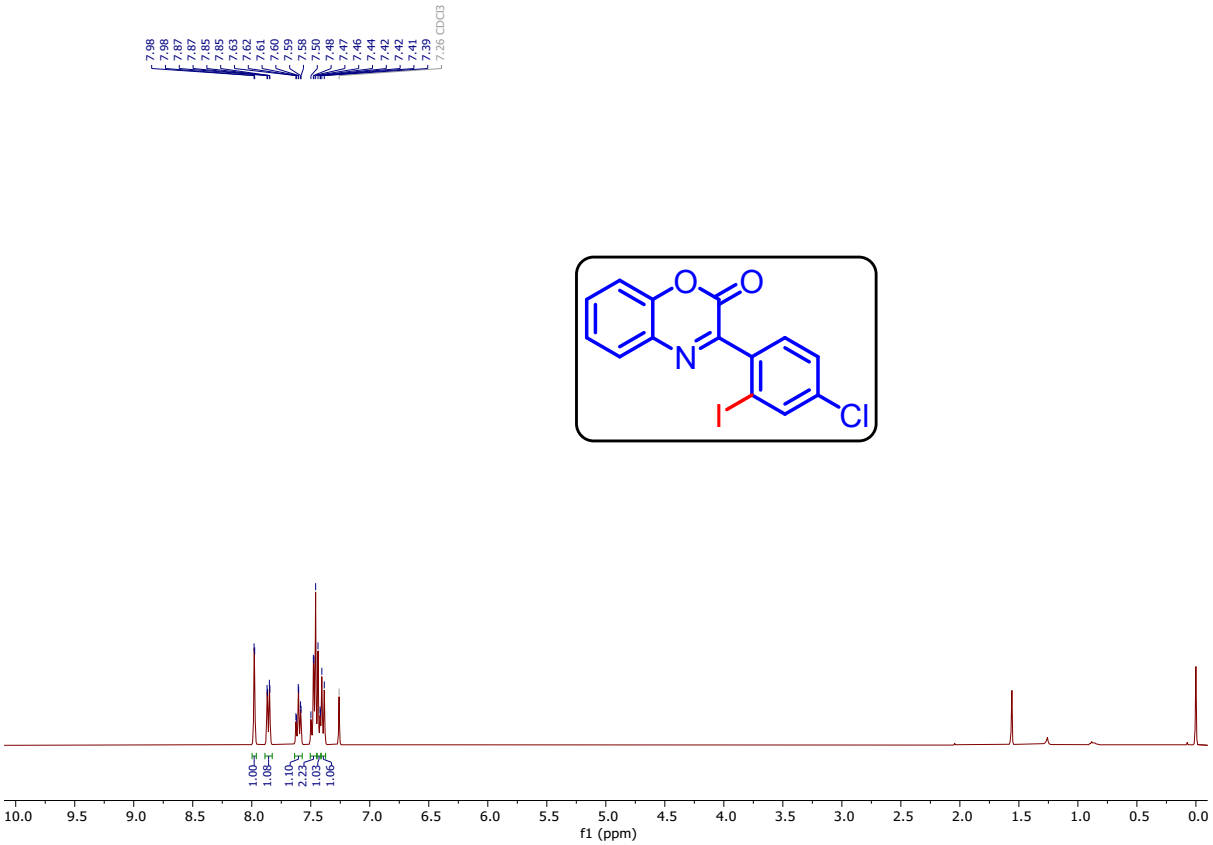



**Figure 35:** $^{1}$H NMR spectrum of compound **4g** (400 MHz, $CDCl_3$).

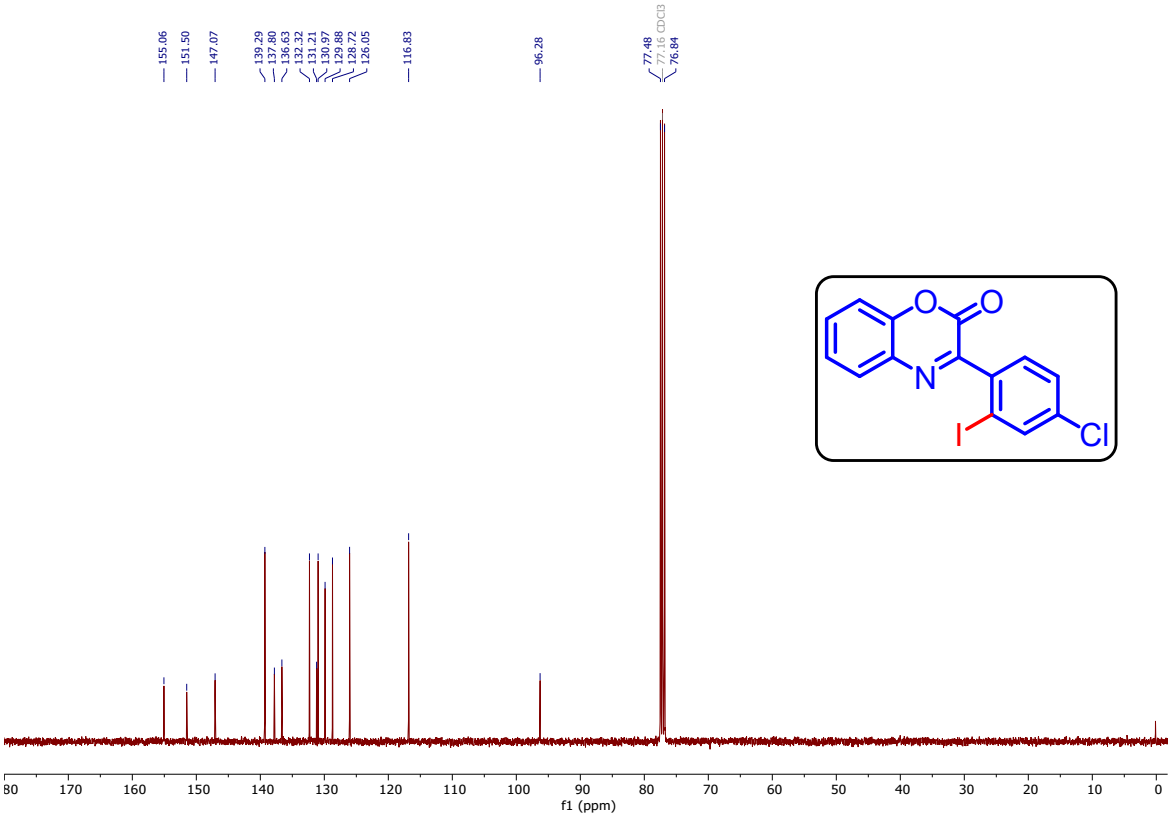



**Figure 36:** $^{13}$C NMR spectrum of compound **4g** (400 MHz, $CDCl_3$).

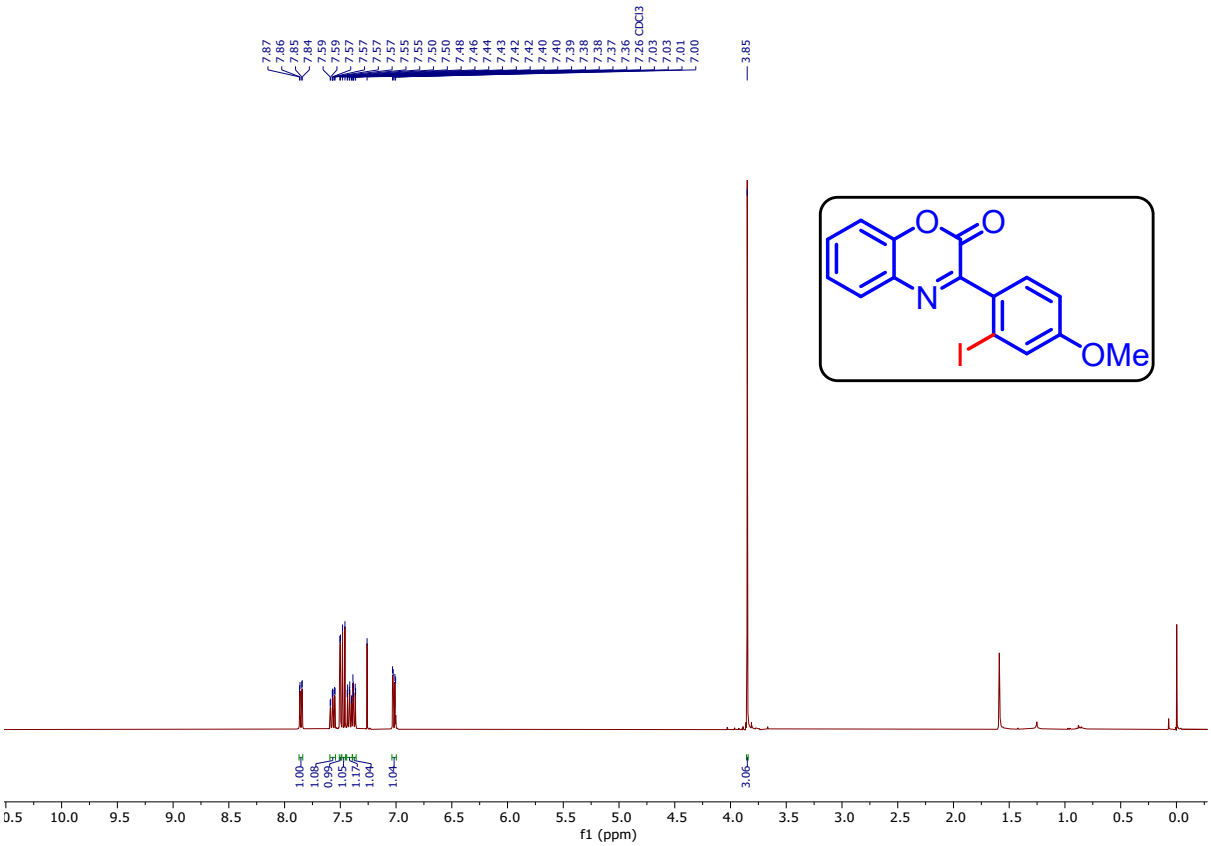



**Figure 37:** $^{1}$H NMR spectrum of compound **4h** (400 MHz, $CDCl_3$).

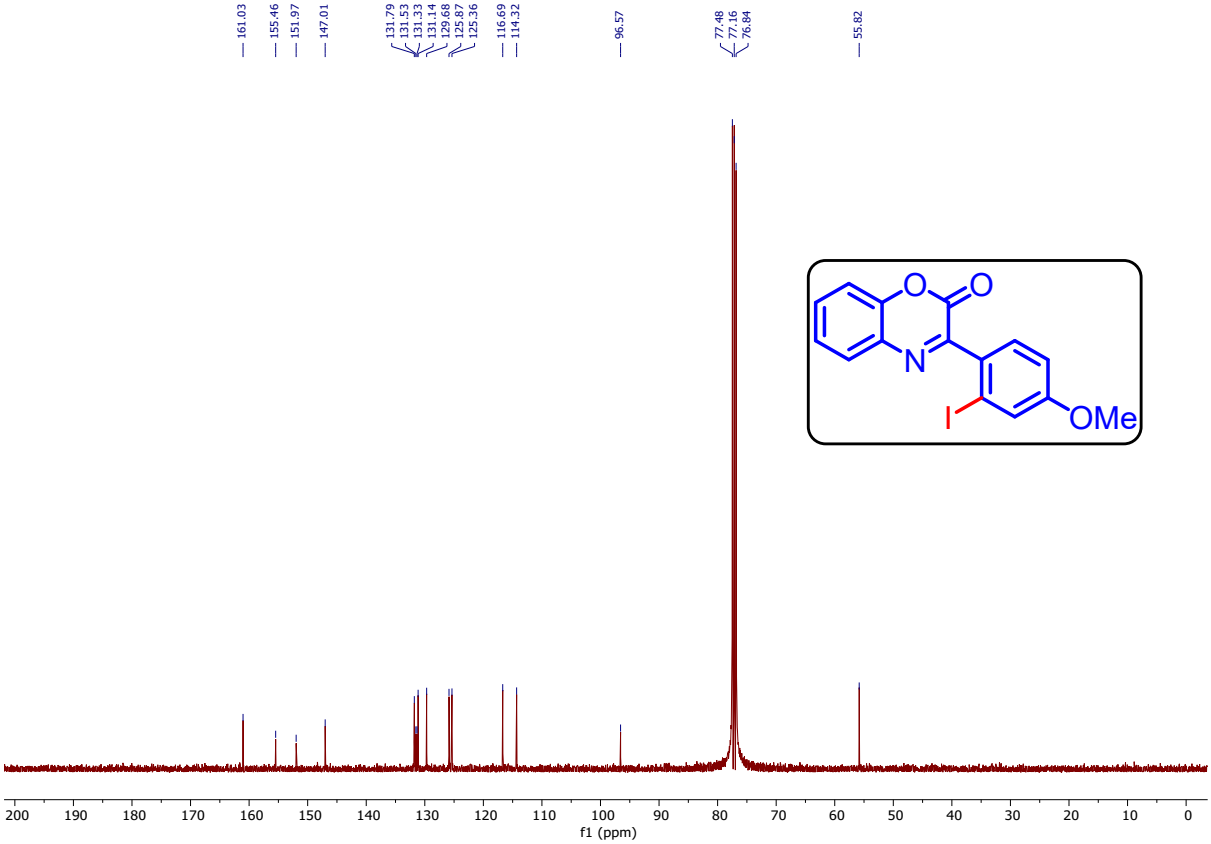



**Figure 38:** $^{13}$C NMR spectrum of compound **4h** (400 MHz, $CDCl_3$).

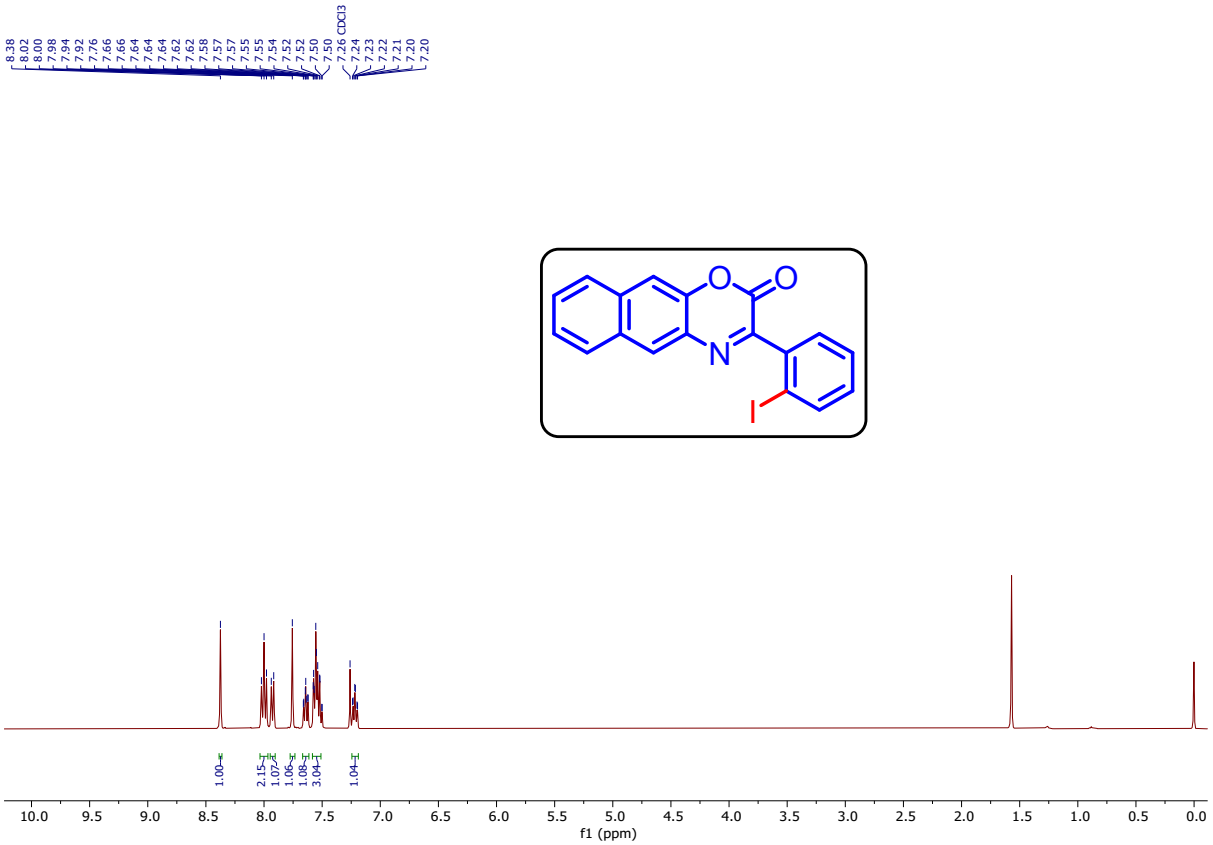



**Figure 39:** $^{1}$H NMR spectrum of compound **4i** (400 MHz, $CDCl_3$).

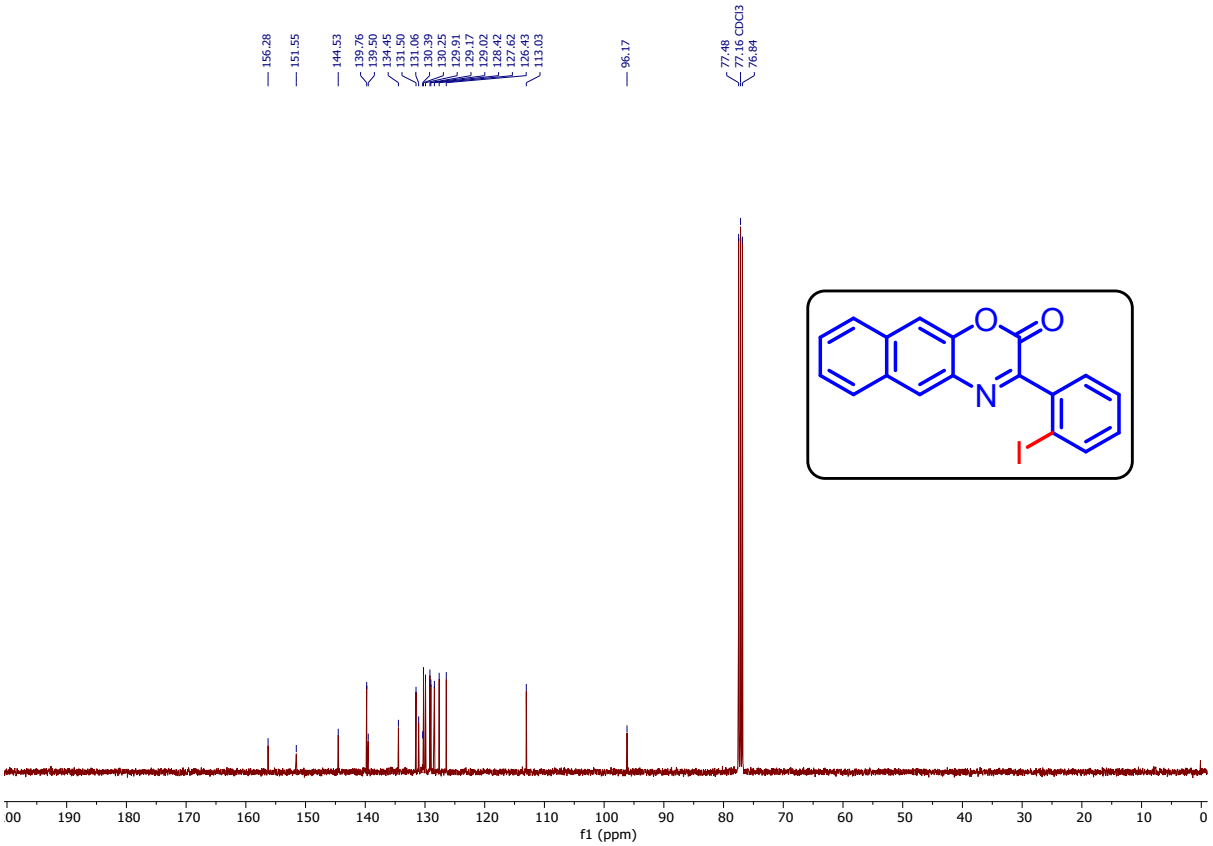



**Figure 40:** $^{13}$C NMR spectrum of compound **4i** (400 MHz, $CDCl_3$).

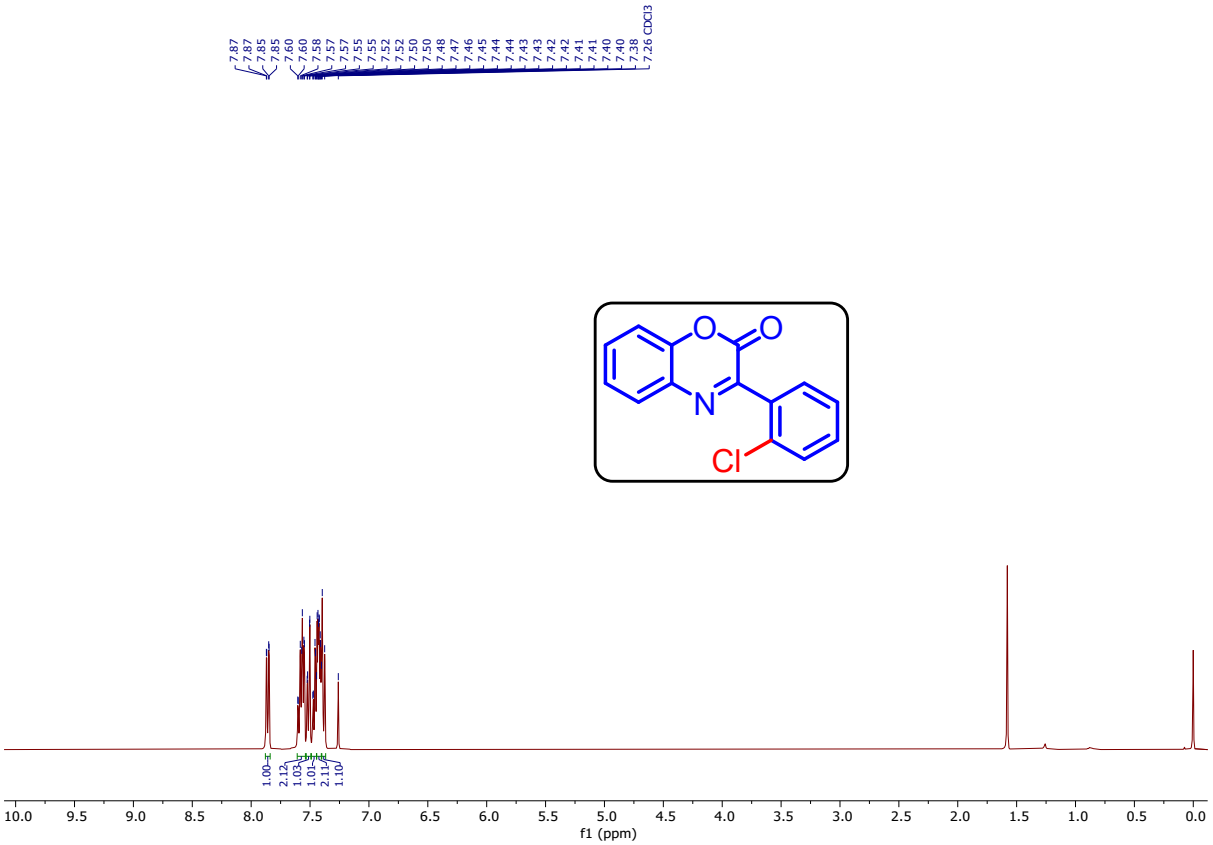



**Figure 41:** $^{1}$H NMR spectrum of compound **5a** (400 MHz, $CDCl_3$).

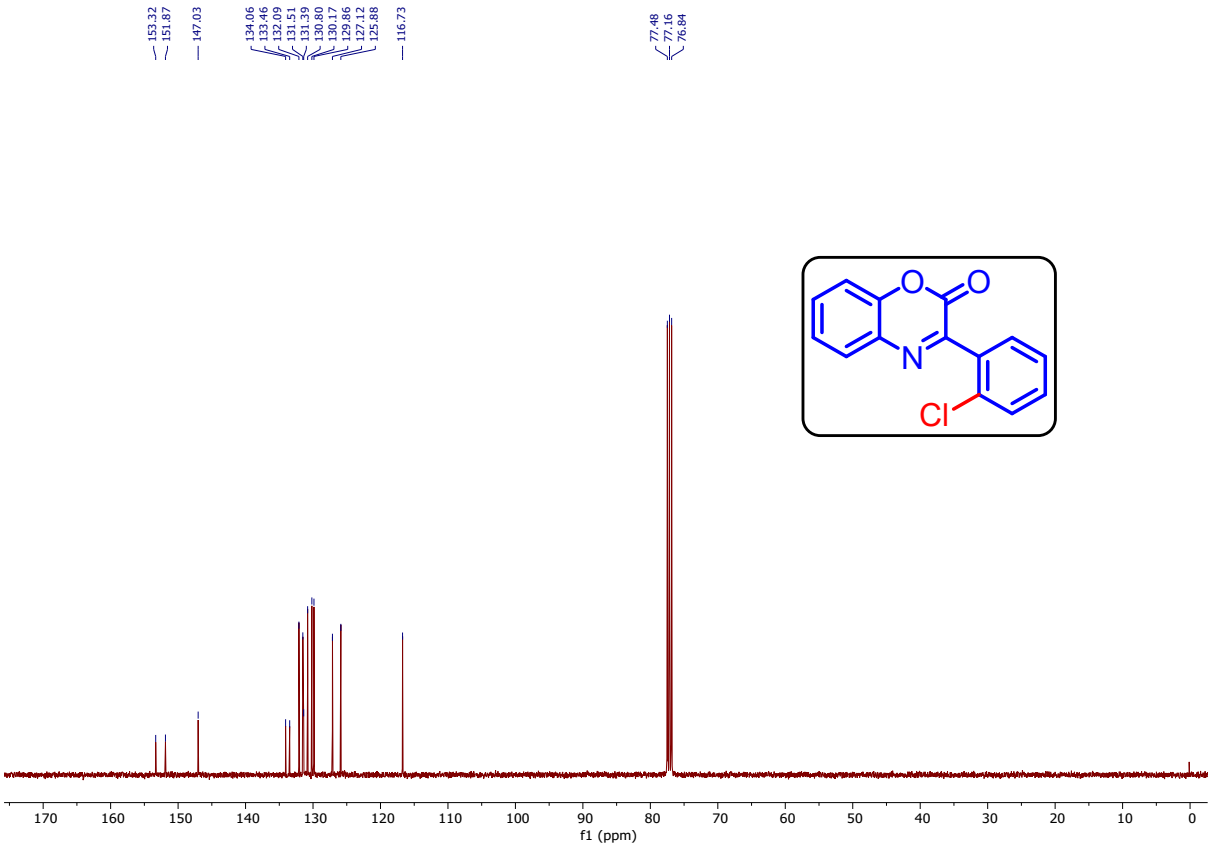



**Figure 42:** $^{13}$C NMR spectrum of compound **5a** (400 MHz, $CDCl_3$).

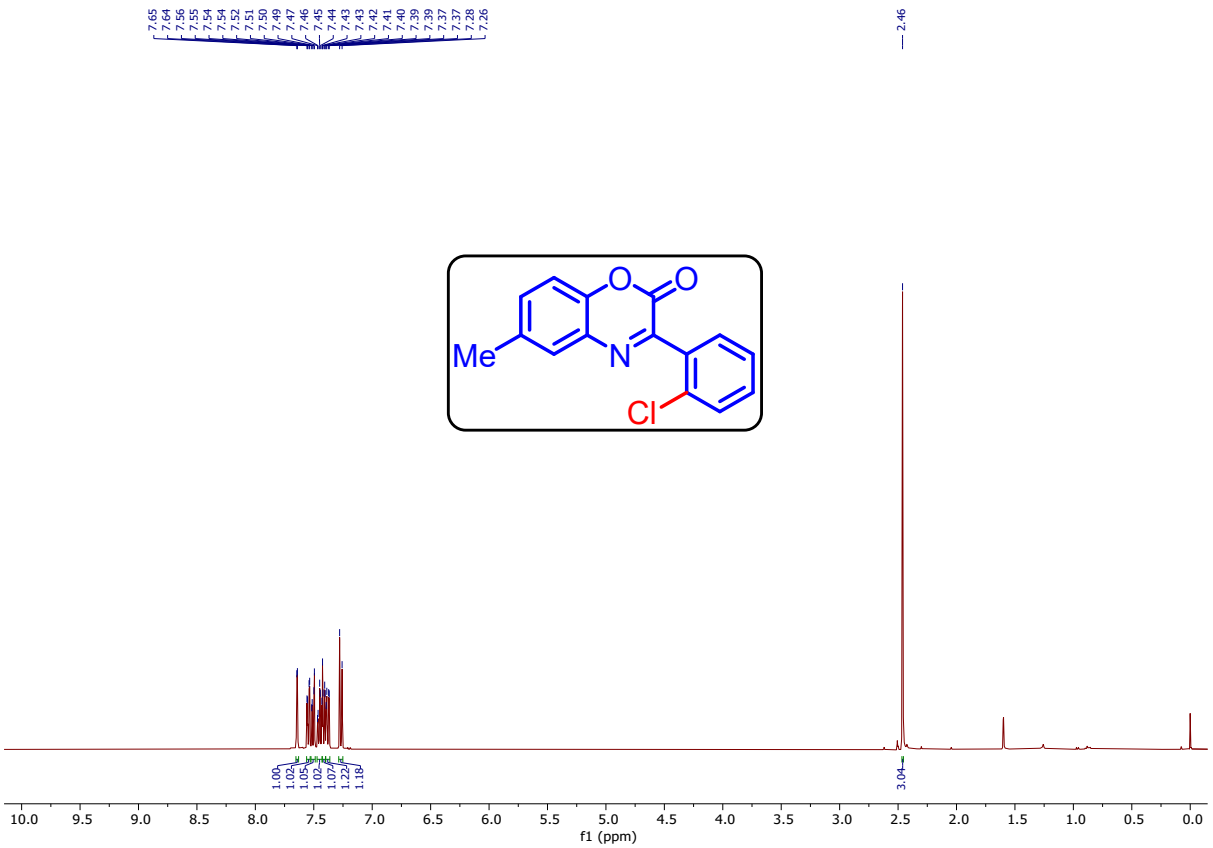



**Figure 43:** $^{1}$H NMR spectrum of compound **5b** (400 MHz, $CDCl_3$).

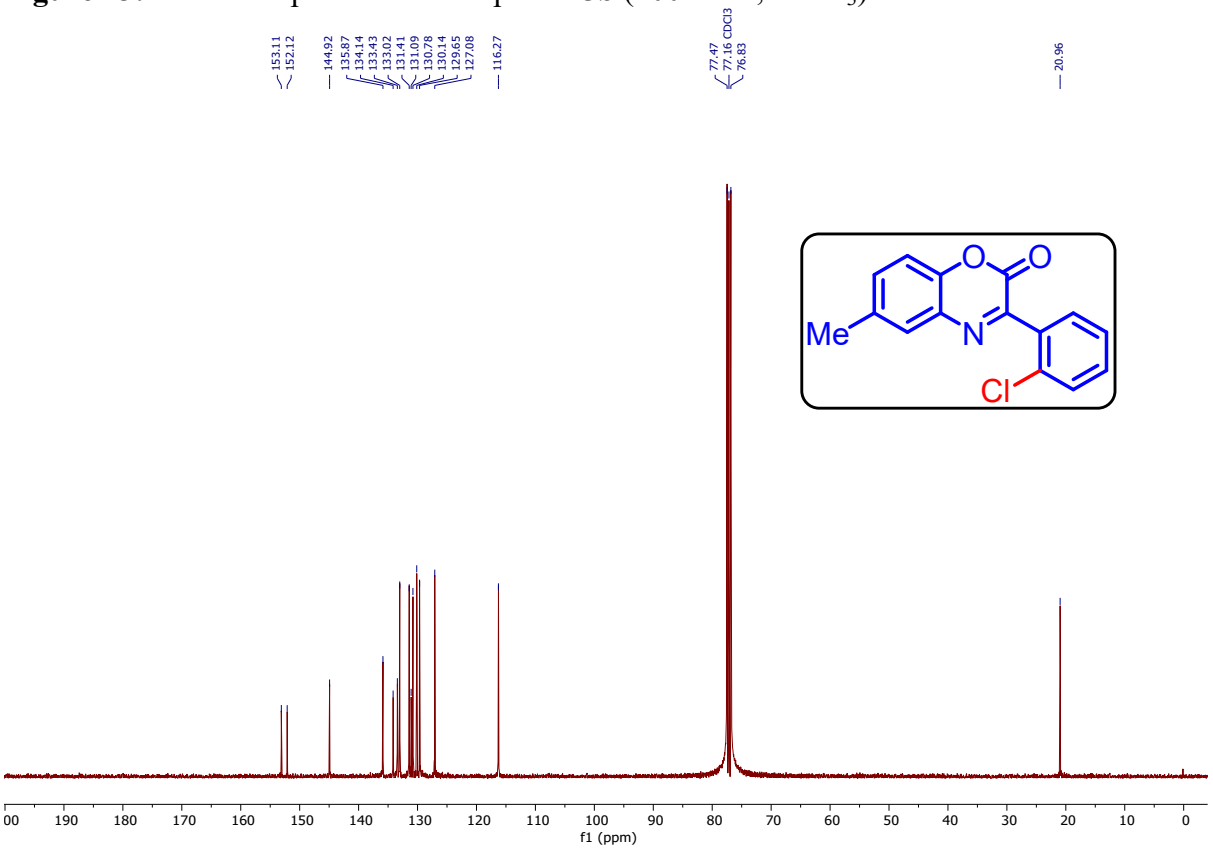



**Figure 44:** $^{13}$C NMR spectrum of compound **5b** (400 MHz, $CDCl_3$).

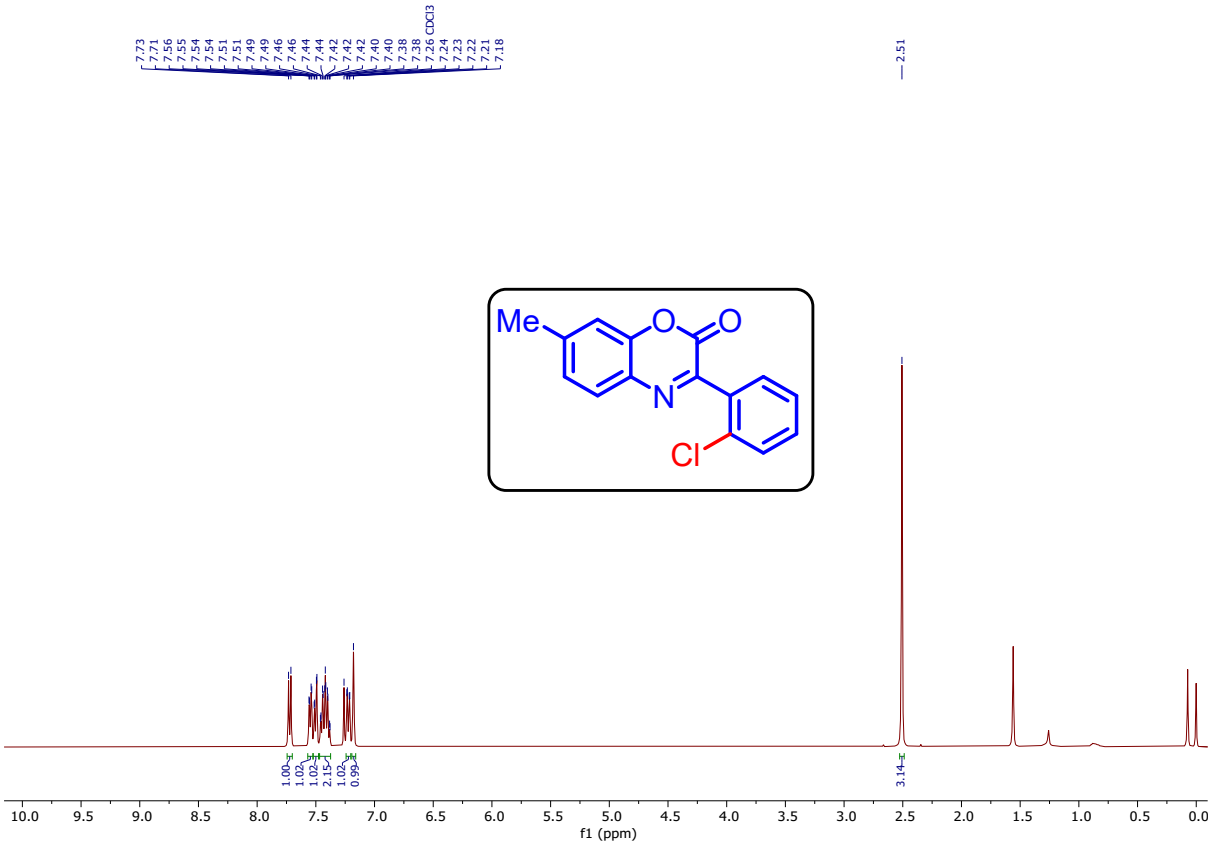



**Figure 45:** $^{1}$H NMR spectrum of compound **5c** (400 MHz, $CDCl_3$).

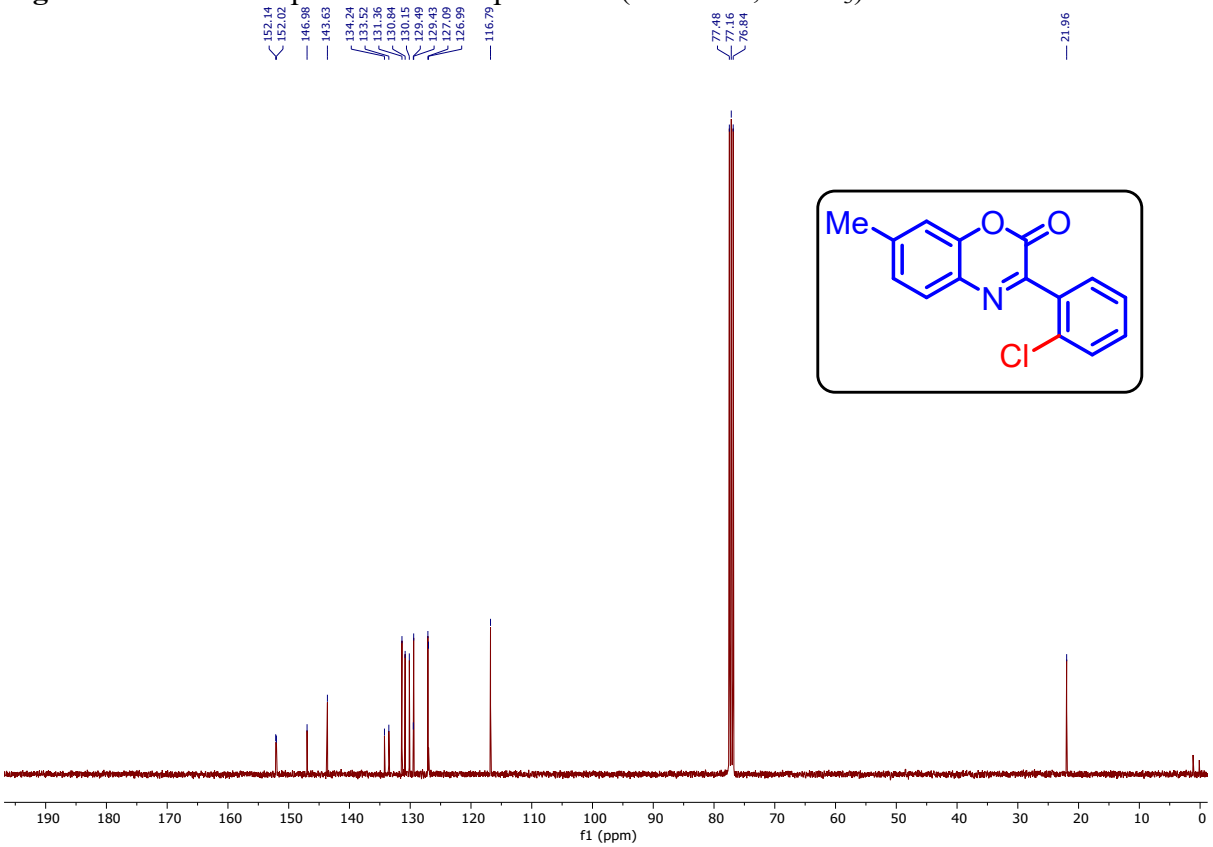



**Figure 46:** $^{13}$C NMR spectrum of compound **5c** (400 MHz, $CDCl_3$).

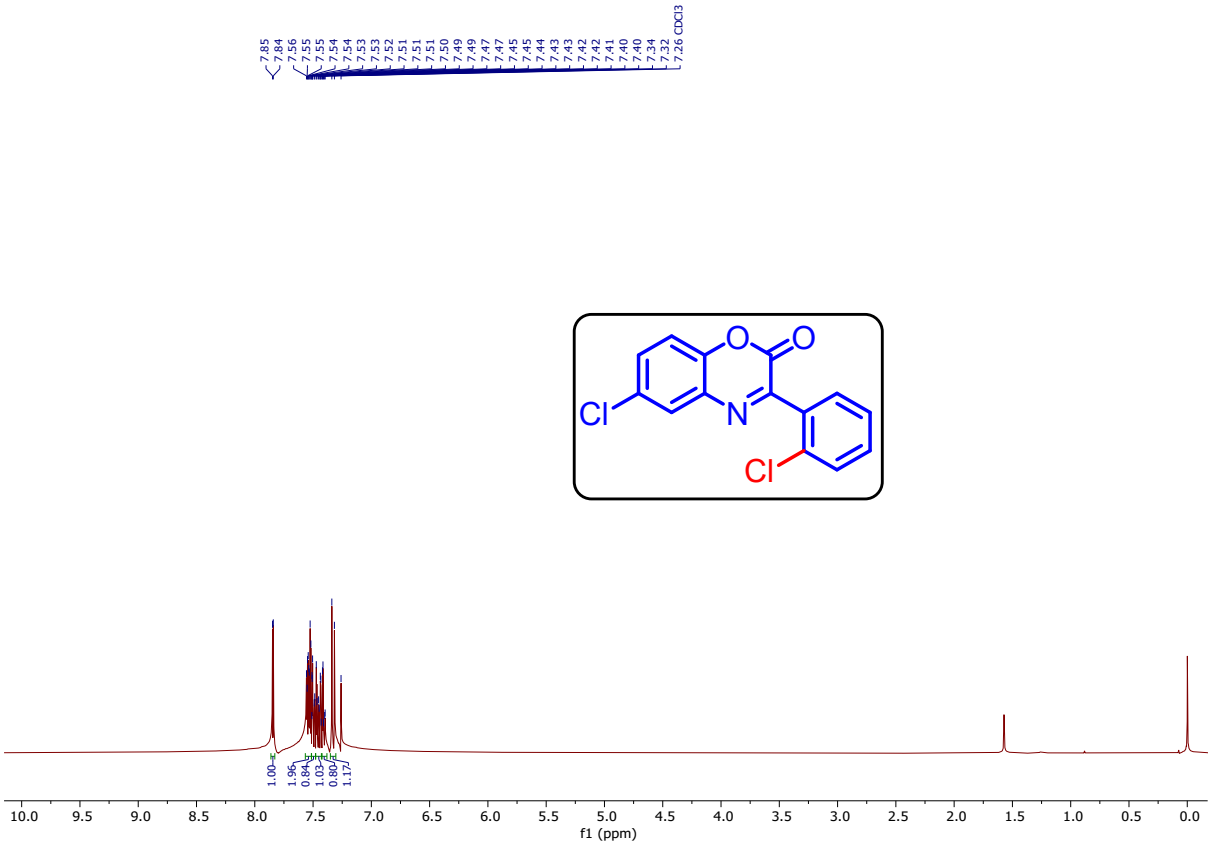



**Figure 47:** $^{1}$H NMR spectrum of compound **5d** (400 MHz, $CDCl_3$).

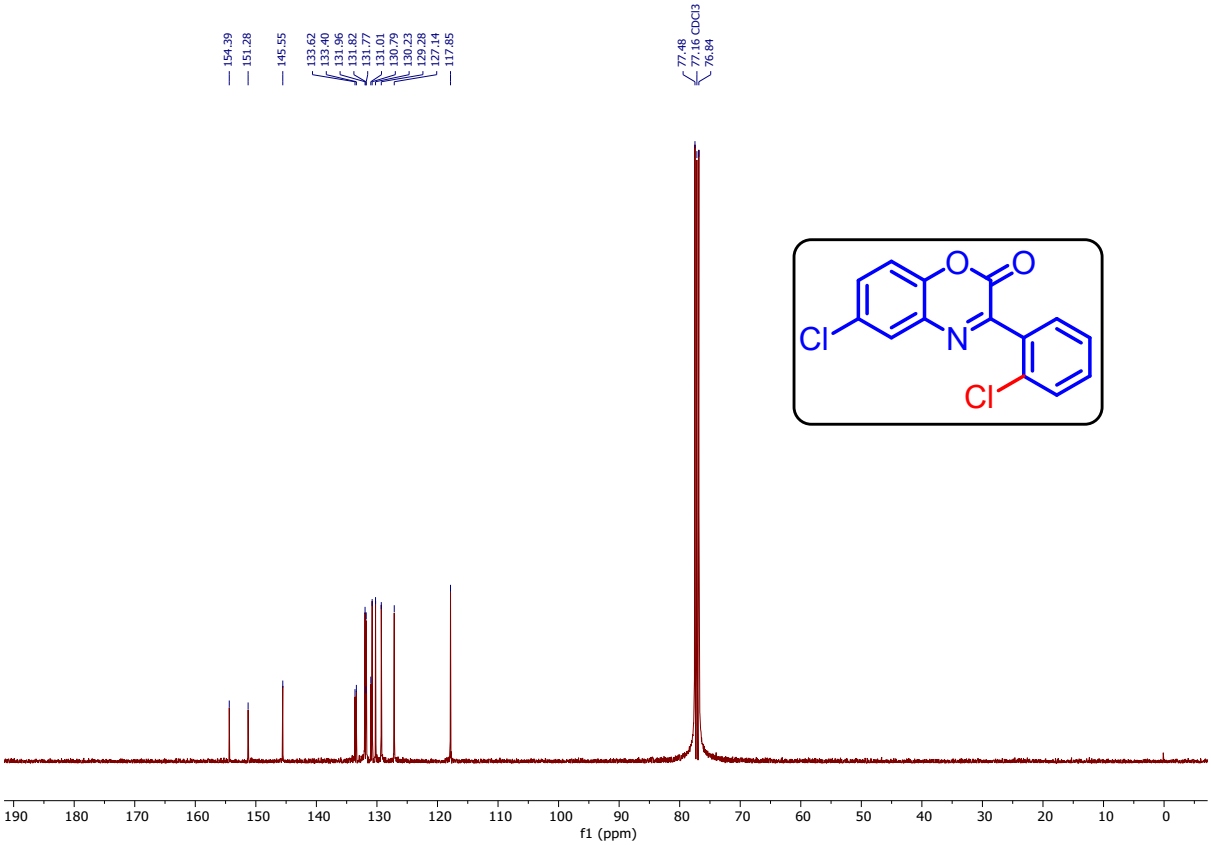



**Figure 48:** $^{13}$C NMR spectrum of compound **5d** (400 MHz, $CDCl_3$).

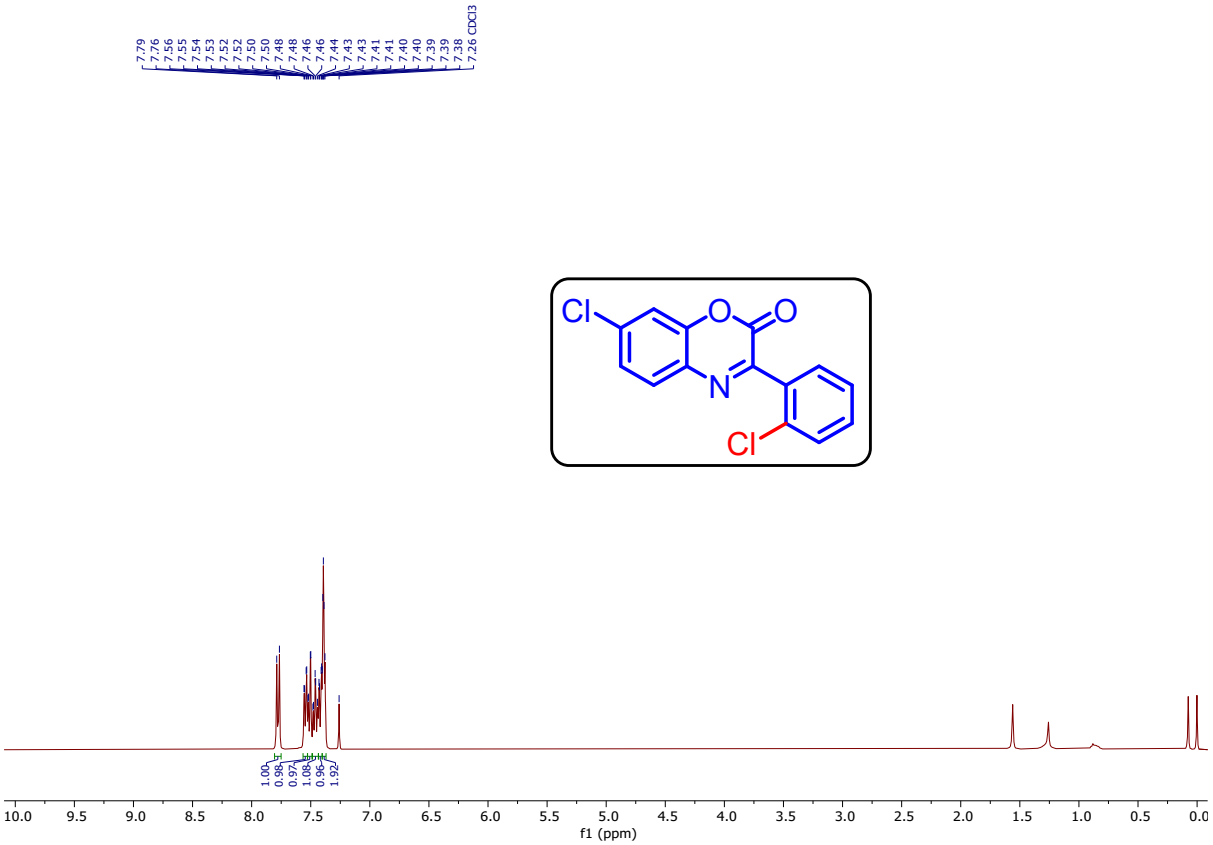



**Figure 49:** $^{1}$H NMR spectrum of compound **5e** (400 MHz, $CDCl_3$).

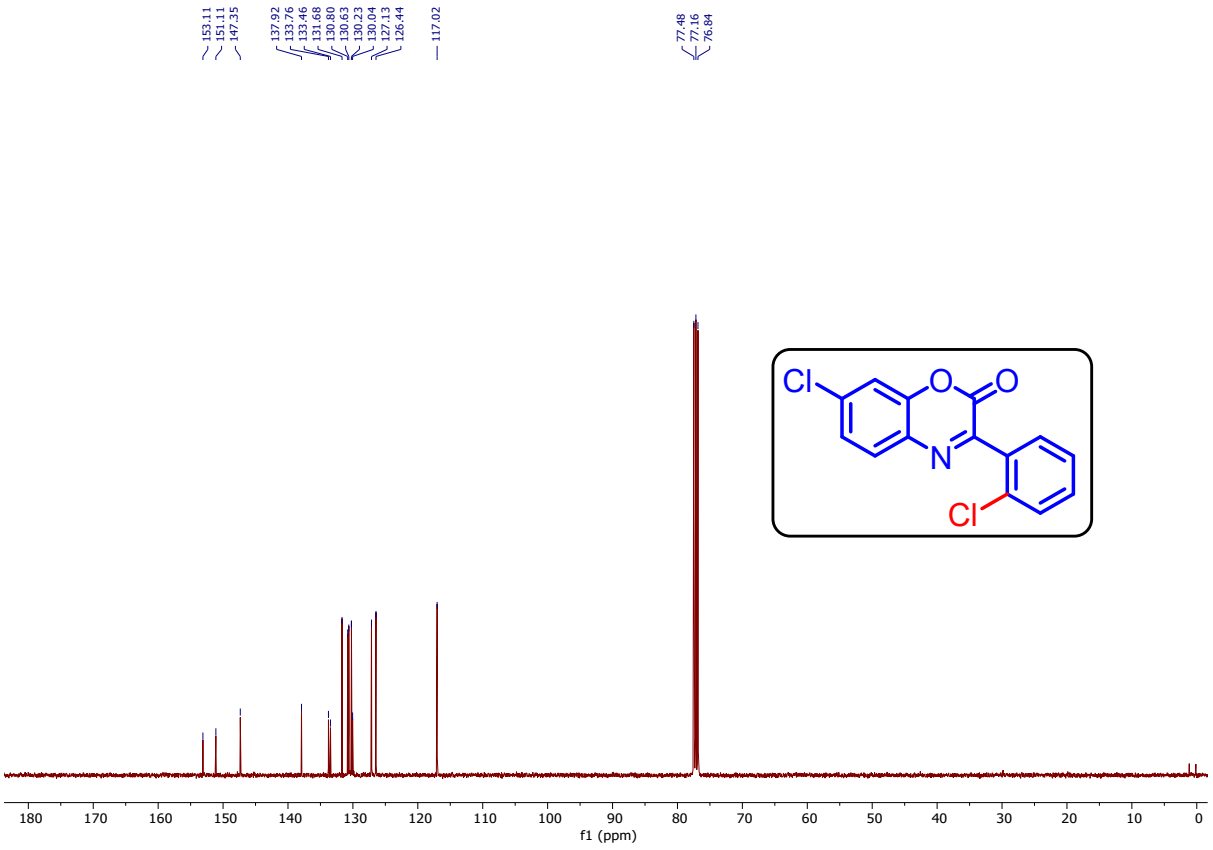



**Figure 50:** $^{13}$C NMR spectrum of compound **5e** (400 MHz, $CDCl_3$).

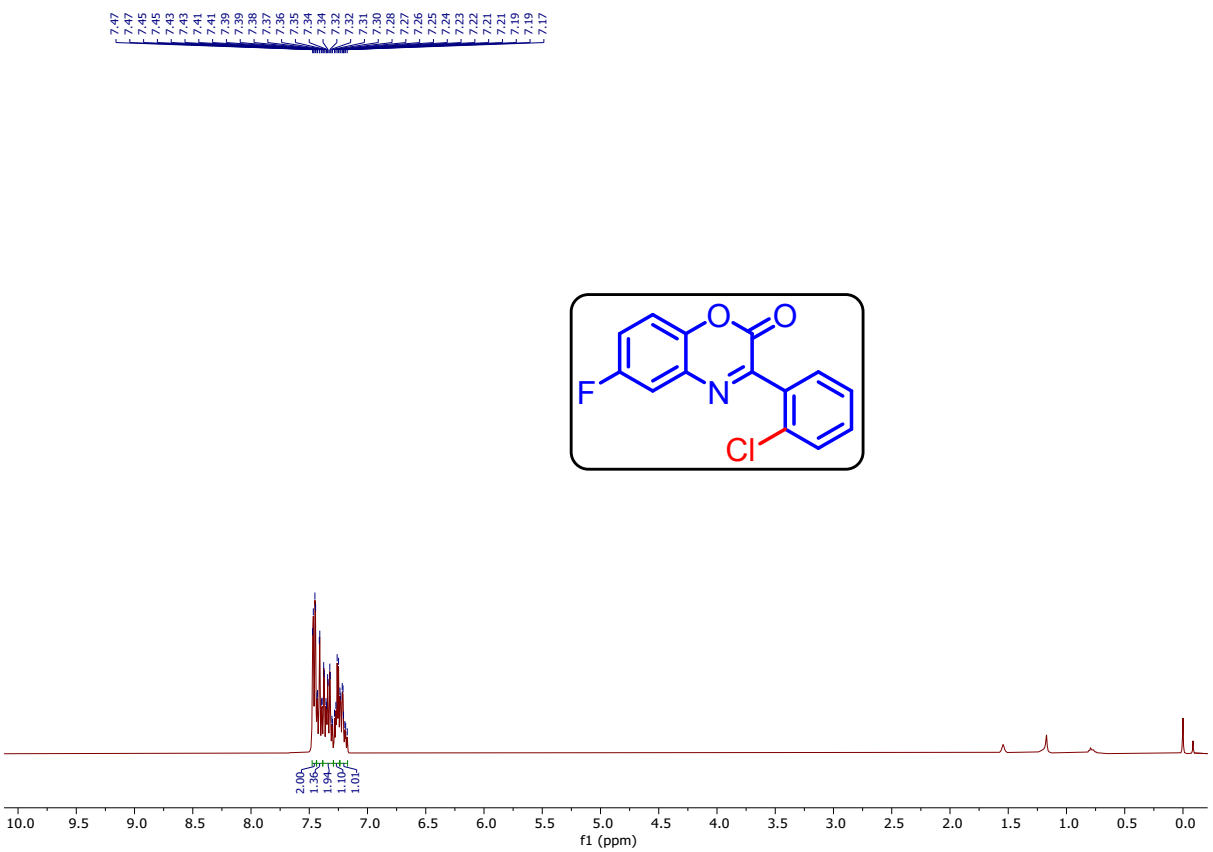



**Figure 51:** $^{1}$H NMR spectrum of compound **5f** (400 MHz, $CDCl_3$).

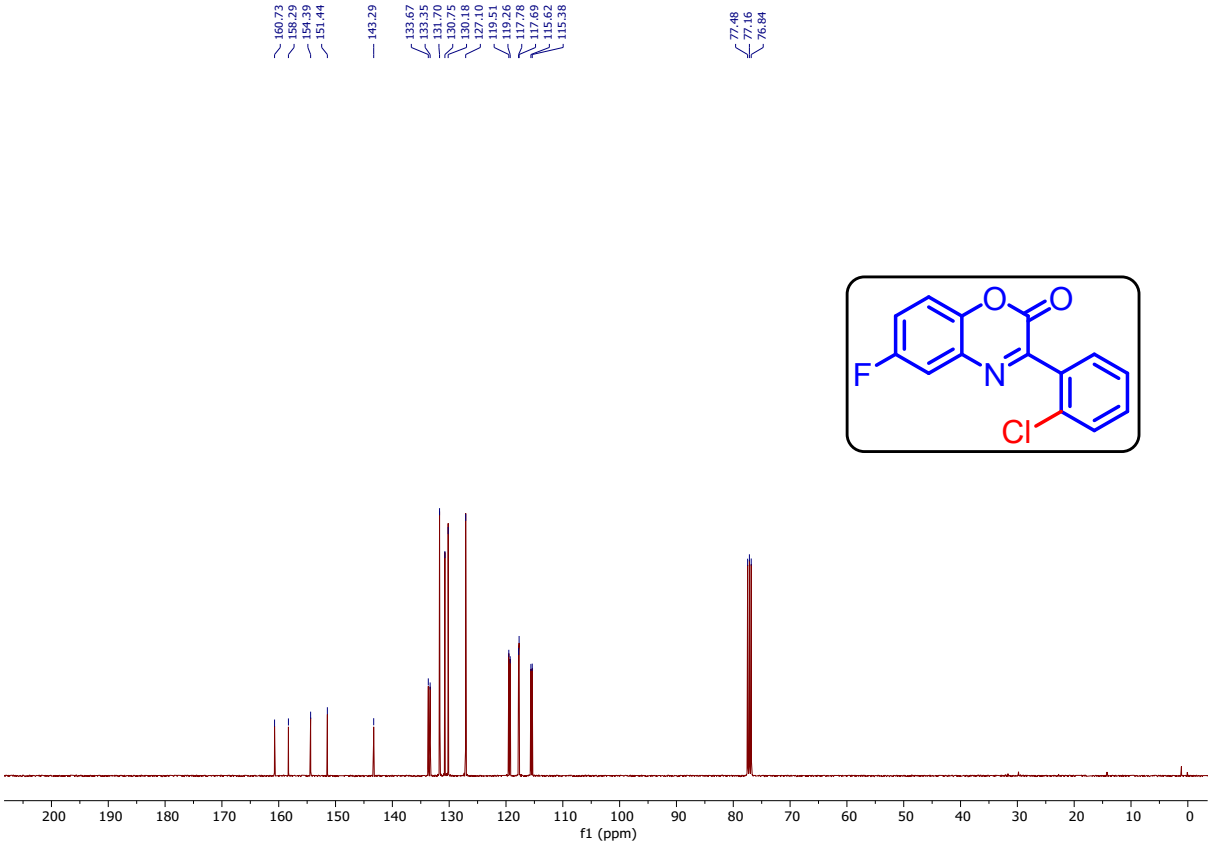



**Figure 52:** $^{13}$C NMR spectrum of compound **5f** (400 MHz, $CDCl_3$).

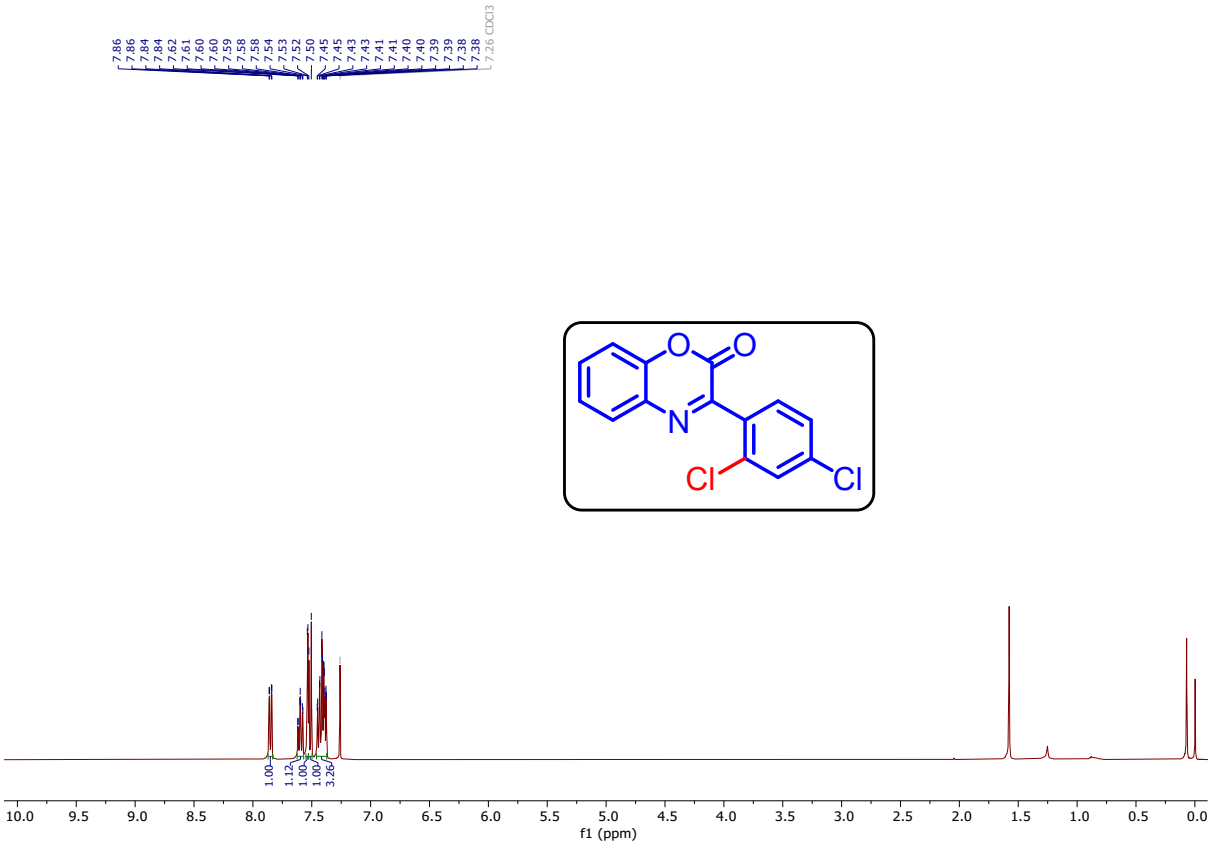



**Figure 53:** $^{1}$H NMR spectrum of compound **5g** (400 MHz, $CDCl_3$).

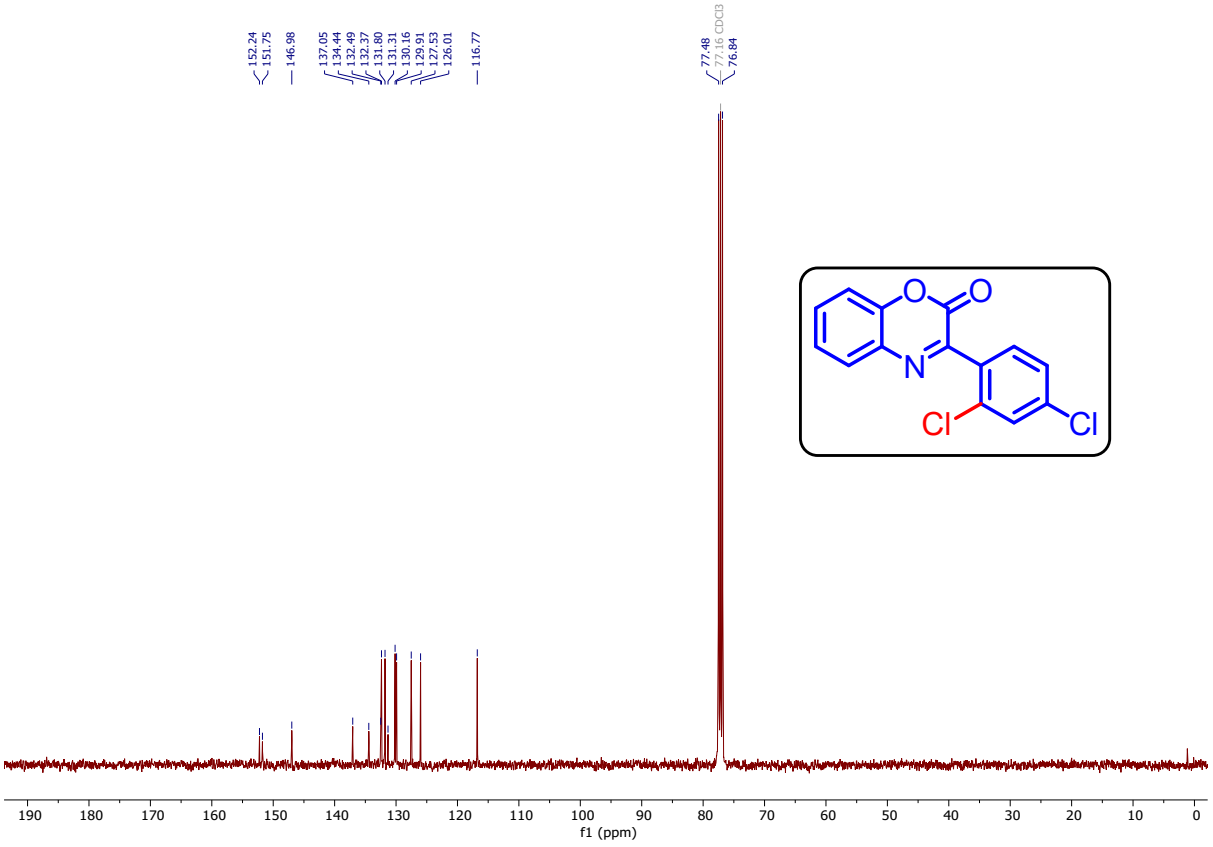



**Figure 54:** $^{13}$C NMR spectrum of compound **5g** (400 MHz, $CDCl_3$).

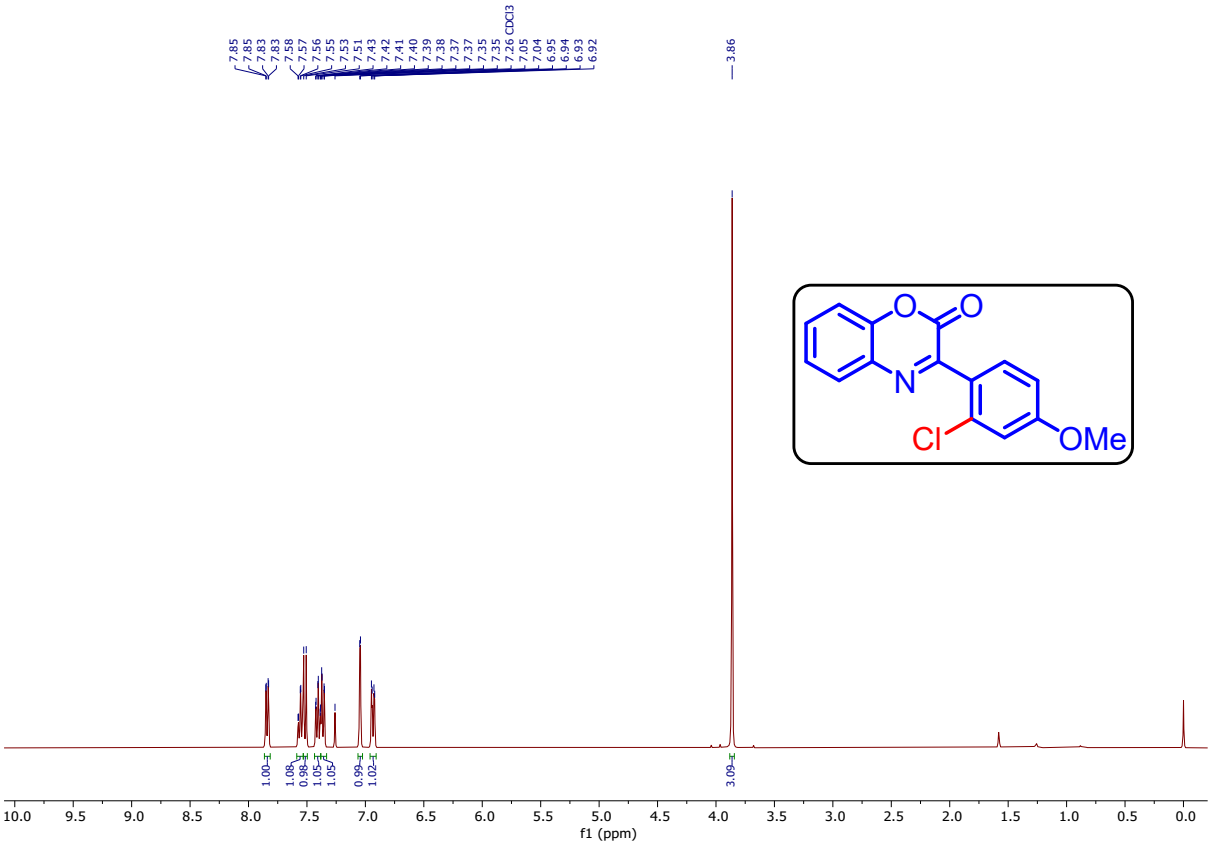



**Figure 55:** $^{1}H$ NMR spectrum of compound **5h** (400 MHz, $CDCl_3$).

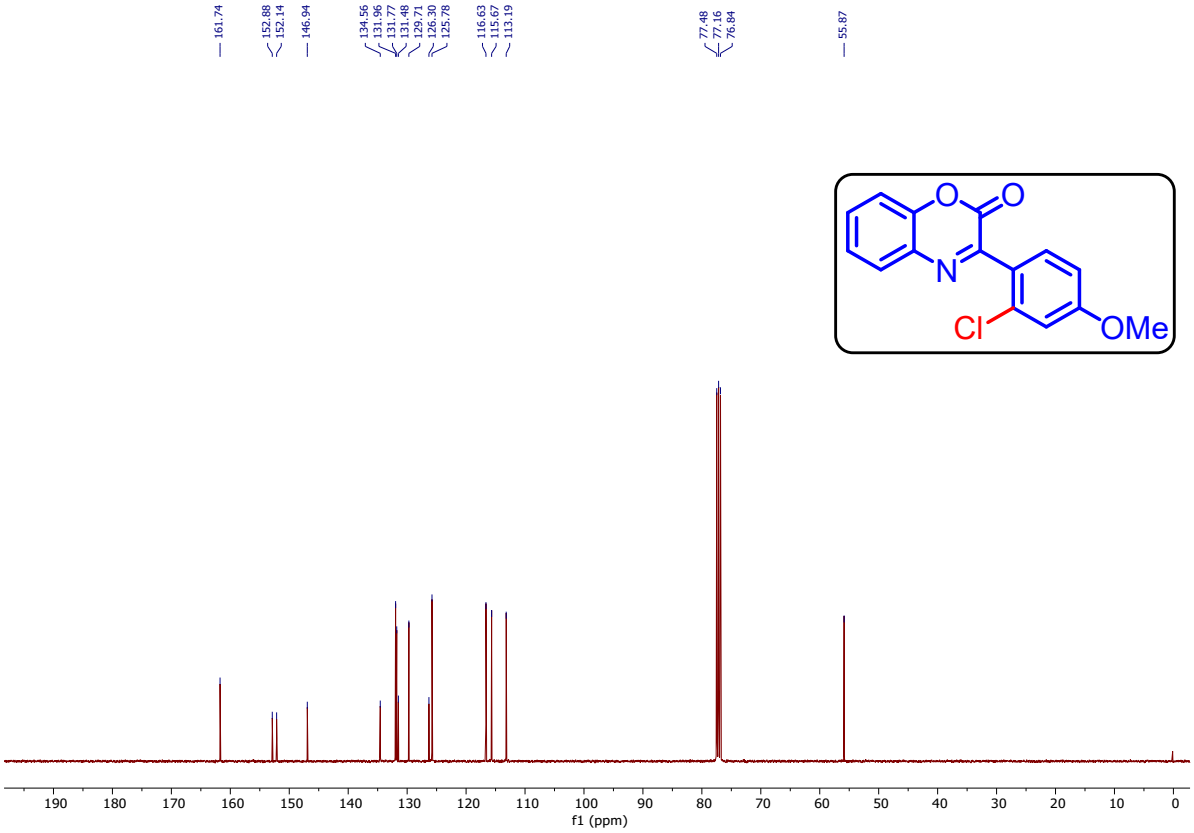



**Figure 56:** $^{13}C$ NMR spectrum of compound **5h** (400 MHz, $CDCl_3$).

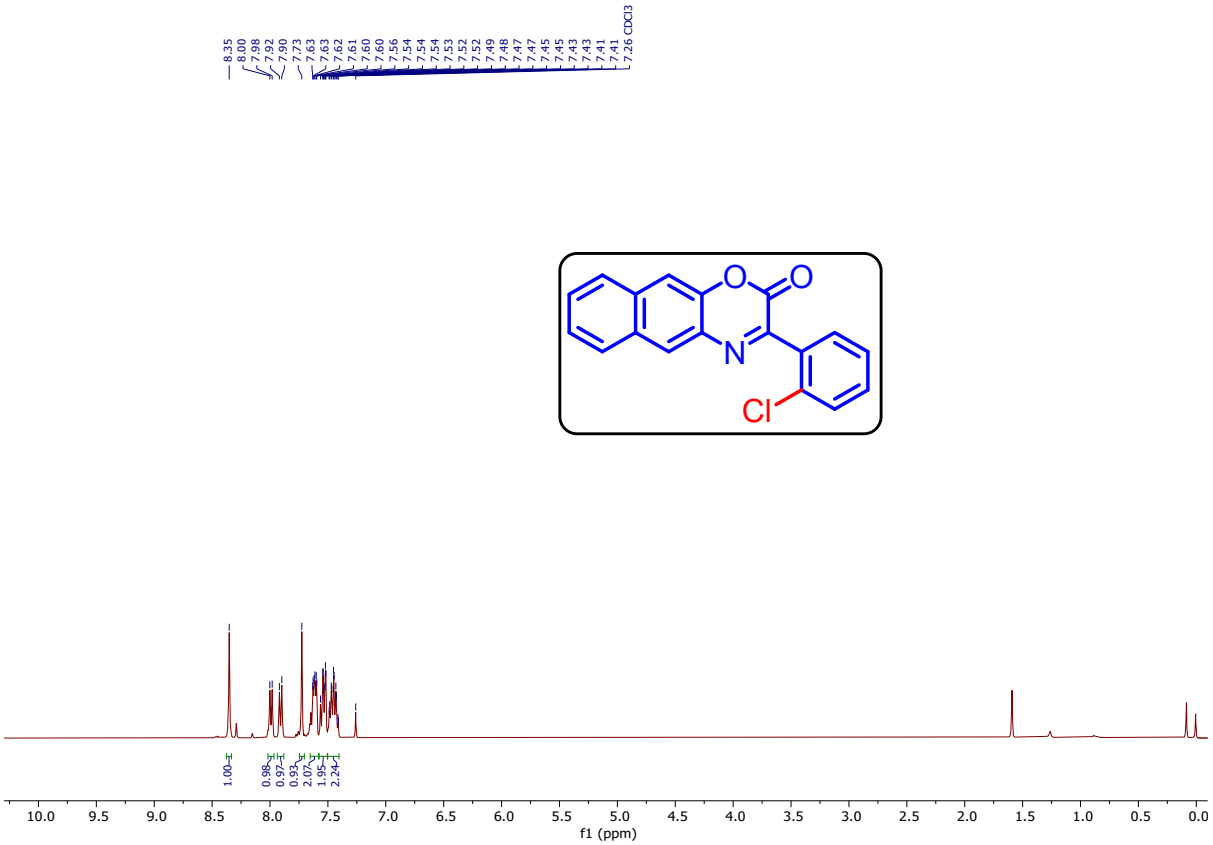



**Figure 57:** $^{1}$H NMR spectrum of compound **5i** (400 MHz, $CDCl_3$).

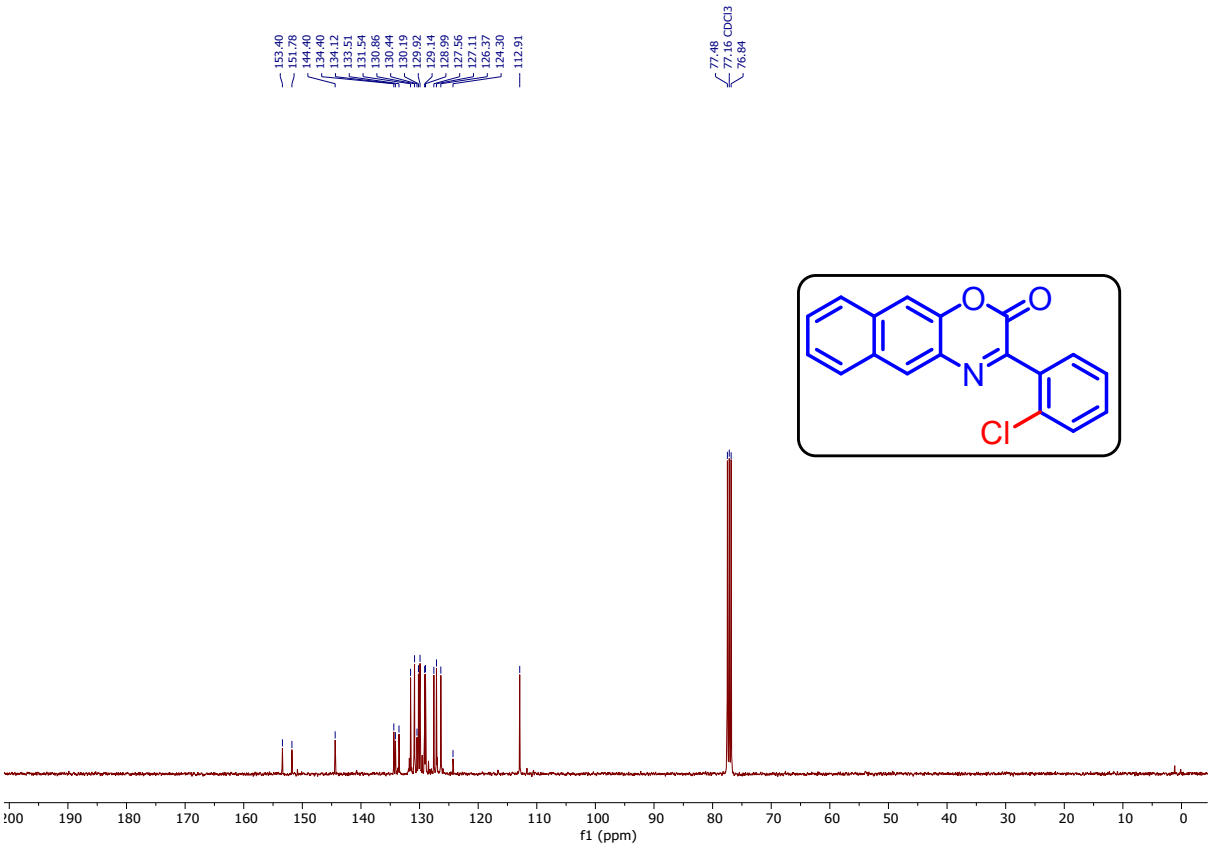



**Figure 58:** $^{13}$C NMR spectrum of compound **5i** (400 MHz, $CDCl_3$).

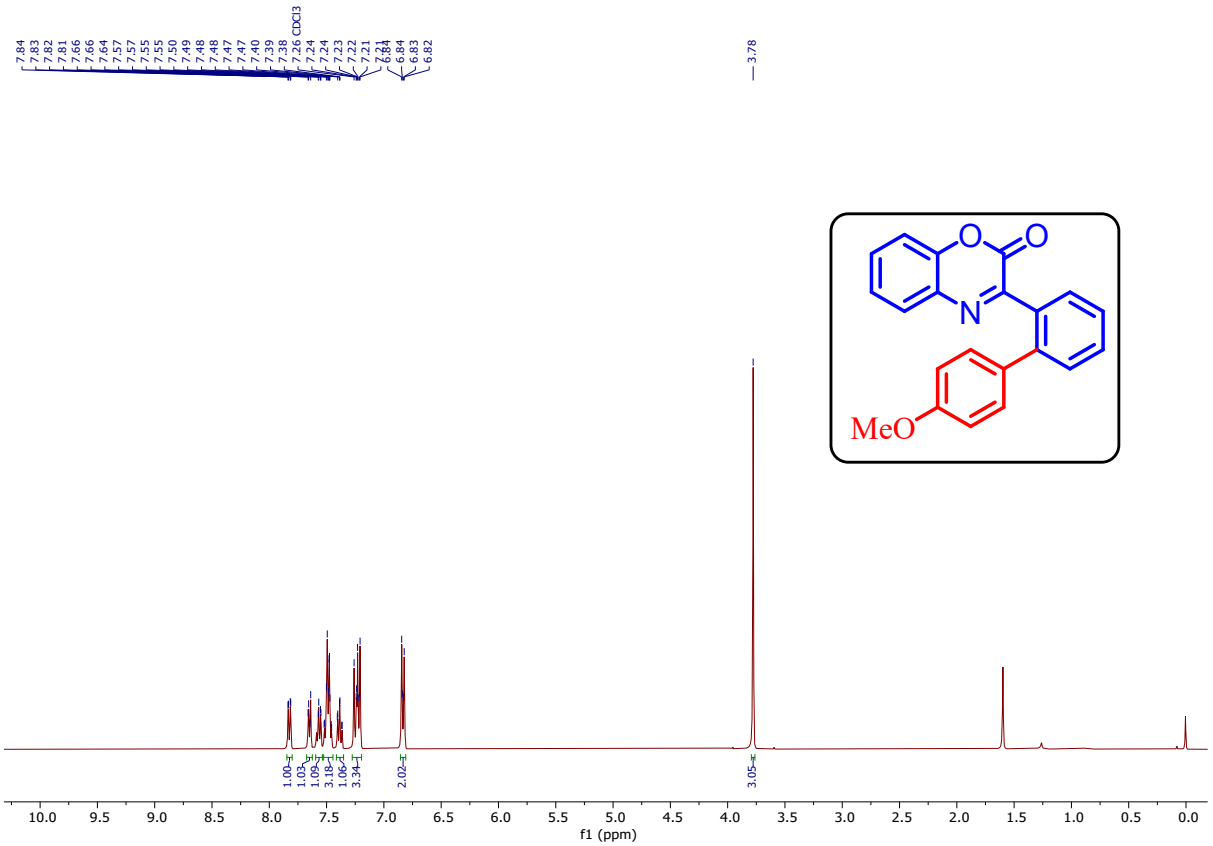



**Figure 59:** $^{1}$H NMR spectrum of compound **8** (400 MHz, $CDCl_3$).

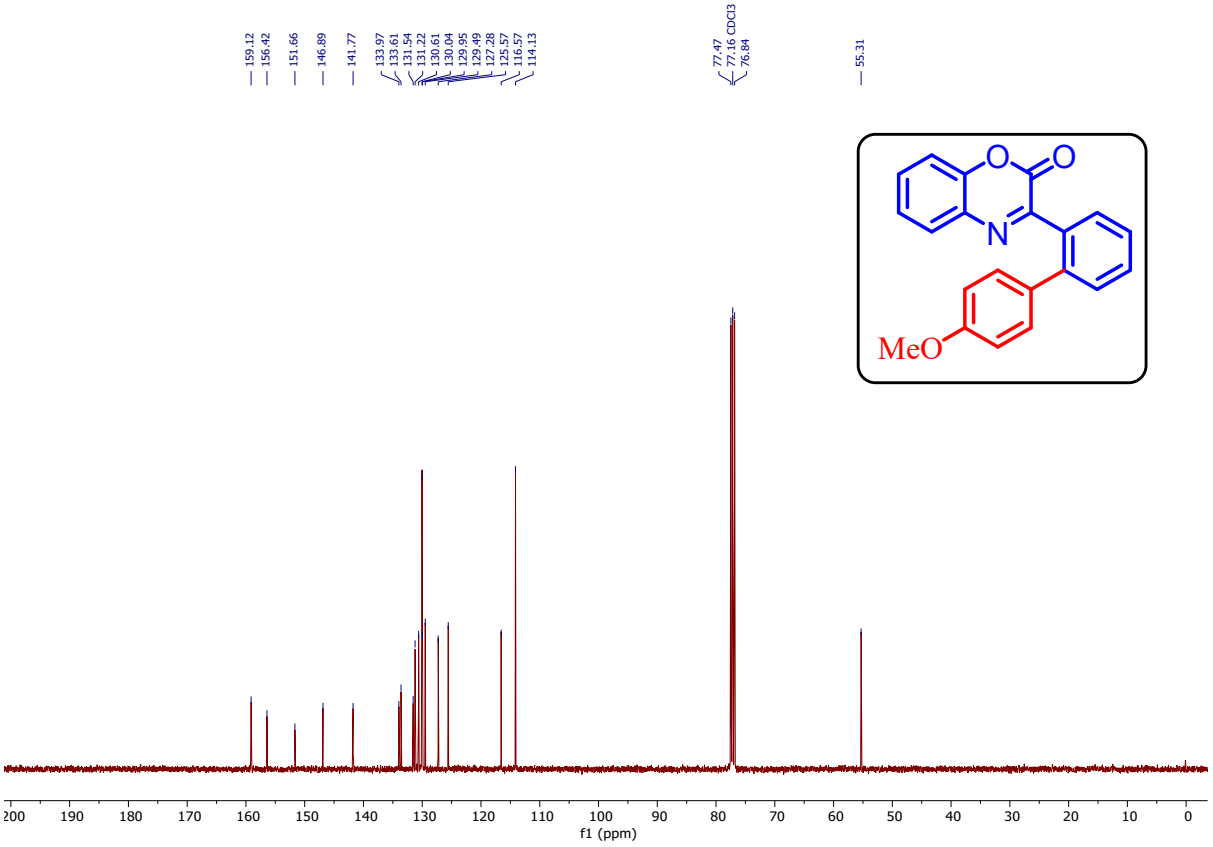



**Figure 60:** $^{13}$C NMR spectrum of compound **8** (400 MHz, $CDCl_3$).

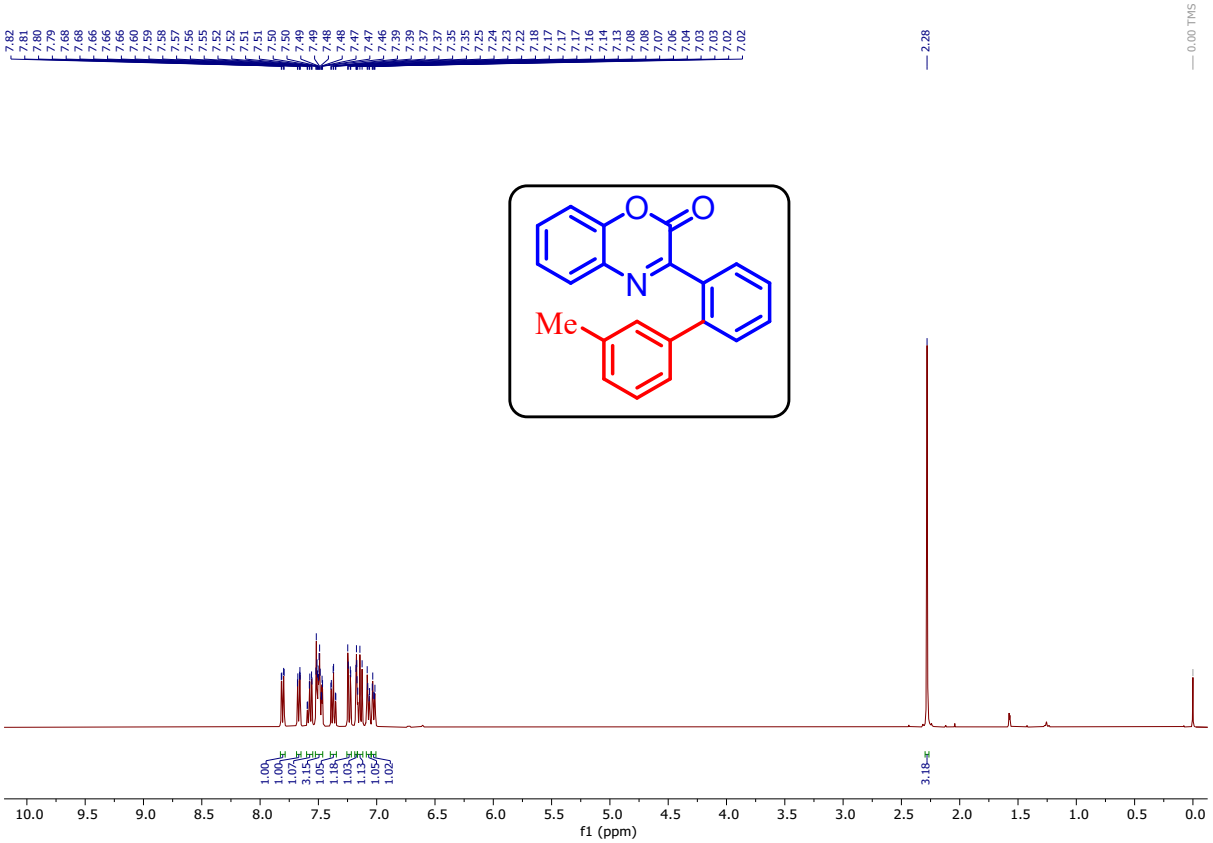



**Figure 61:** $^{1}$H NMR spectrum of compound **9** (400 MHz, $CDCl_3$).

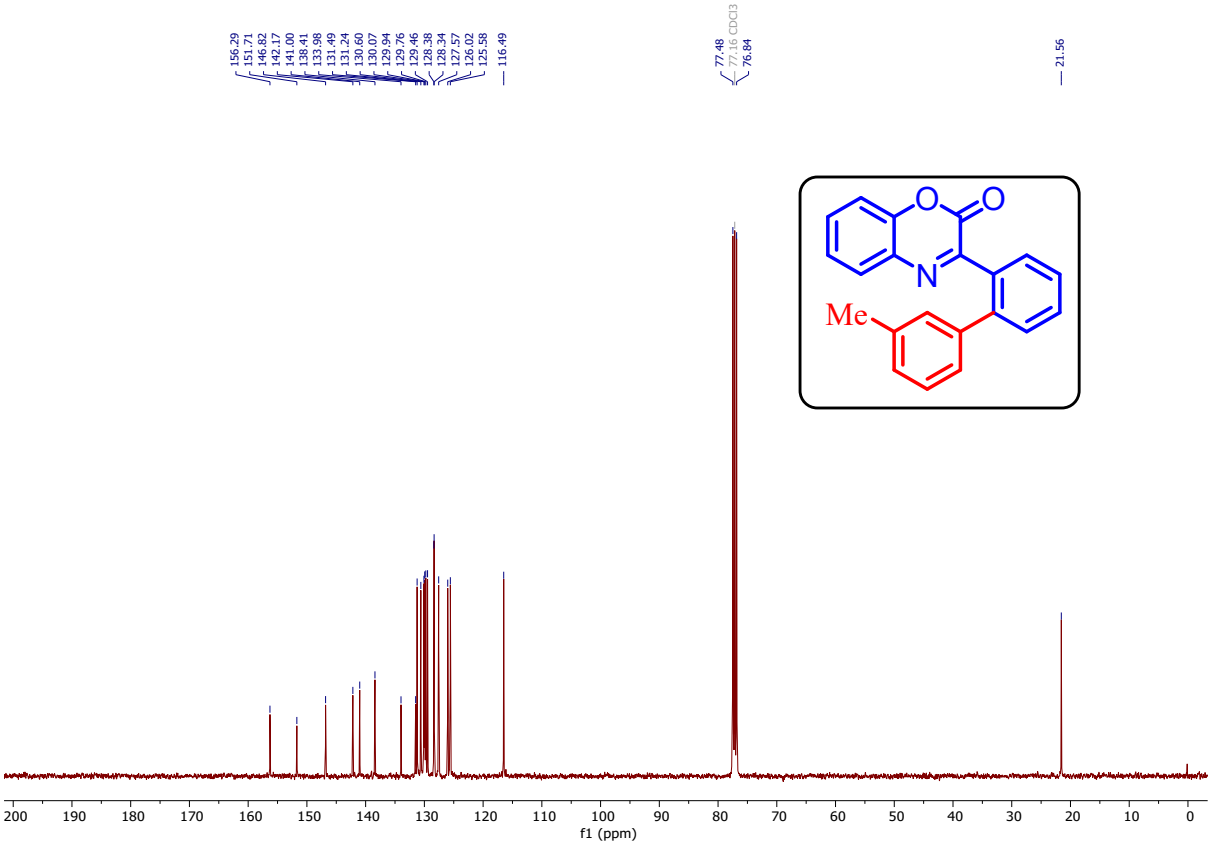



**Figure 62:** $^{13}$C NMR spectrum of compound **9** (400 MHz, $CDCl_3$).

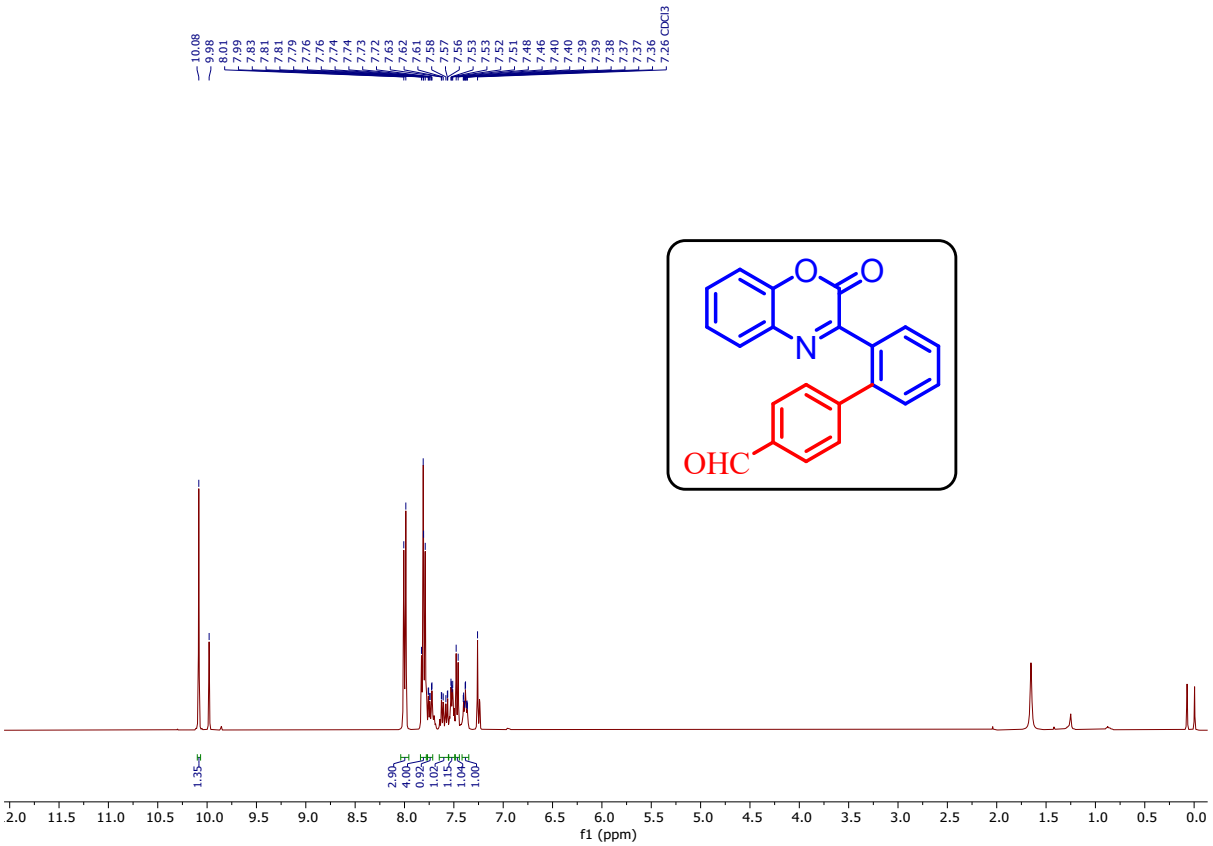



**Figure 63:** $^{1}$H NMR spectrum of compound **10** (400 MHz, $CDCl_3$).

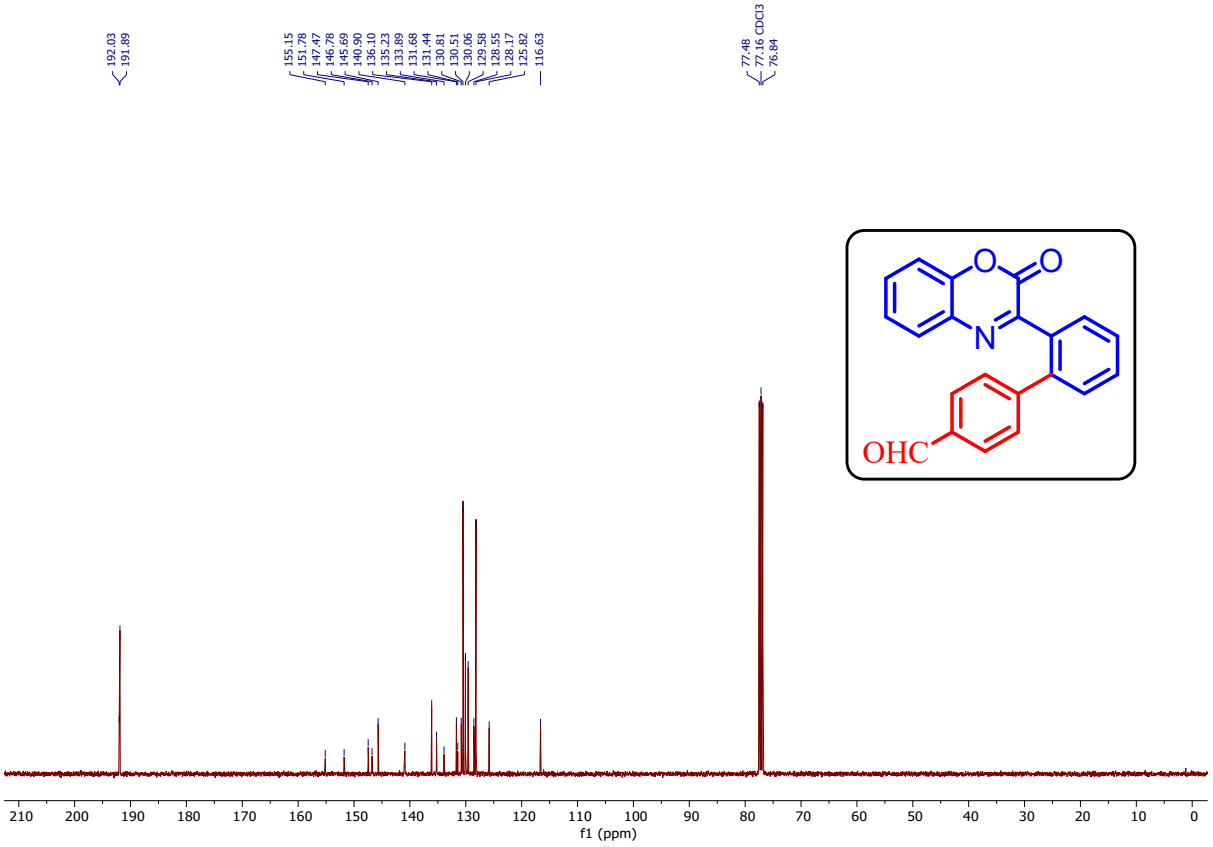



**Figure 64:** $^{13}$C NMR spectrum of compound **10** (400 MHz, $CDCl_3$).

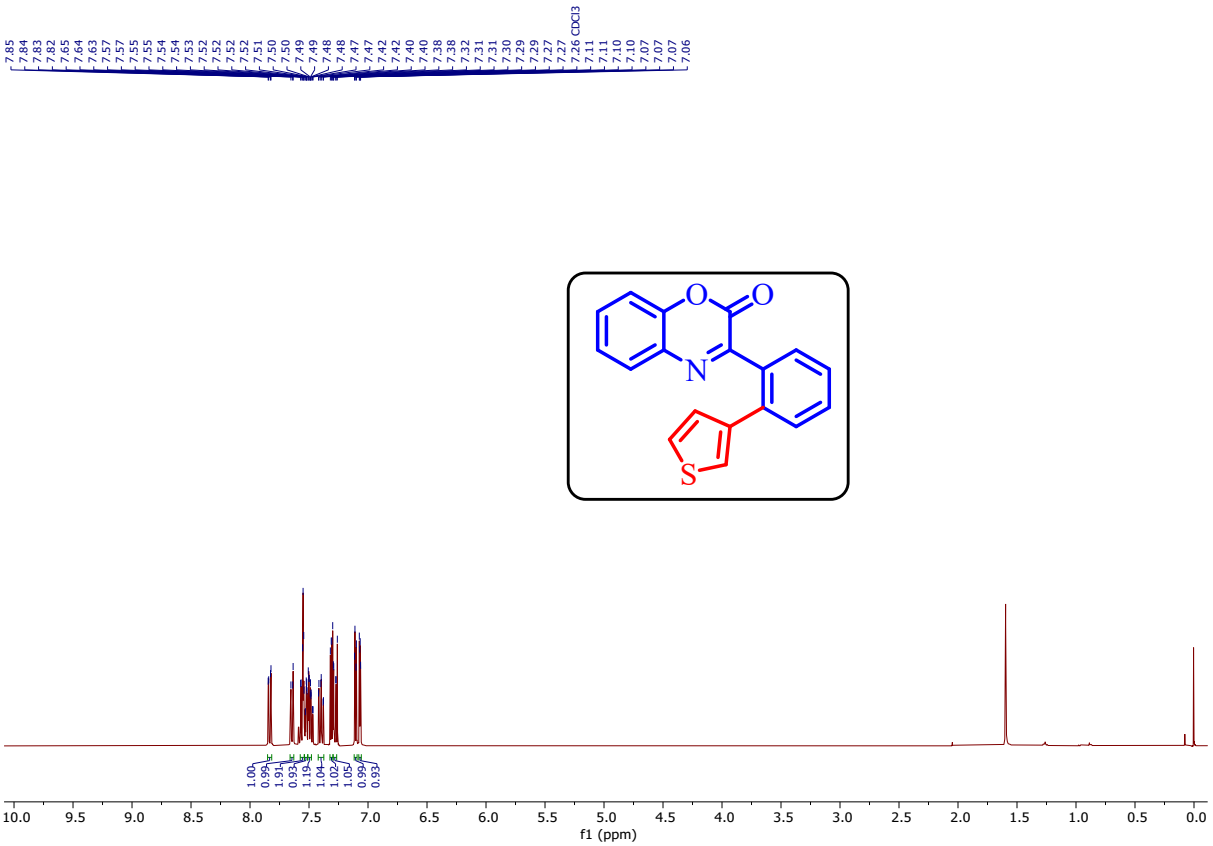



**Figure 65:** $^{1}$H NMR spectrum of compound **11** (400 MHz, $CDCl_3$).

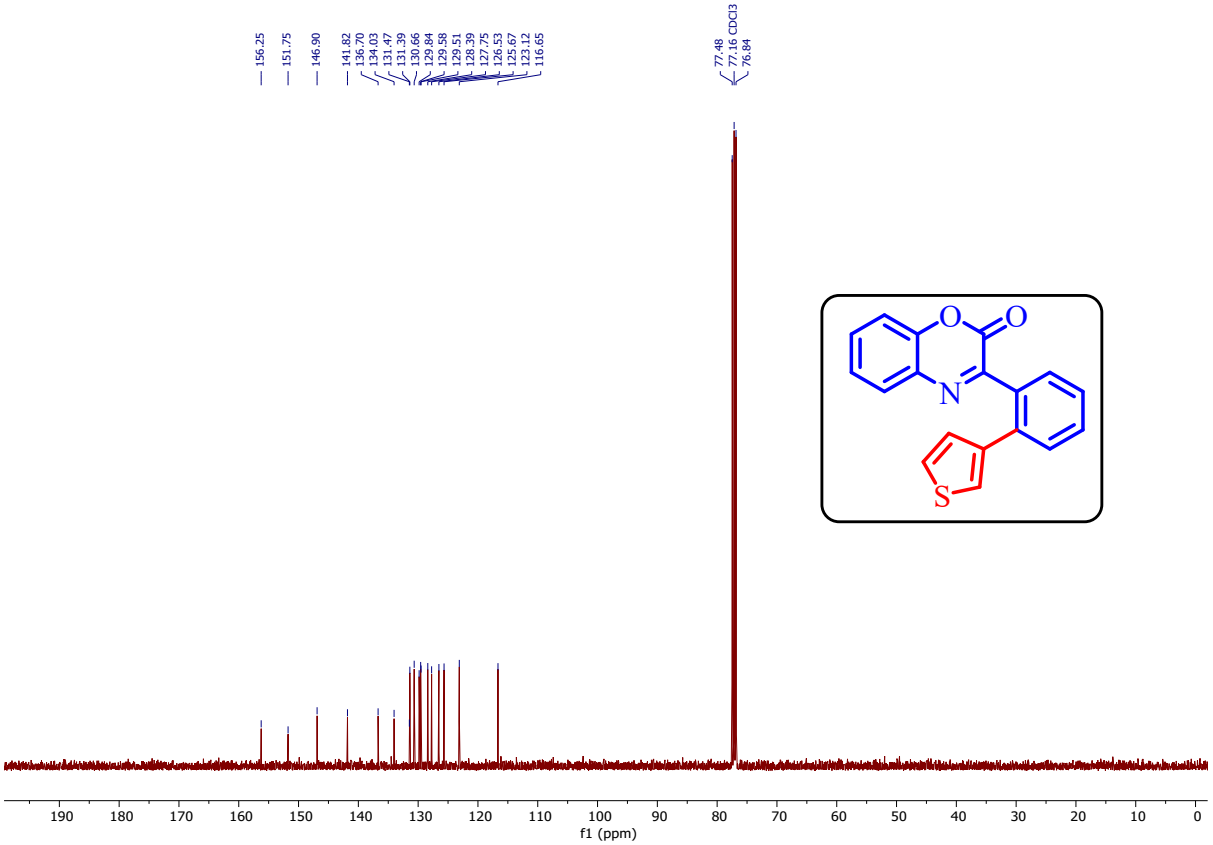



**Figure 66:** $^{13}$C NMR spectrum of compound **11** (400 MHz, $CDCl_3$).

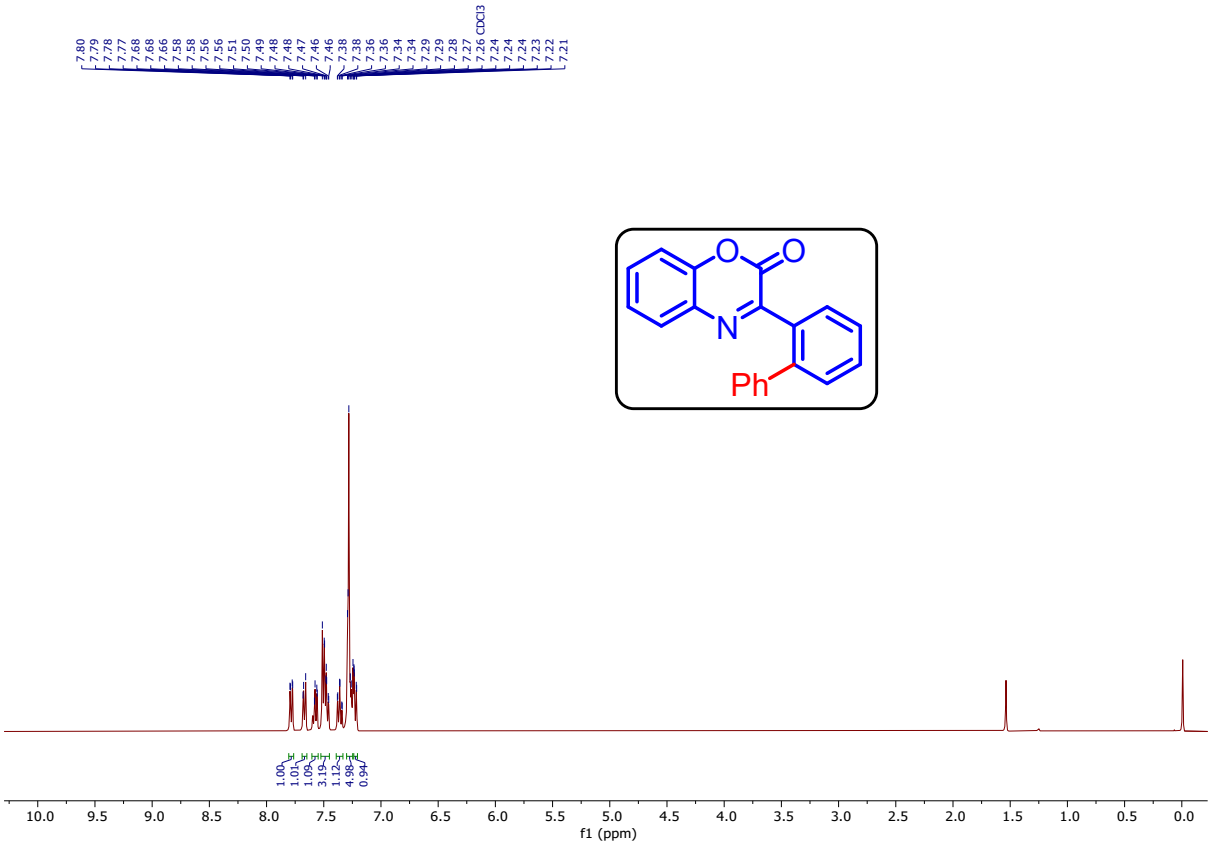



**Figure 67:** $^{1}$H NMR spectrum of compound **12** (400 MHz, $CDCl_3$).

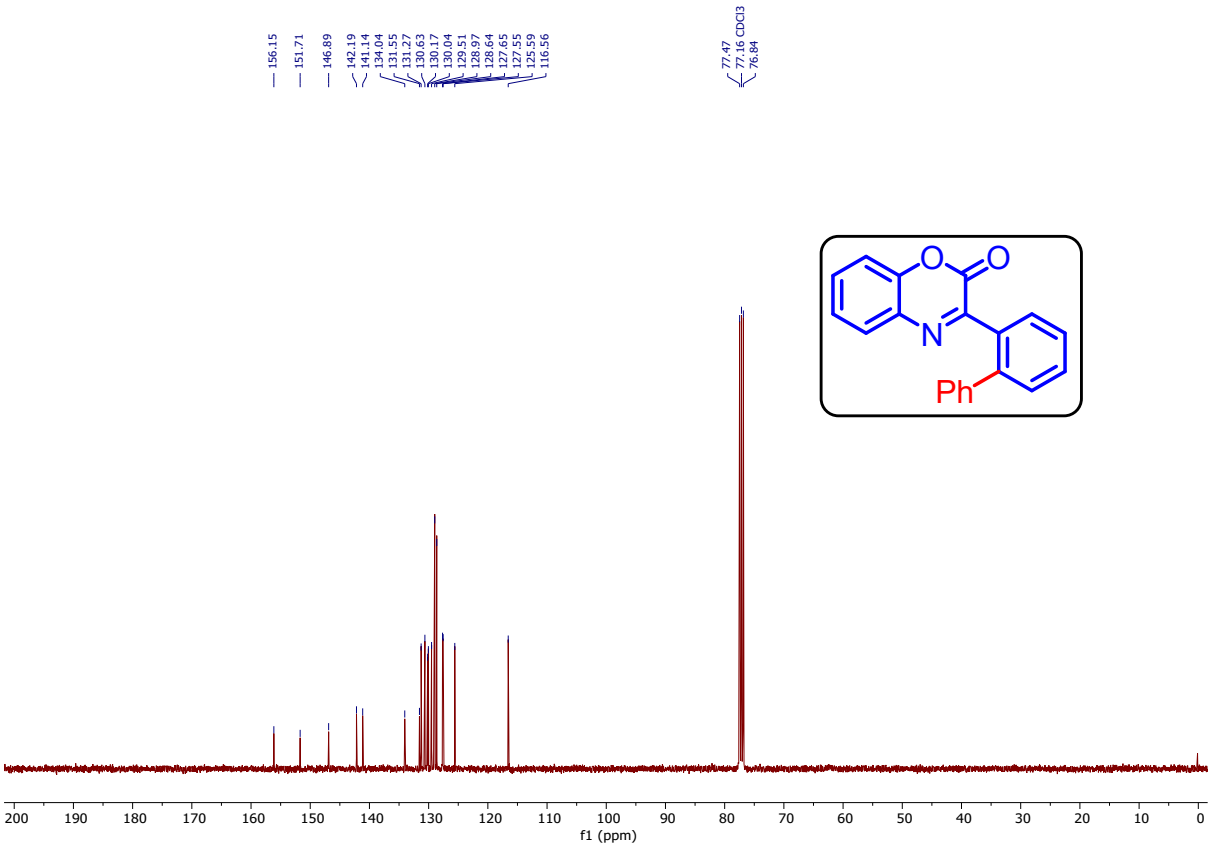



**Figure 68:** $^{13}$C NMR spectrum of compound **12** (400 MHz, $CDCl_3$).