# Supplementary Information

## Metal-free polychloromethyl radical-initiated cyclization of unactivated *N*-allylindoles towards pyrrolo[1,2-*a*]indoles

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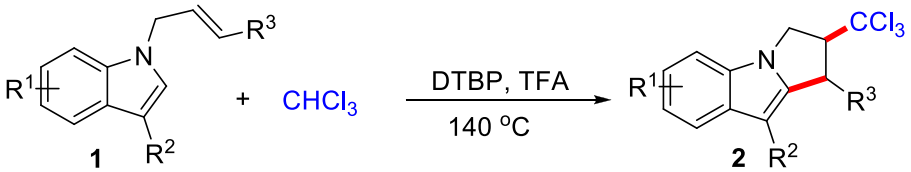
## 1. General Considerations

**General Information:** Unless otherwise noted, all chemicals were purchased and used without further purification. $^{1}$H NMR and $^{13}$C NMR spectra were recorded at ambient temperature on 400 MHz NMR spectrometer (100 MHz for $^{13}$C). NMR experiments are reported in $\delta$ units, parts per million (ppm), and were referenced to $CDCl_3$ (*d* 7.26 or 77.0) as the internal standard. The coupling constants *J* are given in Hz. Column chromatography was performed using EM Silica gel 60 (300-400 mesh).

## 2. General Synthetic Procedures

All indole derivatives **1** were prepared according to the previous reports.[1]

**General procedure for the synthesis of trichloromethylated 2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indoles (2):**

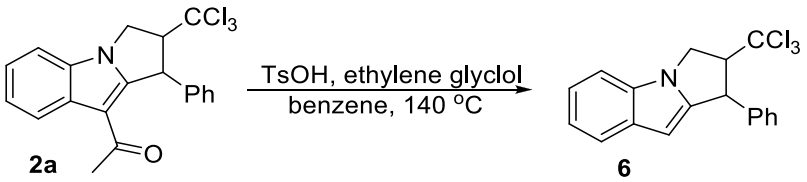



Under air, the mixture of **1** (0.2 mmol), DTBP (3 eq), TFA (2 eq) and chloroform (or $CCl_4$) (2 mL) was added to a Schlenk tube and sealed. The mixture was stirred at 140 ℃ for 12 hours. Then, the solvent was evaporated under reduced pressure, and the residue was purified by silica gel flash column chromatography to obtain product **2**.

**General procedure for the synthesis of dichloromethylated and dibromomethylated 2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indoles (3 or 5):**

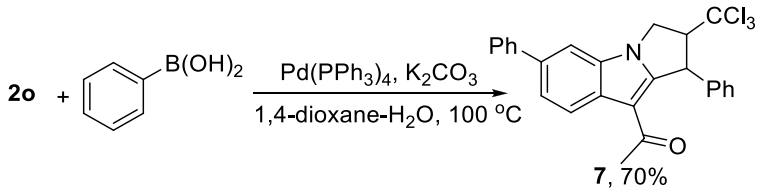
Under air, the mixture of **1** (0.2 mmol), DTBP (3 eq), TFA (1 eq), NaOAc (1 eq) and dichloromethane (or dibromomethane) (2 mL) were added to a Schlenk tube and sealed. The mixture was stirred at 140 ℃ for 12 hours. Then, the solvent was evaporated under reduced pressure, and the residue was purified by silica gel flash column chromatography to obtain product **3** (or **5**).

**Derivatization reactions**

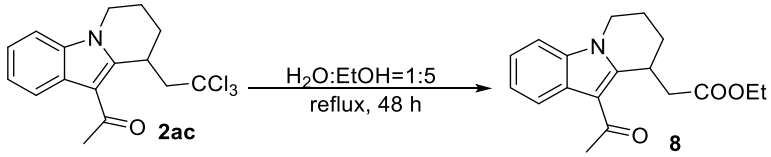



A mixture of **2a** (39.2 mg, 0.1 mmol), TsOH (95 mg, 5 equiv.) and ethylene glycol (50 mg, 8 equiv.) in 2.0 mL of benzene was stirred under 120 °C for 36 hours and cooled.[2] Saturated sodium bicarbonate solution (1 mL) was added and the

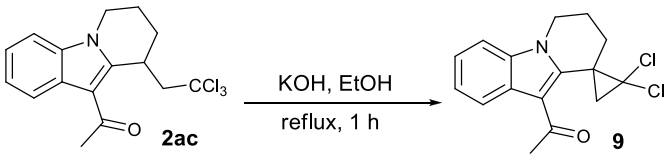
organic layer was separated. Combined organic phase were dried over anhydrous $Na_2SO_4$, evaporated under vacuum and purified by silica gel flash column chromatography to give **6** (23 mg, 66% yield) .




Under $N_2$, a 20 mL Schlenk tube was equipped with a stir bar and charged with **2o** (47.2 mg, 0.1 mmol), $PhB(OH)_2$ (14.6 mg, 1.2 mmol), $K_2CO_3$ (45.5 mg, 3.3 mmol), $Pd(PPh_3)_4$ (5.8 mg, 5 mol %), 0.5 mL of dioxane and 0.5 mL of $H_2O$, sealed with a Teflon lined cap.[3] The mixture was stirred at 100 ℃ for 12 h. Upon the completion of the reaction, the mixture was poured into ethyl acetate (5 mL×3). The organic layer was separated and dried over $Na_2SO_4$ and then filtered. The resulting residue was purified by silica gel flash column chromatography to afford **7** (32.7 mg, 70%).



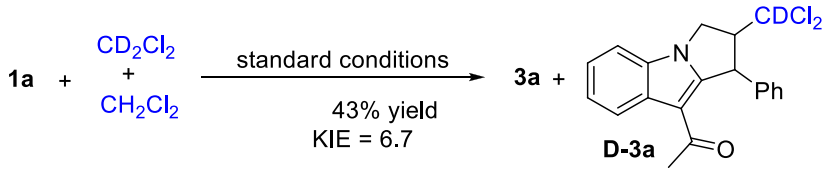

Under air, the mixture of **2ac** (34.5 mg, 0.1 mmol), $H_2O$ (0.5 mL) and EtOH (2.5 mL) heated to reflux and stirred for 48 h.[4] Upon the completion of the reaction, the mixture was extracted with acetate (5 mL×3). The organic layers were collected and dried over $Na_2SO_4$ and then filtered. The resulting residue was purified by silica gel flash column chromatography to afford **8** (15.1 mg, 50%).




A mixture of **2ac** (34.5 mg, 0.1 mmol)) and KOH (56 mg, 10 eq) in EtOH (6 mL) was added into a flask and reflux for 1 h. After the completion of the reaction, the mixture was cooled to room temperature. Afterwards, ice was added and neutralized by 1N HCl. The mixture was extracted by acetate (5 mL×3) and washed with brine (5 mL×3).[5] The combined organic layers were dried and concentrated under reduced pressure. The residue was purified using silica gel flash column chromatography to afford the compound **9** (19.2 mg, 62%).

## 3. Mechanism Studies

### 3.1 The KIE experiment:




The mixture of **1a** (0.1 mmol), DTBP (3 eq), TFA (1 eq), NaOAc (1 equiv), $CH_2Cl_2$ (0.5 mL) and $CD_2Cl_2$ (0.5 mL) was added to a sealed tube. The mixture was stirred at 140 ℃ for 12 hours. Then, the solvent was evaporated under reduced pressure, and the residue was purified by silica gel flash column chromatography to obtain product **3a** and **D-3a** in 43% yield. A KIE value of 6.69 was observed.

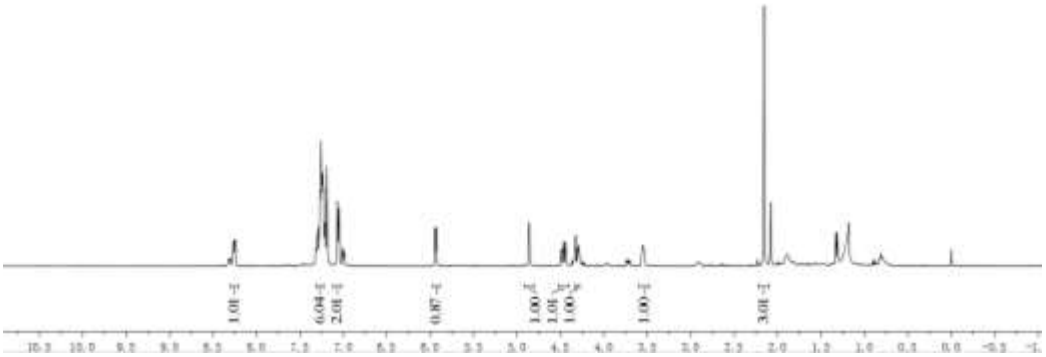
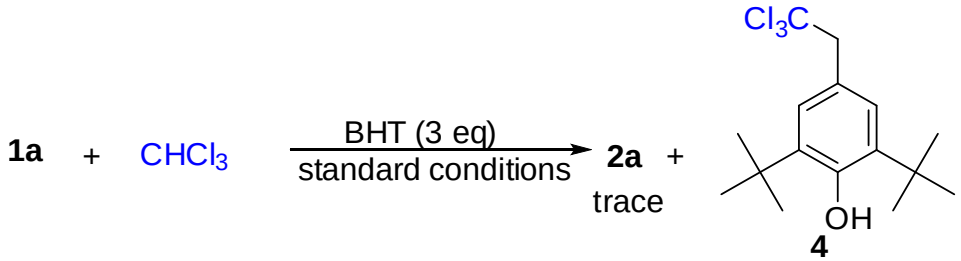


**Figure S1** $^1$H NMR spectrum of the KIE experiment

### 3.2 Radical inhibiting and trapping experiment




Under air, the mixture of **1** (0.1 mmol), DTBP (3 eq), TFA (2 eq), chloroform (2 mL) and BHT (3 eq) was added to a Schlenk tube and sealed. The mixture was stirred at 140 ℃ for 12 hours. Only trace amount of product **2a** was formed. The adduct **4** formed from BHT and trichloromethyl radical was detected by GCMS.

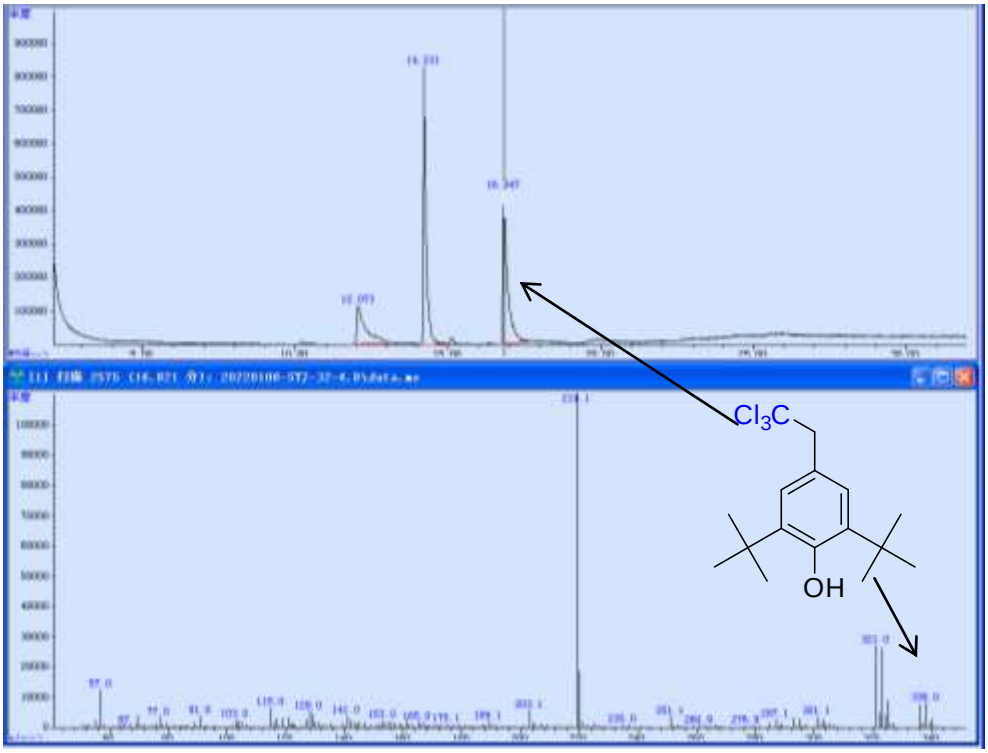
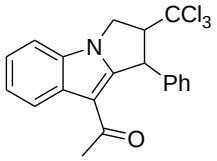
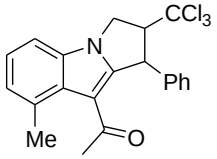



**Figure S2** GC spectrum of the reaction mixture and MS spectrum of adduct **4**

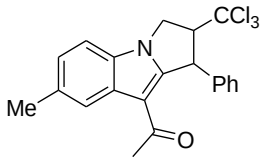
## 4. Characterization Data for the Products



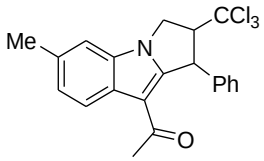

**1-(1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2a**, 63.3 mg, 81% yield), yellow solid; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.33-8.30 (m, 1H), 7.41-7.39 (m, 1H), 7.35 -7.28 (m, 5H), 7.19-7.17 (m, 2H), 5.16 (d, $J$ = 1.9 Hz, 1H), 4.65 (dd, $J$ = 12.4, 8.1 Hz, 1H), 4.55 (dd, $J$ = 12.4, 2.7 Hz, 1H), 4.04 (dt, $J$ = 8.2, 2.4 Hz, 1H), 2.31 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ 192.5, 151.0, 140.3, 132.2, 130.8, 129.3, 127.9, 127.4, 123.0, 123.0, 122.7, 110.6, 110.1, 101.1, 71.7, 50.0, 47.0, 29.9. HRMS (ESI) *m/z* calcd for $C_{20}H_{17}Cl_3NO$ [M+H$^+$]: 392.0370, found 392.0375.



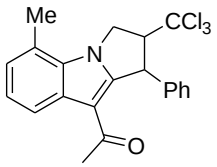

**1-(8-methyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2b**, 56.7 mg, 70% yield), yellow solid; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.34-7.28 (m, 3H), 7.24-7.20 (m, 2H), 7.17-7.13 (m, 2H), 7.08 (d, $J$ = 6.8 Hz, 1H), 5.13 (d, $J$ = 2.0 Hz, 1H), 4.59 (dd, $J$ = 12.4, 7.9 Hz, 1H), 4.51 (dd, $J$ = 12.4, 2.7 Hz, 1H), 3.98 (dt, $J$ = 7.9, 2.3 Hz, 1H), 2.75 (s, 3H), 2.26 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.8, 149.6, 140.4, 133.9, 133.0, 129.5, 129.4, 128.1, 127.3, 125.2, 123.4, 113.1, 107.5, 101.1, 71.6, 50.5, 46.8, 30.6, 23.2. HRMS (ESI) *m/z* calcd for $C_{21}H_{19}Cl_3NO$ [M+H$^+$]: 406.0527, found 406.0533.



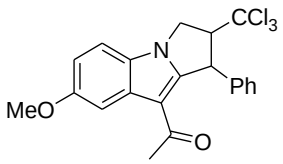

**1-(7-methyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2c**, 55.1 mg, 68% yield), yellow solid; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.15 (s, 1H), 7.35-7.28 (m, 4H), 7.19-7.15 (m, 3H), 5.15 (d, $J$ = 1.8 Hz, 1H), 4.62 (dd, $J$ = 12.4, 8.0 Hz, 1H), 4.52 (dd, $J$ = 12.4, 2.6 Hz, 1H), 4.02 (dt, $J$ = 8.1, 2.3 Hz, 1H), 2.52 (s, 3H), 2.30 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.5, 151.0, 140.4, 132.7, 131.1, 130.5, 129.3, 127.9, 127.4, 124.5, 122.5, 110.2, 109.7, 101.1, 71.7, 50.1, 47.0, 29.8, 21.8. HRMS (ESI) *m/z* calcd for $C_{21}H_{19}Cl_3NO$ [M+H$^+$]: 406.0527, found 406.0533.



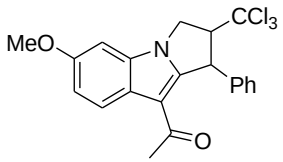
**1-(6-methyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2d**, 58.3 mg, 72% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.17 (d, $J$ = 8.2 Hz, 1H), 7.34-7.28 (m, 3H), 7.22 (s, 1H), 7.19-7.17 (m, 3H), 5.14 (d, $J$ = 2.4 Hz, 1H), 4.61 (dd, $J$ = 12.4, 8.0 Hz, 1H), 4.52 (dd, $J$ = 12.4, 2.7 Hz, 1H), 4.03 (dt, $J$ = 8.1, 2.4 Hz, 1H), 2.53 (s, 3H), 2.31 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ 192.5, 150.7, 140.4, 133.1, 132.6, 129.3, 128.5, 127.9, 127.4, 124.7, 122.3, 110.4, 110.1, 101.1, 71.7, 50.0, 46.9, 29.7, 21.7. HRMS (ESI) *m/z* calcd for $C_{21}H_{19}Cl_3NO$ [M+H$^+$]: 406.0527, found 406.0533.




**1-(5-methyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone**(**2e**, 48.6 mg, 60% yield), yellow solid; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.15 (d, $J$ = 8.1 Hz, 1H), 7.35-7.30 (m, 3H), 7.20-7.18 (m, 3H), 7.06 (d, $J$ = 7.2 Hz, 1H), 5.14 (d, $J$ = 1.9 Hz, 1H), 4.94 (dd, $J$ = 12.3, 8.0 Hz, 1H), 4.85 (dd, $J$ = 12.4, 2.7 Hz, 1H), 4.00-3.98 (m, 1H), 2.79 (s, 3H), 2.32 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.5, 151.4, 140.5, 131.9, 131.1, 129.3, 127.8, 127.4, 124.7, 123.1, 121.0, 120.4, 110.5, 101.2, 71.7, 49.8, 49.3, 30.0, 18.2. HRMS (ESI) *m/z* calcd for $C_{21}H_{19}Cl_3NO$ [M+H$^+$]: 406.0527, found 406.0533.

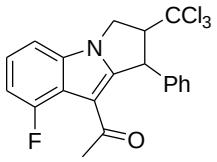



**1-(7-methoxy-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2f**, 64.0 mg, 76% yield), yellow solid; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.89 (d, $J$ = 2.4 Hz, 1H), 7.35-7.26 (m, 4H), 7.17-7.15 (m, 2H), 6.96 (dd, $J$ = 8.8, 2.4 Hz, 1H), 5.12 (d, $J$ = 1.8 Hz, 1H), 4.61 (dd, $J$ = 12.4, 8.1 Hz, 1H), 4.51 (dd, $J$ = 12.4, 2.7 Hz, 1H), 4.01 (dt, $J$ = 8.1, 2.3 Hz, 1H), 3.90 (s, 3H), 2.24 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.5, 156.8, 150.8, 140.3, 131.8, 129.4, 128.0, 127.4, 127.2, 113.2, 110.7, 110.4, 104.6, 101.1, 71.8, 55.9, 50.3, 47.1, 29.6. HRMS (ESI) *m/z* calcd for $C_{21}H_{19}Cl_3NO_2$ [M+H$^+$]: 422.0476, found 422.0465.

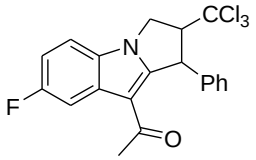



**1-(6-methoxy-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2g**, 58.9 mg, 70% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.20 (d, $J$ = 8.7 Hz, 1H), 7.34-7.28 (m, 3H), 7.18 (d, $J$ = 7.8 Hz, 2H), 6.99-6.96 (m, 1H), 6.87 (t, $J$ = 1.7 Hz, 1H), 5.12 (d, $J$ = 1.9 Hz, 1H), 4.60 (dd, $J$ = 12.3, 8.1 Hz, 1H),

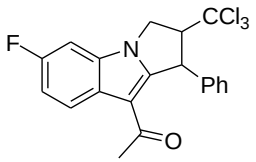
4.50 (dd, $J$ = 12.3, 2.6 Hz, 1H), 4.02 (dt, $J$ = 8.3, 2.2 Hz, 1H), 3.90 (s, 3H), 2.26 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.5, 156.9, 149.9, 140.5, 133.0, 129.3, 127.9, 127.4, 124.7, 123.5, 112.2, 110.5, 101.1, 93.7, 71.8, 55.8, 49.9, 46.8, 29.7. HRMS (ESI) *m/z* calcd for $C_{21}H_{19}Cl_3NO_2$ [M+H$^+$]: 422.0476, found 422.0465.




**1-(8-fluoro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl )ethanone** (**2h**, 61.4 mg, 75% yield), yellow solid; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.32-7.28 (m, 2H), 7.26-7.16 (m, 5H), 6.99 (dd, $J$ = 12.2, 7.5 Hz, 1H), 5.21 (d, $J$ = 2.0 Hz, 1H), 4.64 (dd, $J$ = 12.4, 8.1 Hz, 1H), 4.51 (dd, $J$ = 12.4, 2.7 Hz, 1H), 4.03 (dt, $J$ = 8.1, 2.4 Hz, 1H), 2.53 (d, $J$ = 3.9 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.8, 157.3, 154.8, 152.6, 140.5, 134.7 (d, $J_{C\text{-}F}$ = 11.11 Hz), 128.2 (d, $J_{C\text{-}F}$ = 172.2 Hz), 127.6, 123.4 (d, $J_{C\text{-}F}$ = 8.5 Hz), 117.7 (d, $J_{C\text{-}F}$ = 19.4 Hz), 109.5 (d, $J_{C\text{-}F}$ = 3.0 Hz), 108.7 (d, $J_{C\text{-}F}$ = 22.9 Hz), 106.5 (d, $J_{C\text{-}F}$ = 3.7 Hz), 101.1, 71.5, 50.2, 47.4, 30.5 (d, $J_{C\text{-}F}$ = 14.1 Hz). HRMS (ESI) *m/z* calcd for $C_{20}H_{16}Cl_3FNO$ [M+H$^+$]: 410.0276, found 410.0282.

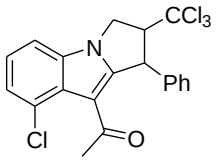



**1-(7-fluoro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl )ethanone** (**2i**, 60.5 mg, 74% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.03 (dt, $J$ = 10.1, 1.9 Hz, 1H), 7.35-7.29 (m, 4H), 7.17-7.15 (m, 2H), 7.07-7.02 (m, 1H), 5.14 (d, $J$ = 1.9 Hz, 1H), 4.65 (dd, $J$ = 12.4, 8.0 Hz, 1H), 4.53 (dd, $J$ = 12.4, 2.6 Hz, 1H), 4.03 (dt, $J$ = 8.1, 2.2 Hz, 1H), 2.25 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.2, 160.0 (d, $J_{C\text{-}F}$ = 238.9 Hz), 152.0, 140.0, 131.6 (d, $J_{C\text{-}F}$ = 10.9 Hz), 128.8, 128.4 (d, $J_{C\text{-}F}$ = 211.3 Hz), 128.1, 111.3 (d, $J_{C\text{-}F}$ = 26.6 Hz), 110.8, 110.7, 110.7, 108.4 (d, $J_{C\text{-}F}$ = 25.5 Hz), 101.0, 71.7, 50.2, 47.2, 29.7. HRMS (ESI) *m/z* calcd for $C_{20}H_{16}Cl_3FNO$ [M+H$^+$]: 410.0276, found 410.0282.

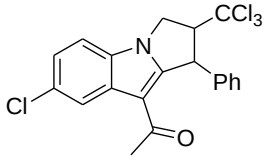



**1-(6-fluoro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2- ]indol-9-yl )ethanone** (**2j**, 67.9 mg, 83% yield), yellow solid; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.30-8.26 (m, 1H), 7.36-7.29 (m, 3H), 7.16 (d, $J$ = 7.3 Hz, 2H), 7.10-7.06 (m, 2H), 5.22-5.04 (m, 1H), 4.60 (dd, $J$ = 12.3, 8.1 Hz, 1H), 4.50 (dd, $J$ = 12.4, 2.7 Hz, 1H), 4.04-4.01 (m, 1H), 2.25 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.4, 160.0 (d, $J_{C\text{-}F}$ = 241.8 Hz), 151.1, 140.1, 132.2 (d, $J_{C\text{-}F}$ = 11.8 Hz), 129.4, 128.0, 127.3, 127.2, 123.9

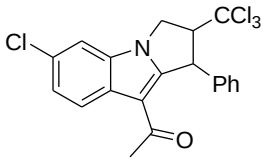
(d, $J_{C\text{-}F}$ = 9.6 Hz), 111.4 (d, $J_{C\text{-}F}$ = 23.7 Hz), 110.6, 100.9, 96.7 (d, $J_{C\text{-}F}$ = 26.5 Hz), 71.7, 49.9, 46.9, 29.7. HRMS (ESI) *m/z* calcd for $C_{20}H_{16}Cl_3FNO$ [M+H$^+$]: 410.0276, found 410.0282.



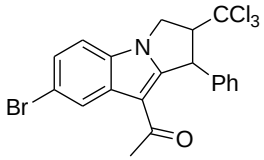

**1-(8-chloro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2k**, 59.5 mg, 70% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.35-7.28 (m, 5H), 7.24-7.20 (m, 1H), 7.16 (d, *J* = 8.2 Hz, 2H), 5.12 (d, *J* = 2.4 Hz, 1H), 4.66 (dd, *J* = 12.2, 8.2 Hz, 1H), 4.53 (dd, *J* = 12.2, 3.1 Hz, 1H), 4.05 (dt, *J* = 8.2, 2.8 Hz, 1H), 2.37 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 194.0, 150.5, 140.3, 133.7, 129.2, 127.9, 127.4, 127.3, 126.7, 124.1, 123.4, 112.2, 108.9, 100.9, 71.4, 49.7, 47.3, 31.9. HRMS (ESI) *m/z* calcd for $C_{20}H_{16}Cl_4NO$ [M+H$^+$]: 425.9981, found 425.9990.



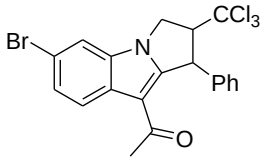

**1-(7-chloro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2l**, 64.6 mg, 76% yield), yellow solid; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.34 (d, *J* = 1.7 Hz, 1H), 7.36-7.28 (m, 5H), 7.16 (d, *J* = 8.2 Hz, 1H), 5.14 (d, *J* = 1.8 Hz, 1H), 4.64 (dd, *J* = 12.4, 8.1 Hz, 1H), 4.53 (dd, *J* = 12.4, 2.7 Hz, 1H), 4.04 (dt, *J* = 8.1, 2.4 Hz, 1H), 2.26 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.2, 151.8, 139.9, 131.8, 130.6, 129.5, 129.1, 128.1, 127.3, 123.4, 122.4, 111.0, 110.2, 100.9, 71.7, 50.1, 47.1, 29.8. HRMS (ESI) *m/z* calcd for $C_{20}H_{16}Cl_4NO$ [M+H$^+$]: 425.9981, found 425.9990.



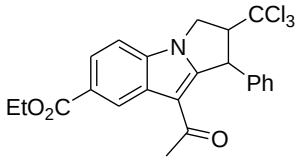

**(6-Chloro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2m**, 68.9 mg, 81% yield), yellow solid; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.25 (d, *J* = 8.6 Hz, 1H), 7.40 (d, *J* = 1.8 Hz, 1H), 7.35-7.27 (m, 4H), 7.17-7.14 (m, 2H), 5.14 (d, *J* = 1.8 Hz, 1H), 4.61 (dd, *J* = 12.4, 8.0 Hz, 1H), 4.52 (dd, *J* = 12.4, 2.6 Hz, 1H), 4.04-4.01 (m, 1H), 2.26 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.3, 151.3, 139.9, 132.6, 129.4, 129.3, 128.9, 128.1, 127.3, 123.8, 123.5, 110.6, 110.1, 100.9, 71.7, 49.9, 46.9, 29.8. HRMS (ESI) *m/z* calcd for $C_{20}H_{16}Cl_4NO$ [M+H$^+$]: 425.9981, found 425.9990.



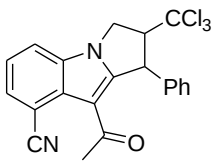

**1-(7-bromo-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2n**, 75.0 mg, 80% yield), yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.42 (s, 1H), 7.31 (d, *J* = 11.9 Hz, 1H), 7.24-7.16 (m, 4H), 7.06 (d, *J* = 7.8 Hz, 2H), 5.05 (d, *J* = 1.9 Hz, 1H), 4.54 (dd, *J* = 12.4, 8.1 Hz, 1H), 4.44 (dd, *J* = 12.5, 2.6 Hz, 1H), 3.96-3.93 (m, 1H), 2.16 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ 192.2, 151.6, 139.9, 132.3, 130.6, 129.5, 128.1, 127.3, 126.0, 125.4, 116.8, 111.2, 110.2, 100.9, 71.7, 50.0, 47.1, 29.8. HRMS (ESI) *m/z* calcd for $C_{20}H_{16}BrCl_3NO$ [M+H$^+$]: 469.9475, found 469.9463.



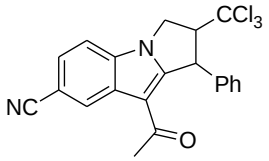

**1-(6-bromo-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2o**, 74.1 mg, 79% yield), yellow solid; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.20 (d, *J* = 8.6 Hz, 1H), 7.56 (s, 1H), 7.41 (d, *J* = 8.6 Hz, 1H), 7.31 (t, *J* = 8.4 Hz, 3H), 7.15 (d, *J* = 7.2 Hz, 2H), 5.13 (s, 1H), 4.61 (dd, *J* = 12.4, 8.0 Hz, 1H), 4.51 (dd, *J* = 12.5, 2.6 Hz, 1H), 4.02 (d, *J* = 7.8 Hz, 1H), 2.25 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.4, 151.2, 139.9, 133.0, 129.7, 129.5, 128.1, 127.1, 126.2, 124.1, 116.4, 113.1, 110.6, 100.9, 71.7, 49.9, 47.0, 29.8. HRMS (ESI) *m/z* calcd for $C_{20}H_{16}BrCl_3NO$ [M+H$^+$]: 469.9475, found 469.9463.



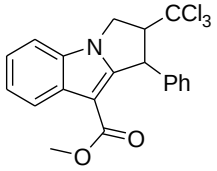

**Methyl-9-acetyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indole-7-carboxylate** (**2p**, 66.7 mg, 72% yield), yellow solid; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.99 (s, 1H), 8.03 (dd, *J* = 8.5, 1.6 Hz, 1H), 7.41 (d, *J* = 8.5 Hz, 1H), 7.34-7.28 (m, 3H), 7.17-7.15 (m, 2H), 5.16 (d, *J* = 2.0 Hz, 1H), 4.67 (dd, *J* = 12.5, 8.1 Hz, 1H), 4.57 (dd, *J* = 12.5, 2.7 Hz, 1H), 4.05 (dt, *J* = 8.1, 2.3 Hz, 1H), 3.94 (s, 3H), 2.33 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ 192.3, 167.8, 152.3, 139.9, 134.6, 130.3, 129.4, 128.0, 127.3, 125.0, 124.9, 124.5, 111.3, 109.8, 100.9, 71.7, 52.1, 49.9, 47.0, 30.0. HRMS (ESI) *m/z* calcd for $C_{23}H_{21}Cl_3NO_3$ [M+H$^+$]: 464.0582, found 464.0573.



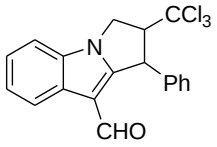
**9-acetyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indole-8-carbonitrile** (**2q**, 52.4 mg, 63% yield), yellow solid; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.65 (dd, $J$ = 14.7, 7.8 Hz, 2H), 7.36-7.29 (m, 4H), 7.12-7.10 (m, 2H), 5.15 (d, $J$ = 1.8 Hz, 1H), 4.71 (dd, $J$ = 12.4, 8.1 Hz, 1H), 4.59 (dd, $J$ = 12.5, 2.5 Hz, 1H), 4.03 (dt, $J$ = 8.0, 2.2 Hz, 1H), 2.25 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 191.7, 151.8, 139.4, 132.8, 131.0, 129.6, 129.1, 128.3, 127.2, 122.8, 119.3, 114.9, 111.4, 105.9, 100.7, 71.4, 50.2, 47.2, 30.0. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}Cl_3N_2O$ [M+H$^+$]: 417.0323, found 417.0328.




**9-acetyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indole-7-carbonitrile** (**2r**, 53.2 mg, 64% yield), yellow solid; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.70 (d, $J$ = 1.4 Hz, 1H), 7.51 (d, $J$ = 1.5 Hz, 1H), 7.46 (d, $J$ = 8.4 Hz, 1H), 7.36-7.31 (m, 3H), 7.15 (d, $J$ = 8.3 Hz, 2H), 5.16 (d, $J$ = 1.8 Hz, 1H), 4.69 (dd, $J$ = 12.5, 8.0 Hz, 1H), 4.59 (dd, $J$ = 12.5, 2.6 Hz, 1H), 4.06 (dt, $J$ = 7.9, 2.3 Hz, 1H), 2.24 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.2, 152.6, 139.4, 133.7, 130.6, 129.6, 128.3, 128.2, 127.3, 126.2, 120.1, 111.0, 110.8, 106.2, 100.7, 71.6, 49.9, 47.1, 29.8. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}Cl_3N_2O$ [M+H$^+$]: 417.0323, found 417.0328.

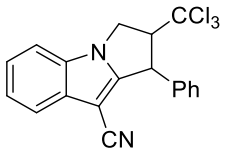



**Methyl 1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indole-9-carboxylate** (**2s**, 60.3 mg, 74% yield), light yellow solid; $^1$H NMR (400 MHz, C $DCl_3$) $\delta$ 8.22-8.20 (m, 1H), 7.43-7.40 (m, 1H), 7.35-7.27 (m, 5H), 7.22-7.20 (d, $J$ =7.4 Hz, 2H), 5.16 (d, $J$ = 2.4 Hz, 1H), 4.73-4.67 (m, 1H), 4.57-4.53 (m, 1H), 4.12-4.08 (m, 1H), 3.70 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 164.7, 1 51.8, 141.3, 132.2, 131.0, 128.9, 127.5, 127.4, 122.6, 122.4, 122.0, 110.1, 101. 2, 100.0, 71.7, 50.7, 49.6, 47.5. HRMS (ESI) *m/z* calcd for $C_{20}H_{17}Cl_3NO_2$ [M+ H$^+$]: 408.0319, found 408.0323.

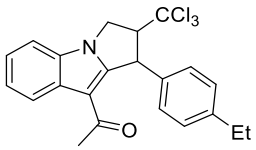



**1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indole-9-carbaldehyde** (**2t**, 32.4 mg, 43% yield), brown solid; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 9.55 (s, 1H), 8.17-8.15 (m, 1H), 7.32-7.19 (m, 1H), 7.27-7.21 (m, 4H), 7.16-7.15 (m, 2H), 5.04 (d, $J$ = 3.9 Hz, 1H), 4.65 (dd, $J$ = 12.1, 8.5 Hz, 1H), 4.45 (dd, $J$ = 12.1, 4.3 Hz, 1H),

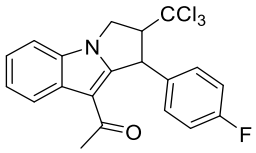
4.14-4.10 (m, 1H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 183.7, 140.6, 132.5, 129.8, 129.4, 128.2, 127.8, 123.7, 123.6, 122.4, 110.2, 110.1, 100.6, 71.5, 48.8, 48.0. HRMS (ESI) *m/z* calcd for $C_{19}H_{15}Cl_3NO$ [M+H$^+$]: 378.0214, found 378.0216.



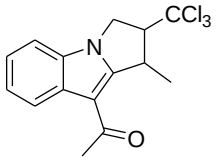

**1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indole-9-carbonitrile** (**2u**, 49.5 mg, 66% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.68-7.66 (m, 1H), 7.41-7.28 (m, 6H), 7.24-7.22 (m, 2H), 4.98 (d, $J$ = 3.9 Hz, 1H), 4.70 (dd, $J$ = 11.9, 8.4 Hz, 1H), 4.52 (dd, $J$ = 11.9, 4.3 Hz, 1H), 4.19 (dt, $J$ = 8.4, 4.2 Hz, 1H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 152.4, 139.2, 132.2, 131.4, 129.4, 128.3, 127.8, 123.6, 122.6, 120.1, 114.9, 110.8, 100.5, 79.1, 71.2, 48.6, 48.2. HRMS (ESI) *m/z* calcd for $C_{19}H_{14}Cl_3N_2$ [M+H$^+$]: 375.0217, found 375.0220.



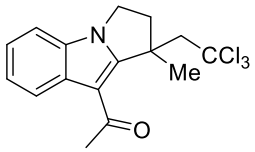

**1-(1-(4-ethylphenyl)-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl )ethan-1-one** (**2x**, 57.2 mg, 68% yield), white solid; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.34-8.31 (m, 1H), 7.40-7.32 (m, 3H), 7.14 (d, J = 8.0 Hz, 2H), 7.08 (d, J = 7.9 Hz, 2H), 5.13 (d, J = 1.9 Hz, 1H), 4.63 (dd, J = 12.4, 8.1 Hz, 1H), 4.53 (dd, J = 12.4, 2.7 Hz, 1H), 4.02 (dt, J = 8.1, 2.4 Hz, 1H), 2.62 (q, J = 7.6 Hz, 2H), 2.31 (s, 3H), 1.22 (t, J = 7.6 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.6, 151.2, 144.0, 137.5, 132.2, 130.8, 128.8, 127.3, 123.0, 122.9, 122.7, 110.5, 110.0, 101.1, 71.8, 49.7, 46.9, 29.8, 28.5, 15.5. HRMS (ESI) *m/z* calcd for $C_{22}H_{21}Cl_3NO$ [M+H$^+$]: 420.0683, found 420.0688.



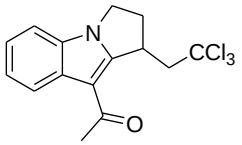

**1-(1-(4-fluorophenyl)-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-y l)ethan-1-one** (**2y**, 59.1 mg, 72% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.26-8.23 (m, 1H), 7.42-7.32 (m, 3H), 7.18-7.14 (m, 2H), 7.03-6.99 (m, 2H), 5.16 (d, J = 2.1 Hz, 1H), 4.65 (dd, J = 12.4, 8.2 Hz, 1H), 4.54 (dd, J = 12.4, 2.9 Hz, 1H), 4.02 (dt, J = 8.1, 2.5 Hz, 1H), 2.35 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.4, 162.1 (d, $J_{C\text{-}F}$ = 248.1 Hz), 150.9, 136.3, 136.3, 132.2, 130.6, 129.1 (d, $J_{C\text{-}F}$ = 8.3 Hz), 123.0, 122.4, 116.2 (d, $J_{C\text{-}F}$ = 8.3 Hz), 110.5, 110.2, 101.0, 71.7, 49.3, 47.0, 30.0. HRMS (ESI) *m/z* calcd for $C_{20}H_{16}Cl_3FNO$ [M+H$^+$]: 410.0276, found 410.0280.



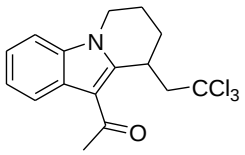
**1-(1-methyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2z**, 20.4 mg, 31% yield), yellow solid; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.02 (dd, $J$ = 7.1, 1.5 Hz, 1H), 7.34-7.27 (m, 3H), 4.55 (dd, $J$ = 12.3, 8.5 Hz, 1H), 4.40 (dd, $J$ = 12.3, 3.3 Hz, 1H), 4.09-4.03 (m, 1H), 3.76 (dt, $J$ = 8.4, 2.9 Hz, 1H), 2.67 (s, 3H), 1.65 (d, $J$ = 7.1 Hz, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.9, 154.6, 132.1, 130.3, 122.6, 122.4, 121.4, 110.3, 109.9, 101.3, 69.9, 47.0, 39.9, 30.3, 20.1. HRMS (ESI) *m/z* calcd for $C_{15}H_{15}Cl_3NO$ [M+H$^+$]: 330.0214, found 330.0209.



**1-(1-methyl-1-(2,2,2-trichloroethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethan-1-one** (**2aa**, 33.0 mg, 48% yield), yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.92-7.90 (m, 1H), 7.35-7.28 (m, 3H), 4.31-4.20 (m, 2H), 3.97 (d, J = 15.5 Hz, 1H), 3.67 (d, J = 15.5 Hz, 1H), 3.46-3.40 (m, 1H), 2.74 (s, 3H), 2.65-2.58 (m, 1H), 1.72 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 193.6, 156.6, 132.1, 130.5, 122.3, 122.1, 121.0, 110.7, 110.5, 98.1, 59.0, 45.7, 43.9, 39.6, 31.5, 25.6. HRMS (ESI) *m/z* calcd for $C_{16}H_{17}Cl_3NO$ [M+H$^+$]: 344.0370, found 344.0368.

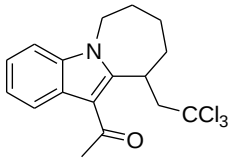


**1-(1-(2,2,2-trichloroethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**2ab**, 40.8 mg, 62% yield), yellow solid; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.98-7.96 (m, 1H), 7.34-7.27 (m, 3H), 4.26-4.12 (m, 3H), 3.78 (d, $J$ = 14.7 Hz, 1H), 3.10-2.97 (m, 2H), 2.80 (dd, $J$ = 14.8, 10.2 Hz, 1H), 2.70 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 193.4, 153.4, 132.6, 130.1, 122.5, 122.4, 121.2, 110.6, 110.3, 98.7, 55.7, 43.5, 38.0, 33.0, 30.6. HRMS (ESI) *m/z* calcd for $C_{15}H_{15}Cl_3NO$ [M+H$^+$]: 330.0214, found 330.0209.

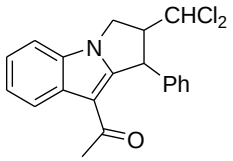


**1-(9-(2,2,2-trichloroethyl)-6,7,8,9-tetrahydropyrido[1,2-*a*]indol-10-yl)ethanone** (**2ac**, 43.9 mg, 64% yield), yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.93-7.91 (m, 1H), 7.38-7.28 (m, 3H), 4.59-4.54 (m, 1H), 4.39-4.33 (m, 1H), 3.98-3.90 (m, 1H), 3.48 (dd, $J$ = 14.9, 3.4 Hz, 1H), 2.99 (dd, $J$ = 15.0, 11.1 Hz, 1H), 2.82-2.76 (m, 1H), 2.73 (s, 3H), 2.38-2.29 (m, 1H), 2.16 (d, $J$ = 20.6 Hz, 1H), 1.86-1.77 (m, 1H); $^{13}$C

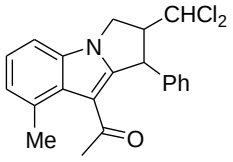
NMR (101 MHz, $CDCl_3$) δ 193.9, 147.4, 136.3, 126.1, 122.7, 122.3, 120.6, 112.3, 109.9, 98.4, 53.3, 42.7, 33.2, 31.7, 21.1, 17.1. HRMS (ESI) *m/z* calcd for $C_{16}H_{17}Cl_3NO$ [M+$H^+$]: 344.0370, found 344.0377.



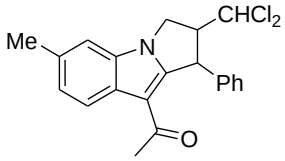

**1-(10-(2,2,2-trichloroethyl)-7,8,9,10-tetrahydro-6H-azepino[1,2-a]indol-11-yl)ethanone** (**2ad**, 34.3 mg, 48% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) *δ* 7.93-7.91 (m, 1H), 7.40-7.38 (m, 1H), 7.30-7.27 (m, 2H), 5.49-5.45 (m, 1H), 4.69-4.64 (m, 1H), 4.00-3.94 (m, 1H), 3.25-3.23 (m, 2H), 2.74 (s, 3H), 2.36-2.31 (m, 1H), 2.20-2.14 (m, 1H), 2.05-1.99 (m, 2H), 1.85-1.71 (m, 1H), 1.53-1.46 (m, 1H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ 195.7, 149.0, 136.3, 126.0, 122.3, 121.8, 121.0, 115.0, 109.6, 98.9, 55.2, 44.9, 32.2, 32.1, 30.4, 28.4, 24.8. HRMS (ESI) *m/z* calcd for $C_{17}H_{19}Cl_3NO$ [M+$H^+$]: 358.0527, found 358.0531.



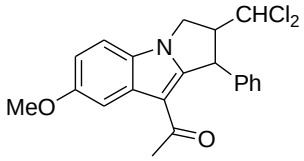

**1-(2-(dichloromethyl)-1-phenyl-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**3a**, 45.7 mg, 64% yield), yellow solid; $^1$H NMR (400 MHz, $CDCl_3$) *δ* 8.36-8.33 (m, 1H), 7.39-7.30 (m, 6H), 7.13 (d, *J* = 7.2 Hz, 2H), 6.02 (d, *J* = 4.8 Hz, 1H), 4.94 (d, *J* = 2.9 Hz, 1H), 4.54 (dd, *J* = 11.7, 7.9 Hz, 1H), 4.38 (dd, *J* = 11.6, 3.5 Hz, 1H), 3.63-3.60 (m, 1H), 2.23 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) *δ* 192.8, 151.0, 140.4, 132.4, 130.8, 129.4, 127.9, 127.2, 123.0, 123.0, 122.8, 110.7, 110.1, 74.0, 62.1, 49.2, 45.7, 29.7. HRMS (ESI) *m/z* calcd for $C_{20}H18Cl_2NO$ [M+$H^+$]: 358.0760, found 358.0762.



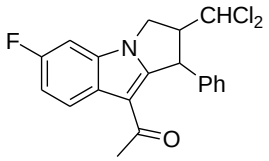

**1-(2-(dichloromethyl)-8-methyl-1-phenyl-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**3b**, 38.6 mg, 52% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) *δ* 7.33-7.29 (m, 3H), 7.24-7.16 (m, 2H), 7.12-7.07 (m, 3H), 5.99 (d, *J* = 4.9 Hz, 1H), 4.93 (d, *J* = 3.2 Hz, 1H), 4.49 (dd, *J* = 11.6, 7.9 Hz, 1H), 4.35 (dd, *J* = 11.5, 3.6 Hz, 1H), 3.59-3.54 (m, 1H), 2.73 (s, 3H), 2.19 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ 193.3, 149.3, 140.4, 133.8, 133.1, 129.5, 129.2, 128.0, 127.2, 125.0, 123.3, 113.2, 107.4, 73.9, 62.1, 49.6, 45.6, 30.6, 23.1. HRMS (ESI) *m/z* calcd for $C_{21}H_{20}Cl_2NO$ [M+$H^+$]: 372.0916, found 372.0909.



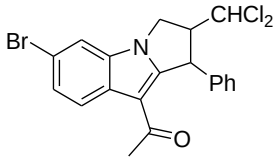

**1-(2-(dichloromethyl)-6-methyl-1-phenyl-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**3c**, 37.9 mg, 51% yield), yellow solid; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.19 (d, $J$ = 8.1 Hz, 1H), 7.34-7.28 (m, 3H), 7.18-7.11 (m, 4H), 6.00 (d, $J$ = 4.9 Hz, 1H), 4.91 (d, $J$ = 3.0 Hz, 1H), 4.49 (dd, $J$ = 11.6, 7.9 Hz, 1H), 4.35 (dd, $J$ = 11.6, 3.5 Hz, 1H), 3.62-3.57 (m, 1H), 2.52 (s, 3H), 2.22 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.7, 150.3, 140.6, 133.0, 132.7, 129.3, 128.5, 127.8, 127.2, 124.6, 122.4, 110.7, 110.0, 74.1, 62.2, 49.1, 45.5, 29.7, 21.7. HRMS (ESI) *m/z* calcd for $C_{21}H_{20}Cl_2NO$ [M+H$^+$]: 372.0916, found 372.0909.



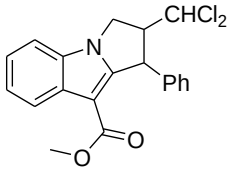

**1-(2-(dichloromethyl)-7-methoxy-1-phenyl-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**3d**, 39.5 mg, 51% yield), yellow solid; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.94 (d, $J$ = 2.4 Hz, 1H), 7.37-7.28 (m, 5H), 7.16-7.14 (m, 2H), 6.98 (dd, $J$ = 8.8, 2.5 Hz, 1H), 6.04 (d, $J$ = 4.7 Hz, 1H), 4.94 (d, $J$ = 3.0 Hz, 1H), 4.53 (dd, $J$ = 11.6, 7.9 Hz, 1H), 4.38-4.35 (m, 1H), 3.93 (s, 3H), 3.64-3.59 (m, 1H), 2.19 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.7, 156.7, 150.6, 140.5, 131.8, 129.4, 127.9, 127.3, 127.2, 113.2, 110.7, 104.6, 74.0, 62.2, 55.9, 49.4, 45.8, 29.7. HRMS (ESI) *m/z* calcd for $C_{21}H_{20}Cl_2NO_2$ [M+H$^+$]: 388.0866, found 388.0862.



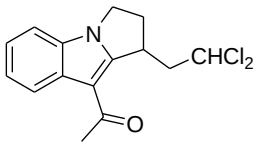

**1-(2-(dichloromethyl)-6-fluoro-1-phenyl-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**3e**, 48.8 mg, 65% yield), yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.32-8.28 (m, 1H), 7.34-7.29 (m, 3H), 7.13-7.11 (m, 2H), 7.06-7.02 (m, 2H), 6.03 (d, $J$ = 4.6 Hz, 1H), 4.91 (d, $J$ = 3.0 Hz, 1H), 4.49 (dd, $J$ = 11.5, 7.9 Hz, 1H), 4.32 (dd, $J$ = 11.5, 3.6 Hz, 1H), 3.64-3.59 (m, 1H), 2.16 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 192.6, 161.2, 158.8, 151.0, 140.3, 132.4 (d, $J_{C\text{-}F}$ = 12.0 Hz), 128.3 (d, $J_{C\text{-}F}$ = 229.6 Hz), 128.0, 123.9 (d, $J_{C\text{-}F}$ = 9.6 Hz), 111.1, 111.1 (d, $J_{C\text{-}F}$ = 55.1 Hz), 96.7 (d, $J_{C\text{-}F}$ = 26.4 Hz), 73.9, 62.1, 49.1, 45.6, 29.7. HRMS (ESI) *m/z* calcd for C20H17Cl2FNO [M+H$^+$]: 376.0666, found 376.0672.



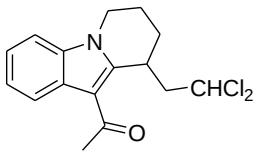

**1-(6-bromo-2-(dichloromethyl)-1-phenyl-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl )ethanone** (**3f**, 53.9 mg, 62% yield), yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.21 (d, $J$ = 8.6 Hz, 1H), 7.52 (s, 1H), 7.41-7.38 (m, 1H), 7.35-7.29 (m, 3H), 7.12-7.10 (m, 2H), 6.02 (d, $J$ = 4.6 Hz, 1H), 4.91 (d, $J$ = 2.9 Hz, 1H), 4.50 (dd, $J$ = 11.6, 7.9 Hz, 1H), 4.35-4.31 (m, 1H), 3.63-3.59 (m, 1H), 2.17 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ 192.6, 151.1, 140.1, 133.1, 129.7, 129.5, 128.0, 127.2, 126.1, 124.1, 116.4, 113.1, 110.8, 73.9, 62.1, 49.0, 45.7, 29.8. HRMS (ESI) *m/z* calcd for $C_{20}H_{17}BrCl_2NO$ [M+H$^+$]: 435.9865, found 435.9877.



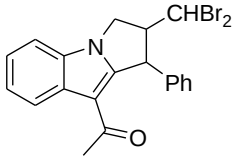

**Methyl-2-(dichloromethyl)-1-phenyl-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indole-9-carb oxylate** (**3g**, 41.1 mg, 55% yield), yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.20-8.18 (m, 1H), 7.38-7.27 (m, 6H), 7.16-7.14(m, 2H), 6.00 (d, $J$ = 4.4 Hz, 1H), 4.88 (d, $J$ = 4.0 Hz, 1H), 4.58 (dd, $J$ = 11.4, 8.1 Hz, 1H), 4.39 (dd, $J$ = 11.4, 4.4 Hz, 1H), 3.68-3.62 (m, 1H), 3.59 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 164.7, 151.4, 141.1, 132.3, 131.0, 128.9, 127.4, 127.3, 122.6, 122.3, 121.9, 110.1, 100.3, 73.9, 62.0, 50.5, 48.9, 45.8. HRMS (ESI) *m/z* calcd for $C_{20}H_{18}Cl_2NO_2$ [M+H$^+$]: 374.0709, found 374.0715.



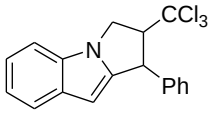

**1-(1-(2,2-dichloroethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**3h**, 31.3 mg, 53% yield), yellow solid; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.01-7.99 (m, 1H), 7.34-7.27 (m, 3H), 6.02-5.99 (m, 1H), 4.20-4.17 (m, 2H), 3.96-3.90 (m, 1H), 3.06-2.99 (m, 1H), 2.95-2.87 (m, 1H), 2.69 (s, 3H), 2.62-2.56 (m, 1H), 2.46-2.38 (t, $J$ = 14.7 Hz, 1H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 193.3, 153.8, 132.6, 130.1, 122.4, 122.4, 121.3, 110.5, 110.2, 72.1, 46.4, 43.3, 37.2, 32.9, 30.4. HRMS (ESI) *m/z* calcd for $C_{15}H_{16}Cl2NO$ [M+H$^+$]: 296.0603, found 296.0604.



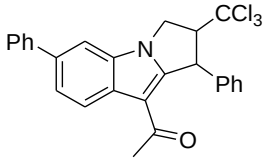
**1-(9-(2,2-dichloroethyl)-6,7,8,9-tetrahydropyrido[1,2-*a*]indol-10-yl)ethanone** (**3i**, 31.5 mg, 51% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.90 (d, $J$ = 8.2 Hz, 1H), 7.36-7.28 (m, 3H), 6.33 (t, $J$ = 6.7 Hz, 1H), 4.34-4.29 (m, 1H), 4.04-3.99 (m, 1H), 3.93-3.85 (m, 1H), 2.74-2.68 (m, 4H), 2.48-2.41 (m, 1H), 2.28-2.11 (m, 3H), 1.93-1.85 (m, 1H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 194.0, 148.4, 136.1, 126.1, 122.6, 122.2, 120.5, 112.2, 109.8, 73.1, 46.9, 42.5, 31.8, 31.7, 23.8, 17.6. HRMS (ESI) *m/z* calcd for $C_{16}H_{18}Cl_2NO$ [M+H$^+$]: 310.0760, found 310.0756.



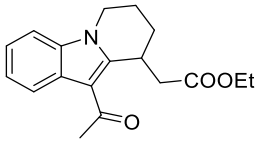

1-**(2-(dibromomethyl)-1-phenyl-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**5**, 40.1 mg, 45% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.34-8.32 (m, 1H), 7.40-7.37 (m, 1H), 7.34-7.30 (m, 5H), 7.16-7.14 (m, 2H), 5.96 (d, $J$ = 4.3 Hz, 1H), 4.85 (d, $J$ = 3.2 Hz, 1H), 4.54 (dd, $J$ = 11.5, 7.9 Hz, 1H), 4.34 (dd, $J$ = 11.6, 3.8 Hz, 1H), 3.72-3.68 (m, 1H), 2.23 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ 192.7, 150.8, 140.4, 132.4, 130.8, 129.4, 127.9, 127.3, 123.0, 122.9, 122.7, 110.8, 110.0, 62.7, 51.0, 47.4, 47.2, 29.9. HRMS (ESI) *m/z* calcd for $C_{20}H_{18}Br_2NO$ [M+H$^+$]: 445.9750, found 445.9742.



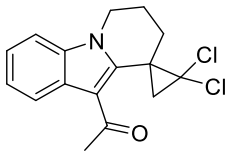

**1-phenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indole** (**6**, 23.0 mg, 66% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.57 (d, $J$ = 7.9 Hz, 1H), 7.37-7.26 (m, 6H), 7.22 (t, $J$ = 7.6 Hz, 1H), 7.13 (t, $J$ = 7.5 Hz, 1H), 6.08 (s, 1H), 4.86 (d, $J$ = 4.3 Hz, 1H), 4.67 (dd, $J$ = 11.3, 8.5 Hz, 1H), 4.48 (dd, $J$ = 11.4, 4.7 Hz, 1H), 4.16 (dt, $J$ = 8.8, 4.6 Hz, 1H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 145.7, 142.3, 133.1, 132.2, 128.9, 128.1, 127.5, 121.0, 121.0, 119.9, 109.6, 101.3, 94.0, 71.9, 48.2, 47.1. HRMS (ESI) *m/z* calcd for $C_{18}H_{15}Cl_3N$ [M+H$^+$]: 350.0265, found 350.0269.




**1-(1,6-diphenyl-2-(trichloromethyl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)ethanone** (**7**, 32.7 mg, 70% yield), yellow oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.34 (d, $J$ = 8.8 Hz, 1H), 7.70 (d, $J$ = 7.8 Hz, 2H), 7.60 (d, $J$ = 7.3 Hz, 2H), 7.48 (t, $J$ = 7.5 Hz, 2H), 7.37-7.31 (m, 4H), 7.20 (d, $J$ = 7.5 Hz, 2H), 5.17 (d, $J$ = 1.8 Hz, 1H), 4.68 (dd, $J$ = 12.4, 8.0 Hz, 1H), 4.60 (dd, $J$ = 12.4, 2.8 Hz, 1H), 4.07-4.04 (m, 1H), 2.32 (s, 3H); $^{13}$C NMR (101 MHz, $CDCl_3$) δ 192.4, 151.4, 141.5, 140.3, 136.6, 132.8, 131.0, 130.0, 129.4, 128.9, 127.9, 127.4, 127.4, 127.2, 122.9, 122.7, 108.5, 101.1, 71.7, 50.0, 47.0, 29.9. HRMS (ESI) *m/z* calcd for $C_{26}H_{21}Cl_3NO$ [M+H$^+$]: 468.0683, found 468.0692.




**ethyl 2-(10-acetyl-6,7,8,9-tetrahydropyrido[1,2-*a*]indol-9-yl)acetate** (**8**, 15.1 mg, 50% yield), yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.93-7.91 (m, 1H), 7.36-7.27 (m, 3H), 4.32-4.28 (m, 2H), 4.24-4.16 (m, 2H), 3.93-3.86 (m, 1H), 3.02 (dd, $J$ = 16.1, 3.0 Hz, 1H), 2.70 (s, 3H), 2.55 (dd, $J$ = 16.0, 10.8 Hz, 1H), 2.12-2.03 (m, 2H), 1.94-1.86 (m, 2H), 1.29 (t, $J$ = 7.1 Hz, 3H); $^{13}$C NMR (75 MHz, $CDCl_3$) $\delta$ 193.7, 172.0, 148.4, 136.1, 126.2, 122.5, 122.0, 120.5, 112.3, 109.7, 60.6, 42.6, 37.6, 31.6, 30.3, 23.8, 17.8, 14.3. HRMS (ESI) *m/z* calcd for $C_{18}H_{22}NO_3$ [M+H$^+$]: 300.1594, found 300.1591.

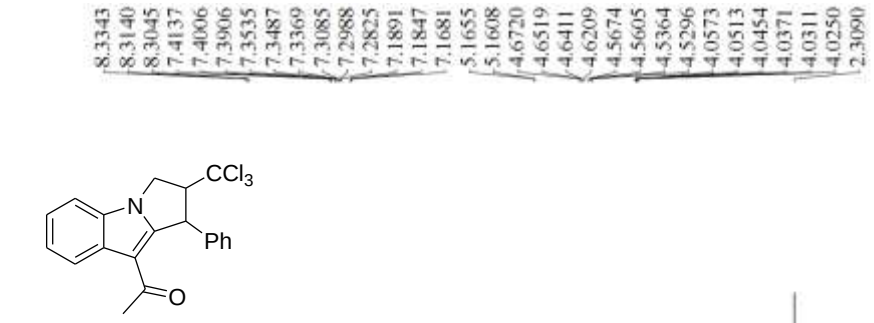



**1-(2,2-dichloro-7',8'-dihydro-6'*H*-spiro[cyclopropane-1,9'-pyrido[1,2-*a*]indol]-10'-yl)ethan-1-one** (**9**, 19.2 mg, 62% yield), yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.76-7.74 (m, 1H), 7.33-7.30 (m, 1H), 7.24-7.18 (m, 2H), 4.21-4.14 (m, 1H), 2.98 (d, $J$ = 8.7 Hz, 1H), 2.59 (s, 3H), 2.38-2.28 (m, 2H), 2.07-1.98 (m, 2H), 1.80 (d, $J$ = 8.7 Hz, 1H); $^{13}$C NMR (101 MHz, $CDCl_3$) $\delta$ 196.6, 140.0, 135.4, 125.9, 122.6, 121.8, 120.8, 116.9, 109.4, 67.3, 41.6, 33.7, 33.4, 32.0, 30.2, 21.5. HRMS (ESI) *m/z* calcd for $C_{16}H_{16}Cl_2NO$ [M+H$^+$]: 308.0603, found 308.0601.

## 5. References

[1] J-T. Zhang, M-Y. Wu, H. Ju, H-T. Yang, B-Y. Qian, K. Ding, J-P, Wu, M-H. Xie, *Org. Chem. Front.*, 2022, **9**, 32.
[2] Y-Q. Yang, P. Gao, Y. Zhao and Z-Z. Shi, *Angew. Chem. Int. Ed.*, 2017, **56**, 3966.
[3] G. Huang, Y. Shan, J.-T. Yu and C. Pan, *Org. Biomol. Chem.*, 2021, **19**, 10085.
[4] C. Xu, Z. Zhu, Y. Wang, Z. Jing, B. Gao, L. Zhao, and W-K. Dong, *J. Org. Chem.*, 2019, **84**, 2234.
[5] H. Liu, Z. Yang, J.-T. Yu and C. Pan, *Adv. Synth. Catal.*, 2022, **364**, 1085.

## 6. Copies of the $^{1}$H NMR and $^{13}$C NMR Spectra







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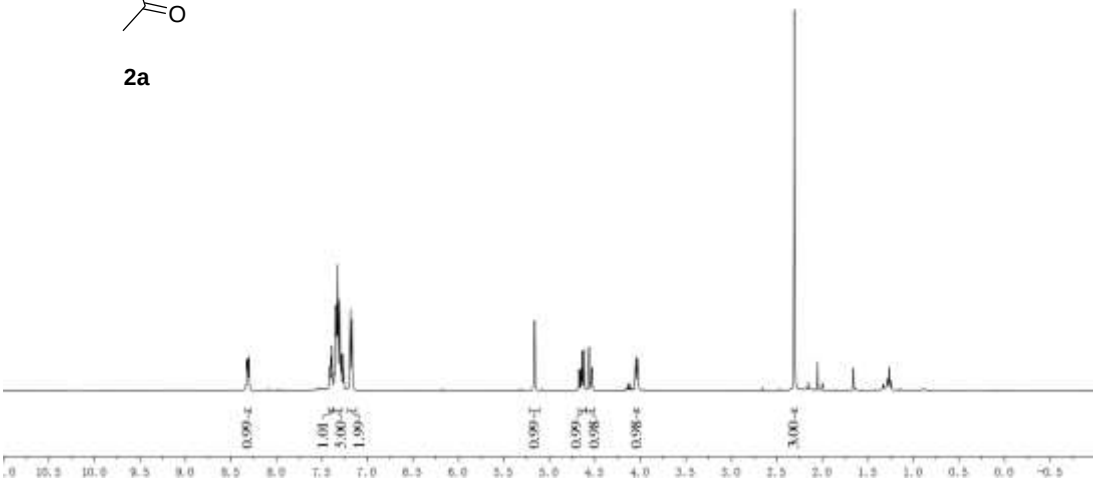

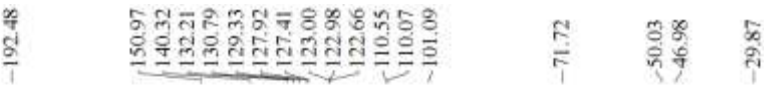





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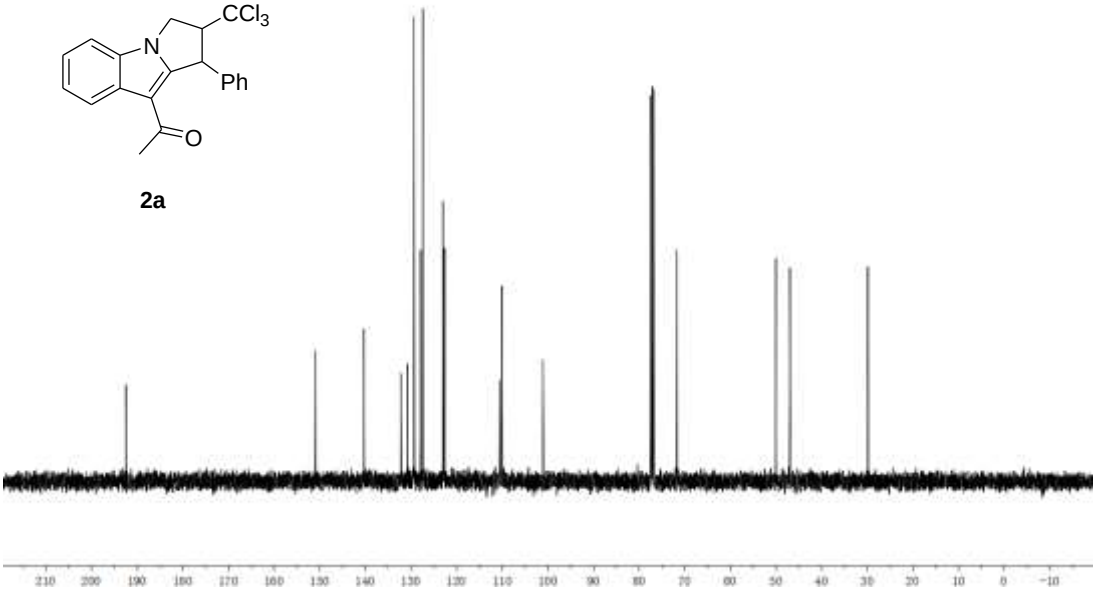

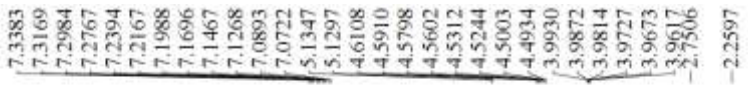
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4.5312
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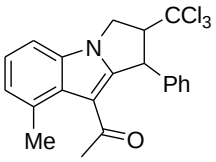
2.2597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O

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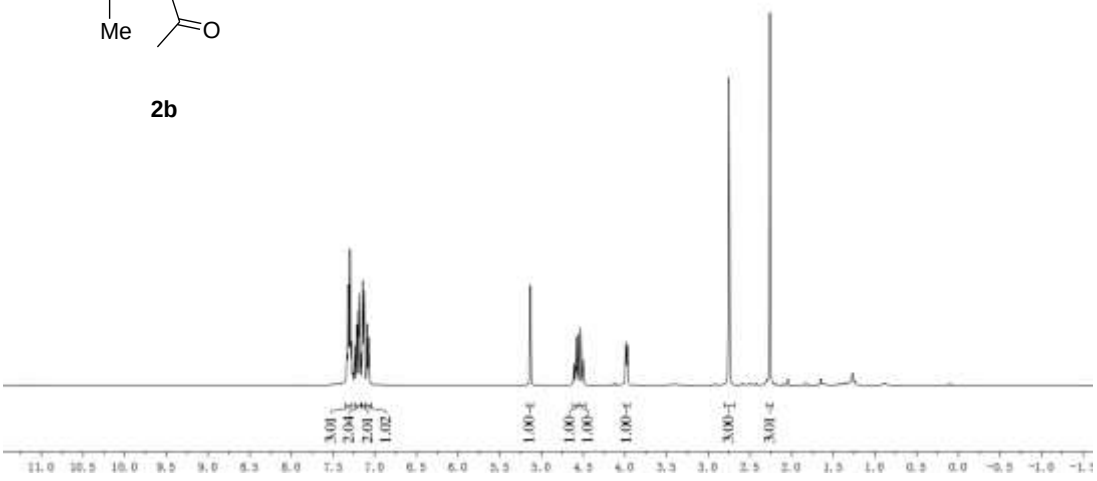

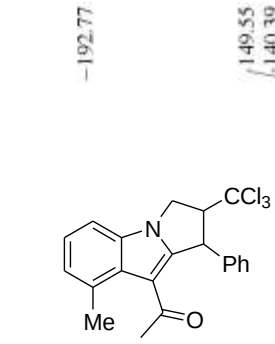
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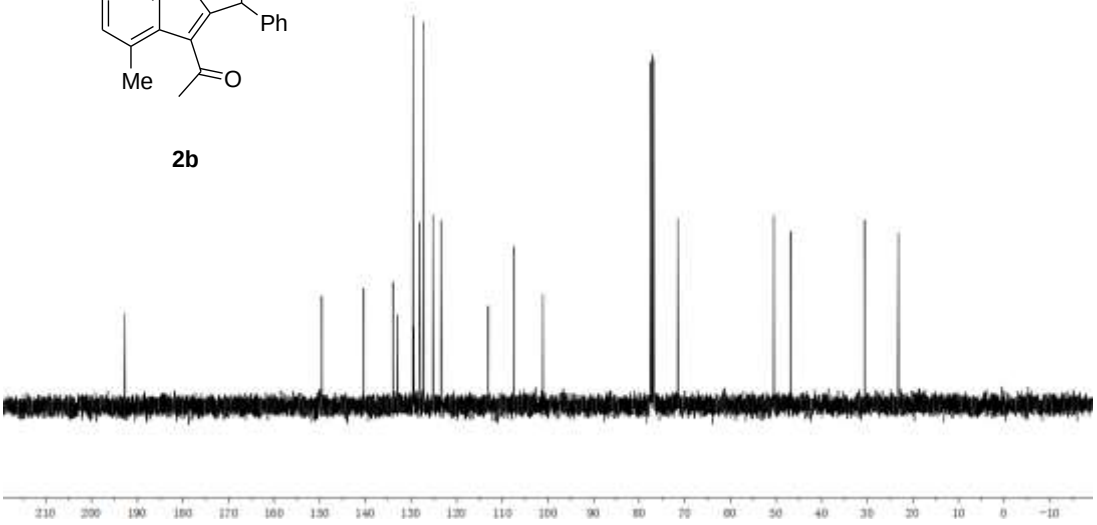
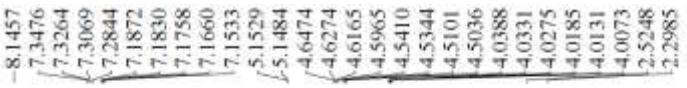
46.83
30.60
23.20


CCl3
N
Ph
Me
O

**2b**

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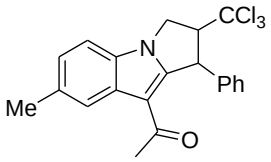
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Ph
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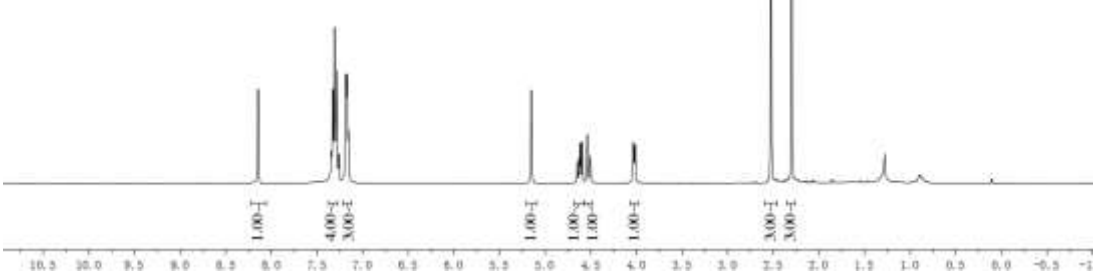
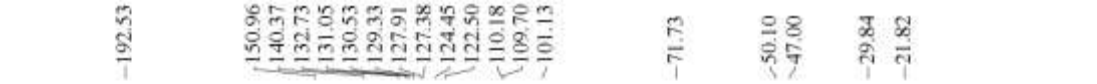
**2c**

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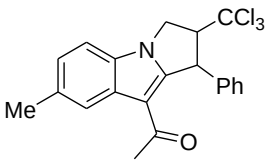
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Ph
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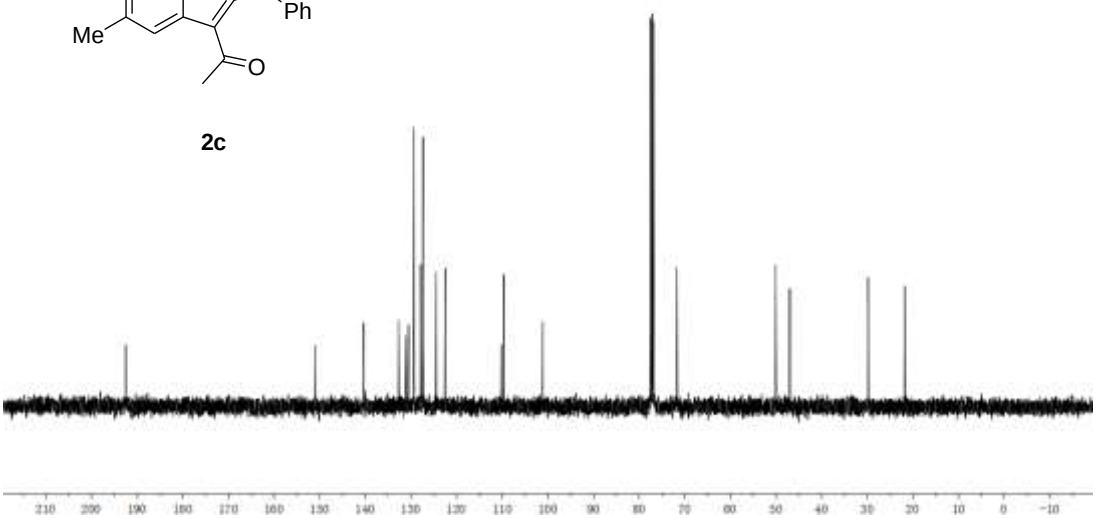
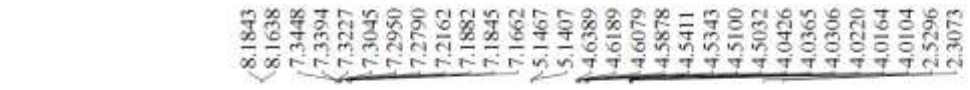
**2c**

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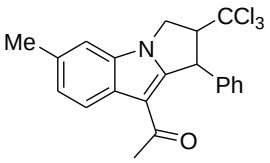
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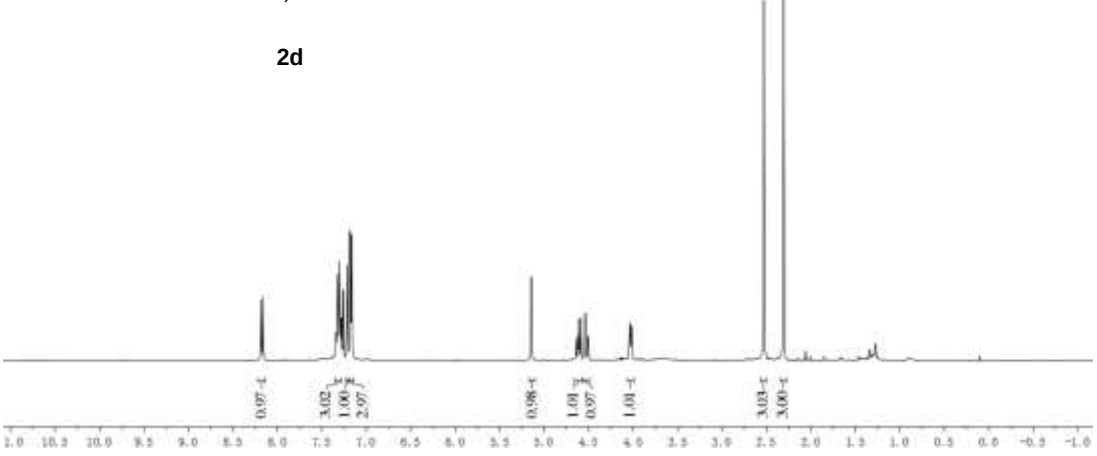


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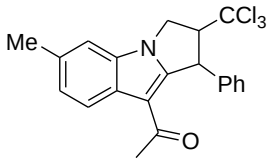
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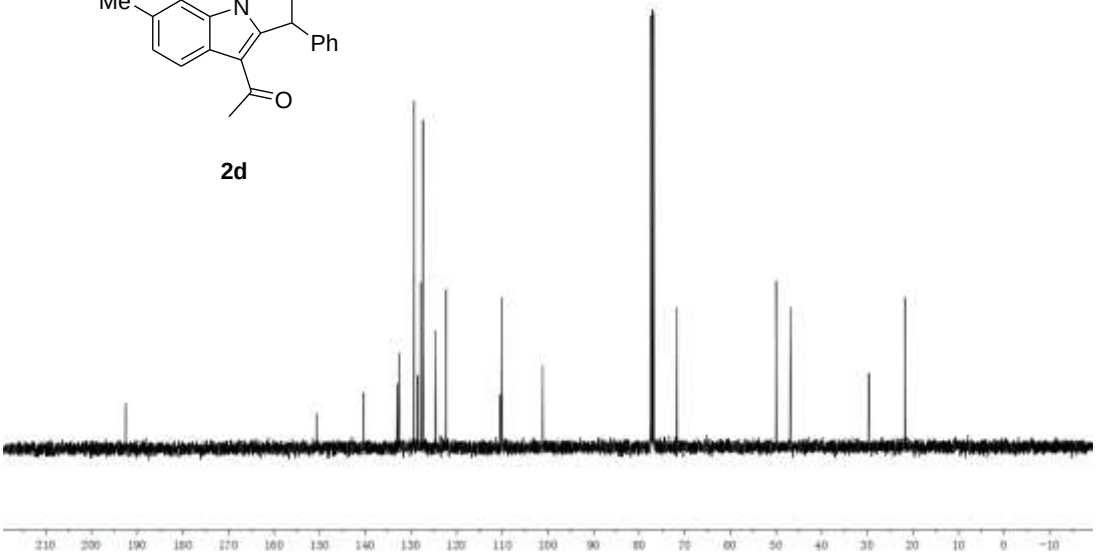

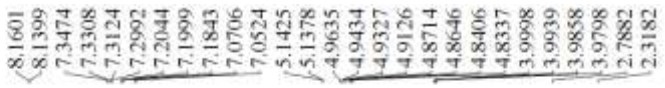
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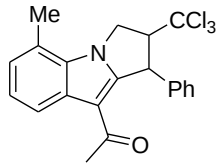
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Ph
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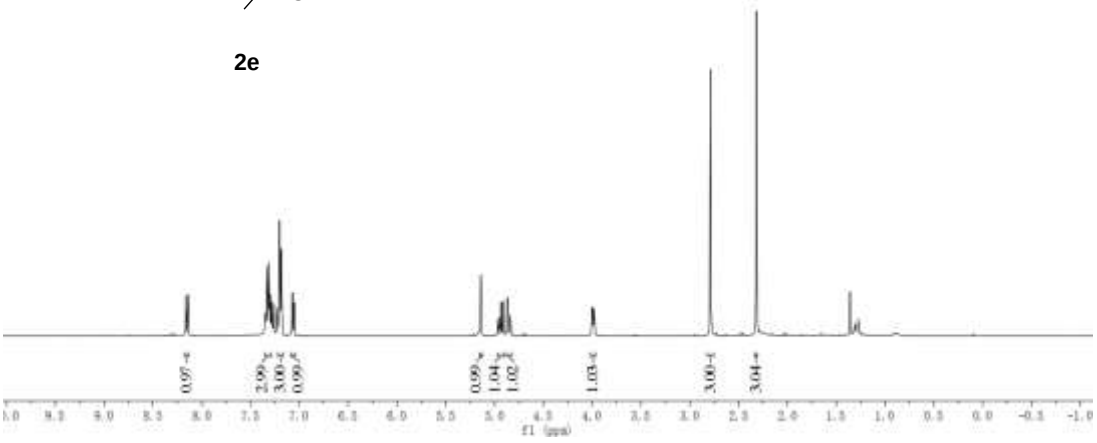
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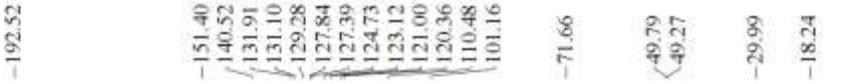
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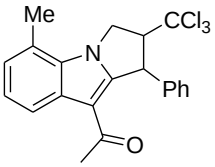
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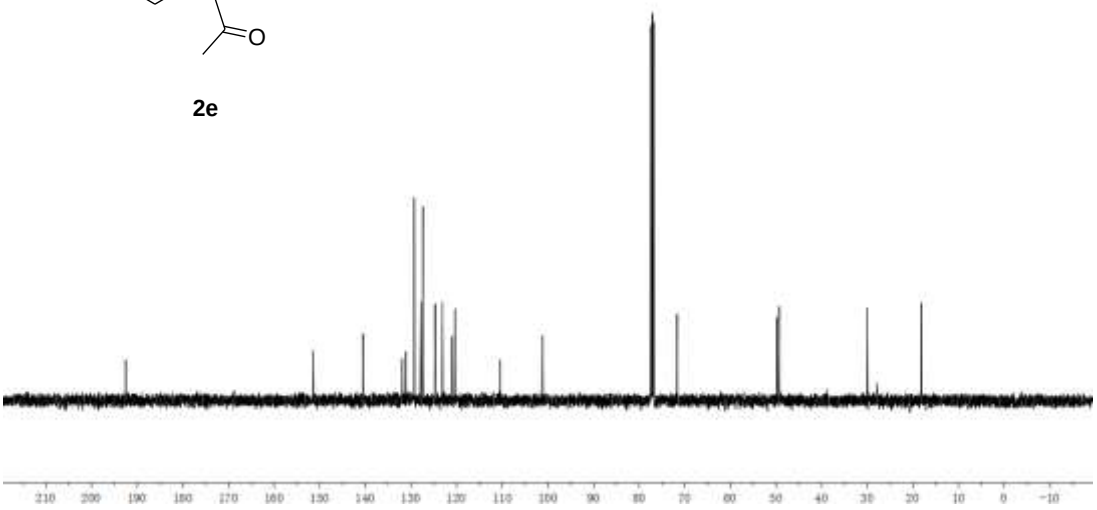

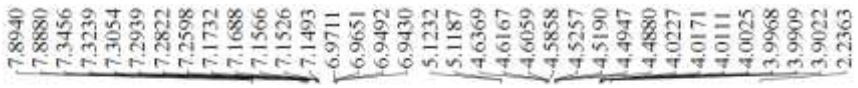
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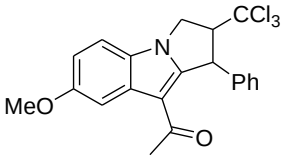
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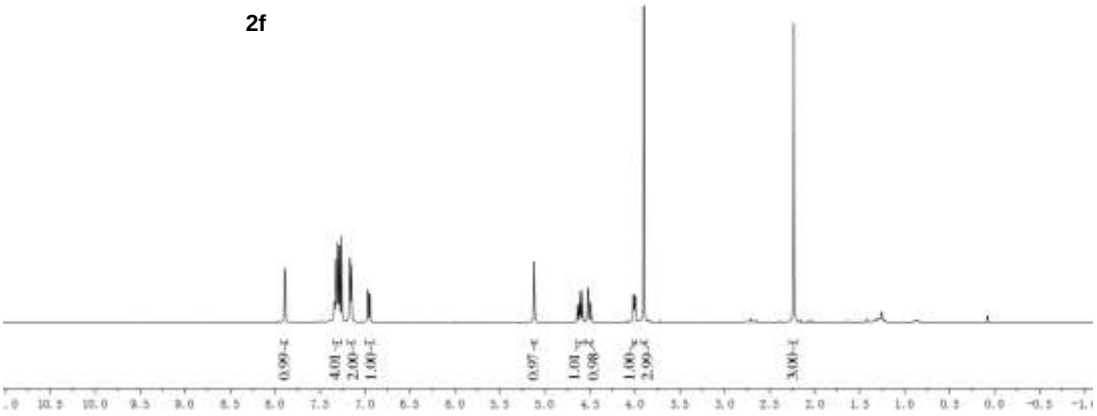
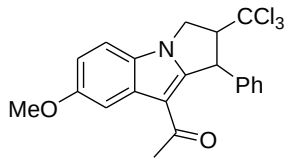
MeO
O

**2f**

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Ph
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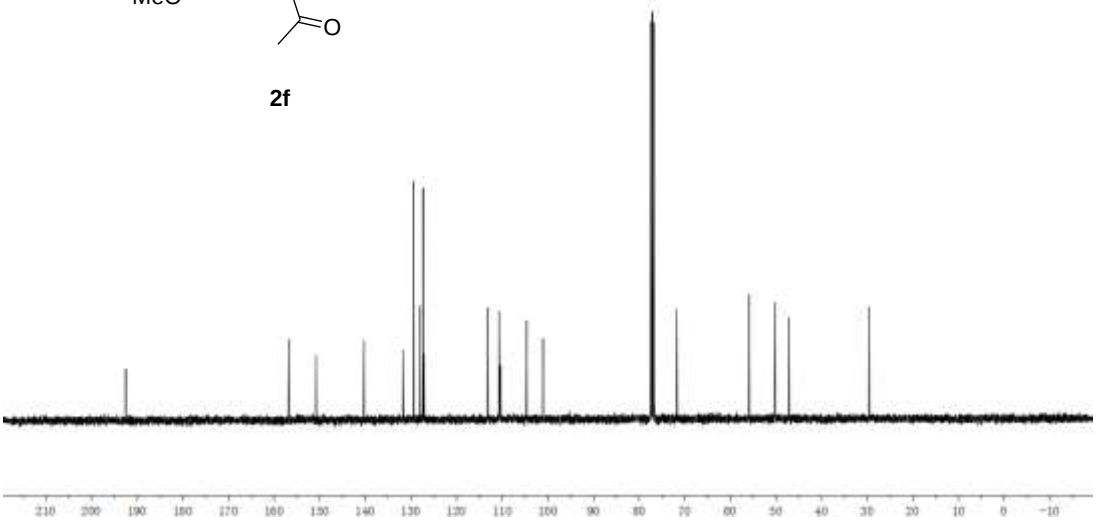

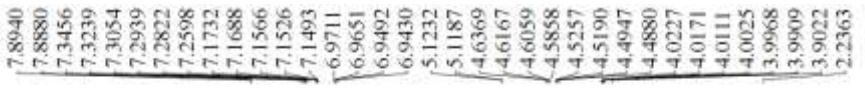
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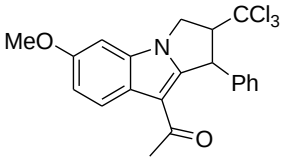
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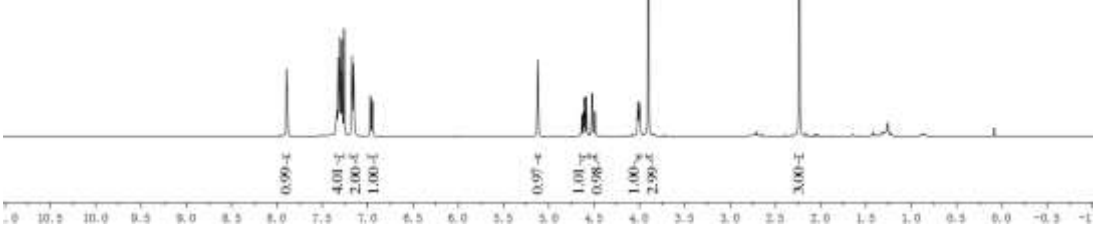
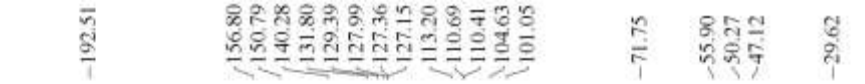
**2g**

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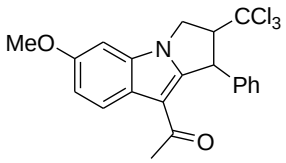
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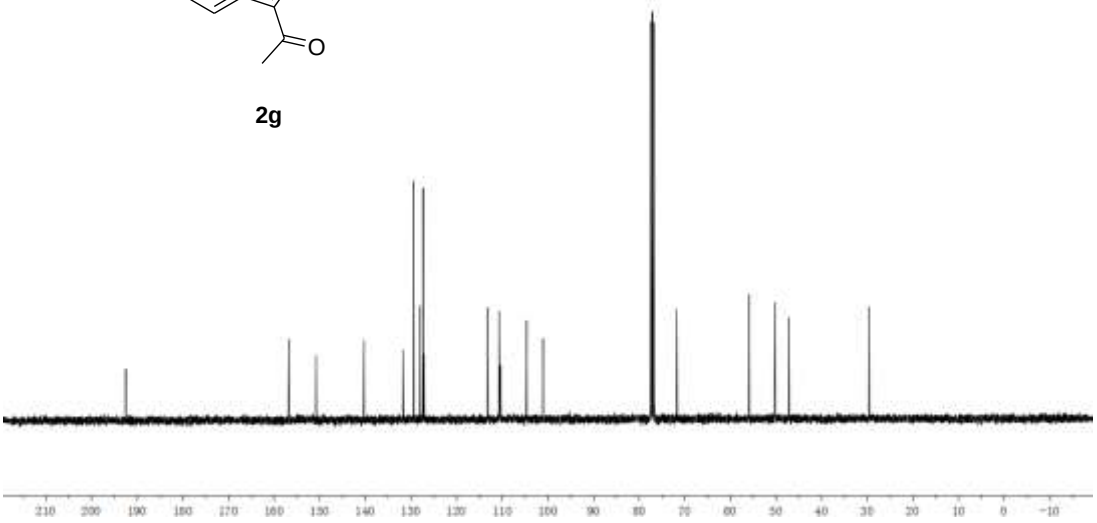

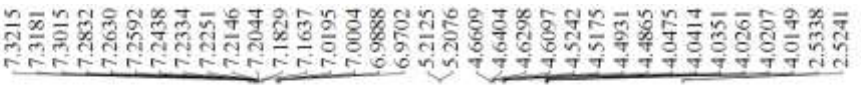
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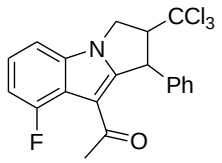
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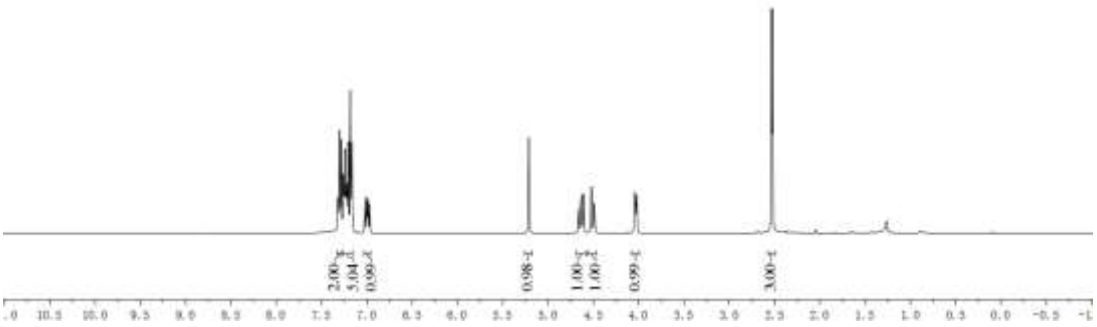
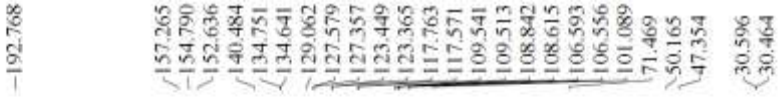
O

**2h**

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123.365
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117.571
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106.556
101.089
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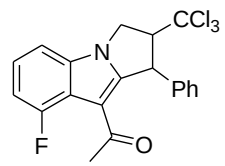
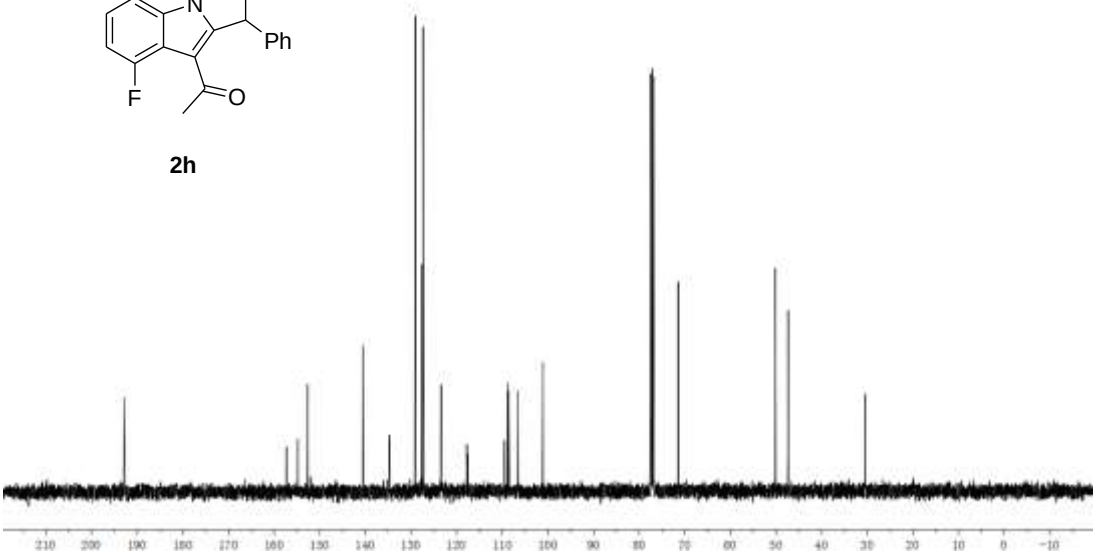
50.165
47.354
30.596
30.464


CCl3
N
Ph
F
O

**2h**

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8.0126
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7.3476
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7.3044
7.2934
7.2873
7.1732
7.1689
7.1537
7.0715
7.0652
7.0491
7.0429
7.0268
7.0206
5.1433
5.1386
4.6718
4.6515
4.6407
4.6207
4.5504
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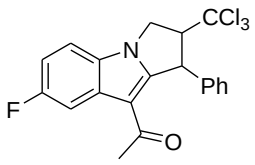
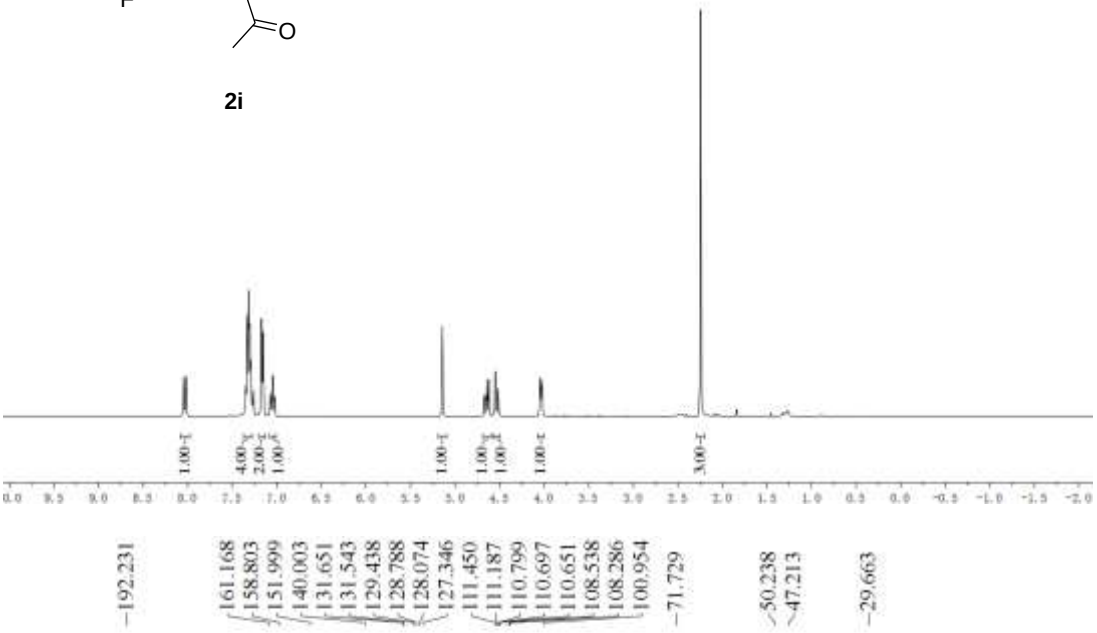
4.0392
4.0297
4.0245
4.0189
2.2456


CCl3
N
Ph
F
O

**2i**

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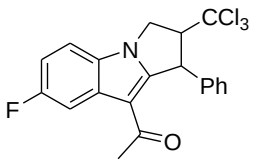
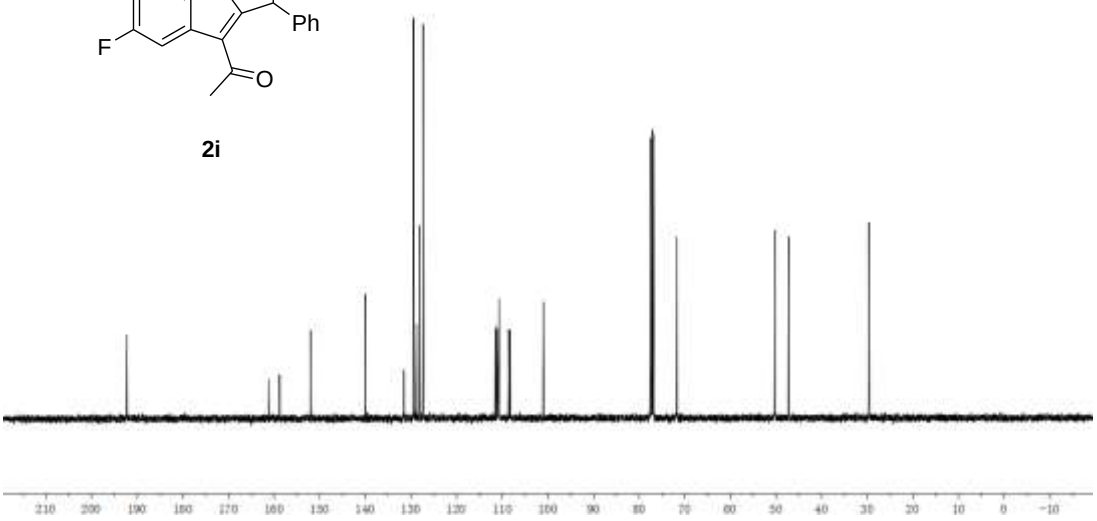
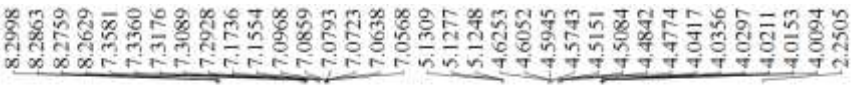

CCl3
N
Ph
F
O

**2i**

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7.3089
7.2928
7.1736
7.1554
7.0968
7.0859
7.0793
7.0723
7.0638
7.0568
5.1309
5.1277
5.1248
4.6253
4.6052
4.5945
4.5743
4.5151
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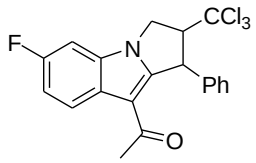
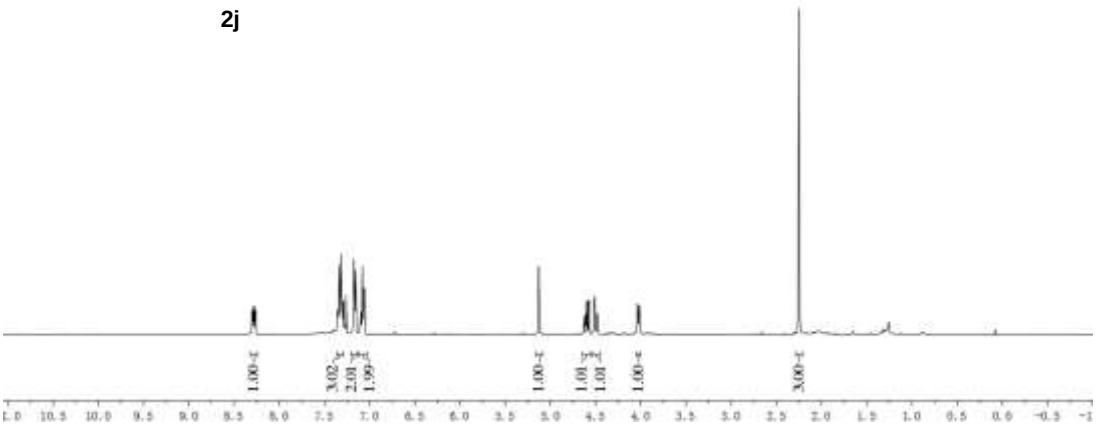
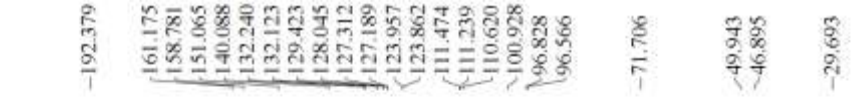
4.0211
4.0153
4.0094
2.2505


F
N
CCl3
Ph
O

**2j**

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129.423
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127.312
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123.957
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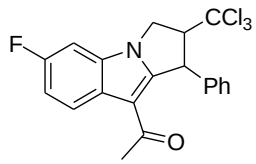
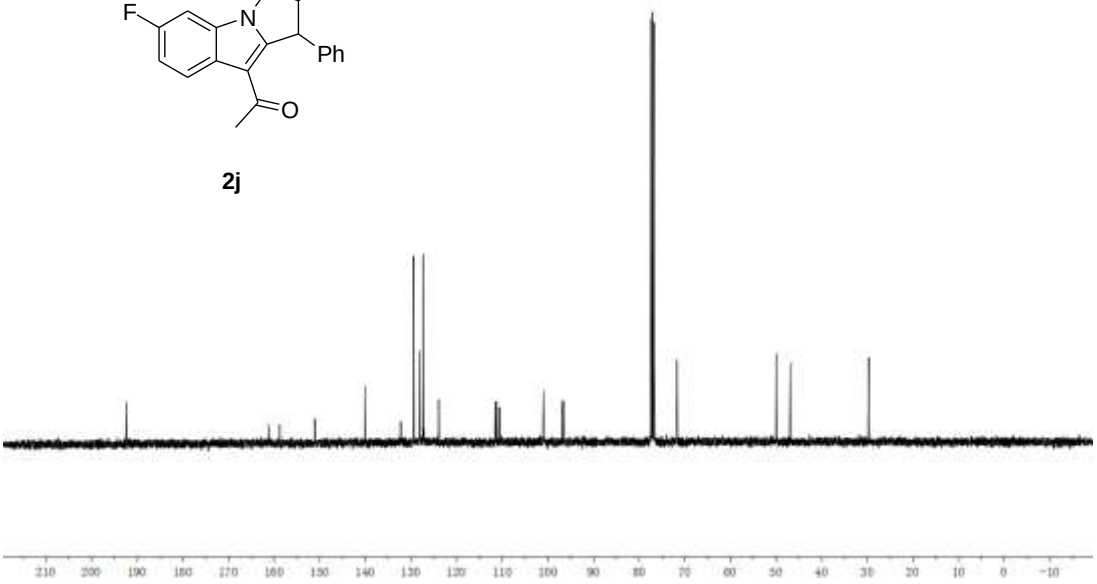
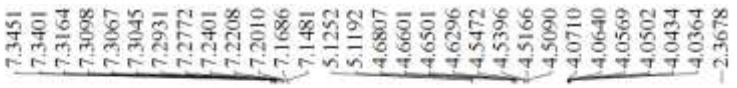
71.706
49.943
46.895
29.693


F
N
CCl3
Ph
O

**2j**

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7.3098
7.3067
7.3045
7.2931
7.2772
7.2401
7.2208
7.2010
7.1686
7.1481
5.1252
5.1192
4.6807
4.6601
4.6501
4.6296
4.5472
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4.5090
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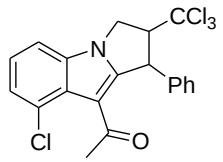
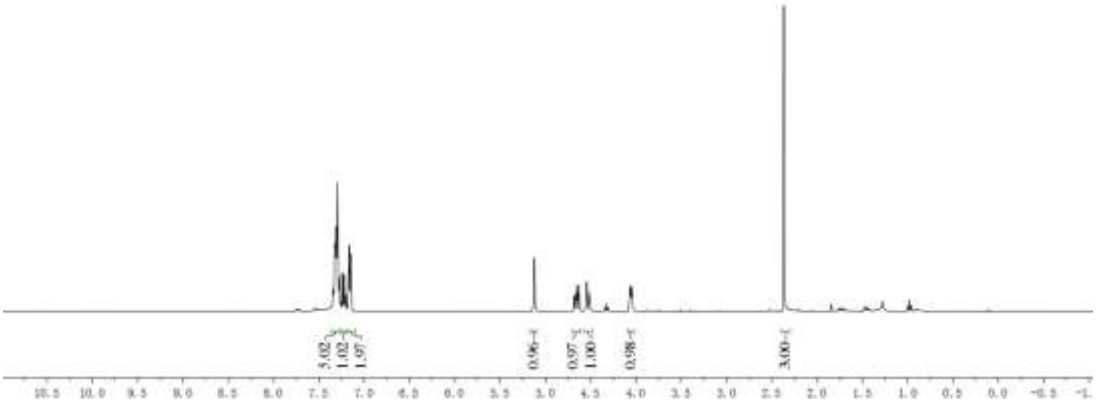
4.0640
4.0569
4.0502
4.0434
4.0364
2.3678


CCl3
N
Ph
Cl
O

**2k**

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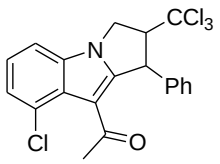
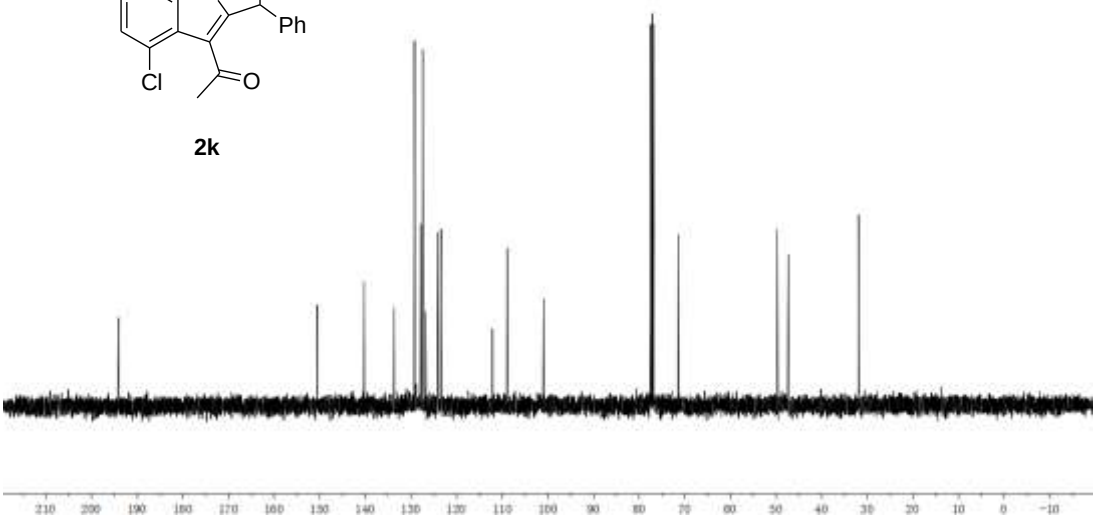
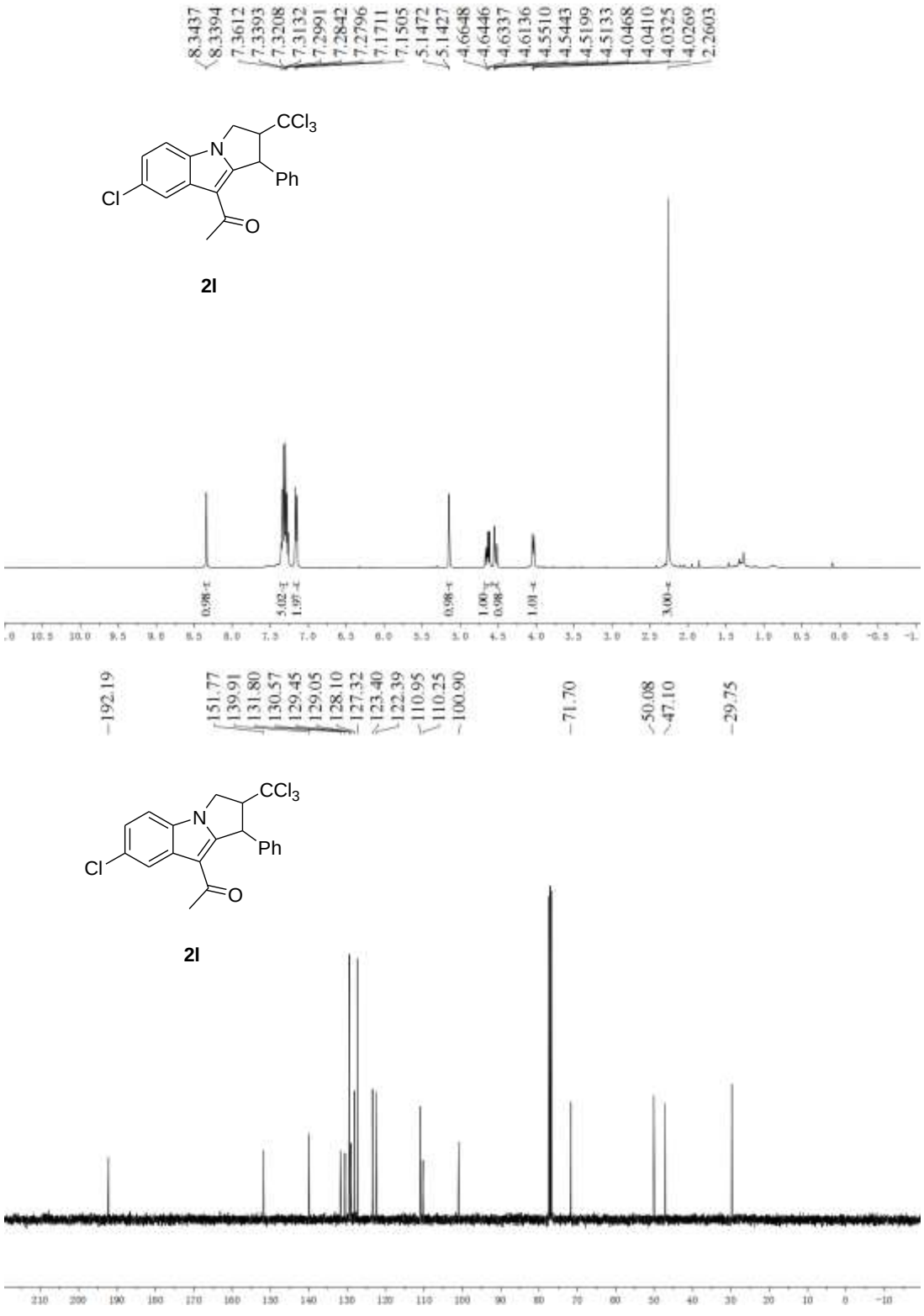
140.27
133.69
129.24
127.88
127.42
127.32
126.73
124.09
123.42
112.15
108.87
100.91
71.39
49.73
47.31
31.91


CCl3
N
Ph
Cl
O

**2k**

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7.3132
7.2991
7.2842
7.2796
7.1711
7.1505
5.1472
5.1427
4.6648
4.6446
4.6337
4.6136
4.5510
4.5443
4.5199
4.5133
4.0468
4.0410
4.0325
4.0269
2.2603
CCl3
N
Ph
Cl
O
2l
192.19
151.77
139.91
131.80
130.57
129.45
129.05
128.10
127.32
123.40
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100.90
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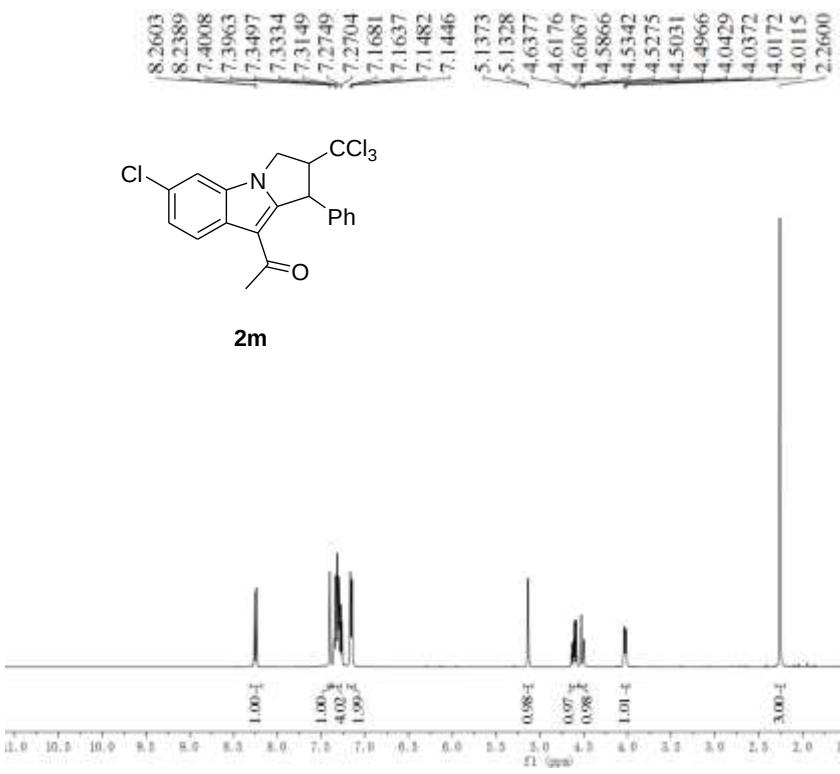
50.08
47.10
29.75
CCl3
N
Ph
Cl
O
2l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7.3497
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7.3149
7.2749
7.2704
7.1681
7.1637
7.1482
7.1446
5.1373
5.1328
4.6377
4.6176
4.6067
4.5866
4.5342
4.5275
4.5031
4.4966
4.0429
4.0372
4.0172
4.0115
2.2600
Cl
N
CCl3
Ph
O
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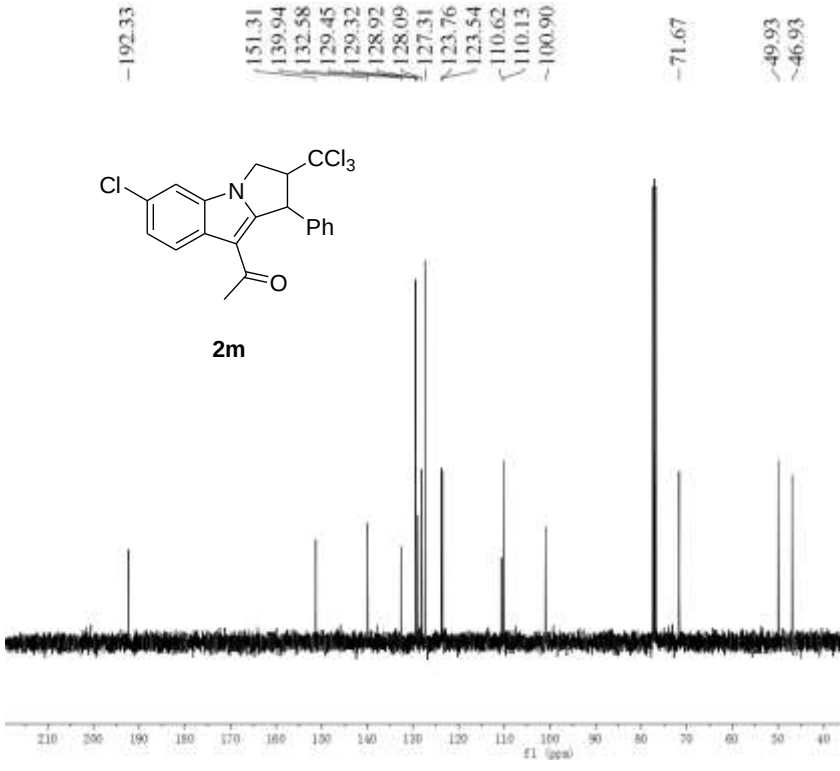
1.00
4.02
1.99
0.98
0.97
0.98
1.01
3.00

**2m**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129.32
128.92
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123.76
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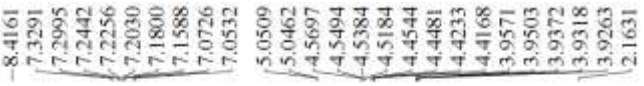
100.90
71.67
49.93
46.93
29.76
Cl
N
CCl3
Ph
O

**2m**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7.2442
7.2256
7.2030
7.1800
7.1588
7.0726
7.0532
5.0509
5.0462
4.5697
4.5494
4.5384
4.5184
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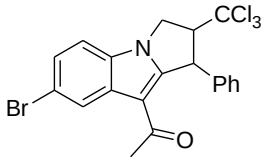
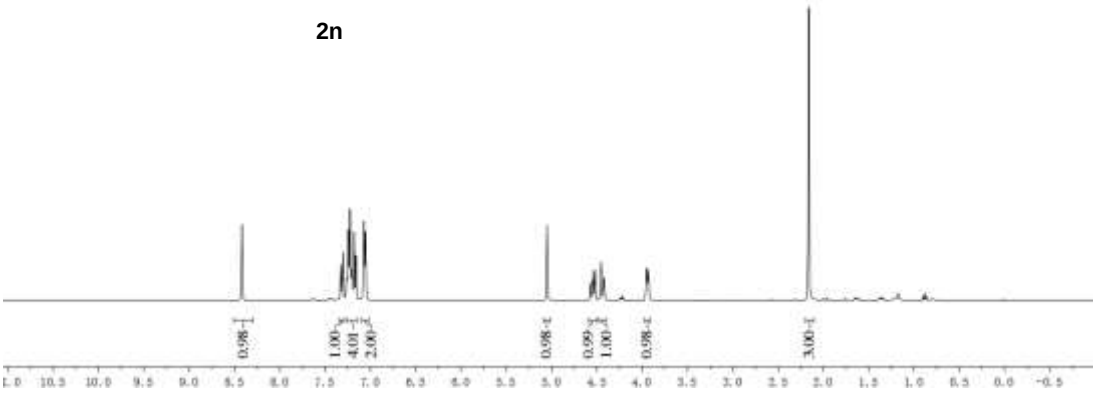
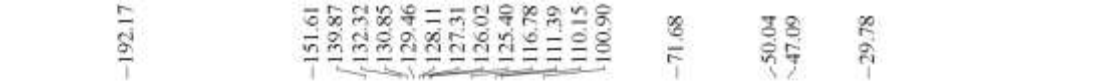
3.9318
3.9263
2.1631


CCl3
N
Ph
Br
O

**2n**

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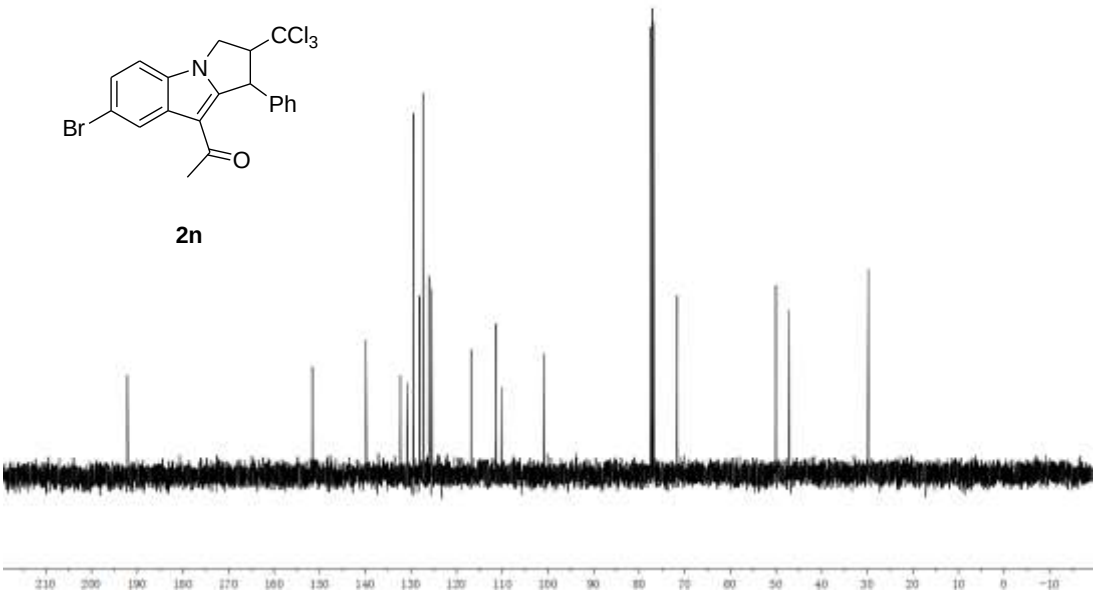
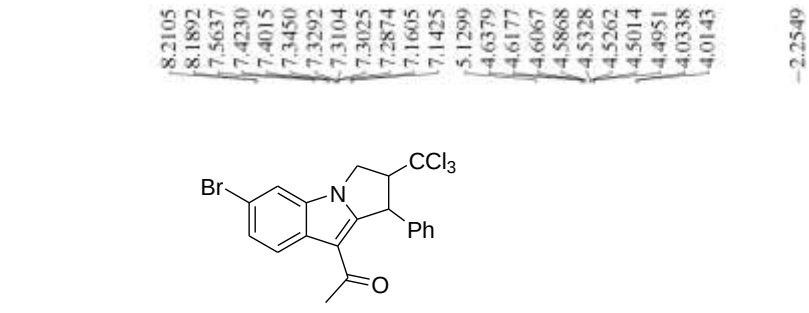
129.46
128.11
127.31
126.02
125.40
116.78
111.39
110.15
100.90
71.68
50.04
47.09
29.78


CCl3
N
Ph
Br
O

**2n**

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7.2874
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7.1425
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4.6177
4.6067
4.5868
4.5328
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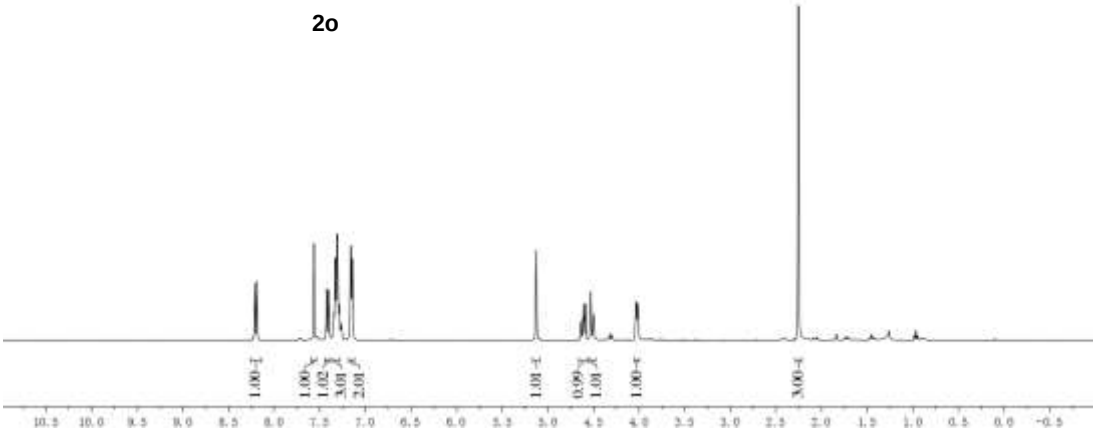
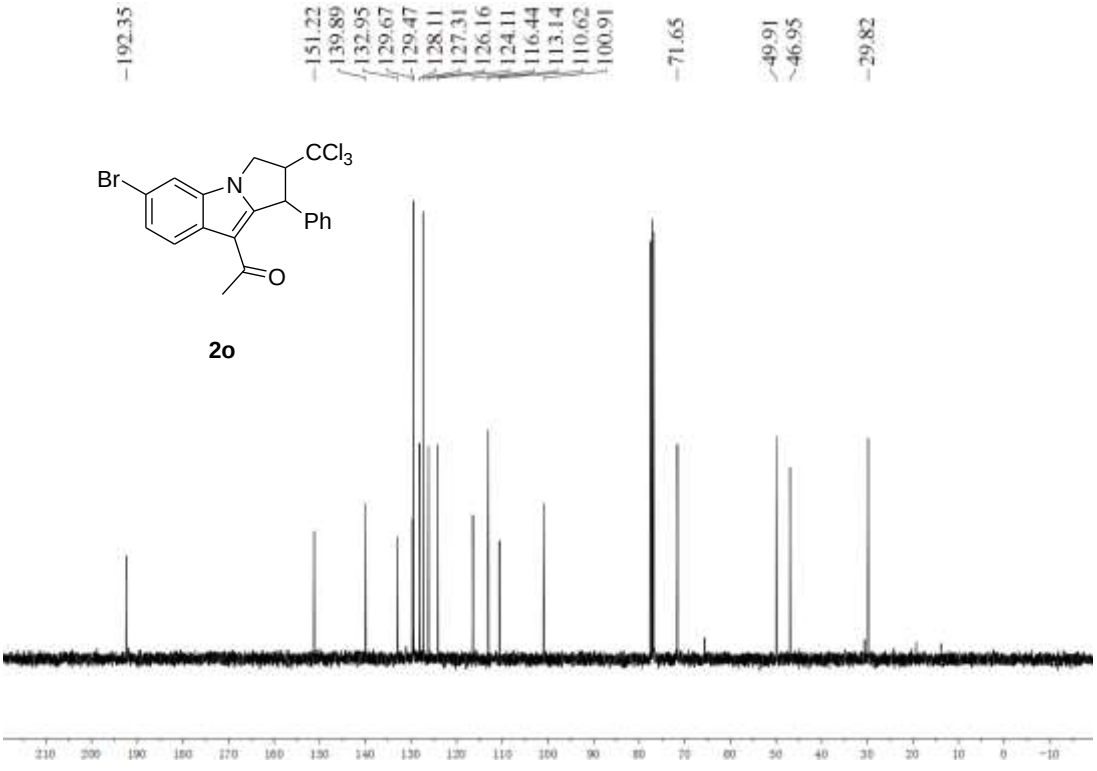
4.4951
4.0338
4.0143
2.2549
Br
N
CCl3
Ph
O

**2o**

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46.95
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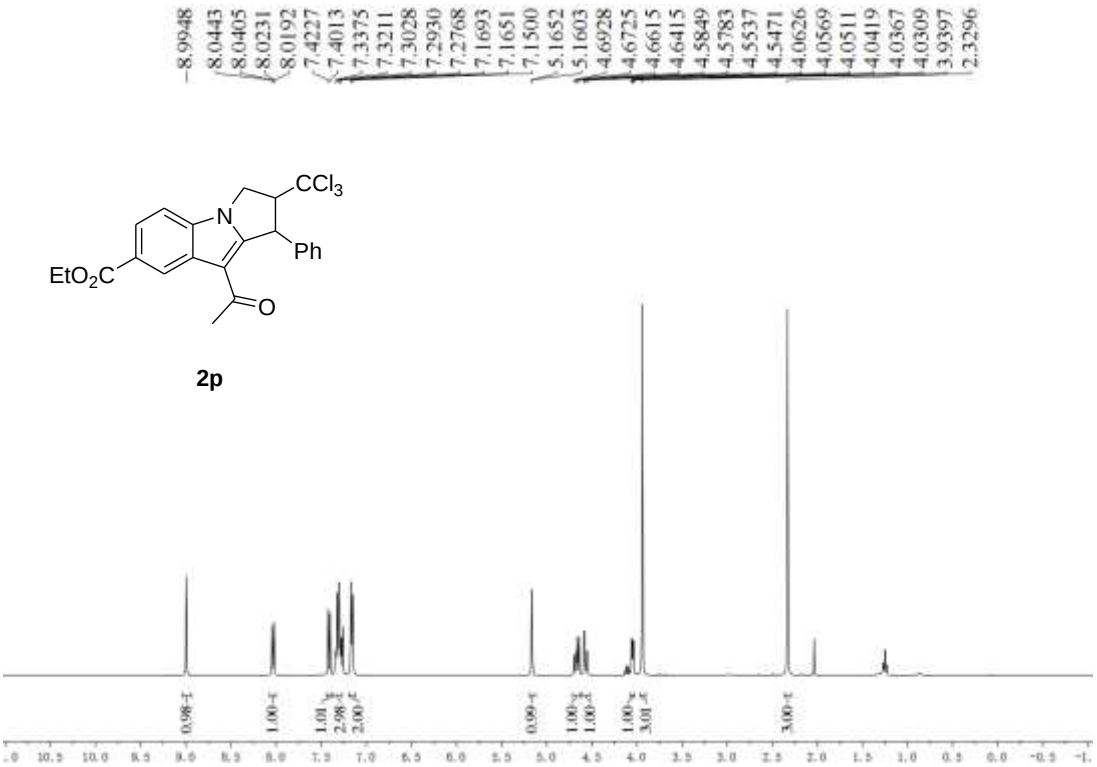
Br
N
CCl3
Ph
O

**2o**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4.0626
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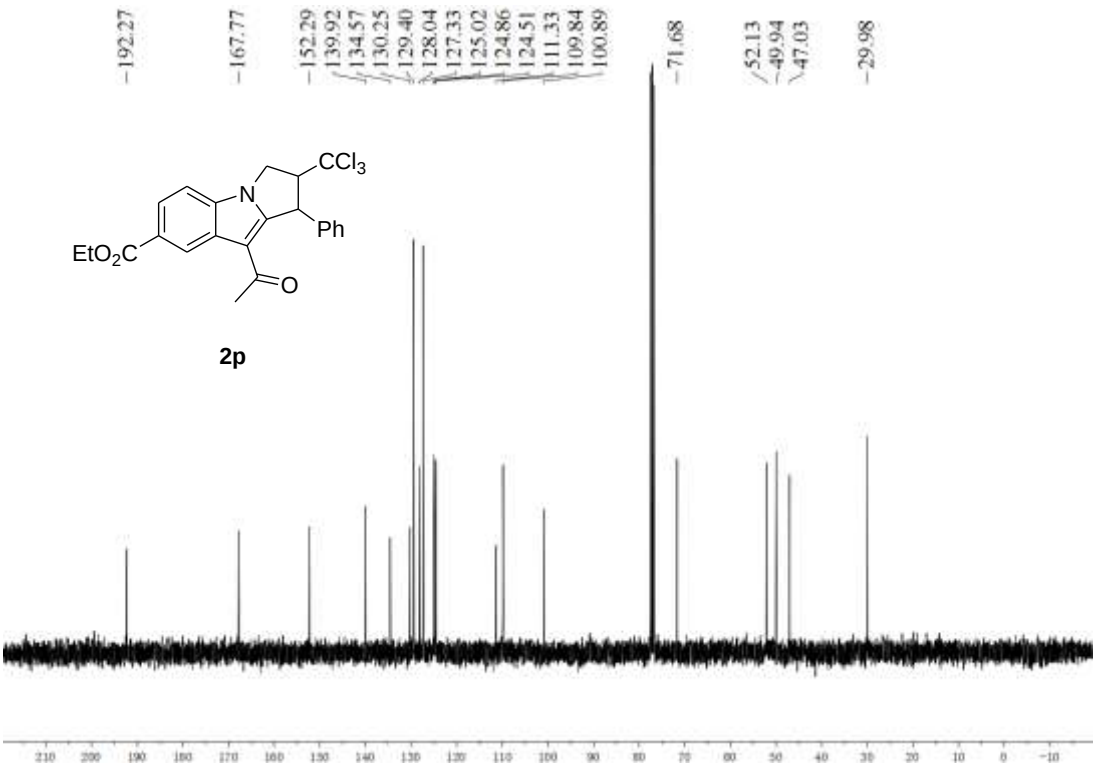
4.0367
4.0309
3.9397
2.3296
CCl3
N
Ph
EtO2C
O

**2p**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111.33
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52.13
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47.03
29.98
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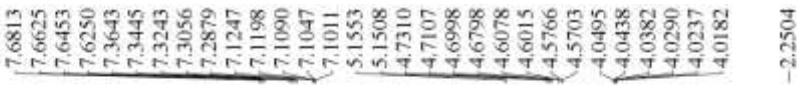
N
Ph
EtO2C
O

**2p**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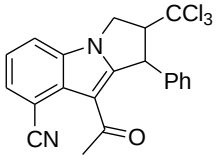
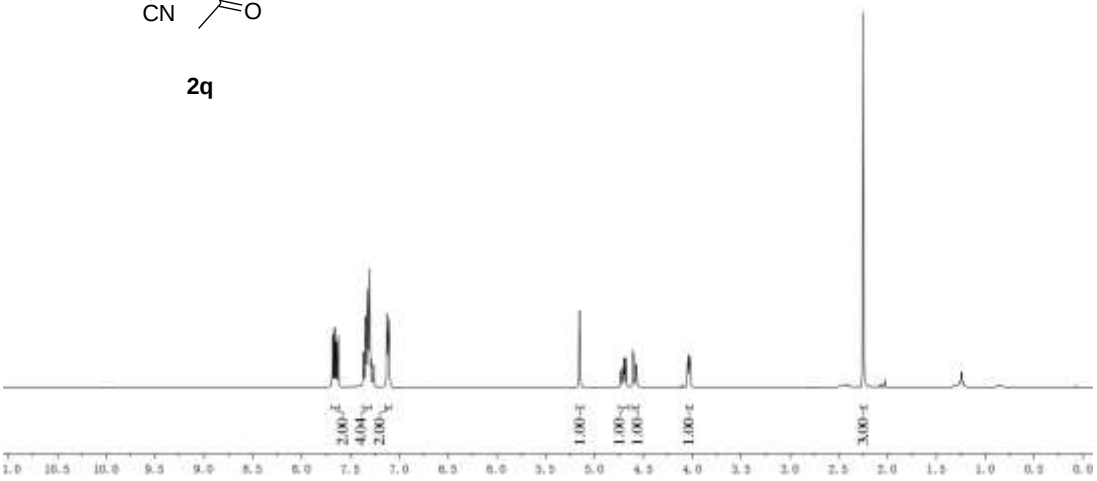
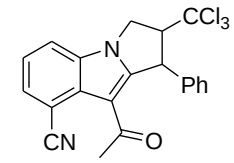
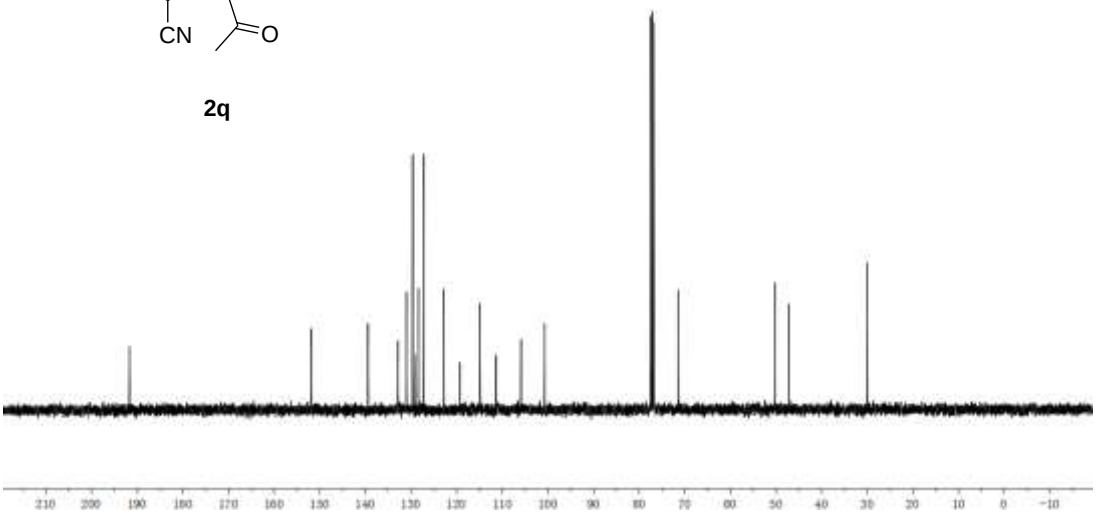

CCl3
N
Ph
CN
O

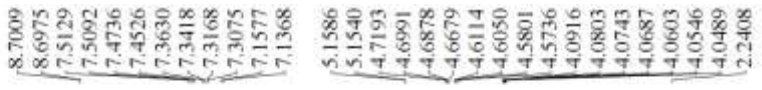
**2q**




CCl3
N
Ph
CN
O

**2q**

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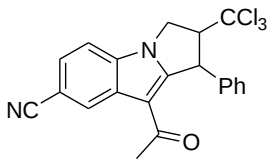
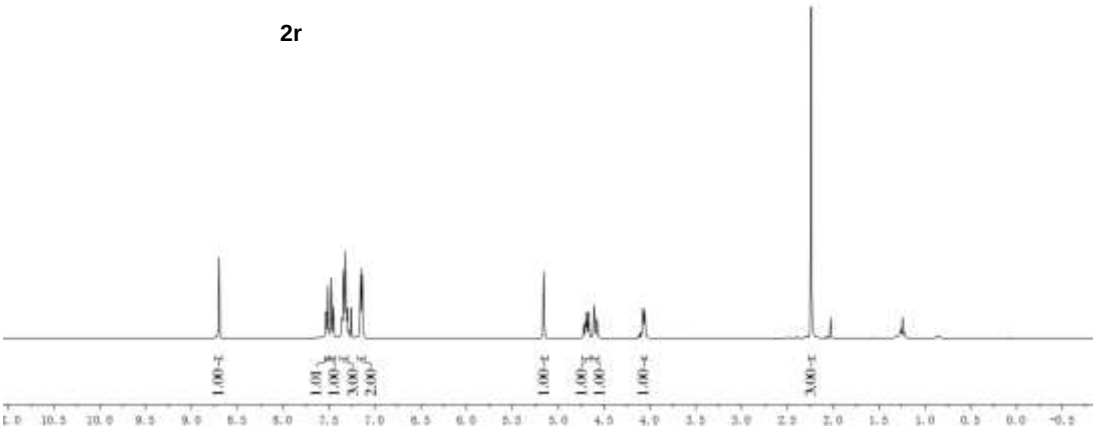

CCl3
N
Ph
NC
O

**2r**

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129.60
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120.13
111.00
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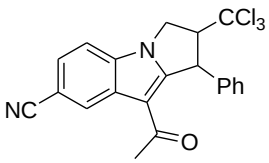
106.19
100.70
71.63
49.87
47.09
29.80


CCl3
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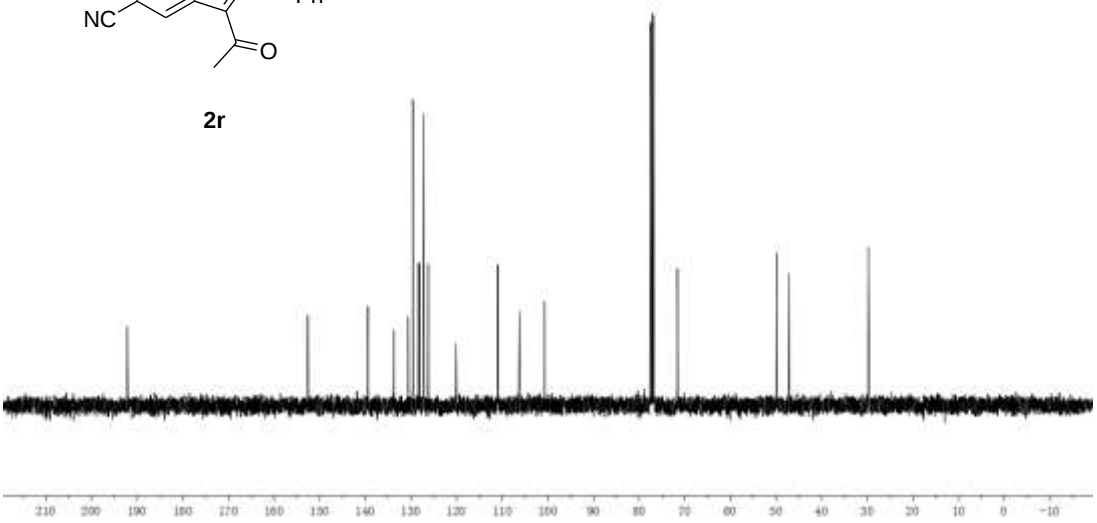
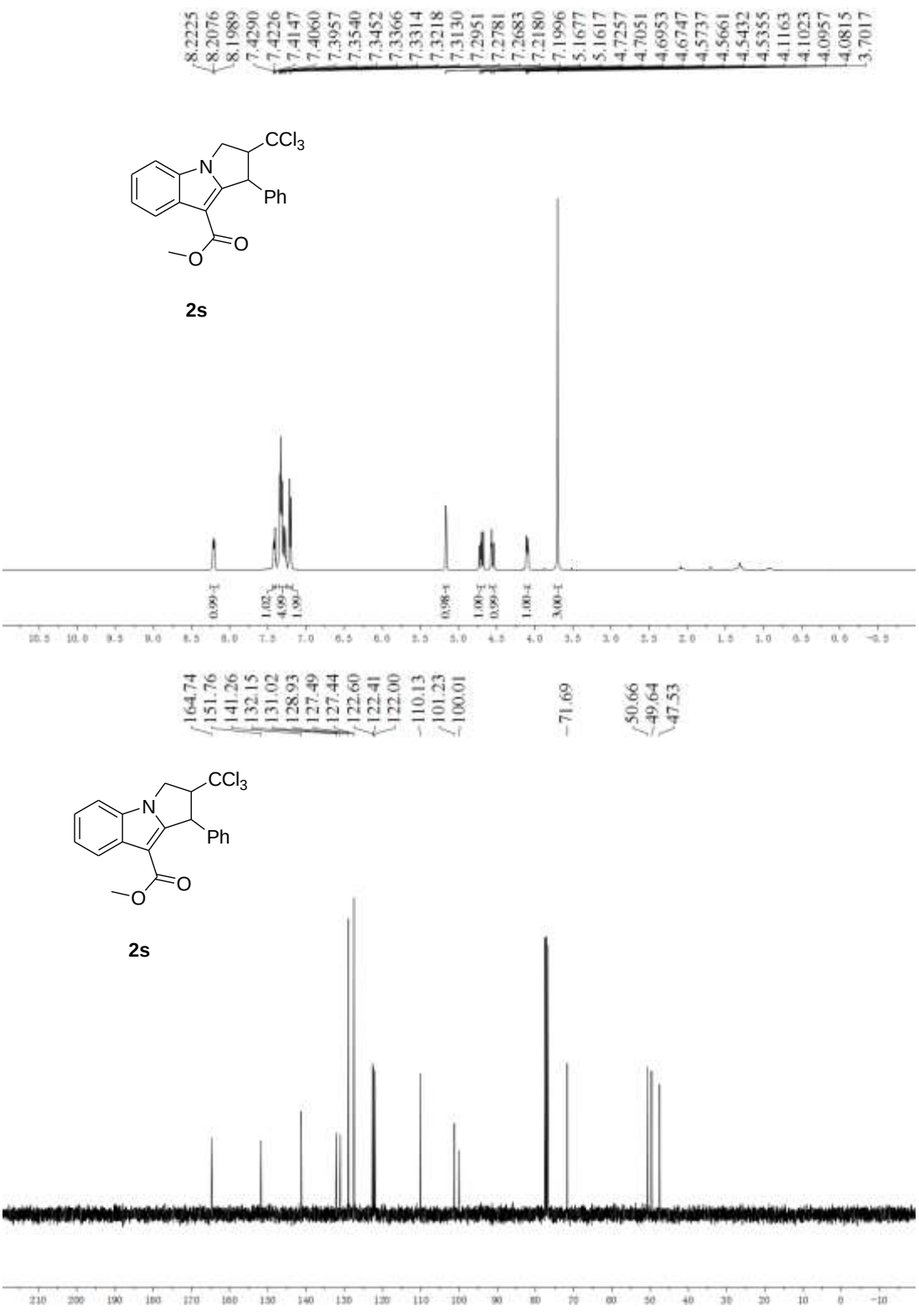
Ph
NC
O

**2r**

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7.2683
7.2180
7.1996
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5.1617
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4.7051
4.6953
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4.5737
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4.5432
4.5355
4.1163
4.1023
4.0957
4.0815
3.7017
CCl3
N
Ph
O
O
2s
0.99
1.02
4.99
1.99
0.98
1.00
0.99
1.00
3.00
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151.76
141.26
132.15
131.02
128.93
127.49
127.44
122.60
122.41
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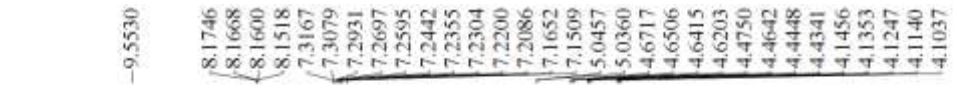
47.53
CCl3
N
Ph
O
O
2s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7.2442
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7.2200
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7.1652
7.1509
5.0457
5.0360
4.6717
4.6506
4.6415
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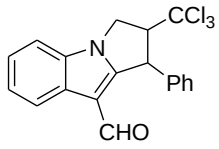
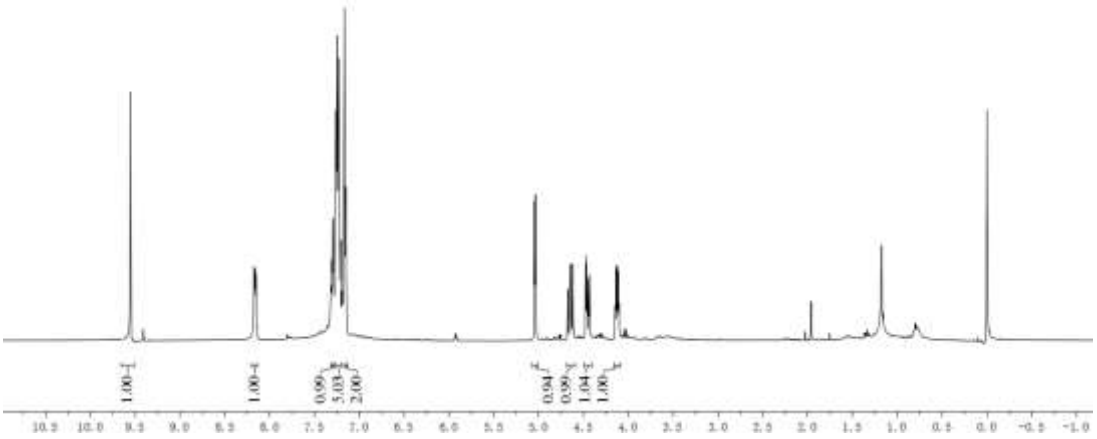
4.1353
4.1247
4.1140
4.1037


CCl3
N
Ph
CHO

**2t**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0.99
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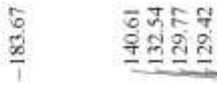
2.00
0.94
0.99
1.04
1.00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132.54
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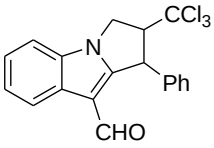
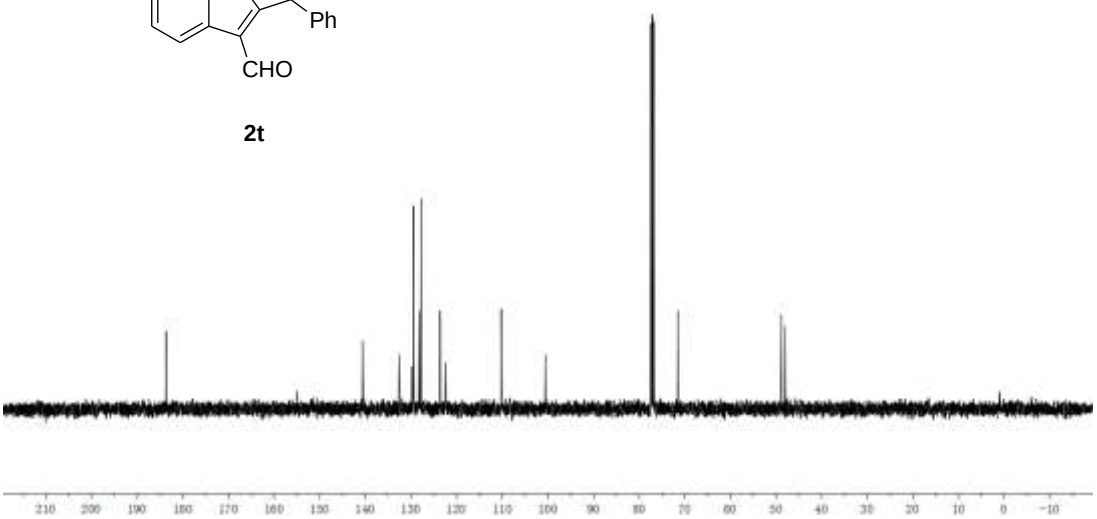
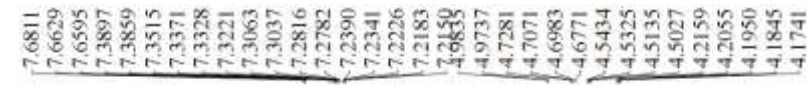
128.22
127.81
123.65
123.59
122.41
110.22
110.11
100.56
71.54
48.80
48.04


CCl3
N
Ph
CHO

**2t**

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7.3371
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7.3221
7.3063
7.3037
7.2816
7.2782
7.2390
7.2341
7.2226
7.2183
4.9737
4.7281
4.7071
4.6983
4.6771
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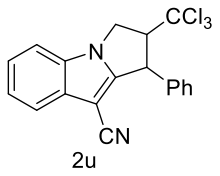
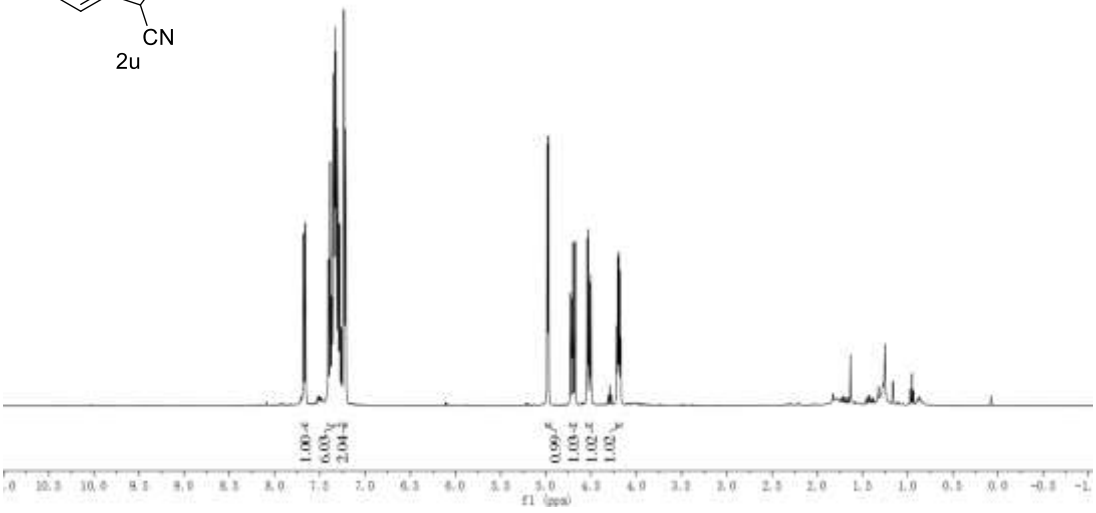
4.5325
4.5135
4.5027
4.2159
4.2055
4.1950
4.1845
4.1741


CCl3
N
Ph
CN

2u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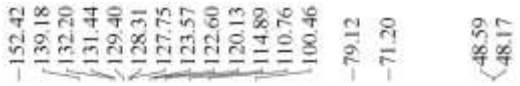
6.03
2.04
0.99
1.03
1.02
1.02
f1 (ppm)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139.18
132.20
131.44
129.40
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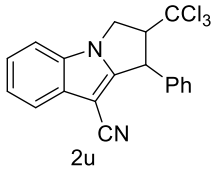
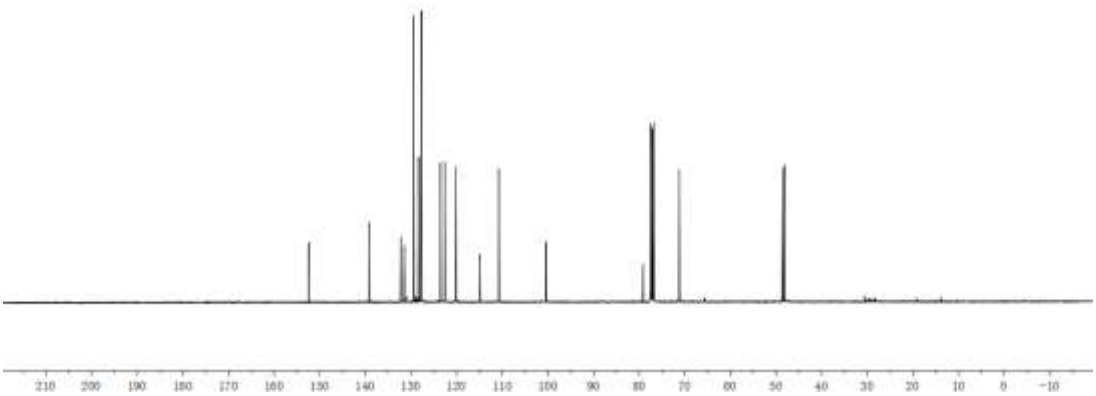
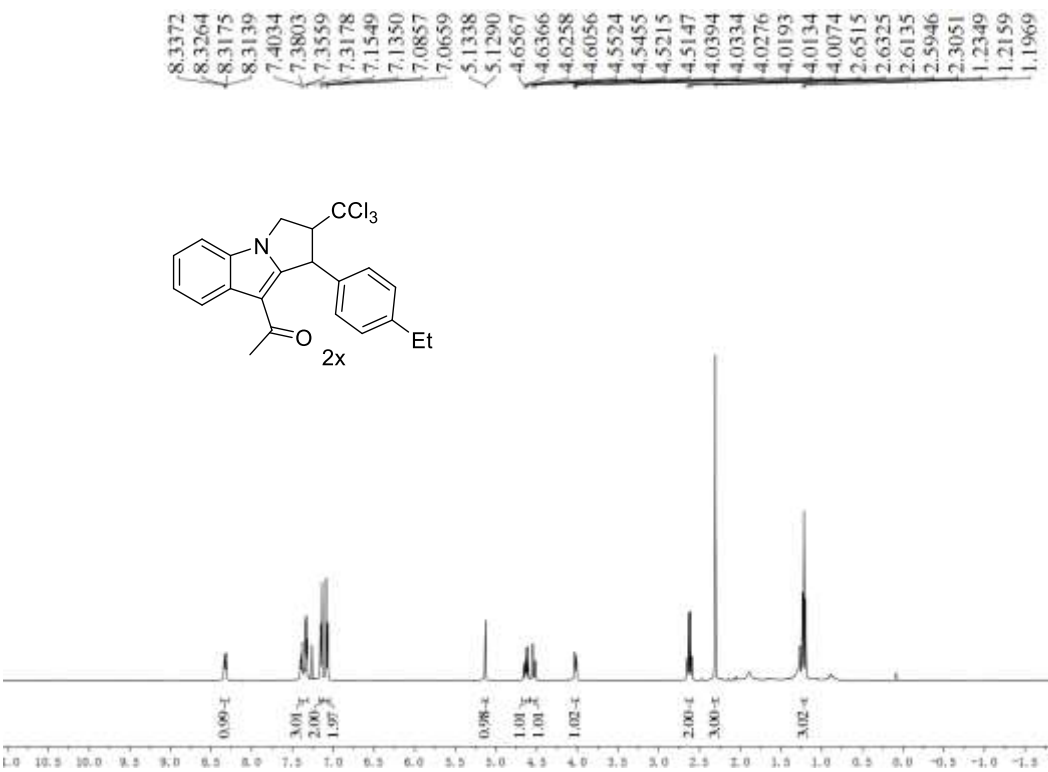
123.57
122.60
120.13
114.89
110.76
100.46
79.12
71.20
48.59
48.17


CCl3
N
Ph
CN

2u

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8.3139
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7.3559
7.3178
7.1549
7.1350
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7.0659
5.1338
5.1290
4.6567
4.6366
4.6258
4.6056
4.5524
4.5455
4.5215
4.5147
4.0394
4.0334
4.0276
4.0193
4.0134
4.0074
2.6515
2.6325
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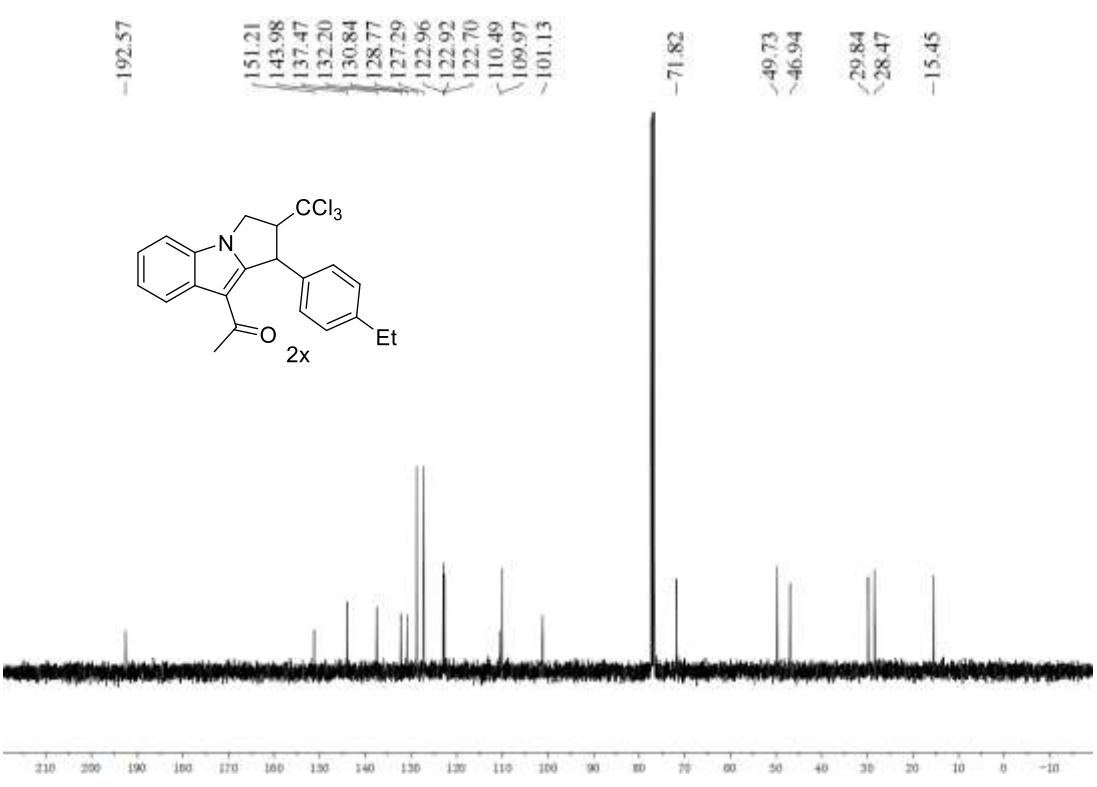
2.5946
2.3051
1.2349
1.2159
1.1969
CCl3
N
O
Et
2x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130.84
128.77
127.29
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122.92
122.70
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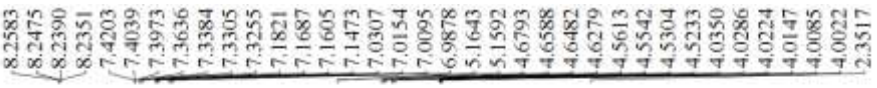
101.13
71.82
49.73
46.94
29.84
28.47
15.45
CCl3
N
O
Et
2x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7.3384
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7.3255
7.1821
7.1687
7.1605
7.1473
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4.6482
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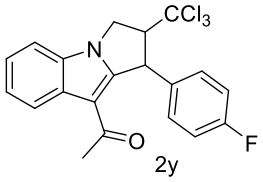
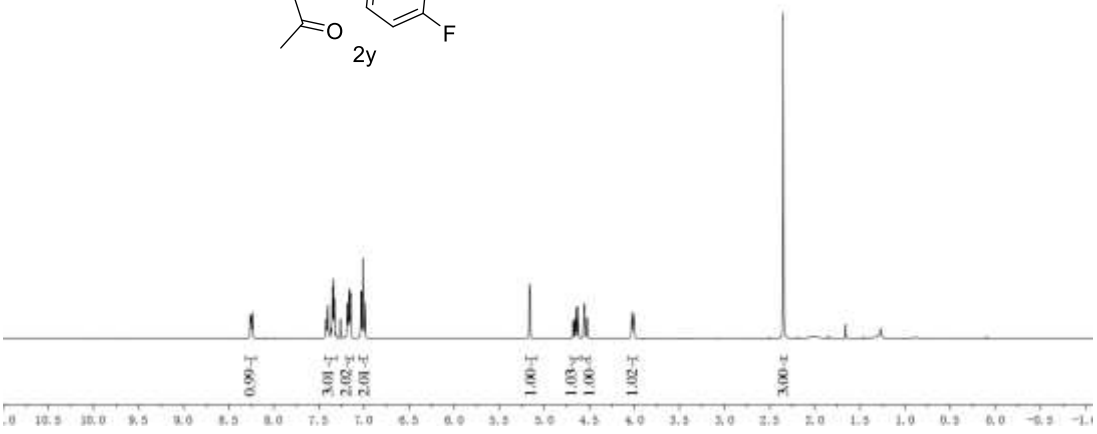

CCl3
N
O
F
2y

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150.857
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136.259
132.221
130.597
129.171
129.089
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122.421
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110.205
100.980
71.711
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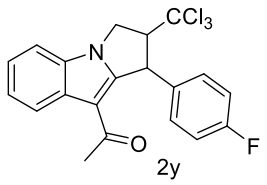
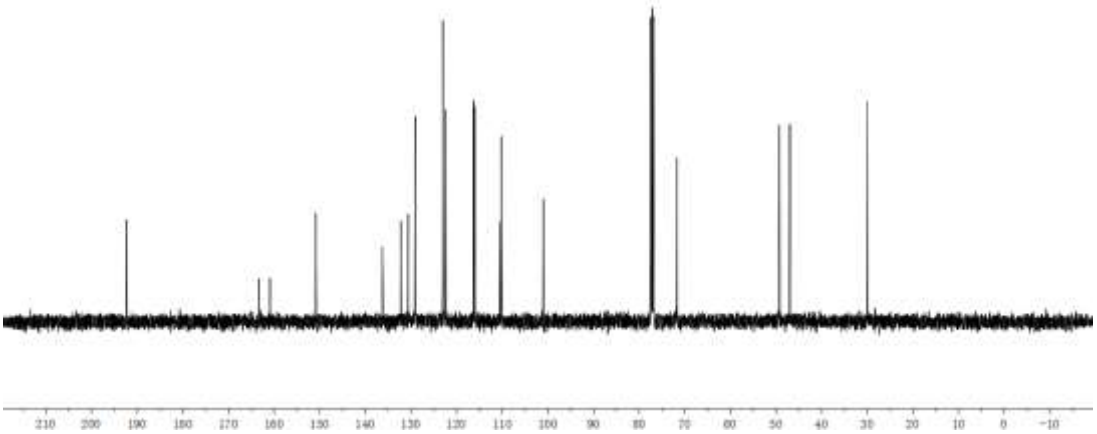
46.989
29.958


CCl3
N
O
F
2y



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4.4189
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4.3800
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4.0687
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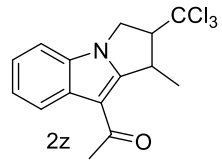
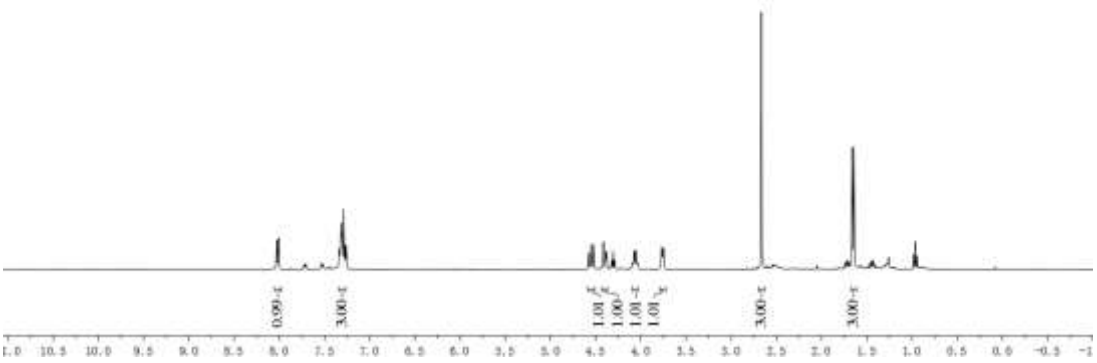
1.6612
1.6434



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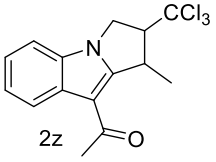
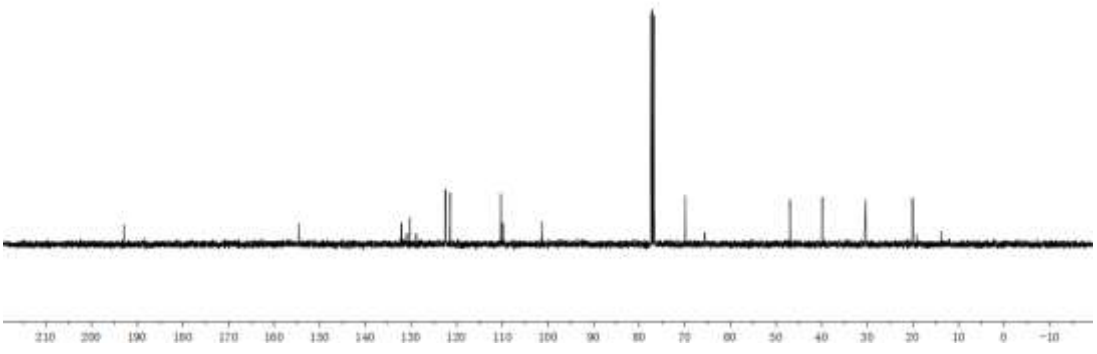
46.97
39.87
30.33
20.09



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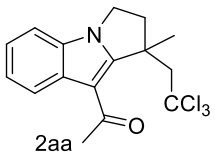


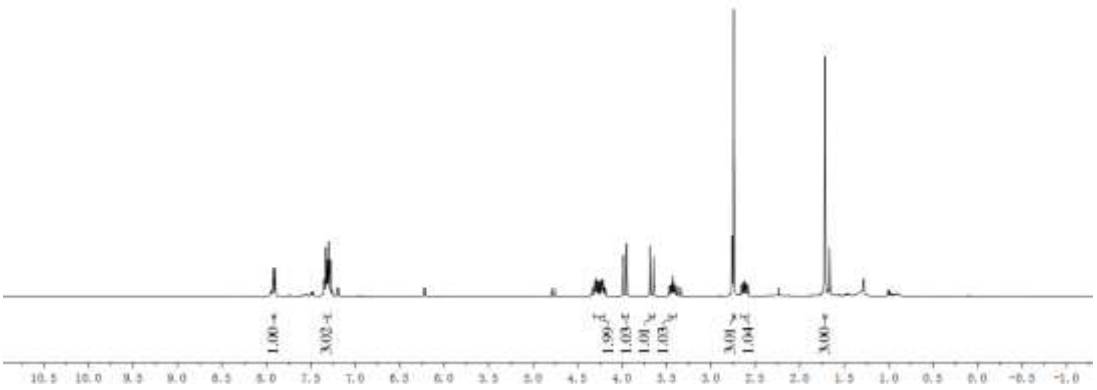

−193.57
−156.59
132.10
130.48
122.27
122.07
120.98
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110.51
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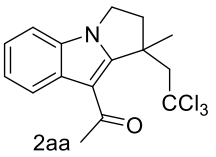
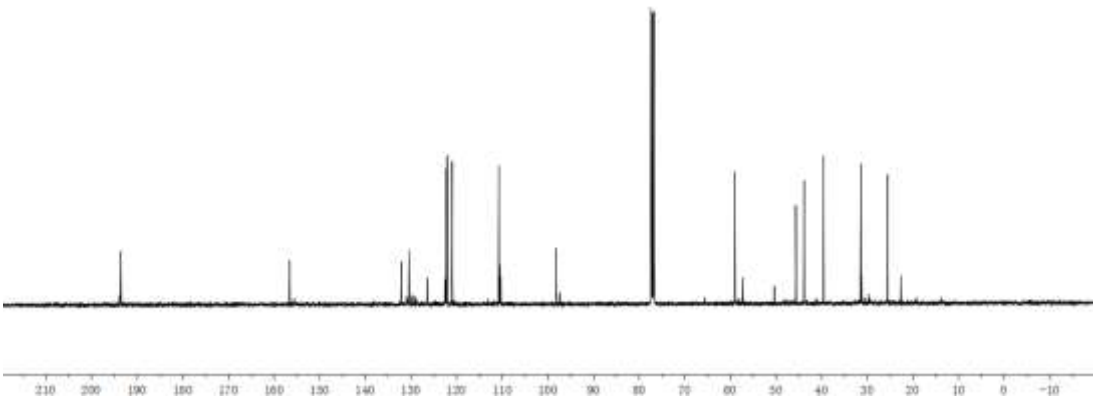
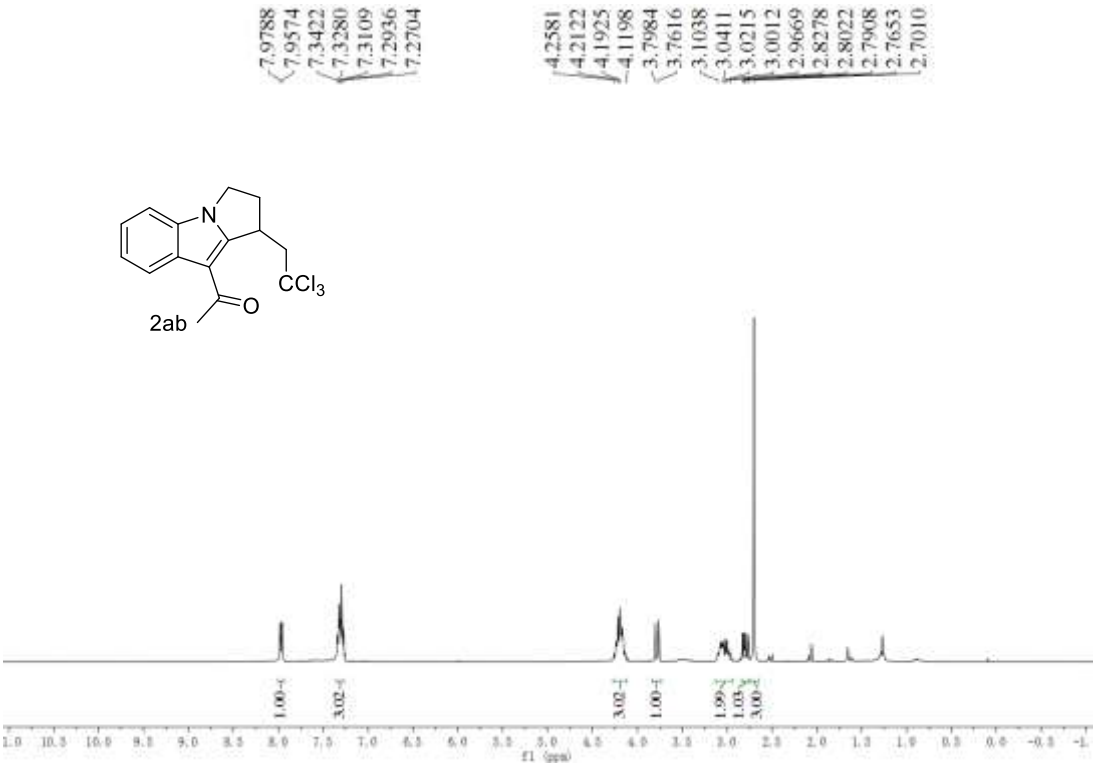
39.59
−31.45
−25.58

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4.2122
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3.0411
3.0215
3.0012
2.9669
2.8278
2.8022
2.7908
2.7653
2.7010
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CCl3
O
2ab
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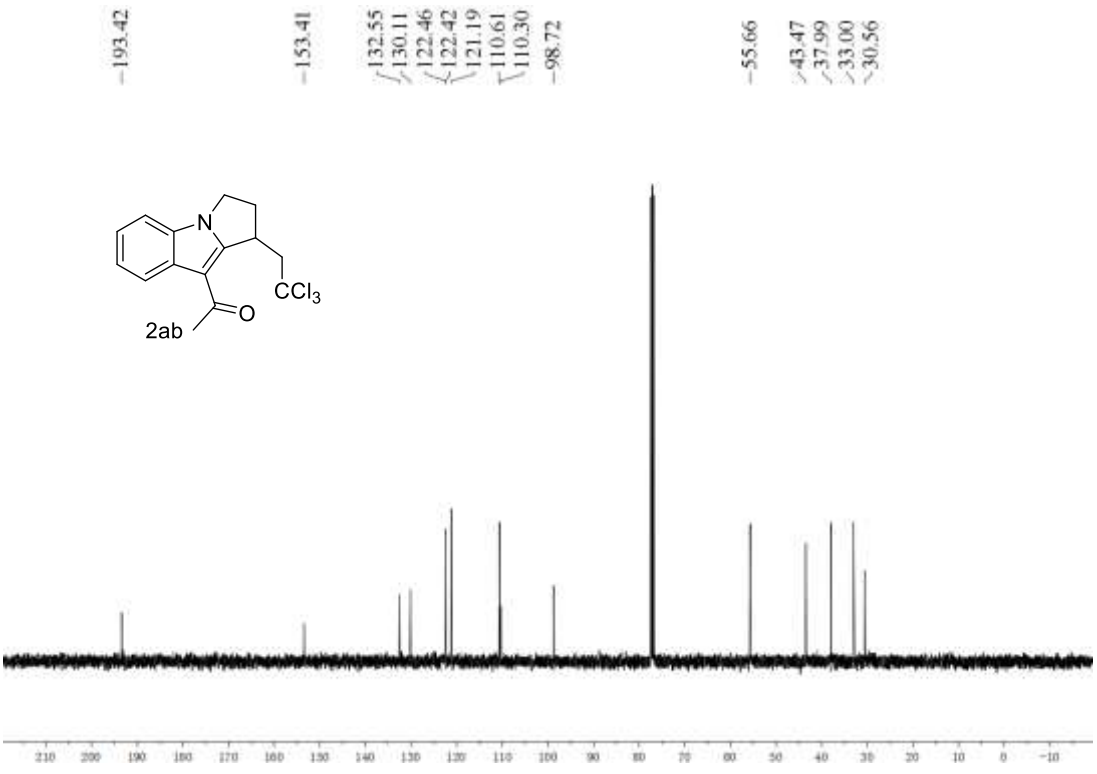
3.02
3.02
1.00
1.99
1.03
3.00
f1 (ppm)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43.47
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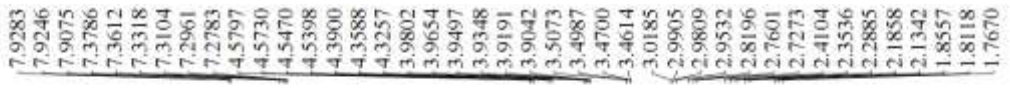
33.00
30.56
N
CCl3
O
2ab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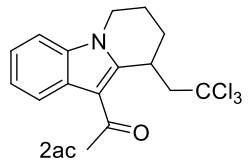
1.7670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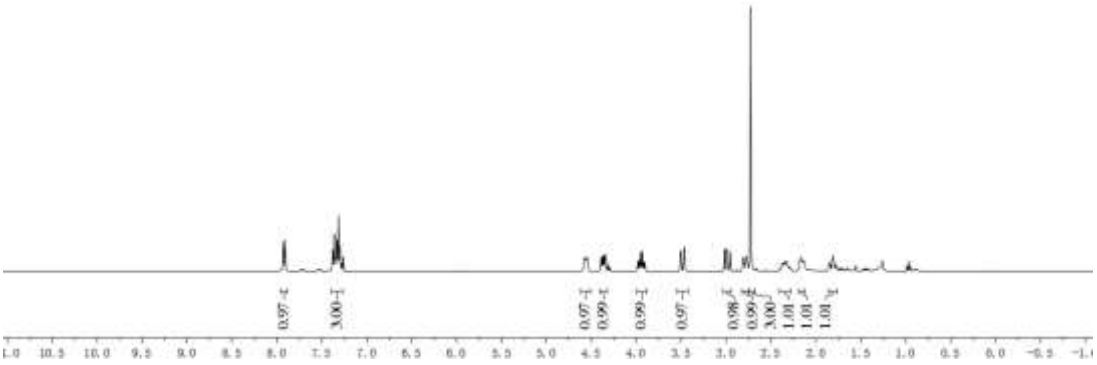
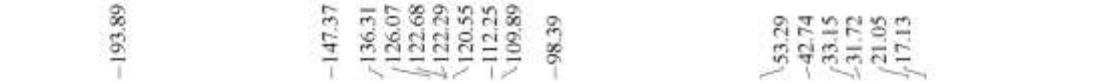
CCl3
O
2ac

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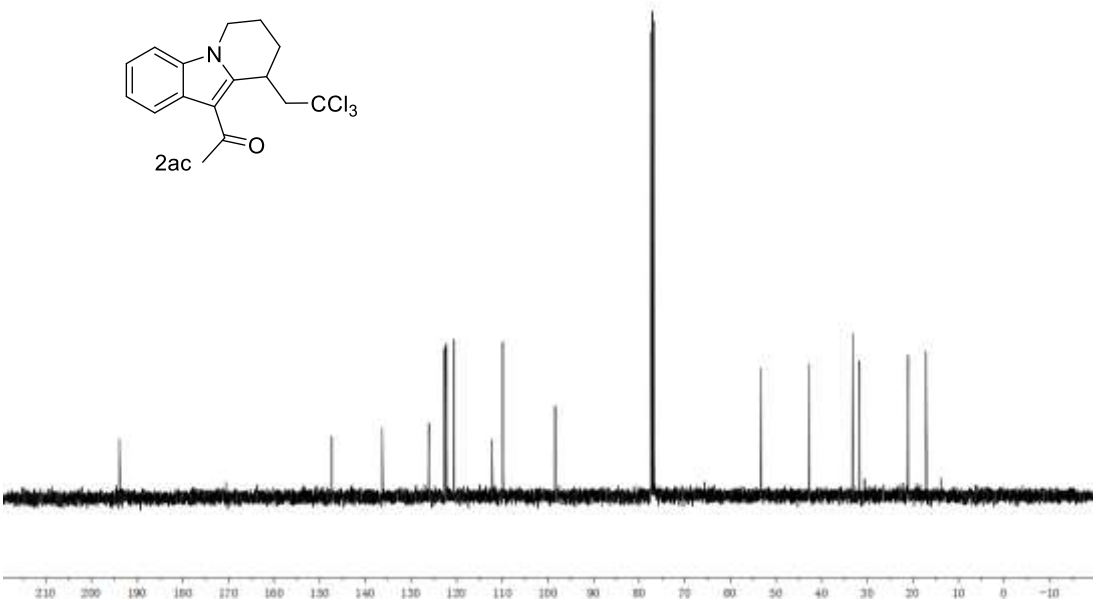
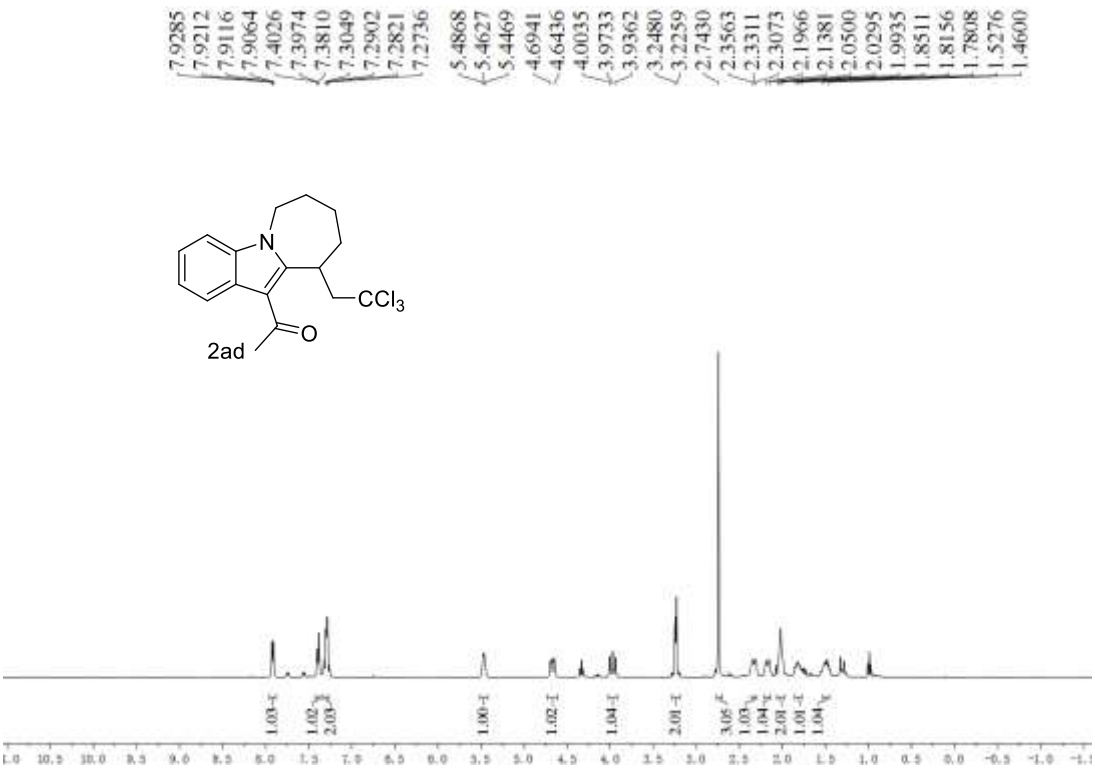
98.39
53.29
42.74
33.15
31.72
21.05
17.13


N
CCl3
O
2ac

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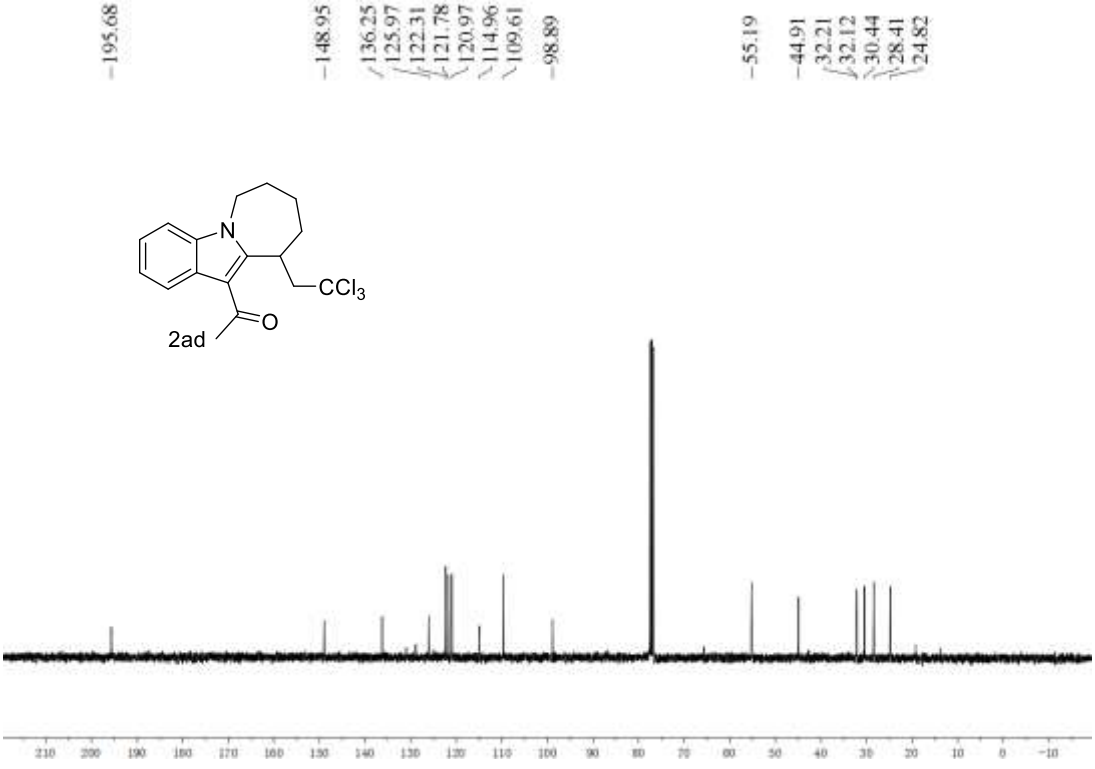
N
CCl3
O
2ad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114.96
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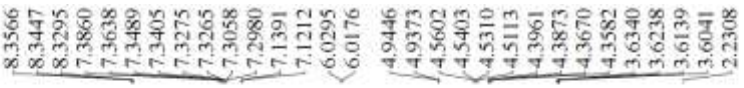
32.21
32.12
30.44
28.41
24.82
N
CCl3
O
2ad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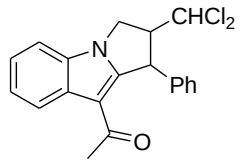
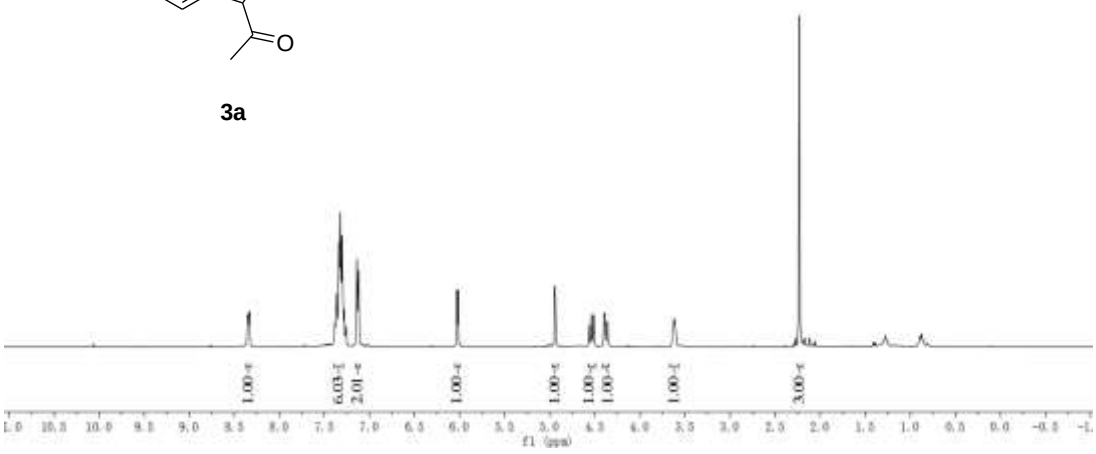
7.3489
7.3405
7.3275
7.3265
7.3058
7.2980
7.1391
7.1212
6.0295
6.0176
4.9446
4.9373
4.5602
4.5403
4.5310
4.5113
4.3961
4.3873
4.3670
4.3582
3.6340
3.6238
3.6139
3.6041
2.2308


CHCl2
N
Ph
O

**3a**


1.00
6.03
2.01
1.00
1.00
1.00
1.00
1.00
3.00
f1 (ppm)


192.76
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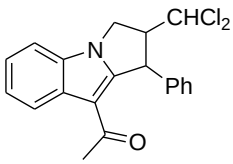
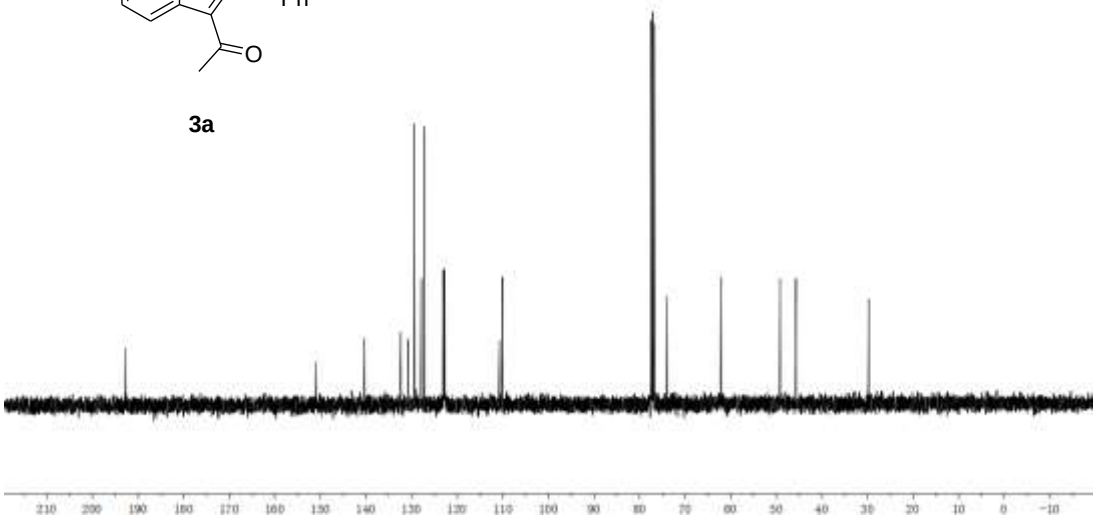
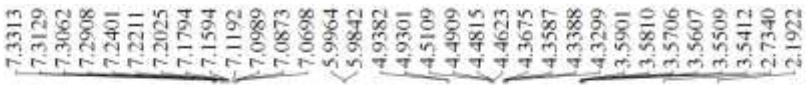
140.43
132.38
130.79
129.38
127.87
127.23
123.03
122.99
122.75
110.72
110.06
74.02
62.13
49.17
45.69
29.74


CHCl2
N
Ph
O

**3a**

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7.2401
7.2211
7.2025
7.1794
7.1594
7.1192
7.0989
7.0873
7.0698
5.9964
5.9842
4.9382
4.9301
4.5109
4.4909
4.4815
4.4623
4.3675
4.3587
4.3388
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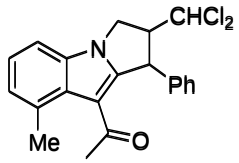
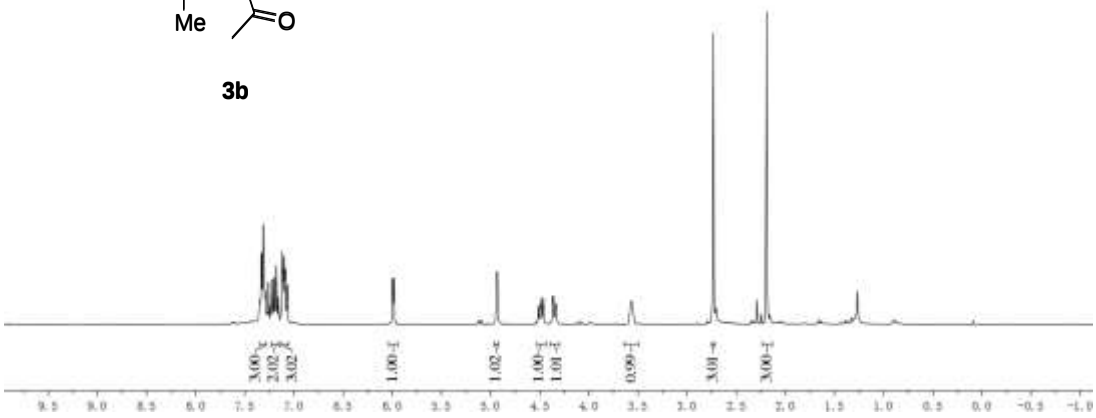
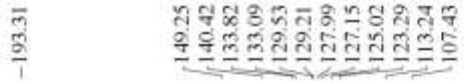
3.5901
3.5810
3.5706
3.5607
3.5509
3.5412
2.7340
2.1922


CHCl2
N
Ph
Me
O

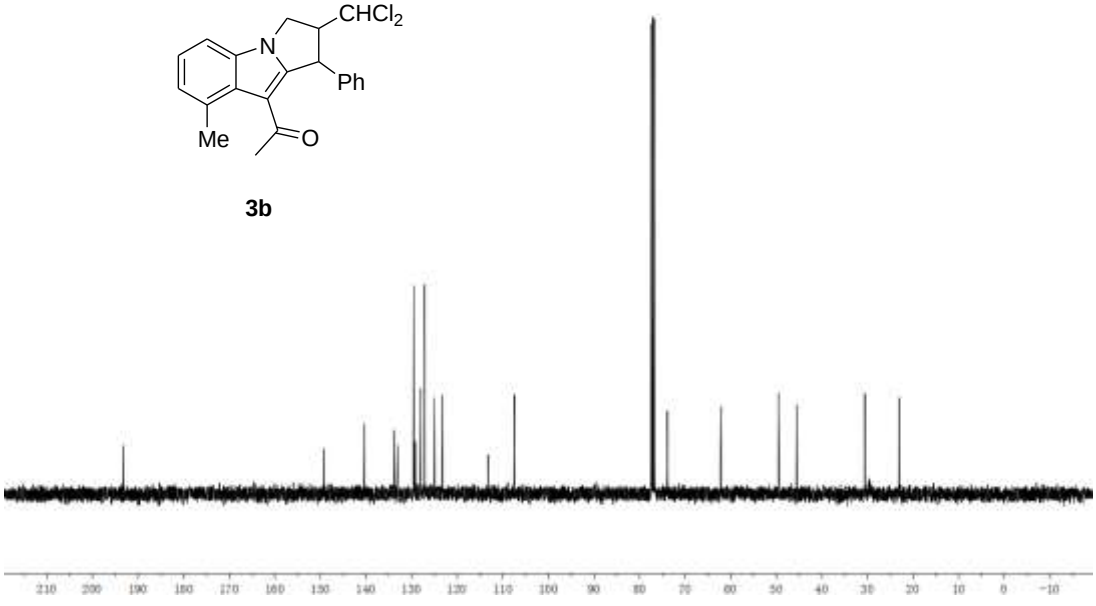
**3b**

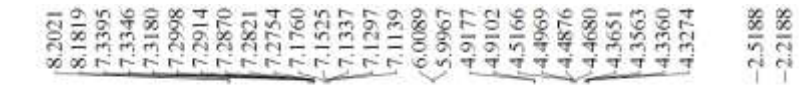



193.31
149.25
140.42
133.82
133.09
129.53
129.21
127.99
127.15
125.02
123.29
113.24
107.43
73.90
62.12
49.57
45.55
30.62
23.05


CHCl2
N
Ph
Me
O

**3b**

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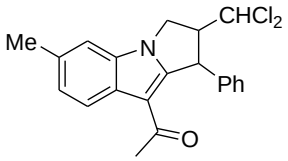
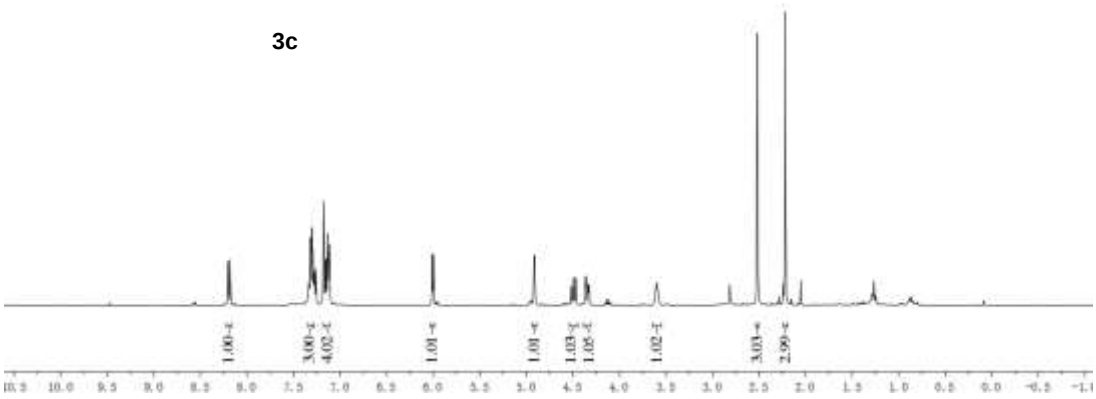
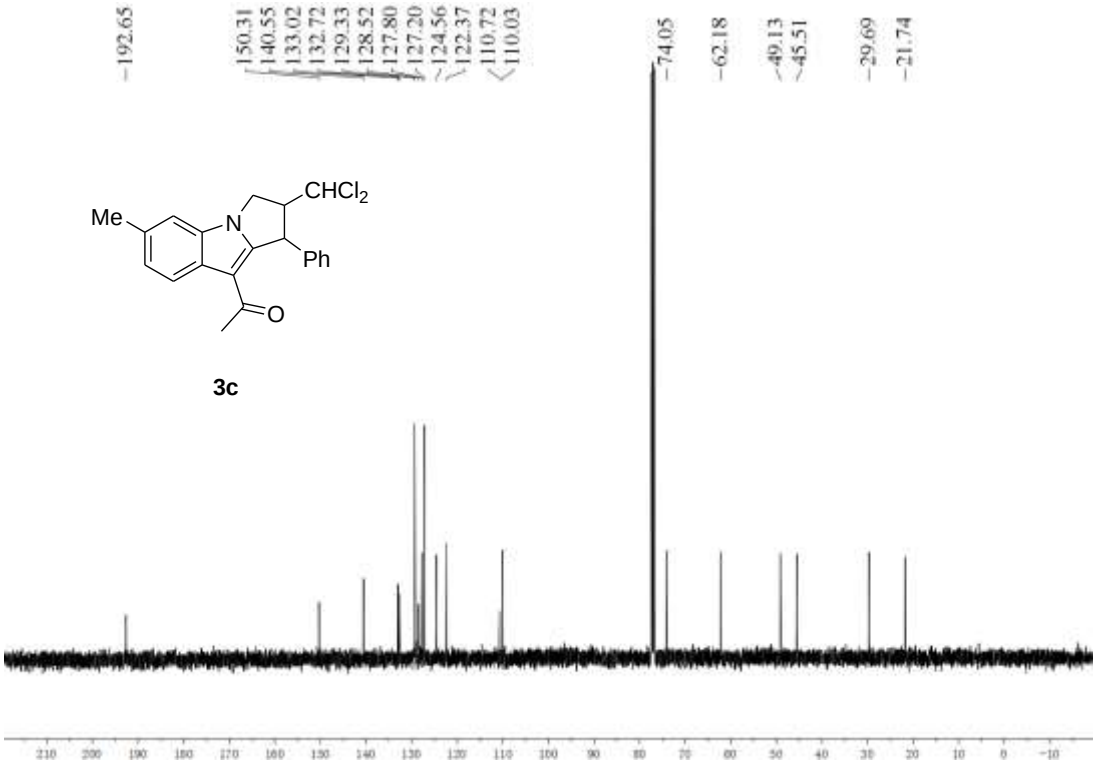
7.3395
7.3346
7.3180
7.2998
7.2914
7.2870
7.2821
7.2754
7.1760
7.1525
7.1337
7.1297
7.1139
6.0089
5.9967
4.9177
4.9102
4.5166
4.4969
4.4876
4.4680
4.3651
4.3563
4.3360
4.3274
2.5188
2.2188


Me
N
CHCl2
Ph
O

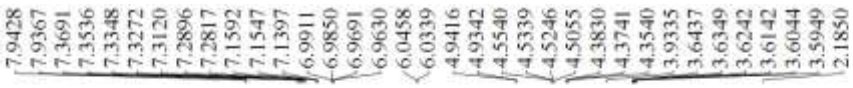
**3c**




192.65
150.31
140.55
133.02
132.72
129.33
128.52
127.80
127.20
124.56
122.37
110.72
110.03
74.05
62.18
49.13
45.51
29.69
21.74


Me
N
CHCl2
Ph
O

**3c**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7.3536
7.3348
7.3272
7.3120
7.2896
7.2817
7.1592
7.1547
7.1397
6.9911
6.9850
6.9691
6.9630
6.0458
6.0339
4.9416
4.9342
4.5540
4.5339
4.5246
4.5055
4.3830
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3.9335
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3.6349
3.6242
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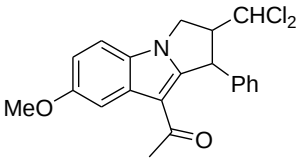
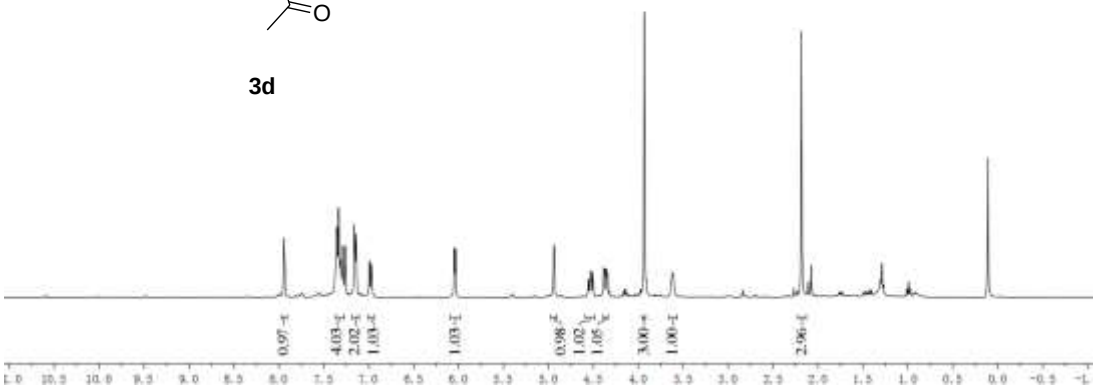
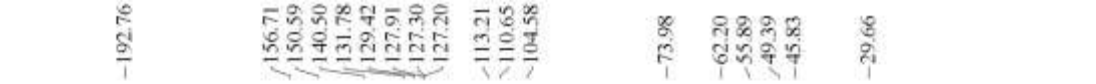
3.6044
3.5949
2.1850


CHCl2
N
Ph
MeO
O

**3d**




192.76
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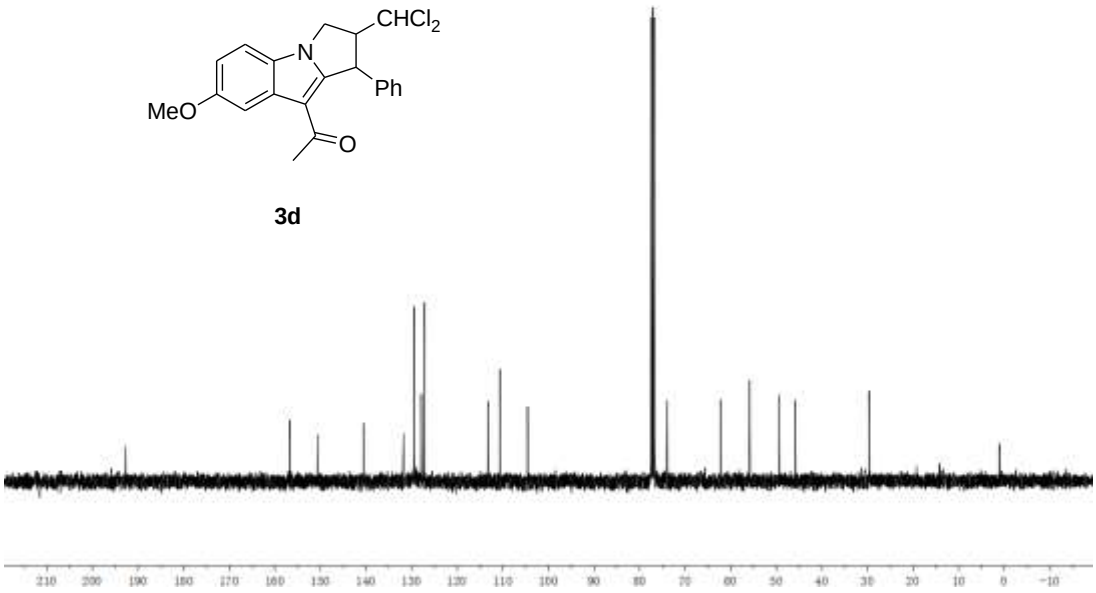
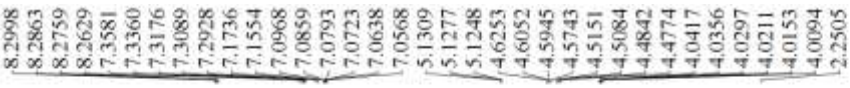
140.50
131.78
129.42
127.91
127.30
127.20
113.21
110.65
104.58
73.98
62.20
55.89
49.39
45.83
29.66


CHCl2
N
Ph
MeO
O

**3d**

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8.2759
8.2629
7.3581
7.3360
7.3176
7.3089
7.2928
7.1736
7.1554
7.0968
7.0859
7.0793
7.0723
7.0638
7.0568
5.1309
5.1277
5.1248
4.6253
4.6052
4.5945
4.5743
4.5151
4.5084
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4.4774
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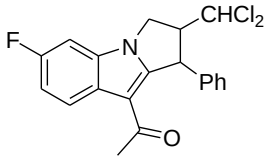
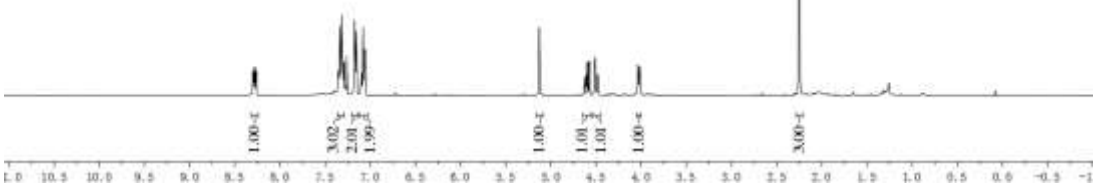
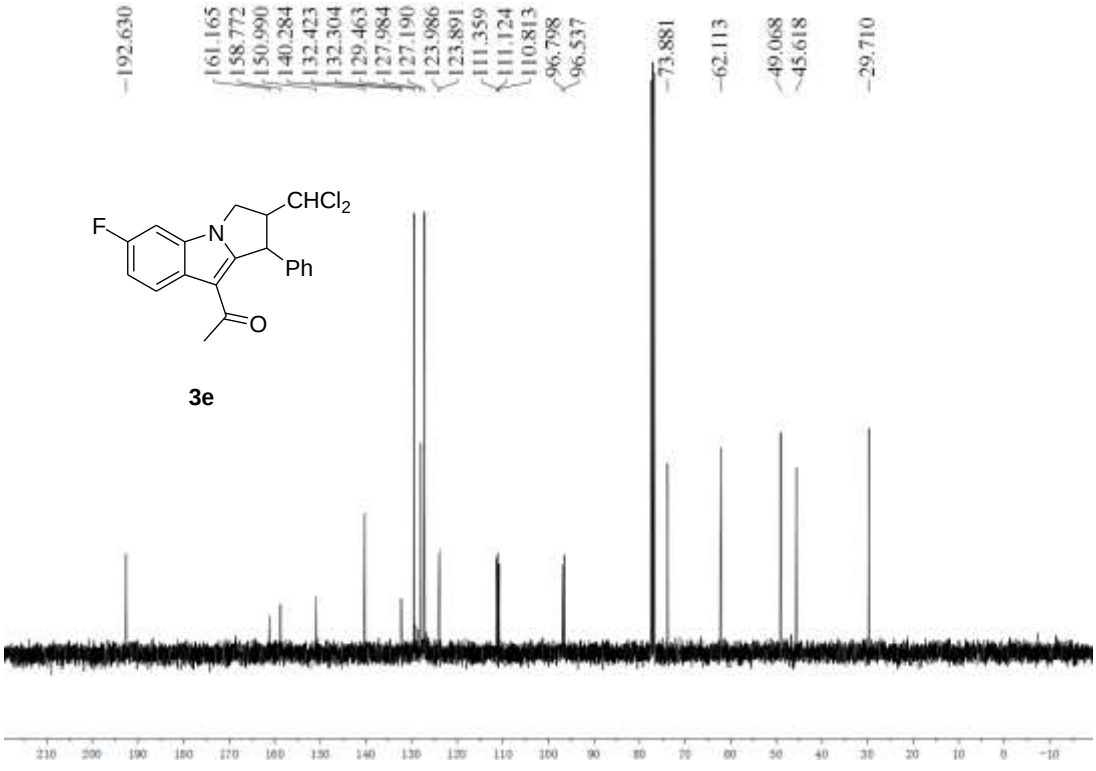
4.0356
4.0297
4.0211
4.0153
4.0094
2.2505


F
N
CHCl2
Ph
O

**3e**

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132.304
129.463
127.984
127.190
123.986
123.891
111.359
111.124
110.813
96.798
96.537
73.881
62.113
49.068
45.618
29.710


F
N
CHCl2
Ph
O

**3e**


8.2207
8.1993
7.5210
7.4126
7.4068
7.3912
7.3852
7.3488
7.3443
7.3288
7.3099
7.2882
7.1167
7.1122
7.0970
6.0290
6.0176
4.9105
4.9032
4.5214
4.5015
4.4923
4.4728
4.3539
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3.6262
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3.6063
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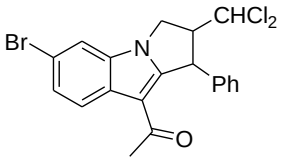
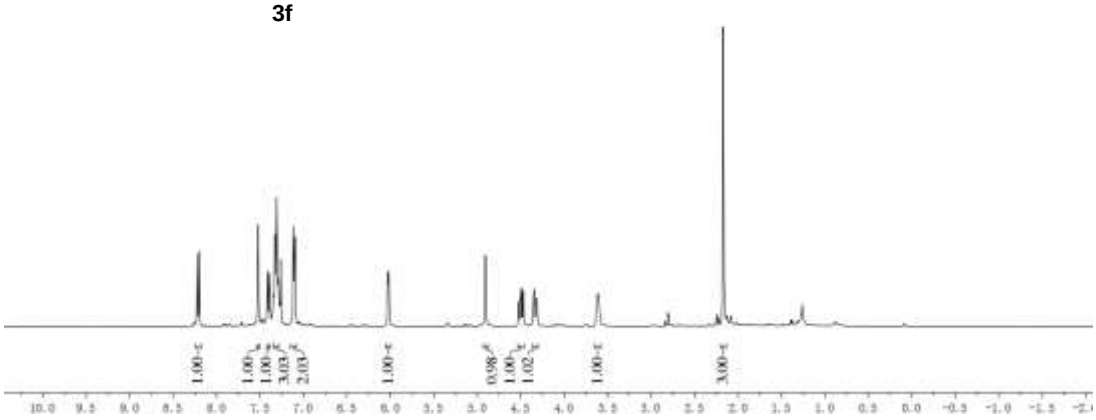
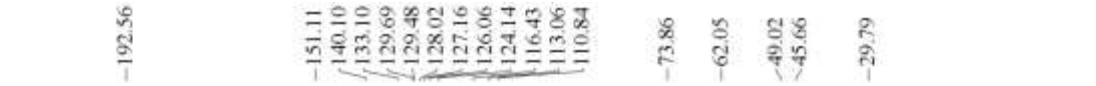
3.5869
2.1700


Br
N
CHCl2
Ph
O

**3f**

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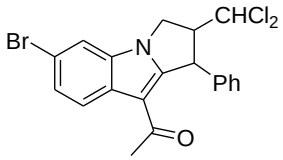
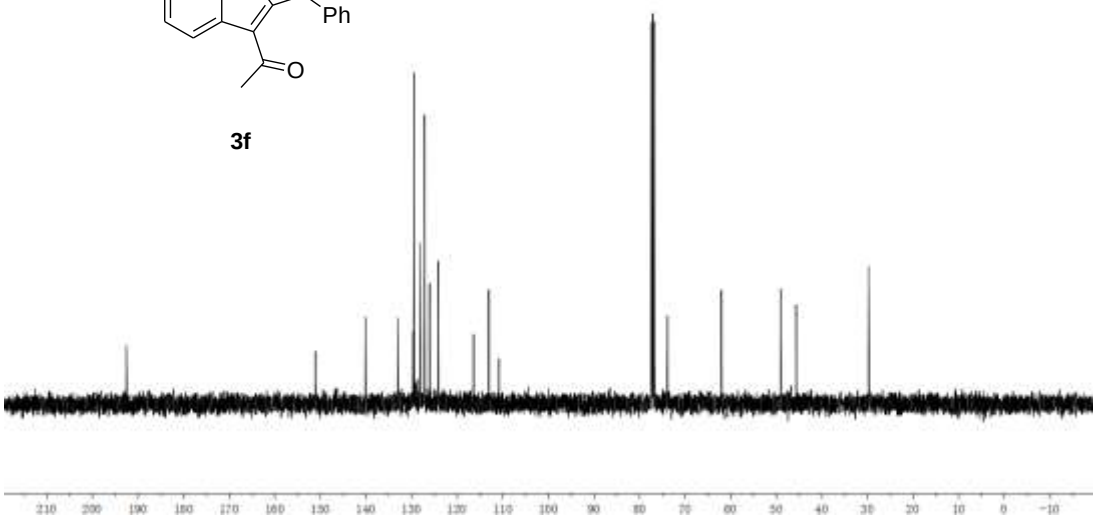
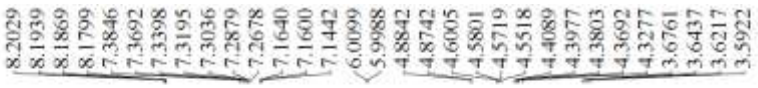
129.48
128.02
127.16
126.06
124.14
116.43
113.06
110.84
73.86
62.05
49.02
45.66
29.79


Br
N
CHCl2
Ph
O

**3f**

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8.1869
8.1799
7.3846
7.3692
7.3398
7.3195
7.3036
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7.2678
7.1640
7.1600
7.1442
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5.9988
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4.5719
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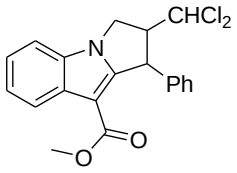
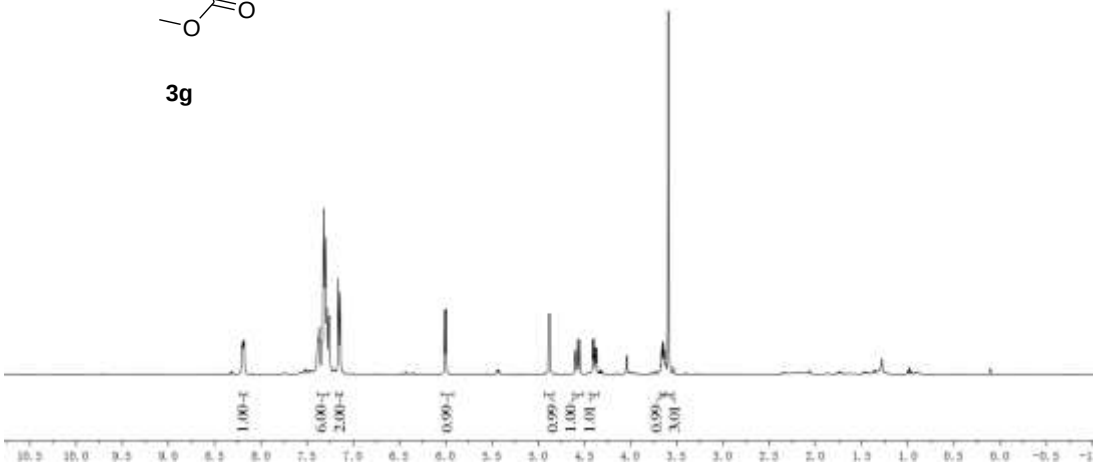
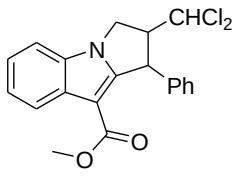
3.5922


CHCl2
N
Ph
O
O

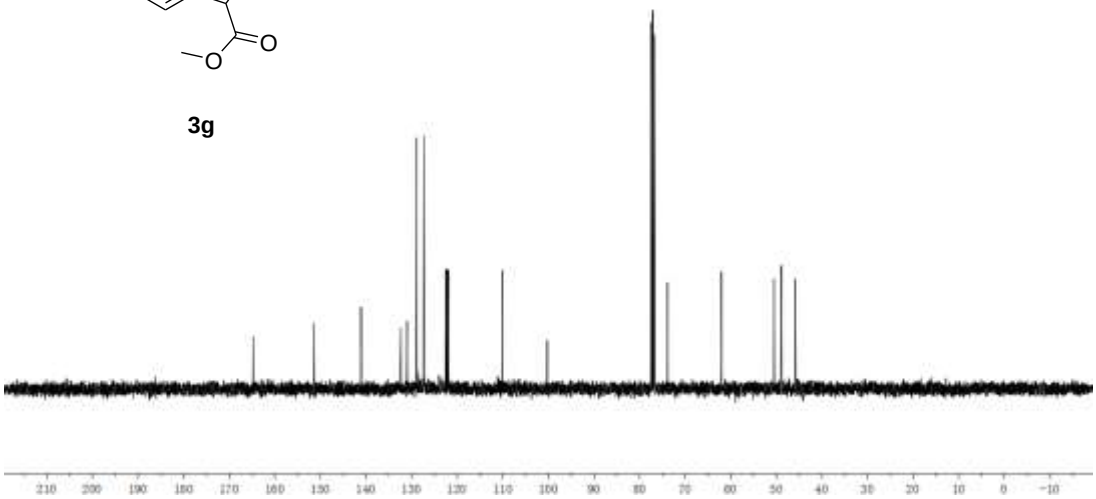
**3g**




164.74
151.39
141.11
132.33
130.97
128.93
127.37
127.27
122.55
122.26
121.93
110.08
100.25
73.88
62.04
50.51
48.89
45.82


CHCl2
N
Ph
O
O

**3g**

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7.2959
7.2907
7.2740
6.0236
6.0080
5.9908
4.2039
4.1895
4.1807
4.1680
3.9626
3.9251
3.9027
3.0571
3.0299
2.9935
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2.5890
2.5562
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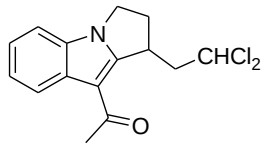
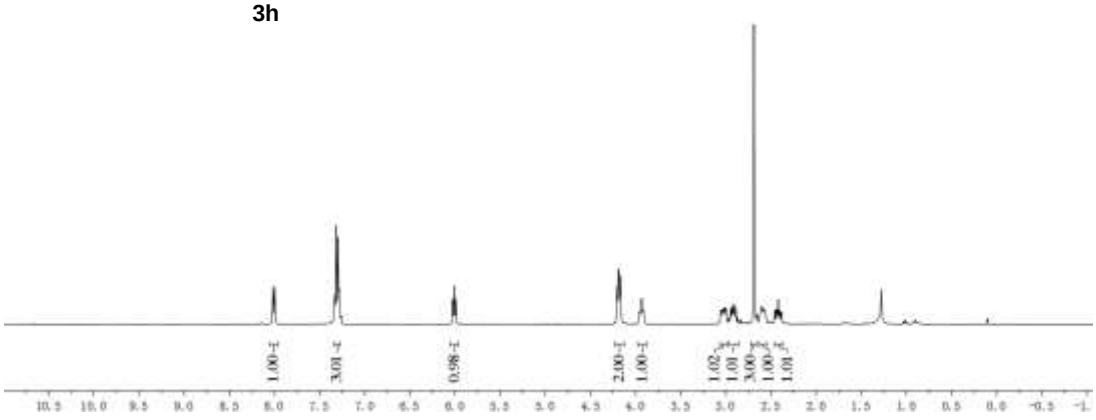
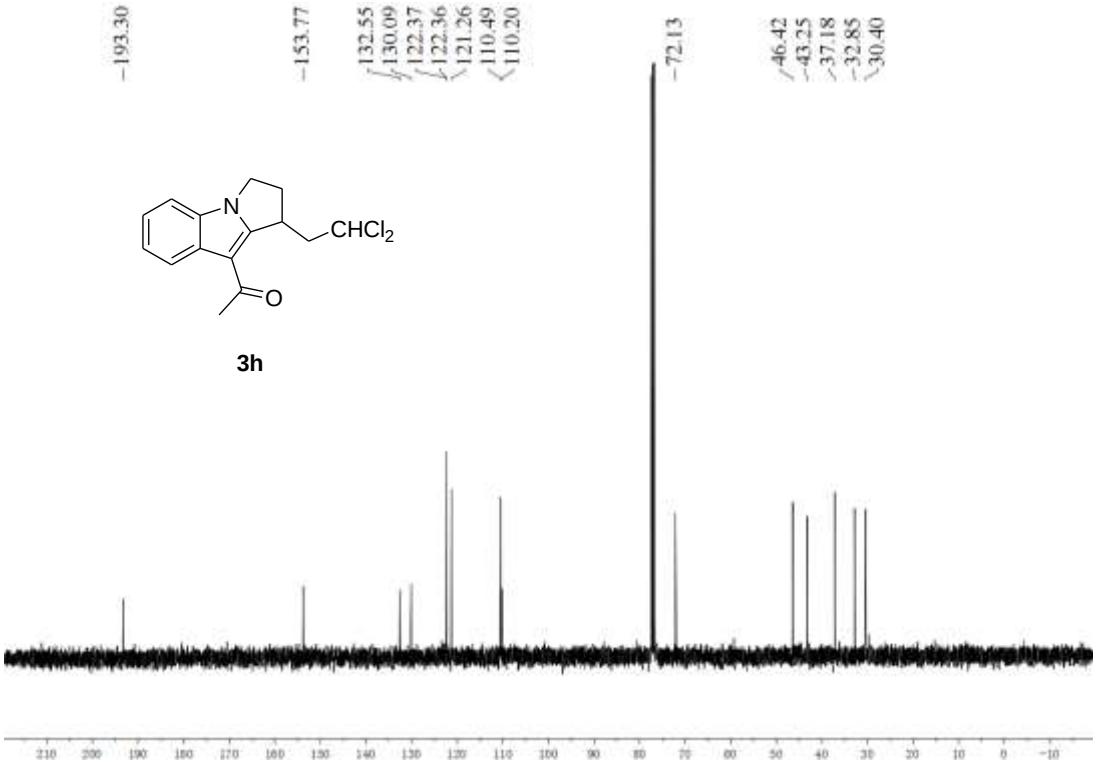
2.4206
2.3840


N
CHCl2
O

**3h**

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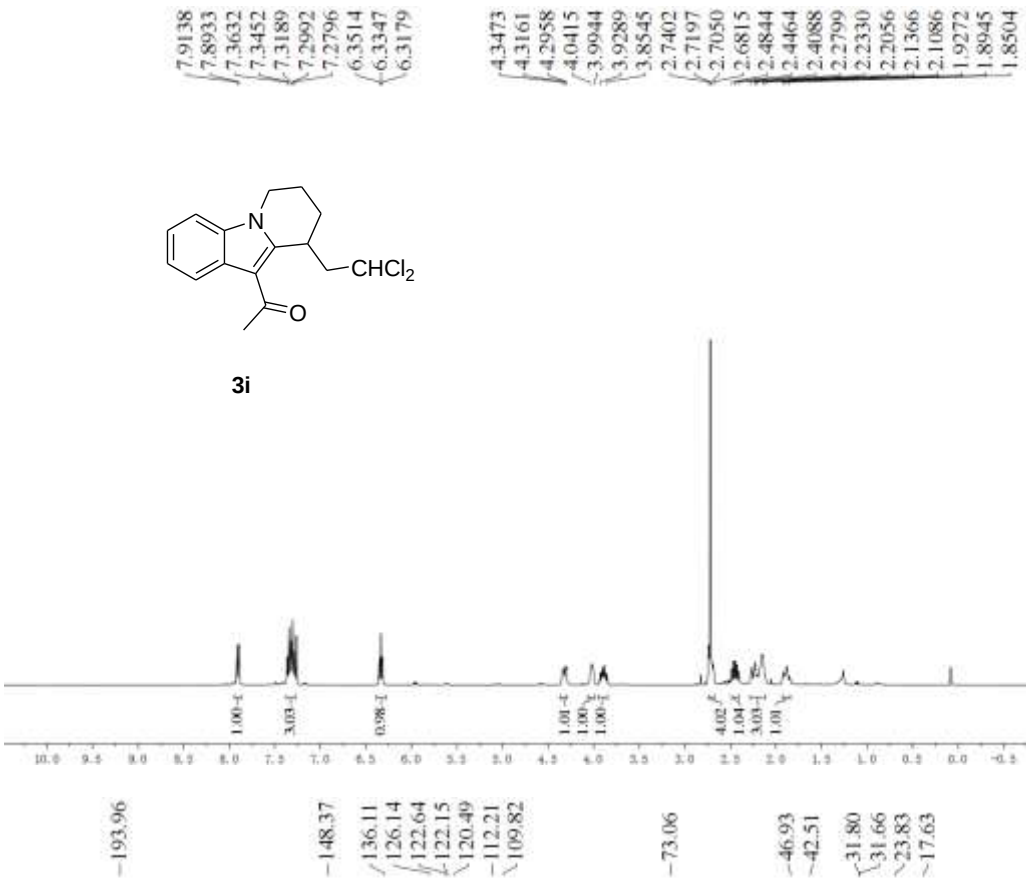
130.09
122.37
122.36
121.26
110.49
110.20
72.13
46.42
43.25
37.18
32.85
30.40


N
CHCl2
O

**3h**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7.2992
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6.3347
6.3179
4.3473
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4.2958
4.0415
3.9944
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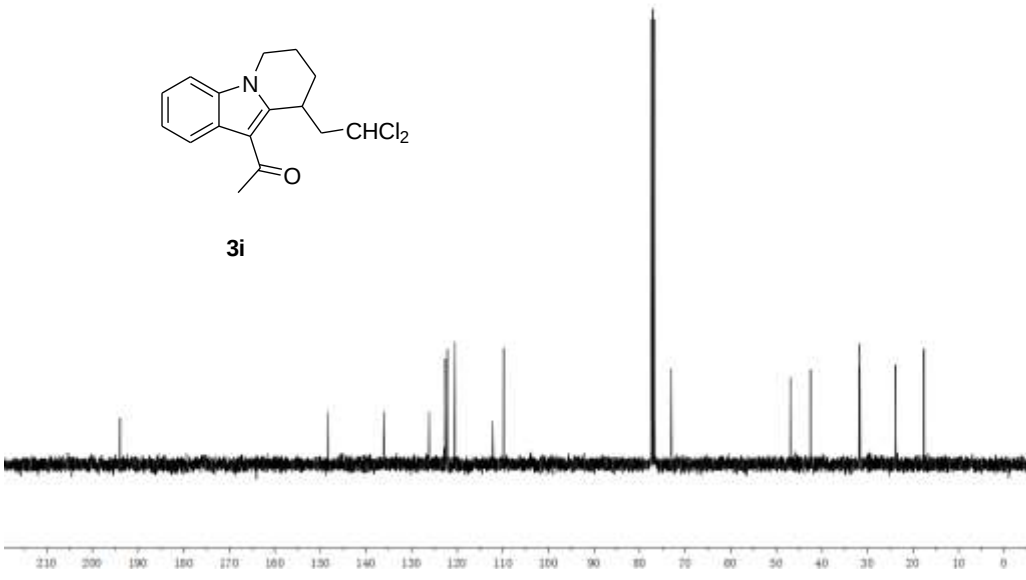
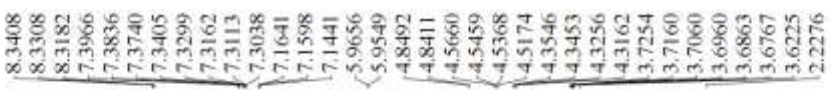
3.8545
2.7402
2.7197
2.7050
2.6815
2.4844
2.4464
2.4088
2.2799
2.2330
2.2056
2.1366
2.1086
1.9272
1.8945
1.8504
N
CHCl2
O
3i


193.96
148.37
136.11
126.14
122.64
122.15
120.49
112.21
109.82
73.06
46.93
42.51
31.80
31.66
23.83
17.63
N
CHCl2
O
3i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8.3182
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7.3740
7.3405
7.3299
7.3162
7.3113
7.3038
7.1641
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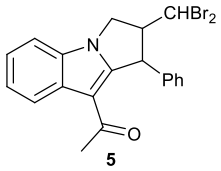
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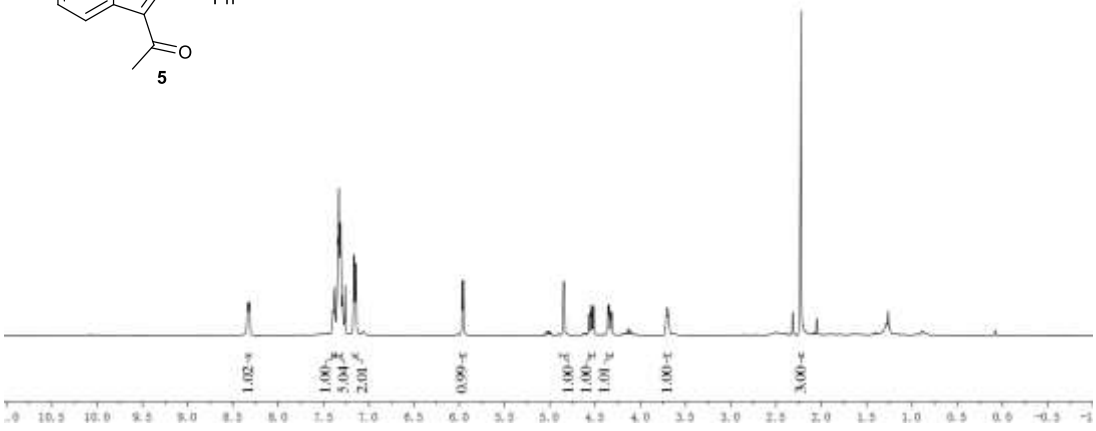

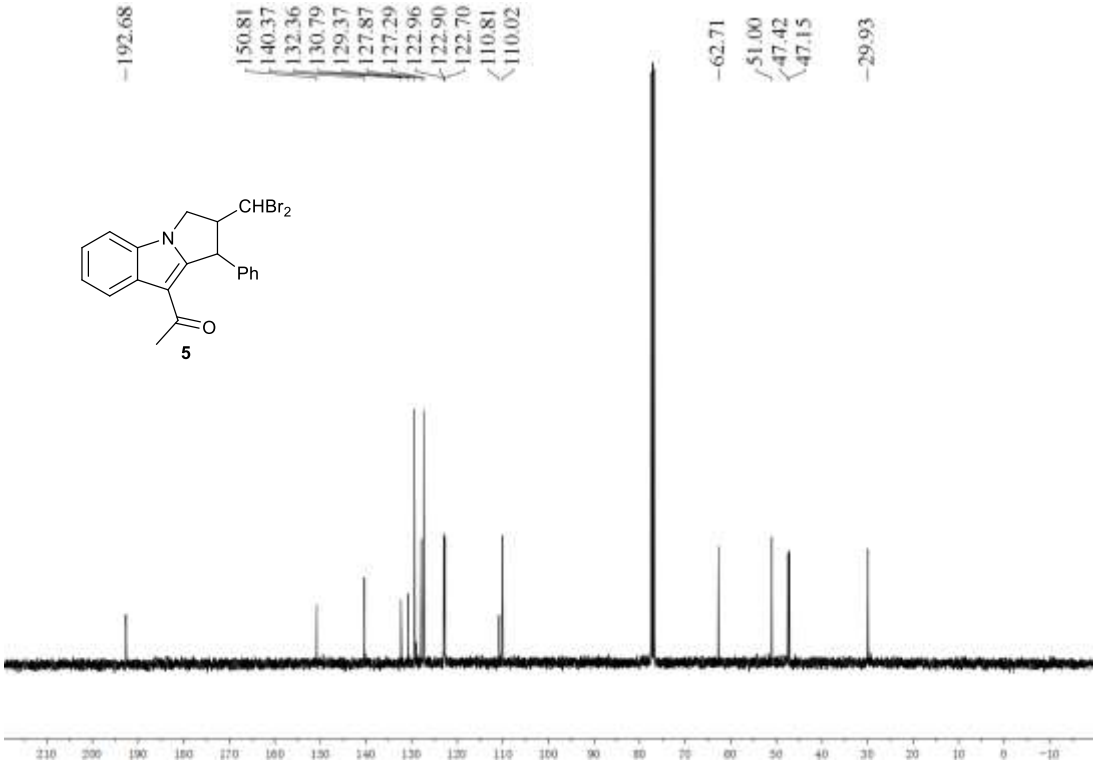
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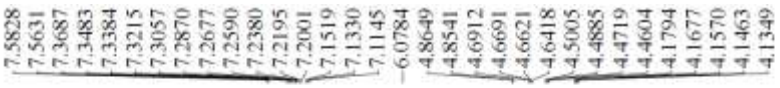
47.15
29.93


CHBr2
N
Ph
O

5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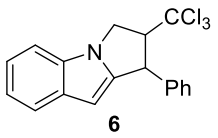
CCl3
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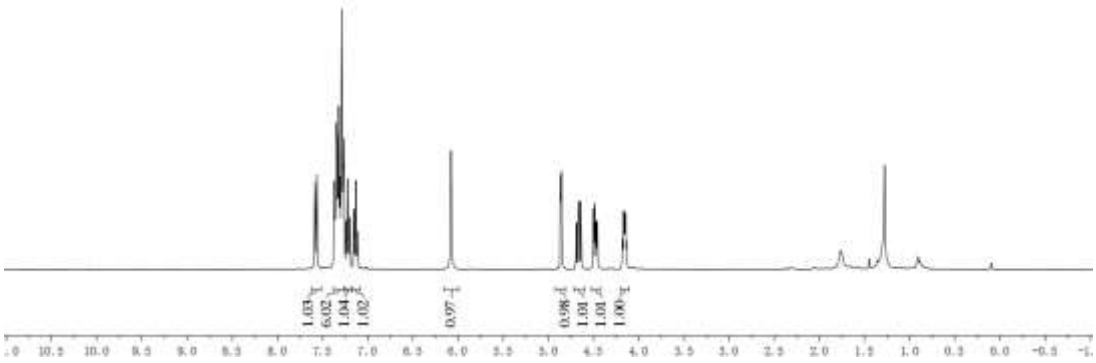
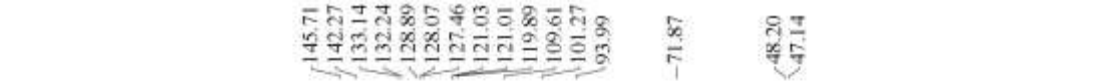
Ph

**6**

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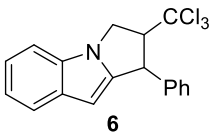
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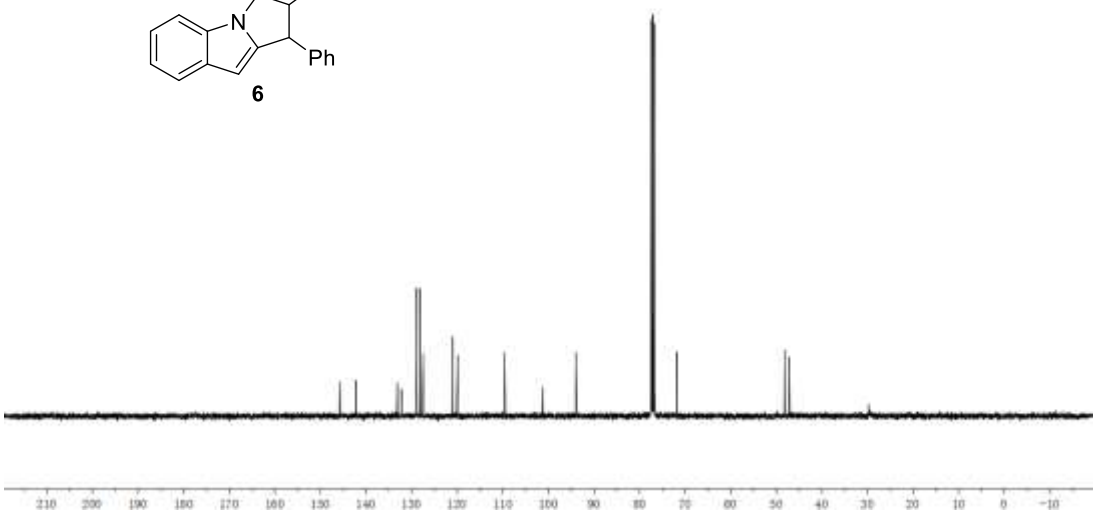
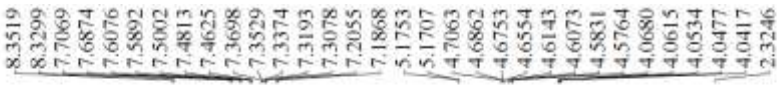
**6**

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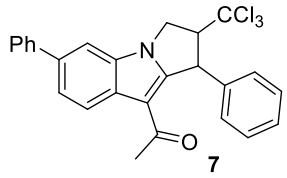
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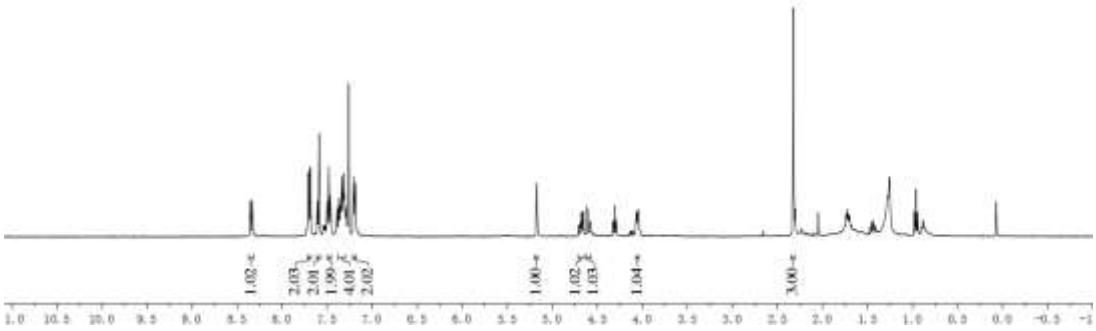
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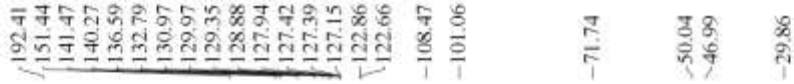
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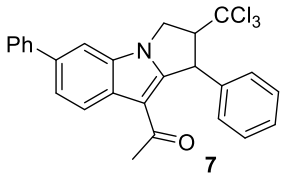
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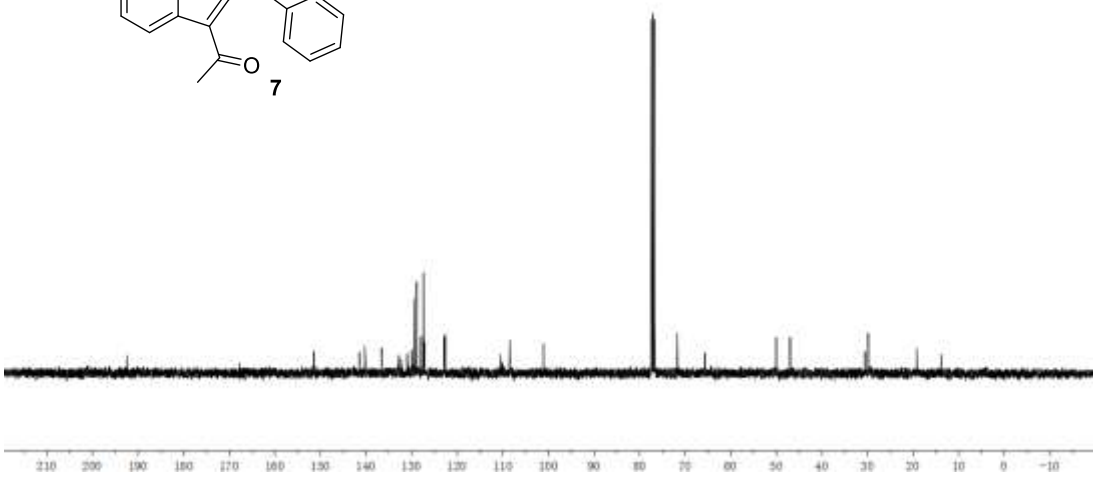


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