

Supplementary Material

DABCO-mediated synthesis of aromatic esters from phenols, naphthols or 3-hydroxypyridines and aryl acyl peroxides at room temperature

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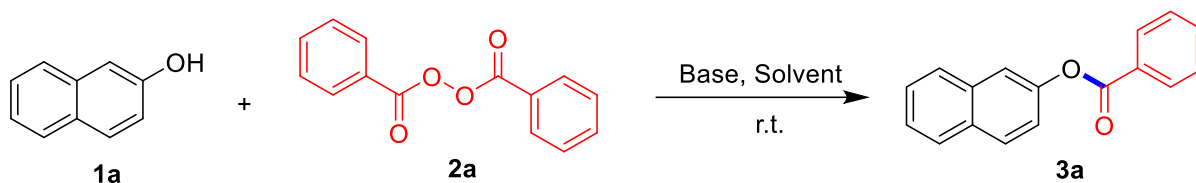
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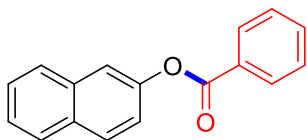
1. Optimization of reaction conditions



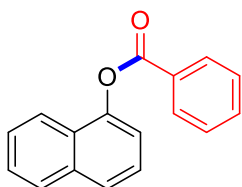
Entry	1a (mmol)	2a (mmol)	Solvent	Base (2.0 equiv.)	Time (h)	Yield (%)
1	0.2	0.3	THF	DABCO	6	26
2	0.2	0.3	DCM	DABCO	6	48
3	0.2	0.3	1,4-Dioxane	DABCO	6	18
4	0.2	0.3	CH ₃ CN	DABCO	6	13
5	0.2	0.3	DMSO	DABCO	6	Trace
6	0.2	0.3	H ₂ O	DABCO	6	Trace
7	0.2	0.3	DCE	DABCO	6	49
8	0.2	0.3	<i>n</i> -Hexane	DABCO	6	15
9	0.2	0.3	DMF	DABCO	6	Trace
10	0.2	0.3	EtOH	DABCO	6	N.R
11	0.2	0.3	NMP	DABCO	6	N.R
12	0.2	0.3	DMA	DABCO	6	trace
13	0.2	0.2	DCE	DABCO	6	59
14	0.2	0.4	DCE	DABCO	6	51
15	0.2	0.6	DCE	DABCO	6	45
16	0.4	0.2	DCE	DABCO	6	69
17	0.6	0.2	DCE	DABCO	6	77
18	0.8	0.2	DCE	DABCO	6	80
19	1.0	0.2	DCE	DABCO	6	85
20	1.2	0.2	DCE	DABCO	6	85
21	1.0	0.2	DCE	K ₂ CO ₃	6	11
22	1.0	0.2	DCE	CsCO ₃	6	Trace
23	1.0	0.2	DCE	DBU	6	28
24	1.0	0.2	DCE	DMAP	6	Trace
25	1.0	0.2	DCE	-	6	Trace
26	1.0	0.2	DCE	DABCO (1.0 equiv.)	6	61
27	1.0	0.2	DCE	DABCO (3.0 equiv.)	6	83
28	1.0	0.2	DCE	DABCO	4	79
29	1.0	0.2	DCE	DABCO	6	85
30	1.0	0.2	DCE	DABCO	8	83
31	1.0	0.2	DCE	DABCO	10	80

^a Reaction conditions: **1a** (1.0 mmol), **2a** (0.2 mmol), DABCO (0.4 mmol), solvent (2 mL), at room temperature for 6 h. ^b Isolated yields.

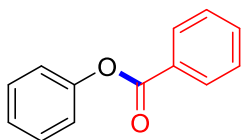
2. Characterization of compounds



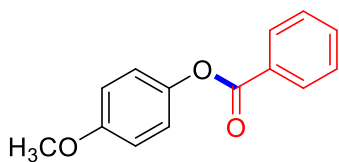
naphthalen-2-yl benzoate (3a)¹: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:20) to afford a white solid in 85% yield (42.3 mg). m.p. 104.5-105.1 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.26 (d, *J* = 7.2 Hz, 2H), 7.92-7.82 (m, 3H), 7.71-7.64 (m, 2H), 7.57-7.47 (m, 4H), 7.36 (dd, *J* = 8.8, 2.3 Hz, 1H); ¹³C NMR (126 MHz, CDCl₃) δ 165.45, 148.64, 133.87, 133.73, 131.57, 130.28, 129.59, 129.55, 128.68, 127.87, 127.75, 126.65, 125.80, 121.32, 118.78. ESI-HRMS calcd for [C₁₇H₁₂O₂+H]⁺ 249.0910, found 249.0917.



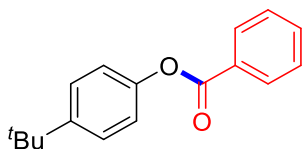
naphthalen-1-yl benzoate (3b)²: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a yellow liquid in 70% yield (34.8 mg). ¹H NMR (500 MHz, CDCl₃) δ 8.26 (d, *J* = 7.2 Hz, 2H), 7.93-7.83 (m, 3H), 7.71-7.64 (m, 2H), 7.56-7.47 (m, 4H), 7.36 (dd, *J* = 8.8, 2.3 Hz, 1H); ¹³C NMR (126 MHz, CDCl₃) δ 165.29, 146.89, 134.77, 133.87, 130.40, 129.42, 128.81, 128.14, 127.04, 126.59, 126.56, 126.18, 125.56, 121.33, 118.33.



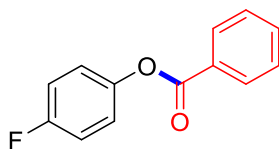
phenyl benzoate (3c)³: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 79% yield (31.1 mg). m.p. 66.9-67.6 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.21 (d, *J* = 7.1 Hz, 2H), 7.63 (t, *J* = 7.5 Hz, 1H), 7.51 (t, *J* = 7.7 Hz, 2H), 7.46-7.39 (m, 2H), 7.27 (t, *J* = 7.5 Hz, 1H), 7.22 (d, *J* = 7.5 Hz, 2H); ¹³C NMR (126 MHz, CDCl₃) δ 165.27, 150.99, 133.66, 130.23, 129.60, 129.57, 128.64, 125.96, 121.79.



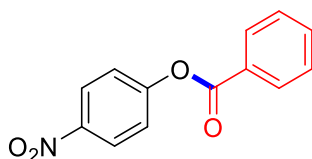
4-methoxyphenyl benzoate (3d)⁴: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 77% yield (35.3 mg). m.p. 73.8-74.2 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.20 (d, *J* = 7.3 Hz, 2H), 7.62 (t, *J* = 7.4 Hz, 1H), 7.50 (t, *J* = 7.8 Hz, 2H), 7.13 (dd, *J* = 9.7, 2.9 Hz, 2H), 6.94 (d, *J* = 9.0 Hz, 2H), 3.81 (s, 3H); ¹³C NMR (126 MHz, CDCl₃) δ 165.61, 157.34, 144.43, 133.57, 130.18, 129.65, 128.59, 122.50, 114.55, 55.65.



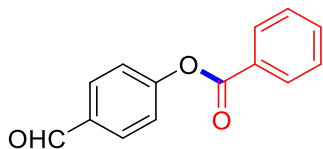
4-(tert-butyl)phenyl benzoate (3e)⁵: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 82% yield (42.0 mg). m.p. 79.7-80.9 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.20 (d, *J* = 7.6 Hz, 2H), 7.62 (t, *J* = 7.4 Hz, 1H), 7.49 (t, *J* = 7.7 Hz, 2H), 7.43 (d, *J* = 8.6 Hz, 2H), 7.14 (d, *J* = 8.6 Hz, 2H), 1.34 (s, 9H); ¹³C NMR (126 MHz, CDCl₃) δ 165.41, 148.73, 148.62, 133.57, 130.22, 129.73, 128.60, 126.46, 121.06, 34.56, 31.50.



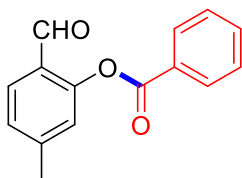
4-fluorophenyl benzoate (3f)⁶: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 80% yield (34.9 mg). m.p. 54.7-56.7 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.19 (d, *J* = 7.5 Hz, 2H), 7.64 (t, *J* = 7.4 Hz, 1H), 7.51 (t, *J* = 7.7 Hz, 2H), 7.17 (dd, *J* = 7.8, 5.7 Hz, 2H), 7.10 (t, *J* = 8.6 Hz, 2H); ¹³C NMR (126 MHz, CDCl₃) δ 165.26, 160.34 (d, *J* = 245.7 Hz), 146.77 (d, *J* = 2.52 Hz), 133.89, 130.22, 129.30, 128.67, 123.18 (d, *J* = 8.82 Hz), 116.29, 116.11.



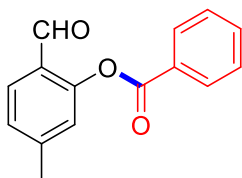
4-nitrophenyl benzoate (3g)⁶: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 87% yield (42.5 mg). m.p. 139.9-141.6 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.32 (d, *J* = 9.0 Hz, 2H), 8.20 (d, *J* = 7.7 Hz, 2H), 7.69 (t, *J* = 7.4 Hz, 1H), 7.55 (t, *J* = 7.7 Hz, 2H), 7.42 (d, *J* = 9.0 Hz, 2H); ¹³C NMR (126 MHz, CDCl₃) δ 164.28, 155.76, 145.41, 134.32, 130.37, 128.84, 128.53, 125.32, 122.70.

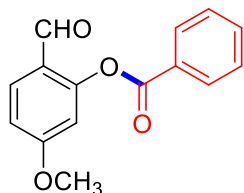


4-formylphenyl benzoate (3h)⁷: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 82% yield (37.3 mg). m.p. 88.7-90.5 °C. ¹H NMR (500 MHz, CDCl₃) δ 10.02 (s, 1H), 8.21 (d, *J* = 7.6 Hz, 2H), 7.97 (d, *J* = 8.5 Hz, 2H), 7.67 (t, *J* = 7.4 Hz, 1H), 7.53 (t, *J* = 7.7 Hz, 2H), 7.42 (d, *J* = 8.5 Hz, 2H); ¹³C NMR (126 MHz, CDCl₃) δ 191.05, 164.54, 155.71, 134.08, 131.32, 130.31, 128.90, 128.76, 128.68, 122.59.

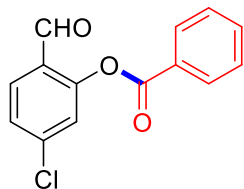


2-formyl-5-methylphenyl benzoate (3i): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a colorless liquid in 80% yield (38.5 mg). ¹H NMR (500 MHz, CDCl₃) δ 10.15 (s, 1H), 8.23 (d, *J* = 7.8 Hz, 2H), 7.85 (d, *J* = 7.9 Hz, 1H), 7.67 (t, *J* = 7.3 Hz, 1H), 7.54 (t, *J* = 7.6 Hz, 2H), 7.24 (d, *J* = 7.9 Hz, 1H), 7.13 (s, 1H), 2.46 (s, 3H); ¹³C NMR (126 MHz, CDCl₃) δ 188.20, 165.10, 152.30, 147.12, 134.07, 130.36, 130.31, 128.79, 127.47, 125.99, 124.01, 21.93.

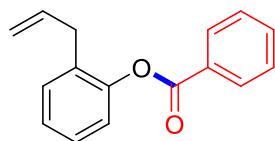




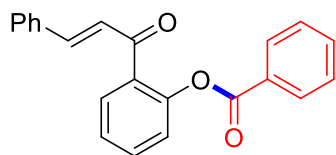
2-formyl-5-methoxyphenyl benzoate (3j)⁸: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 77% yield (43.9 mg). m.p. 79.8-81.2 °C. ¹H NMR (500 MHz, CDCl₃) δ 10.05 (s, 1H), 8.22 (d, *J* = 7.6 Hz, 2H), 7.89 (d, *J* = 8.7 Hz, 1H), 7.67 (t, *J* = 7.4 Hz, 1H), 7.53 (t, *J* = 7.7 Hz, 2H), 6.93 (d, *J* = 8.7 Hz, 1H), 6.81 (s, 1H), 3.88 (s, 3H); ¹³C NMR (126 MHz, CDCl₃) δ 187.21, 165.29, 164.87, 154.12, 134.11, 132.09, 130.37, 128.81, 128.70, 121.89, 112.70, 108.70, 55.95.



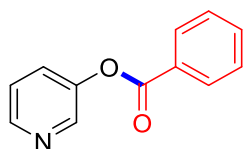
5-chloro-2-formylphenyl benzoate (3k): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 50% yield (26.0 mg). m.p. 97.4-98.1 °C. ¹H NMR (500 MHz, CDCl₃) δ 10.16 (s, 1H), 8.22 (d, *J* = 7.3 Hz, 2H), 7.90 (d, *J* = 8.3 Hz, 1H), 7.69 (t, *J* = 7.5 Hz, 1H), 7.55 (t, *J* = 7.8 Hz, 2H), 7.45-7.34 (m, 2H); ¹³C NMR (126 MHz, CDCl₃) δ 187.25, 164.58, 152.71, 141.25, 134.41, 131.03, 130.44, 128.91, 128.21, 127.08, 126.88, 124.17. ESI-HRMS calcd for [C₁₄H₉ClO₃+H]⁺ 261.0313, found 261.0319.



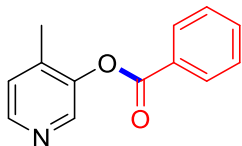
2-cinnamoylphenyl benzoate (3l)⁹: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a yellow liquid in 42% yield (20.1 mg). ¹H NMR (500 MHz, CDCl₃) δ 8.21 (d, *J* = 7.2 Hz, 2H), 7.64 (t, *J* = 7.4 Hz, 1H), 7.52 (t, *J* = 7.7 Hz, 2H), 7.30 (t, *J* = 6.6 Hz, 2H), 7.22 (d, *J* = 7.4 Hz, 1H), 7.17 (d, *J* = 9.1 Hz, 1H), 5.92 (dd, *J* = 16.9, 10.2 Hz, 1H), 5.08-4.97 (m, 2H), 3.36 (d, *J* = 6.6 Hz, 2H); ¹³C NMR (126 MHz, CDCl₃) δ 165.05, 149.14, 135.85, 133.66, 132.15, 130.46, 130.21, 129.49, 128.66, 127.54, 126.29, 122.51, 116.39, 34.74.



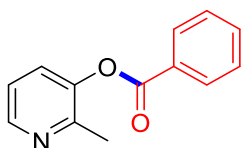
2-cinnamoylphenyl benzoate (3m): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a pale yellow solid in 72% yield (47.2 mg). m.p. 71.5-73.2 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.12 (d, *J* = 8.0 Hz, 2H), 7.76 (d, *J* = 6.3 Hz, 1H), 7.60-7.52 (m, 3H), 7.40 (dd, *J* = 16.8, 8.4 Hz, 5H), 7.35-7.27 (m, 4H), 7.16 (d, *J* = 16.0 Hz, 1H); ¹³C NMR (126 MHz, CDCl₃) δ 191.60, 165.05, 148.97, 145.53, 134.46, 133.77, 132.59, 132.56, 130.63, 130.31, 130.06, 129.03, 128.87, 128.61, 128.43, 126.22, 125.54, 123.64. ESI-HRMS calcd for [C₂₂H₁₆O₃+H]⁺ 329.1172, found 329.1167.



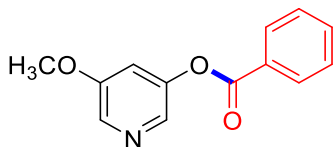
pyridin-3-yl benzoate (4a)¹⁰: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a pale yellow solid in 82% yield (47.2 mg). m.p. 50.0-50.5 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.56 (d, *J* = 18.4 Hz, 2H), 8.21 (d, *J* = 8.4 Hz, 2H), 7.69-7.60 (m, 2H), 7.53 (t, *J* = 7.8 Hz, 2H), 7.40 (dd, *J* = 8.1, 4.4 Hz, 1H); ¹³C NMR (126 MHz, CDCl₃) δ 164.71, 147.70, 146.96, 143.53, 134.09, 130.31, 129.55, 128.75, 124.06.



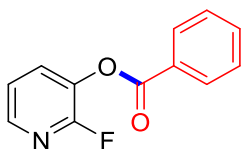
4-methylpyridin-3-yl benzoate (4b): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a pale yellow liquid in 83% yield (36.0 mg). ¹H NMR (500 MHz, CDCl₃) δ 8.45- 8.38 (m, 2H), 8.23 (d, *J* = 7.3 Hz, 2H), 7.68 (t, *J* = 8.0 Hz, 1H), 7.54 (t, *J* = 7.7 Hz, 2H), 7.24 (d, *J* = 4.7 Hz, 1H), 2.27 (s, 3H); ¹³C NMR (126 MHz, CDCl₃) δ 164.45, 147.06, 146.87, 143.65, 139.92, 134.09, 130.32, 128.79, 128.62, 125.95, 15.94. ESI-HRMS calcd for [C₁₃H₁₁NO₂+H]⁺ 214.0863, found 214.0868.



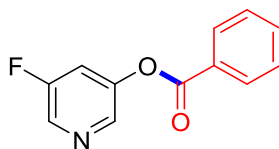
2-methylpyridin-3-yl benzoate (4c): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a pale yellow liquid in 65% yield (28.1 mg). ¹H NMR (500 MHz, CDCl₃) δ 8.44 (d, *J* = 4.7 Hz, 1H), 8.23 (d, *J* = 7.3 Hz, 2H), 7.68 (t, *J* = 7.5 Hz, 1H), 7.54 (dd, *J* = 17.0, 8.6 Hz, 3H), 7.26-7.22 (m, 1H), 2.52 (s, 3H); ¹³C NMR (126 MHz, CDCl₃) δ 164.48, 151.51, 146.48, 145.99, 134.07, 130.27, 129.91, 128.80, 122.08, 19.45. ESI-HRMS calcd for [C₁₃H₁₁NO₂+H]⁺ 214.0863, found 214.0869.



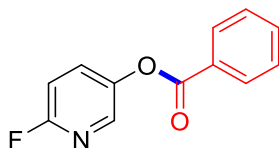
5-methoxypyridin-3-yl benzoate (4d): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a white solid in 87% yield (40.1 mg). m.p. 66.7-69.1 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.26 (s, 1H), 8.21 (d, *J* = 7.4 Hz, 3H), 7.67 (t, *J* = 7.4 Hz, 1H), 7.54 (t, *J* = 7.8 Hz, 2H), 7.17 (s, 1H), 3.89 (s, 3H); ¹³C NMR (126 MHz, CDCl₃) δ 164.68, 156.21, 148.05, 135.39, 135.08, 134.10, 130.31, 128.76, 114.60, 55.92. ESI-HRMS calcd for [C₁₃H₁₁NO₃+H]⁺ 230.0812, found 230.0803.



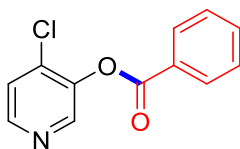
2-fluoropyridin-3-yl benzoate (4e): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a white solid in 84% yield (36.6 mg). m.p. 42.3-42.8 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.20 (d, *J* = 8.2 Hz, 2H), 8.12 (d, *J* = 4.8 Hz, 1H), 7.70 (d, *J* = 26.5 Hz, 2H), 7.53 (t, *J* = 7.7 Hz, 2H), 7.29-7.26 (m, 1H); ¹³C NMR (126 MHz, CDCl₃) δ 163.82, 155.60 (d, *J* = 239.4 Hz), 144.08 (d, *J* = 13.9 Hz), 134.30, 133.86 (d, *J* = 2.5 Hz), 133.61, 130.47, 128.80, 128.09, 122.08 (d, *J* = 3.8 Hz). ESI-HRMS calcd for [C₁₂H₈FNO₂+H]⁺ 218.0612, found 218.0618.



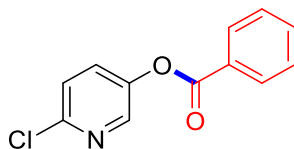
5-fluoropyridin-3-yl benzoate (4f): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a pale yellow liquid in 86% yield (37.8 mg). ^1H NMR (500 MHz, CDCl_3) δ 8.35 (s, 2H), 8.11 (d, J = 7.2 Hz, 2H), 7.59 (t, J = 7.5 Hz, 1H), 7.45 (t, J = 7.8 Hz, 2H), 7.37 (d, J = 9.0 Hz, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.29, 159.04 (d, J = 260.8 Hz), 147.80 (d, J = 5.0 Hz), 139.44 (d, J = 3.8 Hz), 135.36 (d, J = 22.7 Hz), 134.34, 130.37, 128.84, 128.34, 117.43 (d, J = 20.2 Hz). ESI-HRMS calcd for $[\text{C}_{12}\text{H}_8\text{FNO}_2 + \text{H}]^+$ 218.0612, found 218.0617.



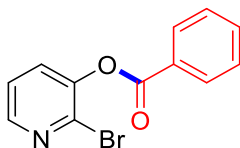
6-fluoropyridin-3-yl benzoate (4g): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a white solid in 83% yield (36.3 mg). m.p. 66.7-67.5 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.24-8.13 (m, 3H), 7.69 (dd, J = 17.5, 8.5 Hz, 2H), 7.54 (t, J = 7.8 Hz, 2H), 7.01 (dd, J = 8.8, 3.4 Hz, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.70, 160.65 (d, J = 239.4 Hz), 145.37 (d, J = 3.8 Hz), 140.61 (d, J = 15.1 Hz), 134.85 (d, J = 7.6 Hz), 134.22, 130.32, 128.80, 128.47, 109.99 (d, J = 40.3 Hz). ESI-HRMS calcd for $[\text{C}_{12}\text{H}_8\text{FNO}_2 + \text{H}]^+$ 218.0612, found 218.0612.



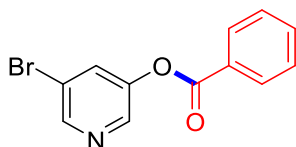
4-chloropyridin-3-yl benzoate (4h): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a pale yellow liquid in 85% yield (40.2 mg). ^1H NMR (500 MHz, CDCl_3) δ 8.58 (s, 1H), 8.45 (d, J = 5.2 Hz, 1H), 8.24 (d, J = 8.1 Hz, 2H), 7.68 (t, J = 7.9 Hz, 1H), 7.54 (t, J = 7.7 Hz, 2H), 7.47 (d, J = 5.2 Hz, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 163.77, 147.80, 145.35, 144.64, 136.98, 134.34, 130.53, 128.83, 128.06, 125.20. ESI-HRMS calcd for $[\text{C}_{12}\text{H}_8\text{ClNO}_2 + \text{H}]^+$ 234.0316, found 234.0315.



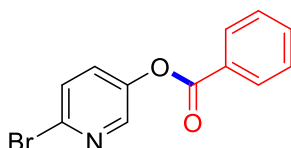
6-chloropyridin-3-yl benzoate (4i): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a white solid in 88% yield (41.4 mg). m.p. 82.1-83.6 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.35 (d, J = 2.8 Hz, 1H), 8.19 (d, J = 7.2 Hz, 2H), 7.68 (t, J = 7.5 Hz, 1H), 7.61 (dd, J = 8.6, 2.9 Hz, 1H), 7.53 (t, J = 7.8 Hz, 2H), 7.40 (d, J = 8.6 Hz, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.45, 147.88, 146.75, 143.15, 134.30, 132.48, 130.35, 128.82, 128.36, 124.76. ESI-HRMS calcd for $[\text{C}_{12}\text{H}_8\text{ClNO}_2 + \text{H}]^+$ 234.0316, found 234.0313.



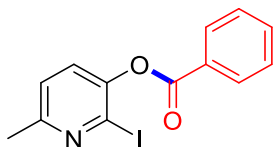
2-bromopyridin-3-yl benzoate (4j): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a white solid in 61% yield (33.7 mg). m.p. 74.7-76.0 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.32 (dd, J = 4.7, 1.6 Hz, 1H), 8.25 (d, J = 7.1 Hz, 2H), 7.72-7.63 (m, 2H), 7.55 (t, J = 7.8 Hz, 2H), 7.40-7.35 (m, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 163.88, 147.11, 145.73, 136.54, 134.34, 131.83, 130.55, 128.84, 128.34, 123.57. ESI-HRMS calcd for $[\text{C}_{12}\text{H}_8\text{BrNO}_2+\text{H}]^+$ 277.9811, found 277.9815.



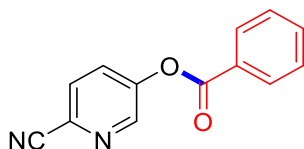
5-bromopyridin-3-yl benzoate (4k): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a white solid in 76% yield (43.0 mg). m.p. 63.9-65.2 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.52 (s, 1H), 8.43 (s, 1H), 8.10 (d, J = 7.2 Hz, 2H), 7.75 (s, 1H), 7.59 (t, J = 7.5 Hz, 1H), 7.45 (t, J = 7.8 Hz, 2H); ^{13}C NMR (126 MHz, CDCl_3) δ 163.22, 146.96, 146.53, 140.67, 133.28, 131.41, 129.30, 127.77, 127.20, 119.01. ESI-HRMS calcd for $[\text{C}_{12}\text{H}_8\text{BrNO}_2+\text{H}]^+$ 277.9811, found 277.9814.



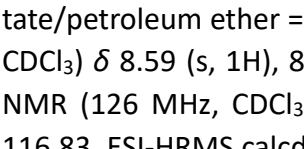
6-bromopyridin-3-yl benzoate (4l): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a white solid in 83% yield (46.9 mg). m.p. 87.7-88.5 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.34 (d, J = 2.7 Hz, 1H), 8.19 (d, J = 7.4 Hz, 2H), 7.68 (t, J = 7.4 Hz, 1H), 7.57-7.49 (m, 4H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.37, 147.26, 143.77, 137.98, 134.32, 132.36, 130.36, 128.83, 128.56, 128.34. ESI-HRMS calcd for $[\text{C}_{12}\text{H}_8\text{BrNO}_2+\text{H}]^+$ 277.9811, found 277.9817.

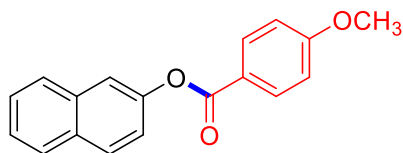


2-iodo-6-methylpyridin-3-yl benzoate (4m): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a white solid in 81% yield (55.6 mg). m.p. 111.9-112.9 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.27 (d, J = 8.5 Hz, 2H), 7.69 (t, J = 7.5 Hz, 1H), 7.55 (t, J = 7.7 Hz, 2H), 7.41 (d, J = 8.1 Hz, 1H), 7.17 (d, J = 8.1 Hz, 1H), 2.59 (s, 3H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.13, 157.79, 146.62, 134.23, 130.61, 130.29, 128.80, 128.63, 123.24, 113.87, 23.70. ESI-HRMS calcd for $[\text{C}_{13}\text{H}_{10}\text{INO}_2+\text{H}]^+$ 339.9829, found 339.9833.

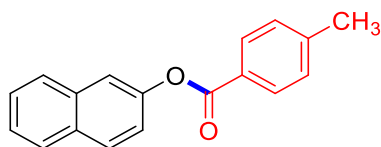


6-cyanopyridin-3-yl benzoate (4n): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:3) to afford a white solid in 76% yield (34.5 mg). m.p. 88.3-90.1 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.59 (s, 1H), 8.12 (d, J = 8.4 Hz, 2H), 7.73 (s, 2H), 7.62 (t, J = 7.5 Hz, 1H), 7.48 (t, J = 7.8 Hz, 2H); ^{13}C NMR (126 MHz, CDCl_3) δ 163.92, 149.81, 145.36, 134.67, 130.56, 130.46, 130.23, 129.30, 128.95, 127.89, 116.83. ESI-HRMS calcd for $[\text{C}_{13}\text{H}_8\text{N}_2\text{O}_2+\text{H}]^+$ 225.0659, found 225.0653.

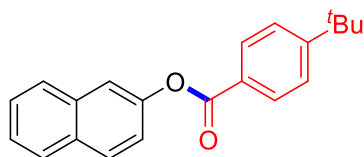




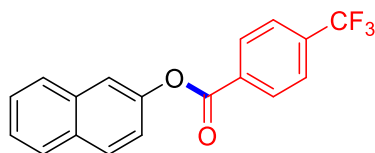
naphthalen-2-yl 4-methoxybenzoate (5b)⁶: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 81% yield (45.5 mg). m.p. 105.9-107.0 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.19 (d, *J* = 8.9 Hz, 2H), 7.90-7.77 (m, 3H), 7.66 (s, 1H), 7.51-7.42 (m, 2H), 7.34 (dd, *J* = 8.8, 2.3 Hz, 1H), 6.97 (d, *J* = 8.9 Hz, 2H), 3.84 (s, 3H); ¹³C NMR (126 MHz, CDCl₃) δ 165.19, 164.00, 148.78, 133.91, 132.42, 131.51, 129.47, 127.87, 127.74, 126.61, 125.72, 121.86, 121.51, 118.82, 113.94, 55.57.



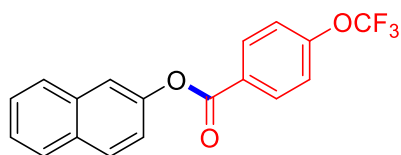
naphthalen-2-yl 4-methylbenzoate (5c)¹¹: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a pale yellow solid in 78% yield (42.5 mg). m.p. 133.8-134.4 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.14 (d, *J* = 8.1 Hz, 2H), 7.87 (dd, *J* = 14.0, 8.2 Hz, 2H), 7.81 (d, *J* = 7.7 Hz, 1H), 7.68 (s, 1H), 7.51-7.44 (m, 2H), 7.33 (dd, *J* = 15.9, 8.4 Hz, 3H), 2.45 (s, 3H); ¹³C NMR (126 MHz, CDCl₃) δ 165.51, 148.72, 144.56, 133.89, 131.53, 130.33, 129.49, 129.40, 127.86, 127.74, 126.83, 126.61, 125.74, 121.42, 118.79, 21.85.



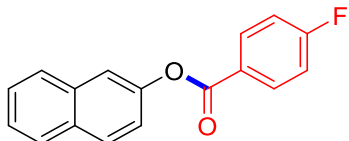
naphthalen-2-yl 4-(tert-butyl)benzoate (5d): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 73% yield (44.6 mg). m.p. 121.3-122.5 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.18 (d, *J* = 8.4 Hz, 2H), 7.92-7.81 (m, 3H), 7.68 (s, 1H), 7.57-7.45 (m, 4H), 7.35 (d, *J* = 11.0 Hz, 1H), 1.38 (s, 9H); ¹³C NMR (126 MHz, CDCl₃) δ 165.43, 157.51, 148.71, 133.87, 131.51, 130.18, 129.47, 127.84, 127.72, 126.76, 126.58, 125.71, 125.66, 121.41, 118.76, 35.27, 31.17. ESI-HRMS calcd for [C₂₁H₂₀O₂+H]⁺ 305.1536, found 305.1530.



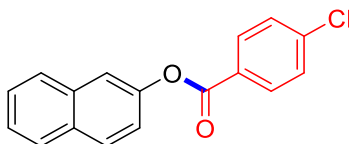
naphthalen-2-yl 4-(trifluoromethyl)benzoate (5e): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 73% yield (46.0 mg). m.p. 121.2-121.6 °C. ¹H NMR (500 MHz, CDCl₃) δ 8.35 (d, *J* = 8.1 Hz, 2H), 7.89 (dd, *J* = 17.5, 8.1 Hz, 2H), 7.83 (d, *J* = 7.4 Hz, 1H), 7.79 (d, *J* = 8.2 Hz, 2H), 7.70 (s, 1H), 7.54-7.47 (m, 2H), 7.35 (dd, *J* = 8.8, 2.2 Hz, 1H); ¹³C NMR (126 MHz, CDCl₃) δ 164.23, 148.31, 135.09 (q, *J* = 32.8 Hz), 133.79, 132.83, 131.66, 130.65, 129.70, 127.89, 127.76, 126.80, 126.01, 125.70 (q, *J* = 3.8 Hz), 123.62 (q, *J* = 273.4 Hz), 120.95, 118.69. ESI-HRMS calcd for [C₁₈H₁₁F₃O₂+H]⁺ 317.0784, found 317.0786.



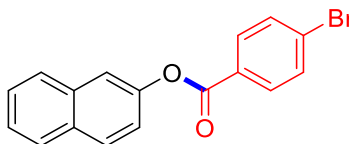
naphthalen-2-yl 4-(trifluoromethoxy)benzoate (5f): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 53% yield (31.1 mg). m.p. 88.3-90.6 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.29 (d, J = 8.8 Hz, 2H), 7.93-7.80 (m, 3H), 7.68 (s, 1H), 7.54-7.46 (m, 2H), 7.35 (d, J = 8.5 Hz, 3H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.25, 153.18, 148.39, 133.81, 132.31, 131.62, 128.70 (d, J = 238.1 Hz), 127.93, 127.88, 126.74, 125.93, 121.38, 121.07, 120.47, 119.32, 118.71. ESI-HRMS calcd for $[\text{C}_{18}\text{H}_{11}\text{F}_3\text{O}_3+\text{H}]^+$ 333.0733, found 333.0740.



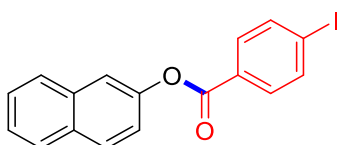
naphthalen-2-yl 4-fluorobenzoate (5g): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 74% yield (43.2 mg). m.p. 114.6-115.2 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.25 (dd, J = 8.5, 5.6 Hz, 2H), 7.91-7.80 (m, 3H), 7.67 (s, 1H), 7.52-7.44 (m, 2H), 7.34 (dd, J = 8.8, 2.1 Hz, 1H), 7.18 (t, J = 8.6 Hz, 2H); ^{13}C NMR (126 MHz, CDCl_3) δ 166.24 (d, J = 255.8 Hz), 164.46, 148.50, 133.84, 132.90 (d, J = 10.1 Hz), 131.59, 129.59, 127.88, 127.75, 126.71, 125.87, 125.83 (d, J = 2.5 Hz), 121.20, 118.75, 115.90 (d, J = 21.4 Hz). ESI-HRMS calcd for $[\text{C}_{17}\text{H}_{11}\text{FO}_2+\text{H}]^+$ 267.0816, found 267.0812.



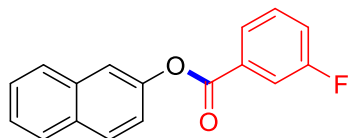
naphthalen-2-yl 4-chlorobenzoate (5h)¹²: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 81% yield (46.0 mg). m.p. 120.6-121.0 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.17 (d, J = 8.5 Hz, 2H), 7.88 (dd, J = 14.8, 8.2 Hz, 2H), 7.82 (d, J = 7.5 Hz, 1H), 7.67 (s, 1H), 7.52-7.46 (m, 4H), 7.34 (dd, J = 8.8, 2.2 Hz, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.58, 148.43, 140.24, 133.82, 131.64, 131.60, 129.61, 129.05, 128.03, 127.88, 127.75, 126.73, 125.90, 121.12, 118.72.



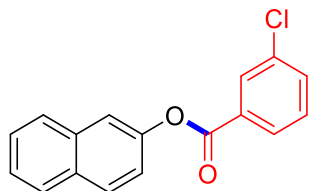
naphthalen-2-yl 4-bromobenzoate (5i)¹²: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 84% yield (55.0 mg). m.p. 129.8-130.4 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.07 (d, J = 8.5 Hz, 2H), 7.89-7.76 (m, 3H), 7.68-7.59 (m, 3H), 7.47 (t, J = 6.5 Hz, 2H), 7.32 (d, J = 8.8 Hz, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.74, 148.41, 133.81, 132.05, 131.76, 131.60, 129.64, 128.99, 128.48, 127.90, 127.76, 126.75, 125.93, 121.12, 118.73.



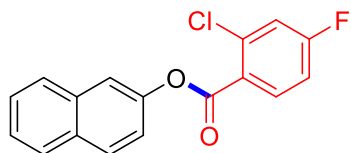
naphthalen-2-yl 4-iodobenzoate (5j): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 83% yield (61.6 mg). m.p. 129.3-131.4 °C. ^1H NMR (500 MHz, CDCl_3) δ 7.95 (d, J = 8.6 Hz, 2H), 7.92-7.86 (m, 4H), 7.83 (d, J = 8.8 Hz, 1H), 7.68 (s, 1H), 7.53-7.46 (m, 2H), 7.34 (dd, J = 8.8, 2.3 Hz, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.99, 148.39, 138.04, 133.80, 131.61, 131.59, 129.61, 129.05, 127.87, 127.74, 126.72, 125.90, 121.10, 118.70, 101.78. ESI-HRMS calcd for $[\text{C}_{17}\text{H}_{11}\text{IO}_2+\text{H}]^+$ 374.9876, found 374.9877.



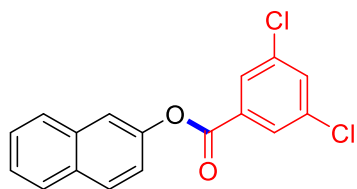
naphthalen-2-yl 3-fluorobenzoate (5k): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 49% yield (25.3 mg). m.p. 109.7-111.5 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.05 (d, J = 7.7 Hz, 1H), 7.96-7.81 (m, 4H), 7.69 (s, 1H), 7.56-7.46 (m, 3H), 7.36 (t, J = 8.8 Hz, 2H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.32, 162.67 (d, J = 248.2 Hz), 148.38, 133.80, 131.72 (d, J = 7.6 Hz), 131.61, 130.34 (d, J = 7.6 Hz), 129.63, 127.88, 127.76, 126.73, 126.02 (d, J = 2.5 Hz), 125.92, 121.05, 120.83 (d, J = 20.2 Hz), 118.69, 117.14 (d, J = 23.9 Hz). ESI-HRMS calcd for $[\text{C}_{17}\text{H}_{11}\text{FO}_2+\text{H}]^+$ 267.0816, found 267.0813.



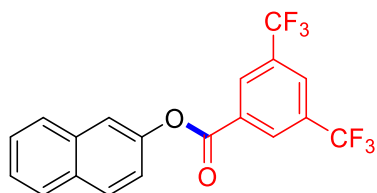
naphthalen-2-yl 3-chlorobenzoate (5l)¹³: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 59% yield (33.2 mg). m.p. 98.9-99.4 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.23 (s, 1H), 8.12 (d, J = 7.8 Hz, 1H), 7.92-7.80 (m, 3H), 7.68 (s, 1H), 7.61 (d, J = 8.0 Hz, 1H), 7.54-7.43 (m, 3H), 7.34 (dd, J = 8.8, 2.3 Hz, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.24, 148.37, 134.83, 133.81, 133.74, 131.62, 131.33, 130.28, 130.01, 129.65, 128.39, 127.89, 127.77, 126.75, 125.94, 121.04, 118.70.



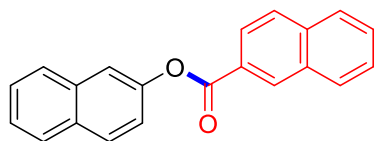
naphthalen-2-yl 2-chloro-4-fluorobenzoate (5m): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a white solid in 28% yield (18.2 mg). m.p. 97.9-99.3 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.17 (dd, J = 8.8, 6.1 Hz, 1H), 7.92-7.80 (m, 3H), 7.71 (s, 1H), 7.54-7.45 (m, 2H), 7.36 (dd, J = 8.8, 2.3 Hz, 1H), 7.28 (dd, J = 8.5, 2.5 Hz, 1H), 7.15-7.07 (m, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 164.60 (d, J = 258.3 Hz), 163.24, 148.20, 136.70 (d, J = 11.3 Hz), 134.24 (d, J = 8.8 Hz), 133.78, 131.64, 129.63, 127.82 (d, J = 13.9 Hz), 126.75, 125.95, 125.30 (d, J = 2.5 Hz), 120.98, 119.14, 118.94, 118.70, 114.38 (d, J = 21.4 Hz). ESI-HRMS calcd for $[\text{C}_{17}\text{H}_{10}\text{ClFO}_2+\text{H}]^+$ 301.0426, found 301.0431.



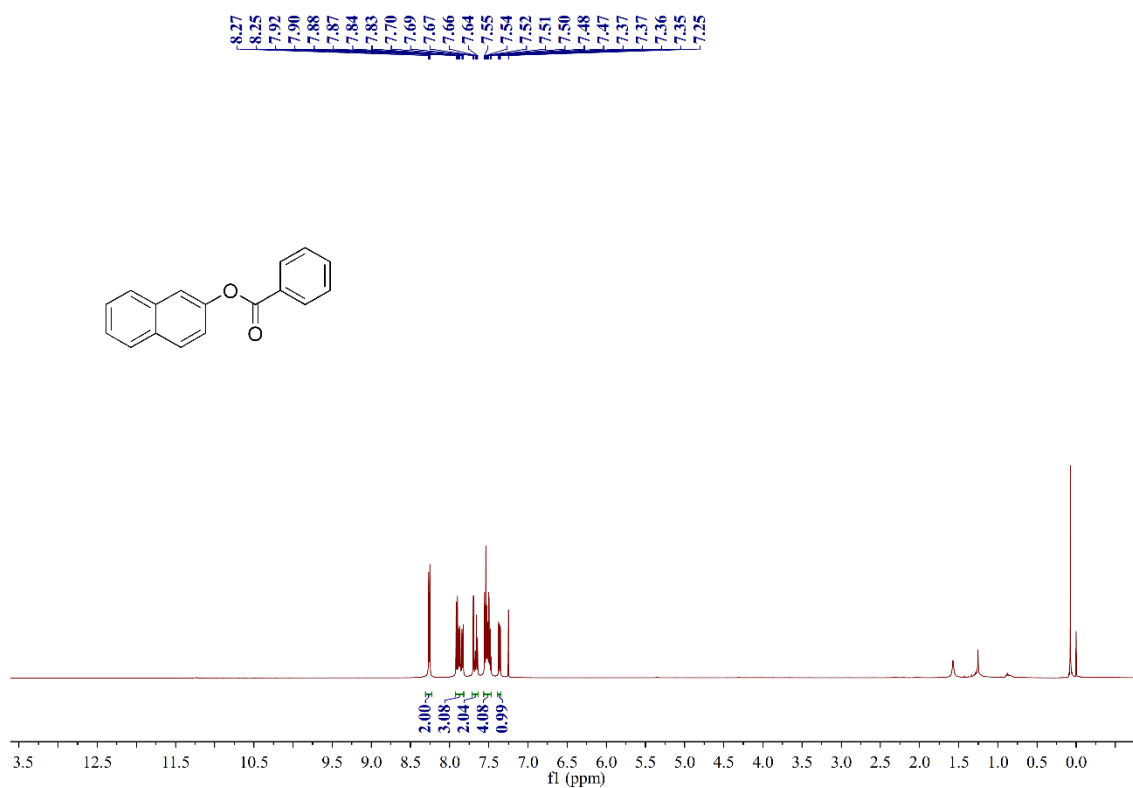
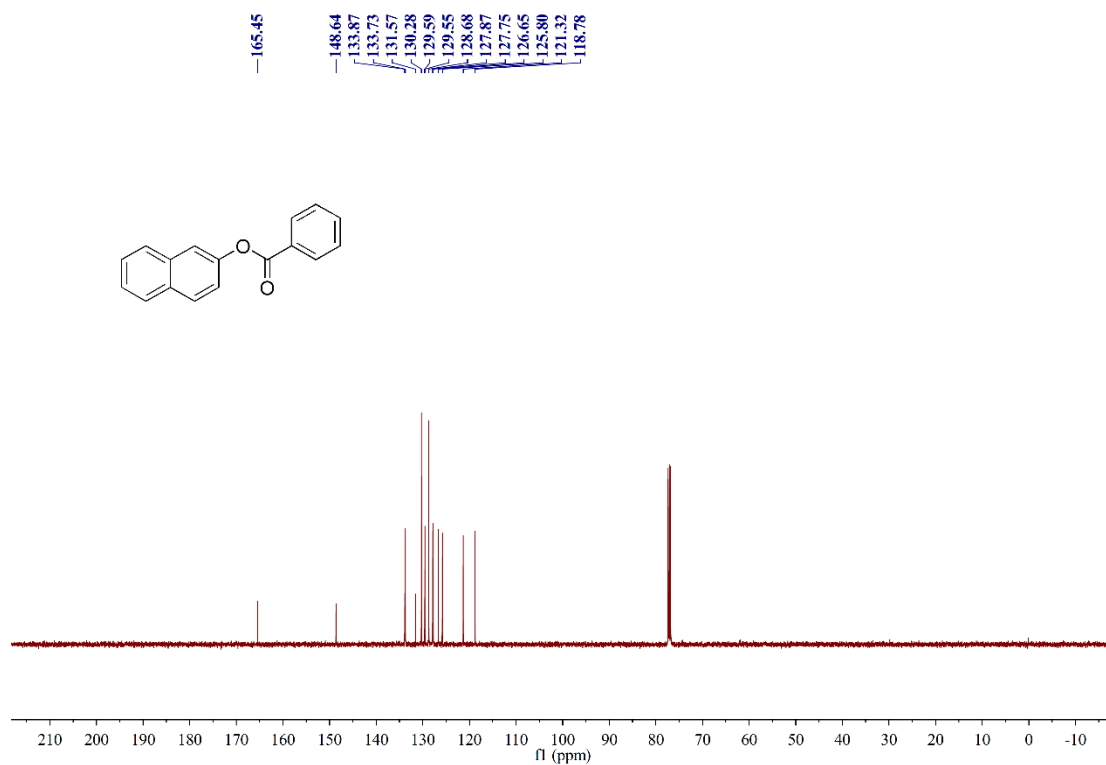
naphthalen-2-yl 3,5-dichlorobenzoate (5n): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a pale yellow solid in 58% yield (36.2 mg). m.p. 162.6-164.5 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.11 (s, 2H), 7.89 (dd, J = 16.2, 8.1 Hz, 2H), 7.83 (d, J = 7.5 Hz, 1H), 7.68 (s, 1H), 7.63 (s, 1H), 7.54-7.48 (m, 2H), 7.33 (dd, J = 8.8, 2.2 Hz, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 163.14, 148.13, 135.60, 133.74, 133.52, 132.41, 131.68, 129.74, 128.60, 127.89, 127.78, 126.83, 126.06, 120.77, 118.61. ESI-HRMS calcd for $[\text{C}_{17}\text{H}_{10}\text{Cl}_2\text{O}_2+\text{H}]^+$ 317.0131, found 317.0139.

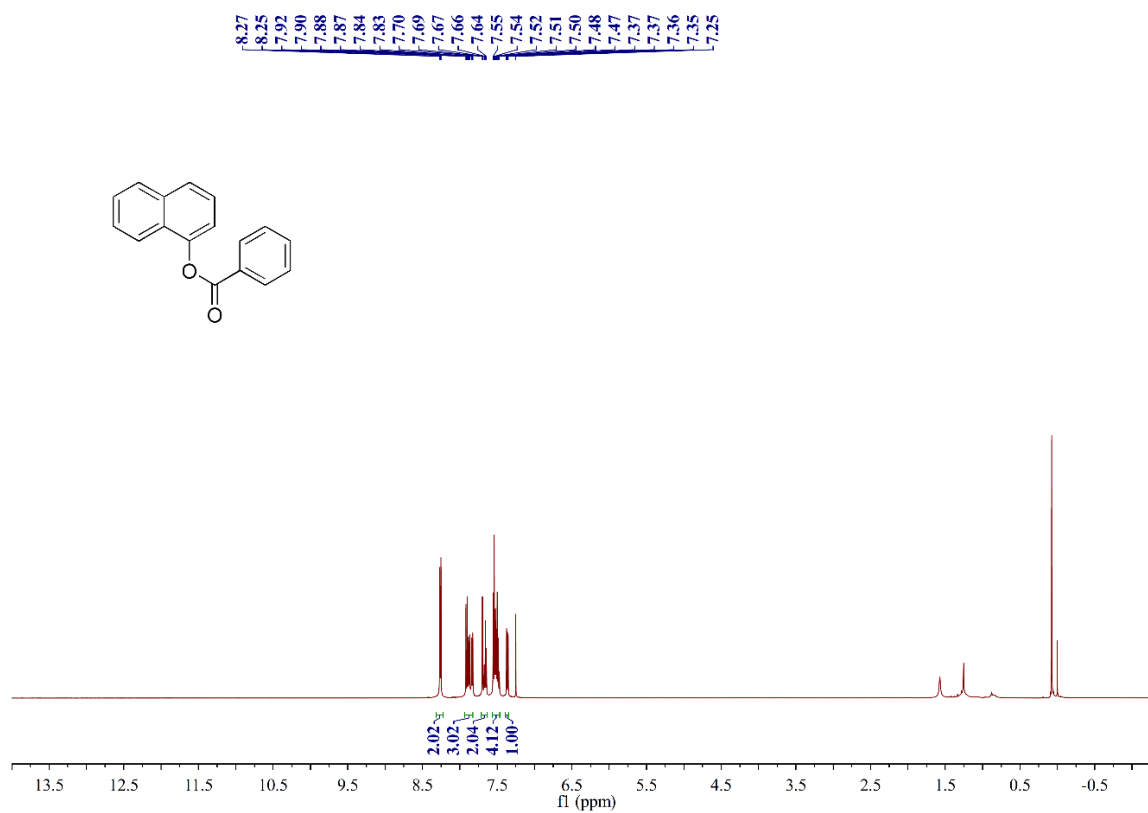
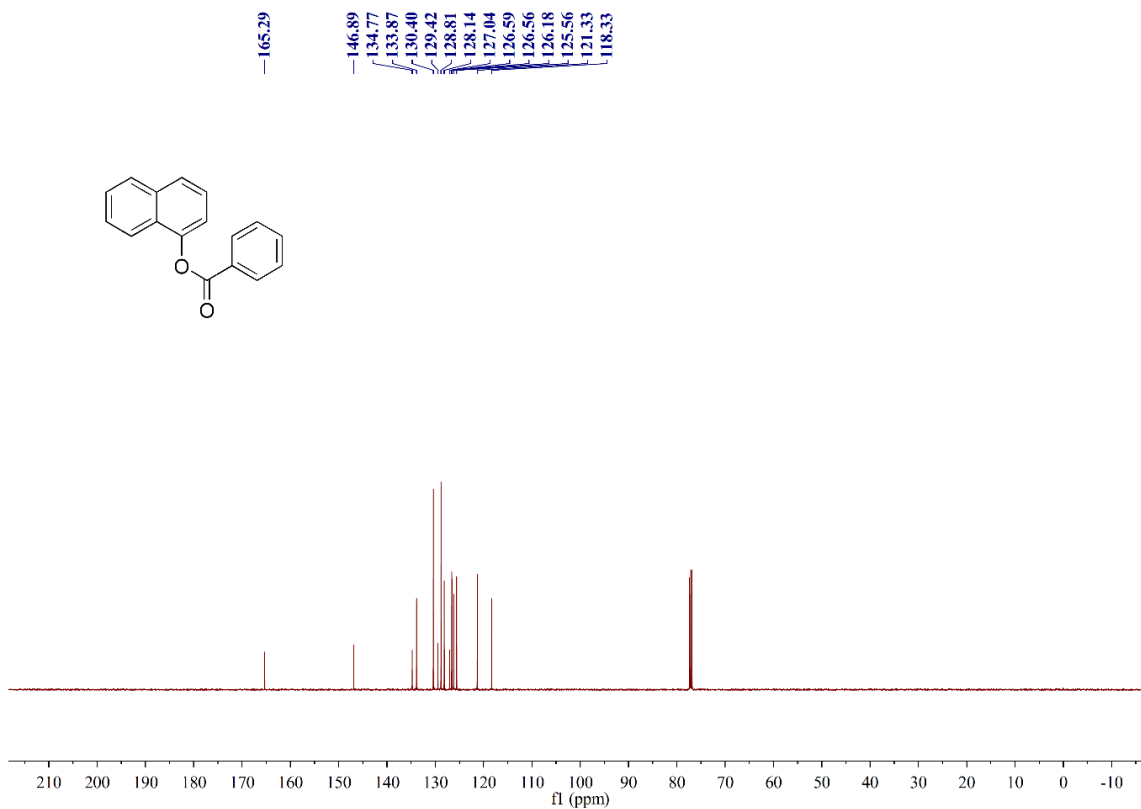


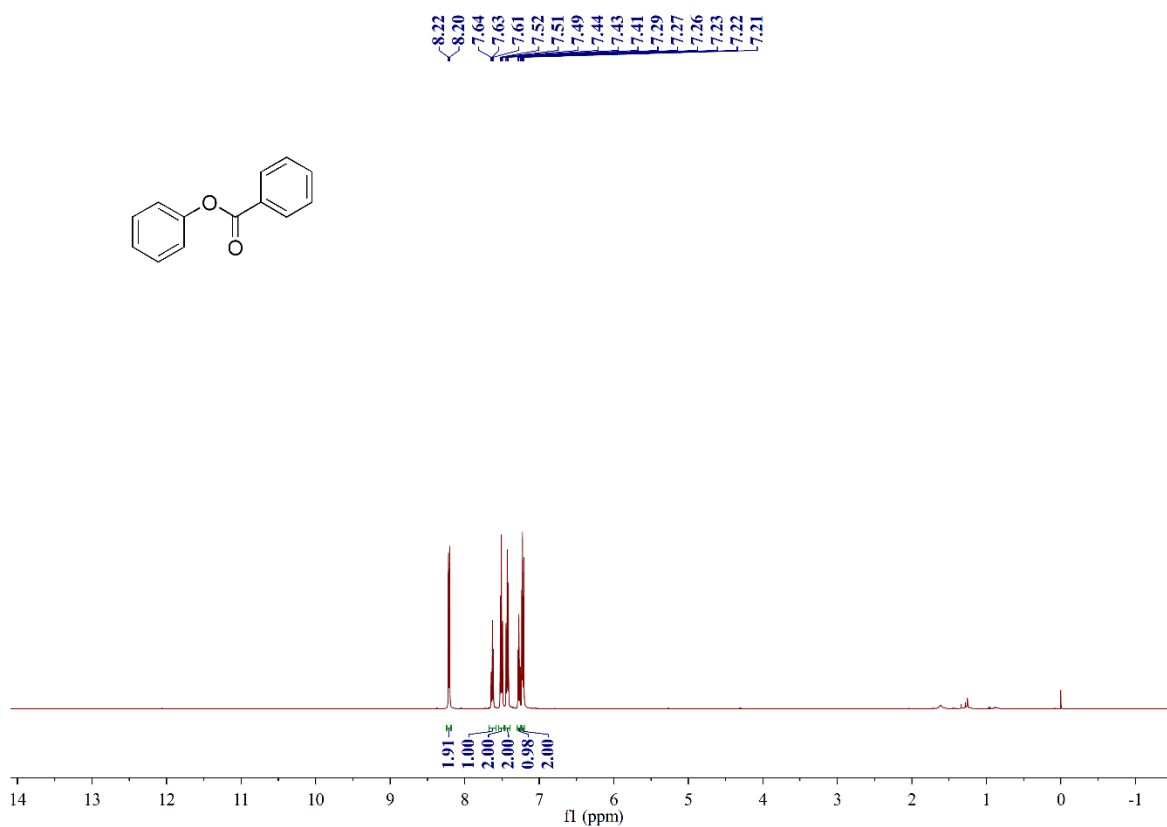
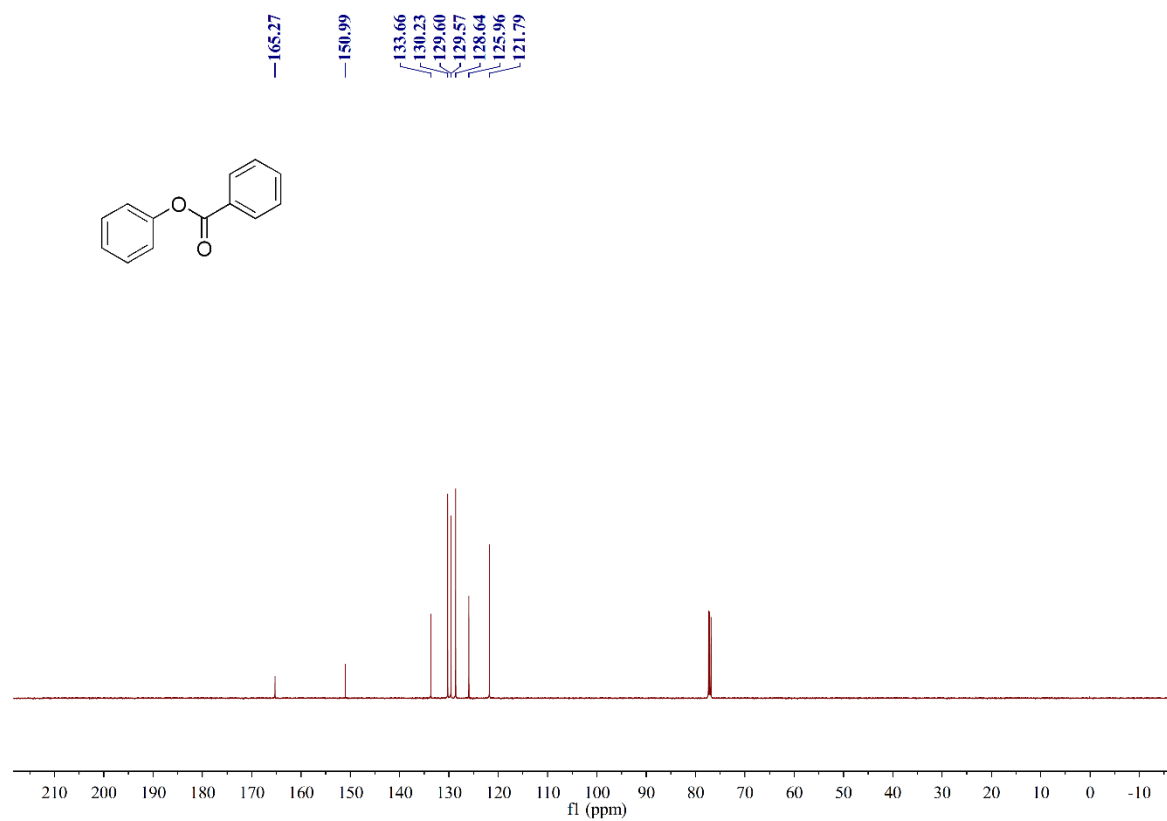
naphthalen-2-yl 3,5-bis(trifluoromethyl)benzoate (5o): This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a pale yellow solid in 72% yield (56.0 mg). m.p. 112.6-115.1 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.69 (s, 2H), 8.15 (s, 1H), 7.93- 7.82 (m, 3H), 7.70 (s, 1H), 7.55 - 7.48 (m, 2H), 7.35 (d, J = 8.8 Hz, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 162.79, 147.98, 133.73, 132.50 (q, J = 34.0 Hz), 131.85, 131.76, 130.32 (d, J = 3.8 Hz), 129.85, 127.92, 127.80, 127.00 (q, J = 3.8 Hz), 126.93, 126.19, 122.83 (q, J = 273.4 Hz), 120.61, 118.64. ESI-HRMS calcd for $[\text{C}_{19}\text{H}_{10}\text{F}_6\text{O}_2+\text{H}]^+$ 385.0658, found 385.0660.

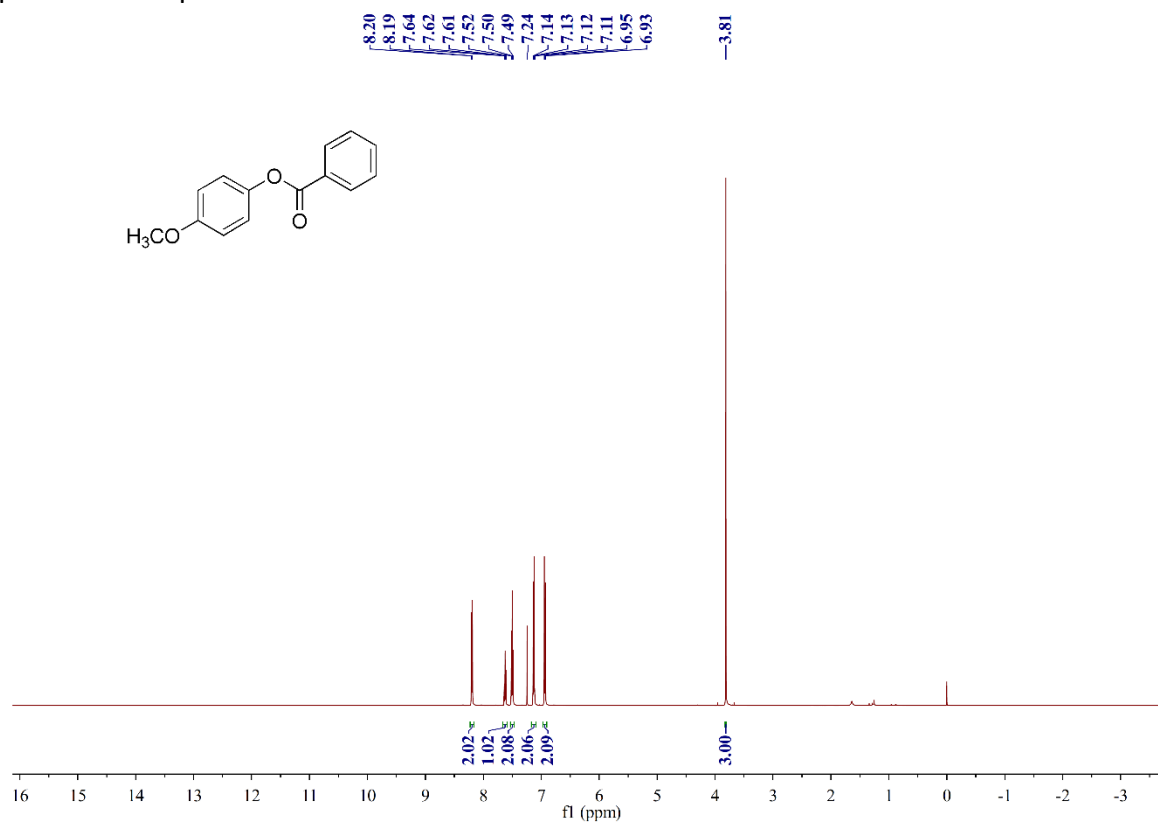
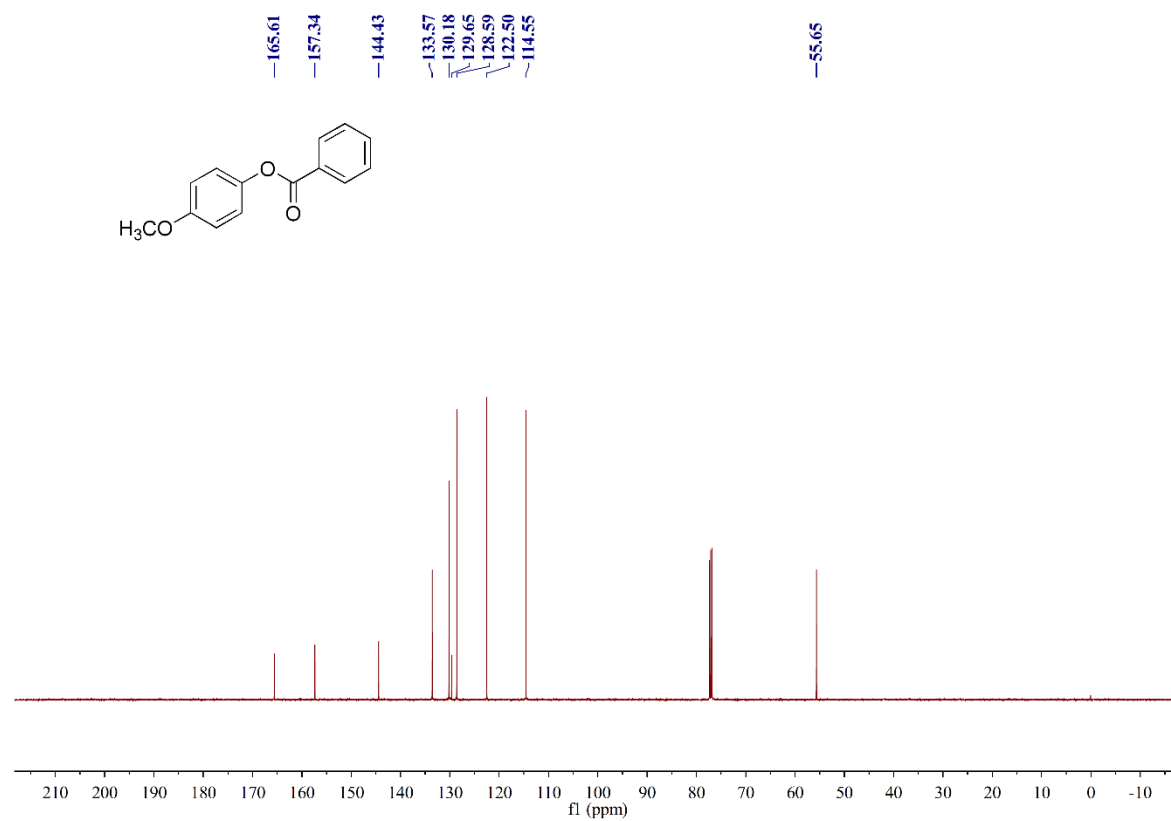


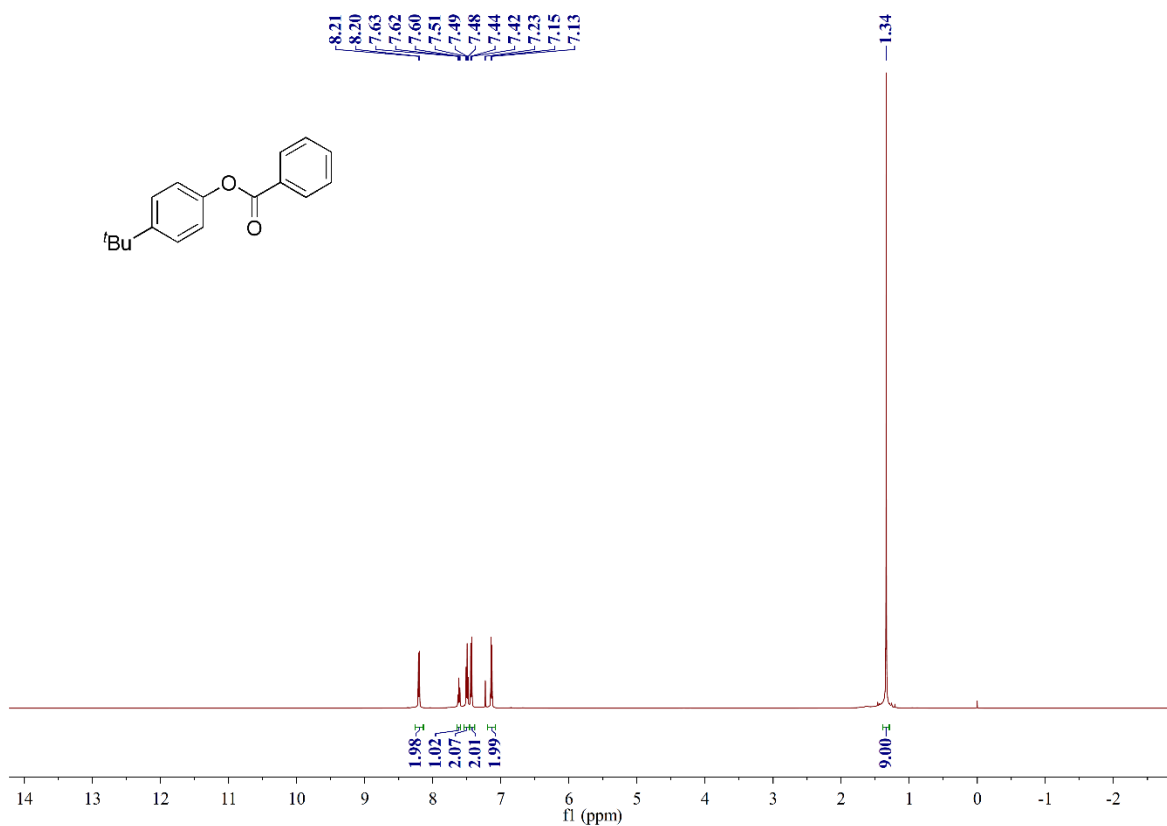
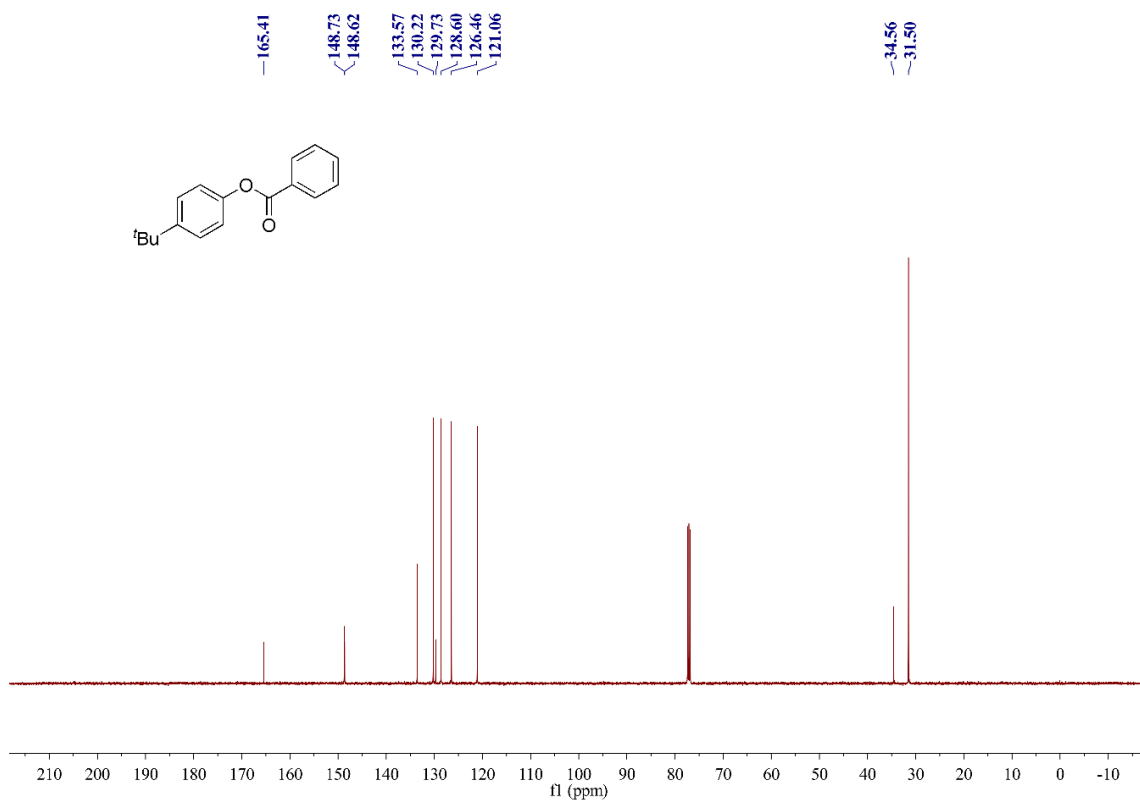
naphthalen-2-yl 2-naphthoate (5p)¹⁴: This compound was purified by column chromatography (ethyl acetate/petroleum ether = 1:10) to afford a yellow solid in 37% yield (22.7 mg). m.p. 146.0-147.1 °C. ^1H NMR (500 MHz, CDCl_3) δ 8.84 (s, 1H), 8.24 (d, J = 8.6 Hz, 1H), 8.01 (d, J = 8.1 Hz, 1H), 7.94 (dd, J = 18.7, 8.7 Hz, 3H), 7.86 (dd, J = 19.4, 7.5 Hz, 2H), 7.75 (s, 1H), 7.61 (dt, J = 27.3, 6.9 Hz, 2H), 7.50 (t, J = 7.2 Hz, 2H), 7.41 (dd, J = 8.8, 2.3 Hz, 1H); ^{13}C NMR (126 MHz, CDCl_3) δ 165.62, 148.72, 135.90, 133.89, 132.56, 132.06, 131.59, 129.57, 128.73, 128.50, 127.91, 127.88, 127.77, 126.93, 126.77, 126.66, 125.81, 125.54, 121.36, 118.82.

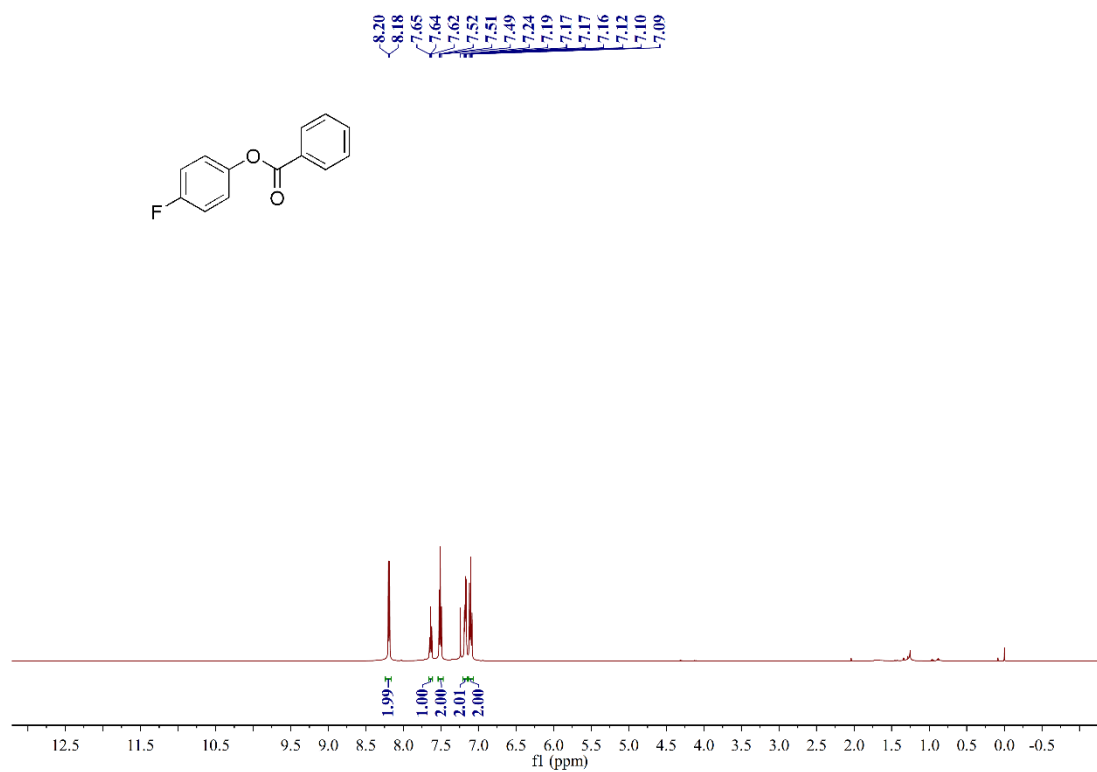
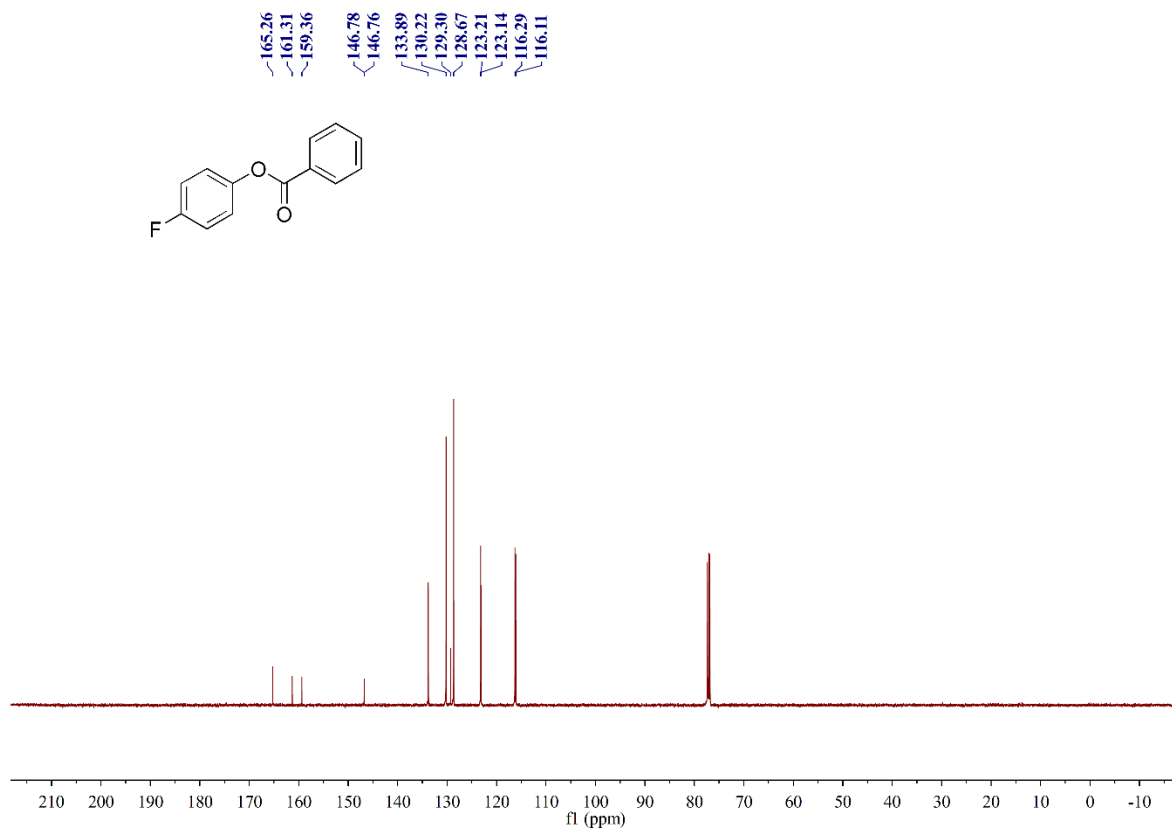
3. ^1H NMR spectra and ^{13}C NMR spectra for compounds **^1H NMR spectra of compound **3a**** **^{13}C NMR spectra of compound **3a****

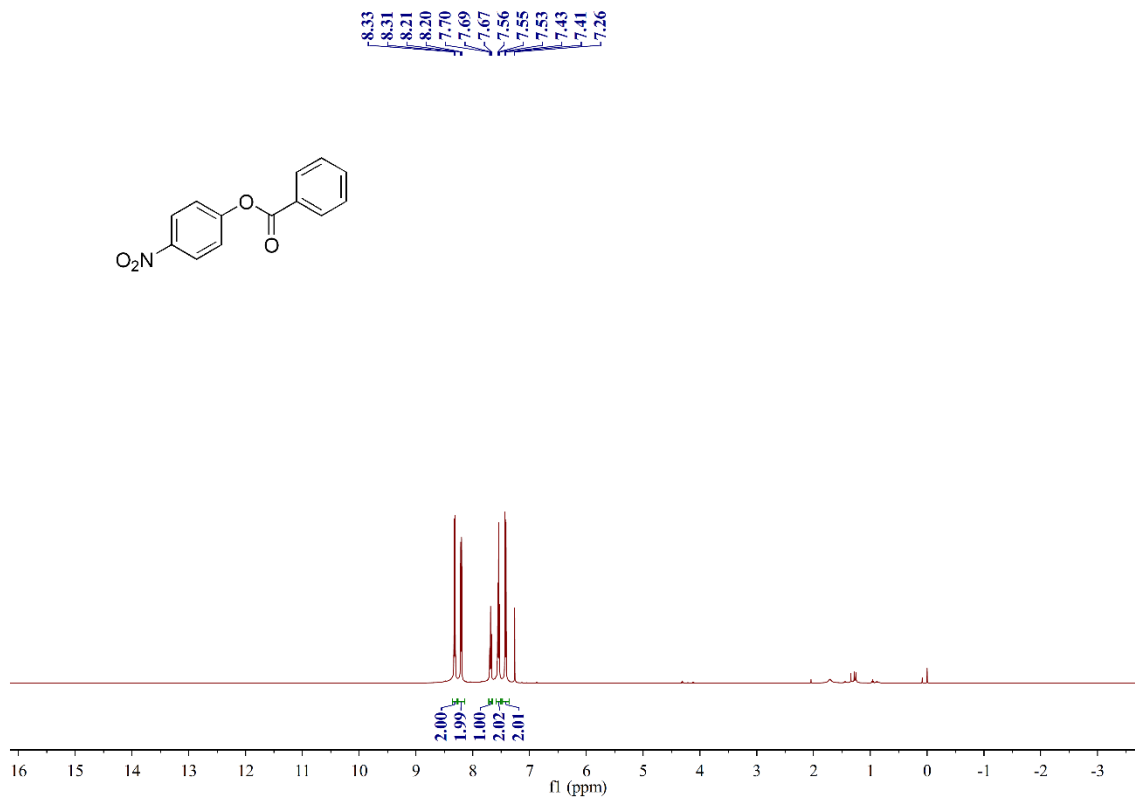
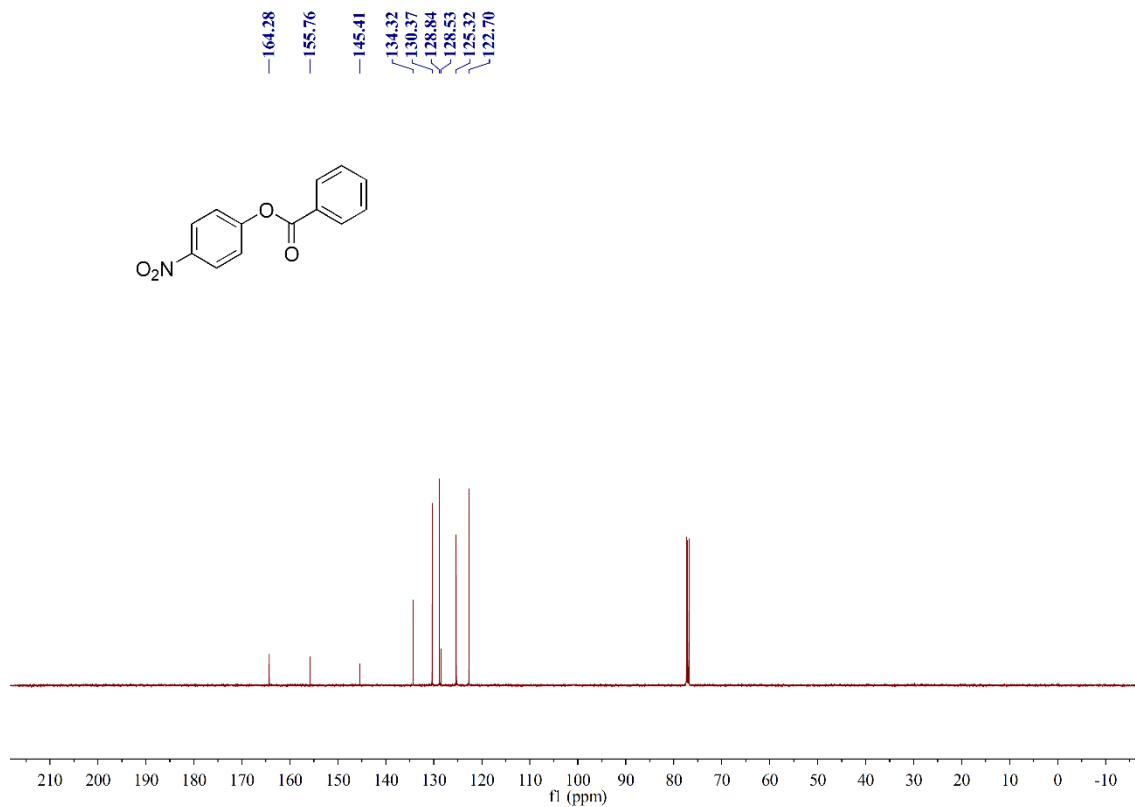
¹H NMR spectra of compound **3b**¹³C NMR spectra of compound **3b**

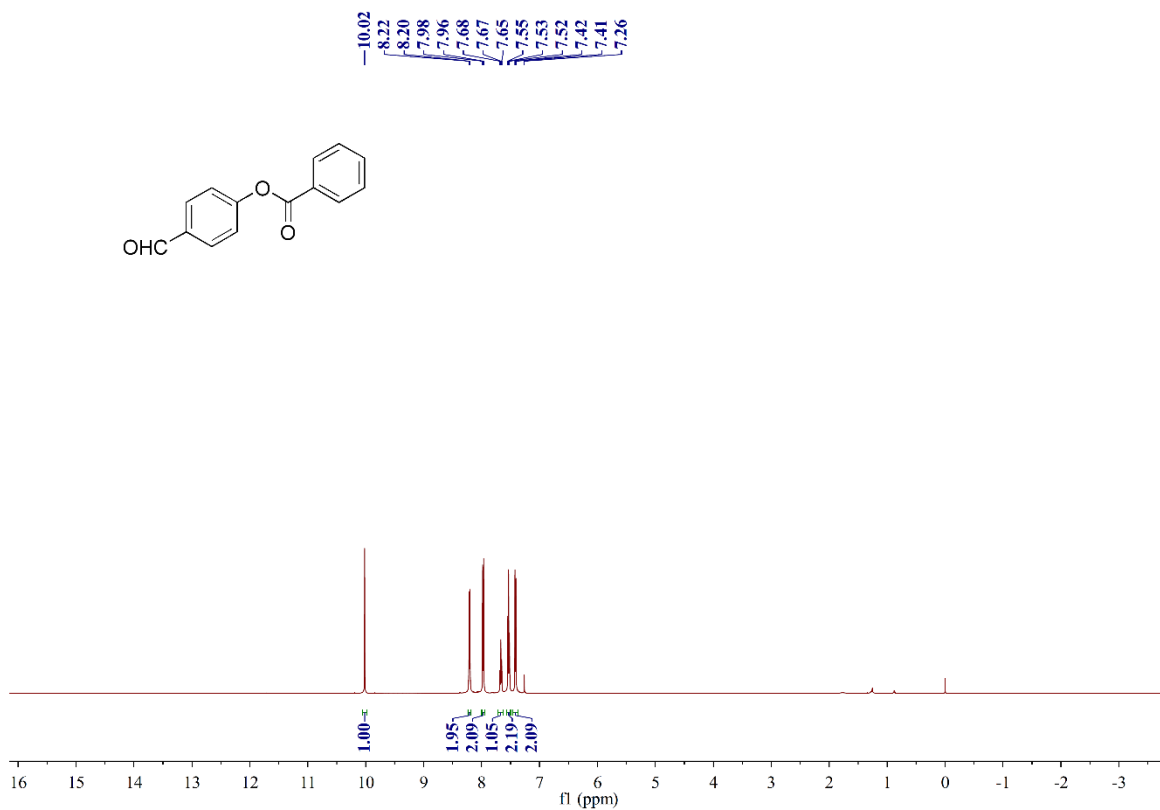
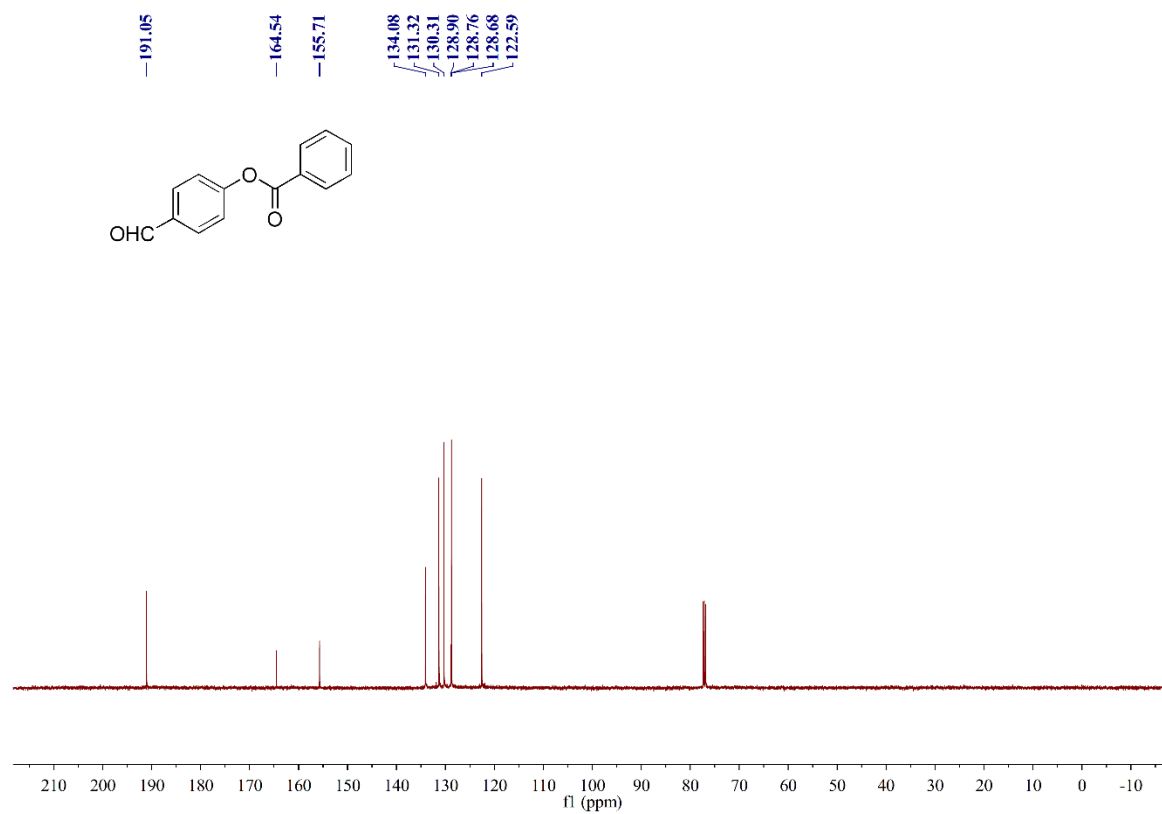
¹H NMR spectra of compound **3c**¹³C NMR spectra of compound **3c**

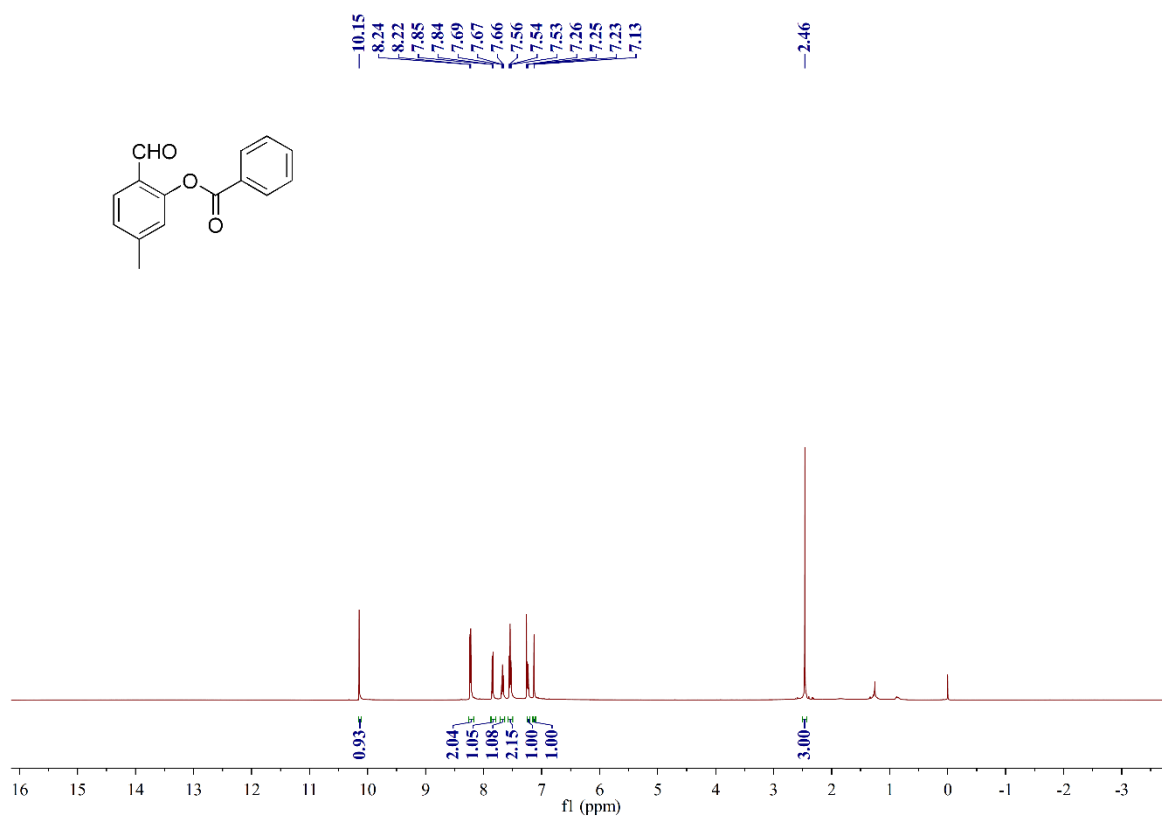
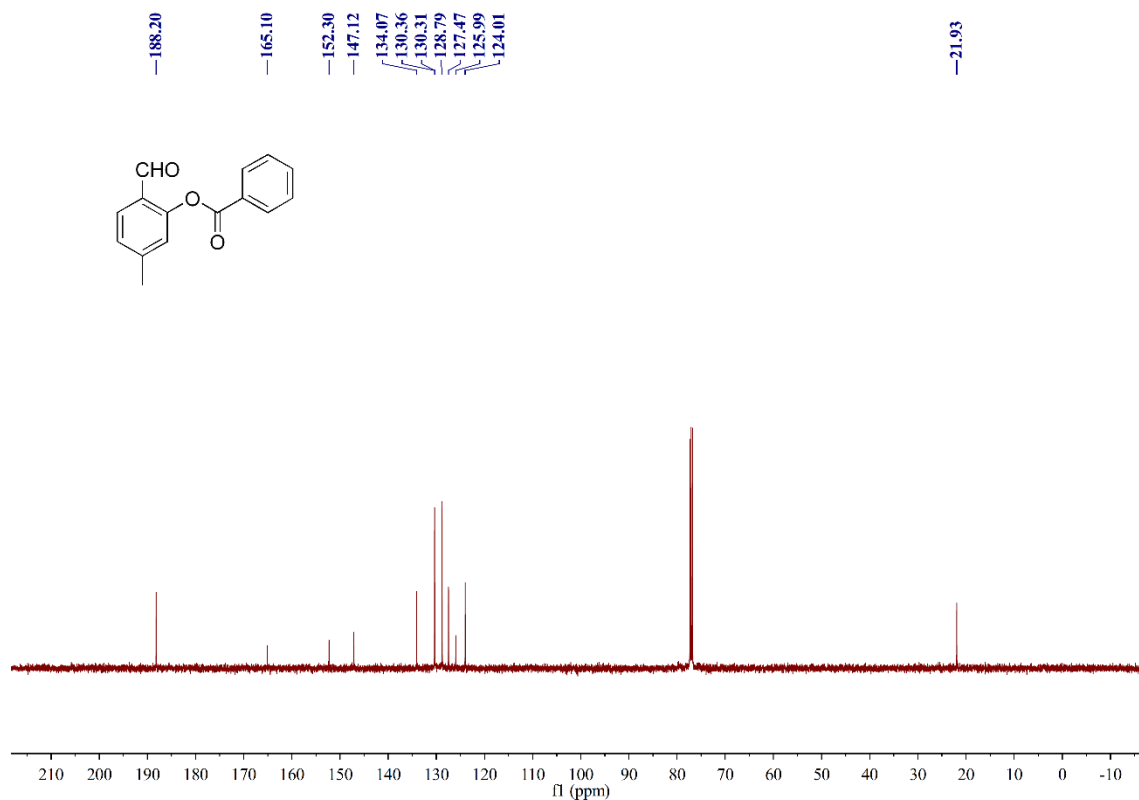
¹H NMR spectra of compound **3d**¹³C NMR spectra of compound **3d**

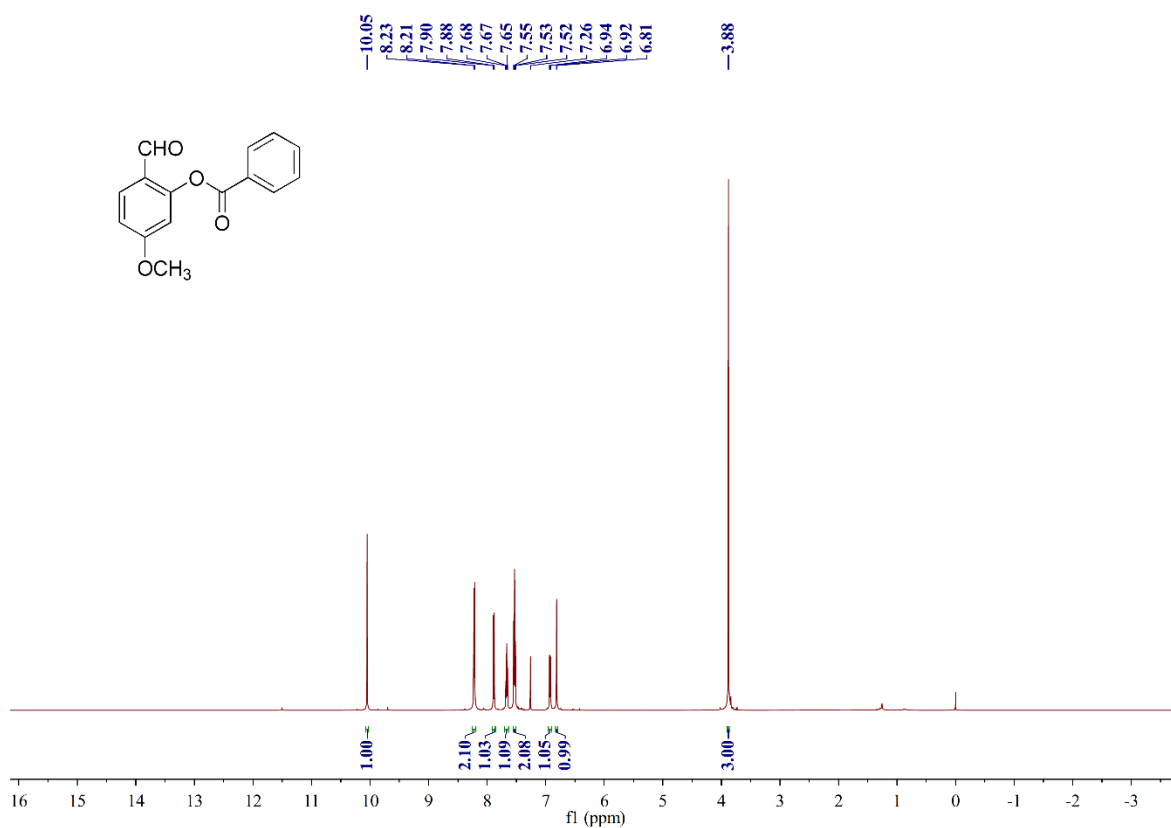
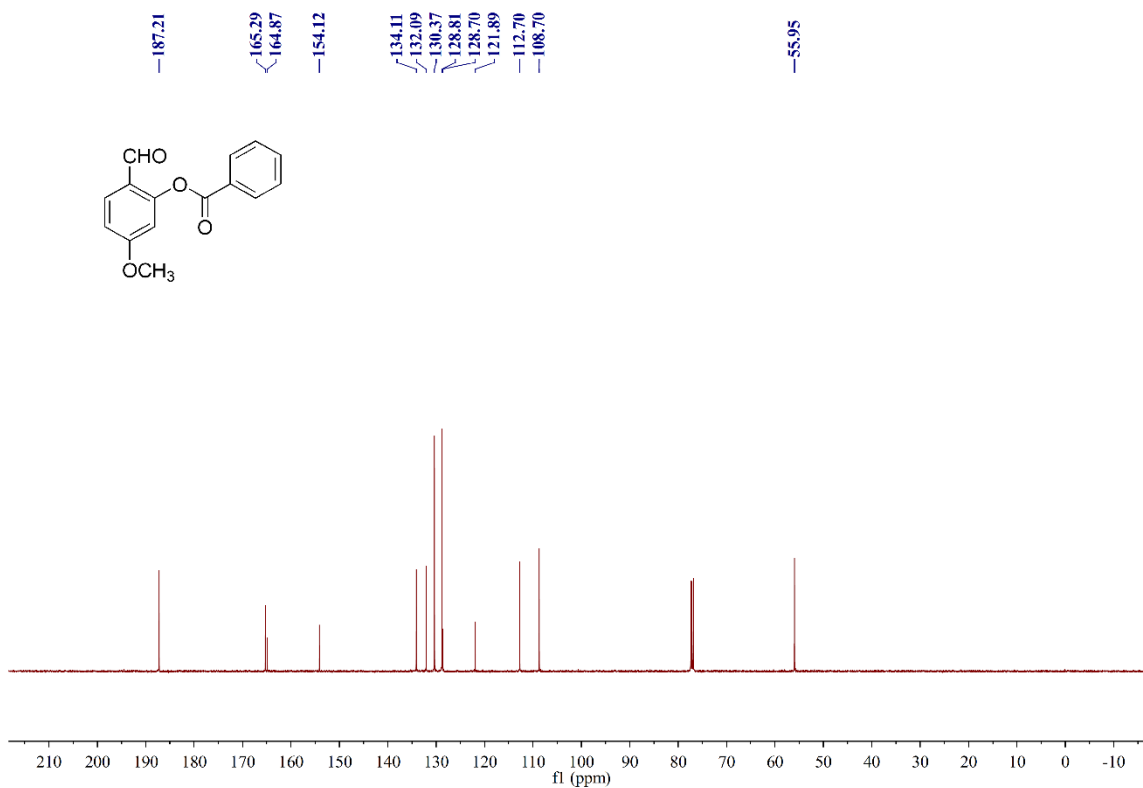
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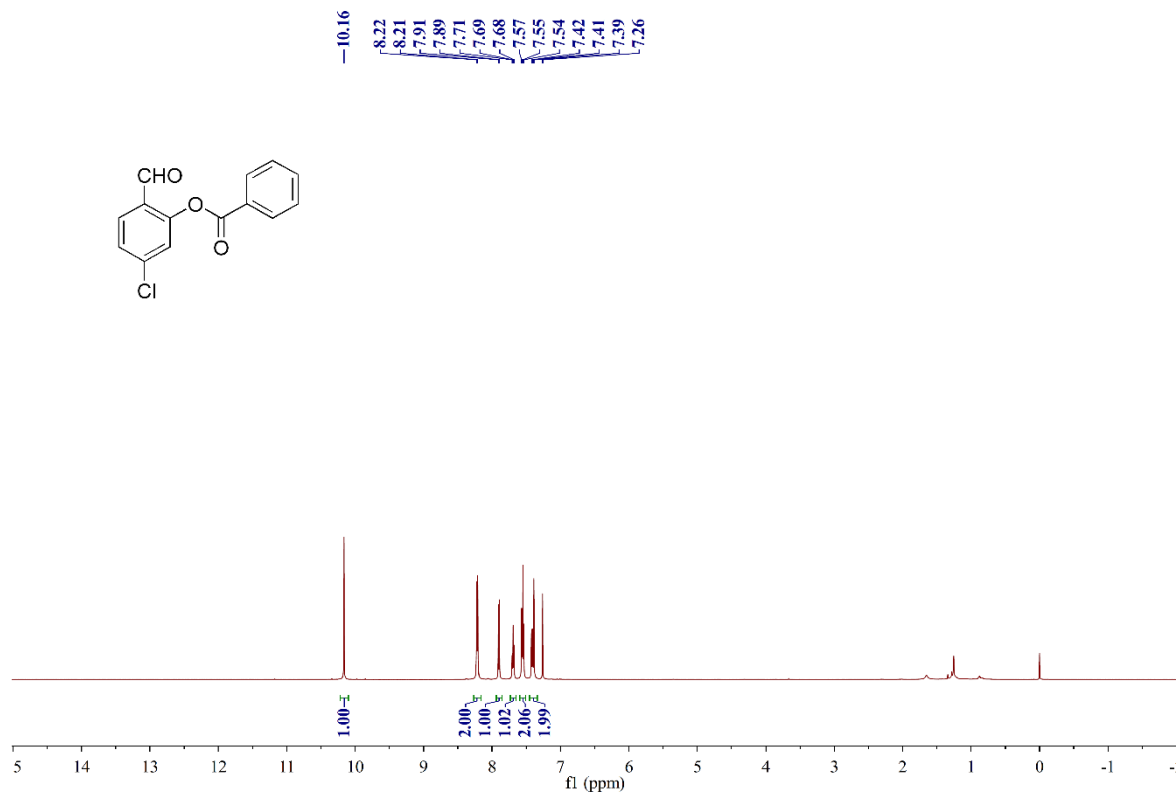
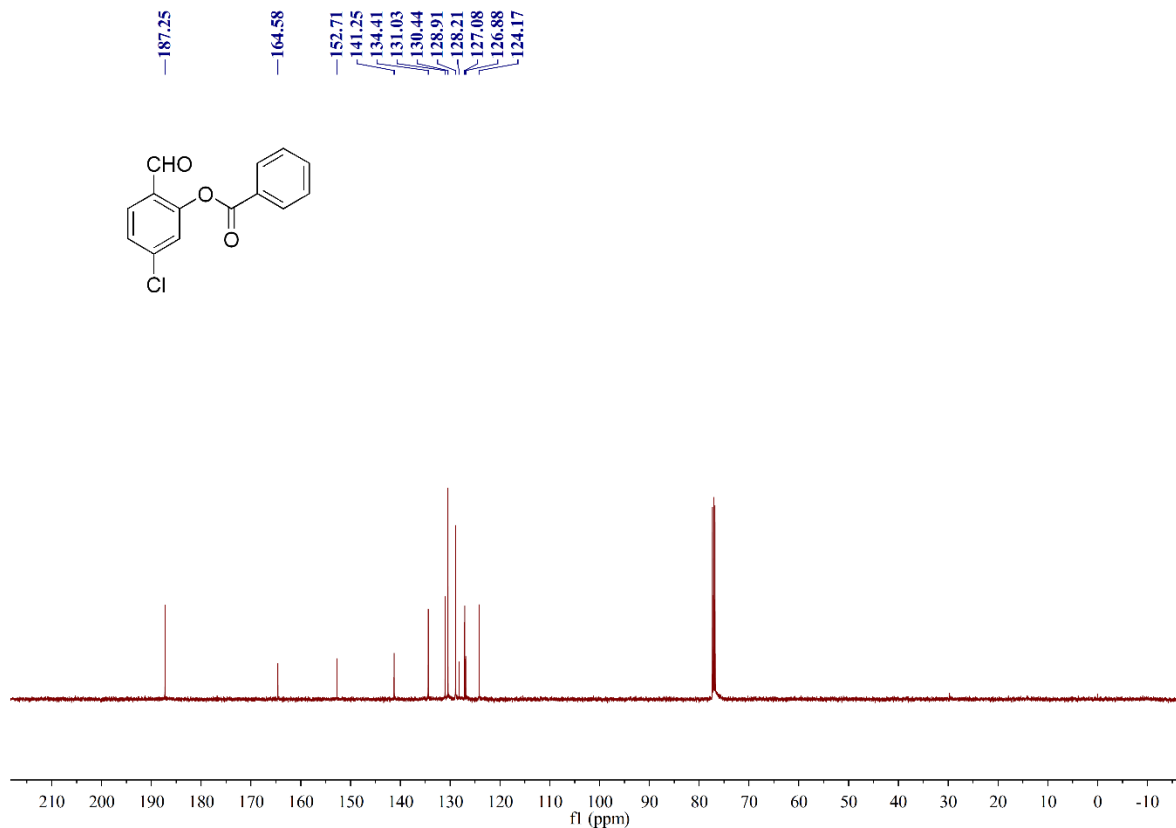
¹H NMR spectra of compound **3f**¹³C NMR spectra of compound **3f**

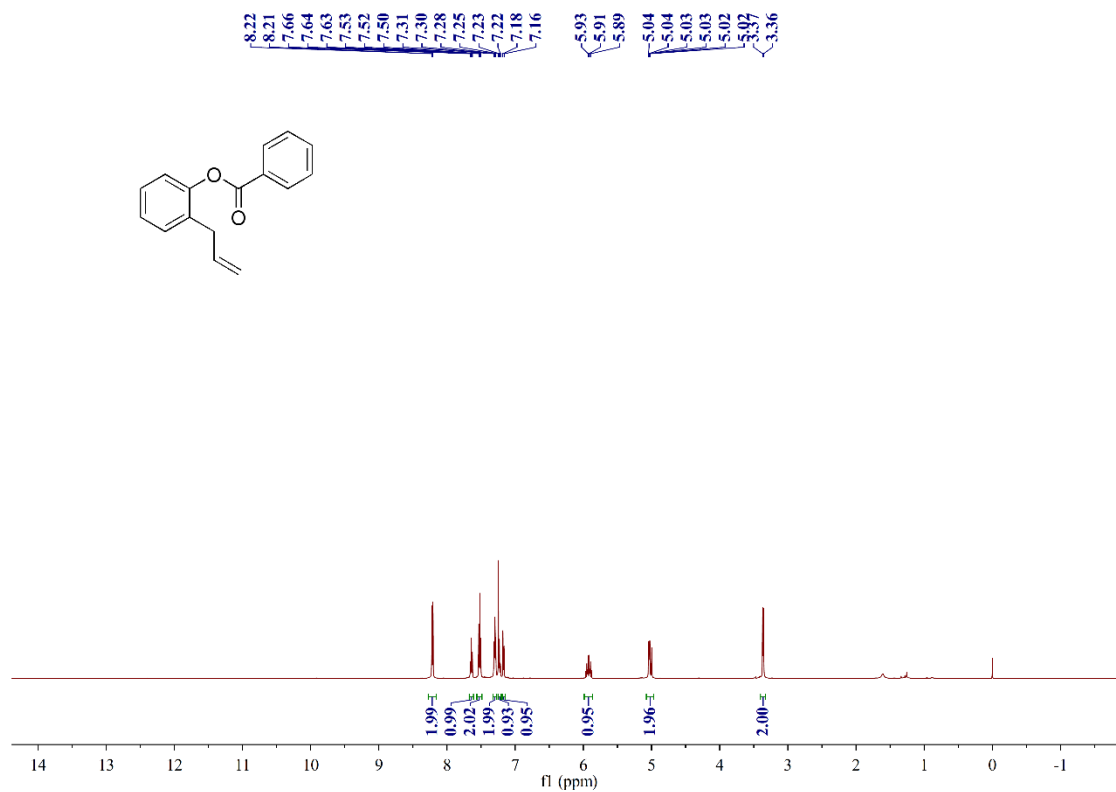
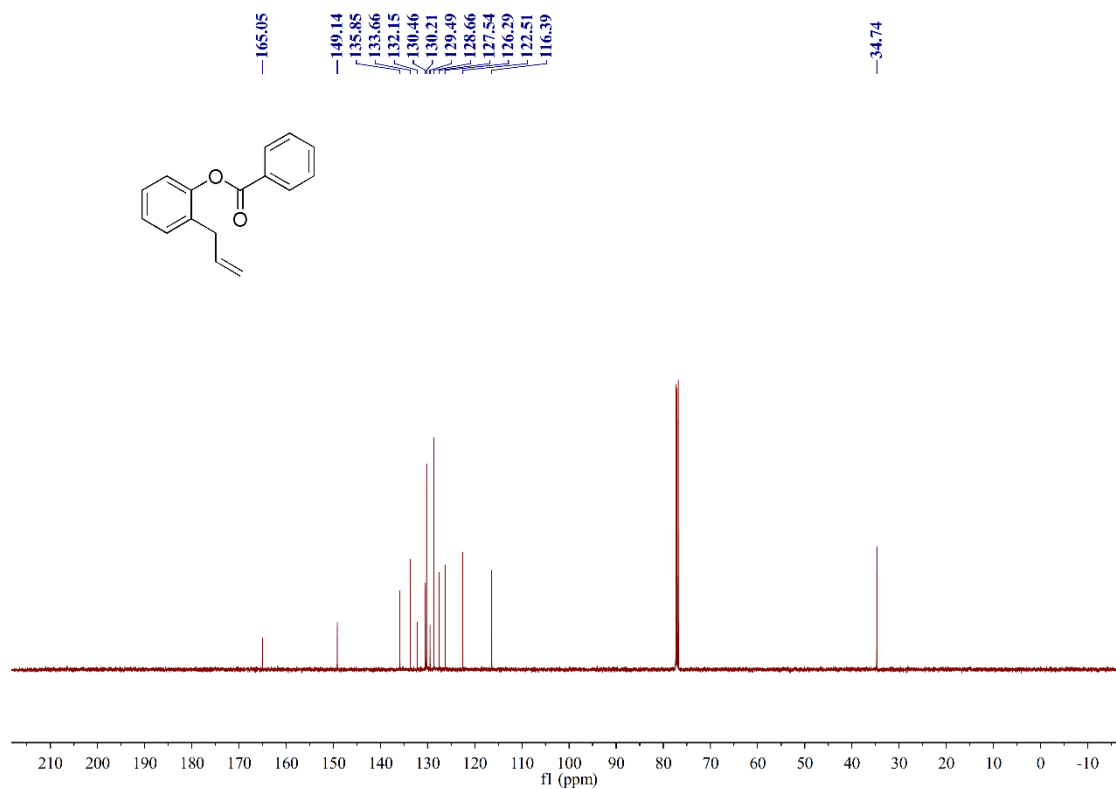
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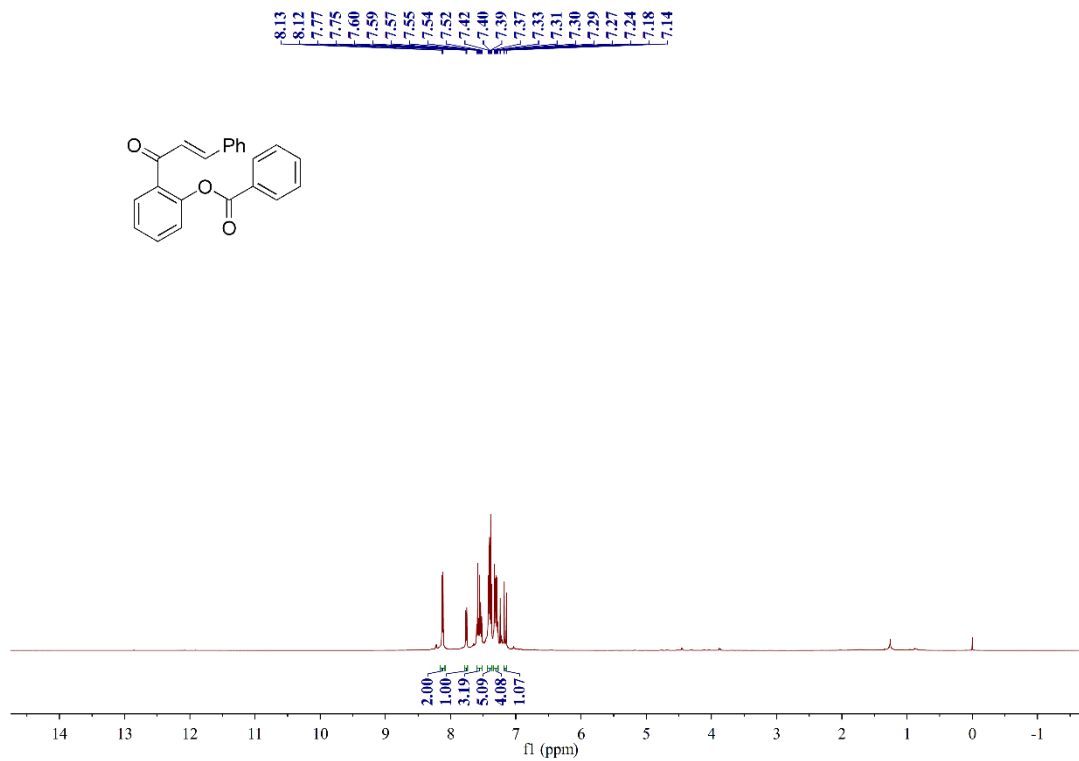
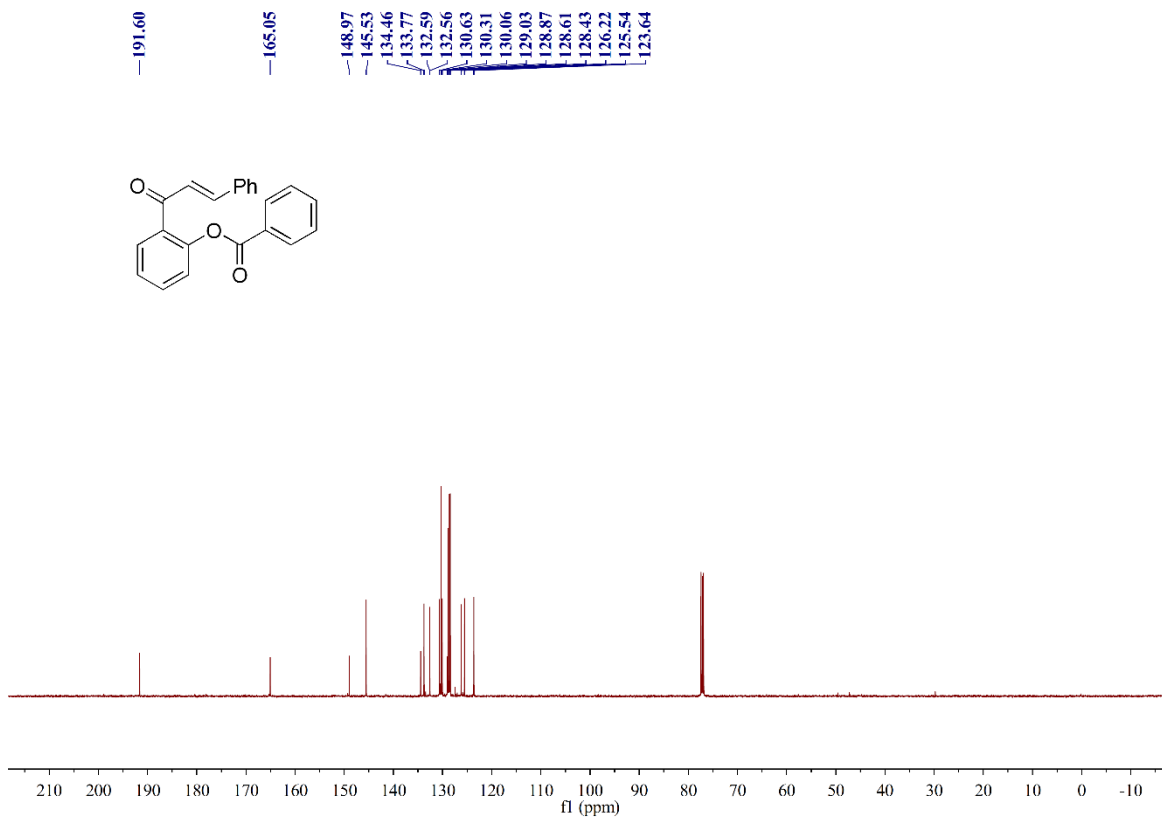
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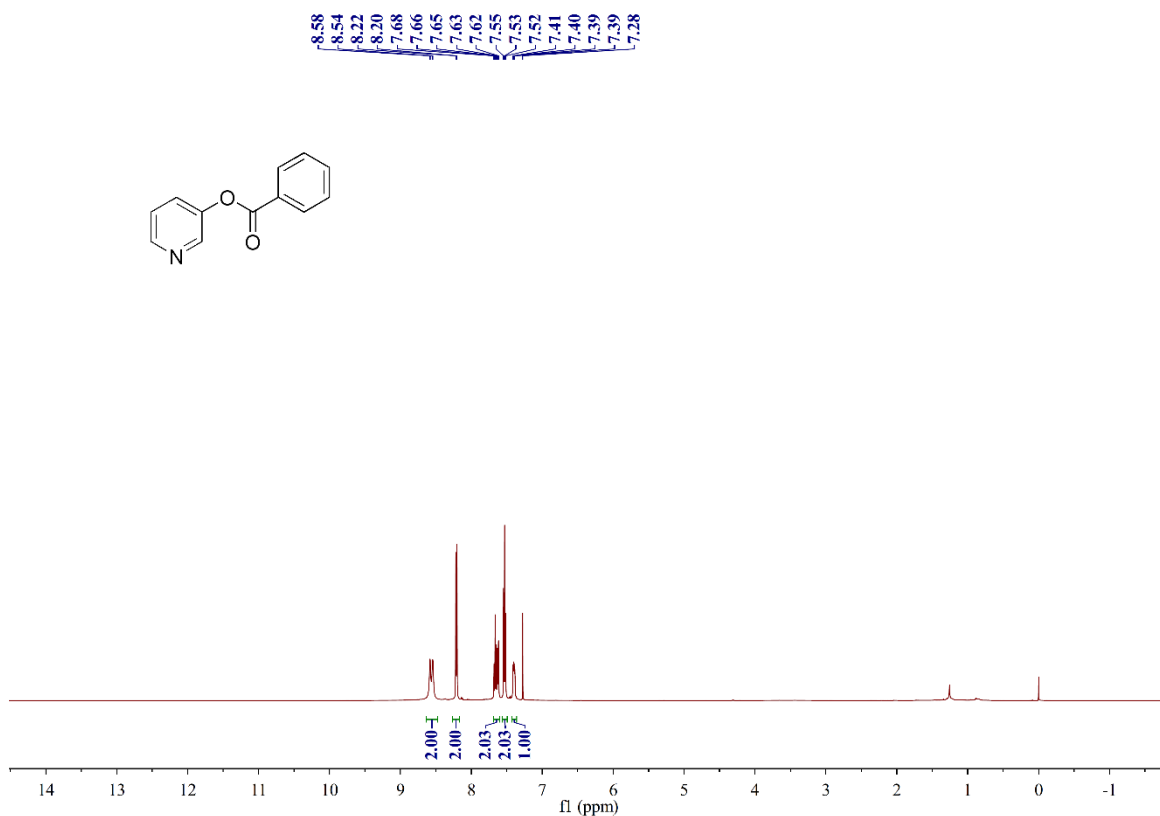
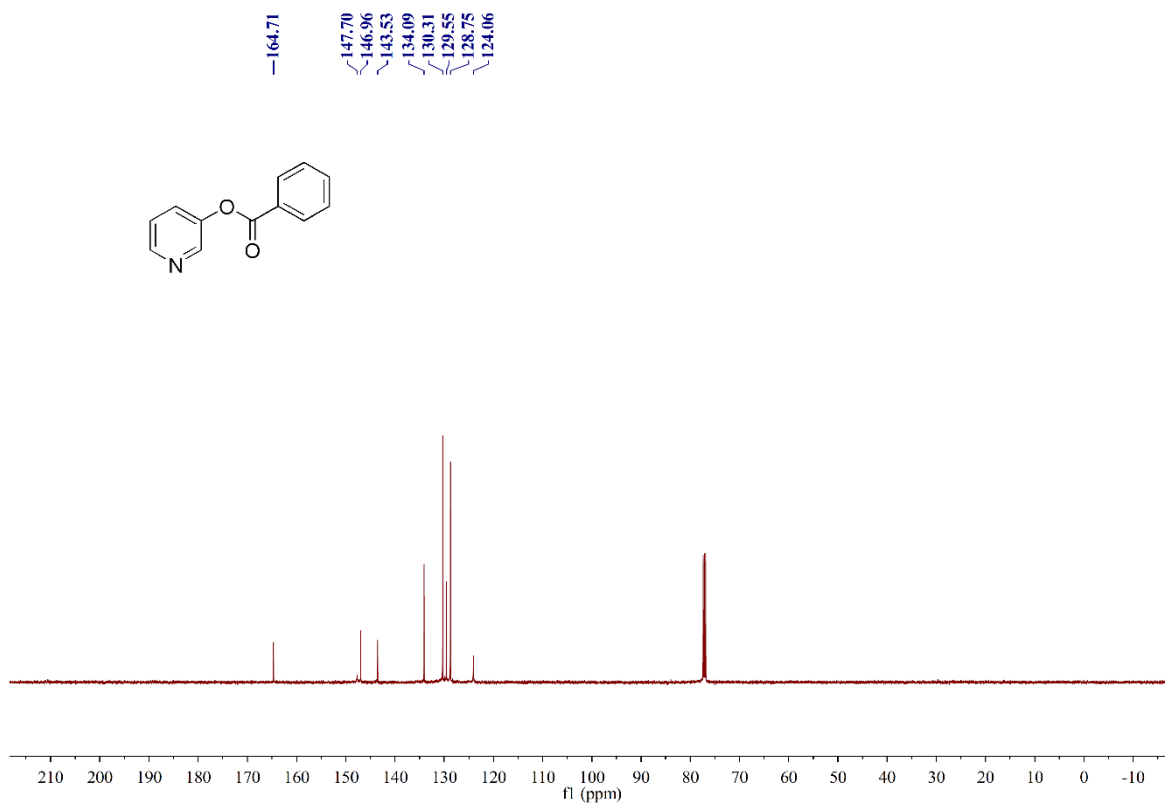
¹H NMR spectra of compound **3i**¹³C NMR spectra of compound **3i**

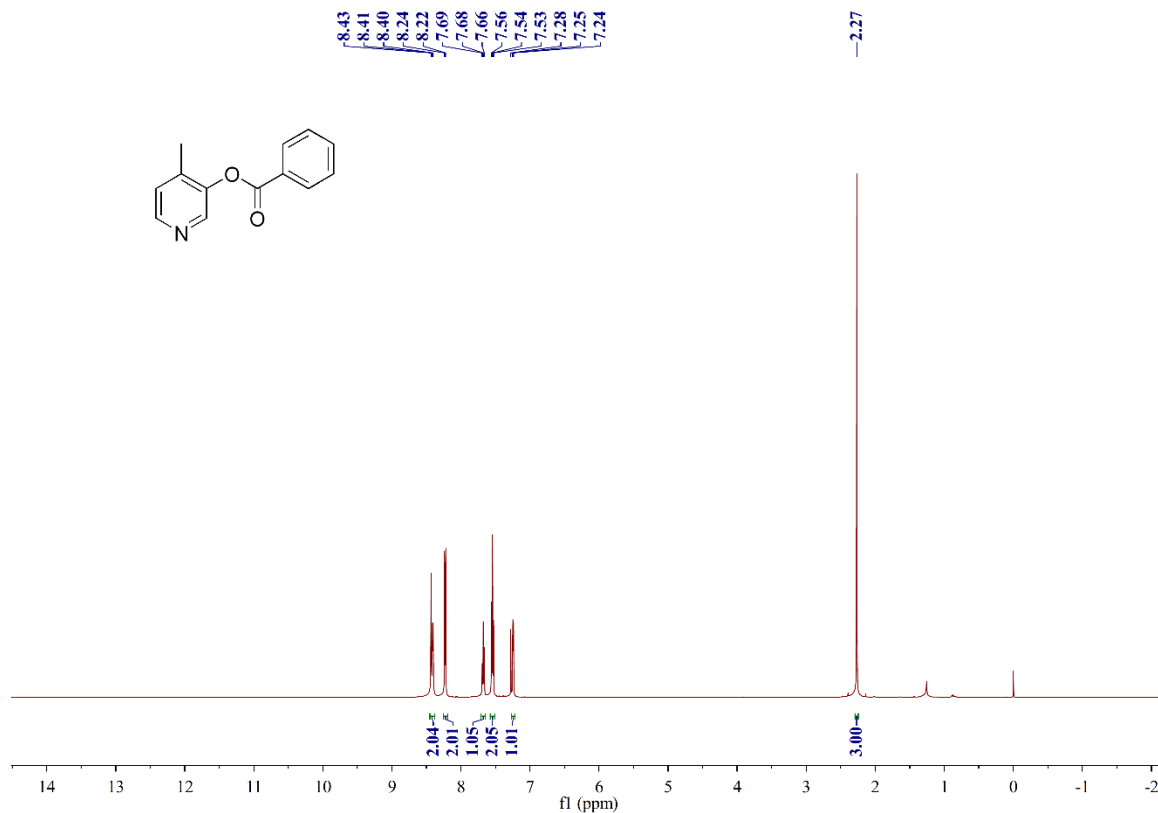
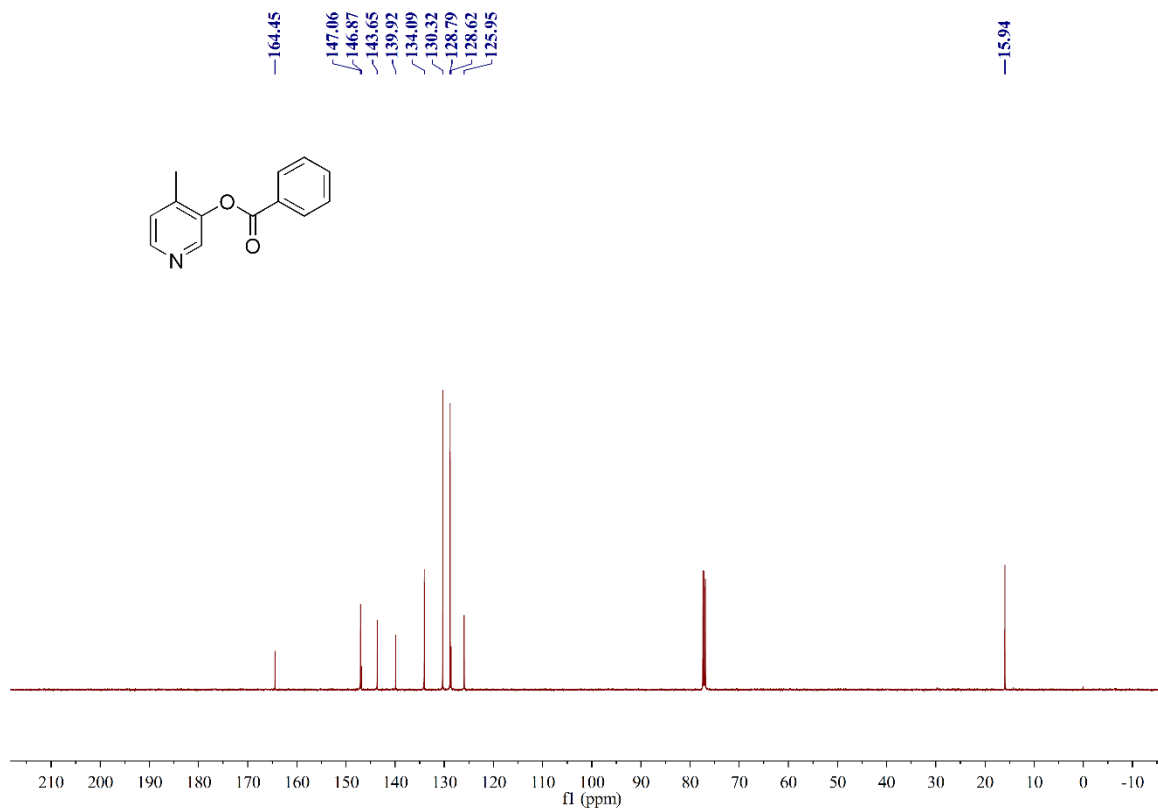
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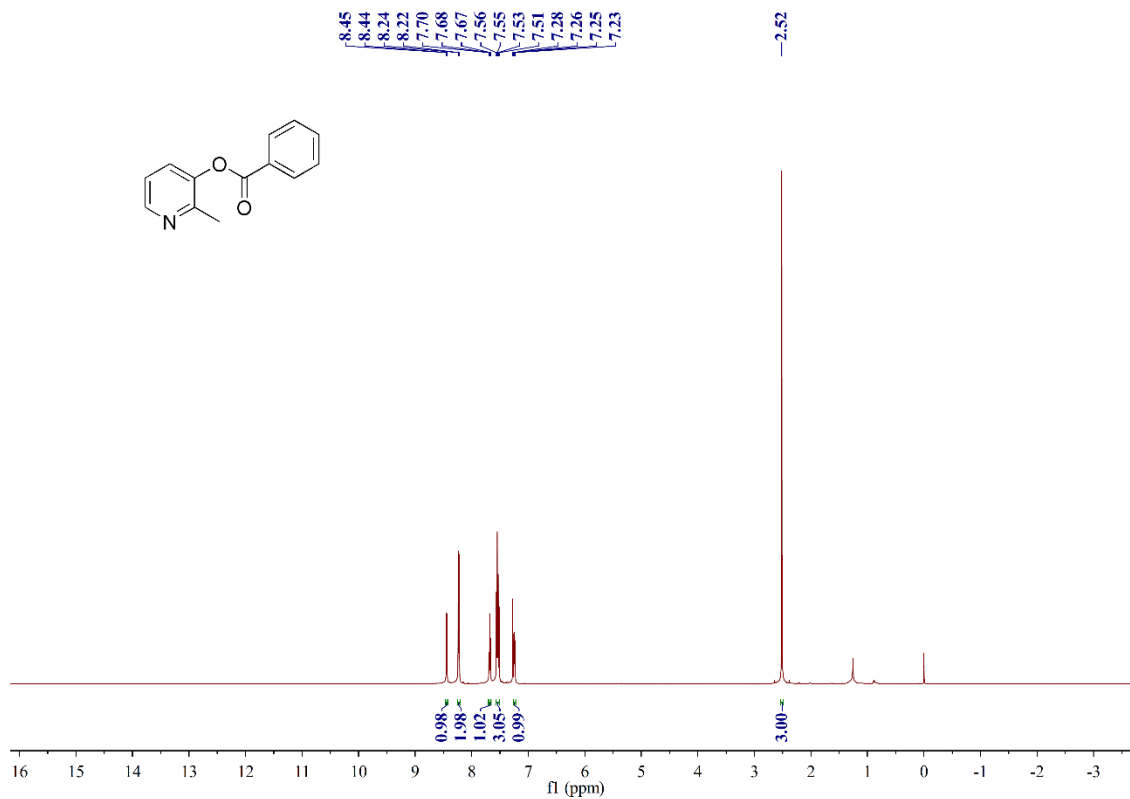
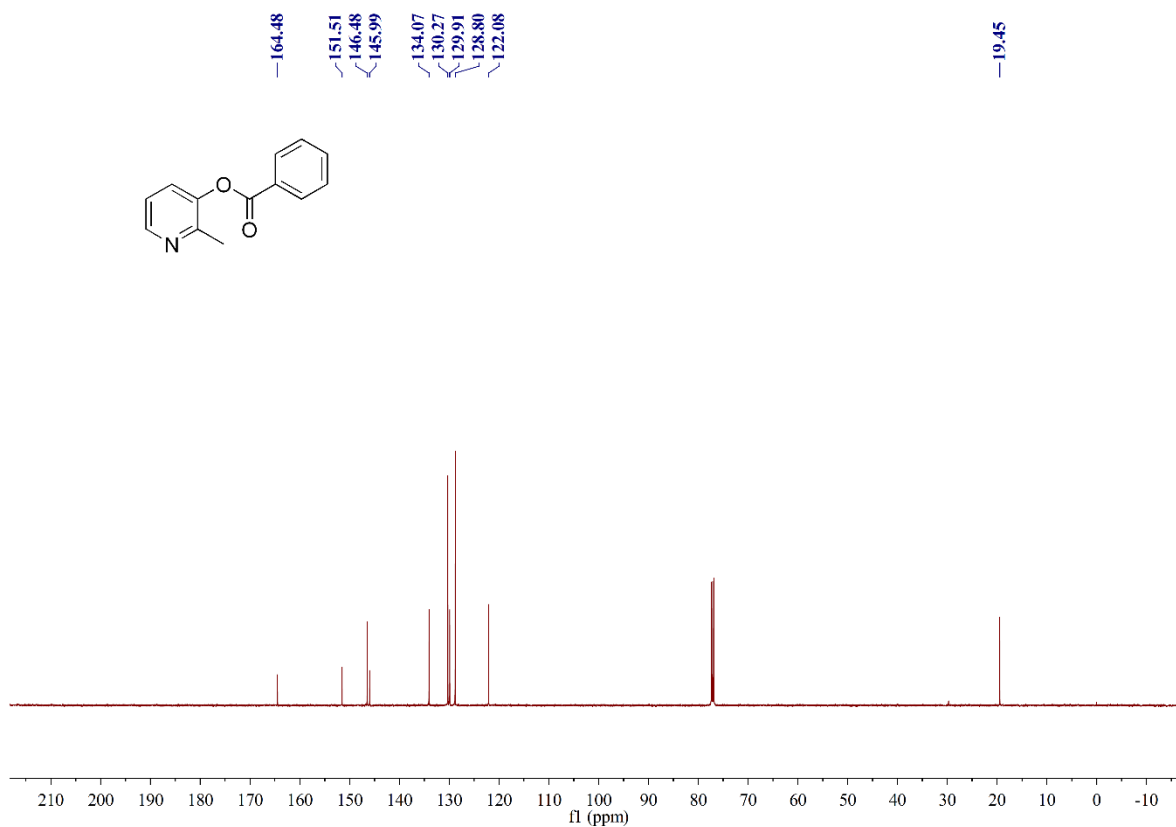
¹H NMR spectra of compound **3k**¹³C NMR spectra of compound **3k**

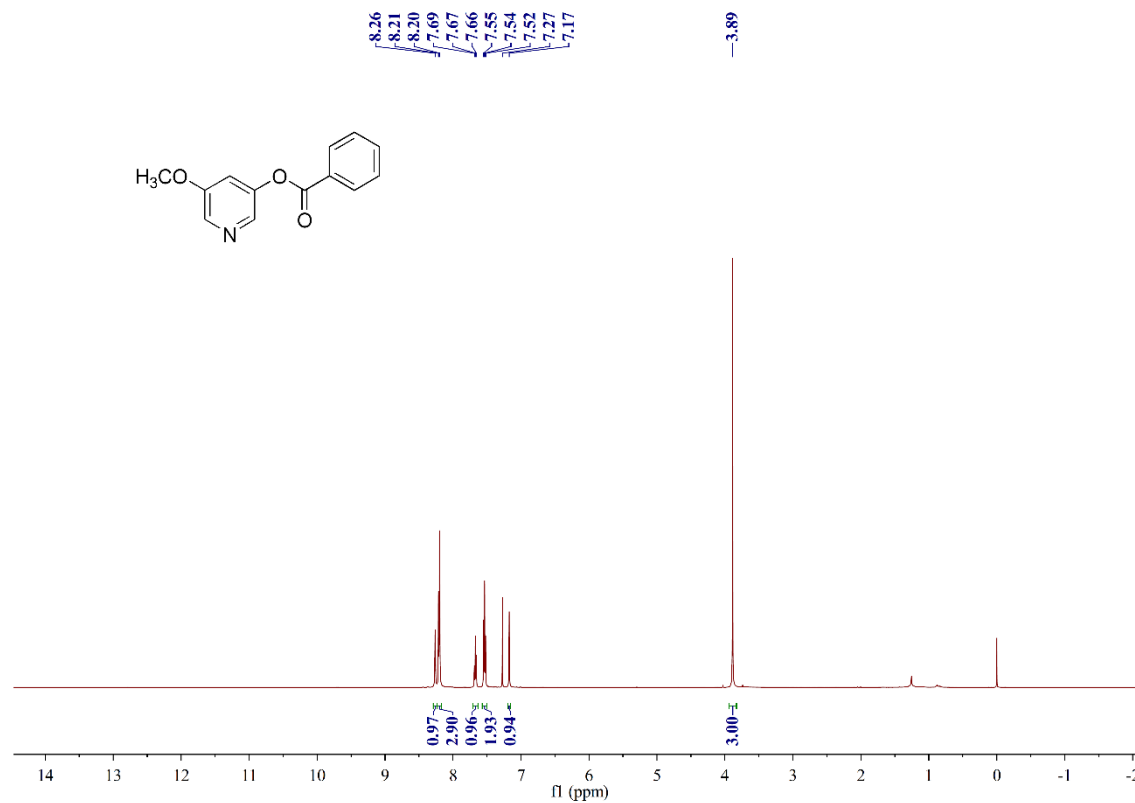
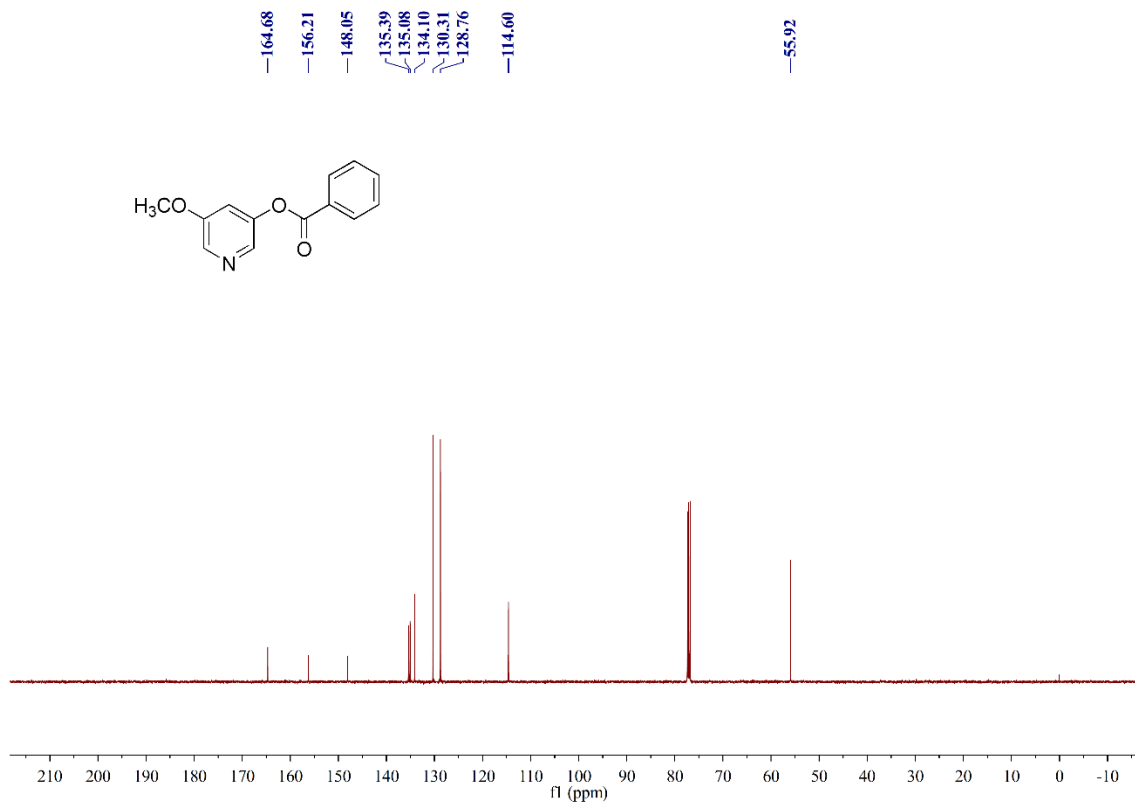
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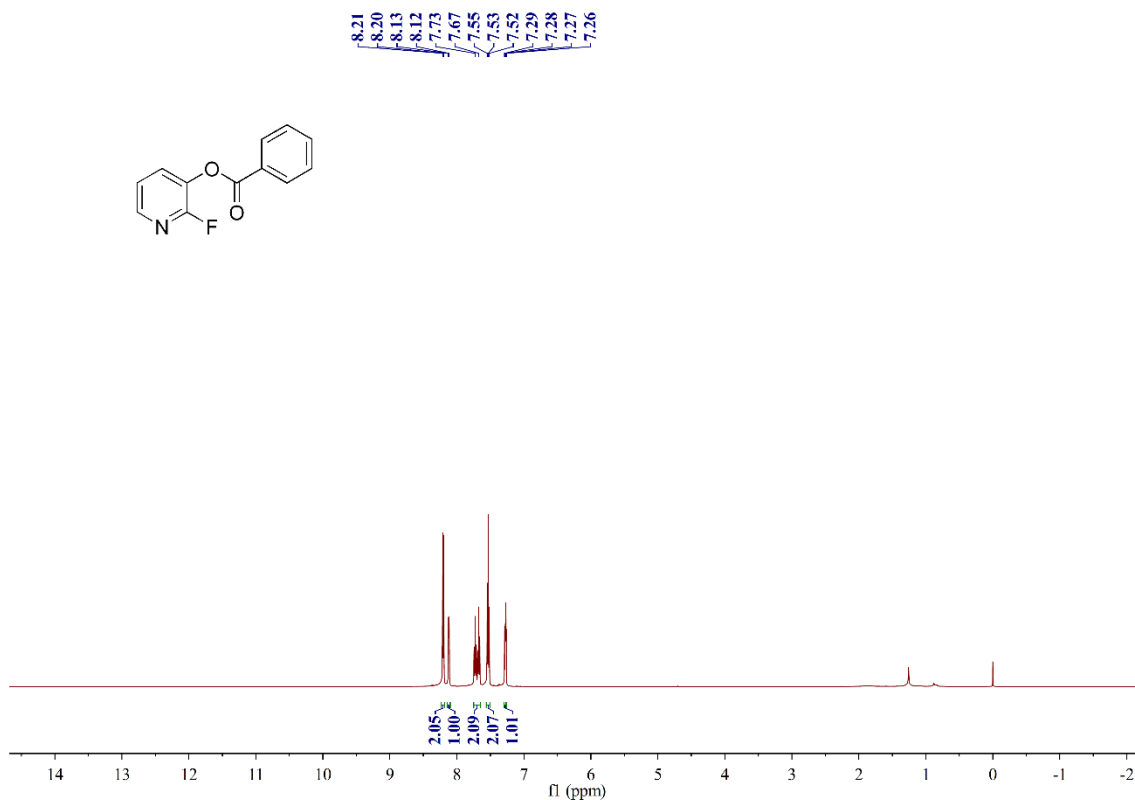
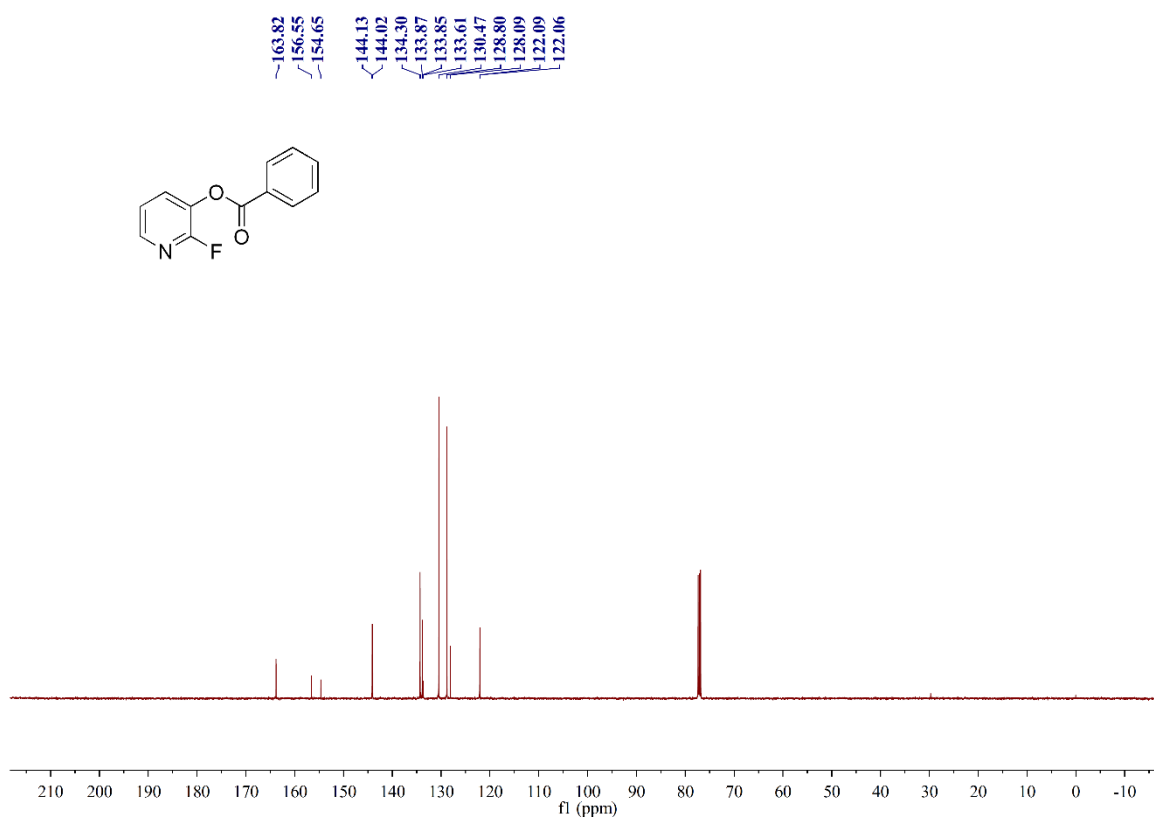
¹H NMR spectra of compound **3m**¹³C NMR spectra of compound **3m**

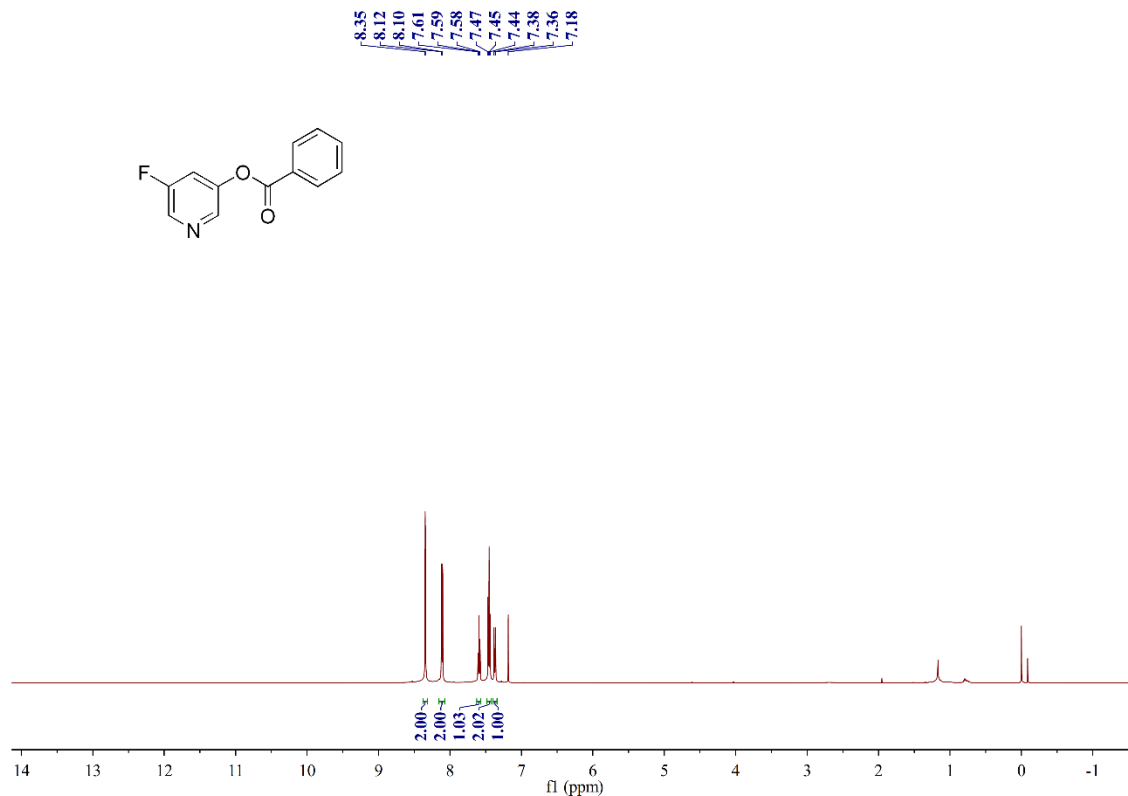
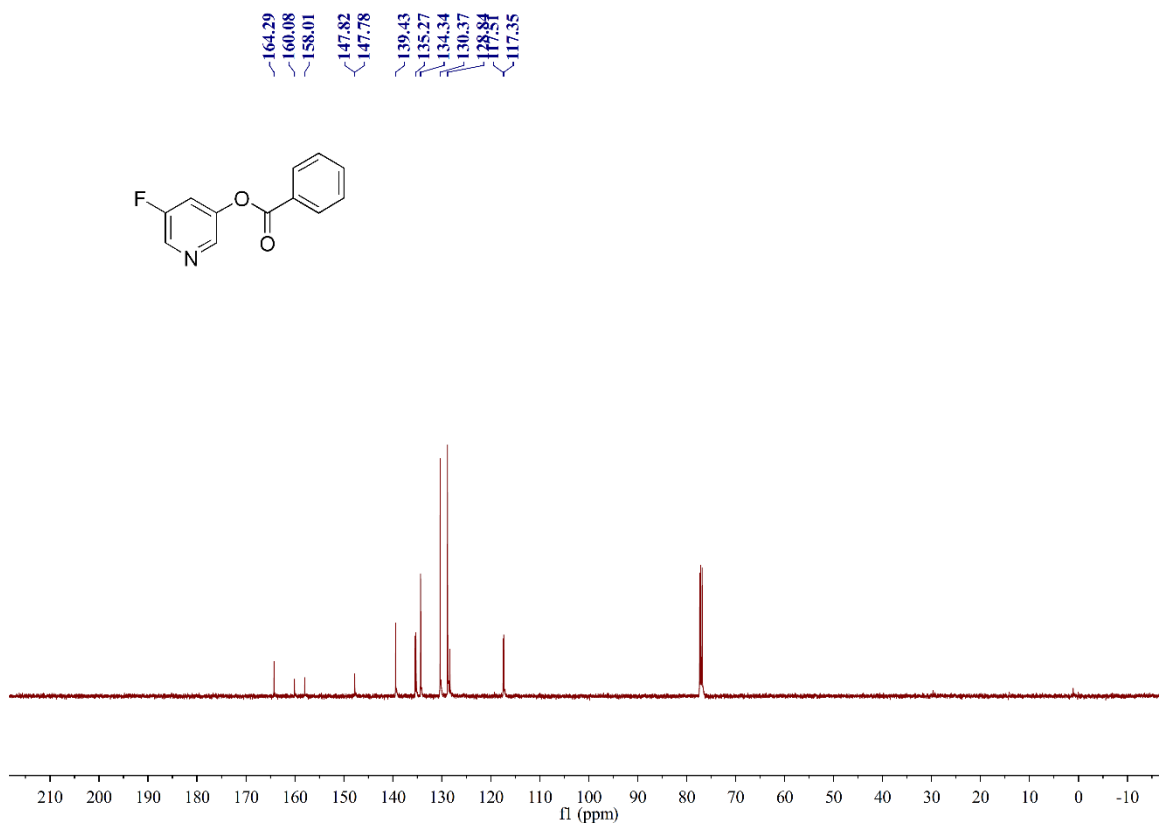
¹H NMR spectra of compound **4a**¹³C NMR spectra of compound **4a**

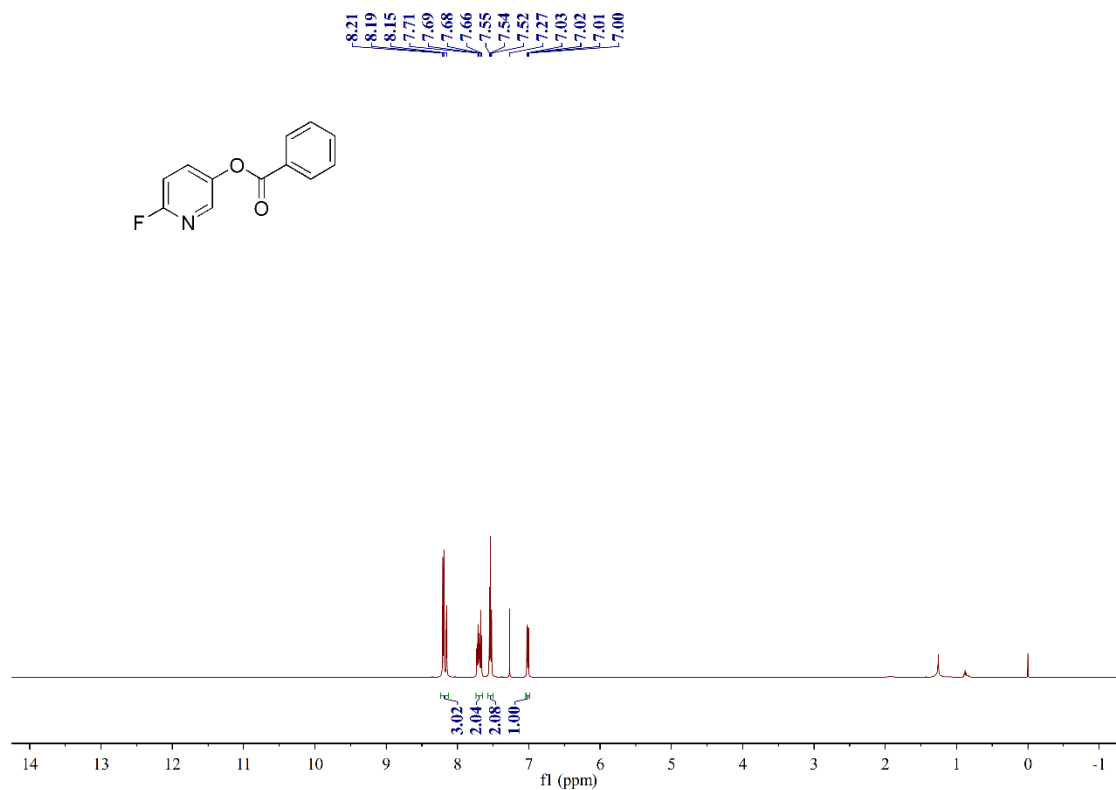
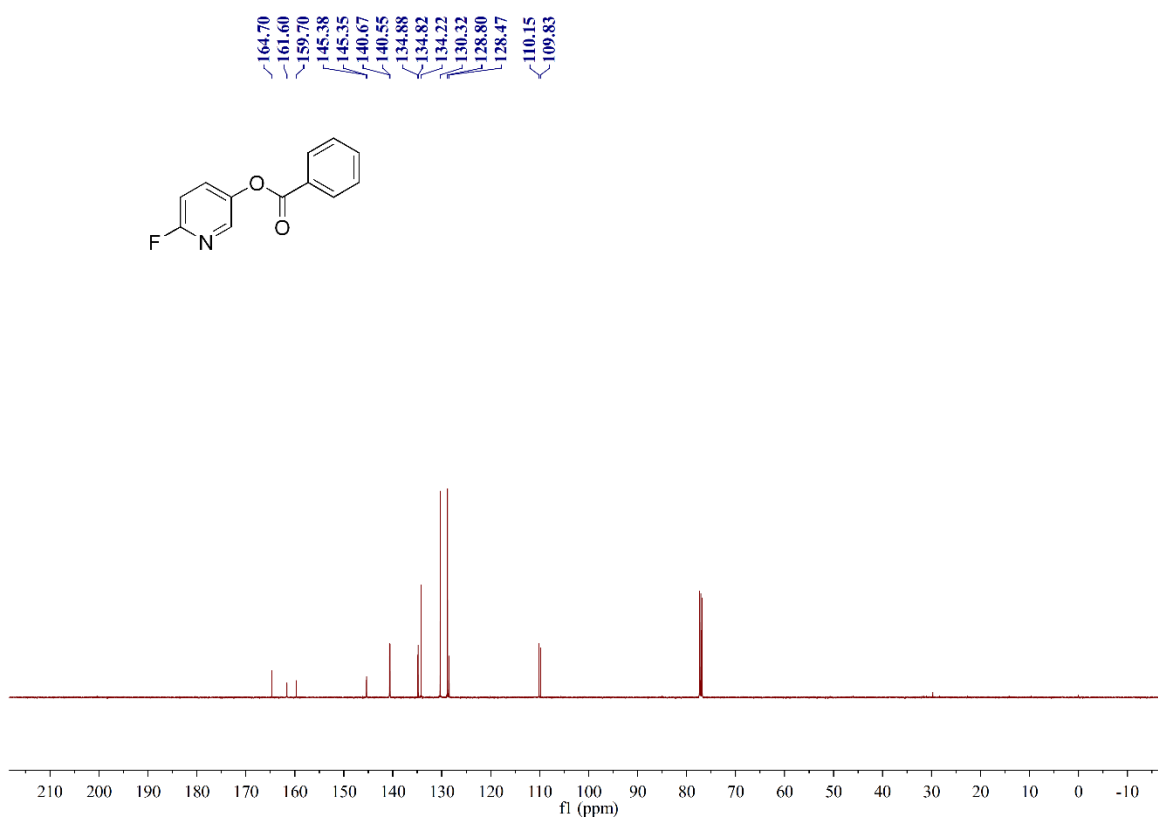
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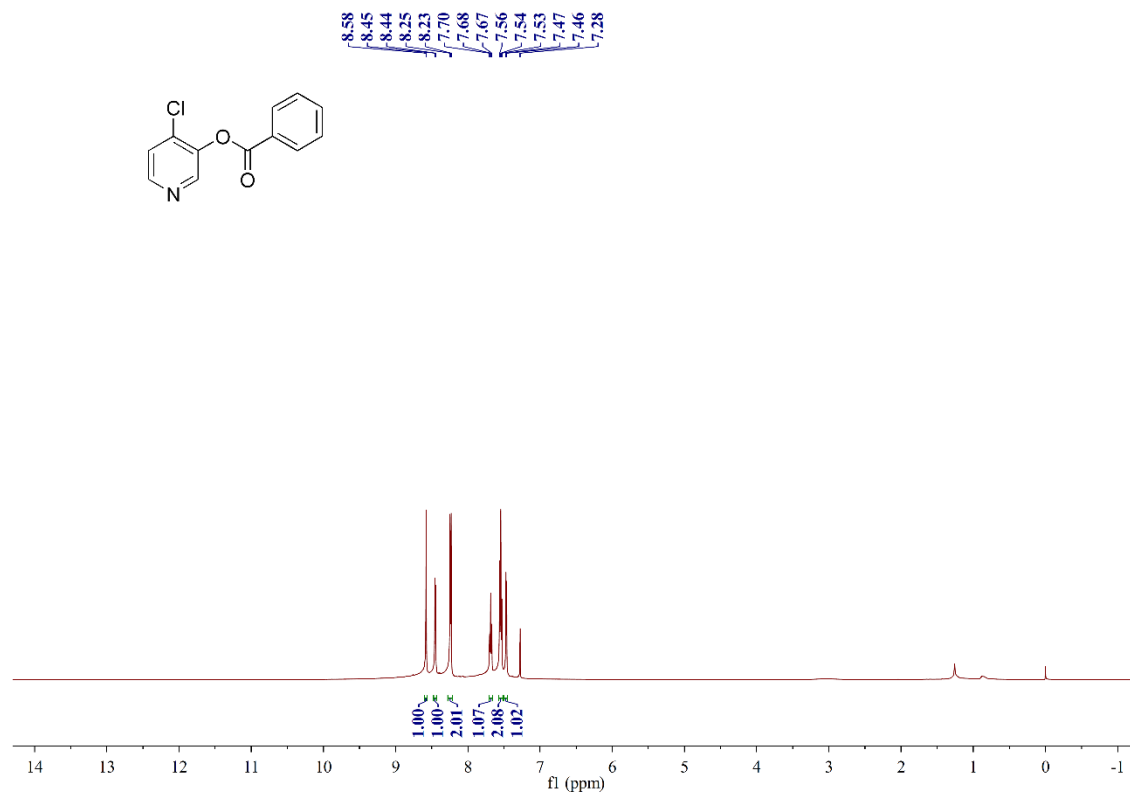
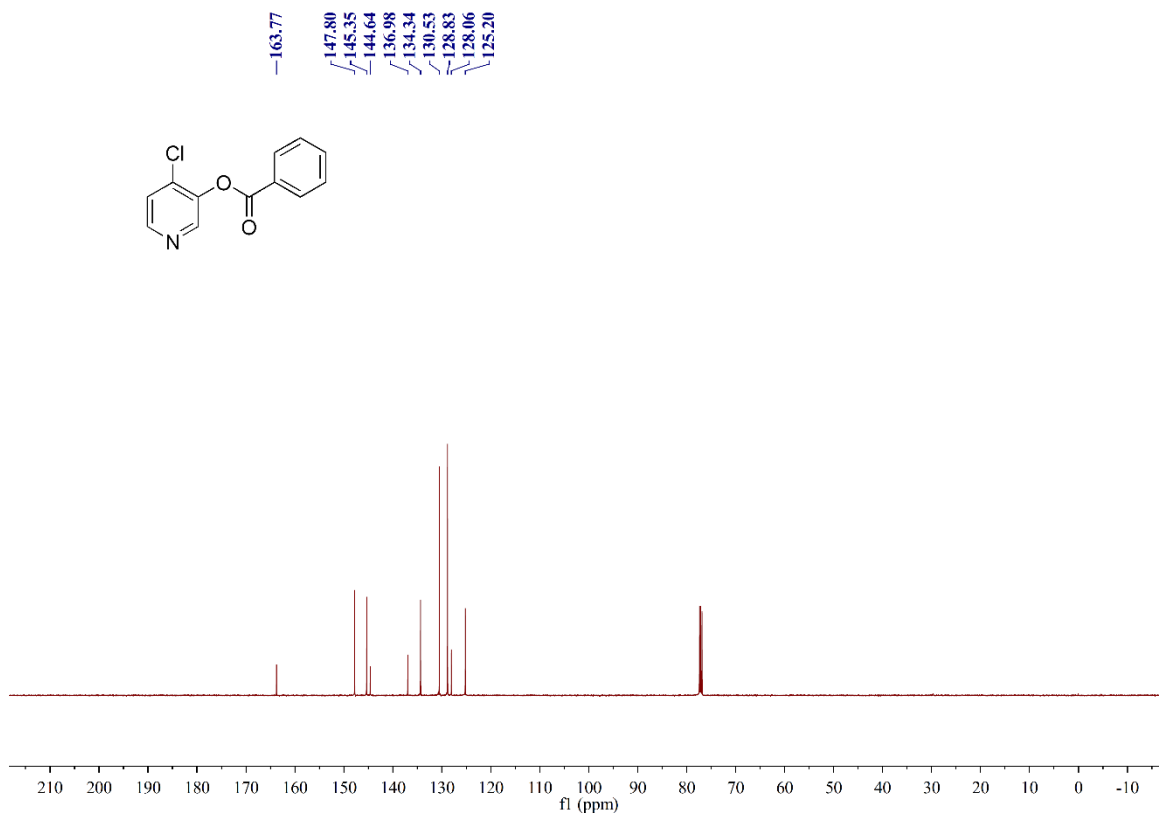
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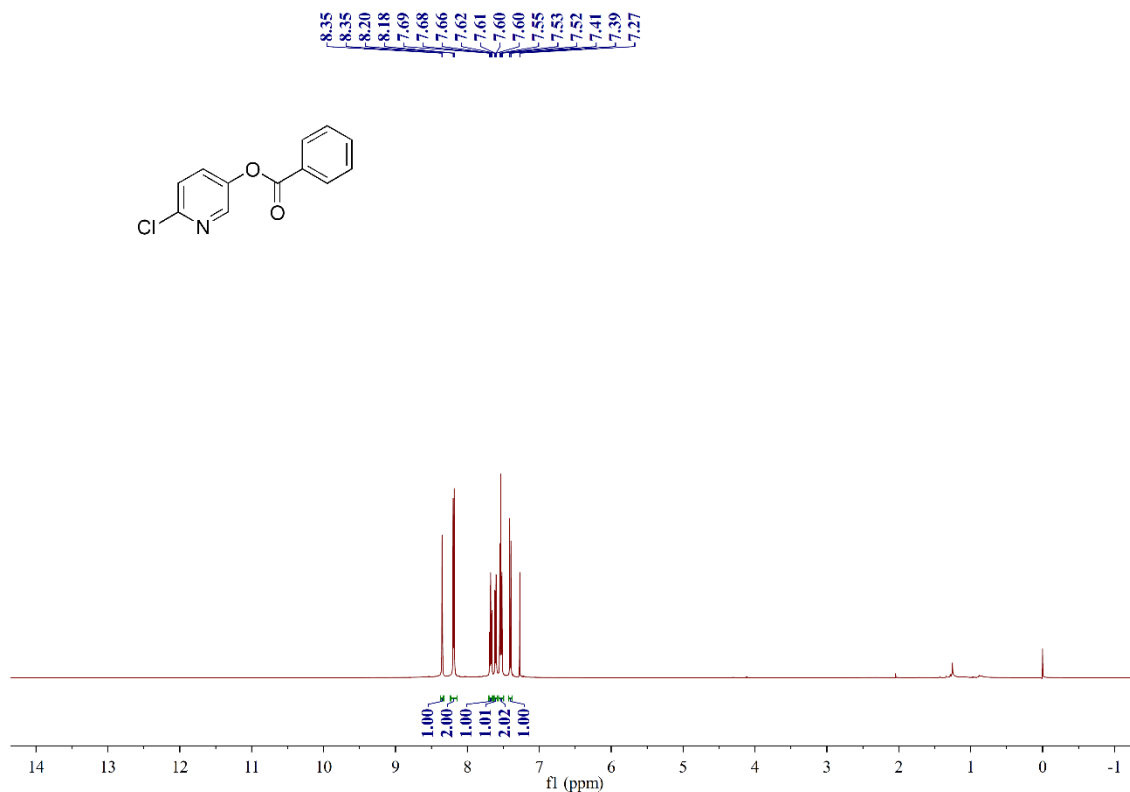
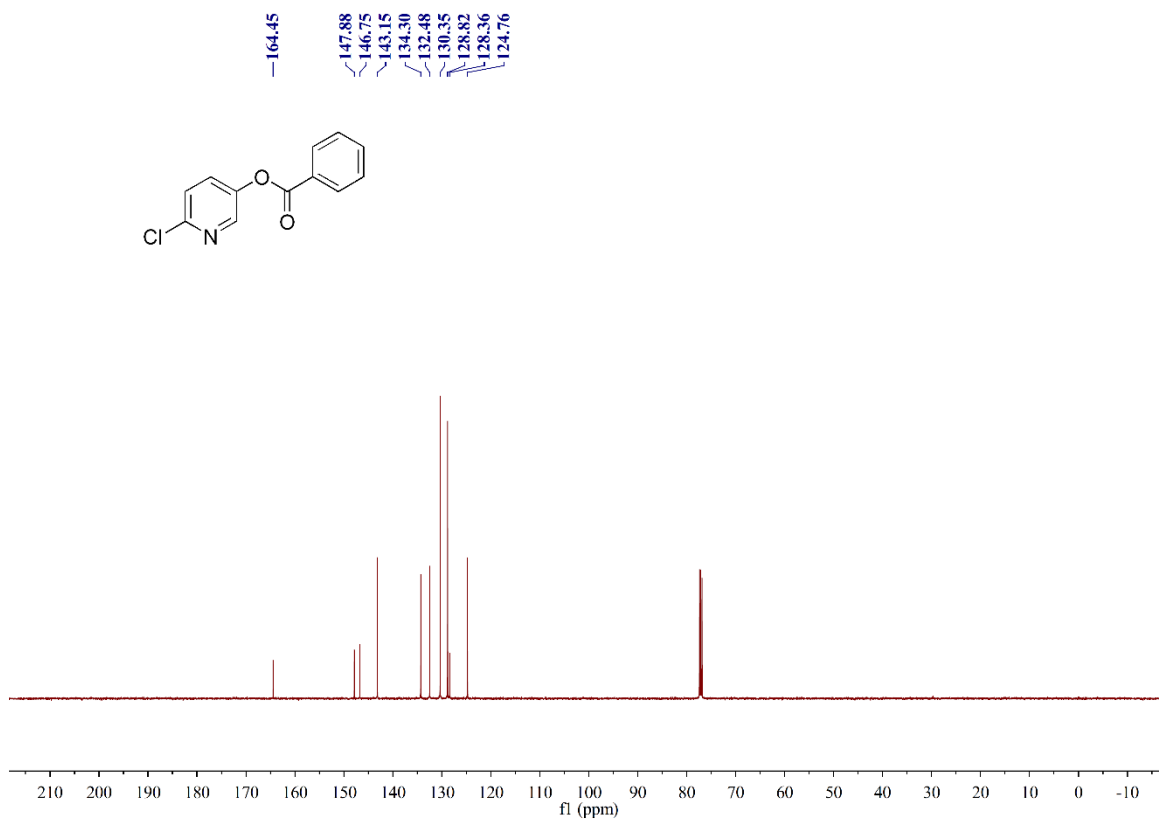
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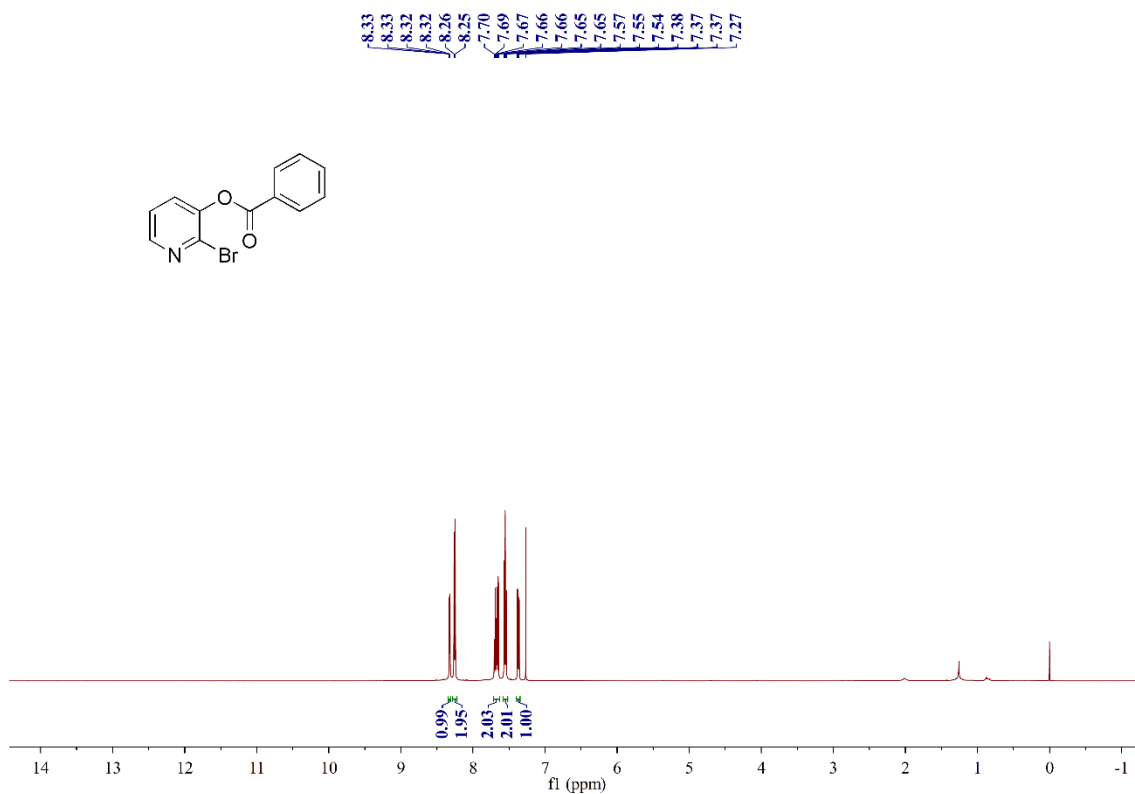
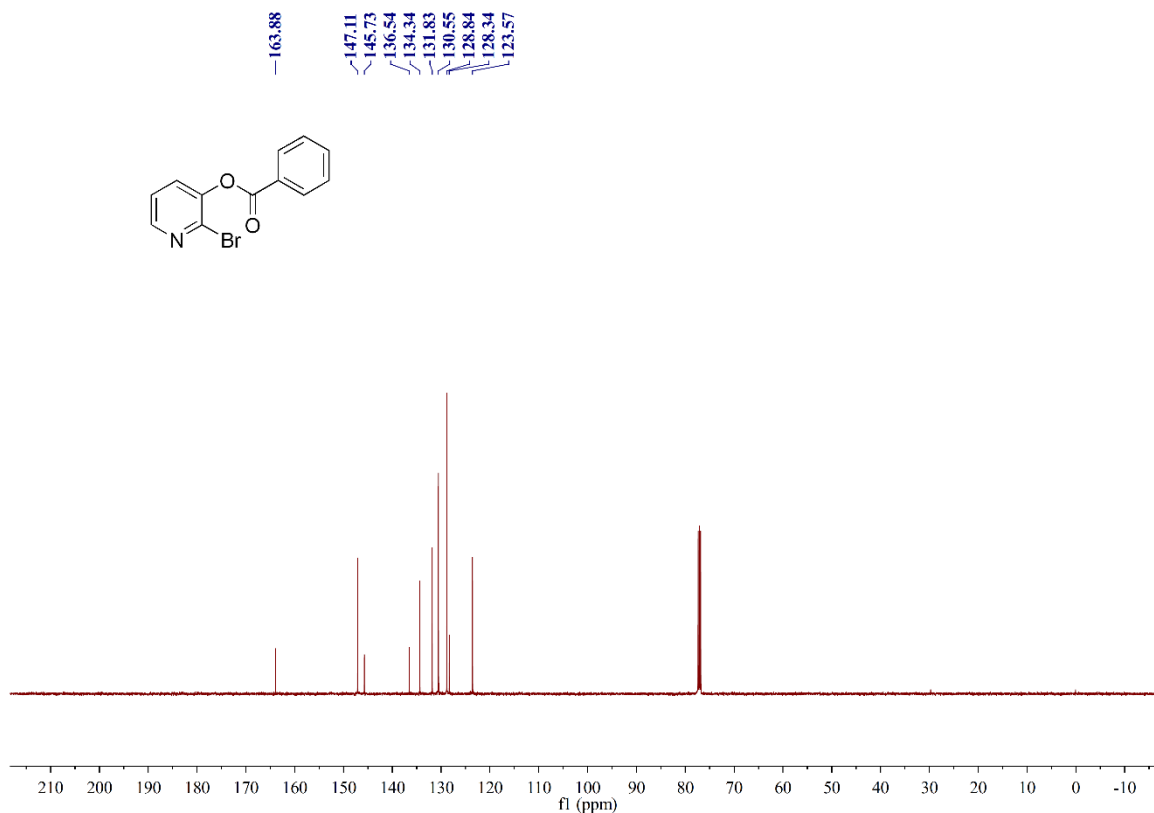
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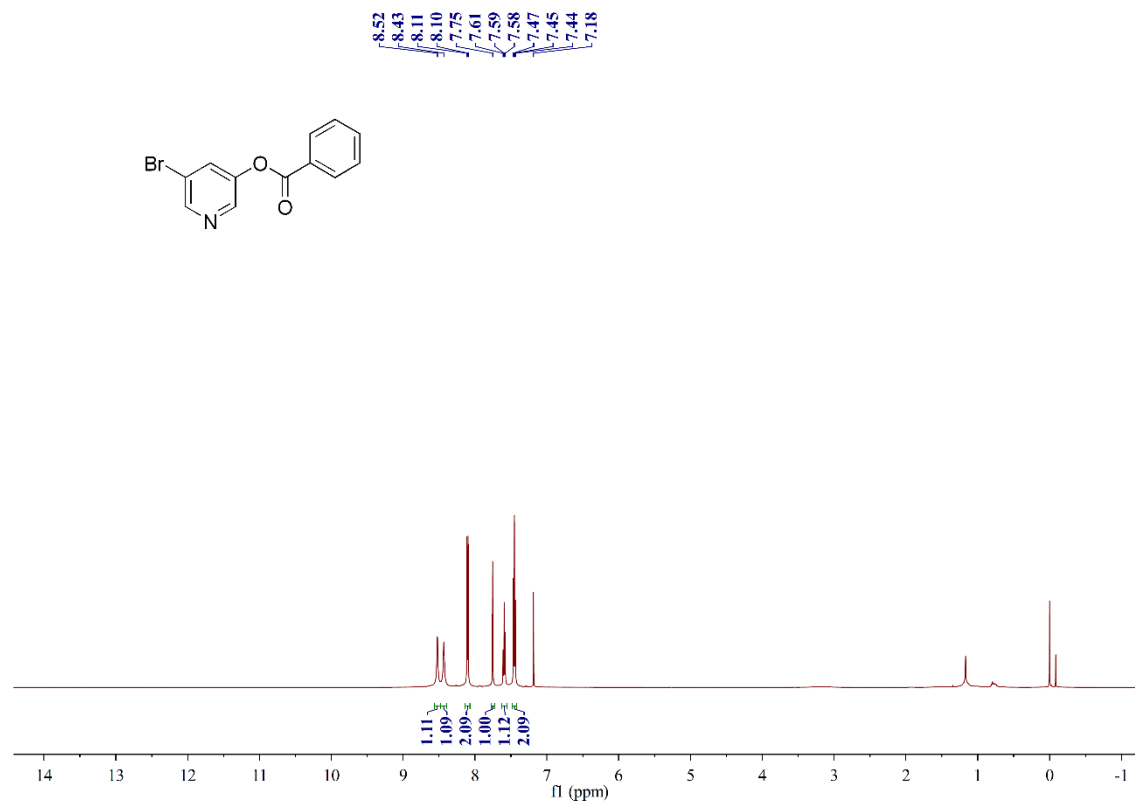
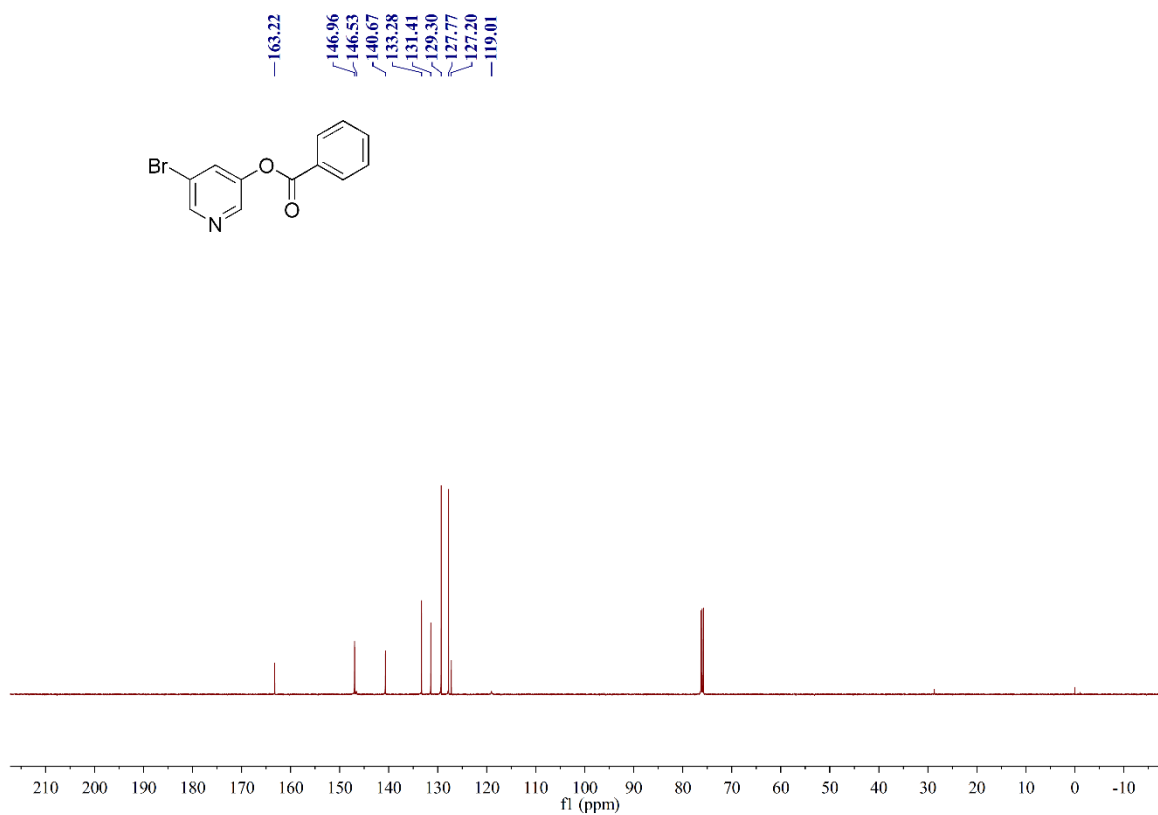
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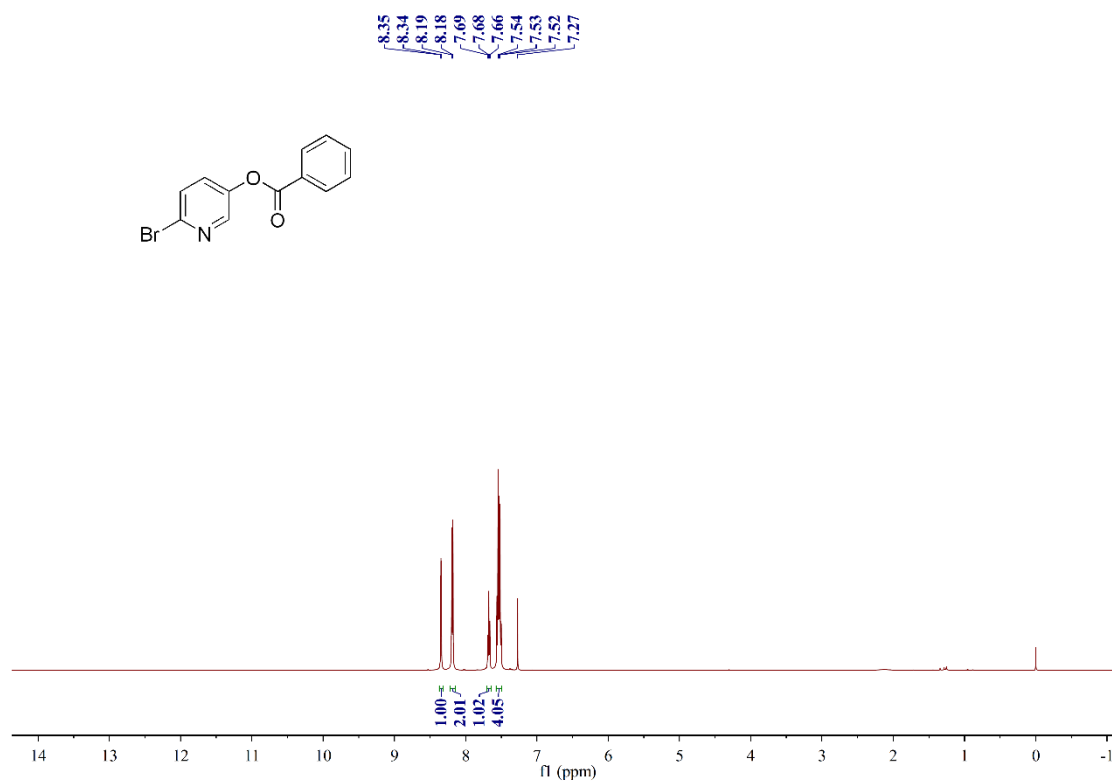
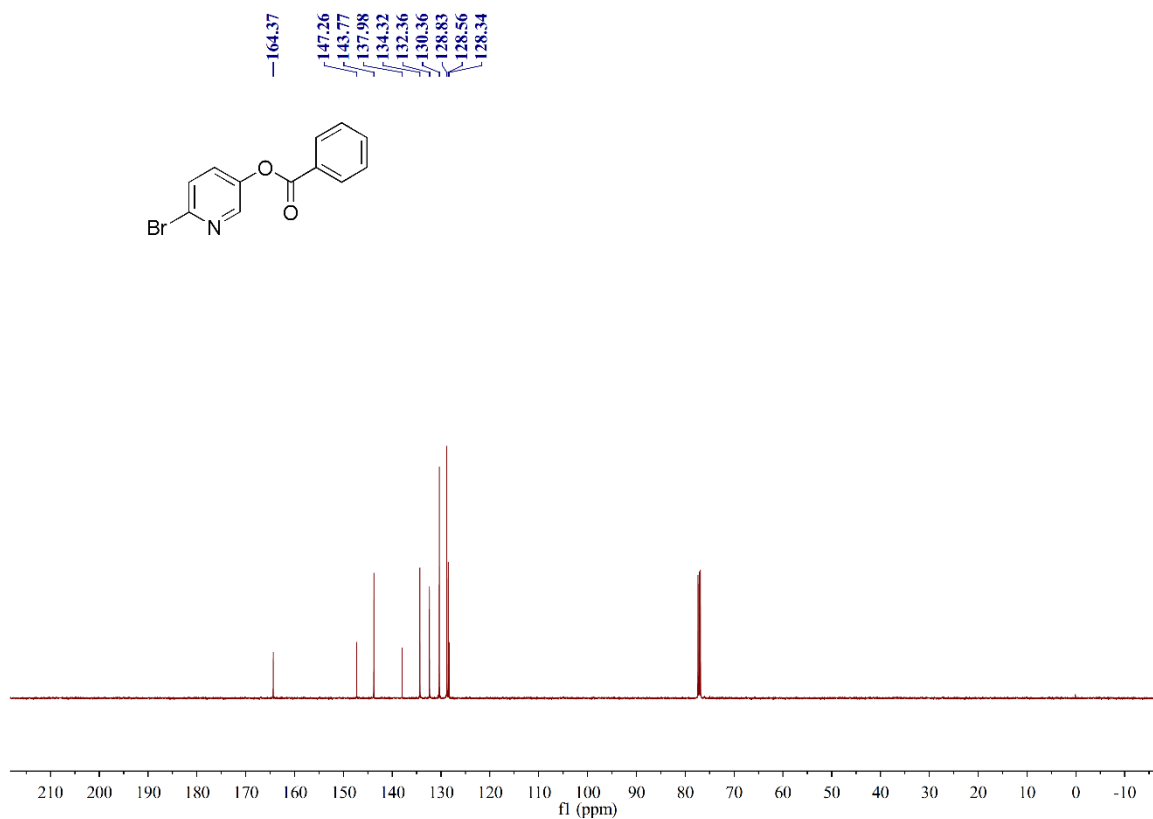
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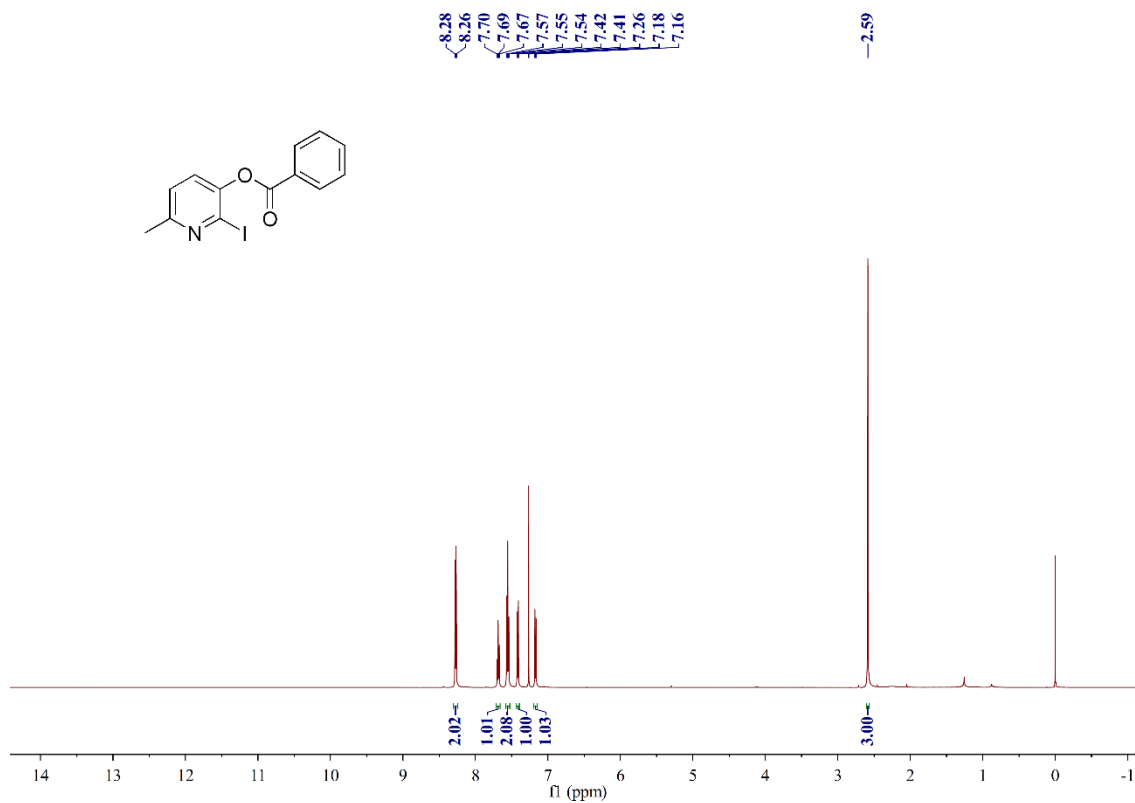
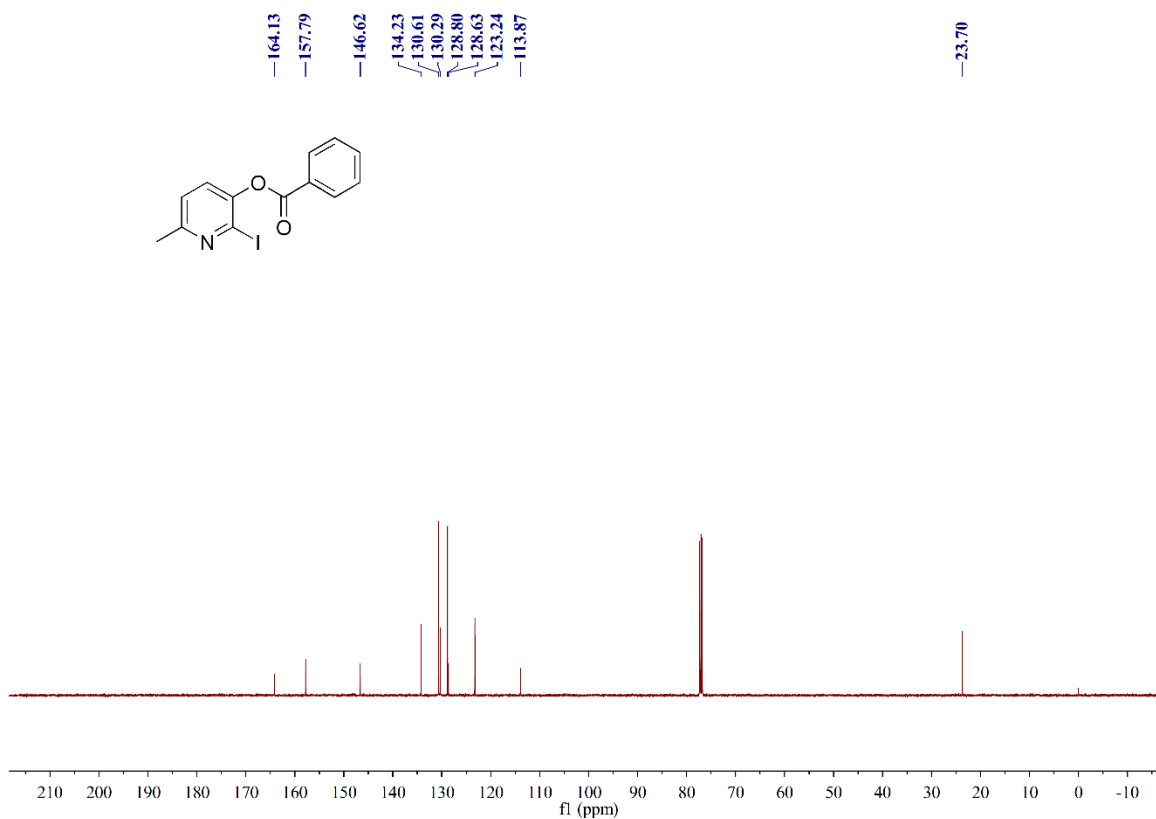
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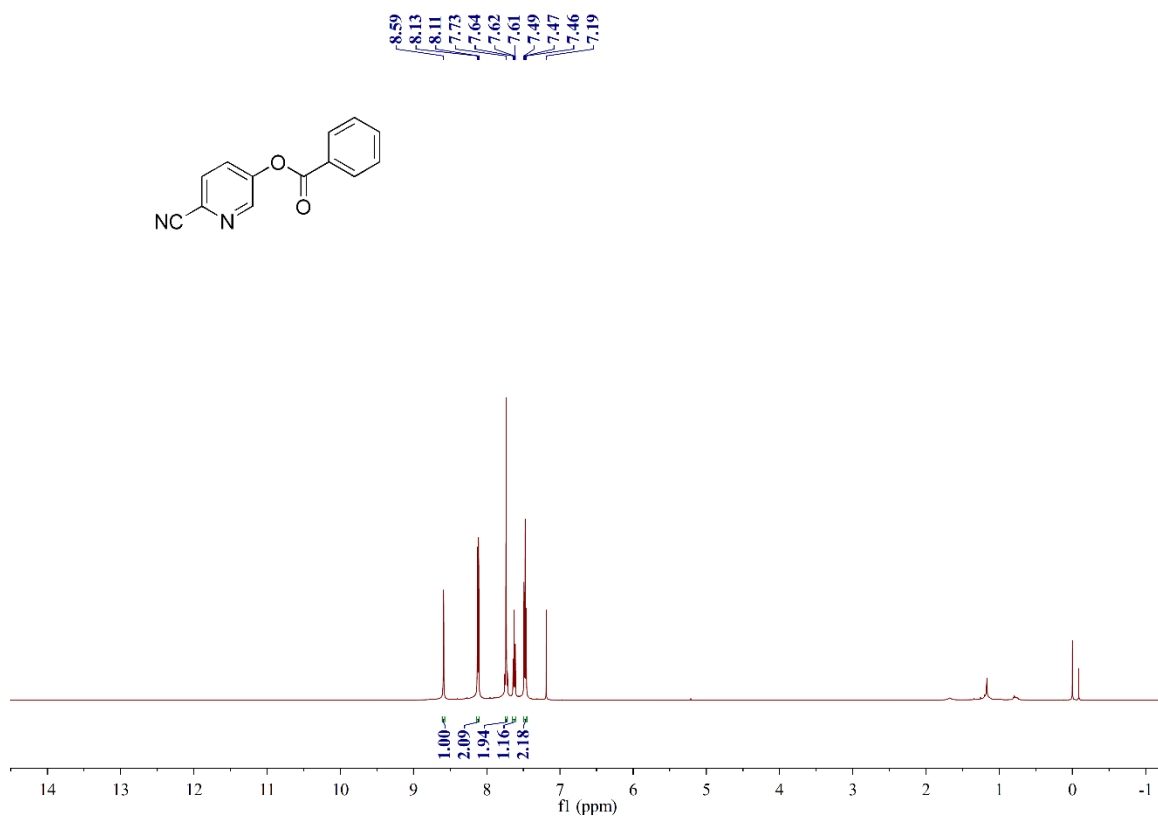
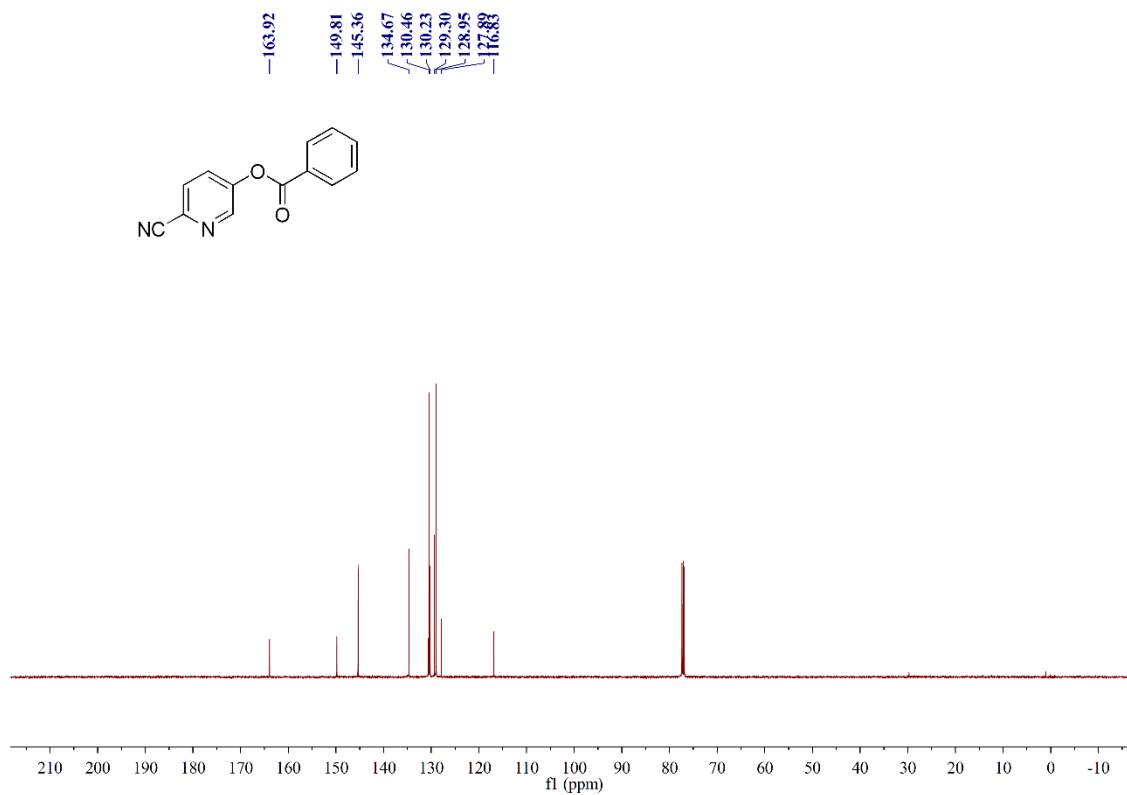
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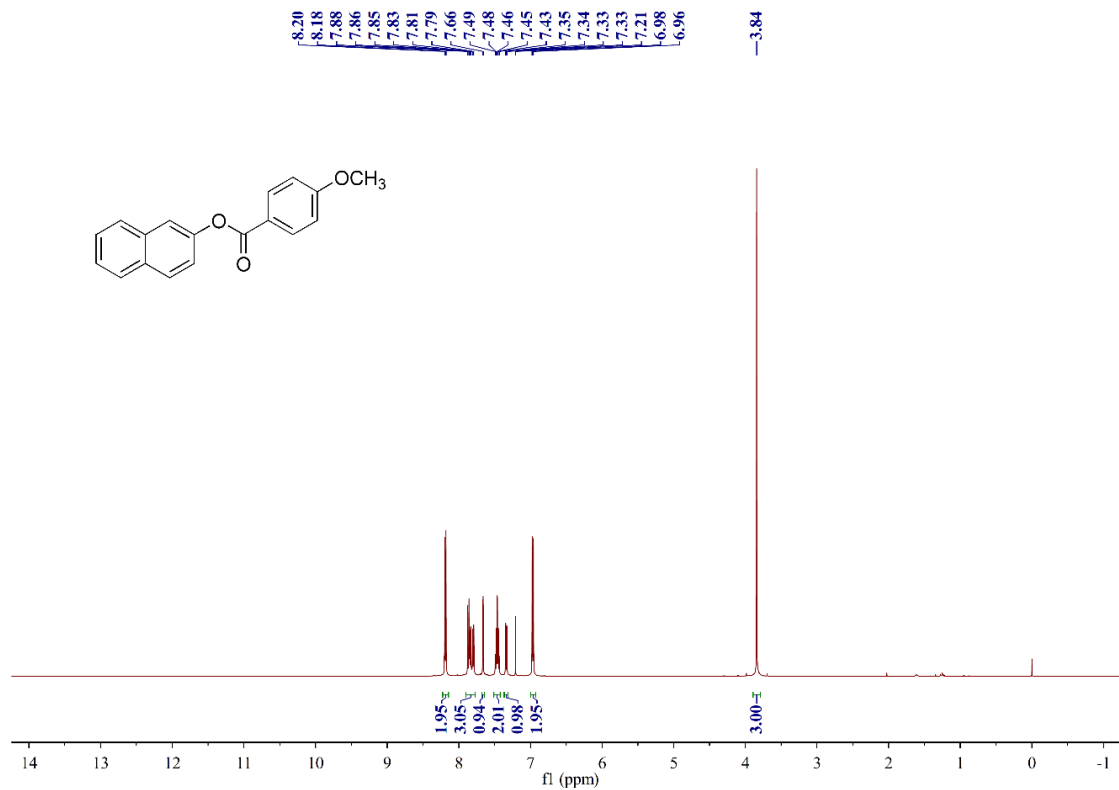
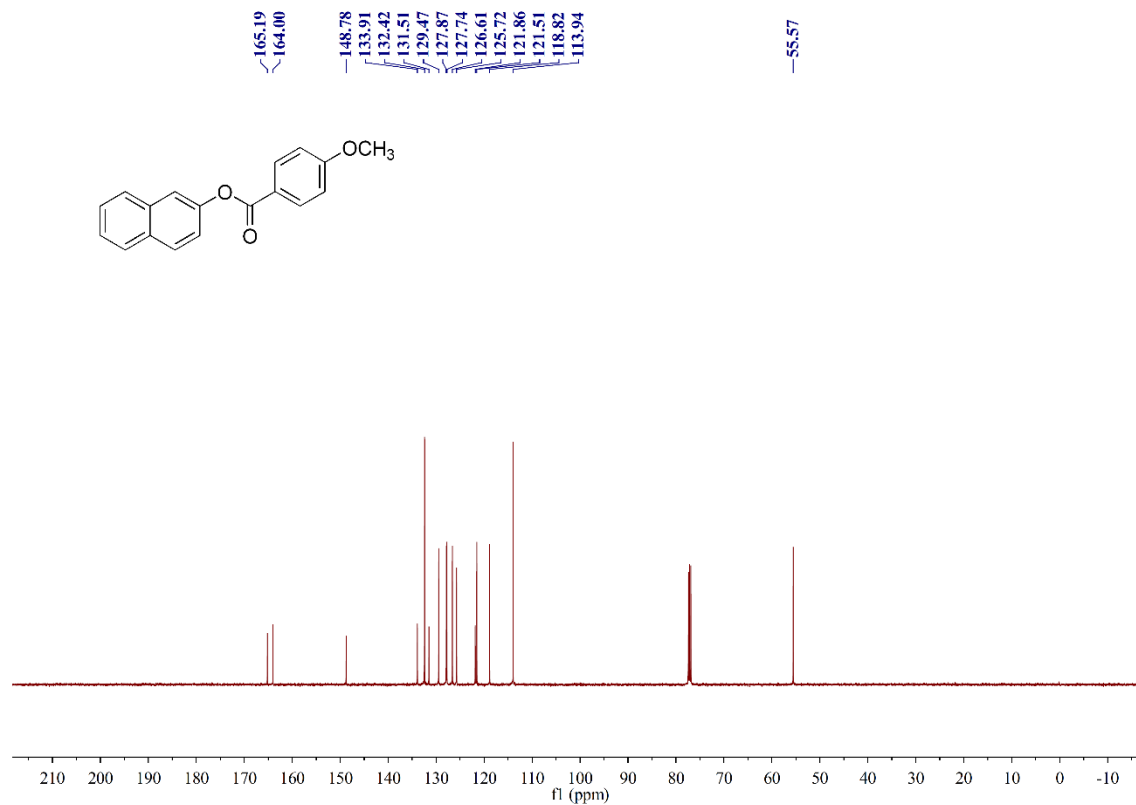
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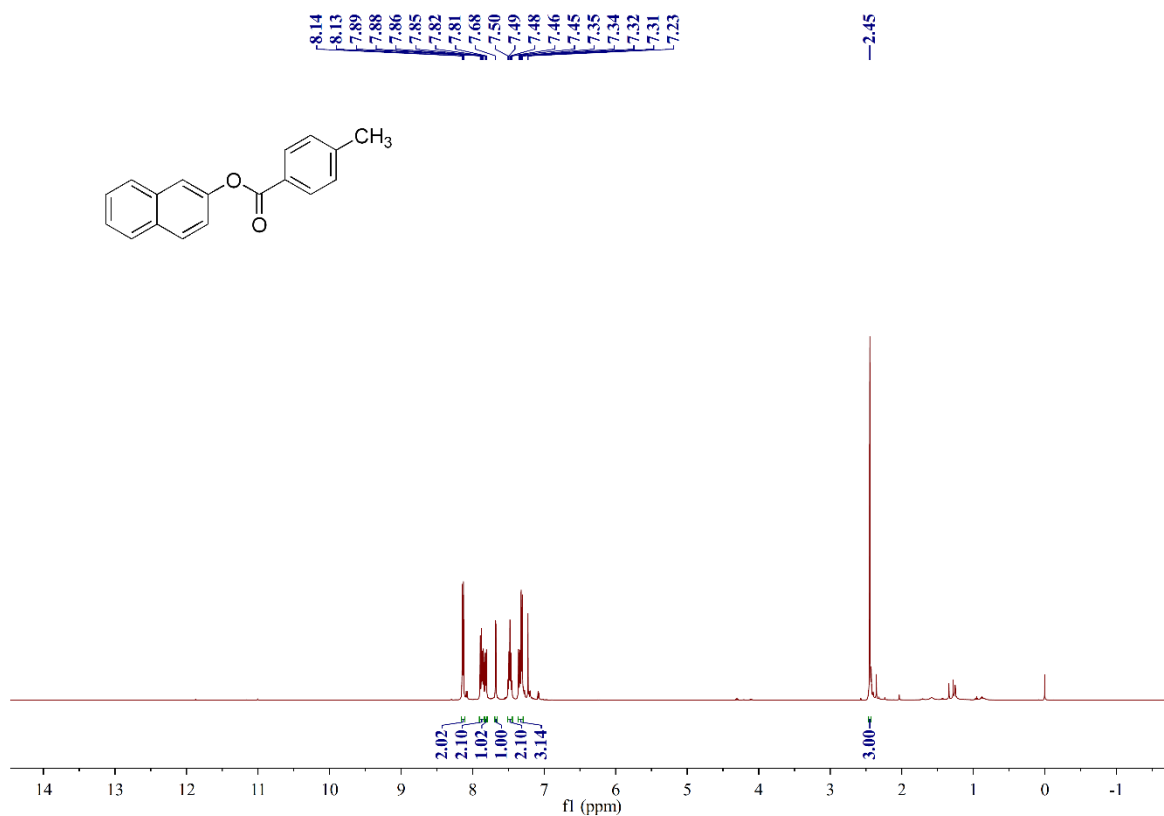
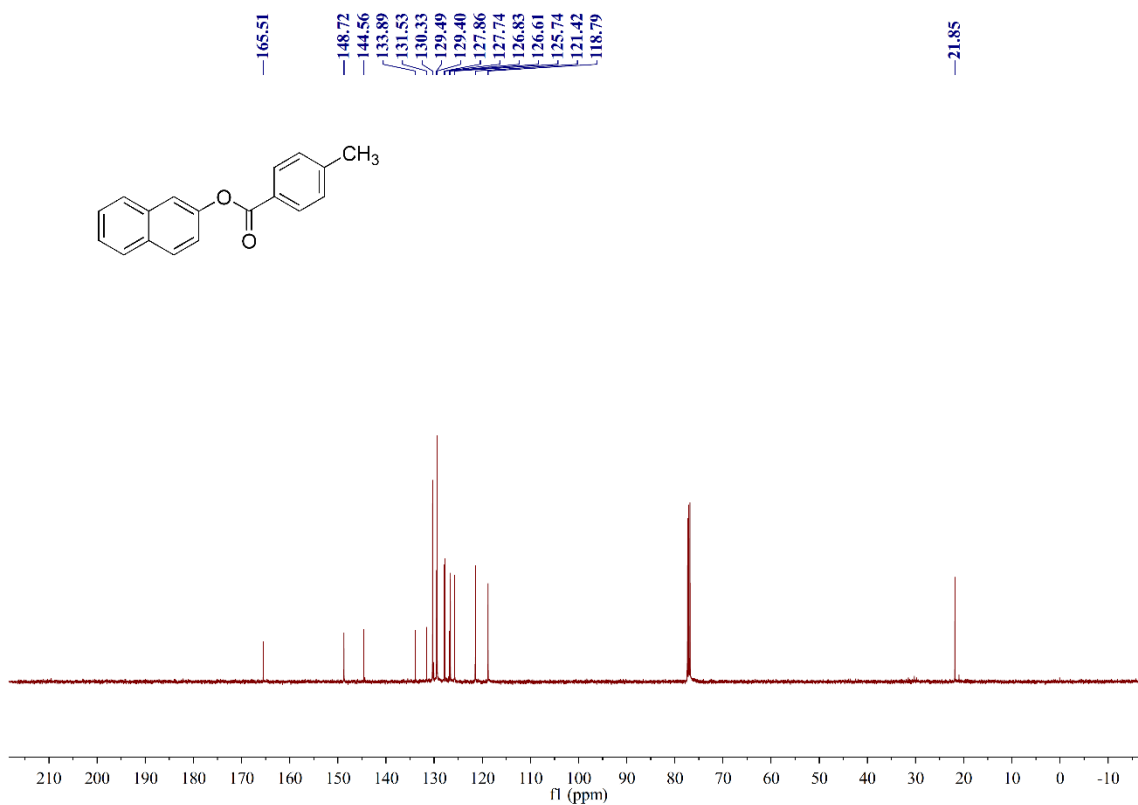
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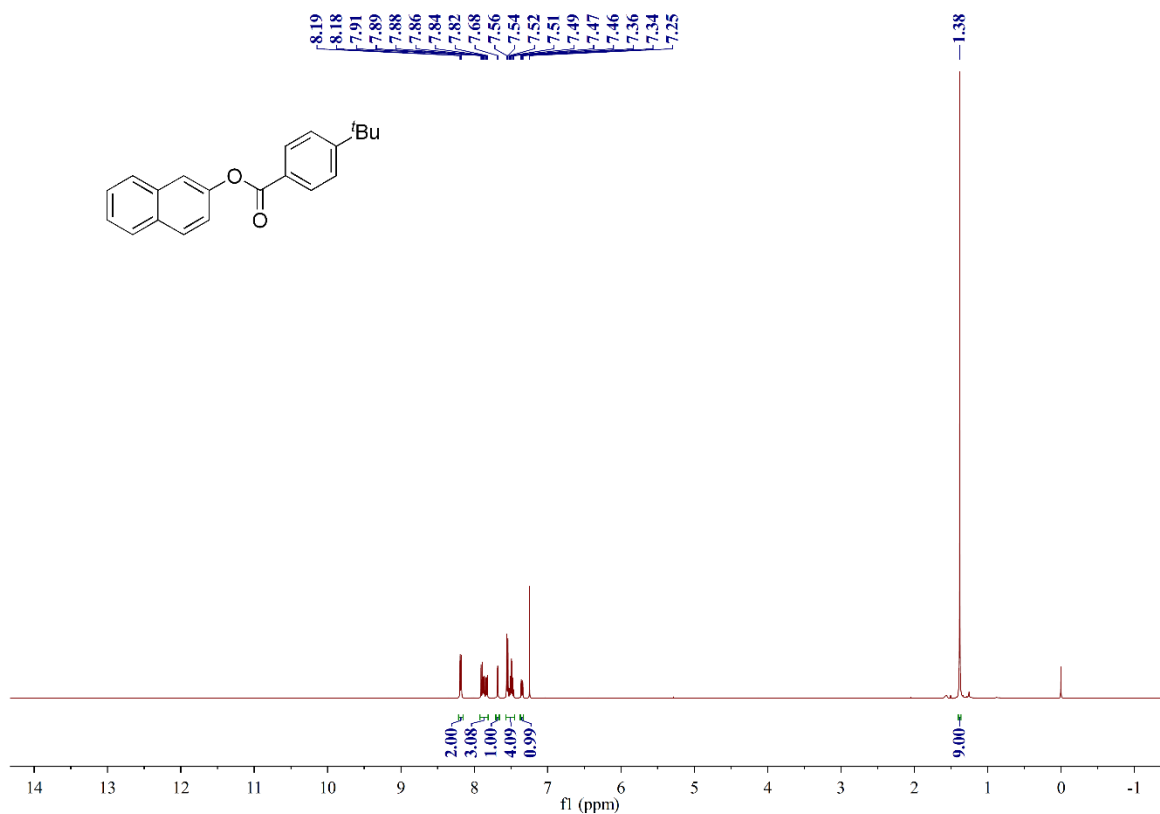
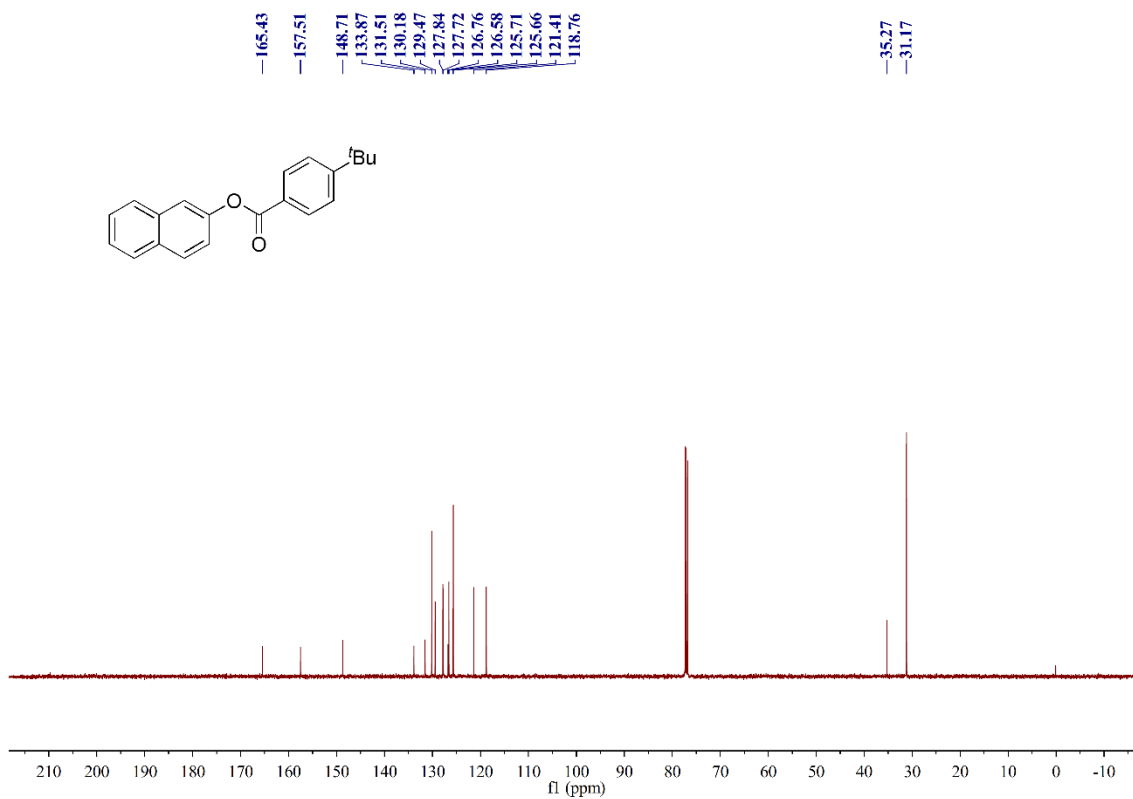
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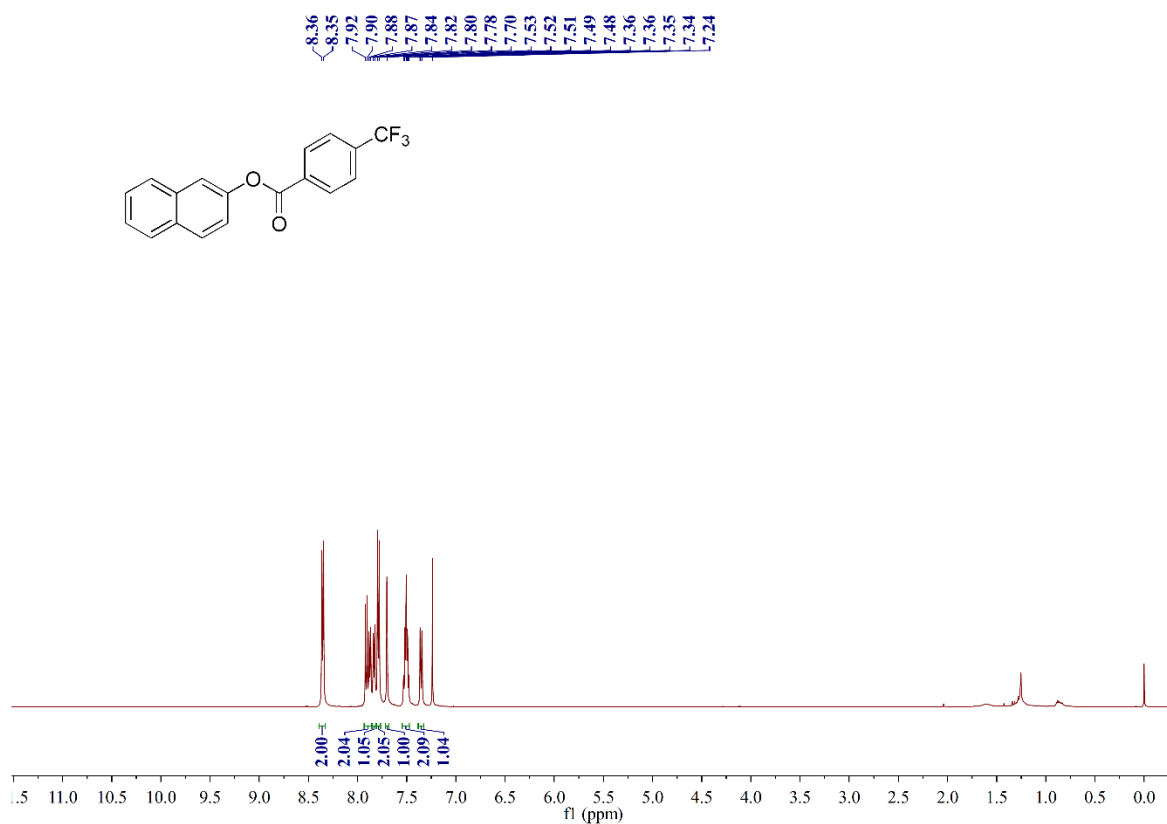
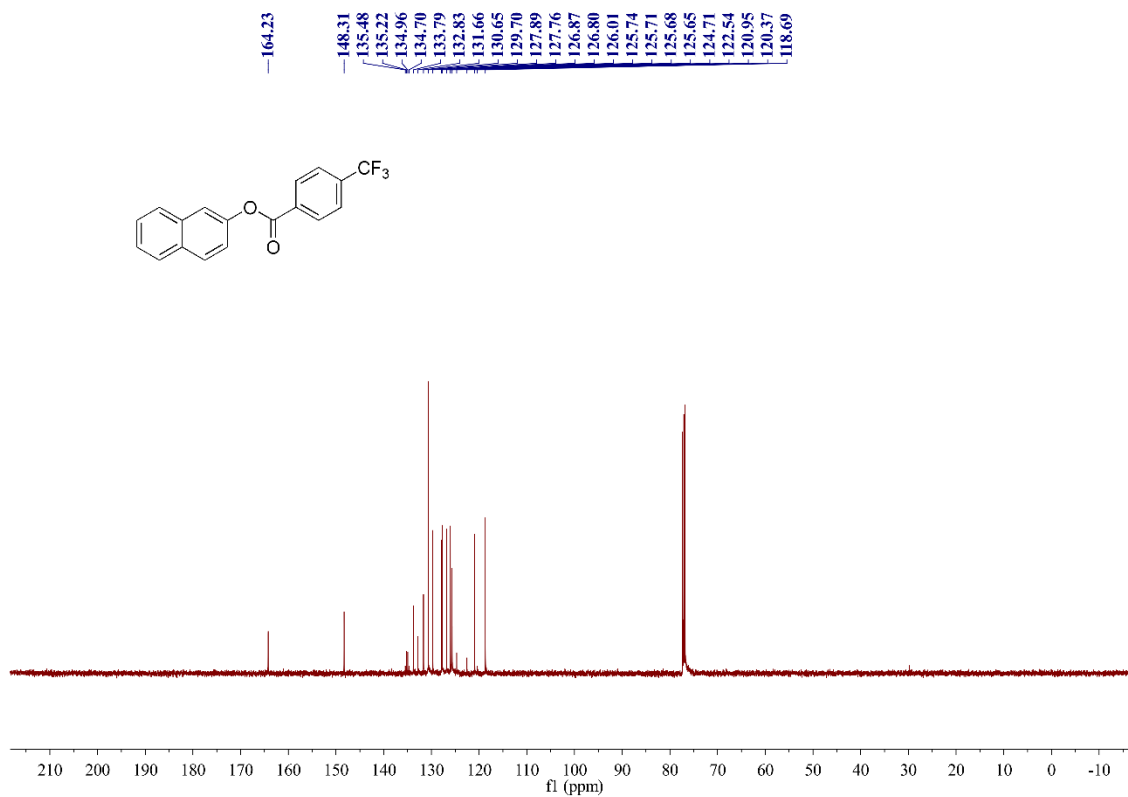
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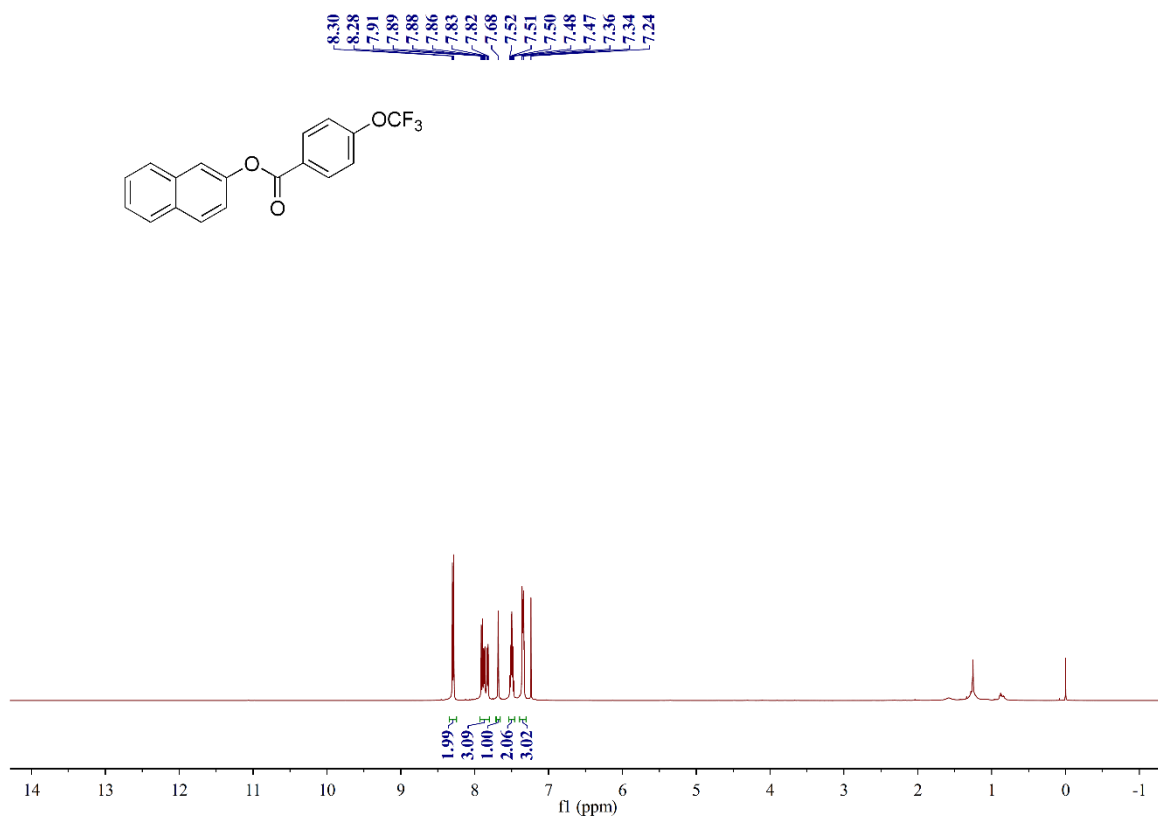
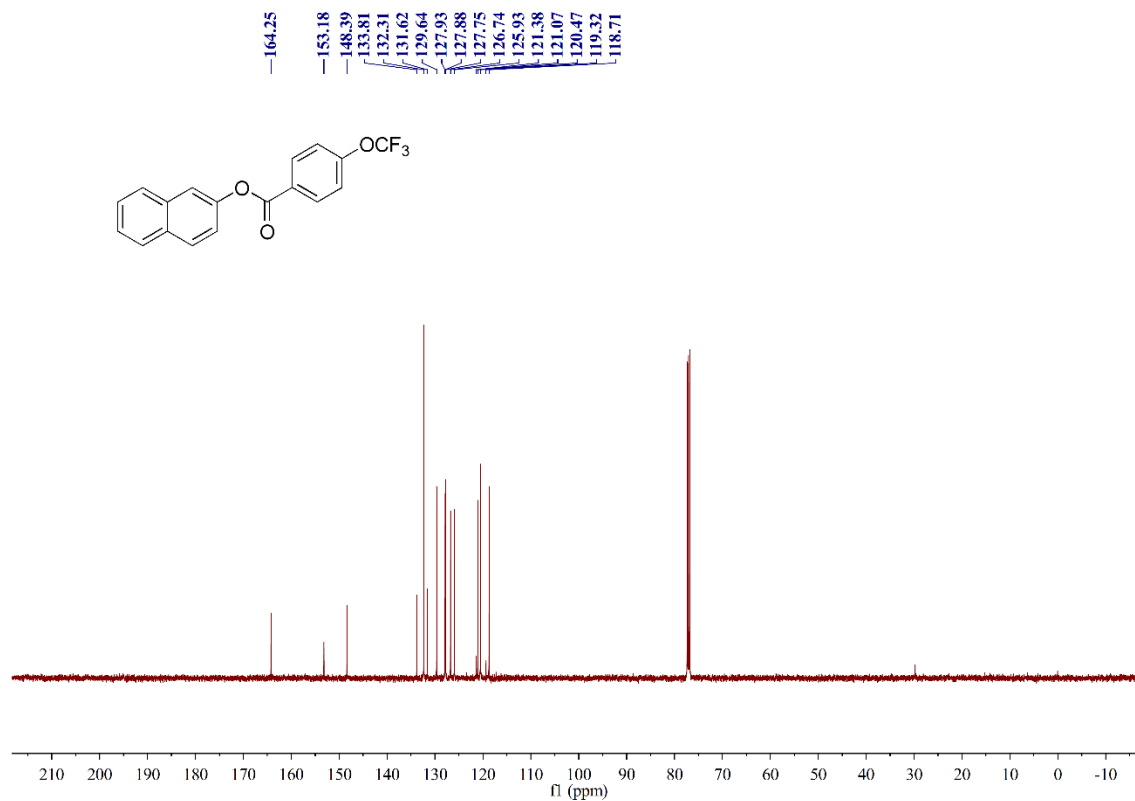
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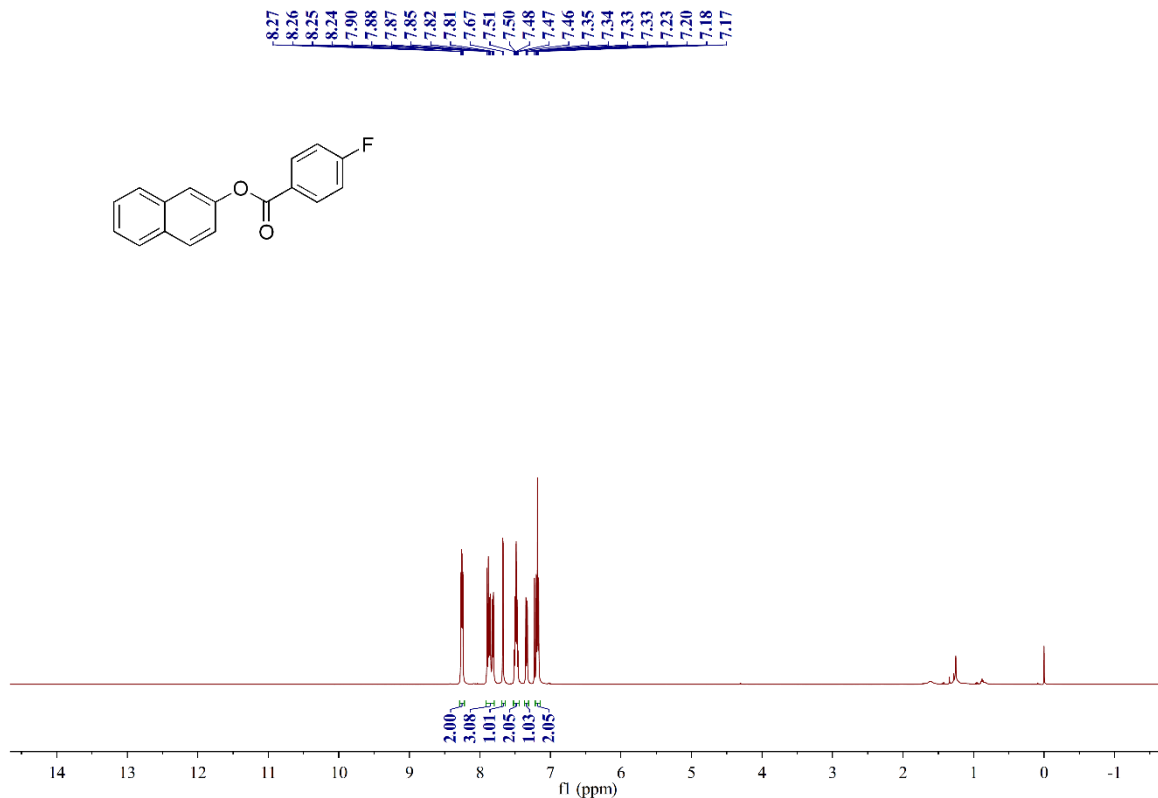
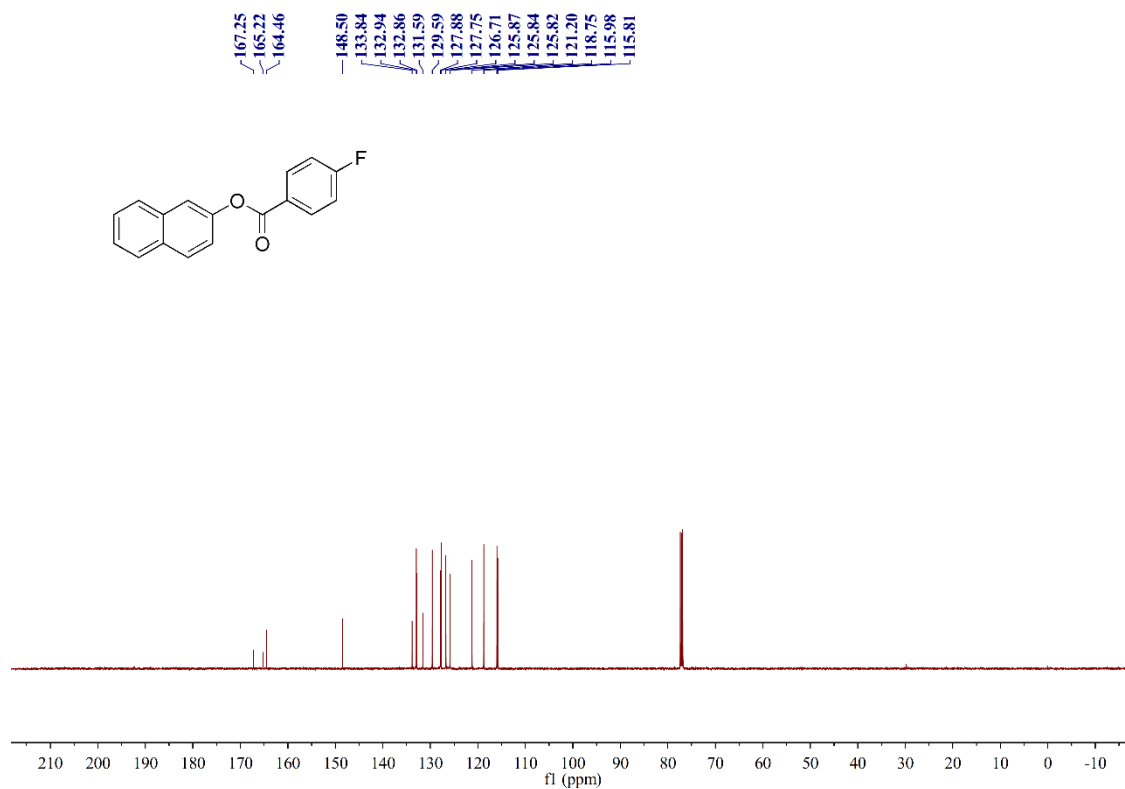
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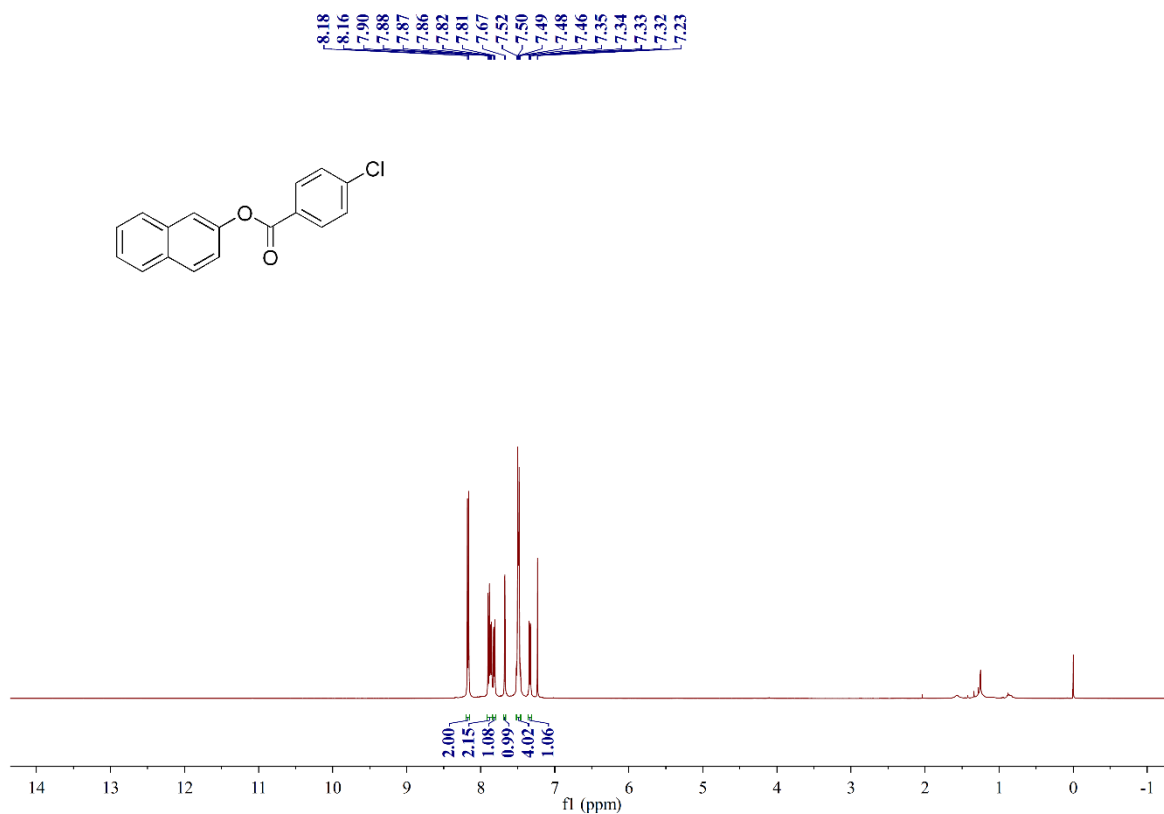
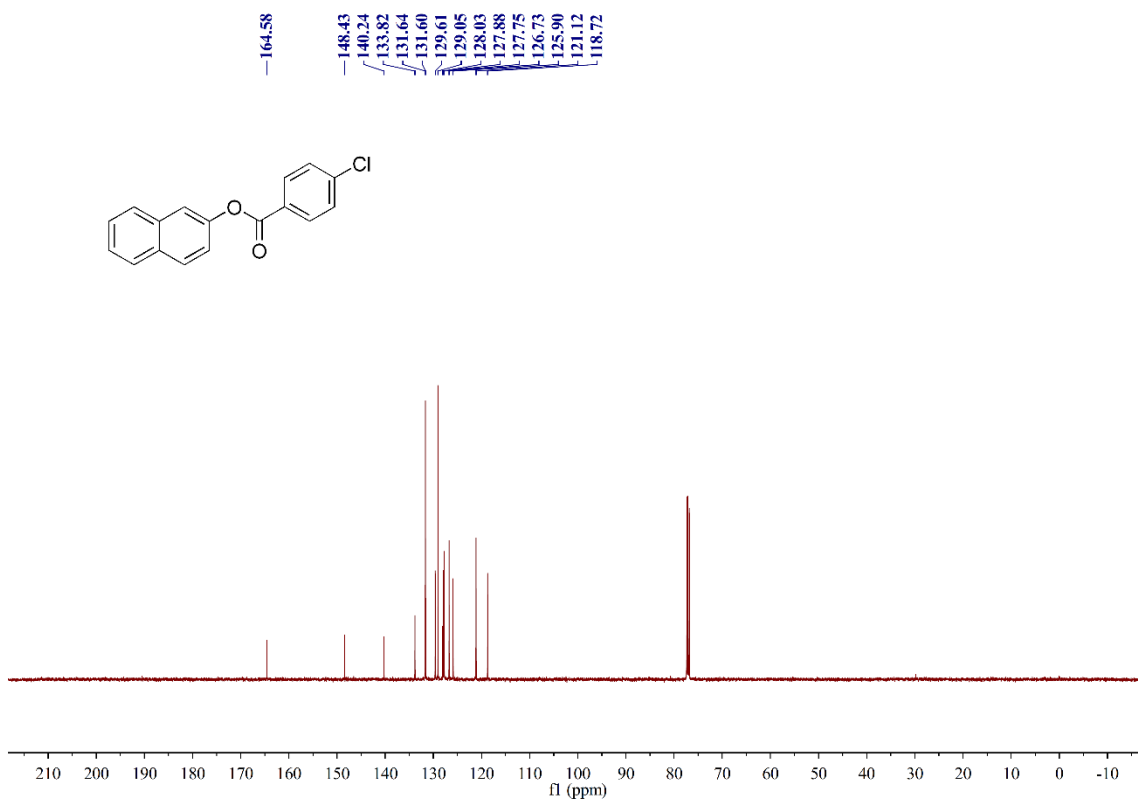
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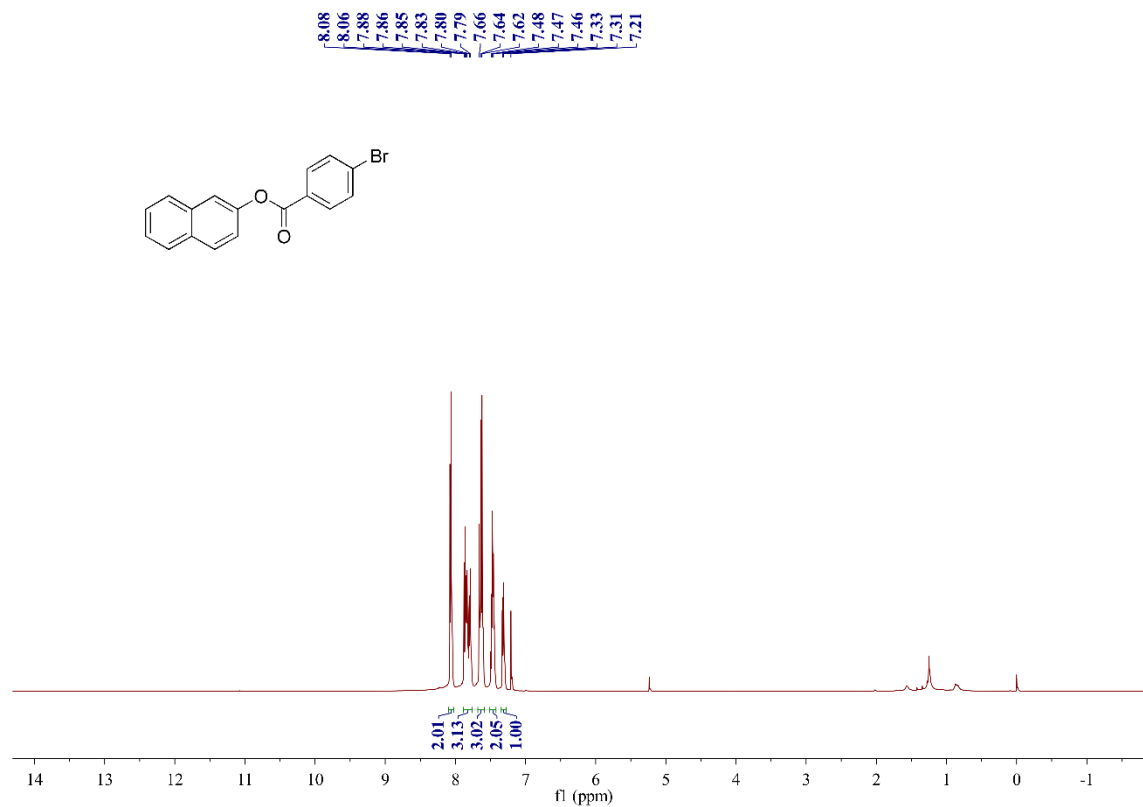
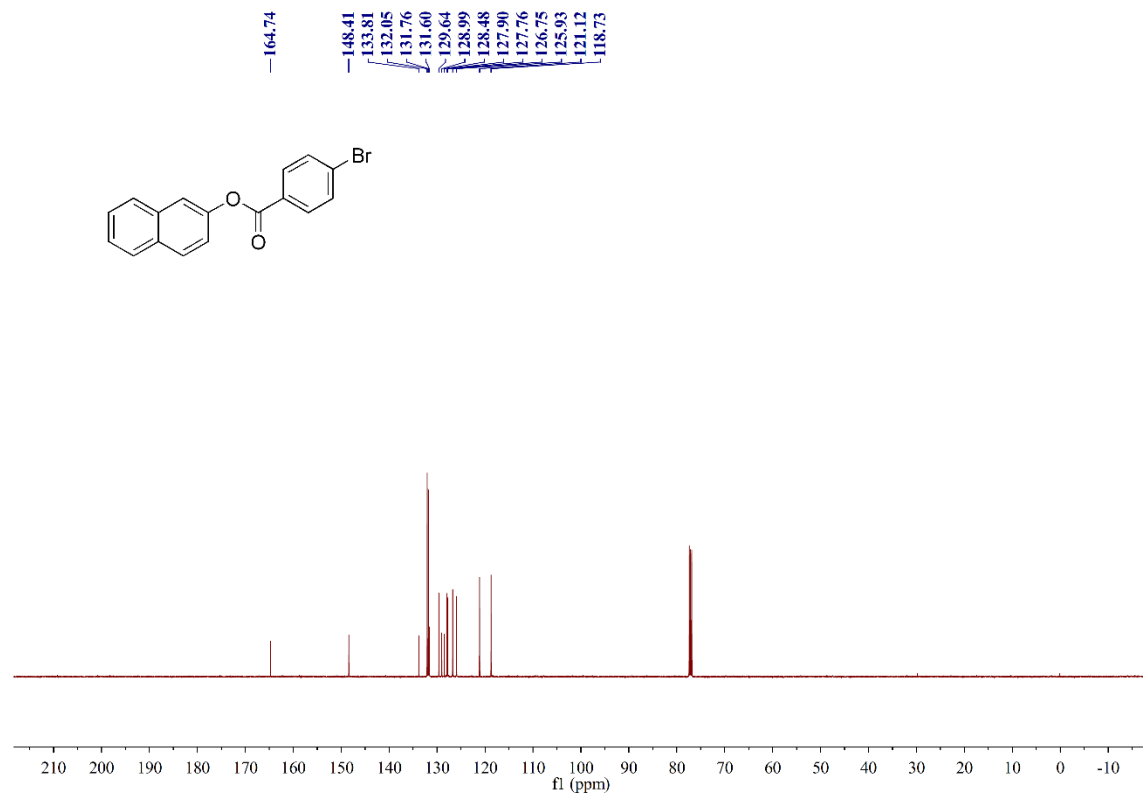
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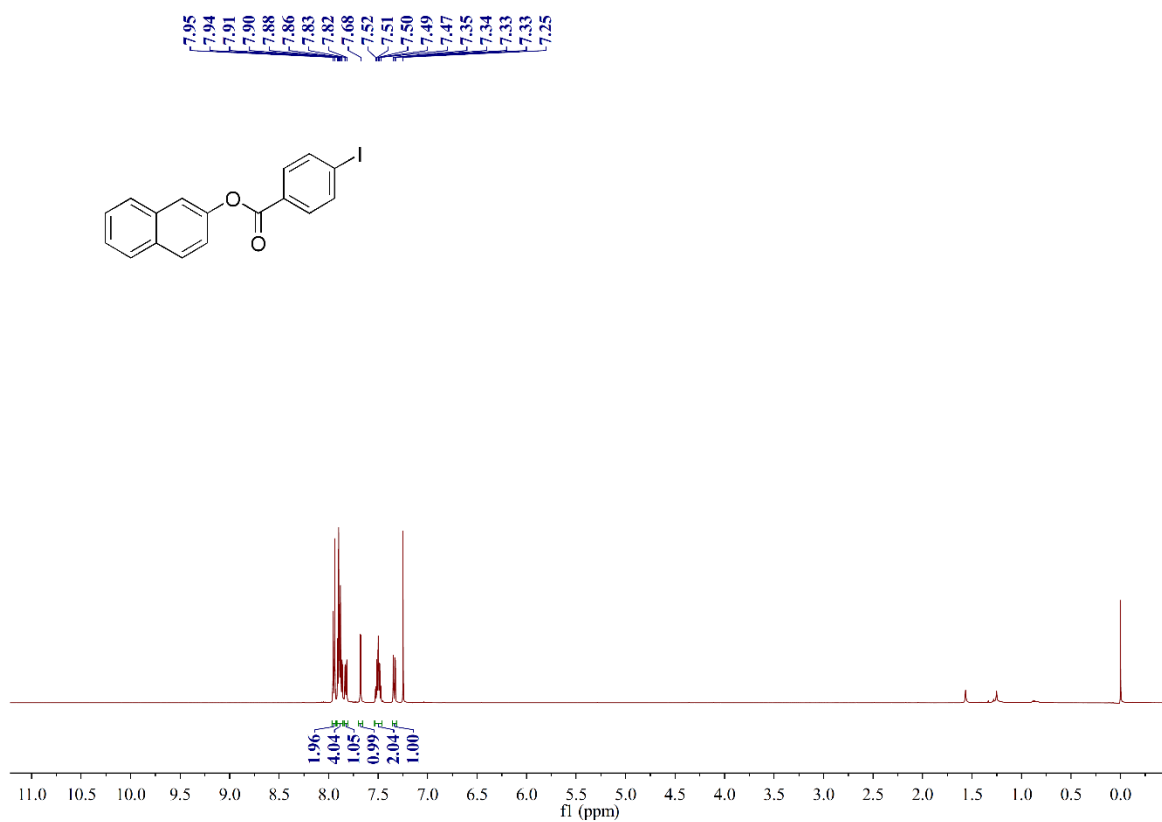
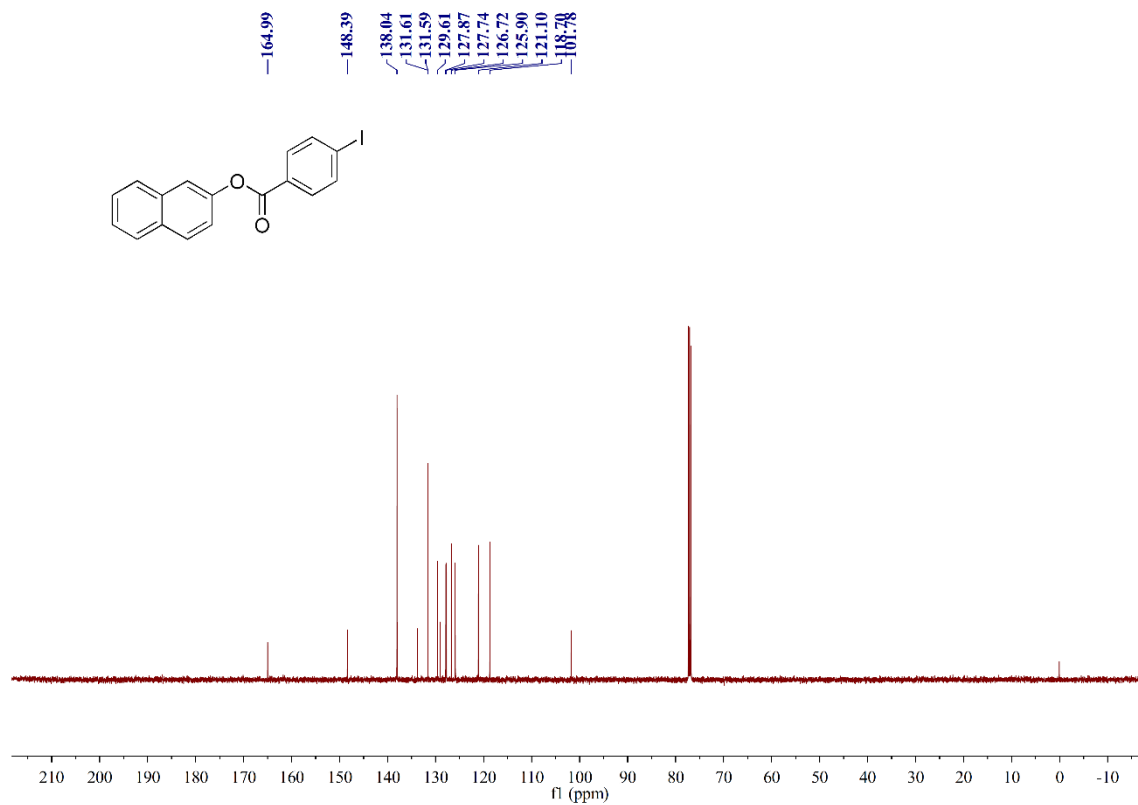
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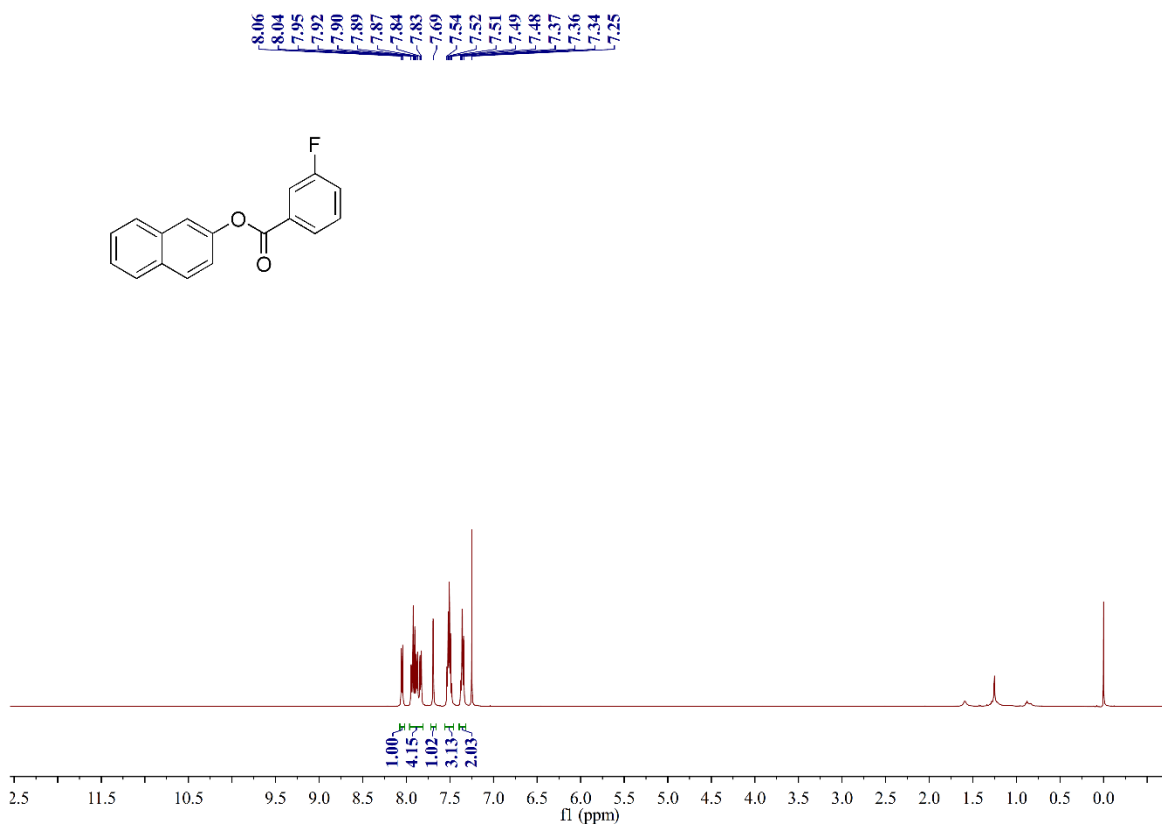
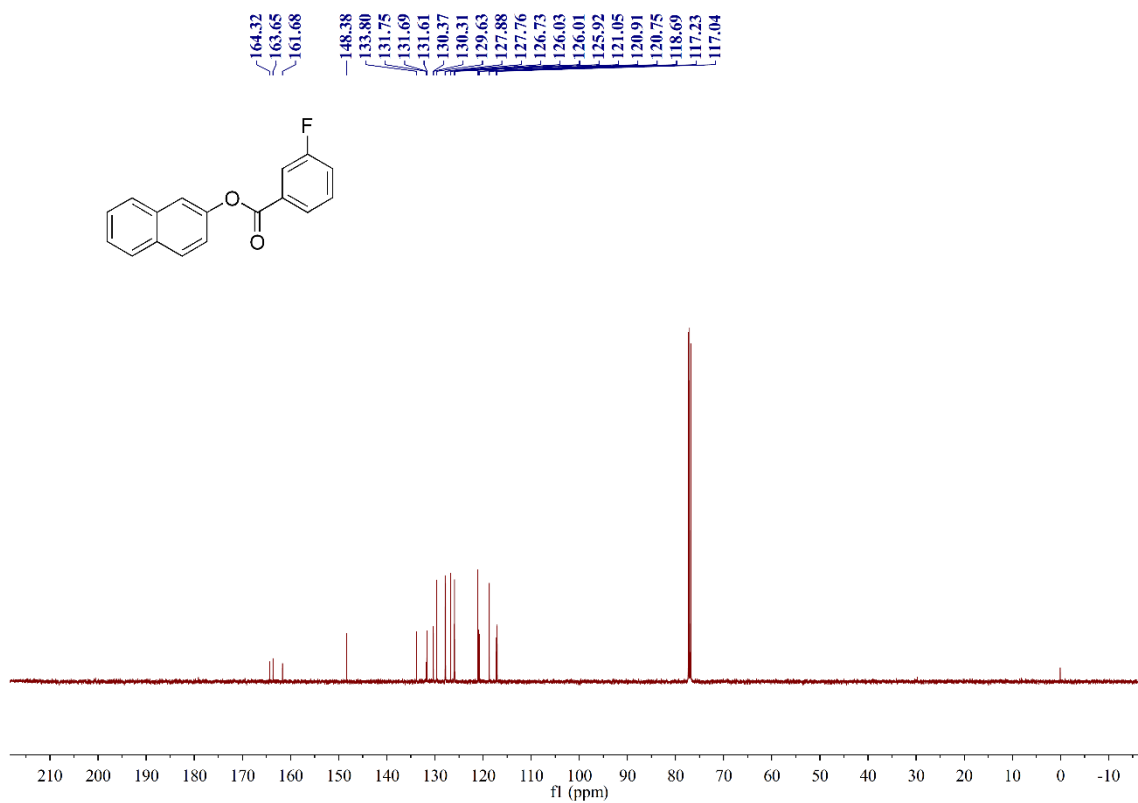
¹H NMR spectra of compound **5f**¹³C NMR spectra of compound **5f**

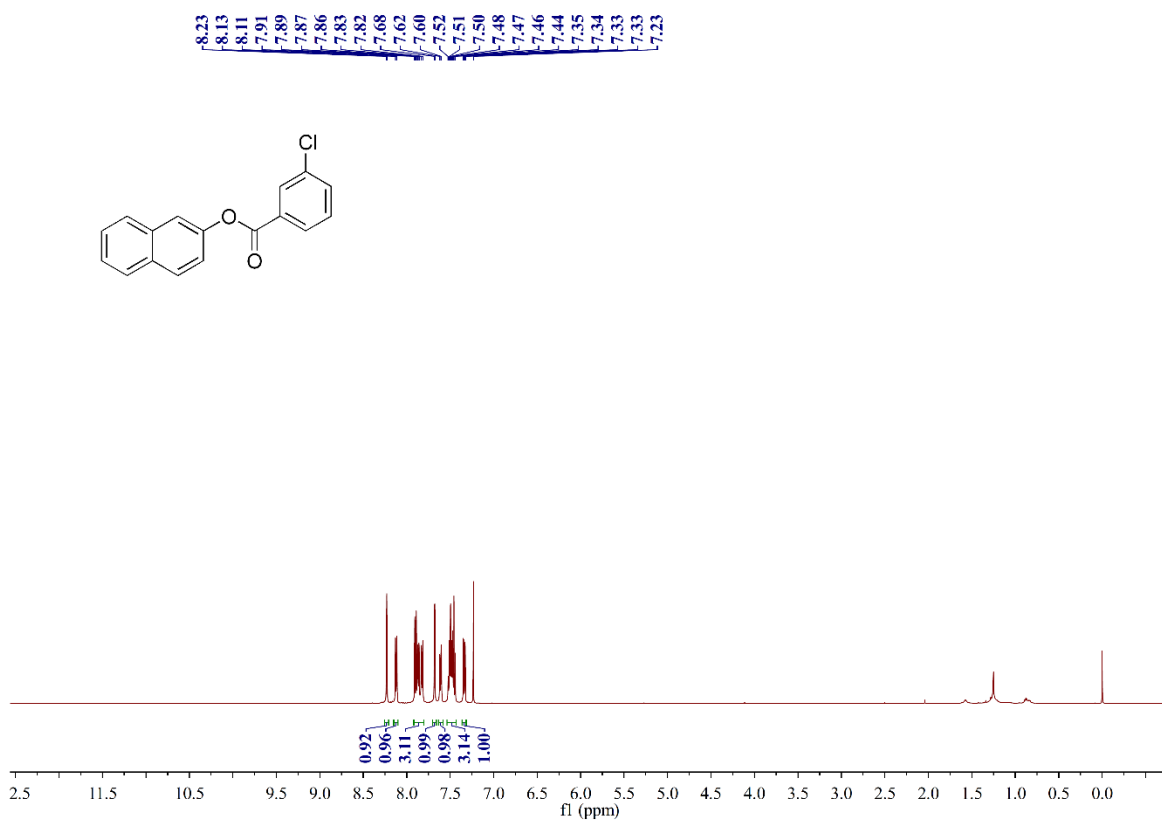
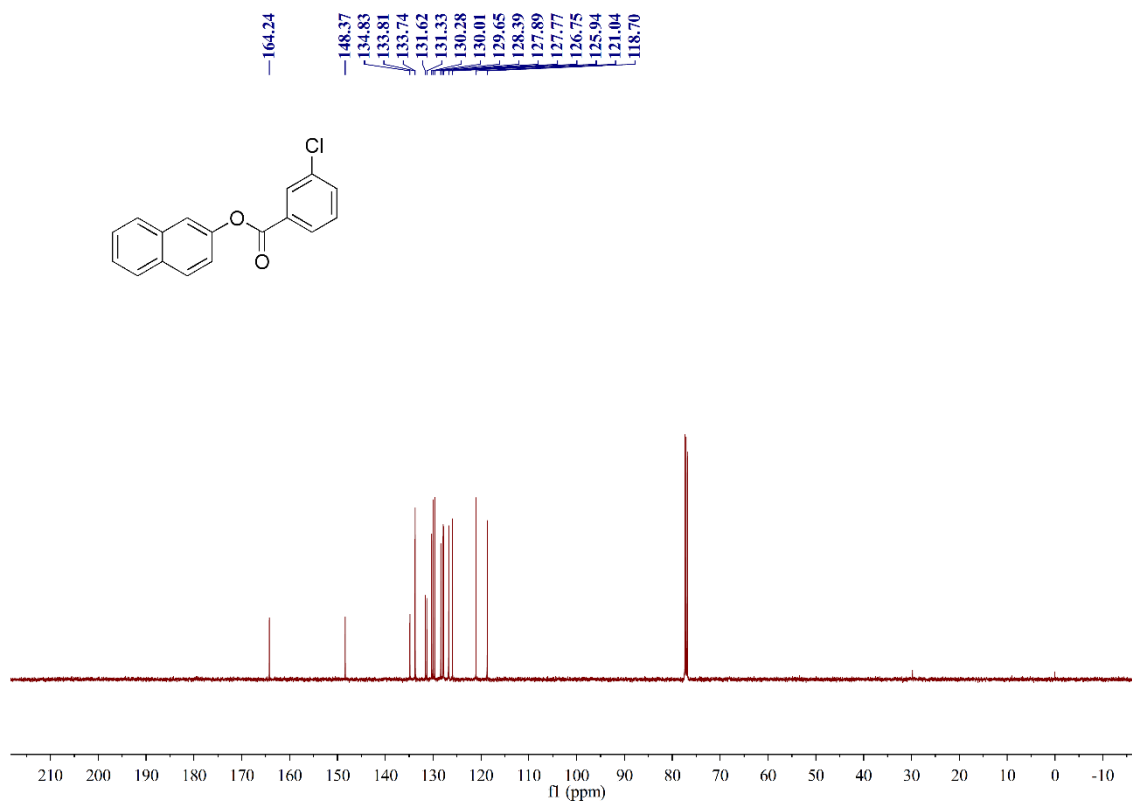
¹H NMR spectra of compound **5g**¹³C NMR spectra of compound **5g**

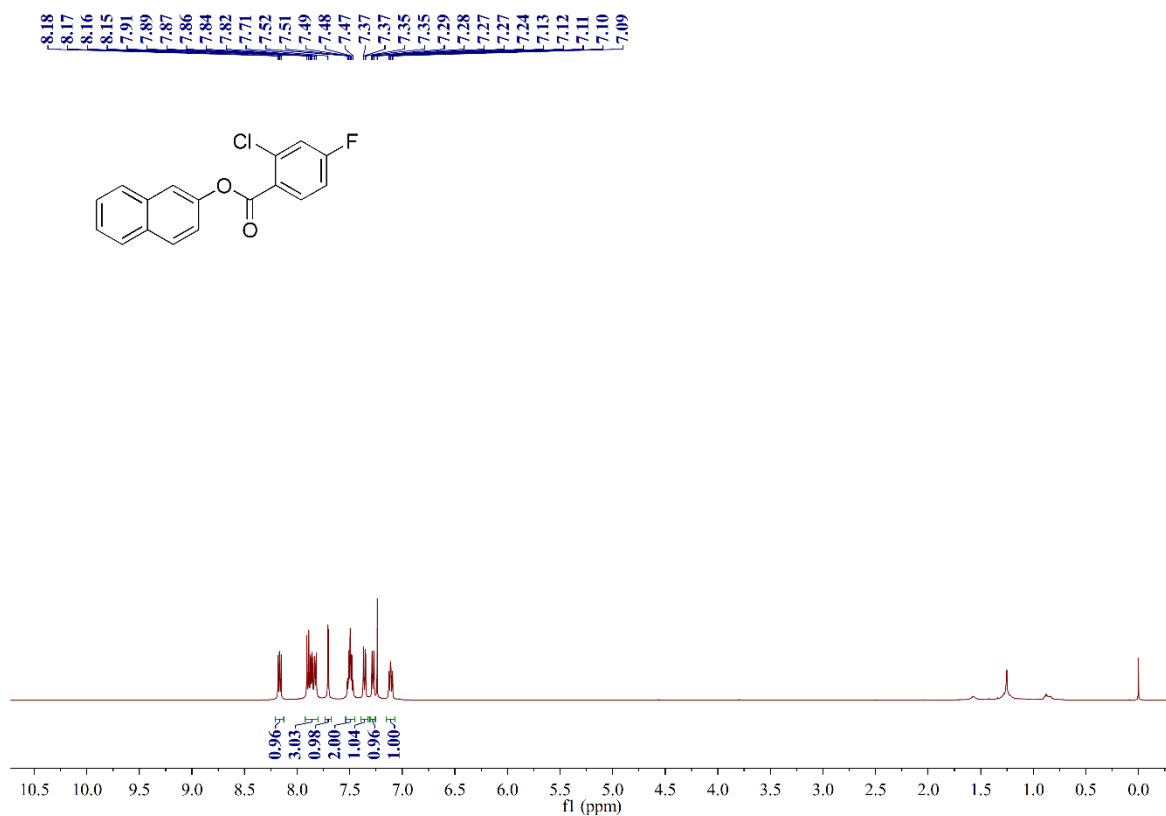
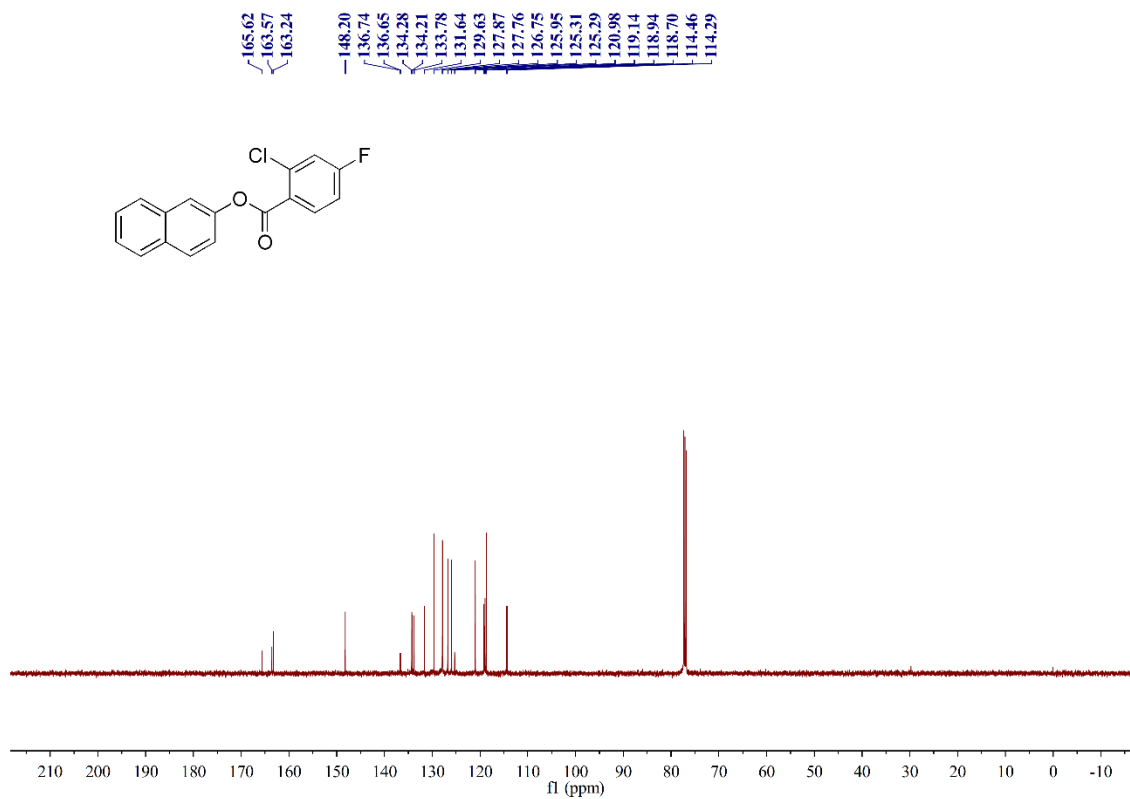
¹H NMR spectra of compound **5h**¹³C NMR spectra of compound **5h**

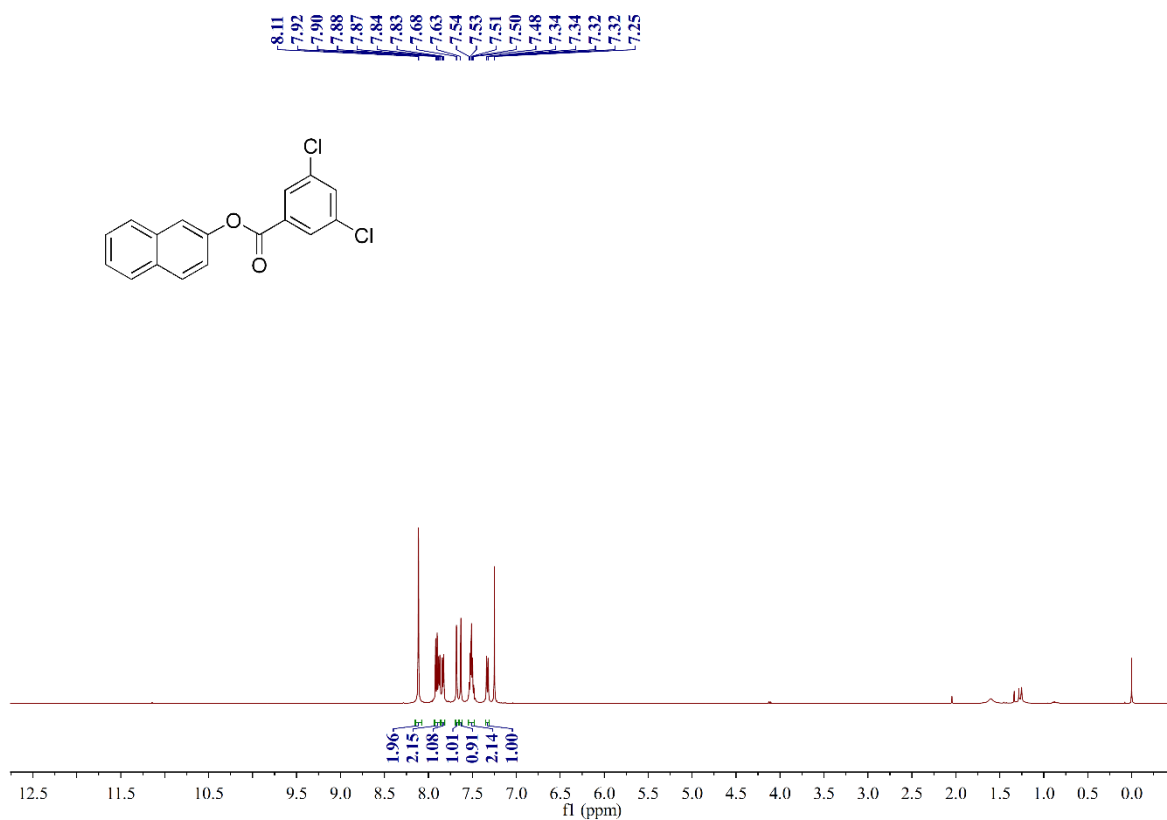
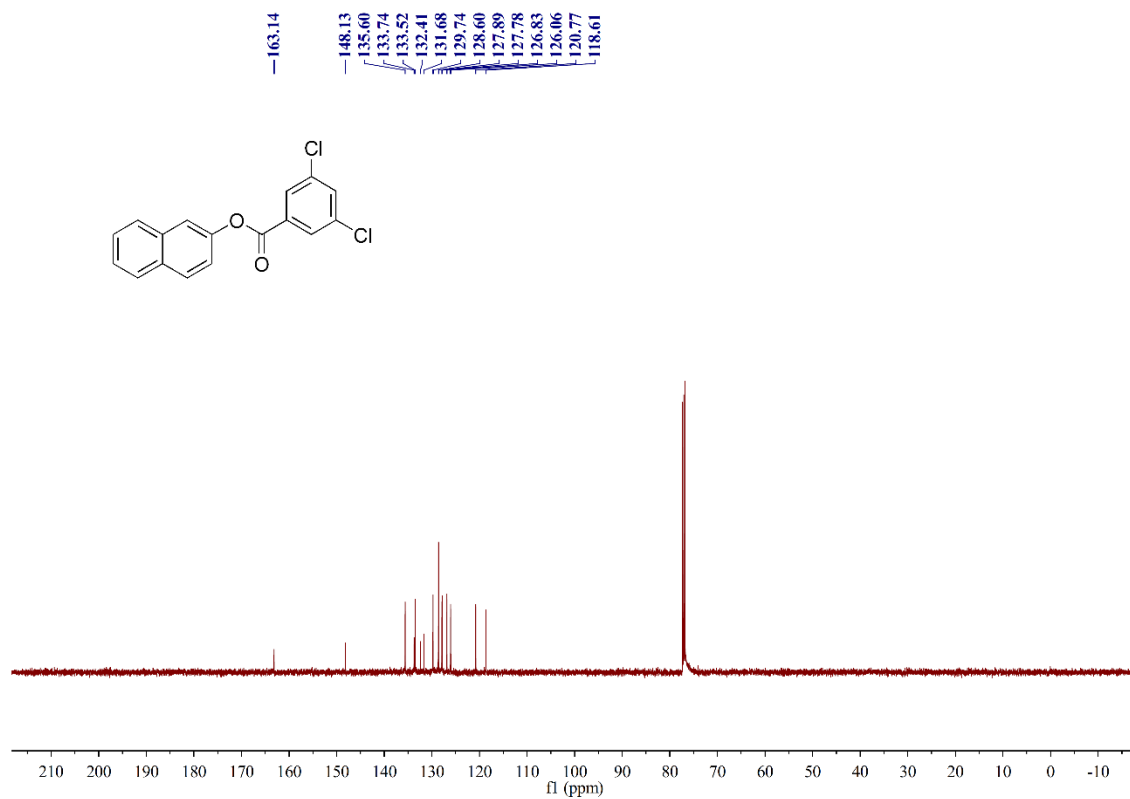
¹H NMR spectra of compound **5i**¹³C NMR spectra of compound **5i**

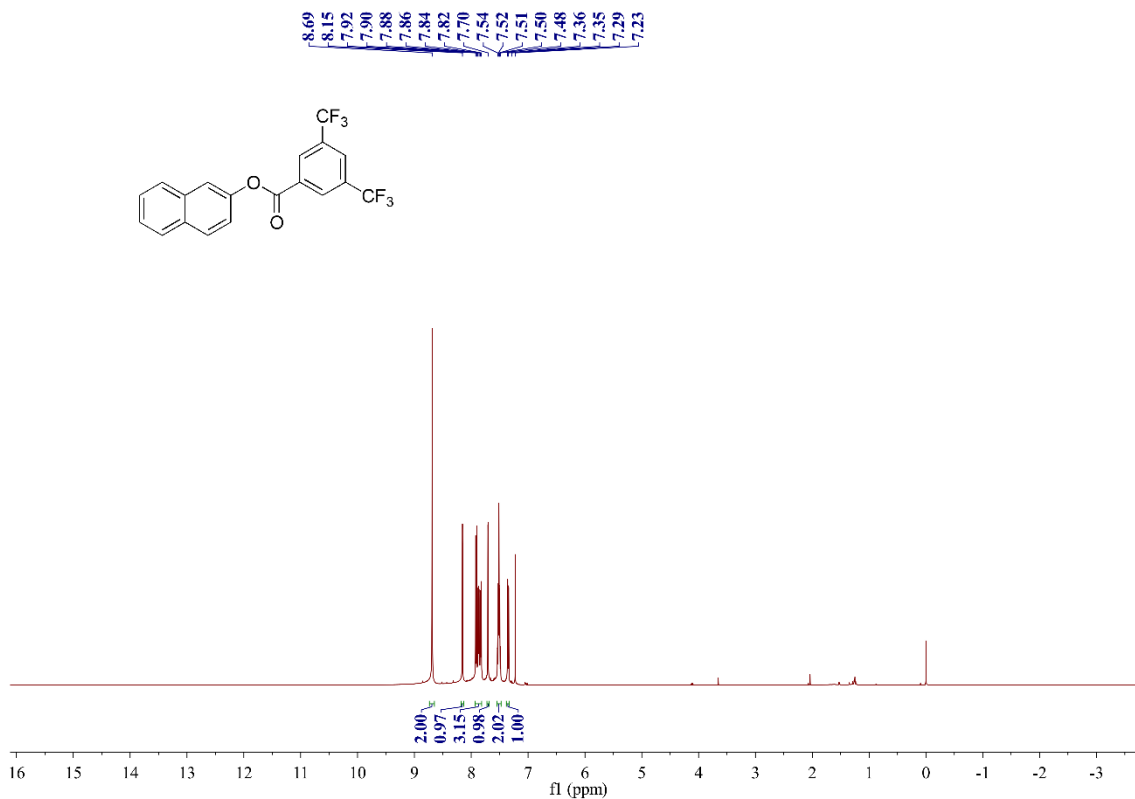
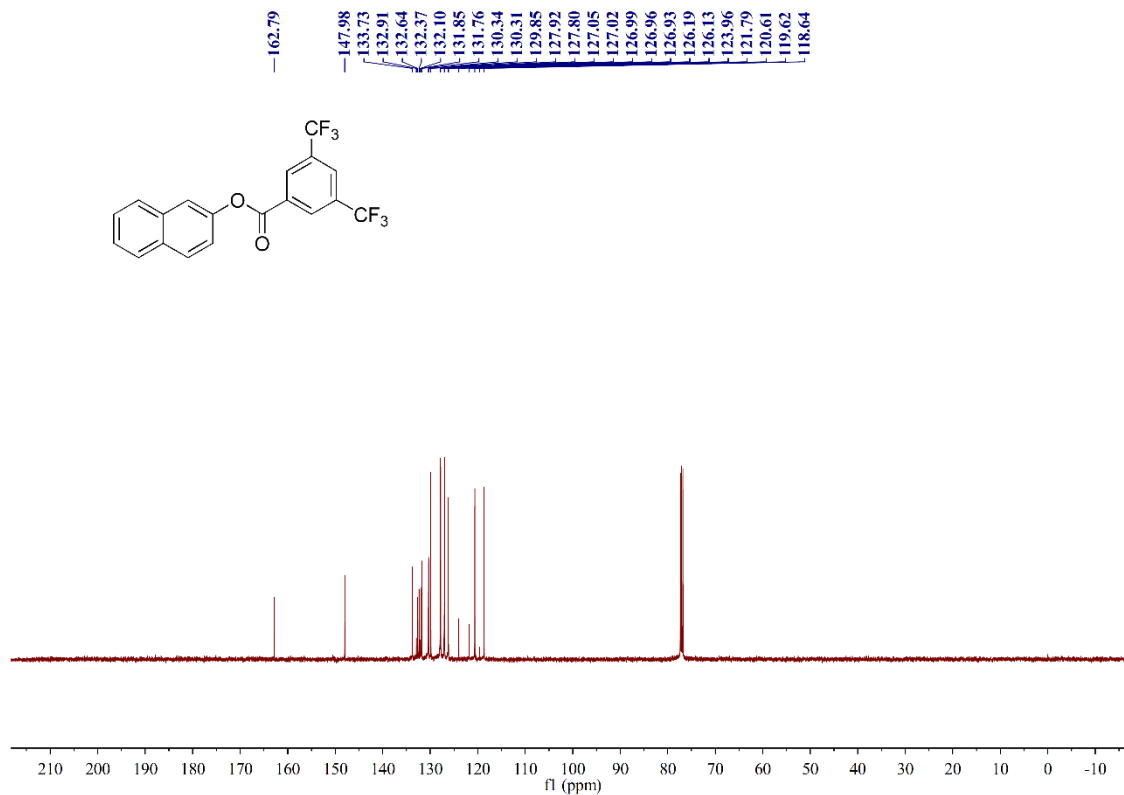
¹H NMR spectra of compound **5j**¹³C NMR spectra of compound **5j**

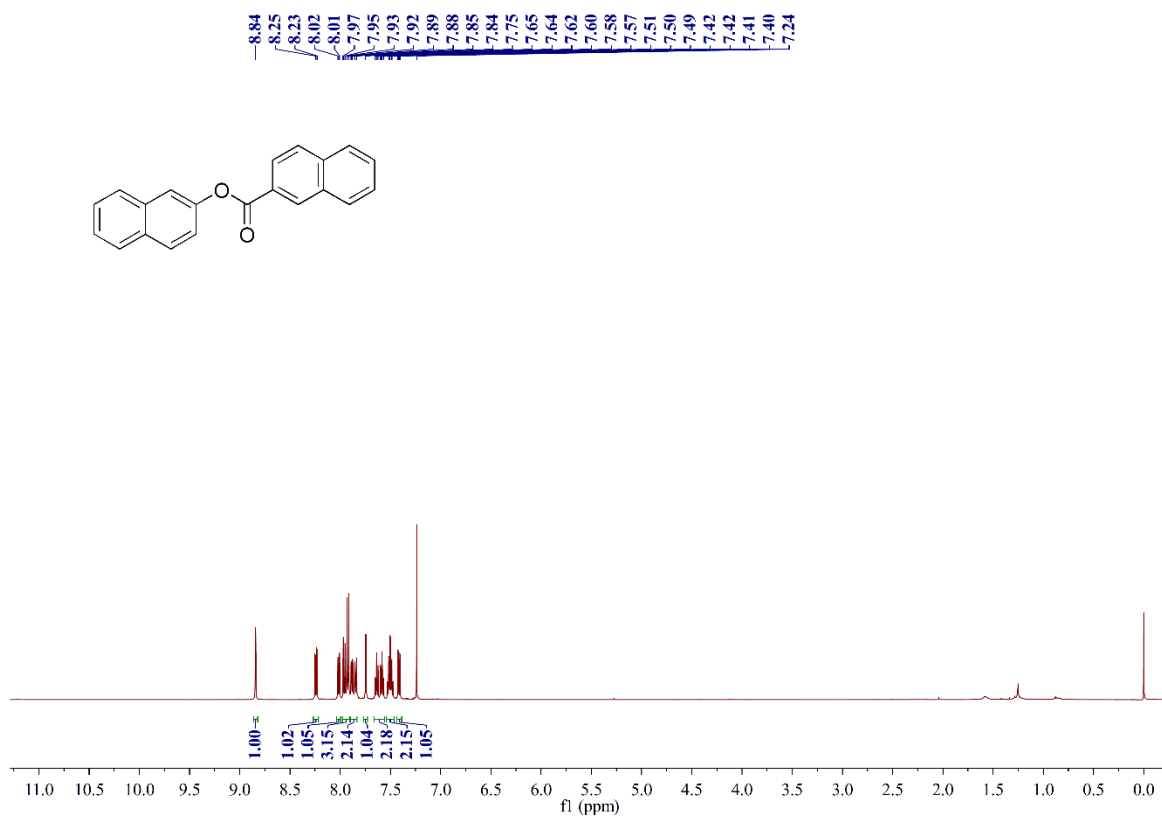
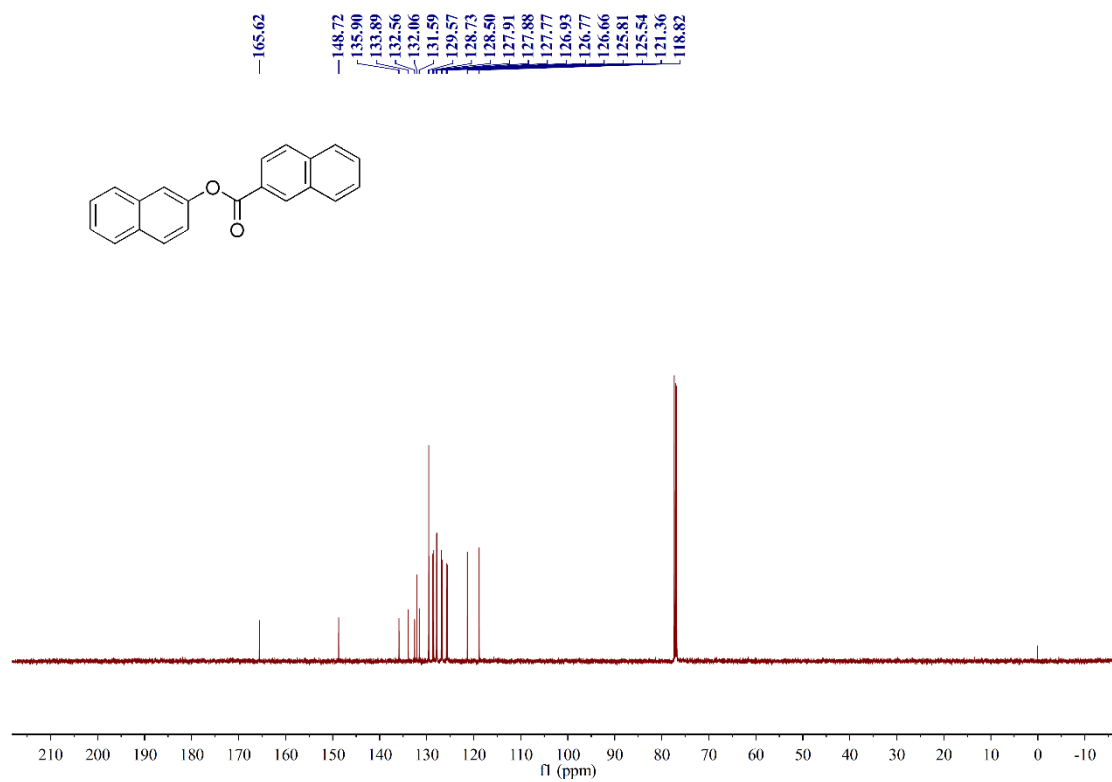
¹H NMR spectra of compound **5k**¹³C NMR spectra of compound **5k**

¹H NMR spectra of compound **5I**¹³C NMR spectra of compound **5I**

¹H NMR spectra of compound **5m**¹³C NMR spectra of compound **5m**

¹H NMR spectra of compound **5n**¹³C NMR spectra of compound **5n**

¹H NMR spectra of compound **5o**¹³C NMR spectra of compound **5o**

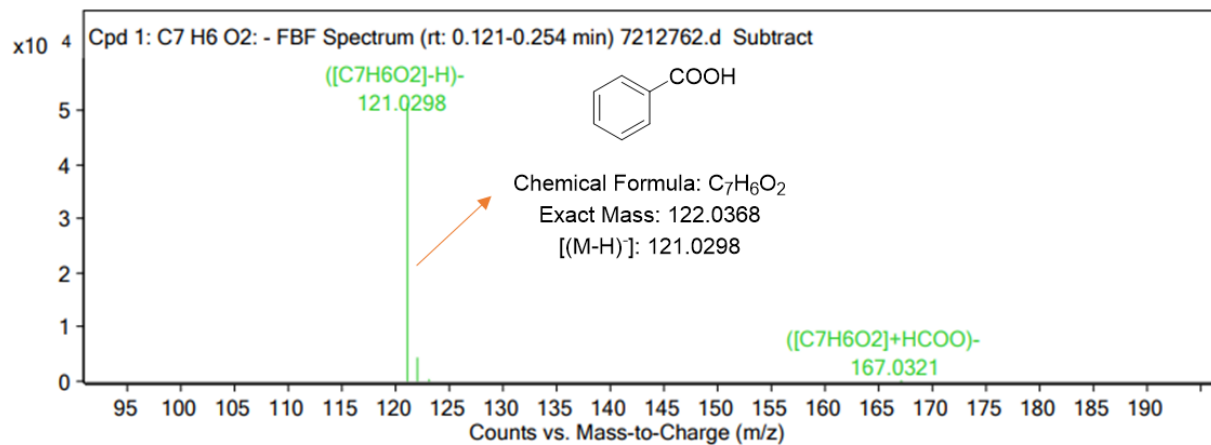
¹H NMR spectra of compound **5p**¹³C NMR spectra of compound **5p**

4. HRMS

Compound Table

Compound Label	RT	Mass	Abund	Formula	Tgt Mass	Diff (ppm)
Cpd 1: C ₇ H ₆ O ₂	0.155	122.037	51414	C ₇ H ₆ O ₂	122.0368	2.14

MS Zoomed Spectrum



5. References

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