Electronic Supplementary Material (ESI) for ChemComm.

Visible-light-driven EDA complex-promoted cascade cyclization to construct 4-cyanoalky isoquinoline-1,3-diones

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Supporting Information

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1. General Information

All reactions involving air- or moisture-sensitive reagents or intermediates were carried out in preheated glassware under an argon atmosphere using standard Schlenk techniques. The light employed in this work was bought from 18 W blue LEDs, λ = 460 ~ 465 nm. All reactions involving heating are carried out on the heated magnetic stirrer from DALB: model MS-H280-Pro. All reagents were weighed and handled in air at room temperature. All chemical reagents were purchased from Energy Chemical and aladdin and used without further purification. *N*-Alkyl-*N*-methacryloyl benzamides **1** and cyclobutanone oxime esters **2** were prepared according to the previous reported protocols.[1-2]

Chromatography: Analytical thin layer chromatography was performed using Qingdao Ocean Chemical Co., Ltd silica gel plates (Silica gel GF254). Visualisation was by ultraviolet fluorescence (λ = 254 nm). Flash column chromatography was performed using 200-300 mesh silica gel.

^{1}H NMR and ^{13}C NMR: Spectra were recorded on Bruker spectrometer and the chemical shifts were reported in parts per million (δ) relative to internal standard TMS (0 ppm) for $CDCl_3$. Spectra were calibrated relative to solvent's residual proton and carbon chemical shift: $CHCl_3$ (δ = 7.26 for ^{1}H NMR and δ = 77.16 for ^{13}C NMR). Data are reported as follows: chemical shift δ/ppm, integration (^{1}H only), multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, dd = doublet of doublets, m = multiplet or combinations thereof, coupling constants J in Hz, assignment.

High Resolution Mass Spectrometry (HRMS): All were recorded on Thermo Q-Exactive instrument (quadrupole mass analyzer) using a positive electrospray ionization (ESI^{+}). Measured values are reported to 4 decimal places of the calculated value. The calculated values are based on the most abundant isotope.

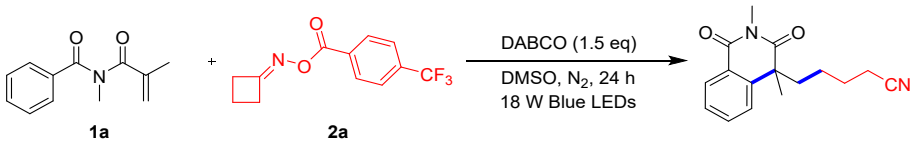
UV-vis spectrophotometer: UV-vis absorption spectra were recorded on Shimadzu UV-1900i spectrophotometer UV-vis absorbance spectra in DMSO.

Gaschromatography-Mass Spectrometry (GC-MS): GC-MS were determined by Thermo Scientific Trace1300-ISQ7000.

Melting points (MP) were determined by WRS-1B.

2. Optimization of the Reaction Conditions

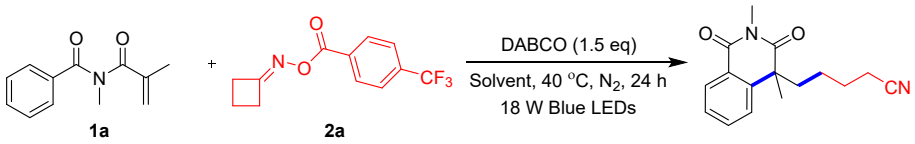
Table S1. Screen of temperature[a]



Entry	Temperature (°C)	Yield (%)[b]
1	20	42
2	25	66
3	30	85
4	40	92
5	50	93
6[c]	40	0
7[d]	40	0
8[e]	40	0

[a] Unless otherwise noted, reactions were carried out with **1a** (0.2 mmol), **2a** (0.24 mmol) and DABCO (1.5 eq) in DMSO (0.1 M) under 18 W blue LEDs for 24 h. [b] isolated yields. [c] Without DABCO. [d] Without blue LED light. [e] Under air.

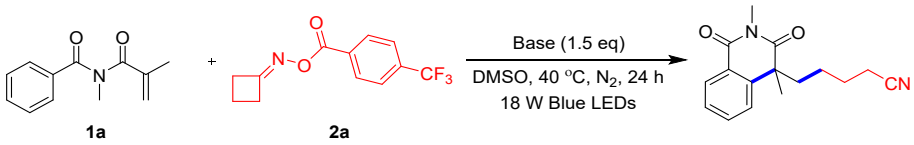
Table S2. Screen of solvents[a]



Entry	Solvent	Yield (%)[b]
1	DMSO	92
2	MeCN	trace
3	DMF	36
4	DMA	69
5	THF	trace
6	DCM	trace
7	EtOAc	0
8	MeOH	0
9	1,4-Dioxane	trace

[a] Unless otherwise noted, reactions were carried out with **1a** (0.2 mmol), **2a** (0.24 mmol) and DABCO (1.5 eq) in solvent (0.1 M) at 40 °C under 18 W blue LEDs for 24 h. [b] isolated yields.

Table S3. Screen of bases[a]

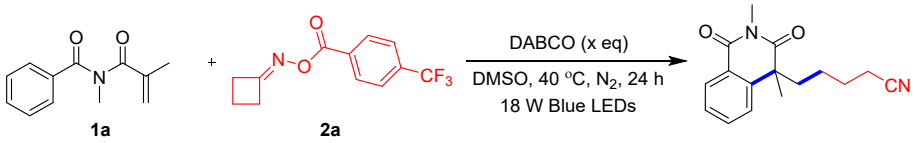


1a 2a

Entry	Base (1.5 eq)	Yield (%)[b]
1	DABCO	92
2	Na_2CO_3	0
3	CsOAc	53
4	K_2CO_3	42
5	Na_2HPO_4	0
6	Et_3N	trace
7	Ph_3N	0
8	DIPEA	trace
9	DBU	68
10	DBN	63
11	2,4,6-trimethylpyridine	0

[a] Unless otherwise noted, reactions were carried out with **1a** (0.2 mmol), **2a** (0.24 mmol) and Bases (1.5 eq) in DMSO (0.1 M) at 40 ℃ under 18 W blue LEDs for 24 h. [b] isolated yields.

Table S4. Screen of DABCO equivalent[a]

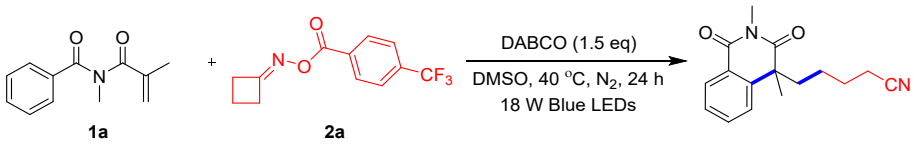


1a 2a

Entry	DABCO (x eq)	Yield (%)[b]
1	none	trace
2	0.5	47
3	1.0	84
4	1.2	88
5	1.5	92
6	1.7	93
7	2.0	93

[a] Unless otherwise noted, reactions were carried out with **1a** (0.2 mmol), **2a** (0.24 mmol) and DABCO (x eq) in DMSO (0.1 M) at 40 ℃ under 18 W blue LEDs for 24 h. [b] isolated yields.

Table S5. Screen of molar ratio (**1a** : **2a**)[a]

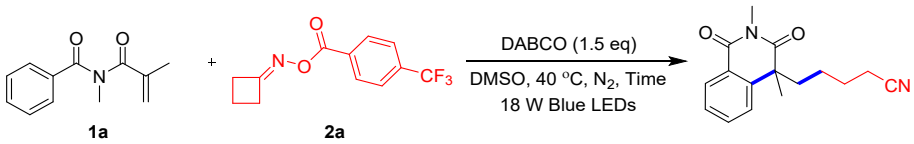


1a **2a**

Entry	Molar ratio (**1a** : **2a**)	Yield (%)[b]
1	1.0 : 1.5	93
2	1.0 : 1.2	92
3	1.0 : 1.0	87
4	1.5 : 1.0	90

[a] Unless otherwise noted, reactions were carried out with **1a**, **2a** and DABCO (1.5 eq) in DMSO (0.1 M) at 40 °C under 18 W blue LEDs for 24 h. [b] isolated yields.

Table S6. Screen of reaction time[a]

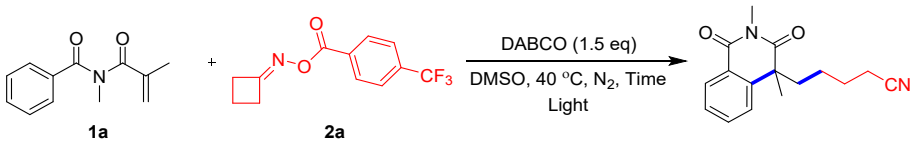


1a **2a**

Entry	Time (h)	Yield (%)[b]
1	12	40
2	16	48
3	20	62
4	22	80
5	24	92
7	28	93

[a] Unless otherwise noted, reactions were carried out with **1a** (0.2 mmol), **2a** (0.24 mmol) and DABCO (1.5 eq) in DMSO (0.1 M) at 40 °C under 18 W blue LEDs. [b] isolated yields.

Table S7. Screen of light source[a]



1a **2a**

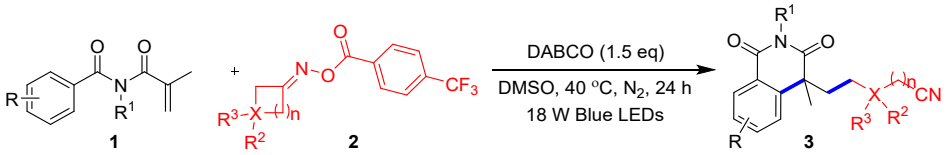
Entry	Light Source	Yield (%)[b]
1	Blue Light (450-455)	92
2	Purple Light (390 nm)	76
3	Green Light (520-525)	0

4	Red Light (620-625)	0
5	Purple Light (365 nm)	90
6[c]	Purple Light (365 nm)	<10
7	12 W Blue Light	89
8	30 W Blue Light	87

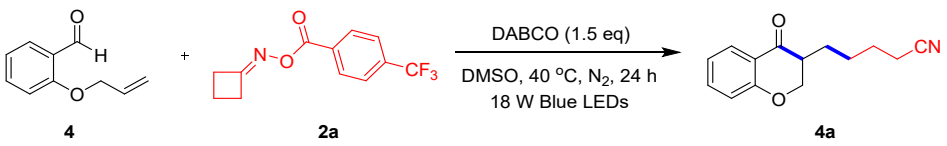
[a] Unless otherwise noted, reactions were carried out with **1a** (0.2 mmol), **2a** (0.24 mmol) and DABCO (1.5 eq) in DMSO (0.1 M) at 40 °C under LEDs light for 24 h. [b] isolated yields. [c] without DABCO.

3. General Procedure

3.1 General Procedure for Synthesis of 3: To a Schlenk tube equipped with a magnetic stir bar was charged with *N*-alkyl-*N*-methacryloyl benzamides **1** (0.2 mmol), cyclobutanone oxime ester **2** (0.24 mmol) and DABCO (1.5 eq). The tube was sealed with a septum, evacuated and backfilled with nitrogen three times. 2.0 mL DMSO was added via syringe with gentle stirring under N_2 atmosphere. The tube was sealed and stirred under 18 W blue LEDs for 24 h. After reaction, water (20 mL) was added, and the reaction mixture was extracted with EtOAc (20 mL×3), washed with saturated brine (20 mL), then dried over anhydrous Na_2SO_4. The residue was purified directly by thin layer chromatography, eluting with ethyl acetate / petroleum ether (1:3 v/v), to afford compound **3**.

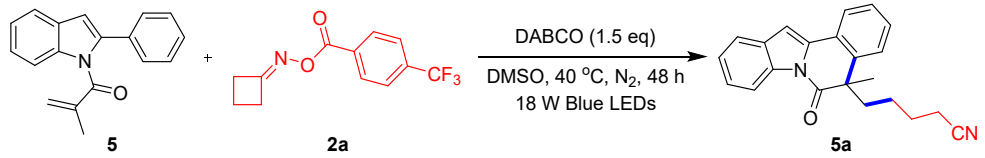


3.2 General Procedure for Synthesis of 4a: To a Schlenk tube equipped with a magnetic stir bar was charged with 2-(allyloxy)benzaldehyde **4** (0.2 mmol), cyclobutanone oxime ester **2a** (0.24 mmol) and DABCO (1.5 eq). The tube was sealed with a septum, evacuated and backfilled with nitrogen three times. 2.0 mL DMSO was added via syringe with gentle stirring under N_2 atmosphere. The tube was sealed and stirred under 18 W blue LEDs for 24 h. After reaction, water (20 mL) was added, and the reaction mixture was extracted with EtOAc (20 mL×3), washed with saturated brine (20 mL), then dried over anhydrous Na_2SO_4. The residue was purified directly by thin layer chromatography, eluting with ethyl acetate / petroleum ether (1:3 v/v), to afford compound **4a**.

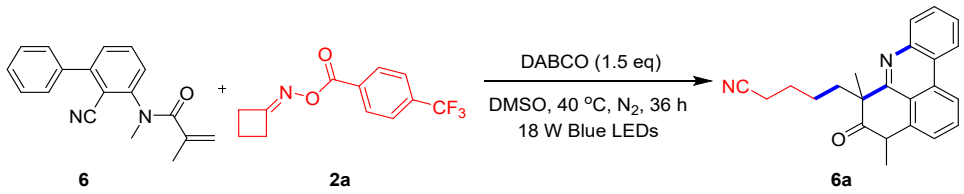


3.3 General Procedure for Synthesis of 5a: To a Schlenk tube equipped with a magnetic stir bar was charged with *N*-methacryloyl-2-phenylindole **5** (0.2 mmol), cyclobutanone oxime ester **2a**

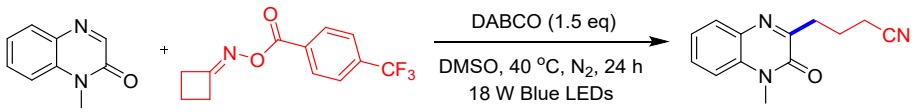
(0.24 mmol) and DABCO (1.5 eq). The tube was sealed with a septum, evacuated and backfilled with nitrogen three times. 2.0 mL DMSO was added via syringe with gentle stirring under N_2 atmosphere. The tube was sealed and stirred under 18 W blue LEDs for 48 h. After reaction, water (20 mL) was added, and the reaction mixture was extracted with EtOAc (20 mL×3), washed with saturated brine (20 mL), then dried over anhydrous Na_2SO_4. The residue was purified directly by thin layer chromatography, eluting with ethyl acetate / cyclohexane (1:5 v/v), to afford compound **5a**.



3.4 General Procedure for Synthesis of 6a: To a Schlenk tube equipped with a magnetic stir bar was charged with *N*-(2-cyano-[1,1'-biphenyl]-3-yl)-*N*-methylmethacrylamide **6** (0.2 mmol), cyclobutanone oxime ester **2a** (0.24 mmol) and DABCO (1.5 eq). The tube was sealed with a septum, evacuated and backfilled with nitrogen three times. 2.0 mL DMSO was added via syringe with gentle stirring under N_2 atmosphere. The tube was sealed and stirred under 18 W blue LEDs for 36 h. After reaction, water (20 mL) was added, and the reaction mixture was extracted with EtOAc (20 mL×3), washed with saturated brine (20 mL), then dried over anhydrous Na_2SO_4. The residue was purified directly by thin layer chromatography, eluting with ethyl acetate / petroleum ether (1:5 v/v), to afford compound **6a**.

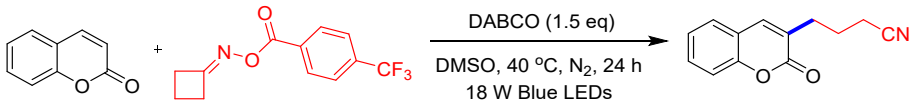


3.5 General Procedure for Synthesis of 7a: To a Schlenk tube equipped with a magnetic stir bar was charged with 1-methylquinoxalin-2(1*H*)-one **7** (0.2 mmol), cyclobutanone oxime ester **2a** (0.24 mmol) and DABCO (1.5 eq). The tube was sealed with a septum, evacuated and backfilled with nitrogen three times. 2.0 mL DMSO was added via syringe with gentle stirring under N_2 atmosphere. The tube was sealed and stirred under 18 W blue LEDs for 24 h. After reaction, water (20 mL) was added, and the reaction mixture was extracted with EtOAc (20 mL×3), washed with saturated brine (20 mL), then dried over anhydrous Na_2SO_4. The residue was purified directly by thin layer chromatography, eluting with ethyl acetate / petroleum ether (1:5 v/v), to afford compound **7a**.



7 2a 7a

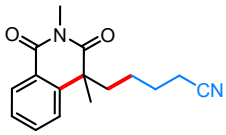
3.6 General Procedure for Synthesis of 8a: To a Schlenk tube equipped with a magnetic stir bar was charged with coumarin **8** (0.2 mmol), cyclobutanone oxime ester **2a** (0.24 mmol) and DABCO (1.5 eq). The tube was sealed with a septum, evacuated and backfilled with nitrogen three times. 2.0 mL DMSO was added via syringe with gentle stirring under N_2 atmosphere. The tube was sealed and stirred under 18 W blue LEDs for 36 h. After reaction, water (20 mL) was added, and the reaction mixture was extracted with EtOAc (20 mL×3), washed with saturated brine (20 mL), then dried over anhydrous Na_2SO_4. The residue was purified directly by thin layer chromatography, eluting with ethyl acetate / petroleum ether (1:5 v/v), to afford compound **8a**.



8 2a 8a

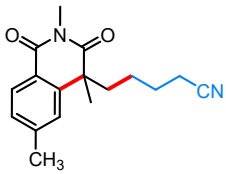
4. Characterization Data

5-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3aa)[3]



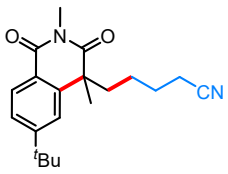
Colorless oil. 49.7 mg, 92% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.25 (dt, *J* = 7.9, 1.7 Hz, 1H), 7.65 (tt, *J* = 7.5, 1.5 Hz, 1H), 7.44 (tt, *J* = 7.6, 1.4 Hz, 1H), 7.40 (d, *J* = 7.9 Hz, 1H), 3.38 (d, *J* = 1.7 Hz, 3H), 2.32 (m, 1H), 2.26-2.12 (m, 2H), 1.90 (m, 1H), 1.60 (d, *J* = 1.6 Hz, 3H), 1.60-1.44 (m, 2H), 1.07-0.83 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.49, 164.38, 143.06, 134.36, 129.09, 127.66, 125.13, 124.91, 119.34, 47.65, 41.74, 29.84, 27.30, 25.37, 24.53, 16.90.

5-(2,4,6-Trimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ba)[3]



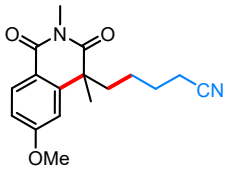
Colorless oil. 51.2 mg, 90% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.11 (dd, *J* = 8.1, 1.5 Hz, 1H), 7.23 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.17 (s, 1H), 3.35 (d, *J* = 1.5 Hz, 3H), 2.44 (s, 3H), 2.34-2.25 (m, 1H), 2.25-2.12 (m, 2H), 1.88 (td, *J* = 12.7, 4.6 Hz, 1H), 1.63-1.43 (m, 5H), 1.06-0.85 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.63, 164.38, 145.24, 143.08, 129.06, 128.74, 125.47, 122.40, 119.34, 47.56, 41.77, 29.77, 27.17, 25.33, 24.48, 22.09, 16.86.

5-(6-(*tert*-Butyl)-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ca)[4]



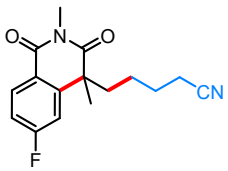
White solid. m.p. 108.5-110.0 °C. 62.7 mg, 96% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.15 (dd, *J* = 8.3, 1.5 Hz, 1H), 7.47 (dt, *J* = 8.4, 1.6 Hz, 1H), 7.40-7.35 (m, 1H), 3.36 (d, *J* = 1.5 Hz, 3H), 2.31 (m, 1H), 2.27-2.11 (m, 2H), 1.91 (td, *J* = 12.7, 4.6 Hz, 1H), 1.60 (d, *J* = 1.3 Hz, 3H), 1.60-1.43 (m, 2H), 1.35 (d, *J* = 1.4 Hz, 9H), 1.10-0.84 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.77, 164.33, 158.19, 142.73, 128.87, 125.07, 122.37, 121.58, 119.28, 47.85, 41.72, 35.47, 31.17 (3), 29.79, 27.18, 25.36, 24.44, 16.83.

5-(6-Methoxy-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3da)[3]



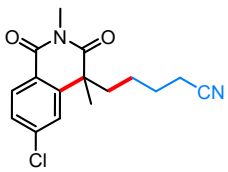
White solid. m.p. 80.4-81.7 °C. 50.5 mg, 84% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.18 (d, *J* = 8.8 Hz, 1H), 6.95 (dd, *J* = 8.8, 2.4 Hz, 1H), 6.83 (d, *J* = 2.4 Hz, 1H), 3.89 (s, 3H), 3.34 (s, 3H), 2.30 (m, 1H), 2.26-2.13 (m, 2H), 1.85 (m, 1H), 1.58 (s, 3H), 1.57-1.44 (m, 2H), 1.08-0.88 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.55, 164.42, 163.99, 145.33, 131.44, 119.35, 117.92, 113.26, 110.41, 55.69, 47.82, 41.88, 29.86, 27.12, 25.34, 24.47, 16.87.

5-(6-Fluoro-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ea)[3]



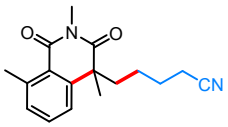
White solid. m.p. 110.6-111.3 °C. 53.6 mg, 93% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.27 (dd, *J* = 8.8, 5.8 Hz, 1H), 7.14 (td, *J* = 8.2, 2.3 Hz, 1H), 7.07 (dd, *J* = 9.5, 2.5 Hz, 1H), 3.36 (d, *J* = 0.9 Hz, 3H), 2.33 (td, *J* = 12.8, 4.5 Hz, 1H), 2.27-2.14 (m, 2H), 1.83 (td, *J* = 12.9, 4.6 Hz, 1H), 1.59 (s, 3H), 1.58-1.46 (m, 2H), 1.09-0.98 (m, 1H), 0.92 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 175.93, 167.62, 165.58, 163.38, 146.21, 146.14, 132.21, 132.14, 121.41, 121.39, 119.23, 115.77, 115.60, 112.14, 111.96, 47.90, 41.84, 29.68, 27.30, 25.29, 24.45, 16.89.

5-(6-Chloro-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3fa)[3]



White solid. m.p. 73.2-73.9 °C. 51.8 mg, 85% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.18 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.41 (dt, *J* = 8.5, 1.8 Hz, 1H), 7.39-7.35 (m, 1H), 3.36 (d, *J* = 1.7 Hz, 3H), 2.31 (m, 1H), 2.21 (m, 2H), 1.89-1.80 (m, 1H), 1.60 (d, *J* = 1.5 Hz, 3H), 1.59-1.46 (m, 2H), 1.08-0.97 (m, 1H), 0.97-0.83 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 175.75, 163.49, 144.81, 140.94, 130.71, 128.33, 125.38, 123.43, 119.22, 47.73, 41.83, 29.58, 27.35, 25.28, 24.46, 16.89.

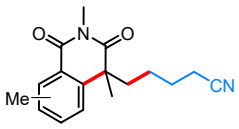
5-(2,4,8-Trimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ga)[3]



Colorless oil. 42.6 mg, 75% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 7.48 (td, *J* = 7.7, 1.2 Hz, 1H), 7.28 (d, *J* = 7.9 Hz, 1H), 7.25-7.21 (m, 1H), 3.34 (d, *J* = 1.4 Hz, 3H), 2.77 (s, 3H), 2.30 (m, 1H), 2.26-2.13 (m, 2H), 1.88 (m, 1H), 1.59 (d, *J* = 1.3 Hz, 3H), 1.57-1.44 (m, 2H), 1.09-0.88 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.18, 164.89, 144.34, 142.69, 133.11, 131.60, 123.36, 123.33, 119.39, 47.61, 41.99, 30.11, 27.26, 25.40, 24.52, 24.12, 16.90.

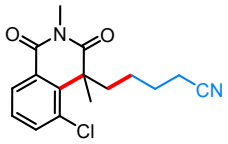
5-(2,4,5-Trimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ha)[4]

5-(2,4,7-Trimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ha')[4]



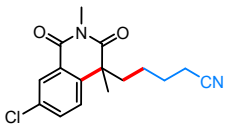
Colorless oil. 47.2 mg, 83% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.22 (dd, *J* = 7.8, 1.6 Hz, 0H), 8.03 (d, *J* = 2.0 Hz, 1H), 7.45 (dd, *J* = 8.0, 2.0 Hz, 1H), 7.34 (t, *J* = 7.7 Hz, 0H), 7.28 (d, *J* = 8.0 Hz, 1H), 3.38 (d, *J* = 1.0 Hz, 1H), 3.36 (d, *J* = 1.0 Hz, 3H), 2.57 (s, 1H), 2.41 (s, 3H), 2.39-2.33 (m, 0H), 2.29 (ddd, *J* = 13.6, 12.1, 4.7 Hz, 1H), 2.25-2.12 (m, 3H), 1.91-1.82 (m, 1H), 1.70 (d, *J* = 0.9 Hz, 1H), 1.57 (s, 3H), 1.56-1.43 (m, 2H), 1.06-0.84 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 177.48, 176.68, 164.59, 164.54, 140.14, 140.11, 138.86, 137.54, 135.41, 135.37, 129.09, 128.12, 127.61, 126.01, 125.06, 124.67, 119.35, 119.32, 49.24, 47.35, 41.70, 37.94, 29.85, 27.59, 27.27, 26.92, 25.44, 25.38, 25.02, 24.51, 22.89, 21.04, 16.88.

5-(5-Chloro-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ia)



Colorless oil. 24.6 mg, 40% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.31 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.66 (dt, *J* = 7.9, 1.1 Hz, 1H), 7.42 (td, *J* = 7.9, 0.8 Hz, 1H), 3.40 (d, *J* = 0.8 Hz, 3H), 2.91 (td, *J* = 13.0, 4.7 Hz, 1H), 2.33-2.24 (m, 1H), 2.21 (t, *J* = 7.2 Hz, 2H), 1.91-1.75 (m, 3H), 1.64-1.47 (m, 2H), 0.96 (m, 1H), 0.91-0.78 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.60, 163.28, 138.79, 137.61, 132.37, 128.91, 128.81, 127.69, 119.34, 49.28, 36.76, 27.76, 25.69, 25.33, 25.02, 16.86. HRMS (ESI) calcd for $C_{16}H_{17}ClN_2O_2$ $(M+H)^+$ 305.1051, found 305.1049.

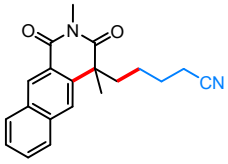
5-(7-Chloro-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ia')



White solid. m.p. 103.8-105.1 °C. 28.6 mg, 47% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.21 (d, *J* = 2.4 Hz, 1H), 7.61 (dd, *J* = 8.4, 2.4 Hz, 1H), 7.35 (d, *J* = 8.4 Hz, 1H), 3.37 (d, *J* = 0.8 Hz, 3H), 2.32 (td, *J* = 12.8, 4.5 Hz, 1H), 2.21 (q, *J* = 7.2 Hz, 2H), 1.87 (td, *J* = 12.9, 4.6 Hz, 1H), 1.62-1.45 (m, 5H), 1.01 (m, 1H), 0.96-0.84 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 175.93, 163.23, 141.34, 134.46, 133.96, 128.76, 126.88, 126.45, 119.27, 47.48, 41.65, 29.76, 27.49, 25.30, 24.48, 16.89. HRMS (ESI) calcd for $C_{16}H_{17}ClN_2O_2$ (

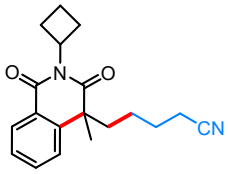
M+H)$^+$ 305.1051, found 305.1049. HRMS (ESI) calcd for $C_{16}H_{17}ClN_2O_2$ (M+H)$^+$ 305.1051, foun d 305.1049.

5-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydrobenzo[g]isoquinolin-4-yl)pentanenitrile (3ja)



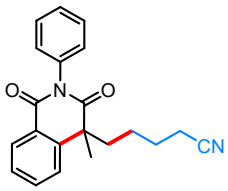
Colorless oil. 26.3 mg, 41% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.50 (d, *J* = 8.5 Hz, 1H), 8.36 (d, *J* = 8.6 Hz, 1H), 7.95 (dd, *J* = 7.9, 1.8 Hz, 1H), 7.91 (d, *J* = 8.7 Hz, 1H), 7.62 (m, 2H), 3.46 (s, 3H), 2.86-2.75 (m, 1H), 2.58 (m, 1H), 2.08 (td, *J* = 7.4, 1.3 Hz, 2H), 2.04 (s, 3H), 1.56-1.35 (m, 2H), 1.06-0.95 (m, 1H), 0.71 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 177.91, 164.66, 140.44, 137.26, 130.38, 129.47, 129.45, 128.26, 126.77, 126.51, 124.23, 123.74, 119.27, 49.67, 40.56, 28.58, 27.57, 25.38, 25.14, 16.80. HRMS (ESI) calcd for $C_{20}H_{20}N_2O_2$ (M+H)$^+$ 321.1598, found 321.1596.

5-(2-Cyclobutyl-4-methyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ka)



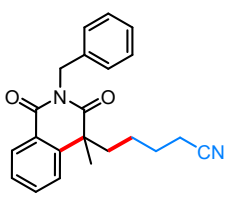
White solid. m.p. 80.7-82.8 °C. 45.9 mg, 74% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.21 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.63 (td, *J* = 7.6, 1.5 Hz, 1H), 7.46-7.40 (m, 1H), 7.37 (d, *J* = 7.9 Hz, 1H), 5.13-5.01 (m, 1H), 2.67 (m, 2H), 2.43-2.35 (m, 2H), 2.33-2.24 (m, 1H), 2.21 (q, *J* = 6.9 Hz, 2H), 1.95-1.83 (m, 2H), 1.83-1.75 (m, 1H), 1.62-1.45 (m, 5H), 1.10 (m, 1H), 0.95 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.67, 164.61, 142.97, 134.13, 129.06, 127.61, 125.66, 124.97, 119.37, 48.71, 47.94, 41.49, 29.37, 28.71, 28.67, 25.45, 24.50, 16.96, 15.73. HRMS (ESI) calcd for $C_{19}H_{22}N_2O_2$ (M+H)$^+$ 311.1754, found 311.1744.

5-(4-Methyl-1,3-dioxo-2-phenyl-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3la)[3]



White solid. m.p. 145.0-146.4 °C. 45.2.8 mg, 68% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.32-8.26 (m, 1H), 7.76-7.69 (m, 1H), 7.50 (dt, *J* = 8.5, 6.9 Hz, 4H), 7.47-7.42 (m, 1H), 7.19 (dd, *J* = 7.5, 1.8 Hz, 2H), 2.38 (td, *J* = 12.8, 4.4 Hz, 1H), 2.24 (td, *J* = 7.2, 4.2 Hz, 2H), 2.00 (td, *J* = 12.9, 4.5 Hz, 1H), 1.72 (s, 3H), 1.58 (m, 2H), 1.26 (m, 1H), 1.10 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.31, 164.25, 143.20, 135.44, 134.71, 129.46 (3), 128.79, 128.41 (2), 127.80, 125.29, 125.09, 119.34, 48.21, 41.83, 29.66, 25.36, 24.61, 16.93.

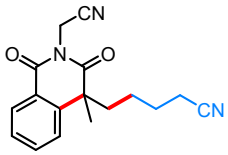
5-(2-Benzyl-4-methyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ma)[3]



White solid. m.p. 79.3-81.6 °C. 58.9 mg, 85% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.26 (dd, *J* = 7.9, 1.4 Hz, 1H), 7.65 (td, *J* = 7.6, 1.5 Hz, 1H), 7.49-7.37 (m, 4H), 7.29 (t, *J* = 7.4 Hz, 2H), 7.23 (dd, *J* = 8.4, 6.0 Hz, 1H), 5.25 (d, *J* = 13.7 Hz, 1H), 5.14 (d, *J* = 13.7 Hz, 1H), 2.26 (m, 1H), 2.12-1.96 (m,

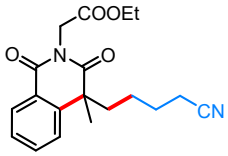
2H), 1.86 (m, 1H), 1.60 (s, 3H), 1.41 (m, 2H), 0.92-0.76 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.14, 164.06, 143.10, 137.24, 134.42, 129.27, 128.94 (2), 128.52 (2), 127.66, 127.60, 125.13, 124.96, 119.32, 47.62, 43.63, 42.11, 29.28, 25.27, 24.33, 16.76.

5-(2-(Cyanomethyl)-4-methyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3na)



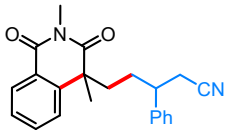
Colorless oil. 41.3 mg, 70% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.26 (dt, *J* = 8.0, 1.3 Hz, 1H), 7.73 (td, *J* = 7.6, 1.4 Hz, 1H), 7.52-7.47 (m, 1H), 7.45 (d, *J* = 7.9 Hz, 1H), 5.10-4.69 (m, 2H), 2.34 (td, *J* = 12.9, 4.6 Hz, 1H), 2.28-2.14 (m, 2H), 1.96 (td, *J* = 12.9, 4.6 Hz, 1H), 1.66 (s, 3H), 1.54 (m, 2H), 1.11-0.89 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 175.22, 162.80, 142.87, 135.40, 129.51, 128.11, 125.44, 123.82, 119.27, 114.68, 48.14, 41.93, 29.36, 27.57, 25.22, 24.37, 16.83. HRMS (ESI) calcd for $C_{17}H_{17}N_3O_2$ $(M+H)^+$ 296.1394, found 296.1387.

Ethyl-2-(4-(4-cyanobutyl)-4-methyl-1,3-dioxo-3,4-dihydroisoquinolin-2(1H)-yl)acetate (3oa)



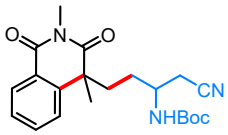
Colorless oil. 39.7 mg, 58% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.24 (dd, *J* = 7.8, 1.4 Hz, 1H), 7.68 (td, *J* = 7.6, 1.4 Hz, 1H), 7.50-7.39 (m, 2H), 4.74 (s, 2H), 4.20 (q, *J* = 7.1 Hz, 2H), 2.36-2.28 (m, 1H), 2.20 (m, 2H), 1.95 (td, *J* = 12.8, 4.6 Hz, 1H), 1.64 (s, 3H), 1.53 (m, 2H), 1.28 (t, *J* = 7.1 Hz, 3H), 1.20 (m, 1H), 0.96 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.05, 168.00, 163.74, 143.25, 134.72, 129.33, 127.74, 125.25, 124.49, 119.51, 61.70, 47.80, 41.68, 41.51, 29.71, 25.44, 24.33, 16.85, 14.25. HRMS (ESI) calcd for $C_{19}H_{22}N_2O_4$ $(M+H)^+$ 343.1652, found 343.1645.

5-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)-3-phenylpentanenitrile (3ab)[4]



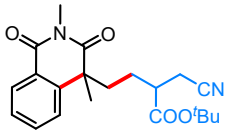
Colorless oil. 49.9 mg, 72% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.26 (m, 1H), 7.66 (td, *J* = 7.6, 1.4 Hz, 0.50H), 7.55 (td, *J* = 7.5, 1.5 Hz, 0.47H), 7.45 (dt, *J* = 9.7, 7.6 Hz, 1H), 7.37 (d, *J* = 7.9 Hz, 0.51H), 7.31 (m, 3H), 7.12-7.07 (m, 1H), 7.03 (d, *J* = 7.9 Hz, 0.46H), 7.00-6.96 (m, 1H), 3.39 (dd, *J* = 11.1, 1.2 Hz, 3H), 2.82 (m, 0.49H), 2.75 (dt, *J* = 9.0, 6.4 Hz, 0.51H), 2.50-2.35 (m, 2H), 2.26 (td, *J* = 12.9, 4.6 Hz, 0.51H), 2.18 (td, *J* = 12.9, 4.5 Hz, 0.56H), 1.82 (td, *J* = 12.9, 4.3 Hz, 0.54H), 1.65 (td, *J* = 13.1, 3.8 Hz, 0.53H), 1.50 (d, *J* = 18.5 Hz, 3H), 1.42 (m, 1H), 1.31-1.22 (m, 0.55H), 1.15 (m, 0.55H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.44, 176.20, 164.36, 164.36, 143.04, 142.85, 140.67, 140.57, 134.41, 134.19, 129.15, 129.10 (2), 129.07 (2), 127.81, 127.78, 127.70, 127.63, 127.25 (2), 127.13 (2), 125.08, 125.06, 124.96, 124.92, 118.11, 47.62, 47.56, 42.22, 42.06, 39.77, 39.48, 30.28, 30.22, 30.11, 29.96, 27.33, 25.52, 25.04.

***tert*-Butyl-(1-cyano-4-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)butan-2-yl)carbamate (3ac)**



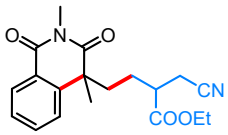
Colorless oil. 72.5 mg, 94% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.25 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.67 (td, *J* = 7.6, 1.5 Hz, 1H), 7.43 (dt, *J* = 26.7, 7.9 Hz, 2H), 4.70 (d, *J* = 7.9 Hz, 0.37H), 4.54 (d, *J* = 8.3 Hz, 0.57H), 3.72-3.60 (m, 1H), 3.38 (d, *J* = 1.2 Hz, 3H), 2.61 (td, *J* = 15.7, 14.3, 5.4 Hz, 1H), 2.52-2.40 (m, 1H), 2.35 (td, *J* = 14.7, 12.8, 4.2 Hz, 1H), 1.98 (m, 1H), 1.60 (d, *J* = 3.6 Hz, 3H), 1.43 (d, *J* = 5.8 Hz, 9H), 1.35-1.03 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.44, 176.28, 164.24, 155.21, 155.00, 142.62, 142.60, 134.59, 134.51, 129.32, 129.30, 127.87, 125.03, 125.00, 124.96, 124.90, 117.06, 116.99, 80.45, 47.61, 47.50, 47.38, 47.30, 38.10, 37.92, 30.72, 30.23, 29.80, 29.41, 28.39 (3), 27.43, 27.41, 24.02, 23.66.

***tert*-Butyl-2-(cyanomethyl)-4-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)butanoate (3ad)**



Colorless oil. 63.0 mg, 85% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.25 (m, 1H), 7.66 (td, *J* = 7.6, 1.3 Hz, 1H), 7.45 (td, *J* = 7.6, 1.3 Hz, 1H), 7.39 (dd, *J* = 8.0, 2.7 Hz, 1H), 3.38 (d, *J* = 1.3 Hz, 3H), 2.56-2.43 (m, 2H), 2.41-2.25 (m, 2H), 2.01-1.93 (m, 0.50H), 1.89 (td, *J* = 13.0, 4.5 Hz, 0.55H), 1.59 (dd, *J* = 6.2, 1.2 Hz, 3H), 1.44 (dd, *J* = 4.8, 1.2 Hz, 9H), 1.34-1.22 (m, 1H), 1.22-1.08 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.17, 176.04, 171.09, 170.99, 164.30, 164.29, 142.65, 142.58, 134.45, 134.42, 129.21, 129.18, 127.79, 125.10, 125.07, 124.98, 124.92, 117.63, 117.54, 82.44, 47.56, 47.50, 42.08, 42.03, 38.73, 38.51, 30.30, 29.98, 28.02 (3), 27.33, 27.11, 26.99, 19.37, 19.17. HRMS (ESI) calcd for $C_{21}H_{26}N_2O_4$ $(M+H)^+$ 371.1965, found 371.1965.

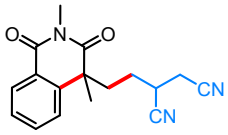
Ethyl-2-(cyanomethyl)-4-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)butanoate (3ae)



Colorless oil. 61.6 mg, 90% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.28-8.21 (m, 1H), 7.66 (m, 1H), 7.49-7.43 (m, 1H), 7.39 (d, *J* = 7.9 Hz, 1H), 4.15 (m, 2H), 3.38 (d, *J* = 1.0 Hz, 3H), 2.64-2.48 (m, 2H), 2.48-2.40 (m, 1H), 2.41-2.26 (m, 1H), 2.03-1.95 (m, 0.53H), 1.91 (td, *J* = 12.9, 4.5 Hz, 0.60H), 1.59 (d, *J* = 6.7 Hz, 3H), 1.431.12 (m, 5H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.17, 176.05, 171.95, 171.86, 164.28, 164.27, 142.57, 142.51, 134.46, 134.43, 129.23, 129.22, 127.83, 127.82, 125.08, 125.04, 124.99, 124.93, 117.50, 117.37, 61.69, 47.61, 47.53, 41.32, 41.20, 38.44, 38.41, 30.43, 30.15, 27.37, 27.06, 26.83, 19.39, 18.94, 14.24, 14.22. HRMS (ESI) calcd for $C_{19}H_{22}N_2O_4$ $(M+H)^+$

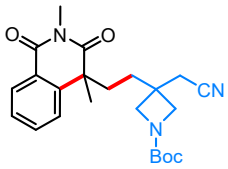
343.1652, found 343.1650.

2-(2-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)succinonitrile (3af)



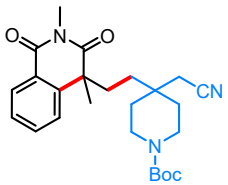
Colorless oil. 54.9 mg, 93% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.25 (dd, *J* = 7.9, 1.3 Hz, 1H), 7.69 (m, 1H), 7.52-7.40 (m, 2H), 3.37 (d, *J* = 3.3 Hz, 3H), 2.91-2.83 (m, 0.50H), 2.82-2.75 (m, 0.56H), 2.71-2.61 (m, 1H), 2.59 (d, *J* = 6.6 Hz, 1H), 2.54 (dd, *J* = 12.8, 4.6 Hz, 0.42H), 2.48 (td, *J* = 12.9, 4.4 Hz, 0.48H), 2.24 (td, *J* = 13.0, 4.3 Hz, 0.49H), 2.12-2.02 (m, 0.59H), 1.62 (d, *J* = 8.9 Hz, 3H), 1.41 (m, 0.52H), 1.36-1.30 (m, 0.65H), 1.30-1.16 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.00, 175.76, 164.06, 164.04, 142.05, 141.86, 134.83, 134.68, 129.37, 128.07, 124.96, 124.93, 124.82, 124.81, 118.43, 118.29, 115.42, 115.32, 47.44, 47.34, 38.17, 37.80, 30.98, 30.30, 28.66, 28.20, 27.68, 27.44, 27.42, 27.08, 21.01, 20.49. HRMS (ESI) calcd for $C_{17}H_{17}N_3O_2$ $(M+H)^+$ 296.1394, found 296.1395.

***tert*-Butyl-3-(cyanomethyl)-3-(2-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)azetidine-1-carboxylate (3ag)**



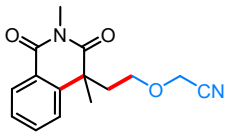
White solid. m.p. 149.7-150.8 °C.. 62.5 mg, 76% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.26 (dt, *J* = 7.9, 1.1 Hz, 1H), 7.73-7.64 (m, 1H), 7.46 (t, *J* = 7.6 Hz, 1H), 7.41 (d, *J* = 7.9 Hz, 1H), 3.61 (d, *J* = 8.9 Hz, 3H), 3.53 (d, *J* = 8.9 Hz, 1H), 3.39 (d, *J* = 0.8 Hz, 3H), 2.55 (s, 2H), 2.31 (td, *J* = 12.5, 4.3 Hz, 1H), 1.91 (td, *J* = 12.6, 5.1 Hz, 1H), 1.61 (s, 3H), 1.39 (s, 9H), 1.22 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.15, 164.18, 156.10, 142.38, 134.63, 129.30, 127.91, 124.92, 116.68, 80.21, 47.51, 36.00, 35.05, 32.17, 30.65, 28.37, 27.42, 25.78. HRMS (ESI) calcd for $C_{23}H_{29}N_3O_4$ $(M+H)^+$ 412.2231, found 412.2233.

***tert*-Butyl-4-(cyanomethyl)-4-(2-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)piperidine-1-carboxylate (3ah)**



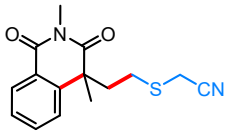
Colorless oil. 68.6 mg, 78% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.25 (dt, *J* = 8.0, 1.4 Hz, 1H), 7.72-7.62 (m, 1H), 7.50-7.43 (m, 1H), 7.41 (d, *J* = 7.9 Hz, 1H), 3.38 (d, *J* = 1.2 Hz, 3H), 3.33 (dt, *J* = 14.2, 5.7 Hz, 2H), 3.23-3.07 (m, 2H), 2.35-2.27 (m, 3H), 1.87 (dt, *J* = 12.8, 6.6 Hz, 1H), 1.65-1.57 (m, 3H), 1.40 (d, *J* = 1.2 Hz, 13H), 0.99 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.32, 164.30, 154.63, 142.65, 134.55, 129.21, 127.80, 124.93, 117.16, 79.90, 47.64, 34.98, 33.95, 31.69, 30.76, 28.44, 27.39, 25.97. HRMS (ESI) calcd for $C_{25}H_{33}N_3O_4$ $(M+H)^+$ 440.2544, found 440.2546.

2-(2-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethoxy)acetonitrile (3ai)[4]



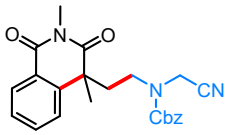
Colorless oil. 46.8 mg, 86% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.26 (dt, *J* = 7.8, 1.7 Hz, 1H), 7.65 (tt, *J* = 7.5, 1.4 Hz, 1H), 7.45 (tt, *J* = 7.5, 1.3 Hz, 1H), 7.39 (d, *J* = 7.9 Hz, 1H), 3.90 (m, 2H), 3.38-3.32 (m, 4H), 3.04 (m, 1H), 2.81 (m, 1H), 2.10 (m, 1H), 1.62 (d, *J* = 1.6 Hz, 3H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.36, 164.20, 142.13, 134.10, 129.18, 127.76, 125.29, 124.96, 115.29, 67.99, 55.99, 45.32, 41.13, 30.05, 27.30.

2-((2-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)thio)acetonitrile (3aj)



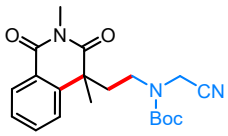
Colorless oil. 42.7 mg, 74% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.27 (dt, *J* = 7.9, 1.6 Hz, 1H), 7.68 (td, *J* = 7.5, 1.4 Hz, 1H), 7.47 (td, *J* = 7.6, 1.2 Hz, 1H), 7.42 (d, *J* = 7.9 Hz, 1H), 3.37 (d, *J* = 1.5 Hz, 3H), 3.28-3.23 (m, 1H), 3.14 (d, *J* = 17.1 Hz, 1H), 2.79-2.70 (m, 1H), 2.39 (m, 1H), 2.33-2.19 (m, 2H), 1.61 (d, *J* = 1.3 Hz, 3H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.16, 164.14, 141.88, 134.50, 129.42, 127.96, 125.21, 125.07, 116.19, 47.20, 39.59, 30.85, 28.30, 27.52, 16.75. HRMS (ESI) calcd for $C_{15}H_{16}N_2O_2S$ $(M+H)^+$ 289.1005, found 289.1003.

Benzyl-(cyanomethyl)(2-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)carbamate (3ak)



Colorless oil. 77.0 mg, 95% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.25 (s, 0.39H), 8.20-8.08 (m, 0.61H), 7.68 (s, 0.47H), 7.53-7.40 (m, 1.61H), 7.39-7.16 (m, 6H), 5.07 (dd, *J* = 30.0, 7.8 Hz, 1.53H), 4.86 (d, *J* = 12.3 Hz, 0.60H), 4.27-3.88 (m, 2H), 3.31 (d, *J* = 0.9 Hz, 3H), 3.19 (d, *J* = 16.4 Hz, 0.5H), 3.03 (t, *J* = 7.2 Hz, 1.68H), 2.71 (dt, *J* = 14.7, 7.9 Hz, 1H), 2.39-2.13 (m, 1H), 1.57 (d, *J* = 5.9 Hz, 3H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.19, 175.89, 164.06, 155.18, 154.42, 141.89, 135.39, 134.30, 129.25, 128.69, 128.54, 128.28 (3), 127.83, 124.89, 115.58, 68.50, 46.04, 45.91, 44.45, 43.85, 38.30, 37.72, 35.10, 31.73, 31.39, 27.34. HRMS (ESI) calcd for $C_{23}H_{23}N_3O_4$ $(M+H)^+$ 406.1761, found 406.1763.

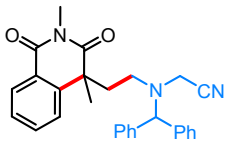
***tert*-Butyl-(cyanomethyl)(2-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)carbamate (3al)**[5]



Colorless oil. 71.3 mg, 96% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.25 (d, *J* = 7.9 Hz, 1H), 7.73-7.62 (m, 1H), 7.46 (t, *J* = 6.8 Hz, 2H), 4.04 (s, 1H), 3.89 (s, 1H), 3.35 (s, 3H), 3.14-2.84 (m, 2H), 2.66 (dt, *J* = 13.8, 8.0 Hz, 1H), 2.22 (s, 1H), 1.58 (s, 3H), 1.45-1.25 (m, 9H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.28, 176.04, 164.07, 154.33, 142.18, 134.41, 129.38, 127.86, 125.06, 124.87, 115.99, 82.15, 45.99, 43.94,

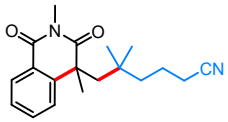
38.55, 37.79, 35.37, 34.70, 31.67, 31.21, 28.14 (3), 27.36.

2-(Benzhydryl(2-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)amino)acetonitrile (3am)



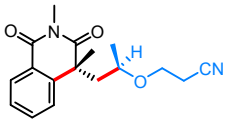
White solid. m.p. 120.1-121.5 °C. 80.5 mg, 92% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.23 (dd, *J* = 7.8, 1.5 Hz, 1H), 7.47-7.40 (m, 1H), 7.36 (t, *J* = 7.6 Hz, 1H), 7.25-7.20 (m, 4H), 7.19-7.13 (m, 2H), 7.07 (d, *J* = 3.8 Hz, 5H), 4.36 (s, 1H), 3.66 (d, *J* = 17.6 Hz, 1H), 3.44 (d, *J* = 17.7 Hz, 1H), 3.37 (s, 3H), 2.69 (m, 1H), 2.15 (dd, *J* = 8.2, 5.5 Hz, 2H), 2.13-2.07 (m, 1H), 1.55 (s, 3H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.21, 164.33, 142.37, 141.28, 140.60, 134.19, 129.24, 128.98 (2), 128.83 (2), 127.70, 127.55 (2), 127.51, 127.46, 127.42 (2), 124.92, 124.79, 114.85, 73.21, 47.84, 46.14, 39.81, 38.24, 31.68, 27.34. HRMS (ESI) calcd for $C_{28}H_{27}N_3O_2$ $(M+H)^+$ 438.2176, found 438.2174.

6-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)-5,5-dimethylhexanenitrile (3an)



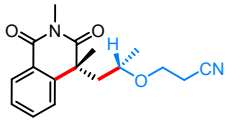
Colorless oil. 56.9 mg, 91% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.24 (dt, *J* = 7.9, 1.8 Hz, 1H), 7.60 (td, *J* = 7.5, 1.6 Hz, 1H), 7.48-7.37 (m, 2H), 3.35 (t, *J* = 1.5 Hz, 3H), 2.48 (dd, *J* = 14.4, 1.9 Hz, 1H), 2.19-2.04 (m, 2H), 2.01 (dd, *J* = 14.5, 1.5 Hz, 1H), 1.57 (d, *J* = 1.7 Hz, 3H), 1.48 (m, 2H), 1.03-0.89 (m, 2H), 0.53 (d, *J* = 1.8 Hz, 3H), 0.40 (d, *J* = 1.8 Hz, 3H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.60, 164.31, 143.89, 133.47, 129.08, 127.48, 126.60, 124.30, 119.61, 52.96, 45.77, 43.10, 34.29, 33.75, 28.09, 27.31, 27.11, 20.21, 17.72. HRMS (ESI) calcd for $C_{19}H_{24}N_2O_2$ $(M+H)^+$ 313.1911, found 313.1909.

3-(((R)-1-((R)-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)propan-2-yl)oxy)propanenitrile (3ao)



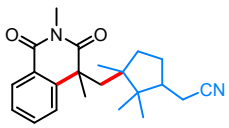
Colorless oil. 34.8 mg, 58% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.20 (dt, *J* = 7.8, 1.6 Hz, 1H), 7.66-7.59 (m, 1H), 7.46 (dd, *J* = 8.0, 1.3 Hz, 1H), 7.44-7.38 (m, 1H), 3.37 (d, *J* = 1.7 Hz, 3H), 3.33 (m, 1H), 3.22-3.14 (m, 1H), 2.87 (m, 1H), 2.37 (m, 1H), 2.23 (m, 1H), 2.01 (m, 1H), 1.91-1.81 (m, 1H), 1.60 (d, *J* = 1.6 Hz, 3H), 0.99 (dd, *J* = 6.1, 1.5 Hz, 3H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.51, 164.66, 144.38, 133.77, 128.45, 127.14, 126.30, 124.12, 117.64, 74.01, 62.63, 49.42, 46.36, 30.24, 27.27, 19.81, 18.53. HRMS (ESI) calcd for $C_{17}H_{20}N_2O_3$ $(M+H)^+$ 301.1547, found 301.1546. The mixture product 3ao and 3ao' was separated by column chromatography on silica gel (petroleum ether/ethylacetate 20:1~10:1).

3-(((S)-1-((R)-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)propan-2-yl)oxy)propanenitrile (3ao')



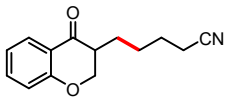
White solid. m.p. 124.1-126.0 °C. 18.0 mg, 30% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.27 (dt, *J* = 8.0, 1.3 Hz, 1H), 7.65 (td, *J* = 7.5, 1.2 Hz, 1H), 7.49-7.43 (m, 1H), 7.37 (d, *J* = 7.9 Hz, 1H), 3.37 (d, *J* = 1.0 Hz, 4H), 2.86 (m, 1H), 2.79-2.70 (m, 2H), 2.27-2.12 (m, 2H), 2.01 (dd, *J* = 14.3, 3.1 Hz, 1H), 1.59 (s, 3H), 1.03 (d, *J* = 6.0 Hz, 3H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.71, 164.69, 142.94, 133.90, 129.01, 127.55, 125.63, 124.97, 117.32, 73.05, 62.73, 49.05, 45.21, 30.67, 27.35, 18.95, 18.55. HRMS (ESI) calcd for $C_{17}H_{20}N_2O_3$ $(M+H)^+$ 301.1547, found 301.1544. The mixture product 3ao and 3ao' was separated by column chromatography on silica gel (petroleum ether/ethylacetate 20:1~10:1).

2-(3-((2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)methyl)-2,2,3-trimethylcyclo-pentyl)acetonitrile (3ap)



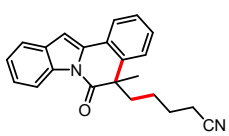
Colorless oil. 50.0 mg, 71% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.26 (m, 1H), 7.67-7.56 (m, 1H), 7.49-7.38 (m, 2H), 3.38 (dd, *J* = 12.7, 1.1 Hz, 3H), 2.56 (dd, *J* = 14.3, 10.0 Hz, 1H), 2.30 (m, 1H), 2.26-2.19 (m, 0.53H), 2.19-2.11 (m, 0.51H), 2.11-1.91 (m, 2H), 1.70 (m, 1H), 1.59 (s, 3H), 1.33-1.20 (m, 1H), 1.20-0.99 (m, 1H), 0.94 (s, 3H), 0.84 (dt, *J* = 13.1, 8.1 Hz, 0.59H), 0.70 (s, 1.38H), 0.61 (s, 1.32H), 0.57-0.52 (m, 0.45H), 0.50 (s, 1.45H), 0.14 (s, 1.41H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 177.07, 176.49, 164.45, 164.39, 144.37, 143.74, 133.50, 133.44, 129.20, 129.15, 127.62, 127.42, 126.76, 126.55, 124.38, 124.32, 119.94, 119.85, 48.05, 47.67, 47.57, 47.37, 46.99, 46.83, 46.00, 45.88, 44.56, 43.75, 35.02, 34.60, 34.35, 33.41, 28.76, 28.27, 27.40, 27.38, 25.48, 23.38, 22.44, 20.68, 20.18, 19.69, 18.96. HRMS (ESI) calcd for $C_{22}H_{28}N_2O_2$ $(M+H)^+$ 353.2224, found 353.2220.

5-(4-Oxochroman-3-yl)pentanenitrile (4a)



Colorless oil. 23.4 mg, 51% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 7.88 (dd, *J* = 7.8, 1.8 Hz, 1H), 7.47 (m, 1H), 7.02 (t, *J* = 7.5 Hz, 1H), 6.96 (d, *J* = 8.4 Hz, 1H), 4.53 (dd, *J* = 11.4, 4.4 Hz, 1H), 4.28 (dd, *J* = 11.4, 8.7 Hz, 1H), 2.68 (m, 1H), 2.38 (t, *J* = 7.0 Hz, 2H), 1.96-1.85 (m, 1H), 1.72 (p, *J* = 7.2 Hz, 2H), 1.68-1.50 (m, 3H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 194.24, 161.54, 136.07, 127.54, 121.63, 120.57, 119.63, 117.86, 70.50, 45.71, 26.31, 25.78, 25.50, 17.16. HRMS (ESI) calcd for $C_{14}H_{15}NO_2$ $(M+H)^+$ 230.1176, found 230.1176.

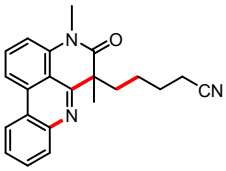
5-(5-Methyl-6-oxo-5,6-dihydroindolo[2,1-*a*]isoquinolin-5-yl)pentanenitrile (5a)[6]



Colorless oil. 41.4 mg, 63% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.58 (d, *J*

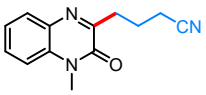
= 8.0 Hz, 1H), 7.91-7.83 (m, 1H), 7.61 (dd, *J* = 7.4, 1.3 Hz, 1H), 7.43-7.31 (m, 5H), 7.04 (s, 1H), 2.43 (m, 1H), 2.25-2.07 (m, 2H), 1.97 (m, 1H), 1.69 (s, 3H), 1.62-1.45 (m, 2H), 1.16-0.93 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 173.03, 137.88, 135.46, 135.26, 130.76, 129.27, 127.54, 126.16, 125.39, 124.83, 124.80, 123.94, 120.62, 119.50, 116.83, 103.19, 48.69, 41.65, 29.37, 25.52, 24.62, 16.88.

5-(4,6-Dimethyl-5-oxo-5,6-dihydro-4H-pyrido[4,3,2-*gh*]phenanthridin-6-yl)pentanenitrile (6a)[7]



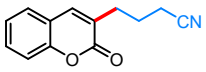
Yellow solid. m.p. 92.3-93.2 °C. 30.1 mg, 44% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 7.55-7.43 (m, 5H), 7.36 (d, *J* = 7.6 Hz, 1H), 7.13 (d, *J* = 7.5 Hz, 1H), 3.65 (s, 3H), 2.40-2.18 (m, 2H), 1.97 (m, 1H), 1.80 (m, 1H), 1.58 (m, 2H), 1.40 (s, 3H), 1.20-1.04 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 180.53, 146.25, 146.15, 138.28, 133.80, 129.10 (2), 128.88, 128.71 (2), 126.25, 124.09, 119.45, 116.64, 93.23, 47.06, 37.44, 28.28, 25.46, 24.04, 23.80, 17.00.

4-(4-Methyl-3-oxo-3,4-dihydroquinoxalin-2-yl)butanenitrile (7a)[8]



Yellow solid. m.p. 107.8-109.0 °C. 37.7 mg, 83% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 7.82 (dt, *J* = 8.0, 1.5 Hz, 1H), 7.55 (m, 1H), 7.35 (tt, *J* = 7.2, 1.3 Hz, 1H), 7.31 (dt, *J* = 8.4, 1.3 Hz, 1H), 3.74-3.67 (m, 3H), 3.08 (td, *J* = 7.2, 1.7 Hz, 2H), 2.54 (td, *J* = 7.3, 1.3 Hz, 2H), 2.22 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 158.56, 154.83, 133.17, 132.51, 130.21, 129.86, 123.88, 119.76, 113.81, 32.40, 29.23, 22.13, 16.87.

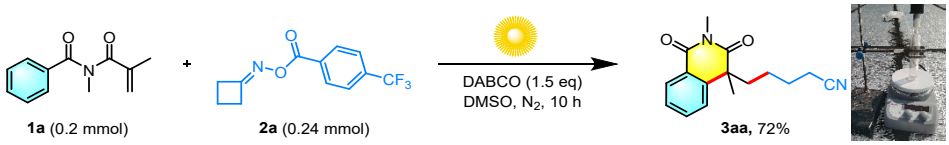
4-(2-Oxo-2H-chromen-3-yl)butanenitrile (8a)[9]



White solid. m.p. 97.3-98.1 °C. 27.2 mg, 64% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 7.60 (s, 1H), 7.53-7.48 (m, 1H), 7.47 (dd, *J* = 7.7, 1.5 Hz, 1H), 7.33 (d, *J* = 8.3 Hz, 1H), 7.28 (t, *J* = 7.6 Hz, 1H), 2.74 (t, *J* = 7.5 Hz, 2H), 2.43 (t, *J* = 7.0 Hz, 2H), 2.05 (p, *J* = 7.2 Hz, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 161.57, 153.45, 140.32, 131.32, 127.55, 127.31, 124.66, 119.25, 116.66, 30.37, 23.79, 16.85.

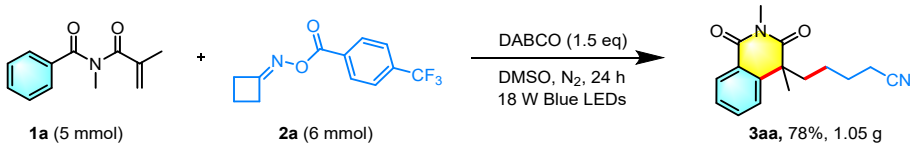
5. Synthetic Utility of the Methodology

5.1 The application under the sunlight



The mixture of substrates **1a** (0.2 mmol), **2a** (0.24 mmol), DABCO (0.3 mmol) and MeCN (2 mL) were sequentially added into a reaction tube, then the reaction system was irradiated under sunlight in N_2 atmosphere for 10 h (from 8:30 to 18:30; 2023/10/17. Nanchang, China.). The isolated yield of **3aa** (72%) was given.

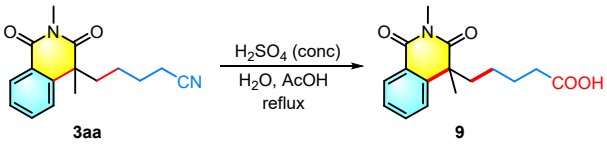
5.2 Gram-scale synthesis



1a (5 mmol), **2a** (6 mmol) and DABCO (7.5 mmol) were added to an oven dried 250 mL Schlenk round-bottomed flask. The reaction mixture was degassed three times. 50 mL of degassed DMSO was then added to the mixture in the presence of a flow of nitrogen. After that, the solution was stirred at a distance of ~5 cm from 18 W blue LEDs (460-465 nm) at 40 °C about 24 h. After reaction, water (50 mL) was added, and the reaction mixture was extracted with EtOAc (50 mL×3), washed with saturated brine (30 mL), then dried over anhydrous Na_2SO_4. The crude product was purified by flash chromatography on silica gel (petroleum ether/ethylacetate 3:1~1:1) directly to give the desired product **3aa**.

5.3 Transformation of cyanoalkylated product

(a) Hydrolysis of isoquinoline-1,3(*2H*,*4H*)-dione 3aa

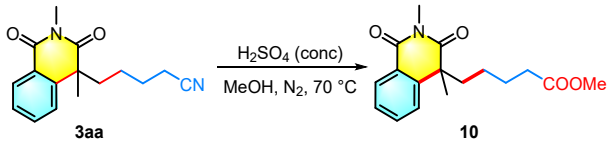


Isoquinoline-1,3(*2H*,*4H*)-dione **3aa** (83.1 mg, 0.3 mmol) was added into 10 mL RBF. H_2SO_4 (0.3 mL), CH3COOH (0.5 mL) and H_2O (0.5 mL) were then added sequentially via syringe. The resulting mixture was heated to reflux. Upon completion of the reaction as monitored by TLC, the solvent was removed under vacuum. The residue was purified directly by flash column chromatography, eluting with ethyl acetate/petroleum ether (1 : 3 *v*/*v*) to give product **9**.

5-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanoic acid. Colorless oil. 79.0 mg, 91% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.22 (dt, *J* = 7.8, 1.4 Hz, 1H), 7.63 (tt, *J* = 7.5,

1.3 Hz, 1H), 7.45-7.37 (m, 2H), 3.36 (d, *J* = 1.4 Hz, 3H), 2.36-2.24 (m, 1H), 2.16 (m, 2H), 1.86 (td, *J* = 12.9, 4.2 Hz, 1H), 1.59 (d, *J* = 1.2 Hz, 3H), 1.55-1.37 (m, 2H), 1.00-0.88 (m, 1H), 0.76 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 179.19, 176.72, 164.58, 143.49, 134.24, 128.94, 127.46, 125.22, 124.92, 47.73, 42.61, 33.58, 29.55, 27.25, 24.68, 24.51. HRMS (ESI) calcd for $C_{16}H_{19}NO_4$ $(M+H)^+$ 290.1387, found 290.1384.

(b) Esterification of isoquinoline-1,3(*2H*,*4H*)-dione 3aa

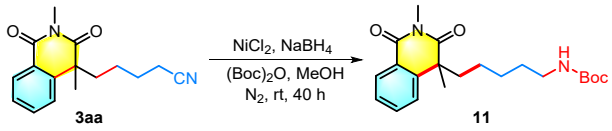


3aa **10**

To a solution of **3aa** (0.3 mmol, 83.1 mg) in methanol (3.0 mL) at 0 ℃ was added concentrated sulphuric acid (1.0 mL), the reaction was heated to 70 ℃ in a sealed tube and stirred overnight under nitrogen atmosphere. The reaction was quenched with cold water and extracted with EtOAc. The combined organic phase were dried over Na_2SO_4, filtered and concentrated under vacuum. Purification by column chromatography on silica gel, get product **10**.

Methyl 5-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)-pentanoate. Colorless oil. 47.3 mg, 52% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.24 (dt, *J* = 7.9, 1.3 Hz, 1H), 7.68-7.60 (m, 1H), 7.46-7.38 (m, 2H), 3.58 (d, *J* = 1.1 Hz, 3H), 3.37 (d, *J* = 1.1 Hz, 3H), 2.38-2.23 (m, 1H), 2.22-2.06 (m, 2H), 1.86 (td, *J* = 12.9, 4.5 Hz, 1H), 1.60 (d, *J* = 0.9 Hz, 3H), 1.56-1.38 (m, 2H), 1.01-0.84 (m, 1H), 0.82-0.66 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.70, 173.84, 164.59, 143.57, 134.21, 128.94, 127.46, 125.26, 124.99, 51.61, 47.76, 42.76, 33.68, 29.53, 27.25, 24.86, 24.79. HRMS (ESI) calcd for $C_{17}H_{21}NO_4$ $(M+H)^+$ 304.1543, found 304.1541.

(c) Reduction of isoquinoline-1,3(*2H*,*4H*)-dione 3aa

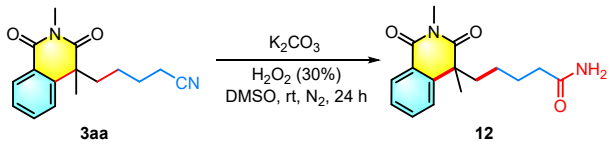


3aa **11**

3aa (0.3 mmol, 83.1 mg), $NaBH_4$ (2.1 mmol, 79.4 mg) and $NiCl_2$ (0.6 mmol, 78.1 mg) were added into a Schlenk tube. The reaction vessel was capped and subjected to three vacuum-purge/nitrogen-flush cycles. Then MeOH (2.5 mL) and Boc_2O (0.9 mmol, 196.4 mg) were added through the side-arm by syringe at 0 ℃. The mixture was stirred at rt for 40 h. After reaction, the mixture was added diethylenetriamine (0.3 mmol, 31.0 mg) and stirred at rt for 30 min. Water (10 mL) was added and it was extracted with EtOAc (10 mL × 3), washed with saturated brine (10 mL), then dried over anhydrous Na_2SO_4. After filtration, the filtrate was concentrated under reduced pressure and the residue was purified by silica gel flash chromatography using petroleum ether/EtOAc (3 : 1) to afford the desired product **11**.

***tert*-Butyl (5-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentyl)carbam-ate.** Colorless oil. 71.9 mg, 64% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.21 (dt, *J* = 8.0, 1.8 Hz, 1H), 7.62 (td, *J* = 7.6, 1.7 Hz, 1H), 7.46-7.33 (m, 2H), 4.48 (s, 1H), 3.35 (d, *J* = 2.0 Hz, 3H), 2.95 (d, *J* = 7.4 Hz, 2H), 2.38-2.14 (m, 1H), 1.89-1.75 (m, 1H), 1.58 (d, *J* = 1.9 Hz, 3H), 1.38 (d, *J* = 2.1 Hz, 9H), 1.27 (p, *J* = 7.3 Hz, 2H), 1.21-1.05 (m, 2H), 0.97-0.80 (m, 1H), 0.71 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.78, 164.56, 156.00, 143.65, 134.16, 128.84, 127.36, 125.23, 124.93, 79.11, 47.76, 43.16, 40.48, 29.78, 29.40, 28.47, 27.19, 26.81, 24.96. HRMS (ESI) calcd for $C_{21}H_{30}N_2O_4$ $(M+H)^+$ 375.2278, found 375.2276.

(d) Amidation of isoquinoline-1,3(*2H*,*4H*)-dione 3aa

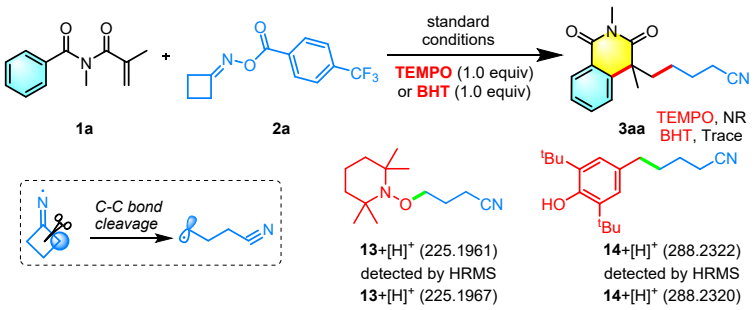


3aa (0.3 mmol, 83.1 mg) and K_2CO_3 (0.3 mmol, 41.5 mg) were weighed into a Schlenk tube, then 30% H_2O_2 (0.5 mL) and DMSO (2.0 mL) was added through the side-arm by syringe. The mixture was stirred at rt for 24 h. After reaction, water (10 mL) was added, and the reaction mixture was extracted with EtOAc (5 mL×3), washed with saturated brine (10 mL), then dried over anhydrous Na_2SO_4. After filtration, the filtrate was concentrated under reduced pressure and the residue was purified by silica gel flash chromatography using EtOAc/CH_2Cl_2 (5 : 1) to afford the desired product **12**.

5-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanamide. White solid. m.p. 116.9-117.6 °C. 82.2 mg, 95% yield. **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.20 (dt, *J* = 7.9, 1.8 Hz, 1H), 7.62 (tt, *J* = 7.6, 1.6 Hz, 1H), 7.43-7.36 (m, 2H), 5.84 (s, 1H), 5.63 (s, 1H), 3.33 (d, *J* = 2.2 Hz, 3H), 2.27 (m, 1H), 2.03 (m, 2H), 1.91-1.80 (m, 1H), 1.57 (d, *J* = 1.9 Hz, 3H), 1.45 (m, 2H), 0.95-0.69 (m, 2H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 176.77, 175.40, 164.53, 143.45, 134.24, 128.84, 127.42, 125.23, 124.84, 47.73, 42.53, 35.30, 29.57, 27.20, 25.23, 24.78. HRMS (ESI) calcd for $C_{16}H_{20}N_2O_3$ $(M+H)^+$ 289.1547, found 289.1541.

6. Preliminary Mechanistic Studies

(a) Radical-Trapping Experiment



To a Schlenk tube equipped with a magnetic stir bar was charged with *N*-Alkyl-*N*-methacryloyl benzamides **1a** (0.2 mmol), cyclobutanone Oximes **2a** (0.24 mmol), DABCO (1.5 eq) and radical-trapping agent. The tube was sealed with a septum, evacuated and backfilled with nitrogen three times. 2.0 mL acetonitrile (MeCN) was added via syringe with gentle stirring under N_2 atmosphere. The tube was sealed and stirred under 18 W blue LEDs. It was observed that the transformation was completely inhibited by TEMPO or BHT, along with the interception of the cyanoalkyl radical species as detected by high-resolution mass spectrometry (HRMS) (Figure S1).

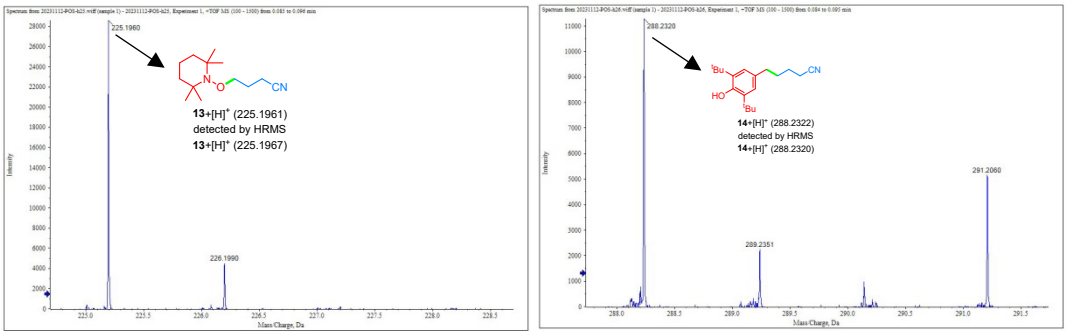


Figure S1. TEMPO or BHT trapping cyanoalkyl Free Radicals

(b) Light On/Off Experiment

To a Schlenk tube equipped with a magnetic stir bar was charged with *N*-Alkyl-*N*-methacryloyl benzamides **1a** (0.2 mmol), cyclobutanone oxime ester **2a** (0.24 mmol) and DABCO (1.5 eq). The tube was sealed with a septum, evacuated and backfilled with nitrogen three times. 2.0 mL DMSO was added via syringe with gentle stirring under N_2 atmosphere. The tube was sealed and stirred under 18 W blue LEDs with the light turned on and off at intervals. The residue was purified directly by thin layer chromatography, eluting with ethyl acetate / petroleum ether (1:3 v/v), to afford compound **3aa**.

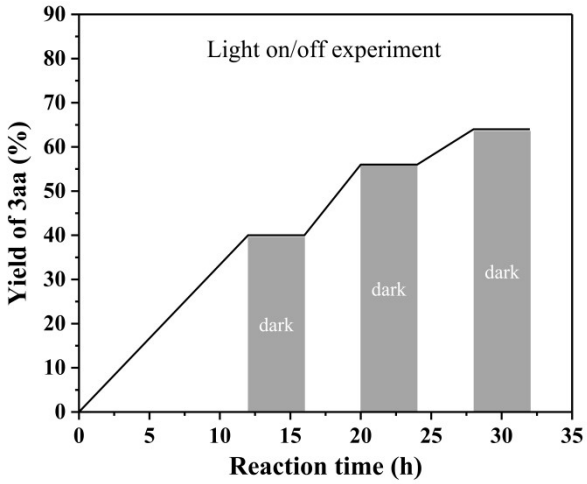


Figure S2. Light on/off experiments

(c) UV-vis Absorption Experiments

UV-vis spectroscopic measurements were performed in DMSO at 0.1 M concentration for each species.

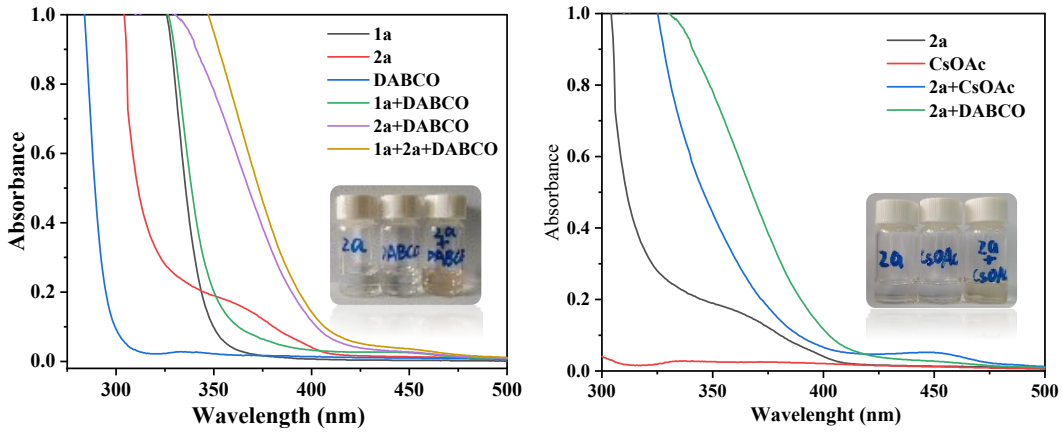


Figure S3. Partial UV/vis absorption spectra.

(d) Determination of the Association Constant of the EDA Complex[10]

The association constant of the EDA complex formed between **2a** and DABCO was determined via UV/vis spectroscopy using the Benesi Hildebrand methodology. The absorbance of a constant concentration of **2a** ($6*10^{-3}$ M in DMSO) with increasing amounts of DABCO (M = $6*10^{-3}$, $9*10^{-3}$, $1.2*10^{-2}$, $1.5*10^{-2}$, $1.8*10^{-2}$, $2.1*10^{-2}$) was recorded at 323 nm. Plotting the reciprocal concentration of 1a against the reciprocal of the absorbance A resulted in a straight line, the intercept of which was divided by its slope to obtain the association constant (K_{EDA} = 6.27 M^{-1})

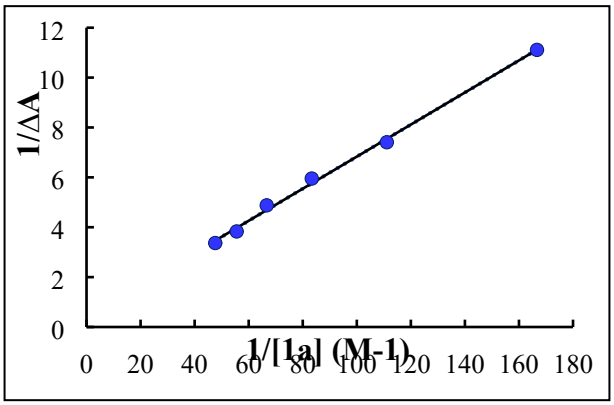
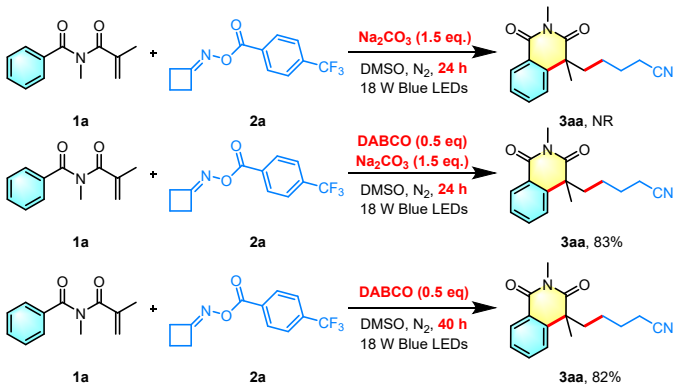


Figure S4. Benesi-Hildebrand plot.

(e) Control Experiment and Determination of trifluoromethyl benzoic acid by GC-MS



To a Schlenk tube equipped with a magnetic stir bar was charged with *N*-alkyl-*N*-methacryloyl benzamides **1a** (0.2 mmol), cyclobutanone oxime ester **2a** (0.24 mmol) and base. The tube was sealed with a septum, evacuated and backfilled with nitrogen three times. 2.0 mL DMSO was added via syringe with gentle stirring under N_2 atmosphere. The tube was sealed and stirred under 18 W blue LEDs. The reaction solution was extracted, dried, diluted and detected by GC-MS.

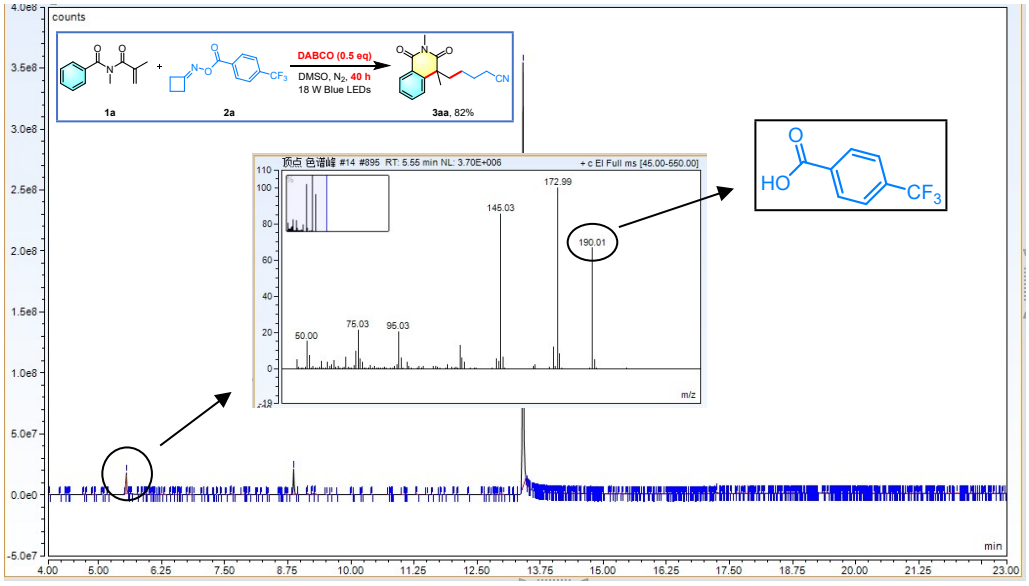


Figure S5. Determination of trifluoromethyl benzoic acid by GC-MS

7. References

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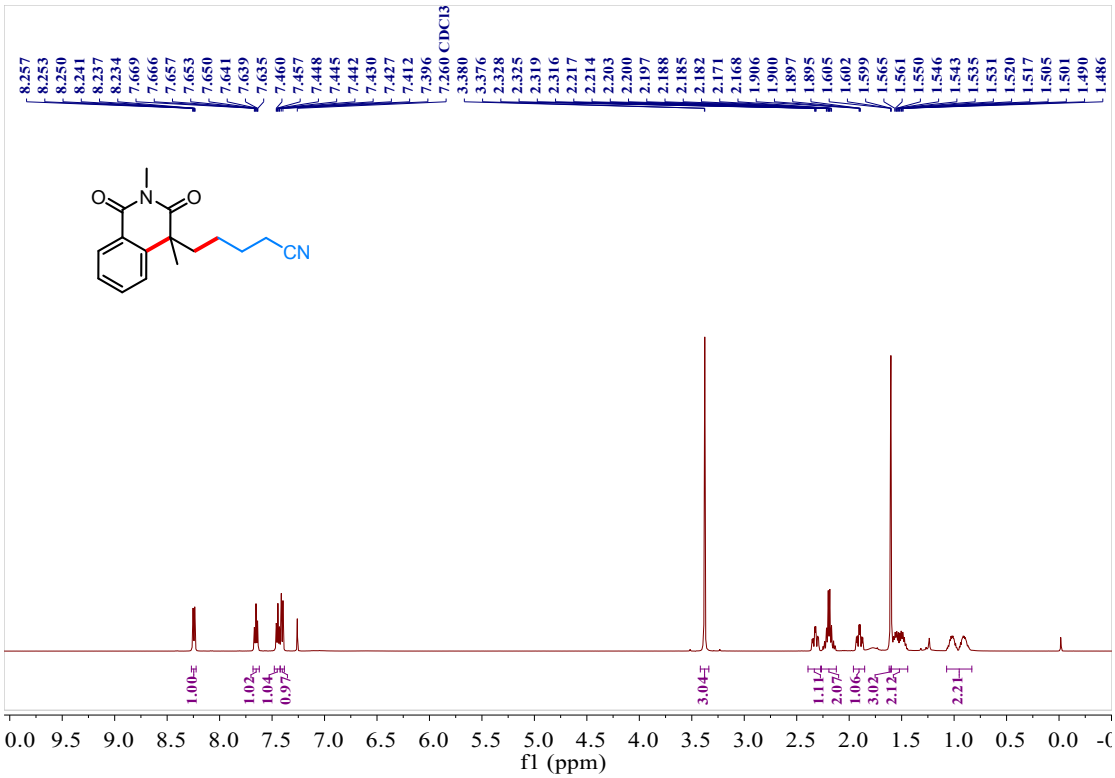
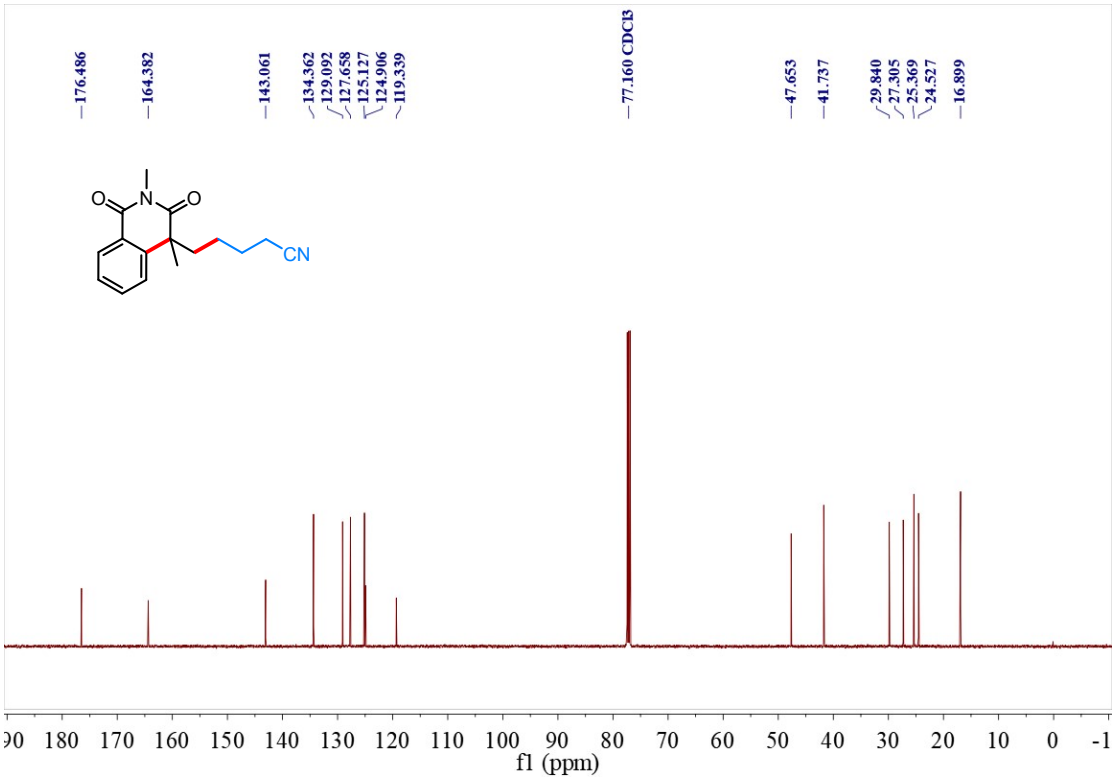
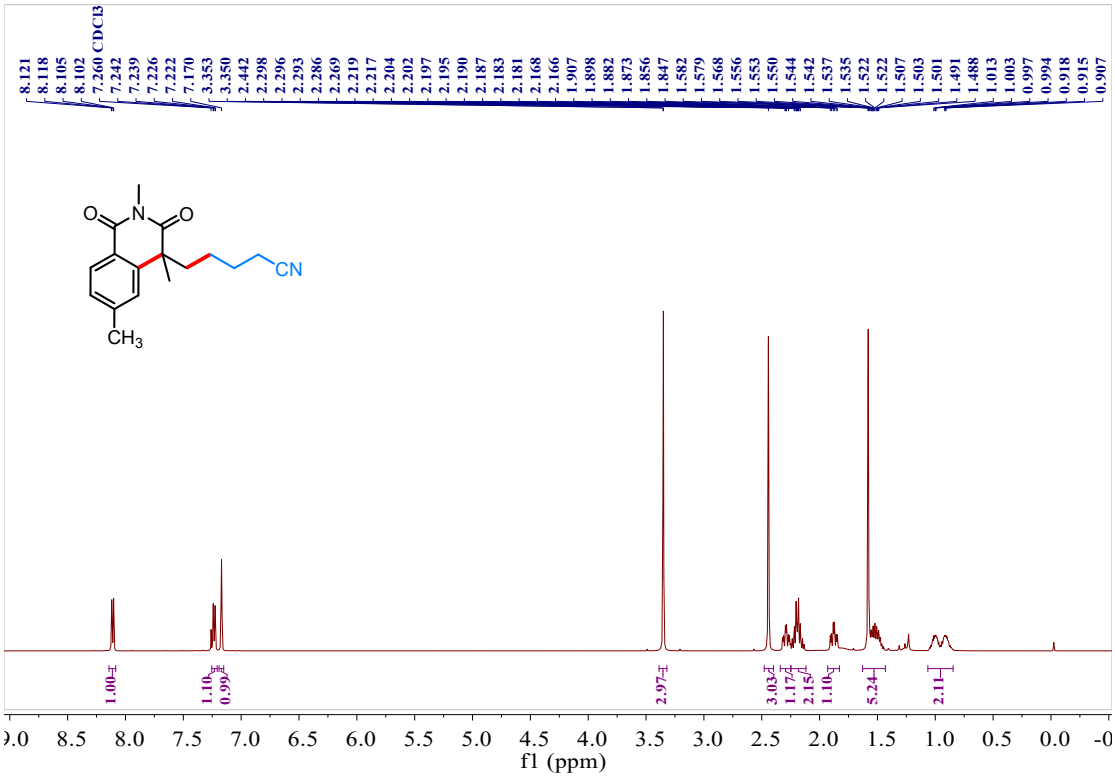
8. NMR Spectra of Products

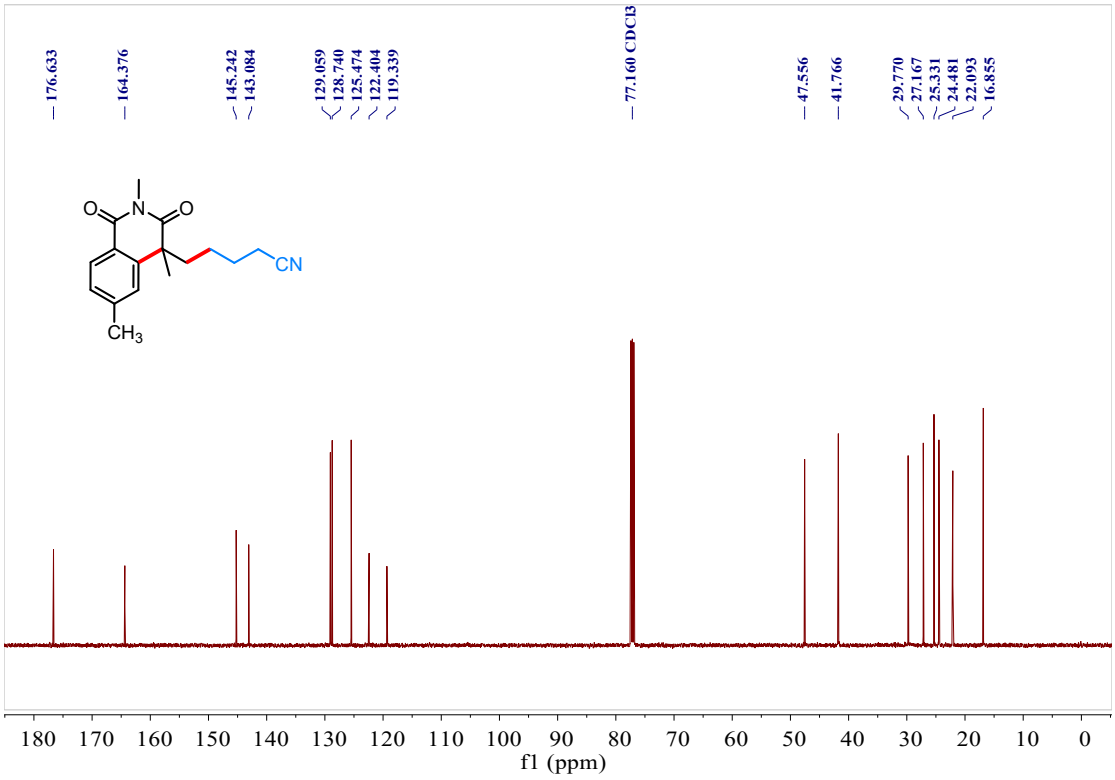
5-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3aa)



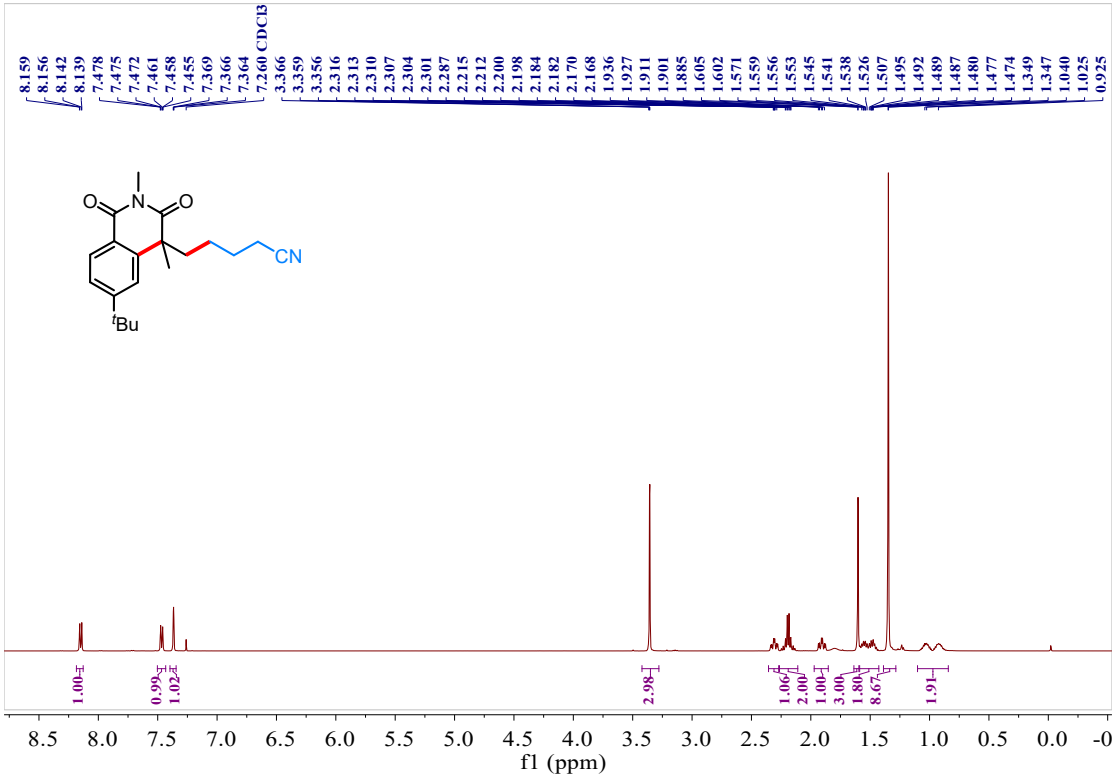


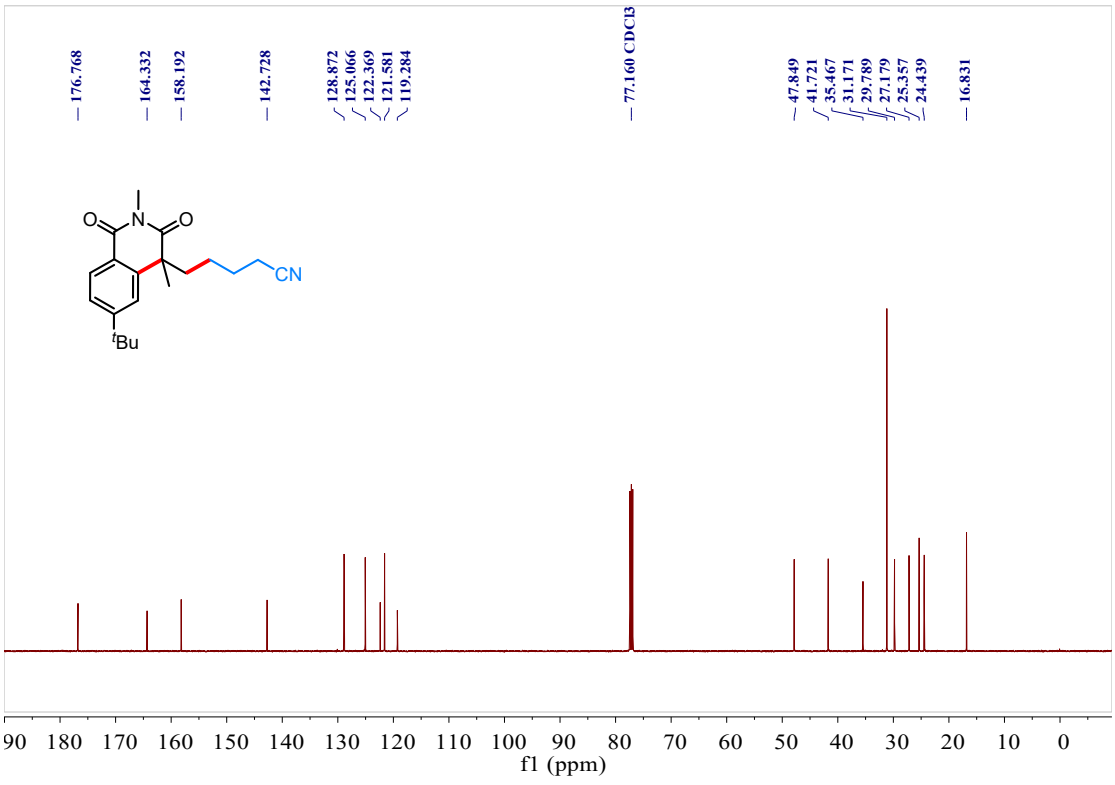
5-(2,4,6-Trimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ba)



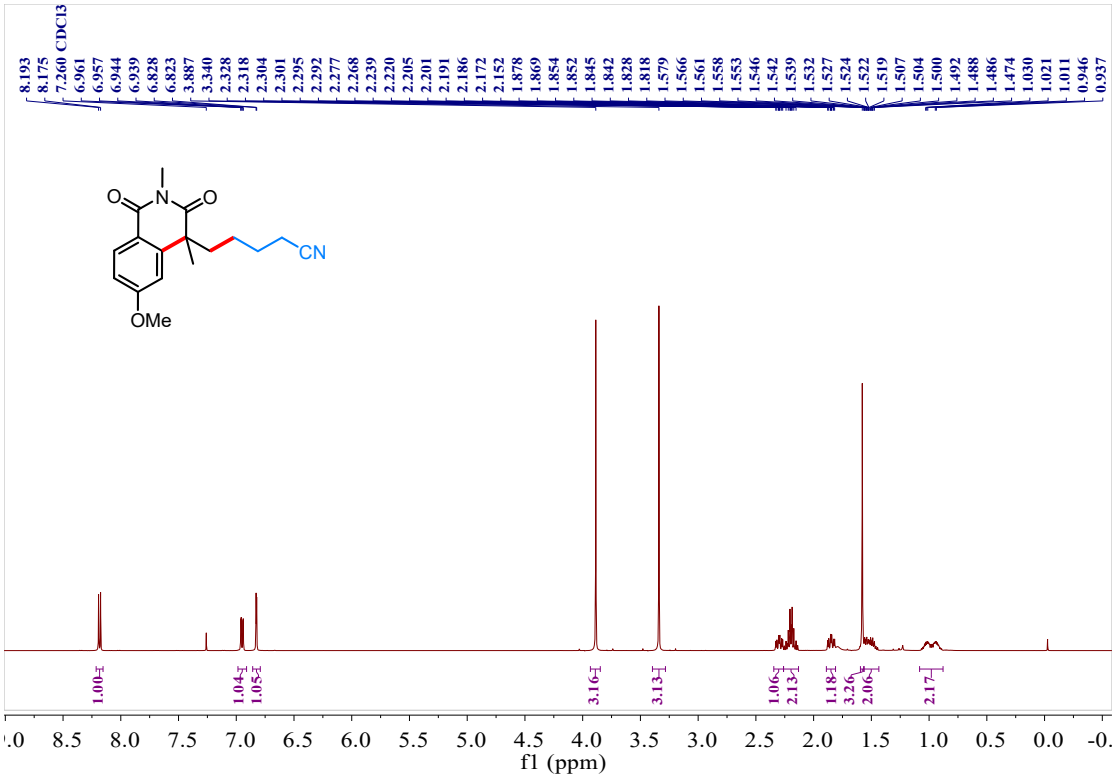


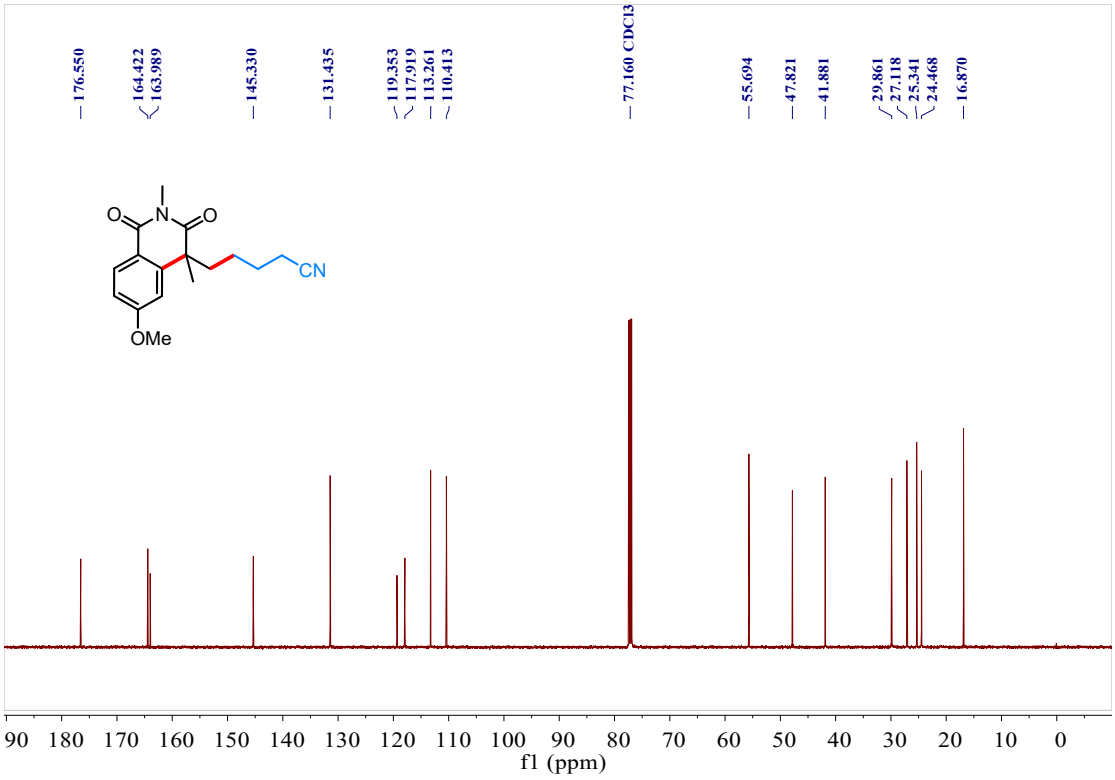
5-(6-(Tert-butyl)-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ca)



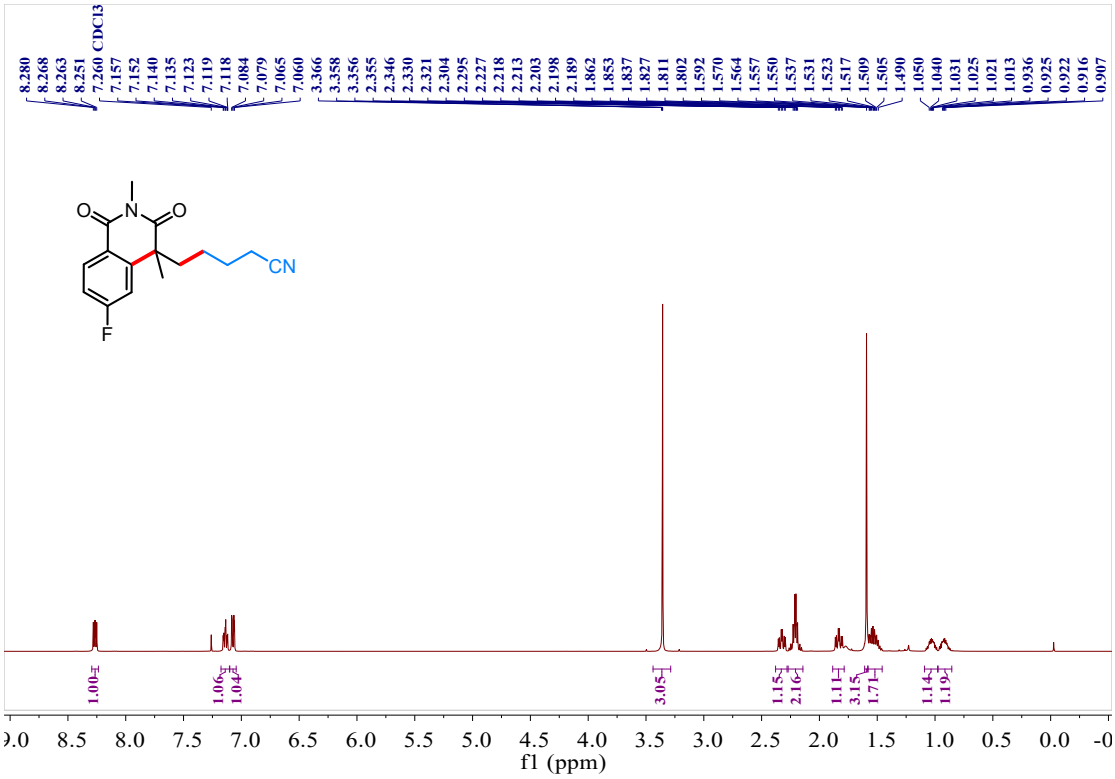


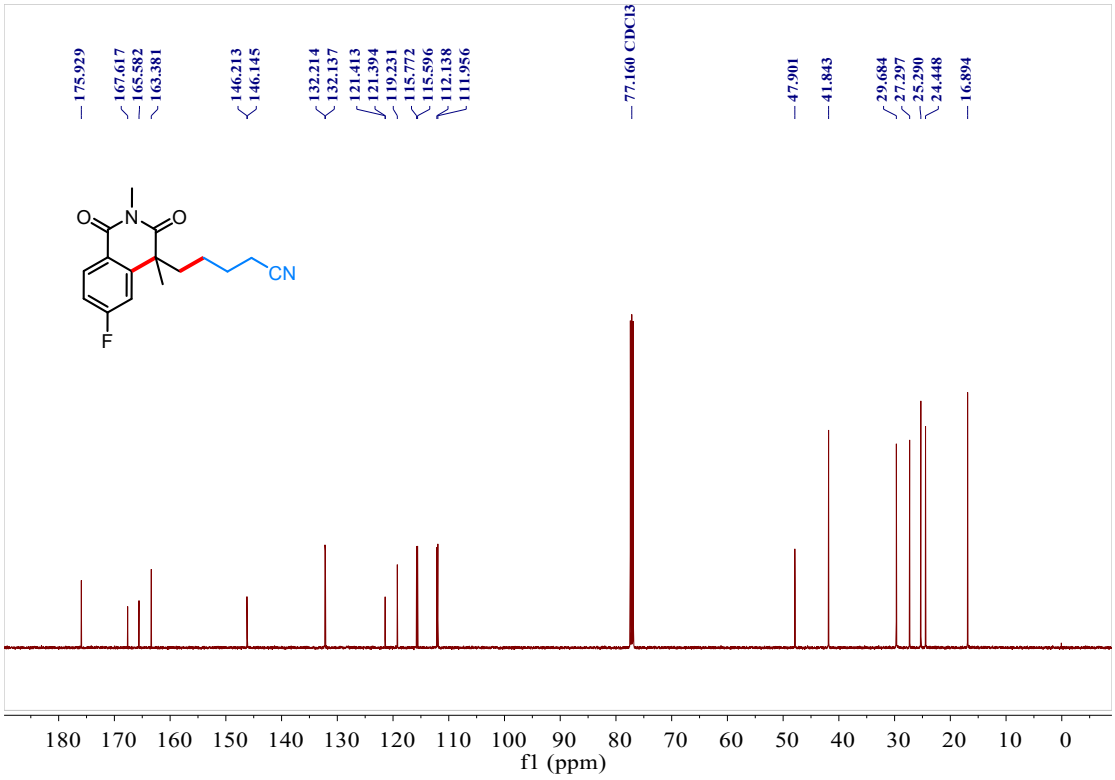
5-(6-Methoxy-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3da)



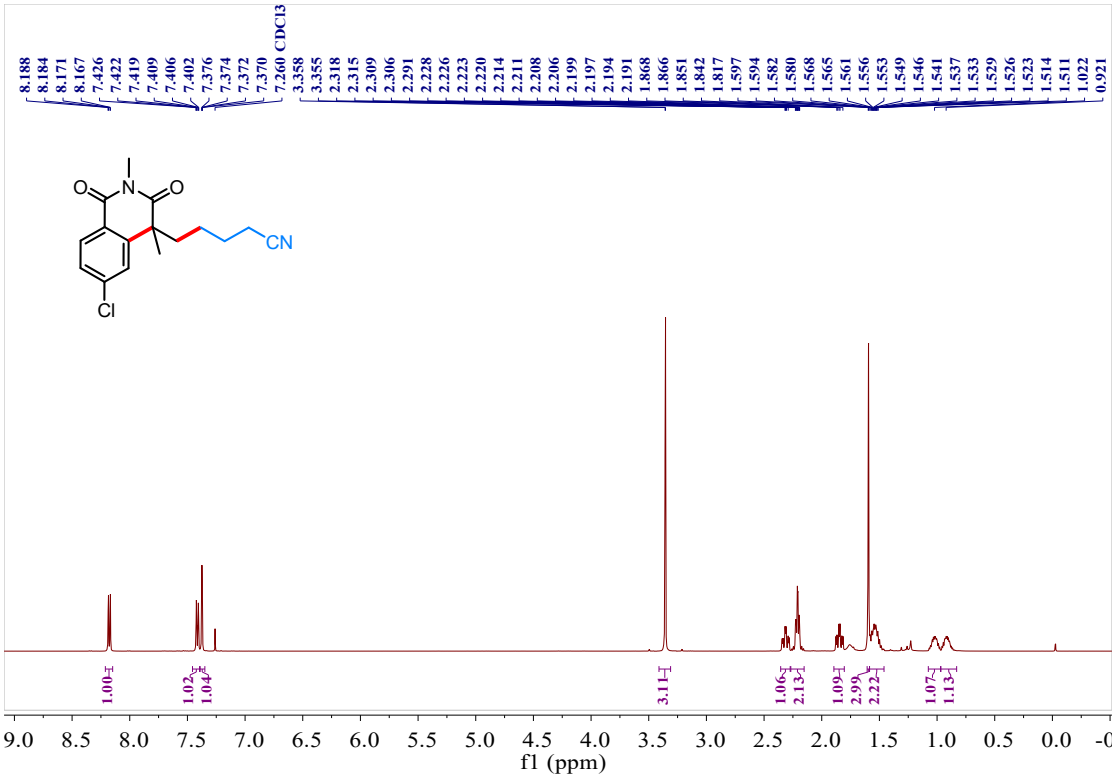


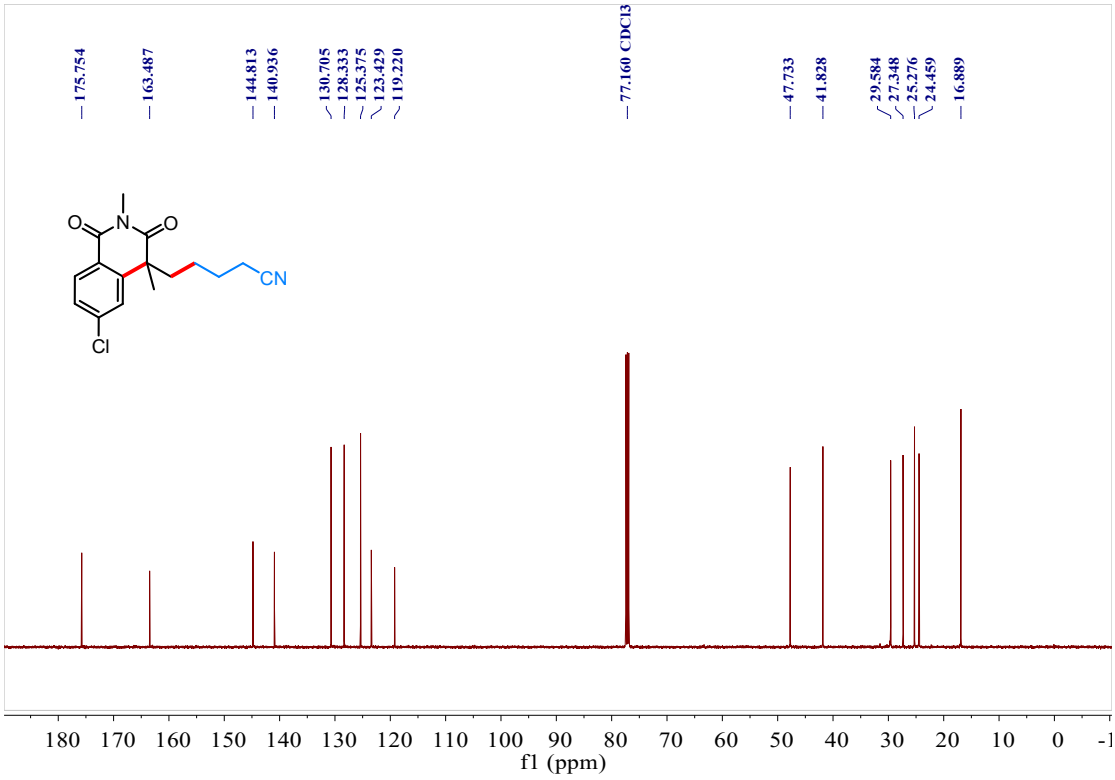
5-(6-Fluoro-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ea)



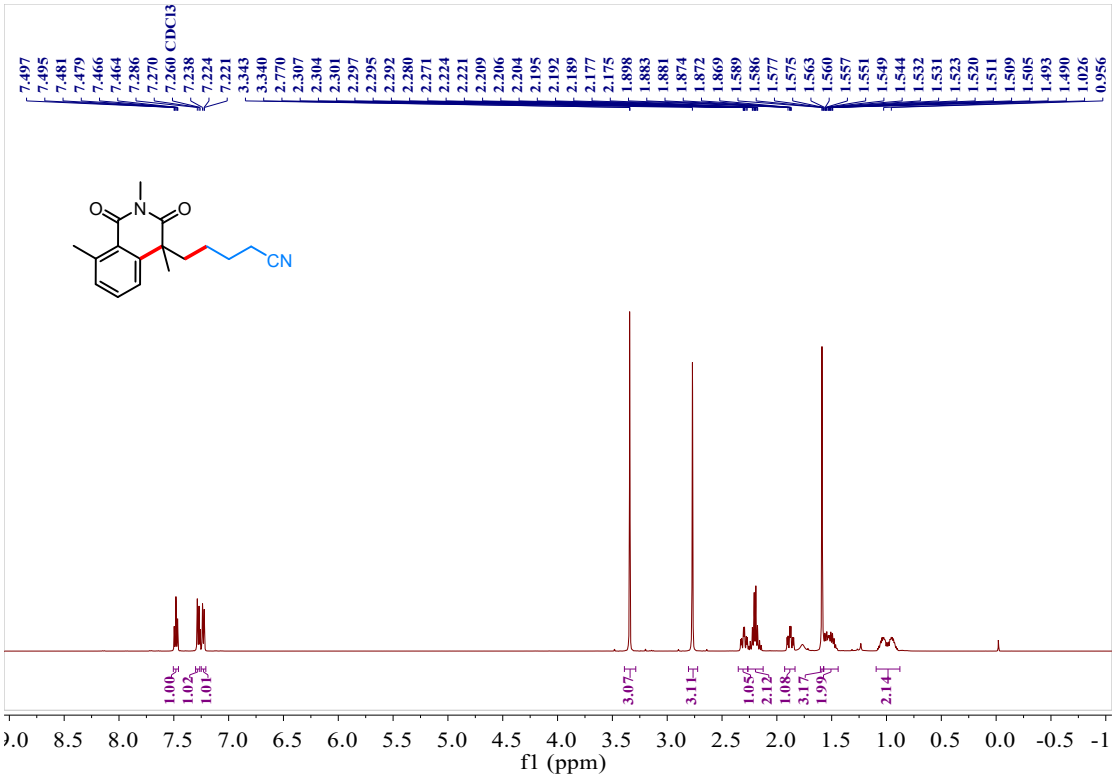


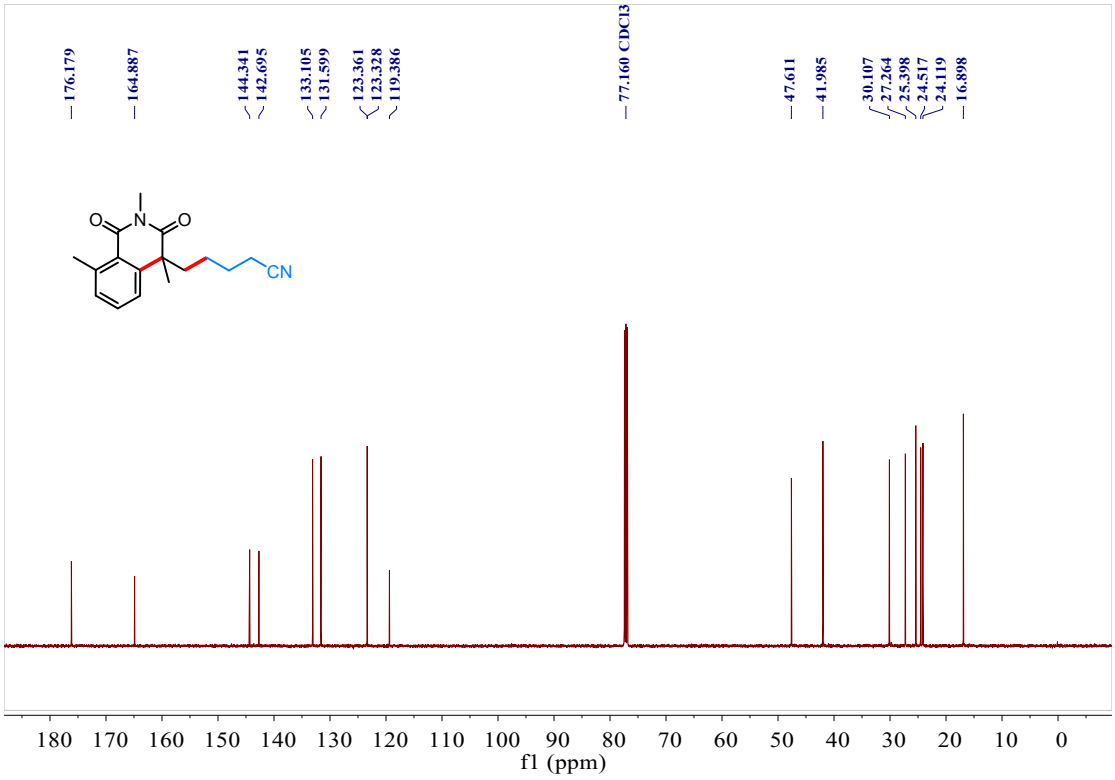
5-(6-Chloro-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3fa)





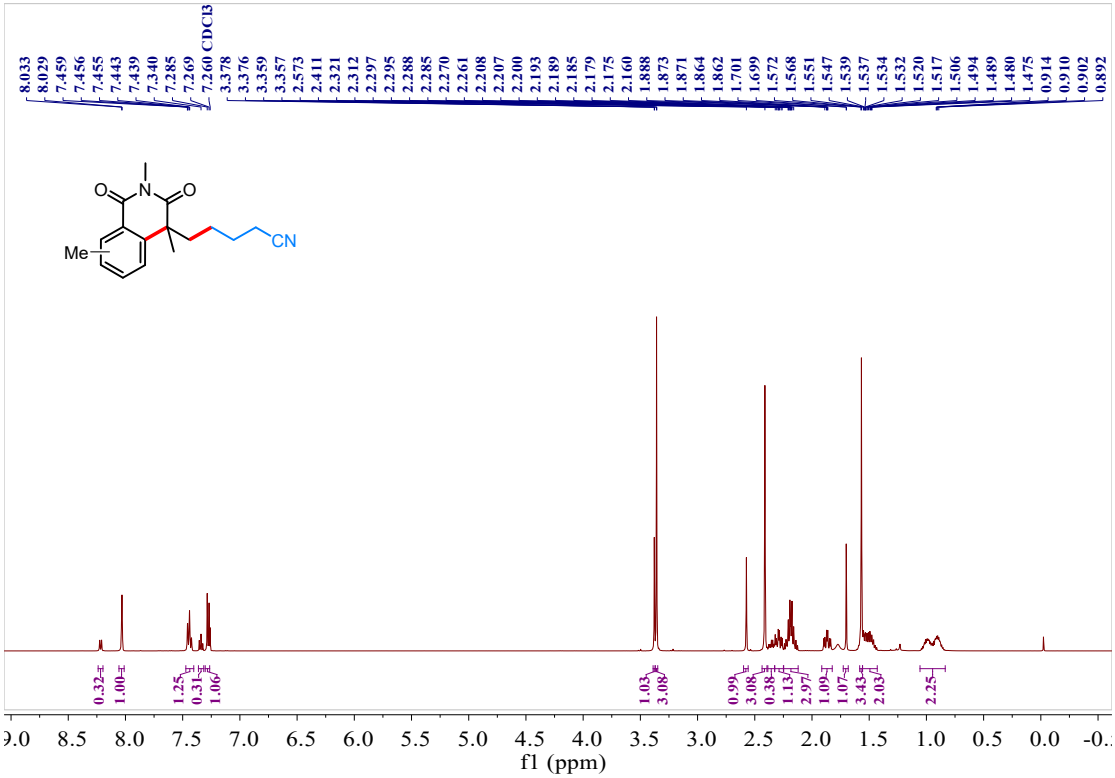
5-(2,4,8-Trimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ga)

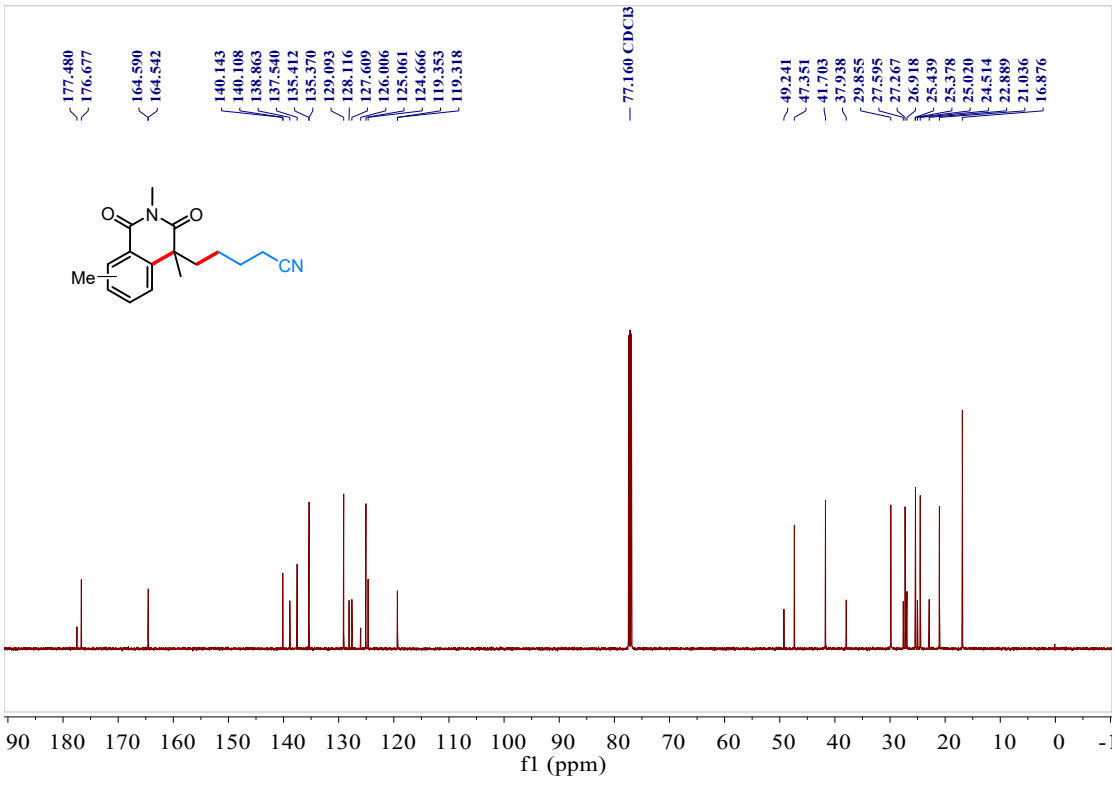




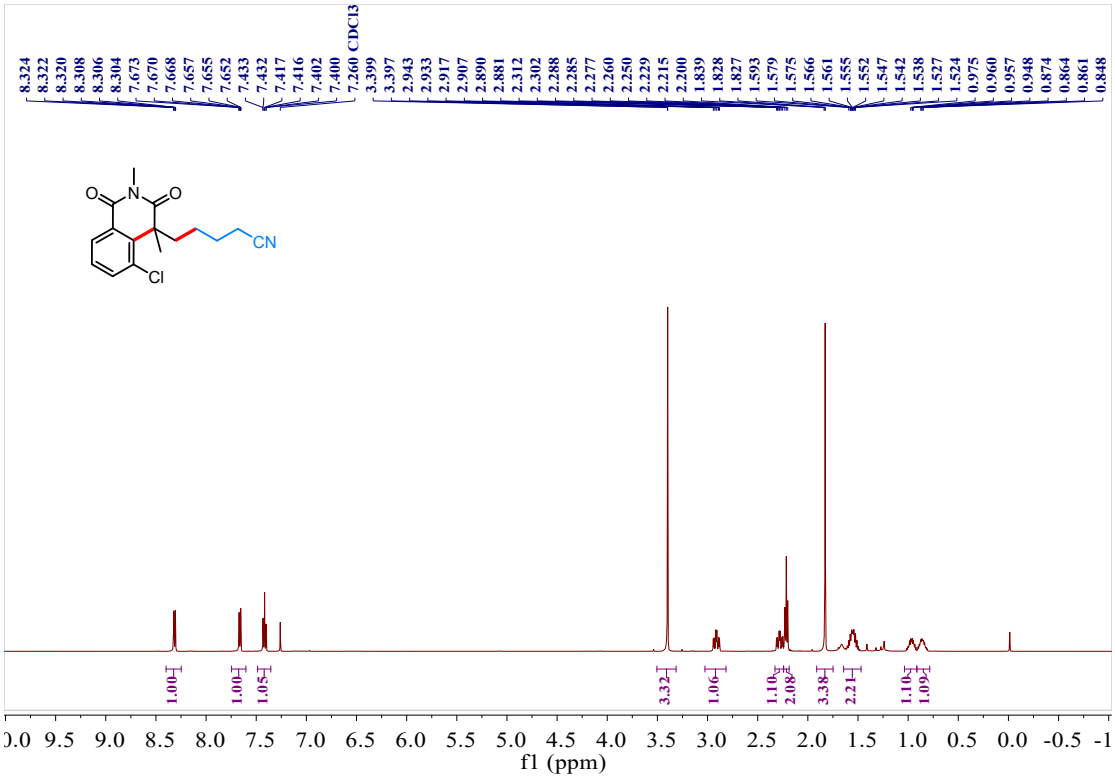
5-(2,4,5-Trimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ha)

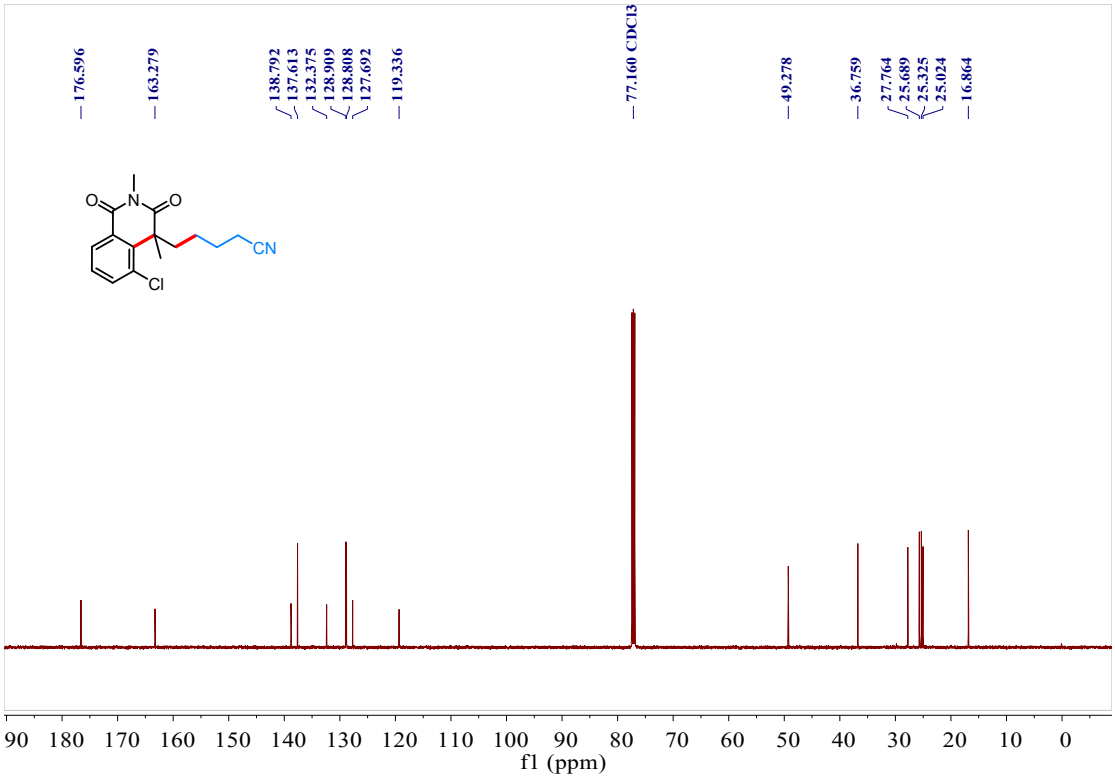
5-(2,4,7-Trimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ha')



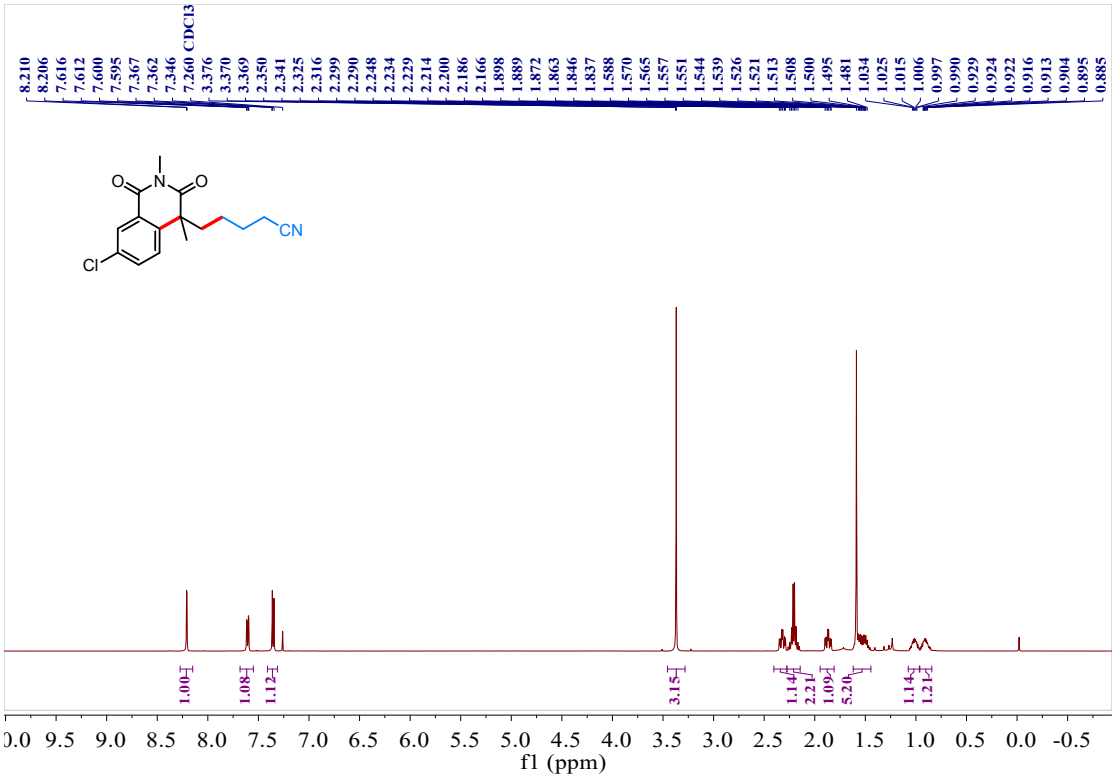


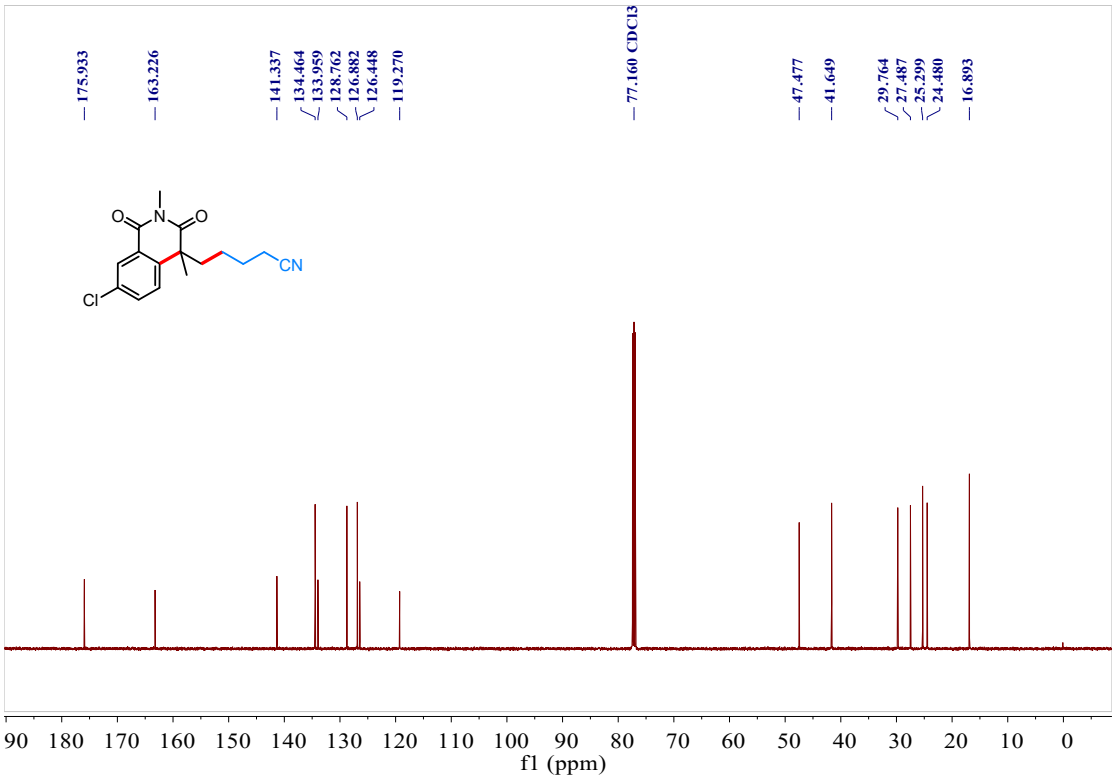
5-(5-Chloro-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ia)



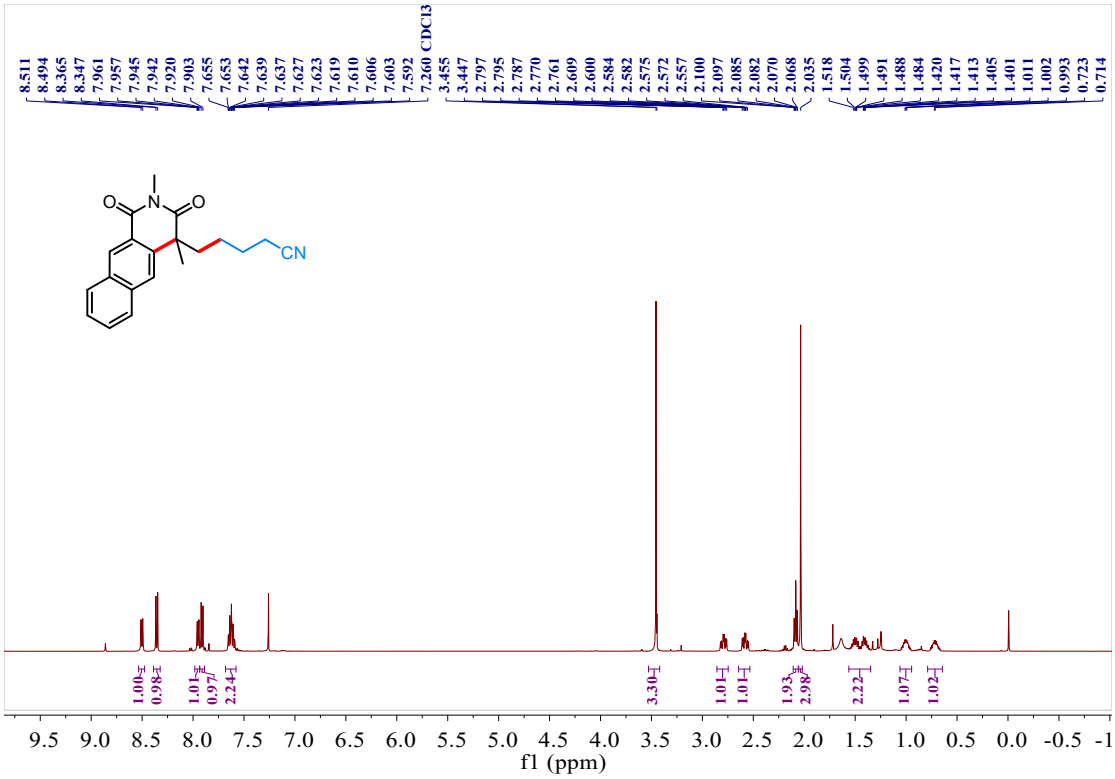


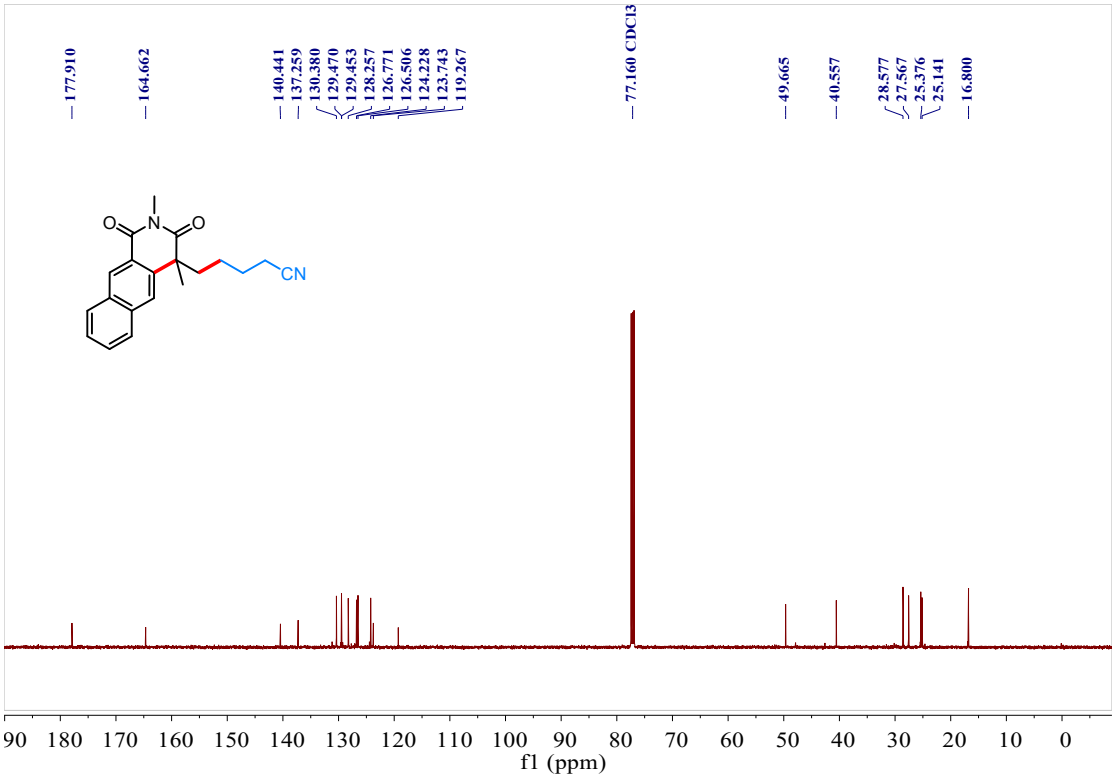
5-(7-Chloro-2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ia')



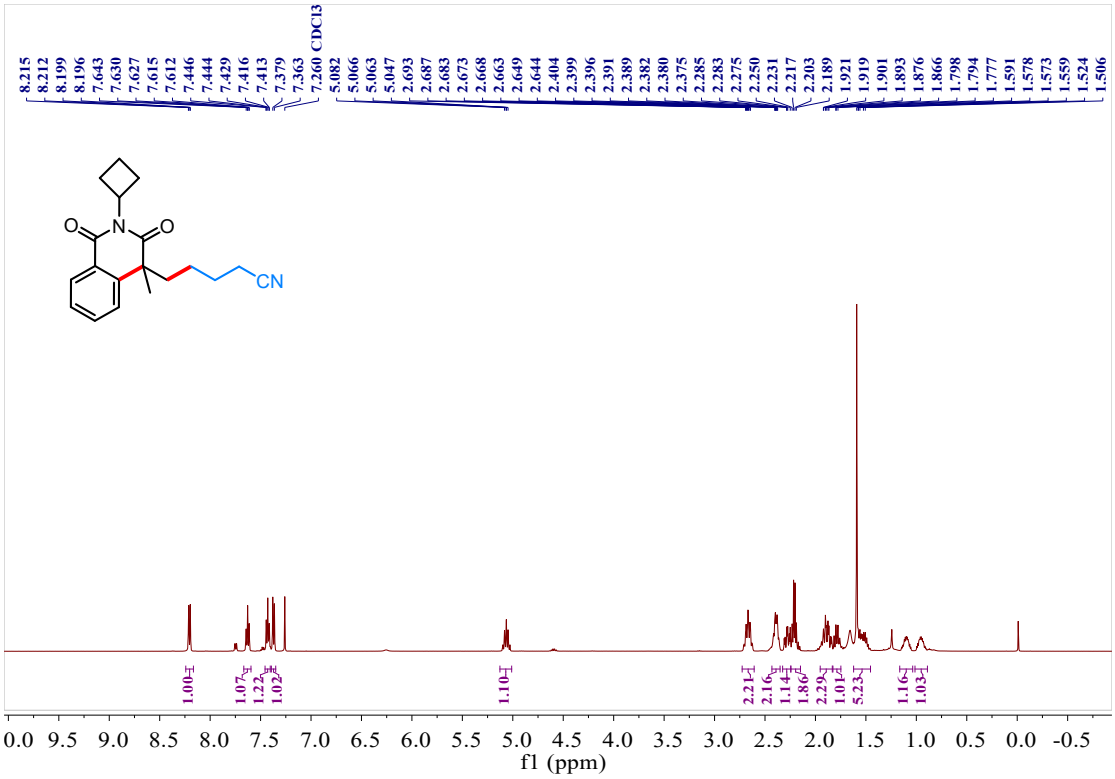


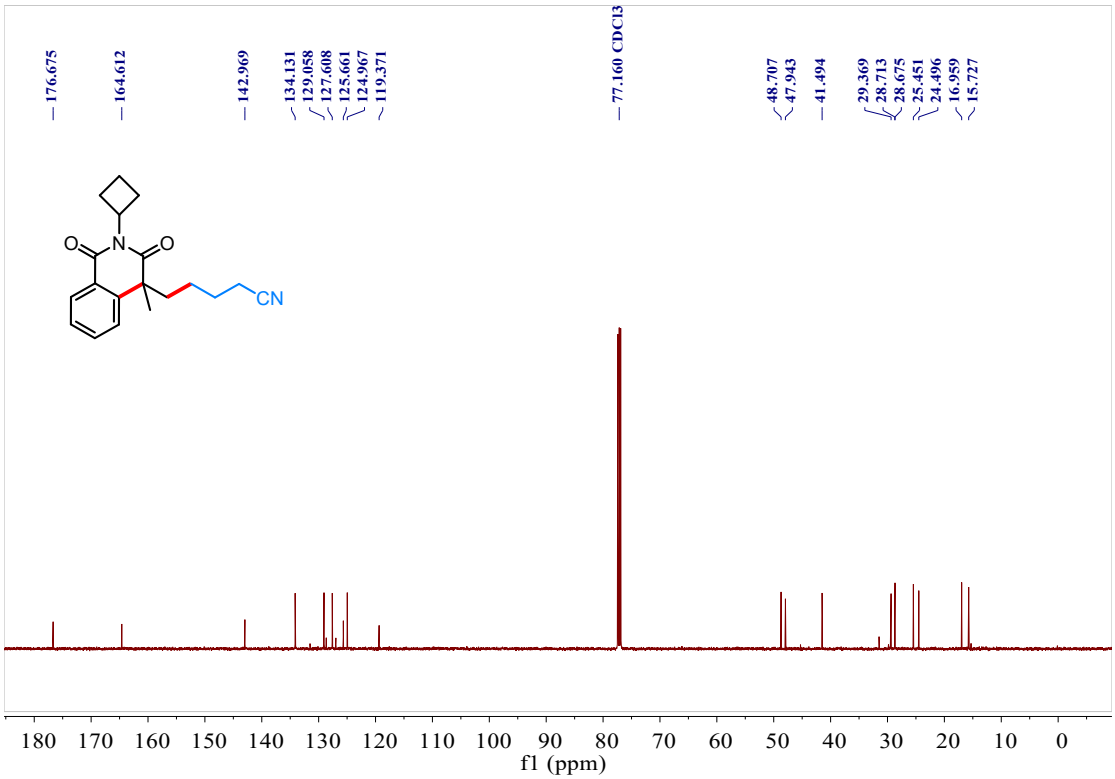
5-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydrobenzo[g]isoquinolin-4-yl)pentanenitrile (3ja)



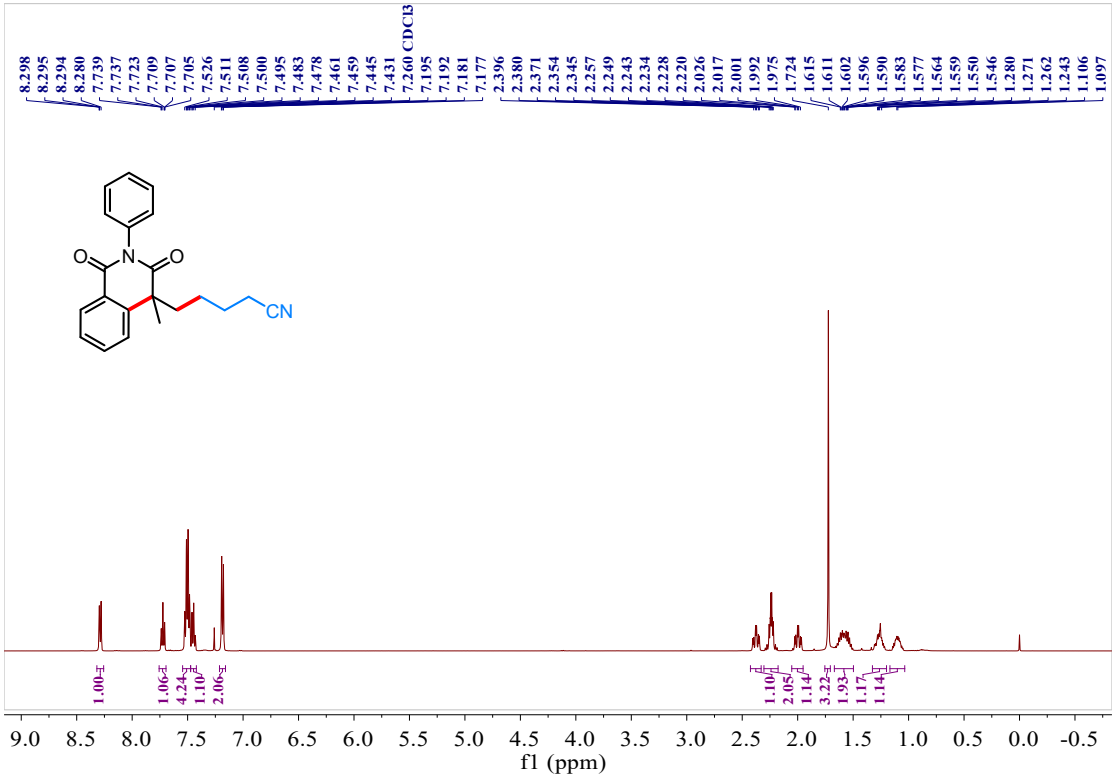


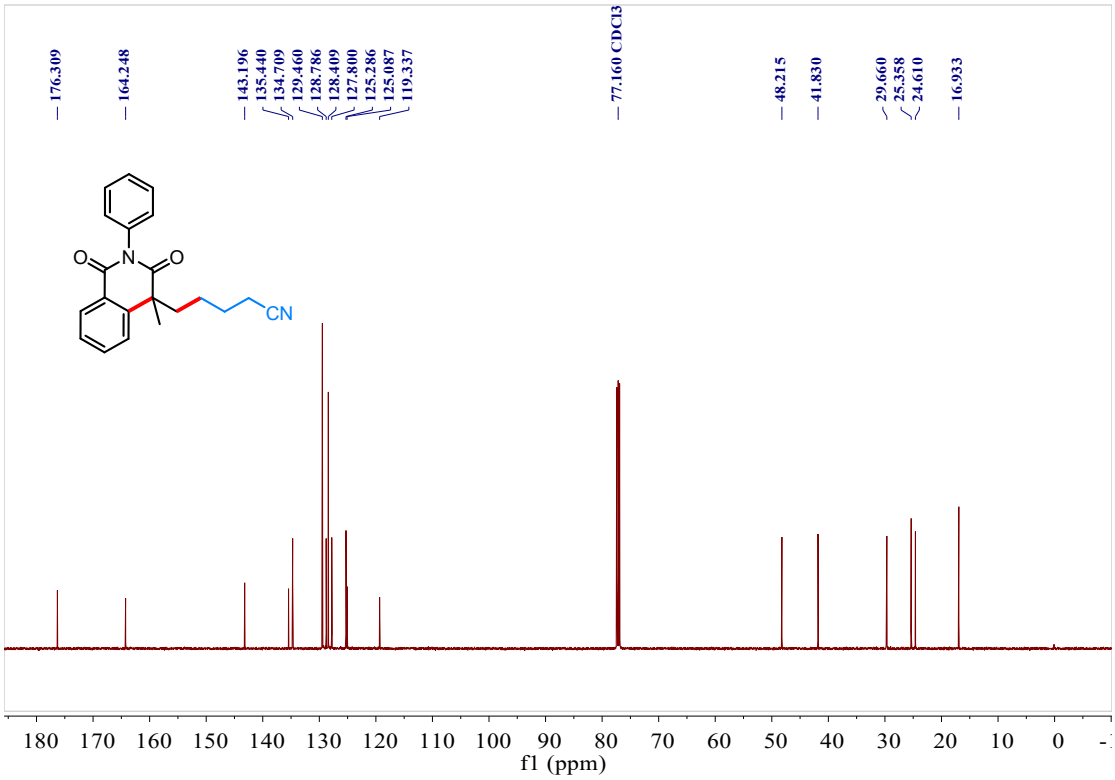
5-(2-Cyclobutyl-4-methyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ka)



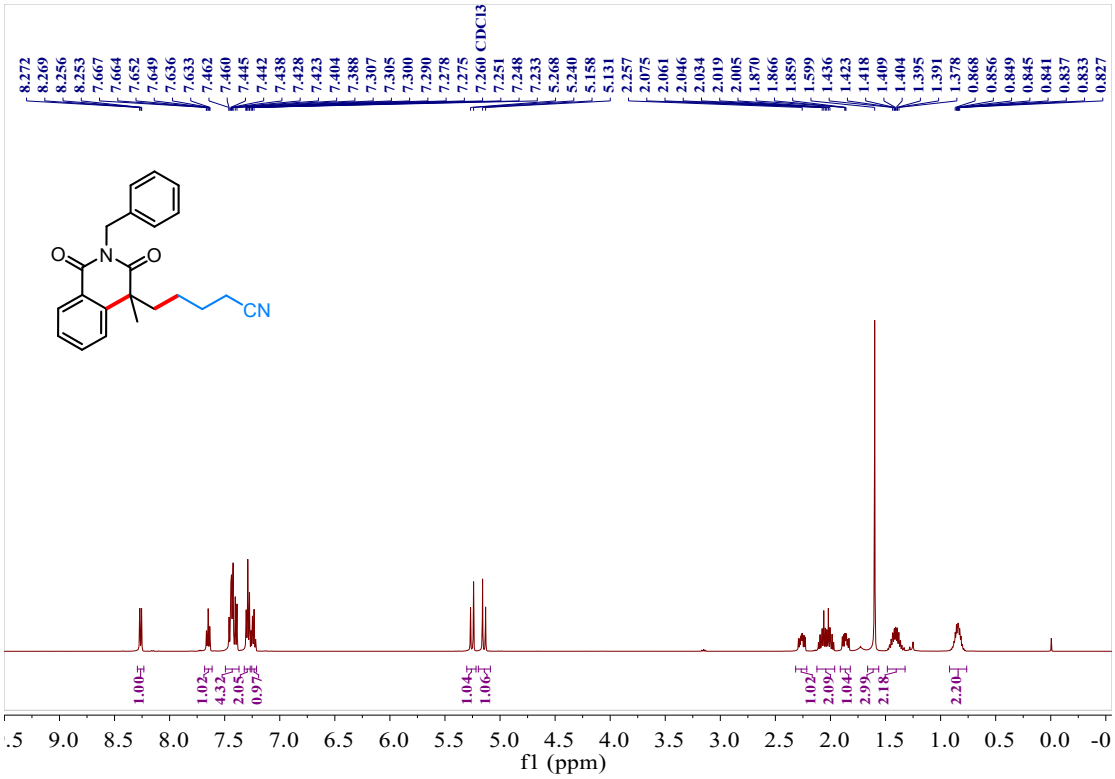


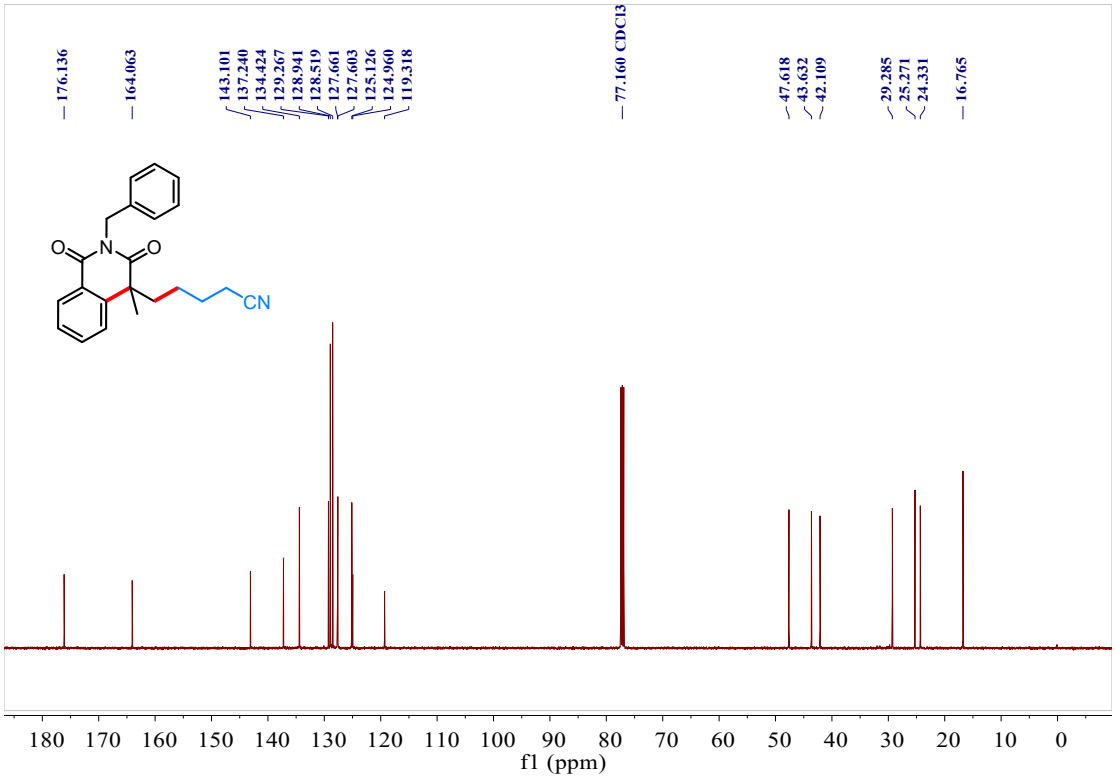
5-(4-Methyl-1,3-dioxo-2-phenyl-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3la)



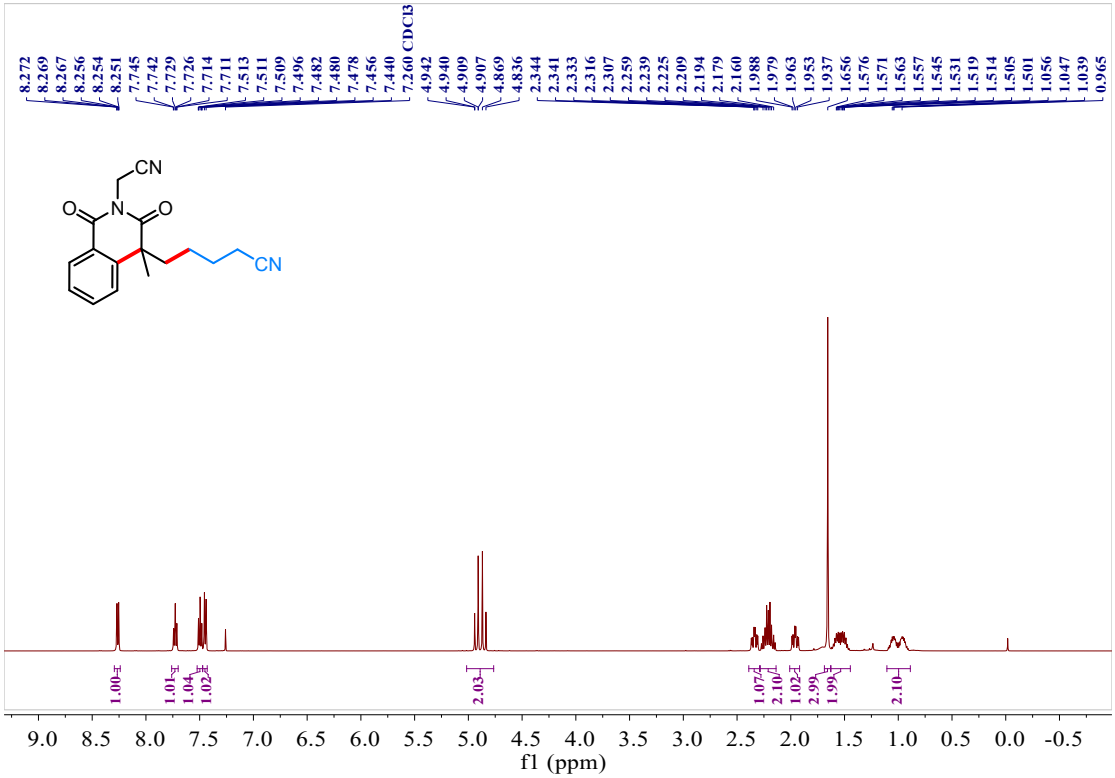


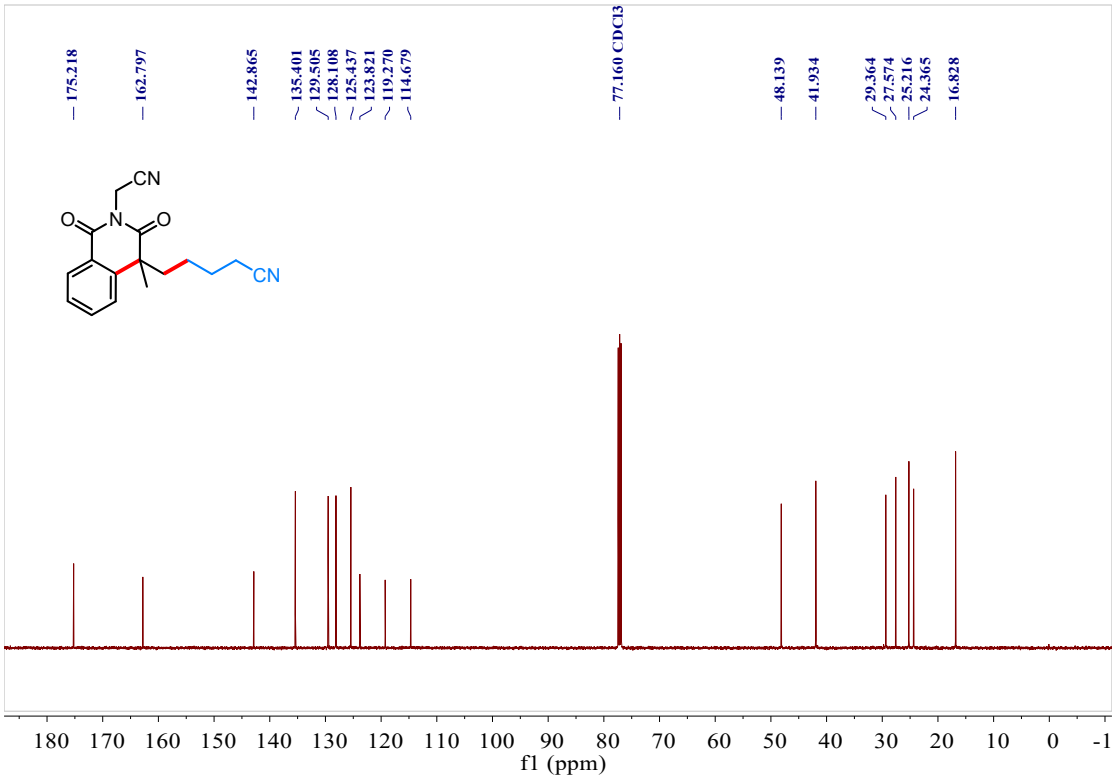
5-(2-Benzyl-4-methyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3ma)



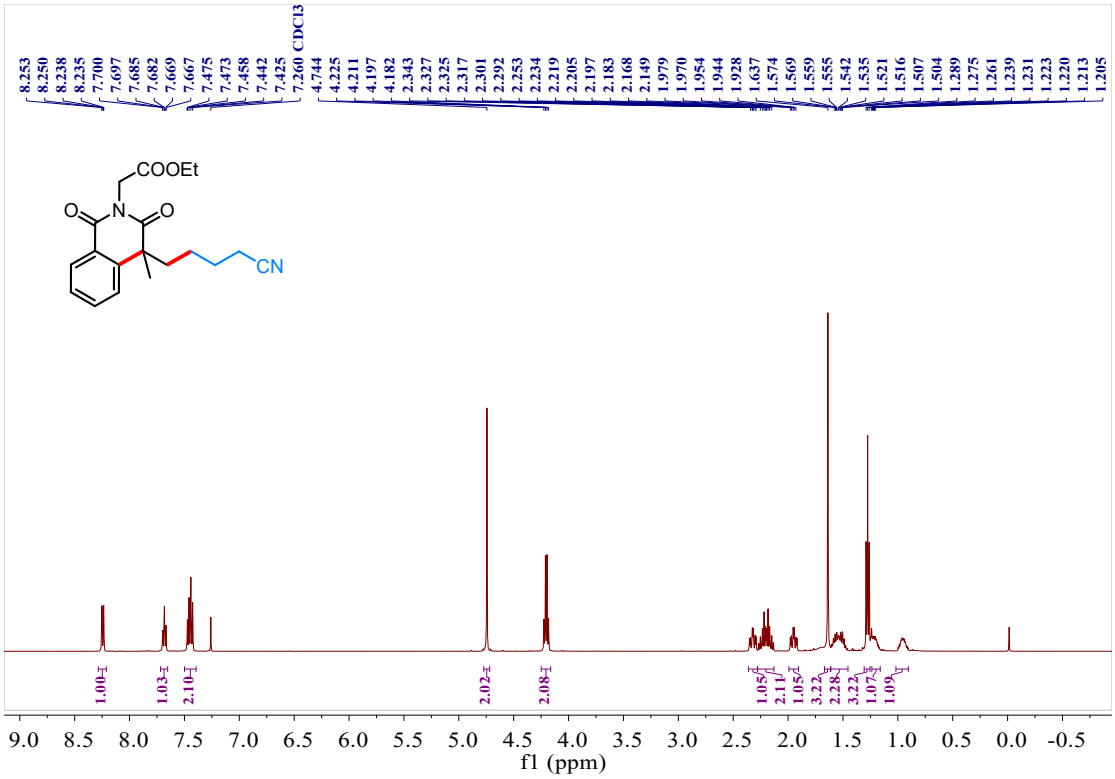


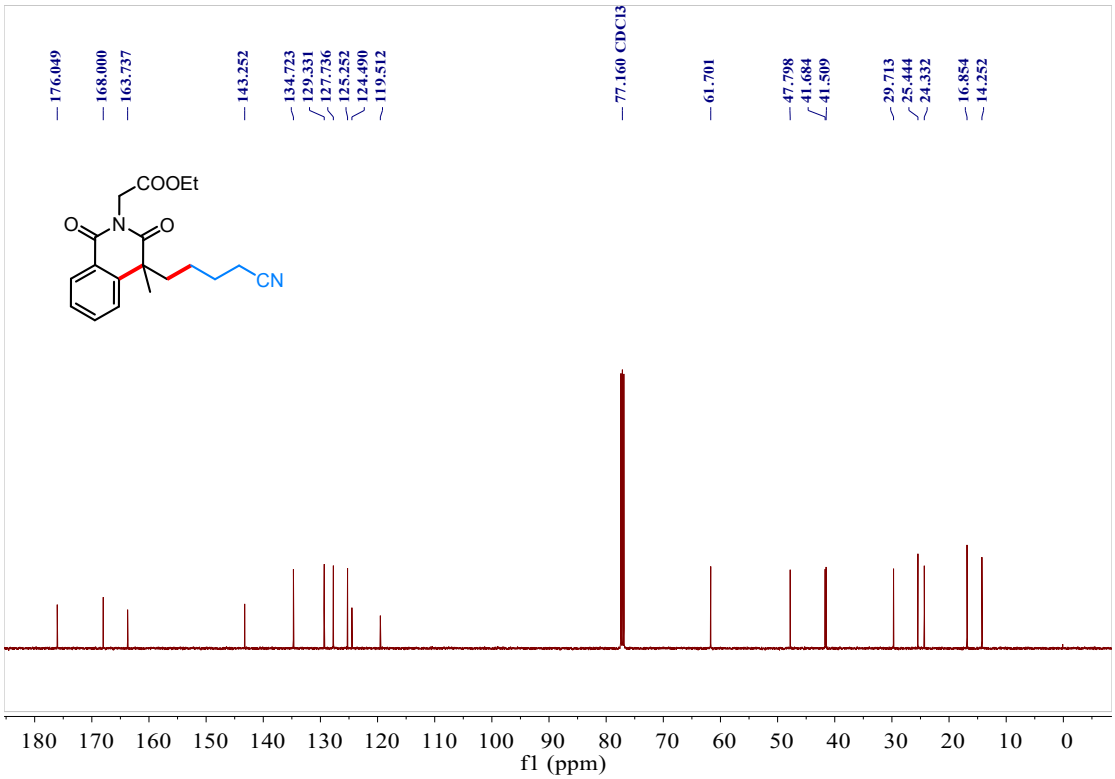
5-(2-(Cyanomethyl)-4-methyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanenitrile (3na)



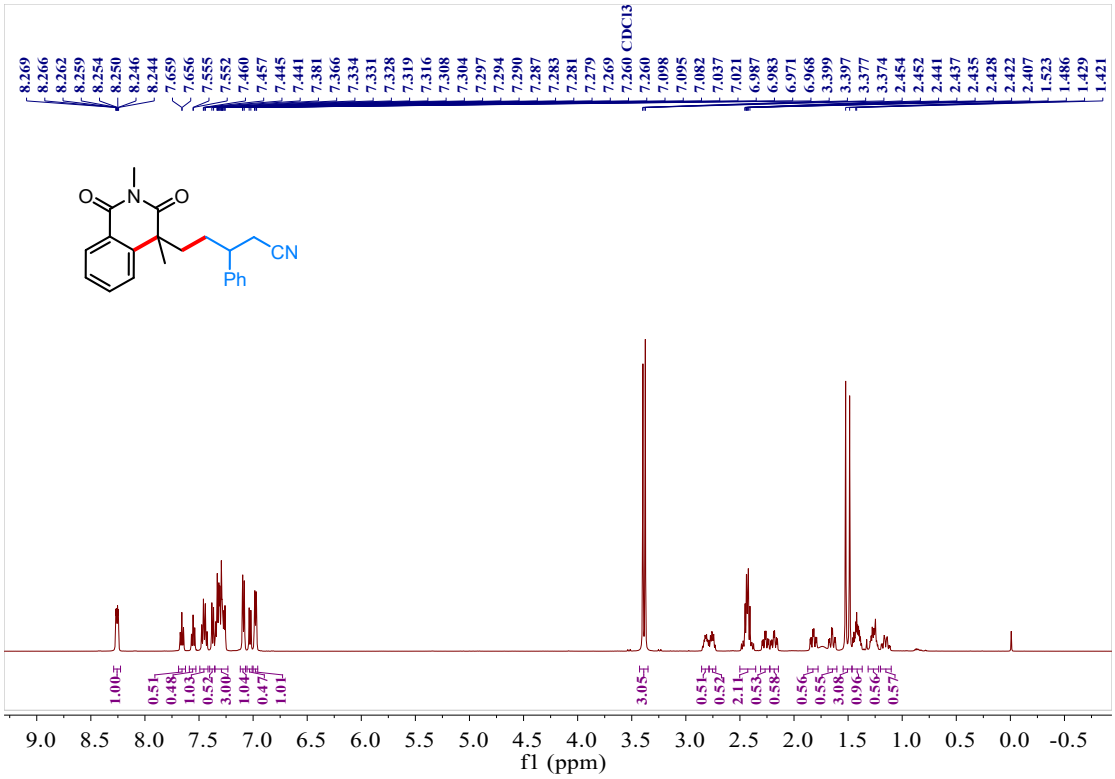


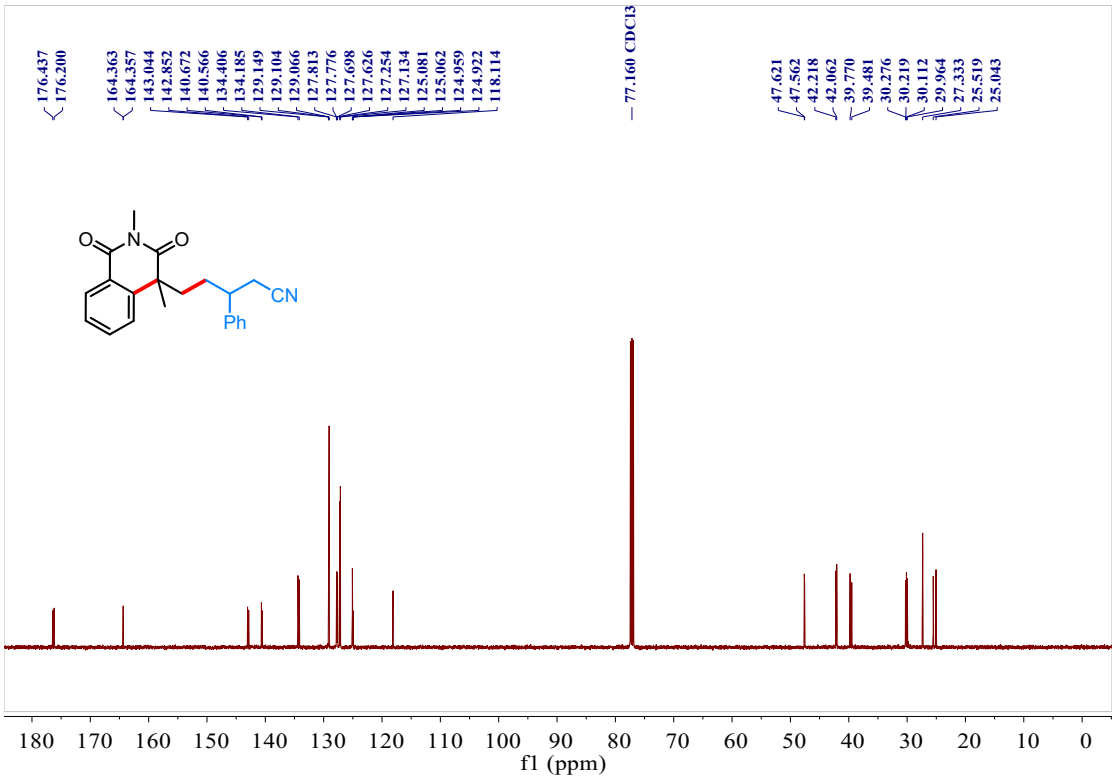
Ethyl-2-(4-(4-cyanobutyl)-4-methyl-1,3-dioxo-3,4-dihydroisoquinolin-2(1H)-yl)acetate (3oa)



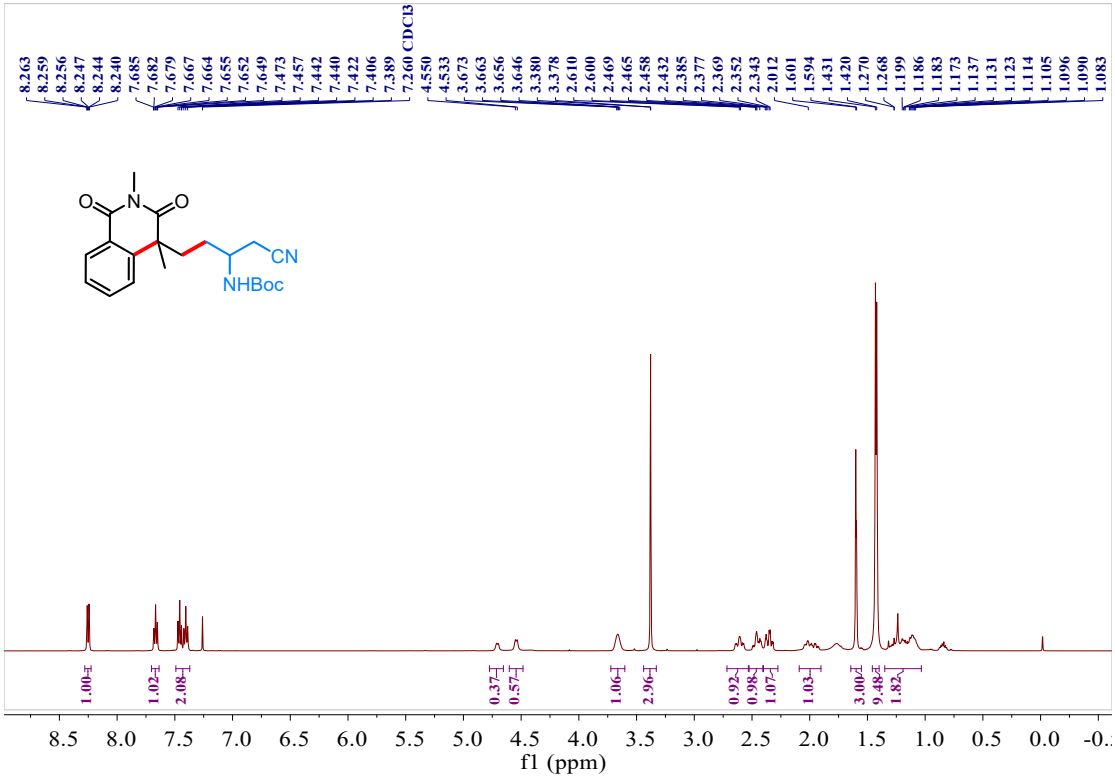


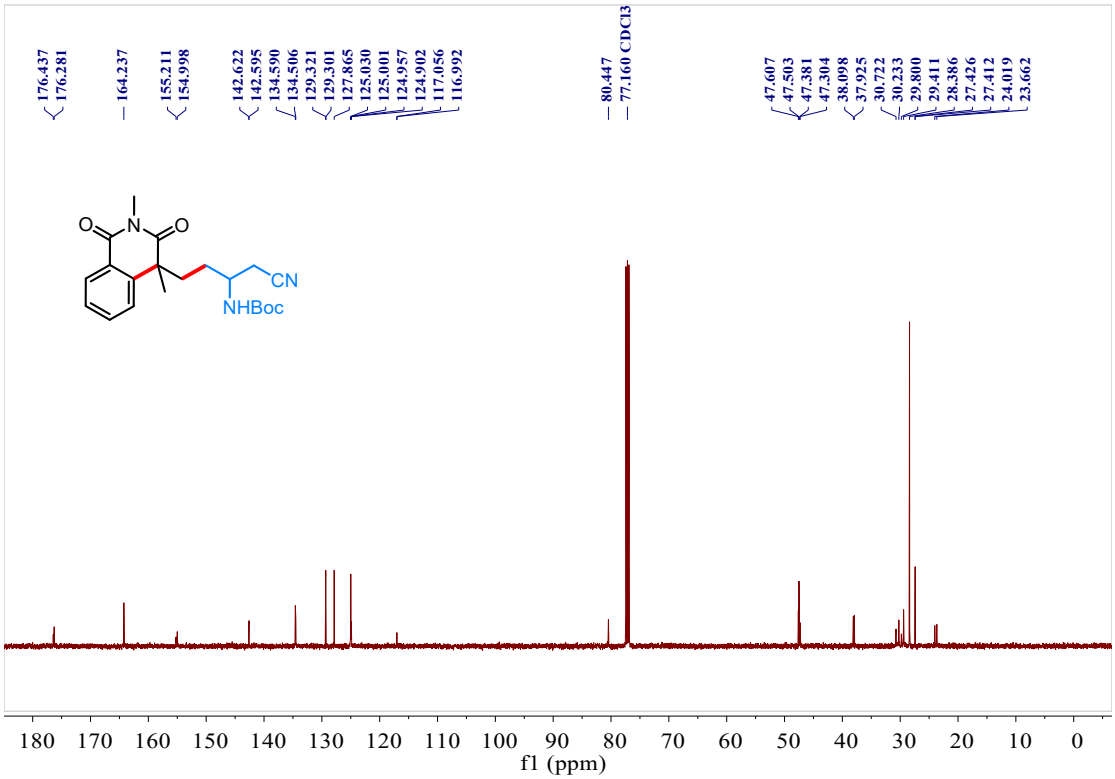
5-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)-3-phenylpentanenitrile (3ab)



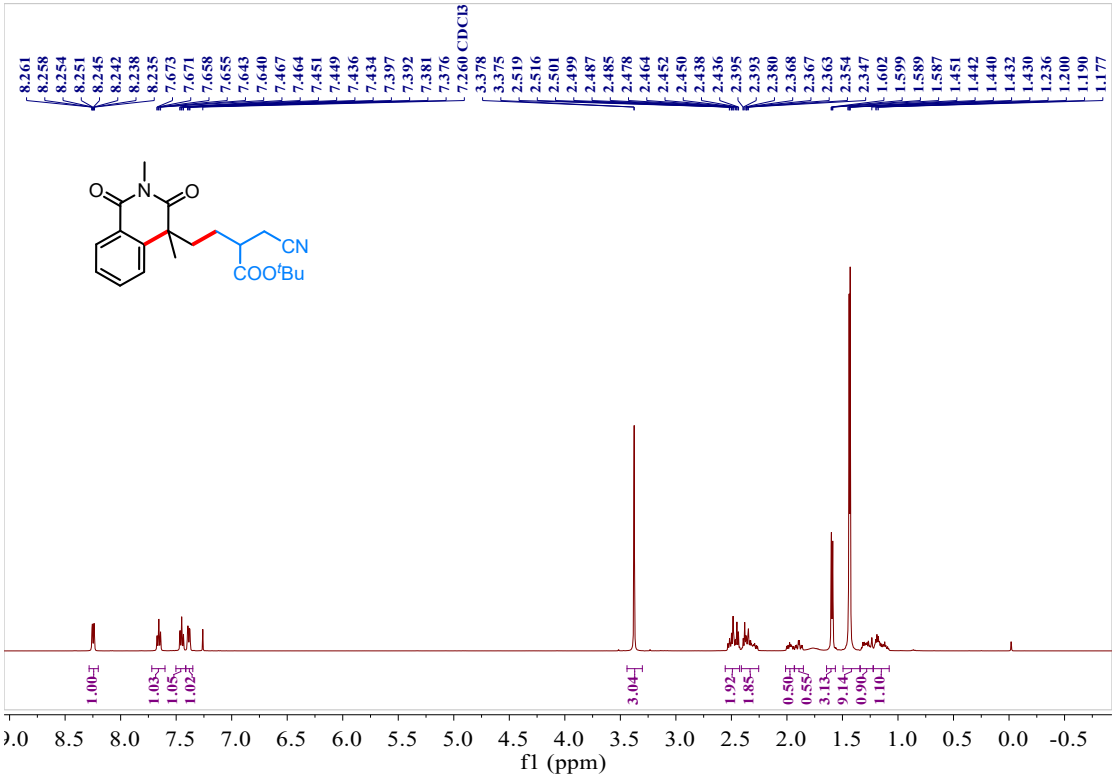


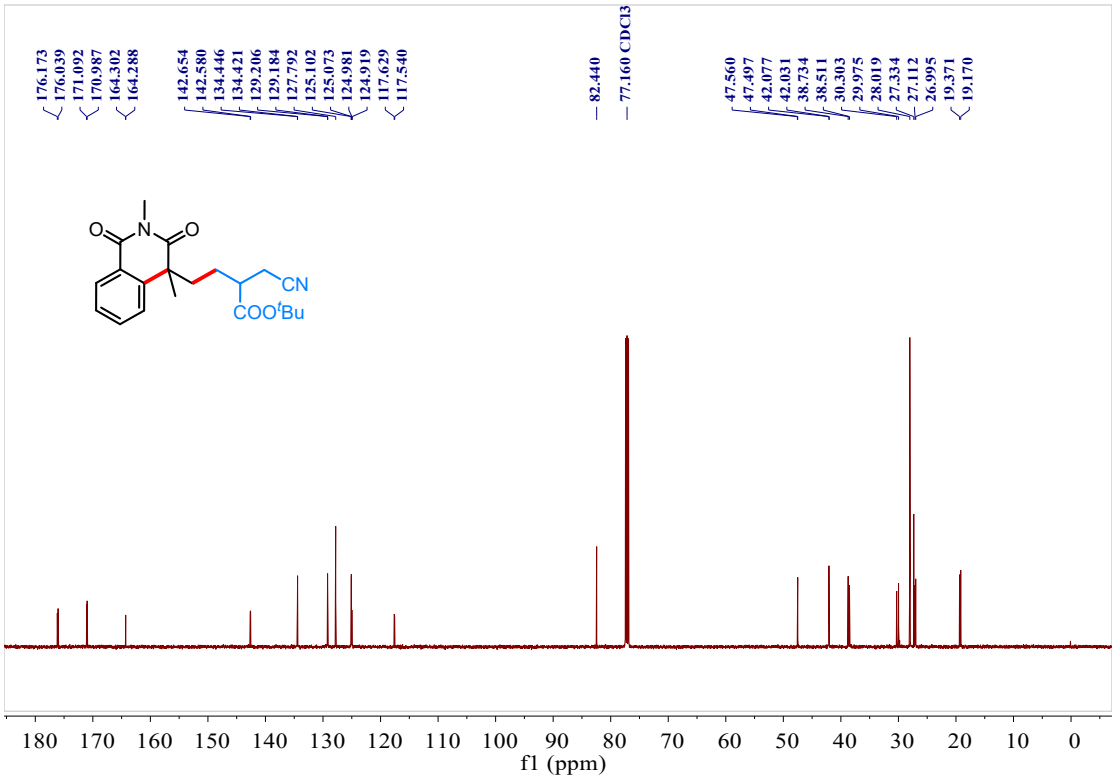
Tert-butyl-(1-cyano-4-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)butan-2-yl)carbamate (3ac)



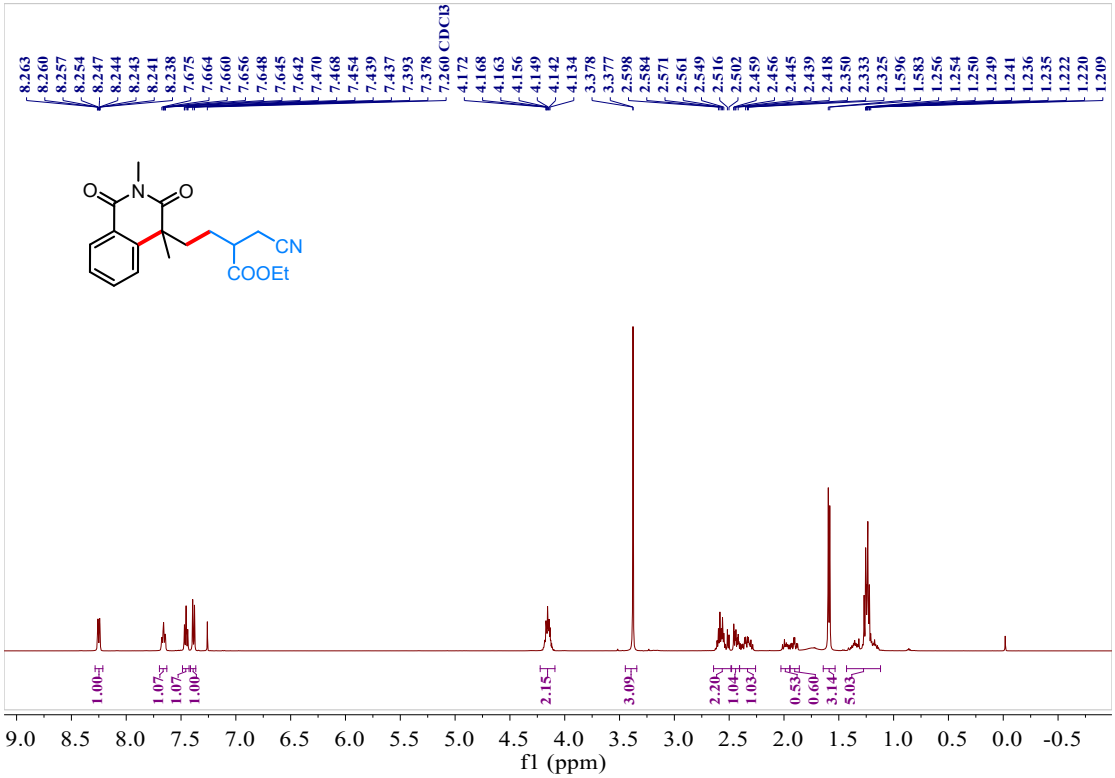


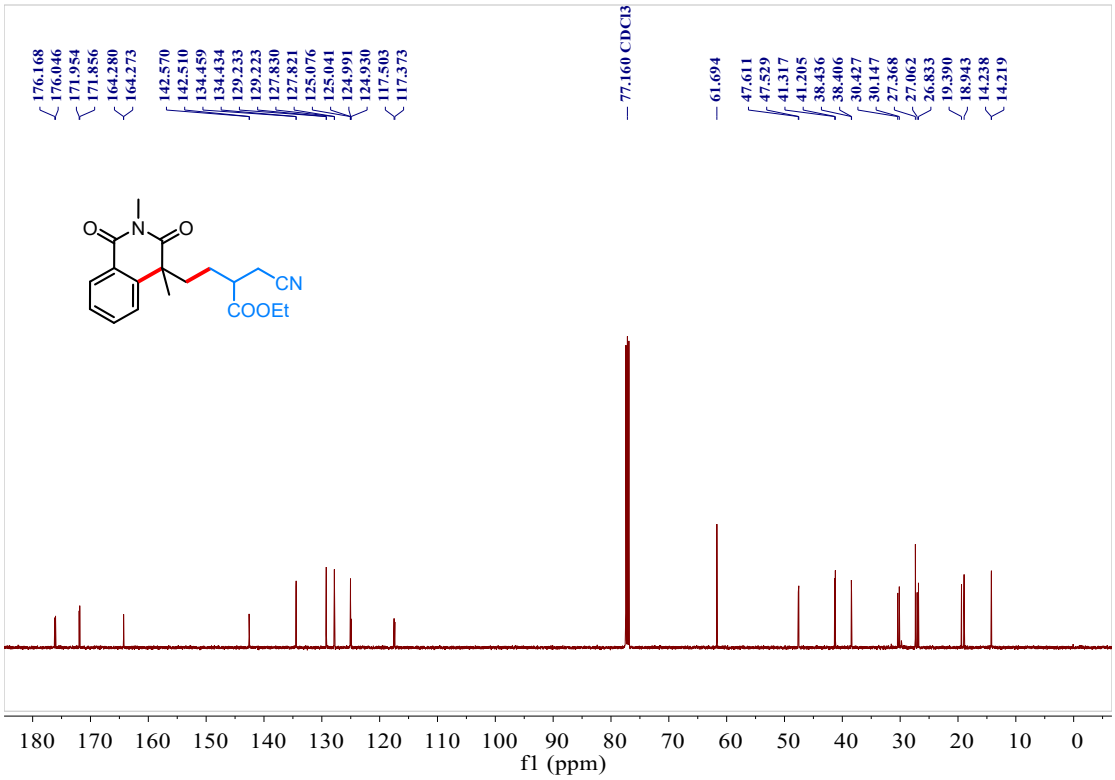
Tert-butyl-2-(cyanomethyl)-4-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)butanoate (3ad)



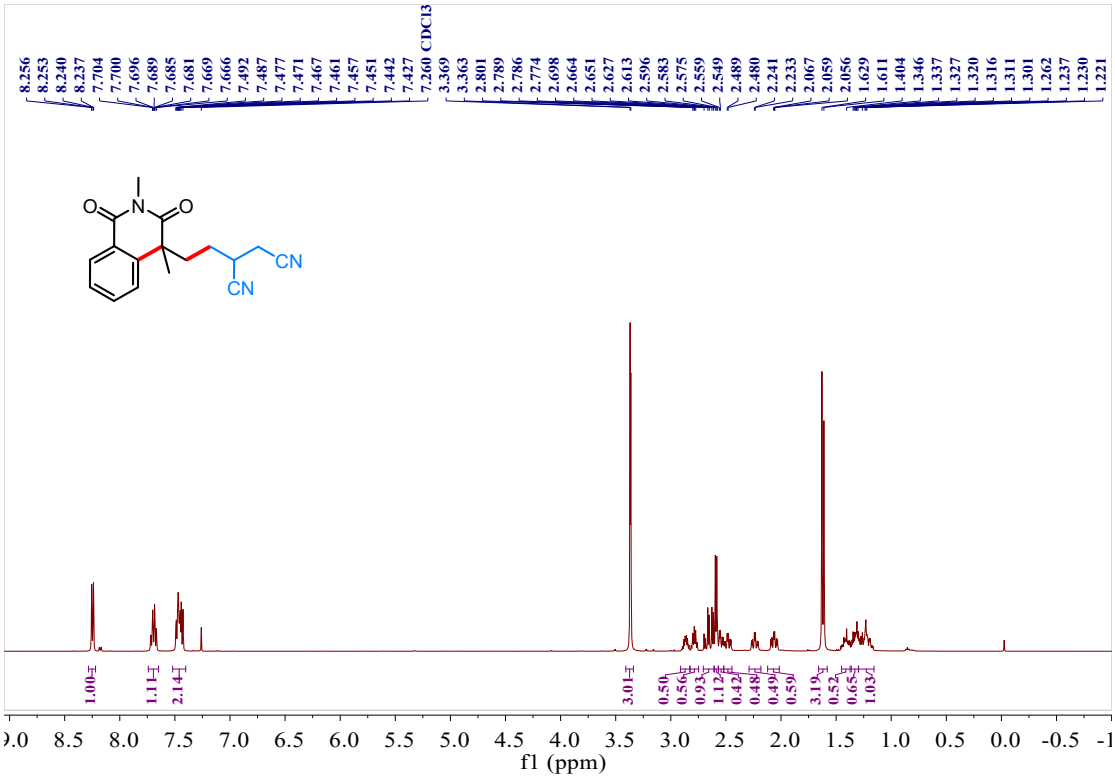


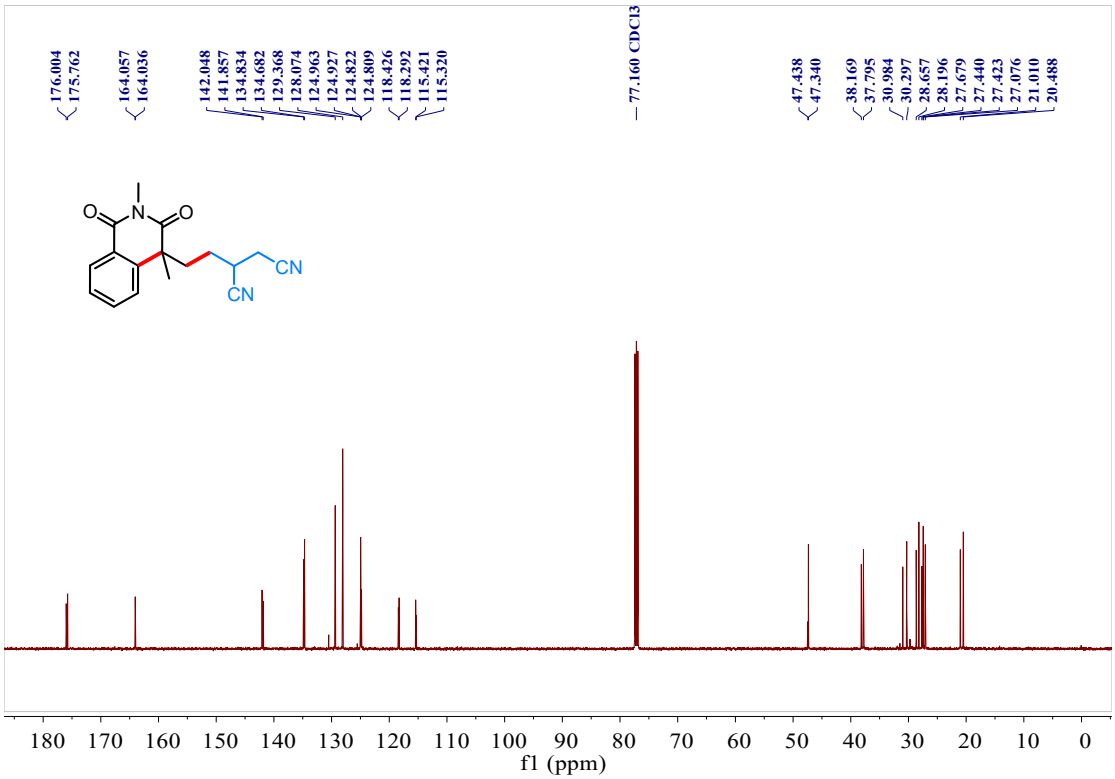
Ethyl-2-(cyanomethyl)-4-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)butano-ate (3ae)



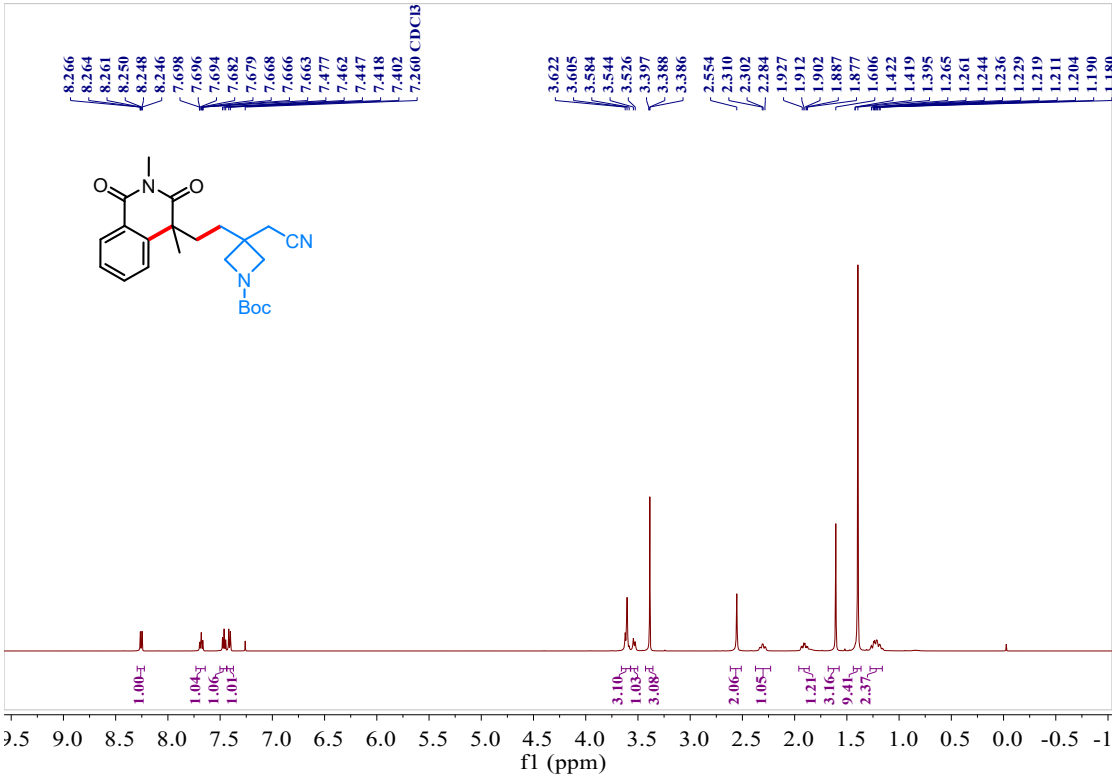


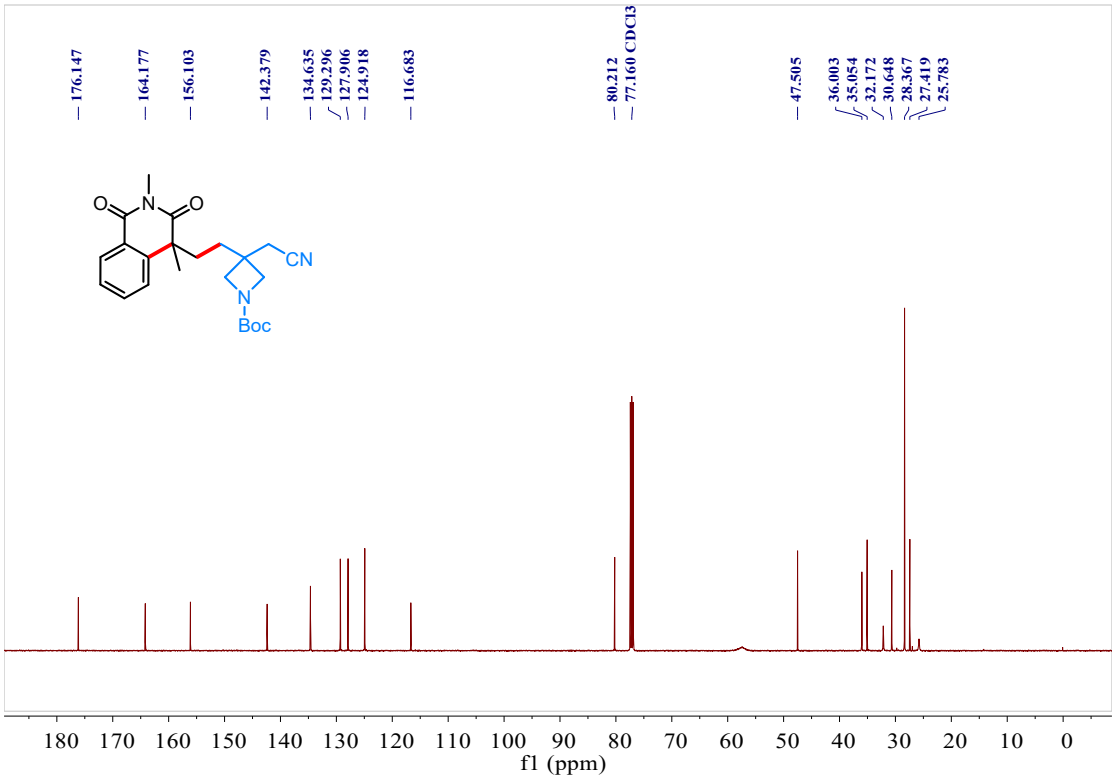
2-(2-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)succinonitrile (3af)



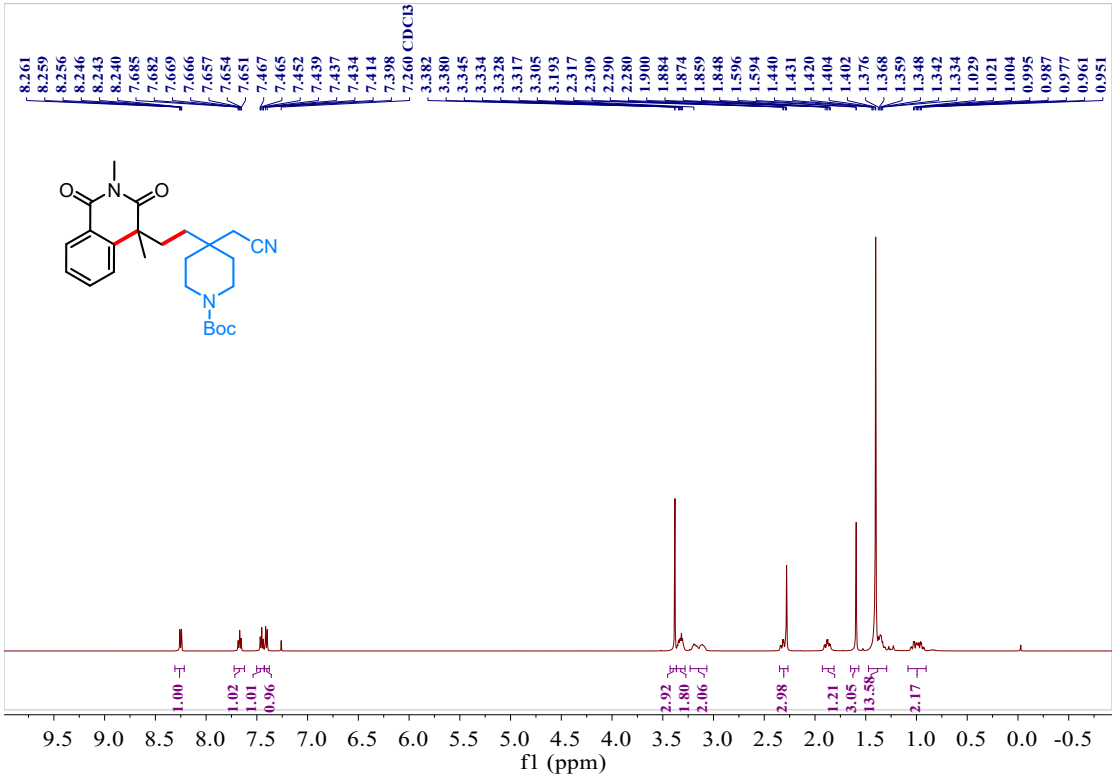


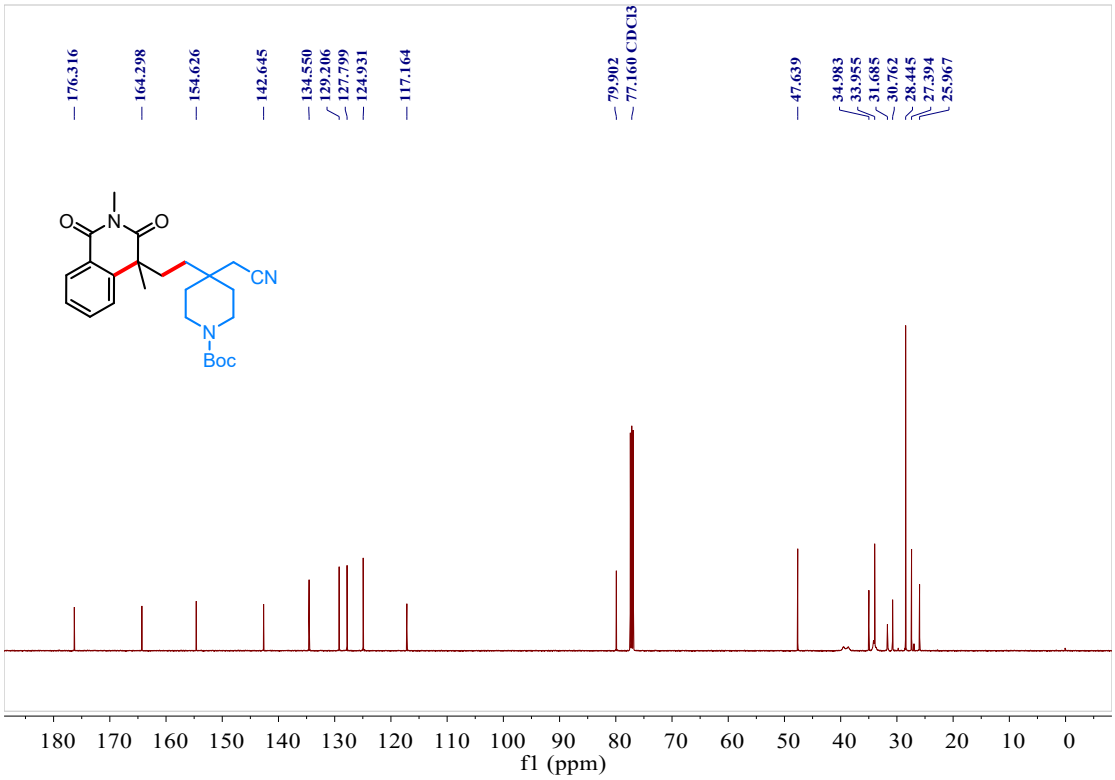
Tert-butyl-3-(cyanomethyl)-3-(2-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)azetidine-1-carboxylate (3ag)



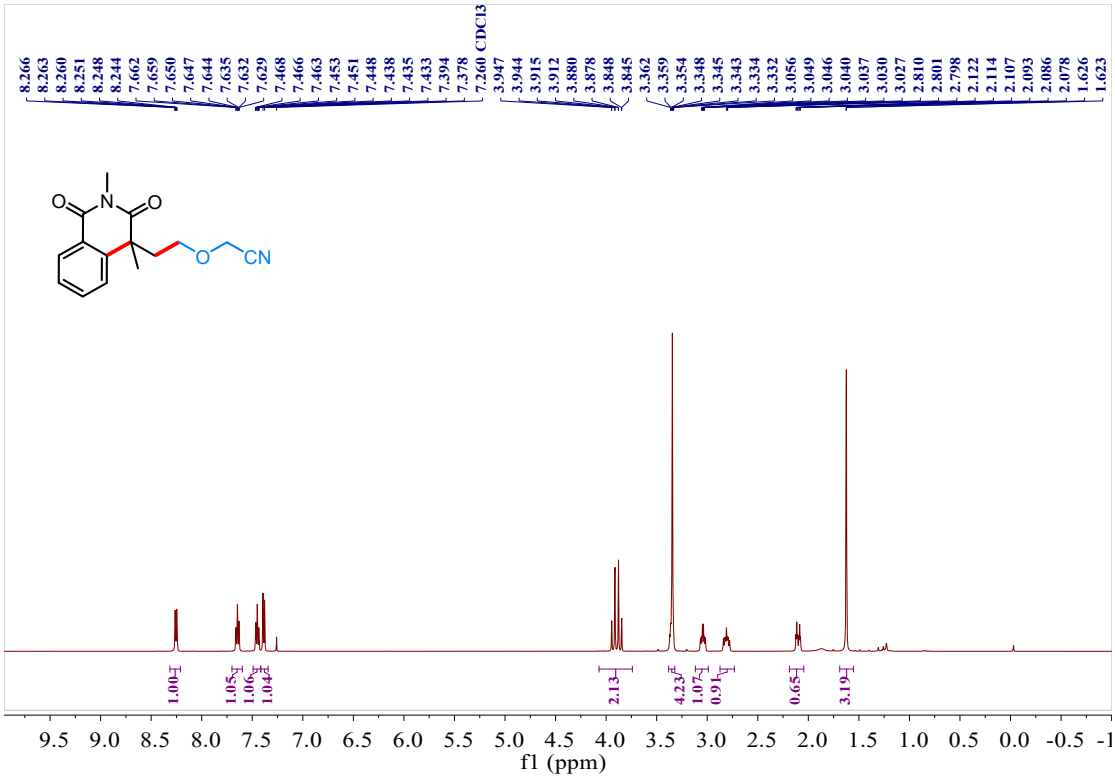


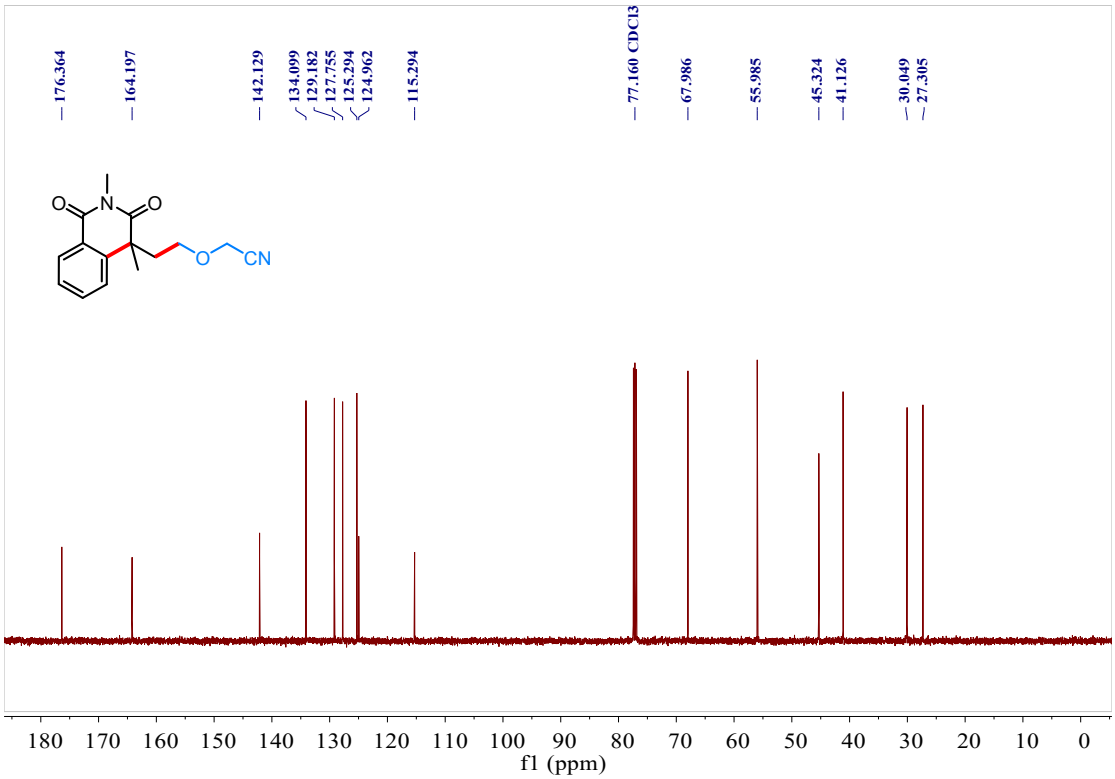
Tert-butyl-4-(cyanomethyl)-4-(2-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)piperidine-1-carboxylate (3ah)



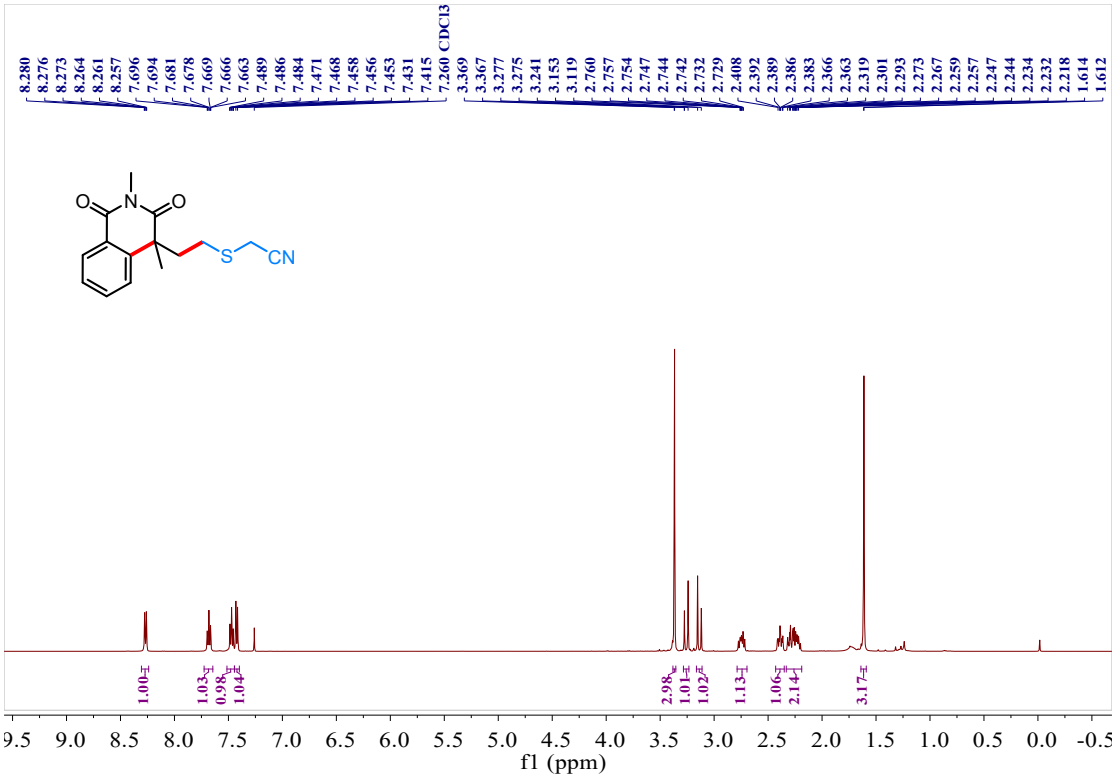


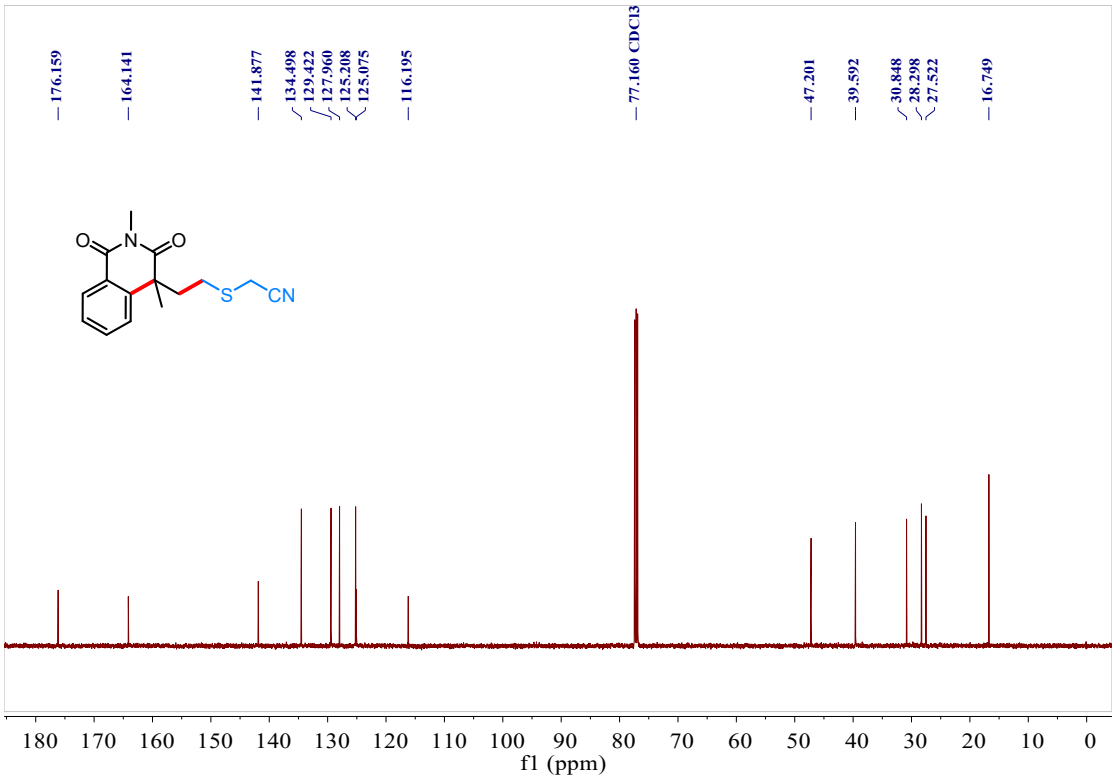
2-(2-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethoxy)acetonitrile (3ai)



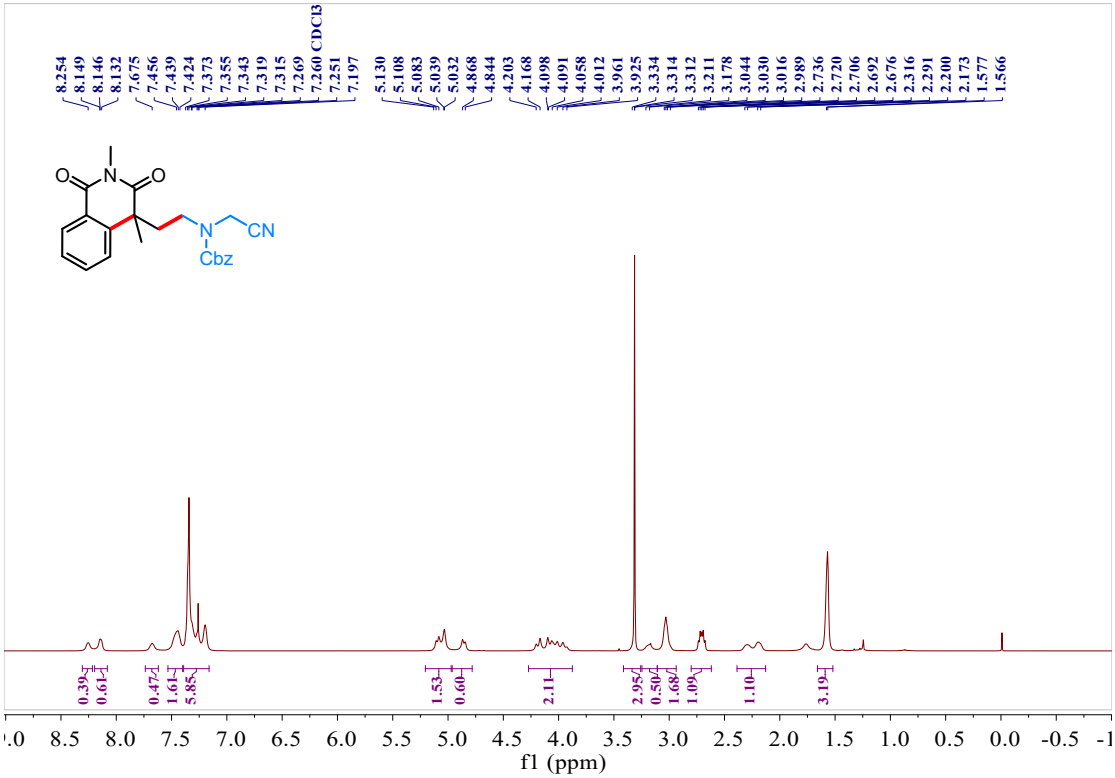


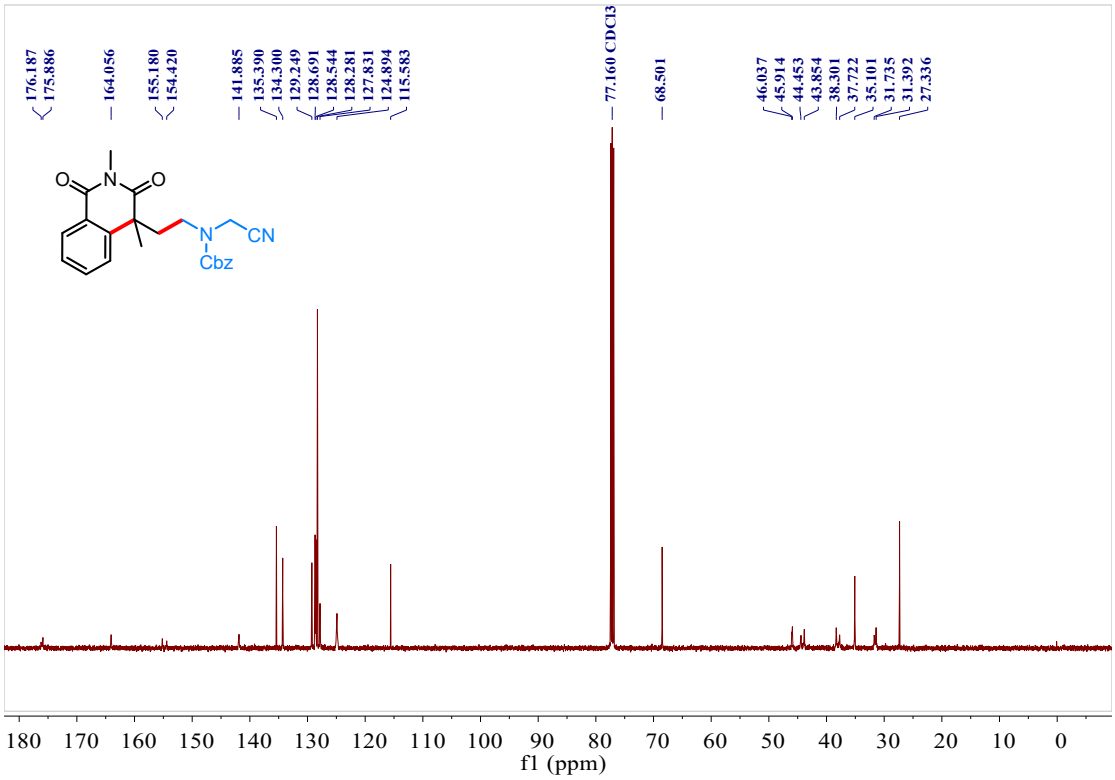
2-((2-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)thio)acetonitrile (3aj)



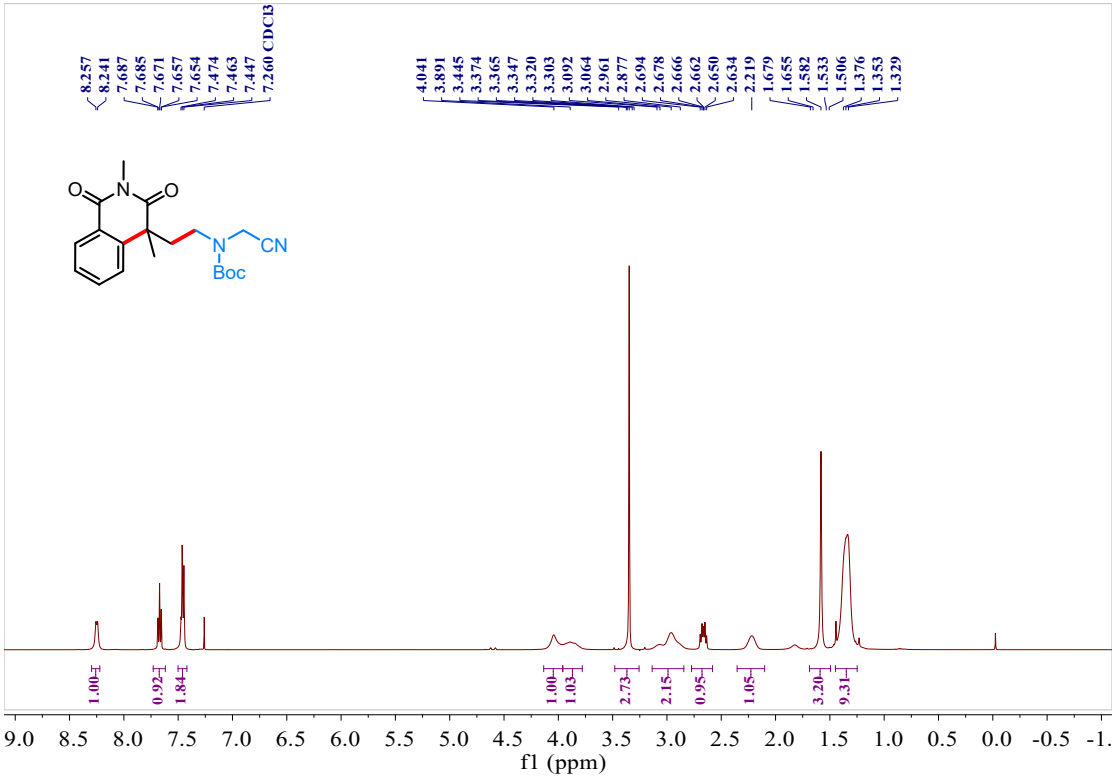


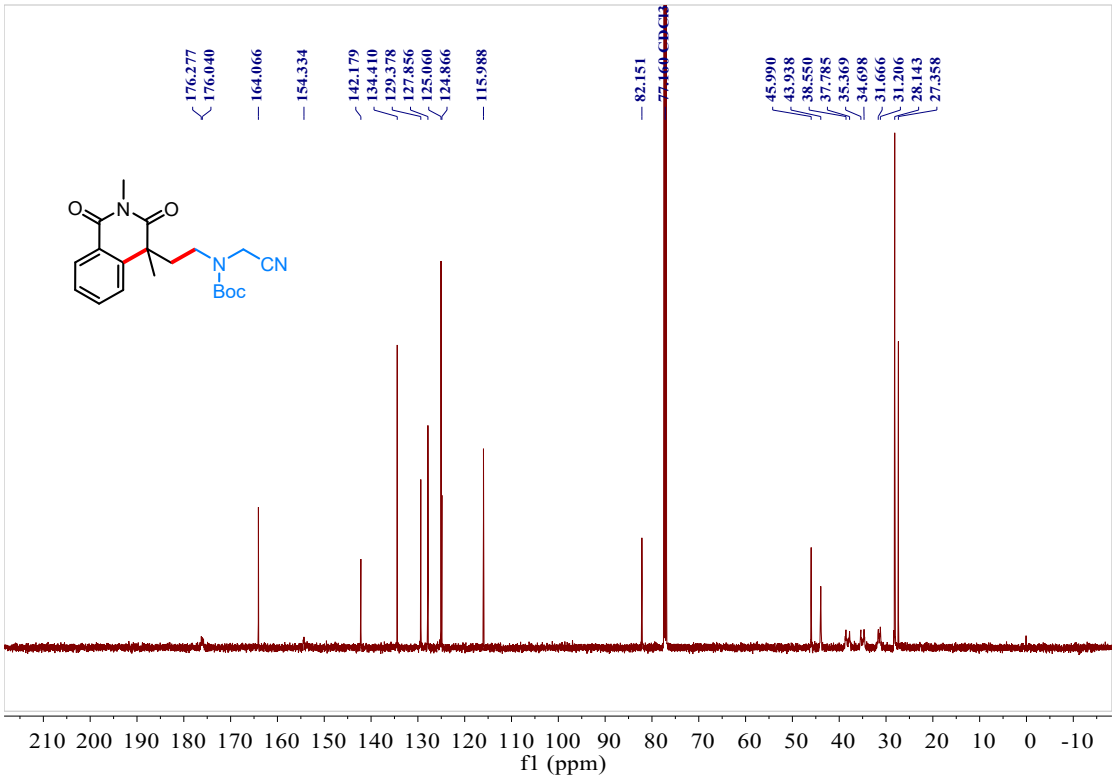
Benzyl-(cyanomethyl)(2-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)carbamate (3ak)



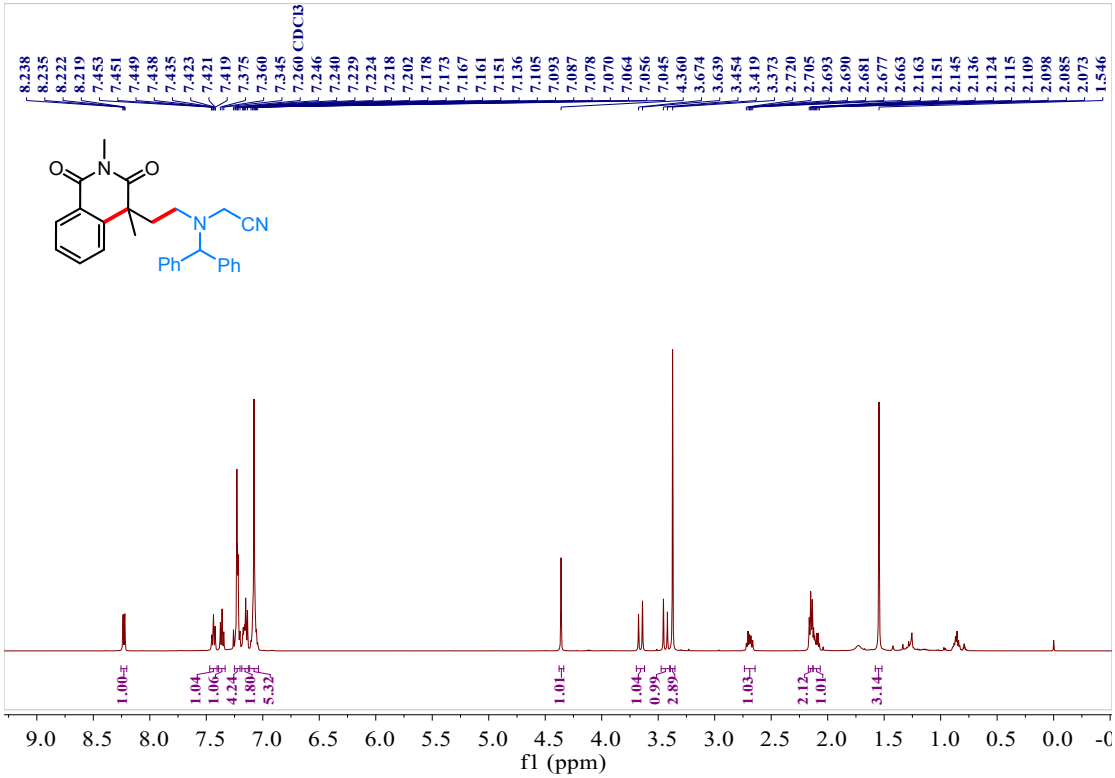


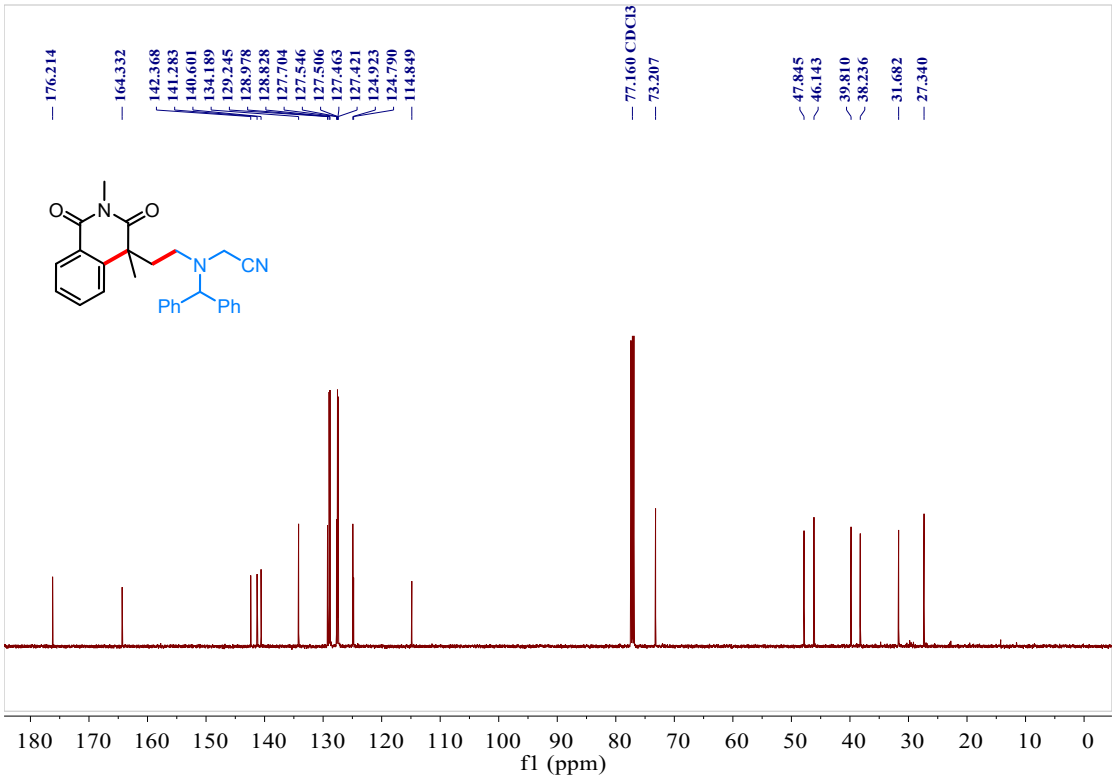
Tert-butyl-(cyanomethyl)(2-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)carbamate (3al)



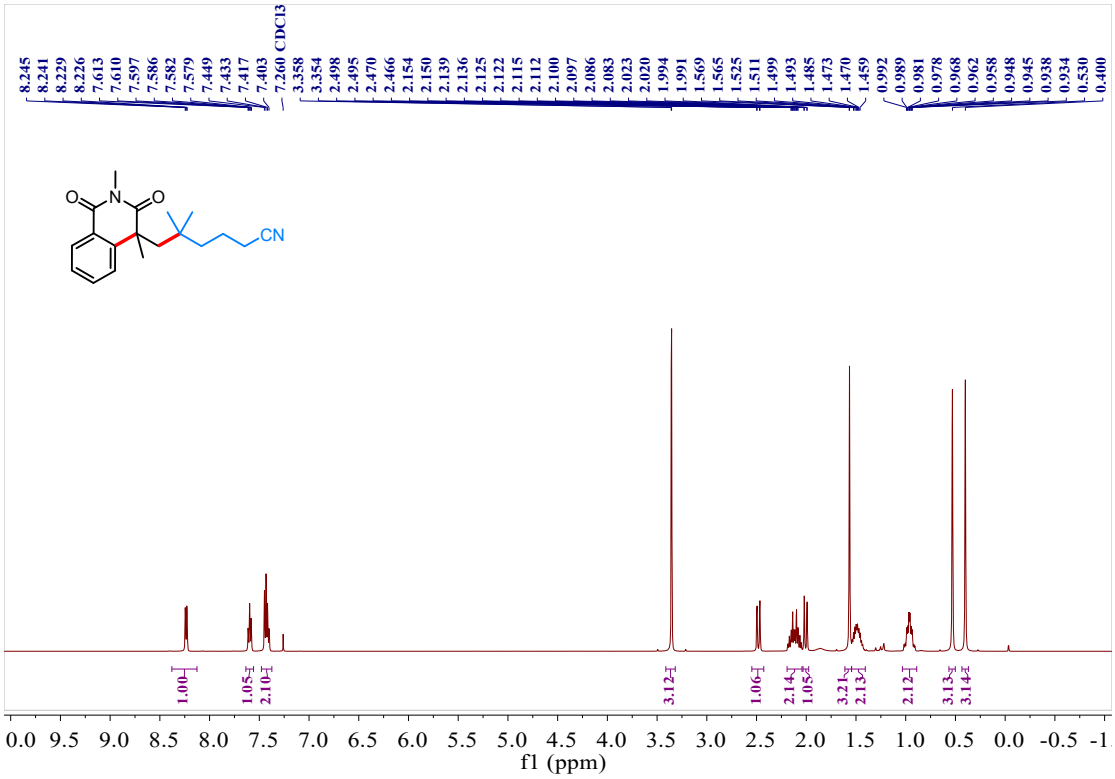


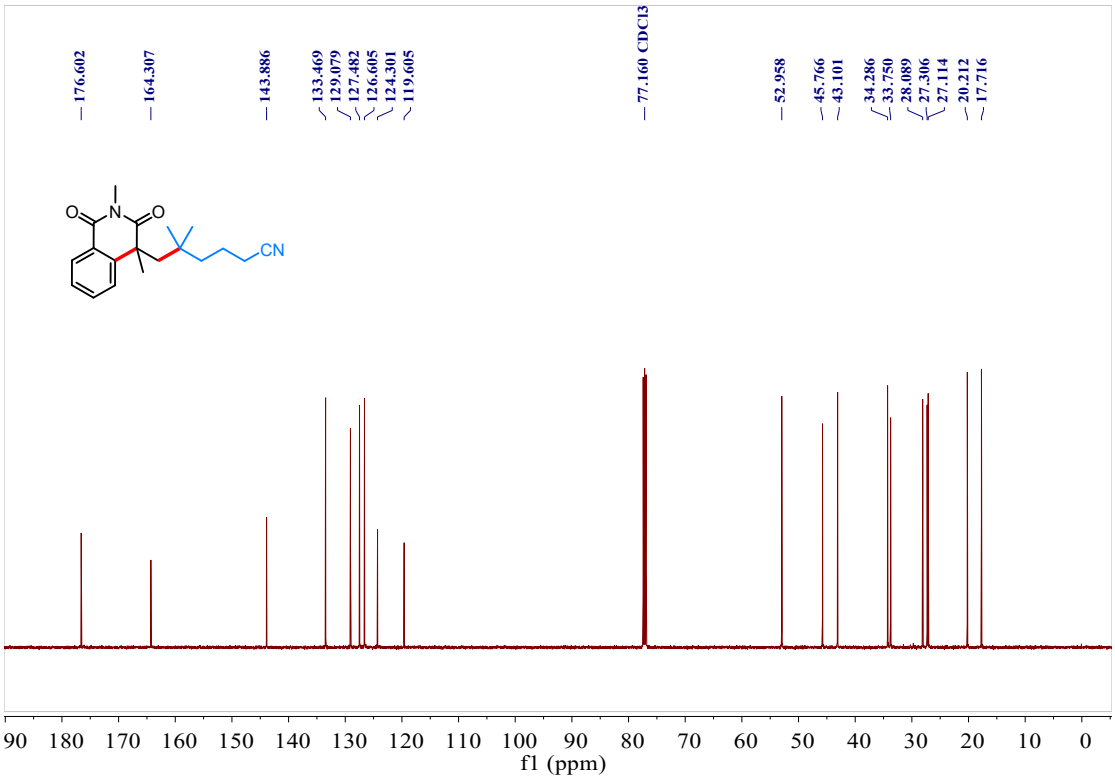
2-(Benzhydryl(2-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)ethyl)amino)acetonitrile (3am)



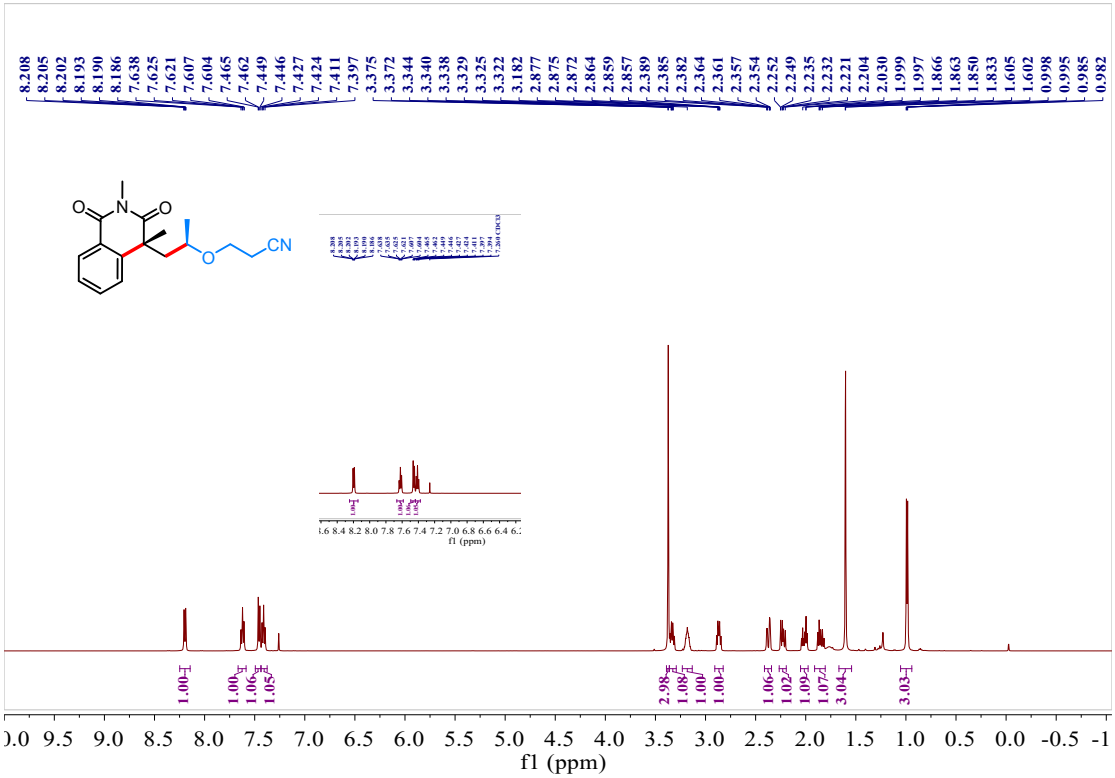


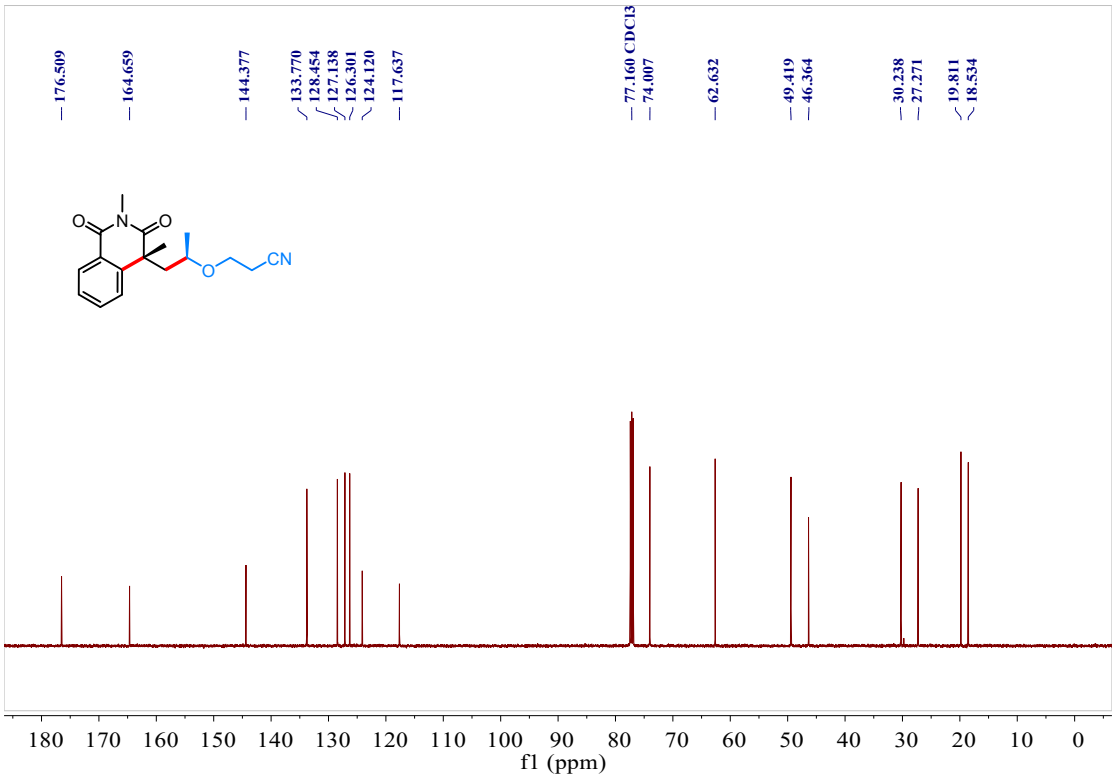
6-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)-5,5-dimethylhexanenitrile (3an)



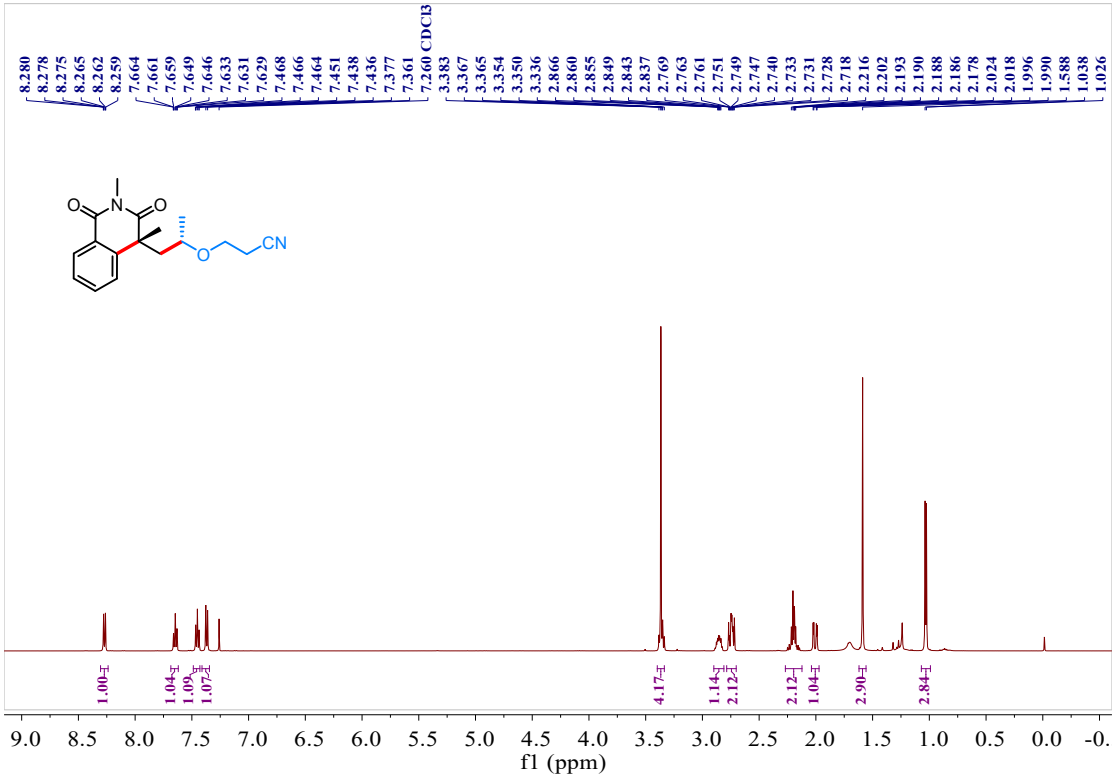


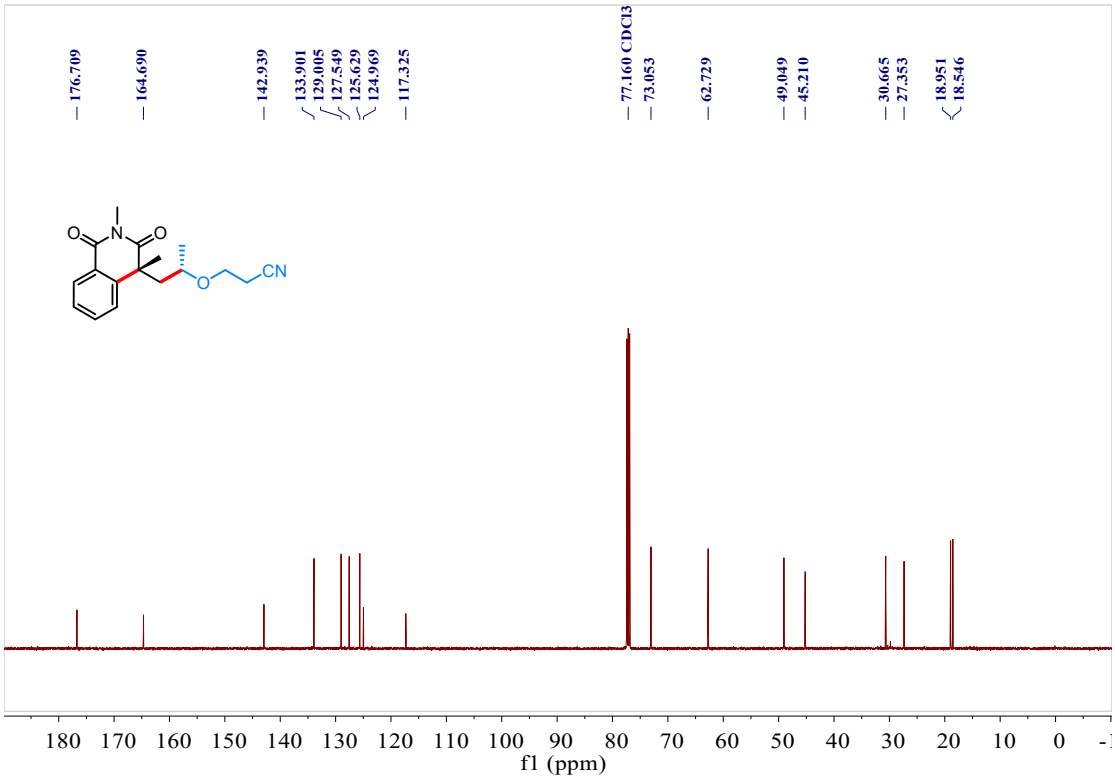
3-(((R)-1-((S)-2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)propan-2-yl)oxy)propanenitrile (3ao)



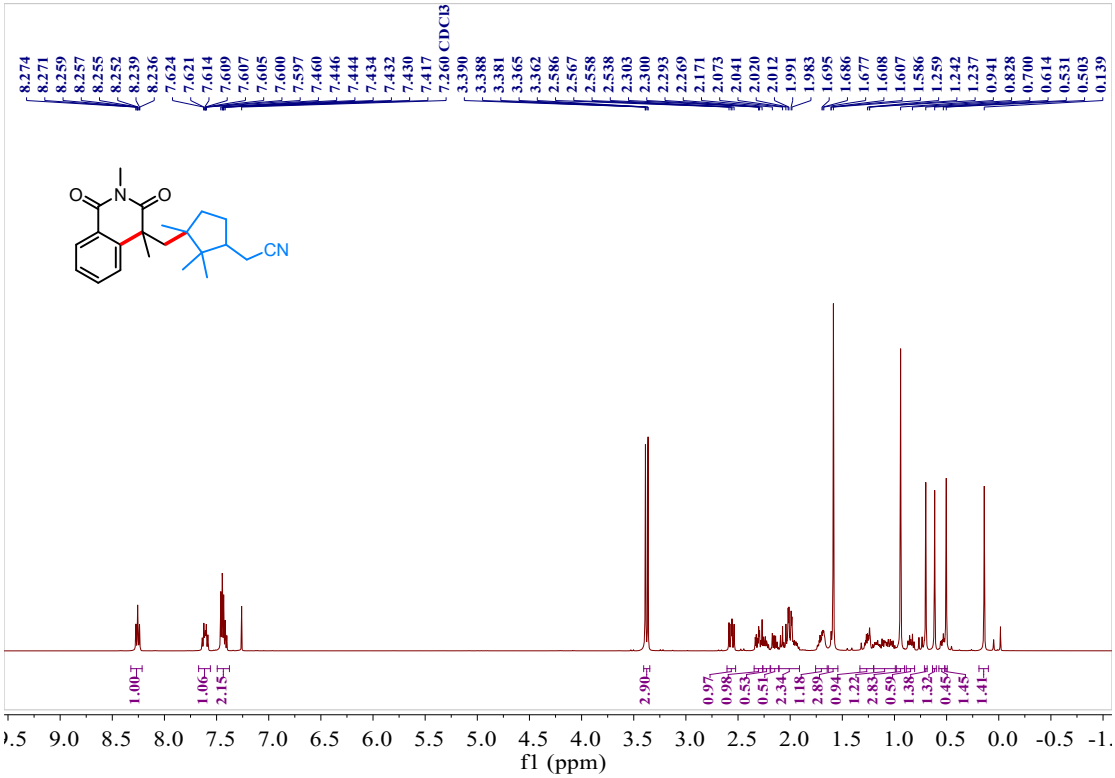


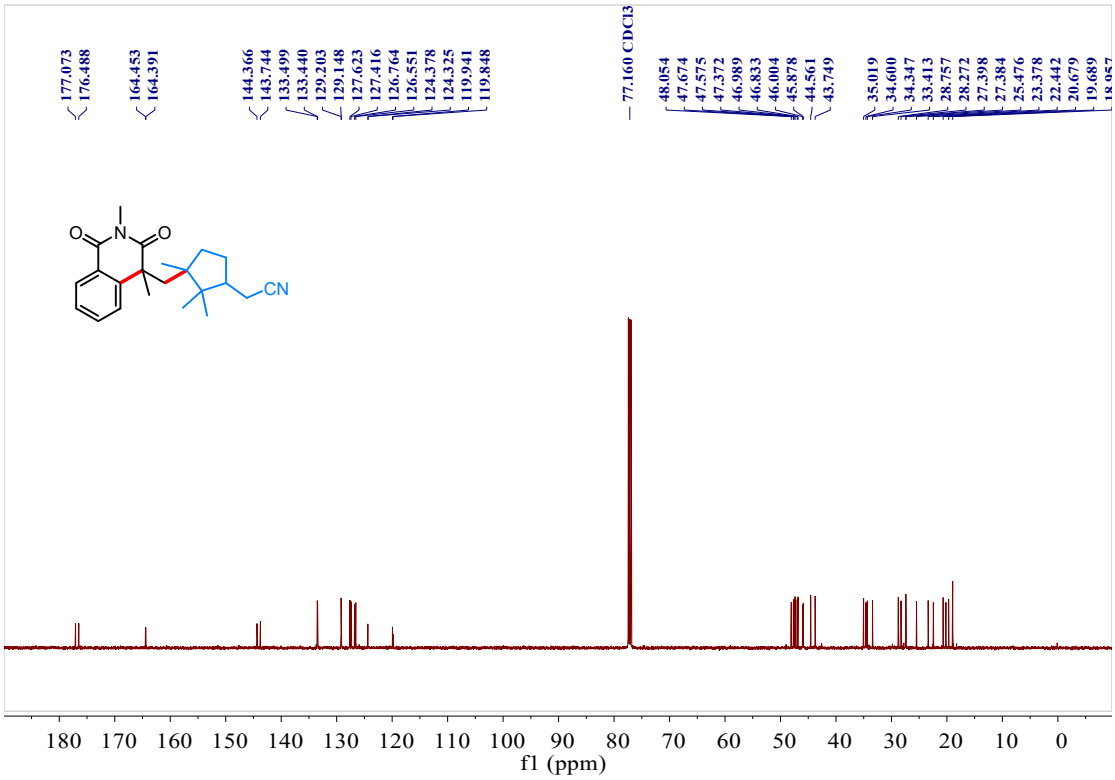
3-((1-((S)-2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)propan-2-yl)oxy)propanenitrile (3ao')



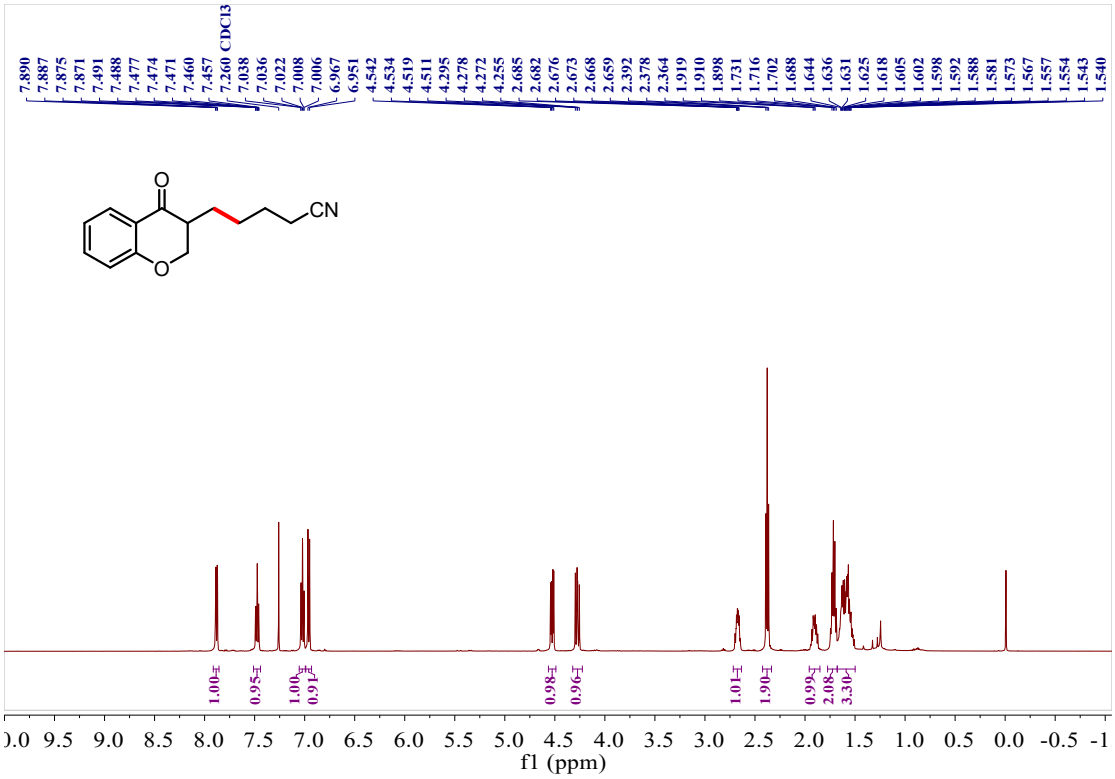


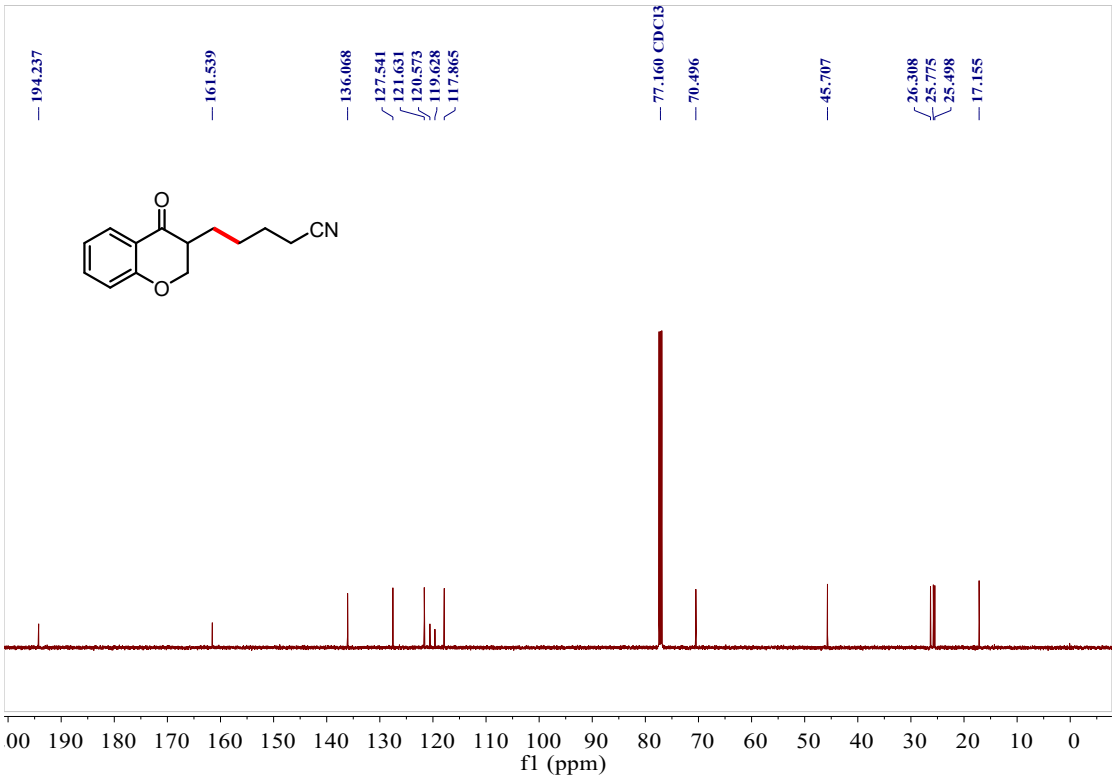
2-(3-((2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)methyl)-2,2,3-trimethylcyclo-pentyl)acetonitrile (3ap)



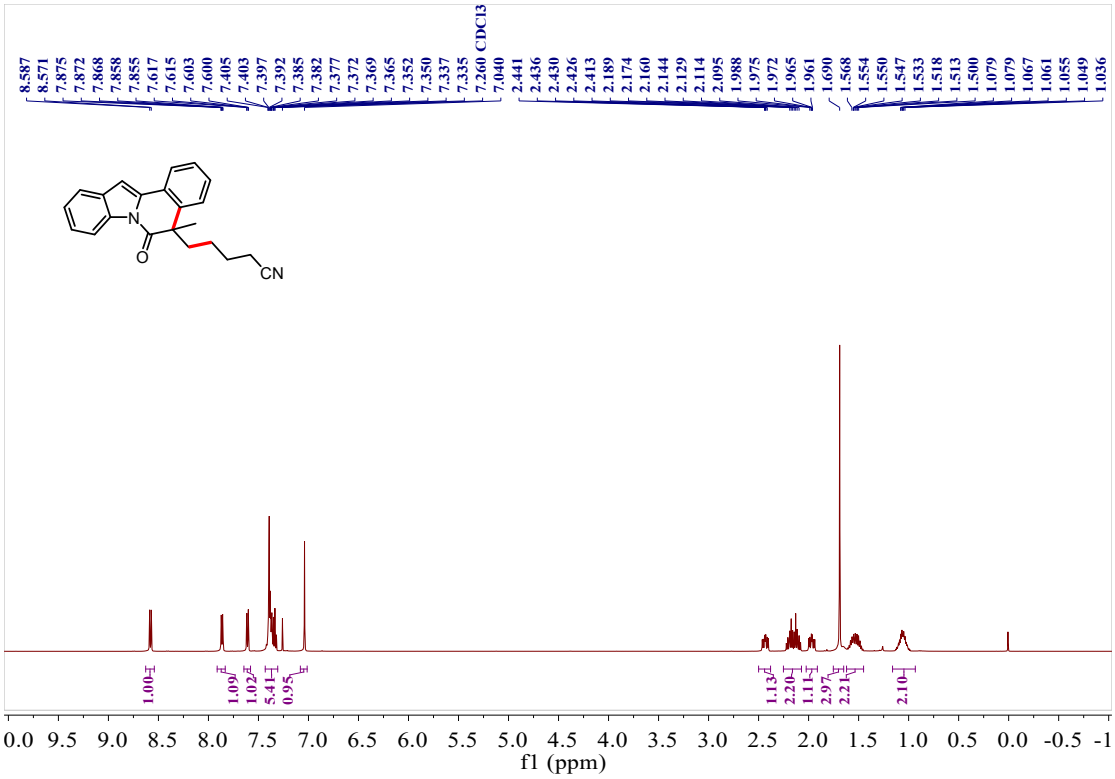


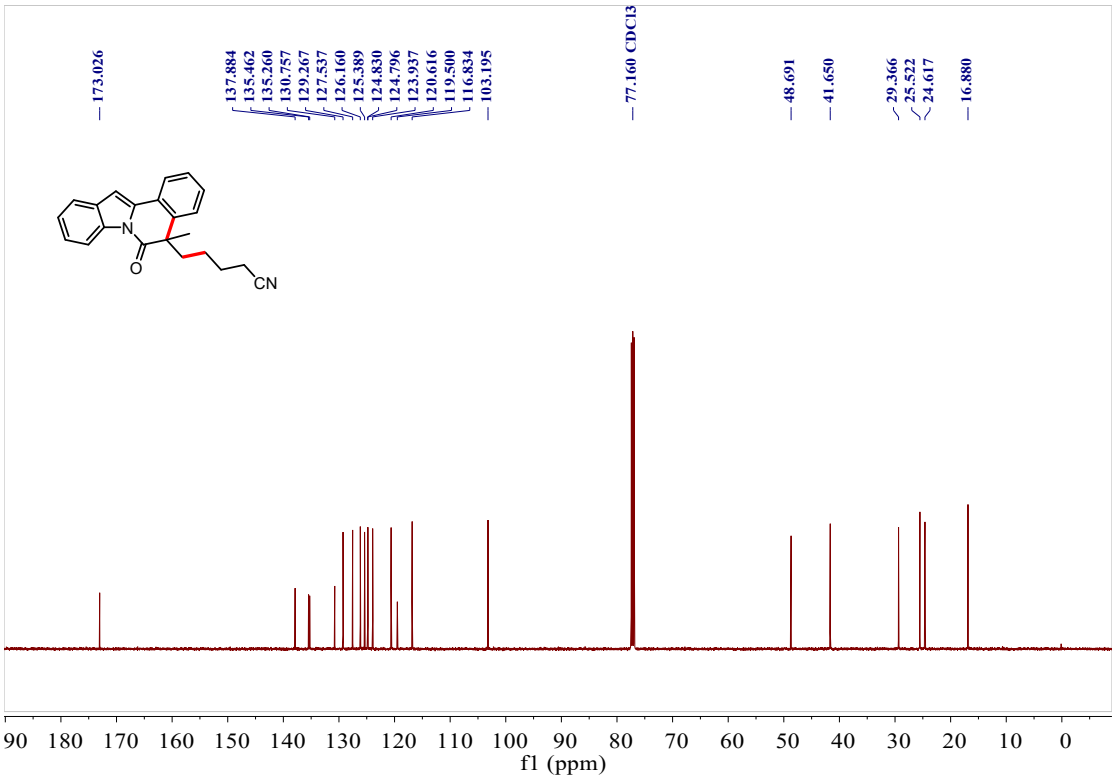
5-(4-Oxochroman-3-yl)pentanenitrile (4a)



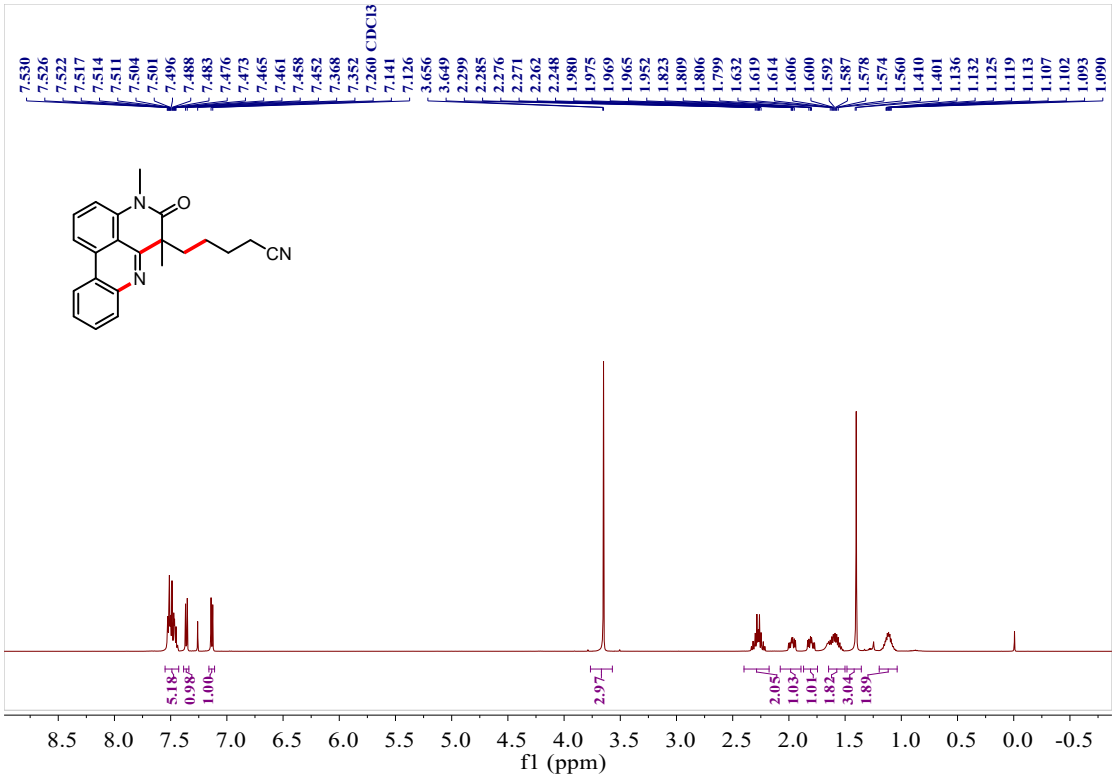


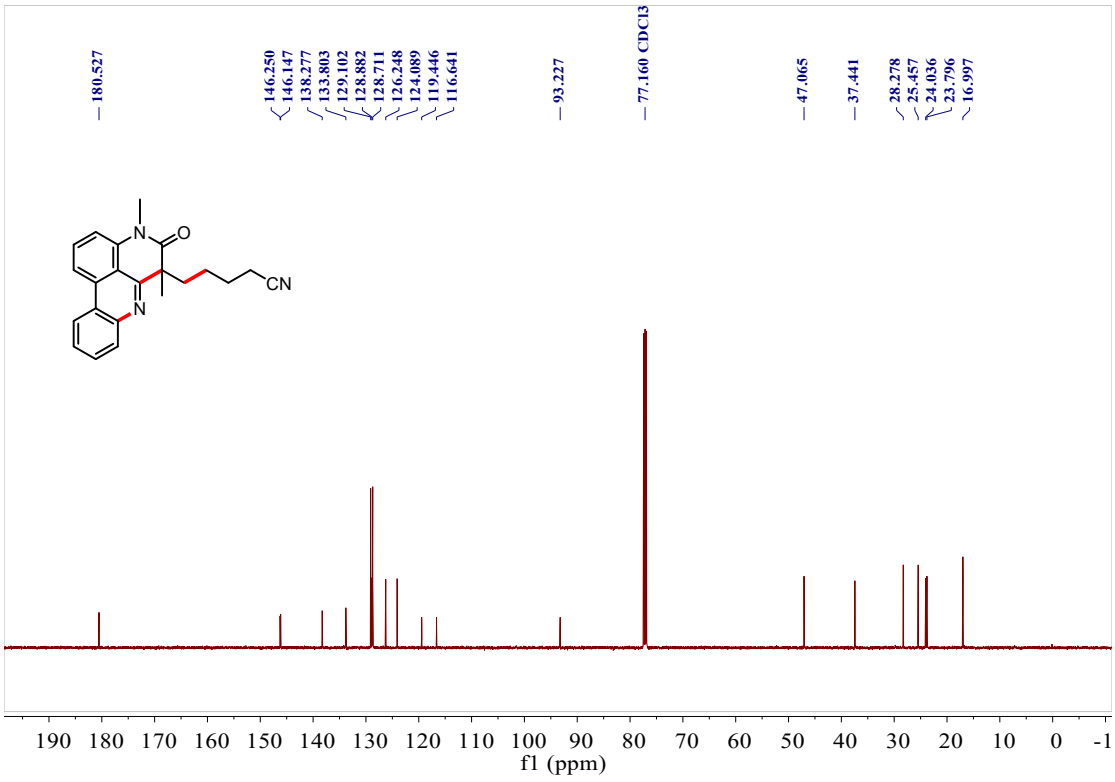
5-(5-Methyl-6-oxo-5,6-dihydroindolo[2,1-a]isoquinolin-5-yl)pentanenitrile (5a)



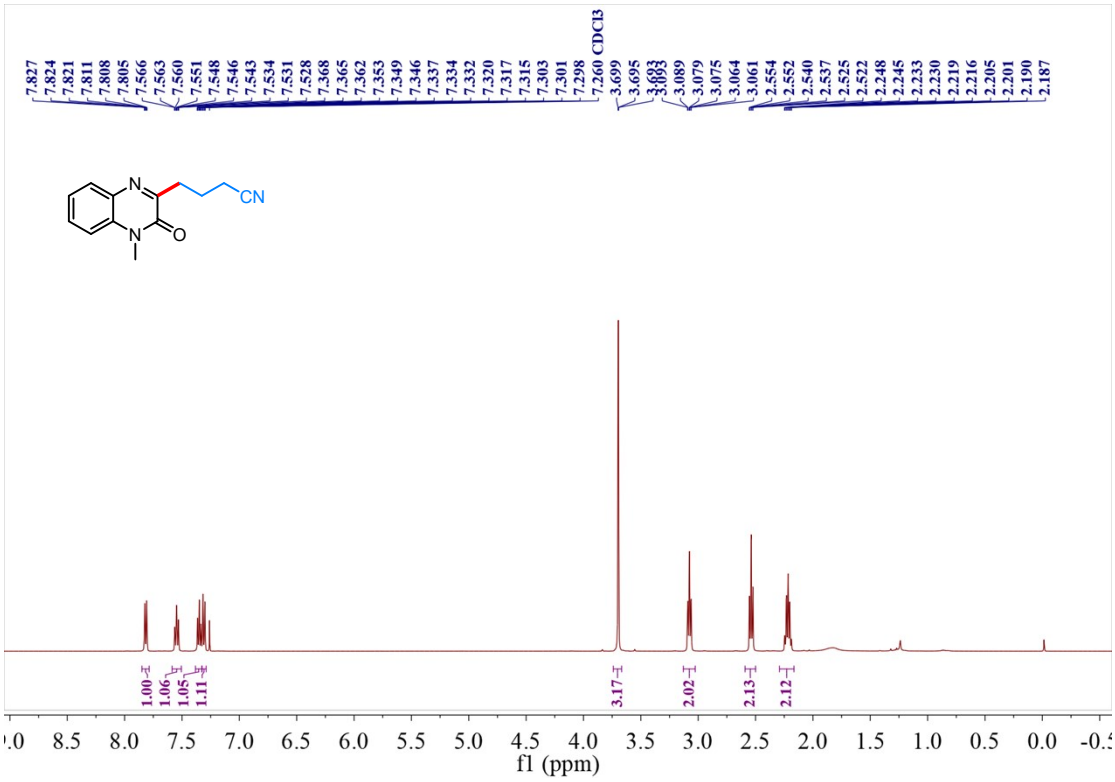


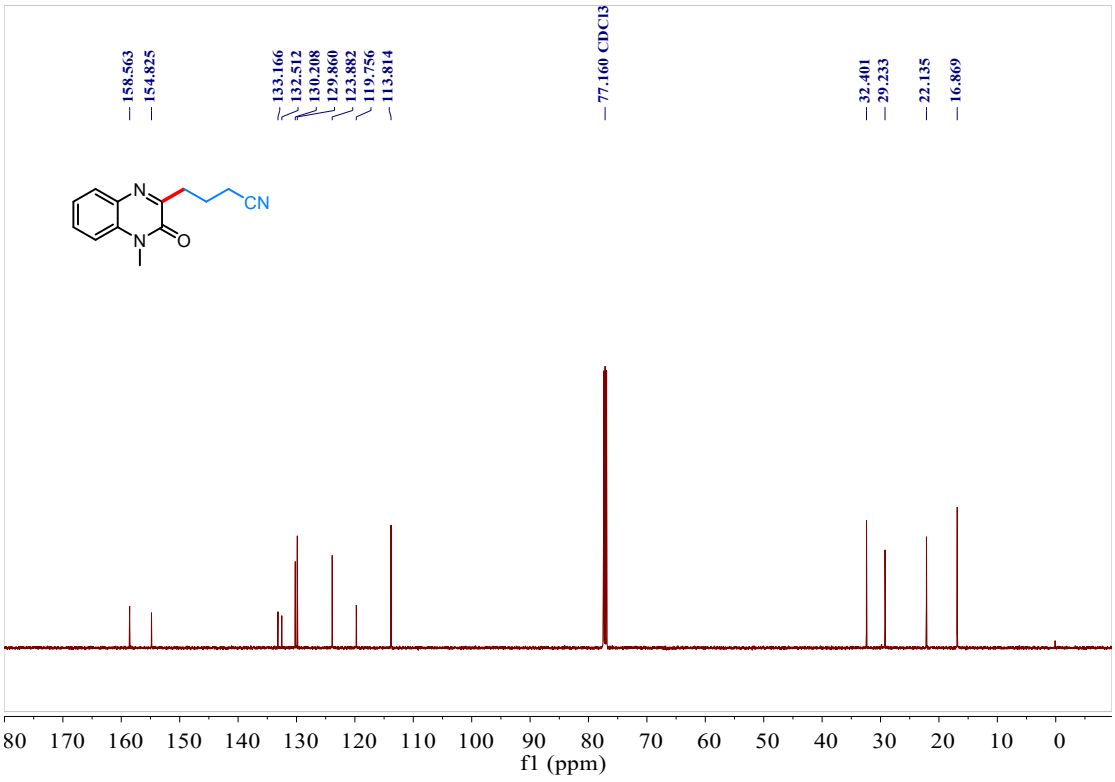
5-(4,6-Dimethyl-5-oxo-5,6-dihydro-4H-pyrido[4,3,2-*gh*]phenanthridin-6-yl)pentanenitrile (6a)



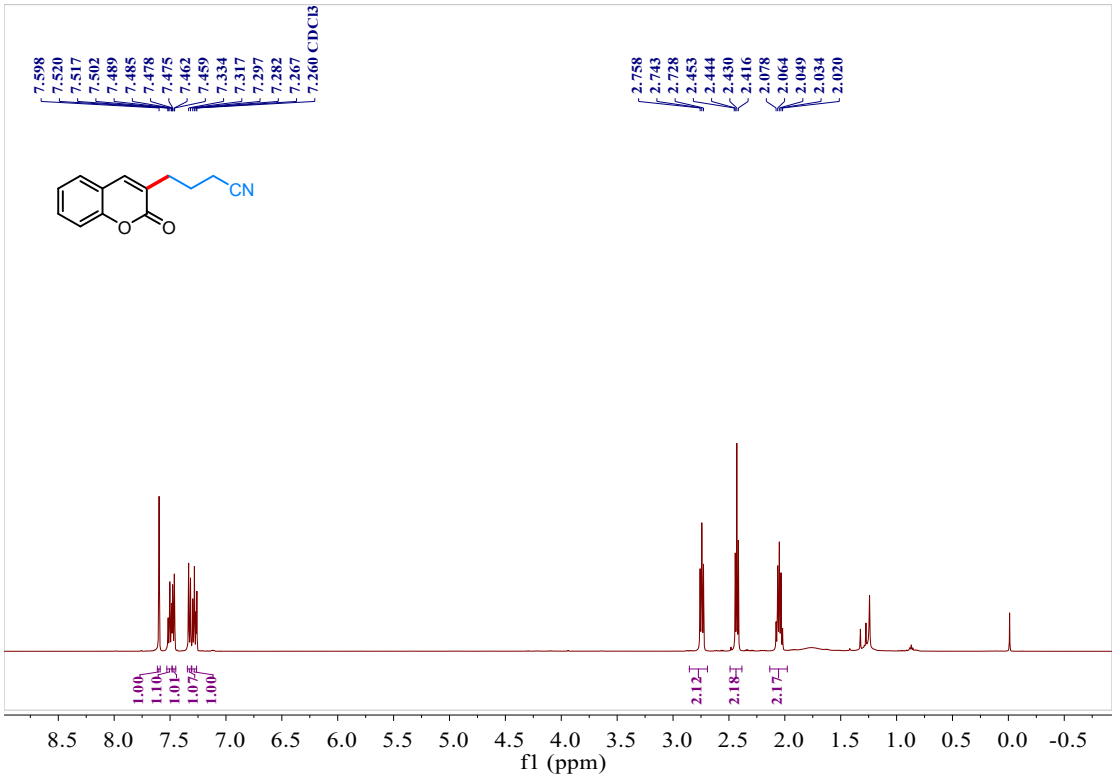


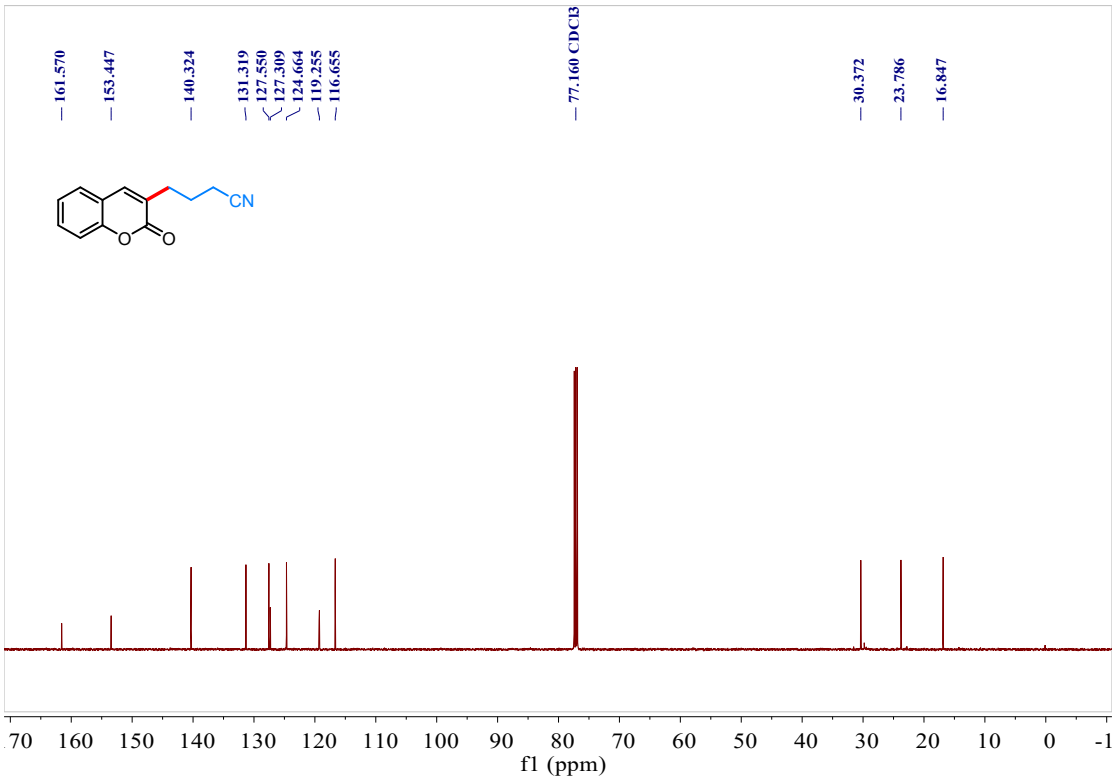
4-(4-Methyl-3-oxo-3,4-dihydroquinoxalin-2-yl)butanenitrile (7a)



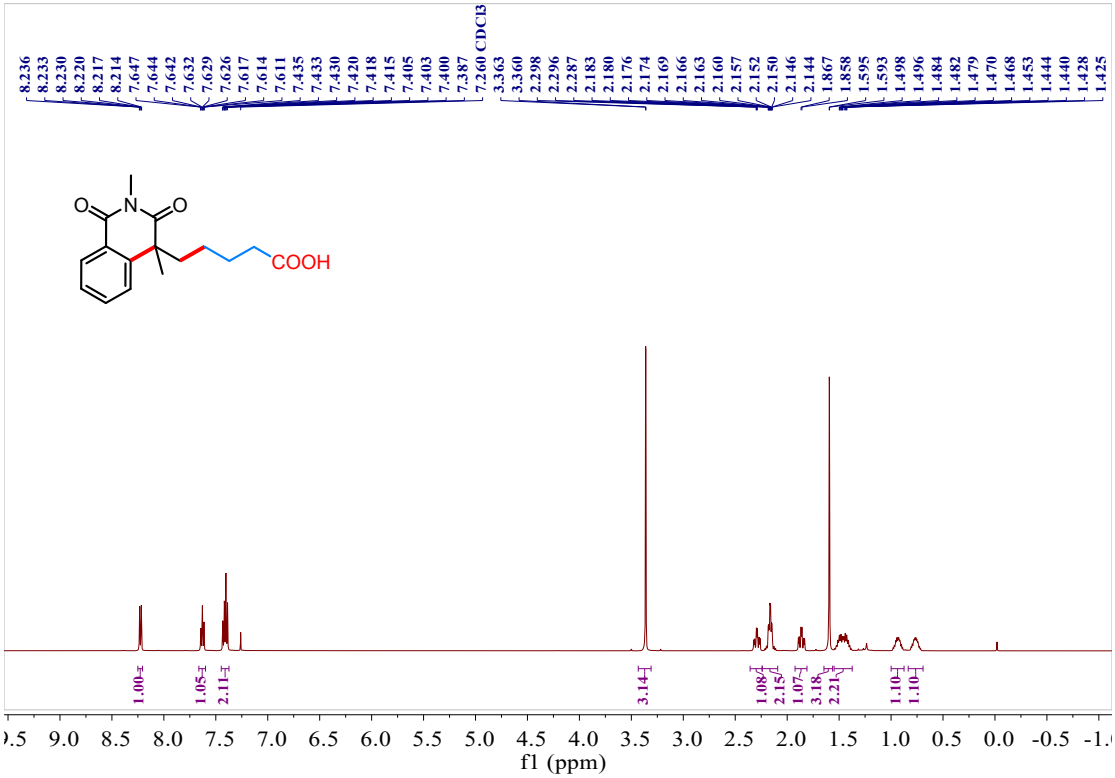


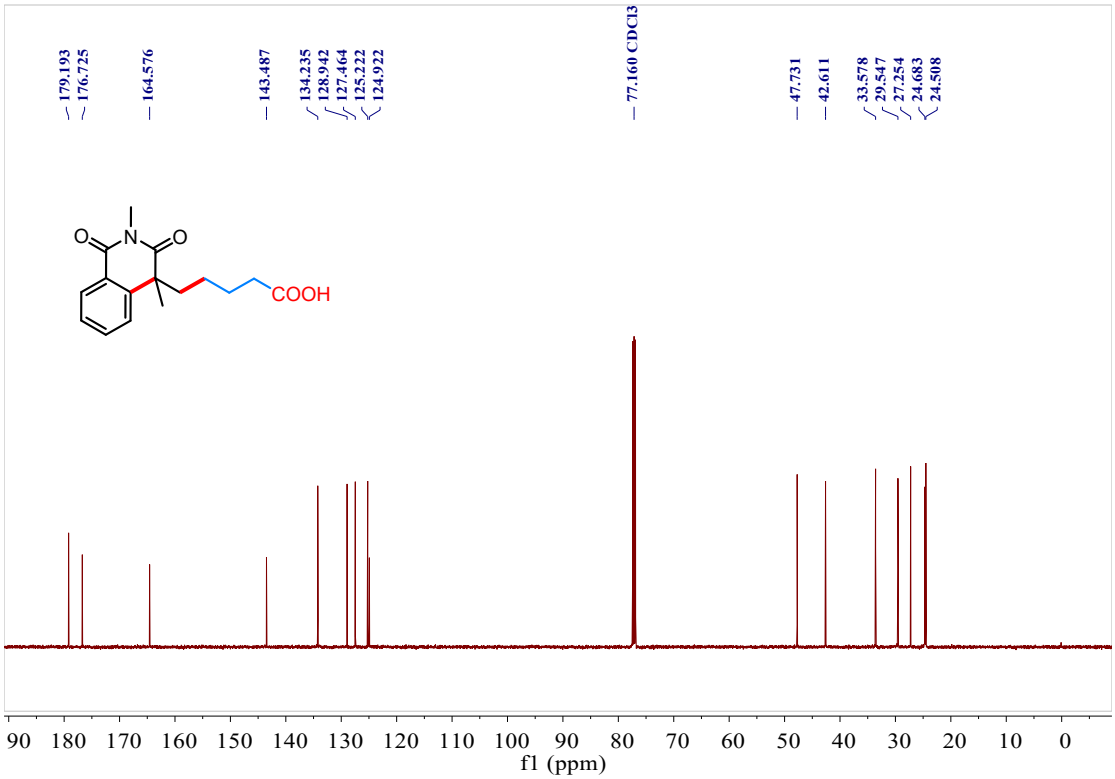
4-(2-Oxo-2H-chromen-3-yl)butanenitrile (8a)



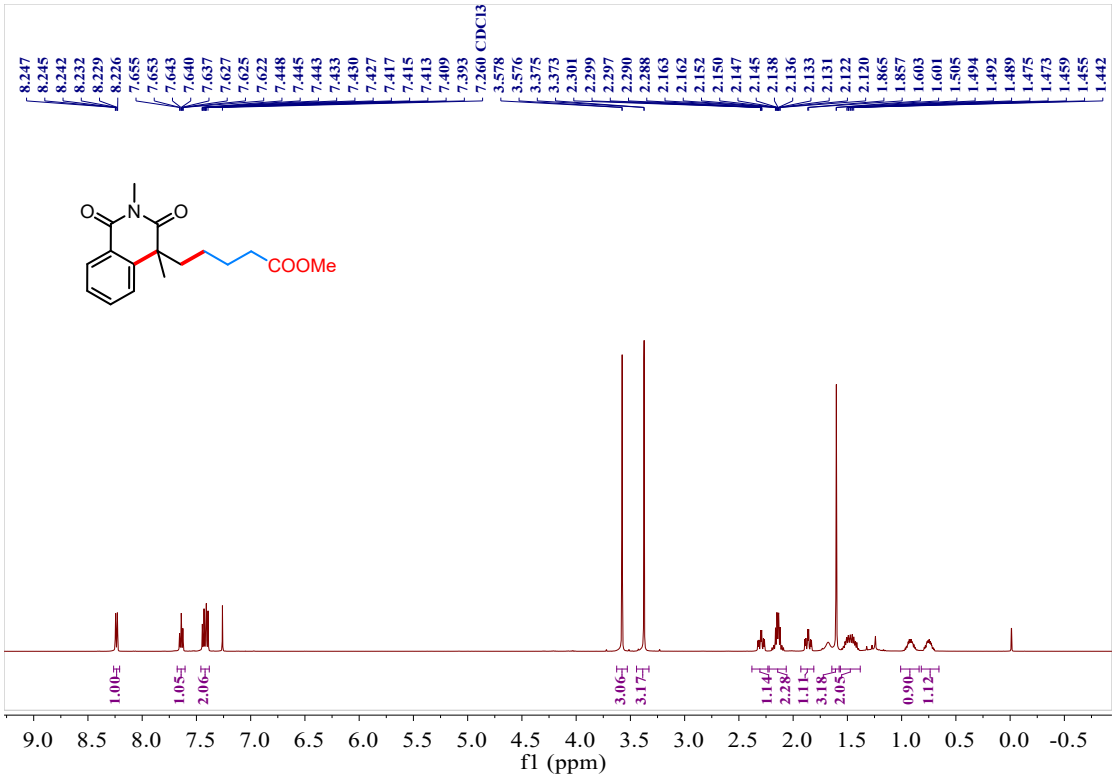


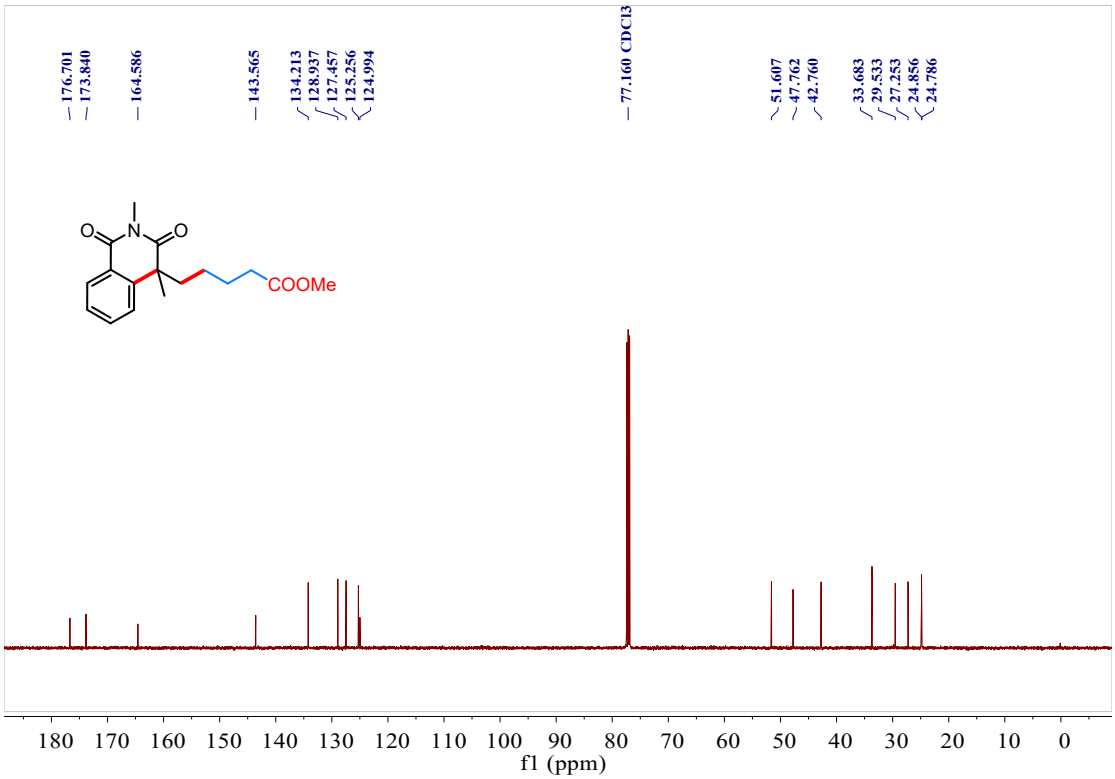
5-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanoic acid (9)



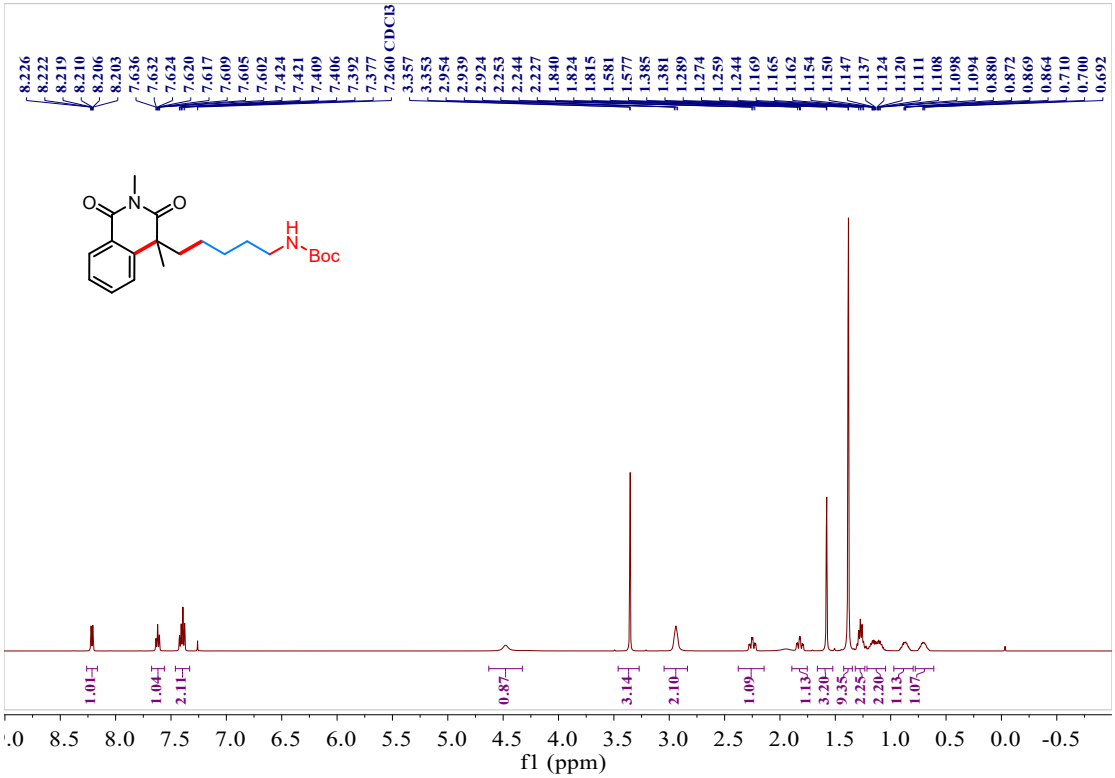


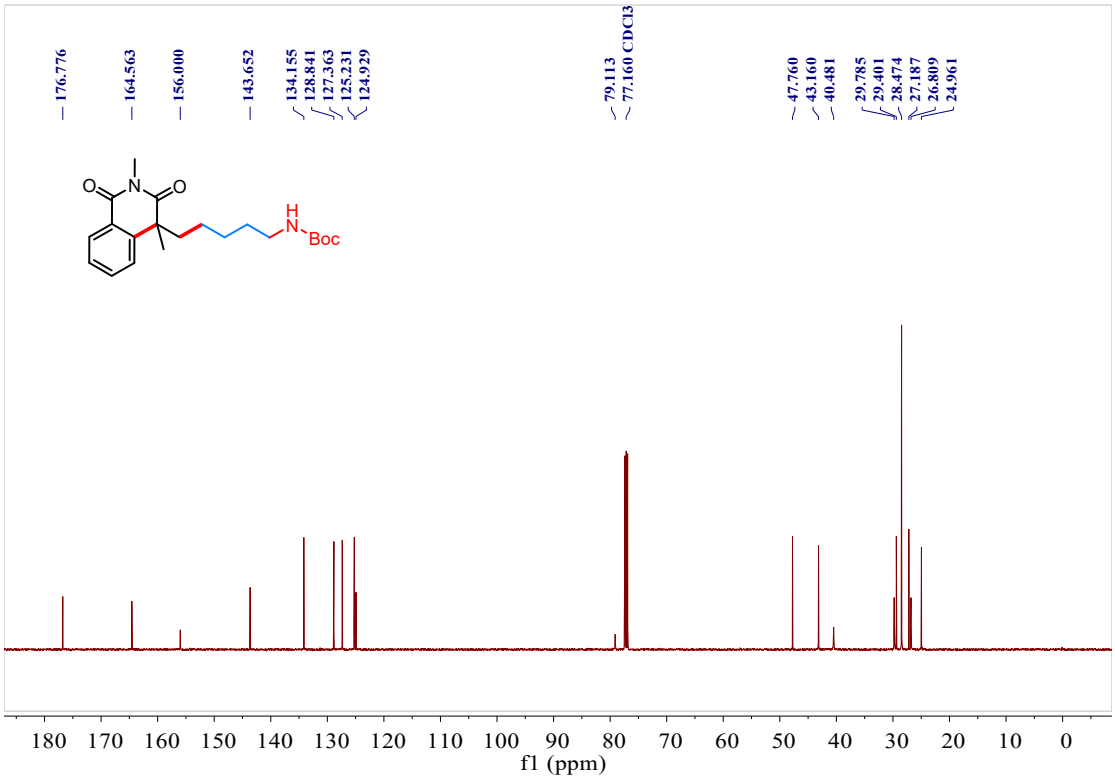
Methyl 5-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)-pentanoate (10)





Tert-butyl (5-(2,4-dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentyl)carbamate (11)





5-(2,4-Dimethyl-1,3-dioxo-1,2,3,4-tetrahydroisoquinolin-4-yl)pentanamide (12)