Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

Supporting Information

Silver-Catalyzed Regioselective 1,6-Hydroarylation of *para*-Quinone Methides with Anilines and Phenols

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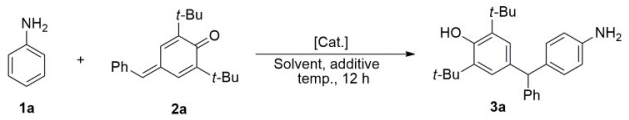
Reaction optimization:

Table S1. Optimization of solvent. [a]

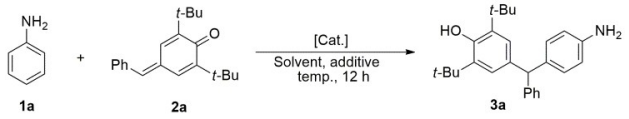


1a 2a 3a

Entry	Solvent	Catalyst	Temp.	Yield [b]
1	**DCE**	**$AgBF_4$**	**80 °C**	**87%**
2	CH_2Cl_2	$AgBF_4$	80 °C	77%
3	DMF	$AgBF_4$	80 °C	44%
4	CH_3CN	$AgBF_4$	80 °C	trace
5	1,4-Dioxane	$AgBF_4$	80 °C	55%
6	H_2O	$AgBF_4$	80 °C	N.D.
7	Toluene	$AgBF_4$	80 °C	33%
8	THF	$AgBF_4$	80 °C	31%

[a] Reactions were operated with aniline (0.2 mmol), 4-benzylidene-2,6-di-*tert*-butylcyclohexa-2,5-dienone (0.2 mmol), catalyst (10 mol%) and solvent (1.0 mL) under N_2 conditions. [b] Yield was determined by GC analysis, and dodecane was used as the internal standard.

Table S2. Optimization of additive. [a]

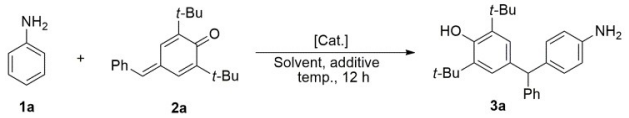


1a 2a 3a

Entry	Solvent	Additive	Catalyst	Temp.	Yield [b]
1	**DCE**	**-**	**$AgBF_4$**	**80 °C**	**87%**
2	DCE	Et_3N	$AgBF_4$	80 °C	trace
3	DCE	K_3PO_4	$AgBF_4$	80 °C	13%
4	DCE	NaOAc	$AgBF_4$	80 °C	17%
5	DCE	PhCOOH	$AgBF_4$	80 °C	73%
6	DCE	$Ph_2P(O)OH$	$AgBF_4$	80 °C	79%

[a] Reactions were operated with aniline (0.2 mmol), 4-benzylidene-2,6-di-*tert*-butylcyclohexa-2,5-dienone (0.2 mmol), additive (10 mol%), catalyst (10 mol%) and solvent (1.0 mL) under N_2 conditions. [b] Yield was determined by GC analysis, and dodecane was used as the internal standard.

Table S3. Optimization of the amount of $AgBF_4$. [a]

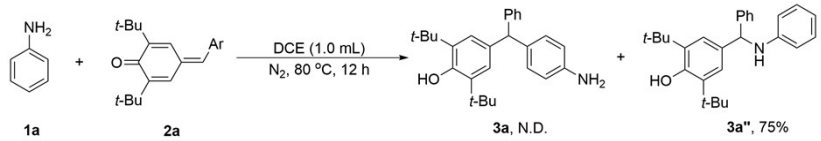


1a 2a 3a

Entry	Solvent	Catalyst	Temp.	Yield [b]
1	DCE	$AgBF_4$	80 °C	11% [c]

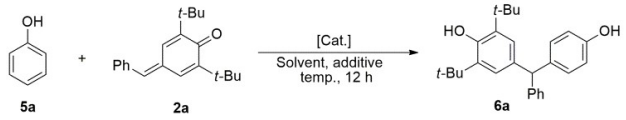
2	DCE	$AgBF_4$	80 °C	33% [d]
3	DCE	$AgBF_4$	80 °C	66% [e]
4	**DCE**	**$AgBF_4$**	**80 °C**	**87%**
5	DCE	$AgBF_4$	80 °C	88% [f]

[a] Reactions were operated with aniline (0.2 mmol), 4-benzylidene-2,6-di-*tert*-butylcyclohexa-2,5-dienone (0.2 mmol), catalyst (10 mol%) and solvent (1.0 mL) under N_2 conditions. [b] Yield was determined by GC analysis, and dodecane was used as the internal standard. [c] $AgBF_4$ (1 mol%) [d] $AgBF_4$ (2 mol%), [e] $AgBF_4$ (5 mol%), [f] $AgBF_4$ (20 mol%).



Scheme S1. 1,6-conjugated addition of **1a** to **2a.**

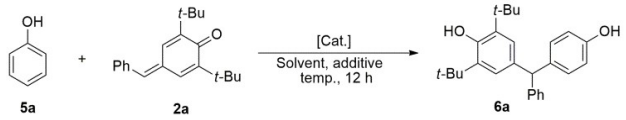
Table S4. Optimization of additive. [a]



Entry	Solvent	Additive	Catalyst	Temp.	Yield [b]
1	DCE	E_3N	$AgBF_4$	R.T.	trace
2	DCE	DIEA	$AgBF_4$	R.T.	trace
3	DCE	DBU	$AgBF_4$	R.T.	trace
4	DCE	K_3PO_4	$AgBF_4$	R.T.	38%
5	DCE	NaOAc	$AgBF_4$	R.T.	35%
6	DCE	PhCOOH	$AgBF_4$	R.T.	84%
7	**DCE**	**$Ph_2P(O)OH$**	**$AgBF_4$**	**R.T.**	**91%**
8	DCE	TfOH	$AgBF_4$	R.T.	81%
9	DCE	HBF_4	$AgBF_4$	R.T.	86%
10	DCE	TsOH	$AgBF_4$	R.T.	83%
22	DCE	CF_3COOH	$AgBF_4$	R.T.	84%

[a] Reactions were operated with phenol (0.2 mmol), 4-benzylidene-2,6-di-*tert*-butylcyclohexa-2,5-dienone (0.2 mmol), additive (10 mol%), catalyst (10 mol%) and solvent (1.0 mL) under N_2 atmosphere. [b] Yield was determined by GC analysis, and dodecane was used as the internal standard.

Table S5. Optimization of the amount of $Ph_2P(O)OH$. [a]



Entry	Solvent	Additive	Catalyst	Temp.	Yield [b]
1	DCE	$Ph_2P(O)OH$	$AgBF_4$	R.T.	86% [c]
2	DCE	$Ph_2P(O)OH$	$AgBF_4$	R.T.	88% [d]
3	DCE	$Ph_2P(O)OH$	$AgBF_4$	R.T.	89% [e]
4	**DCE**	**$Ph_2P(O)OH$**	**$AgBF_4$**	**R.T.**	**91%**

5	DCE	$Ph_2P(O)OH$	$AgBF_4$	R.T.	90%[f]

[a] Reactions were operated with phenol (0.2 mmol), 4-benzylidene-2,6-di-*tert*-butylcyclohexa-2,5-dienone (0.2 mmol), additive (10 mol%), catalyst (10 mol%) and solvent (1.0 mL) under N_2 atmosphere. [b] Yield was determined by GC analysis, and dodecane was used as the internal standard. [c] $Ph_2P(O)OH$ (1 mol%), [d] $Ph_2P(O)OH$ (2 mol%), [e] $Ph_2P(O)OH$ (5 mol%), [f] $Ph_2P(O)OH$ (20 mol%).

Table S6. Optimization of the amount of $AgBF_4$. [a]

Entry	Solvent	Additive	Catalyst	Temp.	Yield [b]
1	DCE	$Ph_2P(O)OH$	$AgBF_4$	R.T.	24%[c]
2	DCE	$Ph_2P(O)OH$	$AgBF_4$	R.T.	45%[d]
3	**DCE**	**$Ph_2P(O)OH$**	**$AgBF_4$**	**R.T.**	**91%**
4	DCE	$Ph_2P(O)OH$	$AgBF_4$	R.T.	68%[e]
5	DCE	$Ph_2P(O)OH$	$AgBF_4$	R.T.	90%[f]

[a] Reactions were operated with phenol (0.2 mmol), 4-benzylidene-2,6-di-*tert*-butylcyclohexa-2,5-dienone (0.2 mmol), additive (10 mol%), catalyst (10 mol%) and solvent (1.0 mL) under N_2 atmosphere. [b] Yield was determined by GC analysis, and dodecane was used as the internal standard. [c] $AgBF_4$ (1 mol%), [d] $AgBF_4$ (2 mol%), [e] $AgBF_4$ (5 mol%), [f] $AgBF_4$ (20 mol%).

Table S7. Optimization of solvent. [a]

Entry	Solvent	Additive	Catalyst	Temp.	Yield [b]
1	**DCE**	**$Ph_2P(O)OH$**	**$AgBF_4$**	**R.T.**	**91%**
2	DCM	$Ph_2P(O)OH$	$AgBF_4$	R.T.	81%
3	DMF	$Ph_2P(O)OH$	$AgBF_4$	R.T.	76%
4	CH_3CN	$Ph_2P(O)OH$	$AgBF_4$	R.T.	trace
5	1,4-dioxane	$Ph_2P(O)OH$	$AgBF_4$	R.T.	45%
6	H_2O	$Ph_2P(O)OH$	$AgBF_4$	R.T.	N.D.
7	Toluene	$Ph_2P(O)OH$	$AgBF_4$	R.T.	69%
8	THF	$Ph_2P(O)OH$	$AgBF_4$	R.T.	67%
9	DME	$Ph_2P(O)OH$	$AgBF_4$	R.T.	trace
10	DMSO	$Ph_2P(O)OH$	$AgBF_4$	R.T.	N.D.

[a] Reactions were operated with phenol (0.2 mmol), 4-benzylidene-2,6-di-*tert*-butylcyclohexa-2,5-dienone (0.2 mmol), additive (10 mol%), catalyst (10 mol%) and solvent (1.0 mL) under N_2 atmosphere. [b] Yield was determined by GC analysis, and dodecane was used as the internal standard.

Table S8. Optimization of atmosphere. [a]

Entry	Solvent	Additive	Catalyst	Temp.	Yield [b]

1	**DCE**	**$Ph_2P(O)OH$**	**$AgBF_4$**	**R.T.**	**91%**
2	DCE	$Ph_2P(O)OH$	$AgBF_4$	R.T.	66%[c]

[a] Reactions were operated with phenol (0.2 mmol), 4-benzylidene-2,6-di-*tert*-butylcyclohexa-2,5-dienone (0.2 mmol), additive (10 mol%), catalyst (10 mol%) and solvent (1.0 mL) under N_2 atmosphere. [b] Yield was determined by GC analysis, and dodecane was used as the internal standard. [c] air atmosphere.

General considerations:

All solvents used in the reactions were freshly distilled. The other reagents were recrystallized or distilled as necessary. All reactions were performed under an atmosphere of N_2 unless specified otherwise. ^1H (400 MHz), ^{13}C (100 MHz), ^{31}P (160 MHz) and ^{19}F (376 MHz) NMR spectra were recorded on a 400 MHz spectrometer in $CDCl_3$. ^1H NMR chemical shifts were reported using TMS as internal standard while ^{13}C NMR chemical shifts were reported relative to $CDCl_3$. The electron ionization method was used for HRMS measurements, and the mass analyzer type was double-focusing.

General procedure for 1,6-hydroarylation of *p*-QMs with anilines:

A mixture of anilines (0.2 mmol), *p*-QMs compounds (0.2 mmol) and $AgBF_4$ (10 mol %) were dissolved in DCE (1.0 mL) under a N_2 atmosphere and the mixture was stirred for 12.0 h at 80 ^oC. Upon completion of the reaction, the mixture was concentrated under vacuum. Removal of the solvent under a reduced pressure gave the crude product; pure product was obtained by passing the crude product through a short silica gel column using hexane/EtOAc (10:1-2:1) as eluent.

General procedure for 1,6-hydroarylation of *p*-QMs with phenols:

A mixture of phenols (0.2 mmol), *p*-QMs compounds (0.2 mmol), $Ph_2P(O)OH$ (10 mol %) and $AgBF_4$ (10 mol %) were dissolved in DCE (1.0 mL) under a N_2 atmosphere and the mixture was stirred for 12.0 h at room temperature. Upon completion of the reaction, the mixture was concentrated under vacuum. Removal of the solvent under a reduced pressure gave the crude product; pure product was obtained by passing the crude product through a short silica gel column using hexane/EtOAc (10:1-2:1) as eluent.

Crystallographic data

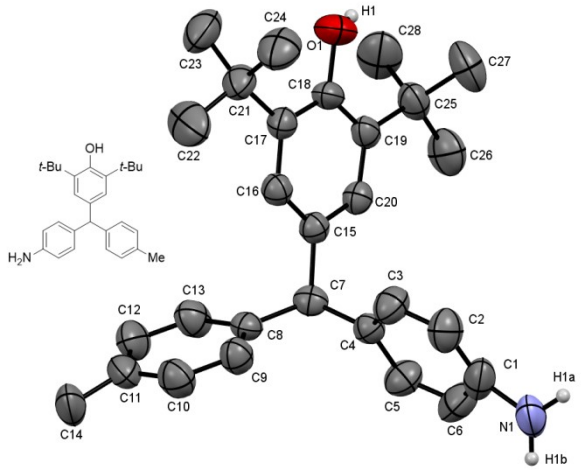


Figure S1. ORTEP drawing (a thermal ellipsoid plot) of compound **4a**.

Hydrogen atoms are omitted for clarity; ellipsoids are drawn at 50% probability.

Table S9. Crystal data and structure refinement for **4a**

Identification code	**4a**
CCDC	2144010
Empirical formula	$C_{28}H_{35}NO$
Formula weight	401.57
Temperature/K	298(2)
Crystal description	block
Space group	P-1
a/Å	9.8041(11)
b/Å	10.9905(12)
c/Å	11.7996(14)
α/°	83.266(2)
β/°	79.515(1)
γ/°	87.061(3)
Volume/Å^3	1241.0(2)
Z	2
ρ calcg/cm^3	1.075
μ/mm^{-1}	0.064
F(000)	436.168
Crystal size/mm^3	0.40 × 0.30 × 0.21
Radiation	MoKα (λ = 0.71073)
Index ranges	**-11≤h≤11, -12≤k≤13, 0≤l≤13**

Reflections collected	7762
Independent reflections	4276 [R_{int} = 0.0421, R_{sigma} = 0.0768]
Data/restraints/parameters	4276/0/282
Goodness-of-fit on F_2	1.058
Final R indexes [I>=2σ (I)]	R_1 = 0.0603, wR_2 = 0.1507
Final R indexes [all data]	R_1 = 0.1073, wR_2 = 0.1784

Experimental:

Single crystals of $C_{28}H_{35}NO$ (**4a**) were obtained by slow evaporation from its saturated solution of dichloromethane/n-hexane at room temperature. Suitable single crystals were selected for indexing, and intensity data were measured on a Siemens Smart CCD diffractometer with graphite-monochromated MoKα radiation (λ = 0.71073 Å) at 298(2) K. The raw data frames were intergrated into SHELX format reflection files and corrected using SAINT program. Absorption corrections based on multiscan were obtained by the SADABS program. The structure was solved by direct methods and refined with fullmatrix least-squares technique using the ShelXL (Sheldrick, 2015) and ShelXT (Sheldrick, 2015) programs, respectively.

Crystal structure determination of **4a**:
Crystal Data for $C_{28}H_{35}NO$ (M = 401.57 g/mol): triclinic, space group P-1, a = 9.8041(11) Å, b = 10.9905(12) Å, c = 11.7996(14) Å, V = 1241.0(2) $Å^3$, Z = 2, T = 298(2) K, μ(MoKα) = 0.71073 mm^{-1} , D_{calc} = 1.075 g/cm^3, 7762 reflections measured, 4276 unique (R_{int} = 0.0421, R_{sigma} = 0.0768) which were used in all calculations. The final R_1 was 0.0603 (I > 2σ(I)) and wR_2 was 0.1784 (all data).

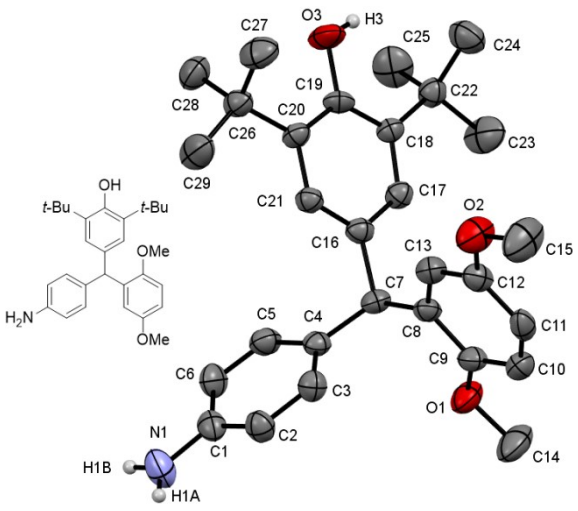


Figure S2. ORTEP drawing (a thermal ellipsoid plot) of compound **4j**.

Hydrogen atoms are omitted for clarity; ellipsoids are drawn at 50% probability.

Table S10. Crystal data and structure refinement for **4j**

Identification code	**4j**
CCDC	2144013
Empirical formula	$C_{29}H_{37}NO_3$
Formula weight	447.60
Temperature/K	298(2)
Crystal description	block
Space group	P2(1)/c
a/Å	9.9675(11)
b/Å	12.6997(13)
c/Å	20.234(2)
α/º	90.00
β/º	101.754(3)
γ/º	90.00
Volume/Å^3	2507.6(5)
Z	4
ρ calcg/cm^3	1.186
μ/mm^{-1}	0.076
F(000)	968
Crystal size/mm^3	0.25 * 0.20 * 0.12
Radiation	MoKα (λ = 0.71073)
Index ranges	**-11≤h≤8**, **-15≤k≤11**, **-24≤l≤21**
Reflections collected	11864
Independent reflections	4418 [R_{int} = 0.0940, R_{sigma} = 0.1251]
Data/restraints/parameters	4418/0/308
Goodness-of-fit on F_2	1.091
Final R indexes [I>=2σ (I)]	R_1 = 0.0747, wR_2 = 0.1607
Final R indexes [all data]	R_1 = 0.1518, wR_2 = 0.1828

Experimental:

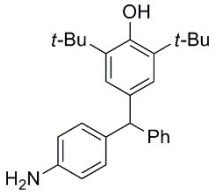
Single crystals of $C_{29}H_{37}NO_3$ (**4j**) were obtained by slow evaporation from its saturated solution of dichloromethane/n-hexane at room temperature. Suitable single crystals were selected for indexing, and intensity data were measured on a Siemens Smart CCD diffractometer with graphite-monochromated MoKα radiation (λ = 0.71073 Å) at 298(2) K. The raw data frames were intergrated into SHELX format reflection files and corrected using SAINT program. Absorption corrections based on multiscan were obtained by the SADABS program. The structure was solved by direct methods and refined with fullmatrix least-squares technique using the ShelXL (Sheldrick, 2015) and ShelXT (Sheldrick, 2015) programs, respectively.

Crystal structure determination of **4j**:
Crystal Data for $C_{29}H_{37}NO_3$ (M = 447.60 g/mol): monoclinic, space group P2(1)/c, a = 9.9675(11) Å, b = 12.6997(13) Å, c = 20.234(2) Å, V = 2507.6(5) Å^3, Z = 4, T =

298(2) K, μ(MoKα) = 0.71073 mm^{-1} , D_{calc} = 1.186 g/cm^3, 11864 reflections measured, 4418 unique (R_{int} = 0.0940, R_{sigma} = 0.1251) which were used in all calculations. The final R_1 was 0.0747 ($I > 2\sigma(I)$) and wR_2 was 0.1828 (all data).

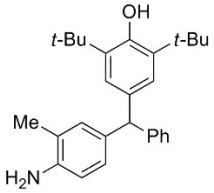
Analytical data for the compounds

4-((4-Aminophenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3a)



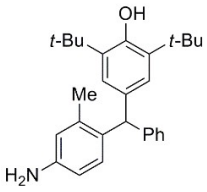
According to the general procedure, work-up and flash column chromatography (Hexane/EtOAc: 10:1) gave product **3a** (68.9 mg, 0.17 mmol, 85%) as a yellow solid. mp: 108.1-108.5 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.23-7.27 (m, 2H), 7.10-7.18 (m, 3H), 6.87-6.90 (m, 4H), 6.59-6.61 (m, 2H), 5.33 (s, 1H), 5.05 (s, 1H), 3.56 (s, 2H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.0 (s), 145.5 (s), 144.3 (s), 135.4 (s), 135.2 (s), 134.7 (s), 130.2 (s), 129.4 (s), 128.1 (s), 126.0 (s), 125.8 (s), 115.1 (s), 56.1 (s), 36.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{34}NO$ $[M+H]^+$: 388.2635, found: 388.2629.

4-((4-Amino-3-methylphenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3b)



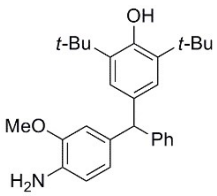
According to the general procedure, work-up and flash column chromatography (Hexane/EtOAc: 10:1) gave product **3b** (66.7 mg, 0.17 mmol, 83%) as a yellow solid. mp: 147.3-147.5 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.22-7.26 (m, 2H), 7.10-7.17 (m, 3H), 6.91-6.92 (m, 2H), 6.82-6.83 (m, 1H), 6.72-6.75 (m, 1H), 6.57-6.59 (m, 1H), 5.31 (s, 1H), 5.05 (s, 1H), 3.49 (s, 2H), 2.10 (s, 3H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.0 (s), 145.6 (s), 142.5 (s), 135.3 (s), 135.2 (s), 134.8 (s), 131.5 (s), 129.4 (s), 128.0 (s), 127.9 (s), 126.0 (s), 125.8 (s), 122.2 (s), 114.9 (s), 56.2 (s), 34.4 (s), 30.4 (s), 17.5 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{36}NO$ $[M+H]^+$: 402.2792, found: 402.2788.

4-((4-Amino-2-methylphenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3c)



According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3c** (68.3 mg, 0.17 mmol, 85%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.22-7.25 (m, 2H), 7.14-7.17 (m, 1H), 7.05-7.06 (m, 2H), 6.82-6.83 (m, 2H), 6.58-6.60 (m, 1H), 6.50-6.51 (m, 1H), 6.42-6.44 (m, 1H), 5.45 (s, 1H), 5.04 (s, 1H), 3.50 (s, 2H), 2.12 (s, 3H), 1.34 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 151.9 (s), 144.8 (s), 144.3 (s), 137.5 (s), 135.3 (s), 134.3 (s), 133.8 (s), 130.3 (s), 129.5 (s), 128.0 (s), 126.2 (s), 125.8 (s), 117.4 (s), 122.4 (s), 52.8 (s), 34.3 (s), 30.4 (s), 20.1 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{36}NO$ $[M+H]^+$: 402.2792, found: 402.2786.

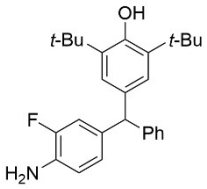
4-((4-Amino-3-methoxyphenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3d)



According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3d** (70.3 mg, 0.17 mmol, 84%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.22-7.26 (m, 2H), 7.10-7.17 (m, 3H), 6.92-6.93 (m, 2H), 6.57-6.62 (m, 2H), 6.48-6.51 (m, 1H), 5.34 (s, 1H), 5.06 (s, 1H), 3.71 (s,

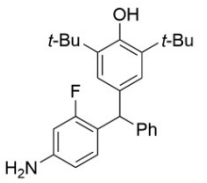
3H), 3.36 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.1 (s), 147.3 (s), 145.5 (s), 135.4 (s), 135.3 (s), 134.7 (s), 134.0 (s), 129.4 (s), 128.1 (s), 126.0 (s), 125.9 (s), 122.0 (s), 114.8 (s), 112.0 (s), 56.5 (s), 55.5 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{36}NO_2$ $[M+H]^+$: 418.2741, found: 418.2735.

4-((4-Amino-3-fluorophenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3e)



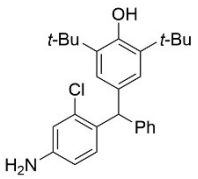
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3e** (66.6 mg, 0.16 mmol, 82%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.24-7.28 (m, 2H), 7.16-7.19 (m, 1H), 7.09-7.11 (m, 2H), 6.88-6.89 (m, 2H), 6.65-6.74 (m, 3H), 5.32 (s, 1H), 5.07 (s, 1H), 3.61 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 151.6 (d, *J*(C,F) = 237.0 Hz), 152.1 (s), 144.8 (s), 136.1 (d, *J*(C,F) = 5.5 Hz), 135.5 (s), 134.2 (s), 132.2 (d, *J*(C,F) = 13.2 Hz), 129.3 (s), 128.2 (s), 126.1 (s), 125.9 (s), 125.2 (d, *J*(C,F) = 3.1 Hz), 116.7 (d, *J*(C,F) = 3.7 Hz), 116.2 (d, *J*(C,F) = 19.1 Hz), 55.9 (s), 34.4 (s), 30.4 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 °C, TMS): δ = -135.2 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}FNO$ $[M+H]^+$: 406.2541, found: 406.2534.

4-((4-Amino-2-fluorophenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3f)



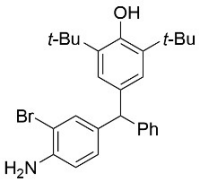
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3f** (65.6 mg, 0.16 mmol, 81%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.23-7.27 (m, 2H), 7.15-7.19 (m, 1H), 7.09-7.11 (m, 2H), 6.88-6.89 (m, 2H), 6.67-6.71 (m, 1H), 6.34-6.36 (m, 2H), 5.60 (s, 1H), 5.02 (s, 1H), 3.63 (s, 2H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 161.3 (d, *J*(C,F) = 243.2 Hz), 152.1 (s), 146.4 (d, *J*(C,F) = 10.9 Hz), 144.2 (s), 135.4 (s), 133.4 (s), 131.4 (d, *J*(C,F) = 6.0 Hz), 129.1 (s), 128.1 (s), 126.0 (s), 125.9 (s), 121.7 (d, *J*(C,F) = 15.1 Hz), 110.5 (d, *J*(C,F) = 2.7 Hz), 102.2 (d, *J*(C,F) = 25.6 Hz), 48.7 (d, *J*(C,F) = 2.6 Hz), 34.4 (s), 30.4 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 °C, TMS): δ = -116.2 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}FNO$ $[M+H]^+$: 406.2541, found: 406.2535.

4-((4-Amino-2-chlorophenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3g)



According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3g** (68.4 mg, 0.16 mmol, 81%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.24-7.27 (m, 2H), 7.18-7.19 (m, 1H), 7.06-7.08 (m, 2H), 6.84-6.85 (m, 2H), 6.70-6.72 (m, 2H), 6.47-6.49 (m, 1H), 5.73 (s, 1H), 5.07 (s, 1H), 3.62 (s, 2 H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.0 (s), 145.5 (s), 144.0 (s), 135.3 (s), 135.3 (s), 134.8 (s), 133.5 (s), 132.5 (s), 131.6 (s), 129.4 (s), 128.1 (s), 126.2 (s), 126.0 (s), 115.8 (s), 52.4 (s), 34.3 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}ClNO$ $[M+H]^+$: 422.2246, found: 422.2241.

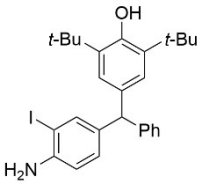
4-((4-Amino-3-bromophenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3h)



According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3h** (77.2 mg, 0.17 mmol, 83%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.22-7.27 (m, 2H), 7.15-7.19 (m, 2H), 7.08-7.10 (m, 2H), 6.87-6.88 (m, 2H), 6.82-6.84 (m, 1H), 6.64-6.66 (m, 1H), 5.30 (s, 1H), 5.08 (s, 1H), 3.95 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.2 (s), 144.8 (s), 142.1 (s), 136.4 (s), 135.5 (s), 134.1 (s), 133.2 (s), 129.4 (s), 129.3 (s), 128.2 (s), 126.1 (s), 125.9 (s),

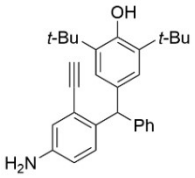
115.6 (s), 109.3 (s), 55.7 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}BrNO$ $[M+H]^+$: 466.1741, found: 466.1735.

4-((4-Amino-3-iodophenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3i)



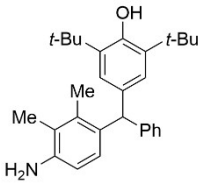
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3i** (81.1 mg, 0.16 mmol, 79%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.41-7.42 (m, 1H), 7.24-7.28 (m, 2H), 7.16-7.20 (m, 1H), 7.08-7.10 (m, 2H), 6.84-6.88 (m, 3H), 6.64-6.66 (m, 1H), 5.28 (s, 1H), 5.08 (s, 1H), 3.98 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.1 (s), 144.8 (s), 139.5 (s), 136.8 (s), 135.5 (s), 134.0 (s), 130.4 (s), 129.3 (s), 129.2 (s), 128.2 (s), 126.1 (s), 125.9 (s), 114.5 (s), 84.4 (s), 55.5 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}INO$ $[M+H]^+$: 514.1602, found: 514.1595.

4-((4-Amino-2-ethynylphenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3j)



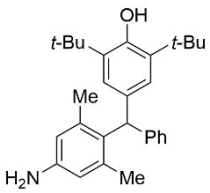
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **3j** (65.9 mg, 0.16 mmol, 80%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.22-7.26 (m, 2H), 7.16-7.18(m, 1H), 7.09-7.11 (m, 2H), 6.89-6.90 (m, 2H), 6.79-6.83 (m, 2H), 6.59-6.61 (m, 1H), 5.86 (s, 1H), 5.05 (s, 1H), 3.59 (s, 2H), 3.15 (s, 1H), 1.35 (m, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 151.9 (s), 144.6 (s), 144.1 (s), 138.0 (s), 135.2 (s), 134.0 (s), 130.2 (s), 129.4 (s), 127.9 (s), 126.2 (s), 125.8 (s), 122.7 (s), 119.0 (s), 116.1 (s), 82.7 (s), 80.9 (s), 53.3 (s), 34.3 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{34}NO$ $[M+H]^+$: 412.2635, found: 412.2631. HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{34}NO$ $[M+H]^+$: 412.2635, found: 412.2630.

4-((4-Amino-2,3-dimethylphenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3k)



According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **3k** (66.7 mg, 0.16 mmol, 81%) as a white solid. mp: 153.2-153.5 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.21-7.25 (m, 2H), 7.13-7.17(m, 1H), 7.04-7.05 (m, 2H), 6.82-6.83 (m, 2H), 6.44-6.49 (m, 2H), 5.54 (s, 1H), 5.04 (s, 1H), 3.50 (s, 2H), 2.12 (s, 3H), 2.09 (s, 3H), 1.34 (m, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 151.8 (s), 145.2 (s), 142.5 (s), 135.6 (s), 135.2 (s), 134.6 (s), 134.0 (s), 129.5 (s), 128.0 (s), 127.6 (s), 126.4 (s), 125.7 (s), 121.4 (s), 112.5 (s), 53.7 (s), 34.3 (s), 30.4 (s), 16.1 (s), 13.5 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{38}NO$ $[M+H]^+$: 416.2948, found: 416.2940.

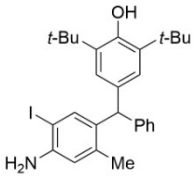
4-((4-Amino-2,6-dimethylphenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3l)



According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3l** (58.2 mg, 0.14 mmol, 68%) as a white solid. mp: 143.3-143.7 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.17-7.28 (m, 5H), 7.04-7.05 (m, 2H), 6.45 (s, 1H), 6.30 (s, 1H), 5.70 (s, 1H), 5.09 (s, 1H), 3.30 (s, 2H), 2.22 (s, 3H), 2.20 (s, 3H), 1.35 (m, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.2 (s), 145.5 (s), 143.4 (s), 137.9 (s), 136.7 (s), 135.7 (s), 132.2 (s), 128.9 (s), 125.8 (s), 124.6 (s), 122.2 (s), 116.4 (s),

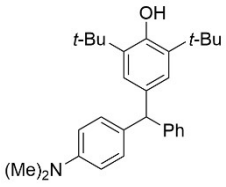
49.8 (s), 34.4 (s), 30.4 (s), 21.5 (s), 21.0 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{38}NO$ $[M+H]^+$: 416.2948, found: 416.2942.

4-((4-Amino-5-iodo-2-methylphenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3m)



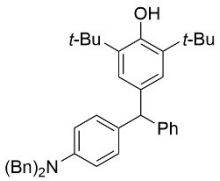
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **3m** (87.6 mg, 0.17 mmol, 83%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.23-7.27 (m, 2H), 7.17-7.18 (m, 1H), 7.03-7.05 (m, 3H), 6.82 (s, 2H), 6.55 (s, 1H), 5.38 (s, 1H), 5.07 (s, 1H), 3.90 (s, 2H), 2.07 (s, 3 H), 1.36 (m, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.1 (s), 144.8 (s), 144.1 (s), 139.5 (s), 138.2 (s), 135.7 (s), 135.5 (s), 133.6 (s), 129.3 (s), 128.2 (s), 126.1 (s), 126.0 (s), 116.8 (s), 80.9 (s), 52.6 (s), 34.4 (s), 30.4 (s), 19.9 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{35}INO$ $[M+H]^+$: 528.1758, found: 528.1753.

2,6-Di-*tert*-butyl-4-((4-(dimethylamino)phenyl)(phenyl)methyl)phenol (3n)



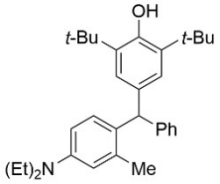
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 20:1) gave product **3n** (71.6 mg, 0.17 mmol, 86%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.23-7.27 (m, 2H), 7.16-7.18 (m, 3H), 6.92-6.98 (m, 4H), 6.66-6.68 (m, 2H), 5.35 (s, 1H), 5.05 (s, 1H), 2.91 (s, 6H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 151.9 (s), 148.9 (s), 145.7 (s), 135.3 (s), 134.8 (s), 133.1 (s), 130.0 (s), 129.4 (s), 128.0 (s), 126.0 (s), 125.8 (s), 112.6 (s), 56.0 (s), 40.8 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{38}NO$ $[M+H]^+$: 416.2948, found: 416.2942.

2,6-Di-*tert*-butyl-4-((4-(dibenzylamino)phenyl)(phenyl)methyl)phenol (3o)



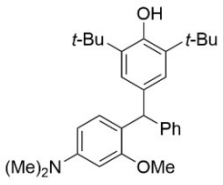
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3o** (88.6 mg, 0.16 mmol, 78%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.11-7.22 (m, 12H), 7.02-7.08 (m, 3H), 6.79-6.82 (m, 4H), 6.55-6.57 (m, 2H), 5.23 (s, 1H), 4.94 (s, 1H), 4.51 (s, 4H), 1.26 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.0 (s), 147.5 (s), 145.7 (s), 138.9 (s), 135.3 (s), 134.9 (s), 133.1 (s), 130.1 (s), 129.5 (s), 128.7 (s), 128.1 (s), 126.9 (s), 126.8 (s), 126.1 (s), 125.9 (s), 112.5 (s), 56.0 (s), 54.5 (s), 34.4 (s), 30.5 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{41}H_{46}NO$ $[M+H]^+$: 568.3574, found: 568.3570.

2,6-Di-*tert*-butyl-4-((4-(diethylamino)-2-methylphenyl)(phenyl)methyl)phenol (3p)



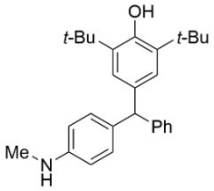
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 20:1) gave product **3p** (65.1 mg, 0.14 mmol, 74%) as a red oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.22-7.26 (m, 2H), 7.12-7.17 (m, 1H), 7.07-7.09 (m, 2H), 6.86 (s, 2H), 6.62-6.64 (m, 1H), 6.43-6.50 (m, 2H), 5.44 (s, 1H), 5.03 (s, 1H), 3.28-3.33 (m, 4H), 2.15 (s, 3H), 1.35 (s, 18H), 1.13 (t, *J* = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 146.5 (s), 140.9 (s), 139.9 (s), 131.9 (s), 129.9 (s), 129.3 (s), 125.3 (s), 124.8 (s), 124.1 (s), 122.6 (s), 121.0 (s), 120.3 (s), 108.7 (s), 104.0 (s), 47.51 (s), 38.96 (s), 29.02 (s), 25.07 (s), 15.36 (s), 7.40 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{32}H_{44}NO$ $[M+H]^+$: 458.3418, found: 458.3413.

2,6-Di-*tert*-butyl-4-((4-(dimethylamino)-2-methoxyphenyl)(phenyl)methyl)phenol (3q)



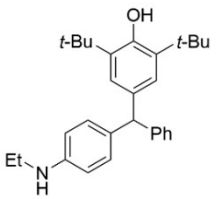
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 20:1) gave product **3q** (66.2 mg, 0.14 mmol, 71%) as a yellow solid. mp: 136.1-136.3 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.11-7.14 (m, 2H), 7.00-7.05 (m, 3H), 6.82-6.83 (m, 2H), 6.63-6.65 (m, 1H), 6.16-6.18 (m, 2H), 5.61 (s, 1H), 4.92 (s, 1H), 3.60 (s, 3H), 2.83 (s, 6H), 1.27 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 157.9 (s), 151.8 (s), 150.5 (s), 145.7 (s), 135.1 (s), 134.8 (s), 130.6 (s), 129.3 (s), 127.8 (s), 126.3 (s), 125.5 (s), 122.3 (s), 104.6 (s), 96.8 (s), 55.7 (s), 49.0 (s), 40.9 (s), 34.4 (s), 30.5 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{30}H_{40}NO_2$ $[M+H]^+$: 446.3054, found: 446.3050.

2,6-Di-*tert*-butyl-4-((4-(methylamino)phenyl)(phenyl)methyl)phenol (3r)



According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 30:1) gave product **3r** (67.5 mg, 0.17 mmol, 84%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.23-7.26 (m, 2H), 7.11-7.17 (m, 3H), 6.92-6.93 (m, 4H), 6.52-6.54 (m, 2H), 5.34 (s, 1H), 5.05 (s, 1H), 3.60 (s, 1H), 2.80 (s, 3H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 151.9 (s), 147.5 (s), 145.7 (s), 135.3 (s), 134.8 (s), 133.8 (s), 130.1 (s), 129.4 (s), 128.1 (s), 126.0 (s), 125.8 (s), 112.3 (s), 56.1 (s), 34.4 (s), 31.0 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{36}NO$ $[M+H]^+$: 402.2792, found: 402.2787.

2,6-Di-*tert*-butyl-4-((4-(ethylamino)phenyl)(phenyl)methyl)phenol (3s)

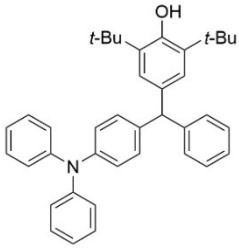


According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 30:1) gave product **3s** (68.2 mg, 0.16 mmol, 82%) as a red oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.22-7.26 (m, 2H), 7.10-7.17 (m, 3H), 6.90-6.91 (m, 4H), 6.52-6.54 (m, 2H), 5.33 (s, 1H), 5.04 (s, 1H), 3.42 (s, 1H), 3.10-3.15 (m, 2H), 1.35 (s, 18H), 1.23 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 151.9 (s), 146.6 (s), 145.7 (s), 135.3 (s), 134.9 (s), 133.8 (s), 130.2 (s), 129.4 (s), 128.0 (s), 126.0 (s), 125.8 (s), 112.6 (s), 56.1 (s), 38.7 (s), 34.4 (s), 30.4 (s), 15.0 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{38}NO$ $[M+H]^+$: 416.2948, found: 416.2944.

2,6-Di-*tert*-butyl-4-((4-(naphthalen-2-ylamino)phenyl)(phenyl)methyl)phenol (3t)

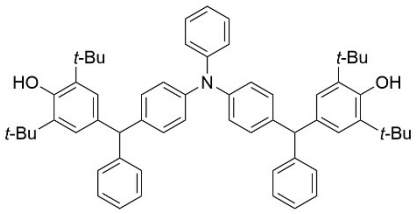
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 20:1) gave product **3t** (75.0 mg, 0.15 mmol, 73%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.69-7.71 (m, 2H), 7.59-7.61 (m, 1H), 7.35-7.39 (m, 2H), 7.24-7.30 (m, 3H), 7.15-7.22 (m, 4H), 7.04-7.09 (m, 4H), 6.94 (s, 2H), 5.80 (s, 1H), 5.42 (s, 1H), 5.07 (s, 1H), 1.37 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.1 (s), 145.1 (s), 141.3 (s), 140.7 (s), 138.2 (s), 135.5 (s), 134.7 (s), 134.4 (s), 130.3 (s), 129.4 (s), 129.1 (s), 129.0 (s), 128.2 (s), 127.7 (s), 126.5 (s), 126.4 (s), 126.1 (s), 126.0 (s), 123.3 (s), 119.8 (s), 118.5 (s), 110.9 (s), 56.3 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{37}H_{40}NO$ $[M+H]^+$: 514.3105, found: 514.3100.

2,6-Di-*tert*-butyl-4-((4-(diphenylamino)phenyl)(phenyl)methyl)phenol (3u)



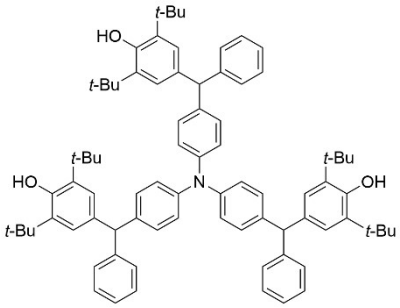
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 20:1) gave product **3u** as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.18-7.23 (m, 2H), 7.10-7.16 (m, 5H), 7.06-7.08 (m, 2H), 6.98-7.00 (m, 4H), 6.88-6.92 (m, 6H), 6.83 (m, 2H), 5.32 (s, 1H), 5.00 (s, 1H), 1.30 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 151.0 (s), 146.9 (s), 144.7 (s), 143.9 (s), 138.4 (s), 134.4 (s), 133.3 (s), 129.1 (s), 128.4 (s), 128.2 (s), 128.1 (s), 127.1 (s), 125.0 (s), 123.2 (s), 122.8 (s), 121.4 (s), 55.2 (s), 33.3 (s), 29.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{39}H_{42}NO$ $[M+H]^+$: 540.3261, found: 540.3254.

4,4'-(((Phenylazanediyl)bis(4,1-phenylene))bis(phenylmethylene))bis(2,6-di-*tert*-butylphenol) (3u')



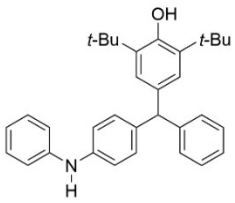
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3u'** as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.17-7.22 (m, 4H), 7.09-7.13 (m, 4H), 7.05-7.07 (m, 4H), 6.96-6.98 (m, 2H), 6.86-6.90 (m, 9H), 6.82 (m, 4H), 5.31 (s, 2H), 4.99 (s, 2H), 1.28 (s, 36H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 151.0 (s), 146.9 (s), 144.7 (s), 143.9 (s), 138.1 (s), 134.3 (s), 133.4 (s), 129.1 (s), 128.4 (s), 128.0 (s), 127.1 (s), 125.0 (s), 122.9 (s), 122.8 (s), 122.4 (s), 121.0 (s), 55.2 (s), 33.3 (s), 29.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{60}H_{68}NO_2$ $[M+H]^+$: 834.5245, found: 834.5241.

4,4',4''-((Nitrilotris(benzene-4,1-diyl))tris(phenylmethylene))tris(2,6-di-*tert*-butylphenol) (3u'')



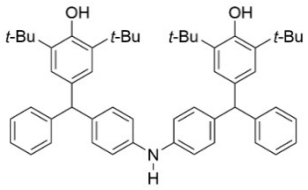
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **3u''** as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.23-7.28 (m, 6H), 7.17-7.19 (m, 2H), 7.11-7.13 (m, 6H), 6.92-6.98 (m, 11H), 6.89 (m, 6H), 5.37 (s, 3H), 5.05 (s, 2H), 1.35 (s, 54H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.1 (s), 145.9 (s), 145.05 (s), 138.8 (s), 135.4 (s), 134.5 (s), 130.0 (s), 129.4 (s), 128.1 (s), 126.1 (s), 126.0 (s), 123.7 (s), 56.2 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{81}H_{94}NO_3$ $[M+H]^+$: 1128.7229, found: 1128.7223.

2,6-Di-*tert*-butyl-4-(phenyl(4-(phenylamino)phenyl)methyl)phenol (3v)



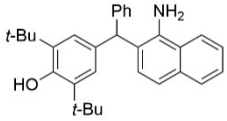
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 20:1) gave product **3v** as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.05-7.22 (m, 7H), 6.90-6.96 (m, 6H), 6.79-6.85 (m, 3H), 5.57 (s, 1H), 5.31 (s, 1H), 4.99 (s, 1H), 1.29 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 151.0 (s), 144.1 (s), 142.5 (s), 139.9 (s), 136.7 (s), 134.4 (s), 133.4 (s), 129.2 (s), 128.3 (s), 128.2 (s), 127.1 (s), 124.9 s), 124.8 s), 119.5 (s), 117.0 (s), 116.3 (s), 55.2 (s), 33.3 (s), 29.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{33}H_{38}NO$ $[M+H]^+$: 464.2948, found: 464.2944.

4,4'-((Azanediylbis(4,1-phenylene))bis(phenylmethylene))bis(2,6-di-*tert*-butylphenol) (3v')



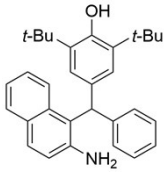
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3v'** as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.24-7.28 (m, 4H), 7.15-7.19 (m, 2H), 7.11-7.13 (m, 4H), 6.94-6.99 (m, 8H), 6.91 (m, 4H), 5.59 (s, 1H), 5.37 (s, 2H), 5.06 (s, 2H), 1.36 (s, 36H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.0 (s), 145.2 (s), 141.3 (s), 137.3 (s), 135.4 (s), 134.5 (s), 130.2 (s), 129.4 (s), 128.1 (s), 126.0 (s), 125.9 (s), 117.5 (s), 56.2 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{54}H_{64}NO_2$ $[M+H]^+$: 758.4932, found: 758.4928.

4-((1-Aminonaphthalen-2-yl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3w)



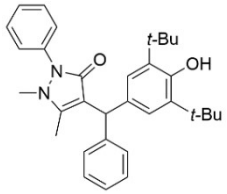
According to the general procedure, work-up and flash column chromatography (Hexane/EtOAc: 10:1) gave product **3w** (49.1 mg, 0.11 mmol, 56%) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.99-8.01 (m, 1H), 7.84-7.86 (m, 1H), 7.36-7.46 (m, 2H), 7.21-7.25 (m, 2H), 7.10-7.17 (m, 3H), 6.88 (s, 2H), 6.69-6.75 (m, 2H), 6.06 (s, 1H), 5.05 (s, 1H), 4.22 (s, 2H), 1.33 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.0 (s), 145.0 (s), 140.5 (s), 135.4 (s), 134.5 (s), 134.1 (s), 132.7 (s), 131.9 (s), 129.5 (s), 128.1 (s), 127.9 (s), 126.4 (s), 125.9 (s), 125.2 (s), 124.4 (s), 124.3 (s), 121.3 (s), 109.5 (s), 52.7 (s), 34.3 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{31}H_{36}NO$ $[M+H]^+$: 438.2792, found: 438.2786.

4-((2-Aminonaphthalen-1-yl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3x)



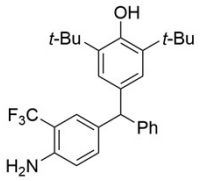
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3x** (64.8 mg, 0.15 mmol, 74%) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.95-7.97 (m, 1H), 7.69-7.71 (m, 1H), 7.60-7.62 (m, 1H), 7.32-7.36 (m, 1H), 7.17-7.28 (m, 6H), 7.07 (s, 2H), 6.84-6.86 (m, 1H), 6.28 (s, 1H), 5.10 (s, 1H), 3.57 (s, 2H), 1.33 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.3 (s), 143.6 (s), 143.0 (s), 135.9 (s), 134.3 (s), 132.1 (s), 129.0 (s), 128.8 (s), 128.7 (s), 128.6 (s), 128.5 (s), 126.5 (s), 126.3 (s), 125.9 (s), 122.7 (s), 121.8 (s), 120.5 (s), 118.8 (s), 48.8 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{31}H_{36}NO$ $[M+H]^+$: 438.2792, found: 438.2788.

4-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)-1,5-dimethyl-2-phenyl-1,2-dihydro-3H-pyrazol-3-one (3y)



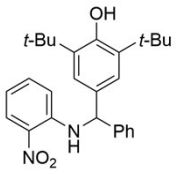
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 20:1) gave product **3y** (55.1 mg, 0.11 mmol, 57%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.39-7.46 (m, 4H), 7.16-7.28 (m, 6H), 7.03 (s, 2H), 5.42 (s, 1H), 5.08 (s, 1H), 2.99 (s, 3H), 1.86 (s, 3H), 1.38 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 165.7 (s), 154.1 (s), 152.2 (s), 143.4 (s), 135.6 (s), 135.5 (s), 132.1 (s), 128.9 (s), 128.8 (s), 128.1 (s), 125.9 (s), 125.8 (s), 125.6 (s), 123.2 (s), 114.9 (s), 45.1 (s), 36.6 (s), 34.4 (s), 30.4 (s), 12.0 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{32}H_{39}N_2O_2$ $[M+H]^+$: 483.3007, found: 483.3001.

4-((4-Amino-3-(trifluoromethyl)phenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3z)



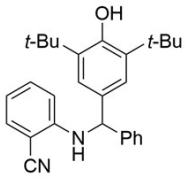
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **3z** (72.1 mg, 0.16 mmol, 79%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.17-7.28 (m, 4H), 7.02-7.10 (m, 3H), 6.88 (s, 2H), 6.64-6.66 (m, 1H), 5.34 (s, 1H), 5.09 (s, 1H), 4.05 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.2 (s), 144.7 (s), 142.6 (s), 135.6 (s), 134.4 (s), 133.9 (s), 133.8 (s), 129.2 (s), 128.3 (s), 127.2 (d, *J*(C,F) = 5.1 Hz), 126.2 (s), 125.9 (s), 125.1 (d, *J*(C,F) = 270.7 Hz), 117.2 (s), 113.6 (d, *J*(C,F) = 29.5 Hz), 55.8 (s), 34.4 (s), 30.3 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = -62.5 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{33}F_3NO$ $[M+H]^+$: 456.2509, found: 456.2505.

2,6-Di-*tert*-butyl-4-(((2-nitrophenyl)amino)(phenyl)methyl)phenol (3aa')



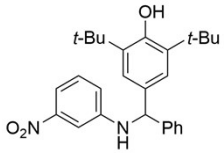
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 30:1) gave product **3aa'** (75.3 mg, 0.17 mmol, 87%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 8.63-8.64 (m, 1H), 8.18-8.20 (m, 1H), 7.24-7.39 (m, 6H), 7.09 (s, 2H), 6.72-6.74 (m, 1H), 6.60-6.65 (m, 1H), 5.66 (d, *J* = 5.6 Hz, 1H), 5.21 (s, 1H), 1.39 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.4 (s), 144.4 (s), 141.7 (s), 136.3 (s), 136.1 (s), 132.3 (s), 132.2 (s), 128.9 (s), 127.5 (s), 126.9 (s), 126.8 (s), 124.1 (s), 115.7 (s), 115.4 (s), 62.1 (s), 34.4 (s), 30.2 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}N_2O_3$ $[M+H]^+$: 433.2486, found: 433.2481.

2-(((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)amino)benzonitrile (3ab')



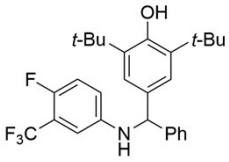
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 20:1) gave product **3ab'** (66.9 mg, 0.16 mmol, 81%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.31-7.41 (m, 5H), 7.20-7.28 (m, 2H), 7.04 (s, 2H), 6.64-6.66 (m, 1H), 6.49-6.51 (m, 1H), 5.53 (d, *J* = 4.8 Hz, 1H), 5.21 (s, 1H), 5.11 (d, *J* = 4.7 Hz, 1H), 1.38 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.5 (s), 149.4 (s), 141.6 (s), 136.3 (s), 134.2 (s), 132.8 (s), 132.3 (s), 128.8 (s), 127.5 (s), 127.1 (s), 124.5 (s), 118.1 (s), 116.9 (s), 112.3 (s), 96.0 (s), 62.4 (s), 34.4 (s), 30.2 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{33}N_2O$ $[M+H]^+$: 413.2588, found: 413.2584.

2,6-Di-*tert*-butyl-4-(((3-nitrophenyl)amino)(phenyl)methyl)phenol (3ac')



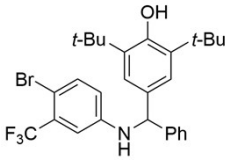
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 30:1) gave product **3ac'** (73.6 mg, 0.17 mmol, 85%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.46-7.48 (m, 1H), 7.32-7.40 (m, 5H), 7.17-7.27 (m, 2H), 7.08 (s, 2H), 6.77-6.80 (m, 1H), 5.48 (d, *J* = 4.4 Hz, 1H), 5.21 (s, 1H), 4.61 (d, *J* = 4.3 Hz, 1H), 1.39 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.4 (s), 149.2 (s), 148.1 (s), 141.8 (s), 136.3 (s), 132.8 (s), 129.6 (s), 128.9 (s), 127.5 (s), 127.1 (s), 124.5 (s), 119.0 (s), 112.0 (s), 107.6 (s), 63.0 (s), 34.5 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}N_2O_3$ $[M+H]^+$: 433.2486, found: 433.2480.

2,6-Di-*tert*-butyl-4-(((4-fluoro-3-(trifluoromethyl)phenyl)amino)(phenyl)methyl)phenol (3ad')



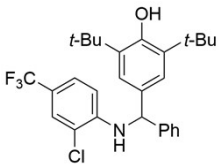
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 40:1) gave product **3ad'** (76.7 mg, 0.17 mmol, 83%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.30-7.39 (m, 4H), 7.21-7.26 (m, 1H), 7.08 (s, 2H), 6.86-6.90 (m, 1H), 6.71-6.73 (m, 1H), 6.55-6.59 (m, 1H), 5.35 (s, 1H), 5.19 (s, 1H), 4.31 (d, *J* = 2.1 Hz, 1H), 1.38 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.3 (s), 152.1 (d, *J*(C,F) = 241.9 Hz), 143.7 (d, *J*(C,F) = 2.1 Hz), 142.2 (s), 136.2 (s), 133.2 (s), 127.4 (s), 127.0 (s), 124.5 (s), 122.8 (d, *J*(C,F) = 269.7 Hz), 117.3 (d, *J*(C,F) = 11.1 Hz), 117.2 (d, *J*(C,F) = 2.6 Hz), 111.2 (d, *J*(C,F) =4.6 Hz), 63.6 (s), 34.5 (s), 30.3 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = -61.5 (d, *J* = 12.8 Hz), -130.7 (q, *J* = 12.7 Hz). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{32}F_4NO$ $[M+H]^+$: 474.2415, found: 474.2411.

4-(((4-Bromo-3-(trifluoromethyl)phenyl)amino)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3ae')



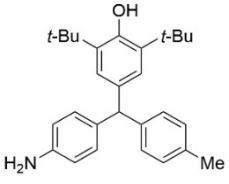
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 40:1) gave product **3ae'** (82.2 mg, 0.15 mmol, 77%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.30-7.37 (m, 5H), 7.20-7.26 (m, 1H), 7.06 (s, 2H), 6.87-6.88 (m, 1H), 6.44-6.47 (m, 1H), 5.38 (d, *J* = 4.1 Hz, 1H), 5.20 (s, 1H), 4.47 (d, *J* = 4.1 Hz, 1H), 1.38 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.4 (s), 146.4 (s), 141.8 (s), 136.3 (s), 135.3 (s), 132.9 (s), 127.5 (s), 127.0 (s), 124.5 (s), 123.0 (d, *J*(C,F) = 271.6 Hz), 116.9 (s), 113.1 (d, *J*(C,F) = 5.7 Hz), 105.4 (s), 63.2 (s), 34.5 (s), 30.3 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = -62.7. HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{32}BrF_3NO$ $[M+H]^+$: 534.1614, found: 534.1607.

2,6-Di-*tert*-butyl-4-(((2-chloro-4-(trifluoromethyl)phenyl)amino)(phenyl)methyl)phenol (3af')



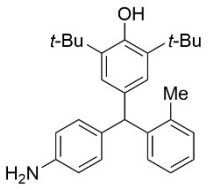
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 40:1) gave product **3af'** (76.4 mg, 0.16 mmol, 78%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.51-7.52 (m, 1H), 7.32-7.35 (m, 4H), 7.22-7.29 (m, 2H), 7.06 (s, 2H), 6.49-6.51 (m, 1H), 5.52 (d, *J* = 4.9 Hz, 1H), 5.22 (s), 5.21 (s), 1.38 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.4 (s), 145.6 (s), 141.6 (s), 136.2 (s), 132.5 (s), 128.9 (s), 127.5 (s), 127.1 (s), 126.2 (d, *J*(C,F) = 3.8 Hz), 125.0 (d, *J*(C,F) = 3.7 Hz), 124.4 (s), 121.0 (d, *J*(C,F) = 365.8 Hz), 118.9 (s), 118.7 (s), 111.8 (s), 62.4 (s), 34.4 (s), 30.2 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = -61.1. HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{32}ClF_3NO$ $[M+H]^+$: 490.2120, found: 490.2115.

4-((4-Aminophenyl)(*p*-tolyl)methyl)-2,6-di-*tert*-butylphenol (4a)



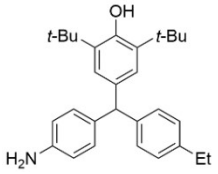
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4a** (65.1 mg, 0.16 mmol, 81%) as a yellow solid. mp: 147.3-147.5 ^{o}C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 6.98-7.06 (m, 4H), 6.87-6.91 (m, 4H), 6.57-6.60 (m, 2H), 5.28 (s, 1H), 5.04 (s, 1H), 3.43 (s, 2H), 2.30 (s, 3H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 151.9 (s), 144.2 (s), 142.5 (s), 135.4 (s), 135.3 (s), 135.2 (s), 134. 9 (s), 130.2 (s), 129.2 (s), 128.8 (s), 126.0 (s), 115.0 (s), 55.7 (s), 34.4 (s), 30.4 (s), 21.1 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{36}NO$ $[M+H]^+$: 402.2792, found: 402.2786.

4-((4-Aminophenyl)(*o*-tolyl)methyl)-2,6-di-*tert*-butylphenol (4b)



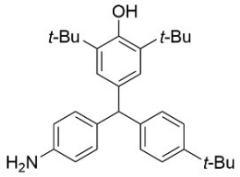
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4b** (68.3 mg, 0.17 mmol, 83%) as a yellow solid. mp: 147.3-147.5 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.06-7.13 (m, 3H), 6.82-6.84 (m, 5H), 6.57-6.61 (m, 2H), 5.44 (s, 1H), 5.04 (s, 1H), 3.29 (s, 2H), 2.21 (s, 3H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 151.9 (s), 144.1 (s), 143.8 (s), 136.6 (s), 135.3 (s), 134.4 (s), 134.2 (s), 130. 3 (s), 130.2 (s), 129.2 (s), 126.2 (s), 125.9 (s), 125.5 (s), 115.1 (s), 52.6 (s), 34.3 (s), 30.4 (s), 20.0 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{36}NO$ $[M+H]^+$: 402.2792, found: 402.2787.

4-((4-Aminophenyl)(4-ethylphenyl)methyl)-2,6-di-*tert*-butylphenol (4c)



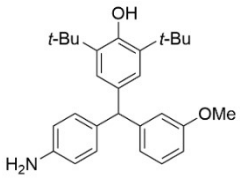
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4c** (69.9 mg, 0.41 mmol, 84%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.07-7.09 (m, 2H), 7.00-7.02 (m, 2H), 6.88-6.91 (m, 4H), 6.58-6.60 (m, 2H), 5.29 (s, 1H), 5.04 (s, 1H), 3.54 (s, 2H), 2.58-2.63 (m, 2H), 1.35 (s, 18H), 1.21 (t, *J* = 7.6 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 151.9 (s), 144.2 (s), 142.7 (s), 141.6 (s), 135.5 (s), 135.3 (s), 134.9 (s), 130.2 (s), 129.2 (s), 127.5 (s), 126.0 (s), 115.1 (s), 55.8 (s), 34.4 (s), 30.4 (s), 28.5 (s), 15.6 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{38}NO$ $[M+H]^+$: 416.2948, found: 416.2941.

4-((4-Aminophenyl)(4-(*tert*-butyl)phenyl)methyl)-2,6-di-*tert*-butylphenol (4d)



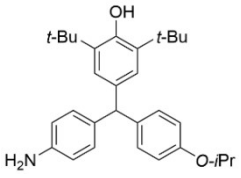
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4d** (71.0 mg, 0.16 mmol, 80%) as a yellow solid. mp: 145.2-145.5 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.22-7.27 (m, 2H), 7.02-7.03 (m, 2H), 6.89-6.91 (m, 4H), 6.57-6.60 (m, 2H), 5.28 (s, 1H), 5.03 (s, 1H), 3.53 (s, 2H), 1.36 (s, 18H), 1.29 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 151.9 (s), 148.5 (s), 144.3 (s), 142.3 (s), 135.5 (s), 135.3 (s), 134.9 (s), 130.2 (s), 128.9 (s), 126.0 (s), 124.9 (s), 115.0 (s), 55.7 (s), 34.4 (s), 31.5 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{31}H_{42}NO$ $[M+H]^+$: 444.3261, found: 444.3255.

4-((4-Aminophenyl)(3-methoxyphenyl)methyl)-2,6-di-*tert*-butylphenol (4e)



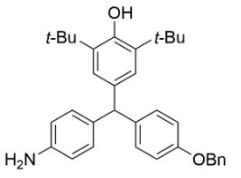
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4e** (71.9 mg, 0.17 mmol, 83%) as a yellow solid. mp: 108.1-108.5 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.15-7.19 (m, 1H), 6.88-6.91 (m, 4H), 6.67-6.72 (m, 3H), 6.58-6.60 (m, 2H), 5.29 (s, 1H), 5.05 (s, 1H), 3.73 (s, 3H), 3.47 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 159.4 (s), 152.0 (s), 147.1 (s), 144.3 (s), 135.3 (s), 135.0 (s), 134.5 (s), 130.2 (s), 128.9 (s), 126.0 (s), 122.0 (s), 115.3 (s), 115.1 (s), 111.1 (s), 56.1 (s), 55.1 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{36}NO_2$ $[M+H]^+$: 418.2741, found: 418.2734.

4-((4-Aminophenyl)(4-isopropoxyphenyl)methyl)-2,6-di-*tert*-butylphenol (4f)



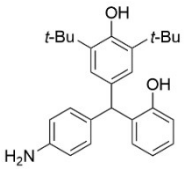
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4f** (73.1 mg, 0.16 mmol, 82%) as a yellow solid. mp: 120.6-120.8 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 6.98-7.00 (m, 2H), 6.88-6.90 (m, 4H), 6.76-6.79 (m, 2H), 6.59-6.61 (m, 2H), 5.26 (s, 1H), 5.04 (s, 1H), 6.45-6.54 (m, 1H), 3.55 (s, 2H), 1.35 (s, 18H), 1.31 (d, *J* = 6.1 Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 156.0 (s), 151.9 (s), 144.2 (s), 137.5 (s), 135.6 (s), 135.3 (s), 135.1 (s), 130.2 (s), 130.1 (s), 125.9 (s), 115.5 (s), 115.0 (s), 69.9 (s), 55.2 (s), 34.3 (s), 30.4 (s), 22.1 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{30}H_{40}NO_2$ $[M+H]^+$: 446.3054, found: 446.3050.

4-((4-Aminophenyl)(4-(benzyloxy)phenyl)methyl)-2,6-di-*tert*-butylphenol (4g)



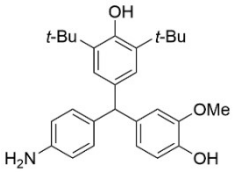
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4g** (82.1 mg, 0.17 mmol, 83%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.41-7.43 (m, 2H), 7.34-7.38 (m, 2H), 7.28-7.32 (m, 1H), 7.00-7.02 (m, 2H), 6.86-6.89 (m, 6H), 6.58-6.60 (m, 2H), 5.28 (s, 1H), 5.04 (s, 1H), 5.02 (s, 2H), 3.54 (s, 2H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 157.0 (s), 151.9 (s), 144.3 (s), 138.0 (s), 137.3 (s), 135.5 (s), 135.3 (s), 135.0 (s), 130.3 (s), 130.1 (s), 128.6 (s), 127.9 (s), 127.6 (s), 125.9 (s), 115.0 (s), 114.4 (s), 70.1 (s), 55.3 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{34}H_{40}NO_2$ $[M+H]^+$: 494.3054, found: 494.3049.

4-((4-Aminophenyl)(2-hydroxyphenyl)methyl)-2,6-di-*tert*-butylphenol (4h)



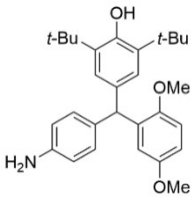
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 2:1) gave product **4h** (58.2 mg, 0.14 mmol, 72%) as a yellow oil. ^{1}H NMR (400 MHz, DMSO-d_6, 25 °C, TMS): δ = 9.21 (s, 1H), 6.95-6.99 (m, 1H), 6.81-6.82 (m, 2H), 6.74-6.77 (m, 2H), 6.67-6.72 (m, 4H), 6.44-6.46 (m, 2H), 5.52 (s, 1H), 4.83 (s, 2H), 1.29 (s, 18H); ^{13}C NMR (100 MHz, DMSO-d_6, 25 °C, TMS): δ = 154.9 (s), 152.0 (s), 146.8 (s), 138.9 (s), 135.9 (s), 132.2 (s), 132.1 (s), 130.1 (s), 129.9 (s), 127.0 (s), 125.6 (s), 118.9 (s), 115.4 (s), 114.1 (s), 48.4 (s), 34.9 (s), 30.9 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{34}NO_2$ $[M+H]^+$: 404.2585, found: 404.2578.

4-((4-Aminophenyl)(4-hydroxy-3-methoxyphenyl)methyl)-2,6-di-*tert*-butylphenol (4i)



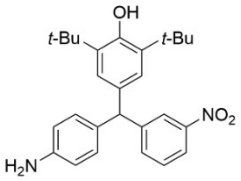
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 2:1) gave product **4i** (66.1 mg, 0.15 mmol, 76%) as a yellow solid. mp: 114.2-114.5 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 6.79-6.91 (m, 5H), 6.47-6.74 (m, 5H), 5.25 (s, 1H), 5.05 (s, 1H), 3.76 (s, 3H), 3.69 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 151.9 (s), 146.2 (s), 144.2 (s), 143.7 (s), 137.5 (s), 135.5 (s), 135.3 (s), 134.9 (s), 130.1 (s), 125. 9 (s), 122.1 (s), 115.1 (s), 113.9 (s), 112.1 (s), 55.9 (s), 55.7 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{36}NO_3$ $[M+H]^+$: 434.2690, found: 434.2685.

4-((4-Aminophenyl)(2,5-dimethoxyphenyl)methyl)-2,6-di-*tert*-butylphenol (4j)



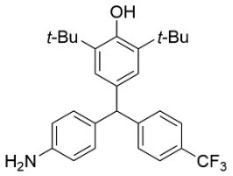
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4j** (79.3 mg, 0.17 mmol, 83%) as a yellow solid. mp: 126.8-127.2 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 6.86-6.89 (m, 4H), 6.76-6.78 (m, 1H), 6.67-6.70 (m, 1H), 6.56-6.58 (m, 2H), 6.49-6.50 (m, 1H), 5.67 (s, 1H), 5.03 (s, 1H), 3.66 (s, 3H), 3.63 (s, 3H), 3.53 (s, 3H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 153.3 (s), 151.9 (s), 151.6 (s), 144.1 (s), 135.7 (s), 135.2 (s), 134.7 (s), 134.4 (s), 130.1 (s), 126.1 (s), 117.0 (s), 115.0 (s), 112.0 (s), 110.9 (s), 56.6 (s), 55.6 (s), 48.8 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{38}NO_3$ $[M+H]^+$: 478.2847, found: 478.2840.

4-((4-Aminophenyl)(3-nitrophenyl)methyl)-2,6-di-*tert*-butylphenol (4k)



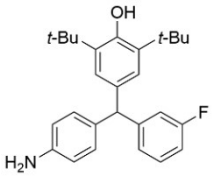
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4k** (50.2 mg, 0.12 mmol, 58%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 8.01-8.06 (m, 2H), 7.40-7.47 (m, 2H), 6.86-6.88 (m, 4H), 6.62-6.64 (m, 2H), 5.42 (s, 1H), 5.12 (s, 1H), 3.64 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.4 (s), 147.8 (s), 144.9 (s), 144.6 (s), 135.8 (s), 135.5 (s), 133.4 (s), 133.2 (s), 130.1 (s), 128.9 (s), 125.8 (s), 124.2 (s), 121.2 (s), 115.2 (s), 55.7 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}N_2O_3$ $[M+H]^+$: 433.2486, found: 433.2482.

4-((4-Aminophenyl)(4-(trifluoromethyl)phenyl)methyl)-2,6-di-*tert*-butylphenol (4l)



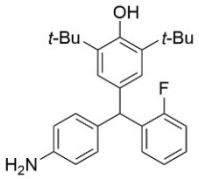
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4l** (55.6 mg, 0.12 mmol, 61%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.49-7.51 (m, 2H), 7.21-7.23 (m, 2H), 6.85-6.87 (m, 4H), 6.61-6.63 (m, 2H), 5.37 (s, 1H), 5.09 (s, 1H), 3.61 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.2 (s), 149.7 (s), 144.7 (s), 135.6 (s), 134.0 (s), 133.8 (s), 130.2 (s), 129.6 (s), 127.1 (d, *J*(C,F) = 239.4 Hz), 125.9 (s), 125.0 (d, *J*(C,F) = 11.1 Hz), 124.9 (d, *J*(C,F) = 3.8 Hz), 115.1 (s), 55.9 (s), 34.4 (s), 30.3 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 °C, TMS): δ = -62.2 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{33}F_3NO$ $[M+H]^+$: 456.2509, found: 456.2503.

4-((4-Aminophenyl)(3-fluorophenyl)methyl)-2,6-di-*tert*-butylphenol (4m)



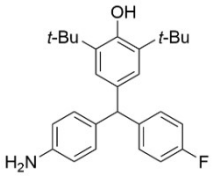
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4m** (57.7 mg, 0.14 mmol, 71%) as a yelllow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.18-7.23 (m, 2H), 6.78-6.91 (m, 7H), 6.60-6.62 (m, 2H), 5.32 (s, 1H), 5.07 (s, 1H), 3.58 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 162.8 (d, *J*(C,F) = 243.4 Hz), 152.1 (s), 148.3 (d, *J*(C,F) = 6.5 Hz), 135.5 (s), 134.1 (s), 130.1 (s), 129.3 (d, *J*(C,F) = 8.3 Hz), 125.9 (s), 125.0 (d, *J*(C,F) = 2.7 Hz), 116.3 (s), 116.1 (s), 115.1 (s), 112.8 (s), 112.6 (s), 55.8 (s), 34.4 (s), 30.3 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 °C, TMS): δ = -113.9 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}FNO$ $[M+H]^+$: 406.2541, found: 406.2537.

4-((4-Aminophenyl)(2-fluorophenyl)methyl)-2,6-di-*tert*-butylphenol (4n)



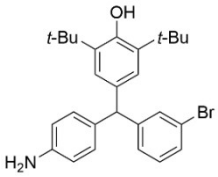
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4n** (60.1 mg, 0.15 mmol, 74%) as a yellow solid. mp: 132.2-132.4 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.14-7.19 (m, 1H), 6.93-7.04 (m, 3H), 6.87-6.89 (m, 4H), 6.59-6.62 (m, 2H), 5.63 (s, 1H), 5.06 (s, 1H), 3.57 (s, 2H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 160.7 (d, *J*(C,F) = 244.5 Hz), 144.5 (s), 135.4 (s), 133.7 (s), 133.3 (s), 132.5 (d, *J*(C,F) = 14.3 Hz), 130.8 (d, *J*(C,F) = 4.2 Hz), 130.0 (s), 127.6 (d, *J*(C,F) = 8.1 Hz), 125.9 (s), 123.6 (d, *J*(C,F) = 3.5 Hz), 115.3 (s), 115.1 (s), 115.0 (s), 48.3 (s), 34.3 (s), 30.3 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 °C, TMS): δ = -116.8 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}FNO$ $[M+H]^+$: 406.2541, found: 406.2535.

4-((4-Aminophenyl)(4-fluorophenyl)methyl)-2,6-di-*tert*-butylphenol (4o)



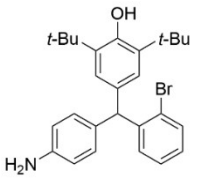
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4o** (58.8 mg, 0.14 mmol, 72%) as a white solid. mp: 126.6-126.9 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.03-7.07 (m, 2H), 6.90-6.96 (m, 2H), 6.85-6.87 (m, 4H), 6.59-6.62 (m, 2H), 5.31 (s, 1H), 5.06 (s, 1H), 3.58 (s, 2H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 161.2 (d, *J*(C,F) = 242.4 Hz), 144.4 (s), 141.2 (s), 135.4 (s), 134.9 (s), 134.6 (s), 130.7 (d, *J*(C,F) = 7.8 Hz), 130.1 (s), 125.9 (s), 115.1 (s), 114.9 (s), 114.7 (s), 55.3 (s), 34.4 (s), 30.4 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 °C, TMS): δ = -117.8 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}FNO$ $[M+H]^+$: 406.2541, found: 406.2533.

4-((4-Aminophenyl)(3-bromophenyl)methyl)-2,6-di-*tert*-butylphenol (4p)



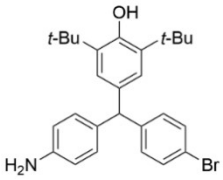
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4p** (75.5 mg, 0.16 mmol, 81%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.28-7.31 (m, 2H), 7.10-7.14 (m, 1H), 7.02-7.03 (m, 1H), 6.85-6.87 (m, 4H), 6.60-6.62 (m, 2H), 5.28 (s, 1H), 5.08 (s, 1H), 3.60 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.2 (s), 147.9 (s), 144.6 (s), 135.5 (s), 134.2 (s), 133.9 (s), 132.4 (s), 130.1 (s), 129.6 (s), 129.0 (s), 128.0 (s), 125.9 (s), 122.3 (s), 115.1 (s), 55.7 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}BrNO$ $[M+H]^+$: 466.1741, found: 466.1735.

4-((4-Aminophenyl)(2-bromophenyl)methyl)-2,6-di-*tert*-butylphenol (4q)



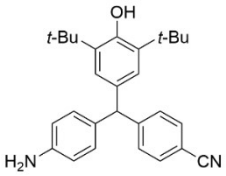
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4q** (74.6 mg, 0.16 mmol, 80%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.52-7.55 (m, 1H), 7.14-7.21 (m, 1H), 7.02-7.06 (m, 1H), 6.96-6.98 (m, 1H), 6.84-6.86 (m, 3H), 6.68-6.78 (m, 1H), 6.60-6.62 (m, 2H), 5.72 (s, 1H), 5.02 (s, 1H), 3.59 (s, 2H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.1 (s), 135.4 (s), 133. 5 (s), 131.2 (s), 130.4 (s), 127.5 (s), 127.0 (s), 126.2 (s), 125.5 (s), 125.3 (s), 115.06 (s), 55.0 (s), 34.3 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}BrNO$ $[M+H]^+$: 466.1741, found: 466.1737.

4-((4-Aminophenyl)(4-bromophenyl)methyl)-2,6-di-*tert*-butylphenol (4r)



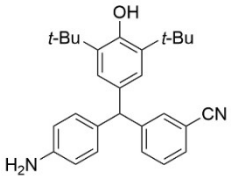
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4r** (77.4 mg, 0.17 mmol, 83%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.35-7.38 (m, 2H), 6.96-6.98 (m, 2H), 6.86-6.88 (m, 4H), 6.65-6.67 (m, 2H), 5.27 (s, 1H), 5.08 (s, 1H), 3.66 (s, 2H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.1 (s), 144.5 (s), 135.5 (s), 134.0 (s), 131.2 (s), 131.1 (s), 130.16 (s), 125.9 (s), 119.7 (s), 115.8 (s), 55.5 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}BrNO$ $[M+H]^+$: 466.1741, found: 466.1733.

4-((4-Aminophenyl)(3,5-di-*tert*-butyl-4-hydroxyphenyl)methyl)benzonitrile (4s)



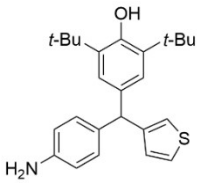
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4s** (55.3 mg, 0.13 mmol, 67%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.45-7.49 (m, 1H), 7.33-7.39 (m, 3H), 6.83-6.85 (m, 4H), 6.62-6.64 (m, 2H), 5.35 (s, 1H), 5.12 (s, 1H), 3.66 (s, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.4 (s), 147.2 (s), 144.8 (s), 135.7 (s), 133.9 (s), 133.3 (s), 132.8 (s), 130.1 (s), 129.8 (s), 128.8 (s), 125.8 (s), 115.2 (s), 112.0 (s), 55.6 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{33}N_2O$ $[M+H]^+$: 413.2588, found: 413.2583.

3-((4-Aminophenyl)(3,5-di-*tert*-butyl-4-hydroxyphenyl)methyl)benzonitrile (4t)



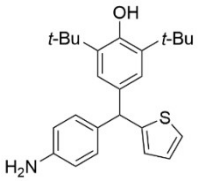
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4t** (57.1 mg, 0.14 mmol, 69%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.53-7.56 (m, 2H), 7.20-7.22 (m, 2H), 6.83-6.85 (m, 4H), 6.61-6.63 (m, 2H), 5.36 (s, 1H), 5.11 (s, 1H), 3.65 (s, 2H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.3 (s), 151.3 (s), 144.8 (s), 135.7 (s), 133.4 (s), 133.3 (s), 132.0 (s), 131.9 (s), 130.2 (s), 130.1 (s), 125.8 (s), 125.7 (s), 119.2 (s), 115.2 (s), 109.7 (s), 56.1 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{33}N_2O$ $[M+H]^+$: 413.2588, found: 413.2581.

4-((4-Aminophenyl)(thiophen-3-yl)methyl)-2,6-di-*tert*-butylphenol (4u)



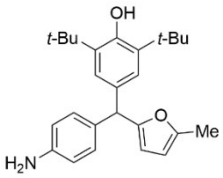
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4u** (60.2 mg, 0.15 mmol, 76%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.21-7.23 (m, 1H), 6.92-6.94 (m, 4H), 6.85-6.86 (m, 1H), 6.70-6.71 (m, 1H), 6.60-6.62 (m, 2H), 5.28 (s, 1H), 5.05 (s, 1H), 3.57 (s, 2H), 1.37 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.1 (s), 146.6 (s), 144.4 (s), 135.4 (s), 135.0 (s), 134.8 (s), 129.7 (s), 129.0 (s), 125.5 (s), 125.0 (s), 122.1 (s), 115.1 (s), 51.8 (s), 34.3 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{25}H_{32}NOS$ $[M+H]^+$: 394.2200, found: 394.2196.

4-((4-Aminophenyl)(thiophen-2-yl)methyl)-2,6-di-*tert*-butylphenol (4v)



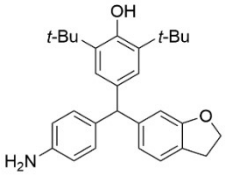
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4v** (56.7 mg, 0.14 mmol, 72%) as a yellow solid. mp: 104.5-104.8 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.15-7.16 (m, 1H), 6.98-7.01 (m, 4H), 6.89-6.91 (m, 1H), 6.66-6.67 (m, 1H), 6.60-6.62 (m, 2H), 5.45 (s, 1H), 5.08 (s, 1H), 3.58 (s, 2H), 1.37 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.3 (s), 150.1 (s), 144.7 (s), 135.4 (s), 135.1 (s), 134.7 (s), 129.6 (s), 126.4 (s), 125.8 (s), 125.4 (s), 124.1 (s), 115.1 (s), 51.5 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{25}H_{32}NOS$ $[M+H]^+$: 394.2200, found: 394.2193.

4-((4-Aminophenyl)(5-methylfuran-2-yl)methyl)-2,6-di-*tert*-butylphenol (4w)



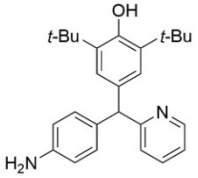
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **4w** (54.1 mg, 0.14 mmol, 69%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 6.94-6.97 (m, 4H), 6.59-6.61 (m, 2H), 5.84-5.85 (m, 1H), 5.70-5.71 (m, 1H), 5.17 (s, 1H), 3.42 (s, 2H), 2.23 (s, 3H),1.37 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 156.4 (s), 152.3 (s), 151.0 (s), 144.6 (s), 135.4 (s), 133.1 (s), 133.0 (s), 129.6 (s), 125.3 (s), 115.2 (s), 108.5 (s), 105.8 (s), 50.1 (s), 34.4 (s), 30.4 (s), 13.7 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{26}H_{34}NO_2$ $[M+H]^+$: 392.2585, found: 392.2579.

4-((4-Aminophenyl)(2,3-dihydrobenzofuran-6-yl)methyl)-2,6-di-*tert*-butylphenol (4x)



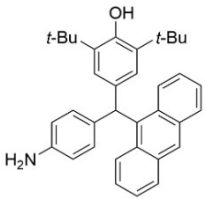
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4x** (62.8 mg, 0.15 mmol, 73%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 6.87-6.94 (m, 5H), 6.81-6.83 (m, 1H), 6.65-6.67 (m, 1H), 6.58-6.60 (m, 2H), 5.26 (s, 1H), 5.04 (s, 1H), 4.52 (t, *J* = 8.7, 2H), 3.54 (s, 2H), 3.12 (t, *J* = 8.6, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 158.2 (s), 151.9 (s), 144.2 (s), 137.7 (s), 135.7 (s), 135.3 (s), 135.2 (s), 130.1 (s), 128.8 (s), 126.7 (s), 125.9 (s), 125.8 (s), 115.0 (s), 108.6 (s), 71.2 (s), 55.5 (s), 34.4 (s), 30.4 (s), 29.9 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{36}NO_2$ $[M+H]^+$: 430.2741, found: 430.2735.

4-((4-Aminophenyl)(pyridin-2-yl)methyl)-2,6-di-*tert*-butylphenol (4y)



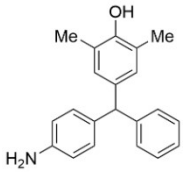
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4y** (58.3 mg, 0.15 mmol, 75%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 8.57-8.58 (m, 1H), 7.55-7.60 (m, 1H), 7.05-7.11 (m, 2H), 6.93-6.95 (m, 4H), 6.61-6.63 (m, 2H), 5.49 (s, 1H), 5.06 (s, 1H), 3.59 (s, 2H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 164.8 (s), 152.2 (s), 149.3 (s), 144.6 (s), 136.2 (s), 135.4 (s), 133.7 (s), 133.5 (s), 130.1 (s), 126.0 (s), 123.5 (s), 121.0 (s), 115.2 (s), 58.6 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{26}H_{33}N_2O$ $[M+H]^+$: 389.2588, found: 389.2581.

4-((4-Aminophenyl)(anthracen-9-yl)methyl)-2,6-di-*tert*-butylphenol (4aa)



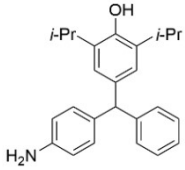
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4aa** (54.7 mg, 0.11 mmol, 56%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.73-7.74 (m, 1H), 7.34-7.42 (m, 3H), 7.15-7.30 (m, 5H), 6.97-7.01 (m, 3H), 6.92 (s, 1H), 6.48-6.50 (m, 2H), 5.19 (s, 1H), 5.11 (s, 1H), 3.49 (s, 2H), 1.32 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.1 (s), 144.5 (s), 141.2 (s), 139.3 (s), 139.1 (s), 135.4 (s), 134.7 (s), 134.2 (s), 128.9 (s), 128.5 (s), 128.4 (s), 127.9 (s), 127.3 (s), 126.6 (s), 126.4 (s), 125.2 (s), 123.7 (s), 115.2 (s), 51.6 (s), 34.3 (s), 30.2 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{36}NO_3$ $[M+H]^+$: 488.2948, found: 488.2943.

4-((4-Aminophenyl)(phenyl)methyl)-2,6-dimethylphenol (4ab)



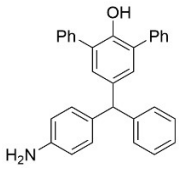
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4ab** (51.7 mg, 0.17 mmol, 85%) as a red oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.22-7.26 (m, 2H), 7.16-7.18 (m, 1H), 7.08-7.10 (m, 2H), 6.86-6.88 (m, 2H), 6.69 (s, 2H), 6.56-6.58 (m, 2H), 5.30 (s, 1H), 3.99 (s, 3H), 2.13 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 150.6 (s), 145.1 (s), 144.4 (s), 136.1 (s), 134.9 (s), 130.3 (s), 129.5 (s), 129.4(s), 128.3 (s), 126.1 (s), 122.9 (s), 115.3 (s), 55.4 (s), 16.2 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{21}H_{22}NO$ $[M+H]^+$: 304.1696, found: 304.1692.

4-((4-Aminophenyl)(phenyl)methyl)-2,6-diisopropylphenol (4ac)



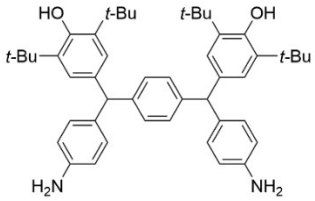
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 2:1) gave product **4ac** (59.8 mg, 0.17 mmol, 83%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.22-7.26 (m, 2H), 7.14-7.18 (m, 1H), 7.09-7.11 (m, 2H), 6.87-6.89 (m, 2H), 6.78 (s, 2H), 6.57-6.61 (m, 2H), 5.36 (s, 1H), 3.92 (s, 3H), 3.03-3.14 (m, 2H), 1.16 (d, *J* = 6.9, 12H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 148.3 (s), 145.3 (s), 144.3 (s), 136.1 (s), 135.1 (s), 133.3 (s), 130.2 (s), 129.4 (s), 128.1 (s), 125.9 (s), 124.6 (s), 115.2 (s), 55.9 (s), 22.8 (s), 22.7 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{25}H_{30}NO$ $[M+H]^+$: 360.2322, found: 360.2316.

5'-((4-Aminophenyl)(phenyl)methyl)-[1,1':3',1''-terphenyl]-2'-ol (4ad)



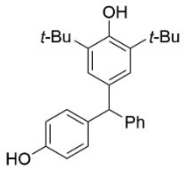
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **4ad** (52.2 mg, 0.12 mmol, 61%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.49-7.50 (m, 4H), 7.35-7.42 (m, 5H), 7.28-7.34 (m, 3H), 7.15-7.20 (m, 3H), 7.04 (s, 2H), 6.92-6.97 (m, 2H), 6.57-6.59 (m, 2H), 5.43 (s, 1H), 5.36 (s, 1H), 3.53 (s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 147.7 (s), 144.7 (s), 144.6 (s), 137.8 (s), 136.8 (s), 134.3 (s), 130.9 (s), 130.2 (s), 129.4 (s), 129.3 (s), 128.8 (s), 128.5 (s), 128.3 (s), 127.6 (s), 126.2 (s), 115.2 (s), 55.5 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{31}H_{26}NO$ $[M+H]^+$: 428.2009, found: 428.2001.

4,4'-(1,4-Phenylenebis((4-Aminophenyl)methylene))bis(2,6-di-*tert*-butylphenol) (4ae)



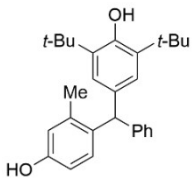
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 2:1) gave product **4ae** (91.9 mg, 0.13 mmol, 66%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 6.99 (s, 4H), 6.86-6.88 (m, 8H), 6.57-6.59 (m, 4H), 5.29 (s, 2H), 5.03 (s, 2H), 3.56 (s, 4H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 151.9 (s), 144.2 (s), 142.8 (s), 142.7 (s), 135.4 (s), 135.2 (s), 135.1 (s), 135.0 (s), 130.2 (s), 129.0 (s), 126.0 (s), 115.0 (s), 55.7 (s), 34.3 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{48}H_{61}N_2O_2$ $[M+H]^+$: 697.4728, found: 697.4722.

2,6-Di-*tert*-butyl-4-((4-hydroxyphenyl)(phenyl)methyl)phenol (6a)



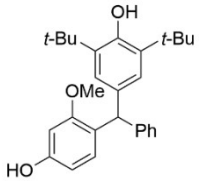
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **6a** (69.2 mg, 0.18 mmol, 89%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.23-7.27 (m, 2H), 7.15-7.19 (m, 1H), 7.09-7.11 (m, 2H), 6.95-6.98 (m, 2H), 6.89 (s, 2H), 6.70-6.74 (m, 2H), 5.38 (s, 1H), 5.07 (s, 1H), 5.00 (s, 1H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.7 (s), 152.1 (s), 145.1 (s), 137.2 (s), 135.5 (s), 134.5 (s), 130.6 (s), 129.4 (s), 128.3 (s), 128.2 (s), 126.0 (s), 115.0 (s), 56.0 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}O_2$ $[M+H]^+$: 389.2476, found: 389.2471.

2,6-Di-*tert*-butyl-4-((4-hydroxy-2-methylphenyl)(phenyl)methyl)phenol (6b)



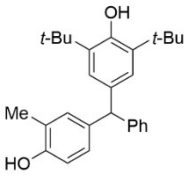
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **6b** (72.5 mg, 0.18 mmol, 90%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.23-7.27 (m, 2H), 7.15-7.19 (m, 1H), 7.03-7.05 (m, 2H), 6.81 (s, 2H), 6.63-6.67 (m, 2H), 6.54-6.57 (m, 1H), 5.47 (s, 1H), 5.05 (s, 1H), 4.54 (s, 1H), 2.16 (s, 3H), 1.34 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.5 (s), 152.0 (s), 144.5 (s), 138.2 (s), 135.8 (s), 135.4 (s), 134.0 (s), 130.5 (s), 129.4 (s), 128.1 (s), 126.2 (s), 125.9 (s), 117.1 (s), 112.2 (s), 52.8 (s), 34.3 (s), 30.4 (s), 20.1 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{35}O_2$ $[M+H]^+$: 403.2632, found: 403.2625.

2,6-Di-*tert*-butyl-4-((4-hydroxy-2-methoxyphenyl)(phenyl)methyl)phenol (6c)



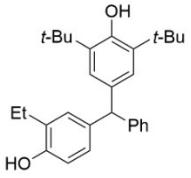
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6c** (74.6 mg, 0.18 mmol, 89%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.21-7.32 (m, 4H), 7.13-7.15 (m, 2H), 6.92 (s, 2H), 6.66-6.68 (m, 1H), 6.40-6.42 (m, 2H), 5.47 (s, 1H), 5.13 (s, 1H), 4.78 (s, 1H), 3.76 (s, 3H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 159.5 (s), 154.6 (s), 152.5 (s), 143.2 (s), 135.9 (s), 132.5 (s), 130.9 (s), 129.2 (s), 128.5 (s), 126.5 (s), 125.9 (s), 123.3 (s), 106.0 (s), 102.3 (s), 55.3 (s), 50.9 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{35}O_3$ $[M+H]^+$: 419.2581, found: 419.2574.

2,6-Di-*tert*-butyl-4-((4-hydroxy-3-methylphenyl)(phenyl)methyl)phenol (6d)



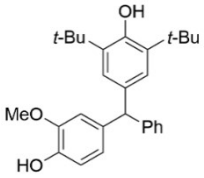
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **6d** (70.2 mg, 0.17 mmol, 87%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.23-7.27 (m, 2H), 7.15-7.18 (m, 1H), 7.07-7.11 (m, 2H), 6.90 (s, 3H), 6.76-6.78 (m, 1H), 6.64-6.66 (m, 1H), 5.34 (s, 1H), 5.06 (s, 1H), 4.76 (s, 1H), 2.17 (s, 1H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.71 (s), 152.0 (s), 145.3 (s), 137.1 (s), 135.4 (s), 134.5 (s), 132.1 (s), 129.3 (s), 128.1 (s), 127.9 (s), 126.0 (s), 125.9 (s), 123.3 (s), 114.6 (s), 56.0 (s), 34.4 (s), 30.4 (s), 15.9 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{35}O_2$ $[M+H]^+$: 403.2632, found: 403.2627.

2,6-Di-*tert*-butyl-4-((3-ethyl-4-hydroxyphenyl)(phenyl)methyl)phenol (6e)



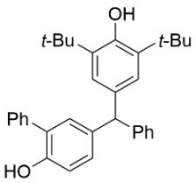
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **6e** (71.2 mg, 0.17 mmol, 86%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.22-7.27 (m, 2H), 7.14-7.18 (m, 1H), 7.09-7.11 (m, 2H), 6.90 (s, 2H), 6.76-6.79 (m, 1H), 6.23-6.25 (m, 1H), 5.35 (s, 1H), 5.06 (s, 1H), 4.86 (s, 1H), 2.51-2.59 (m, 2H), 1.36 (s, 18H), 1.16 (t, *J* = 7.5, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.0 (s), 151.6 (s), 145.4 (s), 137.1 (s), 135.4 (s), 134.6 (s), 130.4 (s), 129.6 (s), 129.4 (s), 128.1 (s), 127.8 (s), 126. 0 (s), 125.9 (s), 114.8 (s), 56.2 (s), 34.4 (s), 30.4 (s), 23.1 (s), 14.2 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{37}O_2$ $[M+H]^+$: 417.2789, found: 417.2783.

2,6-Di-*tert*-butyl-4-((4-hydroxy-3-methoxyphenyl)(phenyl)methyl)phenol (6f)



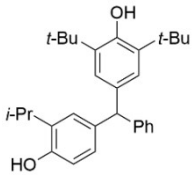
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6f** (73.7 mg, 0.18 mmol, 88%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.24-7.28 (m, 2H), 7.16-7.20 (m, 1H), 7.10-7.11 (m, 2H), 6.91 (s, 2H), 6.81-6.83 (m, 1H), 6.64-6.65 (m, 1H), 6.56-6.59 (m, 1H), 5.50 (s, 1H), 5.36 (s, 1H), 5.08 (s, 1H), 3.77 (s, 3H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.1 (s), 146.2 (s), 145.2 (s), 143.8 (s), 136.9 (s), 135.4 (s), 134.3 (s), 129.3 (s), 128.1 (s) 126.0 (s), 125.9 (s), 122.2 (s), 113.9 (s), 112.1 (s), 56.4 (s), 55.9 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{35}O_3$ $[M+H]^+$: 419.2581, found: 419.2575.

5-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)-[1,1'-biphenyl]-2-ol (6g)



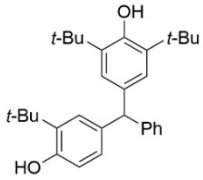
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6g** (76.3 mg, 0.16 mmol, 82%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.40-7.49 (m, 4H), 7.34-7.37 (m, 1H), 7.25-7.28 (m, 2H), 7.13-7.19 (m, 3H), 6.97-7.03 (m, 2H), 6.93 (m, 2H), 6.87-6.89 (m, 1H), 5.40 (s, 1H), 5.09 (s, 1H), 5.06 (s, 1H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.1 (s), 150.6 (s), 145.1 (s), 137.3 (s), 135.5 (s), 134.3 (s), 131.1 (s), 130.1 (s), 129.3 (s), 129.2 (s), 129.1 (s), 128.4 (s), 128.2 (s), 127.8 (s), 127.7 (s), 126.0 (s), 125.9 (s), 115.5 (s), 56.1 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{33}H_{37}O_2$ $[M+H]^+$: 465.2789, found: 465.2782.

2,6-Di-*tert*-butyl-4-((4-hydroxy-3-isopropylphenyl)(phenyl)methyl)phenol (6h)



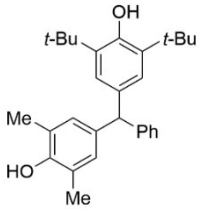
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **6h** (75.9 mg, 0.18 mmol, 88%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.24-7.27 (m, 2H), 7.15-7.19 (m, 1H), 7.09-7.11 (m, 2H), 6.95-6.96 (m, 1H), 6.90 (s, 2H), 6.75-6.78 (m, 1H), 6.62-6.64 (m, 1H), 5.36 (s, 1H), 5.06 (s, 1H), 4.71 (s, 1H), 3.10-3.21 (m, 1H), 1.35 (s, 18H), 1.17 (d, *J* = 6.9, 6H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.0 (s), 150.9 (s), 145.5 (s), 137.1 (s), 135.3 (s), 134.6 (s), 133.9 (s), 129.3 (s), 128.1 (s), 127.6 (s), 127.5 (s), 126.0 (s), 125.9 (s), 114.9 (s), 56.2 (s), 34.4 (s), 30.4 (s), 27.1 (s), 22.6 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{30}H_{39}O_2$ $[M+H]^+$: 431.2945, found: 431.2940.

2,6-Di-*tert*-butyl-4-((3-(*tert*-butyl)-4-hydroxyphenyl)(phenyl)methyl)phenol (6i)



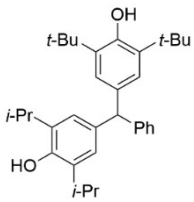
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6i** (77.4 mg, 0.17 mmol, 87%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.23-7.27 (m, 2H), 7.15-7.18 (m, 1H), 7.10-7.11 (m, 2H), 7.02-7.03 (m, 1H), 6.91 (s, 2H), 6.76-6.79 (m, 1H), 6.54-6.56 (m, 1H), 5.34 (s, 1H), 5.06 (s, 1H), 4.74 (s, 1H), 1.36 (s, 18H), 1.33 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.4 (s), 152.0 (s), 145.6 (s), 136.5 (s), 135.5 (s), 135.3 (s), 134.6 (s), 129.3 (s), 128.3 (s), 128.1 (s), 127.7 (s), 126.0 (s), 125.8 (s), 116.2 (s), 56.3 (s), 34.6 (s), 34.4 (s), 30.4 (s), 29.6 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{31}H_{41}O_2$ $[M+H]^+$: 445.3102, found: 445.3097.

2,6-Di-*tert*-butyl-4-((4-hydroxy-3,5-dimethylphenyl)(phenyl)methyl)phenol (6j)



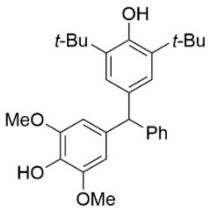
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6j** (68.4 mg, 0.16 mmol, 82%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.23-7.29 (m, 2H), 7.14-7.18 (m, 1H), 7.09-7.11 (m, 2H), 6.89-6.91 (m, 2H), 6.73 (s, 2H), 5.30 (s, 1H), 5.05 (s, 1H), 4.48 (s, 1H), 2.17 (s, 6H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.0 (s), 150.4 (s), 145.4 (s), 136.4 (s), 135.4 (s), 134.6 (s), 129.5 (s), 129.3 (s), 128.1 (s), 126.0 (s), 125.8 (s), 122.6 (s), 56.2 (s), 34.4 (s), 30.4 (s), 16.0 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{37}O_2$ $[M+H]^+$: 417.2789, found: 417.2784.

2,6-Di-*tert*-butyl-4-((4-hydroxy-3,5-diisopropylphenyl)(phenyl)methyl)phenol (6k)



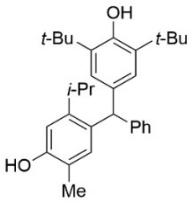
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6k** (74.7 mg, 0.16 mmol, 79%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.23-7.26 (m, 2H), 7.10-7.17 (m, 3H), 6.92 (s, 2H), 6.80 (s, 2H), 5.34 (s, 1H), 5.05 (s, 1H), 4.65 (s, 1H), 3.05-3.16 (m, 2H), 1.36 (s, 18H), 1.17 (d, *J* = 6.9 Hz, 12H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 151.9 (s), 148.1 (s), 136.4 (s), 135.3 (s), 134.8 (s), 133.1 (s), 129.3 (s), 128.0 (s), 126.0 (s), 125.8 (s), 124.6 (s), 56.6 (s), 34.4 (s), 30.4 (s), 27.3 (s), 22.8 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{33}H_{45}O_2$ $[M+H]^+$: 473.3415, found: 473.3410.

2,6-Di-*tert*-butyl-4-((4-hydroxy-3,5-dimethoxyphenyl)(phenyl)methyl)phenol (6l)



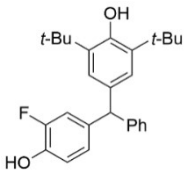
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6l** (46.7 mg, 0.41 mmol, 52%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.25-7.29 (m, 2H), 7.17-7.20 (m, 1H), 7.09-7.11 (m, 2H), 6.92 (s, 2H), 6.34 (s, 2H), 5.39 (s, 1H), 5.35 (s, 1H), 5.08 (s, 1H), 3.76 (s, 6H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.1 (s), 146.8 (s), 145.1 (s), 135.9 (s), 135.5 (s), 134.1 (s), 132.9 (s), 129.3 (s), 128.1 (s), 126.0 (s), 125.9 (s), 106.4 (s), 56.8 (s), 56.2 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{37}O_4$ $[M+H]^+$: 449.2687, found: 449.2681.

4-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)-5-isopropyl-2-methylphenol (6m)



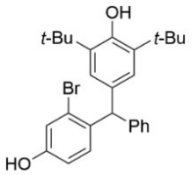
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6m** (73.9 mg, 0.17 mmol, 83%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.22-7.26 (m, 2H), 7.14-7.18 (m, 1H), 7.06-7.07 (m, 2H), 6.82 (s, 2H), 6.79 (s, 1H), 6.55 (s, 1H), 5.62 (s, 1H), 5.03 (s, 1H), 4.58 (s, 1H), 3.09-3.19 (m, 1H), 2.10 (s, 3H), 1.34 (s, 18H), 1.03 (dd, *J* = 8.7, 6.8 Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.2 (s), 151.9 (s), 146.3 (s), 145.3 (s), 135.3 (s), 134.7 (s), 133.8 (s), 132.3 (s), 129.6 (s), 128.0 (s), 126.2 (s), 125.8 (s), 120.1 (s), 112.1 (s), 51.8 (s), 34.3 (s), 30.4 (s), 28.4 (s), 24.0 (s), 15.5 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{31}H_{41}O_2$ $[M+H]^+$: 445.3102, found: 445.3098.

2,6-Di-*tert*-butyl-4-((3-fluoro-4-hydroxyphenyl)(phenyl)methyl)phenol (6n)



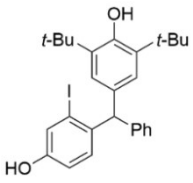
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6n** (70.0 mg, 0.17 mmol, 86%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.26-7.29 (m, 2H), 7.18-7.21 (m, 1H), 7.08-7.10 (m, 2H), 6.87-6.92 (m, 3H), 6.76-6.83 (m, 2H), 5.36 (s, 1H), 5.18 (s, 1H), 5.09 (s, 1H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.2 (s), 150.8 (d, *J*(C,F) = 235.6 Hz), 144.4 (s), 141.6 (d, *J*(C,F) = 8.1 Hz), 138.1 (d, *J*(C,F) = 5.1 Hz), 135.6 (s), 133.8 (s), 129.3 (s), 128.2 (s), 126.2 (s), 125.9 (s), 125.6 (d, *J*(C,F) = 3.3 Hz), 116.7 (d, *J*(C,F) = 2.0 Hz), 116.4 (d, *J*(C,F) = 18.5 Hz), 55.9 (s), 34.4 (s), 30.3 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = -141.0 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{32}FO_2$ $[M+H]^+$: 407.2381, found: 407.2373.

4-((2-Bromo-4-hydroxyphenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (6o)



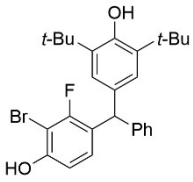
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6o** (82.2 mg, 0.18 mmol, 88%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.25-7.28 (m, 2H), 7.17-7.21 (m, 1H), 7.05-7.10 (m, 3H), 6.80-6.83 (m, 3H), 6.68-6.71 (m, 1H), 5.75 (s, 1H), 5.08 (s, 1H), 4.87 (s, 1H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 154.3 (s), 152.14 (s), 136.5 (s), 135.5 (s), 133.3 (s), 131.8 (s), 130.8 (s), 129.5 (s), 128.1 (s), 126.2 (s), 126.1 (s), 125.5 (s), 124.0 (s), 119.7 (s), 118.8 (s), 114.4 (s), 114.2 (s), 55.0 (s), 34.3 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{32}BrO_2$ $[M+H]^+$: 467.1581, found: 467.1576.

2,6-Di-*tert*-butyl-4-((4-hydroxy-2-iodophenyl)(phenyl)methyl)phenol (6p)



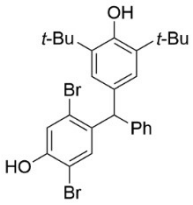
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6p** (89.6 mg, 0.17 mmol, 87%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.36-7.37 (m, 1H), 7.18-7.28 (m, 3H), 7.05-7.07 (m, 2H), 6.73-6.83 (m, 4H), 5.63 (s, 1H), 5.08 (s, 1H), 4.73 (s, 1H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 154.1 (s), 152.1 (s), 143.6 (s), 139.7 (s), 135.5 (s), 133.5 (s), 130.9 (s), 129.6 (s), 128.1 (s), 126.3 (s), 126.1 (s), 115.2 (s), 114.9 (s), 102.2 (s), 59.6 (s), 34.3 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{32}IO_2$ $[M+H]^+$: 515.1442, found: 515.1437.

3-Bromo-4-((3,5-di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)-2-fluorophenol (6q)



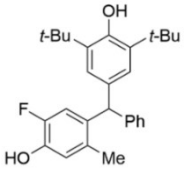
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6q** (72.8 mg, 0.15 mmol, 75%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.24-7.29 (m, 2H), 7.16-7.22 (m, 1H), 7.07-7.09 (m, 2H), 6.87 (s, 2H), 6.79-6.83 (m, 1H), 6.71-6.76 (m, 1H), 5.66 (s, 1H), 5.53 (s, 1H), 5.11 (s, 1H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 156.8 (d, *J*(C,F) = 246.0 Hz), 152.3 (s), 152.0 (s), 143.1 (s), 135.6 (s), 132.4 (s), 130.0 (d, *J*(C,F) = 5.5 Hz), 129.1 (s), 128.3 (s), 126.4 (s), 125.9 (s), 125.1 (d, *J*(C,F) = 15.6 Hz), 110.7 (d, *J*(C,F) = 3.4 Hz), 98.3 (d, *J*(C,F) = 24.1 Hz), 49.0 (s), 34.4 (s), 30.3 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = -108.1 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{31}BrFO_2$ $[M+H]^+$: 485.1486, found: 485.1480.

2,5-Dibromo-4-((3,5-di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)phenol (6r)



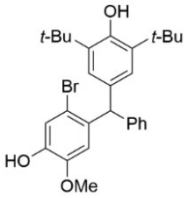
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6r** (86.4 mg, 0.16 mmol, 79%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.17-7.31 (m, 4H), 7.03-7.07 (m, 3H), 6.82 (s, 2H), 5.71 (s, 1H), 5.44 (s, 1H), 5.12 (s, 1H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.4 (s), 151.1 (s), 142.9 (s), 138.0 (s), 135.6 (s), 133.5 (s), 132.6 (s), 129.4 (s), 128.3 (s), 126.4 (s), 126.1 (s), 125.0 (s), 120.2 (s), 109.1 (s), 55.1 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{31}Br_2O_2$ $[M+H]^+$: 547.0665, found: 547.0661.

4-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)-2-fluoro-5-methylphenol (6s)



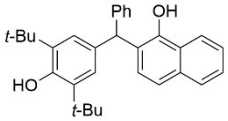
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6s** (69.2 mg, 0.16 mmol, 82%) as a yellow solid. mp: 137.8-138.2 ^{o}C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.23-7.27 (m, 2H), 7.16-7.20 (m, 1H), 7.03-7.04 (m, 2H), 6.77-6.80 (m, 3H), 6.51-6.54 (m, 1H), 5.44 (s, 1H), 5.08 (s, 1H), 5.01 (s, 1H), 2.11 (s, 3H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.2 (s), 149.1 (d, *J*(C,F) = 232.5 Hz), 143.8 (s), 141.1 (d, *J*(C,F) = 14.4 Hz), 136.3 (d, *J*(C,F) = 4.8 Hz), 135.6 (s), 133.5 (s), 133.1 (d, *J*(C,F) = 3.5 Hz), 129.4 (s), 128.2 (s), 126.2 (s), 126.1 (s), 118.8 (d, *J*(C,F) = 1.5 Hz), 116.5 (d, *J*(C,F) = 19.0 Hz), 52.9 (s), 34.4 (s), 30.4 (s), 19.4 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = -144.8 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{34}FO_2$ $[M+H]^+$: 421.2538, found: 421.2531.

5-Bromo-4-((3,5-di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)-2-methoxyphenol (6t)



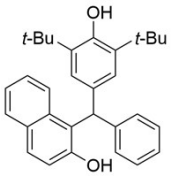
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **6t** (82.5 mg, 0.17 mmol, 83%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.25-7.28 (m, 2H), 7.17-7.21 (m, 1H), 7.13 (s, 1H), 7.06-7.08 (m, 2H), 6.89 (s, 2H), 6.45 (s, 1H), 5.74 (s, 1H), 5.51 (s, 1H), 5.10 (s, 1H), 3.64 (s, 3H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.2 (s), 145.7 (s), 144.5 (s), 143.7 (s), 135.6 (s), 133.5 (s), 133.3 (s), 129.3 (s), 128.2 (s), 126.2 (s), 126.1 (s), 118.6 (s), 115.9 (s), 113.3 (s), 55.9 (s), 55.4 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{34}BrO_3$ $[M+H]^+$: 497.1686, found: 497.1681.

2-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)naphthalen-1-ol (6u)



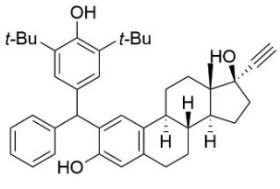
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **6u** (44.8 mg, 0.10 mmol, 51%) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 8.20-8.22 (m, 1H), 7.97-7.99 (m, 1H), 7.38-7.45 (m, 2H), 7.22-7.25 (m, 2H), 7.10-7.18 (m, 3H), 6.88 (m, 2H), 6.74-6.76 (m, 1H), 6.68-6.70 (m, 1H), 6.08 (s, 1H), 5.26 (s, 1H), 5.06 (s, 1H), 1.33 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.1 (s), 150.2 (s), 144.8 (s), 135.5 (s), 134.3 (s), 133.5 (s), 133.1 (s), 129.5 (s), 128.2 (s), 127.4 (s), 126.5 (s), 126.4 (s), 126.0 (s), 124.8 (s), 124.7 (s), 124.5 (s), 122.1 (s), 107.9 (s), 52.7 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{31}H_{35}O_2$ $[M+H]^+$: 439.2632, found: 439.2628.

1-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)naphthalen-2-ol (6v)



According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **6v** (56.2 mg, 0.13 mmol, 64%) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 8.01-8.04 (m, 1H), 7.77-7.79 (m, 1H), 7.71-7.73 (m, 1H), 7.40-7.44 (m, 1H), 7.29-7.33 (m, 3H), 7.22-7.27 (m, 3H), 7.06-7.08 (m, 1H), 7.01 (s, 2H), 6.29 (s, 1H), 5.40 (s, 1H), 5.20 (s, 1H), 1.32 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.2 (s), 153.1 (s), 142.1 (s), 136.8 (s), 133.5 (s), 131.8 (s), 129.6 (s), 129.5 (s), 129.0 (s), 128.9 (s), 128.7 (s), 126.9 (s), 126.7 (s), 125.7 (s), 123.1 (s), 122.9 (s), 120.3 (s), 120.0 (s), 48.6 (s), 34.5 (s), 30.2 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{31}H_{35}O_2$ $[M+H]^+$: 439.2632, found: 439.2625.

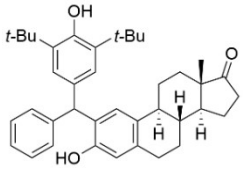
(8*R*,9*S*,13*S*,14*S*,17*R*)-2-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)-17-ethynyl-13-methyl-7,8,9,11,12,13,14,15,16,17-decahydro-6H-cyclopenta[a]phenanthrene-3,17-diol (6w)



According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 2:1) gave product **6w** (77.9 mg, 0.13 mmol, 66%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.28-7.31 (m, 2H), 7.15-7.24 (m, 3H), 6.93-6.97 (m, 2H), 6.74-6.75 (m, 1H), 6.53 (s, 1H), 5.46-5.53 (s, 1H), 5.10-5.11 (s, 1H), 4.52-4.54 (s, 1H), 2.76-2.82 (m, 2H), 2.56-2.57 (m, 1H), 2.28-2.35 (m, 1H), 2.10-2.19 (m, 1H), 1.97-2.04 (m, 2H), 1.73-1.90 (m, 3H), 1.60-1.70 (m, 2H), 1.43 (s, 1H), 1.36-1.37 (s, 18H), 0.85-0.90 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.5 (s), 152.4 (s), 151.5 (s), 151.4 (s), 143.4 (s), 143.3 (s), 136.3 (s), 136.2 (s), 135.9 (s), 135.8 (s), 132.7 (s), 132.6 (s), 132.2 (s), 132.1 (s), 129.2 (s), 129.1 (s),

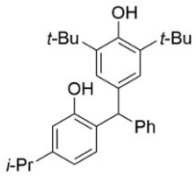
128.5 (s), 128.1 (s), 127.8 (s), 127.7 (s), 127.5 (s), 126.5 (s), 126.0 (s), 116.2 (s), 116.1 (s), 87.6 (s), 77.9 (s), 74.0 (s), 51.8 (s), 51.3 (s), 49.5 (s), 47.2 (s), 47.1 (s), 43.6 (s), 43.5 (s), 39.4 (s), 39.0 (s), 34.4 (s), 32.7 (s), 30.3 (s), 30.2 (s), 29.2 (s), 27.3 (s), 27.2 (s), 26.9 (s), 26.4 (s), 26.3 (s), 22.8 (s), 12.8 (s), 12.7 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{41}H_{51}O_3$ $[M+H]^+$: 591.3833, found: 591.3828.

(8*R*,9*S*,13*S*,14*S*)-2-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(phenyl)methyl)-3-hydroxy-13-methyl-6,7,8,9,11,12,13,14,15,16-decahydro-17H-cyclopenta[a]phenanthren-17-one (6x)



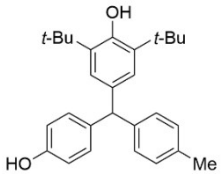
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 2:1) gave product **6x** (99.4 mg, 0.18 mmol, 88%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.14-7.31 (m, 5H), 6.93-6.97 (m, 2H), 6.75-6.76 (m, 1H), 6.54 (s, 1H), 5.48-5.54 (s, 1H), 5.11-5.12 (s, 1H), 4.76-4.80 (s, 1H), 2.82-2.86 (m, 2H), 2.44-2.51 (m, 1H), 1.95-2.18 (m, 4H), 1.82-1.86 (m, 1H), 1.52-1.63 (m, 2H), 1.35-1.36 (s, 18H), 0.78-0.97 (m, 6H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 152.5 (s), 152.4 (s), 151.7 (s), 151.6 (s), 143.4 (s), 143.3 (s), 136.0 (s), 135.9 (s), 135.8 (s), 135.7 (s), 132.7 (s), 132.5 (s), 131.7 (s), 131.5 (s), 129.2 (s), 129.0 (s), 128.5 (s), 128.3 (s), 128.0 (s), 127.6 (s), 127.5 (s), 126.5 (s), 126.0 (s), 125.9 (s), 116.3 (s), 116.2 (s), 51.7 (s), 51.2 (s), 50.4 (s), 48.1 (s), 48.0 (s), 44.1 (s), 44.0 (s), 38.4 (s), 38.3 (s), 35.9 (s), 34.4 (s), 31.5 (s), 30.4 (s), 30.3 (s), 29.1 (s), 29.0 (s), 27.0 (s), 26.6 (s), 26.5 (s), 25.9 (s), 25.8 (s), 21.6 (s), 13.9 (s), 13.8 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{39}H_{49}O_3$ $[M+H]^+$: 565.3677, found: 565.3671.

2,6-Di-*tert*-butyl-4-((2-hydroxy-4-isopropylphenyl)(phenyl)methyl)phenol (6ae)



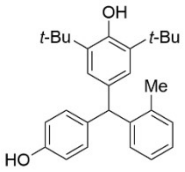
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **6ae** (69.8 mg, 0.16 mmol, 81%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.28-7.31 (m, 2H), 7.19-7.25 (m, 1H), 7.13-7.17 (m, 2H), 6.93 (m, 2H), 6.67-6.73 (m, 3H), 5.50 (s, 1H), 5.12 (s, 1H), 4.63 (s, 1H), 2.78-2.88 (m, 3H), 1.35 (s, 18H), 1.22 (d, *J* = 6.9, 6H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 153.4 (s), 152.5 (s), 149.0 (s), 143.2 (s), 135.9 (s), 132.4 (s), 130.1 (s), 129.3 (s), 128.5 (s), 128.1 (s), 126.6 (s), 126.0 (s), 118.7 (s), 114.3 (s), 51.2 (s), 34.4 (s), 33.6 (s), 30.4 (s), 24.0 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{30}H_{39}O_2$ $[M+H]^+$: 431.2945, found: 431.2940.

2,6-Di-*tert*-butyl-4-((4-hydroxyphenyl)(p-tolyl)methyl)phenol (7a)



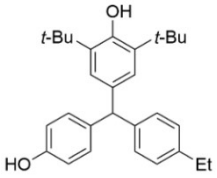
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **7a** (73.3 mg, 0.18 mmol, 91%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.05-7.07 (m, 2H), 6.95-6.99 (m, 4H), 6.89 (s, 2H), 6.70-6.73 (m, 2H), 5.33 (s, 1H), 5.05 (s, 1H), 4.79 (s, 1H), 2.31 (s, 3H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 153.7 (s), 152.0 (s), 142.1 (s), 137.5 (s), 135.4 (s), 135.3 (s), 134.6 (s), 130.5 (s), 129.2 (s), 128.8 (s), 125.9 (s), 114.9 (s), 55.7 (s), 34.4 (s), 30.4 (s), 21.0 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{35}O_2$ $[M+H]^+$: 403.2632, found: 403.2625.

2,6-Di-*tert*-butyl-4-((4-hydroxyphenyl)(o-tolyl)methyl)phenol (7b)



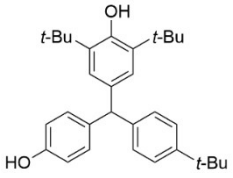
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **7b** (71.7 mg, 0.18 mmol, 89%) as a yellow solid. mp: 156.5-156.7 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.06-7.14 (m, 3H), 6.90-6.92 (m, 2H), 6.80-6.82 (m, 3H), 6.70-6.74 (m, 2H), 5.49 (s, 1H), 5.05 (s, 1H), 4.76 (s, 1H), 2.21 (s, 3H), 1.34 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 153.6 (s), 152.0 (s), 143.5 (s), 136.5 (s), 136.4 (s), 135.4 (s), 134.0 (s), 130.6 (s), 130.2 (s), 129.2 (s), 126.2 (s), 126.0 (s), 125.6 (s), 115.0 (s), 52.6 (s), 34.3 (s), 30.4 (s), 20.0 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{35}O_2$ $[M+H]^+$: 403.2632, found: 403.2627.

2,6-Di-*tert*-butyl-4-((4-ethylphenyl)(4-hydroxyphenyl)methyl)phenol (7c)



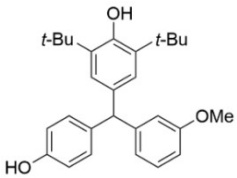
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **7c** (73.4 mg, 0.18 mmol, 88%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.08-7.10 (m, 2H), 6.92-7.02 (m, 4H), 6.90 (s, 2H), 6.71-6.73 (m, 2H), 5.33 (s, 1H), 5.05 (s, 1H), 4.86 (s, 1H), 2.58-2.64 (m, 2H), 1.35 (s, 18H), 1.20 (d, *J* = 7.6, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 153.6 (s), 152.0 (s), 142.3 (s), 141.8 (s), 137.6 (s), 135.4 (s), 134.6 (s), 130.5 (s), 129.2 (s), 127.6 (s), 126.0 (s), 114.9 (s), 55.7 (s), 34.4 (s), 30.4 (s), 28.4 (s), 15.6 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{37}O_2$ $[M+H]^+$: 417.2789, found: 417.2783.

2,6-Di-*tert*-butyl-4-((4-(*tert*-butyl)phenyl)(4-hydroxyphenyl)methyl)phenol (7d)



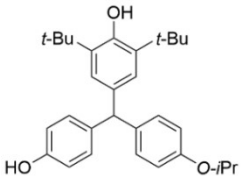
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **7d** (80.1 mg, 0.18 mmol, 90%) as a yellow solid. mp: 160.8-161.1 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.26-7.28 (m, 2H), 6.97-7.03 (m, 4H), 6.90 (s, 2H), 6.71-6.75 (m, 2H), 5.33 (s, 1H), 5.06 (s, 1H), 4.72 (s, 1H), 1.36 (s, 18H), 1.30 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 153.7 (s), 152.0 (s), 148.7 (s), 142.0 (s), 137.5 (s), 135.3 (s), 134.6 (s), 130.5 (s), 128.8 (s), 126.0 (s), 125.0 (s), 114.9 (s), 55.6 (s), 34.4 (s), 34.3 (s), 31.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{31}H_{41}O_2$ $[M+H]^+$: 445.3102, found: 445.3096.

2,6-Di-*tert*-butyl-4-((4-hydroxyphenyl)(3-methoxyphenyl)methyl)phenol (7e)



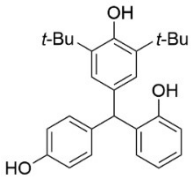
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 10:1) gave product **7e** (73.7 mg, 0.18 mmol, 88%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.15-7.19 (m, 1H), 6.95-9.97 (m, 2H), 6.89-6.90 (m, 2H), 6.67-6.74 (m, 5H), 5.33 (s, 1H), 5.12 (s, 1H), 5.07 (s, 1H), 3.72 (s, 3H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 159.4 (s), 153.8 (s), 152.1 (s), 146.9 (s), 137.0 (s), 135.5 (s), 134.3 (s), 130.5 (s), 129.1 (s), 126.0 (s), 122.1 (s), 115.4 (s), 115.0 (s), 111.2 (s), 56.0 (s), 55.2 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{35}O_3$ $[M+H]^+$: 419.2581, found: 419.2575.

2,6-Di-*tert*-butyl-4-((4-hydroxyphenyl)(4-isopropoxyphenyl)methyl)phenol (7f)



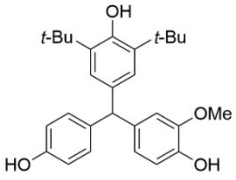
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7f** (76.9 mg, 0.17 mmol, 86%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 6.95-6.99 (m, 4H), 6.88 (s, 2H), 7.78-7.80 (m, 2H), 6.72-6.74 (m, 2H), 5.31 (s, 1H), 5.05 (s, 1H), 4.76 (s, 1H), 4.46-4.55 (m, 1H), 1.35 (s, 18H), 1.31 (d, *J* = 6.0, 6H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 171.3 (s), 156.0 (s), 153.9 (s), 151.9 (s), 137.2 (s), 135.4 (s), 134.9 (s), 130.4 (s), 130.2 (s), 125.9 (s), 115.6 (s), 114.9 (s), 60.5 (s), 34.3 (s), 30.3 (s), 22.1 (s), 21.1 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{30}H_{39}O_3$ $[M+H]^+$: 447.2894, found: 447.2890.

2,6-Di-*tert*-butyl-4-((2-hydroxyphenyl)(4-hydroxyphenyl)methyl)phenol (7h)



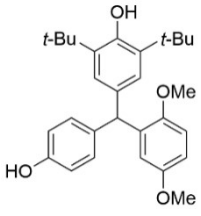
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7h** (64.8 mg, 0.16 mmol, 80%) as a yellow oil. ^{1}H NMR (400 MHz, DMSO-d_6, 25 ^{o}C, TMS): δ = 9.16 (s, 2H), 6.96-7.00 (m, 2H), 6.72-6.82 (m, 4H), 6.67-6.69 (m, 4H), 5.95 (s, 1H), 1.29 (s, 18H); ^{13}C NMR (100 MHz, DMSO-d_6, 25 ^{o}C, TMS): δ = 159.8 (s), 159.7 (s), 156.8 (s), 143.7 (s), 143.6 (s), 139.7 (s), 136.3 (s), 134.6 (s), 134.5 (s), 131.8 (s), 130.4 (s), 123.5 (s), 123.4 (s), 120.1 (s), 47.5 (s), 39.6 (s), 35.7 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{33}O_3$ $[M+H]^+$: 405.2425, found: 405.2420.

2,6-Di-*tert*-butyl-4-((4-hydroxy-3-methoxyphenyl)(4-hydroxyphenyl)methyl)phenol (7i)



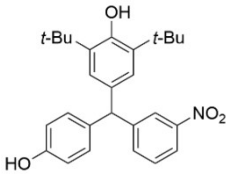
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7i** (68.73 mg, 0.16 mmol, 79%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 6.95-6.97 (m, 2H), 6.89 (s, 2H), 6.80-6.82 (m, 2H), 6.71-6.74 (m, 2H), 6.62-6.63 (m, 1H), 6.55-6.58 (m, 1H), 5.49 (s, 1H), 5.29 (s, 1H), 5.06 (s, 1H), 4.76 (s, 1H), 3.76 (s, 3H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.7 (s), 152.0 (s), 146.2 (s), 143.7 (s), 137.6 (s), 137.2 (s), 135.4 (s), 134.6 (s), 130.4 (s), 125.9 (s), 122.1 (s), 114.9 (s), 113.9 (s), 112.1 (s), 55.9 (s), 55.6 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{35}O_4$ $[M+H]^+$: 435.2530, found: 435.2523.

2,6-Di-*tert*-butyl-4-((2,5-dimethoxyphenyl)(4-hydroxyphenyl)methyl)phenol (7j)



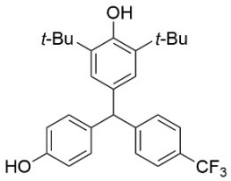
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7j** (71.82 mg, 0.16 mmol, 80%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 6.94-6.96 (m, 2H), 6.88-6.91 (m, 2H), 6.78-6.84 (m, 2H), 6.78-6.72 (m, 2H), 6.47-6.48 (m, 1H), 5.71 (s, 1H), 5.03 (s, 1H), 4.74 (s, 1H), 3.67 (s, 3H), 3.64 (s, 3H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.5 (s), 153.4 (s), 151.9 (s), 151.6 (s), 136.8 (s), 135.4 (s), 135.3 (s), 134.1 (s), 130.4 (s), 126.1 (s), 117.0 (s), 114.8 (s), 112.0 (s), 111.0 (s), 56.5 (s), 55.6 (s), 48.8 (s), 34.3 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{37}O_4$ $[M+H]^+$: 449.2687, found: 449.2681.

2,6-Di-*tert*-butyl-4-((4-hydroxyphenyl)(3-nitrophenyl)methyl)phenol (7k)



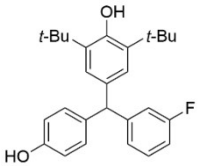
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7k** (71.2 mg, 0.16 mmol, 82%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 8.00-8.07 (m, 2H), 7.41-7.46 (m, 2H), 6.94-6.98 (m, 2H), 6.56 (s, 2H), 6.75-6.79 (m, 2H), 5.46 (s, 1H), 5.13 (s, 1H), 4.85 (s, 1H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 154.2 (s), 152.5 (s), 148.3 (s), 147.5 (s), 135.9 (s), 135.6 (s), 135.4 (s), 133.0 (s), 130.4 (s), 129.0 (s), 125.8 (s), 124.1 (s), 121.3 (s), 115.4 (s), 55.7 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{32}NO_4$ $[M+H]^+$: 434.2326, found: 434.2321.

2,6-Di-*tert*-butyl-4-((4-hydroxyphenyl)(4-(trifluoromethyl)phenyl)methyl)phenol (7l)



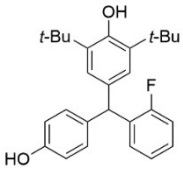
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7l** (76.8 mg, 0.17 mmol, 84%) as a yellow solid. mp: 112.3-112.5 ^{o}C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.50-7.53 (m, 2H), 7.20-7.26 (m, 2H), 6.93-6.96 (m, 2H), 6.86 (s, 2H), 6.73-6.77 (m, 2H), 5.42 (s, 1H), 5.11 (s, 1H), 4.76 (s, 1H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 154.0 (s), 152.3 (s), 149.3 (s), 136.3 (s), 135.8 (s), 132.0 (d, *J*(C,F) = 297.7 Hz), 130.5 (s), 129.7 (s), 129.6 (s), 125.9 (s), 125.1 (q, *J*(C,F) =3.7 Hz), 120.8 (s), 115.2 (s), 55.8 (s), 34.4 (s), 30.3 (s). ^{19}F NMR (376 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = -62.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{32}F_3O_2$ $[M+H]^+$: 457.2349, found: 457.2345.

2,6-Di-*tert*-butyl-4-((3-fluorophenyl)(4-hydroxyphenyl)methyl)phenol (7m)



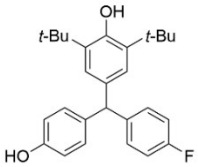
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7m** (70.3 mg, 0.17 mmol, 86%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.19-7.25 (m, 1H), 6.94-6.98 (m, 2H), 6.84-6.91 (m, 4H), 6.73-6.82 (m, 3H), 5.36 (s, 1H), 5.10 (s, 1H), 4.82 (s, 1H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 162.9 (d, *J*(C,F) = 243.7 Hz), 153.9 (s), 152.2 (s), 147.9 (s), 136.5 (s), 135.6 (s), 133.8 (s), 130.5 (s), 129.45 (d, *J*(C,F) = 8.2 Hz), 125.9 (s), 125.0 (s), 116.2 (d, *J*(C,F) = 21.4 Hz), 115.1 (s), 112.9 (d, *J*(C,F) = 21.0 Hz), 55.7 (s), 34.4 (s), 30.3 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = -113.7 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{32}FO_2$ $[M+H]^+$: 407.2381, found: 407.2373.

2,6-Di-*tert*-butyl-4-((2-fluorophenyl)(4-hydroxyphenyl)methyl)phenol (7n)



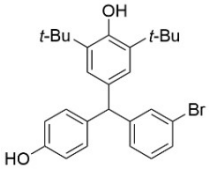
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7n** (65.9 mg, 0.16 mmol, 81%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.15-7.21 (m, 1H), 6.92-7.05 (m, 5H), 6.86-6.88 (m, 2H), 6.73-6.75 (m, 2H), 5.67 (s, 1H), 5.08 (s, 1H), 4.74 (s, 1H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 160.7 (d, *J*(C,F) = 244.8 Hz), 153.8 (s), 152.2 (s), 135.9 (s), 135.5 (s), 133.1 (s), 132.2 (d, *J*(C,F) = 14.3 Hz), 130.7 (d, *J*(C,F) = 4.0 Hz), 130.3 (s), 127.8 (d, *J*(C,F) = 8.3 Hz), 125.9 (s), 123.7 (d, *J*(C,F) = 3.5 Hz), 115.3 (s), 115.1 (d, *J*(C,F) = 9.2 Hz), 48.4 (s), 34.4 (s), 30.3 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = -116.7 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{32}FO_2$ $[M+H]^+$: 407.2381, found: 407.2376.

2,6-Di-*tert*-butyl-4-((4-fluorophenyl)(4-hydroxyphenyl)methyl)phenol (7o)



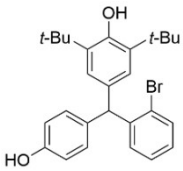
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7o** (69.2 mg, 0.17 mmol, 85%) as a yellow solid. mp: 162.3-162.7 °C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.15-7.21 (m, 1H), 6.92-7.05 (m, 5H), 6.86-6.88 (m, 2H), 6.73-6.75 (m, 2H), 5.67 (s, 1H), 5.08 (s, 1H), 4.74 (s, 1H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 161.3 (d, *J*(C,F) = 242.8 Hz), 153.8 (s), 152.1 (s), 140.9 (s), 137.0 (s), 135.5 (s), 134.3 (s), 130.71 (d, *J*(C,F) = 7.8 Hz), 130.5 (s), 125.6 (s), 115.0 (d, *J*(C,F) = 8.0 Hz), 114.8 (s), 55.2 (s), 34.4 (s), 30.3 (s); ^{19}F NMR (376 MHz, $CDCl_3$, 25 °C, TMS): δ = -117.5 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{32}FO_2$ $[M+H]^+$: 407.2381, found: 407.2375.

4-((3-Bromophenyl)(4-hydroxyphenyl)methyl)-2,6-di-*tert*-butylphenol (7p)



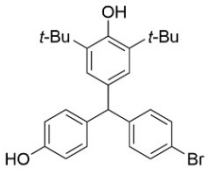
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7p** (80.2 mg, 0.17 mmol, 86%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.31-7.33 (m, 1H), 7.26-7.27 (m, 1H), 7.11-7.15 (m, 1H), 7.01-7.03 (m, 1H), 6.94-6.96 (m, 2H), 6.86 (s, 2H), 6.73-6.77 (m, 2H), 5.33 (s, 1H), 5.10 (s, 1H), 4.71 (s, 1H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 153.9 (s), 152.3 (s), 136.4 (s), 135.6 (s), 133.6 (s), 132.4 (s), 130.7 (s), 129.7 (s), 129.2 (s), 128.0 (s), 125.9 (s), 122.4 (s), 115.1 (s), 100.0 (s), 55.7 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{32}BrO_2$ $[M+H]^+$: 467.1581, found: 467.1577.

4-((2-Bromophenyl)(4-hydroxyphenyl)methyl)-2,6-di-*tert*-butylphenol (7q)



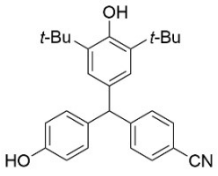
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7q** (75.7 mg, 0.16 mmol, 81%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.53-7.55 (m, 1H), 7.18-7.22 (m, 1H), 7.03-7.07 (m, 1H), 6.92-6.97 (m, 3H), 6.84 (s, 2H), 6.72-6.75 (m, 2H), 5.76 (s, 1H), 5.08 (s, 1H), 4.84 (s, 1H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 153.8 (s), 152.2 (s), 144.4 (s), 135.6 (s), 135.5 (s), 133.3 (s), 133.0 (s), 131.1 (s), 130.7 (s), 127.7 (s), 127.1 (s), 126.2 (s), 125.5 (s), 115.0 (s), 55.0 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{32}BrO_2$ $[M+H]^+$: 467.1581, found: 467.1573.

4-((4-Bromophenyl)(4-hydroxyphenyl)methyl)-2,6-di-*tert*-butylphenol (7r)



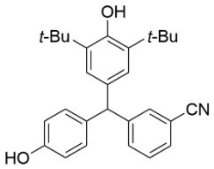
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7r** (80.2 mg, 0.17 mmol, 86%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 °C, TMS): δ = 7.36-7.39 (m, 2H), 6.93-6.98 (m, 4H), 6.85 (s, 2H), 6.72-6.76 (m, 2H), 5.32 (s, 1H), 5.08 (s, 1H), 4.83 (s, 1H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 °C, TMS): δ = 153.9 (s), 152.2 (s), 144.3 (s), 136.6 (s), 135.6 (s), 133.9 (s), 131.2 (s), 131.1 (s), 130.5 (s), 129.7 (s), 125.8 (s), 120.8 (s), 119.9 (s), 115.1 (s), 55.4 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{32}BrO_2$ $[M+H]^+$: 467.1581, found: 467.1575.

4-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(4-hydroxyphenyl)methyl)benzonitrile (7s)



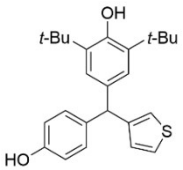
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7s** (63.8 mg, 0.15 mmol, 77%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.55-7.57 (m, 2H), 7.20-7.22 (m, 2H), 6.92-6.94 (m, 2H), 6.83 (s, 2H), 6.75-6.78 (m, 2H), 5.41 (s, 1H), 5.13 (s, 1H), 4.95 (s, 1H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 154.2 (s), 152.4 (s), 150.9 (s), 135.8 (s), 135.5 (s), 133.0 (s), 132.0 (s), 130.5 (s), 130.1 (s), 125.8 (s), 119.1 (s), 115.3 (s), 109.8 (s), 56.0 (s), 34.4 (s), 30.3 (s); HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{32}NO_2$ $[M+H]^+$: 414.2428, found: 414.2424.

3-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(4-hydroxyphenyl)methyl)benzonitrile (7t)



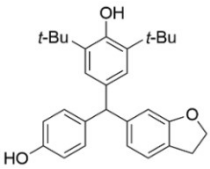
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7t** (65.4 mg, 0.16 mmol, 79%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.48-7.50 (m, 1H), 7.36-7.39 (m, 3H), 6.92-6.94 (m, 2H), 6.76-6.82 (m, 2H), 5.39 (s, 1H), 5.13 (s, 1H), 4.83 (s, 1H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 154.2 (s), 152.5 (s), 146.8 (s), 135.9 (s), 135.6 (s), 133.9 (s), 133.1 (s), 132.8 (s), 130.5 (s), 129.9 (s), 128.9 (s), 125.8 (s), 119.1 (s), 115.3 (s), 112.1 (s), 55.5 (s), 34.4 (s), 30.3 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{32}NO_2$ $[M+H]^+$: 414.2428, found: 414.2421.

2,6-Di-*tert*-butyl-4-((4-hydroxyphenyl)(thiophen-3-yl)methyl)phenol (7u)



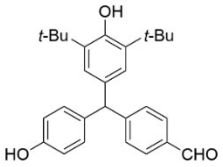
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7u** (64.8 mg, 0.16 mmol, 82%) as a yellow solid. mp: 121.8-122.1 ^{o}C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.23-7.25 (m, 1H), 7.00-7.02 (m, 2H), 6.92-6.94 (m, 2H), 6.85-6.86 (m, 1H), 6.70-6.75 (m, 3H), 5.33 (s, 1H), 5.07 (s, 1H), 4.70 (s, 1H), 1.37 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.8 (s), 152.2 (s), 146.2 (s), 137.1 (s), 135.5 (s), 134.5 (s), 130.1 (s), 128.9 (s), 125.5 (s), 125.2 (s), 122.3 (s), 115.0 (s), 51.8 (s), 34.4 (s), 30.4 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{25}H_{31}O_2S$ $[M+H]^+$: 395.2040, found: 395.2035.

2,6-Di-*tert*-butyl-4-((2,3-dihydrobenzofuran-6-yl)(4-hydroxyphenyl)methyl)phenol (7x)



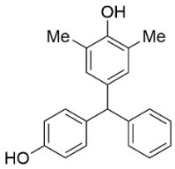
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7x** (73.3 mg, 0.17 mmol, 85%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 6.93-6.97 (m, 3H), 6.89 (s, 2H), 6.80-6.83 (m, 1H), 6.71-6.75 (m, 2H), 6.67-6.69 (m, 1H), 5.43 (s, 1H), 5.06 (s, 1H), 4.79 (s, 1H), 4.54 (t, *J* = 8.7 Hz, 2H), 3.14 (t, *J* = 8.7 Hz, 2H), 1.36 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 158.3 (s), 153.6 (s), 152.0 (s), 137.7 (s), 137.4 (s), 135.4 (s), 134.9 (s), 130.5 (s), 128.8 (s), 126.8 (s), 125.9 (s), 125.8 (s), 114.9 (s), 108.7 (s), 71.2 (s), 55.4 (s), 34.4 (s), 30.4 (s), 29.8 (s); HRMS (ESI) *m*/*z*: calcd. for $C_{29}H_{35}O_3$ $[M+H]^+$: 431.2581, found: 431. 2573.

4-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(4-hydroxyphenyl)methyl)benzaldehyde (7z)



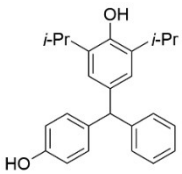
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7z** (55.2 mg, 0.13 mmol, 66%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 9.98 (s, 1H), 7.78-7.80 (m, 2H), 7.26-7.29 (m, 2H), 6.94-6.96 (m, 2H), 6.86 (s, 2H), 6.75-6.78 (m, 2H), 5.45 (s, 1H), 5.12 (s, 1H), 5.02 (s, 1H), 1.35 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 192.2 (s), 154.1 (s), 152.6 (s), 152.4 (s), 136.0 (s), 135.7 (s), 134.5 (s), 133.4 (s), 130.5 (s), 130.0 (s), 129.8 (s), 125.9 (s), 115.2 (s), 34.4 (s), 30.3(s). HRMS (ESI) *m*/*z*: calcd. for $C_{28}H_{33}O_3$ $[M+H]^+$: 417.2425, found: 417.2420.

4-((4-Hydroxyphenyl)(phenyl)methyl)-2,6-dimethylphenol (7ab)



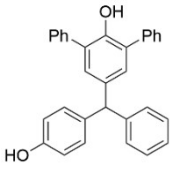
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7ab** (51.9 mg, 0.17 mmol, 85%) as a yellow solid. mp: 127.5-127.9 ^{o}C. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.25-7.29 (m, 2H), 7.17-7.21 (m, 1H), 7.09-7.10 (m, 2H), 6.94-6.97 (m, 2H), 6.70-6.75 (m, 4H), 5.35 (s, 1H), 4.80 (s, 1H), 4.53 (s, 1H), 2.17 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.8 (s), 150.6 (s), 144.7 (s), 136.8 (s), 135.8 (s), 130.5 (s), 129.5 (s), 129.3 (s), 128.2 (s), 126.1 (s), 122.8 (s), 115.1 (s), 55.3 (s), 16.1 (s); HRMS (ESI) *m*/*z*: calcd. for $C_{21}H_{21}O_2$ $[M+H]^+$: 305.1537, found: 305.1531.

4-((4-Hydroxyphenyl)(phenyl)methyl)-2,6-diisopropylphenol (7ac)



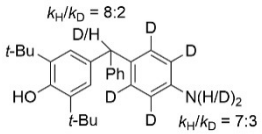
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7ac** (60.1 mg, 0.17 mmol, 83%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.24-7.28 (m, 2H), 7.15-7.20 (m, 1H), 7.09-7.10 (m, 2H), 6.95-6.98 (m, 2H), 6.77 (s, 2H), 6.70-6.75 (m, 2H), 5.40 (s, 1H), 4.77 (s, 1H), 4.68 (s, 1H), 3.00-3.14 (m, 2H), 1.17 (d, *J* = 6.9 Hz, 12H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.7 (s), 148.3 (s), 145.0 (s), 137.1 (s), 135.9 (s), 133.3 (s), 130.5 (s), 129.3 (s), 128.2 (s), 126.0 (s), 124.5 (s), 115.0 (s), 55.8 (s), 27.3 (s), 22.7 (s); HRMS (ESI) *m*/*z*: calcd. for $C_{25}H_{29}O_2$ $[M+H]^+$: 361.2163, found: 361.2159.

5'-((4-Hydroxyphenyl)(phenyl)methyl)-[1,1':3',1''-terphenyl]-2'-ol (7ad)



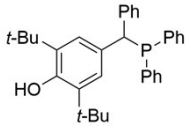
According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 5:1) gave product **7ad** (62.6 mg, 0.15 mmol, 73%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.48-7.50 (m, 4H), 7.40-7.44 (m, 4H), 7.24-7.35 (m, 4H), 7.16-7.21 (m, 3H), 7.02-7.04 (m, 4H), 6.72-6.74 (m, 2H), 5.48 (s, 1H), 5.35 (s, 1H), 4.87 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.9 (s), 147.7 (s), 144.4 (s), 137.7 (s), 136.5 (s), 136.4 (s), 130.80 (s), 130.54 (s), 129.4 (s), 129.3 (s), 128.83 (s), 128.5 (s), 128.4 (s), 127.6 (s), 126.23 (s), 115.2 (s), 55.45 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{31}H_{25}O_2$ $[M+H]^+$: 429.1850, found: 429.1846.

4-((4-Aminophenyl)(phenyl)methyl)-2,6-di-*tert*-butylphenol (3a')



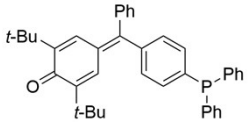
According to the general procedure, work-up and flash column chromatography (Hexane/EtOAc: 10:1) gave product **3a'** (68.9 mg, 0.16 mmol, 82%) as a yellow oil. ^{1}H NMR (400 MHz, Acetone-d_6, 25 ^{o}C, TMS): δ = 7.11-7.17 (m, 2H), 6.99-7.07 (m, 3H), 6.85 (s, 2H), 5.76-5.81 (s, 1H), 5.35 (s, 0.8H), 4.35 (s, 1.4H), 1.22 (s, 18H); ^{13}C NMR (100 MHz, Acetone-d_6, 25 ^{o}C, TMS): δ = 152.2 (s), 145.3 (s), 137.1 (s), 135.1 (s), 129.2 (s), 129.1 (s), 128.1 (s), 127.9 (s), 125.9 (s), 125.7 (s), 125.6 (s), 119.0 (s), 56.0 (s), 34.3 (s), 29.8 (s). HRMS (ESI) *m*/*z*: calcd. for $C_{27}H_{34}NO$ $[M+H]^+$: 388.2635, found: 388.2629.

2,6-Di-*tert*-butyl-4-((diphenylphosphaneyl)(phenyl)methyl)phenol (9a)



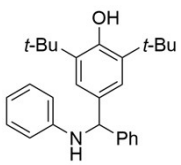
According to the general procedure, work-up and flash column chromatography (Hexane/EtOAc: 20:1) gave product **9a** (85.6 mg, 0.18 mmol, 89%) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.62-7.68 (m, 2H), 7.14-7.51 (m, 13H), 6.94-6.95 (m, 2H), 5.06 (s, 1H), 4.89 (d, *J* = 17.5 Hz, 1H), 1.29 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 152.9 (s), 138.1 (s), 135.3 (d, *J*(C,P) = 1.6 Hz), 133.2 (d, *J*(C,P) = 17.1 Hz), 133.0 (d, *J*(C,P) = 9.3 Hz), 131.7 (d, *J*(C,P) = 2.4 Hz), 130.9 (d, *J*(C,P) = 2.4 Hz), 130.8 (d, *J*(C,P) = 2.4 Hz), 130.0 (d, *J*(C,P) = 6.3 Hz), 129,8 (d, *J*(C,P) = 81.5 Hz), 129,3 (d, *J*(C,P) = 78.8 Hz), 129,1 (d, *J*(C,P) = 10.4 Hz), 128,4 (d, *J*(C,P) = 9.9 Hz), 128.1 (d, *J*(C,P) = 9.6 Hz), 127.0 (d, *J*(C,P) = 5.1 Hz), 126.9 (d, *J*(C,P) = 1.8 Hz), 51.2 (d, *J*(C,P) = 29.0 Hz), 34.3 (s), 30.2 (s). ^{31}P NMR (160 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 22.5. HRMS (ESI) *m*/*z*: calcd. for $C_{33}H_{38}OP$ $[M+H]^+$: 481.2655, found: 481.2651.

2,6-Di-*tert*-butyl-4-((4-(diphenylphosphaneyl)phenyl)(phenyl)methylene)cyclohexa-2,5-dien-1-one (9b)



According to the general procedure, work-up and flash column chromatography (Hexane/EtOAc: 40:1) gave product **9b** (94.4 mg, 0.17 mmol, 85%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.53-7.60 (m, 2H), 7.37-7.48 (m, 7H), 7.29-7.30 (m, 10H), 7.06 (s, 1H), 7.02 (s, 1H), 1.32 (d, *J* = 14.0 Hz, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 186.6 (s), 149.4 (s), 147.8 (s), 142.6 (s), 137.3 (d, *J*(C,P) = 10.9 Hz), 136.0 (s), 135.2 (s), 133.8 (d, *J*(C,P) = 19.5 Hz), 133.3 (d, *J*(C,P) = 9.6 Hz), 132.0 (s), 131.3 (d, *J*(C,P) = 2.3 Hz), 130.4 (s), 129,3 (d, *J*(C,P) = 57.7 Hz), 129,0 (d, *J*(C,P) = 25.3 Hz), 128,9 (d, *J*(C,P) = 4.3 Hz), 128,6 (d, *J*(C,P) = 6.9 Hz), 127.9 (s), 35.5 (s), 35.1 (s), 29.6 (s), 29.5 (s). ^{31}P NMR (160 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = -5.37. HRMS (ESI) *m*/*z*: calcd. for $C_{39}H_{40}OP$ $[M+H]^+$: 555.2812, found: 555.2807.

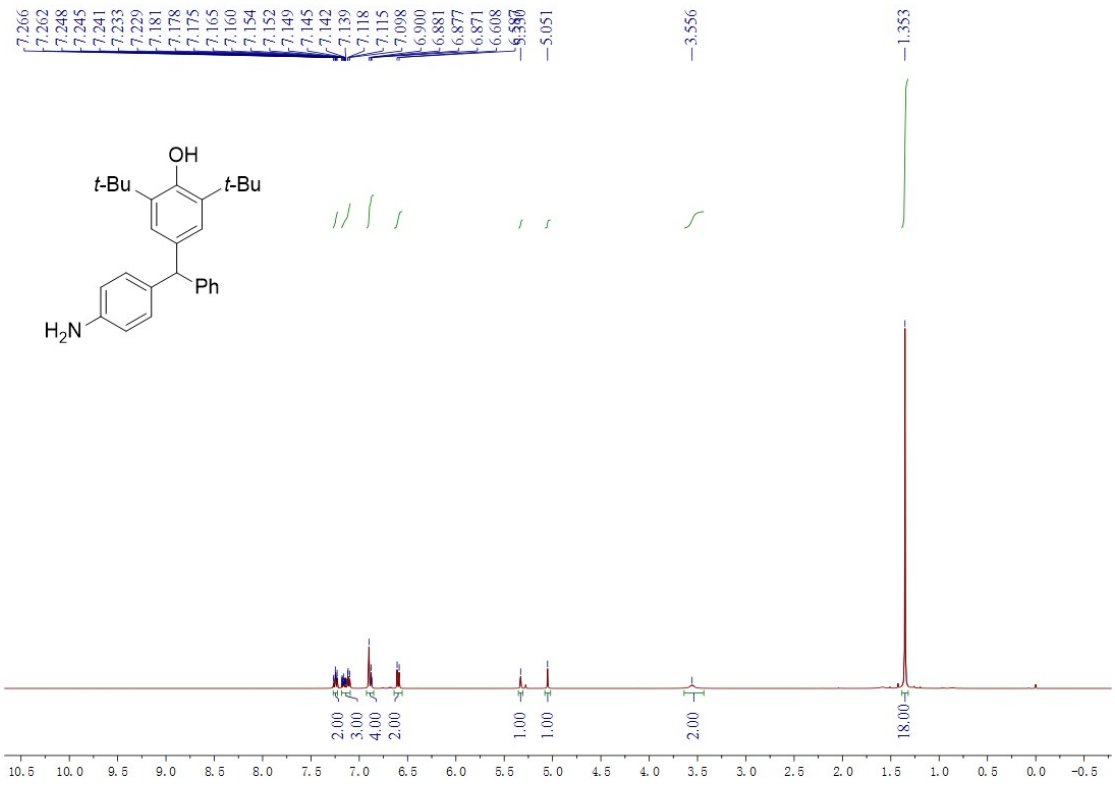
2,6-Di-*tert*-butyl-4-(phenyl(phenylamino)methyl)phenol (3a'')

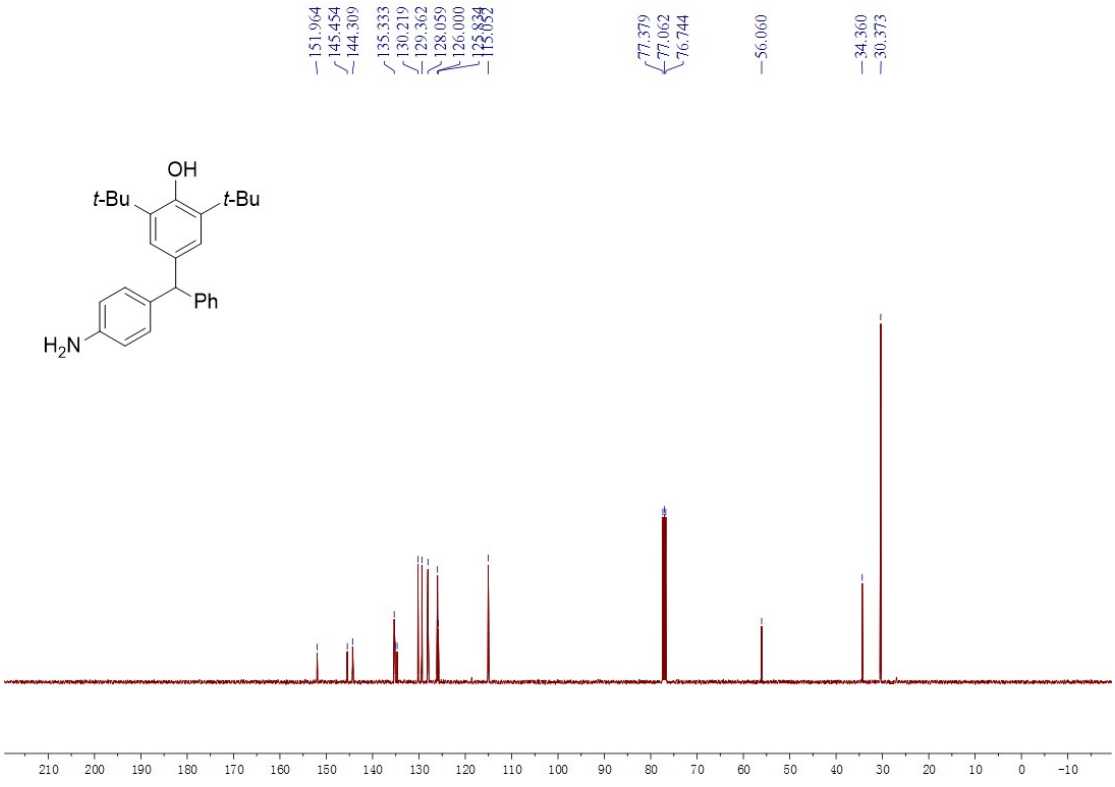


According to the general procedure, work-up and flash column chromatography (hexane/EtOAc: 40:1) gave product **3a''** (58.3 mg, 0.15 mmol, 75%) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 7.39-7.41 (m, 2H), 7.30-7.34 (m, 2H), 7.21-7.25 (m, 1H), 7.07-7.12 (m, 4H), 6.65-6.68 (m, 1H), 6.53-6.55 (m, 2H), 5.40 (s, 1H), 5.16 (s, 1H), 4.24 (s, 1H), 1.38 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$, 25 ^{o}C, TMS): δ = 153.1 (s), 147.7 (s), 143.1 (s), 136.0 (s), 134.1 (s), 129.1 (s), 128.6 (s), 127.1 (s), 126.9 (s), 124.6 (s), 117.3 (s), 113.4 (s), 63.2 (s), 34.4 (s), 30.3 (s).

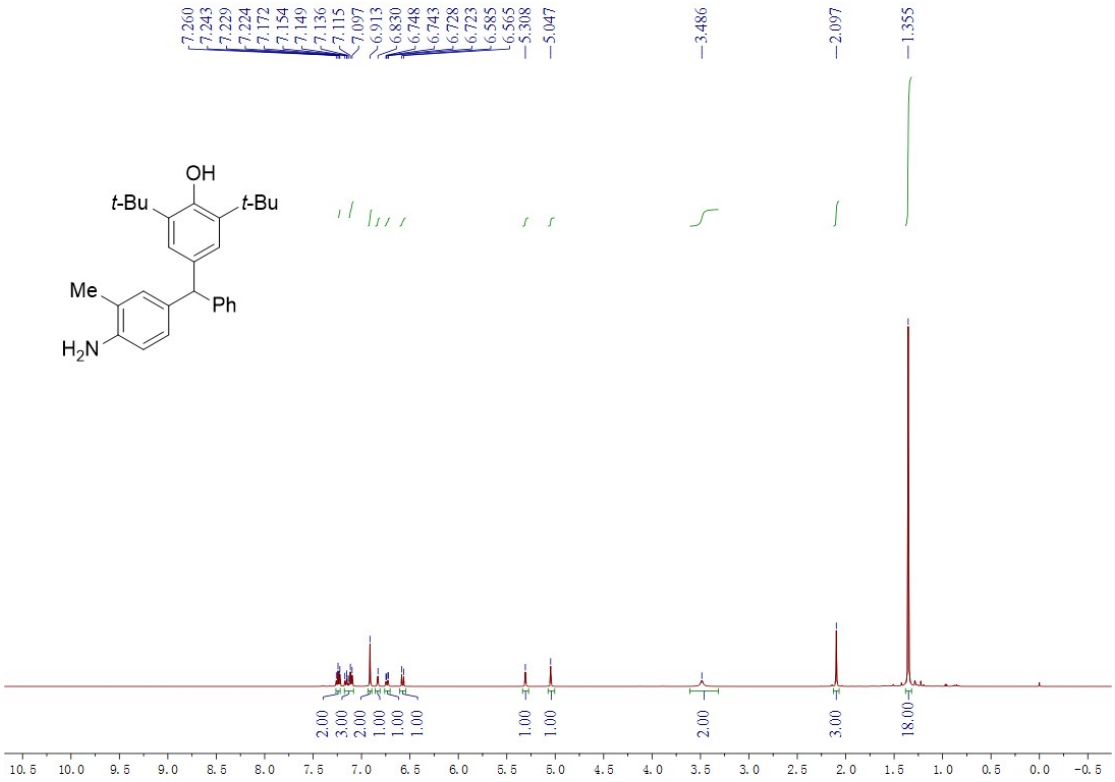
^{1}H, ^{13}C, ^{31}P and ^{19}F NMR spectra

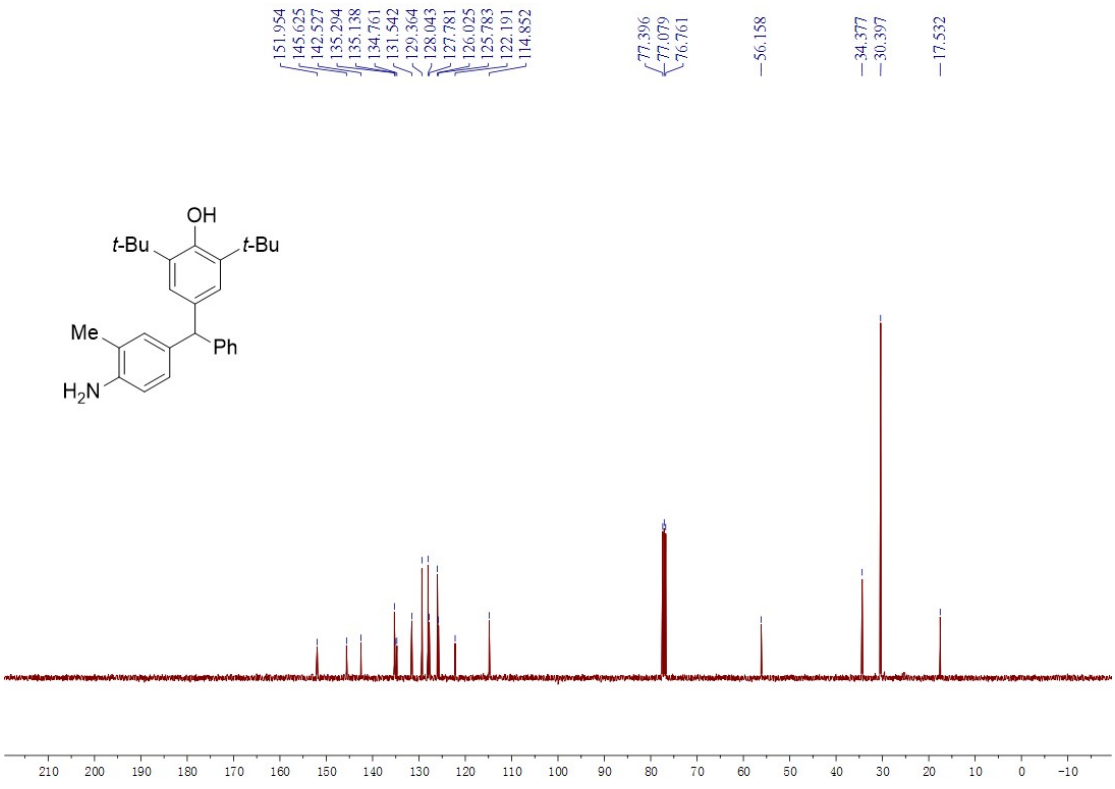
4-((4-Aminophenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3a)



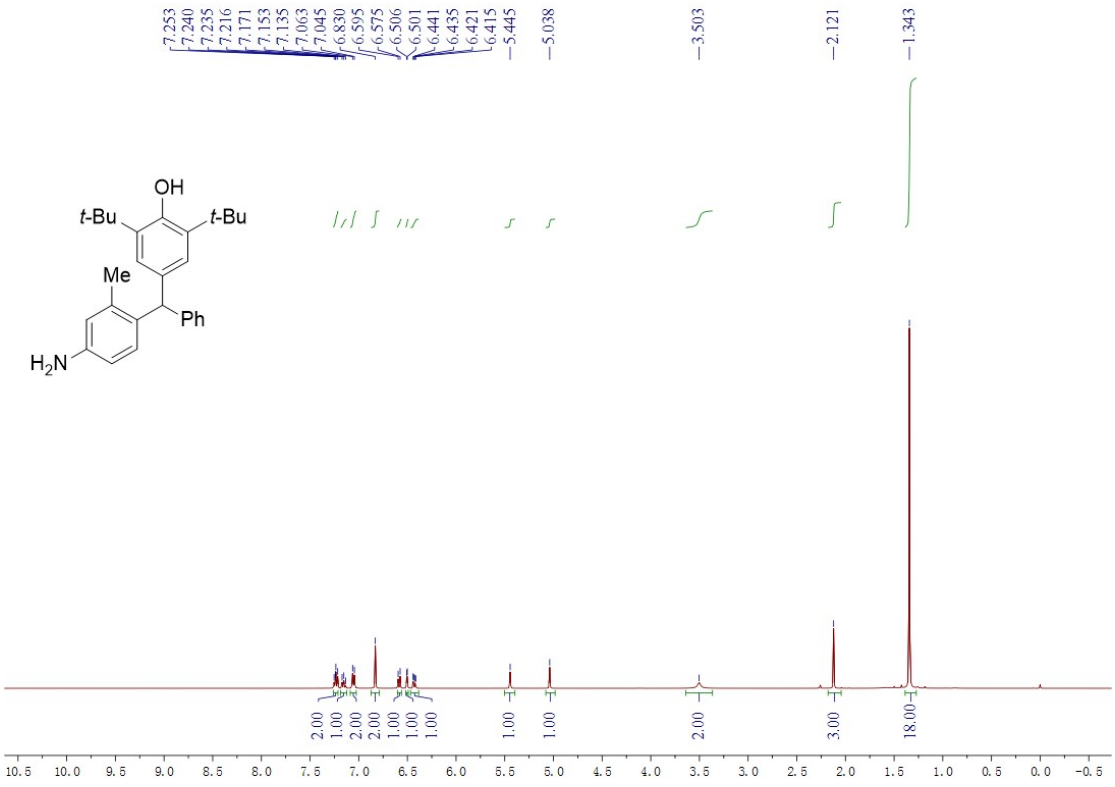


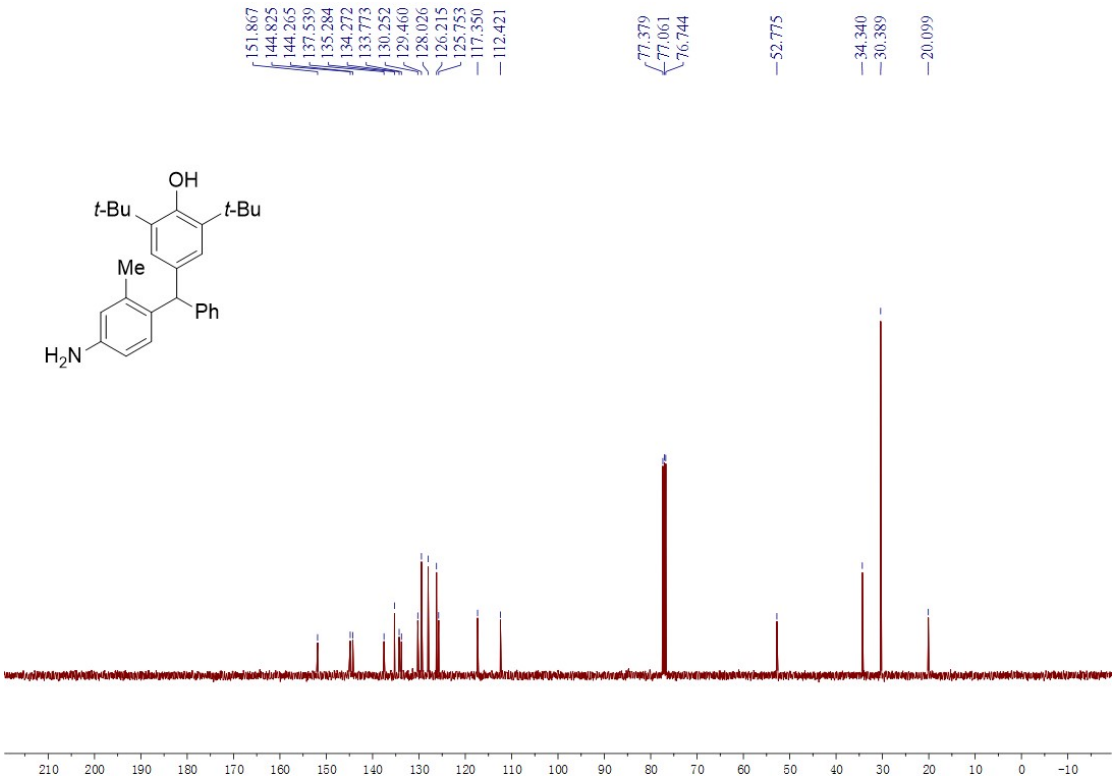
4-((4-Amino-3-methylphenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3b)



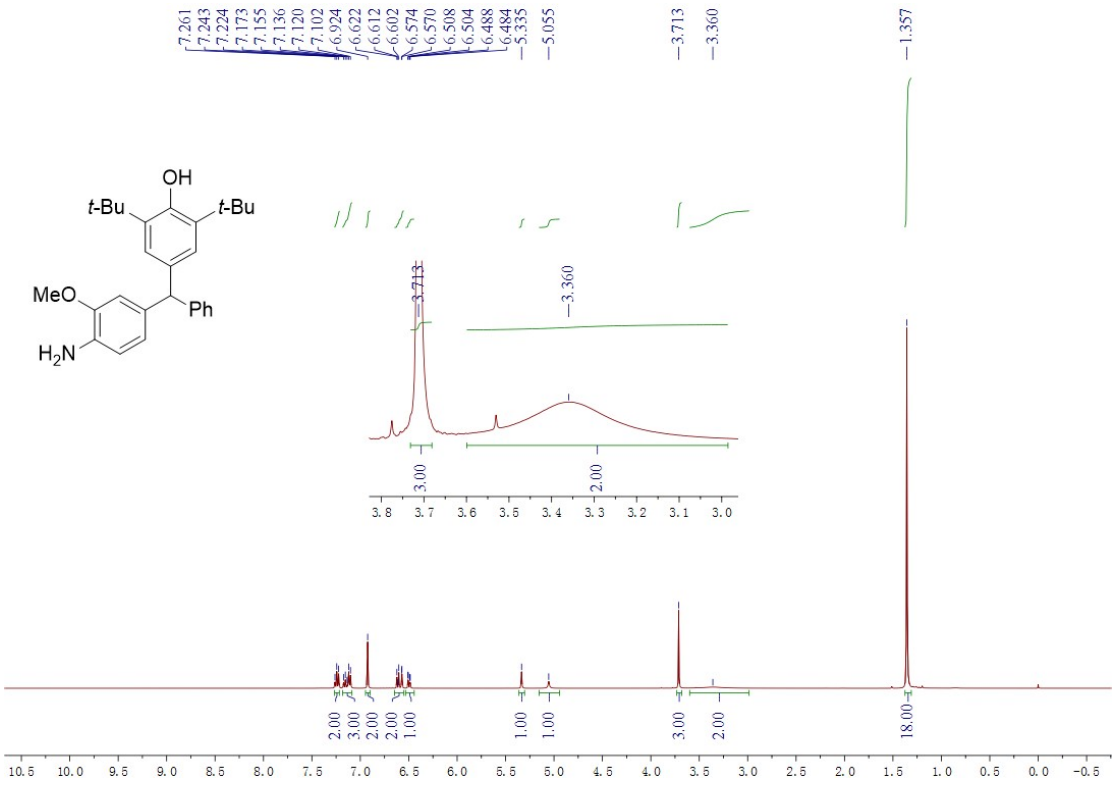


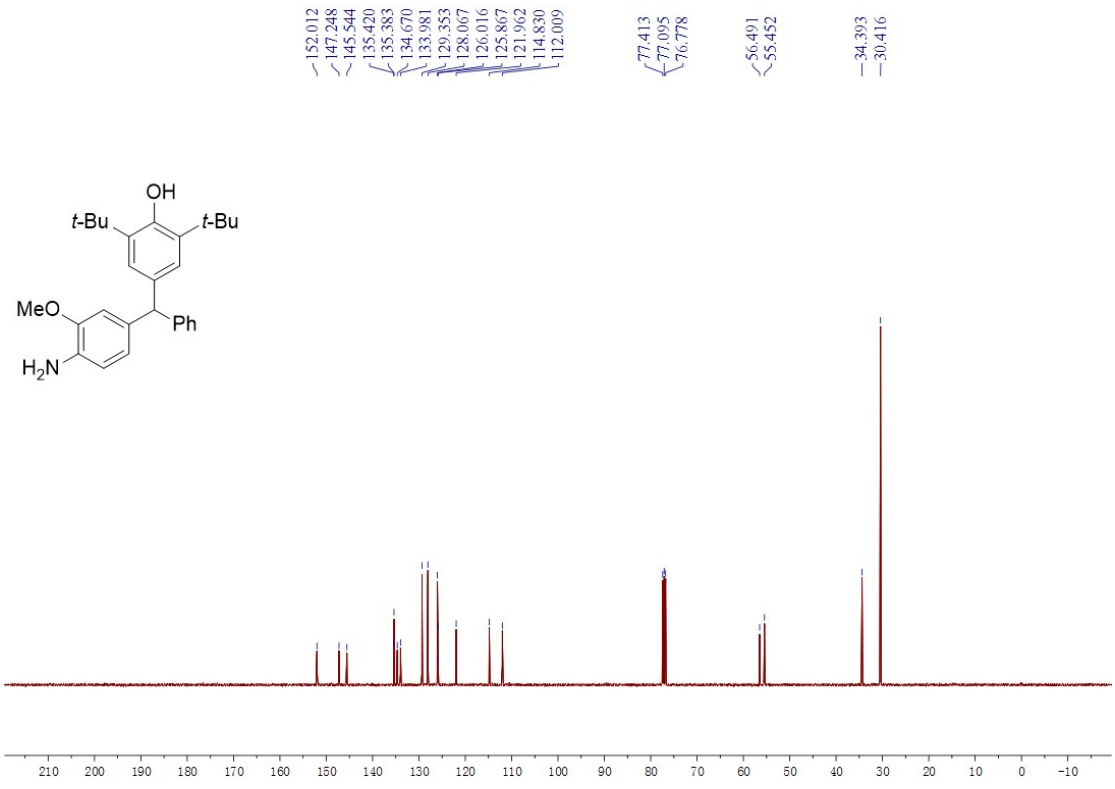
4-((4-Amino-2-methylphenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3c)



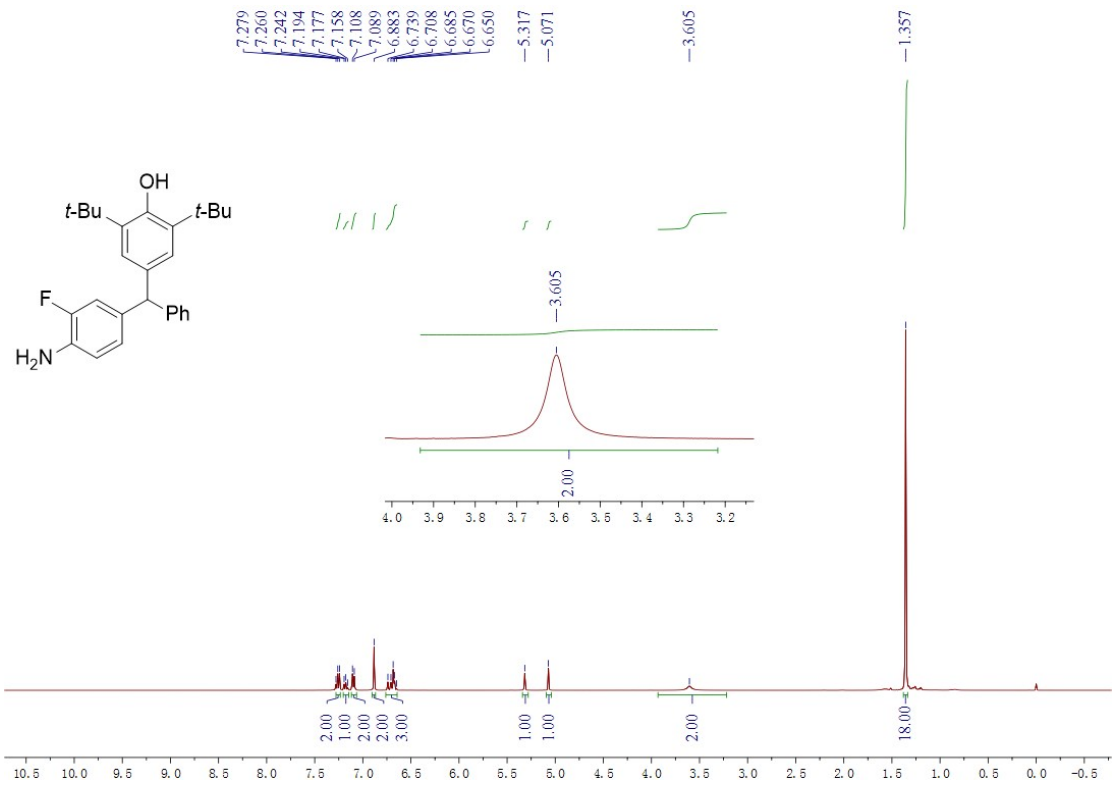


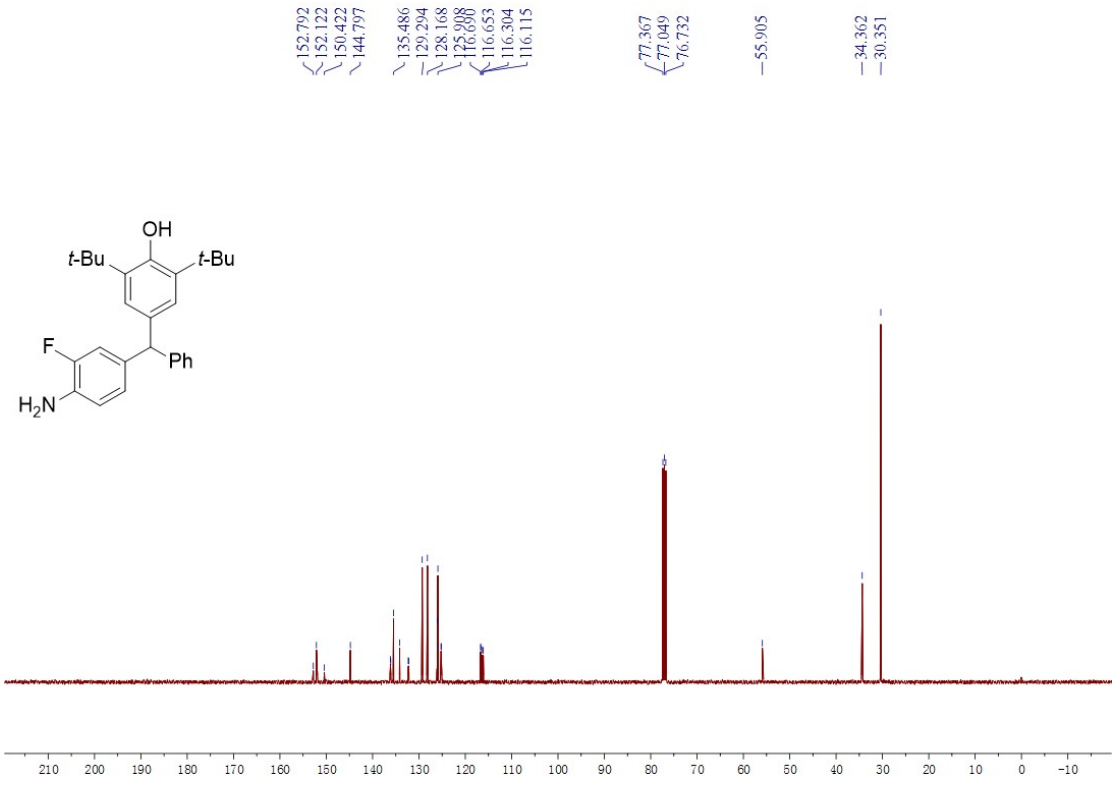
4-((4-Amino-3-methoxyphenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3d)

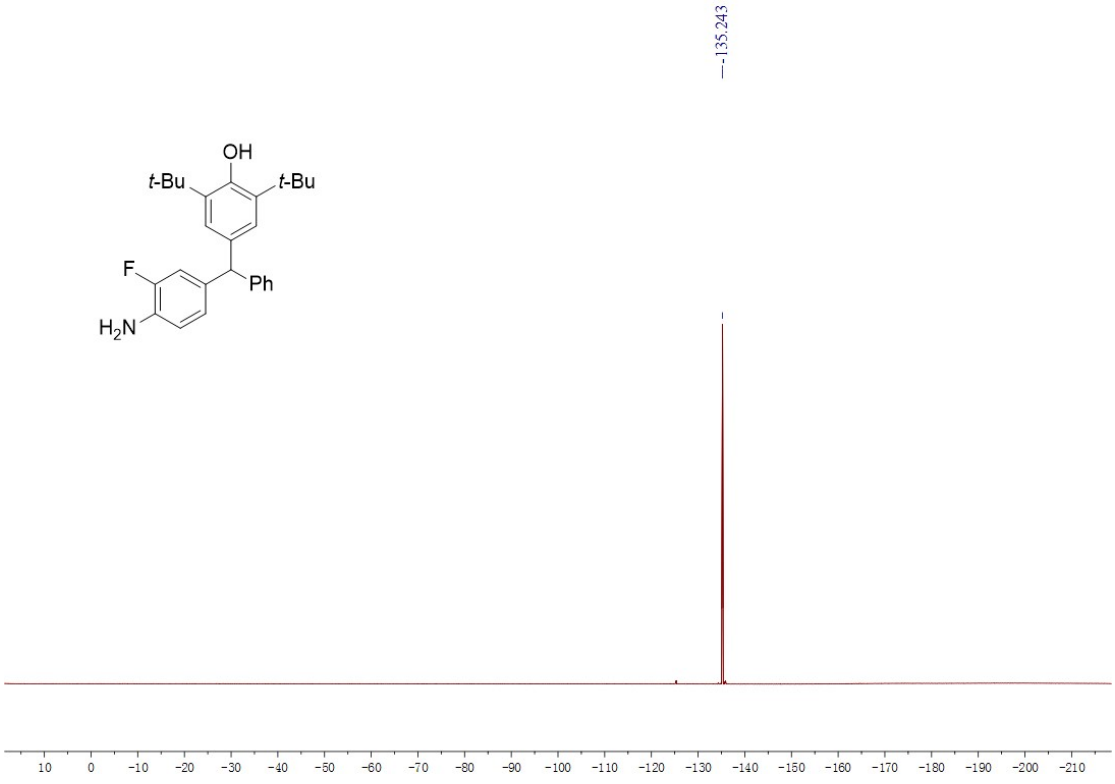




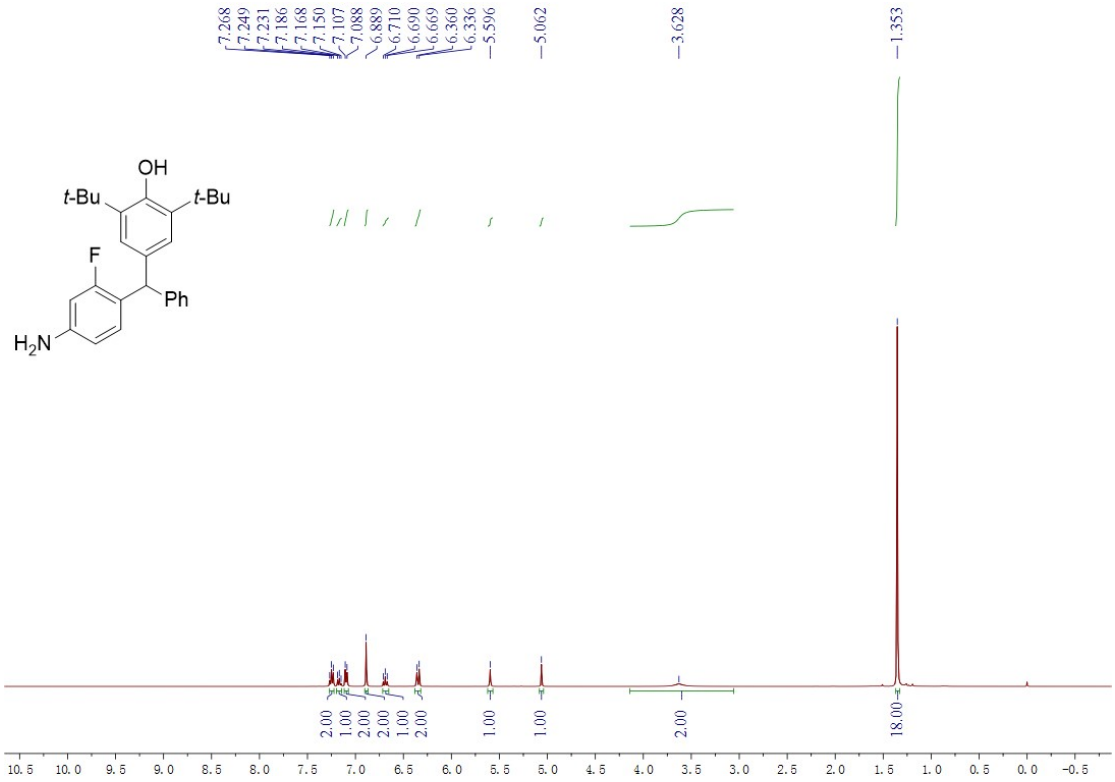
4-((4-Amino-3-fluorophenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3e)







4-((4-Amino-2-fluorophenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3f)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7.150
7.107
7.088
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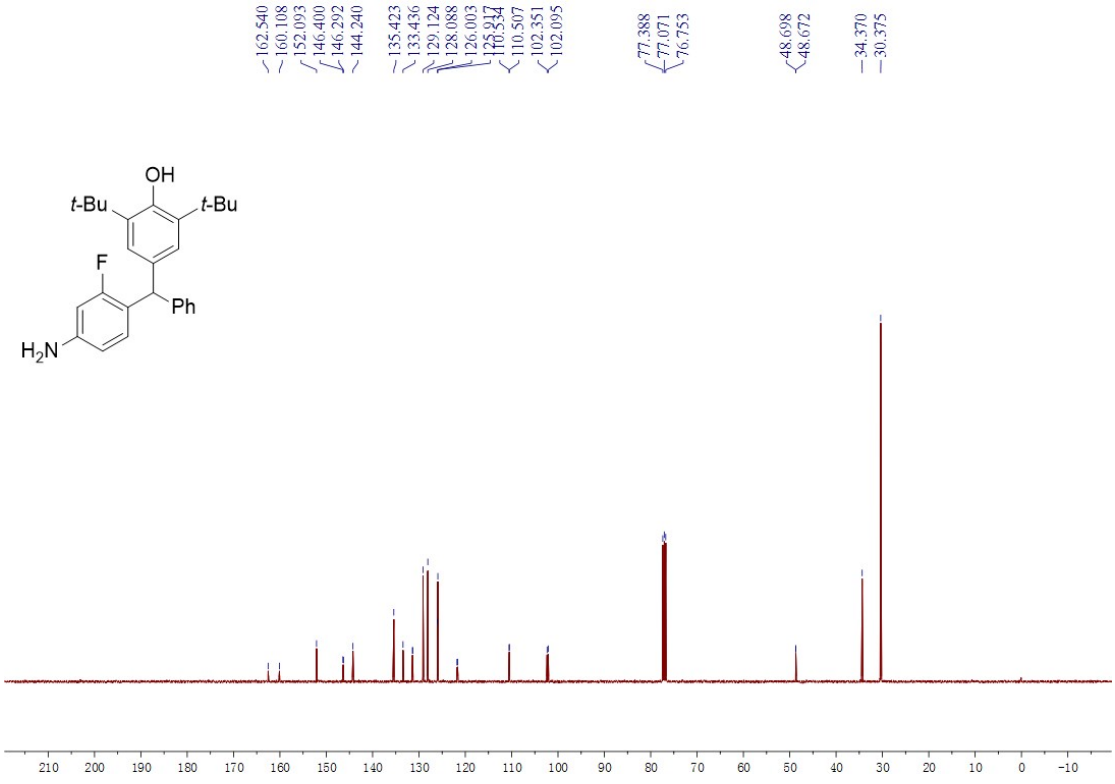
6.710
6.690
6.669
6.360
6.336
5.596
5.062
3.628
1.353
OH
t-Bu
t-Bu
F
Ph
H2N
2.00
1.00
2.00
2.00
1.00
2.00
1.00
1.00
2.00
18.00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146.400
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129.124
128.088
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110.507
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102.095
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76.753
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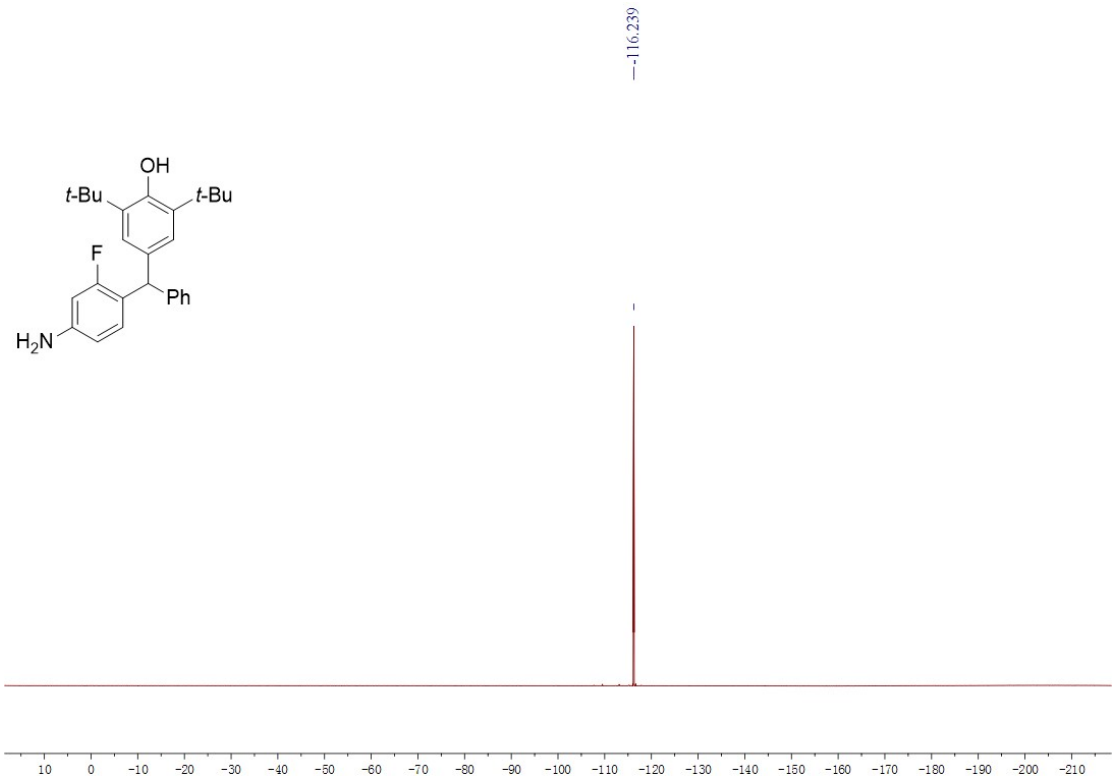
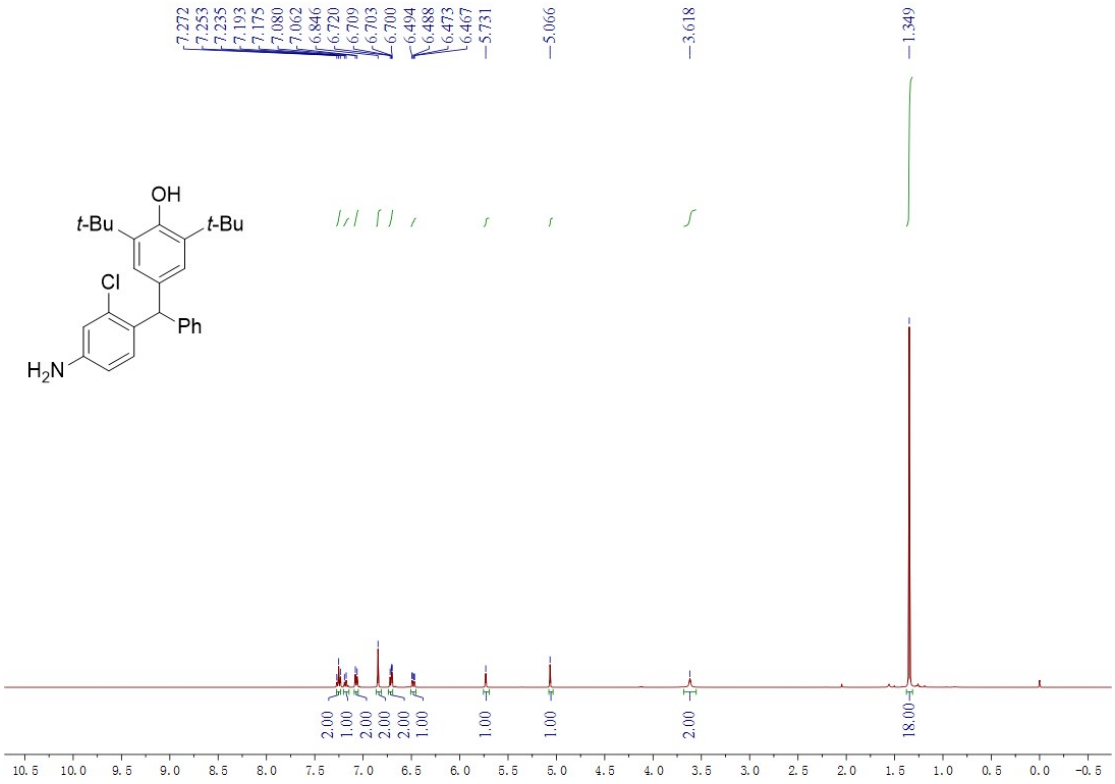
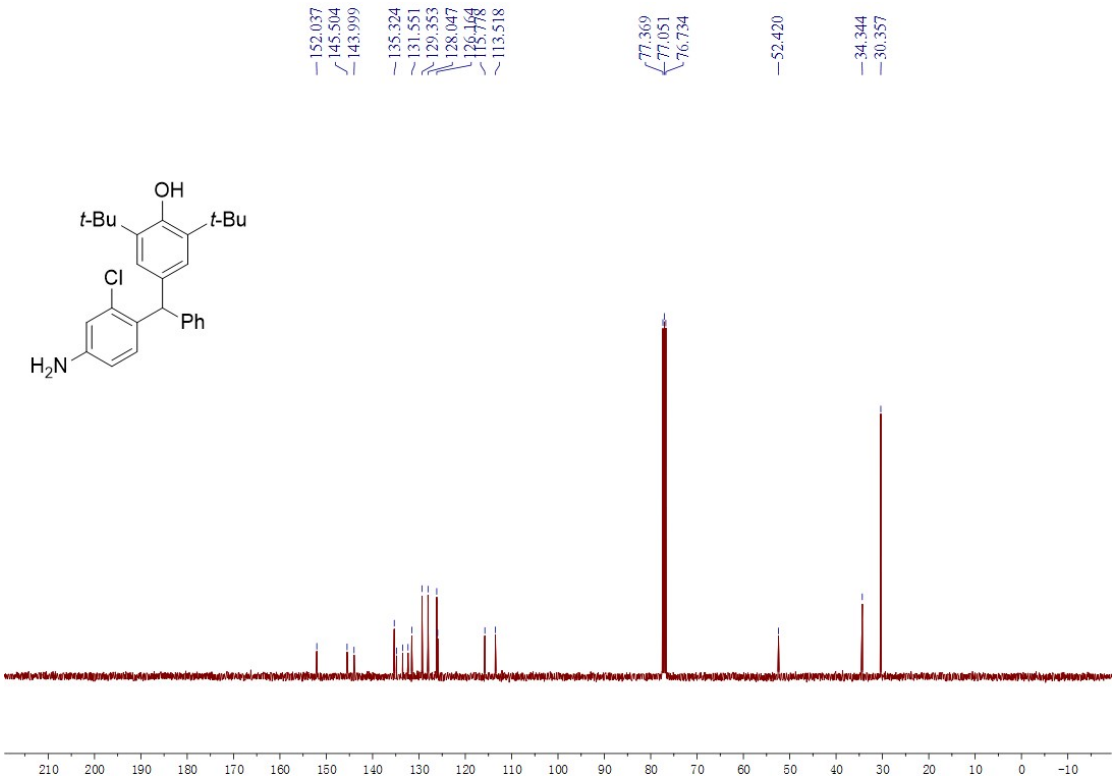
H2N

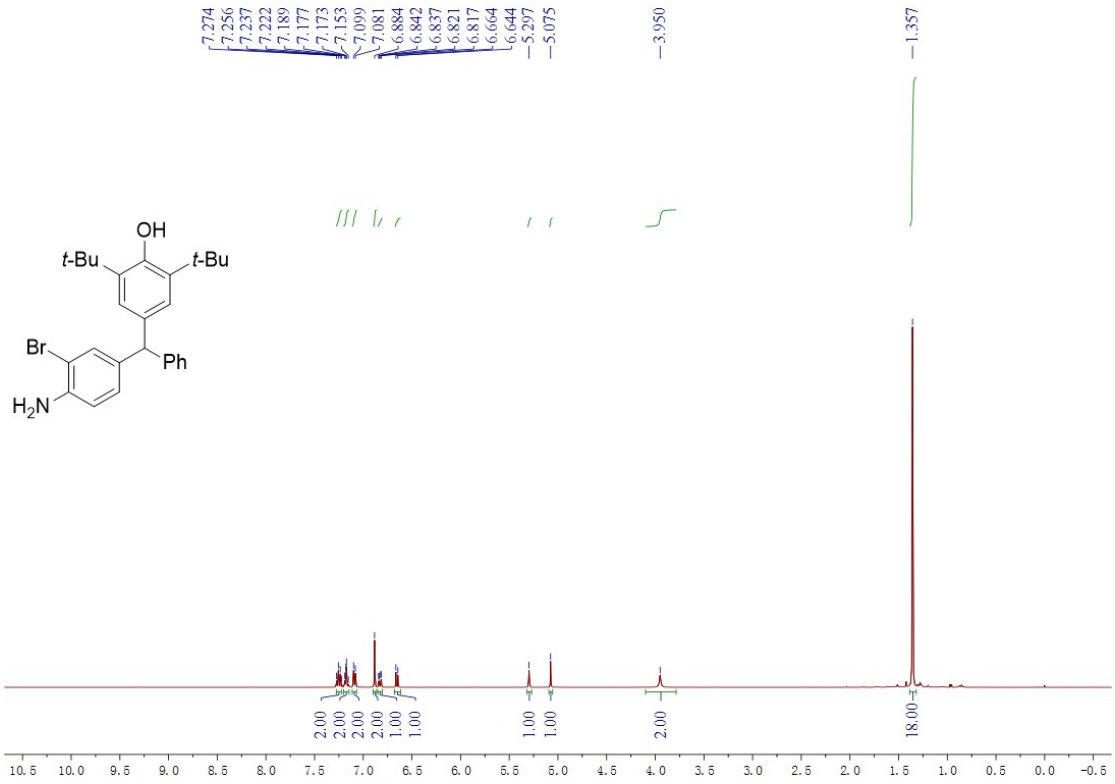


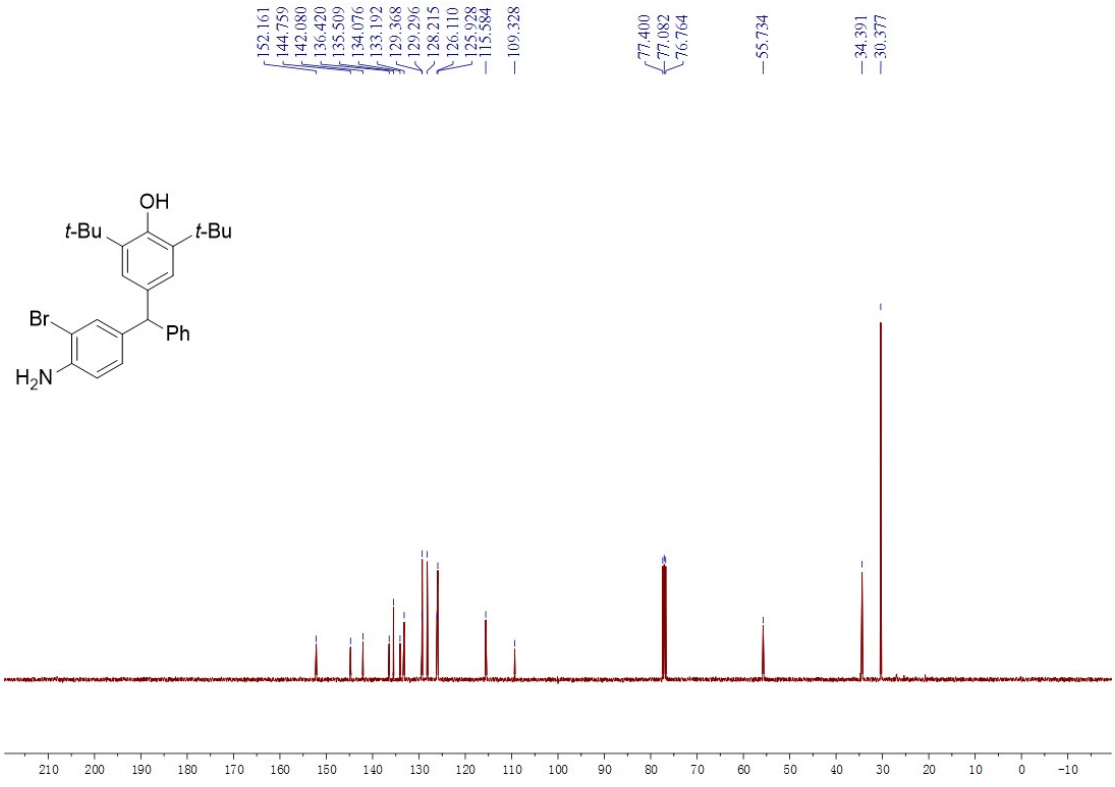
4-((4-Amino-2-chlorophenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3g)



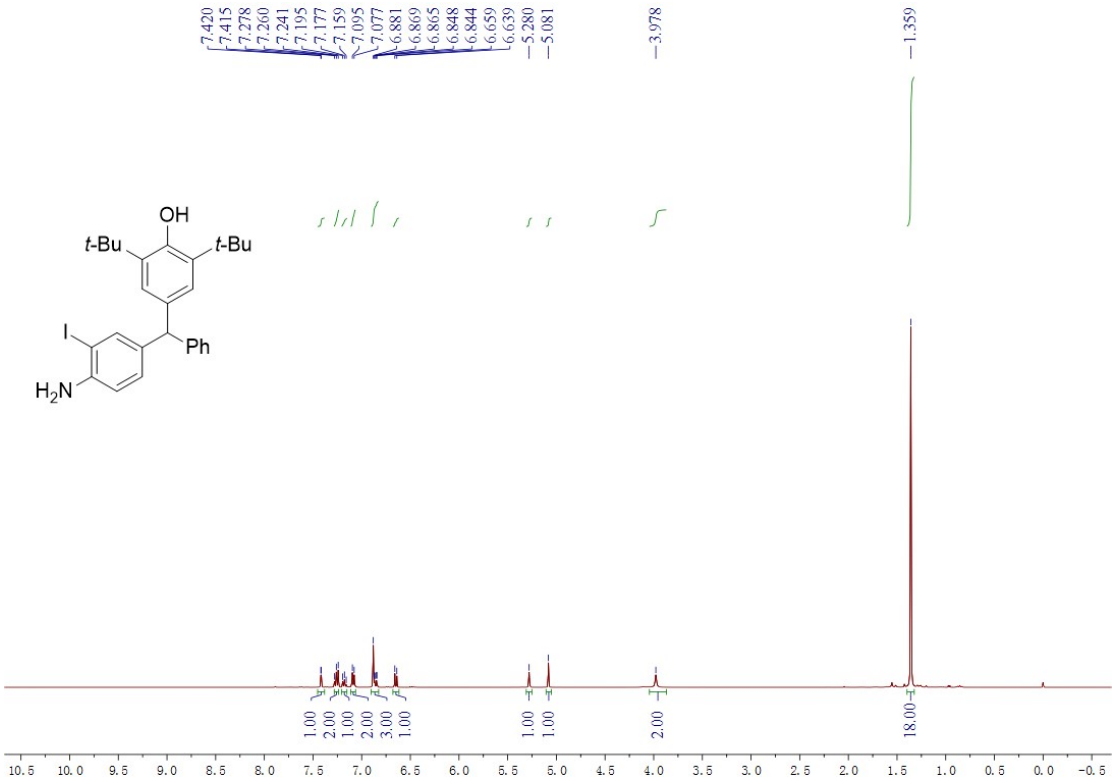


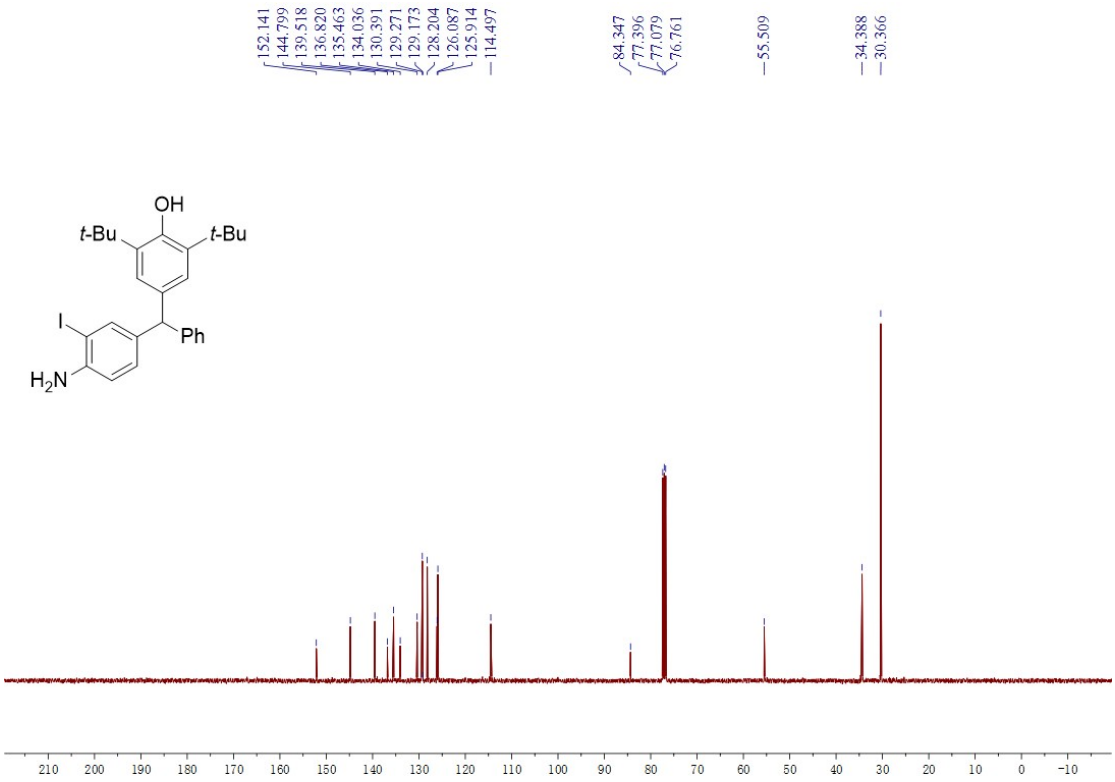
4-((4-Amino-3-bromophenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3h)



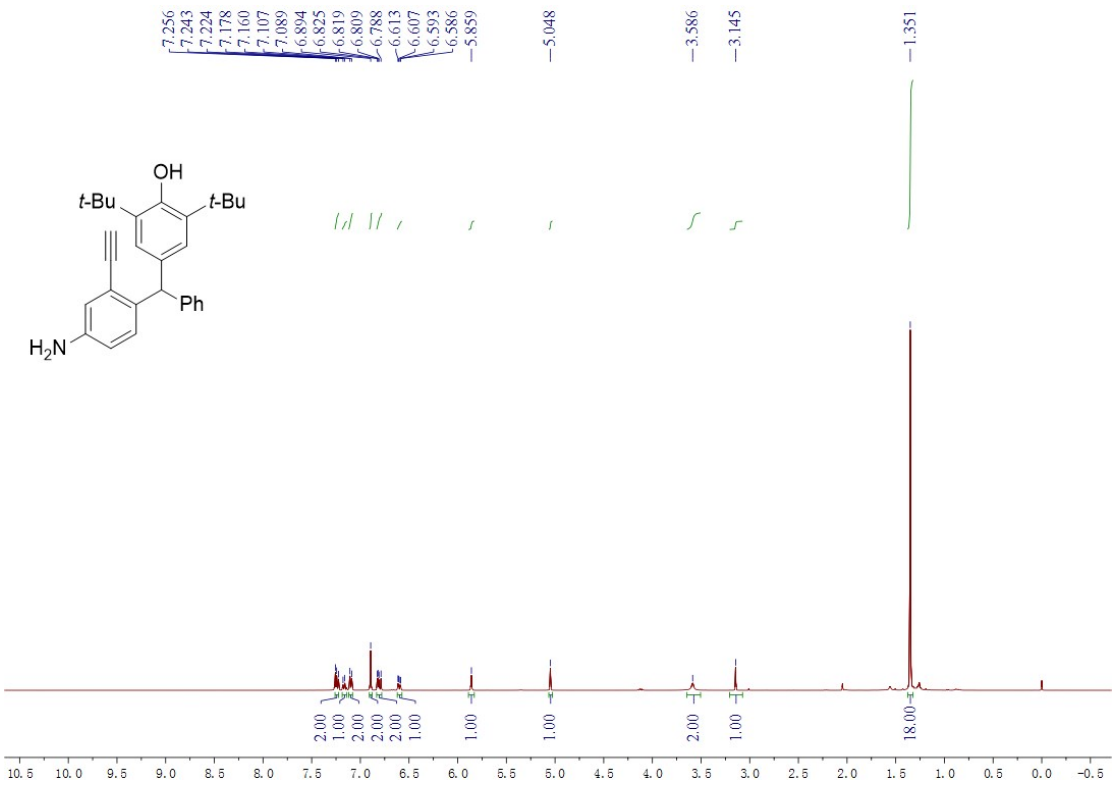


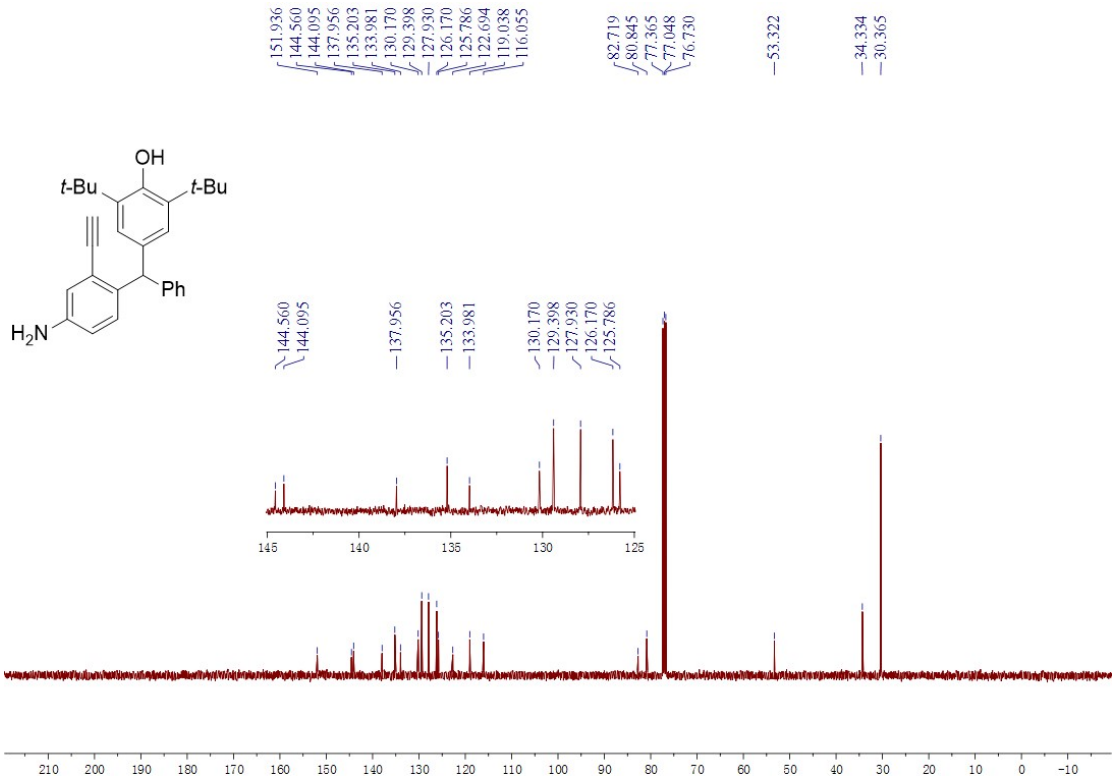
4-((4-Amino-3-iodophenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3i)



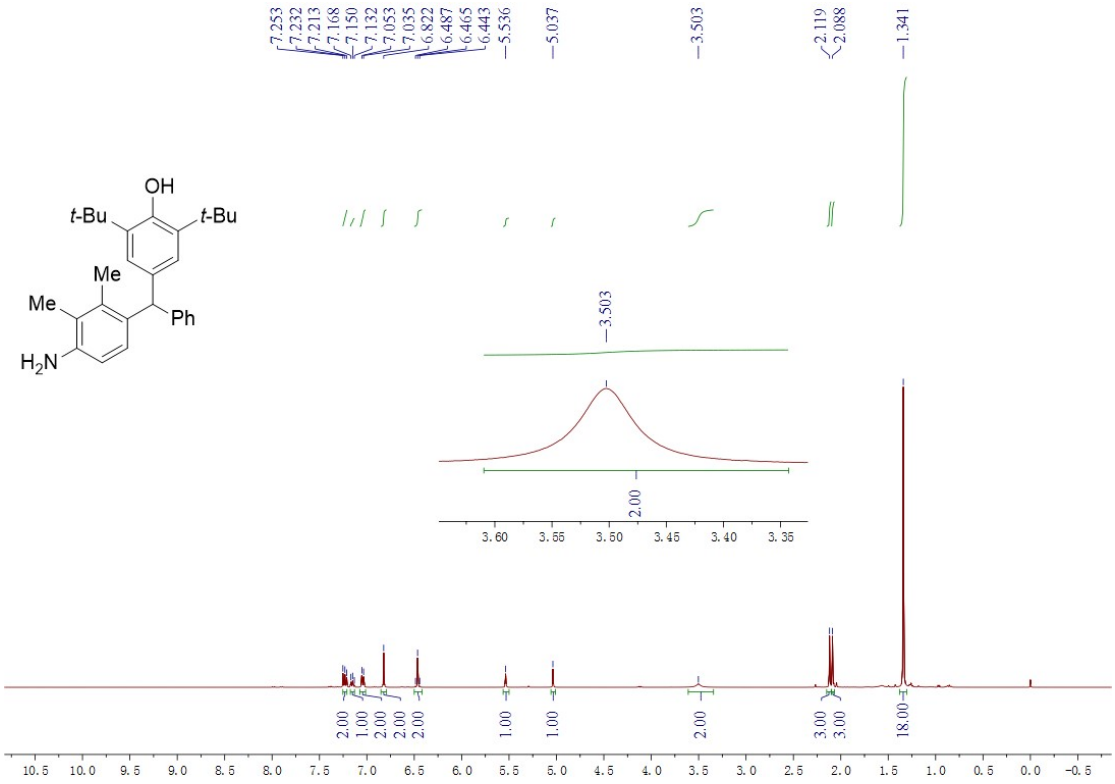


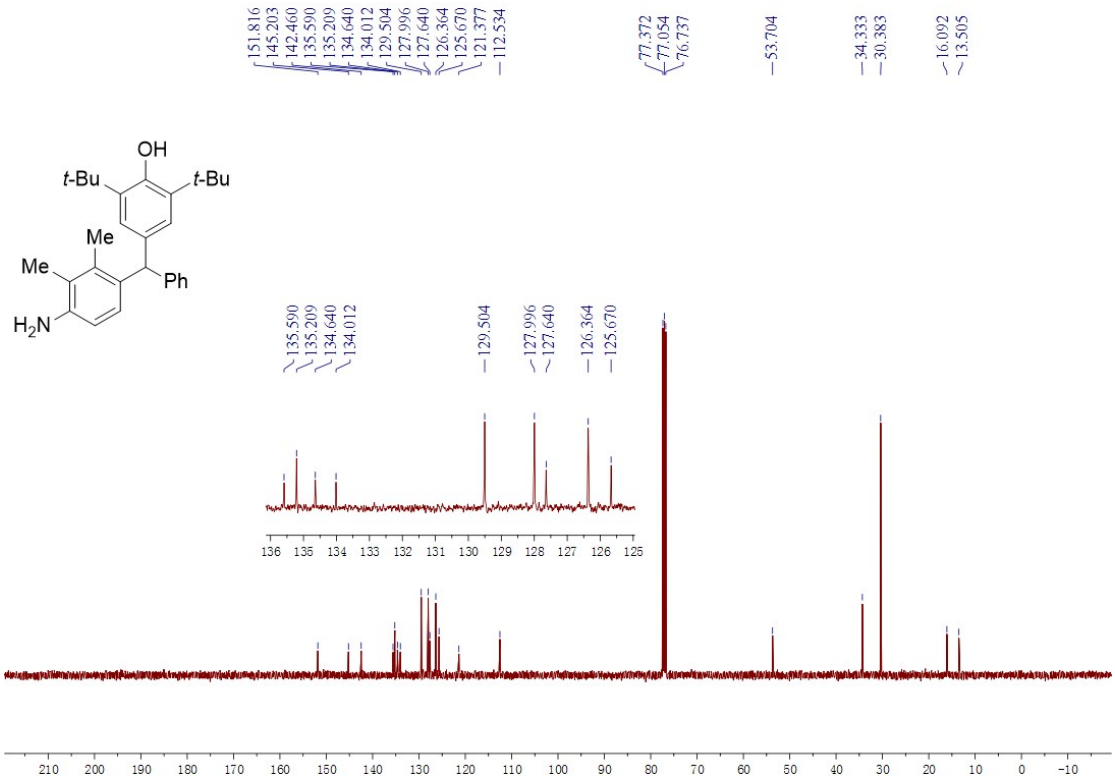
4-((4-Amino-2-ethynylphenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3j)



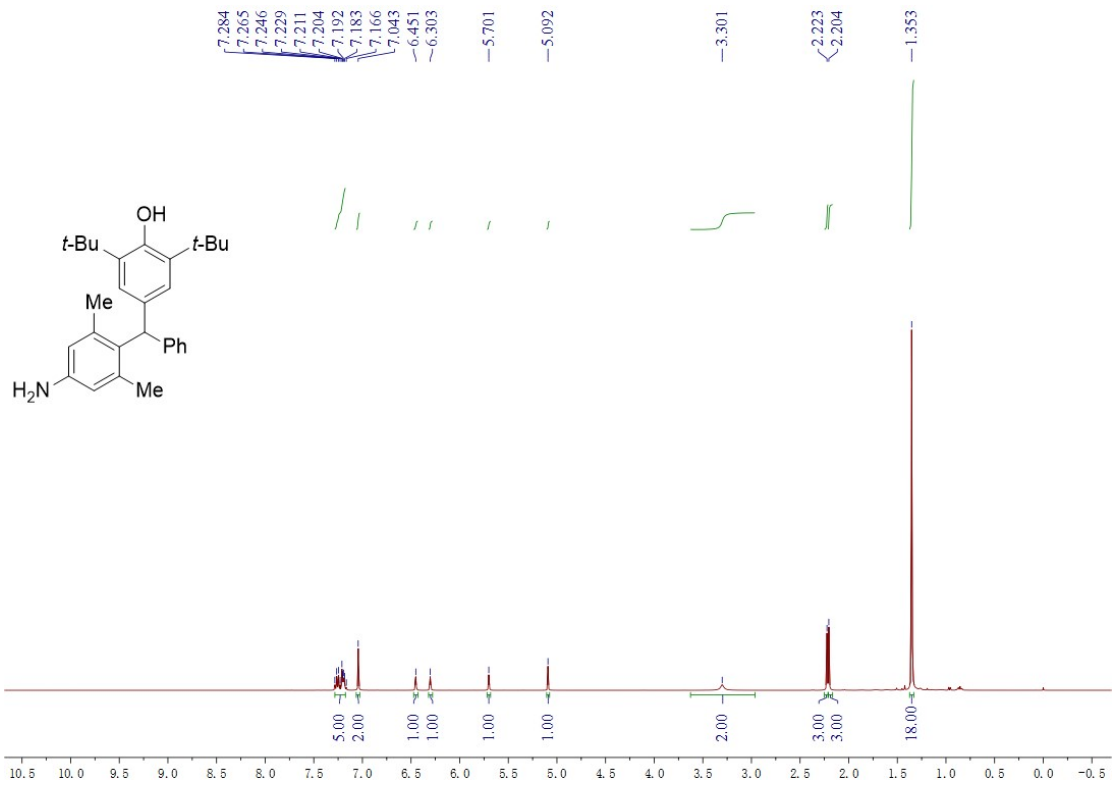


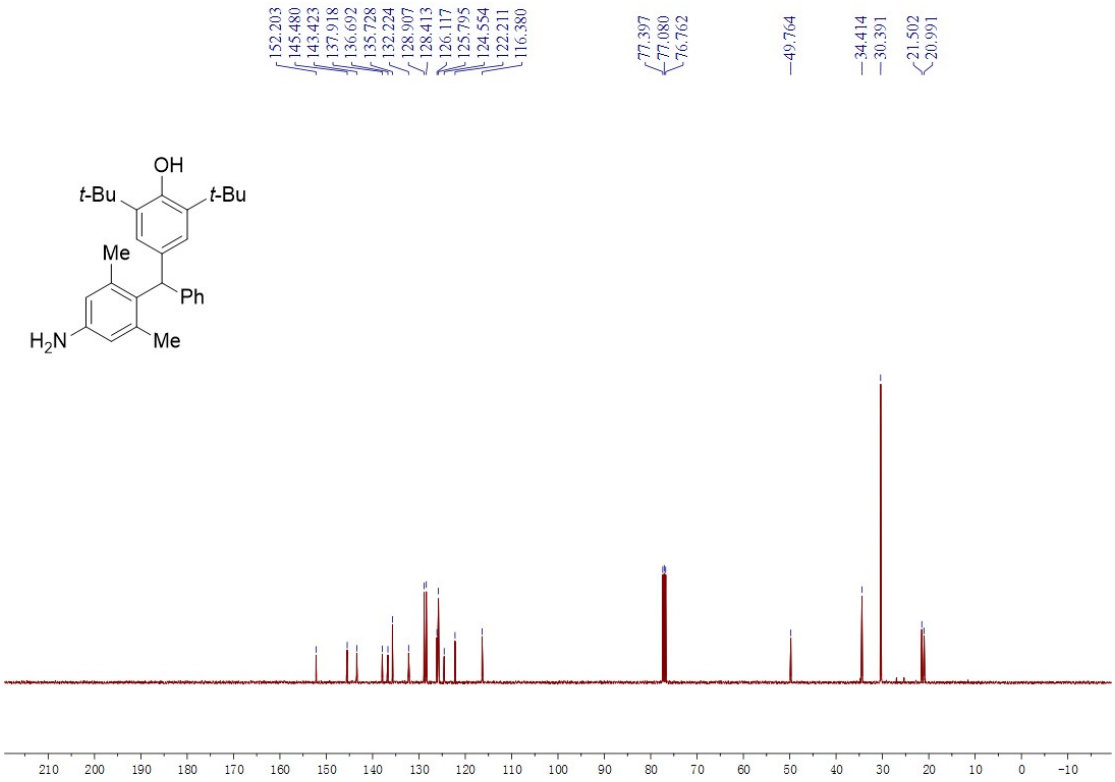
4-((4-Amino-2,3-dimethylphenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3k)



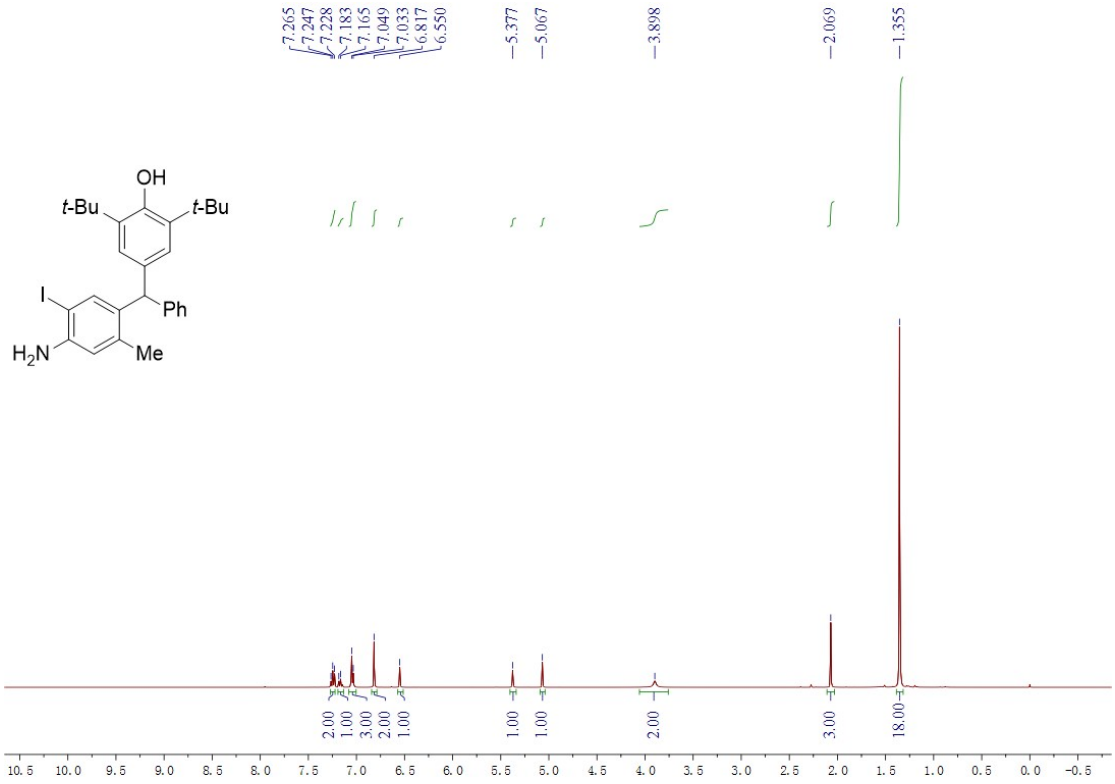


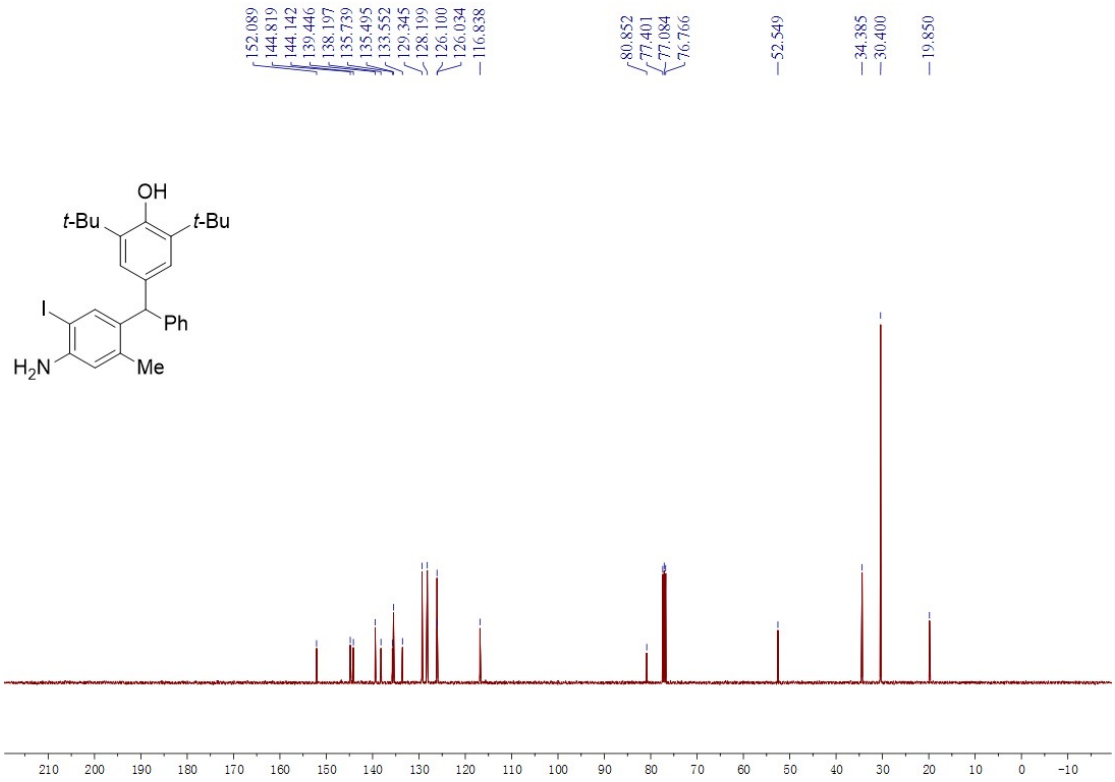
4-((4-Amino-2,6-dimethylphenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3l)



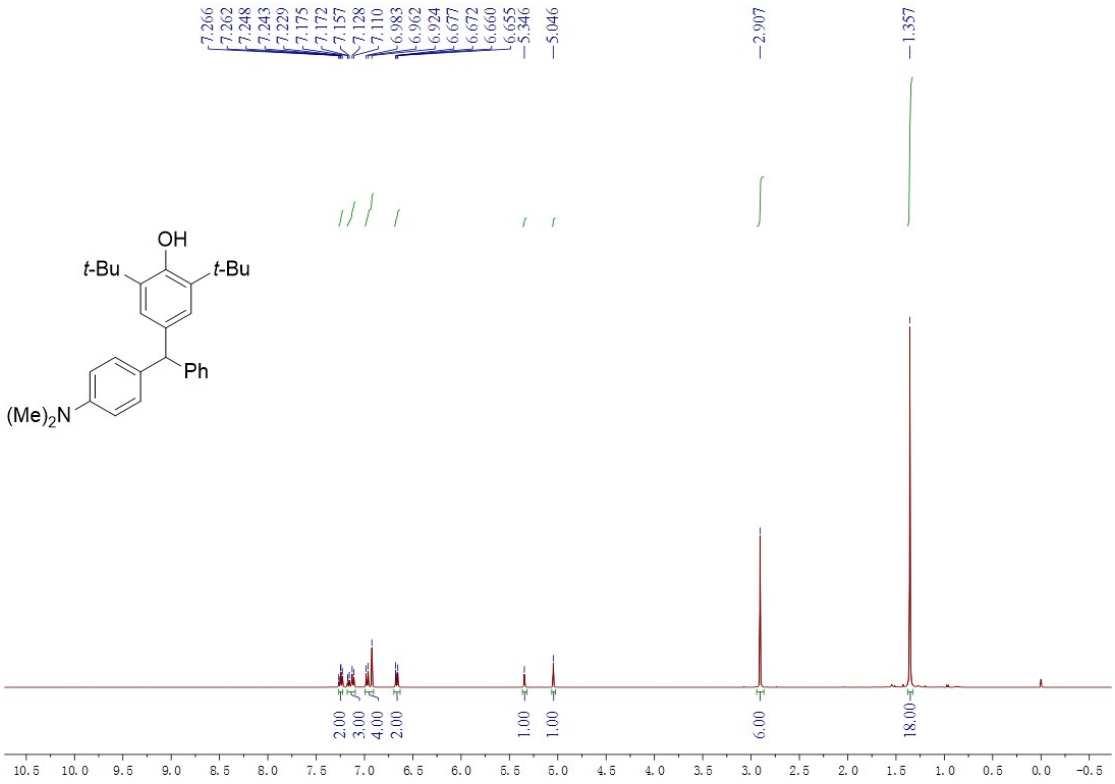


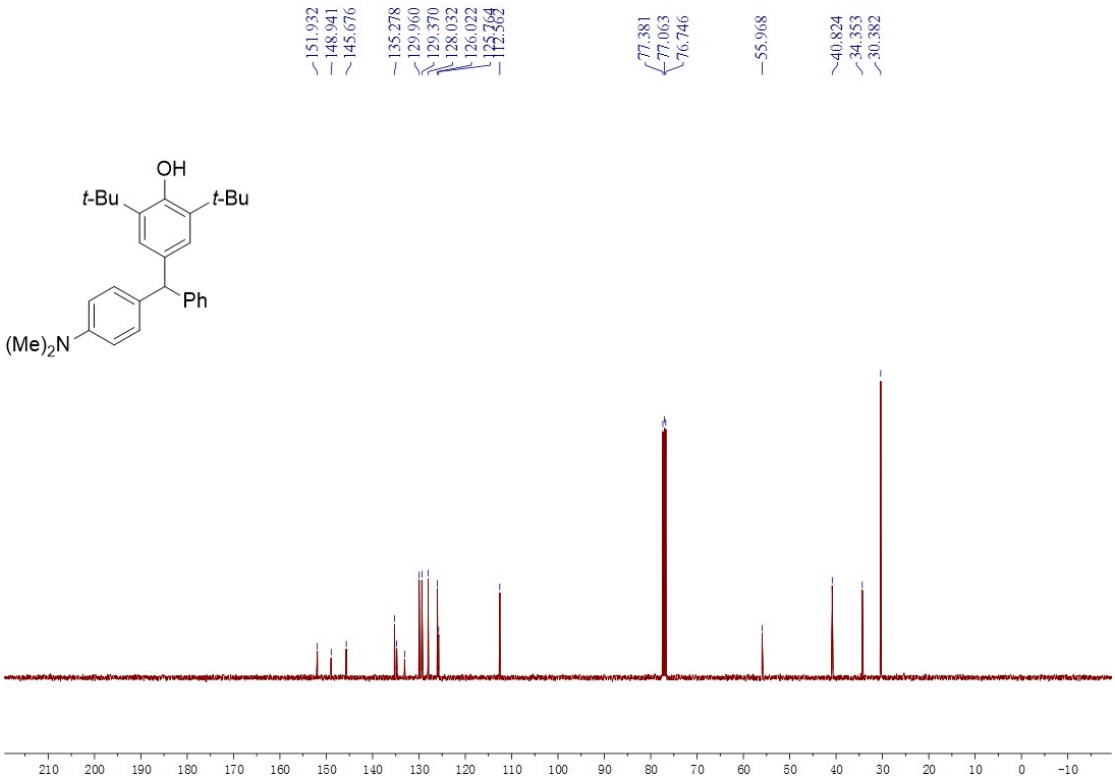
4-((4-Amino-5-iodo-2-methylphenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3m)



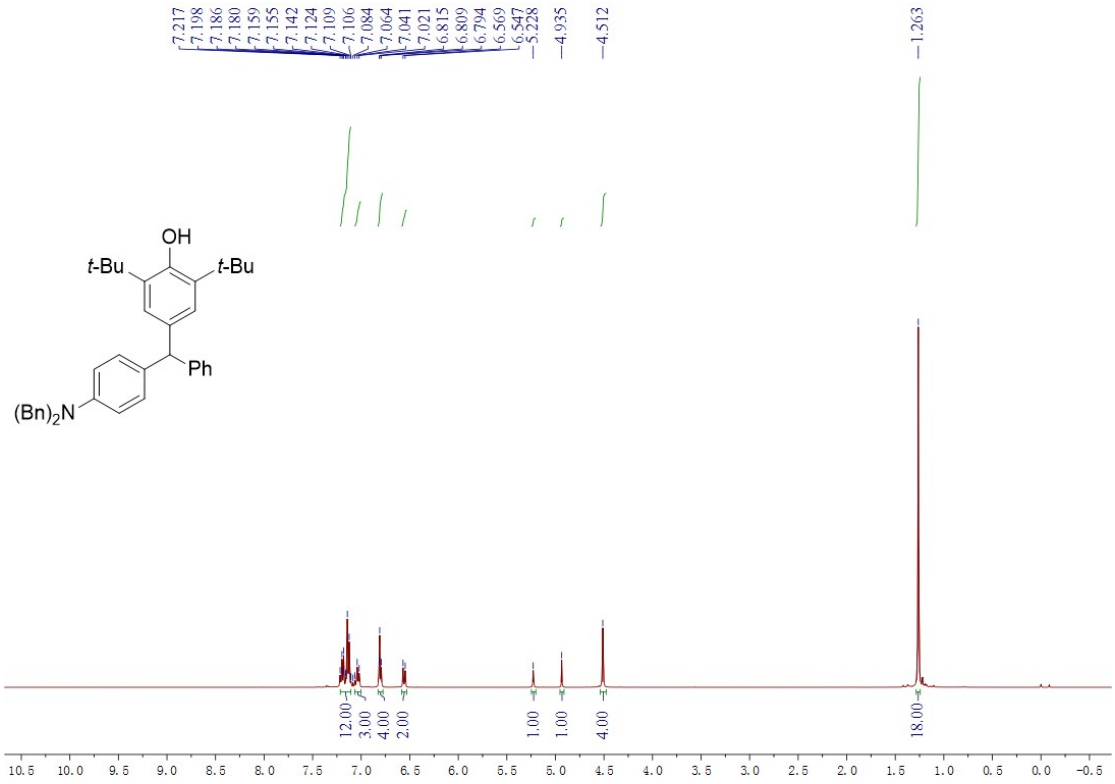


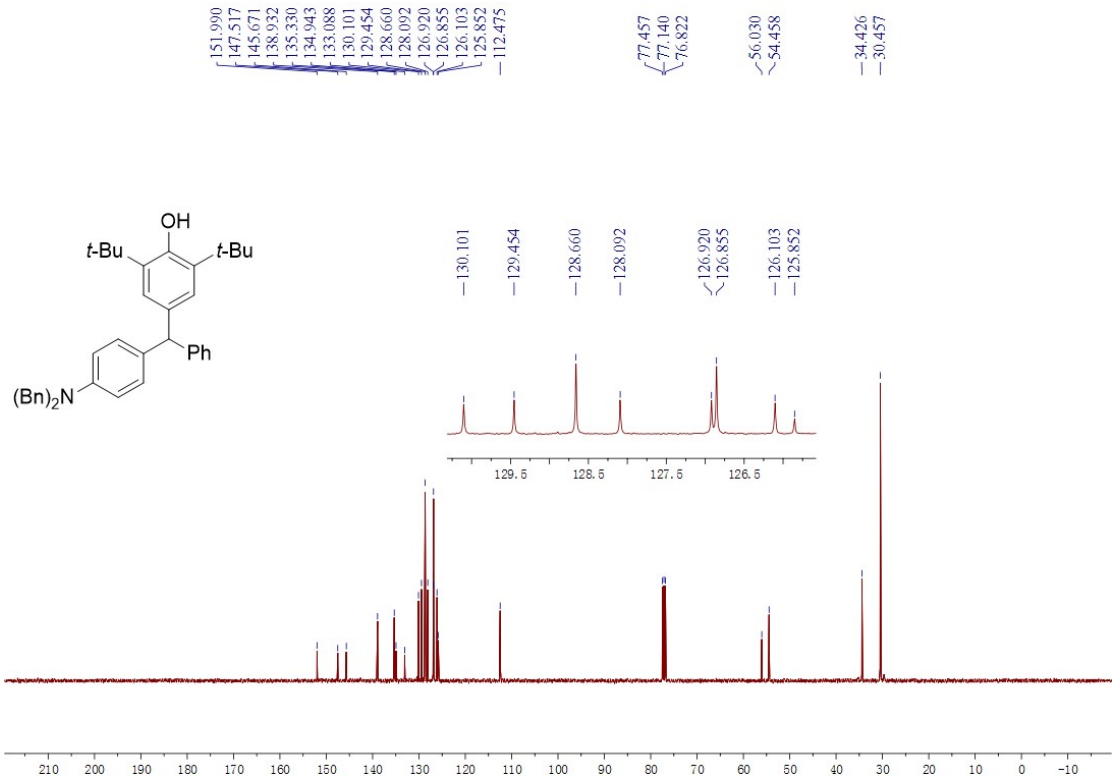
2,6-Di-tert-butyl-4-((4-(dimethylamino)phenyl)(phenyl)methyl)phenol (3n)



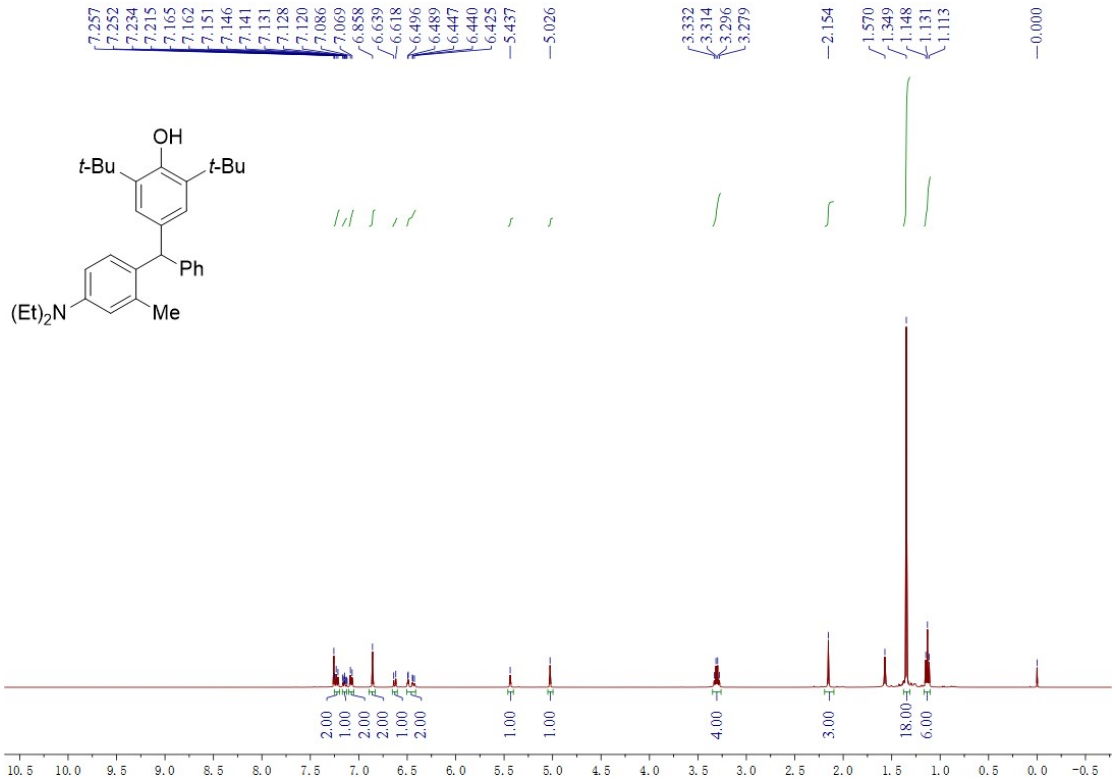


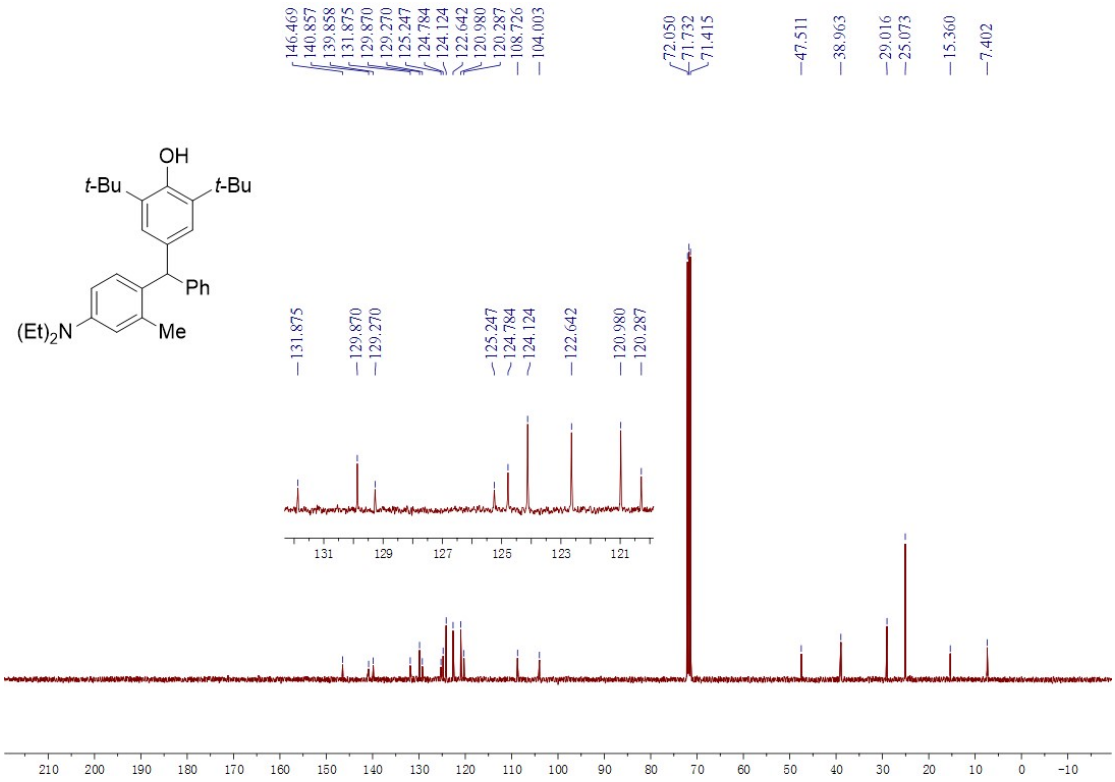
2,6-Di-tert-butyl-4-((4-(dibenzylamino)phenyl)(phenyl)methyl)phenol (3o)



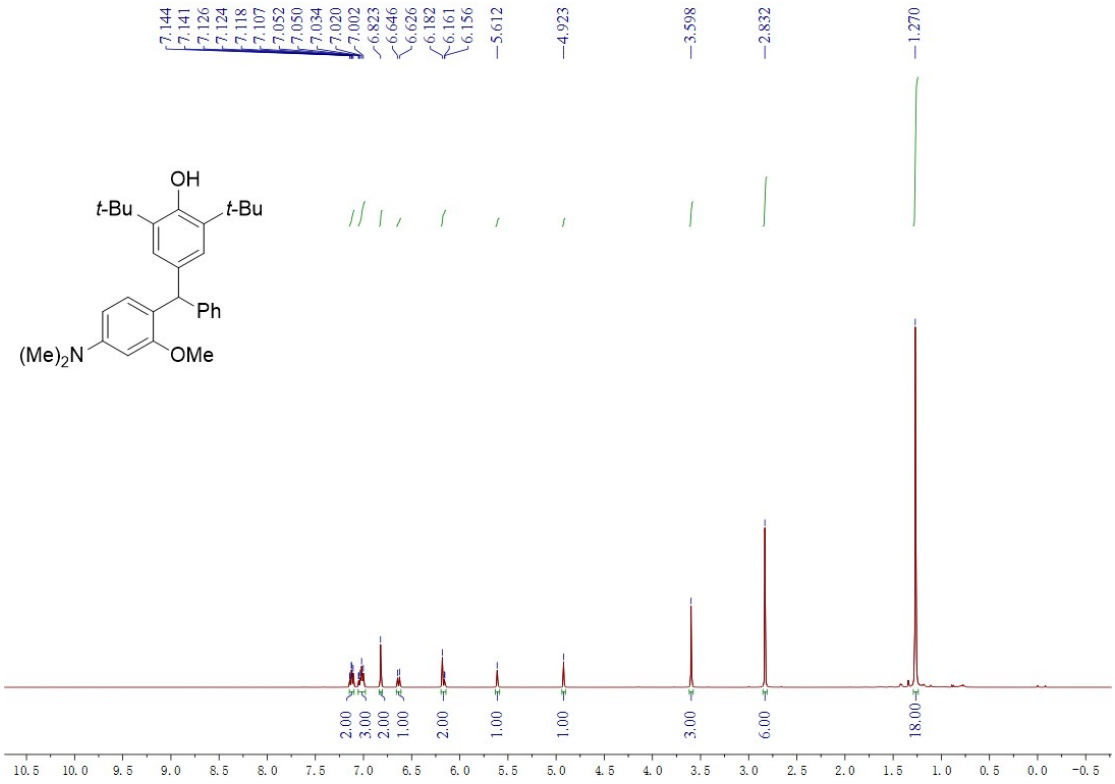


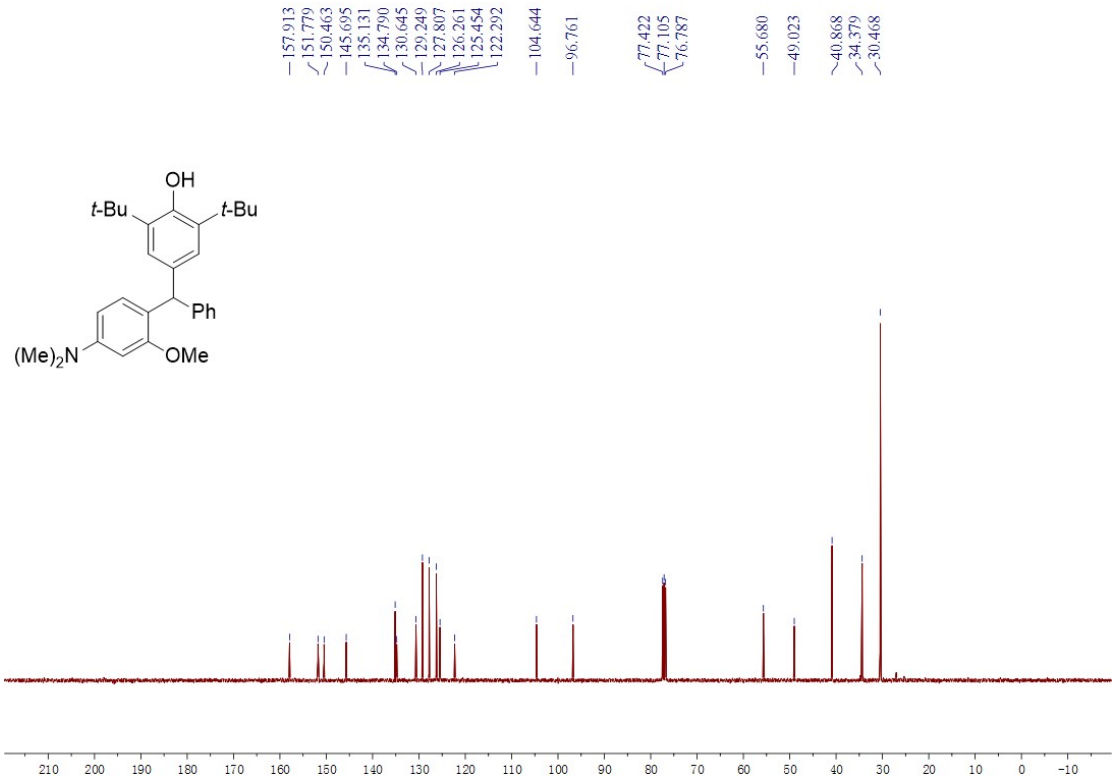
2,6-Di-tert-butyl-4-((4-(diethylamino)-2-methylphenyl)(phenyl)methyl)phenol (3p)



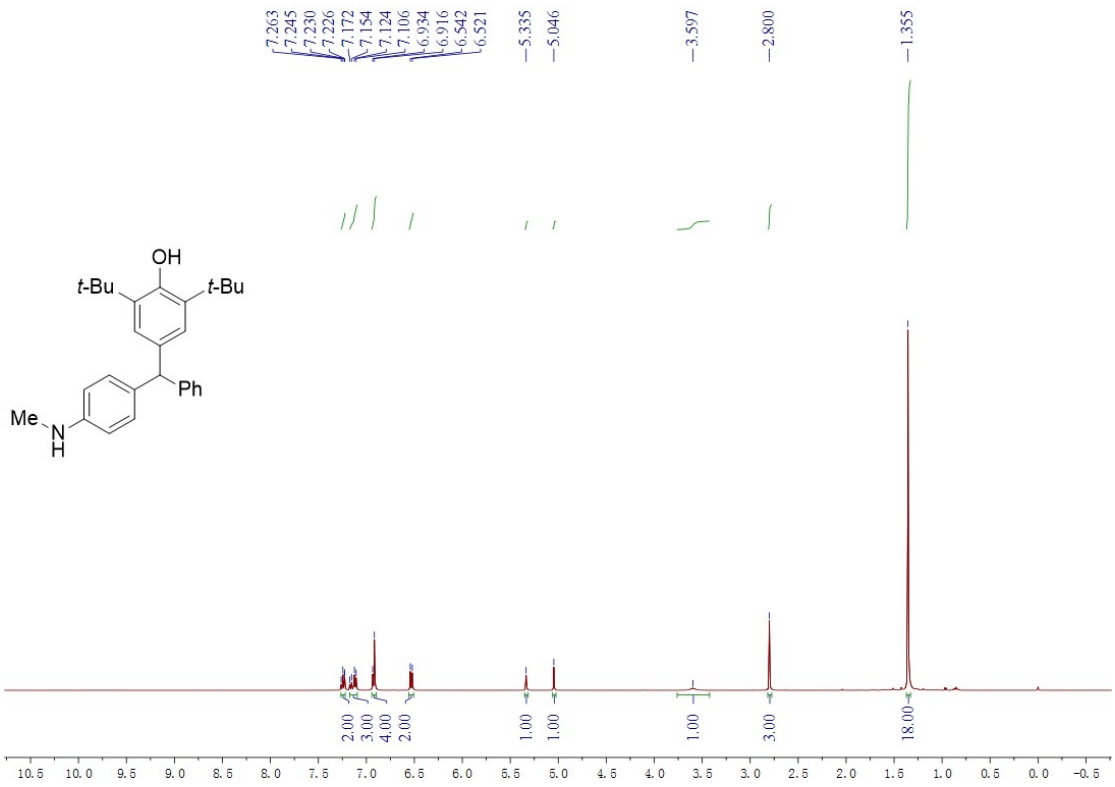


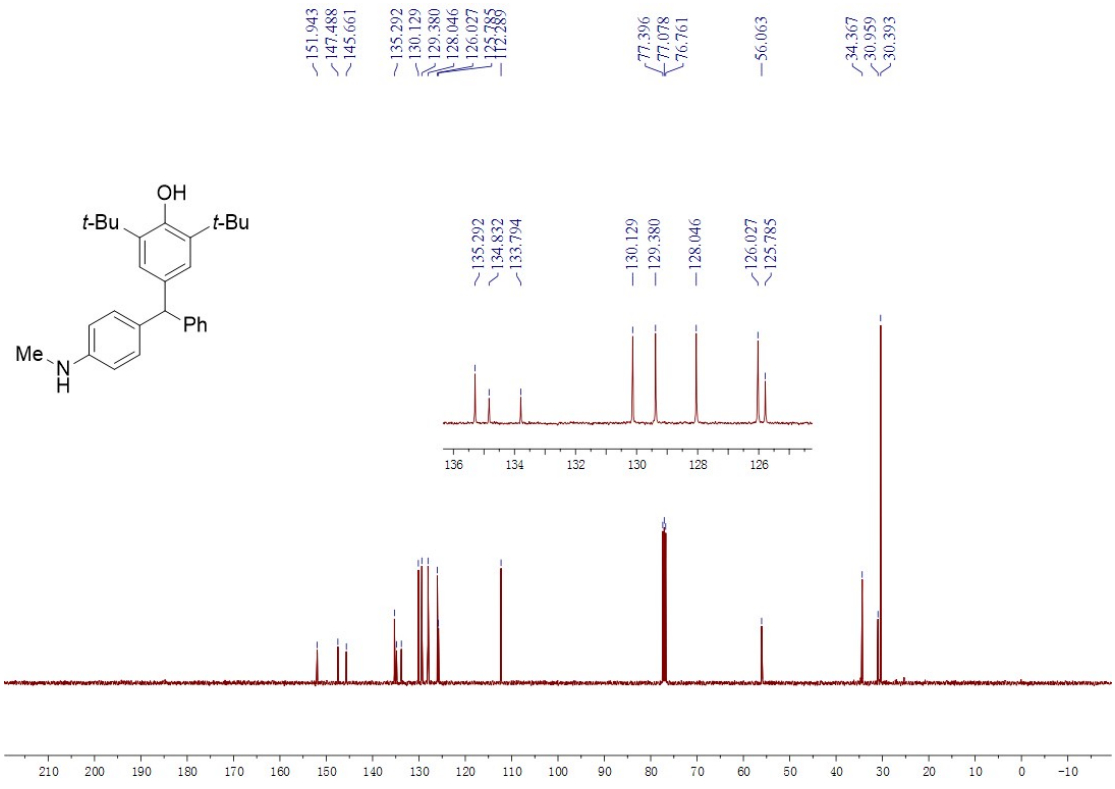
2,6-Di-tert-butyl-4-((4-(dimethylamino)-2-methoxyphenyl)(phenyl)methyl)phenol (3q)



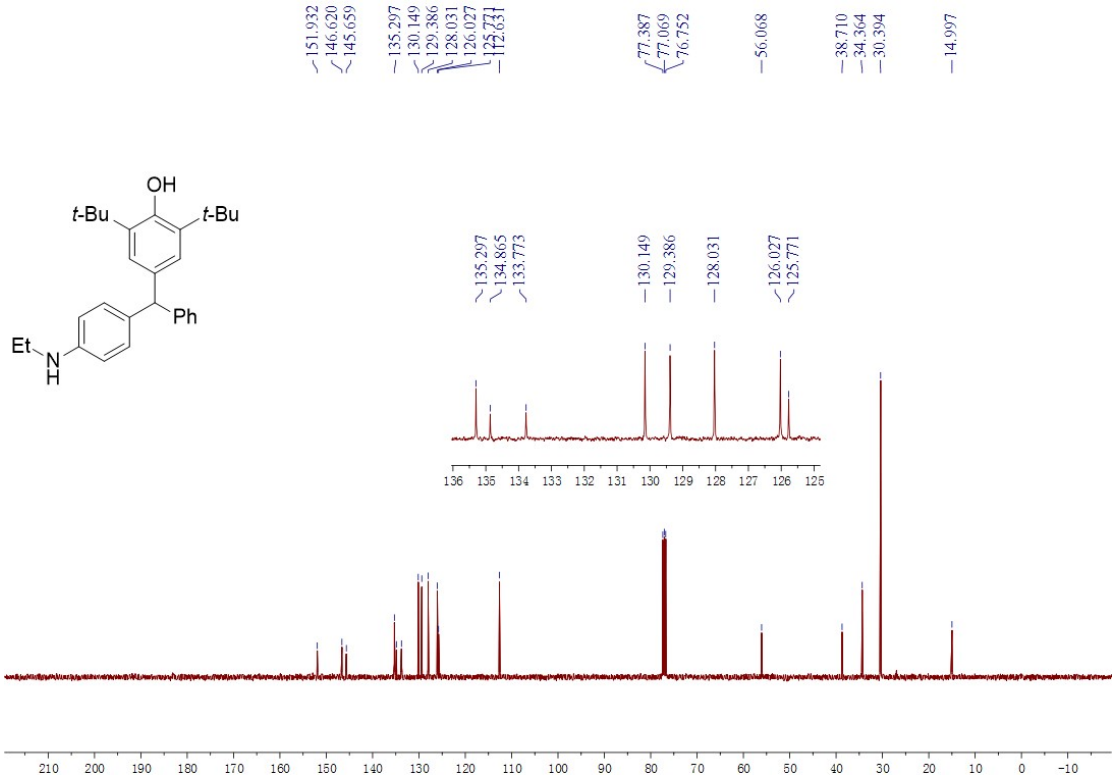


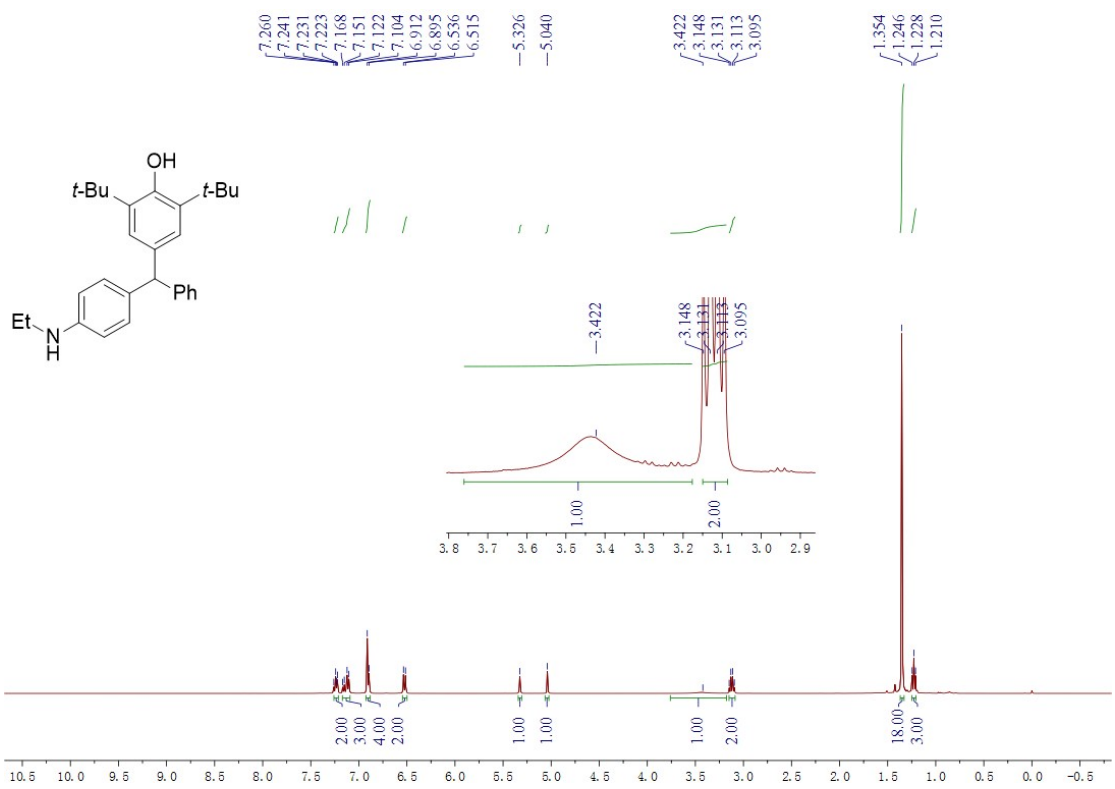
2,6-Di-tert-butyl-4-((4-(methylamino)phenyl)(phenyl)methyl)phenol (3r)



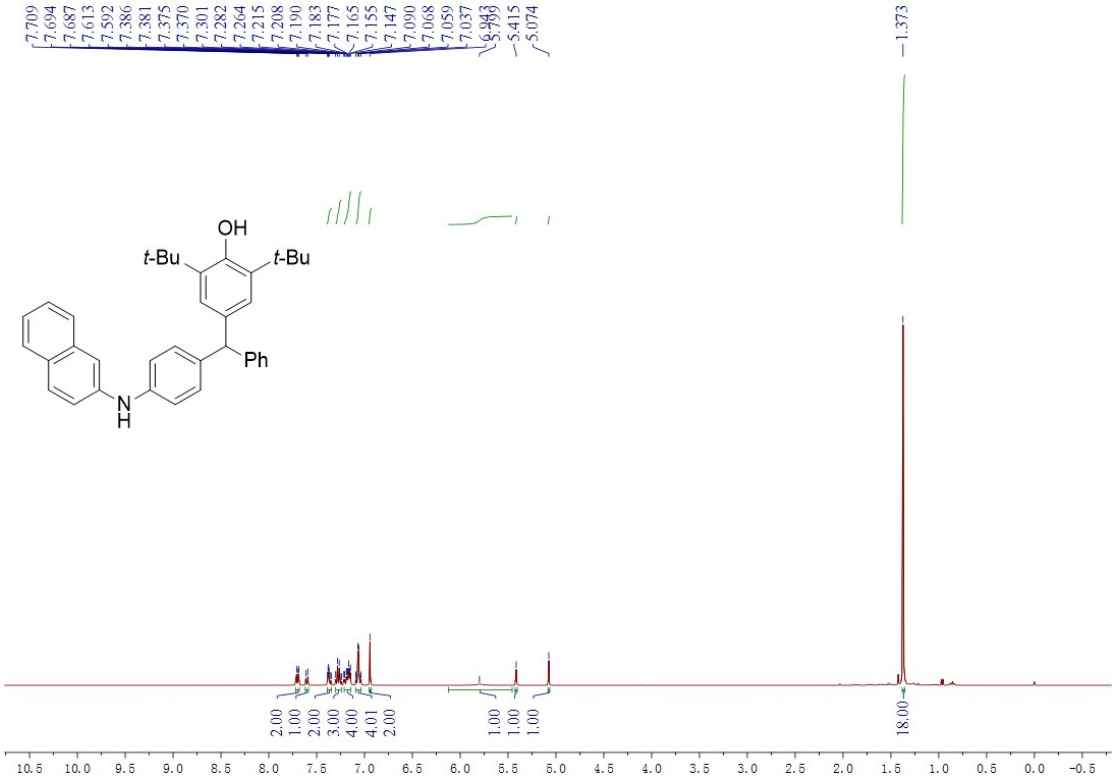


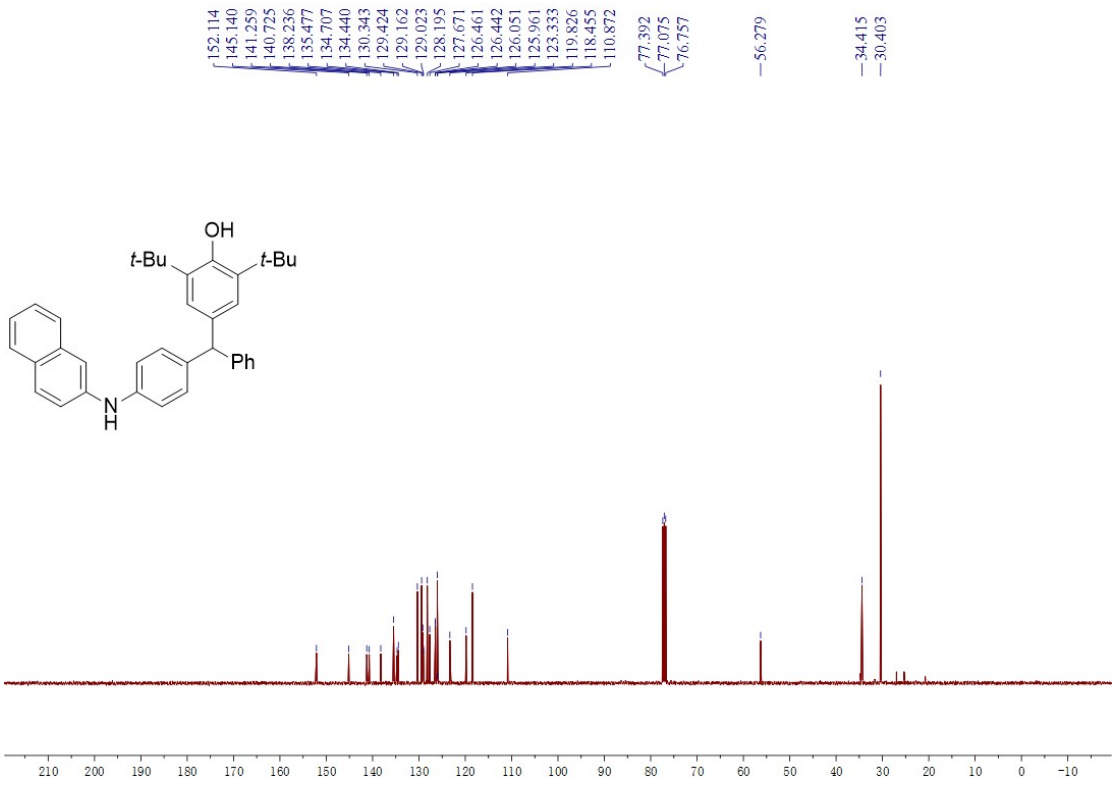
2,6-Di-tert-butyl-4-((4-(ethylamino)phenyl)(phenyl)methyl)phenol (3s)



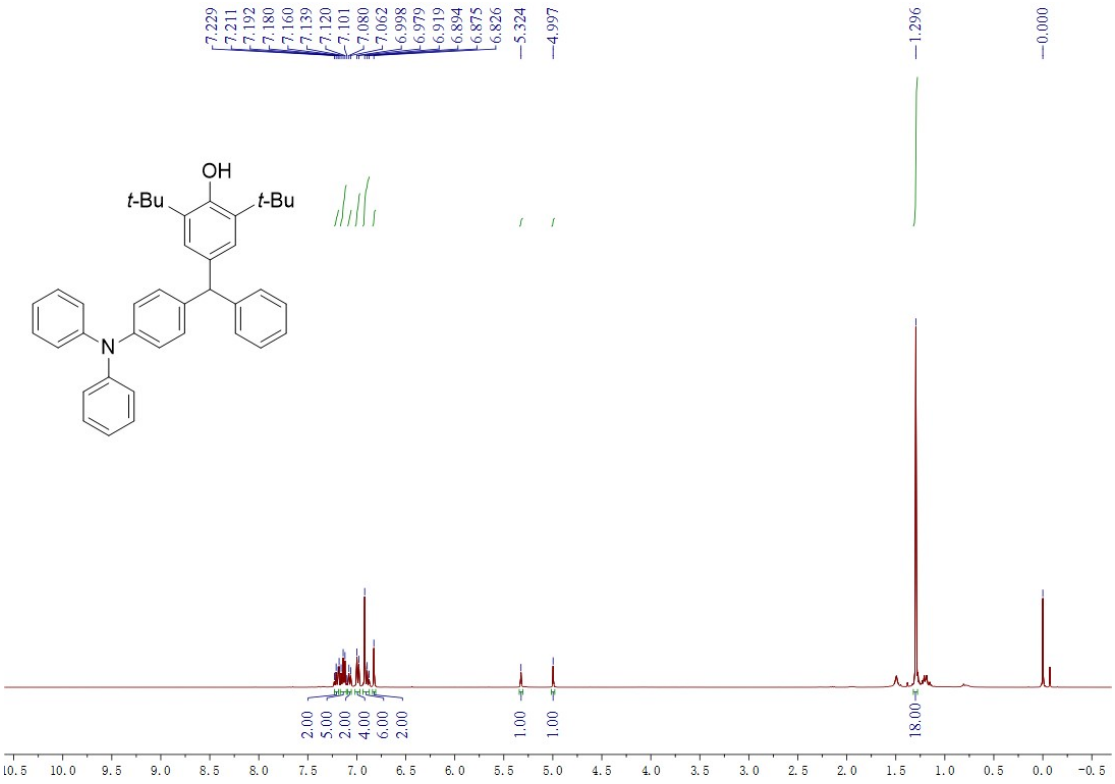


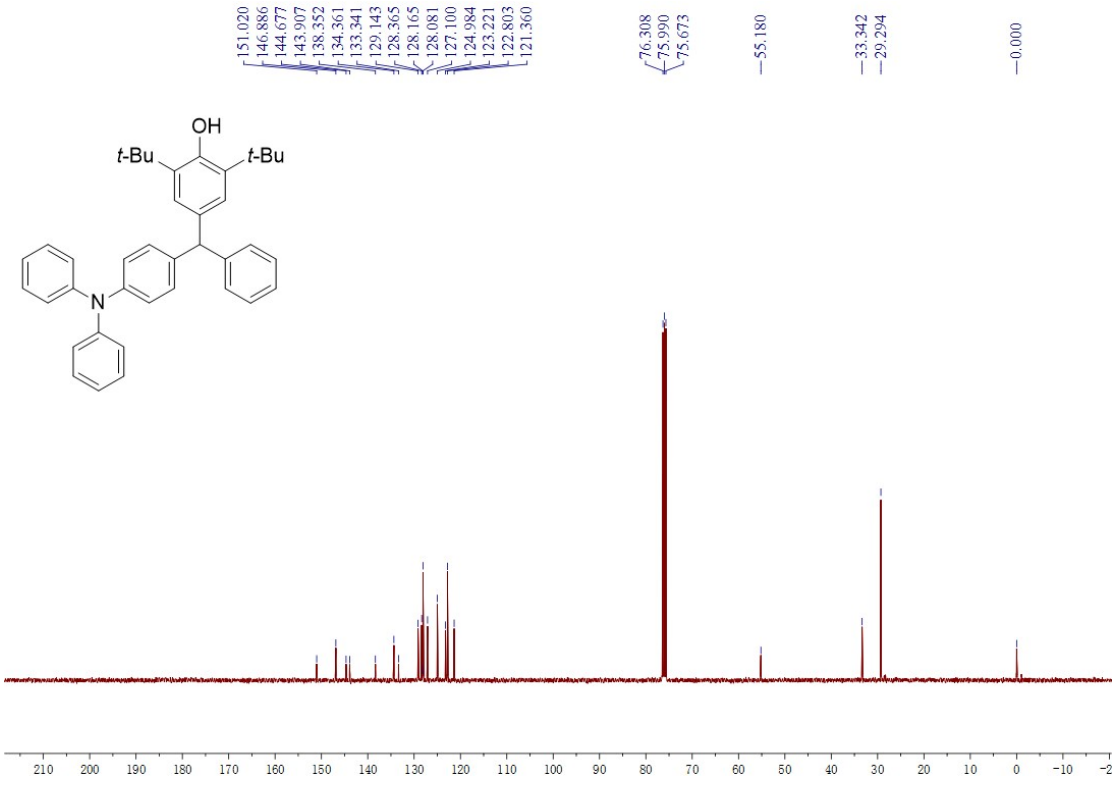
2,6-Di-tert-butyl-4-((4-(naphthalen-2-ylamino)phenyl)(phenyl)methyl)phenol (3t)



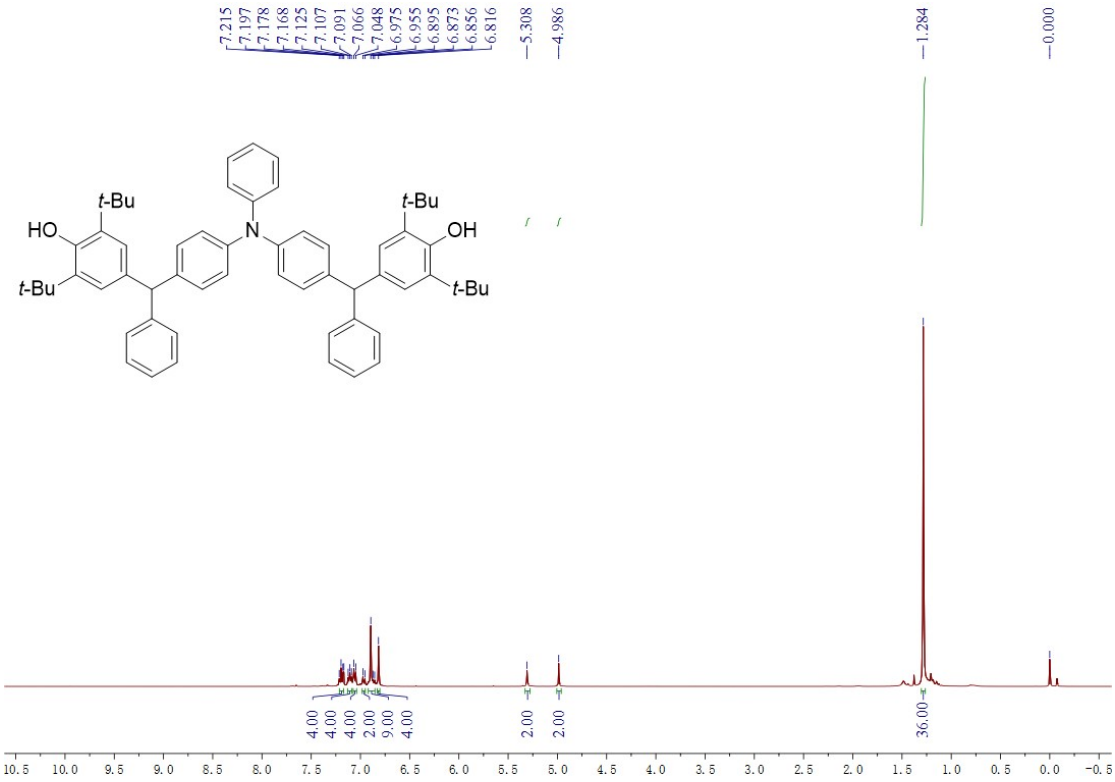


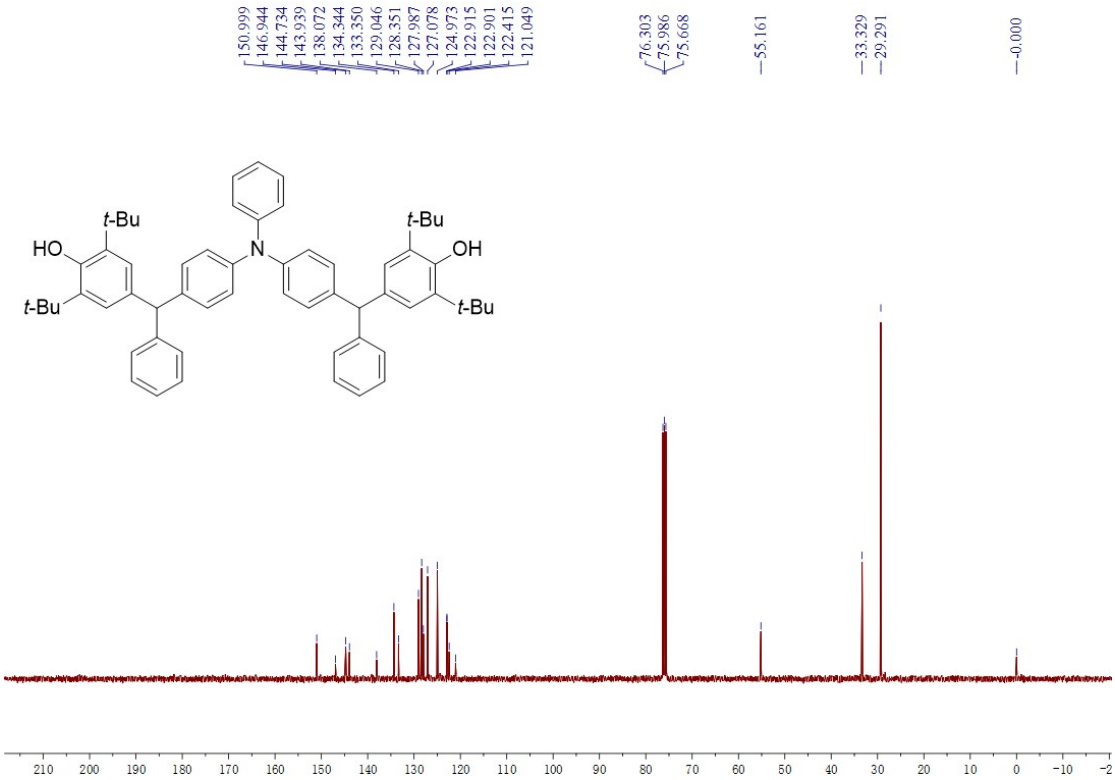
2,6-Di-tert-butyl-4-((4-(diphenylamino)phenyl)(phenyl)methyl)phenol (3u)



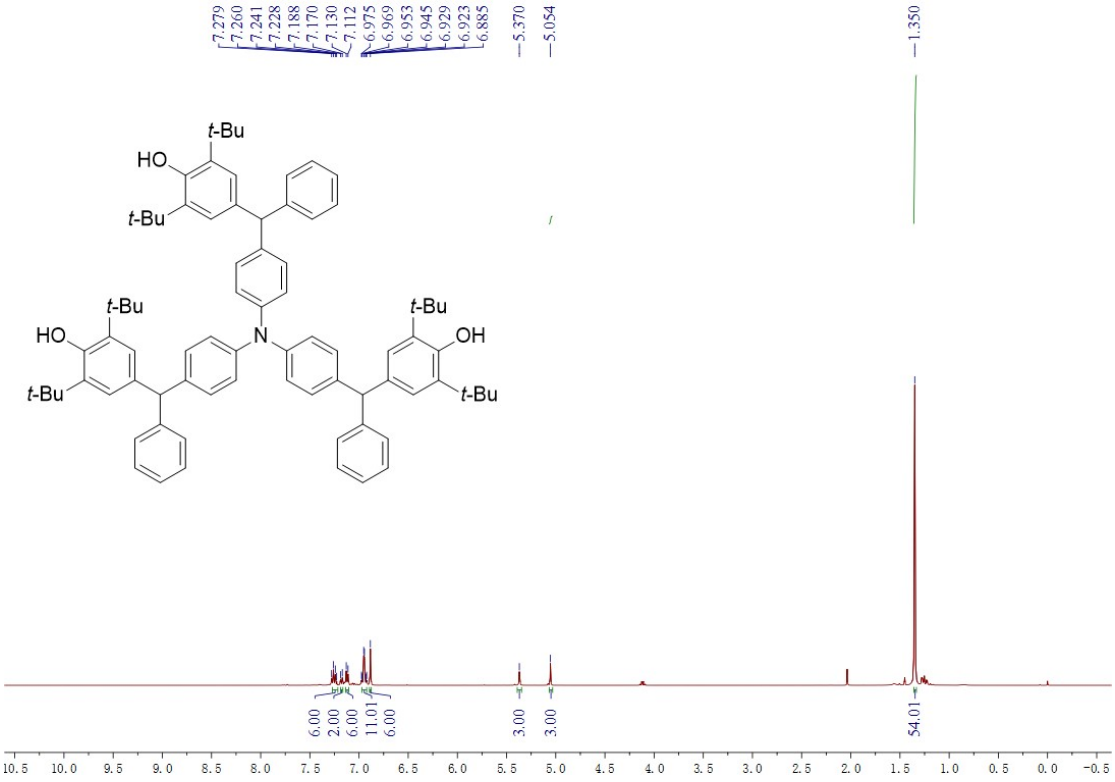


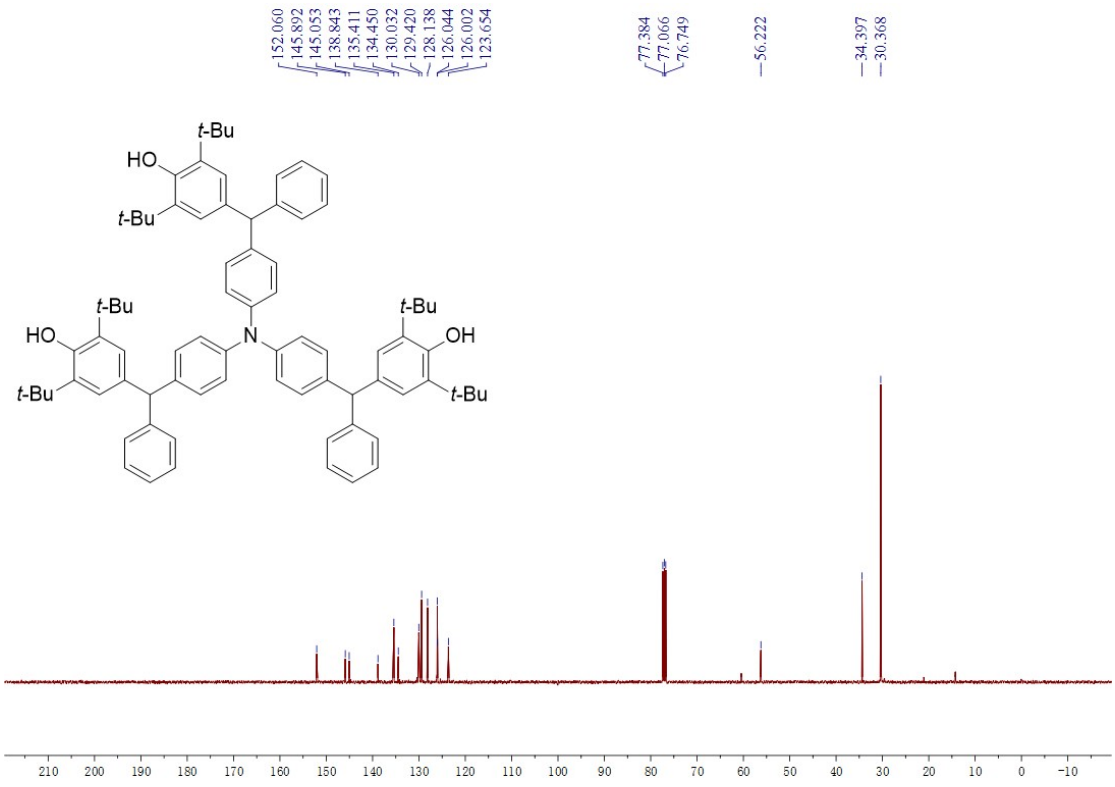
4,4'-(((Phenylazanediyl)bis(4,1-phenylene))bis(phenylmethylene))bis(2,6-di-tert-butylphenol) (3u')



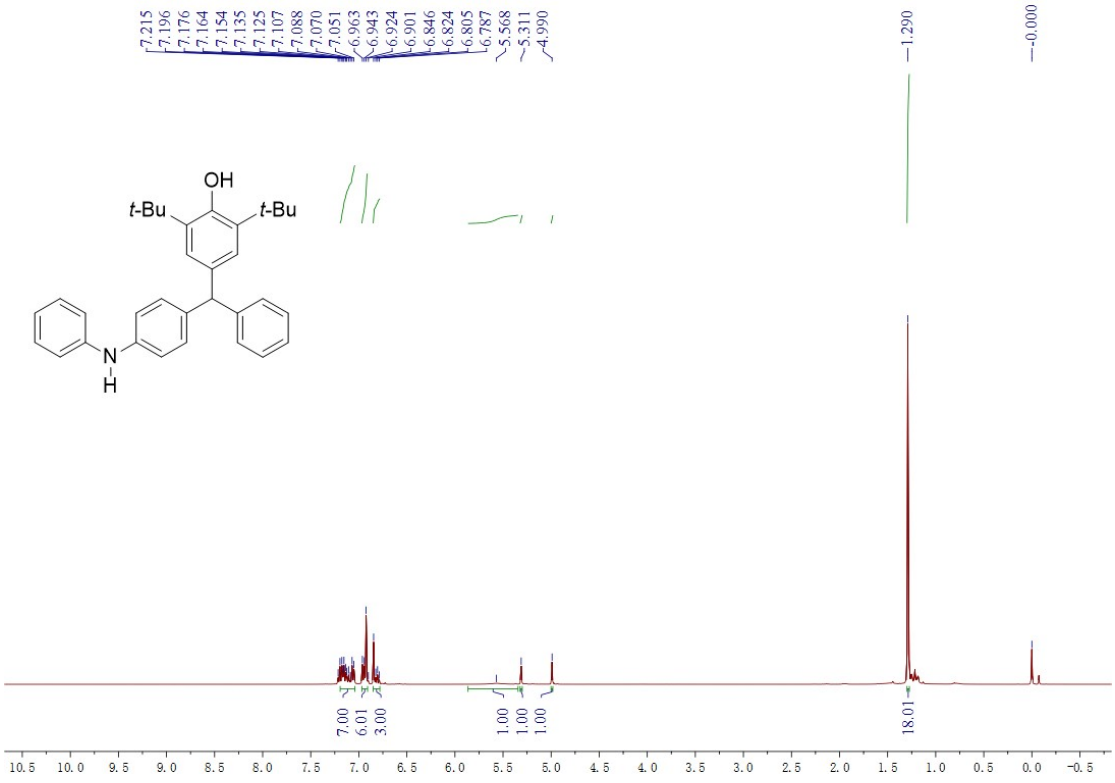


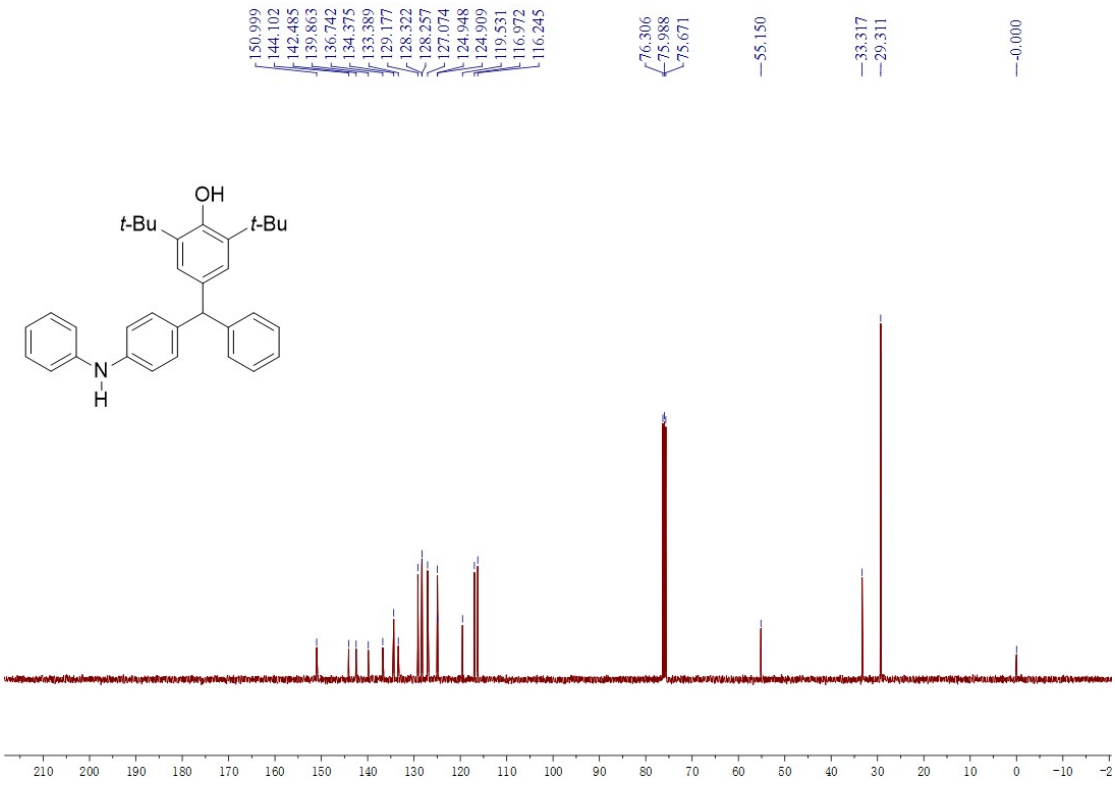
4,4',4''-((Nitrilotris(benzene-4,1-diyl))tris(phenylmethylene))tris(2,6-di-tert-butylphenol) (3u'')



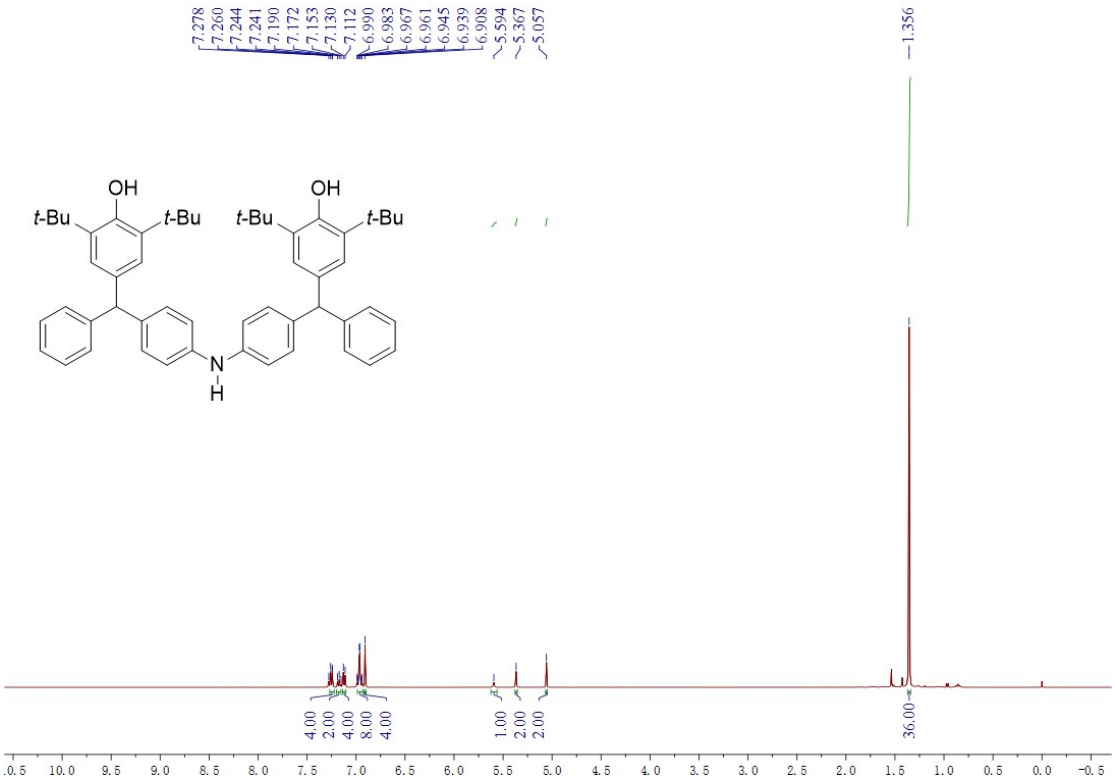


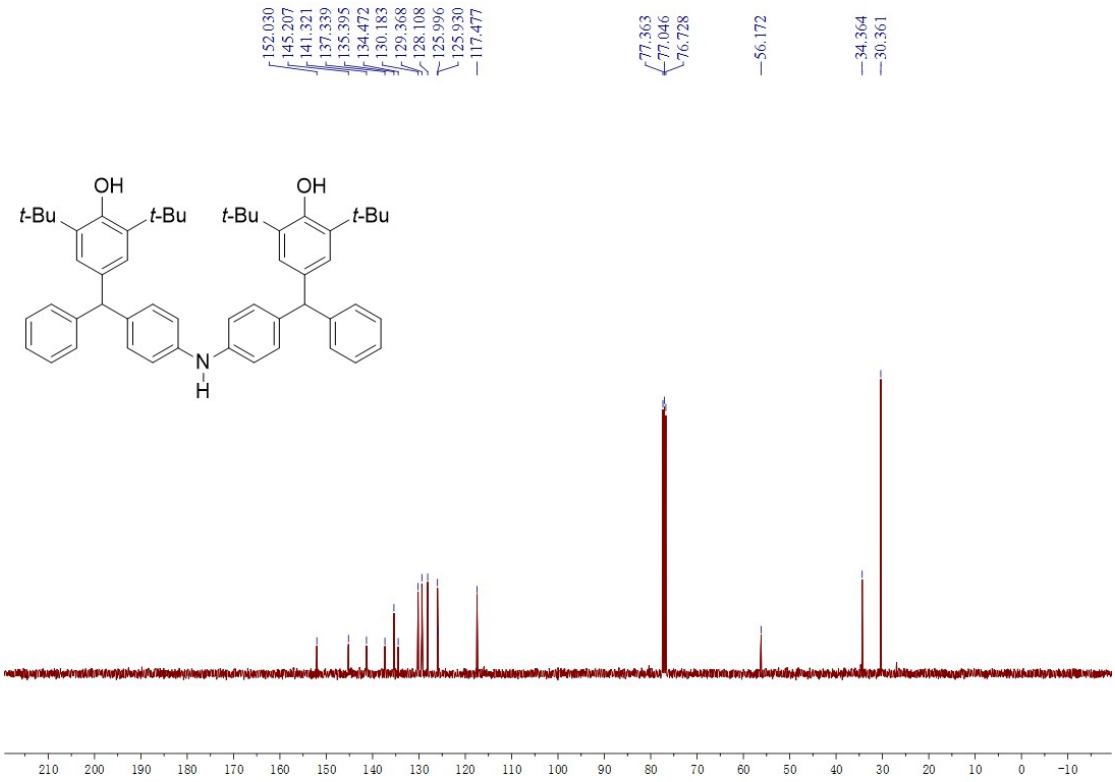
2,6-Di-tert-butyl-4-(phenyl(4-(phenylamino)phenyl)methyl)phenol (3v)



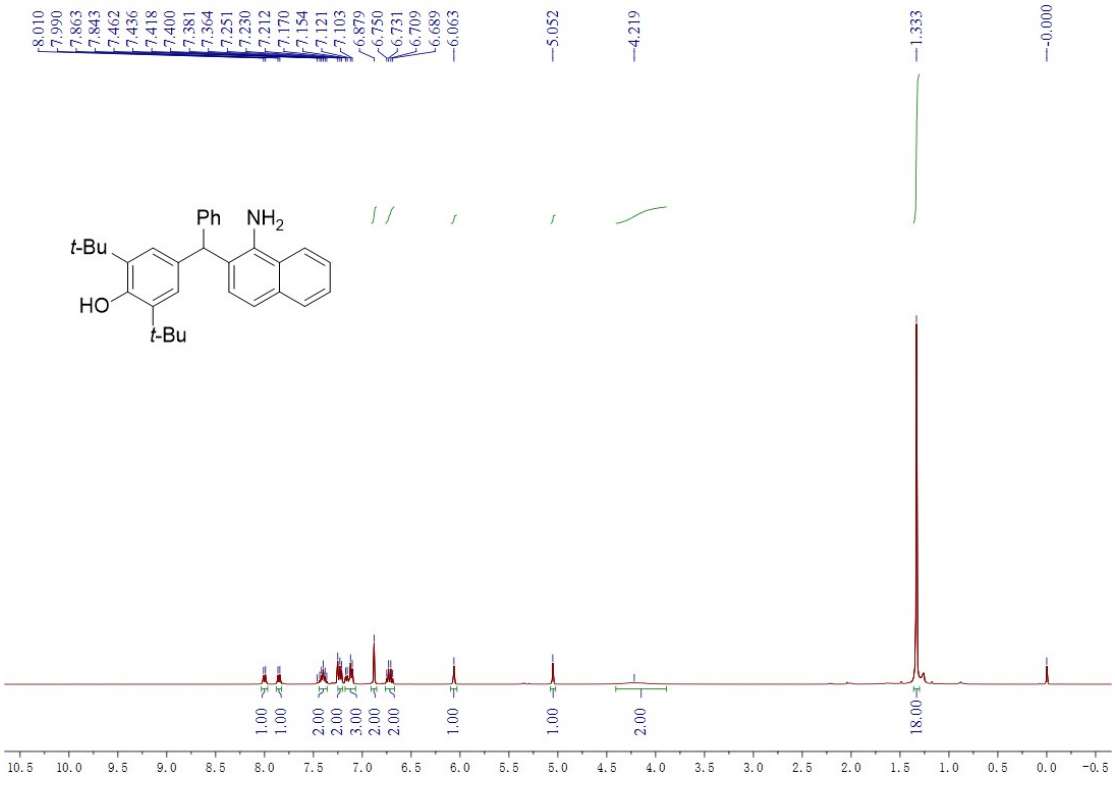


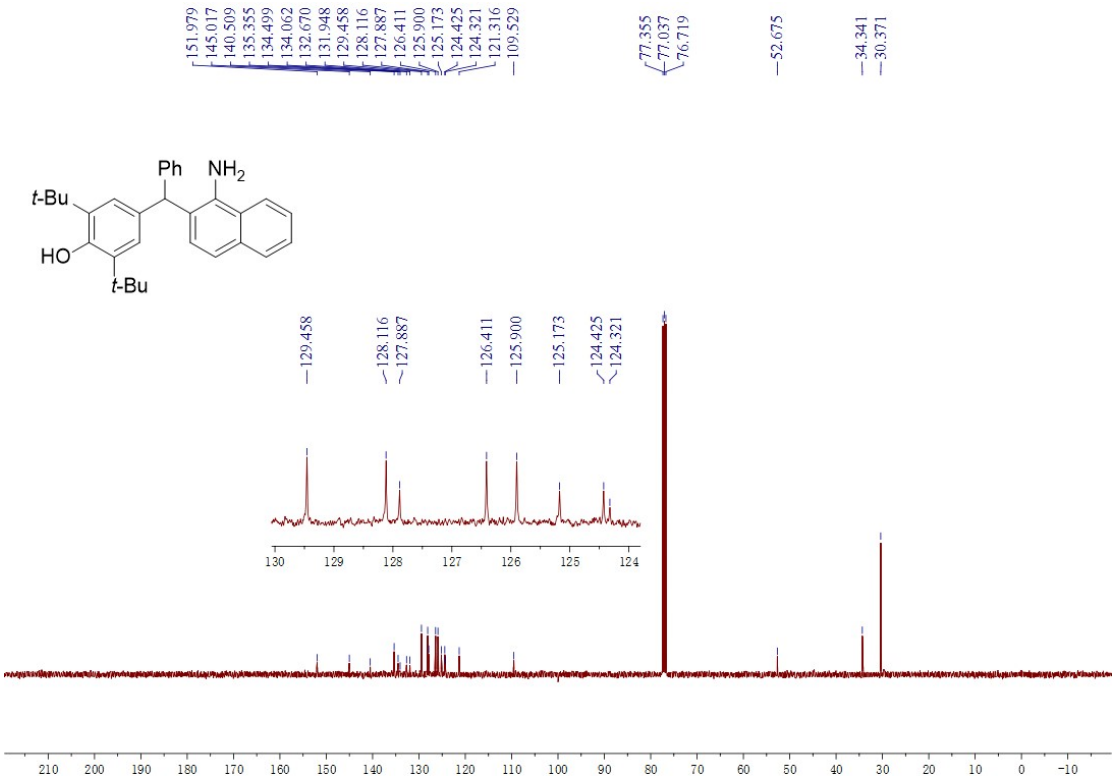
4,4'-((Azanediylbis(4,1-phenylene))bis(phenylmethylene))bis(2,6-di-tert-butylphenol) (3v')



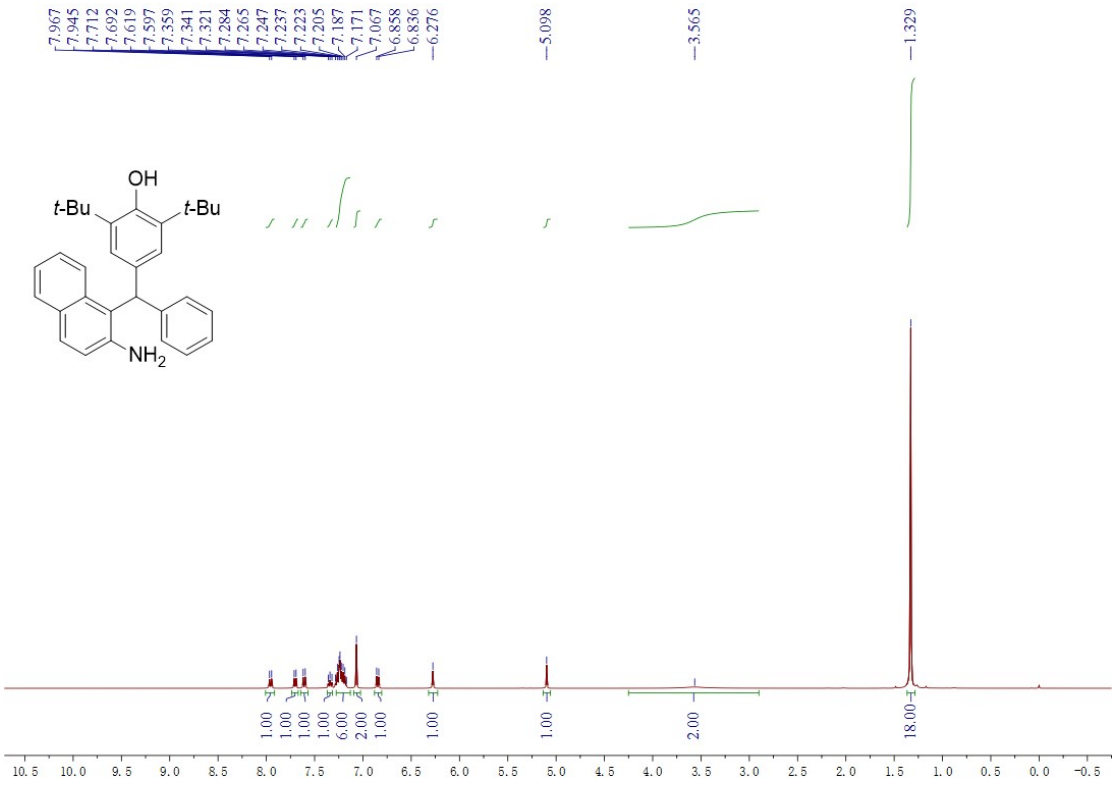


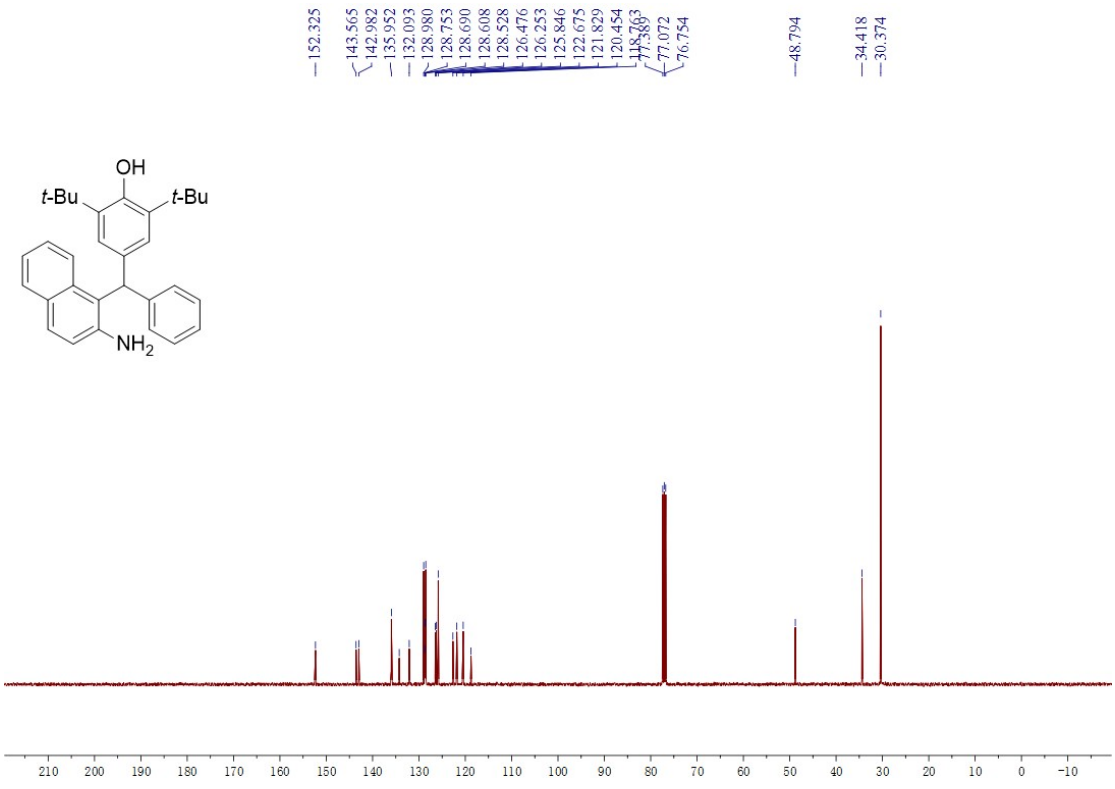
4-((1-Aminonaphthalen-2-yl)(phenyl)methyl)-2,6-di-tert-butylphenol (3w)



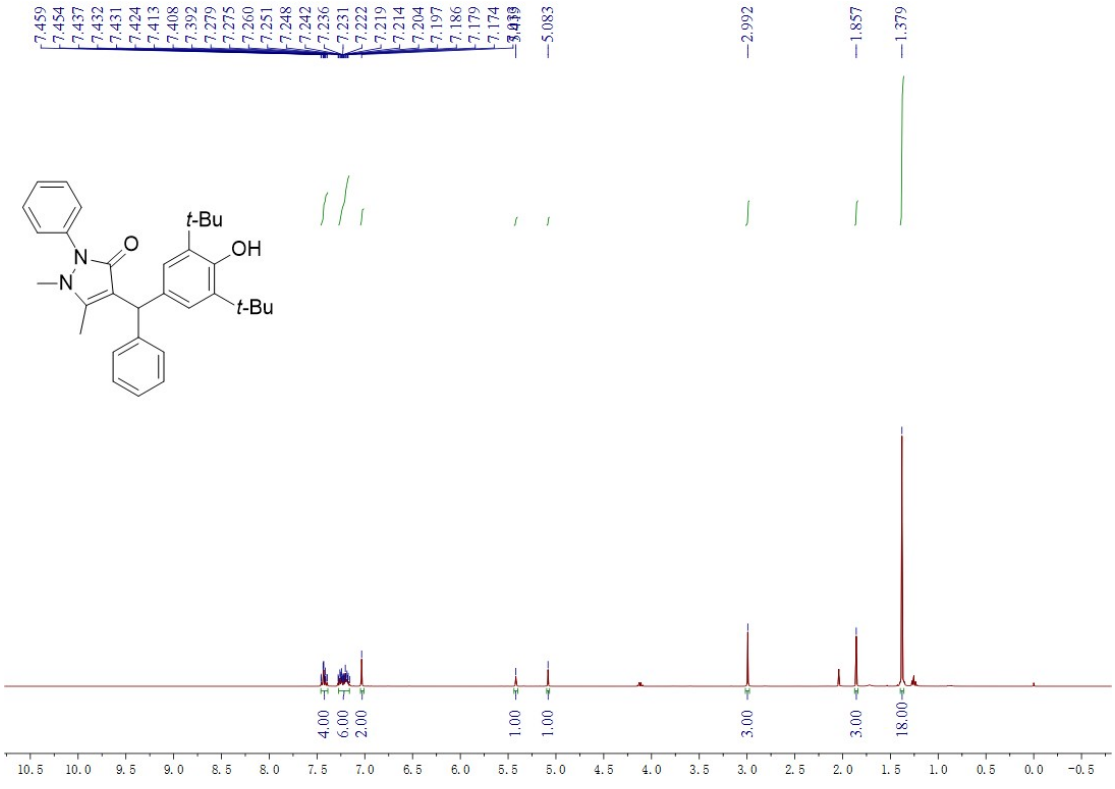


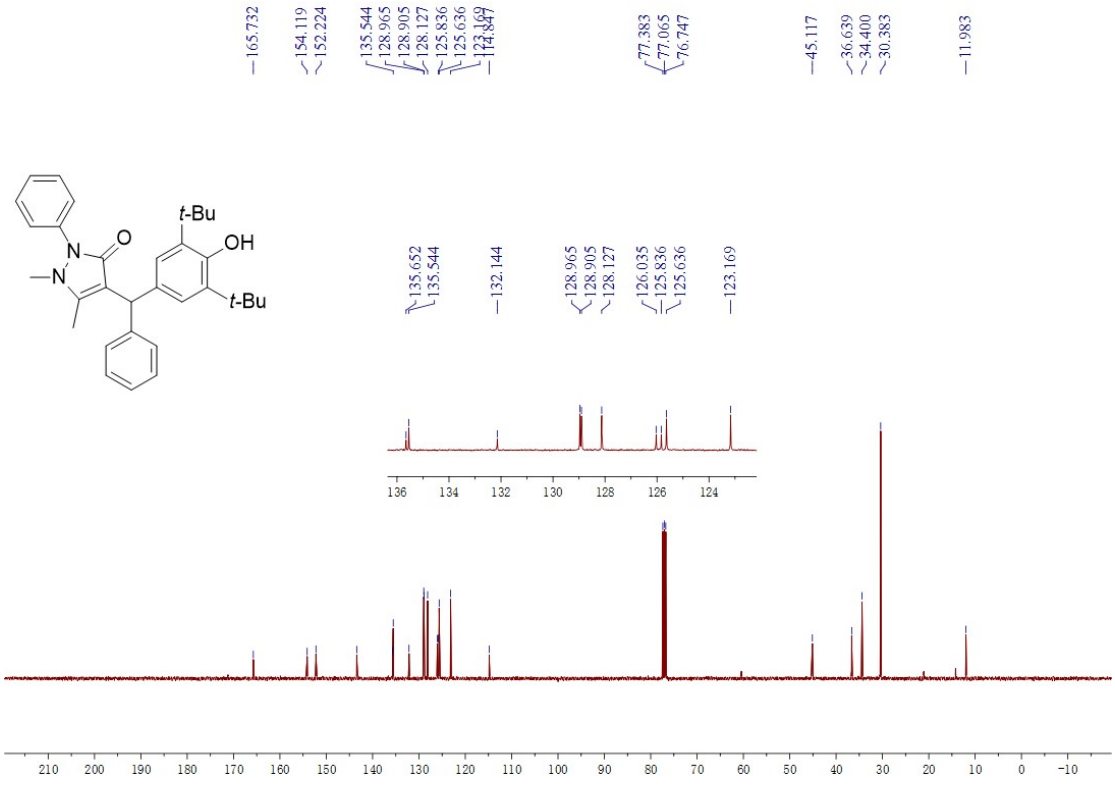
4-((2-Aminonaphthalen-1-yl)(phenyl)methyl)-2,6-di-tert-butylphenol (3x)



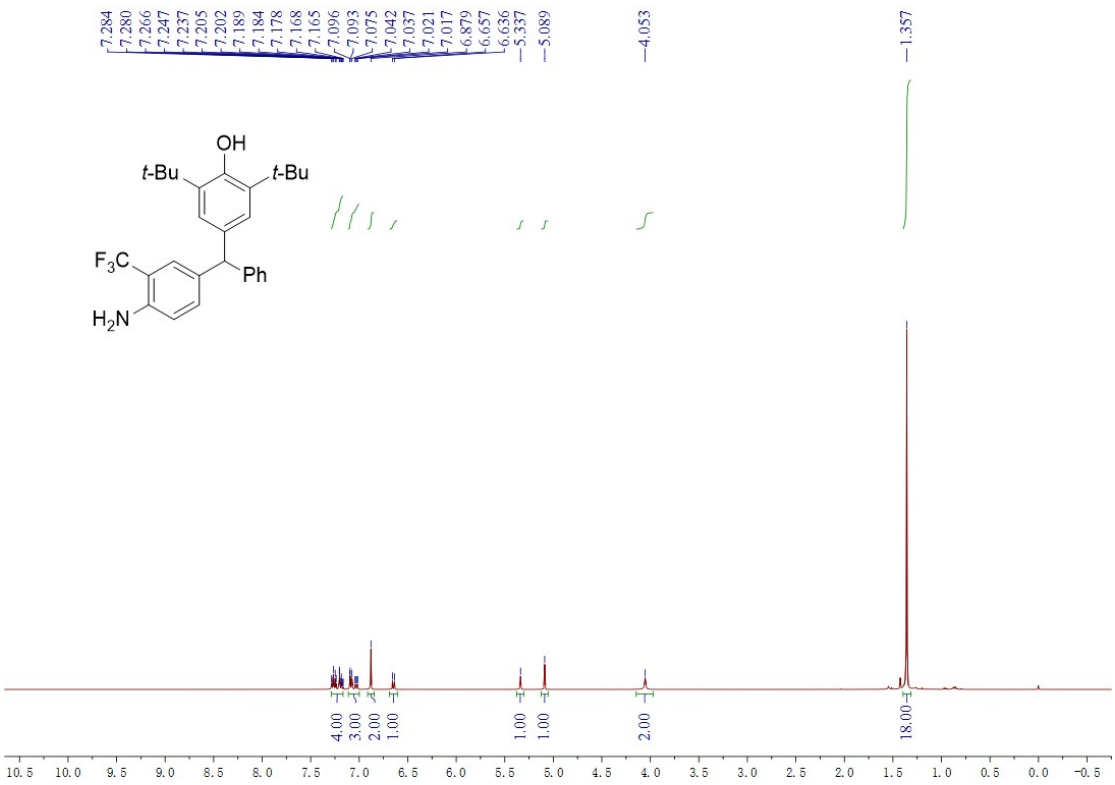


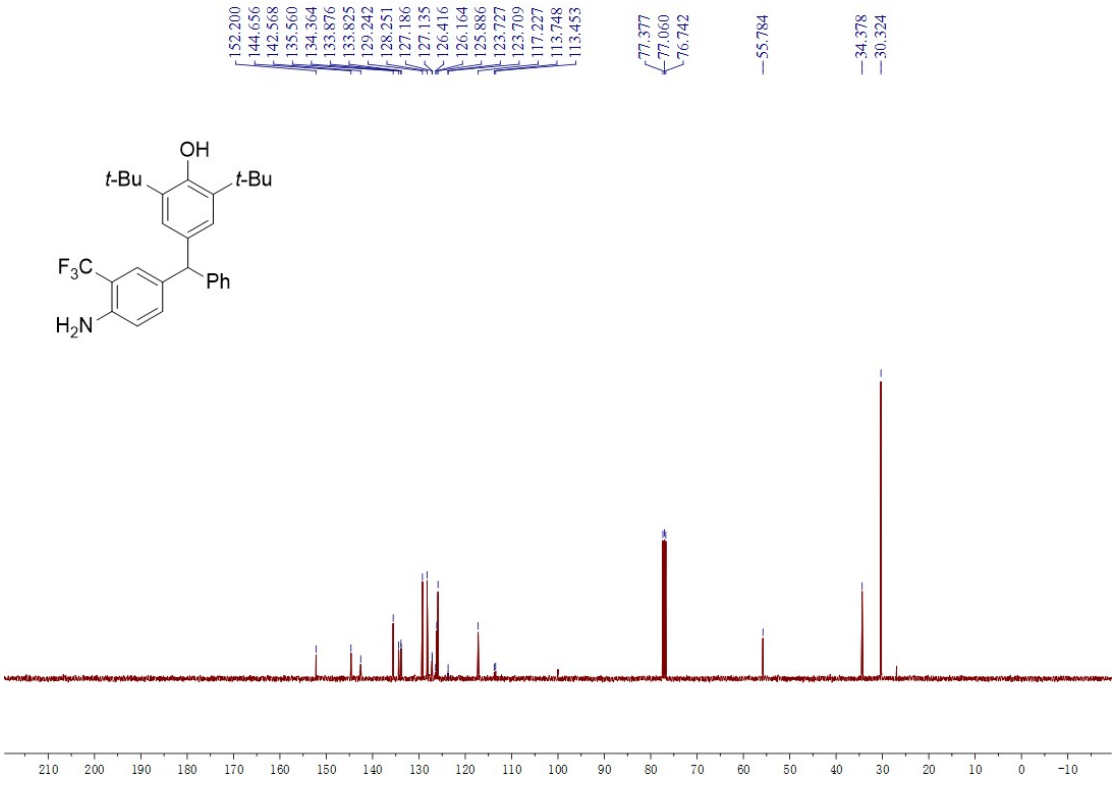
4-((3,5-Di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)-1,5-dimethyl-2-phenyl-1,2-dihydro-3H-pyrazol-3-one (3y)

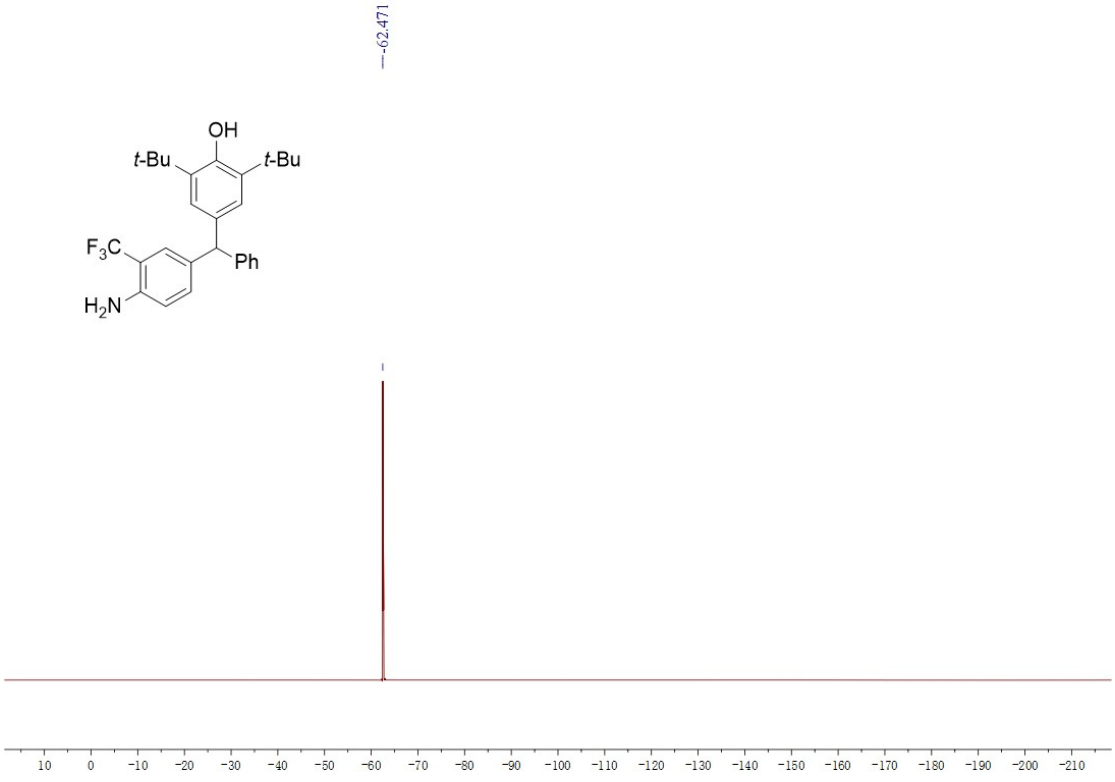




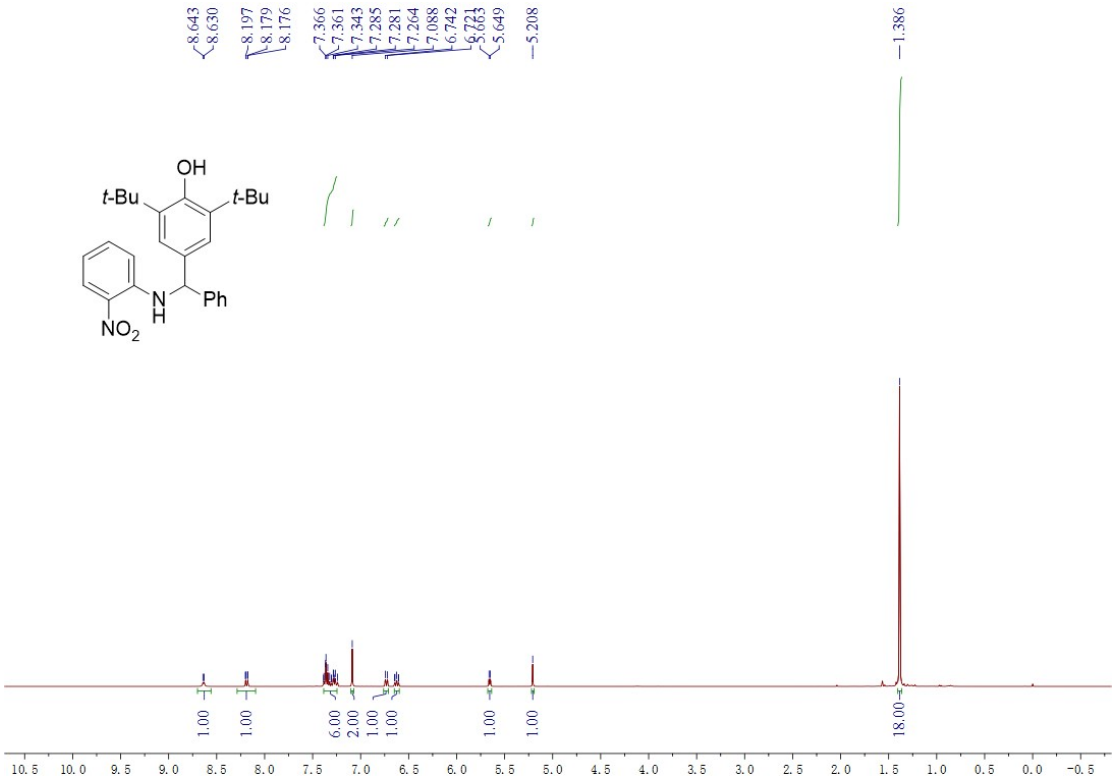
4-((4-Amino-3-(trifluoromethyl)phenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3z)

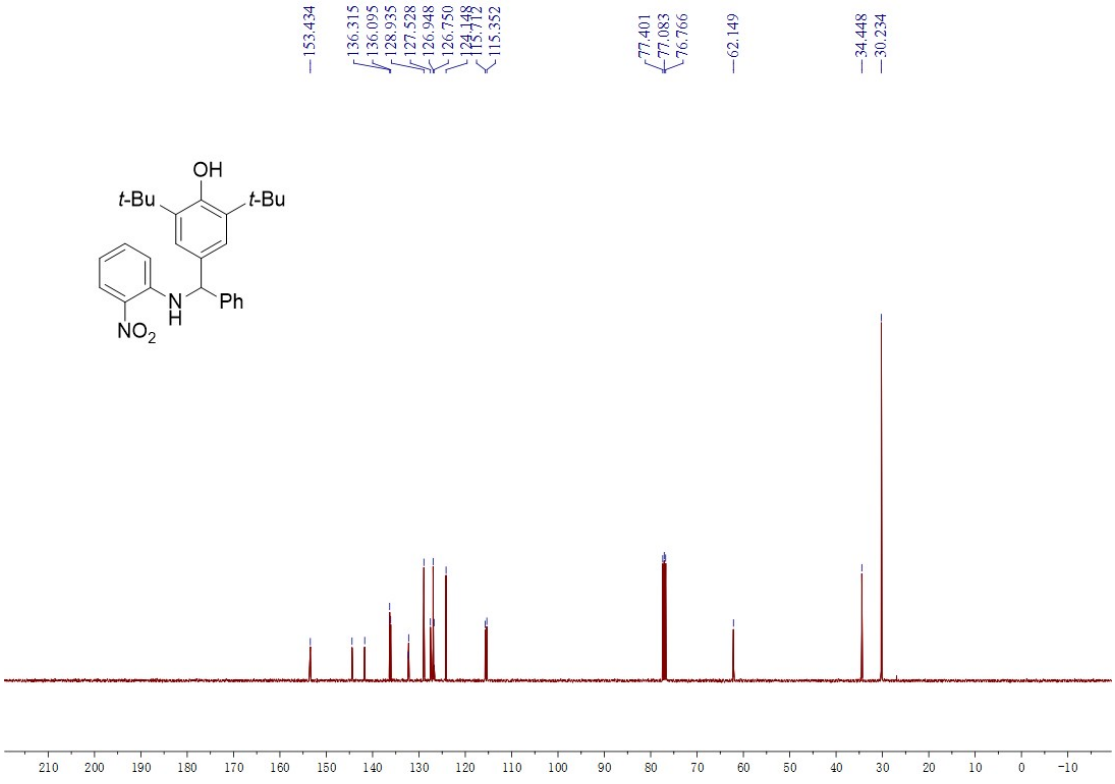




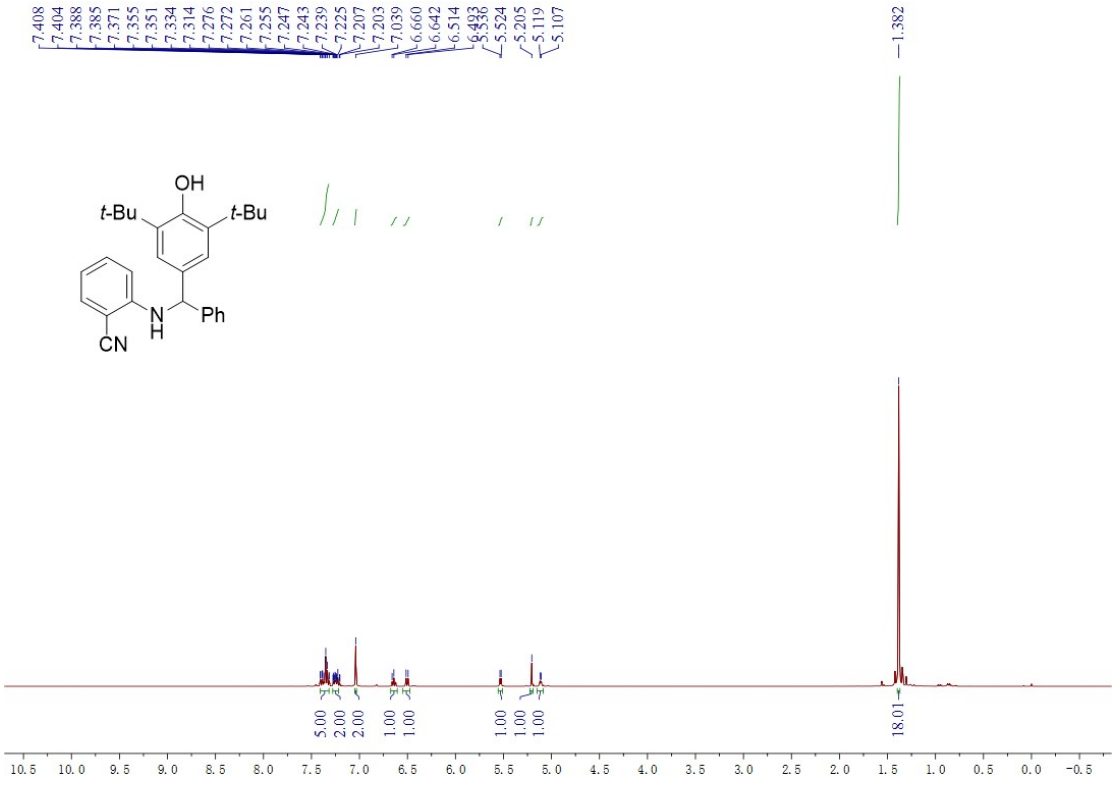


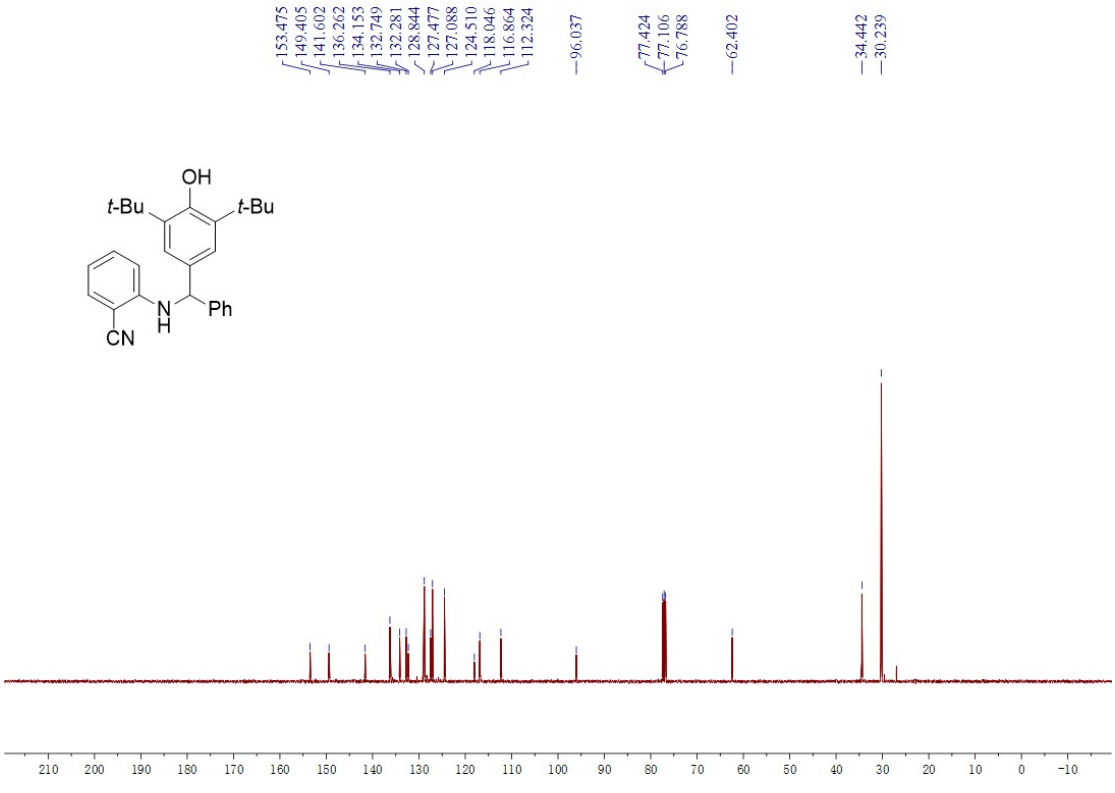
2,6-Di-tert-butyl-4-(((2-nitrophenyl)amino)(phenyl)methyl)phenol (3aa')



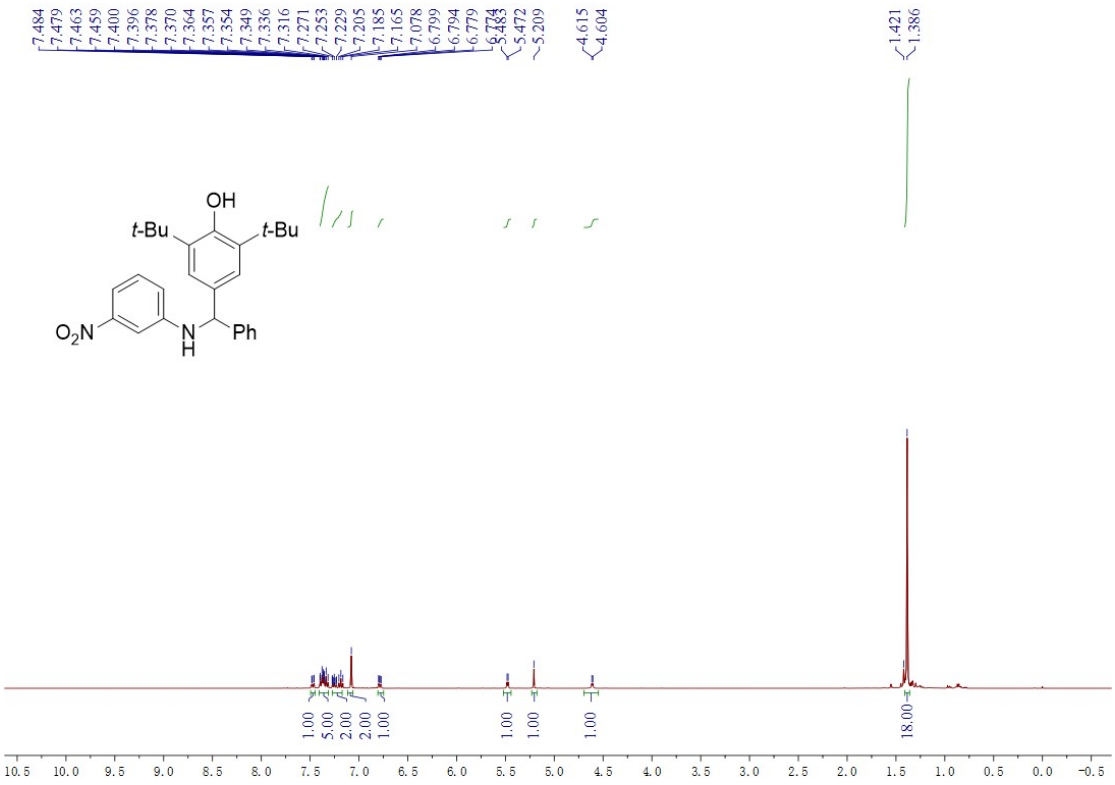


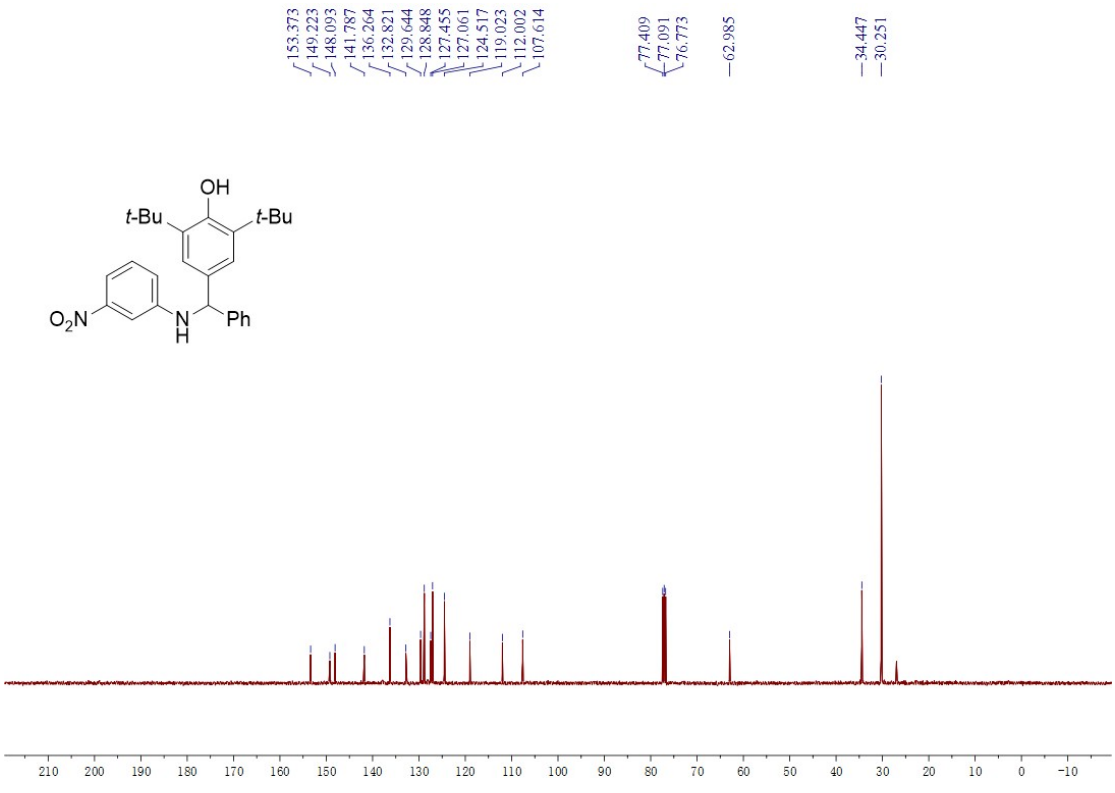
2-(((3,5-Di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)amino)benzonitrile (3ab')



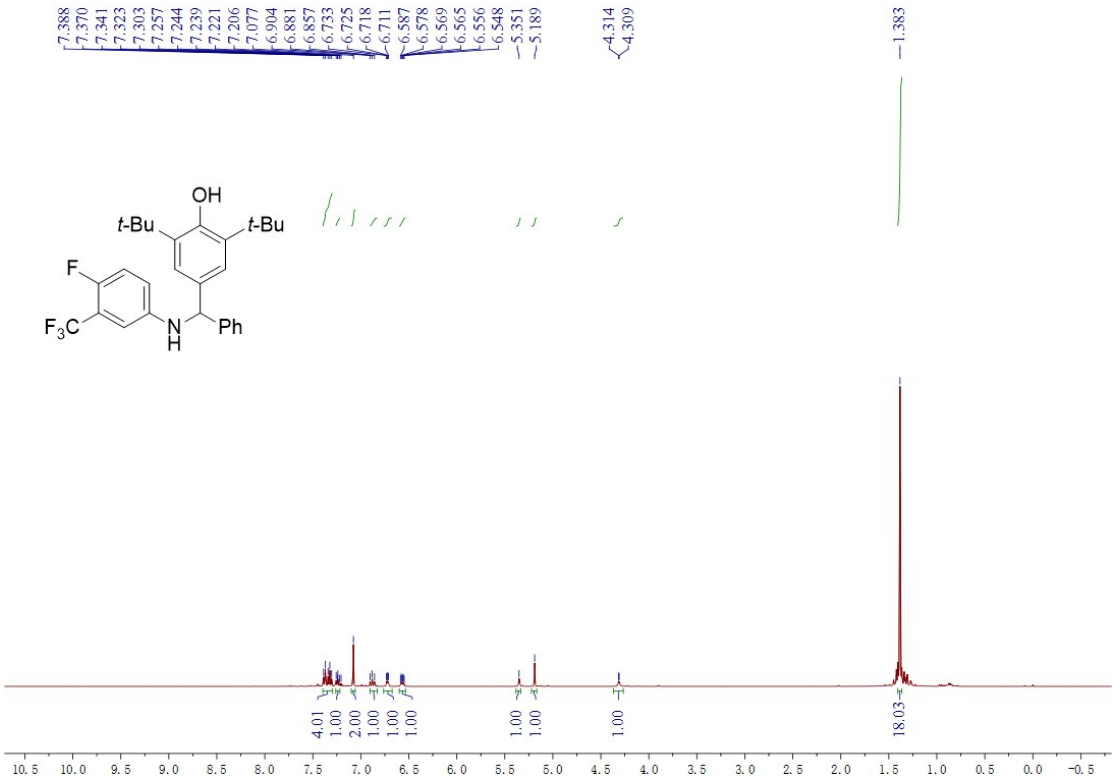


2,6-Di-tert-butyl-4-(((3-nitrophenyl)amino)(phenyl)methyl)phenol (3ac')





2,6-Di-tert-butyl-4-(((4-fluoro-3-(trifluoromethyl)phenyl)amino)(phenyl)methyl)phenol (3ad')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6.733
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6.718
6.711
6.587
6.578
6.569
6.565
6.556
6.548
5.351
5.189
4.314
4.309
1.383
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t-Bu
t-Bu
F
F3C
N
H
Ph
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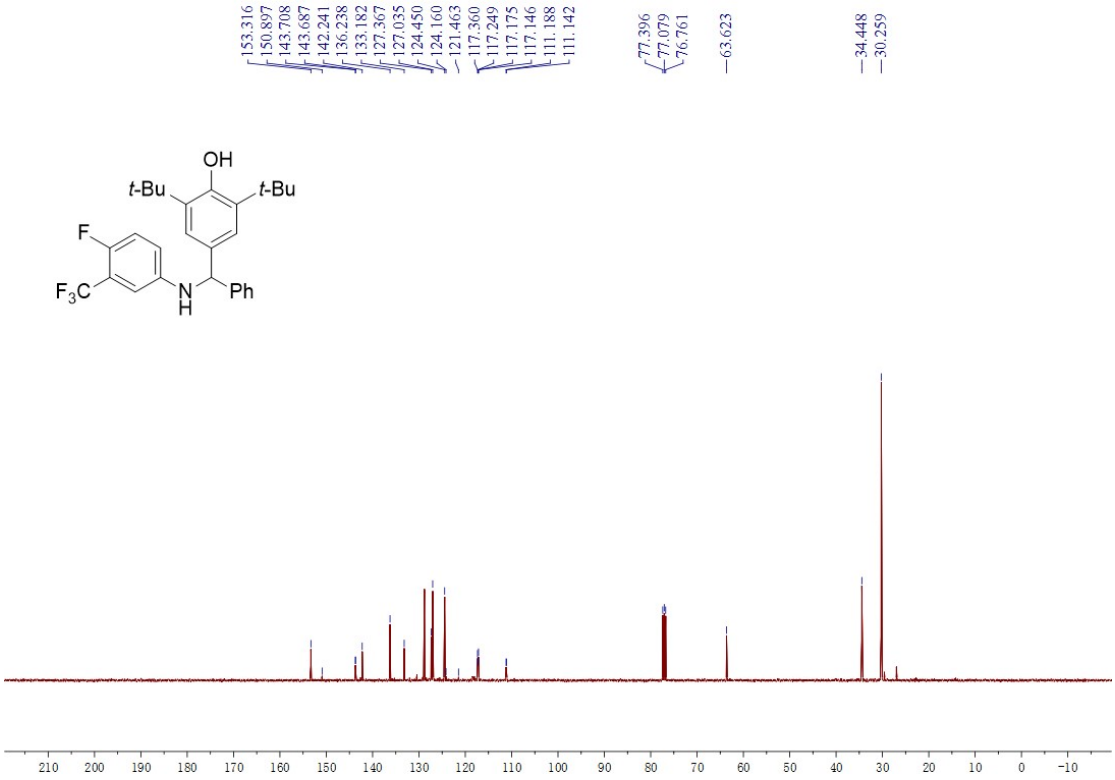
1.00
2.00
1.00
1.00
1.00
1.00
1.00
1.00
18.03
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5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117.360
117.249
117.175
117.146
111.188
111.142
77.396
77.079
76.761
63.623
34.448
30.259
OH
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t-Bu
F
F3C
N
H
Ph
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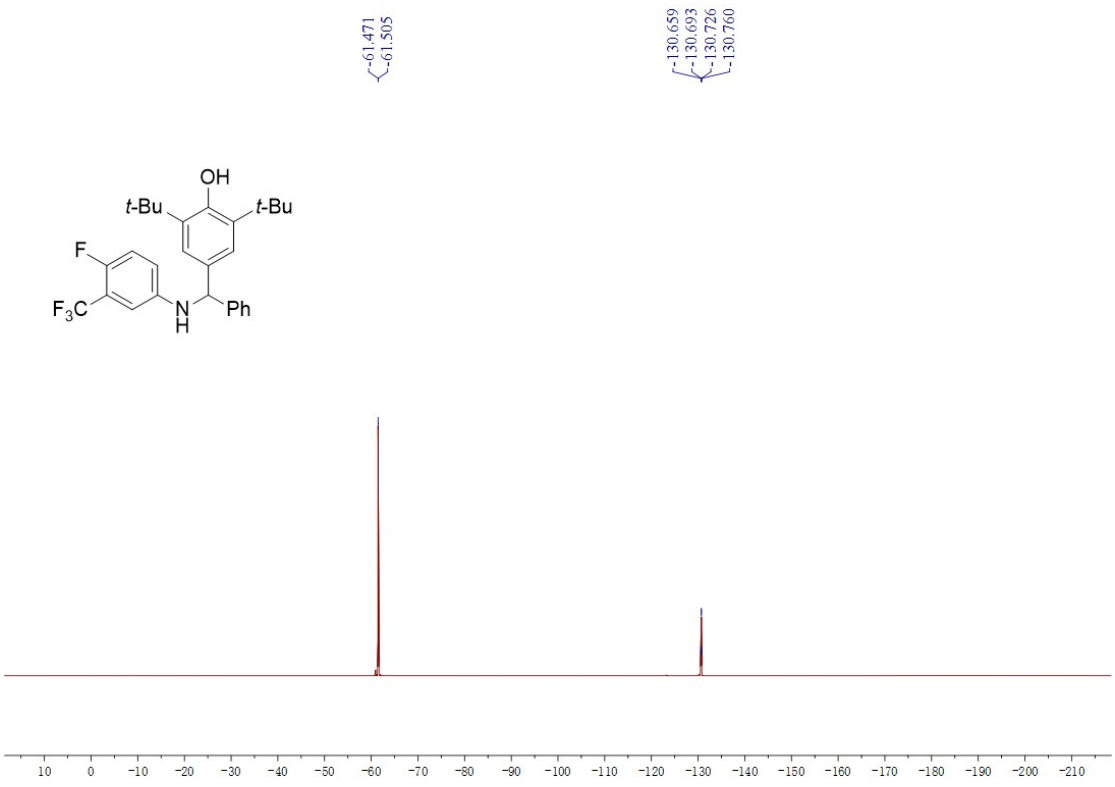
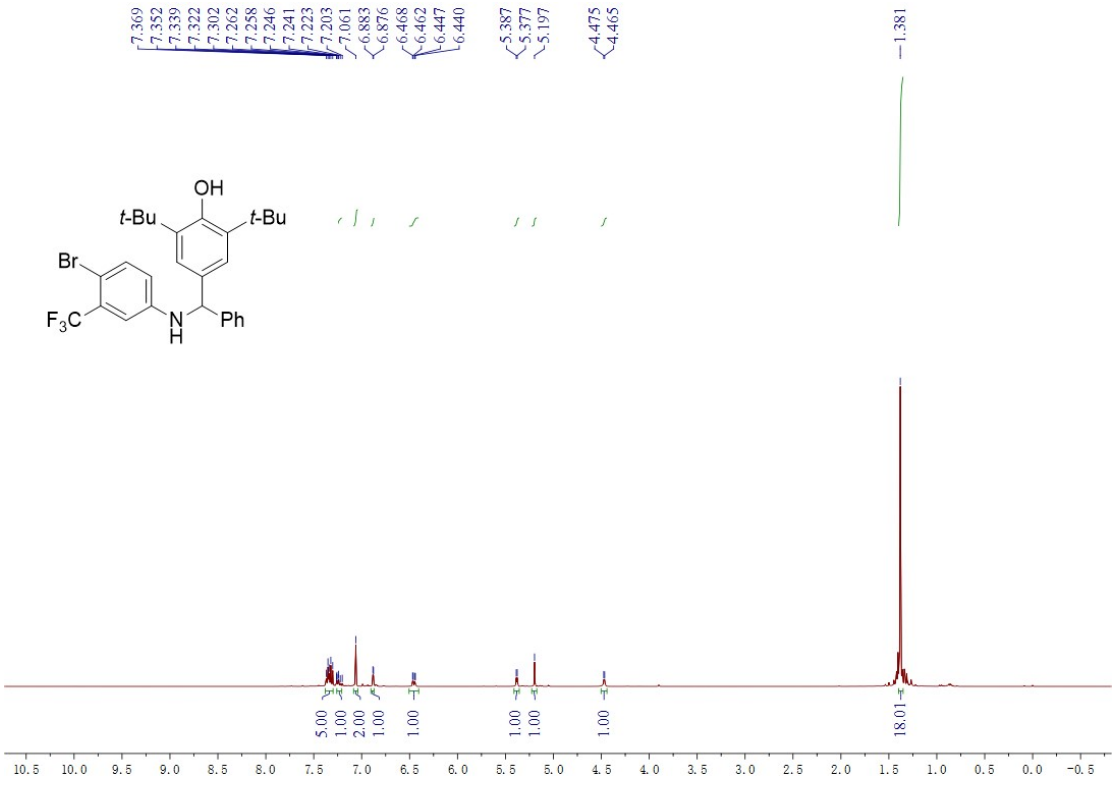
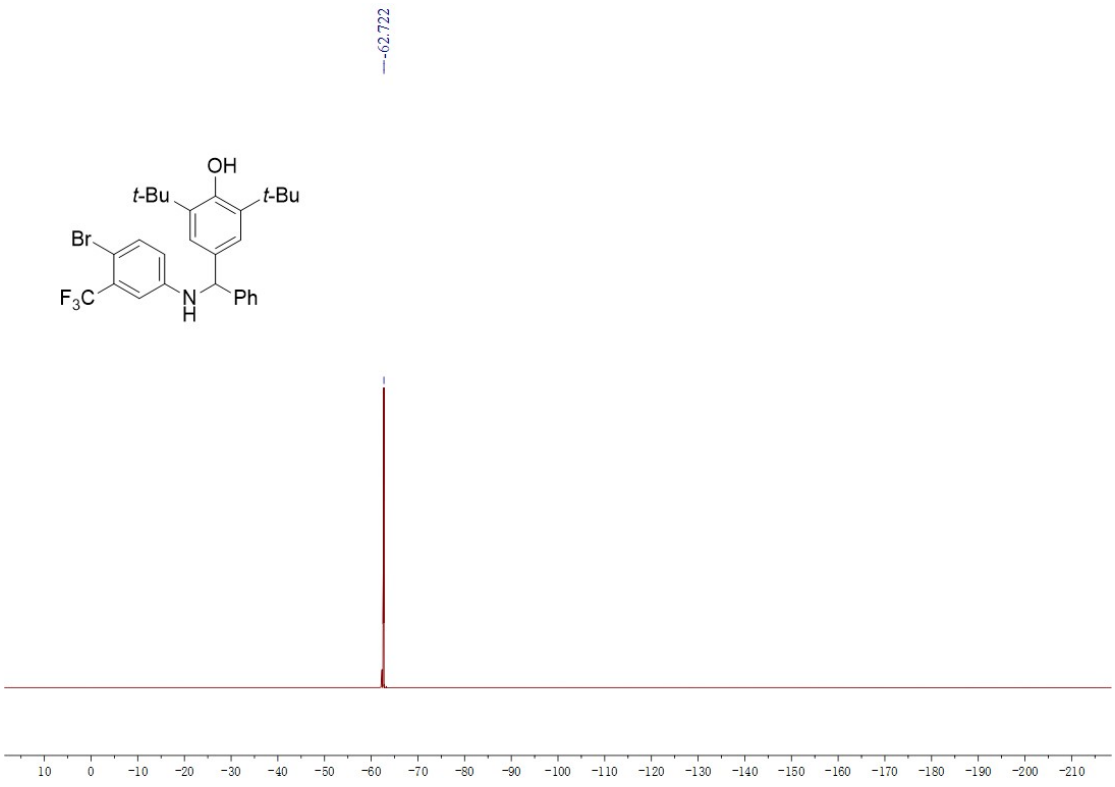


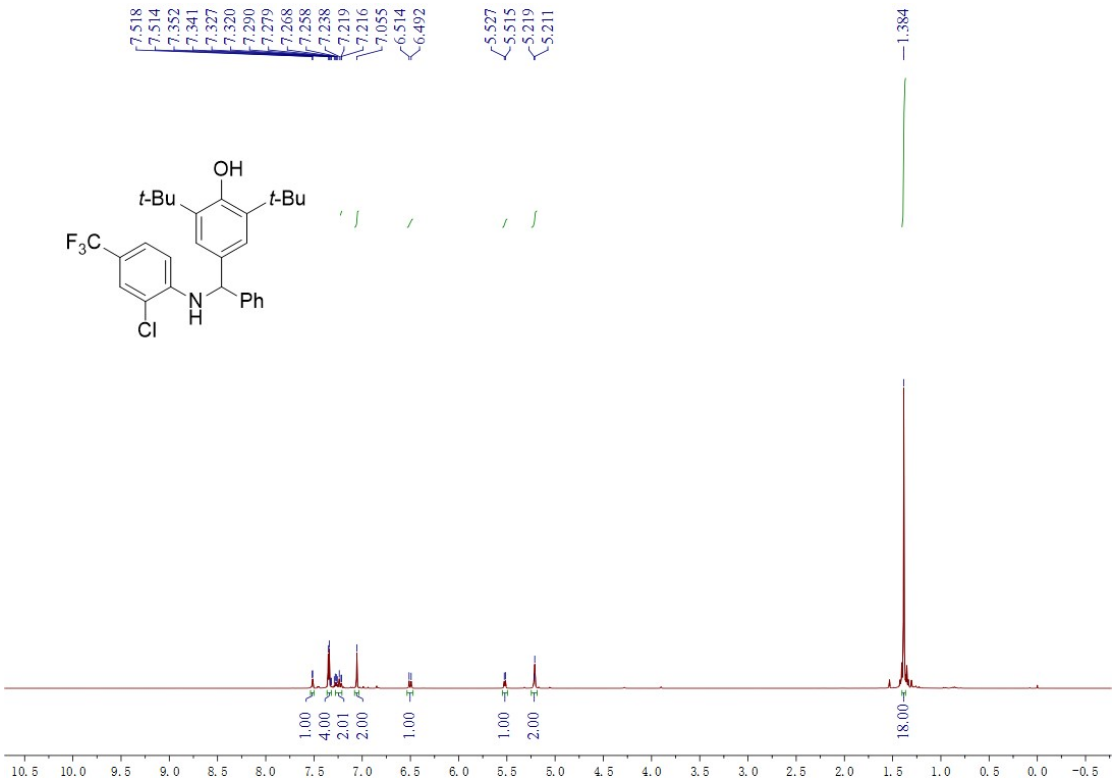
4-(((4-Bromo-3-(trifluoromethyl)phenyl)amino)(phenyl)methyl)-2,6-di-tert-butylphenol (3ae')





2,6-Di-tert-butyl-4-(((2-chloro-4-(trifluoromethyl)phenyl)amino)(phenyl)methyl)ph-

enol (3af')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7.279
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t-Bu
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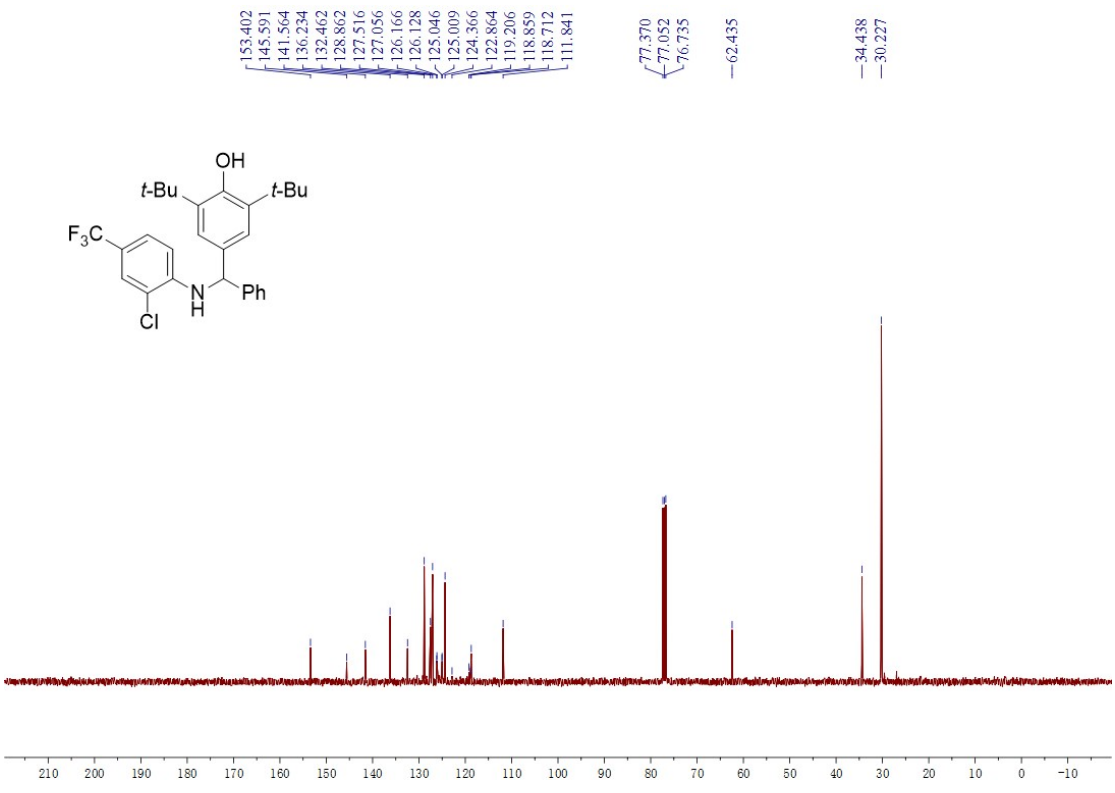
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N
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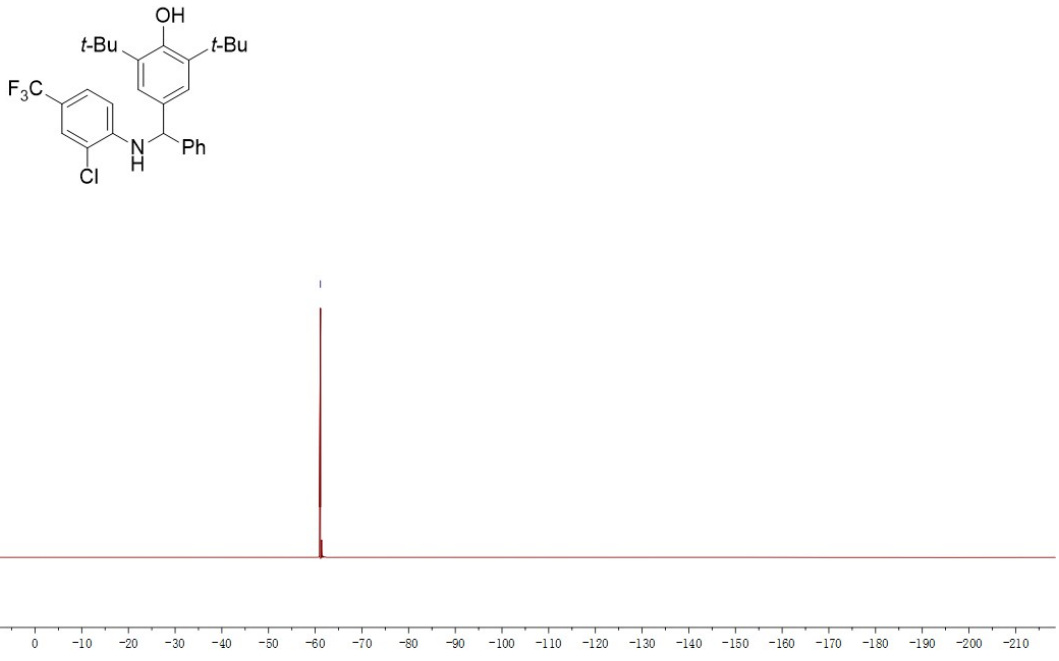
Ph
Cl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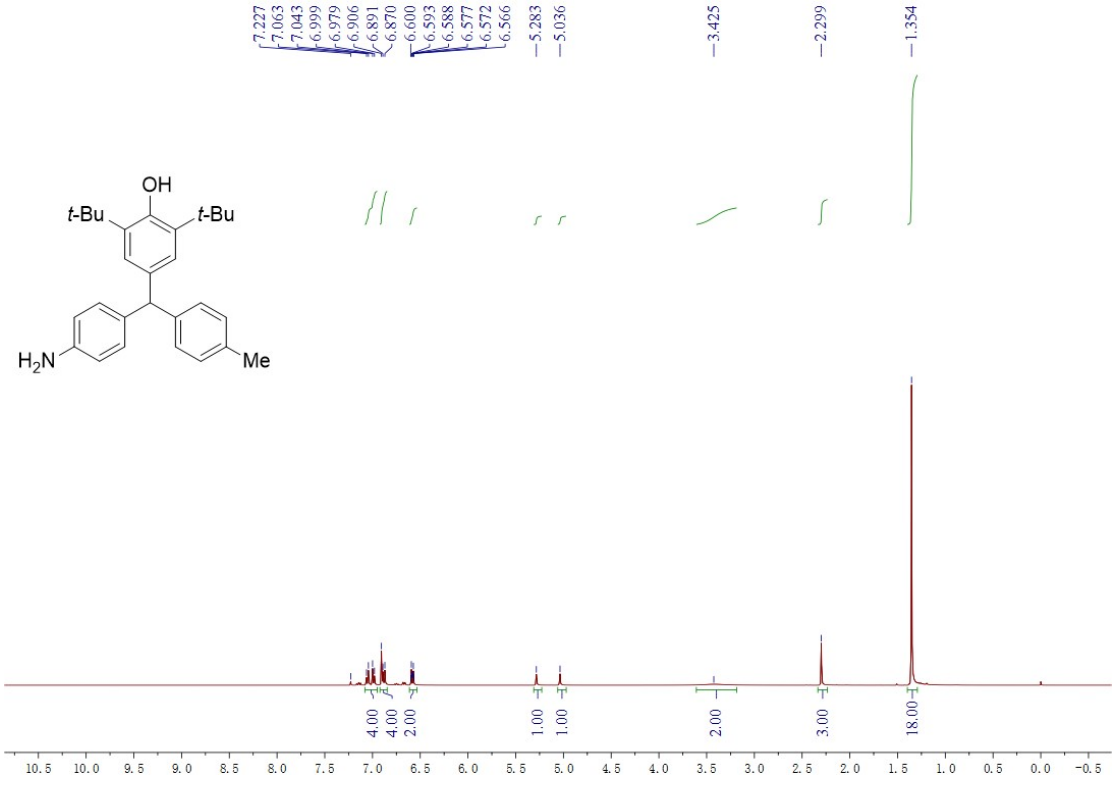
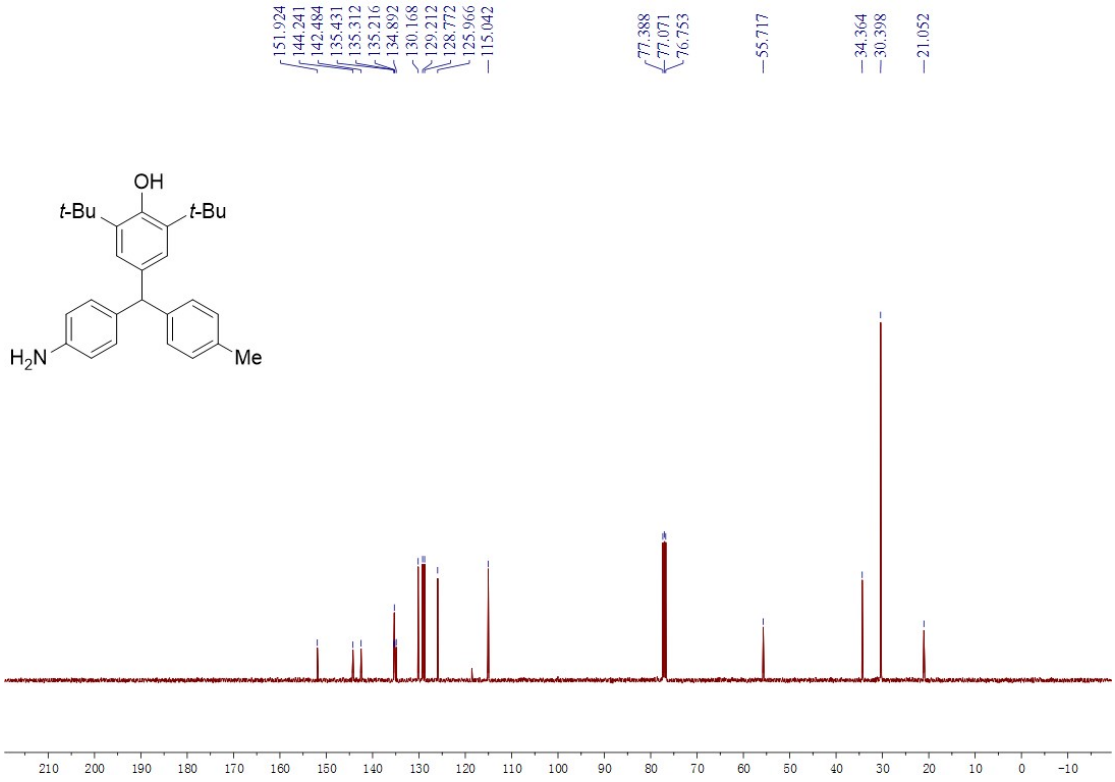
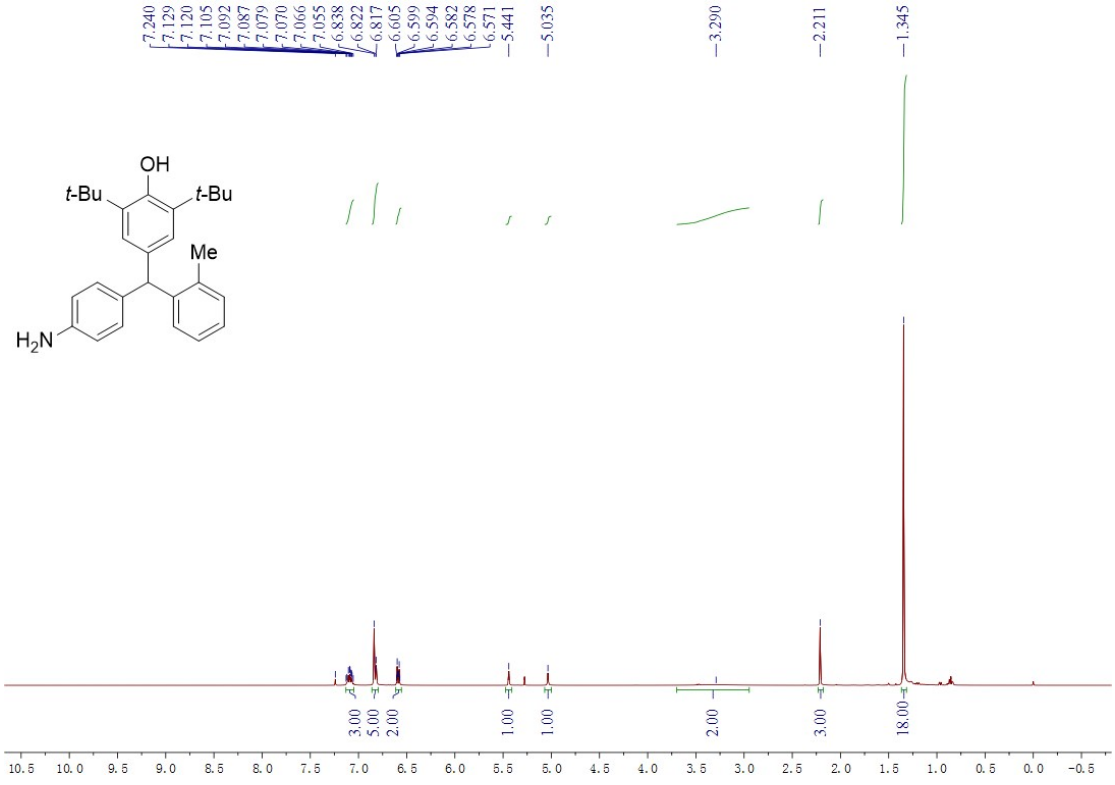
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210

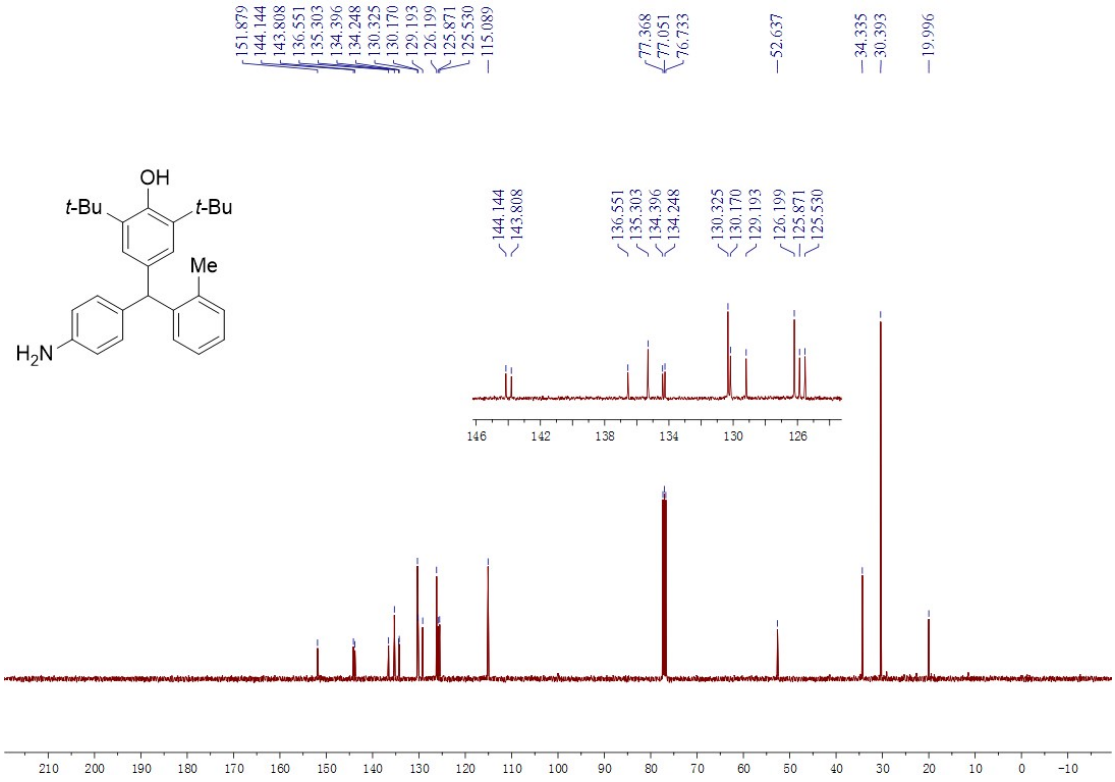
4-((4-Aminophenyl)(p-tolyl)methyl)-2,6-di-tert-butylphenol (4a)



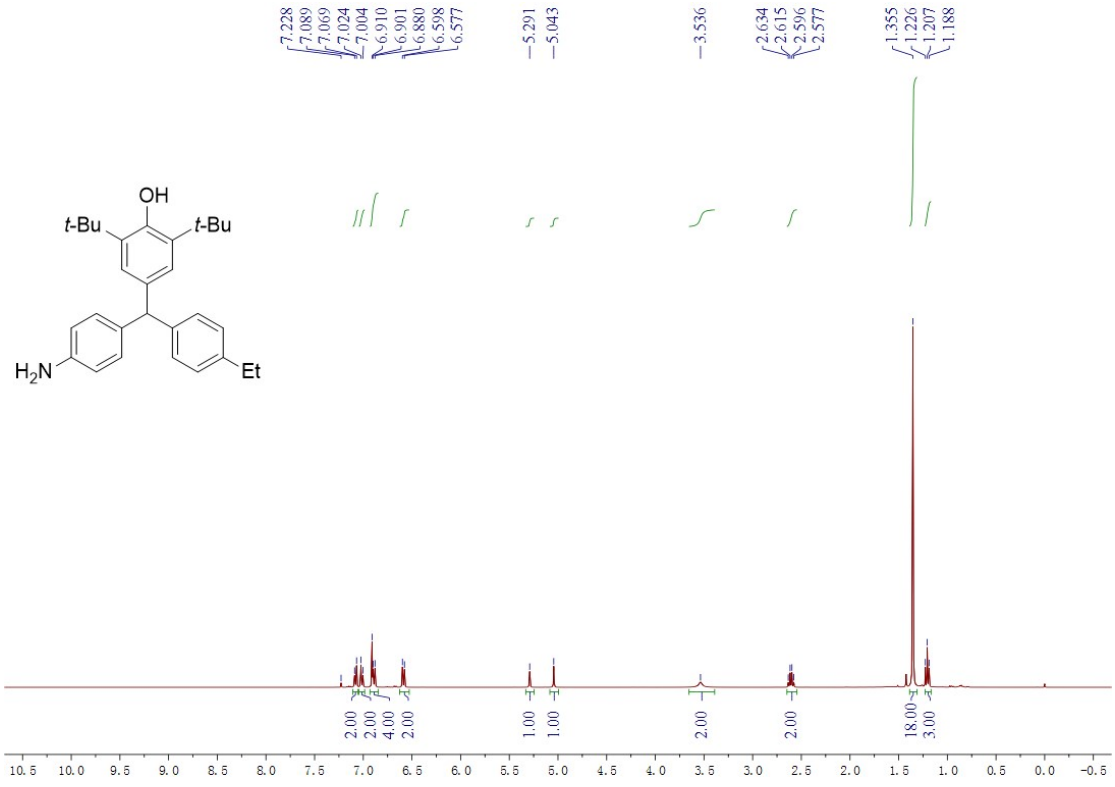


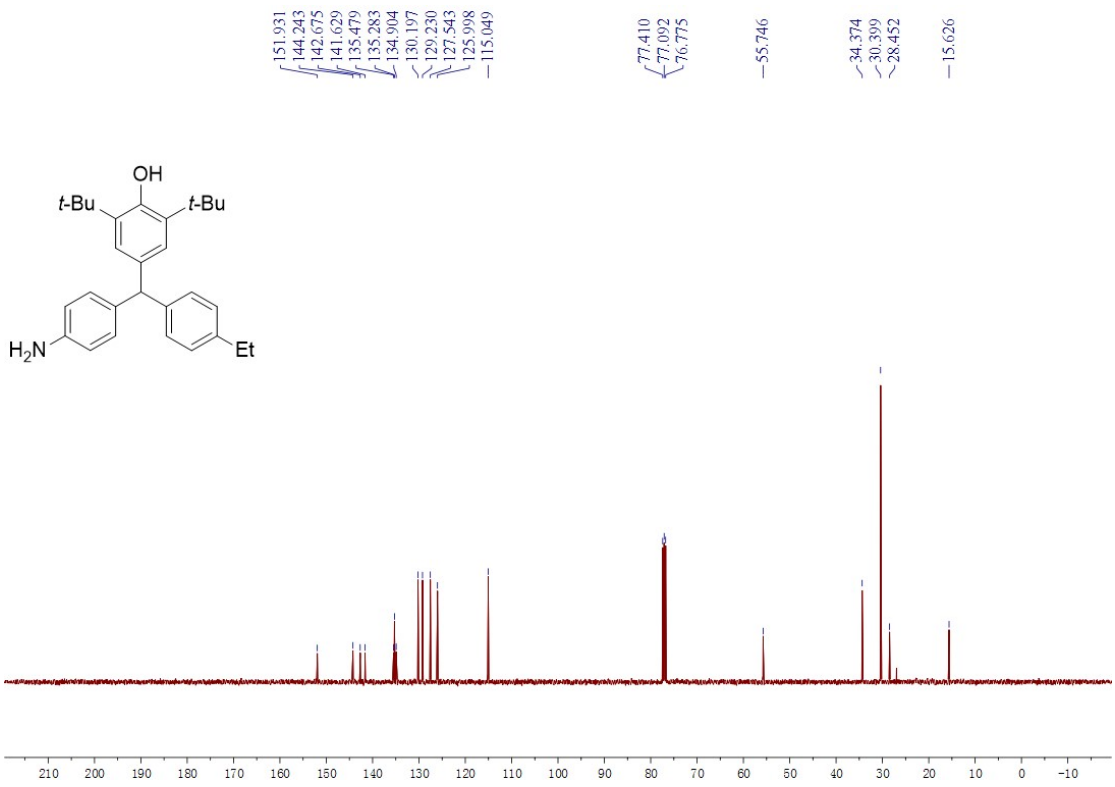
4-((4-Aminophenyl)(o-tolyl)methyl)-2,6-di-tert-butylphenol (4b)



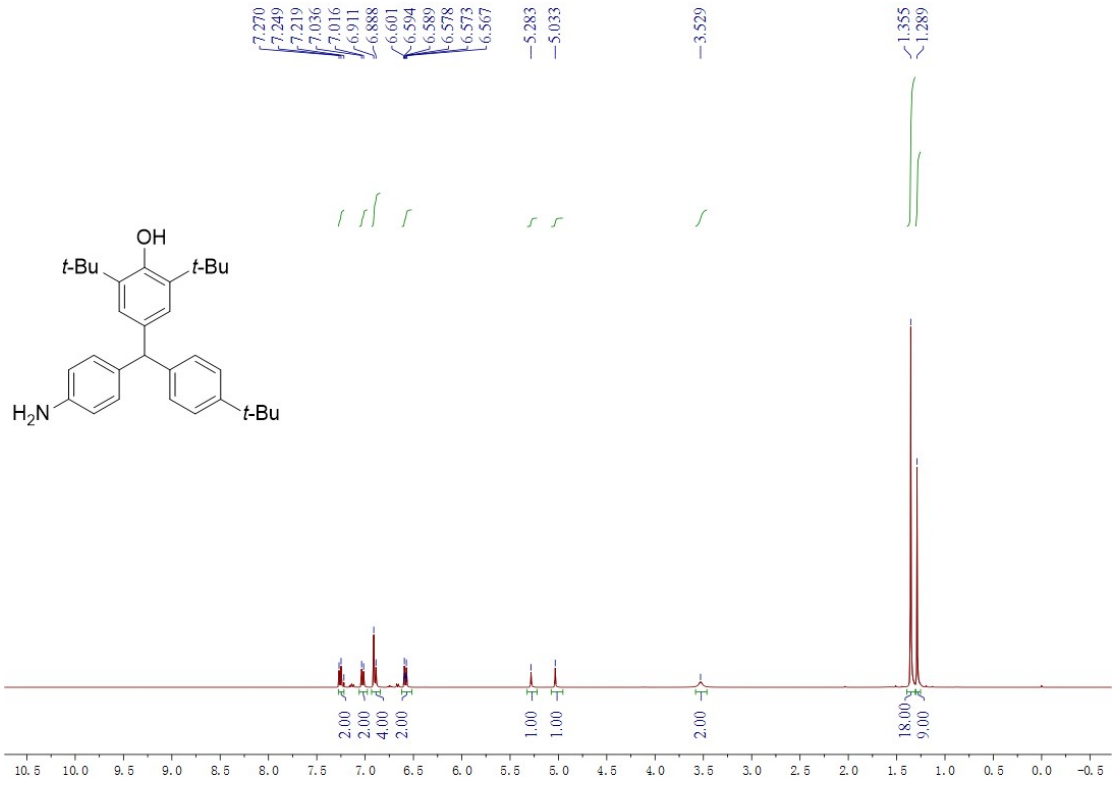


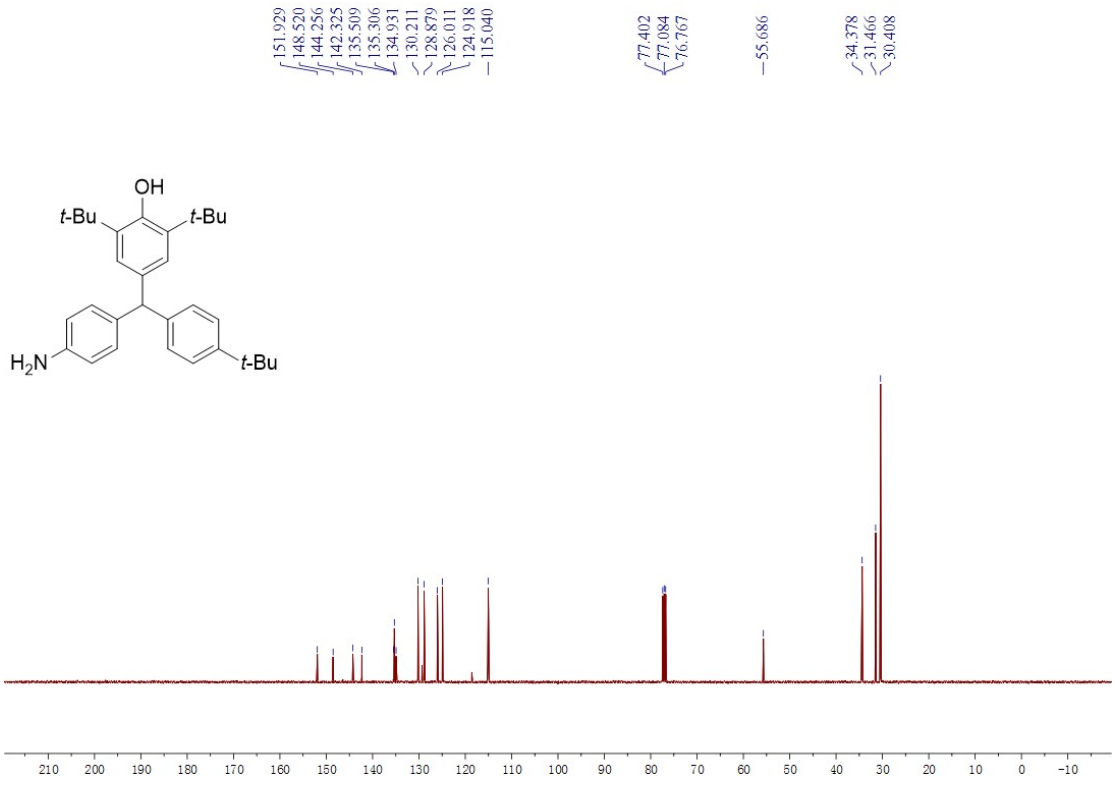
4-((4-Aminophenyl)(4-ethylphenyl)methyl)-2,6-di-tert-butylphenol (4c)



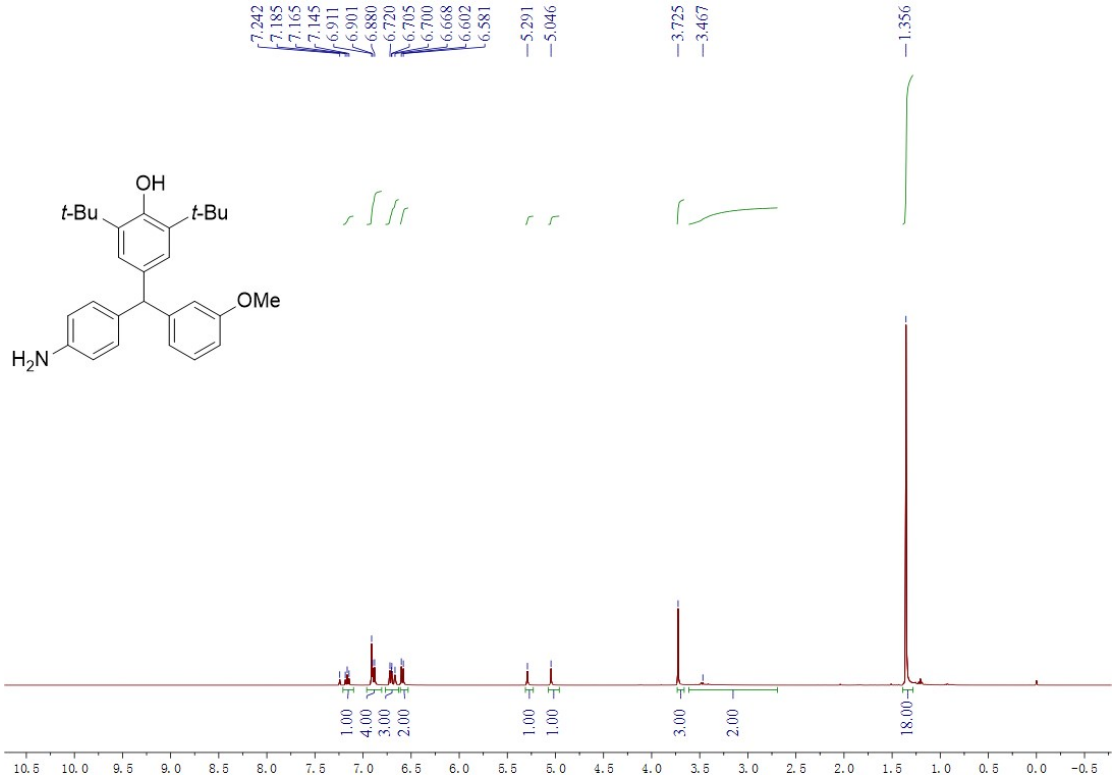


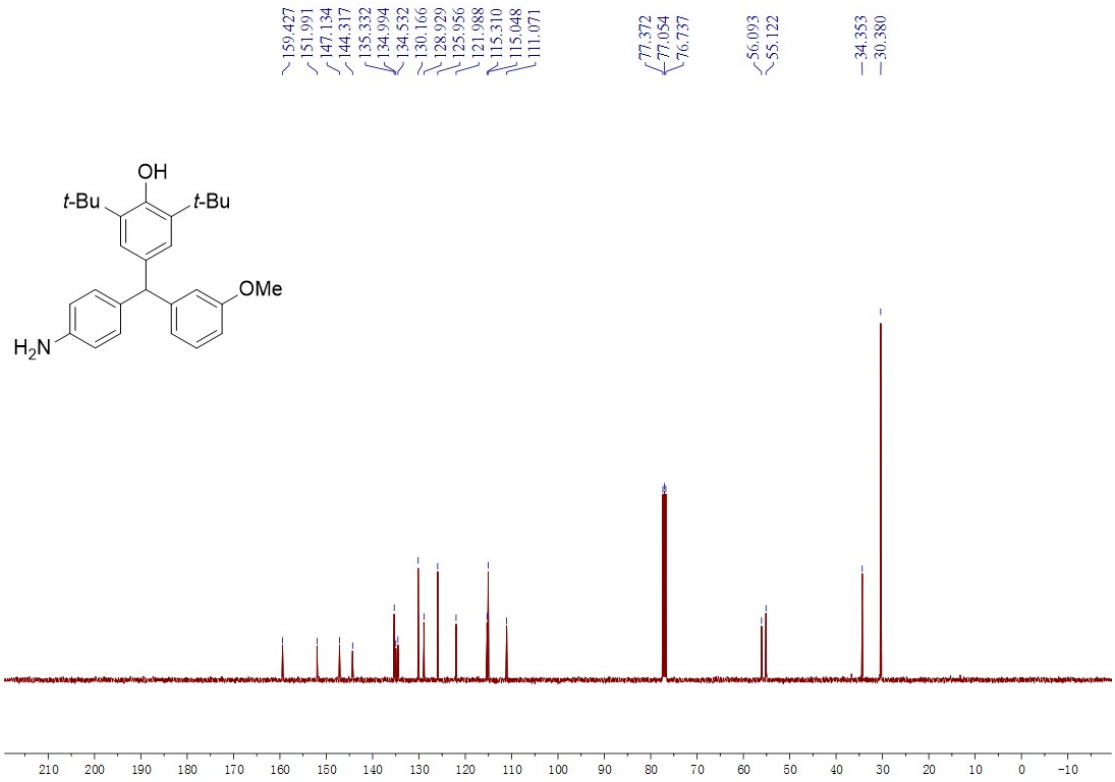
4-((4-Aminophenyl)(4-(tert-butyl)phenyl)methyl)-2,6-di-tert-butylphenol (4d)



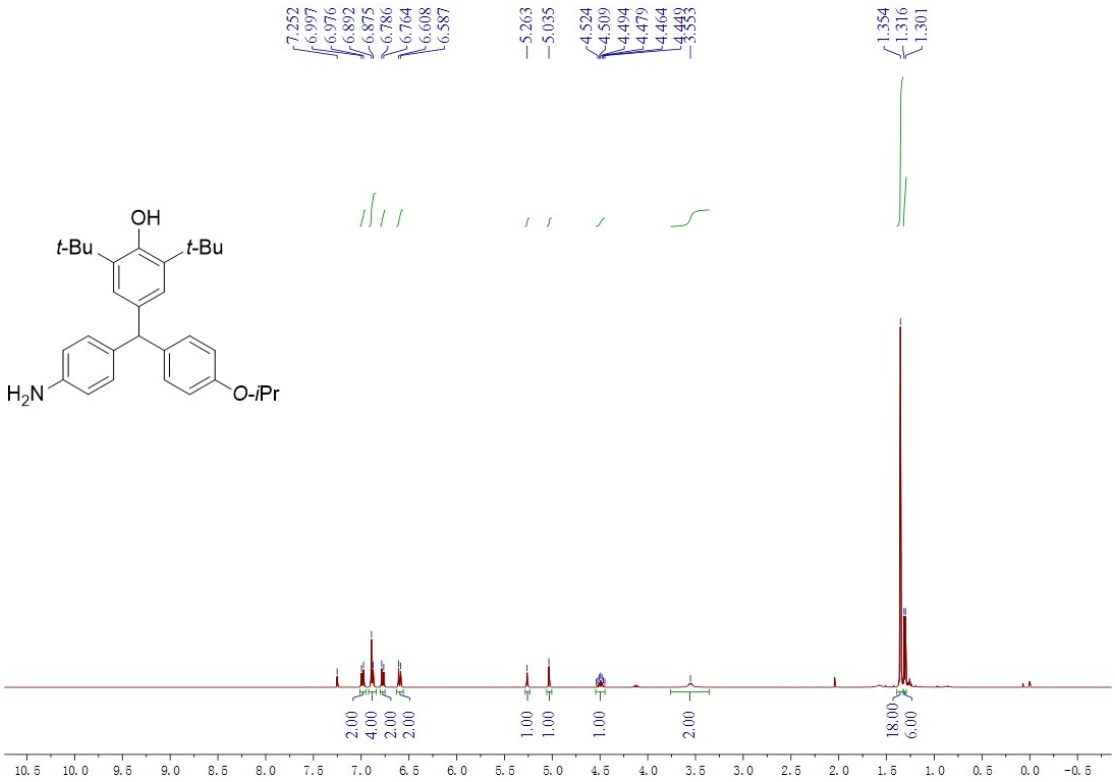


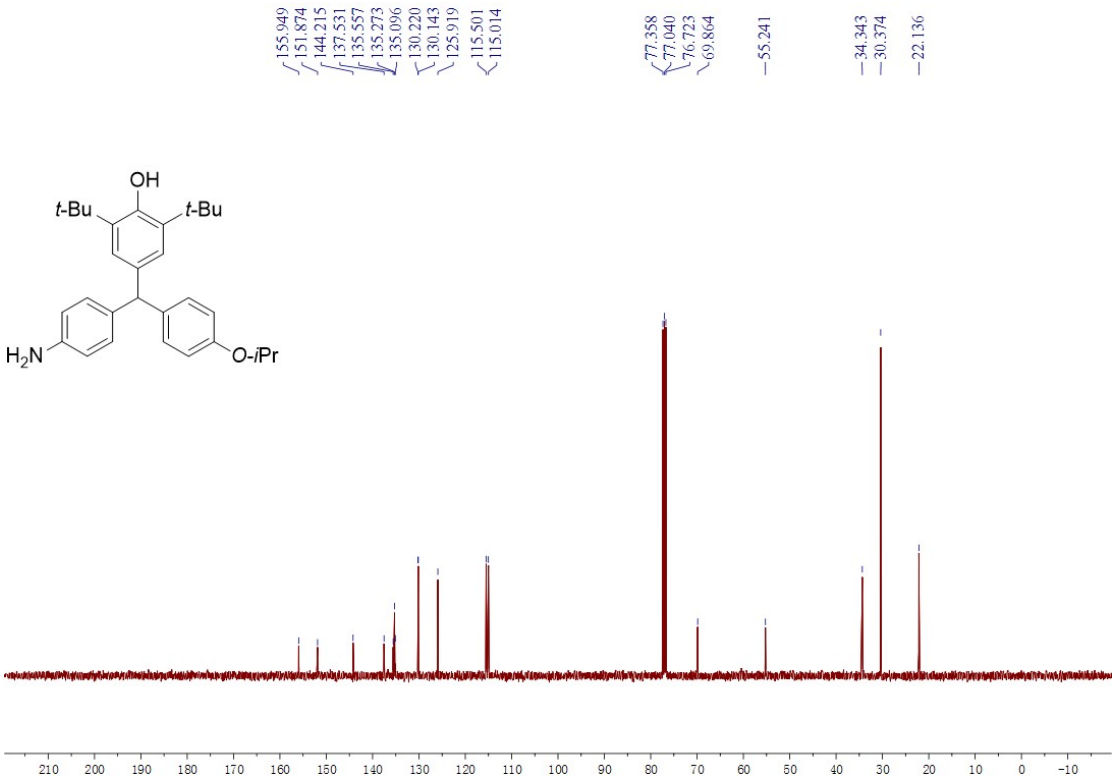
4-((4-Aminophenyl)(3-methoxyphenyl)methyl)-2,6-di-tert-butylphenol (4e)



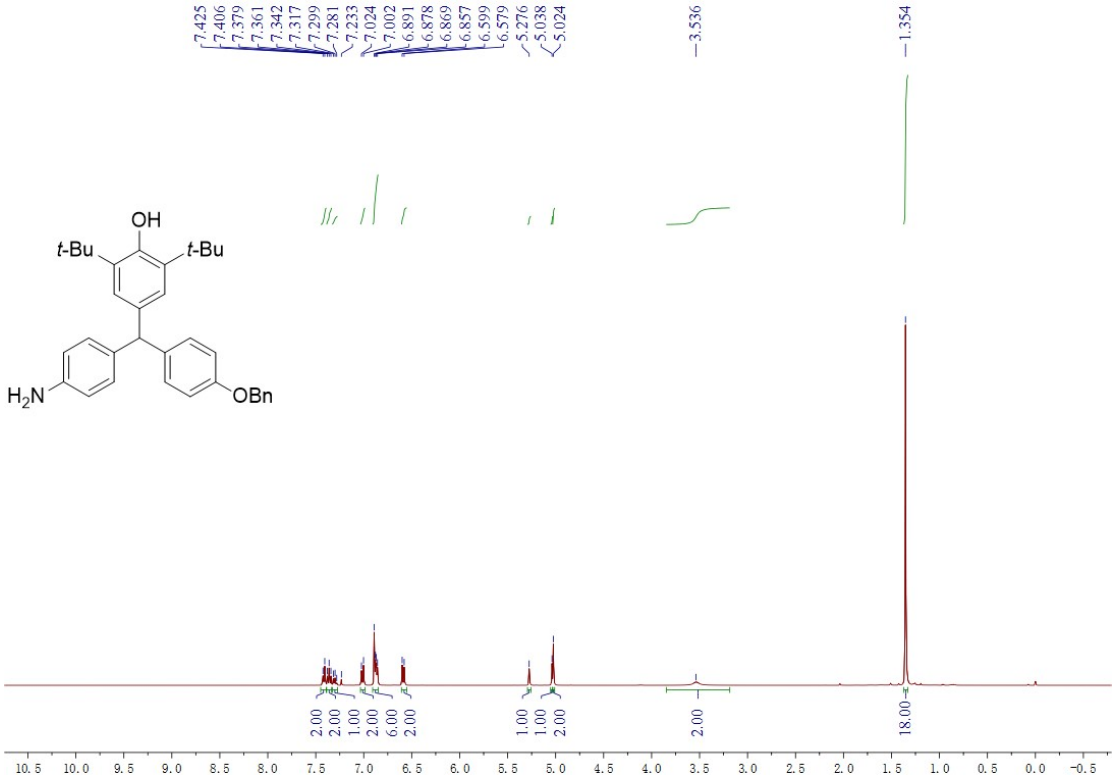


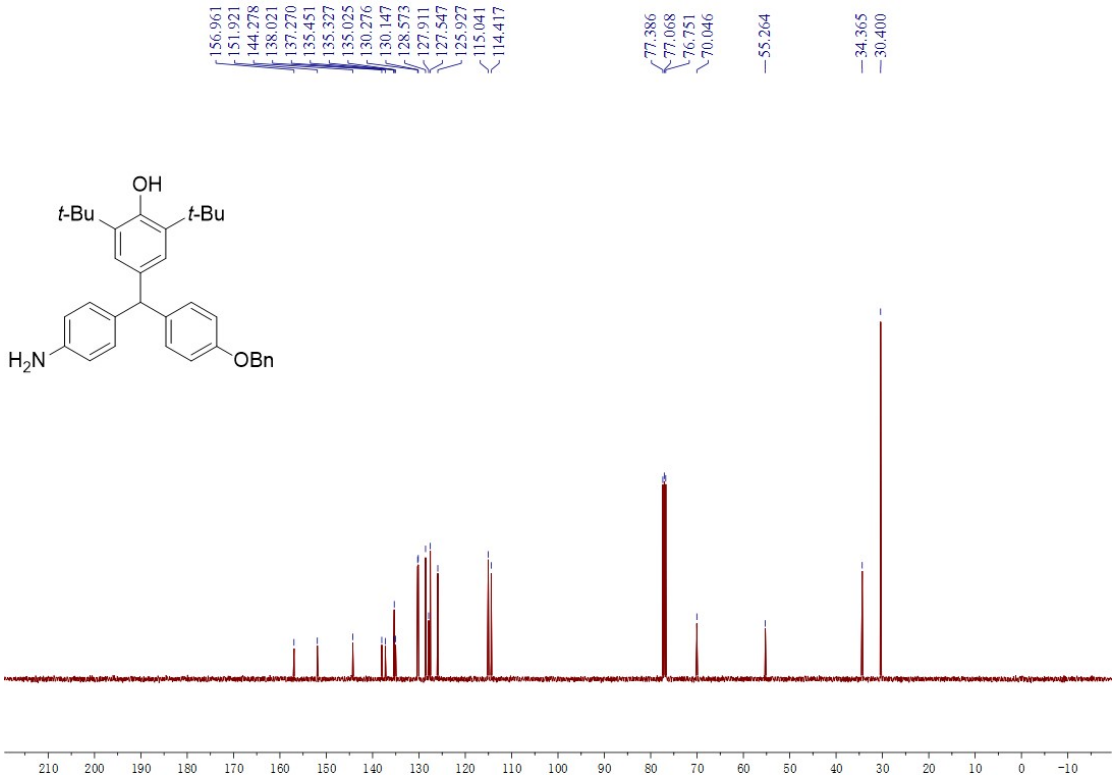
4-((4-Aminophenyl)(4-isopropoxyphenyl)methyl)-2,6-di-tert-butylphenol (4f)



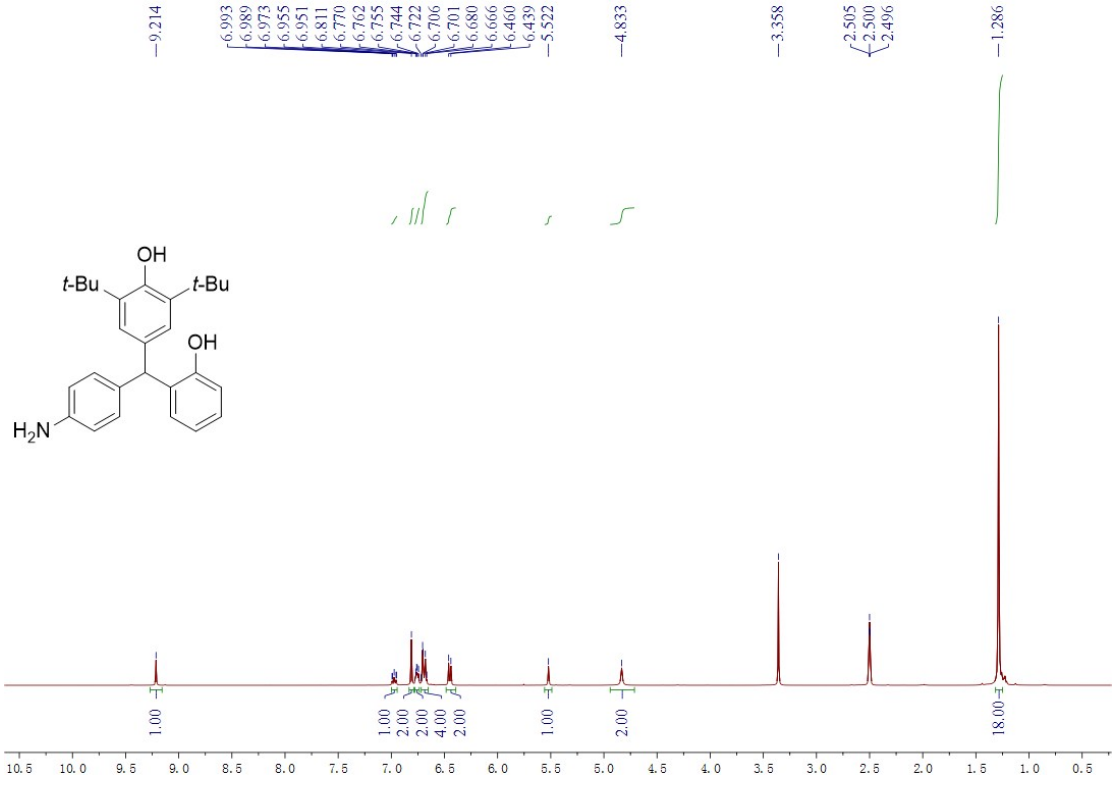


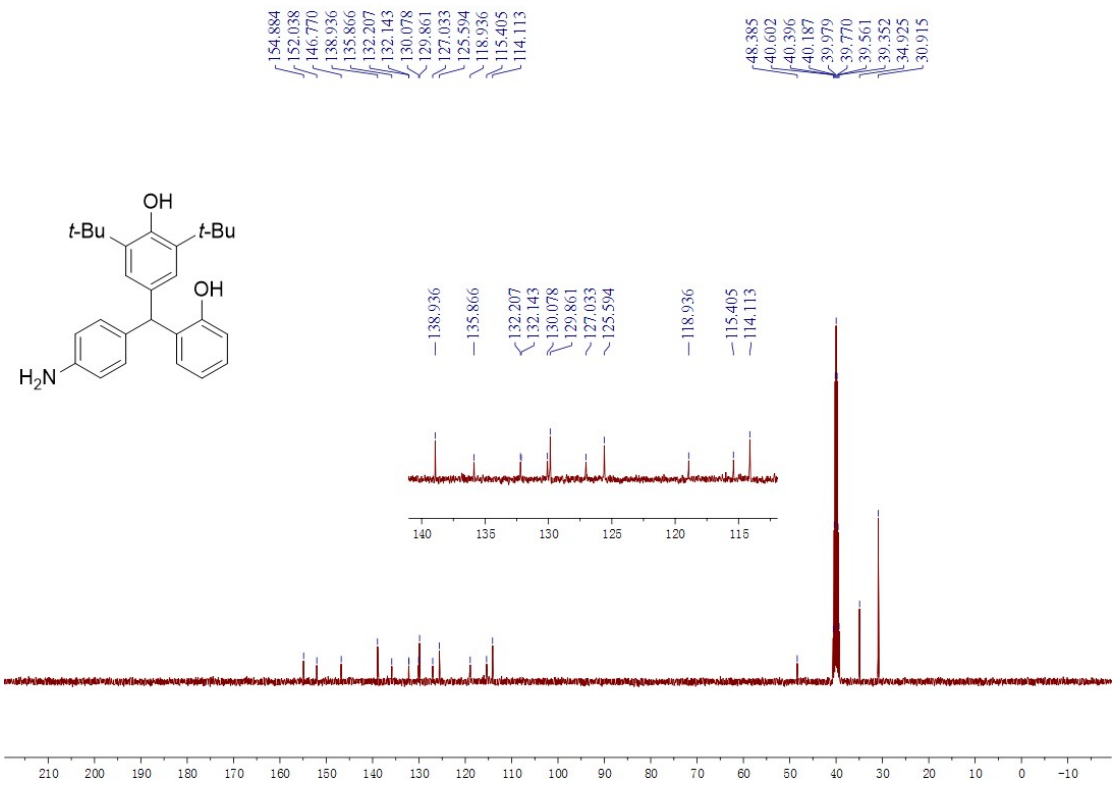
4-((4-Aminophenyl)(4-(benzyloxy)phenyl)methyl)-2,6-di-tert-butylphenol (4g)



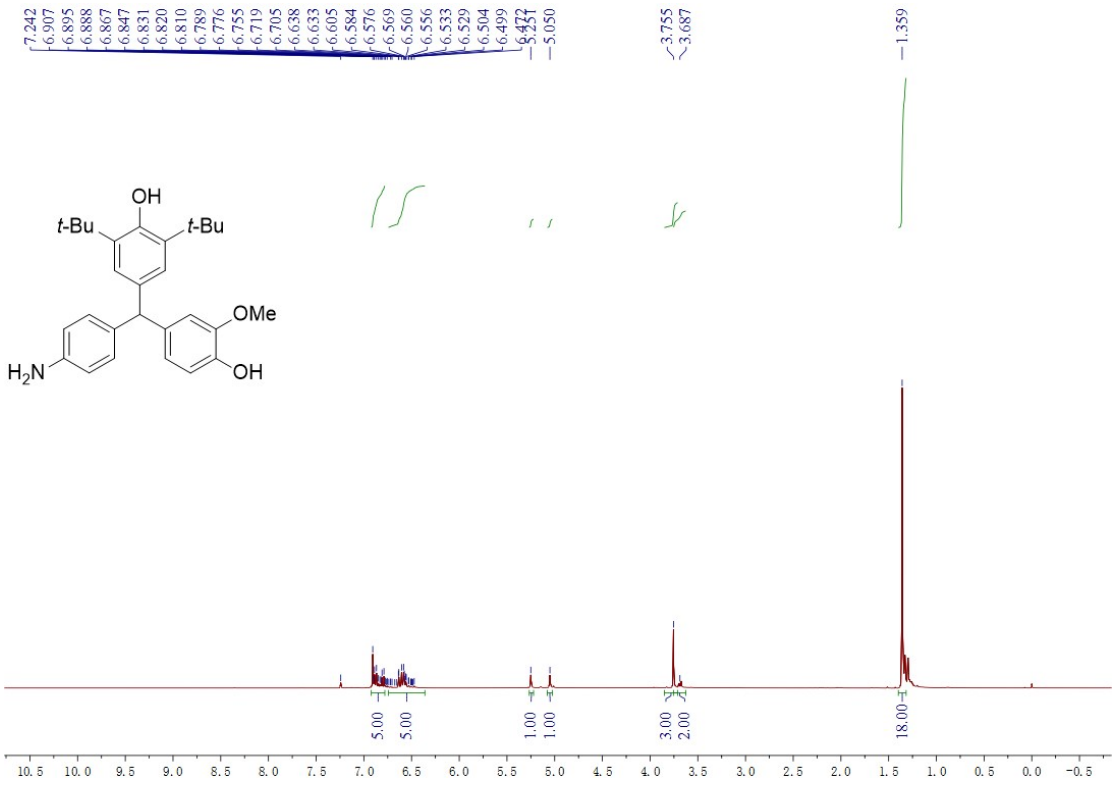


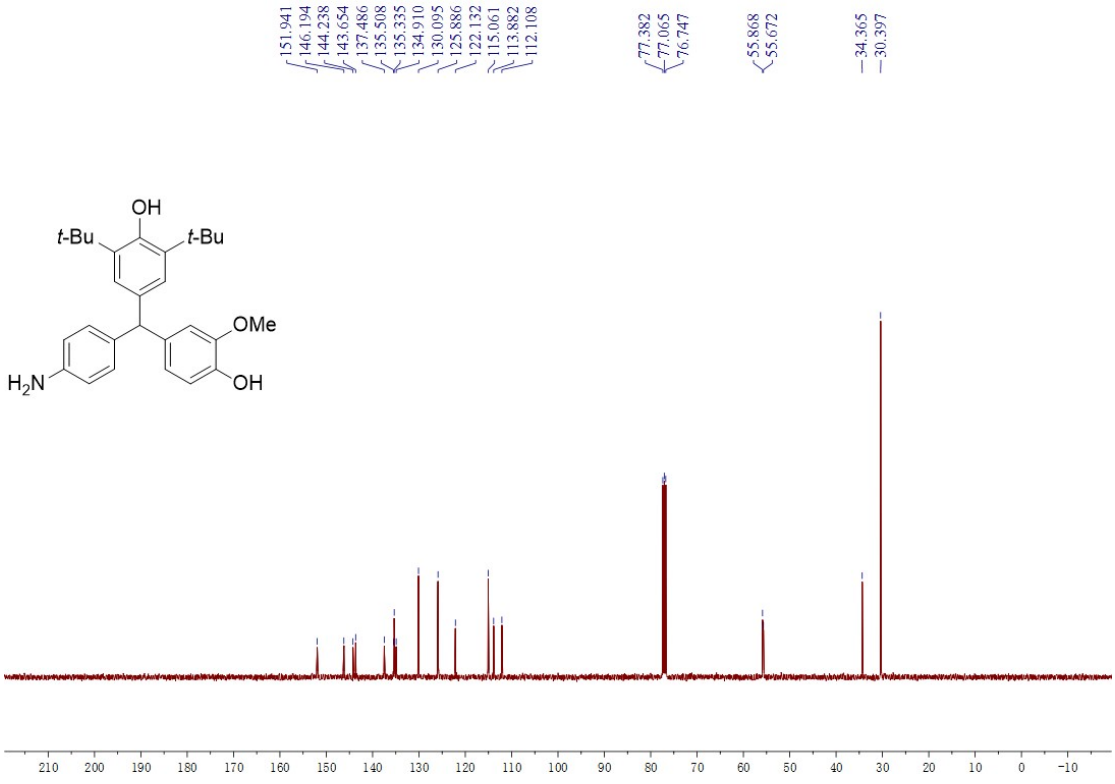
4-((4-Aminophenyl)(2-hydroxyphenyl)methyl)-2,6-di-tert-butylphenol (4h)



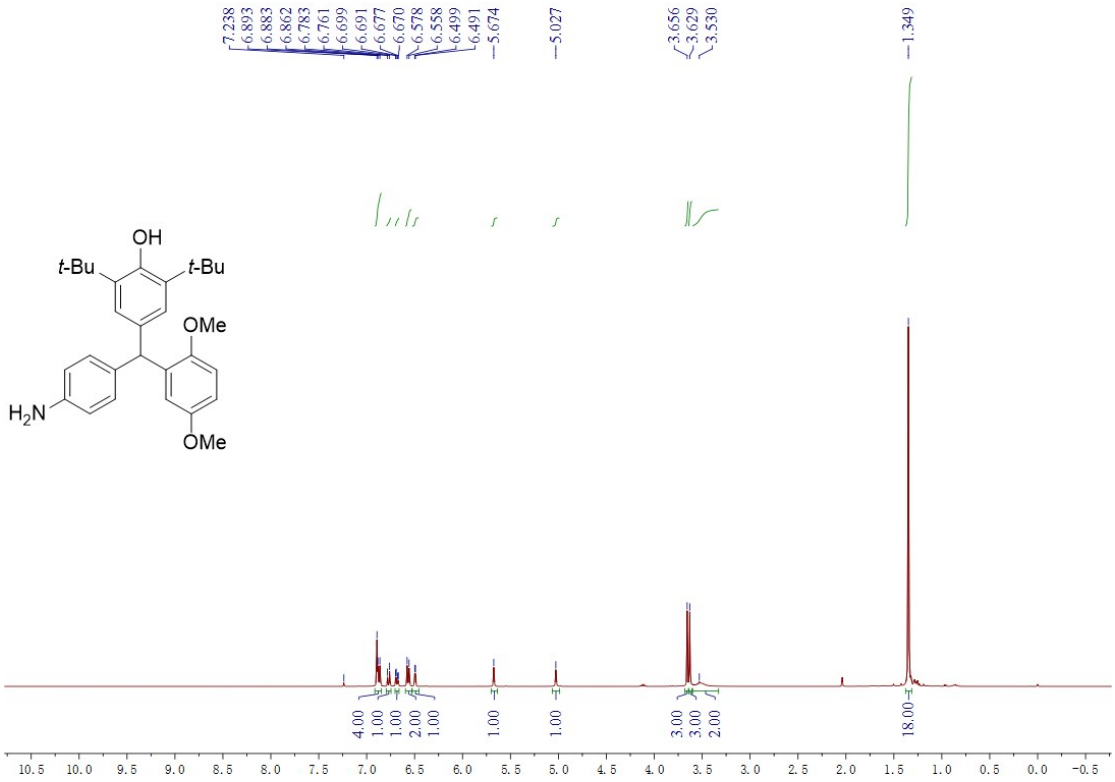


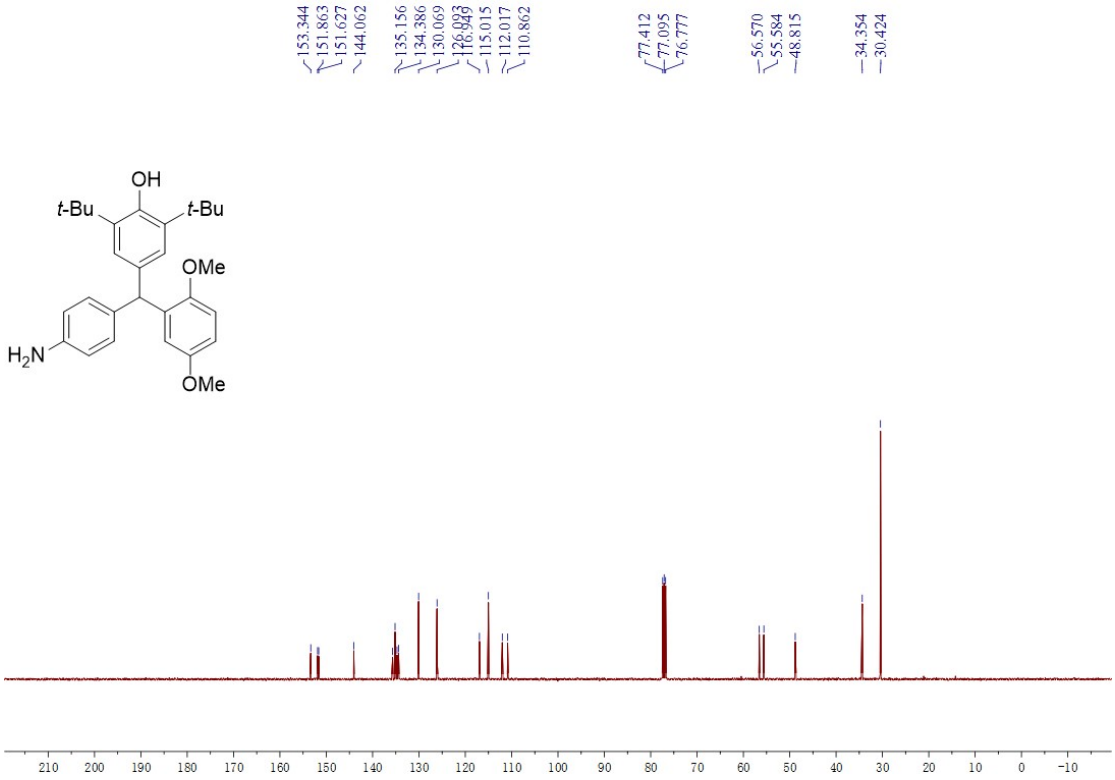
4-((4-Aminophenyl)(4-hydroxy-3-methoxyphenyl)methyl)-2,6-di-tert-butylphenol (4i)



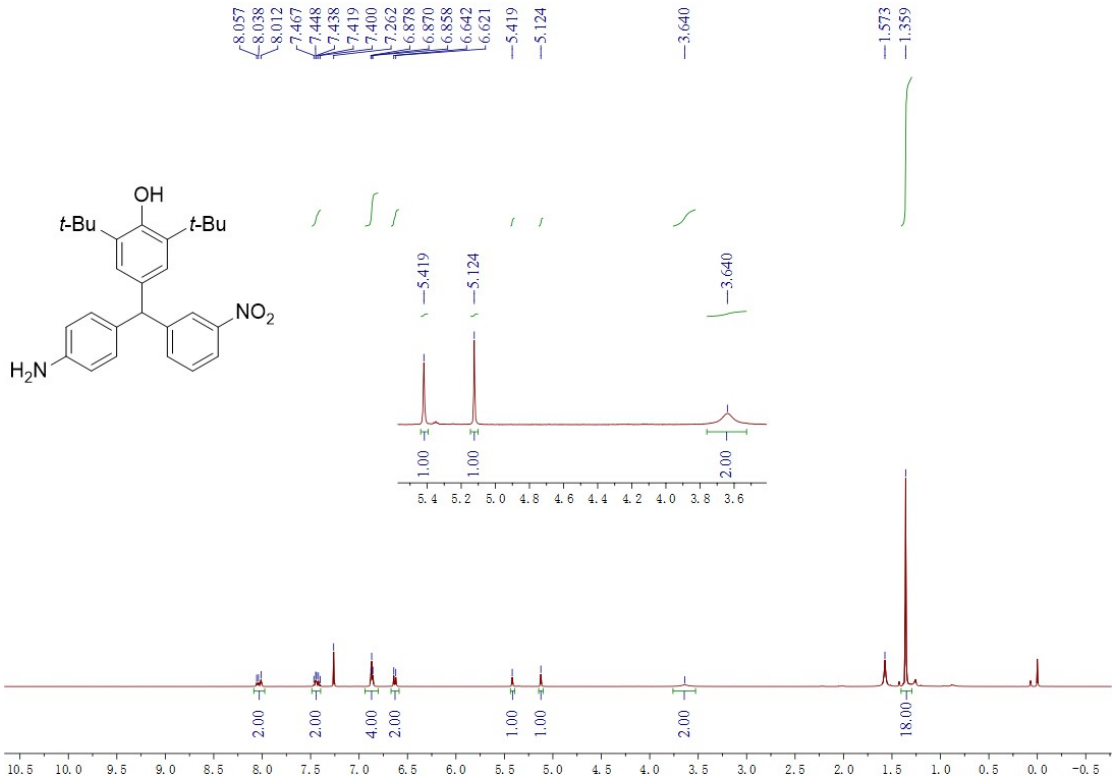


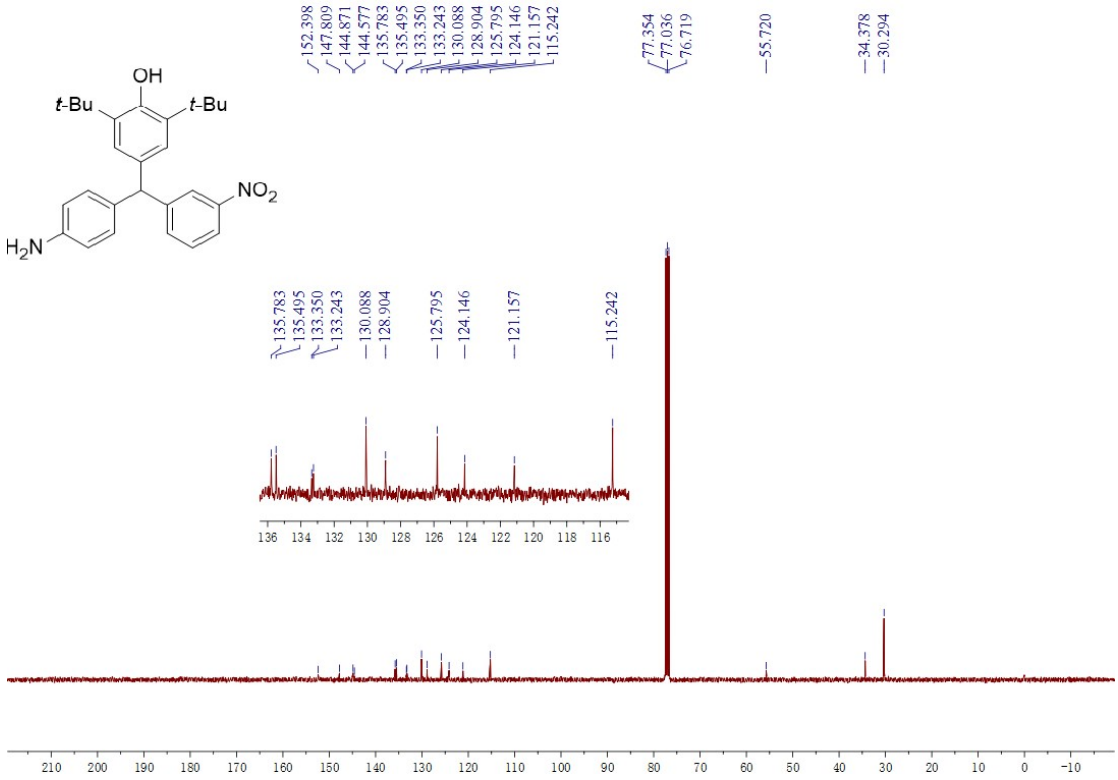
4-((4-Aminophenyl)(2,5-dimethoxyphenyl)methyl)-2,6-di-tert-butylphenol (4j)



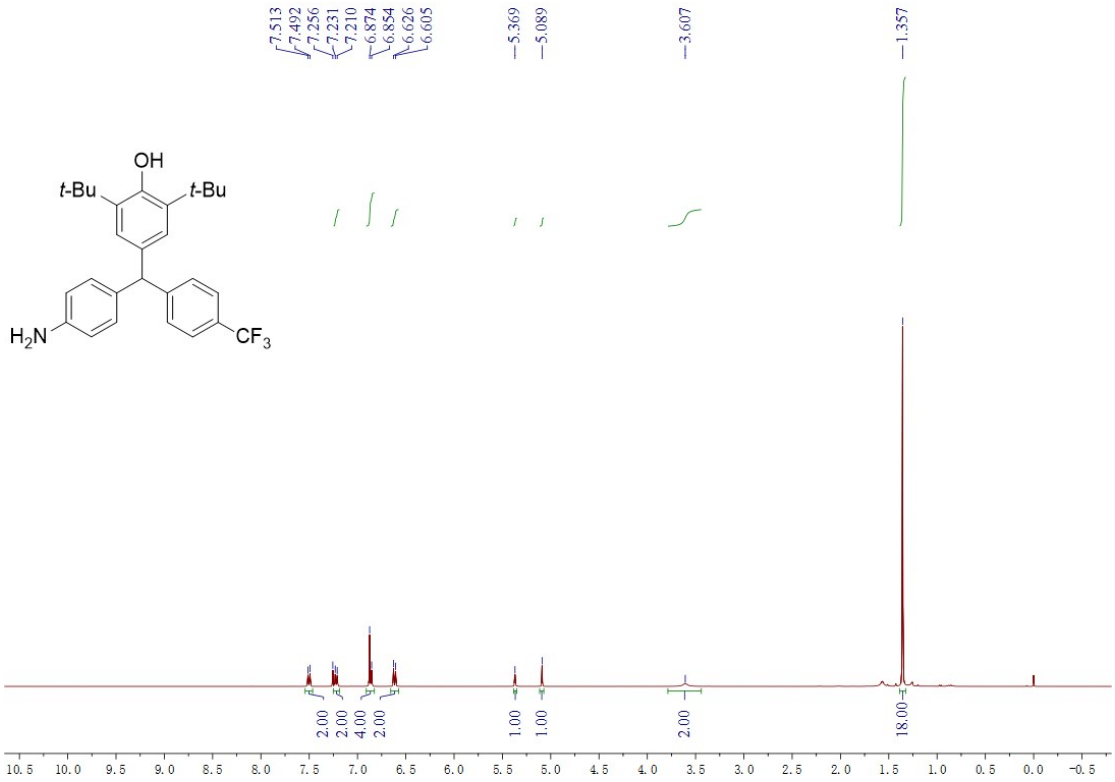


4-((4-Aminophenyl)(3-nitrophenyl)methyl)-2,6-di-tert-butylphenol (4k)





4-((4-Aminophenyl)(4-(trifluoromethyl)phenyl)methyl)-2,6-di-tert-butylphenol (4l)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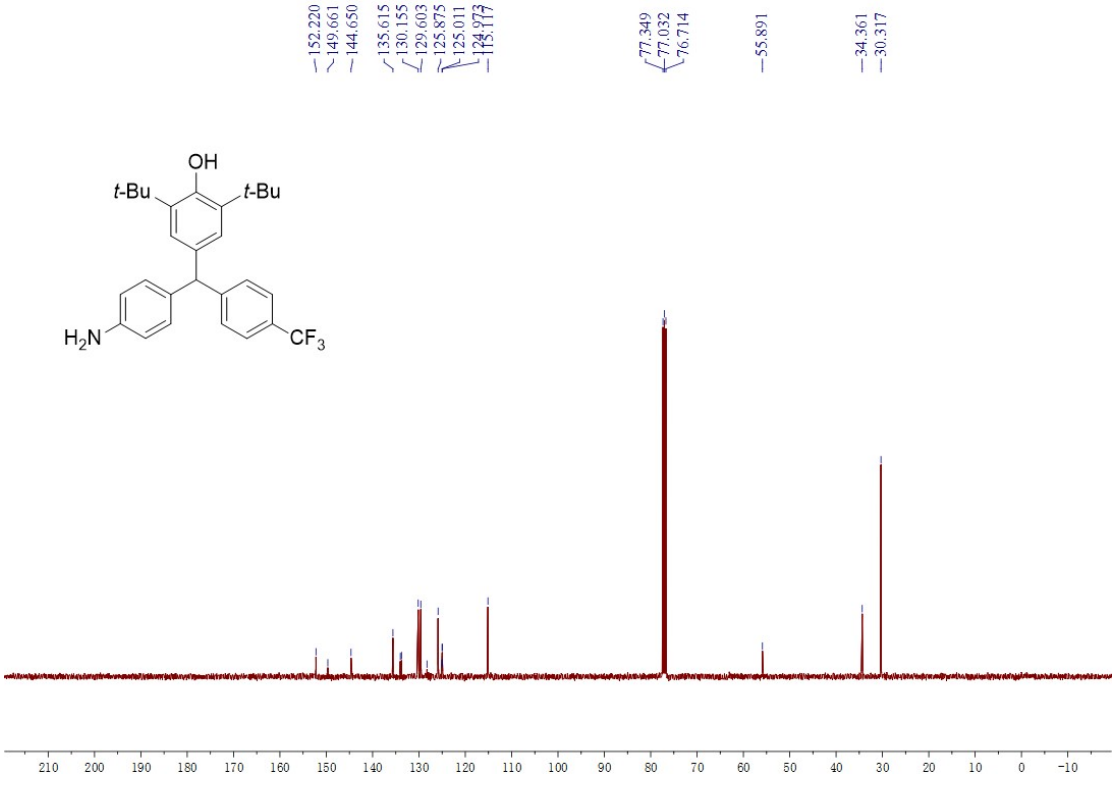
t-Bu
H2N
CF3
2.00
2.00
4.00
2.00
1.00
1.00
2.00
18.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5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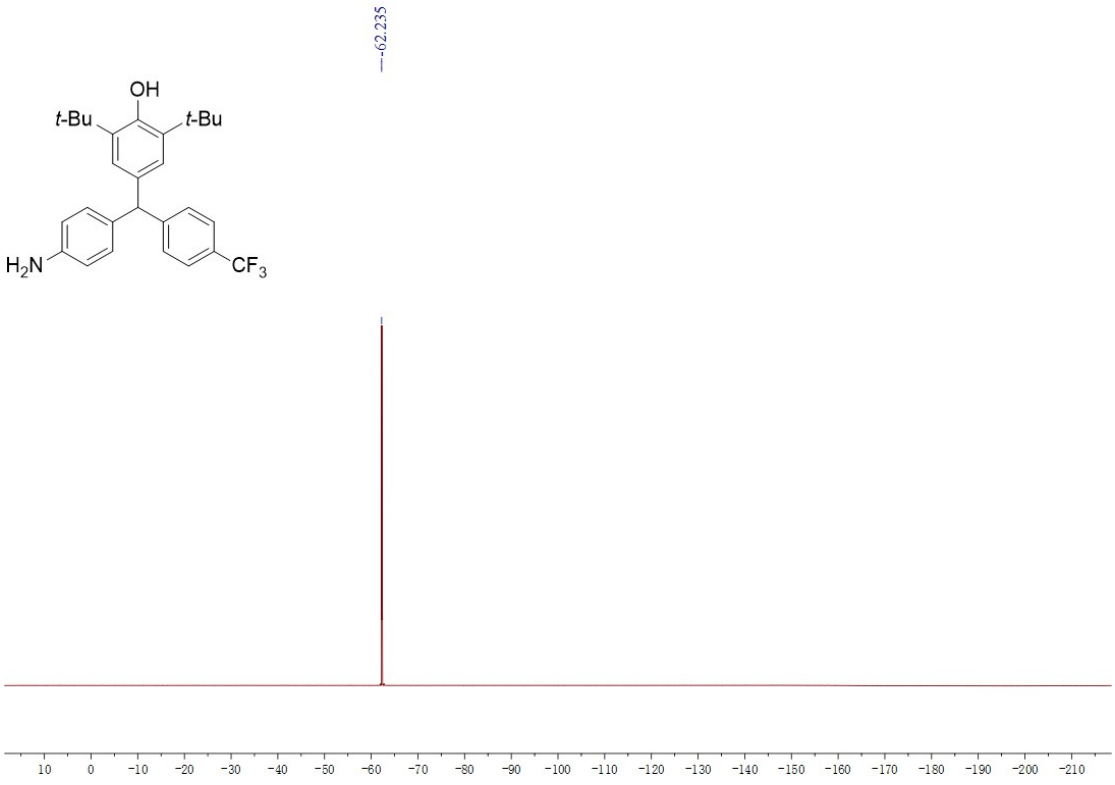
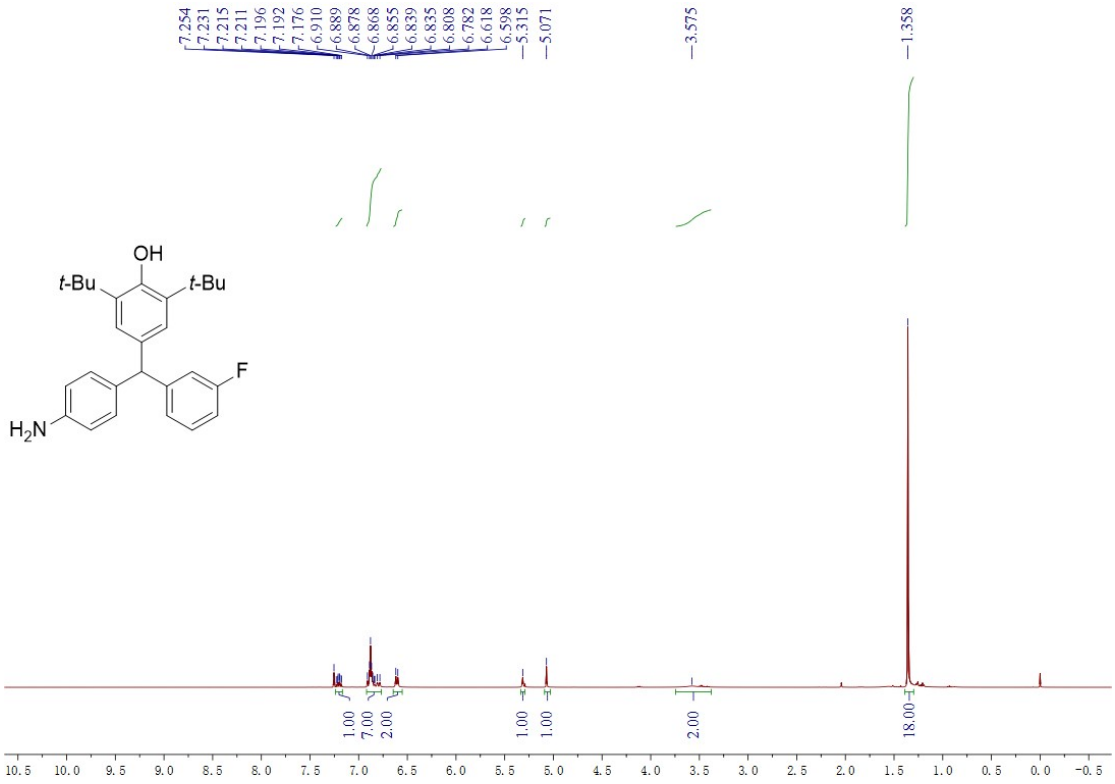
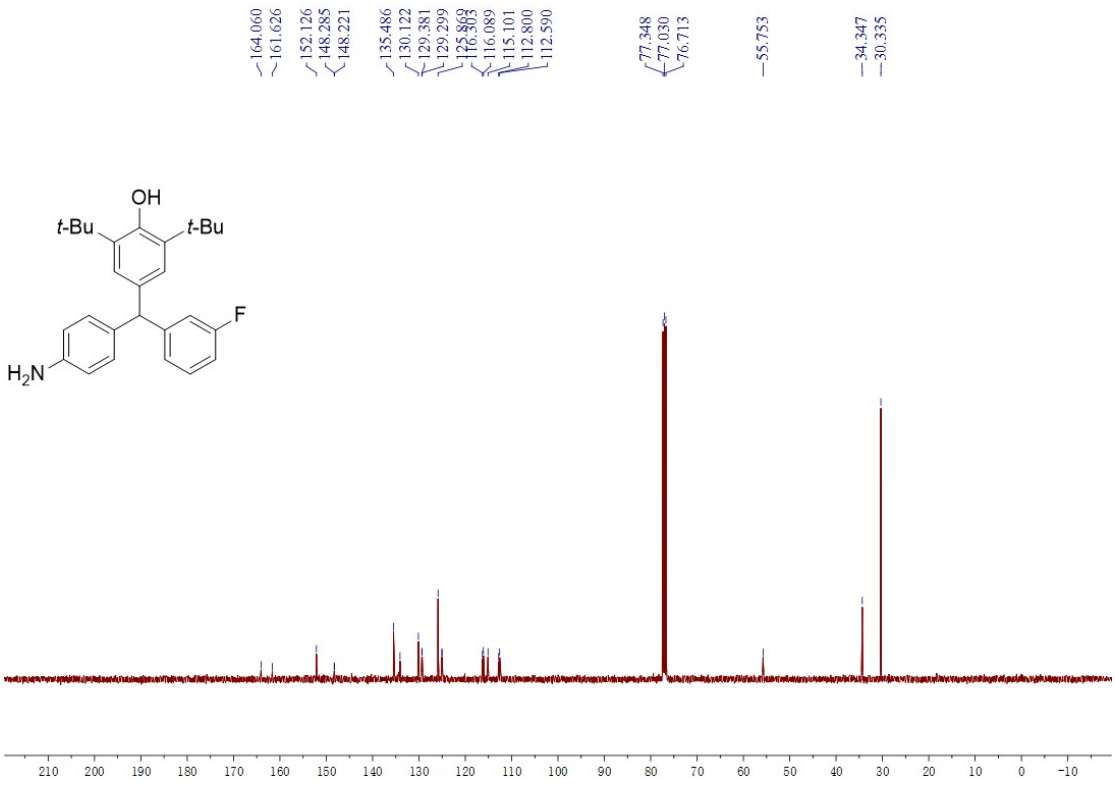
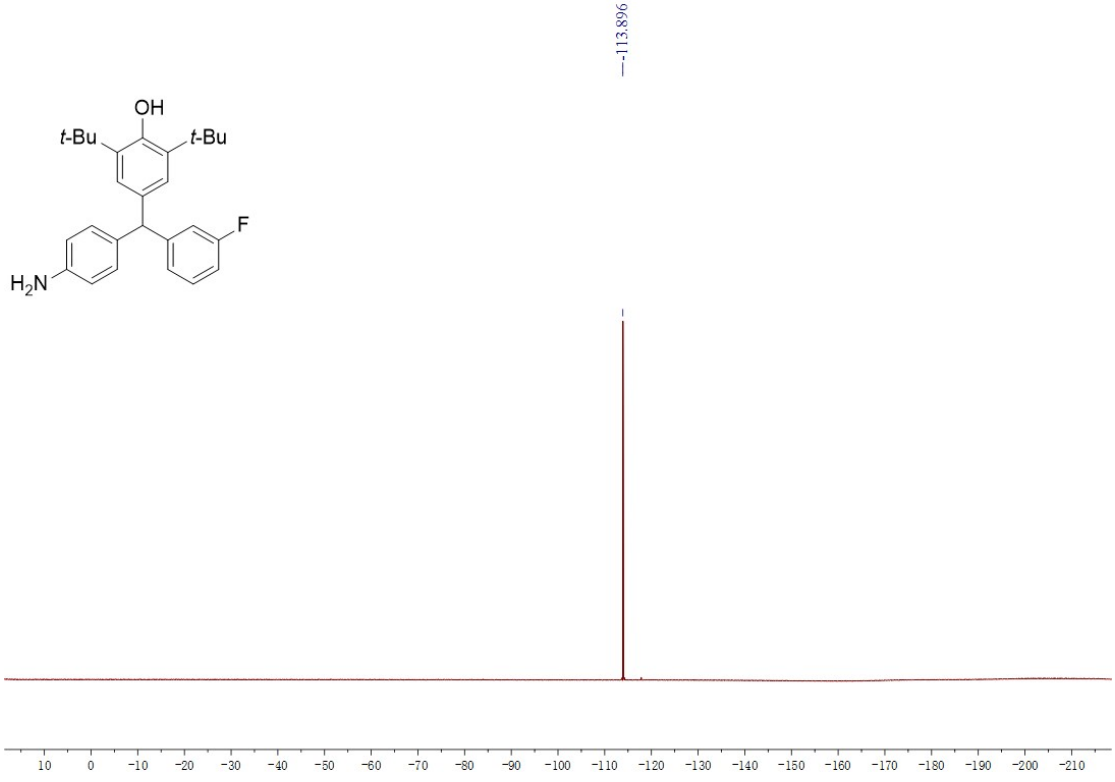


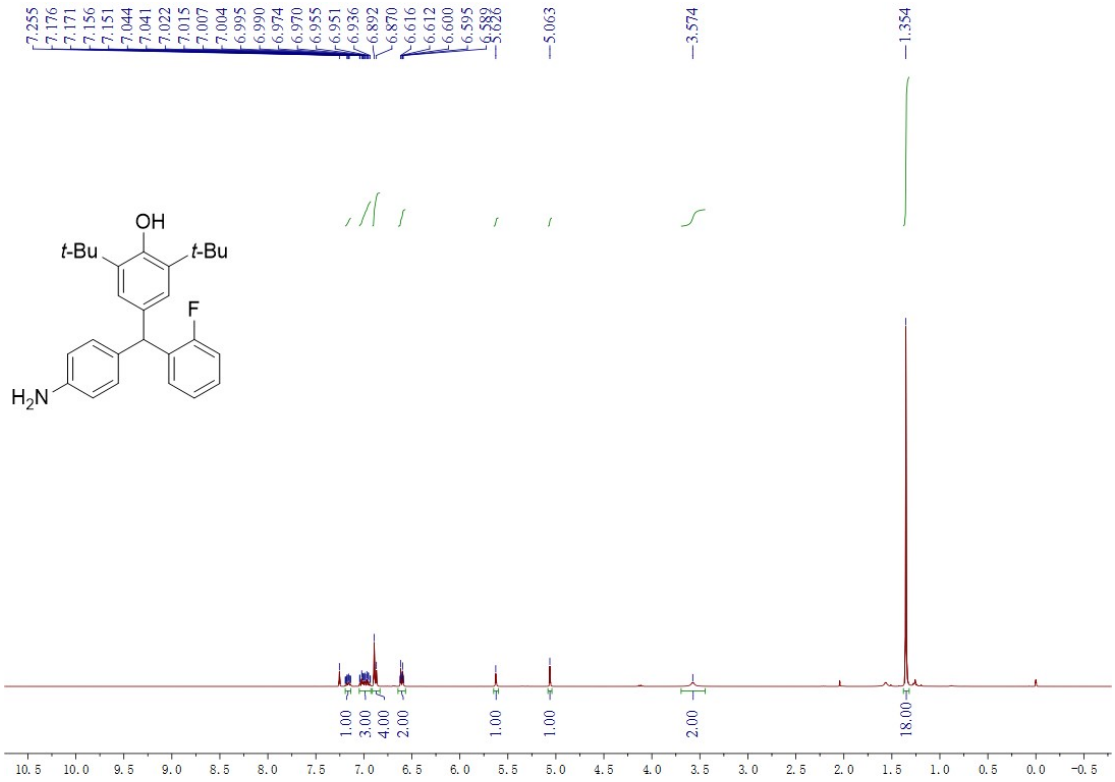
4-((4-Aminophenyl)(3-fluorophenyl)methyl)-2,6-di-tert-butylphenol (4m)







4-((4-Aminophenyl)(2-fluorophenyl)methyl)-2,6-di-tert-butylphenol (4n)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6.870
6.616
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6.600
6.595
6.589
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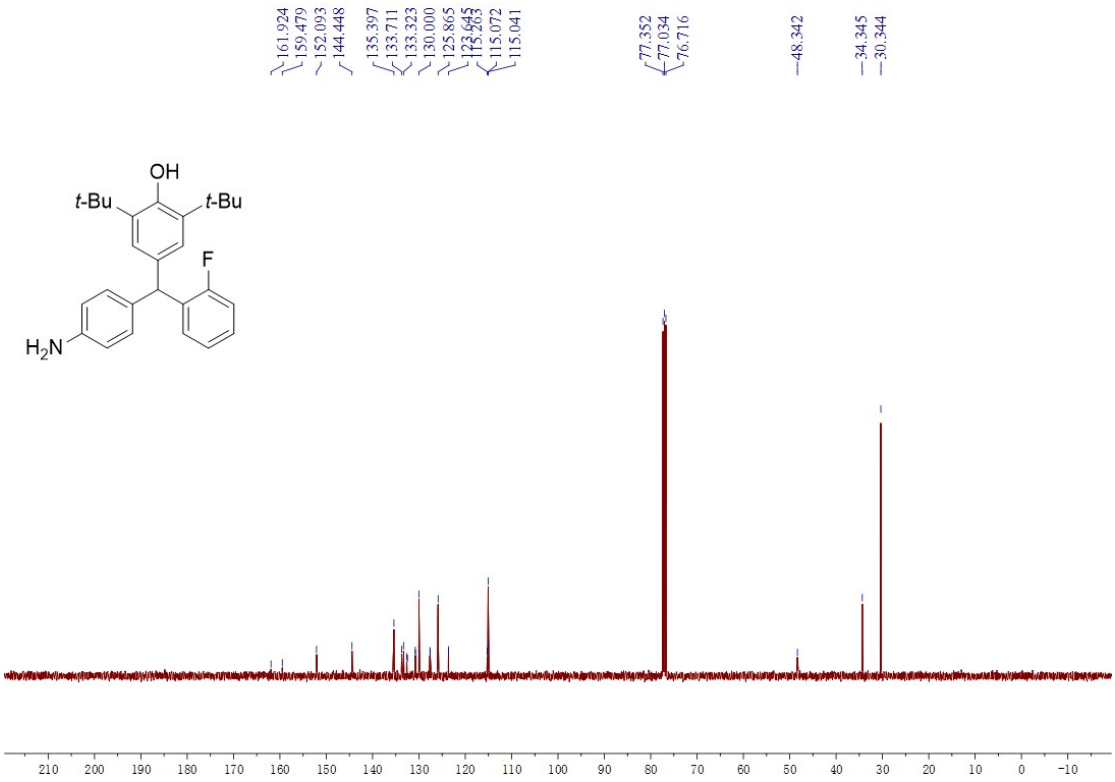
5.063
3.574
1.354
OH
t-Bu
t-Bu
F
H2N
1.00
3.00
4.00
2.00
1.00
1.00
2.00
18.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5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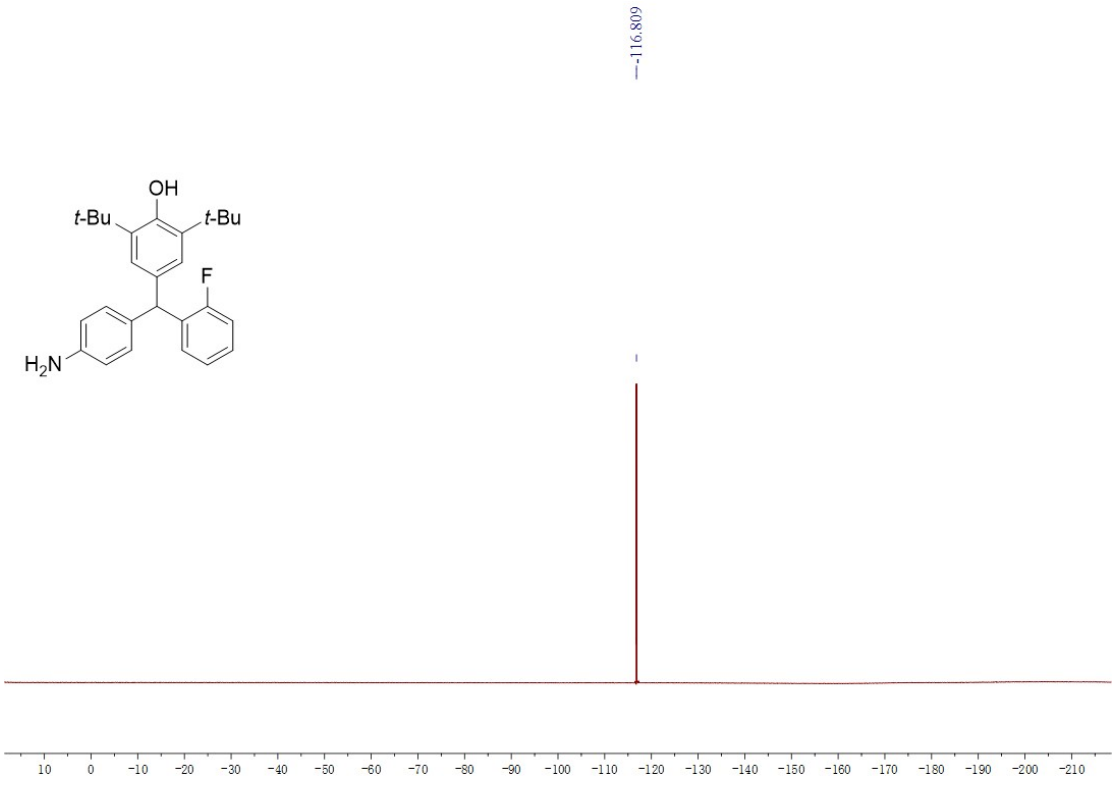
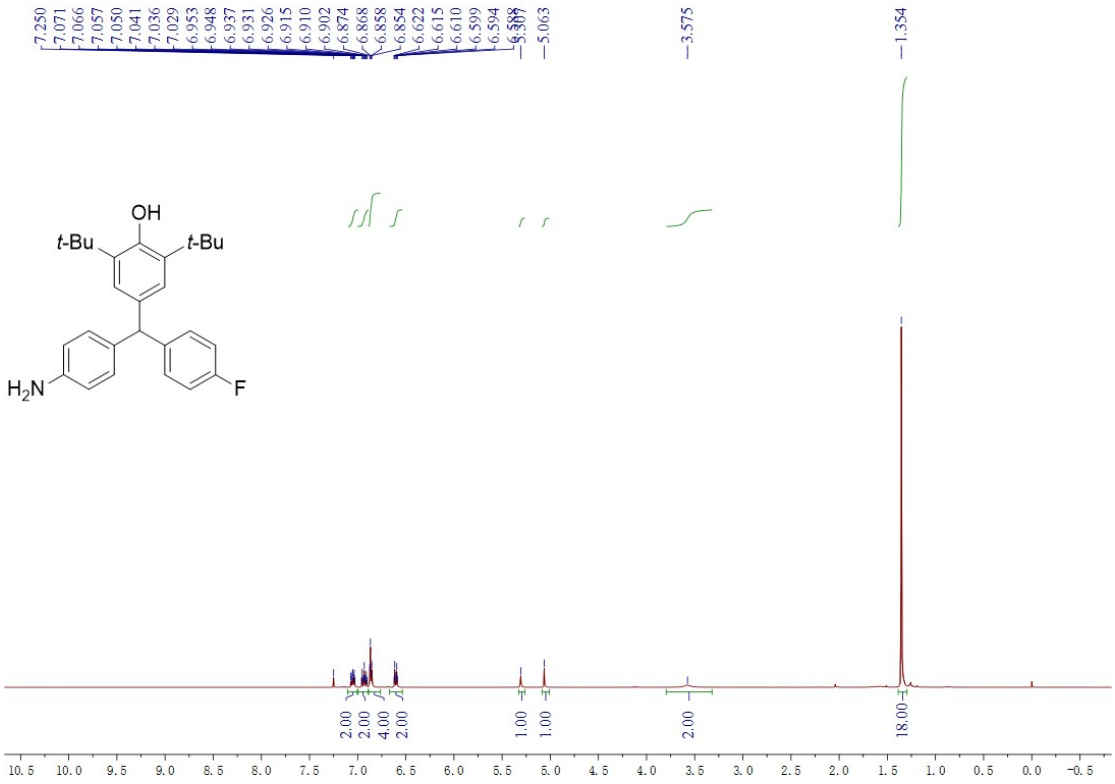
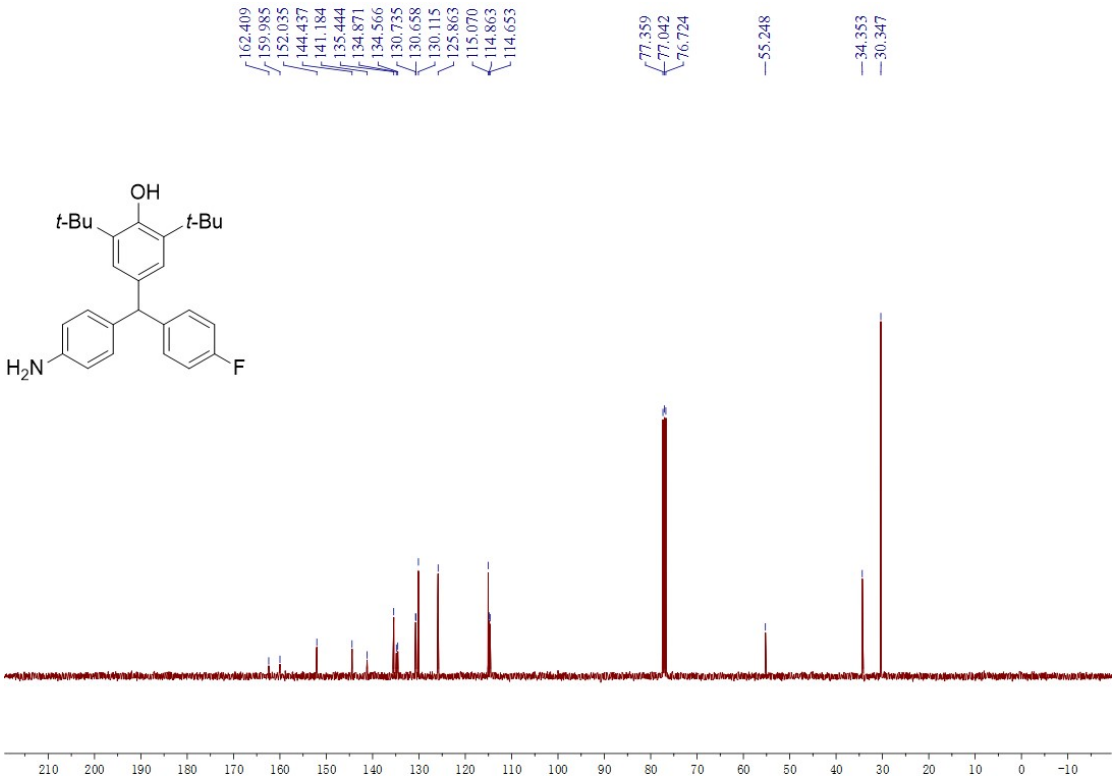
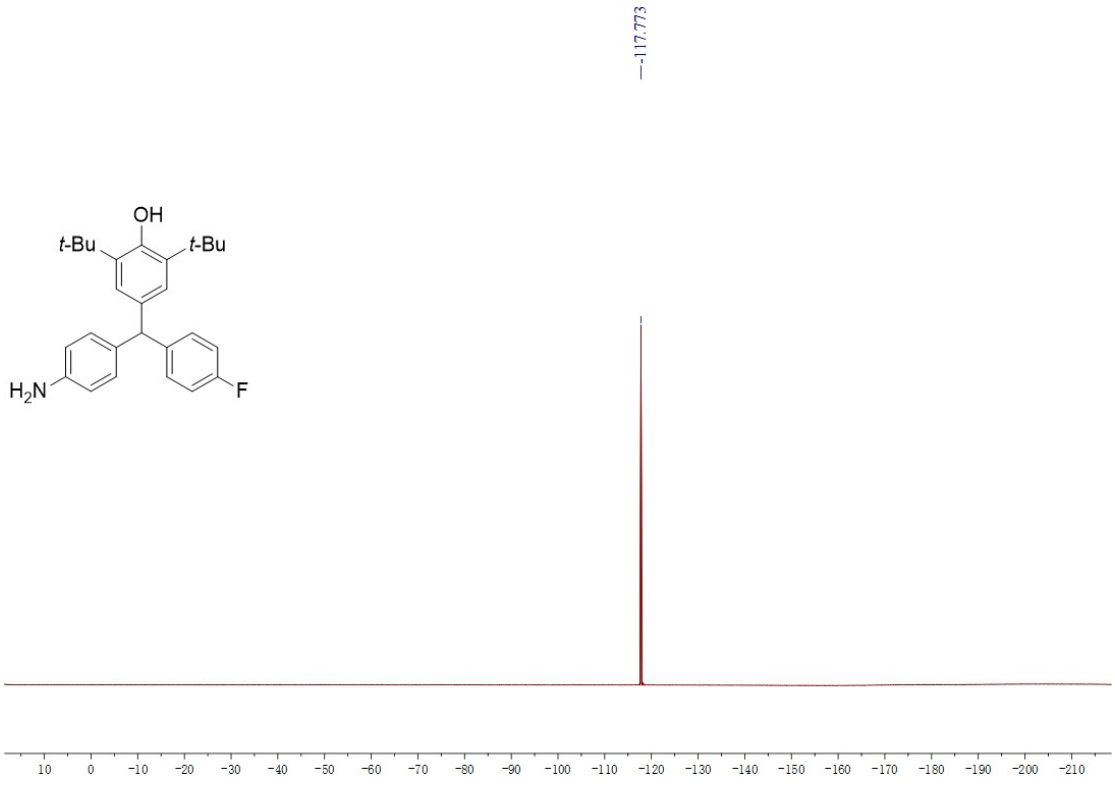


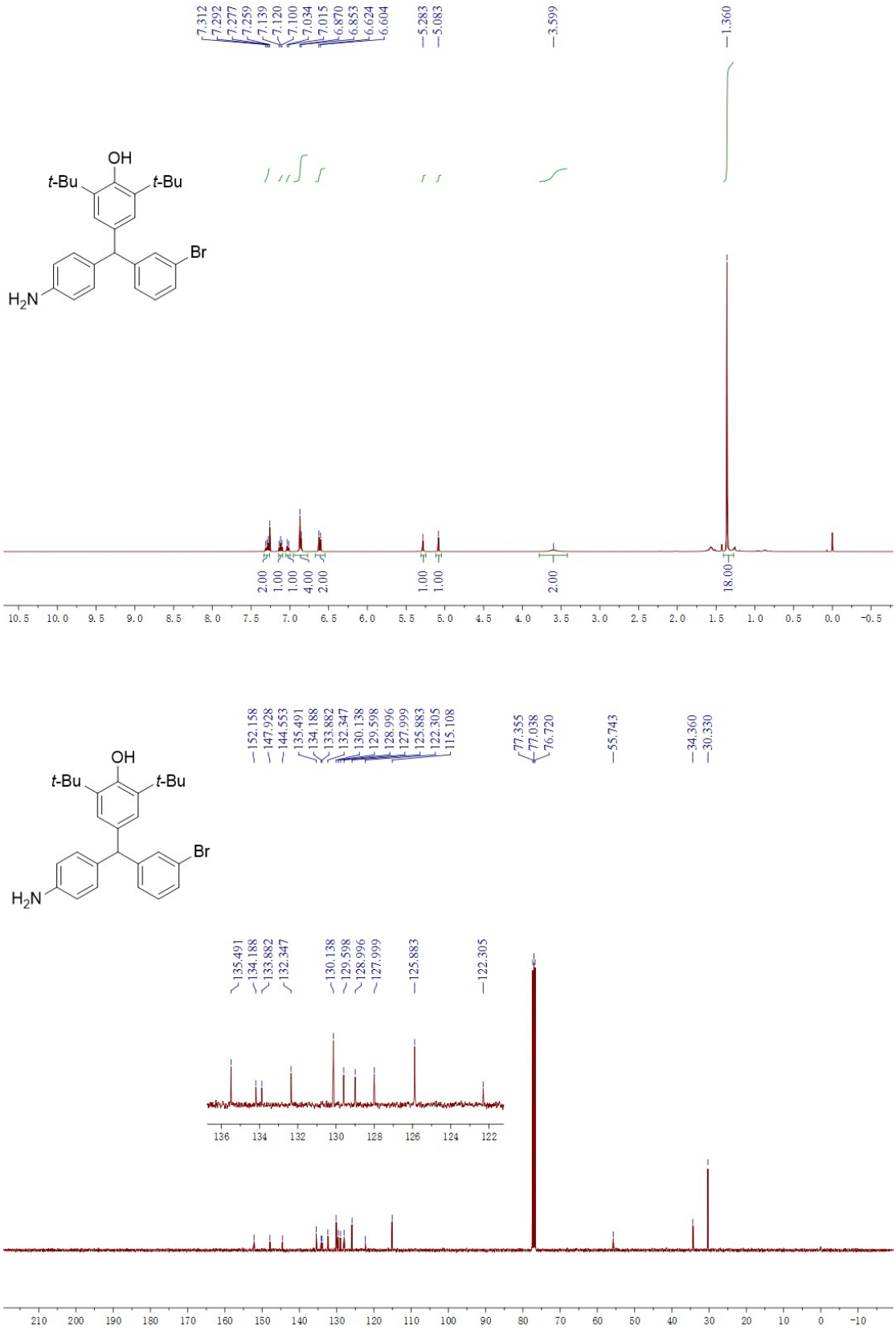
4-((4-Aminophenyl)(4-fluorophenyl)methyl)-2,6-di-tert-butylphenol (4o)



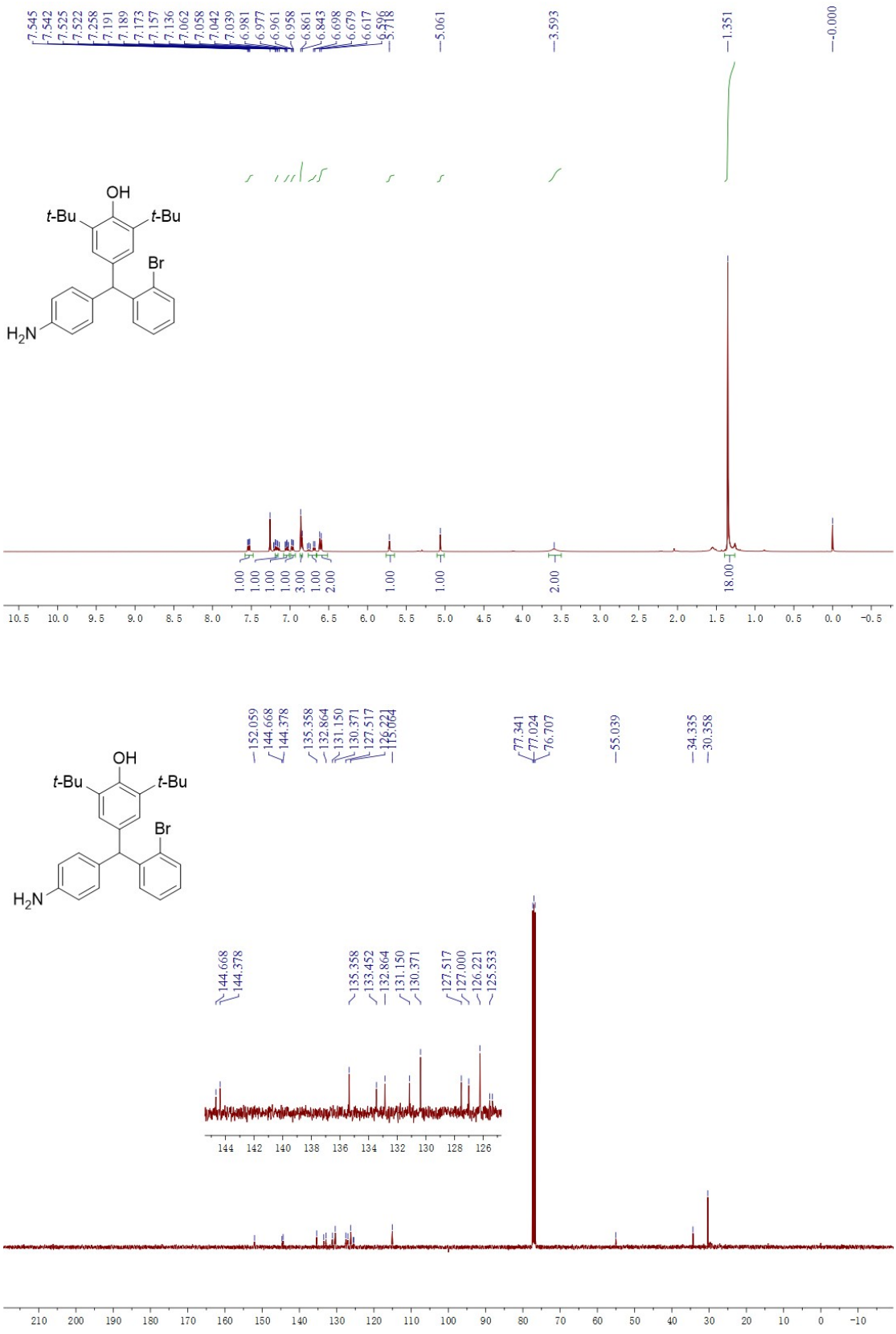




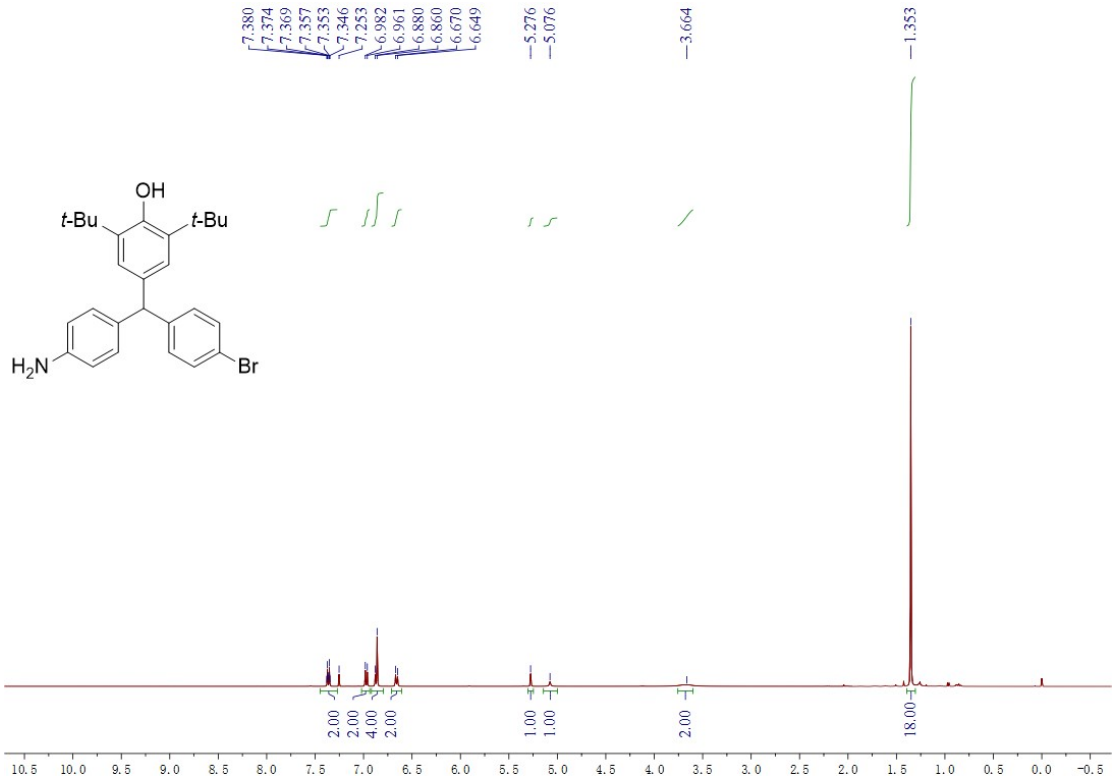
4-((4-Aminophenyl)(3-bromophenyl)methyl)-2,6-di-tert-butylphenol (4p)

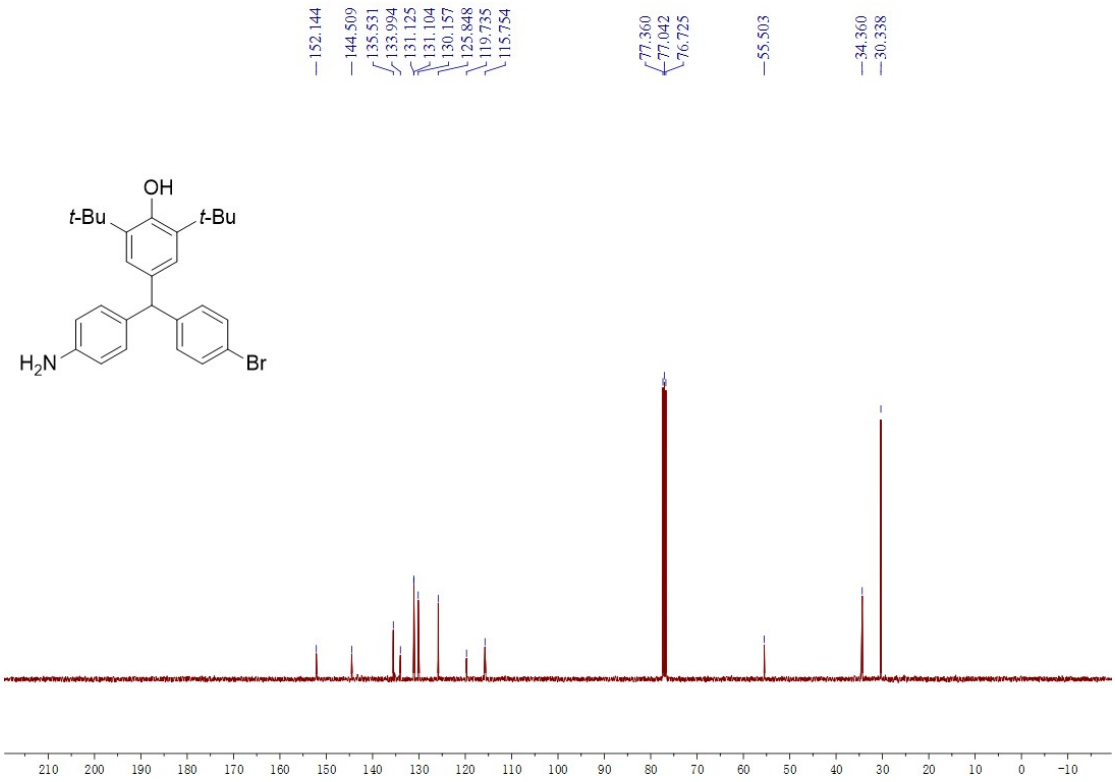


4-((4-Aminophenyl)(2-bromophenyl)methyl)-2,6-di-tert-butylphenol (4q)

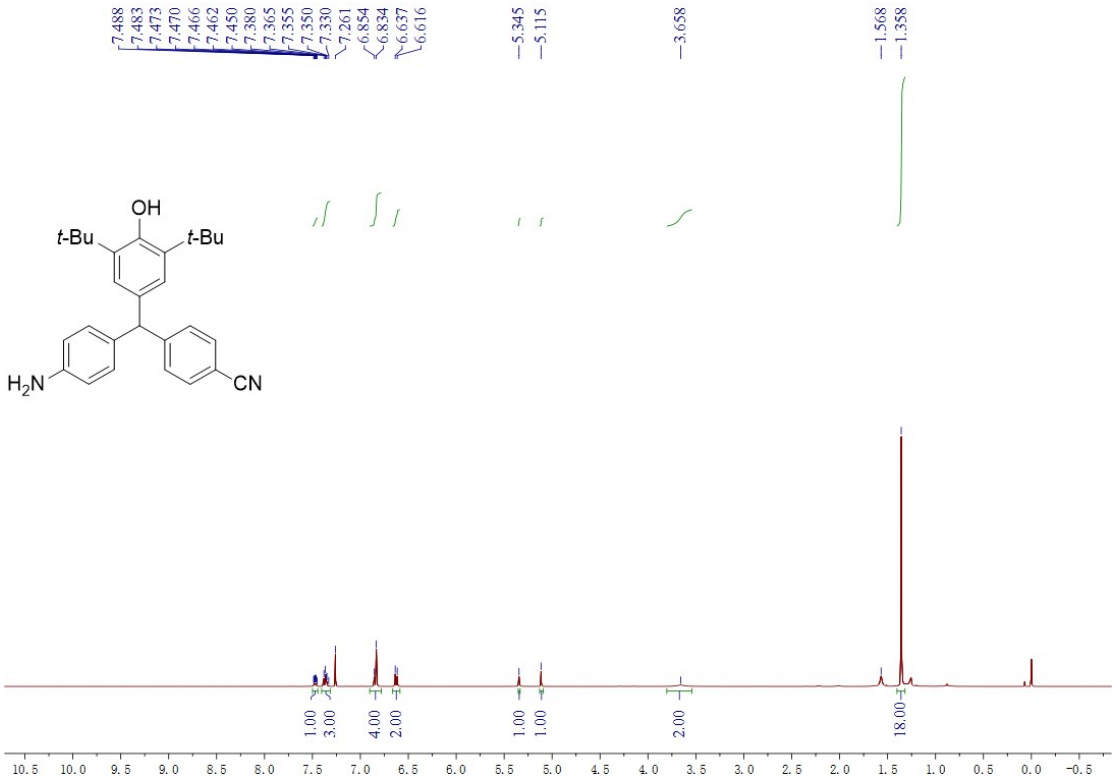


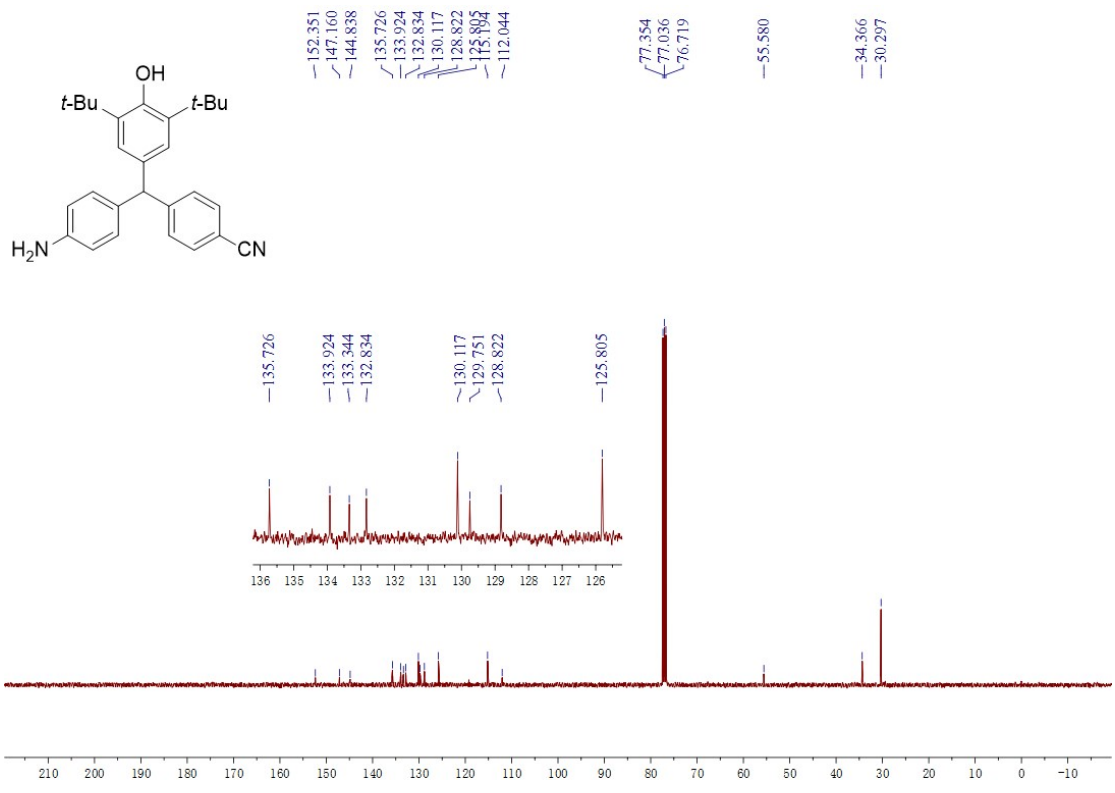
4-((4-Aminophenyl)(4-bromophenyl)methyl)-2,6-di-tert-butylphenol (4r)



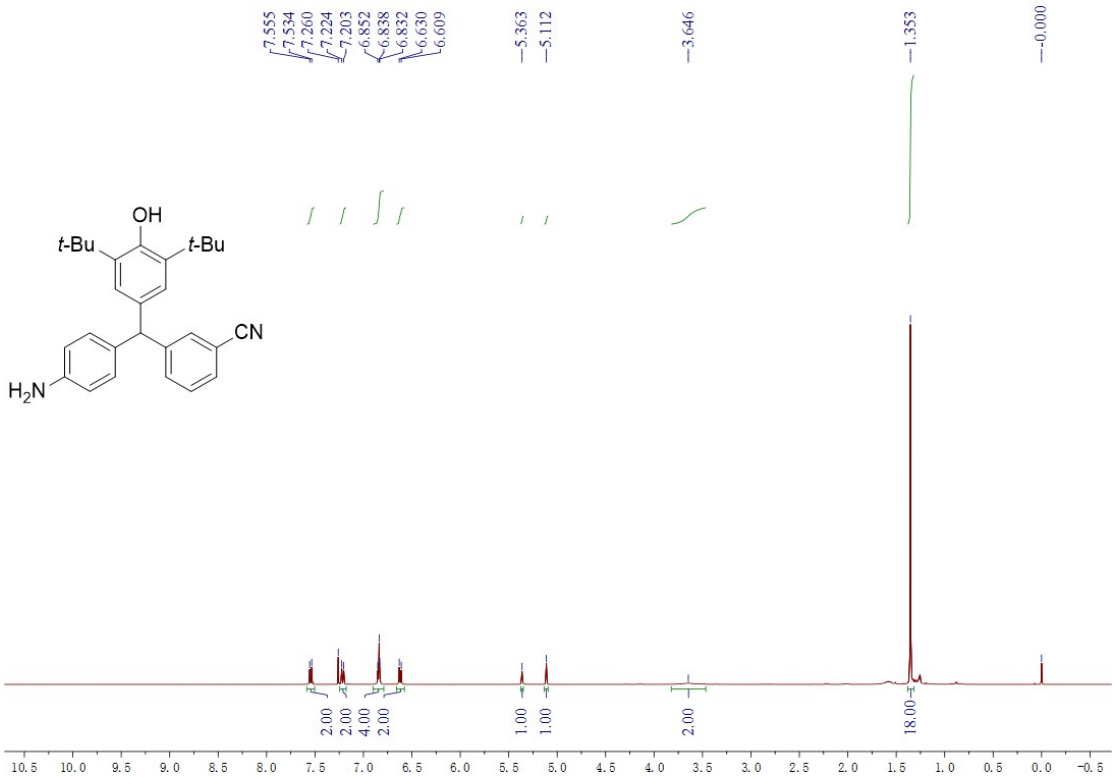


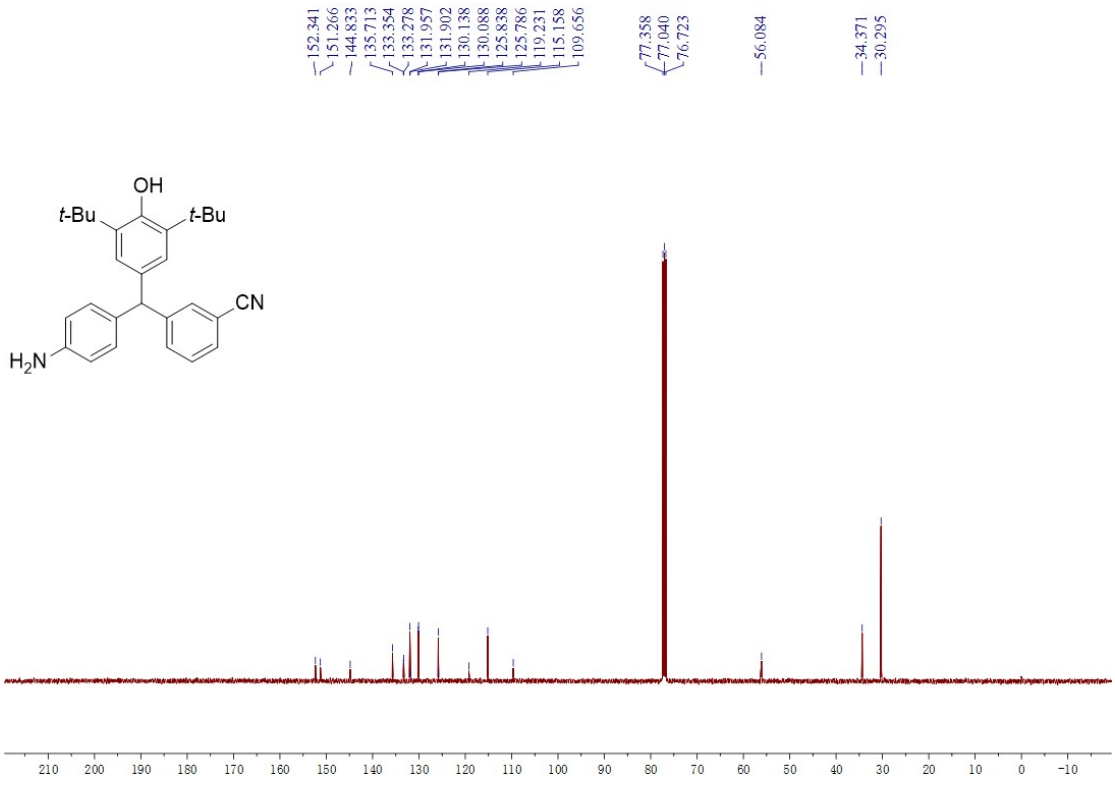
4-((4-Aminophenyl)(3,5-di-tert-butyl-4-hydroxyphenyl)methyl)benzonitrile (4s)



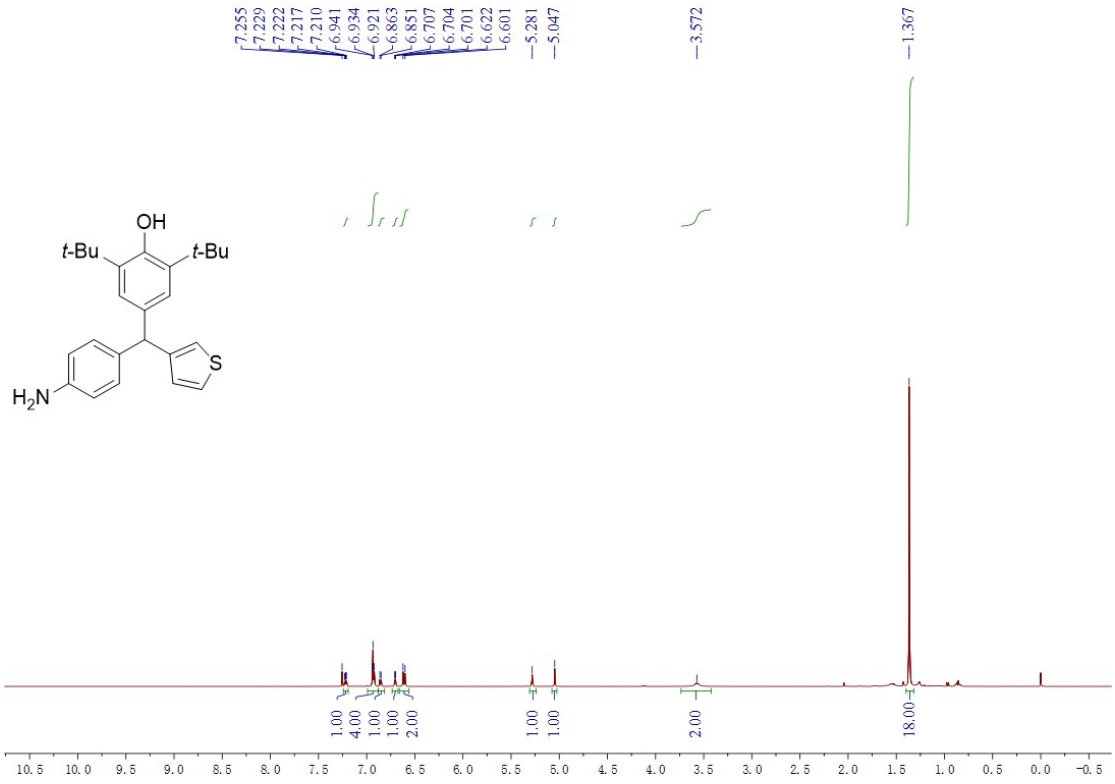


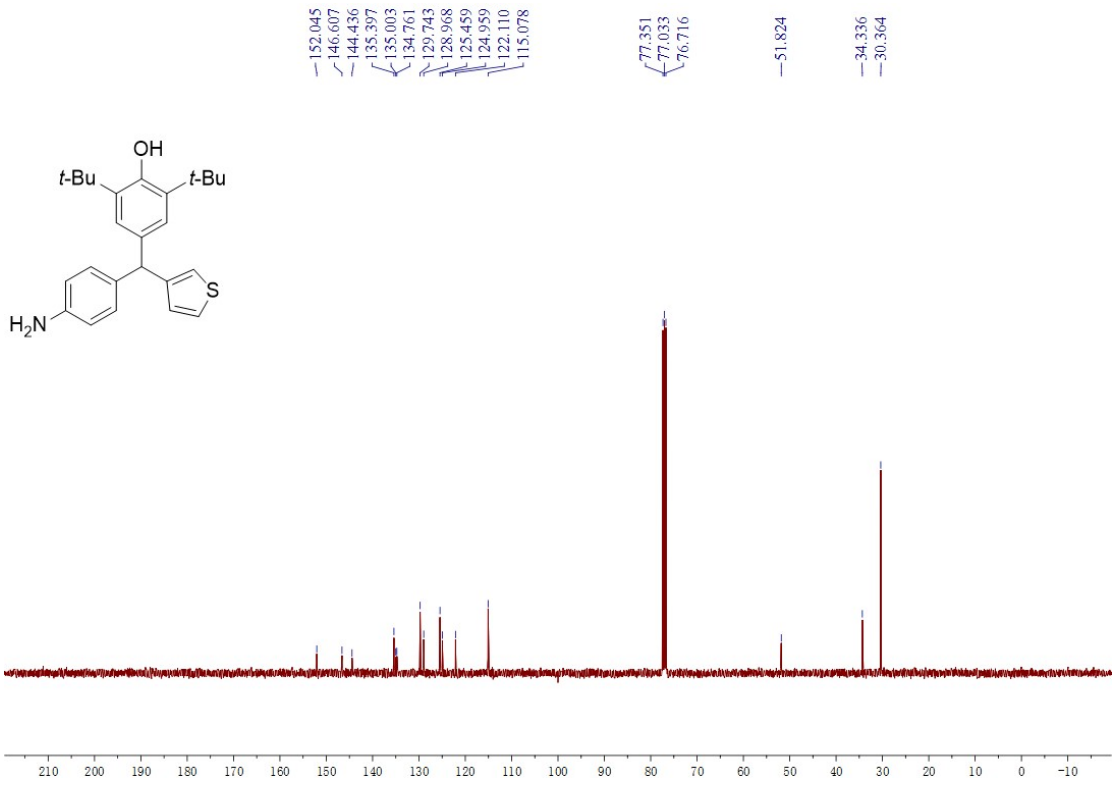
3-((4-Aminophenyl)(3,5-di-tert-butyl-4-hydroxyphenyl)methyl)benzonitrile (4t)



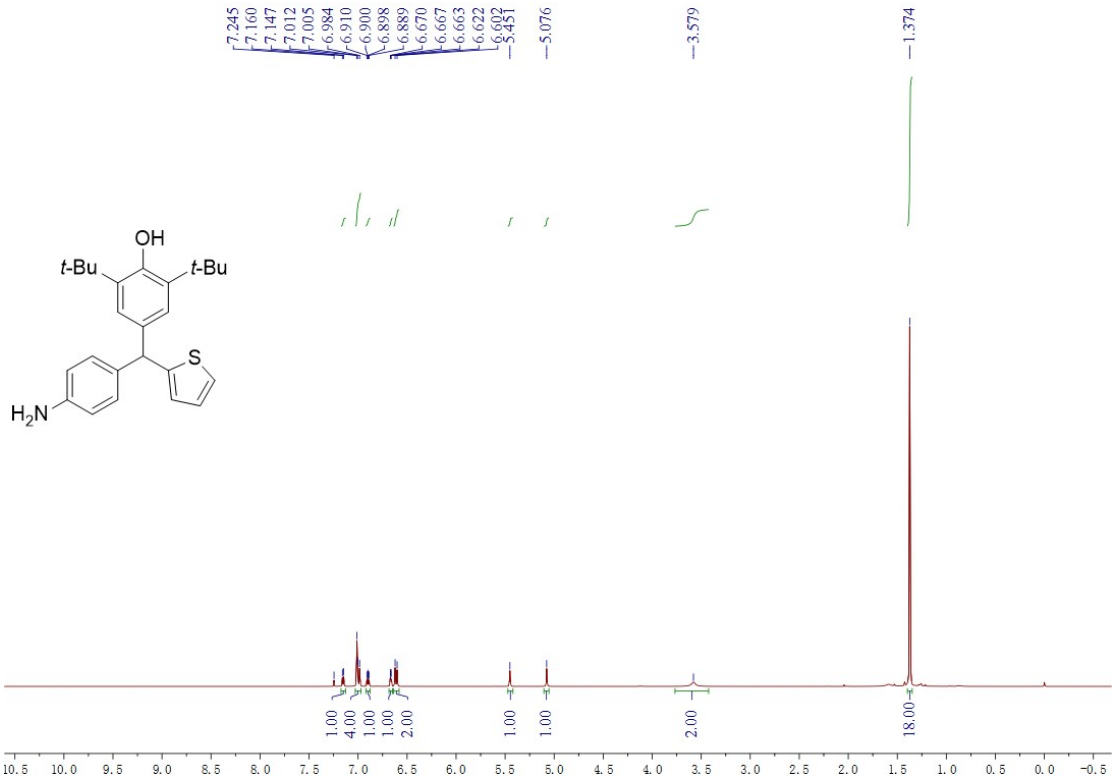


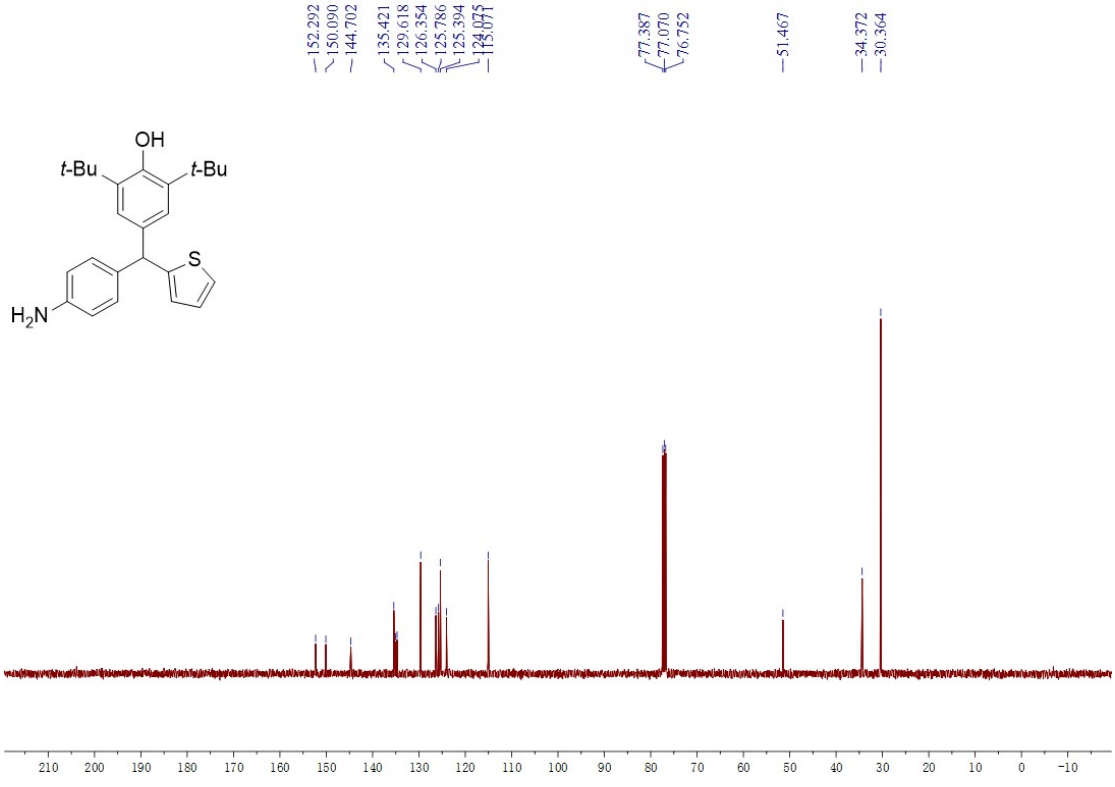
4-((4-Aminophenyl)(thiophen-3-yl)methyl)-2,6-di-tert-butylphenol (4u)



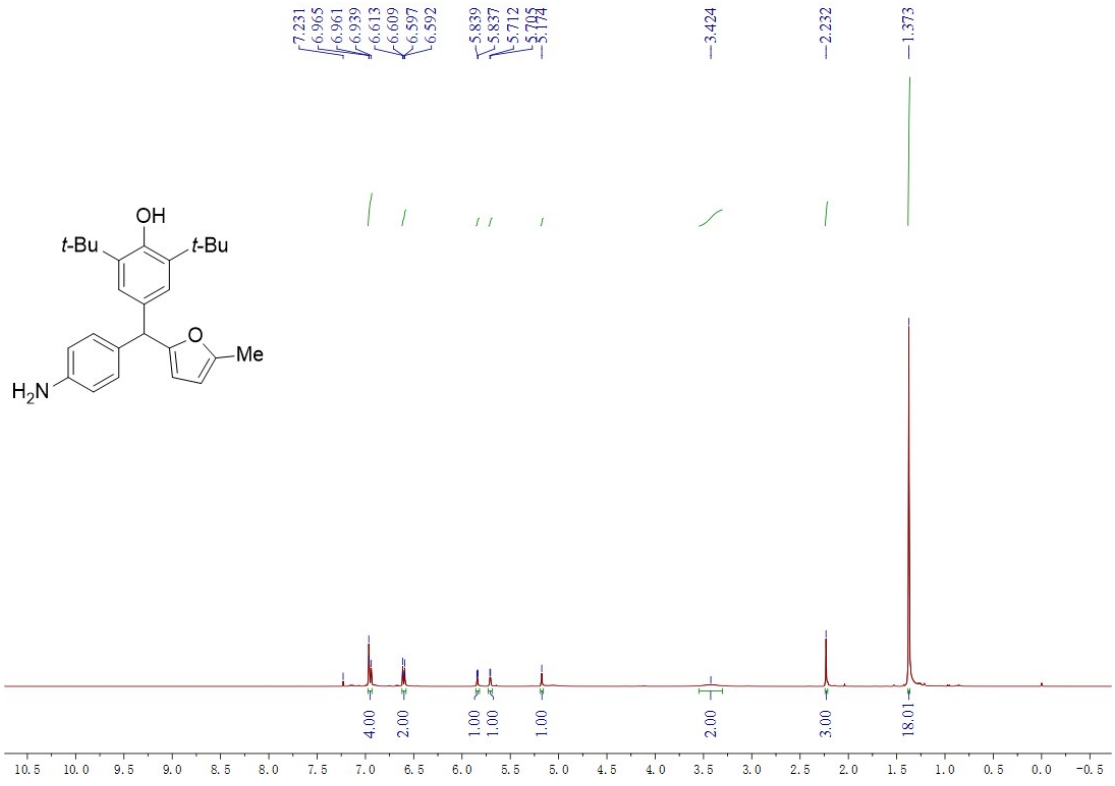


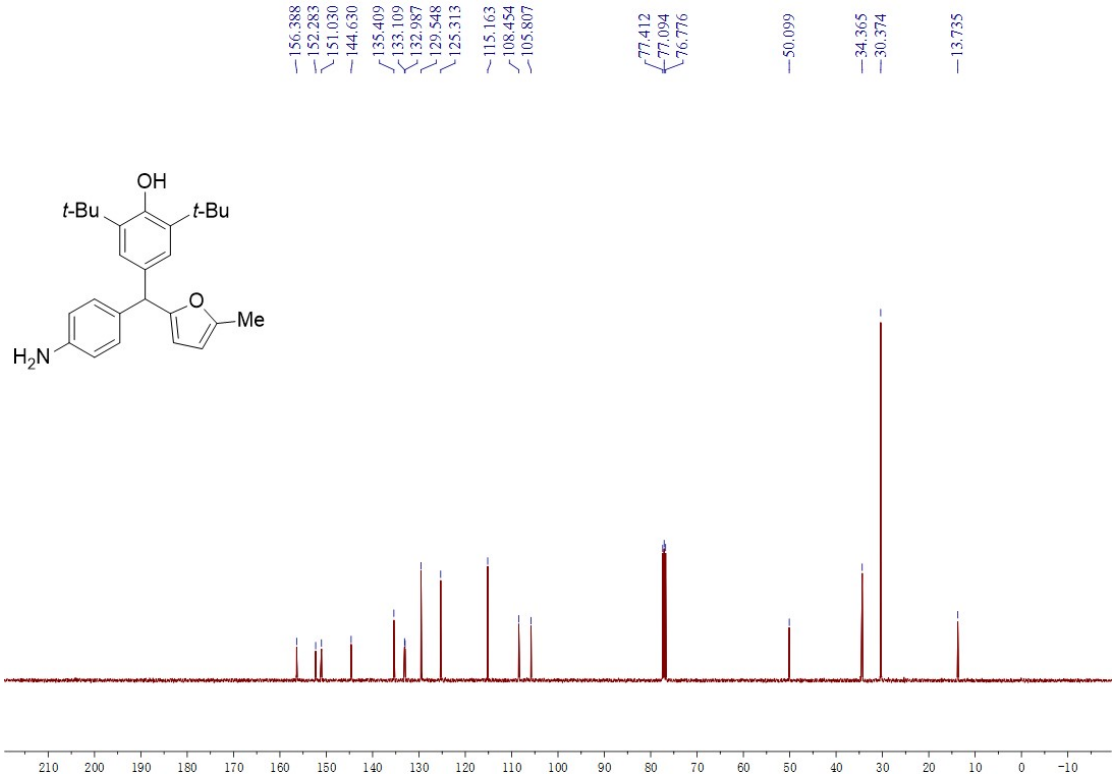
4-((4-Aminophenyl)(thiophen-2-yl)methyl)-2,6-di-tert-butylphenol (4v)



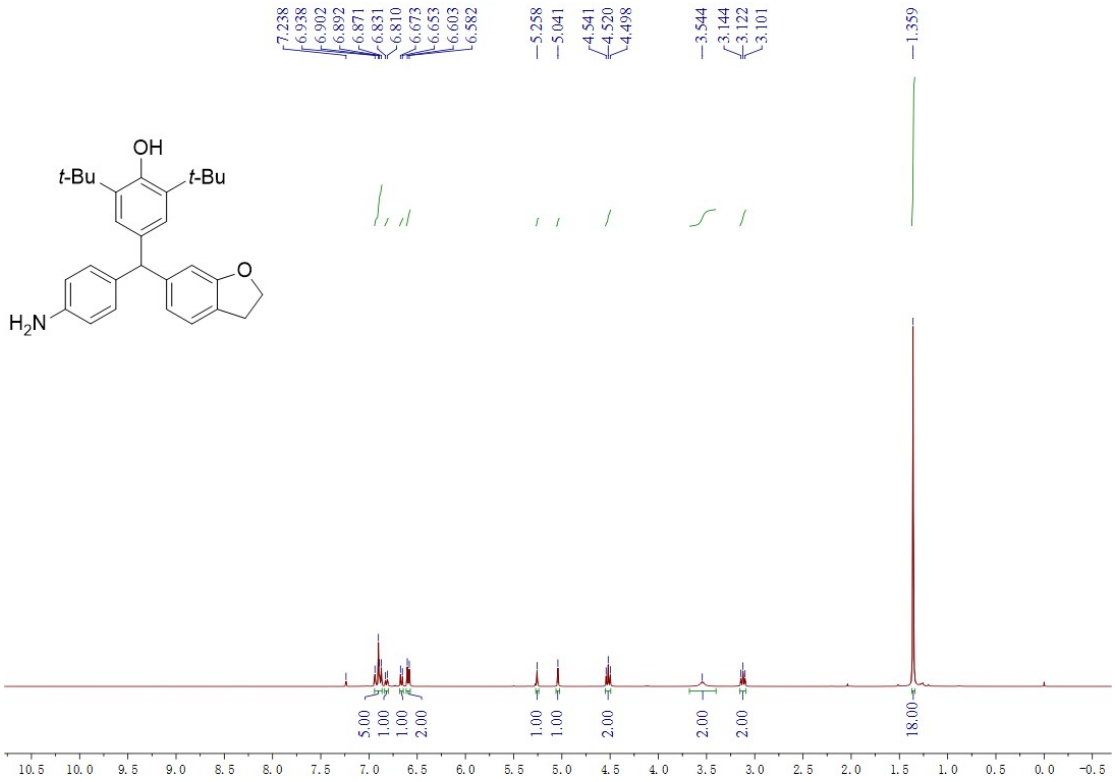


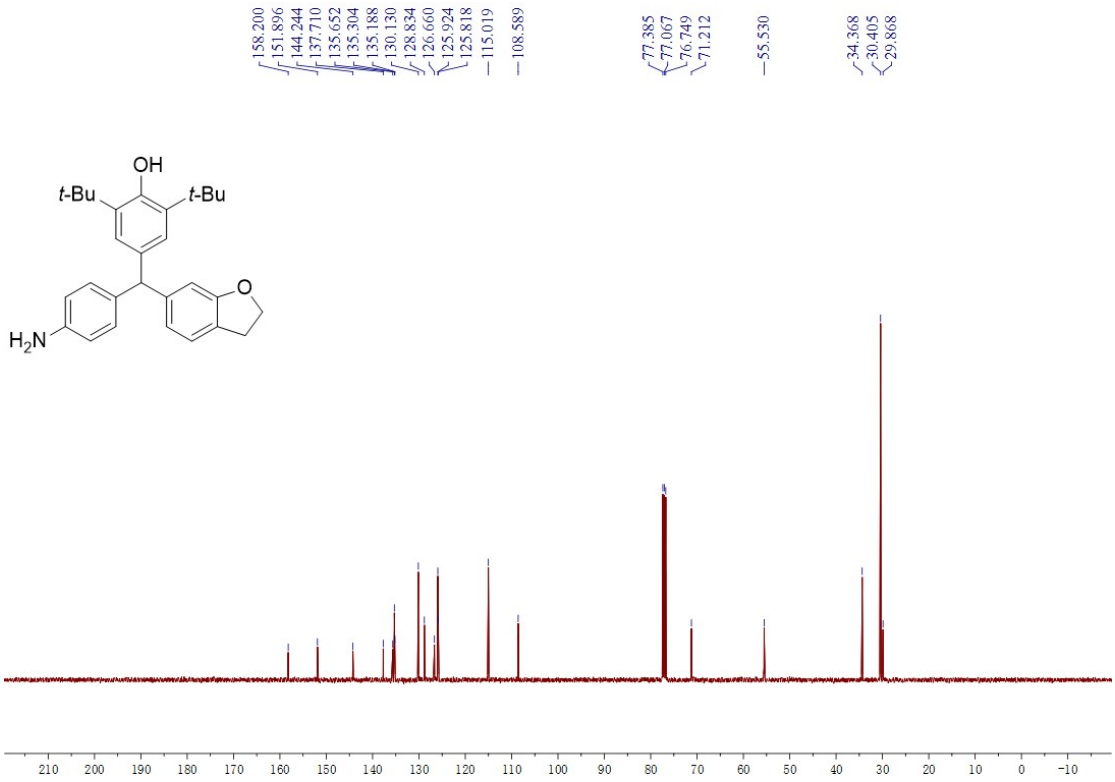
4-((4-Aminophenyl)(5-methylfuran-2-yl)methyl)-2,6-di-tert-butylphenol (4w)



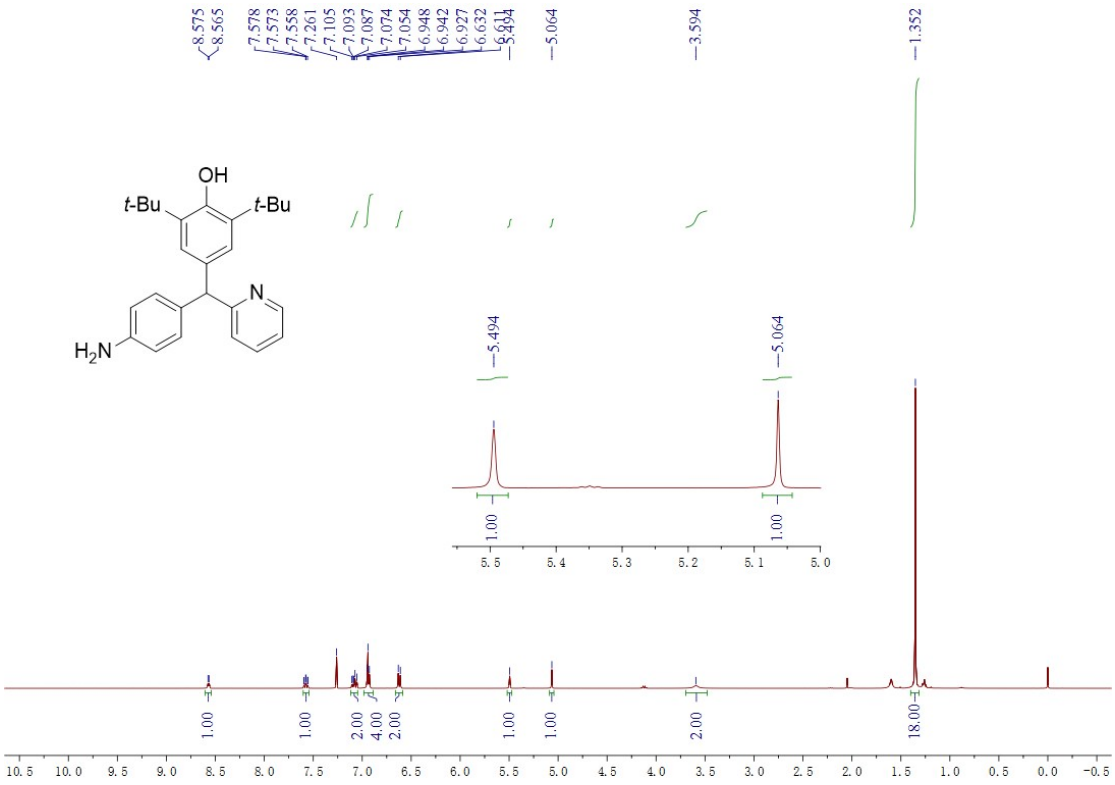


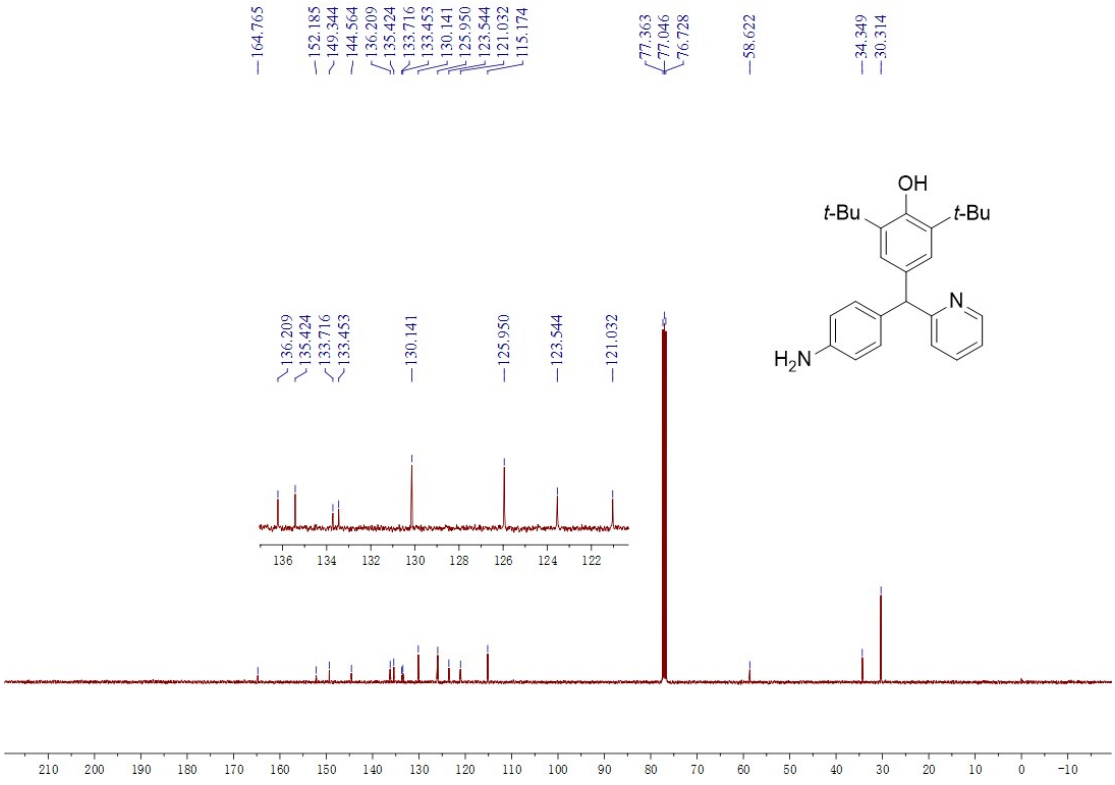
4-((4-Aminophenyl)(2,3-dihydrobenzofuran-6-yl)methyl)-2,6-di-tert-butylphenol (4x)



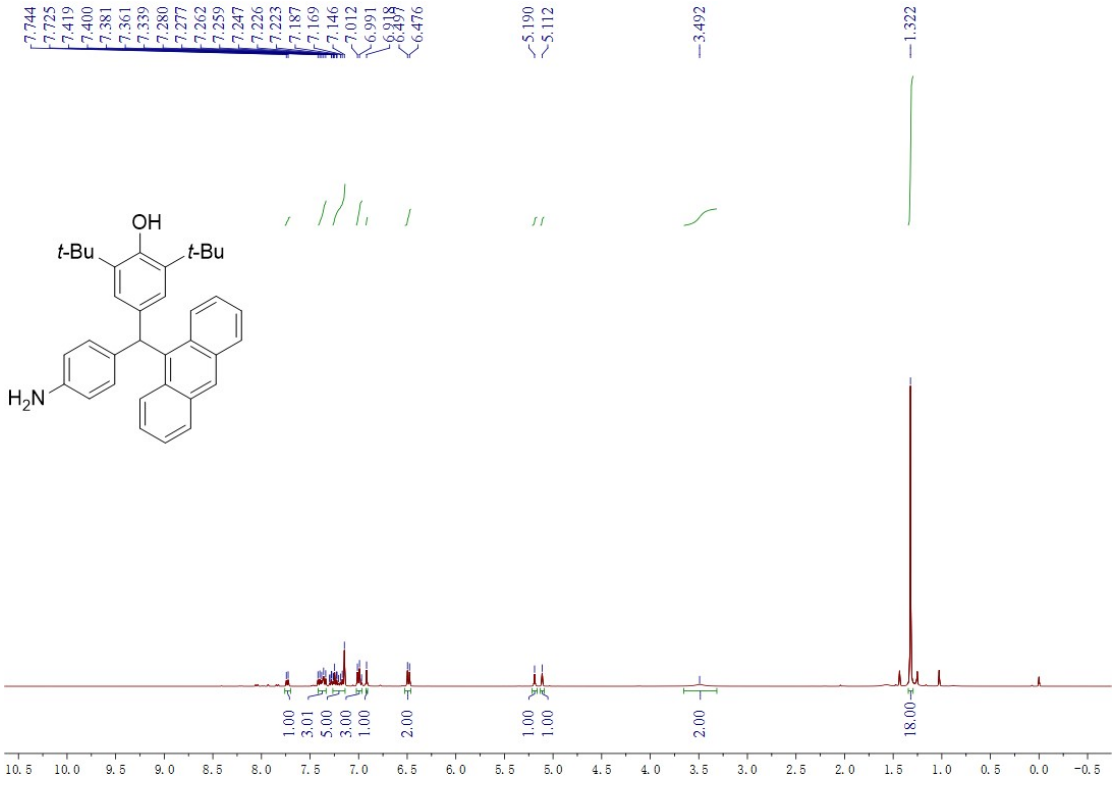


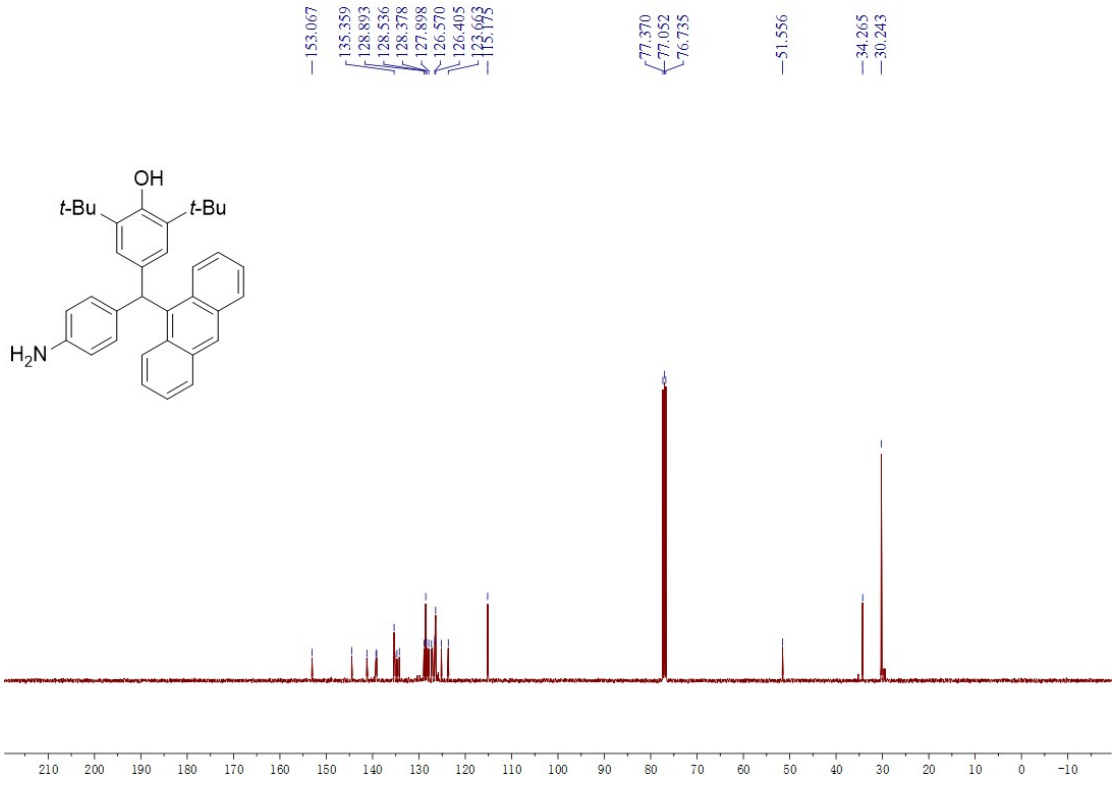
4-((4-Aminophenyl)(pyridin-2-yl)methyl)-2,6-di-tert-butylphenol (4y)



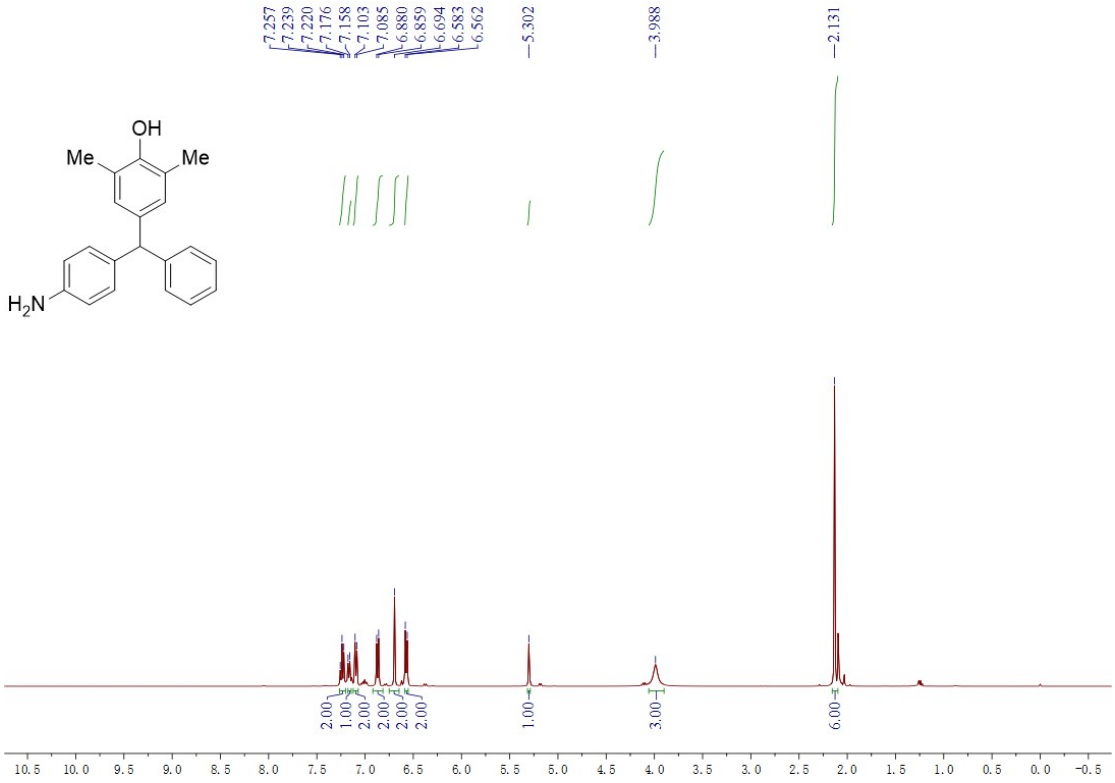


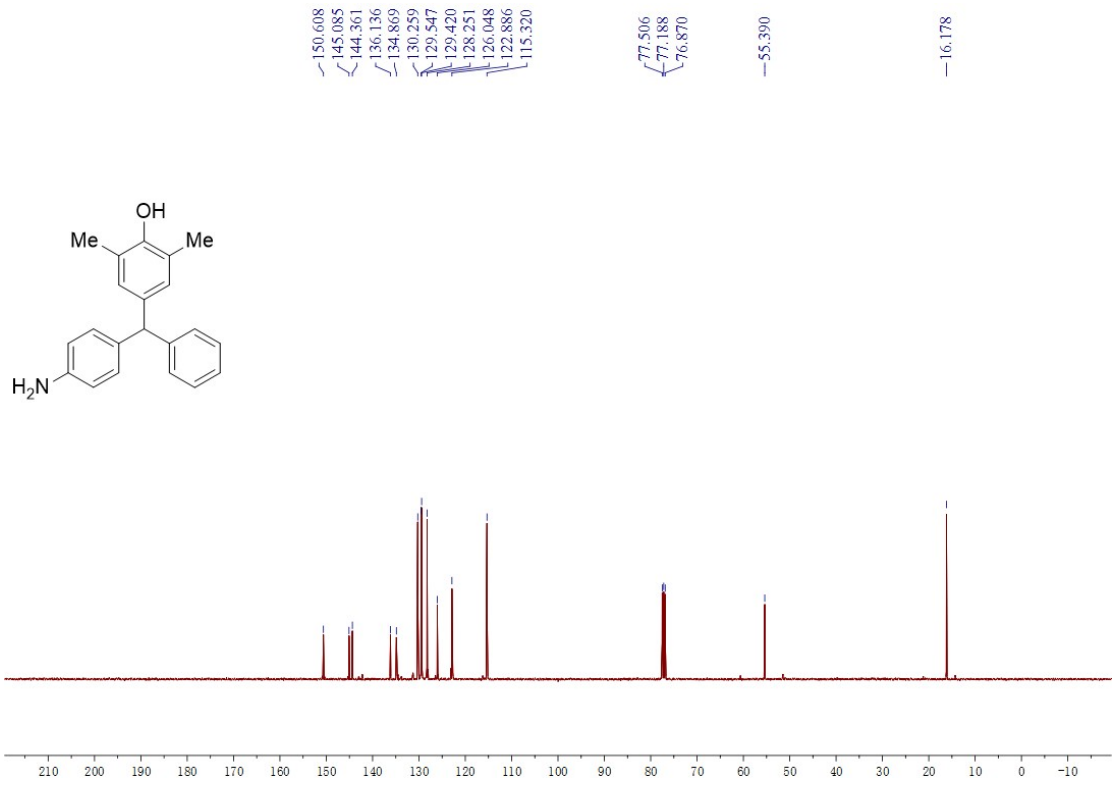
4-((4-Aminophenyl)(anthracen-9-yl)methyl)-2,6-di-tert-butylphenol (4aa)



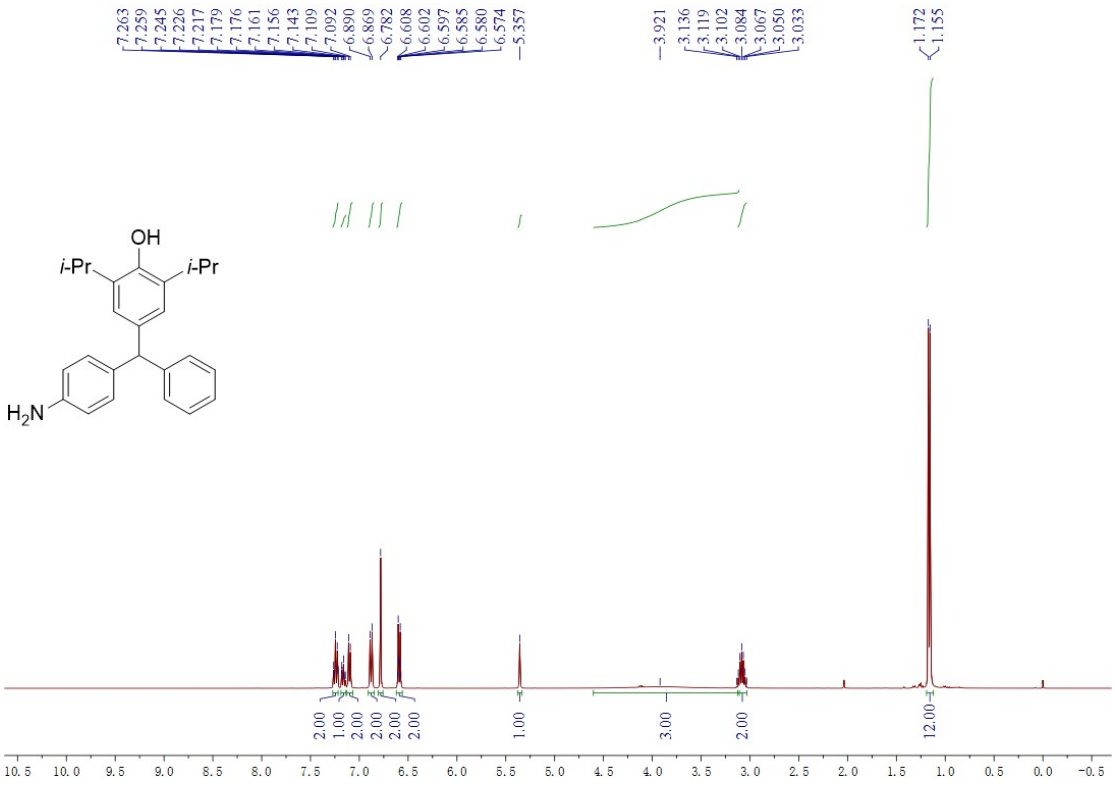


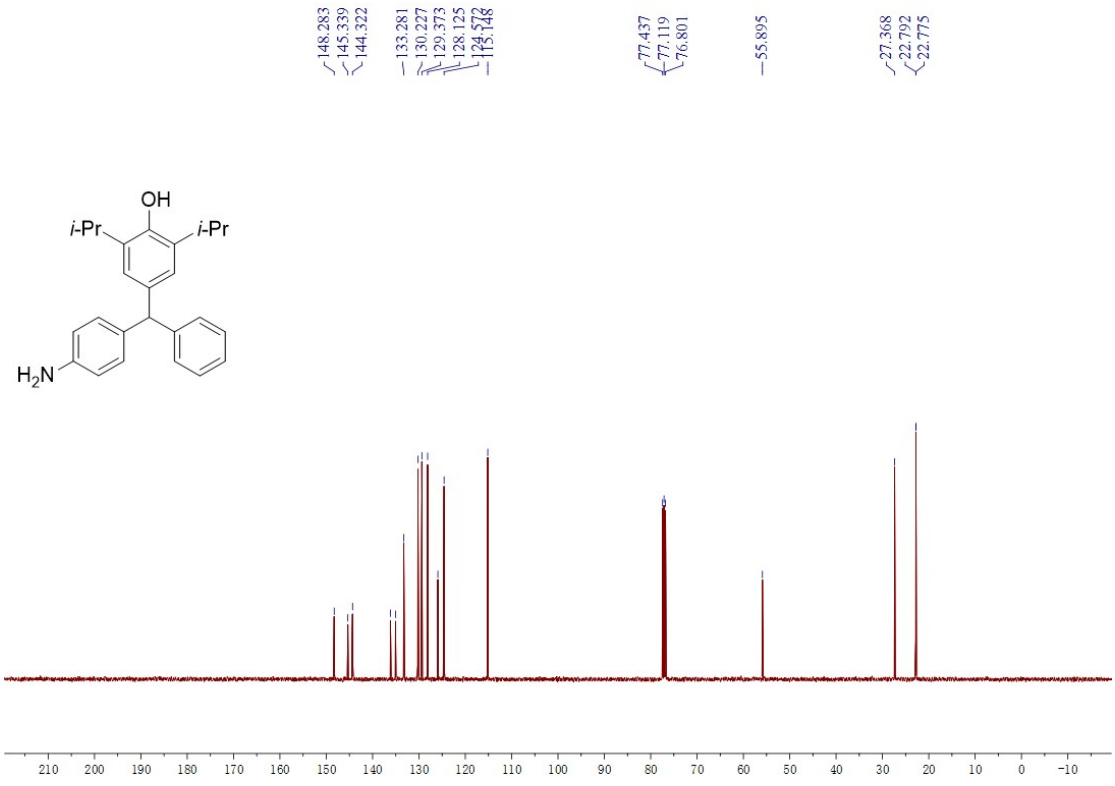
4-((4-Aminophenyl)(phenyl)methyl)-2,6-dimethylphenol (4ab)



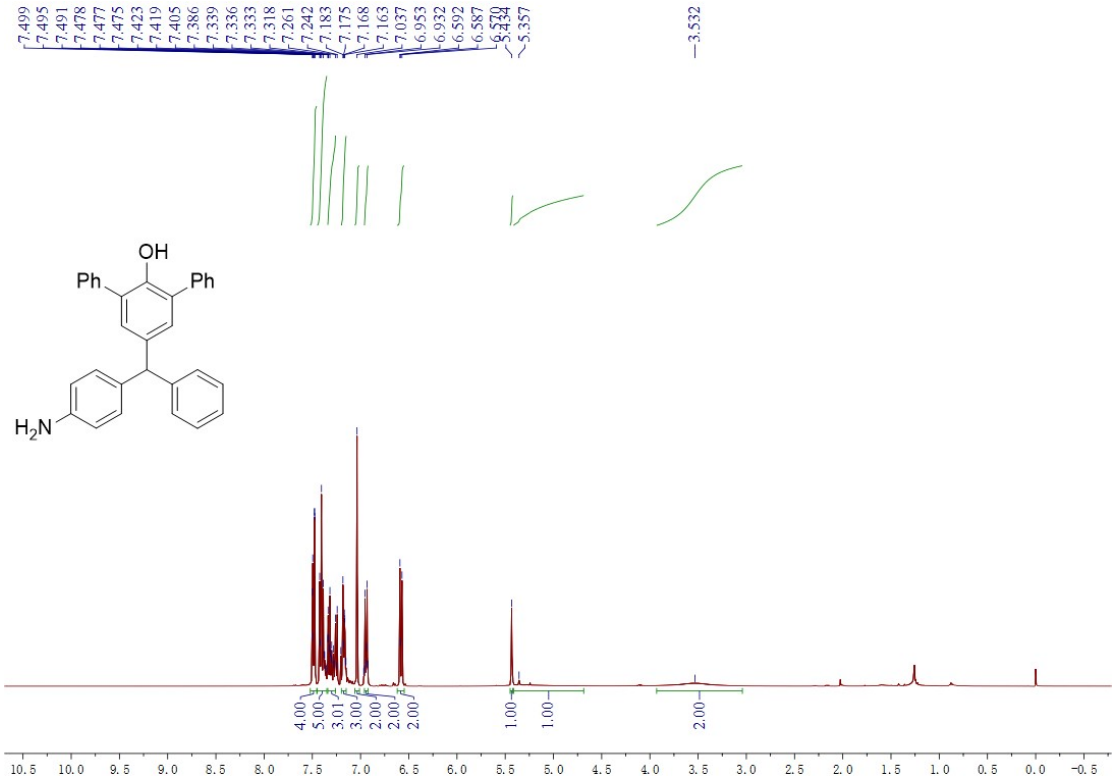


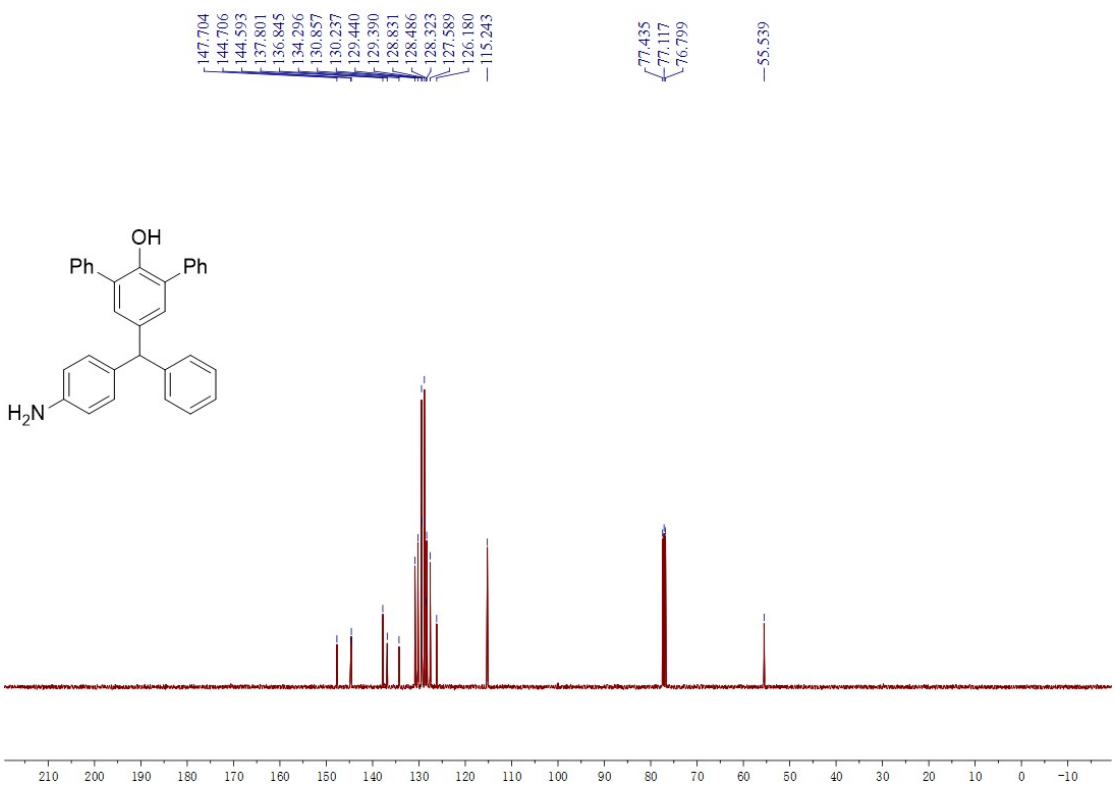
4-((4-Aminophenyl)(phenyl)methyl)-2,6-diisopropylphenol (4ac)



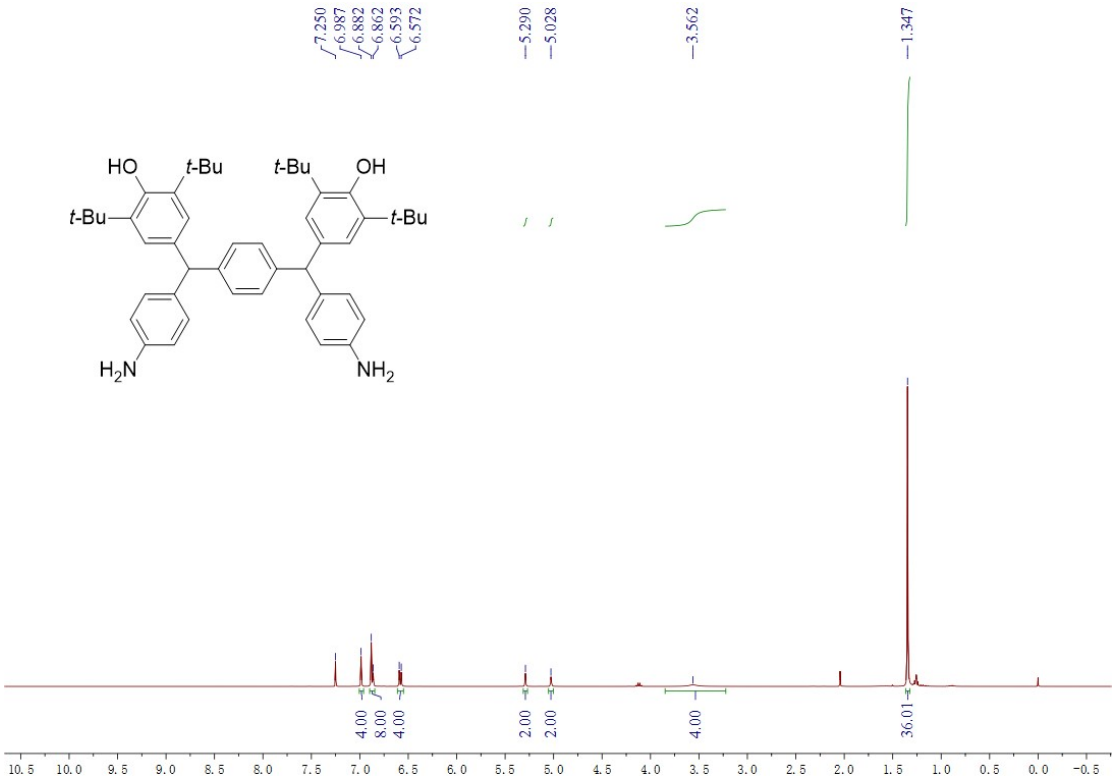


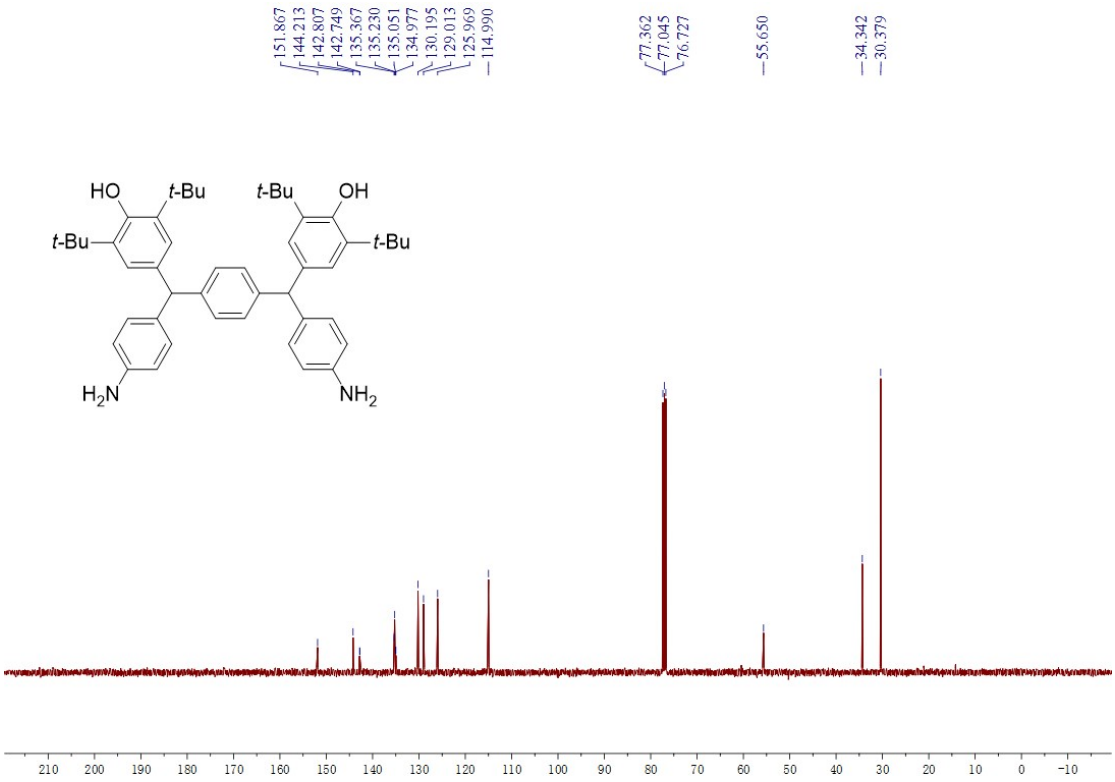
5'-((4-Aminophenyl)(phenyl)methyl)-[1,1':3',1''-terphenyl]-2'-ol (4ad)



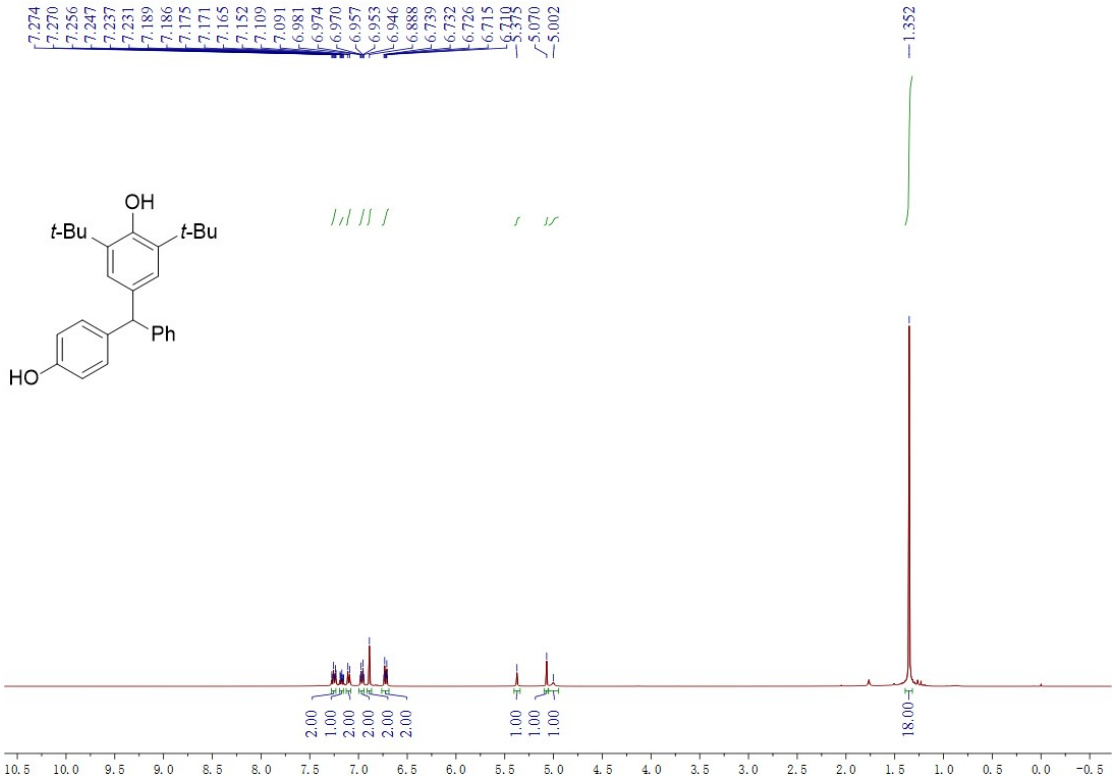


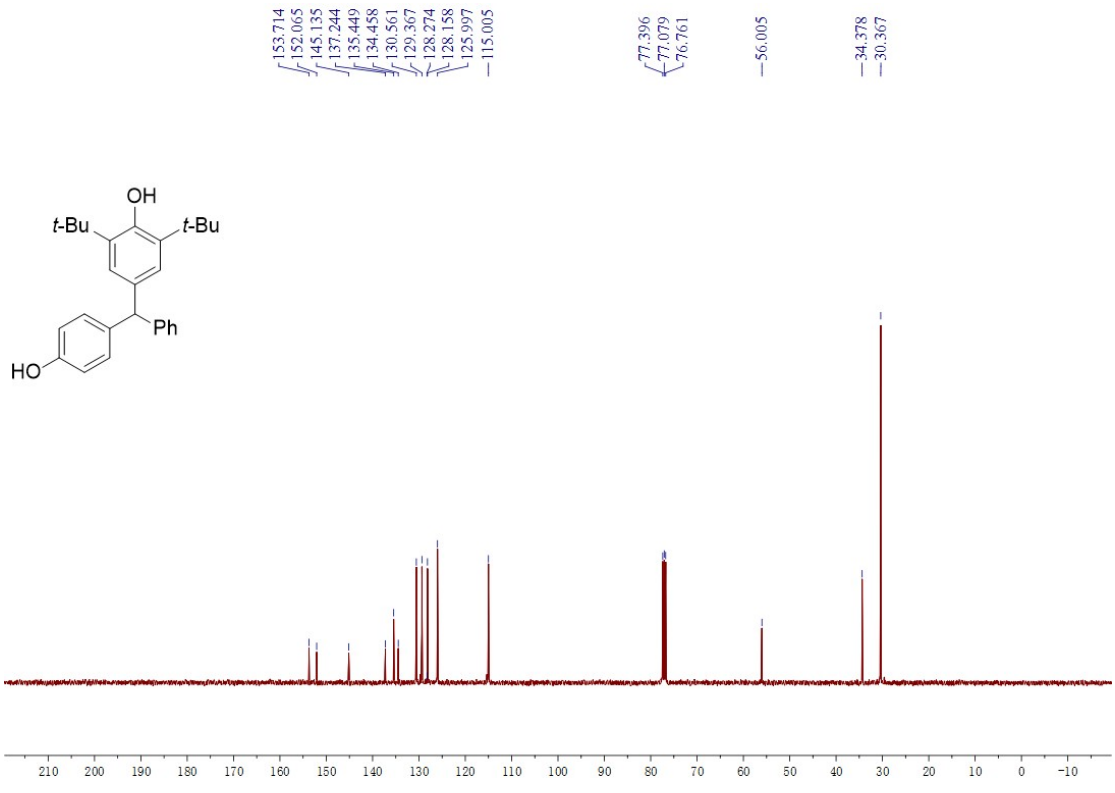
4,4'-(1,4-Phenylenebis((4-Aminophenyl)methylene))bis(2,6-di-tert-butylphenol) (4ae)



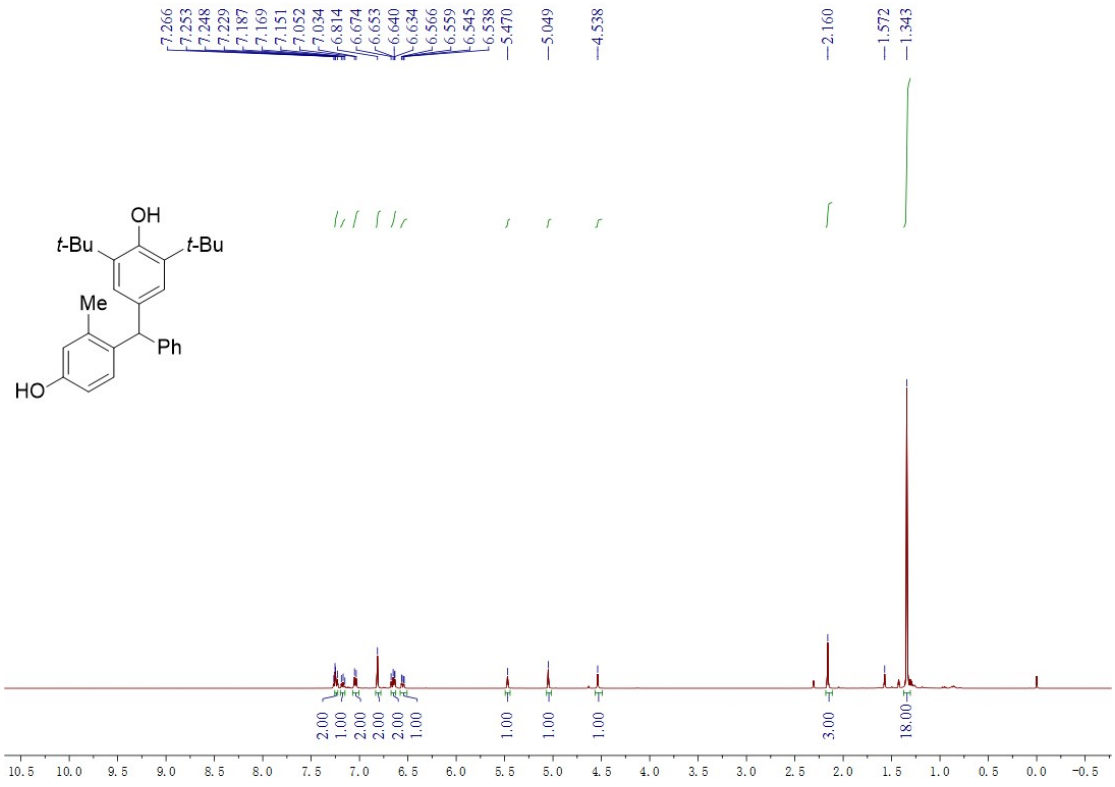


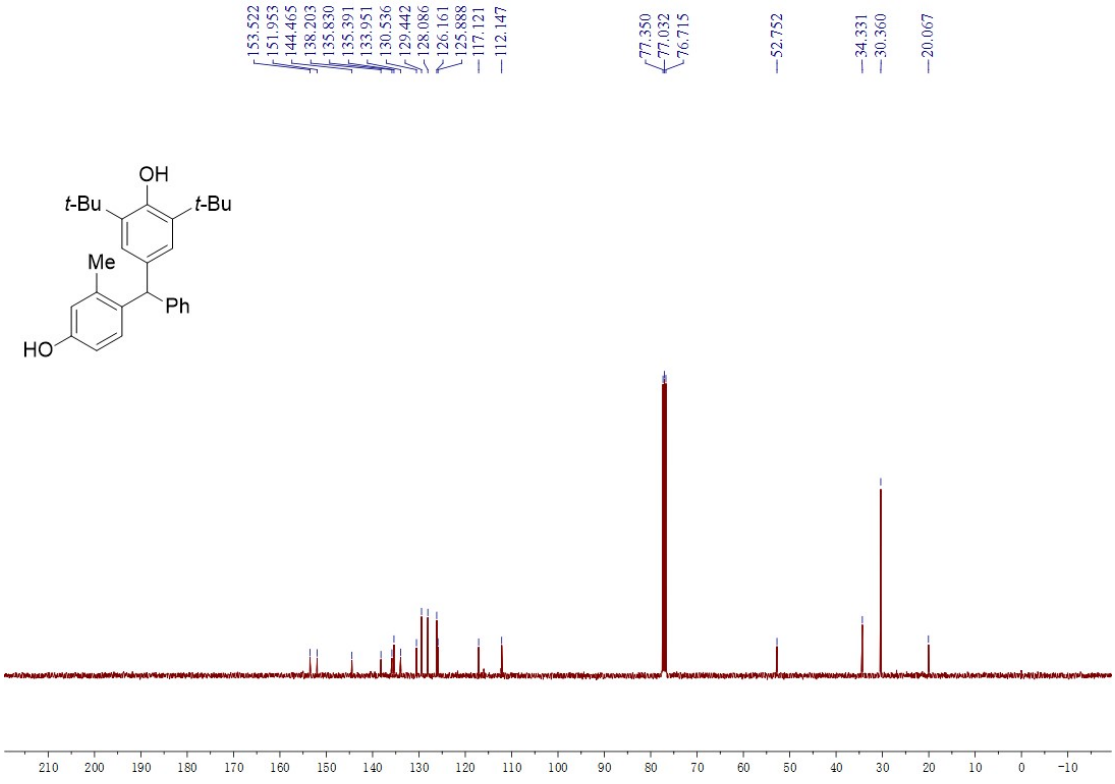
2,6-Di-tert-butyl-4-((4-hydroxyphenyl)(phenyl)methyl)phenol (6a)



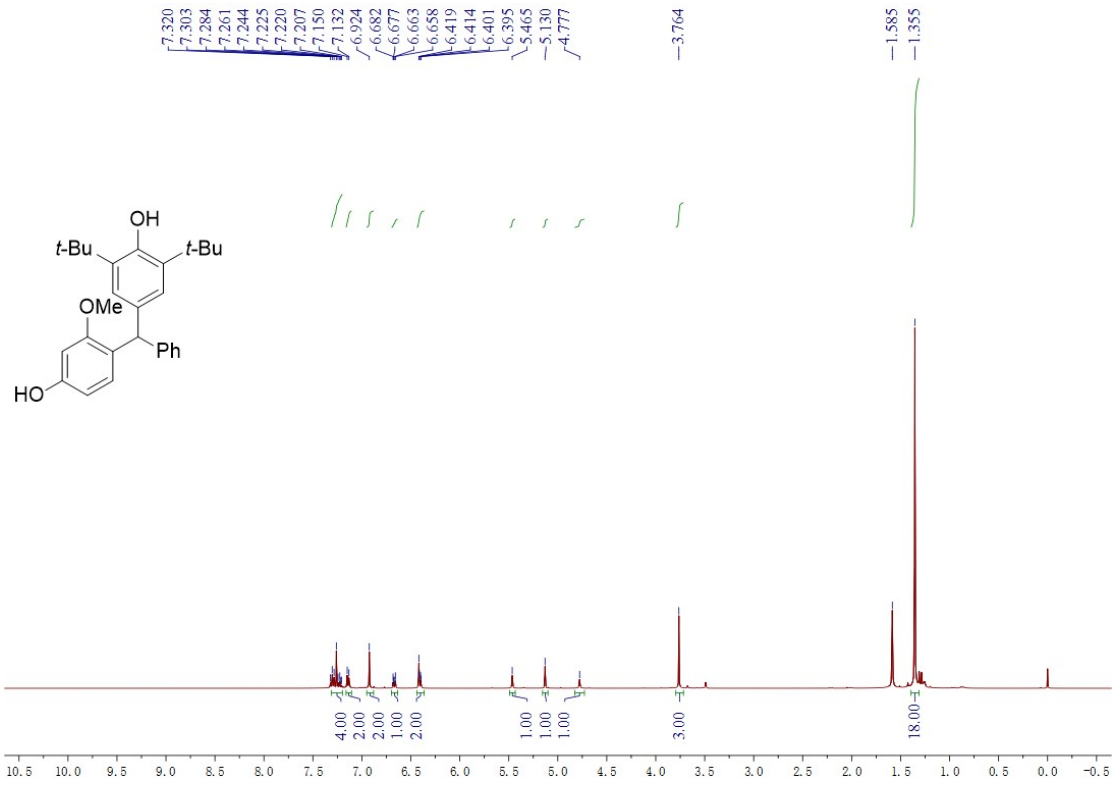


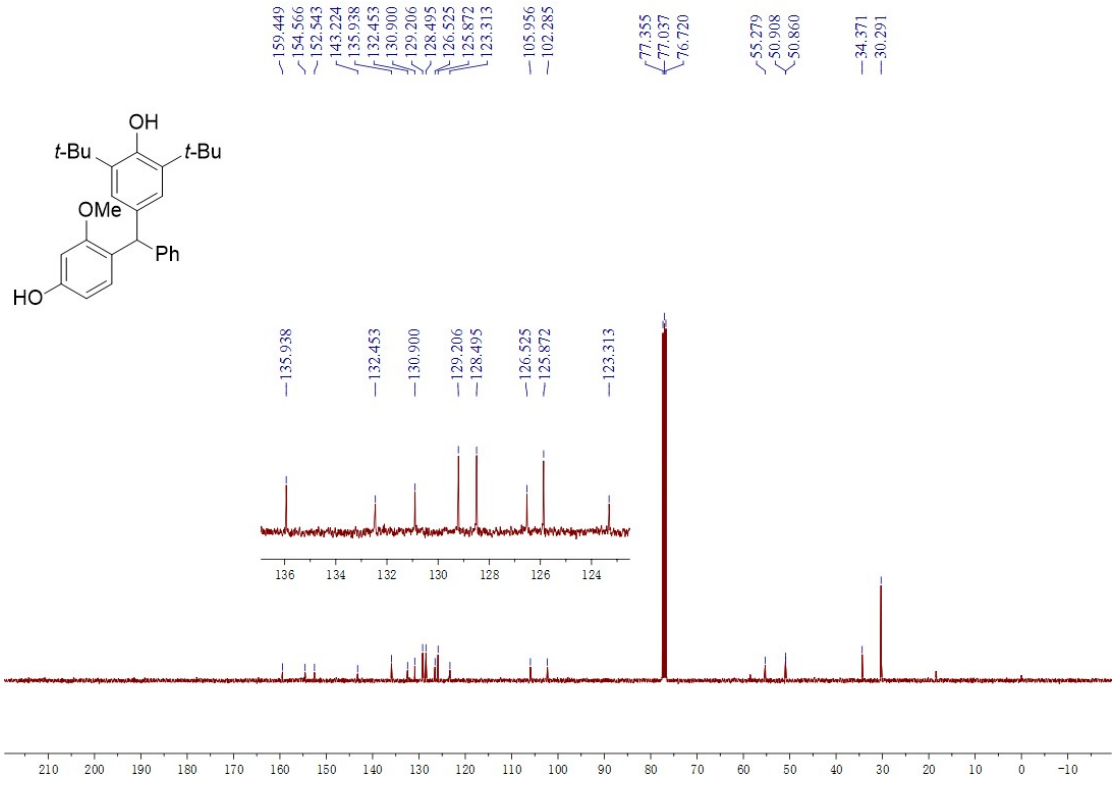
2,6-Di-tert-butyl-4-((4-hydroxy-2-methylphenyl)(phenyl)methyl)phenol (6b)



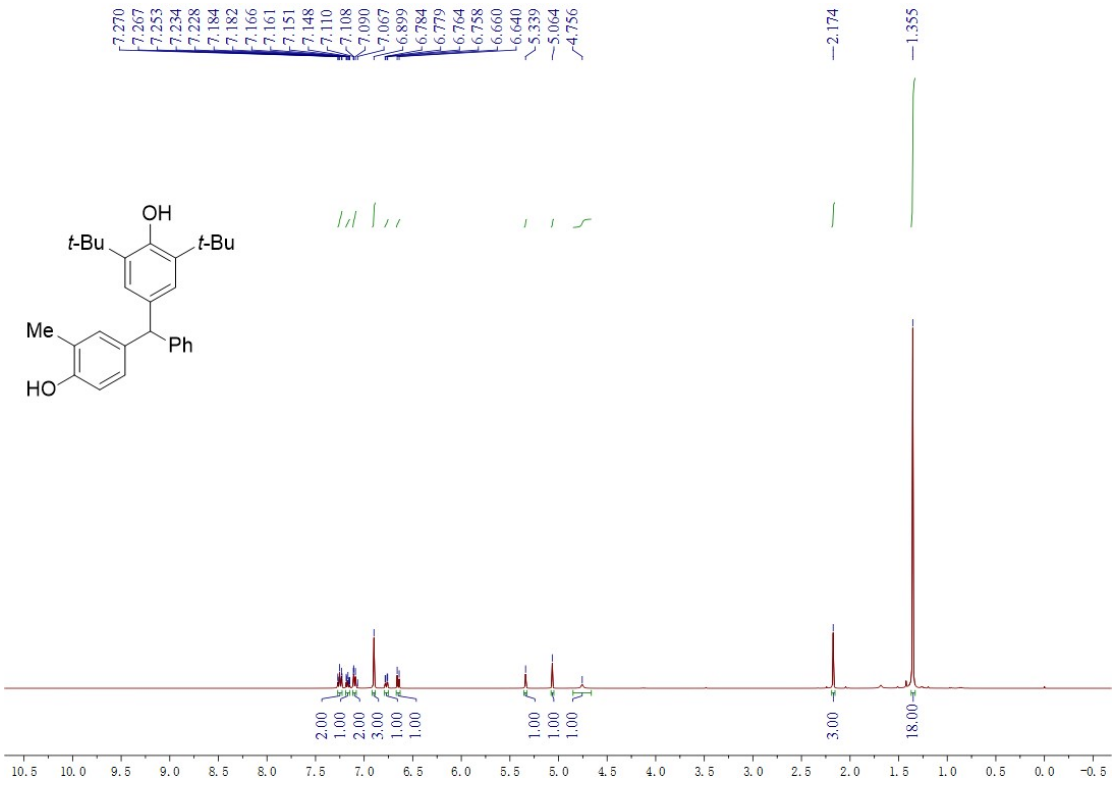


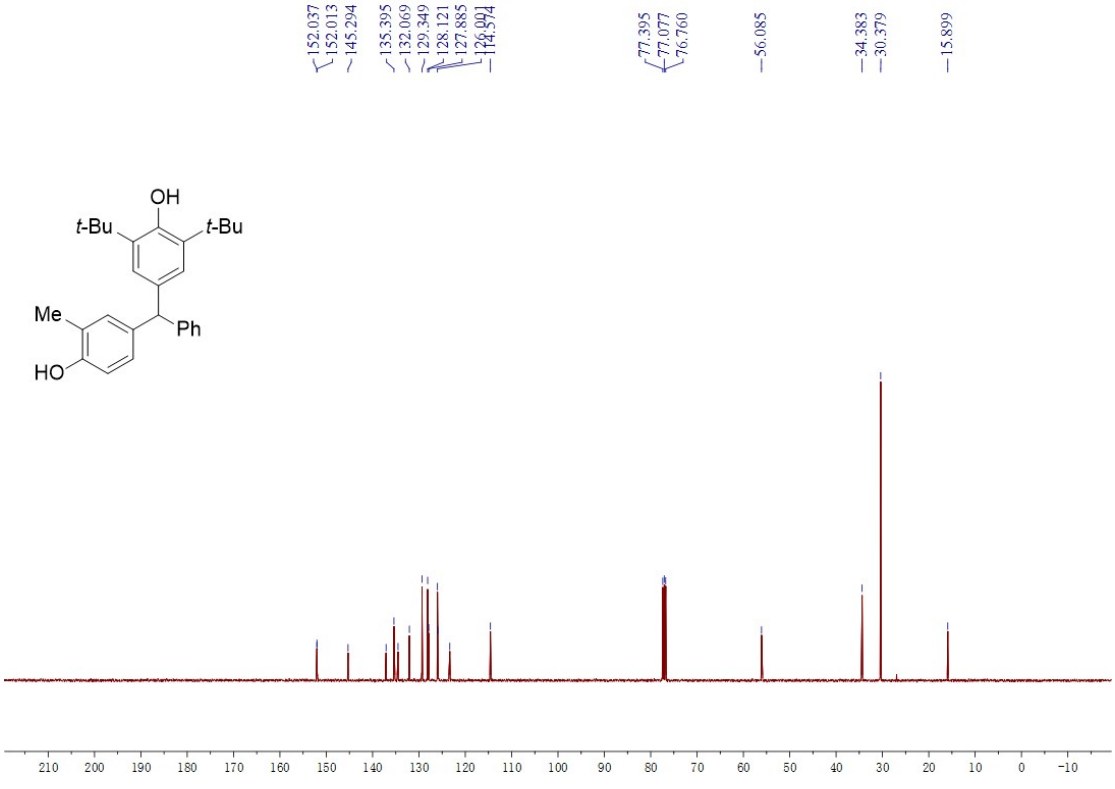
2,6-Di-tert-butyl-4-((4-hydroxy-2-methoxyphenyl)(phenyl)methyl)phenol (6c)



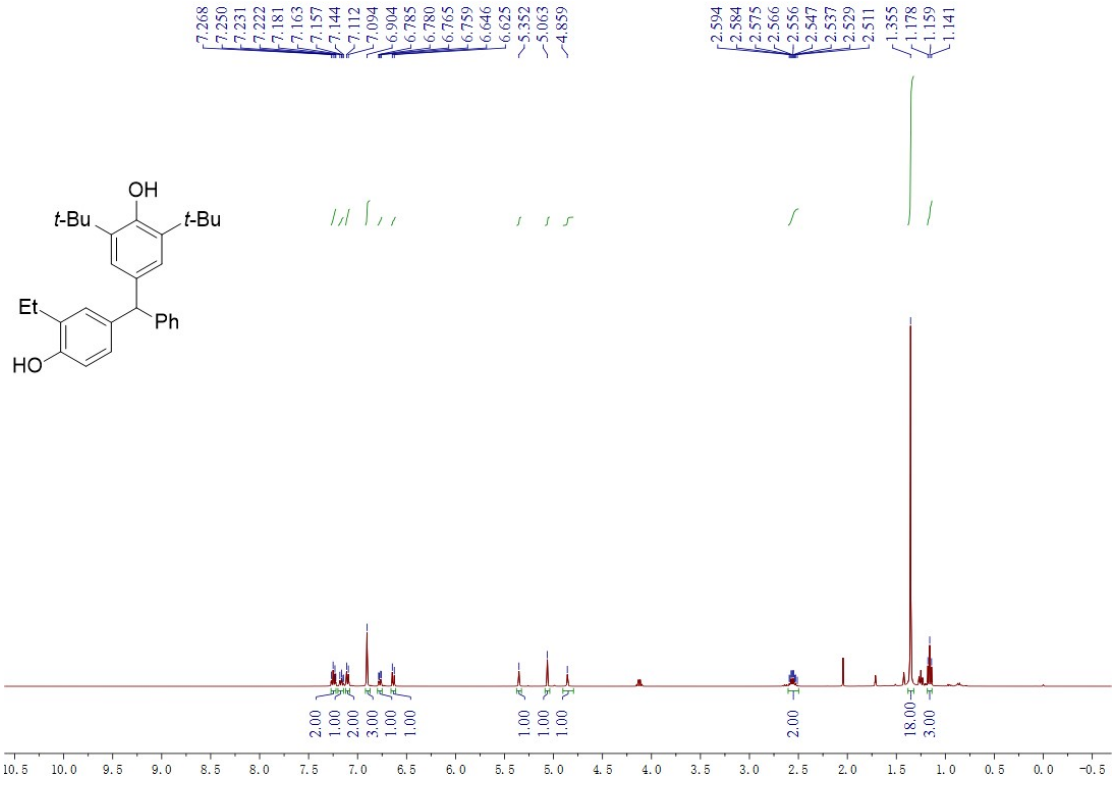


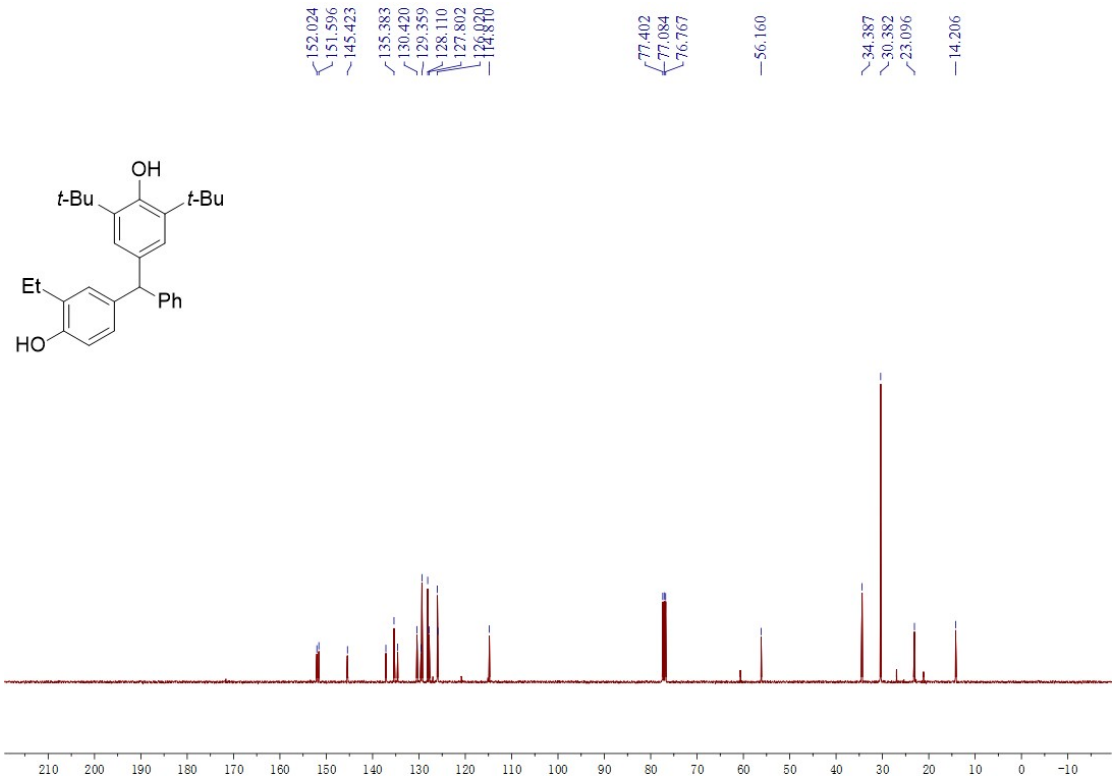
2,6-Di-tert-butyl-4-((4-hydroxy-3-methylphenyl)(phenyl)methyl)phenol (6d)



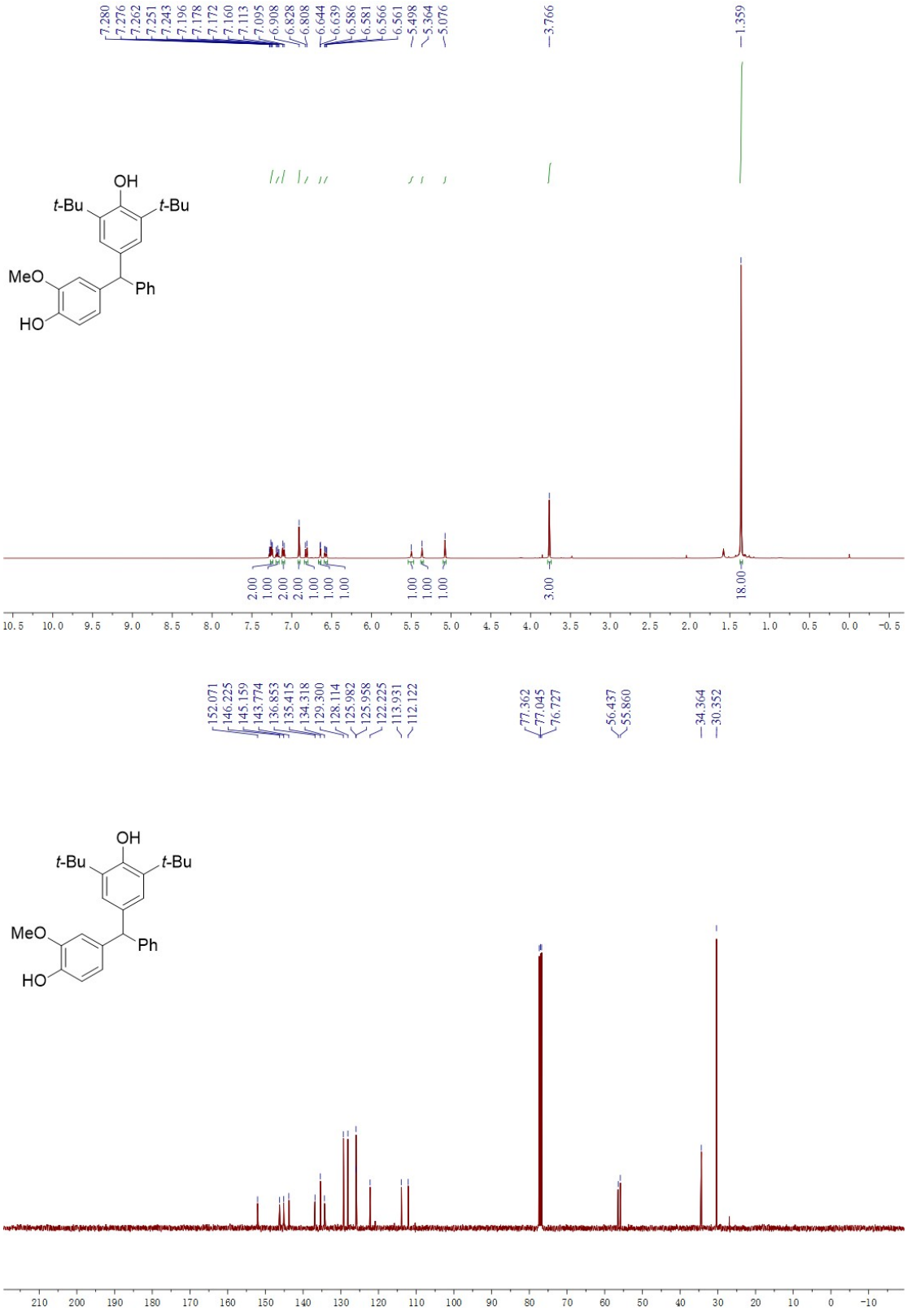


2,6-Di-tert-butyl-4-((3-ethyl-4-hydroxyphenyl)(phenyl)methyl)phenol (6e)

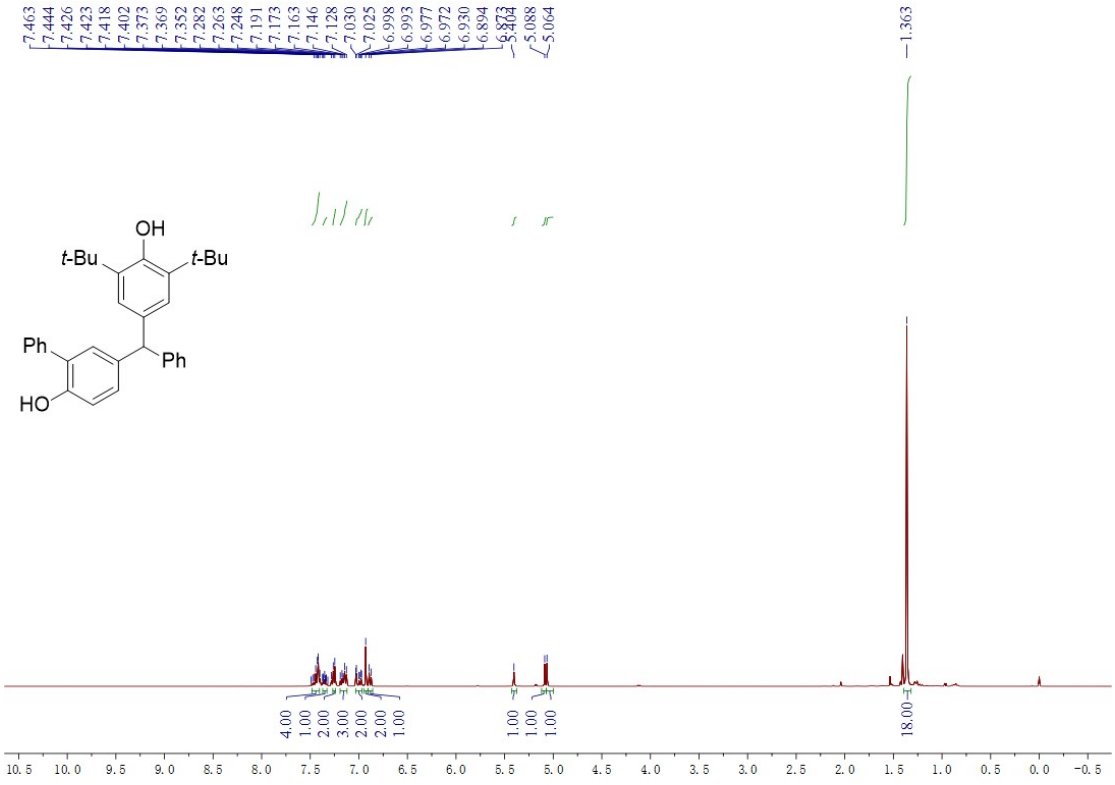


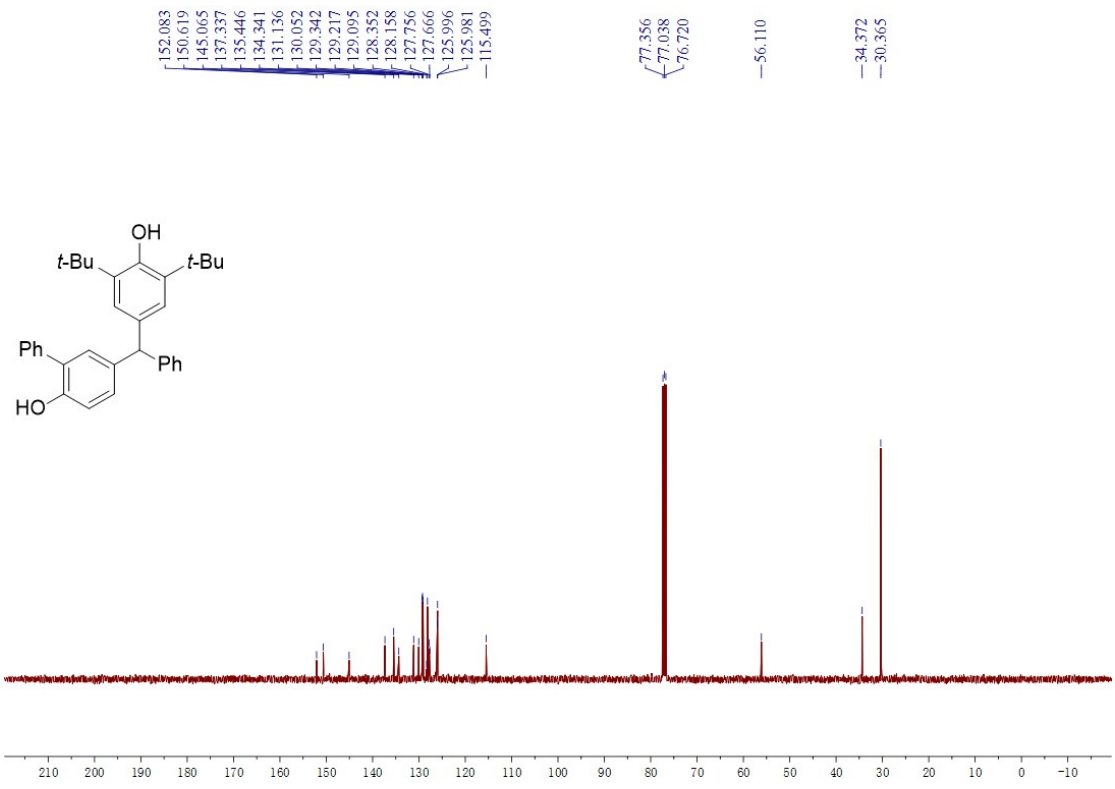


2,6-Di-tert-butyl-4-((4-hydroxy-3-methoxyphenyl)(phenyl)methyl)phenol (6f)

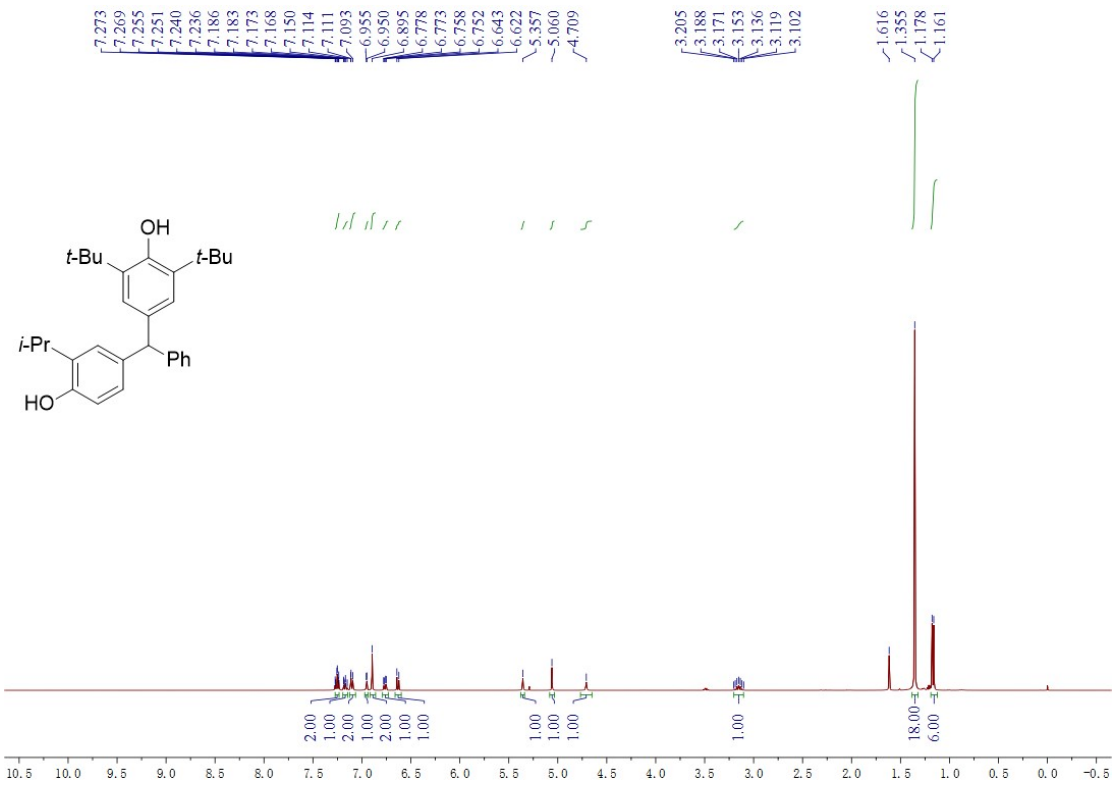


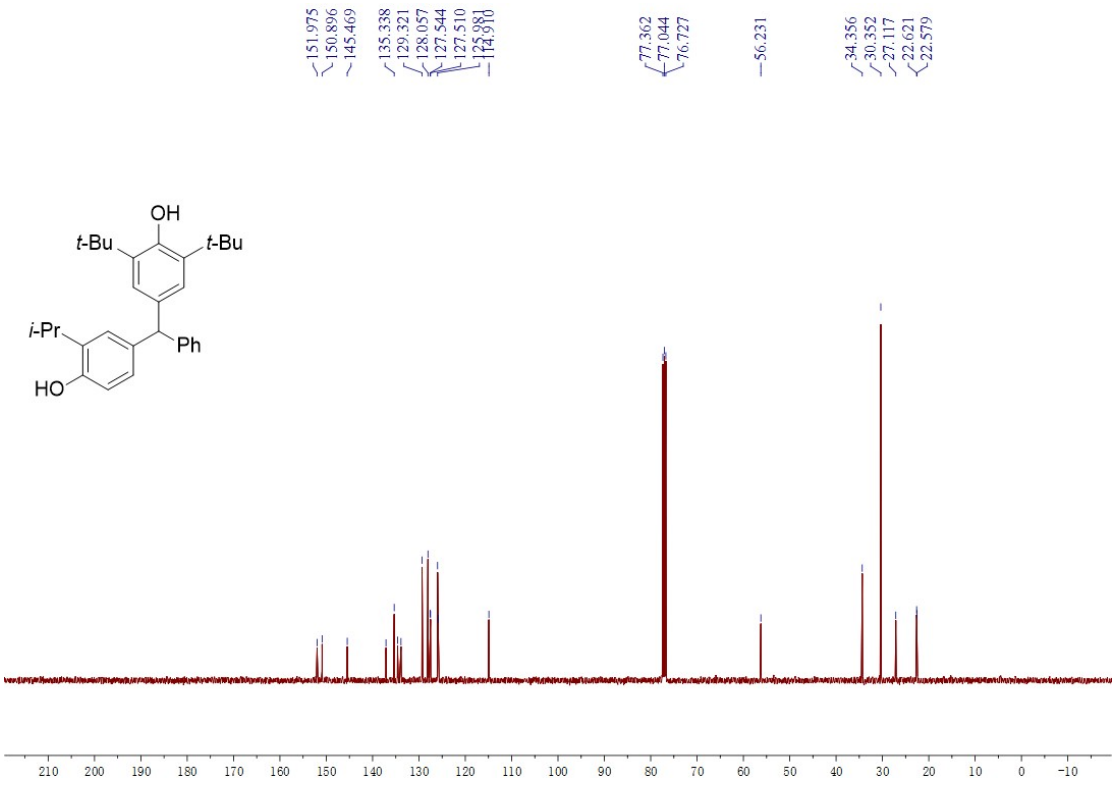
5-((3,5-Di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)-[1,1'-biphenyl]-2-ol (6g)



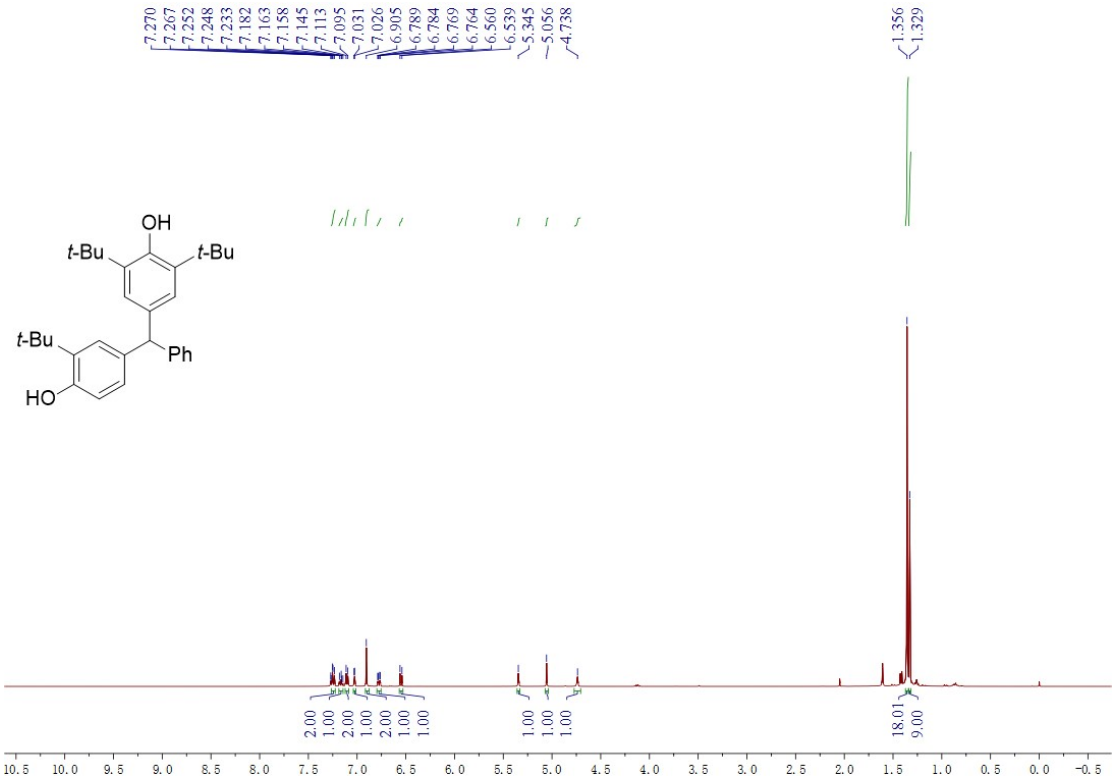


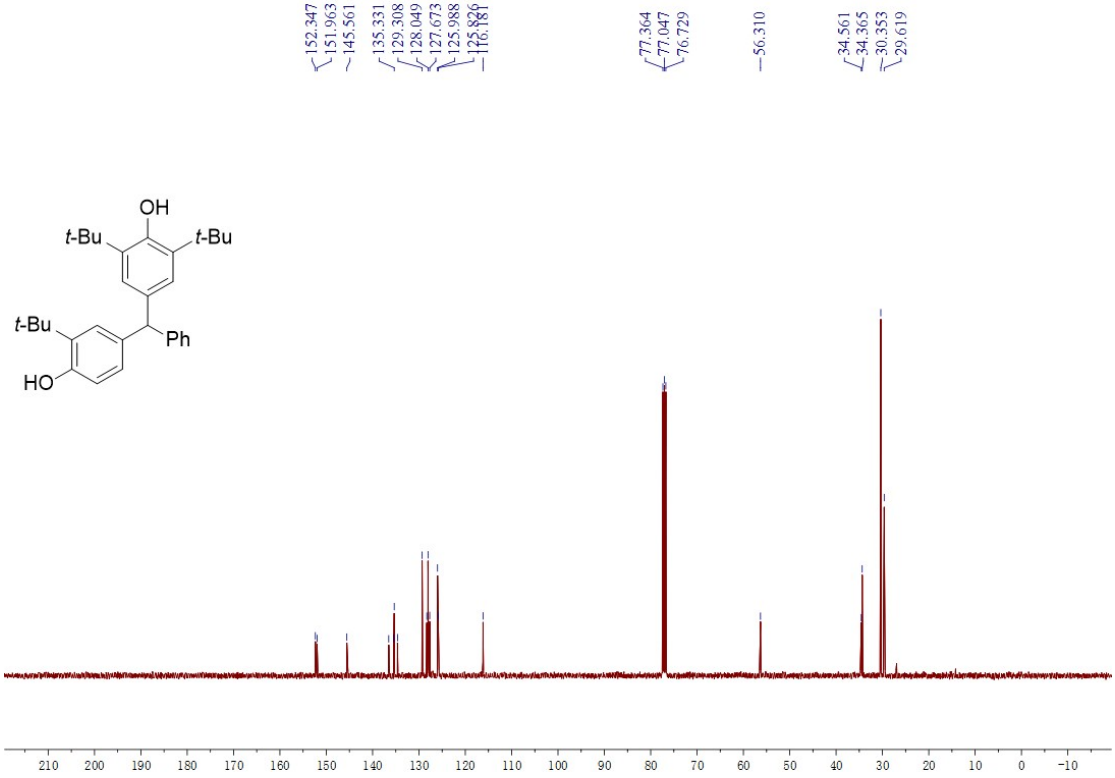
2,6-Di-tert-butyl-4-((4-hydroxy-3-isopropylphenyl)(phenyl)methyl)phenol (6h)



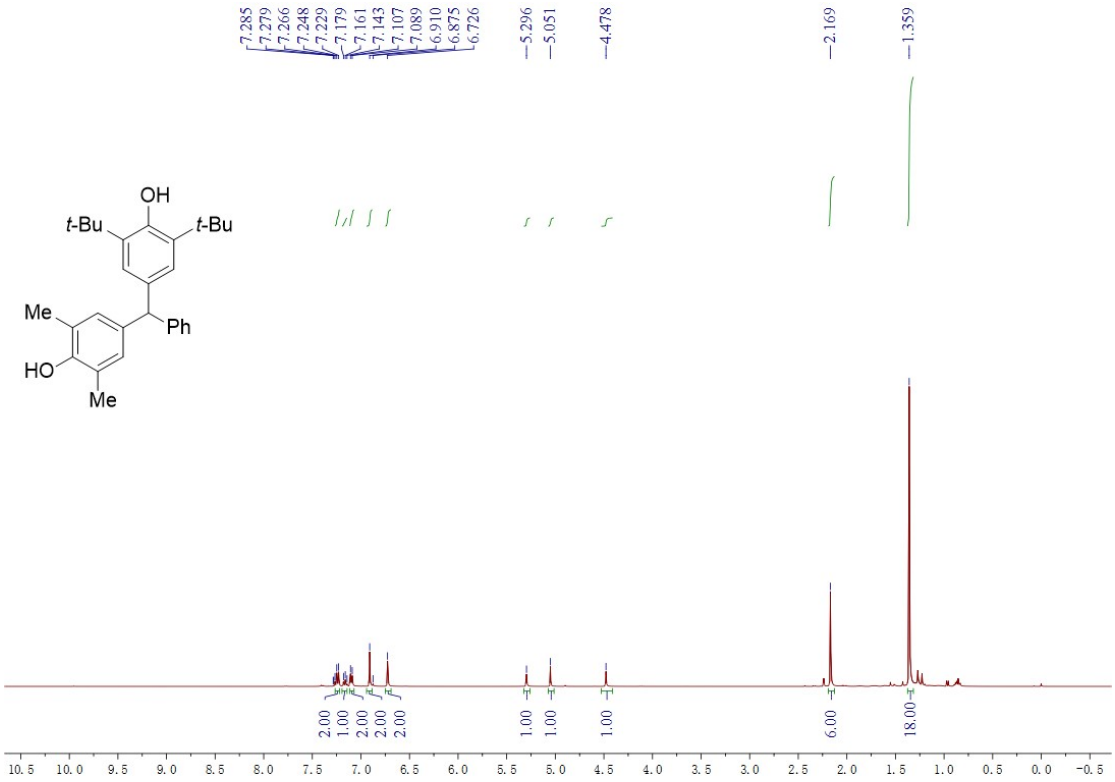


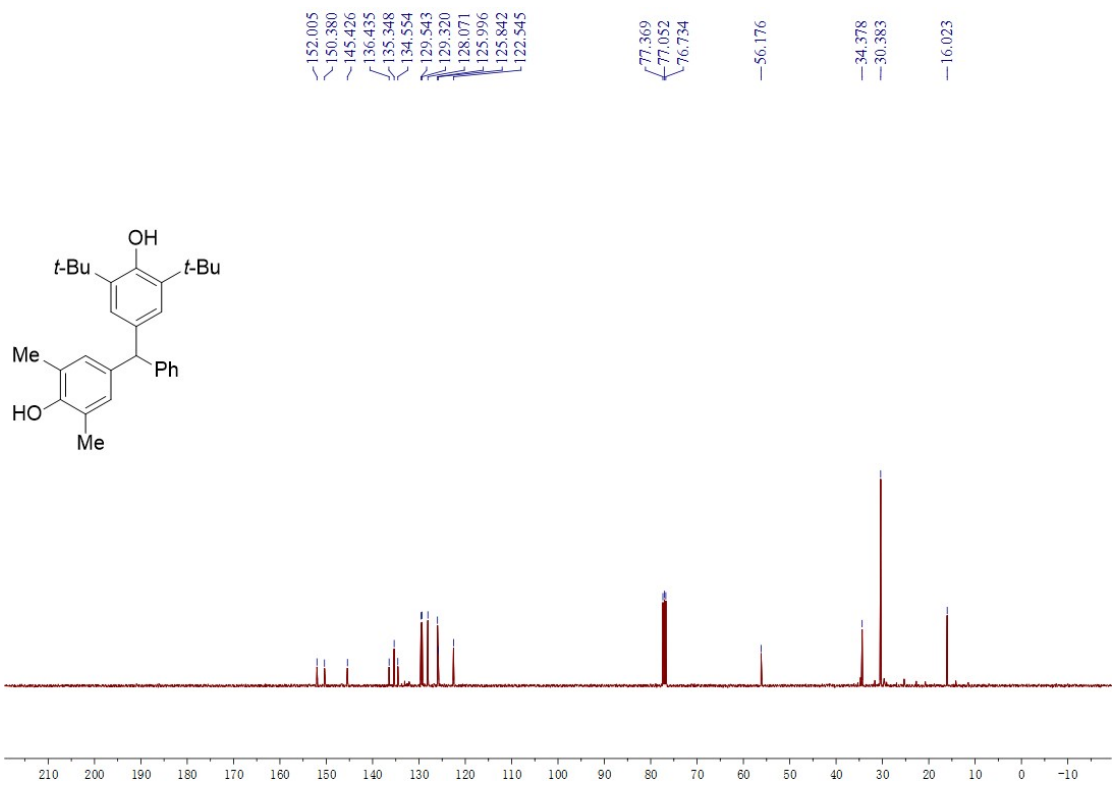
2,6-Di-tert-butyl-4-((3-(tert-butyl)-4-hydroxyphenyl)(phenyl)methyl)phenol (6i)



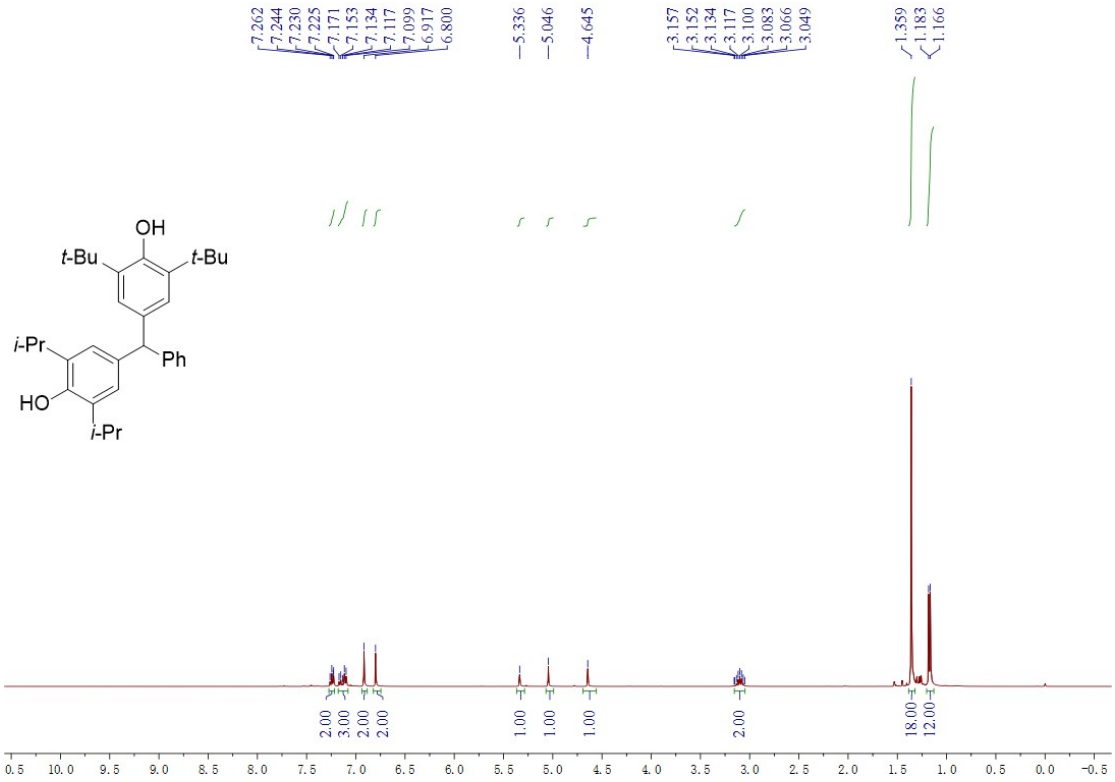


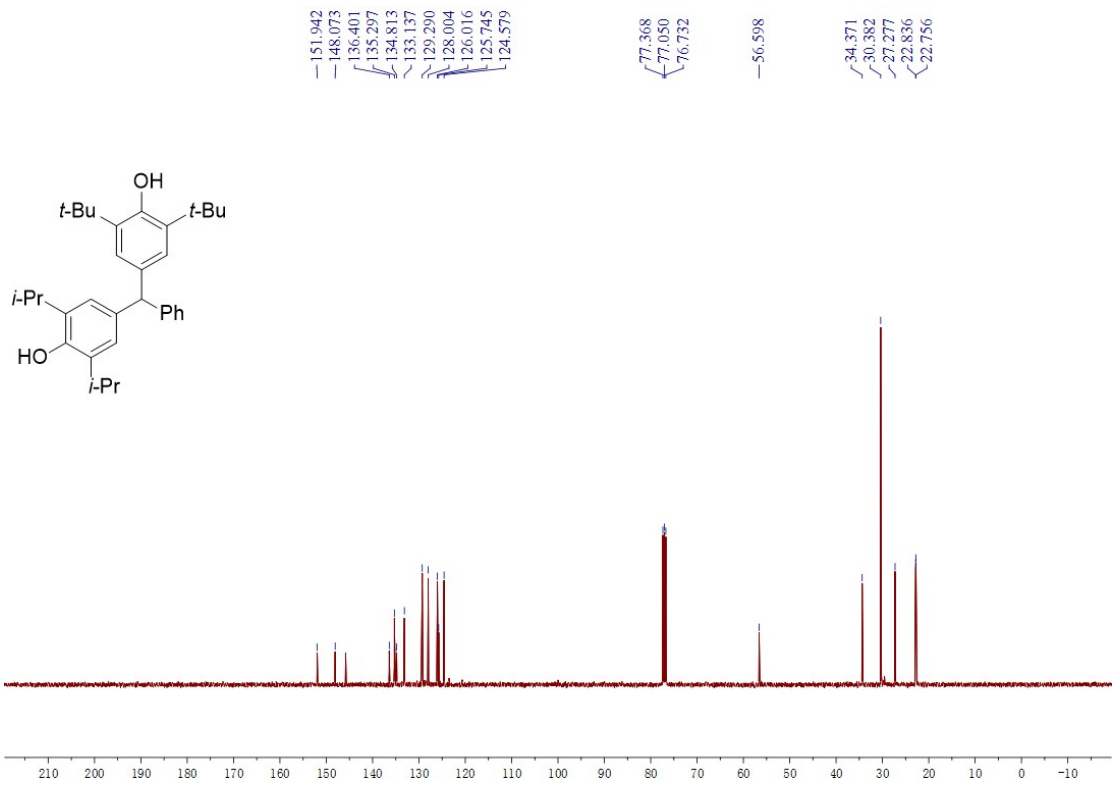
2,6-Di-tert-butyl-4-((4-hydroxy-3,5-dimethylphenyl)(phenyl)methyl)phenol (6j)



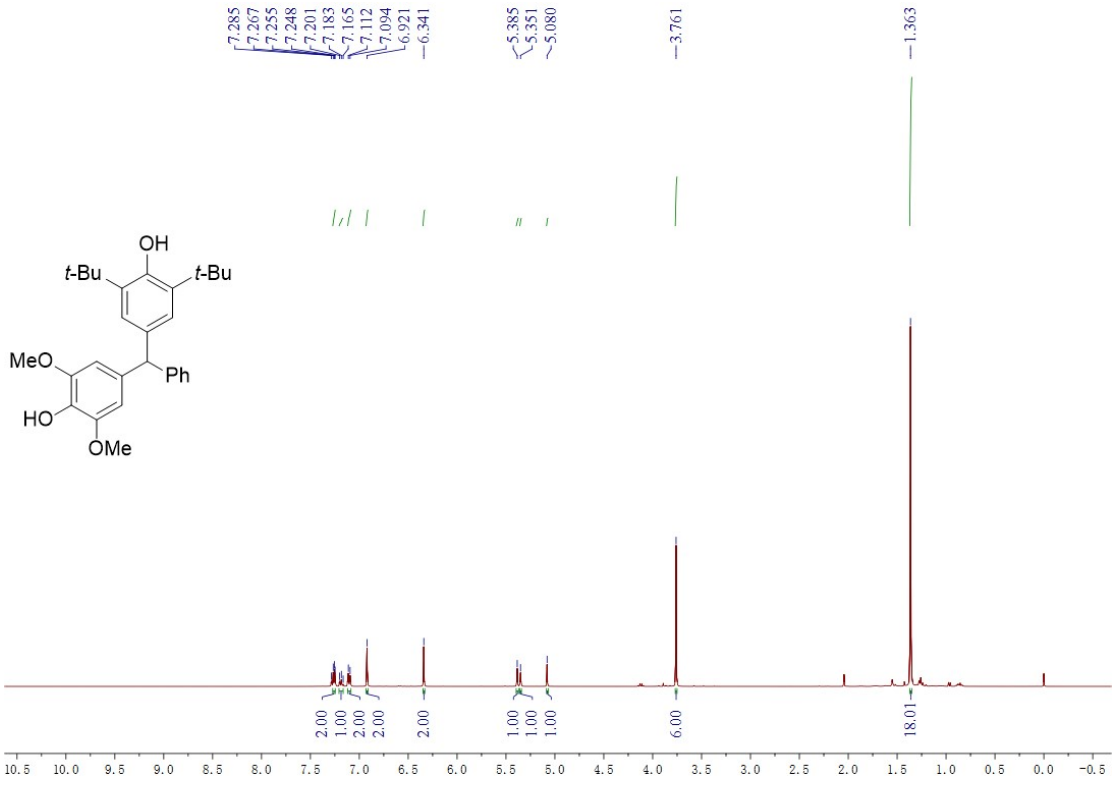


2,6-Di-tert-butyl-4-((4-hydroxy-3,5-diisopropylphenyl)(phenyl)methyl)phenol (6k)





2,6-Di-tert-butyl-4-((4-hydroxy-3,5-dimethoxyphenyl)(phenyl)methyl)phenol (6l)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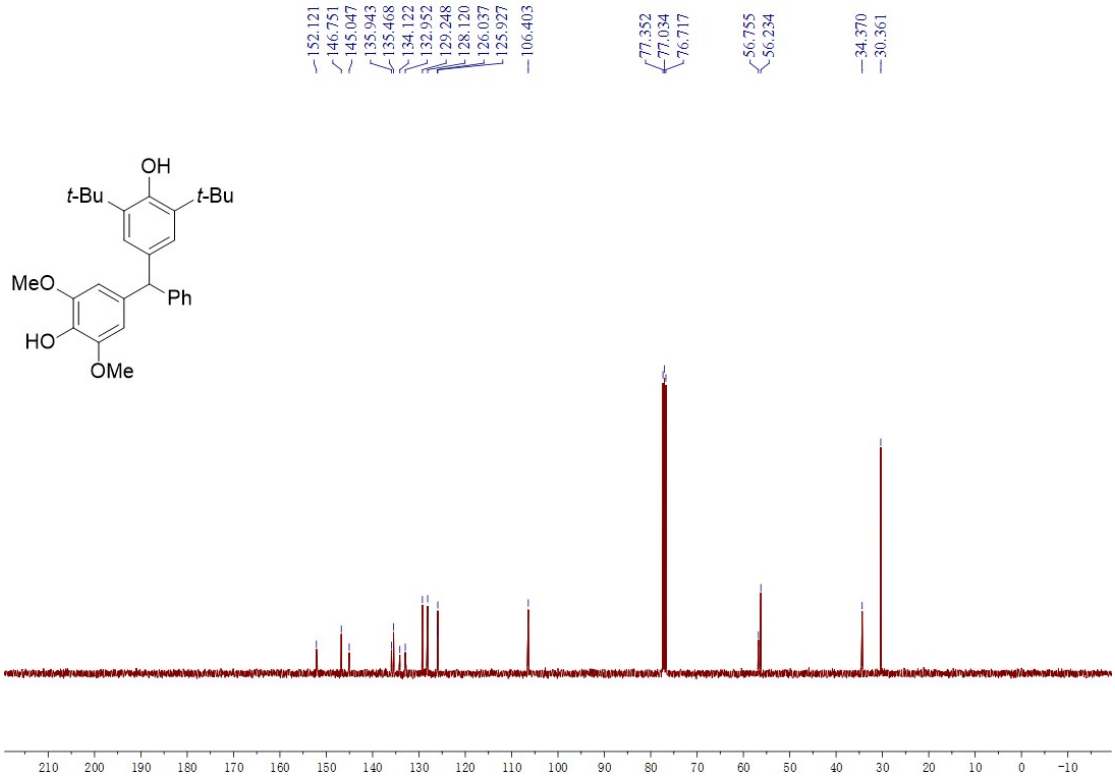
7.255
7.248
7.201
7.183
7.165
7.112
7.094
6.921
6.341
5.385
5.351
5.080
3.761
1.363
OH
t-Bu
t-Bu
MeO
Ph
HO
OMe
2.00
1.00
2.00
2.00
2.00
1.00
1.00
1.00
6.00
18.01
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5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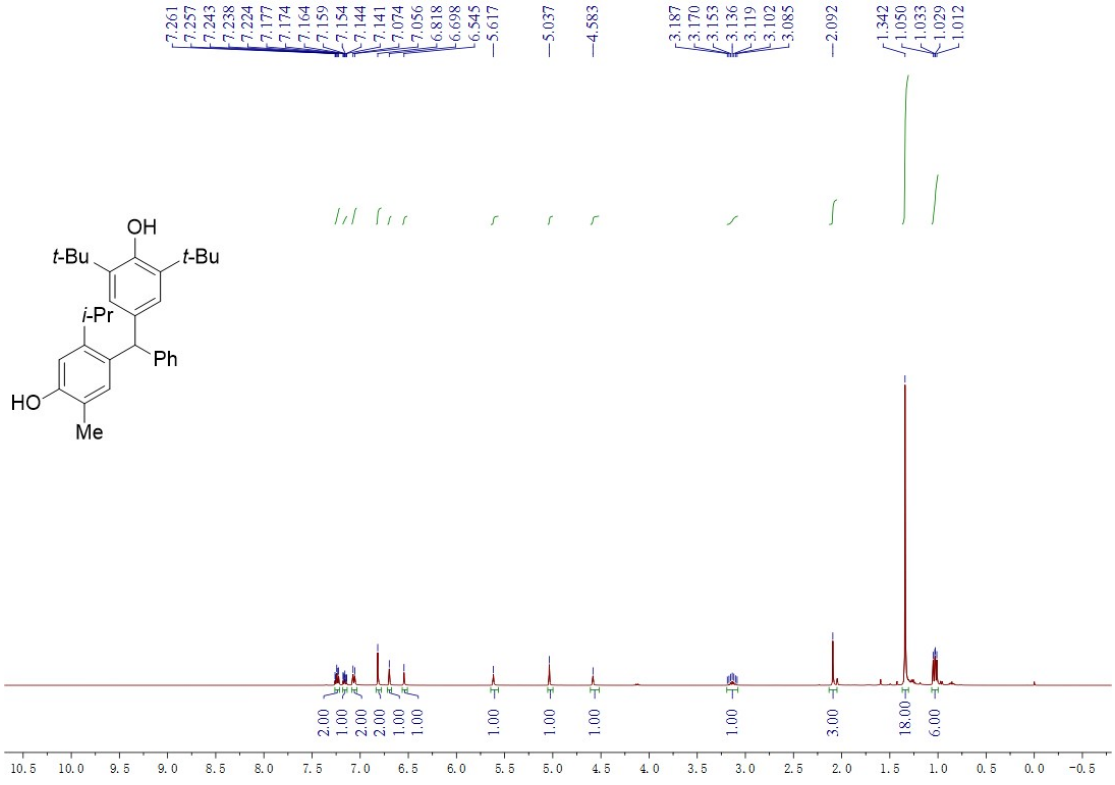
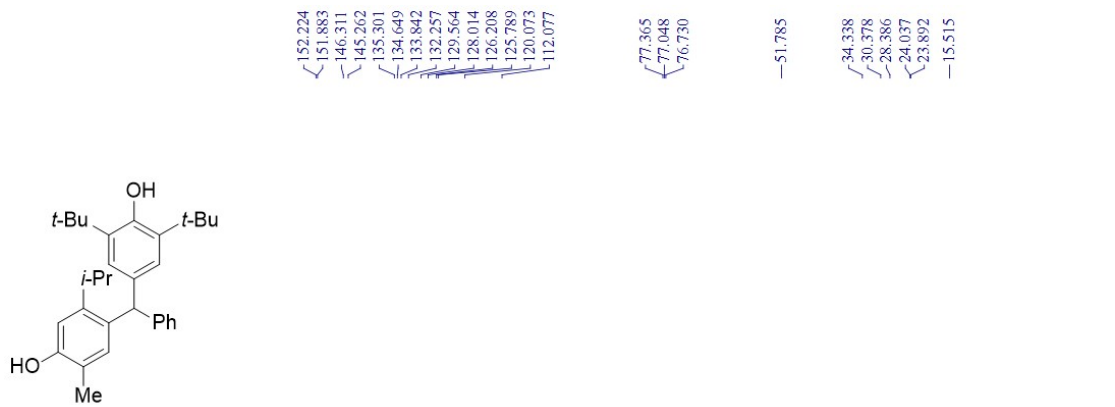
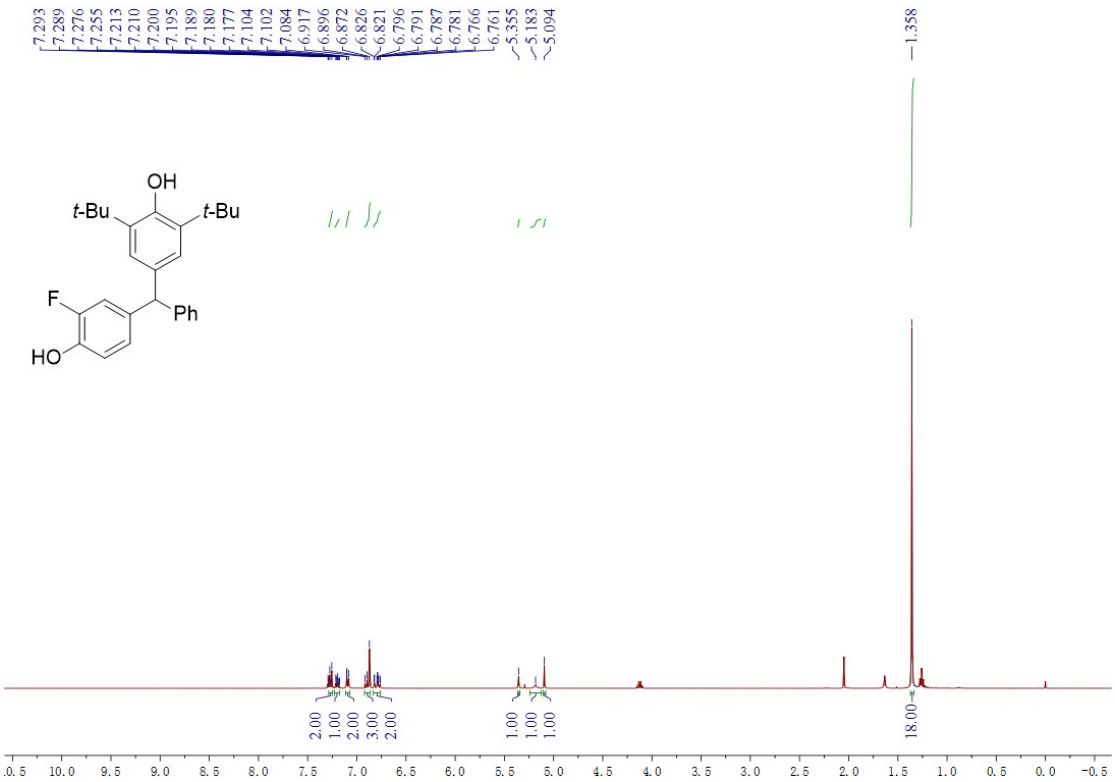
77.034
76.717
56.755
56.234
34.370
30.361
OH
t-Bu
t-Bu
MeO
Ph
HO
OMe
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10

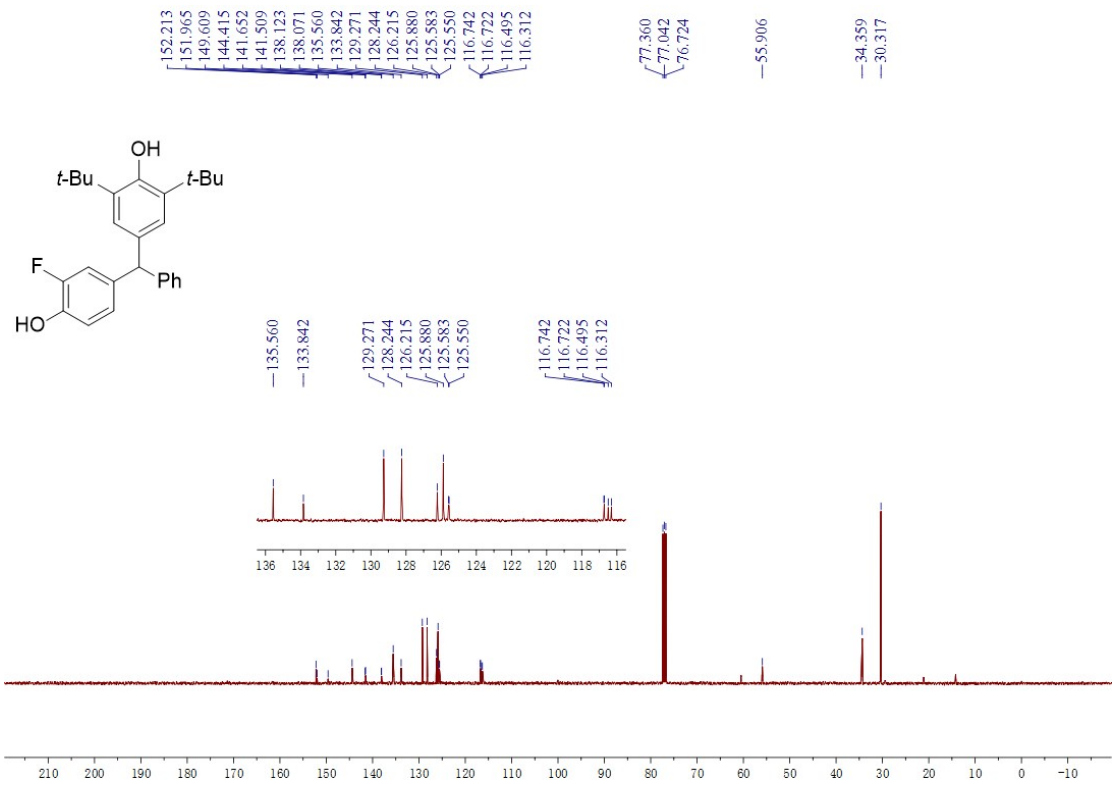
4-((3,5-Di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)-5-isopropyl-2-methylphenol (6m)

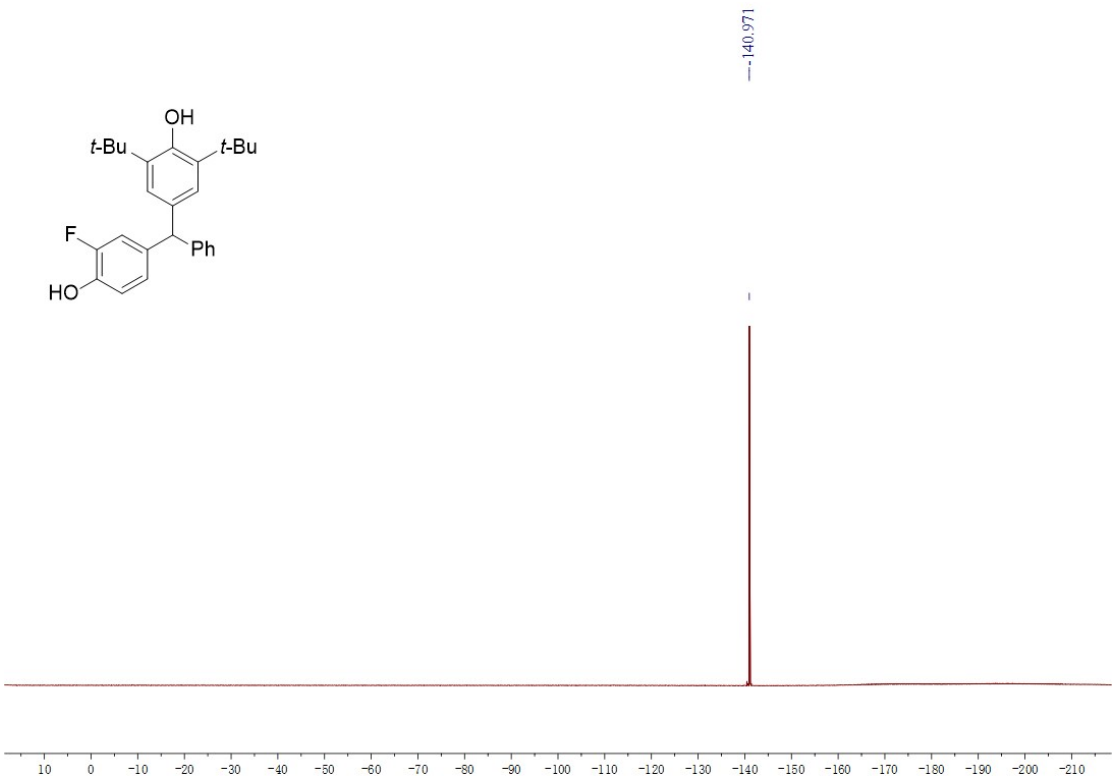




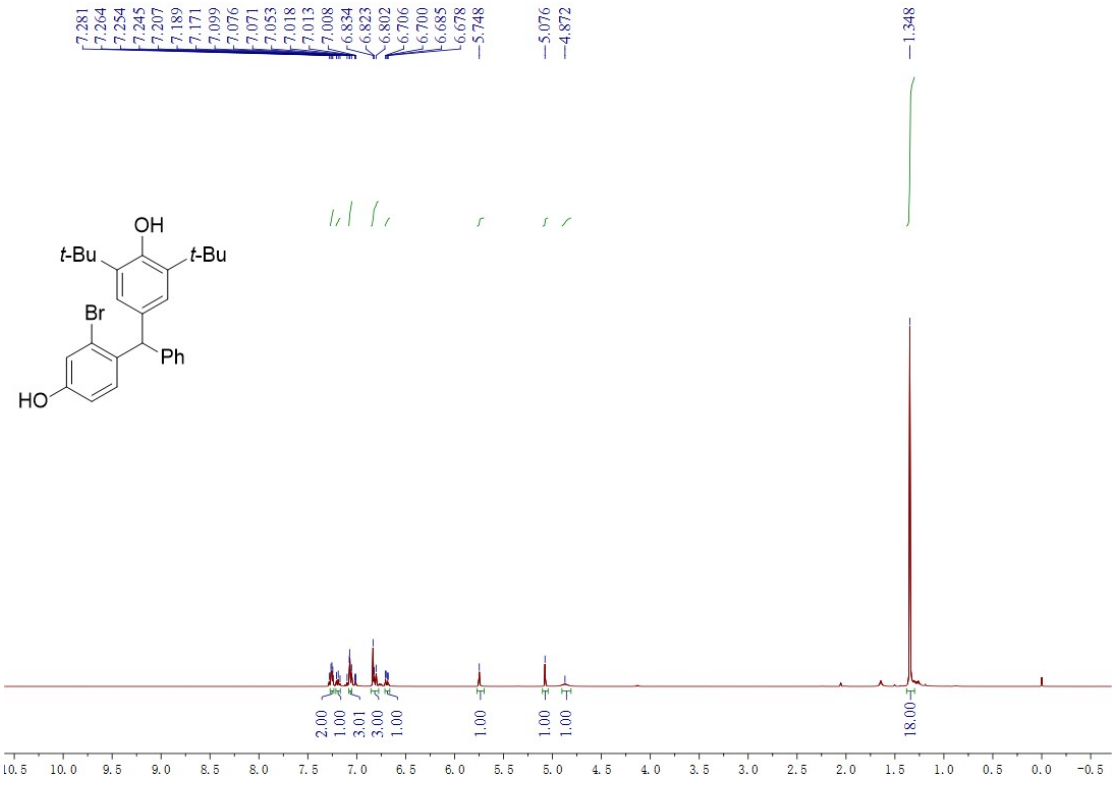
2,6-Di-tert-butyl-4-((3-fluoro-4-hydroxyphenyl)(phenyl)methyl)phenol (6n)

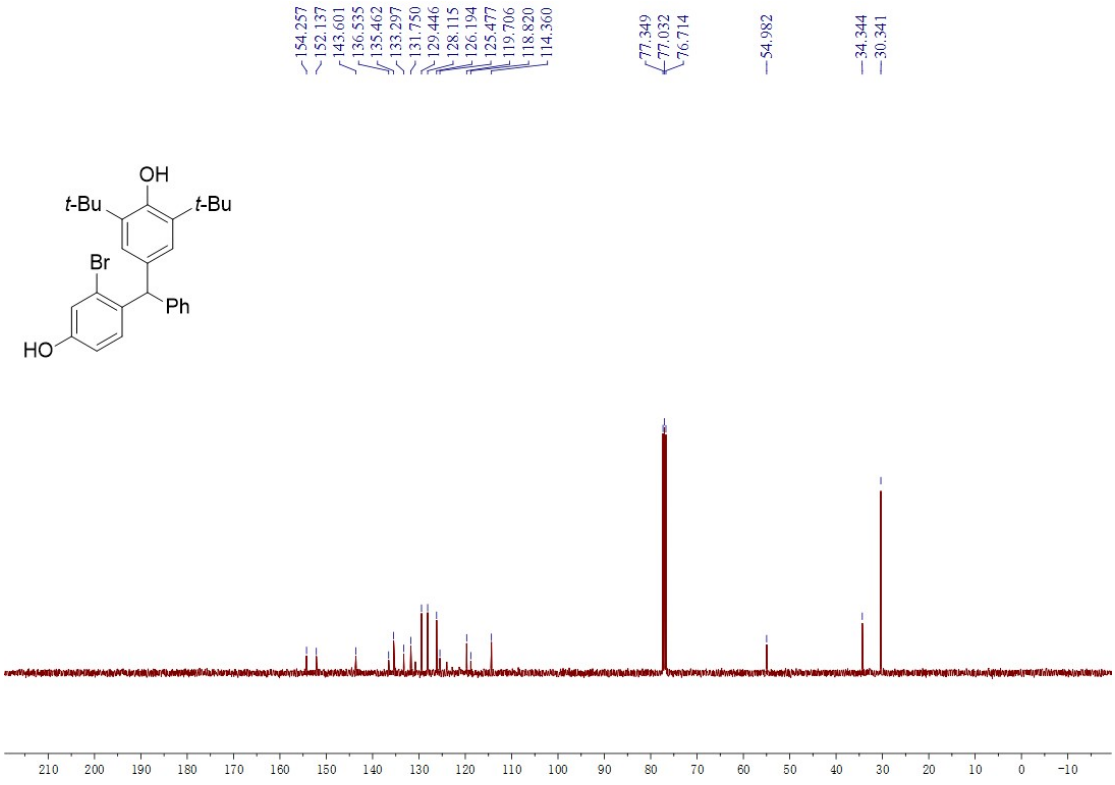




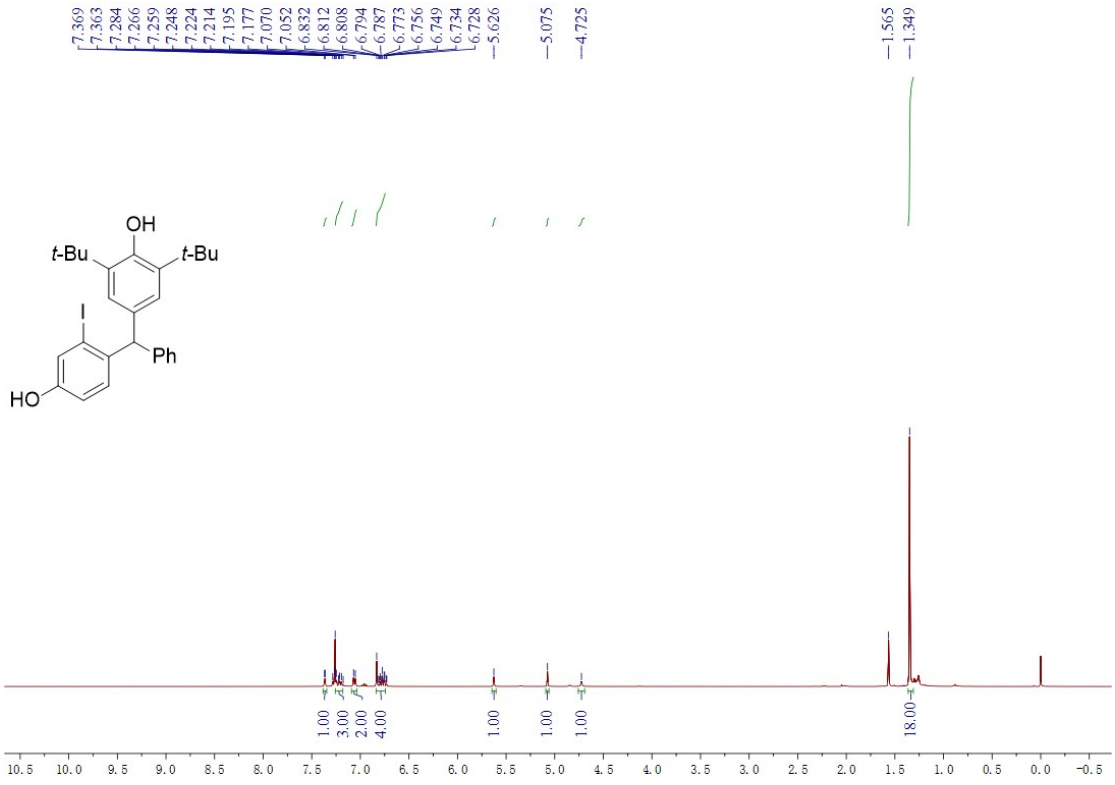


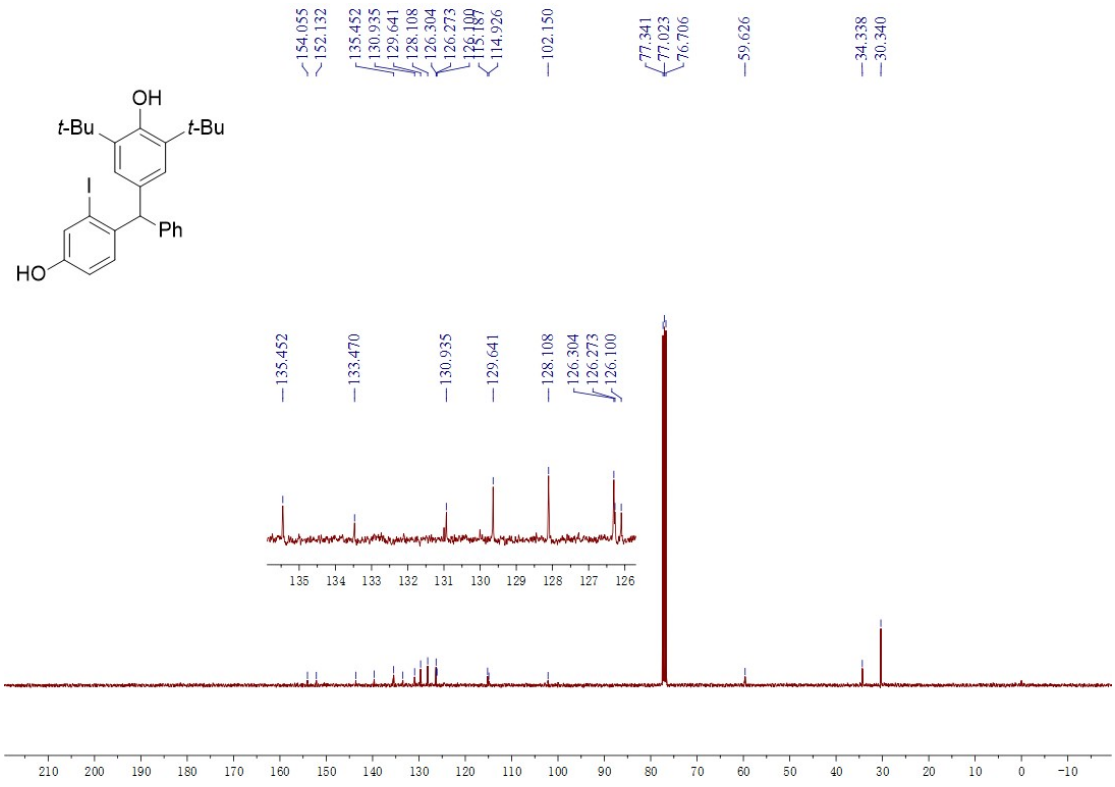
4-((2-Bromo-4-hydroxyphenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (6o)



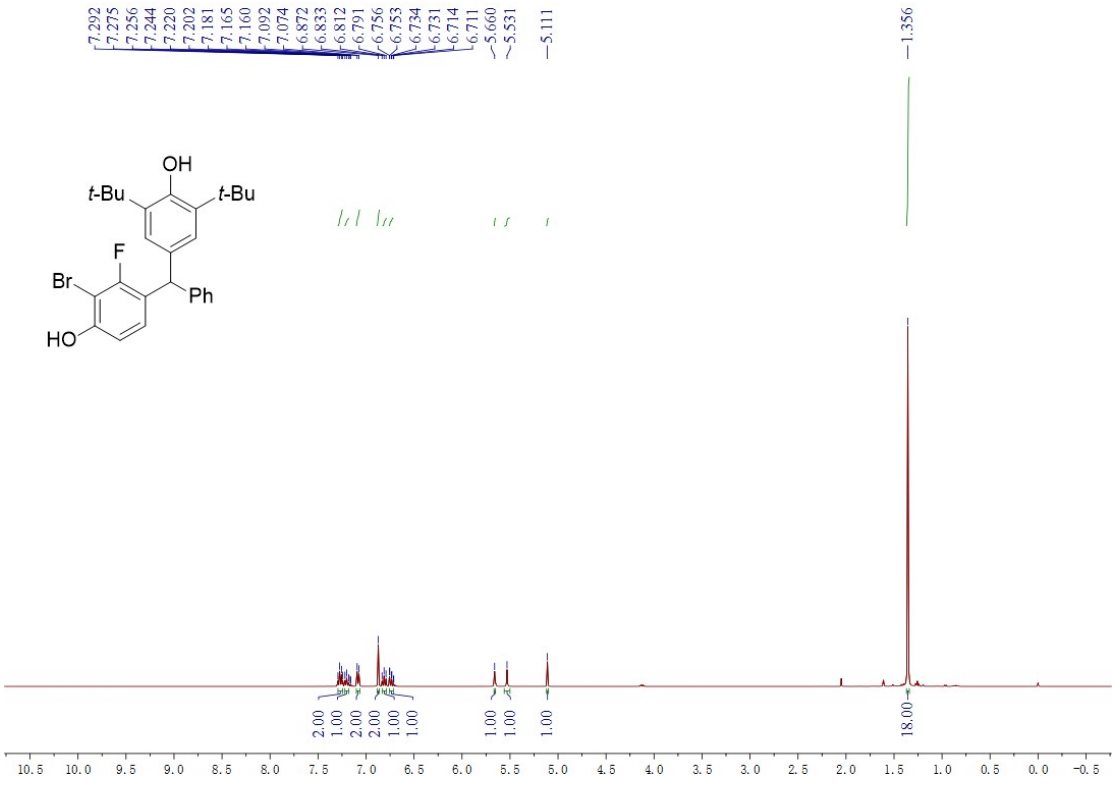


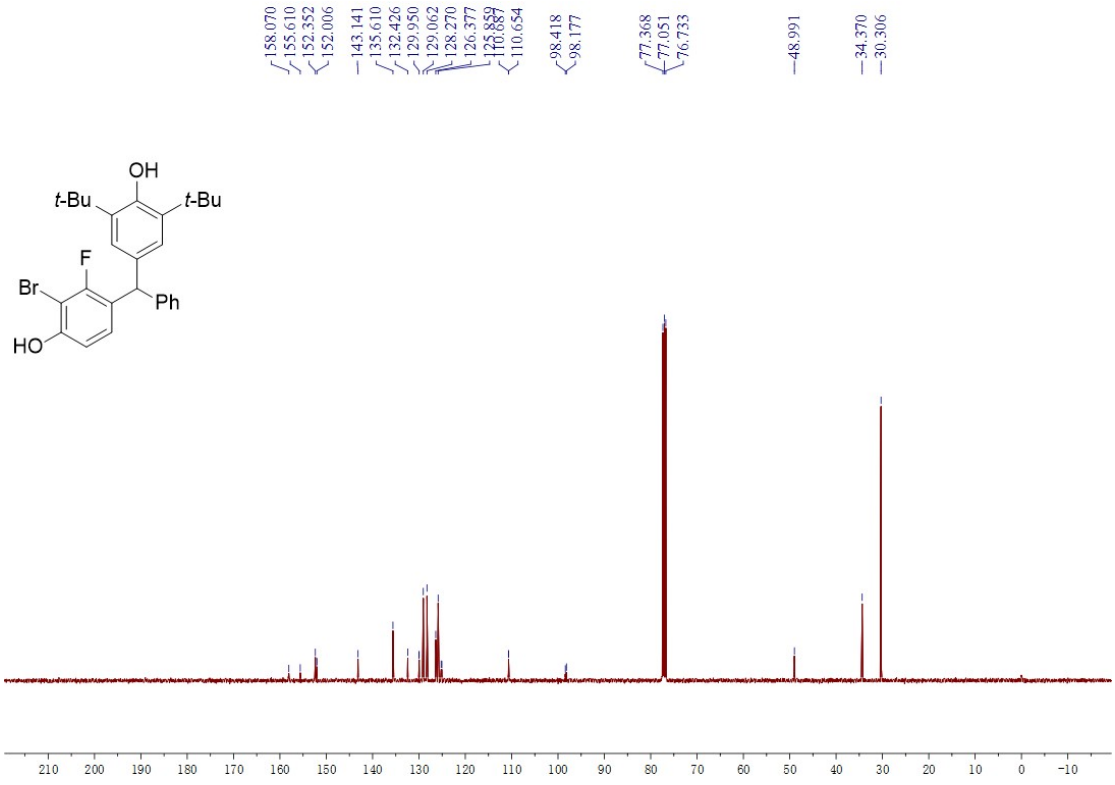
2,6-Di-tert-butyl-4-((4-hydroxy-2-iodophenyl)(phenyl)methyl)phenol (6p)





3-Bromo-4-((3,5-di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)-2-fluorophenol (6q)

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110.654
98.418
98.177
77.368
77.051
76.733
48.991
34.370
30.306
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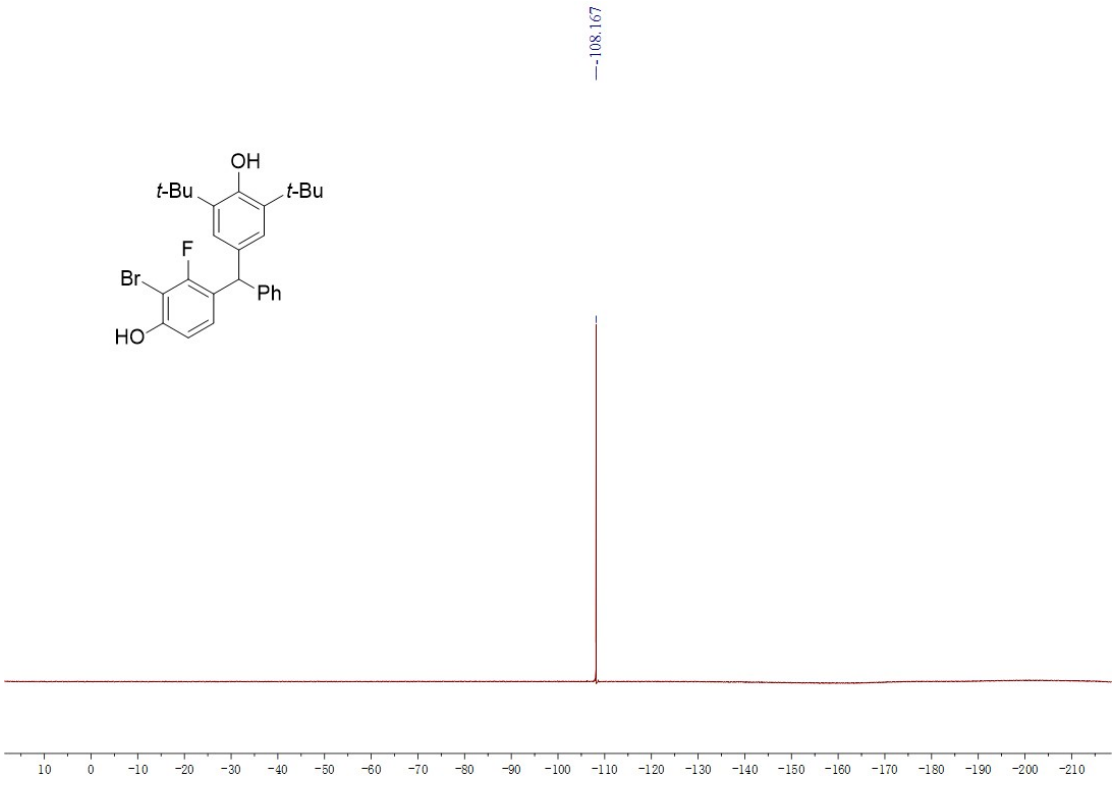
t-Bu
t-Bu
F
Br
Ph
HO
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10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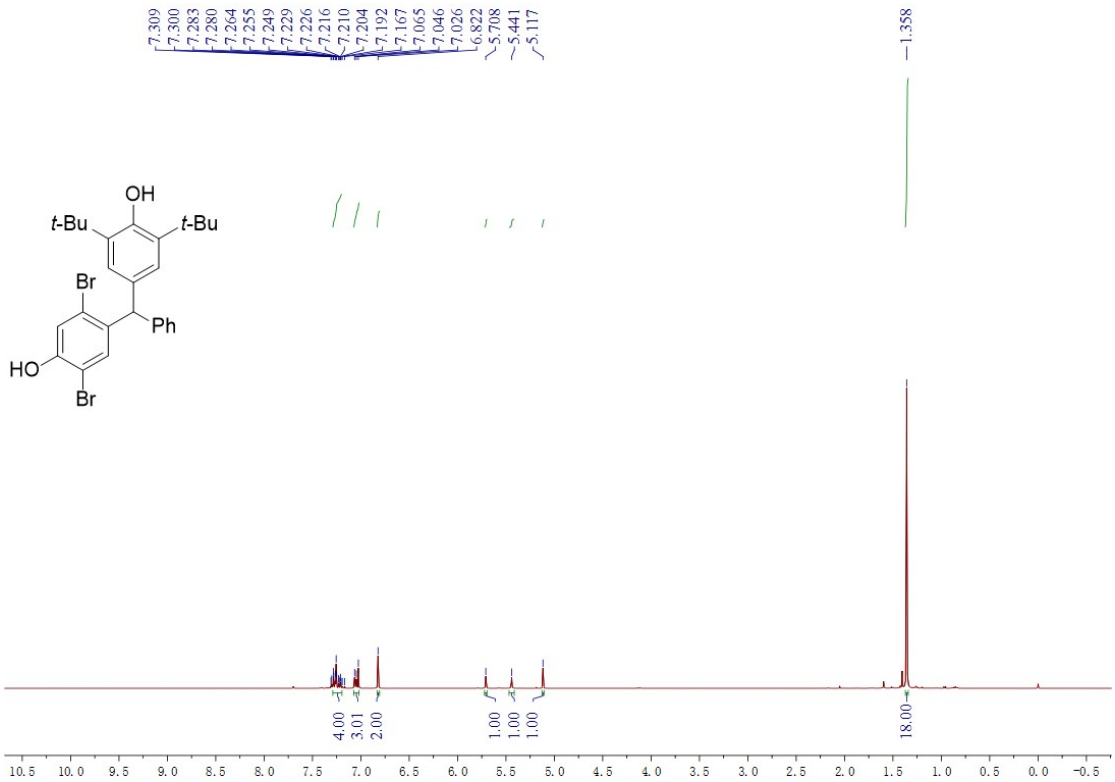
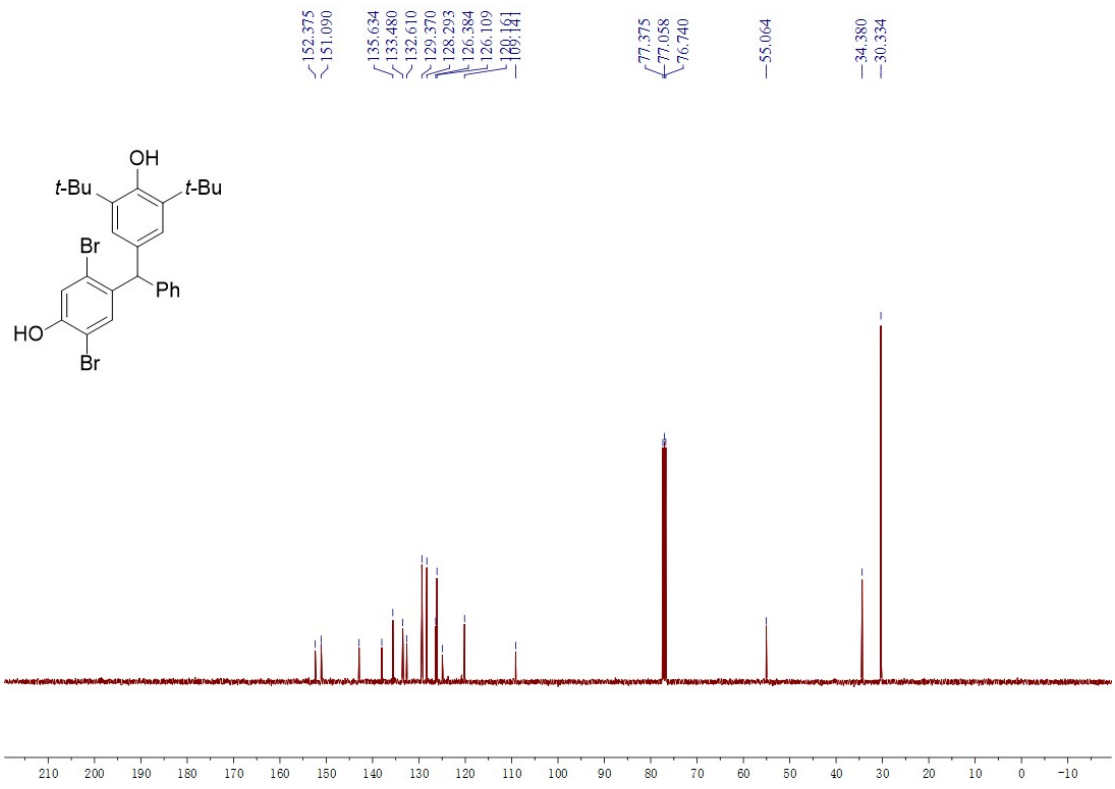
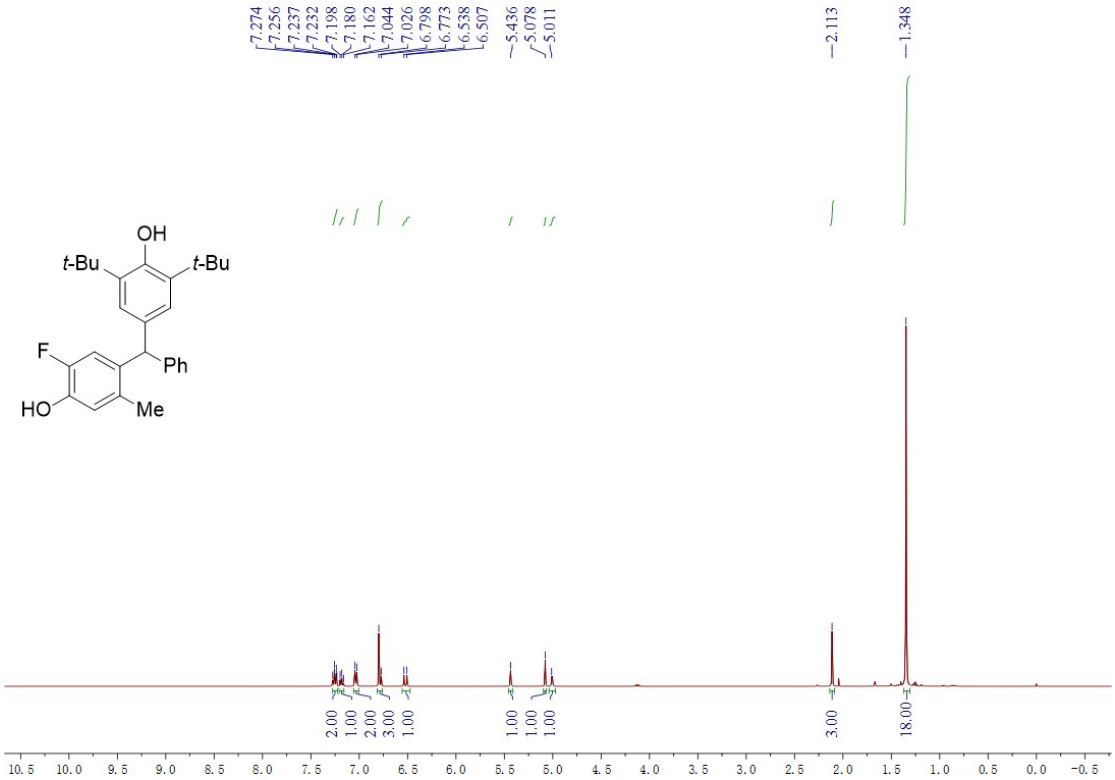
t-Bu
F
Br
Ph
HO
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210

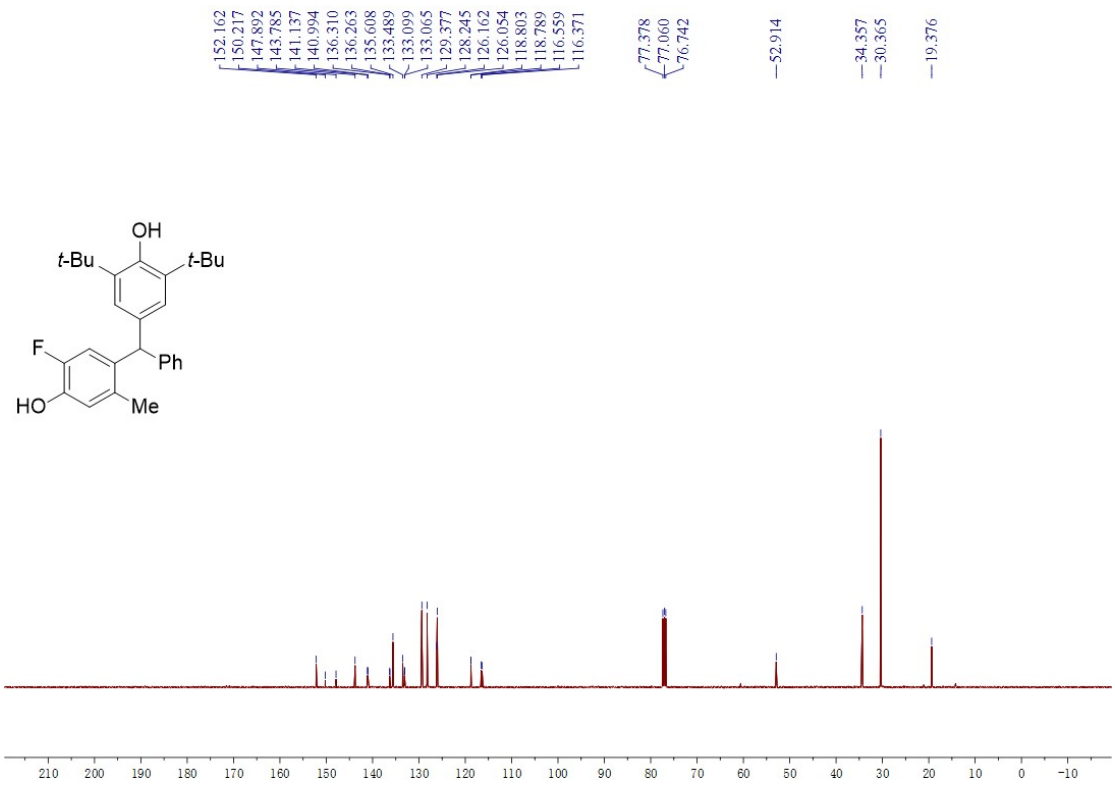
2,5-Dibromo-4-((3,5-di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)phenol (6r)

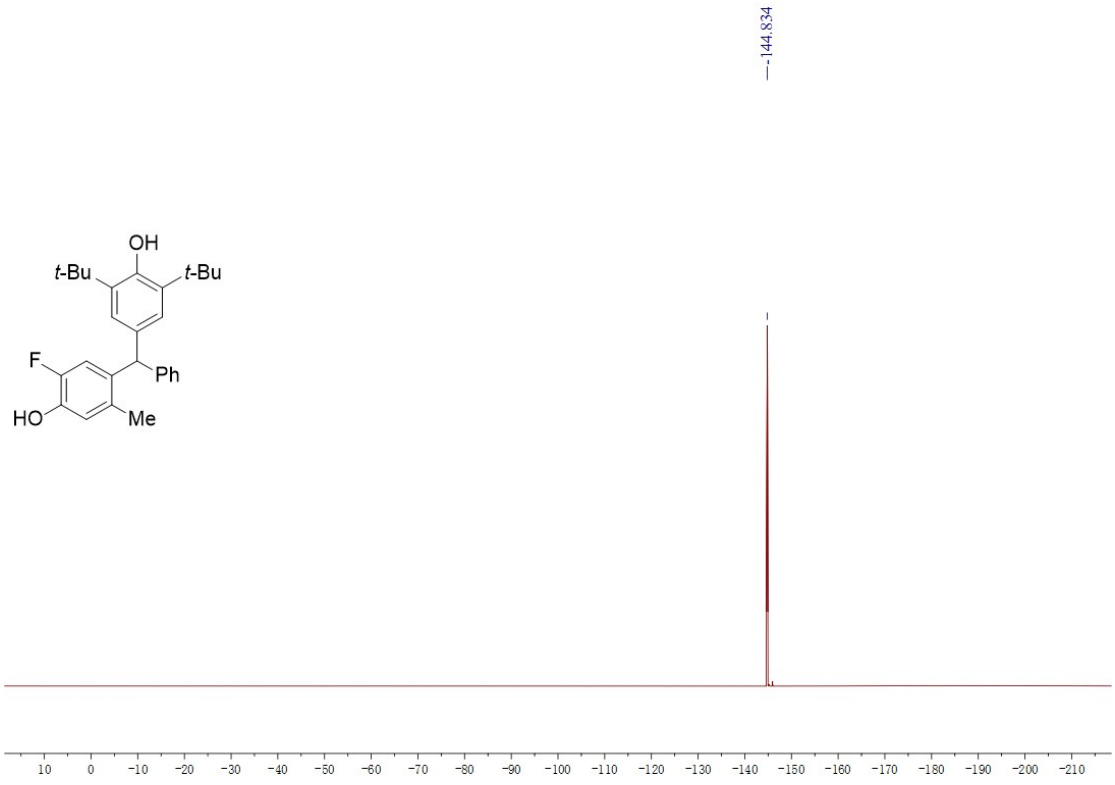




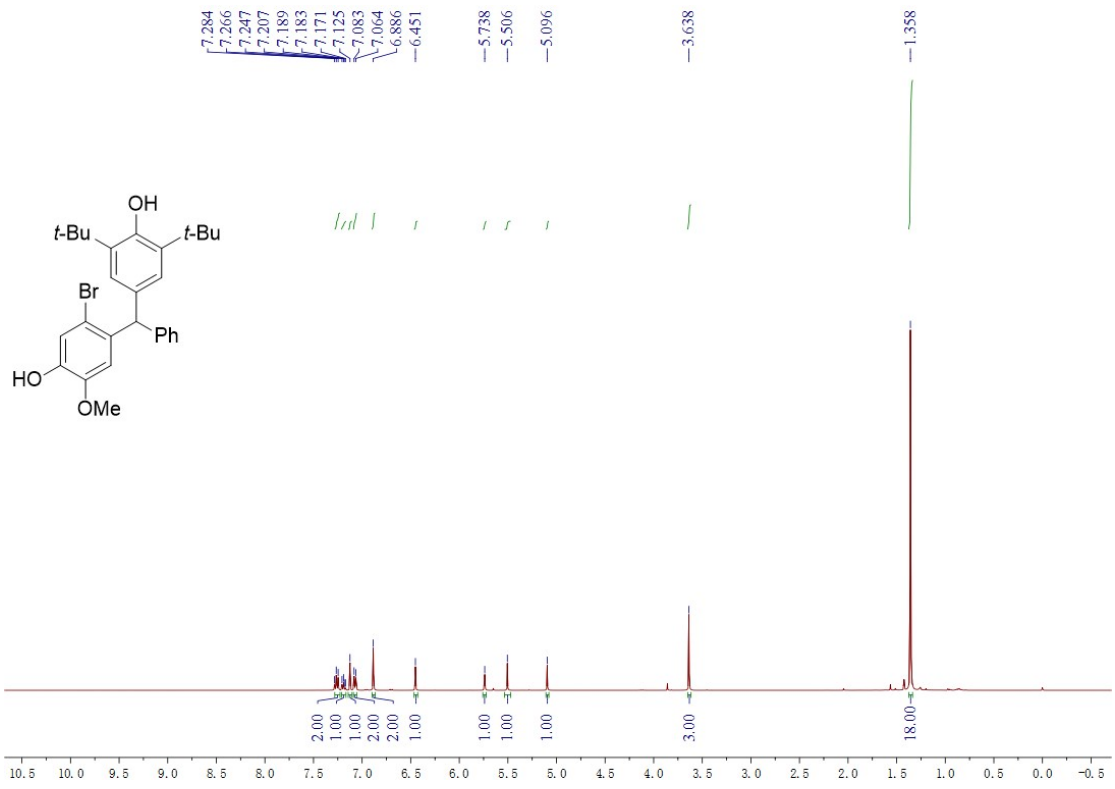
4-((3,5-Di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)-2-fluoro-5-methylphenol (6s)

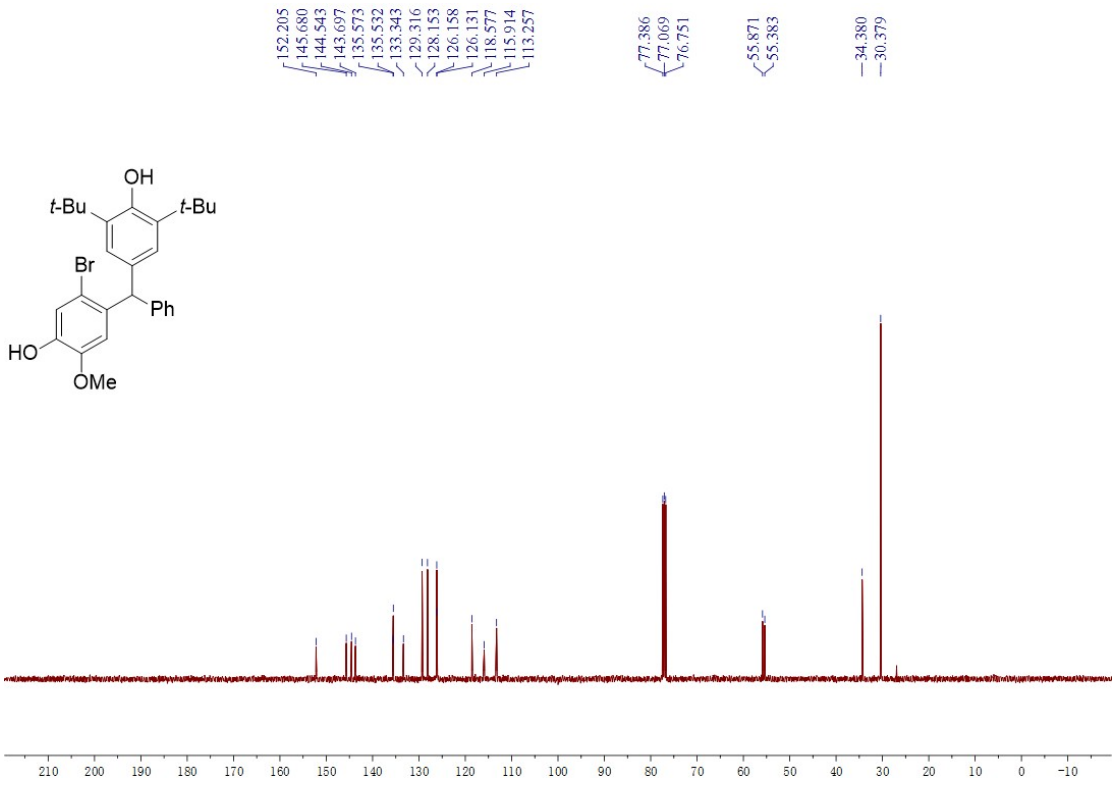




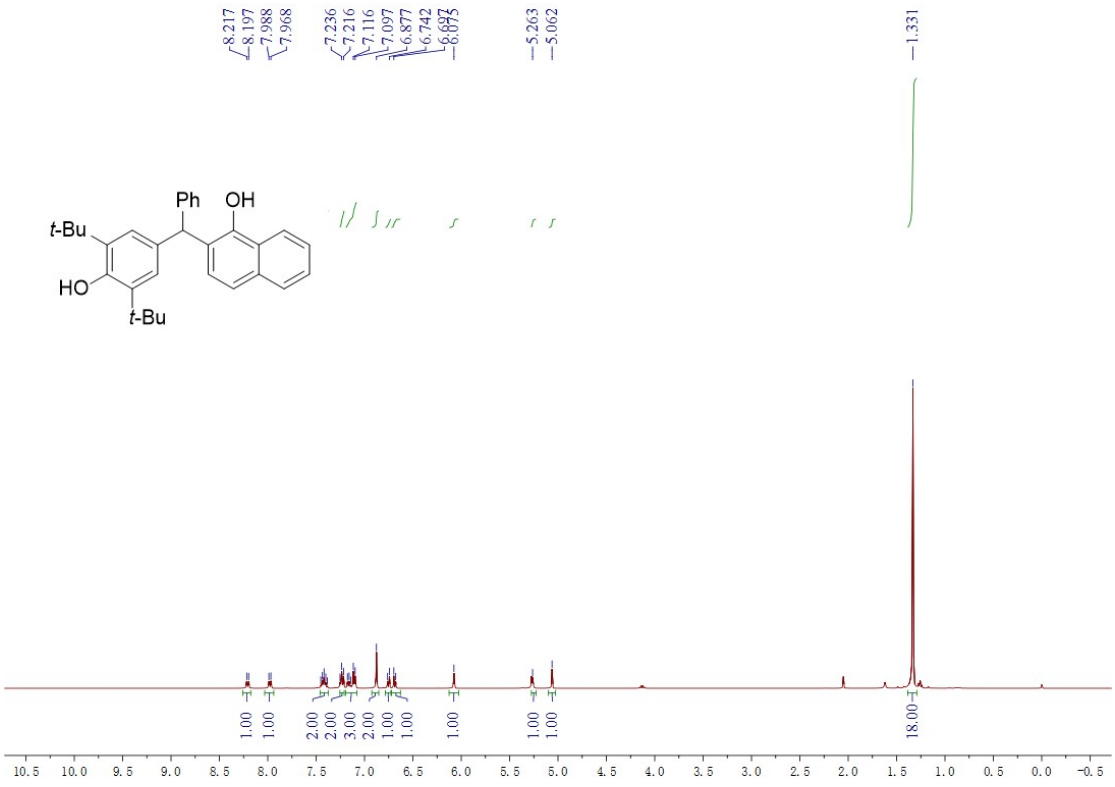


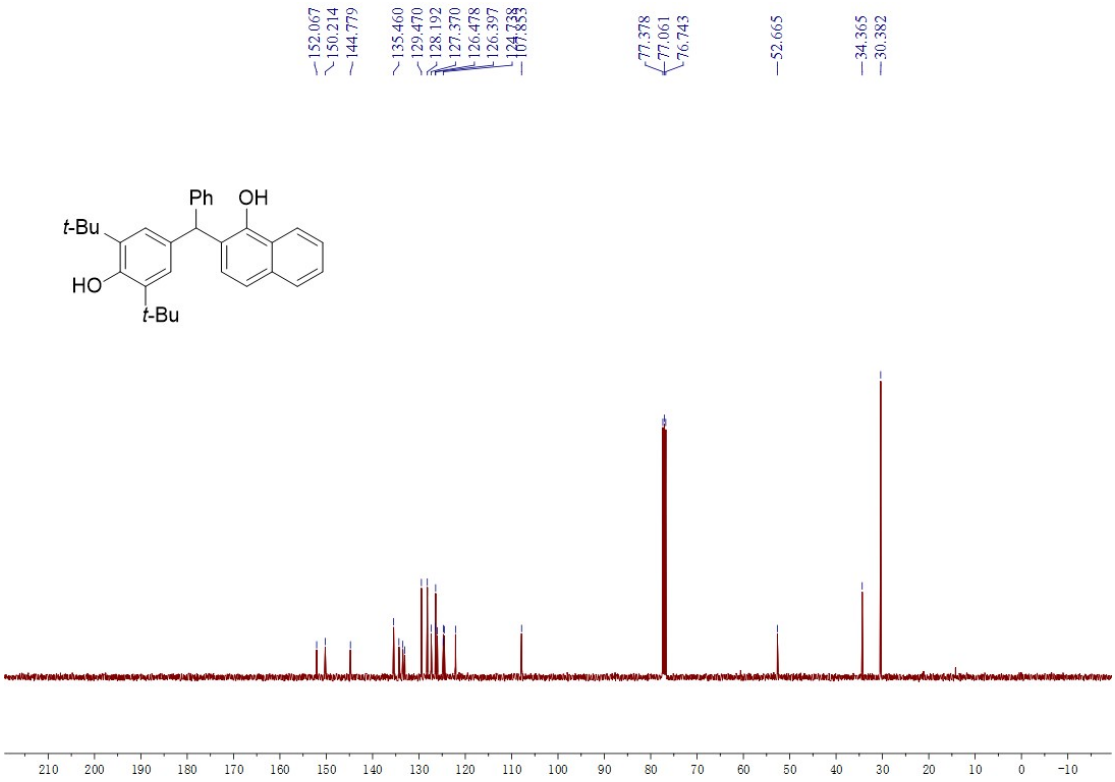
5-Bromo-4-((3,5-di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)-2-methoxyphenol (6t)



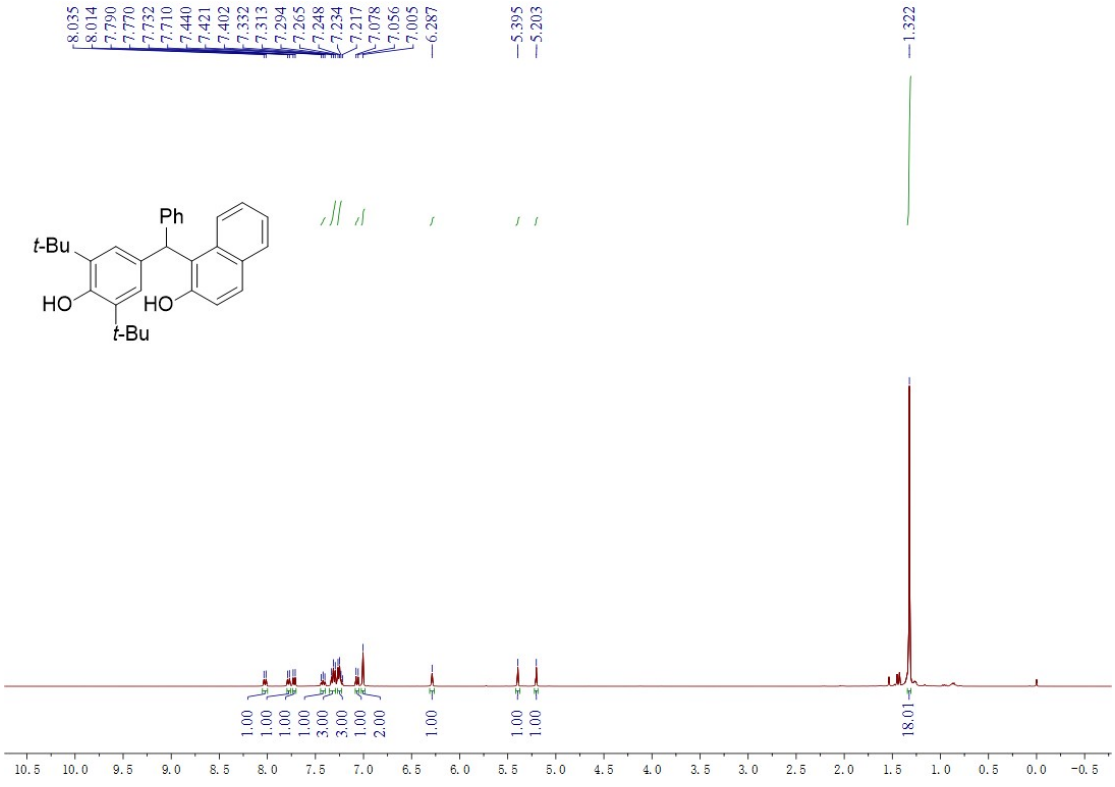


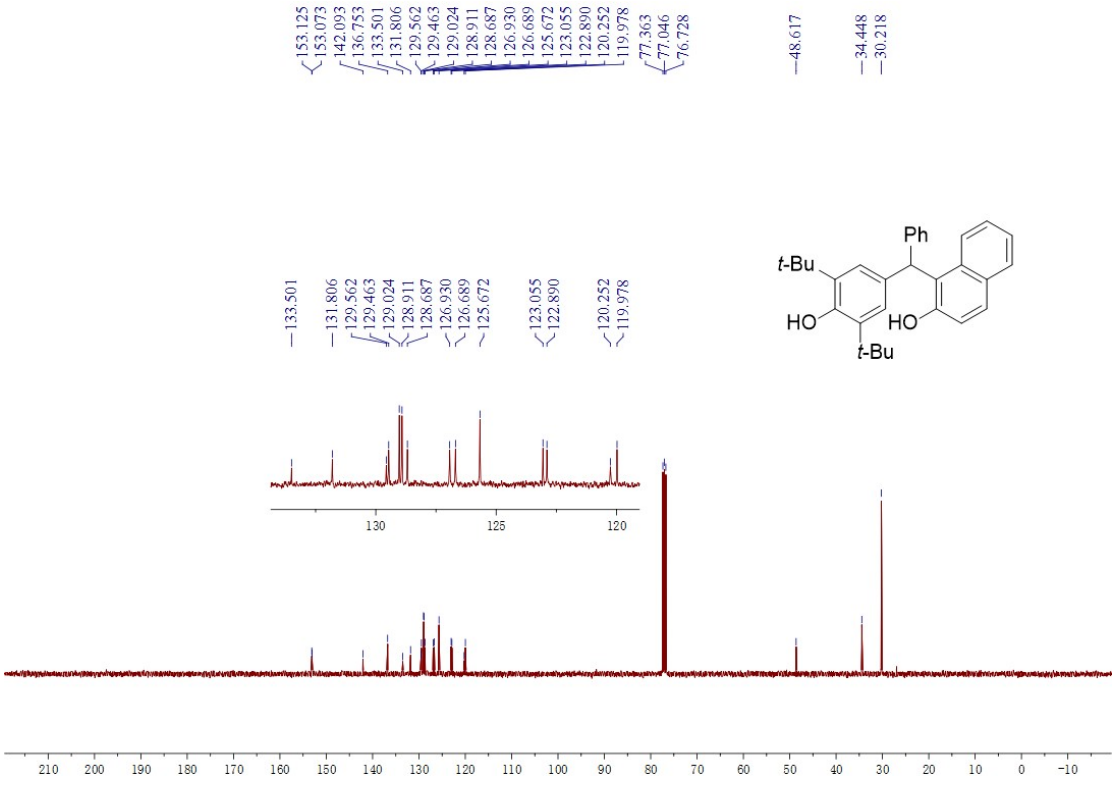
2-((3,5-Di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)naphthalen-1-ol (6u)



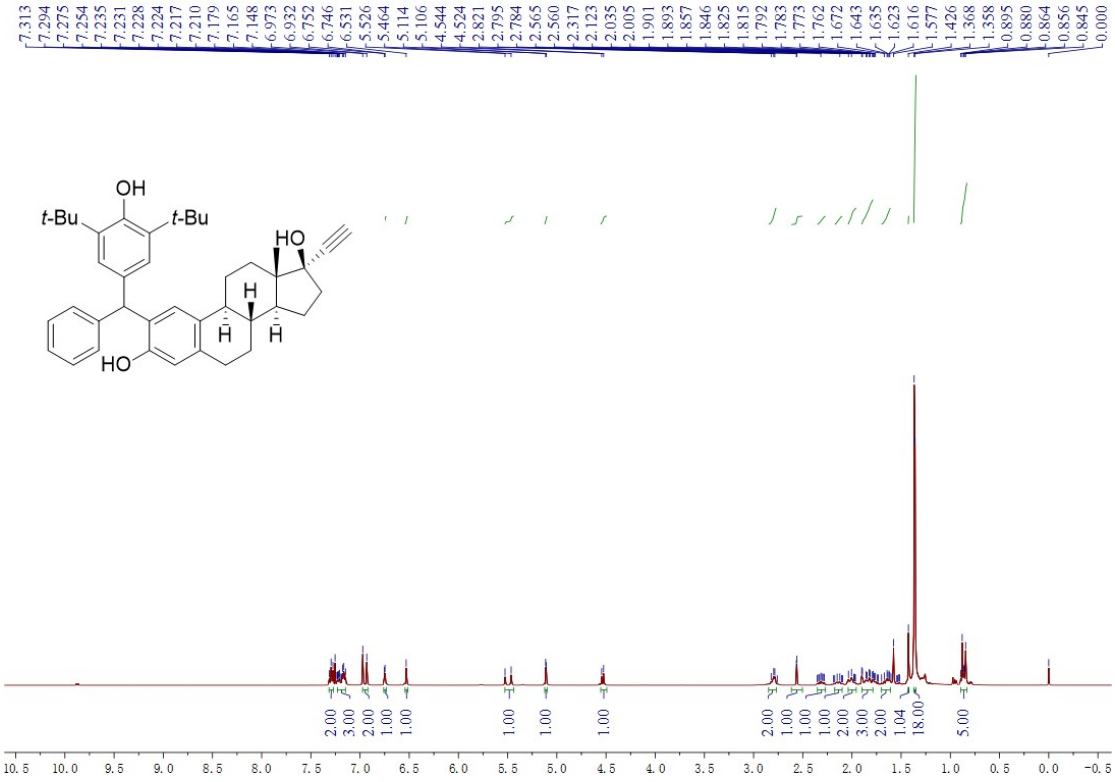


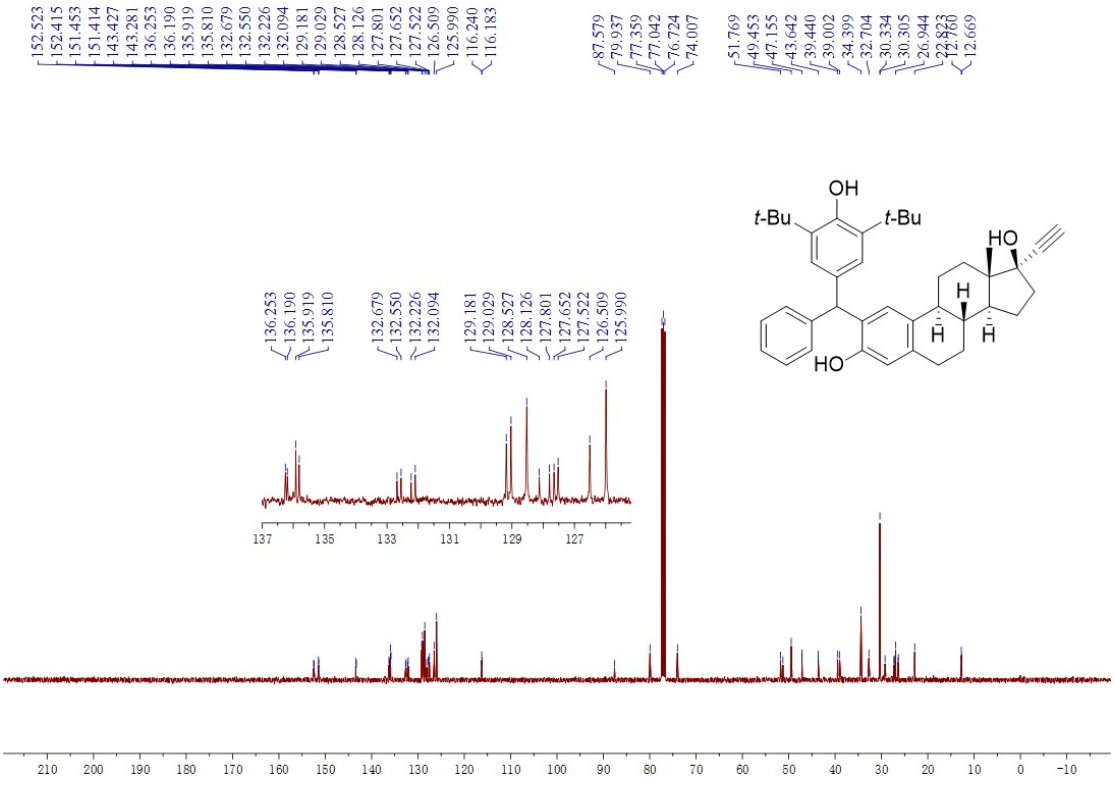
1-((3,5-Di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)naphthalen-2-ol (6v)



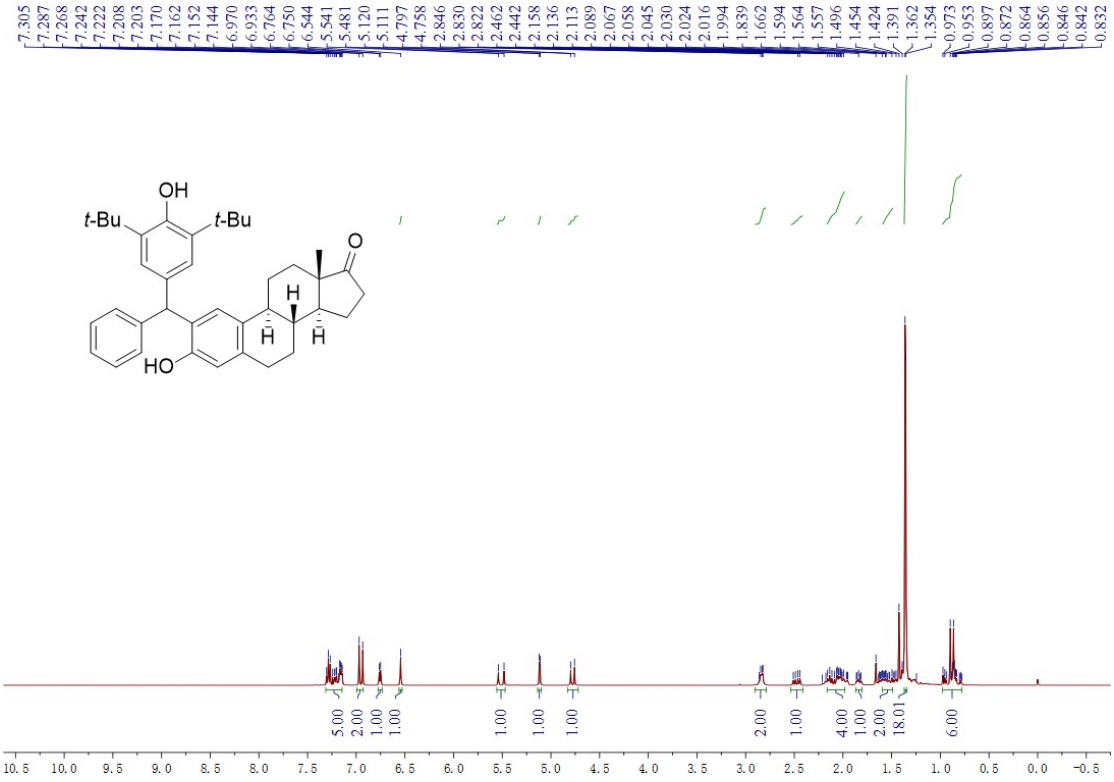


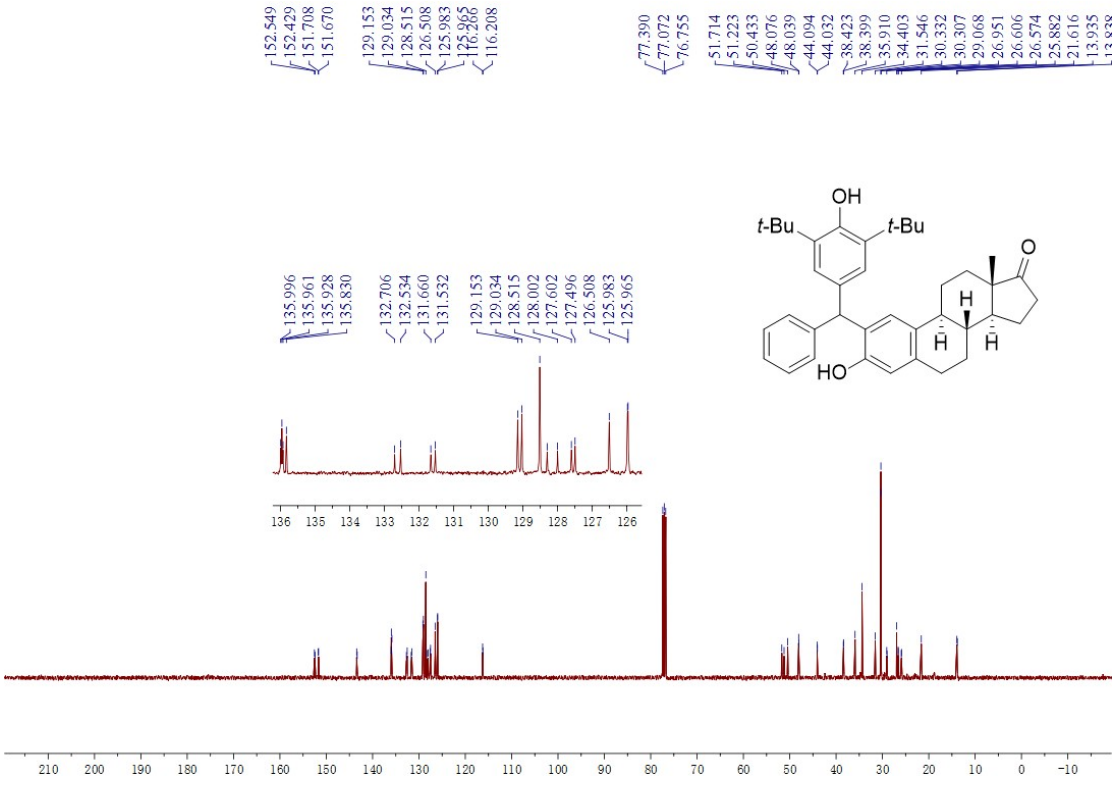
(8R,9S,13S,14S,17R)-2-((3,5-Di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)-17-ethynyl-13-methyl-7,8,9,11,12,13,14,15,16,17-decahydro-6H-cyclopenta[a]phenanthrene-3,17-diol (6w)



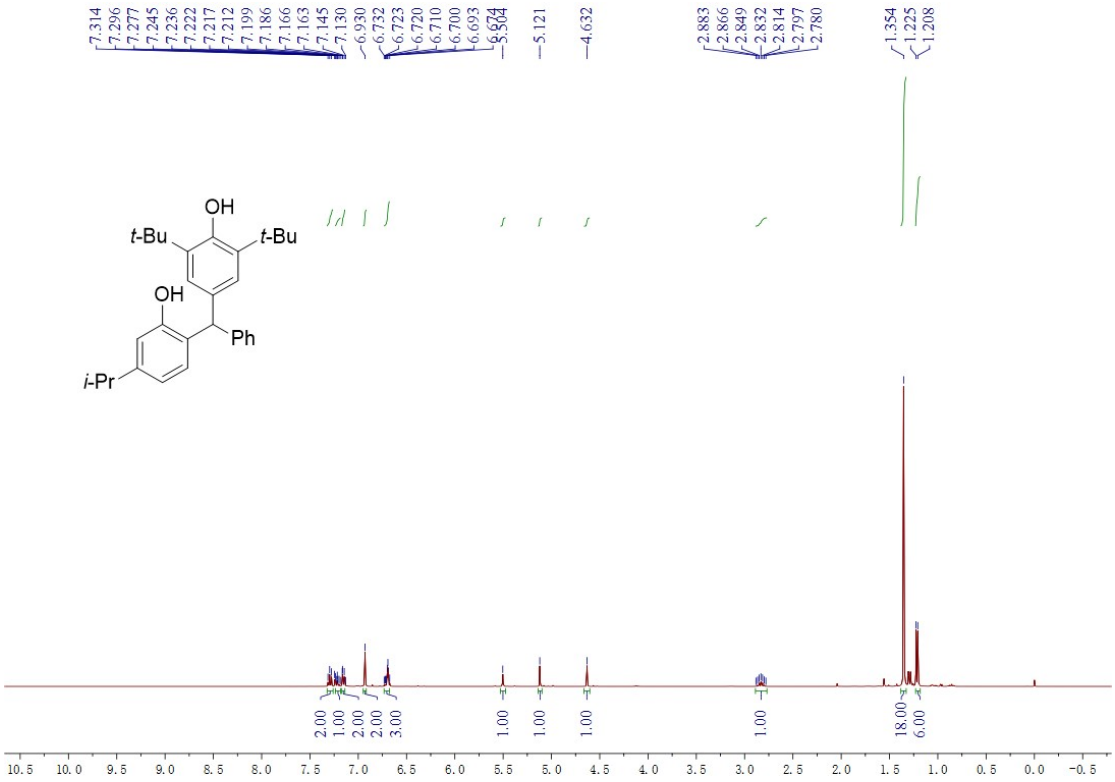


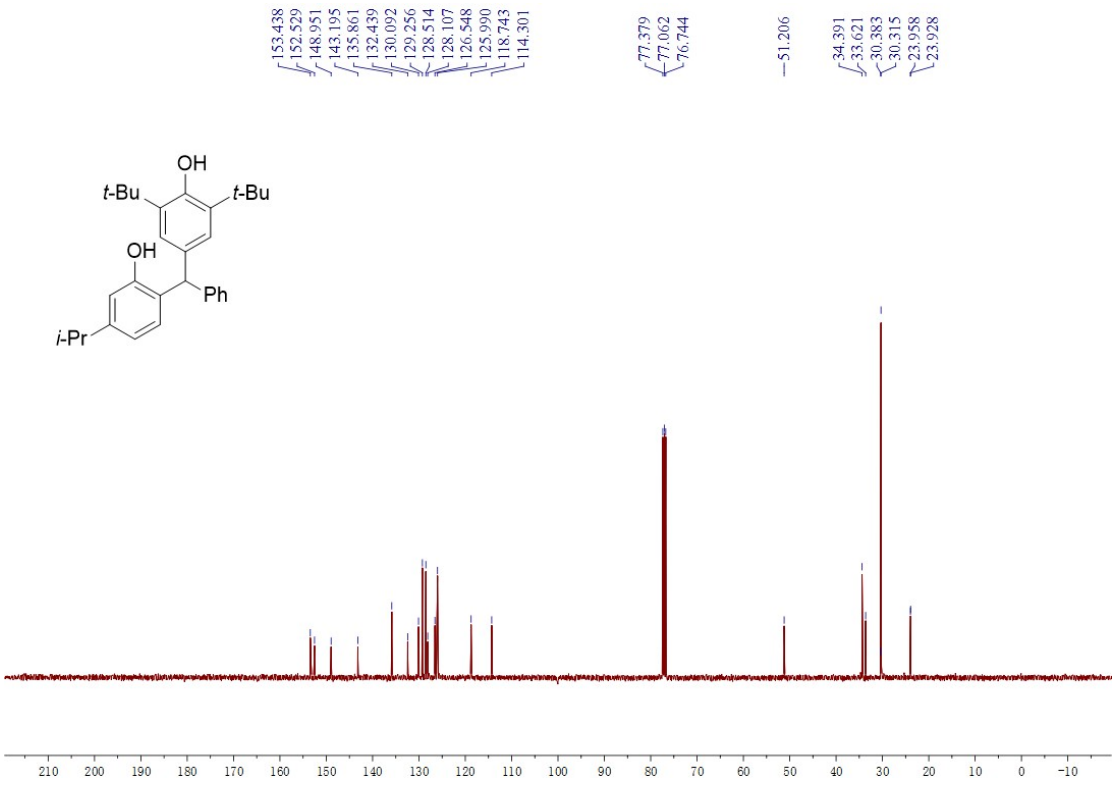
(8R,9S,13S,14S)-2-((3,5-Di-tert-butyl-4-hydroxyphenyl)(phenyl)methyl)-3-hydroxy-13-methyl-6,7,8,9,11,12,13,14,15,16-decahydro-17H-cyclopenta[a]phenanthren-17-one (6x)



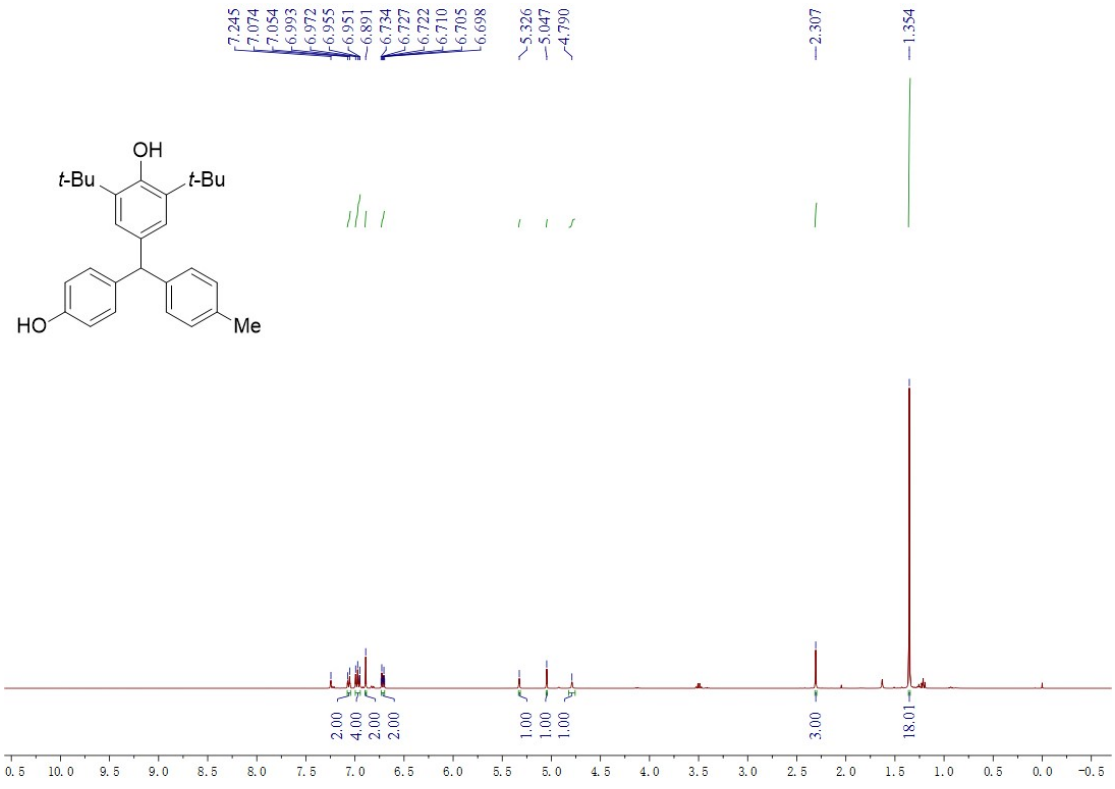


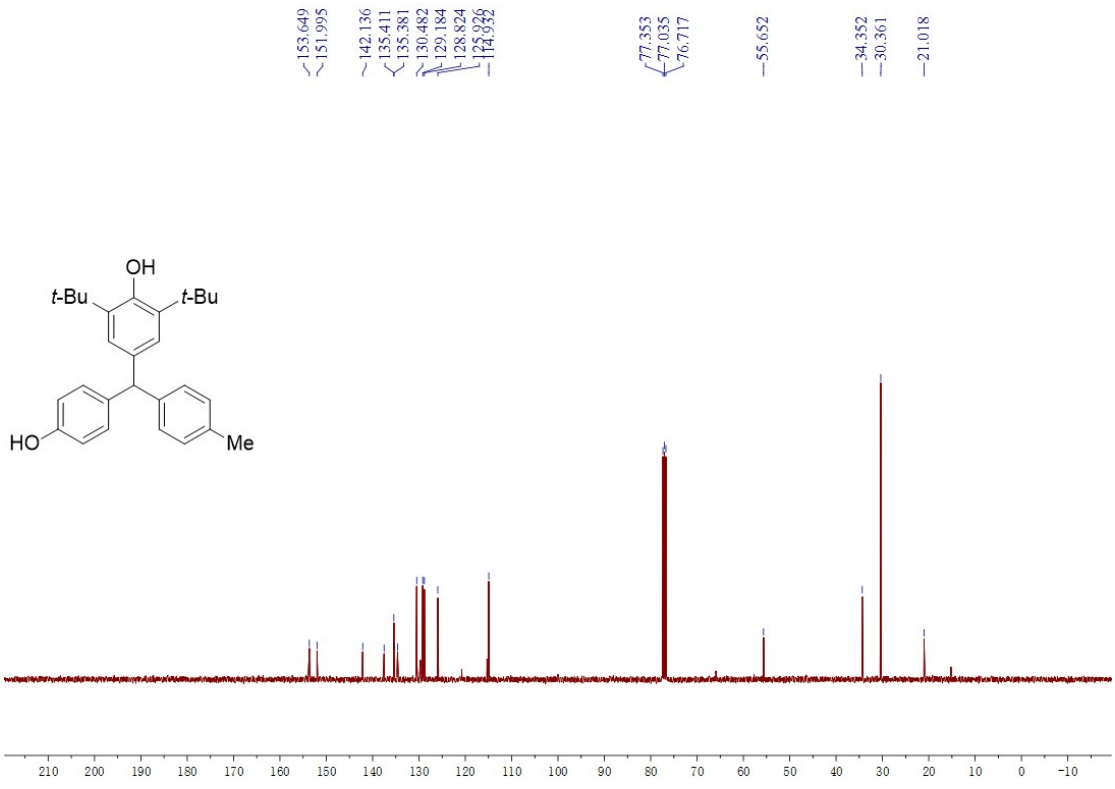
2,6-Di-tert-butyl-4-((2-hydroxy-4-isopropylphenyl)(phenyl)methyl)phenol (6ae)



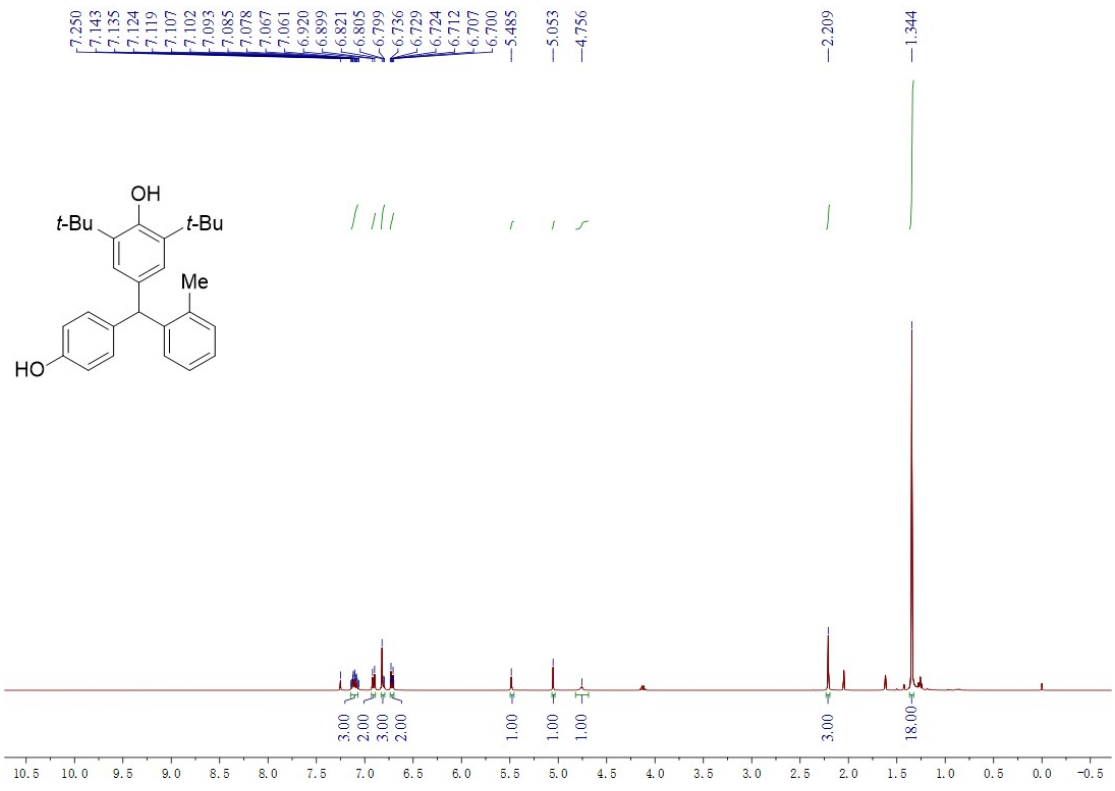


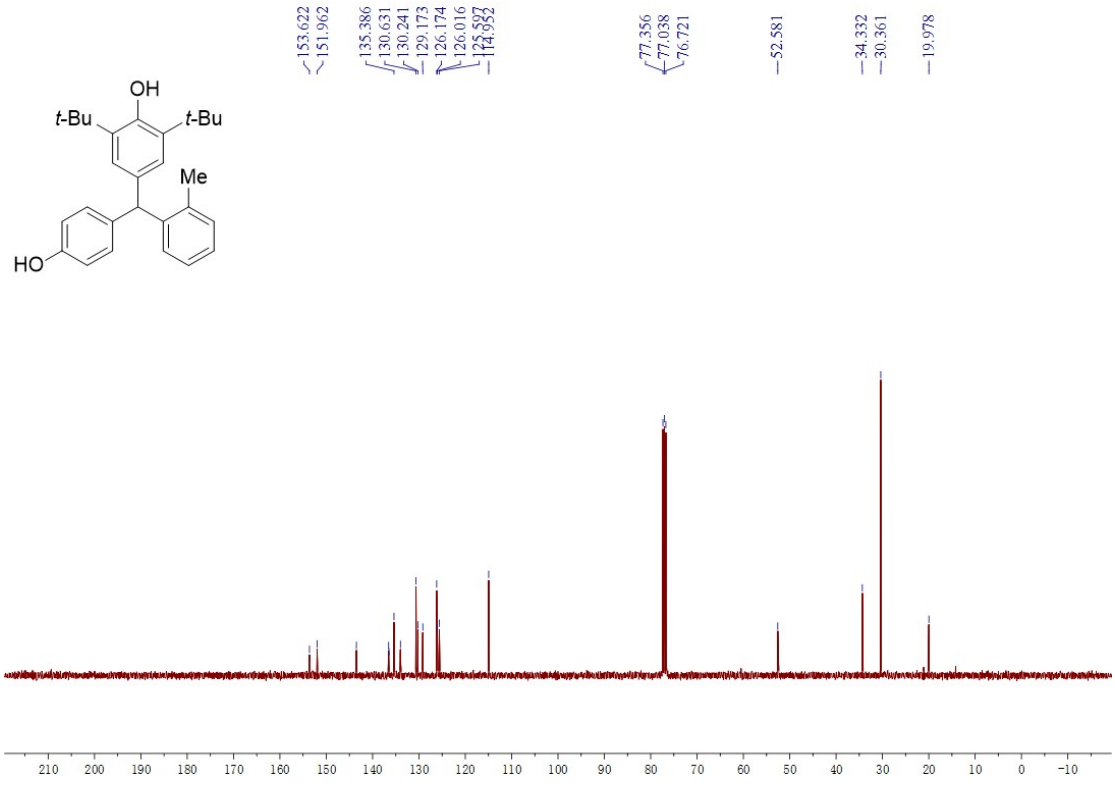
2,6-Di-tert-butyl-4-((4-hydroxyphenyl)(p-tolyl)methyl)phenol (7a)



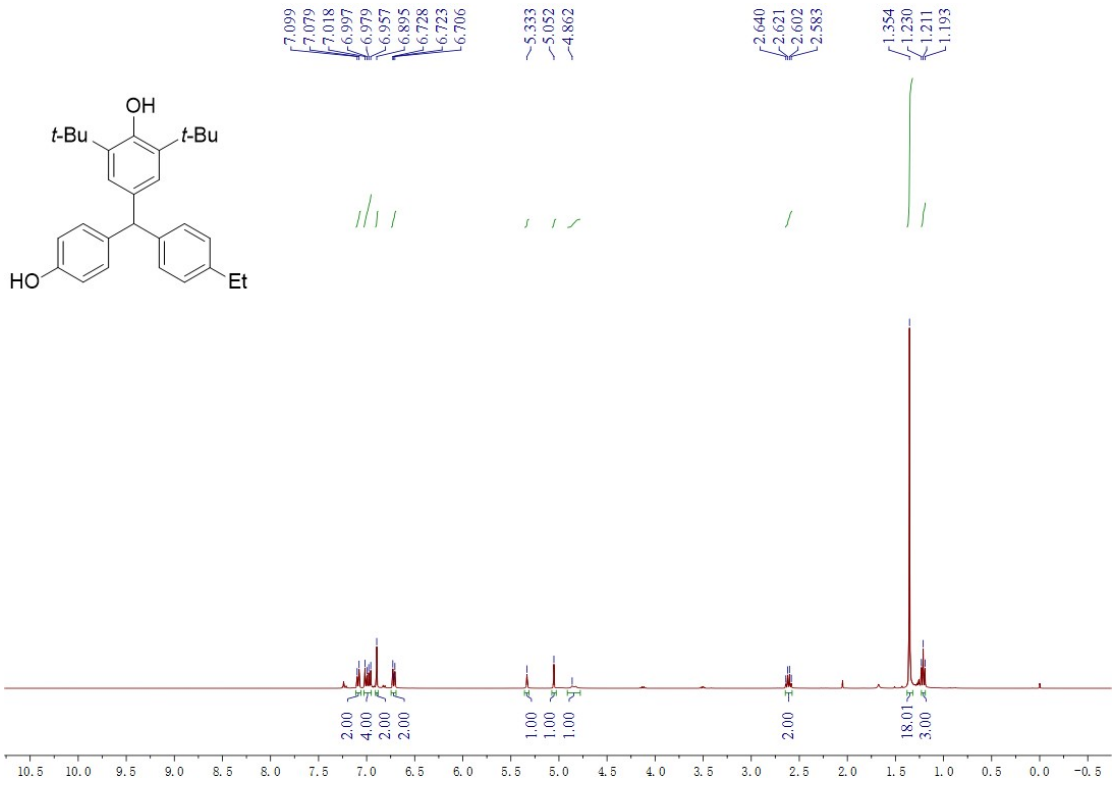


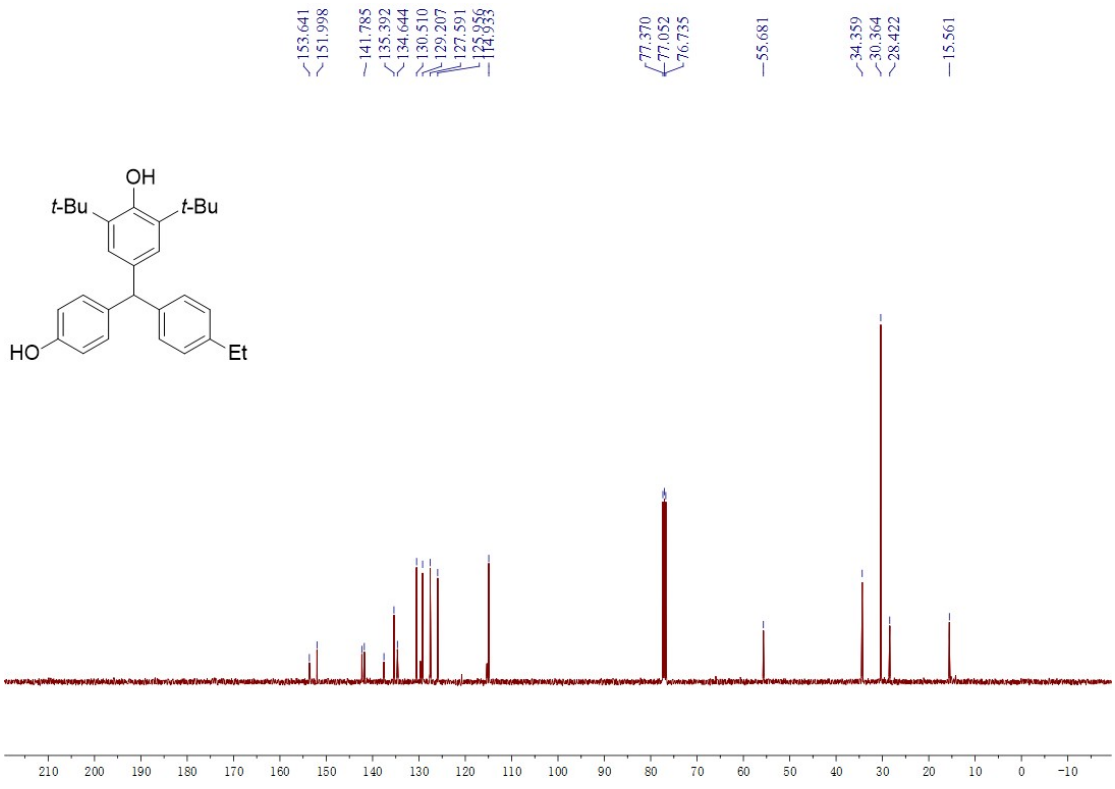
2,6-Di-tert-butyl-4-((4-hydroxyphenyl)(o-tolyl)methyl)phenol (7b)



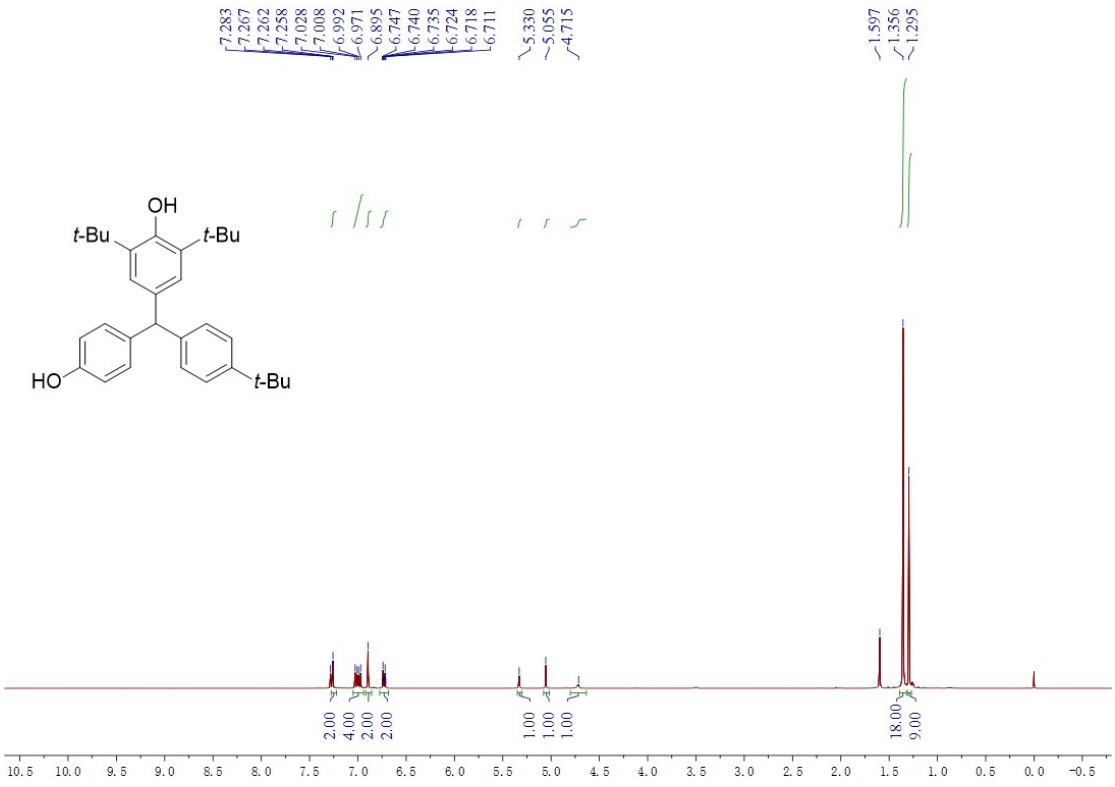


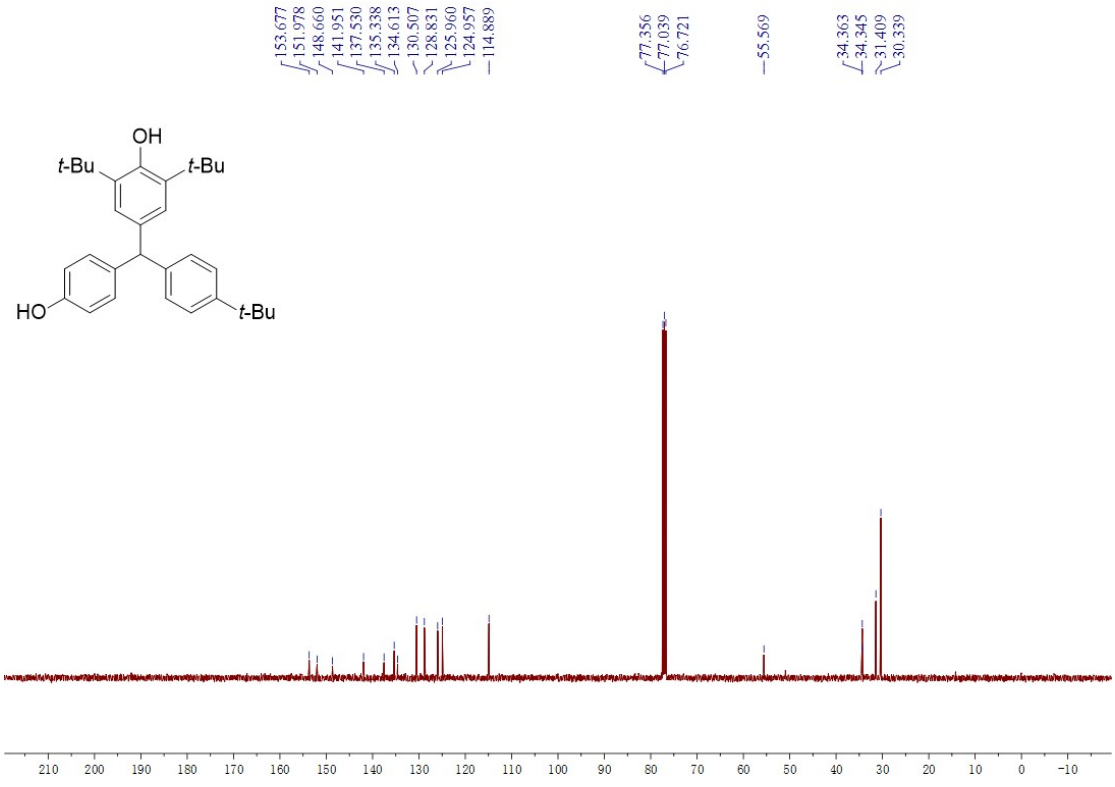
2,6-Di-tert-butyl-4-((4-ethylphenyl)(4-hydroxyphenyl)methyl)phenol (7c)



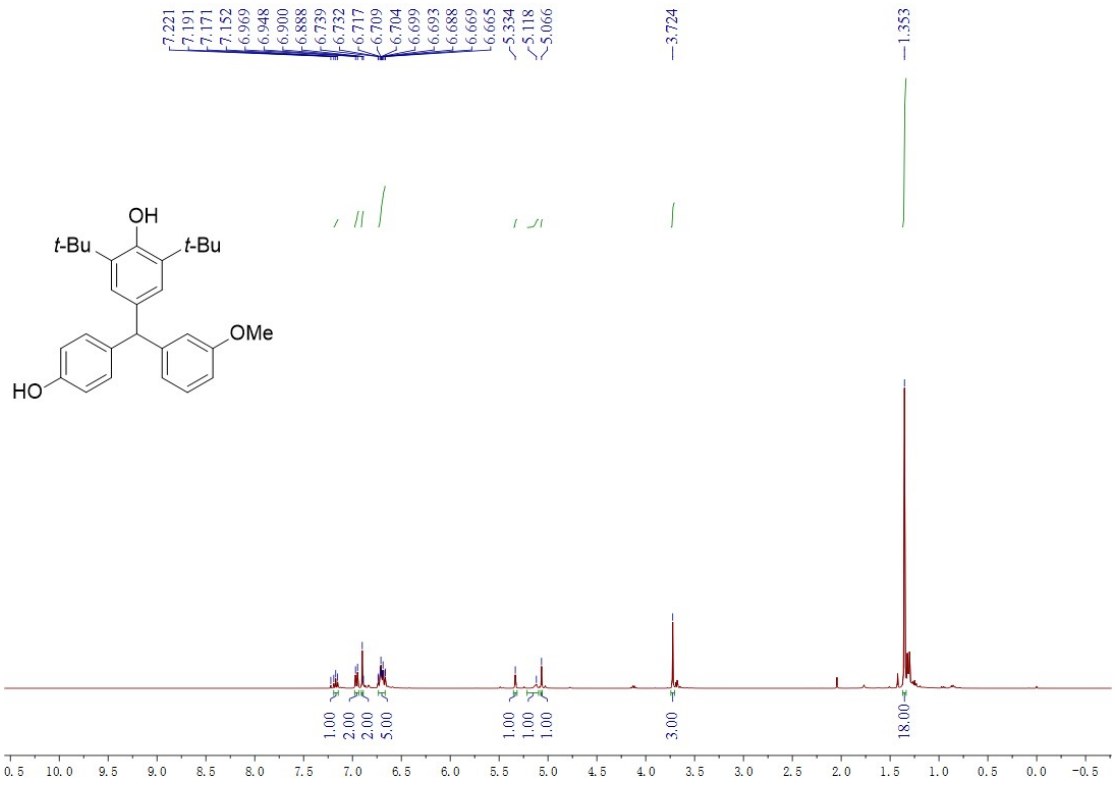


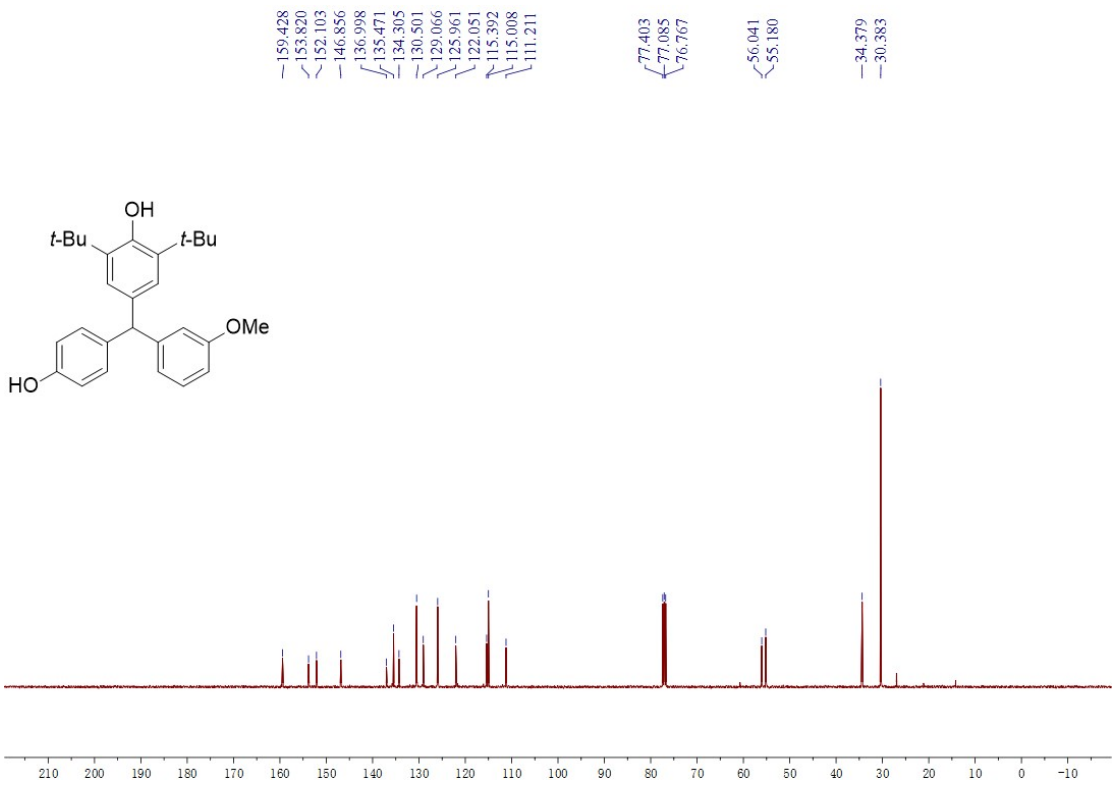
2,6-Di-tert-butyl-4-((4-(tert-butyl)phenyl)(4-hydroxyphenyl)methyl)phenol (7d)



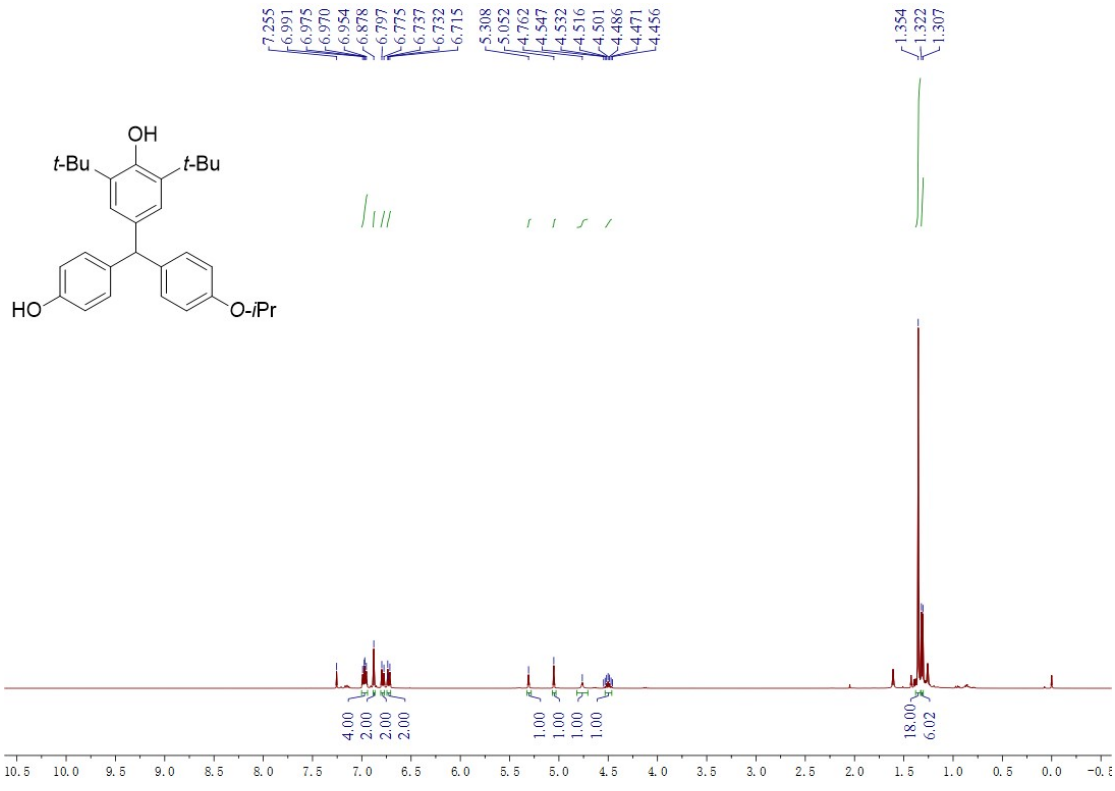


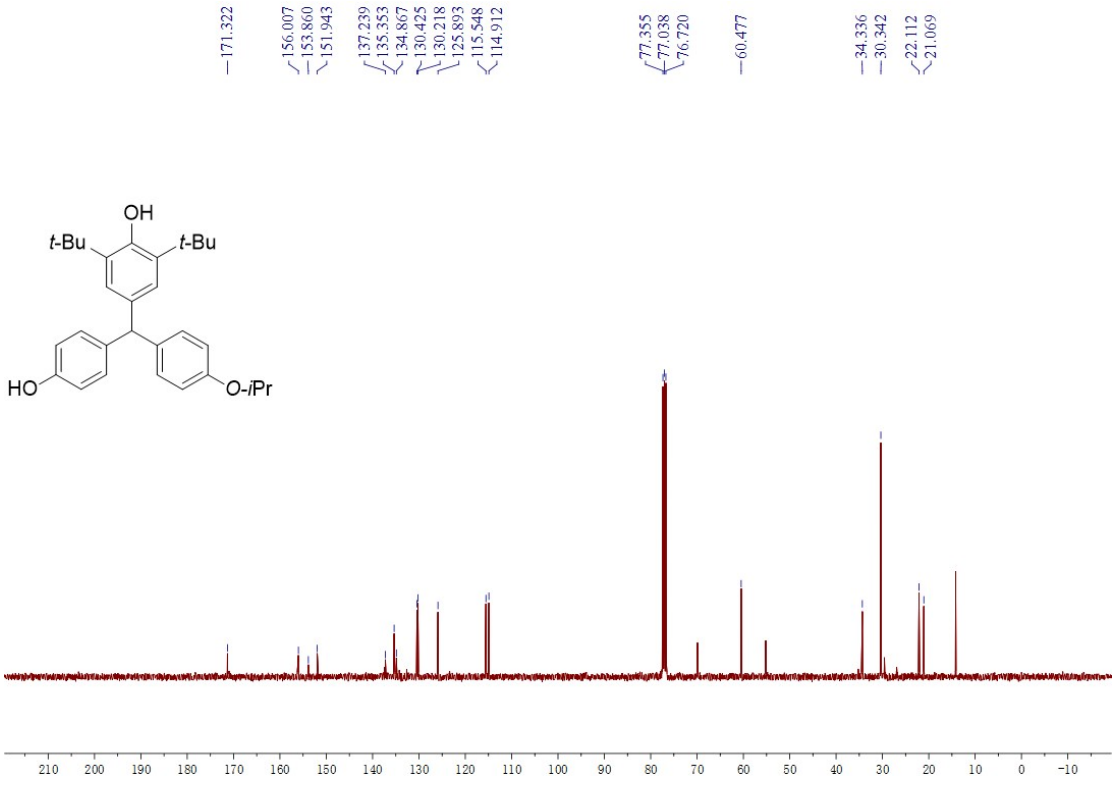
2,6-Di-tert-butyl-4-((4-hydroxyphenyl)(3-methoxyphenyl)methyl)phenol (7e)



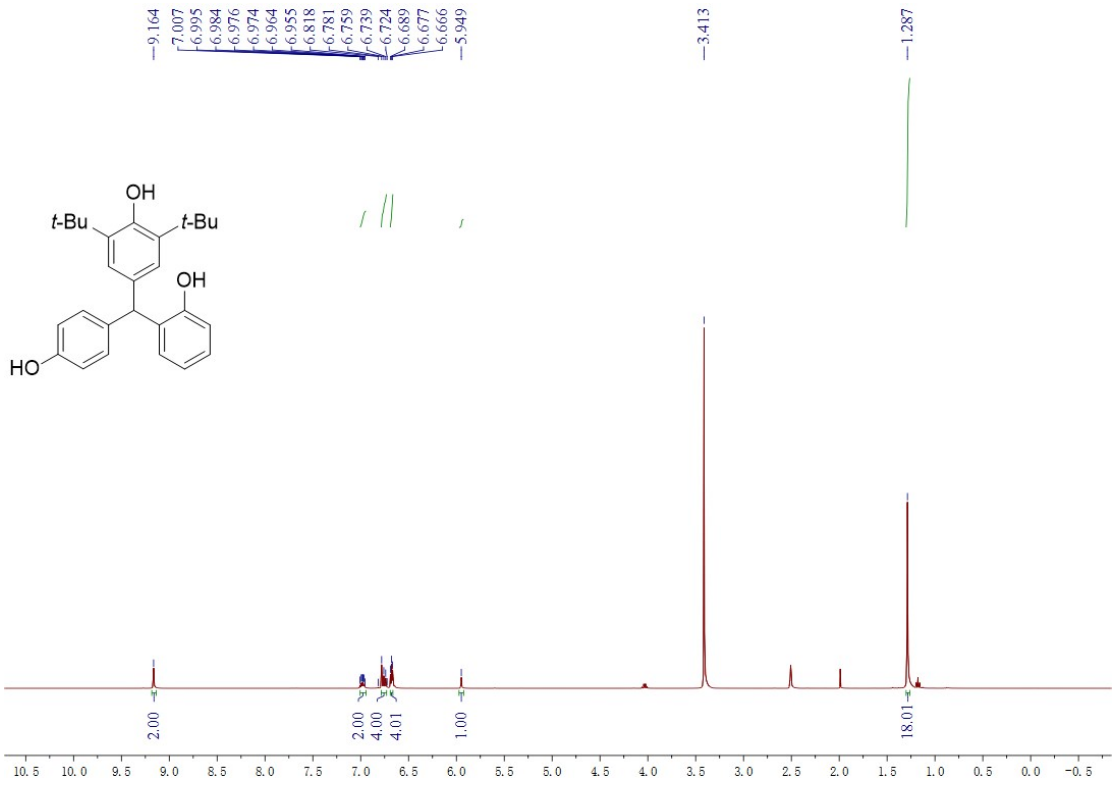


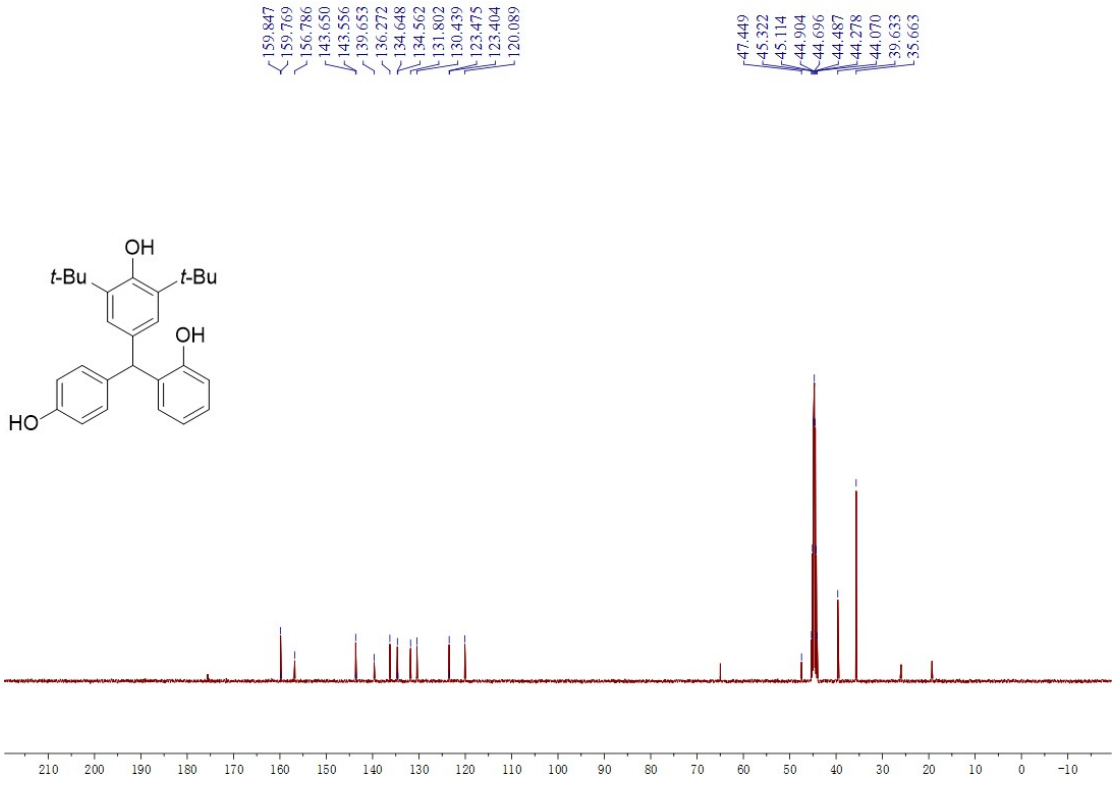
2,6-Di-tert-butyl-4-((4-hydroxyphenyl)(4-isopropoxyphenyl)methyl)phenol (7f)



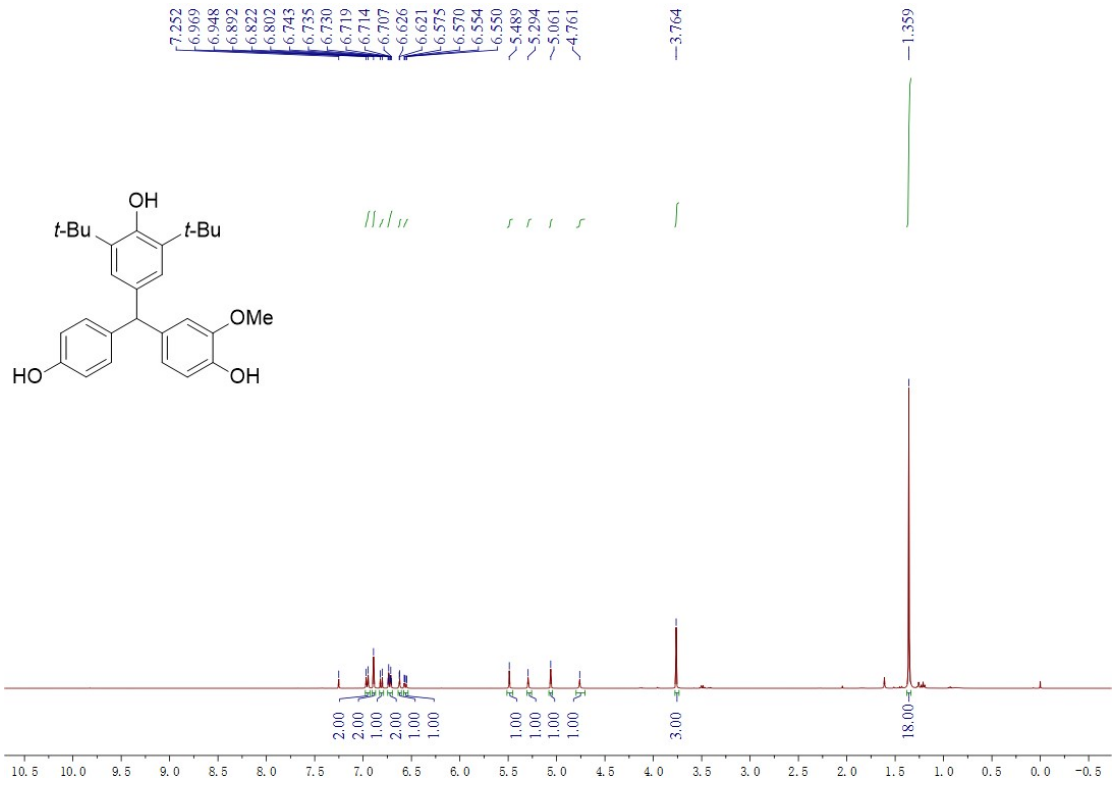


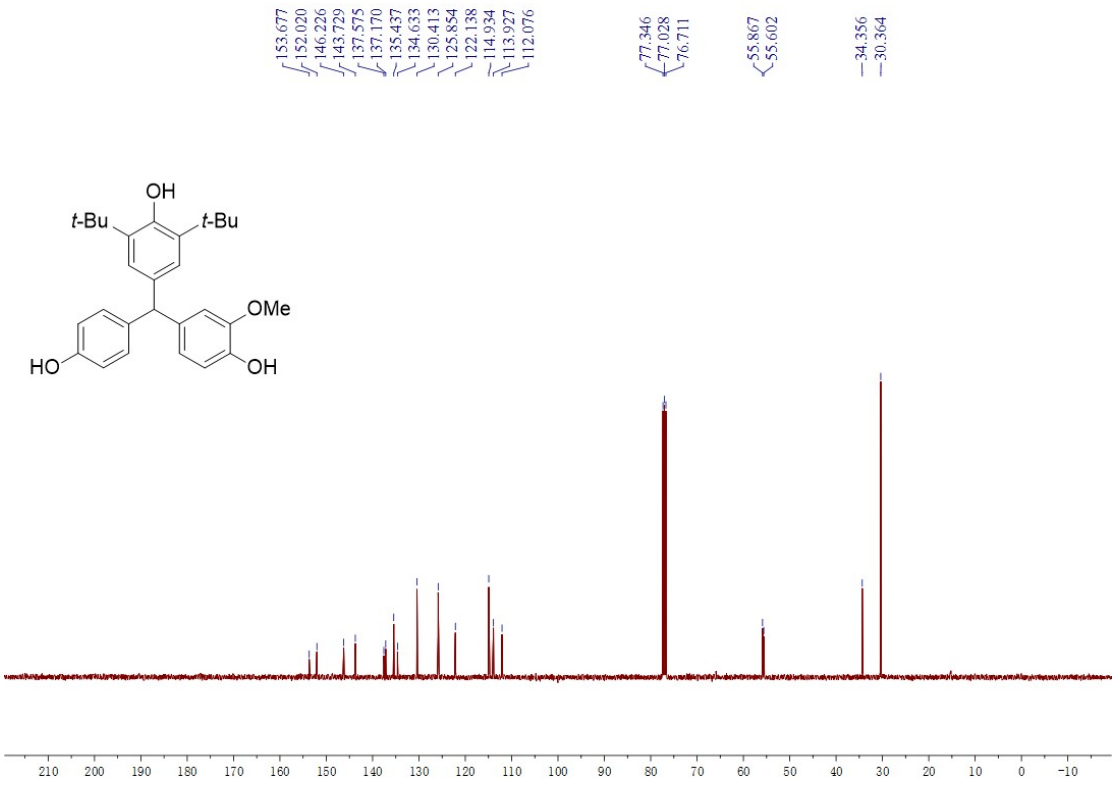
2,6-Di-tert-butyl-4-((2-hydroxyphenyl)(4-hydroxyphenyl)methyl)phenol (7h)



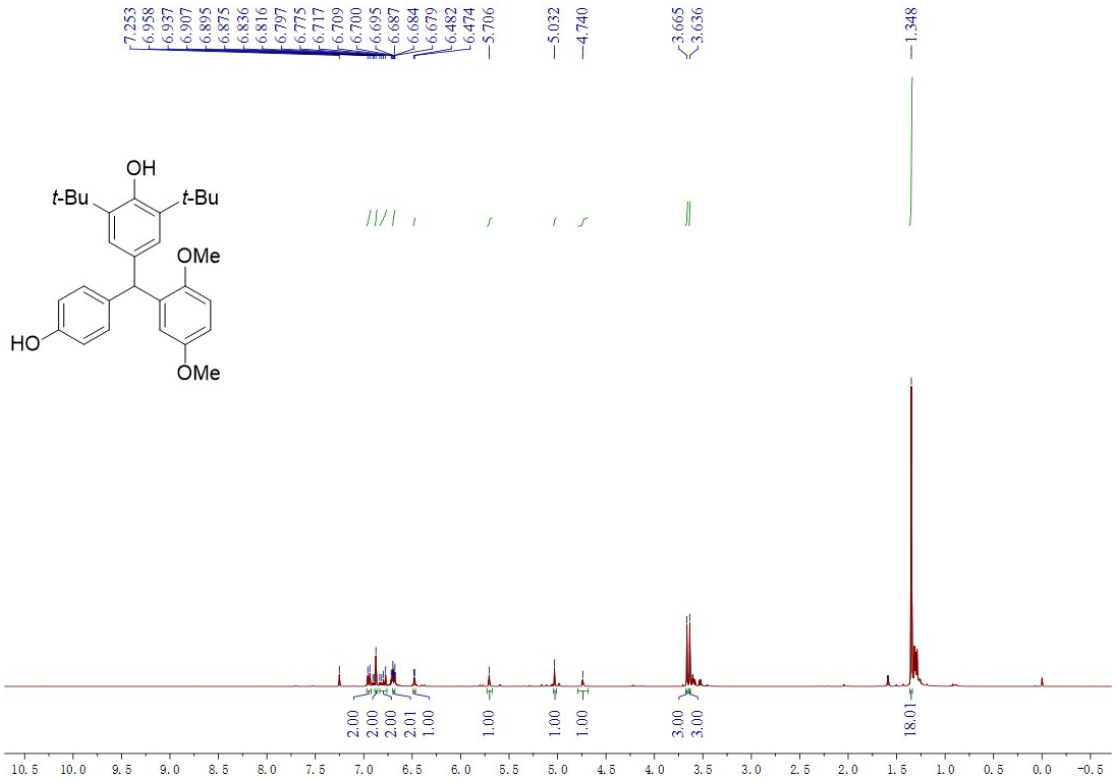


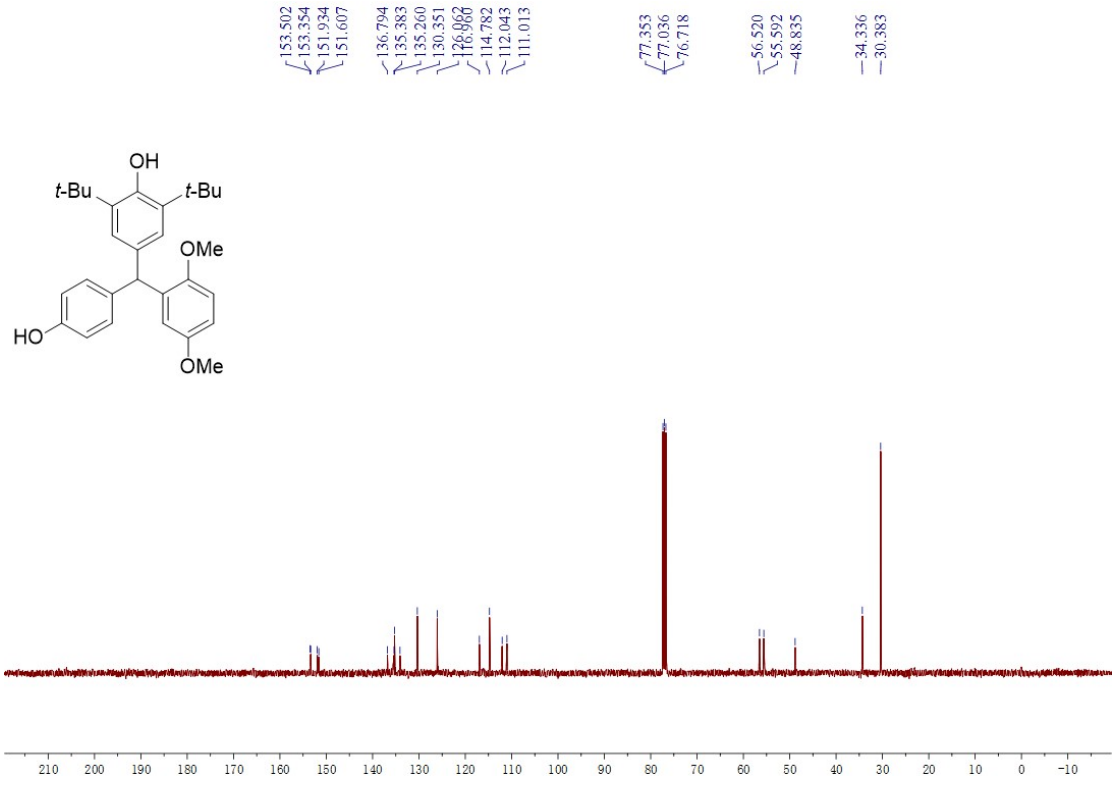
2,6-Di-tert-butyl-4-((4-hydroxy-3-methoxyphenyl)(4-hydroxyphenyl)methyl)phenol (7i)



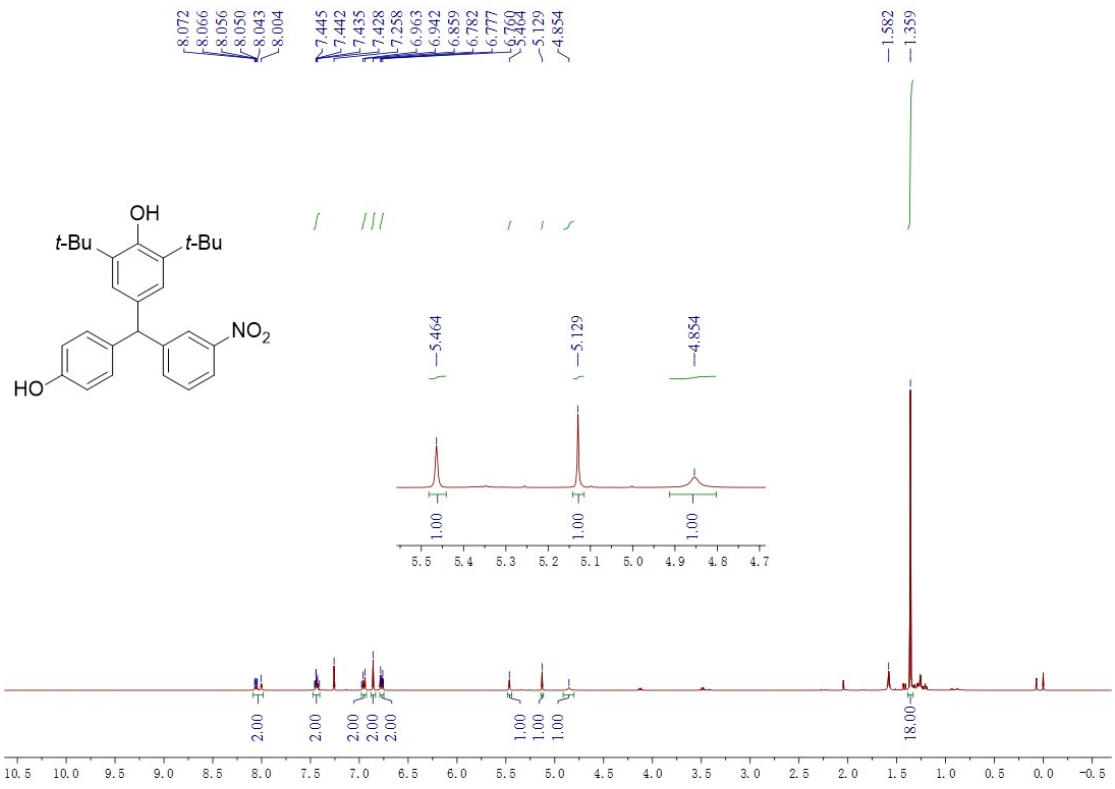


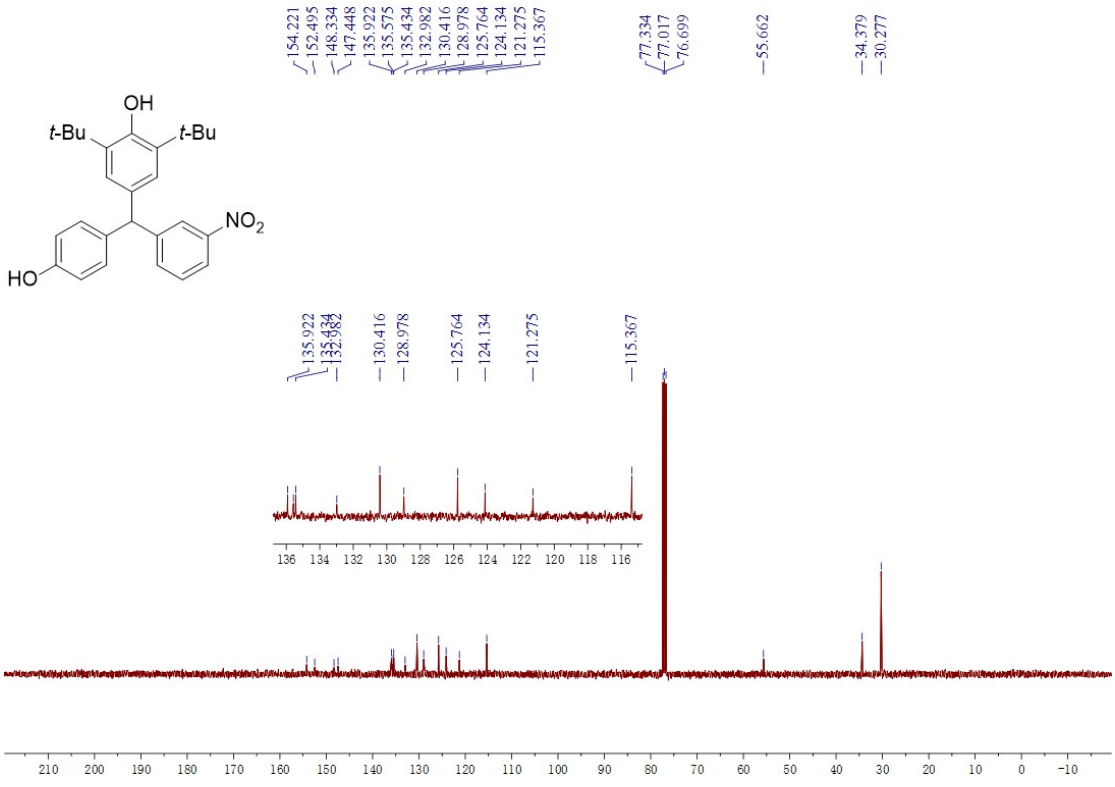
2,6-Di-tert-butyl-4-((2,5-dimethoxyphenyl)(4-hydroxyphenyl)methyl)phenol (7j)



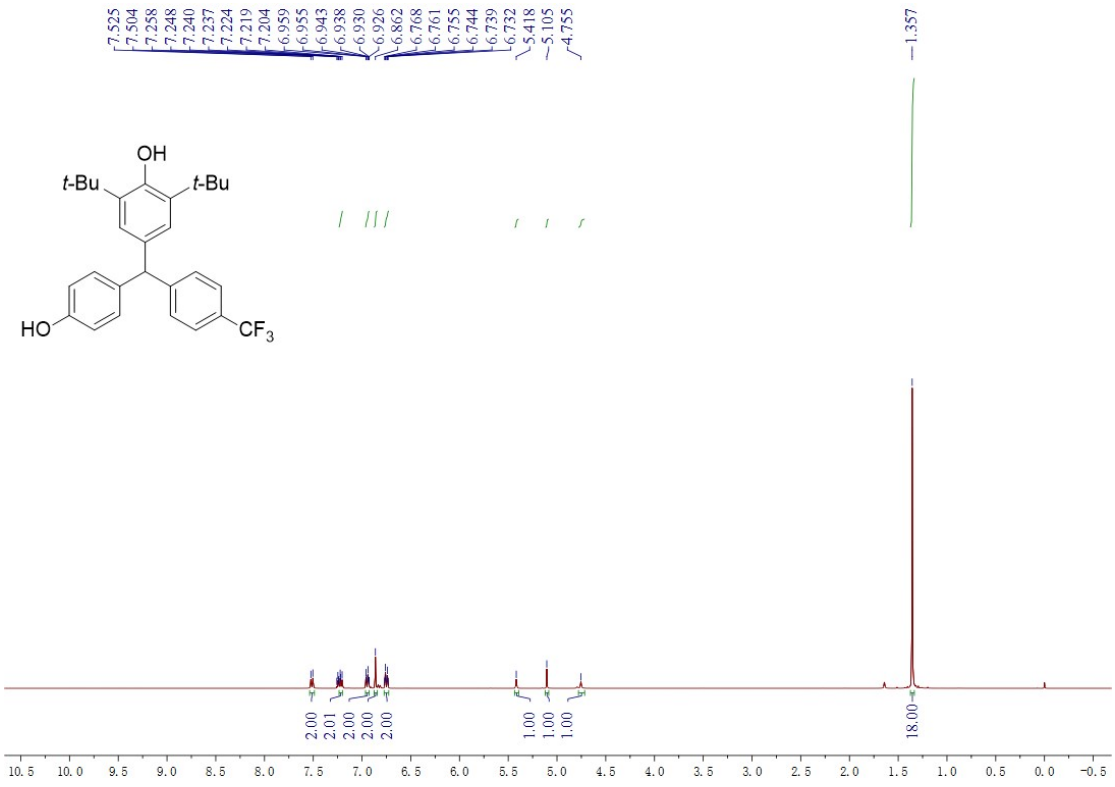


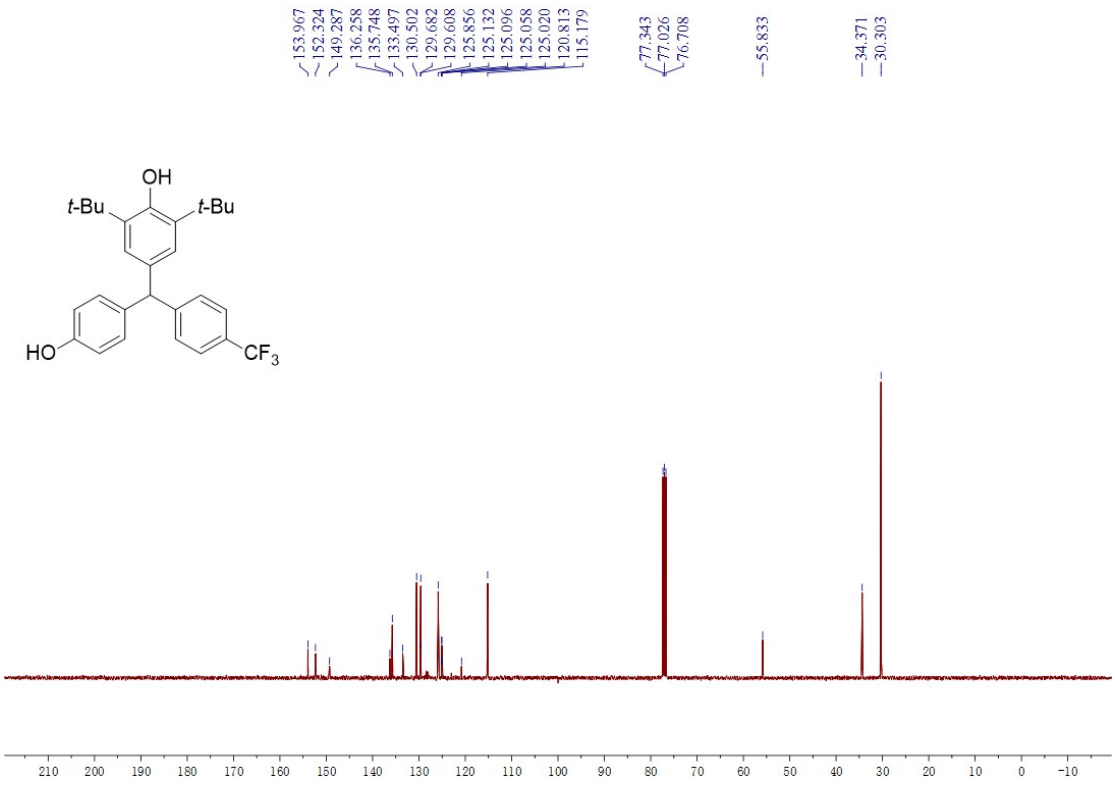
2,6-Di-tert-butyl-4-((4-hydroxyphenyl)(3-nitrophenyl)methyl)phenol (7k)

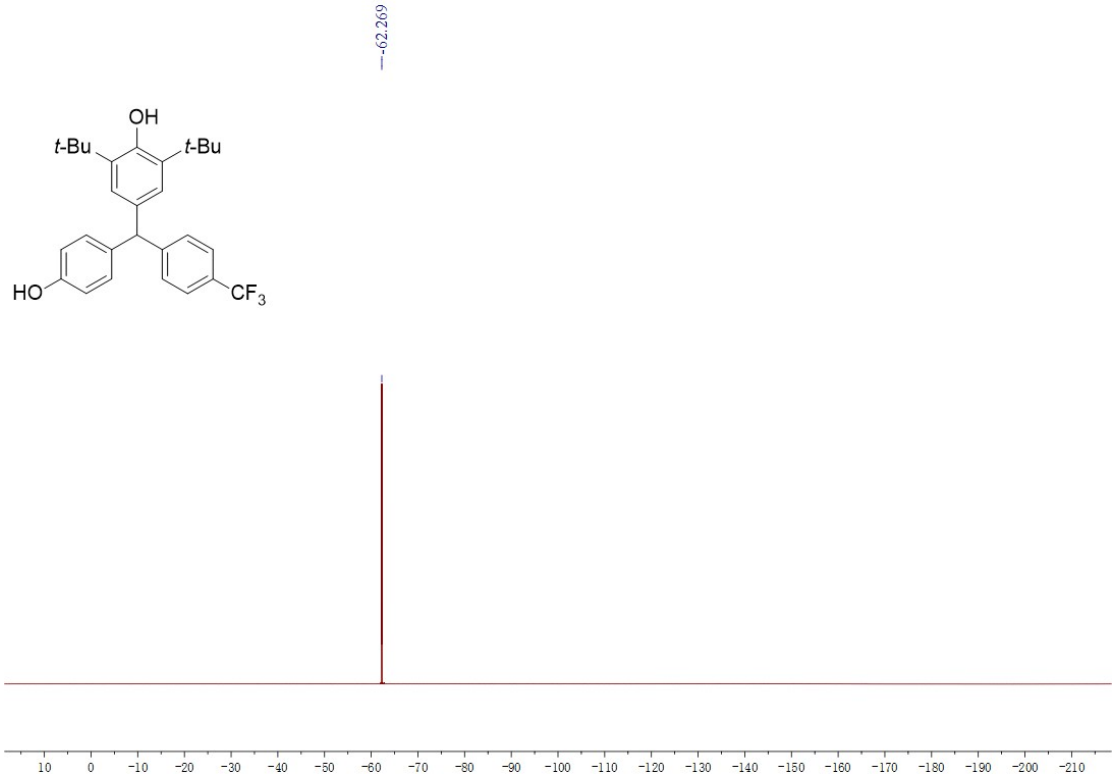




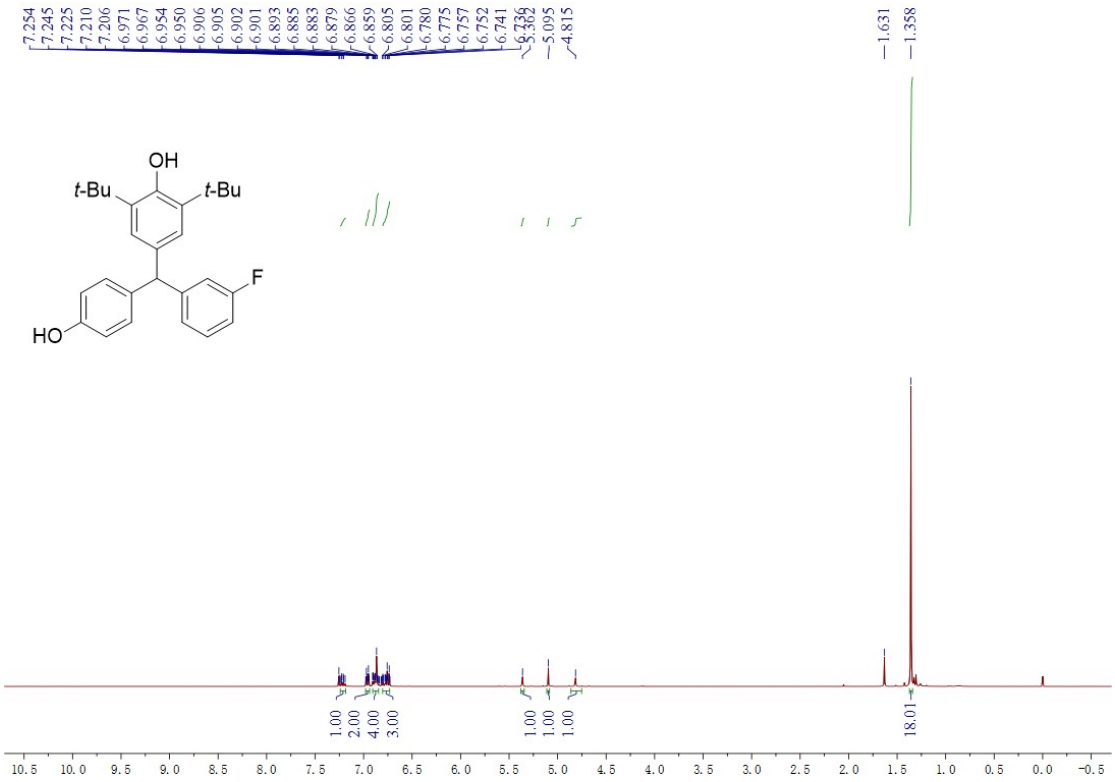
2,6-Di-tert-butyl-4-((4-hydroxyphenyl)(4-(trifluoromethyl)phenyl)methyl)phenol (7l)







2,6-Di-tert-butyl-4-((3-fluorophenyl)(4-hydroxyphenyl)methyl)phenol (7m)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6.905
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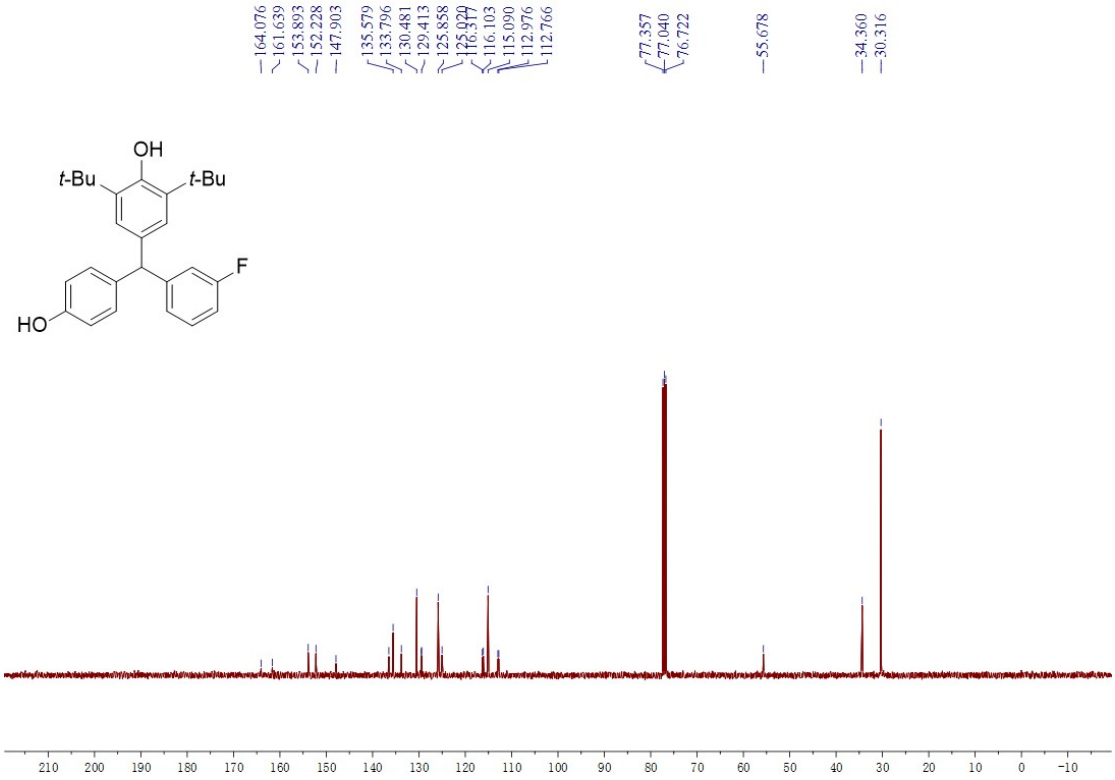
6.893
6.885
6.883
6.879
6.866
6.859
6.805
6.801
6.780
6.775
6.757
6.752
6.741
5.095
4.815
1.631
1.358
OH
t-Bu
t-Bu
F
HO
1.00
2.00
4.00
3.00
1.00
1.00
1.00
18.01
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5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115.090
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112.766
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77.040
76.722
55.678
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F
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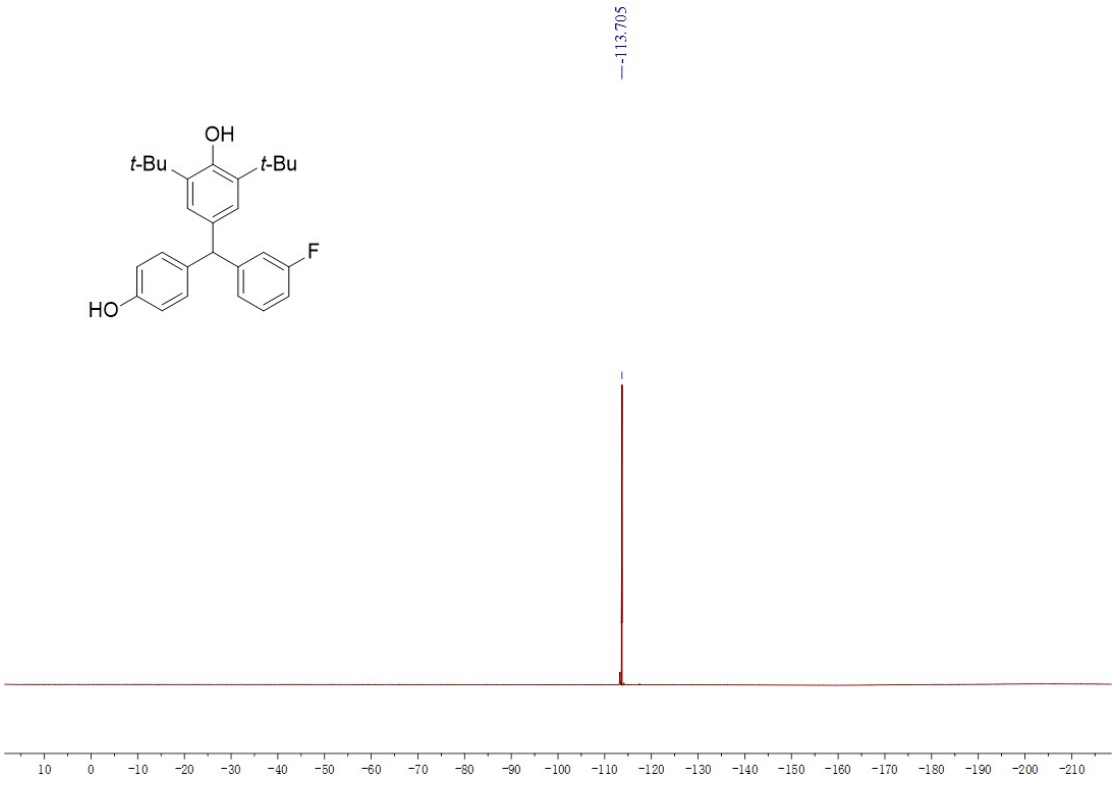
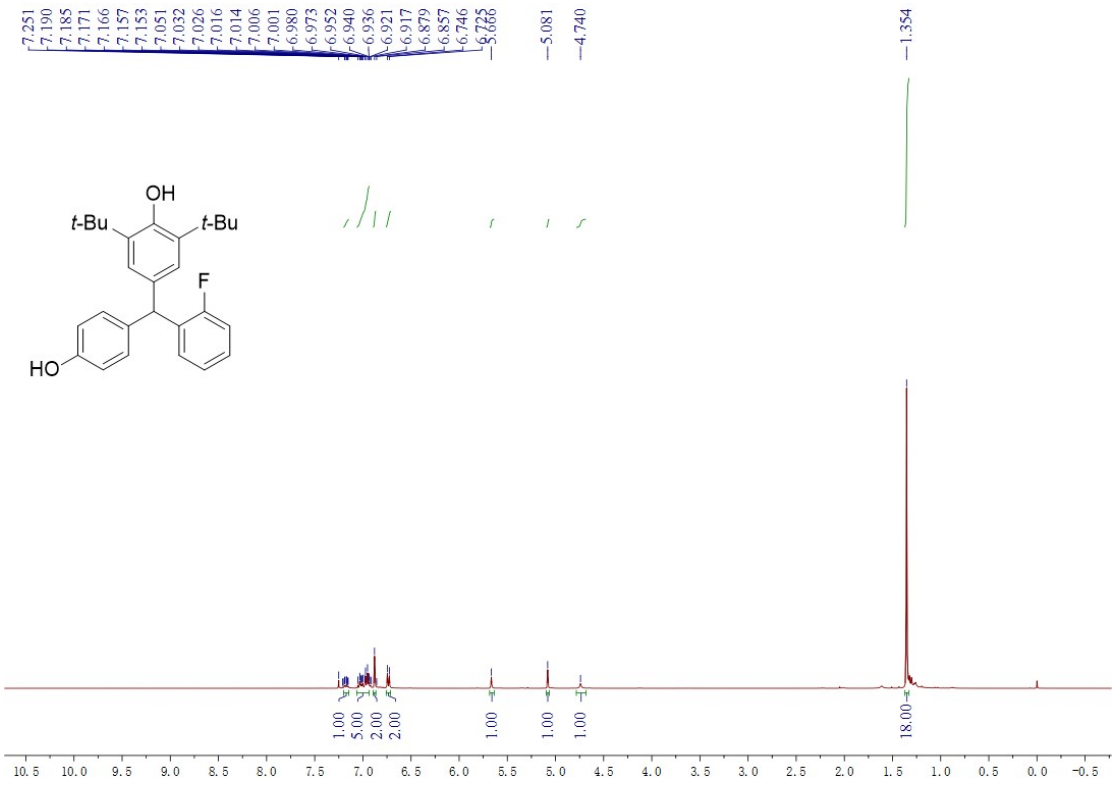
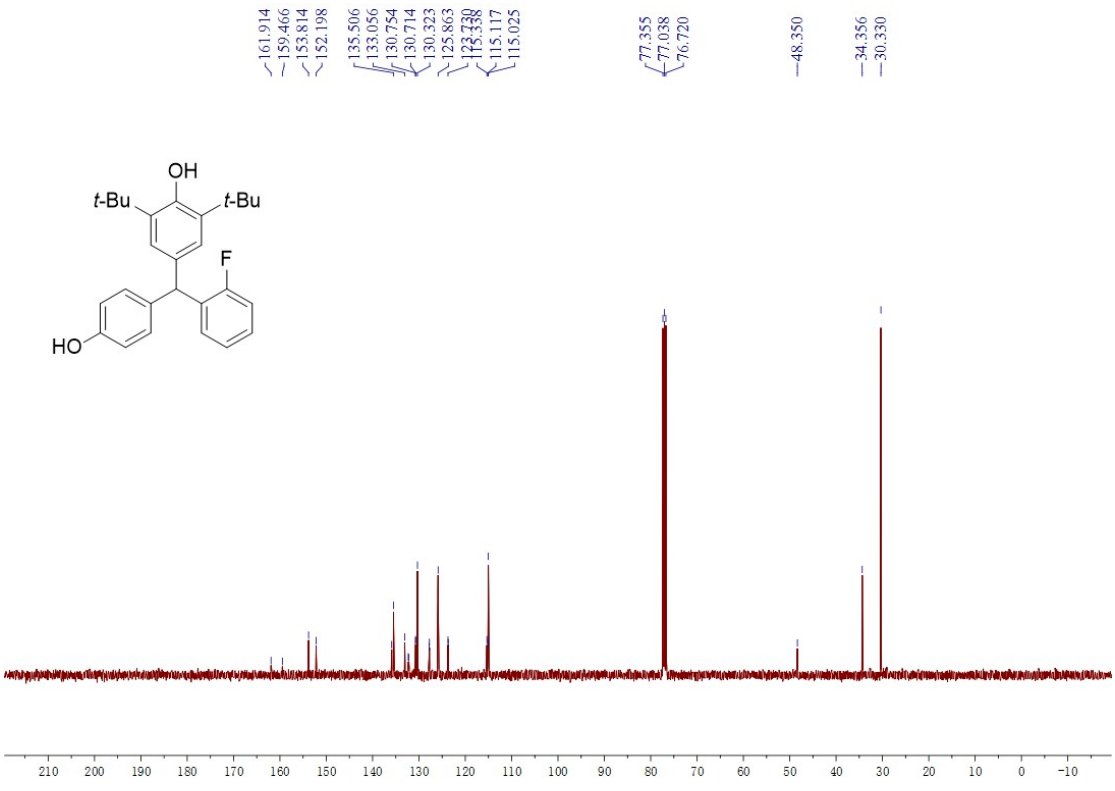


2,6-Di-tert-butyl-4-((2-fluorophenyl)(4-hydroxyphenyl)methyl)phenol (7n)

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76.720
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F
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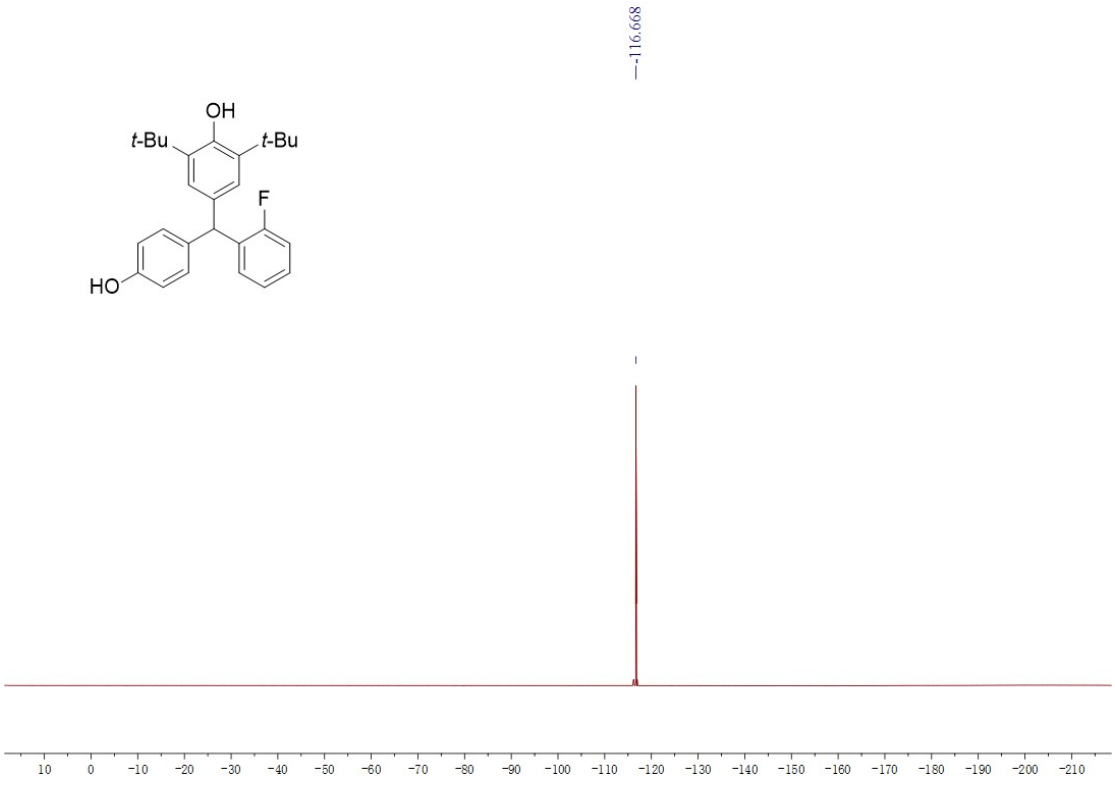
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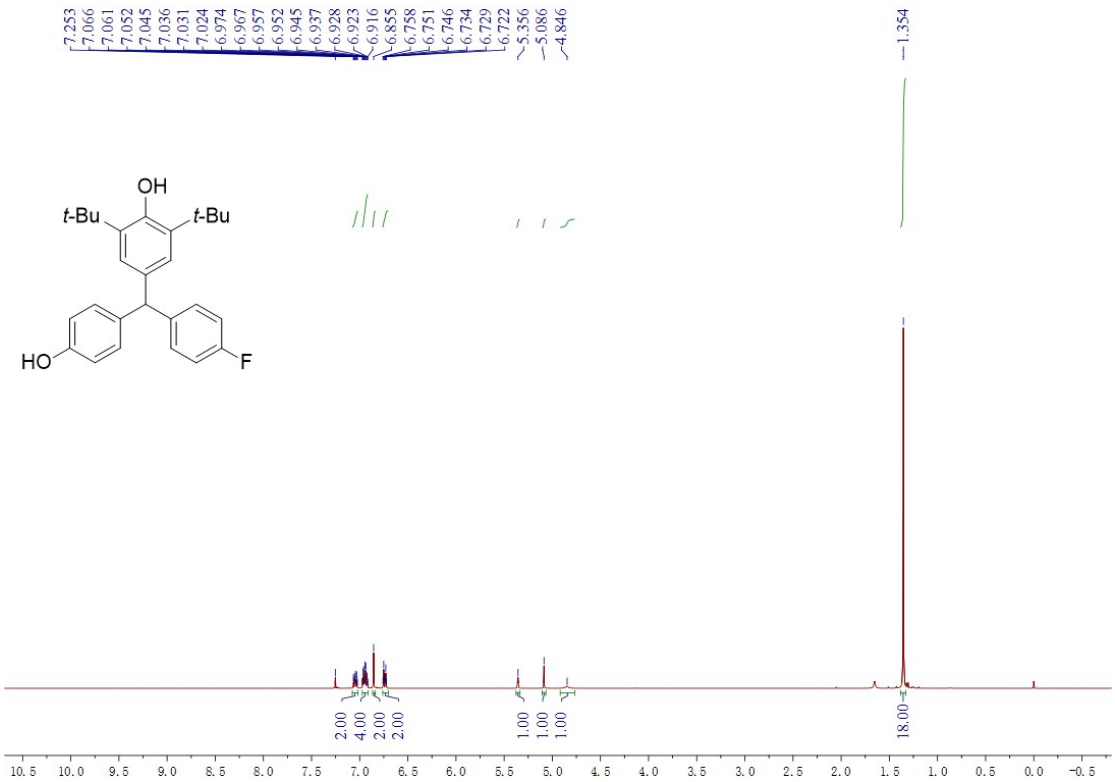
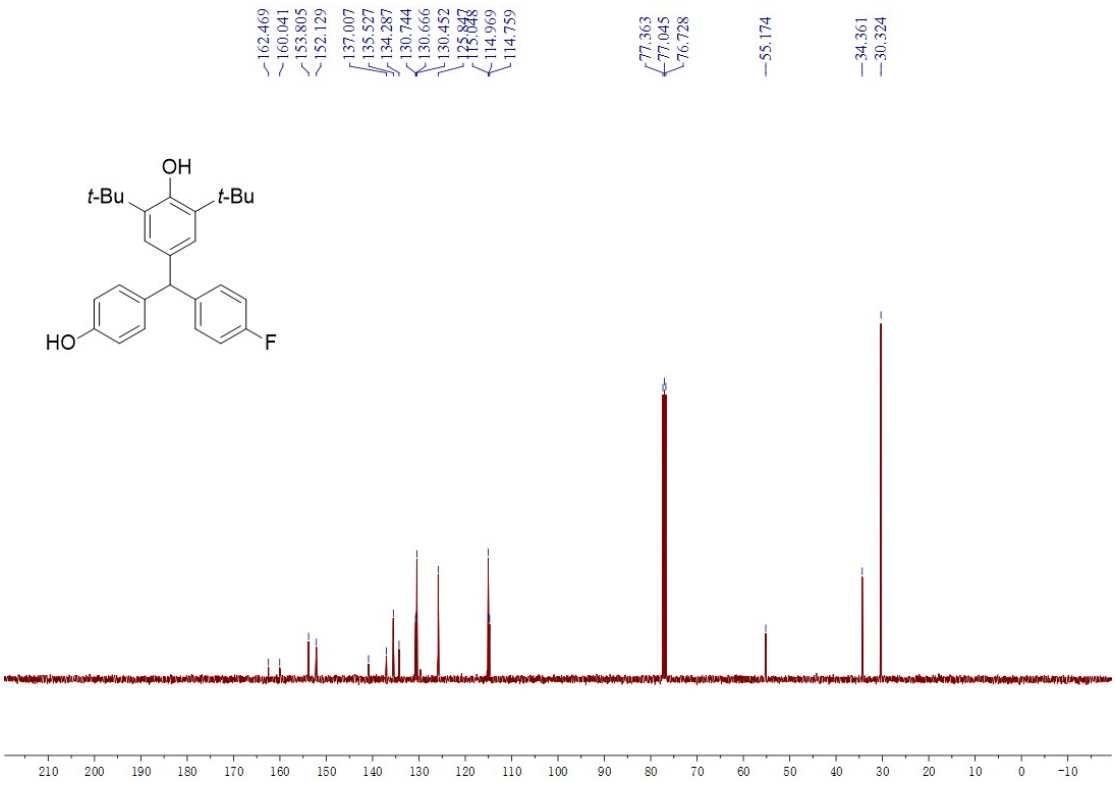
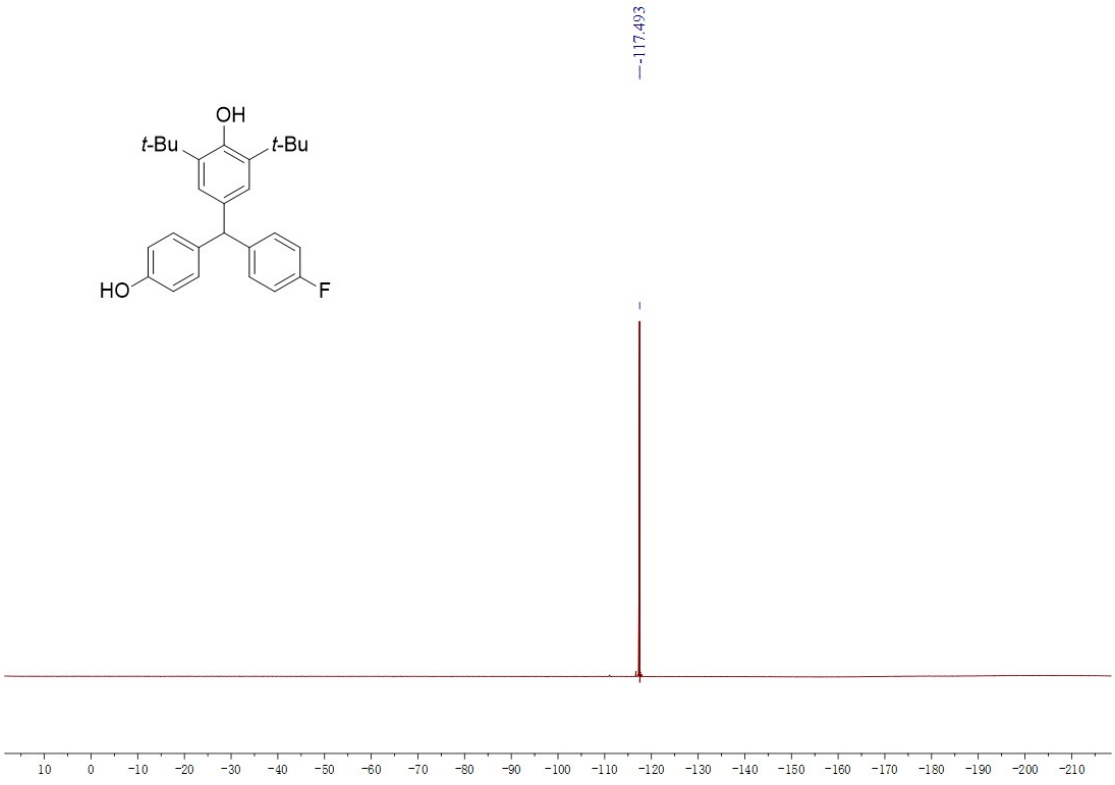
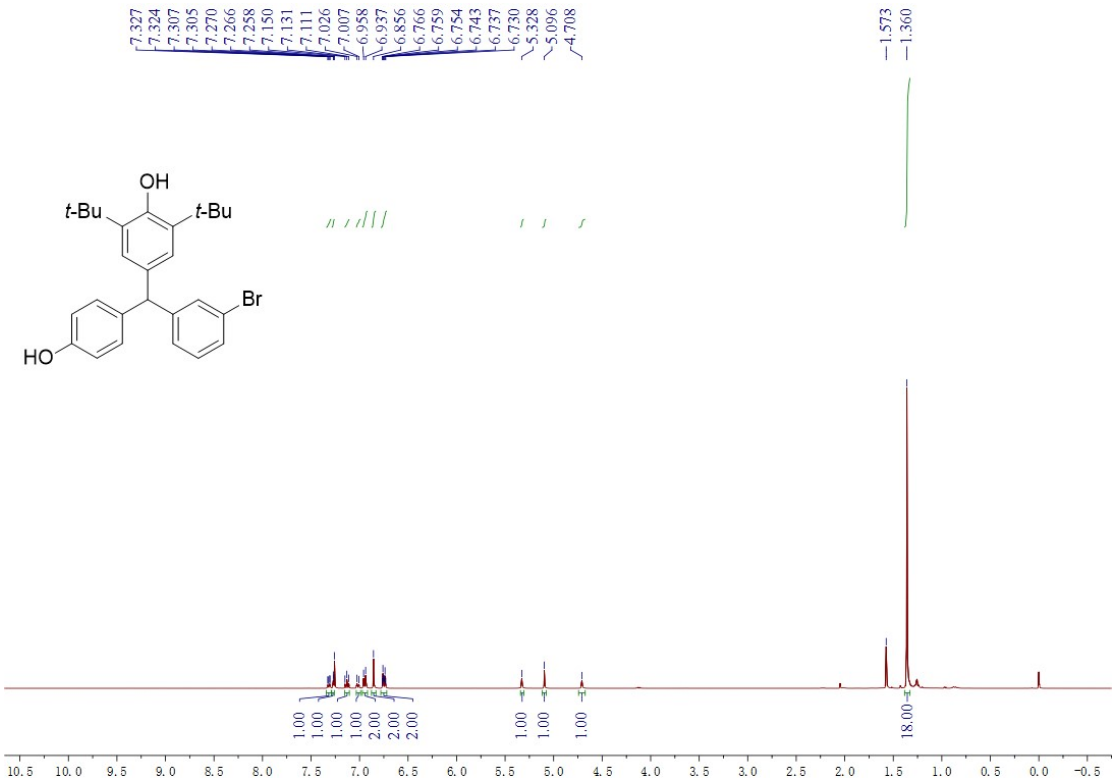
2,6-Di-tert-butyl-4-((4-fluorophenyl)(4-hydroxyphenyl)methyl)phenol (7o)

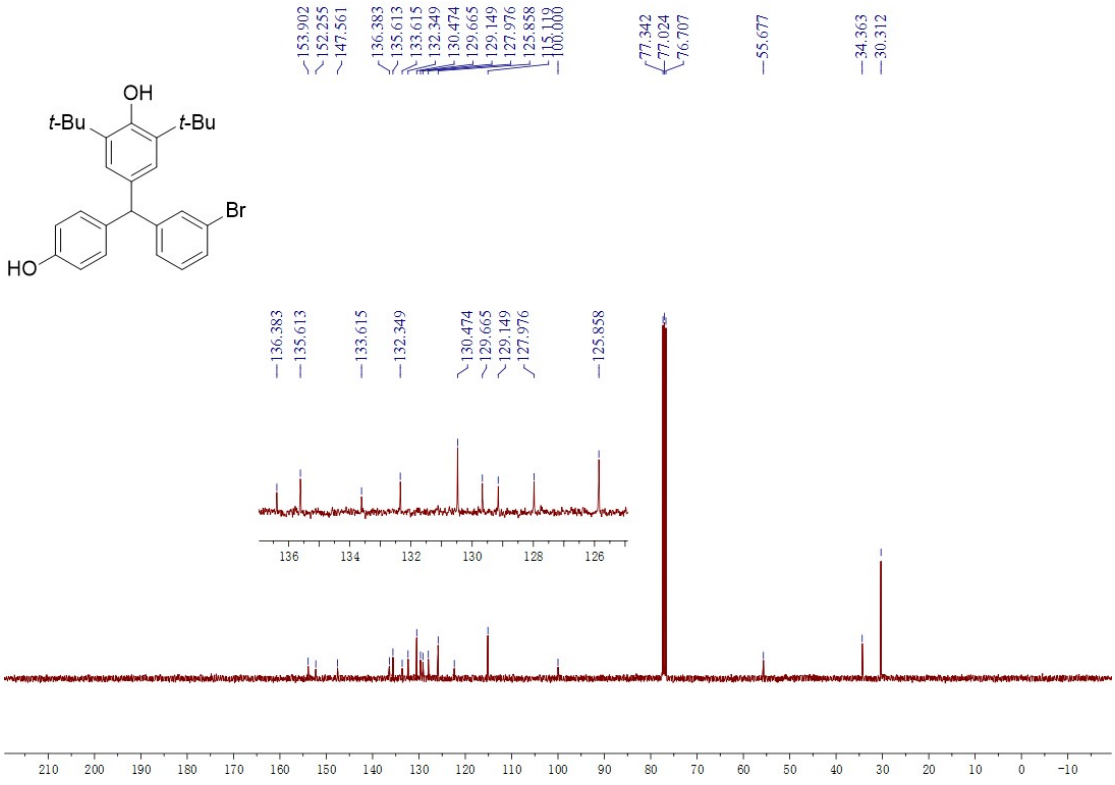




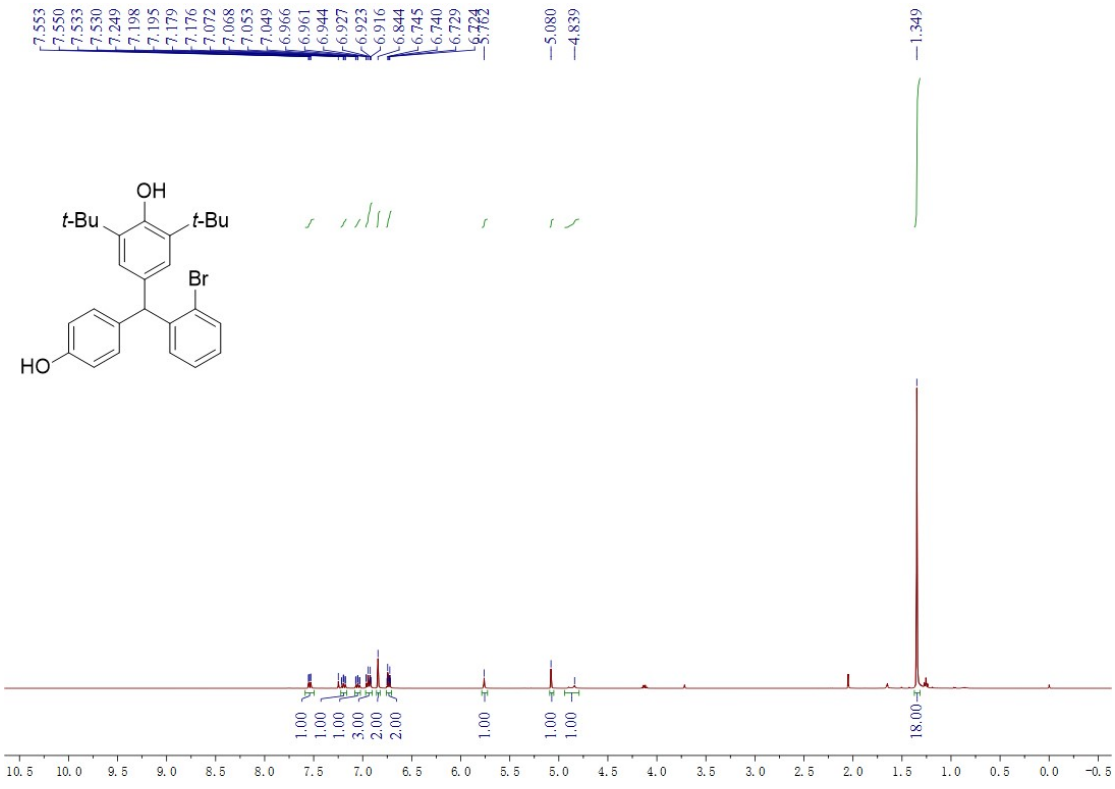


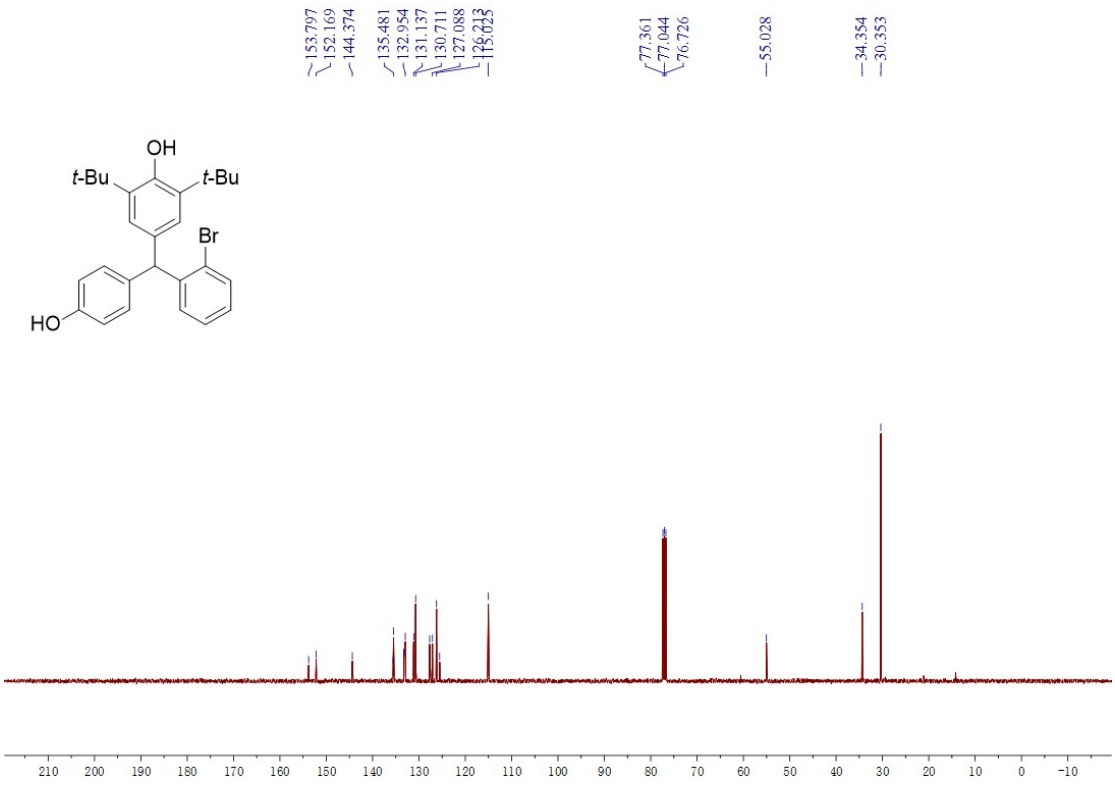
4-((3-Bromophenyl)(4-hydroxyphenyl)methyl)-2,6-di-tert-butylphenol (7p)



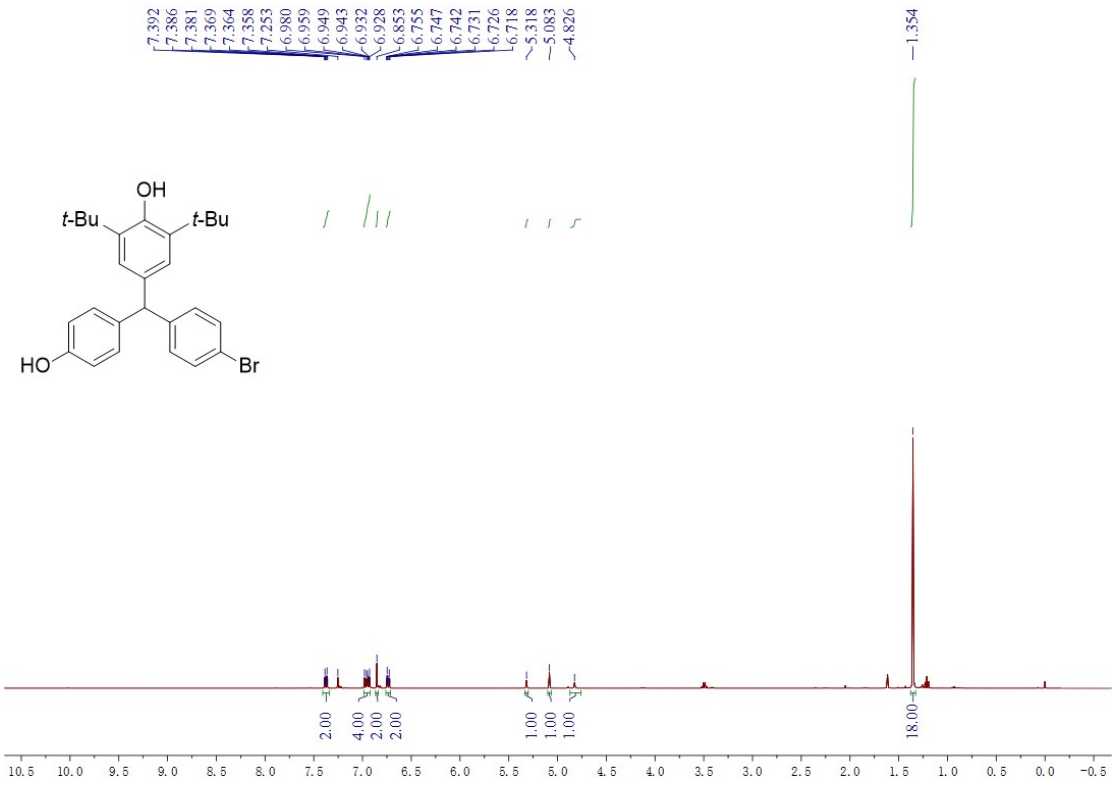


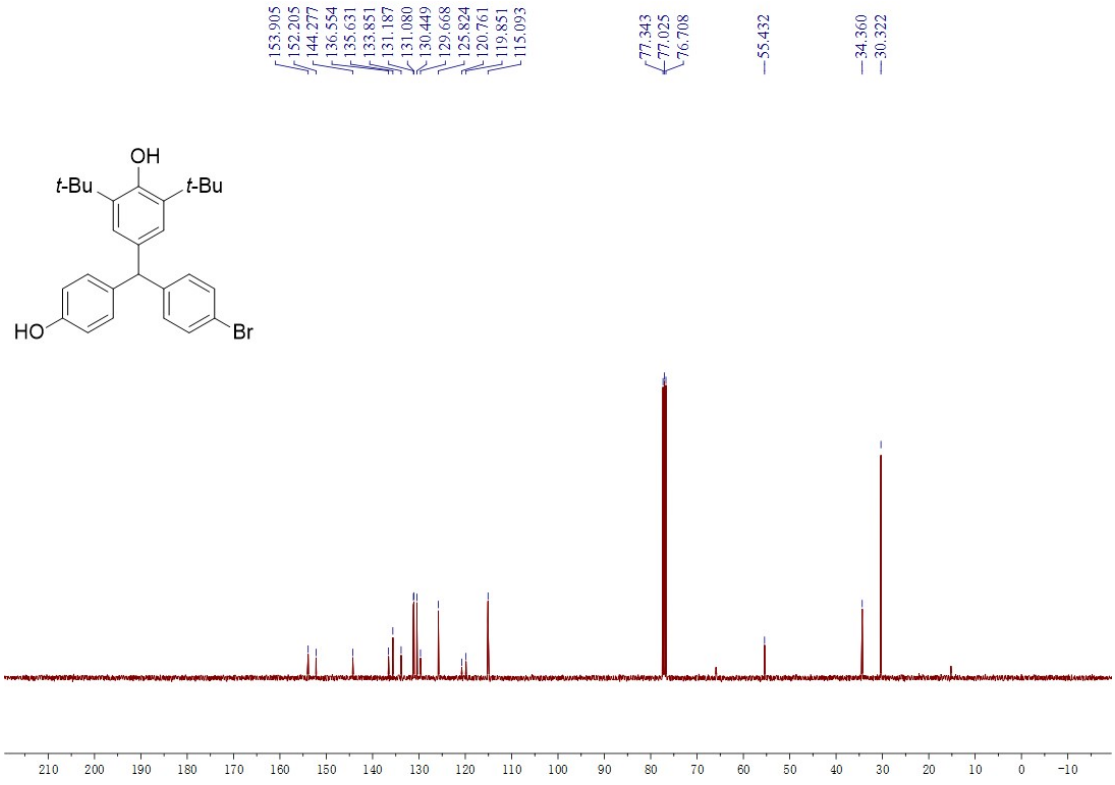
4-((2-Bromophenyl)(4-hydroxyphenyl)methyl)-2,6-di-tert-butylphenol (7q)



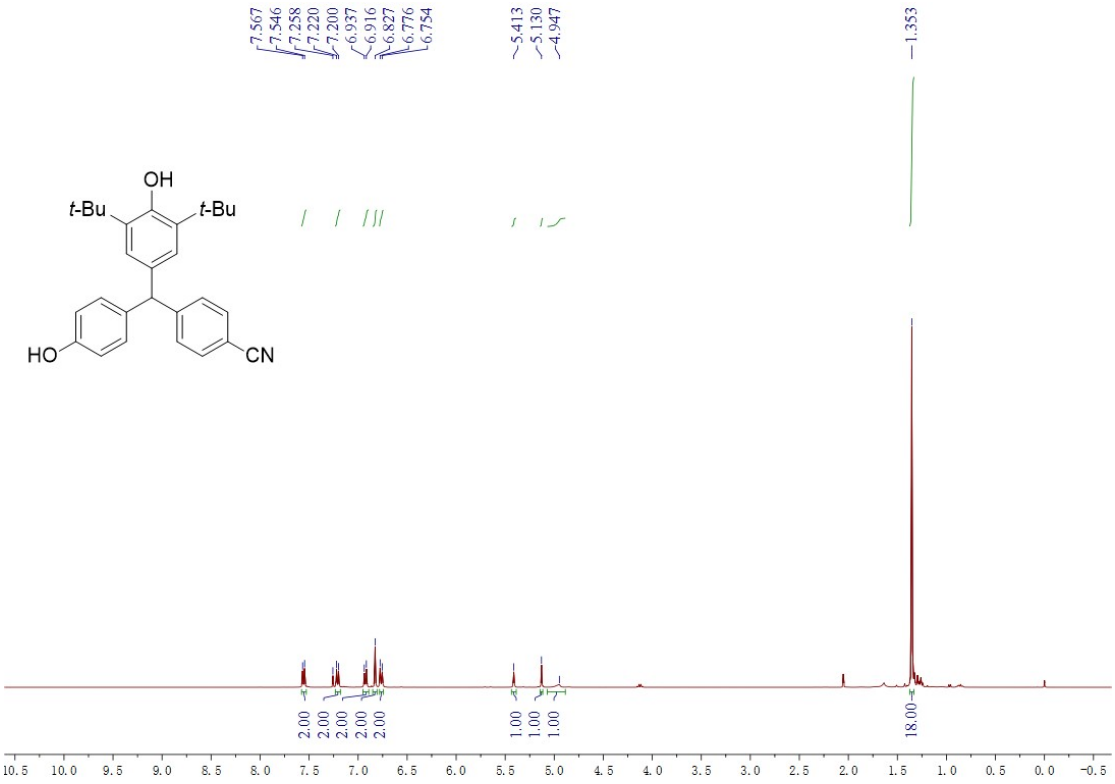


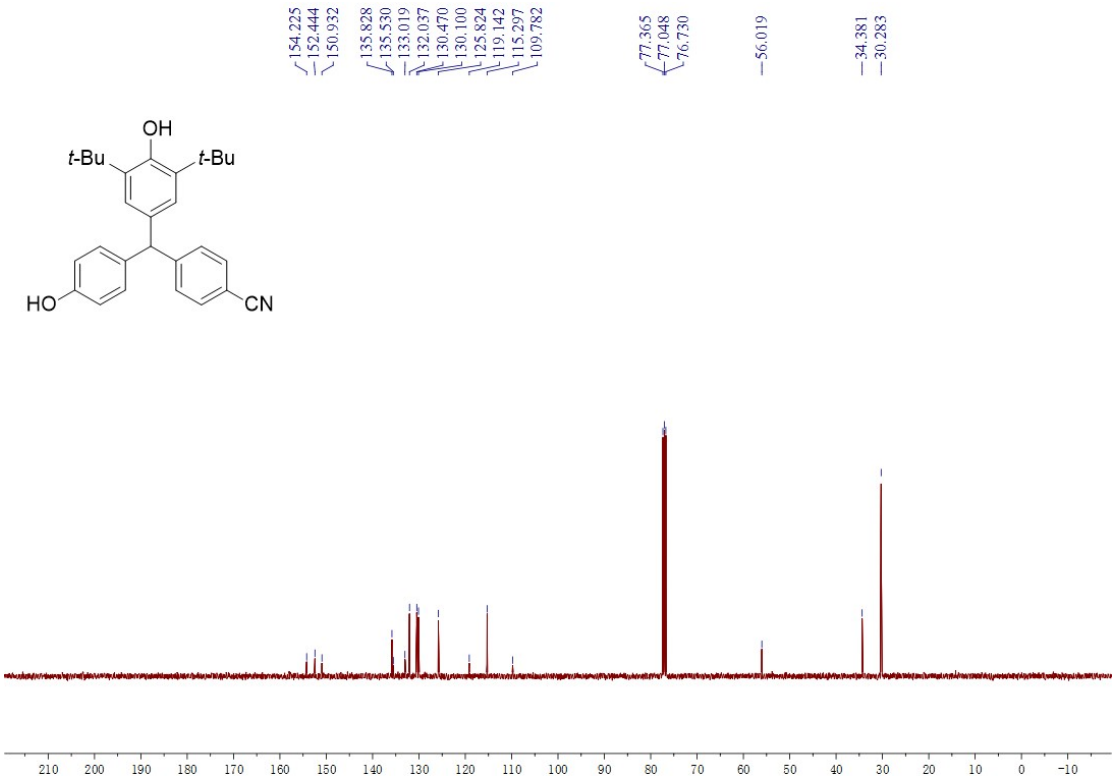
4-((4-Bromophenyl)(4-hydroxyphenyl)methyl)-2,6-di-tert-butylphenol (7r)



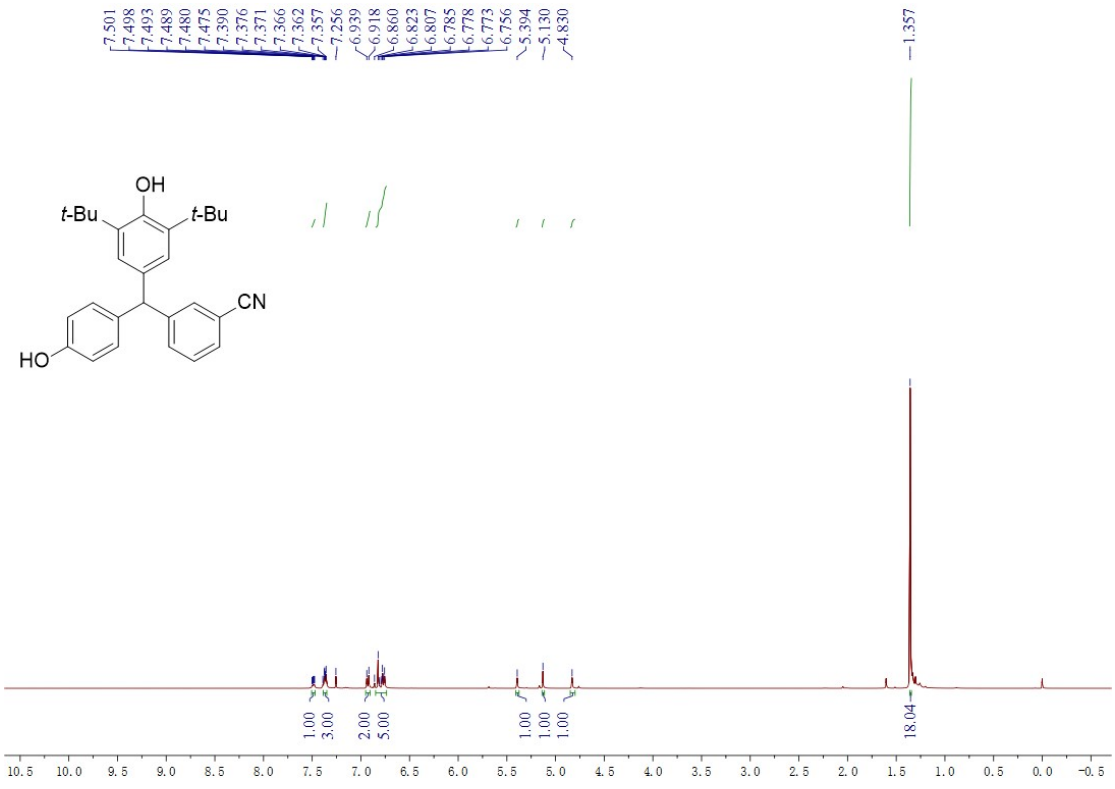


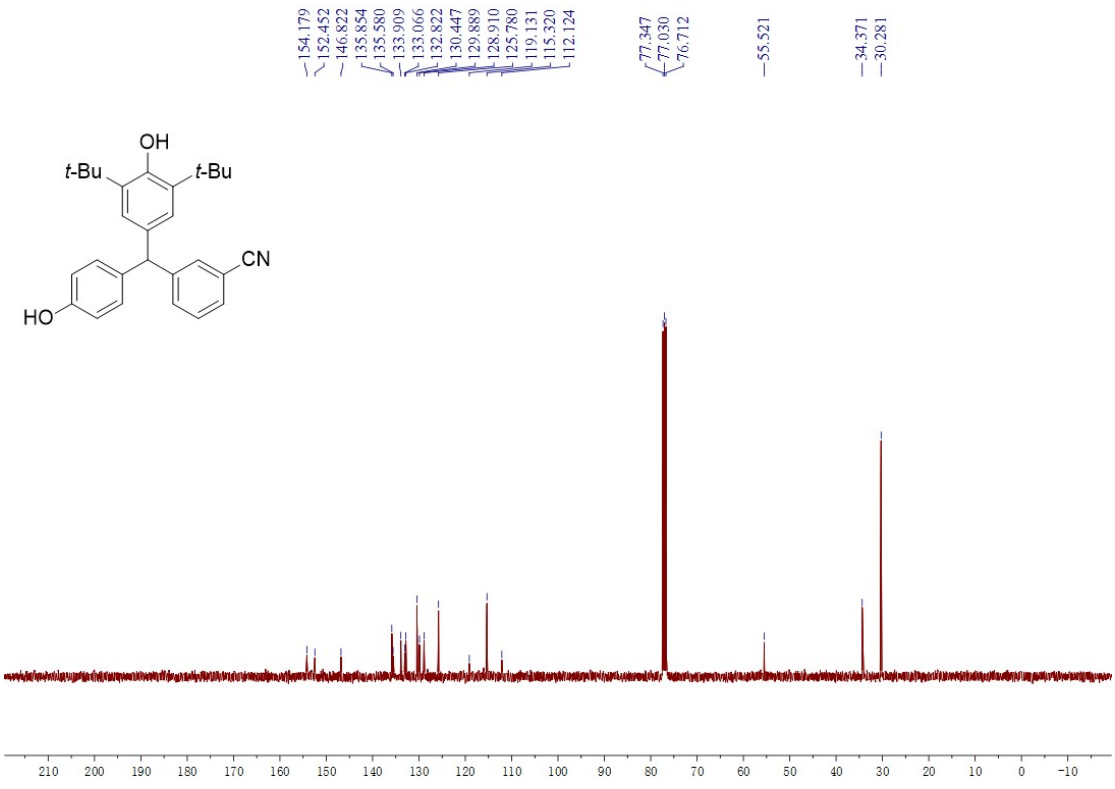
4-((3,5-Di-tert-butyl-4-hydroxyphenyl)(4-hydroxyphenyl)methyl)benzonitrile (7s)



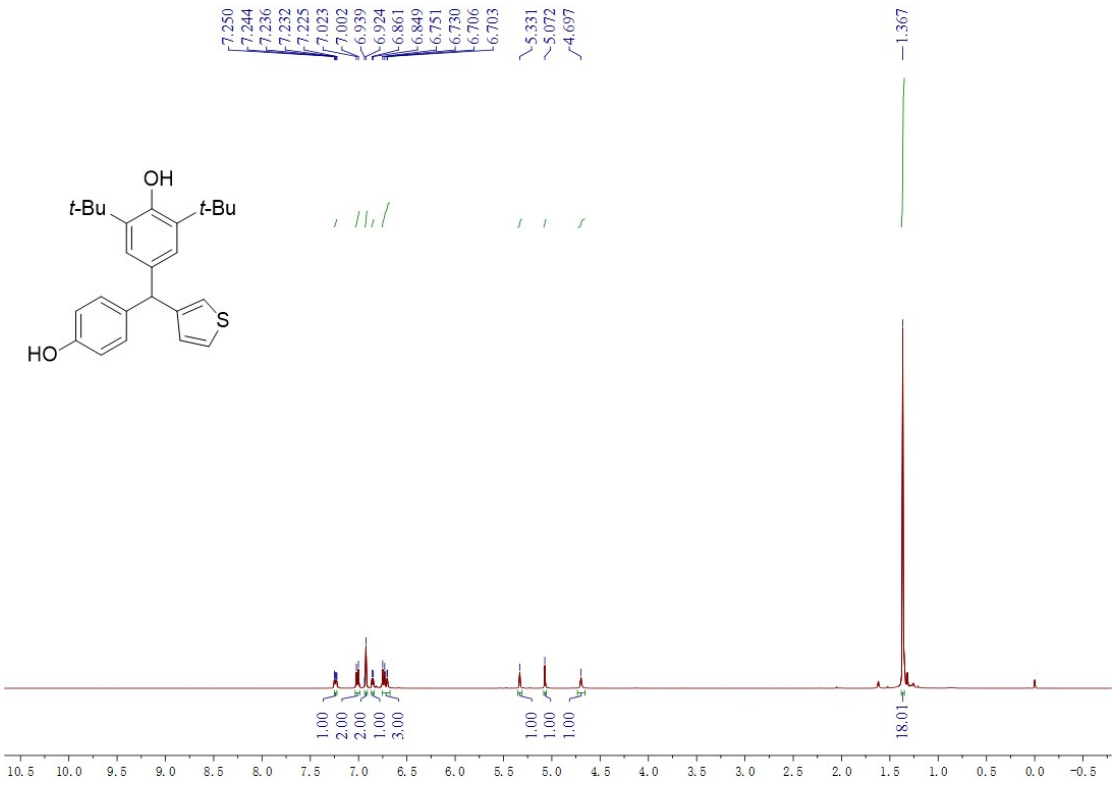


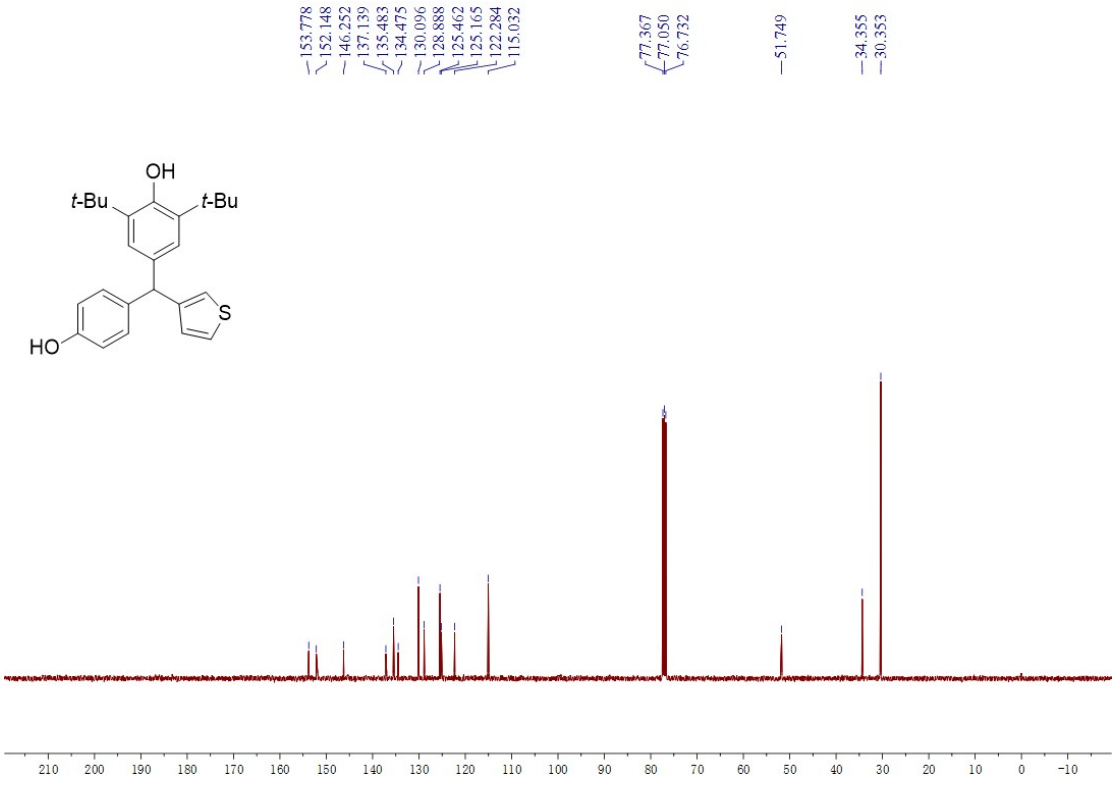
3-((3,5-Di-tert-butyl-4-hydroxyphenyl)(4-hydroxyphenyl)methyl)benzonitrile (7t)



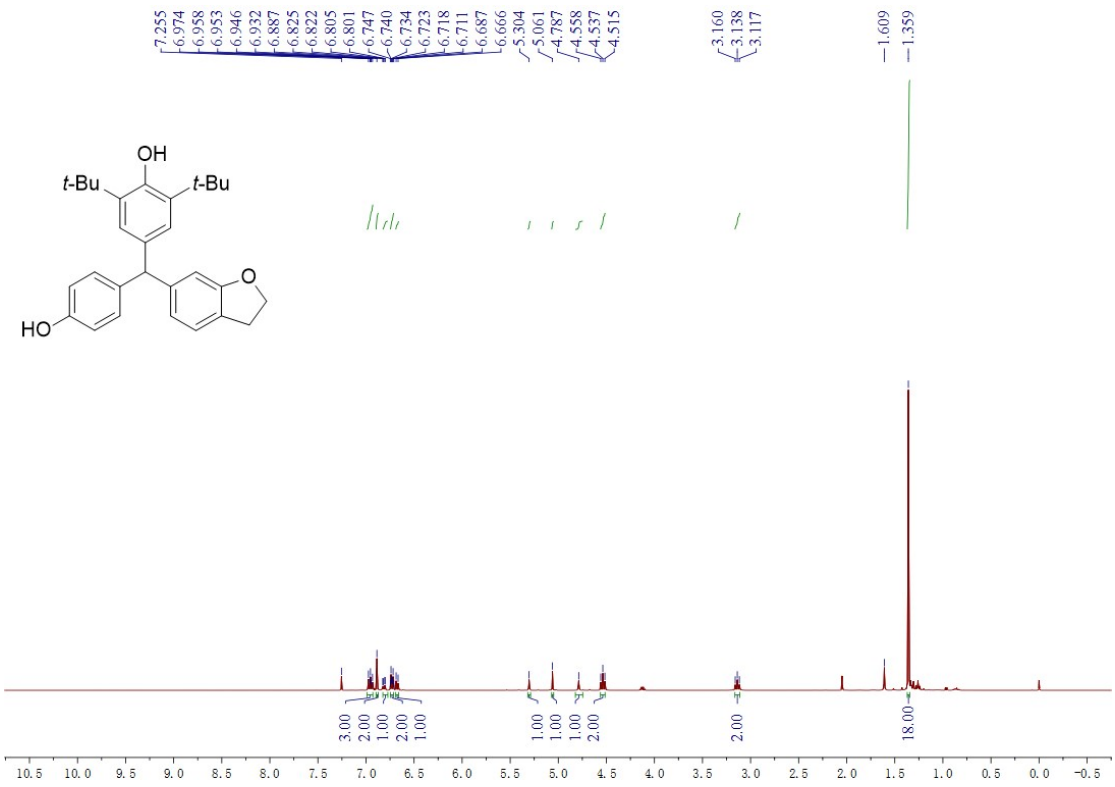


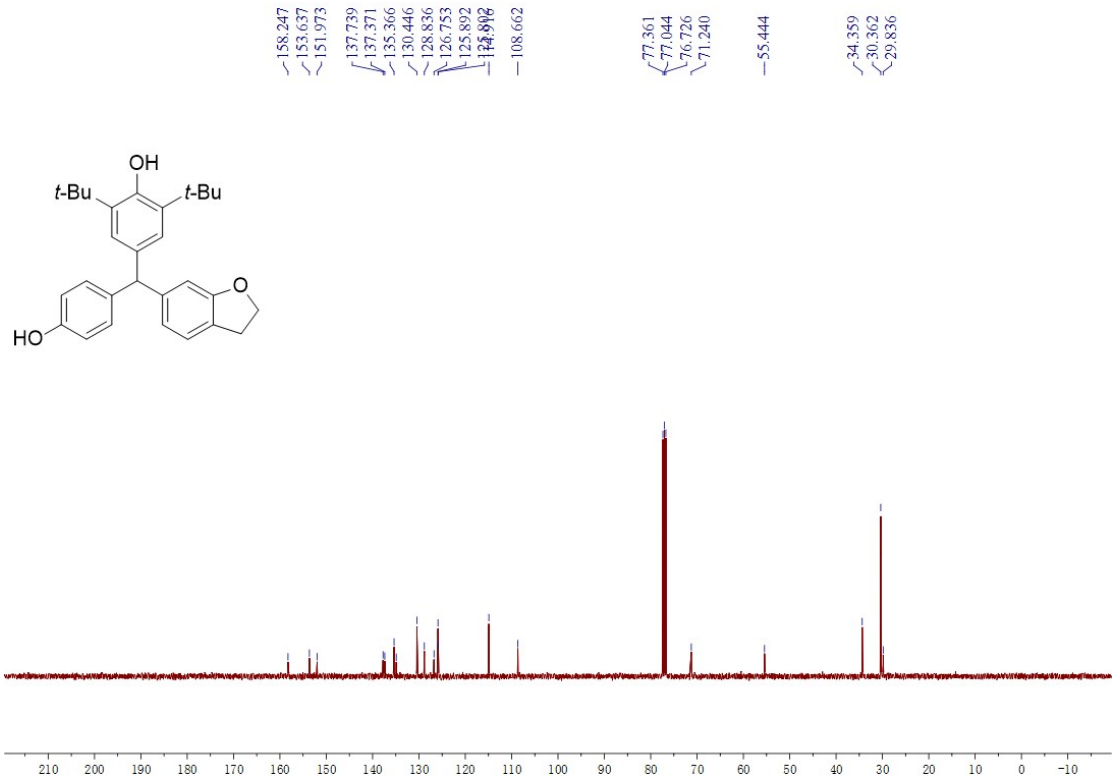
2,6-Di-tert-butyl-4-((4-hydroxyphenyl)(thiophen-3-yl)methyl)phenol (7u)



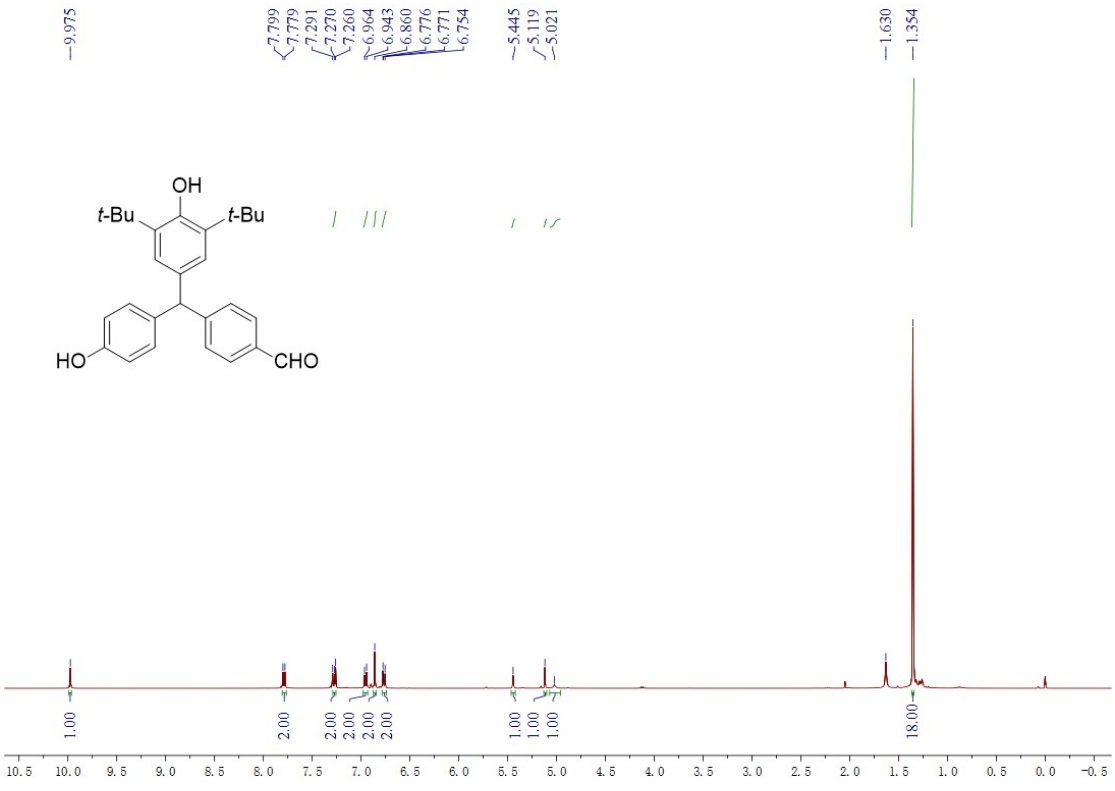


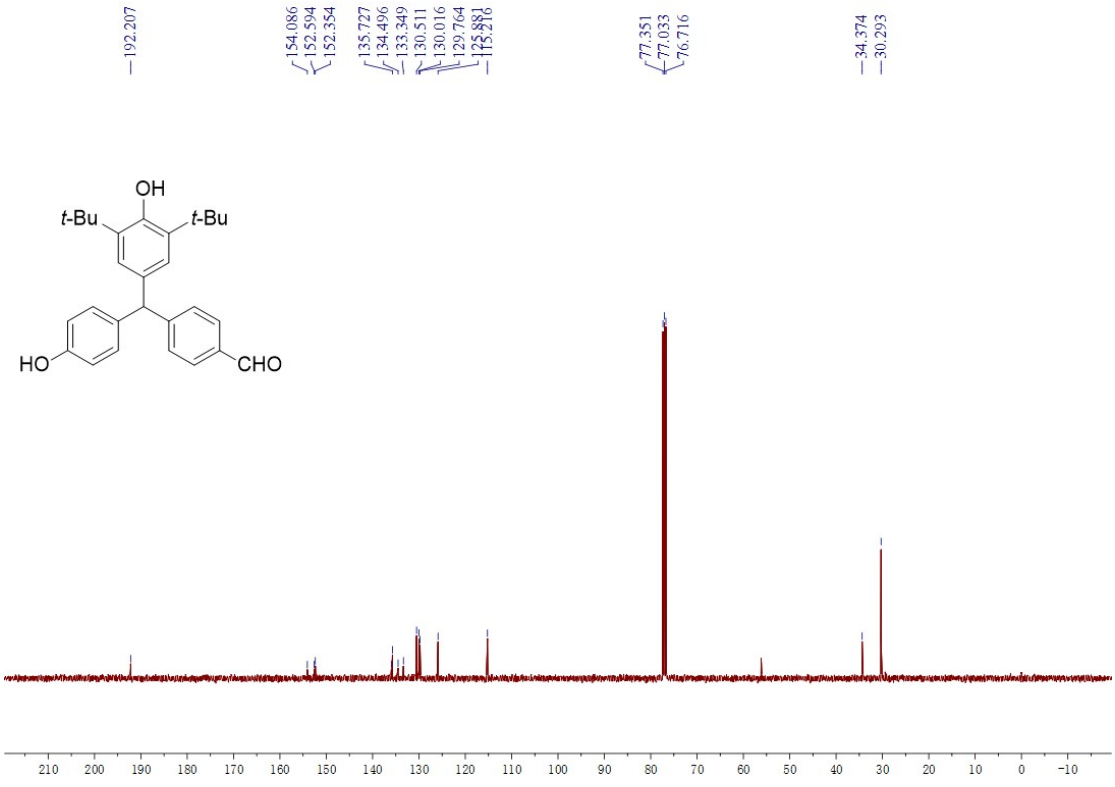
2,6-Di-tert-butyl-4-((2,3-dihydrobenzofuran-6-yl)(4-hydroxyphenyl)methyl)phenol (7x)



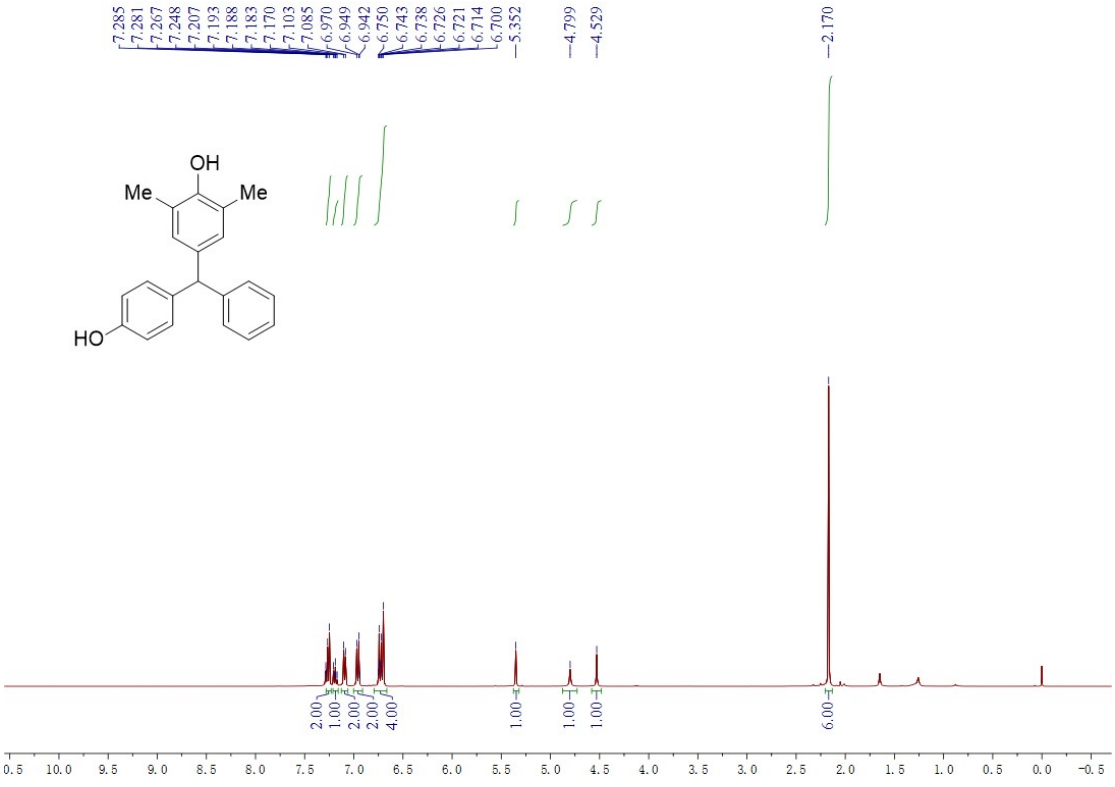


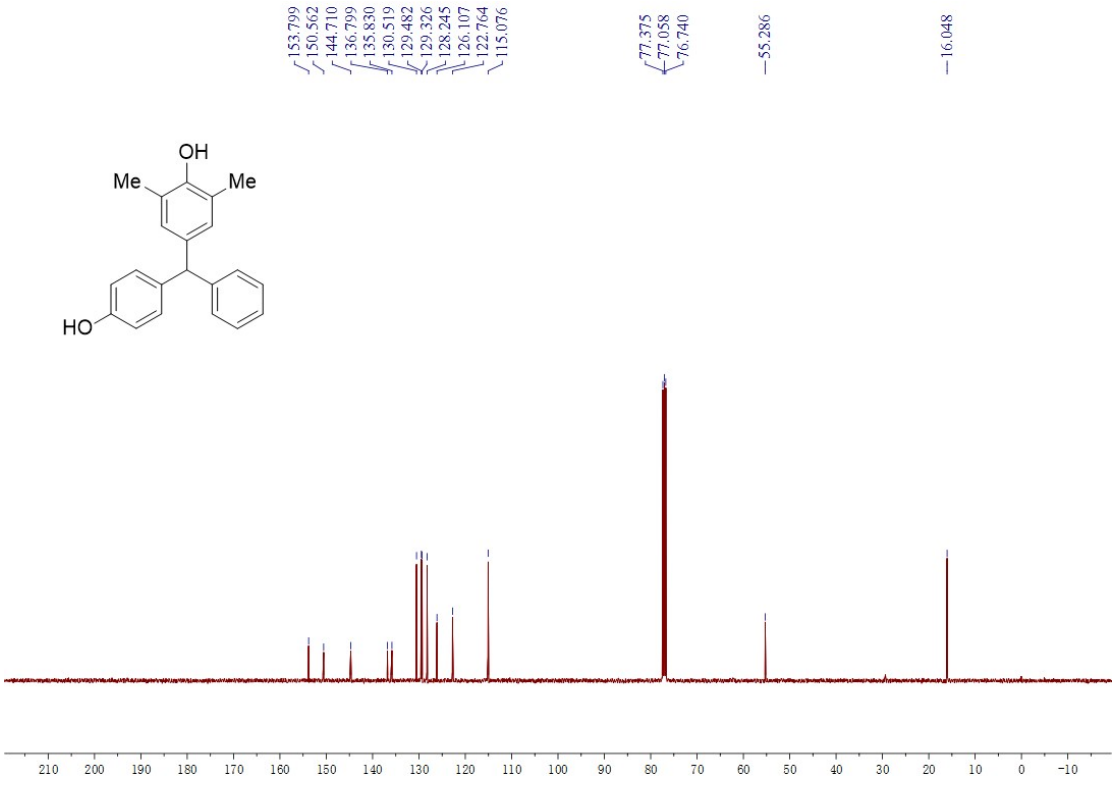
4-((3,5-Di-tert-butyl-4-hydroxyphenyl)(4-hydroxyphenyl)methyl)benzaldehyde (7z)



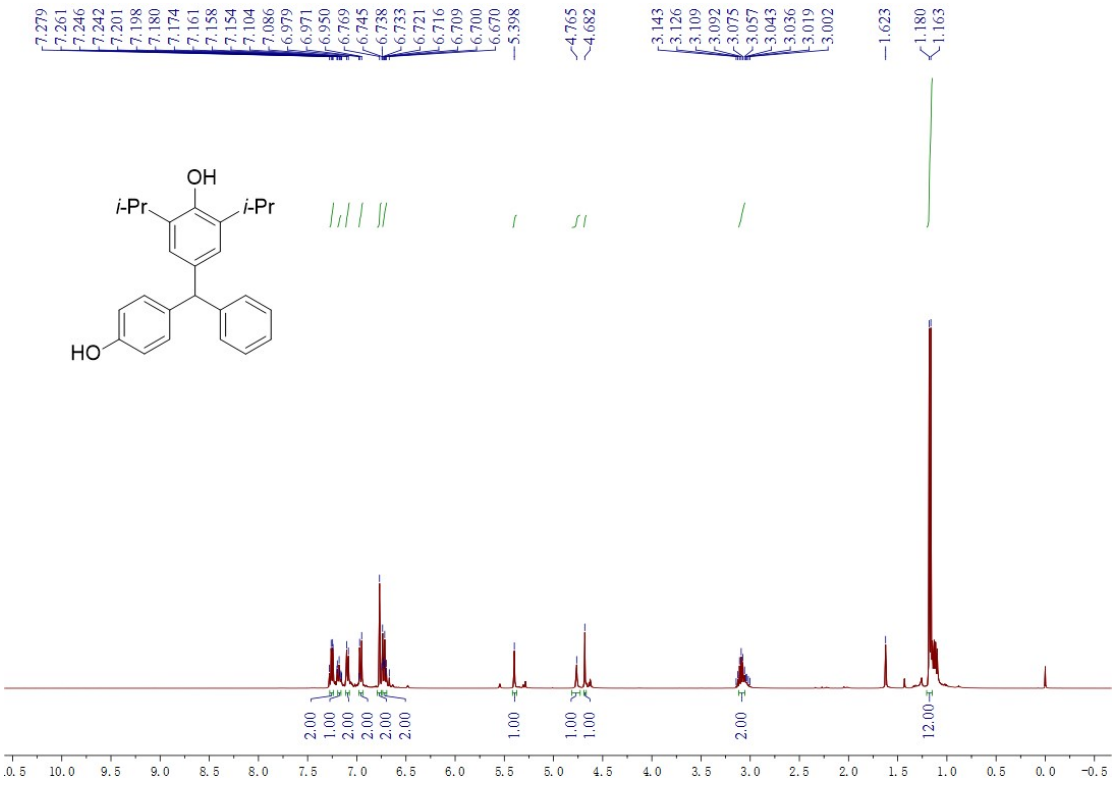


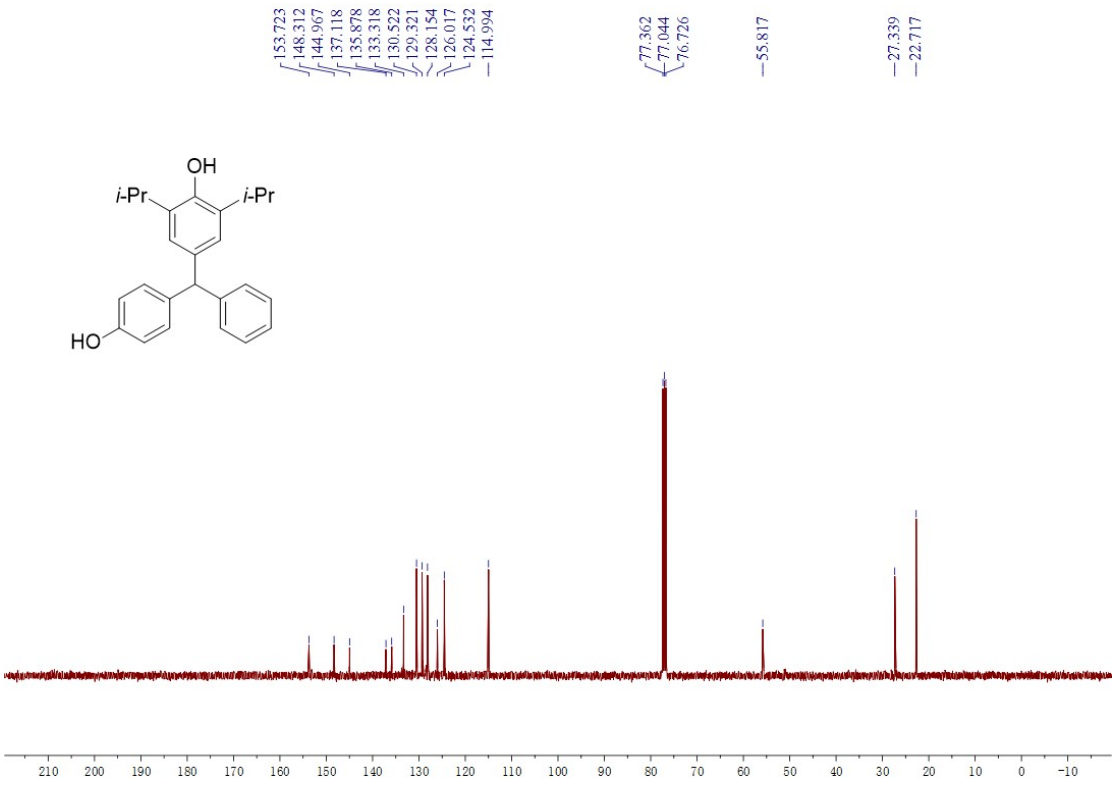
4-((4-Hydroxyphenyl)(phenyl)methyl)-2,6-dimethylphenol (7ab)



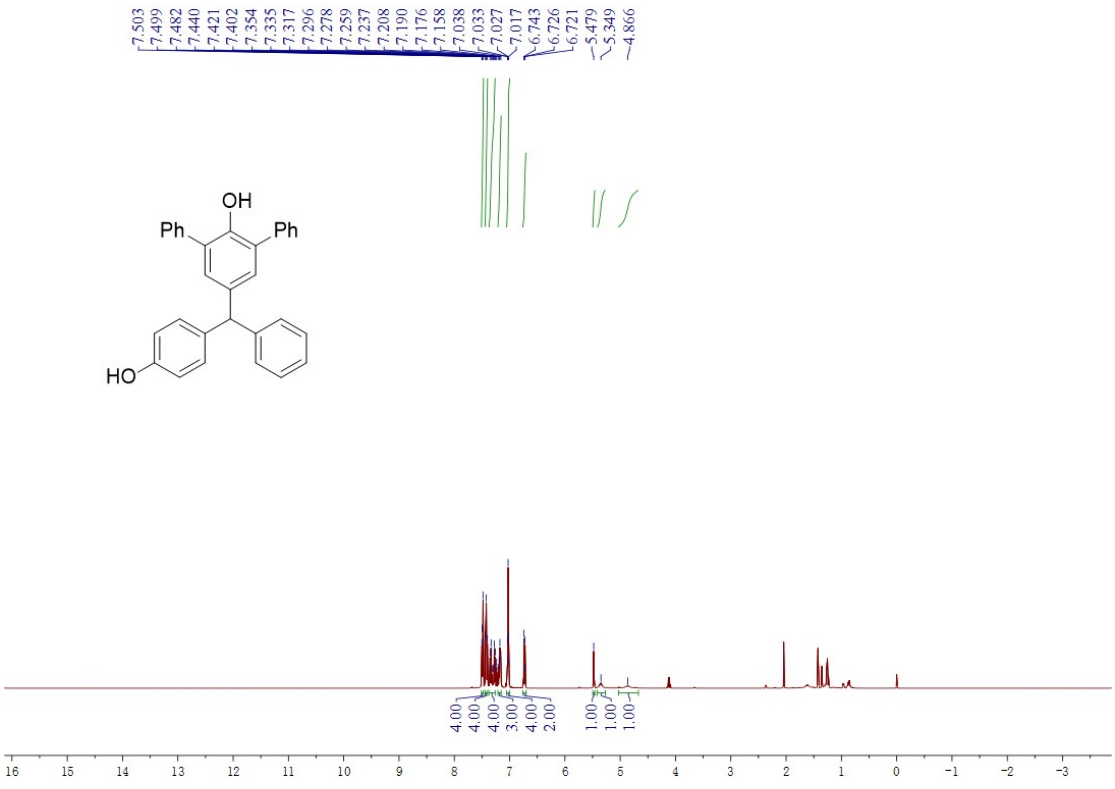


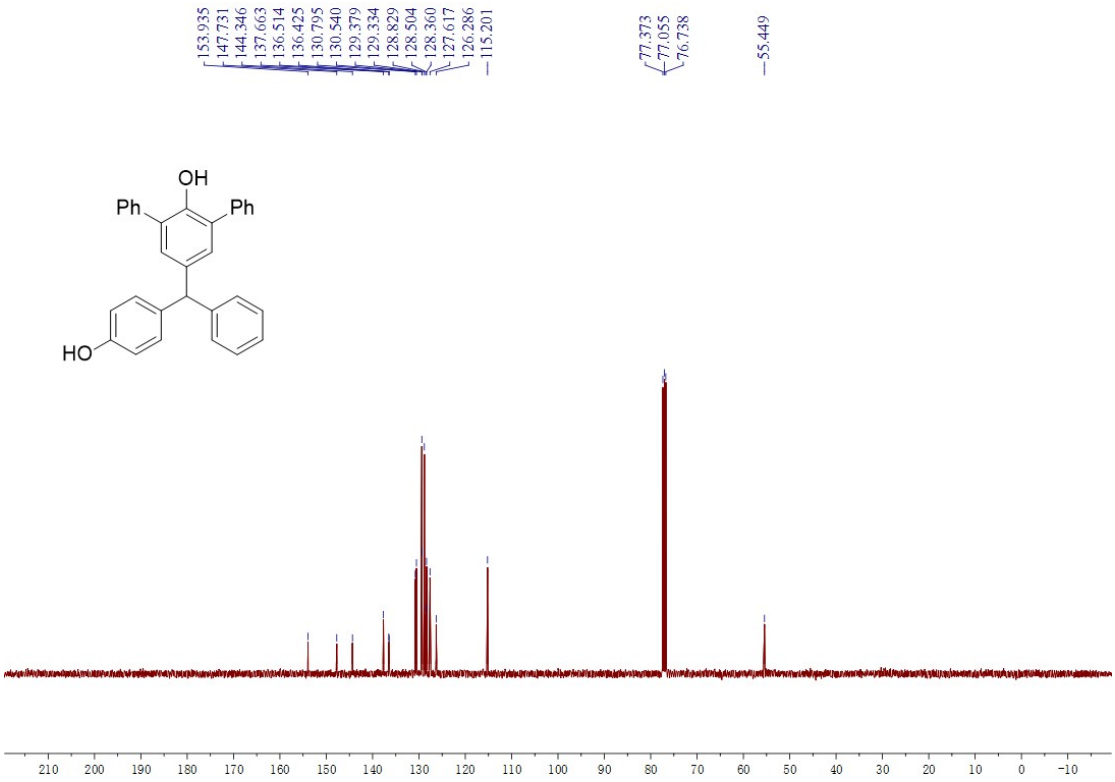
4-((4-Hydroxyphenyl)(phenyl)methyl)-2,6-diisopropylphenol (7ac)



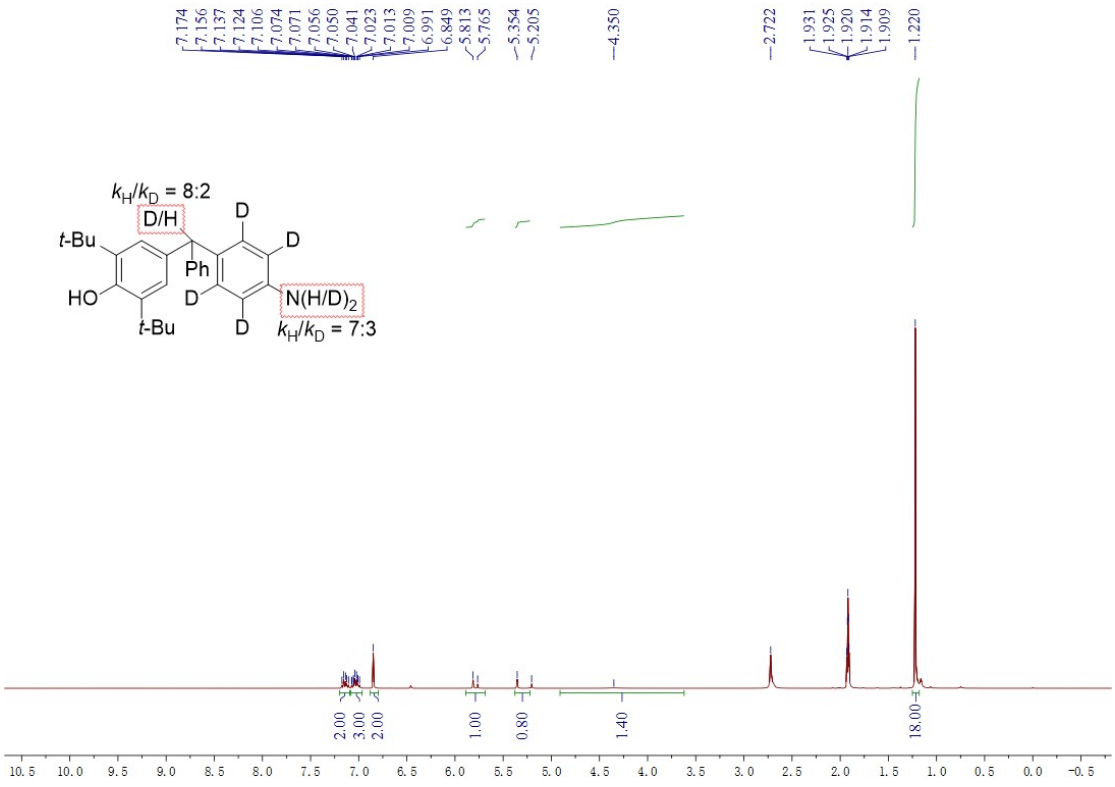


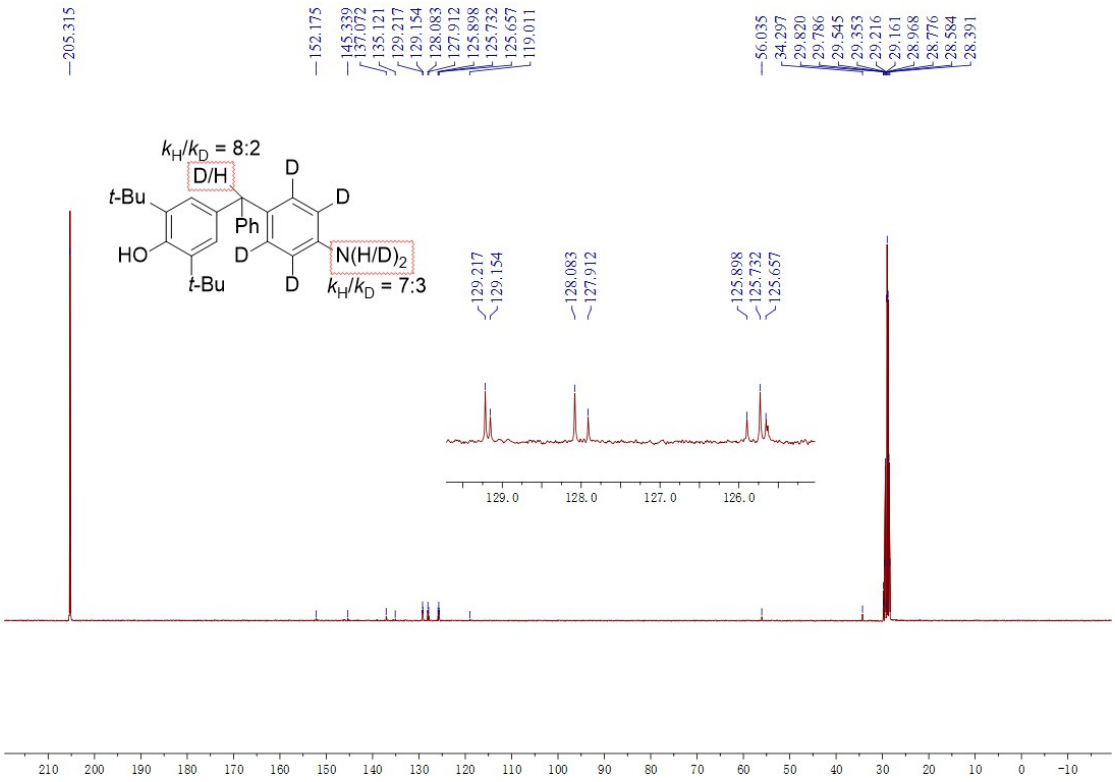
5'-((4-Hydroxyphenyl)(phenyl)methyl)-[1,1':3',1''-terphenyl]-2'-ol (7ad)



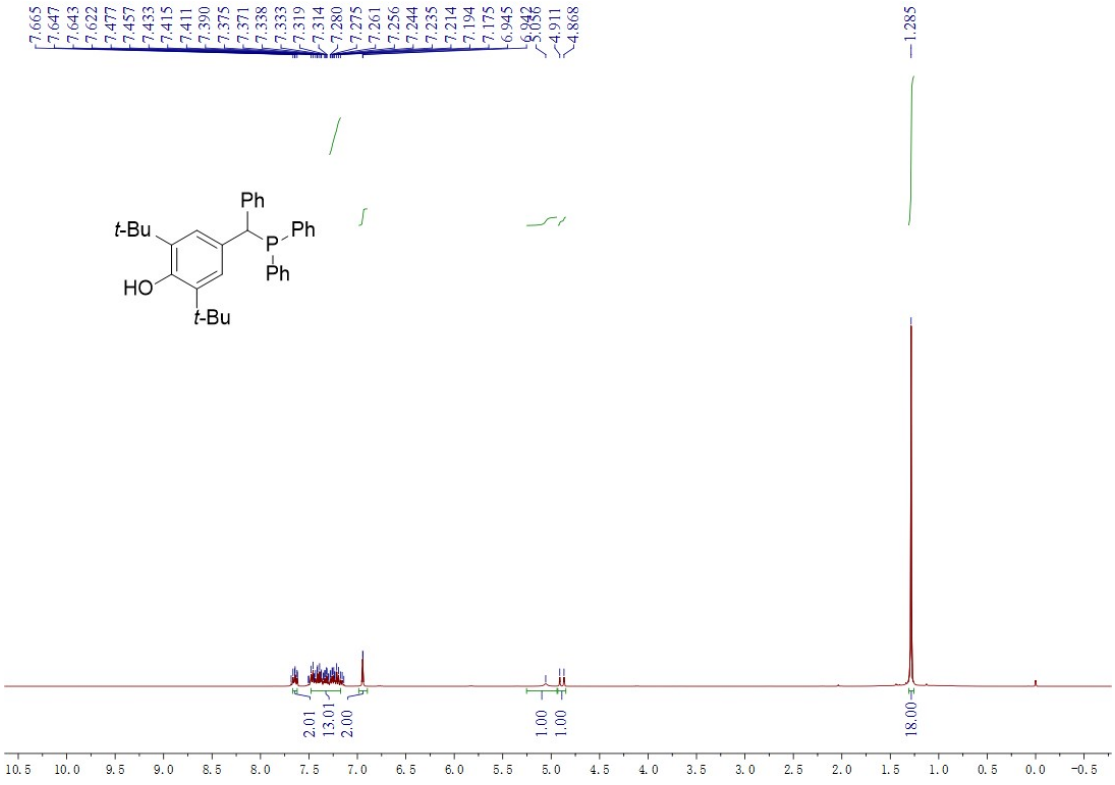


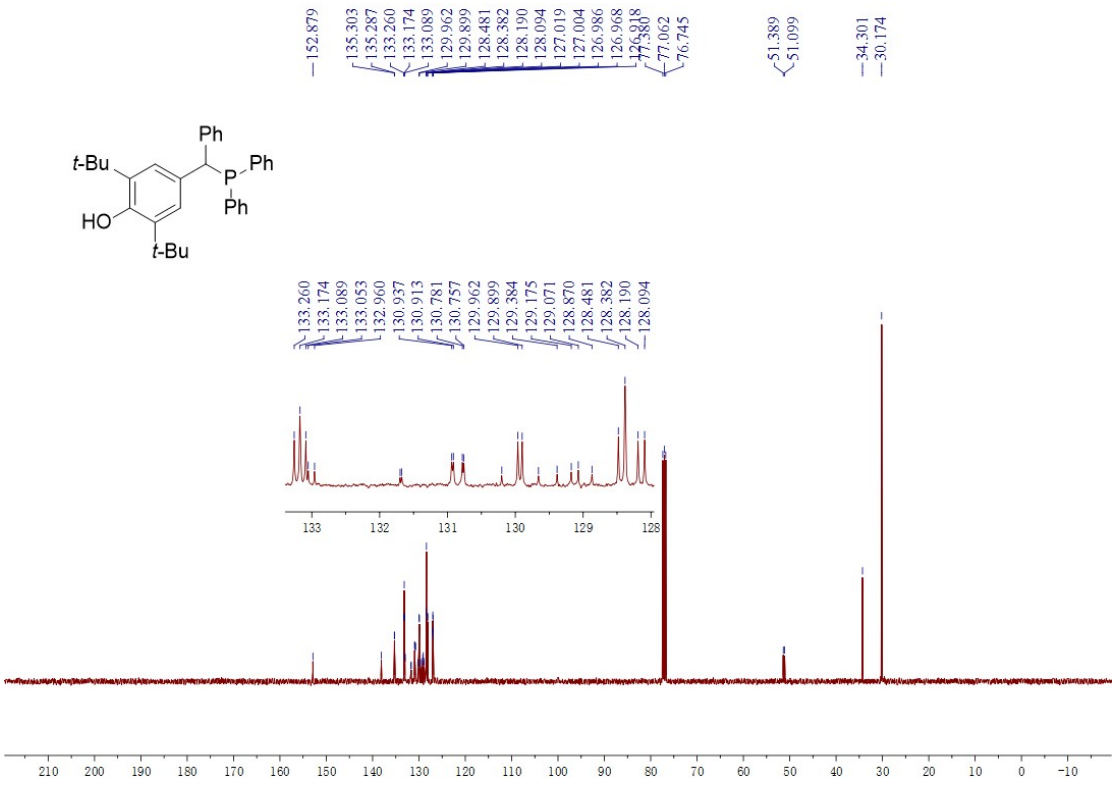
4-((4-Aminophenyl)(phenyl)methyl)-2,6-di-tert-butylphenol (3a')





2,6-Di-tert-butyl-4-((diphenylphosphaneyl)(phenyl)methyl)phenol (9a)

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P
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HO
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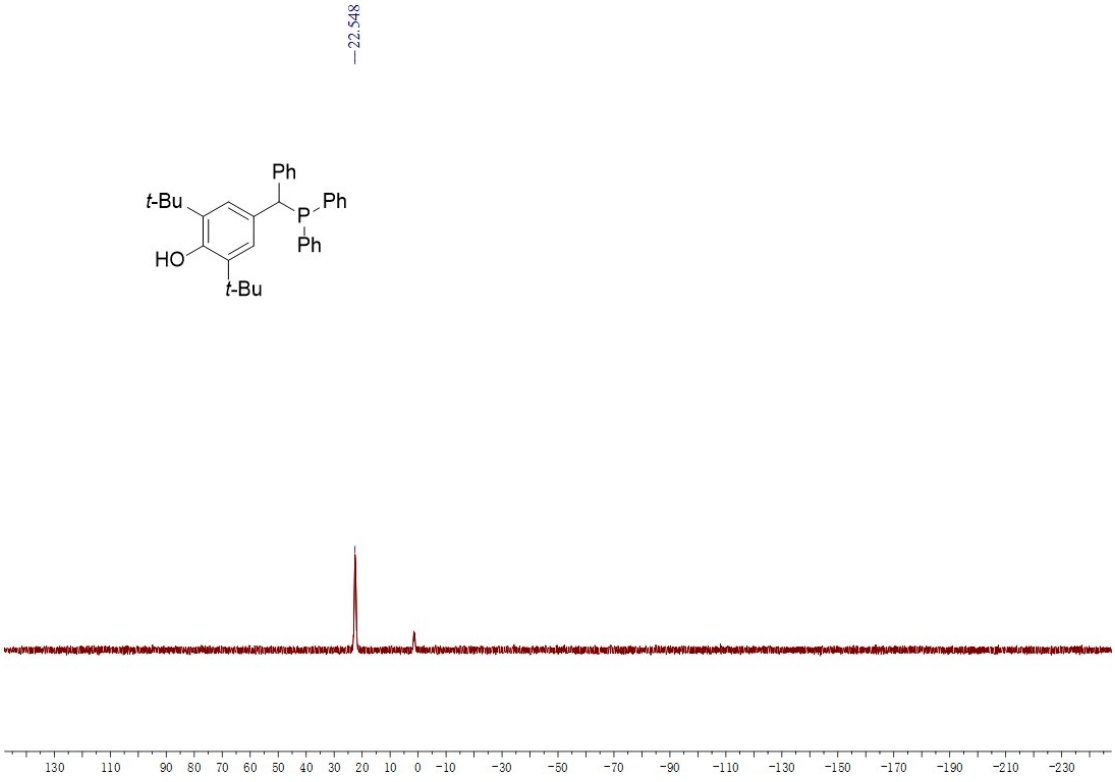
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40
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20
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-30
-50
-70
-90
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-130
-150
-170
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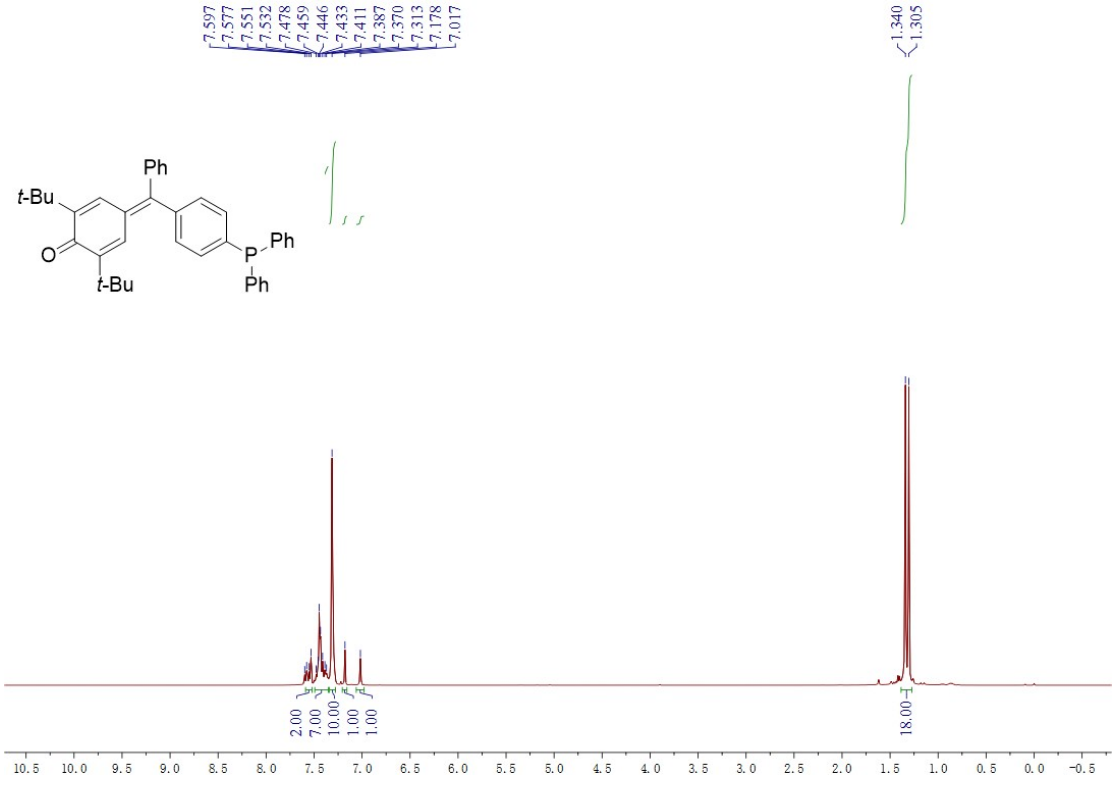
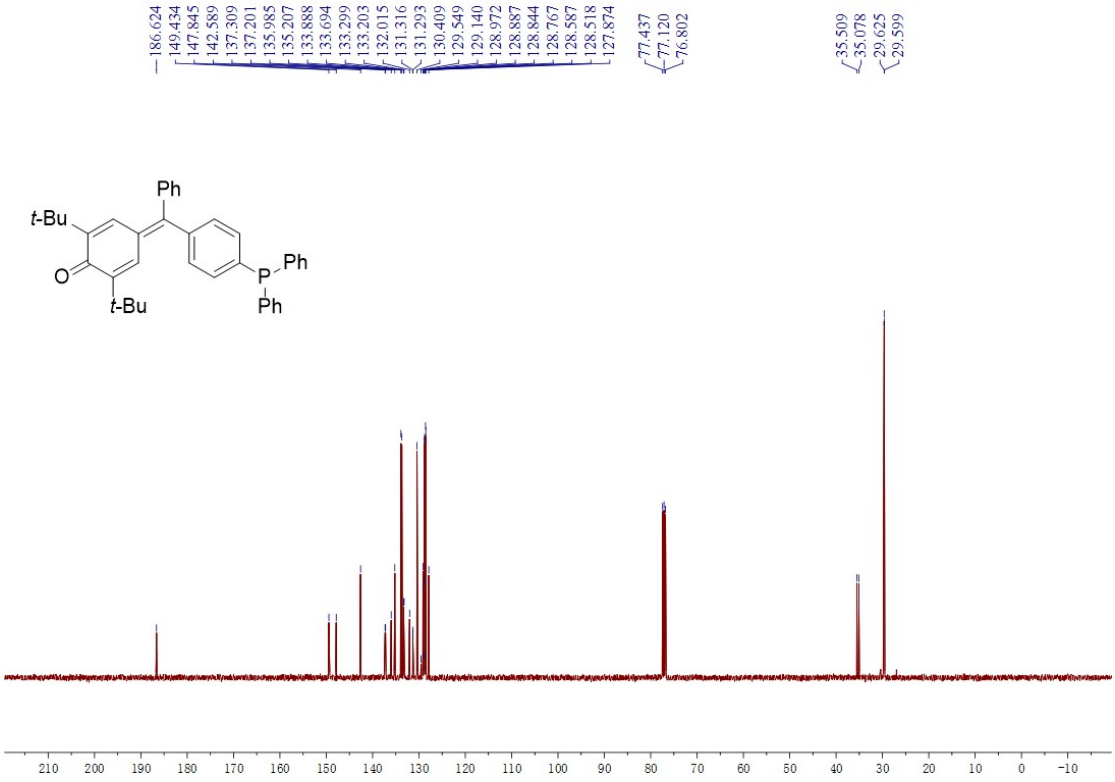
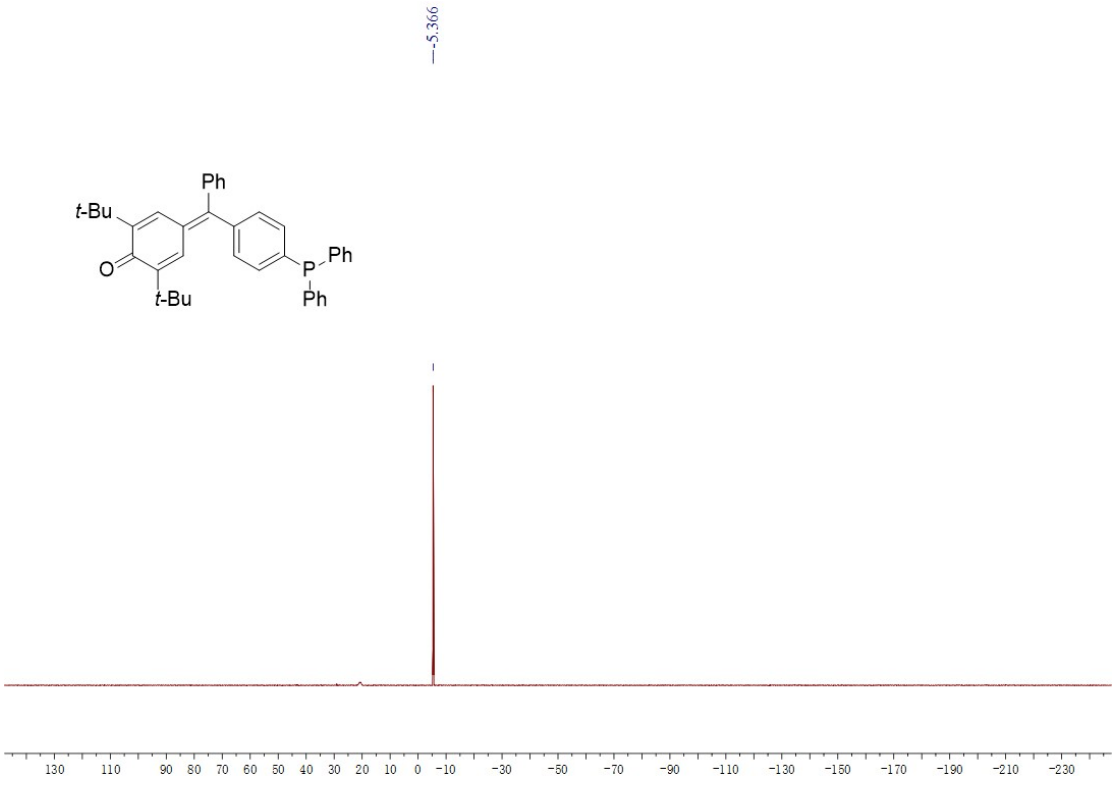
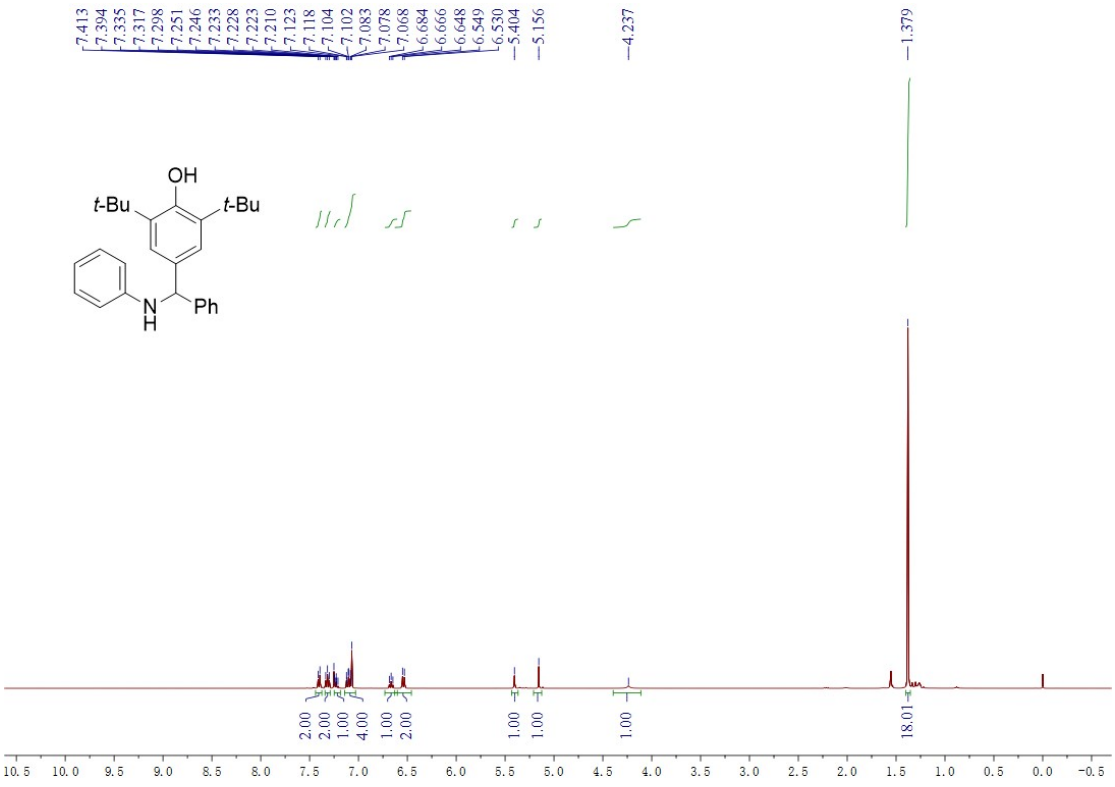
2,6-Di-tert-butyl-4-((4-(diphenylphosphaneyl)phenyl)(phenyl)methylene)cyclohexa-2,5-dien-1-one (9b)

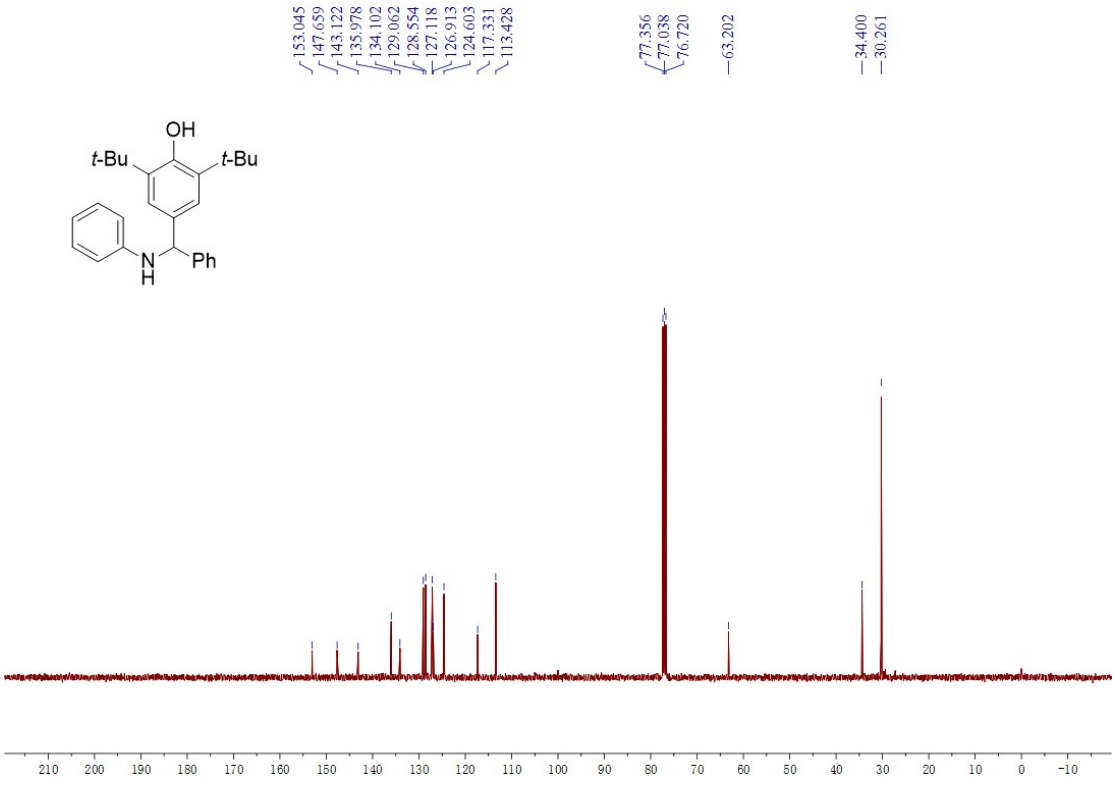




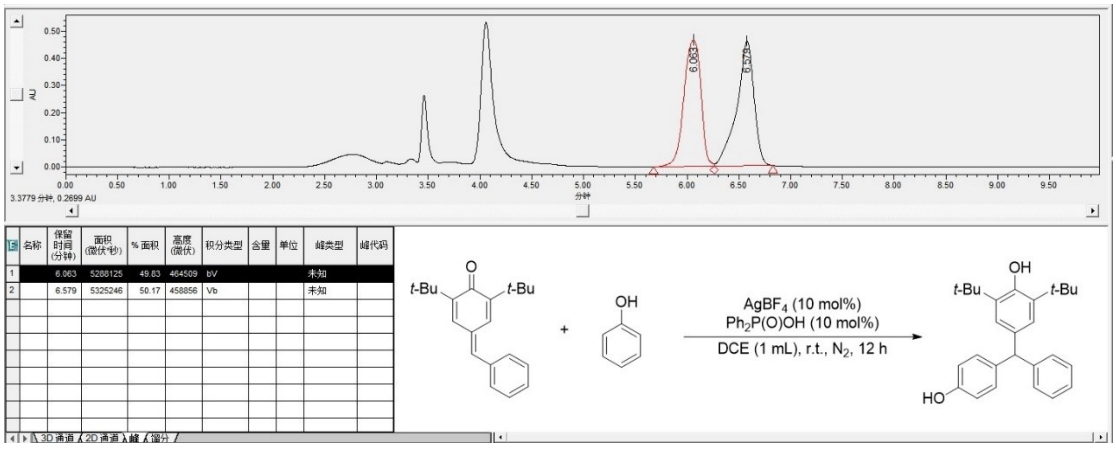


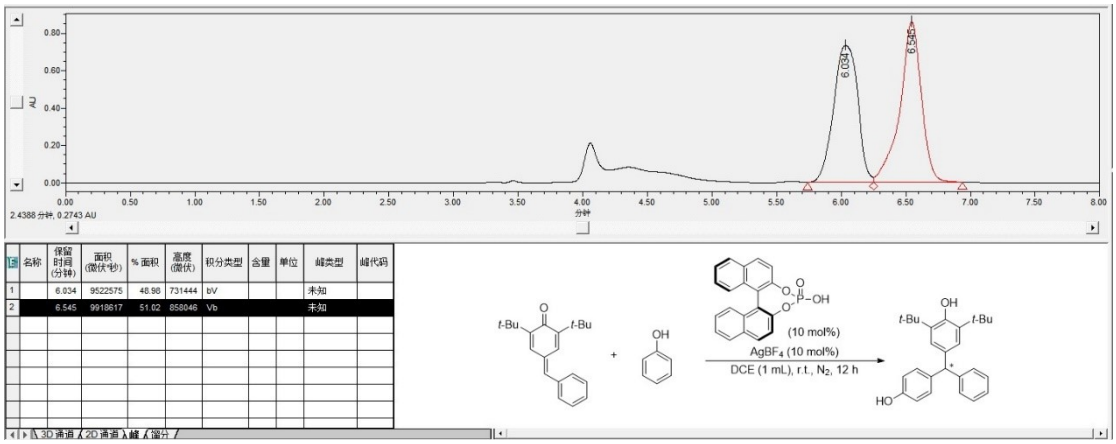
2,6-Di-tert-butyl-4-(phenyl(phenylamino)methyl)phenol (3a'')





Copies of HPLC spectra





	名称	保留时间 (分钟)	面积 (微伏*秒)	% 面积	高度 (微伏)	积分类型	含量	单位	峰类型	峰代码
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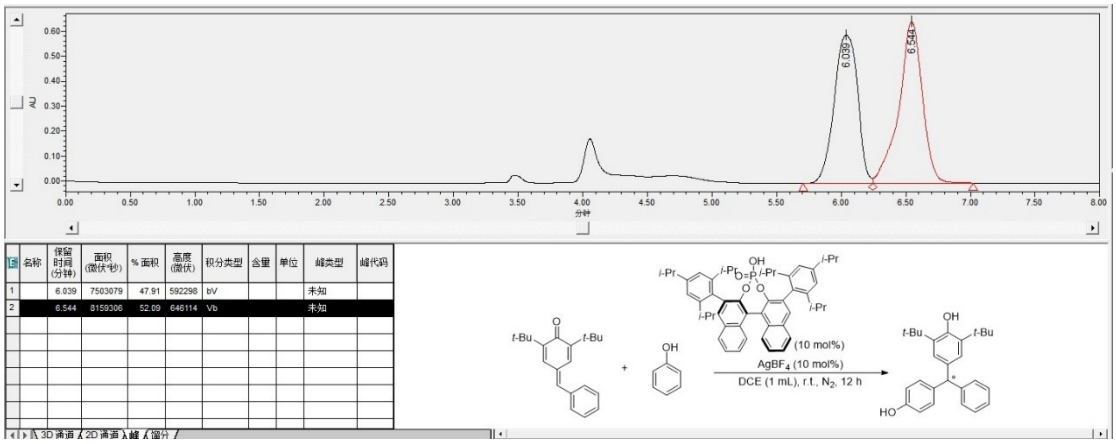
2		6.545	9918617	51.02	858046	Vb			未知	



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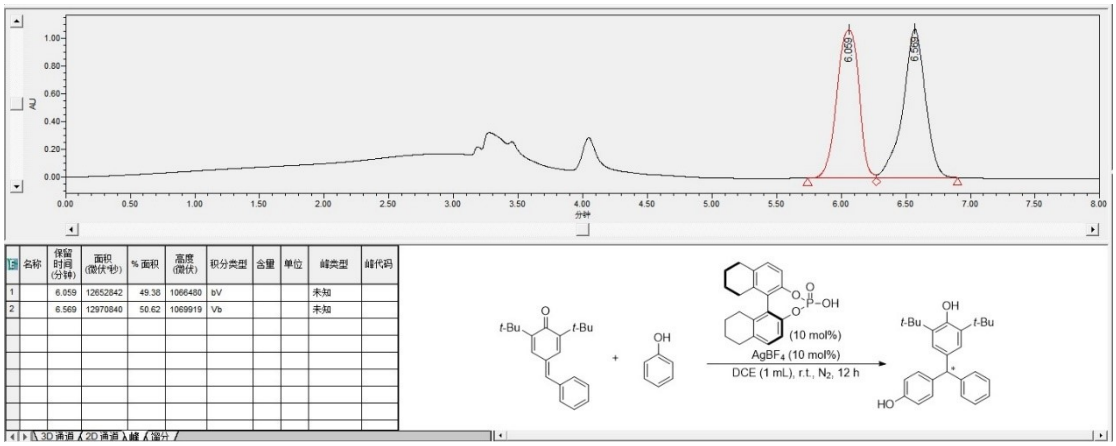
2		6.544	8159306	52.09	646114	Vb			未知	



	名称	保留时间 (分钟)	面积 (微伏*秒)	% 面积	高度 (微伏)	积分类型	含量	单位	峰类型	峰代码
1		6.059	12652842	49.38	1066480	bV			未知	
2		6.569	12970840	50.62	1069919	Vb			未知	