

SUPPORTING INFORMATION

Pd-Catalyzed Cross-Coupling of Aryllithium Reagents with 2-Alkoxy-Substituted Aryl Chlorides: Mild and Efficient Synthesis of 3,3'-Diaryl BINOLs.

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General Methods:

Chromatography: Merck silica gel type 9385 230-400 mesh, TLC: Merck silica gel 60, 0.25 mm. Components were visualized by UV and cerium/molybdenum or potassium permanganate staining. Progress of the reaction and conversion were determined by GC-MS (GC, HP6890; MS HP5973) with an HP1 or HP5 column (Agilent Technologies, Palo Alto, CA). Mass spectra were recorded on a LTQ Orbitrap XL (ESI+). ^1H - and ^{13}C -NMR were recorded on a Varian AMX400 (400 and 100.59 MHz, respectively) or a Varian VXR300 (300 and 75 MHz, respectively) using CDCl_3 as solvent. Chemical shift values are reported in ppm with the solvent resonance as the internal standard (CHCl_3 : δ 7.26 for ^1H , δ 77.0 for ^{13}C). Data are reported as follows: chemical shifts, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, br = broad, m = multiplet), coupling constants (Hz), and integration. Carbon assignments are based on APT ^{13}C -NMR experiments. Optical rotations were measured on a *Schmidt + Haensch* polarimeter (Polartronic MH8) with a 10 cm cell (c given in g/100 mL).

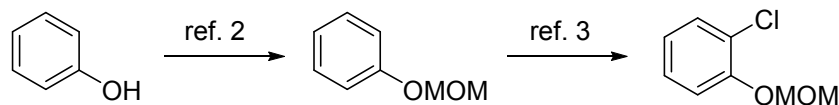
All reactions were carried out under a nitrogen atmosphere using oven dried glassware and using standard Schlenk techniques. THF and toluene were dried and distilled over sodium. Hexachloroethane, $\text{Pd}_2(\text{dba})_3$, P^tBu_3 , XPhos and Pd-PEPPSI-Ipent were purchased from Aldrich and used without further purification. PhLi (1.8 M solution in dibutylether) and $^n\text{BuLi}$ (1.6 M solution in hexane) were purchased from Acros. $^i\text{BuLi}$ (1.7 M solution in pentane) was purchased from Aldrich. *O*-chloroanisole **1a** and *O*-bromoanisole **1a'** were purchased from TCI Europe N.V. Aryl chlorides **1b** and **3a-b** were synthesized according to described procedures (vide infra).

Organolithium reagents other than the afore mentioned were prepared according to our previously described procedures.¹ Compounds used as precursors for the preparation of these organolithium reagents, namely, 1-bromo-2,6-dimethyl-benzene, 1-bromo-4-methoxybenzene, 1-bromo-3-trifluoromethyl-benzene, 1-bromo-2,4,6-triisopropylbenzene and 1,3-dimethoxybenzene were purchased from Aldrich. Mesityl bromide was purchased from TCI Europe N.V.

¹ (a) Giannerini, M.; Fañanás-Mastral, M.; Feringa, B. L. *Nature Chem.* **2013**, *5*, 667. (b) Giannerini, M.; Hornillos, V.; Vila, C.; Fañanás-Mastral, M.; Feringa, B. L. *Angew. Chem. Int. Ed.* **2013**, *52*, 13329-13333.

Preparation of substrates:

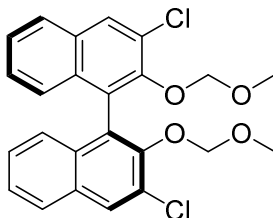
A. 1-Chloro-2-(methoxymethoxy)benzene (**1b**)^{2,3}



To a solution of phenol (10 mmol) in DMF (15 mL) cooled at 0 °C a suspension of NaH (1 equiv, 10 mmol) in DMF (10 mL) was added. The mixture was warmed to 23 °C and stirred at that temperature for 15 min. Then the mixture was cooled to 0 °C, chloromethylmethyl ether (2 equiv, 20 mmol) was added and the resulting mixture was warmed to room temperature and stirred overnight. Then this suspension was diluted with 50 mL of ether and poured into 50 mL of H₂O. The organic layer was washed with 1M KOH aq. (50 mL), H₂O (50 mL) and brine (50 mL), dried over Na₂SO₄, filtered and concentrated. Purification by column chromatography on silica gel (*n*-pentane/EtOAc 100:5) afforded pure (methoxymethoxy)benzene in 93% yield (9.3 mmol).

(Methoxymethoxy)benzene was dissolved in dry THF and the solution was cooled to -78 °C. ^tBuLi (1 equiv, 9.3 mmol) was added slowly and the solution was stirred for 1 h. Then the solution was warmed to 0 °C and hexachloroethane (3 equiv, 27.9 mmol) was added. The mixture was warmed up to room temperature overnight before quenching with saturated aq. NH₄Cl solution. The layers were separated and the aqueous layer was extracted with CH₂Cl₂ (3 x 50 mL). The combined organic layers were dried over Na₂SO₄ and concentrated *in vacuo*. The residue was purified by column chromatography on silica gel (*n*-pentane/Et₂O 10:1) to provide 8.5 mmol (85% yield over 2 steps) of 1-chloro-2-(methoxymethoxy)benzene **1b** as a colorless oil.

B. (*S*)-3,3'-Dichloro-2,2'-bis(methoxymethoxy)-1,1'-binaphthalene (**3a**)

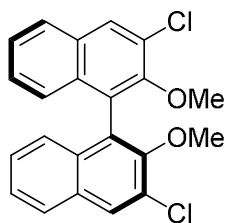


Synthesized according to a literature procedure.³

² Vo, C.-V. T.; Mitchell, T. A.; Bode, J. W. *J. Am. Chem. Soc.*, **2011**, *133* 14082–14089.

³ Turner, H. M.; Patel, J.; Niljianskul, N.; Chong, J. M. *Org. Lett.* **2011**, *13*, 5796-5799.

C. (*S*)-3,3'-Dichloro-2,2'-dimethoxy-1,1'-binaphthalene (**3b**)



To a stirred solution of N,N,N',N'-tetramethylethylenediamine (TMEDA) (2.69 mL, 17.8 mmol, 2.8 equiv) in anhydrous Et₂O (100 mL) was added ⁿBuLi (11.9 mL, 19.31 mmol, 3.0 equiv) at room temperature. The resultant colorless solution was stirred at ambient temperature for 1 h. Next, (*S*)-2,2'-dimethoxy-1,1'-binaphthalene (2.0 g, 6.36 mmol, 1 equiv) was added as a solid and the resultant solution was stirred for 6 h. Then the reaction mixture was cooled to 0 °C and THF (70 mL) and hexachloroethane (5 g, 19.1 mmol, 3 equiv) were added. The mixture was stirred overnight at room temperature before quenching with saturated aq. NH₄Cl. The combined organic layers were dried over Na₂SO₄ and concentrated *in vacuo*. The residue was purified by column chromatography on silica gel (*n*-pentane/Et₂O 10:1) to provide 2.16 g (89% yield) of (*S*)-3,3'-dichloro-2,2'-dimethoxy-1,1'-binaphthalene **3b**.

¹H NMR (400 MHz, CHCl₃) δ 8.07 (s, 2H), 7.83 (dt, *J* = 7.9, 0.6 Hz, 2H), 7.43 (ddd, *J* = 8.1, 6.8, 1.2 Hz, 2H), 7.26 (ddd, *J* = 8.3, 6.9, 1.3 Hz, 2H), 7.08 (ddd, *J* = 8.5, 1.3, 0.7 Hz, 2H), 3.55 (s, 6H). ¹³C NMR (101 MHz, CDCl₃) δ 151.8, 132.6, 130.9, 129.5, 127.9, 127.2, 126.7, 126.6, 125.9, 125.7, 61.0. HRMS (ESI+, *m/z*): calcd for C₂₂H₁₇Cl₂O₂ [M+H] 383.0600; found: 383.0596.

General procedure for the cross-coupling of aryllithium reagents with 2-alkoxy-substituted aryl chlorides

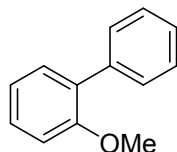
In a dry Schlenk flask Pd-PEPSSI-IPent (5 mol%, 0.015 mmol, 11.9 mg) and the corresponding substrate **1** (0.3 mmol) were dissolved in 0.5 mL of dry toluene and the solution was warmed to 40 °C. The corresponding aryllithium reagent (0.45 mmol, 1.5 equiv) was diluted with THF to reach the concentration of 0.6 M; the resulting solution was slowly added by syringe pump over 2 h to the solution of **1** and catalyst. After the addition was completed the mixture was quenched with MeOH (1 mL). Evaporation of the solvent under reduced pressure afforded the crude product that was then purified by column chromatography.

General protocol for the synthesis of 3,3'-diaryl BINOLs via palladium-catalyzed cross-coupling of aryllithium reagents

In a dry Schlenk flask Pd-PEPSSI-IPent (5 mol%, 0.015 mmol, 7.8 mg) and the corresponding substrate **3** (0.2 mmol) were dissolved in 1 mL of dry toluene and the solution was warmed to 40

°C. The corresponding aryllithium reagent (0.6 mmol, 3 equiv) was diluted with THF to reach the concentration of 0.6 M; this solution was slowly added by syringe pump over 2 h to the solution of **3** and catalyst. After the addition was completed the mixture was quenched with MeOH (1 mL). Evaporation of the solvent under reduced pressure afforded the crude product that was then purified by column chromatography.

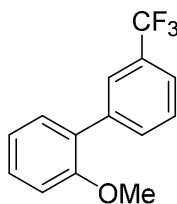
Compound characterization



2-Methoxy-1,1'-biphenyl (**2a**)

CAS Registry Number: 86-26-0

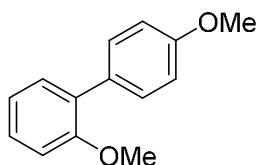
Colorless oil obtained in 78% yield (43 mg) after column chromatography (SiO₂, *n*-pentane/Et₂O 100:1). ¹H NMR (400 MHz, CDCl₃) δ 7.57 (d, *J*=7.9 Hz, 2H), 7.44 (t, *J*=7.5 Hz, 2H), 7.36 (dt, *J*=11.8, 3.5 Hz, 3H), 7.10 – 6.99 (m, 2H), 3.84 (s, 3H). ¹³C NMR (50 MHz, CDCl₃) δ 156.4, 138.5, 130.9, 130.7, 129.5, 128.6, 127.9, 126.9, 120.8, 111.2, 55.5.



2-Methoxy-3'-(trifluoromethyl)-1,1'-biphenyl (**2b**)

CAS Registry Number: 1334621-11-2

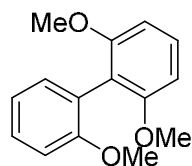
Colorless oil obtained in 79% yield (60 mg) after column chromatography (SiO₂, *n*-pentane/Et₂O 100:1). ¹H NMR (400 MHz, CDCl₃) δ 7.80 (s, 1H), 7.73 (d, *J*=7.6 Hz, 1H), 7.58 (d, *J*=7.8 Hz, 1H), 7.53 (d, *J*=7.7 Hz, 1H), 7.40 – 7.30 (m, 2H), 7.06 (td, *J*=7.5, 1.0 Hz, 1H), 7.02 (d, *J*=8.3 Hz, 1H), 3.83 (s, 3H). ¹³C NMR (50 MHz, CDCl₃) δ 156.3, 139.2, 132.8, 130.7, 129.4, 128.3, 126.3, 123.6, 121.0, 111.3, 55.5.



2,4'-Dimethoxy-1,1'-biphenyl (**2c**)

CAS Registry Number: 49602-47-3

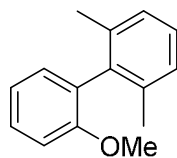
Colorless solid obtained in 74% yield (48 mg) after column chromatography (SiO₂, *n*-pentane/CH₂Cl₂ 8:2). ¹H NMR (400 MHz, CDCl₃) δ 7.50 (d, *J*=7.6 Hz, 2H), 7.30 (dd, *J*=19.3, 11.6 Hz, 2H), 7.07 – 6.94 (m, 4H), 3.86 (s, 3H), 3.83 (s, 3H). ¹³C NMR (50 MHz, CDCl₃) δ 158.6, 156.4, 130.7, 130.6, 128.2, 127.7, 120.8, 114.2, 113.5, 111.2, 55.5, 55.3.



2,2',6-Trimethoxy-1,1'-biphenyl (2d)

CAS Registry Number: 70388-58-8

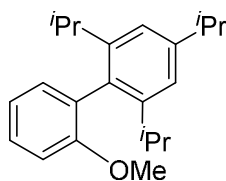
White solid obtained in 81% yield (60 mg) after column chromatography (SiO₂, *n*-pentane/Et₂O 100:0.3 to 100:1). ¹H NMR (200 MHz, CDCl₃) δ 7.31 – 7.05 (m, 3H), 6.93 (t, *J*=7.6 Hz, 2H), 6.57 (d, *J*=8.3 Hz, 2H), 3.67 (s, 3H), 3.64 (s, 6H). ¹³C NMR (50 MHz, CDCl₃) δ 158.1, 157.5, 132.1, 128.7, 128.5, 123.6, 120.3, 116.3, 111.2, 104.2, 56.0, 55.8.



2'-Methoxy-2,6-dimethyl-1,1'-biphenyl (2e)

CAS Registry Number: 137898-21-6

Colorless oil obtained in 75% yield (47 mg) after column chromatography (SiO₂, *n*-pentane/Et₂O 100:0.1 to 100:1). ¹H NMR (400 MHz, CDCl₃) δ 7.36 (ddd, *J*=8.3, 6.4, 2.8 Hz, 1H), 7.18 (dd, *J*=8.6, 6.2 Hz, 1H), 7.14 – 7.10 (m, 2H), 7.07 – 6.97 (m, 3H), 3.75 (s, 3H), 2.03 (s, 6H). ¹³C NMR (50 MHz, CDCl₃) δ 156.5, 138.2, 136.6, 130.6, 129.5, 128.4, 127.0, 127.0, 120.7, 110.9, 55.4, 20.4.

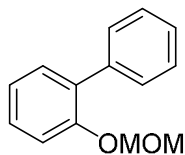


2,4,6-Triisopropyl-2'-methoxy-1,1'-biphenyl (2f)

CAS Registry Number: 787618-34-2

Colorless oil obtained in 80% yield (75 mg) after column chromatography (SiO₂, *n*-pentane/Et₂O 100:1). ¹H NMR (400 MHz, CDCl₃) δ 7.32 – 7.26 (m, 1H), 7.21 (s, 1H), 7.03 – 6.98 (m, 3H), 6.93 (dd, *J*=12.7, 7.8 Hz, 2H), 3.67 (s, 3H), 2.90 (septet, *J*=7.0 Hz, 1H), 2.49 (septet, *J*=6.9 Hz, 2H),

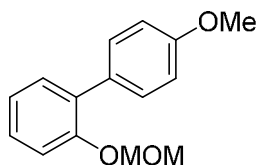
1.26 (d, $J=6.9$ Hz, 6H), 1.02 (t, $J=6.7$ Hz, 12H). ^{13}C NMR (50 MHz, CDCl_3) δ 147.1, 134.3, 133.4, 132.0, 129.8, 128.5, 120.9, 120.5, 110.8, 55.5, 34.5, 30.9, 24.7, 24.4, 24.2.



2-(Methoxymethoxy)-1,1'-biphenyl (2g)

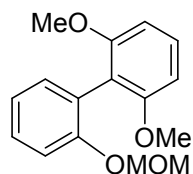
CAS Registry Number: 115377-97-4

Colorless oil obtained in 83% yield (53 mg) after column chromatography (SiO_2 , *n*-pentane/ Et_2O 100:1). ^1H NMR (400 MHz, CDCl_3) δ 7.47 – 7.43 (m, 2H), 7.33 (dd, $J=8.1$, 6.8 Hz, 2H), 7.28 – 7.18 (m, 3H), 7.16 – 7.11 (m, 1H), 7.02 (dd, $J=7.4$, 1.2 Hz, 1H), 5.03 (s, 2H), 3.30 (s, 3H). ^{13}C NMR (50 MHz, CDCl_3) δ 154.2, 138.6, 131.9, 130.9, 129.5, 128.6, 127.9, 126.9, 122.2, 115.7, 95.0, 56.0.



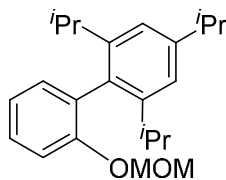
4'-Methoxy-2-(methoxymethoxy)-1,1'-biphenyl (2h)^{1a}

Colorless oil obtained in 81% yield (59 mg) after column chromatography (SiO_2 , *n*-pentane/ CH_2Cl_2 8:2). ^1H NMR (400 MHz, CDCl_3) δ 7.48 (d, $J=8.9$ Hz, 2H), 7.33 (dd, $J=7.5$, 1.6 Hz, 1H), 7.29 – 7.25 (m, 1H), 7.21 (dd, $J=8.2$, 1.1 Hz, 1H), 7.08 (td, $J=7.4$, 1.3 Hz, 1H), 6.97 (d, $J=8.9$ Hz, 1H), 5.13 (s, 2H), 3.86 (s, 3H), 3.41 (s, 3H). ^{13}C NMR (50 MHz, CDCl_3) δ 158.6, 154.1, 131.5, 130.9, 130.8, 130.6, 128.2, 122.3, 115.7, 113.4, 95.1, 56.1, 55.2.



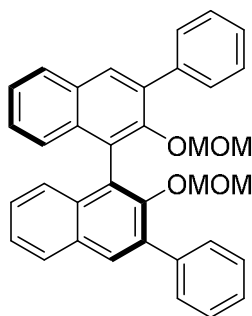
2,6-Dimethoxy-2'-(methoxymethoxy)-1,1'-biphenyl (2i)

White solid obtained in 84% yield (69 mg) after column chromatography (SiO_2 , *n*-pentane/ Et_2O 100:0.3 to 100:1). ^1H NMR (400 MHz, CDCl_3) δ 7.30 (ddd, $J=8.3$, 5.1, 3.8 Hz, 2H), 7.20 (ddd, $J=15.9$, 7.9, 1.3 Hz, 2H), 7.09 (dd, $J=7.3$, 1.2 Hz, 1H), 6.65 (d, $J=8.4$ Hz, 2H), 5.05 (s, 2H), 3.72 (s, 6H), 3.36 (s, 3H). ^{13}C NMR (50 MHz, CDCl_3) δ 158.0, 155.3, 132.2, 128.7, 128.5, 124.8, 121.7, 116.2, 115.7, 103.9, 95.1, 77.7, 77.0, 76.4, 55.9, 55.6. HRMS (ESI-, m/z): calcd for $\text{C}_{16}\text{H}_{17}\text{O}_4$ [M-H] 273.1121; found: 273.1146.



2,4,6-Triisopropyl-2'-(methoxymethoxy)-1,1'-biphenyl (2j)

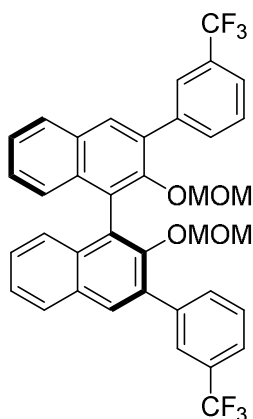
Colorless oil obtained in 85% yield (87 mg) after column chromatography (SiO₂, *n*-pentane/Et₂O 99:1 to 90:10). ¹H NMR (400 MHz, CDCl₃) δ 7.29 – 7.24 (m, 1H), 7.22 – 7.17 (m, 2H), 7.04 – 6.95 (m, 4H), 5.02 (s, 2H), 3.30 (s, 3H), 2.90 (septet, *J*= 6.9 Hz, 1H), 2.51 (septet, *J*=6.8 Hz, 2H), 1.26 (d, *J*=6.9 Hz, 6H), 1.04 (d, *J*=6.9 Hz, 6H), 1.00 (d, *J*=6.9 Hz, 6H). ¹³C NMR (50 MHz, CDCl₃) δ = 155.2, 147.5, 146.6, 133.0, 131.7, 129.9, 128.2, 121.3, 120.4, 114.2, 105.0, 94.3, 55.7, 34.1, 30.5, 24.4, 24.0, 23.8. HRMS (ESI+, *m/z*): calcd for C₂₃H₃₂O₂ [M+H] 341.2475; found: 341.2479.



(S)-2,2'-Bis(methoxymethoxy)-3,3'-diphenyl-1,1'-binaphthalene (6a)

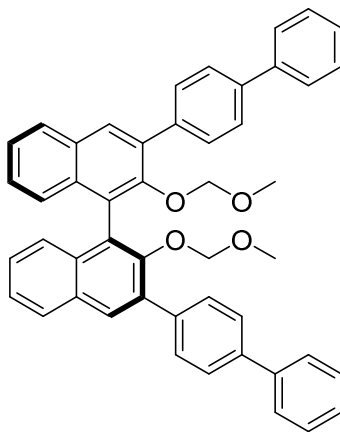
CAS Registry Number: 428874-67-3

Foamy solid obtained in 86% yield (92 mg) after column chromatography (SiO₂, *n*-pentane/EtOAc 100:1 to 100:10). ¹H NMR (400 MHz, CDCl₃) δ 7.97 (s, 2H), 7.91 (d, *J*=8.0 Hz, 2H), 7.78 (d, *J*=6.8 Hz, 4H), 7.53 – 7.35 (m, 8H), 7.31 – 7.27 (m, 4H), 4.41 (d, *J*=9.1 Hz, 4H), 2.36 (s, 6H). ¹³C NMR (50 MHz, CDCl₃) δ 151.3, 139.0, 135.5, 133.6, 130.8, 130.6, 129.6, 128.3, 127.8, 127.3, 126.5, 126.4, 126.3, 125.2, 98.5, 55.8.



(S)-2,2'-Bis(methoxymethoxy)-3,3'-bis(3-(trifluoromethyl)phenyl)-1,1'-binaphthalene (6b)⁴

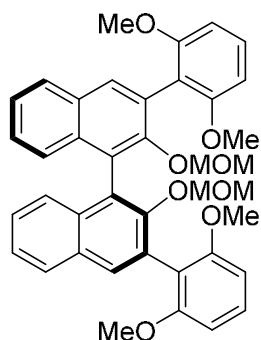
Brown oil obtained in 92% yield (110 mg) after column chromatography (SiO₂, *n*-pentane/toluene 3:7). ¹H NMR (400 MHz, CDCl₃) δ 8.03 (s, 2H), 7.98 (m, 4H), 7.93 (d, *J*=8.2 Hz, 2H), 7.66 (d, *J*=7.9 Hz, 2H), 7.61 (t, *J*=7.7 Hz, 2H), 7.46 (ddd, *J*=8.1, 6.4, 1.5 Hz, 2H), 7.36 – 7.25 (m, 4H), 4.41 (d, *J*=5.9 Hz, 2H), 4.36 (d, *J*=5.9 Hz, 2H), 2.40 (s, 6H). ¹³C NMR (50 MHz, CDCl₃) δ 151.2, 139.8, 134.1, 133.8, 133.2, 131.1, 130.8, 130.8, 130.5, 128.7, 128.0, 126.8, 126.4, 126.3, 125.5, 124.1, 98.8, 56.0.



(S)-3,3'-Di([1,1'-biphenyl]-4-yl)-2,2'-bis(methoxymethoxy)-1,1'-binaphthalene (6c)

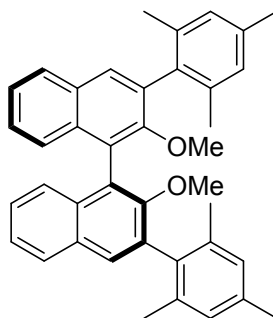
Yellow oil obtained in 82% yield (112 mg) after column chromatography (SiO₂, *n*-hexane/ Et₂O 95:5 to 90:10). ¹H NMR (400 MHz, CDCl₃): δ 8.05 (s, 2H), 7.95 (d, *J* = 8.2 Hz, 2H), 7.91 (d, *J* = 8.2 Hz, 4H), 7.76 (d, *J* = 8.2 Hz, 4H), 7.71 (d, *J* = 7.3 Hz, 4H), 7.55-7.44 (m, 6H), 7.43-7.31 (m, 6H), 4.53 (d, *J* = 5.8 Hz, 2H), 4.49 (d, *J* = 5.8 Hz, 2H), 2.42 (s, 6H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 151.4, 140.7, 140.1, 138.0, 135.0, 133.7, 130.9, 130.6, 130.1, 128.9, 127.9, 127.4, 127.1, 127.1, 126.6, 126.5, 126.4, 125.3, 98.6, 55.9. [α]_D²⁵ = +131.9 (c 1.03, CHCl₃).

⁴ Kobayashi, S.; Kusakabe, K.-I.; Ishitani, H. *Org. Lett.* **2000**, 2, 1225-1227.



(S)-3,3'-Bis(2,6-dimethoxyphenyl)-2,2'-bis(methoxymethoxy)-1,1'-binaphthalene (6d)

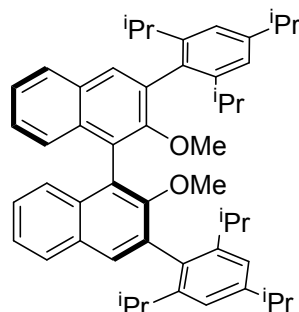
Colorless oil obtained in 64% yield (83 mg) after column chromatography (SiO₂, *n*-pentane/EtOAc 80:20). ¹H NMR (400 MHz, CDCl₃) δ = 7.85 (d, *J*=8.0 Hz, 2H), 7.82 (s, 2H), 7.50 (d, *J*=8.2 Hz, 2H), 7.38 (t, *J*=6.9 Hz, 2H), 7.30 (dt, *J*=5.6, 4.7 Hz, 4H), 6.68 (dd, *J*=8.2, 6.0 Hz, 4H), 4.49 (d, *J*=5.4 Hz, 2H), 4.46 (d, *J*=5.3 Hz, 2H), 3.82 (s, 6H), 3.74 (s, 6H), 2.40 (s, 6H). ¹³C NMR (50 MHz, CDCl₃) δ = 158.5, 158.3, 152.5, 133.7, 131.5, 130.8, 129.0, 128.9, 127.7, 126.6, 125.7, 125.6, 124.4, 117.1, 104.2, 104.1, 98.1, 56.2, 55.8, 55.2. HRMS (ESI+, *m/z*): calcd for C₄₀H₃₈O₈ [M+H]⁺:669.2459; found: 669.2450. [α]_D²³ = -75.2 (c. 1.0, CHCl₃).



(S)-3,3'-Dimesityl-2,2'-dimethoxy-1,1'-binaphthalene (6e)⁵

Colorless solid obtained in 74% yield (81 mg) after column chromatography (SiO₂, *n*-pentane/Et₂O 100:3). ¹H NMR (201 MHz, CDCl₃) δ 7.77 (d, *J*=8.1 Hz, 2H), 7.61 (s, 2H), 7.30 (dd, *J*=8.1, 4.0 Hz, 2H), 7.21 – 7.12 (m, 4H), 6.89 (s, 4H), 3.02 (s, 6H), 2.26 (s, 6H), 2.11 (s, 6H), 2.06 (s, 6H). ¹³C NMR (50 MHz, CDCl₃) δ = 155.2, 137.5, 137.4, 137.1, 136.2, 135.0, 134.4, 131.4, 131.2, 128.8, 128.5, 126.7, 126.4, 126.1, 125.3, 60.6, 21.8, 21.6, 21.4.

⁵ Gribkov, D. V.; Hultsch, K. C.; Hampel, F. *Chem. Eur. J.* **2003**, *9*, 4796–4810.



(S)-3,3'-Bis(2,4,6-triisopropylphenyl)-2,2'-dimethoxy-1,1'-binaphthalene (6f)⁵

White solid obtained in 76% yield (109 mg) after column chromatography (SiO₂, *n*-pentane/Et₂O 100:1). [Reaction on 1.6 mmol scale: 68% yield (780 mg)]. ¹H NMR (400 MHz, CDCl₃) δ 7.86 (d, *J*=8.1 Hz, 2H), 7.75 (s, 2H), 7.41 (ddd, *J*=8.1, 6.4, 1.6 Hz, 2H), 7.32 (dt, *J*=6.4, 4.1 Hz, 4H), 7.10 (d, *J*=5.2 Hz, 4H), 3.09 (s, 6H), 2.97 (septet, *J*=6.9 Hz, 2H), 2.86 (septet, *J*=6.8 Hz, 2H), 2.80 (septet, *J*=6.8 Hz, 2H), 1.33(d, *J*=6.9 Hz, 12H), 1.21 (d, *J*=6.8 Hz, 6H), 1.18 (d, *J*=6.9 Hz, 6H), 1.13 (d, *J*=6.8 Hz, 6H), 1.09 (d, *J*=6.8 Hz, 6H). ¹³C NMR (50 MHz, CDCl₃) δ 155.0, 148.0, 147.0, 146.7, 134.1, 133.8, 133.2, 130.8, 130.2, 127.8, 125.8, 125.7, 124.6, 124.5, 120.6, 59.7, 34.2, 30.9, 30.8, 25.4, 25.2, 24.1, 24.1, 23.3, 23.3.

^1H and ^{13}C NMR spectra

