Supporting Information

Mn-Catalyzed 1,6-Conjugate Addition/Aromatization of *para*-Quinone Methides

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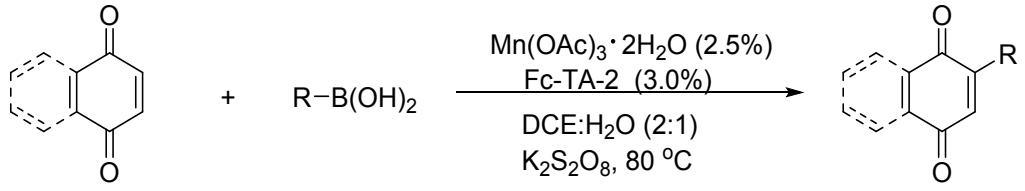
Ⅰ. General Methods and materials:

All of the reactions were carried out under the air atmosphere in an 20 mL colorimetric tube. Most of the reagents and starting materials were purchased from commercial sources and used as such. All *p*-quinone methides were prepared by following a literature procedure.[1] ^{1}H ,^{13}C and ^{31}P spectra were recorded on Varian 400, 101 or 162 MHz spectrometers. Chemical shifts were reported relative to internal tetramethylsilane (δ 0.00 ppm) or $CDCl_3$ (δ 7.26 ppm) for ^{1}H NMR, $CDCl_3$ (δ 77.16 ppm) for ^{13}C NMR, and H_3PO_4 [85%] (δ 0.00 ppm) for ^{31}P NMR. Flash column chromatography was performed on 230-430 mesh silica gel. Analytical thin layer chromatography was performed with visualized by fluorescence and by charring after treatment with potassium permanganate stain.

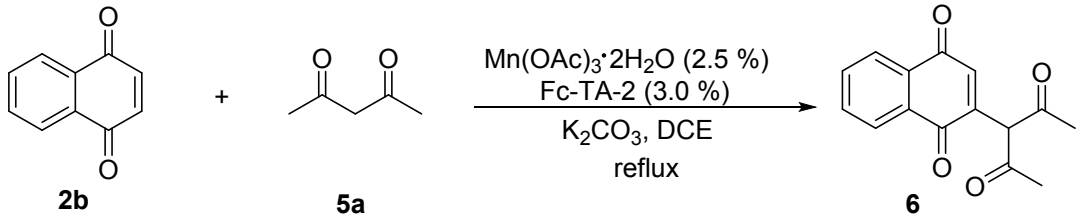
1.1 Representative procedure for the preparation of 4



2 **3** **4**

To 20 mL colorimetric tube was added **2** (0.5 mmol), **3** (0.75 mmol), $Mn(OAc)_3{\cdot}2H_2O$ (2.5 mol%), Fc-TA-2 (3.0 mol%), $K_2S_2O_8$ (3.0 eq.), DCM:H_2O =2:1 (3.0 mL). The mixture was stirred at 80 ºC in air for 10 h and then cooled to room temperature. The resulting solution was directly purified by column chromatography with petroleum ether/ethyl acetate as eluent to give the desired product.

1.2 Representative procedure for the preparation of 6

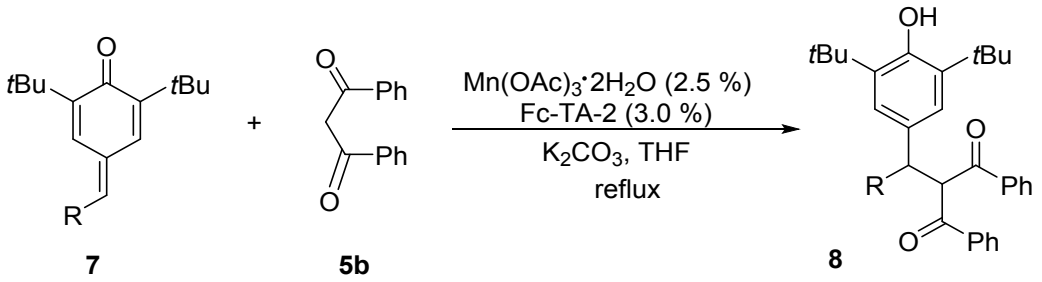


2b **5a** **6**

To 20 mL colorimetric tube was added **2b** (0.5 mmol), **5a** (1.0 mmol), $Mn(OAc)_3{\cdot}2H_2O$ (2.5 mol%), Fc-TA-2 (3.0 mol%), K_2CO_3 (2.0 eq.), DCE (2.0 mL).

The mixture was refluxed for 8 h and then cooled to room temperature. The resulting solution was directly purified by column chromatography with petroleum ether/ethyl acetate as eluent to give the desired product.

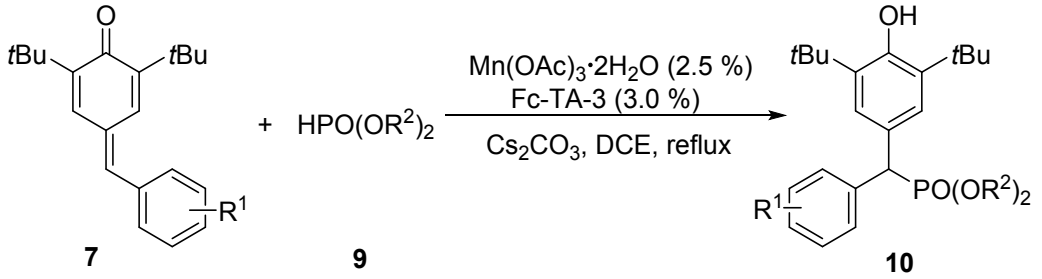
1.3 Representative procedure for the preparation of 8



7 **5b** **8**

To 20 mL colorimetric tube was added **7** (0.2 mmol), **5b** (0.3 mmol), $Mn(OAc)_3{\cdot}2H_2O$ (2.5 mol%), Fc-TA-1 (3.0 mol%), K_2CO_3 (2.0 eq.), THF (2.0 mL). The mixture was refluxed for 5 h and then cooled to room temperature. The resulting solution was directly purified by column chromatography with petroleum ether/ethyl acetate as eluent to give the desired product.

1.4 Representative procedure for the preparation of 11

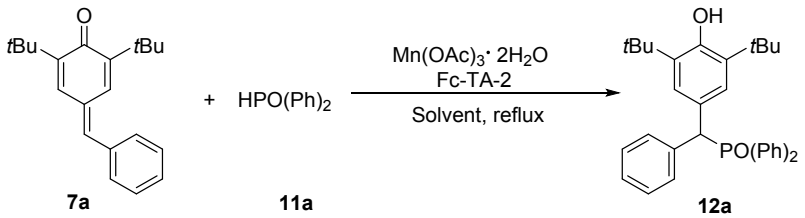


7 **9** **10**

To 20 mL colorimetric tube was added **7** (0.2 mmol), **9** (0.3 mmol), $Mn(OAc)_3{\cdot}2H_2O$ (2.5 mol%), Fc-TA-3 (3.0 mol%), Cs_2CO_3 (2.0 eq.), DCE (2.0 mL). The mixture was refluxed for3 h and then cooled to room temperature. The resulting solution was directly purified by column chromatography with petroleum ether/ethyl acetate as eluent to give the desired product.

1.5 Representative procedure for the preparation of 12

Table S1. Screening of reaction conditions[a]

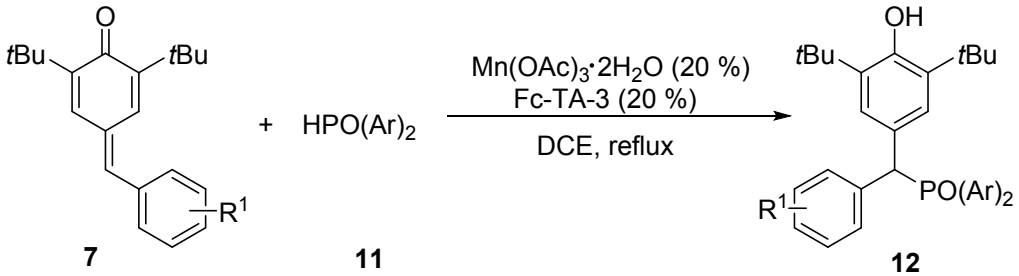


7a **11a** **12a**

Entry	Catalyst	Base	Solvent	Yield[%] [b]
1	$Mn(OAc)_3{\cdot}2H_2O$ (20%)	-	DCE	<5
2	$Mn(OAc)_3{\cdot}2H_2O$(2.5%)	NaOAc (1.5 eq)	DCE	<5
3	$Mn(OAc)_3{\cdot}2H_2O$(2.5%) /Fc-TA-3(3.0%)	-	DCE	31
4	$Mn(OAc)_3{\cdot}2H_2O$(2.5%) /Fc-TA-3(3.0%)	NaOAc (1.5 eq)	DCE	34
5	$Mn(OAc)_3{\cdot}2H_2O$(2.5%) /Fc-TA-3(3.0%)	KOAc (1.5 eq)	DCE	32
6	$Mn(OAc)_3{\cdot}2H_2O$(20%) /Fc-TA-3(20%)	NaOAc (1.5 eq)	DCE	83
7	$Mn(OAc)_3{\cdot}2H_2O$(20%) /Fc-TA-3(20%)	-	DCE	82
8	$Mn(OAc)_3{\cdot}2H_2O$(2.5%) /Fc-TA-3(3.0%)	NaOAc (1.5 eq)	TBA	38
9	$Mn(OAc)_3{\cdot}2H_2O$(2.5%) /Fc-TA-3(3.0%)	NaOAc (1.5 eq)	EtOH	41

[a]Reagents and conditions: **7a** (0.2 mmol), **11a** (0.3 mmol, 1.5 eq), $Mn(OAc)_3{\cdot}2H_2O$ (2.5-20 mol%), L (3.0-20 mol%), base (0.3 mmol), solvent (3.0 mL), reflux, 10 h. [b]Isolated yield.

1.6 Representative procedure for the preparation of 12



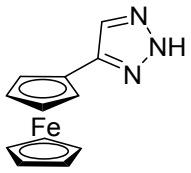
7 **11** **12**

To 20 mL colorimetric tube was added **7** (0.2 mmol), **11** (0.3 mmol), $Mn(OAc)_3{\cdot}2H_2O$ (20 mol%), Fc-TA-3 (20 mol%), DCE (2.0 mL). The mixture was refluxed for 10 h and then cooled to room temperature. The resulting solution was directly purified by column chromatography with petroleum ether/ethyl acetate as

eluent to give the desired product.

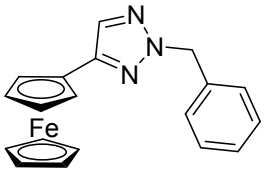
[1] (a) W. D. Chu, L. F. Zhang, X. Bao, X. H. Zhao, C. Zeng, J. Y. Du, G. B. Zhang, F. X. Wang, X. Y. Ma, C. A. Fan, *Angew. Chem. Int. Ed*. **2013**, *52*, 9229–9233; (b) V. Reddy, R. V. Anand, *Org. Lett.* **2015**, *17*, 3390–3393.

Ⅱ. Compounds Characterization



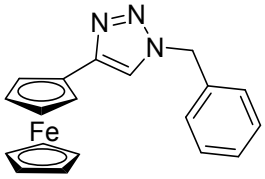
Fc-TA-1

Fc-TA-1. Khaki solid. Mp: 174−177 °C. ^{1}H NMR (400 MHz, DMSO) δ 7.89 (s, 1H), 4.75 (s, 2H), 4.33 (s, 2H), 4.04 (s, 5H). ^{13}C NMR (101 MHz, DMSO) δ 69.20 (s), 66.56 (s), 30.64 (s).^{13}C NMR (101 MHz, DMSO) δ 69.74 (s), 68.92 (s), 67.06 (s). HRMS (ESI) Calculated for $C_{12}H_{11}FeN_3$+H $(M+H)^+$ 254.0381, found 254.0382.



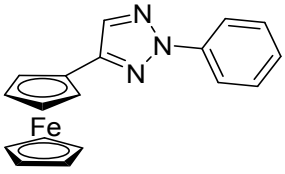
Fc-TA-2

Fc-TA-2. Yellow solid. Mp: 79−80 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 (s, 1H), 7.36 – 7.28 (m, 5H), 5.58 (s, 2H), 4.72 – 4.65 (m, 2H), 4.33 – 4.27 (m, 2H), 4.05 (s, 5H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 147.59 (s), 135.78 (s), 131.73 (s), 128.87 (s), 128.31 (s), 127.84 (s), 74.95 (s), 69.71 (s), 69.01 (s), 66.96 (s), 58.58 (s). HRMS (ESI) Calculated for $C_{19}H_{17}FeN_3$+H $(M+H)^+$ 344.0845, found 344.0843.



Fc-TA-3

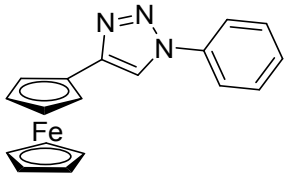
Fc-TA-3. Yellow solid. Mp: 149−151 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 – 7.33 (m, 4H), 7.29 (d, J = 7.3 Hz, 2H), 5.55 (s, 2H), 4.76 (s, 2H), 4.34 (s, 2H), 4.11 (s, 5H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.37 (s), 158.36 (s), 152.54 (s), 135.82 (s), 134.09 (s), 131.94 (s), 128.83 (s), 124.33 (s), 114.01 (s), 58.26 (s), 55.22 (s), 52.56 (s), 52.43 (s), 50.60 (s), 34.42 (s), 30.40 (s). HRMS (ESI) Calculated for $C_{19}H_{17}FeN_3$+H $(M+H)^+$ 344.0845, found 344.0842.



Fc-TA-4

Fc-TA-4. Dark red solid. Mp: 122−123 °C.^{1}H NMR (400 MHz, $CDCl_3$) δ 8.10 (dd, J = 8.6, 1.0 Hz, 2H), 7.78 (s, 1H), 7.50 (t, J = 8.0 Hz, 2H), 7.34 (t, J = 7.4 Hz, 1H), 4.79

(t, J = 1.8 Hz, 2H), 4.7 (t, J = 2 Hz, 2H), 4.11 (s, 5H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 148.76 (s), 140.05 (s), 132.94 (s), 129.36 (s), 127.16 (s), 118.75 (s), 74.51 (s), 69.78 (s), 69.27 (s), 67.19 (s), 31.03 (s). HRMS (ESI) Calculated for $C_{18}H_{15}FeN_3$+H $(M+H)^+$ 330.0694, found 330.0692.



Fc-TA-5

Fc-TA-5. Yellow solid. Mp: 168−170 °C. ^{1}H NMR (400 MHz, DMSO) δ 8.91 (s, 1H), 7.95 (d, J = 7.7 Hz, 2H), 7.63 (t, J = 7.8 Hz, 2H), 7.50 (t, J = 7.3 Hz, 1H), 4.81 (d, J = 1.5 Hz, 2H), 4.36 (d, J = 1.5 Hz, 2H), 4.09 (s, 5H); ^{13}C NMR (101 MHz, DMSO) δ 206.99 (s), 147.13 (s), 137.16 (s), 130.36 (s), 128.93 (s), 120.23 (s), 118.92 (s), 75.78 (s), 69.83 (s), 68.99 (s), 66.97 (s), 31.16 (s). HRMS (ESI) Calculated for $C_{18}H_{15}FeN_3$+H $(M+H)^+$ 330.0694, found 330.0695.

[1,1'-Biphenyl]-2,5-dione (4a) (Known compound, see: Y. Fujiwara, V. Domingo, I. B. Seiple, R. Gianatassio, M. D. Bel, P. S. Baran, *J. Am. Chem. Soc.* **2011**, *133*, 3292.). Faint yellow solid. 173.0 mg. Mp: 117−118 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 – 7.45 (m, 5H), 6.90-6.84 (m, 3H).

3'-Methyl-[1,1'-biphenyl]-2,5-dione (4b) (Known compound, see: Y. Fujiwara, V. Domingo, I. B. Seiple, R. Gianatassio, M. D. Bel, P. S. Baran, *J. Am. Chem. Soc.* **2011**, *133*, 3292.). Yellow solid. 164.5mg. Mp: 76−78 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 – 7.33 (m, 1H), 7.29 (d, J = 7.6 Hz, 3H), 6.93 – 6.80 (m, 3H), 2.42 (s, 3H).

4'-Isopropyl-[1,1'-biphenyl]-2,5-dione (4c) (Known compound, see: D. Wang, B. Ge, L. Li, J. Shan, Y. Ding, *J. Org. Chem*. **2014**, *79*, 8607.). Light yellow solid. 192.2 mg. Mp: 48−50°C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (d, J = 8.3 Hz, 2H), 7.31 (d, J = 8.2 Hz, 2H), 6.91 – 6.77 (m, 3H), 2.95 (dt, J = 13.8, 6.9 Hz, 1H), 1.28 (d, J = 6.9 Hz, 6H).

3',5'-Dimethyl-[1,1'-biphenyl]-2,5-dione (4d) (Known compound, see: K. Komeyama, T. Kashihara, K. Takaki, *Tetrahedron Lett*. **2013**, *54*, 1084.). Pale yellow solid. 165.5 mg. Mp: 101−102 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.10 (s, 1H), 7.08 (s, 2H), 6.88 – 6.79 (m, 3H), 2.36 (s, 6H).

4'-Ethyl-[1,1'-biphenyl]-2,5-dione (4e) (Known compound, see: D. Wang, B. Ge, L. Li, J. Shan, Y. Ding, *J. Org. Chem*. **2014**, *79*, 8607.). Yellow oil. 169.8 mg. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (d, J = 8.3 Hz, 2H), 7.29 (d, J = 8.3 Hz, 2H), 6.89 – 6.79 (m, 3H), 2.71 (q, J = 7.6 Hz, 2H), 1.28 (t, J = 7.6 Hz, 3H). HRMS (ESI) Calculated for $C_{14}H_{12}O_2$+H $(M+H)^+$ 213.0916, found 213.0918.

2'-Methyl-[1,1'-biphenyl]-2,5-dione (4f) (Known compound, see: D. Wang, B. Ge, L. Li, J. Shan, Y. Ding, *J. Org. Chem*. **2014**, *79*, 8607.). Yellow oil. 160.5 mg. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 – 7.34 (m, 1H), 7.31 – 7.28 (m, 2H), 7.12 (d, *J* = 7.2 Hz, 1H), 6.91 – 6.84 (m, 2H), 6.74 (d, *J* = 2.2 Hz, 1H), 2.21 (s, 3H).

3'-Methoxy-[1,1'-biphenyl]-2,5-dione (4g) (Known compound, see: D. Wang, B. Ge, L. Li, J. Shan, Y. Ding, *J. Org. Chem*. **2014**, *79*, 8607.). Yellow solid. 162.8 mg. Mp: 113−115 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 – 7.30 (m, 1H), 7.09 – 6.95 (m, 3H), 6.89 – 6.74 (m, 3H), 3.83 (s, 3H).

4'-Bromo-[1,1'-biphenyl]-2,5-dione (4h) (Known compound, see: A. Honraedt, F. L. Callonnec, E. L. Grognec, V. Fernandez, F. Felpin, *J. Org. Chem*. **2013**, *78*, 4604.). Yellow solid. 231.5 mg. Mp: 100−102 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, *J* = 8.5 Hz, 2H), 7.36 (d, *J* = 8.5 Hz, 2H), 6.91 – 6.78 (m, 3H).

4'-Iodo-[1,1'-biphenyl]-2,5-dione (4i) (Known compound, see: Y. Fujiwara, V. Domingo, I. B. Seiple, R. Gianatassio, M. D. Bel, P. S. Baran, *J. Am. Chem. Soc.* **2011**, *133*, 3292.). Light yellow solid. 257.4 mg. Mp: 133−136 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 (d, *J* = 8.2 Hz, 2H), 7.22 (d, *J* = 8.2 Hz, 2H), 6.90 – 6.81 (m, 3H).

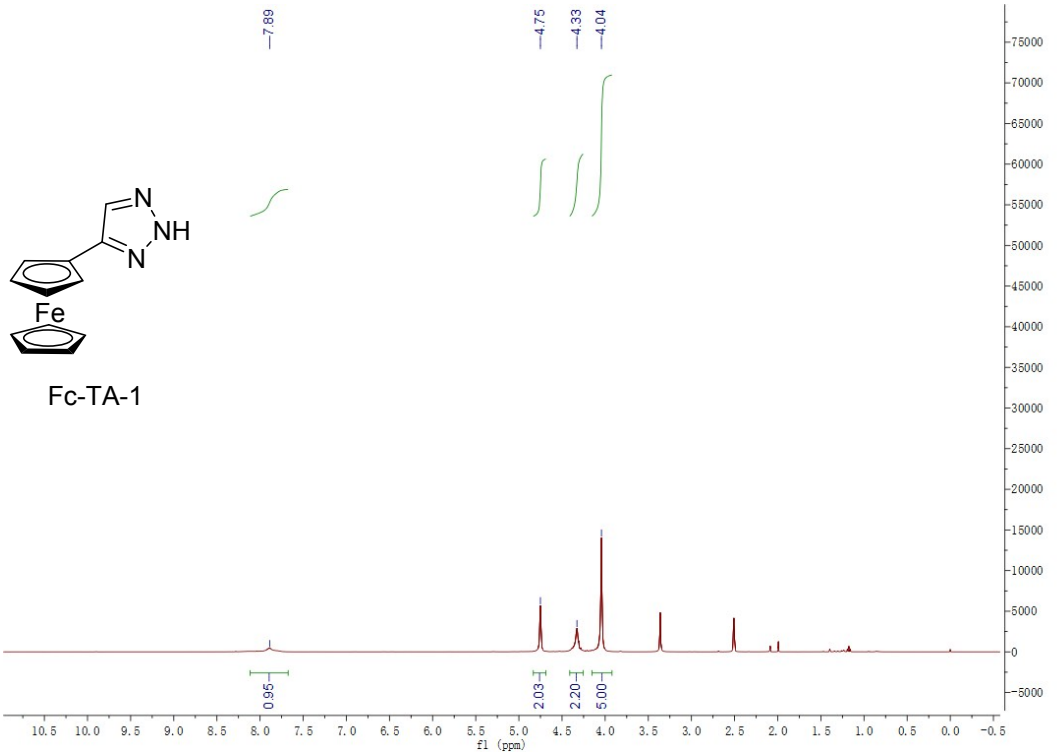
2-(Naphthalen-2-yl)cyclohexa-2,5-diene-1,4-dione (4j) (Known compound, see: Wang, J.; Wang, S.; Wang, G.; Zhang, J.; Yu, X. Yu. *Chem. Commun*. **2012**, *48*, 11769). Pale yellow solid. 156.8 mg. Mp: 172−174 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (s, 1H), 7.94 – 7.85 (m, 3H), 7.59 – 7.51 (m, 3H), 6.99 (d, *J* = 2.2 Hz, 1H), 6.94 – 6.84 (m, 2H).

2-Methylcyclohexa-2,5-diene-1,4-dione (4k) (Known compound, see: D. Wang, B. Ge, L. Du, H. Miao, Y. Ding, *Synlett*, **2014**, *25*, 2895). Yellow solid. 67.2 mg. Mp: 65-67 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.78 – 6.68 (m, 2H), 6.61 (s, 1H), 2.06 (s, 3H).

[2,2'-Binaphthalene]-1,4-dione (4l) (Known compound, see: G. S. Sidhu, M. Pardhasaradhi, M. H. Babu, *Indian J. Chem*. **1976**, *14*, 218.). Light yellow solid. 176.3 mg. Mp: 168−170 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.25 – 8.20 (m, 1H), 8.16 – 8.11 (m, 2H), 7.93 (d, *J* = 8.5 Hz, 2H), 7.88 (d, *J* = 7.0 Hz, 1H), 7.83 – 7.77 (m, 2H), 7.65 (d, *J* = 7.5 Hz, 1H), 7.58 – 7.52 (m, 2H), 7.21 (s, 1H).

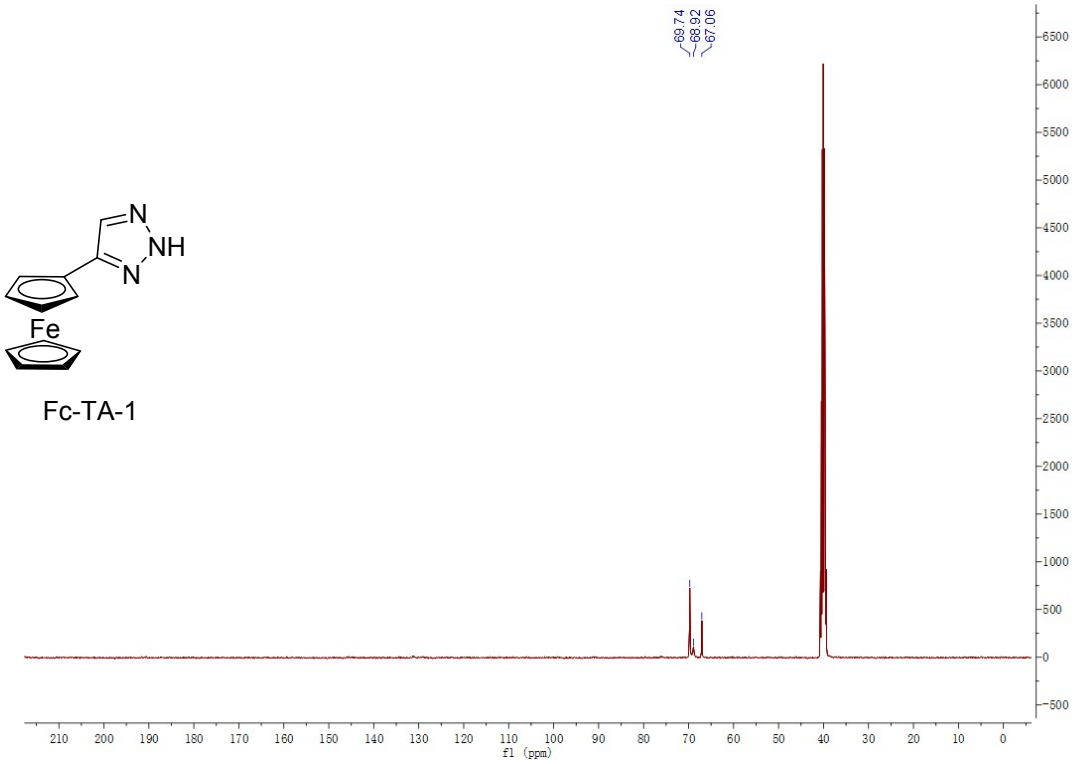
Ⅲ. ^{1}H NMR and ^{13}C NMR Spectra

^{1}H NMR Spectrum of Fc-TA-1



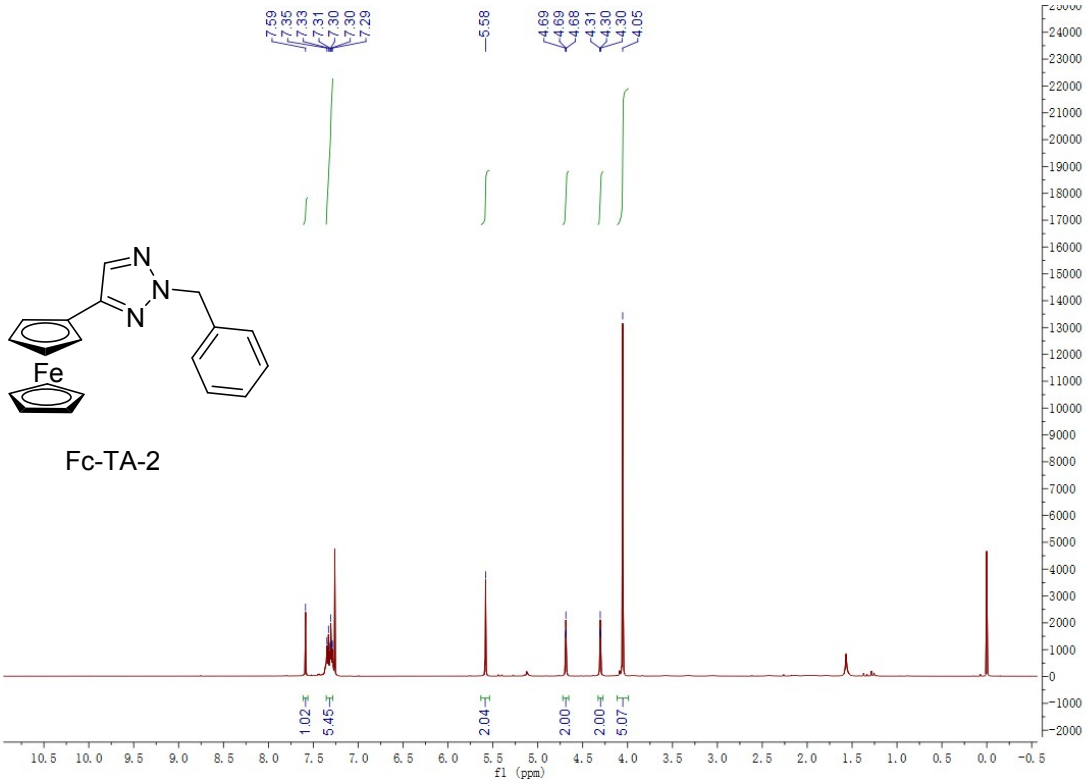
Fc-TA-1

^{13}C NMR Spectrum of Fc-TA-1



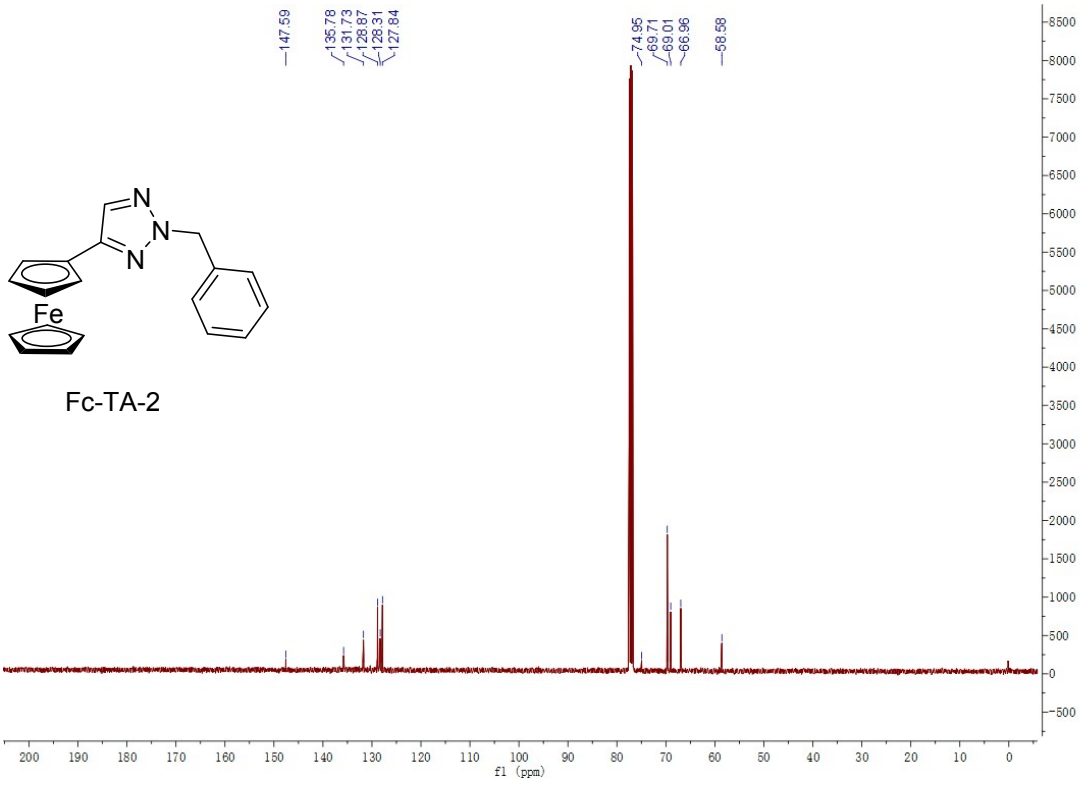
Fc-TA-1

^{1}H NMR Spectrum of Fc-TA-2



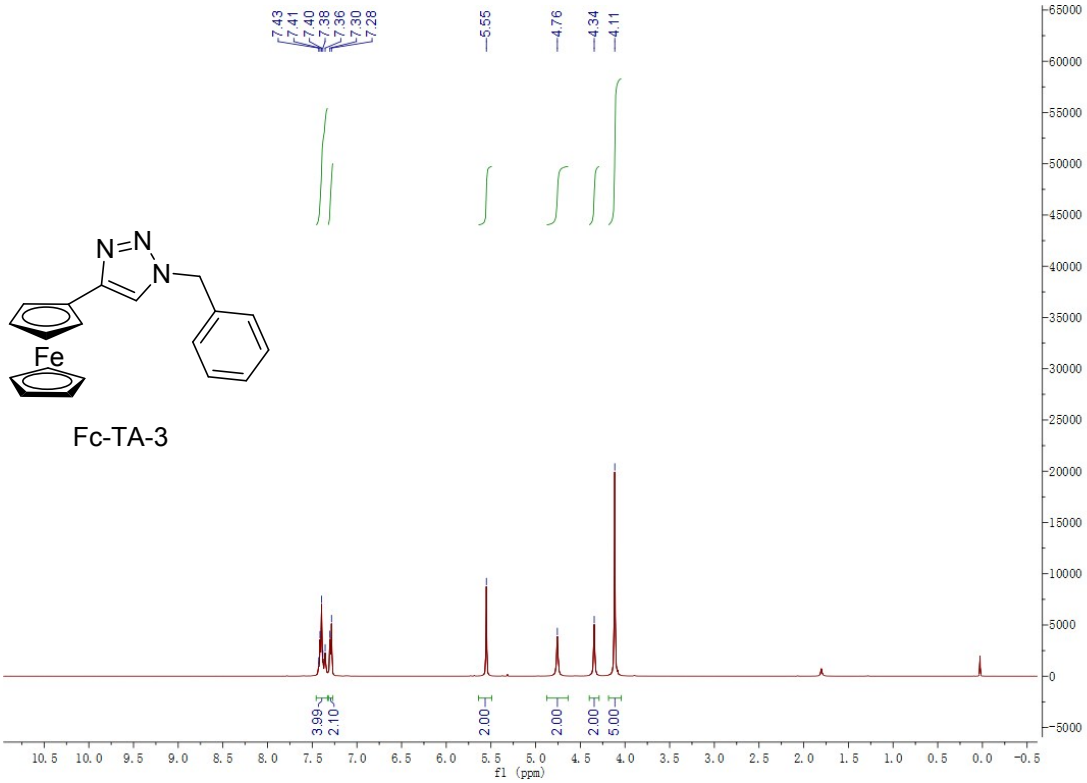
Fc-TA-2

^{13}C NMR Spectrum of Fc-TA-2



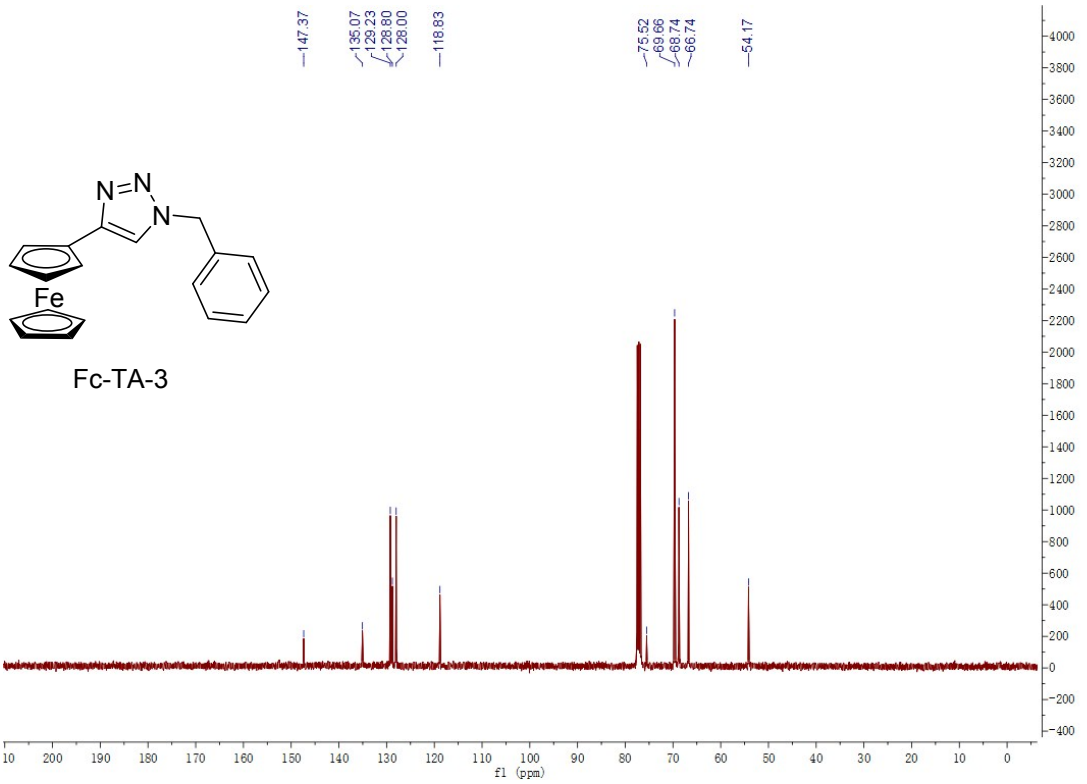
Fc-TA-2

^{1}H NMR Spectrum of Fc-TA-3



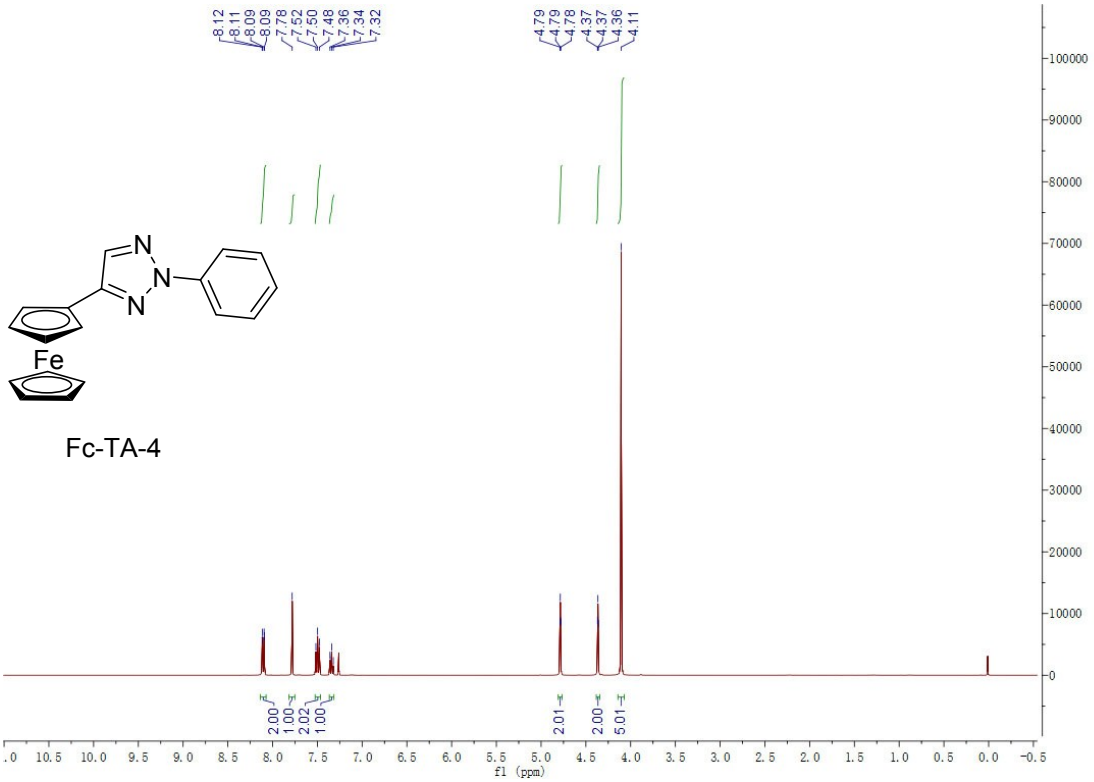
Fc-TA-3

^{13}C NMR Spectrum of Fc-TA-3

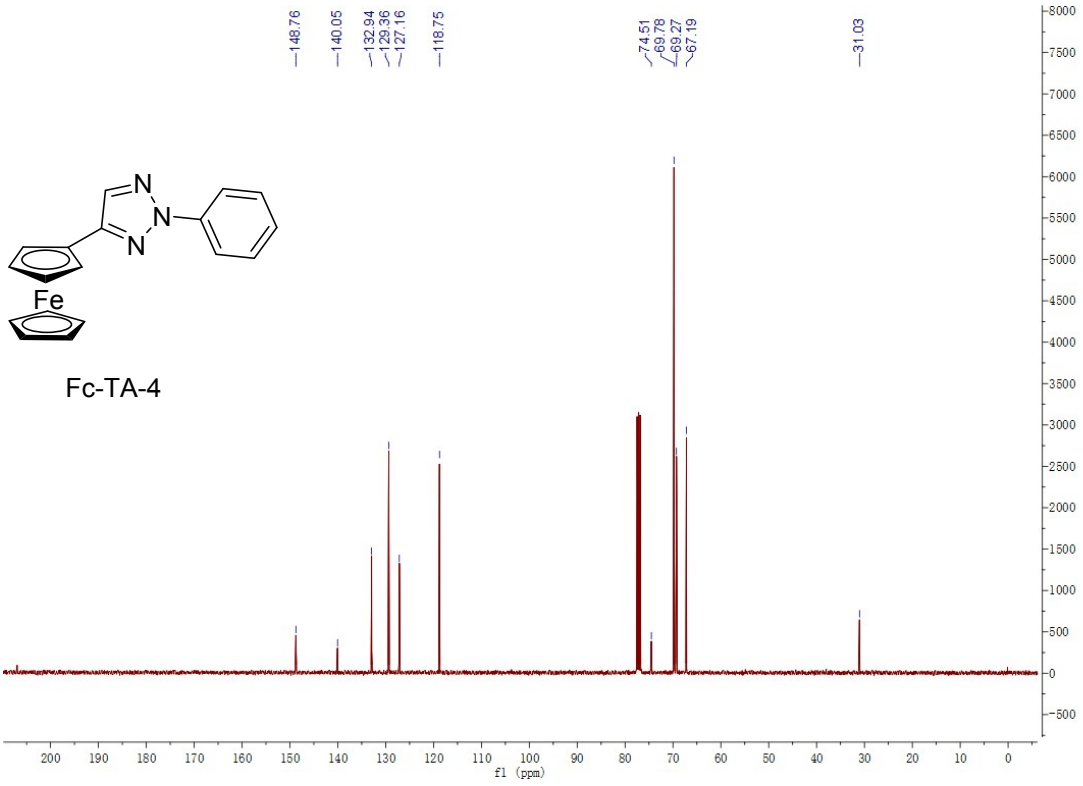


Fc-TA-3

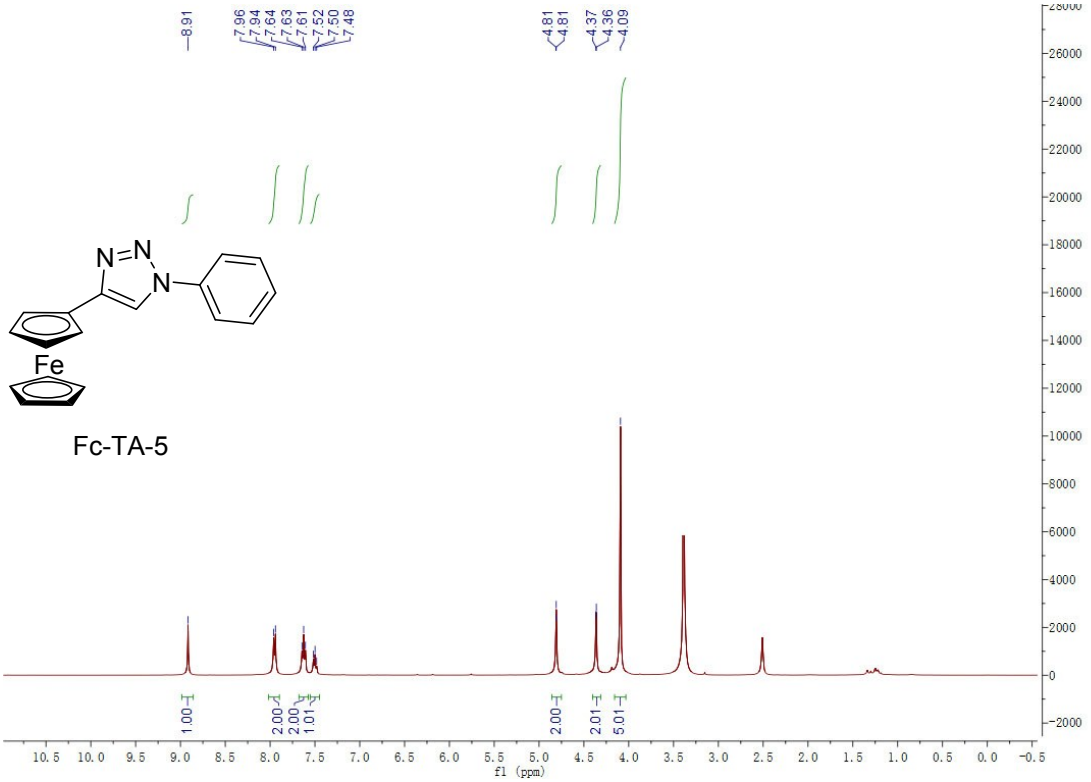
^{1}H NMR Spectrum of Fc-TA-4



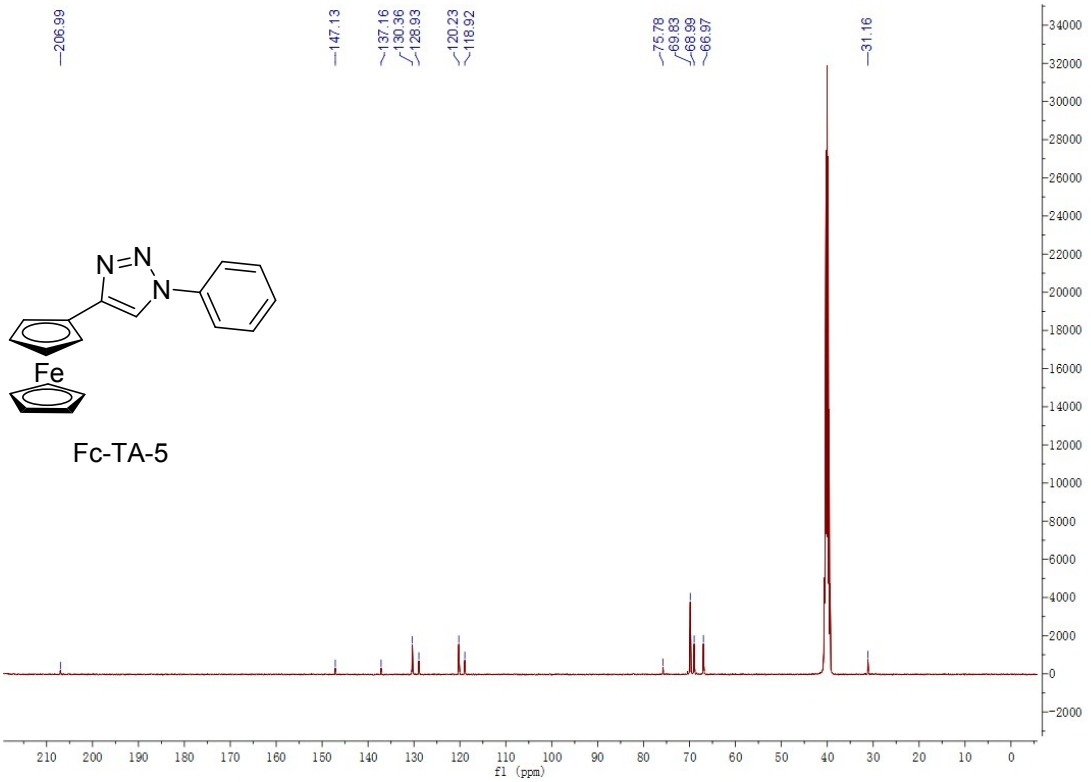
^{13}C NMR Spectrum of Fc-TA-4



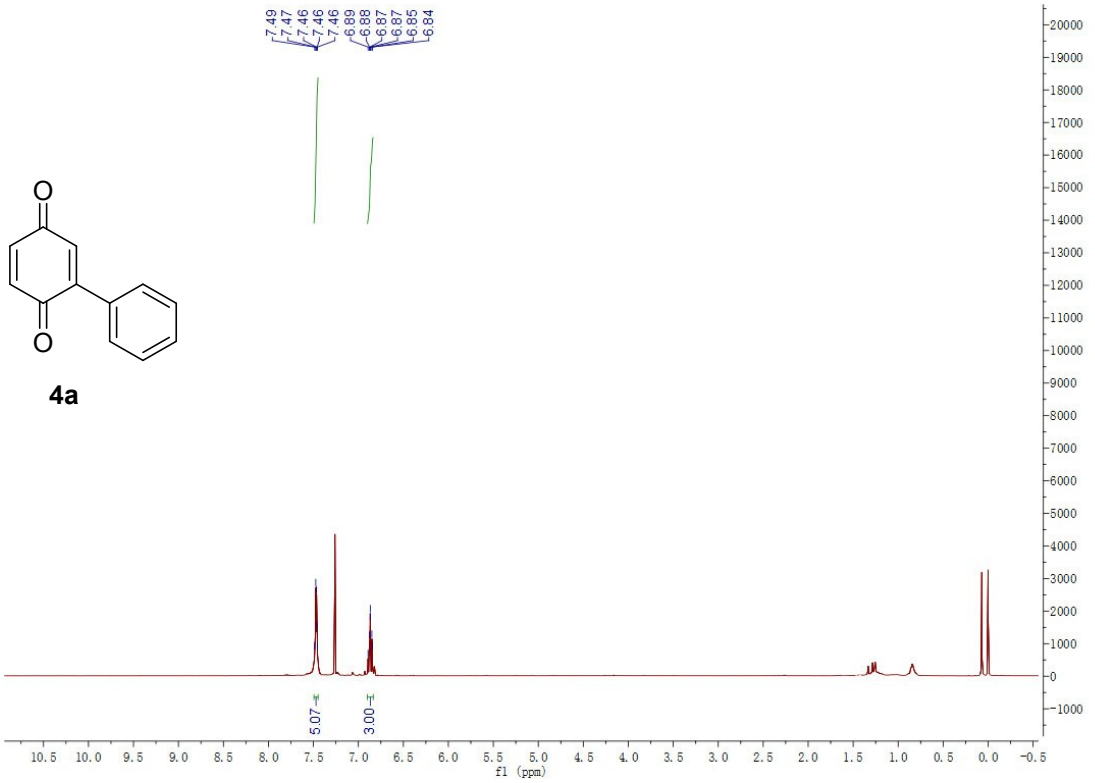
^{1}H NMR Spectrum of Fc-TA-5



^{13}C NMR Spectrum of Fc-TA-5

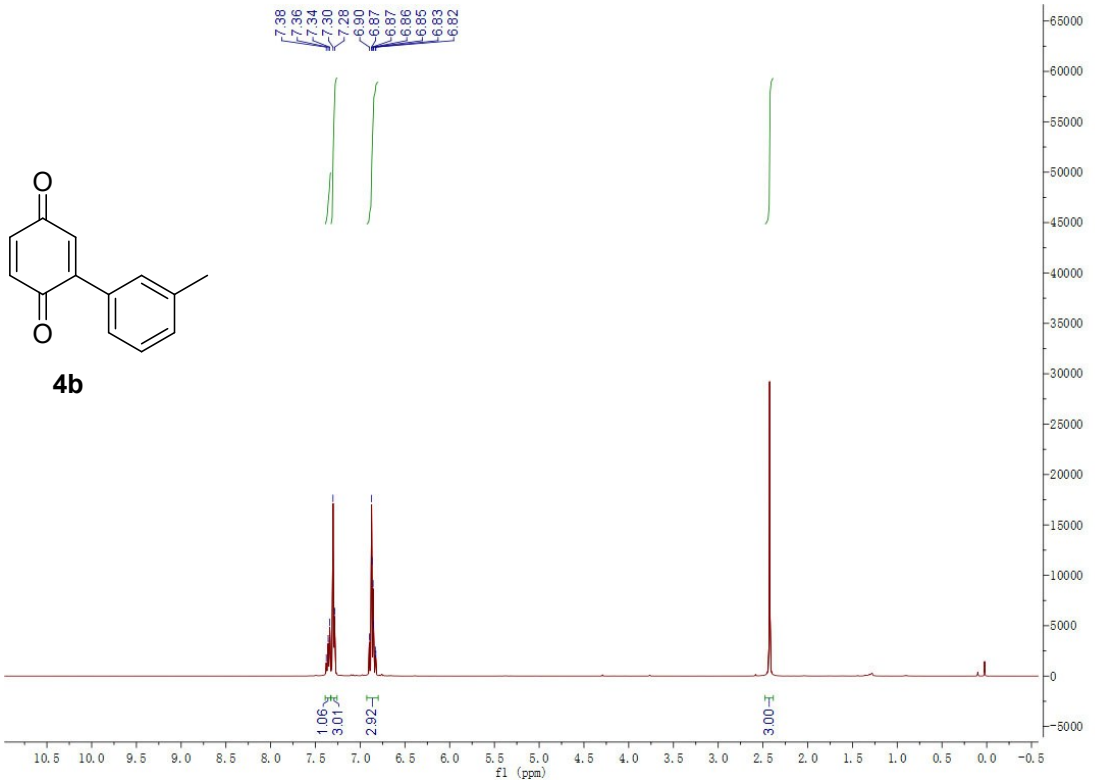


^{1}H NMR Spectrum of 4a



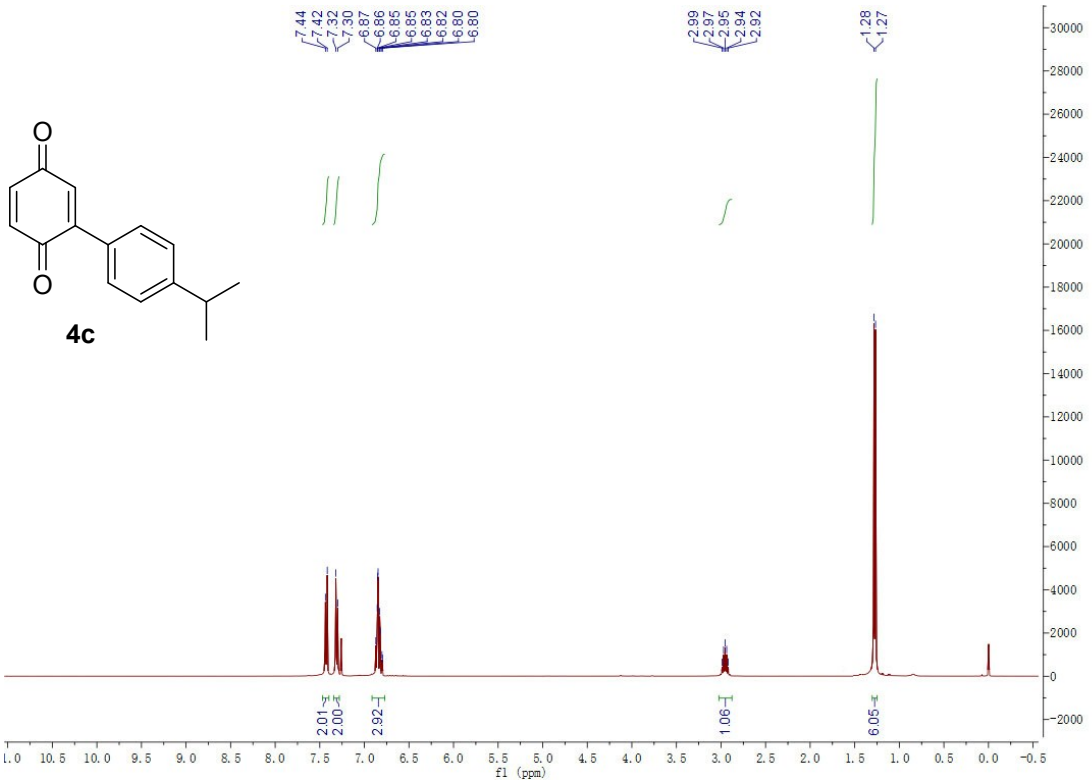
4a

^{1}H NMR Spectrum of 4b



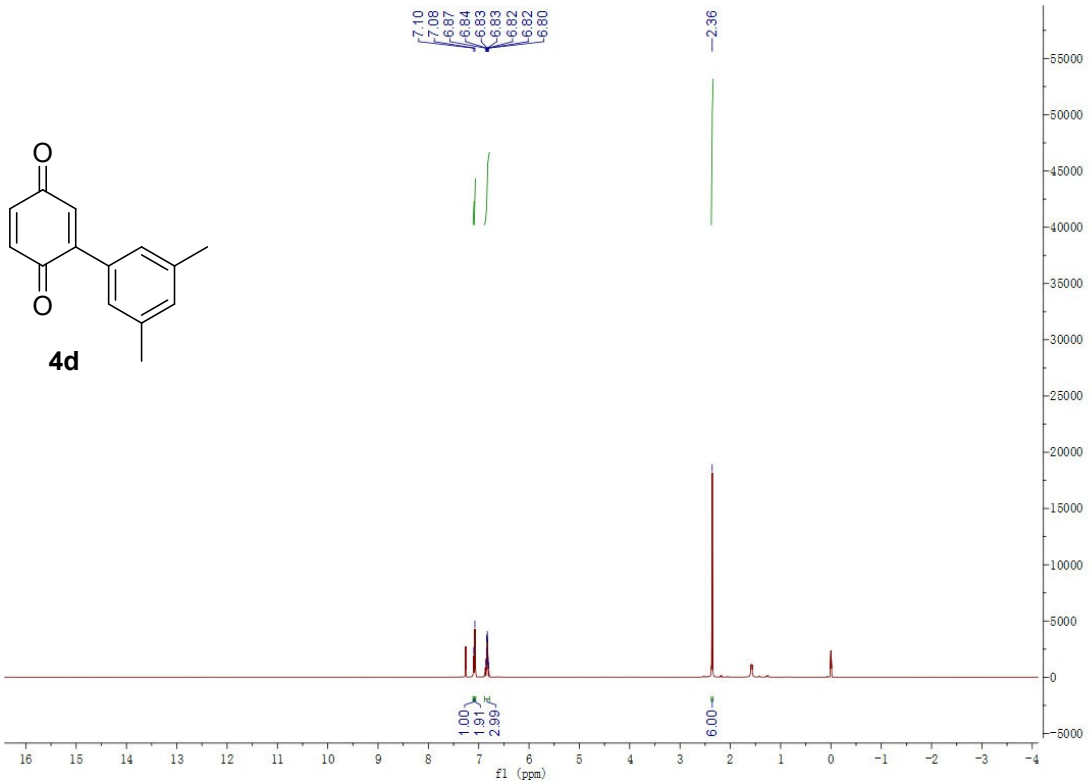
4b

^{1}H NMR Spectrum of 4c



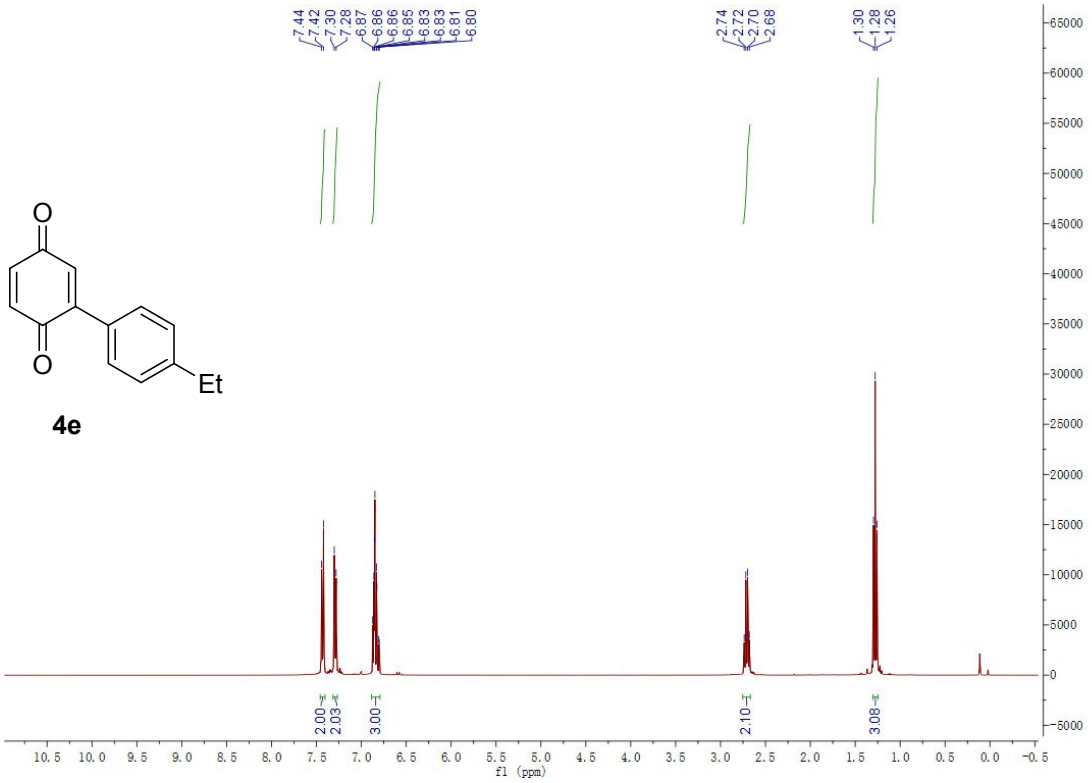
4c

^{1}H NMR Spectrum of 4d



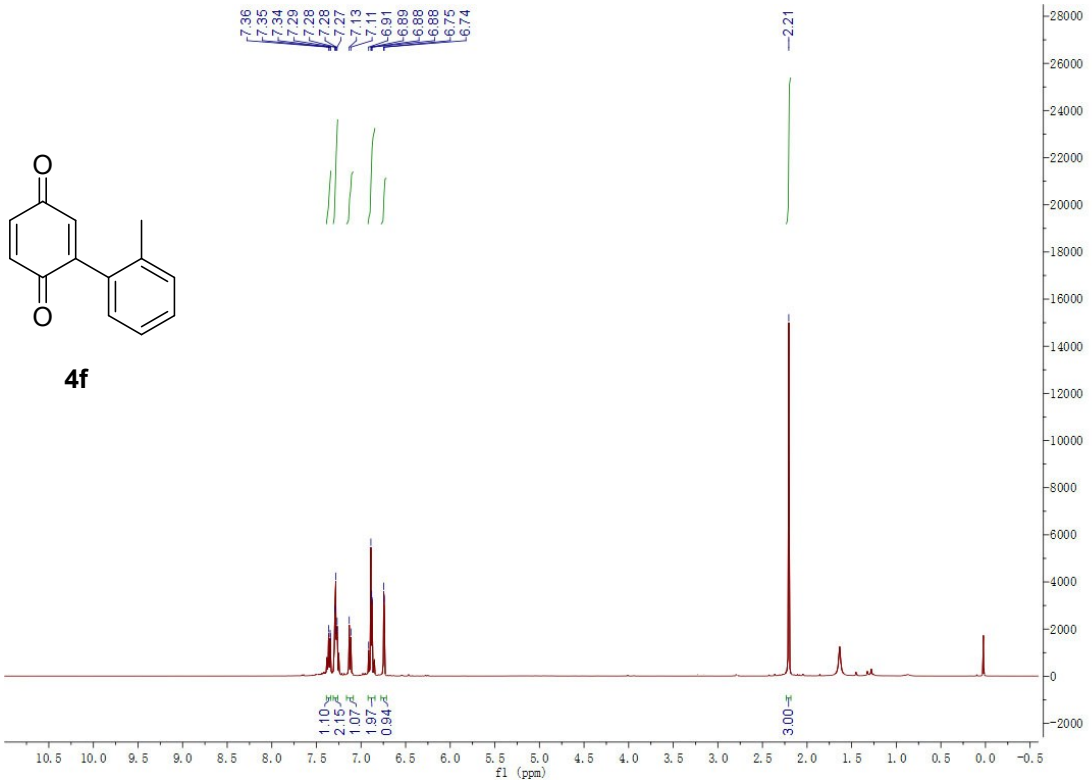
4d

^{1}H NMR Spectrum of 4e



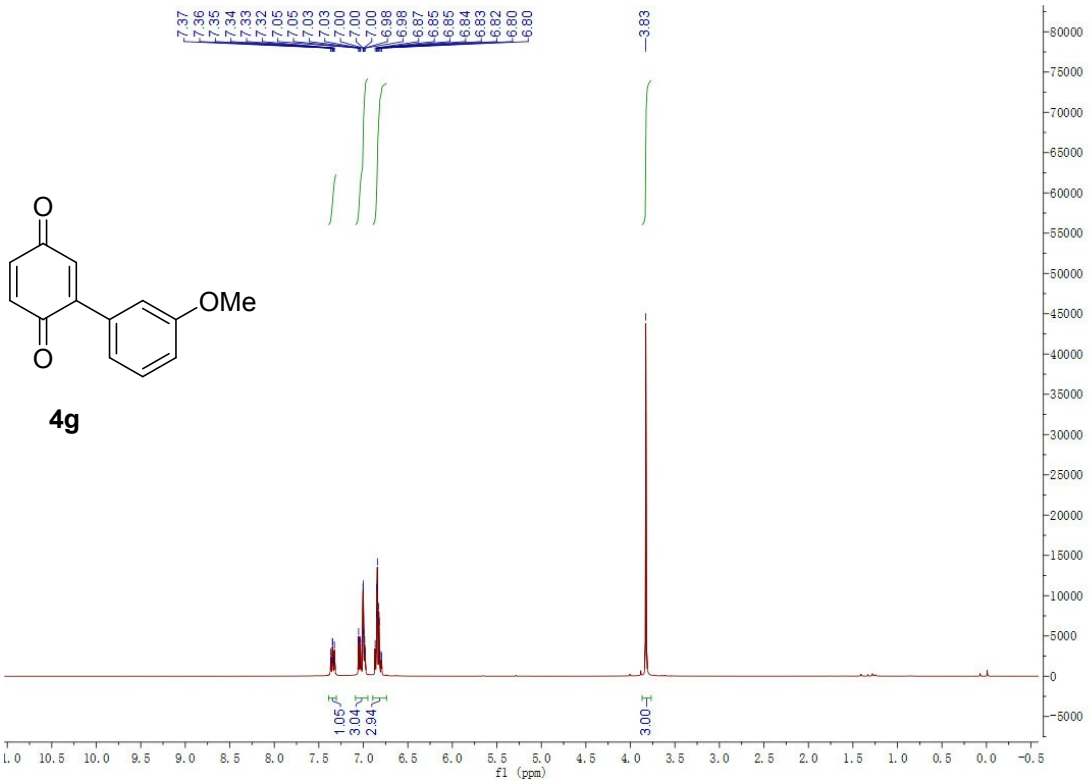
4e

^{1}H NMR Spectrum of 4f

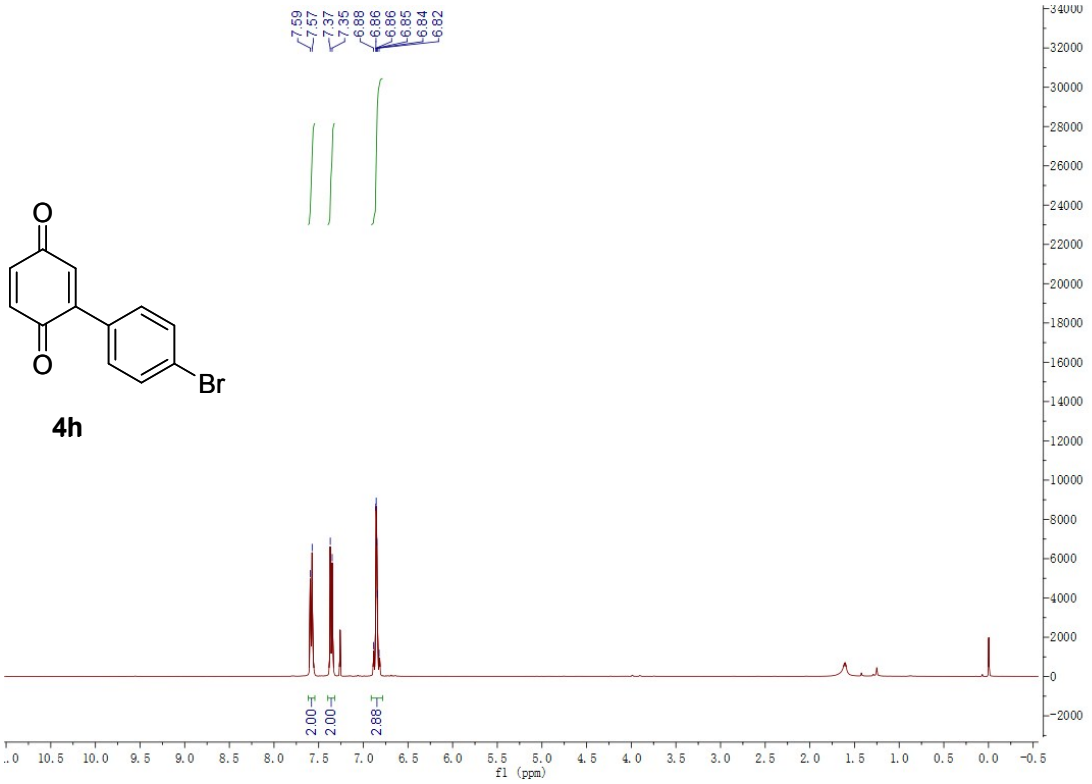


4f

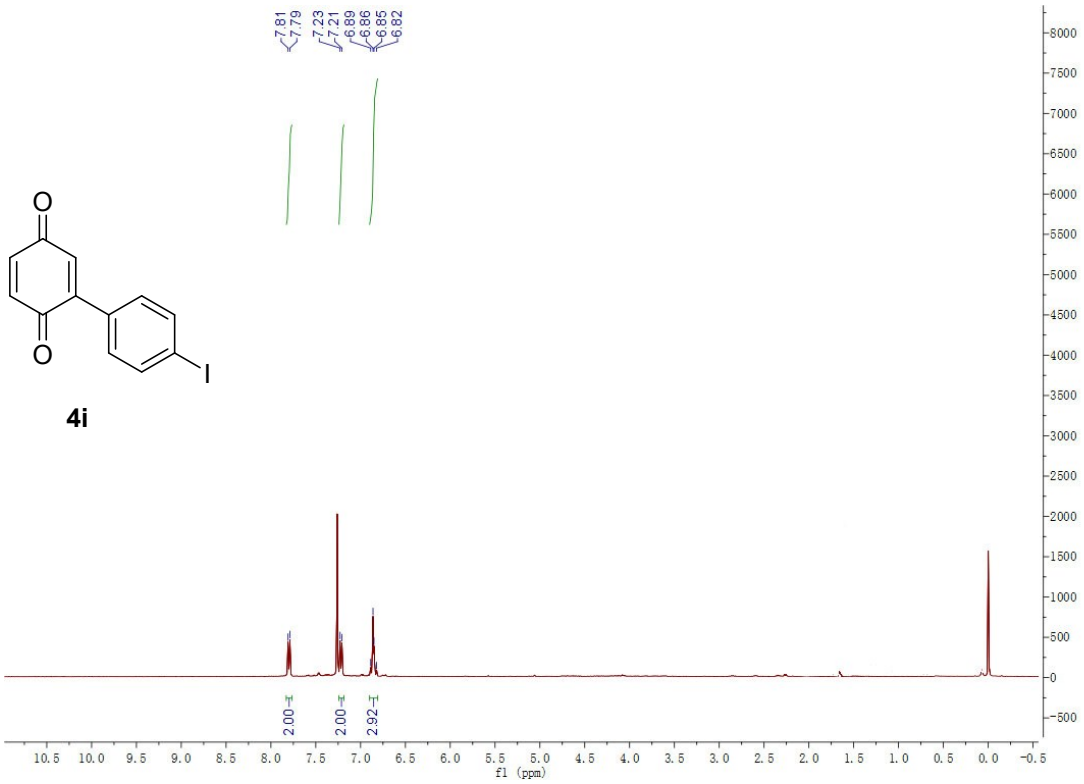
^{1}H NMR Spectrum of 4g



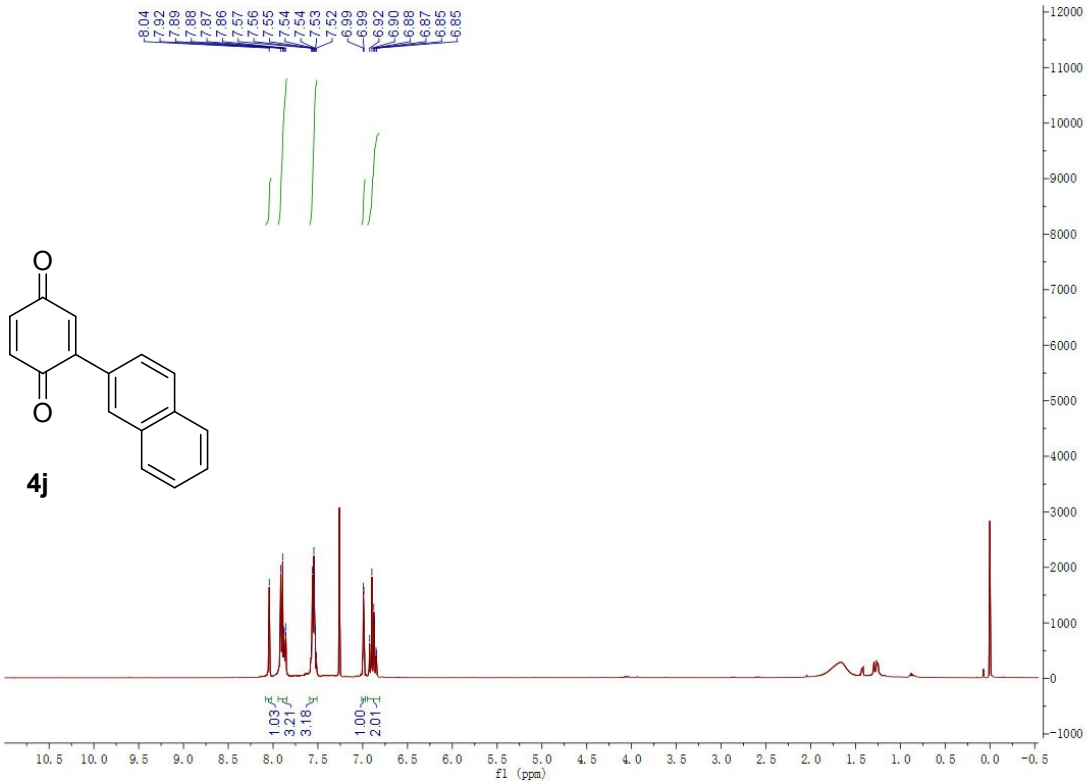
^{1}H NMR Spectrum of 4h



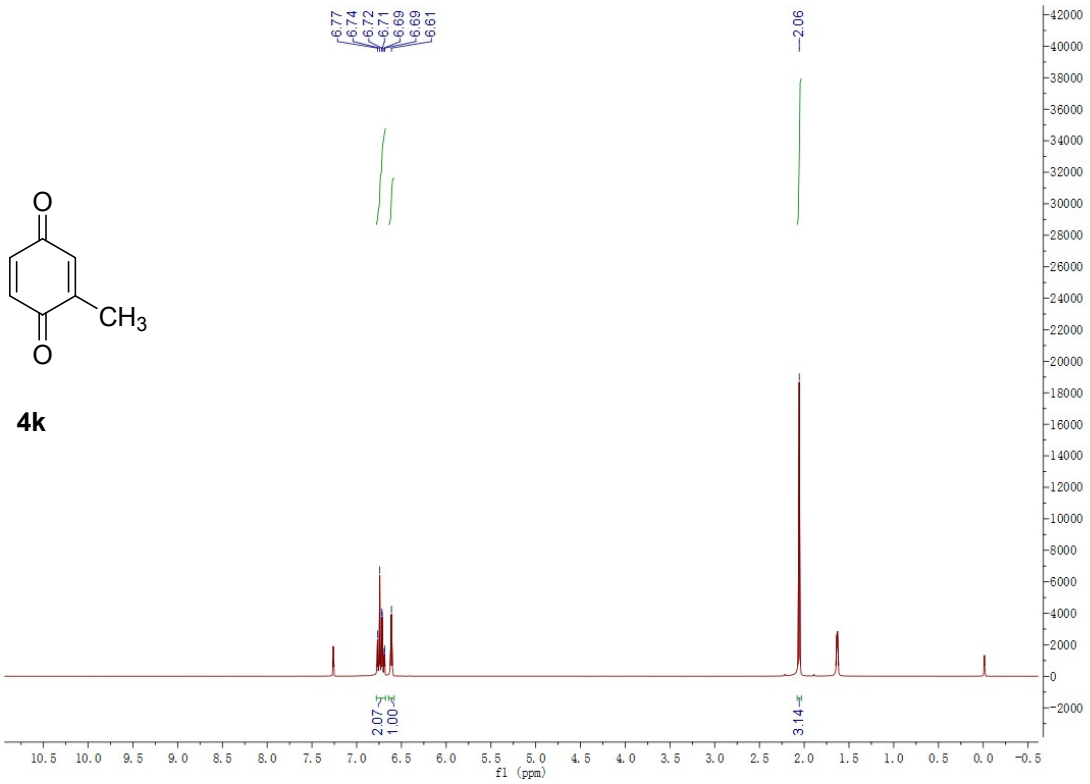
^{1}H NMR Spectrum of 4i



^{1}H NMR Spectrum of 4j

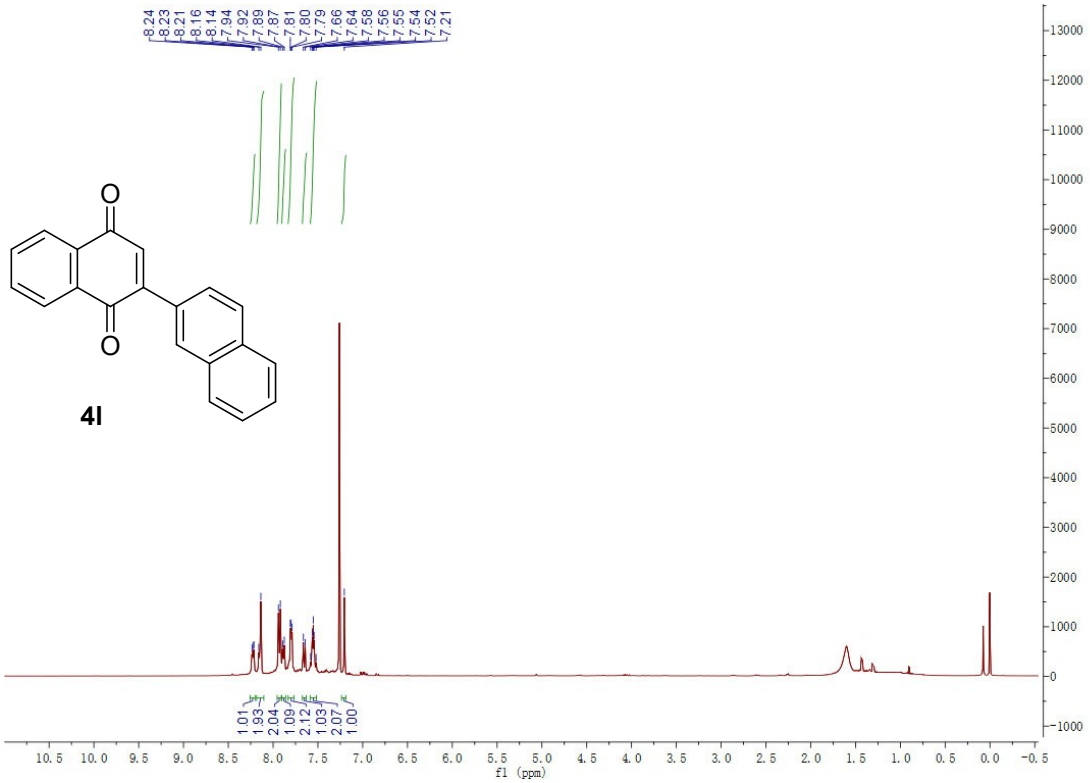


^{1}H NMR Spectrum of 4k



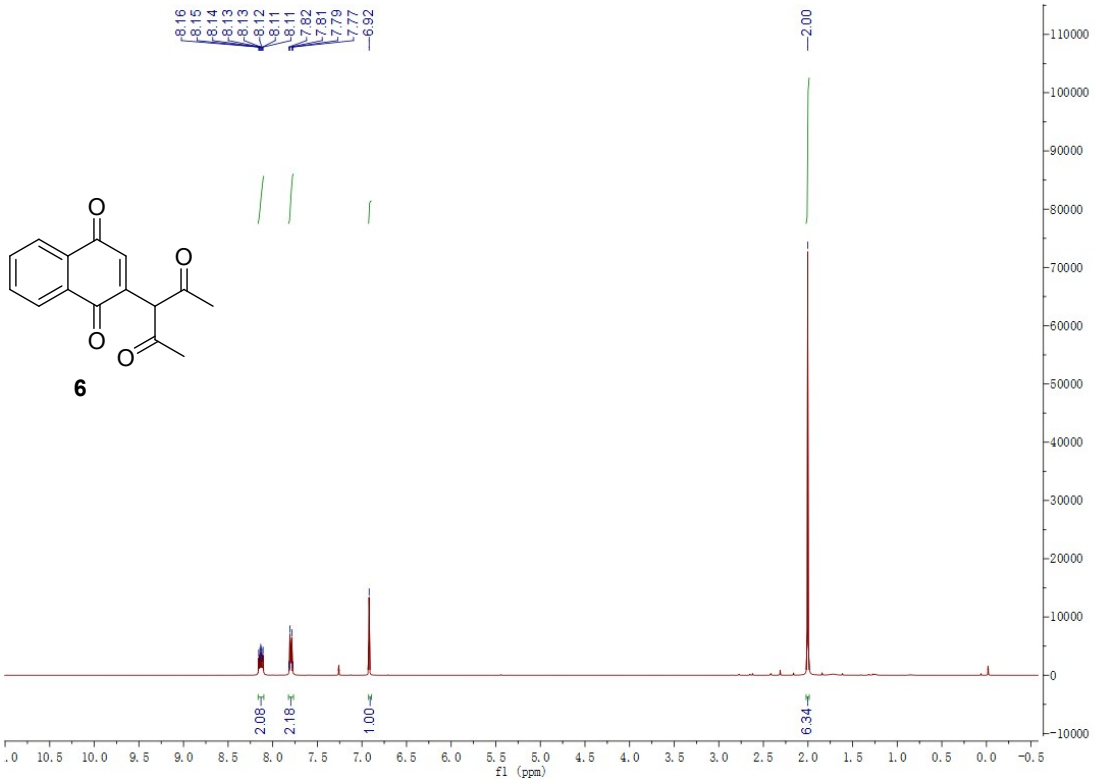
4k

^{1}H NMR Spectrum of 4l



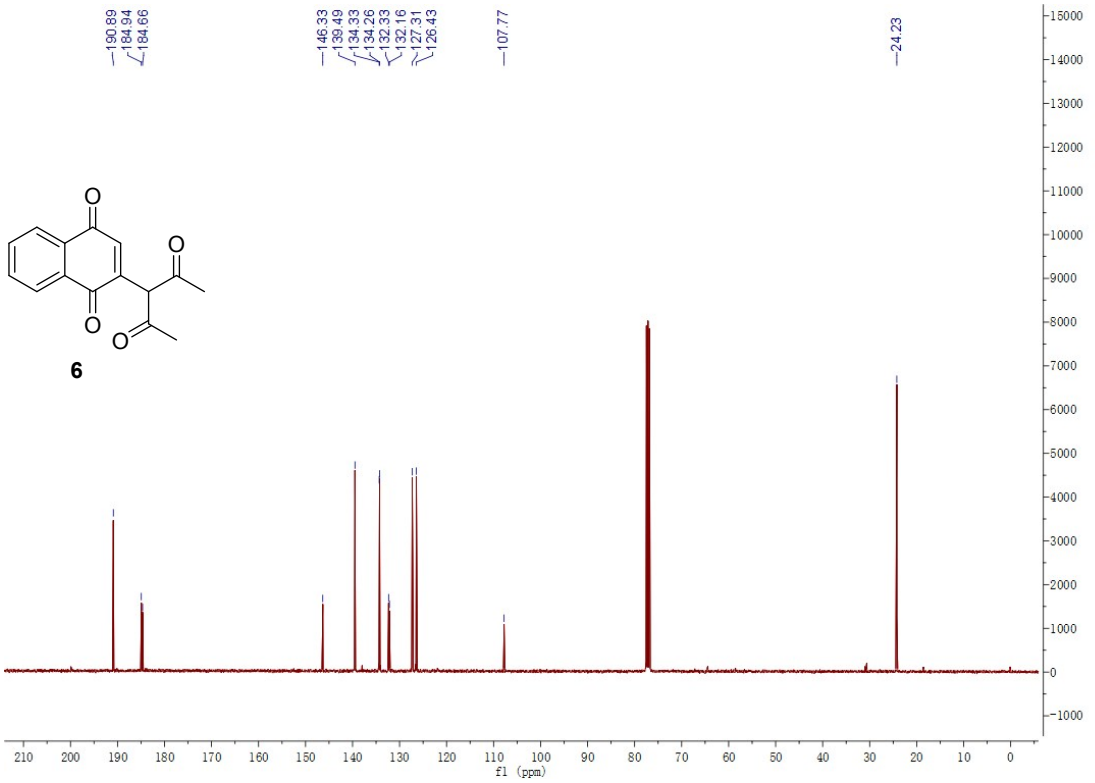
4l

^{1}H NMR Spectrum of 6



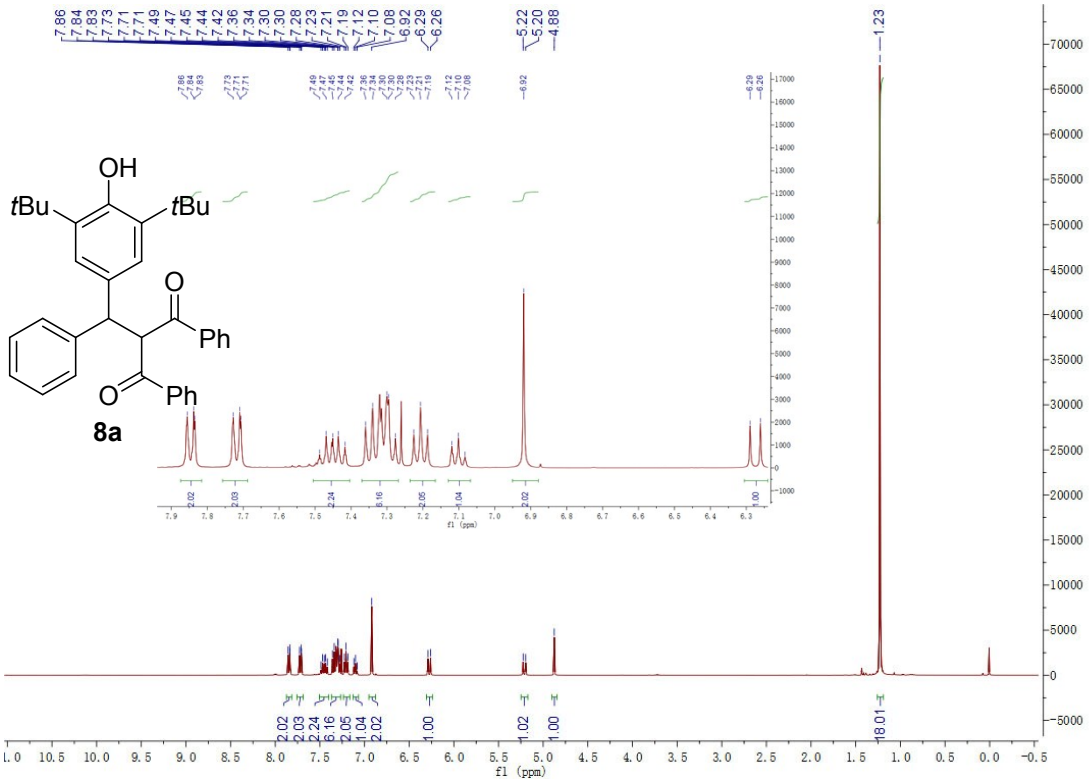
6

^{13}C NMR Spectrum of 6

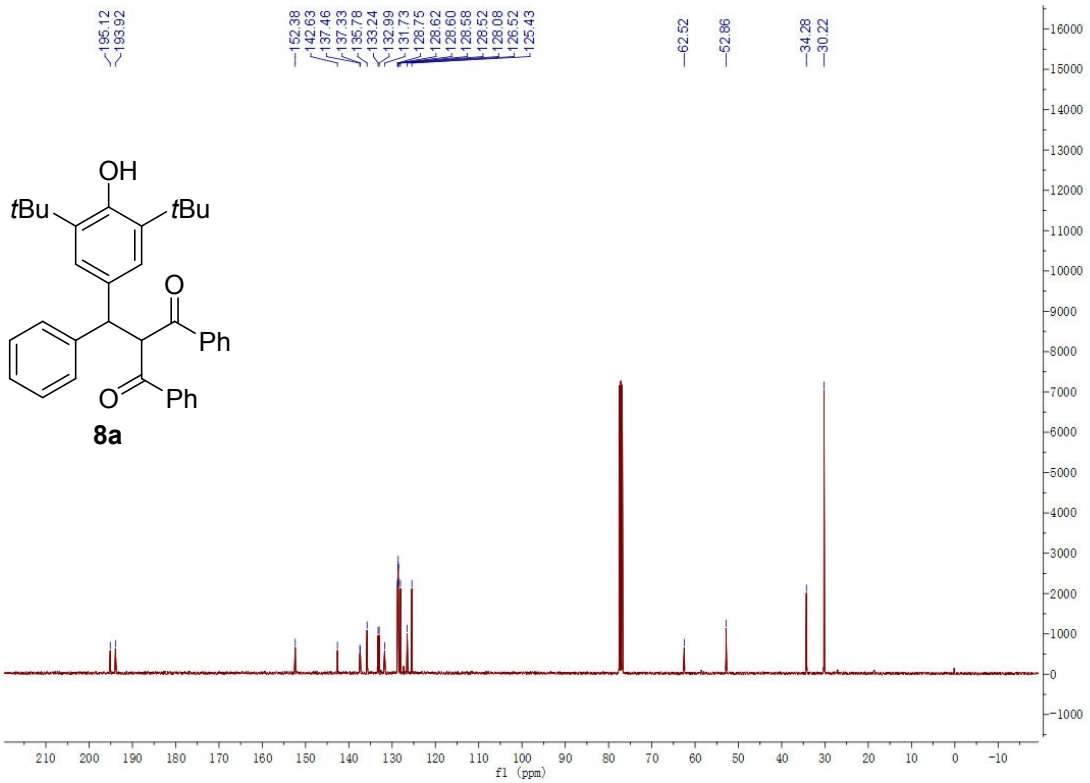


6

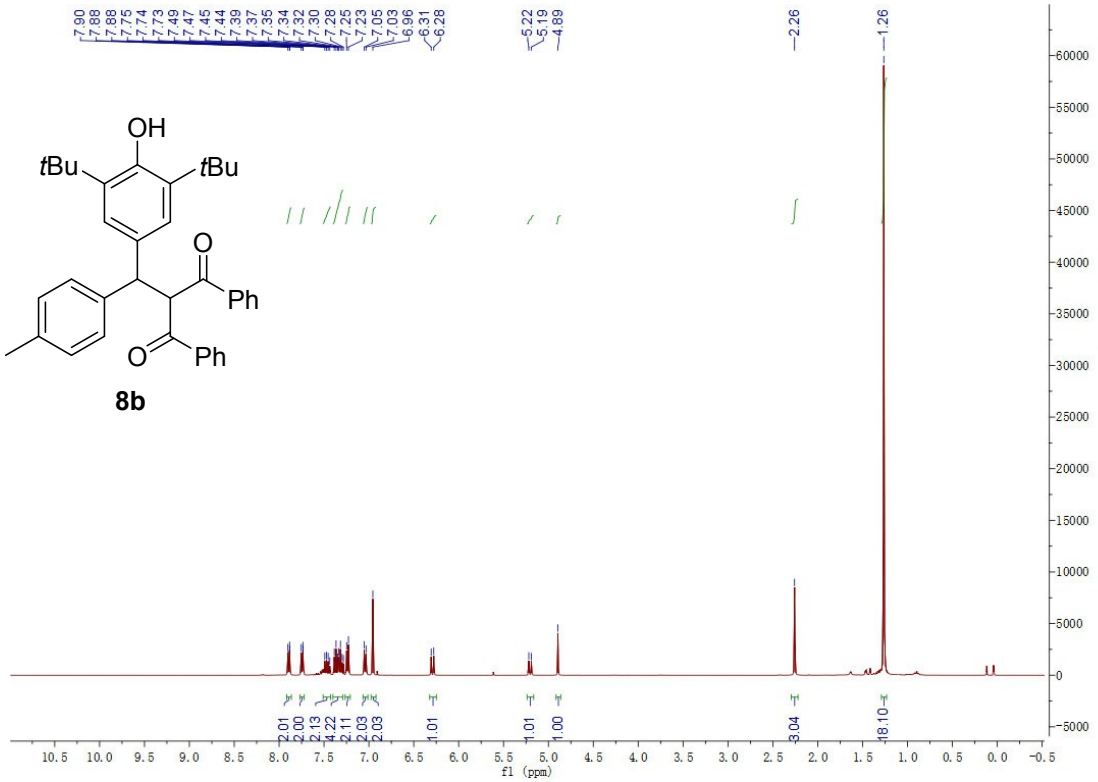
^{1}H NMR Spectrum of 8a



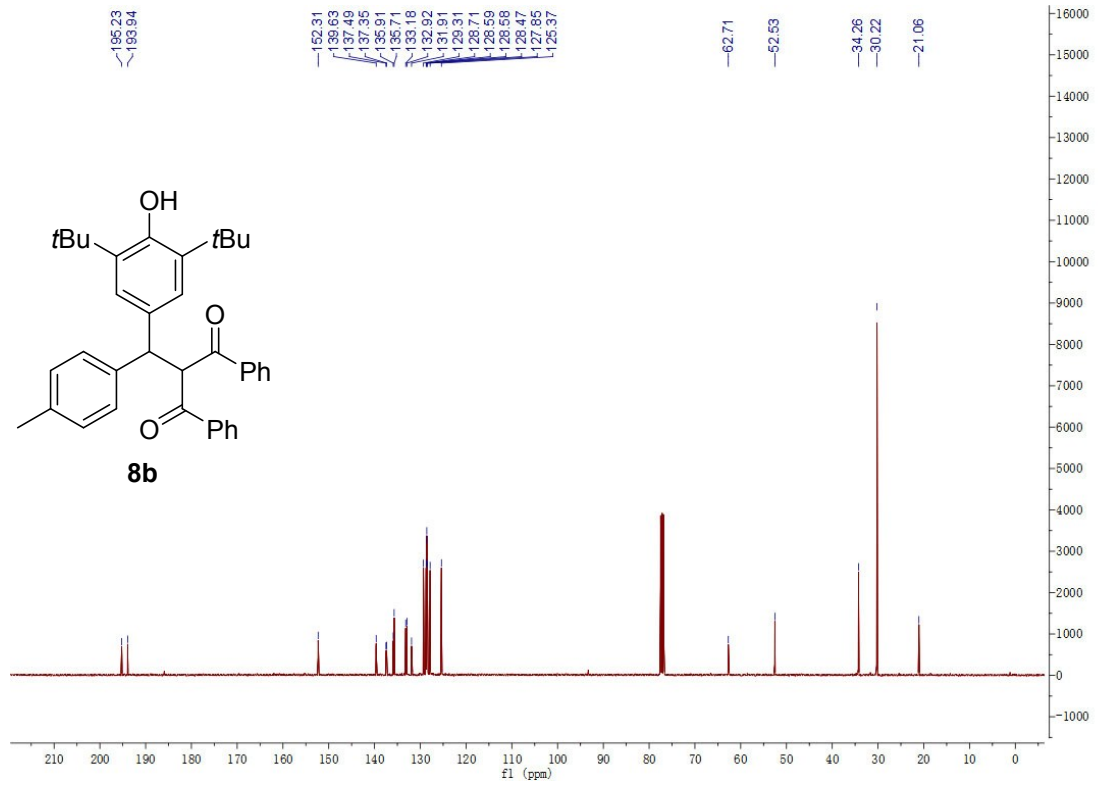
^{13}C NMR Spectrum of 8a



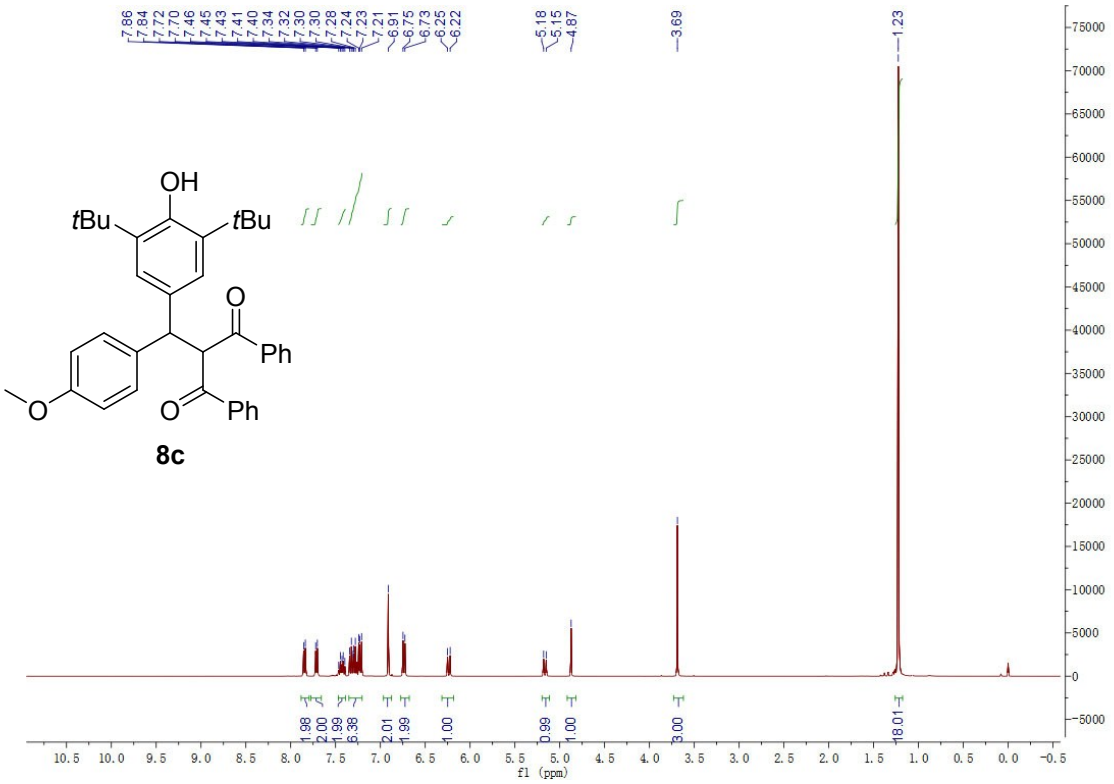
^{1}H NMR Spectrum of 8b



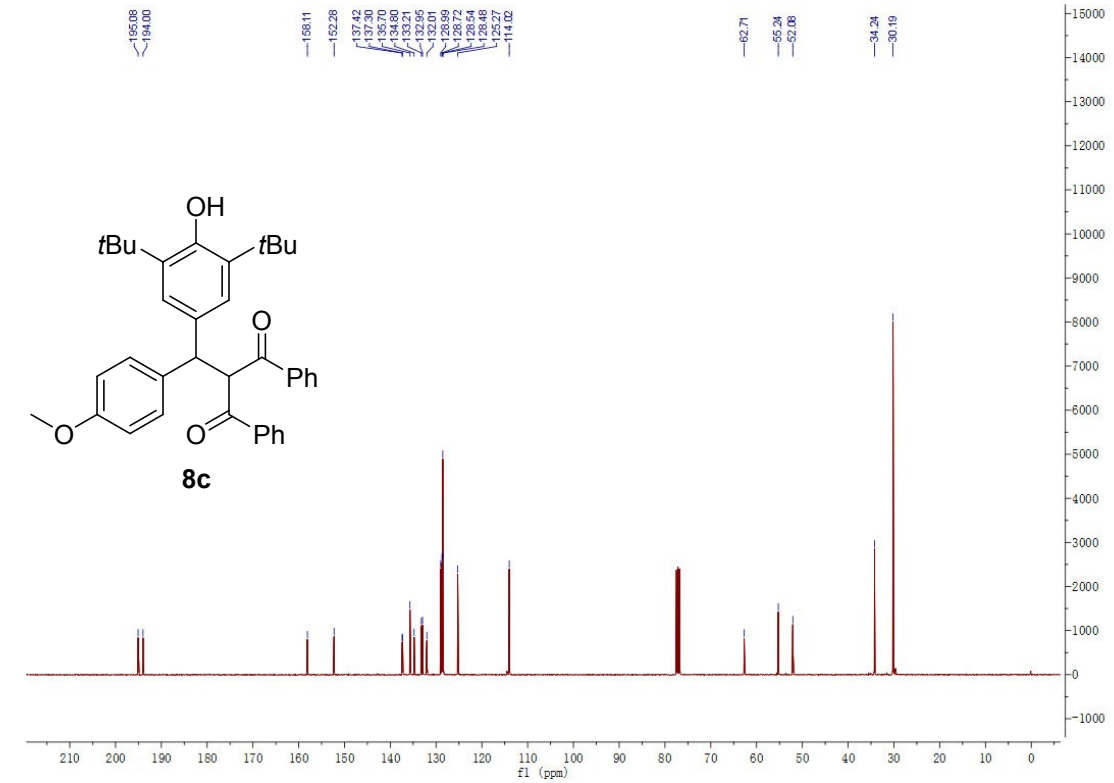
^{13}C NMR Spectrum of 8b



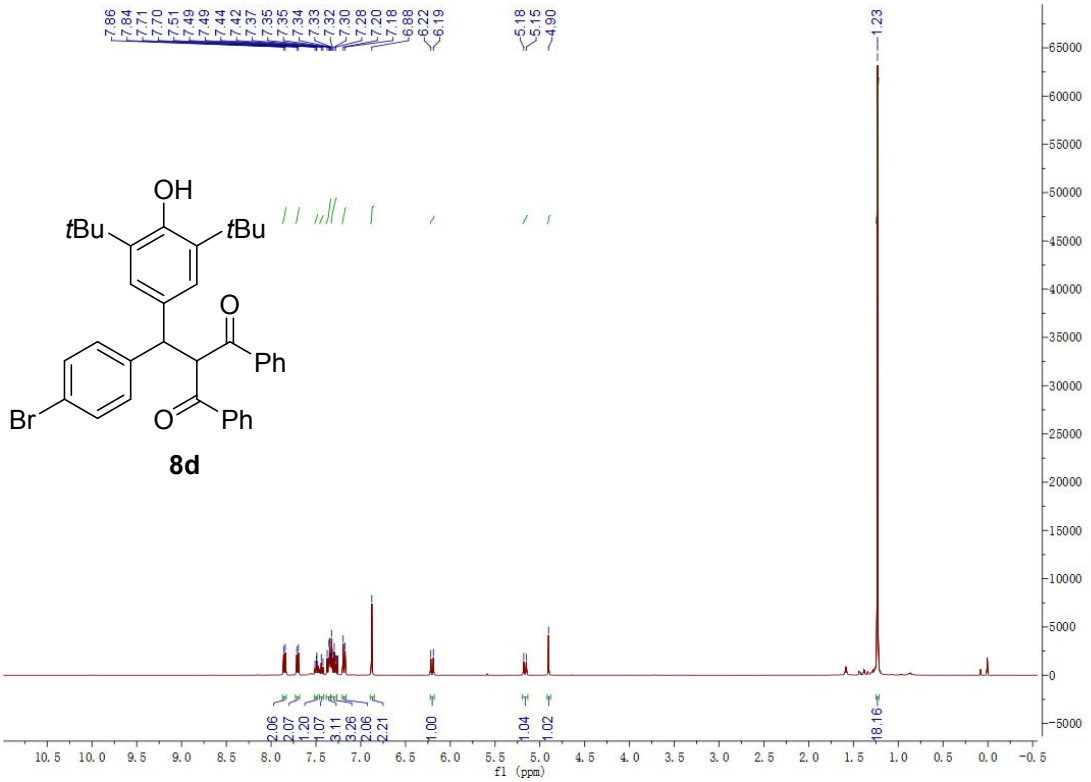
^{1}H NMR Spectrum of 8c



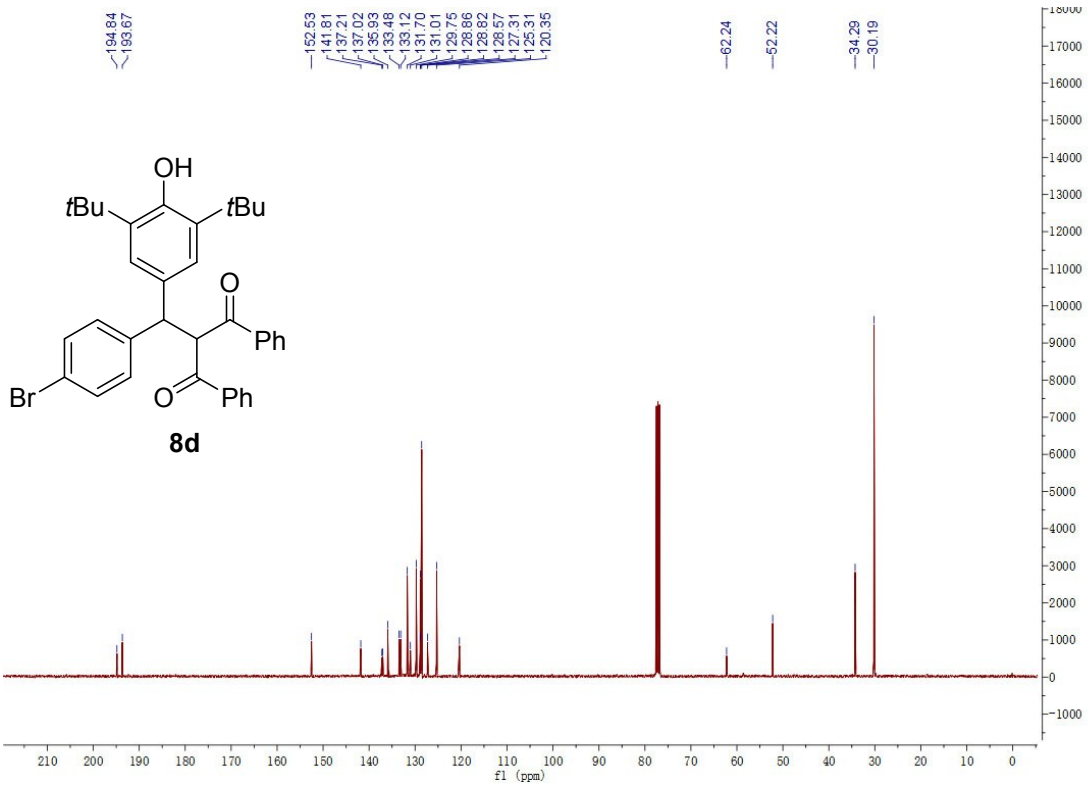
^{13}C NMR Spectrum of 8c



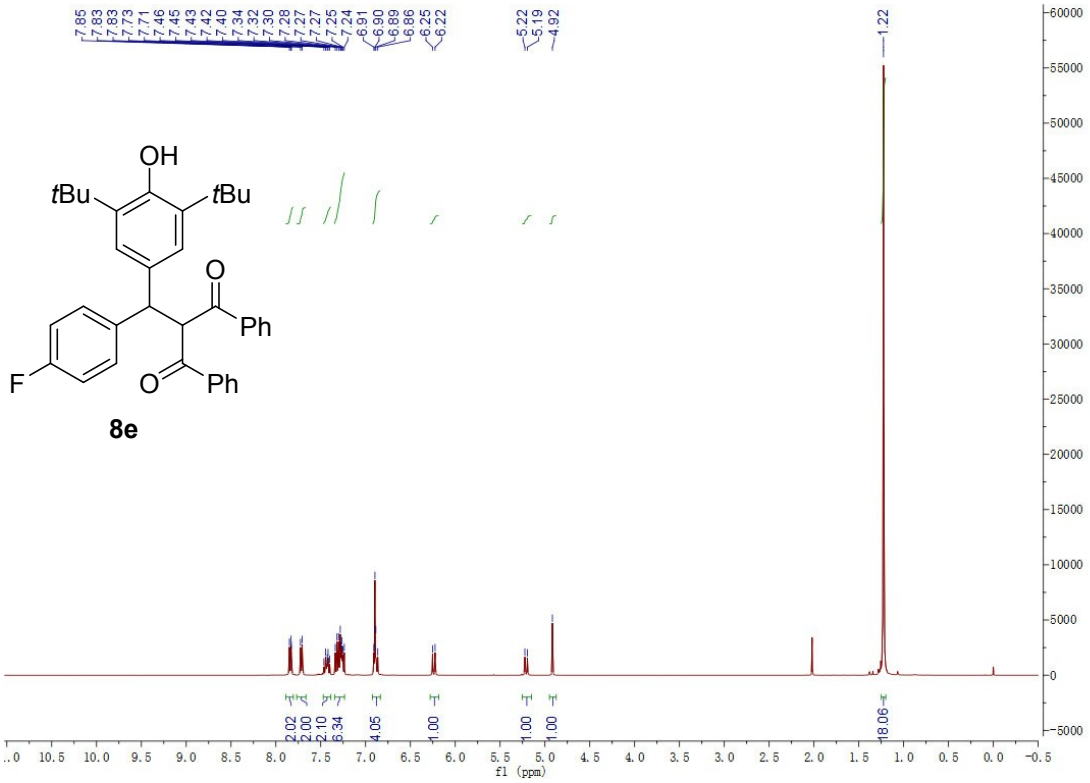
^{1}H NMR Spectrum of 8d



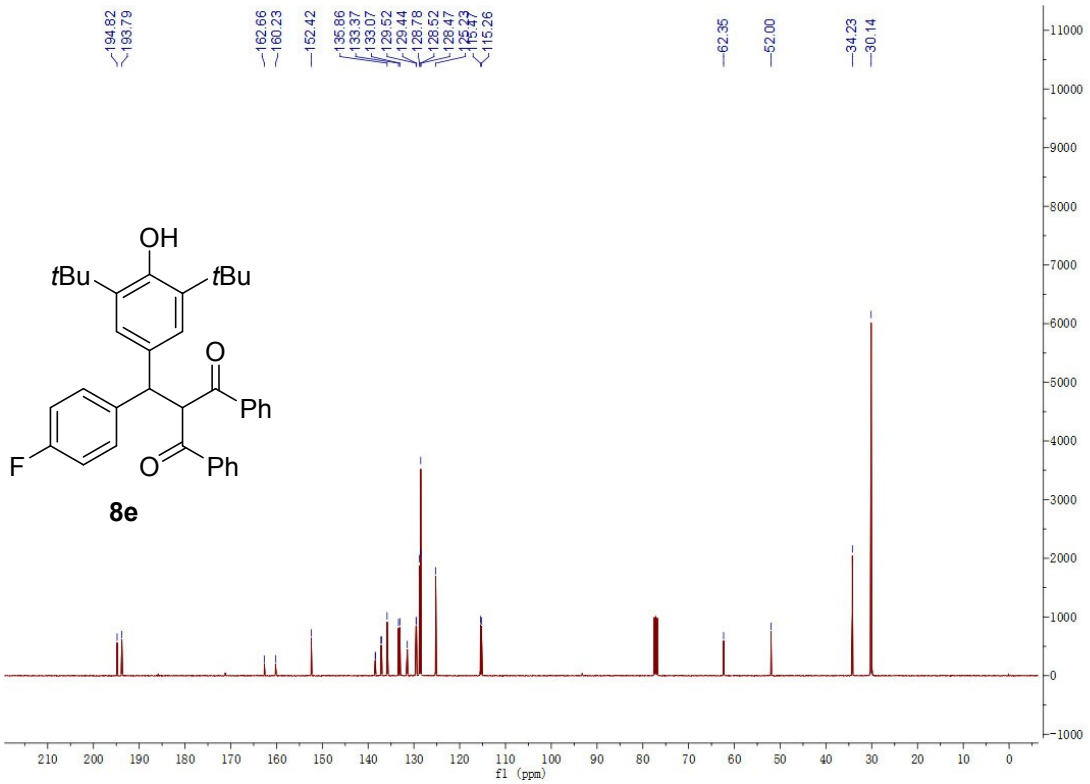
^{13}C NMR Spectrum of 8d



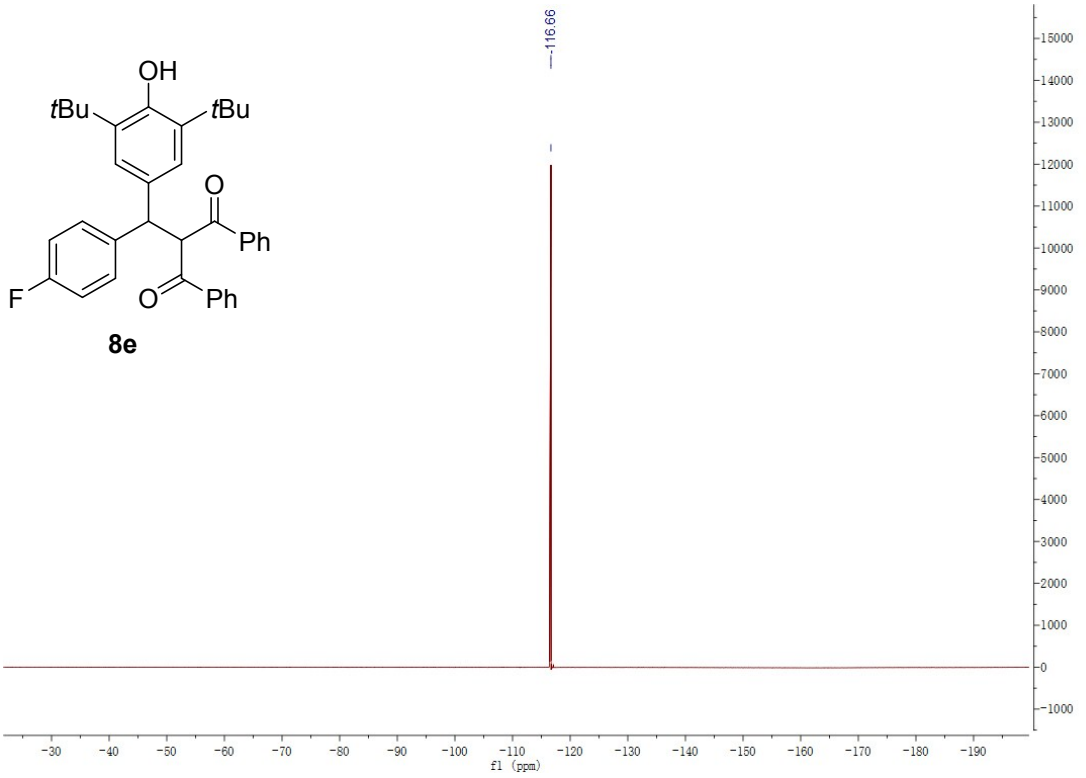
^{1}H NMR Spectrum of 8e



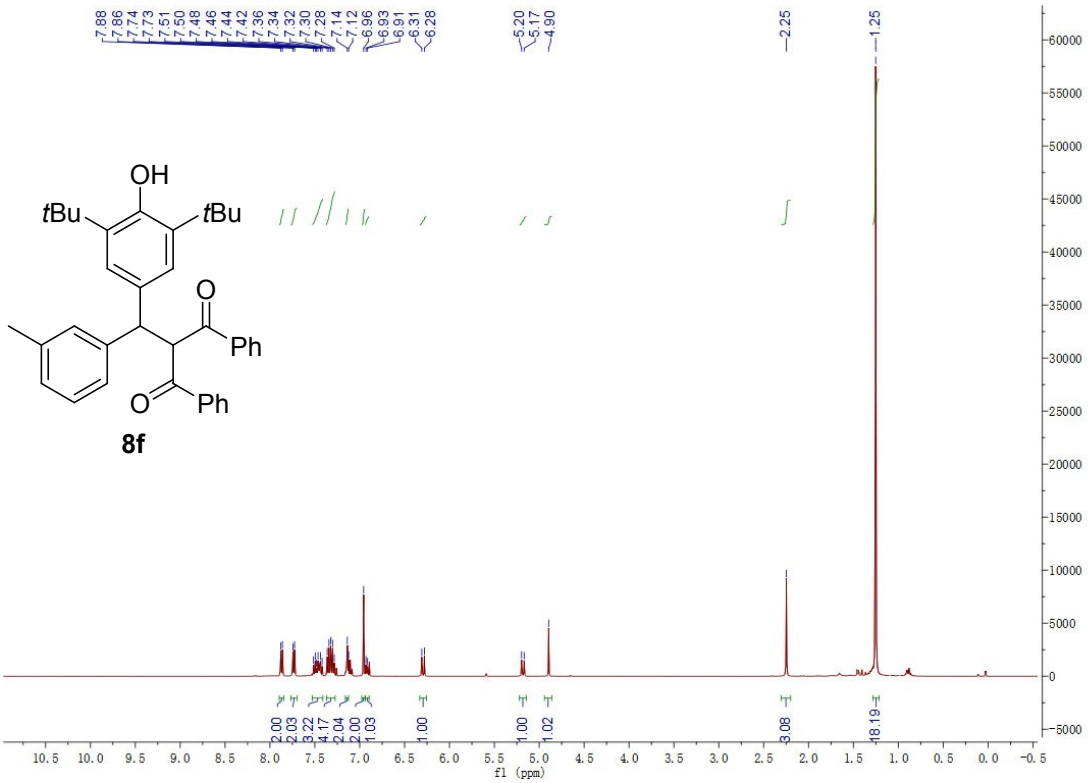
^{13}C NMR Spectrum of 8e



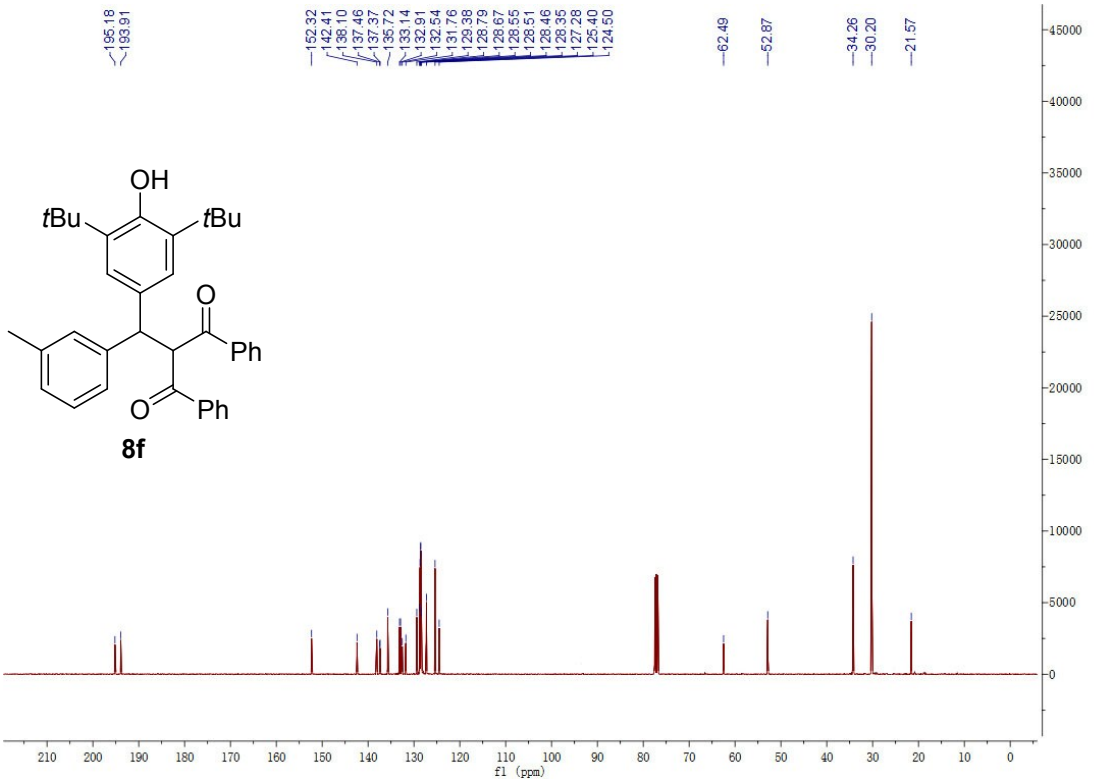
^{19}F NMR Spectrum of 8e



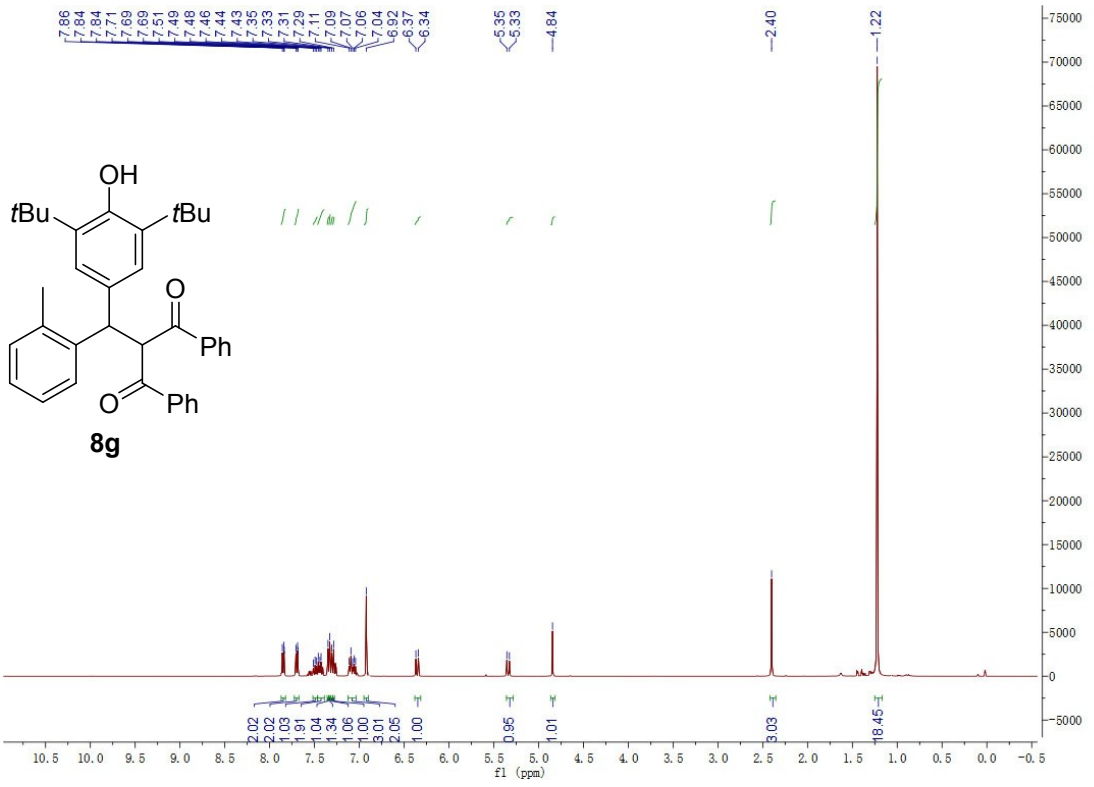
^{1}H NMR Spectrum of 8f



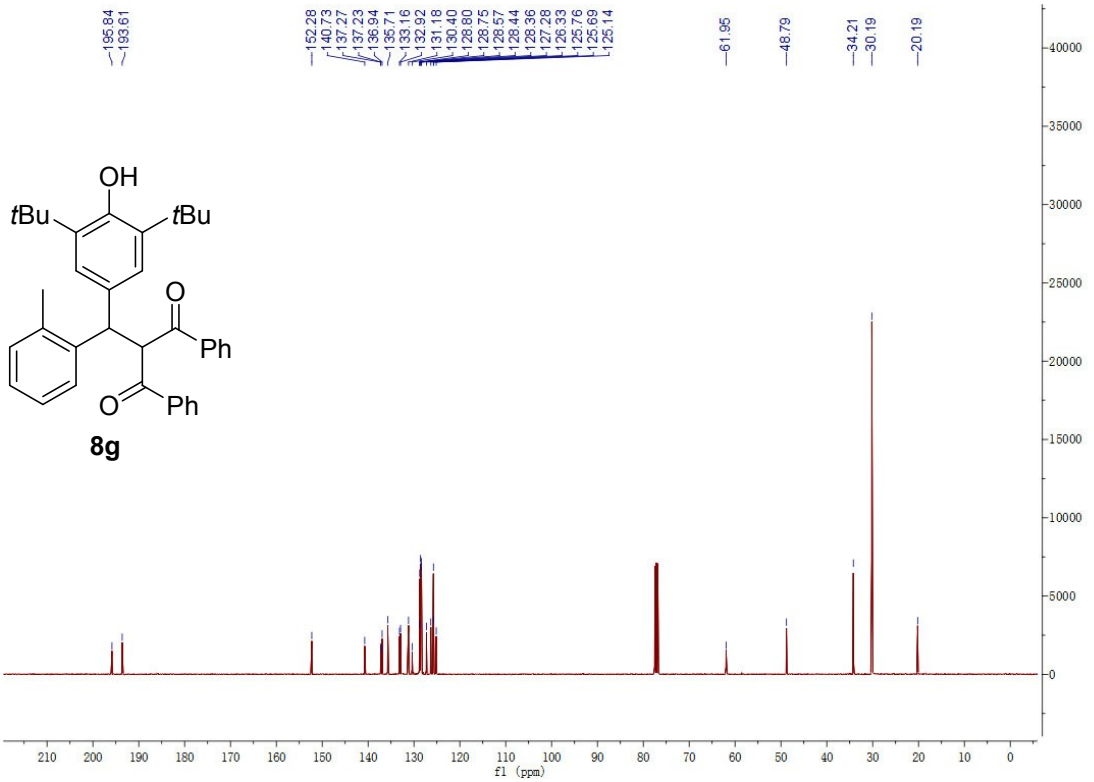
^{13}C NMR Spectrum of 8f



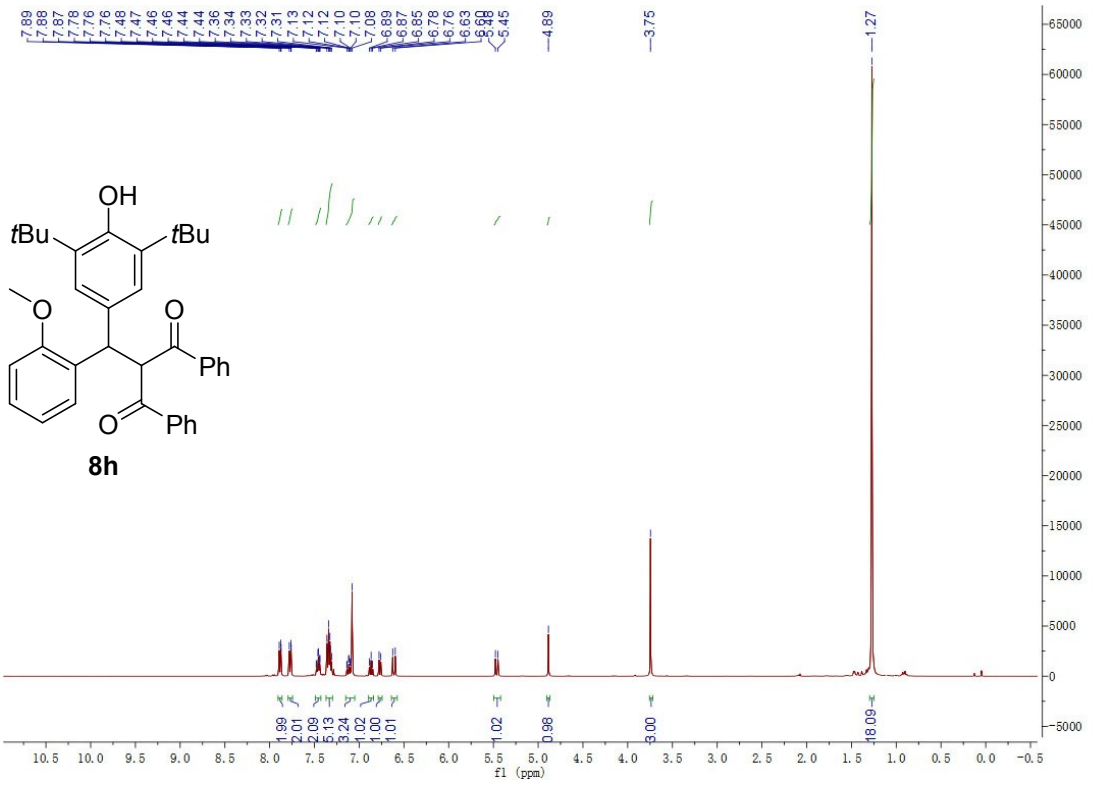
^{1}H NMR Spectrum of 8g



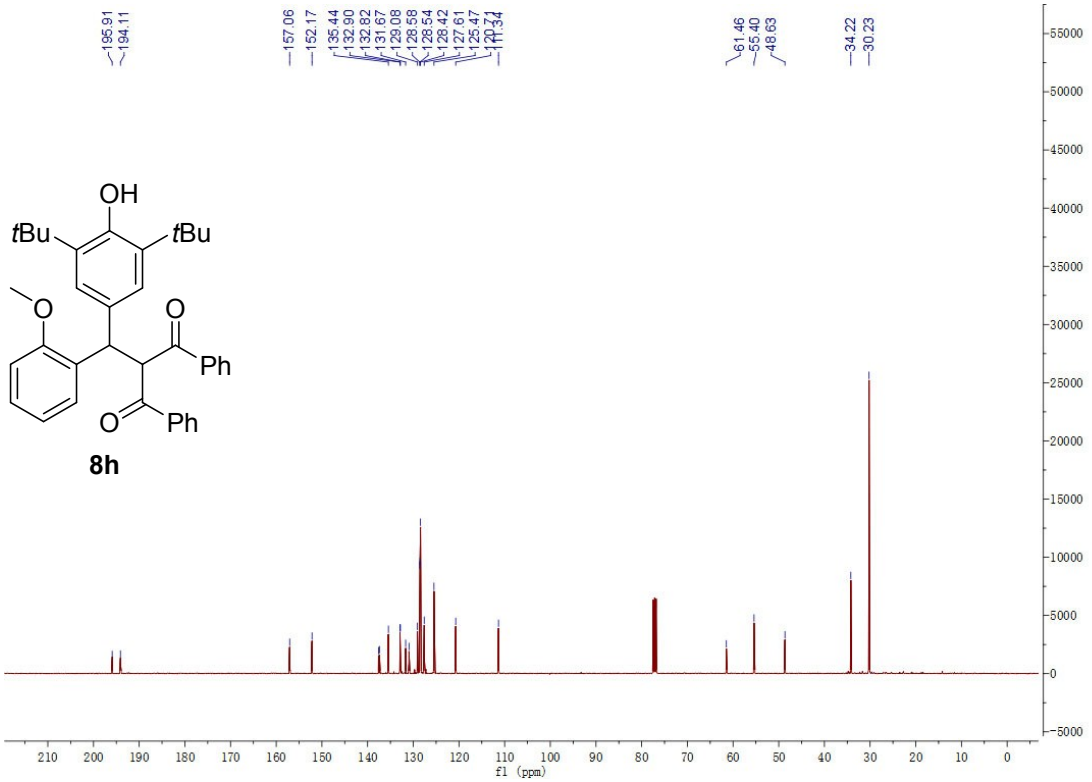
^{13}C NMR Spectrum of 8g



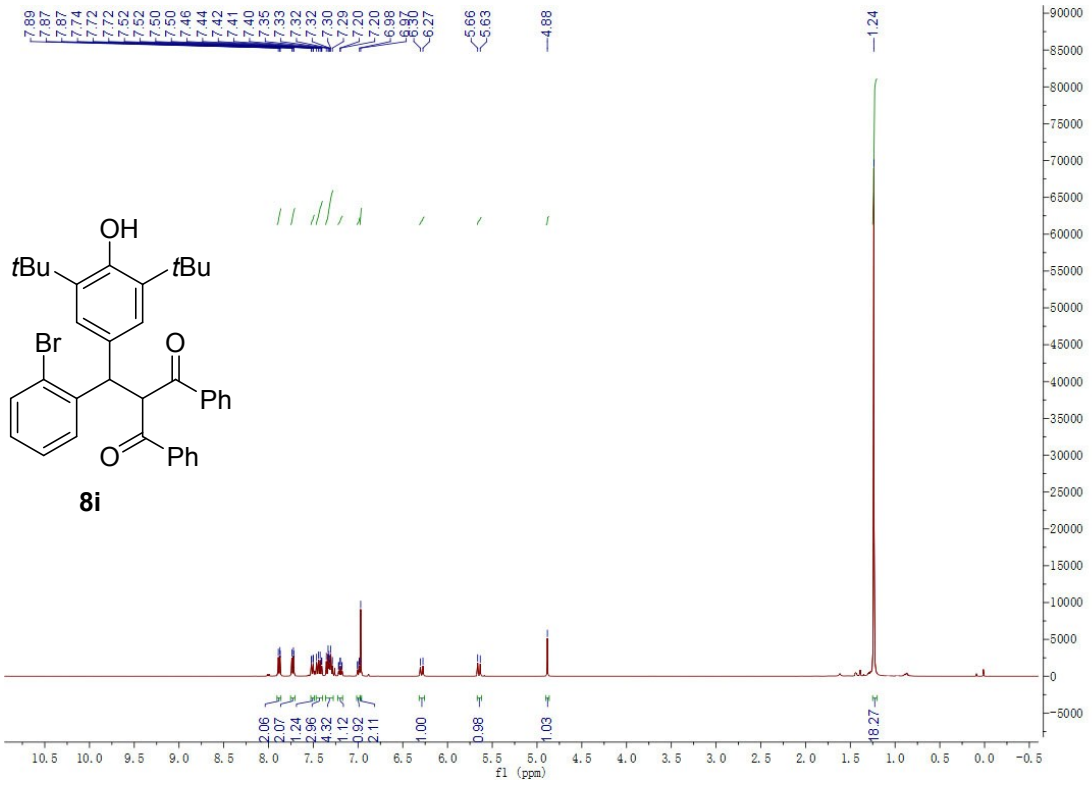
^{1}H NMR Spectrum of 8h



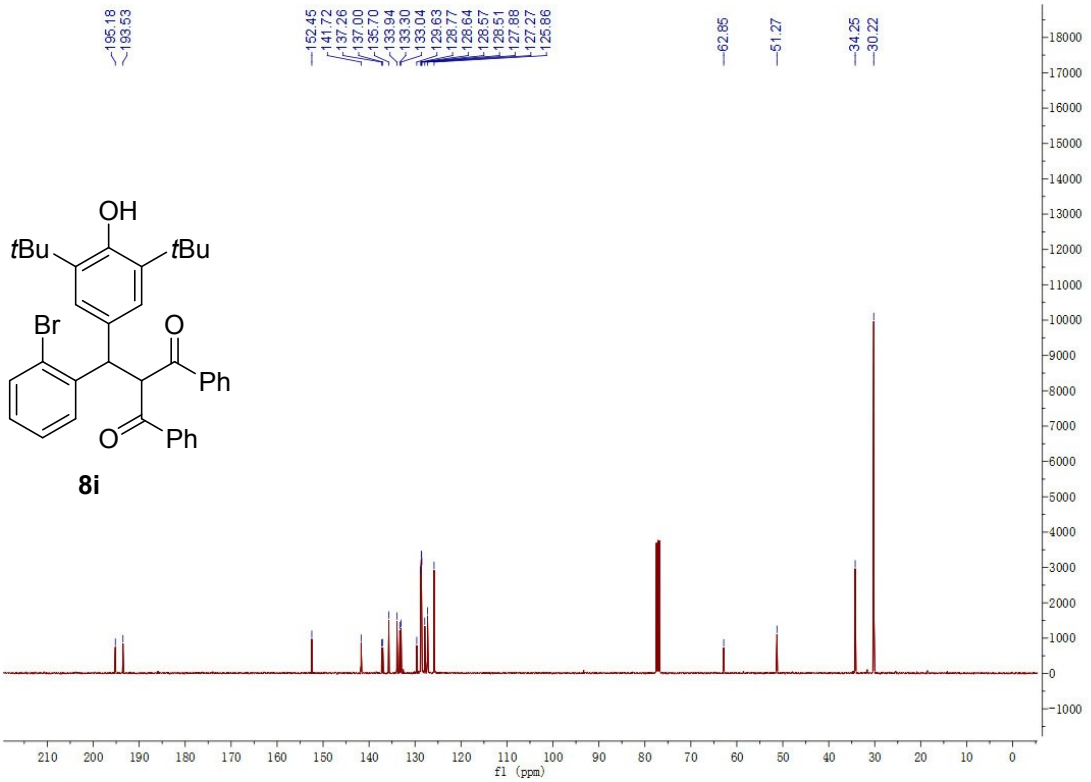
^{13}C NMR Spectrum of 8h



^{1}H NMR Spectrum of 8i

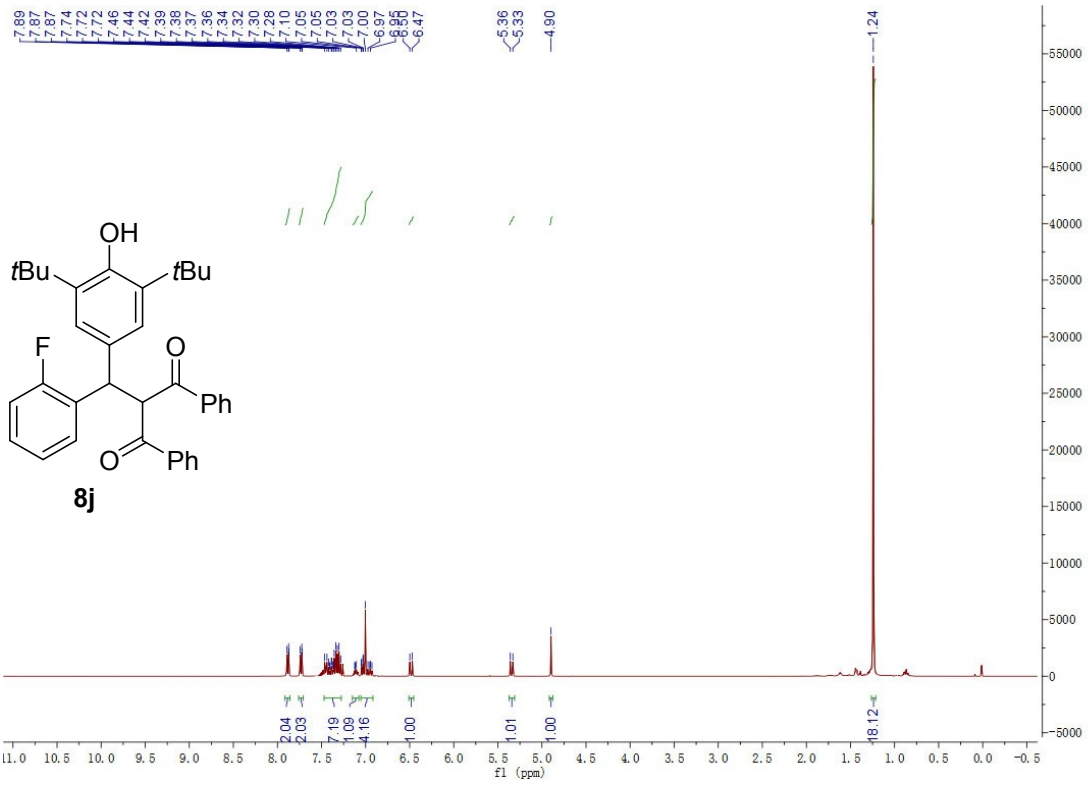


^{13}C NMR Spectrum of 8i



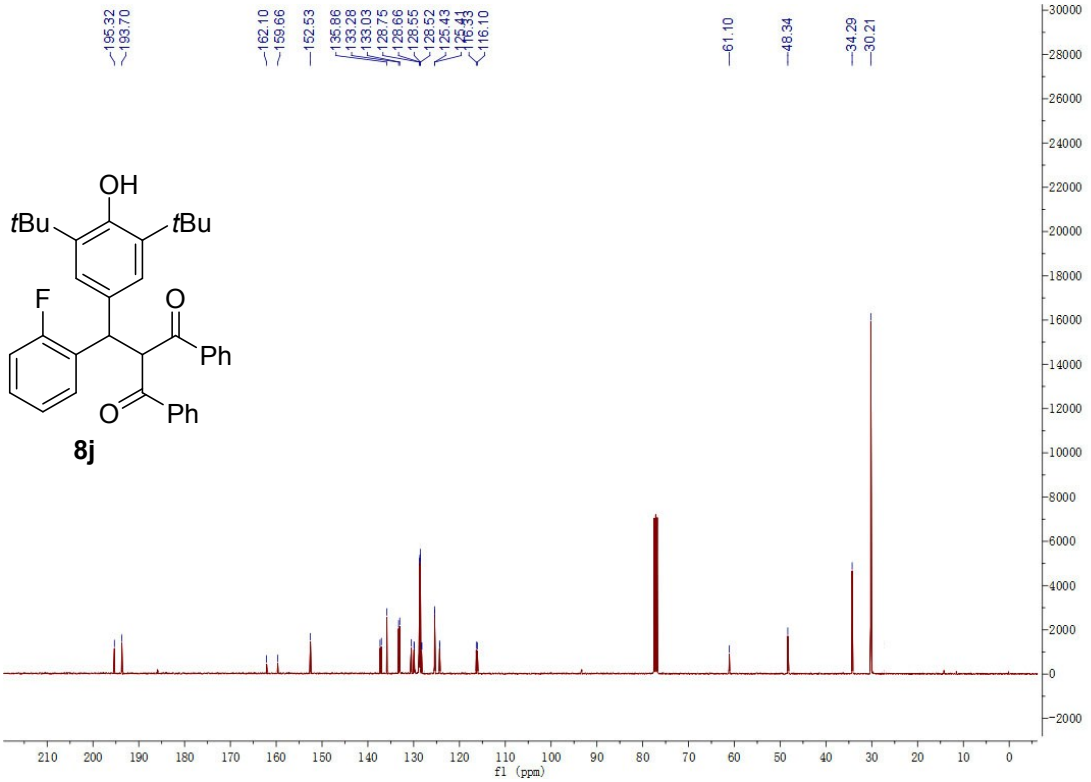
8i

^{1}H NMR Spectrum of 8j



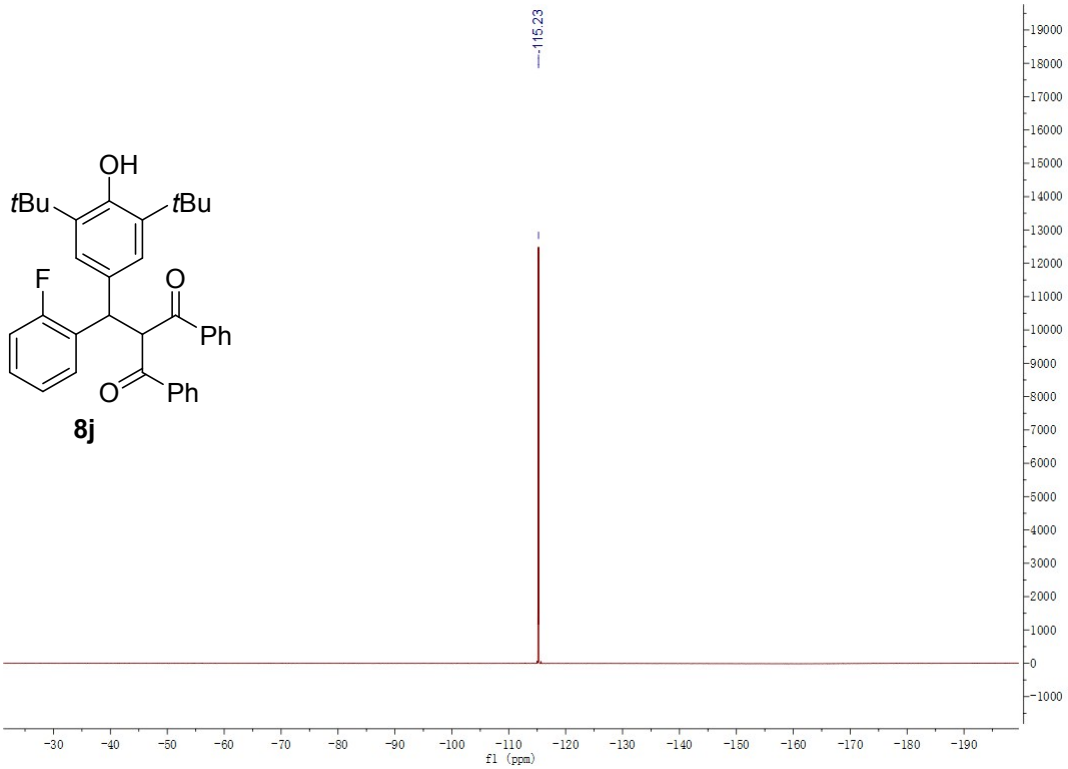
8j

^{13}C NMR Spectrum of 8j



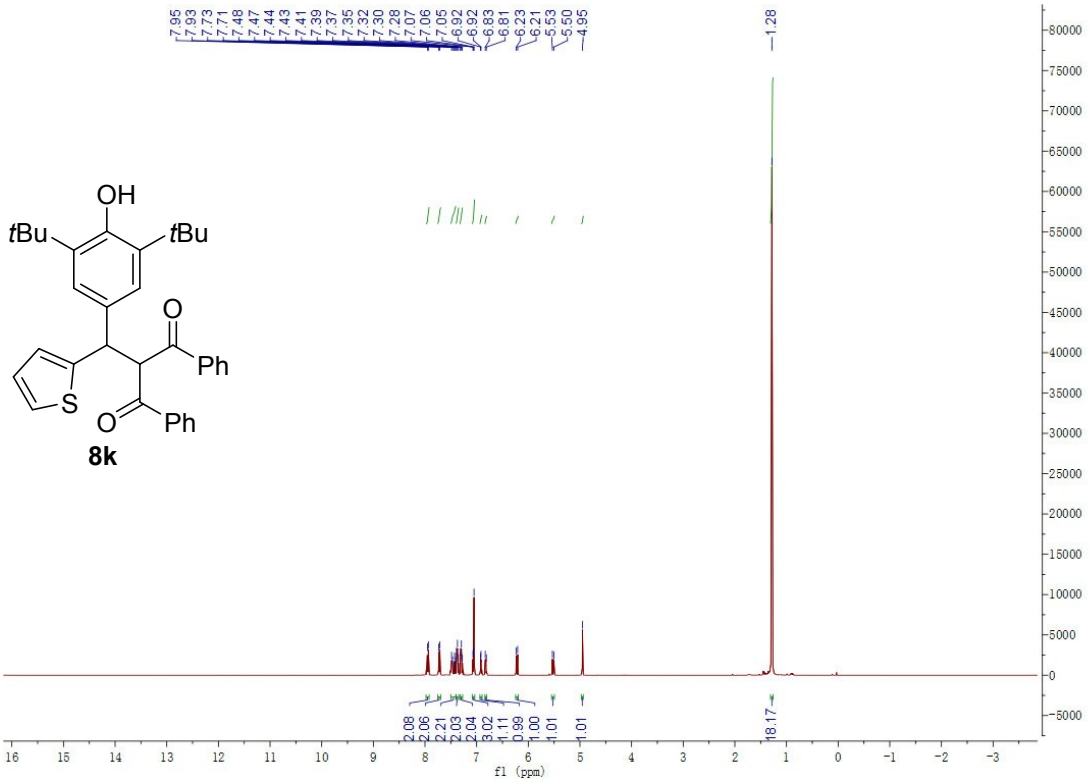
8j

^{19}F NMR Spectrum of 8j

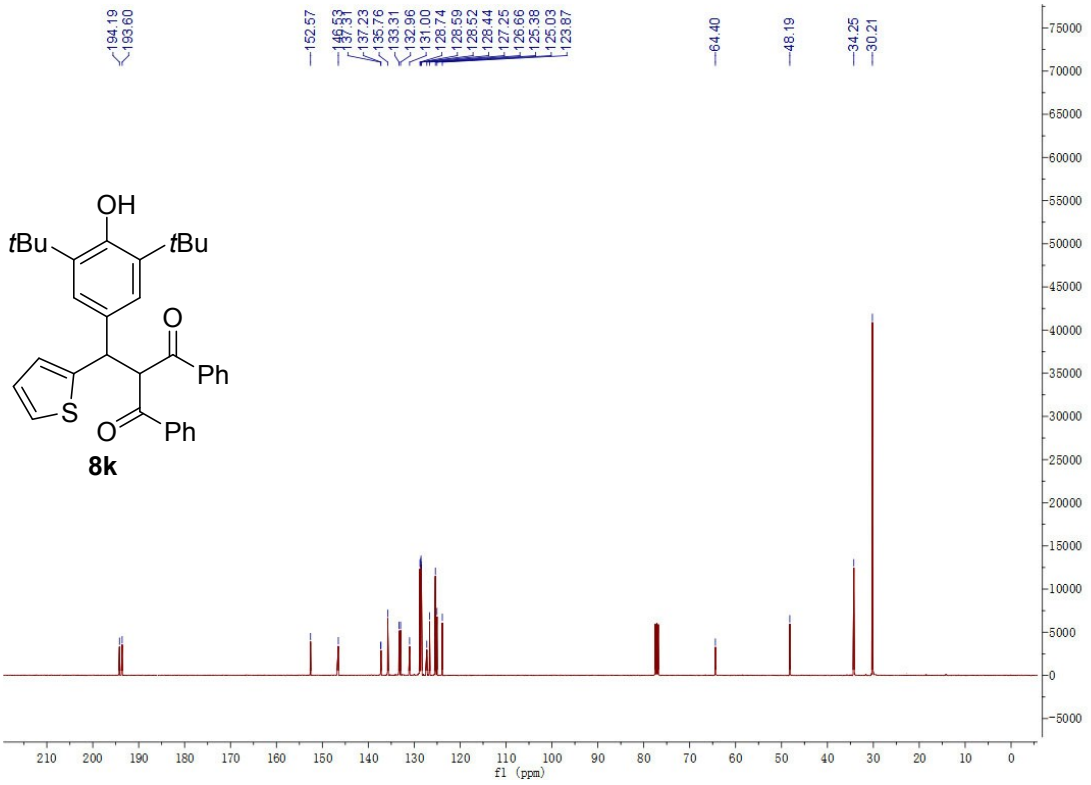


8j

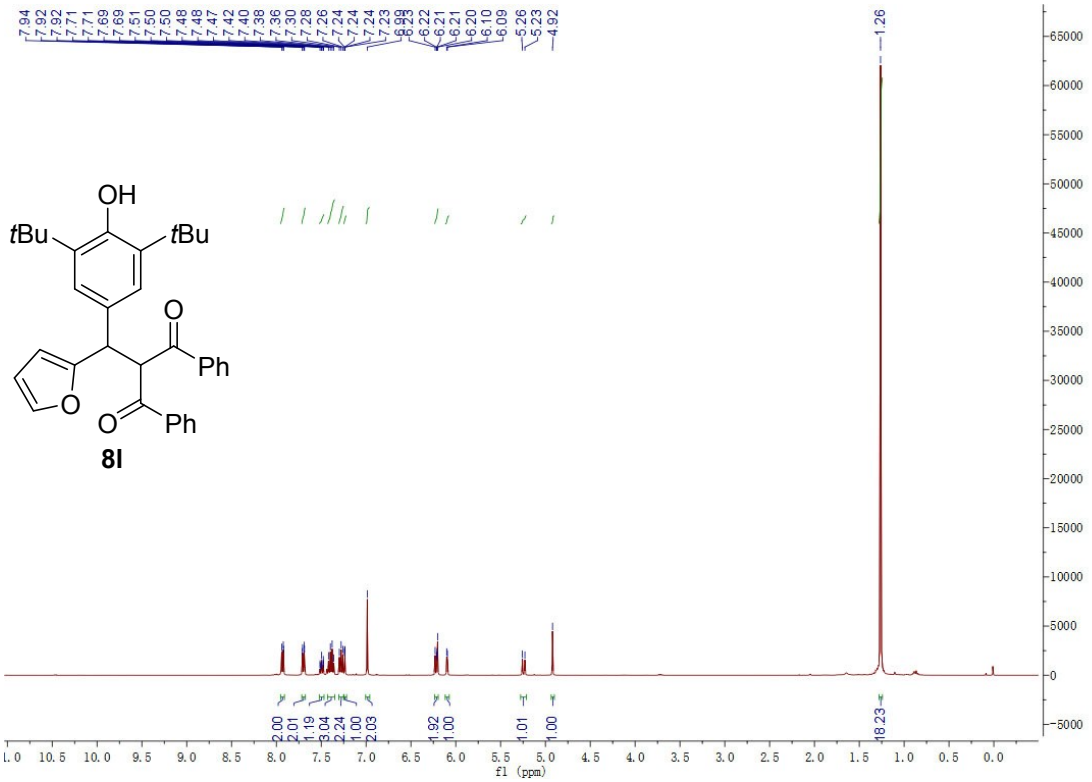
^{1}H NMR Spectrum of 8k



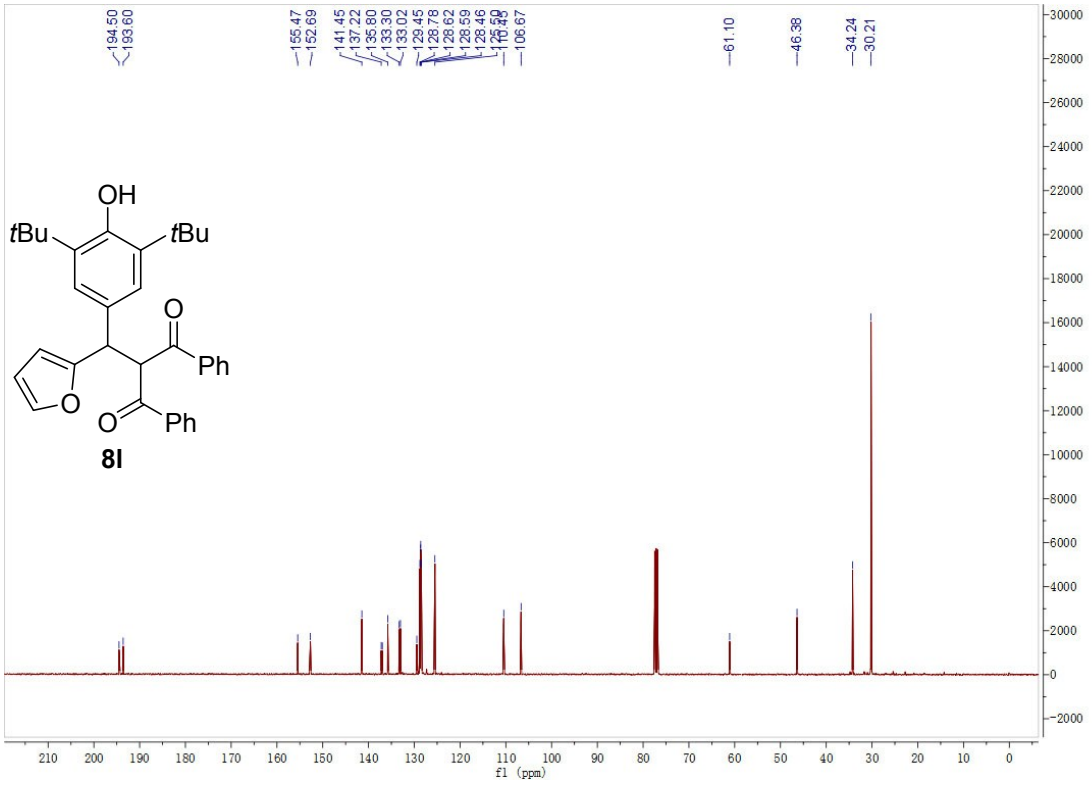
^{13}C NMR Spectrum of 8k



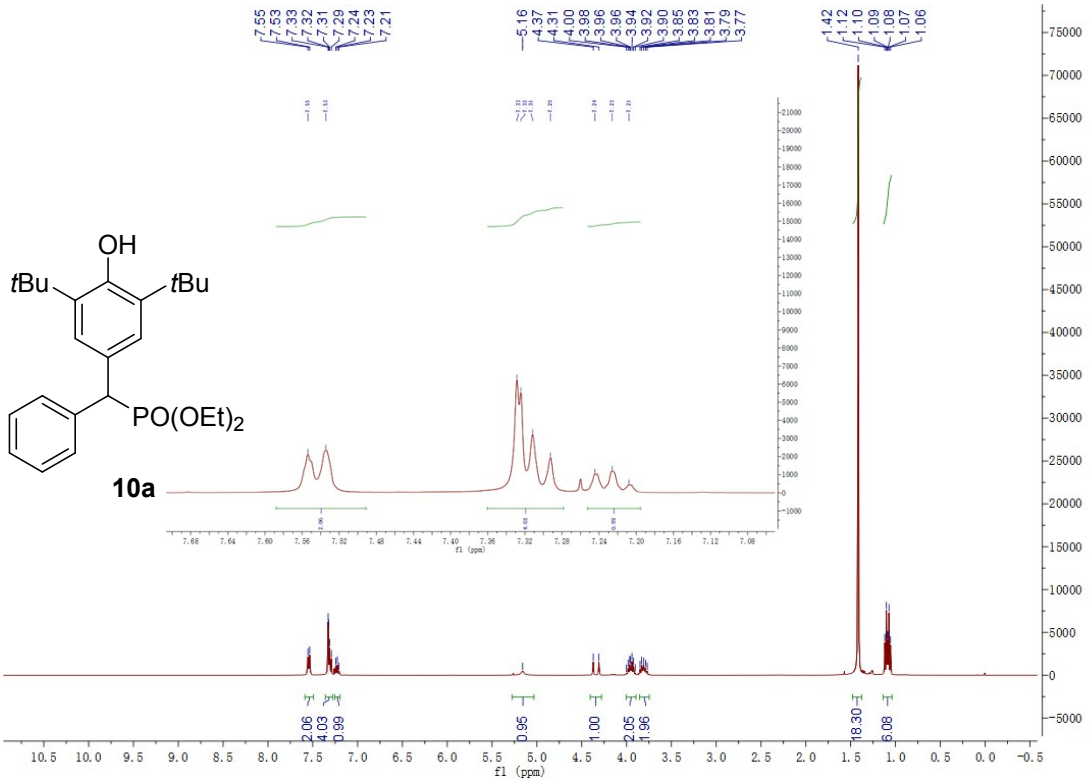
^{1}H NMR Spectrum of 8l



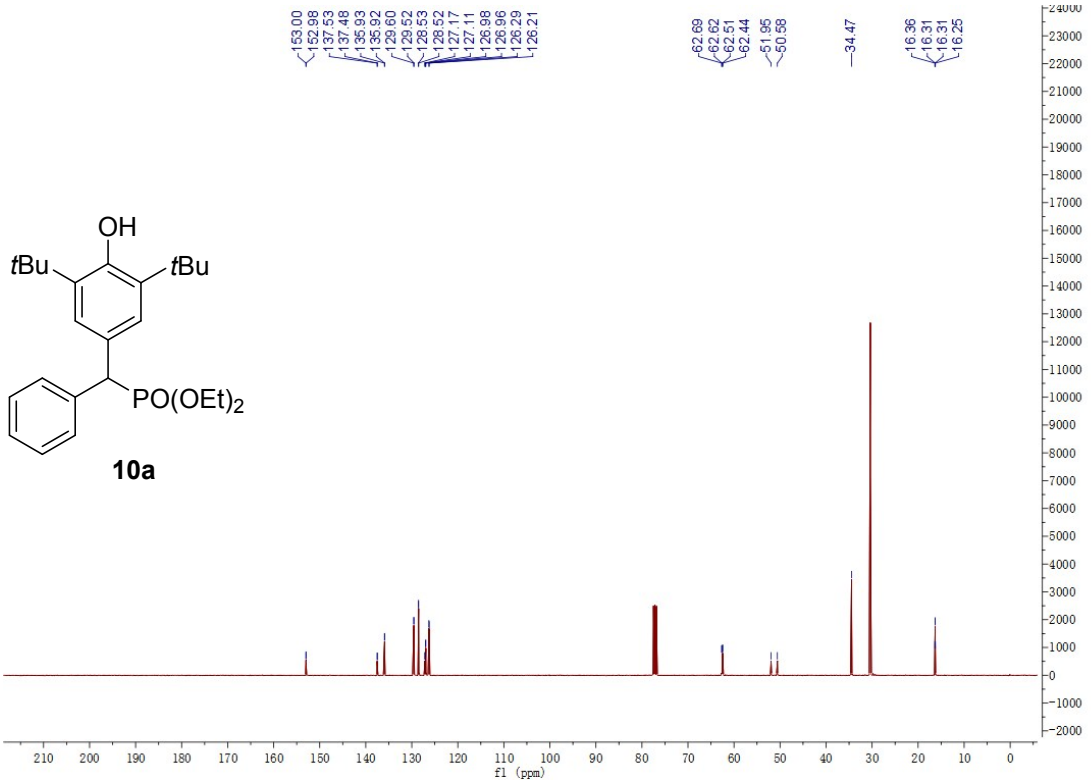
^{13}C NMR Spectrum of 8l



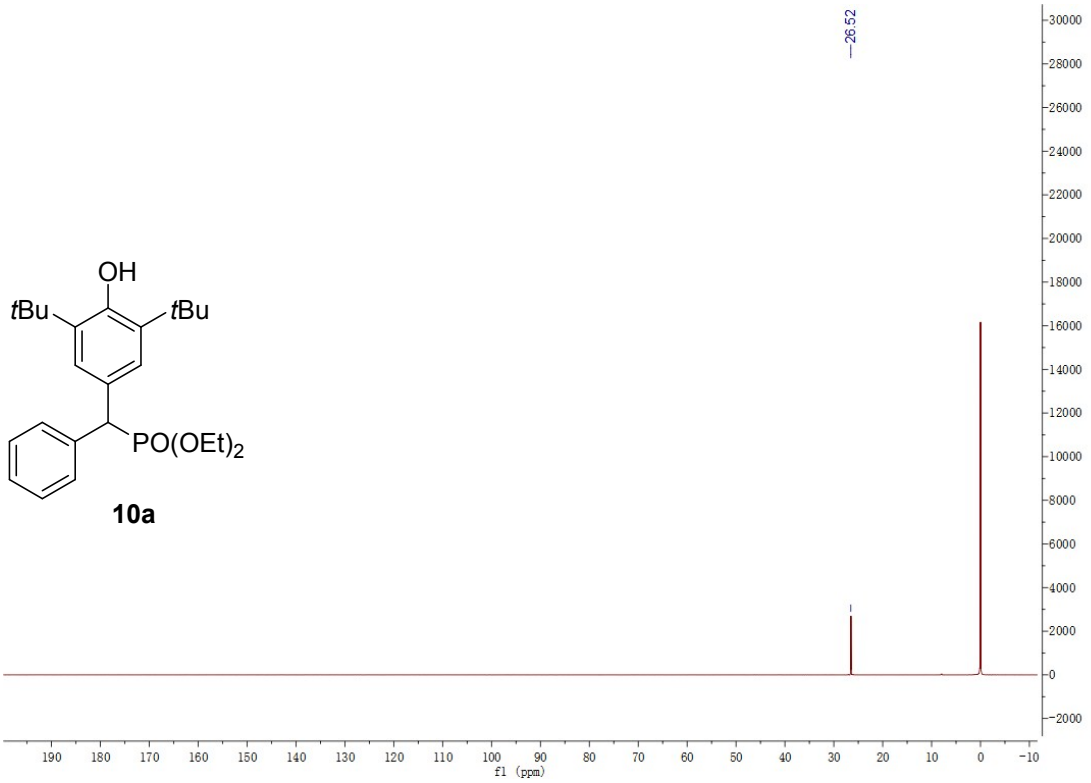
^{1}H NMR Spectrum of 10a



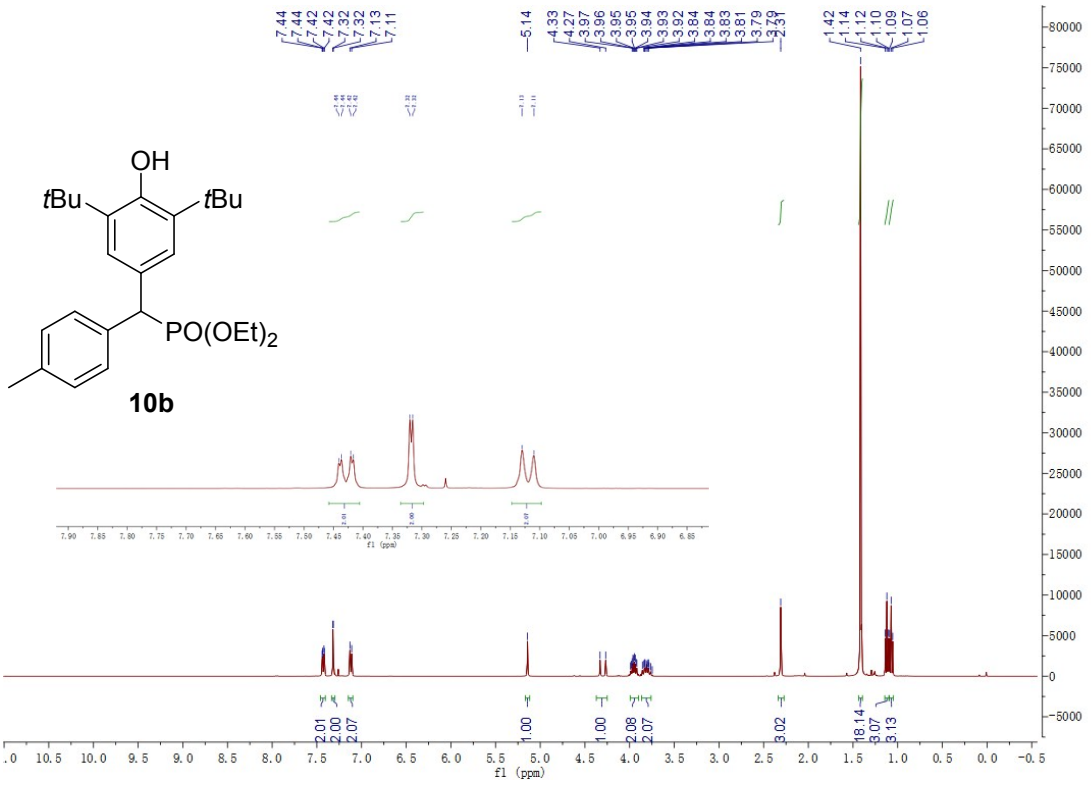
^{13}C NMR Spectrum of 10a



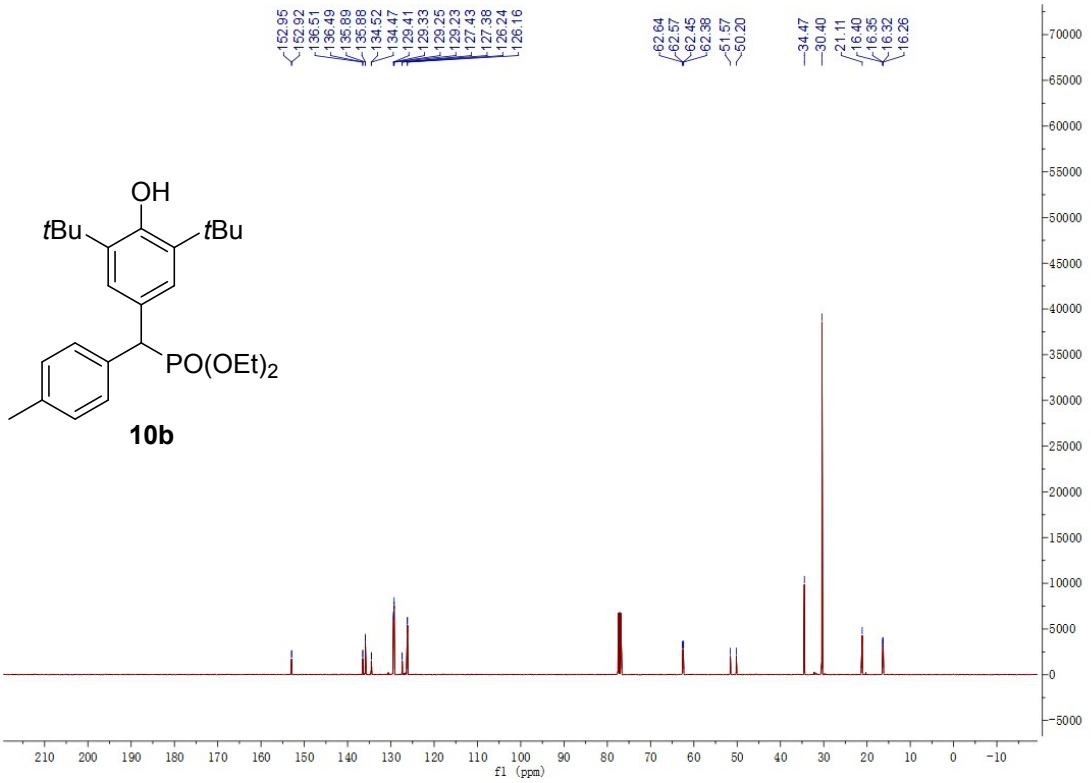
^{31}P NMR Spectrum of 10a



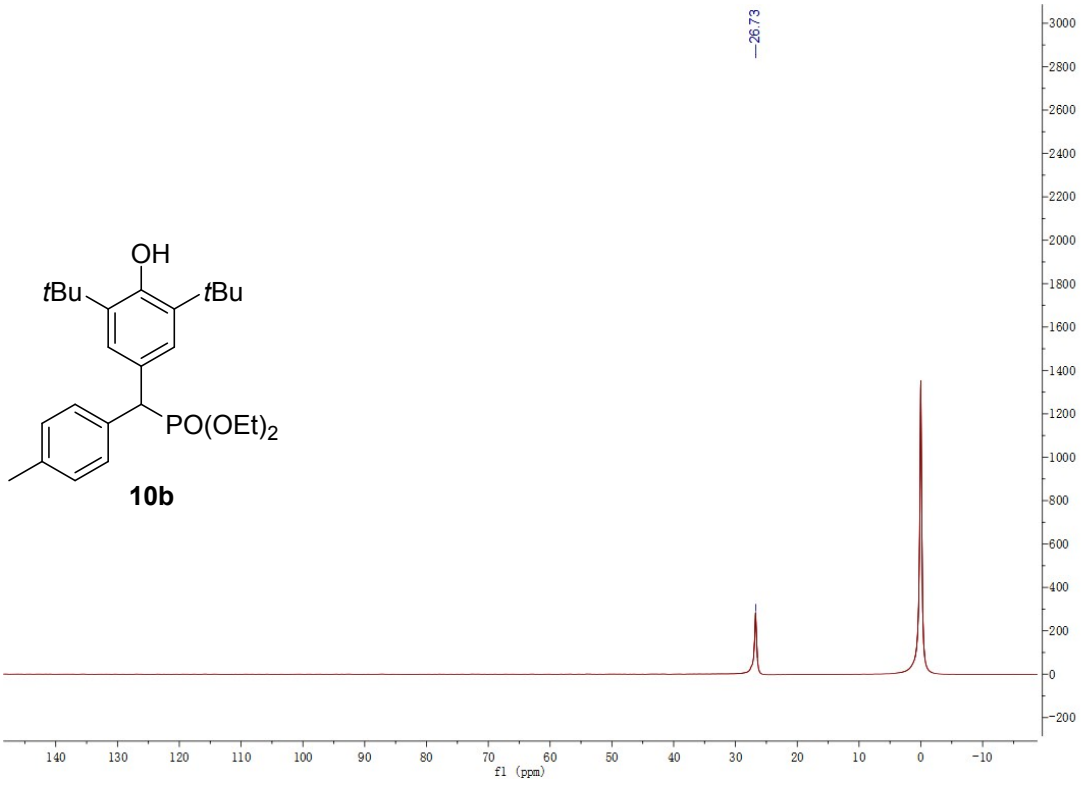
^{1}H NMR Spectrum of 10b



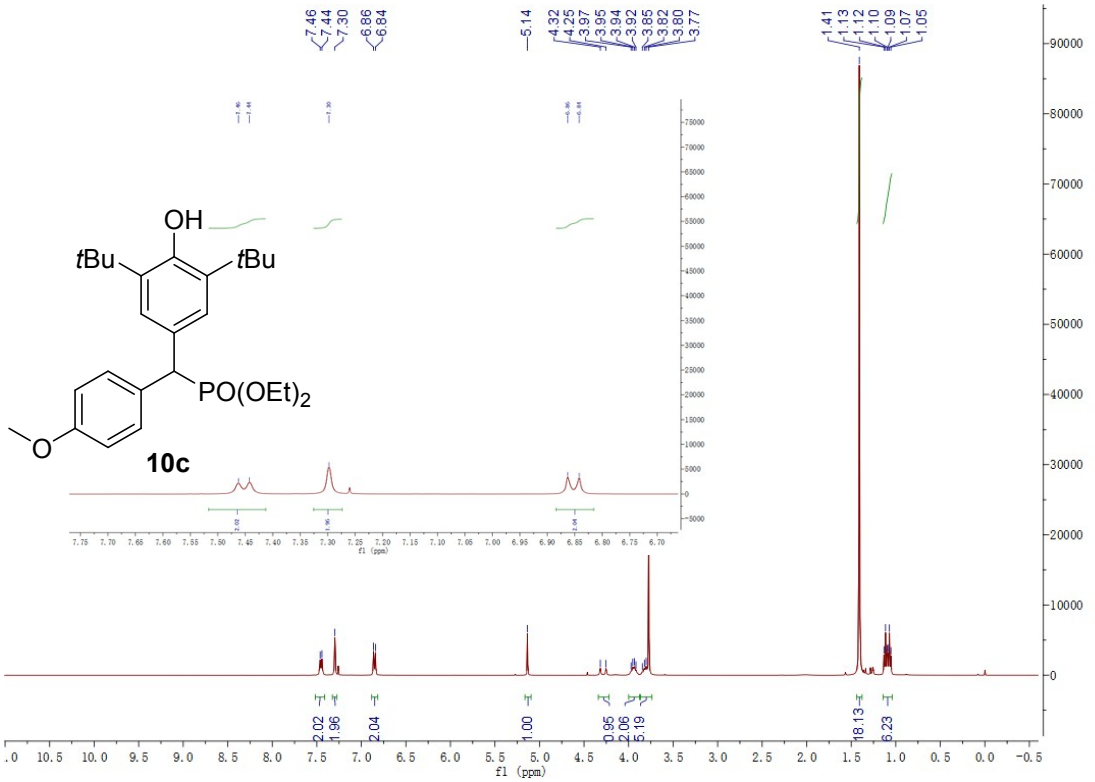
^{13}C NMR Spectrum of 10b



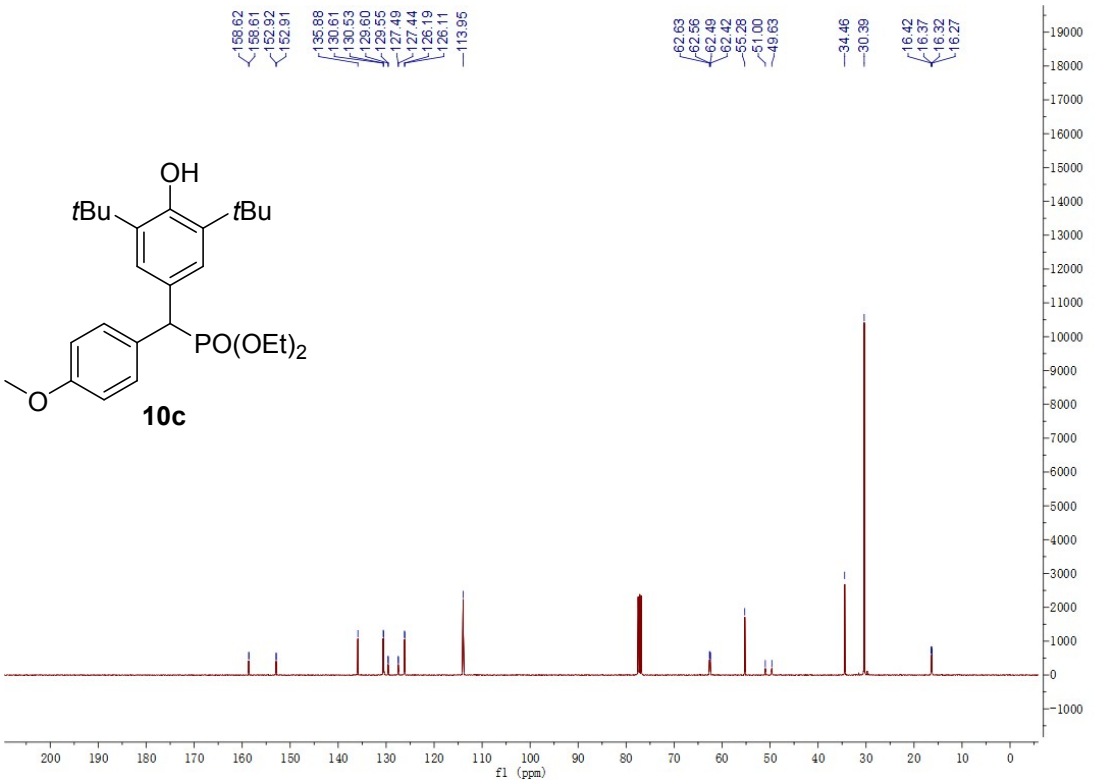
^{31}P NMR Spectrum of 10b



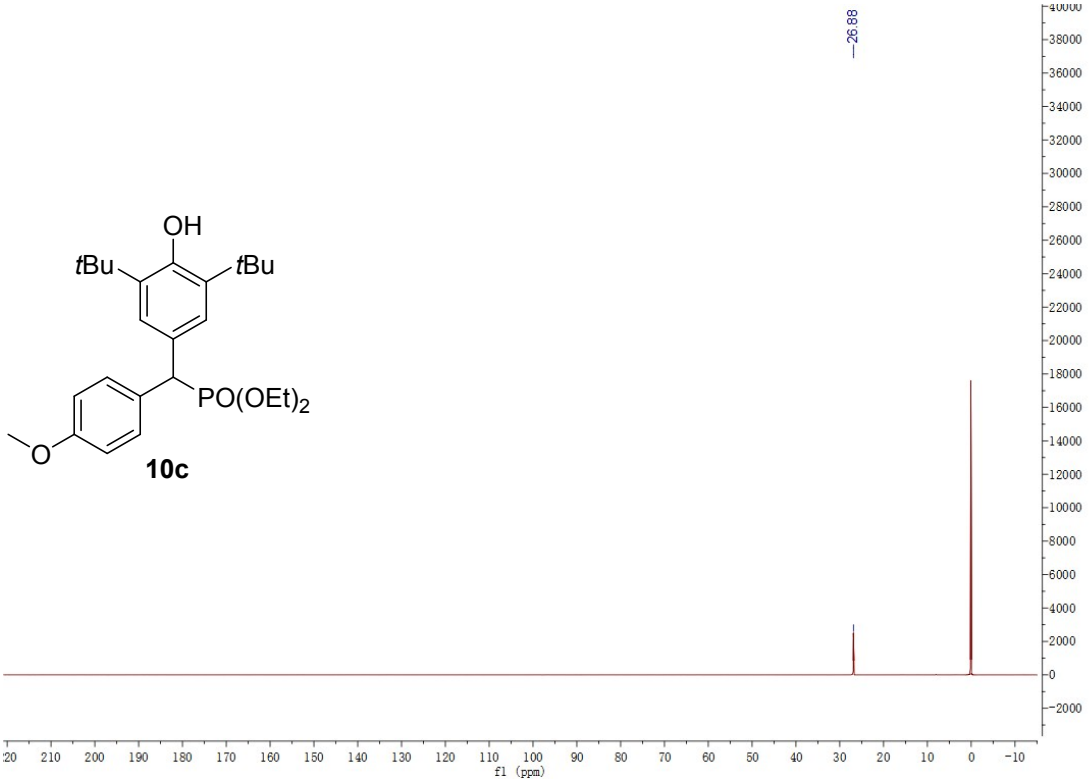
^{1}H NMR Spectrum of 10c



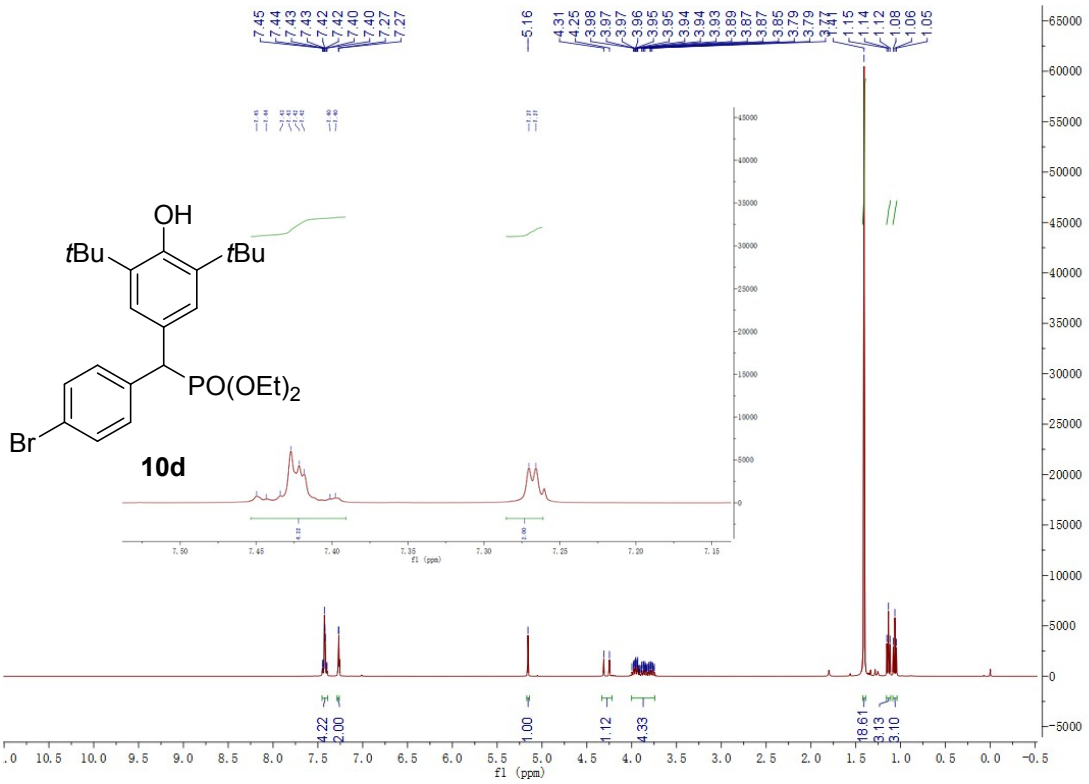
^{13}C NMR Spectrum of 10c



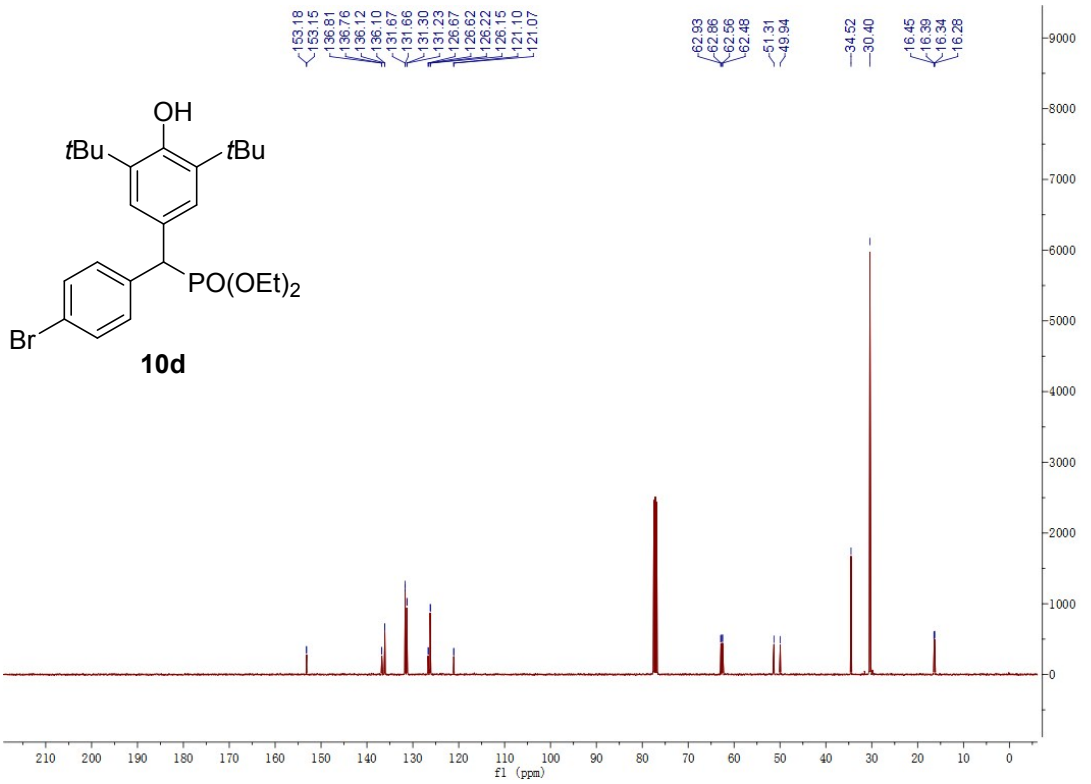
^{31}P NMR Spectrum of 10c



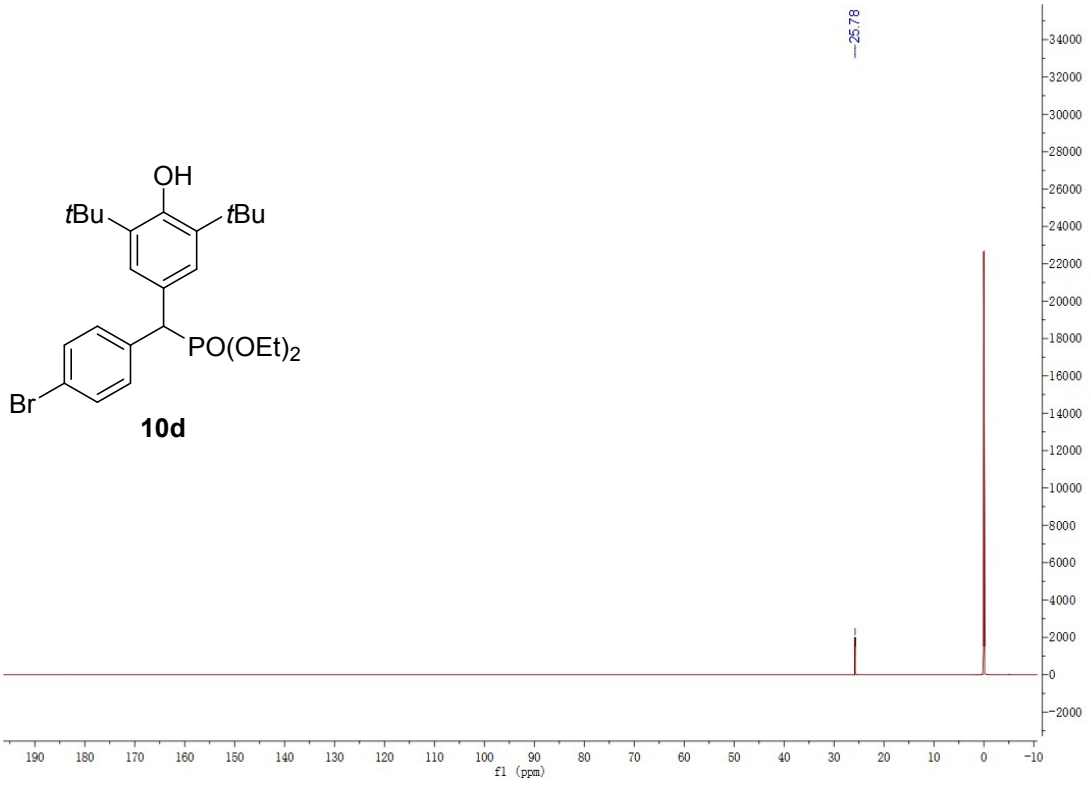
^{1}H NMR Spectrum of 10d



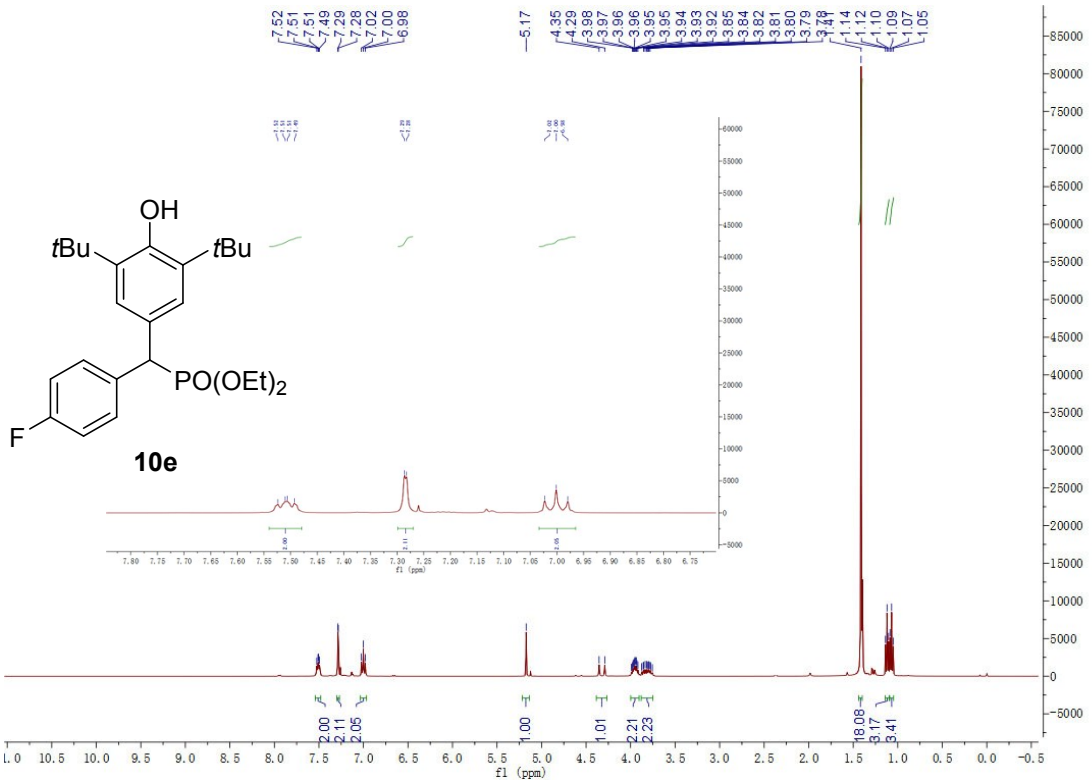
^{13}C NMR Spectrum of 10d



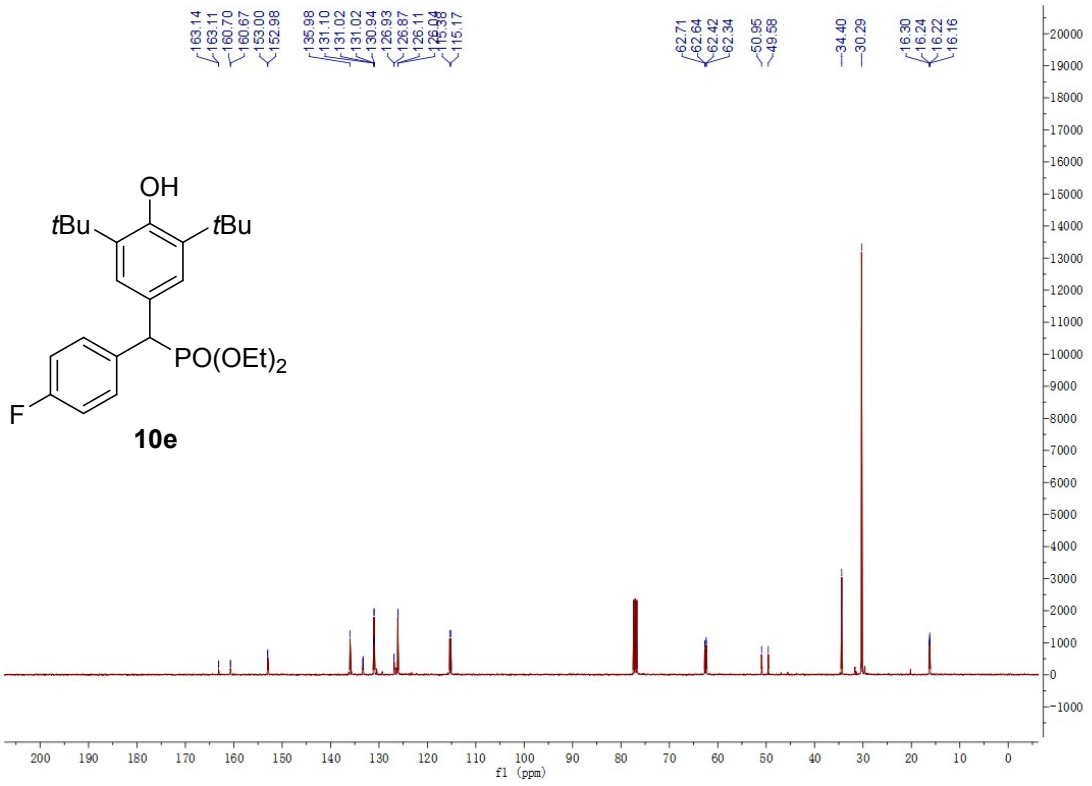
^{31}P NMR Spectrum of 10d



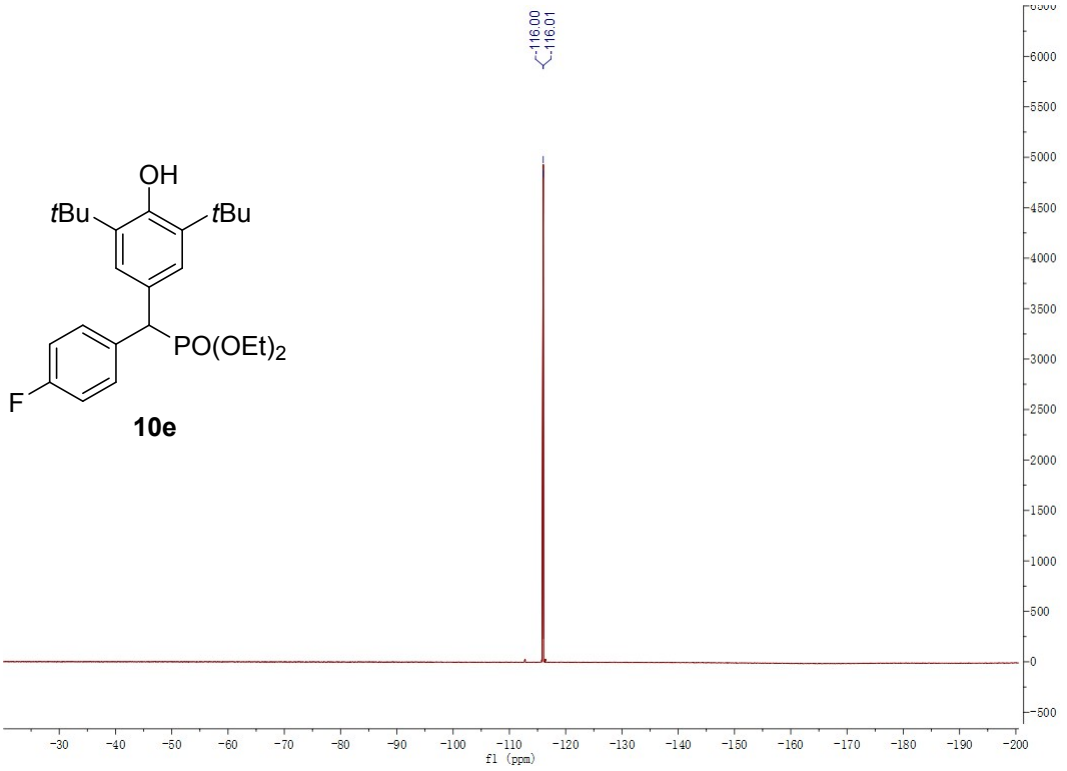
^{1}H NMR Spectrum of 10e



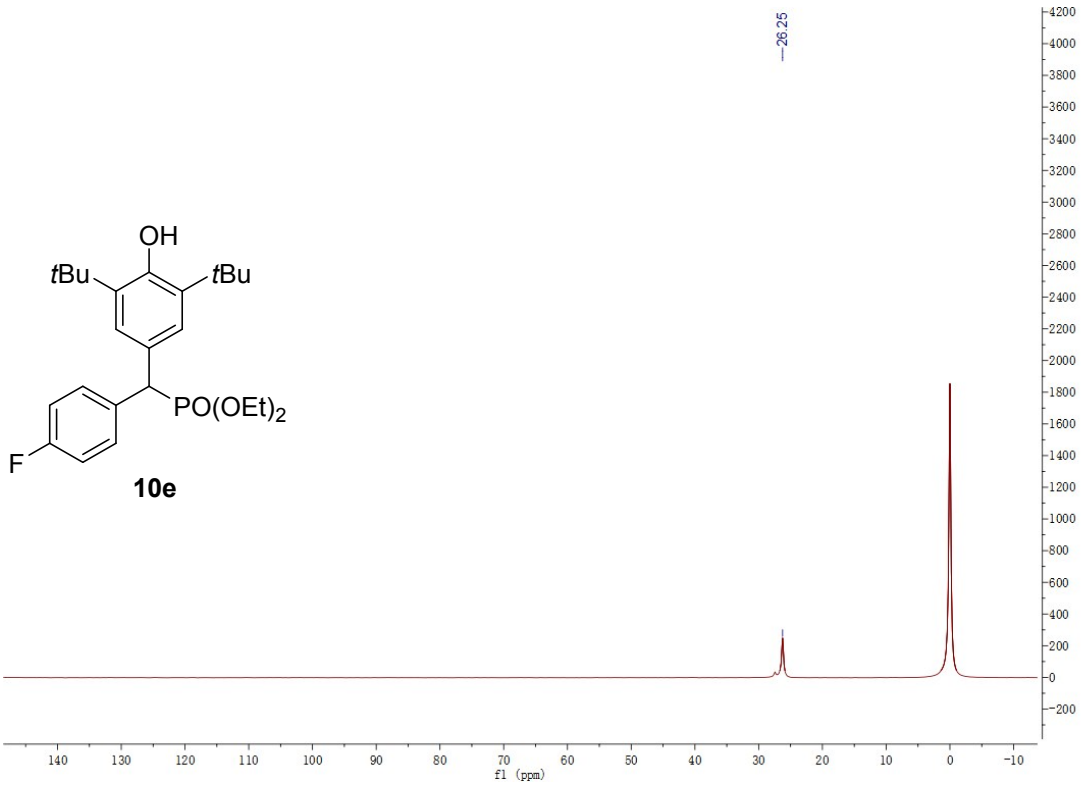
^{13}C NMR Spectrum of 10e



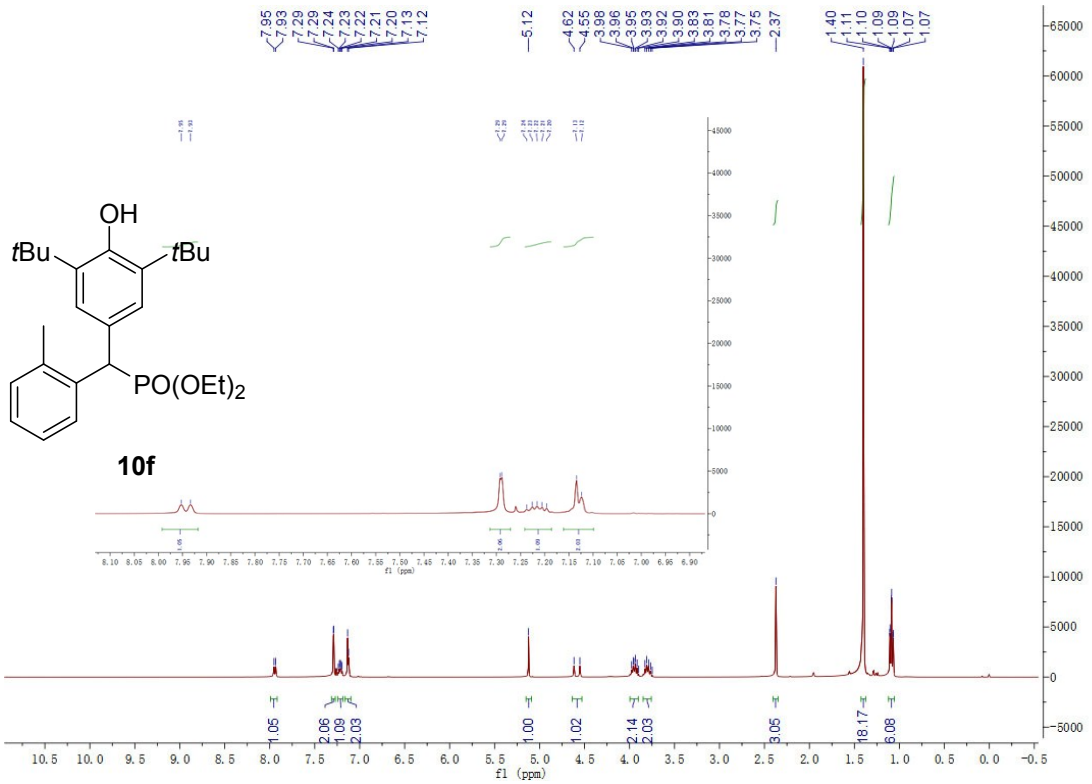
^{19}F NMR Spectrum of 10e



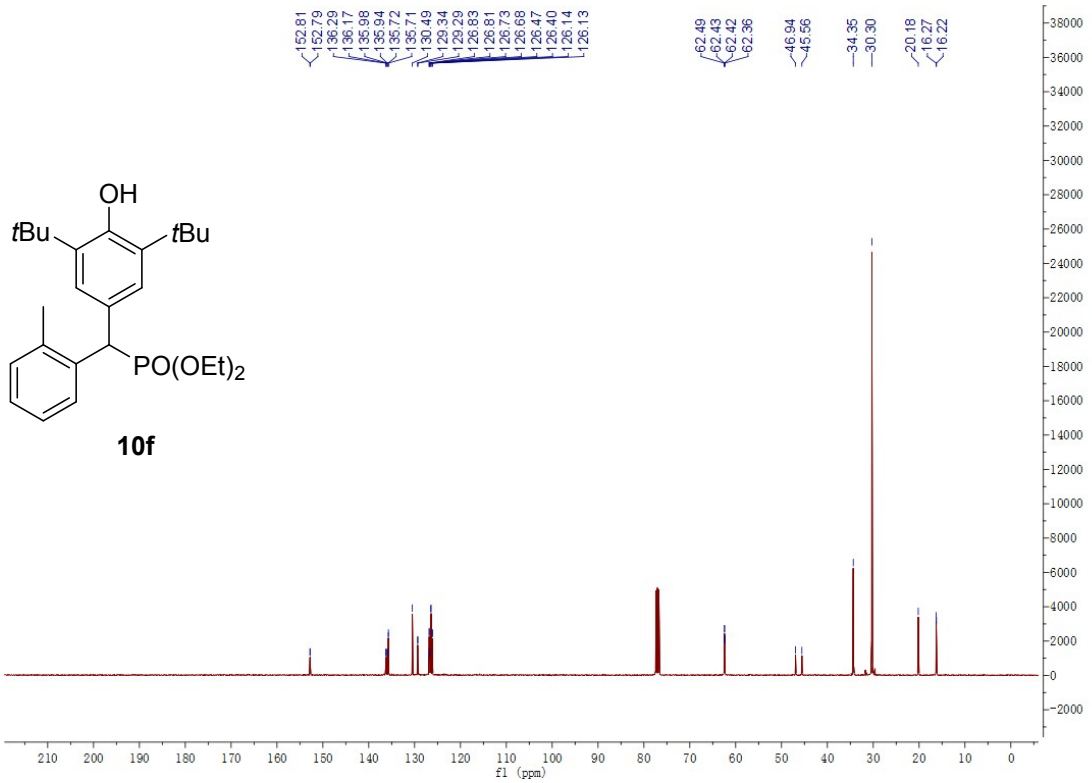
^{31}P NMR Spectrum of 10e



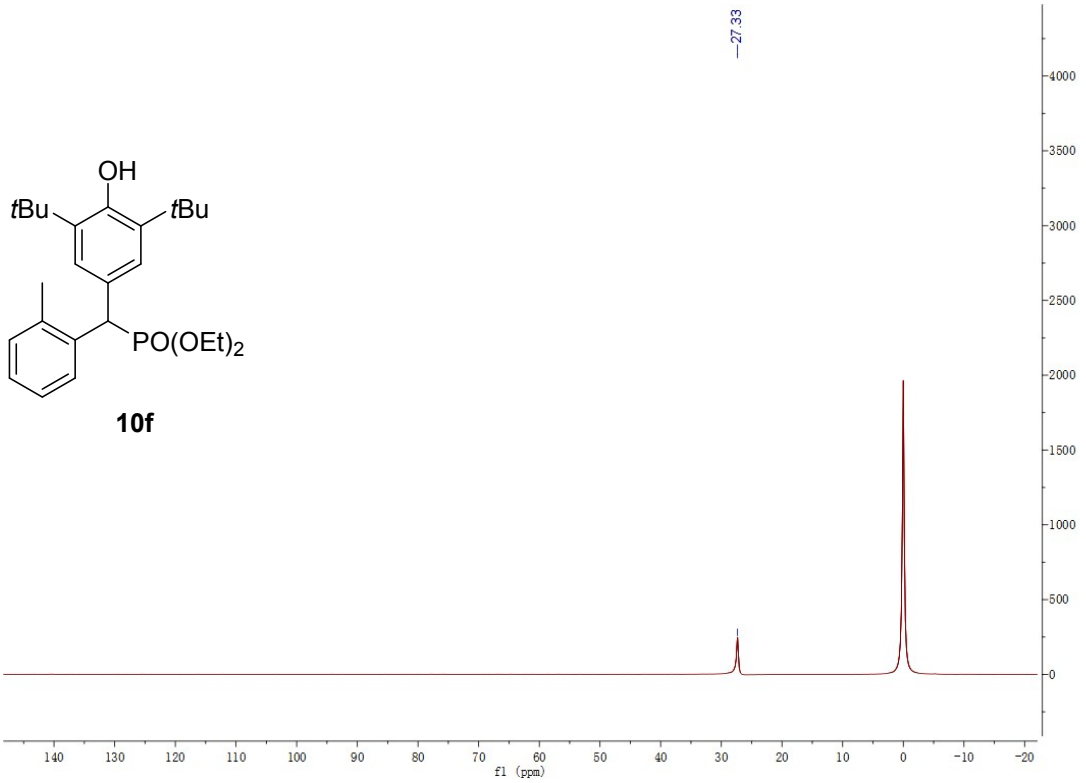
^{1}H NMR Spectrum of 10f



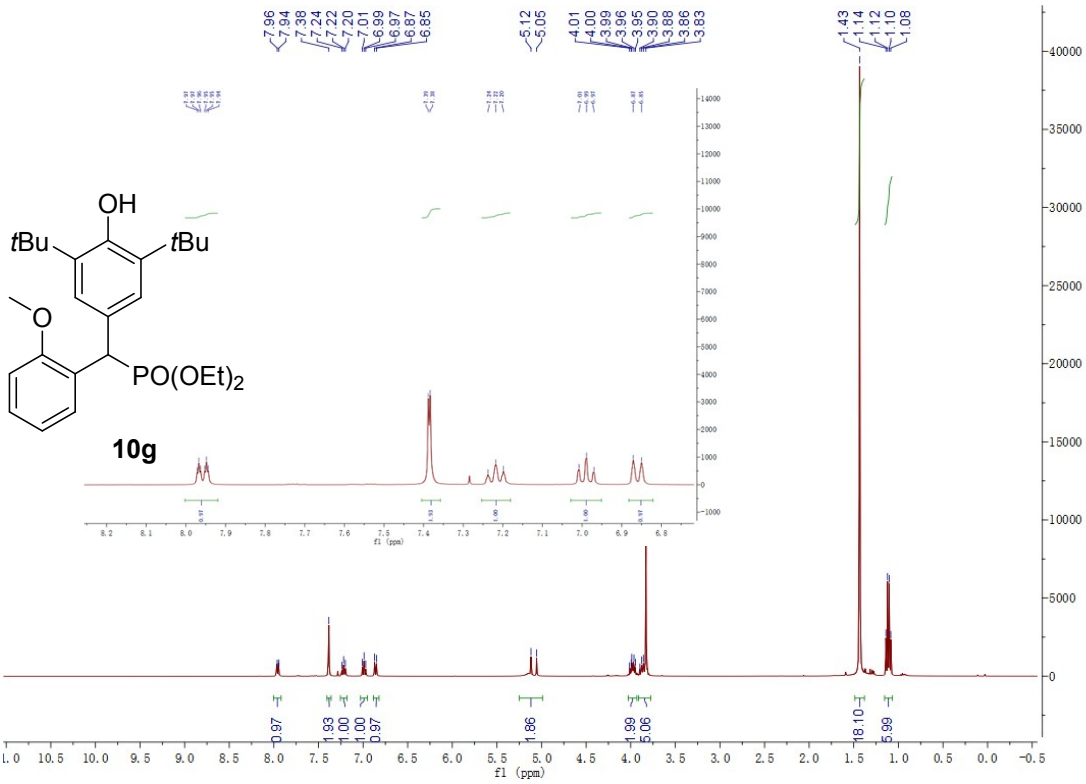
^{13}C NMR Spectrum of 10f



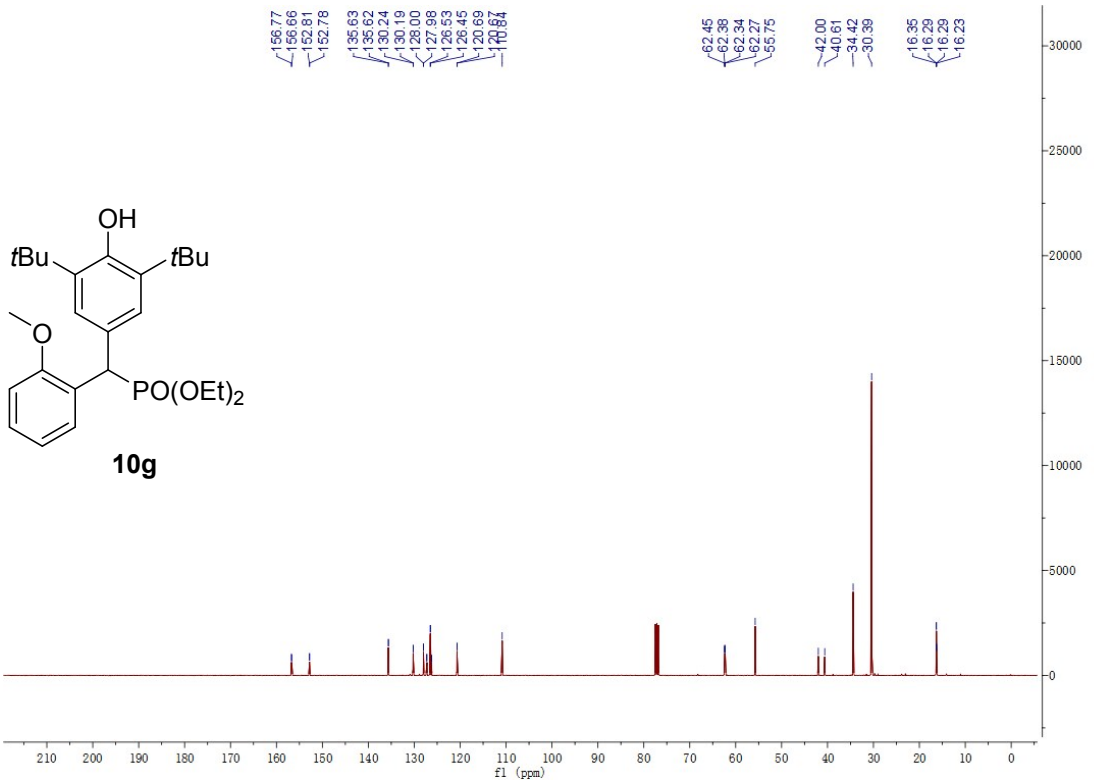
^{31}P NMR Spectrum of 10f



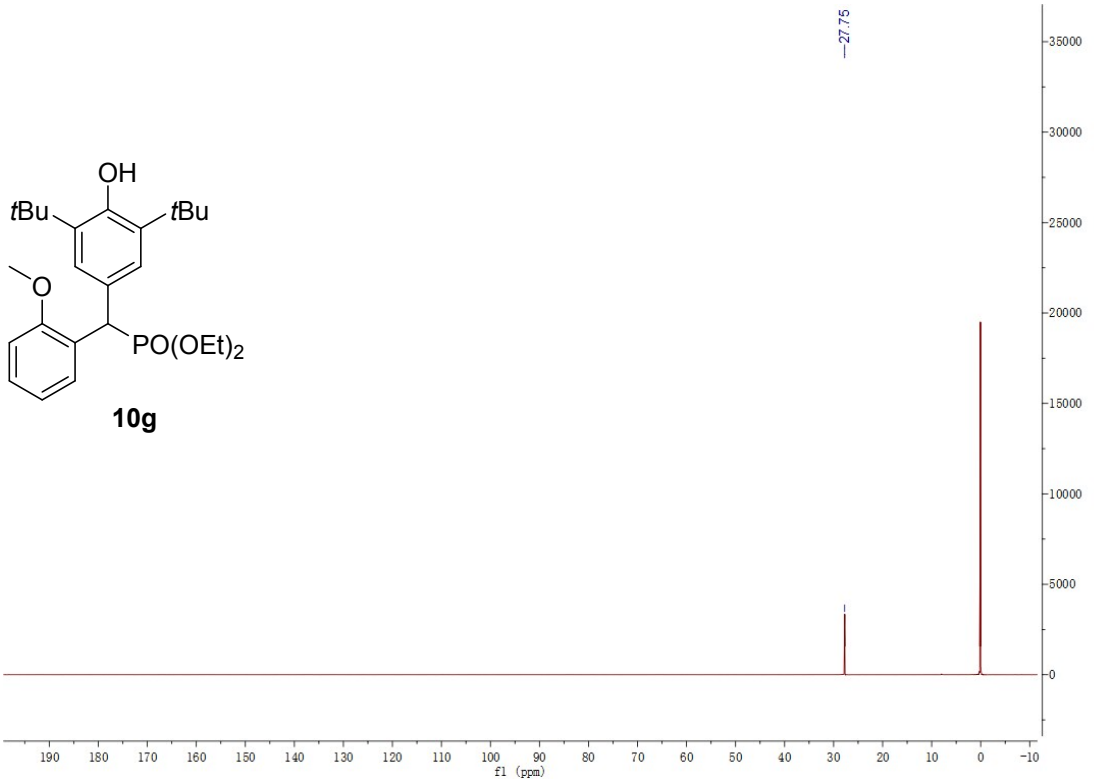
^{1}H NMR Spectrum of 10g



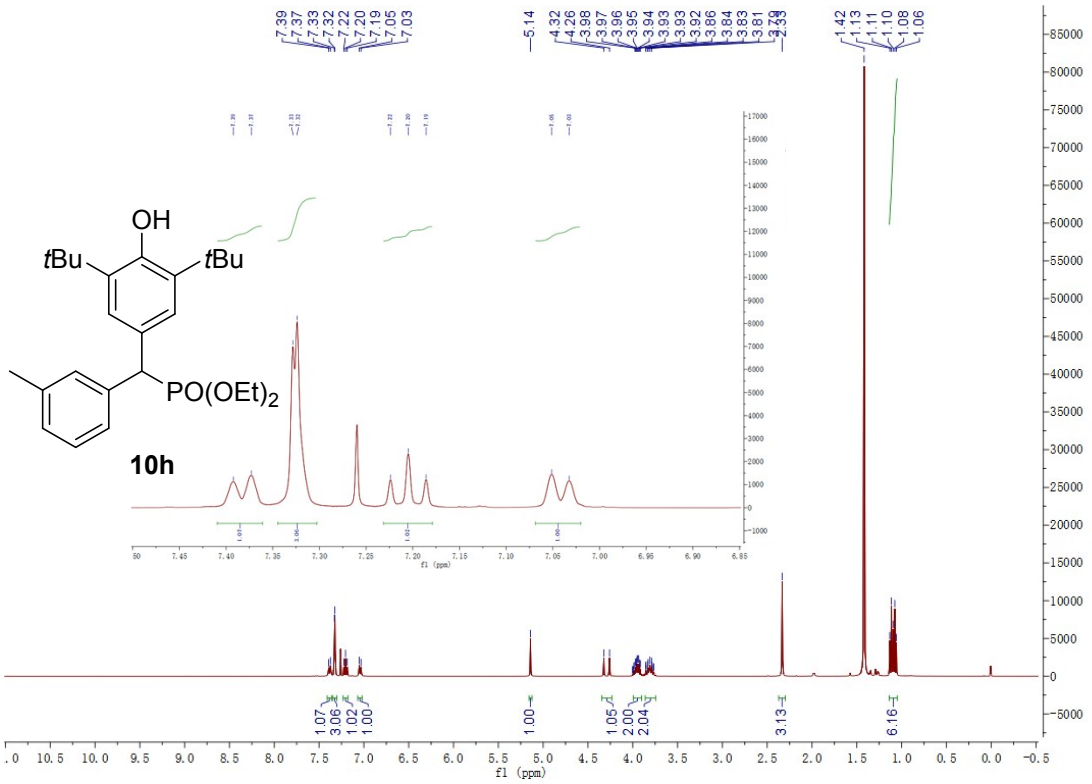
^{13}C NMR Spectrum of 10g



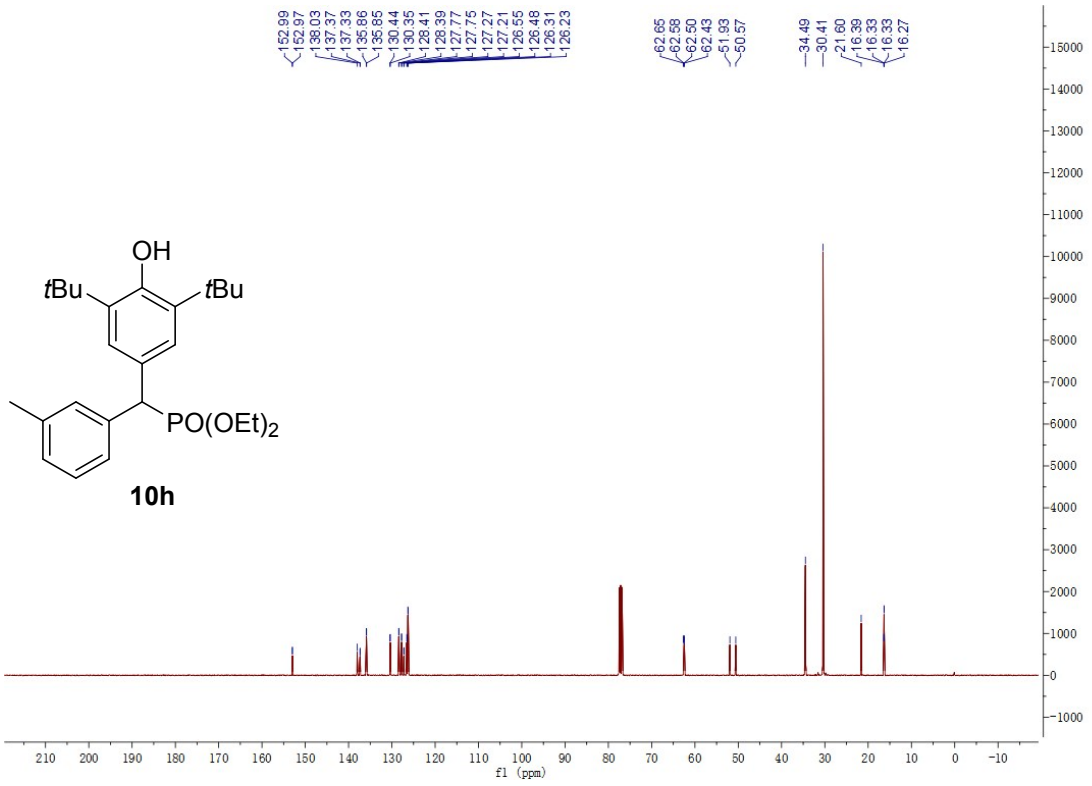
^{31}P NMR Spectrum of 10g



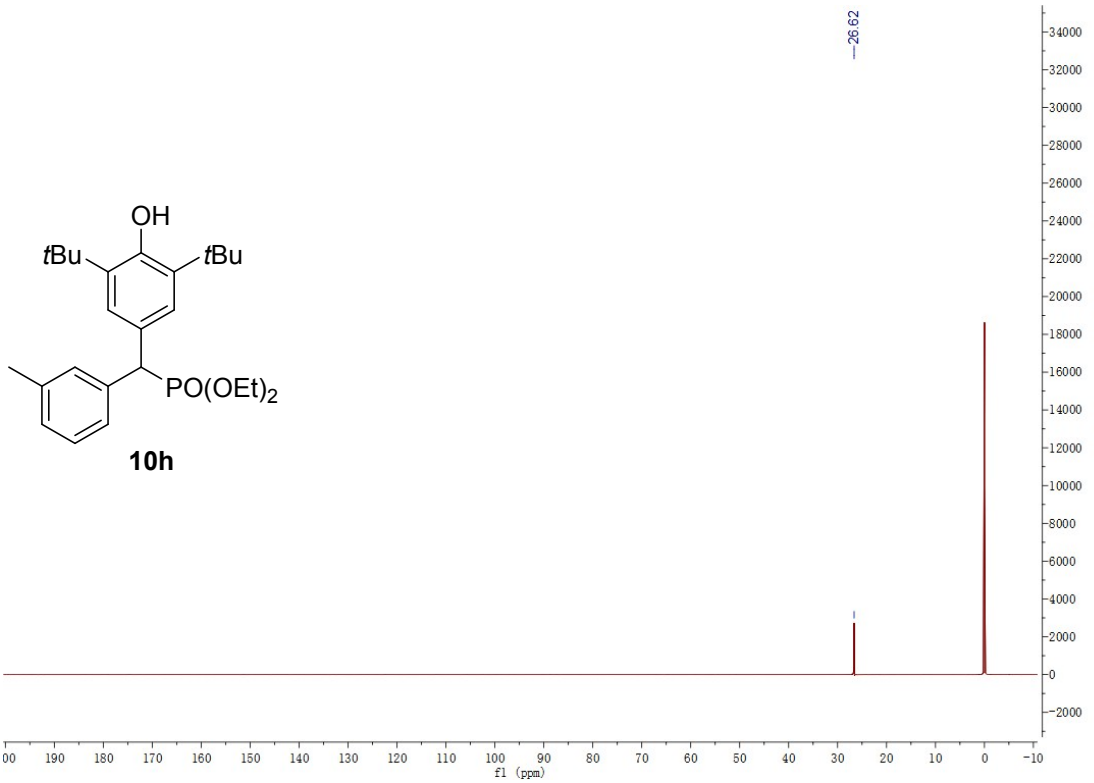
^{1}H NMR Spectrum of 10h



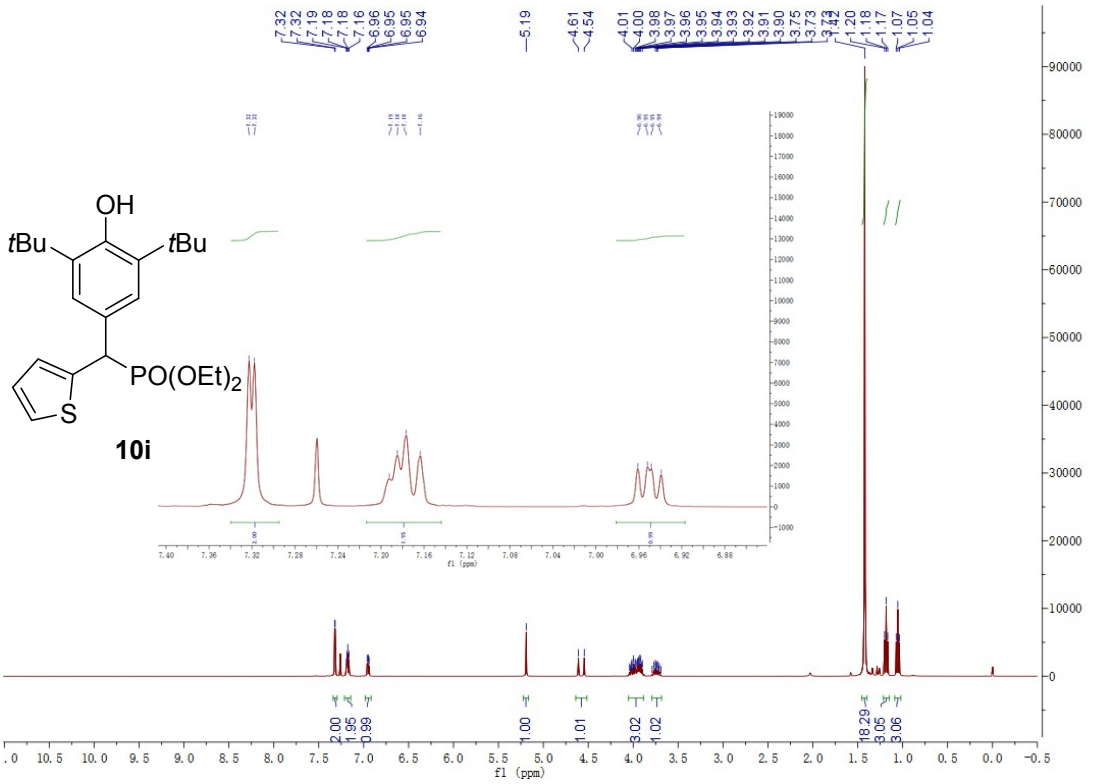
^{13}C NMR Spectrum of 10h



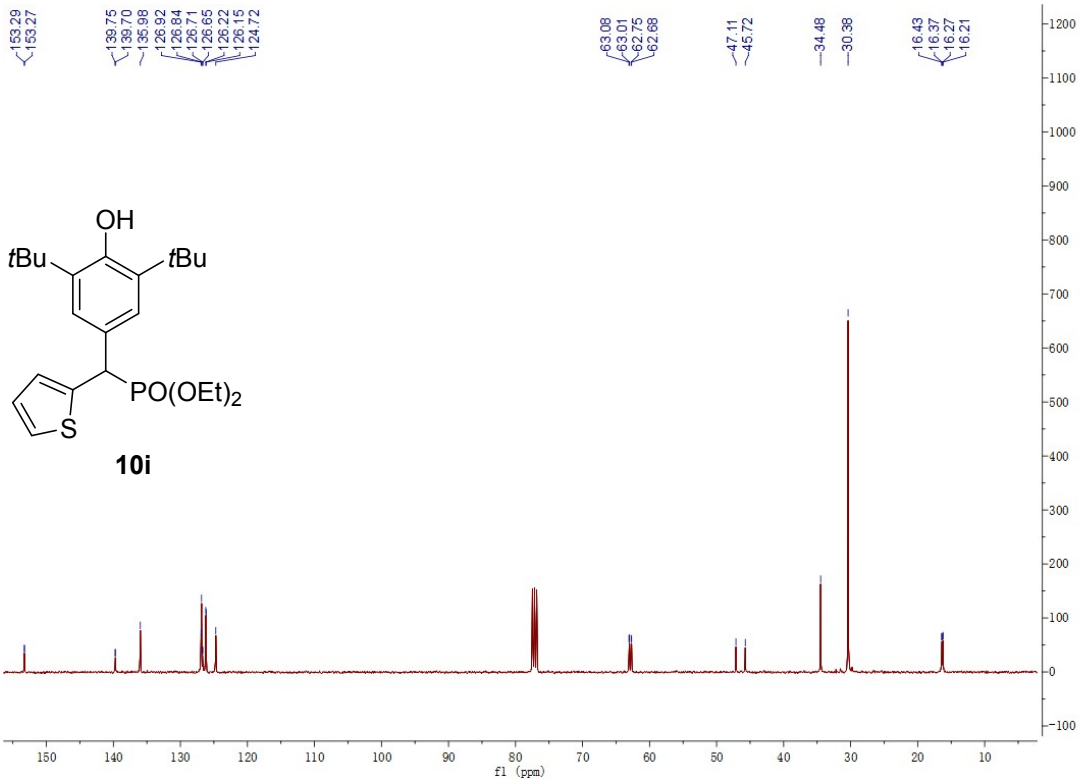
^{31}P NMR Spectrum of 10h



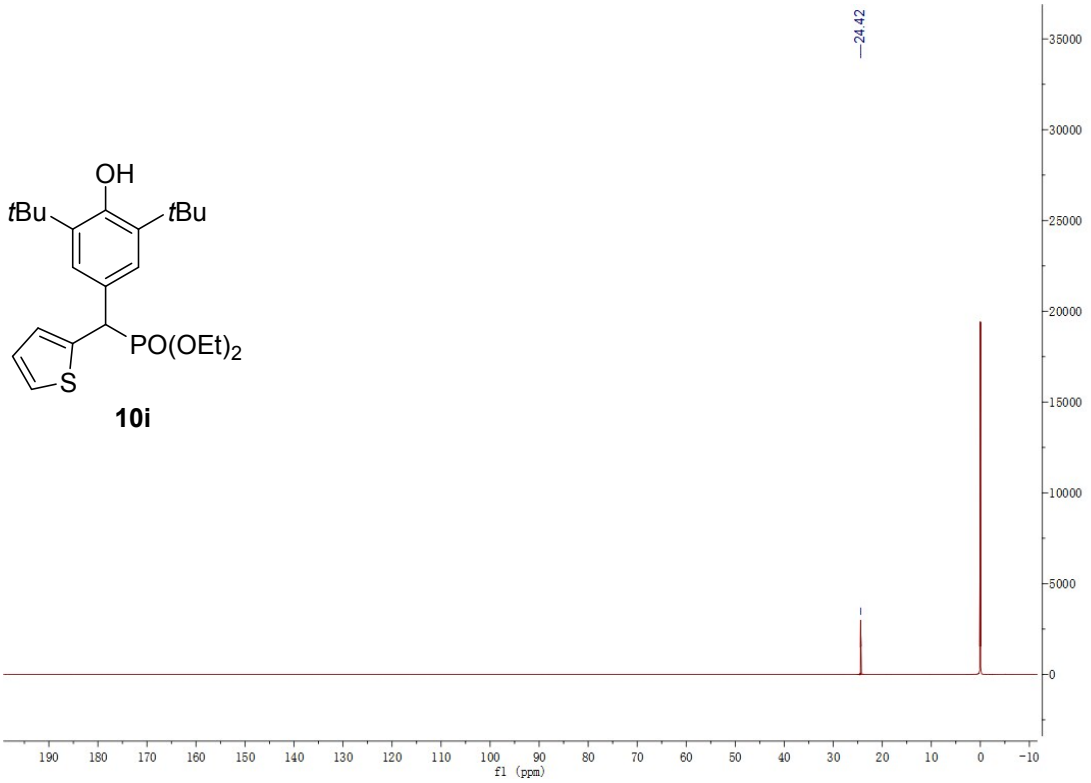
^{1}H NMR Spectrum of 10i



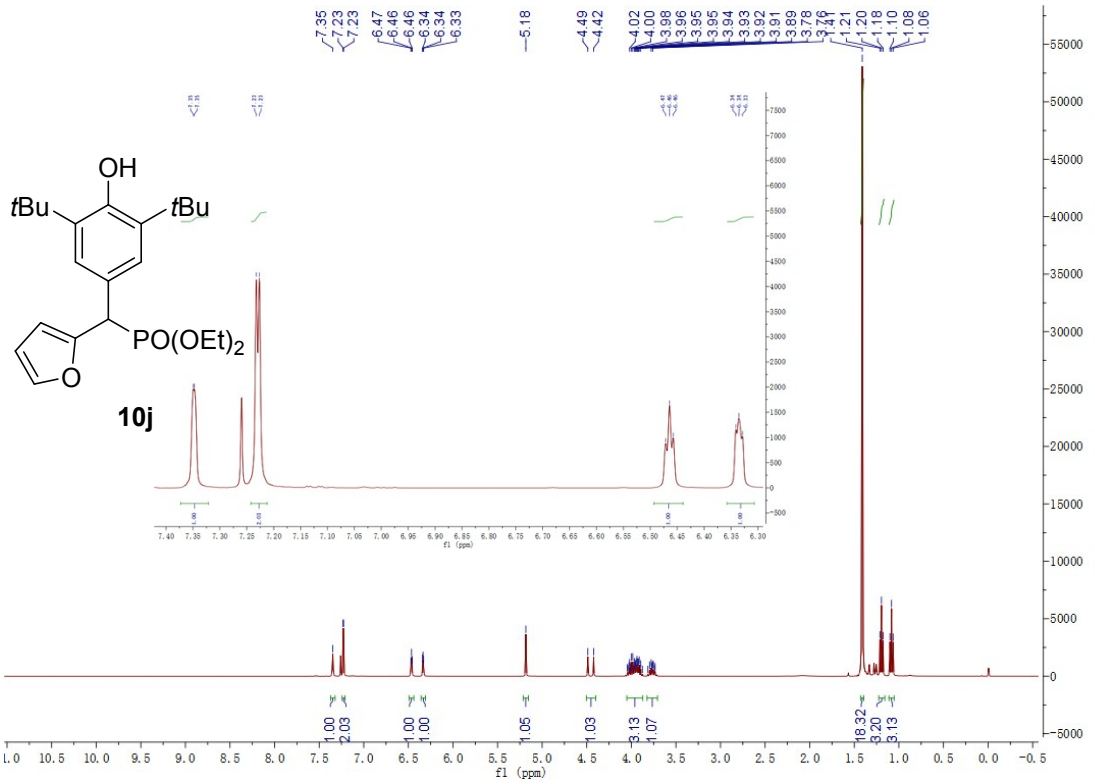
^{13}C NMR Spectrum of 10i



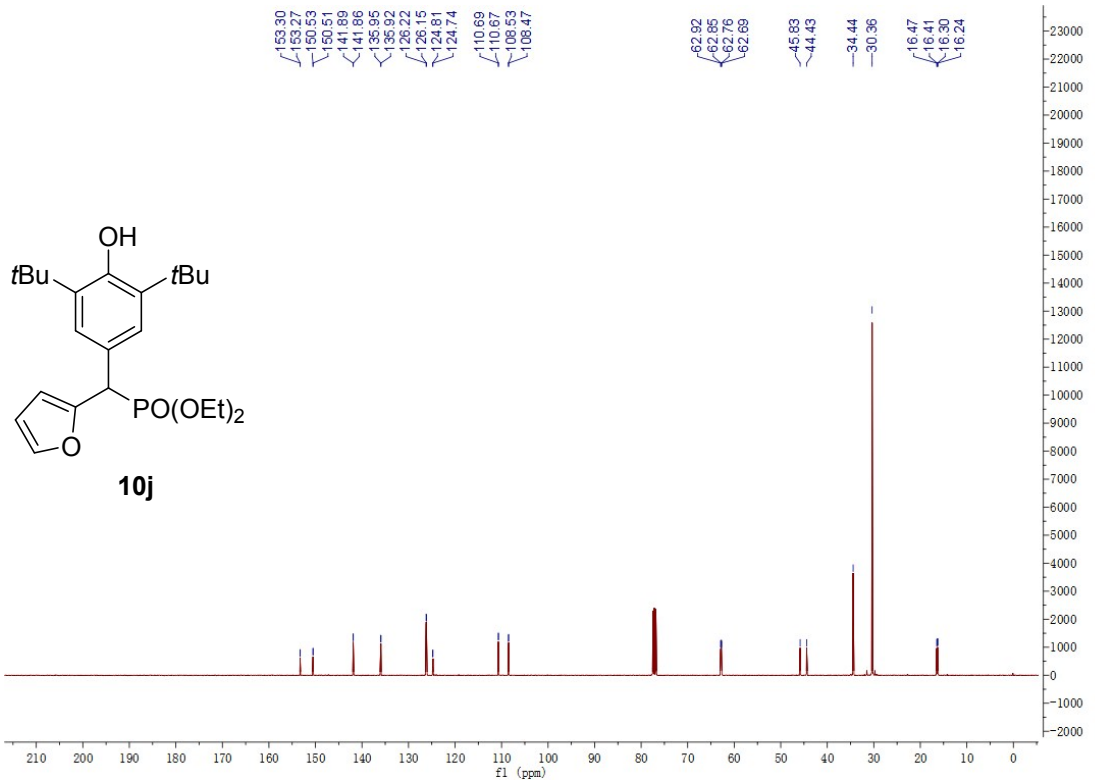
^{31}P NMR Spectrum of 10i



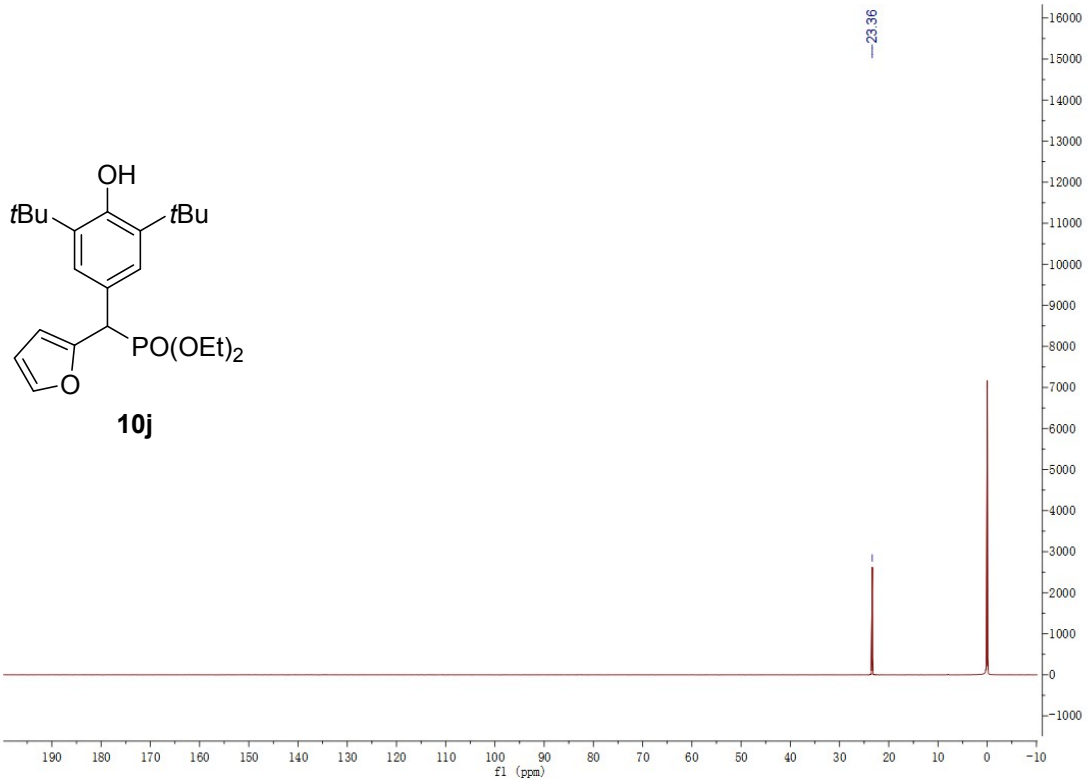
^{1}H NMR Spectrum of 10j



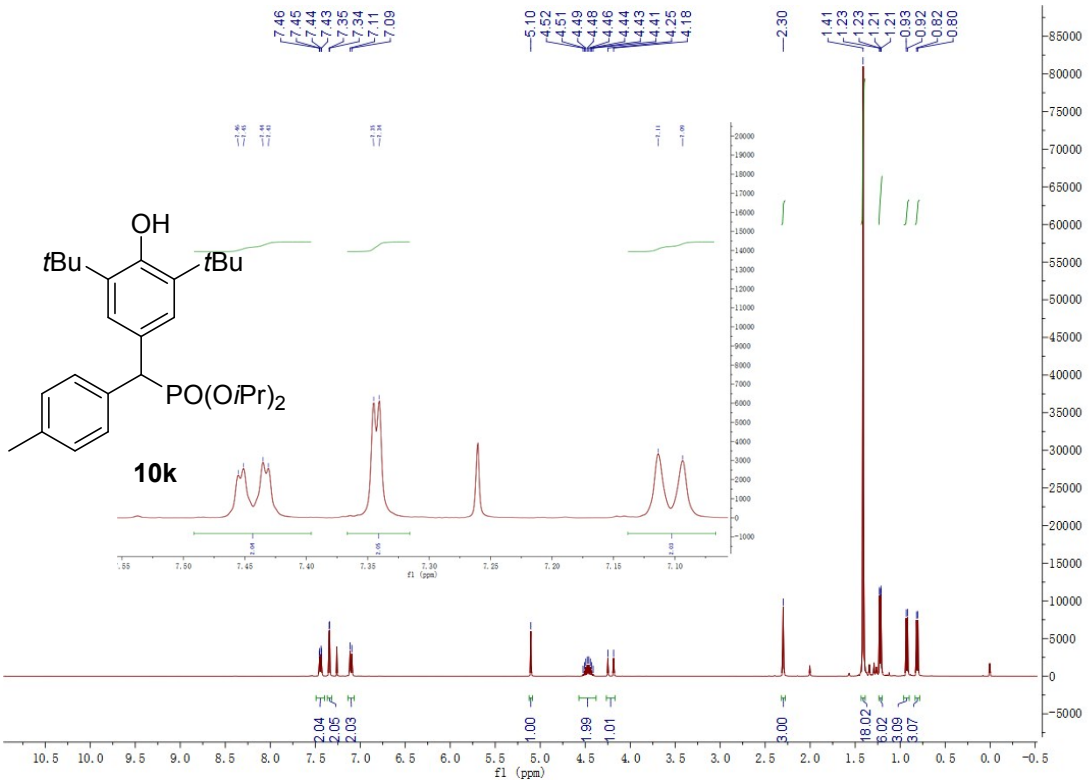
^{13}C NMR Spectrum of 10j



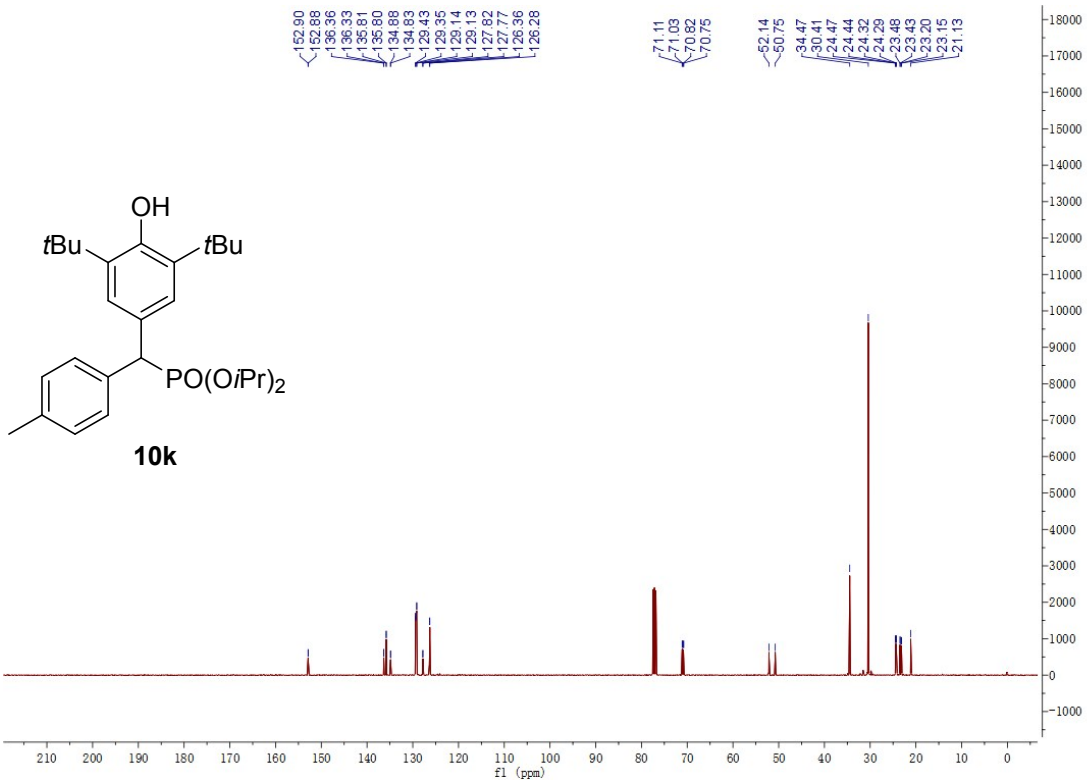
^{31}P NMR Spectrum of 10j



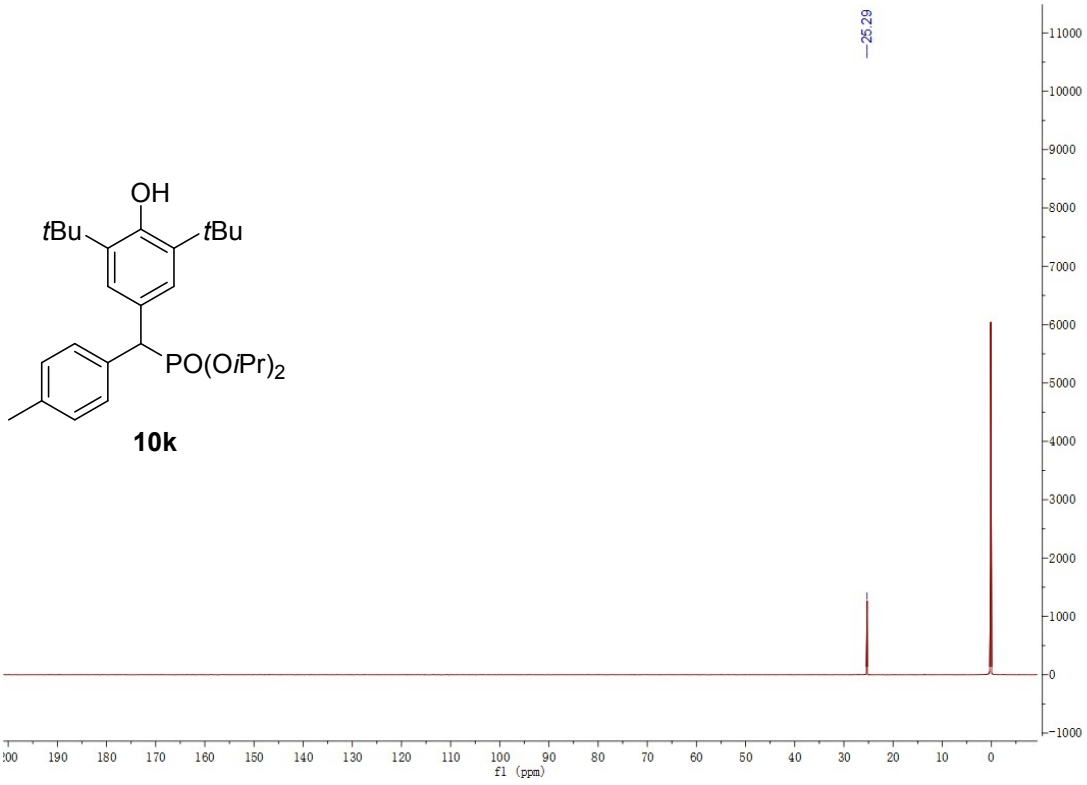
^{1}H NMR Spectrum of 10k



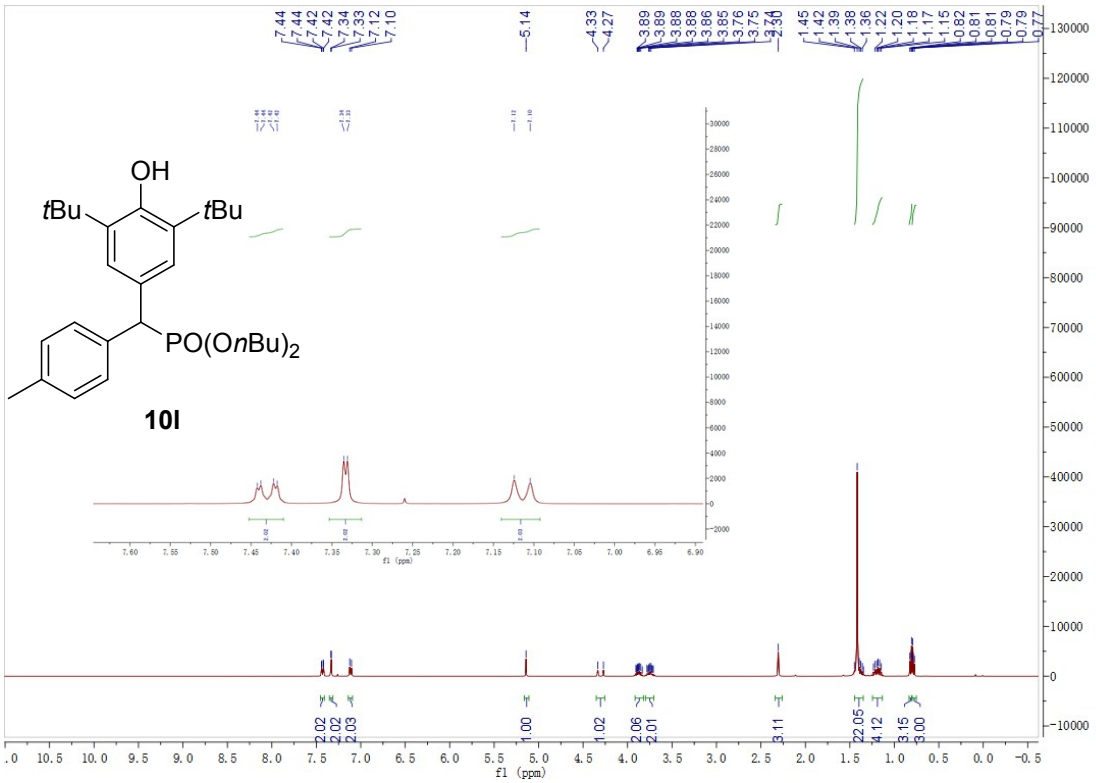
^{13}C NMR Spectrum of 10k



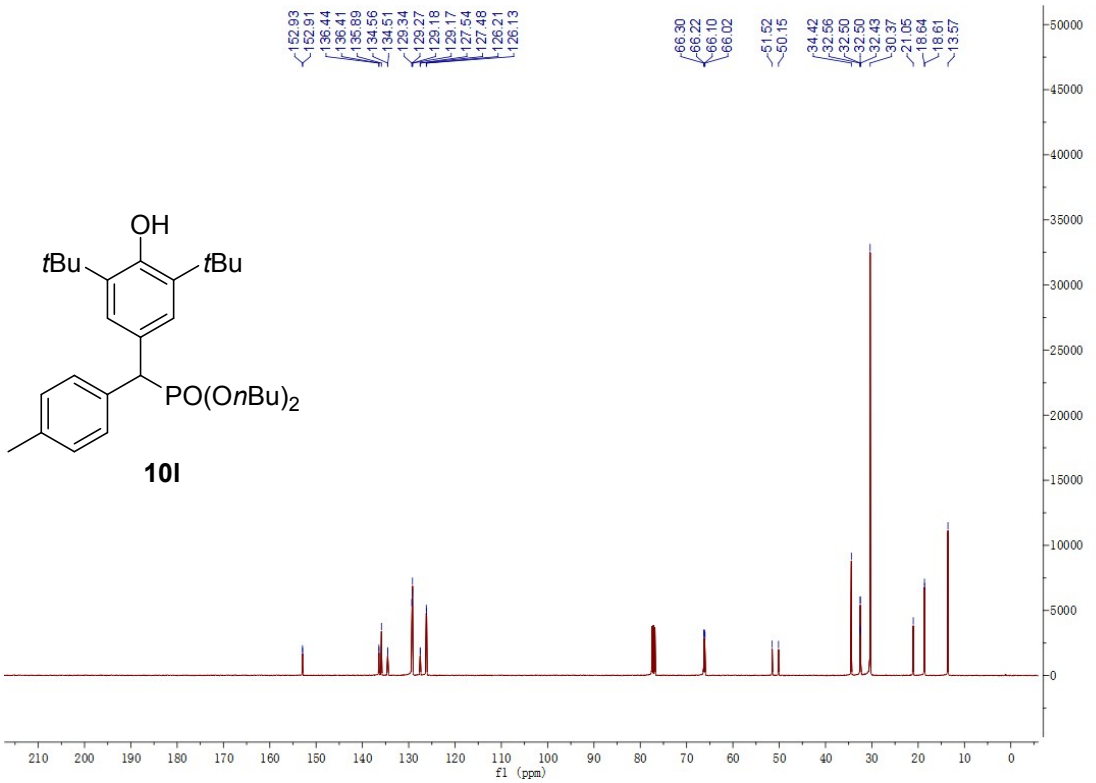
^{31}P NMR Spectrum of 10k



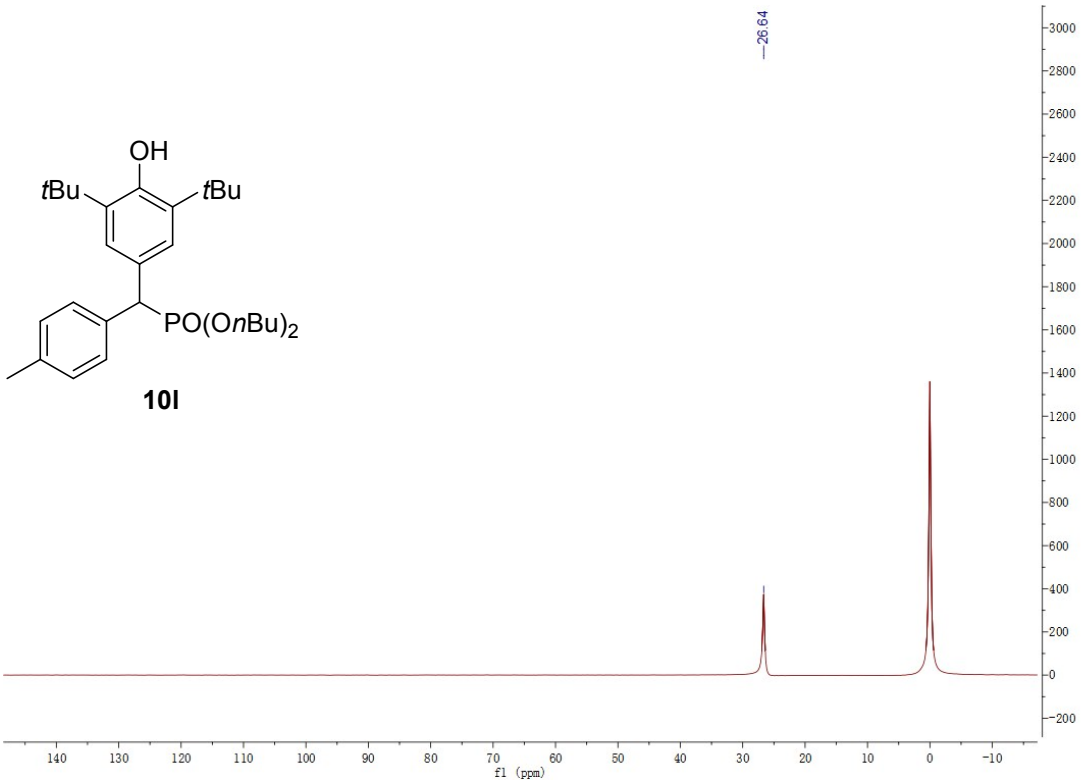
^{1}H NMR Spectrum of 10l



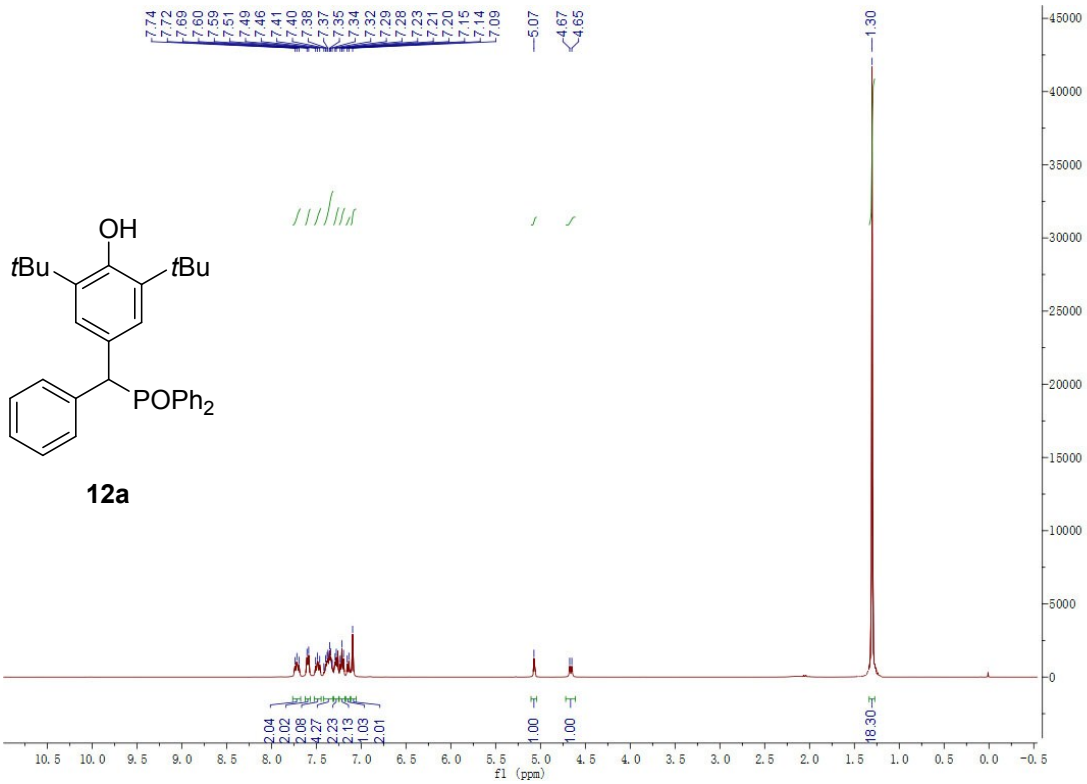
^{13}C NMR Spectrum of 10l



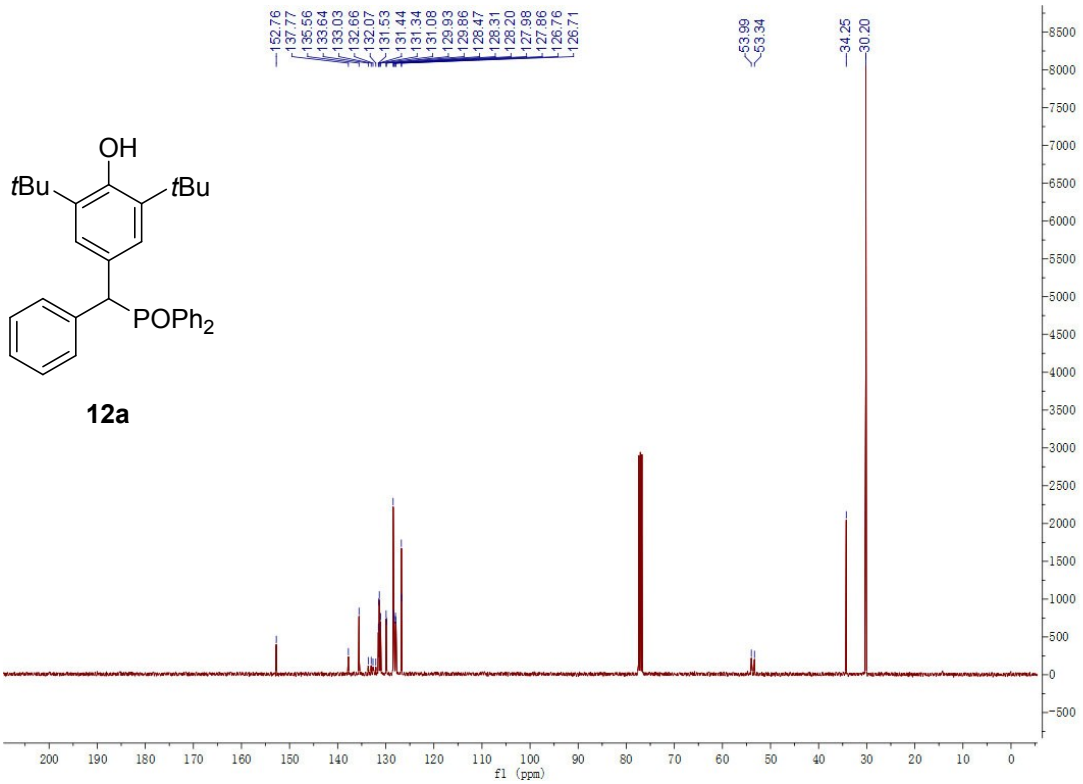
^{31}P NMR Spectrum of 10l



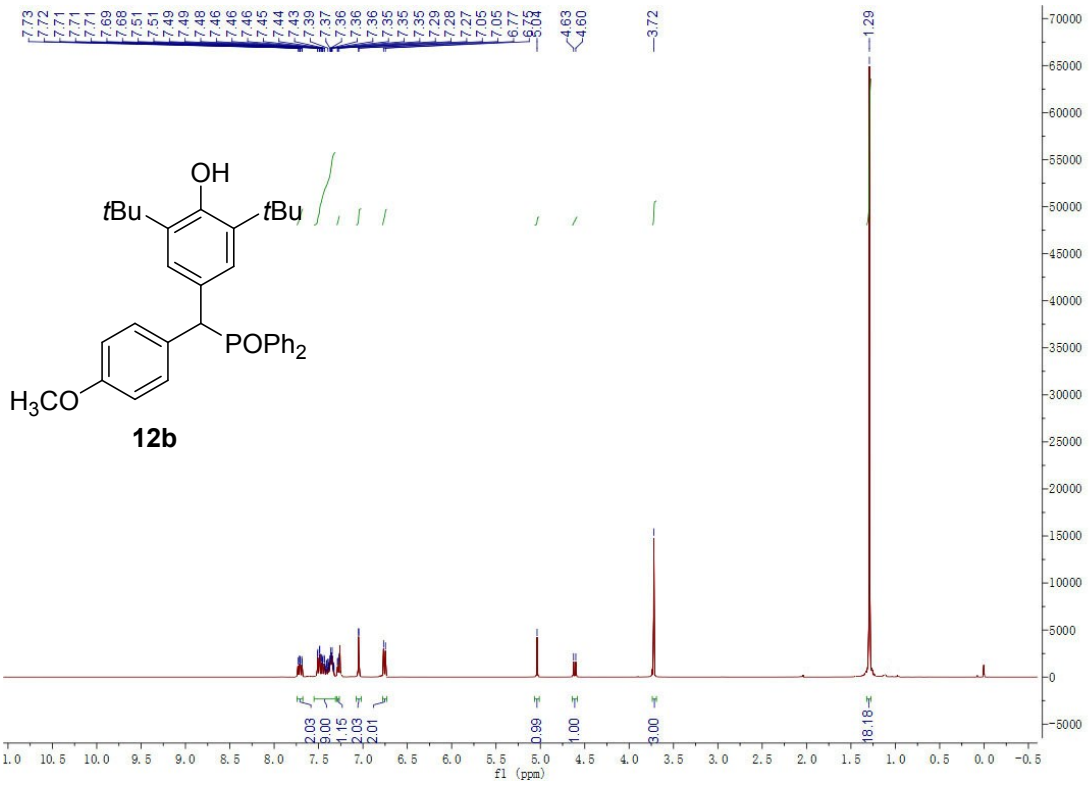
^{1}H NMR Spectrum of 12a



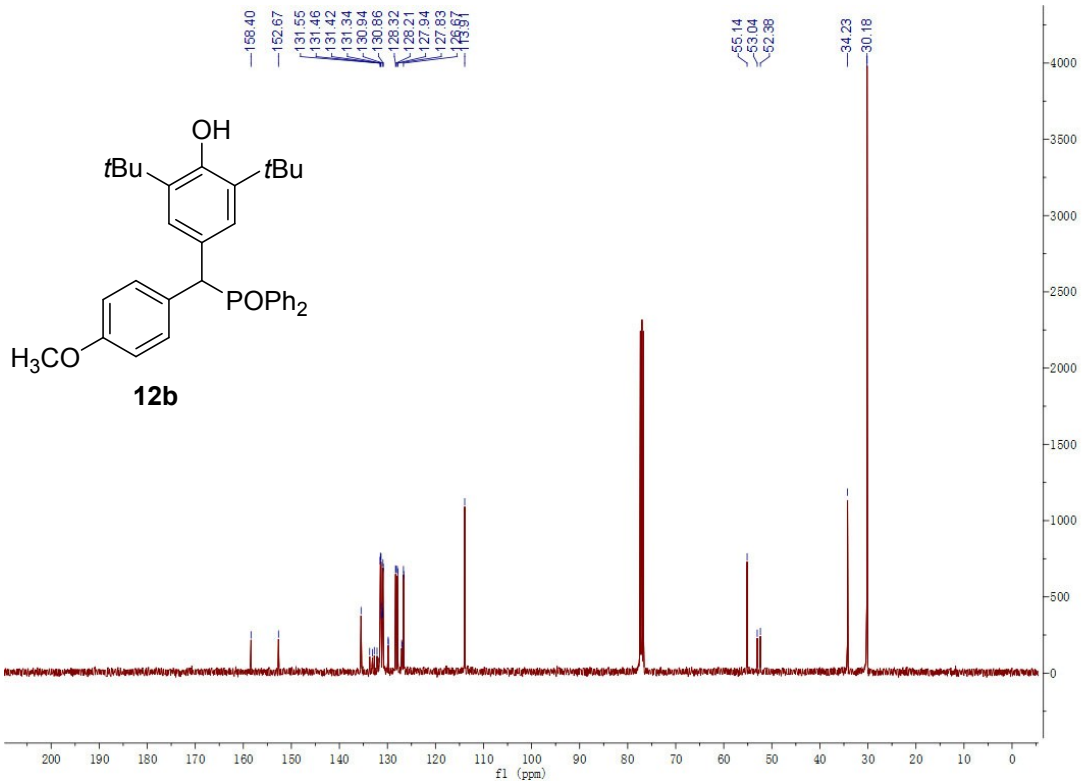
^{13}C NMR Spectrum of 12a



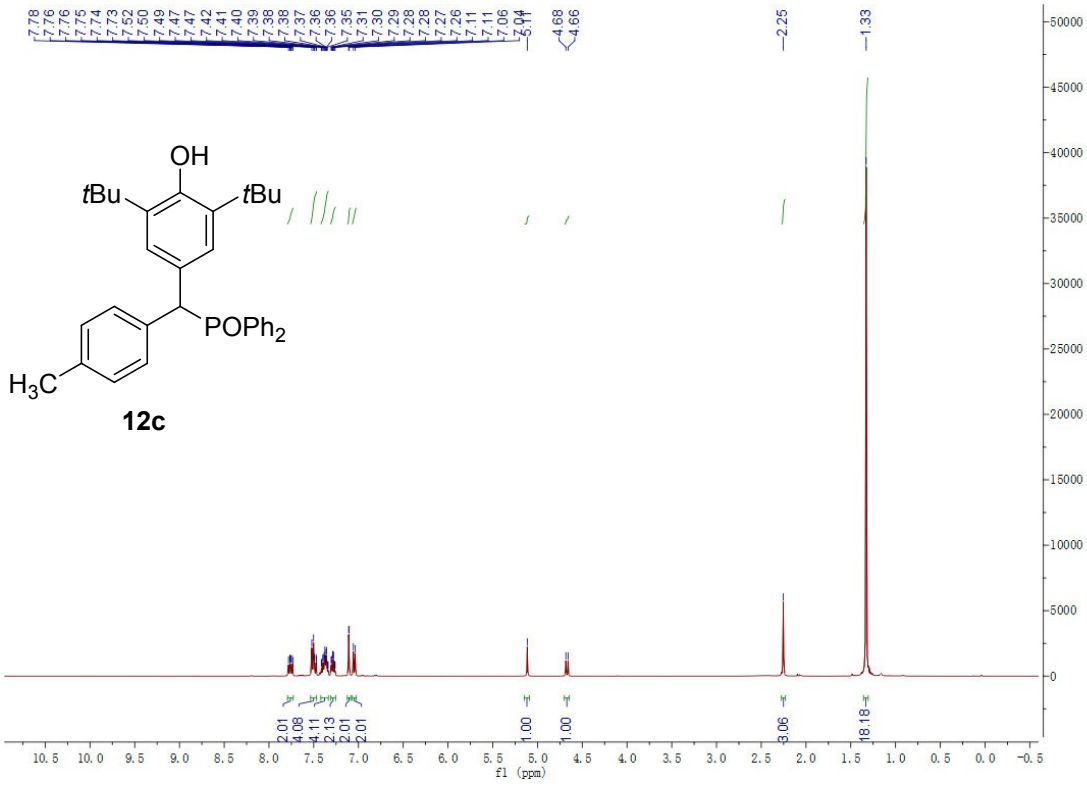
^{1}H NMR Spectrum of 12b



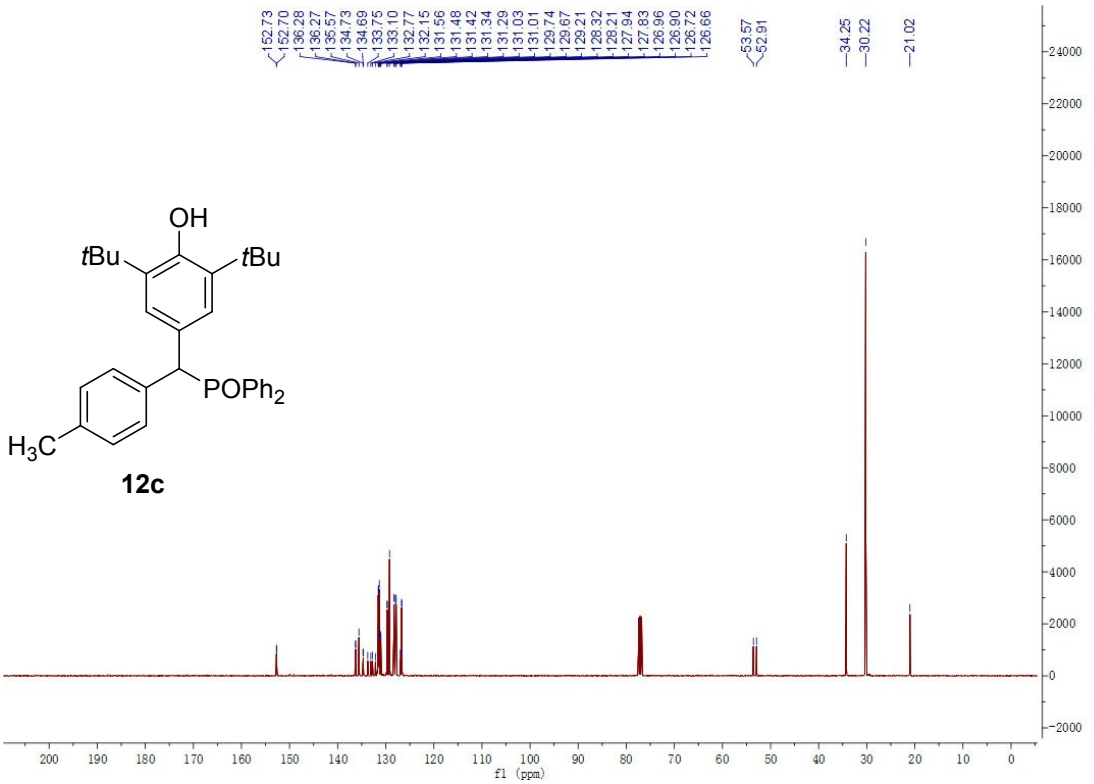
^{13}C NMR Spectrum of 12b



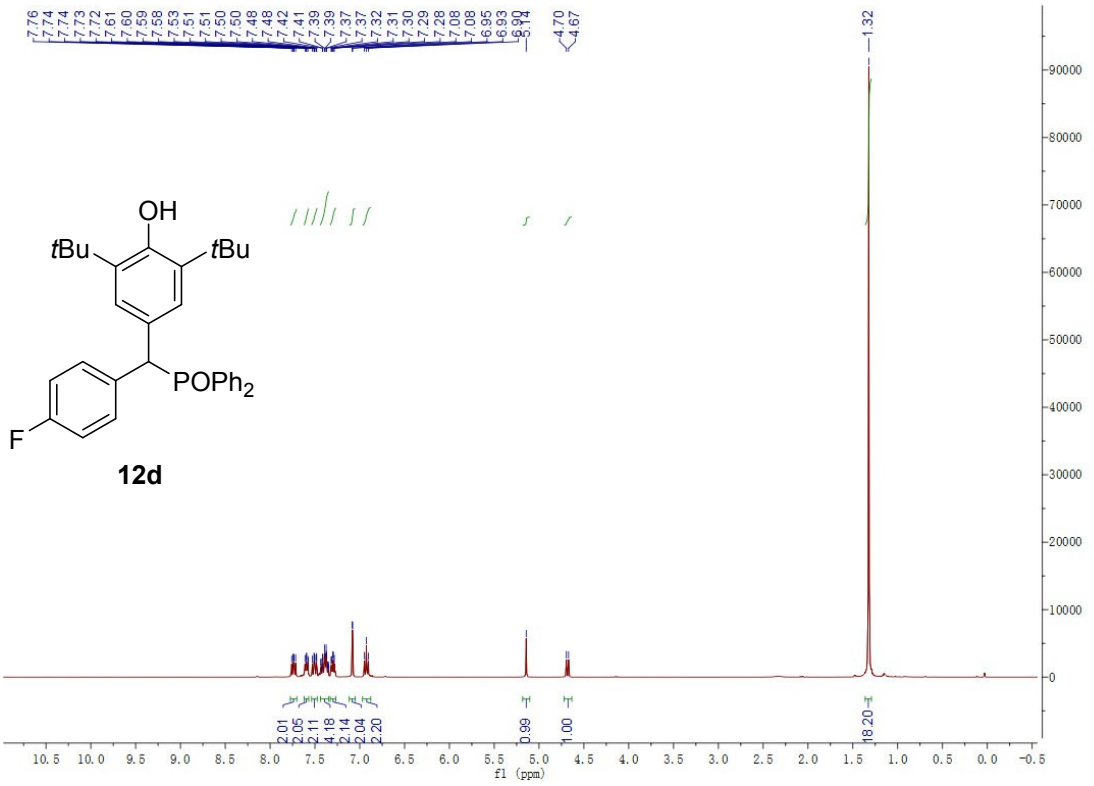
^{1}H NMR Spectrum of 12c



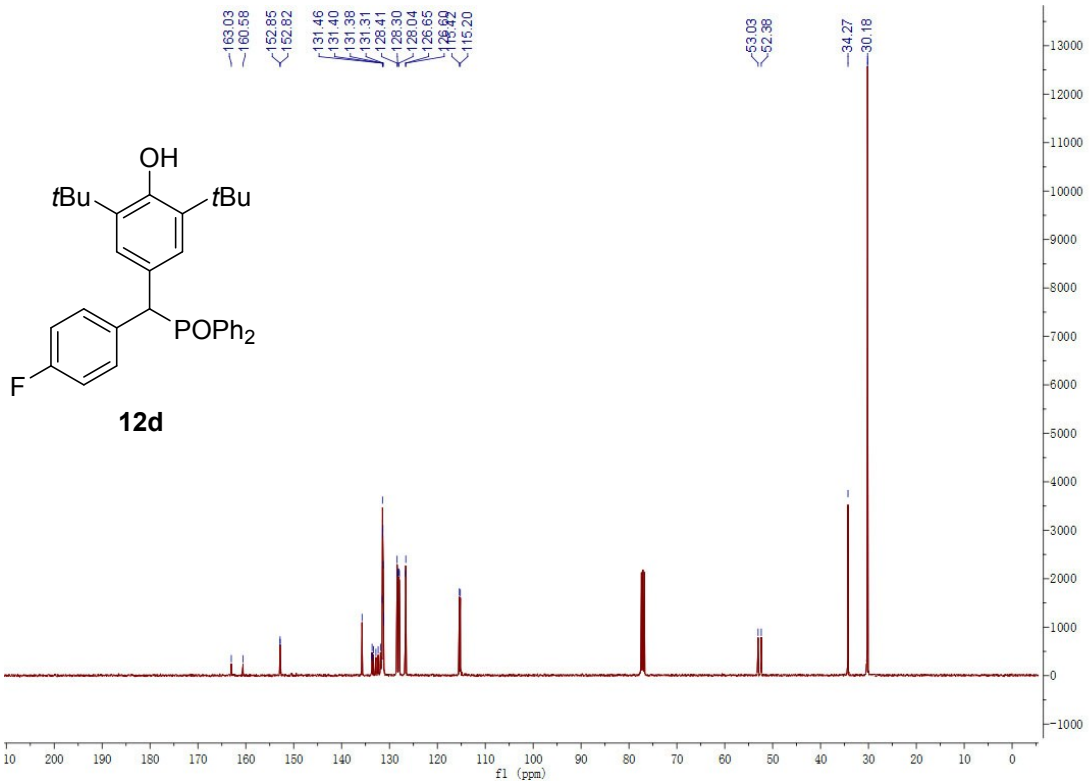
^{13}C NMR Spectrum of 12c



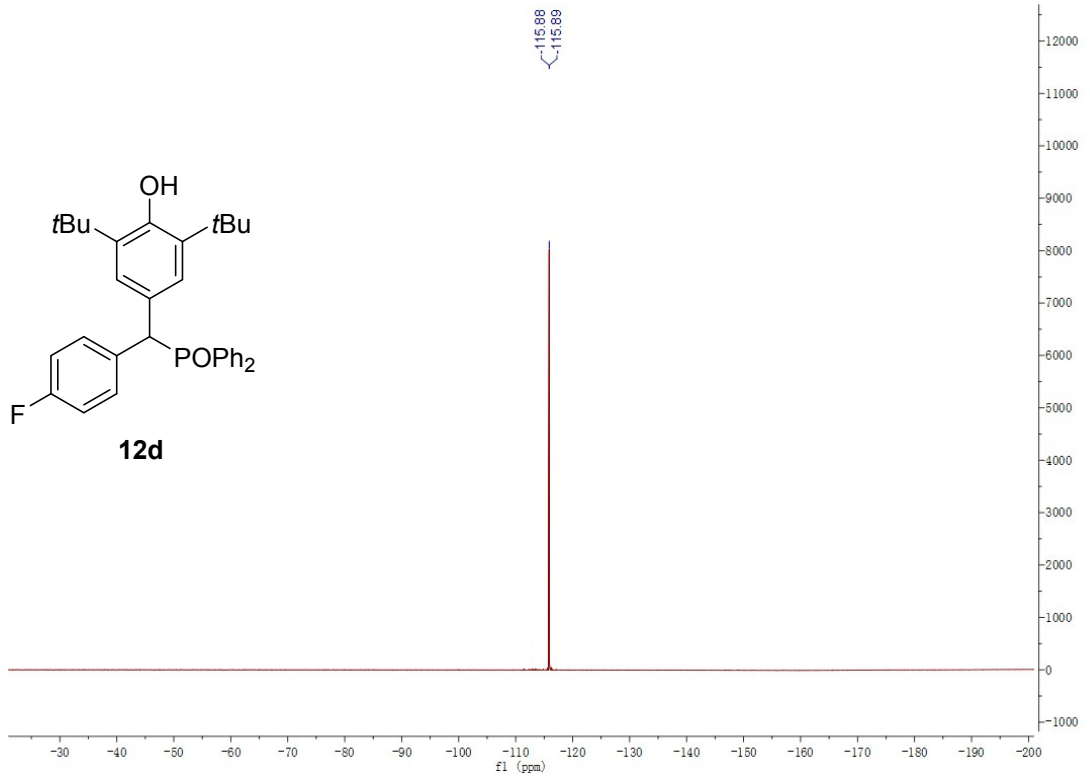
^{1}H NMR Spectrum of 12d



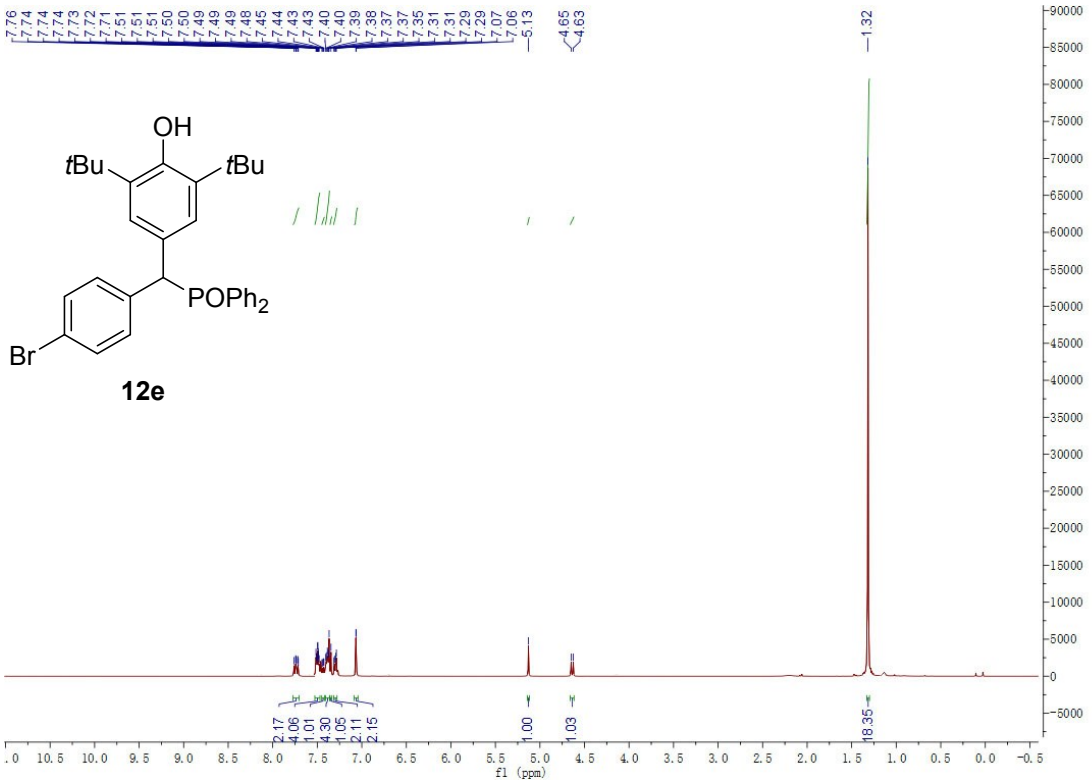
^{13}C NMR Spectrum of 12d



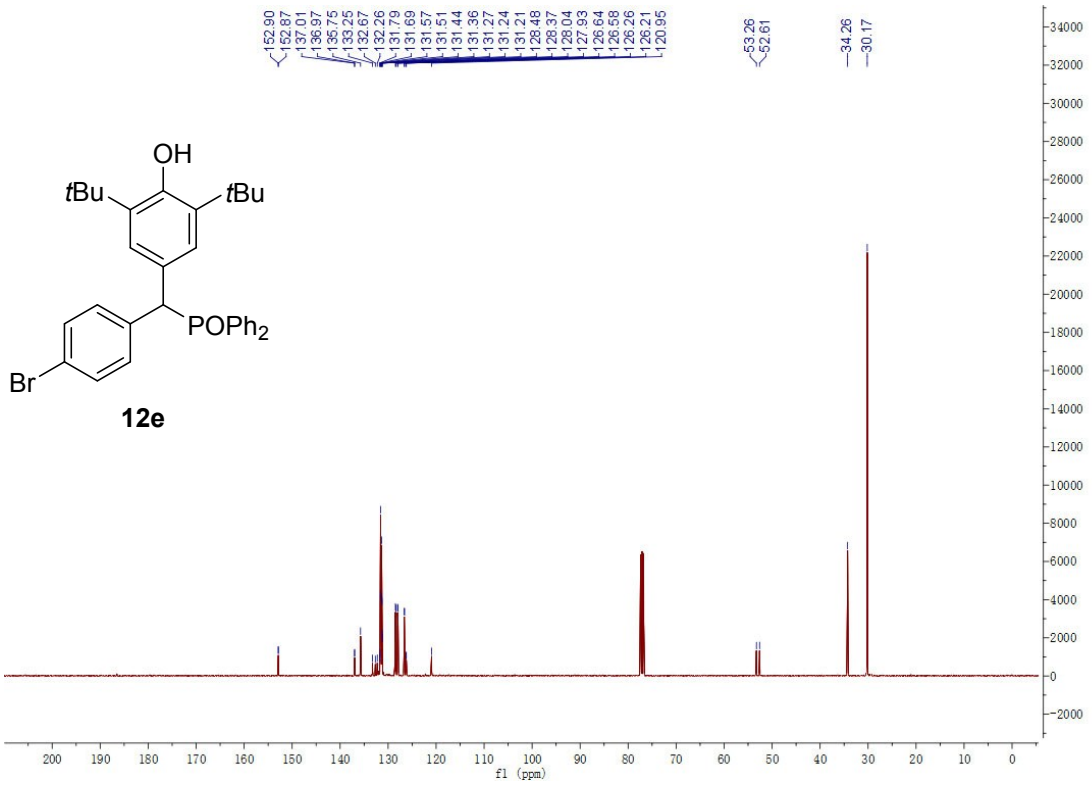
^{19}F NMR Spectrum of 12d



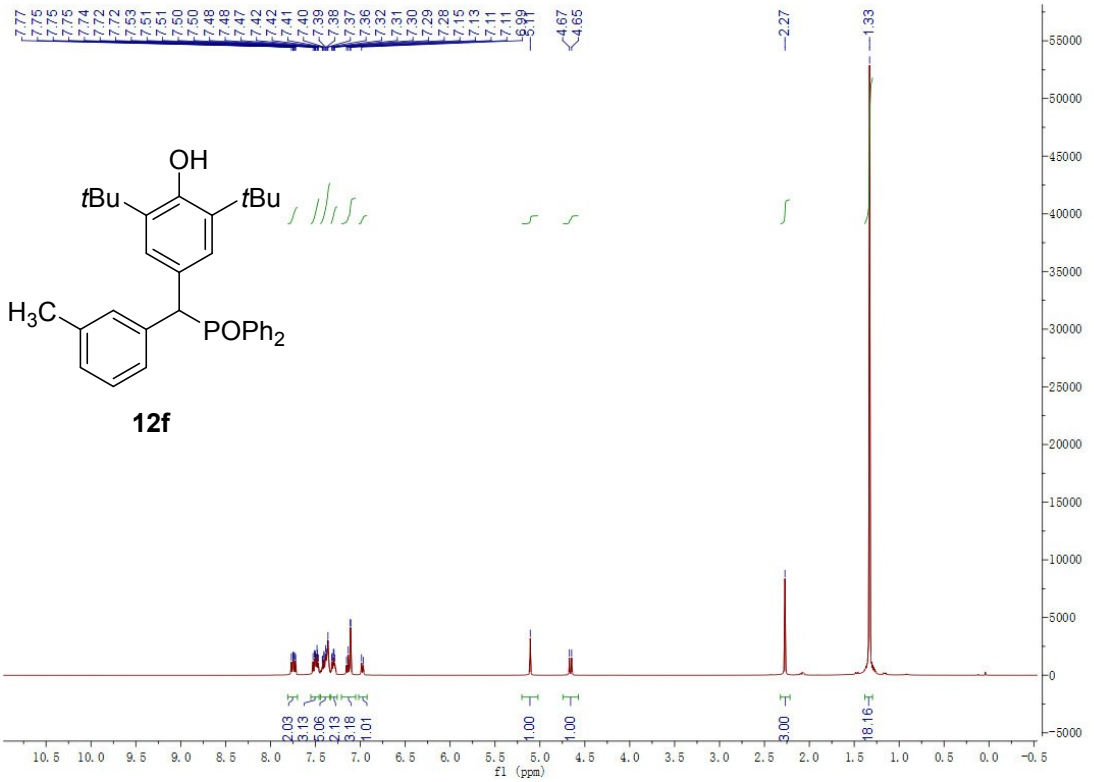
^{1}H NMR Spectrum of 12e



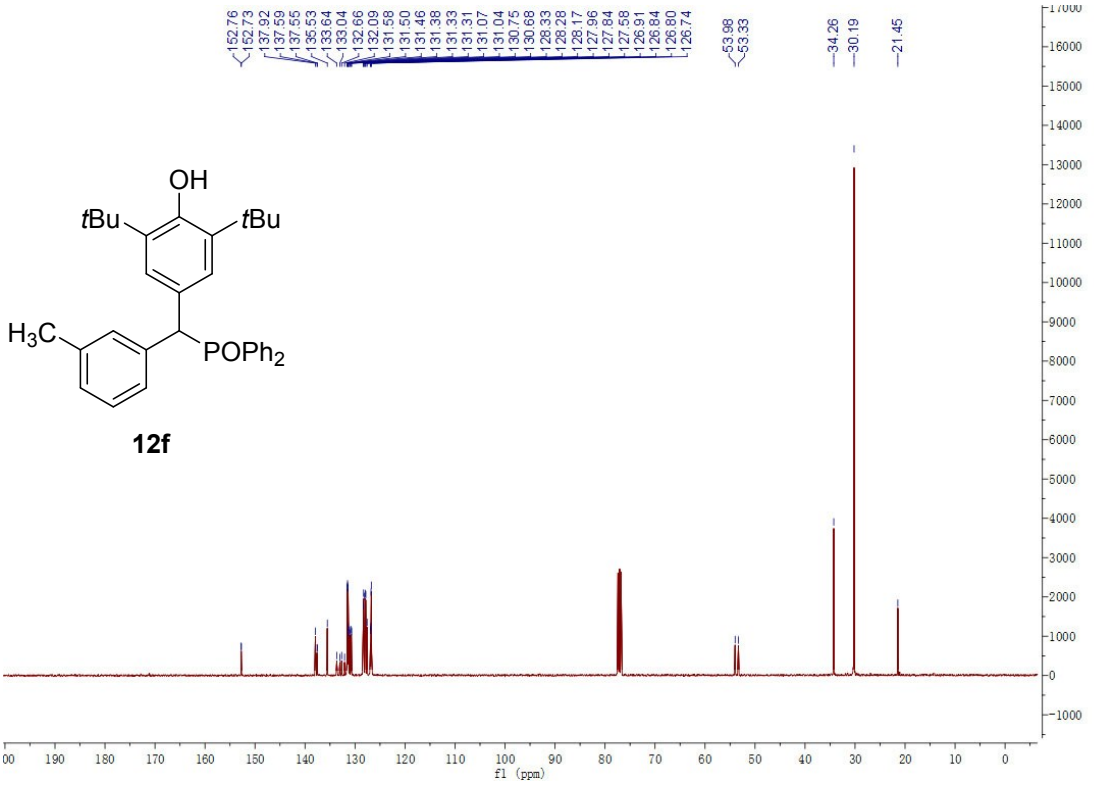
^{13}C NMR Spectrum of 12e



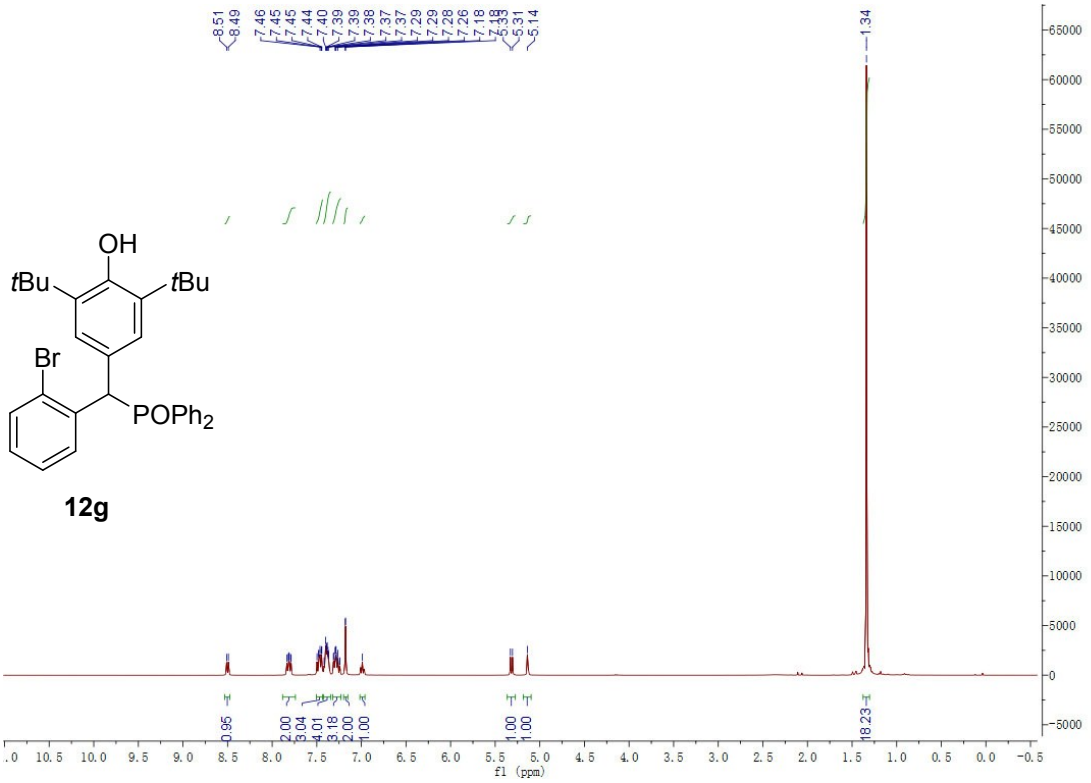
^{1}H NMR Spectrum of 12f



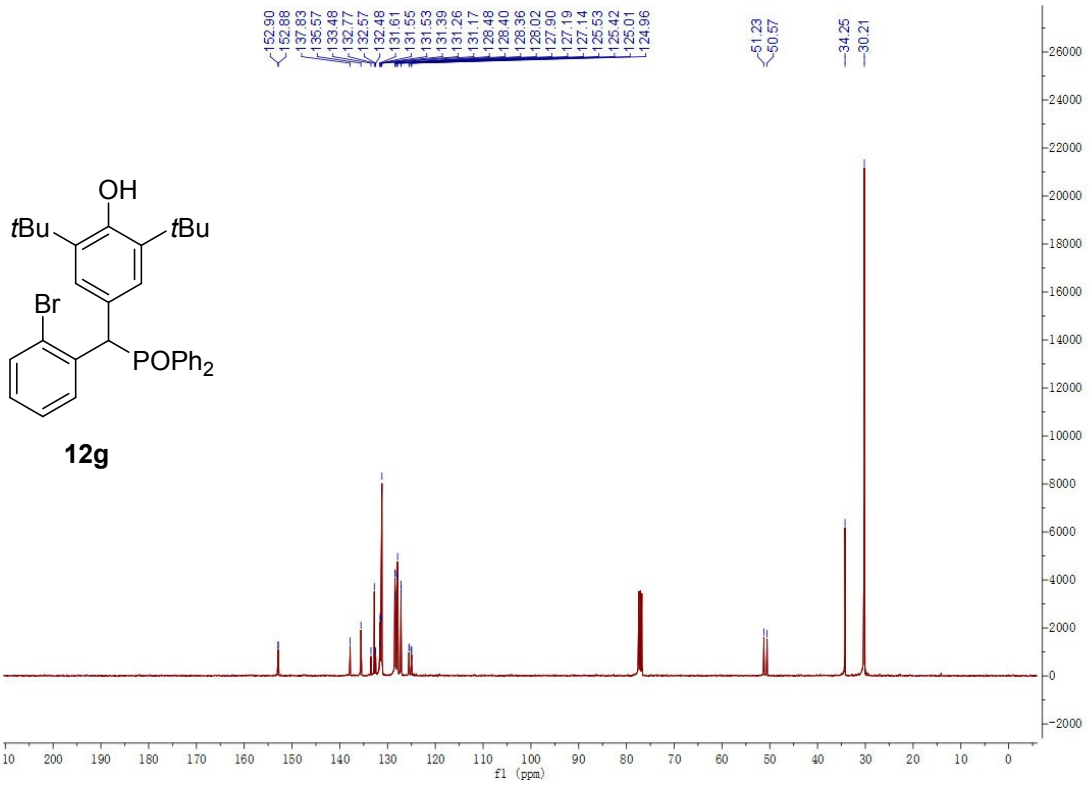
^{13}C NMR Spectrum of 12f



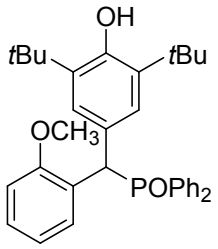
^{1}H NMR Spectrum of 12g



^{13}C NMR Spectrum of 12g

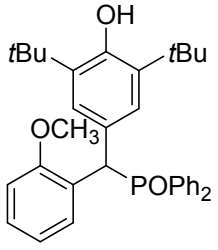


^{1}H NMR Spectrum of 12h



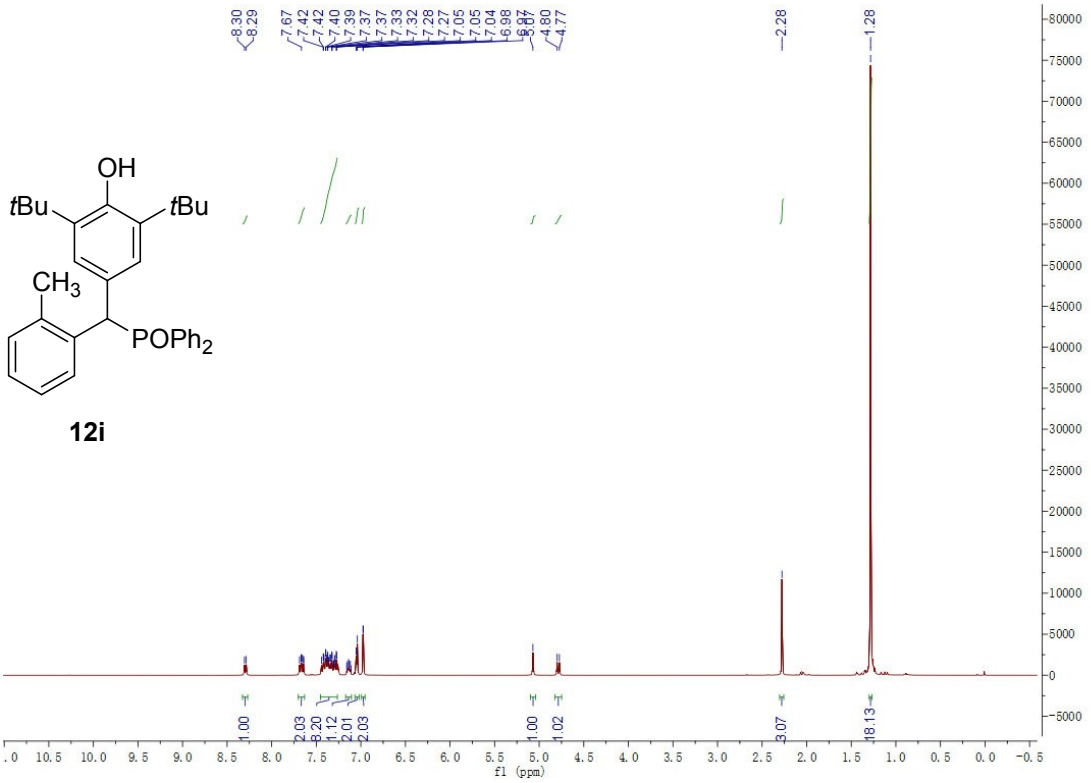
12h

^{13}C NMR Spectrum of 12h



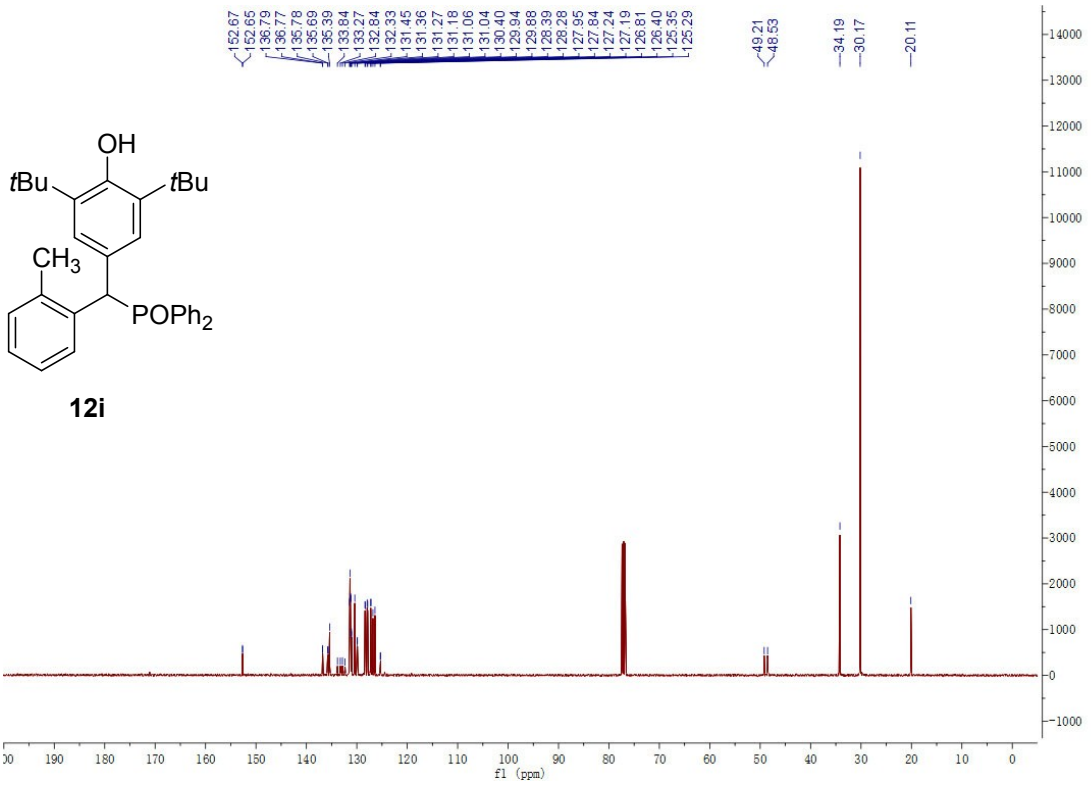
12h

^{1}H NMR Spectrum of 12i



12i

^{13}C NMR Spectrum of 12i



12i