Supporting Information for

A Facile Assembly of Bifunctional, Magnetically Retrievable Mesoporous Silica for Enantioselective Cascade Reactions

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Experimental

1. General: All experiments, which are sensitive to moisture or air, were carried out under an Ar atmosphere using the standard Schlenk techniques. Tetraethoxysilane (TEOS), 1,4–bis(triethoxysilyl)ethane, cetyltrimethylammonium bromide (CTAB), fluorocarbon surfactant (FC–4: \([\text{C}_3\text{F}_7\text{O}((\text{CFCF}_3)\text{CF}_2\text{O})_2\text{CF}(\text{CF}_3)\text{CONH}(\text{CH}_2)_3\text{N}^+ (\text{C}_2\text{H}_5)_2\text{CH}_3]^-\)), 4–(2–(trimethoxysilyl)ethyl)benzene–1–sulfonyl chloride, 4–(methylphenylsulfonyl)–1,2–diphenylethlenediamine [(S,S)–TsDPEN], PdCl$_2$, (MesityleneRuCl)$_2$ were purchased from Sigma–Aldrich Company Ltd and used as received. Compound of (S,S)–4–(trimethoxysilyl)ethyl)phenylsulfonyl–1,2–diphenylethlenediamine [J. Mater. Chem. 2010, 20, 1970–1975.] were synthesized according to the reported literature.

2. Characterization: Ru and Pd loading amounts in the catalyst were analyzed using an inductively coupled plasma optical emission spectrometer (ICP, Varian VISTA–MPX). Fourier transform infrared (FT–IR) spectra were collected on a Nicolet Magna 550 spectrometer using KBr method. Scanning electron microscopy (SEM) images were obtained using a JEOL JSM−6380LV microscope operating at an acceleration voltage of 220 kV. Nitrogen adsorption isotherms were measured at 77 K using a Quantachrome Nova 4000 analyzer. The samples were measured after being outgassed at 423 K overnight. Pore size distributions were calculated by using the BJH model. The specific surface area ($S_{\text{BET}}$) of samples were determined from the linear parts of BET plots ($p/p_0 = 0.05–1.00$). Solid state NMR experiments were explored on a Bruker AVANCE spectrometer at a magnetic field strength of 9.4 T with $^1$H frequency of 400.1 MHz, $^{13}$C frequency of 100.5 MHz and $^{29}$Si frequency of 79.4 MHz with 4 mm rotor at two spinning frequency of 5.5 kHz and 8.0 kHz, TPPM decoupling is applied in the during acquisition period. $^1$H cross polarization in all solid state NMR experiments was employed using a contact time of 2 ms and the pulse lengths of 4μs.

3. General procedure for the preparation of catalyst 5. In a typical synthesis, (First step for the preparation of 3) the obtained solids 1 (0.20 g) were suspended in an alkaline solution (0.35 mL of NaOH (2.0 M) in mixed 125.0 mL of water and 50.0 mL of ethanol with ultrasonication for 20 minutes. After that, an aqueous solution (0.04 g, 0.044 mmol) of FC–4 (FC–4: \([\text{C}_3\text{F}_7\text{O}((\text{CFCF}_3)\text{CF}_2\text{O})_2\text{CF}(\text{CF}_3)\text{CONH}(\text{CH}_2)_3\text{N}^+ (\text{C}_2\text{H}_5)_2\text{CH}_3]^-\)), 0.08 g (0.22 mmol) of cetyltrimethylammonium bromide (CTAB) and 0.20 mL (25 wt%) of NH$_3$·H$_2$O in 3.0 mL of water) was added, and the mixture was stirred at 38 °C for another 30 minutes. Next, 0.89 g (2.50 mmol) of 1,2–bis(triethoxysilyl)ethane and 0.15 g (0.30 mmol) of (S,S)–ArDpen–siloxane (2) in 2.0 mL of ethanol (2 minutes later) were added at room temperature, and the mixture was stirred under vigorous stirring for further 1.5 h. Finally, the temperature was raised to 80 °C and the mixture was stirred at 80 °C for another 3 h. After cooling the above mixture down to room temperature, the solid was collected by filtration to afford the ArDpen@SiO$_2$@Pd/C@Fe$_3$O$_4$ (3) as a black powder. (Second step for the selective etching) To remove the surfactant, the collected 3 were dispersed in 120 mL of solution (80 mg (1.0 mmol) of ammonium nitrate in 120 mL (95%) of ethanol), and the mixture was stirred at 60 °C for 10 h. After cooling the above mixture down to room temperature, the solids were filtered and washed with excess water and ethanol, and dried at 60 °C under vacuum overnight to afford the ArDpen@Pd/C@Fe$_3$O$_4$ (4) as a dark–gray powder. (Third step for the coordination) 50.0 mg of (MesRuCl)$_2$ (0.086 mmol) was added to a suspension of 4 (0.50 g) in 20.0 mL of dry CH$_2$Cl$_2$ at room temperature, and the resulting mixture was stirred at 25 °C for 12 h. The solids were filtered and rinsed with excess dry CH$_2$Cl$_2$. After Soxhlet extraction for 4.0 h in CH$_2$Cl$_2$, the solids were collected and dried at 60 °C under vacuum overnight to...
afford the magnetic catalyst 5 as a light–gray powder. An inductively coupled plasma optical emission spectrometer (ICP–OES) analysis showed that the Pd and Ru loadings were 41.63 mg (0.39 mmol of Pd) and 9.27 mg (0.091 mmol of Ru) per gram of catalyst, respectively. $^{13}$C CP/MAS NMR (161.9 MHz): 161.5–121.1 (C of Ph and Ar groups), 109.7, 106.2 (C of mesitylene), 78.2–72.9 (CH of –NCHPh), 67.8–64.2 (C of –NCH$_2$ and –NCH$_3$ in CTAB molecule), 38.4–28.7 (CH$_2$ of –CH$_2$Ar and C of CH$_3$CH$_2$– in CTAB molecule), 24.4 (CH$_3$ of mesitylene), 15.0–0.9 (CH$_2$ of –CH$_2$Si) ppm. $^{29}$Si MAS/NMR (79.4 MHz): T$^2$ (δ = −57.7 ppm), T$^3$ (δ = −65.9 ppm), Q$^3$ (δ = −102.6 ppm), Q$^4$ (δ = −112.7 ppm).

4. General procedure for the enantioselective cascade reactions. A typical procedure was as follows. (For successive reduction/ATH enantioselective cascade reductions of styryl-substituted aromatic ketones) Catalyst 5 (21.98 mg, 2.0 μmol of Ru, 8.57 μmol of Pd, based on ICP analysis), HCO$_2$Na (1.0 mmol), ketones (0.10 mmol), and 4.0 mL of the mixed solvents (iPrOH/H$_2$O v/v = 3/1) were added sequentially to a 10.0 mL round–bottom flask. The mixture was then stirred at 50 °C for 6–12 h. (For successive reduction/ATH enantioselective cascade reductions of styryl-substituted aromatic ketones: catalyst 5 (21.98 mg, 2.0 μmol of Ru, 8.57 μmol of Pd, based on ICP analysis), HCO$_2$Na (1.0 mmol), iodoacetophenones (0.10 mmol) and boronic acids (0.12 mmol), and 4.0 mL of the mixed solvents (iPrOH/H$_2$O v/v = 3/1) were added sequentially to a 10.0 mL round–bottom flask. The mixture was then stirred at 60 °C for 12–16 h). During this period, the reaction was monitored constantly by TLC. After completion of the reaction, the catalyst was separated by centrifugation (10,000 rpm) for the recycling experiment. The aqueous solution was extracted with ethyl ether (3 × 3.0 mL). The combined ethyl ether extracts were washed with aqueous Na$_2$CO$_3$ and brine, and then dehydrated with Na$_2$SO$_4$. After evaporation of ethyl ether, the residue was purified by silica gel flash column chromatography to afford the desired product. The ee values were determined using an HPLC analysis with a UV–Vis detector and a Daicel chiralcel column (Φ 0.46 × 25 cm).

Figure S1. FT–IR spectra of 4 and catalyst 5.
Figure S2. TG/DTA curves of 4 and catalyst 5.

Explanation: The TG/DTA curves of ArDpen@Pd/C@Fe₃O₄ (4) and catalyst 5 was treated in the air as shown above. For the ArDpen@Pd/C@Fe₃O₄ (4), an endothermic peak around 351 K with weight loss of (100-93.1) 6.9% could be attributed to the release of physical adsorption water. In addition, the weight loss of (93.1-66.2) 28.9% between 440K and 1200K could be assigned to the oxidation of the organic moieties (including alkyl-linked ArDPEN moiety, alkyl fragments and part of the residual surfactants). Because the totally weight loss of organic moieties was 28.9% per 93.1% the extracted catalyst when eliminated the part of water, meaning the whole weight loss 31.1% of the oxidation of the organic molecules per 100% materials.

For catalyst 5, it was found easily that a similar endothermic peak around 349 K with weight loss of (100-91.9) 8.1% were strongly similar to that of parent 4 due to the release of physical adsorption water. It was worth mentioning that the all exothermic peaks were combined into one complicated exothermic peak between 400K and 1200K with weight loss of (91.9-62.0) 29.9% could be assigned to the oxidation of organic molecules (including alkyl-linked MesityleneRuArDPEN complexes, alkyl fragments and part of the residual surfactants). Because the totally weight loss of organic moieties was 29.9% per 91.9% the extracted catalyst when eliminated the part of water, meaning the whole weight loss 32.5% of the oxidation of the organic molecules per 100% materials.

As compared the weight loss of 5 with 4, the weight loss of the MesityleneCl moieties was 1.4% (32.5-31.1) per 100% materials. This finding means that the mole amounts of [MesityleneCl] in 5 is 0.009003 mol% (Mr = 155.5), demonstrating the 9.1741 mg (0.09003 mmol of Ru) of the Ru loading per gram of 5.
**Figure S3.** Solid-state $^{13}$C CP/MAS NMR spectra of 4’ and catalyst 5’.

**Figure S4.** Solid-state $^{29}$Si MAS NMR spectra of 4’ and catalyst 5’.
**Figure S5.** (a) SEM and TEM (b) images of catalyst 5.

**Figure S6.** Nitrogen adsorption–desorption isotherms of 4 and catalyst 5.
**Figure S7.** Time course for the cascade reaction of (E)-1-(4-styrylphenyl)ethanone catalyzed by 5 (the reaction was performed with 2.0 mmol% Ru and 8.57 mmol% Pd of catalyst 5, 1 equivalent of (E)-1-(4-styrylphenyl)ethan-1-one, and 10.0 equivalent of HCOONa at 50 °C)

**Table S1.** Optimizing reaction conditions for the Suzuki cross-coupling/ATH cascade reaction of 4-iodoacetophenone and phenylboronic acid.

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Reaction conditions: Catalyst 5 (38.50 mg, 3.50 μmol of Ru, 15.0 μmol of Pd, based on ICP analysis), iodoacetophenones (1.0 mmol), boronic acids (1.20 mmol), and 10.0 mL of co–solvents were added sequentially to a 10.0 mL round–bottom flask. Yields were determined by ¹H–NMR analysis.
Figure S8. HPLC analyses for chiral products.

(S)-1-[(1,1'-biphenyl]-4-yl)ethan-1-ol (8a): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 ºC, $t_1 = 19.1$ min (major), $t_2 = 21.8$ min).
(S)-1-(4′-fluoro-[1,1′-biphenyl]-4-yl)ethanol (8b): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 °C, t₁ = 20.0 min (major), t₂ = 23.1 min).

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(S)-1-(3'-chloro-[1,1'-biphenyl]-4-yl)ethanol (8d): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 ºC, t₁ = 17.6 min (major), t₂ = 19.9 min.)
(S)-1-(4′-(trifluoromethyl)-[1,1′-biphenyl]-4-yl)ethanol (8e) : (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 °C, t₁ = 14.3 min (major), t₂ = 19.8 min).
(S)-1-(3′-(trifluoromethyl)-[1,1′-biphenyl]-3-yl)ethan-1-ol (8f): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 ºC, t₁ = 13.9 min (major), t₂ = 15.1 min.)

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(S)-1-(4’-methyl-[1,1’-biphenyl]-4-yl)ethanol (8g): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 ºC, t₁ = 15.5 min (major), t₂ = 20.8 min.)
(S)-1-(3'-methyl-[1,1'-biphenyl]-4-yl)ethanol (8h): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 °C, \( t_1 = 34.6 \) min (major), \( t_2 = 38.3 \) min.)
(S)-1-(4'-methoxy-[1,1'-biphenyl]-4-yl)ethanol (8i): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 ºC, t₁ = 31.2 min (major), t₂ = 36.0 min.)
(S)-1-(4-(thiophen-3-yl)phenyl)ethan-1-ol (8j): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 °C, t₁ = 28.4 min, t₂ = 33.5 min (major)).
(S)-1-([1,1′-biphenyl]-3-yl)ethanol (8k): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 ºC, t₁ = 18.1 min, t₂ = 19.8 min (major)).
(S)-1-(4'-fluoro-[1,1'-biphenyl]-3-yl)ethanol (8l): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 °C, t₁ = 21.1 min, t₂ = 23.4 min (major)).
(S)-1-(4'-chloro-[1,1'-biphenyl]-3-yl)ethanol (8m): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 ºC, t₁ = 22.2 min, t₂ = 25.4 min (major))
(S)-1-(3'-chloro-[1,1'-biphenyl]-3-yl)ethanol (8n): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 ºC, $t_1 = 16.4$ min, $t_2 = 19.6$ min(major)).
(S)-1-(4'-(trifluoromethyl)-[1,1'-biphenyl]-3-yl)ethanol (8o): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 °C, t₁ = 17.8 min (major), t₂ = 20.1 min).
(S)-1-((4'-methyl-[1,1'-biphenyl]-3-yl)ethanol (8p): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: nhexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 ºC, $t_1 = 18.4$ min, $t_2 = 22.0$ min (major)).
(S)-1-((3'-methyl-[1,1'-biphenyl]-3-yl)ethanol (8q): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 ºC, t₁ = 14.6 min, t₂ = 17.2 min (major))

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(S)-1-((4'-methoxy-[1,1'-biphenyl]-3-yl)ethanol (8r): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 °C, t₁ = 36.0 min, t₂ = 41.8 min (major)).
(S)-1-(3-(thiophen-3-yl)phenyl)ethan-1-ol (8s): (HPLC: Chiracel AD-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1.0 mL/min, 25 ºC, t₁ = 28.4 min, t₂ = 30.8 min (major)).
(S,S)-1,1'−[(1,1'−biphenyl)−4,4'−diyl]diethanol (8t): (HPLC: Chiracel AD−H, detected at 254 nm, eluent: n−hexane/2−propanol = 92.5/7.5, flow rate = 1.0 mL/min, 25 ºC).
(S)-1-(4-phenethylphenyl)ethan-1-ol: (10a) (HPLC: Chiracel OB-H, detected at 254 nm, eluent: n-hexane/2-propanol = 99/1, flow rate = 0.8mL/min, 25 °C).
(S)-1-(4-(4-fluorophenethyl)phenyl)ethan-1-ol: (10b) (HPLC: Chiracel OB-H, detected at 254 nm, eluent: n-hexane/2-propanol = 99/1, flow rate = 0.8mL/min, 25 °C).
(S)-1-(4-(3-fluorophenethyl)phenyl)ethan-1-ol: (10c) (HPLC: Chiracel OB-H, detected at 254 nm, eluent: n-hexane/2-propanol = 99/1, flow rate = 0.8mL/min, 25 °C).
(S)-1-(4-(4-chlorophenethyl)phenyl)ethan-1-ol: (10d) (HPLC: Chiracel OB-H, detected at 254 nm, eluent: n-hexane/2-propanol = 98/2, flow rate = 1 mL/min, 25 °C).
(S)-1-(4-(4-methylphenethyl)phenyl)ethan-1-ol: (10e) (HPLC: Chiracel OB-H, detected at 254 nm, eluent: n-hexane/2-propanol = 98/2, flow rate = 0.8 mL/min, 25 °C).
(S)-1-(4-(3-methylphenethyl)phenyl)ethan-1-ol: (10f) (HPLC: Chiracel OB-H, detected at 254 nm, eluent: n-hexane/2-propanol = 98/2, flow rate = 1 mL/min, 25 °C).
(S)-1-(4-(4-methoxyphenethyl)phenyl)ethan-1-ol: (10g) (HPLC: Chiracel OB-H, detected at 254 nm, eluent: n-hexane/2-propanol = 98/2, flow rate = 1 mL/min, 25 °C).
(S)-1-(3-phenethylphenyl)ethan-1-ol: (10h) (HPLC: Chiracel OJ-H, detected at 254 nm, eluent: n-hexane/2-propanol =98/2, flow rate = 1 mL/min, 25 ℃).
(S)-1-(3-(4-fluorophenethyl)phenyl)ethan-1-ol: (10i) (HPLC: Chiracel OJ-H, detected at 254 nm, eluent: n-hexane/2-propanol =97/3, flow rate = 1 mL/min, 25 °C).
(S)-1-(3-(3-fluorophenethyl)phenyl)ethan-1-ol: (10j) (HPLC: Chiracel OJ-H, detected at 254 nm, eluent: n-hexane/2-propanol =97/3, flow rate = 1 mL/min, 25 °C).
(S)-1-(3-(4-chlorophenethyl)phenyl)ethan-1-ol: (10k) (HPLC: Chiracel OJ-H, detected at 254 nm, eluent: n-hexane/2-propanol =97/3, flow rate = 1 mL/min, 25 °C).
(S)-1-(3-(4-methylphenethyl)phenyl)ethan-1-ol: (10l) (HPLC: Chiracel OJ-H, detected at 254 nm, eluent: n-hexane/2-propanol =97/3, flow rate = 1 mL/min, 25 ℃).
(S)-1-(3-(3-methylphenethyl)phenyl)ethan-1-ol: (10m) (HPLC: Chiracel OJ-H, detected at 254 nm, eluent: n-hexane/2-propanol = 97/3, flow rate = 1 mL/min, 25 °C).
(S)-1-(3-(4-methoxyphenethyl)phenyl)ethan-1-ol: (10n) (HPLC: Chiracel AS-H, detected at 254 nm, eluent: n-hexane/2-propanol =96/4, flow rate = 1 mL/min, 25 °C).
Table S2. Reusability of catalyst 5 in the Suzuki cross–coupling/ATH cascade reaction of 4–iodoacetophenone and phenylboronic acid.[a]

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[a] Reaction conditions: catalyst 5 (219.80 mg, 20.0 μmol of Ru, 85.70 μmol of Pd, based on ICP analysis), HCO₂Na (10.0 mmol), iodoacetophenones (1.0 mmol) and boronic acids (1.2 mmol), and 40.0 mL of (iPrOH/H₂O v/v = 3/1) were added sequentially to a 100.0 mL round–bottom flask. The mixture was then stirred at 60 °C for 12 h. Yields were determined by ¹H–NMR analysis and ee values were determined by chiral HPLC analysis.

Figure S9. HPLC analyses for the 5-catalyzed Suzuki cross–coupling/ATH cascade reaction of 4–iodoacetophenone and phenylboronic acid.

Recycling experiment part:

Recycle 1.

Recycle 2.
Recycle 3.

Recycle 4.

Recycle 5.
Recycle 6.

Recycle 7.

Recycle 8.
Table S3. Reusability of catalyst 5 in the successive reduction/ATH of (E)−1−(4−styrylphenyl)than−1−one.[a]

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</table>

[a] Reaction conditions: Catalyst 5 (219.80 mg, 20.0 μmol of Ru, 85.70 μmol of Pd, based on ICP analysis), HCO₂Na (10.0 mmol), (E)−l-(4−styrylphenyl)than−l-one (1.0 mmol), and 40.0 mL of co−solvents (PrOH/H₂O v/v = 3/1) were added sequentially to a 100.0 mL round−bottom flask. The mixture was then stirred at 50 °C for 6 h. Yields were determined by ¹H−NMR analysis and ee values were determined by chiral HPLC analysis.

Figure S10. HPLC analyses for the 5-catalyzed reduction/ATH of (E)−1−(4−styrylphenyl)than−1−one.

Recycling experiment part:

Recycle 1.

Recycle 2.
Recycle 3.

Recycle 4.

Recycle 5.

Recycle 6.
Recycle 7.

Recycle 8.

Recycle 9.

Table view of compound

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Figure S11. The characterizations of chiral products (The $^1$H NMR and GC–MS spectra of all chiral products).

(S)-1-([1,1'-biphenyl]-4-yl)ethan-1-ol (8a).

Chemical Formula: C$_{16}$H$_{14}$O
Molecular Weight: 198.27
(S)-1-(4'-fluoro-[1,1'-biphenyl]-4-yl)ethan-1-ol (8b).
(S)-1-(4'-chloro-[1,1'-biphenyl]-4-yl)ethan-1-ol (8c).

Chemical Formula: C_{14}H_{12}ClO
Molecular Weight: 232.71
(S)-1-(3'-chloro-[1,1'-biphenyl]-4-yl)ethan-1-ol (8d)
(S)-1-(4’-(trifluoromethyl)-[1,1’-biphenyl]-4-yl)ethan-1-ol (8e)
(S)-1-(3'-(trifluoromethyl)-[1,1'-biphenyl]-4-yl)ethan-1-ol (8f)
(S)-1-(4'-methyl-[1,1'-biphenyl]-4-yl)ethan-1-ol (8g)

Chemical Formula: C_{15}H_{19}O
Molecular Weight: 212.29
(S)-1-(3’-methyl-[1,1’-biphenyl]-4-yl)ethan-1-ol (8h).
(S)-1-(4'-methoxy-[1,1'-biphenyl]-4-yl)ethan-1-ol (8i).
(S)-1-(4-(thiophen-3-yl)phenyl)ethan-1-ol (8j).
(S)-1-[[1,1'-biphenyl]-3-yl]ethan-1-ol (8k).

Chemical Formula: C_{14}H_{14}O
Molecular Weight: 198.27
(S)-1-(4'-fluoro-[1,1'-biphenyl]-3-yl)ethan-1-ol (8).
(S)-1-(4'-chloro-[1,1'-biphenyl]-3-yl)ethan-1-ol (8m).
(S)-1-(3'-chloro-[1,1'-biphenyl]-3-yl)ethan-1-ol (8n).
(S)-1-(4′-(trifluoromethyl)-[1,1′-biphenyl]-3-yl)ethan-1-ol (8o).
(S)-1-(4'-methyl-[1,1'-biphenyl]-3-yl)ethan-1-ol (8p).
(S)-1-(3'-methyl-[1,1'-biphenyl]-3-yl)ethan-1-ol (8q).

Chemical Formula: C_{19}H_{18}O
Molecular Weight: 212.29
(S)-1-(4'-methoxy-[1,1'-biphenyl]-3-yl)ethan-1-ol (8r).

Chemical Formula: C₁₅H₁₆O₂
Molecular Weight: 228.29
(S)-1-(3-(thiophen-3-yl)phenyl)ethan-1-ol (8s).
(S,S)-1,1'-(4,4'-diyl)diethanol (8t).

Chemical Formula: C_{16}H_{18}O_{2}
Molecular Weight: 242.32
(S)-1-(4-phenethylphenyl)ethan-1-ol (10a).
(S)-1-(4-(4-fluorophenethyl)phenyl)ethan-1-ol (10b).
(S)-1-(4-(3-fluorophenethyl)phenyl)ethan-1-ol (10c).

Chemical Formula: C_{16}H_{17}FO
Molecular Weight: 244.31
(S)-1-(4-(4-chlorophenethyl)phenyl)ethan-1-ol (10d).
(S)-1-(4-(4-methylphenethyl)phenyl)ethan-1-ol (10e).
(S)-1-(4-(3-methylphenethyl)phenyl)ethan-1-ol (10f).

Chemical Formula: C_{17}H_{20}O
Molecular Weight: 240.35
(S)-1-(4-(4-methoxyphenethyl)phenyl)ethan-1-ol (10g).

Chemical Formula: $\text{C}_{17}\text{H}_{20}\text{O}_2$

Molecular Weight: 256.35
(S)-1-(3-phenethylphenyl)ethan-1-ol (10h).

Chemical Formula: C_{18}H_{19}O
Molecular Weight: 226.32
(S)-1-(3-(4-fluorophenethyl)phenyl)ethan-1-ol (10i).

Chemical Formula: C₁₆H₁₇FO
Molecular Weight: 244.31
(S)-1-(3-(3-fluorophenethyl)phenyl)ethan-1-ol (10j).

Chemical Formula: C_{18}H_{17}FO
Molecular Weight: 244.31
(S)-1-(3-(4-chlorophenethyl)phenyl)ethan-1-ol (10k).
(S)-1-(3-(4-methylphenethyl)phenyl)ethan-1-ol (10l).

Chemical Formula: $C_{17}H_{20}O$
Molecular Weight: 240.35
(S)-1-(3-(3-methylphenethyl)phenyl)ethan-1-ol (10m).
(S)-1-(3-(4-methoxyphenethyl)phenyl)ethan-1-ol (10n).