# Synthesis of isoquinoline-1,4-diones via photocatalytic C($sp^2$)-C($sp^3$)-scission/oxidation of 4-(hydroxy(aryl)methyl)-isoquinoline-1(2H)-ones

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## Supporting Information

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# 1. General Considerations

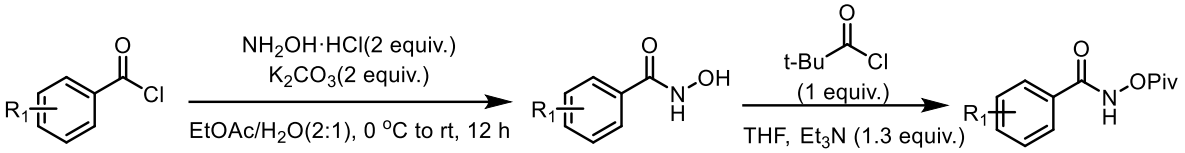
Unless otherwise noted, all reactions were carried out under an atmosphere of nitrogen in dried glassware. If reaction was not carried out at room temperature, reaction temperatures are reported as the temperature of the bath surrounding the vessel unless otherwise stated. The dry solvents used were purified by distillation over the drying agents indicated in parentheses and were transferred under argon: THF (Na-benzophenone), 1,2-dichloroethane ($CaH_2$), dichloromethane ($CaH_2$). Anhydrous DMF and MeOH were purchased from Acros Organics and stored under argon. Commercially available chemicals were obtained from Acros Organics, Aldrich Chemical Co., Strem Chemicals, Alfa Aesar, ABCR and TCI Europe and used as received unless otherwise stated.

Analytical thin layer chromatography was performed on Polygram SIL G/$UV_{254}$ plates. Visualization was accomplished with short wave UV light, or $KMnO_4$ staining solutions followed by heating. Flash chromatography was performed on silica gel (200-300 mesh) by standard technique. The visible-light mediated reactions wereperformed on Wp-TEC-1020SL instruments which are purchased from WATTCAS, China.

$^1H$ were recorded on a Bruker AV 600 in solvents as indicate. Chemical shifts (δ) are given in ppm relative to TMS. The residual solvent signals were used as references and the chemical shifts converted to the TMS scale ($CDCl_3$: $\delta_H$ = 7.26 ppm, $\delta_C$ = 77.16 ppm; $d_6$-DMSO: $\delta_H$ = 2.50 ppm, $\delta_C$ = 39.52 ppm; $d_4$-MeOD: $\delta_H$ = 3.31 ppm, $\delta_C$ = 49.00 ppm). The following abbreviations were used to describe peak splitting patterns when appropriate: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, dd = doublet of doublet. Coupling constants, *J*, were reported in hertz unit (Hz). $^{13}C$ NMR spectra were recorded on 151 MHz spectrometers. Chemical shifts were reported in parts per million relative to tetramethylsilane (δ = 0). High-resolution mass spectra (HRMS) were produced by Thermo Fisher Scientific spectrometer with EI and ESI mode unless otherwise stated.

No attempts were made to optimize yields for substrate synthesis.

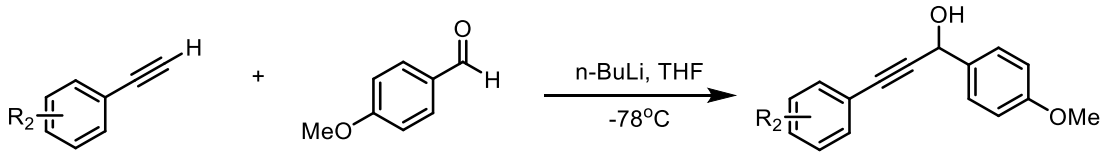
## 2. Preparation of N-(pivaloyloxy)benzamide




A 250 mL round-bottom flask was charged with $K_2CO_3$ (2.76 g, 20.0 mmol, 2.0 equiv.) and hydroxylammonium chloride (1.39 g, 20.0 mmol, 2.0 equiv.) in a mixture of EtOAc (40 mL) and water (20 mL). The reaction was cooled to 0 °C (ice bath), benzoyl chloride (1.16 mL, 1.41 g,10.0 mmol, 1.0 equiv.) was added, and the solution was stirred at 25 °C for 12 h. Then, the organic phase was separated, and the aqueous phase was extracted with EtOAc (3 x 30 mL). The combined organic layers were washed with brine, dried over anhydrous $MgSO_4$, filtered, and concentrated under vacuo. The crude hydroxamic acid was dissolved in dry THF (40 mL) and $Et_3N$ (1.81 mL, 1.32 g, 13.0 mmol, 1.3 equiv.) under argon atmosphere followed by dropwise addition of trimethylacetyl chloride (1.23 mL, 1.21 g, 10.0 mmol, 1.0 equiv.). After stirring at 25 °C for 12 h, the reaction mixture was extracted with water (30 mL) and EtOAc (3 x 20 mL). The organic layer was separated and dried over anhydrous $MgSO_4$, filtered and concentrated in *vacuo*. The crude was purified by flash column chromatography ($SiO_2$, cyclohexane/EtOAc 100:0 to 70:30, v/v).

These compounds were prepared according to a known procedure and the characterization data matches those reported in the literature[1].

## 3. Preparation of 1-(4-methoxyphenyl)-3-phenylprop-2-yn-1-ol

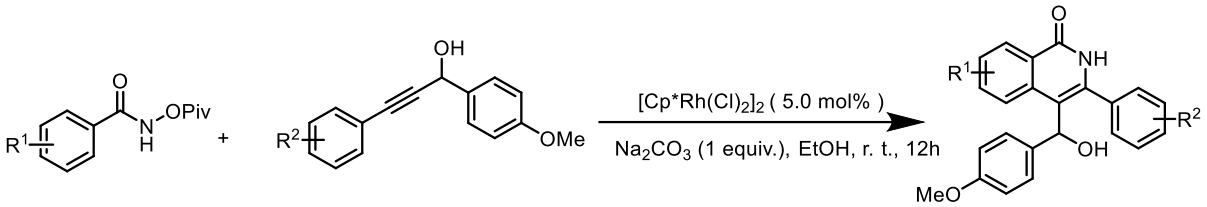



To a solution of alkyne (3.9 mmol) in anhydrous THF (5 mL) at -78 °C under $N_2$ atmosphere was added n-BuLi (1.6 M solution in hexanes, 2.06 mL, 3.3 mmol). The reaction was stirred at this temperature for 20 min then at room temperature for l h. After cooling to -78 °C, aldehyde (3 mmol) was added to the mixture and was allowed to warm up to room temperature gradually and stirredfor an additional hour before quenched with aqueous $NH_4Cl$. The mixture was extracted with EtOAc (30 x 2 mL), and the combined organic phases were washed with water and brine, dried with anhydrous $MgSO_4$, and filtered. The filtrate was concentrated under reduced pressure and the

residue was purified by flash chromatography on silica gel (hexanes/ethyl acetate, v/v, 15:1) to produce the desired product.

The title compounds were prepared according to a known procedure and the characterization data matches those reported in the literature[2].

## 4. Preparation of 4-(hydroxymethyl)-isoquinolin-1(2H)-ones




**S1**, 1.0 equiv. **S2**, 1.2 equiv. **1**

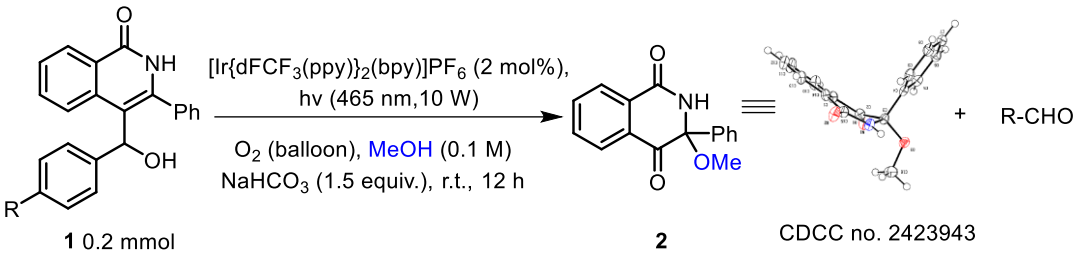
In an 8 mL reaction tube, the mixture of **S1** (0.25 mmol), **S2** (0.3 mmol), $[Cp^*RhCl_2]_2$ (5.0 mol%) and $Na_2CO_3$(1.0 equiv.) was added EtOH (2 mL). Then the resulting mixture was stirred for 16 h. When the reaction was finished, the desired product precipitated out as a solid, and the product was simply collected by filtration. For some cases, if the precipitation did not occur, the reaction mixture was subjected directly to flash chromatography on silica gel (petroleum ether/ethyl acetate) to provide the desired products **1a**.

The title compounds were prepared according to a known procedure and the characterization data matches those reported in the literature[3].

## 5. Optimization of the reaction conditions

It was pleased to find that the reaction proceeded smoothly in the presence of 1.5 equivalent of CsOAc at room temperature in MeOH under oxygen atmosphere, afforded the desired product **2** in the yield of 78%, along with 80% yield of 4-methoxybenzaldehyde (entry 1). The structure of compound **2** was unambiguously determined by X-ray crystallographic analysis (CDCC 2423943). In the absence of base or the use of PivOH as an additive, lowering the yield of **2** (entries 2 and 3). Switching the base to other commonly used inorganic bases (entries 4-7), or 1,2,6-collidine (entry 8) which was commonly used in the PCET procedure, showed that $NaHCO_3$ was the optimum (entry 6). Control experiments showed that Ir(III), irradiation and oxygen were essential as their absence led to no formation of the desired product (entries 9-11).

**Table 1. Optimization of the reaction conditions** [a]




**1** 0.2 mmol

**2**

CDCC no. 2423943

| Entry | R | Additive | Solvent | Yield |
|---|---|---|---|---|
| 1 | OMe | CsOAc | MeOH | 78% |
| 2 | OMe | - | MeOH | 69% |
| 3 | OMe | PivOH | MeOH | 16% |
| 4 | OMe | NaOAc | MeOH | 78% |
| 5 | OMe | $Na_2CO_3$ | MeOH | 76% |
| 6 | OMe | $NaHCO_3$ | MeOH | 81% |
| 7 | OMe | CsOPiv | MeOH | 73% |
| 8 | OMe | 1,2,6-collidine | MeOH | 69% |
| 9 [b] | OMe | $NaHCO_3$ | MeOH | trace |
| 10 [c] | OMe | $NaHCO_3$ | MeOH | trace |
| 11 [d] | OMe | $NaHCO_3$ | MeOH | trace |
| 12 | H | $NaHCO_3$ | MeOH | 72% |
| 13 | *t*Bu | $NaHCO_3$ | MeOH | 75% |
| 14 | $CF_3$ | $NaHCO_3$ | MeOH | 48% |
| 15[e] | OMe | $Na_2CO_3$ | MeOH | 12% |
| 16[f] | OMe | $Na_2CO_3$ | MeOH | 35% |
| 17[g] | OMe | $Na_2CO_3$ | MeOH | trace |

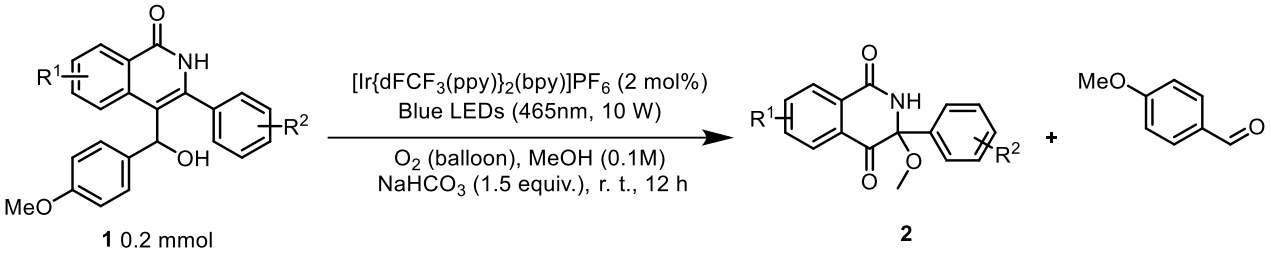
[a] isolated yield. [b] Without a catalyst. [c] $N_2$ atmosphere. [d] Without light. [e] Light Source: 456 nm 5W. [f] Light Source: White LED, 10W. [f] Light Source: 365 nm, 10W.

Next, we evaluated the influence of the substitution on the Ar ring at C4 position of 1 (entries 12-14, Table 1). It was observed that both electron-rich and electron-deficient substituents were well tolerated. Notably, the electron-rich substituents such as methoxy (OMe) resulted in significantly higher yields of product 2 (entry 6), with the yield order being OMe > tert-butyl (tBu) > hydrogen (H) > trifluoromethyl (CF3). This phenomenon may be attributed to the increased electron density provided by the OMe substituent, which facilitates the β-scission process leading to the formation of 4-methoxybenzaldehyde.

Finally, the screening of light sources (entries 15-17) revealed that the condition of 465 nm at 10W (entry 6) was the optimal reaction condition.

## 6. General Procedure

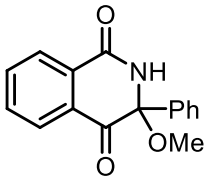
### General Procedure:




A 15 mL-Quartz capsule tube charged with a stirring bar, was added 4-(hydroxy(phenyl) methyl)-3-phenylisoquinolin-1(2H)-one **1** (0.2 mmol, 1 equiv.), $[Ir\{dFCF_3ppy\}_2(bpy)]PF_6$ (4. 0 mg, 0.004 mmol, 2.0 mol%), $NaHCO_3$ (25.2 mg, 0.3 mmol, 1.5 equiv.), and dry MeOH (2.0 mL) were added subsequently into the reaction vessel. The reaction was allowed to stir at 25 °C for 12 hours. The reaction mixture was then diluted with EtOAc (20 mL) and was hed with brine. The aqueous phase was extracted with EtOAc again. The organic layers wer e combined, washed with brine and dried over $Na_2SO_4$. The pure product was purified by fl ash column chromatography on silica with an appropriate solvent to afford the pure product.

## 7. Characterization of Products

### 3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (2)



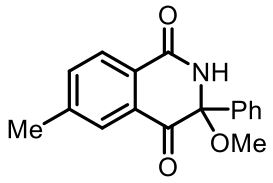
The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 4/1), **2** was obtained as a white solid (443.3 mg, 0.162 mmol, 81 %). $R_f$ = 0.4 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.55 (s, 1H), 8.22 – 8.20 (m, 1H), 7.98 – 7.95 (m, 1H), 7.91 (dd, *J* = 7.8, 1.3 Hz, 1H), 7.82 (td, *J* = 7.6, 1.3 Hz, 1H), 7.48 – 7.46 (m, 2H), 7.40 – 7.36 (m, 3H), 3.31 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 191.1, 162.9, 138.6, 136.3, 134.0, 131.7, 129.5, 128.9, 128.5, 127.0, 126.9, 90.7, 51.9.

ESI-MS: calculated for $C_{16}H_{14}NO_3$ $[M+H]^+$: 268.0968, found: 268.0968.

## 3-methoxy-6-methyl-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (3)



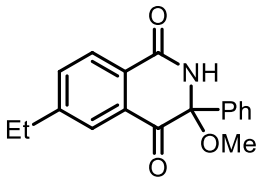

The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 4/1), **3** was obtained as a white solid (35.4 mg, 0.126 mmol, 63 %). $R_f$ = 0.4 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.47 (s, 1H), 8.02 (s, 1H), 7.81 (d, J = 7.9 Hz, 1H), 7.63 (d, J = 7.9 Hz, 1H), 7.46 (d, J = 7.9, 1.8 Hz, 2H), 7.37 (m, J = 6.9 Hz, 3H), 3.29 (s, 3H), 2.51 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.7, 163.0, 147.5, 138.9, 134.7, 131.6, 129.4, 128.8, 128.7, 128.4, 127.1, 126.9, 90.7, 51.8, 22.0.

ESI-MS: calculated for $C_{17}H_{16}NO_3$ $[M+H]^+$: 282.1124, found: 282.1124.

## 6-ethyl-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (4)



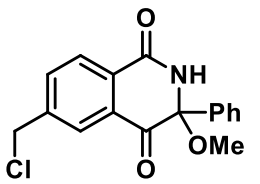

The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 4/1), **4** was obtained as a white solid (50.1 mg, 0.17 mmol, 85 %). $R_f$ = 0.40 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.45 (s, 1H), 8.12 (d, *J* = 8.0 Hz, 1H), 7.81 (dd, *J* = 8.1, 1.8 Hz, 1H), 7.73 (d, *J* = 1.8 Hz, 1H), 7.48 – 7.45 (dd, 2H), 7.40 – 7.35 (m, 3H), 2.74 (q, *J* = 7.6 Hz, 2H), 1.19 (t, *J* = 7.6 Hz, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 191.3, 163.0, 150.5, 138.7, 135.9, 130.7, 129.5, 129.4, 128.9, 128.7, 127.0, 125.7, 90.8, 51.9, 28.4, 15.4.

ESI-MS: calculated for $C_{18}H_{18}NO_3$ $[M+H]^+$: 296.1281, found: 296.1281.

## 6-(chloromethyl)-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (5)




The title compound was prepared *via* the general procedure after purification by silica gel column chromatography (PE/EA = 4/1), **5** was obtained as a white solid (25.8 mg, 0.082 mmol, 41%). $R_f$ = 0.30 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.52 (s, 1H), 8.19 (d, *J* = 8.0 Hz, 1H), 7.90 – 7.87 (m, 1H), 7.82 (d, *J* = 1.7 Hz, 1H), 7.48 – 7.44 (m, 2H), 7.41 – 7.35 (m, 3H), 4.55 (s, 2H), 3.31 (s, 3H).

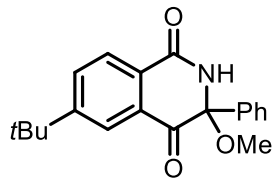
**$^{13}$C NMR (151 MHz, DMSO)** δ 191.1, 162.9, 145.0, 138.6, 134.5, 130.7, 130.6, 129.5, 128.9, 128.7, 127.0, 124.9, 90.8, 72.8, 58.5, 51.9.

**$^{1}$H NMR (400 MHz, Chloroform-d)** δ 8.34 (d, J = 8.0 Hz, 1H), 8.01 (d, J = 1.7 Hz, 1H), 7.87 (dd, J = 8.0, 1.8 Hz, 1H), 7.59 – 7.55 (m, 2H), 7.38 – 7.35 (m, 3H), 6.60 (s, 1H), 4.64 (s, 2H), 3.45 (s, 3H).

**$^{13}$C NMR (101 MHz, Chloroform-d)** δ 189.7, 162.9, 143.5, 137.7, 135.4, 131.2, 130.7, 129.8, 129.6, 129.0, 127.1, 126.5, 91.3, 52.3, 44.7.

ESI-MS: calculated for $C_{17}H_{15}ClNO_3$ $[M+H]^+$ : 316.0734, found: 316.0732

## 6-(tert-butyl)-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (6)



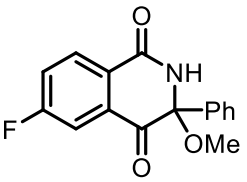

The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 4/1), **6** was obtained as a white solid (48.4 mg, 0.15 mmol, 75 %). $R_f$ = 0.5 (PE/EA = 4/1).

**$^{1}$H NMR (600 MHz, DMSO)** δ 9.46 (s, 1H), 8.15 (d, *J* = 8.2 Hz, 1H), 8.04 (dd, *J* = 8.2 Hz, 1H), 7.86 (d, *J* = 2.1 Hz, 1H), 7.49 – 7.46 (m, 2H), 7.37 (m, *J* = 9.4, 7.1 Hz, 3H), 3.30 (s, 3H), 1.31 (s, 9H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 191.3, 157.1, 138.8, 133.7, 130.4, 129.4, 129.4, 128.9, 128.6, 127.0, 122.8, 90.9, 51.9, 35.5, 31.0.

ESI-MS: calculated for $C_{20}H_{22}NO_3$ $[M+H]^+$: 324.1594, found: 324.1594.

## 6-fluoro-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (7)




The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 4/1), **7** was obtained as a white solid (37.6 mg, 0.132 mmol, 66 %). $R_f$ = 0.4 (PE/EA = 4/1).

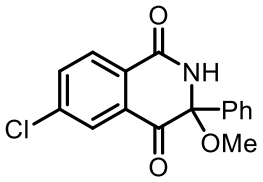
**$^{1}$H NMR (600 MHz, DMSO)** δ 9.60 (s, 1H), 8.27 (dd, J = 8.7, 5.3 Hz, 1H), 7.80 (td, J = 8.6, 2.7 Hz, 1H), 7.65 (dd, J = 8.4, 2.7 Hz, 1H), 7.47 (dd, J = 8.0, 1.7 Hz, 2H), 7.41 – 7.37 (m, 3H), 3.31 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.2, 166.0, 164.4, 162.2, 138.2, 133.1, 133.0, 132.1, 132.1, 129.6, 128.9, 128.4, 127.1, 123.6, 123.4, 113.2, 113.1, 91.0, 52.0.

**$^{19}$F NMR (377 MHz, DMSO)** δ -104.43.

ESI-MS: calculated for $C_{16}H_{13}FNO_3$ $[M+H]^+$: 286.0873, found: 286.0873.

## 6-chloro-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (8)



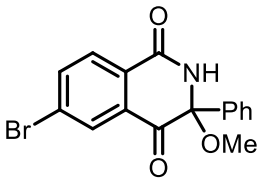

The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 4/1), **8** was obtained as a white solid (38.9 mg, 0.13 mmol, 65 %). $R_f$ = 0.5 (PE/EA = 4/1).

**$^1$H NMR (400 MHz, $CDCl_3$)** δ 8.27 (d, *J* = 8.4 Hz, 1H), 7.95 (d, *J* = 2.1 Hz, 1H), 7.77 (dd, *J* = 8.4, 2.1 Hz, 1H), 7.58 – 7.53 (m, 2H), 7.38 – 7.35 (m, 3H), 6.83 (s, 1H), 3.44 (s, 3H).

**$^{13}$C NMR (101 MHz, $CDCl_3$)** δ 189.1, 162.8, 140.5, 137.4, 135.5, 132.1, 130.6, 129.8, 129.1, 129.0, 127.2, 126.6, 91.4, 52.3.

ESI-MS: calculated for $C_{16}H_{13}ClNO_3$ $[M+H]^+$: 302.0578, found: 301.0574.

## 6-bromo-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (9)



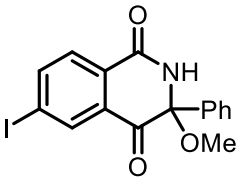

The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 8/1), **9** was obtained as a white solid (47.5 mg, 0.14 mmol, 69 %). $R_f$ = 0.2 (PE/EA = 8/1).

$^1$H NMR (400 MHz, $CDCl_3$) δ 8.19 (d, *J* = 8.4 Hz, 1H), 8.11 (d, *J* = 2.0 Hz, 1H), 7.94 (dd, *J* = 8.4, 2.0 Hz, 1H), 7.57 – 7.53 (m, 2H), 7.38 – 7.35 (m, 3H), 6.76 (s, 1H), 3.44 (s, 3H).

$^{13}$C NMR (101 MHz, $CDCl_3$) δ 189.0, 162.9, 138.5, 137.4, 132.0, 130.6, 130.2, 129.9, 129.5, 129.0, 128.9, 126.5, 91.4, 52.3.

ESI-MS: calculated for $C_{16}H_{13}BrNO_3$ $[M+H]^+$: 346.0073, found: 346.0076.

## 6-iodo-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (10)



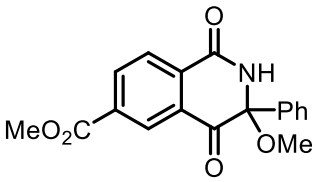

The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 4/1), **10** was obtained as a a white solid (57.3 mg, 0.146 mmol, 73 %). $R_f$ = 0.40 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.62 (s, 1H), 8.33 (d, *J* = 8.2 Hz, 1H), 8.16 (s, 0H), 7.93 (d, *J* = 8.2 Hz, 1H), 7.48 – 7.43 (m, 2H), 7.39 (d, *J* = 7.2 Hz, 3H), 3.30 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.1, 162.6, 144.8, 138.2, 135.0, 131.6, 130.9, 130.3, 129.6, 128.9, 127.0, 102.0, 90.8, 52.0.

ESI-MS: calculated for $C_{16}H_{13}INO_3$ $[M+H]^+$: 393.9934, found: 393.9934.

## methyl 3-methoxy-1,4-dioxo-3-phenyl-1,2,3,4-tetrahydroisoquinoline-6-carboxylate (11)



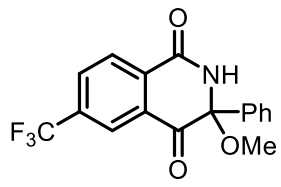

The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **11** was obtained as a colourless oil (50.7 mg, 0.156 mmol, 78 %). $R_f$ = 0.4 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.77 (s, 1H), 8.45 (dd, *J* = 8.0, 1.8 Hz, 1H), 8.35 – 8.32 (m, 2H), 7.48 (dd, *J* = 7.9, 1.9 Hz, 2H), 7.42 – 7.38 (m, 3H), 3.91 (s, 3H), 3.32 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.4, 165.1, 162.1, 138.1, 136.0, 134.9, 134.4, 130.9, 129.6, 129.5, 128.9, 127.4, 127.1, 90.8, 53.3, 52.0.

ESI-MS: calculated for $C_{18}H_{16}NO_5$ $[M+H]^+$ : 326.1022, found: 326.1022.

## 3-methoxy-3-phenyl-6-(trifluoromethyl)-2,3-dihydroisoquinoline-1,4-dione (12)




The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **12** was obtained as a colourless oil (29.5 mg, 0.088 mmol, 44 %). $R_f$ = 0.50 (PE/EA = 4/1).

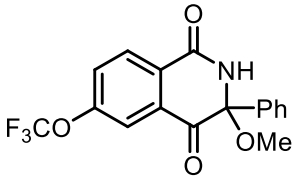
**$^1$H NMR (600 MHz, DMSO)** δ 9.83 (s, 1H), 8.41 (d, *J* = 8.2 Hz, 1H), 8.33 (dd, *J* = 8.2, 2.2 Hz, 1H), 8.15 (s, 1H), 7.50 – 7.47 (m, 2H), 7.42 – 7.38 (m, 3H), 3.33 (s, 3H).

**$^{19}$F NMR (377 MHz, DMSO)** δ -61.87.

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.0, 161.8, 137.9, 134.9, 133.6, 132.5, 132.5, 131.3, 130.1, 129.7, 129.0, 127.1, 124.5, 123.7, 123.7, 122.7, 90.8, 52.1.

ESI-MS: calculated for $C_{17}H_{13}F_3NO_3$ $[M+H]^+$: 336.0842, found: 336.0842.

## 3-methoxy-3-phenyl-6-(trifluoromethoxy)-2,3-dihydroisoquinoline-1,4-dione (13)



The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **13** was obtained as a white solid (51.2 mg, 0.146 mmol, 73 %). $R_f$ = 0.50 (PE/EA = 4/1).

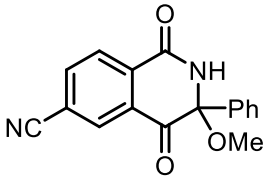
**$^1$H NMR (600 MHz, DMSO)** δ 9.71 (s, 1H), 8.34 (d, *J* = 8.6 Hz, 1H), 7.95 (ddd, *J* = 8.6, 2.6, 1.1 Hz, 1H), 7.76 (dd, *J* = 2.4, 1.3 Hz, 1H), 7.48 (dd, *J* = 7.9, 1.8 Hz, 2H), 7.42 – 7.38 (m, 3H), 3.32 (s, 3H).

**$^{19}$F NMR (377 MHz, DMSO)** δ -56.77.

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.0, 161.9, 152.0, 138.0, 132.6, 131.8, 130.5, 129.6, 128.9, 128.2, 127.1, 122.9, 121.1, 119.4, 118.0, 90.9. .

ESI-MS: calculated for $C_{17}H_{13}F_3NO_4$ $[M+H]^+$ : 352.0791, found: 352.0791.

## 3-methoxy-1,4-dioxo-3-phenyl-1,2,3,4-tetrahydroisoquinoline-6-carbonitrile (14)



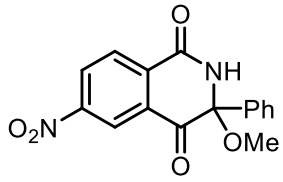
The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 2/1), **14** was obtained as a colourless oil (19.3 mg, 0.066 mmol, 33 %). $R_f$ = 0.50 (PE/EA = 2/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.87 (s, 1H), 8.39 (dd, *J* = 8.1, 1.7 Hz, 1H), 8.35 (dd, *J* = 1.7, 0.6 Hz, 1H), 8.33 (dd, *J* = 8.1, 0.6 Hz, 1H), 7.48 – 7.46 (m, 2H), 7.42 – 7.38 (m, 3H), 3.31 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 189.6, 161.7, 139.1, 137.7, 134.7, 131.2, 131.1, 129.7, 129.5, 129.0, 127.1, 117.7, 116.6, 90.7, 52.1.

ESI-MS: calculated for $C_{17}H_{13}N_2O_3$ $[M+H]^+$ : 293.0920, found: 293.0920.

## 3-methoxy-6-nitro-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (15)



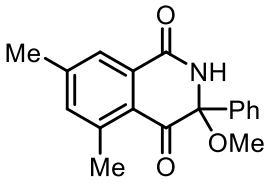
The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 2/1), **15** was obtained as a colourless oil (9.9 mg, 0.032 mmol, 16 %). $R_f$ = 0.5 (PE/EA = 2/1).

**$^1$H NMR (400 MHz, Chloroform-d)** δ 8.80 (d, J = 2.2 Hz, 1H), 8.63 (dd, J = 8.5, 2.3 Hz, 1H), 8.54 (d, J = 8.5 Hz, 1H), 7.57 – 7.54 (m, 2H), 7.41 – 7.38 (m, 3H), 3.47 (s, 3H).

**$^{13}$C NMR (151 MHz, Chloroform-d)** δ 188.0, 161.6, 136.6, 135.1, 132.2, 130.9, 130.2, 129.2, 129.2, 126.6, 122.7, 91.5, 52.5, 29.9.

ESI-MS: calculated for $C_{16}H_{13}N_2O_5$ $[M+H]^+$: 313.0818, found: 313.0818.

## 3-methoxy-5,7-dimethyl-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (16)



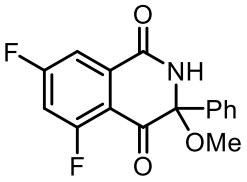

The title compound was prepared *via* the general procedure after purification by silica gel column chromatorgraph (PE/EA = 4/1), **16** was obtained as a colourless oil (30.7mg, 0.104 mmol, 52%). $R_f$ = 0.50 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.51 (s, 1H), 7.91 (d, *J* = 2.0 Hz, 1H), 7.44 – 7.42 (m, 3H), 7.39 – 7.35 (m, 3H), 3.28 (s, 3H), 2.46 (s, 3H), 2.44 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 191.5, 163.3, 145.7, 140.9, 138.7, 137.5, 132.8, 129.3, 128.8, 127.2, 127.0, 126.5, 90.7, 51.7, 21.8, 21.7.

ESI-MS: calculated for $C_{18}H_{18}NO_3$ $[M+H]^+$: 296.1281, found: 296.1281.

## 5,7-difluoro-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (17)




The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 4/1), **17** was obtained as a white solid (38.1 mg, 0.126 mmol, 63 %). $R_f$ = 0.40 (PE/EA = 4/1).

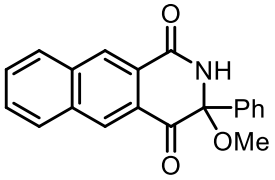
**$^1$H NMR (600 MHz, DMSO)** δ 9.86 (s, 1H), 7.83 – 7.73 (m, 2H), 7.47 – 7.44 (m, 2H), 7.41 (m, *J* = 8.6, 3.8 Hz, 3H), 3.32 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 186.8, 167.3, 167.2, 165.6, 165.5, 162.9, 162.8, 161.2, 161.1, 137.7, 135.9, 135.9, 129.6, 128.9, 127.1, 112.2, 112.2, 112.1, 112.0, 110.8, 110.6, 110.5, 90.8, 52.0 .

**$^{19}$F NMR (471 MHz, DMSO)** δ -95.94 (d, J = 15.3 Hz), -106.85, -106.88.

ESI-MS: calculated for $C_{16}H_{12}F_2NO_3$ $[M+H]^+$: 304.0779, found: 304.0779.

## 3-methoxy-3-phenyl-2,3-dihydrobenzo[g]isoquinoline-1,4-dione (18)



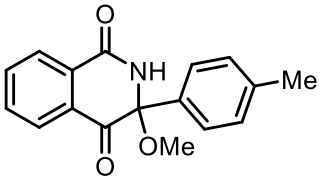
The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **18** was obtained as a yellow solid (38.0 mg, 0.120 mmol, 60 %). $R_f$ = 0.40 (PE/EA = 4/1).

**$^1$H NMR (400 MHz, Chloroform-d)** δ 9.21 (d, J = 8.4 Hz, 1H), 8.42 (d, J = 8.6 Hz, 1H), 8.27 (d, J = 8.6 Hz, 1H), 7.95 – 7.92 (m, 1H), 7.69 – 7.62 (m, 4H), 7.38 – 7.34 (m, J = 5.0, 3H), 6.61 (s, 1H), 3.51 (s, 3H).

**$^{13}$C NMR (151 MHz, Chloroform-d)** δ 191.5, 163.7, 136.5, 136.2, 131.9, 130.3, 129.9, 129.6, 129.0, 129.0, 128.9, 127.4, 127.3, 126.6, 123.9, 91.3, 52.2, 29.9.

ESI-MS: calculated for $C_{20}H_{16}NO_3$ $[M+H]^+$: 318.1124, found: 318.1121

## 3-methoxy-3-(p-tolyl)-2,3-dihydroisoquinoline-1,4-dione (20)



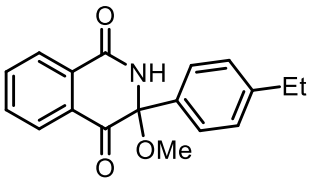
The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **20** was obtained as a colourless oil (49.4 mg, 0.176 mmol, 88 %). $R_f$ = 0.4 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.51 (s, 1H), 8.19 (d, *J* = 7.8 Hz, 1H), 7.95 (dd, *J* = 8.3, 6.9 Hz, 1H), 7.89 (d, *J* = 7.7 Hz, 1H), 7.81 (t, *J* = 7.5 Hz, 1H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.18 (d, *J* = 8.0 Hz, 2H), 3.29 (s, 3H), 2.27 (s, 3H)..

**$^{13}$C NMR (151 MHz, DMSO)** δ 191.1, 163.0, 139.0, 136.2, 135.6, 134.0, 131.7, 130.7, 129.4, 128.4, 126.9, 126.9, 90.8, 51.9, 21.1.

ESI-MS: calculated for $C_{17}H_{16}NO_3$ $[M+H]^+$: 282.1124, found: 282.1124.

## 3-(4-ethylphenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (21)



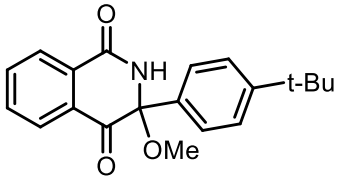
The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 4/1), **21** was obtained as a white solid (44.8 mg, 0.152mmol, 76 %). $R_f$ = 0.30 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.51 (s, 1H), 8.20 (dd, *J* = 7.8, 1.3 Hz, 1H), 7.96 (td, *J* = 7.6, 1.3 Hz, 1H), 7.90 (d, *J* = 7.3 Hz, 0H), 7.82 (td, *J* = 7.5, 1.3 Hz, 1H), 7.38 – 7.35 (m, 2H), 7.23 – 7.20 (m, 2H), 3.30 (s, 3H), 2.58 (q, *J* = 7.6 Hz, 2H), 1.14 (t, *J* = 7.6 Hz, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 191.1, 162.9, 145.2, 136.2, 135.9, 134.0, 131.7, 130.7, 128.5, 128.3, 127.0, 126.9, 90.8, 51.9, 28.2, 15.9.

ESI-MS: calculated for $C_{18}H_{18}NO_3$ $[M+H]^+$ : 296.1281, found: 296.1281.

## 3-(4-(tert-butyl)phenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (22)



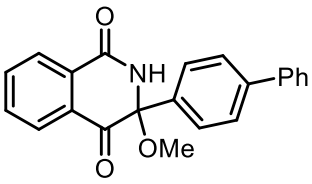

The title compound was prepared *via* the general procedure after purification by silica gel column chromatography (PE/EA = 4/1), **22** was obtained as a white solid (49.8mg, 0.154 mmol, 77 %). $R_f$ = 0.40 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.49 (s, 1H), 8.20 (d, *J* = 7.8 Hz, 1H), 7.97 – 7.95 (m, 1H), 7.91 (d, *J* = 7.7 Hz, 1H), 7.82 (dd, *J* = 8.4, 6.8 Hz, 1H), 7.38 (td, *J* = 8.4, 1.7 Hz, 4H), 3.30 (s, 3H), 1.25 (s, 9H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 191.1, 162.9, 152.0, 136.2, 135.6, 134.0, 131.7, 130.7, 128.5, 126.9, 126.7, 125.7, 90.7, 51.9, 34.8, 31.5.

ESI-MS: calculated for $C_{20}H_{22}NO_3$ $[M+H]^+$: 324.1594, found: 324.1594.

## 3-([1,1'-biphenyl]-4-yl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (23)



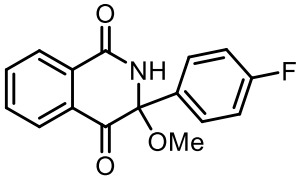

The title compound was prepared *via* the general procedure after purification by silica gel column chromatorgraph (PE/EA = 4/1), **23** was obtained as a colourless oil (40.5 mg, 0.118 mmol, 59 %). $R_f$ = 0.50 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.60 (s, 1H), 8.23 (dd, *J* = 7.9, 1.2 Hz, 1H), 7.99 – 7.97 (m, 1H), 7.94 (dd, *J* = 7.8, 1.3 Hz, 1H), 7.85 – 7.82 (m, 1H), 7.71 – 7.67 (m, 2H), 7.66 – 7.63 (m, 2H), 7.57 – 7.53 (m, 2H), 7.47 (t, *J* = 7.7 Hz, 2H), 7.38 (t, *J* = 7.4 Hz, 1H), 3.31 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 191.0, 162.9, 141.3, 139.8, 137.6, 136.3, 134.1, 131.7, 130.7, 129.5, 128.5, 128.3, 127.7, 127.2, 127.2, 126.9, 90.6, 51.9.

ESI-MS: calculated for $C_{22}H_{18}NO_3$ $[M+H]^+$: 344.1281, found: 344.1280.

## 3-(4-fluorophenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (24)



The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **24** was obtained as a colourless oil (30.2 mg, 0.106 mmol, 53 %). $R_f$ = 0.40 (PE/EA = 4/1).

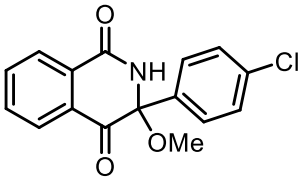
**$^1$H NMR (600 MHz, DMSO)** δ 9.59 (s, 1H), 8.21 (dd, *J* = 7.8, 1.2 Hz, 1H), 7.98 – 7.96 (m, 1H), 7.92 (dd, *J* = 7.8, 1.3 Hz, 1H), 7.85 – 7.82 (m, 1H), 7.53 – 7.49 (m, 2H), 7.22 (t, *J* = 8.9 Hz, 2H), 3.29 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.8, 163.7, 162.9, 162.1, 136.3, 134.1, 131.6, 130.5, 129.5, 129.4, 128.5, 126.9, 115.8, 115.6, 90.2, 51.8.

**$^{19}$F NMR (377 MHz, DMSO)** δ -113.18.

ESI-MS: calculated for $C_{16}H_{13}FNO_3$ $[M+H]^+$ : 286.0873, found: 286.0873.

## 3-(4-chlorophenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (25)



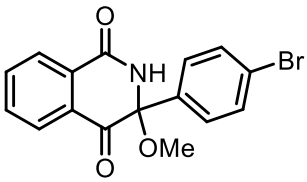
The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **25** was obtained as a white solid (36.7 mg, 0.122 mmol, 61 %). $R_f$ = 0.40 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.61 (s, 1H), 8.21 (dd, *J* = 7.9, 1.2 Hz, 1H), 7.97 (td, *J* = 7.6, 1.4 Hz, 1H), 7.92 (dd, *J* = 7.8, 1.3 Hz, 1H), 7.85 – 7.82 (m, 1H), 7.50 – 7.48 (m, 2H), 7.47 – 7.45 (m, 2H), 3.29 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.6, 162.9, 137.4, 136.4, 134.3, 134.1, 131.6, 130.5, 129.1, 128.8, 128.5, 126.9, 90.1, 51.8.

ESI-MS: calculated for $C_{16}H_{13}ClNO_3$ $[M+H]^+$: 302.0578, found: 302.0578.

## 3-(4-bromophenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (26)



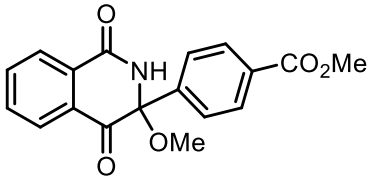
The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **26** was obtained as a white solid (49.8 mg, 0.144 mmol, 72 %). $R_f$ = 0.40 (PE/EA = 4/1).

**$^1$H NMR (400 MHz, Chloroform-d)** δ 8.35 – 8.29 (m, 1H), 8.01 (dd, J = 7.7, 1.0 Hz, 1H), 7.87 – 7.83 (m, 1H), 7.75 – 7.71 (m, 1H), 7.50 – 7.43 (m, 4H), 6.98 (s, 1H), 3.42 (s, 3H).

**$^{13}$C NMR (101 MHz, Chloroform-d)** δ 189.7, 163.4, 137.0, 135.7, 133.8, 132.0, 130.7, 128.9, 128.4, 127.4, 124.2, 90.6, 52.2.

ESI-MS: calculated for $C_{16}H_{13}BrNO_3$ $[M+H]^+$ : 346.0073, found: 346.0073.

## methyl 4-(3-methoxy-1,4-dioxo-1,2,3,4-tetrahydroisoquinolin-3-yl)benzoate (27)



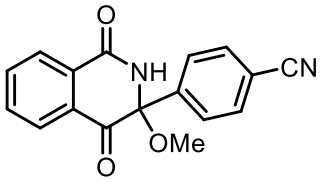

The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **27** was obtained as a white solid (45.5 mg, 0.140 mmol, 70 %). $R_f$ = 0.4 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.66 (s, 1H), 8.23 (d, *J* = 7.8 Hz, 1H), 8.00 – 7.97 (m, 3H), 7.93 (d, *J* = 7.7 Hz, 1H), 7.84 (td, *J* = 7.4, 1.3 Hz, 1H), 7.64 (d, *J* = 8.2 Hz, 2H), 3.85 (s, 3H), 3.31 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.6, 166.3, 162.8, 143.5, 136.5, 134.1, 131.6, 130.6, 130.5, 129.7, 128.6, 127.6, 126.9, 90.3, 52.7, 51.9.

ESI-MS: calculated for $C_{18}H_{16}NO_5$ $[M+H]^+$ : 326.1022, found: 326.1021.

## 4-(3-methoxy-1,4-dioxo-1,2,3,4-tetrahydroisoquinolin-3-yl)benzonitrile (28)



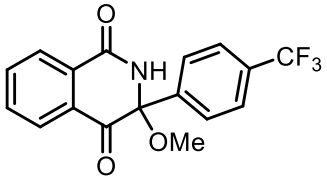

The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 2/1), **28** was obtained as a white solid (17.5 mg, 0.06 mmol, 30 %). $R_f$ = 0.40 (PE/EA = 2/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.69 (s, 1H), 8.22 (dd, *J* = 7.7, 1.2 Hz, 1H), 8.01 – 7.98 (m, 1H), 7.93 (dd, *J* = 7.8, 1.3 Hz, 1H), 7.90 – 7.87 (m, 2H), 7.85 – 7.83 (m, 1H), 7.69 – 7.67 (m, 2H), 3.29 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.3, 162.8, 143.5, 136.5, 134.2, 132.8, 131.6, 130.4, 128.6, 128.3, 127.0, 118.9, 112.3, 89.9, 51.9.

ESI-MS: calculated for $C_{17}H_{13}N_2O_3$ $[M+H]^+$ : 293.0920, found: 293.0920.

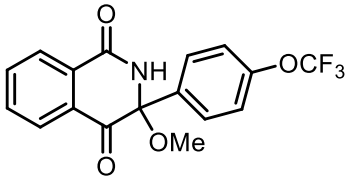
## 3-methoxy-3-(4-(trifluoromethyl)phenyl)-2,3-dihydroisoquinoline-1,4-dione (29)



The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 4/1), **29** was obtained as a white solid (28.8 mg, 0.086 mmol, 43 %). $R_f$ = 0.30 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, Chloroform-d)** δ 8.34 (d, J = 7.8 Hz, 1H), 8.02 (d, J = 7.7 Hz, 1H), 7.86 (t, J = 7.3 Hz, 1H), 7.74 (dd, J = 11.4, 8.0 Hz, 3H), 7.62 (d, J = 8.4 Hz, 2H), 6.90 (s, 1H), 3.45 (s, 3H).
**$^{13}$C NMR (151 MHz, Chloroform-d)** δ 189.6, 163.3, 141.9, 135.9, 133.9, 131.8(q, C-F, 2JC-F =52.65), 130.8, 130.7, 129.0, 127.4, 127.2, 125.8(q, C-F, 3JC-F =3.79),123.9(q, C-F, 1JC-F =273.61), 90.6, 52.3.
**$^{19}$F NMR (377 MHz, DMSO)** δ -61.15.
ESI-MS: calculated for $C_{17}H_{13}F_3NO_3$ $[M+H]^+$ : 336.0842, found: 336.0842.

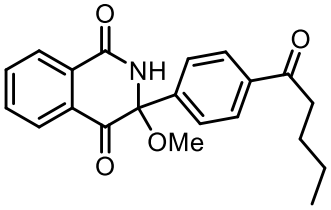
## 3-methoxy-3-(4-(trifluoromethoxy)phenyl)-2,3-dihydroisoquinoline-1,4-dione (30)



The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **30** was obtained as a white solid (42.8 mg, 0.122 mmol, 61 %). $R_f$ = 0.50 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.62 (s, 1H), 8.24 – 8.20 (m, 1H), 7.98 (td, *J* = 7.6, 1.4 Hz, 1H), 7.93 (dd, *J* = 7.8, 1.4 Hz, 1H), 7.85 (dd, *J* = 7.5, 1.3 Hz, 1H), 7.62 – 7.60 (m, 2H), 7.40 (d, *J* = 8.4 Hz, 2H), 3.29 (s, 3H).
**$^{13}$C NMR (151 MHz, DMSO)** δ 190.6, 162.8, 149.2, 137.7, 136.4, 134.1, 131.6, 130.5, 129.4, 128.6, 127.0, 121.3, 121.3, 119.6, 90.0, 51.8.
**$^{19}$F NMR (377 MHz, DMSO)** δ -56.78.
ESI-MS: calculated for $C_{17}H_{13}F_3NO_4$ $[M+H]^+$: 352.0791, found: 352.0791.

## 3-methoxy-3-(4-pentanoylphenyl)-2,3-dihydroisoquinoline-1,4-dione (31)



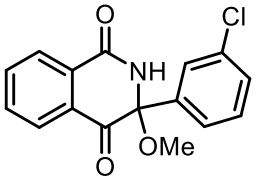
The title compound was prepared *via* the general procedure, after purification by silica gel column chromatorgraph (PE/EA = 4/1), **31** was obtained as a white solid (58.2 mg, 0.166 mmol, 83 %). $R_f$ = 0.40 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.65 (s, 1H), 8.22 (dd, *J* = 7.9, 1.2 Hz, 1H), 7.99 – 7.96 (m, 3H), 7.93 – 7.91 (m, 1H), 7.85 – 7.83 (m, 1H), 7.62 – 7.59 (m, 2H), 3.31 (s, 3H), 3.00 (t, *J* = 7.3 Hz, 2H), 1.58 (m, *J* = 7.4, 6.4, 1.3 Hz, 2H), 1.35 – 1.31 (m, 2H), 0.89 (t, *J* = 7.3 Hz, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 200.2, 190.6, 162.8, 143.0, 137.5, 136.4, 135.3, 134.1, 131.6, 130.5, 128.6, 128.4, 127.5, 126.9, 123.8, 90.4, 51.9, 38.2, 26.4, 22.2, 14.3.

ESI-MS: calculated for $C_{21}H_{22}NO_4$ $[M+H]^+$ : 352.1543, found: 352.1543.

## 3-(3-chlorophenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (32)



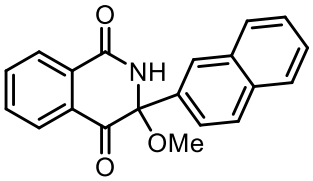
The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **32** was obtained as a white solid (37.9 mg, 0.126 mmol, 63 %). $R_f$ = 0.40 (PE/EA = 4/1).

**$^1$H NMR (400 MHz, DMSO-d6)** δ 9.64 (s, 1H), 8.21 (d, J = 7.7 Hz, 1H), 8.00 – 7.91 (m, 2H), 7.84 (t, J = 7.4 Hz, 1H), 7.51 (s, 1H), 7.43 (dd, J = 13.7, 4.8 Hz, 3H), 3.27 (s, 3H).

**$^{13}$C NMR (101 MHz, DMSO-d6)** δ 190.0, 162.4, 140.3, 136.0, 133.7, 133.1, 131.1, 130.3, 130.0, 129.0, 128.1, 126.6, 126.5, 125.5, 89.4, 51.4.

ESI-MS: calculated for $C_{16}H_{13}ClNO_3$ $[M+H]^+$ : 302.0578, found: 302.0578.

## 3-methoxy-3-(naphthalen-2-yl)-2,3-dihydroisoquinoline-1,4-dione (33)



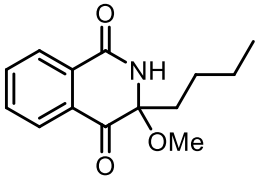
The title compound was prepared *via* the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), **33** was obtained as a colourless oil (43.1 mg, 0.136 mmol, 68 %). $R_f$ =0.50 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, Chloroform-d)** δ 8.38 (d, J = 7.8 Hz, 1H), 8.04 – 8.00 (m, 2H), 7.87 – 7.81 (m, 4H), 7.74 – 7.70 (m, 2H), 7.52 – 7.45 (m, 2H), 6.57 (s, 1H), 3.52 (s, 3H).

**$^{13}$C NMR (151 MHz, Chloroform-d)** δ 190.0, 163.4, 135.6, 135.3, 133.8, 133.8, 132.9, 131.0, 130.9, 129.0, 128.9, 128.7, 127.8, 127.4, 127.2, 126.7, 126.1, 123.9, 91.3, 52.4.

ESI-MS: calculated for $C_{20}H_{16}NO_3$ $[M+H]^+$: 318.1124, found: 318.1124.

## 3-butyl-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (34)



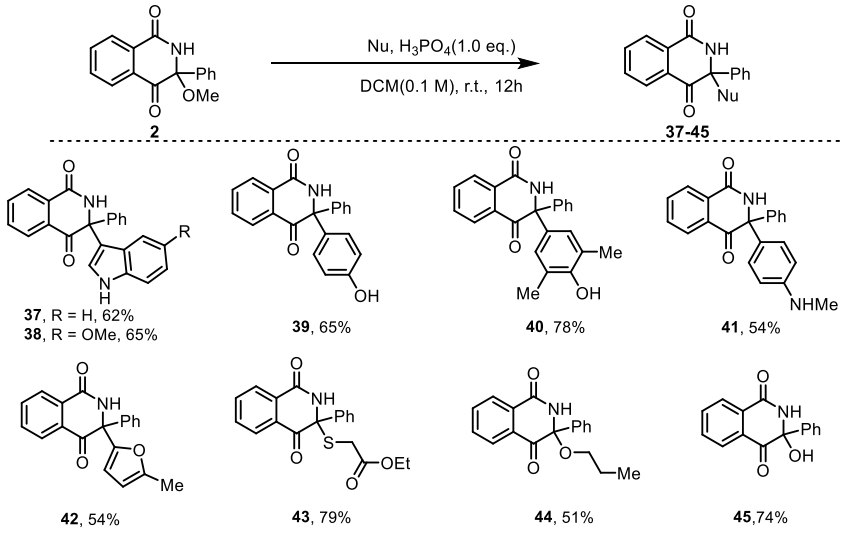
The title compound was prepared via the general procedure, after purification by silica gel column chromatography (PE/EA = 4/1), 34 was obtained as a colourless oil (24.7 mg, 0.10 mmol, 50 %). Rf = 0.4 (PE/EA = 4/1).

**$^1$H NMR (600 MHz, DMSO)** δ 9.09 (s, 1H), 8.14 (dd, J = 7.7, 1.2 Hz, 1H), 8.00 (dd, J = 7.8, 1.3 Hz, 1H), 7.94 (td, J = 7.5, 1.3 Hz, 1H), 7.88 – 7.80 (m, 1H), 3.04 (s, 3H), 2.04 – 1.95 (m, 1H), 1.77 (td, J = 12.7, 3.8 Hz, 1H), 1.26 – 1.17 (m, 4H), 0.79 (t, J = 7.1 Hz, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 192.7, 162.6, 136.2, 134.8, 133.9, 131.4, 128.4, 126.3, 89.4, 50.9, 37.4, 25.7, 22.6, 14.2.

ESI-MS: calculated for $C_{14}H_{18}NO_3$ $[M+H]^+$ : 248.1281, found: 248.1281

## 7. Synthetic Transformation of 2 to 37-45




In a 15 mL pressure tube, compound **3** (0.1 mmol), phosphoric acid (0.12 mmol), and nucleophile (0.12 mmol) were combined and dissolved in 2 mL of dichloromethane. The mixture was stirred at 25°C overnight to ensure full conversion. Upon completion of the reaction, the volatile components were removed under reduced pressure. The crude residue was then purified by flash

column chromatography on silica gel using a petroleum ether/ethyl acetate eluent system, yielding the target product **37-45** (51-79% yield).

Characterization Data of **37**

**$^1$H NMR (600 MHz, DMSO)** δ 11.16 (s, J = 2.8 Hz, 1H), 9.41 (s, 1H), 8.12 (dd, J = 7.8, 1.3 Hz, 1H), 7.93 (dd, J = 7.7, 1.3 Hz, 1H), 7.88 (td, J = 7.6, 1.3 Hz, 1H), 7.77 (td, J = 7.5, 1.3 Hz, 1H), 7.43 – 7.36 (m, 6H), 7.19 (dd, J = 8.0, 1.1 Hz, 1H), 7.10 (ddd, J = 8.2, 7.0, 1.1 Hz, 1H), 6.92 (ddd, J = 8.0, 7.0, 1.0 Hz, 1H), 6.79 (d, J = 2.7 Hz, 1H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 193.0, 162.2, 140.6, 137.4, 135.6, 133.7, 131.9, 131.2, 128.8, 128.6, 128.1, 127.9, 127.0, 126.4, 125.6, 122.0, 120.5, 119.6, 116.1, 112.4, 70.5.

ESI-MS: calculated for $C_{23}H_{17}N_2O_2$ $[M+H]^+$ : 353.1284, found: 353.1284

Characterization Data of **38**

**$^1$H NMR (600 MHz, DMSO)** δ 11.02 (d, J = 2.8 Hz, 1H), 9.39 (s, 1H), 8.10 (d, J = 7.8 Hz, 1H), 7.92 (d, J = 7.7 Hz, 1H), 7.86 (t, J = 7.5 Hz, 1H), 7.76 (t, J = 7.6 Hz, 1H), 7.40 – 7.31 (m, 5H), 7.29 (dd, J = 8.8, 1.5 Hz, 1H), 6.81 (t, J = 2.0 Hz, 1H), 6.76 (dt, J = 8.8, 2.0 Hz, 1H), 6.63 (d, J = 2.4 Hz, 1H), 3.55 (d, J = 1.8 Hz, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 192.7, 162.1, 153.5, 140.7, 135.5, 133.7, 132.6, 131.9, 131.2, 128.7, 128.5, 128.1 (d, J = 11.1 Hz), 126.9 (d, J = 7.0 Hz), 126.0, 115.3, 113.0, 111.4, 103.2, 70.5, 55.7.

ESI-MS: calculated for $C_{24}H_{19}N_2O_3$ $[M+H]^+$ : 383.1390, found: 383.1390

Characterization Data of **39**

**$^1$H NMR (600 MHz, DMSO)** δ 9.64 (s, 1H), 9.46 (s, 1H), 8.08 (dd, J = 7.8, 1.3 Hz, 1H), 7.95 – 7.92 (m, 1H), 7.87 (td, J = 7.6, 1.3 Hz, 1H), 7.79 (td, J = 7.6, 1.3 Hz, 1H), 7.37 – 7.32 (m, 3H), 7.23 – 7.21 (m, 2H), 7.06 – 7.02 (m, 2H), 6.76 – 6.73 (m, 2H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 194.0, 162.0, 157.7, 141.7, 135.7, 133.8, 131.9, 131.3, 131.2, 129.6, 128.7, 128.6, 128.4, 128.0, 126.9, 115.5, 73.9.

ESI-MS: calculated for $C_{21}H_{16}NO_3$ $[M+H]^+$ : 330.1124, found: 330.1124

Characterization Data of **40**

**$^1$H NMR (600 MHz, DMSO)** δ 9.42 (s, 1H), 8.47 (s, 1H), 8.09 (d, J = 7.7 Hz, 1H), 7.95 (d, J = 7.7 Hz, 1H), 7.87 (t, J = 7.6 Hz, 1H), 7.78 (t, J = 7.5 Hz, 1H), 7.34 (dq, J = 14.1, 7.2 Hz, 3H), 7.22 (d, J = 7.5 Hz, 2H), 6.81 (s, 2H), 2.11 (s, 6H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 193.9, 162.0, 153.6, 141.8, 135.6, 133.8, 131.9, 131.4, 131.2, 128.6 (d, J = 12.0 Hz), 128.4, 128.2, 128.0, 126.9, 124.4, 73.9, 17.4.

ESI-MS: calculated for $C_{23}H_{20}NO_3$ $[M+H]^+$ : 358.1437, found: 358.1437

Characterization Data of **41**

**$^1$H NMR (400 MHz, DMSO-d6)** δ 11.14 (S, 1H), 9.39 (s, 1H), 8.11 (d, J = 7.7 Hz, 1H), 7.91 (t, J = 7.0 Hz, 1H), 7.89 – 7.84 (m, 1H), 7.79 – 7.74 (m, 1H), 7.41 – 7.34 (m, 6H), 7.19 (d, J = 8.0 Hz, 1H), 7.09 (t, J = 7.3 Hz, 1H), 6.92 (t, J = 7.5 Hz, 1H), 6.78 (d, J = 2.6 Hz, 1H).

**$^{13}$C NMR (101 MHz, DMSO-d6)** δ 192.5, 161.7, 140.2, 136.9, 135.1, 133.3, 131.5, 130.7, 128.3, 128.1, 127.6, 127.4, 126.5, 126.0, 125.2, 121.5, 120.1, 119.1, 115.6, 111.9, 70.0.

ESI-MS: calculated for $C_{22}H_{19}N_2O_2$ $[M+H]^+$ : 343.1441, found: 343.1441

Characterization Data of **42**

**$^1$H NMR (400 MHz, Chloroform-d)** δ 8.52 (s, 1H), 8.24 (d, J = 7.6 Hz, 1H), 8.02 (d, J = 7.6 Hz, 1H), 7.76 (t, J = 7.5 Hz, 1H), 7.67 (t, J = 7.5 Hz, 1H), 7.49 – 7.47 (m, 2H), 7.34 – 7.31 (m, 3H), 7.24 (d, J = 8.9 Hz, 1H), 6.94 (d, J = 2.7 Hz, 1H), 6.82 (dd, J = 8.9, 2.3 Hz, 1H), 6.79 (s, 1H), 6.63 (d, J = 2.1 Hz, 1H), 3.63 (s, 3H).

**$^{13}$C NMR (151 MHz, Chloroform-d)** δ 191.6, 162.8, 154.3, 139.7, 134.8, 133.4, 132.2, 131.3, 131.0, 128.8, 128.7, 128.3, 127.6, 127.5, 125.9, 125.6, 116.2, 112.9, 112.4, 102.7, 70.9, 55.9.

Characterization Data of **43**

**$^1$H NMR (600 MHz, DMSO)** δ 9.63 (s, 1H), 8.14 (dd, J = 7.7, 1.3 Hz, 1H), 7.97 (dd, J = 7.8, 1.2 Hz, 1H), 7.94 (td, J = 7.5, 1.3 Hz, 1H), 7.84 (td, J = 7.5, 1.3 Hz, 1H), 7.60 – 7.57 (m, 2H), 7.44 – 7.40 (m, 2H), 7.39 – 7.36 (m, 1H), 3.94 – 3.88 (m, 1H), 3.85 – 3.79 (m, 1H), 3.51 (d, J = 15.5 Hz, 1H), 3.37 (s, 1H), 1.00 (t, J = 7.1 Hz, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 188.3, 169.2, 161.7, 137.9, 136.0, 134.0, 131.3, 130.6, 129.4, 129.1, 128.2, 127.7, 127.4, 75.0, 61.4, 33.5, 14.1.

ESI-MS: calculated for $C_{19}H_{18}NO_4S$ $[M+H]^+$ : 356.0951, found: 356.0951

Characterization Data of **44**

**$^{1}$H NMR (600 MHz, DMSO)** δ 9.54 (s, 1H), 8.19 (d, J = 7.8 Hz, 1H), 7.95 (td, J = 7.6, 1.3 Hz, 1H), 7.90 (d, J = 7.6 Hz, 1H), 7.83 (d, J = 2.2 Hz, 1H), 7.82 – 7.78 (m, 1H), 7.50 – 7.45 (m, 2H), 7.41 – 7.32 (m, 3H), 3.54 (dt, J = 8.6, 6.4 Hz, 1H), 1.58 (h, J = 7.1 Hz, 2H), 0.89 (t, J = 7.4 Hz, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 191.2, 162.8, 138.9, 136.2, 134.8, 134.0, 131.7, 130.6, 129.4, 128.8, 128.5, 127.0, 126.9, 123.4, 90.3, 65.7, 23.1, 11.0.

ESI-MS: calculated for $C_{18}H_{18}NO_3$ $[M+H]^+$ : 296.1281, found: 296.1280

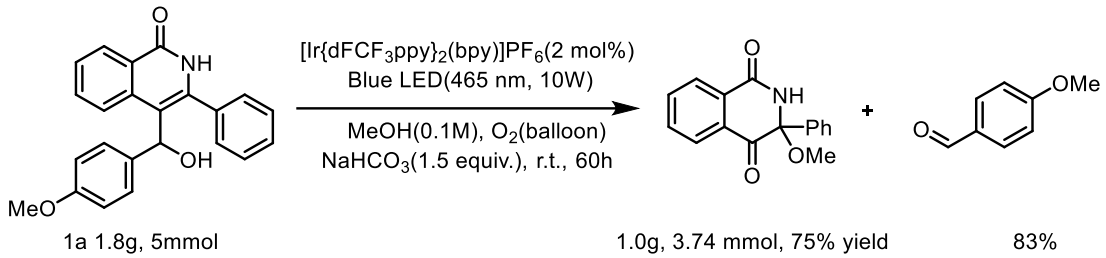
Characterization Data of **45**

**$^{1}$H NMR (400 MHz, Chloroform-d)** δ 8.23 (d, J = 8.9 Hz, 1H), 7.70 (dd, J = 7.5, 1.2 Hz, 1H), 7.61 – 7.58 (m, 1H), 7.57 – 7.53 (m, 1H), 7.40 – 7.37 (m, 2H), 7.32 (d, J = 5.9 Hz, 4H), 7.09 (d, J = 7.3 Hz, 1H), 6.88 (t, J = 7.4 Hz, 1H), 6.70 (d, J = 7.9 Hz, 1H), 5.93 (s, 1H), 2.72 (s, 3H).

**$^{13}$C NMR (101 MHz, Chloroform-d)** δ 163.6, 151.9, 136.2, 135.8, 132.8, 130.4, 129.7, 129.6, 129.2, 128.9, 128.8, 127.2, 127.0, 124.7, 119.9, 108.7, 93.8, 72.9, 27.6.

ESI-MS: calculated for $C_{15}H_{12}NO_3$ $[M+H]^+$ : 254.0811, found: 254.0811

## 8. Gram Scale Reaction

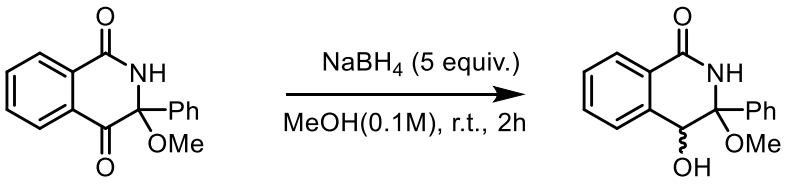



1a 1.8g, 5mmol 1.0g, 3.74 mmol, 75% yield 83%

A 50 mL-round bottom flask charged with a stirring bar, was added 4-(hydroxy(4-meth oxyphenyl)methyl)-3-phenylisoquinolin-1(2H)-one **1a** (5 mmol, 1 equiv.) and、[Ir{dFCF$_3$pp y}$_2$(bpy)]PF$_6$ (100 mg, 0.10 mmol, 2.0 mol%)、 NaHCO$_3$ (630 mg, 7.5 mmol, 1.5 equiv.), dry MeOH (50.0 mL) were added subsequently into the reaction vessel. The reaction was a llowed to stir at 25 ºC for 60 hours. The reaction mixture was then diluted with EtOAc (20 mL) and washed with brine. The aqueous phase was extracted with EtOAc again. The orga nic layers were combined, washed with brine and dried over $Na_2SO_4$. The pure product was purified by flash column chromatography on silica with an appropriate solvent to afford the pure product (75%).

## 9. Derivatization of 2

Synthetic Transformation of **2** to **46**




**3** **46, 74%**, dr= 8:1

A 15 mL-schlenk tube was charged with **2** (0.1 mmol) and $NaBH_4$ (0.5 mmol) in MeOH (2.0 mL), the mixture was stirred at room temperature until the complete consumption of **2** as monitored by TLC analysis (typically 2.0 hours). The reaction mixture was then diluted with EtOAc (5.0 mL) and washed with brine. The aqueous phase was extracted with EtOAc again. The organic layers were combined, washed with brine and dried over $Na_2SO_4$. The mixture was concentrated in vacuo

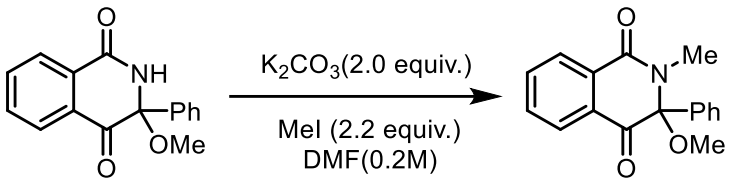
and purified by flash chromatography on silica gel (petroleum ether/ethyl acetate) to afford the corresponding product (19.9mg, 74 % yield).

**$^1$H NMR (600 MHz, DMSO)** δ 9.00 (s, 1H), 7.96 (dd, J = 7.7, 1.4 Hz, 1H), 7.56 (dd, J = 7.5, 1.4 Hz, 1H), 7.53 – 7.51 (m, 2H), 7.47 (dd, J = 7.5, 1.2 Hz, 1H), 7.43 (dd, J = 8.4, 6.8 Hz, 2H), 7.39 (dd, J = 7.7, 1.1 Hz, 1H), 7.37 (t, J = 7.3 Hz, 1H), 5.46 (d, J = 7.4 Hz, 1H), 4.35 (dd, J = 7.5, 1.5 Hz, 1H), 2.94 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 165.7, 141.3, 138.4, 132.7, 129.2, 128.4, 128.4, 128.3, 128.2, 127.6, 127.3, 91.2, 72.1, 49.6.

ESI-MS: calculated for $C_{16}H_{16}NO_{23}[M+H]^+$: 270.1124, found: 270.1124.

Synthetic Transformation of **2** to **47**




**2** **47**, 92%

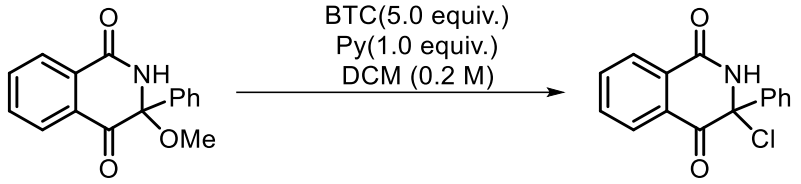
A 15 mL-schlenk tube was charged with **2** (0.1 mmol) in DMF (2.0 mL), then iodomethane (31 mg, 0.22 mmol) and $K_2CO_3$ (27.6mg, 0.2 mmol) was added respectively. The mixture at room temperature for 12.0 h. The reaction mixture was then diluted with EtOAc (5.0 mL) and washed with brine. The aqueous phase was extracted with EtOAc again. The organic layers were combined, washed with brine and dried over $Na_2SO_4$. The mixture was concentrated in vacuo and purified by flash chromatography on silica gel (petroleum ether/ethyl acetate) to afford the corresponding product (26 mg, 92 % yield).

**$^1$H NMR (600 MHz, DMSO)** δ 8.33 (d, J = 7.9 Hz, 1H), 8.01 (td, J = 7.6, 1.3 Hz, 1H), 7.93 (d, J = 7.7 Hz, 1H), 7.83 (td, J = 7.6, 1.3 Hz, 1H), 7.36 (qd, J = 7.5, 2.1 Hz, 6H), 3.28 (s, 3H), 2.84 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.4, 162.2, 137.2, 136.8, 134.0, 131.7, 130.1, 129.7, 129.5, 129.0, 126.9, 126.4, 94.6, 52.1, 28.9.

ESI-MS: calculated for $C_{17}H_{16}NO_3$ $[M+H]^+$ : 282.1124, found: 282.1124

Synthetic Transformation of **2** to **48**



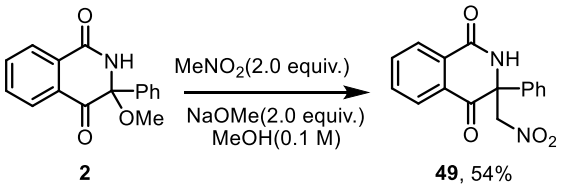

In a nitrogen-filled environment, triphosgene (0.5 mmol, 5equiv.) was dissolved in dichloromethane (DCM) inside a 15 mL pressure tube, and the mixture was cooled to 0°C. Pyridine (0. mmol, 1 equiv.) was slowly added dropwise, followed by the addition of compound **2** (0.1 mmol, 1 equiv.) dissolved in DCM. The mixture was allowed to warm to room temperature and stirred overnight to ensure complete reaction. Once the reaction was finished, it was quenched with hydrochloric acid (HCl), and the desired product was extracted using dichloromethane. The organic layer was washed with saturated sodium bicarbonate solution to neutralize any remaining acid and then dried over anhydrous sodium sulfate. After removing the dichloromethane under reduced pressure, the crude product was obtained. The crude material was dissolved in diethyl ether ($Et_2O$), and the insoluble solids were filtered off. The filtrate was concentrated to afford the final product (12.7 mg, 47 % yield).

**$^1$H NMR (600 MHz, DMSO)** δ 9.32 (s, 1H), 8.16 (d, J = 7.8 Hz, 1H), 7.92 (td, J = 7.5, 1.2 Hz, 1H), 7.88 (d, J = 7.6 Hz, 1H), 7.79 (td, J = 7.5, 1.2 Hz, 1H), 7.48 – 7.46 (m, 2H), 7.34 (dd, J = 13.0, 7.2 Hz, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 192.7, 161.8, 140.6, 135.7, 133.7, 132.1, 130.2, 128.9, 128.6, 128.2, 126.9 (d, J = 7.9 Hz), 85.9.

ESI-MS: calculated for $C_{15}H_{11}ClNO_2$ $[M+H]^+$ : 272.0472, found: 272.0472

Synthetic Transformation of **3** to **49**



In a 15 mL pressure tube, compound **2** (0.1 mmol), nitromethane ($MeNO_2$, 0.2 mmol), and sodium methoxide (NaOMe, 0.2 mmol) were combined and dissolved in 2 mL of methanol. The resulting mixture was stirred at room temperature overnight to ensure complete reaction. The mixture was then diluted with $CH_2Cl_2$ and filtered through celite. All volatiles were removed under reduced pressure. The purification was performed by flash column chromatography on silica gel (petroleum ether/ethyl acetate) to afford the corresponding product (16.0 mg, 54 % yield).

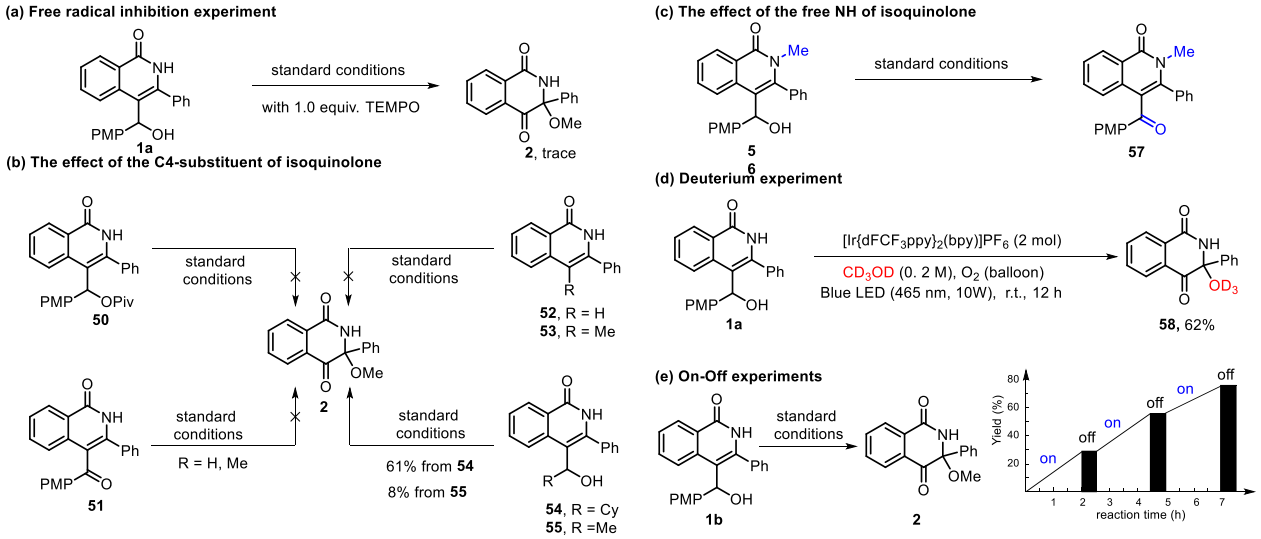
**$^1$H NMR (600 MHz, DMSO)** δ 9.43 (s, 1H), 8.18 (dd, J = 7.8, 1.2 Hz, 1H), 7.99 – 7.92 (m, 2H), 7.82 (td, J = 7.6, 1.3 Hz, 1H), 7.48 – 7.43 (m, 2H), 7.40 (dd, J = 8.7, 6.8 Hz, 2H), 7.37 – 7.34 (m, 1H), 6.27 (d, J = 15.1 Hz, 1H), 4.93 (d, J = 15.1 Hz, 1H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 190.7, 162.0, 136.5, 136.4, 134.1, 131.5, 130.2, 129.8, 129.6, 128.5, 127.1, 126.3, 80.2, 68.1.

ESI-MS: calculated for $C_{16}H_{13}N_2O_4$ $[M+H]^+$ : 297.0869, found: 297.0869

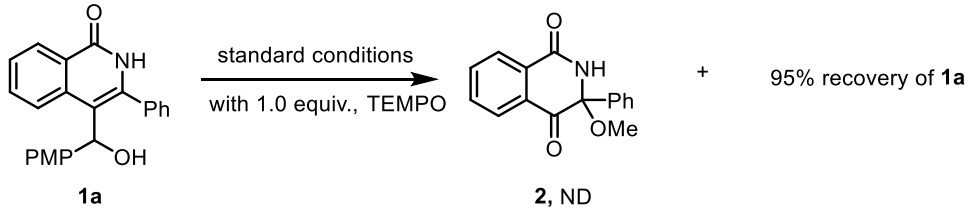
## 10. Mechanistic Studies

**Scheme S1. Preliminary Mechanistic Studies**

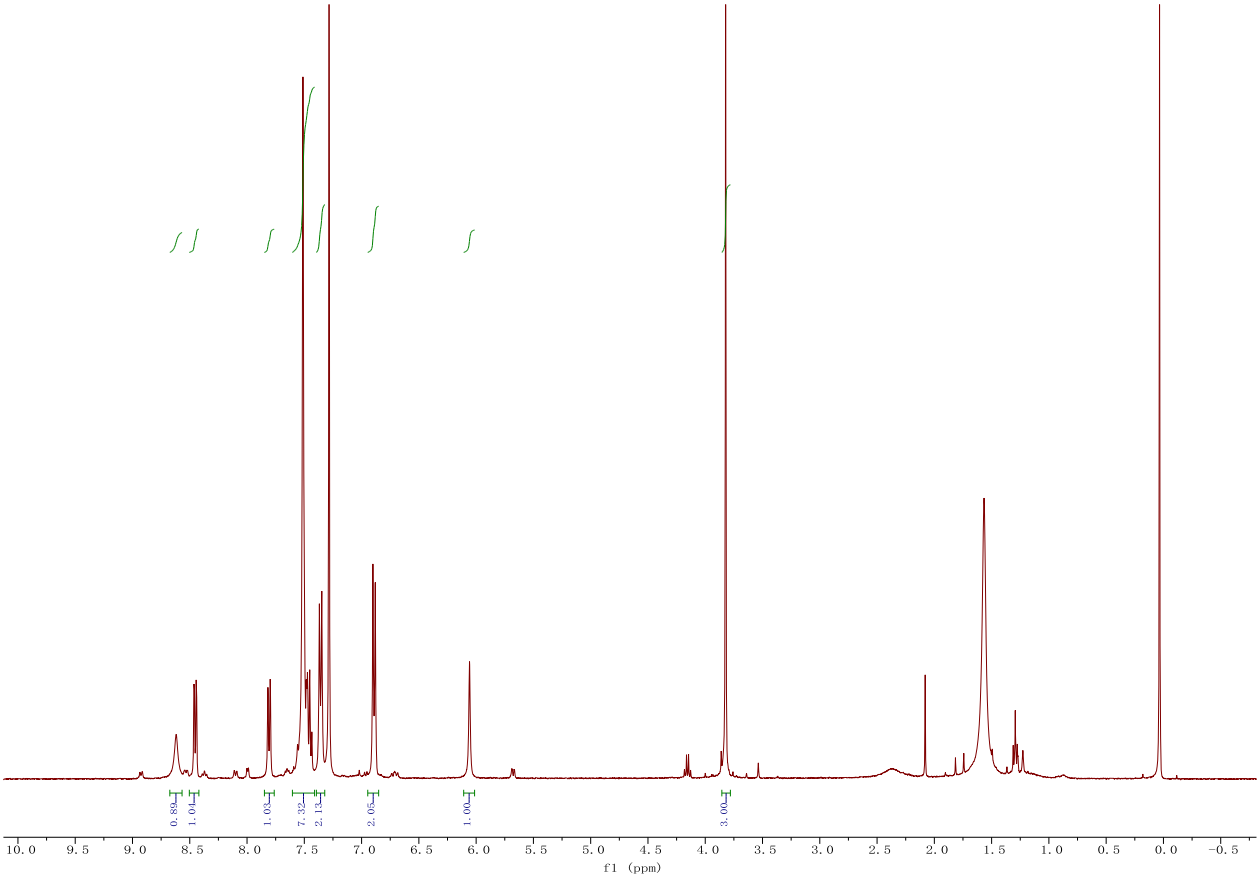



### 9.1 Radical and singlet oxygen trapping experiments

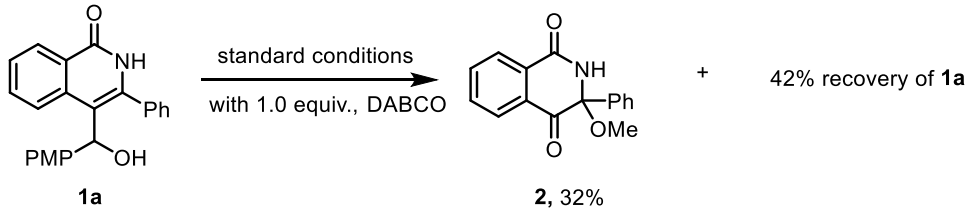
#### 9.1.1 Radical trapping experiment



In a 10 mL quartz tube equipped with a stir bar, 4-(hydroxy(4-methoxyphenyl)methyl)-3-phenylisoquinolin-1(2H)-one **1a** (0.1 mmol, 1 equiv.), [Ir{dFCF$_3$ppy}$_2$(bpy)]PF$_6$ (2.0 mol%), NaHCO$_3$ (0.15 mmol, 1.5 equiv.), 2,2,6,6-tetramethylpiperidine-1-oxyl (0.10 mmol, 1.0 equiv.), and dry methanol (2.0 mL) were added sequentially. The reaction mixture was stirred at 25°C for 12 hours. Subsequently, thin-layer chromatography (TLC) monitoring indicated no formation of the target product **2**. The reaction solution was removing under reduced pressure, the crude product was obtained for $^1$H NMR analysis, the spectrum clearly shows the absence of new proton signals that could be assigned to a TEMPO-derived product. And the mixture was concentrated in vacuo and purified by flash chromatography on silica gel (petroleum ether/ethyl acetate) to recover the start material **1a** (34.3 mg, 96 % of 1a was recovered).

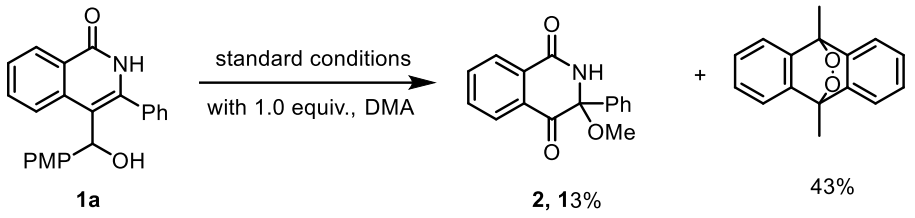


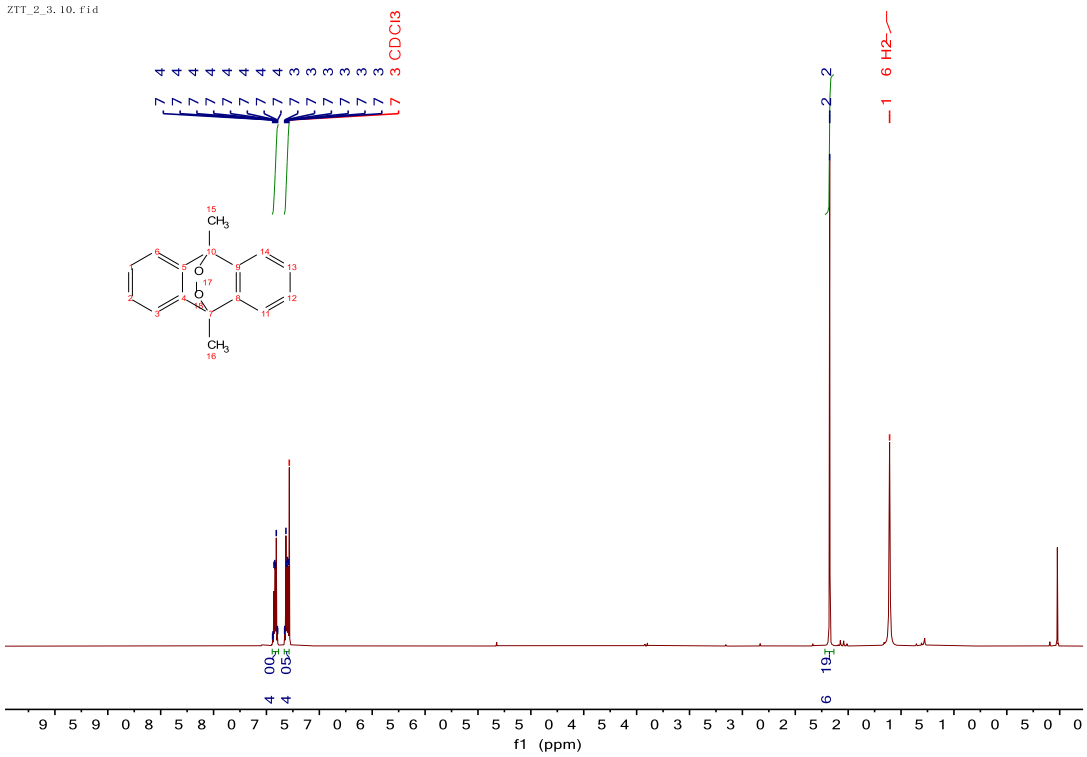

### 9.1.2 Singlet oxygen ($^1O_2$) trapping experiment




**1a** **2**, 32%

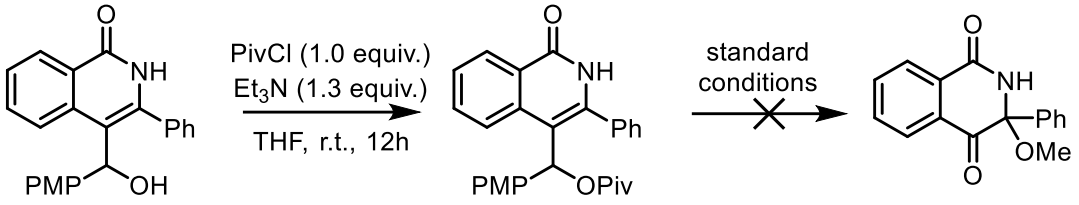
In a 10 mL quartz tube equipped with a stir bar, 4-(hydroxy(4-methoxyphenyl)methyl)-3-phenylisoquinolin-1(2H)-one **1a** (0.1 mmol, 1 equiv.), [Ir{dFCF$_3$ppy}$_2$(bpy)]PF$_6$ (2.0 mol%), NaHCO$_3$ (0.15 mmol, 1.5 equiv.), 1,4-diazabicyclo[2.2.2]octane (DABCO) (0.10 mmol, 1.0 equiv.), and dry methanol (2.0 mL) were added sequentially. The reaction mixture was stirred at 25°C for 12 hours. The reaction solution was removing under reduced pressure, and purified by flash chromatography on silica gel (petroleum ether/ethyl acetate) to give **2** in 8.5 mg and recovered the start material **1a** in 14.9 mg.




## 9.2 Competition Experiments

### 9.2.1 The effect of the C4-substituent of isoquinolone



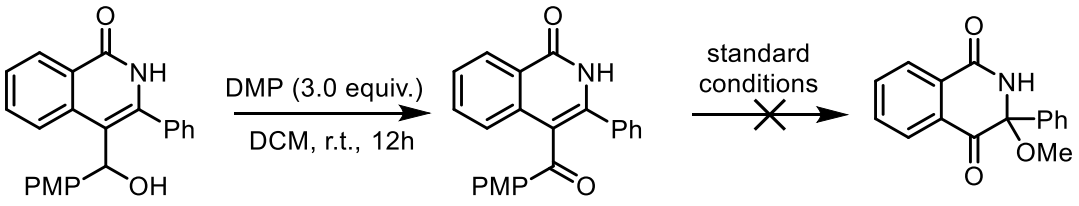

**1a** **50** **2**

The 4-(1-hydroxy-2-(4-methoxyphenyl)ethyl)-3-phenylisoquinolin-1(2H)-one (**1a,** 2mmol) was dissolved in dry THF and $Et_3N$ (1.3 equiv.) under argon atmosphere followed by dropwise addition of trimethylacetyl chloride (1.0 equiv.). After stirring at 25 °C for 12 h, the reaction mixture was extracted with water (30 mL) and EtOAc (3 x 20 mL). The organic layer was separated and dried over anhydrous $MgSO_4$, filtered and concentrated in *vacuo*. The crude was purified by flash column chromatography and the product 48 was obtained as white solid. Compound 48 was subjected to the standard conditions of the photocatalytic reaction. After monitoring by TLC, no target product **2** was observed.

Characterization Data of **50**

**$^1$H NMR (600 MHz, DMSO)** δ 8.24 – 8.21 (m, 1H), 7.94 – 7.91 (m, 1H), 7.66 – 7.63 (m, 2H), 7.61 – 7.59 (m, 2H), 7.52 – 7.48 (m, 2H), 7.47 – 7.44 (m, 1H), 7.15 – 7.12 (m, 2H), 6.85 – 6.82 (m, 2H), 6.47 (d, *J* = 4.0 Hz, 1H), 6.19 (d, *J* = 3.9 Hz, 1H), 3.68 (s, 3H), 1.45 (s, 9H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 176.7, 158.2, 154.7, 149.8, 140.0, 137.8, 136.8, 130.8, 130.2, 129.8, 128.7, 128.6, 128.3, 128.2, 127.0, 123.7, 121.7, 114.0, 70.1, 55.4, 27.3.




**1a** **51** **2**

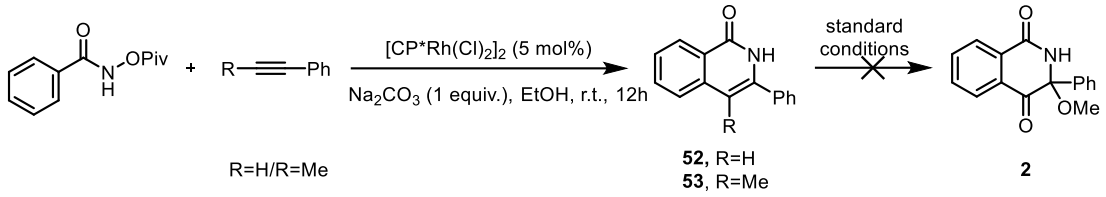
The 4-(1-hydroxy-2-(4-methoxyphenyl)ethyl)-3-phenylisoquinolin-1(2H)-one (**1a,** 2mmol) was dissolved in dry DCM and DMP (3 equiv.) under argon atmosphere. After stirring at 25 °C for 12 h, the reaction mixture was extracted with water (30 mL) and EtOAc (3 x 20 mL). The organic layer was separated and dried over anhydrous $MgSO_4$, filtered and concentrated in *vacuo*. The crude was purified by flash column chromatography and the product 49 was obtained as white solid.

Compound 49 was subjected to the standard conditions of the photocatalytic reaction. After monitoring by TLC, no target product **2** was observed.

Characterization Data of **51**

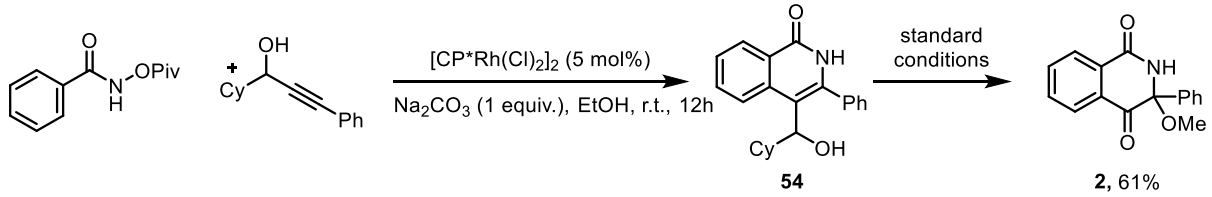
**$^1$H NMR (600 MHz, DMSO)** δ 11.77 (s, 1H), 8.35 – 8.32 (m, 1H), 7.69 (d, *J* = 8.8 Hz, 2H), 7.67 – 7.65 (m, 1H), 7.55 (ddd, *J* = 8.1, 7.1, 1.1 Hz, 1H), 7.40 – 7.37 (m, 2H), 7.30 (dd, *J* = 5.0, 1.7 Hz, 3H), 7.27 – 7.25 (m, 1H), 6.87 – 6.84 (m, 2H), 3.75 (s, 3H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 194.5, 163.9, 162.3, 140.0, 136.1, 133.9, 133.4, 132.3, 131.0, 129.9, 129.5, 128.6, 127.6, 127.3, 125.2, 124.6, 114.9, 114.4, 56.0.




In an 8 mL reaction tube, the mixture of N-(pivaloyloxy)benzamide (0.25 mmol), phenylacetylene/prop-1-yn-1-ylbenzene (0.3 mmol), $[Cp^*RhCl_2]_2$ (5.0 mol%) and $Na_2CO_3$(1.0 equiv.) was added EtOH. Then the resulting mixture was stirred for 16 h. When the reaction was finished, the desired product precipitated out as a solid, and the product was simply collected by filtration. For some cases, if the precipitation did not occur, the reaction mixture was subjected directly to flash chromatography on silica gel (petroleum ether/ethyl acetate) to provide the desired products **51**/**52**. Compound **51**/**52** was subjected to the standard conditions of the photocatalytic reaction. After monitoring by TLC, no target product **2** was observed.

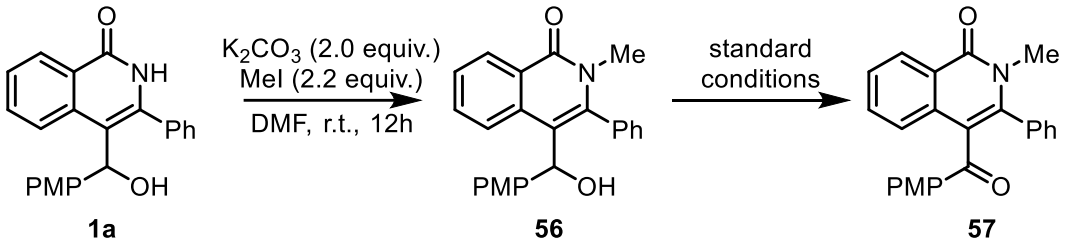
The compounds **52** and **53** were prepared according to a known procedure and the characterization data matches those reported in the literature[4] and literature,[5] respectively.




In an 8 mL reaction tube, the mixture of *N*-(pivaloyloxy)benzamide (0.25 mmol), 1-cyclohexyl-3-phenylprop-2-yn-1-ol (0.3 mmol), $[Cp^*RhCl_2]_2$ (5.0 mol%) and $Na_2CO_3$(1.0 equiv.) was added EtOH. Then the resulting mixture was stirred for 16 h. When the reaction was finished, the desired product precipitated out as a solid, and the product was simply collected by filtration. For some

cases, if the precipitation did not occur, the reaction mixture was subjected directly to flash chromatography on silica gel (petroleum ether/ethyl acetate) to provide the desired products **53**. Compound **54** was subjected to the standard conditions of the photocatalytic reaction. The reaction was monitored by TLC until completion. After separation and purification, the target product 3 was successfully obtained (61% yield).

### 9.2.2 The effect of the free NH of isoquinolone




**1a** **56** **57**

A 15 mL-schlenk tube was charged with **1a** (0.2 mmol) in DMF, then Iodomethane (0.22 mmol) and $K_2CO_3$(0.2 mmol) was added respectively. The mixture at room temperature for 12.0 h. The reaction mixture was then diluted with EtOAc and washed with brine. The aqueous phase was extracted with EtOAc again. The organic layers were combined, washed with brine and dried over $Na_2SO_4$. The mixture was concentrated in vacuo and purified by flash chromatography on silica gel (petroleum ether/ethyl acetate) to afford the corresponding product **55**. Compound **55** was subjected to the standard conditions of the photocatalytic reaction. The reaction was monitored by TLC until completion. After separation and purification, the oxidized product **56** was successfully obtained.

Characterization Data of **56**

**$^1$H NMR (600 MHz, DMSO)** δ 8.3 (ddd, *J* = 7.8, 1.7, 0.6 Hz, 1H), 7.8 – 7.8 (m, 0H), 7.6 (td, *J* = 3.1, 1.0 Hz, 2H), 7.6 – 7.5 (m, 1H), 7.5 – 7.5 (m, 2H), 7.4 (ddd, *J* = 8.4, 7.0, 1.7 Hz, 1H), 7.4 (ddd, *J* = 8.3, 7.1, 1.3 Hz, 1H), 7.3 – 7.2 (m, 2H), 6.8 – 6.8 (m, 2H), 5.9 – 5.9 (m, 1H), 5.3 (s, 1H), 3.7 (s, 3H), 3.2 (s, 3H).

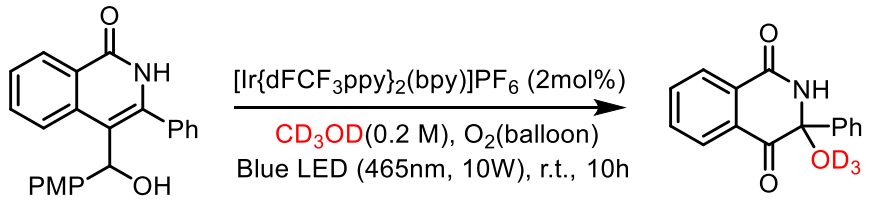
**$^{13}$C NMR (151 MHz, DMSO)** δ 162.0, 158.1, 142.5, 136.6, 135.2, 135.1, 131.4, 129.7 (d, *J* = 2.7 Hz), 129.5 (d, *J* = 6.7 Hz), 129.3, 127.6 (d, *J* = 8.9 Hz), 126.8, 126.5, 126.2, 116.4, 113.8, 70.3, 55.3, 34.3.

Characterization Data of **57**

**$^1$H NMR (600 MHz, DMSO)** δ 8.38 (dt, *J* = 8.1, 2.0 Hz, 1H), 7.71 – 7.64 (m, 3H), 7.57 (tdd, *J* = 7.9, 2.8, 1.2 Hz, 1H), 7.33 (dp, *J* = 11.1, 2.7 Hz, 5H), 7.14 (dd, *J* = 8.1, 2.8 Hz, 1H), 6.87 (dd, *J* = 9.0, 2.7 Hz, 2H), 3.78 (s, 2H), 3.22 (s, 2H).

**$^{13}$C NMR (151 MHz, DMSO)** δ 193.9, 163.9, 162.0, 141.6, 134.5, 133.5, 133.3, 132.3, 130.8, 129.6, 128.7, 128.0, 127.6, 124.6, 124.4, 117.1, 114.4, 56.0, 34.0.

### 9.3 Deuteration experiment




**1a** **58**, 62%

**Synthesis of deuterated substrate 58**

In a 10 mL quartz tube equipped with a stir bar, 4-(hydroxy(4-methoxyphenyl)methyl)-3-phenylisoquinolin-1(2H)-one **1a** (0.1 mmol, 1 equiv.), $[Ir\{dFCF_3ppy\}_2(bpy)]PF_6$ (2.0 mol%), sodium bicarbonate (0.15 mmol, 1.5 equi.v), and deuterated methanol (2.0 mL) were added sequentially. The reaction mixture was stirred at 25°C for 10 hours. Afterwards, the reaction mixture was diluted with ethyl acetate (20 mL) and washed with brine. The aqueous phase was extracted again with ethyl acetate. The organic phases were combined, washed with brine, and dried over anhydrous sodium sulfate. The crude product was purified by flash column chromatography on silica gel using an appropriate solvent system to afford the pure product **57** in 62% yield.

Characterization Data of **58**

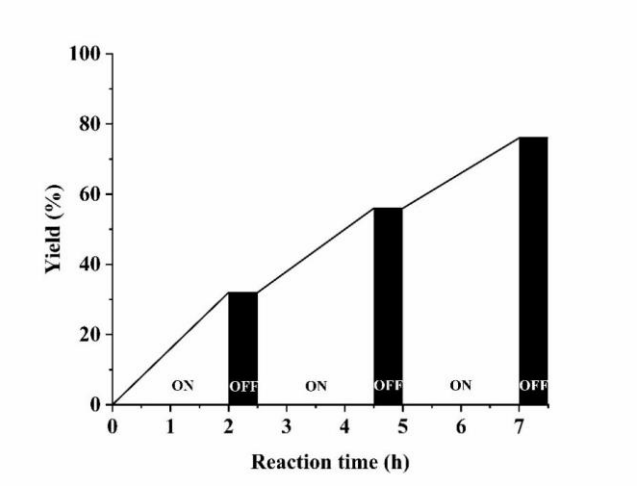
**$^1$H NMR (600 MHz, DMSO)** δ 9.55 (s, 1H), 8.20 (dd, J = 7.9, 1.2 Hz, 1H), 7.95 (td, J = 7.6, 1.4 Hz, 1H), 7.90 (dd, J = 7.7, 1.3 Hz, 1H), 7.81 (td, J = 7.5, 1.3 Hz, 1H), 7.47 – 7.45 (m, 2H), 7.39 – 7.35 (m, 3H).

ESI-MS: calculated for $C_{15}H_{11}D_3NO_3$ $[M+H]^+$: 259.1156, found: 259.1156

### 9.4 Light on–off experiment

From the profile of the reaction with the light ON/OFF over time, it was observed that the transformation progressed smoothly under light, but no further conversion was observed when the

light was turned off, which suggested that the transformation requires the constant participation of light.




## 11. References

1. Qi, T.; N. Fang,; W. Huang,; J. Chen,; Y. Luo, Y. Xia, *Org. Lett.* **2022**, *24*, 5674-5678

2. Y. Li, H. Xu, L. Huang, Z. Zhou, Z. Tang, H. Meng, W. Zhang , W. Yi, and X. Wu , *Org. Chem. Front.*, **2023**, *10*, 3000 -3009

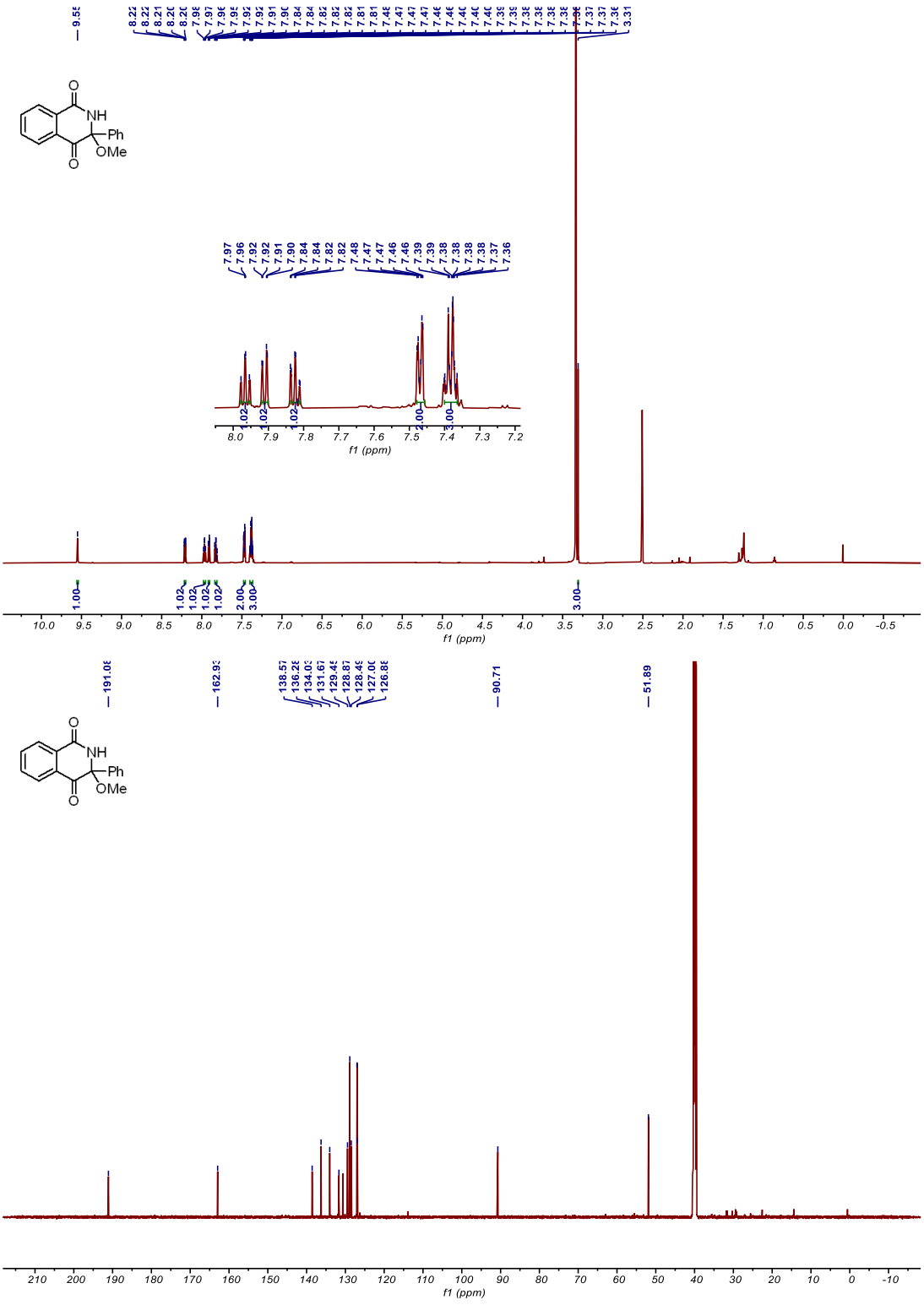
3. H. Meng, H. Xu, Z. Zhou, Z. Tang, Y. Li, Y. Zhou, W. Yi, and X. Wu, *Green Chem.*, **2022**, *24*, 7012 -7021.

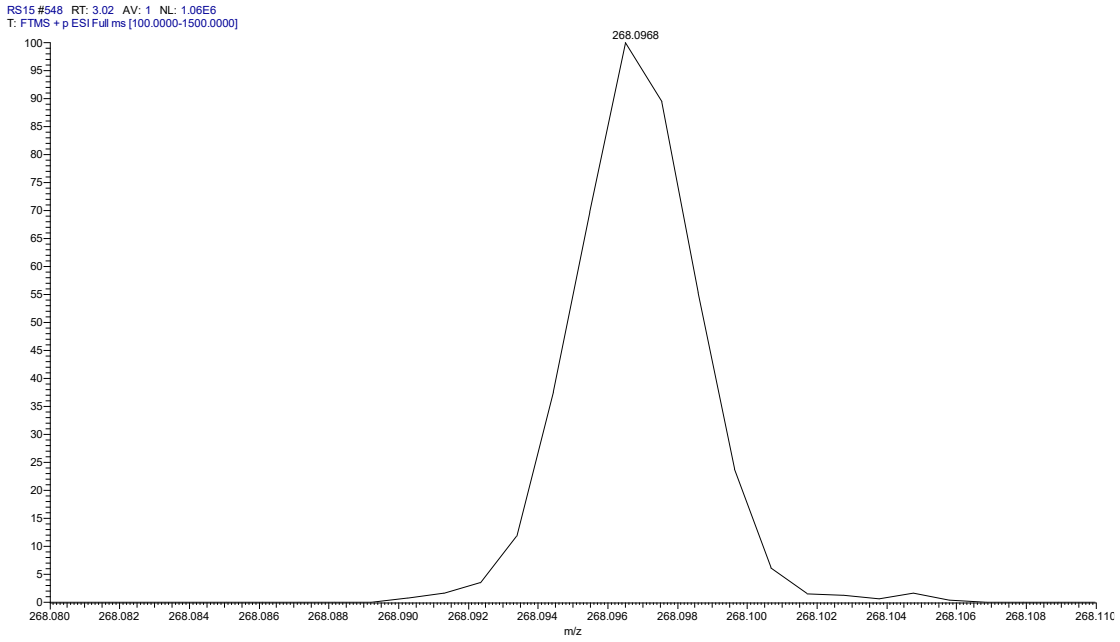
4. M.-Y. Xu, C. Wang, W.-T. Jiang, B. Xiao, *Adv. Synth. Catal.*, **2020**, *362*, 1706.

5. N. Guimond, S. I. Gorelsky, and K. Fagnou, *J. Am. Chem. Soc.,* **2011**, *133*, 16, 6449-6457.

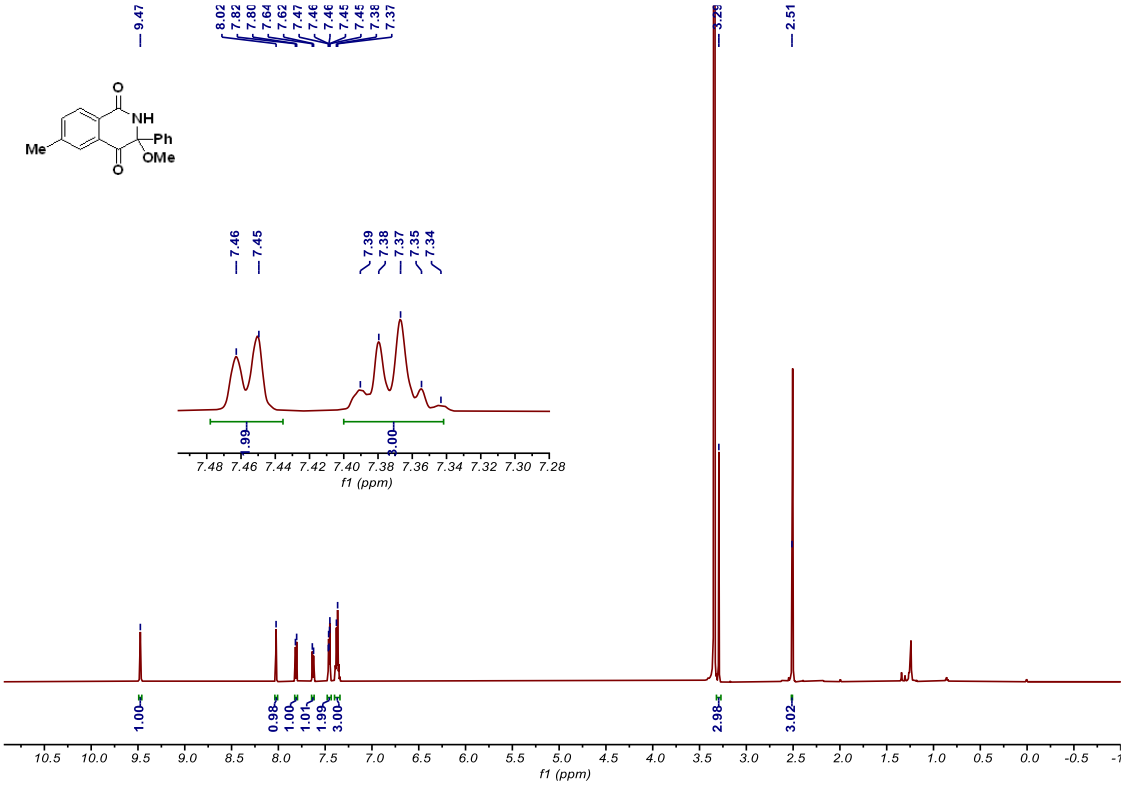
## 12. $^{1}$H NMR 、$^{19}$F NMR and $^{13}$C NMR spectra of Products

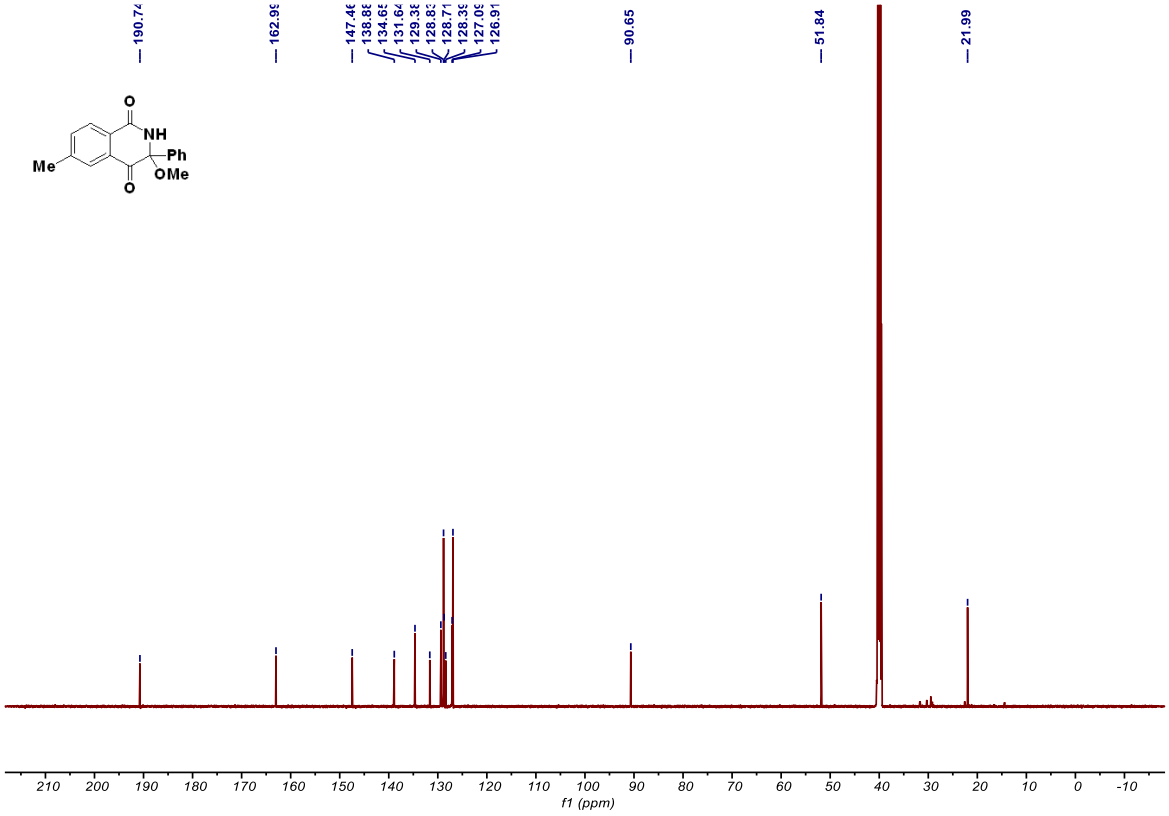
## 3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (2)

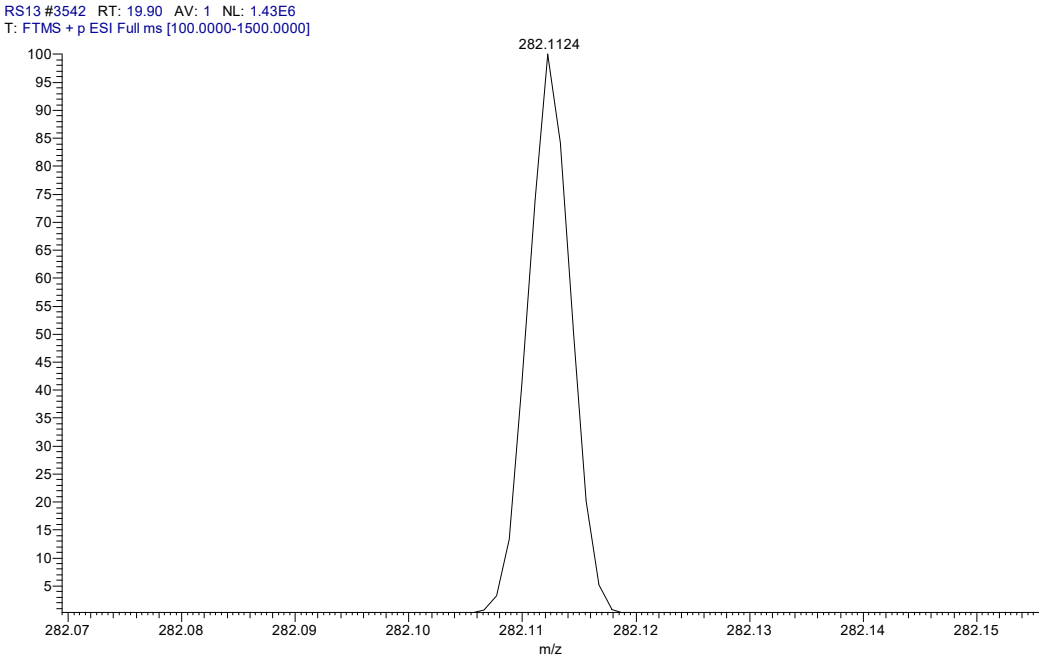




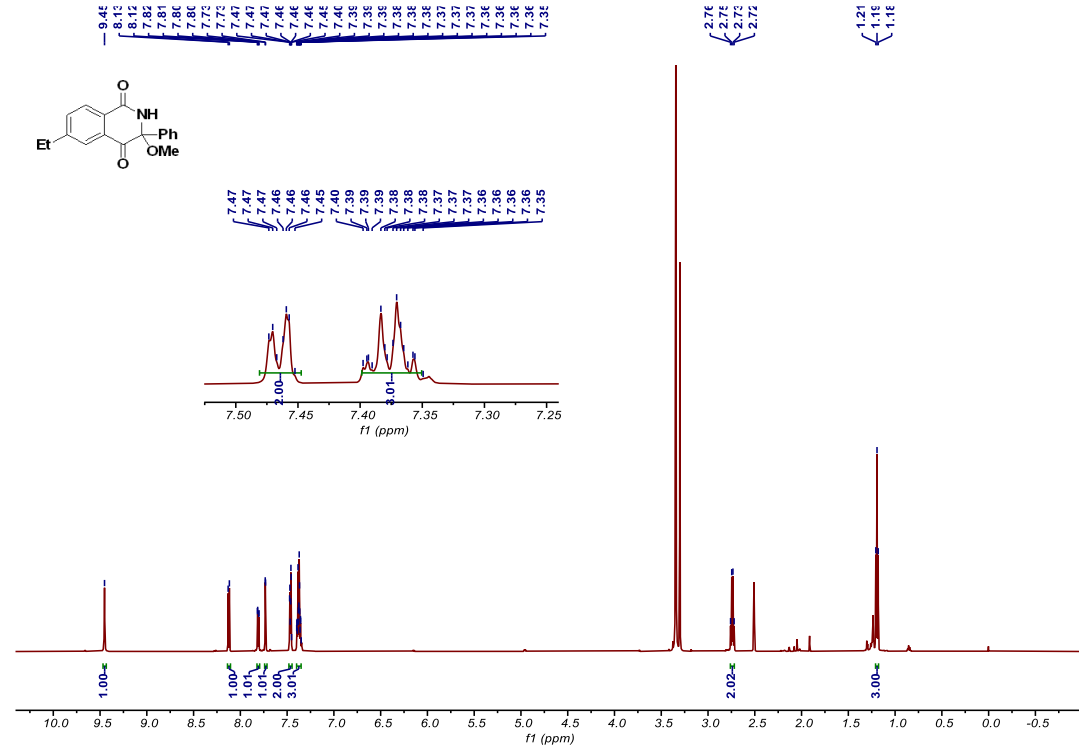

## 3-methoxy-6-methyl-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (3)

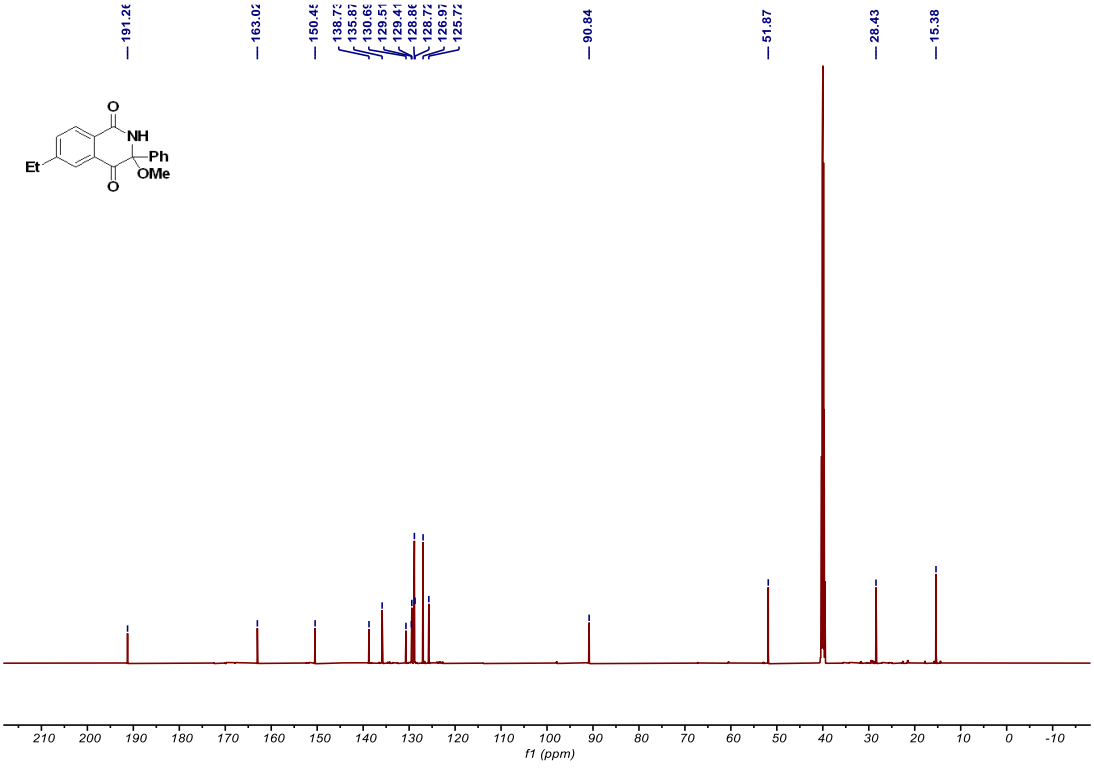


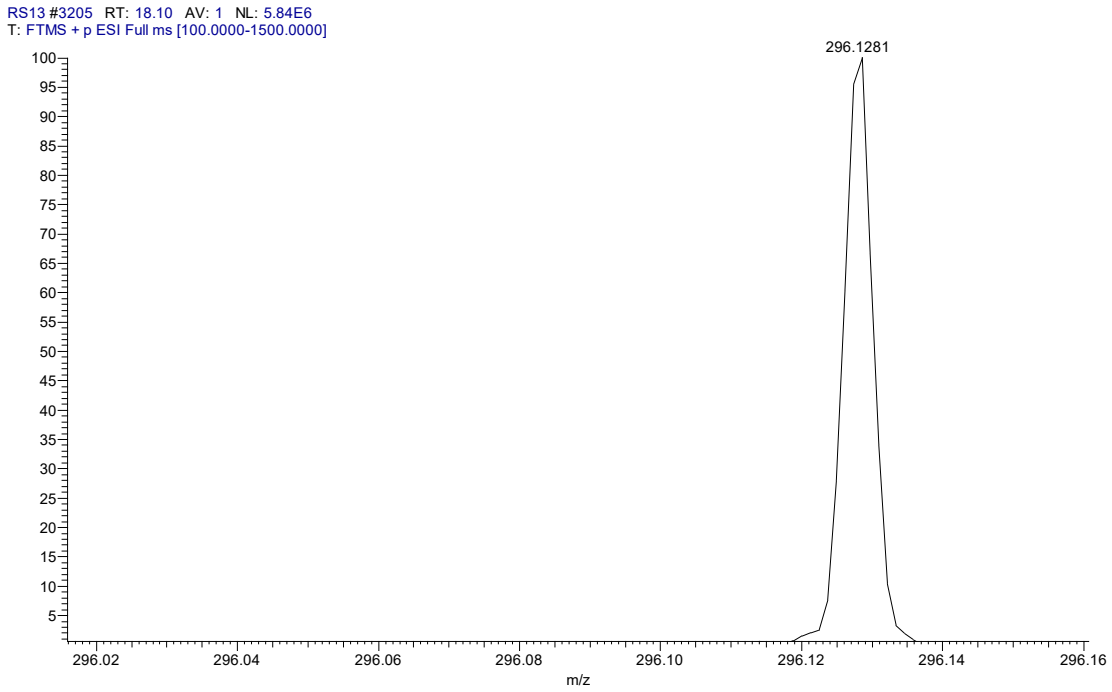

190.74
162.95
147.46
138.88
134.65
131.64
129.38
128.83
128.71
128.39
127.09
126.91
90.65
51.84
21.99
O
NH
Ph
OMe
Me
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


RS13 #3542 RT: 19.90 AV: 1 NL: 1.43E6
T: FTMS + p ESI Full ms [100.0000-1500.0000]
282.1124
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
282.07 282.08 282.09 282.10 282.11 282.12 282.13 282.14 282.15
m/z

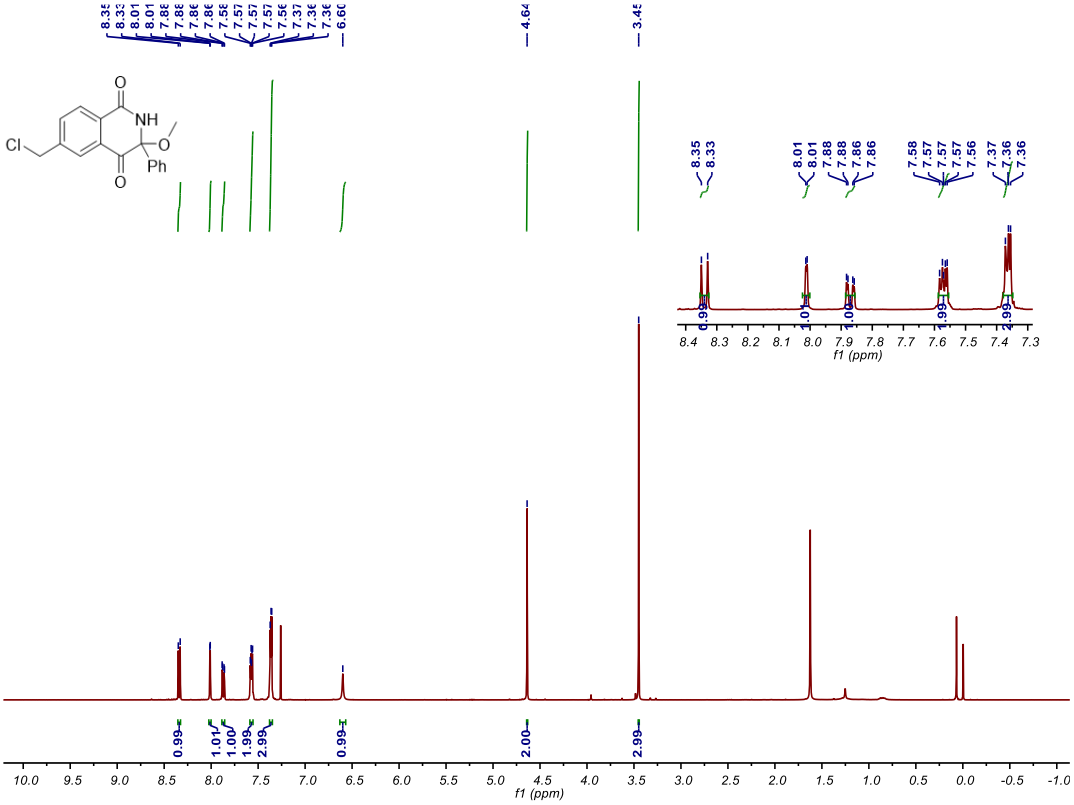
## 6-ethyl-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (4)

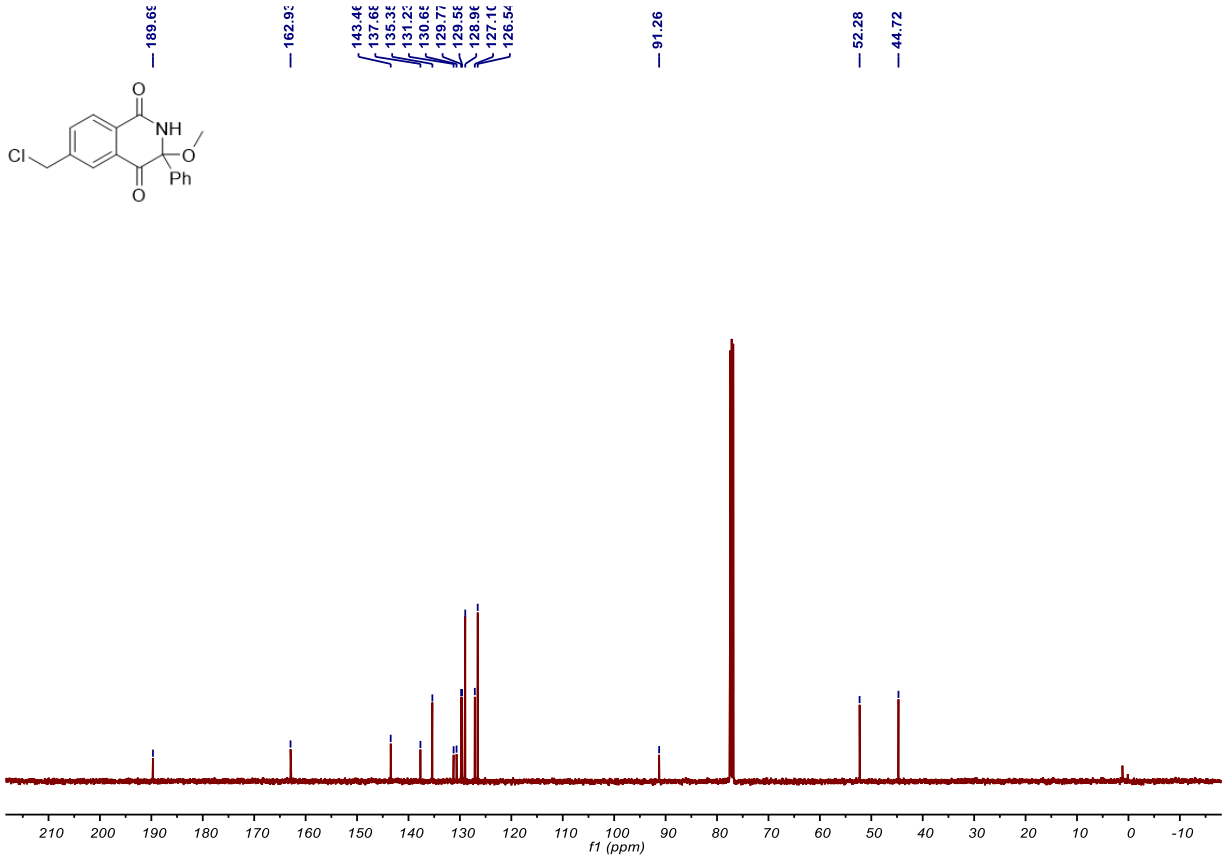


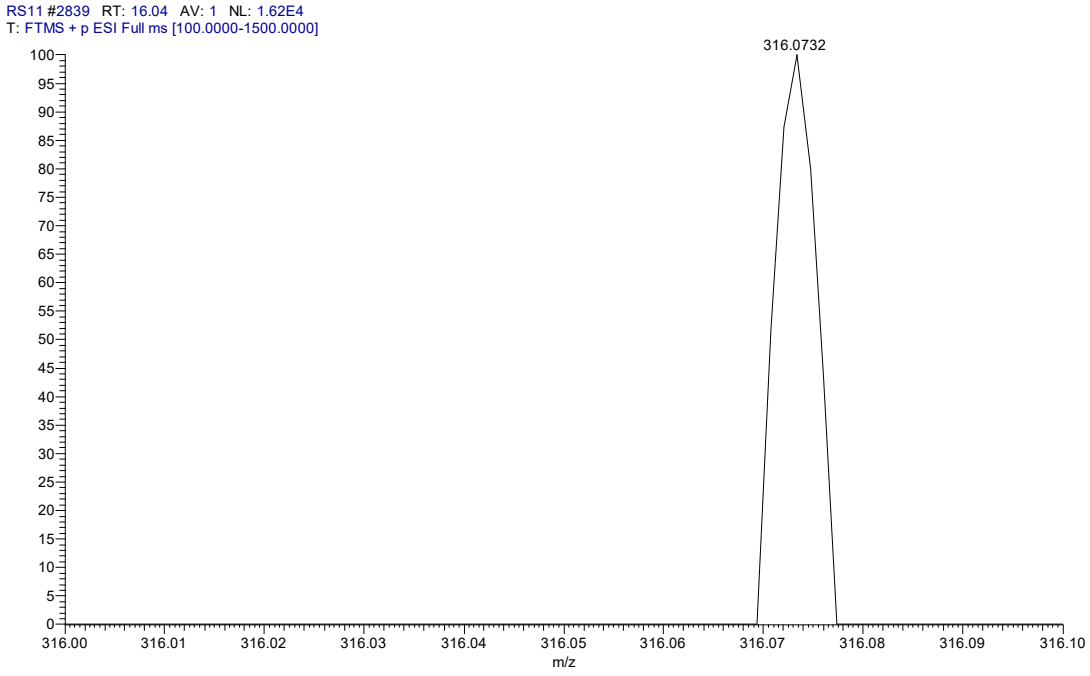





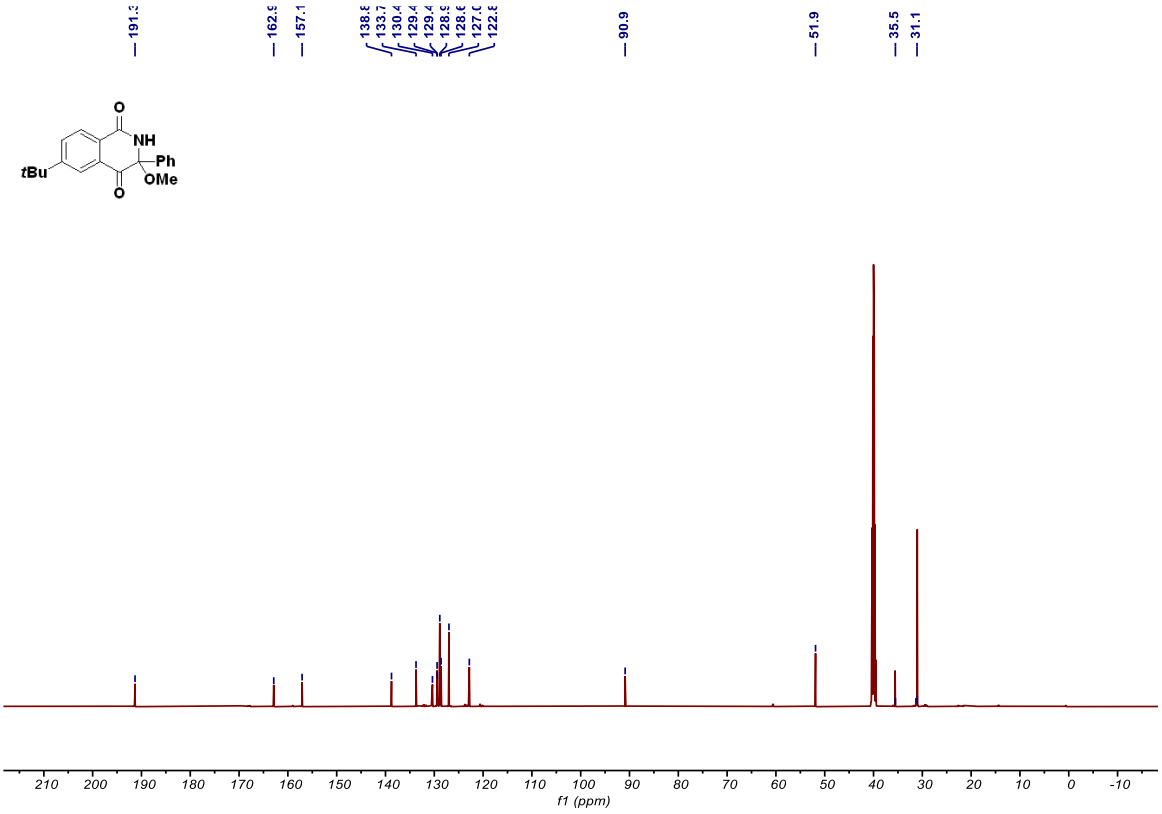

## 6-(chloromethyl)-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (5)

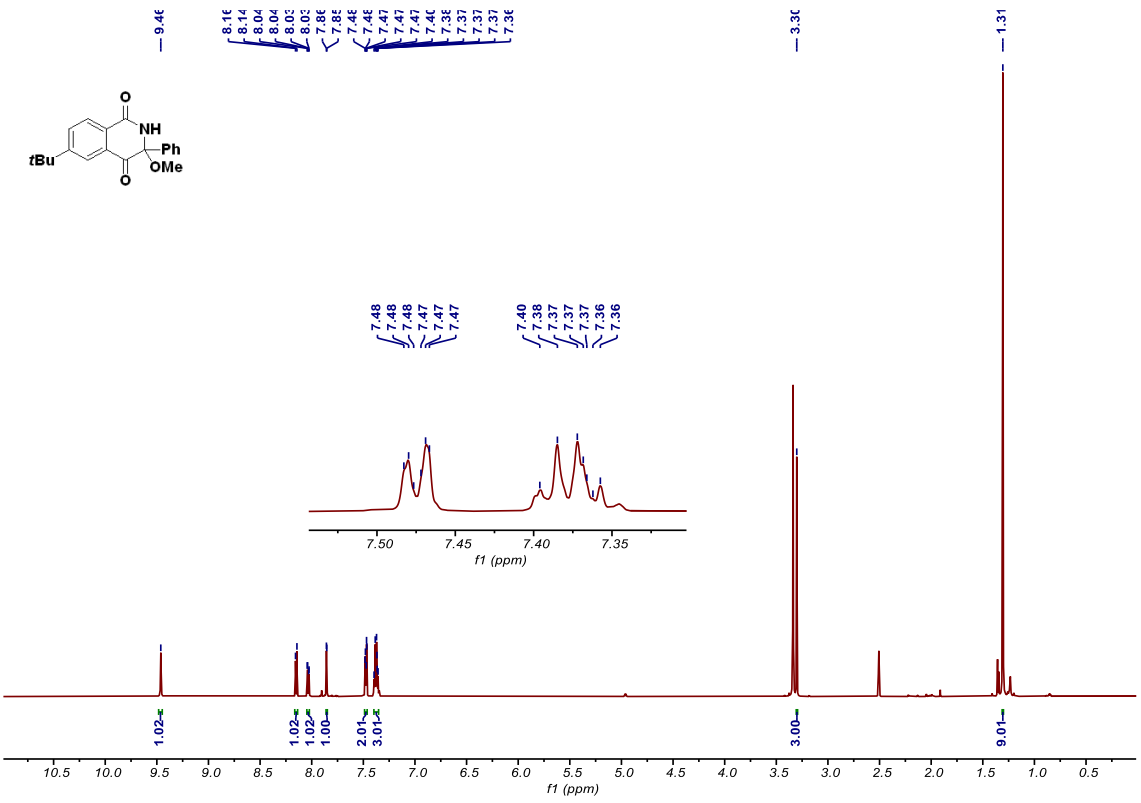


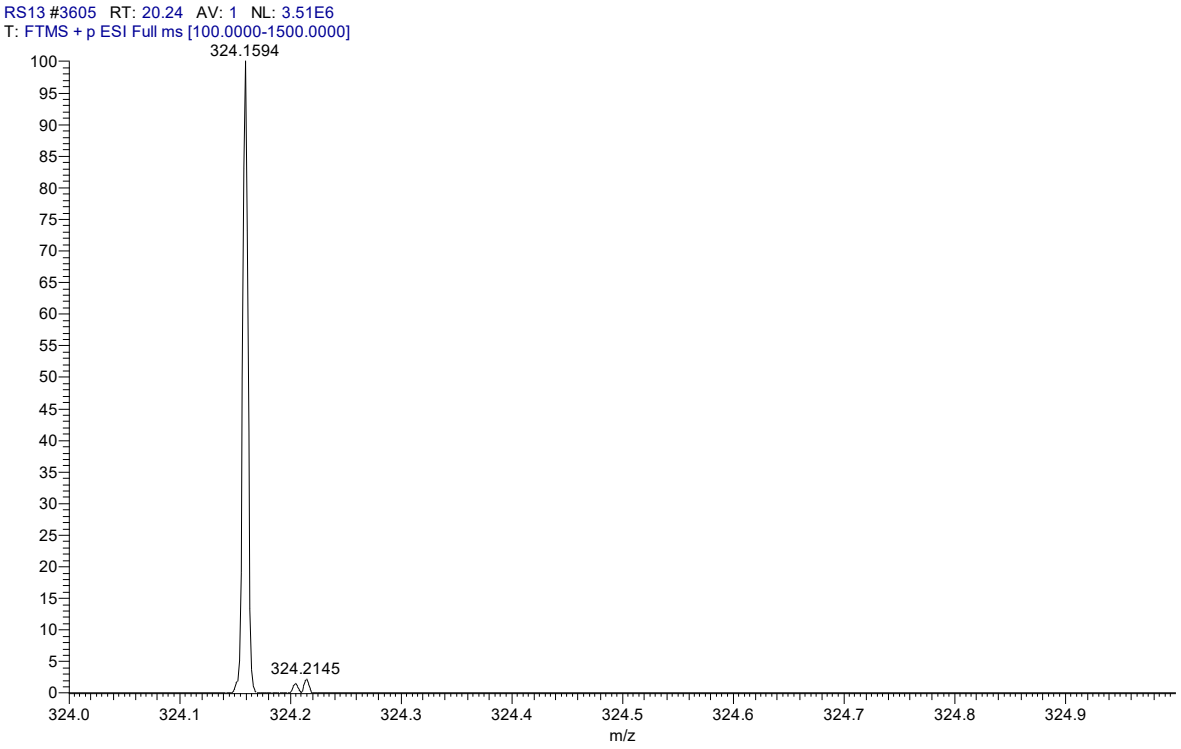

189.68
162.93
143.46
137.68
135.38
131.23
130.68
129.77
129.58
128.96
127.10
126.54
91.26
52.28
44.72
O
NH
O
Cl
Ph
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


RS11 #2839 RT: 16.04 AV: 1 NL: 1.62E4
T: FTMS + p ESI Full ms [100.0000-1500.0000]
316.0732
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
316.00 316.01 316.02 316.03 316.04 316.05 316.06 316.07 316.08 316.09 316.10
m/z

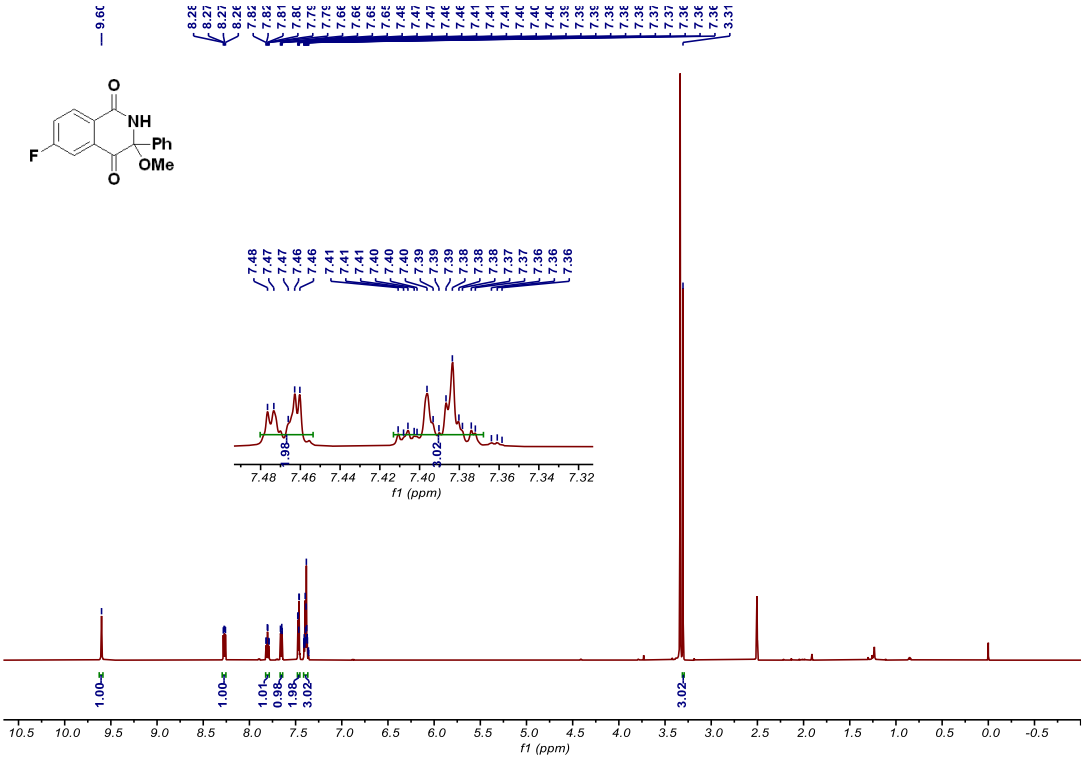
## 6-(tert-butyl)-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (6)

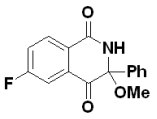


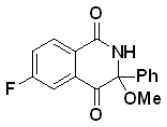



## 6-fluoro-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (7)

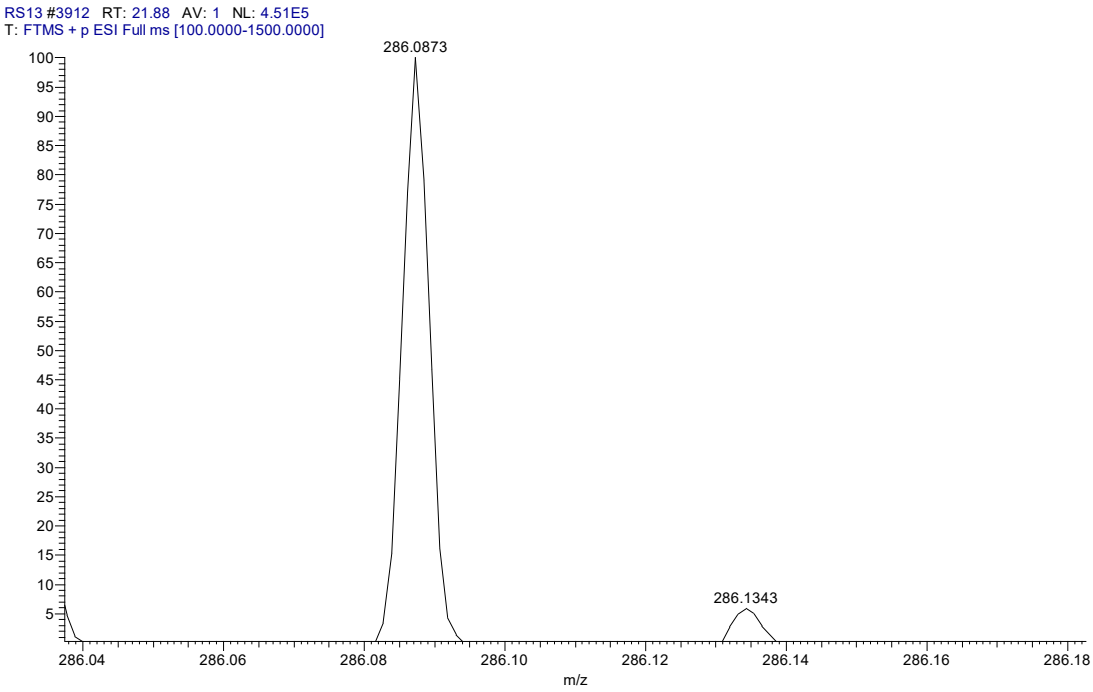



O
NH
Ph
F
OMe
O

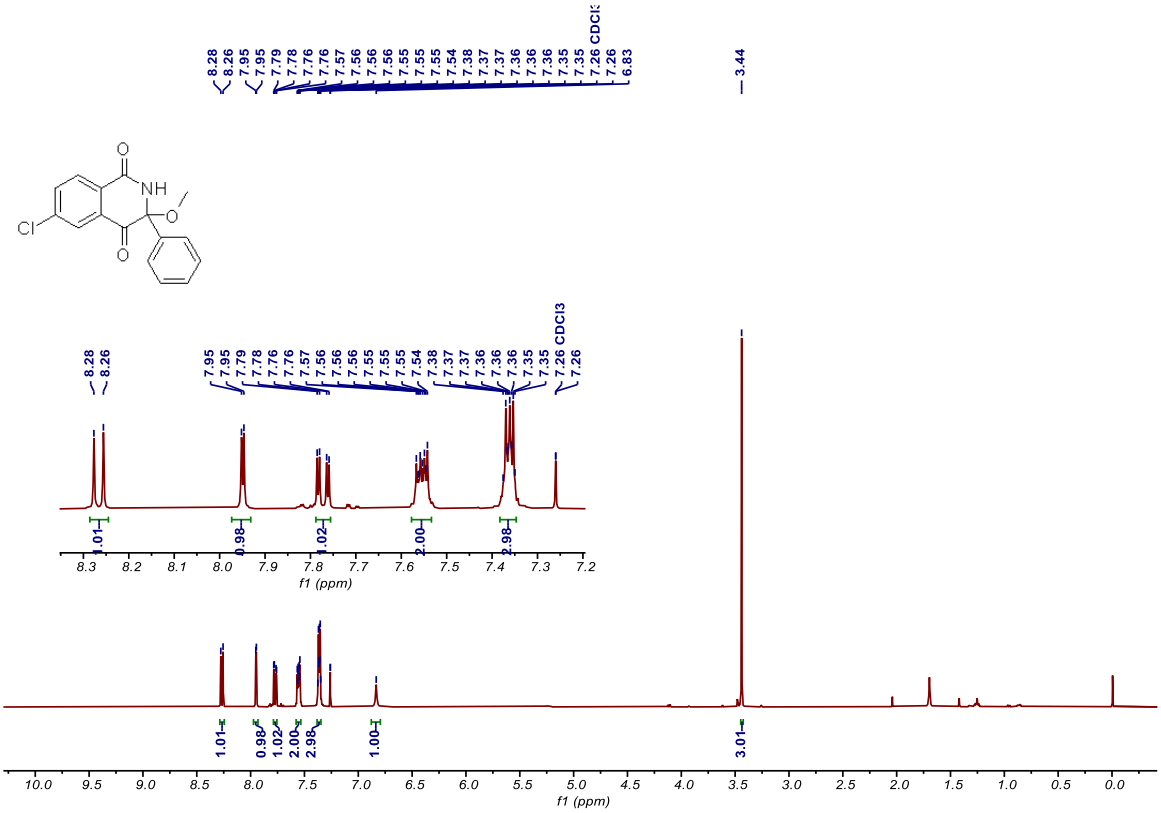

-104.43
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

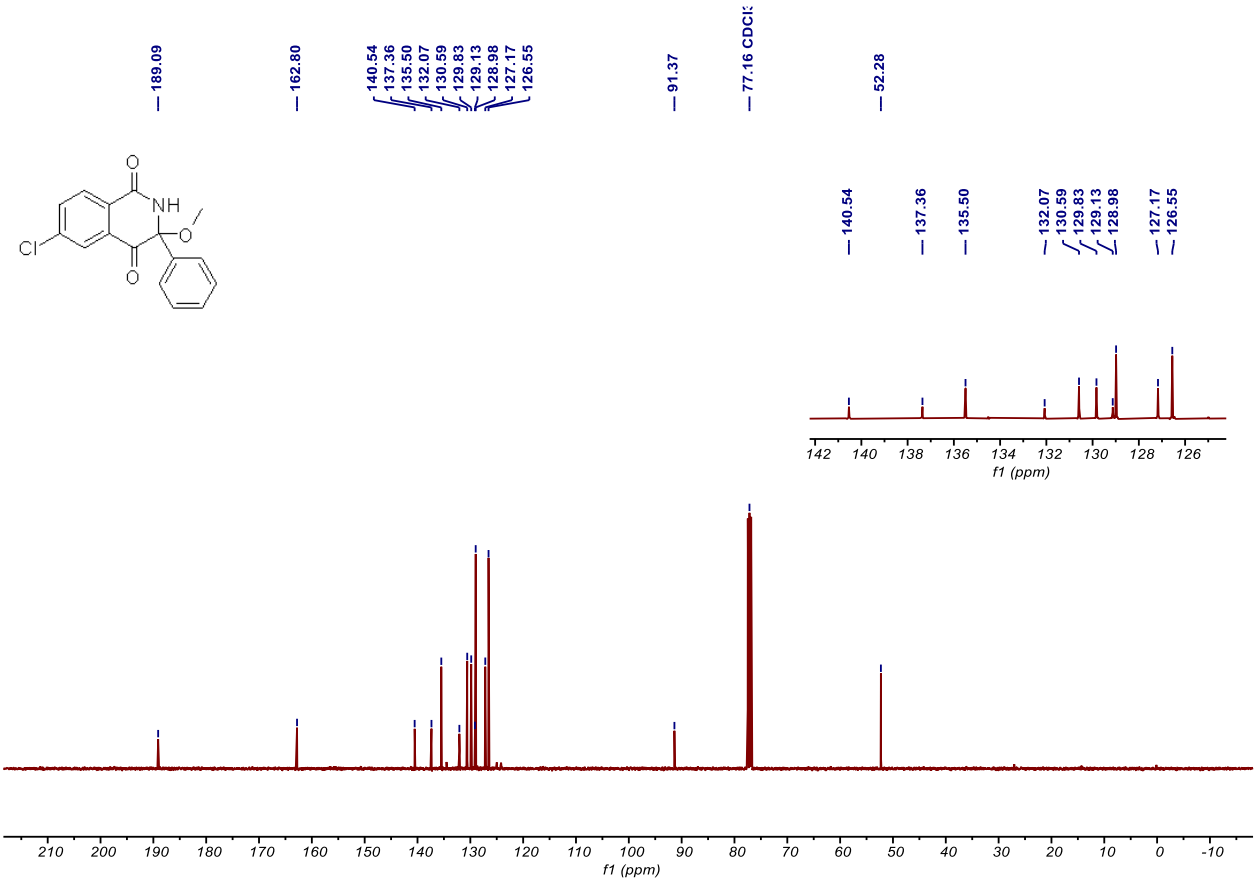

O
NH
Ph
F
OMe
O

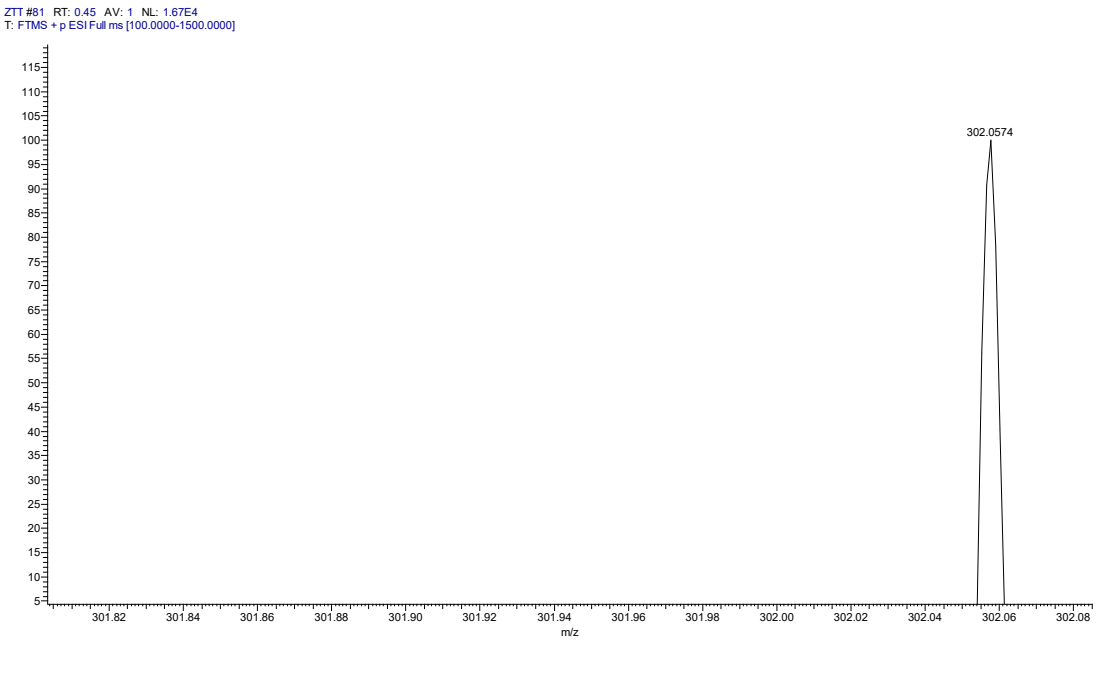

190.23
166.04
164.36
162.18
138.15
133.07
133.02
132.11
132.05
129.57
128.92
128.45
127.07
123.55
123.44
113.21
113.06
90.97
51.96
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)



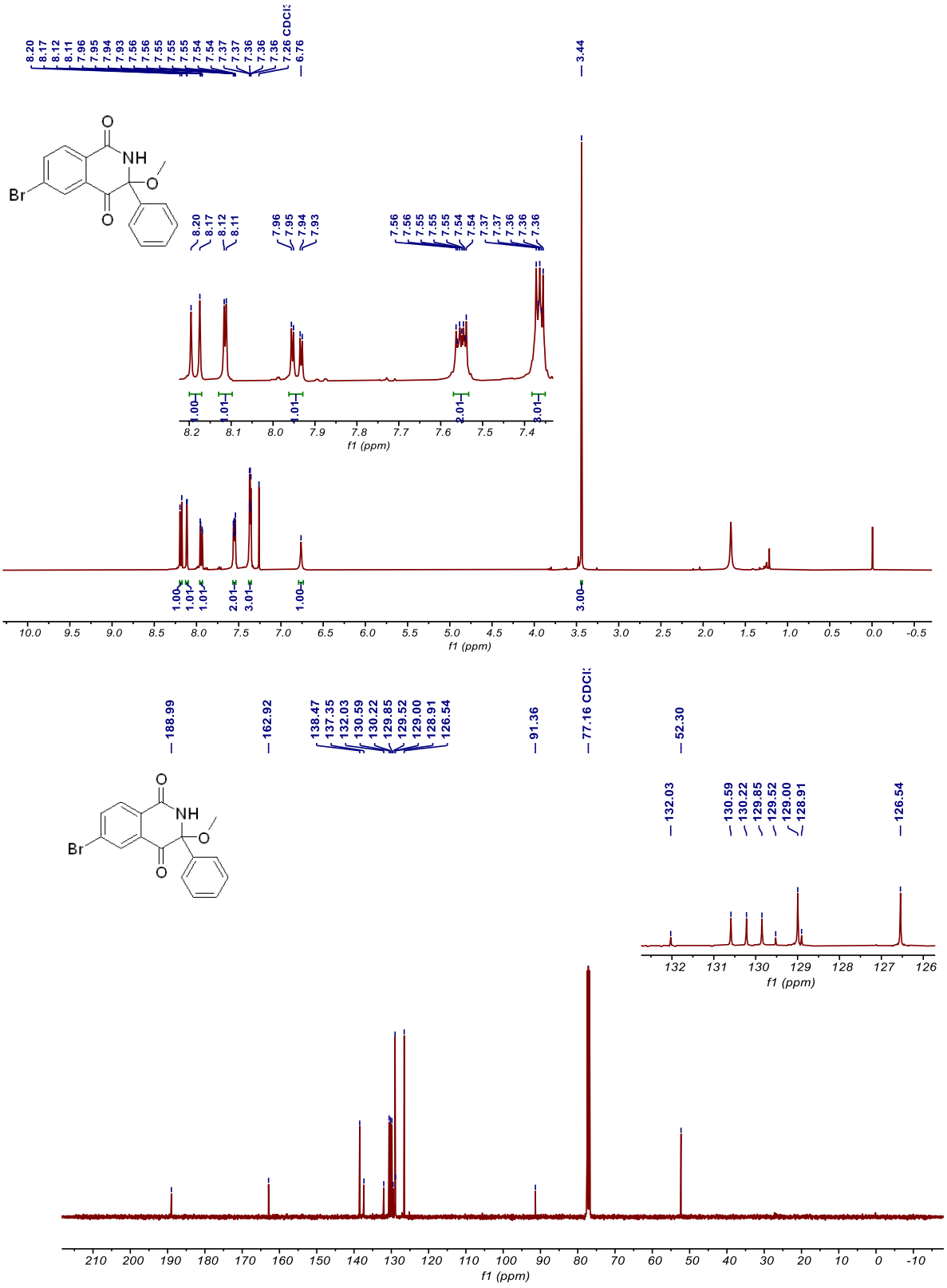

## 6-chloro-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (8)

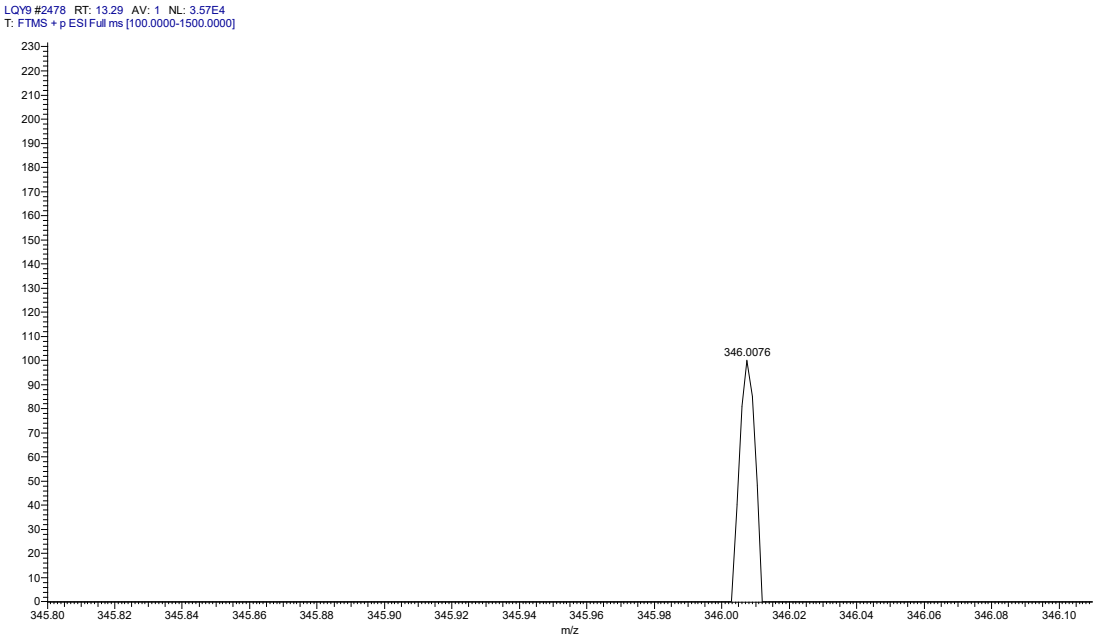



189.09
162.80
140.54
137.36
135.50
132.07
130.59
129.83
129.13
128.98
127.17
126.55
91.37
77.16 CDCl3
52.28
NH
O
Cl
f1 (ppm)

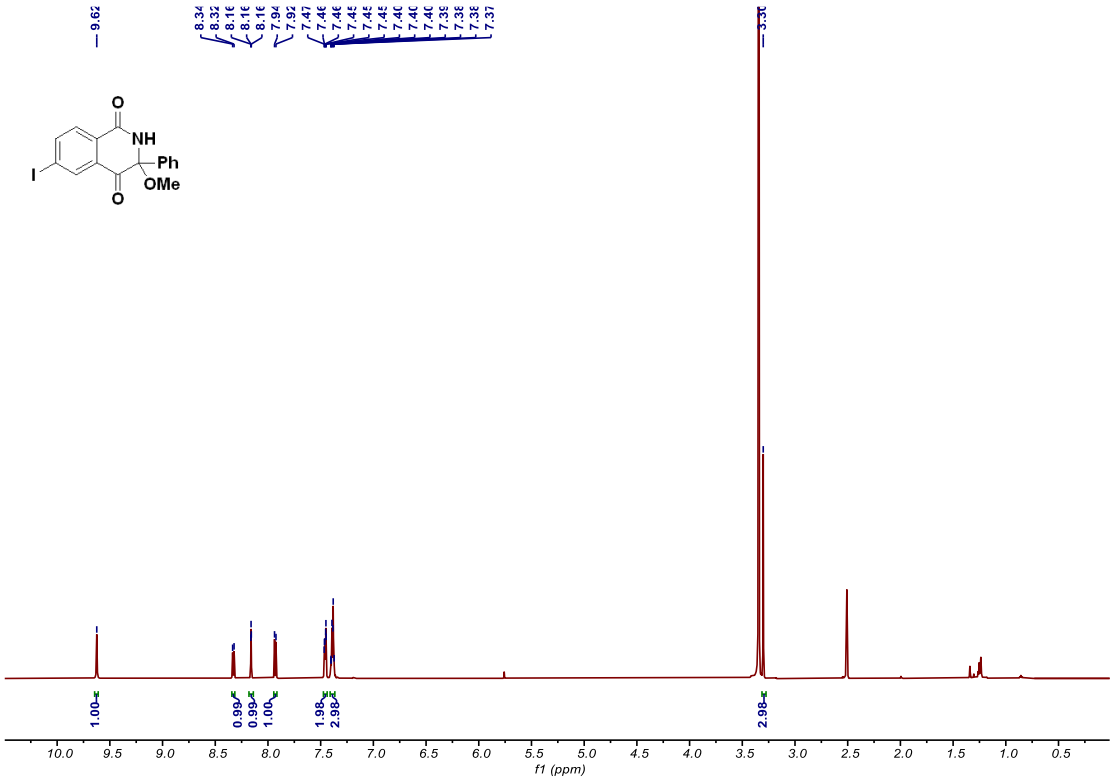

ZTT #81 RT: 0.45 AV: 1 NL: 1.67E4
T: FTMS + p ESI Full ms [100.0000-1500.0000]
302.0574
m/z

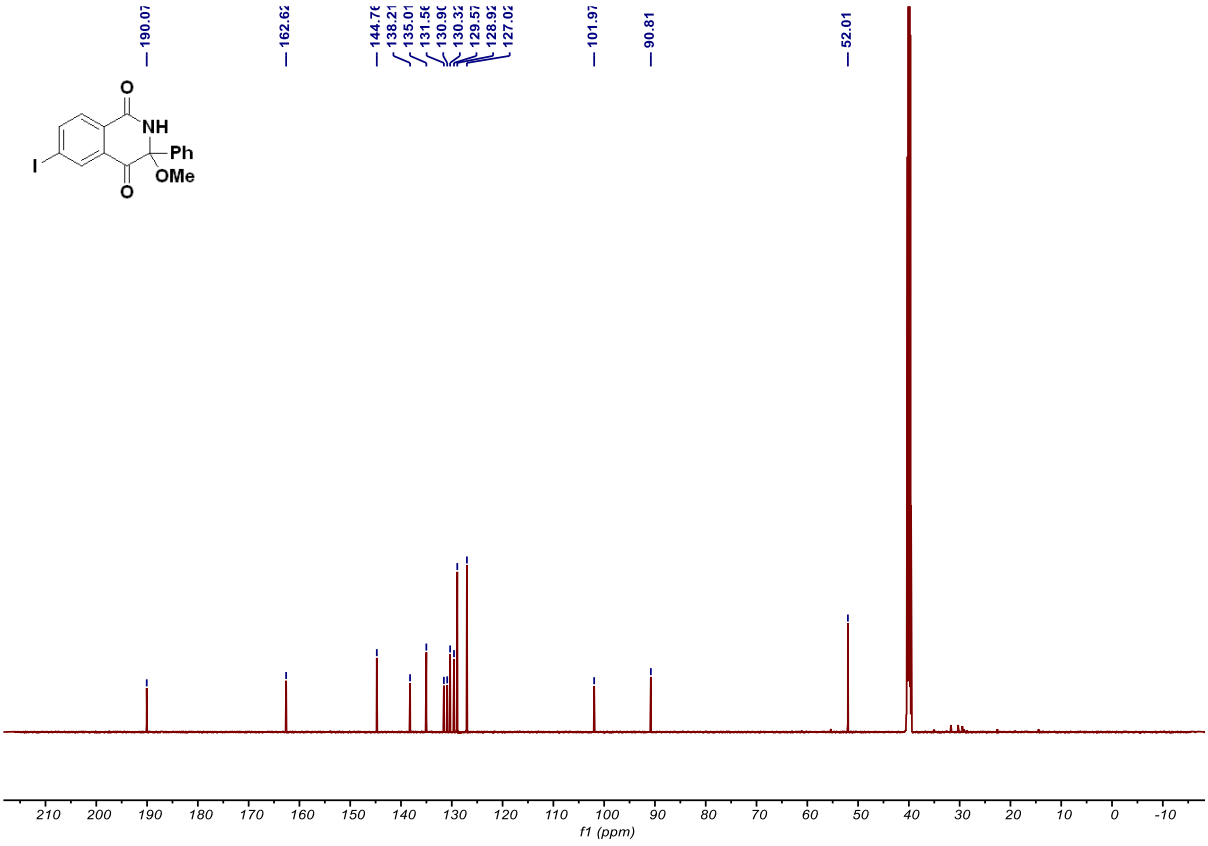
## 6-bromo-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (9)

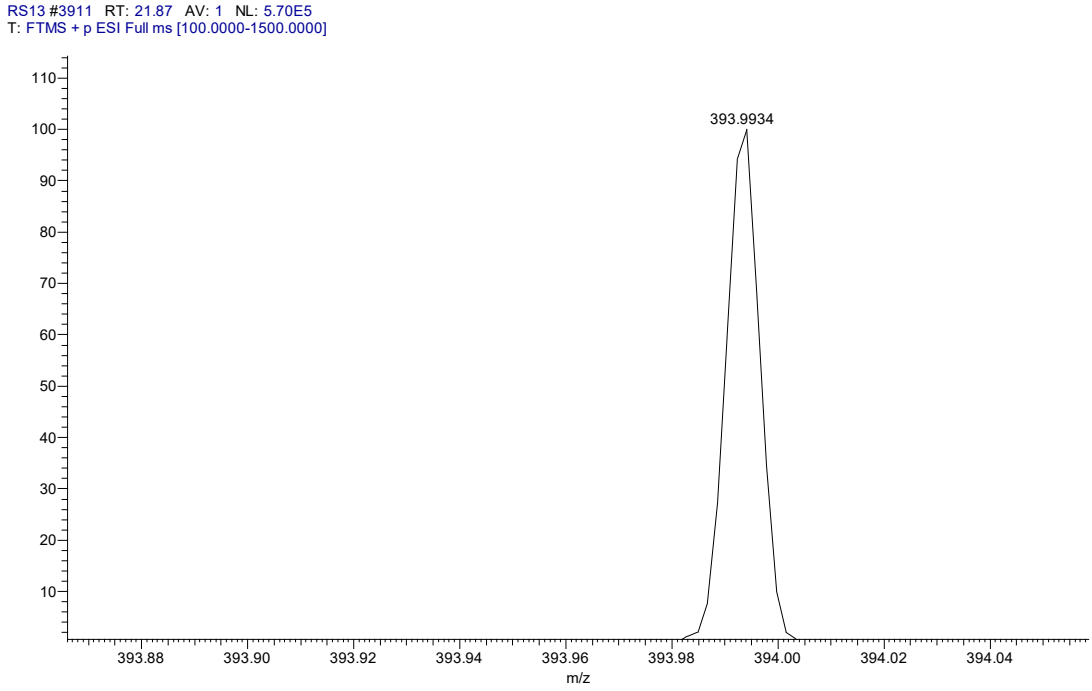




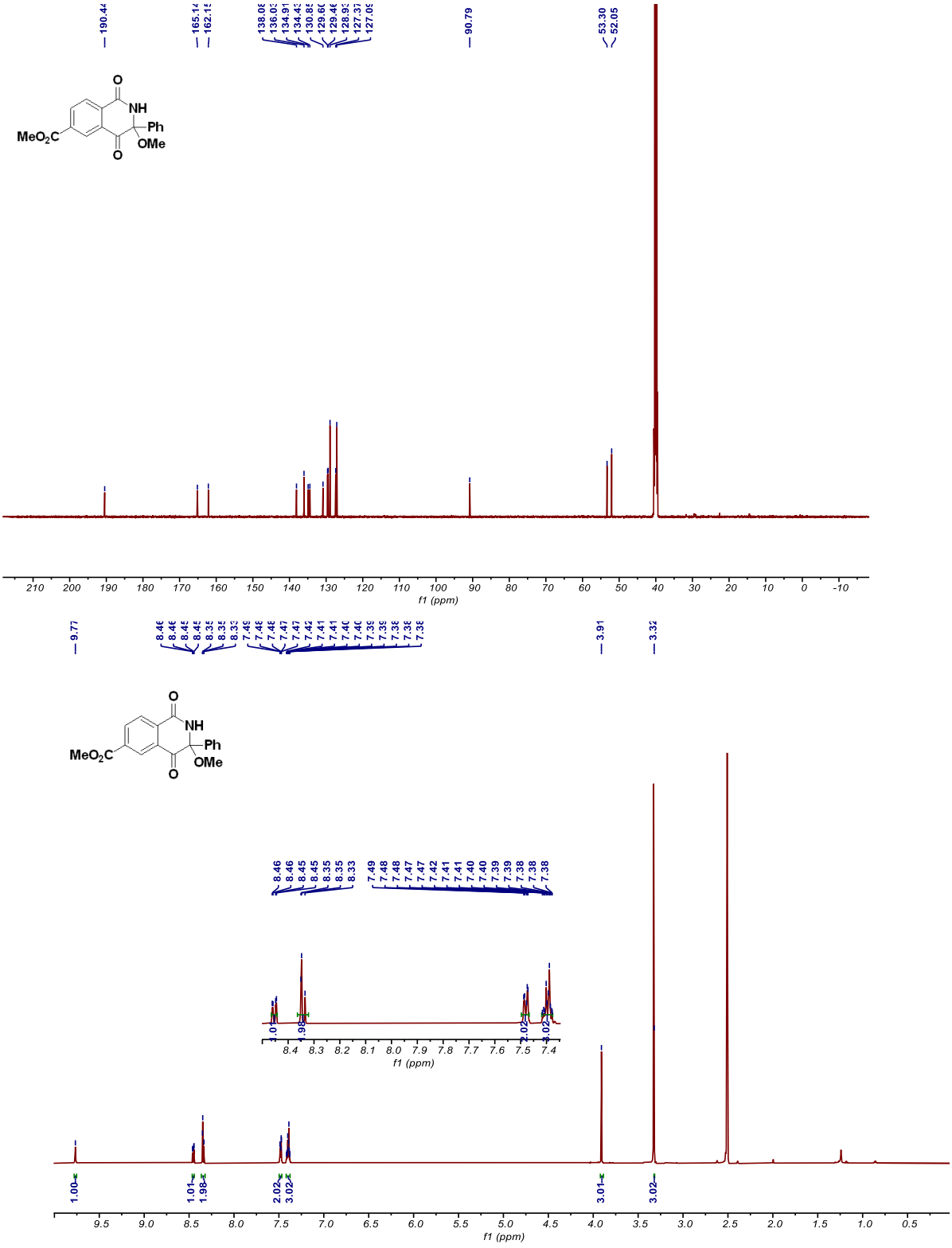

## 6-iodo-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (10)

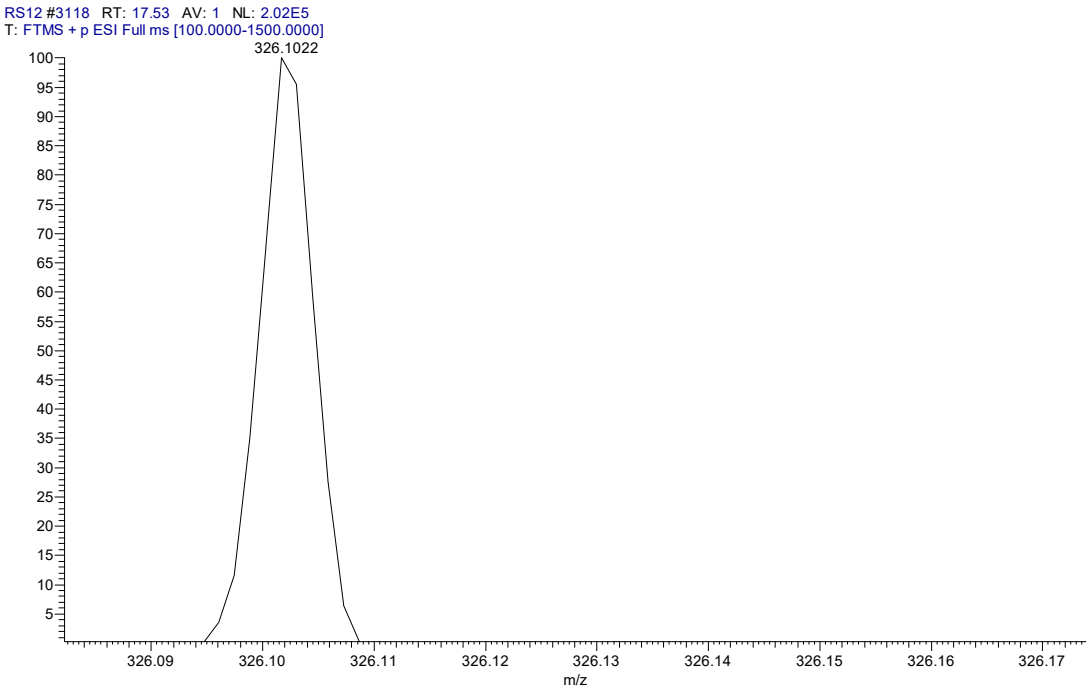



190.07
162.62
144.76
138.21
135.01
131.58
130.90
130.32
129.57
128.95
127.02
101.97
90.81
52.01
O
NH
Ph
OMe
I
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

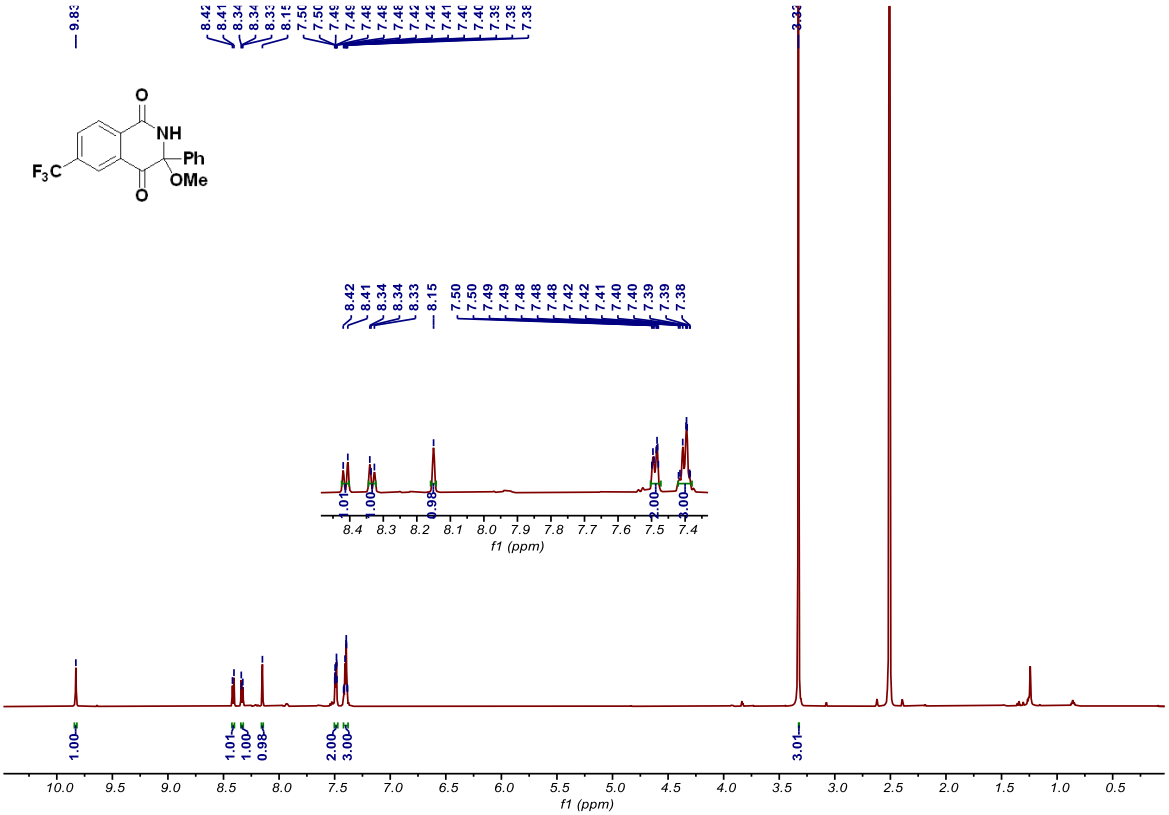

RS13 #3911 RT: 21.87 AV: 1 NL: 5.70E5
T: FTMS + p ESI Full ms [100.0000-1500.0000]
393.9934
110
100
90
80
70
60
50
40
30
20
10
393.88 393.90 393.92 393.94 393.96 393.98 394.00 394.02 394.04
m/z

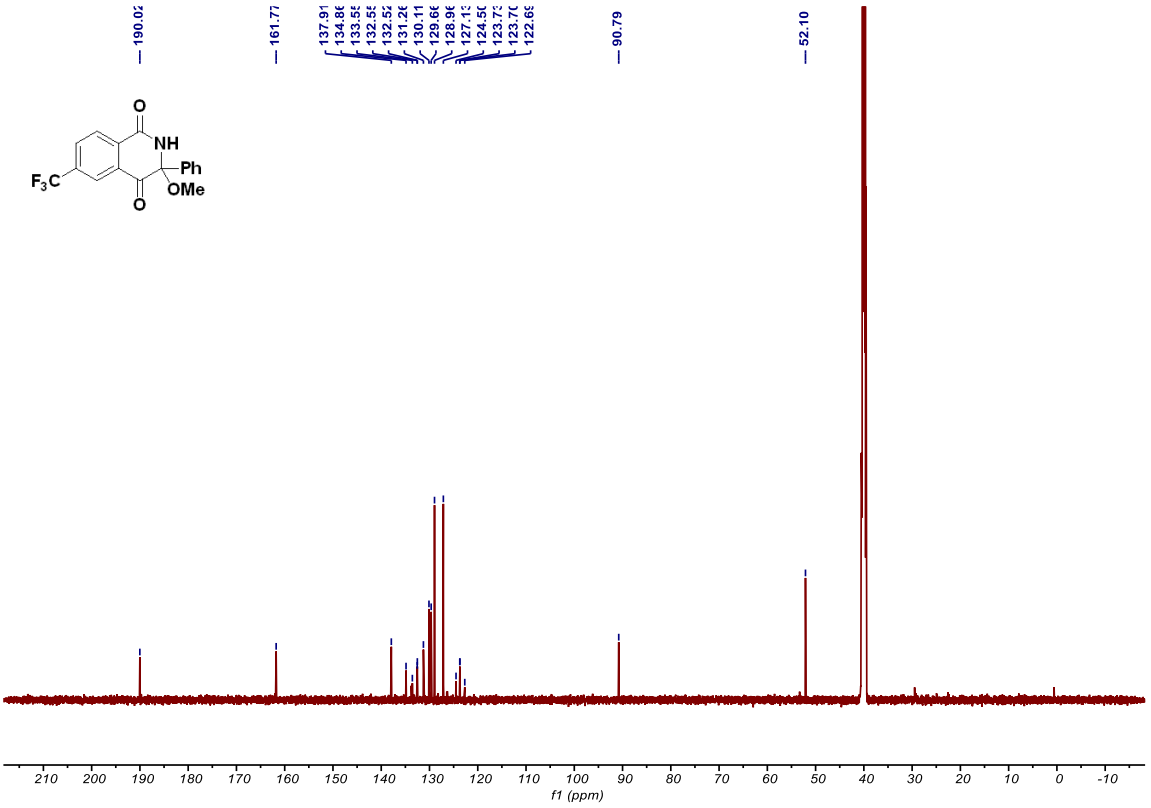
**methyl 3-methoxy-1,4-dioxo-3-phenyl-1,2,3,4-tetrahydroisoquinoline-6-carboxylate (11)**

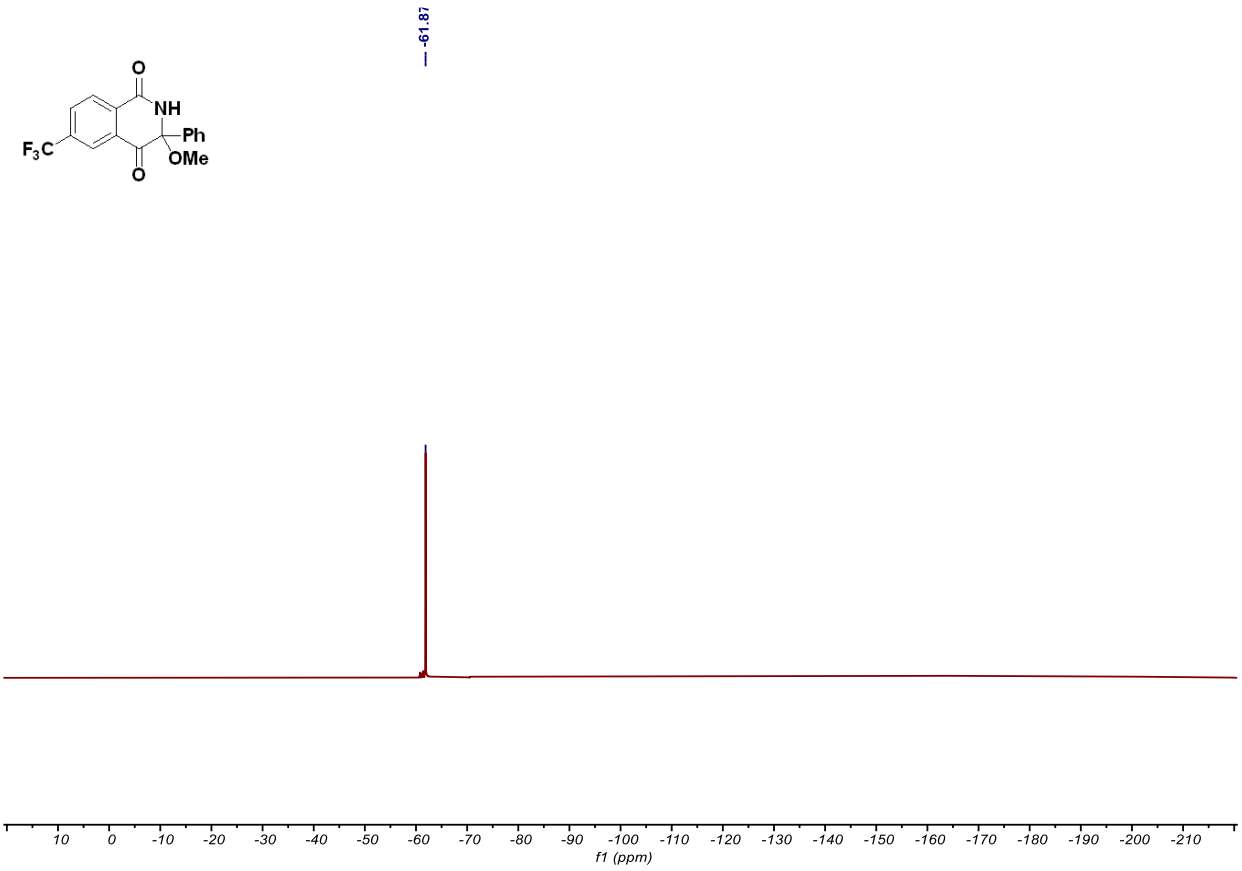


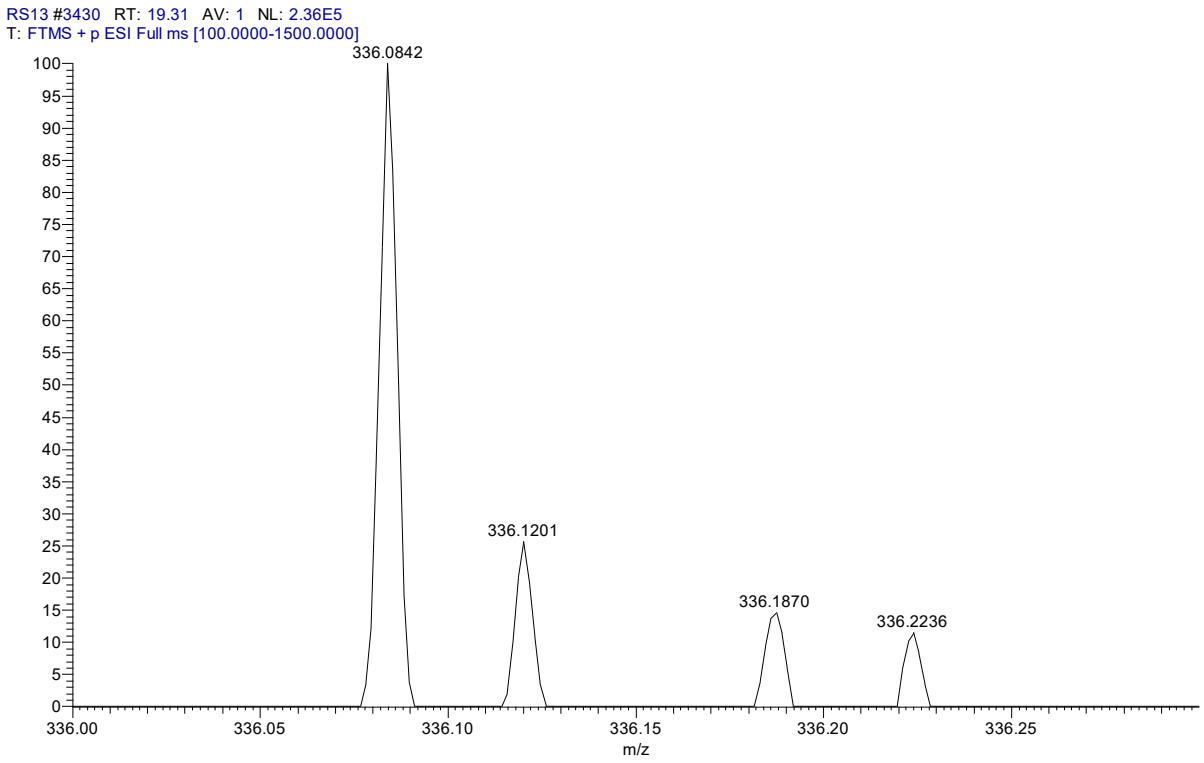



## 3-methoxy-3-phenyl-6-(trifluoromethyl)-2,3-dihydroisoquinoline-1,4-dione (12)

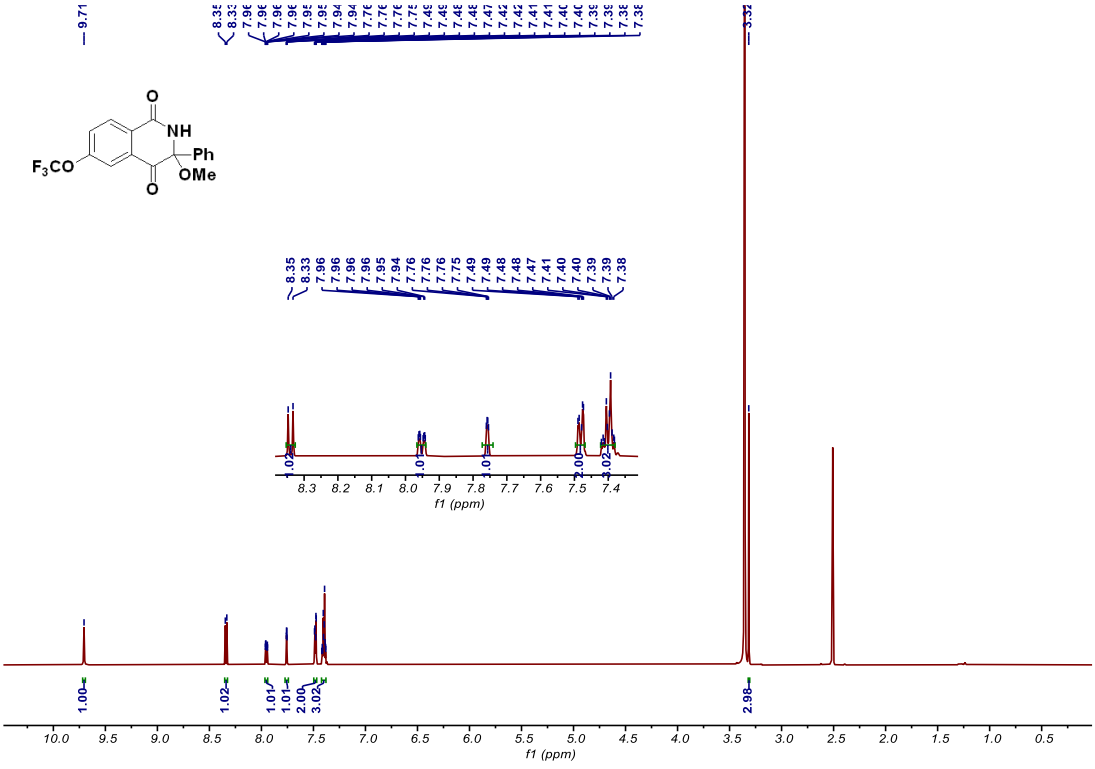


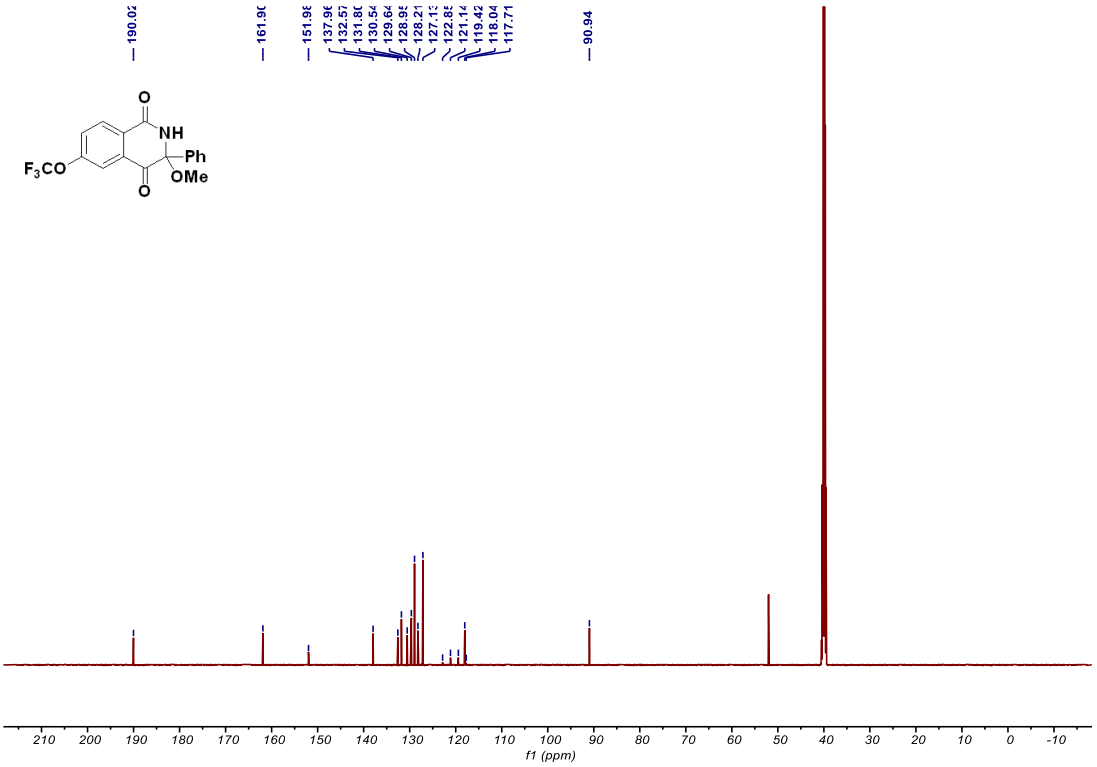

190.05
161.77
137.91
134.86
133.55
132.55
132.52
131.22
130.11
129.66
128.98
127.13
124.50
123.73
123.70
122.65
90.79
52.10
O
NH
Ph
OMe
O
F3C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

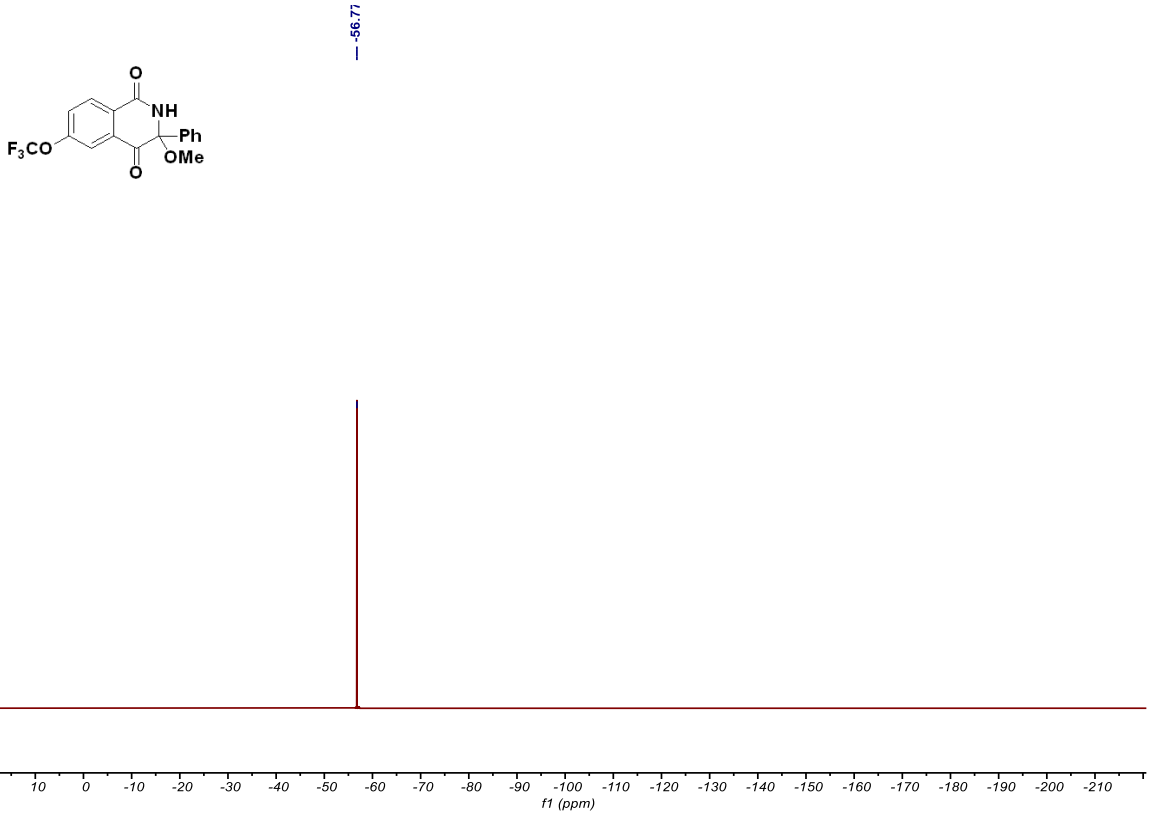

-61.87
O
NH
Ph
OMe
O
F3C
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

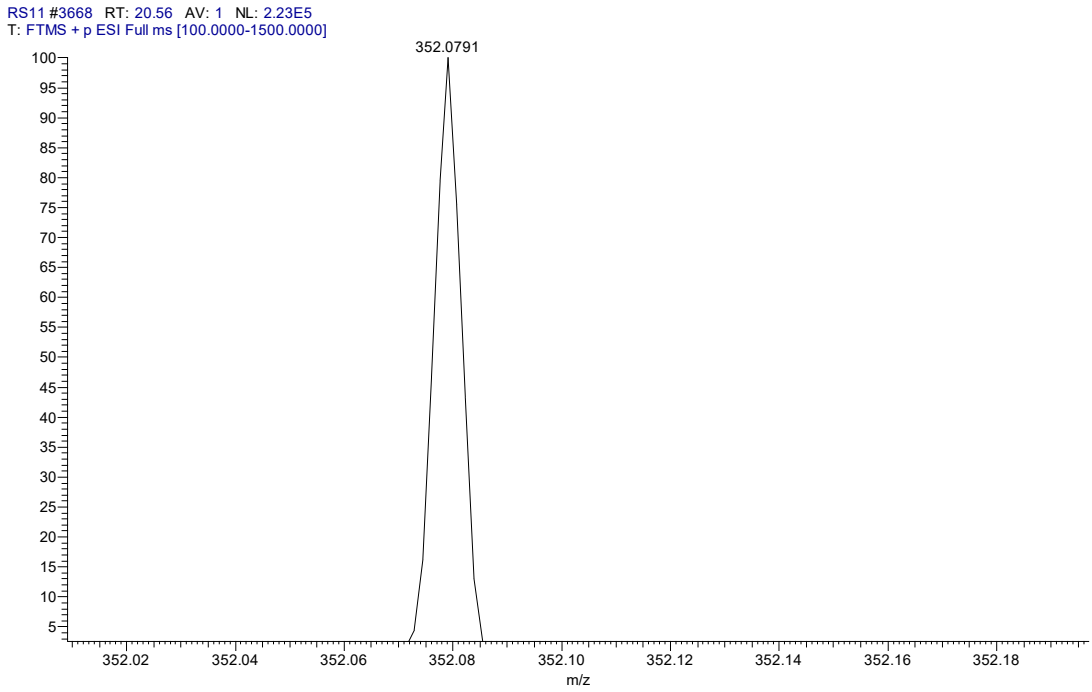



## 3-methoxy-3-phenyl-6-(trifluoromethoxy)-2,3-dihydroisoquinoline-1,4-dione (13)

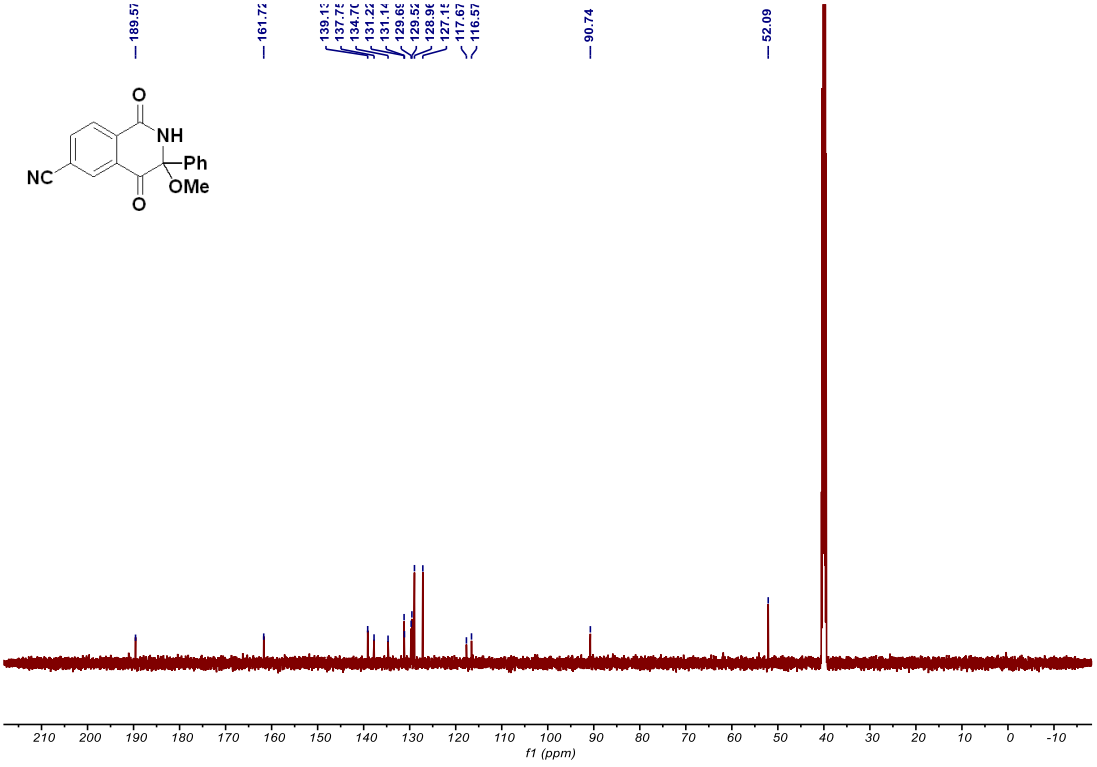


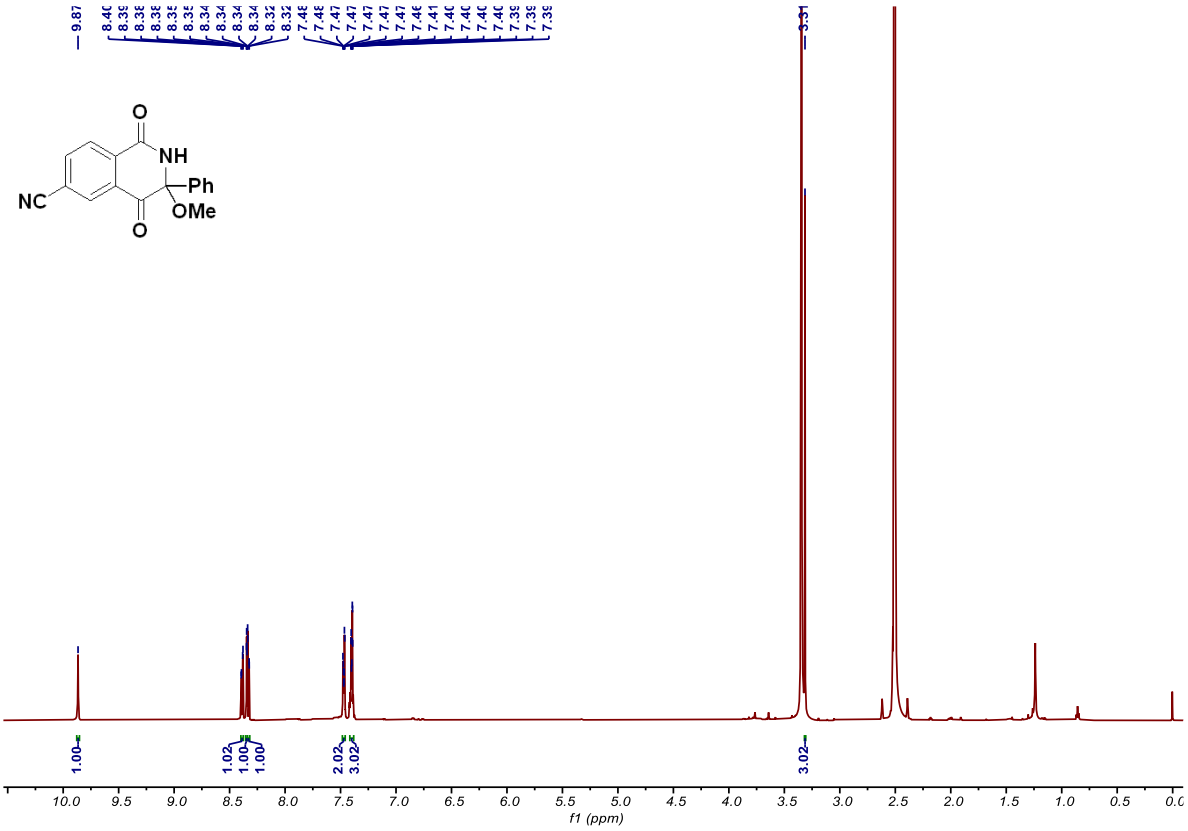

— 190.02
— 161.90
— 151.98
137.96
132.57
131.80
130.56
129.64
128.98
128.22
127.13
122.88
121.14
119.42
118.04
117.71
— 90.94
O
NH
Ph
OMe
O
F3CO
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

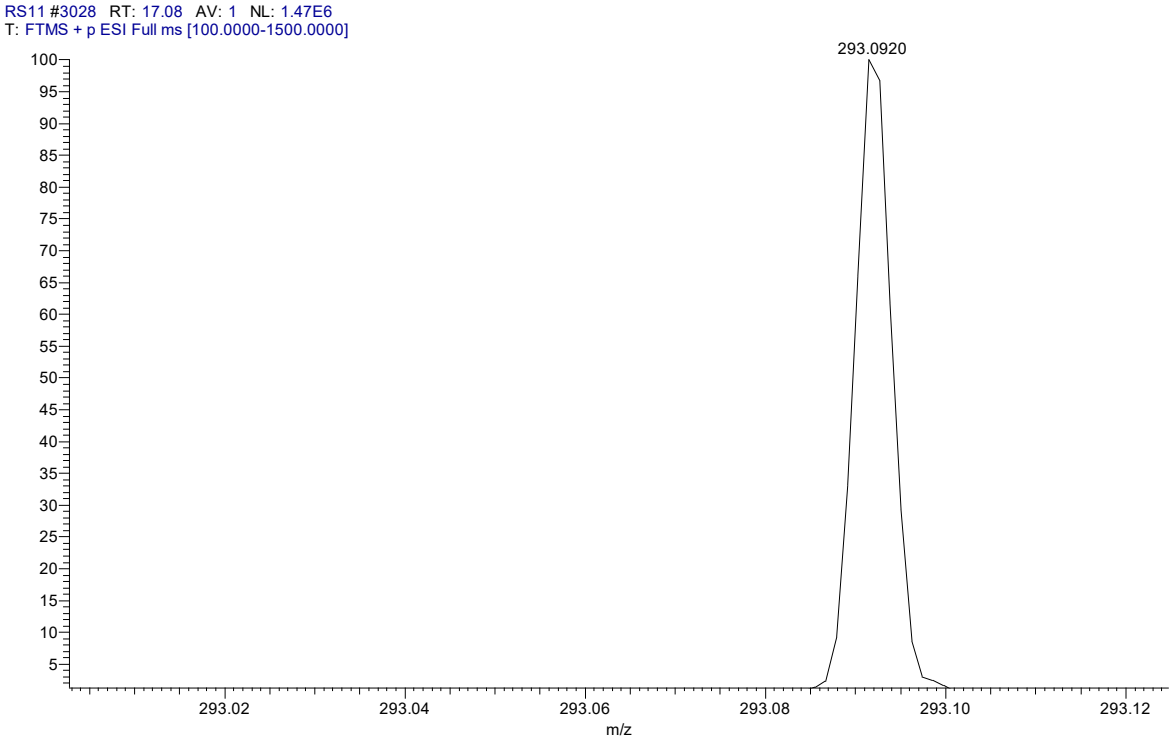

— -56.77
O
NH
Ph
OMe
O
F3CO
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)



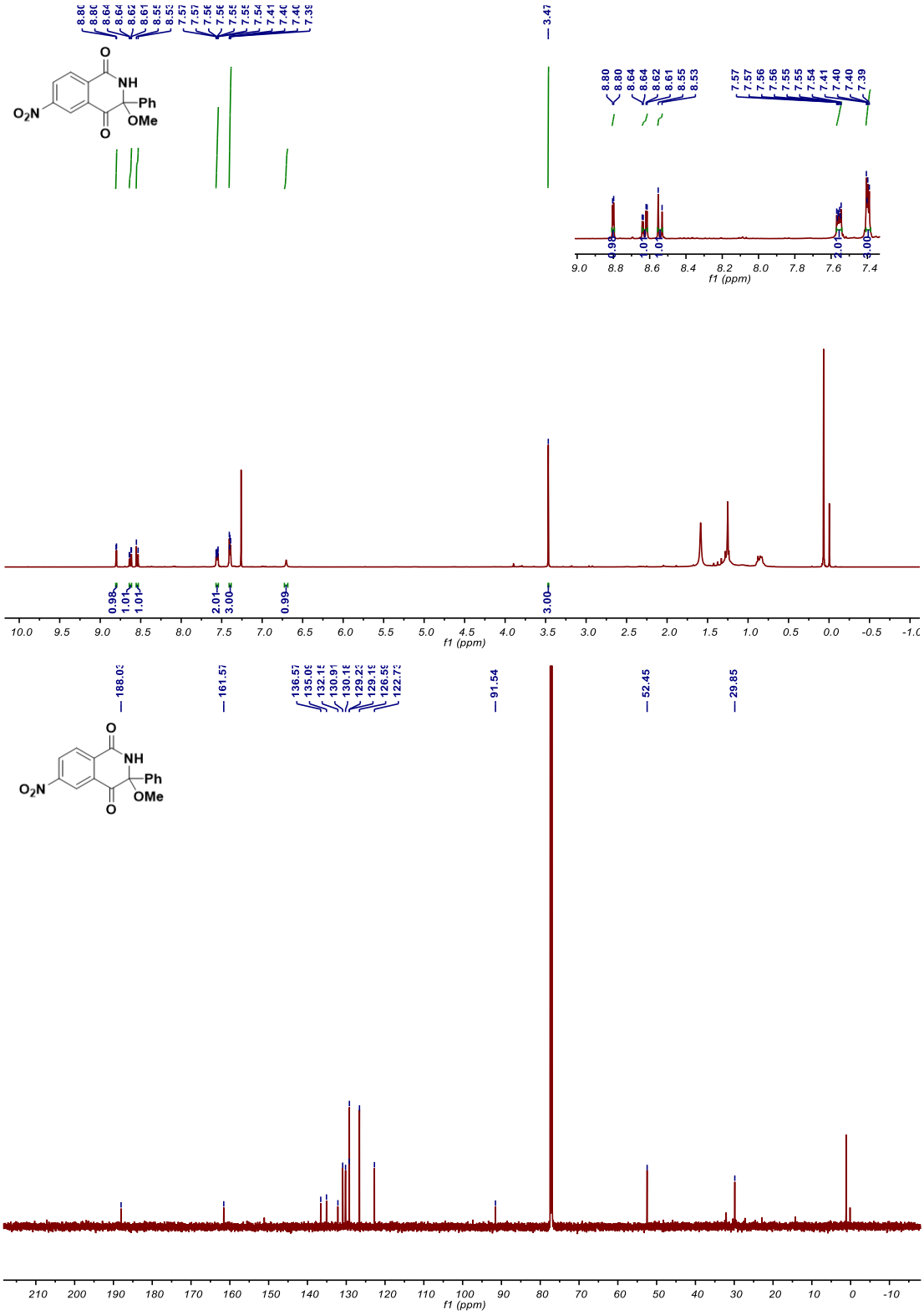

## 3-methoxy-1,4-dioxo-3-phenyl-1,2,3,4-tetrahydroisoquinoline-6-carbonitrile (14)

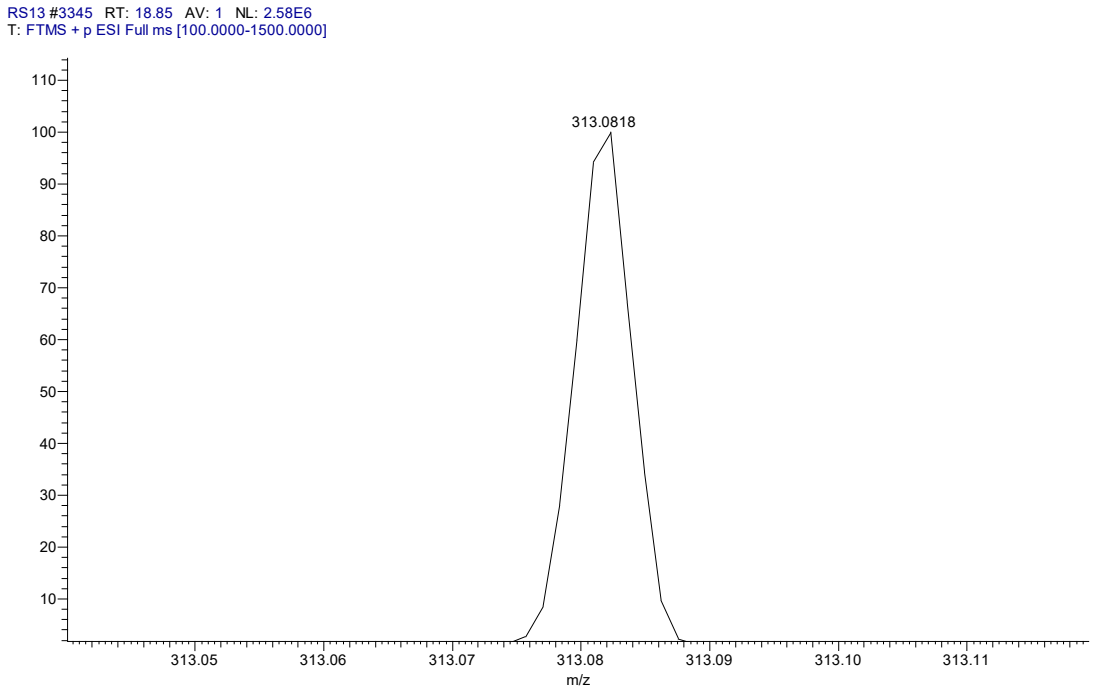



NC
NH
Ph
OMe
O
O
1.00
1.02
1.00
1.00
2.02
3.02
3.02
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)

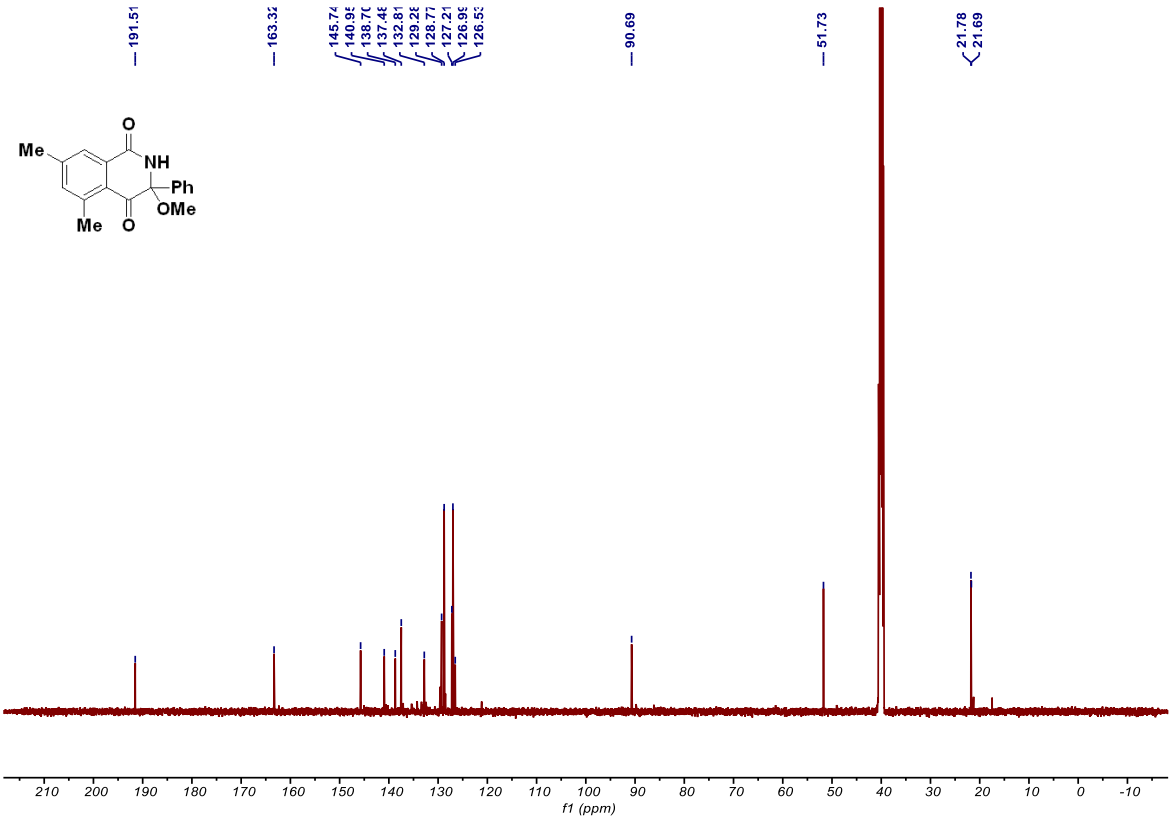

RS11 #3028 RT: 17.08 AV: 1 NL: 1.47E6
T: FTMS + p ESI Full ms [100.0000-1500.0000]
293.0920
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
293.02
293.04
293.06
293.08
293.10
293.12
m/z

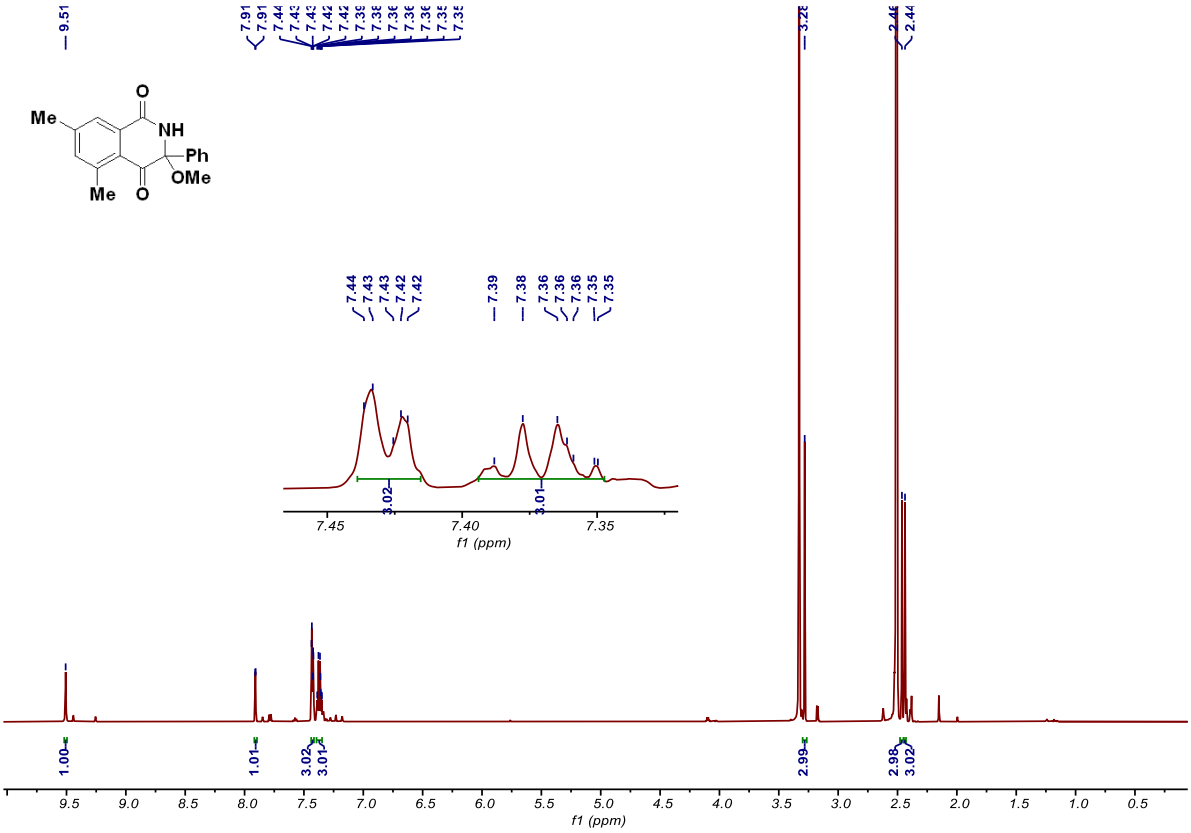
**3-methoxy-6-nitro-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (15)**

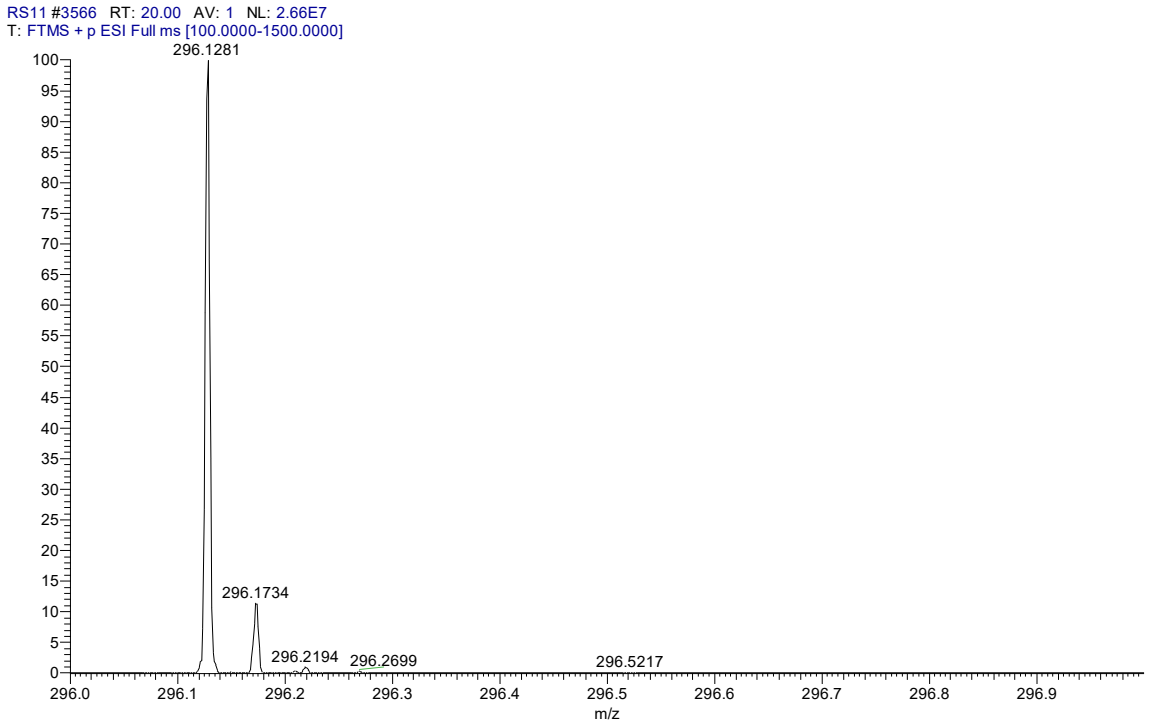




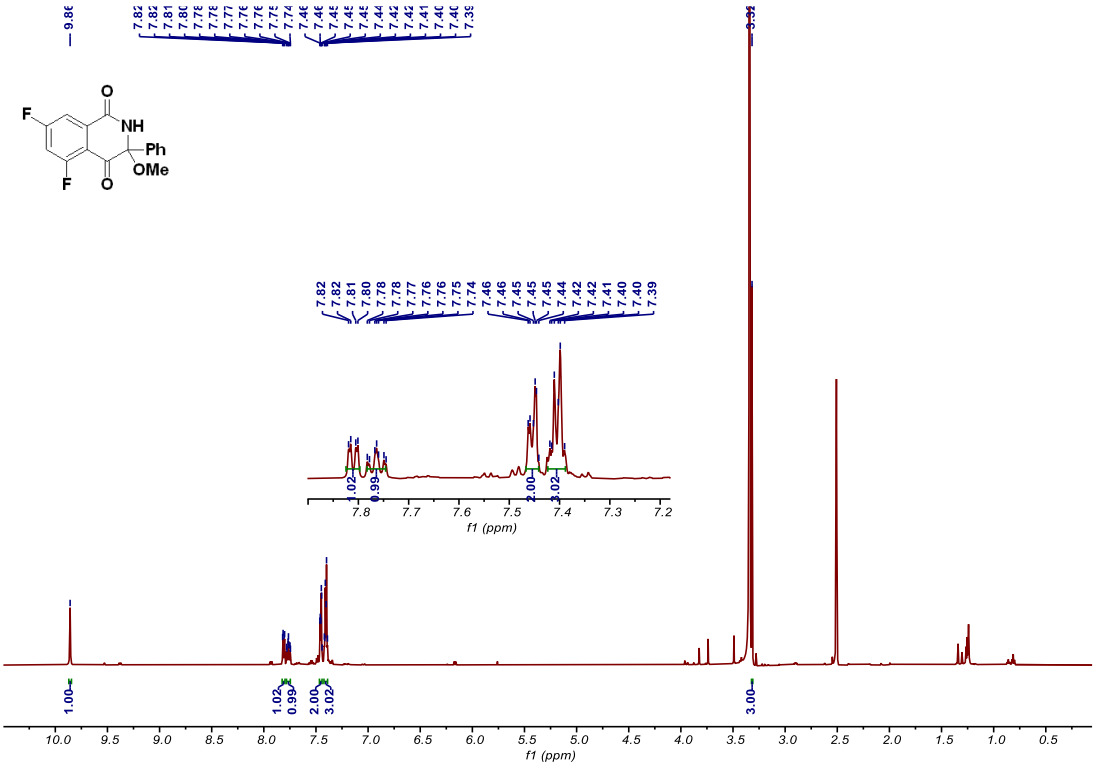

## 3-methoxy-5,7-dimethyl-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (16)

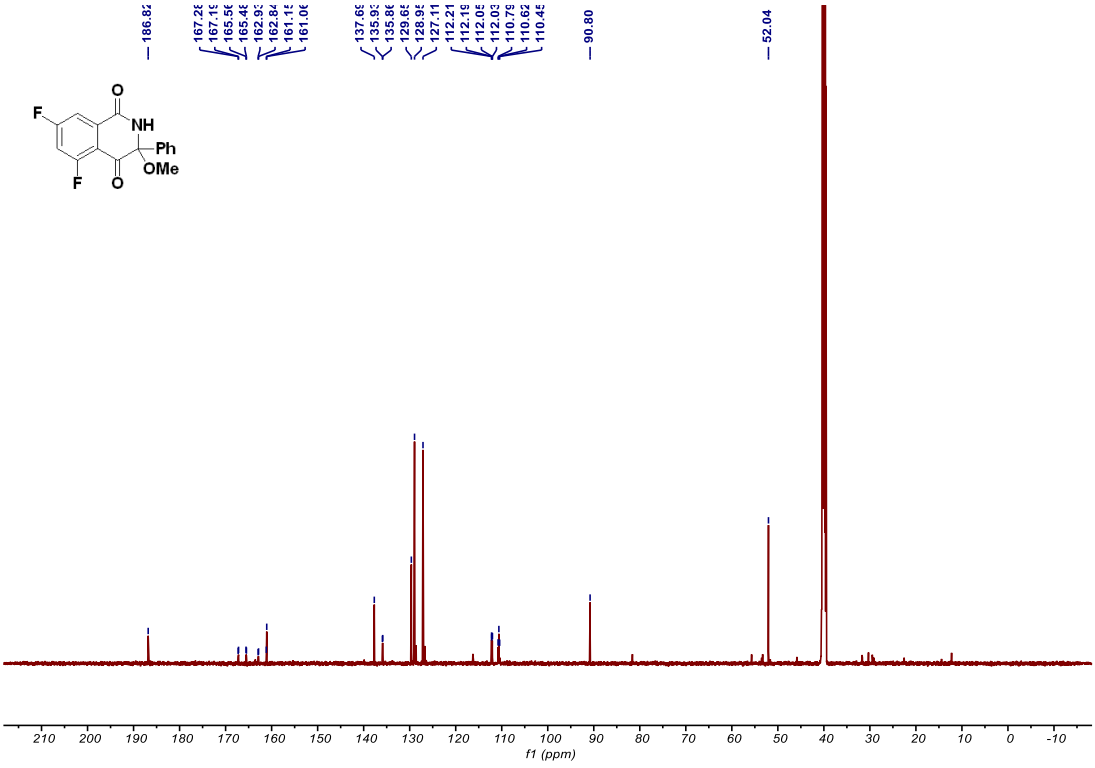


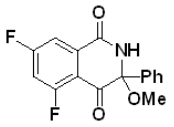

9.51
7.91
7.91
7.44
7.43
7.43
7.42
7.42
7.38
7.38
7.36
7.36
7.36
7.35
7.35
3.22
2.46
2.44
Me
O
NH
Ph
OMe
Me
O
7.44
7.43
7.43
7.42
7.42
7.39
7.38
7.36
7.36
7.36
7.35
7.35
3.02
3.01
7.45
7.40
7.35
f1 (ppm)
1.00
1.01
3.02
3.01
2.99
2.98
3.02
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)


RS11 #3566 RT: 20.00 AV: 1 NL: 2.66E7
T: FTMS + p ESI Full ms [100.0000-1500.0000]
296.1281
296.1734
296.2194
296.2699
296.5217
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
296.0
296.1
296.2
296.3
296.4
296.5
296.6
296.7
296.8
296.9
m/z

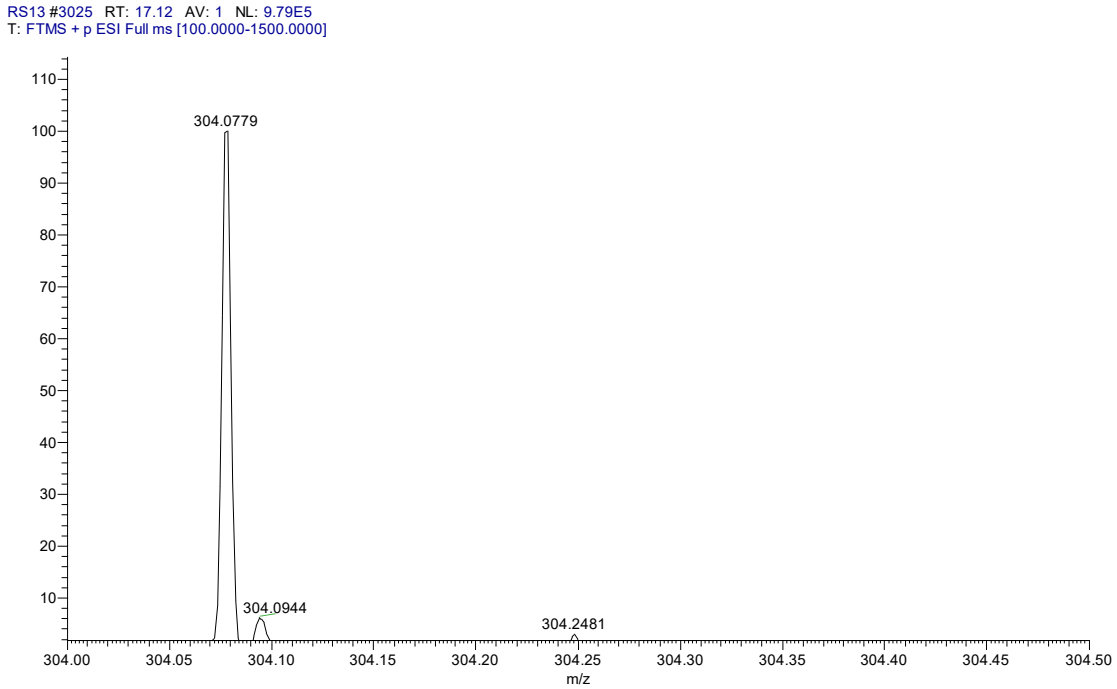
## 5,7-difluoro-3-methoxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (17)



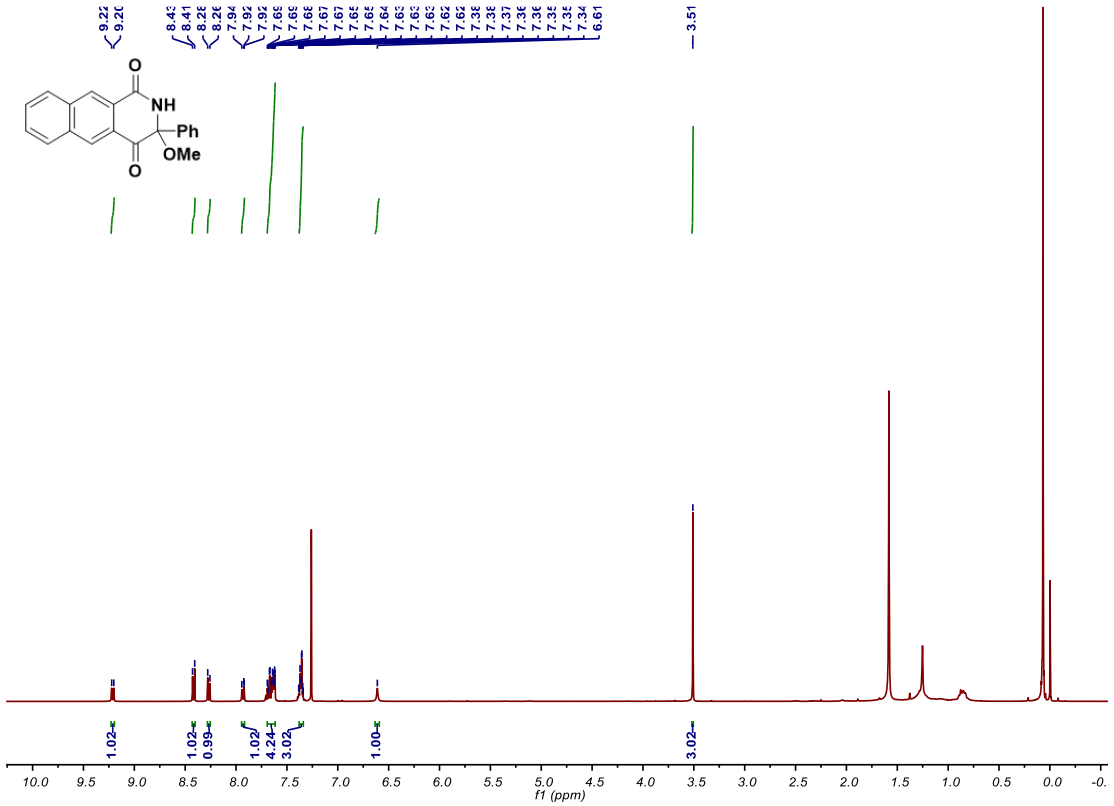



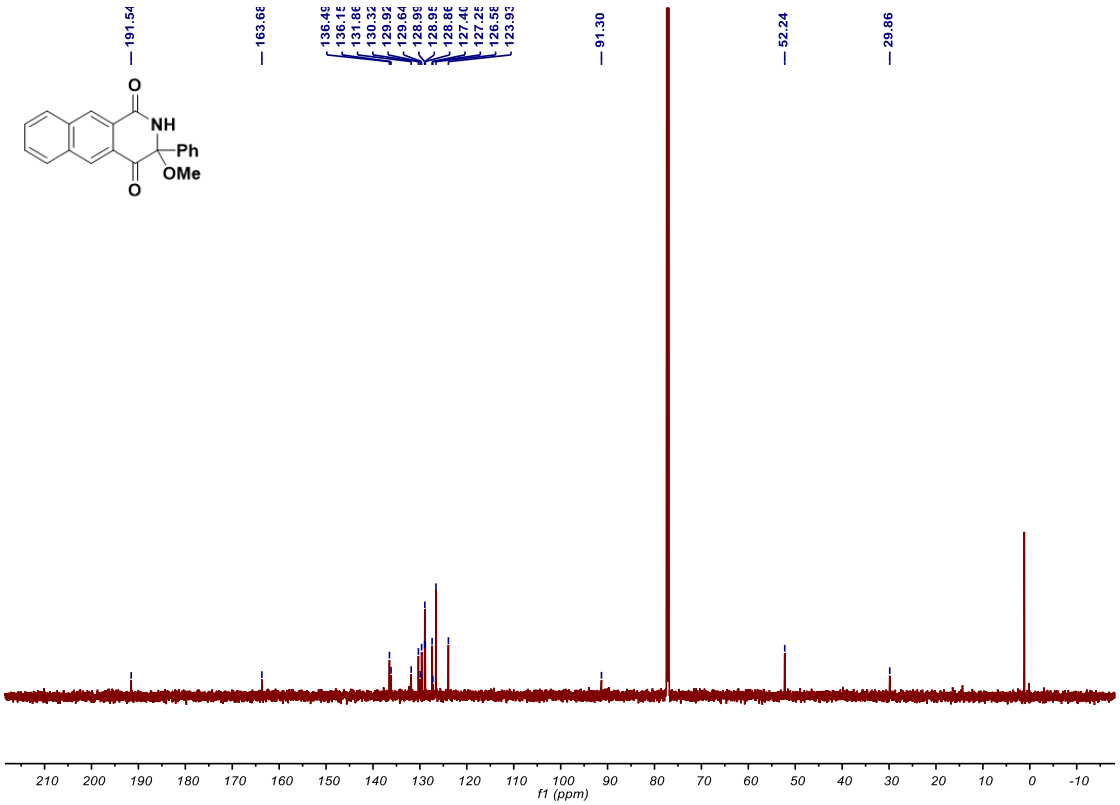

O
F
NH
Ph
OMe
F
O

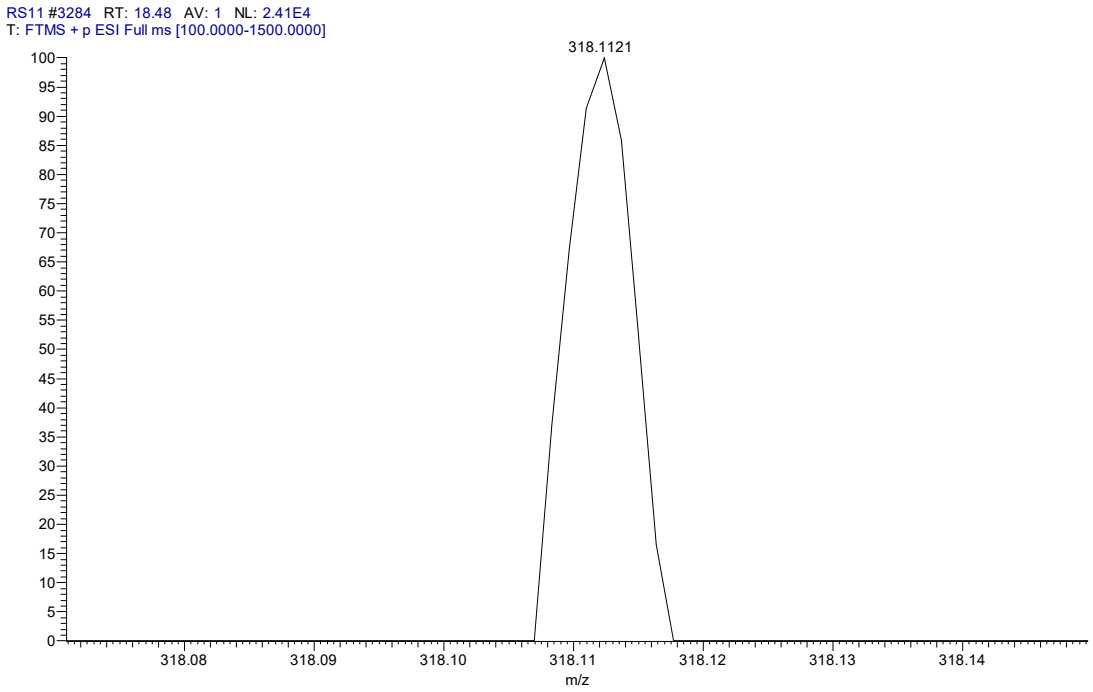

-95.92
-95.96
-106.85
-106.88
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)


RS13 #3025 RT: 17.12 AV: 1 NL: 9.79E5
T: FTMS + p ESI Full ms [100.0000-1500.0000]
304.0779
304.0944
304.2481
304.00 304.05 304.10 304.15 304.20 304.25 304.30 304.35 304.40 304.45 304.50
m/z

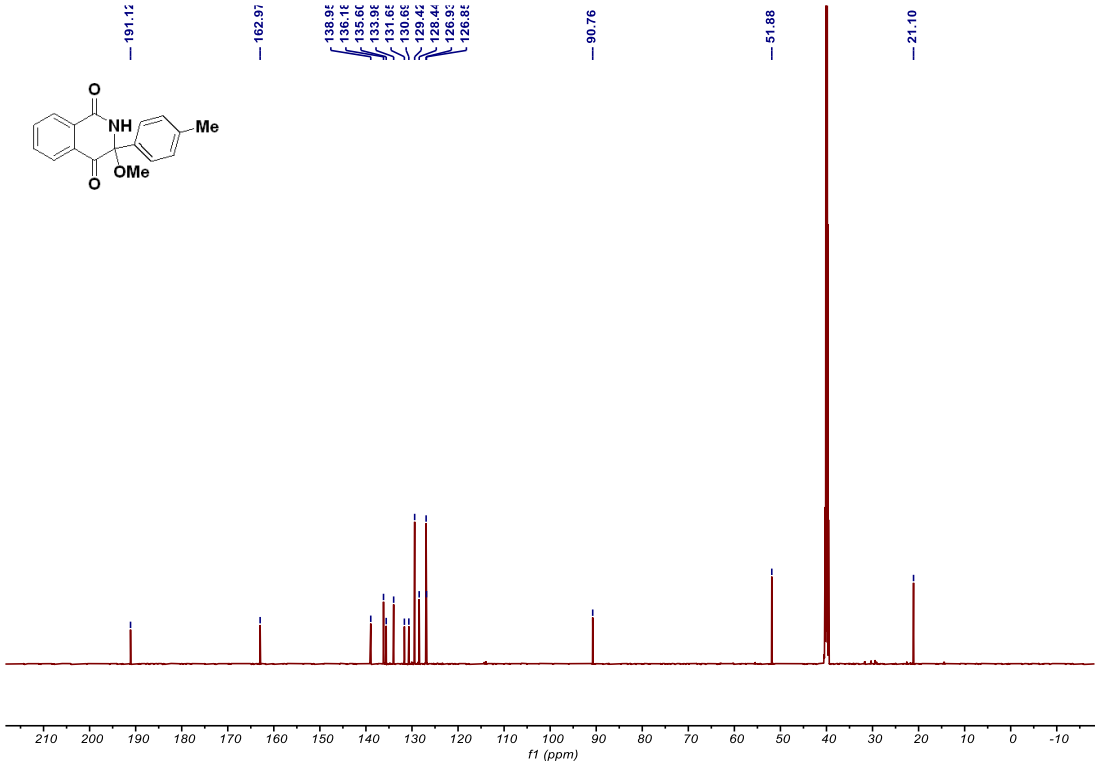
**3-methoxy-3-phenyl-2,3-dihydrobenzo[g]isoquinoline-1,4-dione (18)**

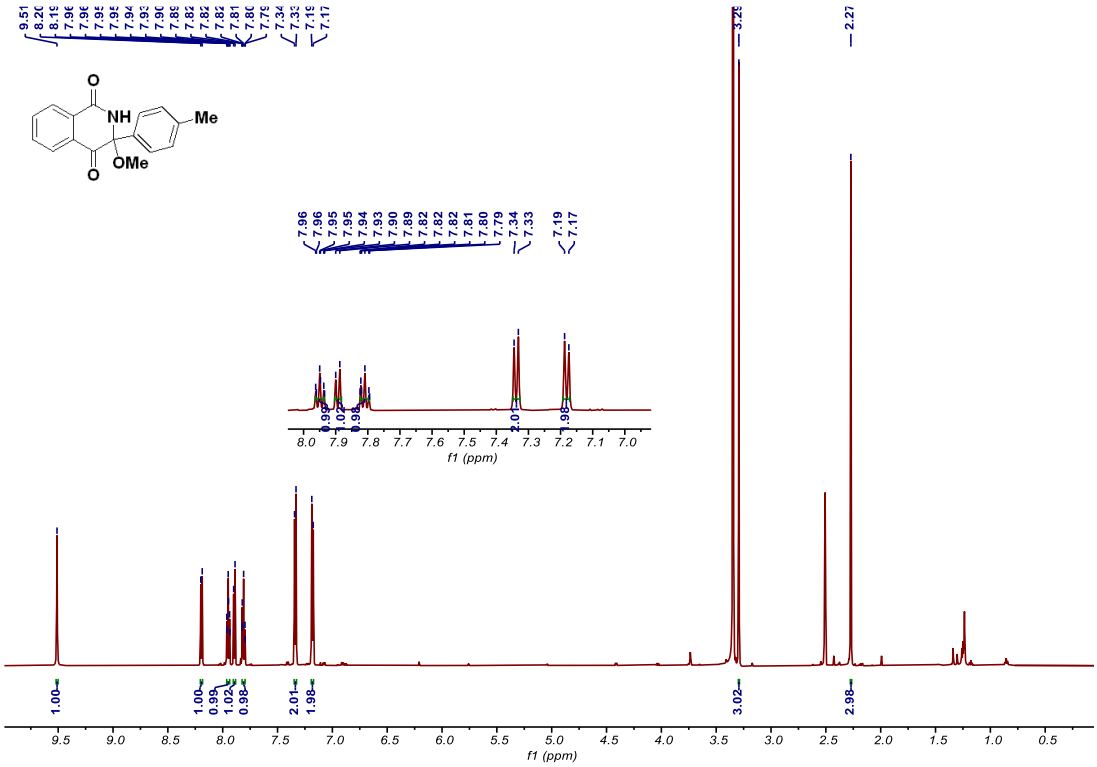


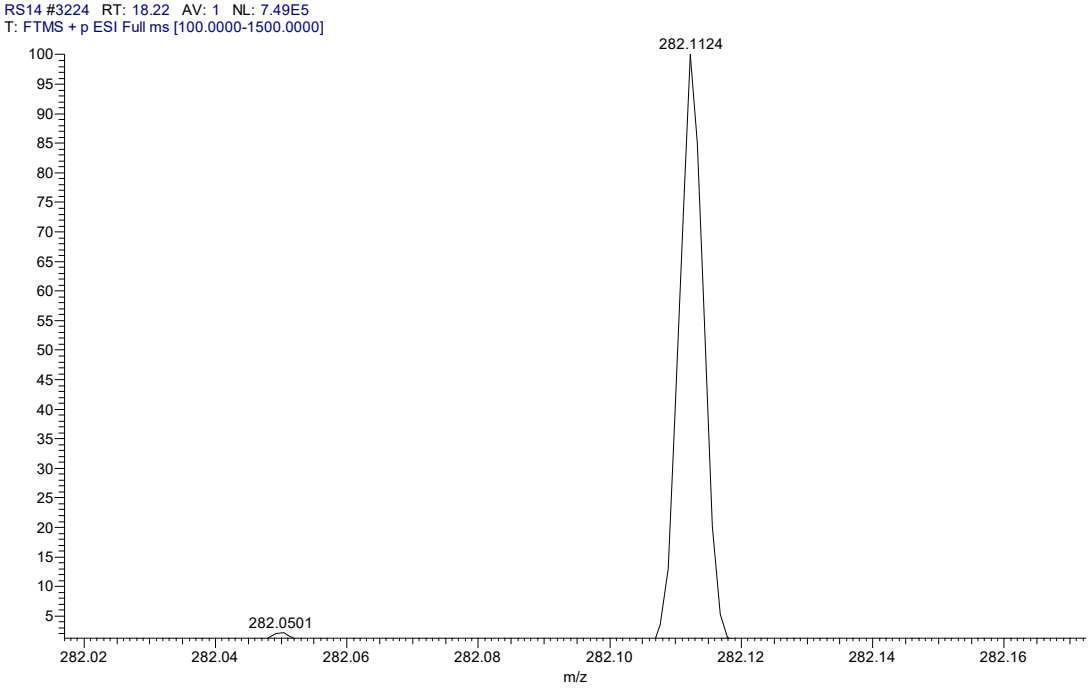





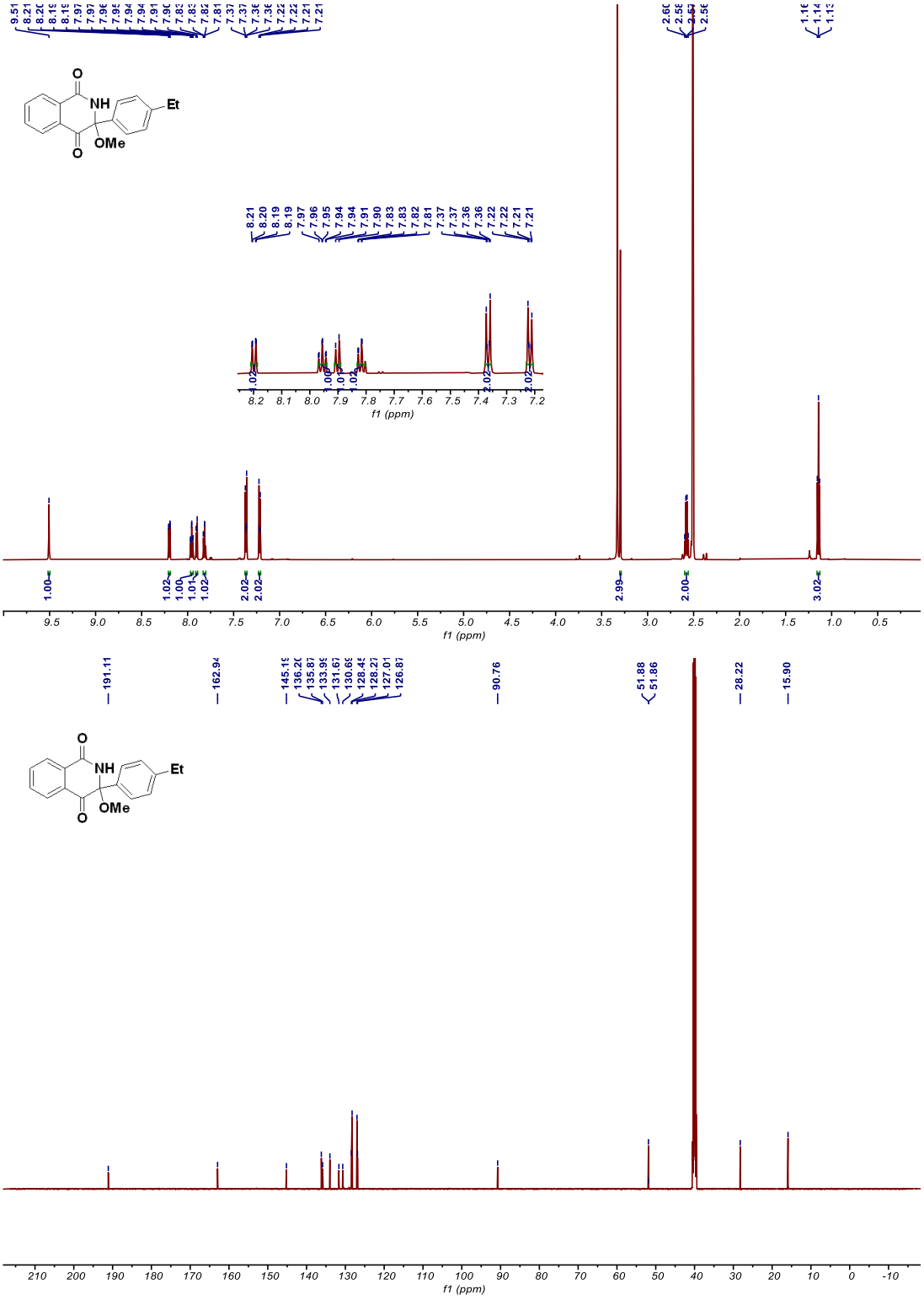

## 3-methoxy-3-(p-tolyl)-2,3-dihydroisoquinoline-1,4-dione (20)

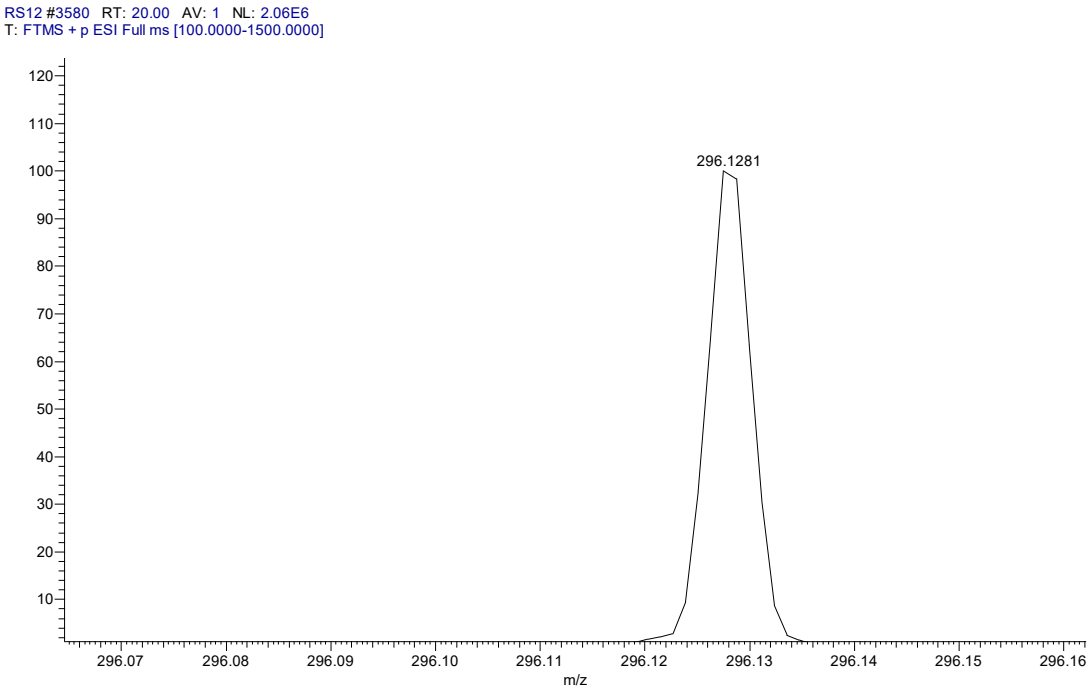



NH
Me
OMe
f1 (ppm)

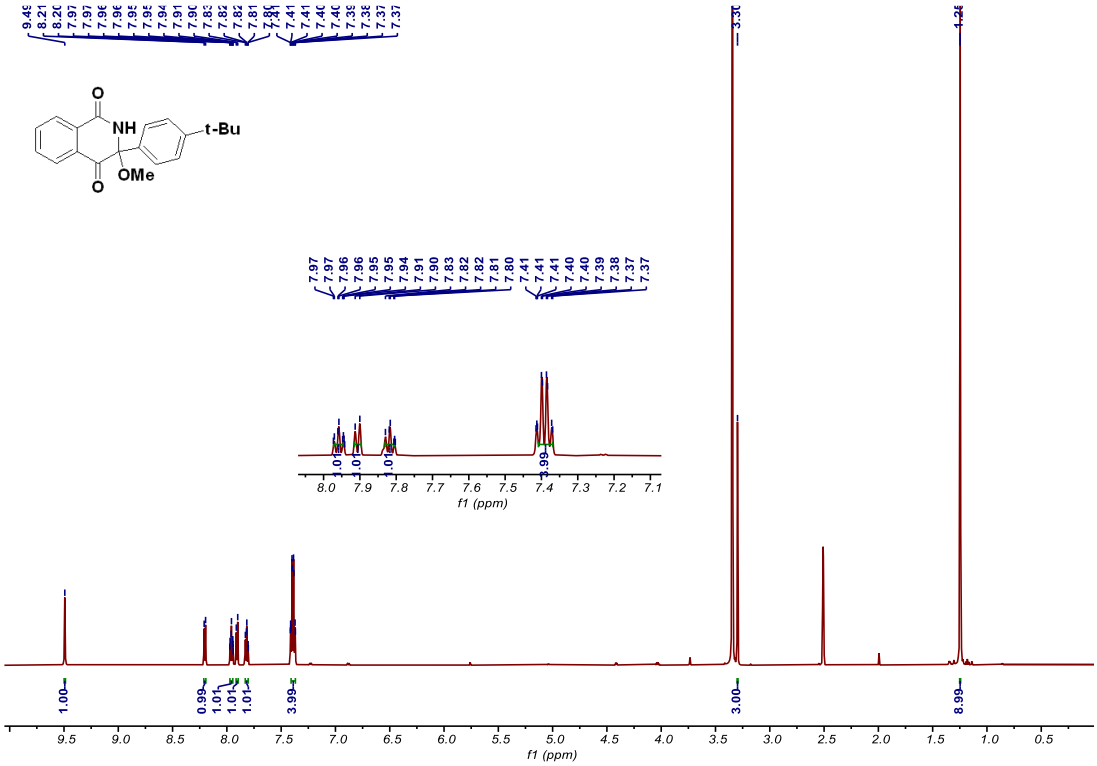

RS14 #3224 RT: 18.22 AV: 1 NL: 7.49E5
T: FTMS + p ESI Full ms [100.0000-1500.0000]
282.1124
282.0501
m/z

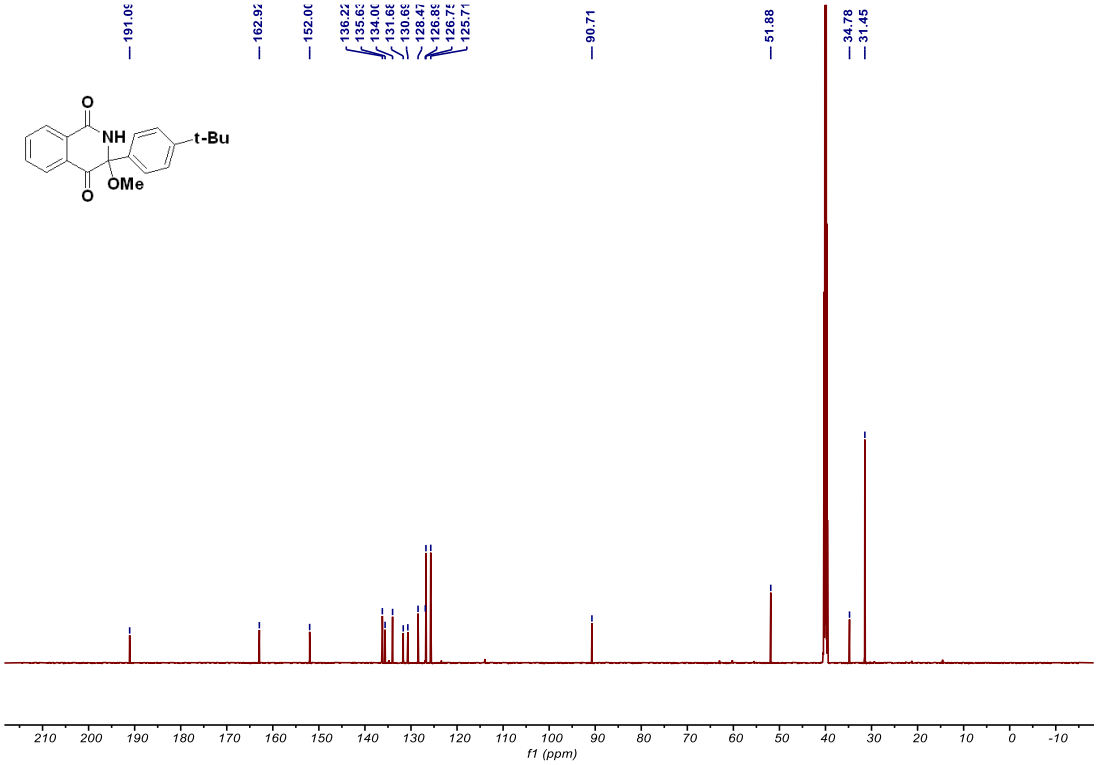
## 3-(4-ethylphenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (21)

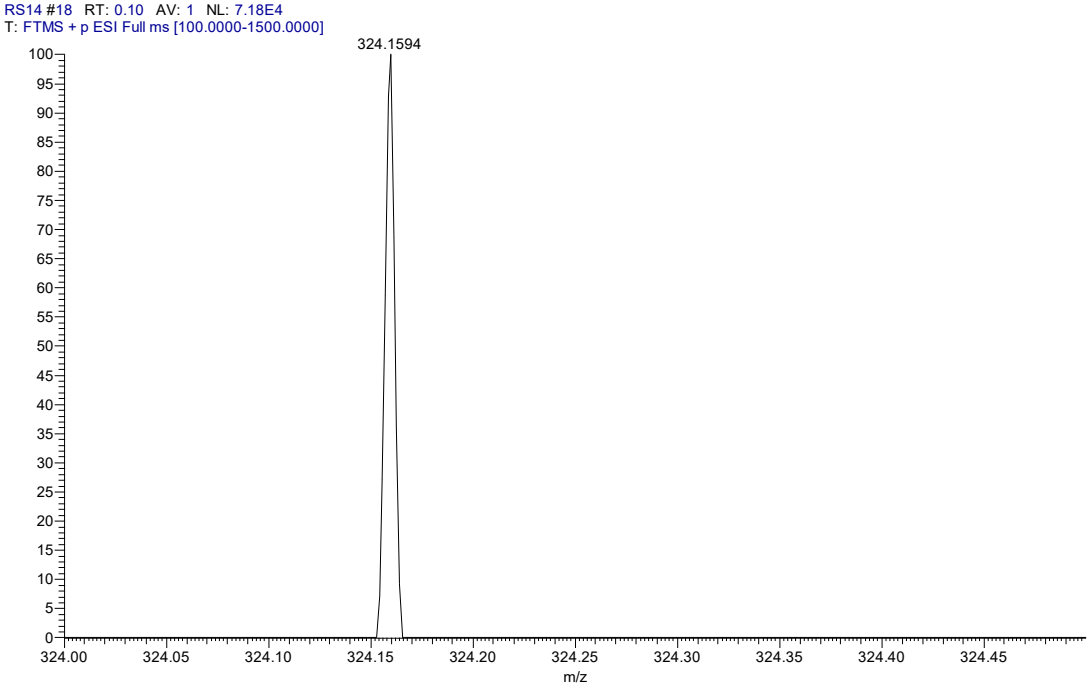




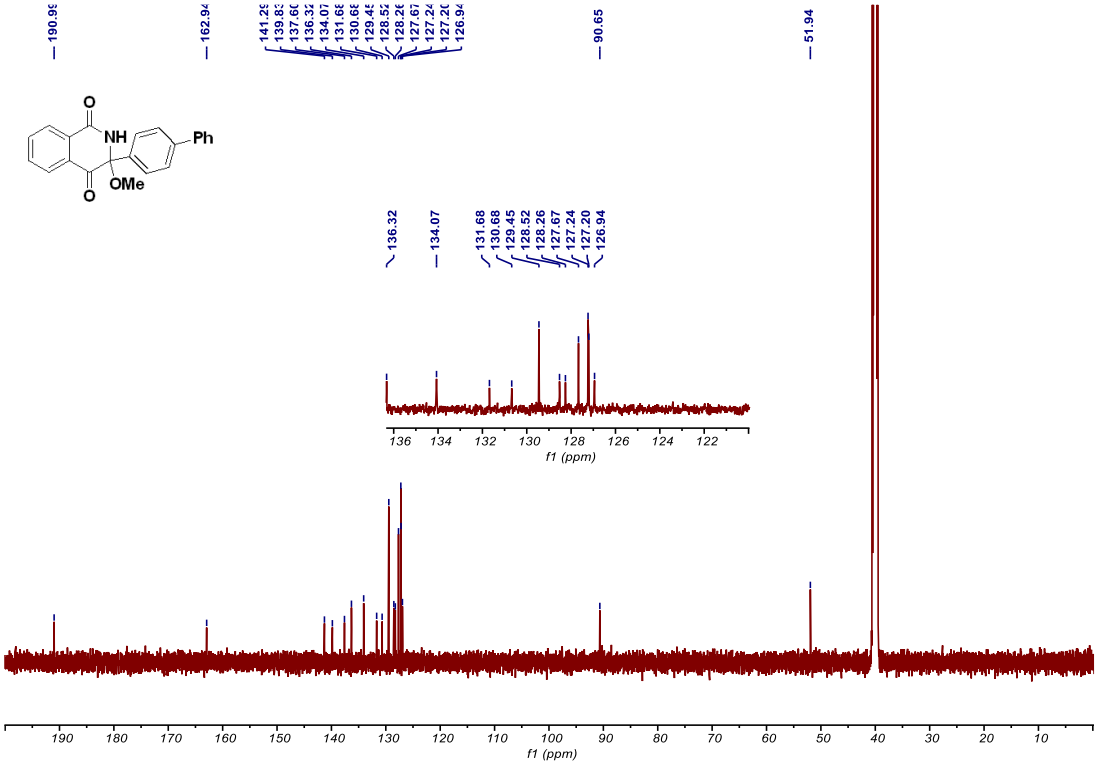

## 3-(4-(tert-butyl)phenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (22)

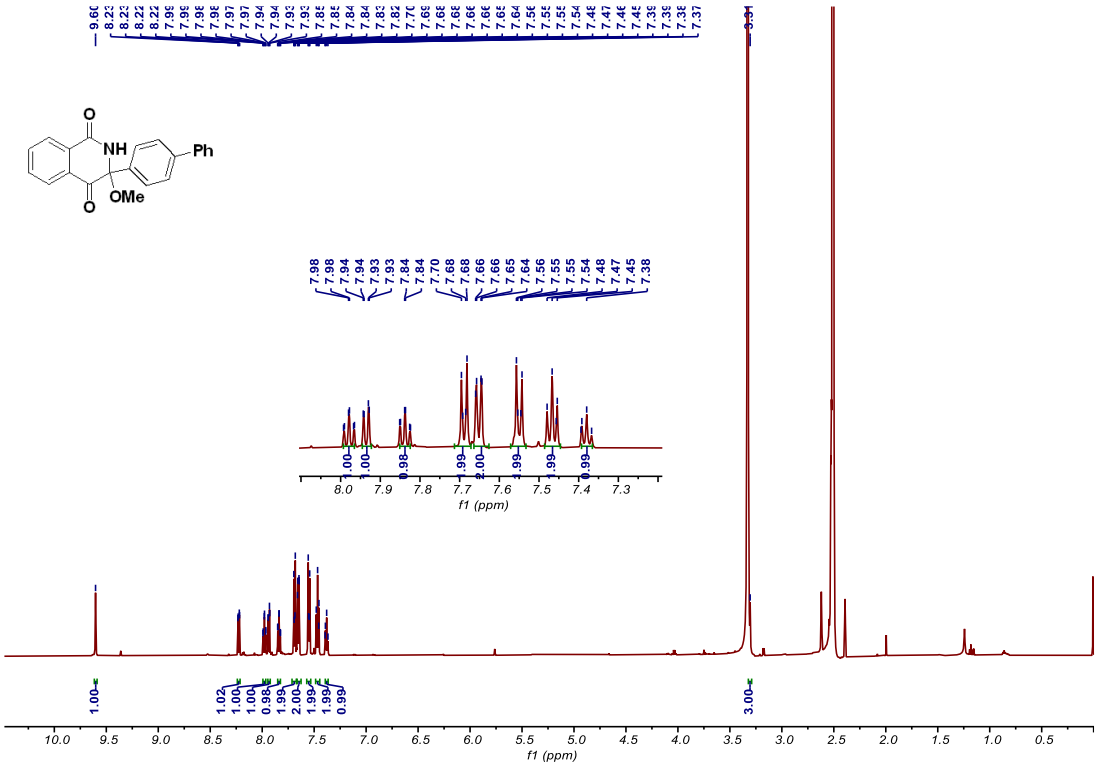


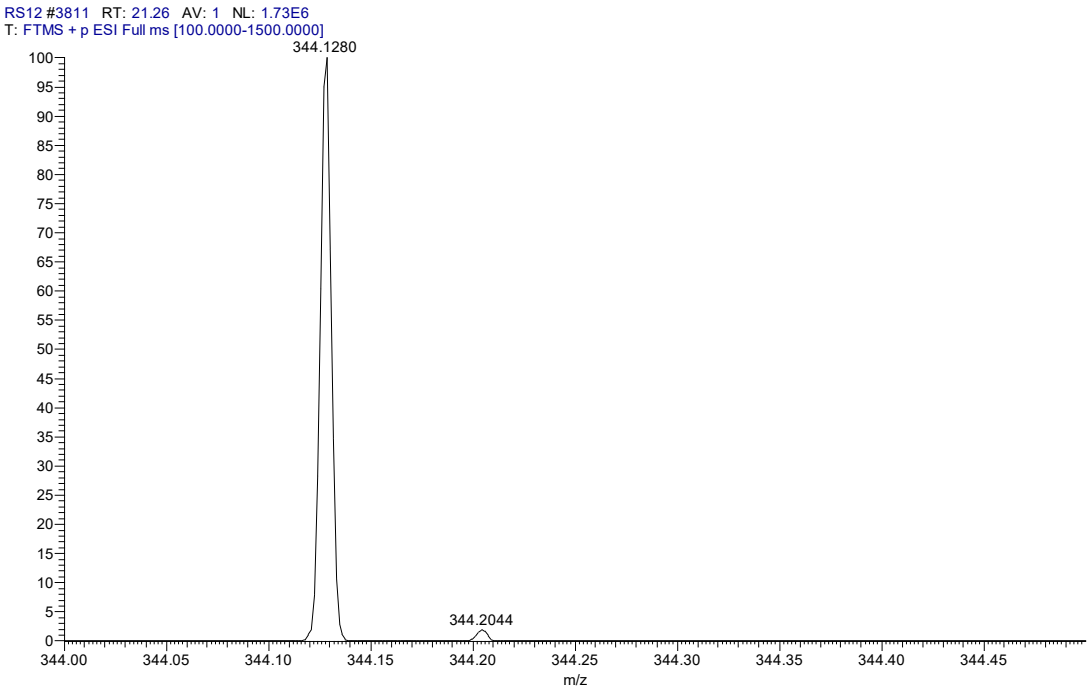

191.05
162.92
152.00
136.22
135.63
134.00
131.66
130.65
128.47
126.85
126.75
125.71
90.71
51.88
34.78
31.45
O
NH
t-Bu
OMe
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


RS14 #18 RT: 0.10 AV: 1 NL: 7.18E4
T: FTMS + p ESI Full ms [100.0000-1500.0000]
324.1594
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
324.00 324.05 324.10 324.15 324.20 324.25 324.30 324.35 324.40 324.45
m/z

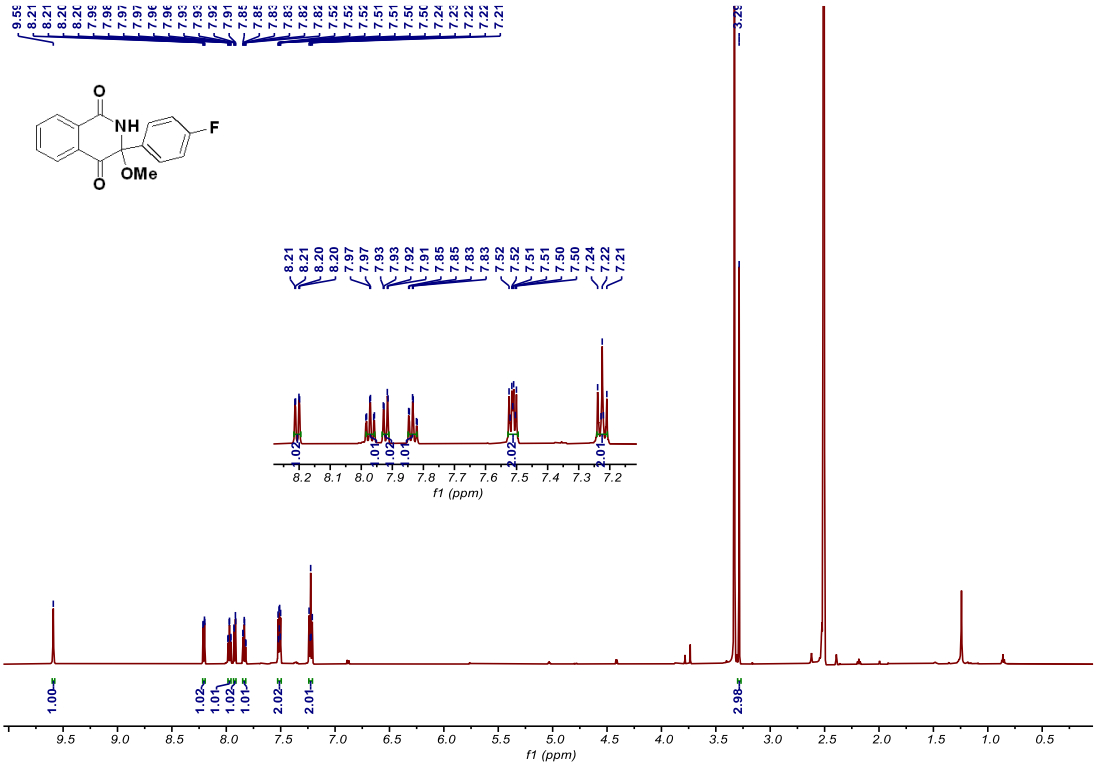
**3-([1,1'-biphenyl]-4-yl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (23)**

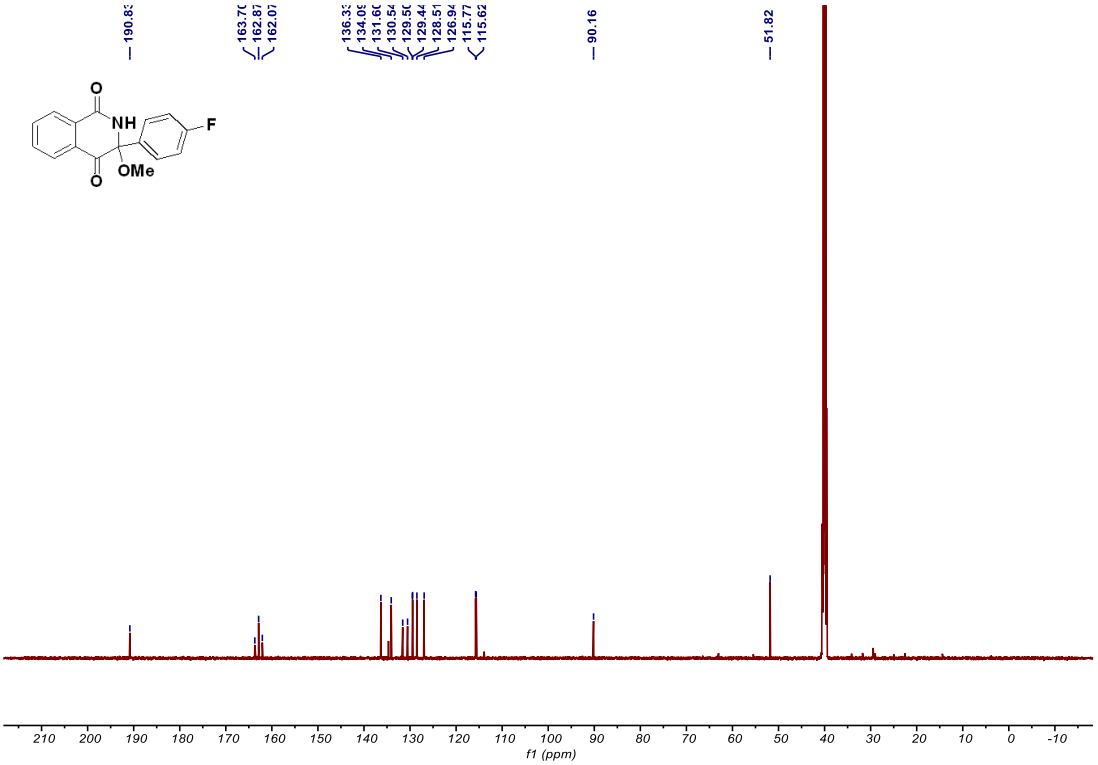


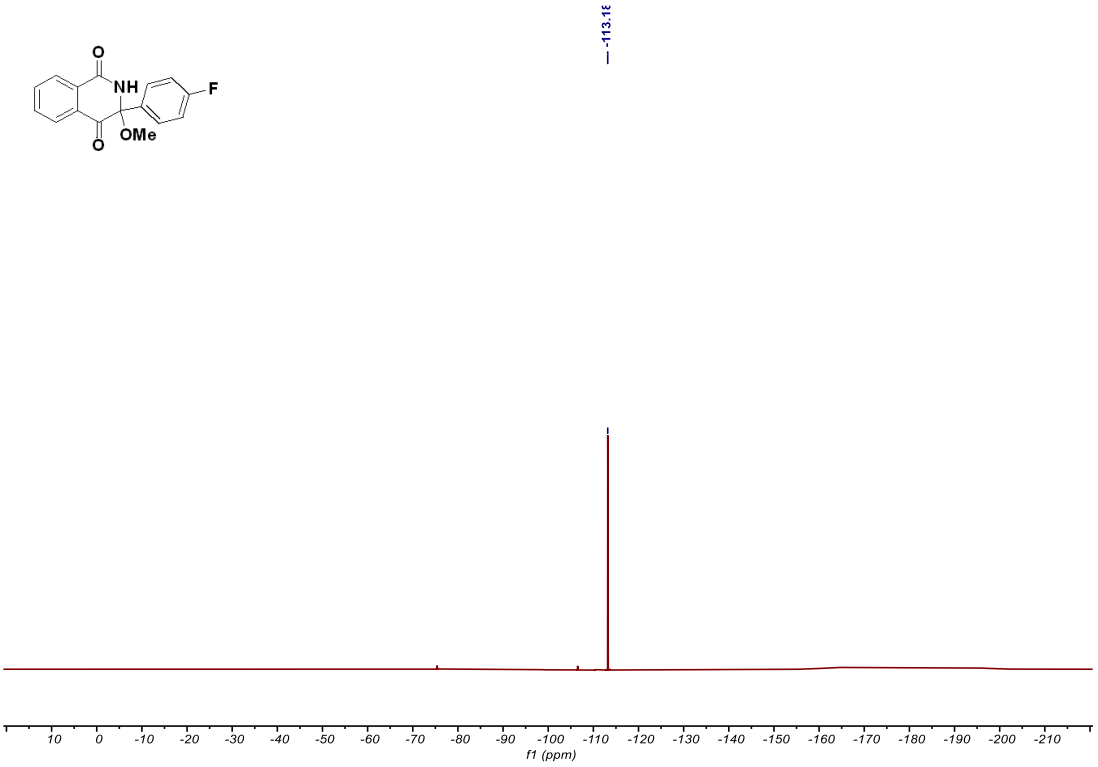



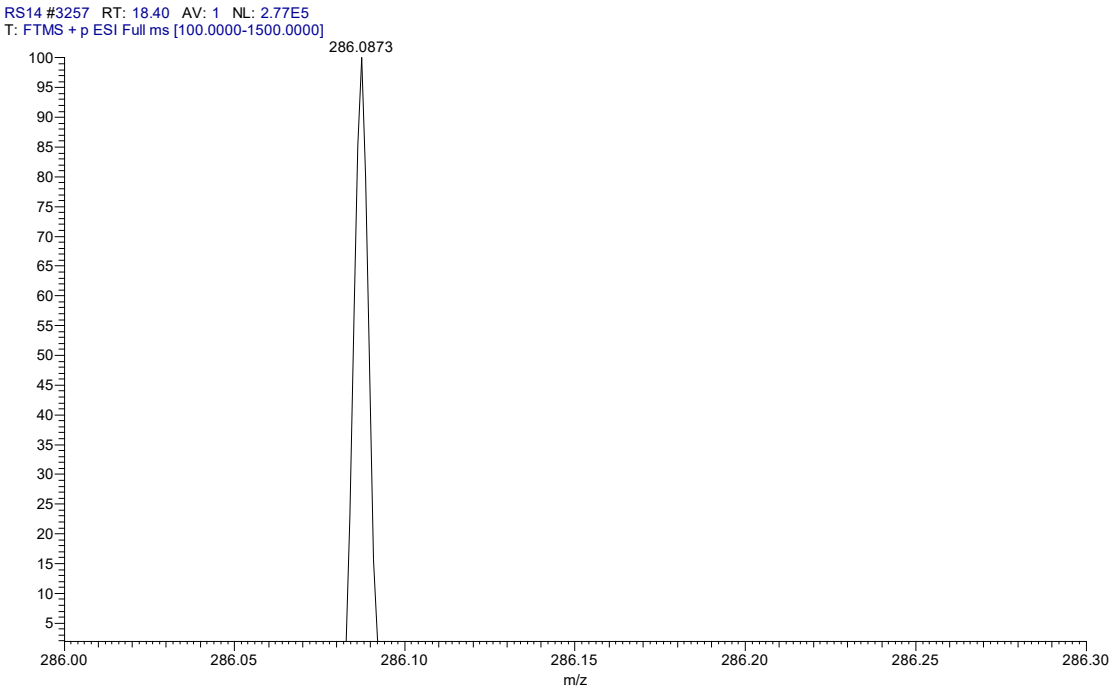



## 3-(4-fluorophenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (24)

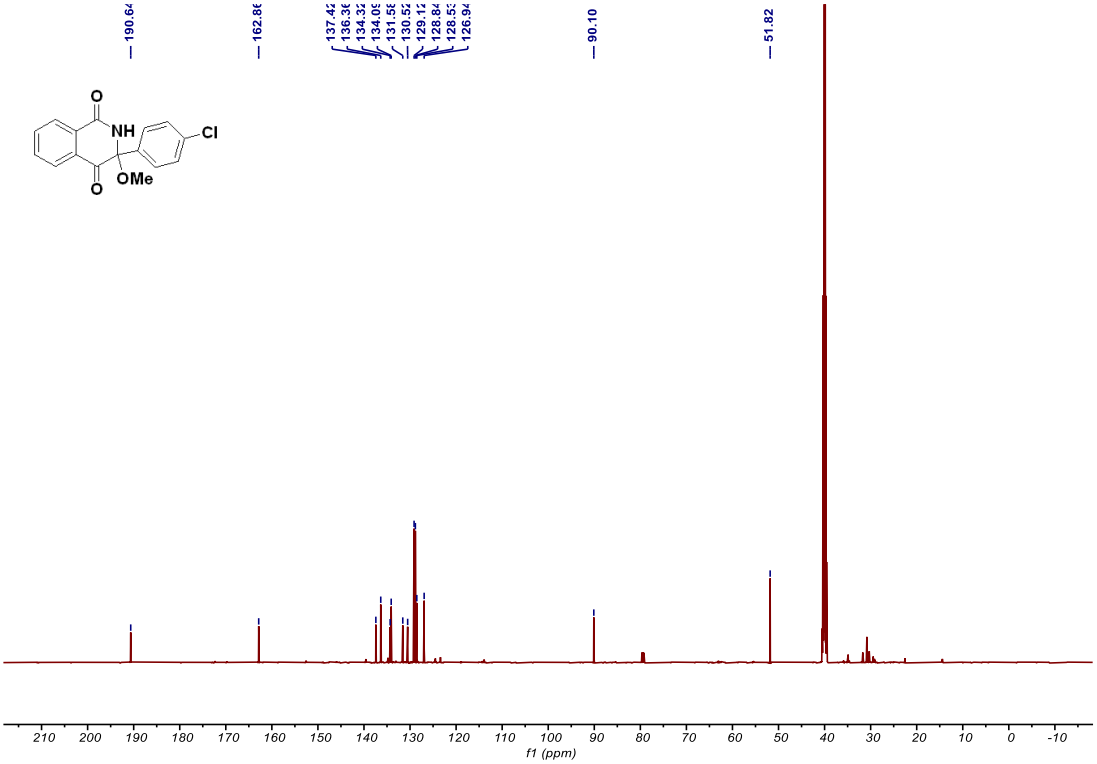


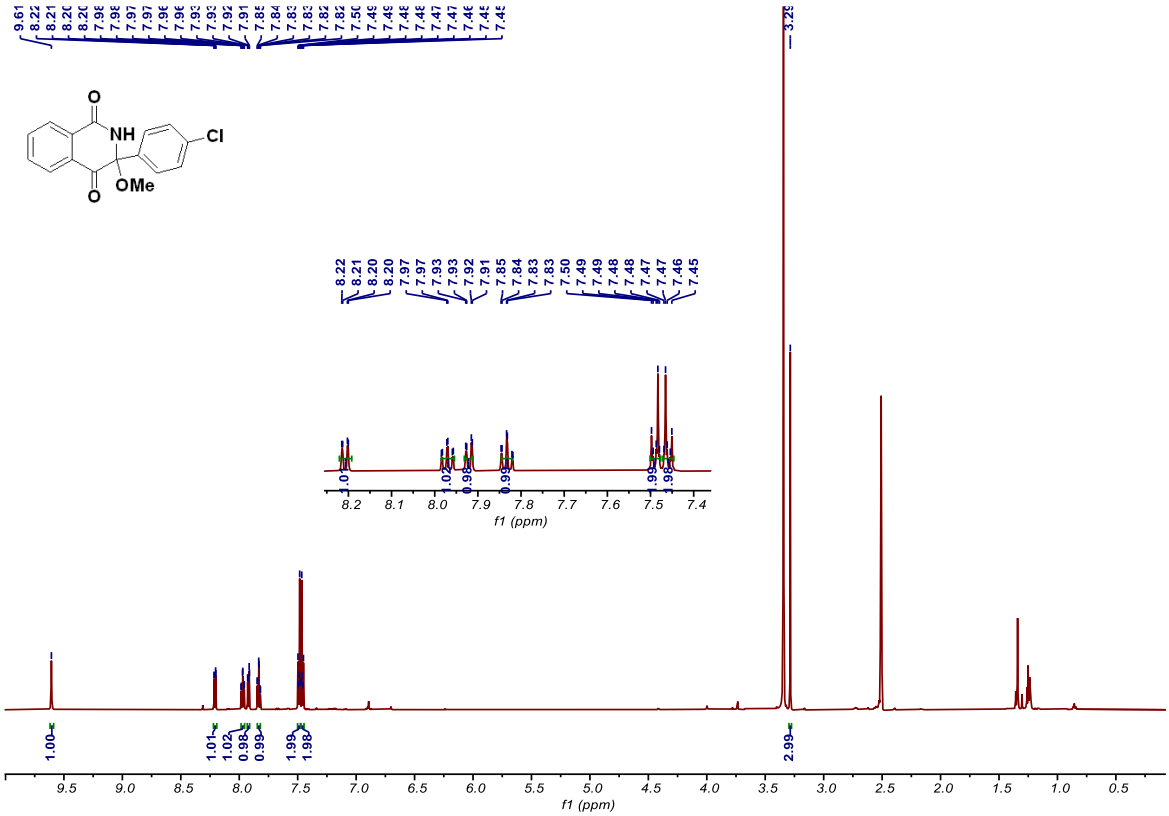

190.83
163.76
162.87
162.01
136.33
134.05
131.66
130.54
129.56
129.44
128.51
126.94
115.77
115.62
90.16
51.82
O
NH
F
OMe
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

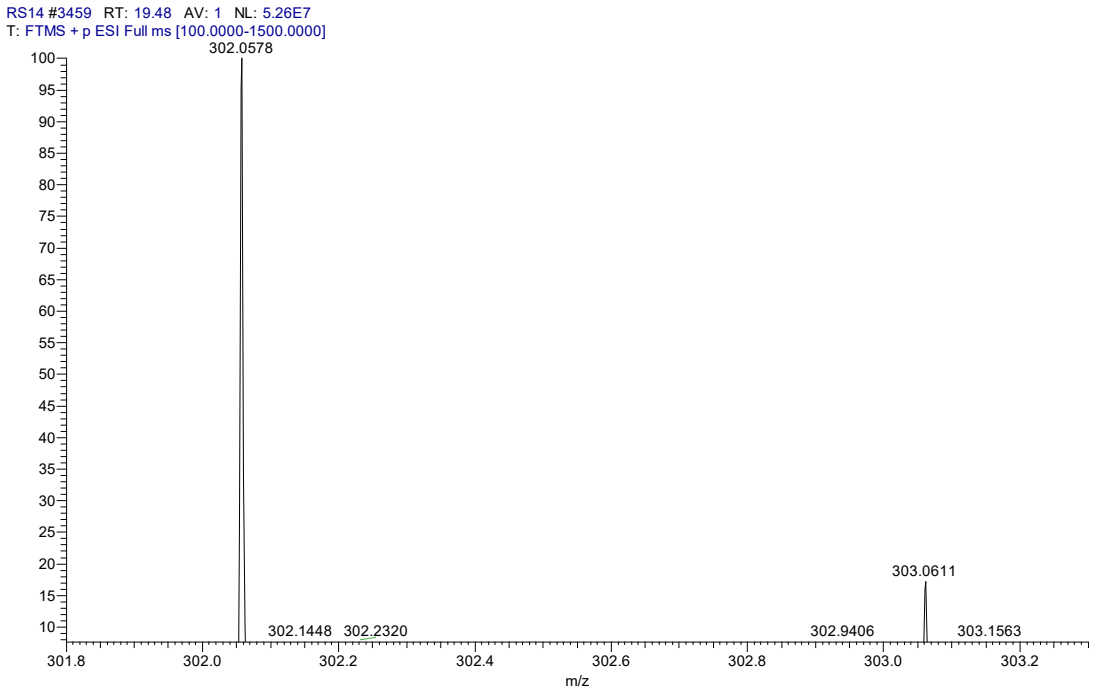

-113.18
O
NH
F
OMe
O
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)



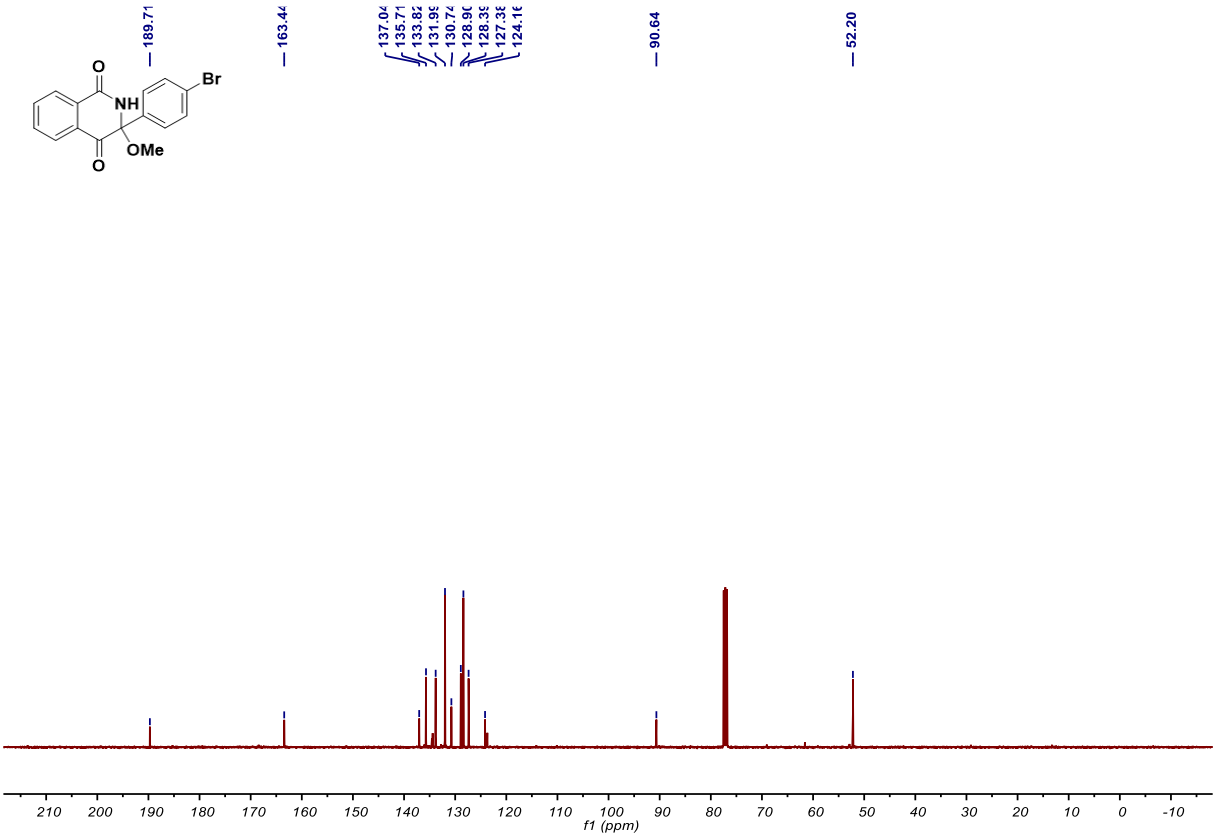

## 3-(4-chlorophenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (25)

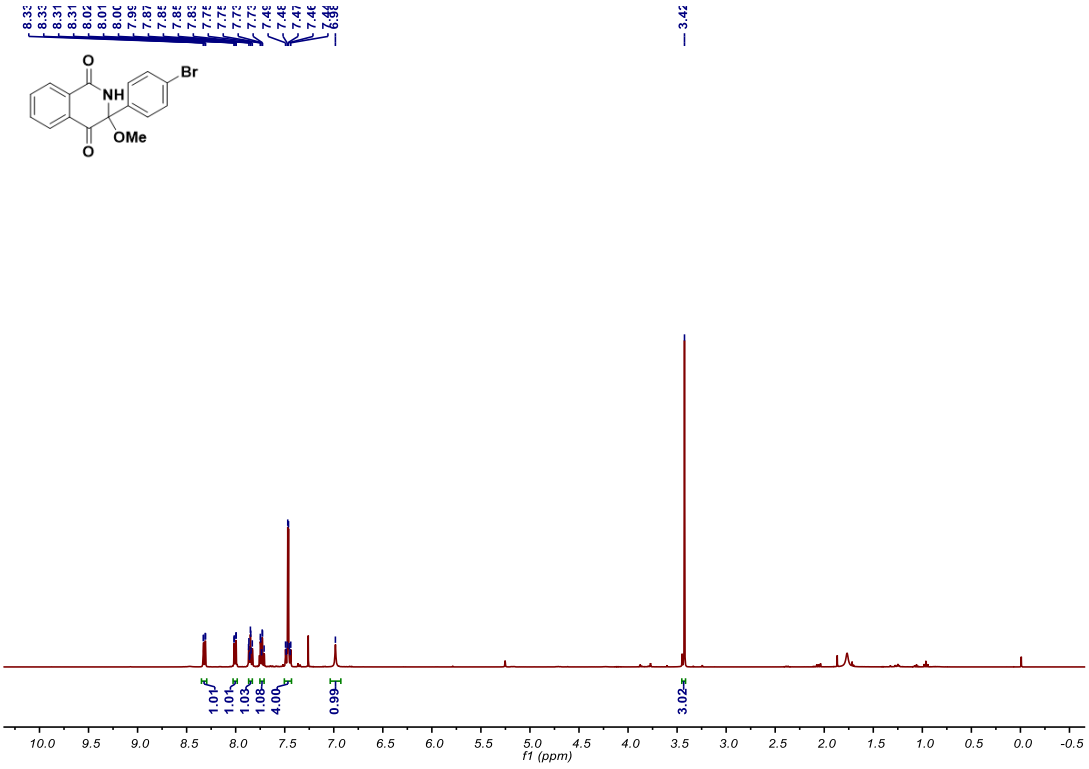


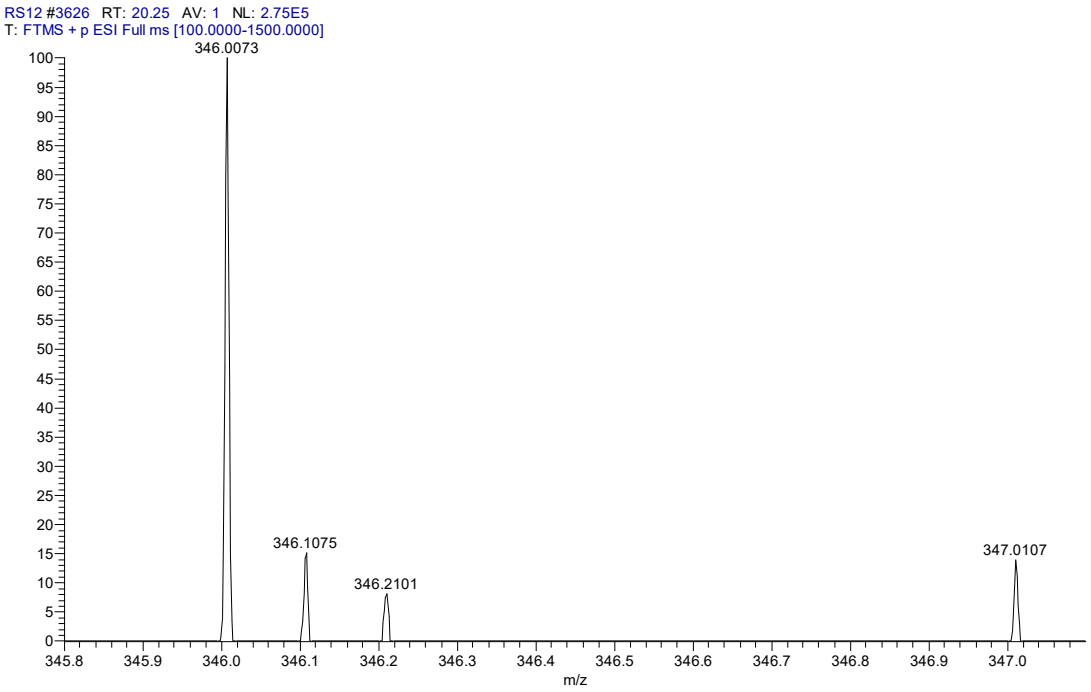

NH
Cl
OMe
f1 (ppm)


RS14 #3459 RT: 19.48 AV: 1 NL: 5.26E7
T: FTMS + p ESI Full ms [100.0000-1500.0000]
302.0578
303.0611
302.1448
302.2320
302.9406
303.1563
m/z

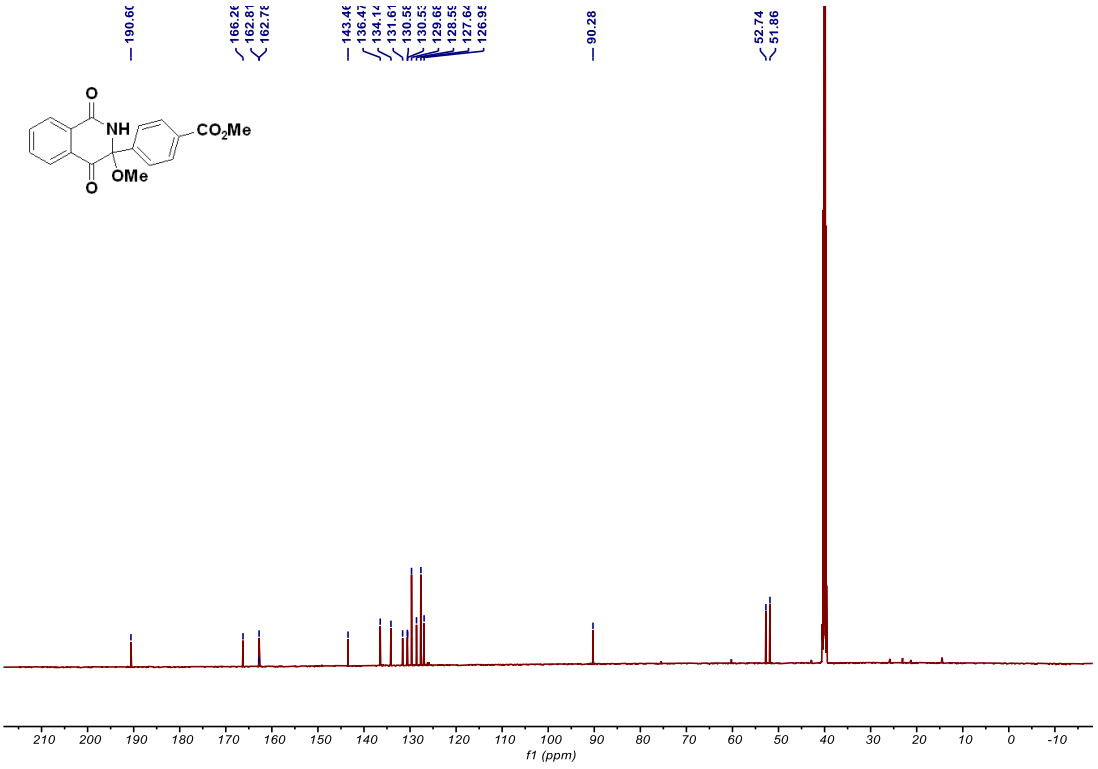
## 3-(4-bromophenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (26)

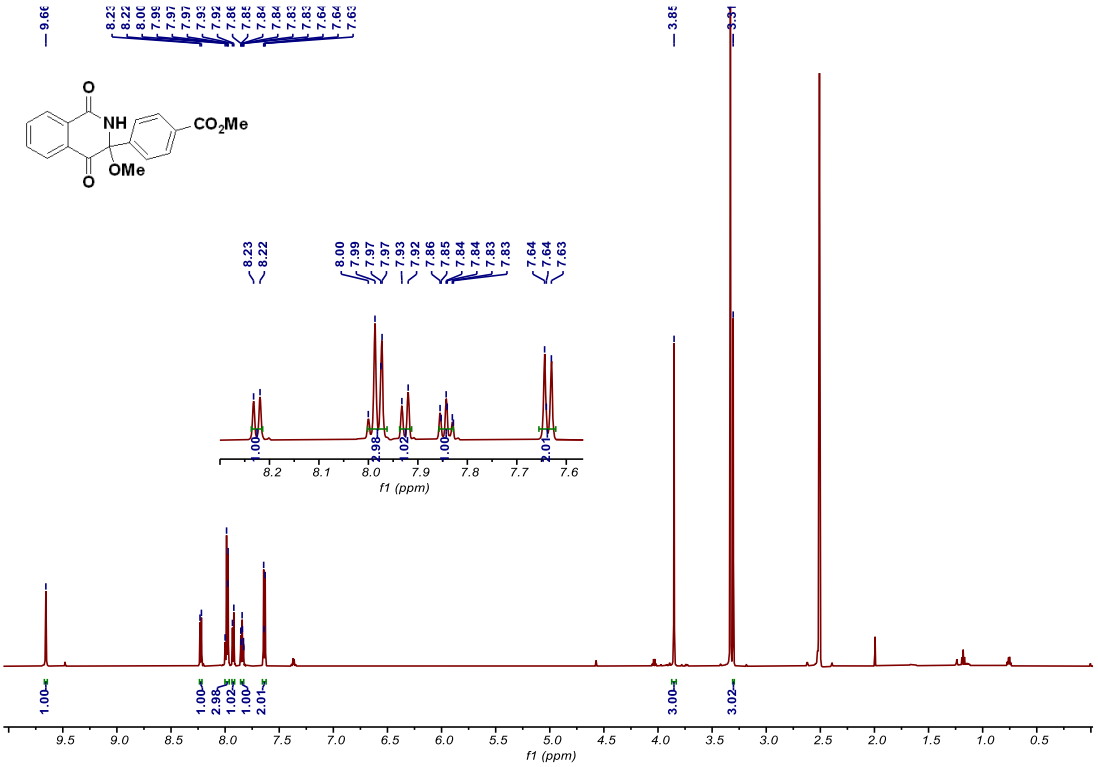


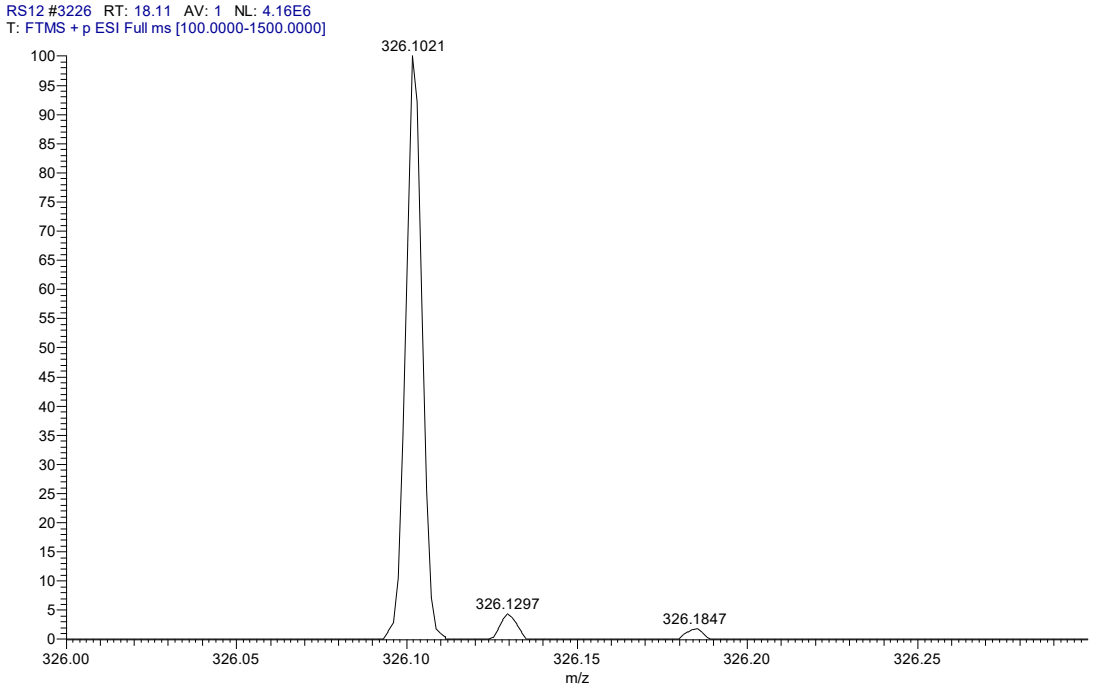





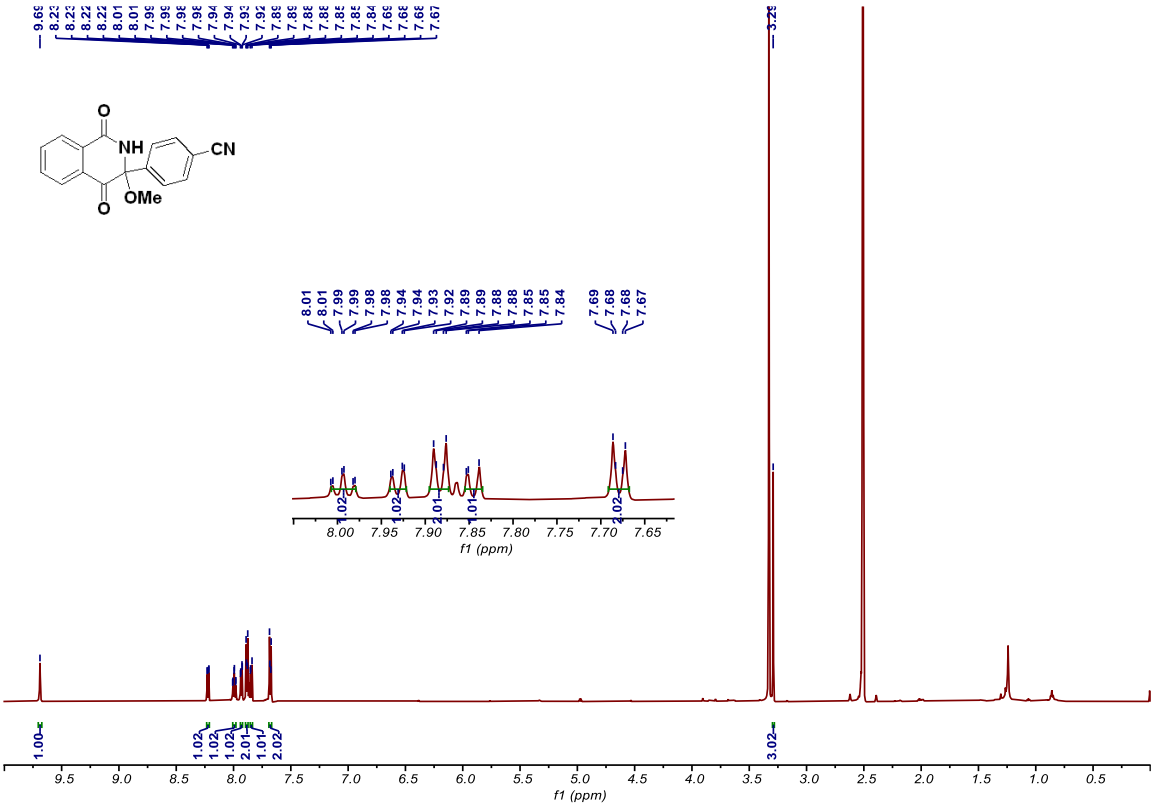

**methyl 4-(3-methoxy-1,4-dioxo-1,2,3,4-tetrahydroisoquinolin-3-yl)benzoate (27)**

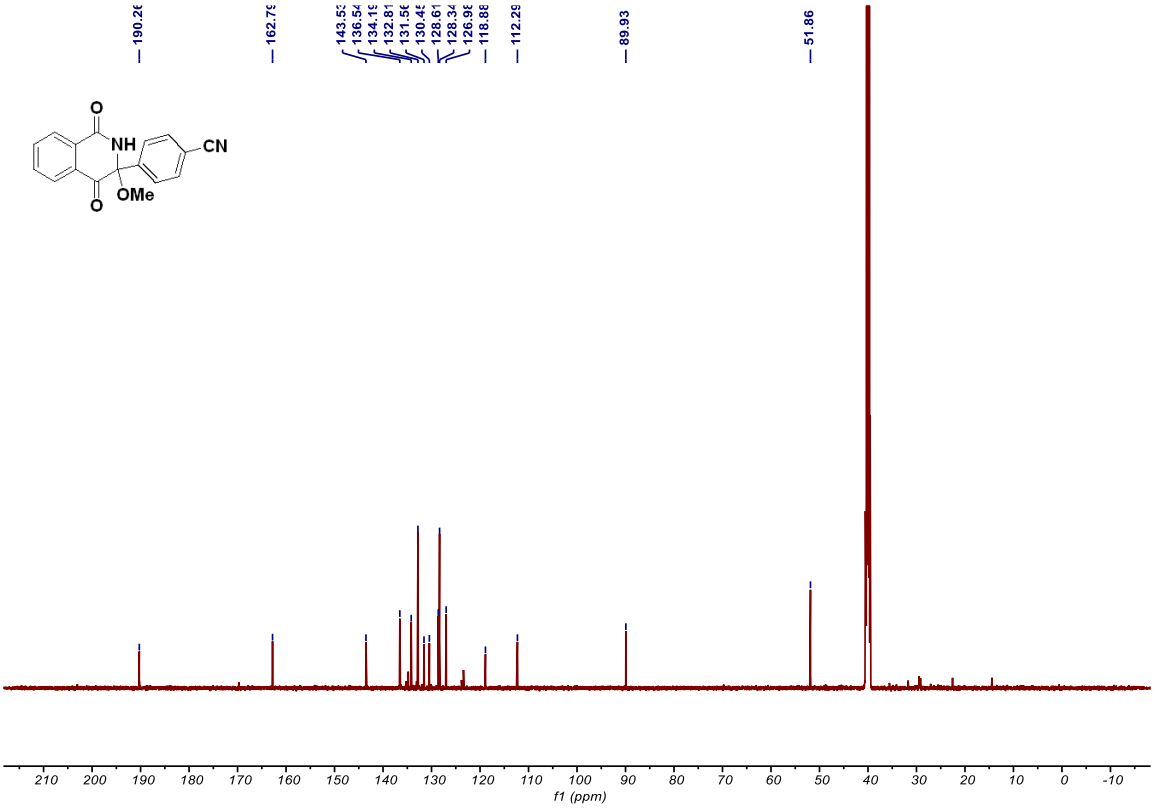


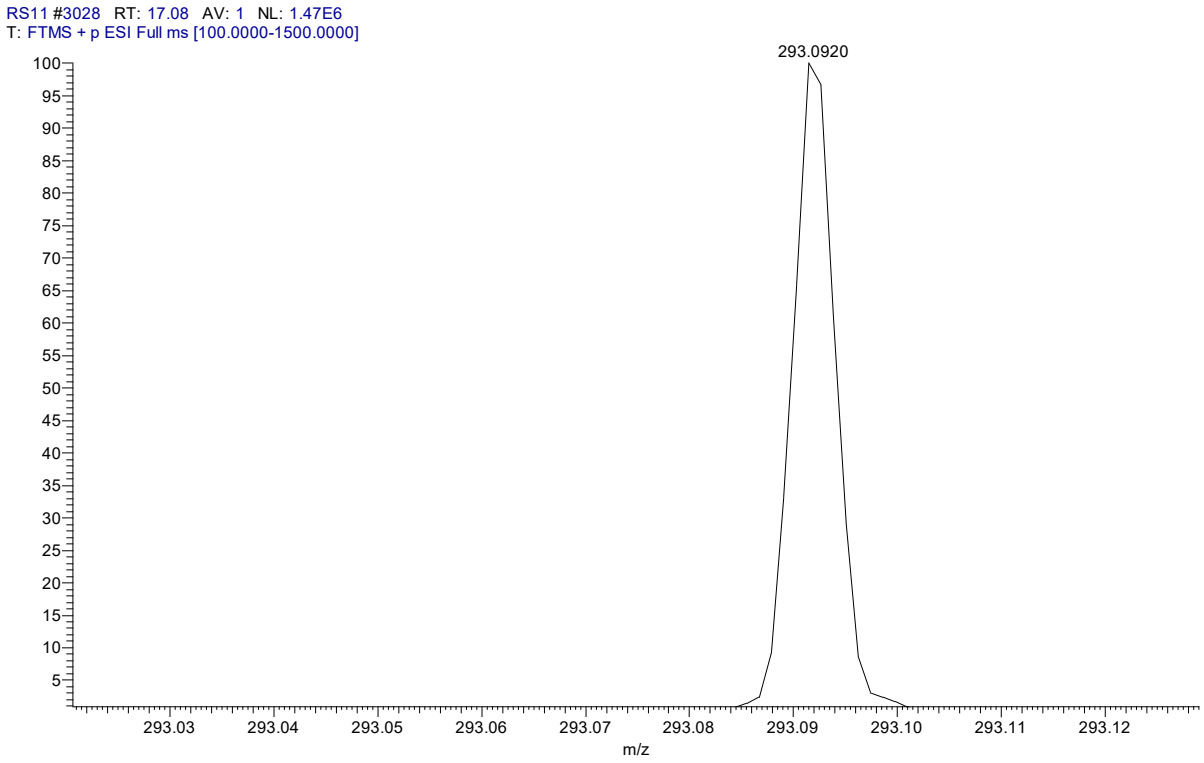

NH
CO2Me
OMe
f1 (ppm)


RS12 #3226 RT: 18.11 AV: 1 NL: 4.16E6
T: FTMS + p ESI Full ms [100.0000-1500.0000]
326.1021
326.1297
326.1847
m/z

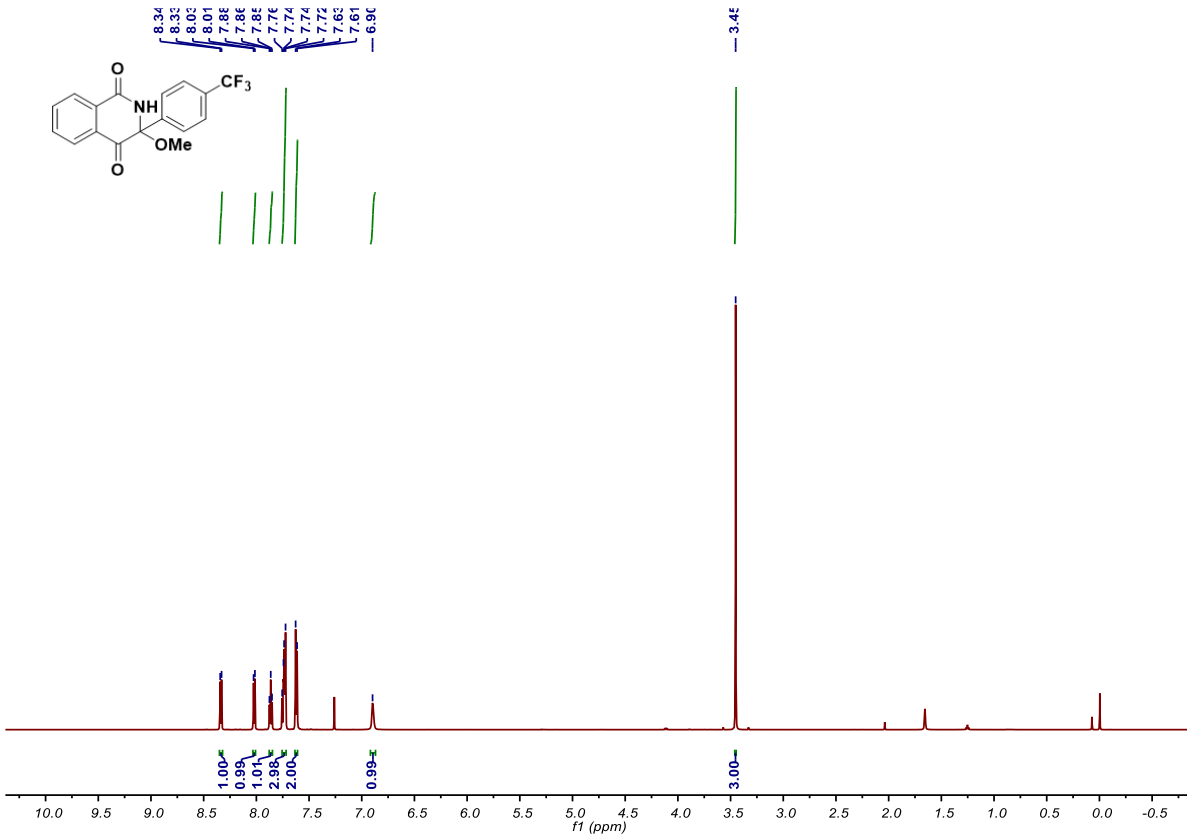
## 4-(3-methoxy-1,4-dioxo-1,2,3,4-tetrahydroisoquinolin-3-yl)benzonitrile (28)

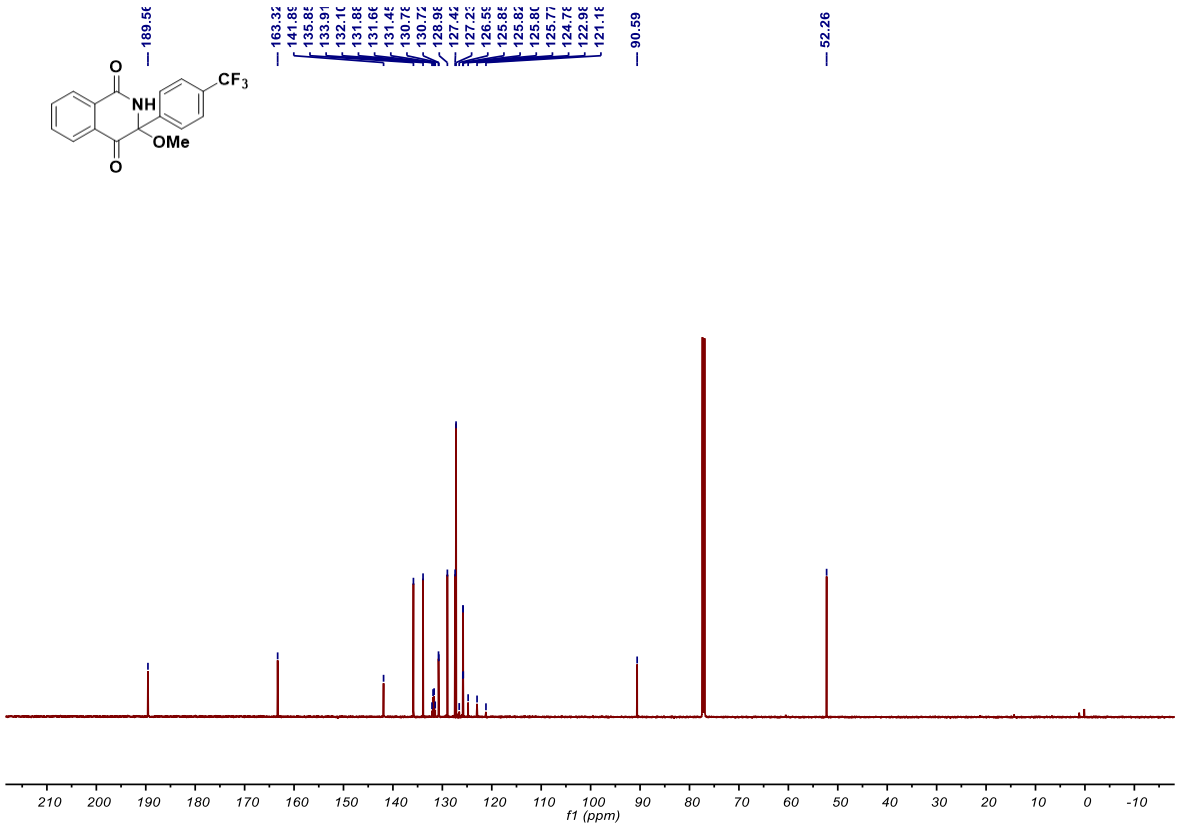


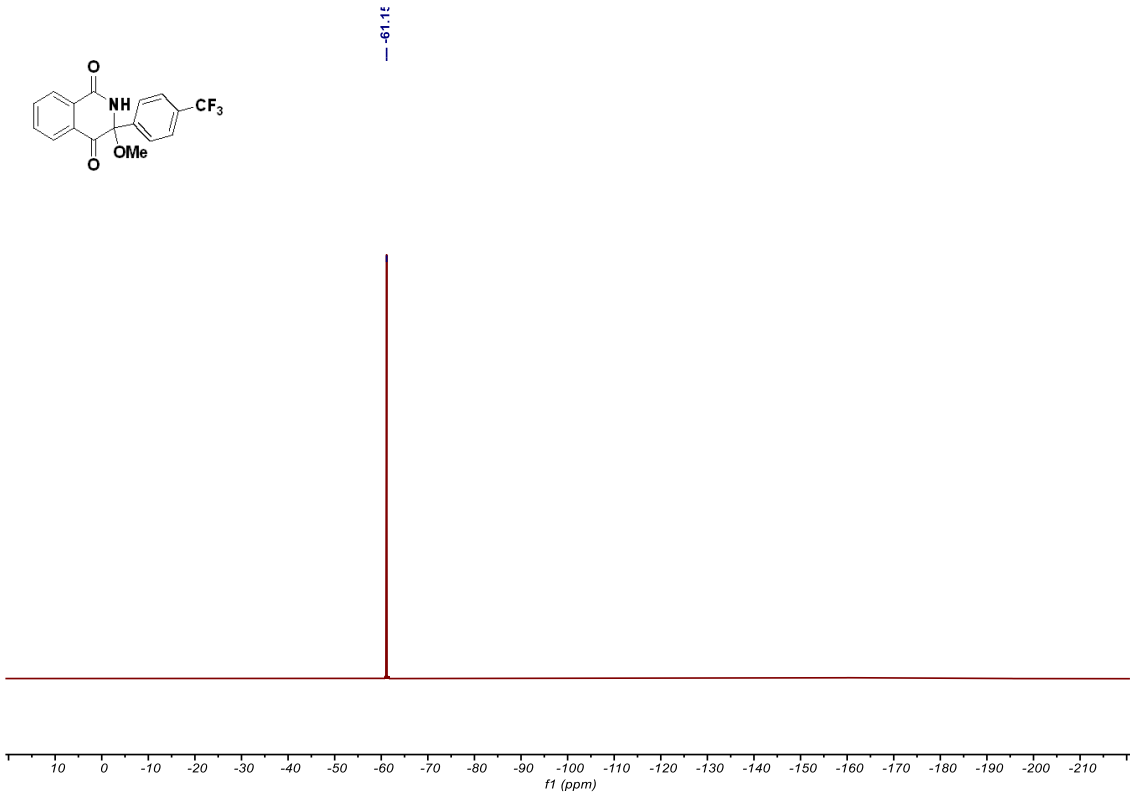



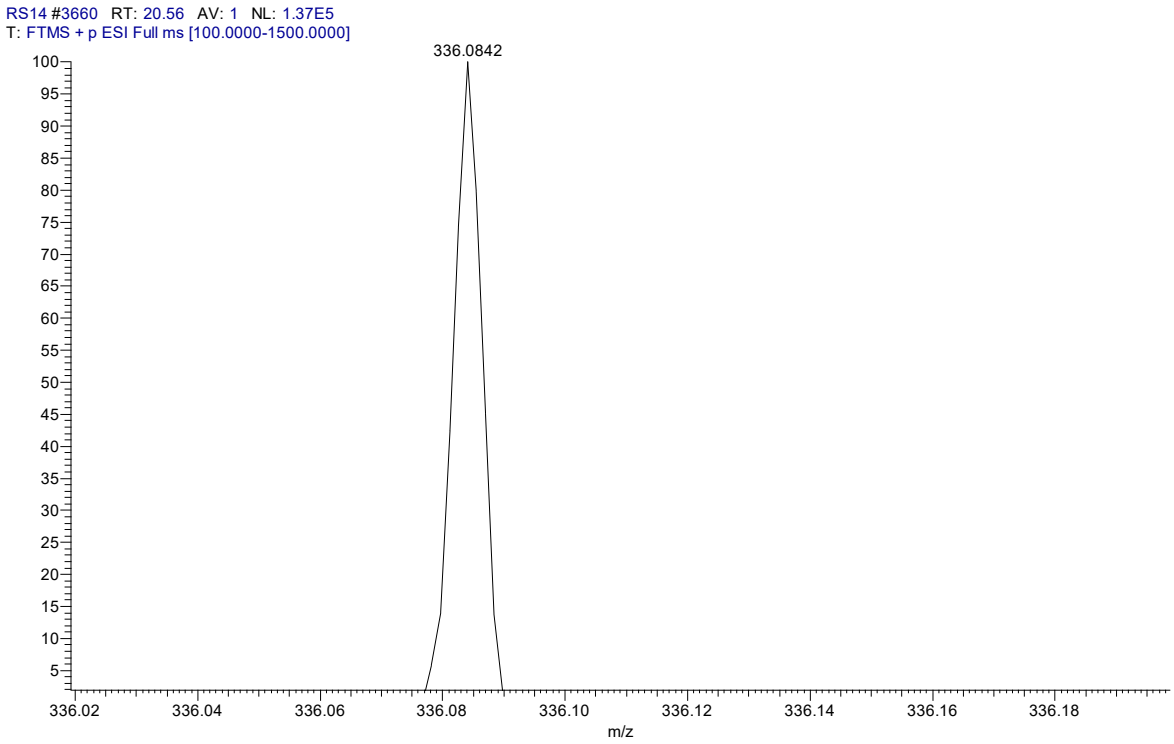



**3-methoxy-3-(4-(trifluoromethyl)phenyl)-2,3-dihydroisoquinoline-1,4-dione (29)**

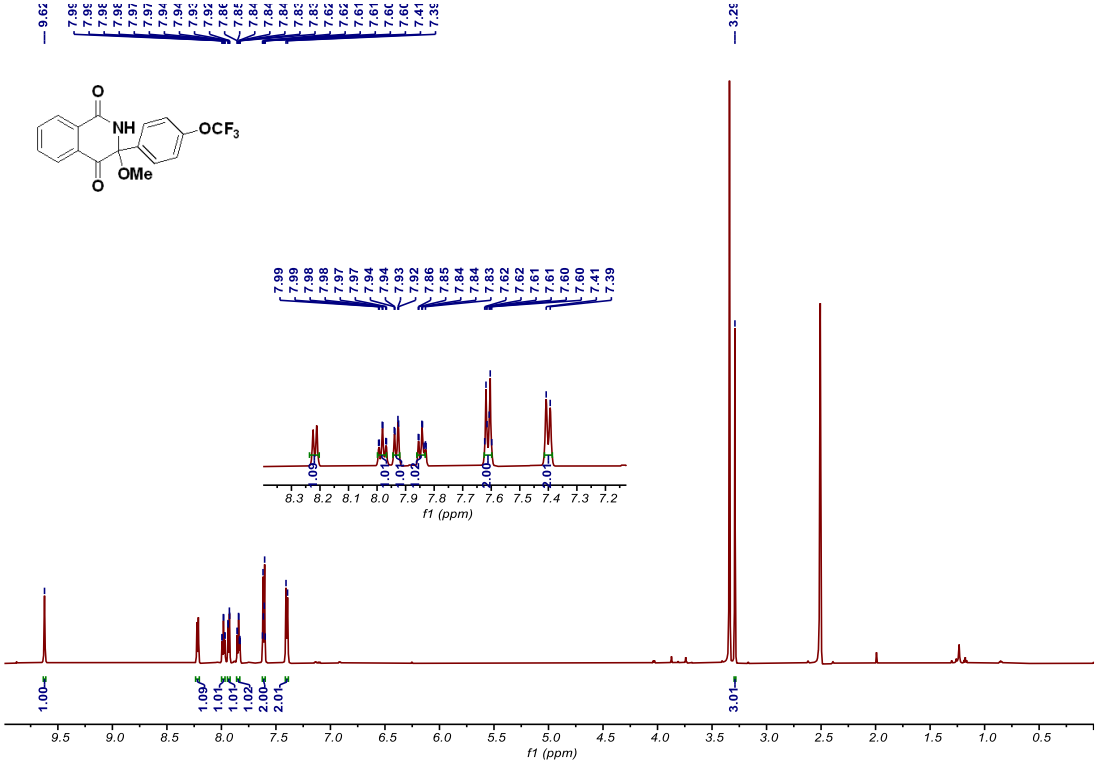


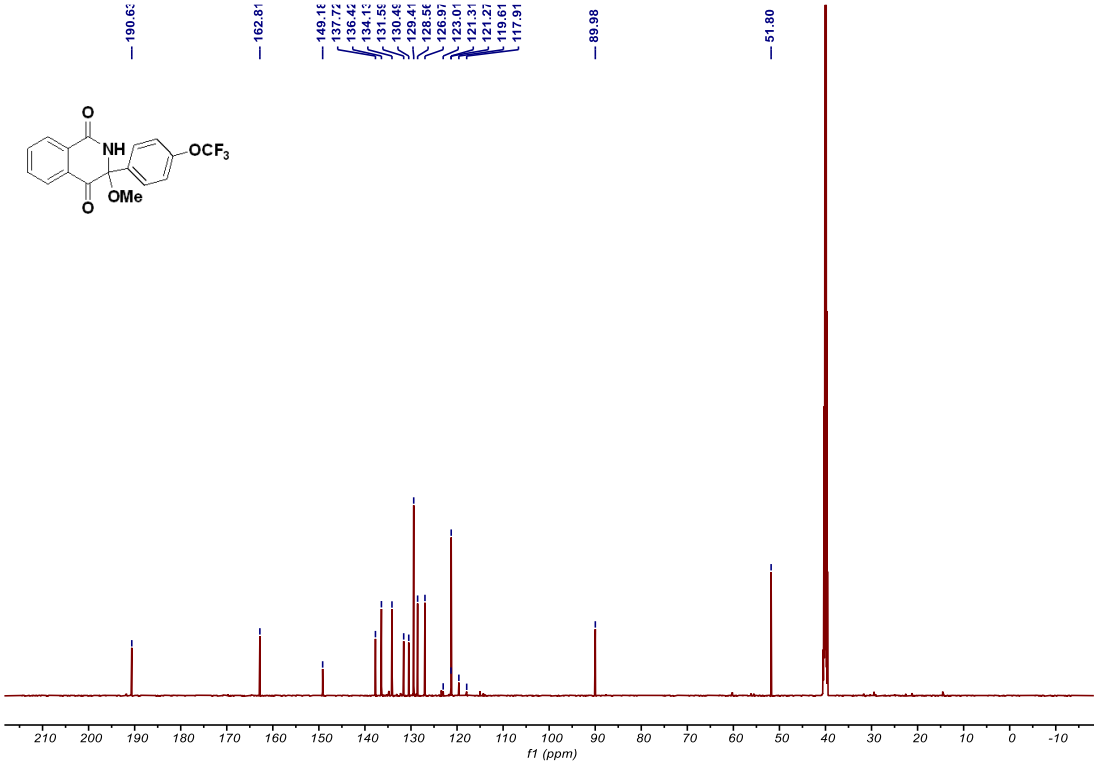

189.56
163.32
141.85
135.85
133.91
132.10
131.88
131.66
131.44
130.77
130.72
128.93
127.44
127.23
126.55
125.88
125.85
125.80
125.77
124.78
122.98
121.18
90.59
52.26
O
NH
CF3
OMe
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

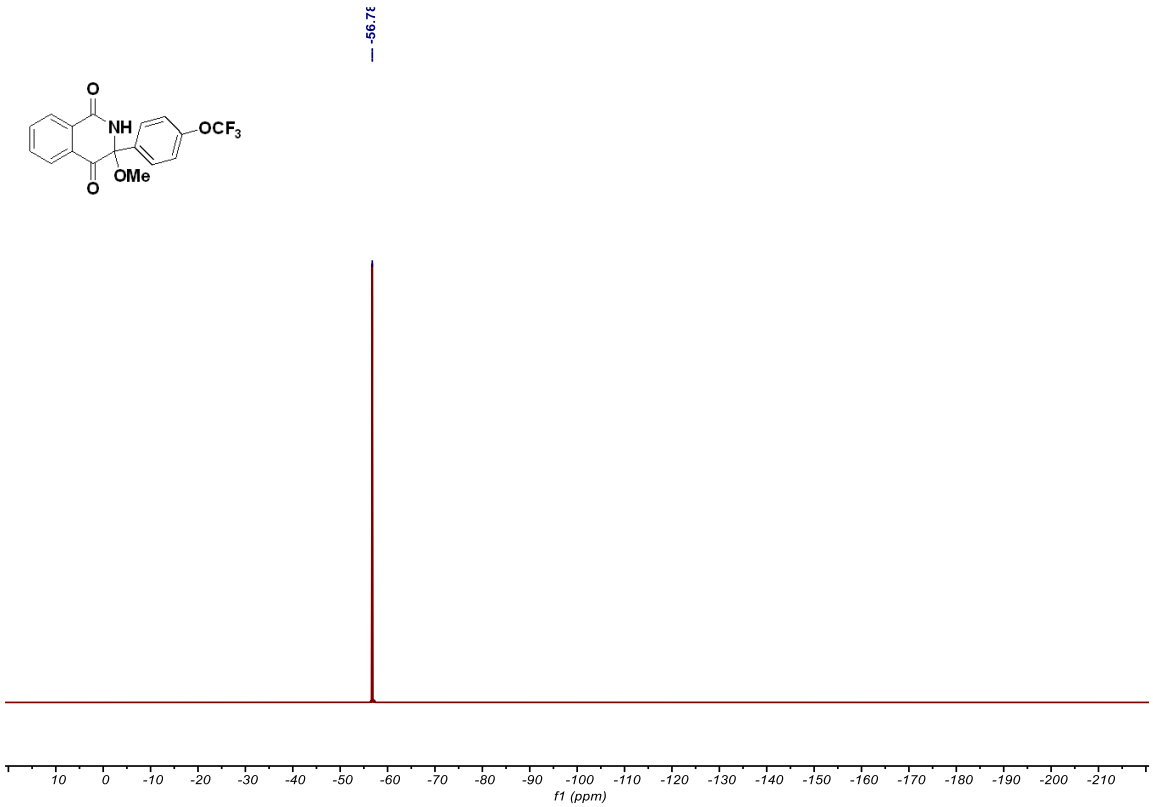

-61.15
O
NH
CF3
OMe
O
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

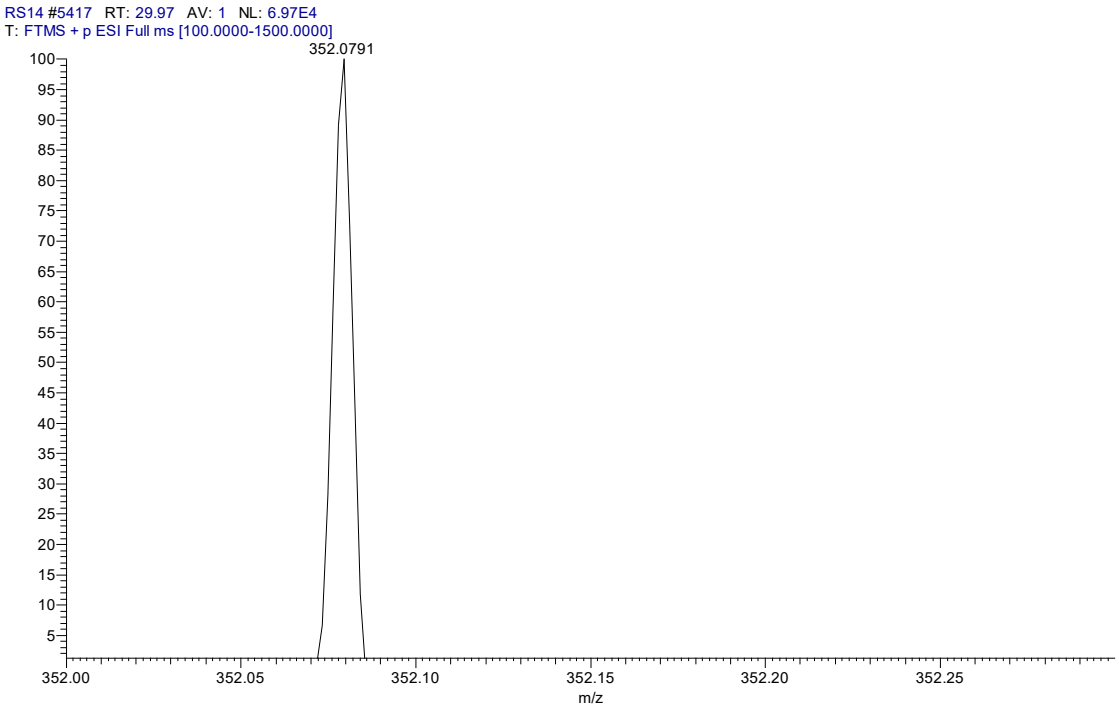



## 3-methoxy-3-(4-(trifluoromethoxy)phenyl)-2,3-dihydroisoquinoline-1,4-dione (30)

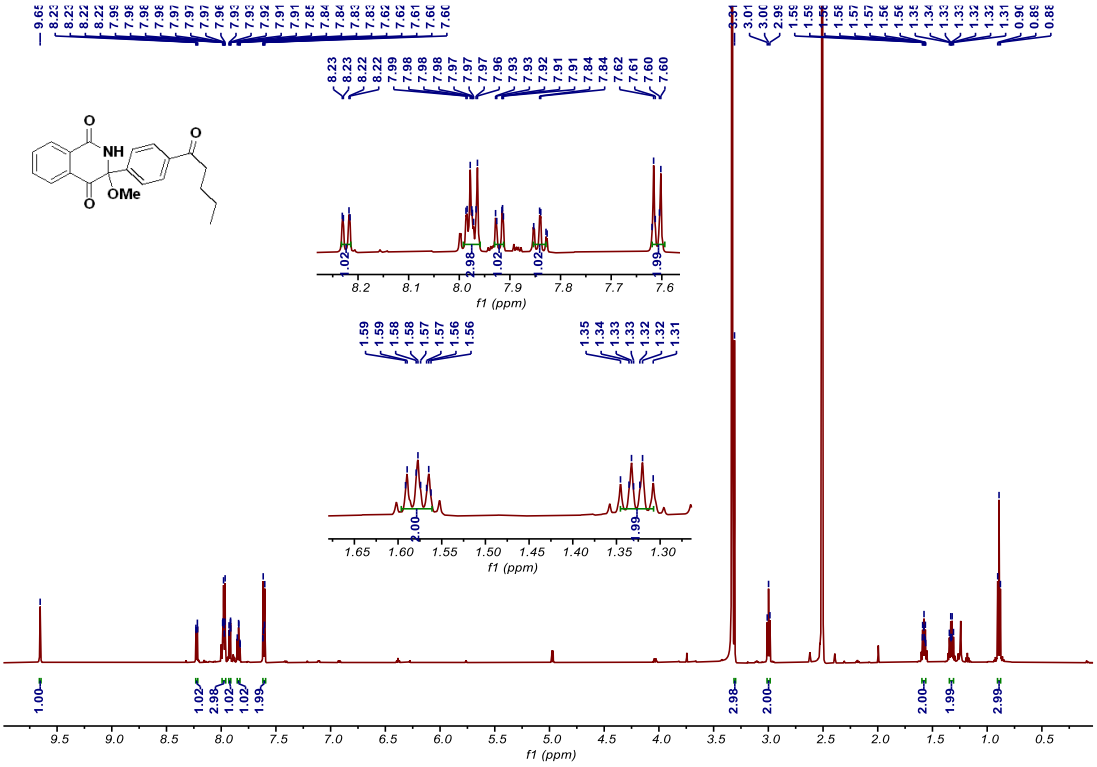


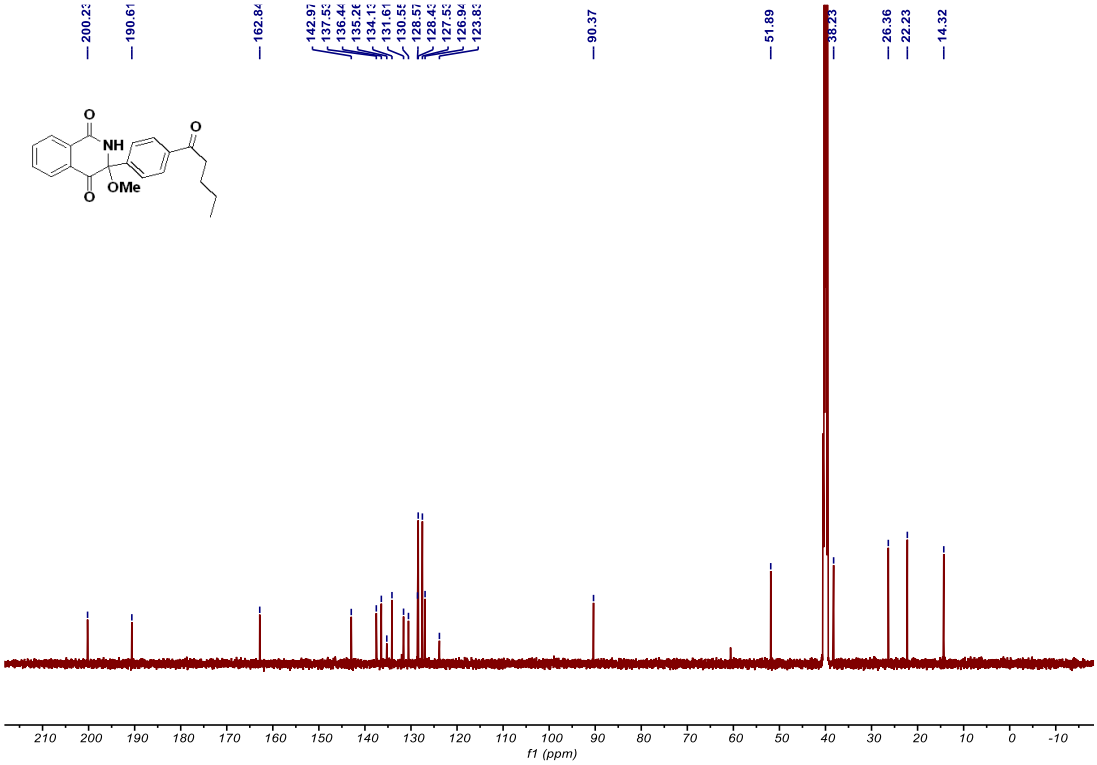

190.63
162.81
149.18
137.77
136.42
134.13
131.58
130.48
129.41
128.56
126.97
123.01
121.31
121.27
119.61
117.91
89.98
51.80
O
NH
OCF3
OMe
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

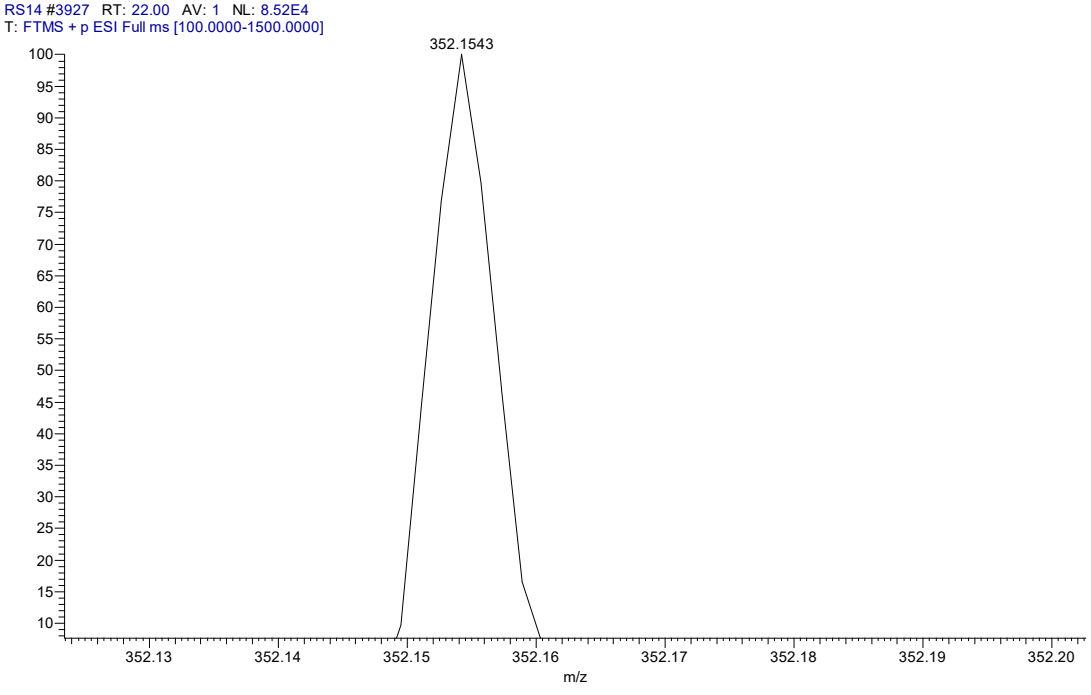

-56.78
O
NH
OCF3
OMe
O
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)



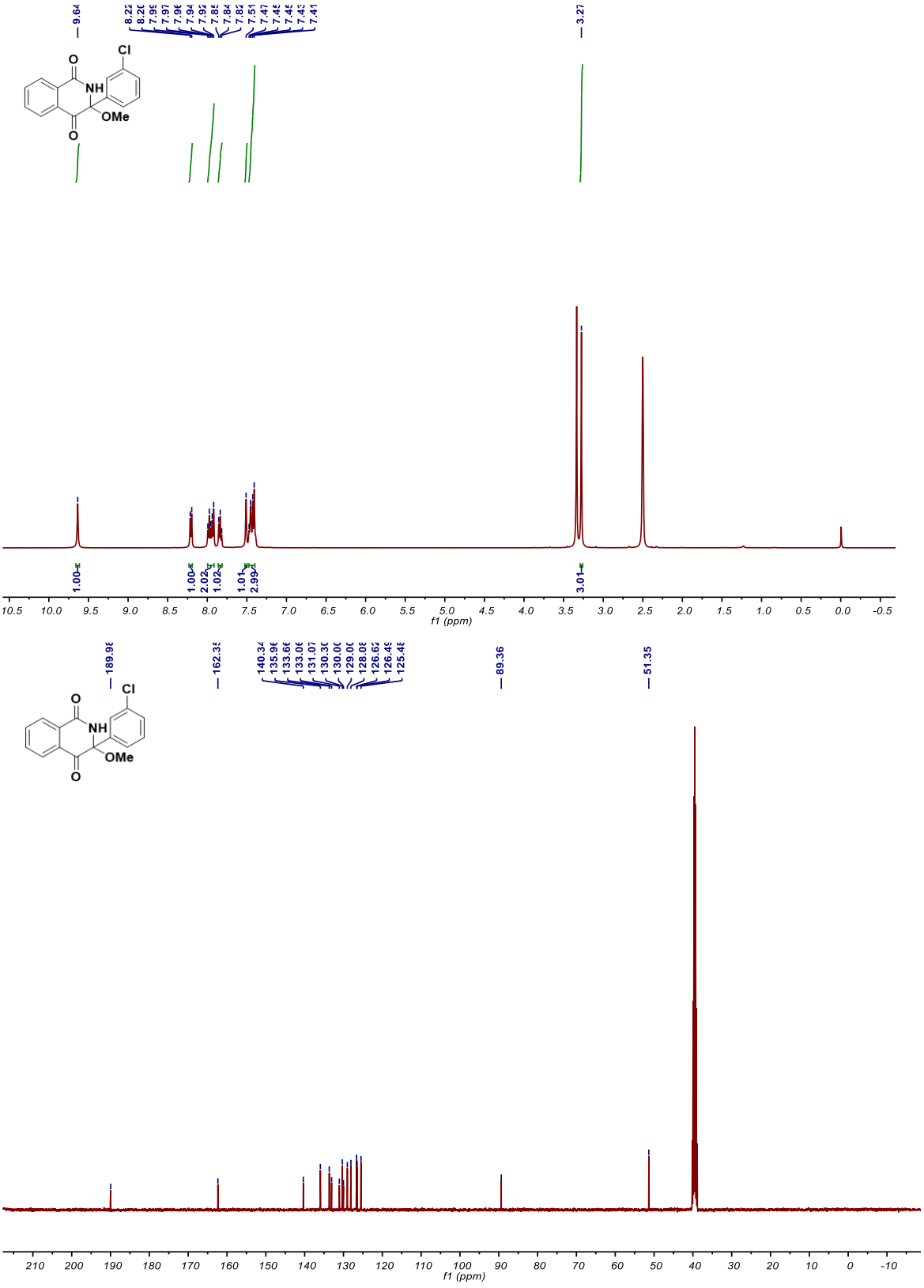

## 3-methoxy-3-(4-pentanoylphenyl)-2,3-dihydroisoquinoline-1,4-dione (31)

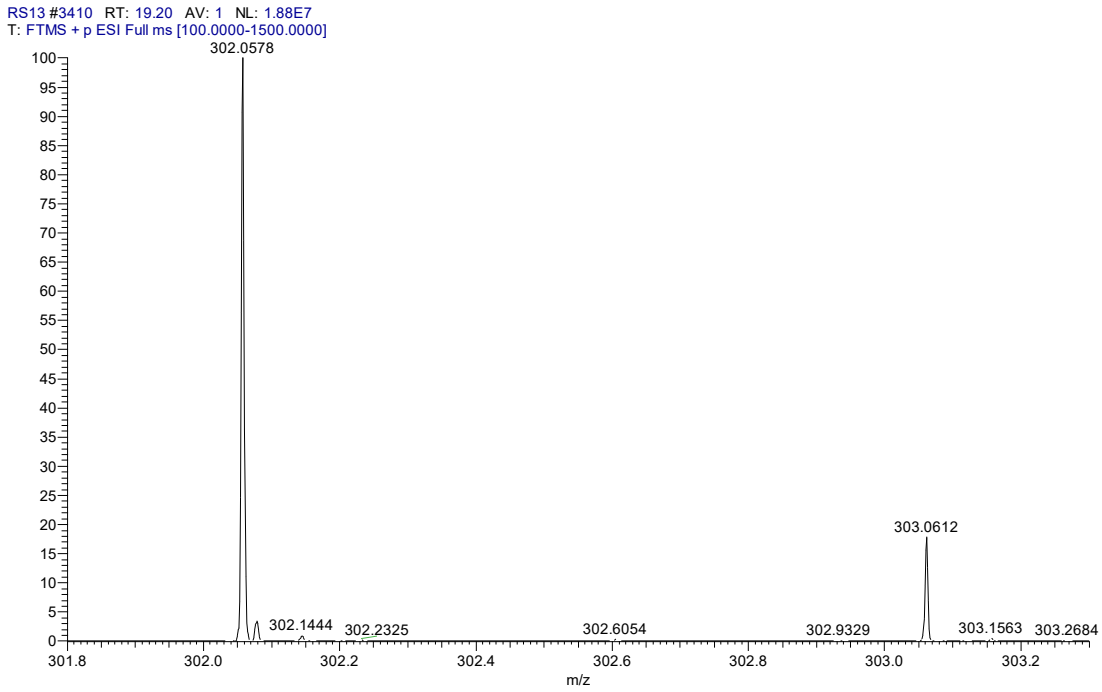



200.23
190.61
162.84
142.97
137.53
136.44
135.26
134.13
131.61
130.55
128.51
128.43
127.53
126.94
123.83
90.37
51.89
38.23
26.36
22.23
14.32
O
NH
O
OMe
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

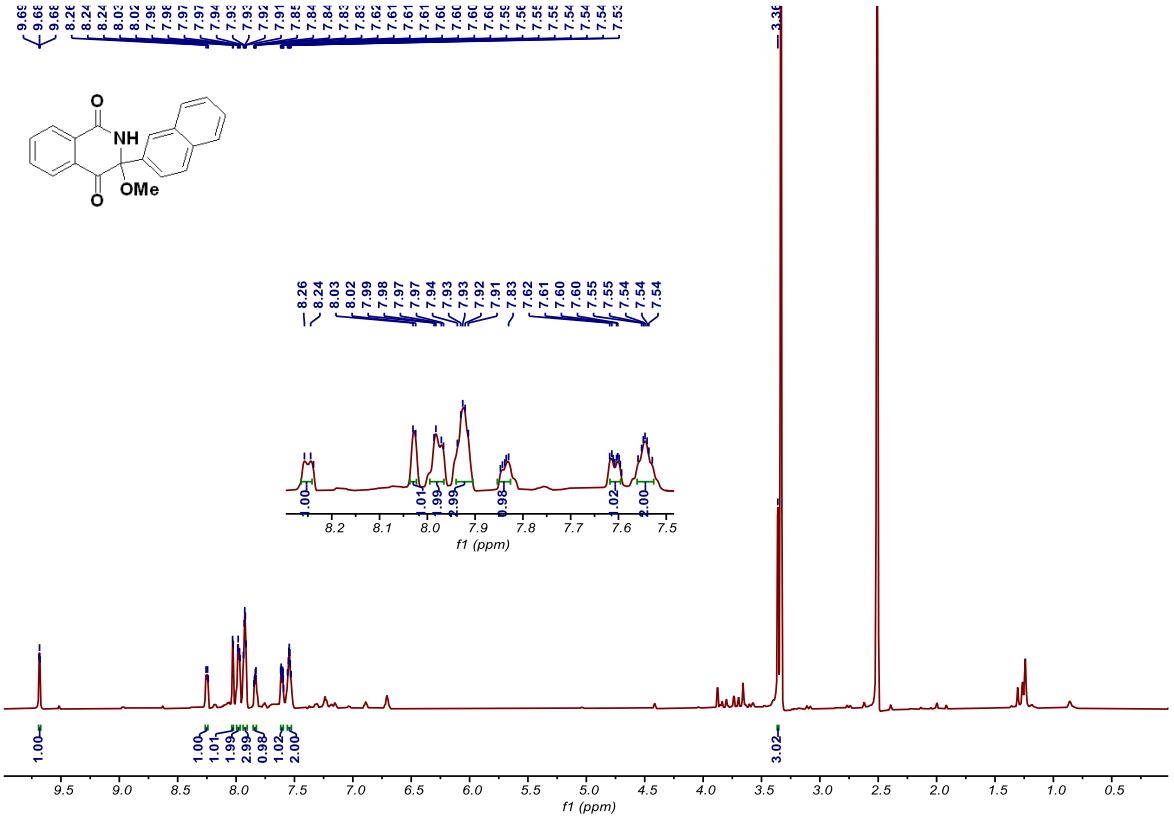

RS14 #3927 RT: 22.00 AV: 1 NL: 8.52E4
T: FTMS + p ESI Full ms [100.0000-1500.0000]
352.1543
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
352.13
352.14
352.15
352.16
352.17
352.18
352.19
352.20
m/z

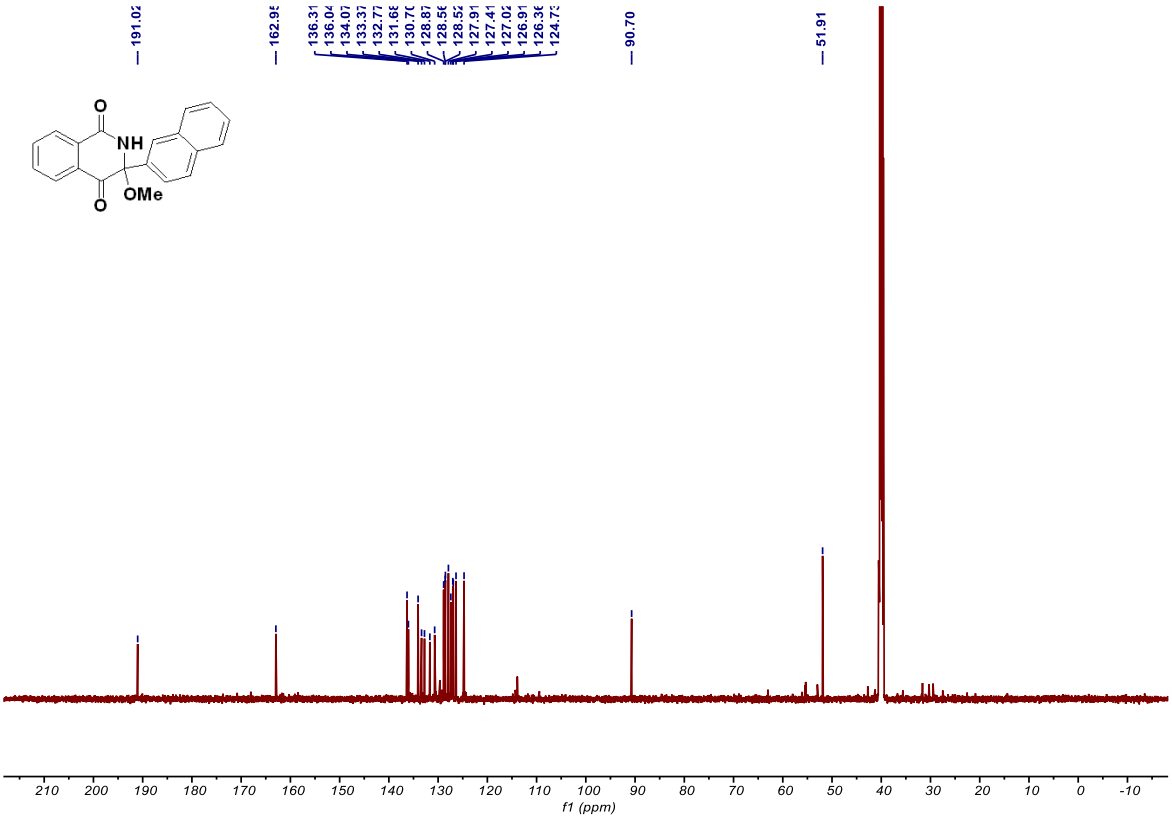
**3-(3-chlorophenyl)-3-methoxy-2,3-dihydroisoquinoline-1,4-dione (32)**

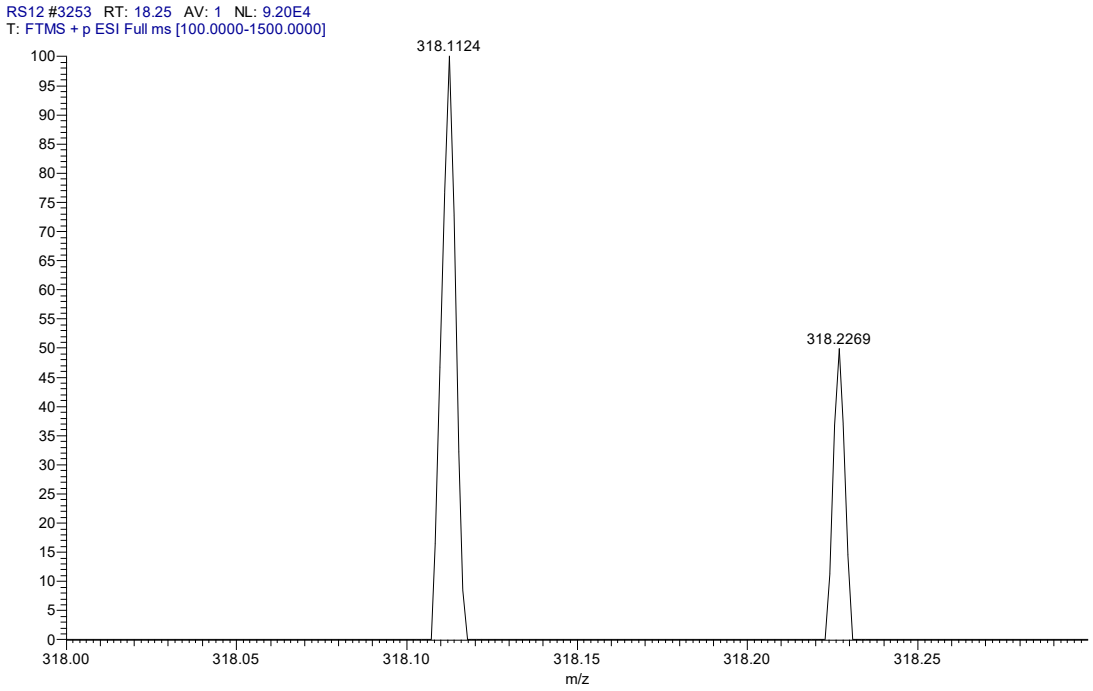




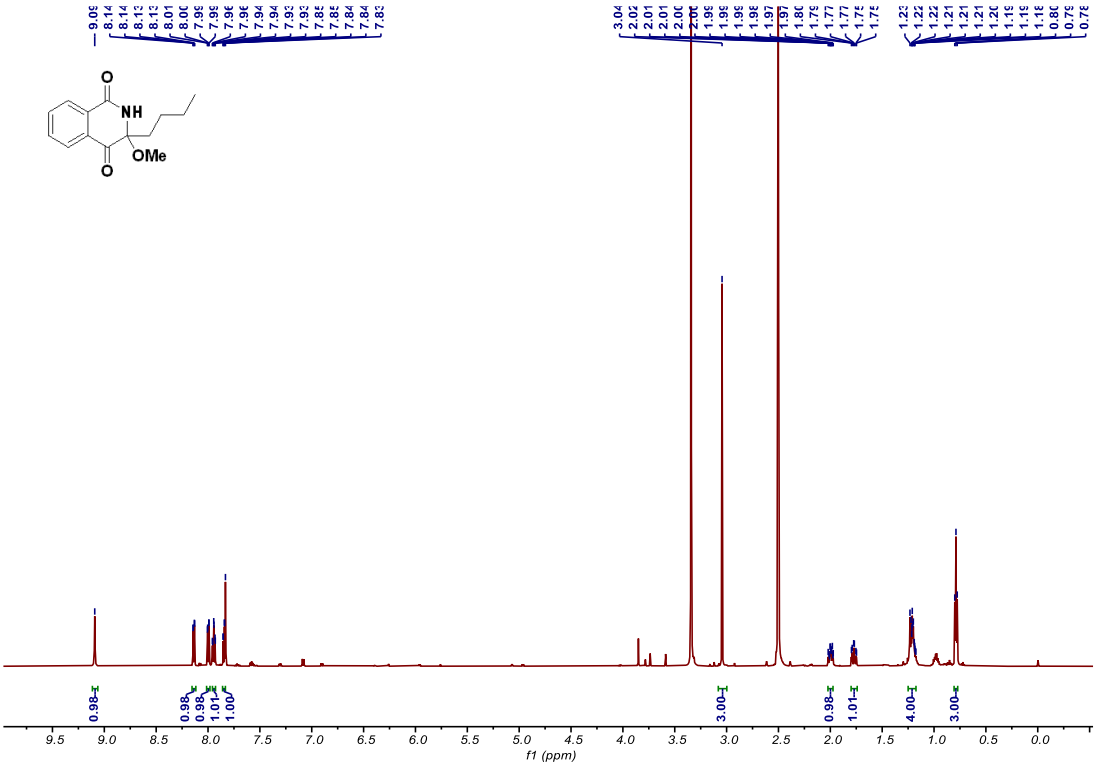

## 3-methoxy-3-(naphthalen-2-yl)-2,3-dihydroisoquinoline-1,4-dione (33)

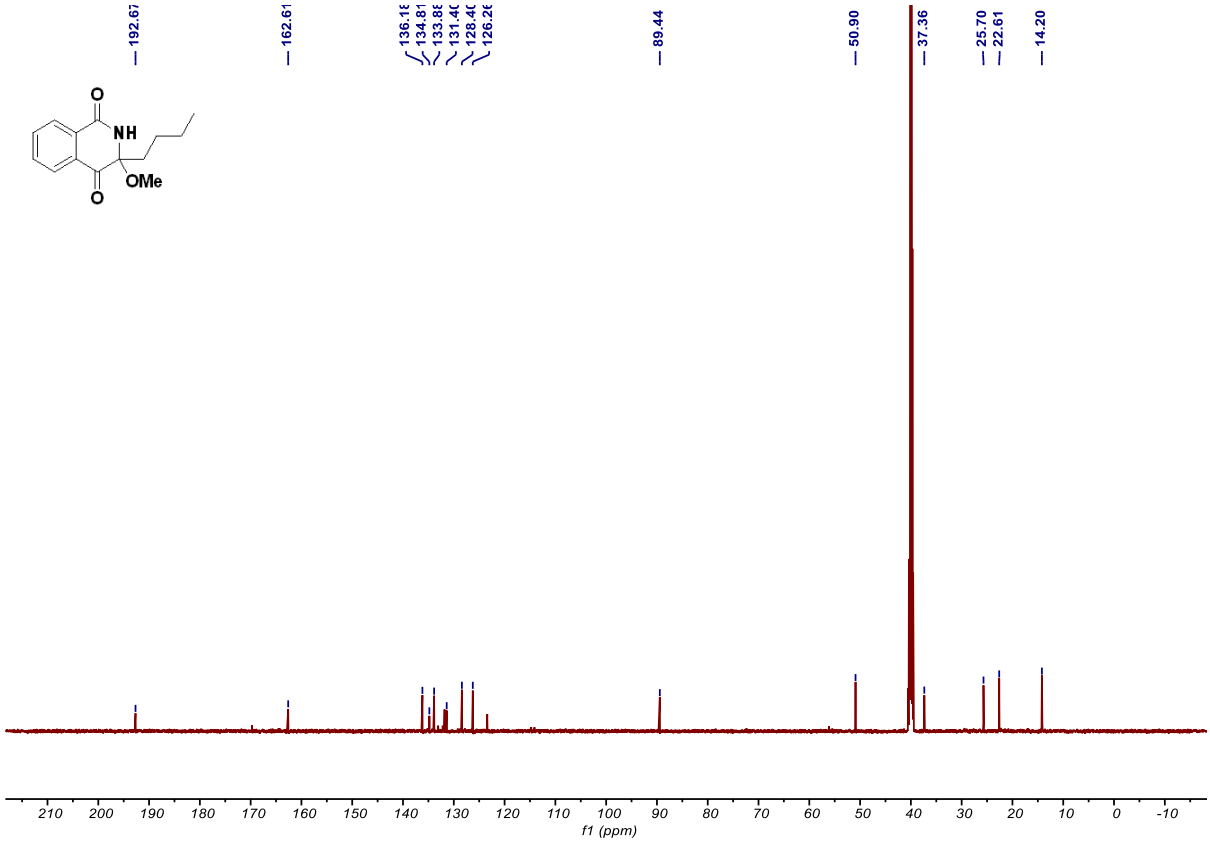


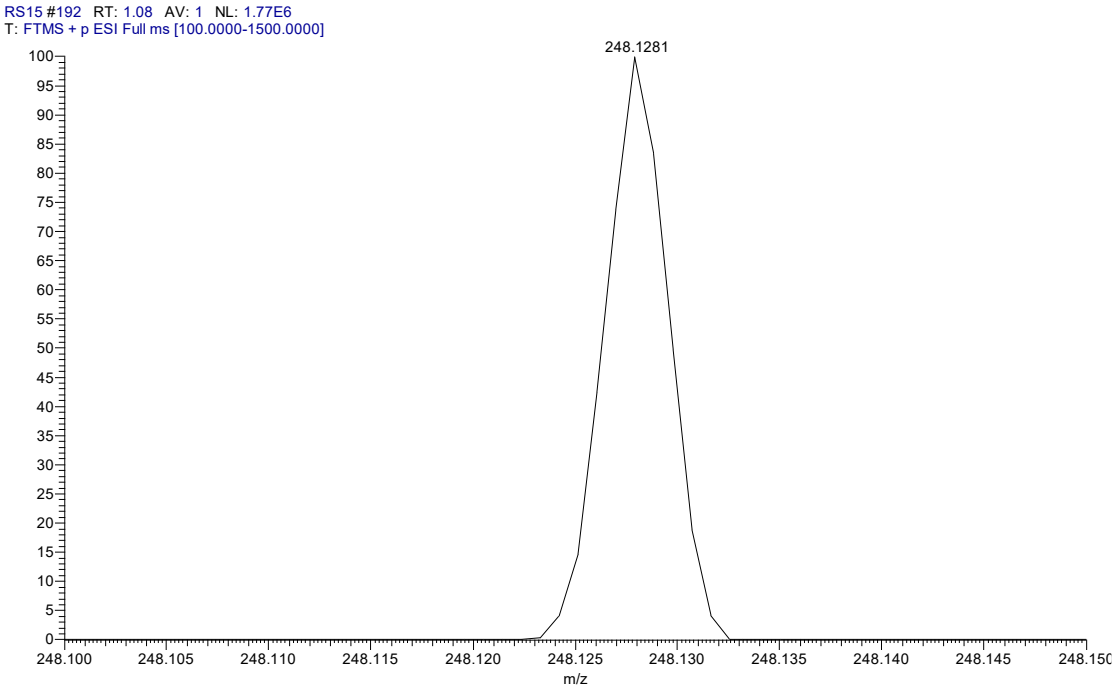

191.02
162.95
136.31
136.04
134.01
133.37
132.77
131.68
130.70
128.87
128.56
128.52
127.91
127.41
127.02
126.91
126.36
124.73
90.70
51.91
O
NH
OMe
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


RS12 #3253 RT: 18.25 AV: 1 NL: 9.20E4
T: FTMS + p ESI Full ms [100.0000-1500.0000]
318.1124
318.2269
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
318.00 318.05 318.10 318.15 318.20 318.25
m/z

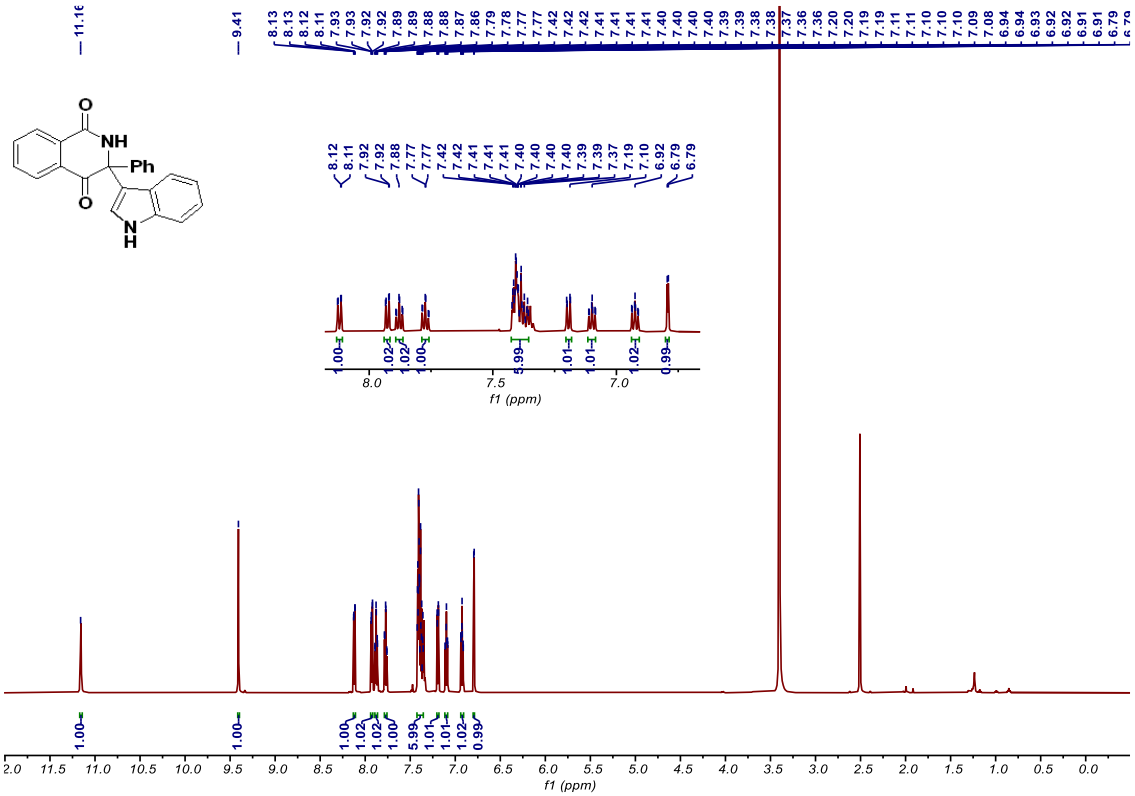
**3-butyl-3-methoxy-2,3-dihydroisoquinoline-1,4-dione(34)**

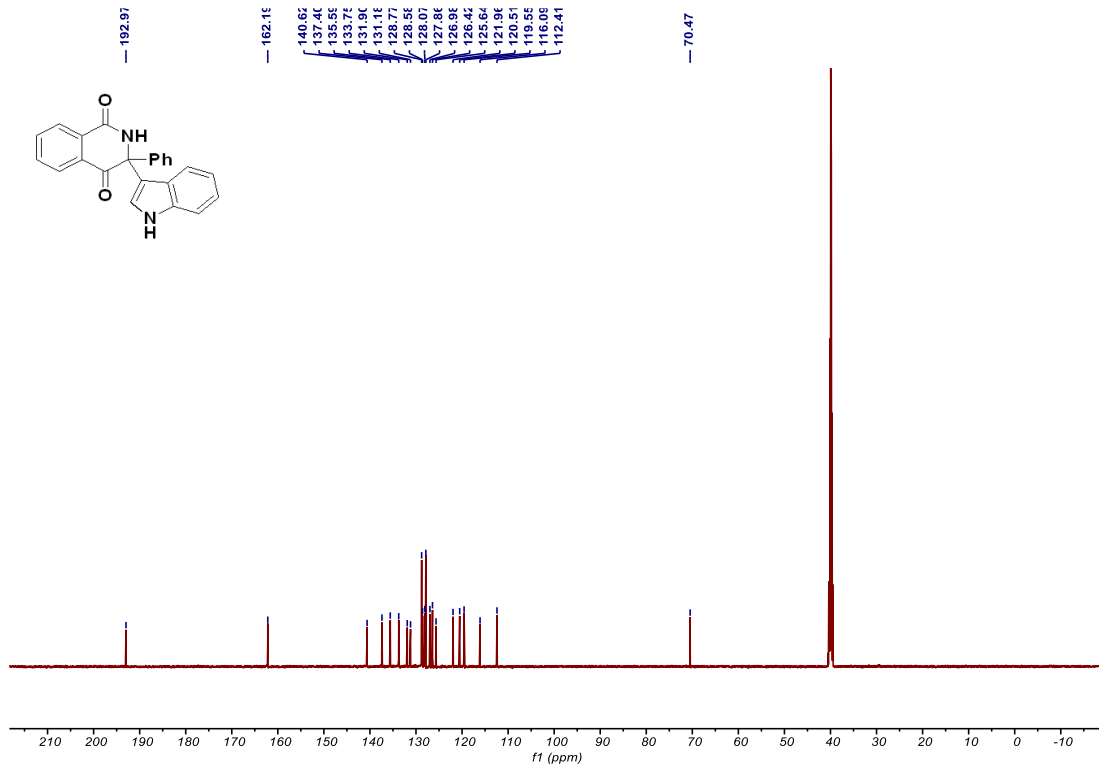


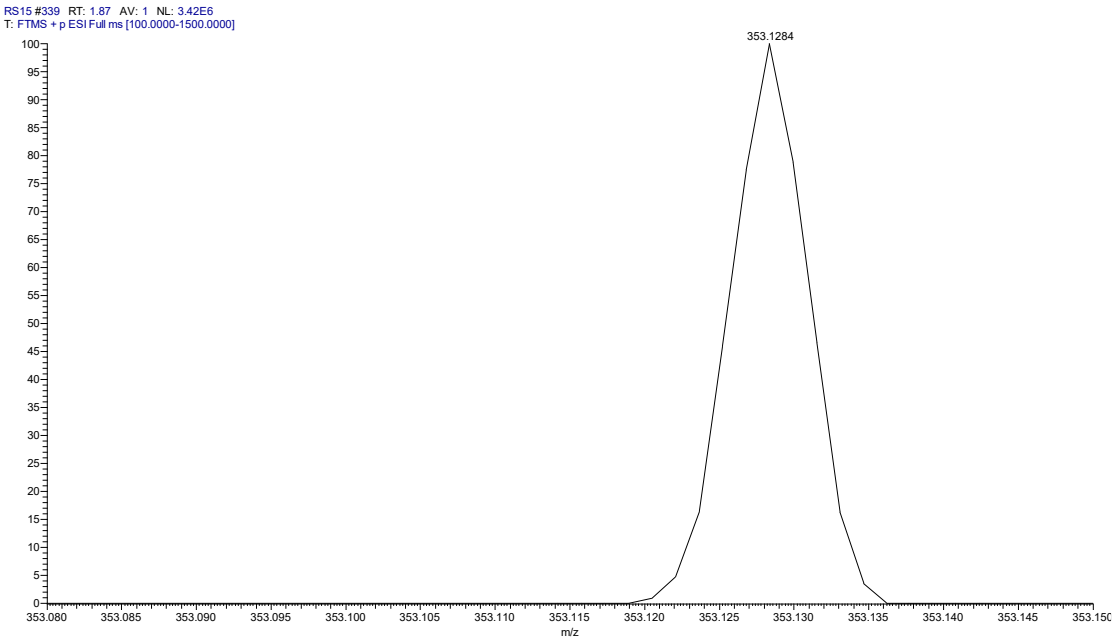





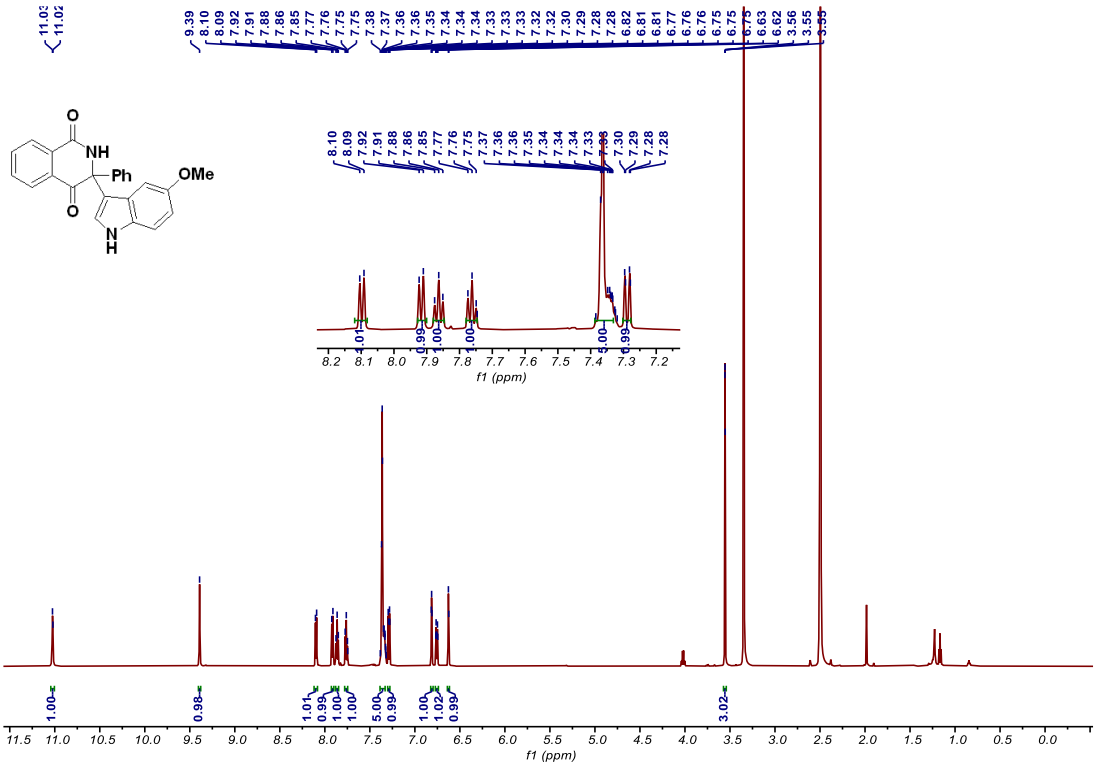

## 3-(1H-indol-3-yl)-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (37)

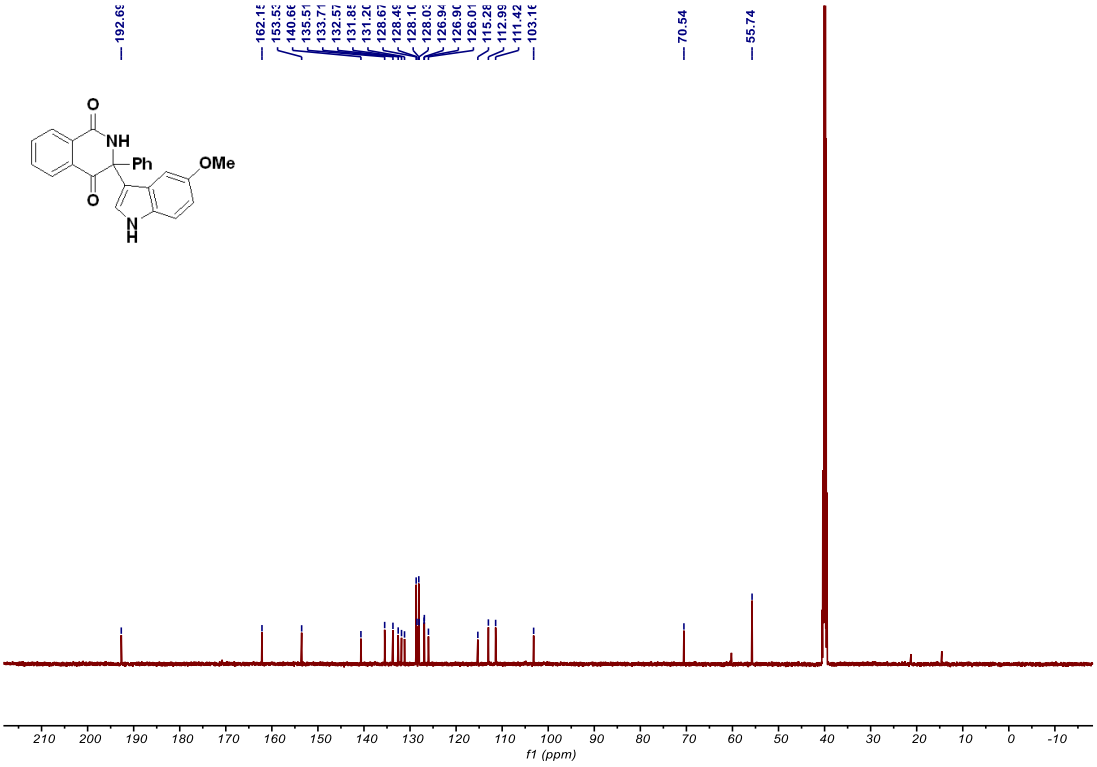



192.97
162.15
140.62
137.40
135.56
133.75
131.90
131.18
128.77
128.58
128.07
127.86
126.98
126.44
125.64
121.98
120.51
119.55
116.09
112.41
70.47
O
NH
Ph
O
N
H
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

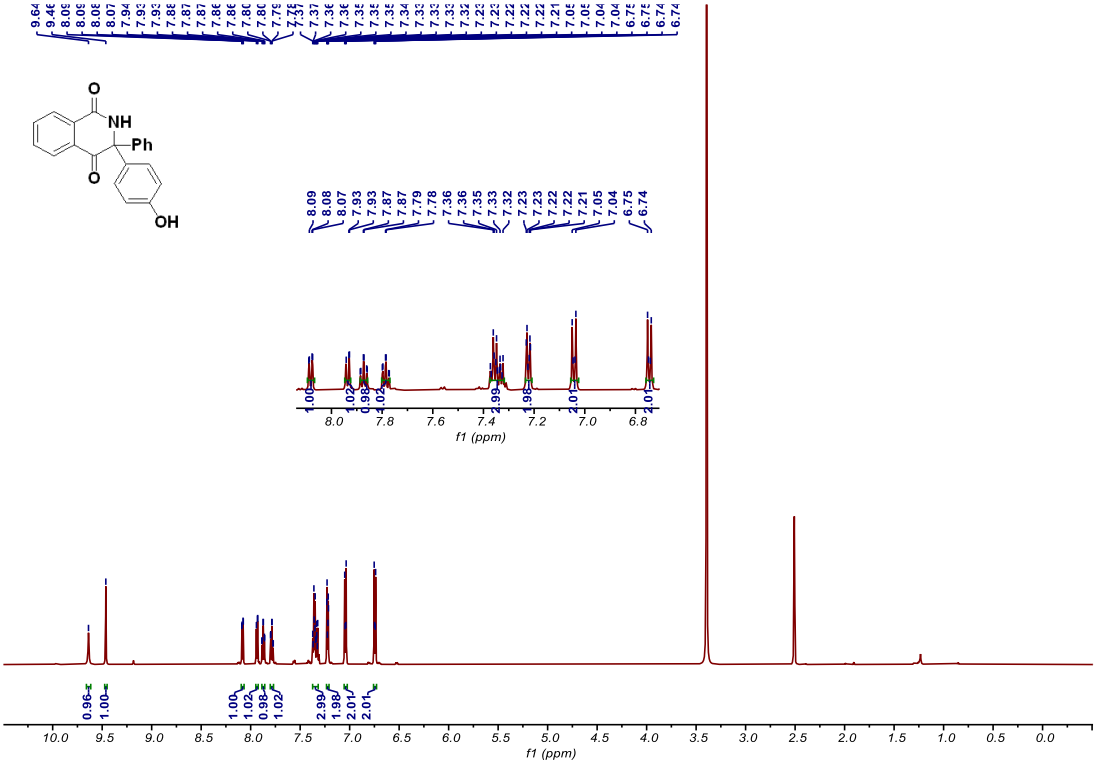

RS15 #339 RT: 1.87 AV: 1 NL: 3.42E6
T: FTMS + p ESI Full ms [100.0000-1500.0000]
353.1284
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
353.080 353.085 353.090 353.095 353.100 353.105 353.110 353.115 353.120 353.125 353.130 353.135 353.140 353.145 353.150
m/z

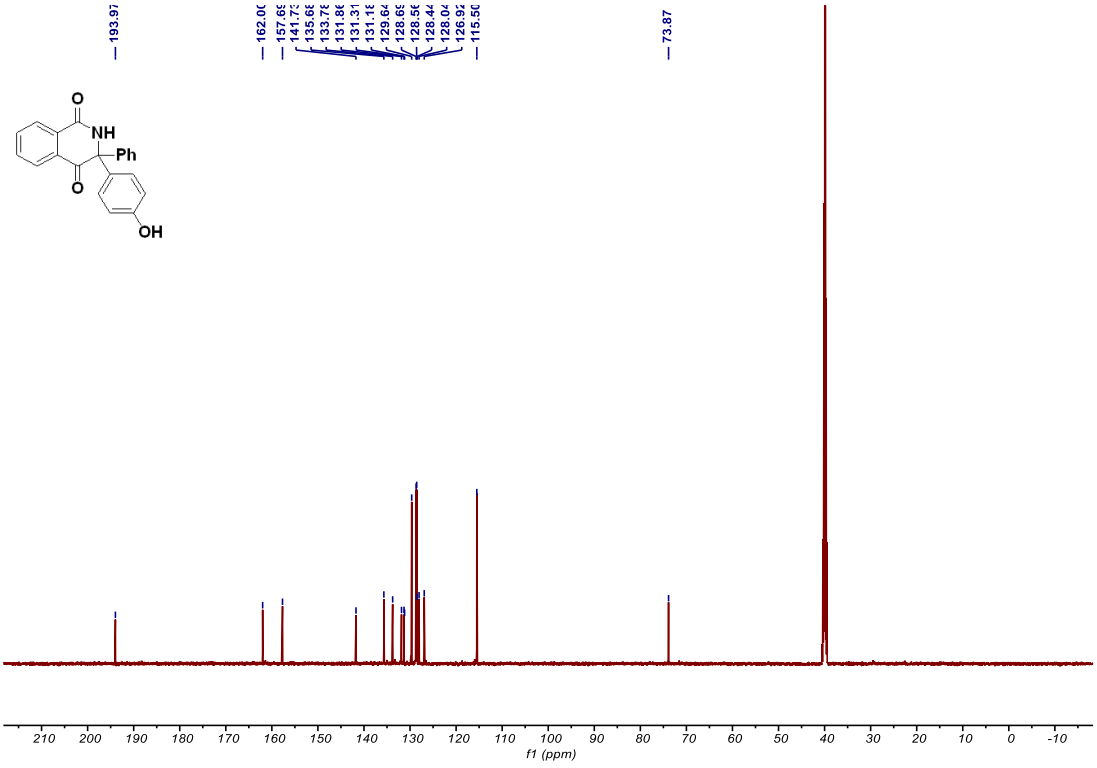
## 3-(5-methoxy-1H-indol-3-yl)-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (38)

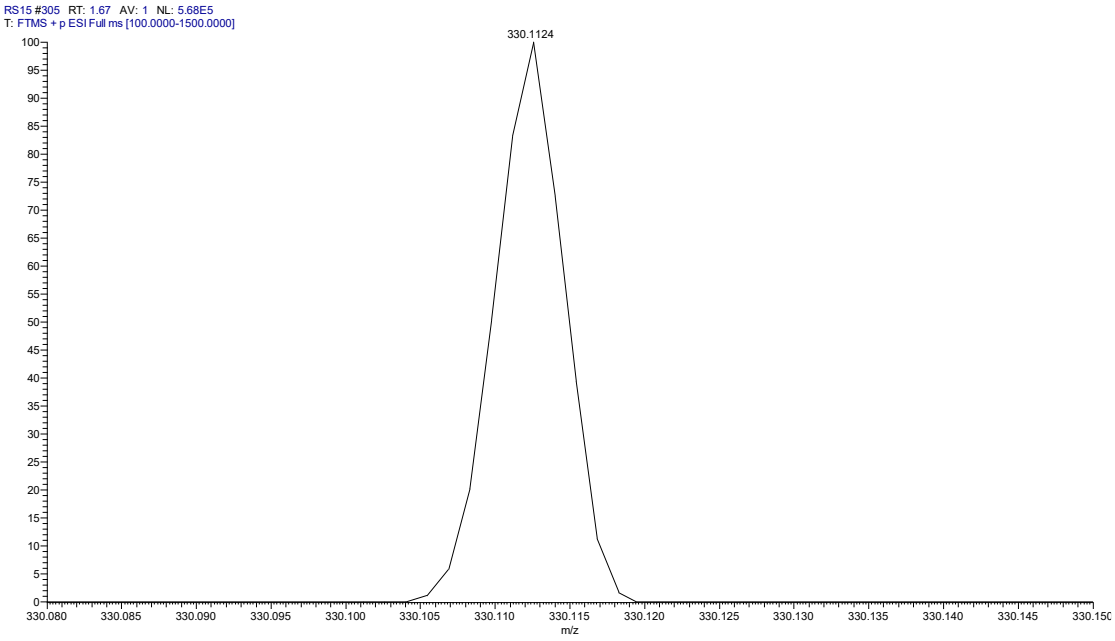


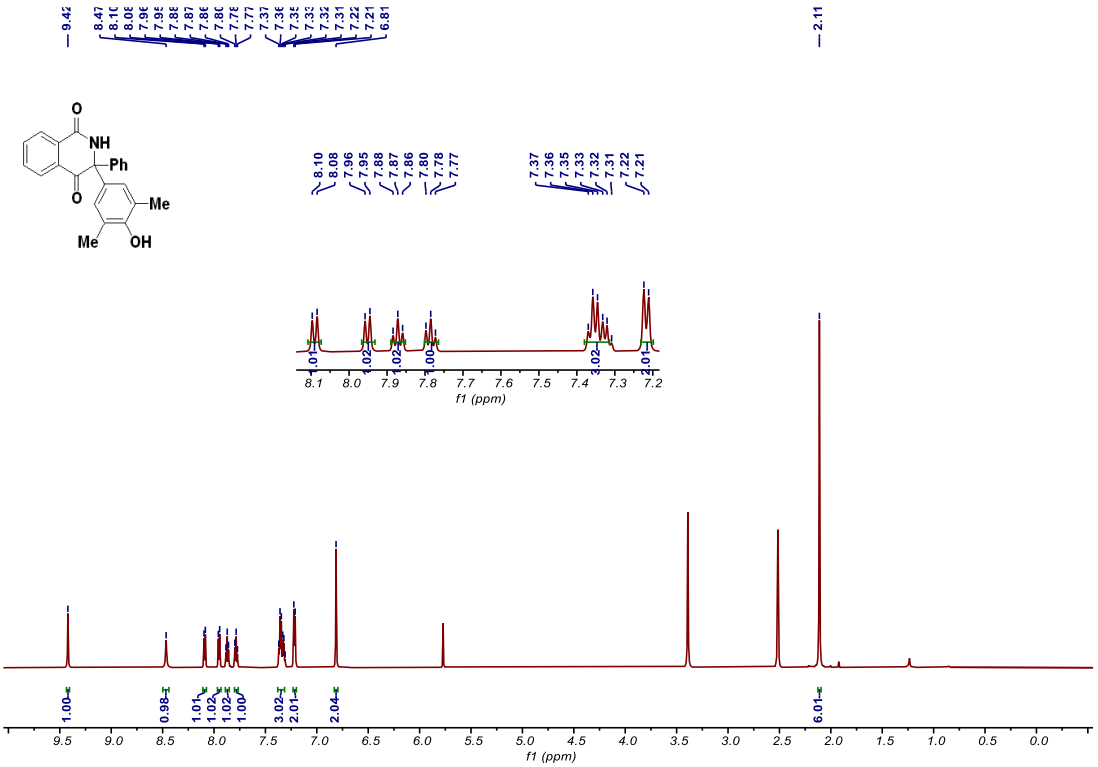
## 3-(4-hydroxyphenyl)-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (39)

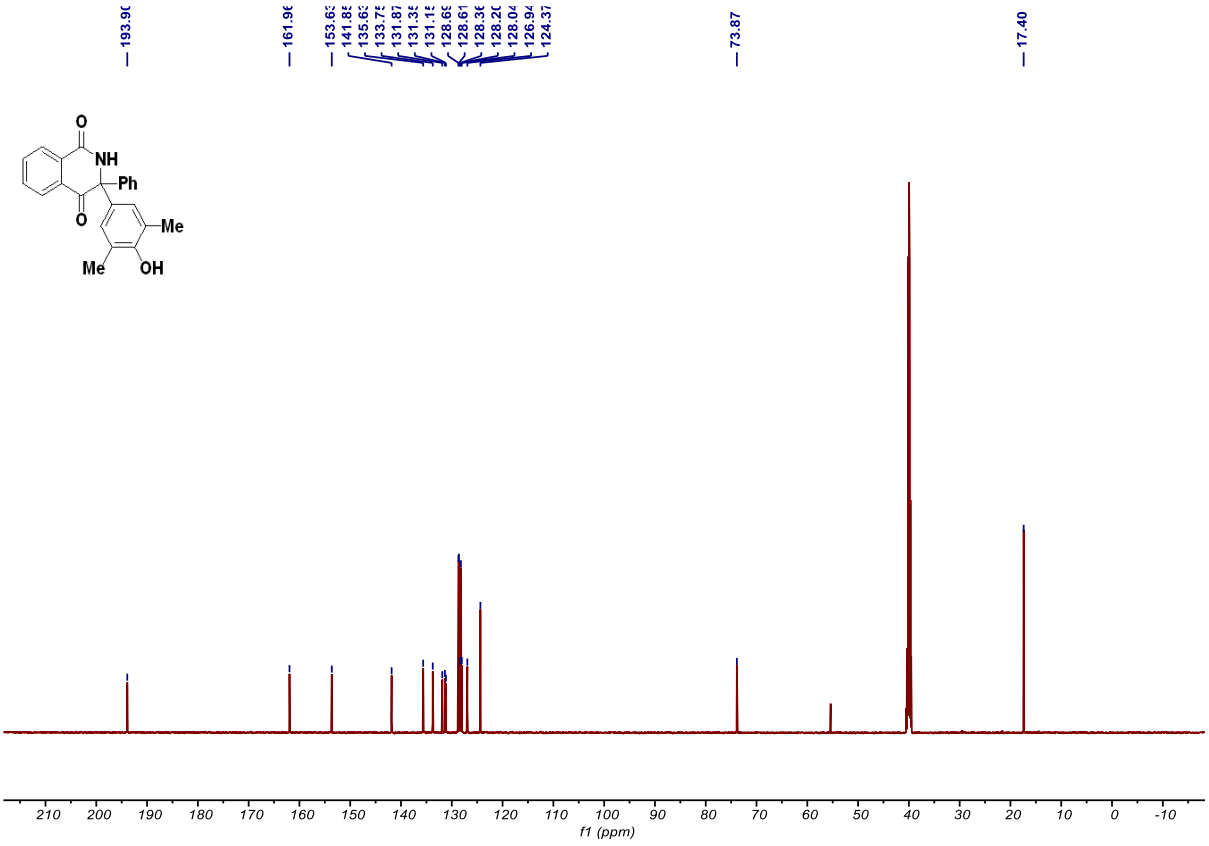


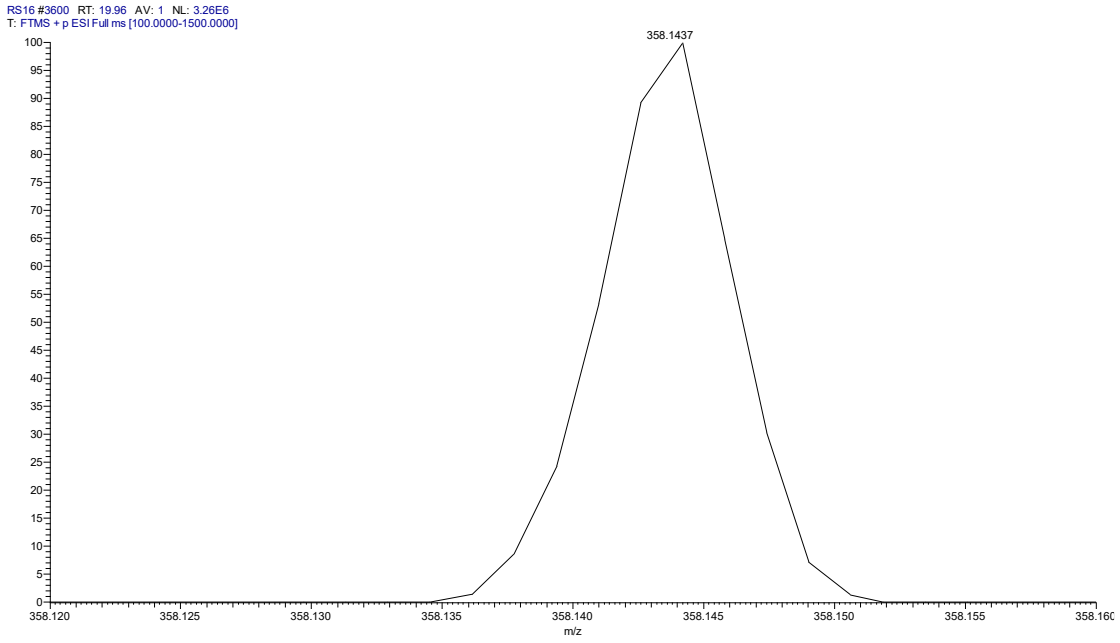





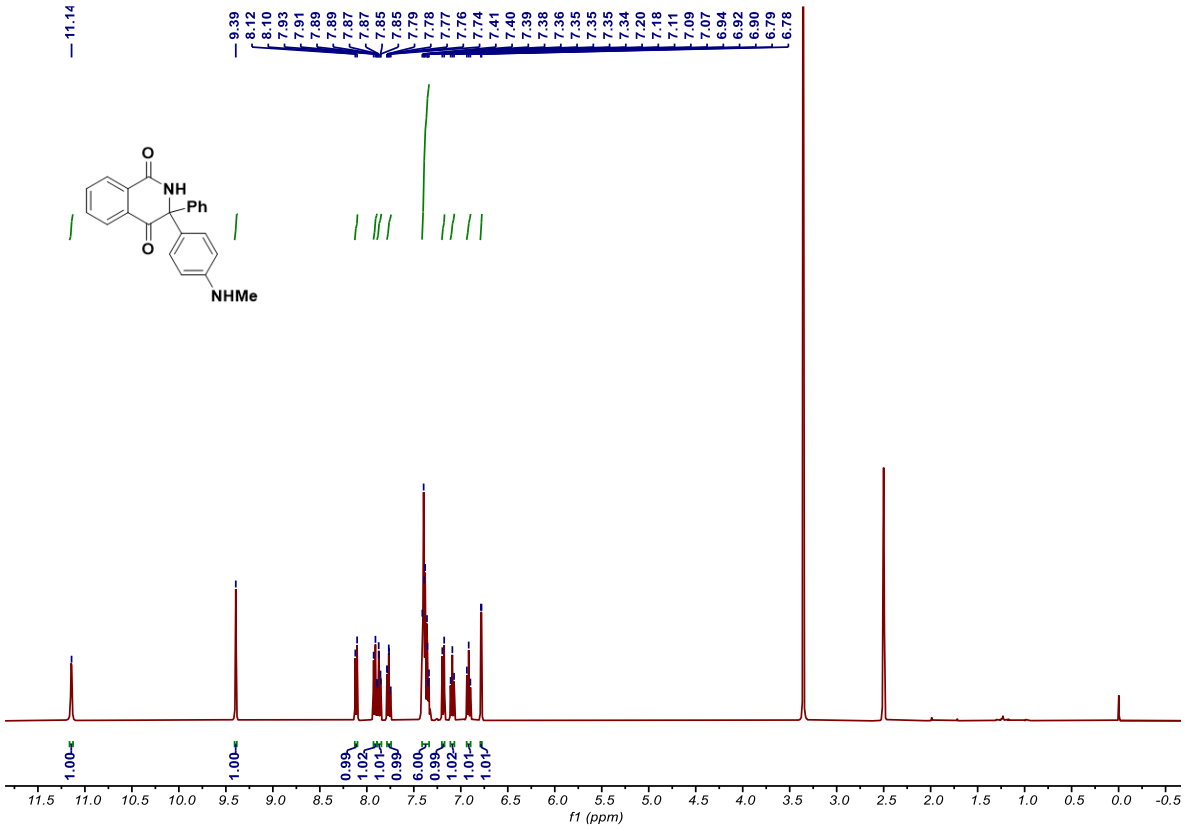

## 3-(4-hydroxy-3,5-dimethylphenyl)-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (40)

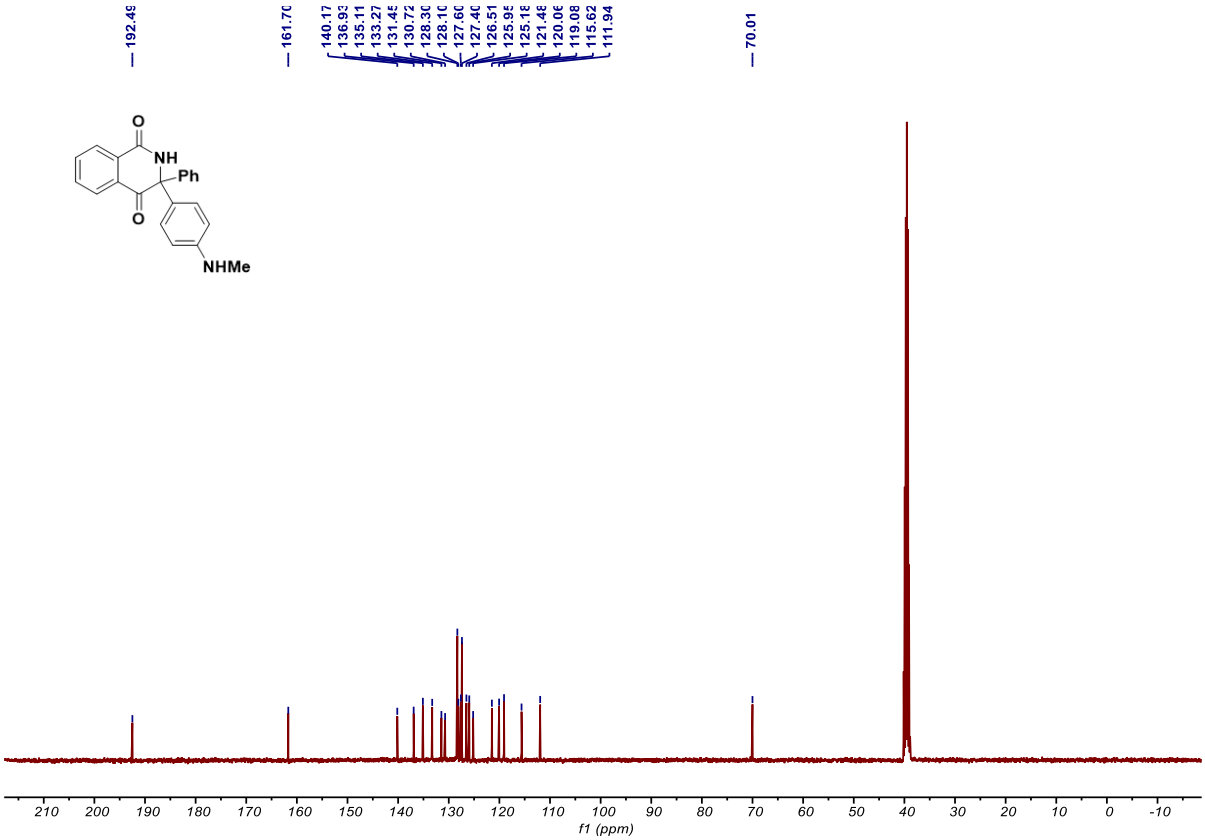


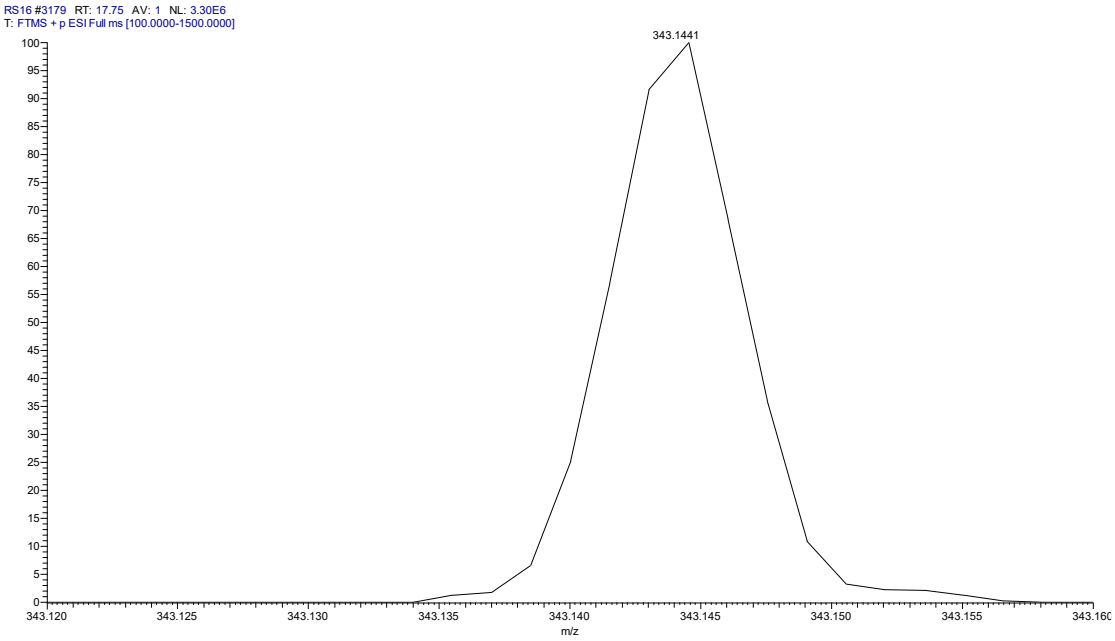

193.90
161.98
153.63
141.85
135.62
133.78
131.87
131.35
131.15
128.68
128.61
128.36
128.20
128.04
126.94
124.37
73.87
17.40
O
NH
Ph
O
Me
Me
OH
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


RS16 #3600 RT: 19.96 AV: 1 NL: 3.26E6
T: FTMS + p ESI Full ms [100.0000-1500.0000]
358.1437
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
358.120 358.125 358.130 358.135 358.140 358.145 358.150 358.155 358.160
m/z

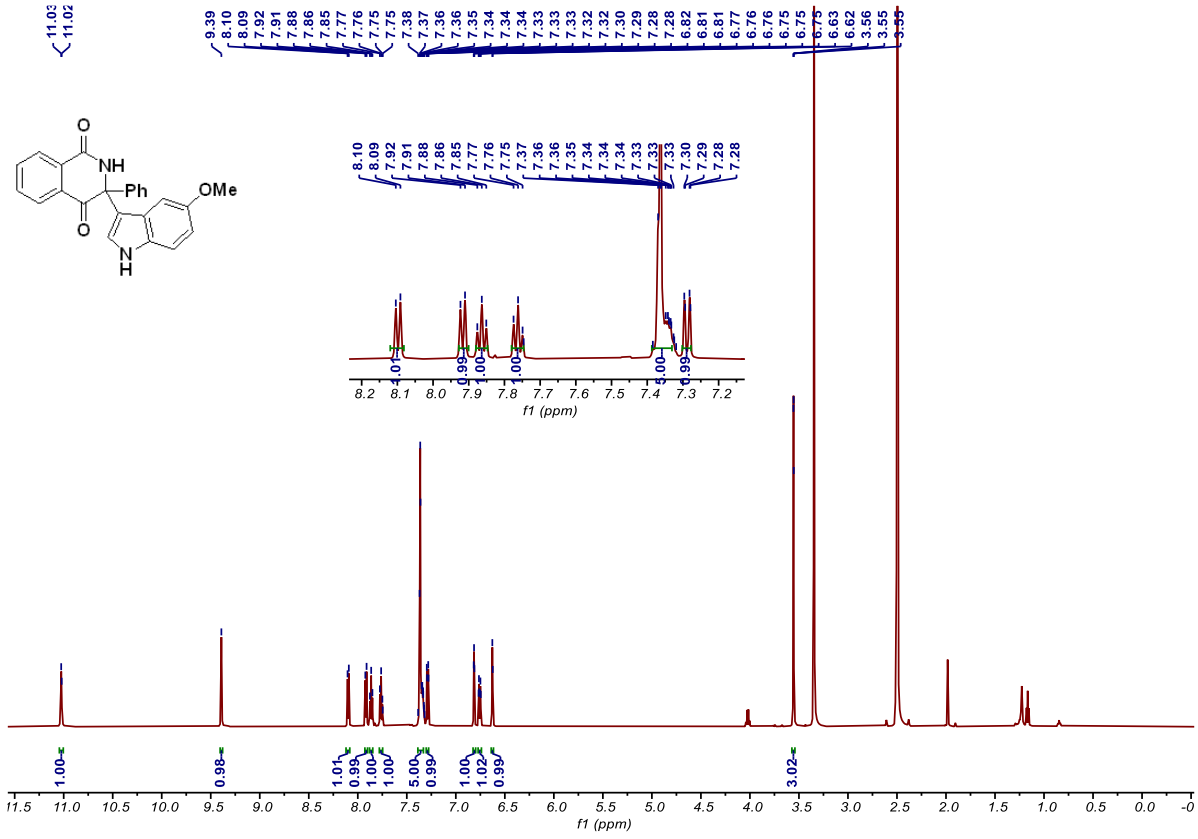
**3-(4-(methylamino)phenyl)-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (41)**

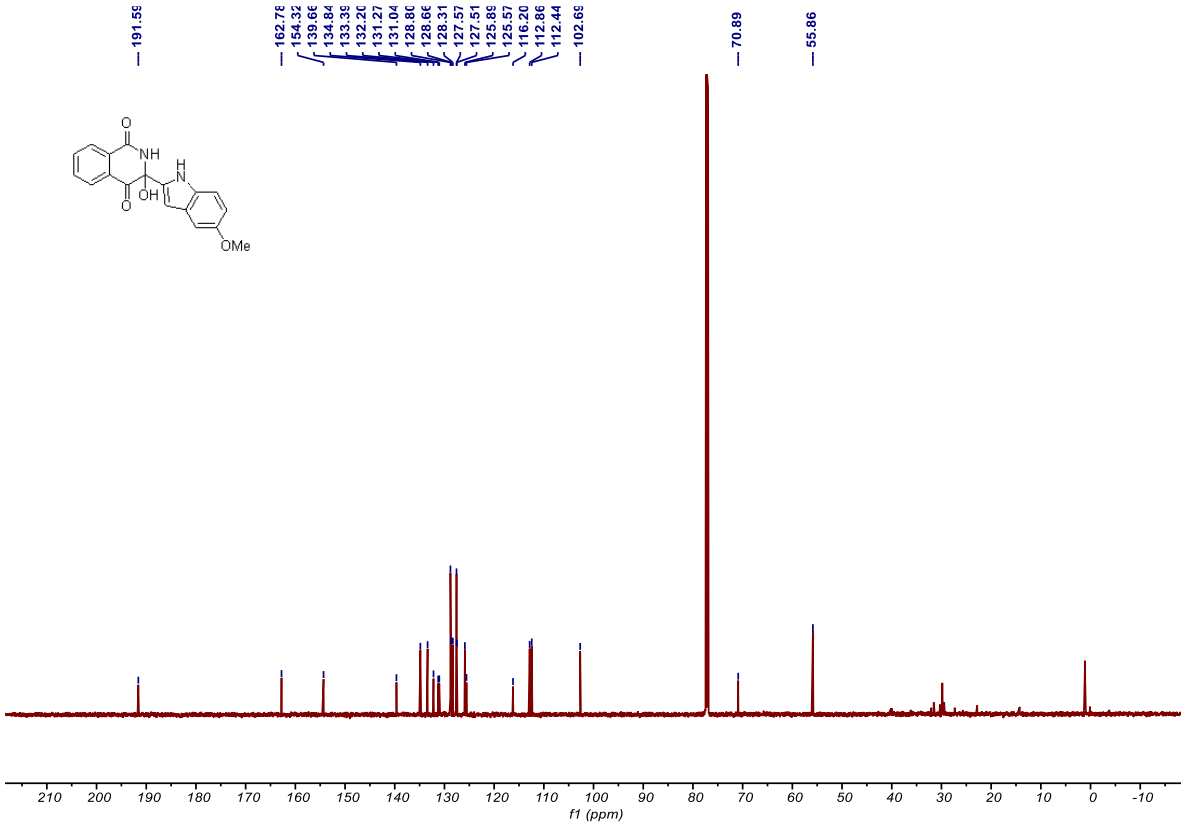


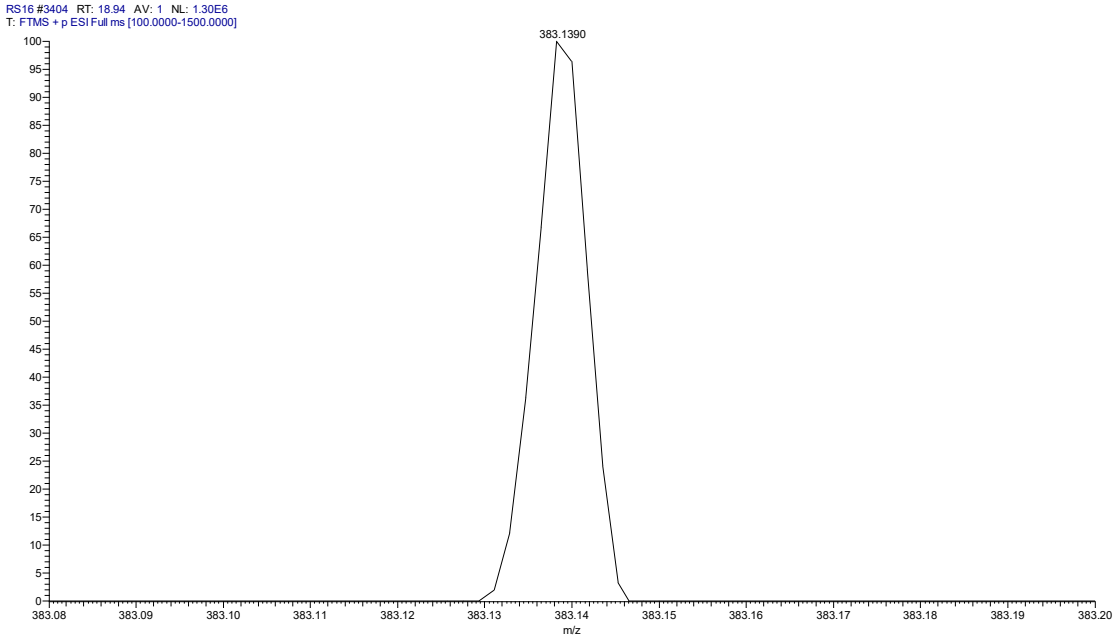





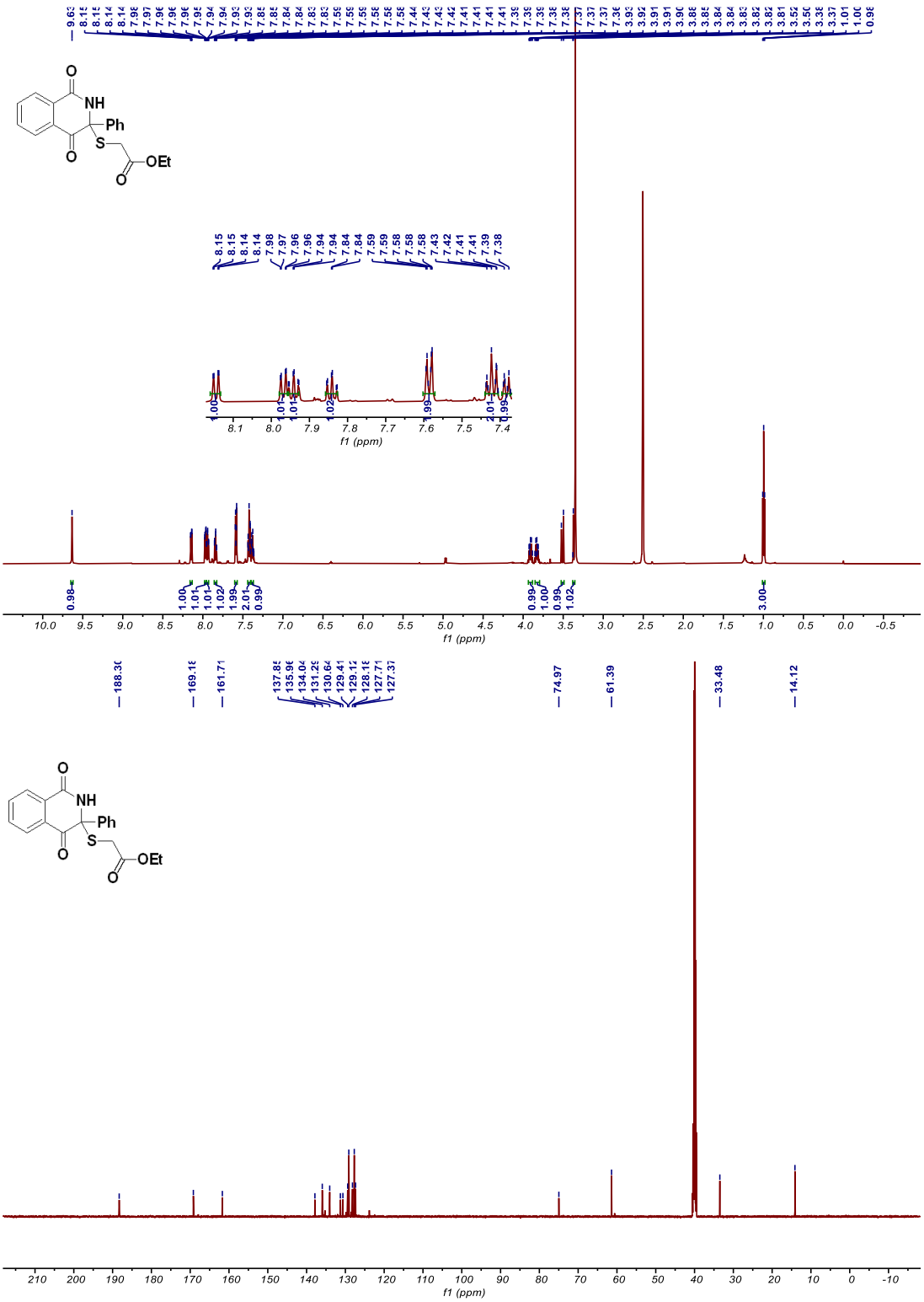

## 3-(5-methylfuran-2-yl)-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (42)

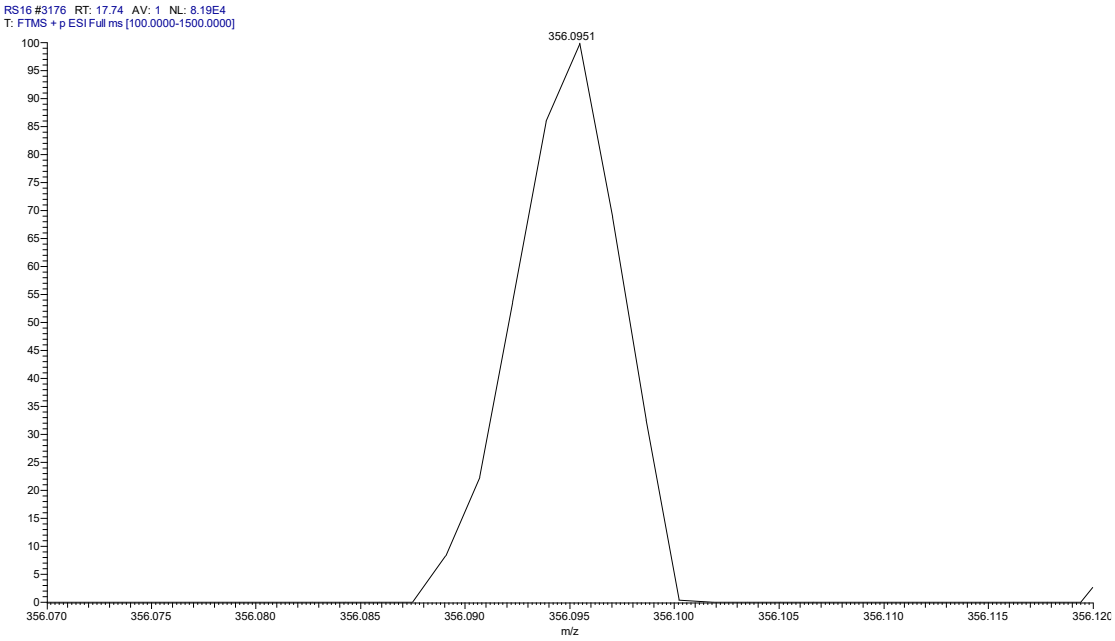



191.59
162.78
154.32
139.66
134.84
133.39
132.20
131.27
131.04
128.80
128.66
128.31
127.57
127.51
125.88
125.57
116.20
112.86
112.44
102.69
70.89
55.86
O
NH
H
N
OH
O
OMe
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

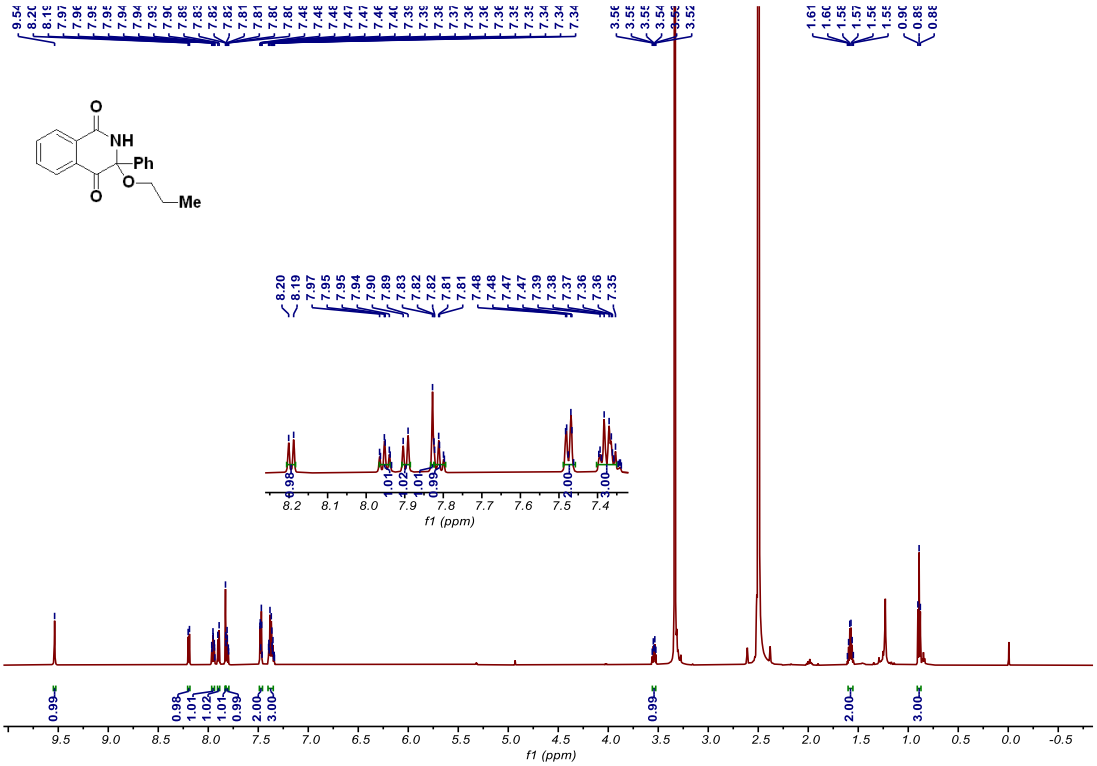

RS16 #3404 RT: 18.94 AV: 1 NL: 1.30E6
T: FTMS + p ESI Full ms [100.0000-1500.0000]
383.1390
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
383.08 383.09 383.10 383.11 383.12 383.13 383.14 383.15 383.16 383.17 383.18 383.19 383.20
m/z

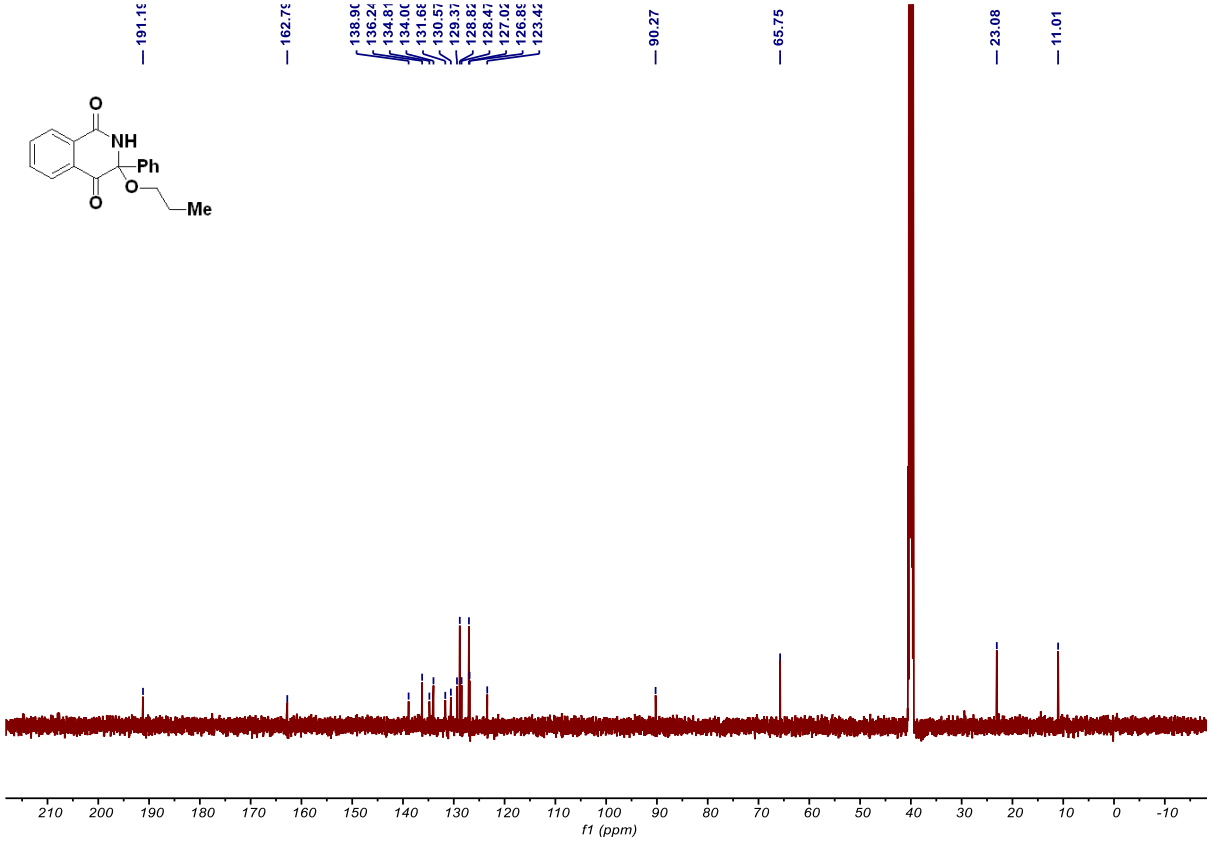
**ethyl 2-((1,4-dioxo-3-phenyl-1,2,3,4-tetrahydroisoquinolin-3-yl)thio)acetate (43)**

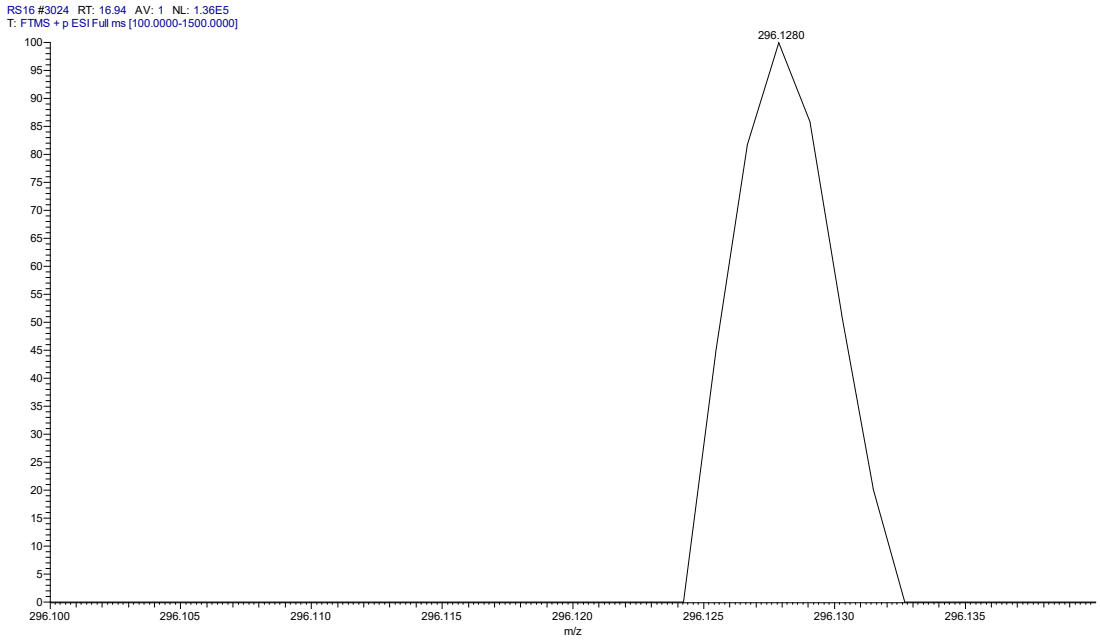




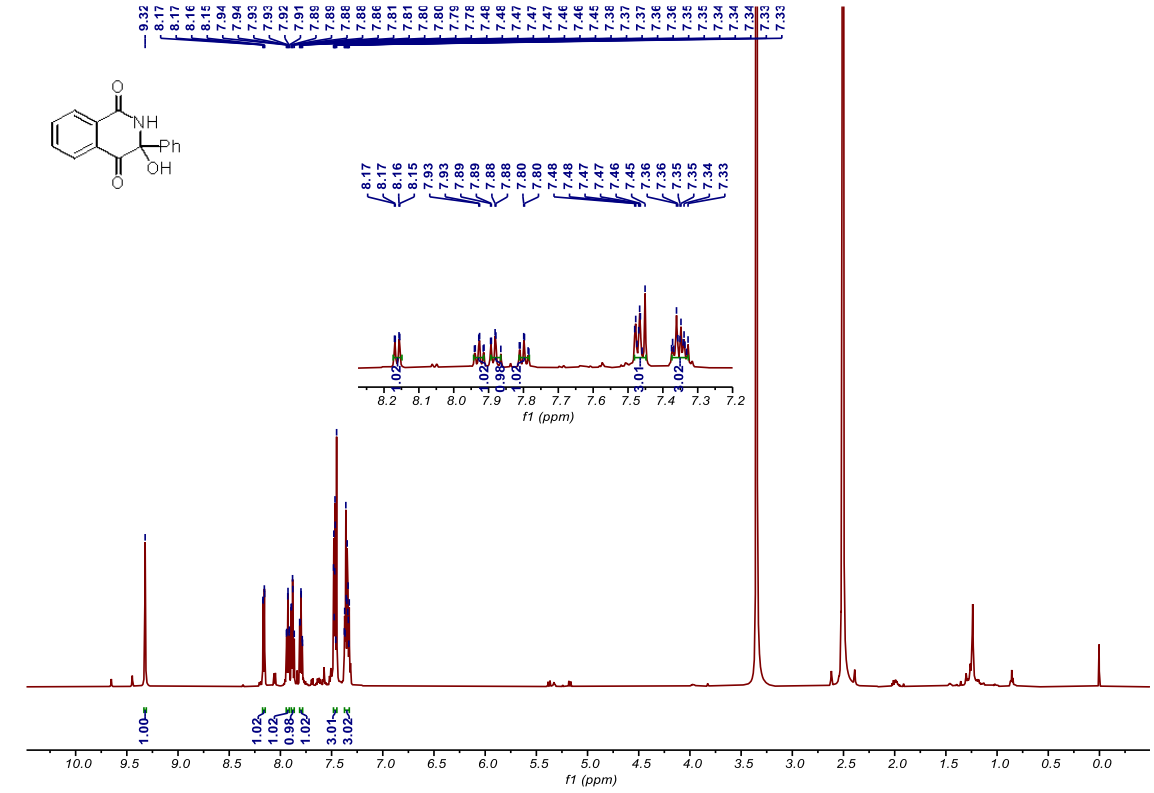

## 3-phenyl-3-propoxy-2,3-dihydroisoquinoline-1,4-dione (44)

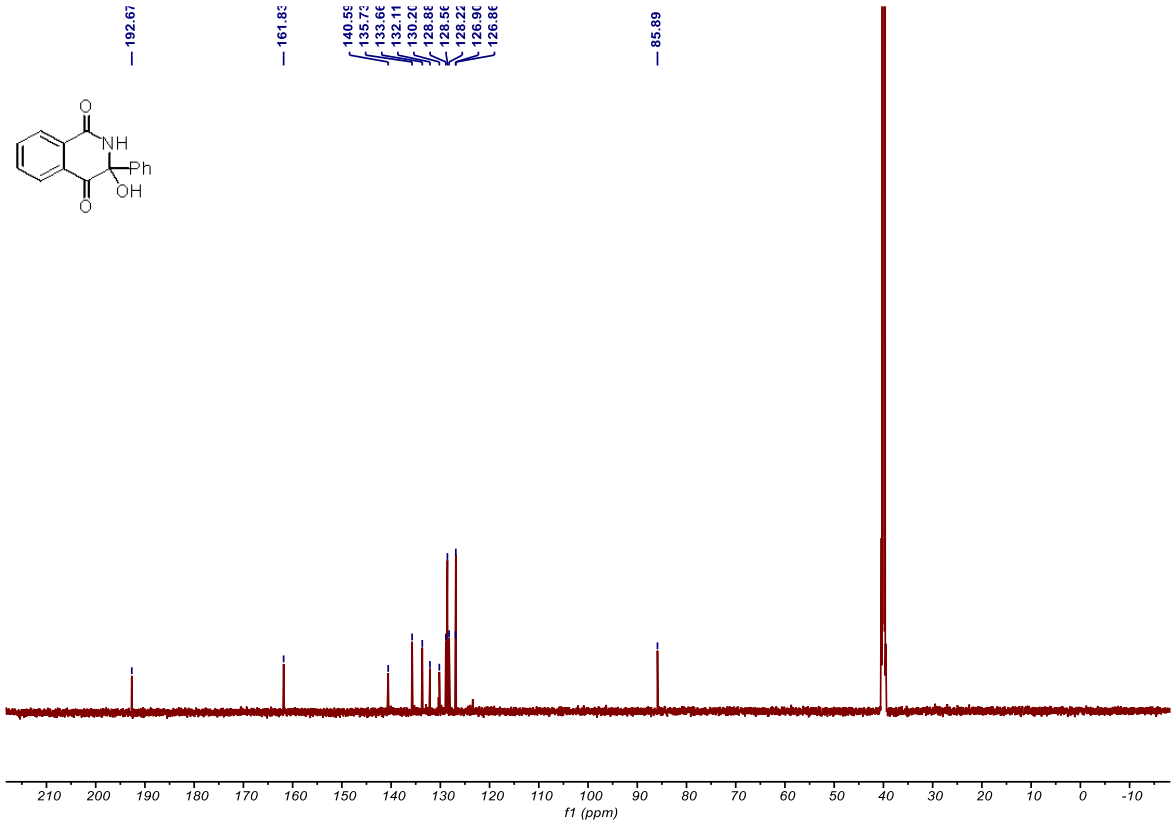


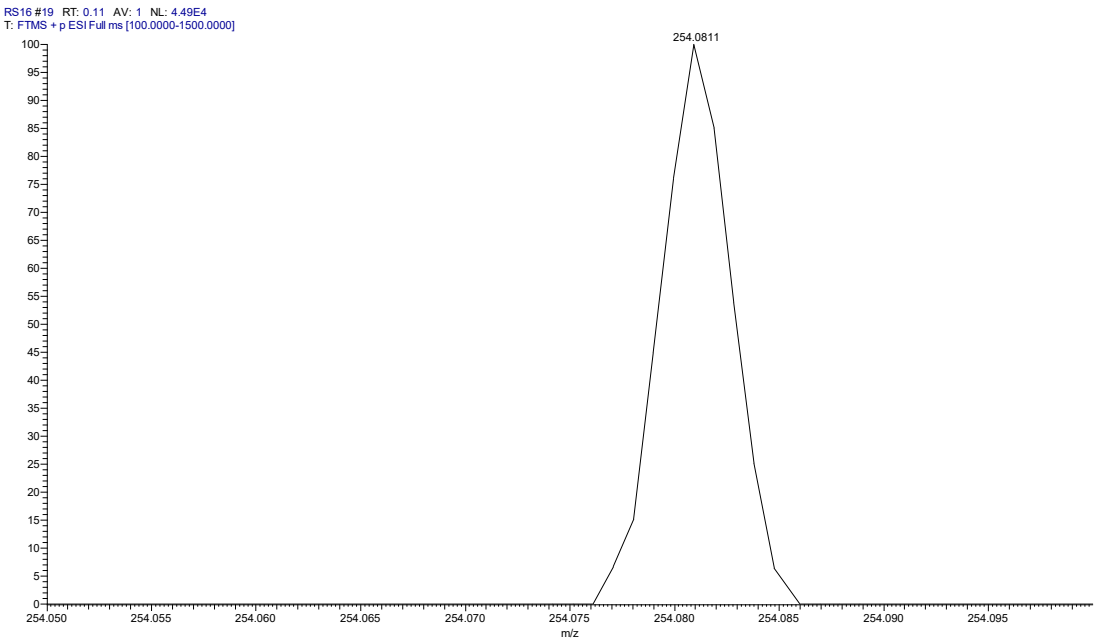

191.1
162.7
138.9
136.2
134.8
134.0
131.6
130.5
129.3
128.8
128.4
127.0
126.8
123.4
90.27
65.75
23.08
11.01
O
NH
Ph
O
O
Me
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


RS16 #3024 RT: 16.94 AV: 1 NL: 1.36E5
T: FTMS + p ESI Full ms [100.0000-1500.0000]
296.1280
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
296.100 296.105 296.110 296.115 296.120 296.125 296.130 296.135
m/z

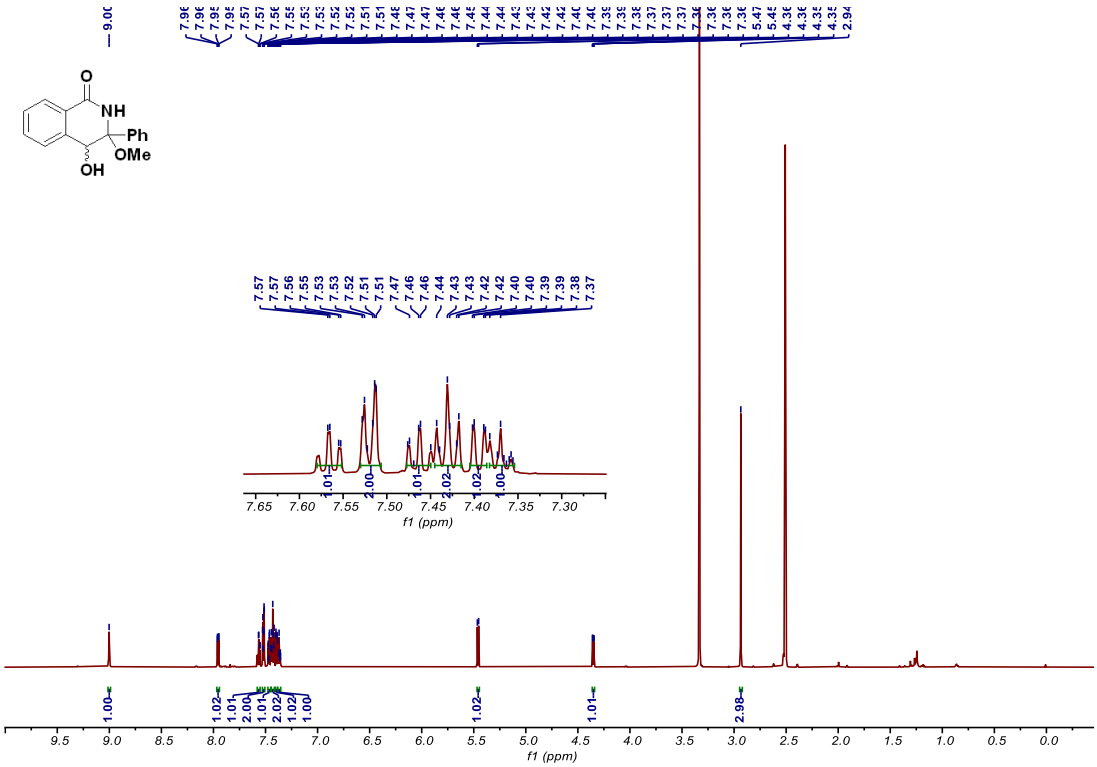
**3-hydroxy-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (45)**

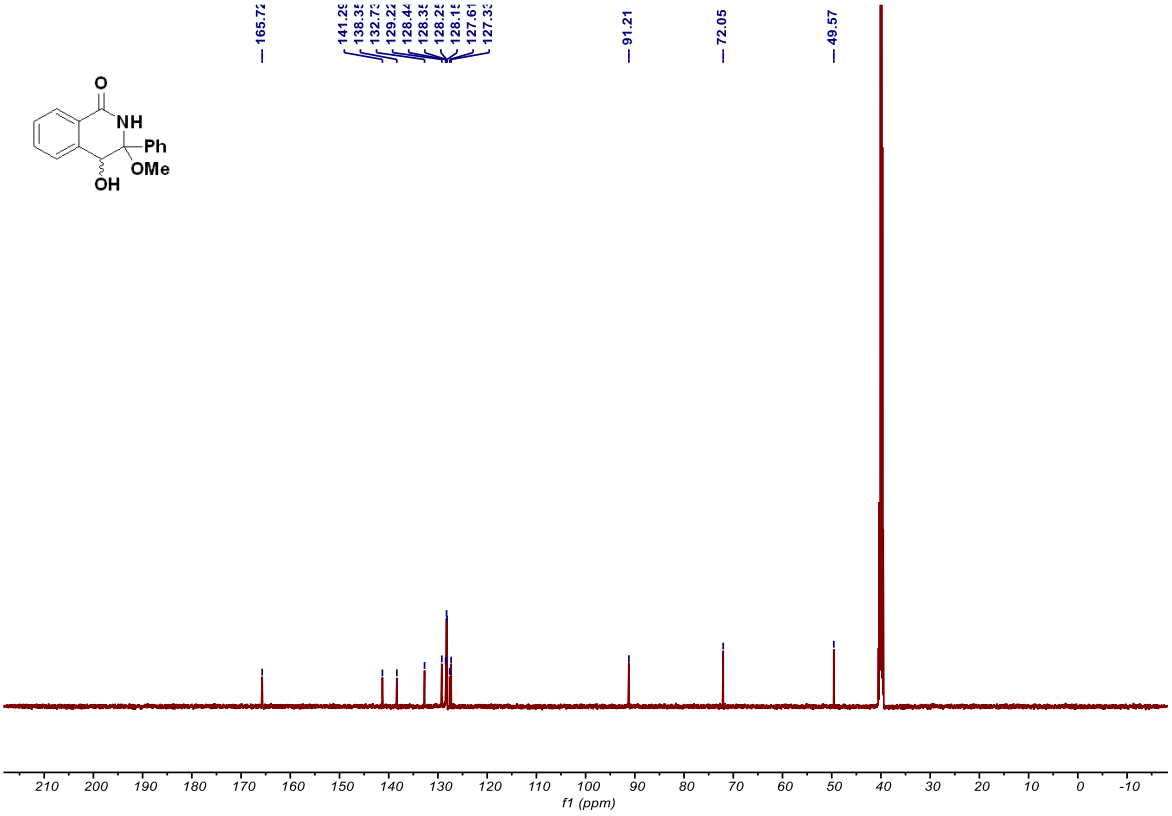


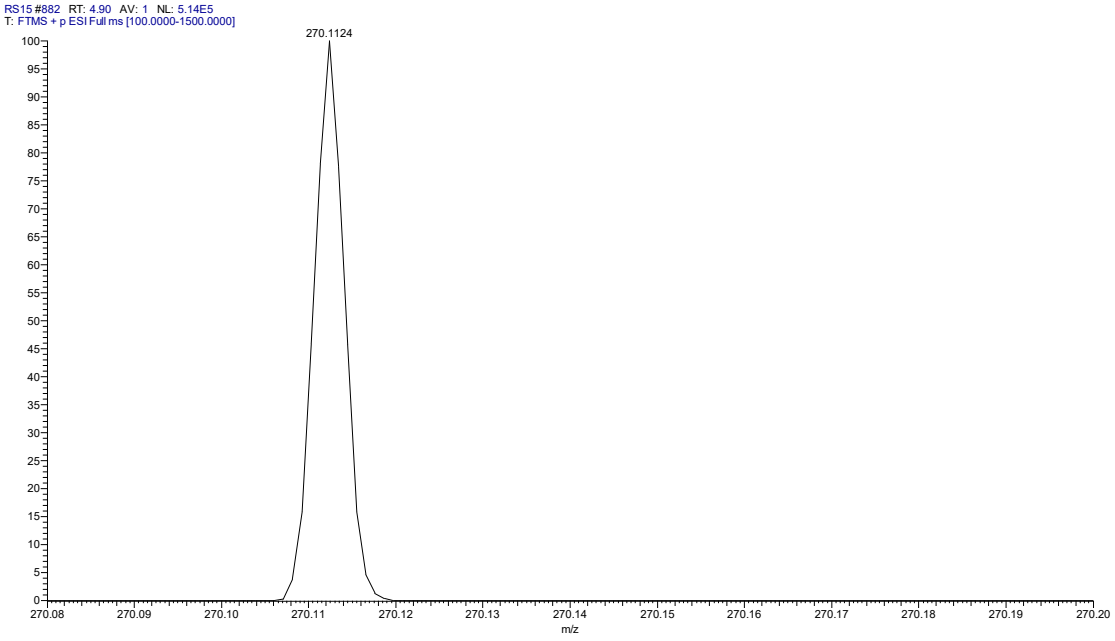





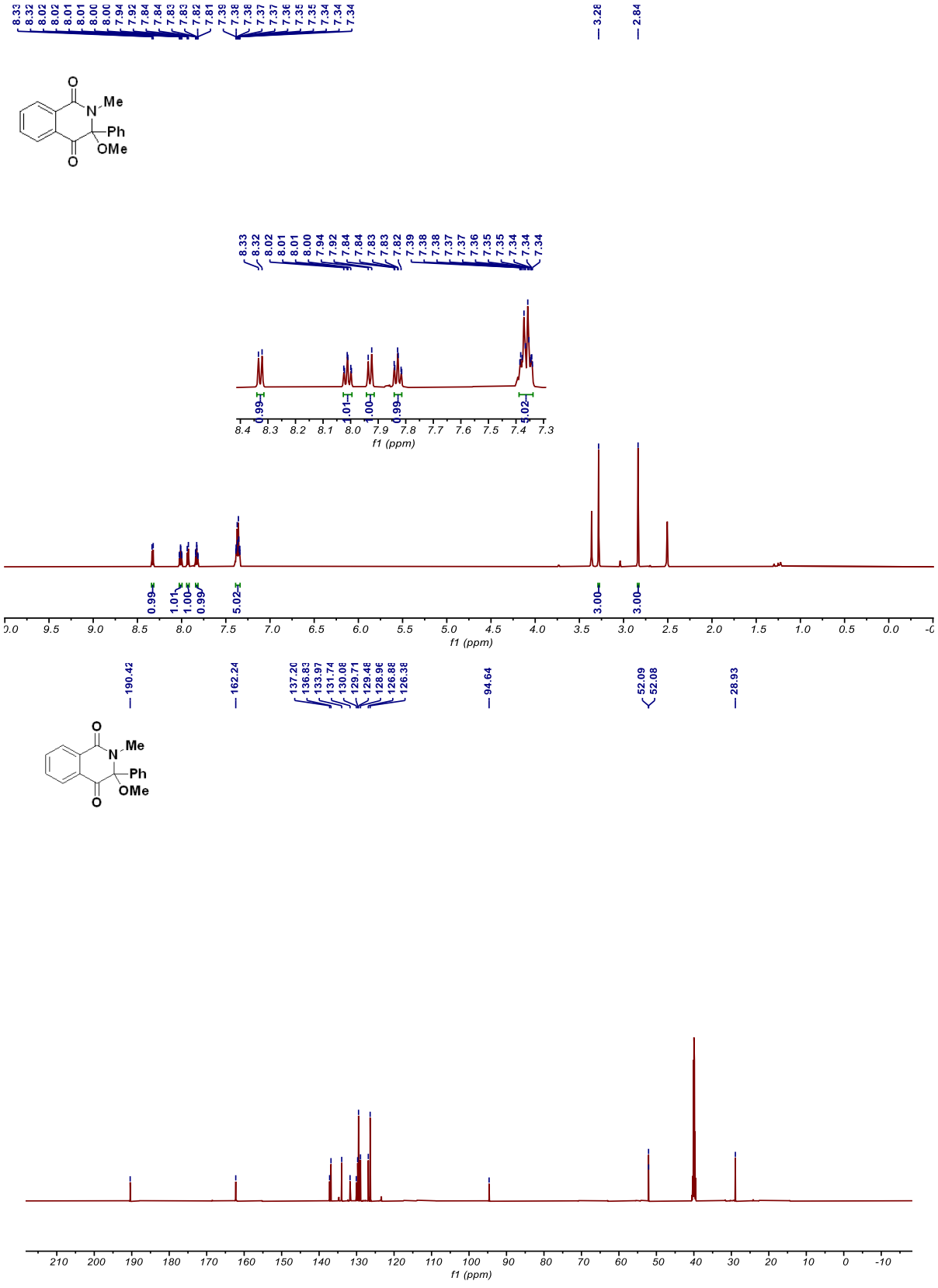

## 4-hydroxy-3-methoxy-3-phenyl-3,4-dihydroisoquinolin-1(2H)-one（46）

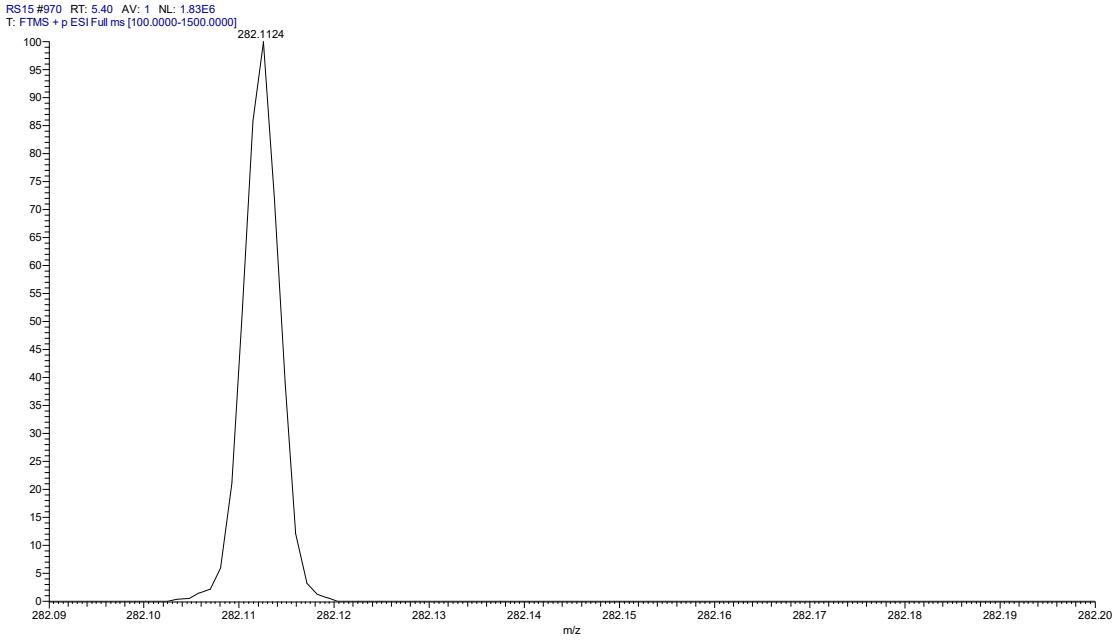



O
NH
Ph
OMe
OH
165.72
141.29
138.35
132.77
129.22
128.44
128.35
128.25
128.15
127.61
127.33
91.21
72.05
49.57
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

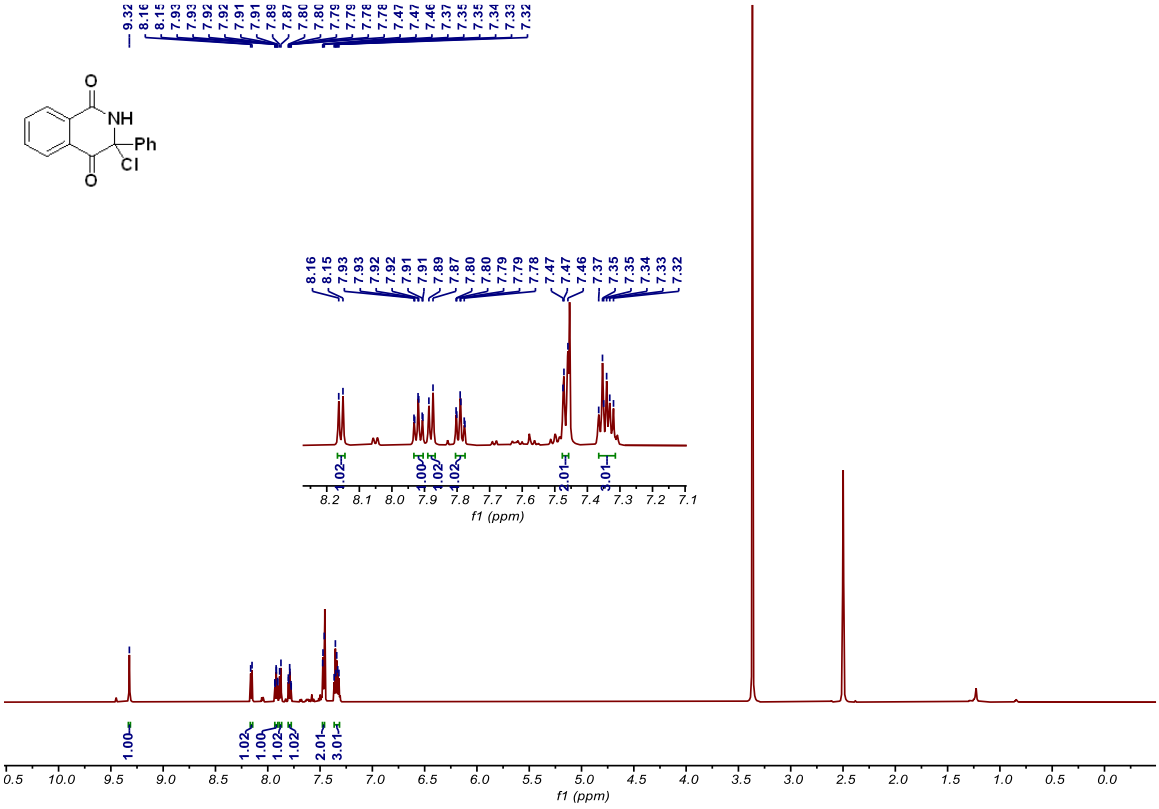

RS15 #882 RT: 4.90 AV: 1 NL: 5.14E5
T: FTMS + p ESI Full ms [100.0000-1500.0000]
270.1124
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
270.08 270.09 270.10 270.11 270.12 270.13 270.14 270.15 270.16 270.17 270.18 270.19 270.20
m/z

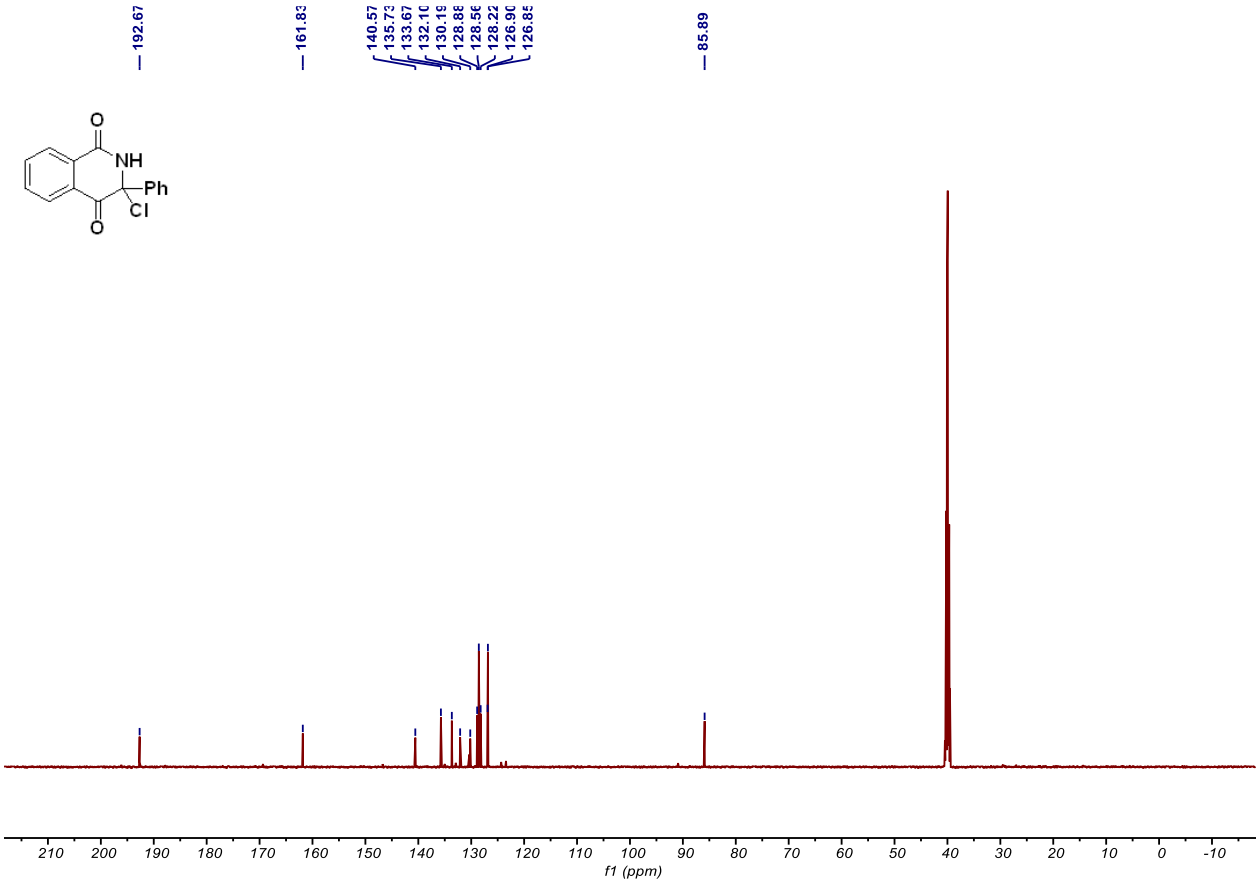
## 3-methoxy-2-methyl-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (47)

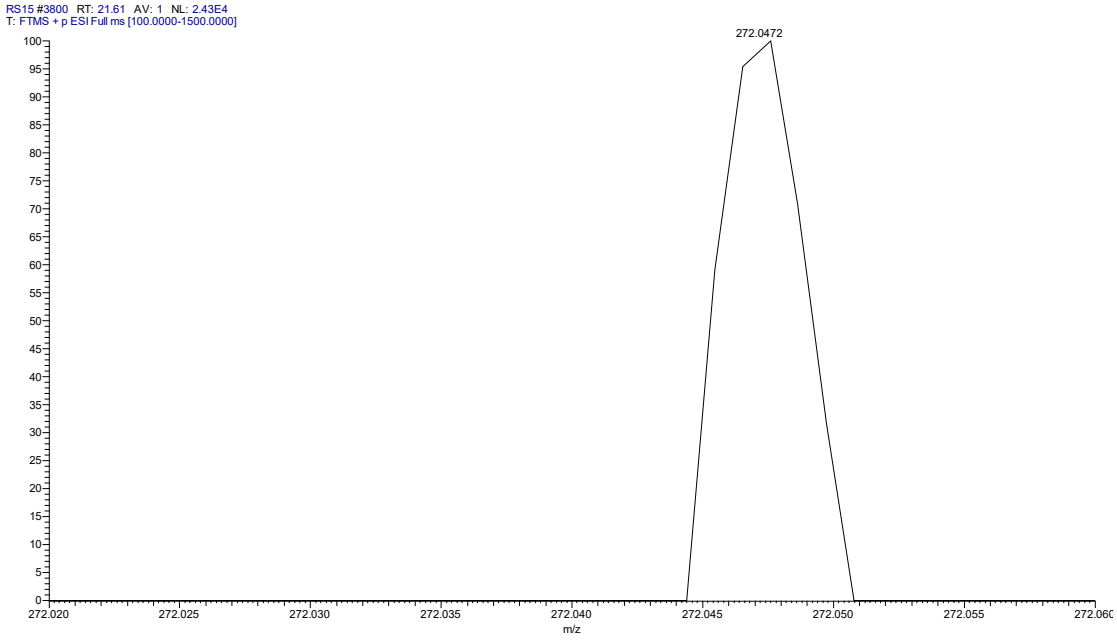




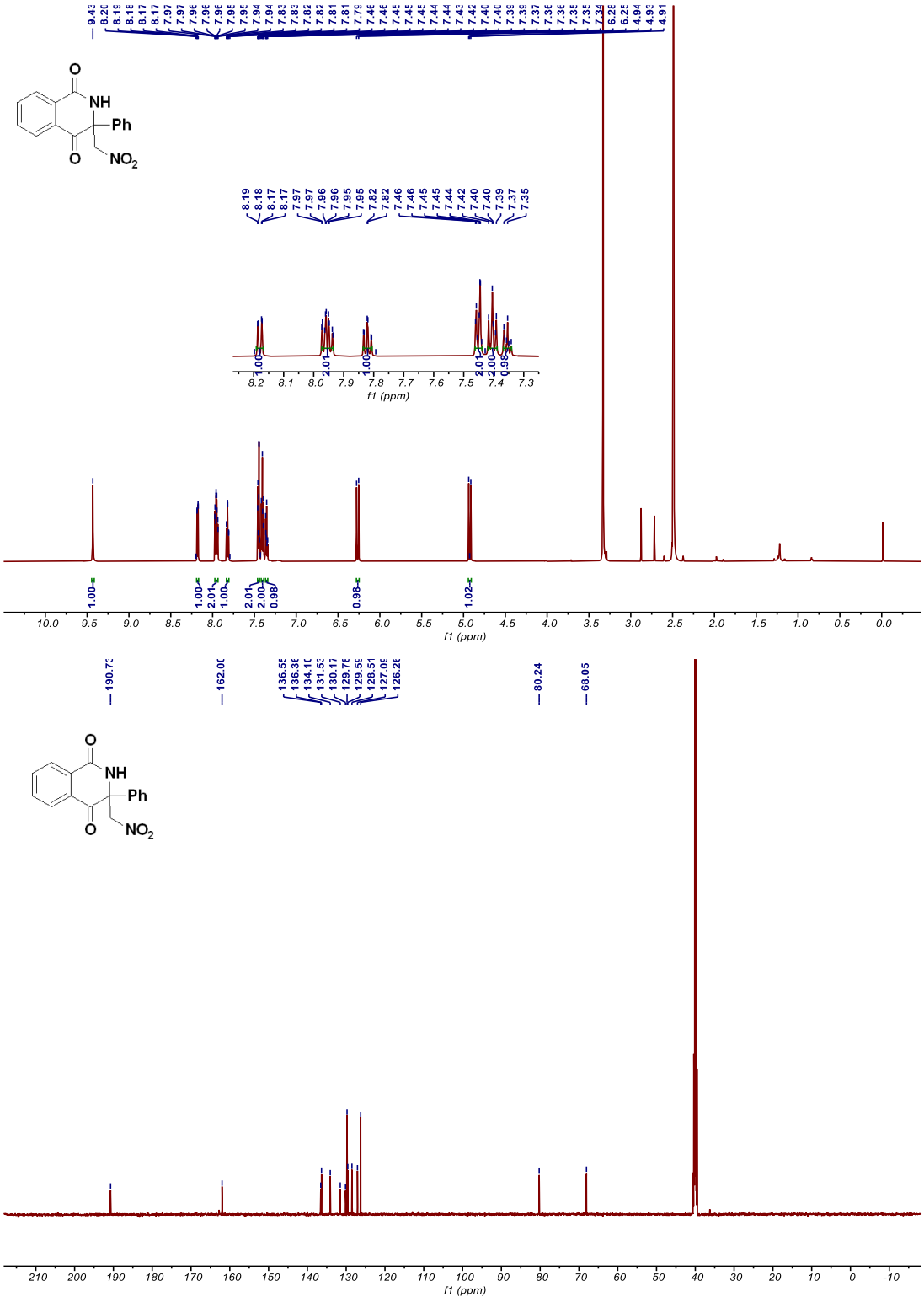

## 3-chloro-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (48)

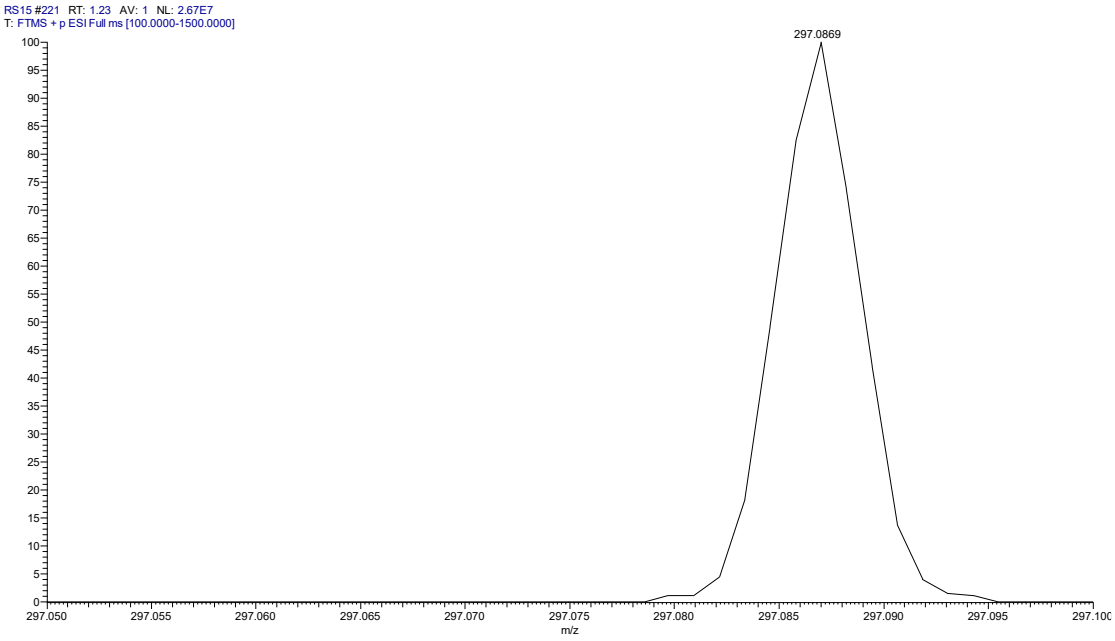



192.67
161.83
140.57
135.73
133.67
132.10
130.19
128.88
128.56
128.22
126.90
126.85
85.89
O
NH
Ph
Cl
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

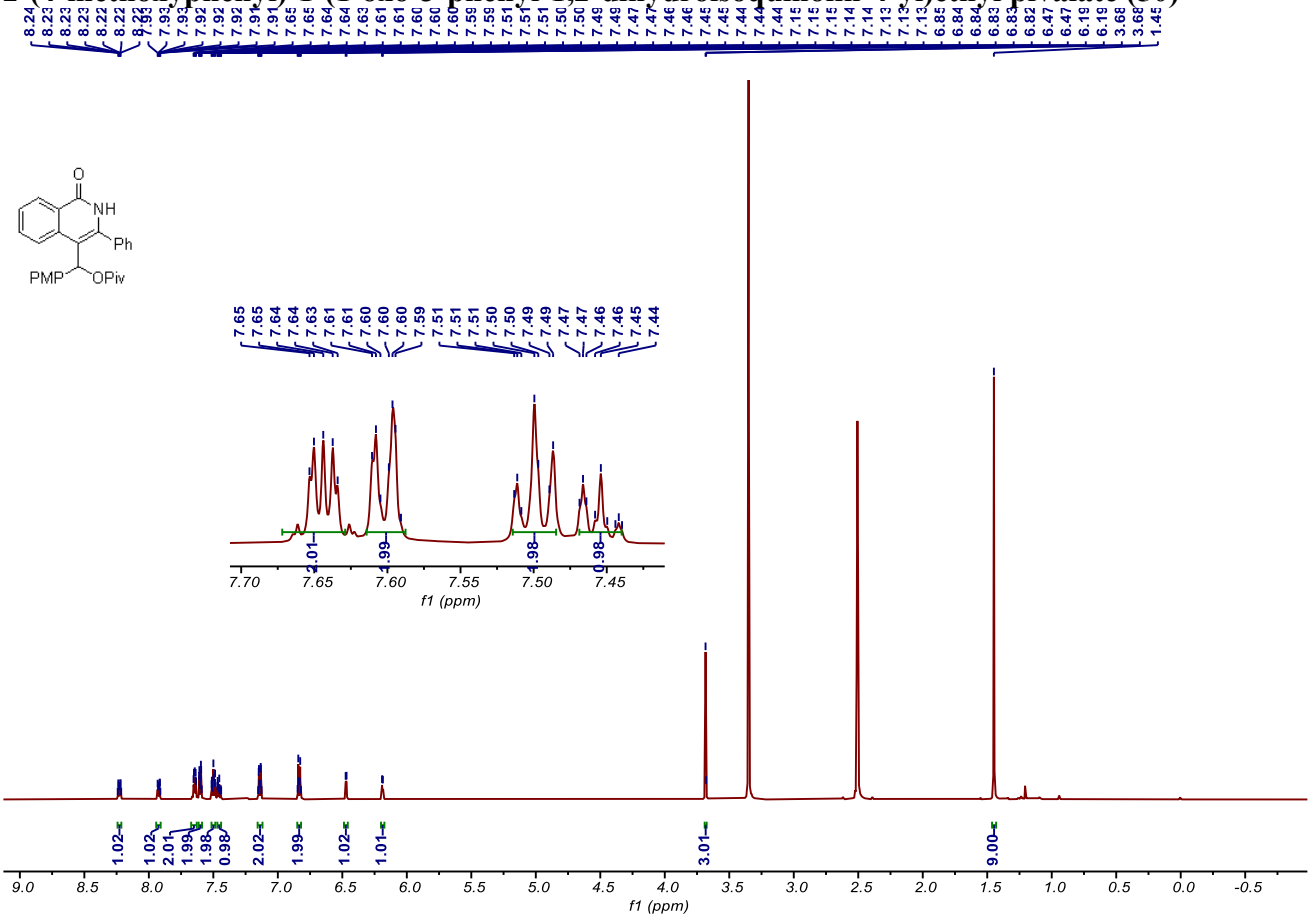

RS15 #3800 RT: 21.61 AV: 1 NL: 2.43E4
T: FTMS + p ESI Full ms [100.0000-1500.0000]
272.0472
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
272.020 272.025 272.030 272.035 272.040 272.045 272.050 272.055 272.060
m/z

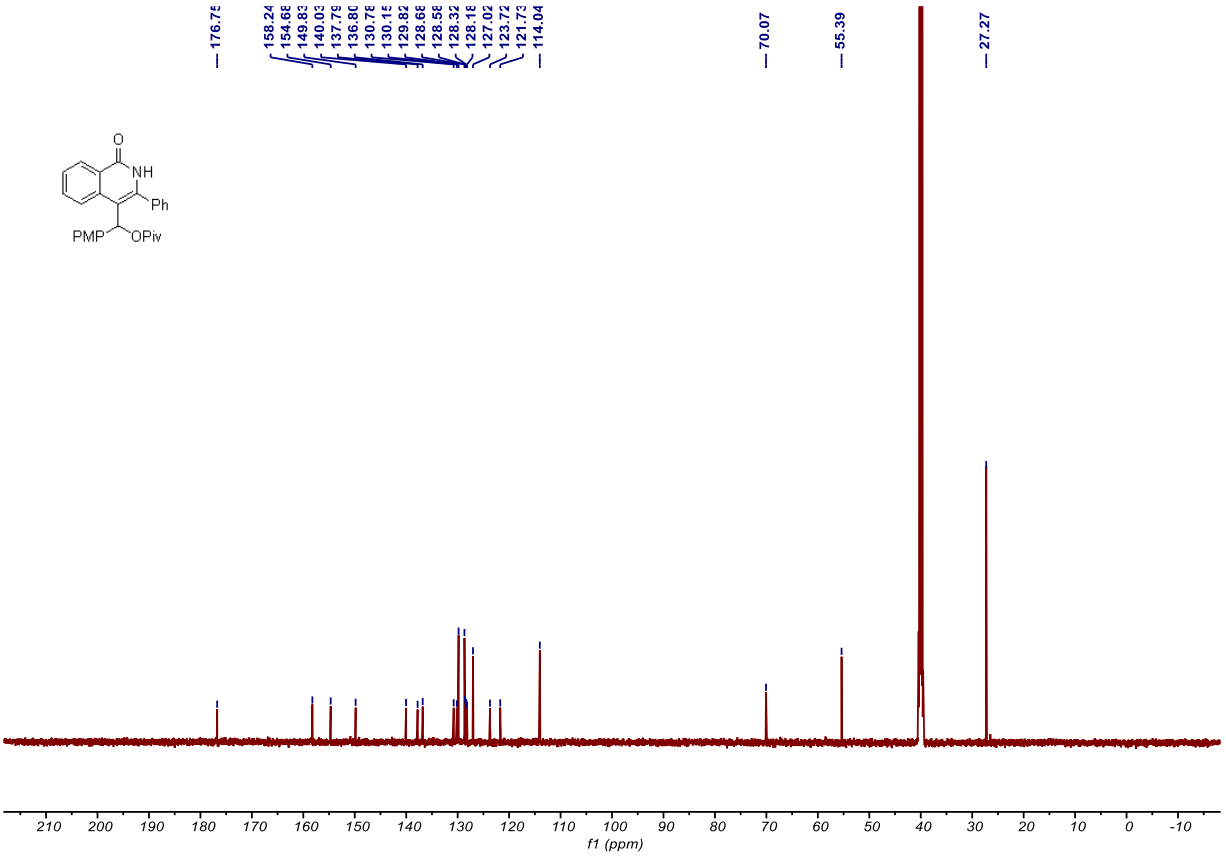
## 3-(nitromethyl)-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (49)



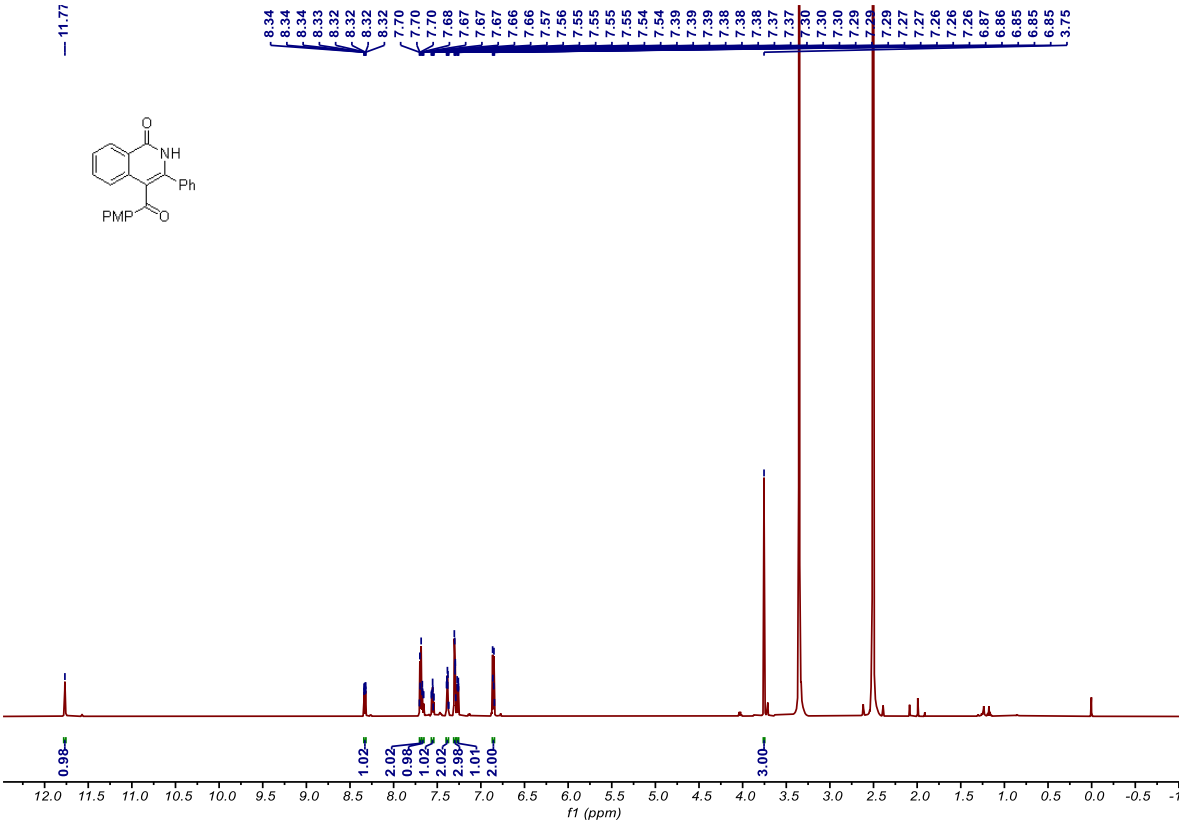


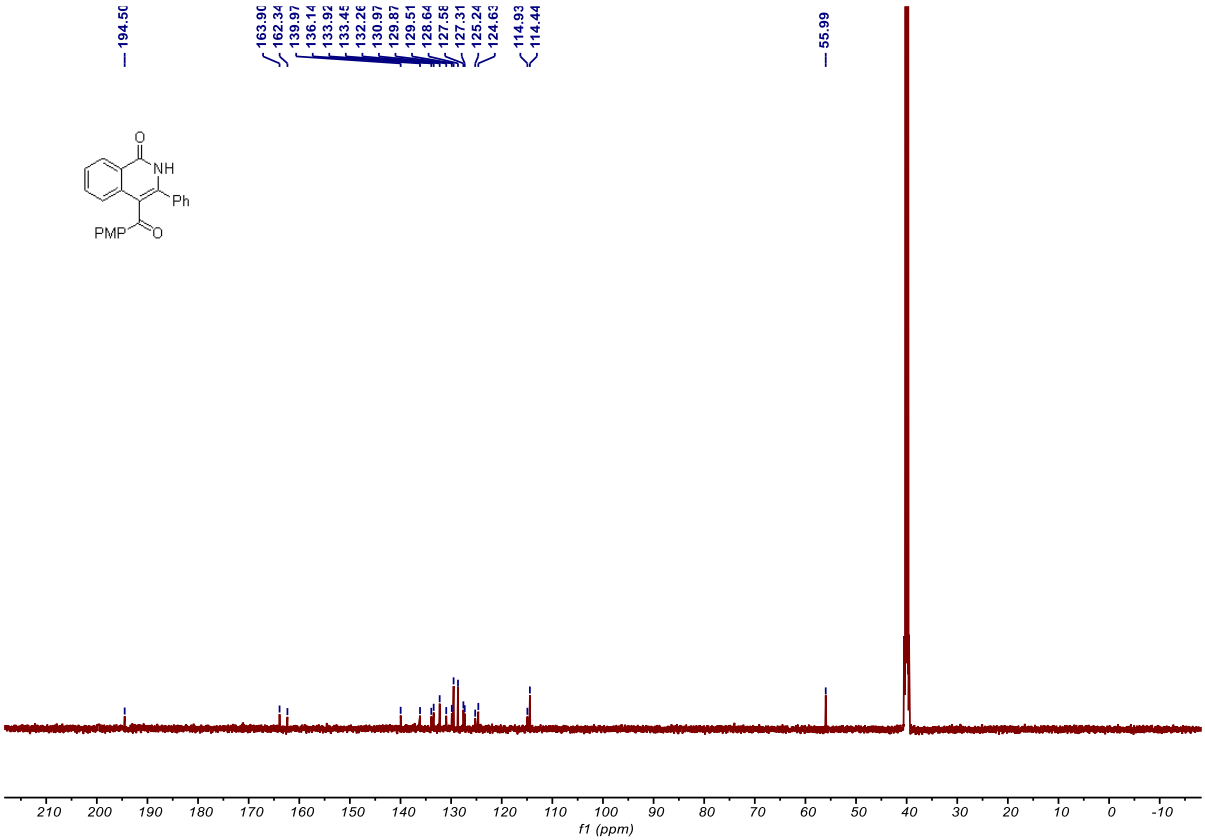

## 2-(4-methoxyphenyl)-1-(1-oxo-3-phenyl-1,2-dihydroisoquinolin-4-yl)ethyl pivalate (50)



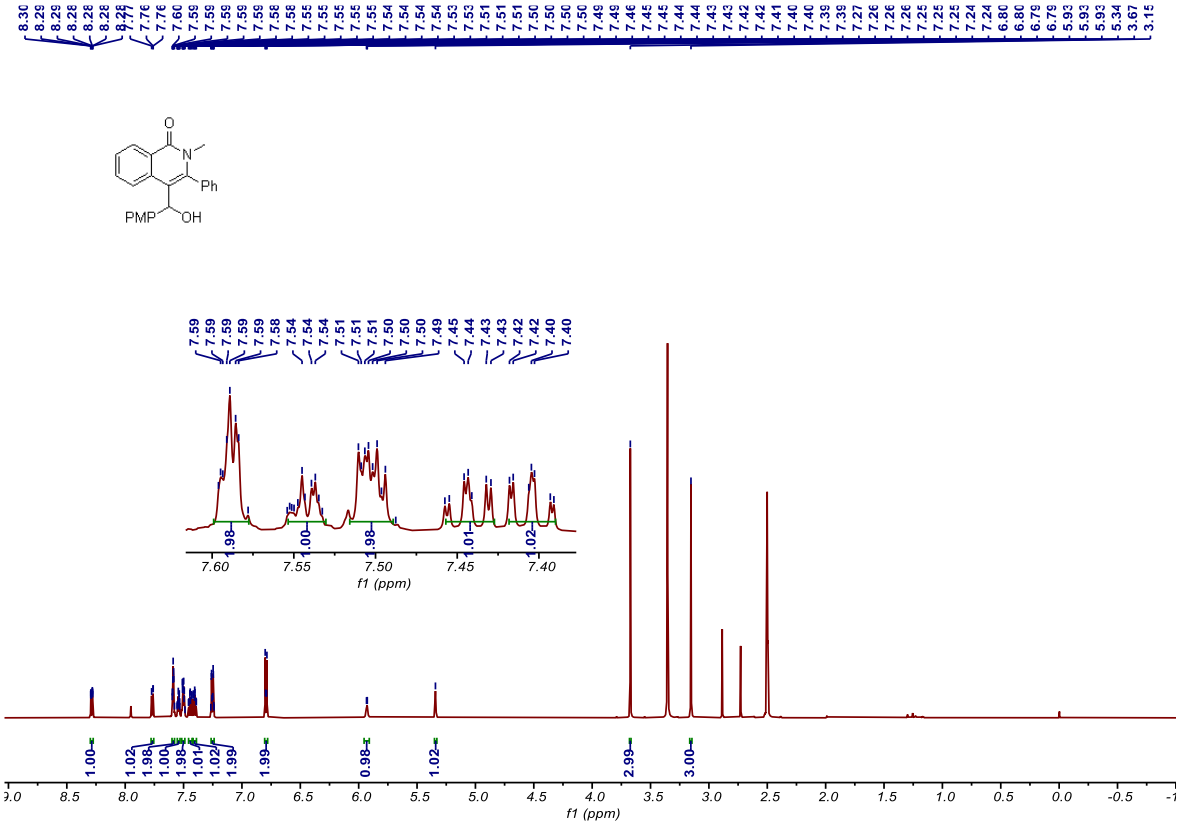


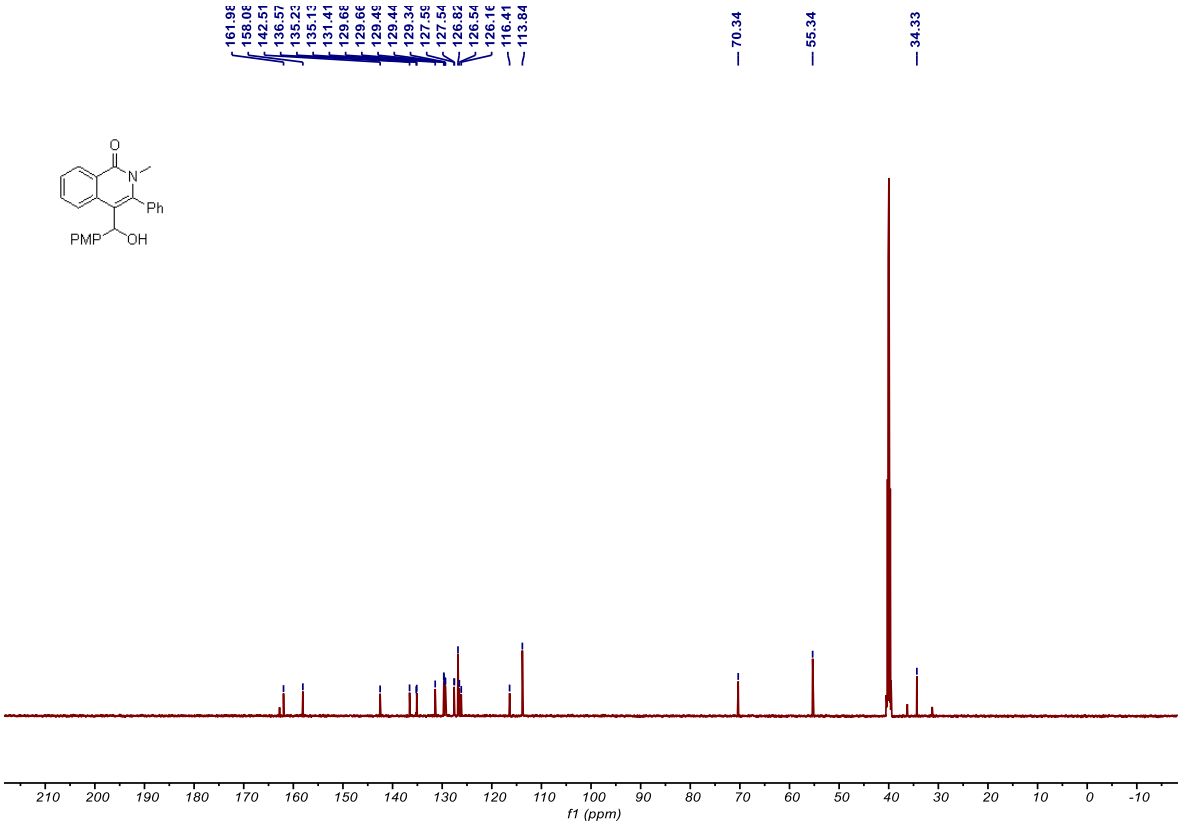

**4-(2-(4-methoxyphenyl)acetyl)-3-phenylisoquinolin-1(2H)-one (51)**



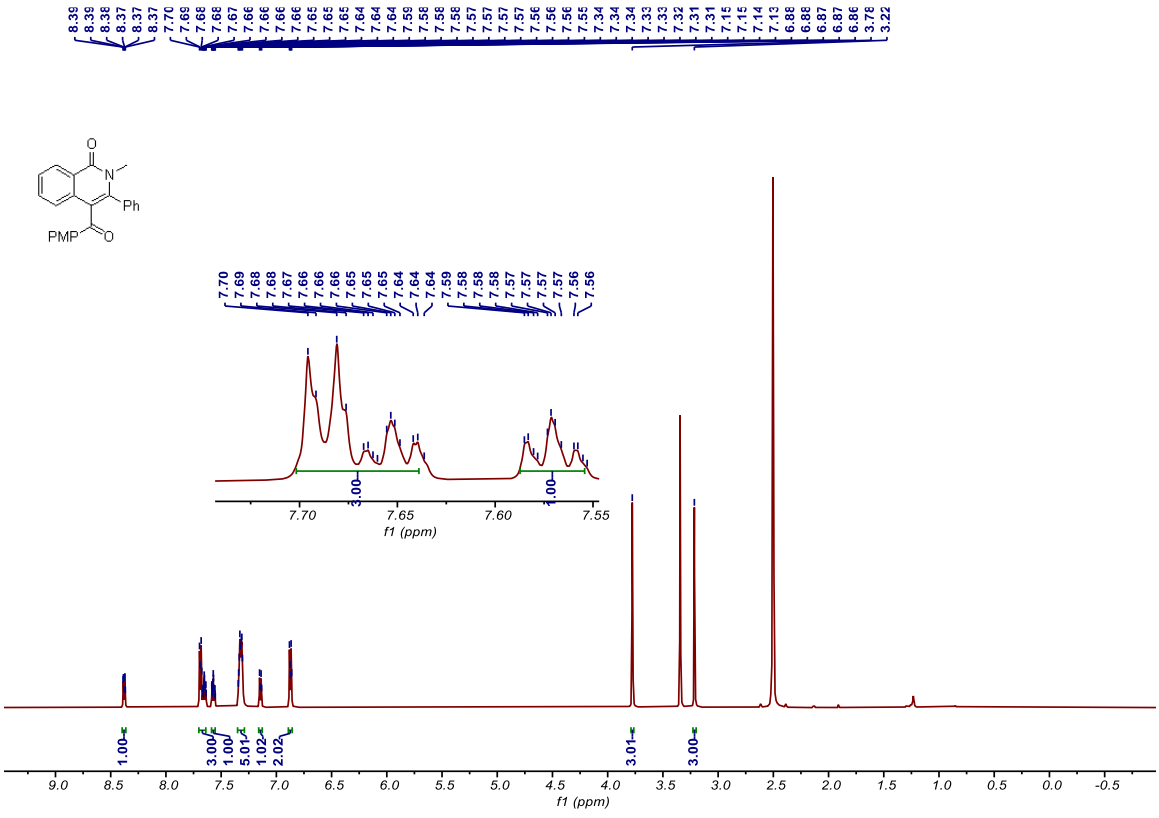


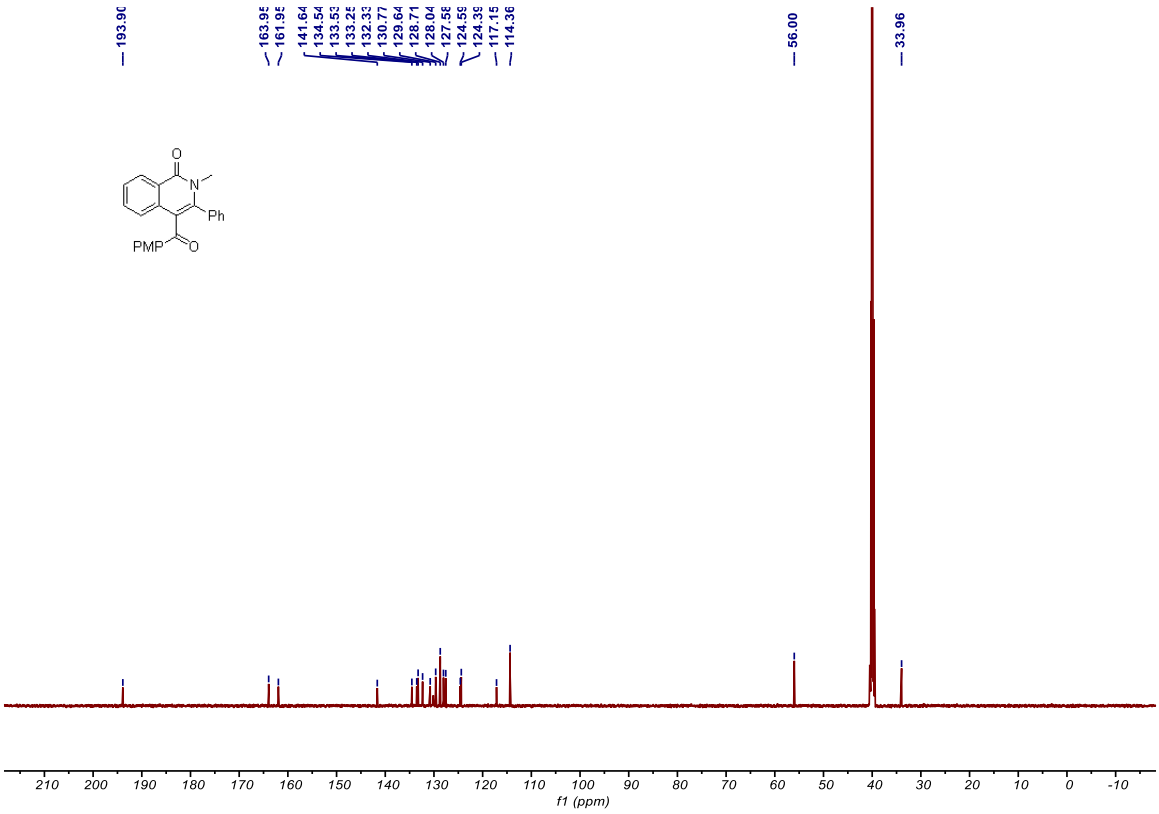

**4-(1-hydroxy-2-(4-methoxyphenyl)ethyl)-2-methyl-3-phenylisoquinolin-1(2H)-one (56)**



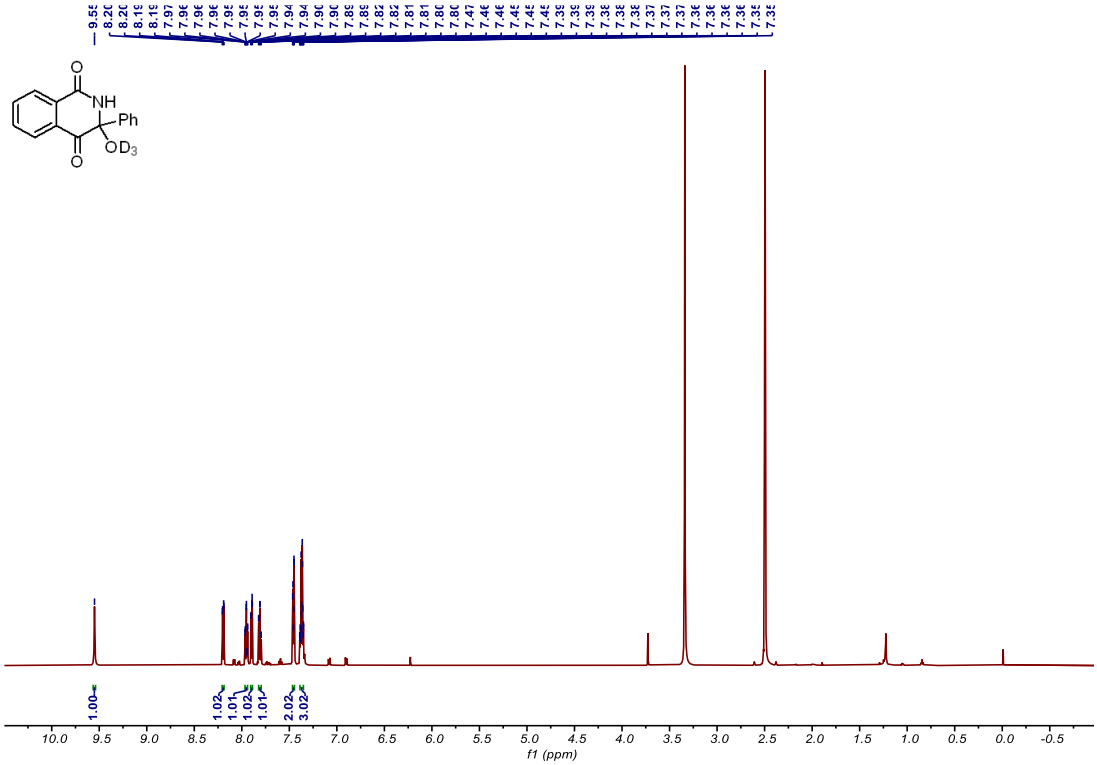


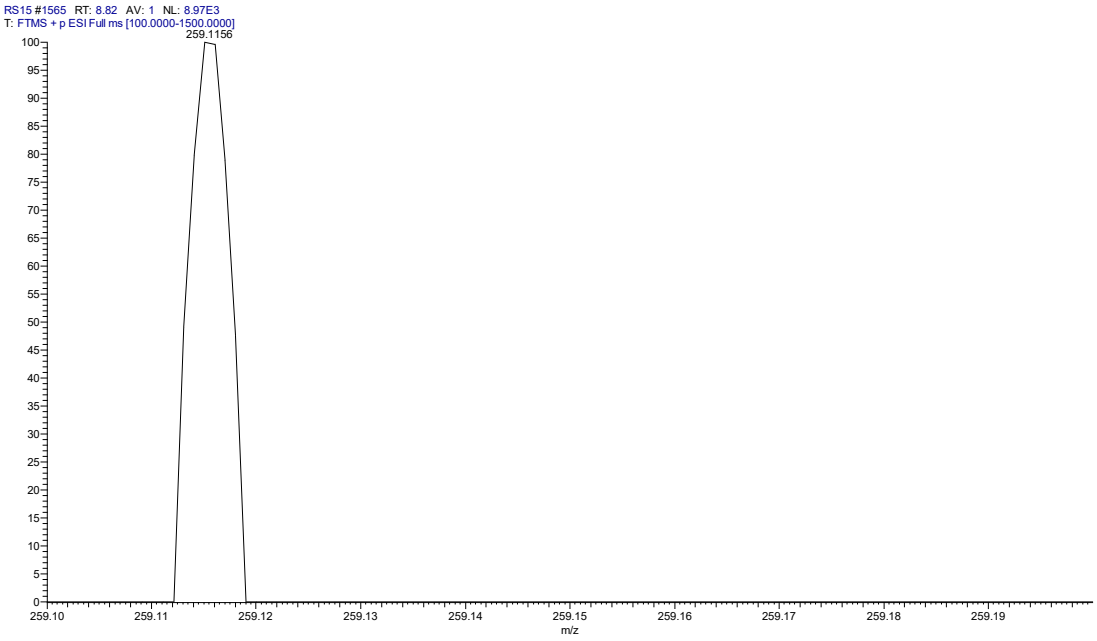

## 4-(2-(4-methoxyphenyl)acetyl)-2-methyl-3-phenylisoquinolin-1(2H)-one (57)






**3-(λ$^4$-oxidaneyl-*d*$_3$)-3-phenyl-2,3-dihydroisoquinoline-1,4-dione (58)**

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m/z