

Electronic Supplementary Information

for

Pd-Catalyzed 1, 2-Diarylation of Vinylarenes at Ambient

Temperature

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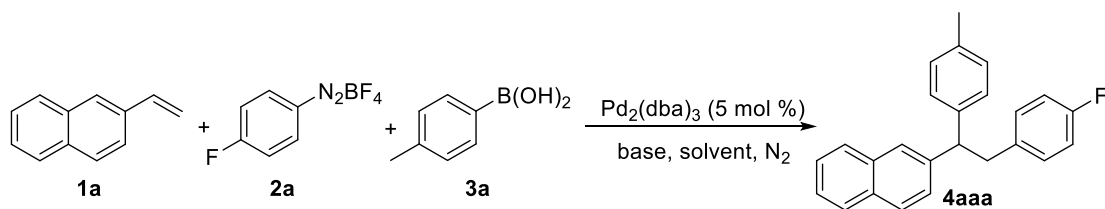
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1. General information. ¹H NMR and ¹³C NMR spectra were recorded at ambient temperature using 500 MHz spectrometers. The data are reported as follows: chemical shift in ppm from internal tetramethylsilane on the δ scale, multiplicity (br = broad, s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constants (Hz) and integration. High-resolution mass spectra were obtained by peak matching. All reactions were carried out under an atmosphere of nitrogen in glassware, which had been oven-dried. All reagents and solvents were purchased from commercial suppliers and used without further purification. Unless otherwise stated, all experiments were conducted in a Schlenk tube under N₂ atmosphere. Reactions were monitored by TLC or GC-MS analysis. Flash column chromatography was performed over silica gel (200-300 mesh).

2. Optimization of experimental conditions¹

Table S1. Condition Screening.^a



entry	base (2 equiv)	solvent (1 mL)	temp (°C)	GC yield (%) ^b
1	Na_2CO_3	t-Amy-OH	60	59
2	K_2CO_3	t-Amy-OH	60	67
3	Cs_2CO_3	t-Amy-OH	60	70
4	KF	t-Amy-OH	60	53
5	NaOAc	t-Amy-OH	60	trace
6	K_3PO_4	t-Amy-OH	60	64
7	K_2HPO_4	t-Amy-OH	60	59
8	KH_2PO_4	t-Amy-OH	60	58
9	CsF	t-Amy-OH	60	trace
10 ^c	Cs_2CO_3	t-Amy-OH	RT	trace
11	Cs_2CO_3	t-Amy-OH	RT	80
12	Cs_2CO_3	MeOH	RT	trace
13	Cs_2CO_3	dioxane	RT	trace
14	Cs_2CO_3	toluene	RT	trace
15	Cs_2CO_3	DMF	RT	no reaction
16	Cs_2CO_3	DCE	RT	trace
17	Cs_2CO_3	THF	RT	no reaction
18	Cs_2CO_3	EtOH	RT	no reaction
19	Cs_2CO_3	t-BuOH	RT	no reaction
20	Cs_2CO_3	EA	RT	no reaction

[a] Reaction conditions: all reactions were ran on 0.2 mmol scale with respect to **1a**.

[b] Yields determined by GC by utilizing dodecane as internal standard, figures in brackets represent separation yield. t-Amy-OH = tert-amyl alcohol. [c] under air.

byproducts

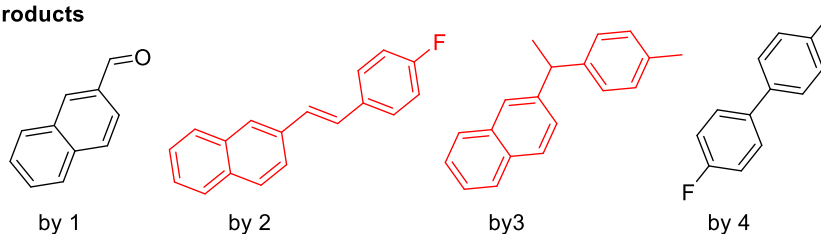
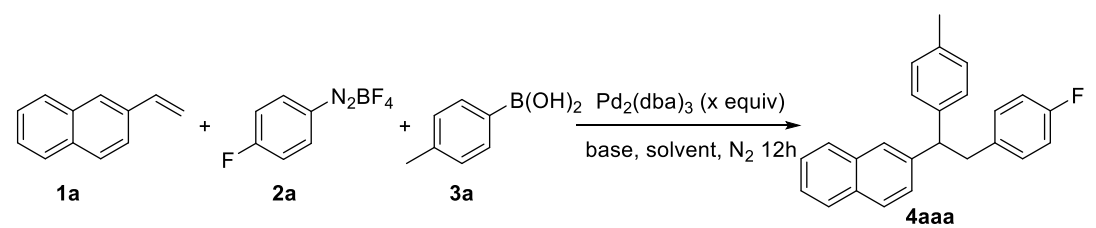
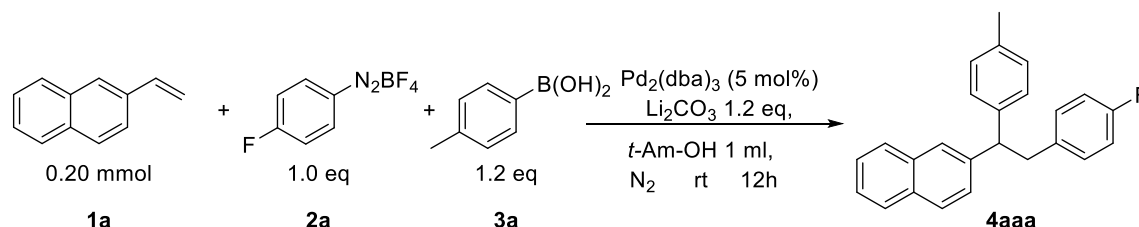


Table S1. Base screening.^a


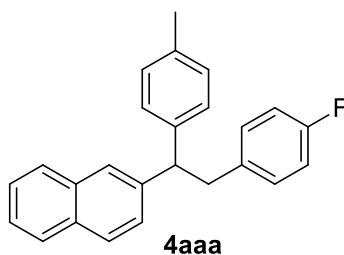
entry	1a (equiv)	2a (equiv)	Pd (equiv)	base (equiv)	solvent (1 mL)	temp (°C)	yield (%) ^b
21	1.0	1.5	0.05	Cs ₂ CO ₃ 2.0	<i>t</i> -Amy-OH	rt	81
22	1.0	1.1	0.05	Cs ₂ CO ₃ 2.0	<i>t</i> -Amy-OH	rt	64
23	1.0	1.2	0.05	Cs₂CO₃ 2.0	<i>t</i>-Amy-OH	rt	80 (70)
24	1.0	1.2	0.05	Cs ₂ CO ₃ 1.5	<i>t</i> -Amy-OH	rt	73
25	1.0	1.2	0.05	Cs ₂ CO ₃ 1.2	<i>t</i> -Amy-OH	rt	77
26	1.0	1.2	0.05	Cs ₂ CO ₃ 1.0	<i>t</i> -Amy-OH	rt	68
27	1.0	1.2	0.05	Li₂CO₃ 1.2	<i>t</i>-Amy-OH	rt	92 (82)
28	1.2	1.2	0.05	Li ₂ CO ₃ 1.2	<i>t</i> -Amy-OH	rt	88 (79)
29	1.0	1.2	0.05	Li ₂ CO ₃ 1.2	<i>t</i> -Amy-OH	0	84
30	1.0	1.2	0.03	Li ₂ CO ₃ 1.2	<i>t</i> -Amy-OH	rt	70
31	1.0	1.2	0.01	Li ₂ CO ₃ 1.2	<i>t</i> -Amy-OH	rt	30

[a] Reaction conditions: all reactions were run on 0.2 mmol scale with respect to **1a**. [b] Yields determined by GC by utilizing dodecane as internal standard, figures in brackets represent separation yield. *t*-Amy-OH = tert-amyl alcohol.

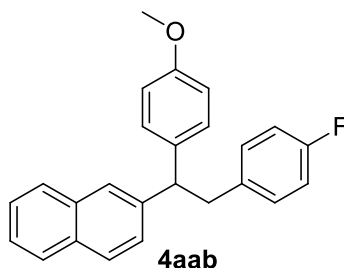
3. General procedure for 1,2-diarylation of vinylnaphthalene derivatives.



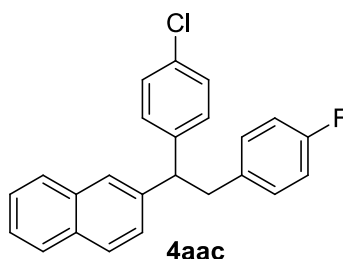
To a 25 mL Schlenk tube, under a nitrogen atmosphere, was added 0.20 mmol of 2-vinylnaphthalene (**1a**) followed by 0.20 mmol of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (1.0 equiv), 0.24 mmol of p-tolylboronic acid (**3a**) (1.2 equiv), 0.01 mmol of Pd₂(dba)₃ (0.05 equiv), 0.24 mmol of lithium carbonate (1.2 equiv), in 1.0 mL of *t*-Amy-OH. The Schlenk tube was sealed and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 120:1 – 80:1, v/v) to afford the product **4aaa** as a slight yellow solid.



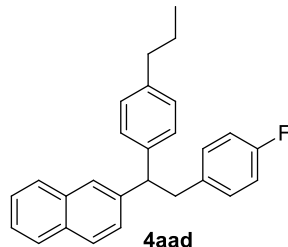
2-(2-(4-fluorophenyl)-1-(p-tolylethyl)naphthalene (4aaa). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 32.6 mg of p-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 56.2 mg of the product as a slight yellow solid (82%). ¹H NMR (500 MHz, CDCl₃) δ 7.78 (t, *J* = 7.8 Hz, 2H), 7.74 (d, *J* = 8.5 Hz, 1H), 7.65 (s, 1H), 7.48 – 7.41 (m, 2H), 7.33 (d, *J* = 8.5 Hz, 1H), 7.14 (d, *J* = 7.8 Hz, 2H), 7.08 (d, *J* = 7.8 Hz, 2H), 7.01 – 6.95 (m, 2H), 6.86 (t, *J* = 8.7 Hz, 2H), 4.32 (t, *J* = 7.8 Hz, 1H), 3.48–3.39 (m, 2H), 2.31 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 161.2 (d, *J* = 242.0 Hz), 141.8, 141.0, 135.9 (d, *J* = 3.3 Hz), 135.8, 133.4, 132.1, 130.4 (d, *J* = 7.8 Hz), 129.1, 128.0, 127.9, 127.7, 127.5, 126.8, 126.0 (d, *J* = 11.4 Hz), 125.4, 114.9, 114.7, 52.9, 41.1, 21.0. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.4. HRMS (EI) *m/z*: calcd for: C₂₅H₂₁F:340.1627; Found: 340.1633.



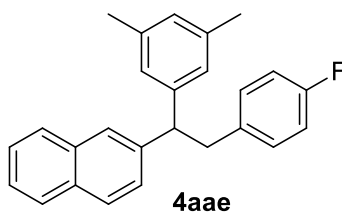
2-(2-(4-fluorophenyl)-1-(4-methoxyphenyl)ethyl)naphthalene (4aab). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 36.5 mg of (4-methoxyphenyl)boronic acid (**3b**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 50:1, v/v) to afford 51.9 mg of the product as a bronzing oil (73%). ¹H NMR (500 MHz, CDCl₃) δ 7.78 (t, *J* = 7.8 Hz, 2H), 7.74 (d, *J* = 8.5 Hz, 1H), 7.65 (s, 1H), 7.48 – 7.41 (m, 2H), 7.31 (d, *J* = 8.5 Hz, 1H), 7.14 (d, *J* = 8.4 Hz, 2H), 7.00 – 6.94 (m, 2H), 6.85 (t, *J* = 8.4 Hz, 2H), 6.81 (d, *J* = 8.7 Hz, 2H), 4.30 (t, *J* = 7.8 Hz, 1H), 3.77 (s, 3H), 3.41 (qd, *J* = 13.6, 7.8 Hz, 2H). ¹³C NMR (125 MHz, CDCl₃) δ 161.2 (d, *J* = 242.1 Hz), 158.0, 142.0, 136.1, 135.9 (d, *J* = 3.2 Hz), 133.4, 132.1, 130.4 (d, *J* = 7.7 Hz), 129.0, 128.0, 127.7, 127.5, 126.8, 125.9 (d, *J* = 8.3 Hz), 125.4, 114.9, 114.7, 113.7, 55.2, 52.4, 41.2. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.4. HRMS (EI) *m/z*: calcd for: C₂₅H₂₁FO: 356.1576; Found: 356.1569.



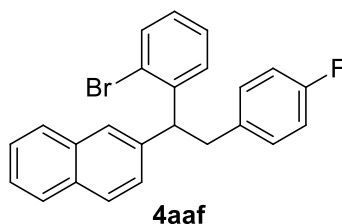
2-(1-(4-chlorophenyl)-2-(4-fluorophenyl)ethyl)naphthalene (4aac). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 37.5 mg of (4-chlorophenyl)boronic acid (**3c**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 80:1, v/v) to afford 51.9 mg of the product as a slight yellow solid (70%). ¹H NMR (500 MHz, CDCl₃) δ 7.79 (dd, *J* = 8.8, 7.9 Hz, 2H), 7.75 (d, *J* = 8.5 Hz, 1H), 7.65 (s, 1H), 7.50 – 7.43 (m, 2H), 7.28 (dd, *J* = 8.5, 1.4 Hz, 1H), 7.23 (d, *J* = 8.4 Hz, 2H), 7.14 (t, *J* = 7.5 Hz, 2H), 6.96 (dt, *J* = 8.1, 5.9 Hz, 2H), 6.87 (t, *J* = 8.7 Hz, 2H), 4.32 (t, *J* = 7.8 Hz, 1H), 3.46 (dd, *J* = 13.6, 7.4 Hz, 1H), 3.36 (dd, *J* = 13.6, 8.3 Hz, 1H). ¹³C NMR (125 MHz, CDCl₃) δ 161.3 (d, *J* = 242.4 Hz), 142.5, 141.1, 135.4 (d, *J* = 3.2 Hz), 133.4, 132.2, 132.1, 130.4 (d, *J* = 7.8 Hz), 129.5, 128.5, 128.2, 127.7, 127.6, 126.6, 126.0 (d, *J* = 18.0 Hz), 125.7, 115.0, 114.9, 52.6, 41.0. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.0. HRMS (EI) *m/z*: calcd for: C₂₄H₁₈ClF: 360.1081; Found: 360.1085.



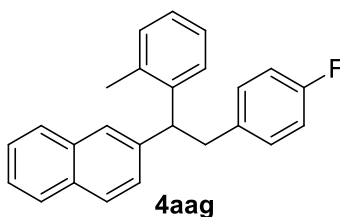
2-(2-(4-fluorophenyl)-1-(4-propylphenyl)ethyl)naphthalene (4aad). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 39.4 mg of (4-propylphenyl)boronic acid (**3d**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 52.5 mg of the product as a slight yellow solid (71%). ¹H NMR (500 MHz, CDCl₃) δ 7.81 (t, *J* = 7.5 Hz, 2H), 7.77 (d, *J* = 8.6 Hz, 1H), 7.68 (s, 1H), 7.50 – 7.43 (m, 2H), 7.37 (d, *J* = 8.5 Hz, 1H), 7.19 (d, *J* = 7.5 Hz, 2H), 7.12 (d, *J* = 7.3 Hz, 2H), 7.02 – 6.96 (m, 2H), 6.88 (t, *J* = 8.2 Hz, 2H), 4.35 (t, *J* = 7.8 Hz, 1H), 3.52 – 3.40 (m, 2H), 2.58 (t, *J* = 7.6 Hz, 2H), 1.70 – 1.61 (m, 2H), 0.97 (t, *J* = 7.3 Hz, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 161.2 (d, *J* = 242.0 Hz), 141.8, 141.3, 140.6, 135.9 (d, *J* = 3.1 Hz), 133.4, 132.1, 130.4 (d, *J* = 7.8 Hz), 128.5, 128.0, 127.8, 127.7, 127.5, 126.8, 126.0 (d, *J* = 23.4 Hz), 125.4, 114.9, 114.7, 52.9, 41.1, 37.6, 24.5, 13.8. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.5. HRMS (EI) *m/z*: calcd for: C₂₇H₂₅F: 368.1940; Found: 368.1937.



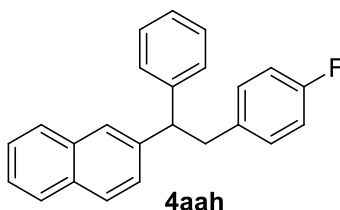
2-(1-(3,5-dimethylphenyl)-2-(4-fluorophenyl)ethyl)naphthalene (4aae). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 39.4 mg of (3, 5-dimethylphenyl)boronic acid (**3e**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 54.4 mg of the product as a yellow oil (77%). ¹H NMR (500 MHz, CDCl₃) δ 7.78 (dd, *J* = 8.8, 7.1 Hz, 2H), 7.74 (d, *J* = 8.5 Hz, 1H), 7.64 (s, 1H), 7.48 – 7.41 (m, 2H), 7.34 (dd, *J* = 8.5, 1.7 Hz, 1H), 7.01 – 6.95 (m, 2H), 6.89 (s, 2H), 6.85 (dd, *J* = 11.9, 5.5 Hz, 3H), 4.28 (t, *J* = 7.8 Hz, 1H), 3.48 – 3.39 (m, 2H), 2.28 (s, 6H). ¹³C NMR (125 MHz, CDCl₃) δ 161.2 (d, *J* = 242.0 Hz), 144.1, 141.7, 137.8, 136.0 (d, *J* = 3.2 Hz), 133.4, 132.1, 130.4 (d, *J* = 7.8 Hz), 128.0 (d, *J* = 6.4 Hz), 127.7, 127.5, 126.8, 126.2, 125.9, 125.4, 114.9, 114.7, 53.2, 41.1, 21.4. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.6. HRMS (EI) *m/z*: calcd for: C₂₆H₂₃F: 354.1784; Found: 354.1790.



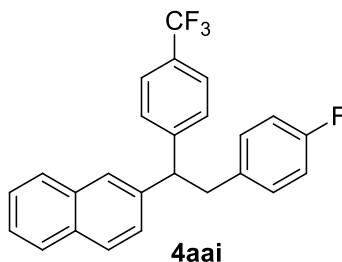
2-(1-(2-bromophenyl)-2-(4-fluorophenyl)ethyl)naphthalene (4aaf). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 48.0 mg of (2-bromophenyl)boronic acid (**3f**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 54.4 mg of the product as a slight bronzing solid (62%). ¹H NMR (500 MHz, CDCl₃) δ 7.80 (dd, *J* = 7.9, 6.6 Hz, 2H), 7.76 (d, *J* = 8.5 Hz, 1H), 7.72 (s, 1H), 7.55 (dd, *J* = 8.0, 1.1 Hz, 1H), 7.50 – 7.43 (m, 2H), 7.41 (dd, *J* = 7.8, 1.5 Hz, 1H), 7.36 (dd, *J* = 8.5, 1.7 Hz, 1H), 7.32 – 7.27 (m, 1H), 7.07 (dd, *J* = 11.1, 5.5 Hz, 3H), 6.92 – 6.85 (m, 2H), 4.99 (t, *J* = 7.8 Hz, 1H), 3.43 (qd, *J* = 13.9, 7.8 Hz, 2H). ¹³C NMR (125 MHz, CDCl₃) δ 161.3 (d, *J* = 242.4 Hz), 143.1, 139.9, 135.2 (d, *J* = 3.2 Hz), 133.3, 133.0, 132.2, 130.4 (d, *J* = 7.8 Hz), 129.2, 127.9 (d, *J* = 4.5 Hz), 127.8, 127.6 (d, *J* = 1.4 Hz), 127.1, 126.6, 126.0, 125.6, 125.3, 115.0, 114.8, 51.0, 40.7. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.1. HRMS (EI) *m/z*: calcd for: C₂₄H₁₈BrF: 404.0576; Found: 404.0580.



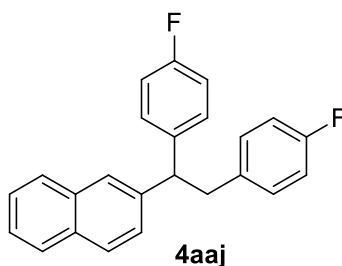
2-(2-(4-fluorophenyl)-1-(o-tolyl)ethyl)naphthalene (4aag). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 32.6 mg of (2-tolylphenyl)boronic acid (**3g**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 54.4 mg of the product as a yellow solid (76%). ¹H NMR (500 MHz, CDCl₃) δ 7.79 – 7.76 (m, 1H), 7.74 – 7.71 (m, 1H), 7.70 (d, *J* = 8.5 Hz, 1H), 7.54 (s, 1H), 7.46 – 7.40 (m, 3H), 7.22 (ddd, *J* = 9.6, 8.5, 4.5 Hz, 2H), 7.14 (td, *J* = 7.4, 1.2 Hz, 1H), 7.09 (d, *J* = 6.7 Hz, 1H), 6.96 – 6.90 (m, 2H), 6.85 (t, *J* = 8.7 Hz, 2H), 4.52 (t, *J* = 7.7 Hz, 1H), 3.45 – 3.36 (m, 2H), 2.14 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 161.3 (d, *J* = 241.1 Hz), 142.1, 141.1, 136.4, 135.9 (d, *J* = 3.2 Hz), 133.3, 132.0, 130.5 (d, *J* = 2.5 Hz), 130.4, 127.8, 127.7, 127.5, 127.1 (d, *J* = 5.2 Hz), 126.4, 126.3, 126.1, 125.9, 125.4, 114.9, 114.7, 48.9, 41.5, 19.8. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.3. HRMS (EI) *m/z*: calcd for: C₂₅H₂₁F: 340.1627; Found: 340.1614.



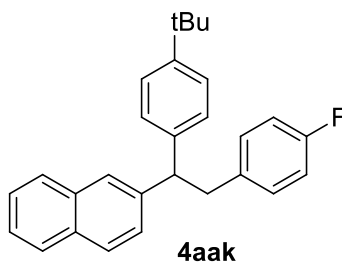
2-(2-(4-fluorophenyl)-1-phenylethyl)naphthalene (4aah). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 29.3 mg of boronic acid (**3h**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 44.5 mg of the product as a yellow oil (68%). ¹H NMR (500 MHz, CDCl₃) δ 7.81 (t, *J* = 7.3 Hz, 2H), 7.77 (d, *J* = 8.5 Hz, 1H), 7.69 (s, 1H), 7.50 – 7.43 (m, 2H), 7.35 (dd, *J* = 8.5, 1.6 Hz, 1H), 7.32 – 7.28 (m, 2H), 7.27 (dd, *J* = 6.6, 1.2 Hz, 2H), 7.24 – 7.19 (m, 1H), 7.02 – 6.96 (m, 2H), 6.87 (dd, *J* = 12.1, 5.2 Hz, 2H), 4.38 (t, *J* = 7.8 Hz, 1H), 3.47 (qd, *J* = 13.7, 7.9 Hz, 2H). ¹³C NMR (125 MHz, CDCl₃) δ 161.6 (d, *J* = 242.3 Hz), 144.0, 141.6, 135.8 (d, *J* = 3.2 Hz), 133.4, 132.1, 130.4 (d, *J* = 7.8 Hz), 128.4, 128.1, 128.0, 127.7, 127.5, 126.8, 126.3, 126.0 (d, *J* = 12.9 Hz), 125.5, 114.9, 114.7, 53.3, 41.0. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.4. HRMS (EI) *m/z*: calcd for: C₂₄H₁₉F: 326.1471; Found: 326.1459.



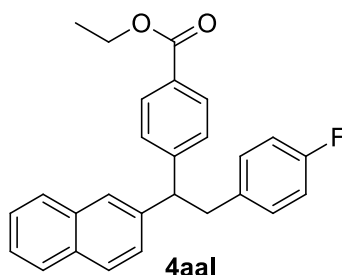
2-(2-(4-fluorophenyl)-1-(4-(trifluoromethyl)phenyl)ethyl)naphthalene (4aai). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 45.6 mg of (4-(trifluoromethyl)phenyl)boronic acid (**3i**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 80:1, v/v) to afford 49.5 mg of the product as a bronzing solid (63 %). ¹H NMR (500 MHz, CDCl₃) δ 7.83 (ddd, *J* = 15.3, 9.3, 5.2 Hz, 2H), 7.77 (d, *J* = 8.6 Hz, 1H), 7.68 (s, 1H), 7.51 (dd, *J* = 8.4, 4.9 Hz, 2H), 7.49 – 7.44 (m, 2H), 7.33 (d, *J* = 8.1 Hz, 2H), 7.29 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.00 – 6.95 (m, 2H), 6.91 – 6.84 (m, 2H), 4.41 (t, *J* = 7.8 Hz, 1H), 3.51 (dd, *J* = 13.7, 7.6 Hz, 1H), 3.41 (dd, *J* = 13.7, 8.1 Hz, 1H). ¹³C NMR (125 MHz, CDCl₃) δ 161.3 (d, *J* = 242.9 Hz), 148.1, 140.5, 135.1 (d, *J* = 3.3 Hz), 133.4, 132.3, 130.4 (d, *J* = 7.9 Hz), 128.4, 128.3, 127.7, 127.6, 126.5, 126.2 (d, *J* = 5.7 Hz), 125.8, 125.3 (q, *J* = 3.7 Hz), 115.1, 115.0, 53.1, 40.8. ¹⁹F NMR (471 MHz, CDCl₃) δ -62.3, -116.9. HRMS, *m/z*: calcd for: C₂₅H₁₈F₄: 394.1345; Found: 394.1335.



2-(1,2-bis(4-fluorophenyl)ethyl)naphthalene (4aaj). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 33.6 mg of (4-fluorophenyl)boronic acid (**3j**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 55.1 mg of the product as a yellow solid (80%). ¹H NMR (500 MHz, CDCl₃) δ 7.79 (t, *J* = 7.7 Hz, 2H), 7.75 (d, *J* = 8.6 Hz, 1H), 7.66 (s, 1H), 7.46 (p, *J* = 6.9 Hz, 2H), 7.30 (d, *J* = 8.5 Hz, 1H), 7.16 (dd, *J* = 7.2, 5.5 Hz, 2H), 7.00 – 6.91 (m, 4H), 6.90 – 6.83 (m, 2H), 4.33 (t, *J* = 7.8 Hz, 1H), 3.46 (dd, *J* = 13.6, 7.4 Hz, 1H), 3.37 (dd, *J* = 13.6, 8.2 Hz, 1H). ¹³C NMR (125 MHz, CDCl₃) δ 161.4 (d, *J* = 251.6 Hz), 161.4 (d, *J* = 233.9 Hz), 141.4, 139.7 (d, *J* = 3.2 Hz), 135.6 (d, *J* = 3.1 Hz), 133.4, 132.2, 130.4 (d, *J* = 7.9 Hz), 129.5 (d, *J* = 7.8 Hz), 128.1, 127.7 (d, *J* = 19.2 Hz), 126.7, 126.0 (d, *J* = 18.4 Hz), 125.6, 115.3, 115.1, 115.0, 114.8, 52.5, 41.2. ¹⁹F NMR (471 MHz, CDCl₃) δ -116.7, -117.2. HRMS (EI) *m/z*: calcd for: C₂₄H₁₈F₂: 344.1377; Found: 344.1385.

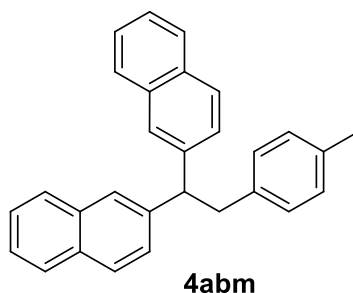


2-(1-(4-(tert-butyl)phenyl)-2-(4-fluorophenyl)ethyl)naphthalene (4aak). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 42.7 mg of (4-(tert-butyl)phenyl)boronic acid (**3k**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 66.5 mg of the product as a slight yellow solid (87%). ¹H NMR (500 MHz, CDCl₃) δ 7.76 (dd, *J* = 19.9, 9.8 Hz, 3H), 7.63 (s, 1H), 7.47 – 7.40 (m, 2H), 7.34 (d, *J* = 8.5 Hz, 1H), 7.32 – 7.28 (m, 2H), 7.21 (d, *J* = 8.2 Hz, 2H), 6.99 – 6.94 (m, 2H), 6.84 (t, *J* = 8.7 Hz, 2H), 4.33 (t, *J* = 7.7 Hz, 1H), 3.44 (d, *J* = 7.8 Hz, 2H), 1.30 (s, 9H). ¹³C NMR (125 MHz, CDCl₃) δ 161.2 (d, *J* = 241.9 Hz), 149.1, 141.6, 141.1, 136.0 (d, *J* = 3.2 Hz), 133.4, 132.1, 130.4 (d, *J* = 7.8 Hz), 128.0, 127.7, 127.5, 126.8, 126.3, 125.9, 125.4, 125.3, 114.9, 114.7, 52.9, 41.1, 34.3, 31.3. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.5. HRMS (EI) *m/z*: calcd for: C₂₈H₂₇F: 382.2097; Found: 382.2106.

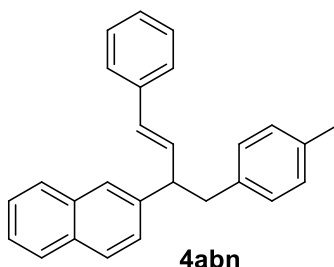


ethyl 4-(2-(4-fluorophenyl)-1-(naphthalen-2-yl)ethyl)benzoate (4aal). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 46.6 mg of (4-(ethoxycarbonyl)phenyl)boronic acid (**3l**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 43.1 mg of the product as a yellow solid (54%). ¹H NMR (500 MHz, CDCl₃) δ 7.95 (d, *J* = 7.3 Hz, 2H), 7.79 (t, *J* = 7.2 Hz, 2H), 7.75 (d, *J* = 8.5 Hz, 1H), 7.68 (s, 1H), 7.50 – 7.43 (m, 2H), 7.29 (d, *J* = 7.3 Hz, 3H), 6.97 (dd, *J* = 8.2, 5.6 Hz, 2H), 6.86 (t, *J* = 8.4 Hz, 2H), 4.41 (t, *J* = 7.8 Hz, 1H), 4.36 (q, *J* = 6.8 Hz, 2H), 3.50 (dd, *J* = 13.7, 7.4 Hz, 1H), 3.42 (dd, *J* = 13.7, 8.3 Hz, 1H), 1.38 (t, *J* = 7.1 Hz, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 166.4, 161.3 (d, *J* = 242.6 Hz), 149.1, 140.8, 135.3 (d, *J* = 3.2 Hz), 133.4, 132.2, 130.4 (d, *J* = 7.8 Hz), 129.7, 128.7, 128.2 (d, *J* = 4.9 Hz), 127.7, 127.6, 126.6, 126.1 (d, *J* = 2.8 Hz), 125.7, 115.0, 114.9, 60.8,

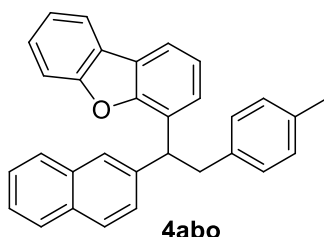
53.3, 40.8, 14.3. ^{19}F NMR (471 MHz, CDCl_3) δ -117.0. HRMS (EI) m/z : calcd for: $\text{C}_{27}\text{H}_{23}\text{FO}_2$: 398.1682; Found: 398.1680.



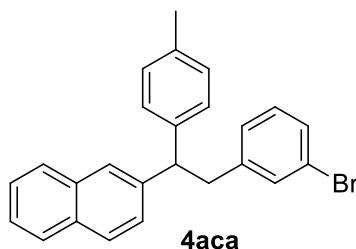
2,2'-(2-(*p*-tolyl)ethane-1,1-diyl)dinaphthalene(4abm). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 41.2 mg of 4-tolyldiazonium tetrafluoroborate (**2b**) (0.20 mmol), 41.3 mg of naphthalen-2-ylboronic acid (**3m**) (0.24 mmol), 9.2 mg of $\text{Pd}_2(\text{dba})_3$ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:0, v/v) to afford 38.9 mg of the product as a colourless solid (52%). ^1H NMR (500 MHz, CDCl_3) δ 7.78 (dd, J = 7.6, 1.7 Hz, 4H), 7.74 – 7.71 (m, 4H), 7.47 – 7.40 (m, 4H), 7.38 (dd, J = 8.6, 1.6 Hz, 2H), 6.97 (s, 4H), 4.57 (t, J = 7.7 Hz, 1H), 3.55 (d, J = 7.7 Hz, 2H), 2.25 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 141.9, 137.0, 135.3, 133.4, 132.1, 128.9, 128.8, 128.0, 127.8, 127.5, 127.0, 126.2, 125.9, 125.4, 53.1, 41.3, 21.0. HRMS (EI) m/z : calcd for: $\text{C}_{29}\text{H}_{24}$: 372.1878; Found: 372.1951.



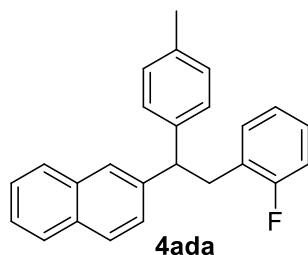
(*E*)-2-(4-phenyl-1-(*p*-tolyl)but-3-en-2-yl)naphthalene(4abn). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 41.2 mg of 4-tolyldiazonium tetrafluoroborate (**2b**) (0.20 mmol), 35.5 mg of (*E*)-styrylboronic acid (**3n**) (0.24 mmol), 9.2 mg of $\text{Pd}_2(\text{dba})_3$ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:0, v/v) to afford 32.1 mg of the product as a colourless solid (46%). ^1H NMR (500 MHz, CDCl_3) δ 7.80 (dd, J = 16.3, 7.8 Hz, 3H), 7.66 (s, 1H), 7.48 – 7.43 (m, 2H), 7.41 (d, J = 8.4 Hz, 1H), 7.30 (dd, J = 16.3, 7.3 Hz, 4H), 7.19 (t, J = 7.1 Hz, 1H), 7.02 (s, 4H), 6.50 (dd, J = 15.9, 7.3 Hz, 1H), 6.33 (d, J = 15.9 Hz, 1H), 3.90 (q, J = 7.4 Hz, 1H), 3.20 (d, J = 7.4 Hz, 2H), 2.28 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 141.3, 137.5, 136.8, 135.4, 133.6, 133.4, 132.3, 130.2, 129.1, 128.9, 128.5, 128.0, 127.7, 127.6, 127.1, 126.6, 126.2, 126.2, 125.9, 125.4, 51.0, 42.1, 21.0. HRMS (EI) m/z : calcd for: $\text{C}_{27}\text{H}_{24}$: 348.1878; Found: 348.1951.



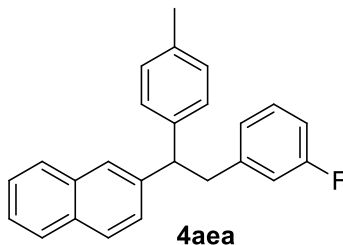
4-(1-(naphthalen-2-yl)-2-(p-tolyl)ethyl)dibenzo[*b,d*]furan(4abo). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 41.2 mg of 4-tolyldiazonium tetrafluoroborate (**2b**) (0.20 mmol), 50.9 mg of dibenzo[*b,d*]furan-4-ylboronic acid (**3o**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 37.9 mg of the product as a colourless solid (46%). ¹H NMR (500 MHz, CDCl₃) δ 7.92 (d, *J* = 7.6 Hz, 1H), 7.85 (s, 1H), 7.81 – 7.73 (m, 4H), 7.60 – 7.54 (m, 2H), 7.42 (dq, *J* = 13.9, 6.8, 1.1 Hz, 4H), 7.31 (dt, *J* = 15.1, 7.5 Hz, 2H), 7.06 (d, *J* = 7.9 Hz, 2H), 6.96 (d, *J* = 7.9 Hz, 2H), 5.11 (t, *J* = 7.8 Hz, 1H), 3.69 (dd, *J* = 14.0, 7.5 Hz, 1H), 3.63 (dd, *J* = 14.0, 8.2 Hz, 1H), 2.23 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 156.0, 154.2, 140.8, 137.0, 135.3, 133.4, 132.2, 128.8, 128.8, 128.7, 127.8, 127.8, 127.5, 126.9, 126.9, 126.5, 125.9, 125.9, 125.4, 124.5, 124.1, 122.8, 122.5, 120.6, 118.6, 111.7, 47.3, 40.4, 21.0. HRMS (EI) *m/z*: calcd for: C₃₁H₂₄O: 412.1827; Found: 412.1900.



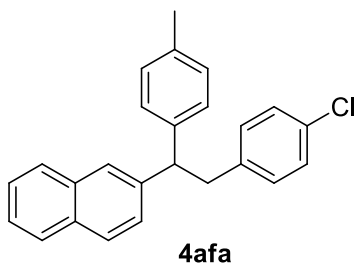
2-(2-(3-bromophenyl)-1-(p-tolyl)ethyl)naphthalene (4aca). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 59.8 mg of 3-bromophenyldiazonium tetrafluoroborate (**2c**) (0.20 mmol), 32.6 mg of p-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 58.6 mg of the product as a brown oil (73%). ¹H NMR (500 MHz, CDCl₃) δ 7.80 – 7.76 (m, 2H), 7.74 (d, *J* = 8.5 Hz, 1H), 7.66 (s, 1H), 7.47 – 7.41 (m, 2H), 7.32 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.26 (d, *J* = 7.0 Hz, 2H), 7.13 (d, *J* = 8.1 Hz, 2H), 7.08 (d, *J* = 8.0 Hz, 2H), 7.00 (t, *J* = 8.0 Hz, 1H), 6.91 (d, *J* = 7.6 Hz, 1H), 4.35 (t, *J* = 7.8 Hz, 1H), 3.42 (qd, *J* = 13.7, 7.9 Hz, 2H), 2.30 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 142.6, 141.6, 140.8, 135.9, 133.4, 132.1, 132.0, 129.6, 129.1, 129.0, 128.0, 127.9, 127.7, 127.7, 127.5, 126.7, 125.9, 125.9, 125.4, 122.10, 52.4, 41.5, 21.0. HRMS (EI) *m/z*: calcd for: C₂₅H₂₁Br: 400.0827; Found: 400.0824.



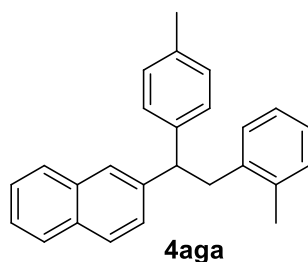
2-(2-(2-fluorophenyl)-1-(p-tolyl)ethyl)naphthalene (4ada). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 2-fluorophenyldiazonium tetrafluoroborate (**2d**) (0.20 mmol), 32.6 mg of p-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 38.2 mg of the product as a yellow oil (57 %). ¹H NMR (500 MHz, CDCl₃) δ 7.80 – 7.75 (m, 2H), 7.74 (d, *J* = 8.5 Hz, 1H), 7.69 (s, 1H), 7.47 – 7.40 (m, 2H), 7.36 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.17 (d, *J* = 8.1 Hz, 2H), 7.13 – 7.06 (m, 3H), 6.96 (td, *J* = 9.3, 2.5 Hz, 2H), 6.88 (td, *J* = 7.5, 1.1 Hz, 1H), 4.47 (t, *J* = 7.9 Hz, 1H), 3.55 – 3.43 (m, 2H), 2.31 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 161.2 (d, *J* = 243.1 Hz), 141.8, 141.0, 135.8, 133.4, 132.1, 131.2 (d, *J* = 4.9 Hz), 129.0, 127.9 (d, *J* = 2.1 Hz), 127.6 (d, *J* = 28.8 Hz), 127.6 (d, *J* = 8.1 Hz), 127.0 (d, *J* = 15.3 Hz), 126.8, 126.0, 125.8, 125.3, 123.6 (d, *J* = 3.5 Hz), 115.1, 114.9, 51.1, 35.0, 21.0. ¹⁹F NMR (471 MHz, CDCl₃) δ -118.1. HRMS (EI) *m/z*: calcd for: C₂₅H₂₁F: 340.1627; Found: 340.1634.



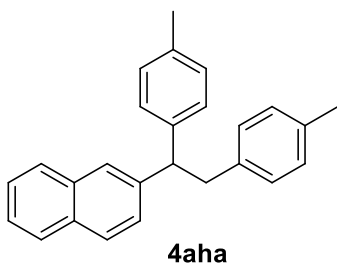
2-(2-(3-fluorophenyl)-1-(p-tolyl)ethyl)naphthalene (4aea). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 42.0 mg of 3-fluorophenyldiazonium tetrafluoroborate (**2e**) (0.20 mmol), 32.6 mg of p-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 45.1 mg of the product as a yellow oil (67%). ¹H NMR (500 MHz, CDCl₃) δ 7.78 (t, *J* = 7.1 Hz, 2H), 7.74 (d, *J* = 8.5 Hz, 1H), 7.67 (s, 1H), 7.48 – 7.41 (m, 2H), 7.34 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.18 – 7.11 (m, 3H), 7.09 (d, *J* = 8.0 Hz, 2H), 7.00 – 6.82 (m, 2H), 6.81 – 6.77 (m, 1H), 4.38 (t, *J* = 7.8 Hz, 1H), 3.47 (qd, *J* = 13.7, 7.8 Hz, 2H), 2.31 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 162.6 (d, *J* = 243.5 Hz), 142.9 (d, *J* = 7.3 Hz), 141.7, 140.9, 135.9, 133.4, 132.1, 129.4 (d, *J* = 8.4 Hz), 129.1, 128.0, 127.9, 127.7, 127.5, 126.7, 125.9 (d, *J* = 2.9 Hz), 125.4, 124.7 (d, *J* = 2.7 Hz), 115.9, 115.7, 112.9, 112.7, 52.4, 41.6, 21.0. ¹⁹F NMR (471 MHz, CDCl₃) δ -113.9. HRMS (EI) *m/z*: calcd for: C₂₅H₂₁F: 340.1627; Found: 340.1626.



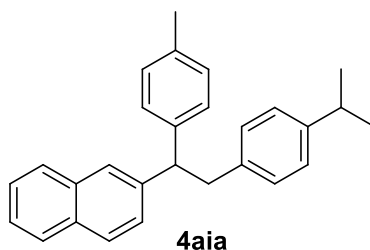
2-(2-(4-chlorophenyl)-1-(*p*-tolyl)ethyl)naphthalene (4afa). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 45.4 mg of 4-chlorophenyldiazonium tetrafluoroborate (**2f**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 56.2 mg of the product as a slight yellow oil (79%). ¹H NMR (500 MHz, CDCl₃) δ 7.79 (t, *J* = 7.6 Hz, 2H), 7.75 (d, *J* = 8.5 Hz, 1H), 7.66 (s, 1H), 7.48 – 7.42 (m, 2H), 7.33 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.15 (d, *J* = 8.3 Hz, 4H), 7.09 (d, *J* = 8.0 Hz, 2H), 6.97 (d, *J* = 8.4 Hz, 2H), 4.34 (t, *J* = 7.8 Hz, 1H), 3.48 – 3.39 (m, 2H), 2.32 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 141.7, 140.9, 138.8, 135.9, 133.4, 132.1, 131.6, 130.4, 129.1, 128.2, 128.0, 127.9, 127.7, 127.53, 126.7, 126.0, 126.0, 125.4, 52.6, 41.3, 21.0. HRMS (EI) *m/z*: calcd for: C₂₅H₂₁Cl: 356.1332; Found: 356.1343.



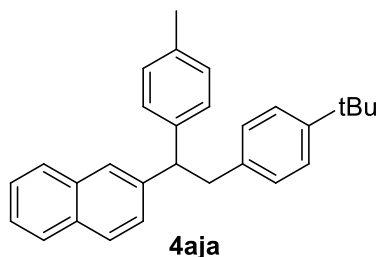
2-(2-(*o*-tolyl)-1-(*p*-tolyl)ethyl)naphthalene (4aga). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 41.2 mg of *o*-tolyl diazonium tetrafluoroborate (**2g**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 50.6 mg of the product as a slight yellow oil (76%). ¹H NMR (500 MHz, CDCl₃) δ 7.80 – 7.76 (m, 2H), 7.74 (d, *J* = 8.5 Hz, 1H), 7.66 (s, 1H), 7.47 – 7.41 (m, 2H), 7.33 (dd, *J* = 8.5, 1.7 Hz, 1H), 7.13 (t, *J* = 7.3 Hz, 2H), 7.07 (ddd, *J* = 9.5, 8.6, 3.1 Hz, 4H), 6.97 (t, *J* = 6.6 Hz, 1H), 6.89 (d, *J* = 7.3 Hz, 1H), 4.39 (t, *J* = 7.5 Hz, 1H), 3.51 – 3.41 (m, 2H), 2.32 (s, 3H), 2.22 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 142.2, 141.4, 138.4, 136.3, 135.7, 133.4, 132.1, 123.0, 129.7, 129.0, 128.0, 127.9, 127.7, 127.5, 127.0, 126.0, 125.9, 125.8, 125.5, 125.3, 51.3, 39.1, 21.0, 19.5. HRMS (EI) *m/z*: calcd for: C₂₆H₂₄: 336.1878; Found: 336.1867.



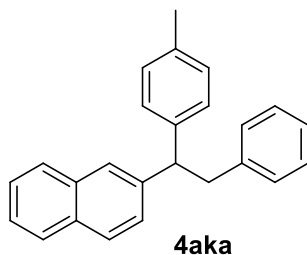
2-(2-(4-ethylphenyl)-1-(*p*-tolyl)ethyl)naphthalene (4aha). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 44.0 mg of 4-ethylphenyldiazonium tetrafluoroborate (**2h**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 47.6 mg of the product as a yellow oil (68%). ¹H NMR (500 MHz, CDCl₃) δ 7.78 (t, *J* = 6.9 Hz, 2H), 7.74 (d, *J* = 8.5 Hz, 1H), 7.68 (s, 1H), 7.47 – 7.41 (m, 2H), 7.36 (dd, *J* = 8.5, 1.7 Hz, 1H), 7.18 (d, *J* = 8.1 Hz, 2H), 7.09 (d, *J* = 7.9 Hz, 2H), 7.01 (q, *J* = 8.3 Hz, 4H), 4.40 (t, *J* = 7.7 Hz, 1H), 3.50 – 3.41 (m, 2H), 2.58 (q, *J* = 7.6 Hz, 2H), 2.31 (s, 3H), 1.20 (t, *J* = 7.6 Hz, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 142.2, 141.6, 141.5, 137.4, 135.6, 133.4, 132.1, 129.0, 128.9, 128.0, 127.9, 127.7, 127.5, 127.5, 126.9, 126.0, 125.8, 125.3, 52.6, 41.5, 28.4, 21.0, 15.5. HRMS (EI) *m/z*: calcd for: C₂₇H₂₆: 350.2035; Found: 350.2030.



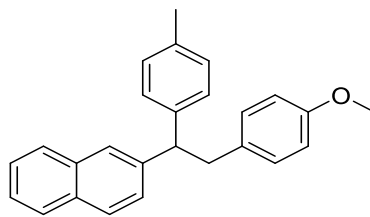
2-(2-(4-isopropylphenyl)-1-(*p*-tolyl)ethyl)naphthalene (4aia). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 50.4 mg of 4-isopropylphenyldiazonium tetrafluoroborate (**2i**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 43.1 mg of the product as a slight yellow oil (59%). ¹H NMR (500 MHz, CDCl₃) δ 7.77 (t, *J* = 7.7 Hz, 2H), 7.73 (d, *J* = 8.5 Hz, 1H), 7.67 (s, 1H), 7.43 (dq, *J* = 6.9, 5.5 Hz, 2H), 7.36 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.18 (d, *J* = 8.0 Hz, 2H), 7.09 (d, *J* = 7.9 Hz, 2H), 7.04 (d, *J* = 8.0 Hz, 2H), 7.00 (d, *J* = 8.0 Hz, 2H), 4.40 (t, *J* = 7.7 Hz, 1H), 3.50 – 3.40 (m, 2H), 2.93 – 2.76 (m, 1H), 2.31 (s, 3H), 1.21 (d, *J* = 6.9 Hz, 6H). ¹³C NMR (125 MHz, CDCl₃) δ 146.3, 142.3, 141.6, 137.6, 135.6, 133.4, 132.1, 129.0, 128.9, 128.0, 127.9, 127.7, 127.5, 126.9, 126.1, 126.0, 125.8, 125.3, 52.6, 41.4, 33.6, 24.0, 24.0, 21.0. HRMS (EI) *m/z*: calcd for: C₂₈H₂₈: 364.2191; Found: 364.2199.



2-(2-(4-(*tert*-butyl)phenyl)-1-(*p*-tolyl)ethyl)naphthalene (4aja). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 49.6 mg of 4-(*tert*-butyl)phenyldiazonium tetrafluoroborate (**2j**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 57.5 mg of the product as a yellow oil (76%). ¹H NMR (500 MHz, CDCl₃) δ 7.78 (dd, *J* = 8.9, 7.4 Hz, 2H), 7.74 (d, *J* = 8.5 Hz, 1H), 7.68 (s, 1H), 7.47 – 7.41 (m, 2H), 7.37 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.23 – 7.17 (m, 4H), 7.10 (d, *J* = 8.0 Hz, 2H), 7.02 (d, *J* = 8.1 Hz, 2H), 4.42 (t, *J* = 7.7 Hz, 1H), 3.51 – 3.42 (m, 2H), 2.32 (s, 3H), 1.29 (s, 9H). ¹³C NMR (125 MHz, CDCl₃) δ 148.6, 142.3, 141.6, 137.2, 135.6, 133.5, 132.1, 129.1, 128.6, 128.0, 127.9, 127.7, 127.5, 126.9, 126.1, 125.8, 125.3, 125.0, 52.5, 41.3, 34.3, 31.4, 21.0. HRMS (EI) *m/z*: calcd for: C₂₉H₃₀: 378.2348; Found: 378.2346.

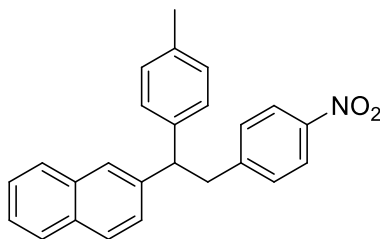


2-(2-phenyl-1-(*p*-tolyl)ethyl)naphthalene (4aka). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 38.4 mg of phenyldiazonium tetrafluoroborate (**2k**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 49.0 mg of the product as a slight yellow oil (76%). ¹H NMR (500 MHz, CDCl₃) δ 7.79 (dd, *J* = 8.0, 7.0 Hz, 2H), 7.74 (d, *J* = 8.5 Hz, 1H), 7.68 (s, 1H), 7.48 – 7.41 (m, 2H), 7.36 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.22 – 7.16 (m, 4H), 7.16 – 7.12 (m, 1H), 7.09 (t, *J* = 8.2 Hz, 4H), 4.41 (t, *J* = 7.8 Hz, 1H), 3.54 – 3.44 (m, 2H), 2.32 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 142.1, 141.3, 140.3, 135.6, 133.4, 132.0, 129.0, 129.0, 128.0, 128.0, 127.9, 127.7, 127.5, 126.9, 126.0, 125.8, 125.8, 125.3, 52.6, 41.9, 21.0. HRMS (EI) *m/z*: calcd for: C₂₅H₂₂: 322.1722; Found: 322.1727.



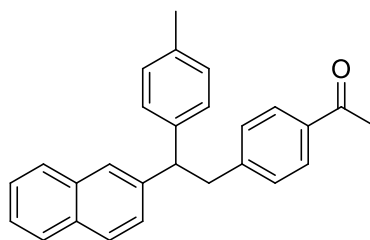
4ala

2-(2-(4-methoxyphenyl)-1-(p-tolyl)ethyl)naphthalene (4ala). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 44.4 mg of 4-methoxyphenyldiazonium tetrafluoroborate (**2l**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 50:1, v/v) to afford 48.2 mg of the product as a slight yellow solid (69%). ¹H NMR (500 MHz, CDCl₃) δ 7.83 – 7.79 (m, 2H), 7.77 (d, *J* = 8.5 Hz, 1H), 7.70 (s, 1H), 7.50 – 7.43 (m, 2H), 7.38 (dd, *J* = 8.5, 1.4 Hz, 1H), 7.20 (d, *J* = 8.0 Hz, 2H), 7.12 (d, *J* = 8.1 Hz, 2H), 7.00 (d, *J* = 8.5 Hz, 2H), 6.76 (d, *J* = 8.6 Hz, 2H), 4.38 (t, *J* = 7.7 Hz, 1H), 3.77 (s, 3H), 3.50 – 3.39 (m, 2H), 2.34 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 157.7, 142.2, 141.4, 135.6, 133.5, 132.4, 132.1, 129.9, 129.0, 128.0, 127.9, 127.8, 127.5, 126.9, 126.1, 125.8, 125.3, 113.5, 55.1, 53.0, 41.1, 21.0. HRMS (EI) *m/z*: calcd for: C₂₆H₂₄O: 352.1827; Found: 352.1833.



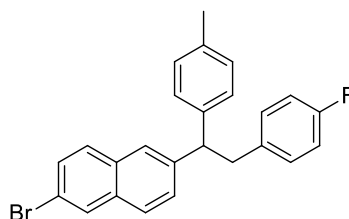
4ama

2-(2-(4-nitrophenyl)-1-(p-tolyl)ethyl)naphthalene (4ama). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 47.4 mg of 4-nitrophenyldiazonium tetrafluoroborate (**2m**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 40:1, v/v) to afford 44.5 mg of the product as a yellow oil (61%). ¹H NMR (500 MHz, CDCl₃) δ 8.04 – 8.02 (m, 1H), 8.02 – 8.00 (m, 1H), 7.80 – 7.74 (m, 3H), 7.65 (s, 1H), 7.49 – 7.42 (m, 2H), 7.32 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.17 (d, *J* = 8.7 Hz, 2H), 7.13 (d, *J* = 8.2 Hz, 2H), 7.09 (d, *J* = 8.0 Hz, 2H), 4.38 (t, *J* = 7.9 Hz, 1H), 3.61 – 3.51 (m, 2H), 2.31 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 148.2, 146.3, 141.1, 140.2, 136.2, 133.3, 132.2, 129.8, 129.2, 128.2, 127.8, 127.7, 127.5, 126.4, 126.1, 125.9, 125.6, 123.3, 52.3, 41.7, 21.0. HRMS (EI) *m/z*: calcd for: C₂₉H₂₁NO₂: 367.1572; Found: 367.1575.



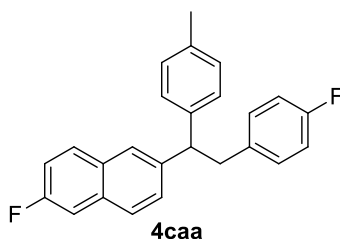
4ana

1-(4-(2-(naphthalen-2-yl)-2-(p-tolyl)ethyl)phenyl)ethan-1-one (4ana). The optimized procedure was followed by using 30.8 mg of 2-vinylnaphthalene (**1a**) (0.20 mmol), 50.2 mg of 4-acetylphenyldiazonium tetrafluoroborate (**2n**) (0.20 mmol), 32.6 mg of p-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at 50 °C. After 12 h, the reaction mixture was extracted with water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 40:1, v/v) to afford 30.5 mg of the product as a brown oil (42%). ¹H NMR (500 MHz, CDCl₃) δ 7.76 (ddd, *J* = 9.3, 6.0, 4.0 Hz, 4H), 7.73 (d, *J* = 8.6 Hz, 1H), 7.65 (s, 1H), 7.43 (ddd, *J* = 5.4, 4.6, 1.5 Hz, 2H), 7.32 (dd, *J* = 8.5, 1.6 Hz, 1H), 7.13 (d, *J* = 8.3 Hz, 4H), 7.07 (d, *J* = 8.1 Hz, 2H), 4.39 (t, *J* = 7.8 Hz, 1H), 3.56 – 3.47 (m, 2H), 2.53 (s, 3H), 2.30 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 197.9, 146.1, 141.6, 140.8, 136.0, 135.1, 133.4, 132.2, 129.2, 129.2, 128.9, 128.4, 128.3, 128.1, 127.9, 127.7, 127.53, 126.7, 126.0, 125.45, 52.3, 41.9, 26.5, 21.0. HRMS (EI) *m/z*: calcd for: C₂₇H₂₄O: 364.1827; Found: 364.1831.

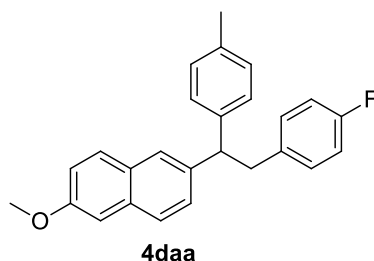


4baa

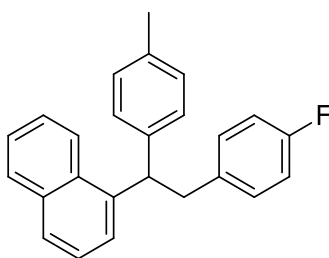
2-bromo-6-(2-(4-fluorophenyl)-1-(p-tolyl)ethyl)naphthalene (4baa). The optimized procedure was followed by using 46.4 mg of 2-bromo-6-vinylnaphthalene (**1b**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 32.6 mg of p-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted with water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 55.6 mg of the product as a slight yellow solid (67%). ¹H NMR (500 MHz, CDCl₃) δ 7.94 (d, *J* = 1.7 Hz, 1H), 7.63 (dd, *J* = 8.5, 5.9 Hz, 2H), 7.59 (s, 1H), 7.51 (dd, *J* = 8.8, 1.9 Hz, 1H), 7.34 (dd, *J* = 8.6, 1.7 Hz, 1H), 7.13 (d, *J* = 8.1 Hz, 2H), 7.09 (d, *J* = 8.2 Hz, 2H), 6.96 (dd, *J* = 8.5, 5.5 Hz, 2H), 6.85 (t, *J* = 8.7 Hz, 2H), 4.30 (t, *J* = 7.8 Hz, 1H), 3.41 (d, *J* = 7.8 Hz, 2H), 2.31 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 161.2 (d, *J* = 242.2 Hz), 142.4, 140.7, 136.0, 135.7 (d, *J* = 3.2 Hz), 133.2, 131.8, 130.4 (d, *J* = 7.8 Hz), 129.5, 129.3 (d, *J* = 13.2 Hz), 129.2, 127.9, 127.8, 127.1, 126.0, 119.3, 114.9, 114.8, 52.8, 41.0, 21.0. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.2. HRMS (EI) *m/z*: calcd for: C₂₅H₂₀BrF: 418.0732; Found: 418.0727.



2-fluoro-6-(2-(4-fluorophenyl)-1-(*p*-tolyl)ethyl)naphthalene (4caa). The optimized procedure was followed by using 17.2 mg of 2-fluoro-6-vinylnaphthalene (**1c**) (0.10 mmol), 21.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.10 mmol), 16.3 mg of *p*-tolylboronic acid (**3a**) (0.12 mmol), 4.6 mg of Pd₂(dba)₃ (0.005 mmol), 8.9 mg of lithium carbonate (0.12 mmol) and 0.5 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 23.1 mg of the product as a slight yellow solid (65%). ¹H NMR (500 MHz, CDCl₃) δ 7.73 (dd, *J* = 9.0, 5.6 Hz, 1H), 7.66 (d, *J* = 8.5 Hz, 1H), 7.61 (s, 1H), 7.38 (dd, *J* = 9.8, 2.5 Hz, 1H), 7.33 (d, *J* = 8.5 Hz, 1H), 7.22 (td, *J* = 8.7, 2.6 Hz, 1H), 7.12 (d, *J* = 8.1 Hz, 2H), 7.08 (d, *J* = 8.1 Hz, 2H), 6.96 (dd, *J* = 8.5, 5.5 Hz, 2H), 6.84 (t, *J* = 8.7 Hz, 2H), 4.29 (t, *J* = 7.8 Hz, 1H), 3.44 – 3.36 (m, 2H), 2.30 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 161.3 (d, *J* = 242.3 Hz), 160.4 (d, *J* = 243.8 Hz), 141.2, 140.9, 135.9, 135.8 (d, *J* = 3.2 Hz), 132.7 (d, *J* = 9.1 Hz), 130.4, 130.4 (d, *J* = 7.8 Hz), 130.3, 130.0 (d, *J* = 8.9 Hz), 129.1, 127.9, 127.8, 127.4 (d, *J* = 5.3 Hz), 126.0, 116.2 (d, *J* = 25.3 Hz), 114.9 (d, *J* = 21.1 Hz), 110.6 (d, *J* = 20.3 Hz), 52.7, 41.1, 21.0. ¹⁹F NMR (471 MHz, CDCl₃) δ -115.5, -117.3. HRMS (EI) *m/z*: calcd for: C₂₅H₂₀F₂: 358.1533; Found: 358.1536.

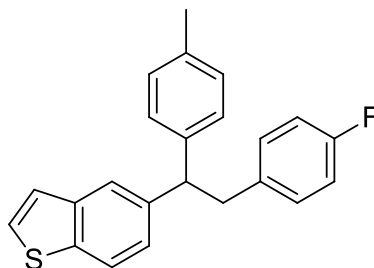


2-(2-(4-fluorophenyl)-1-(*p*-tolyl)ethyl)-6-methoxynaphthalene (4daa). The optimized procedure was followed by using 36.8 mg of 2-methoxy-6-vinylnaphthalene (**1d**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 40:1, v/v) to afford 47.0 mg of the product as a field gray solid (63%). ¹H NMR (500 MHz, CDCl₃) δ 7.65 (dd, *J* = 12.9, 8.7 Hz, 2H), 7.57 (s, 1H), 7.29 (dd, *J* = 8.4, 1.5 Hz, 1H), 7.15 – 7.12 (m, 3H), 7.08 (d, *J* = 8.2 Hz, 3H), 6.97 (dd, *J* = 8.3, 5.6 Hz, 2H), 6.85 (t, *J* = 8.7 Hz, 2H), 4.29 (t, *J* = 7.8 Hz, 1H), 3.91 (s, 3H), 3.46 – 3.36 (m, 2H), 2.31 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 161.2 (d, *J* = 242.8 Hz), 157.4, 141.3, 139.6, 136.0 (d, *J* = 3.1 Hz), 135.7, 133.1, 130.4 (d, *J* = 7.8 Hz), 129.1 (d, *J* = 16.5 Hz), 128.9, 127.9, 127.3, 126.9, 125.9, 118.7, 114.9, 114.7, 105.8, 55.3, 52.7, 41.2, 21.0. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.5. HRMS (EI) *m/z*: calcd for: C₂₆H₂₃FO: 370.1733; Found: 370.1737.



4eaa

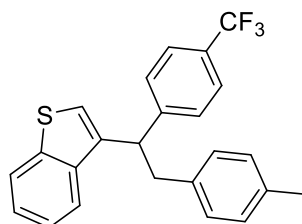
1-(2-(4-fluorophenyl)-1-(*p*-tolyl)ethyl)naphthalene (4eaa). The optimized procedure was followed by using 30.8 mg of 1-vinylnaphthalene (**1e**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 51.7 mg of the product as a yellow oil (76%). ¹H NMR (500 MHz, CDCl₃) δ 8.05 (d, *J* = 9.0 Hz, 1H), 7.85 – 7.81 (m, 1H), 7.75 (d, *J* = 8.1 Hz, 1H), 7.58 (d, *J* = 7.1 Hz, 1H), 7.49 (t, *J* = 7.7 Hz, 1H), 7.42 (p, *J* = 6.9 Hz, 2H), 7.01 (ddd, *J* = 13.8, 12.7, 6.8 Hz, 6H), 6.86 (t, *J* = 8.4 Hz, 2H), 4.98 – 4.91 (m, 1H), 3.50 (dd, *J* = 13.8, 6.3 Hz, 1H), 3.41 (dd, *J* = 13.8, 9.0 Hz, 1H), 2.27 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 161.3 (d, *J* = 242.1 Hz), 140.8, 140.0, 136.0 (d, *J* = 3.1 Hz), 135.7, 134.0, 131.7, 130.4 (d, *J* = 7.8 Hz), 129.0, 128.8, 128.1, 127.1, 125.9, 125.3 (d, *J* = 4.0 Hz), 124.4, 123.6, 114.9, 114.7, 47.9, 41.8, 21.0. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.4. HRMS (EI) *m/z*: calcd for: C₂₅H₂₁F: 340.1627; Found: 340.1621.



4faa

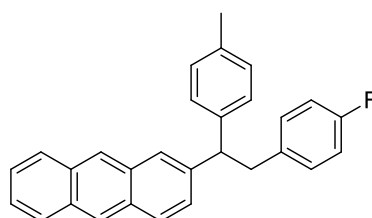
5-(2-(4-fluorophenyl)-1-(*p*-tolyl)ethyl)benzo[*b*]thiophene (4faa). The optimized procedure was followed by using 16.0 mg of 5-vinylbenzo[*b*]thiophene (**1f**) (0.10 mmol), 21.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.10 mmol), 16.3 mg of *p*-tolylboronic acid (**3a**) (0.12 mmol), 4.6 mg of Pd₂(dba)₃ (0.005 mmol), 8.9 mg of lithium carbonate (0.12 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 80:1, v/v) to afford 14.9 mg of the product as a slight yellow solid (44%). ¹H NMR (500 MHz, CDCl₃) δ 7.74 (d, *J* = 8.4 Hz, 1H), 7.63 (d, *J* = 1.6 Hz, 1H), 7.40 (d, *J* = 5.4 Hz, 1H), 7.25 (d, *J* = 5.4 Hz, 1H), 7.17 (dd, *J* = 8.4, 1.7 Hz, 1H), 7.12 (d, *J* = 8.1 Hz, 2H), 7.07 (d, *J* = 8.0 Hz, 2H), 6.98 – 6.93 (m, 2H), 6.87 – 6.81 (m, 2H), 4.27 (t, *J* = 7.8 Hz, 1H), 3.38 (d, *J* = 7.8 Hz, 2H), 2.29 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 161.2 (d, *J* = 242.0 Hz), 141.4, 140.7, 139.8, 137.6, 136.0 (d, *J* = 3.2 Hz), 135.8, 130.4 (d, *J* = 7.8 Hz), 129.1, 127.8, 126.5, 124.9, 123.8, 122.4 (d, *J* = 24.2 Hz), 114.9, 114.7, 52.7, 41.4, 21.0.

^{19}F NMR (471 MHz, CDCl_3) δ -117.5. HRMS (EI) m/z : calcd for: $\text{C}_{23}\text{H}_{19}\text{FS}$: 346.1191; Found: 346.1189.



4gbi

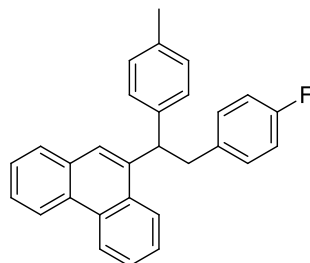
3-(2-(*p*-tolyl)-1-(4-(trifluoromethyl)phenyl)ethyl)benzo[*b*]thiophene (4gbi). The optimized procedure was followed by using 32.0 mg of 3-vinylbenzo[*b*]thiophene (**1g**) (0.20 mmol), 41.2 mg of *p*-tolyl diazonium tetrafluoroborate (**2b**) (0.20 mmol), 4-(trifluoromethyl)phenylboronic acid (**3i**) (0.24 mmol), 9.2 mg of $\text{Pd}_2(\text{dba})_3$ (0.01 mmol), 17.8 mg of lithium carbonate (0.024 mmol) and 1.0 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 200:1, v/v) to afford 43 mg of the product as a light yellow oil (55%). ^1H NMR (500 MHz, CDCl_3) δ 7.85 (d, J = 7.9 Hz, 1H), 7.52 (d, J = 8.0 Hz, 1H), 7.46 (d, J = 8.1 Hz, 2H), 7.38 (s, 1H), 7.31 (dd, J = 11.1, 4.0 Hz, 1H), 7.29 – 7.26 (m, 1H), 7.23 (d, J = 8.1 Hz, 2H), 7.02 (d, J = 7.8 Hz, 2H), 6.91 (d, J = 7.9 Hz, 2H), 4.61 (dd, J = 9.3, 5.9 Hz, 1H), 3.57 (dd, J = 13.7, 5.9 Hz, 1H), 3.27 (dd, J = 13.6, 9.4 Hz, 1H), 2.30 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 147.0, 140.5, 138.3, 138.0, 136.0, 135.8, 129.0, 128.8, 128.7 (q, J = 75.8, 43.5 Hz), 128.4, 125.3 (q, J = 3.7 Hz), 124.4, 124.0, 122.9, 122.2, 122.0, 47.1, 41.8, 21.0. ^{19}F NMR (471 MHz, CDCl_3) δ -62.3. HRMS (EI) m/z : calcd for: $\text{C}_{24}\text{H}_{19}\text{F}_3\text{S}$: 396.1160; Found: 396.1161.



4haa

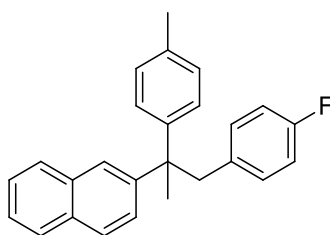
2-(2-(4-fluorophenyl)-1-(*p*-tolyl)ethyl)anthracene (4haa). The optimized procedure was followed by using 20.4 mg of 2-vinylanthracene (**1h**) (0.10 mmol), 21.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.10 mmol), 16.3 mg of *p*-tolylboronic acid (**3a**) (0.12 mmol), 4.6 mg of $\text{Pd}_2(\text{dba})_3$ (0.005 mmol), 8.9 mg of lithium carbonate (0.12 mmol) and 0.5 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 29 mg of the product as a brown solid (74%). ^1H NMR (500 MHz, CDCl_3) δ 8.35 (s, 1H), 8.34 (s, 1H), 7.98 (dd, J = 9.2, 3.4 Hz, 2H), 7.89 (d, J = 8.8 Hz, 1H), 7.78 (s, 1H), 7.47 – 7.44 (m, 2H), 7.29 (dd, J = 8.8, 1.7 Hz, 1H), 7.16 (d, J = 8.1 Hz, 2H), 7.10 (s, 1H), 7.09 (s, 1H), 6.99 (d, J = 3.2 Hz, 1H), 6.98 (s, 1H), 6.85 (t, J = 8.8 Hz, 2H), 4.33 (t, J = 7.8 Hz, 1H), 3.49 (dd, J = 13.7, 7.8 Hz, 1H), 3.42 (dd, J

= 13.7, 7.7 Hz, 1H), 2.31 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 161.2 (d, J = 242.1 Hz), 141.1, 140.7, 135.9 (d, J = 2.9 Hz), 131.8, 131.7, 131.5, 130.6, 130.4 (d, J = 7.8 Hz), 129.1, 129.0, 128.8 (d, J = 15.6 Hz), 128.3, 128.1, 128.1, 128.0, 126.8, 125.9, 125.6, 125.3, 125.1, 114.9, 114.8, 53.0, 40.8, 21.0. ^{19}F NMR (471 MHz, CDCl_3) δ -117.4. HRMS (EI) m/z : calcd for: $\text{C}_{29}\text{H}_{23}\text{F}$: 390.1784; Found:390.1787.



4iaa

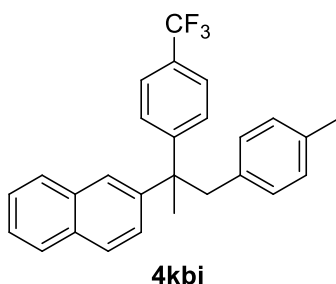
9-(2-(4-fluorophenyl)-1-(*p*-tolyl)ethyl)phenanthrene (4iaa). The optimized procedure was followed by using 40.8 mg of 9-vinylphenanthrene (**1i**) (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of $\text{Pd}_2(\text{dba})_3$ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 56.2 mg of the product as a slight yellow solid (72%). ^1H NMR (500 MHz, CDCl_3) δ 8.73 (d, J = 8.1 Hz, 1H), 8.68 (d, J = 7.5 Hz, 1H), 8.12 (d, J = 8.1 Hz, 1H), 7.94 (dd, J = 7.6, 1.5 Hz, 1H), 7.88 (s, 1H), 7.67 – 7.58 (m, 3H), 7.54 – 7.50 (m, 1H), 7.07 (d, J = 8.1 Hz, 2H), 7.02 (td, J = 8.2, 5.5 Hz, 4H), 6.90 (t, J = 8.7 Hz, 2H), 4.94 (dd, J = 9.1, 5.9 Hz, 1H), 3.62 (dd, J = 13.7, 5.9 Hz, 1H), 3.45 (dd, J = 13.7, 9.2 Hz, 1H), 2.28 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 161.3 (d, J = 242.1 Hz), 140.4, 137.9, 136.0 (d, J = 3.2 Hz), 135.8, 131.5, 131.1, 130.9, 130.5 (d, J = 7.8 Hz), 129.7, 129.0, 128.5, 128.1, 126.6 (d, J = 9.8 Hz), 126.4, 126.1, 125.2, 124.5, 123.1, 122.4, 114.9, 114.8, 48.2, 41.9, 21.0. ^{19}F NMR (471 MHz, CDCl_3) δ -117.4. HRMS (EI) m/z : calcd for: $\text{C}_{29}\text{H}_{23}\text{F}$: 390.1784; Found:390.1786.



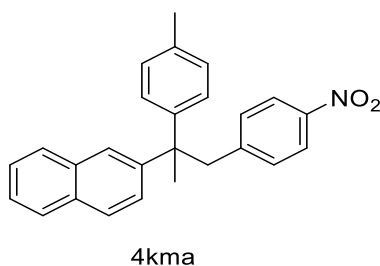
4kaa

2-(1-(4-fluorophenyl)-2-(*p*-tolyl)propan-2-yl)naphthalene (4kaa). The optimized procedure was followed by using 16.8 mg of 2-(prop-1-en-2-yl)naphthalene (**1k**) (0.10 mmol), 21.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.10 mmol), 16.3 mg of *p*-tolylboronic acid (**3a**) (0.12 mmol), 4.6 mg of $\text{Pd}_2(\text{dba})_3$ (0.005 mmol), 8.9 mg of lithium carbonate (0.12 mmol) and 0.5mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 25.0 mg of the product as a slight yellow solid (70%). ^1H NMR (500 MHz, CDCl_3) δ 7.80 (t, J = 8.7 Hz, 2H),

7.74 – 7.68 (m, 2H), 7.48 (p, $J = 6.9$ Hz, 2H), 7.21 (d, $J = 8.8$ Hz, 1H), 7.08 (s, 4H), 6.89 – 6.70 (m, 2H), 6.60 – 6.50 (m, 2H), 3.51 (q, $J = 12.7$ Hz, 2H), 2.35 (s, 3H), 1.61 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 161.4 (d, $J = 242.4$ Hz), 146.4, 145.7, 135.4, 133.7 (d, $J = 3.2$ Hz), 133.0, 132.0 (d, $J = 7.8$ Hz), 131.8, 130.6, 128.7, 128.0, 127.6, 127.4 (d, $J = 13.4$ Hz), 125.9, 125.6, 124.9, 114.2, 114.0, 46.9, 46.5, 26.8, 20.9. ^{19}F NMR (471 MHz, CDCl_3) δ -117.5. HRMS (EI) m/z : calcd for: $\text{C}_{26}\text{H}_{24}\text{O}$: 354.1784; Found: 354.1794.

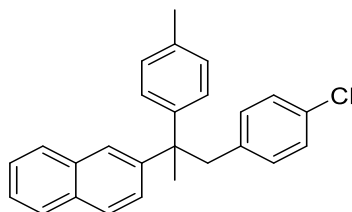


2-(1-(*p*-tolyl)-2-(4-(trifluoromethyl)phenyl)propan-2-yl)naphthalene (4kbi). The optimized procedure was followed by using 33.6 mg of 2-(prop-1-en-2-yl)naphthalene (**1k**) (0.20 mmol), 41.2 mg of *p*-tolyl diazonium tetrafluoroborate (**2b**) (0.20 mmol), 45.6 mg of 4-(trifluoromethyl)phenylboronic acid (**3i**) (0.24 mmol), 9.2 mg of $\text{Pd}_2(\text{dba})_3$ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1.0 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 200:1, v/v) to afford 66.1 mg of the product as a slight yellow oil (82%). ^1H NMR (500 MHz, CDCl_3) δ 7.83 (dd, $J = 8.8, 5.6$ Hz, 2H), 7.75 (d, $J = 9.4$ Hz, 2H), 7.54 – 7.48 (m, 4H), 7.31 (d, $J = 8.2$ Hz, 2H), 7.17 (dd, $J = 8.6, 1.9$ Hz, 1H), 6.88 (d, $J = 7.8$ Hz, 2H), 6.52 (d, $J = 7.9$ Hz, 2H), 3.58 (d, $J = 12.6$ Hz, 1H), 3.51 (d, $J = 12.6$ Hz, 1H), 2.26 (s, 3H), 1.68 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 153.2, 145.7, 135.7, 134.1, 133.0, 131.9, 130.5, 128.2, 128.2, 128.0, 127.7, 127.4, 127.2, 126.1, 125.8, 125.6 (q, $J = 272.3$ Hz), 125.1, 124.8 (q, $J = 3.7$ Hz), 47.5, 46.8, 26.8, 20.9. ^{19}F NMR (471 MHz, CDCl_3) δ -62.2. HRMS (EI) m/z : calcd for: $\text{C}_{27}\text{H}_{23}\text{F}_3$: 404.1752; Found: 404.1749.



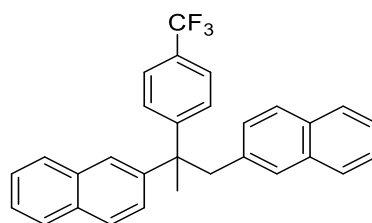
2-(1-(4-nitrophenyl)-2-(*p*-tolyl)propan-2-yl)naphthalene (4kma). The optimized procedure was followed by using 33.6 mg of 2-(prop-1-en-2-yl)naphthalene (**1k**) (0.20 mmol), 47.4 mg of 4-nitrophenyl diazonium tetrafluoroborate (**2m**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of $\text{Pd}_2(\text{dba})_3$ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 40:1, v/v) to afford 40.6 mg of the product as a slight yellow oil (53%). ^1H NMR (500 MHz, CDCl_3) δ 7.89 (d, $J = 8.6$ Hz, 2H), 7.82

– 7.79 (m, 1H), 7.78 – 7.75 (m, 1H), 7.72 (d, $J = 8.7$ Hz, 1H), 7.68 (s, 1H), 7.50 – 7.46 (m, 2H), 7.18 (dd, $J = 8.6, 1.7$ Hz, 1H), 7.06 (q, $J = 8.3$ Hz, 4H), 6.76 (d, $J = 8.6$ Hz, 2H), 3.62 (q, $J = 12.3$ Hz, 2H), 2.33 (s, 3H), 1.56 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 146.4, 146.2, 145.9, 145.7, 144.9, 135.7, 131.7, 131.3, 128.7, 127.9, 127.7, 127.4, 127.3, 127.1, 126.0, 125.7, 124.6, 122.4, 47.2, 47.0, 26.8, 20.8. HRMS (EI) m/z : calcd for: $\text{C}_{26}\text{H}_{23}\text{NO}_2$: 381.1729; Found: 381.1732.



4kfa

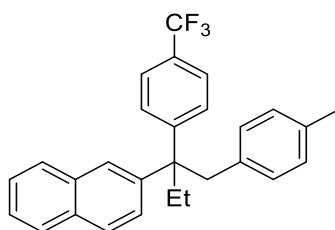
2-(1-(4-chlorophenyl)-2-(*p*-tolyl)propan-2-yl)naphthalene (4kfa). The optimized procedure was followed by using 33.6 mg of 2-(prop-1-en-2-yl)naphthalene (**1k**) (0.20 mmol), 45.4 mg of 4-chlorophenyldiazonium tetrafluoroborate (**2f**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of $\text{Pd}_2(\text{dba})_3$ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 26.1 mg of the product as a slight yellow oil (35%). ^1H NMR (500 MHz, CDCl_3) δ 7.79 (dd, $J = 7.1, 4.7$ Hz, 2H), 7.71 (d, $J = 8.0$ Hz, 2H), 7.51 – 7.44 (m, 2H), 7.20 (ddd, $J = 8.5, 5.8, 2.5$ Hz, 1H), 7.06 (s, 4H), 7.04 – 6.98 (m, 2H), 6.54 (dd, $J = 8.3, 2.7$ Hz, 2H), 3.50 (q, $J = 12.6$ Hz, 2H), 2.33 (s, 3H), 1.59 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 146.3, 145.6, 136.5, 135.5, 133.0, 132.4, 132.0, 131.8, 131.8, 128.7, 128.0, 127.6, 127.5, 127.4, 127.4, 125.9, 125.6, 124.8, 46.9, 46.7, 26.8, 20.9. HRMS (EI) m/z : calcd for: $\text{C}_{26}\text{H}_{23}\text{Cl}$: 370.1488; Found: 370.1486.



4koi

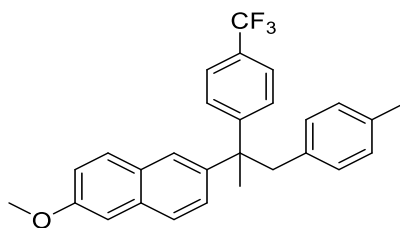
2,2'-(2-(4-(trifluoromethyl)phenyl)propane-1,2-diyl)dinaphthalene (4koi). The optimized procedure was followed by using 33.6 mg of 2-(prop-1-en-2-yl)naphthalene (**1k**) (0.20 mmol), 48.4 mg of 2-naphthalenediazonium tetrafluoroborate (**2o**) (0.20 mmol), 45.6 mg of (4-(trifluoromethyl)phenyl)boronic acid (**3i**) (0.24 mmol), 9.2 mg of $\text{Pd}_2(\text{dba})_3$ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1.0 mL of *t*-Amy-OH and stirred at rt. After further 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 200:1, v/v) to afford 70.8 mg of the product as a slight yellow oil (80%). ^1H NMR (500 MHz, CDCl_3) δ 7.88 – 7.84 (m, 1H), 7.80 (dt, $J = 12.8, 6.1$ Hz, 3H), 7.75 (dd, $J = 5.6, 3.7$ Hz, 1H), 7.62 – 7.58 (m, 1H), 7.52 (dt, $J = 12.3, 8.6$ Hz, 5H), 7.44 – 7.40 (m, 2H), 7.32 (d, $J = 8.2$ Hz, 2H), 7.23 – 7.18 (m, 2H), 6.62 (dd, $J = 8.4, 1.5$ Hz, 1H), 3.78 (d, $J = 12.5$ Hz, 1H), 3.71 (d, $J =$

12.5 Hz, 1H), 1.73 (s, 3H). ^{13}C NMR (126 MHz, CDCl_3) δ 153.0, 145.6, 135.0, 133.0, 132.9, 132.0, 131.9, 129.4, 129.0, 128.3, 128.1, 127.8, 127.5, 127.4, 127.4, 127.2, 126.7, 126.1, 125.9, 125.8 (q, $J = 213.8$ Hz), 125.7, 125.4, 125.1, 124.8 (q, $J = 3.6$ Hz), 47.8, 47.5, 26.8. ^{19}F NMR (471 MHz, CDCl_3) δ -62.2. HRMS (EI) m/z : calcd for: $\text{C}_{30}\text{H}_{23}\text{F}_3$: 440.1752; Found: 440.1747.



4lbi

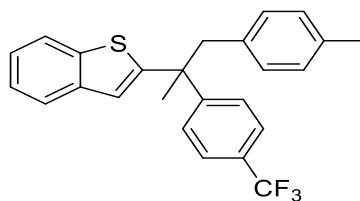
2-(1-(*p*-tolyl)-2-(4-(trifluoromethyl)phenyl)butan-2-yl)naphthalene (4lbi). The optimized procedure was followed by using 36.4 mg of 2-(but-1-en-2-yl)naphthalene (**1l**) (0.20 mmol), 41.2 mg of *p*-tolyl diazonium tetrafluoroborate (**2b**) (0.20 mmol), 45.6 mg of (4-(trifluoromethyl)phenyl)boronic acid (**3i**) (0.24 mmol), 9.2 mg of $\text{Pd}_2(\text{dba})_3$ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After further 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 41.1 mg of the product as a slight yellow oil (49%). ^1H NMR (500 MHz, CDCl_3) δ 7.81 (dd, $J = 6.4, 2.8$ Hz, 2H), 7.75 – 7.70 (m, 2H), 7.52 – 7.46 (m, 4H), 7.22 (d, $J = 8.2$ Hz, 2H), 7.07 (dd, $J = 8.7, 1.8$ Hz, 1H), 6.85 (d, $J = 7.8$ Hz, 2H), 6.43 (d, $J = 7.9$ Hz, 2H), 3.55 (d, $J = 12.8$ Hz, 1H), 3.43 (d, $J = 12.8$ Hz, 1H), 2.24 (s, 3H), 2.18 – 2.06 (m, 2H), 0.79 (t, $J = 7.3$ Hz, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 152.4, 144.7, 135.7, 134.0, 132.9, 131.9, 130.2, 128.9, 128.2, 128.1, 128.1, 127.7, 127.6, 127.4, 126.7 (q, $J = 294.9$ Hz), 126.0 (d, $J = 2.2$ Hz), 125.8, 124.6 (q, $J = 3.6$ Hz), 123.2, 51.2, 42.1, 28.4, 21.0, 8.9. ^{19}F NMR (471 MHz, CDCl_3) δ -62.2. HRMS (EI) m/z : calcd for: $\text{C}_{28}\text{H}_{25}\text{F}_3$: 418.1908; Found: 418.1905.



4mbi

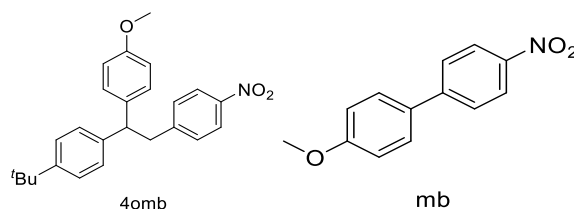
2-methoxy-6-(1-(*p*-tolyl)-2-(4-(trifluoromethyl)phenyl)propan-2-yl)naphthalene (4mbi). The optimized procedure was followed by using 39.8 mg of 2-methoxy-6-(prop-1-en-2-yl)naphthalene (**1m**) (0.20 mmol), 41.2 mg of *p*-tolyl diazonium tetrafluoroborate (**2b**) (0.20 mmol), 45.6 mg of (4-(trifluoromethyl)phenyl)boronic acid (**3i**) (0.24 mmol), 9.2 mg of $\text{Pd}_2(\text{dba})_3$ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After further 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 51.2 mg of the product as a pale yellow oil (59%). ^1H NMR (500 MHz, CDCl_3) δ 7.70 (d, $J = 8.9$ Hz, 1H), 7.67 – 7.63 (m, 2H), 7.52 (dd, $J = 13.2, 8.4$ Hz, 2H), 7.30 (t, $J = 7.2$ Hz, 2H), 7.18 – 7.15 (m, 1H), 7.12 (d, $J = 6.7$ Hz, 2H), 6.87 (d, $J = 7.8$ Hz, 2H),

6.50 (d, $J = 7.8$ Hz, 2H), 3.93 (s, 3H), 3.58 – 3.45 (m, 2H), 2.25 (s, 3H), 1.64 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 157.7, 153.4, 143.4, 135.6, 134.2, 132.9, 130.9, 130.5, 129.6, 129.0 (d, $J = 32.3$ Hz), 128.4, 128.2, 128.2, 127.7, 126.6, 124.9, 124.74 (q, $J = 3.7$ Hz), 118.7, 105.5, 55.3, 47.3, 46.9, 26.8, 20.9. ^{19}F NMR (471 MHz, CDCl_3) δ -62.2. HRMS (EI) m/z : calcd for: $\text{C}_{28}\text{H}_{25}\text{F}_3\text{O}$: 434.1858; Found: 434.1857.

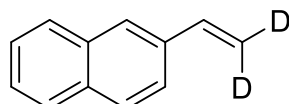


4nbi

2-(1-(*p*-tolyl)-2-(4-(trifluoromethyl)phenyl)propan-2-yl)benzo[*b*]thiophene (4nbi). The optimized procedure was followed by using 34.8 mg of 2-(prop-1-en-2-yl)benzo[*b*]thiophene (**1n**) (0.20 mmol), 41.2 mg of *p*-tolyl diazonium tetrafluoroborate (**2b**) (0.20 mmol), 45.6 mg of (4-(trifluoromethyl)phenyl)boronic acid (**3i**) (0.24 mmol), 9.2 mg of $\text{Pd}_2(\text{dba})_3$ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After further 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 44.4 mg of the product as a yellow oil (54%). ^1H NMR (500 MHz, CDCl_3) δ 7.76 (dd, $J = 7.8, 3.5$ Hz, 1H), 7.71 (d, $J = 7.8$ Hz, 1H), 7.56 (dd, $J = 15.1, 8.3$ Hz, 2H), 7.42 (d, $J = 9.6$ Hz, 1H), 7.40 – 7.33 (m, 2H), 7.32 – 7.28 (m, 1H), 7.11 (d, $J = 11.6$ Hz, 1H), 6.90 (dd, $J = 33.8, 7.9$ Hz, 2H), 6.63 (d, $J = 7.9$ Hz, 2H), 3.55 (dt, $J = 24.6, 8.5$ Hz, 2H), 2.28 (s, 3H), 1.72 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 155.1, 151.3, 139.4, 136.1, 133.5, 130.8, 130.4, 128.4, 127.7, 127.6, 124.9 (q, $J = 3.7$ Hz), 124.2, 124.0, 123.3, 122.2, 122.1, 120.8, 48.2, 46.5, 27.4, 21.0. ^{19}F NMR (471 MHz, CDCl_3) δ -62.3. HRMS (EI) m/z : calcd for: $\text{C}_{25}\text{H}_{21}\text{F}_3\text{S}$: 410.1316; Found: 410.1326.

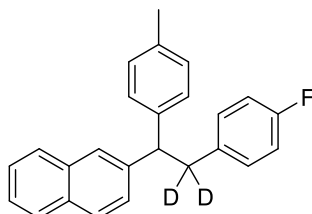


- 1-(*tert*-butyl)-4-(1-(4-methoxyphenyl)-2-(4-nitrophenyl)ethyl)benzene (4omb).** The procedure was followed by using 474 mg of *p*-nitrophenyldiazonium tetrafluoroborate (**2m**) (2.0 mmol), 365 mg of (4-methoxyphenyl)boronic acid (**3b**) (2.4 mmol), 46 mg of $\text{Pd}_2(\text{dba})_3$ (0.05 mmol), 178 mg of lithium carbonate (2.4 mmol), 160 mg of 1-(*tert*-butyl)-4-vinylbenzene (**1o**) (1 mmol) and 6 mL of *t*-Amy-OH and stirred at 40 °C. After further 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na_2SO_4 , and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:3, v/v) to afford 60.5 mg of the product with byproduct (mb) as a yellow solid (7% analyzed by NMR). HRMS (EI) m/z : calcd for: $\text{C}_{25}\text{H}_{27}\text{NO}_3$: 389.1991; Found: 389.1996.



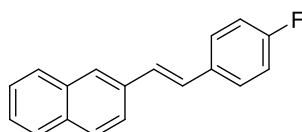
1a-D₂

2-(vinyl-2,2-*d*₂)naphthalene (1a-D₂).² The operation process was on the basis of reference 2. The desired product was got as a white solid (39%, 71% D). And the determination of the rates of deuteration was based on the peak area of ¹H NMR of the corresponding 1H. ¹H NMR (500 MHz, CDCl₃) δ 7.88 – 7.83 (m, 3H), 7.80 (s, 1H), 7.69 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.54 – 7.47 (m, 2H), 6.97 – 6.91 (m, 1H), 5.96 – 5.90 (m, 0.29H), 5.39 (dd, *J* = 10.9, 7.4 Hz, 0.29H). ¹³C NMR (125 MHz, CDCl₃) δ 136.8 (dd, *J* = 13.7, 10.9 Hz), 134.9, 133.5, 133.1, 128.1, 128.0, 127.6, 126.3, 126.2, 125.9, 123.1, 114.1.



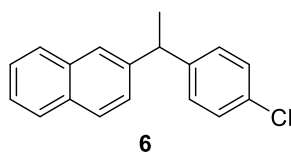
4aaa-D₂

2-(2-(4-fluorophenyl)-1-(*p*-tolylethyl)-2,2-*d*₂)naphthalene (4aaa-D₂). The optimized procedure was followed by using 31.2 mg of 2-(vinyl-2,2-*d*₂)naphthalene **1a-D₂** (0.20 mmol), 42.0 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (0.20 mmol), 32.6 mg of *p*-tolylboronic acid (**3a**) (0.24 mmol), 9.2 mg of Pd₂(dba)₃ (0.01 mmol), 17.8 mg of lithium carbonate (0.24 mmol) and 1 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 41.1 mg of the product as a yellowish oil (60%, 2x71% D). ¹H NMR (500 MHz, CDCl₃) δ 7.78 (dd, *J* = 8.6, 7.3 Hz, 2H), 7.74 (d, *J* = 8.5 Hz, 1H), 7.65 (s, 1H), 7.45 (pd, *J* = 6.8, 1.4 Hz, 2H), 7.33 (dd, *J* = 8.5, 1.3 Hz, 1H), 7.14 (d, *J* = 8.0 Hz, 2H), 7.09 (d, *J* = 8.0 Hz, 2H), 7.00 – 6.95 (m, 2H), 6.91 – 6.80 (m, 2H), 4.37 – 4.29 (m, 1H), 3.48 – 3.38 (m, 0.58H), 2.31 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 161.2 (d, *J* = 243.4 Hz), 141.8, 141.0, 135.8, 133.4, 132.1, 130.4 (d, *J* = 7.8 Hz), 129.1, 127.96 (d, *J* = 8.4 Hz), 127.7, 127.5, 126.8, 125.9 (d, *J* = 10.7 Hz), 125.4, 114.9, 114.7, 52.8, 52.7, 21.0. ¹⁹F NMR (471 MHz, CDCl₃) δ -117.4. HRMS (EI) *m/z*: calcd for: C₂₅H₁₉D₂F:342.1753; Found: 342.1762.



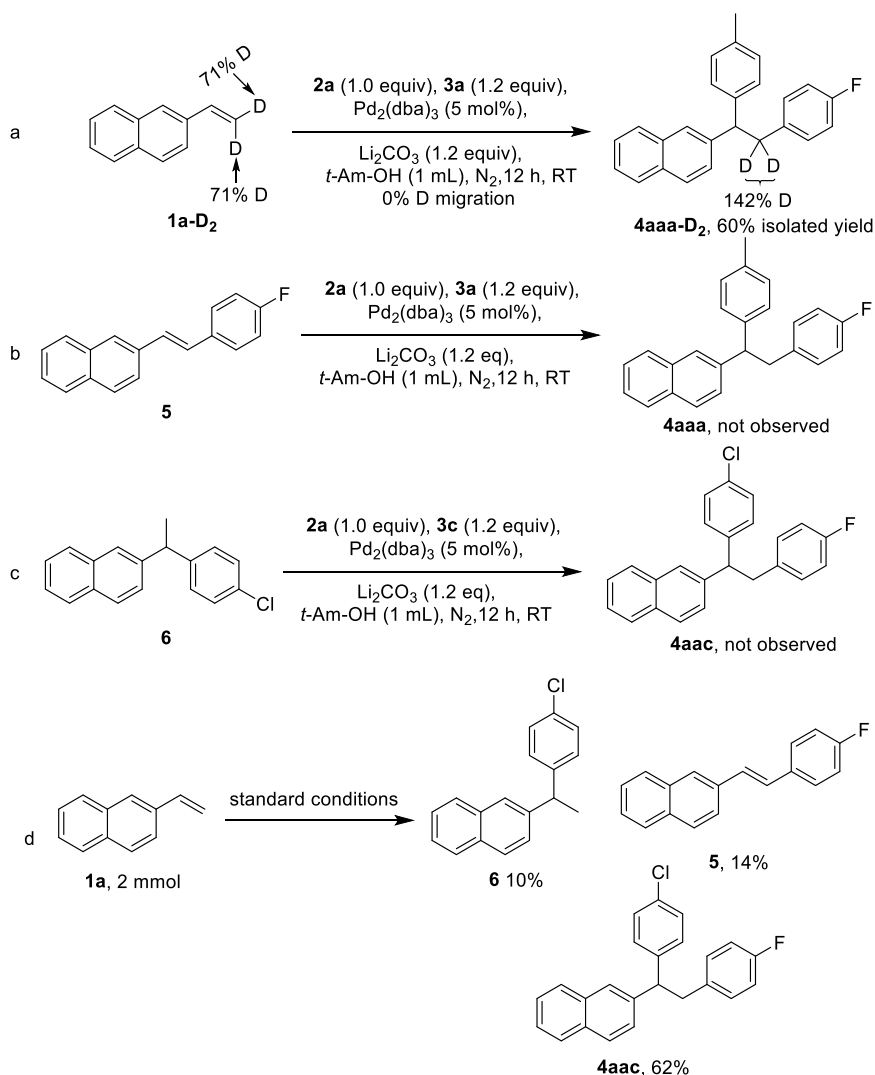
5

(E)-2-(4-fluorostyryl)naphthalene (5).³ The optimized procedure was followed by using 303 mg of 2-vinylnaphthalene (**1a**) (2.0 mmol), 420 mg of 4-fluorophenyldiazonium tetrafluoroborate (**2a**) (2.0 mmol), 394 mg of (4-propylphenyl)boronic acid (**3d**) (2.4 mmol), 91.5 mg of Pd₂(dba)₃ (0.1 mmol), 178 mg of lithium carbonate (2.4 mmol) and 8 mL of *t*-Amy-OH and stirred at rt. After 12 h, the reaction mixture was extracted water/EA. Then the organic layers were dried with Na₂SO₄, and concentrated to dryness. The crude product was purified by silica gel chromatography (silica gel, PE: EA = 100:1, v/v) to afford 446 mg of the product as a slight yellow solid (62%) along with 10% of the byproduct (**6**) as a slight yellow oil and 14% of Heck-type product (**5**) as a white solid. ¹H NMR (500 MHz, CDCl₃) δ 7.84 (dd, *J* = 8.4, 4.1 Hz, 4H), 7.73 (dd, *J* = 8.6, 1.7 Hz, 1H), 7.55 – 7.51 (m, 2H), 7.47 (ddd, *J* = 8.3, 7.2, 1.5 Hz, 2H), 7.20 (s, 2H), 7.12 – 7.06 (m, 2H). ¹³C NMR (125 MHz, CDCl₃) δ 162.3 (d, *J* = 246.3 Hz), 134.6, 133.7, 133.5 (d, *J* = 3.4 Hz), 133.0, 128.5 (d, *J* = 2.4 Hz), 128.3, 128.0, 128.0, 127.7 (d, *J* = 9.2 Hz), 126.6, 126.4, 125.9, 123.4, 115.7, 115.6.



2-(1-(4-chlorophenyl)ethyl)naphthalene (6).⁴ ¹H NMR (500 MHz, CDCl₃) δ 7.80 (d, *J* = 8.2 Hz, 2H), 7.75 (d, *J* = 8.5 Hz, 1H), 7.68 (s, 1H), 7.46 (tdd, *J* = 9.3, 6.9, 1.4 Hz, 2H), 7.29 – 7.26 (m, 2H), 7.26 – 7.25 (m, 1H), 7.21 – 7.16 (m, 2H), 4.29 (q, *J* = 7.2 Hz, 1H), 1.72 (d, *J* = 7.2 Hz, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 144.7, 143.2, 133.5, 132.1, 131.8, 129.1, 128.5, 128.1, 127.7, 127.6, 126.6, 126.1, 125.5, 125.3, 44.2, 21.7.

4. Preliminary mechanistic studies

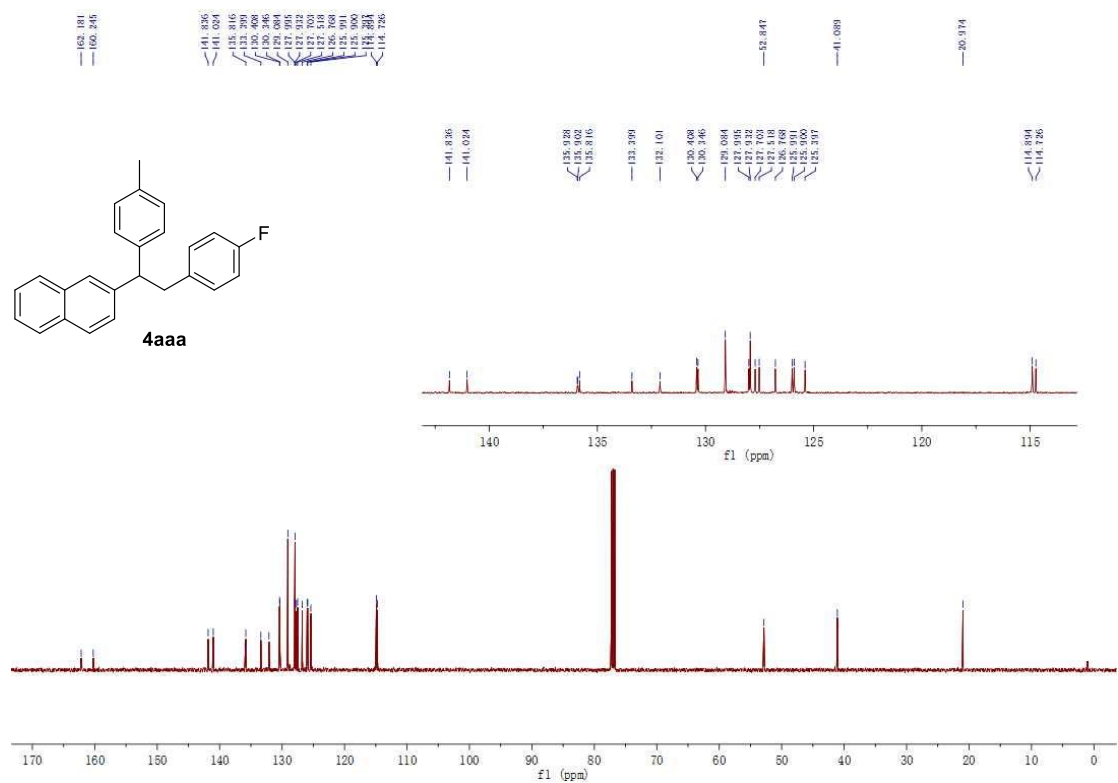


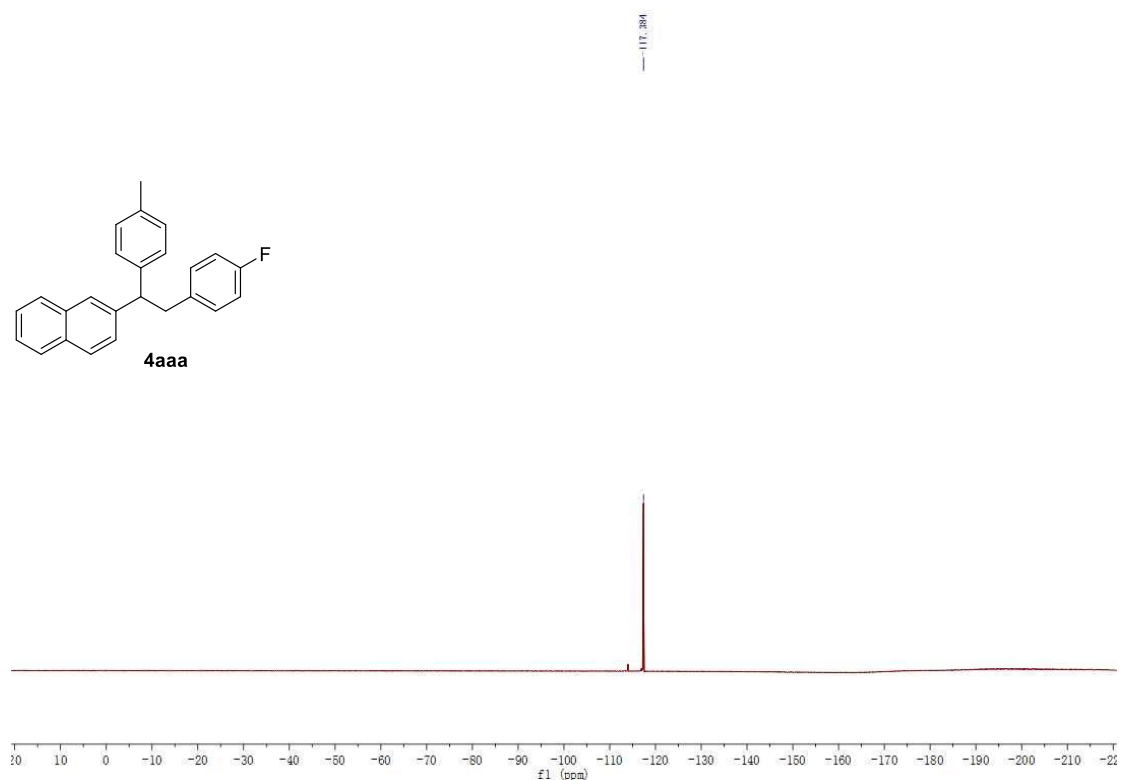
The reaction (eq a) was carried out under the optimized conditions with the D-labeled 2-vinylnaphthalene **1a-D₂** (71% D). Subsequently, the compound **4aaa-D₂** was isolated as a yellow oil in 60% yield with 71% D. By deuterium label experiments, we found that the deuterium ratio of β was almost no change, and the α was no deuterium replacement.

In the process of optimizing conditions, we found the Heck byproduct and hydroarylation byproduct were detected, so we prepared these two products accordingly and subjected them to the standard conditions (compounds **5** and **6** in eq b and eq c), no corresponding desired products were detected. These results suggested that the above two byproducts were not key intermediates for this transformation.

To understand the mechanism of this transformation, a scale-up reaction was conducted with 2 mmol of **1a** with **2a** and **3c** under the standard condition, the corresponding desired product **4aac** was obtained in 62% yield along with 10% of 2-(1-(4-chlorophenyl)ethyl)naphthalene (**6**) and 14% of Heck-type product **5** (eq d), and the structures of both **5** and **6** were verified by corresponding spectroscopic analysis.

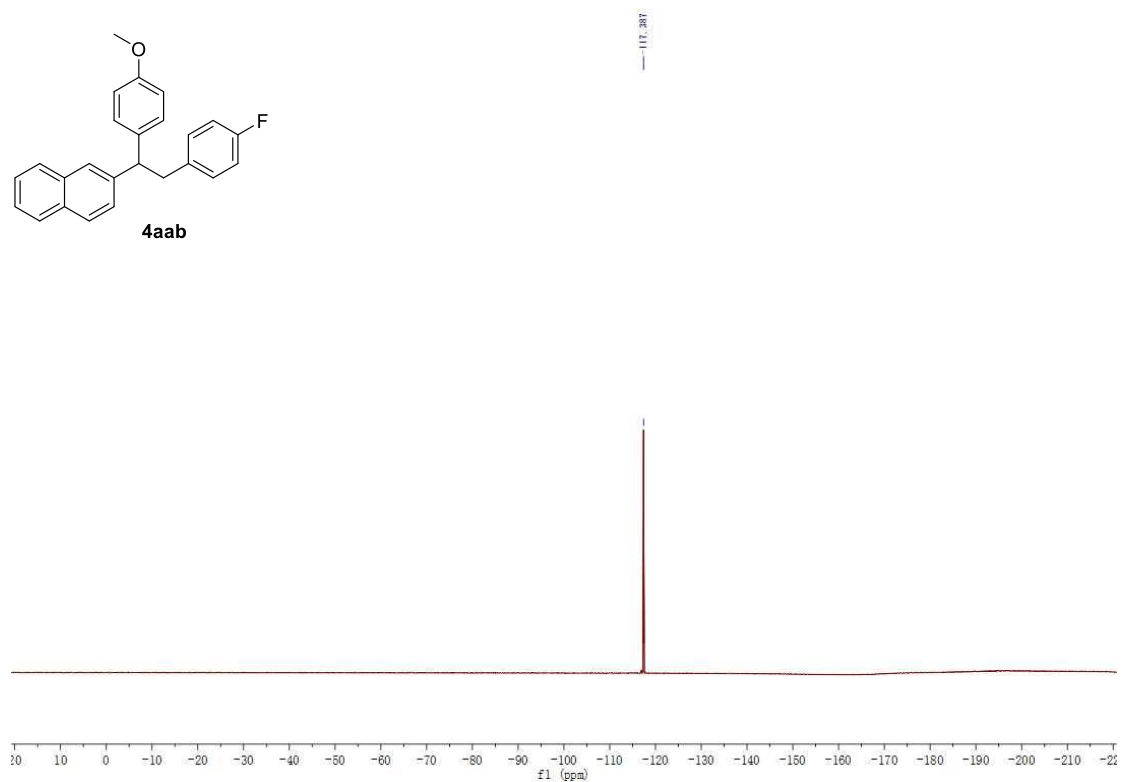
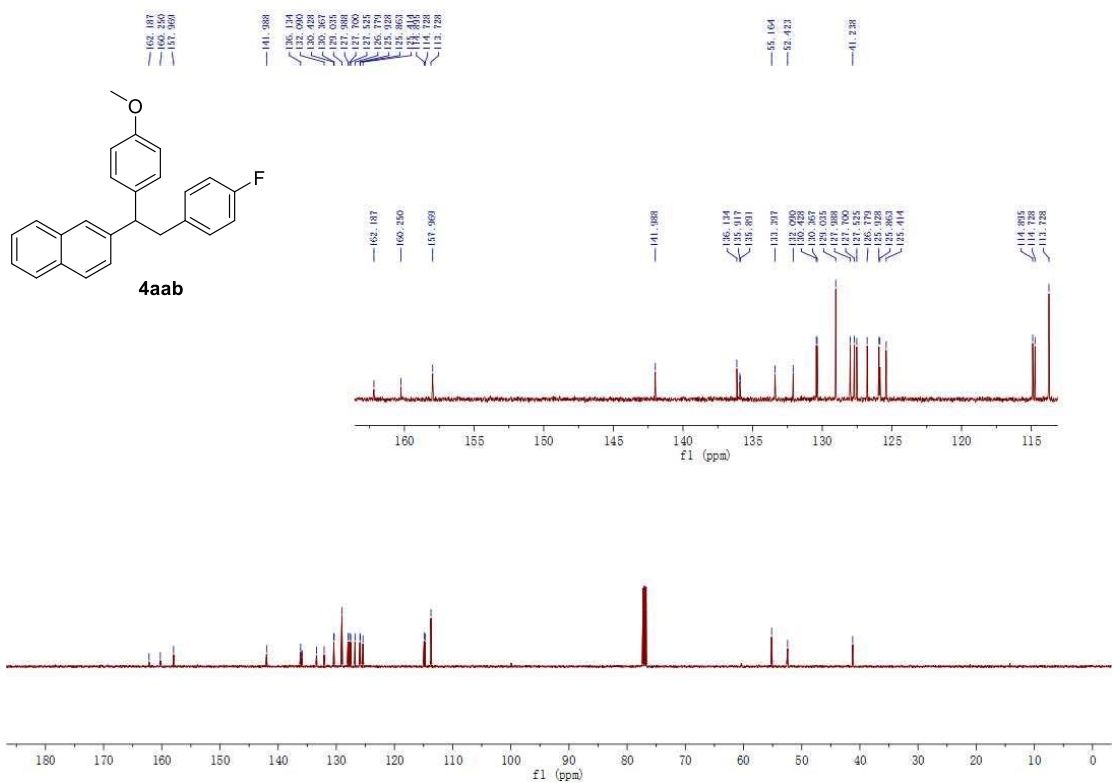
2-(2-(4-fluorophenyl)-1-(*p*-tolyl)ethyl)naphthalene (4aaa)



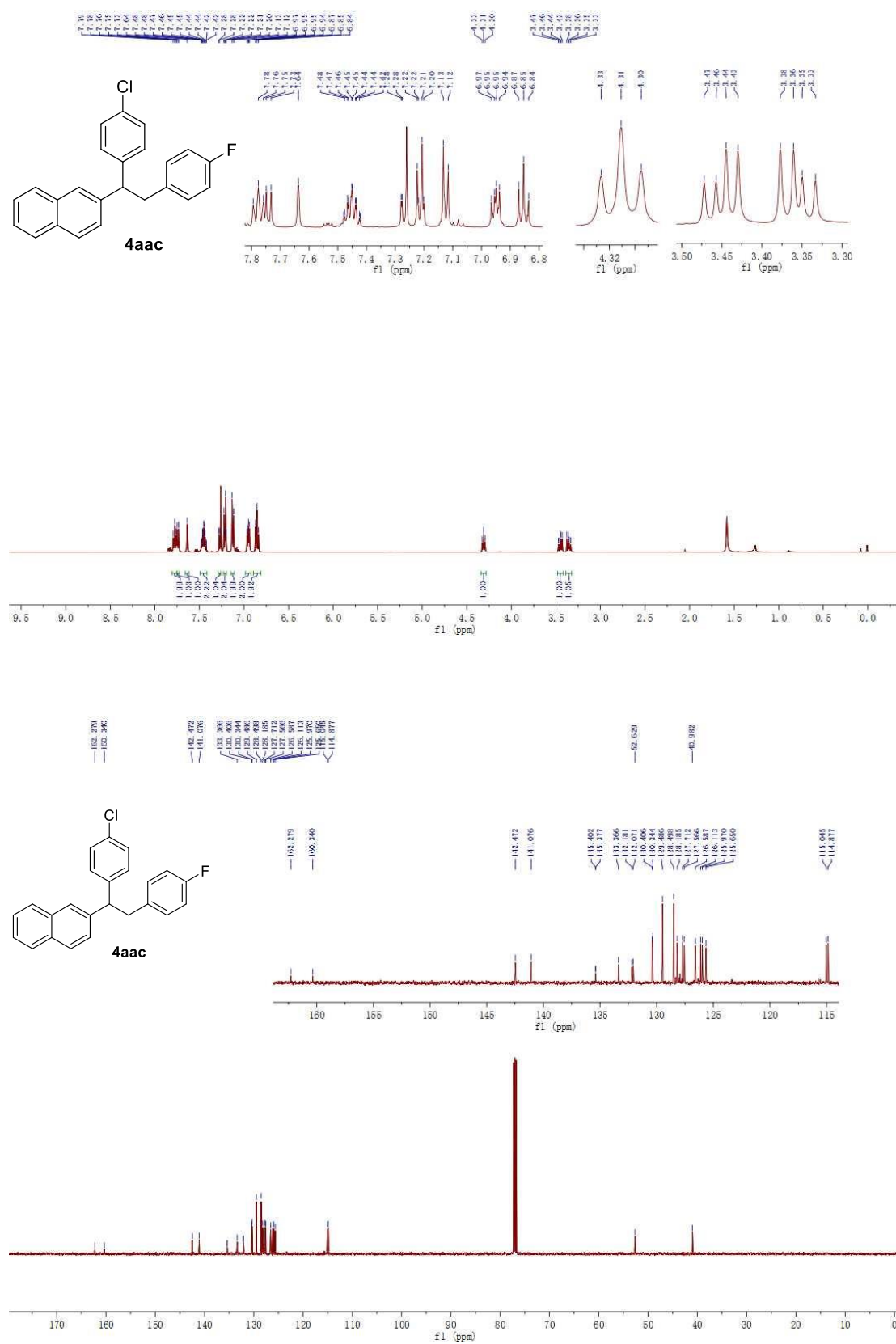


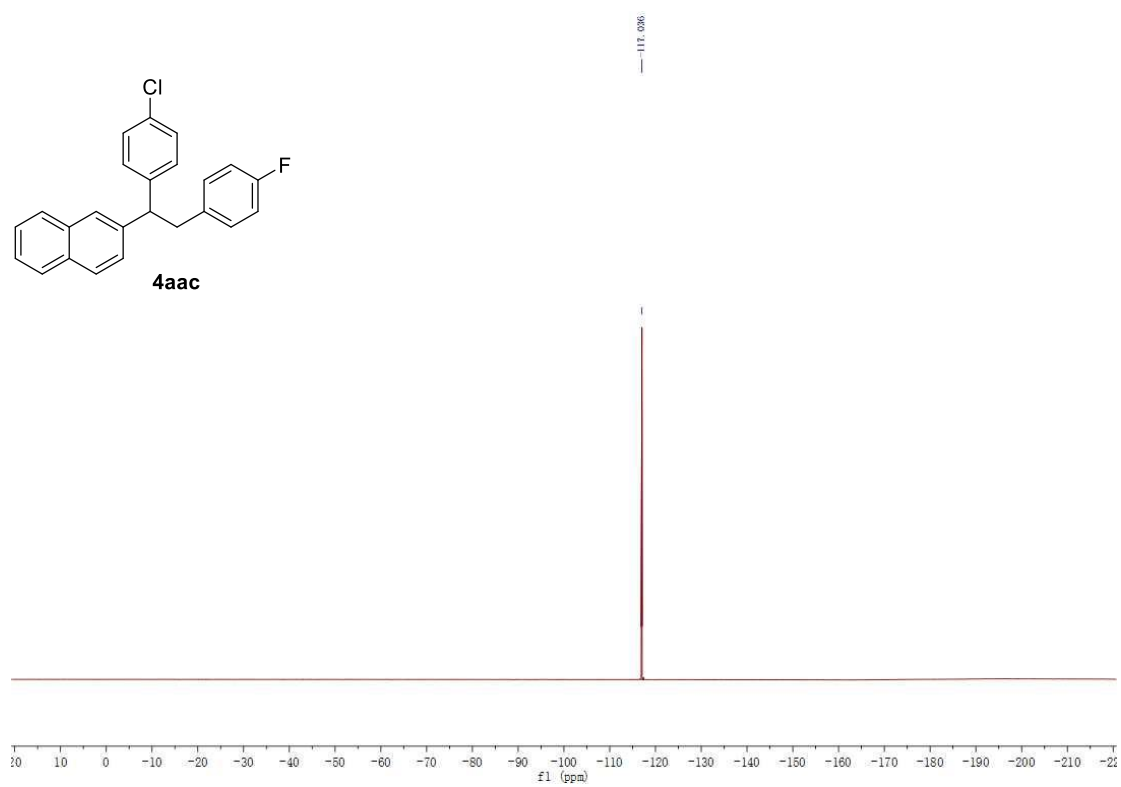
4aab

¹H NMR spectrum (CDCl₃) of compound **4aab**. The spectrum shows peaks in the aromatic region (6.8–7.8 ppm), a methoxy singlet (3.8 ppm), and aliphatic protons (1.0–2.1 ppm). Integration values are provided below the baseline, and chemical shift ranges for each multiplet are shown above the peaks.

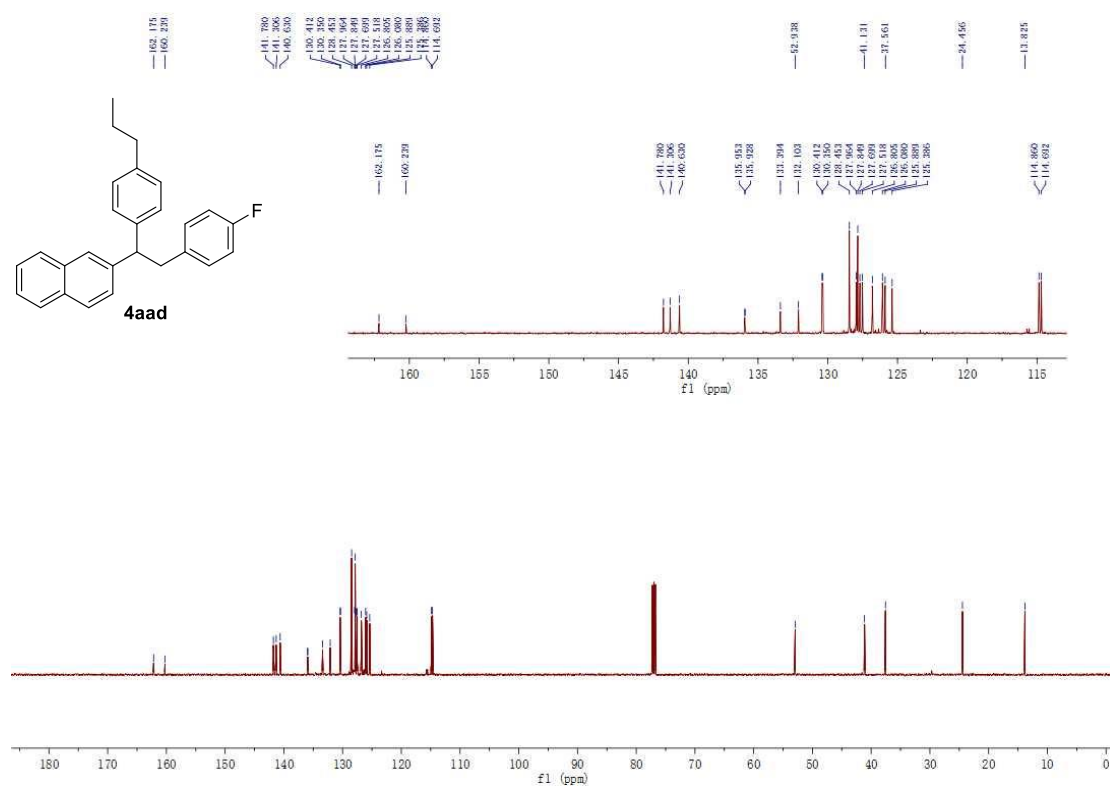


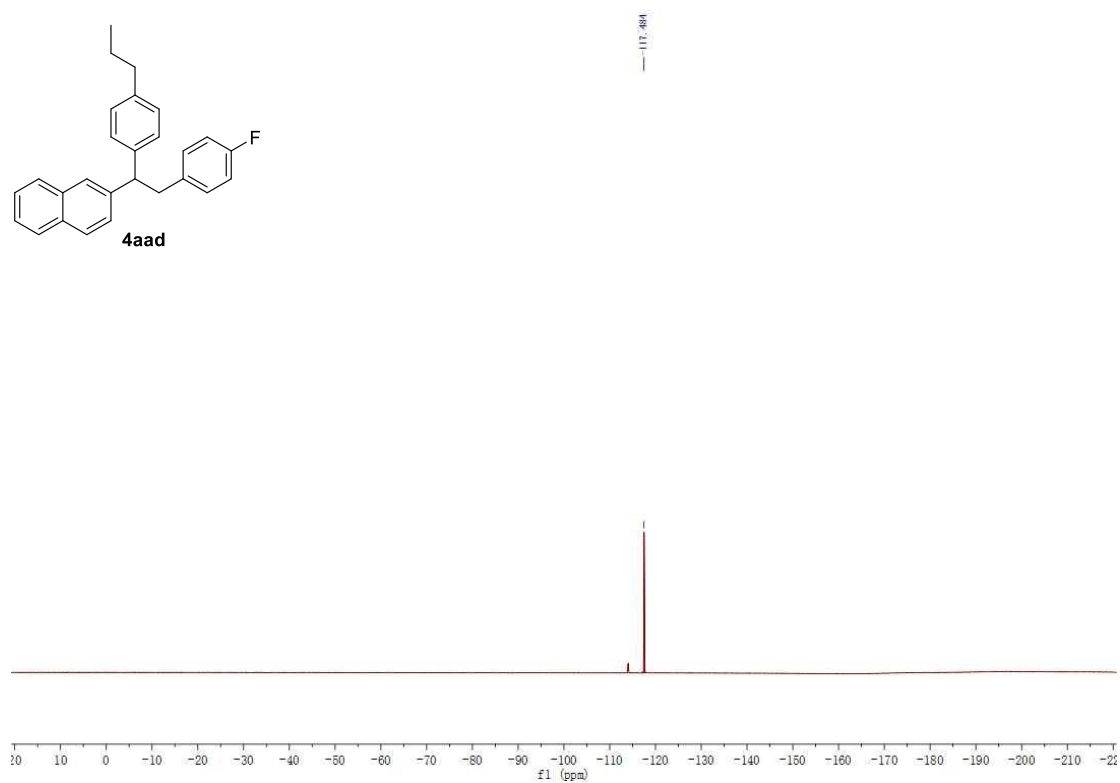
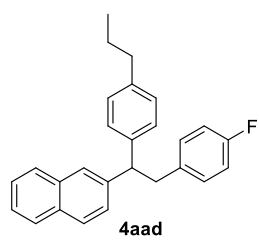
2-(1-(4-chlorophenyl)-2-(4-fluorophenyl)ethyl)naphthalene (4aac)





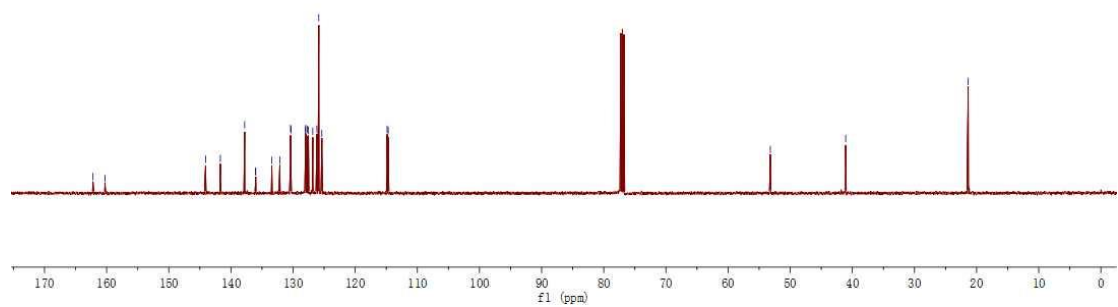
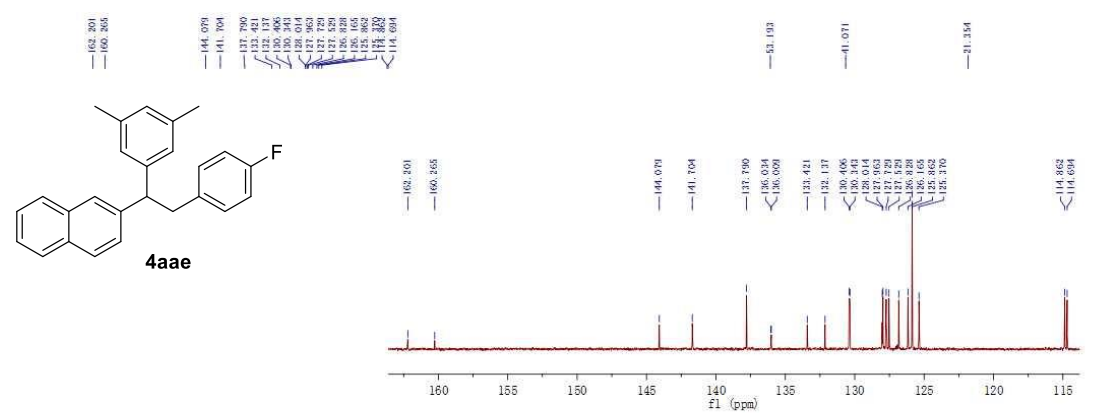
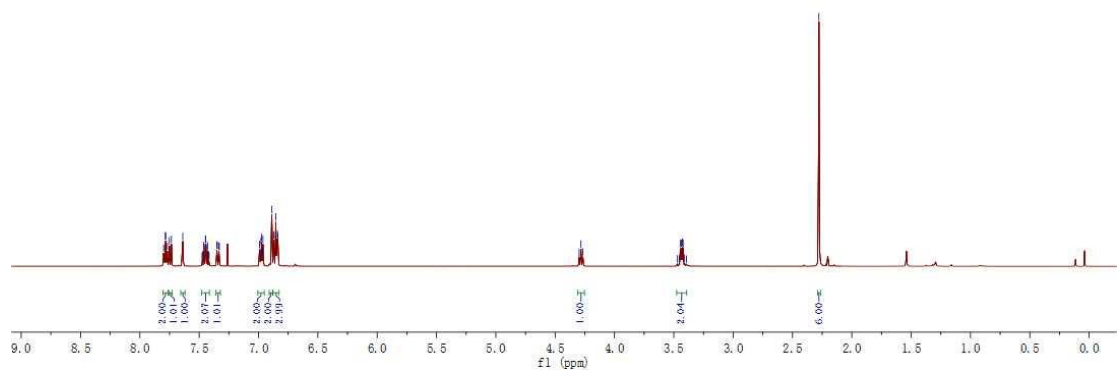
Chemical structure of **4aad** is shown. The ¹H NMR spectrum (CDCl₃) displays peaks in the aromatic region (6.8–7.8 ppm) and aliphatic region (0.9–3.6 ppm). Integration values are provided for each peak.

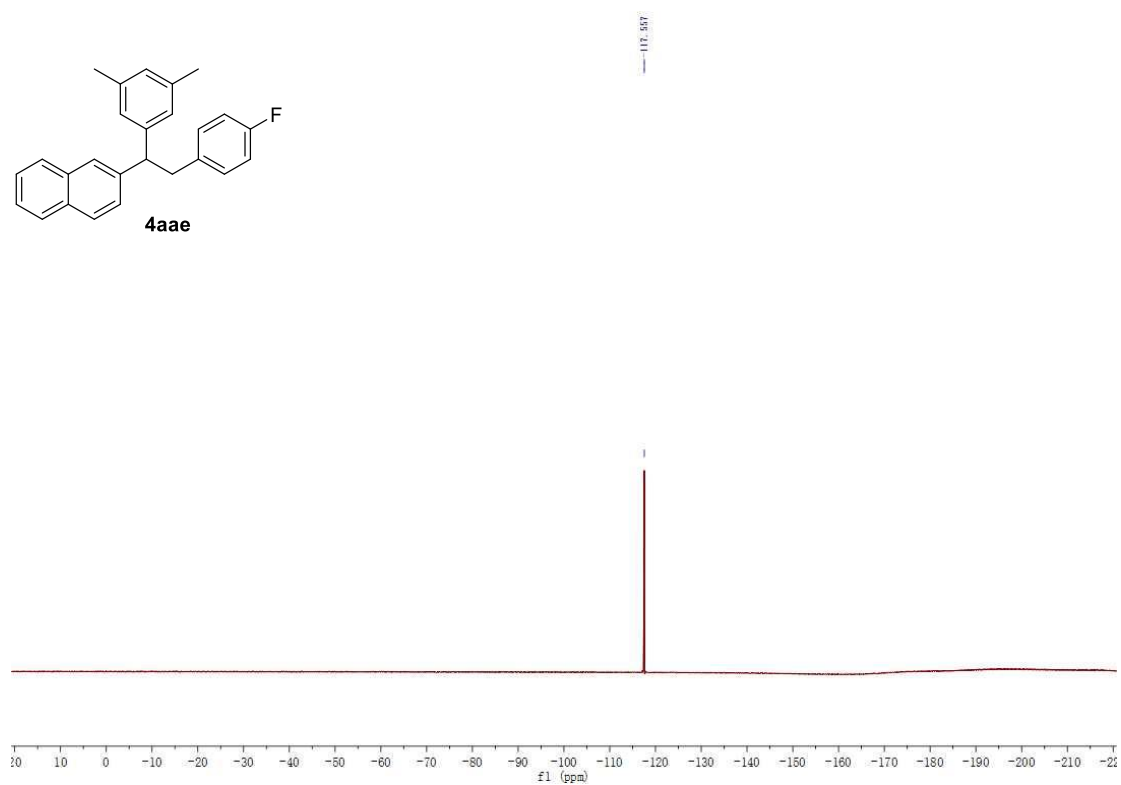
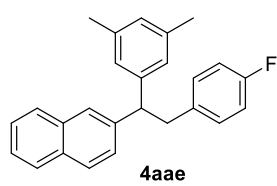




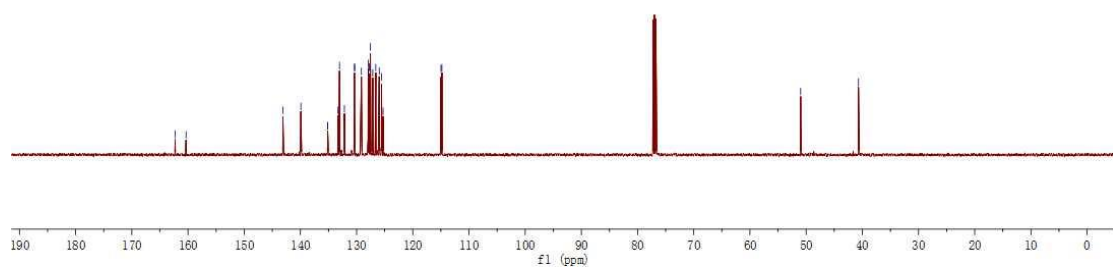
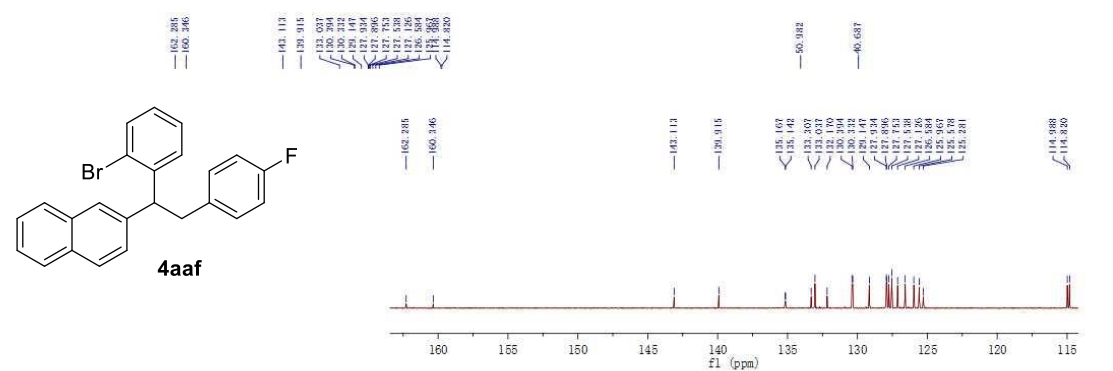
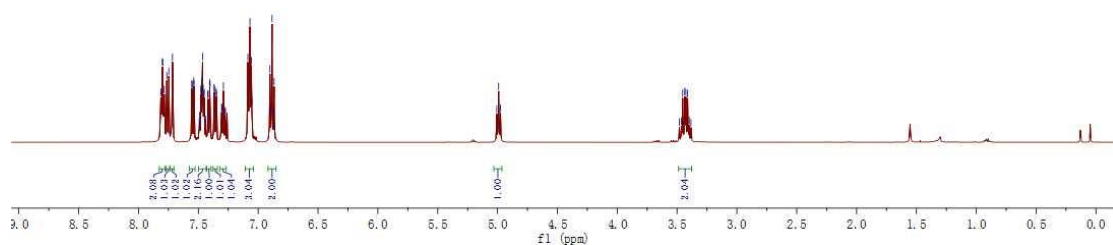
4aae

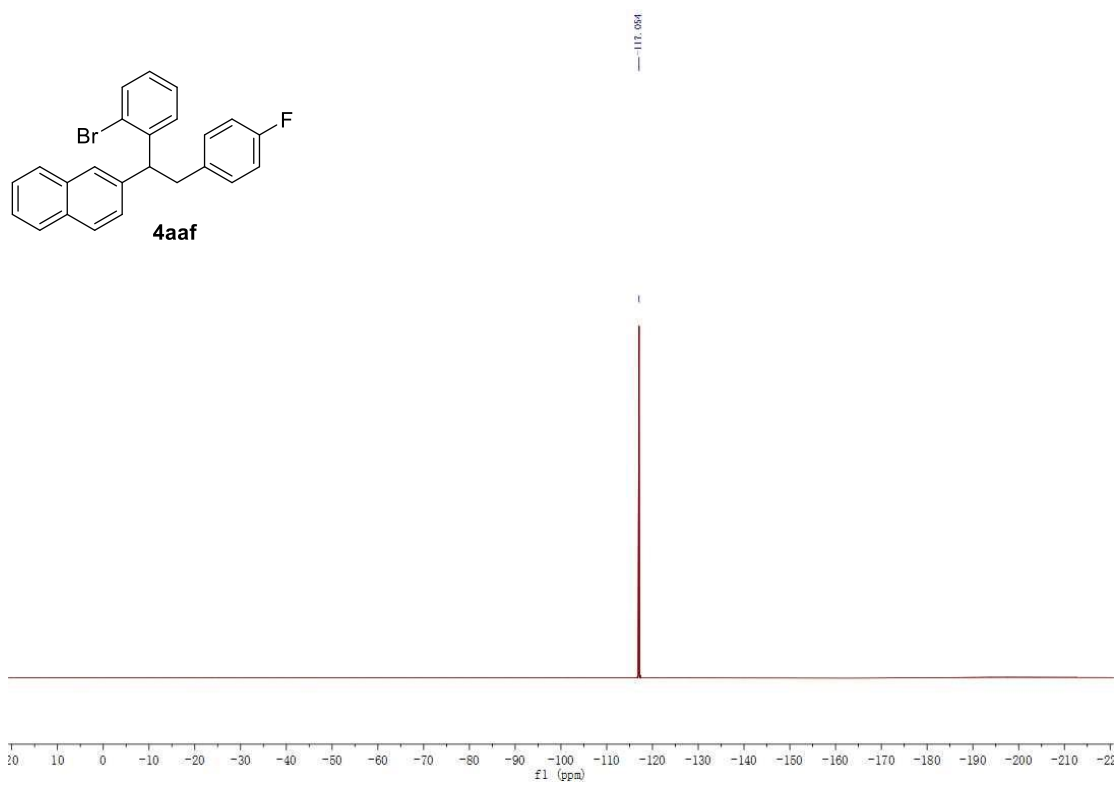
Chemical structure of **4aae** is shown. The ¹H NMR spectrum (CDCl₃) displays peaks in the aromatic region (6.8–7.8 ppm) and aliphatic region (2.3–2.9 ppm). Integration values are indicated above the peaks.





Chemical structure of **4aaf** is shown. The ¹H NMR spectrum (CDCl₃) displays peaks from 2.384 to 7.801 ppm. Integration values are provided for several peak groups.





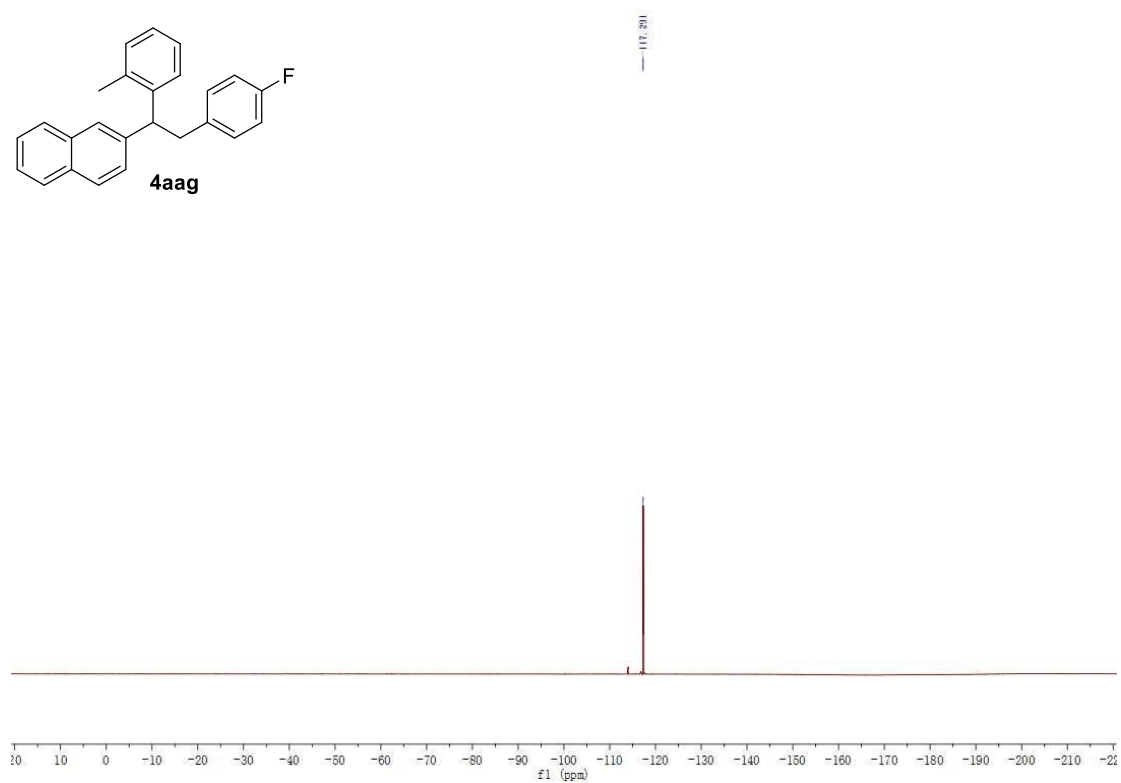
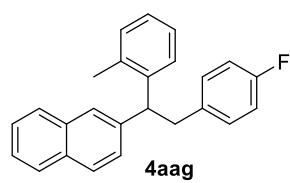
Chemical structure of 4aag: Cc1ccccc1C(c2ccccc2)Cc3ccc(F)cc3

¹H NMR spectrum (400 MHz, CDCl₃):

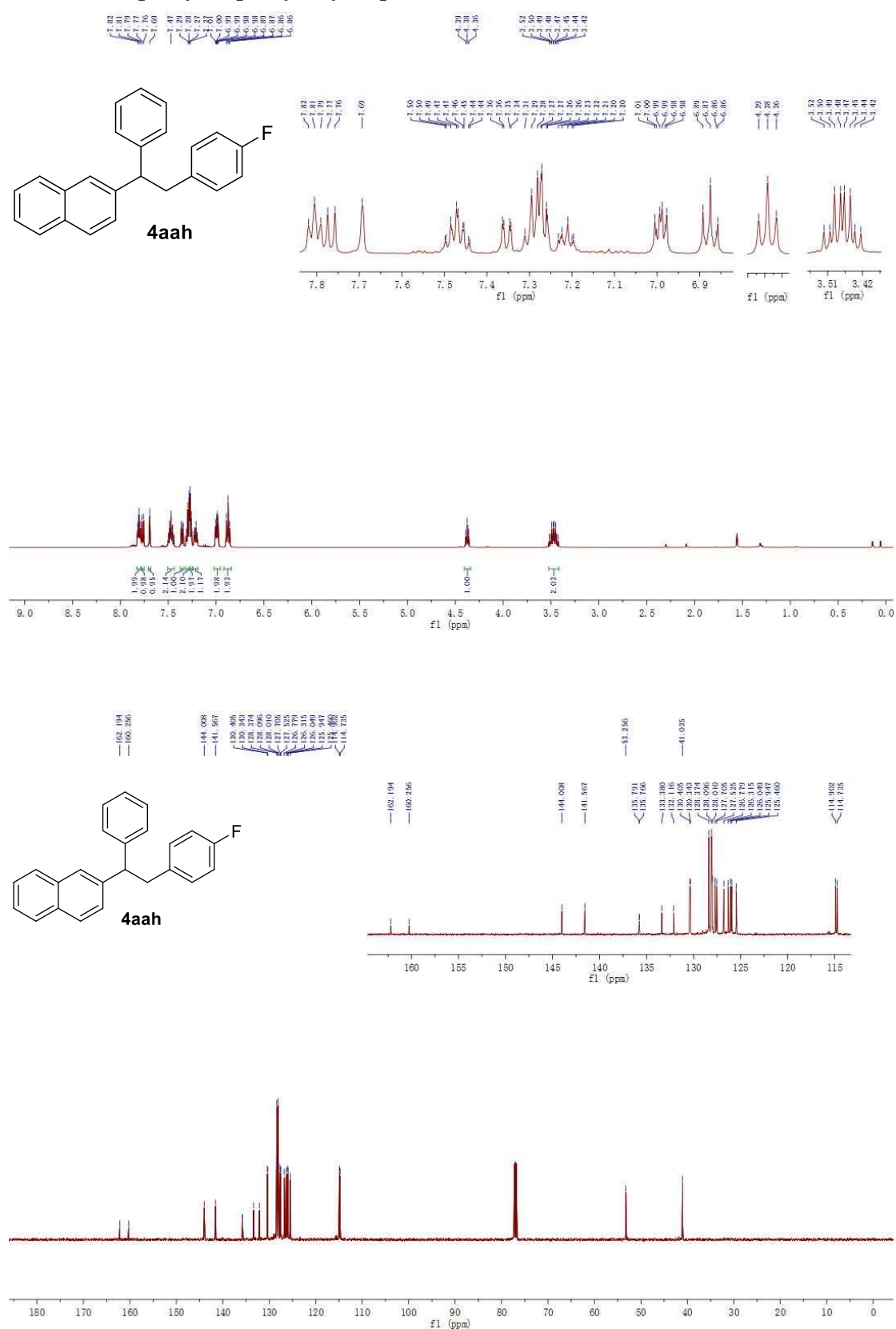
- Chemical shift range: 0.0 to 8.5 ppm.
- Integration values: 1.01, 0.99, 3.01, 2.00, 1.01, 1.00, 1.94, 1.00, 2.06, 3.00.
- Peak list (ppm): 7.77, 7.72, 7.71, 7.60, 7.54, 7.44, 7.43, 7.42, 7.40, 7.25, 7.18, 7.15, 7.14, 7.12, 7.10, 7.09, 6.94, 6.93, 6.92, 6.91, 6.86, 6.83, 4.54, 4.51, 3.45, 3.43, 3.41, 3.40, 3.38, 3.37, 2.14.

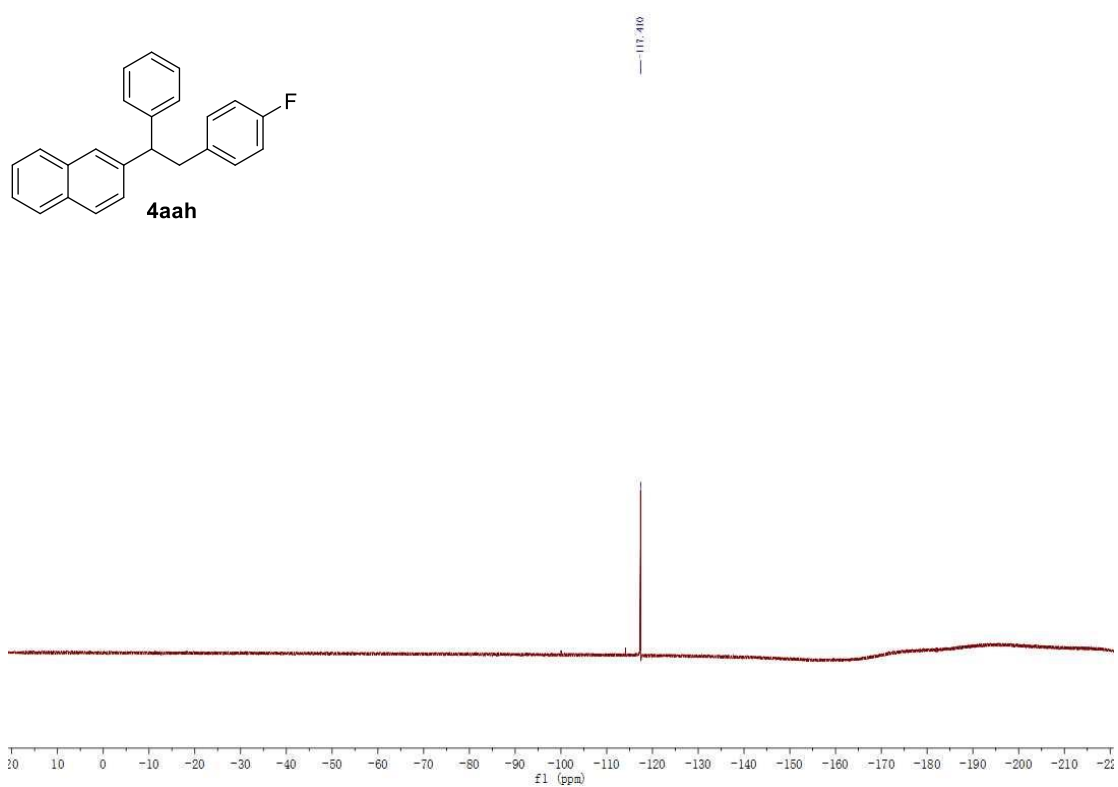
¹³C NMR spectrum (100 MHz, CDCl₃):

- Chemical shift range: 10 to 160 ppm.
- Peak list (ppm): 162.268, 160.329, 142.099, 141.132, 136.472, 135.452, 134.306, 132.825, 127.695, 127.096, 127.055, 126.111, 126.291, 126.080, 125.884, 114.726, 114.394, 114.126, 88.371, 41.316, 19.835.



2-(2-(4-fluorophenyl)-1-phenylethyl)naphthalene (4aah)



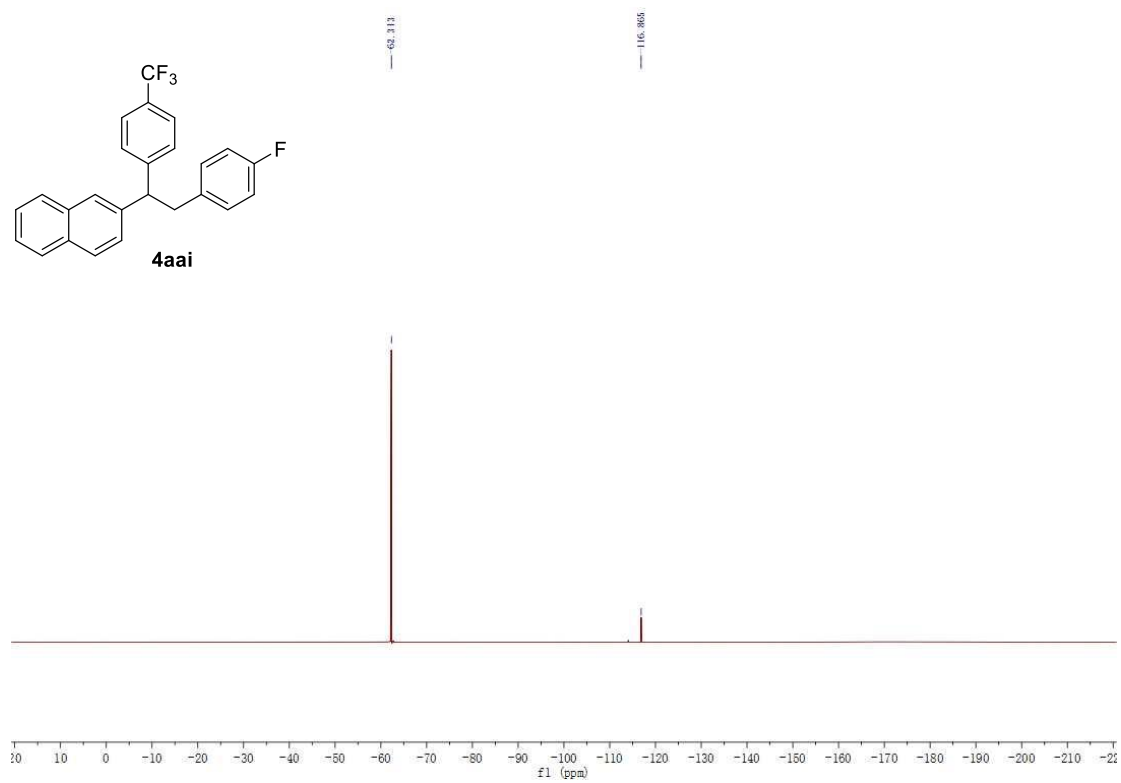


The figure displays the chemical structure of compound 4aai and its corresponding ¹H and ¹³C NMR spectra.

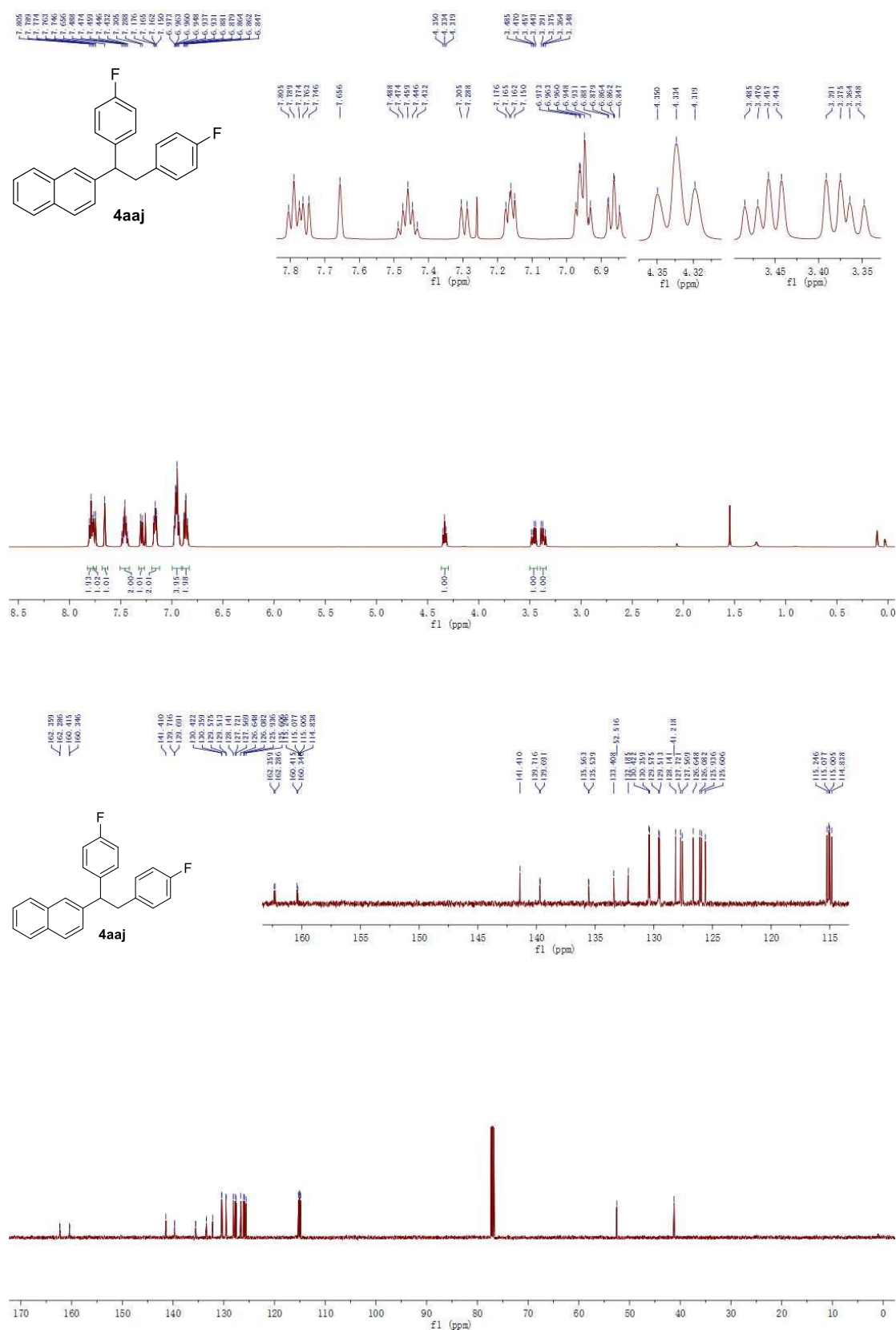
Chemical Structure of 4aai: FC1=CC=C(C=C1)CC(Cc2ccc(C(F)(F)F)cc2)c3ccc4ccccc4c3

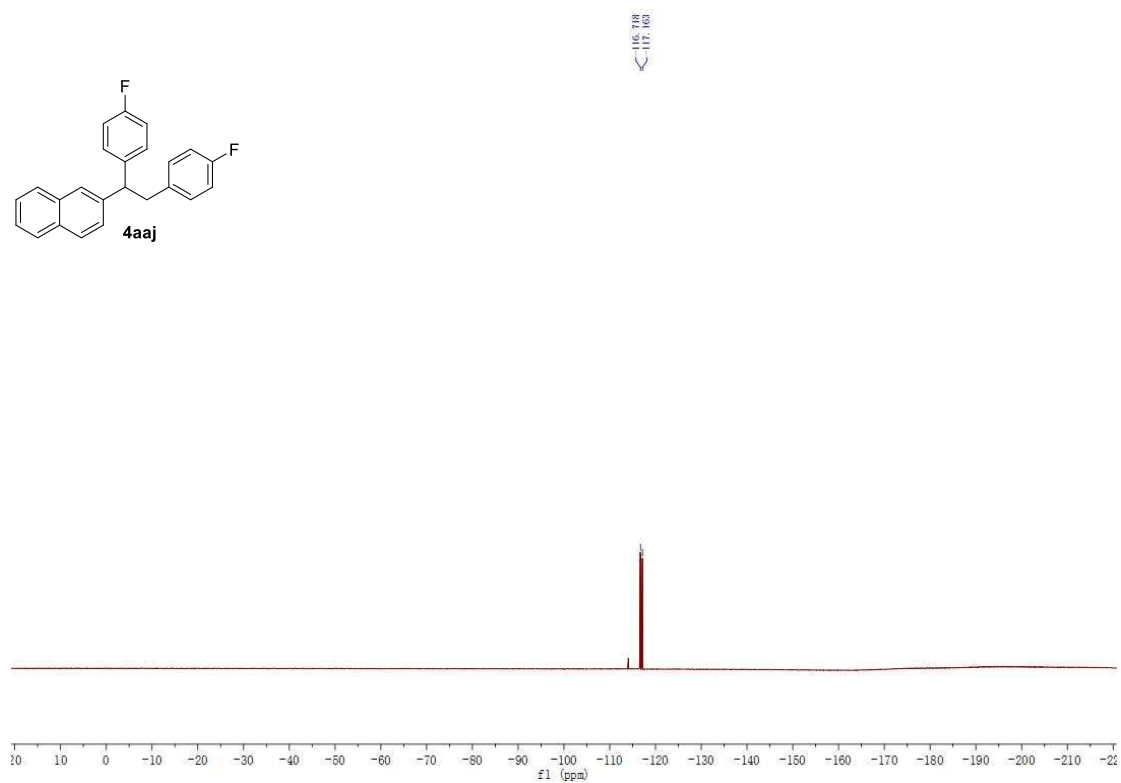
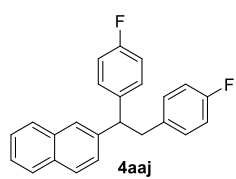
¹H NMR Spectrum (CDCl₃): The spectrum shows peaks in the aromatic region (6.9–7.8 ppm) and aliphatic region (3.4–4.4 ppm). Integration values are provided below the peaks.

¹³C NMR Spectrum (CDCl₃): The spectrum shows peaks in the aromatic region (114–136 ppm) and aliphatic region (125–135 ppm).



2-(1,2-bis(4-fluorophenyl)ethyl)naphthalene (4aaj)



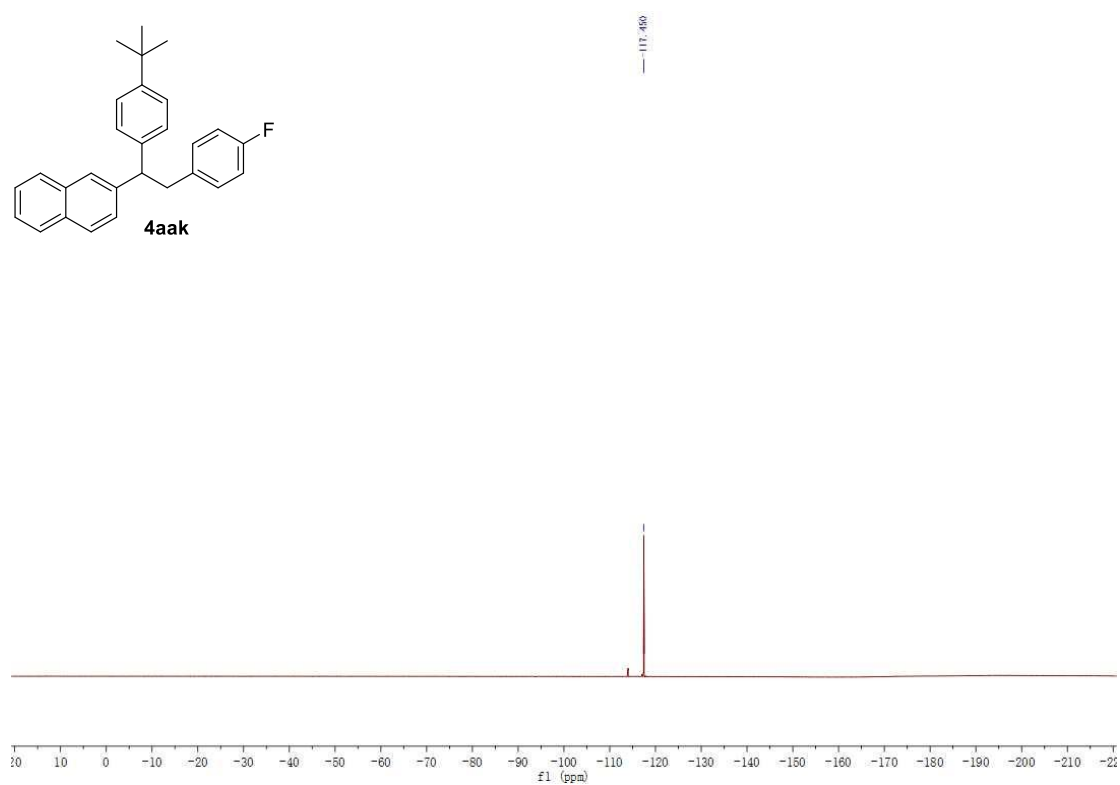
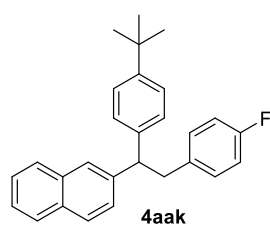


The figure displays the chemical structure of compound 4aak and its corresponding ¹H and ¹³C NMR spectra.

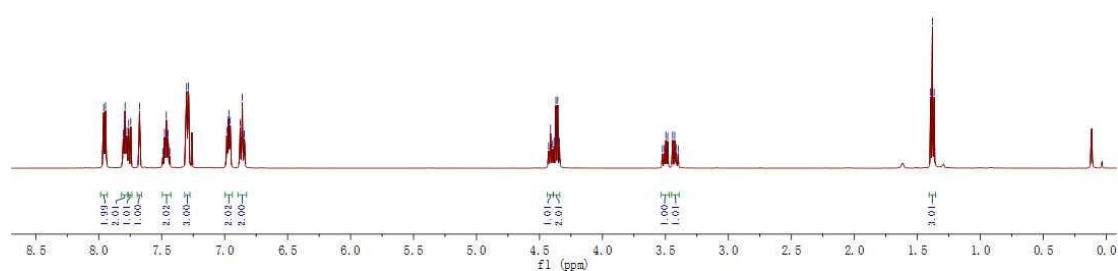
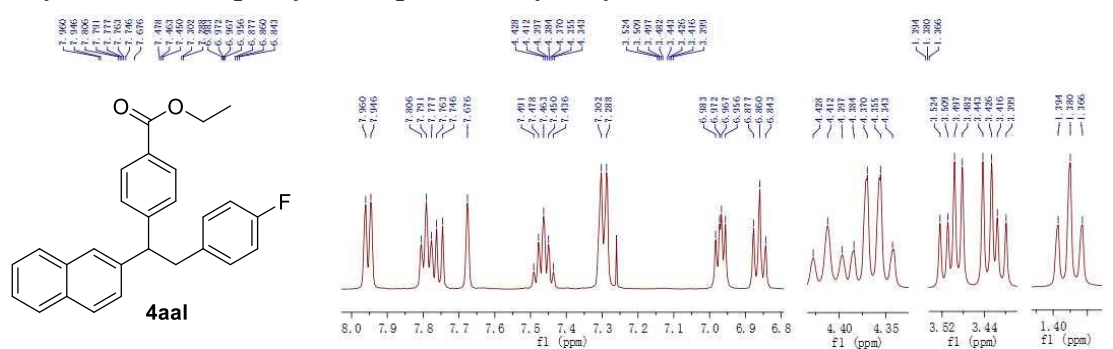
Chemical Structure of 4aak: CC(C)(C)c1ccc(cc1)C(Cc2ccc(F)cc2)c3ccc4ccccc4c3

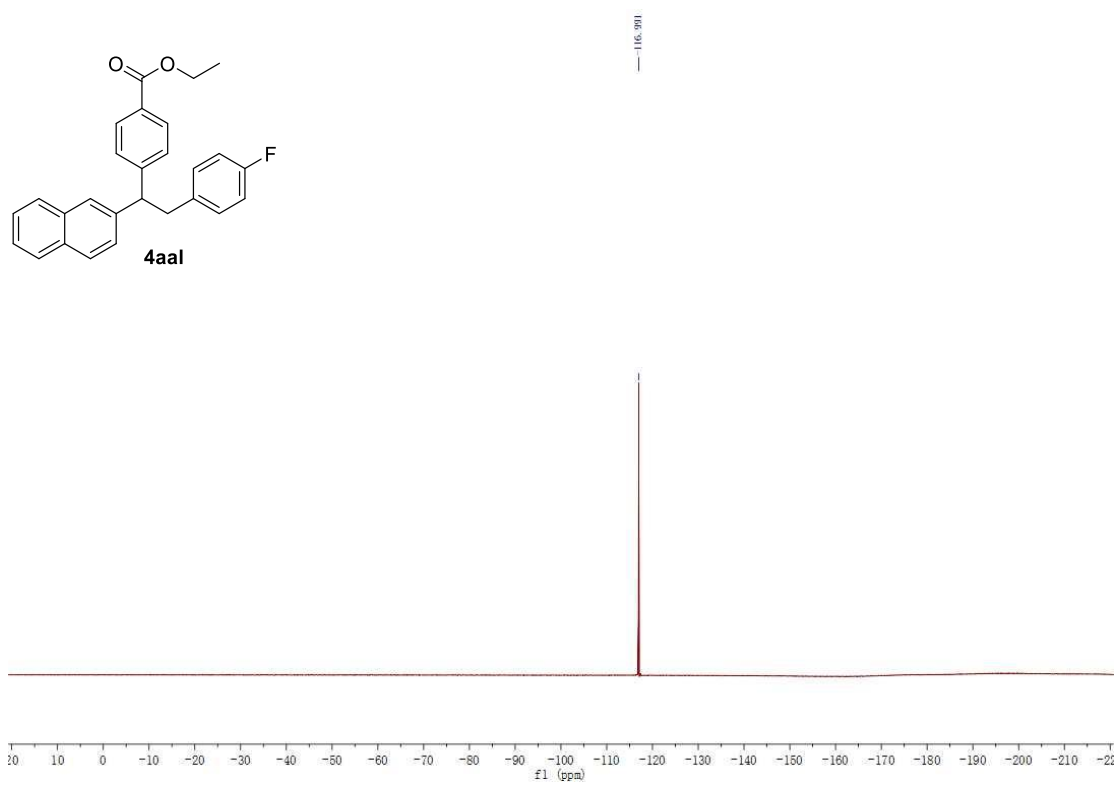
¹H NMR Spectrum (CDCl₃):

- Chemical shift range: 7.8 to 1.3 ppm.
- Integration values: 3.34, 0.98, 2.20, 2.21, 2.28, 2.04, 2.01, 1.03, 1.99, 9.09.
- Peak assignments (ppm): 7.73, 7.72, 7.71, 7.70, 7.69, 7.68, 7.67, 7.66, 7.65, 7.64, 7.63, 7.62, 7.61, 7.60, 7.59, 7.58, 7.57, 7.56, 7.55, 7.54, 7.53, 7.52, 7.51, 7.50, 7.49, 7.48, 7.47, 7.46, 7.45, 7.44, 7.43, 7.42, 7.41, 7.40, 7.39, 7.38, 7.37, 7.36, 7.35, 7.34, 7.33, 7.32, 7.31, 7.30, 7.29, 7.28, 7.27, 7.26, 7.25, 7.24, 7.23, 7.22, 7.21, 7.20, 7.19, 7.18, 7.17, 7.16, 7.15, 7.14, 7.13, 7.12, 7.11, 7.10, 7.09, 7.08, 7.07, 7.06, 7.05, 7.04, 7.03, 7.02, 7.01, 7.00, 6.99, 6.98, 6.97, 6.96, 6.95, 6.94, 6.93, 6.92, 6.91, 6.90, 6.89, 6.88, 6.87, 6.86, 6.85, 6.84, 6.83, 6.82, 6.81, 6.80, 6.79, 6.78, 6.77, 6.76, 6.75, 6.74, 6.73, 6.72, 6.71, 6.70, 6.69, 6.68, 6.67, 6.66, 6.65, 6.64, 6.63, 6.62, 6.61, 6.60, 6.59, 6.58, 6.57, 6.56, 6.55, 6.54, 6.53, 6.52, 6.51, 6.50, 6.49, 6.48, 6.47, 6.46, 6.45, 6.44, 6.43, 6.42, 6.41, 6.40, 6.39, 6.38, 6.37, 6.36, 6.35, 6.34, 6.33, 6.32, 6.31, 6.30, 6.29, 6.28, 6.27, 6.26, 6.25, 6.24, 6.23, 6.22, 6.21, 6.20, 6.19, 6.18, 6.17, 6.16, 6.15, 6.14, 6.13, 6.12, 6.11, 6.10, 6.09, 6.08, 6.07, 6.06, 6.05, 6.04, 6.03, 6.02, 6.01, 6.00, 5.99, 5.98, 5.97, 5.96, 5.95, 5.94, 5.93, 5.92, 5.91, 5.90, 5.89, 5.88, 5.87, 5.86, 5.85, 5.84, 5.83, 5.82, 5.81, 5.80, 5.79, 5.78, 5.77, 5.76, 5.75, 5.74, 5.73, 5.72, 5.71, 5.70, 5.69, 5.68, 5.67, 5.66, 5.65, 5.64, 5.63, 5.62, 5.61, 5.60, 5.59, 5.58, 5.57, 5.56, 5.55, 5.54, 5.53, 5.52, 5.51, 5.50, 5.49, 5.48, 5.47, 5.46, 5.45, 5.44, 5.43, 5.42, 5.41, 5.40, 5.39, 5.38, 5.37, 5.36, 5.35, 5.34, 5.33, 5.32, 5.31, 5.30, 5.29, 5.28, 5.27, 5.26, 5.25, 5.24, 5.23, 5.22, 5.21, 5.20, 5.19, 5.18, 5.17, 5.16, 5.15, 5.14, 5.13, 5.12, 5.11, 5.10, 5.09, 5.08, 5.07, 5.06, 5.05, 5.04, 5.03, 5.02, 5.01, 5.00, 4.99, 4.98, 4.97, 4.96, 4.95, 4.94, 4.93, 4.92, 4.91, 4.90, 4.89, 4.88, 4.87, 4.86, 4.85, 4.84, 4.83, 4.82, 4.81, 4.80, 4.79, 4.78, 4.77, 4.76, 4.75, 4.74, 4.73, 4.72, 4.71, 4.70, 4.69, 4.68, 4.67, 4.66, 4.65, 4.64, 4.63, 4.62, 4.61, 4.60, 4.59, 4.58, 4.57, 4.56, 4.55, 4.54, 4.53, 4.52, 4.51, 4.50, 4.49, 4.48, 4.47, 4.46, 4.45, 4.44, 4.43, 4.42, 4.41, 4.40, 4.39, 4.38, 4.37, 4.36, 4.35, 4.34, 4.33, 4.32, 4.31, 4.30, 4.29, 4.28, 4.27, 4.26, 4.25, 4.24, 4.23, 4.22, 4.21, 4.20, 4.19, 4.18, 4.17, 4.16, 4.15, 4.14, 4.13, 4.12, 4.11, 4.10, 4.09, 4.08, 4.07, 4.06, 4.05, 4.04, 4.03, 4.02, 4.01, 4.00, 3.99, 3.98, 3.97, 3.96, 3.95, 3.94, 3.93, 3.92, 3.91, 3.90, 3.89, 3.88, 3.87, 3.86, 3.85, 3.84, 3.83, 3.82, 3.81, 3.80, 3.79, 3.78, 3.77, 3.76, 3.75, 3.74, 3.73, 3.72, 3.71, 3.70, 3.69, 3.68, 3.67, 3.66, 3.65, 3.64, 3.63, 3.62, 3.61, 3.60, 3.59, 3.58, 3.57, 3.56, 3.55, 3.54, 3.53, 3.52, 3.51, 3.50, 3.49, 3.48, 3.47, 3.46, 3.45, 3.44, 3.43, 3.42, 3.41, 3.40, 3.39, 3.38, 3.37, 3.36, 3.35, 3.34, 3.33, 3.32, 3.31, 3.30, 3.29, 3.28, 3.27, 3.26, 3.25, 3.24, 3.23, 3.22, 3.21, 3.20, 3.19, 3.18, 3.17, 3.16, 3.15, 3.14, 3.13, 3.12, 3.11, 3.10, 3.09, 3.08, 3.07, 3.06, 3.05, 3.04, 3.03, 3.02, 3.01, 3.00, 2.99, 2.98, 2.97, 2.96, 2.95, 2.94, 2.93, 2.92, 2.91, 2.90, 2.89, 2.88, 2.87, 2.86, 2.85, 2.84, 2.83, 2.82, 2.81, 2.80, 2.79, 2.78, 2.77, 2.76, 2.75, 2.74, 2.73, 2.72, 2.71, 2.70, 2.69, 2.68, 2.67, 2.66, 2.65, 2.64, 2.63, 2.62, 2.61, 2.60, 2.59, 2.58, 2.57, 2.56, 2.55, 2.54, 2.53, 2.52, 2.51, 2.50, 2.49, 2.48, 2.47, 2.46, 2.45, 2.44, 2.43, 2.42, 2.41, 2.40, 2.39, 2.38, 2.37, 2.36, 2.35, 2.34, 2.33, 2.32, 2.31, 2.30, 2.29, 2.28, 2.27, 2.26, 2.25, 2.24, 2.23, 2.22, 2.21, 2.20, 2.19, 2.18, 2.17, 2.16, 2.15, 2.14, 2.13, 2.12, 2.11, 2.10, 2.09, 2.08, 2.07, 2.06, 2.05, 2.04, 2.03, 2.02, 2.01, 2.00, 1.99, 1.98, 1.97, 1.96, 1.95, 1.94, 1.93, 1.92, 1.91, 1.90, 1.89, 1.88, 1.87, 1.86, 1.85, 1.84, 1.83, 1.82, 1.81, 1.80, 1.79, 1.78, 1.77, 1.76, 1.75, 1.74, 1.73, 1.72, 1.71, 1.70, 1.69, 1.68, 1.67, 1.66, 1.65, 1.64, 1.63, 1.62, 1.61, 1.60, 1.59, 1.58, 1.57, 1.56, 1.55, 1.54, 1.53, 1.52, 1.51, 1.50, 1.49, 1.48, 1.47, 1.46, 1.45, 1.44, 1.43, 1.42, 1.41, 1.40, 1.39, 1.38, 1.37, 1.36, 1.35, 1.34, 1.33, 1.32, 1.31, 1.

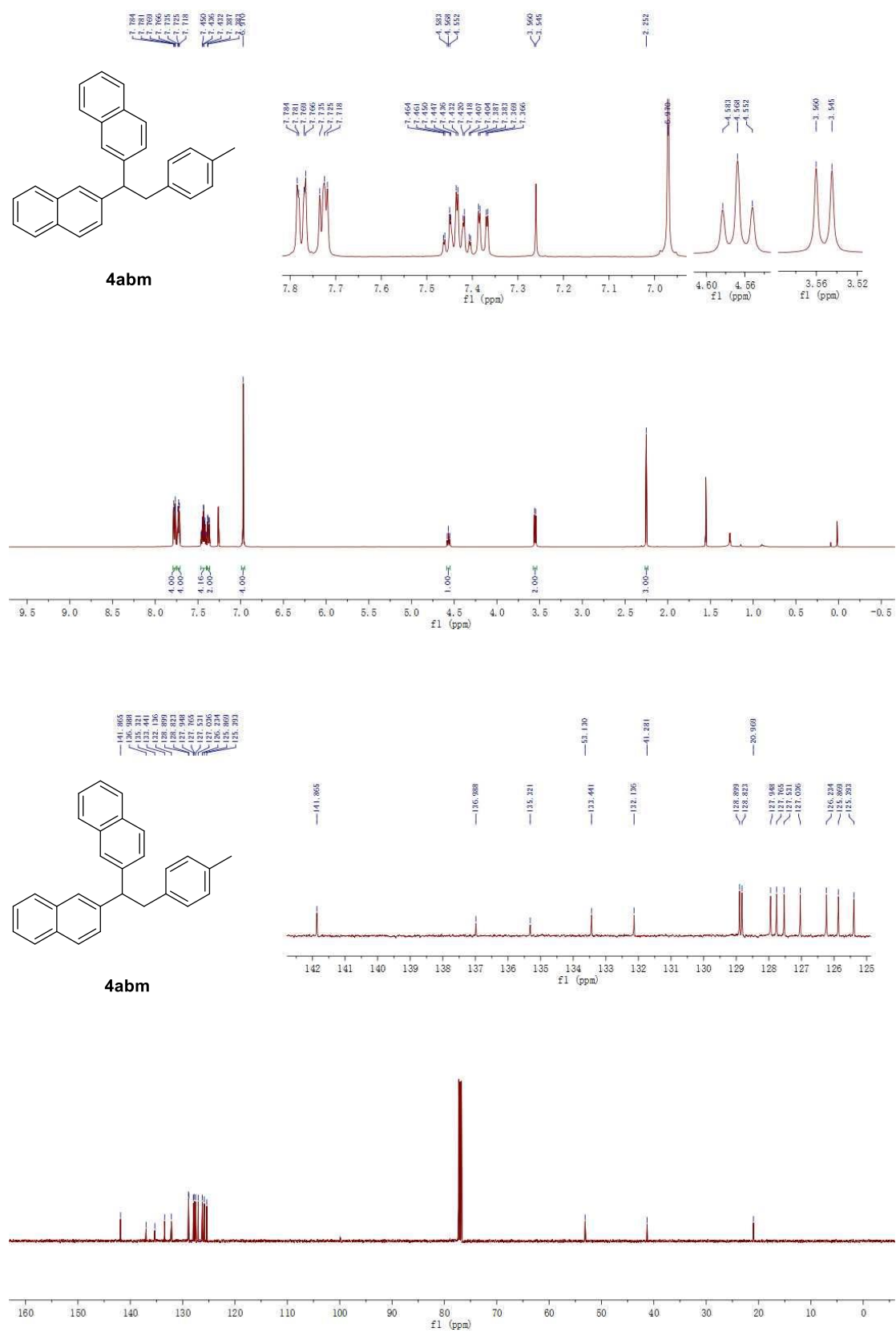


ethyl 4-(2-(4-fluorophenyl)-1-(naphthalen-2-yl)ethyl)benzoate (4aai)

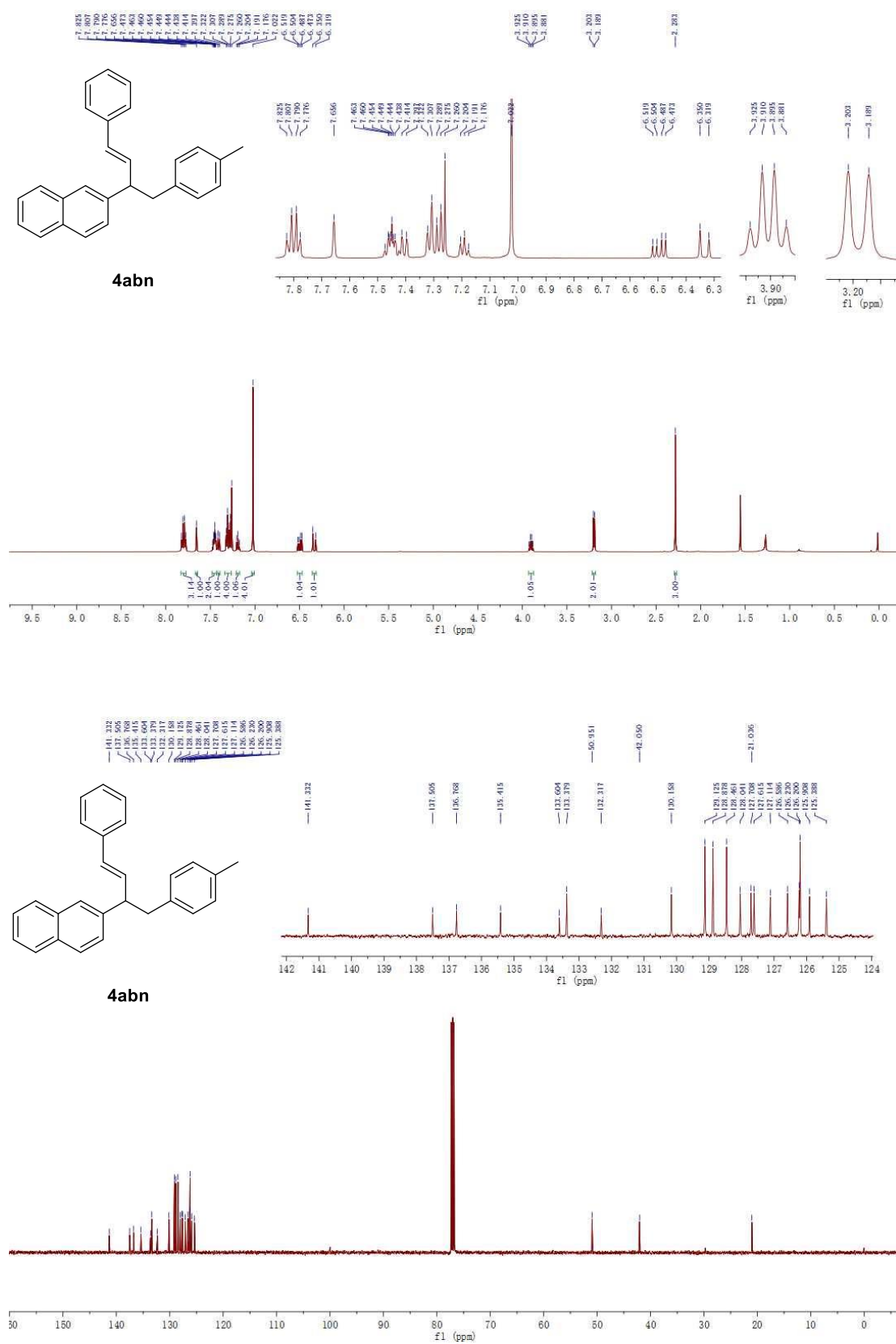




2,2'-(2-(*p*-tolyl)ethane-1,1-diyl)dinaphthalene(4abm)

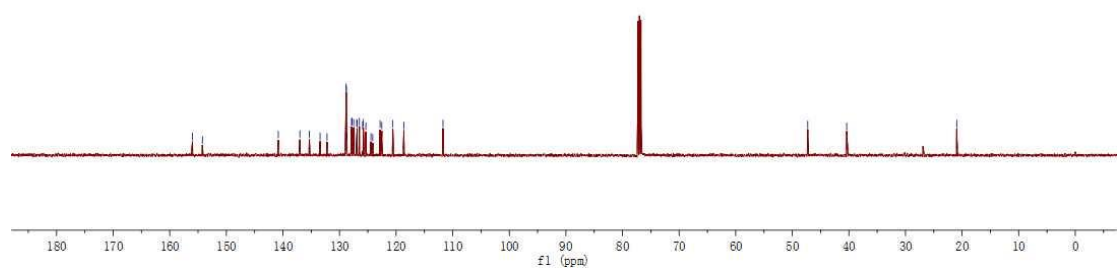
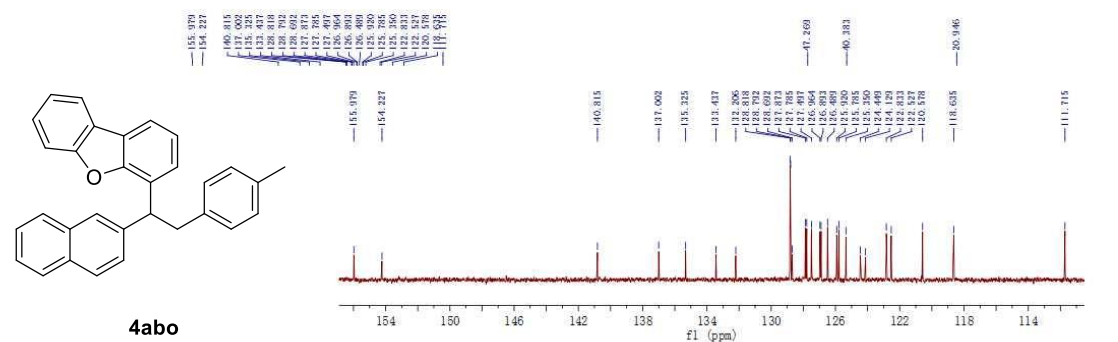
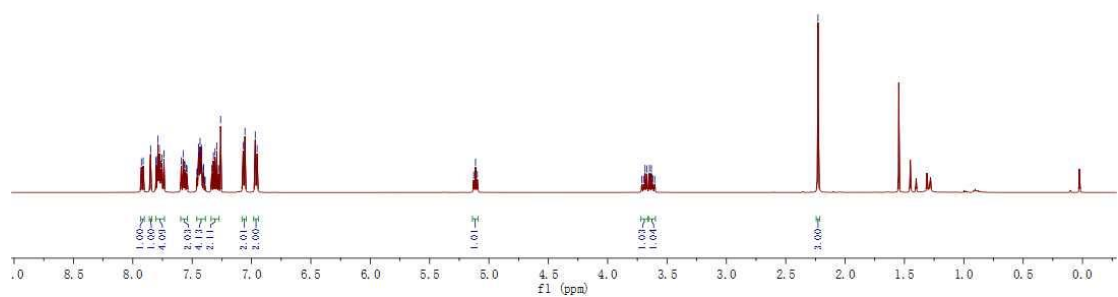


(E)-2-(4-phenyl-1-(p-tolyl)but-3-en-2-yl)naphthalene(4abn)

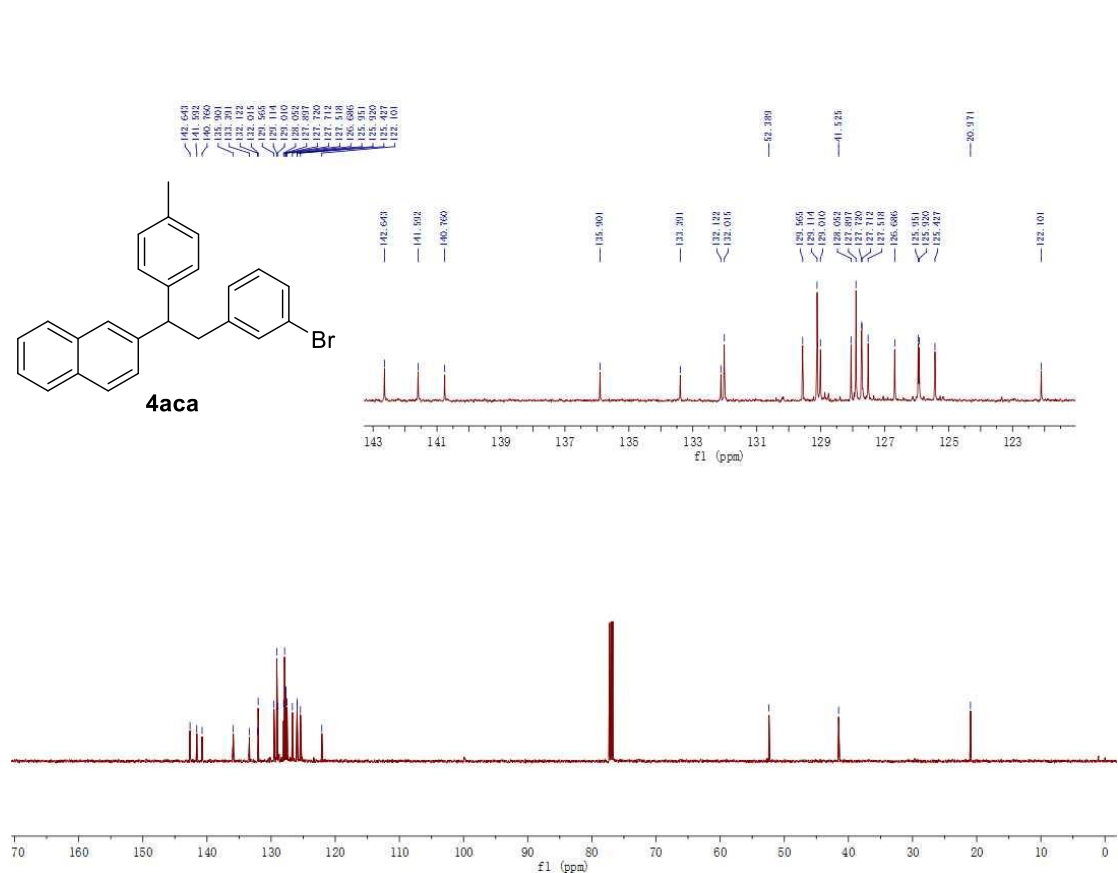
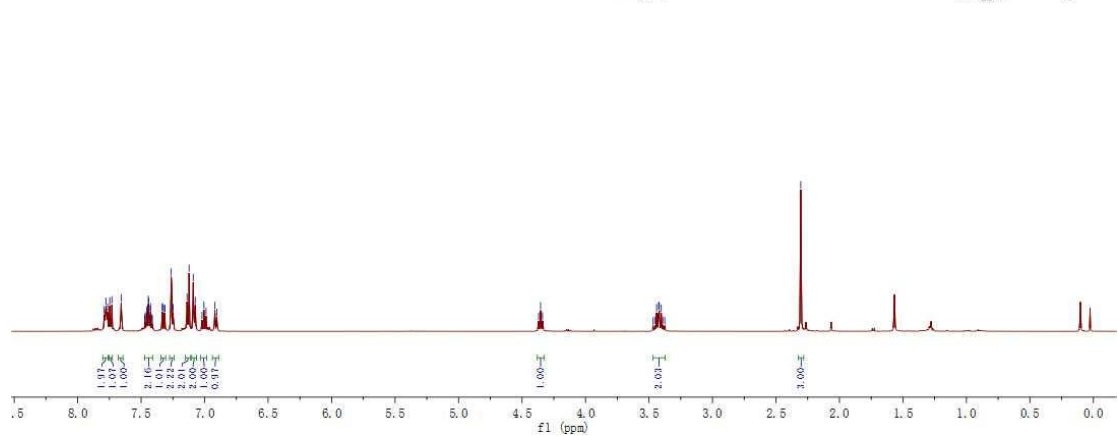
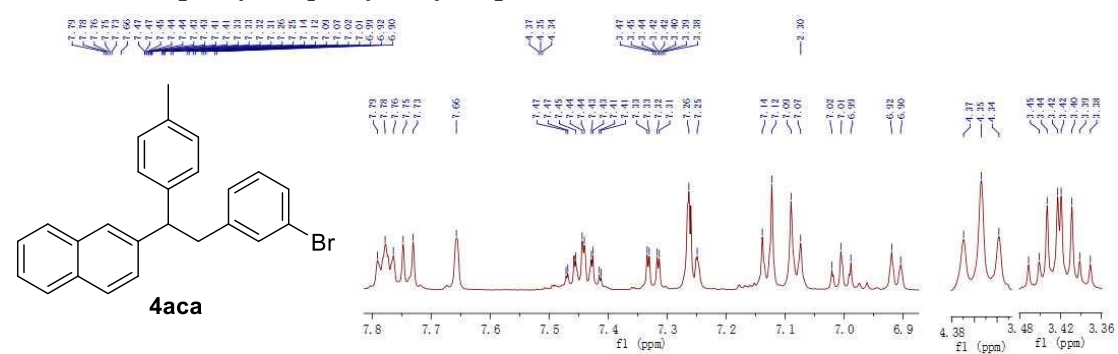


4abo

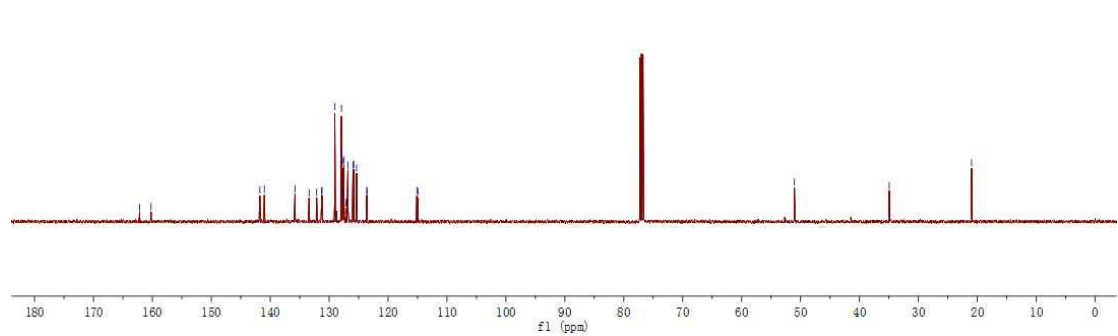
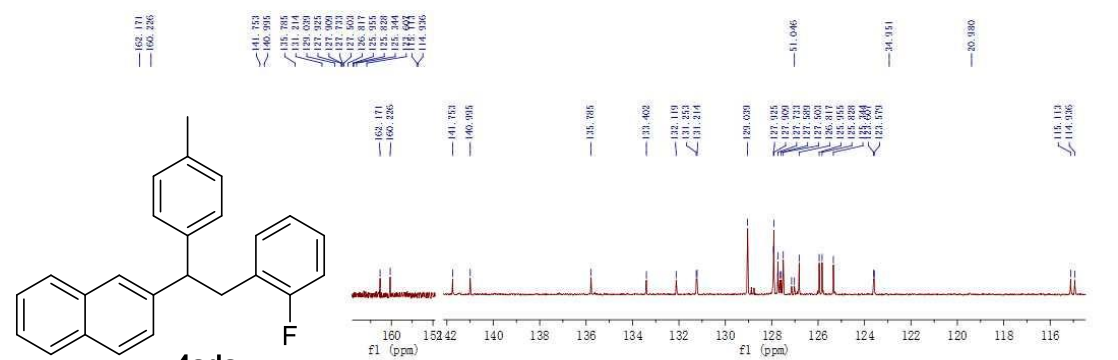
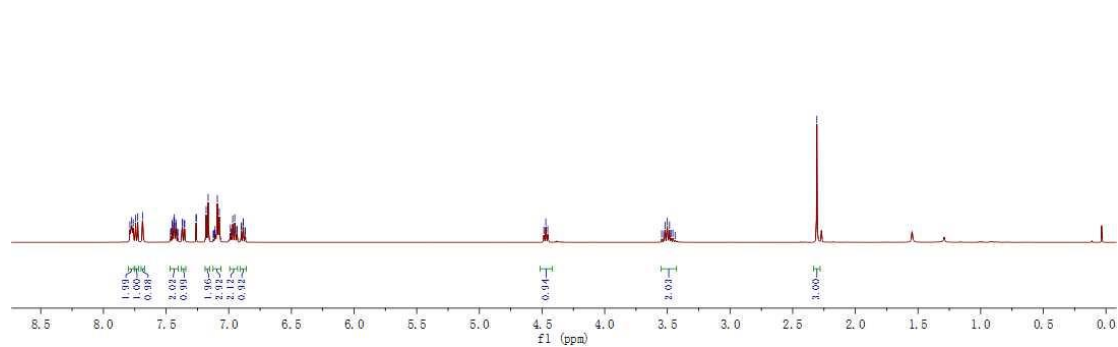
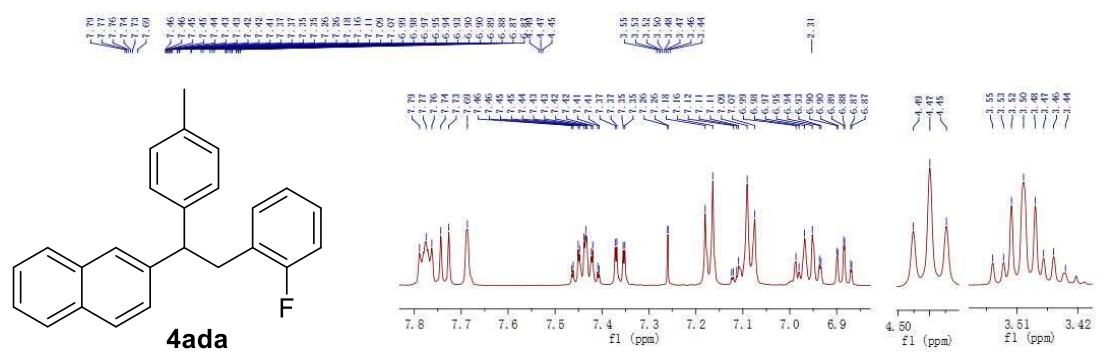
¹H NMR spectrum (CDCl₃) of compound **4abo**. The spectrum shows peaks in the aromatic region (7.1–7.9 ppm) and aliphatic region (3.6–4.0 ppm). Integration values are provided above the peaks.

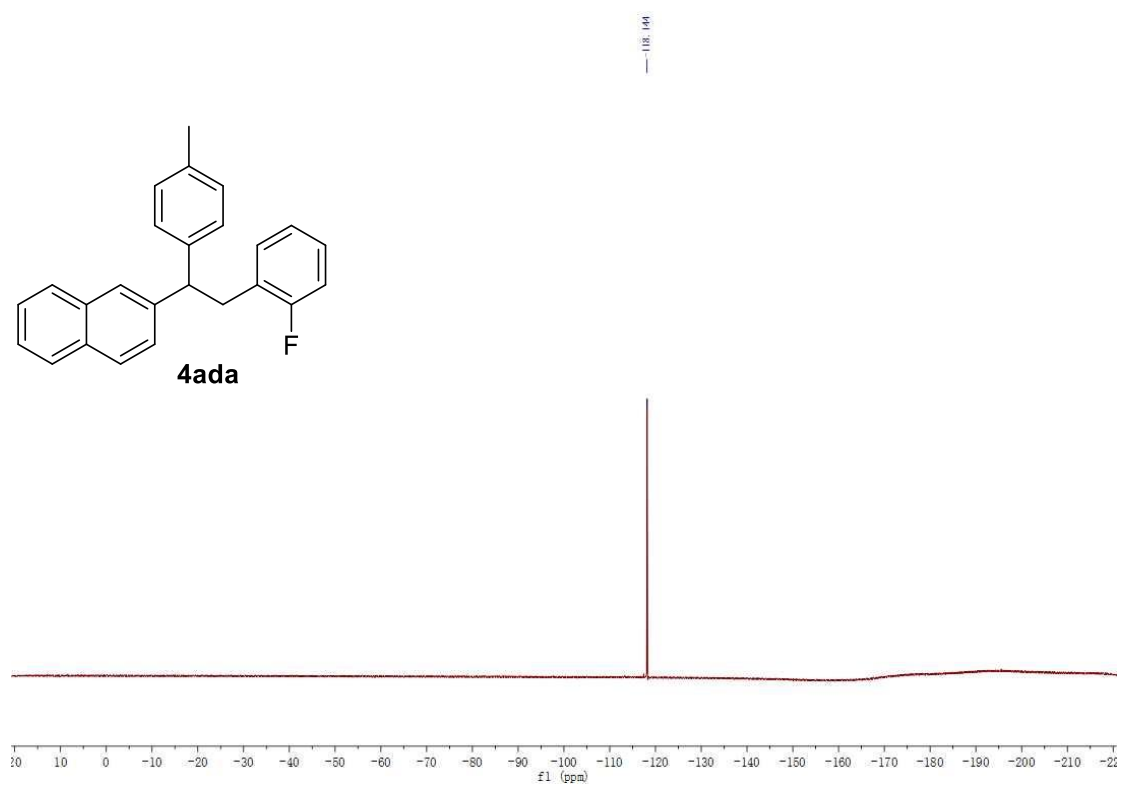


2-(2-(3-bromophenyl)-1-(*p*-tolyl)ethyl)naphthalene (4aca)



2-(2-(2-fluorophenyl)-1-(*p*-tolyl)ethyl)naphthalene (4ada)

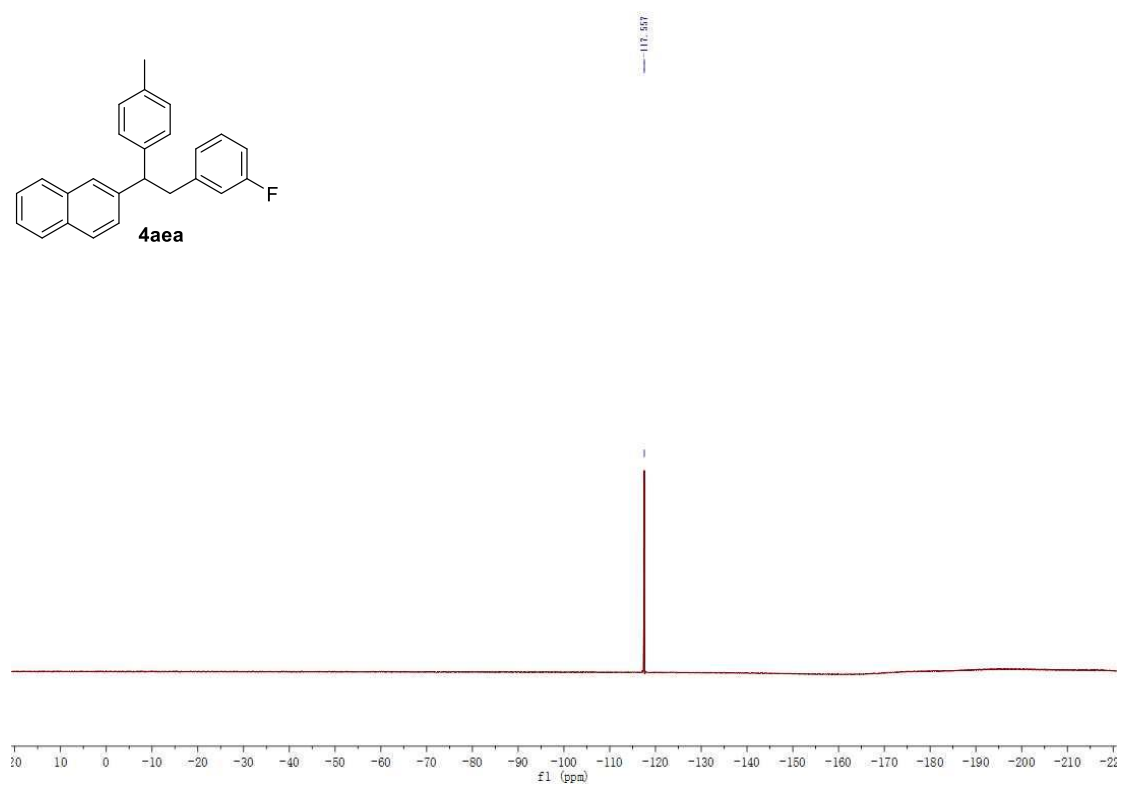
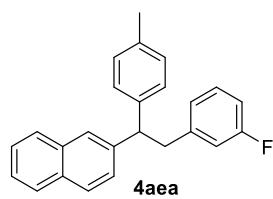




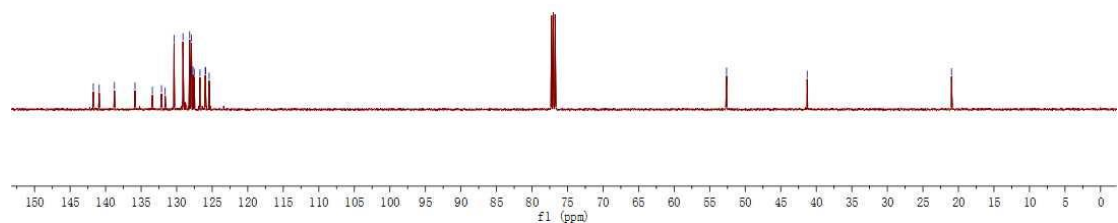
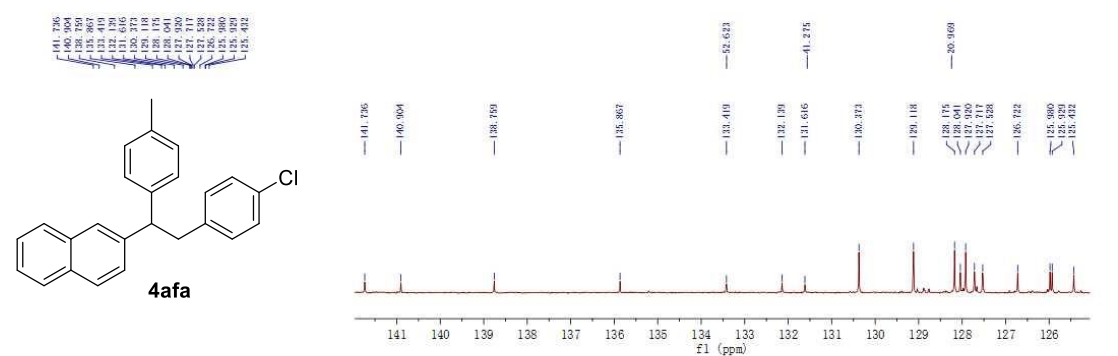
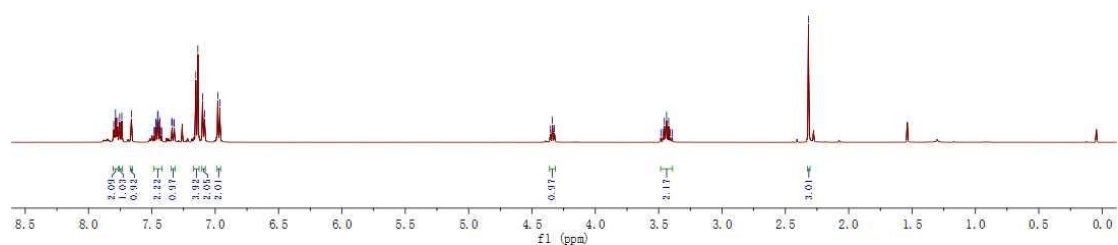
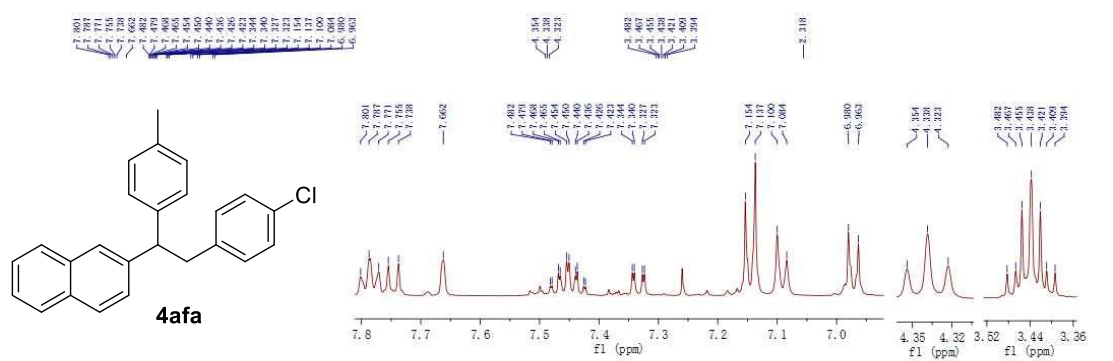
4aea

¹H NMR (400 MHz, CDCl₃) spectrum showing peaks from 7.8 to 3.4 ppm. Integration values are provided below the peaks.

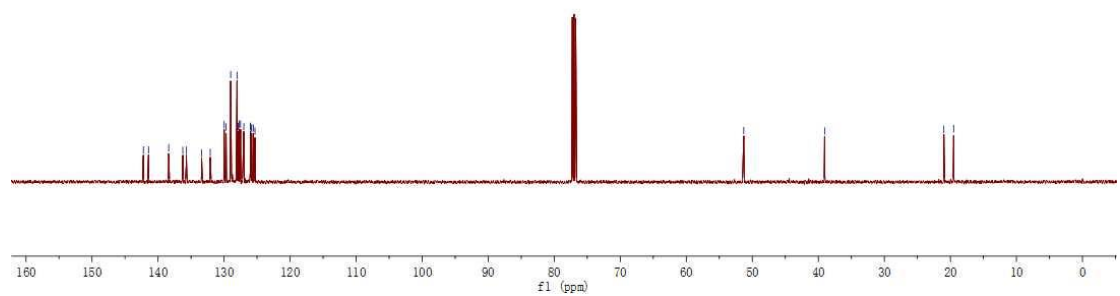
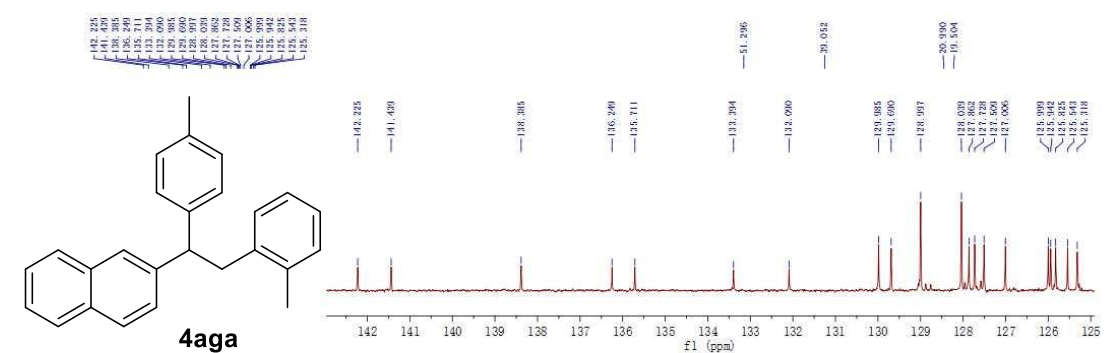
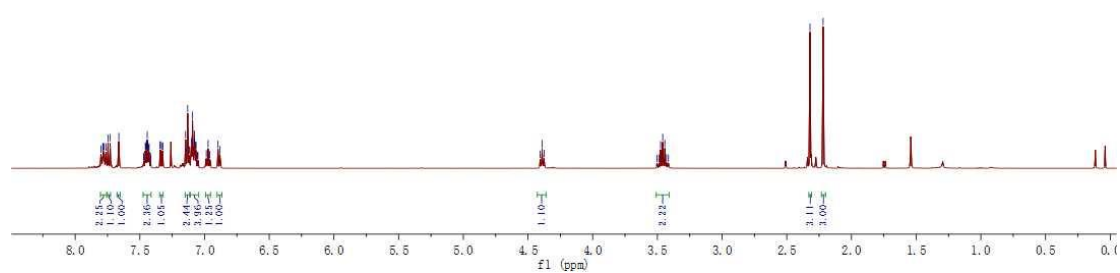
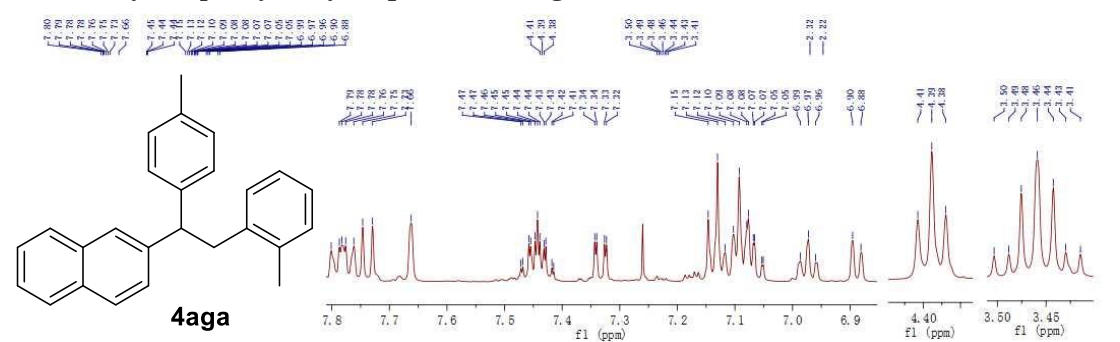
¹³C NMR (100 MHz, CDCl₃) spectrum showing peaks from 163 to 112 ppm.



2-(2-(4-chlorophenyl)-1-(*p*-tolylethyl)naphthalene (4afa)



2-(2-(o-tolyl)-1-(p-tolyl)ethyl)naphthalene (4aga)

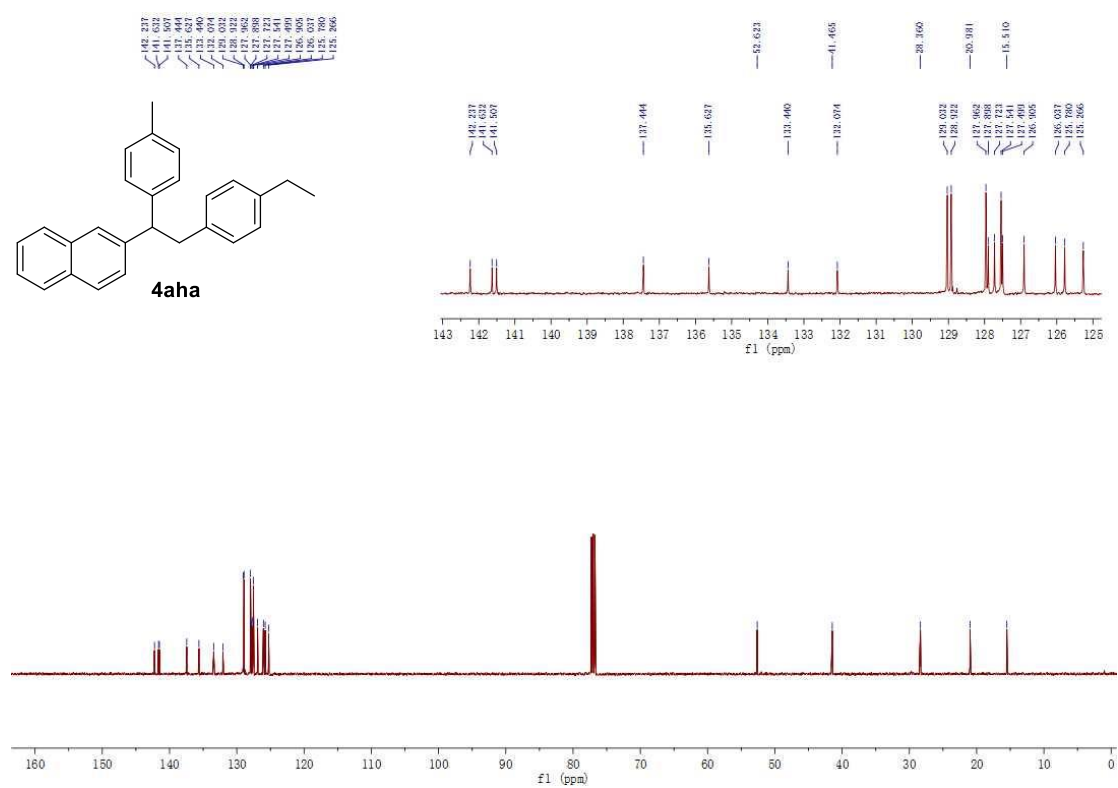


Chemical structure of **4a** (1-(4-ethylphenyl)-2-(naphthalen-1-yl)ethane) is shown. The ^1H NMR spectrum (CDCl₃) displays peaks in the aromatic region (7.0–7.8 ppm) and aliphatic region (1.0–2.5 ppm). The spectrum includes integration values for each peak group.

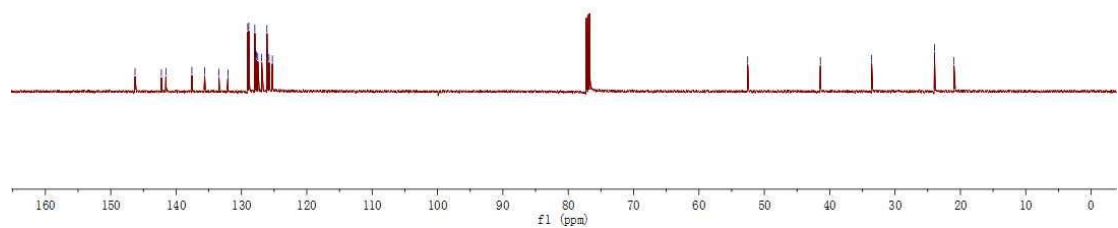
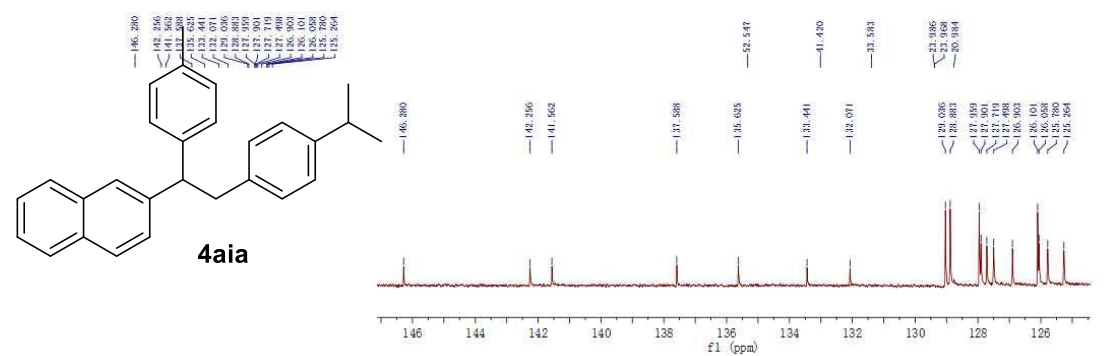
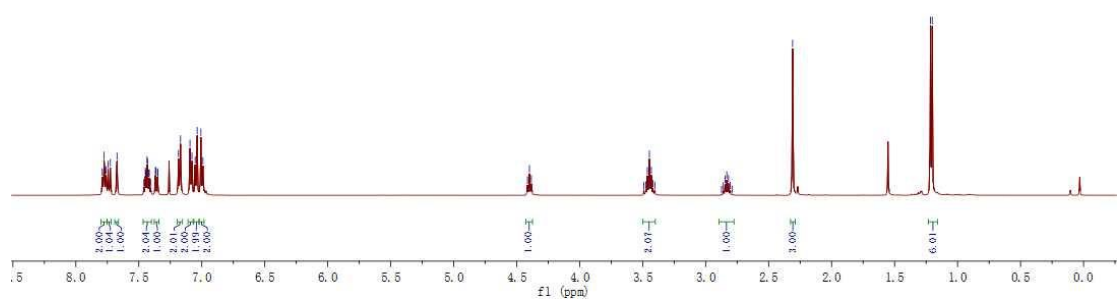
Chemical Structure: CCc1ccc(cc1)CC(c2ccccc2c3ccccc3)c4ccccc4

^1H NMR Spectrum (CDCl₃):

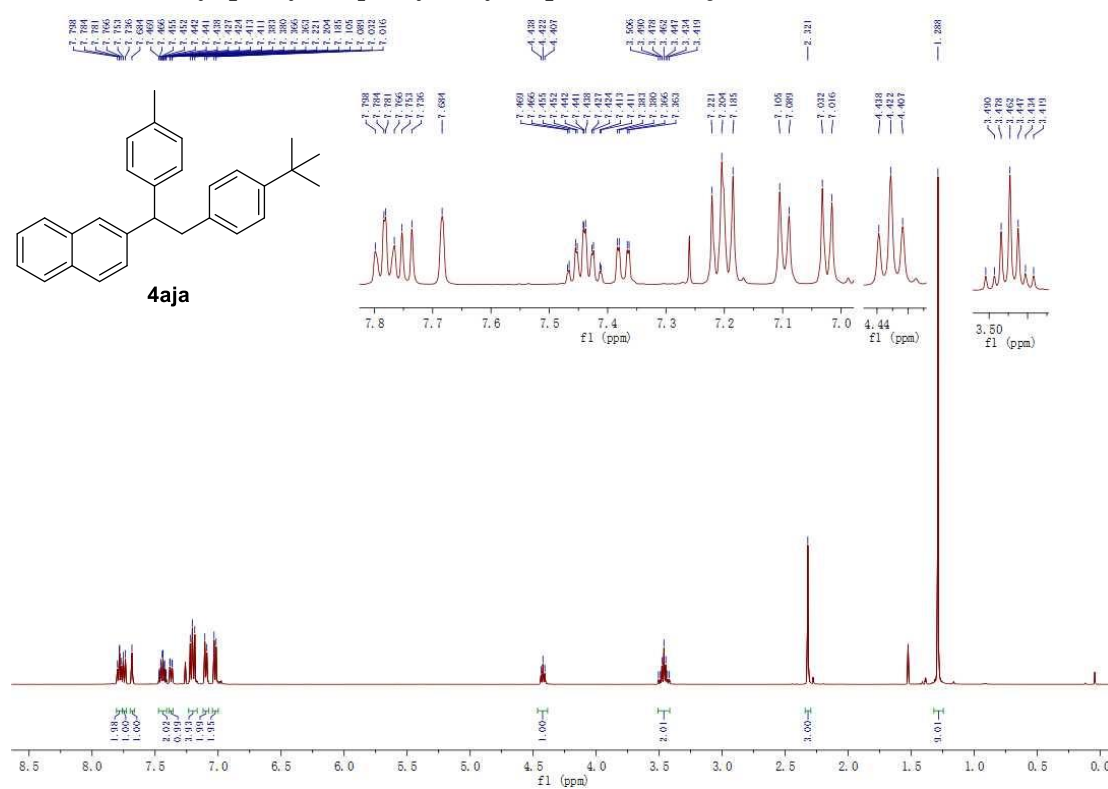
- Aromatic Region (7.0–7.8 ppm):**
 - 7.78 (d, 1H, integration 1.00)
 - 7.75 (d, 1H, integration 1.00)
 - 7.72 (d, 1H, integration 1.00)
 - 7.68 (d, 1H, integration 1.00)
 - 7.65 (d, 1H, integration 1.00)
 - 7.45 (m, 1H, integration 1.00)
 - 7.42 (m, 1H, integration 1.00)
 - 7.40 (m, 1H, integration 1.00)
 - 7.38 (m, 1H, integration 1.00)
 - 7.35 (m, 1H, integration 1.00)
 - 7.28 (m, 1H, integration 1.00)
 - 7.25 (m, 1H, integration 1.00)
 - 7.18 (m, 1H, integration 1.00)
 - 7.10 (m, 1H, integration 1.00)
 - 7.08 (m, 1H, integration 1.00)
 - 7.03 (m, 1H, integration 1.00)
 - 7.01 (m, 1H, integration 1.00)
 - 7.00 (m, 1H, integration 1.00)
 - 6.99 (m, 1H, integration 1.00)
- Aliphatic Region (1.0–2.5 ppm):**
 - 2.48 (m, 2H, integration 2.00)
 - 2.42 (m, 2H, integration 2.00)
 - 2.38 (m, 2H, integration 2.00)
 - 2.35 (m, 2H, integration 2.00)
 - 2.32 (m, 2H, integration 2.00)
 - 2.28 (m, 2H, integration 2.00)
 - 2.25 (m, 2H, integration 2.00)
 - 2.22 (m, 2H, integration 2.00)
 - 2.18 (m, 2H, integration 2.00)
 - 2.15 (m, 2H, integration 2.00)
 - 2.12 (m, 2H, integration 2.00)
 - 2.08 (m, 2H, integration 2.00)
 - 2.03 (m, 2H, integration 2.00)
 - 2.01 (m, 2H, integration 2.00)
 - 2.00 (m, 2H, integration 2.00)
 - 1.99 (m, 2H, integration 2.00)



Chemical structure of **4aia** is shown. The ¹H NMR spectrum (CDCl₃) displays peaks from 7.8 to 1.2 ppm. The integration values are: 7.8 (1.79), 7.7 (1.07), 7.6 (1.07), 7.5 (1.07), 7.4 (1.07), 7.3 (1.07), 7.2 (1.07), 7.1 (1.07), 7.0 (1.07), 4.0 (1.07), 3.48 (1.07), 2.85 (1.07), 2.80 (1.07), 1.20 (1.07).



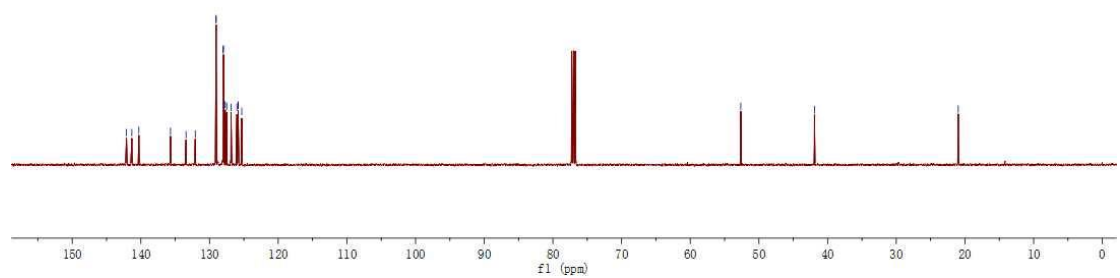
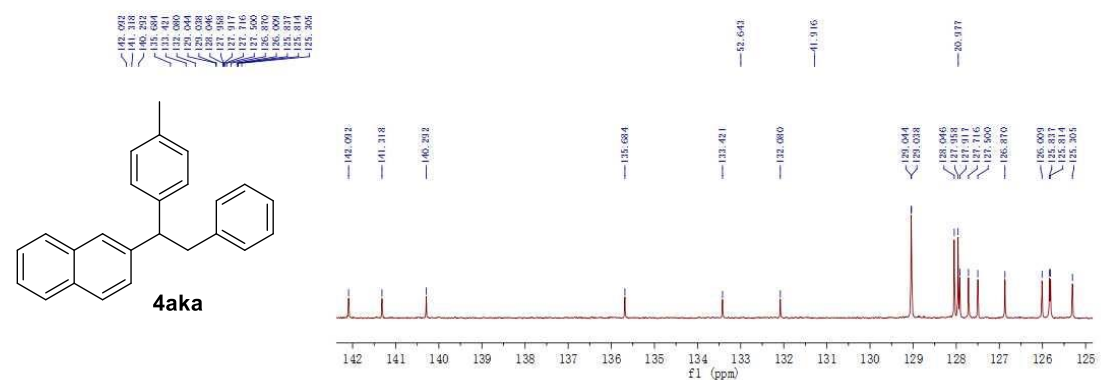
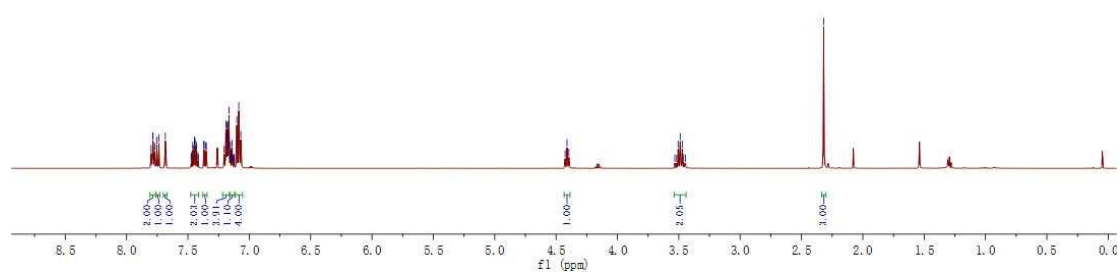
2-(2-(4-(*tert*-butyl)phenyl)-1-(*p*-tolyl)ethyl)naphthalene (4aja)



Chemical structure of 4aka: Cc1ccc(cc1)C(Cc2ccccc2)c3ccccc3

¹H NMR spectrum (ppm):

- 7.80 (d, 2H)
- 7.78 (d, 2H)
- 7.76 (d, 2H)
- 7.74 (d, 2H)
- 7.72 (d, 2H)
- 7.70 (d, 2H)
- 7.68 (d, 2H)
- 7.66 (d, 2H)
- 7.64 (d, 2H)
- 7.62 (d, 2H)
- 7.60 (d, 2H)
- 7.58 (d, 2H)
- 7.56 (d, 2H)
- 7.54 (d, 2H)
- 7.52 (d, 2H)
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- 7.48 (d, 2H)
- 7.46 (d, 2H)
- 7.44 (d, 2H)
- 7.42 (d, 2H)
- 7.40 (d, 2H)
- 7.38 (d, 2H)
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- 6.98 (d, 2H)
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- 2.84 (d, 2



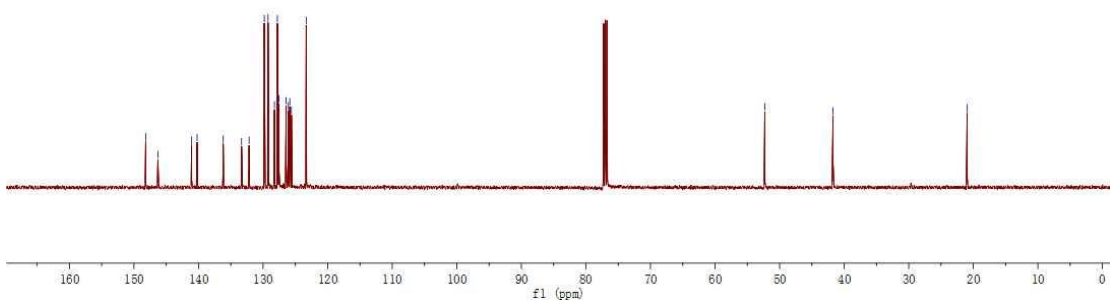
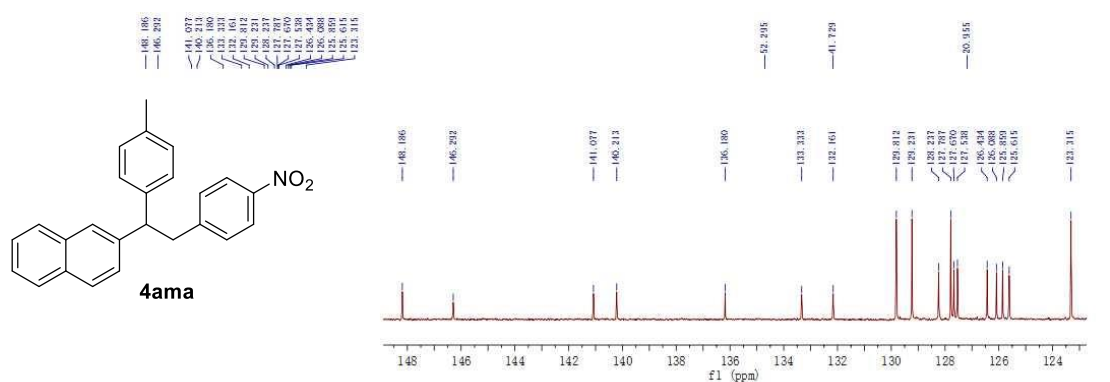
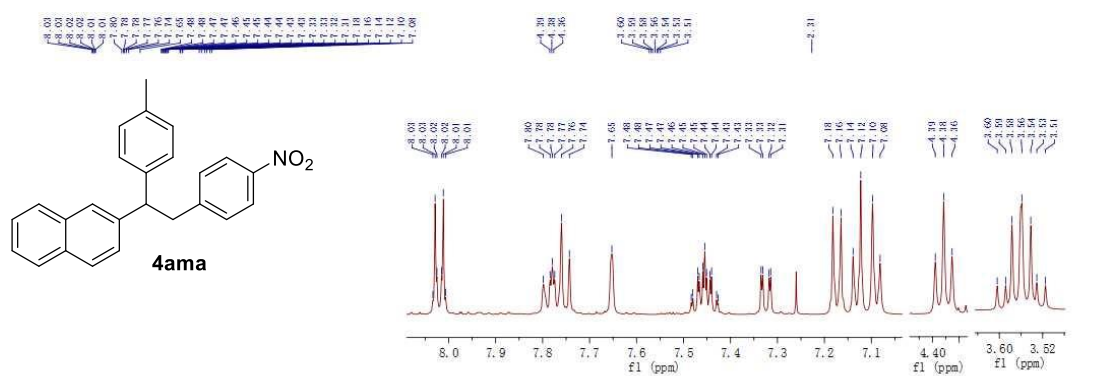
The figure displays the chemical structure of compound 4ala and its corresponding ¹H and ¹³C NMR spectra.

Chemical Structure of 4ala: COc1ccc(cc1)CC(Cc2ccc(C)cc2)c3ccc4ccccc4c3

¹H NMR Spectrum (Top): The spectrum shows peaks in the aromatic region (6.5-7.9 ppm) and aliphatic region (3.4-3.7 ppm). Integration values are provided below the peaks.

Chemical Shift (ppm)	Integration
7.823, 7.821, 7.819, 7.797, 7.795, 7.793, 7.791, 7.789, 7.787, 7.785, 7.783, 7.781, 7.779, 7.777, 7.775, 7.773, 7.771, 7.769, 7.767, 7.765, 7.763, 7.761, 7.759, 7.757, 7.755, 7.753, 7.751, 7.749, 7.747, 7.745, 7.743, 7.741, 7.739, 7.737, 7.735, 7.733, 7.731, 7.729, 7.727, 7.725, 7.723, 7.721, 7.719, 7.717, 7.715, 7.713, 7.711, 7.709, 7.707, 7.705, 7.703, 7.701, 7.699, 7.697, 7.695, 7.693, 7.691, 7.689, 7.687, 7.685, 7.683, 7.681, 7.679, 7.677, 7.675, 7.673, 7.671, 7.669, 7.667, 7.665, 7.663, 7.661, 7.659, 7.657, 7.655, 7.653, 7.651, 7.649, 7.647, 7.645, 7.643, 7.641, 7.639, 7.637, 7.635, 7.633, 7.631, 7.629, 7.627, 7.625, 7.623, 7.621, 7.619, 7.617, 7.615, 7.613, 7.611, 7.609, 7.607, 7.605, 7.603, 7.601, 7.599, 7.597, 7.595, 7.593, 7.591, 7.589, 7.587, 7.585, 7.583, 7.581, 7.579, 7.577, 7.575, 7.573, 7.571, 7.569, 7.567, 7.565, 7.563, 7.561, 7.559, 7.557, 7.555, 7.553, 7.551, 7.549, 7.547, 7.545, 7.543, 7.541, 7.539, 7.537, 7.535, 7.533, 7.531, 7.529, 7.527, 7.525, 7.523, 7.521, 7.519, 7.517, 7.515, 7.513, 7.511, 7.509, 7.507, 7.505, 7.503, 7.501, 7.499, 7.497, 7.495, 7.493, 7.491, 7.489, 7.487, 7.485, 7.483, 7.481, 7.479, 7.477, 7.475, 7.473, 7.471, 7.469, 7.467, 7.465, 7.463, 7.461, 7.459, 7.457, 7.455, 7.453, 7.451, 7.449, 7.447, 7.445, 7.443, 7.441, 7.439, 7.437, 7.435, 7.433, 7.431, 7.429, 7.427, 7.425, 7.423, 7.421, 7.419, 7.417, 7.415, 7.413, 7.411, 7.409, 7.407, 7.405, 7.403, 7.401, 7.399, 7.397, 7.395, 7.393, 7.391, 7.389, 7.387, 7.385, 7.383, 7.381, 7.379, 7.377, 7.375, 7.373, 7.371, 7.369, 7.367, 7.365, 7.363, 7.361, 7.359, 7.357, 7.355, 7.353, 7.351, 7.349, 7.347, 7.345, 7.343, 7.341, 7.339, 7.337, 7.335, 7.333, 7.331, 7.329, 7.327, 7.325, 7.323, 7.321, 7.319, 7.317, 7.315, 7.313, 7.311, 7.309, 7.307, 7.305, 7.303, 7.301, 7.299, 7.297, 7.295, 7.293, 7.291, 7.289, 7.287, 7.285, 7.283, 7.281, 7.279, 7.277, 7.275, 7.273, 7.271, 7.269, 7.267, 7.265, 7.263, 7.261, 7.259, 7.257, 7.255, 7.253, 7.251, 7.249, 7.247, 7.245, 7.243, 7.241, 7.239, 7.237, 7.235, 7.233, 7.231, 7.229, 7.227, 7.225, 7.223, 7.221, 7.219, 7.217, 7.215, 7.213, 7.211, 7.209, 7.207, 7.205, 7.203, 7.201, 7.199, 7.197, 7.195, 7.193, 7.191, 7.189, 7.187, 7.185, 7.183, 7.181, 7.179, 7.177, 7.175, 7.173, 7.171, 7.169, 7.167, 7.165, 7.163, 7.161, 7.159, 7.157, 7.155, 7.153, 7.151, 7.149, 7.147, 7.145, 7.143, 7.141, 7.139, 7.137, 7.135, 7.133, 7.131, 7.129, 7.127, 7.125, 7.123, 7.121, 7.119, 7.117, 7.115, 7.113, 7.111, 7.109, 7.107, 7.105, 7.103, 7.101, 7.099, 7.097, 7.095, 7.093, 7.091, 7.089, 7.087, 7.085, 7.083, 7.081, 7.079, 7.077, 7.075, 7.073, 7.071, 7.069, 7.067, 7.065, 7.063, 7.061, 7.059, 7.057, 7.055, 7.053, 7.051, 7.049, 7.047, 7.045, 7.043, 7.041, 7.039, 7.037, 7.035, 7.033, 7.031, 7.029, 7.027, 7.025, 7.023, 7.021, 7.019, 7.017, 7.015, 7.013, 7.011, 7.009, 7.007, 7.005, 7.003, 7.001, 6.999, 6.997, 6.995, 6.993, 6.991, 6.989, 6.987, 6.985, 6.983, 6.981, 6.979, 6.977, 6.975, 6.973, 6.971, 6.969, 6.967, 6.965, 6.963, 6.961, 6.959, 6.957, 6.955, 6.953, 6.951, 6.949, 6.947, 6.945, 6.943, 6.941, 6.939, 6.937, 6.935, 6.933, 6.931, 6.929, 6.927, 6.925, 6.923, 6.921, 6.919, 6.917, 6.915, 6.913, 6.911, 6.909, 6.907, 6.905, 6.903, 6.901, 6.899, 6.897, 6.895, 6.893, 6.891, 6.889, 6.887, 6.885, 6.883, 6.881, 6.879, 6.877, 6.875, 6.873, 6.871, 6.869, 6.867, 6.865, 6.863, 6.861, 6.859, 6.857, 6.855, 6.853, 6.851, 6.849, 6.847, 6.845, 6.843, 6.841, 6.839, 6.837, 6.835, 6.833, 6.831, 6.829, 6.827, 6.825, 6.823, 6.821, 6.819, 6.817, 6.815, 6.813, 6.811, 6.809, 6.807, 6.805, 6.803, 6.801, 6.799, 6.797, 6.795, 6.793, 6.791, 6.789, 6.787, 6.785, 6.783, 6.781, 6.779, 6.777, 6.775, 6.773, 6.771, 6.769, 6.767, 6.765, 6.763, 6.761, 6.759, 6.757, 6.755, 6.753, 6.751, 6.749, 6.747, 6.745, 6.743, 6.741, 6.739, 6.737, 6.735, 6.733, 6.731, 6.729, 6.727, 6.725, 6.723, 6.721, 6.719, 6.717, 6.715, 6.713, 6.711, 6.709, 6.707, 6.705, 6.703, 6.701, 6.699, 6.697, 6.695, 6.693, 6.	

2-(2-(4-nitrophenyl)-1-(p-tolyl)ethyl)naphthalene (4ama)

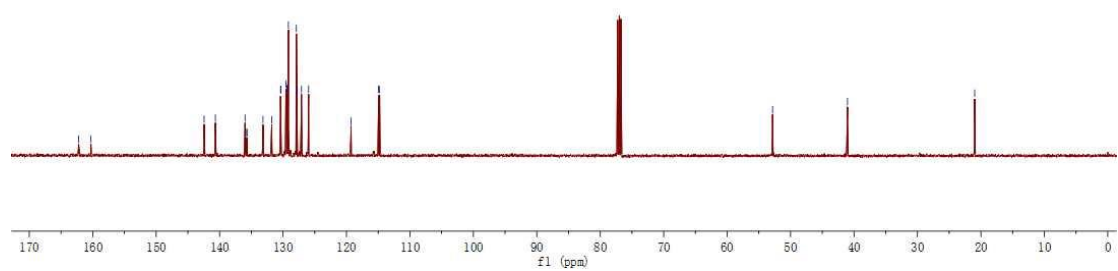
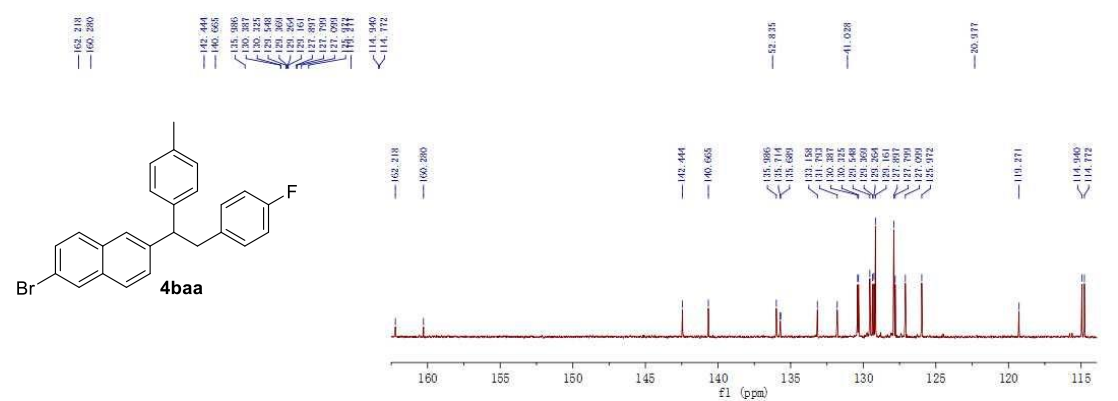
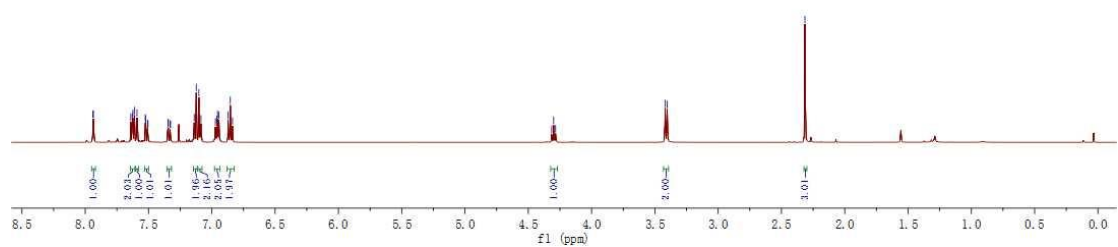


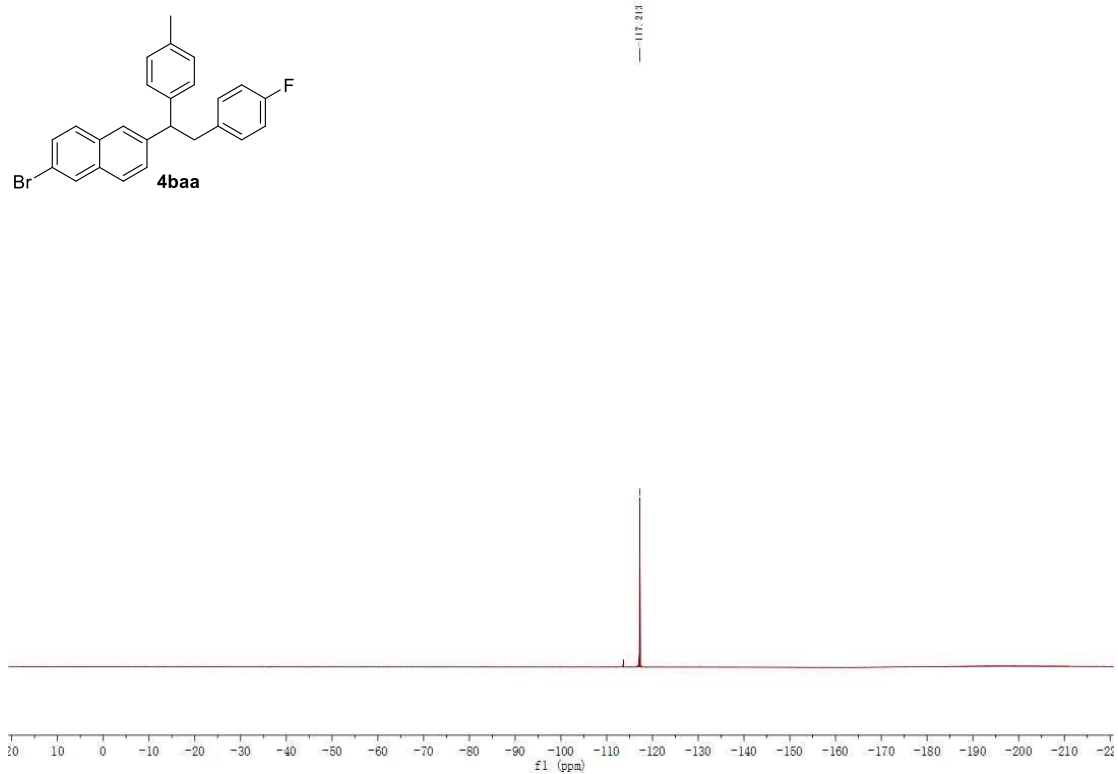
The figure displays the chemical structure of compound 4ana and its corresponding ¹H and ¹³C NMR spectra.

Chemical Structure of 4ana: CC(=O)c1ccc(cc1)CC(c2ccc(C)cc2)c3ccc4ccccc4c3

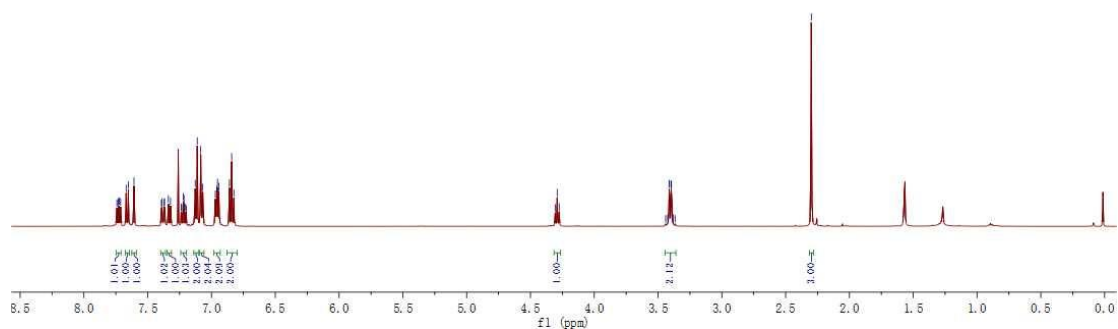
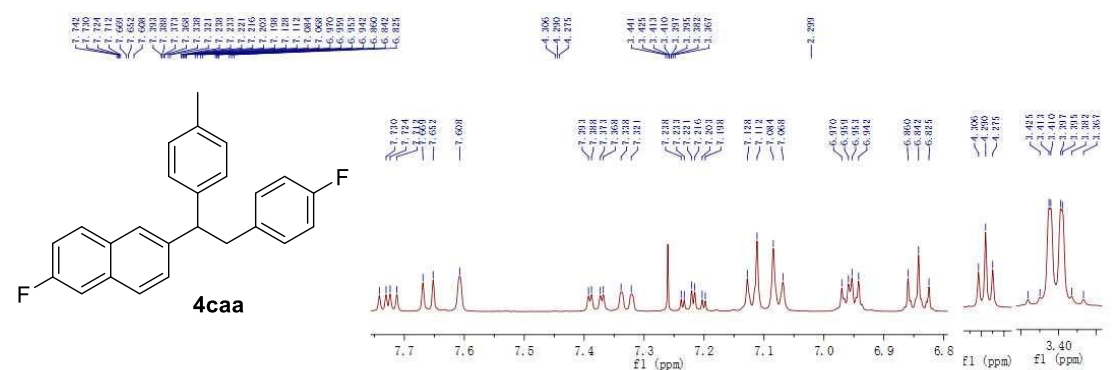
¹H NMR Spectrum (CDCl₃):

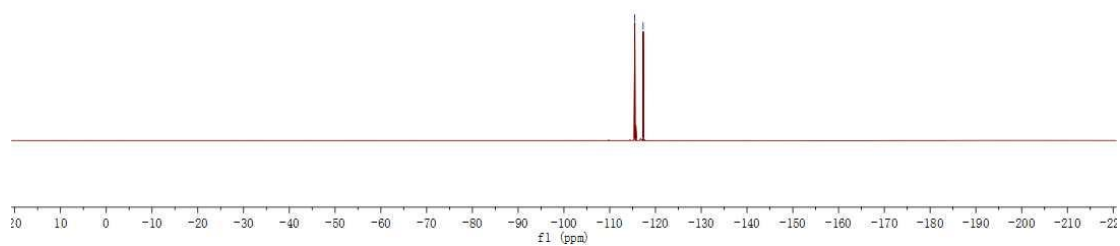
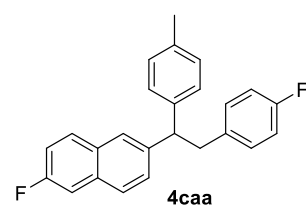
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[illegible]



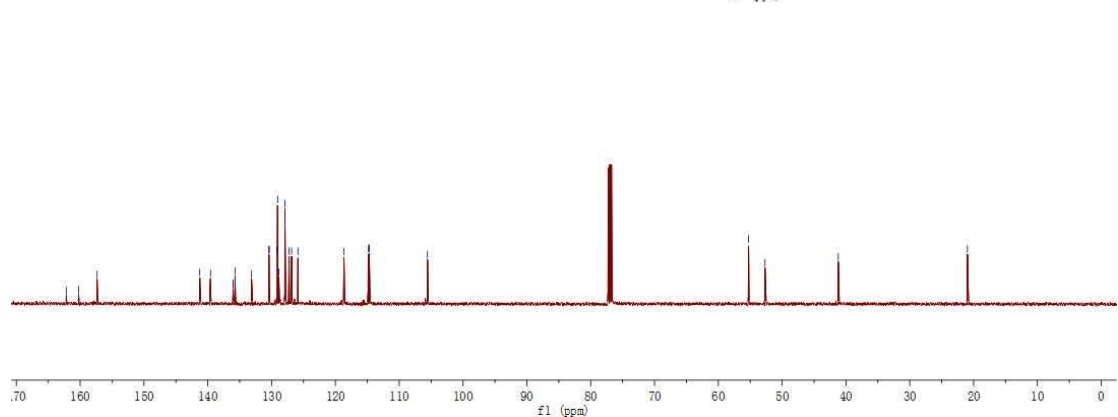
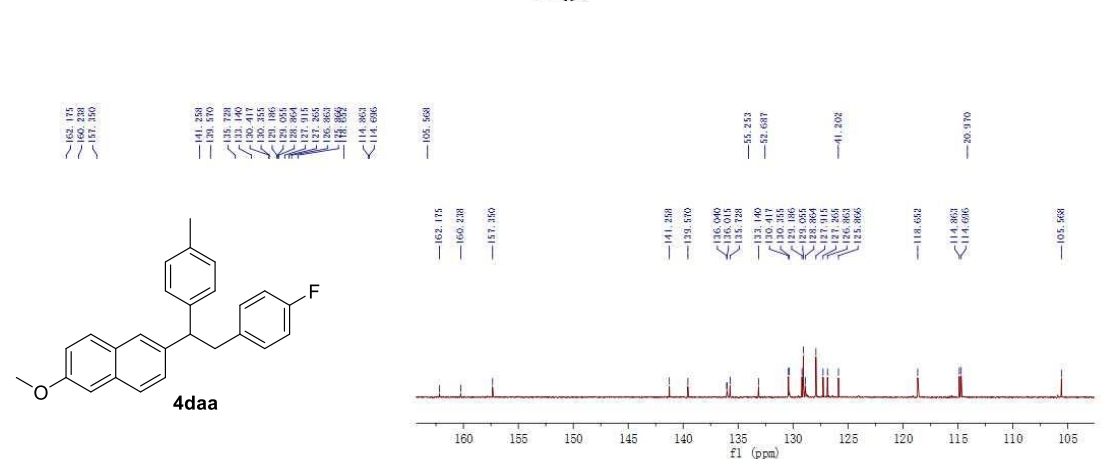
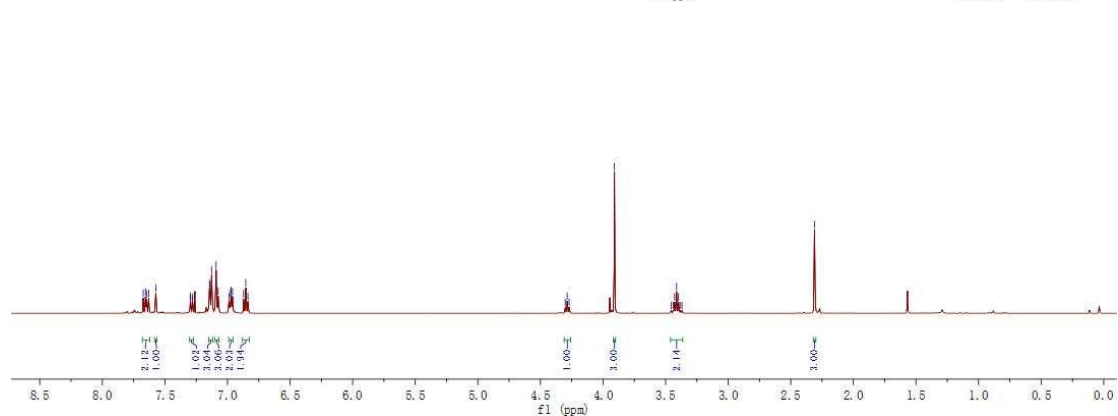
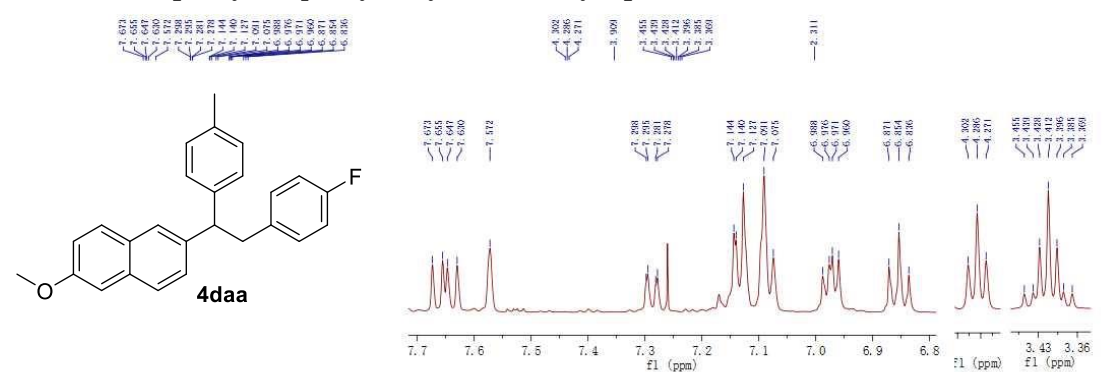
2-fluoro-6-(2-(4-fluorophenyl)-1-(*p*-tolyl)ethyl)naphthalene (4caa)

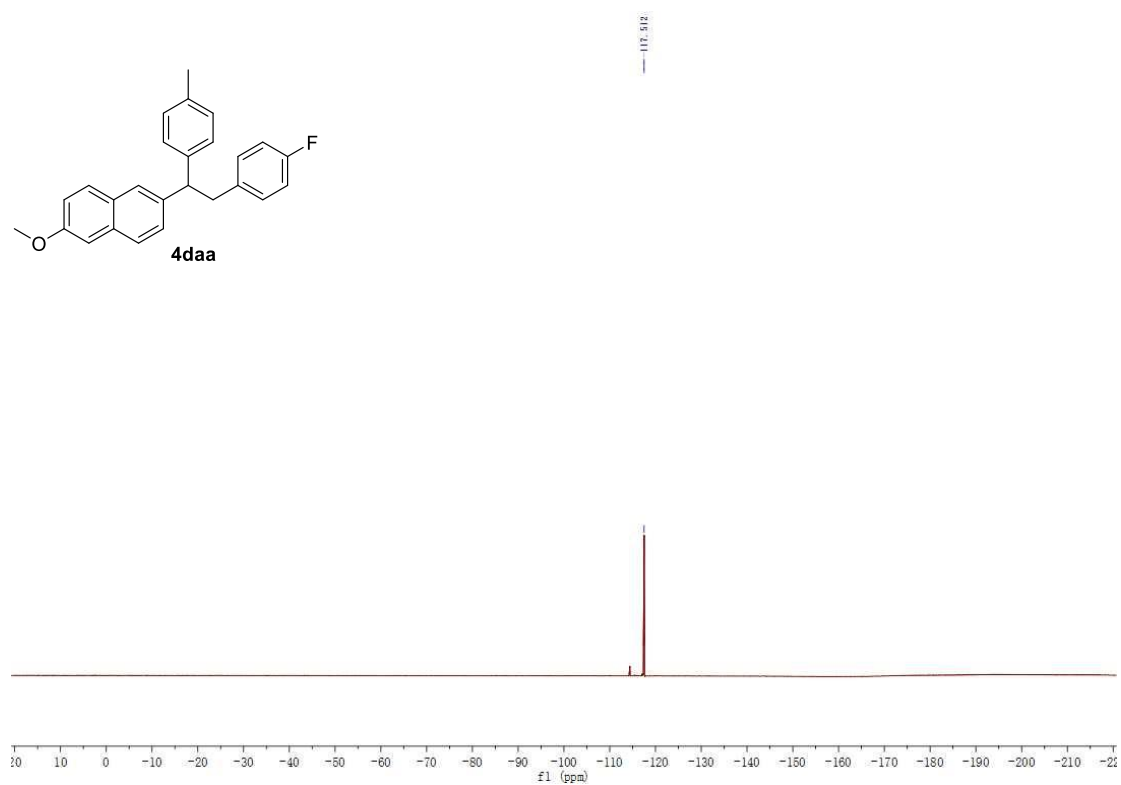
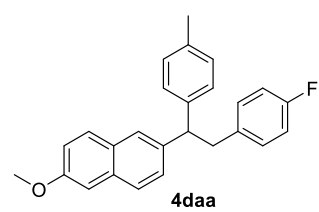




115.474
 111.265

2-(2-(4-fluorophenyl)-1-(p-tolylethyl)-6-methoxynaphthalene (4daa)

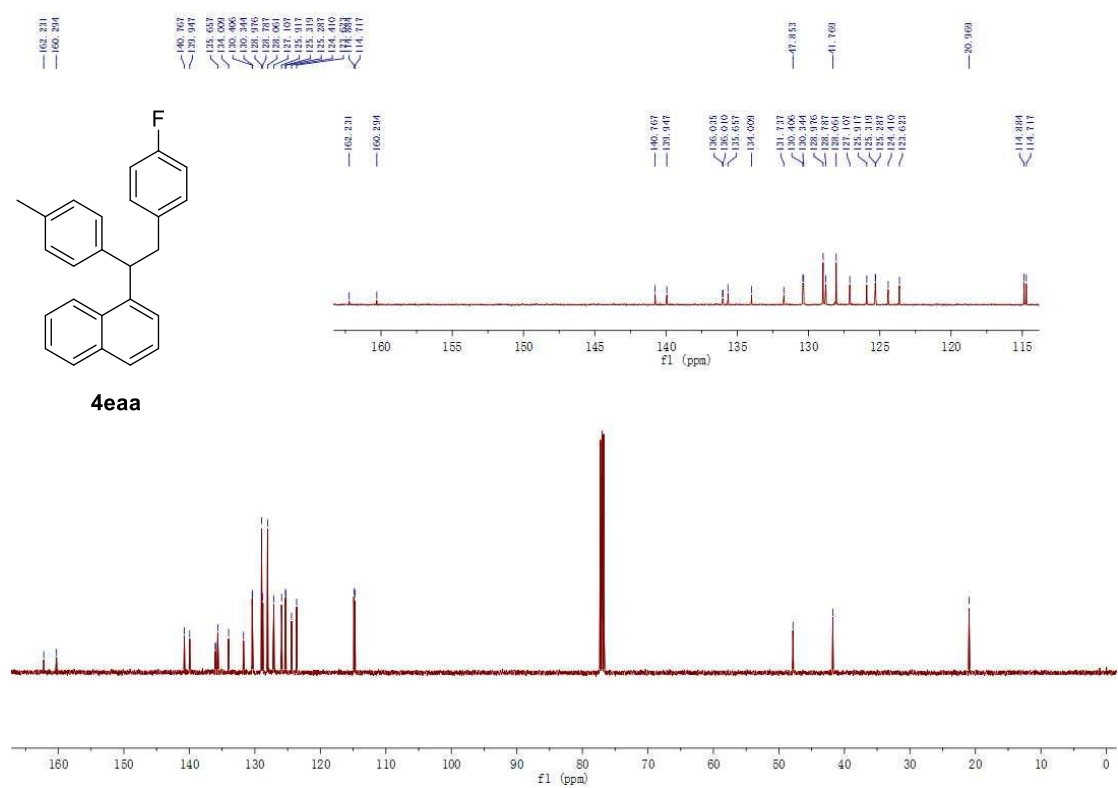


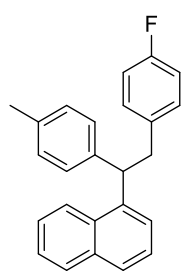


4eaa

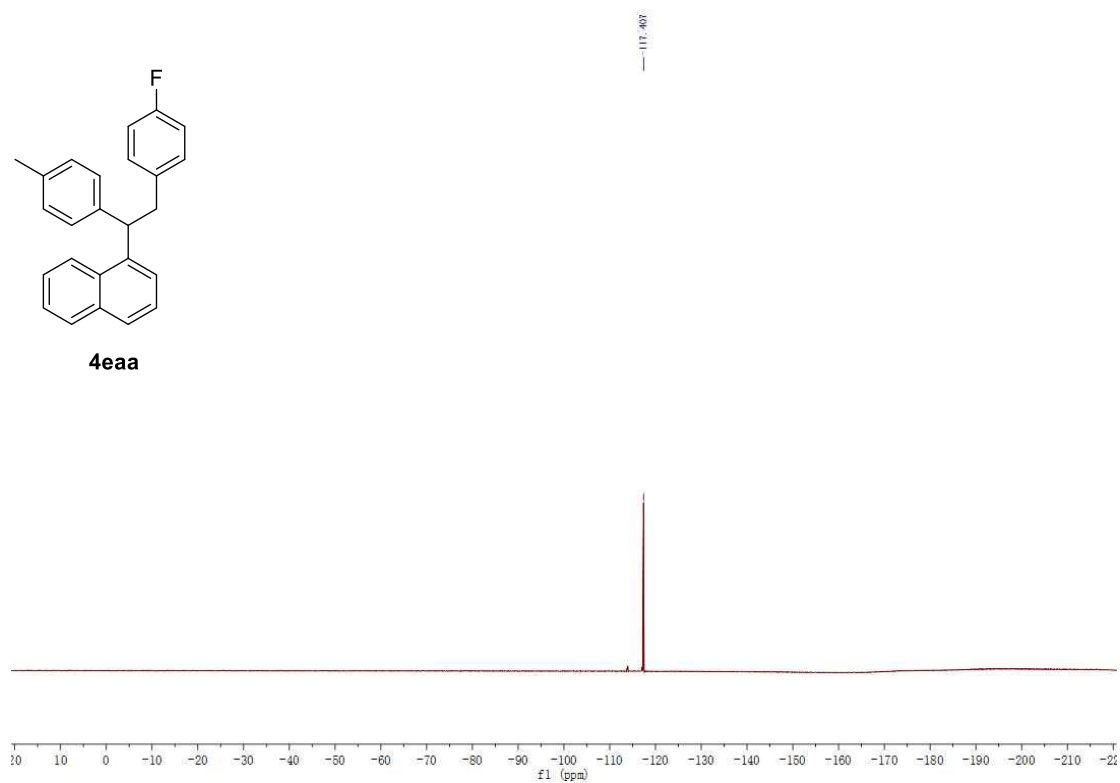
Cc1ccc(cc1)C(CO)(CO)c2ccc(F)cc2

¹H NMR spectrum (CDCl₃) of compound **4eaa**. The spectrum shows peaks from 0.0 to 8.0 ppm. Key features include a sharp singlet at 2.371 ppm (3H, CH₃), a multiplet between 6.8-7.1 ppm (aromatic protons), and a multiplet between 7.1-7.6 ppm (aromatic protons). Integration values are provided below the baseline.





4eaa

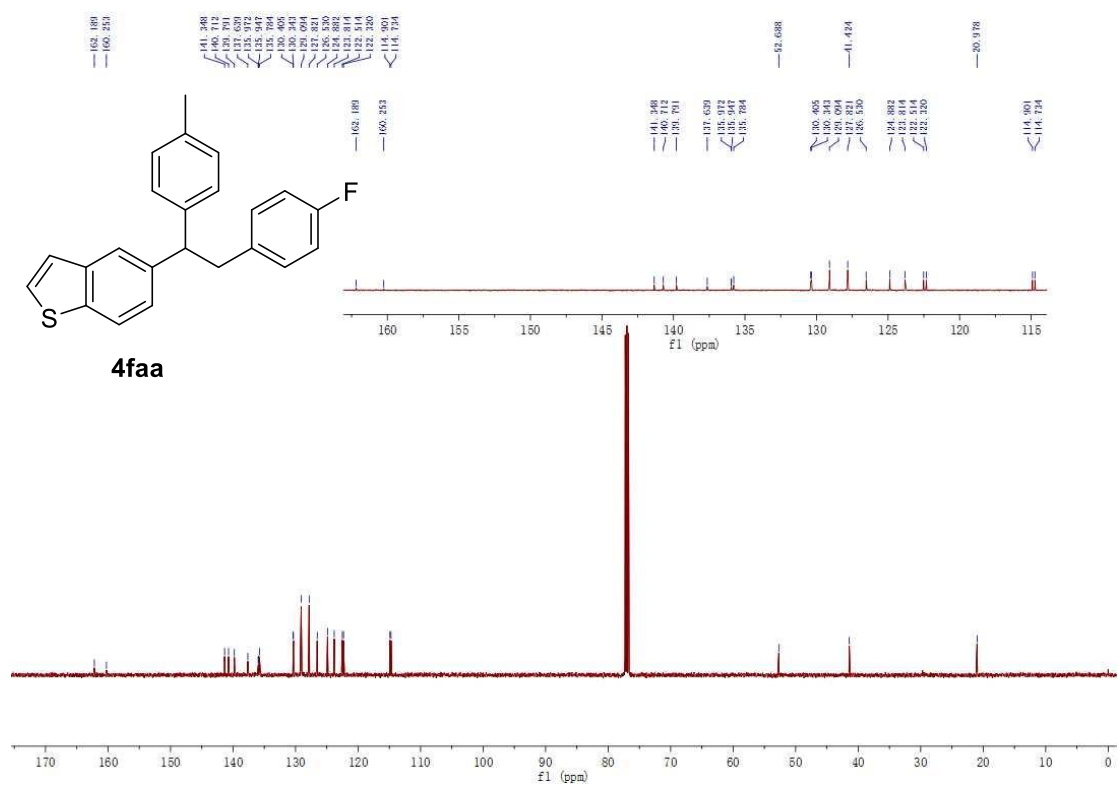
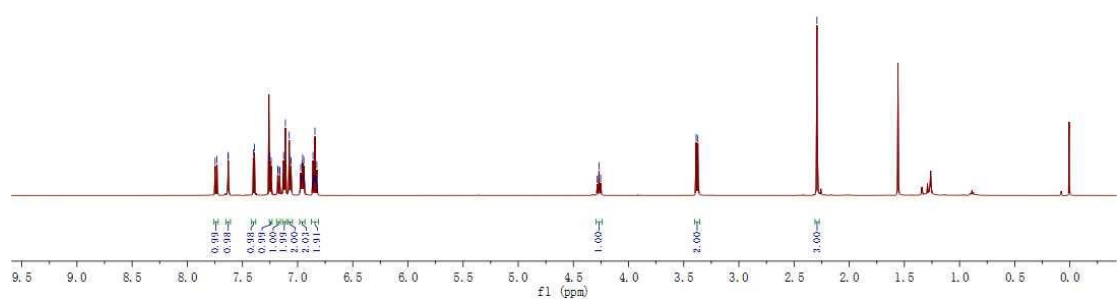


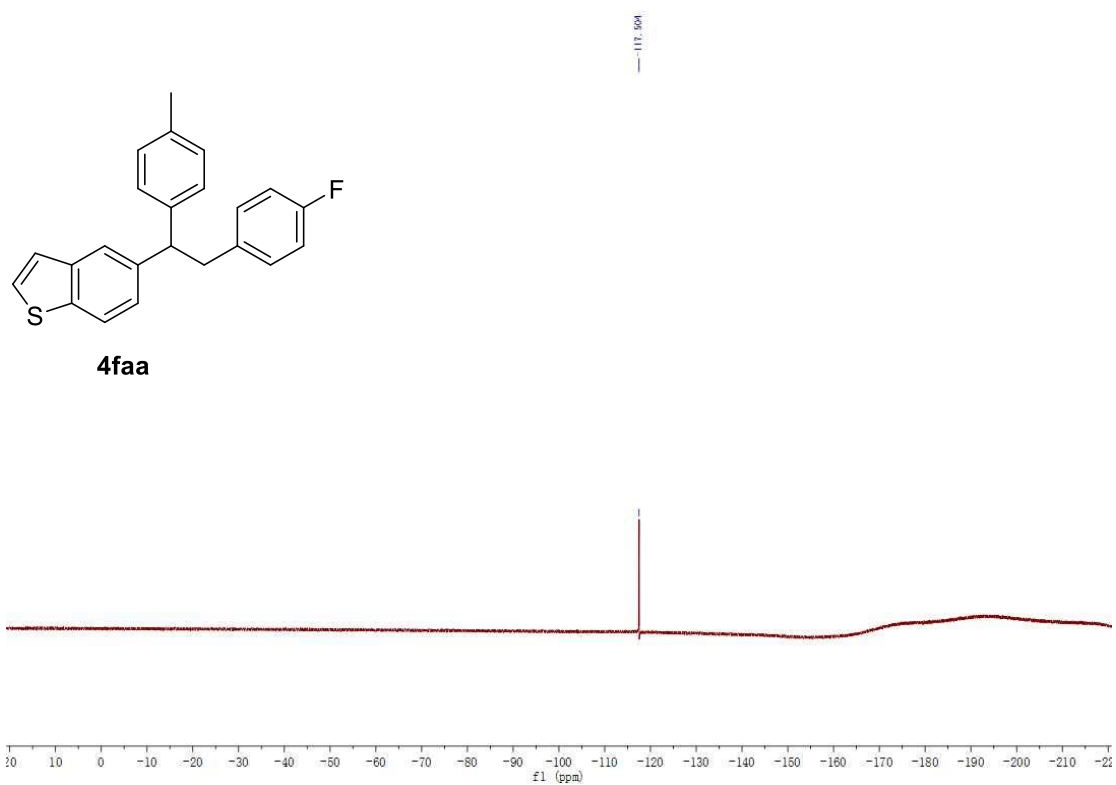
4faa

Cc1ccc(cc1)C(c2ccc(F)cc2)c3cc4ccccc4s3

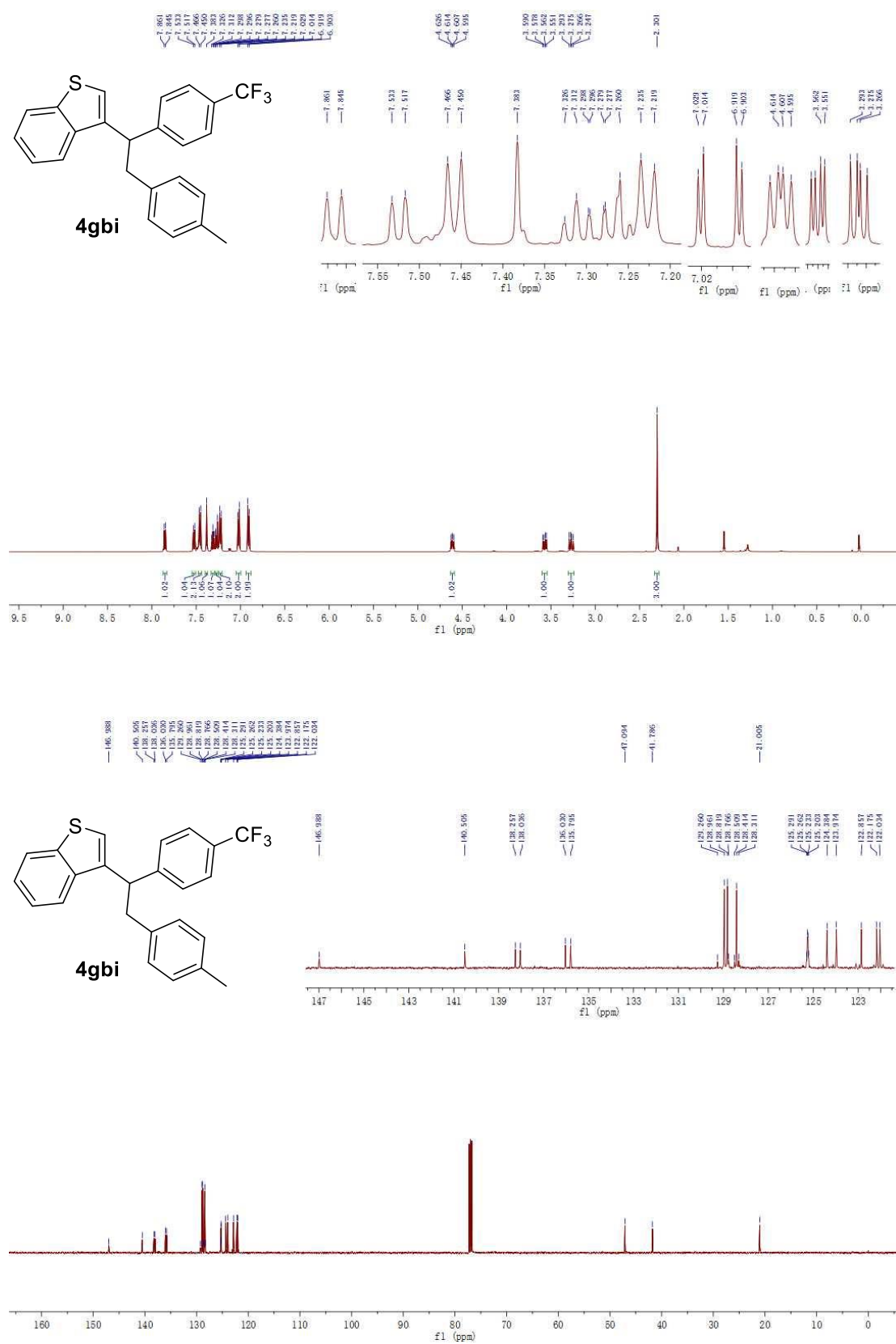
¹H NMR (CDCl₃) spectrum of compound 4faa. The spectrum shows peaks in the aromatic region (6.8–7.8 ppm) and aliphatic region (3.4–4.3 ppm). Integration values are provided for each peak.

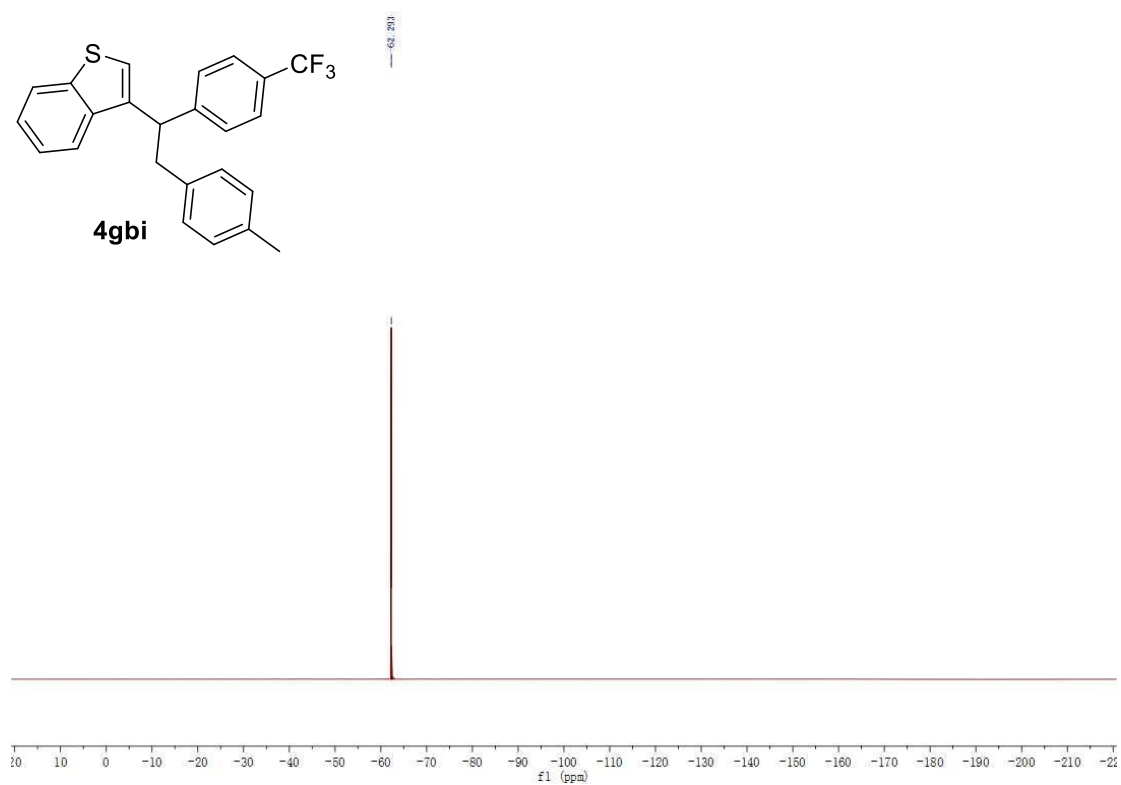
Chemical Shift (ppm)	Integration
7.747, 7.731	1.00
7.628, 7.601, 7.584, 7.551, 7.540, 7.524, 7.517, 7.506, 7.492, 7.477	1.00
7.461, 7.454	1.00
7.360	1.00
7.241, 7.240	1.00
7.180, 7.164, 7.100, 7.111, 7.076, 7.060, 7.047, 7.030, 7.013, 6.996, 6.964, 6.943, 6.937	1.00
6.860, 6.847, 6.838, 6.825	1.00
4.269, 4.253	1.00
3.389, 3.374	1.00





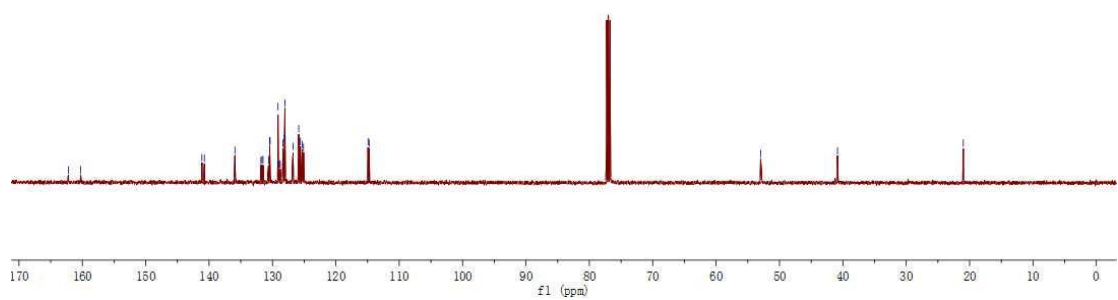
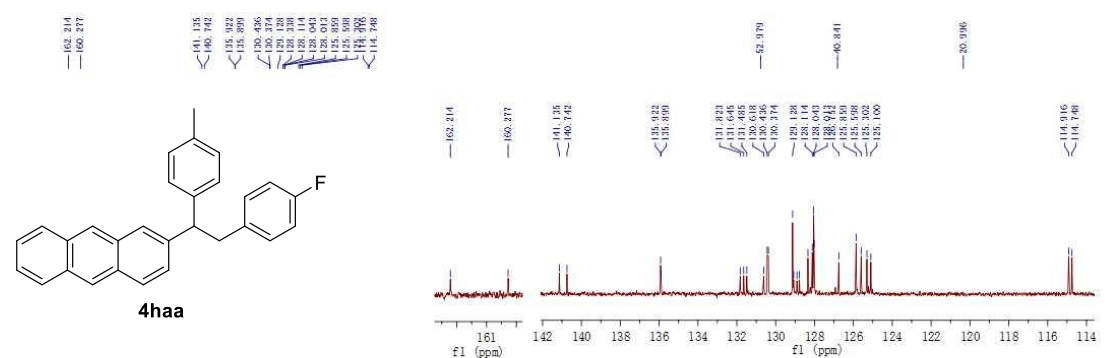
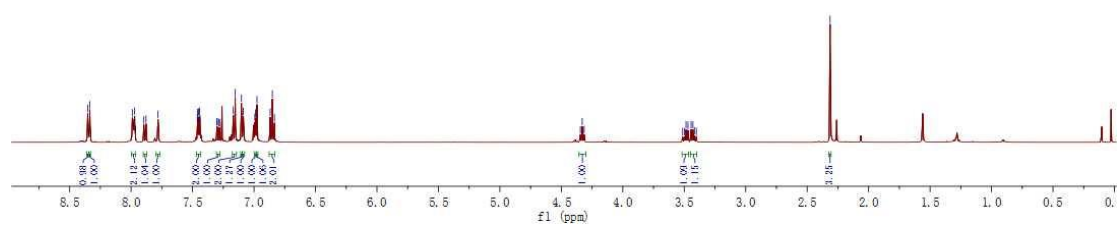
3-(2-(*p*-tolyl)-1-(4-(trifluoromethyl)phenyl)ethyl)benzo[*b*]thiophene (4gbi).

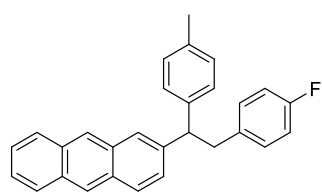




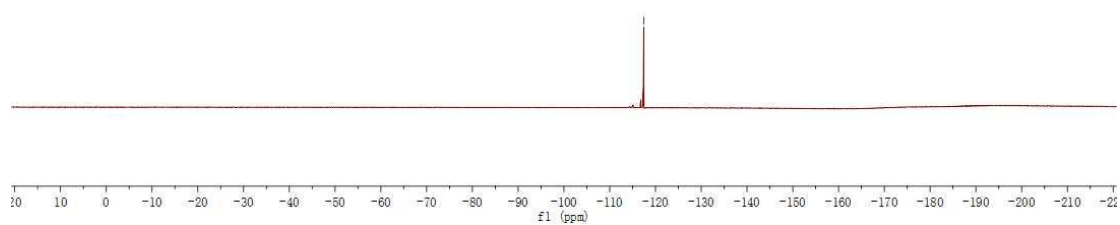
4haa

Chemical structure of **4haa** is shown. The ¹H NMR spectrum (CDCl₃) is displayed below the structure, showing peaks from 8.3 to 3.4 ppm. The spectrum includes integrations for each peak group.

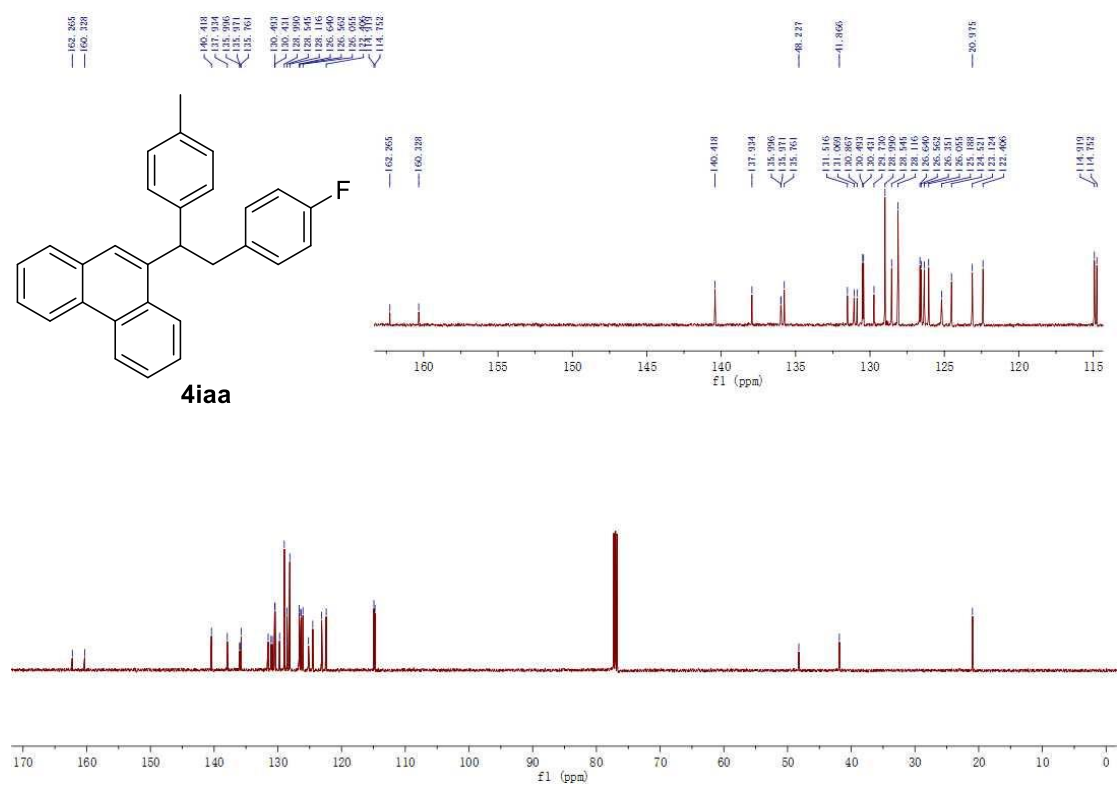
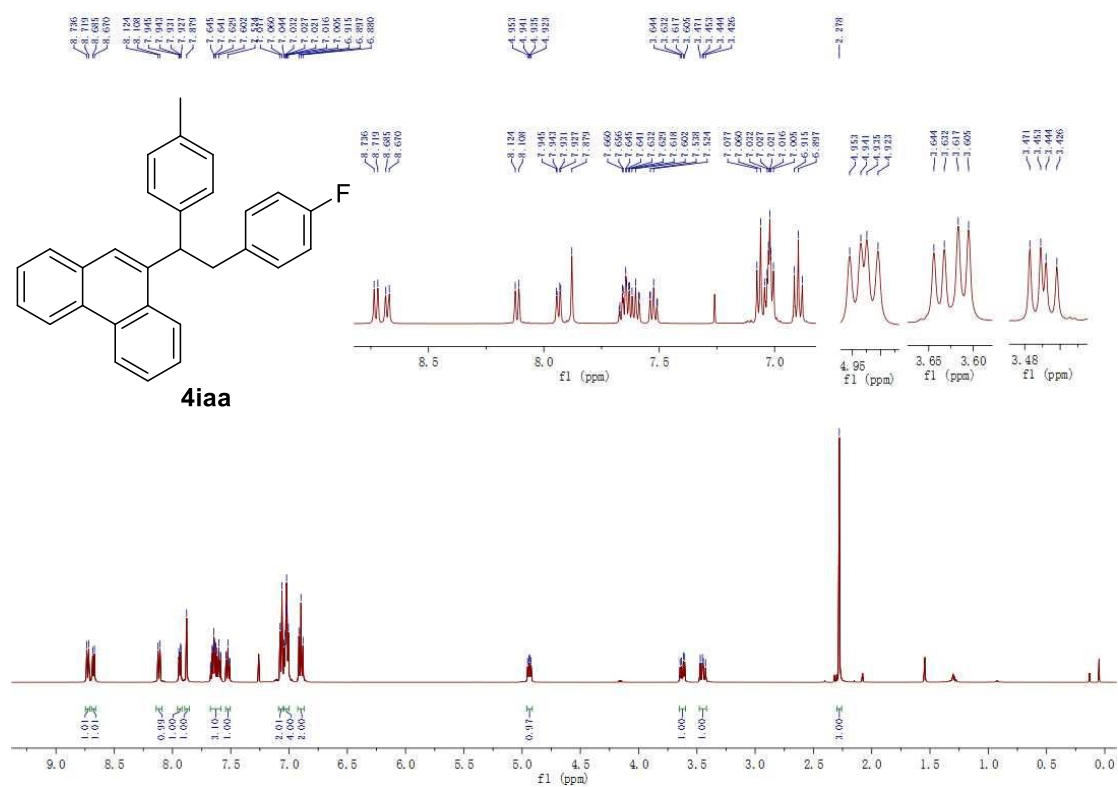


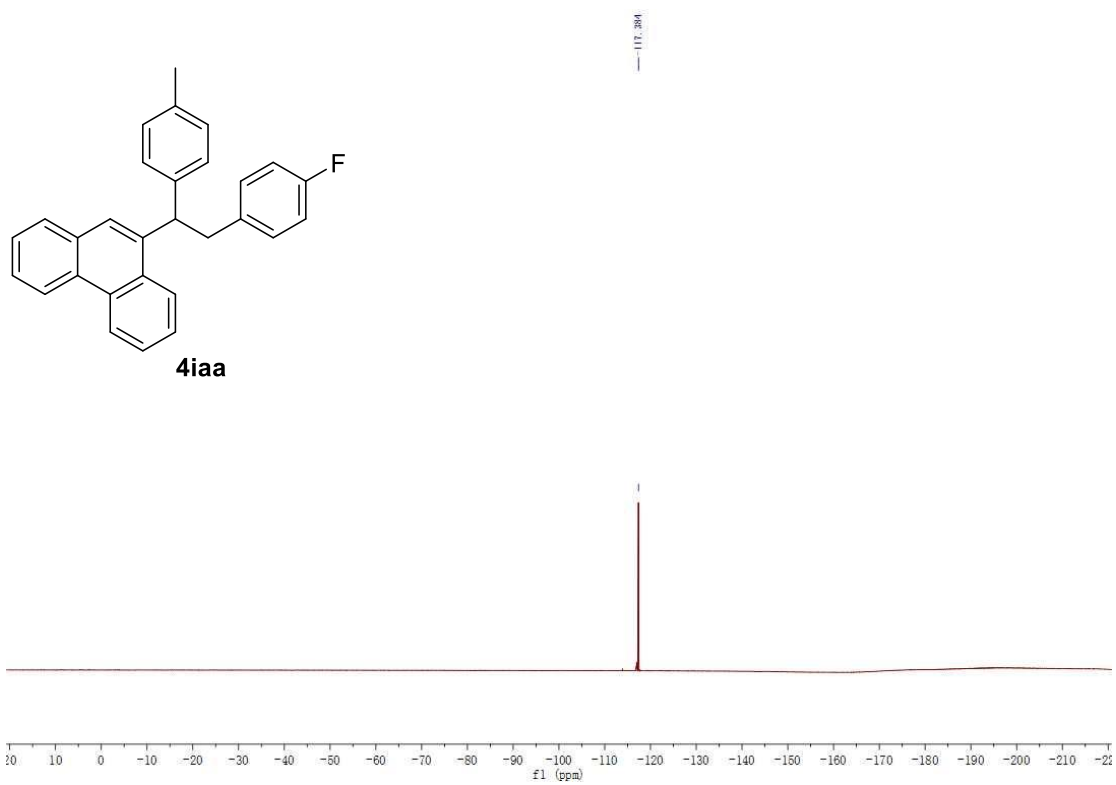


4haa



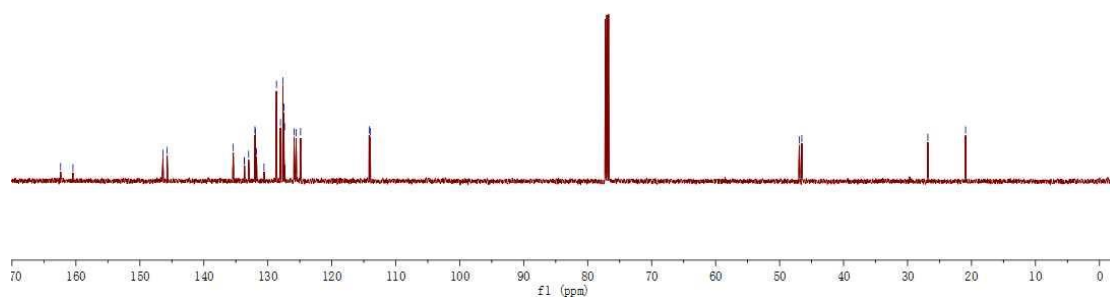
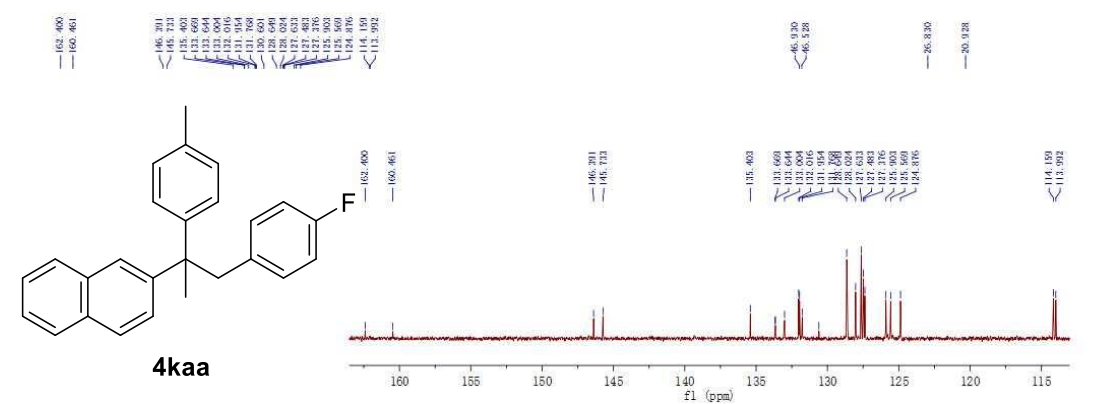
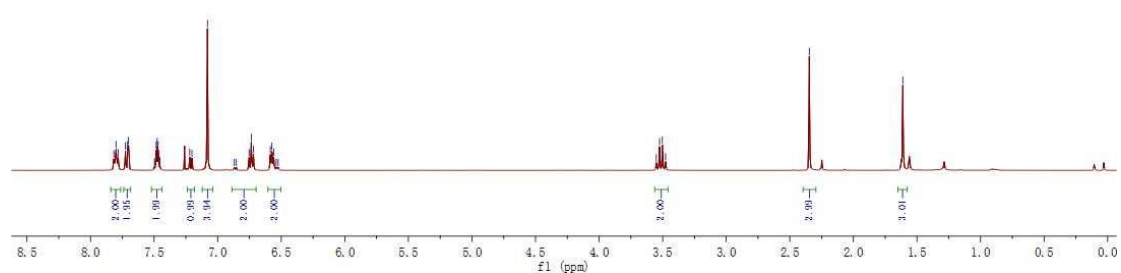
9-(2-(4-fluorophenyl)-1-(*p*-tolylethyl)phenanthrene (4iaa)

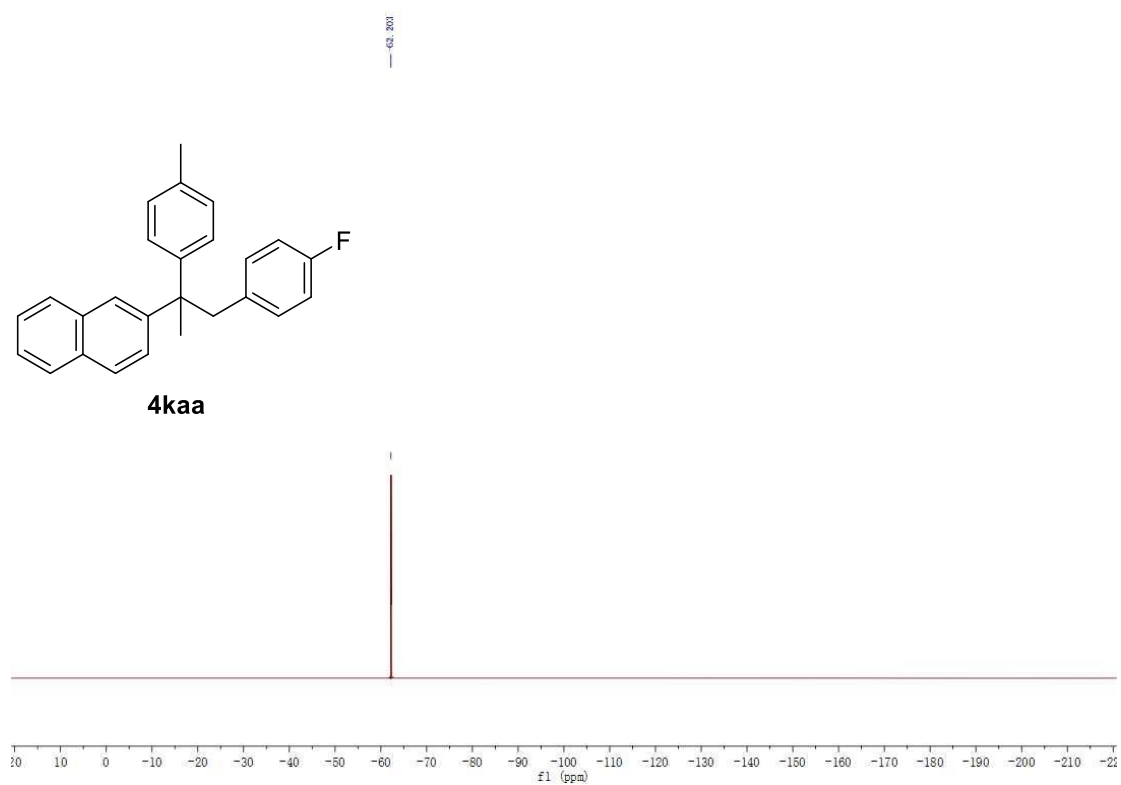




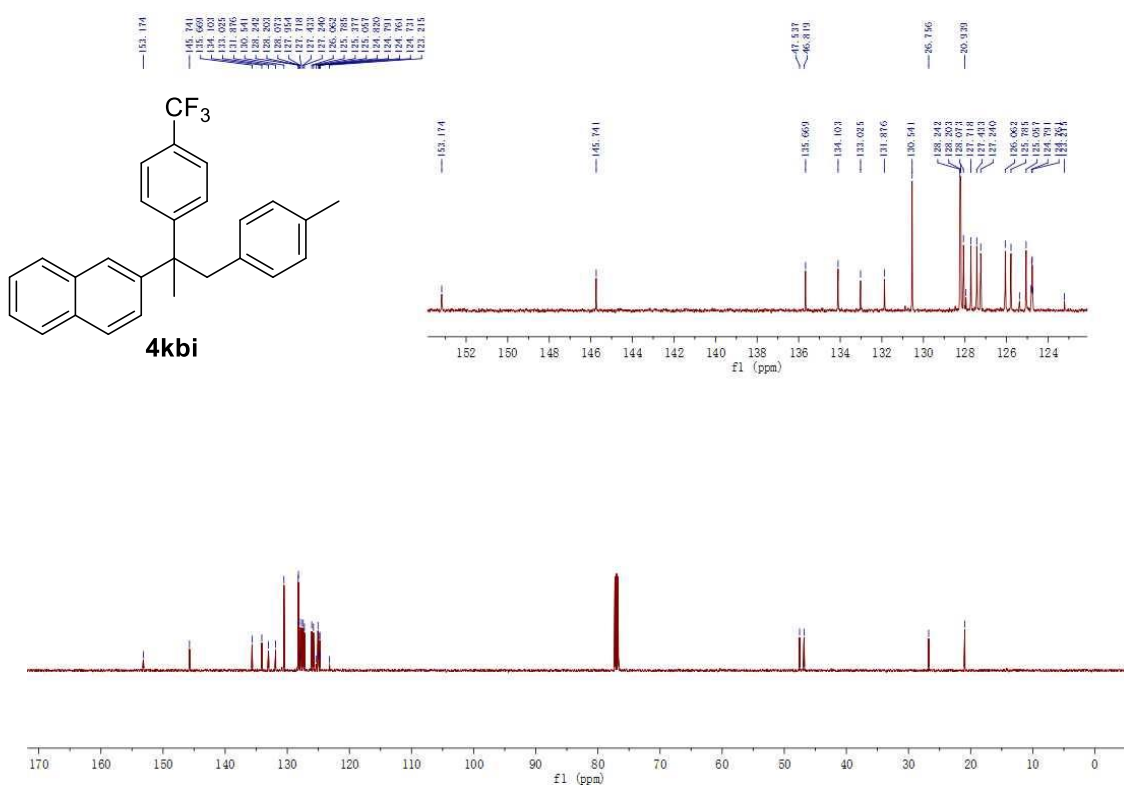
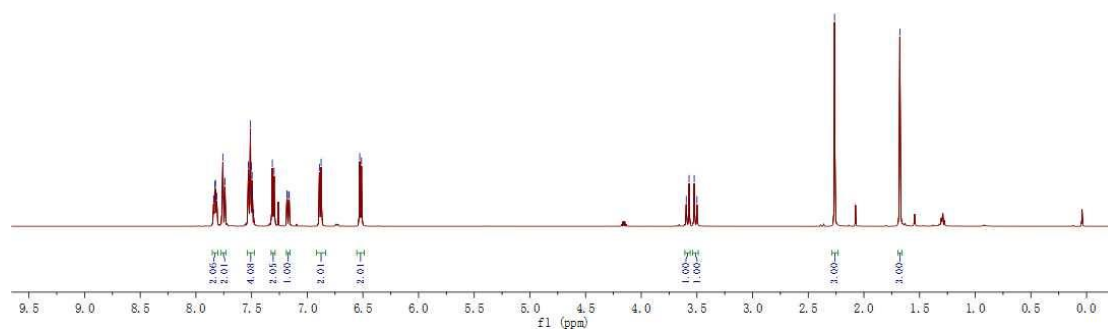
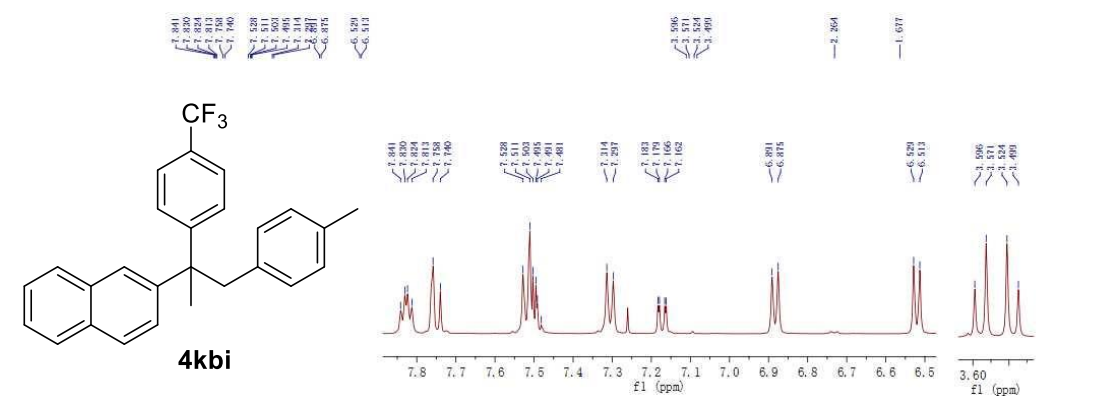
4kaa

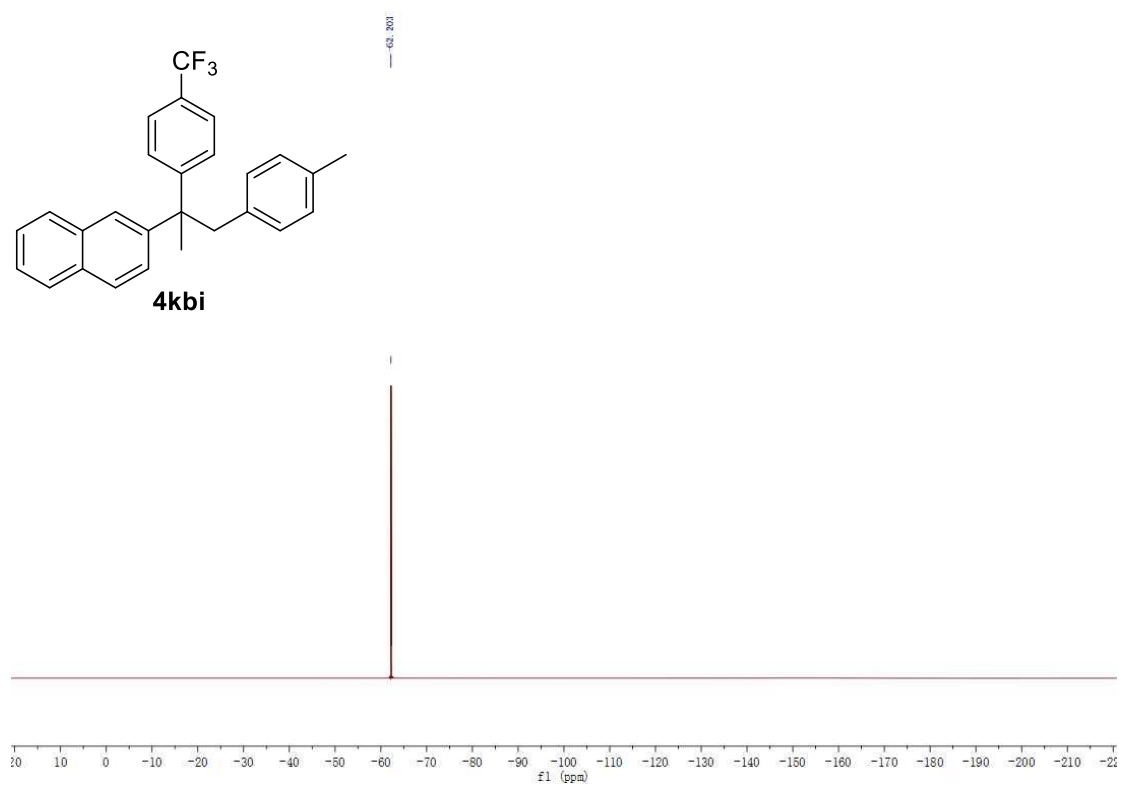
Chemical structure of **4kaa** (2-(4-fluorophenyl)-2-(naphthalen-1-yl)propane) and its ^1H NMR spectrum (CDCl₃). The spectrum shows peaks corresponding to the structure, with integration values indicated above the peaks.





2-(1-(*p*-tolyl)-2-(4-(trifluoromethyl)phenyl)propan-2-yl)naphthalene (4kbi)



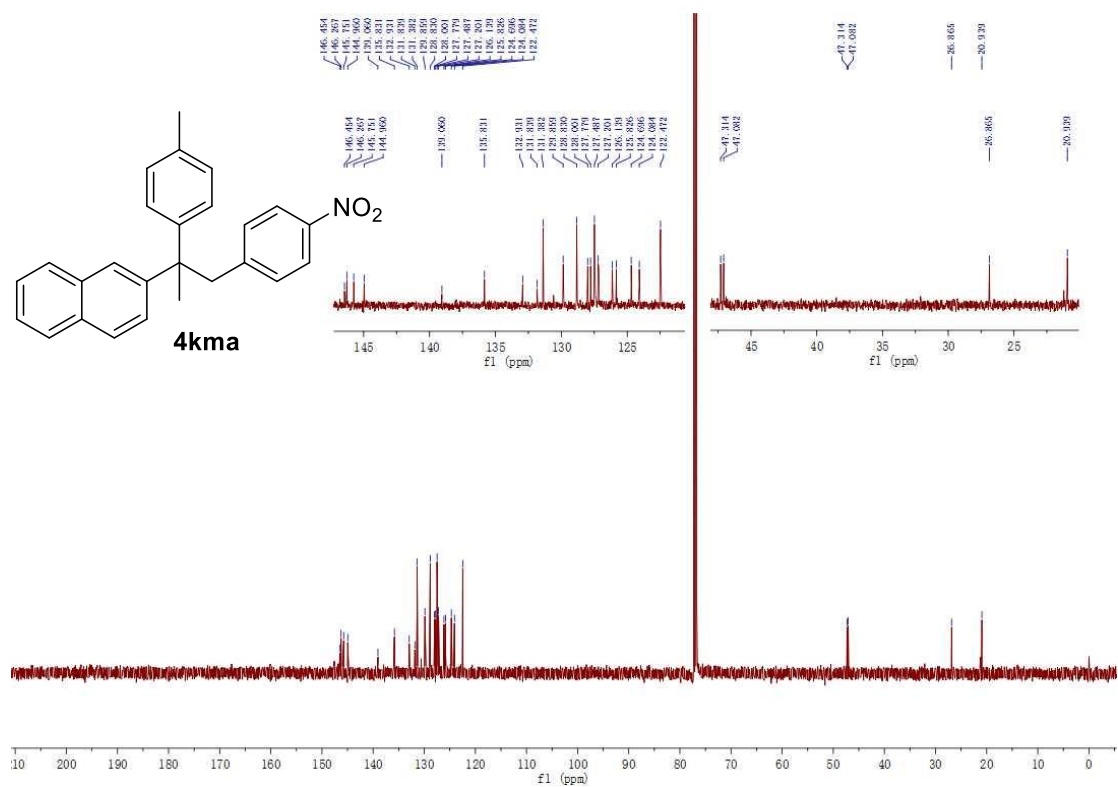


The chemical structure of compound **4kma** is shown, which is 2-(4-nitrobenzyl)-2-(4-methylphenyl)naphthalene. The structure consists of a naphthalene ring substituted at the 2-position with a quaternary carbon atom. This carbon is also bonded to a 4-methylphenyl group and a 4-nitrobenzyl group.

The ¹H NMR spectrum (CDCl₃) is displayed below the structure. The spectrum shows several multiplets in the aromatic region (6.5-8.0 ppm) and two doublets in the aliphatic region (1.5 and 2.3 ppm). Integration values are provided for several peaks.

Chemical Shifts (ppm): 8.00, 7.996, 7.879, 7.880, 7.881, 7.882, 7.883, 7.884, 7.885, 7.886, 7.887, 7.888, 7.889, 7.890, 7.891, 7.892, 7.893, 7.894, 7.895, 7.896, 7.897, 7.898, 7.899, 7.900, 7.901, 7.902, 7.903, 7.904, 7.905, 7.906, 7.907, 7.908, 7.909, 7.910, 7.911, 7.912, 7.913, 7.914, 7.915, 7.916, 7.917, 7.918, 7.919, 7.920, 7.921, 7.922, 7.923, 7.924, 7.925, 7.926, 7.927, 7.928, 7.929, 7.930, 7.931, 7.932, 7.933, 7.934, 7.935, 7.936, 7.937, 7.938, 7.939, 7.940, 7.941, 7.942, 7.943, 7.944, 7.945, 7.946, 7.947, 7.948, 7.949, 7.950, 7.951, 7.952, 7.953, 7.954, 7.955, 7.956, 7.957, 7.958, 7.959, 7.960, 7.961, 7.962, 7.963, 7.964, 7.965, 7.966, 7.967, 7.968, 7.969, 7.970, 7.971, 7.972, 7.973, 7.974, 7.975, 7.976, 7.977, 7.978, 7.979, 7.980, 7.981, 7.982, 7.983, 7.984, 7.985, 7.986, 7.987, 7.988, 7.989, 7.990, 7.991, 7.992, 7.993, 7.994, 7.995, 7.996, 7.997, 7.998, 7.999, 8.000.

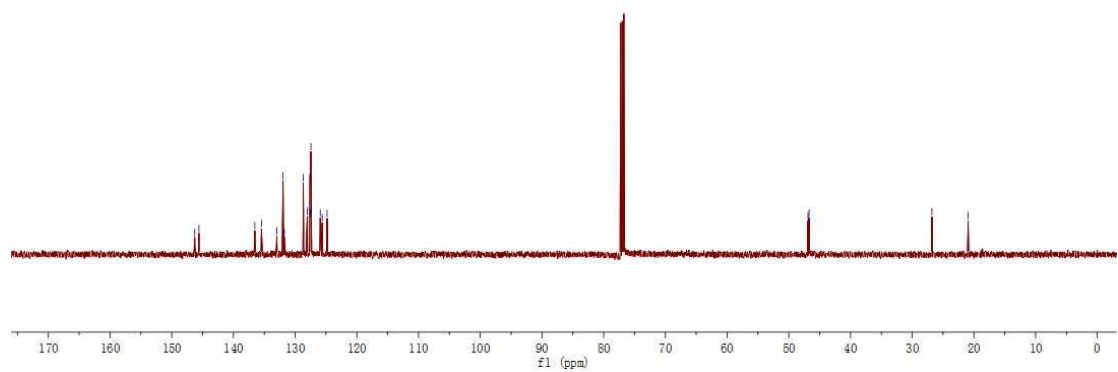
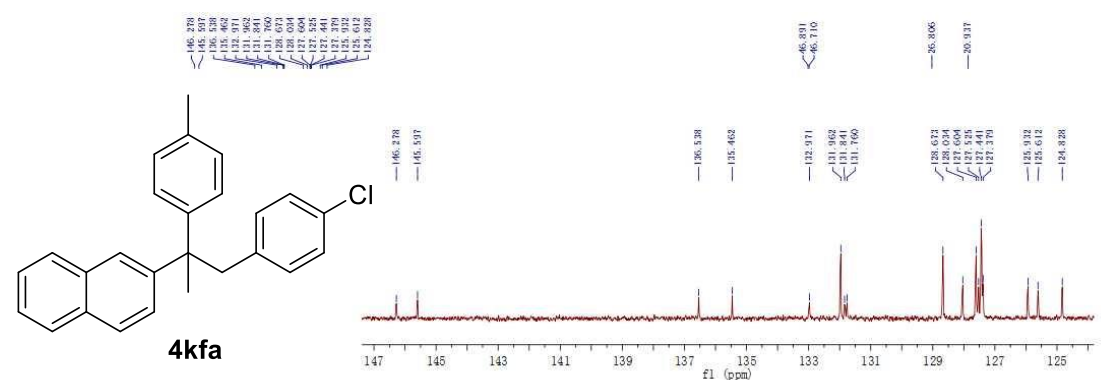
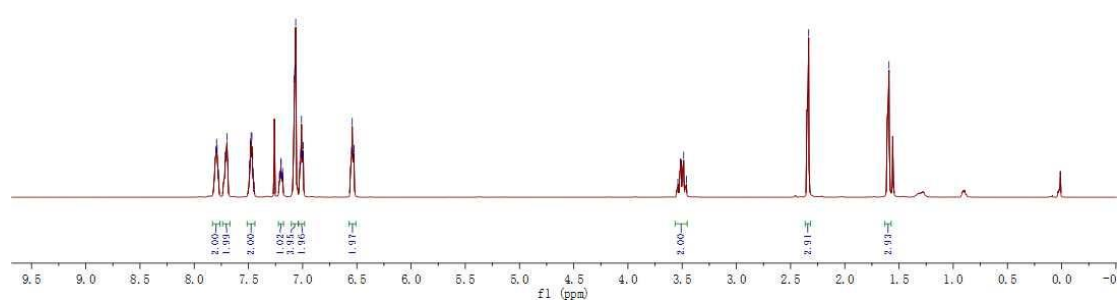
Integration values: 2.00, 1.04, 1.04, 1.00, 1.00, 2.00, 1.01, 1.01, 1.95.



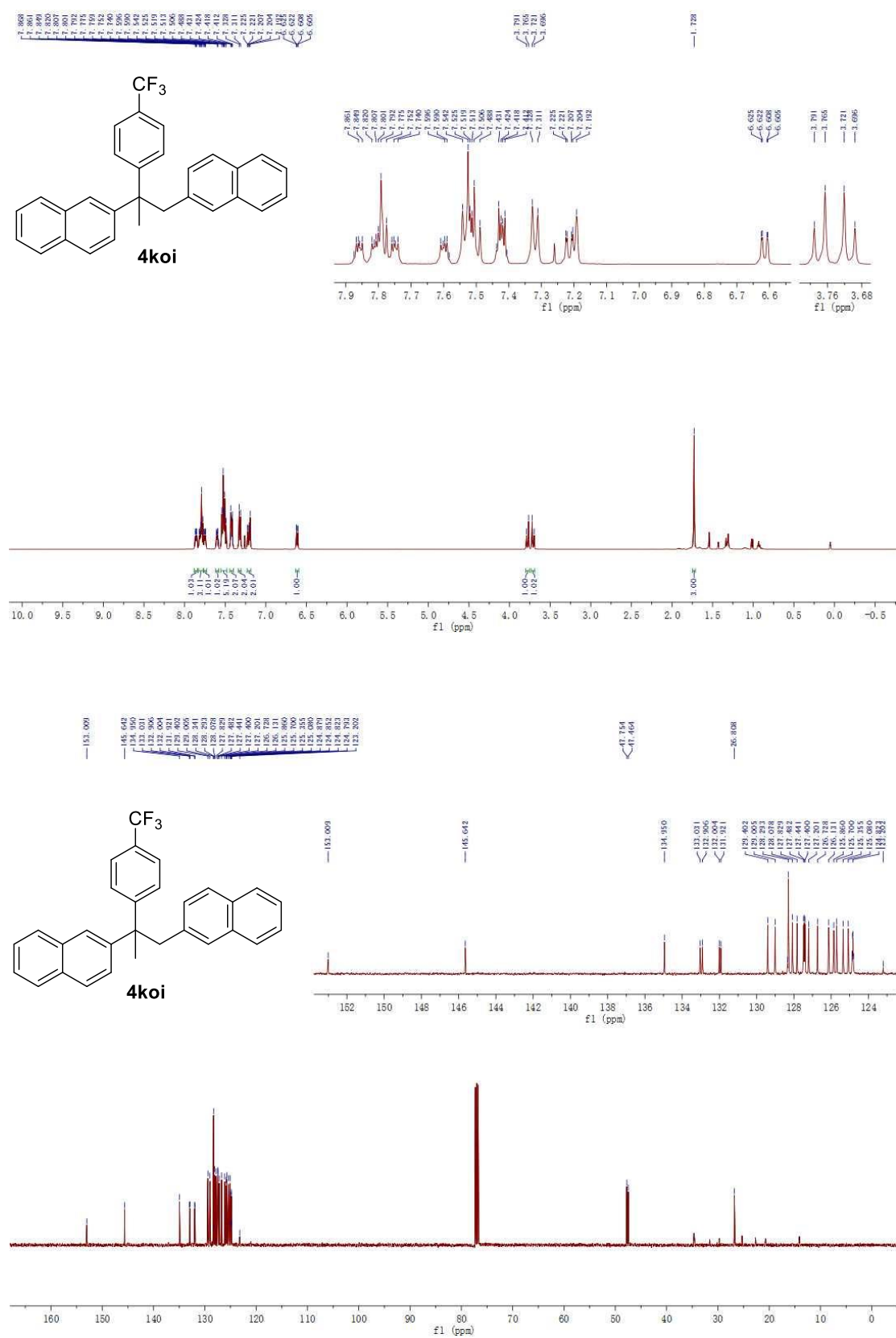
4kfa

The chemical structure of compound 4kfa is shown, which is 2-(4-chlorophenyl)-2-(4-methylphenyl)-1,2,3,4-tetrahydronaphthalene. The structure consists of a naphthalene ring system with a quaternary carbon at position 2, which is substituted with a 4-methylphenyl group and a 4-chlorophenyl group. The 1H NMR spectrum (CDCl3) is displayed below the structure, showing peaks in the aromatic region (7.0-7.9 ppm) and aliphatic region (2.3-3.6 ppm). The spectrum includes integration values and chemical shift labels in ppm.

¹H NMR (CDCl₃) peaks (ppm): 7.939, 7.932, 7.789, 7.782, 7.714, 7.698, 7.458, 7.455, 7.050, 7.044, 7.040, 6.544, 6.531, 6.526, 3.540, 3.535, 3.530, 3.461, 3.456, 3.451, 3.447, 3.214, 3.208, 3.201, 3.201, 3.184, 3.181, 3.181, 3.070, 3.064, 3.064, 3.017, 3.011, 3.005, 3.005, 3.008, 3.004, 6.548, 6.543, 6.538, 6.535, 3.540, 3.535, 3.530, 3.461.

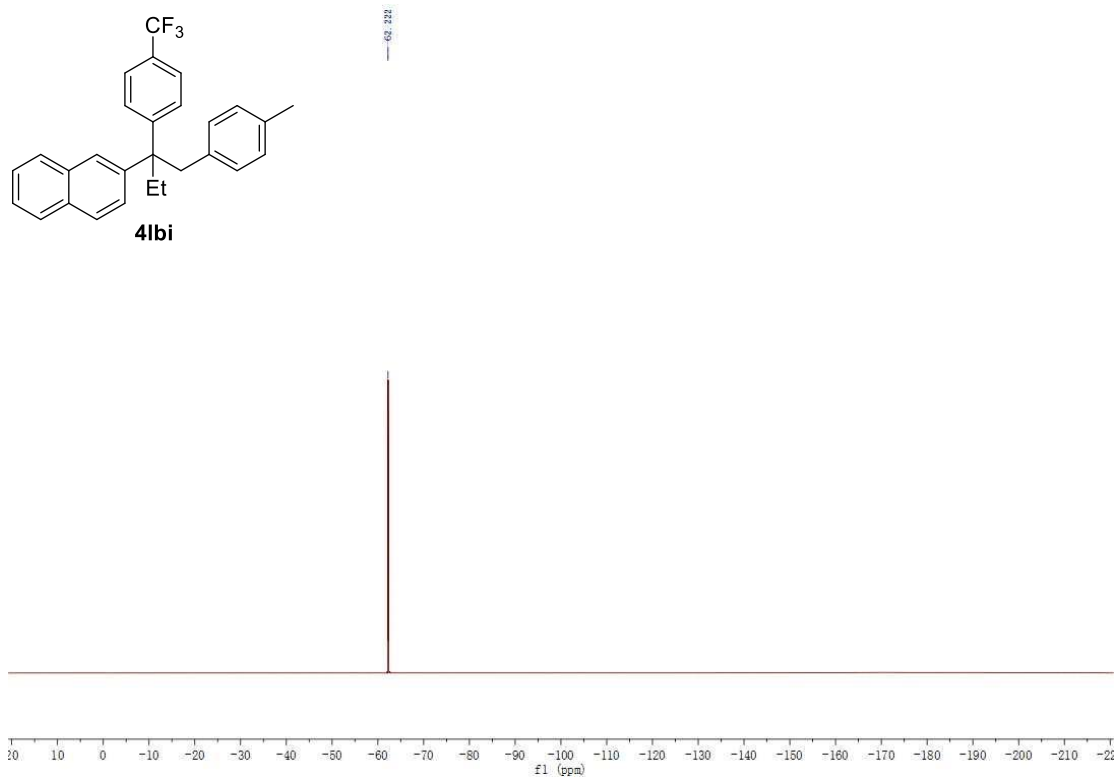


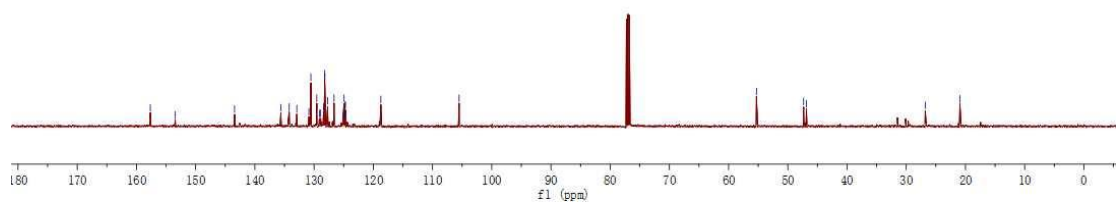
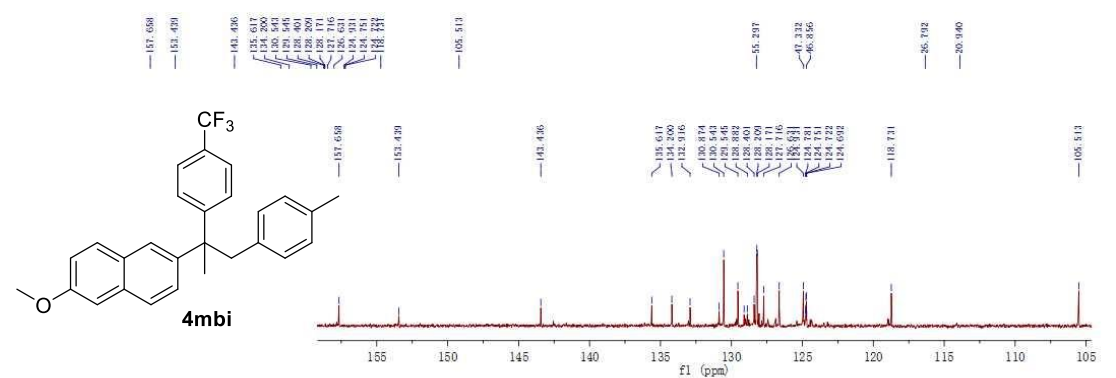
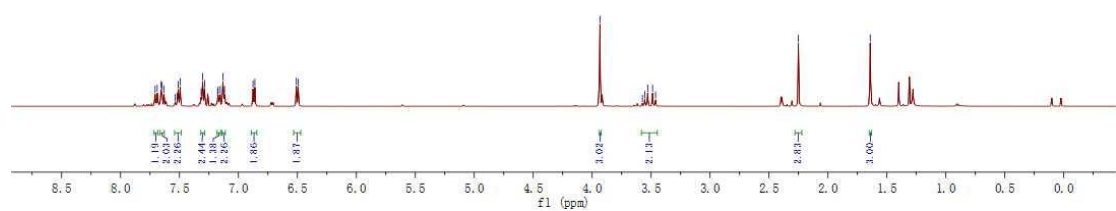
2,2'-(2-(4-(trifluoromethyl)phenyl)propane-1,2-diyl)dinaphthalene (4koi)

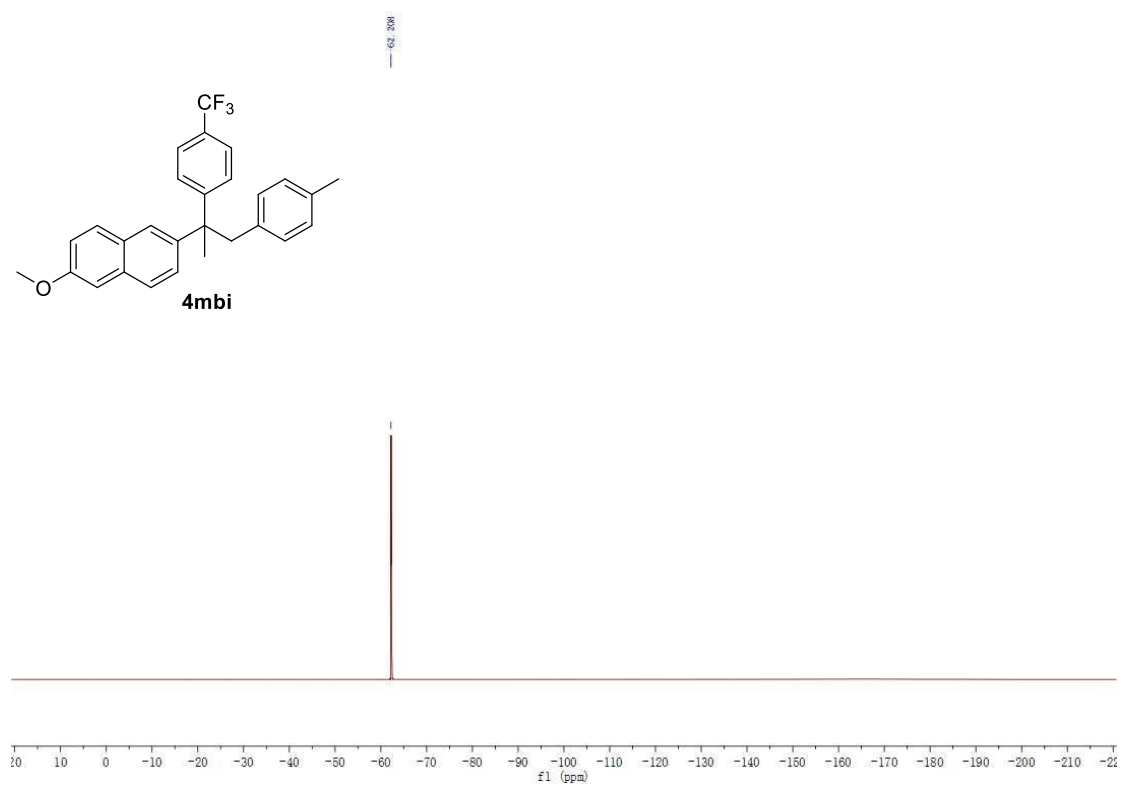




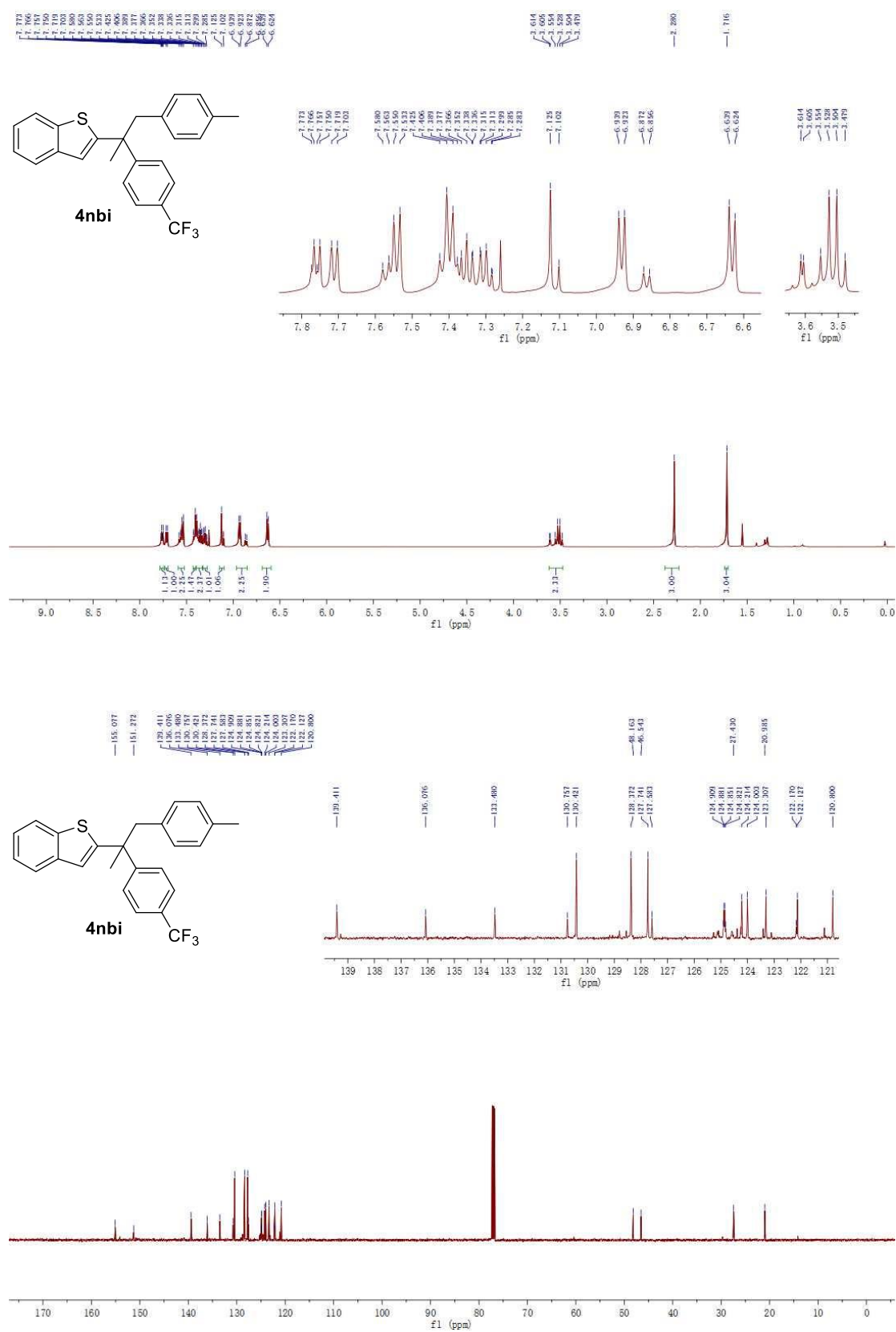
[illegible]

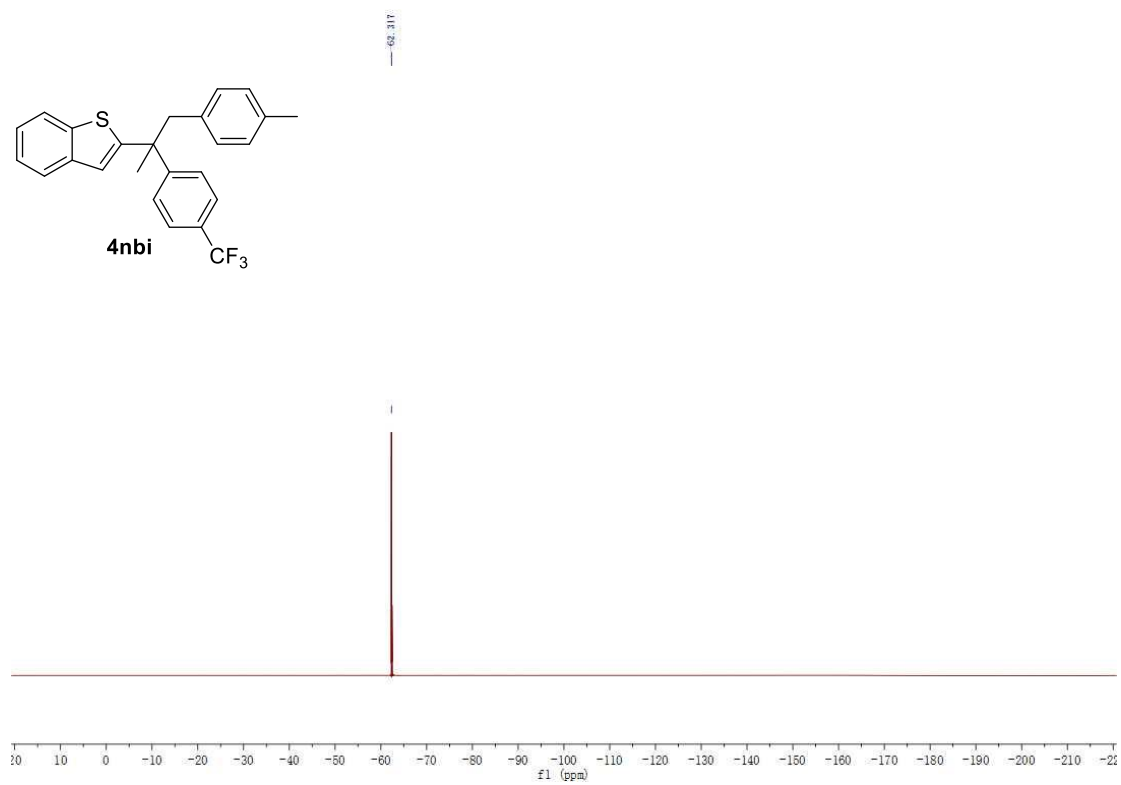






2-(1-(*p*-tolyl)-2-(4-(trifluoromethyl)phenyl)propan-2-yl)benzo[*b*]thiophene (4nbi)





4omb

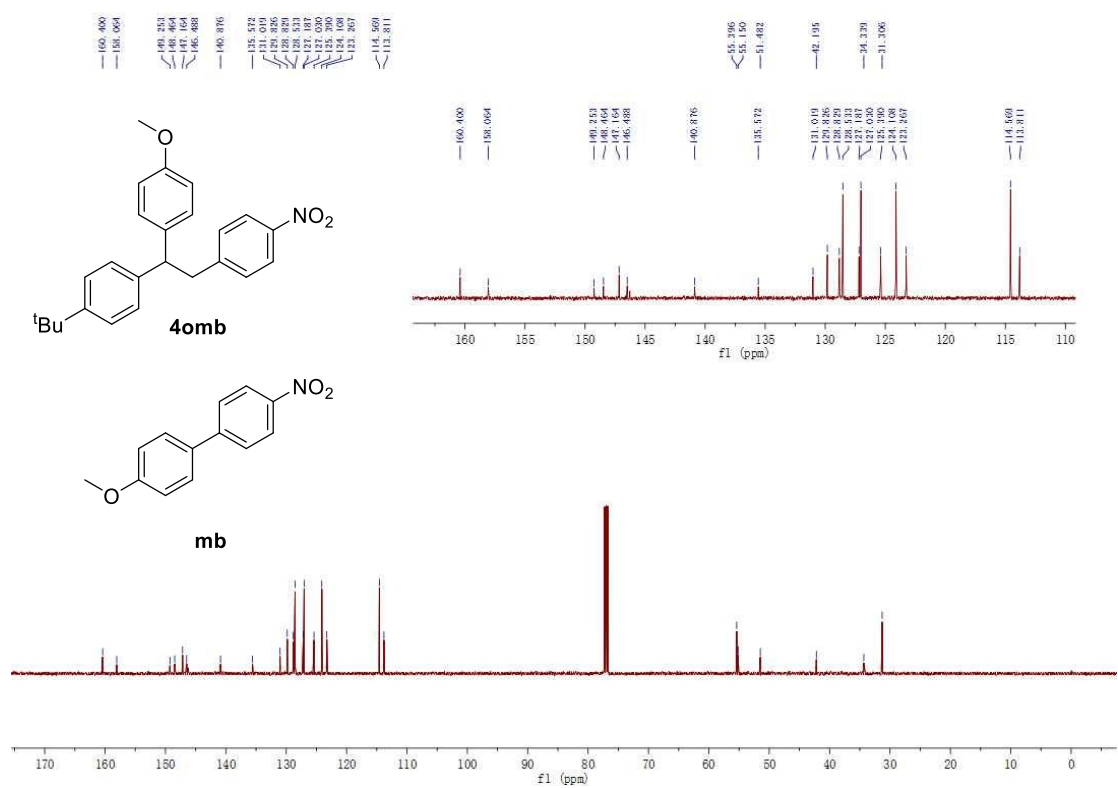
mb

1H NMR Spectrum of 4omb (Top):

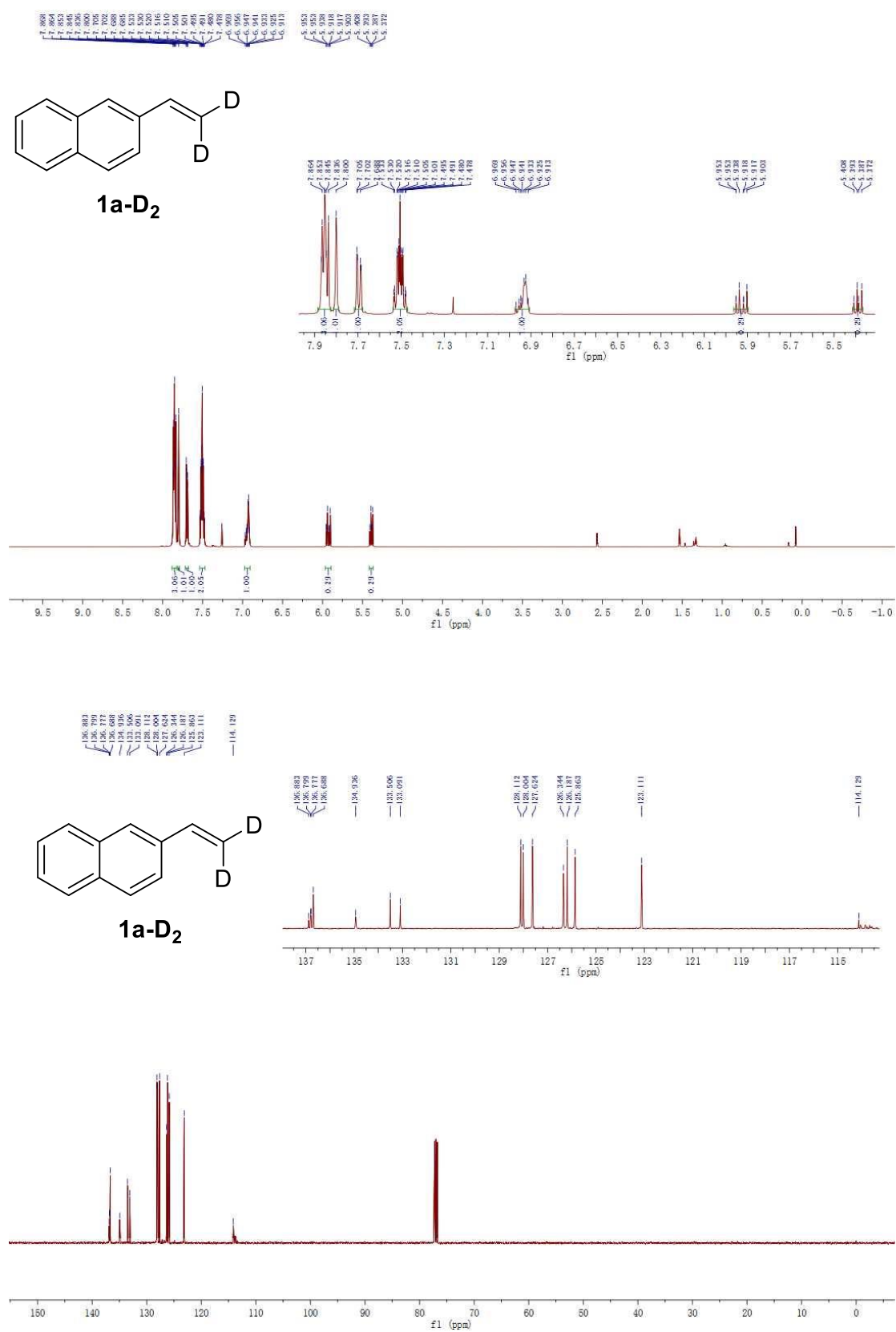
- Chemical structure: CC(C)(C)c1ccc(cc1)C(c2ccc(OC)cc2)Cc3ccc([N+](=O)[O-])cc3
- Peak list (ppm): 8.27, 8.271, 8.264, 8.260, 8.037, 8.010, 7.706, 7.701, 7.691, 7.683, 7.593, 7.588, 7.580, 7.576, 7.296, 7.279, 7.142, 7.137, 7.120, 7.082, 7.083, 7.073, 7.019, 6.942, 6.775, 4.162, 4.146, 4.130, 3.460, 3.446, 3.433, 3.410, 3.394, 3.384, 3.366.
- Integration values: 1.00, 6.23, 3.01, 2.00, 9.09.

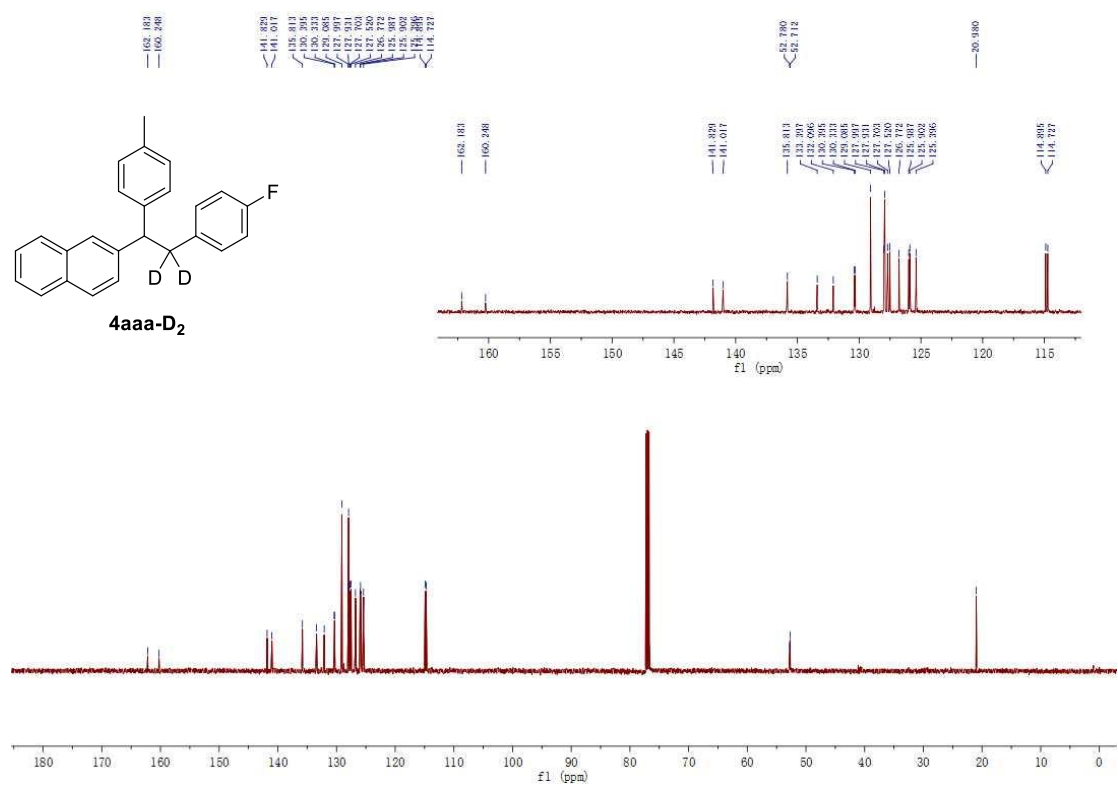
1H NMR Spectrum of mb (Bottom):

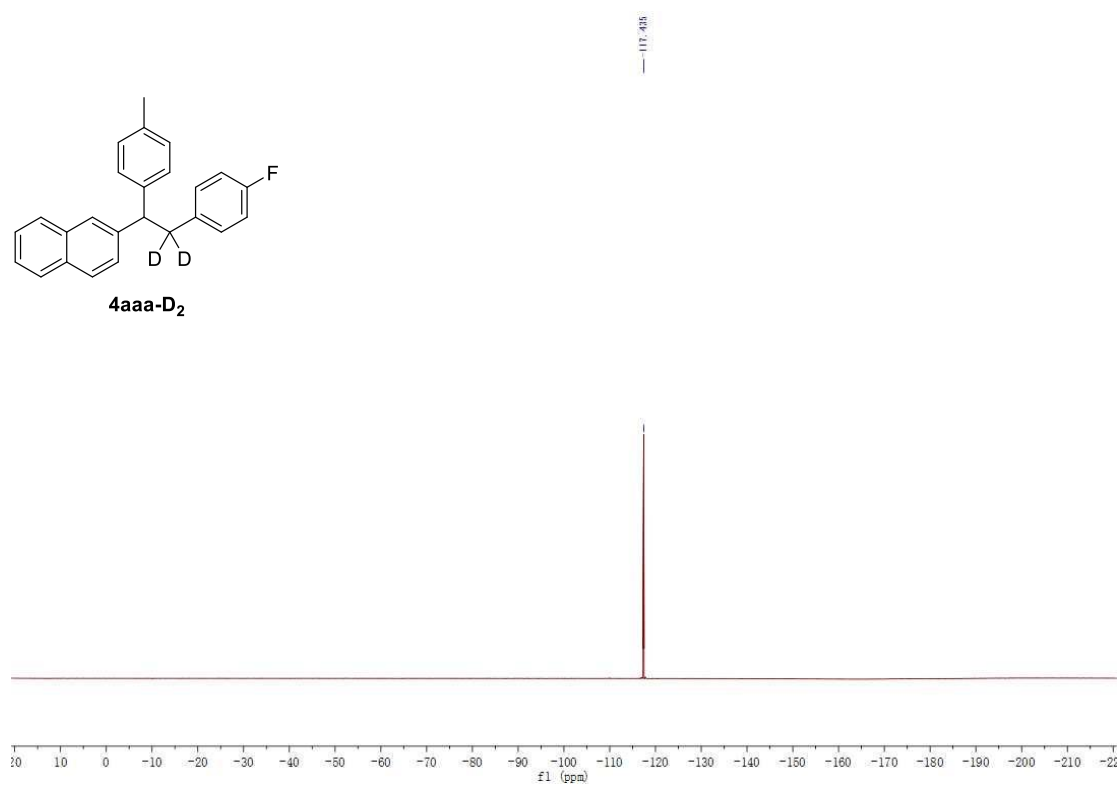
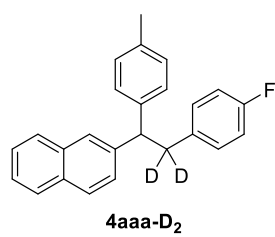
- Chemical structure: COc1ccc(cc1)-c2ccc([N+](=O)[O-])cc2
- Peak list (ppm): 8.40, 8.398, 8.396, 8.394, 8.392, 8.390, 8.388, 8.386, 8.384, 8.382, 8.380, 8.378, 8.376, 8.374, 8.372, 8.370, 8.368, 8.366, 8.364, 8.362, 8.360, 8.358, 8.356, 8.354, 8.352, 8.350, 8.348, 8.346, 8.344, 8.342, 8.340, 8.338, 8.336, 8.334, 8.332, 8.330, 8.328, 8.326, 8.324, 8.322, 8.320, 8.318, 8.316, 8.314, 8.312, 8.310, 8.308, 8.306, 8.304, 8.302, 8.300, 8.298, 8.296, 8.294, 8.292, 8.290, 8.288, 8.286, 8.284, 8.282, 8.280, 8.278, 8.276, 8.274, 8.272, 8.270, 8.268, 8.266, 8.264, 8.262, 8.260, 8.258, 8.256, 8.254, 8.252, 8.250, 8.248, 8.246, 8.244, 8.242, 8.240, 8.238, 8.236, 8.234, 8.232, 8.230, 8.228, 8.226, 8.224, 8.222, 8.220, 8.218, 8.216, 8.214, 8.212, 8.210, 8.208, 8.206, 8.204, 8.202, 8.200, 8.198, 8.196, 8.194, 8.192, 8.190, 8.188, 8.186, 8.184, 8.182, 8.180, 8.178, 8.176, 8.174, 8.172, 8.170, 8.168, 8.166, 8.164, 8.162, 8.160, 8.158, 8.156, 8.154, 8.152, 8.150, 8.148, 8.146, 8.144, 8.142, 8.140, 8.138, 8.136, 8.134, 8.132, 8.130, 8.128, 8.126, 8.124, 8.122, 8.120, 8.118, 8.116, 8.114, 8.112, 8.110, 8.108, 8.106, 8.104, 8.102, 8.100, 8.098, 8.096, 8.094, 8.092, 8.090, 8.088, 8.086, 8.084, 8.082, 8.080, 8.078, 8.076, 8.074, 8.072, 8.070, 8.068, 8.066, 8.064, 8.062, 8.060, 8.058, 8.056, 8.054, 8.052, 8.050, 8.048, 8.046, 8.044, 8.042, 8.040, 8.038, 8.036, 8.034, 8.032, 8.030, 8.028, 8.026, 8.024, 8.022, 8.020, 8.018, 8.016, 8.014, 8.012, 8.010, 8.008, 8.006, 8.004, 8.002, 8.000, 7.998, 7.996, 7.994, 7.992, 7.990, 7.988, 7.986, 7.984, 7.982, 7.980, 7.978, 7.976, 7.974, 7.972, 7.970, 7.968, 7.966, 7.964, 7.962, 7.960, 7.958, 7.956, 7.954, 7.952, 7.950, 7.948, 7.946, 7.944, 7.942, 7.940, 7.938, 7.936, 7.934, 7.932, 7.930, 7.928, 7.926, 7.924, 7.922, 7.920, 7.918, 7.916, 7.914, 7.912, 7.910, 7.908, 7.906, 7.904, 7.902, 7.900, 7.898, 7.896, 7.894, 7.892, 7.890, 7.888, 7.886, 7.884, 7.882, 7.880, 7.878, 7.876, 7.874, 7.872, 7.870, 7.868, 7.866, 7.864, 7.862, 7.860, 7.858, 7.856, 7.854, 7.852, 7.850, 7.848, 7.846, 7.844, 7.842, 7.840, 7.838, 7.836, 7.834, 7.832, 7.830, 7.828, 7.826, 7.824, 7.822, 7.820, 7.818, 7.816, 7.814, 7.812, 7.810, 7.808, 7.806, 7.804, 7.802, 7.800, 7.798, 7.796, 7.794, 7.792, 7.790, 7.788, 7.786, 7.784, 7.782, 7.780, 7.778, 7.776, 7.774, 7.772, 7.770, 7.768, 7.766, 7.764, 7.762, 7.760, 7.758, 7.756, 7.754, 7.752, 7.750, 7.748, 7.746, 7.744, 7.742, 7.740, 7.738, 7.736, 7.734, 7.732, 7.730, 7.728, 7.726, 7.724, 7.722, 7.720, 7.718, 7.716, 7.714, 7.712, 7.710, 7.708, 7.706, 7.704, 7.702, 7.700, 7.698, 7.696, 7.694, 7.692, 7.690, 7.688, 7.686, 7.684, 7.682, 7.680, 7.678, 7.676, 7.674, 7.672, 7.670, 7.668, 7.666, 7.664, 7.662, 7.660, 7.658, 7.656, 7.654, 7.652, 7.650, 7.648, 7.646, 7.644, 7.642, 7.640, 7.638, 7.636, 7.634, 7.632, 7.630, 7.628, 7.626, 7.624, 7.622, 7.620, 7.618, 7.616, 7.614, 7.612, 7.610, 7.608, 7.606, 7.604, 7.602, 7.600, 7.598, 7.596, 7.594, 7.592, 7.590, 7.588, 7.586, 7.584, 7.582, 7.580, 7.578, 7.576, 7.574, 7.572, 7.570, 7.568, 7.566, 7.564, 7.562, 7.560, 7.558, 7.556, 7.554, 7.552, 7.550, 7.548, 7.546, 7.544, 7.542, 7.540, 7.538, 7.536, 7.534, 7.532, 7.530, 7.528, 7.526, 7.524, 7.522, 7.520, 7.518, 7.516, 7.514, 7.512, 7.510, 7.508, 7.506, 7.504, 7.502, 7.500, 7.498, 7.496, 7.494, 7.492, 7.490, 7.488, 7.486, 7.484, 7.482, 7.480, 7.478, 7.476, 7.474, 7.472, 7.470, 7.468, 7.466, 7.464, 7.462, 7.460, 7.458, 7.456, 7.454, 7.452, 7.450, 7.448, 7.446, 7.444, 7.442, 7.440, 7.438, 7.436, 7.434, 7.432, 7.430, 7.428, 7.426, 7.424, 7.422, 7.420, 7.418, 7.416, 7.414, 7.412, 7.410, 7.408, 7.406, 7.404, 7.402, 7.400, 7.398, 7.396, 7.394, 7.392, 7.390, 7.388, 7.386,



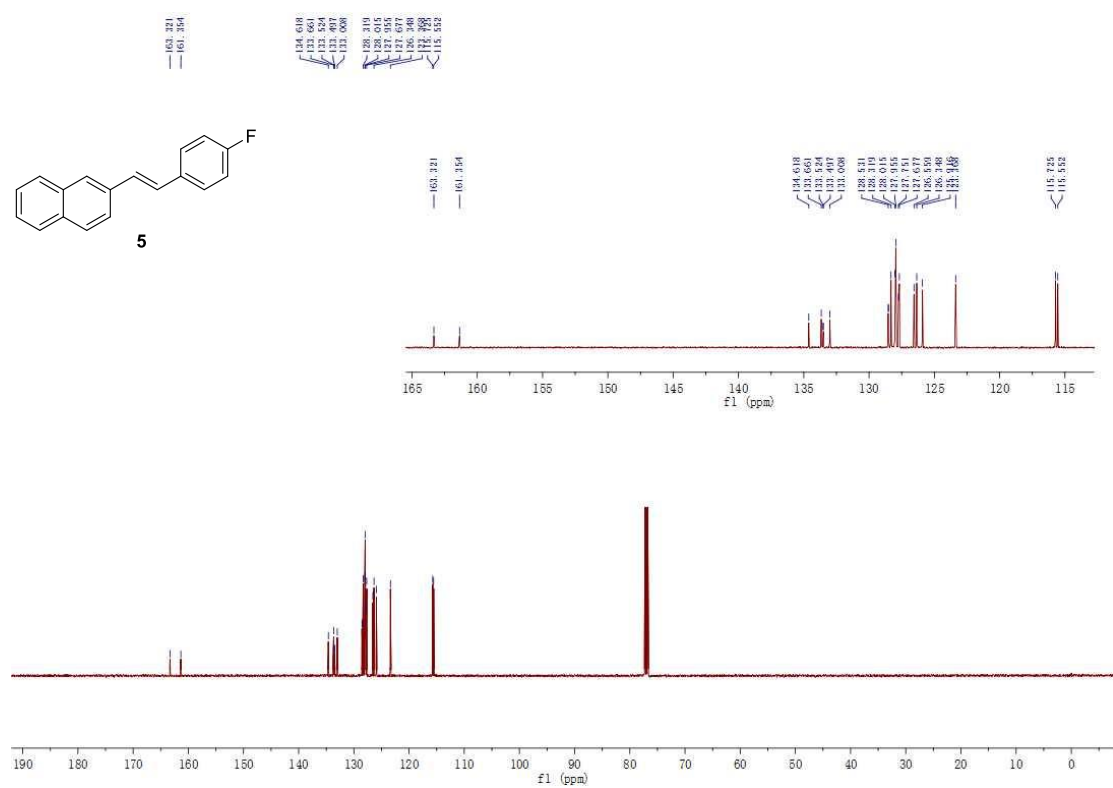
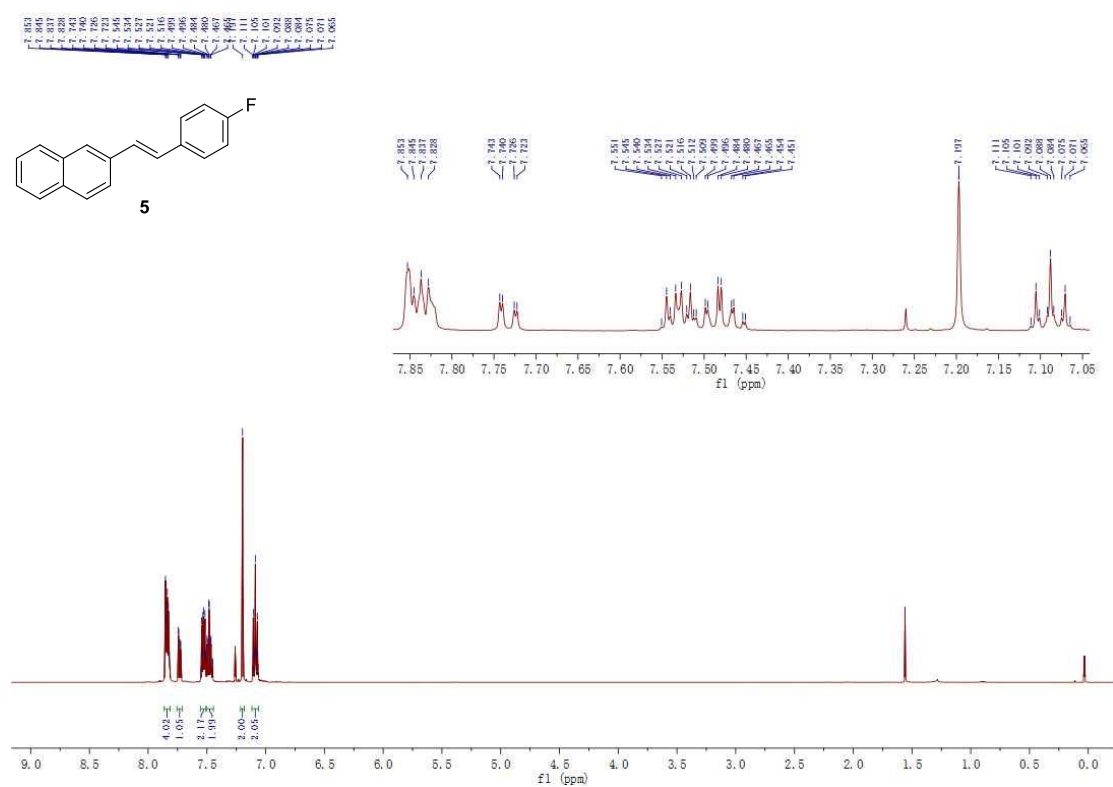
2-(vinyl-2,2- d_2)naphthalene (1a- D_2)



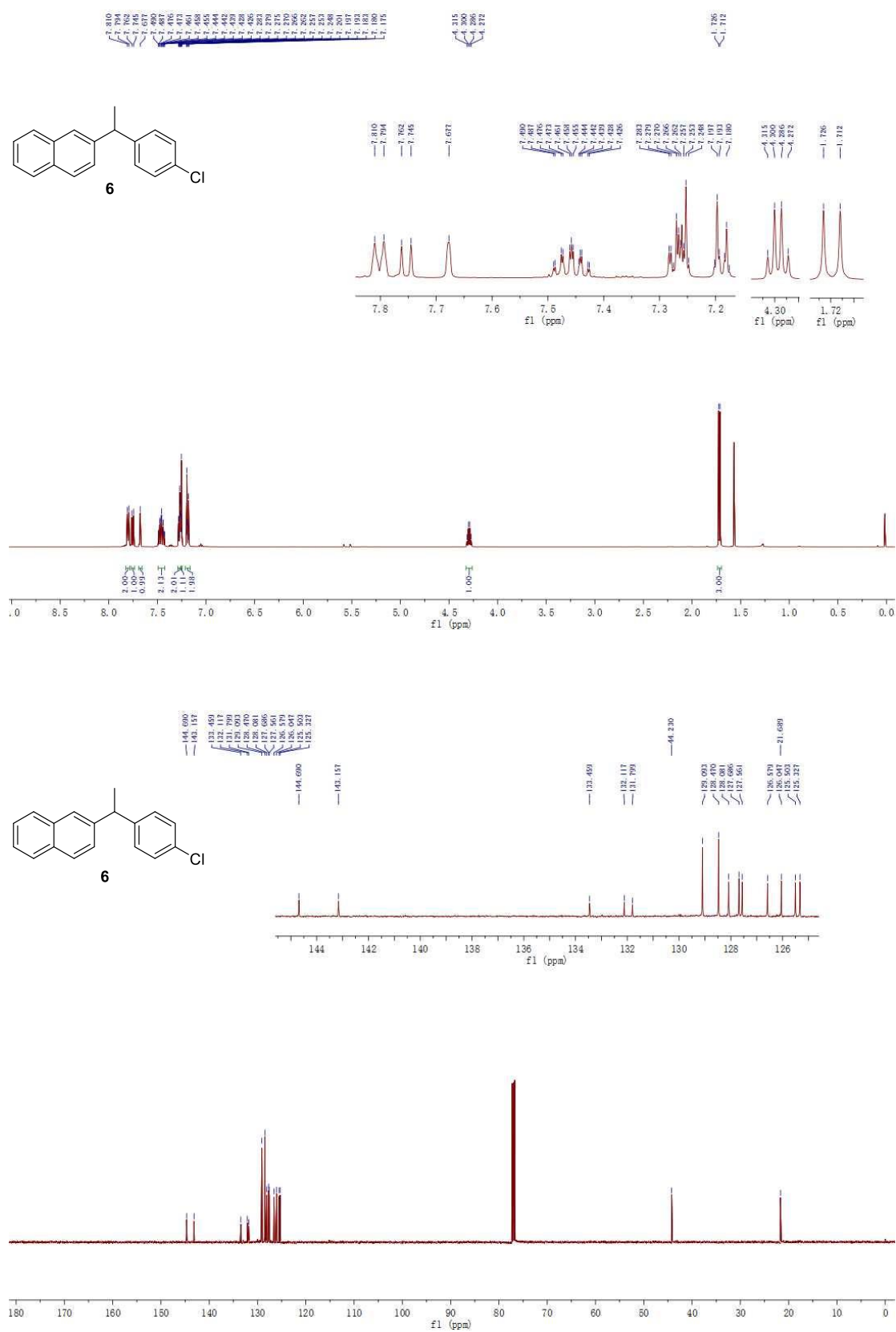




(E)-2-(4-fluorostyryl)naphthalene (5)



2-(1-(4-chlorophenyl)ethyl)naphthalene (6)



6. References

- (1) Stokes, B. J.; Liao, L.; de Andrade, A. M.; Wang, Q.; Sigman, M. S. *Org. Lett.* **2014**, *16*, 4666.
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- (4) Duan, H.; Meng, L.; Bao, D.; Zhang, H.; Li, Y.; Lei, A. *Angew. Chem. Int. Ed.* **2010**, *49*, 6387.