

# Supporting Information

## Rh-Catalyzed Highly Regioselective Hydroformylation to Linear Aldehyde by Employing Porous Organic Polymer as a Ligand

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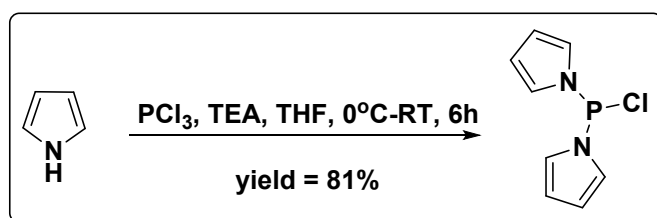
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## 1. General considerations

Unless otherwise noted, all reagents were purchased commercially from Sigma-Aldrich, or Aladdin and used as received without further purification. All operations were carried out in an argon atmosphere using glove box and Schlenk techniques unless otherwise specified. Anhydrous tetrahydrofuran (THF), hexanes and toluene were obtained from an argon purged solvent purification system comprised of columns of activated alumina and molecular sieves. Gas chromatography analysis was performed on an Agilent HP-7890 instrument with a flame ionization detector (FID) and an HP-5MS capillary column (30 m, 0.25 mm i.d., 0.25  $\mu\text{m}$  film thicknesses) using helium as the carrier gas. Gas chromatography-mass spectrometry analysis was carried out on an Agilent HP-7890 instrument with an Agilent HP-5975 with triple-axis detector and HP-5 capillary column using helium carrier gas. NMR spectra were recorded using DRX-400, or DRX-600, Chemical shifts are reported in ppm relative to the residual solvent signal ( $\text{CDCl}_3$ : 7.26 ppm ( $^1\text{H}$ ), 77.16 ppm ( $^{13}\text{C}$ ), DMSO: 2.50 ppm ( $^1\text{H}$ ), 39.52 ppm ( $^{13}\text{C}$ )). Multiplicities were reported using the following abbreviations: s = singlet, d = doublet, dd = doublet of doublets, t = triplet, q = quartet, m = multiplet, brs= broad singlet. High-resolution mass data were recorded on Bruker Maxis UHR TOF mass spectrometers in ESI mode.

## 2. Synthesis of polymer supported phosphorus ligands

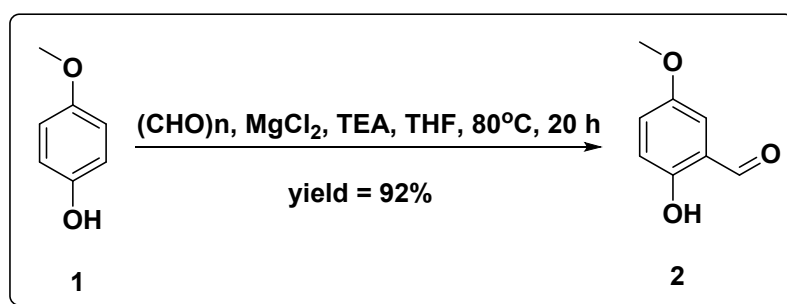
### Synthesis of 1,1'-(chlorophosphanediyl)bis(1H-pyrrole) .



The 1,1'-(chlorophosphanediyl)bis(1H-pyrrole) was synthesized according to the reported literature procedure<sup>[1]</sup>. To a stirring solution of  $\text{Et}_3\text{N}$  (12.9 g, 3.5 eq) in THF

(100 mL) in a 250-mL three-necked round bottomed flask under argon was added  $\text{PCl}_3$  (5.0 g, 1 eq) slowly at 0 °C. The solution was maintained at 0 °C and pyrrole (5.0 g, 2.05 eq) was added dropwise to it. The reaction mixture was stirred for 6 hours at room temperature. The mixture was then filtered, the filter cake was washed with THF and the filtrate was removed in vacuo. The residue was distilled in vacuo at  $10^{-3}$  Torr to afford compound **2** (6.0 g, 81% yield) as a colorless liquid.  $^1\text{H NMR}$  (400 MHz,  $\text{C}_6\text{D}_6$ )  $\delta$  (ppm): 6.84-6.74 (m, 4H), 6.18 (t,  $J = 2.0$  Hz, 4H);  $^{13}\text{C NMR}$  (101 MHz,  $\text{C}_6\text{D}_6$ )  $\delta$  (ppm): 122.4 (d,  $J = 17.0$  Hz), 113.7 (d,  $J = 5.0$  Hz);  $^{31}\text{P NMR}$  (162 MHz,  $\text{C}_6\text{D}_6$ )  $\delta$  (ppm): 104.4. Analytical data matches that reported in the literature<sup>[1]</sup>.

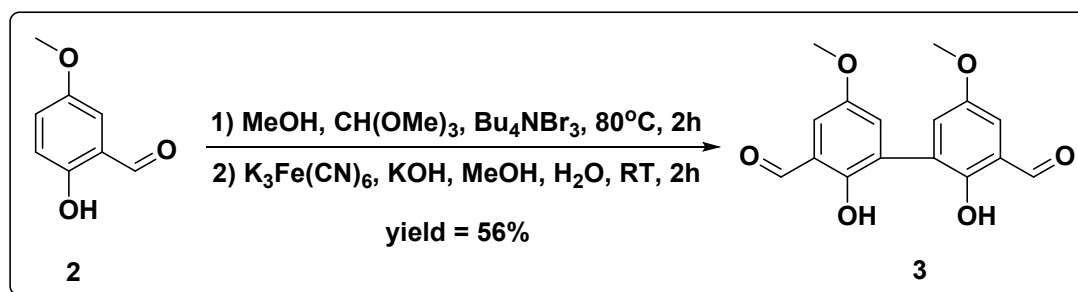
#### Synthesis of 2-hydroxy-5-methoxybenzaldehyde (**2**).



The compound **2** was synthesized according to the reported literature procedure<sup>[2]</sup>.  $\text{Et}_3\text{N}$  (36.6 g, 3 eq) was added to a mixture of  $\text{MgCl}_2$  (34.5 g, 3 eq) and paraformaldehyde (18.0 g, 5 eq) in THF (600 mL) in a 2-L three-necked round-bottomed flask under argon. The mixture was stirred for 10 min at room temperature. Compound **1** (15.0 g, 1 eq) was added to above reaction mixture. The resulting reaction mixture was stirred for 20 hours at 80°C. Cooled down to room temperature. The reaction mixture was acidified to pH=3 by 1M HCl and diluted with 1000 ml of water. The solution was extracted twice with 500 ml of ethyl acetate and the organic layer was washed with brine and dried over anhydrous  $\text{Na}_2\text{SO}_4$ . It was filtered and concentrated under vacuum. Purification by flash chromatography on silica gel provided compound **2** (17.0 g, 92% yield) as a yellow liquid.  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$ (ppm): 10.62 (s, 1H), 9.83 (s, 1H), 7.12 (dd,  $J = 9.1, 3.1$  Hz, 1H), 6.97 (d,  $J = 3.1$  Hz, 1H), 6.90 (d,  $J = 9.0$  Hz, 1H), 3.79 (s, 3H);  $^{13}\text{C NMR}$  (101 MHz,  $\text{CDCl}_3$ )  $\delta$ (ppm): 196.2, 156.0, 152.7, 125.2, 120.0, 118.6, 115.2, 55.8. Analytical data matches that reported in the

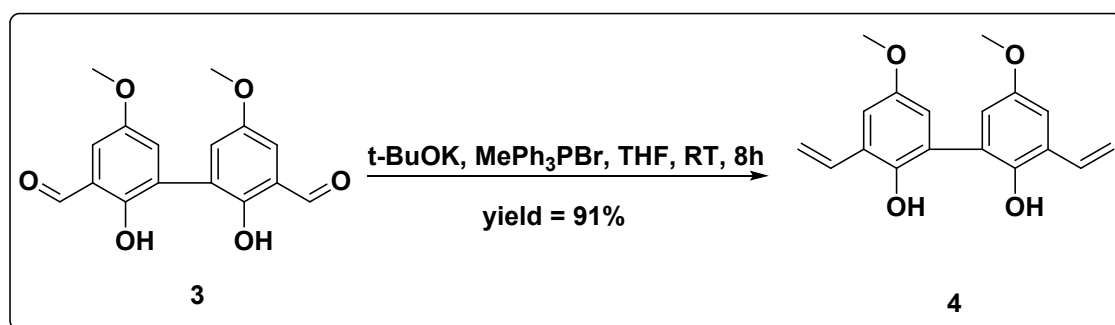
literature<sup>[2]</sup>.

### Synthesis of 2,2'-dihydroxy-5,5'-dimethoxy-[1,1'-biphenyl]-3,3'-dicarbaldehyde(3)



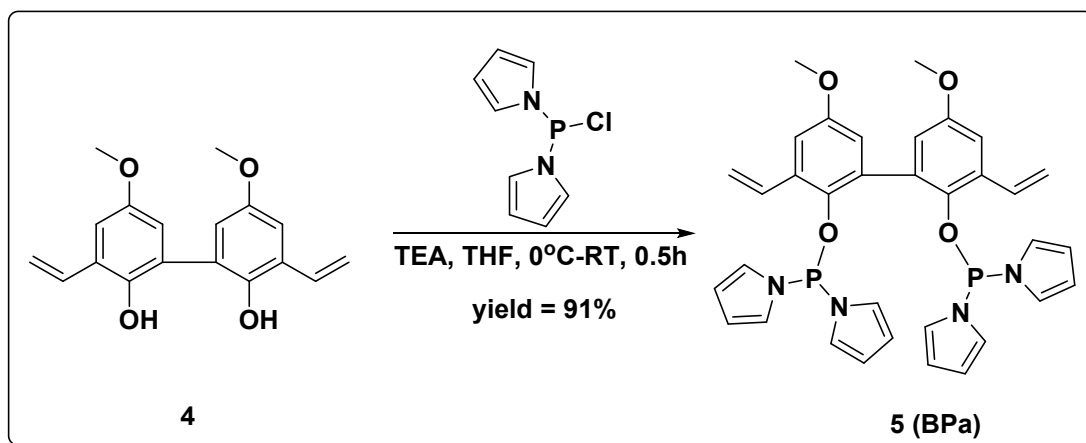
Compound 3 (1.0 g, 1 eq), MeOH (5 ml), Trimethoxymethane (1.05 g, 1.5 eq) and Tetrabutylammonium tribromide (0.16 g, 0.05 eq) were added to a 100-mL three-necked round bottomed flask under argon, and the reaction mixture was stirred at 80°C for 2 hours. When the reaction was completed, it was allowed to cool down to room temperature and diluted with 25 ml of MeOH. A solution of K<sub>3</sub>Fe(CN)<sub>6</sub> (2.16 g, 1eq) and KOH (1.29 g, 3.5 eq) in 30 ml of water was added dropwise to above reaction system under vigorous stirring over 1 hour at room temperature. The mixture was stirred for 2 hours at room temperature. It was acidified to pH=1 by 1M HCl and stirred unceasingly for 30 min at room temperature. The crude product was filtered out and further purified by flash chromatography on silica gel provided compound 3 (0.55 g, 56% yield) as a yellow solid. <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>) δ(ppm): 11.04 (s, 2H), 9.95 (s, 2H), 7.30 (d, *J* = 3.1 Hz, 2H), 7.11 (d, *J* = 3.1 Hz, 2H), 3.88 (s, 6H); <sup>13</sup>C NMR (151 MHz, CDCl<sub>3</sub>) δ(ppm): 196.2, 153.5, 152.3, 126.7, 126.1, 120.5, 115.9, 56.0. Analytical data matches that reported in the literature<sup>[3]</sup>.

### Synthesis of 5,5'-dimethoxy-3,3'-divinyl-[1,1'-biphenyl]-2,2'-diol(4).



t-BuOK (1.34 g, 4.5 eq) was added in portions to a mixture of Methyltriphenylphosphonium bromide (4.24 g, 4.5 eq) in THF (40 mL) in a 100-mL three-necked round-bottomed flask under argon. The mixture was stirred for 30 min at room temperature. Compound **3** (0.8 g, 1 eq) was added to above reaction system. The last reaction mixture was stirred for 15 hours at room temperature. The reaction mixture was quenched with 100 ml of water and extracted twice with 100 ml of ethyl acetate. The organic layer was washed with brine and dried over anhydrous Na<sub>2</sub>SO<sub>4</sub>. It was filtered and concentrated under vacuum. Purification by flash chromatography on silica gel provided compound **4** (0.72 g, 91% yield) as a white solid. <sup>1</sup>H NMR (400 MHz, DMSO) δ(ppm): 8.33 (s, 2H), 7.17-7.01 (m, 4H), 6.72 (d, *J* = 3.1 Hz, 2H), 5.82 (dd, *J* = 17.7, 1.4 Hz, 2H), 5.28 (dd, *J* = 11.1, 1.3 Hz, 2H), 3.75 (s, 6H); <sup>13</sup>C NMR (101 MHz, DMSO) δ(ppm): 153.3, 145.4, 132.4, 129.4, 127.6, 117.1, 115.0, 110.4, 55.9.

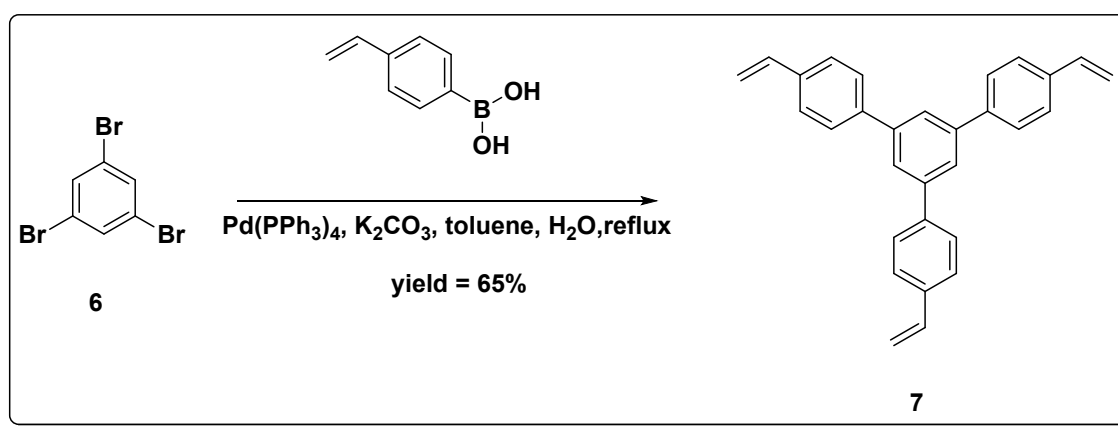
**Synthesis of 1,1',1'',1'''-(((5,5'-dimethoxy-3,3'-divinyl-[1,1'-biphenyl]-2,2'-diyl)bis(oxy))bis(phosphanetriyl))tetrakis(1H-pyrrole)(5).**



A solution of 1,1'-(chlorophosphanediyl)bis(1H-pyrrole) (400 mg, 3 eq) in THF (5 mL) in a 50-mL three-necked round bottomed flask under argon was cooled down to 0°C. Another solution of compound **4** (200 mg, 1 eq) and Et<sub>3</sub>N (203 mg, 3 eq) in THF (5 mL) was then added dropwise slowly to above solution. The mixture was stirred for 30 min at room temperature. Quenched with 50 ml of water and extracted twice with 20 ml of ethyl acetate. The organic layer was washed with brine and concentrated under vacuum. Purification by flash chromatography on silica gel provided compound **5** (380

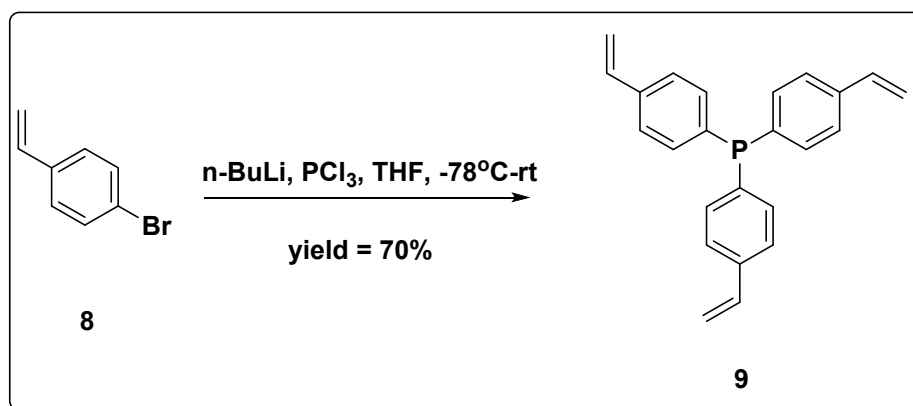
mg, 91% yield) as a pink solid. **<sup>1</sup>H NMR** (400 MHz, CDCl<sub>3</sub>) δ(ppm): 6.83-6.76 (m, 6H), 6.67-6.60 (m, 4H), 6.51 (d, *J* = 3.1 Hz, 2H), 6.24-6.12 (m, 6H), 6.06 (t, *J* = 2.1 Hz, 4H), 5.45 (dd, *J* = 17.4, 1.2 Hz, 2H), 5.00 (dd, *J* = 10.9, 1.1 Hz, 2H), 3.62 (s, 6H); **<sup>13</sup>C NMR** (101 MHz, CDCl<sub>3</sub>) δ(ppm): 156.0, 142.4 (t, *J* = 5.1 Hz), 132.2 (t, *J* = 1.2 Hz), 131.4 (t, *J* = 2.3 Hz), 130.8, 121.7-121.1 (m), 116.4, 116.1, 112.1 (t, *J* = 2.3 Hz), 111.9 (t, *J* = 2.3), 111.6, 55.5; **<sup>31</sup>P NMR** (162 MHz, CDCl<sub>3</sub>) δ(ppm): 108.7; **HRMS** (ESI) *m/z* : calcd. for C<sub>34</sub>H<sub>32</sub>N<sub>4</sub>O<sub>4</sub>P<sub>2</sub> [M+H], 623.1932; found, 623.1980.

#### Synthesis of 4,4''-divinyl-5'-(4-vinylphenyl)-1,1':3',1''-terphenyl(7).



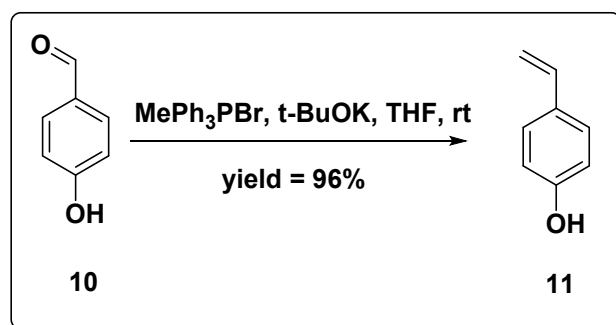
The compound 7 was synthesized according to the reported literature procedure<sup>[4]</sup>. Pd(PPh<sub>3</sub>)<sub>4</sub> (276.1 mg, 0.05 eq) was added to a mixture of compound 6 (1.5 g, 1 eq), 4-Vinylbenzeneboronic acid (4.2 g, 6 eq), K<sub>2</sub>CO<sub>3</sub> (4.0 g, 6 eq) and water (4.5 mL) in toluene (30 mL) in a 50-mL three-necked round bottomed flask under argon. The mixture was stirred overnight at 110°C. Quenched with 100 ml of water and extracted twice with 50 ml of ethyl acetate. The organic layer was washed with brine and concentrated under vacuum. Purification by flash chromatography on silica gel provided compound 7 (1.2 g, 65% yield) as a white solid. **<sup>1</sup>H NMR** (400 MHz, CDCl<sub>3</sub>) δ(ppm): 7.76 (s, 3H), 7.65 (d, *J* = 8.2 Hz, 6H), 7.51 (d, *J* = 8.2 Hz, 6H), 6.77 (dd, *J* = 17.6, 10.9 Hz, 3H), 5.81 (d, *J* = 17.6 Hz, 3H), 5.29 (d, *J* = 11.0 Hz, 3H); **<sup>13</sup>C NMR** (101 MHz, CDCl<sub>3</sub>) δ(ppm): 142.0, 140.5, 137.0, 136.4, 127.5, 126.8, 124.9, 114.2. Analytical data matches that reported in the literature<sup>[4]</sup>.

### Synthesis of tris(4-vinylphenyl)phosphane(9).



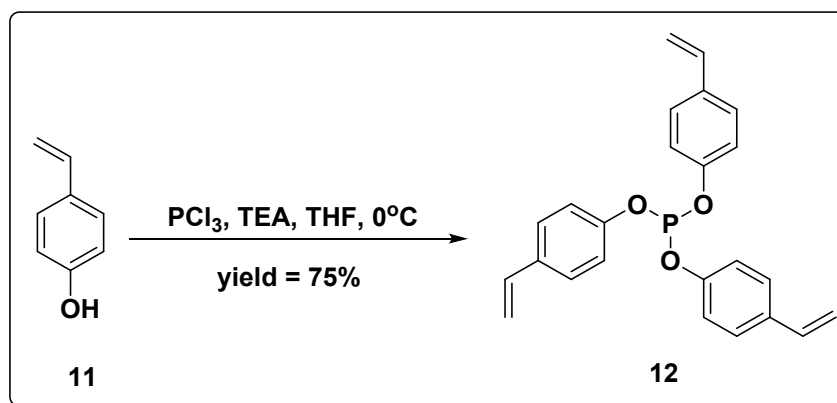
n-BuLi (6.0 mL, 1.1 eq) was added to THF (50 mL) at -78 °C in a 100-mL three-necked round bottomed flask under argon. A solution of compound **8** (2.5 g, 1 eq) in THF (5 mL) was added dropwise slowly to above solution over 1 hour at -78 °C. The solution was stirred for 1 hour at -78 °C. Another solution of PCl<sub>3</sub> (0.38 g, 0.2 eq) in THF (5 mL) was also added dropwise slowly to above solution over 1 hour at -78 °C. The resulting solution was stirred for 2 hours at room temperature. Quenched with 100 ml of water and extracted twice with 50 ml of ethyl acetate. The organic layer was washed with brine and concentrated under vacuum. Purification by flash chromatography on silica gel provided compound **9** (0.66 g, 70% yield) as a white solid. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ(ppm): 7.39-7.35 (m, 6H), 7.27 (t, *J* = 7.9 Hz, 6H), 6.70 (dd, *J* = 17.6, 10.9 Hz, 3H), 5.77 (dd, *J* = 17.6, 0.4 Hz, 3H), 5.27 (d, *J* = 11.0 Hz, 3H); <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) δ(ppm): 138.0, 136.7 (d, *J* = 10.8 Hz), 136.4, 133.9 (d, *J* = 19.6 Hz), 126.3 (d, *J* = 7.1 Hz), 114.7; <sup>31</sup>P NMR (162 MHz, CDCl<sub>3</sub>) δ(ppm): -6.7. Analytical data matches that reported in the literature<sup>[5]</sup>.

### Synthesis of 4-vinylphenol(11).



t-BuOK (4.1 g, 2.25 eq) was added in portions to a mixture of Methyltriphenylphosphonium bromide (13.2 g, 2.25 eq) in THF (120 mL) in a 250-mL three-necked round-bottomed flask under argon. The mixture was stirred for 30 min at room temperature. Compound **10** (2.0 g, 1 eq) was added to above reaction system. The resulting reaction mixture was stirred for 8 hours at room temperature. The reaction mixture was quenched with 300 ml of water and extracted twice with 300 ml of ethyl acetate. The organic layer was washed with brine and dried over anhydrous Na<sub>2</sub>SO<sub>4</sub>. It was filtered and concentrated under vacuum. Purification by flash chromatography on silica gel provided compound **11** (1.9 g, 96% yield) as a white solid. <sup>1</sup>H NMR (600 MHz, DMSO) δ(ppm): 9.54 (s, 1H), 7.29 (d, *J* = 10.9, 2H), 6.77 (d, *J* = 5.5, 2H), 6.62 (dd, *J* = 17.6, 10.9 Hz, 1H), 5.59 (d, *J* = 17.6 Hz, 1H), 5.05 (d, *J* = 10.9 Hz, 1H); <sup>13</sup>C NMR (151 MHz, DMSO) δ(ppm): 157.9, 136.9, 128.8, 127.9, 115.8, 111.1. Analytical data matches that reported in the literature<sup>[6]</sup>.

#### Synthesis of tris(4-vinylphenyl) phosphite (**12**).

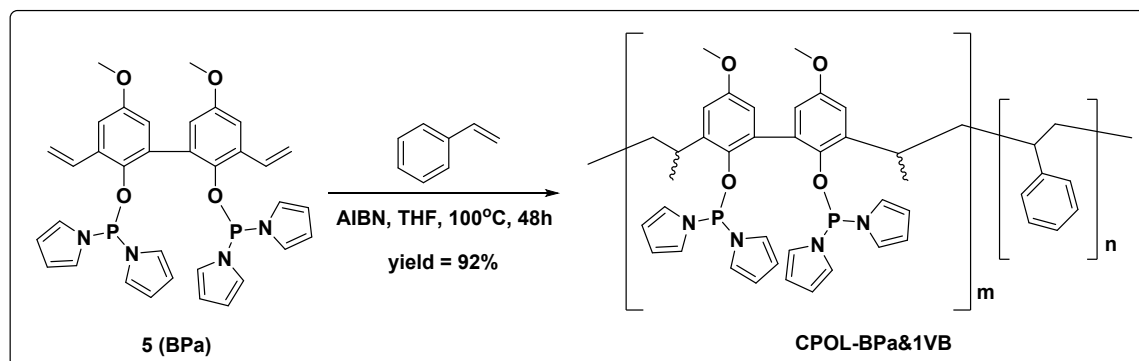


The compound **12** was synthesized according to the reported literature procedure<sup>[6]</sup>. PCl<sub>3</sub> (0.68 g, 1 eq) in THF (2 mL) was added to a solution of Et<sub>3</sub>N (2.3 g, 4.5 eq) and compound **11** (1.8 g, 3 eq) in THF (40 mL) in a 100-mL three-necked, round bottomed flask under argon at 0°C. The mixture was stirred for 1 hour at 0°C. Quenched with 100 ml of water and extracted twice with 50 ml of ethyl acetate. The organic layer was washed with brine and concentrated under vacuum. Purification by flash chromatography on silica gel provided compound **12** (1.45 g, 75% yield) as a colorless oil. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ(ppm): 7.28 (d, *J* = 8.6 Hz, 6H), 7.05-6.94 (m, 6H), 6.59 (dd, *J* = 17.6, 10.9 Hz, 3H), 5.58 (dd, *J* = 17.6, 0.6 Hz, 3H), 5.12 (dd, *J* = 10.9, 0.4



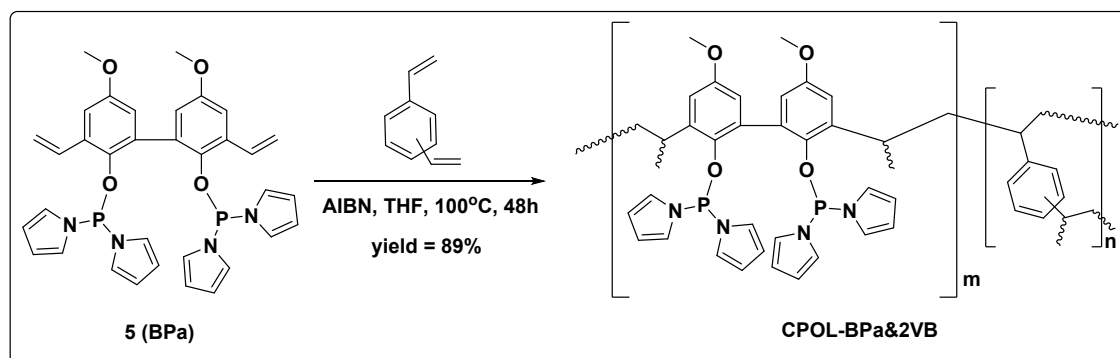
Hz, 3H);  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$ (ppm): 150.1 (d,  $J = 3.1$  Hz), 134.9, 132.9 (d,  $J = 1.1$  Hz), 126.5, 119.7 (d,  $J = 7.0$  Hz), 112.3;  $^{31}\text{P}$  NMR (162 MHz,  $\text{CDCl}_3$ )  $\delta$ (ppm): 127.6. Analytical data matches that reported in the literature<sup>[6]</sup>.

### Synthesis of CPOL-BPa&1VB.



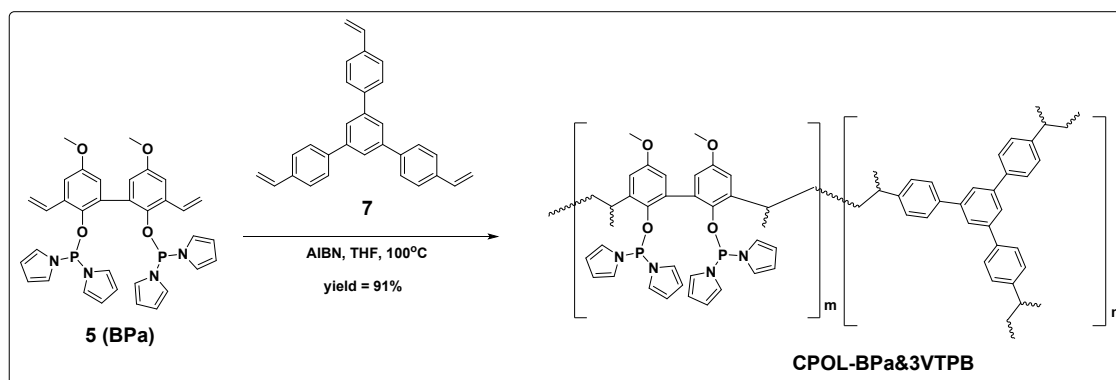
Compound **5** (100 mg, 1 eq), styrene (167.2 mg, 10 eq), AIBN (6.6 mg, 0.25 eq) and THF (2 mL) were added to a 25-mL sealed tube under argon. The solution was stirred for 48 h at 100°C. The product was precipitated by adding methanol (10 mL), it was filtered out and washed with methanol, the solid was dried in vacuum to afford CPOL-BPa&1VB (245 mg, 92% yield) as a pink solid.

### Synthesis of CPOL-BPa&2VB.



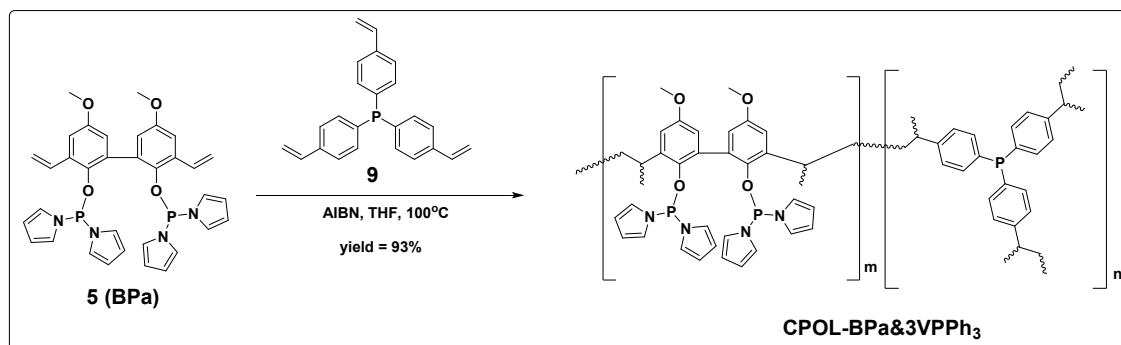
Compound **5** (200 mg, 1 eq), divinylbenzene (418.0 mg, 10 eq), AIBN (13.2 mg, 0.25 eq) and THF (5 mL) were added to a 25-mL sealed tube under argon. The solution was stirred for 24 h at 100°C. The product was precipitated by adding methanol (15 mL), it was filtered out and washed with methanol, the solid was dried in vacuum to afford CPOL-BPa&2VB (550 mg, 89% yield) as a pink solid.

### Synthesis of CPOL-BPa&3VTPB.



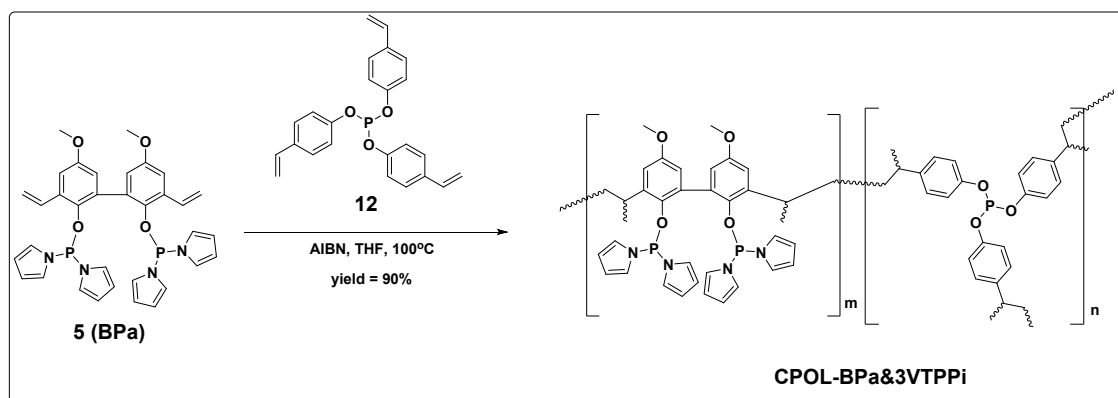
Compound **5** (100 mg, 1 eq), compound **7** (617.0 mg, 10 eq), AIBN (6.6 mg, 0.25 eq) and THF (10 mL) were added to a 25-mL sealed tube under argon. The solution was stirred for 24 h at 100°C. The product was precipitated by adding methanol (30 mL), it was filtered out and washed with methanol, the solid was dried in vacuum to afford CPOL-BPa&3VTPB (650 mg, 91% yield) as a white solid.

### Synthesis of CPOL-BPa&3VPPh<sub>3</sub>.



Compound **5** (100 mg, 1 eq), compound **9** (546 mg, 10 eq), AIBN (6.6 mg, 0.25 eq) and THF (10 mL) were added to a 25-mL sealed tube under argon. The solution was stirred for 24 h at 100°C. The product was precipitated by adding methanol (30 mL), it was filtered out and washed with methanol, the solid was dried in vacuum to afford CPOL-BPa&3VPPh<sub>3</sub> (600 mg, 93% yield) as a white solid.

## Synthesis of CPOL-BPa&3VTPPi.



Compound **5** (100 mg, 1 eq), compound **12** (624 mg, 10 eq), AIBN (6.6 mg, 0.25 eq) and THF (10 mL) were added to a 25-mL sealed tube under argon. The solution was stirred for 24 h at 100°C. The product was precipitated by adding methanol (30 mL), it was filtered out and washed with methanol, the solid was dried in vacuum to afford CPOL-BPa&3VTPPi (650 mg, 90% yield) as a white solid.

### 3. Characterization of the as-prepared ligand

$^{13}\text{C}$  (101 MHz) cross-polarization magic-angle spinning (CP-MAS) and  $^{31}\text{P}$  (162 MHz) HPDEC-MAS solid-state NMR experiments were recorded on a Bruker 400 MHz. The morphology of the ligand was examined using a Hitachi S-4800 scanning electron microscope (SEM) and a Hitachi H-7650 transmission electron microscope (TEM). Nitrogen adsorption-desorption data were obtained using a Micromeritics ASAP 2020 static volumetric sorption analyzer. The samples were outgassed for 15 h at 150 °C before the measurements. The specific surface area of the samples was calculated using the Brunauer-Emmett-Teller (BET) method. The pore size distribution was determined using non-local density functional theory (DFT). Thermogravimetric analysis (TGA) was determined on a STA449F5 jupiter, the sample was heated at the rate of 10 K•min<sup>-1</sup> from 298 K up to 973 K under a nitrogen atmosphere.

## 4. Test of as-prepared ligands

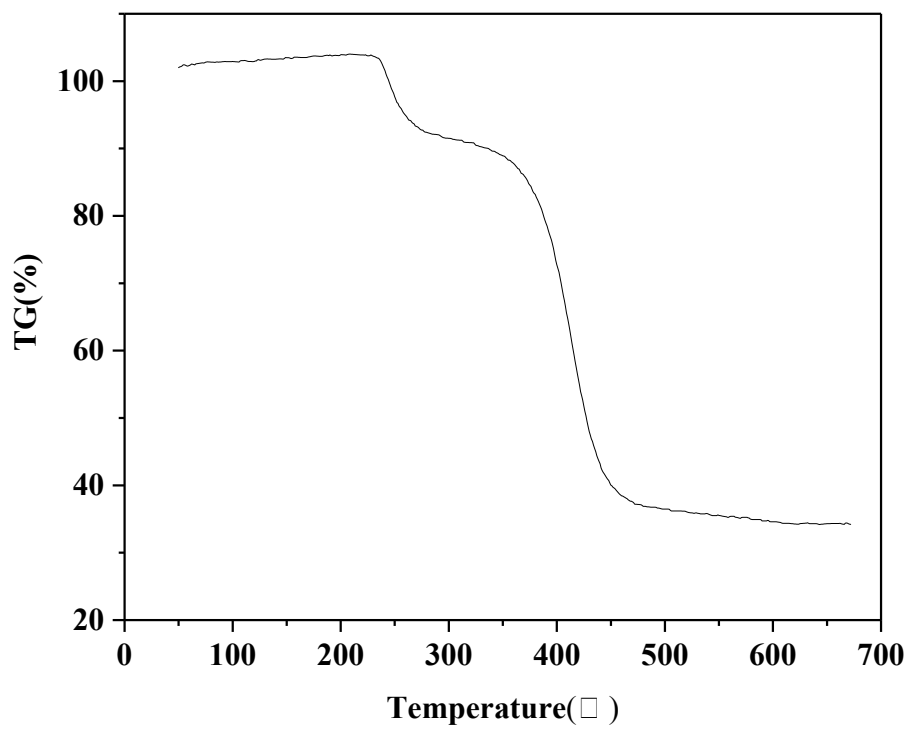
### 4.1. General procedure for the hydroformylation of 1-hexene.

In a glove box, a 25-mL sealed tube was charged with CPOL-BPa&1VB (8 mg), Rh(acac)(CO)<sub>2</sub> (0.49 mg,  $1.9 \times 10^{-3}$  mmol) and 1-hexene (3 mL, 24.2 mmol). The mixture was stirred for 24 hours at room temperature and then it was transferred to a stainless steel autoclave (25 mL). After sealing and purging with syngas (CO/H<sub>2</sub> = 1:1) for 3 times, the pressure of syngas was adjusted to 2 MPa. The reaction was stirred for 8 hours at 80°C. The autoclave was cooled to room temperature, and the gas was released slowly in a well-ventilated hood. Add decane (2.3 mL, 12.1 mmol) as the internal standard. The mixture subsequently was analyzed by GC.

### 4.2. Recycling studies of the Rh/CPOL-BPa&1VB in hydroformylation of 1-hexene

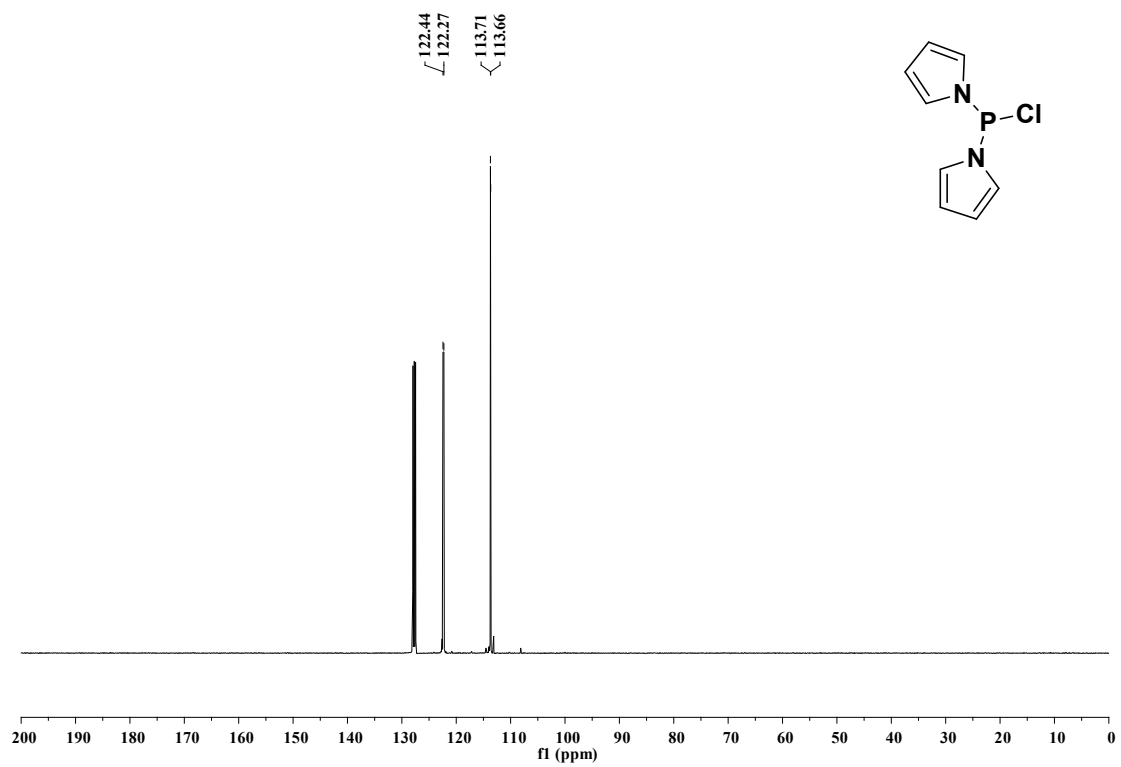
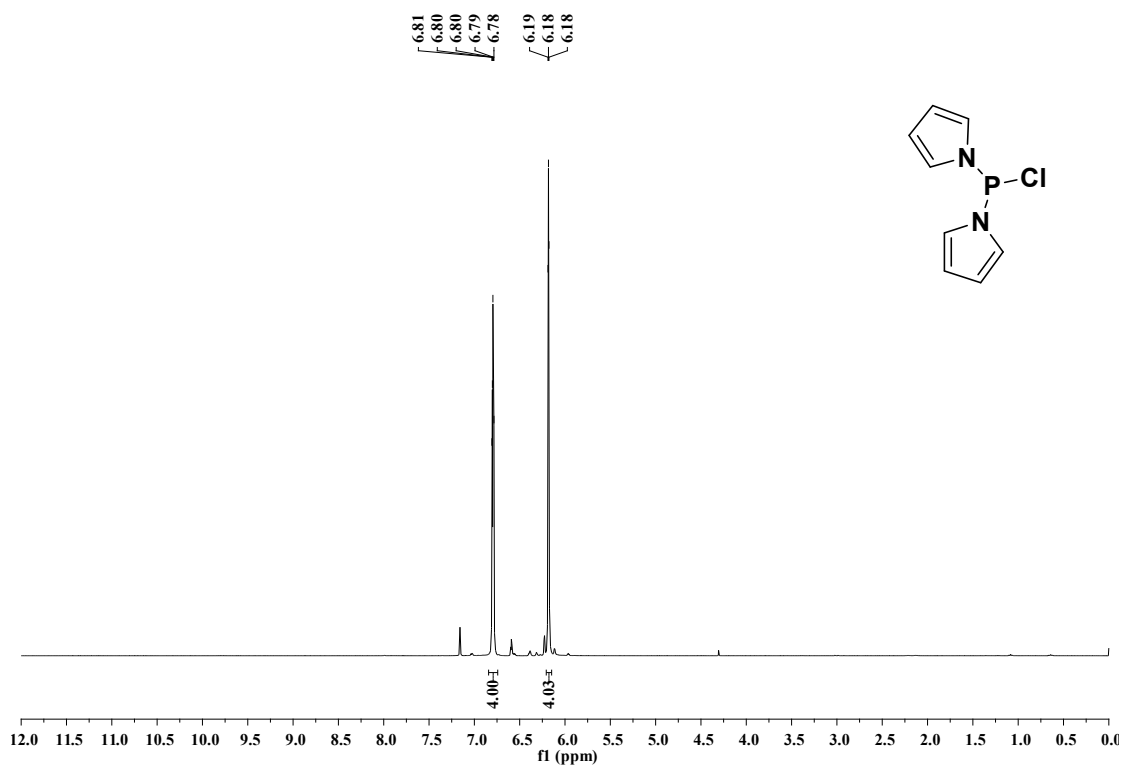
In a glove box, a 25-mL sealed tube was charged with CPOL-BPa&1VB (32 mg), Rh(acac)(CO)<sub>2</sub> (1.96 mg,  $7.6 \times 10^{-3}$  mmol) and 1-hexene (3 mL, 24.2 mmol). The mixture was stirred for 24 hours at room temperature and then it was transferred to a stainless steel autoclave (25 mL). After sealing and purging with syngas (CO/H<sub>2</sub> = 1:1) for 3 times, the pressure of syngas was adjusted to 2 MPa. The reaction was stirred for 1 hours at 80°C. The autoclave was cooled to room temperature, and the gas was released slowly in a well-ventilated hood. Add decane (2.3 mL, 12.1 mmol) as the internal standard. The mixture subsequently was analyzed by GC. The catalyst was separated from reaction mixture by centrifugation and used to test next recycling reaction with the same condition and procedure. The mixture subsequently was analyzed by GC.

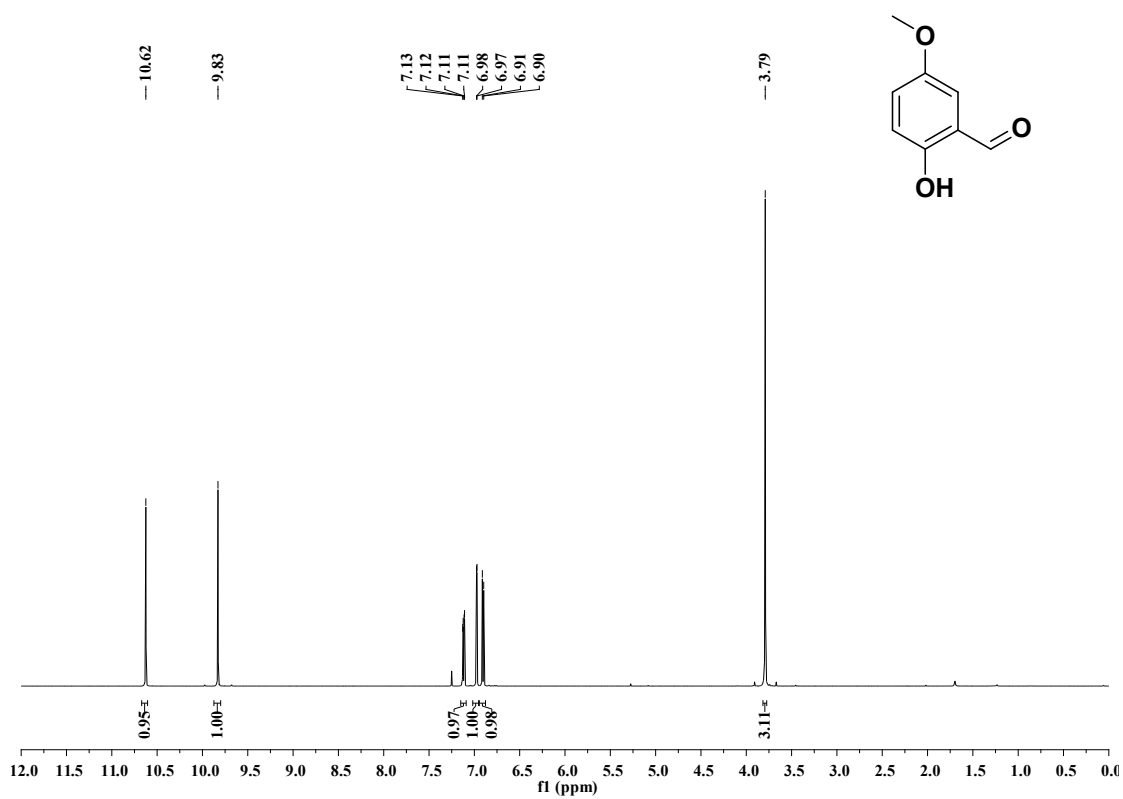
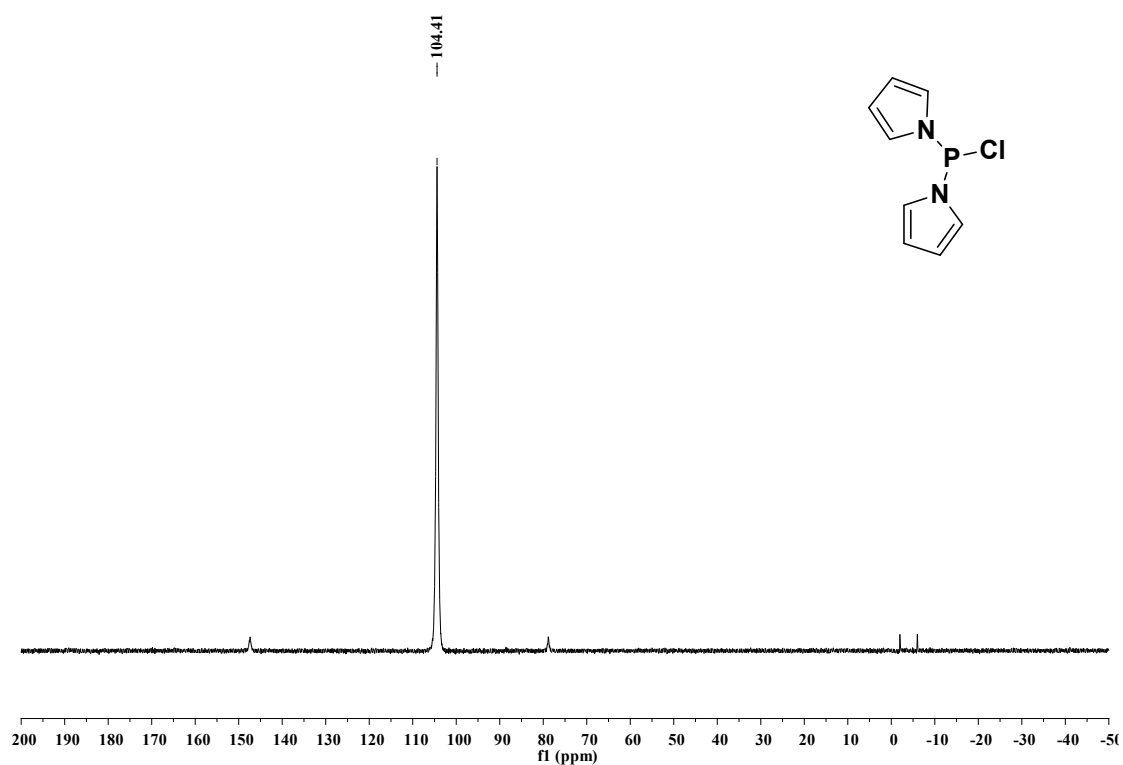
## 5. Characterization results

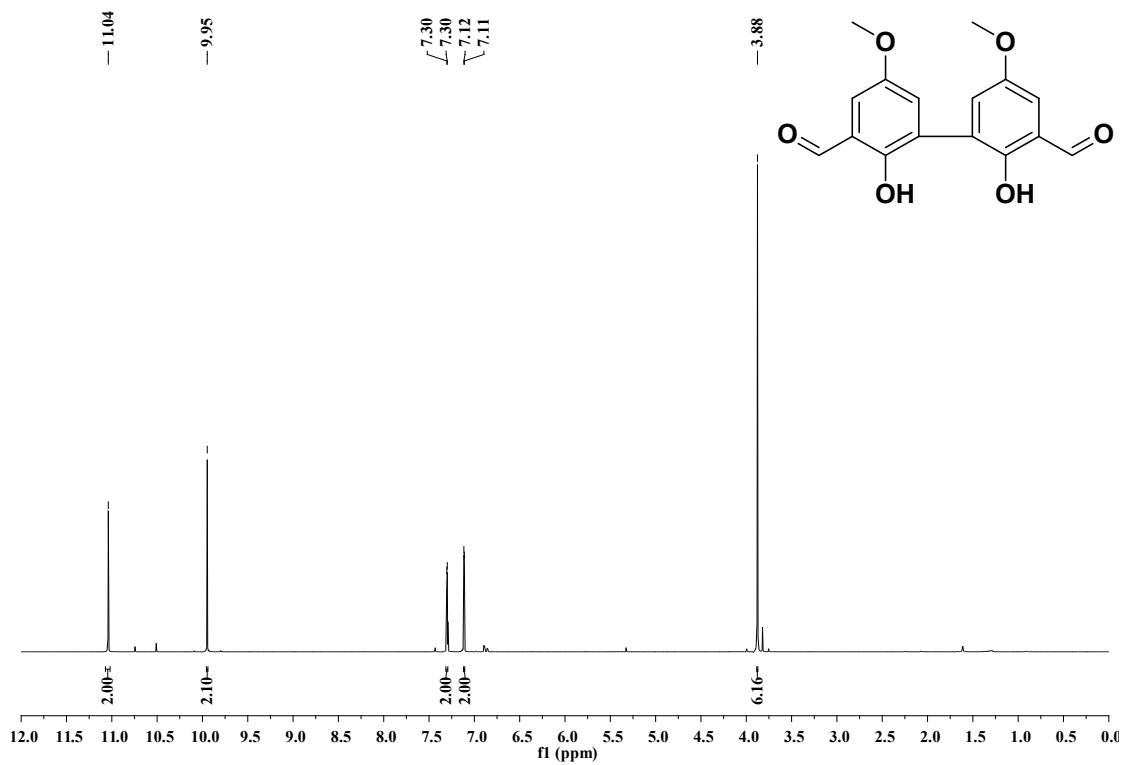
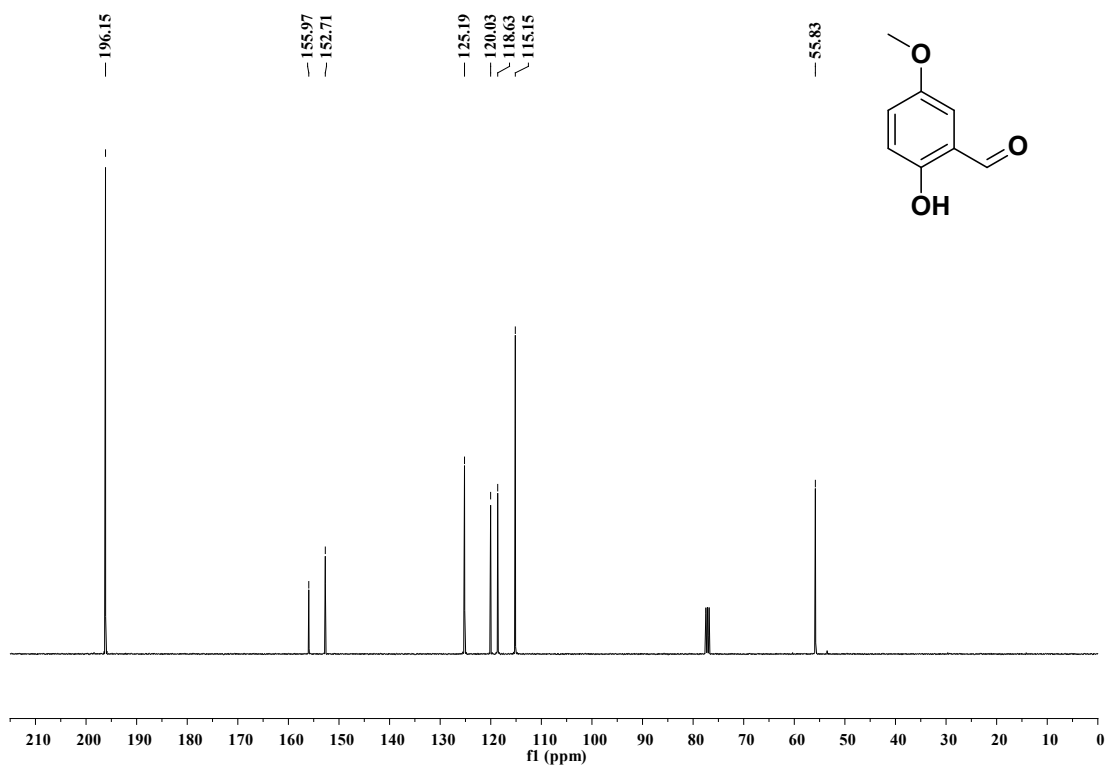


**Figure S1.** TGA curve of the CPOL-BPa&1VB.

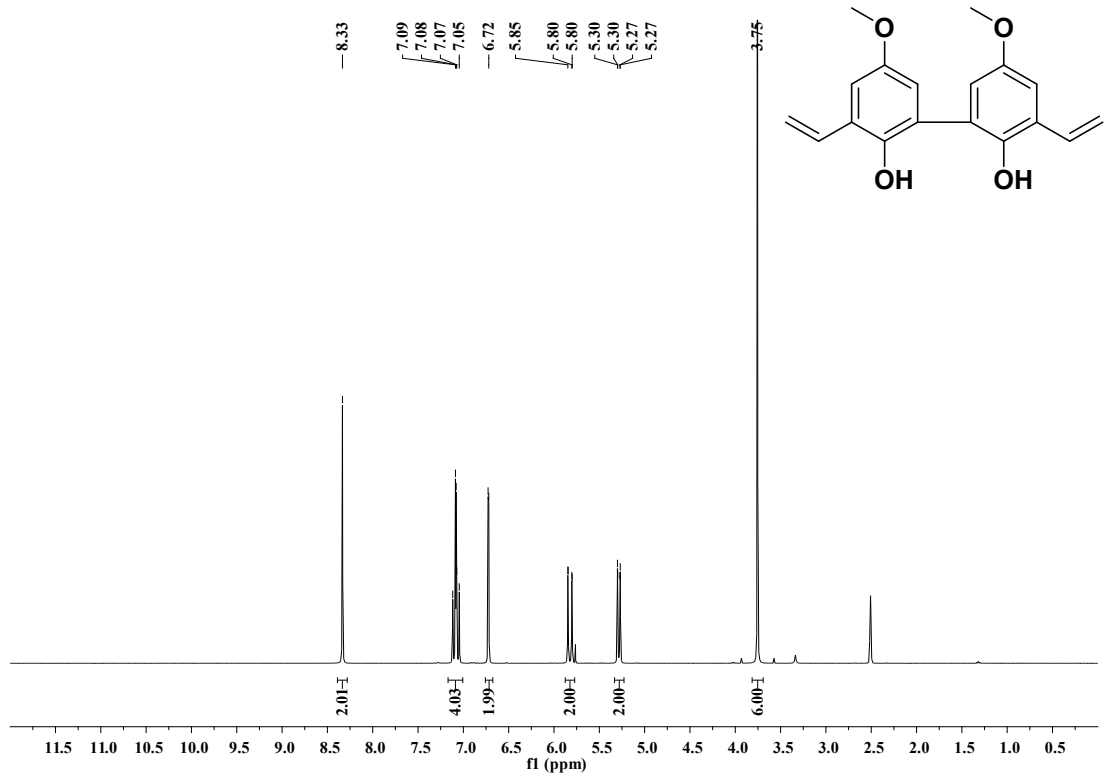
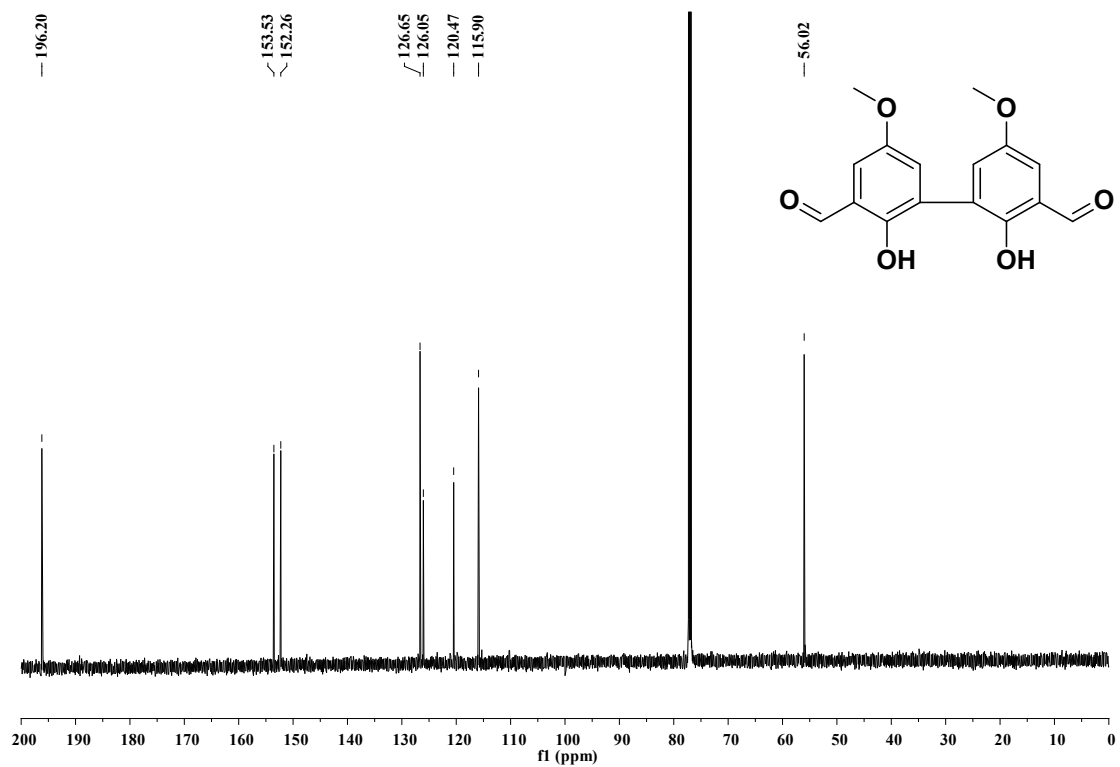
## 6. $^1\text{H}$ and $^{13}\text{C}$ NMR spectra

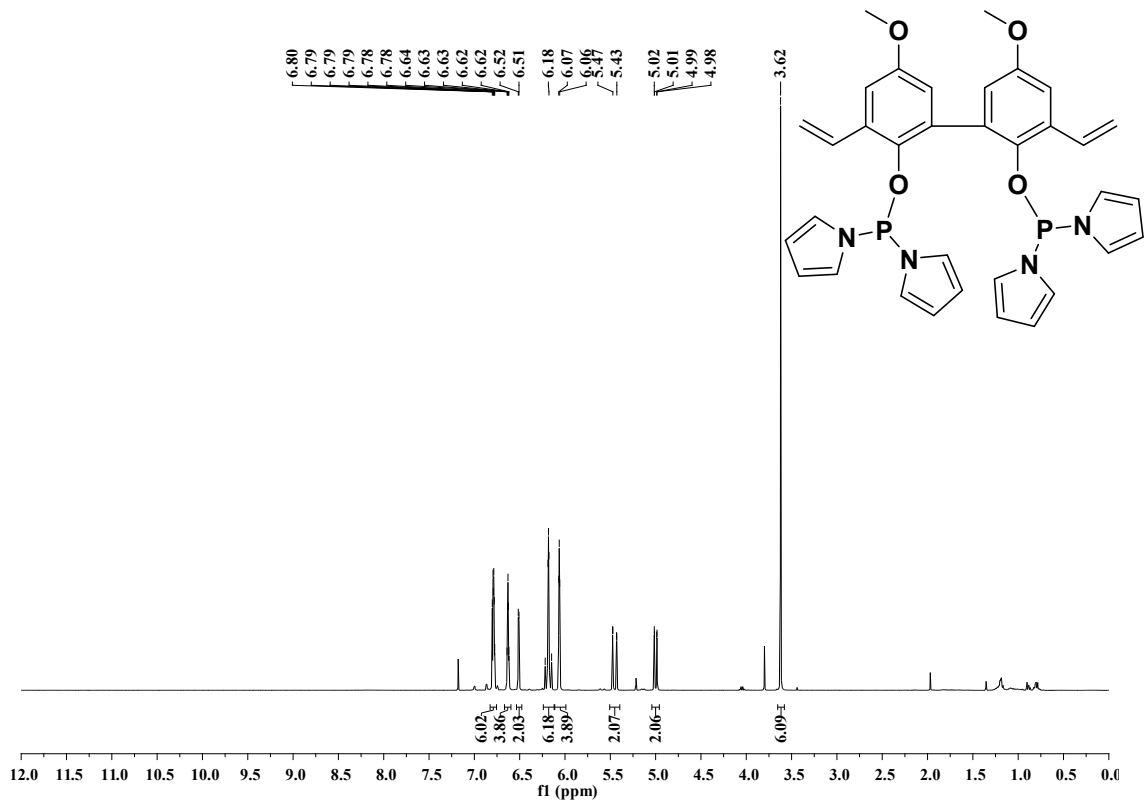
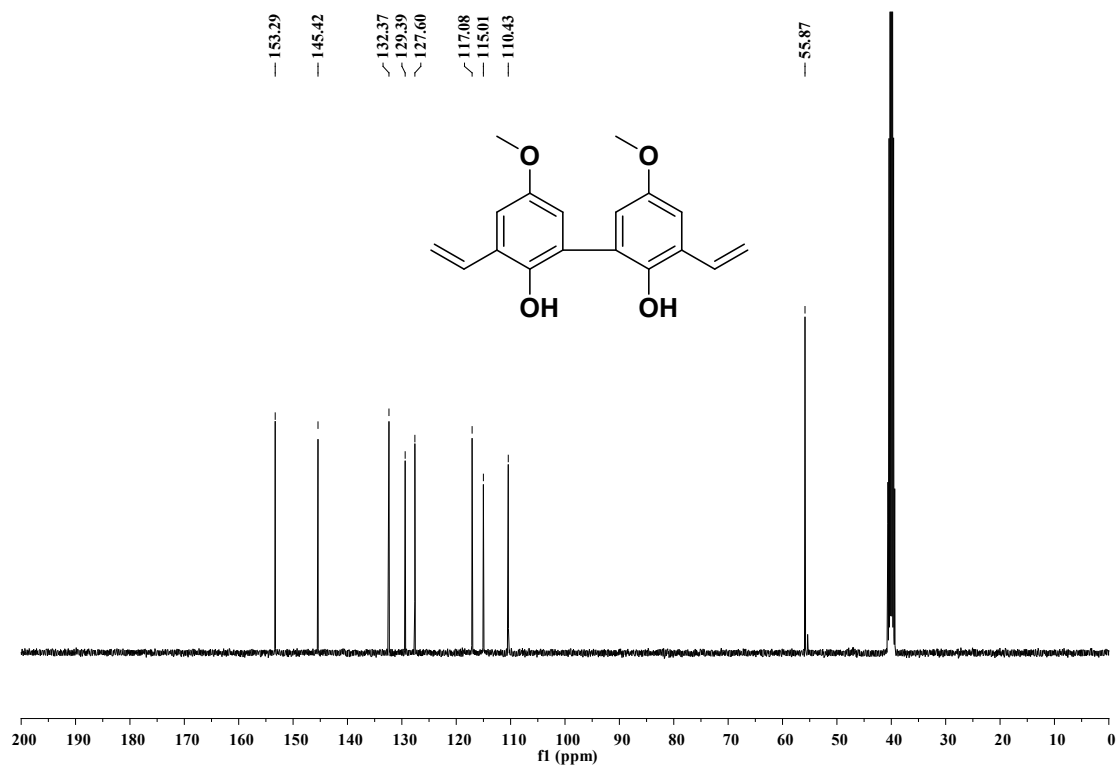


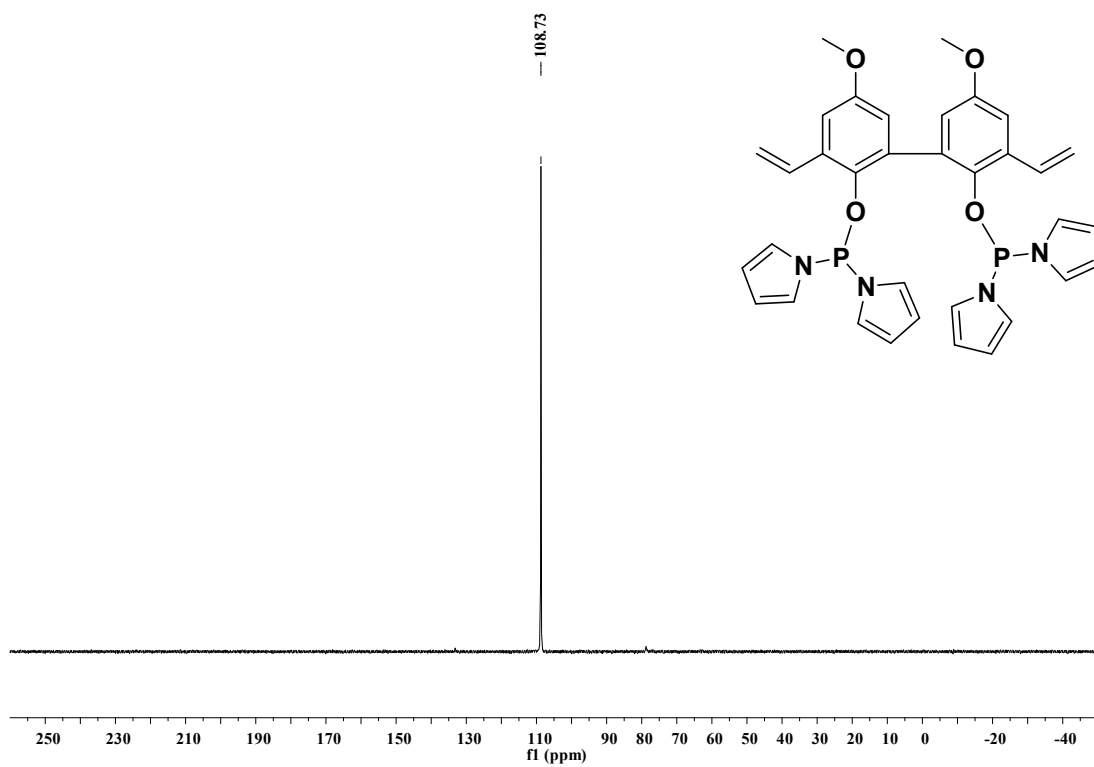
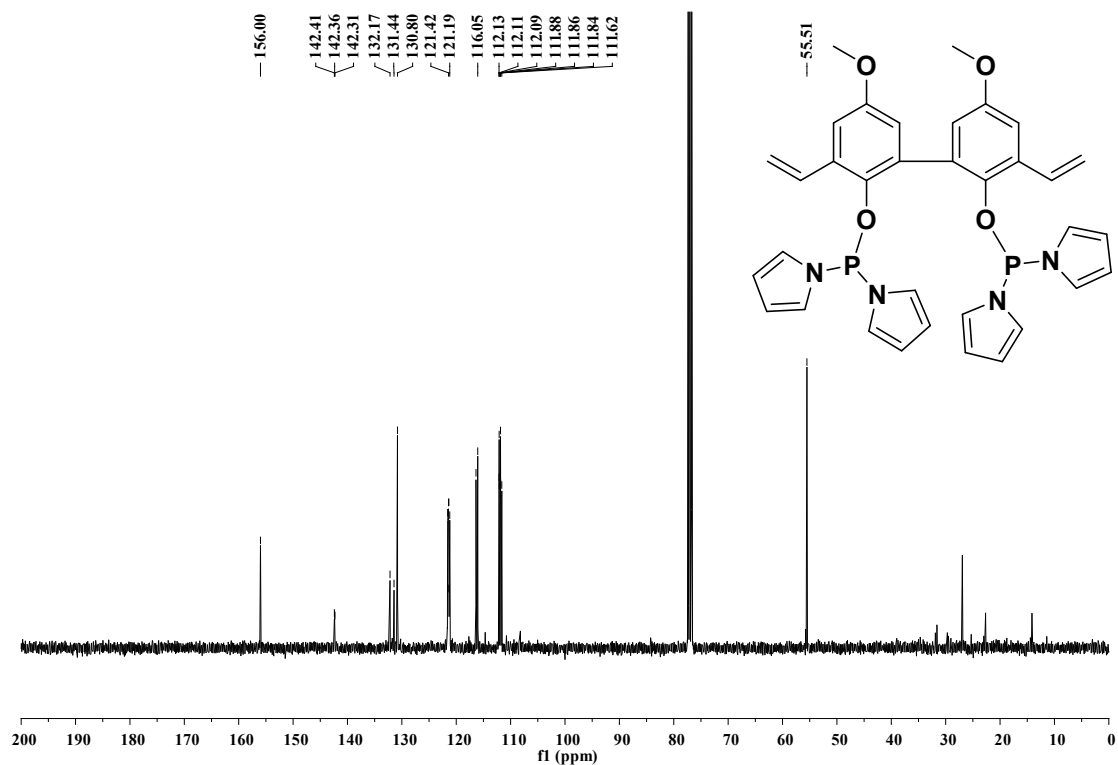


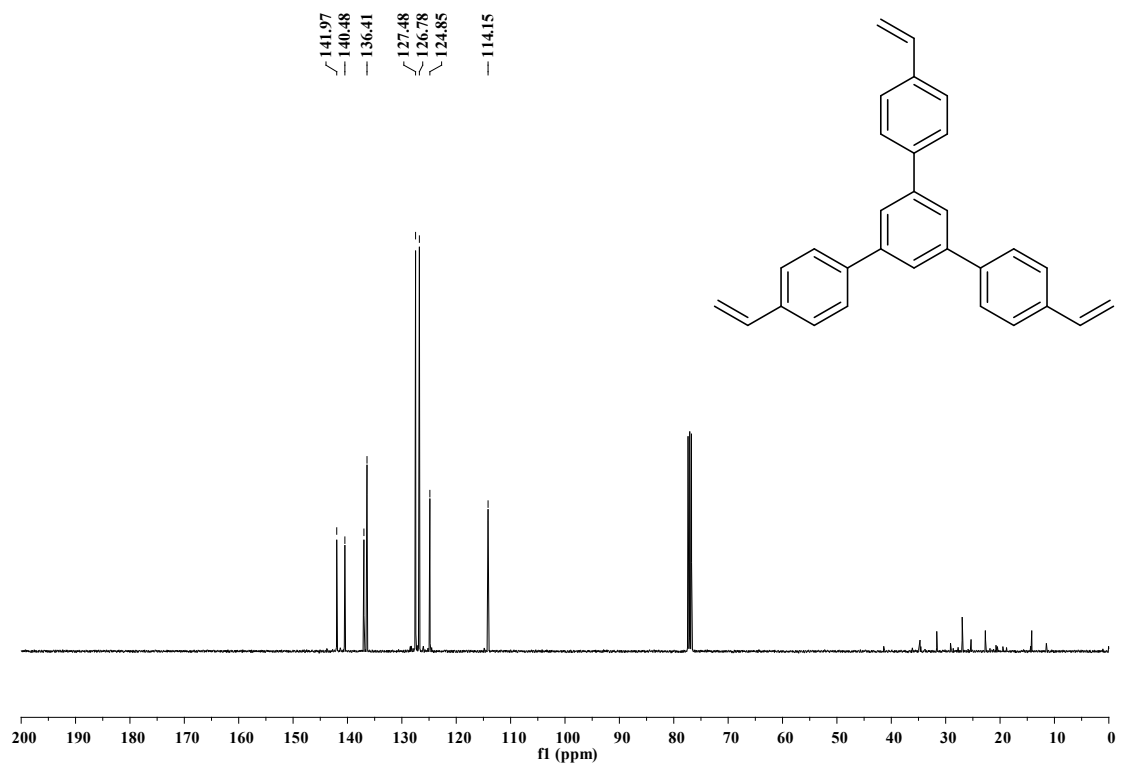
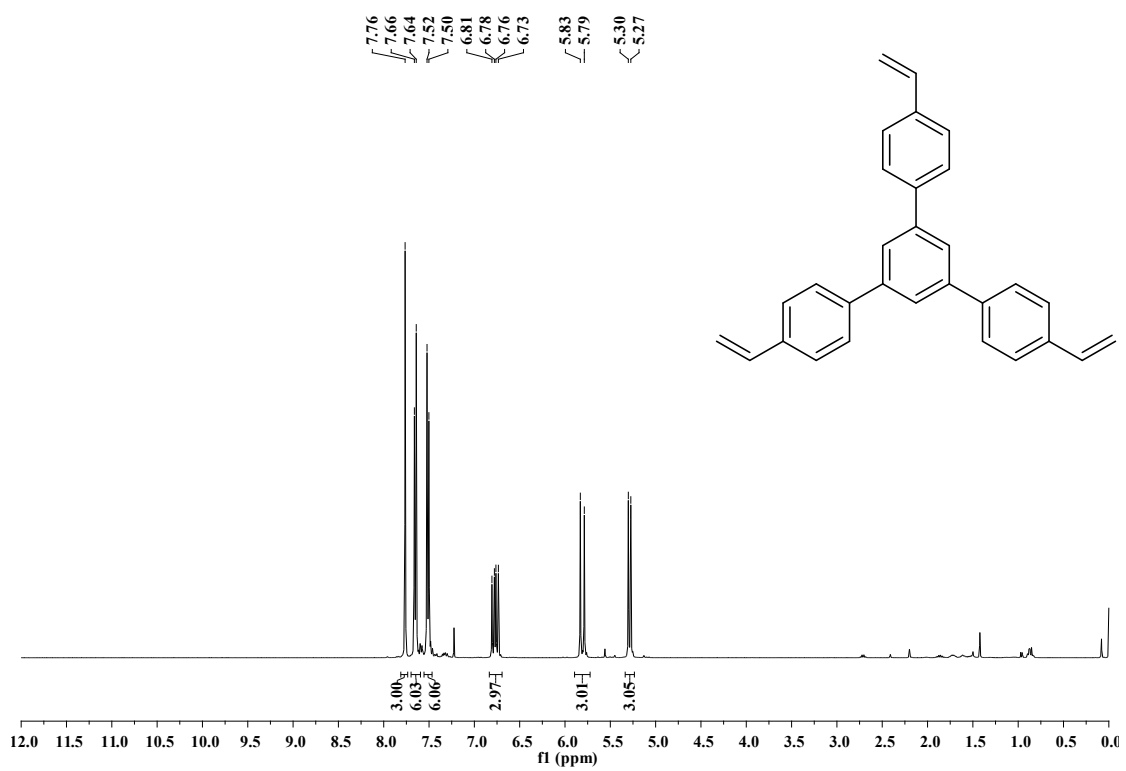


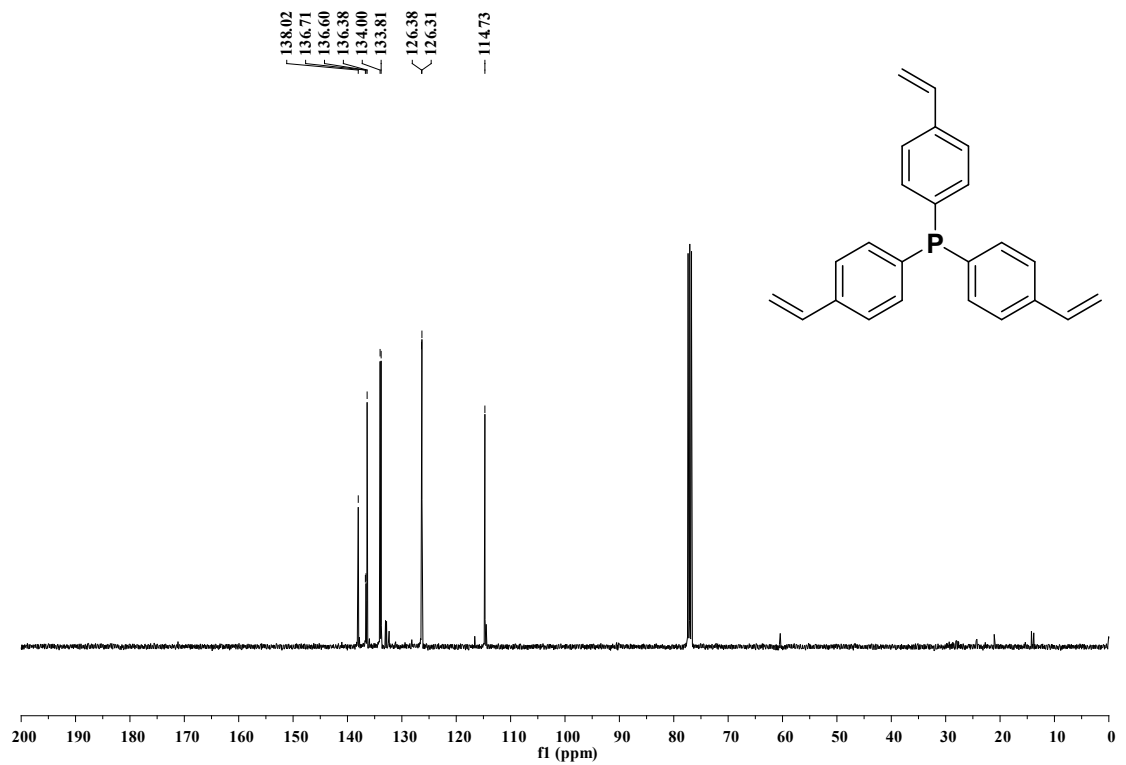
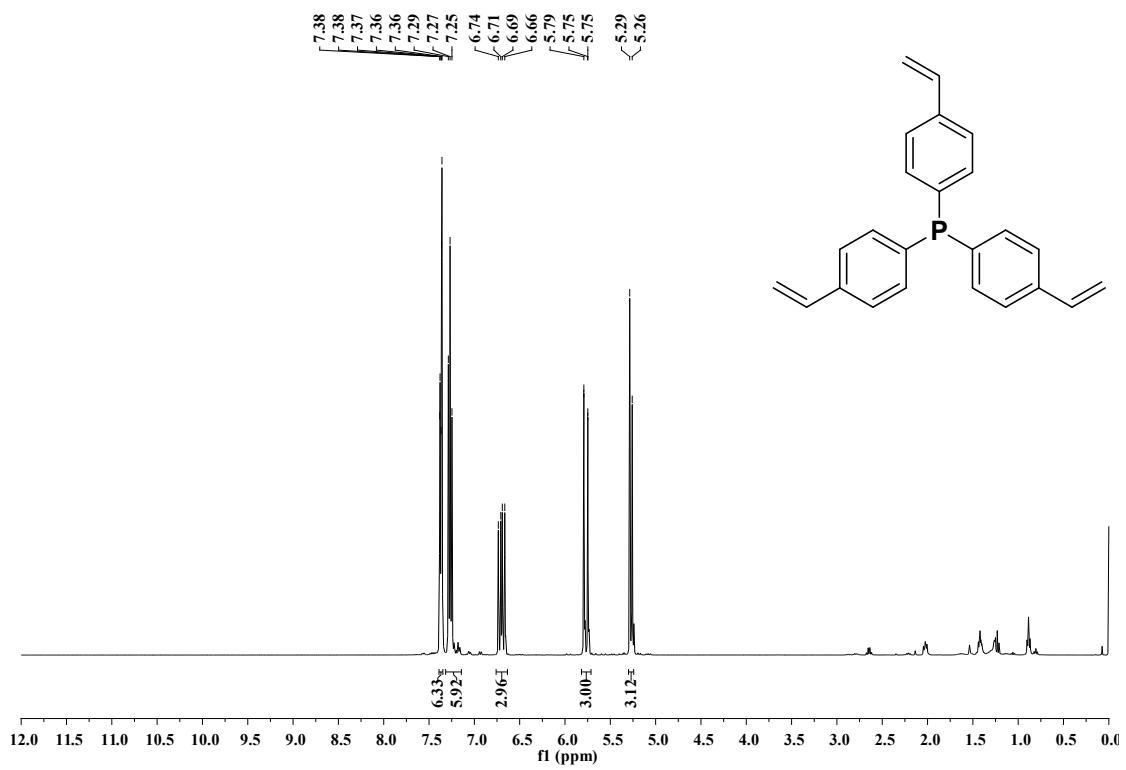


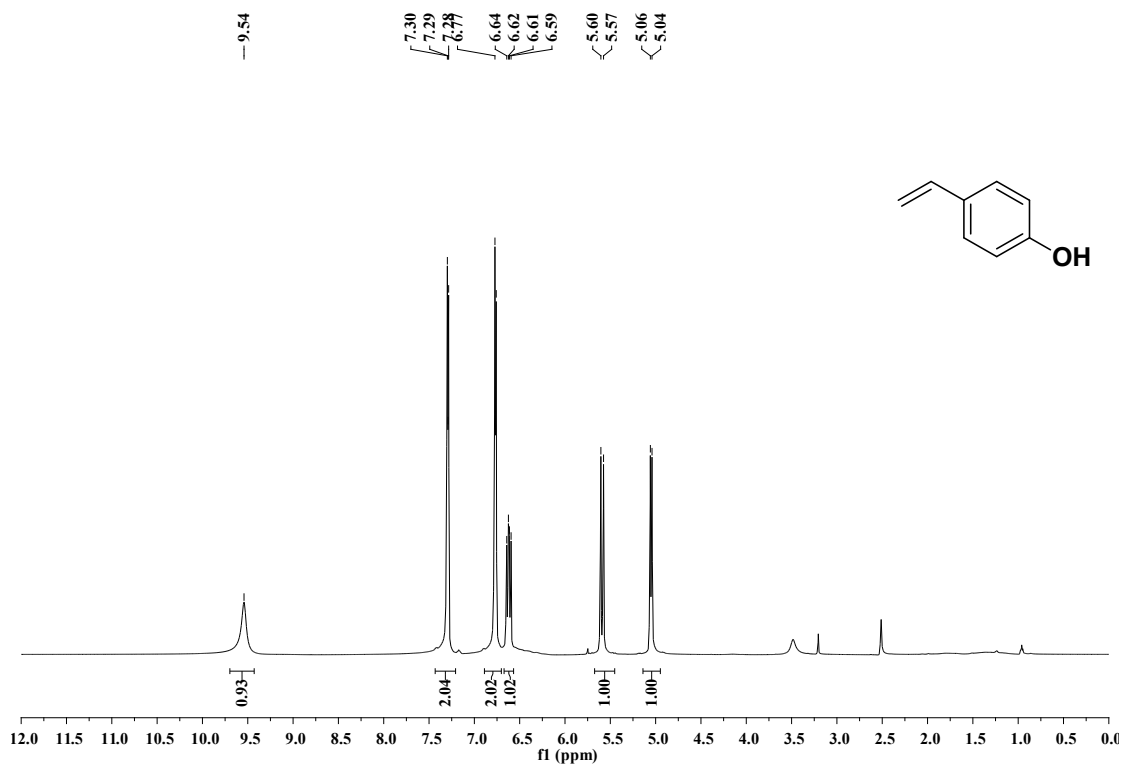
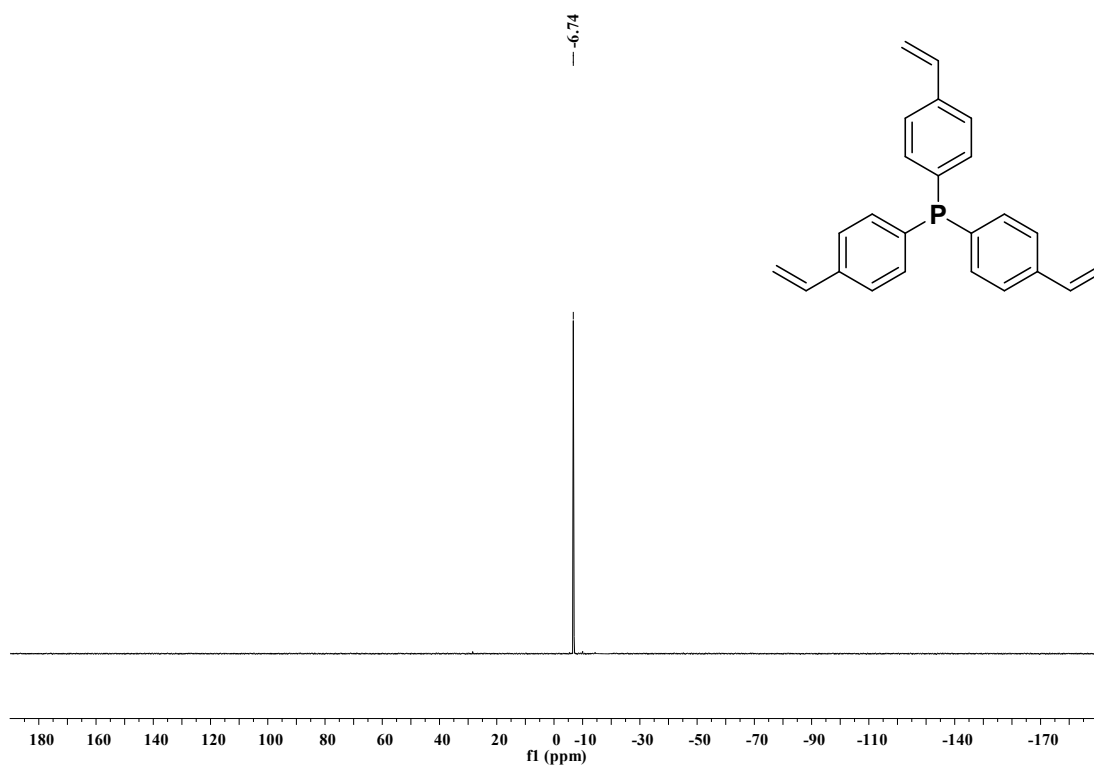


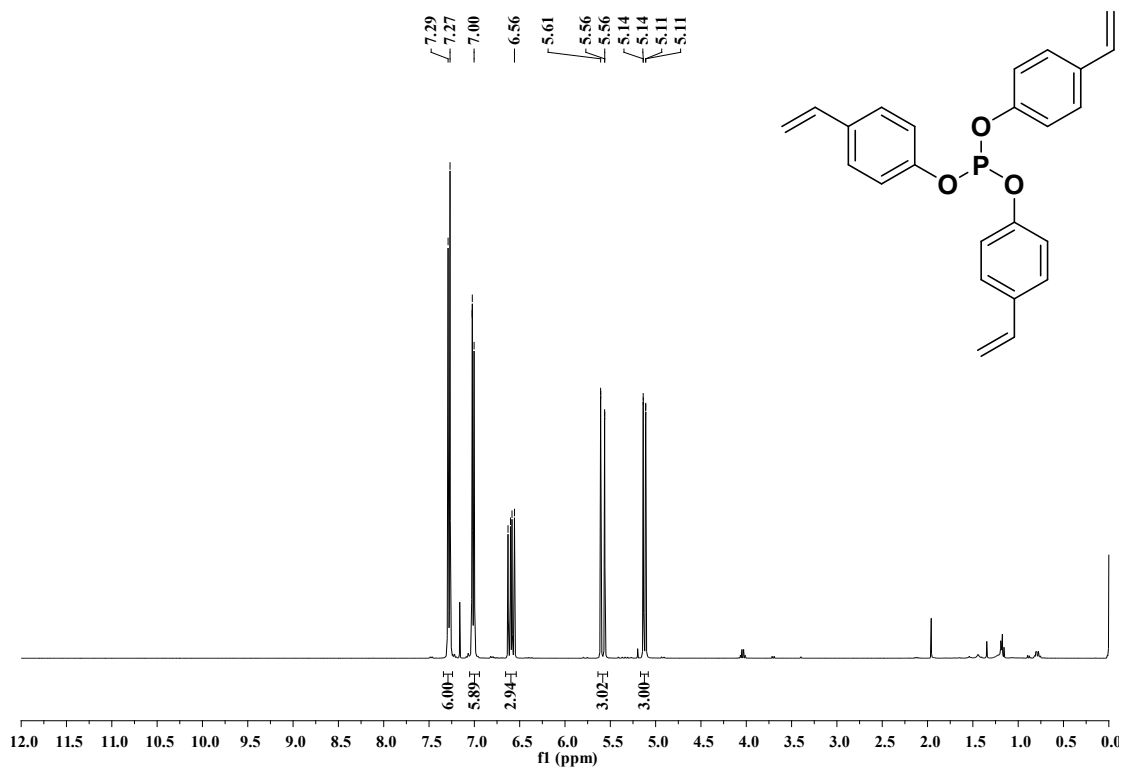
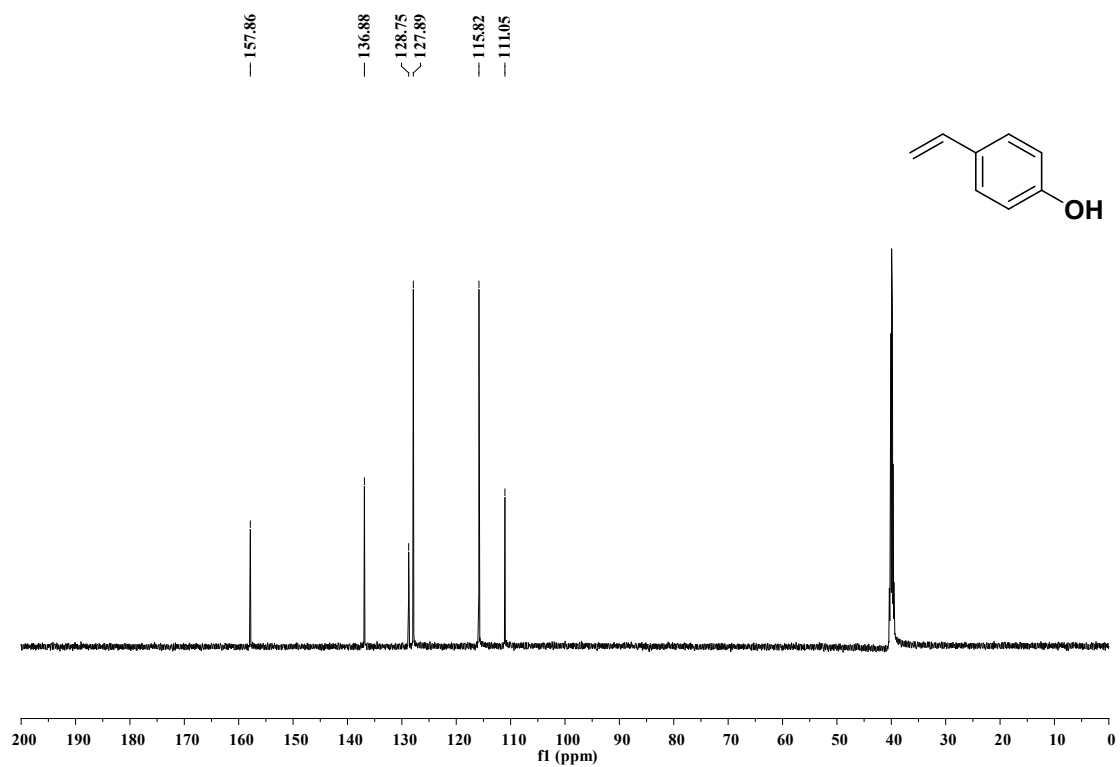


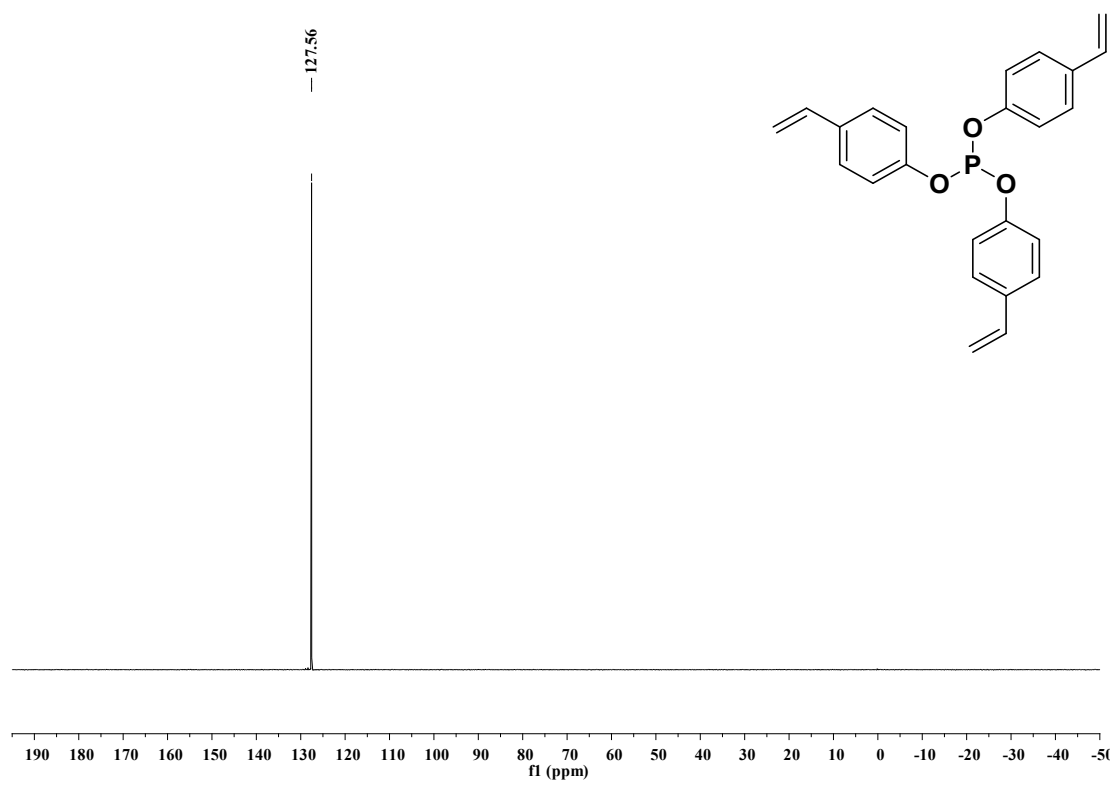
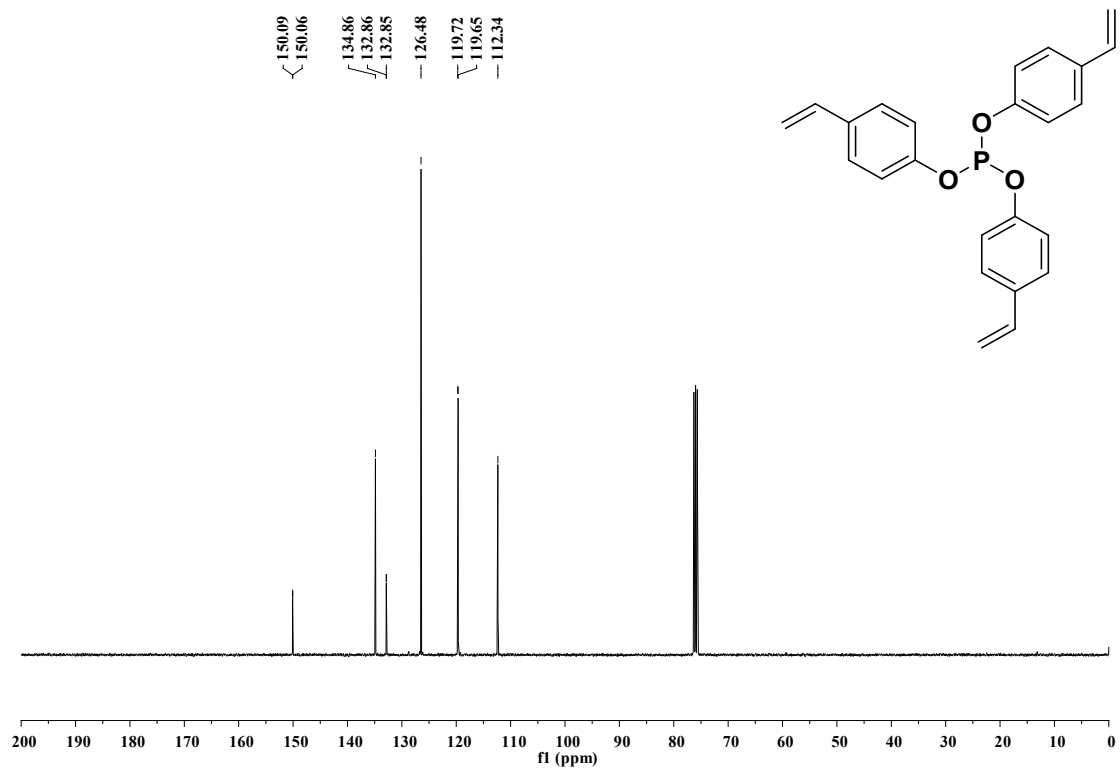




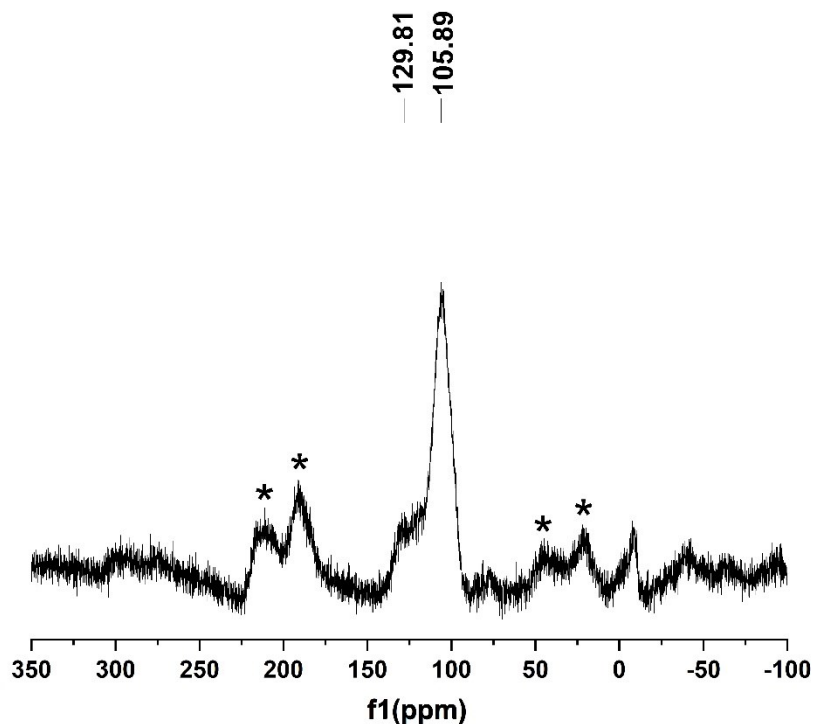






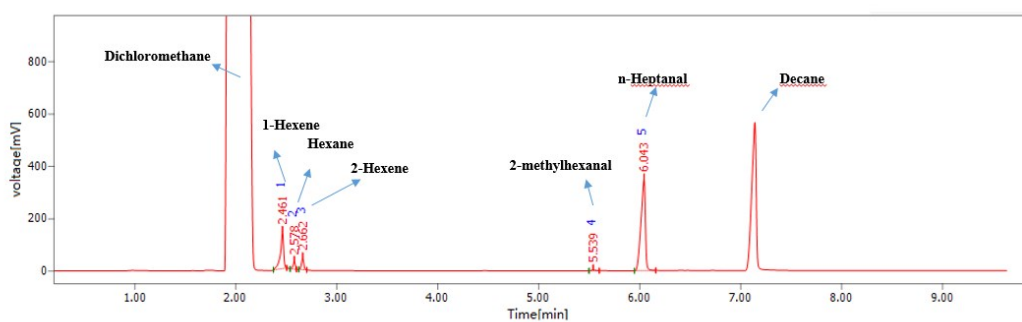






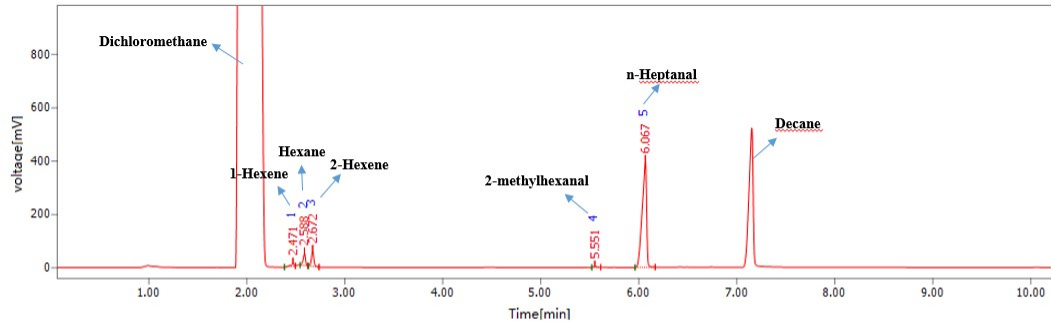
**Figure S2.**  $^{31}\text{P}$  MAS NMR spectrum for the as-prepared catalyst upon reaction of  $\text{Rh}(\text{acac})(\text{CO})_2$  with CPOL-BPa&1VB.

## 7. Partial GC Data



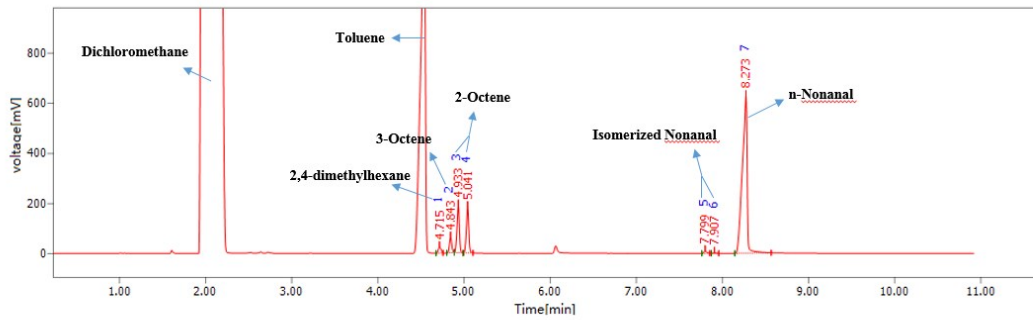
Peak No.	Retention time [min]	Area [mV.s]	Area [%]	Height [mV]	Height [%]	Start time [min]	End time [min]	Conc. [g/L]	Conc. [%]
1	2.4609	304.7496	20.4514	140.5587	24.9260	2.3725	2.5042	-0	-0
2	2.5784	43.6064	2.9264	28.7856	5.1047	2.5375	2.6000	0	-0
3	2.6617	68.0695	4.5681	43.5548	7.7238	2.6234	2.7025	0	-0
4	5.5394	6.0218	0.4041	2.4147	0.4282	5.4977	5.6003	0	-0
5	6.0429	1067.6710	71.6501	348.5912	61.8174	5.9478	6.1587	0	-0
Total		1490.1180	100.0000	563.9049	100.0000			0.000	0.0000

Hydroformylation of 1-Hexene at 60 °C



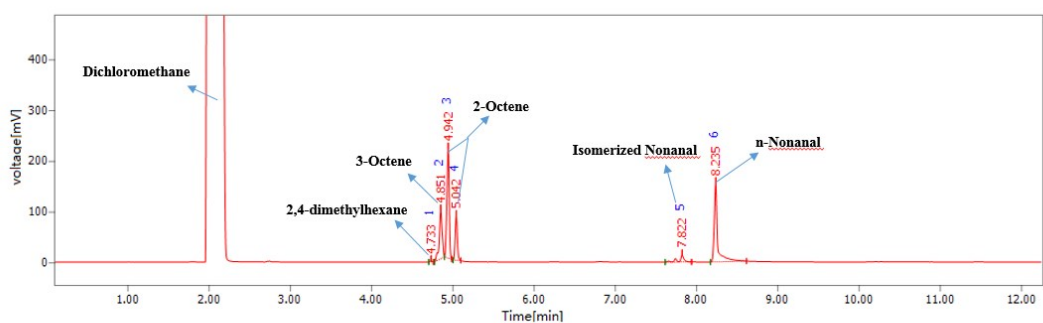
Peak No.	Retention time [min]	Area [mV.s]	Area [%]	Height [mV]	Height [%]	Start time [min]	End time [min]	Conc. [g/L]	Conc. [%]
1	2.4709	23.0485	1.5754	10.1431	1.9617	2.3842	2.4959	-0	-0
2	2.5884	77.8762	5.3229	45.7290	8.8440	2.5434	2.6217	0	-0
3	2.6717	99.0012	6.7668	58.5798	11.3293	2.6275	2.7375	0	-0
4	5.5511	7.9844	0.5457	3.4620	0.6695	5.5202	5.6119	0	-0
5	6.0670	1255.1230	85.7891	399.1504	77.1955	5.9620	6.1671	0	-0
Total		1463.0330	100.0000	517.0642	100.0000			0.000	0.0000

### Hydroformylation of 1-Hexene at 80°C



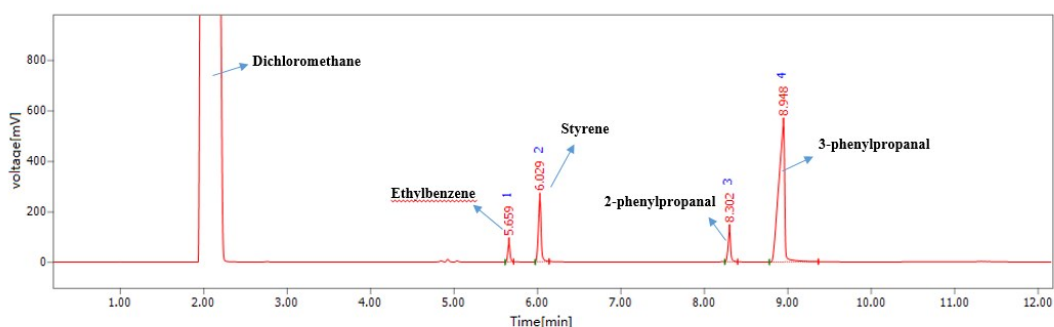
Peak No.	Retention time [min]	Area [mV.s]	Area [%]	Height [mV]	Height [%]	Start time [min]	End time [min]	Conc. [g/L]	Conc. [%]
1	4.7151	51.9958	1.5485	23.5019	2.1498	4.6751	4.7551	0	-0
2	4.8434	112.6438	3.3503	60.8772	5.5687	4.8001	4.8859	0	-0
3	4.9326	364.3004	10.8352	188.4898	17.2420	4.8859	4.9901	0	-0
4	5.0410	355.0299	10.5594	182.6793	16.7105	4.9910	5.1043	0	-0
5	7.7991	18.9377	0.5633	8.9378	0.8176	7.7616	7.8524	0	-0
6	7.9074	4.7342	0.1408	2.1096	0.1930	7.8716	7.9566	0	-0
7	8.2725	2454.5660	73.0046	626.6089	57.3186	8.1433	8.5659	0	-0
Total		3362.2080	100.0000	1093.2040	100.0000			0.000	0.0000

### Hydroformylation of 1-Octene at 80°C



Peak No.	Retention time [min]	Area [mV.s]	Area [%]	Height [mV]	Height [%]	Start time [min]	End time [min]	Conc. [g/L]	Conc. [%]
1	4.7326	3.2648	0.2452	1.9696	0.3454	4.7034	4.7609	0	-0
2	4.8509	243.4827	18.2884	95.6828	16.7817	4.7743	4.8968	0	-0
3	4.9418	426.5934	32.0422	216.1641	37.9127	4.8968	4.9851	0	-0
4	5.0418	159.8735	12.0084	87.2857	15.3054	5.0001	5.0960	0	-0
5	7.8216	51.1257	3.8401	13.2769	2.3286	7.6149	7.9383	0	-0
6	8.2350	447.0076	33.5756	155.8034	27.3261	8.1708	8.6151	0	-0
Total		1331.3480	100.0000	570.1624	100.0000			0.000	0.0000

### Hydroformylation of 2-Octene at 100°C



Peak No.	Retention time [min]	Area [mV.s]	Area [%]	Height [mV]	Height [%]	Start time [min]	End time [min]	Conc. [g/L]	Conc. [%]
1	5.6586	132.6168	3.5723	73.4659	7.3689	5.6136	5.7128	0	-0
2	6.0287	559.3444	15.0669	249.5407	25.0300	5.9726	6.1404	0	-0
3	8.3017	276.7943	7.4559	125.8823	12.6265	8.2450	8.3992	0	-0
4	8.9476	2743.6550	73.9050	548.0788	54.9746	8.7793	9.3661	0	-0
Total		3712.4110	100.0000	996.9677	100.0000			0.000	0.0000

### Hydroformylation of styrene at 80°C

## 8. Reference

- [1] Jackstell R, Klein H, Beller M, et al. *European Journal of Organic Chemistry*, 2001, 20, 3871-3877.
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- [5] Li C, Xiong K, Yan L, et al. *Catalysis Science & Technology*, 2016, 6, 2143-2149.
- [6] Sun Q, Aguila B, Verma G, et al. *Chem*, 2016, 1, 628-639.