

Supporting Information

Ethers as Hydrogen Sources in $\text{BF}_3 \cdot \text{OEt}_2$ Promoted Reduction of Diphenylmethyl Alcohols, Ethers and Esters to Hydrocarbons

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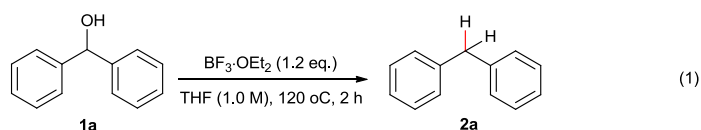
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1. General information

All reactions were carried out under an inert atmosphere of argon unless otherwise noted. All solvents were distilled from deep purple sodium benzophenone ketyl. Commercial reagents were purchased from the suppliers and used without further purification, unless otherwise noted. Liquid reagents were transferred with stainless steel syringes. NMR spectra were recorded on a 500 spectrometer (500 MHz for ^1H , 125 MHz for ^{13}C) with deuterated chloroform (CDCl_3) as a solvent at 20-25 $^\circ\text{C}$. ^1H NMR spectra were reported in parts per million using TMS ($\delta = 0.00$ ppm) as an internal standard. ^{13}C NMR spectra were reported in parts per million using solvent CDCl_3 ($\delta = 77.2$ ppm) as an internal standard. High-resolution mass spectra (HRMS) atmospheric pressure chemical ionization (APCI) was carried out on a UPLC-Q-ToF MS spectrometer. Unless otherwise specified, column chromatography and thin-layer chromatography (TLC) which was used to monitor the reactions were performed on silica gel.

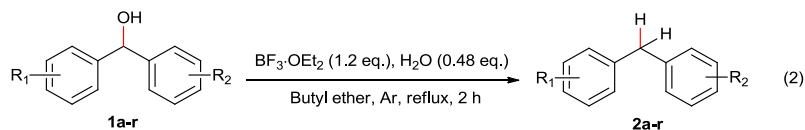
2. General experimental procedures

2.1 Standard procedures under air conditions.



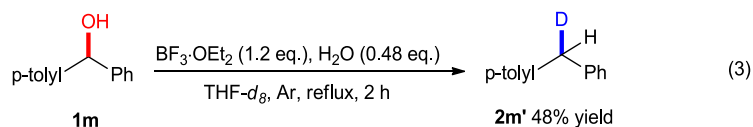
To a round-bottom flask, diphenylmethanol (**1a**, 184.2 mg, 1.0 mmol), $\text{BF}_3 \cdot \text{OEt}_2$ (151.4 μL , 1.2 mmol) and 1.0 mL of THF were added. Then the resulting mixture was stirred under open-flask condition at 120 $^\circ\text{C}$ (oil bath temp.) for 2 h. The solvent was evaporated, and the residue was chromatographed on silica gel (eluent: petroleum ether) to give colorless diphenylmethane (**2a**, 30.5 mg, 18% yield).

2.2 Standard procedures under argon condition.



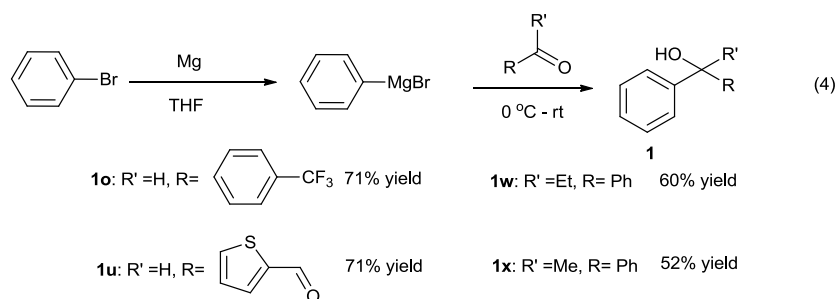
To a three-necked flask, diphenylmethanols (**1**, 1.0 mmol), H_2O (8.64 μL , 0.48 mmol), 1.0 mL of distilled butyl ether and $\text{BF}_3 \cdot \text{OEt}_2$ (151.4 μL , 1.2 mmol) were added successively. Then the resulting mixture was stirred under an argon atmosphere at 160 $^\circ\text{C}$ (oil bath temp.) for 2 h. The solvent was evaporated, and the residue was chromatographed on silica gel (eluent: petroleum ether) to give desired products (**2**). (For all the yields, please see the main text.)

2.3 General procedures of deuterated experiment



To a three-necked flask, alcohols (**1m**) (1.0 mmol), H₂O (8.64 μ L, 0.48 mmol), 1.0 mL of deuterated THF and BF₃ OEt₂ (151.4 μ L, 1.2 mmol) were added. Then the resulting mixture was stirred under an argon atmosphere at 120 °C (oil bath temp.) for 2 h. The solvent was evaporated, and the residue was chromatographed on silica gel (eluent: petroleum ether) to give colorless liquid (**2m'**) with 48% yield.

2.4 General procedures for preparation substrates by Grignard reaction



To a three-necked flask, magnesium (7.0 mmol), distilled THF (6 mL) and bromobenzene (5 mmol) were added under argon atmosphere. After stirring for 1 h, aldehyde (5 mmol) were added dropwisely to the prepared phenyl magnesium bromide in Ar atmosphere at 0 °C, and stirred at room temperature overnight. Then the reaction was quenched by saturated NH₄Cl (aq.), extracted by EtOAc, dried over MgSO₄, evaporated in vacuum, and further purified by flash chromatography on silica gel with petroleum ether/EtOAc (10:1, v/v) to afford the corresponding alcohols (**1o**, **1u**, **1w**, and **1x**) with 52-71% yields.

3. Experiment data

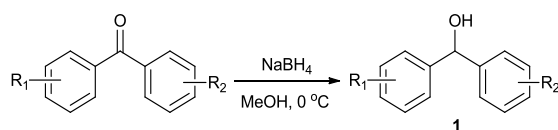
Table 1. Detailed optimization of reaction conditions.^[a]

Entry	BF ₃ OEt ₂ (eq.)	H ₂ O (eq.)	T (°C) ^[b]	Solvent	Yield (%) ^[c]	
1	1.2	-	rt.	THF	8 ^d	
2	1.2	-	120	THF	18 ^d	
3	1.2	-	120	THF	53	
4	1.2	0.24	120	THF	58	
5	1.2	0.36	120	THF	55	
6	1.2	0.48	120	THF	62	

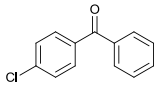
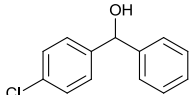
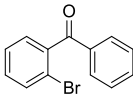
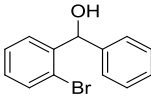
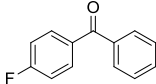
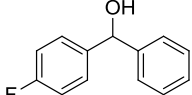
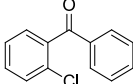
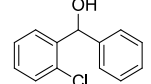
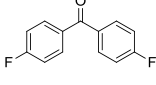
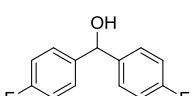
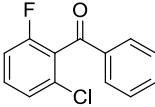
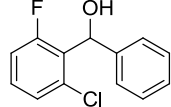
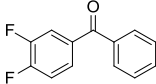
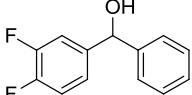
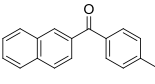
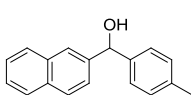
7	1.2	0.60	120	THF	52
8	1.2	0.72	120	THF	53
9	1.2	0.96	120	THF	48
10	0.2	0.48	120	THF	20
11	0.6	0.48	120	THF	52
12	0.8	0.48	120	THF	61
13	1.0	0.48	120	THF	63
14	1.5	0.48	120	THF	52
15	1.2	0.48	100	THF	51
16	1.2	0.48	120	THF	62
17	1.2	0.48	120	CHCl ₃	42
18	1.2	0.48	120	CH ₂ Cl ₂	22
19	1.2	0.48	120	DME	30
20	1.2	0.48	120	Dioxane	22
21	1.2	0.48	120	DMF	trace
22	1.2	0.48	120	DMSO	2
23	1.2	0.48	120	MTBE	/[e]
24	1.2	0.48	120	Isopropyl ether	/[e]
25	1.2	0.48	120	Et ₂ O	53
26	1.2	0.48	120	2-methyl THF	55
27	1.2	0.48	80	Butyl ether	68
28	1.2	0.48	100	Butyl ether	80
29	1.2	0.48	120	Butyl ether	83
30	1.2	0.48	140	Butyl ether	84
31	1.2	0.48	160	Butyl ether	87

[a] Conditions: **1a** (1.0 mmol), BF₃ OEt₂ (specified), H₂O (specified), temperature (specified) in solvent (1.0 mL) under argon for 2 h. [b] The temperature of oil bath. [c] Isolated yields. [d] Reactions were conducted under air condition. [e] Complex reaction.

Table 2. Preparation of diarylmethanols (**1**) from diarylketones.^[a]

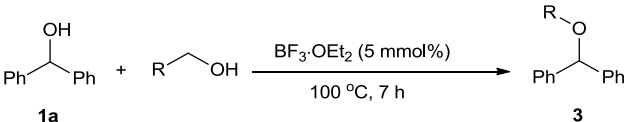


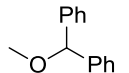
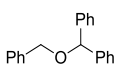
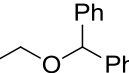
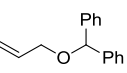
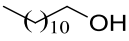
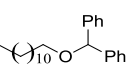
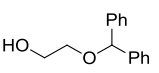
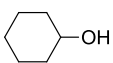
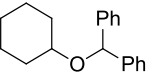
Ketones	Diarylmethanols	Yield (%)	Ketones	Diarylmethanols	Yield (%)
		99			99
		97			99
		94			95

		85			84
		84			98
		65			43
		98			99

[a] Conditions: a mixture of ketones (5-10 mmol) and NaBH₄ (1.4 eq.) in 10-20 mL MeOH was stirred at 0 °C for 1-3 hours. Then the residual was extracted with CH₂Cl₂ and chromatographed on silica gel after the solvent is evaporated.

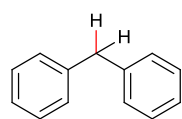
Table 3. Preparation of diarylmethyl ethers (**3**) from diarylmethanols (**1a**).^[a]



Alcohols	Ethers (3)	Yield (%)	Alcohols	Ethers (3)	Yield (%)
MeOH		92	Ph-CH ₂ -OH		79
EtOH		90	CH ₂ =CH-CH ₂ -OH		92
		87	HO-CH ₂ -CH ₂ -OH		76
		94			

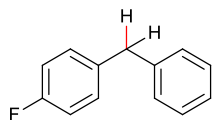
[a] Conditions: a mixture of **1a** (6-10 mmol) and BF₃·OEt₂ (5 mol%) in 6-10 mL **5** was stirred under 100 °C for 7 hours. Then the residual was chromatographed on silica gel after the solvent is evaporated.

4. Characterization data for all products



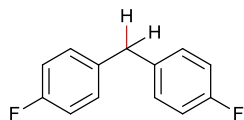
Diphenylmethane (2a)

Colorless liquid; 146.5 mg, 87% yield; ¹H NMR (500 MHz, CDCl₃) δ 7.27 (t, *J* = 8.0 Hz, 4H), 7.21-7.17 (m, 6H), 3.97 (s, 2H); ¹³C NMR (125 MHz, CDCl₃) δ 141.3, 129.1, 128.6, 126.2, 42.1; HRMS (APCI) calcd for C₁₃H₁₂ [M + H]⁺ 169.1017, found 169.1019.



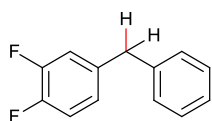
4-Fluorodiphenylmethane (2b)

Colorless liquid; 174.0 mg, 93% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.27 (d, $J = 7.0$ Hz, 2H), 7.19 (t, $J = 7.5$ Hz, 1H), 7.16-7.11 (m, 4H), 6.95 (t, $J = 8.5$ Hz, 2H), 3.94 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 161.6 (d, $J = 245.3$ Hz), 141.1, 136.9 (d, $J = 3.1$ Hz), 130.4 (d, $J = 7.75$ Hz), 129.0, 128.7, 126.3, 115.4 (d, $J = 21.0$ Hz), 41.3; HRMS (APCI) calcd for $\text{C}_{13}\text{H}_{11}\text{F}$ $[\text{M} + \text{H}]^+$ 187.0923, found 187.0912.



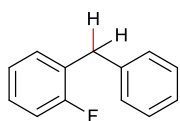
4, 4'-Difluorodiphenylmethane (2c)

Colorless liquid; 171.1 mg, 84% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.11 (t, $J = 6.0$ Hz, 4H), 6.97 (t, $J = 8.5$ Hz, 4H), 3.91 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 161.6 (d, $J = 242.8$ Hz), 136.7 (d, $J = 3.0$ Hz), 130.4 (d, $J = 7.9$ Hz), 115.5 (d, $J = 21.1$ Hz), 40.4; HRMS (APCI) calcd for $\text{C}_{13}\text{H}_{10}\text{F}_2$ $[\text{M} + \text{H}]^+$ 205.0829, found 205.0835.



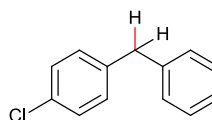
3, 4 -Difluorodiphenylmethane (2d)

Colorless liquid; 184.6 mg, 90% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.31-7.29 (m, 2H), 7.23-7.21 (m, 1H), 7.16-7.15 (m, 2H), 7.08-7.02 (m, 1H), 6.98-6.93 (m, 1H), 6.90-6.88 (m, 1H), 3.92 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 150.5 (dd, $J_1 = 246.9$ Hz, $J_2 = 12.8$ Hz), 149.1 (dd, $J_1 = 244.6$ Hz, $J_2 = 12.4$ Hz), 140.3, 138.3 (t, $J = 4.3$ Hz), 129.0, 128.8, 126.7, 124.8 (t, $J = 2.5$ Hz), 117.8 (d, $J = 16.9$ Hz), 117.2 (d, $J = 17.0$ Hz), 41.2; HRMS (APCI) calcd for $\text{C}_{13}\text{H}_{10}\text{F}_2$ $[\text{M} - \text{H}]^-$ 205.0829, found 203.0816.



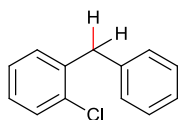
2-Fluorodiphenylmethane (2e)

Colorless liquid; 134.8 mg, 72% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.28 (t, $J = 7.5$ Hz, 2H), 7.22-7.17 (m, 4H), 7.13 (t, $J = 9.5$ Hz, 1H), 7.05-7.00 (m, 2H), 3.99 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 161.1 (d, $J = 243.8$ Hz), 140.0, 131.2 (d, $J = 4.3$ Hz), 129.0, 128.7, 128.3, 128.1 (d, $J = 8.0$ Hz), 126.4, 124.2 (d, $J = 2.9$ Hz), 115.5 (d, $J = 21.9$ Hz), 35.0; HRMS (APCI) calcd for $\text{C}_{13}\text{H}_{11}\text{F}$ $[\text{M} + \text{H}]^+$ 187.0923, found 187.0913.



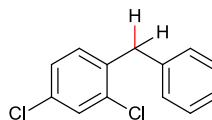
4-Chlorodiphenylmethane (2f)

Colorless liquid; 172.3 mg, 85% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.29 (t, $J = 7.0$ Hz, 2H), 7.24 (d, $J = 8.5$ Hz, 2H), 7.21 (t, $J = 7.0$ Hz, 1H), 7.16 (d, $J = 7.5$ Hz, 2H), 7.11 (d, $J = 8.5$ Hz, 2H); 3.94 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 140.7, 139.8, 132.1, 130.4, 129.0, 128.7, 126.5, 41.4; HRMS (APCI) calcd for $\text{C}_{13}\text{H}_{11}\text{Cl}$ $[\text{M} + \text{H}]^+$ 203.0628, found 203.0612.



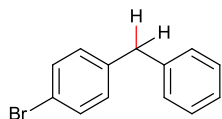
2-Chlorodiphenylmethane (2g)

Colorless liquid; 141.5 mg, 70% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.37-7.35 (m, 1H), 7.29-7.26 (m, 2H), 7.21-7.13 (m, 6H), 4.10 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 139.7, 138.9, 134.4, 131.2, 129.7, 129.1, 128.6, 127.8, 127.0, 126.4, 39.4; HRMS (APCI) calcd for $\text{C}_{13}\text{H}_{11}\text{Cl}$ $[\text{M} + \text{H}]^+$ 203.0628, found 203.0626.



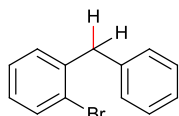
2, 4-Dichlorodiphenylmethane (2h)

Colorless liquid; 124.4 mg, 53% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.39, (d, $J = 2.0$ Hz, 1H), 7.29, (t, $J = 7.5$ Hz, 2H), 7.22 (t, $J = 7.0$ Hz, 1H), 7.17-7.14 (m, 3H), 7.05 (d, $J = 8.5$ Hz, 1H), 4.05 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 139.1, 137.5, 135.0, 132.8, 131.9, 129.4, 129.1, 128.8, 127.3, 126.6, 38.8; HRMS (APCI) calcd for $\text{C}_{13}\text{H}_{10}\text{Cl}_2$ $[\text{M} + \text{H}]^+$ 237.0238, found 237.0244.



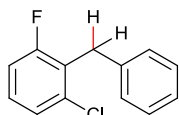
4-Bromodiphenylmethane (2i)

Colorless liquid; 231.9 mg, 94% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.39 (d, $J = 8.0$ Hz, 2H), 7.28 (t, $J = 7.0$ Hz, 2H), 7.20 (t, $J = 7.5$ Hz, 1H), 7.15 (d, $J = 8.0$ Hz, 2H), 7.04 (d, $J = 8.5$ Hz, 2H); 3.91 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 140.6, 140.3, 131.7, 130.8, 129.0, 128.7, 126.5, 120.1, 41.5; HRMS (APCI) calcd for $\text{C}_{13}\text{H}_{11}\text{Br}$ $[\text{M} + \text{H}]^+$ 247.0122, found 247.0107.



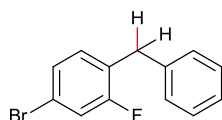
2-Bromodiphenylmethane (2j)

Colorless liquid; 173.0 mg, 70% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.55 (d, $J = 8.0$ Hz, 1H), 7.28 (t, $J = 7.5$ Hz, 2H), 7.22-7.17 (m, 4H), 7.12 (d, $J = 7.0$ Hz, 1H), 7.06 (t, $J = 7.0$ Hz, 1H); 4.11 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 140.5, 139.7, 133.0, 131.3, 129.2, 128.7, 128.1, 127.6, 126.4, 125.1, 41.9; HRMS (APCI) calcd for $\text{C}_{13}\text{H}_{11}\text{Br}$ $[\text{M} + \text{H}]^+$ 247.0122, found 247.0120.



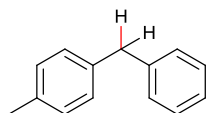
1-Chloro-6-fluorodiphenylmethane (2k)

Colorless liquid; 149.5 mg, 68% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.27-7.25, (m, 4H), 7.18, (d, $J = 8.0$ Hz, 2H), 7.15-7.10 (m, 1H), 6.98 (t, $J = 9.0$ Hz, 1H), 4.15 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 161.7 (d, $J = 246.3$ Hz), 138.9, 135.6 (d, $J = 5.8$ Hz), 128.7, 128.6, 128.3 (d, $J = 9.5$ Hz), 127.1 (d, $J = 18.6$ Hz), 126.5, 125.5 (d, $J = 3.4$ Hz), 114.2 (d, $J = 22.9$ Hz), 32.2 (d, $J = 2.6$ Hz); HRMS (APCI) calcd for $\text{C}_{13}\text{H}_{10}\text{ClF}$ $[\text{M} + \text{H}]^+$ 221.0533, found 221.0531.



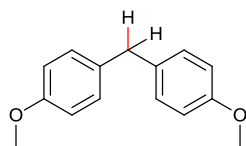
2-Fluoro-4-bromodiphenylmethane (2l)

Colorless liquid; 155.1 mg, 59% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.27, (t, $J = 6.5$ Hz, 2H), 7.21-7.16, (m, 5H), 6.98 (t, $J = 8.0$, 1H), 3.92 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 160.9 (d, $J = 248.6$ Hz), 139.3, 132.2 (d, $J = 5.0$ Hz), 128.9, 128.8, 127.5 (d, $J = 3.4$ Hz), 127.4, 126.6, 120.2 (d, $J = 9.5$ Hz), 119.1 (d, $J = 25.4$ Hz), 34.6; HRMS (APCI) calcd for $\text{C}_{13}\text{H}_{10}\text{BrF}$ $[\text{M} + \text{H}]^+$ 265.0028, found 265.0033.



4-Methyl-diphenylmethane (2m)

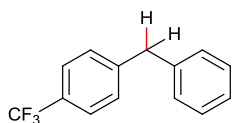
Colorless liquid; 168.8 mg, 93% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.26 (t, $J = 7.5$ Hz, 2H), 7.20-7.17 (m, 3H), 7.10-7.06 (m, 4H), 3.93 (s, 2H), 2.30 (s 3H); ^{13}C NMR (125 MHz, CDCl_3) δ 141.6, 138.2, 135.7, 129.3, 129.04, 128.98, 128.6, 126.1, 41.7, 21.2; HRMS (APCI) calcd for $\text{C}_{14}\text{H}_{14}$ $[\text{M} + \text{H}]^+$ 183.1174, found 183.1177.



3,4-Difluorodiphenylmethane (2n)

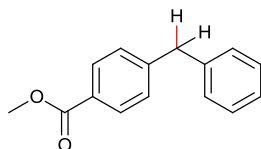
Yellow liquid; 54.0 mg, 24% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.08 (d, $J = 7.5$ Hz, 4H), 6.82 (d, $J = 7.0$, 4H), 3.86 (s, 2H), 3.77 (s, 6H); ^{13}C NMR

(125 MHz, CDCl₃) δ 158.1, 133.9, 129.9, 114.0, 55.4, 40.3; HRMS (APCI) calcd for C₁₅H₁₆O₂ [M + H]⁺ 229.1229, found 229.1214.



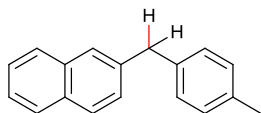
4-Trifluoromethyldiphenylmethane (2o)

Colorless liquid; 70.0 mg, 30% yield; ¹H NMR (500 MHz, CDCl₃) δ 7.53 (d, *J* = 8.0 Hz, 2H), 7.32-7.28 (m, 4H), 7.22 (t, *J* = 7.0 Hz, 1H), 7.17 (d, *J* = 7.5 Hz, 2H), 4.03 (s, 2H); ¹³C NMR (125 MHz, CDCl₃) δ 145.4, 140.2, 129.4, 129.1, 128.9, 128.5, 126.7, 125.6 (m), 123.4, 41.9; HRMS (APCI) calcd for C₁₄H₁₁F₃ [M]⁺ 236.0813, found 236.0809.



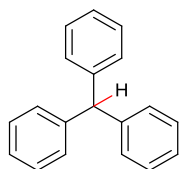
Diphenylmethane-4-carboxylic acid methyl ester (2p)

Yellow liquid; 90.0 mg, 40% yield; ¹H NMR (500 MHz, CDCl₃) δ 7.95 (d, *J* = 8.5 Hz, 2H), 7.29 (t, *J* = 7.0 Hz, 2H), 7.25 (d, *J* = 8.5 Hz, 2H), 7.21 (t, *J* = 7.5 Hz, 1H), 7.17 (d, *J* = 7.5 Hz, 2H), 4.02 (s, 2H), 3.89 (s, 3H); ¹³C NMR (125 MHz, CDCl₃) δ 167.2, 146.7, 140.3, 130.0, 129.1, 128.8, 128.3, 126.5, 52.2, 42.1; HRMS (APCI) calcd for C₁₅H₁₄O₂ [M + H]⁺ 227.1072, found 227.1060.



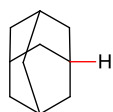
2-(4-Methylbenzyl)naphthalene (2q)

Colorless liquid; 177.0 mg, 76% yield; ¹H NMR (500 MHz, CDCl₃) δ 7.78-7.73, (m, 3H), 7.62, (s, 1H), 7.45-7.40 (m, 2H), 7.30 (d, *J* = 8.0 Hz, 1H), 7.12-7.09 (m, 4H), 4.09 (s, 2H), 2.31 (s, 3H); ¹³C NMR (125 MHz, CDCl₃) δ 139.1, 138.1, 135.8, 133.8, 132.2, 129.4, 129.1, 128.2, 127.81, 127.79, 127.7, 127.2, 126.1, 125.5, 41.9, 21.2; HRMS (APCI) calcd for C₁₈H₁₆ [M + H]⁺ 233.1330, found 233.1334.



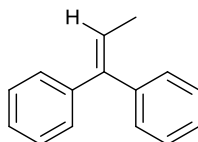
Triphenylmethane (2r/2s)

Colorless liquid; 234.0 mg, 95% yield (**2p**); 222.9 mg, 91% yield (**2q**); ¹H NMR (500 MHz, CDCl₃) δ 7.28 (t, *J* = 7.5 Hz, 6H), 7.20 (t, *J* = 7.5 Hz, 3H), 7.11 (d, *J* = 7.0, 6H), 5.55 (s, 1H); ¹³C NMR (125 MHz, CDCl₃) δ 144.1, 129.6, 128.5, 126.5, 57.0; HRMS (APCI) calcd for C₁₉H₁₆ [M + H]⁺ 245.1330, found 245.1330.



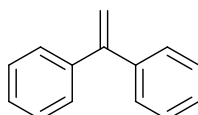
Adamantine (2t)

White solid 40.1 mg, 29% yield; ¹H NMR (500 MHz, CDCl₃) δ 1.87 (s, 4H), 1.75 (t, *J* = 3.5 Hz, 12H); ¹³C NMR (125 MHz, CDCl₃) δ 38.0, 28.5.



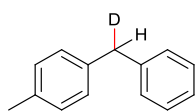
Prop-1-ene-1,1-diyl dibenzene (2w)

White solid; 99% yield (**2w**); ¹H NMR (500 MHz, CDCl₃) δ 7.37 (t, *J* = 8.0 Hz, 2H), 7.30 (t, *J* = 7.5 Hz, 1H), 7.25 (t, *J* = 7.5, 2H), 7.22-7.18 (m, 5H), 6.17 (q, *J* = 7.0 Hz, 1H), 1.76 (d, *J* = 7.0 Hz, 3H); ¹³C NMR (125 MHz, CDCl₃) δ 143.2, 142.6, 140.2, 130.2, 128.3, 128.2, 127.4, 127.0, 126.9, 124.3, 15.9. HRMS (APCI) calcd for C₁₅H₁₄ [M + H]⁺ 195.1174, found 195.1165.



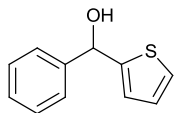
Ethene-1,1-diyl dibenzene (2x)

Colorless liquid; 99.0 mg, 55% yield (**2x**); ^1H NMR (500 MHz, CDCl_3) δ 7.33- 7.26 (m, 10H), 5.46 (s, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 150.2, 141.7, 128.4, 128.3, 127.9, 114.5.



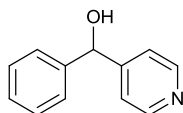
4-Methyl-diphenylmethane (2m')

Colorless liquid; 87.0 mg, 48% yield; ^1H NMR (500 MHz, CDCl_3) δ 7.26 (t, J = 7.5 Hz, 2H), 7.19-7.16 (m, 3H), 7.10-7.06 (m, 4H), 3.92 (d, J = 10.0 Hz 1H), 2.30 (s 3H); ^{13}C NMR (125 MHz, CDCl_3) δ 141.6, 138.2, 135.7, 129.3, 129.04, 128.98, 128.6, 126.2, 41.4 (m), 21.2.



Phenyl(thiophen-2-yl)methanol (1u)

Yellow solid; ^1H NMR (500 MHz, CDCl_3) δ 7.45 (d, J = 7.0 Hz, 2H), 7.37 (t, J = 7.0 Hz, 2H), 7.31 (t, J = 7.5 Hz, 1H), 7.27-7.25 (m, 1H), 6.95-6.93 (m, 1H), 6.88 (d, J = 3.5 Hz, 1H), 6.05 (d, J = 3.5 Hz, 1H), 2.44 (d, J = 4.0 Hz, 1H).

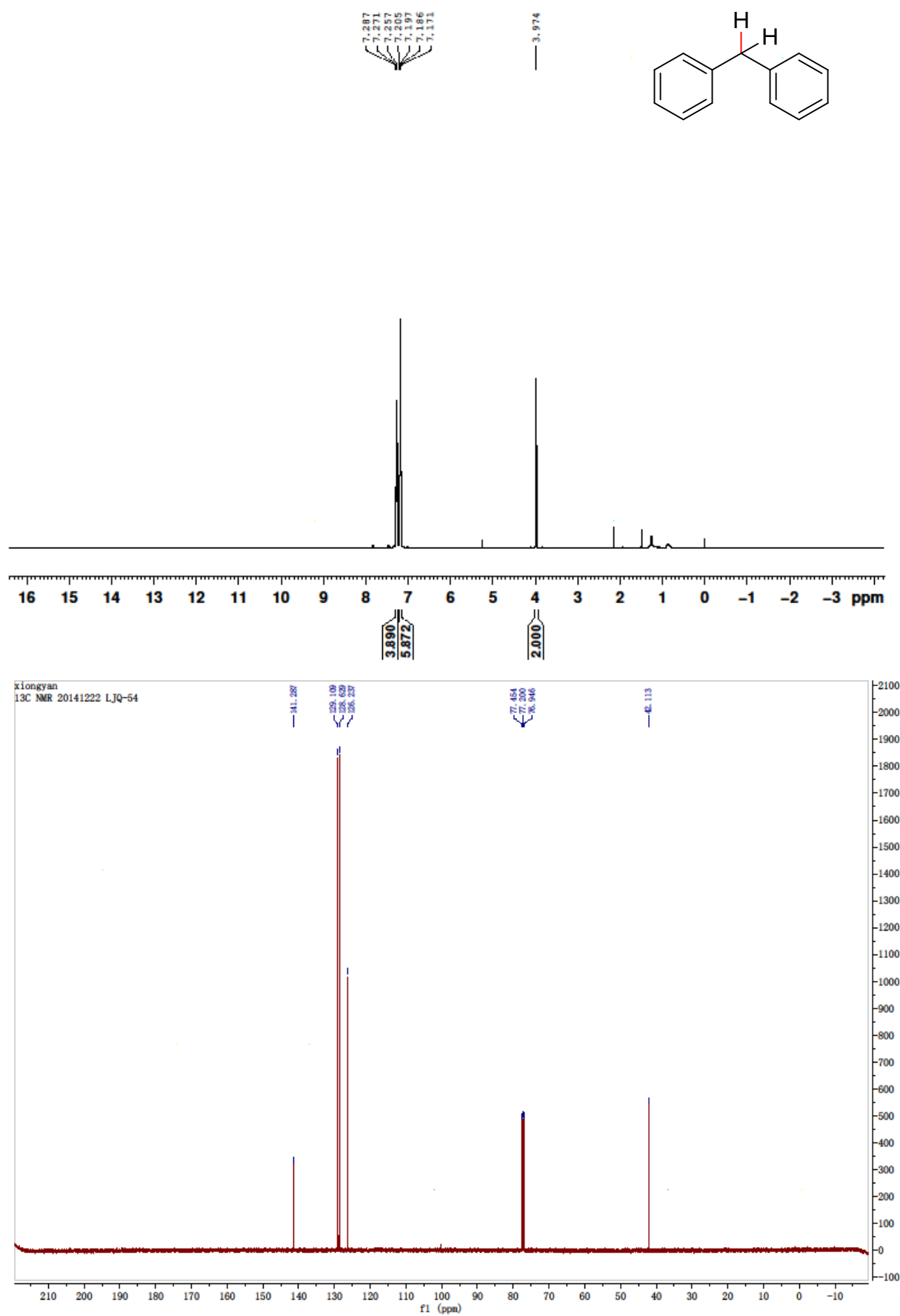


Phenyl(pyridin-4-yl)methanol (1v)

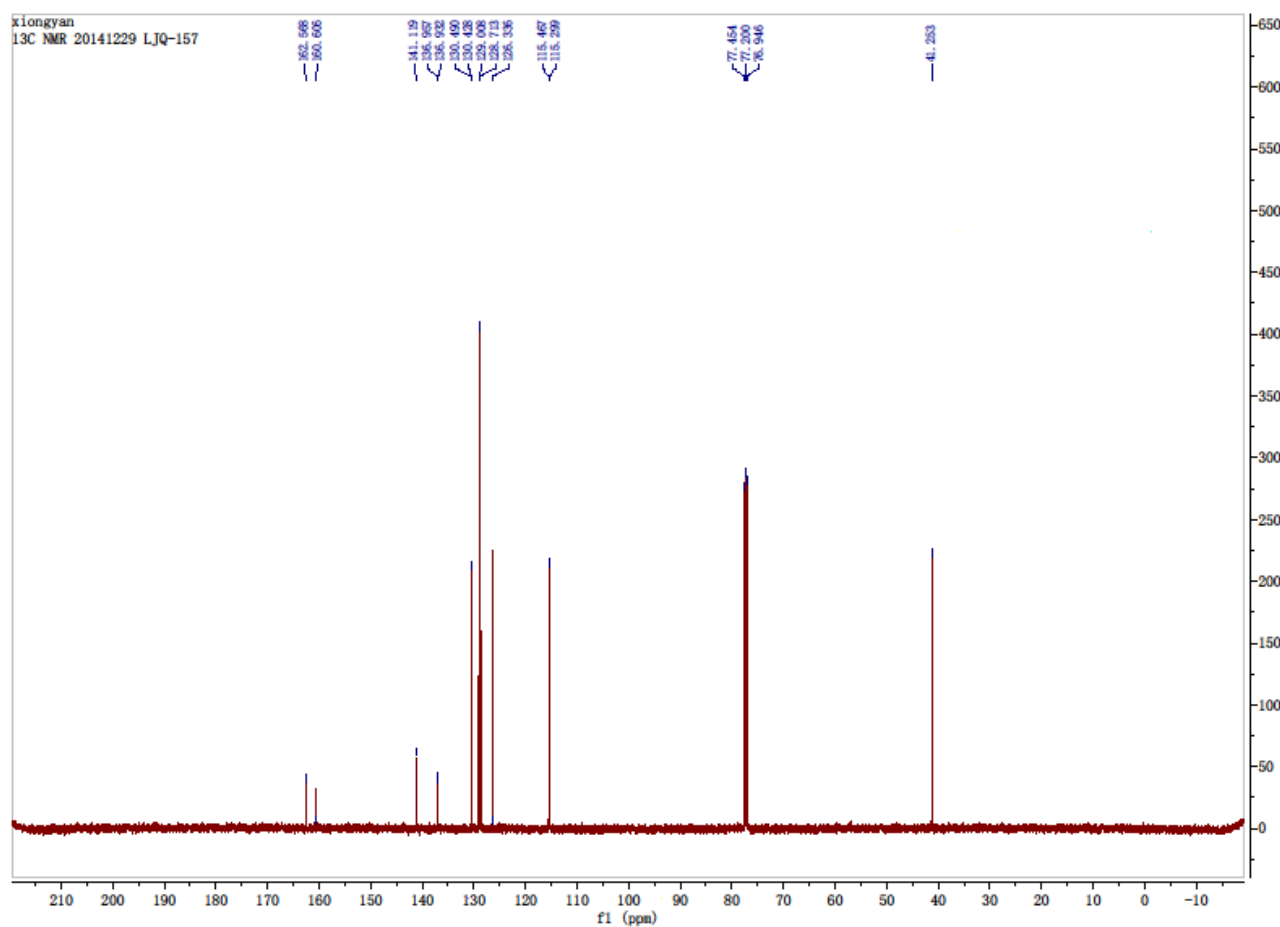
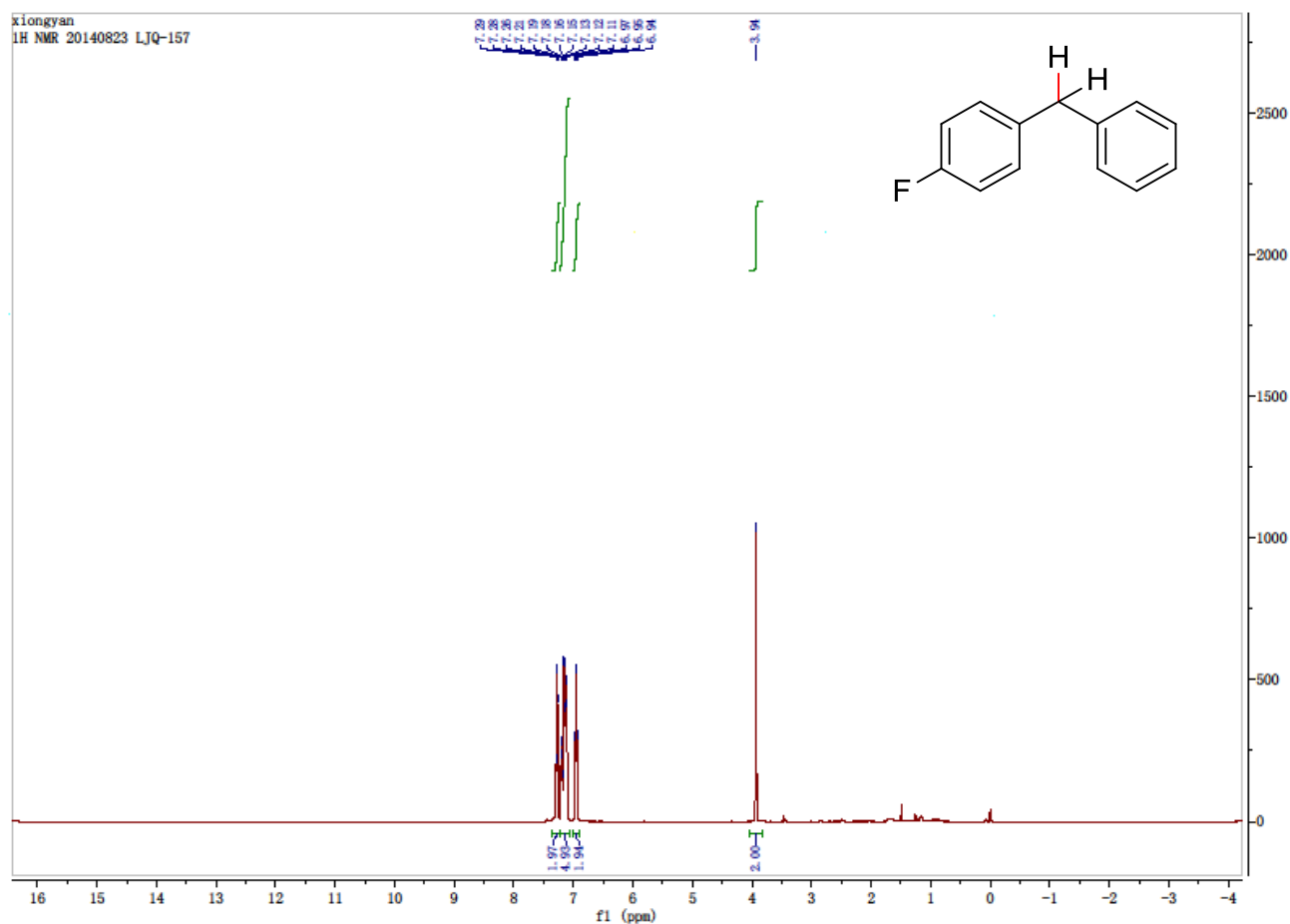
White solid; ^1H NMR (500 MHz, CDCl_3) δ 8.39-8.37 (m, 2H), 7.35-7.32 (m, 4H), 7.31- 7.27 (m, 3H), 5.76 (s, 1H), 4.26 (s, 1H).

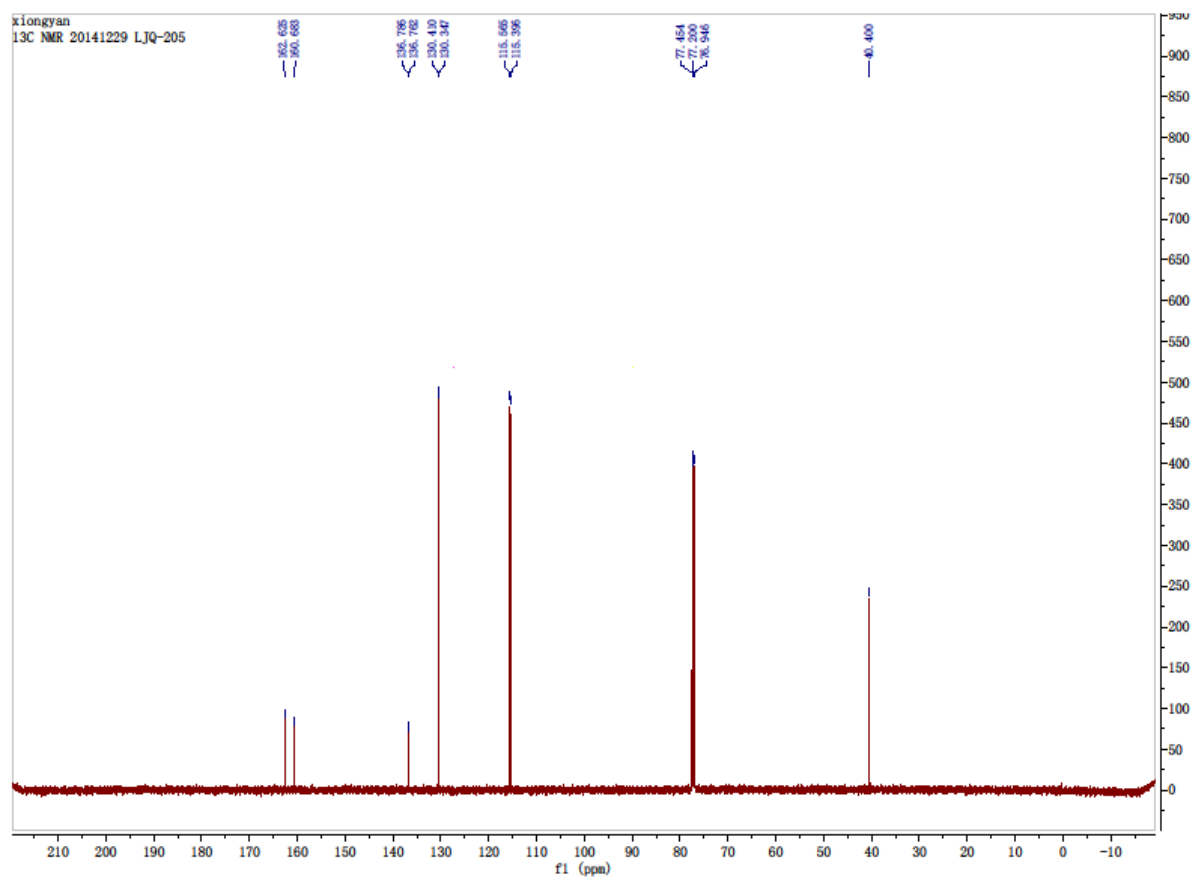
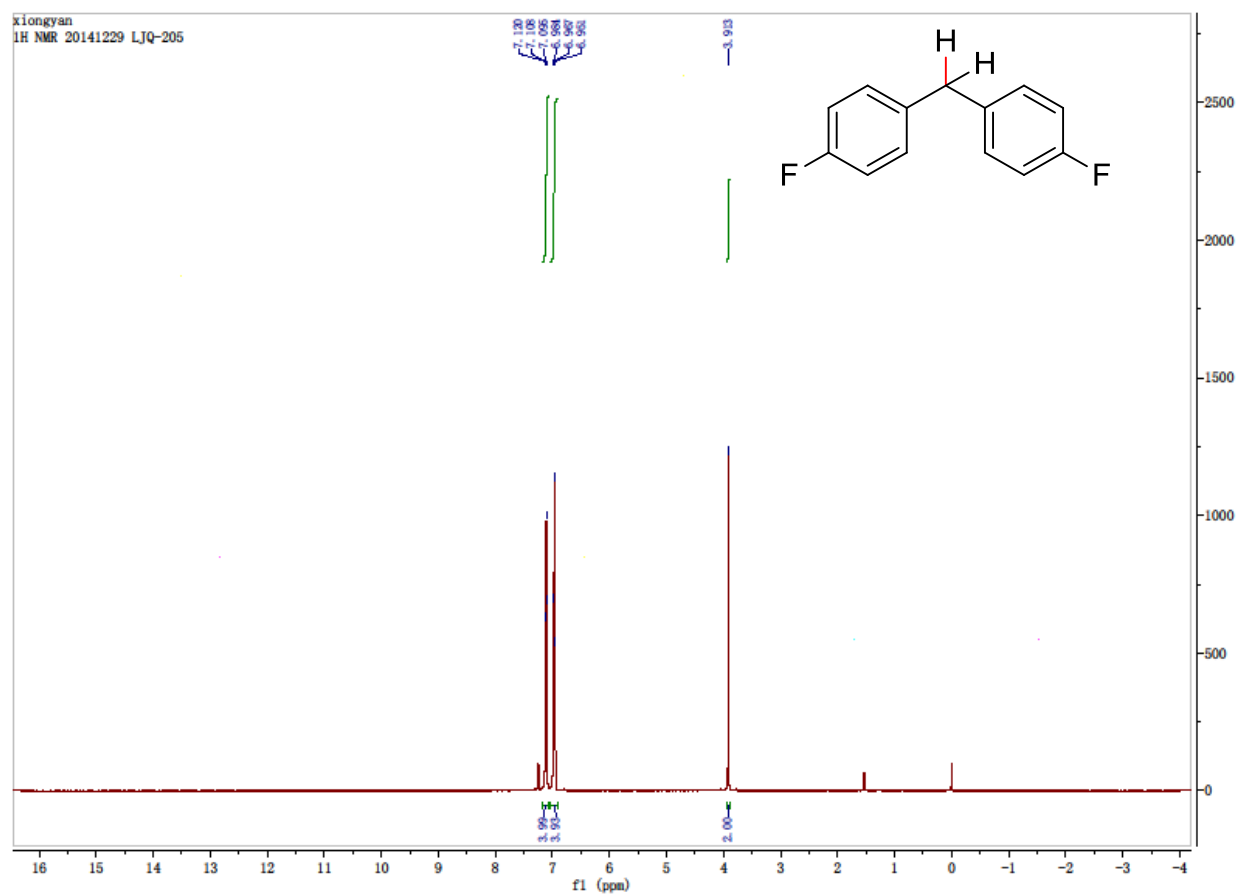
5. ^1H and ^{13}C spectra

Diphenylmethane (**2a**, 87%).

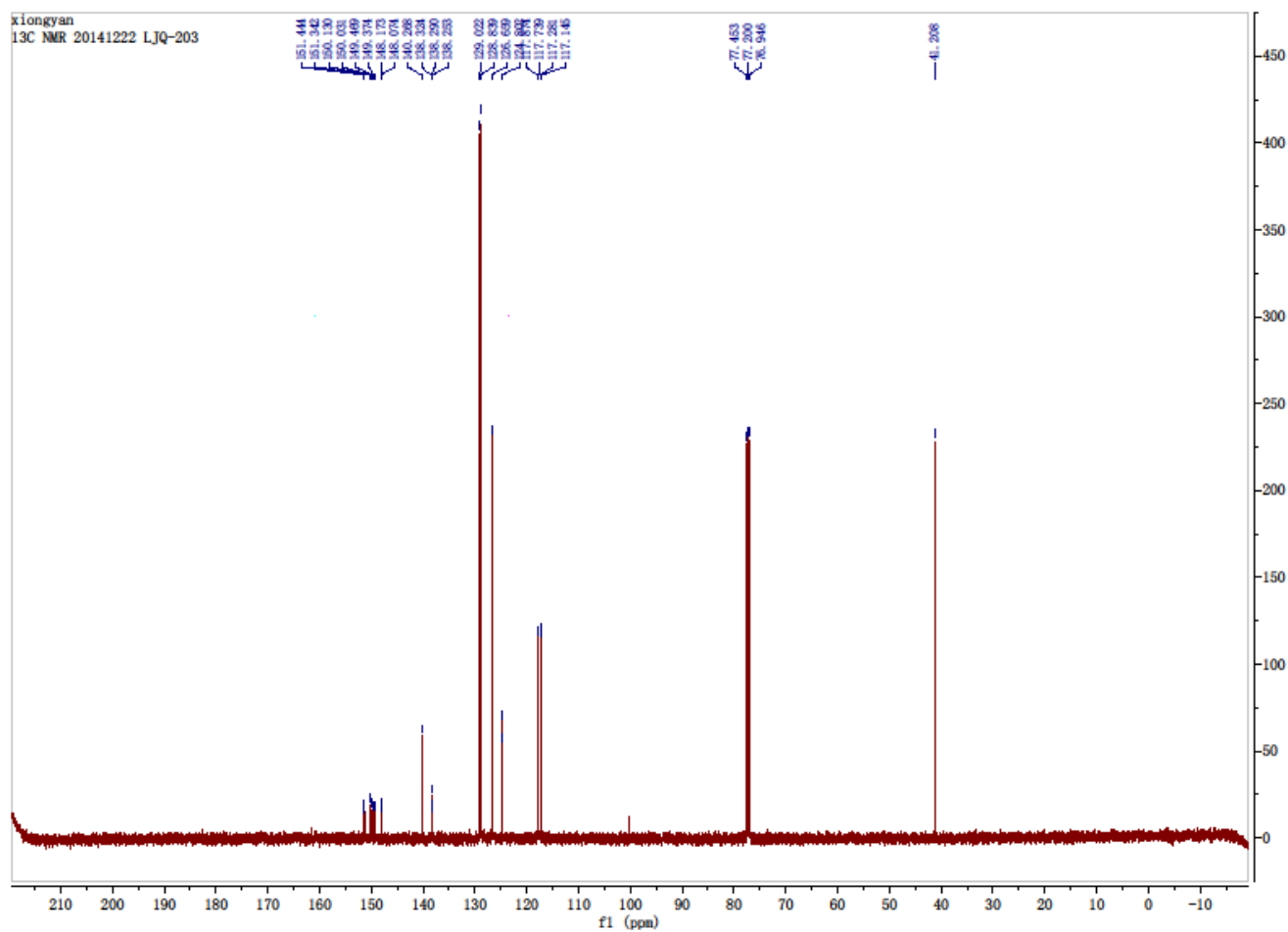
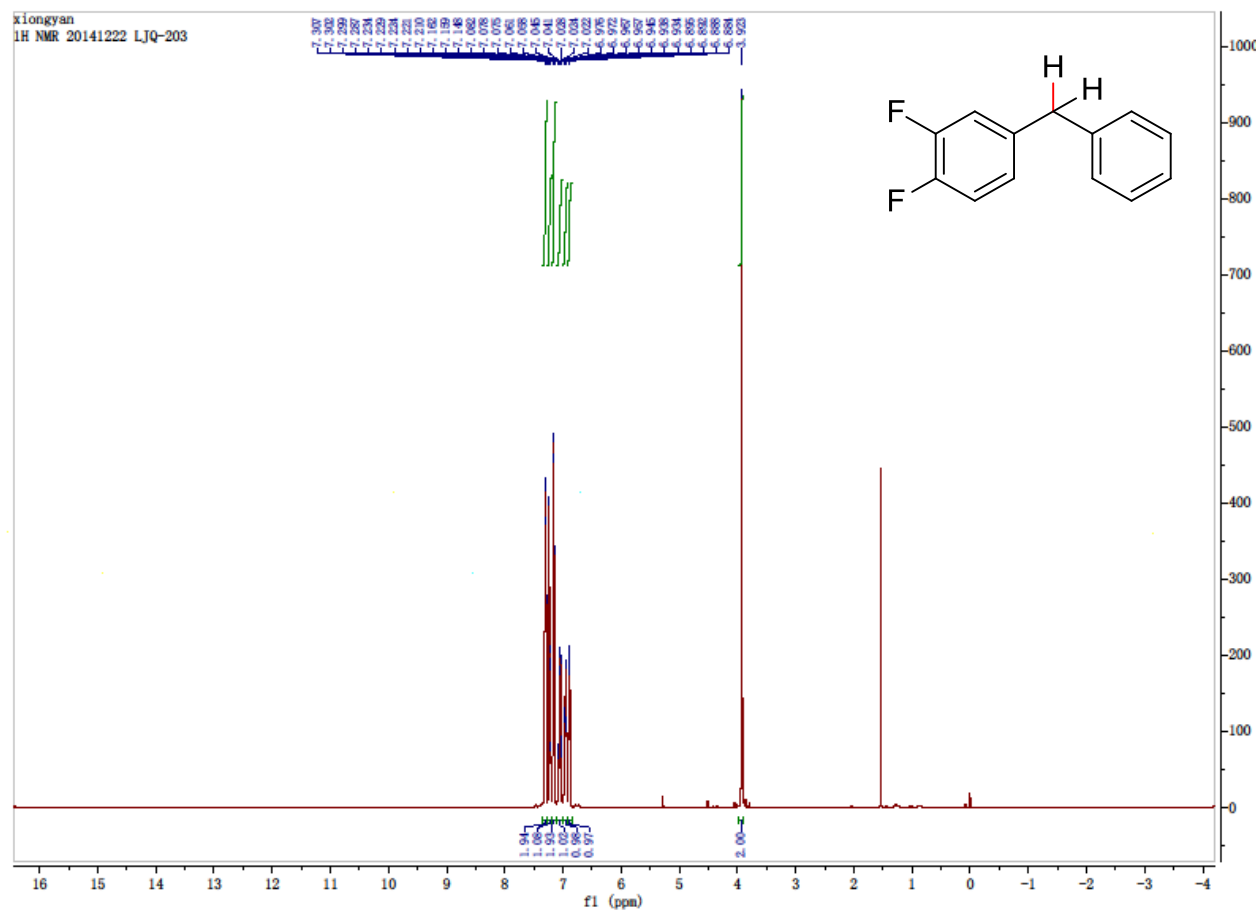


4-Fluorodiphenylmethane (**2b**, 93%)

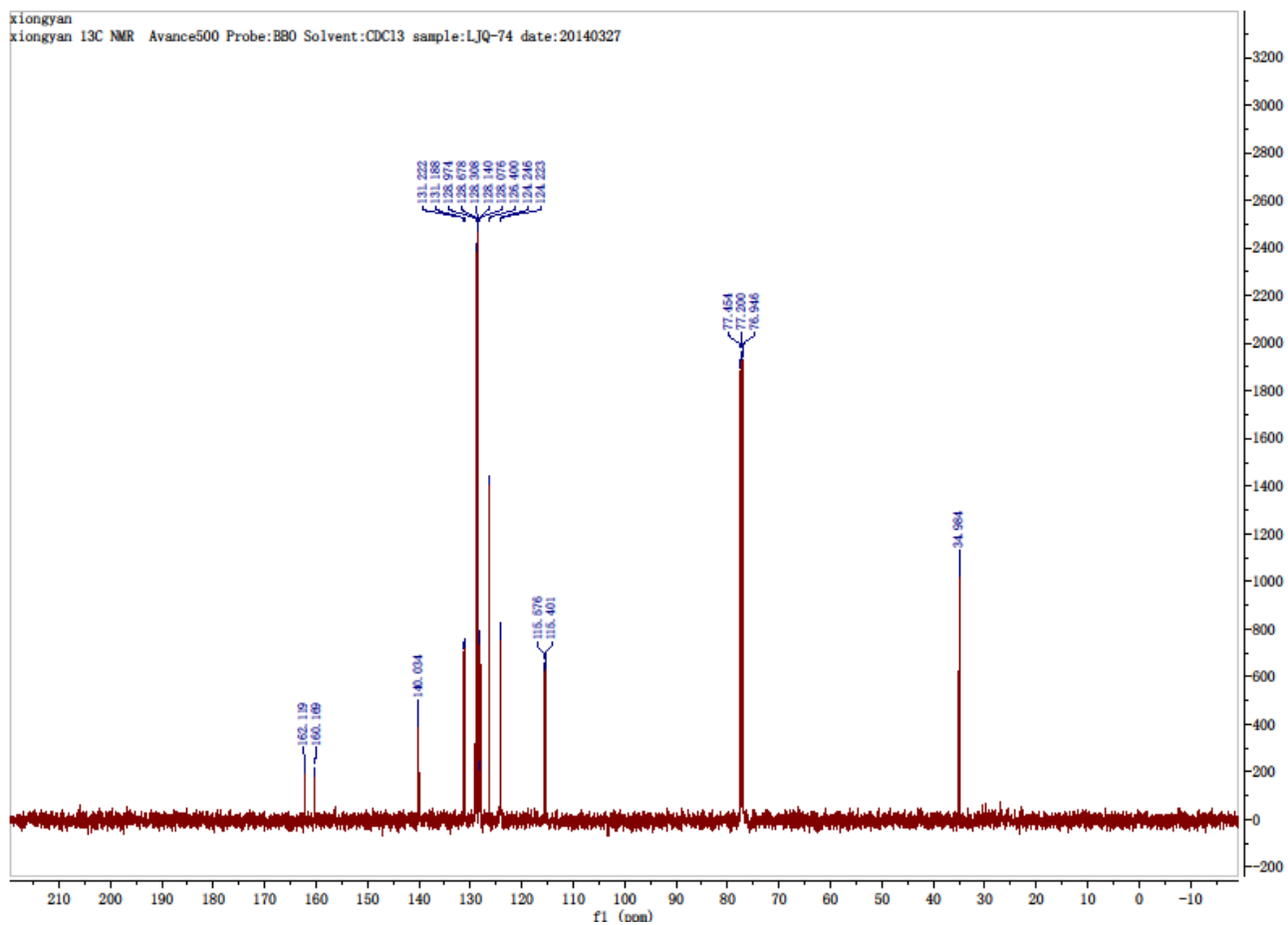
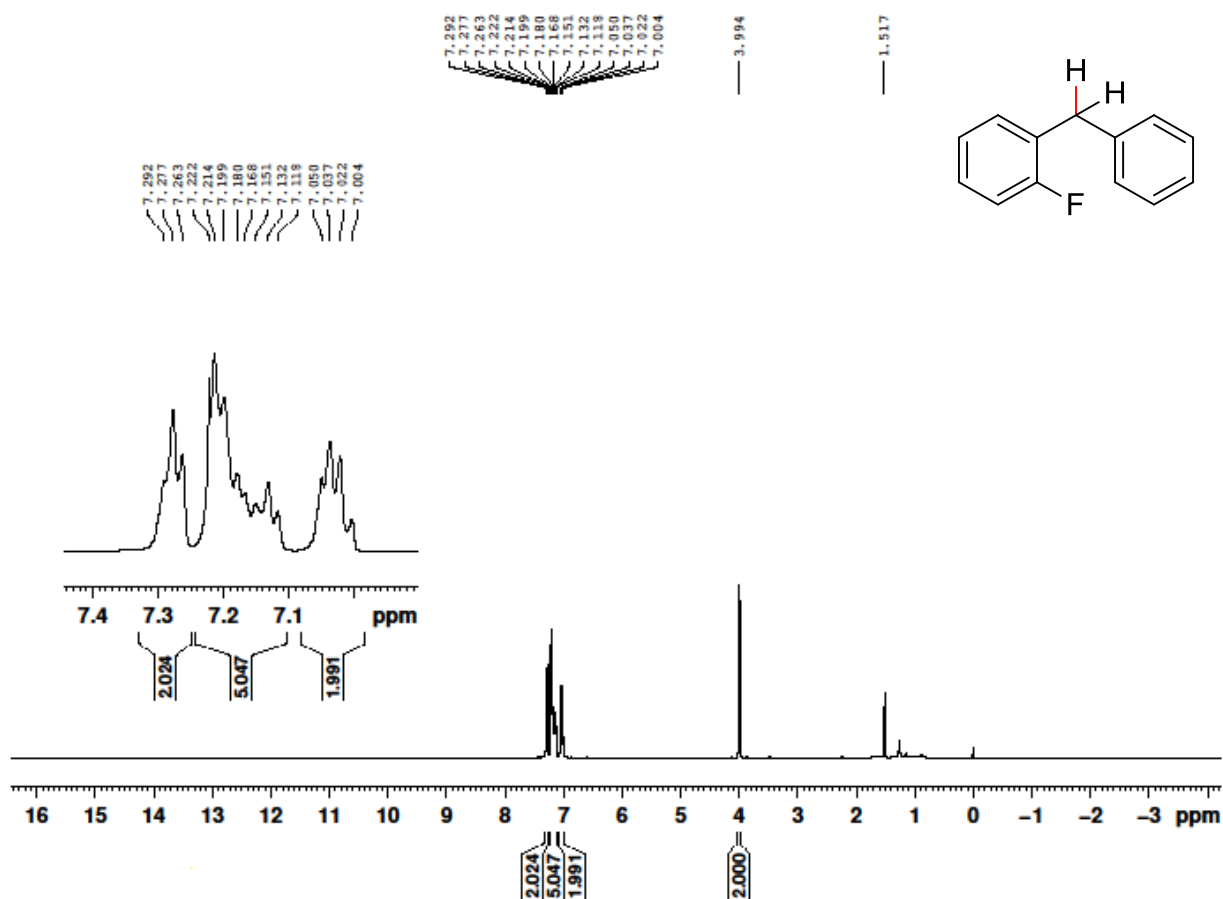


4, 4'-Difluorodiphenylmethane (**2c**, 84%)

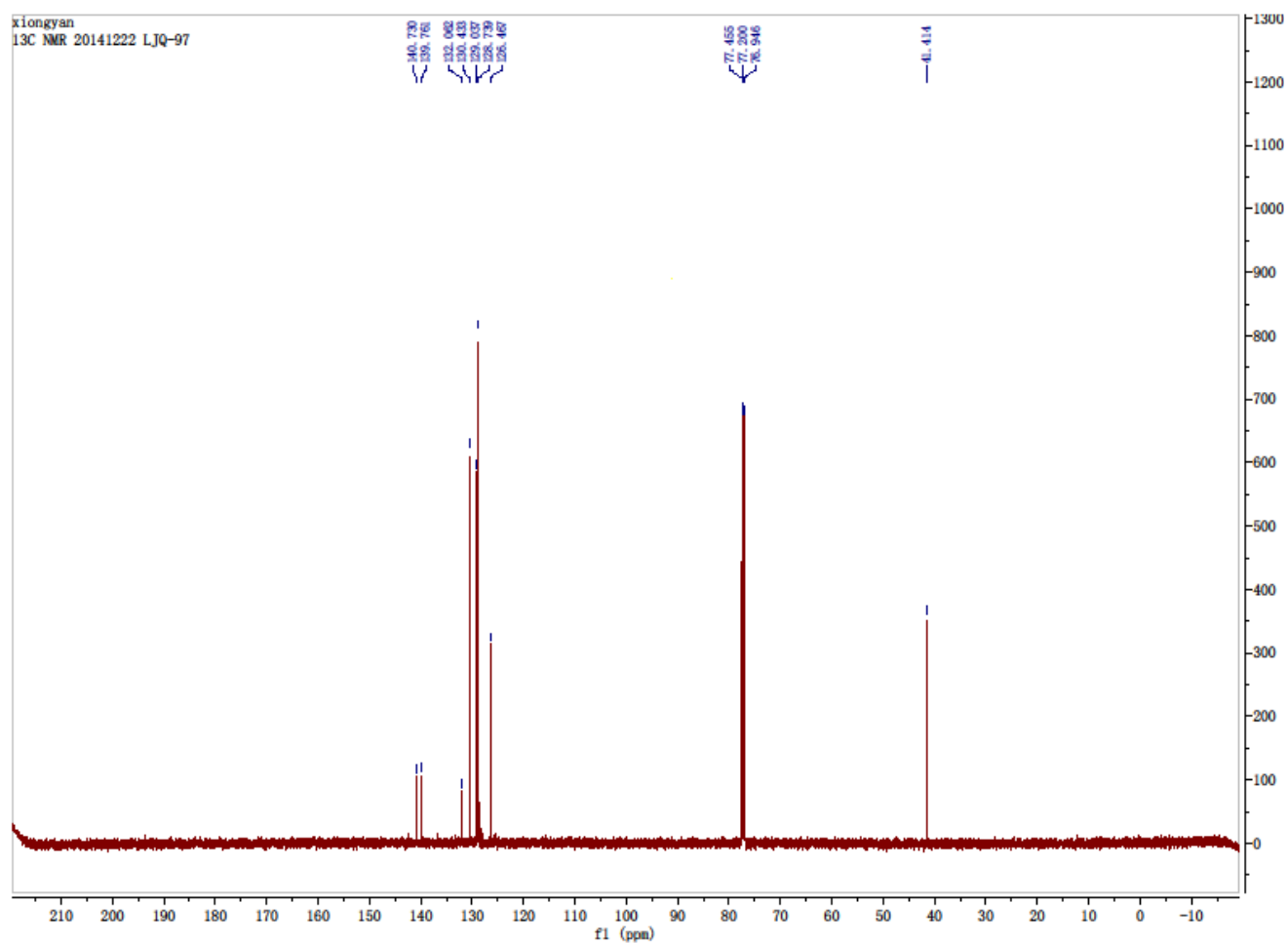
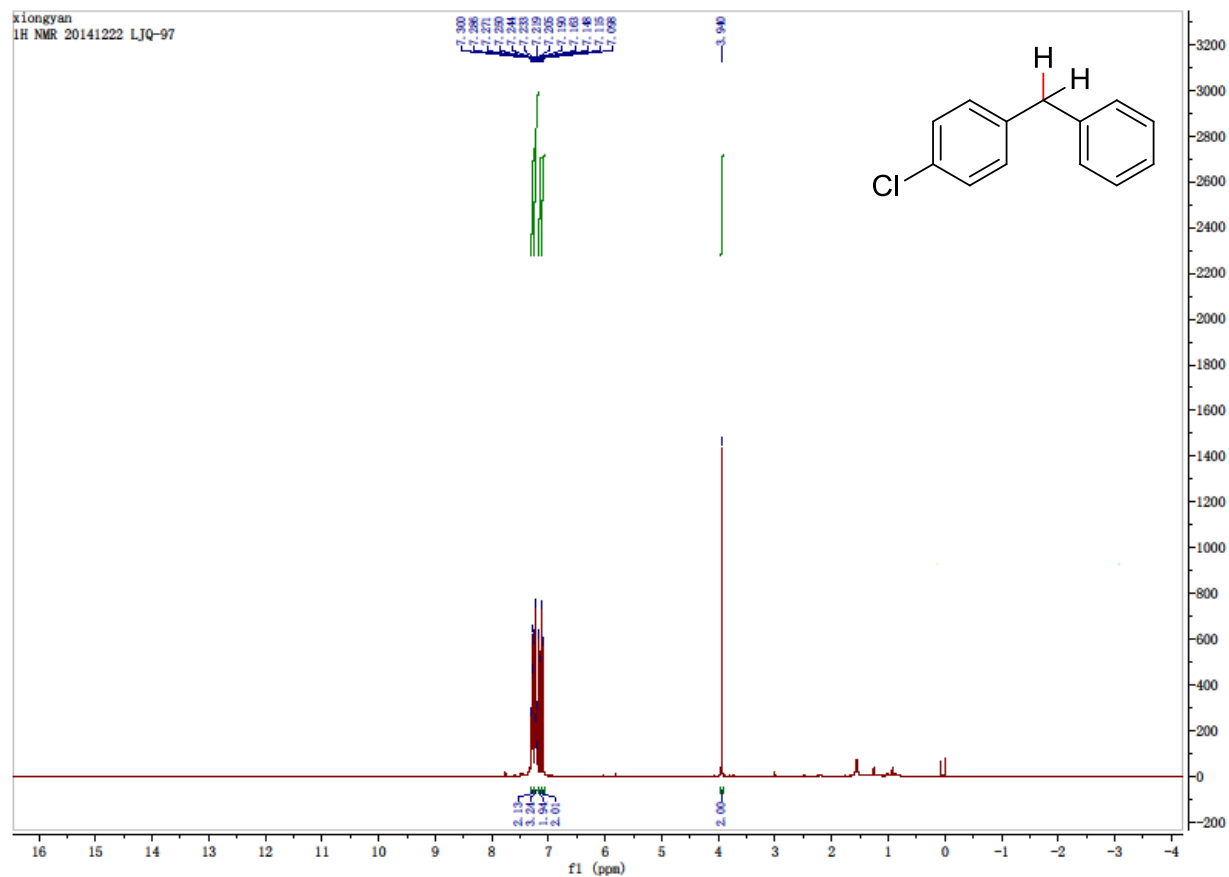
3, 4 -Difluorodiphenylmethane (**2d**, 90%)



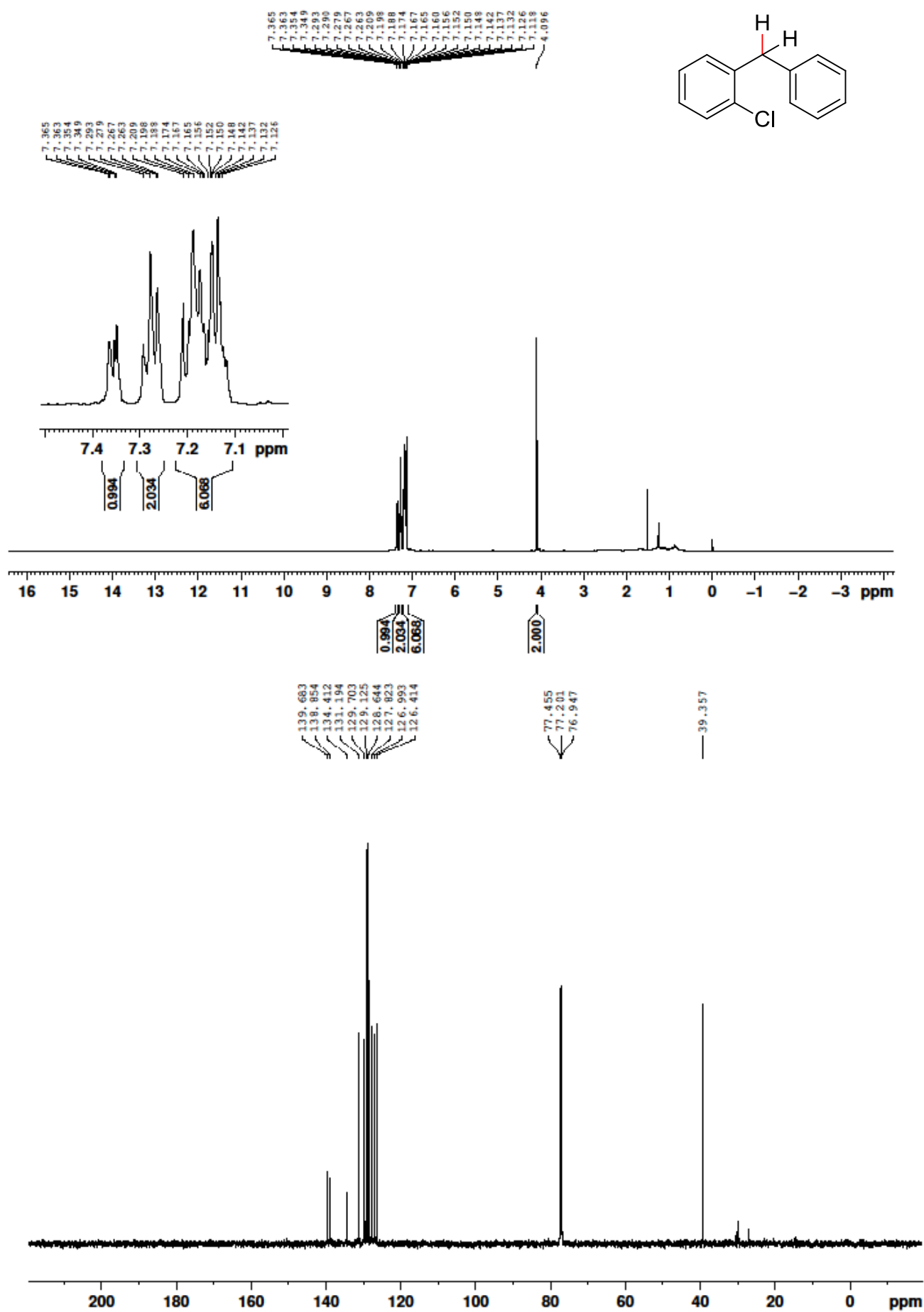
2-Fluorodiphenylmethane (**2e**, 72%)



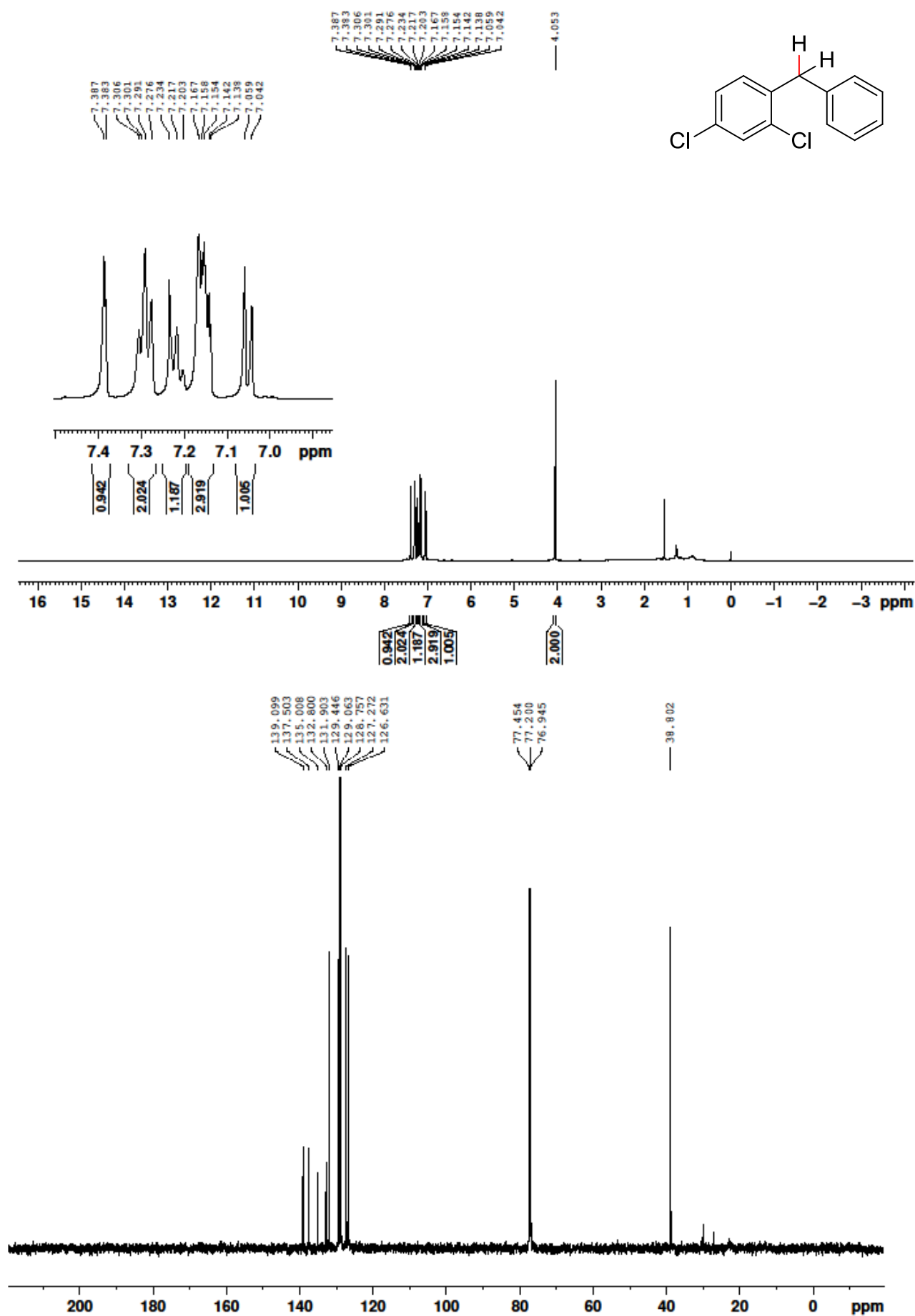
4-Chlorodiphenylmethane (**2f**, 85%)



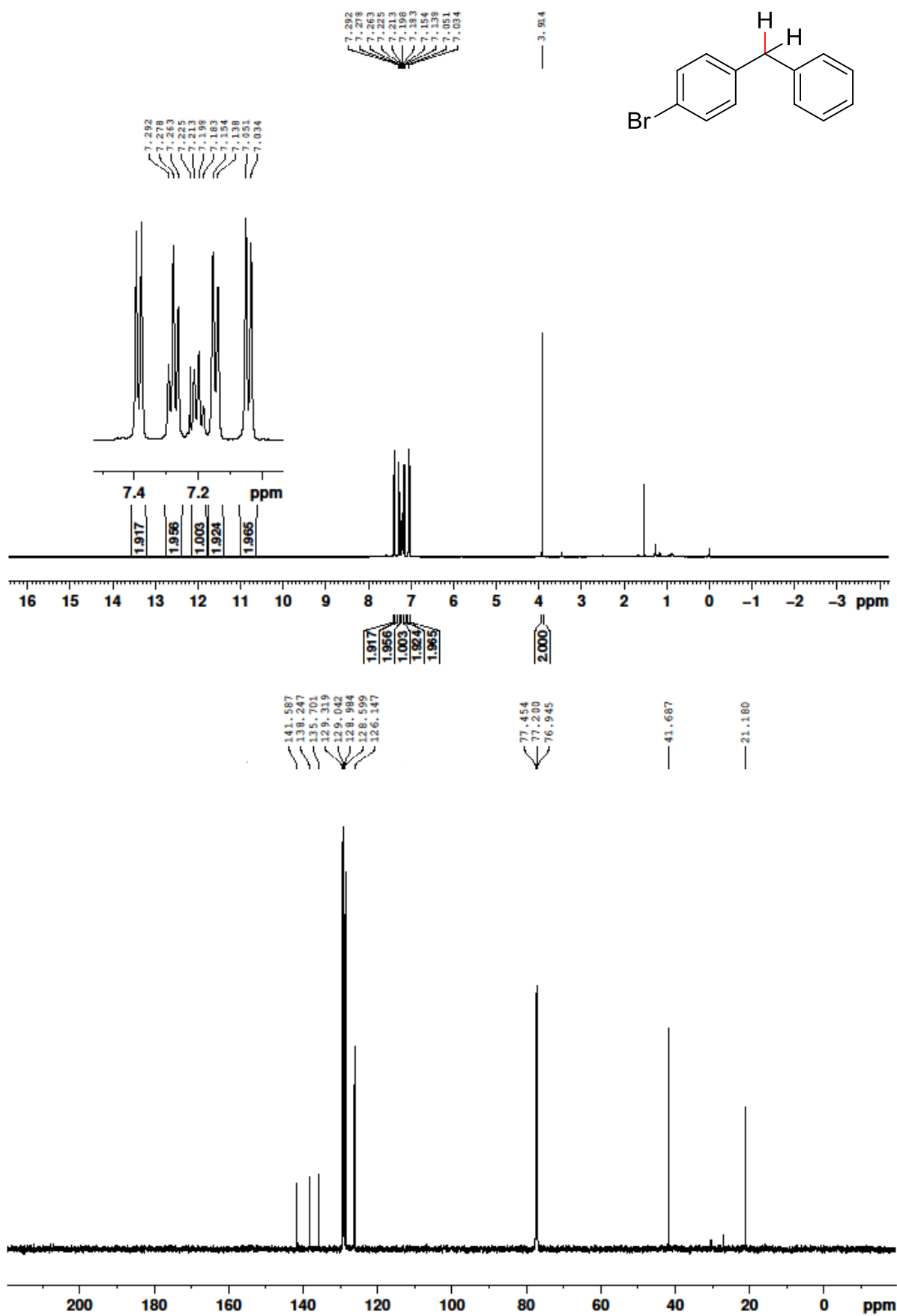
2-Chlorodiphenylmethane (**2g**, 70%)



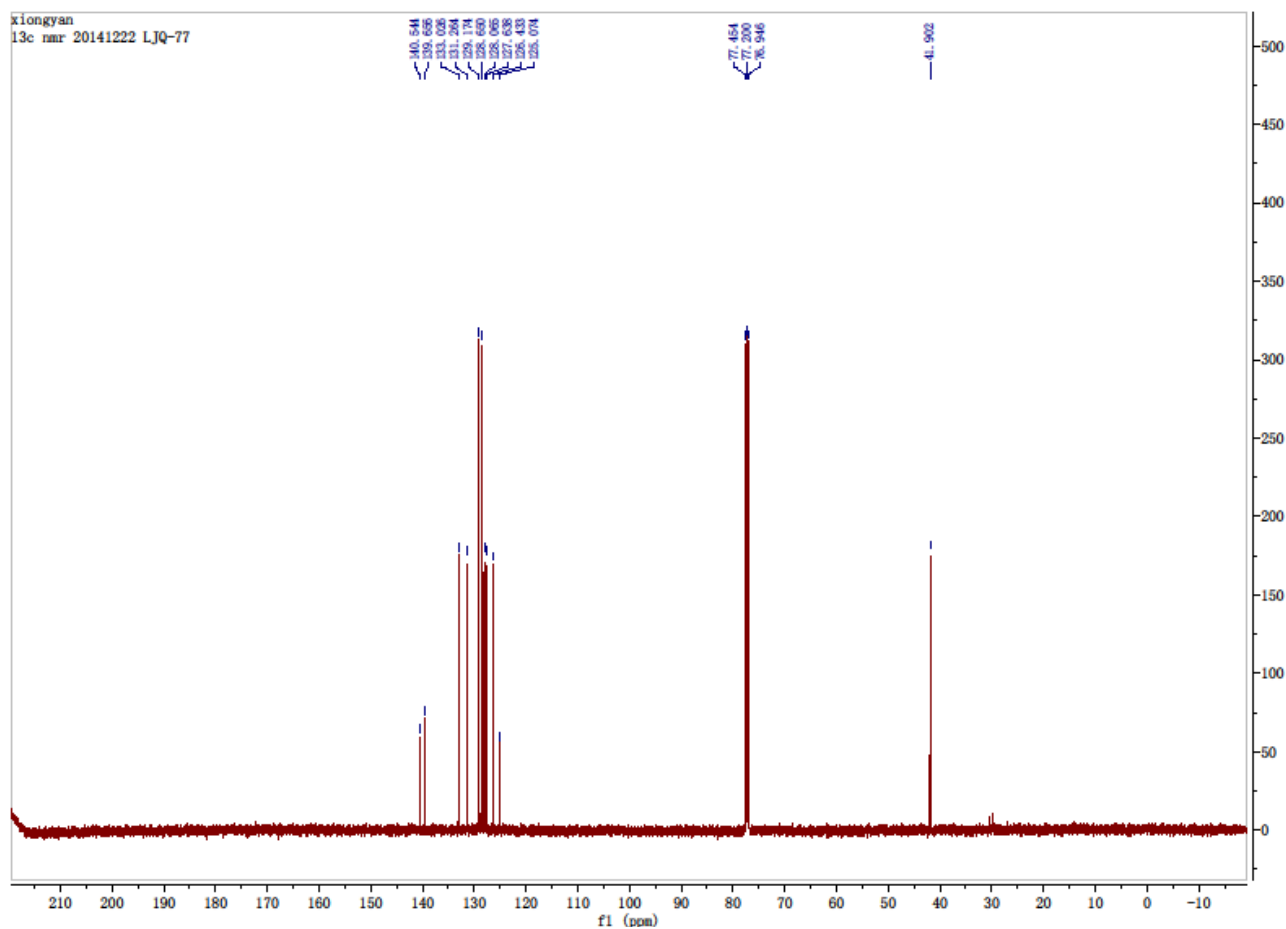
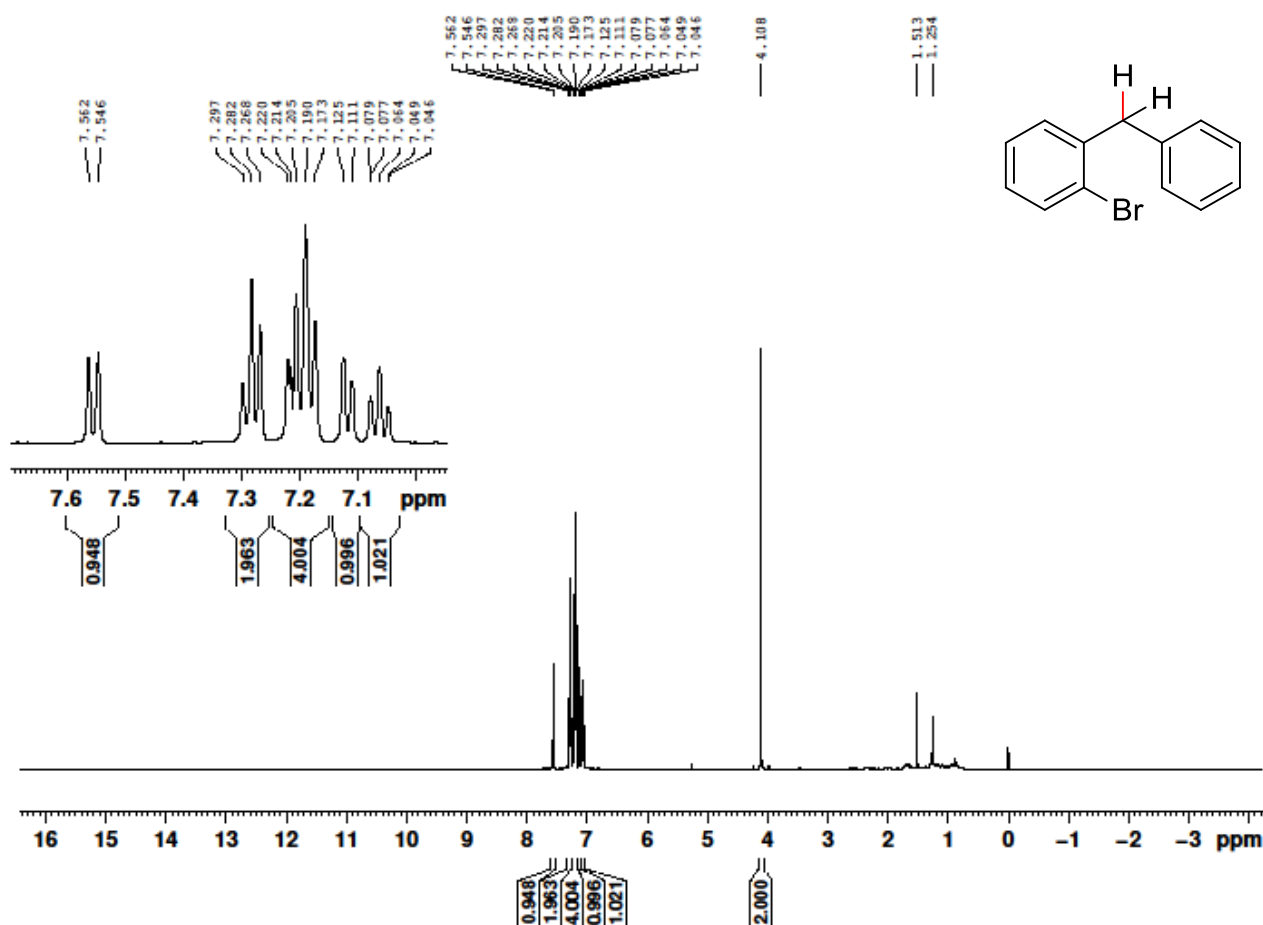
2, 4-Dichlorodiphenylmethane (**2h**, 53%)



4-Bromodiphenylmethane (**2i**, 94%)



2-Bromodiphenylmethane (**2j**, 70%)



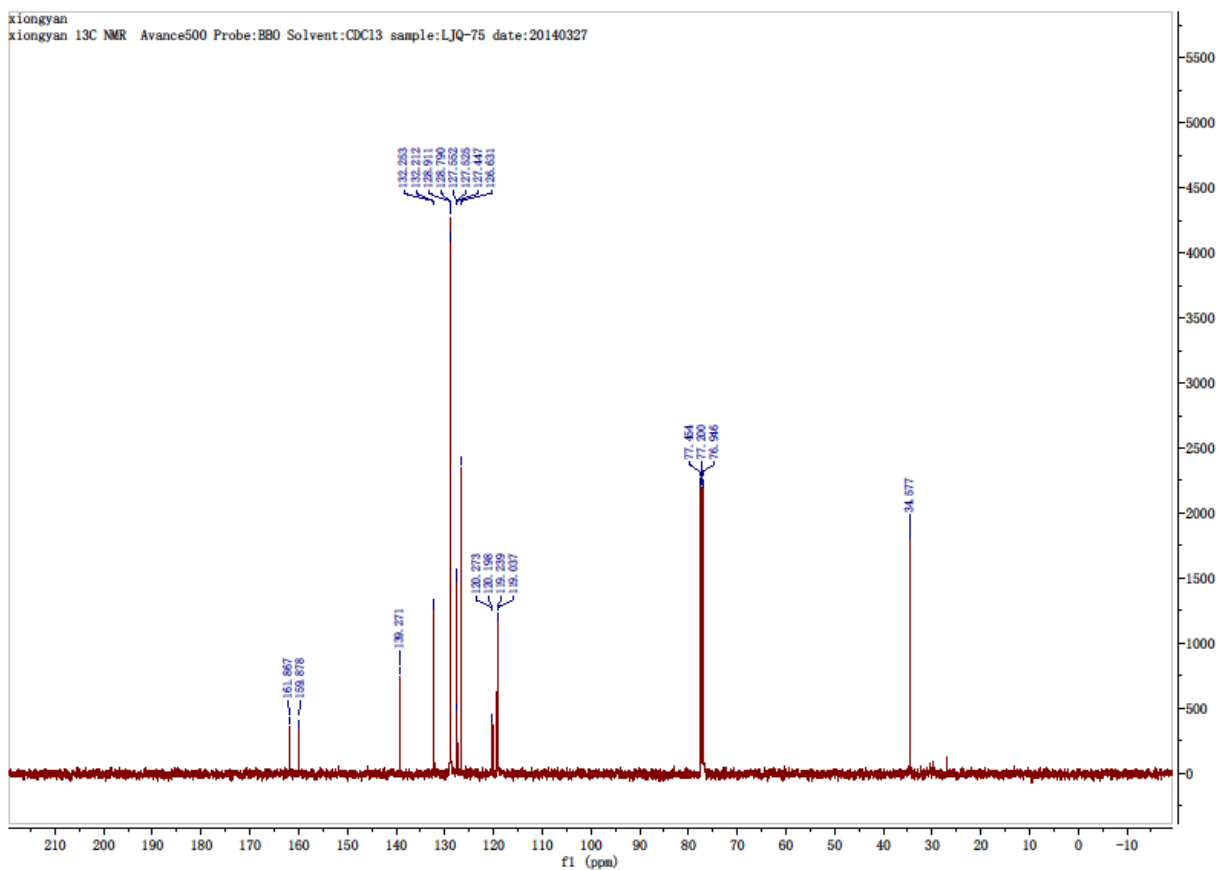
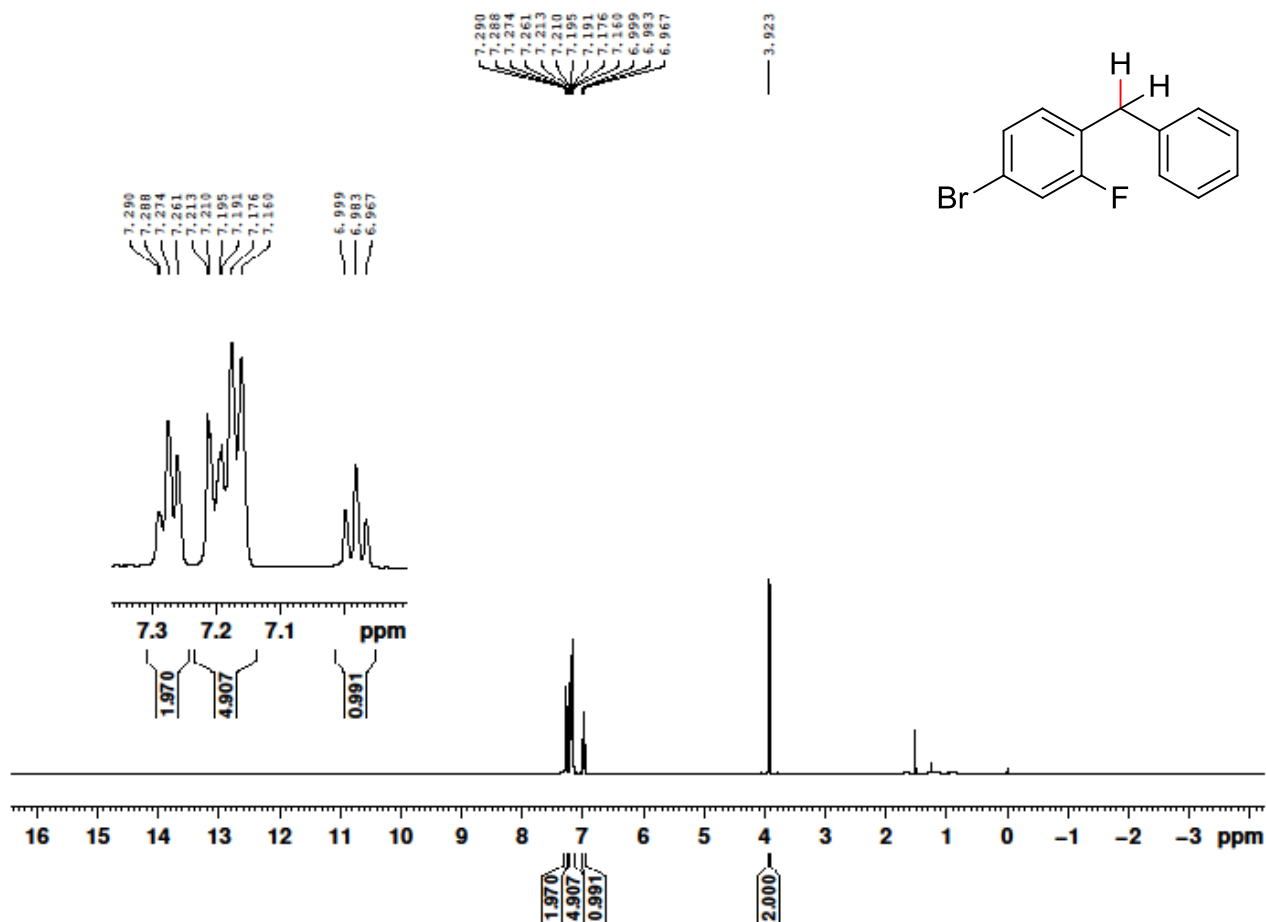
Chemical Structure: 1-chloro-2-fluoro-2-phenylethane

¹H NMR Spectrum Data:

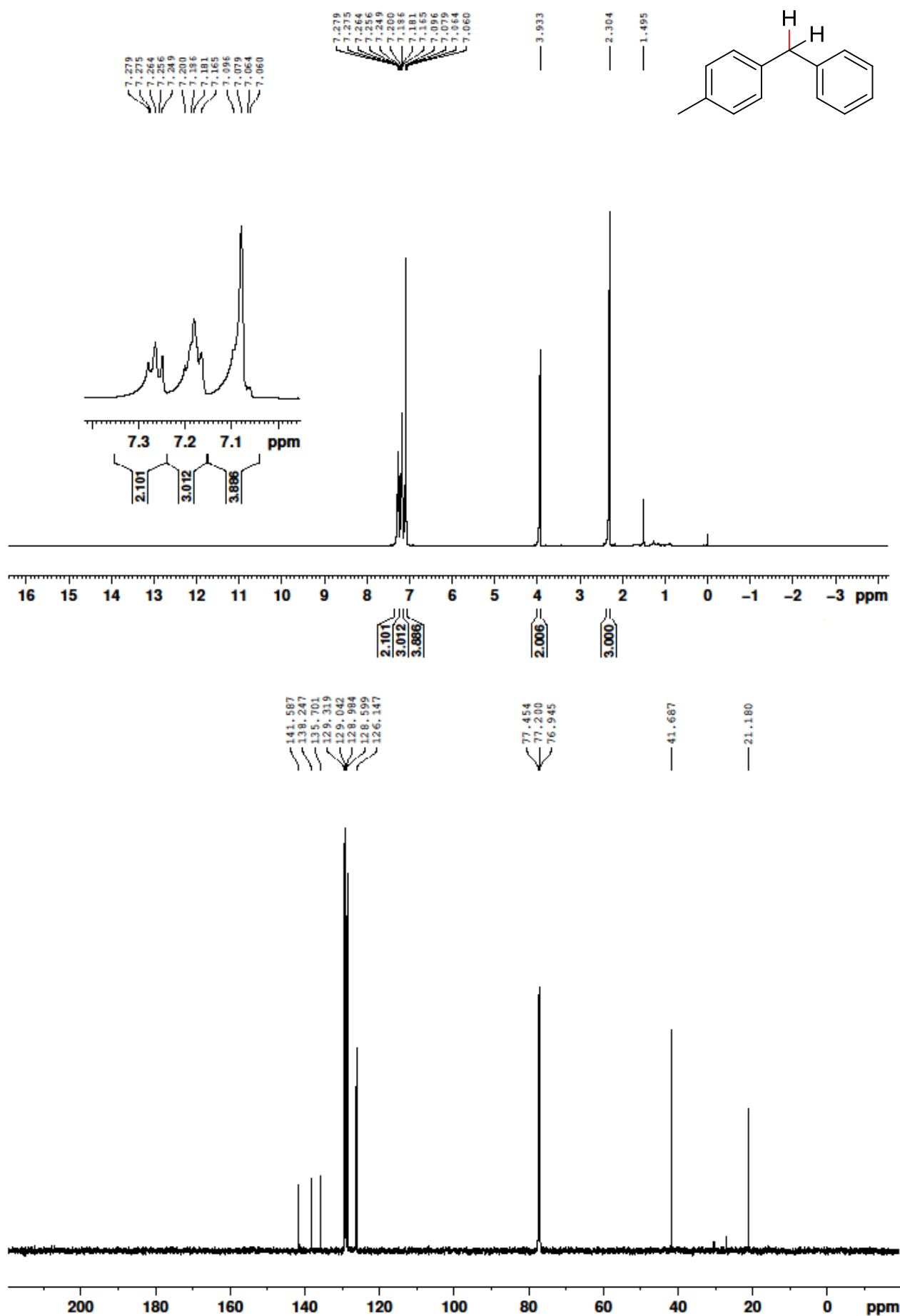
Chemical Shift (ppm)	Multiplicity	Integration
~7.28	d	1.92
~7.22	t	1.95
~7.15	m	1.01
~6.98	m	1.00
~4.1	s	1.00



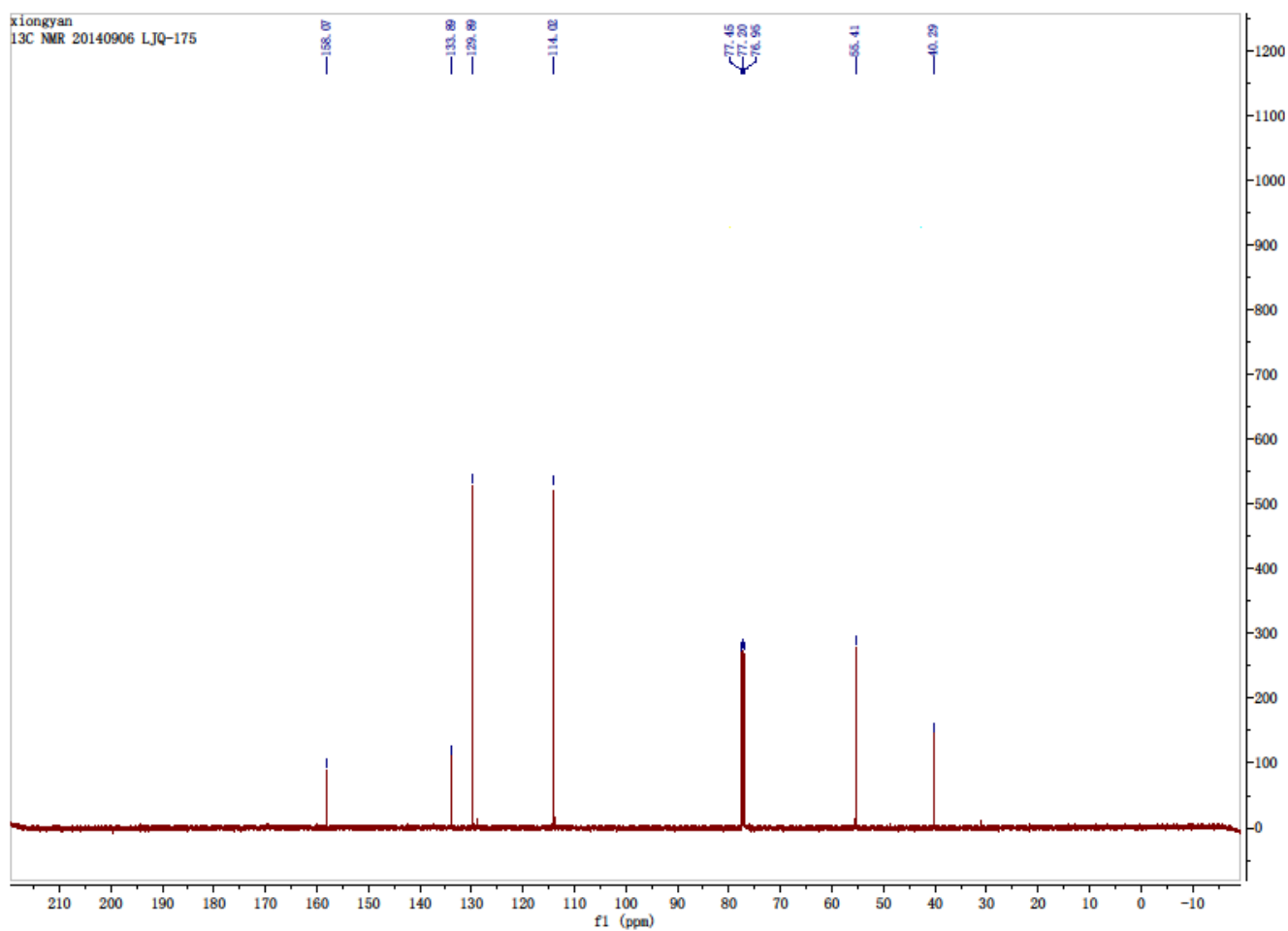
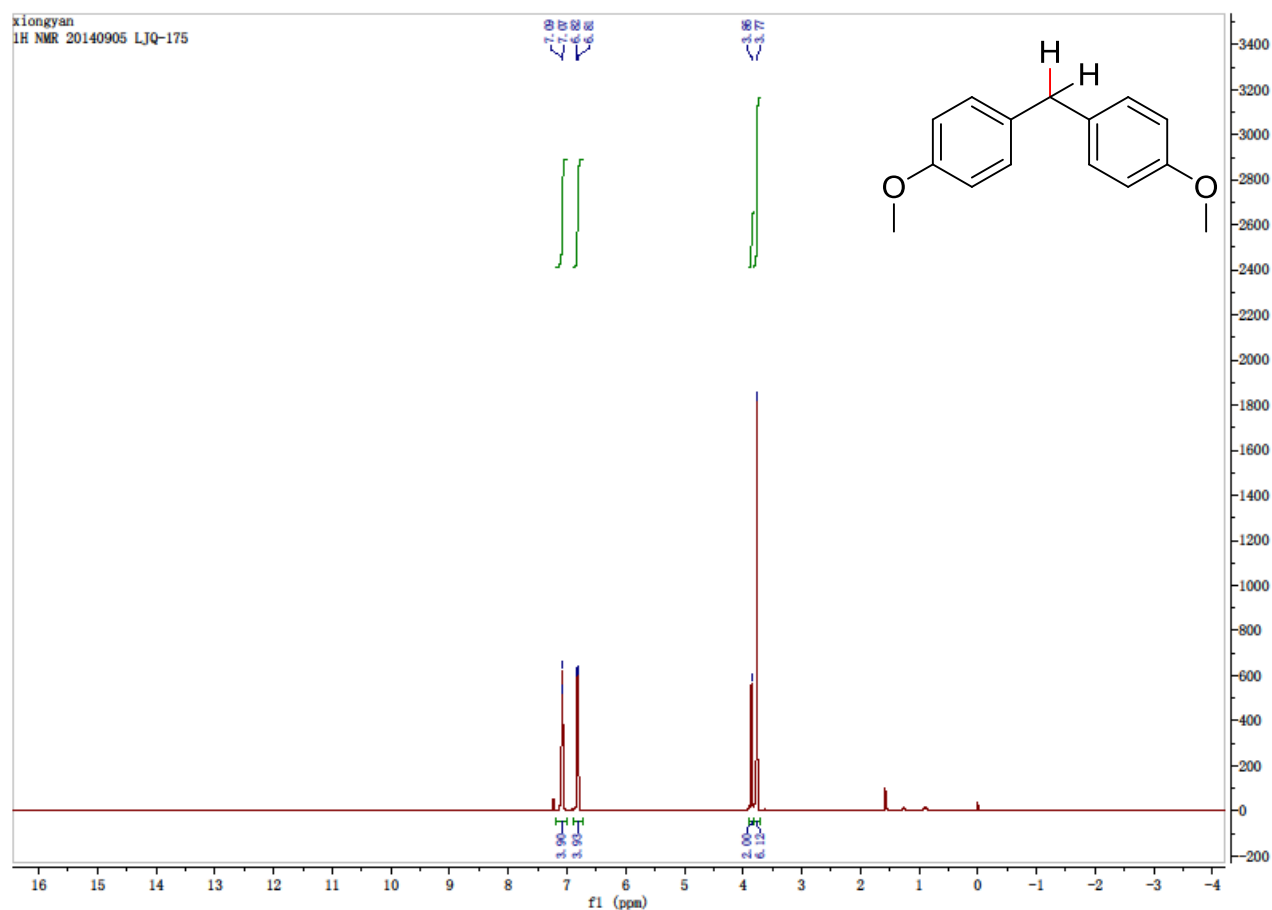
2-Fluoro-4-bromodiphenylmethane (**2l**, 59%)



4-Methyl-diphenylmethane (**2m**, 93%)

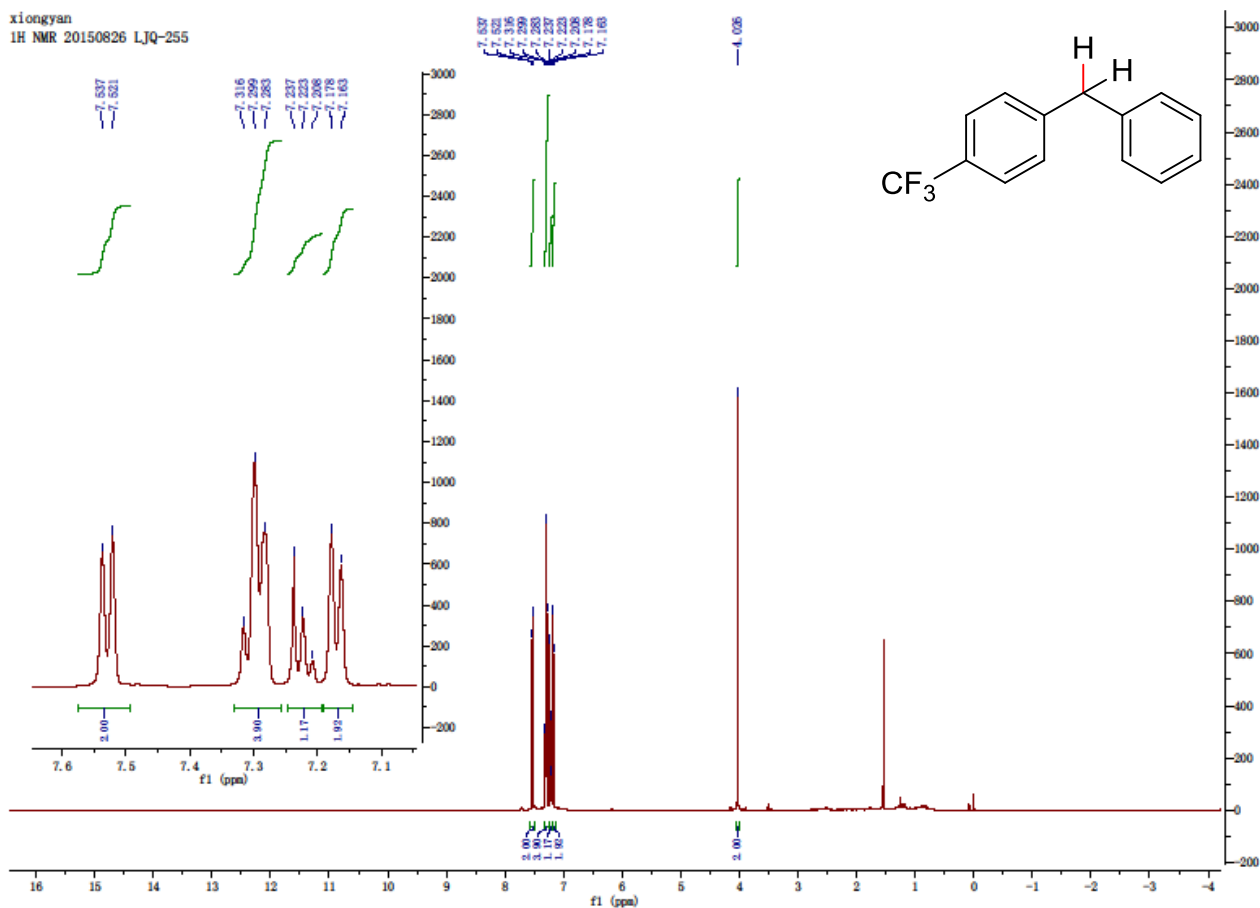


4, 4'-Dimethoxydiphenylmethane (**2n**, 24%)

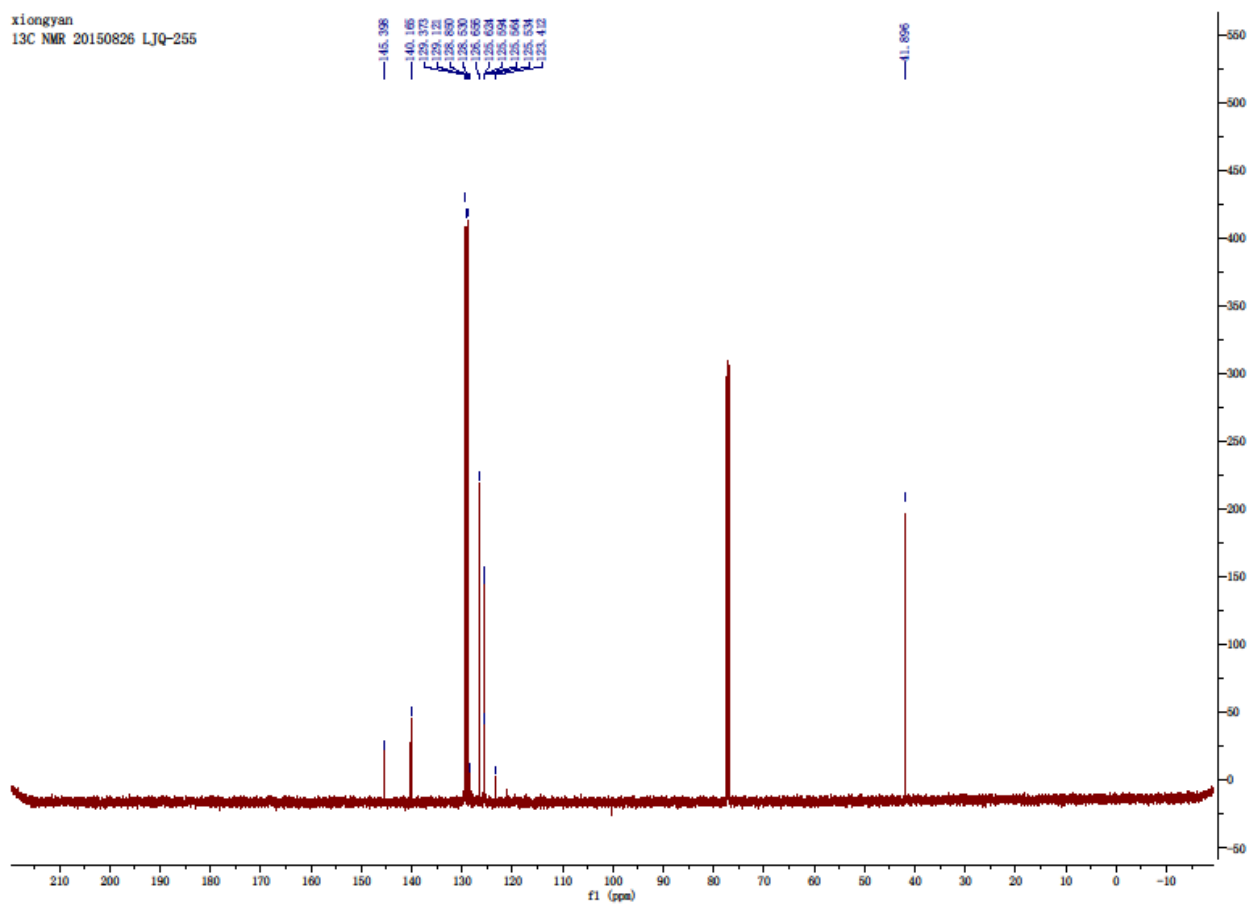


4-Trifluoromethyldiphenylmethane (**2o**)

xiongyan
1H NMR 20150826 LJQ-255

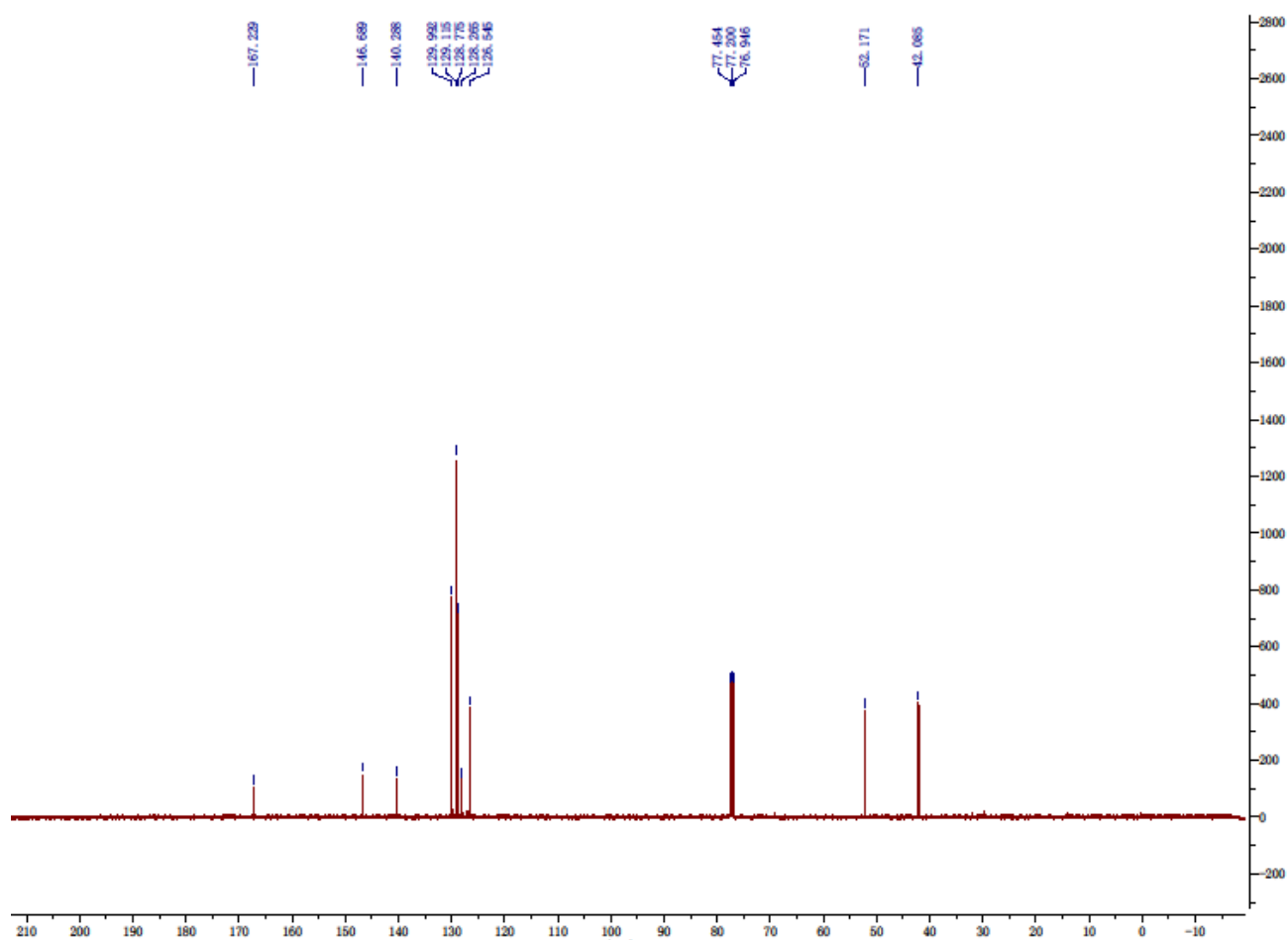
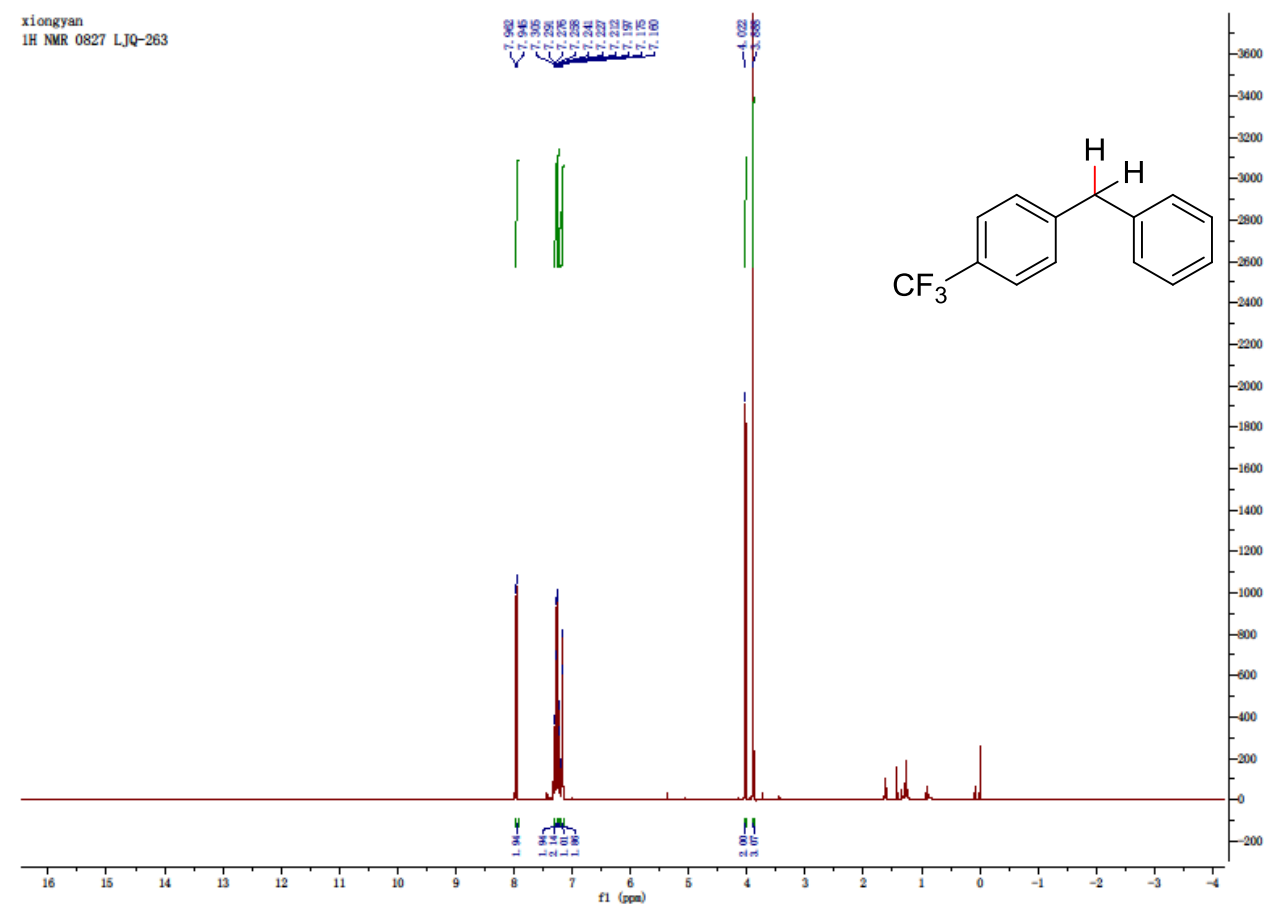


xiongyan
13C NMR 20150826 LJQ-255

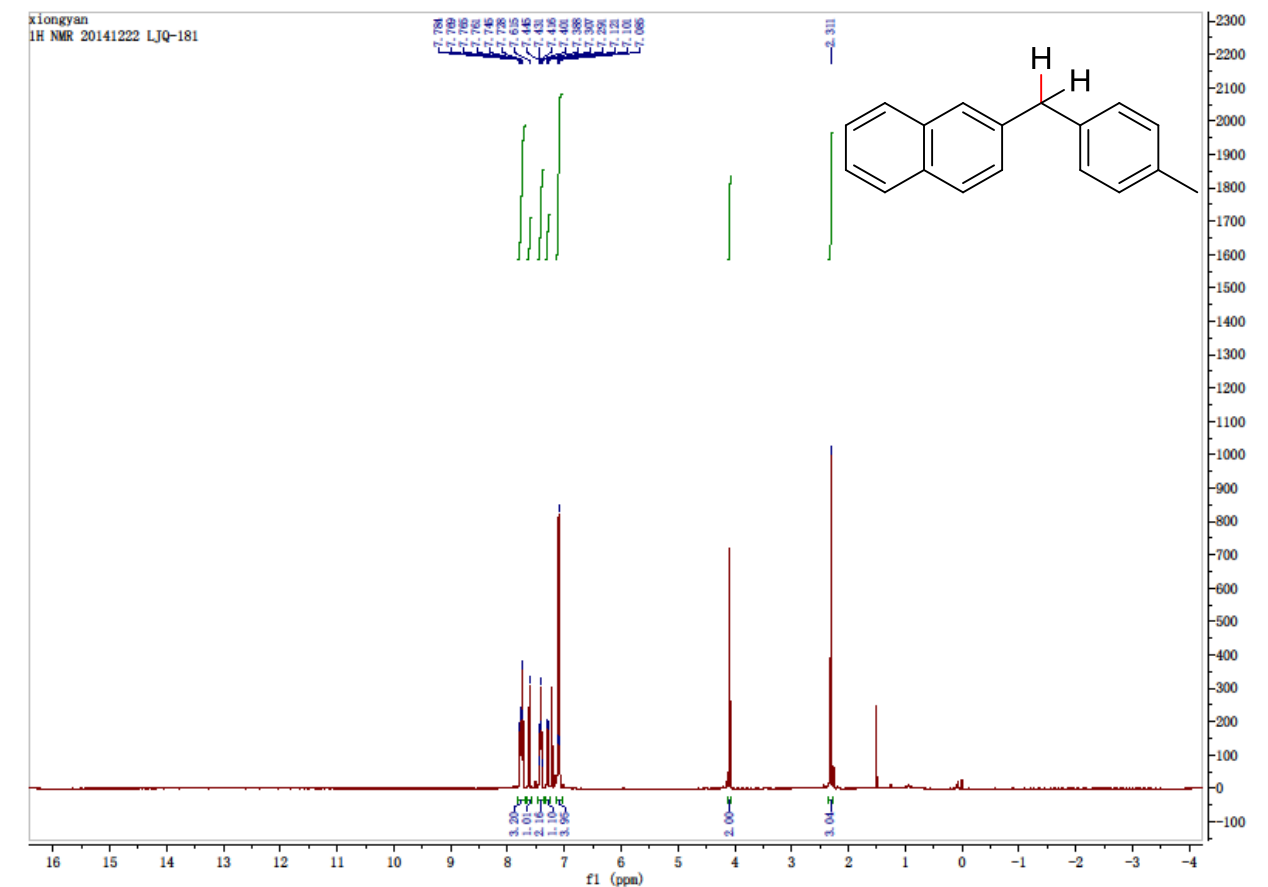


Diphenylmethane-4-carboxylic acid methyl ester (2p)

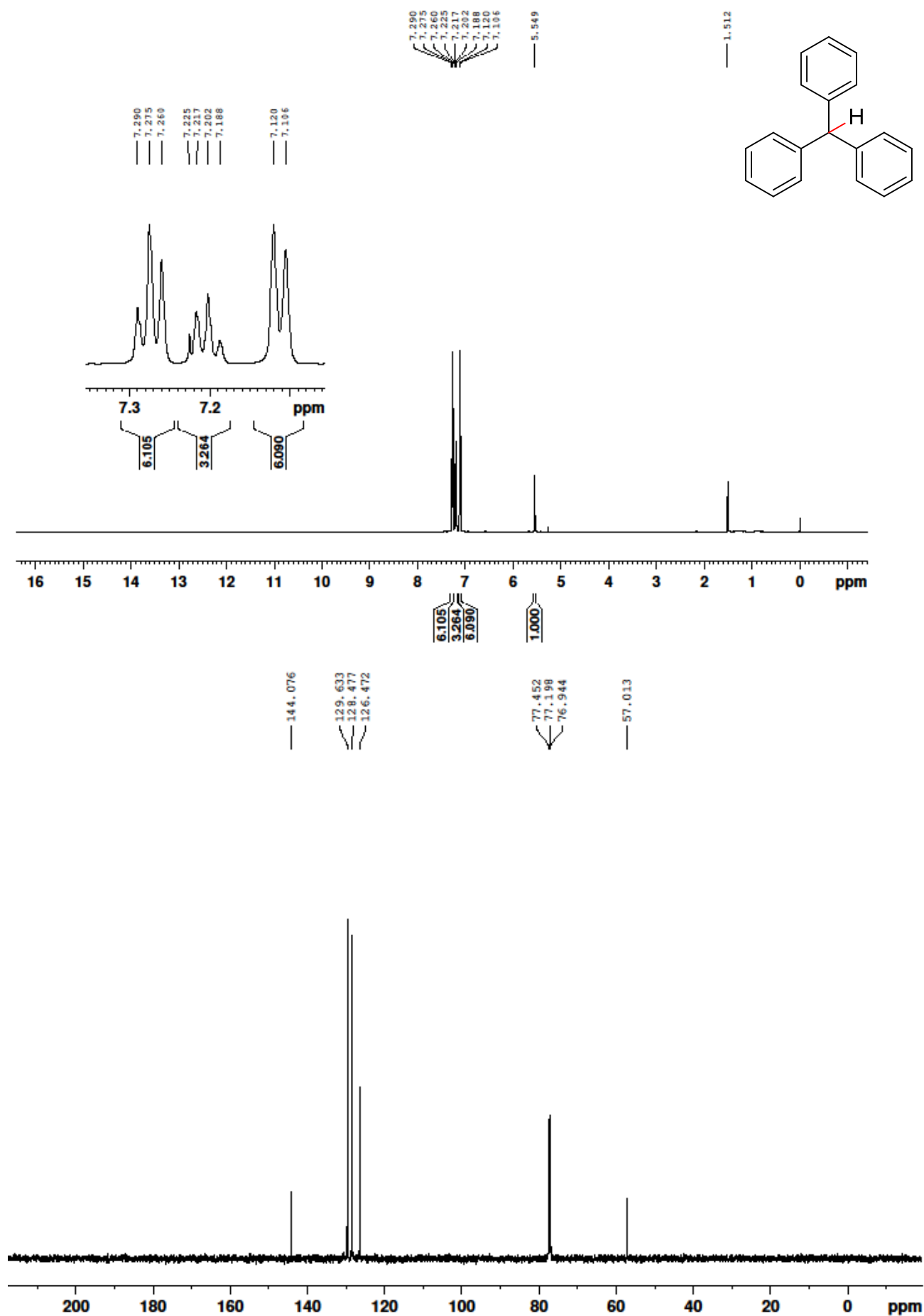
xiongyan
1H NMR 0827 LJQ-263



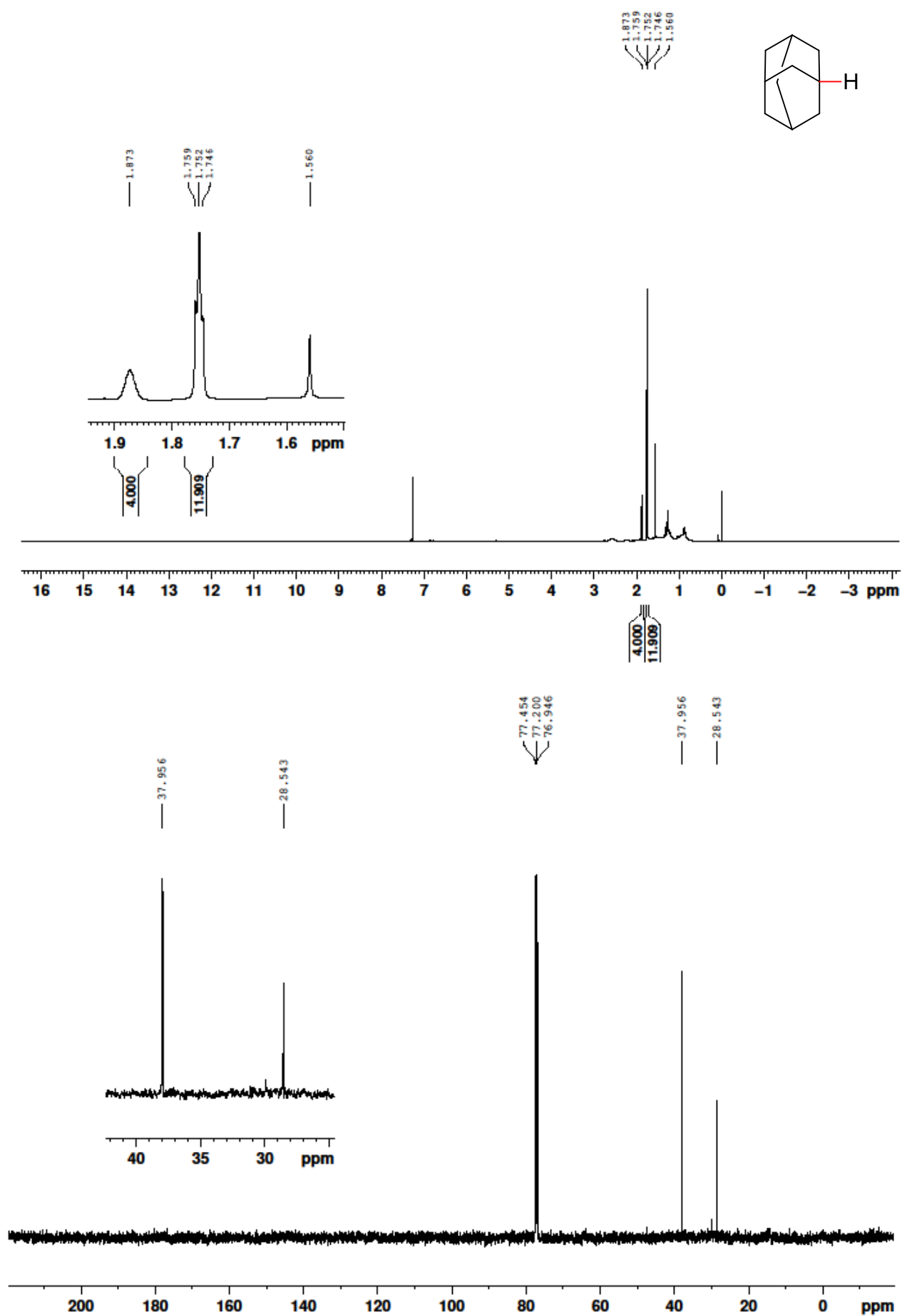
2-(4-Methylbenzyl)naphthalene (**2q**, 76%)



Triphenylmethane (**2r/2s**, 95%/91%)

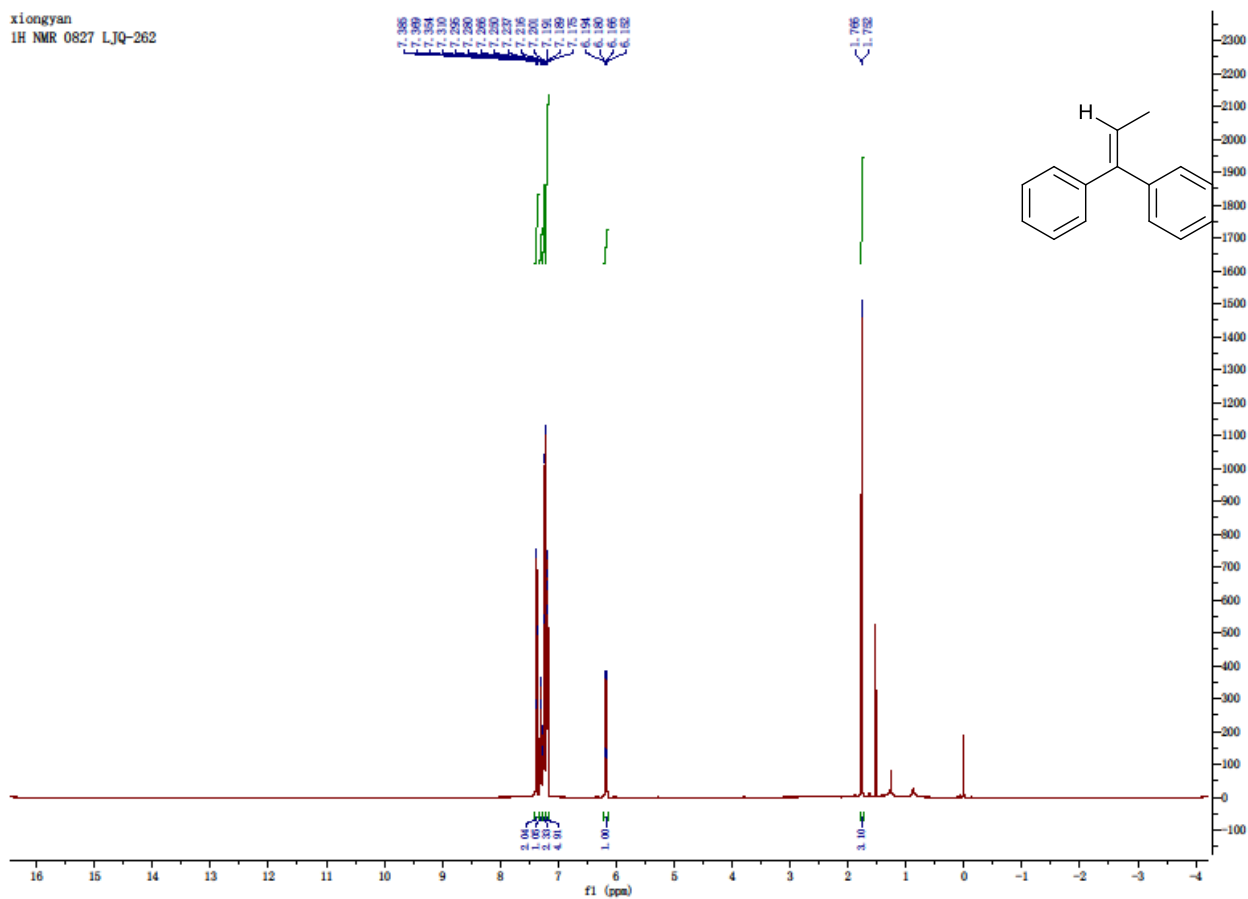


Adamantane (**2t**, 29%)

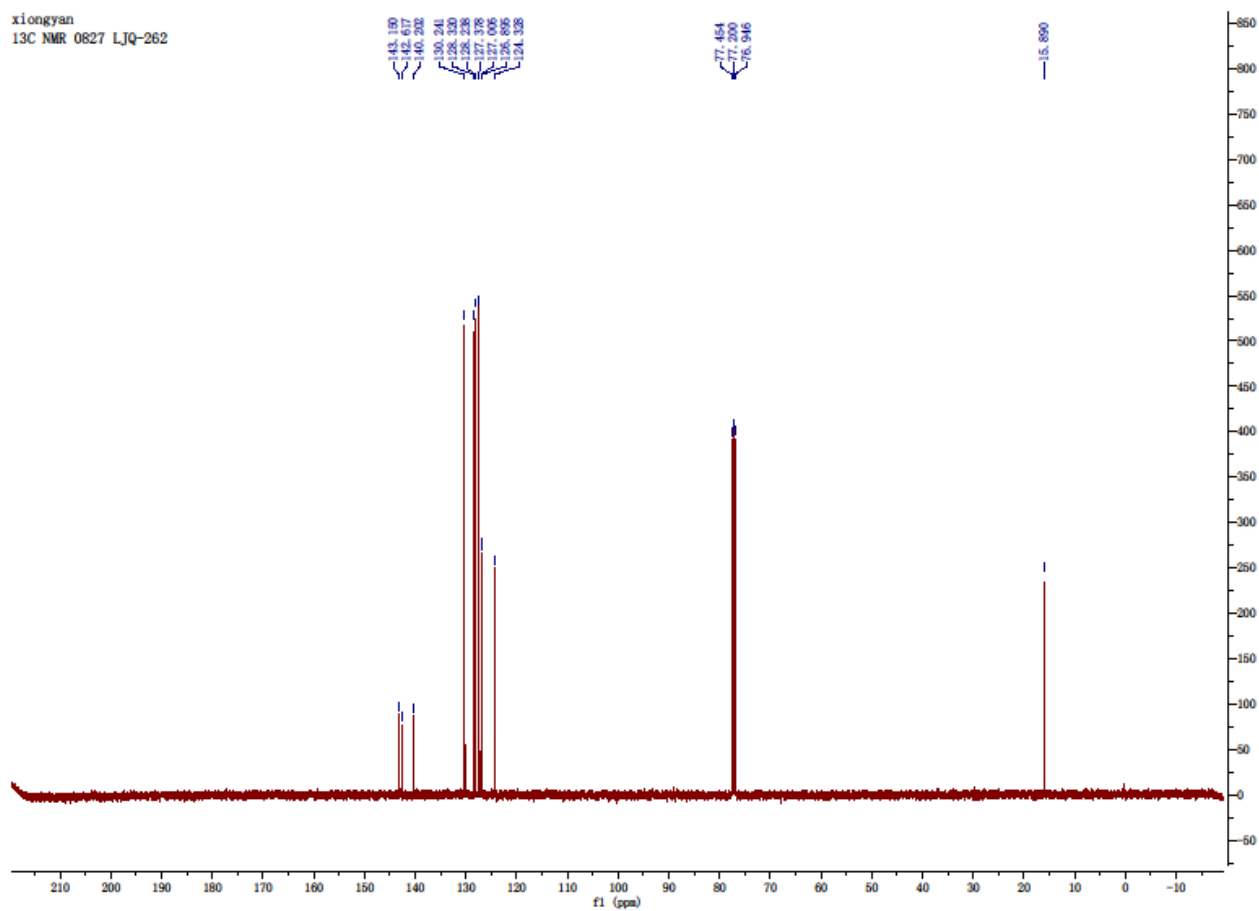


Prop-1-ene-1,1-diylidibenzene (**2w**, 99%)

xiongyan
1H NMR 0827 LJQ-262

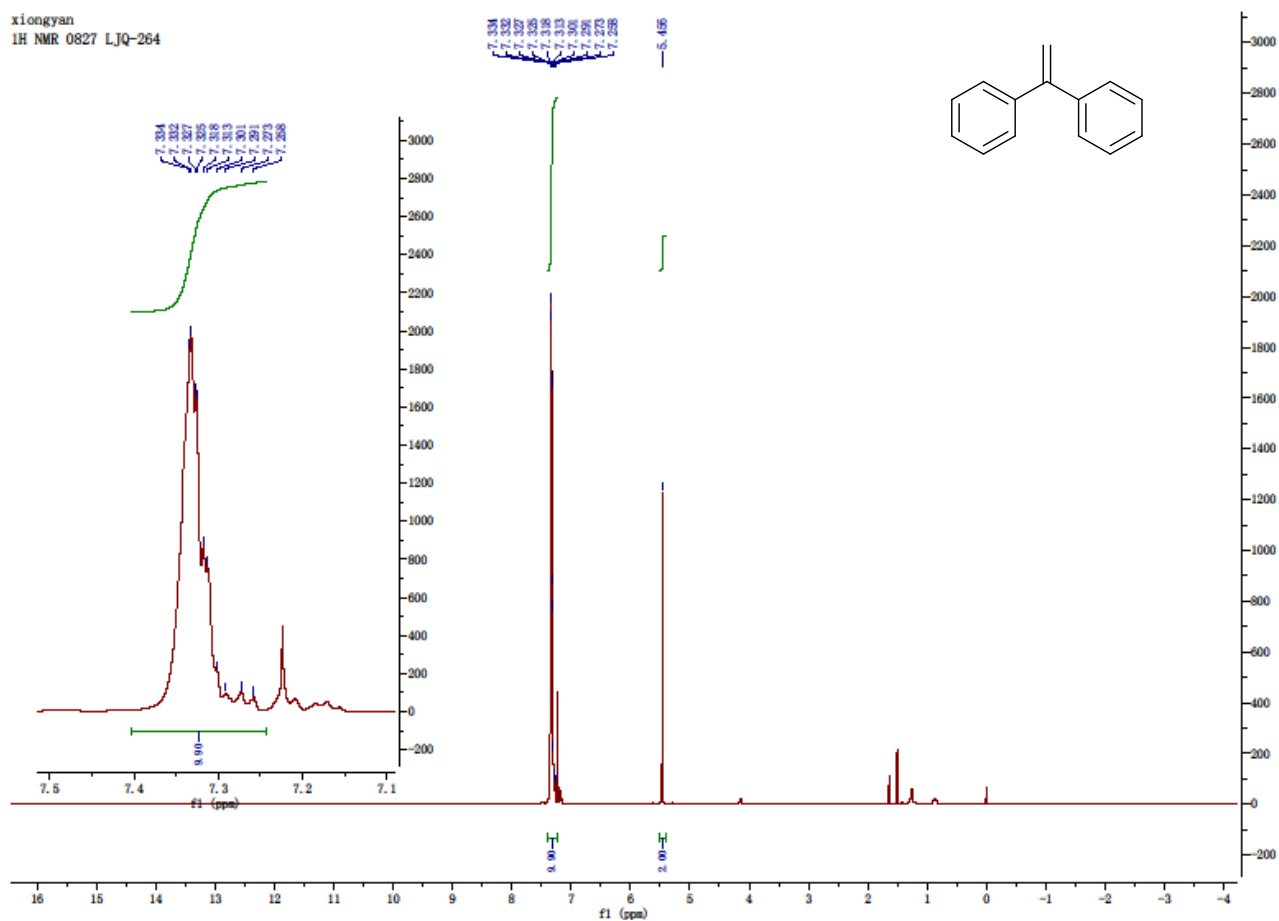


xiongyan
13C NMR 0827 LJQ-262

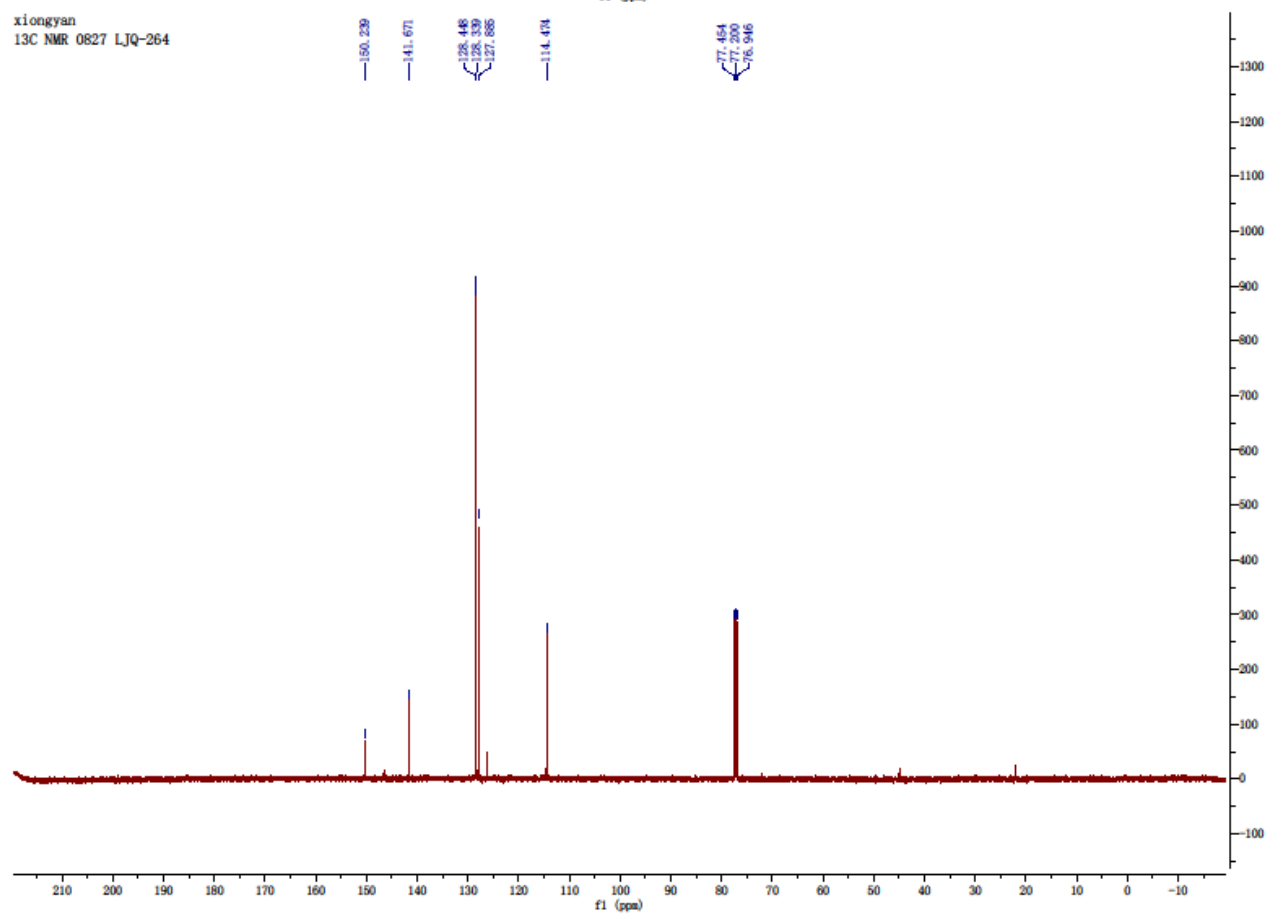


Ethene-1,1-diyl dibenzene (**2x**, 55%)

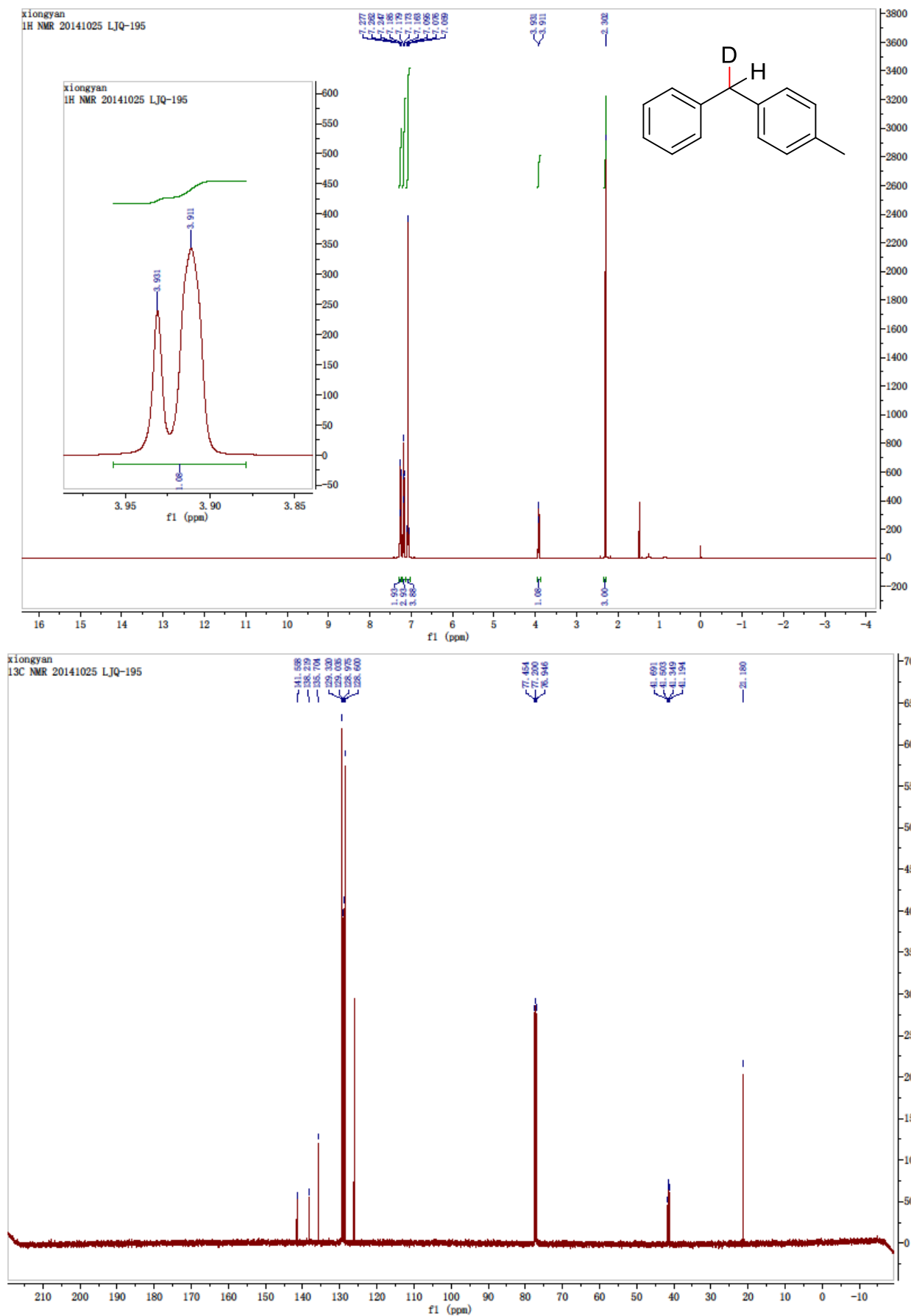
xiongyan
1H NMR 0827 LJQ-264



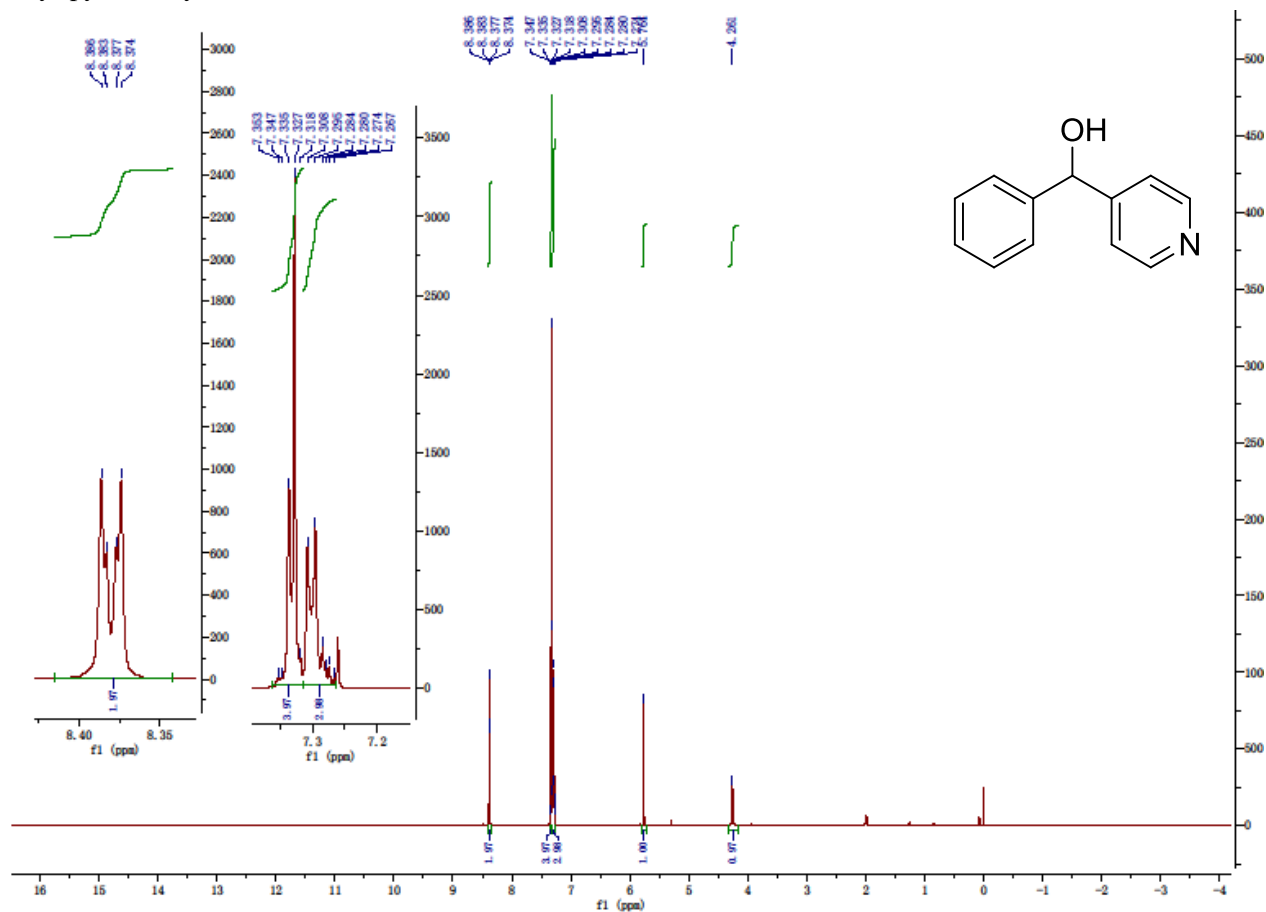
xiongyan
13C NMR 0827 LJQ-264



Deuterated 4-methyldiphenylmethane (**2m'**, 48%)



Phenyl(pyridin-4-yl)methanol (**1u**)



Phenyl(thiophen-2-yl)methanol (**1v**)

