

Supporting Information
for
Fe-Catalyzed Hydroalkylation of Olefins with
***para*-Quinone Methides**

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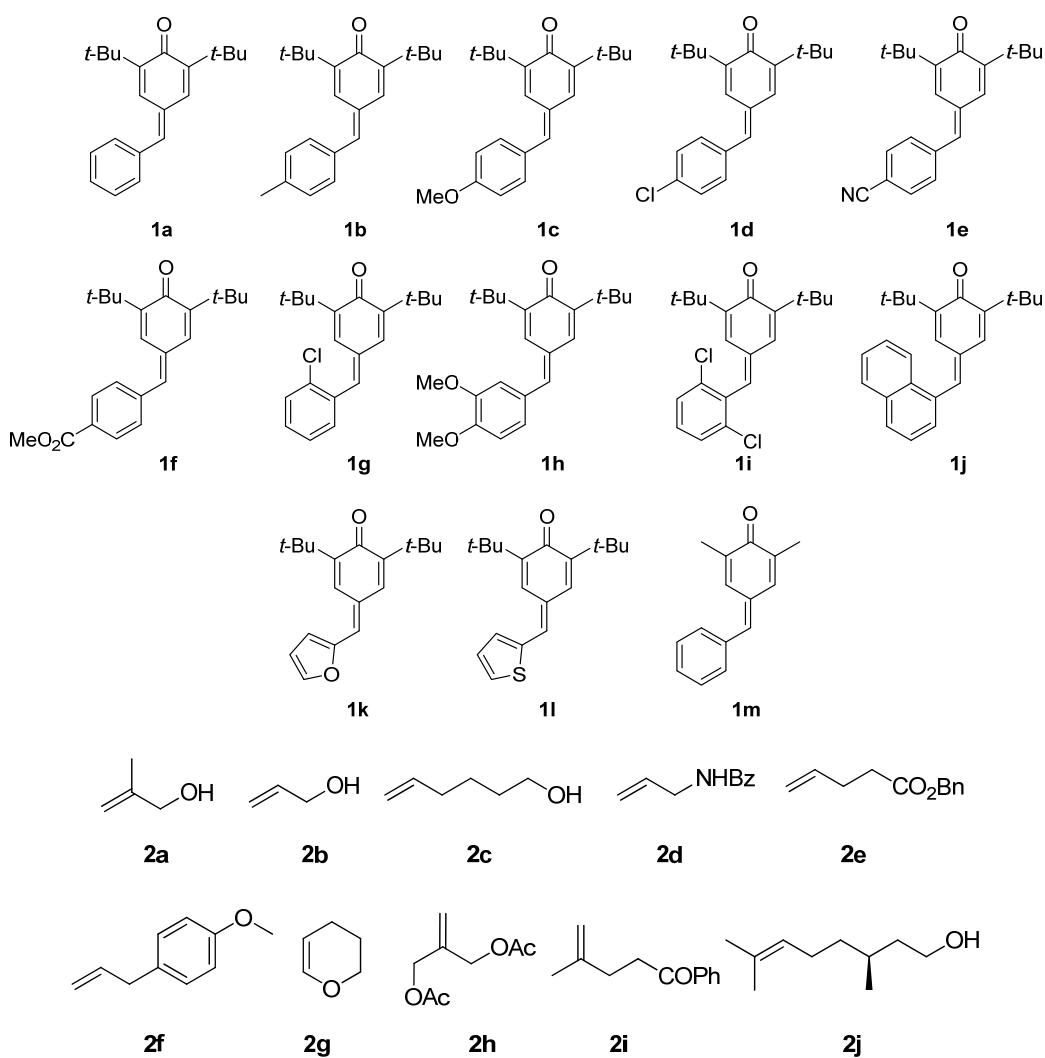
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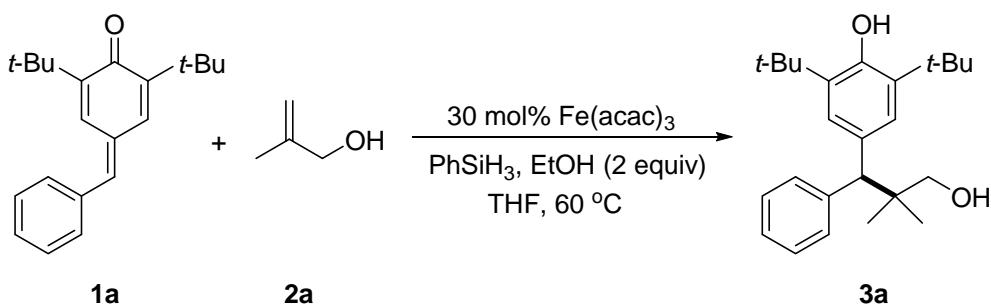
1. General Information:

Infrared spectra were obtained on a FTIR spectrometer. ^1H NMR and ^{13}C NMR spectra were recorded on BRUKER AVANCE III 400 spectrometer. CDCl_3 and CD_3OD were used as solvent. Chemical shifts were referenced relative to residual solvent. The following abbreviations are used to describe peak patterns where appropriate: br = broad, s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet. Coupling constants (J) are reported in Hertz (Hz). HRMS were performed on Waters GCT Premier Time of Flight Mass Spectrometer (EI) or Agilent Technologies 6224 TOF LC/MS apparatus (ESI). Melting points were measured with micro melting point apparatus.

$\text{Fe}(\text{acac})_3$, PhSiH_3 , EtOH, THF were commercial available, and the *para*-Quinone compounds (**1a-1m**) were prepared according the literature.^{1, 2} The alkenes (**2a-2j**) were commercial available or could be easily prepared.



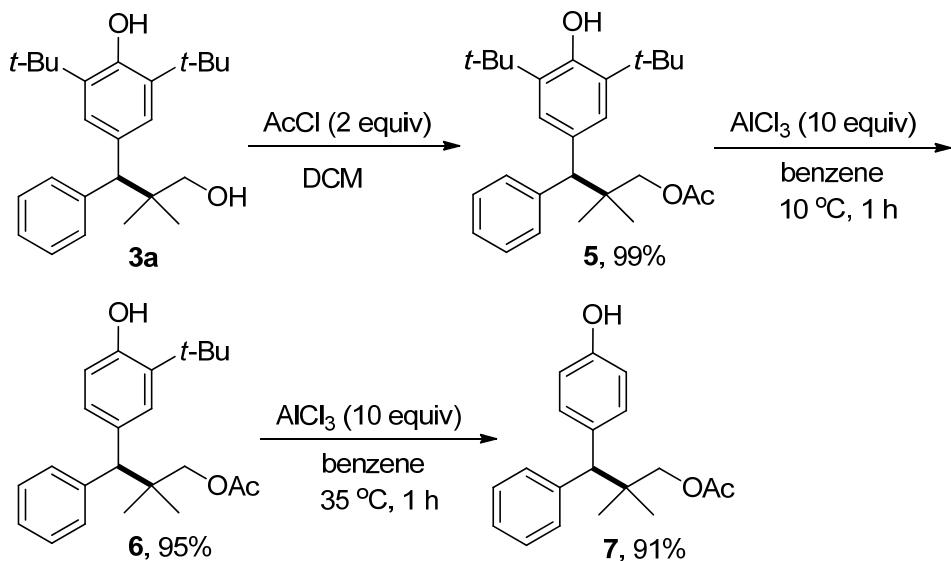
2. Typical Procedure for Synthesis of 3a:



A Schlenk tube containing Fe(acac)₃ (10.5 mg, 30 mol %) and **1a** (29.4 mg, 0.1 mmol) was evacuated and purged with Argon three times. Afterwards, 2-Methyl-2-propen-1-ol **2a** (21.6 mg, 0.3 mmol), EtOH (9.2 mg, 0.2 mmol), PhSiH₃ (10.8 mg, 0.1 mmol) and 1 ml THF were added

via syringe. The solution was kept at 60 °C for 1 h. Then the solution was diluted with CH₂Cl₂ and transferred to a round bottom flask. Silica gel was added to the flask and volatiles were evaporated under vacuum. The purification was performed by flash column chromatography on silica gel using ethyl acetate/petroleum ether (v/v, 1:10) as eluent to give **3a** as a colorless oil (32 mg, 87 % yield).

3. Typical Procedure for Synthesis of **5**, **6**, **7**.



A schlenk tube was evacuated and purged with Argon three times, then a DCM solution (3 mL) of **3a** (80 mg, 0.22 mmol) and AcCl (34 mg, 0.44 mmol) was added, and the reaction was kept at 25 °C overnight. Then the solution was diluted with CH₂Cl₂ and transferred to a round bottom flask, washed with water for three times, and the organic layer was dried with anhydrous magnesium sulfate. Afterwards, the solution was filtered and then concentrated to give the crude product, which was next purified in flash column chromatography on silica gel using ethyl

acetate/petroleum ether (v/v, 1:20) as eluent to get **5** (89 mg, 99 % yield).

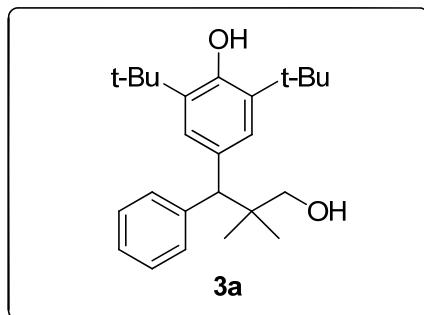
AlCl_3 (110 mg, 0.97 mmol) was added to a schlenk tube, which was evacuated and purged with Argon three times. Then a benzene solution (2 mL) of **5** (40 mg, 0.097 mmol) was added, and the reaction was kept at 10 °C for 1 h. Afterwards, 5 ml water was added to quench the reaction, and the aqueous phase was extracted with 5 ml ethyl acetate for three times. The organic layer was dried with anhydrous magnesium sulfate, which was next filtered and concentrated to give the crude product. The residue was next purified in flash column chromatography on silica gel using ethyl acetate/petroleum ether (v/v, 1:10) as eluent to get **6** (33 mg, 95 % yield).

AlCl_3 (110 mg, 0.97mmol) was added to a schlenk tube, which was evacuated and purged with Argon three times. Then a benzene solution (2 mL) of **6** (40 mg, 0.097 mmol) was added, and the reaction was kept at 10 °C for 1 h and then 30-35 °C for another hour. Then 5 ml water was added to quench the reaction, and the aqueous phase was extracted with 5 ml ethyl acetate for three times. The organic layer was dried with anhydrous magnesium sulfate. Afterwards, the solution was filtered and then concentrated to give the crude product, which was next purified in flash column chromatography on silica gel using ethyl acetate/petroleum ether (v/v, 1:5) as eluent to get **7** (25 mg, 91 % yield).

4. Characterization of **3, **4**, **5**, **6** and **7**:**

2,6-Di-*tert*-butyl-4-(3-hydroxy-2,2-dimethyl-1-phenylpropyl)phenol

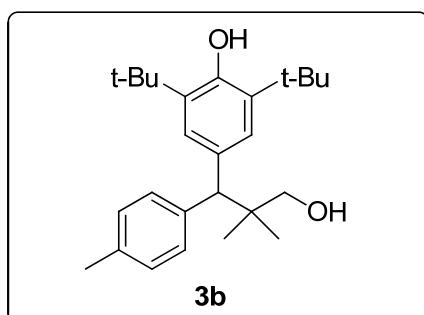
(3a)



Colorless oil, 32 mg, yield: 87 %; $R_f = 0.45$ (EtOAc/Petroleum ether 1:10); ^1H NMR (CDCl_3 , 400MHz), δ : 7.44-7.42 (m, 2H), 7.24-7.21 (m, 4H), 7.17-7.15 (m, 1H), 5.01 (s, 1H), 3.86 (s, 1H), 3.26 (s, 2H), 1.39 (s, 18H), 0.97 (s, 3H), 0.95 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 152.3, 143.1, 135.3, 132.6, 130.0, 128.2, 126.4, 126.2, 71.6, 58.8, 40.0, 34.4, 30.5, 23.4, 23.1; IR (film) ν : 3640, 2957, 2364, 1716, 1594, 1432, 1361, 1239, 1153, 1118, 1032, 870, 702 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{25}\text{H}_{36}\text{O}_2(\text{M}^+)$: 368.2715; Found: 368.2718.

2,6-Di-*tert*-butyl-4-(3-hydroxy-2,2-dimethyl-1-(*p*-tolyl)propyl)phenol(

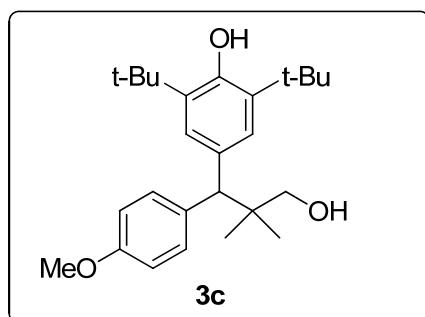
3b)



Colorless oil, 25 mg, yield: 65 %; $R_f = 0.45$ (EtOAc/Petroleum ether 1:10); ^1H NMR (CDCl_3 , 400MHz), δ : 7.37 (d, $J = 8.0$ Hz, 2H), 7.25 (s,

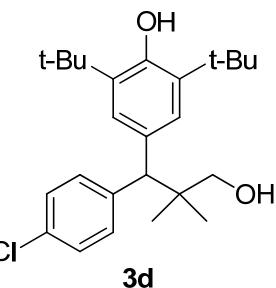
2H), 7.11 (d, $J = 7.6$ Hz, 2H), 5.05 (s, 1H), 3.87 (s, 1H), 3.31 (s, 2H), 2.31 (s, 3H), 1.44 (s, 18H), 1.01 (s, 3H), 1.00 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 152.2, 140.1, 135.7, 135.3, 132.9, 129.8, 129.0, 126.4, 71.7, 58.6, 40.0, 34.4, 30.5, 23.4, 23.2, 21.0; IR (film) ν : 3645, 2957, 2364, 1710, 1508, 1437, 1361, 1234, 1153, 1118, 1042, 826 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{26}\text{H}_{38}\text{O}_2(\text{M}^+)$: 382.2872; Found: 382.2871.

2,6-Di-*tert*-butyl-4-(3-hydroxy-1-(4-methoxyphenyl)-2,2-dimethylpropyl)phenol (3c)



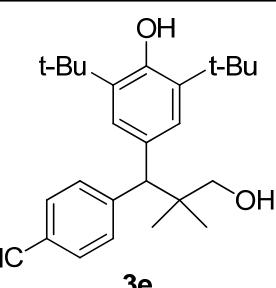
Light yellow oil, 25 mg, yield: 62 %; $R_f = 0.35$ (EtOAc/Petroleum ether 1:10); ^1H NMR (CDCl_3 , 400MHz), δ : 7.40-7.36 (m, 2H), 7.22 (s, 2H), 6.86-6.82 (m, 2H), 5.04 (s, 1H), 3.86 (s, 1H), 3.78 (s, 3H), 3.30 (s, 2H), 1.43 (s, 18H), 0.99 (s, 3H), 0.98 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 158.0, 152.2, 135.3, 133.0, 130.9, 126.3, 113.6, 71.7, 58.0, 55.3, 40.0, 34.5, 30.5, 23.4, 23.1; IR (film) ν : 3645, 2961, 2364, 1710, 1614, 1508, 1437, 1361, 1249, 1183, 1041, 839 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{26}\text{H}_{38}\text{O}_3(\text{M}^+)$: 398.2821; Found: 398.2817.

2,6-Di-*tert*-butyl-4-(1-(4-chlorophenyl)-3-hydroxy-2,2-dimethylpropyl)phenol (3d)



Coloress oil, 25 mg, yield: 63 %; $R_f = 0.40$ (EtOAc/Petroleum ether 1:10);
 ^1H NMR (CDCl_3 , 400MHz), δ : 7.41-7.37 (m, 2H), 7.24-7.23 (m, 2H),
 7.20 (s, 2H), 5.07 (s, 1H), 3.92 (s, 1H), 3.31-3.25 (m, 2H), 1.43 (s, 18H),
 0.99 (s, 3H), 0.97 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 152.4, 141.6,
 135.5, 132.2, 132.0, 131.3, 128.3, 126.3, 71.4, 57.9, 39.9, 34.5, 30.5, 23.5,
 22.9; IR (film) ν : 3640, 2961, 2871, 2354, 1716, 1488, 1437, 1366, 1234,
 1153, 1017, 845 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{25}\text{H}_{35}\text{ClO}_2$ (M^+):
 402.2326; Found: 402.2330.

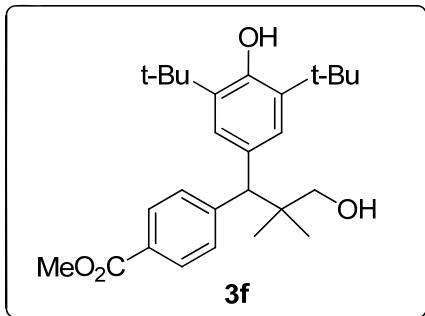
4-(1-(3,5-Di-tert-butyl-4-hydroxyphenyl)-3-hydroxy-2,2-dimethylpropyl)benzonitrile (3e)



Coloress solid, m.p. 135.8-136.2 °C, 37 mg, yield: 94 %; $R_f = 0.40$ (EtOAc/Petroleum ether 1:10); ^1H NMR (CDCl_3 , 400MHz), δ : 7.57 (s, 4H), 7.19 (s, 2H), 5.11 (s, 1H), 4.04 (s, 1H), 3.31-3.22 (m, 2H), 1.42 (s, 18H), 1.00 (s, 3H), 0.97 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 152.6,

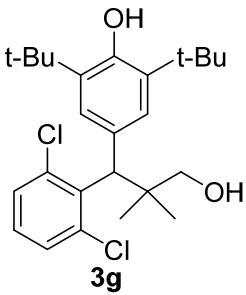
148.9, 135.7, 131.9, 131.3, 130.8, 126.4, 119.2, 109.9, 71.0, 58.3, 40.0, 34.5, 30.5, 23.5, 22.9; IR (KBr) ν : 3487, 2957, 2238, 1726, 1594, 1437, 1371, 1250, 1138, 1041, 839 cm⁻¹; HRMS (EI) (m/z): calcd for C₂₆H₃₅NO₂(M⁺): 393.2668; Found: 393.2666.

Methyl 4-(1-(3,5-di-*tert*-butyl-4-hydroxyphenyl)-3-hydroxy-2,2-dimethylpropyl)benzoate (3f)



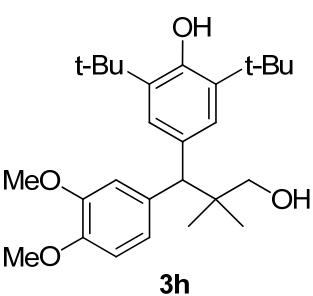
Coloress oil, 34 mg, yield: 80 %; R_f = 0.30 (EtOAc/Petroleum ether 1:10); ¹H NMR (CDCl₃, 400MHz), δ : 7.96 (d, J = 8.4 Hz, 2H), 7.54 (d, J = 8.4 Hz, 2H), 7.22 (s, 2H), 5.09 (s, 1H), 4.02 (s, 1H), 3.89 (s, 3H), 3.33-3.25 (m, 2H), 1.42 (s, 18H), 1.02 (s, 3H), 0.98 (s, 3H); ¹³C NMR (CDCl₃, 100MHz), δ : 167.3, 152.5, 148.7, 135.5, 131.8, 130.1, 129.5, 128.0, 126.4, 71.3, 58.5, 52.1, 40.0, 34.5, 30.5, 23.5, 23.0; IR (film) ν : 3640, 2957, 1721, 1609, 1437, 1366, 1240, 1183, 1159, 1112, 971, 860 cm⁻¹; HRMS (EI) (m/z): calcd for C₂₇H₃₈O₄(M⁺): 426.2770; Found: 426.2774.

2,6-Di-*tert*-butyl-4-(1-(2,6-dichlorophenyl)-3-hydroxy-2,2-dimethylpropyl)phenol (3g)



Coloress solid, m.p. 83.7-84.8 °C, 17 mg, yield: 40 %; $R_f = 0.40$ (EtOAc/Petroleum ether 1:10); ^1H NMR (CDCl_3 , 400MHz), δ : 7.38-7.34 (m, 3H), 7.22-7.20 (m, 1H), 7.03 (t, $J = 8.0$ Hz, 1H), 5.26 (s, 1H), 5.06 (s, 1H), 3.71 (d, $J = 10.8$ Hz, 1H), 3.48 (d, $J = 11.2$ Hz, 1H), 1.40 (s, 18H), 1.28 (s, 3H), 1.16 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 152.1, 139.6, 138.1, 136.1, 134.7, 131.1, 130.3, 128.9, 127.7, 127.7, 71.8, 51.9, 41.7, 34.5, 30.5, 25.1, 24.7; IR (KBr) ν : 3640, 2957, 1553, 1432, 1366, 1240, 1193, 1146, 1042, 971, 870 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{25}\text{H}_{34}\text{Cl}_2\text{O}_2(\text{M}^+)$: 436.1936; Found: 436.1937.

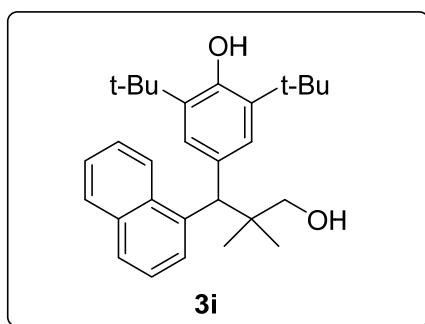
2,6-Di-*tert*-butyl-4-(1-(3,4-dimethoxyphenyl)-3-hydroxy-2,2-dimethylpropyl)phenol (3h)



Coloress oil, 26 mg, yield: 60 %; $R_f = 0.35$ (EtOAc/Petroleum ether 1:10); ^1H NMR (CDCl_3 , 400MHz), δ : 7.24 (s, 2H), 7.05-6.98 (m, 2H), 6.79 (d, $J = 8.4$ Hz, 1H), 5.05 (s, 1H), 3.89 (s, 3H), 3.84 (s, 4H), 3.30 (s, 2H), 1.43

(s, 18H), 0.99 (s, 6H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 152.3, 148.4, 147.4, 135.7, 135.3, 132.8, 126.3, 122.0, 113.4, 111.0, 71.7, 58.3, 55.9, 55.8, 40.1, 34.5, 30.5, 23.4, 23.2; IR (KBr) ν : 3645, 2957, 2369, 1716, 1594, 1513, 1462, 1437, 1366, 1254, 1143, 1027, 753 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{27}\text{H}_{40}\text{O}_4(\text{M}^+)$: 428.2927; Found: 428.2924.

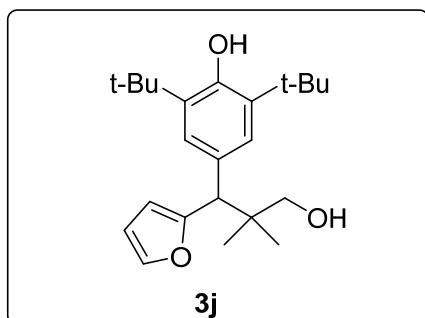
2,6-Di-*tert*-butyl-4-(3-hydroxy-2,2-dimethyl-1-(naphthalen-1-yl)propyl)phenol (3i)



Coloress solid, m.p. 138.5-141.6 °C, 29 mg, yield: 70 %; $R_f = 0.5$ (EtOAc/Petroleum ether 1:10); ^1H NMR (CDCl_3 , 400MHz), δ : 8.43 (d, $J = 8.4 \text{ Hz}$, 1H), 7.92 (d, $J = 7.2 \text{ Hz}$, 1H), 7.83 (d, $J = 8.0 \text{ Hz}$, 1H), 7.72 (d, $J = 8.0 \text{ Hz}$, 1H), 7.54-7.42 (m, 3H), 7.33 (s, 2H), 5.04 (s, 1H), 5.02 (s, 1H), 3.43-3.36 (m, 2H), 1.42 (s, 18H), 1.16 (s, 3H), 1.06 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 152.2, 139.5, 135.2, 134.4, 133.0, 132.2, 129.2, 126.8, 126.8, 126.3, 126.1, 125.3, 125.0, 123.8, 71.8, 49.5, 40.6, 34.4, 30.5, 23.9, 23.7; IR (KBr) ν : 3620, 2957, 2363, 1472, 1431, 1315, 1234, 1118, 1042, 773 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{29}\text{H}_{38}\text{O}_2(\text{M}^+)$: 418.2872; Found: 418.2867.

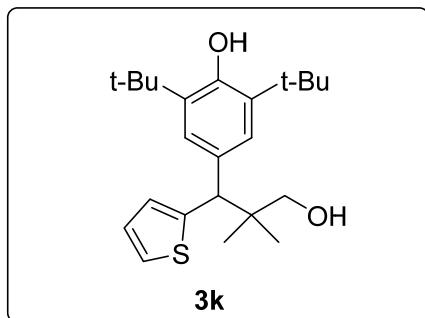
2,6-Di-*tert*-butyl-4-(1-(furan-2-yl)-3-hydroxy-2,2-dimethylpropyl)phe

nol (3j)



Coloress oil, 23 mg, yield: 65 %; $R_f = 0.4$ (EtOAc/Petroleum ether 1:10);
 ^1H NMR (CDCl_3 , 400MHz), δ : 7.37 (d, $J = 1.2$ Hz, 1H), 7.23 (s, 2H),
6.30-6.29 (m, 1H), 6.17 (d, $J = 2.8$ Hz, 1H), 5.09 (s, 1H), 4.02 (s, 1H),
3.31-3.25 (m, 2H), 1.43 (s, 18H), 0.94 (s, 3H), 0.93 (s, 3H); ^{13}C NMR
(CDCl_3 , 100MHz), δ : 156.9, 152.5, 141.1, 135.1, 129.9, 126.6, 110.2,
107.4, 71.1, 51.2, 40.1, 34.4, 30.5, 22.8, 22.7; IR (film) ν : 3640, 3306,
2962, 2369, 1716, 1584, 1503, 1472, 1437, 1361, 1321, 1234, 1153, 1052,
1022, 930, 875, 728 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{23}\text{H}_{34}\text{O}_3$ (M^+):
358.2508; Found: 358.2510.

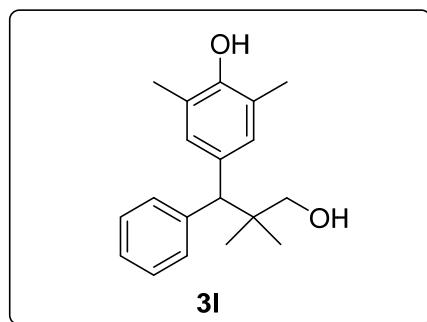
2,6-Di-tert-butyl-4-(3-hydroxy-2,2-dimethyl-1-(thiophen-2-yl)propyl)phenol (3k)



Coloress solid, m.p. 92.5-94.1 °C, 26 mg, yield: 70 %; $R_f = 0.4$
(EtOAc/Petroleum ether 1:10); ^1H NMR (CDCl_3 , 400MHz), δ : 7.26 (s,

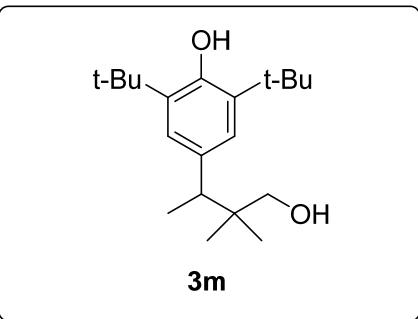
2H), 7.16 (d, $J = 4.8$ Hz, 1H), 7.01-7.00 (m, 1H), 6.95-6.93 (m, 1H), 5.09 (s, 1H), 4.34 (s, 1H), 3.35-3.26 (m, 2H), 1.45 (s, 18H), 1.00 (s, 3H), 0.98 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 152.4, 145.5, 135.2, 131.4, 126.5, 126.4, 126.2, 123.7, 71.2, 53.8, 40.1, 34.5, 30.5, 22.7, 22.6; IR (KBr) ν : 3645, 3312, 2958, 2848, 1707, 1634, 1546, 1499, 1410, 1223, 1087, 853 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{23}\text{H}_{34}\text{O}_2\text{S}$ (M^+): 374.2280; Found: 374.2279.

4-(3-Hydroxy-2,2-dimethyl-1-phenylpropyl)-2,6-dimethylphenol (3l)



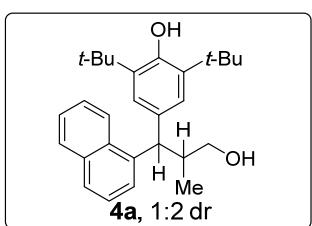
Coloress oil, 17 mg, yield: 30 %; $R_f = 0.3$ (EtOAc/Petroleum ether 1:10); ^1H NMR (CDCl_3 , 400MHz), δ : 7.42 (d, $J = 7.2$ Hz, 2H), 7.28-7.24 (m, 2H), 7.18-7.15 (m, 1H), 7.05 (s, 2H), 4.56 (s, 1H), 3.88 (s, 1H), 3.35-3.29 (m, 2H), 2.21 (s, 6H), 1.02 (s, 3H), 1.00 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 150.8, 142.9, 134.0, 130.1, 129.9, 128.3, 126.2, 122.7, 71.5, 58.0, 39.8, 23.5, 23.1, 16.3; IR (film) ν : 2972, 2364, 1721, 1488, 1371, 1295, 1209, 1027, 875 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{19}\text{H}_{24}\text{O}_2$ (M^+): 284.1776; Found: 284.1782.

2,6-Di-*tert*-butyl-4-(4-hydroxy-3,3-dimethylbutan-2-yl)phenol (3m)



Coloress oil, 21 mg, yield: 70 %; $R_f = 0.4$ (EtOAc/Petroleum ether 1:10);
 ^1H NMR (CDCl_3 , 400MHz), δ : 6.97 (s, 2H), 5.04 (s, 1H), 3.49-3.24 (m, 2H), 2.72 (q, $J = 6.0$ Hz, 1H), 1.43 (s, 18H), 1.24 (d, $J = 6.0$ Hz, 3H), 0.90 (s, 3H), 0.79 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 152.1, 135.1, 134.8, 125.4, 71.5, 45.0, 38.7, 34.4, 30.6, 22.6, 21.3, 15.7; IR (film) ν : 3640, 2962, 2875, 1726, 1645, 1432, 1366, 1316, 1240, 1159, 1037, 880 cm^{-1} ; HRMS (ESI) (m/z): calcd for $\text{C}_{20}\text{H}_{34}\text{O}_2$ ($[\text{M}+\text{H}]^+$): 307.2637; Found: 307.2637.

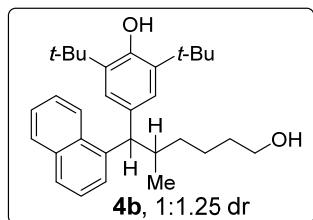
2,6-Di-tert-butyl-4-(3-hydroxy-2-methyl-1-(naphthalen-1-yl)propyl)phenol (4a)



Coloress oil, 19 mg, yield: 48 %; $R_f = 0.4$ (EtOAc/Petroleum ether 1:10);
 ^1H NMR (CDCl_3 , 400MHz), δ : 8.37-8.31 (m, 1H), 7.83 (d, $J = 8.0$ Hz, 1H), 7.72-7.64 (m, 2H), 7.55-7.43 (m, 1H), 7.44-7.43 (m, 3H), 7.20 and 7.18 (s, 2H), 5.00 and 4.97 (s, 1H), 4.52 and 4.51 (d, $J = 10.8$ Hz, 1H), 3.66-3.36 (m, 2H), 2.69-2.62 (m, 1H), 1.39 and 1.38 (s, 18H), 1.28 (d, $J =$

10.8 Hz, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 152.1 and 151.9, 140.6 and 140.3, 135.8 and 135.4, 134.2, 133.8 and 133.7, 132.4 and 132.0, 129.0 and 128.9, 126.6, 125.9 and 125.7, 125.6 and 125.5, 125.3 and 125.2, 124.8 and 124.5, 124.0 and 123.8, 123.6 and 123.4, 67.4 and 66.7, 49.2 and 47.9, 40.4 and 40.3, 34.33 and 34.31, 30.4 and 30.3, 16.6 and 16.5; IR (film) ν : 3635, 3422, 2957, 2870, 1594, 1584, 1437, 1391, 1229, 1027, 971, 789cm $^{-1}$; HRMS (ESI) (m/z): calcd for $\text{C}_{28}\text{H}_{36}\text{O}_2$ ([M+H] $^+$): 405.2793; Found: 405.2793.

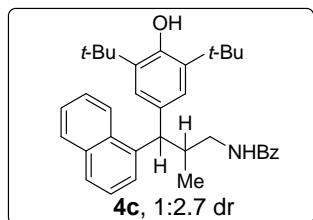
**2,6-Di-*tert*-butyl-4-(6-hydroxy-2-methyl-1-(naphthalen-1-yl)hexyl)phe
nol (4b)**



Coloress oil, 20 mg, yield: 45 %; $R_f = 0.4$ (EtOAc/Petroleum ether 1:10); ^1H NMR (CDCl_3 , 400MHz), δ : 8.34 (t, $J = 9.2$ Hz, 1H), 7.82 (d, $J = 8.0$ Hz, 1H), 7.69-7.60 (m, 2H), 7.53-7.41 (m, 3H), 7.16 and 7.14 (s, 2H), 4.96 and 4.94 (s, 1H), 4.35 and 4.31 (d, $J = 10.8$ Hz, 1H), 3.59-3.49 (m, 2H), 2.49-2.41 (m, 1H), 1.58-1.38 (m, 24H), 0.89 and 0.83 (d, $J = 8.4$ Hz, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 151.9 and 151.8, 141.7 and 141.4, 135.44 and 135.37, 134.72 and 134.70, 134.3 and 134.2, 132.6 and 132.5, 129.0, 126.32 and 126.29, 125.73 and 125.69, 125.24 and 125.20, 124.84 and 124.82, 124.62 and 124.60, 124.0 and 123.8, 123.75 and 123.72,

63.10 and 63.06, 52.3 and 52.1, 37.7 and 37.5, 34.9 and 34.8, 34.42 and 32.40, 32.97 and 32.96, 30.5, 23.3 and 23.0, 18.7 and 18.5; IR (film) ν : 3640, 3397, 2957, 2871, 1599, 1437, 1396, 1320, 1234, 1118, 773 cm^{-1} ; HRMS (ESI) (m/z): calcd for $\text{C}_{31}\text{H}_{42}\text{O}_2$ ([M+H] $^+$): 447.3263; Found: 447.3260.

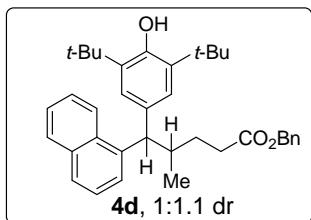
N-(3-(3,5-di-*tert*-butyl-4-hydroxyphenyl)-2-methyl-3-(naphthalen-1-yl)propyl)benzamide (4c)



Coloress solid, 29 mg, yield: 57 %; m.p. 255.6-256.2 °C; $R_f = 0.3$ (EtOAc/Petroleum ether 1:5); ^1H NMR (CDCl_3 , 400MHz), δ : 8.37 and 8.27 (d, $J = 8.8$ Hz, 1H), 7.86-7.67 (m, 3H), 7.56-7.33 (m, 8H), 7.28 and 7.20 (s, 2H), 5.94 and 5.53 (s, 1H), 5.08 and 5.01 (s, 1H), 4.47 and 4.44 (d, $J = 10.4$ Hz, 1H), 3.95-3.18 (m, 2H), 2.90-2.77 (m, 1H), 1.40 and 1.31 (s, 18H), 1.04 and 1.01 (d, $J = 6.4$ Hz, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 167.4 and 166.8, 152.6 and 152.1, 140.2 and 140.1, 136.4 and 135.7, 134.6 and 134.3, 134.4 and 134.2, 133.8, 132.2 and 131.9, 131.34 and 131.29, 129.3 and 129.1, 128.5, 126.91 and 126.80, 126.85, 126.60 and 125.94, 125.88 and 125.61, 125.5 and 125.4, 124.9 and 124.8, 124.5 and 123.8, 123.5 and 123.3, 52.9 and 50.5, 46.4 and 45.2, 39.1 and 38.4, 34.4, 30.5 and 30.3, 19.0 and 18.0; IR (film) ν : 3634, 2957, 1716, 1600, 1437,

1275, 1153, 1067, 966, 885 cm⁻¹; HRMS (ESI) (*m/z*): calcd for C₃₅H₄₁NO₂ ([M+H]⁺): 508.3215; Found: 508.3215.

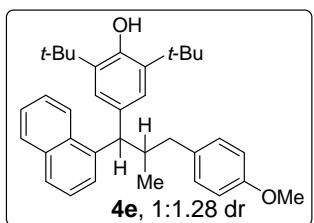
Benzyl-5-(3,5-di-*tert*-butyl-4-hydroxyphenyl)-4-methyl-5-(naphthalen-1-yl)pentanoate (4d)



Coloress oil, 37 mg, yield: 66 %; R_f = 0.4 (EtOAc/Petroleum ether 1:100); ¹H NMR (CDCl₃, 400MHz), δ: 8.26-8.21 (m, 1H), 7.75-7.73 (m, 1H), 7.61-7.59 (m, 1H), 7.54-7.48 (m, 1H), 7.44-7.43 (m, 3H), 7.28-7.18 (m, 5H), 7.07-7.04 (m, 2H), 5.02-4.87 (m, 3H), 4.26 and 4.24 (d, *J* = 10.8 Hz, 1H), 2.42-2.17 (m, 3H), 1.84-1.71 (m, 1H), 1.30-1.29 (m, 19H), 0.81 and 0.76 (d, *J* = 6.4 Hz, 3H); ¹³C NMR (CDCl₃, 100MHz), δ: 173.8 and 173.7, 152.0 and 151.9, 141.3, 140.7, 136.2 and 136.1, 135.6 and 135.4, 134.4 and 134.3, 134.2 and 134.1, 132.5 and 132.4, 129.1, 128.69 and 128.65, 128.3, 126.6 and 126.4, 125.81 and 125.78, 125.72 and 125.71, 125.3, 124.83 and 124.79, 123.9 and 123.8, 123.67 and 123.64, 66.21 and 66.20, 55.3 and 55.1, 37.2 and 37.1, 34.41 and 34.40, 32.2 and 32.1, 30.49 and 30.48, 18.31 and 18.29; IR (film) ν: 3635, 2957, 2871, 1731, 1594, 1432, 1361, 1240, 1159, 1082, 966, 875, 773cm⁻¹; HRMS (ESI) (*m/z*): calcd for C₃₇H₄₄O₃ ([M+Na]⁺): 559.3188; Found: 559.3191.

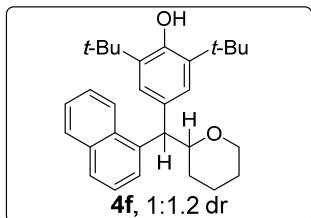
2,6-Di-*tert*-butyl-4-(3-(4-methoxyphenyl)-2-methyl-1-(naphthalen-1-yl

(*t*-propyl)phenol (4e**)**



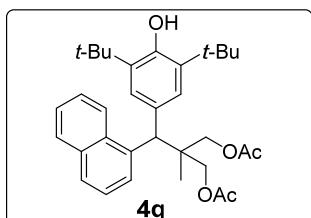
Coloress oil, 23 mg, yield: 45 %; $R_f = 0.4$ (EtOAc/Petroleum ether 1:120);
 ^1H NMR (CDCl_3 , 400MHz), δ : 8.36 and 8.30 (d, $J = 8.8$ Hz, 1H),
7.84-7.41 (m, 6H), 7.24 and 7.13 (s, 2H), 7.01-6.95 (m, 2H), 6.81-6.76 (m,
2H), 4.97 and 4.93 (s, 1H), 4.40 and 4.35 (d, $J = 10.8$ Hz, 1H), 3.74 and
3.76 (s, 3H), 2.83-2.64 (m, 2H), 2.16-2.09 (m, 1H), 1.40 and 1.35 (s,
18H), 0.79 and 0.72 (d, $J = 8.4$ Hz, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ :
157.6, 151.9 and 151.8, 141.34 and 141.25, 135.5 and 135.3, 134.24 and
134.19, 134.1 and 134.0, 133.4, 132.4 and 132.3, 130.1 and 130.0, 129.0,
126.5 and 126.2, 125.70 and 125.67, 125.67 and 125.63, 125.2 and 125.1,
124.8 and 124.7, 123.8 and 123.7, 123.7 and 123.6, 113.54 and 113.45,
55.3 and 55.2, 52.2 and 51.9, 41.0 and 40.8, 40.7 and 40.2, 34.4 and 34.3,
30.43 and 30.39, 18.3 and 18.0; IR (film) ν : 3640, 2957, 2865, 1609,
1508, 1432, 1397, 1250, 1173, 1042, 794cm⁻¹; HRMS (ESI) (m/z): calcd
for $\text{C}_{35}\text{H}_{42}\text{O}_2$ ([M+Na]⁺): 517.3083; Found: 517.3083.

**2,6-Di-*tert*-butyl-4-(naphthalen-1-yl(tetrahydro-2H-pyran-2-yl)methyl)
phenol (**4f**)**



Coloress oil, 26 mg, yield: 60 %; $R_f = 0.4$ (EtOAc/Petroleum ether 1:100);
 ^1H NMR (CDCl_3 , 400MHz), δ : 8.38 and 8.20 (d, $J = 8.8$ Hz, 1H), 7.84 and 7.80 (d, $J = 8.8$ Hz, 1H), 7.72-7.37 (m, 5H), 7.22 and 7.10 (s, 2H), 4.99 and 4.98 (s, 1H), 4.79 and 4.66 (d, $J = 8.8$ Hz, 1H), 4.15-3.94 (m, 2H), 3.53-3.45 (m, 1H), 1.66-1.35 (s, 24H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 152.2 and 152.1, 140.0 and 138.4, 135.5 and 135.2, 134.4 and 134.1, 133.2 and 132.7, 132.3 and 132.2, 129.0 and 128.9, 126.7 and 126.6, 126.0, 125.7 and 125.6, 125.4 and 125.3, 125.1, 125.0 and 124.2, 124.0 and 123.9, 80.8 and 79.8, 68.9 and 68.8, 52.3 and 50.8, 34.44 and 34.38, 30.50 and 30.46, 30.32 and 30.25, 26.2 and 26.1, 24.0 and 23.9; IR (film) ν : 3635, 3053, 2952, 2860, 1599, 1432, 1361, 1159, 1082, 773 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{30}\text{H}_{38}\text{O}_2(\text{M}^+)$: 430.2872; Found: 430.2786.

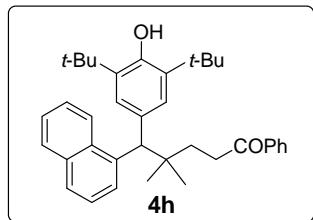
2-((3,5-Di-*tert*-butyl-4-hydroxyphenyl)(naphthalen-1-yl)methyl)-2-methylpropane-1,3-diyi diacetate (4g)



Coloress solid, m.p. 187.6-188.2 °C, 43 mg, yield: 82 %; $R_f = 0.4$ (EtOAc/Petroleum ether 1:7); ^1H NMR (CDCl_3 , 400MHz), δ : 8.29 (d, J

=8.4 Hz, 1H), 7.92-7.71 (m, 3H), 7.53-7.41 (m, 3H), 7.26 (s, 2H), 5.15 (s, 1H), 5.04 (s, 1H), 4.07-3.91 (m, 4H), 2.06 (s, 3H), 1.84 (s, 3H), 1.39 (s, 18H), 1.26 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 171.0, 170.8, 152.6, 137.6, 135.4, 134.5, 132.7, 130.0, 129.4, 127.4, 126.8, 126.2, 126.1, 125.4, 125.0, 123.2, 67.7, 67.4, 46.6, 41.9, 34.4, 30.4, 21.1, 20.9, 17.5; IR (KBr) ν : 3630, 2962, 1641, 1609, 1543, 1508, 1432, 1310, 1254, 1031, 849, 773 cm $^{-1}$; HRMS (ESI) (m/z): calcd for $\text{C}_{33}\text{H}_{42}\text{O}_5$ ([M+H] $^+$): 519.3110; Found: 519.3110.

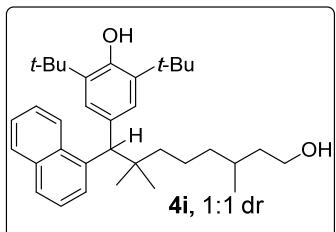
5-(3,5-Di-*tert*-butyl-4-hydroxyphenyl)-4,4-dimethyl-5-(naphthalen-1-yl)-1-phenylpentan-1-one (4h)



Coloress oil, 24 mg, yield: 46 %; $R_f = 0.5$ (EtOAc/Petroleum ether 1:100); ^1H NMR (CDCl_3 , 400MHz), δ : 8.37 (d, $J = 8.8$ Hz, 1H), 7.95-7.73 (m, 3H), 7.55-7.43 (m, 6H), 7.30-7.28 (m, 4H), 5.03 (s, 1H), 4.80 (s, 1H), 2.88-2.73 (m, 2H), 1.95-1.80 (m, 2H), 1.39 (s, 18H), 1.19 (s, 3H), 1.15 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 201.4, 152.2, 139.6, 136.8, 135.0, 134.4, 132.9, 132.8, 132.2, 129.3, 128.6, 128.2, 127.0, 126.8, 126.2, 126.2, 125.3, 125.2, 123.6, 53.1, 38.3, 37.4, 34.4, 34.3, 30.5, 27.7, 27.0; IR (film) ν : 3636, 2965, 1722, 1680, 1594, 1437, 1359, 1243, 1210, 1118, 971, 780 cm $^{-1}$; HRMS (EI) (m/z): calcd for $\text{C}_{37}\text{H}_{44}\text{O}_2$ (M^+): 520.3341;

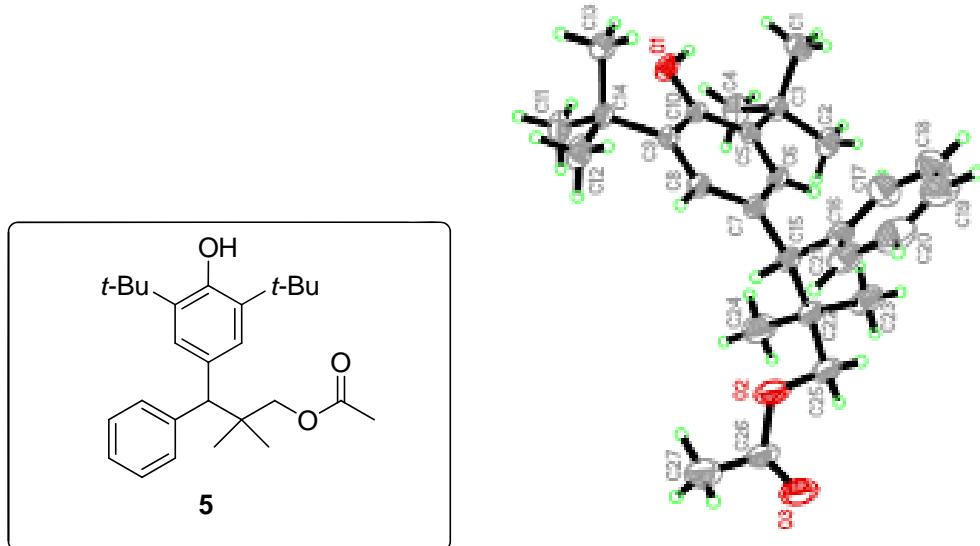
Found: 520.3341.

2,6-Di-*tert*-butyl-4-((6*S*)-8-hydroxy-2,2,6-trimethyl-1-(naphthalen-1-yl)octyl)phenol (4i)



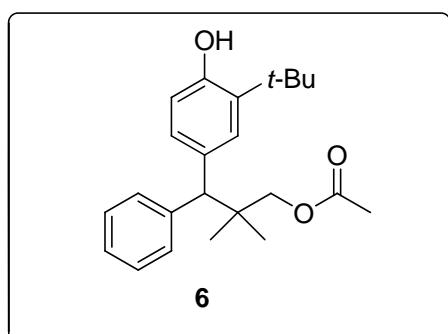
Coloress oil, 19 mg, yield: 39 %; $R_f = 0.4$ (EtOAc/Petroleum ether 1:10); ^1H NMR (CDCl_3 , 400MHz), δ : 8.33 (d, $J = 8.8$ Hz, 1H), 7.94-7.68 (m, 3H), 7.51-7.40 (m, 3H), 7.25 and 7.24 (s, 2H), 4.97 and 4.97 (s, 1H), 4.75 (s, 1H), 3.54-3.39 (m, 2H), 1.40 (s, 18H), 1.36-1.24 (m, 9H), 1.09 (s, 3H), 1.06 and 1.05(s, 3H), 0.72 and 0.71(d, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 151.9, 140.25 and 140.22, 134.70 and 134.69, 134.31 and 134.29, 133.08 and 133.06, 132.57 and 132.53, 129.15 and 129.11, 127.0, 126.50 and 126.48, 126.0, 125.90 and 125.85, 125.04, 125.00, 123.9, 61.28 and 61.24, 53.18 and 53.16, 42.6 and 42.4, 39.9 and 39.7, 38.38 and 38.37, 38.0 and 37.8, 34.4, 30.5, 29.4 and 29.2, 27.6 and 27.5, 26.4 and 26.3, 21.5 and 21.1, 19.7; IR (film) ν : 3645, 2952, 1646, 1508, 1361, 1316, 1238, 1189, 11118, 778 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{35}\text{H}_{50}\text{O}_2(\text{M}^+)$: 502.3811; Found: 502.3794.

3-(3,5-Di-*tert*-butyl-4-hydroxyphenyl)-2,2-dimethyl-3-phenylpropyl acetate (5)



Coloress solid, 89 mg, yield: 99 %; m.p. 110.6-111.2 °C;; $R_f = 0.4$ (EtOAc/Petroleum ether 1:20); ^1H NMR (CDCl_3 , 400MHz), δ : 7.41 (d, J = 7.6 Hz, 2H), 7.24-7.13 (m, 5H), 5.00 (s, 1H), 3.84 (s, 1H), 3.69 (s, 2H), 2.05 (s, 3H), 1.38 (m, 18H), 1.01 (s, 3H), 0.97 (s, 3H); ^{13}C NMR (CDCl_3 , 100MHz), δ : 171.2, 152.3, 142.7, 135.2, 132.1, 130.0, 128.2, 126.5, 126.3, 72.2, 59.3, 38.4, 34.4, 30.5, 23.8, 23.1, 21.2; IR (film) ν : 3640, 2962, 1736, 1594, 1442, 1371, 1118, 1037, 875 cm^{-1} ; HRMS (EI) (m/z): calcd for $\text{C}_{27}\text{H}_{38}\text{O}_3(\text{M}^+)$: 410.2821; Found: 410.2825.

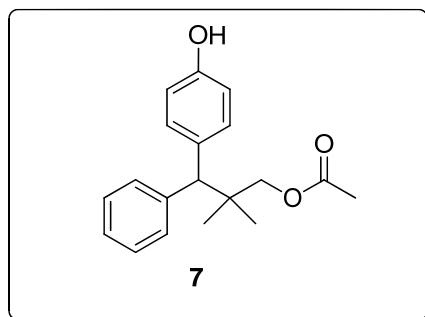
3-(3-(*tert*-Butyl)-4-hydroxyphenyl)-2,2-dimethyl-3-phenylpropyl acetate (6)



Coloress oil, 33 mg, yield: 95 %; $R_f = 0.4$ (EtOAc/Petroleum ether 1:10);

¹H NMR (CDCl₃, 400MHz), δ: 7.41 (d, *J* =7.2 Hz, 2H), 7.28-7.24 (m, 3H), 7.19-7.10 (m, 2H), 6.54 (d, *J* =8.0 Hz, 1H), 5.19-5.15 (m, 1H), 3.89 (s, 1H), 3.78-3.72 (m, 2H), 2.08 (s, 3H), 1.38 (m, 9H), 1.03 (s, 3H), 1.01 (s, 3H); ¹³C NMR (CDCl₃, 100MHz), δ: 171.5, 153.0, 142.4, 135.5, 133.3, 130.0, 129.0, 128.2, 127.9, 126.4, 116.2, 72.2, 58.9, 38.4, 34.6, 29.7, 23.7, 23.2, 21.2; IR (film) *v*: 3428, 2957, 1711, 1604, 1513, 1427, 1381, 1254, 1088, 1037, 819, 702 cm⁻¹; HRMS (EI) (*m/z*): calcd for C₂₃H₃₀O₃ (M⁺): 354.2195; Found: 354.2201.

3-(4-Hydroxyphenyl)-2,2-dimethyl-3-phenylpropyl acetate (7)



Coloress solid, m.p. 124.0-124.2 °C, 25 mg, yield: 91 %; R_f = 0.4 (EtOAc/Petroleum ether 1:7); ¹H NMR (CDCl₃, 400MHz), δ: 7.38 (d, *J* =7.6 Hz, 2H), 7.26-7.14 (m, 5H), 6.72-6.69 (m, 2H), 5.65-5.60 (m, 1H), 3.89 (s, 1H), 3.80-3.74 (m, 2H), 2.06 (s, 3H), 1.03 (s, 3H), 1.01 (s, 3H); ¹³C NMR (CDCl₃, 100MHz), δ: 171.7, 154.4, 142.1, 133.7, 131.0, 129.9, 128.3, 126.4, 115.1, 72.2, 58.6, 38.3, 23.6, 23.3, 21.1; IR (KBr) *v*: 3255, 3077, 2967, 2354, 1706, 1609, 1513, 1457, 1381, 1280, 1042, 743, 698 cm⁻¹; HRMS (EI) (*m/z*): calcd for C₁₉H₂₂O₃ (M⁺): 298.1569; Found: 298.1567.

5. References

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(b) Richter, D.; Hampel, N.; Singer, T.; Ofial, R. A.; Mayr, H. *Eur. J. Org. Chem.* **2009**, 3203. (c) Uno, T.; Minari, M.; Kubo, M.; Itoh, T. *J. Polym. Sci., Part A: Polym. Chem.* **2004**, *42*, 4548. (d) Bacha, J. D.; Matthews, J. S. *US 4032547*, 1977.
2. B-Koutek, L.; Pavlickova; M, Souc'ek *Synthetic Commun.* **1976**, *6*, 305.

