Supporting Information

Room temperature chemoselective hydrogenation of C=C, C=O and C=N bonds by well-defined mixed donor Mn(I) pincer catalyst

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1. General Experimental

All the manipulations were conducted under an argon atmosphere either in a glove box or using standard Schlenk techniques in pre-dried glasswares. The catalytic reactions were performed in flame-dried glass vials with magnetic bar by placing them in the pressure reactor. Solvents were dried over Na/benzophenone or Mg and distilled prior to use. Liquid reagents were flushed with argon prior to use. The ligand precursor 6-(1H-pyrazol-1-yl)pyridin-2-amine,$^1$ ligands L1$^2$ and L3$^{1,3}$ were prepared according to the previously described procedures. The Mn(CO)$_5$Br was prepared by treating the Mn(CO)$_{10}$ with Br$_2$. All other chemicals were obtained from commercial sources and were used without further purification. Infrared (IR) spectra were recorded on a FT-IR Bruker Alpha II spectrometer as solution of chloroform, THF or methanol. High resolution mass spectrometry (HRMS) mass spectra were recorded on a Thermo Scientific Q-Exactive, Accela 1250 pump. NMR: ($^1$H and $^{13}$C{${^1}$H}) spectra were recorded at 200, 400 or 500 MHz ($^1$H), 100 or 125 MHz ($^{13}$C{${^1}$H}), DEPT (distortionless enhancement by polarization transfer), 377 MHz ($^{19}$F), 162 MHz ($^{31}$P{${^1}$H}) respectively, in CDCl$_3$ solutions, if not otherwise specified; chemical shifts ($\delta$) are given in ppm. The $^1$H and $^{13}$C{${^1}$H} NMR spectra are referenced to residual solvent signals (CDCl$_3$: $\delta$ H = 7.26 ppm, $\delta$ C = 77.2 ppm; DMSO-d$_6$: $\delta$ H = 2.50 ppm, $\delta$ C = 39.5 ppm; acetone-d$_3$: $\delta$ H = 2.05 ppm).

**GC Method.** Gas Chromatography analyses were performed using a Shimadzu GC2010 gas chromatograph equipped with a Shimadzu AOC-20s auto sampler and a Restek RTX-5 capillary column (30 m x 0.25 mm x 0.25 µm). The instrument was set to an injection volume of 1 µL, an inlet split ratio of 10:1, and inlet and detector temperatures of 250 and 320 °C, respectively. UHP-grade nitrogen was used as carrier gas with a flow rate of 30 mL/min. The temperature program used for all the analyses is as follows: 80 °C, 1 min; 30 °C/min to 200 °C, 2 min; 30 °C/min to 260 °C, 3 min; 30 °C/min to 300 °C, 15 min.

2. Synthesis of Ligand and Manganese Complexes

**Synthesis of N-(di-iso-propylphosphaneyl)-6-(1H-pyrazol-1-yl)pyridin-2-amine (L2):**

In a 50 mL oven dried Schlenk flask, 6-(1H-pyrazol-1-yl)pyridin-2-amine (0.20 g, 1.25 mmol) was dissolved in THF (10 mL) followed by the addition of freshly distilled Et$_3$N (0.21
mL, 1.5 mmol) under inert atmosphere. The reaction mixture was cooled to 0 °C and chlorodiisopropylphosphine (0.21 g, 1.37 mmol) was added dropwise. The reaction mixture was allowed to room temperature and stirred for 1 h. Further the reaction mixture was cooled to -78 °C and n-BuLi (0.94 mL, 1.5 mmol; 1.6 M in THF) was added dropwise resulting in a colorless solution. Then the reaction was allowed to room temperature and stirred for 1 h, followed by heating at 60 °C for 16 h. The volatiles were evaporated under vacuum and 30 mL of toluene was added into it. The filtration and evaporation of toluene extract gave N-(di-iso-propylphosphaneyl)-6-(1H-pyrazol-1-yl)pyridin-2-amine (L2; 0.27 g, 78%) as colorless liquid. $^1$H-NMR (500 MHz, C$_6$D$_6$): δ = 8.65 (d, J = 2.1 Hz, 1H, Ar–H), 7.68-7.66 (m, 2H, Ar–H), 7.13 (t, J = 8.1 Hz, 1H, Ar–H), 6.95 (dd, J = 7.9, 2.2 Hz, 1H, Ar–H), 6.14 (dd, J = 2.4, 1.5 Hz, 1H), 4.55 (br s, 1H, NH), 1.41 (d sept, J = 6.9, 1.7 Hz, 2H, CH), 0.90 (dd, J = 16.2, 7.3 Hz, 6H, CH$_3$), 0.86 (dd, J = 11.0, 7.0 Hz, 6H, CH$_3$). $^{13}$C{$^1$H}-NMR (125 MHz, C$_6$D$_6$): δ = 160.4 (d, J = 20.0 Hz, C$_q$), 151.4 (C$_q$), 142.2 (CH), 140.6 (CH), 127.0 (CH), 107.7 (CH), 106.4 (d, J = 17.2 Hz, CH), 103.0 (CH), 26.8 (d, J = 12.4 Hz, 2C, CH), 19.2 (CH$_3$), 19.0 (CH$_3$), 17.5 (CH$_3$), 17.4 (CH$_3$). $^{31}$P{$^1$H}-NMR (162 MHz, C$_6$D$_6$): 48.6 (s).

$N$-(Di-tert-butylphosphaneyl)-$N$-methyl-6-(1H-pyrazol-1-yl)pyridin-2-amine (L3$^{Me}$): In a 50 mL round bottom flask, $N$-(di-tert-butylphosphaneyl)-6-(1H-pyrazol-1-yl)pyridin-2-amine (0.10 g, 0.33 mmol) in THF (5 mL) was cooled to -20 °C and n-BuLi (0.25 mL, 0.40 mmol; 1.6 M in hexane) was added followed by the addition of MeI (0.055 g, 0.39 mmol). The reaction mixture was allowed to the room temperature and stirred for overnight. The volatiles were evaporated under vacuo and 20 mL of water was added. The organic layer was extracted in EtOAc and the crude product was subjected to the column chromatography on silica gel (petroleum ether/EtOAc:10/1) to yield L3$^{Me}$ (0.071 g, 68%) as white solid. $^1$H-NMR (500 MHz, CDCl$_3$): δ = 8.30 (d, J = 2.4 Hz, 1H, Ar–H), 7.66 (s, 1H, Ar–H), 7.36 (dt, J = 7.9, 2.1 Hz, 1H, Ar–H), 7.04 (d, J = 7.5 Hz, 1H, Ar–H), 6.51 (d, J = 8.1 Hz, 1H), 6.37 (t, J = 2.1 Hz, 1H, Ar–H), 1.83 (d, J = 11.1 Hz, 3H, CH$_3$), 1.34 (d, J = 14.1 Hz, 18H, CH$_3$). $^{13}$C{$^1$H}-NMR (100 MHz, CDCl$_3$): δ = 164.4 (d, J = 9.2 Hz, C$_q$), 149.8 (C$_q$), 140.9 (CH), 138.6 (d, J = 3.8 Hz, CH), 126.3 (CH), 116.1 (d, J = 22.1 Hz, CH), 106.5 (CH), 98.5 (CH), 36.4 (d, J = 65.6 Hz, 2C, C$_q$), 27.2 (6C, CH$_3$), 5.6 (d, J = 42.0 Hz, CH$_3$). $^{31}$P{$^1$H}-NMR (162 MHz, CDCl$_3$): 36.9 (s).
**Synthesis and Characterization of Mn-1:** In a 25 mL round bottom flask 1-(diphenylphosphanylene)-6-(1H-pyrazol-1-yl)pyridin-2-amine (L1; 0.084 g, 0.244 mmol) and Mn(CO)₅Br (0.067 g, 0.244 mmol) were added inside the glove box. The reaction flask was taken out and THF (3 mL) was added. The reaction mixture was stirred under inert atmosphere at room temperature (27 °C) for 20 h, wherein the desired complex was precipitated out. The solid compound was separated from mother liquor and was washed with n-hexane (10 mL x 3). The resulted complex was dried under vacuum to give yellow powder of Mn-1 (0.090 g, 69%). FT-IR (ν₀, cm⁻¹): 1935, 1865, 1857. ¹H-NMR (500 MHz, DMSO-d₆): (one isomer): δ = 10.34 (br s, 1H), 9.15 (br s, 1H), 8.57 (br s, 1H), 8.10 (br s, 1H), 7.77-7.42 (m, 11H), 7.28 (br s, 1H), 6.92 (br s, 1H); (other isomer): δ = 10.02 (br s, 1H), 8.99 (br s, 1H), 8.22 (br s, 1H), 7.96 (br s, 1H), 7.77-7.42 (m, 11H), 7.16 (br s, 1H), 6.77 (br s, 1H). ¹³C{¹H}-NMR (125 MHz, DMSO-d₆): (for both isomers) δ = 229.3, 225.3, 223.8, 160.0, 147.4, 146.1, 144.9, 141.5, 139.9, 136.2, 130.9, 129.8, 129.5, 128.9, 128.1, 127.7, 127.0, 125.7, 110.9, 106.7, 99.3. ³¹P{¹H}-NMR (162 MHz, DMSO-d₆, ppm): 136. 9 (s), 134.5 (s). ESI-MS (–ve mode): m/z [M–H]⁻ Calcd for [C₂₂H₁₇⁷⁹BrMnN₄O₂P–H] 532.9569, Found 532.9575; m/z [M–H]⁻ Calcd for [C₂₂H₁₇⁸¹BrMnN₄O₂P–H] 534.9549, Found 534.9554.

**Synthesis and Characterization of Mn-2:** This complex was synthesized following the procedure similar to the synthesis of Mn-1, using 1-(di-isopropylphosphanylene)-6-(1H-pyrazol-1-yl)pyridin-2-amine (L2; 0.060 g, 0.217 mmol) and Mn(CO)₅Br (0.060 g, 0.218 mmol). The complex Mn-2 was obtained as an orange powder. Yield: 0.090 g (89%). FT-IR (ν₀, cm⁻¹): 1940, 1872, 1857. ¹H-NMR (400 MHz, DMSO-d₆): (one isomer): δ = 9.15 (br s, 1H), 8.92 (br s, 1H), 8.49 (br s, 1H), 7.94 (br s, 1H), 7.53 (br s, 1H), 7.03 (br s, 1H), 6.91 (br s, 1H), 1.30-1.18 (m, 14H); (other isomer): δ = 9.13 (br s, 1H), 8.80 (br s, 1H), 8.10 (br s, 1H), 7.79 (br s, 1H), 7.40 (br s, 1H), 6.91 (br s, 1H), 6.72 (br s, 1H), 1.18-1.09 (m, 14H).
$^{13}$C-$^1$H-NMR (100 MHz, DMSO-$d_6$): (one isomer): $\delta = 230.2$ (d, $J = 15.3$ Hz, CO), 226.6 (d, $J = 22.9$ Hz, CO), 161.0 (d, $J = 9.5$ Hz, C$_q$), 147.4 (C$_q$), 146.1 (CH), 141.1 (CH), 130.9 (CH), 111.4 (CH), 106.5 (CH), 98.8 (CH), 29.7, 26.4, 18.1, 17.4; (other isomer): $\delta = 227.0$ (d, $J = 19.1$ Hz, CO), 225.8 (d, $J = 22.9$ Hz, CO), 160.6 (d, $J = 9.5$ Hz, C$_q$), 147.4 (C$_q$), 144.3 (CH), 139.5 (CH), 129.3 (CH), 110.6 (CH), 105.2 (CH), 98.1 (CH), 26.5, 25.8, 17.3, 16.5.

$^{31}$P-$^1$H-NMR (162 MHz, DMSO-$d_6$, ppm): 159.8 (s), 158.4 (s).  

Synthesis and Characterization of Mn-3: In a 25 mL round bottom flask $N$-(di-tert-butylphosphaneyle)-6-(1H-pyrazol-1-yl)pyridin-2-amine (L3; 0.050 g, 0.164 mmol), Mn(CO)$_5$Br (0.045 g, 0.164 mmol) and THF (10 mL) were added under argon atmosphere. The reaction mixture was stirred under inert atmosphere in dark at room temperature (27 °C) for 48 h. The resulted dark-red reaction mixture was concentrated and hexane was slowly added to precipitate out the orange compound. The mother liquor was separated and the solid compound was washed with hexane (5 mL x 3) and dried under vacuum to give orange solid of Mn-3 (0.064 g, 79%). Note: The synthesized Mn-3 is sensitive to light, hence stored in brown colored vial. FT-IR ($\nu$CO, cm$^{-1}$): 2053, 1959, 1930.  
$^1$H-NMR (200 MHz, CD$_3$OD): (one isomer): $\delta = 8.53$ (br s, 1H, Ar–H), 7.79 (br s, 1H, Ar–H), 7.56 (br s, 1H, Ar–H), 7.07 (br s, 1H, Ar–H), 6.75 (br s, 1H, Ar–H), 6.48 (br s, 1H, Ar–H), 0.99 (d, $J = 14.5$ Hz, 18H, CH$_3$); (other isomer): $\delta = 8.39$ (br s, 1H, Ar–H), 7.79 (br s, 1H, Ar–H), 7.56 (br s, 1H, Ar–H), 7.07 (br s, 1H, Ar–H), 6.75 (br s, 1H, Ar–H), 6.39 (br s, 1H, Ar–H), 0.93 (d, $J = 14.5$ Hz, 18H, CH$_3$).  
$^{31}$P-$^1$H-NMR (162 MHz, CD$_3$OD, ppm): 178.5 (s), 175.3 (s).  
$^3$P-$^1$H-NMR (162 MHz, CD$_2$Cl$_2$, ppm): 176.6 (s), 171.3 (s).  
ESI-MS (–ve mode): $m/z$ [M–H]$^-$ Calcd for [C$_{18}$H$_{25}$$^{79}$BrMnN$_4$O$_2$P–H] 493.0195, Found 493.0197; $m/z$ [M–H]$^-$ Calcd for [C$_{18}$H$_{25}$$^{81}$BrMnN$_4$O$_2$P–H] 495.0175, Found 495.0178.  
Synthesis and characterization of Mn-3Me: This complex was synthesized following the procedure similar to the synthesis of Mn-1, using N-(di-tert-butylphosphaneyl)-N-methyl-6-(1H-pyrazol-1-yl)pyridin-2-amine (0.042 g, 0.132 mmol) and Mn(CO)₅Br (0.036 g, 0.131 mmol), and the reaction mixture was stirred at room temperature (27 °C) for 16 h. The complex Mn-3Me was obtained as an orange powder. Yield: 0.060 g (85%). FT-IR (νCO, cm⁻¹): 2018, 1924, 1901. ¹H-NMR (500 MHz, acetone-d₆): δ = 8.67 (br s, 1H, Ar–H), 8.21 (br s, 1H, Ar–H), 7.02 (br s, 1H, Ar–H), 6.73 (br s, 1H, Ar–H), 6.63 (br s, 1H, Ar–H), 5.1 (d, J = 42.0 Hz, CH₃). ¹³C{¹H}-NMR (125 MHz, DMSO-d₆): δ = 224.2 (CO), 223.9 (CO), 223.1 (CO), 164.9 (Cq), 148.3 (Cq), 144.0 (CH), 138.1 (CH), 129.7 (CH), 112.0 (CH), 110.5 (CH), 96.4 (CH), 36.2 (d, J = 63.6 Hz, 2C Cq), 25.8 (d, J = 30.5 Hz, 6C, CH₃), 25.8 (d, J = 30.5 Hz, 6C, CH₃), 5.1 (d, J = 42.0 Hz, CH₃). ³¹P{¹H}-NMR (162 MHz, acetone-d₆): 41.5 (s).

3. Synthesis of Starting Compound

(Z)-2-(4-Acetylphenoxy)-1,3-diphenylprop-2-en-1-one (40a): A mixture of 2-(4-acetylphenoxy)-1-phenylethan-1-one (0.50 g, 1.97 mmol) and benzaldehyde (0.21 g, 1.98 mmol) were dissolved in 20 mL mixture of EtOH:MeOH (4:1) in a round bottom flask followed by dropwise addition of 10% NaOH (10 mL) at 0 °C. The reaction mixture was allowed to the room temperature and stirred for overnight. The volatiles were evaporated under vacuo and 20 mL of water was added. The organic layer was extracted in EtOAc and the crude product was subjected to the column chromatography (silica gel, petroleum ether/EtOAc:30/1) to yield (Z)-2-(4-acetylphenoxy)-1,3-diphenylprop-2-en-1-one (40a) (0.41 g, 61%) as yellow solid. ¹H-NMR (400 MHz, CDCl₃): δ = 7.87 (d, J = 8.6 Hz, 4H, Ar–H), 7.52-7.70 (m, 2H, Ar–H), 7.55 (t, J = 7.4 Hz, 1H, Ar–H), 7.44 (t, J = 7.7 Hz, 2H, Ar–H), 7.37-7.36 (m, 3H), 7.12 (s, 1H, CH), 7.05 (d, J = 8.8 Hz, 2H, Ar–H), 2.51 (s, 3H, CH₃).
$^{13}$C{$^{1}$H}-NMR (100 MHz, CDCl$_3$): $\delta$ = 196.8 (CO), 191.5 (CO), 160.1 (C$_q$), 147.3 (C$_q$), 136.9 (C$_q$), 133.0 (CH), 132.5 (C$_q$), 132.3 (C$_q$), 130.9 (2C, CH), 130.8 (2C, CH), 130.3 (CH), 129.9 (CH), 129.5 (2C, CH), 129.1 (2C, CH), 128.6 (2C, CH), 115.9 (2C, CH), 26.6 (CH$_3$). HRMS (ESI): $m/z$ Calcd for C$_{23}$H$_{18}$O$_3$ + H$^+$ [M + H]$^+$ 343.1329; Found 343.1321.

4. Detailed Optimization Study

Table S1. Detailed Optimization of Reaction Parameters.$^a$

\[
\begin{array}{cccccccc}
\text{Entry} & \text{[Mn]} & \text{base} & \text{H$_2$ (bar)} & \text{T ($^\circ$C)/t (h)} & \text{Conv (%)$^b$} & 4 (%)$^b$ & 4'$ (%)$^b$ \\
1 & Mn-1 & KO$^t$Bu & 30 & 50/20 & 75 & 65 & 10 \\
2 & Mn-2 & KO$^t$Bu & 30 & 50/20 & 100 & -- & 80 \\
3 & Mn-3 & KO$^t$Bu & 30 & 50/20 & 100 & 63 (60) & 37 \\
4 & Mn-3 & KO$^t$Bu & 30 & 27/20 & 100 & 81 (79) & 19 \\
5 & Mn-3 & KO$^t$Bu & 20 & 27/20 & 100 & 86 & 14 \\
6 & Mn-3 & KO$^t$Bu & 10 & 27/20 & 100 & 91 (88) & 9 \\
7 & Mn-3 & NaO$^t$Bu & 10 & 27/20 & 40 & 39 & trace \\
8 & Mn-3 & LiO$^t$Bu & 10 & 27/20 & 74 & 73 & trace \\
9 & Mn-3 & K$_2$CO$_3$ & 10 & 27/20 & 100 & 74 & 26 \\
10 & Mn-3 & KOAc & 10 & 27/20 & 20 & 19 & trace \\
11 & Mn-3 & K$_3$PO$_4$ & 10 & 27/20 & 100 & 88 & 12 \\
12 & Mn-3 & K$_3$PO$_4$ & 10 & 27/8 & 100 & 95 & 5 \\
13 & Mn-3 & K$_3$PO$_4$ & 10 & 27/1 & 99 & 95 & 4 \\
14 & Mn-3 & K$_3$PO$_4$ & 5 & 27/1 & 100 & 98 (96) & 2 \\
15 & Mn-3 & K$_3$PO$_4$ & 2 & 27/1 & 53 & 53 & -- \\
16 & Mn-3 & K$_3$PO$_4$ & 5 & 27/1 & 50 & 49 & 1 \\
17 & Mn-3 & K$_3$PO$_4$ & 5 & 27/1 & 68 & 68 & trace \\
18 & Mn-3 & K$_3$PO$_4$ & 5 & 27/1 & 45 & 44 & 1 \\
19 & Mn-1 & K$_3$PO$_4$ & 5 & 27/1 & trace & trace & -- \\
20 & Mn-2 & K$_3$PO$_4$ & 5 & 27/1 & 23 & 19 & -- \\
21 & Mn(CO)$_3$Br/L3 & K$_3$PO$_4$ & 5 & 27/1 & 39 & 39 & -- \\
\end{array}
\]
5. Representative Procedure for Hydrogenation

Synthesis of 1,3-diphenylpropan-1-one (4): To a dry vial with magnetic bar was introduced Mn-3 (0.005 g, 0.01 mmol), K$_3$PO$_4$ (0.0043 g, 0.02 mmol), and (E)-chalcone (4a; 0.042 g, 0.202 mmol) inside the glove box. The reaction vial was transferred to an autoclave under argon atmosphere. Then MeOH (1.0 mL) was added and the autoclave was pressurized with H$_2$ (5 bar) and vented for five times. Finally, the autoclave was pressurized with 5 bar H$_2$ and stirred (700 rpm) at room temperature (27 °C) for 1 h. After reaction time, the reaction mixture was concentrated and subjected to column chromatography on silica gel (petroleum ether/EtOAc: 70/1) to yield 4 (0.041 g, 96%) as white solid. $^1$H-NMR (500 MHz, CDCl$_3$): $\delta =$
7.95 (d, $J = 7.4$ Hz, 2H, Ar–H), 7.54 (t, $J = 7.4$ Hz, 1H, Ar–H), 7.44 (t, $J = 7.6$ Hz, 2H, Ar–H), 7.31-7.18 (m, 5H, Ar–H), 3.29 (t, $J = 7.7$ Hz, 2H, CH$_2$), 3.06 (t, $J = 7.7$ Hz, 2H, CH$_2$).

$^1$H-NMR (400 MHz, CDCl$_3$): $\delta = 7.85$ (d, $J = 8.3$ Hz, 2H, Ar–H), 7.30-7.27 (m, 2H, Ar–H), 7.25-7.17 (m, 5H, Ar–H), 3.26 (t, $J = 7.8$ Hz, 2H, CH$_2$), 3.05 (t, $J = 7.7$ Hz, 2H, CH$_2$), 2.39 (s, 3H, CH$_3$).

13C{^1}H-NMR (100 MHz, CDCl$_3$): $\delta = 199.1$ (CO), 147.7 (C$_q$), 141.6 (C$_q$), 134.8 (C$_q$), 129.5 (2C, CH), 128.6 (2C, CH), 128.3 (2C, CH), 126.2 (CH), 40.5 (CH$_2$), 30.4 (CH$_2$), 21.8 (CH$_3$).

HRMS (ESI): $m/z$ Calcd for C$_{16}$H$_{16}$O $^+ [M + H]^+$ 225.1274; Found 225.1272. The $^1$H and 13C{^1}H spectra are consistent with those reported in the literature.

6. Characterization Data of Hydrogenated Compounds

3-Phenyl-1-(p-tolyl)propan-1-one (5): The representative procedure was followed, using substrate 5a (0.045 g, 0.202 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 5 (0.040 g, 88%) as brown solid. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta = 7.85$ (d, $J = 8.3$ Hz, 2H, Ar–H), 7.30-7.27 (m, 2H, Ar–H), 7.25-7.17 (m, 5H, Ar–H), 3.26 (t, $J = 7.8$ Hz, 2H, CH$_2$), 3.05 (t, $J = 7.7$ Hz, 2H, CH$_2$), 2.39 (s, 3H, CH$_3$).

13C{^1}H-NMR (100 MHz, CDCl$_3$): $\delta = 199.4$ (CO), 144.4 (C$_q$), 137.0 (C$_q$), 133.2 (CH), 128.8 (2C, CH), 128.7 (2C, CH), 128.6 (2C, CH), 128.2 (2C, CH), 126.3 (CH), 40.6 (CH$_2$), 30.3 (CH$_2$), 30.1 (CH$_2$), 21.8 (CH$_3$).

HRMS (ESI): $m/z$ Calcd for C$_{15}$H$_{14}$O $^+ [M + H]^+$ 211.1117; Found 211.1115. The $^1$H and 13C{^1}H spectra are consistent with those reported in the literature.

O

1-(4-Isobutylphenyl)-3-phenylpropan-1-one (6): The representative procedure was followed, using substrate 6a (0.053 g, 0.20 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 5 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 6 (0.037 g, 70%) as yellow oil. $^1$H-NMR (500 MHz, CDCl$_3$): $\delta = 7.88$ (d, $J = 8.1$ Hz, 2H, Ar–H), 7.31-7.28 (m, 2H, Ar–H), 7.26-7.18 (m, 5H, Ar–H), 3.28 (t, $J = 7.7$ Hz, 2H, CH$_2$), 3.06 (t, $J = 7.8$ Hz, 2H, CH$_2$), 2.52 (d, $J = 7.1$ Hz, 2H, CH$_2$), 1.90-1.88 (m, 1H, CH), 0.90 (d, $J = 6.6$ Hz, 6H, CH$_3$).

13C{^1}H-NMR (125 MHz, CDCl$_3$): $\delta = 199.1$ (CO), 147.7 (C$_q$), 141.6 (C$_q$), 134.8 (C$_q$), 129.5 (2C, CH), 128.6 (2C, CH), 128.2 (2C, CH), 126.3 (CH), 45.6 (CH$_2$), 40.5 (CH$_2$), 30.4 (CH$_2$), 30.3 (CH), 30.1 (CH$_2$), 21.8 (CH$_3$).
22.5 (2C, CH₃). HRMS (ESI): m/z Calcd for C₁₉H₂₂O + H⁺ [M + H]⁺ 267.1743; Found 276.1740. The ¹H and ¹³C {¹H} spectra are consistent with those reported in the literature.⁶

![Chemical Structure](image)

**1-(4-Methoxyphenyl)-3-phenylpropan-1-one (7):** The representative procedure was followed, using substrate 7a (0.048 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 7 (0.043 g, 89%) as white solid. ¹H-NMR (400 MHz, CDCl₃): δ = 7.94 (d, J = 9.0 Hz, 2H, Ar–H), 7.32-7.24 (m, 4H, Ar–H), 7.20 (t, J = 7.0 Hz, 1H, Ar–H), 6.92 (d, J = 9.0 Hz, 2H, Ar–H), 3.85 (s, 3H, CH₃), 3.25 (t, J = 7.8 Hz, 2H, CH₂), 3.06 (t, J = 7.8 Hz, 2H, CH₂). ¹³C {¹H}-NMR (100 MHz, CDCl₃): δ = 198.0 (CO), 163.6 (Cₚ), 141.6 (Cₚ), 130.4 (2C, CH), 130.1 (Cₚ), 128.6 (2C, CH), 128.6 (2C, CH), 126.2 (CH), 113.9 (2C, CH), 55.6 (CH₃), 40.2 (CH₂), 30.5 (CH₂). HRMS (ESI): m/z Calcd for C₁₁₆H₁₆O₂ + H⁺ [M + H]⁺ 241.1223; Found 241.1220. The ¹H and ¹³C {¹H} spectra are consistent with those reported in the literature.⁵

![Chemical Structure](image)

**1-(4-Chlorophenyl)-3-phenylpropan-1-one (8):** The representative procedure was followed, using substrate 8a (0.049 g, 0.202 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 8 (0.040 g, 81%) as white solid. ¹H-NMR (400 MHz, CDCl₃): δ = 7.88 (d, J = 8.6 Hz, 2H, Ar–H), 7.41 (d, J = 8.6 Hz, 2H, Ar–H), 7.31-7.27 (m, 2H, Ar–H), 7.24-7.18 (m, 3H, Ar–H), 3.26 (t, J = 7.7 Hz, 2H, CH₂), 3.05 (t, J = 7.7 Hz, 2H, CH₂). ¹³C {¹H}-NMR (100 MHz, CDCl₃): δ = 198.1 (CO), 141.2 (Cₚ), 139.6 (Cₚ), 135.3 (Cₚ), 129.6 (2C, CH), 129.1 (2C, CH), 128.7 (2C, CH), 128.6 (2C, CH), 126.4 (CH), 40.6 (CH₂), 30.2 (CH₂). HRMS (ESI): m/z Calcd for C₁₁₆H₁₆ClO + H⁺ [M + H]⁺ 245.0728; Found 245.0726. The ¹H and ¹³C {¹H} spectra are consistent with those reported in the literature.⁷
1-(4-Bromophenyl)-3-phenylpropan-1-one (9): The representative procedure was followed, using substrate 9a (0.058 g, 0.202 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 100/1) yielded 9 (0.042 g, 72%) as white solid. \( ^1 \)H-NMR (400 MHz, CDCl\(_3\)): \( \delta = 7.80 \ (d, J = 8.6 \text{ Hz}, 2\text{H, Ar–H}), 7.58 \ (d, J = 8.6 \text{ Hz}, 2\text{H, Ar–H}), 7.31-7.18 \ (m, 5\text{H, Ar–H}), 3.25 \ (t, J = 7.6 \text{ Hz}, 2\text{H, CH}_2), 3.05 \ (t, J = 7.6 \text{ Hz}, 2\text{H, CH}_2) \). \( ^{13} \)C\{\(^1\)H\}-NMR (100 MHz, CDCl\(_3\)): \( \delta = 198.3 \ (\text{CO}), 141.2 \ (\text{C}_q), 135.7 \ (\text{C}_q), 132.1 \ (2\text{C, CH}), 129.7 \ (2\text{C, CH}), 128.7 \ (2\text{C, CH}), 128.6 \ (2\text{C, CH}), 128.4 \ (\text{C}_q), 126.4 \ (\text{CH}), 40.6 \ (\text{CH}_2), 30.2 \ (\text{CH}_2) \). HRMS (ESI): \( m/z \) Calcd for C\(_{15}\)H\(_{13}\)BrO + H\(^+\) [M + H\(^+\)] 289.0223, 291.0208; Found 289.0216, 291.0197. The \(^1\)H and \(^{13}\)C\{\(^1\)H\} spectra are consistent with those reported in the literature.\(^8\)

1-(4-Iodophenyl)-3-phenylpropan-1-one (10): The representative procedure was followed, using substrate 10a (0.067 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 10 (0.055 g, 81%) as white solid. \( ^1 \)H-NMR (400 MHz, CDCl\(_3\)): \( \delta = 7.80 \ (d, J = 8.4 \text{ Hz}, 2\text{H, Ar–H}), 7.64 \ (d, J = 8.4 \text{ Hz}, 2\text{H, Ar–H}), 7.29 \ (t, J = 7.4 \text{ Hz}, 2\text{H, Ar–H}), 7.24-7.18 \ (m, 3\text{H, Ar–H}), 3.24 \ (t, J = 7.6 \text{ Hz}, 2\text{H, CH}_2), 2.93 \ (t, J = 7.6 \text{ Hz}, 2\text{H, CH}_2) \). \( ^{13} \)C\{\(^1\)H\}-NMR (100 MHz, CDCl\(_3\)): \( \delta = 198.6 \ (\text{CO}), 141.2 \ (\text{C}_q), 138.1 \ (2\text{C, CH}), 136.2 \ (\text{C}_q), 129.6 \ (2\text{C, CH}), 128.7 \ (2\text{C, CH}), 128.6 \ (2\text{C, CH}), 126.4 \ (\text{CH}), 101.2 \ (\text{C}_q), 40.5 \ (\text{CH}_2), 30.2 \ (\text{CH}_2) \). HRMS (ESI): \( m/z \) Calcd for C\(_{15}\)H\(_{13}\)IO + H\(^+\) [M + H\(^+\)] 337.0084; Found 337.0080. The \(^1\)H and \(^{13}\)C\{\(^1\)H\} spectra are consistent with those reported in the literature.\(^9\)

3-Phenyl-1-(4-(trifluoromethyl)phenyl)propan-1-one (11): The representative procedure was followed, using substrate 11a (0.056 g, 0.203 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel.
(petroleum ether/EtOAc: 100/1) yielded 11 (0.044 g, 78%) as yellow oil. \(^1\)H-NMR (500 MHz, CDCl\(_3\)): \(\delta = 8.04\) (d, \(J = 8.2\) Hz, 2H, Ar–H), 7.71 (d, \(J = 8.2\) Hz, 2H, Ar–H), 7.33-7.28 (m, 2H, Ar–H), 3.33 (t, \(J = 7.6\) Hz, 2H, CH\(_2\)), 3.08 (t, \(J = 7.6\) Hz, 2H, CH\(_2\)). \(^{13}\)C\{\(^1\)H\}-NMR (125 MHz, CDCl\(_3\)): \(\delta = 198.4\) (CO), 141.0 (C\(_q\)), 139.7 (C\(_q\)), 134.5 (q, \(^2\)J\(_{C–F}\) = 32.8 Hz, C\(_q\)), 128.8 (2C, CH), 128.6 (2C, CH), 128.5 (2C, CH), 126.5 (CH), 125.9 (q, \(^3\)J\(_{C–F}\) = 3.8 Hz, 2C, CH), 123.8 (q, \(^1\)J\(_{C–F}\) = 272.6 Hz, C\(_q\)), 40.9 (CH\(_2\)), 30.1 (CH\(_2\)). \(^{19}\)F-NMR (377 MHz, CDCl\(_3\)): \(\delta = -63.1\) (s). HRMS (ESI): \(m/z\) Calcd for C\(_{16}\)H\(_{13}\)F\(_3\)O + H\(^+\) [M + H\(^+\)] 279.0991; Found 279.0988. The \(^1\)H and \(^{13}\)C\{\(^1\)H\} spectra are consistent with those reported in the literature.\(^7\)

3-Phenyl-1-(o-tolyl)propan-1-one (12): The representative procedure was followed, using substrate 12a (0.045 g, 0.202 mmol) and the reaction mixture was stirred at room temperature (27 \(^\circ\)C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 12 (0.035 g, 77%) as yellow oil. \(^1\)H-NMR (400 MHz, CDCl\(_3\)): \(\delta = 7.59\) (d, \(J = 7.9\) Hz, 1H, Ar–H), 7.35 (t, \(J = 7.4\) Hz, 1H, Ar–H), 7.28 (t, \(J = 7.4\) Hz, 2H, Ar–H), 7.24-7.17 (m, 5H, Ar–H), 3.22 (t, \(J = 7.7\) Hz, 2H, Ar–H), 3.04 (t, \(J = 7.6\) Hz, 2H, CH\(_2\)), 2.46 (s, 3H, CH\(_3\)). \(^{13}\)C\{\(^1\)H\}-NMR (100 MHz, CDCl\(_3\)): \(\delta = 203.6\) (CO), 141.4 (C\(_q\)), 138.3 (C\(_q\)), 138.1 (C\(_q\)), 132.1 (CH), 131.4 (CH), 128.7 (2C, CH), 128.6 (2C, CH), 128.5 (CH), 126.3 (CH), 125.8 (CH), 43.4 (CH\(_2\)), 30.5 (CH\(_2\)), 21.4 (CH\(_3\)). HRMS (ESI): \(m/z\) Calcd for C\(_{16}\)H\(_{16}\)O + H\(^+\) [M + H\(^+\)] 225.1274; Found 225.1271. The \(^1\)H and \(^{13}\)C\{\(^1\)H\} spectra are consistent with those reported in the literature.\(^10\)

3-Phenyl-1-(2-(trifluoromethyl)phenyl)propan-1-one (13): The representative procedure was followed, using substrate 13a (0.056 g, 0.203 mmol) and the reaction mixture was stirred at room temperature (27 \(^\circ\)C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 13 (0.048 g, 85%) as yellow oil. \(^1\)H-NMR (400 MHz, CDCl\(_3\)): \(\delta = 7.69\) (d, \(J = 7.8\) Hz, 1H, Ar–H), 7.57-7.50 (m, 2H, Ar–H), 7.31-7.27 (m, 3H, Ar–H), 7.24-7.18 (m, 3H, Ar–H), 3.16 (t, \(J = 7.6\) Hz, 2H, CH\(_2\)), 3.05 (t, \(J = 7.4\) Hz, 2H, CH\(_2\)).
\(^{13}\text{C} \{^1\text{H}\}\text{-NMR} (100 \text{ MHz, CDCl}_3): \delta = 203.6 (\text{CO}), 140.8 (\text{C}_q), 140.5 (\text{q, }^3J_{\text{C-F}} = 1.9 \text{ Hz, } \text{C}_q), 132.0 (\text{CH}), 130.2 (\text{CH}), 128.7 (2\text{C, CH}), 128.5 (2\text{C, CH}), 127.1 (\text{q, }^2J_{\text{C-F}} = 32.1 \text{ Hz, } \text{C}_q), 127.0 (\text{CH}), 126.9 (\text{q, }^3J_{\text{C-F}} = 5.0 \text{ Hz, CH}), 126.4 (\text{CH}), 122.4 (\text{q, }^1J_{\text{C-F}} = 273.9 \text{ Hz, } \text{C}_q), 45.0 (\text{q, }^5J_{\text{C-F}} = 1.5 \text{ Hz, CH}_2), 30.0 (\text{CH}_2)\).

\(^{19}\text{F}\text{-NMR} (377 \text{ MHz, CDCl}_3): \delta = -58.1 (\text{s}). \text{HRMS (ESI): } m/z \text{ Calcd for } C_{16}H_{13}F_3O + H^+ [M + H]^+ 279.0991; \text{ Found 279.0986. The } ^1\text{H} \text{ and } ^{13}\text{C} \{^1\text{H}\} \text{ spectra are consistent with those reported in the literature.}^{10}

\begin{center}
\begin{tikzpicture}
\draw[thick] (-1,0) -- (1,0) -- (1,1) -- (-1,1) -- cycle;
\draw[thick] (-1,0) -- (1,-1) -- (1,0);
\draw[thick] (-1,1) -- (1,1);
\draw[thick] (-1,1) -- (1,-1);
\end{tikzpicture}
\end{center}

1-(3-Hydroxyphenyl)-3-phenylpropan-1-one (14): The representative procedure was followed, using substrate 14a (0.045 g, 0.201 mmol) and the reaction mixture was stirred at 50 °C for 24 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 10/1) yielded 14 (0.015 g, 33%) as a white solid. \(^1\text{H}\text{-NMR} (400 \text{ MHz, CDCl}_3): \delta = 7.53 (\text{s, } 1\text{H, Ar–H}), 7.50 (\text{d, } J = 7.9 \text{ Hz, } 1\text{H, Ar–H}), 7.34-7.27 (\text{m, } 3\text{H, Ar–H}), 7.24-7.18 (\text{m, } 3\text{H, Ar–H}), 7.07 (\text{d, } J = 7.9 \text{ Hz, } 1\text{H, Ar–H}), 7.07 (\text{d, } J = 7.9 \text{ Hz, } 1\text{H, Ar–H}), 6.21-6.09 (\text{br s, } 1\text{H, OH}), 3.28 (\text{t, } J = 7.3 \text{ Hz, } \text{CH}_2), 3.05 (\text{t, } J = 7.3 \text{ Hz, } 2\text{H, CH}_2). \ ^{13}\text{C} \{^1\text{H}\}\text{-NMR} (100 \text{ MHz, CDCl}_3): \delta = 200.0 (\text{CO}), 156.4 (\text{C}_q), 141.3 (\text{C}_q), 138.4 (\text{C}_q), 130.1 (\text{CH}), 128.7 (2\text{C, CH}), 128.6 (2\text{C, CH}), 126.4 (\text{CH}), 120.9 (\text{CH}), 120.8 (\text{CH}), 114.7 (\text{CH}), 40.8 (\text{CH}_2), 30.3 (\text{CH}_2). \text{HRMS (ESI): } m/z \text{ Calcd for } C_{15}H_{14}O_2 + H^+ [M + H]^+ 227.1067; \text{ Found 227.1065.}^{11}

\begin{center}
\begin{tikzpicture}
\draw[thick] (-1,0) -- (1,0) -- (1,1) -- (-1,1) -- cycle;
\draw[thick] (-1,0) -- (1,-1) -- (1,0);
\draw[thick] (-1,1) -- (1,1);
\end{tikzpicture}
\end{center}

1-(3-(Allyloxy)phenyl)-3-phenylpropan-1-one (15): The representative procedure was followed, using substrate 15a (0.053 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 15 (0.039 g, 73%) as yellow oil. \(^1\text{H}\text{-NMR} (400 \text{ MHz, CDCl}_3): \delta = 7.54 (\text{d, } J = 7.8 \text{ Hz, } 1\text{H, Ar–H}), 7.51-7.50 (\text{m, } 1\text{H, Ar–H}), 7.34-7.19 (\text{m, } 3\text{H, Ar–H}), 7.12 (\text{dd, } J = 8.3, 2.0 \text{ Hz, } 1\text{H, Ar–H}), 7.30 (\text{t, } J = 7.3 \text{ Hz, } 2\text{H, Ar–H}), 6.10-6.01 (\text{m, } 1\text{H, CH}), 5.43 (\text{dd, } J = 17.3, 1.5 \text{ Hz, } 1\text{H, CH}), 5.31 (\text{dd, } J = 10.6, 1.4 \text{ Hz, } 1\text{H, CH}), 4.57 (\text{d, } J = 5.3 \text{ Hz, } 2\text{H, CH}_2), 3.28 (\text{t, } J = 7.7 \text{ Hz, } 2\text{H, CH}_2), 3.06 (\text{t, } J = 7.6 \text{ Hz, } 2\text{H, CH}_2). \ ^{13}\text{C} \{^1\text{H}\}\text{-NMR} (100 \text{ MHz, CDCl}_3): \delta = 199.4 (\text{CO}), 159.3 (\text{C}_q), 141.7 (\text{C}_q), 138.7 (\text{C}_q), 133.3 (\text{CH}), 130.1 (\text{CH}), 129.0 (2\text{C, CH}), 129.0 (2\text{C, CH}), 126.6 (\text{CH}),
121.3 (CH), 120.6 (CH), 118.4 (CH), 113.8 (CH), 69.4 (CH), 41.0 (CH), 30.6 (CH).

HRMS (ESI): $m/z$ Calcd for C$_{18}$H$_{18}$O$_2$ + H$^+$ [M + H]$^+$ 267.1380; Found 267.1373.

3-Phenyl-1-(3-(prop-2-yn-1-yloxy)phenyl)propan-1-one (16): The representative procedure was followed, using substrate 16a (0.053 g, 0.202 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 16 (0.037 g, 69%) as yellow oil. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta = 7.57$ (d, $J = 8.1$ Hz, 2H, Ar–H), 7.38 (t, $J = 7.9$ Hz, 1H, Ar–H), 7.30 (t, $J = 7.4$ Hz, 2H, Ar–H), 7.26-7.16 (m, 4H, Ar–H), 4.73 (d, $J = 2.3$ Hz, 2H, CH$_2$), 3.28 (t, $J = 7.7$ Hz, 2H, CH$_2$), 3.06 (t, $J = 7.6$ Hz, 2H, CH$_2$), 2.53 (t, $J = 2.2$ Hz, 1H, CH). $^{13}$C$\{^1$H$\}$-NMR (100 MHz, CDCl$_3$): $\delta = 198.9$ (CO), 157.9 (C$_q$), 141.4 (C$_q$), 138.4 (C$_q$), 129.8 (CH), 128.7 (2C, CH), 128.6 (2C, CH), 126.3 (CH), 121.6 (CH), 120.4 (CH), 113.7 (CH), 78.2 (C$_q$), 76.1 (CH), 56.1 (CH$_2$), 40.7 (CH$_2$), 30.3 (CH$_2$). HRMS (ESI): $m/z$ Calcd for C$_{18}$H$_{16}$O$_2$ + H$^+$ [M + H]$^+$ 265.1223; Found 265.1217.

1-(3-(Oxiran-2-ylmethoxy)phenyl)-3-phenylpropan-1-one (17): The representative procedure was followed, using substrate 17a (0.057 g, 0.203 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 4 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 17 (0.039 g, 68%) as yellow oil. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta = 7.56$ (d, $J = 7.8$ Hz, 1H, Ar–H), 7.50 (t, $J = 1.9$ Hz, 1H, Ar–H), 7.36 (t, $J = 7.9$ Hz, 1H, Ar–H), 7.30 (t, $J = 7.3$ Hz, 2H, Ar–H), 7.26-7.19 (m, 3H, Ar–H), 7.14 (dd, $J = 2.5$, 0.6 Hz, 1H, Ar–H), 4.30 (dd, $J = 11.0$, 2.9 Hz, 1H, CH), 3.97 (dd, $J = 11.0$, 5.9 Hz, 1H, CH), 3.39-3.35 (m, 1H, CH), 3.29 (t, $J = 7.6$ Hz, 2H, CH$_2$), 3.06 (t, $J = 7.6$ Hz, 2H, CH$_2$), 2.92 (t, $J = 4.5$ Hz, 1H, CH$_2$), 2.67 (dd, $J = 4.9$ Hz, 2.63 Hz, 1H, CH$_2$). $^{13}$C$\{^1$H$\}$-NMR (100 MHz, CDCl$_3$): $\delta = 199.1$ (CO), 158.9 (C$_q$), 141.4 (C$_q$), 138.4 (C$_q$), 129.9 (CH), 128.7 (2C, CH), 128.6 (2C, CH), 126.3 (CH), 121.4 (CH), 120.3 (CH), 113.2 (CH), 69.1 (CH$_2$), 50.2 (CH), 44.7 (CH$_2$), 40.7 (CH$_2$), 30.3 (CH$_2$). HRMS (ESI): $m/z$ Calcd for C$_{18}$H$_{18}$O$_3$ + H$^+$ [M + H]$^+$ 283.1329; Found 283.1223.
1-(Naphthalen-2-yl)-3-phenylpropan-1-one (18): The representative procedure was followed, using substrate 18a (0.052 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 18 (0.037 g, 71%) as brown solid. $^1$H-NMR (500 MHz, CDCl$_3$): $\delta = 8.44$ (s, 1H, Ar–H), 8.02 (dd, $J = 8.6, 1.6$ Hz, 1H, Ar–H), 7.92-7.84 (m, 3H, Ar–H), 7.59-7.50 (m, 2H, Ar–H), 7.33-7.19 (m, 5H, Ar–H), 3.42 (t, $J = 7.8$ Hz, 2H, CH$_2$), 3.12 (t, $J = 7.7$ Hz, 2H, CH$_2$). $^{13}$C{$^1$H}-NMR (125 MHz, CDCl$_3$): $\delta = 199.3$ (CO), 141.5 (C$q$), 135.7 (C$q$), 134.3 (C$q$), 132.7 (C$q$), 129.8 (CH), 129.7 (CH), 128.7 (2C, CH), 128.6 (2C, CH), 128.6 (CH), 128.6 (CH), 127.9 (CH), 126.9 (CH), 126.3 (CH), 124.0 (CH), 40.7 (CH$_2$), 30.4 (CH$_2$). HRMS (ESI): m/z Calcd for C$_{19}$H$_{16}$O + H$^+$ [M + H]$^+$ 261.1274; Found 261.1270. The $^1$H and $^{13}$C{$^1$H} spectra are consistent with those reported in the literature.$^7$

1-(Naphthalen-1-yl)-3-phenylpropan-1-one (19): The representative procedure was followed, using substrate 19a (0.052 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 19 (0.049 g, 94%) as white solid. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta = 8.54$ (d, $J = 8.5$ Hz, 1H, Ar–H), 7.94 (d, $J = 8.3$ Hz, 1H, Ar–H), 7.85 (d, $J = 8.3$ Hz, 1H, Ar–H), 7.79 (dd, $J = 7.1, 0.9$ Hz, 1H, Ar–H), 7.58-7.49 (m, 2H, Ar–H), 7.44 (t, $J = 7.7$ Hz, 1H, Ar–H), 7.30-7.17 (m, 5H, Ar–H), 3.36 (t, $J = 7.7$ Hz, 2H, CH$_2$), 3.12 (t, $J = 7.6$ Hz, 2H, CH$_2$). $^{13}$C{$^1$H}-NMR (100 MHz, CDCl$_3$): $\delta = 203.7$ (CO), 141.3 (C$q$), 136.1 (C$q$), 134.1 (C$q$), 132.7 (CH), 130.3 (C$q$), 128.7 (2C, CH), 128.6 (2C, CH), 128.6 (CH), 128.0 (CH), 127.6 (CH), 126.6 (CH), 126.3 (CH), 125.9 (CH), 124.5 (CH), 44.0 (CH$_2$), 30.7 (CH$_2$). HRMS (ESI): m/z Calcd for C$_{19}$H$_{16}$O + H$^+$ [M + H]$^+$ 261.1274; Found 261.1270. The $^1$H and $^{13}$C{$^1$H} spectra are consistent with those reported in the literature.$^7$
3-[(1,1′-Biphenyl)-4-yl]-1-phenylpropan-1-one (20): The representative procedure was followed, using substrate 20a (0.057 g, 0.20 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 20 (0.051 g, 89%) as yellow solid. 1H-NMR (500 MHz, CDCl3): δ = 8.01 (d, J = 7.1 Hz, 2H, Ar–H), 7.63-7.56 (m, 5H, Ar–H), 7.50-7.44 (m, 4H, Ar–H), 7.38-7.34 (m, 3H, Ar–H), 3.37 (t, J = 7.7 Hz, 2H, CH2), 3.15 (t, J = 7.6 Hz, 2H, CH2). 13C{1H}-NMR (125 MHz, CDCl3): δ = 199.3 (CO), 141.1 (Cq), 140.6 (Cq), 139.3 (Cq), 137.0 (Cq), 133.2 (CH), 129.0 (2C, CH), 128.9 (2C, CH), 128.8 (2C, CH), 128.2 (2C, CH), 127.4 (2C, CH), 127.3 (CH), 127.1 (2C, CH), 40.5 (CH2), 29.9 (CH2). HRMS (ESI): m/z Calcd for C21H18O + H+ [M + H]+ 287.1430; Found 287.1425. The 1H and 13C{1H} spectra are consistent with those reported in the literature.5

3-(4-Methoxyphenyl)-1-phenylpropan-1-one (21): The representative procedure was followed, using substrate 21a (0.048 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 21 (0.044 g, 91%) as yellow solid. 1H-NMR (400 MHz, CDCl3): δ = 7.98-7.95 (m, 2H, Ar–H), 7.56 (vt, J = 7.4 Hz, 1H, Ar–H), 7.48-7.43 (m, 2H, Ar–H), 7.18 (d, J = 8.8 Hz, 2H, Ar–H), 6.85 (d, J = 8.8 Hz, 2H, Ar–H), 3.79 (s, 3H, CH3), 3.28 (t, J = 7.7 Hz, 2H, CH2), 3.02 (t, J = 7.6 Hz, 2H, CH2). 13C{1H}-NMR (100 MHz, CDCl3): δ = 199.5 (CO), 158.1 (Cq), 137.0 (Cq), 133.5 (Cq), 133.2 (CH), 129.5 (2C, CH), 128.7 (2C, CH), 128.2 (2C, CH), 114.1 (2C, CH), 55.4 (CH3), 40.9 (CH2), 29.4 (CH2). HRMS (ESI): m/z Calcd for C16H16O2 + H+ [M + H]+ 241.1223; Found 241.1218. The 1H and 13C{1H} spectra are consistent with those reported in the literature.5
3-(4-(Benzyloxy)phenyl)-1-phenylpropan-1-one (22): The representative procedure was followed, using substrate 22a (0.063 g, 0.20 mmol), 1.0 mL of MeOH:DCM (4:1) and the reaction mixture was stirred at room temperature (27 °C) for 5 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 22 (0.046 g, 73%) as yellow oil. ¹H-NMR (400 MHz, CDCl₃): δ = 7.96 (d, J = 7.7 Hz, 2H, Ar–H), 7.56 (v, J = 7.4 Hz, 1H, Ar–H), 7.48-7.31 (m, 7H, Ar–H), 7.18 (d, J = 8.8 Hz, 2H, Ar–H), 6.92 (d, J = 8.6 Hz, 2H, Ar–H), 5.05 (s, 2H, CH₂), 3.28 (t, J = 7.6 Hz, 2H, CH₂), 3.02 (t, J = 7.7 Hz, 2H, CH₂). ¹³C{¹H}-NMR (100 MHz, CDCl₃): δ = 199.6 (CO), 157.4 (Cq), 137.3 (Cq), 137.1 (Cq), 133.8 (Cq), 133.2 (CH), 129.6 (2C, CH), 128.8 (2C, CH), 128.7 (2C, CH), 128.2 (2C, CH), 128.1 (CH), 127.6 (2C, CH), 115.1 (2C, CH), 70.2 (CH₂), 40.9 (CH₂), 29.5 (CH₂). HRMS (ESI): m/z Calcd for C₂₂H₂₀O₂ + H⁺ [M + H]⁺ 317.1536; Found 317.1531. The ¹H and ¹³C{¹H} spectra are consistent with those reported in the literature.¹³

3-(4-Chlorophenyl)-1-phenylpropan-1-one (23): The representative procedure was followed, using substrate 23a (0.049 g, 0.20 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 23 (0.039 g, 80%) as yellow solid. ¹H-NMR (400 MHz, CDCl₃): δ = 7.94 (d, J = 7.4 Hz, 2H, Ar–H), 7.55 (t, J = 7.4 Hz, 1H, Ar–H), 7.45 (t, J = 7.6 Hz, 2H, Ar–H), 7.25 (d, J = 8.4 Hz, 2H, Ar–H), 7.17 (d, J = 8.4 Hz, 2H, Ar–H), 3.27 (t, J = 7.6 Hz, 2H, CH₂), 3.03 (t, J = 7.6 Hz, 2H, CH₂). ¹³C{¹H}-NMR (100 MHz, CDCl₃): δ = 199.0 (CO), 139.9 (Cq), 136.9 (Cq), 133.3 (CH), 132.0 (Cq), 130.0 (2C, CH), 128.8 (2C, CH), 128.7 (2C, CH), 128.2 (2C, CH), 40.3 (CH₂), 29.5 (CH₂). HRMS (ESI): m/z Calcd for C₁₅H₁₃ClO − H⁺ [M − H]⁺ 243.0571; Found 243.0570. The ¹H and ¹³C{¹H} spectra are consistent with those reported in the literature.¹⁰
1-Phenyl-3-(4-(trifluoromethyl)phenyl)propan-1-one (24): The representative procedure was followed, using substrate 24a (0.056 g, 0.203 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 24 (0.054 g, 96%) as a white solid. $^1$H-NMR (500 MHz, CDCl$_3$): \(\delta = 7.96\) (d, \(J = 7.8\) Hz, 2H, Ar–H), 7.59-7.54 (m, 3H, Ar–H), 7.46 (t, \(J = 7.6\) Hz, 2H, Ar–H), 7.38 (d, \(J = 8.0\) Hz, 2H, Ar–H), 3.33 (t, \(J = 7.6\) Hz, 2H, CH$_2$), 3.14 (t, \(J = 7.5\) Hz, 2H, CH$_2$). $^{13}$C\{$^1$H\}-NMR (125 MHz, CDCl$_3$): \(\delta = 198.7\) (CO), 145.6 (q, $^5$J$_{C-F} = 1.5$ Hz, C$_q$), 136.8 (C$_q$), 133.4 (CH), 129.0 (2C, CH), 128.8 (2C, CH), 128.7 (q, $^2$J$_{C-F} = 32.1$ Hz, C$_q$), 128.2 (2C, CH), 125.6 (q, $^1$J$_{C-F} = 3.8$ Hz, 2C, CH), 124.5 (q, $^1$J$_{C-F} = 271.1$ Hz, CF$_3$), 40.0 (CH$_2$), 29.9 (CH$_2$). $^{19}$F-NMR (377 MHz, CDCl$_3$): \(\delta = -62.4\) (s). HRMS (ESI): \(m/z\) Calcd for C$_{18}$H$_{14}$F$_3$O + H$^+$ [M + H]$^+$ 279.0991; Found 279.0985. The $^1$H and $^{13}$C\{$^1$H\} spectra are consistent with those reported in the literature.$^5$

3-(4-(Dimethylamino)phenyl)-1-phenylpropan-1-one (25): The representative procedure was followed, using substrate 25a (0.051 g, 0.203 mmol), 1.0 mL of MeOH:DCM (4:1) and the reaction mixture was stirred at room temperature (27 °C) for 5 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 25 (0.041 g, 80%) as yellow oil. $^1$H-NMR (400 MHz, CDCl$_3$): \(\delta = 7.97\) (d, \(J = 7.8\) Hz, 2H, Ar–H), 7.56 (t, \(J = 7.3\) Hz, 1H, Ar–H), 7.46 (t, \(J = 7.6\) Hz, 2H, Ar–H), 7.15 (d, \(J = 8.63\) Hz, 2H, Ar–H), 6.72 (d, \(J = 8.8\) Hz, 2H, Ar–H), 3.27 (t, \(J = 7.8\) Hz, 2H, CH$_2$), 2.99 (t, \(J = 7.8\) Hz, 2H, CH$_2$), 2.93 (s, 6H, CH$_3$). $^{13}$C\{$^1$H\}-NMR (100 MHz, CDCl$_3$): \(\delta = 199.9\) (CO), 149.4 (C$_q$), 137.1 (C$_q$), 133.1 (CH), 129.4 (C$_q$), 129.2 (2C, CH), 128.7 (2C, CH), 128.2 (2C, CH), 113.2 (2C, CH), 41.1 (CH$_2$), 41.0 (CH$_3$), 29.4 (CH$_2$). HRMS (ESI): \(m/z\) Calcd for C$_{18}$H$_{19}$NO + H$^+$ [M + H]$^+$ 254.1539; Found 254.1536. The $^1$H and $^{13}$C\{$^1$H\} spectra are consistent with those reported in the literature.$^8$
4-(3-Oxo-3-phenylpropyl)benzonitrile (26): The representative procedure was followed, using substrate 26a (0.047 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 26 (0.042 g, 89%) as white solid. $^1$H-NMR (500 MHz, CDCl$_3$): $\delta = 7.94$ (d, $J = 7.2$ Hz, 2H, Ar–H), 7.54-7.58 (m, 3H, Ar–H), 7.54 (t, $J = 7.7$ Hz, 2H, Ar–H), 7.36 (d, $J = 8.3$ Hz, 2H, Ar–H), 3.32 (t, $J = 7.4$ Hz, 2H, CH$_2$), 3.13 (t, $J = 7.4$ Hz, 2H, CH$_2$). $^{13}$C{$^1$H}-NMR (125 MHz, CDCl$_3$): $\delta = 198.4$ (CO), 147.1 (C$_q$), 136.7 (C$_q$), 133.5 (CH), 132.4 (2C, CH), 129.5 (2C, CH), 128.8 (2C, CH), 128.1 (2C, CH), 119.1 (C$_q$), 110.2 (C$_q$), 39.5 (CH$_2$), 30.1 (CH$_2$). HRMS (ESI): $m/z$ Calcd for C$_{16}$H$_{13}$NO + H$^+$ [M + H]$^+$ 236.1070; Found 236.1067. The $^1$H and $^{13}$C{$^1$H} spectra are consistent with those reported in the literature.

3-(3-Fluorophenyl)-1-phenylpropan-1-one (27): The representative procedure was followed, using substrate 27a (0.046 g, 0.203 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 27 (0.038 g, 82%) as yellow solid. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta = 7.96$ (d, $J = 7.8$ Hz, 2H, Ar–H), 7.57 (tt, $J = 7.4$, 1.9 Hz, 1H, Ar–H), 7.46 (t, $J = 7.6$ Hz, 2H, Ar–H), 7.28-7.23 (m, 1H, Ar–H), 7.03 (d, $J = 7.6$ Hz, 1H, Ar–H), 6.98-6.95 (m, 1H, Ar–H), 6.90 (td, $J = 8.5$, 2.4 Hz, 1H, Ar–H), 3.31 (t, $J = 7.6$ Hz, 2H, CH$_2$), 3.08 (t, $J = 7.6$ Hz, 2H, CH$_2$). $^{13}$C{$^1$H}-NMR (100 MHz, CDCl$_3$): $\delta = 198.4$ (CO), 163.1 (d, $^1$J$_{C-F} = 245.4$ Hz, C$_q$), 144.0 (d, $^3$J$_{C-F} = 6.9$ Hz, C$_q$), 136.9 (C$_q$), 133.3 (CH), 130.1 (d, $^3$J$_{C-F} = 8.4$ Hz, CH), 128.8 (2C, CH), 128.2 (2C, CH), 124.2 (d, $^4$J$_{C-F} = 3.1$ Hz, CH), 115.5 (d, $^2$J$_{C-F} = 20.6$ Hz, CH), 113.2 (d, $^2$J$_{C-F} = 21.4$ Hz, CH), 40.1 (CH$_2$), 29.9 (d, $^4$J$_{C-F} = 1.5$ Hz, CH$_2$). $^{19}$F-NMR (377 MHz, CDCl$_3$): $\delta = -113.5$ (s). HRMS (ESI): $m/z$ Calcd for C$_{15}$H$_{13}$FO + H$^+$ [M + H]$^+$ 229.1023; Found 229.1021. The $^1$H and $^{13}$C{$^1$H} spectra are consistent with those reported in the literature.
3-(3-Nitrophenoxy)-1-phenylpropan-1-one (28): The representative procedure was followed, using substrate 28a (0.051 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 5 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 28 (0.045 g, 88%) as a white solid. \(^1\)H-NMR (400 MHz, CDCl\(_3\)): \(\delta = 8.12\) (s, 1H, Ar–H), 8.05 (d, \(J = 8.1\) Hz, 1H, Ar–H), 7.95 (d, \(J = 7.8\) Hz, 2H, Ar–H), 7.61 (d, \(J = 7.8\) Hz, 1H, Ar–H), 7.57 (t, \(J = 7.4\) Hz, 1H, Ar–H), 7.48-7.43 (m, 3H, Ar–H), 3.37 (t, \(J = 7.4\) Hz, 2H, CH\(_2\)), 3.19 (t, \(J = 7.3\) Hz, 2H, CH\(_2\)). \(^{13}\)C\({}^{1}\)H-NMR (100 MHz, CDCl\(_3\)): \(\delta = 198.4\) (CO), 148.5 (C\(_q\)), 143.5 (C\(_q\)), 136.7 (C\(_q\)), 135.1 (CH), 133.5 (CH), 129.5 (CH), 128.9 (2C, CH), 128.1 (2C, CH), 123.4 (CH), 121.5 (CH), 39.7 (CH\(_2\)), 29.6 (CH\(_2\)). HRMS (ESI): \(m/z\) Caled for C\(_{15}\)H\(_{13}\)NO\(_3\) + H\(^+\) [M + H]\(^+\) 256.0973; Found 256.0961. The \(^1\)H and \(^{13}\)C\({}^{1}\)H\) spectra are consistent with those reported in the literature.\(^\text{16}\)

3-(Naphthalen-2-yl)-1-phenylpropan-1-one (29): The representative procedure was followed, using substrate 29a (0.052 g, 0.201 mmol), 1.0 mL of MeOH:DCM (4:1)] and the reaction mixture was stirred at room temperature (27 °C) for 5 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 29 (0.050 g, 96%) as a white solid. \(^1\)H-NMR (400 MHz, CDCl\(_3\)): \(\delta = 7.99\) (d, \(J = 8.3\) Hz, 2H, Ar–H), 7.81 (t, \(J = 7.8\) Hz, 3H, Ar–H), 7.70 (s, 1H, Ar–H), 7.56 (t, \(J = 7.4\) Hz, 1H, Ar–H), 7.49-7.39 (m, 5H, Ar–H), 3.40 (t, \(J = 7.7\) Hz, 2H, CH\(_2\)), 3.25 (t, \(J = 7.7\) Hz, 2H, CH\(_2\)). \(^{13}\)C\({}^{1}\)H-NMR (100 MHz, CDCl\(_3\)): \(\delta = 199.4\) (CO), 139.0 (C\(_q\)), 137.0 (C\(_q\)), 133.8 (C\(_q\)), 133.3 (CH), 132.3 (C\(_q\)), 128.8 (2C, CH), 128.3 (CH), 128.2 (2C, CH), 127.8 (CH), 127.6 (CH), 127.4 (CH), 126.7 (CH), 126.2 (CH), 125.5 (CH), 40.5 (CH\(_2\)), 30.4 (CH\(_2\)). HRMS (ESI): \(m/z\) Caled for C\(_{19}\)H\(_{16}\)O + H\(^+\) [M + H]\(^+\) 261.1274; Found 261.1270. The \(^1\)H and \(^{13}\)C\({}^{1}\)H\) spectra are consistent with those reported in the literature.\(^\text{17}\)
3-(Furan-2-yl)-1-phenylpropan-1-one (30): The representative procedure was followed, using substrate 30a (0.040 g, 0.202 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 30 (0.035 g, 87%) as yellow oil. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta = 7.98$ (d, $J = 7.8$ Hz, 2H, Ar–H), 7.56 (tt, $J = 7.4$, 1.9 Hz, 1H, Ar–H), 7.46 (t, $J = 7.6$ Hz, 2H, Ar–H), 7.31 (d, $J = 1.8$ Hz, 1H, Ar–H), 6.29 (dd, $J = 3.1$, 1.9 Hz, 1H, Ar–H), 6.05 (dd, $J = 3.1$, 0.8 Hz, 1H, Ar–H), 3.34 (t, $J = 7.4$ Hz, 2H, CH$_2$), 3.10 (t, $J = 7.5$ Hz, 2H, CH$_2$). $^{13}$C {$^1$H}-NMR (100 MHz, CDCl$_3$): $\delta = 198.8$ (CO), 154.9 (C$_q$), 141.2 (CH), 136.9 (C$_q$), 133.3 (CH), 128.8 (2C, CH), 128.2 (2C, CH), 110.4 (CH), 105.5 (CH), 37.1 (CH$_2$), 22.6 (CH$_2$). HRMS (ESI): $m/z$ Calcd for C$_{13}$H$_{12}$O$_2$ + H$^+$ [M + H]$^+$ 201.0910; Found 201.0908. The $^1$H and $^{13}$C {$^1$H} spectra are consistent with those reported in the literature.$^4$

1-Phenyl-3-(thiophen-2-yl)propan-1-one (31): The representative procedure was followed, using substrate 31a (0.043 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 31 (0.035 g, 81%) as green oil. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta = 7.96$ (d, $J = 7.4$ Hz, 2H, Ar–H), 7.56 (t, $J = 7.4$ Hz, 1H, Ar–H), 7.46 (t, $J = 7.7$ Hz, 2H, Ar–H), 7.11 (d, $J = 5.1$ Hz, 1H, Ar–H), 6.91 (dd, $J = 5.0$, 3.5 Hz, 1H, Ar–H), 6.86 (d, $J = 3.3$ Hz, 1H, Ar–H), 3.38-3.34 (m, 2H, CH$_2$), 3.31-3.27 (m, 2H, CH$_2$). $^{13}$C {$^1$H}-NMR (100 MHz, CDCl$_3$): $\delta = 198.7$ (CO) 144.0 (C$_q$), 136.9 (C$_q$), 133.3 (CH), 128.8 (2C, CH), 128.2 (2C, CH), 127.0 (CH), 124.8 (CH), 123.5 (CH), 40.7 (CH$_2$), 24.4 (CH$_2$). The $^1$H and $^{13}$C {$^1$H} spectra are consistent with those reported in the literature.$^5$

3-(1H-Indol-5-yl)-1-phenylpropan-1-one (32): The representative procedure was followed, using substrate 32a (0.050 g, 0.202 mmol), 1.0 mL of MeOH:DCM (4:1) and the reaction
mixture was stirred at room temperature (27 °C) for 5 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 20/1) yielded 32 (0.036 g, 72%) as a yellow solid. \(^1\)H-NMR (400 MHz, CDCl\(_3\)): \(\delta = 8.19\) (br s, 1H, NH), 7.99 (d, \(J = 7.4\) Hz, 2H, Ar–H), 7.58-7.53 (m, 2H, Ar–H), 7.46 (t, \(J = 7.6\) Hz, 2H, Ar–H), 7.33 (d, \(J = 8.4\) Hz, 1H, Ar–H), 7.19 (t, \(J = 2.8\) Hz, 1H, Ar–H), 7.11 (dd, \(J = 8.4, 1.6\) Hz, 1H, Ar–H), 6.51 (t, \(J = 8.4\) Hz, 1H, Ar–H), 3.36 (d, \(J = 7.8\) Hz, 2H, CH\(_2\)), 3.18 (t, \(J = 7.7\) Hz, 2H, CH\(_2\)). \(^{13}\)C\{\(^1\)H\}-NMR (100 MHz, CDCl\(_3\)): \(\delta = 200.0\) (CO), 137.1 (C\(_q\)), 134.7 (C\(_q\)), 133.1 (CH), 132.7 (C\(_q\)), 128.7 (2C, CH), 128.3 (C\(_q\)), 128.2 (2C, CH), 124.7 (CH), 123.0 (CH), 120.0 (CH), 111.2 (CH), 102.4 (CH), 41.7 (CH\(_2\)), 30.5 (CH\(_2\)). HRMS (ESI): \(m/z\) Calcd for C\(_{17}\)H\(_{15}\)NO + H\(^+\) [M + H\(^+\)] 250.1226; Found 250.1225.

3-Phenyl-1-(pyridin-2-yl)propan-1-one (33): The representative procedure was followed, using substrate 33a (0.042 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 33 (0.026 g, 61%) as a green oil. \(^1\)H-NMR (400 MHz, CDCl\(_3\)): \(\delta = 8.66\) (d, \(J = 4.6\) Hz, 1H, Ar–H), 8.05 (d, \(J = 7.8\) Hz, 1H, Ar–H), 7.83 (td, \(J = 7.8, 1.7\) Hz, 1H, Ar–H), 7.47-7.44 (m, 1H, Ar–H), 7.28 (d, \(J = 4.5\) Hz, 4H, Ar–H), 7.21-7.17 (m, 1H, Ar–H), 3.58 (t, \(J = 7.7\) Hz, 2H, CH\(_2\)), 3.08 (t, \(J = 7.7\) Hz, 2H, CH\(_2\)). \(^{13}\)C\{\(^1\)H\}-NMR (100 MHz, CDCl\(_3\)): \(\delta = 201.2\) (CO), 153.5 (C\(_q\)), 149.1 (CH), 141.6 (C\(_q\)), 137.0 (CH), 128.6 (2C, CH), 128.6 (2C, CH), 127.3 (CH), 126.1 (CH), 122.0 (CH), 39.6 (CH\(_2\)), 30.0 (CH\(_2\)). HRMS (ESI): \(m/z\) Calcd for C\(_{14}\)H\(_{13}\)NO + H\(^+\) [M + H\(^+\)] 212.1070; Found 212.1068. The \(^1\)H and \(^{13}\)C\{\(^1\)H\} spectra are consistent with those reported in the literature.\(^{17}\)

3-(1H-Pyrrol-2-yl)-1-(thiophen-2-yl)propan-1-one (34): The representative procedure was followed, using substrate 34a (0.041 g, 0.202 mmol), 1.0 mL of MeOH:DCM (4:1) and the reaction mixture was stirred at room temperature (27 °C) for 12 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 20/1) yielded 34 (0.025 g, 60%) as brown solid. \(^1\)H-NMR (400 MHz, CDCl\(_3\)): \(\delta = 8.65\) (br s, 1H, NH), 7.72 (dd, \(J = 3.8, 0.8\) Hz, 1H, Ar–H), 7.65 (dd, \(J = 4.9, 0.8\) Hz, 1H, Ar–H), 7.13 (dd, \(J = 4.8, 4.0\) Hz, 1H, Ar–H), 6.68-
6.67 (m, 1H, Ar–H), 6.12-6.09 (m, 1H, Ar–H), 5.96 (s, 1H, Ar–H), 3.29 (t, J = 6.4 Hz, 2H, CH₂), 3.05 (t, J = 6.4 Hz, 2H, CH₂). $^{13}$C{¹H}-NMR (100 MHz, CDCl₃): $\delta$ = 193.6 (CO), 144.0 (Cₗ), 134.0 (CH), 132.3 (CH), 131.5 (Cₗ), 128.4 (CH), 117.0 (CH), 108.0 (CH), 105.6 (CH), 40.1 (CH₂), 21.8 (CH₂). HRMS (ESI): m/z Calcd for C₁₁H₁₁NOS + H⁺ [M + H]⁺ 206.0634; Found 206.0630.

3-(Furan-2-yl)-1-(thiophen-2-yl)propan-1-one (35): The representative procedure was followed, using substrate 35a (0.041 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 35 (0.037 g, 89%) as brown liquid. $^1$H-NMR (400 MHz, CDCl₃): $\delta$ = 7.71 (d, J = 3.9 Hz, 1H, Ar–H), 7.63 (d, J = 5.0 Hz, 1H, Ar–H), 7.30 (d, J = 1.1 Hz, 1H, Ar–H), 7.12 (dd, J = 4.9, 3.9 Hz, 1H, Ar–H), 6.27 (dd, J = 2.9, 2.0 Hz, 1H, Ar–H), 6.05 (d, J = 3.0 Hz, 1H, Ar–H), 3.26 (t, J = 7.5 Hz, 2H, CH₂), 3.08 (t, J = 7.5 Hz, CH₂). $^{13}$C{¹H}-NMR (100 MHz, CDCl₃): $\delta$ = 191.7 (CO), 154.6 (Cₗ), 144.1 (Cₗ), 141.3 (CH), 133.8 (CH), 132.0 (CH), 128.3 (CH), 110.4 (CH), 105.6 (CH), 37.7 (CH₂), 22.8 (CH₂). HRMS (ESI): m/z Calcd for C₁₁H₁₀O₂S + H⁺ [M + H]⁺ 207.0474; Found 207.0470.

3-Ferrocenyl-1-phenylpropan-1-one (36): The representative procedure was followed, using substrate 36a (0.064 g, 0.202 mmol), 1.0 mL of MeOH:DCM (4:1) and the reaction mixture was stirred at room temperature (27 °C) for 5 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 36 (0.046 g, 72%) as a yellow solid. $^1$H-NMR (400 MHz, CDCl₃): $\delta$ = 7.97 (d, J = 7.8 Hz, 2H, Ar–H), 7.57 (t, J = 7.4 Hz, 1H, Ar–H), 7.47 (t, J = 7.6 Hz, 2H, Ar–H), 4.14 (s, 5H, Ar–H), 4.13 (s, 2H, Ar–H), 4.08 (s, 2H, Ar–H), 3.20 (t, J = 7.7 Hz, 2H, CH₂) 2.79 (t, J = 7.7 Hz, 2H, CH₂). $^{13}$C{¹H}-NMR (100 MHz, CDCl₃): $\delta$ = 199.7 (CO), 137.1 (Cₗ), 133.2 (CH), 128.8 (2C, CH), 128.2 (2C, CH), 88.2 (Cₗ), 68.8 (5C, CH), 68.3 (2C, CH), 67.6 (2C, CH), 40.5 (CH₂), 24.3 (CH₂). HRMS (ESI): m/z Calcd for C₁₉H₁₈FeO + H⁺ [M + H]⁺ 318.0702; Found 318.0699. The $^1$H and $^{13}$C{¹H} spectra are consistent with those reported in the literature.⁸
(E)-1,5-Diphenylpent-4-en-1-one (37): The representative procedure was followed, using substrate 37a (0.047 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 2 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 37 (0.037 g, 78%) as brown solid. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta$ = 8.01 (d, $J$ = 7.8 Hz, 2H, Ar–H), 7.58 (t, $J$ = 7.3 Hz, 1H, Ar–H), 7.48 (t, $J$ = 7.6 Hz, 2H, Ar–H), 7.36 (d, $J$ = 7.3 Hz, 2H, Ar–H), 7.30 (t, $J$ = 7.6 Hz, 2H, Ar–H), 7.21 (t, $J$ = 7.1 Hz, 1H, Ar–H), 6.48 (d, $J$ = 15.8 Hz, 1H, CH), 6.31 (dt, $J$ = 15.9, 6.8 Hz, 1H, CH) 3.17 (t, $J$ = 7.4 Hz, 2H, CH$_2$), 2.68 (q, $J$ = 6.9 Hz, 2H, CH$_2$). $^{13}$C{$^1$H}-NMR (100 MHz, CDCl$_3$): $\delta$ = 199.5 (CO), 137.6 (C$_q$), 137.1 (C$_q$), 133.2 (CH), 130.9 (CH), 129.3 (CH), 128.8 (2C, CH), 128.7 (2C, CH), 128.2 (2C, CH), 127.2 (CH), 126.2 (2C, CH), 38.4 (CH$_2$), 27.7 (CH$_2$). HRMS (ESI): $m/z$ Calcd for C$_{17}$H$_{16}$O + H$^+$ [M + H]$^+$ 237.1274; Found 237.1271. The $^1$H and $^{13}$C{$^1$H} spectra are consistent with those reported in the literature.$^{18}$

(E)-1,5-Diphenylpent-1-en-3-one (38): The representative procedure was followed, using substrate 38a (0.047 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 1 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 38 (0.035 g, 74%) as yellow solid. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta$ = 7.56-7.51 (m, 3H, Ar–H), 7.39-7.37 (m, 3H, Ar–H), 7.31-7.28 (m, 2H, Ar–H), 7.24-7.18 (m, 3H, Ar–H), 7.73 (d, $J$ = 16.3 Hz, 1H, Ar–H), 3.00 (br s, 4H, CH$_2$). $^{13}$C{$^1$H}-NMR (100 MHz, CDCl$_3$): $\delta$ = 199.5 (CO), 142.9 (CH), 131.4 (C$_q$), 134.6 (C$_q$), 130.6 (CH), 129.1 (2C, CH), 128.7 (2C, CH), 128.6 (2C, CH), 128.4 (2C, CH), 126.3 (CH), 126.3 (CH), 42.6 (CH$_2$), 30.3 (CH$_2$). HRMS (ESI): $m/z$ Calcd for C$_{17}$H$_{16}$O + H$^+$ [M + H]$^+$ 237.1274; Found 237.1273. The $^1$H and $^{13}$C{$^1$H} spectra are consistent with those reported in the literature.$^{19}$
2-Methyl-1,3-diphenylpropan-1-one (39): The representative procedure was followed, using substrate 39a (0.045 g, 0.202 mmol), 10 bar H₂ and the reaction mixture was stirred at 50 °C for 20 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded 39 (0.028 g, 62%) as colorless oil. ¹H-NMR (400 MHz, CDCl₃): δ = 7.94-7.91 (m, 2H, Ar–H), 7.55-7.51 (m, 1H, Ar–H), 7.43 (vt, J = 7.5 Hz, 2H, Ar–H), 7.28-7.24 (m, 2H, Ar–H), 7.20-7.15 (m, 3H, Ar–H), 3.79-3.70 (m, 1H, CH), 3.17 (dd, J = 13.7, 6.3 Hz, 1H, CH₂), 2.69 (dd, J = 13.7, 7.8 Hz, 1H, CH₂), 1.20 (d, J = 6.9 Hz, 3H, CH₃). ¹³C{¹H}-NMR (100 MHz, CDCl₃): δ = 203.9 (CO), 140.1 (C₉), 136.6 (C₉), 133.1 (CH), 129.3 (2C, CH), 128.8 (2C, CH), 128.5 (2C, CH), 126.4 (CH), 42.9 (CH), 39.5 (CH₂), 17.6 (CH₃). HRMS (ESI): m/z Calcd for C₁₆H₁₆O + H⁺ [M + H]⁺ 225.1274; Found 225.1268. The ¹H and ¹³C{¹H} spectra are consistent with those reported in the literature.

![2-Methyl-1,3-diphenylpropan-1-one (39)](image)

2-(4-Acetylphenoxy)-1,3-diphenylpropan-1-one (40): The representative procedure was followed, using substrate 40a (0.069 g, 0.202 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 40 (0.040 g, 57%) as a yellow solid. ¹H-NMR (500 MHz, CDCl₃): δ = 8.04 (d, J = 7.9 Hz, 2H, Ar–H), 7.82 (d, J = 8.8 Hz, 2H, Ar–H), 7.61 (t, J = 7.4 Hz, 1H, Ar–H), 7.48 (t, J = 7.8 Hz, 2H, Ar–H), 7.32-7.23 (m, 5H, Ar–H), 6.84 (d, J = 8.9 Hz, 2H, Ar–H), 5.61 (dd, J = 7.4, 5.3 Hz, 1H, CH), 3.36-3.34 (m, 2H, CH₂), 2.48 (s, 3H, CH₃). ¹³C{¹H}-NMR (125 MHz, CDCl₃): δ = 197.4 (CO), 196.8 (CO), 161.5 (C₉), 136.6 (C₉), 134.4 (C₉), 134.2 (CH), 131.2 (C₉), 130.8 (2C, CH), 129.5 (2C, CH), 129.1 (2C, CH), 128.9 (2C, CH), 128.8 (2C, CH), 127.3 (CH), 115.1 (2C, CH), 81.8 (CH), 39.4 (CH₂), 26.5 (CH₃). HRMS (ESI): m/z Calcd for C₂₃H₂₀O₃ + H⁺ [M + H]⁺ 345.1485; Found 345.1478.

![2-(4-Acetylphenoxy)-1,3-diphenylpropan-1-one (40)](image)

1-Phenyldecan-1-one (41): The representative procedure was followed, using substrate 41a (0.041 g, 0.203 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 1 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 100/1)
yielded 41 (0.031 g, 75%) as colorless oil. \(^1\)H-NMR (400 MHz, CDCl\(_3\)): 7.96 (d, \(J = 7.4\) Hz, 2H, Ar–H), 7.55 (t, \(J = 7.4\) Hz, 1H, Ar–H), 7.45 (t, \(J = 7.6\) Hz, 2H, Ar–H), 2.96 (t, \(J = 7.4\) Hz, 2H, CH\(_2\)), 1.76-1.69 (m, 2H, CH\(_2\)), 1.39-1.23 (m, 8H, CH\(_2\)), 0.88 (t, \(J = 6.7\) Hz, 3H, CH\(_3\)). \(^{13}\)C\{\(^1\)H\}-NMR (100 MHz, CDCl\(_3\)): \(\delta = 200.8\) (CO), 137.2 (C\(_q\)), 133.0 (CH), 128.7 (2C, CH), 128.2 (2C, CH), 38.8 (CH\(_2\)), 31.9 (CH\(_2\)), 29.5 (CH\(_2\)), 29.3 (CH\(_2\)), 24.5 (CH\(_2\)), 22.8 (CH\(_2\)), 14.3 (CH\(_3\)). The \(^1\)H and \(^{13}\)C\{\(^1\)H\} spectra are consistent with those reported in the literature.\(^{21}\)

(\(E\))-3-Phenylprop-2-en-1-ol (42): The representative procedure was followed, using substrate 42a (0.027 g, 0.204 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 1 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 10/1) yielded 42 (0.026 g, 95%) as yellow oil. \(^1\)H-NMR (500 MHz, CDCl\(_3\)): \(\delta = 7.38\) (d, \(J = 7.3\) Hz, 2H, Ar–H), 7.32 (t, \(J = 7.4\) Hz, 2H, Ar–H), 7.24 (t, \(J = 7.2\) Hz, 1H, Ar–H), 6.61 (d, \(J = 16.0\) Hz, 1H, CH), 6.35 (dt, \(J = 15.8, 5.8\) Hz, 1H, CH), 4.31 (dd, \(J = 5.8, 1.5\) Hz, 2H, CH\(_2\)), 2.01 (br s, 1H, OH). \(^{13}\)C\{\(^1\)H\}-NMR (125 MHz, CDCl\(_3\)): \(\delta = 136.8\) (C\(_q\)), 131.2 (CH), 128.7 (2C, CH), 128.7 (CH), 127.8 (CH), 126.6 (2C, CH), 63.8 (CH\(_2\)). The \(^1\)H and \(^{13}\)C\{\(^1\)H\} spectra are consistent with those reported in the literature.\(^{22}\)

(\(E\))-3-(4-Methoxyphenyl)prop-2-en-1-ol (43): The representative procedure was followed, using substrate 43a (0.033 g, 0.203 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 10/1) yielded 43 (0.033 g, 99%) as a white solid. \(^1\)H-NMR (400 MHz, CDCl\(_3\)): \(\delta = 7.31\) (d, \(J = 8.6\) Hz, 2H, Ar–H), 6.85 (d, \(J = 8.8\) Hz, 2H, Ar–H), 6.54 (d, \(J = 15.9\) Hz, 1H, CH), 6.22 (dt, \(J = 15.9, 5.9\) Hz, 1H, CH), 4.28 (dd, \(J = 4.9, 1.4\) Hz, 2H, CH\(_2\)), 3.80 (s, 3H, CH\(_3\)), 1.88 (br s, 1H, OH). \(^{13}\)C\{\(^1\)H\}-NMR (100 MHz, CDCl\(_3\)): \(\delta = 159.4\) (C\(_q\)), 131.0 (CH), 129.6 (C\(_q\)), 127.8 (2C, CH), 126.4 (CH), 114.1 (2C, CH), 64.0 (CH\(_2\)), 55.4 (CH\(_3\)). HRMS (ESI): \(m/z\) Calcd for C\(_{10}\)H\(_{12}\)O\(_2\) + H\(^+\) [M + H]\(^+\) 165.0910; Found 165.0908. The \(^1\)H and \(^{13}\)C\{\(^1\)H\} spectra are consistent with those reported in the literature.\(^{22}\)
(E)-2-Methyl-3-phenylprop-2-en-1-ol (44): The representative procedure was followed, using substrate 44a (0.030 g, 0.205 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 10/1) yielded 44 (0.026 g, 86%) as colorless liquid. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta$ = 7.33 (t, $J = 7.4$ Hz, 2H, Ar–H), 7.27 (d, $J = 7.1$ Hz, 2H, Ar–H), 7.21 (t, $J = 7.13$ Hz, 1H, Ar–H), 6.52 (s, 1H, CH), 4.18 (s, 2H, CH$_2$), 1.90 (s, 3H, CH$_3$), 1.82 (br s, 1H, OH).

$^{13}$C{$^1$H}-NMR (100 MHz, CDCl$_3$): $\delta$ = 137.8 (C$_q$), 137.7 (C$_q$), 129.0 (2C, CH), 128.3 (2C, CH), 126.6 (CH), 125.2 (CH), 69.1 (CH$_2$), 15.4 (CH$_3$). The $^1$H and $^{13}$C{$^1$H} spectra are consistent with those reported in the literature.$^{23}$

(4-(Prop-1-en-2-yl)cyclohex-1-en-1-yl)methanol (45): The representative procedure was followed, using substrate 45a (0.031 g, 0.206 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 20/1) yielded 45 (0.024 g, 77%) as yellow oil. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta$ = 5.71-5.67 (m, 1H, CH), 4.73-4.66 (m, 2H, CH$_2$), 4.01-3.97 (m, 2H, CH$_2$), 2.19-1.79 (m, 7H, CH), 1.74 (s, 3H, CH$_3$), 1.37 (br s, 1H, OH).

$^{13}$C{$^1$H}-NMR (100 MHz, CDCl$_3$): $\delta$ = 150.0 (C$_q$), 137.4 (C$_q$), 122.7 (CH), 108.8 (CH$_2$), 67.5 (CH$_2$), 41.3 (CH), 30.6 (CH$_2$), 27.7 (CH$_2$), 26.3 (CH$_2$), 21.0 (CH$_3$). HRMS (ESI): $m/z$ Calcd for C$_{10}$H$_{16}$O + H$^+$ [M + H]$^+$ 153.1274; Found 153.11273. The $^1$H and $^{13}$C{$^1$H} spectra are consistent with those reported in the literature.$^{24}$

(E/Z)-3-(4-Methoxyphenyl)prop-2-en-1-ol (46): The representative procedure was followed, using isomeric mixture of 46a (0.031 g, 0.204 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 10/1) yielded isomeric mixture (3:2) of 46 (0.023 g, 73%) as colorless oil. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta$ = 5.45-5.41 (m, 1H, CH), 5.11-5.06 (m, 1H, CH), 4.15-4.07 (m, 2H, CH$_2$), 2.12-2.00 (m, 4H, CH$_2$), 1.75-1.67 (m, 6H, CH$_3$), 1.60 (s, 3H,
1,4-Phenylenedimethanol (47): The representative procedure was followed, using substrate 47a (0.027 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 10/1) yielded 47 (0.024 g, 86%) as white solid. 1H-NMR (500 MHz, DMSO-d6): 6 = 7.26 (s, 4H, Ar–H), 5.12 (t, J = 5.7 Hz, 2H, OH), 4.48 (d, J = 5.6 Hz, 4H, CH2). 13C{1H}-NMR (125 MHz, DMSO-d6): 6 = 140.9 (2C, Cq), 126.2 (4C, CH). The 1H and 13C{1H} spectra are consistent with those reported in the literature.25

(4-(Benzyloxy)phenyl)methanol (48): The representative procedure was followed, using substrate 48a (0.043 g, 0.203 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 10/1) yielded 48 (0.043 g, 99%) as a white solid. 1H-NMR (400 MHz, CDCl3): 6 = 7.41 (d, J = 7.3 Hz, 2H, Ar–H), 7.36 (t, J = 7.3 Hz, 2H, Ar–H), 7.30 (t, J = 7.1 Hz, 1H, Ar–H), 7.25 (d, J = 8.6 Hz, 2H, Ar–H), 6.94 (d, J = 8.6 Hz, 2H, Ar–H), 5.04 (s, 2H, CH2), 4.56 (s, 2H, CH2), 1.91 (s, 1H, OH). 13C{1H}-NMR (100 MHz, CDCl3): 6 = 158.5 (Cq), 137.1 (Cq), 133.6 (Cq), 128.8 (2C, CH), 128.7 (2C, CH), 128.1 (CH), 127.6 (2C, CH), 115.1 (2C, CH), 70.2 (CH2), 65.1 (CH2). HRMS (ESI): m/z Calcd for C14H14O2−H+ [M − H]+ 213.0910; Found 213.0907. The 1H and 13C{1H} spectra are consistent with those reported in the literature.25
(4-Nitrophenyl)methanol (49): The representative procedure was followed, using substrate 49a (0.031 g, 0.205 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 10/1) yielded 49 (0.029 g, 92%) as yellow solid. \(^1\)H-NMR (400 MHz, CDCl\(_3\)): \(\delta = 8.18\) (d, \(J = 8.8\) Hz, 2H, Ar–H), 7.51 (d, \(J = 8.9\) Hz, 2H, Ar–H), 4.82 (s, 2H, CH\(_2\)), 2.28 (s, 1H, OH). \(^{13}\)C\{\(^1\)H\}-NMR (100 MHz, CDCl\(_3\)): \(\delta = 148.4\) (C\(_q\)), 147.4 (C\(_q\)), 127.2 (2C, CH), 123.9 (2C, CH), 64.1 (CH\(_2\)). The \(^1\)H and \(^{13}\)C\{\(^1\)H\} spectra are consistent with those reported in the literature.\(^{27}\)

\[ \text{HO} \begin{array}{l}
\text{OH} \\
\end{array} \]

3-(Hydroxymethyl)phenol (50): The representative procedure was followed, using substrate 50a (0.025 g, 0.205 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 10/1) yielded 50 (0.021 g, 83%) as white solid. \(^1\)H-NMR (400 MHz, DMSO-\(d_6\)): \(\delta = 9.30\) (s, 1H, OH), 7.13 (t, \(J = 7.8\) Hz, 1H, Ar–H), 6.78 (s, 1H, Ar–H), 6.75 (d, \(J = 7.5\) Hz, 1H, Ar–H), 6.65 (dd, \(J = 8.0, 2.0\) Hz, 1H, Ar–H), 5.12 (t, \(J = 5.8\) Hz, 1H, OH), 4.45 (d, \(J = 5.8\) Hz, 2H, CH\(_2\)). \(^{13}\)C\{\(^1\)H\}-NMR (100 MHz, DMSO-\(d_6\)): \(\delta = 158.2\) (C\(_q\)), 145.0 (C\(_q\)), 129.9 (CH), 117.8 (CH), 114.4 (CH), 114.2 (CH), 63.8 (CH\(_2\)). The \(^1\)H and \(^{13}\)C\{\(^1\)H\} spectra are consistent with those reported in the literature.\(^{28}\)

\[ \begin{array}{c}
\text{Fe} \\
\text{OH}
\end{array} \]

Ferrocenylmethanol (51): The representative procedure was followed, using substrate 51a (0.043 g, 0.201 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 10/1) yielded 51 (0.042 g, 97%) as a yellow solid. \(^1\)H-NMR (400 MHz, CDCl\(_3\)): \(\delta = 4.32\) (s, 2H, CH\(_2\)), 4.24 (t, \(J = 1.6\) Hz, 2H, Ar–H), 4.19-4.17 (m, 7H, Ar–H), 1.71 (s, 1H, OH). \(^{13}\)C\{\(^1\)H\}-NMR (100 MHz, CDCl\(_3\)): \(\delta = 88.5\) (C\(_q\)), 68.5 (7C, CH), 68.1 (2C, CH), 60.9 (CH\(_2\)). HRMS (ESI): \(m/z\) Calcd for C\(_{11}\)H\(_{12}\)FeO + H\(^+\) [M + H\(^+\)] = 217.0312; Found 217.0311. The \(^1\)H and \(^{13}\)C\{\(^1\)H\} spectra are consistent with those reported in the literature.\(^{25}\)
(1H-Pyrrol-2-yl)methanol (52): The representative procedure was followed, using substrate 52a (0.019 g, 0.20 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 3 h. Purification by column chromatography on neutral alumina (petroleum ether/EtOAc: 20/1) yielded 52 (0.018 g, 93%) as a colorless liquid. After purification the isolated product was stored in the refrigerator to avoid polymerization at room temperature. ¹H-NMR (400 MHz, CDCl₃): δ = 8.62 (br s, 1H, NH), 6.73 (s, 1H, Ar–H), 6.13 (d, J = 15.3 Hz, 2H, Ar–H), 4.54 (s, 2H, CH₂), 2.66 (br s, 1H, OH). ¹³C{¹H}-NMR (100 MHz, CDCl₃): δ = 131.1 (Cₚ), 118.8 (CH), 108.4 (CH), 107.3 (CH), 58.0 (CH₂).

N-Cinnamylaniline (53): The representative procedure was followed, using substrate 53a (0.042 g, 0.203 mmol) and the reaction mixture was stirred at room temperature (27 °C) for 4 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 50/1) yielded mixture of 53 and N-(3-phenylpropylaniline (0.038 g, 89%) as a yellow oil. For compound 53: ¹H-NMR (400 MHz, CDCl₃): δ = 7.35 (d, J = 7.1 Hz, 2H, Ar–H), 7.29 (t, J = 7.3 Hz, 2H, Ar–H), 7.23-7.16 (m, 3H, Ar–H), 6.71 (t, J = 7.3 Hz, 1H, Ar–H), 6.65 (d, J = 7.9 Hz, 2H, Ar–H), 6.58-6.55 (m, 1H, CH), 6.31 (dt, J = 15.9, 5.7 Hz, 1H, CH), 3.92 (d, J = 5.4 Hz, 2H, CH₂), 3.68 (br s, 1H, NH). ¹³C{¹H}-NMR (100 MHz, CDCl₃): δ = 148.2 (Cₚ), 137.0 (Cₚ), 131.7 (CH), 129.4 (2C, CH), 128.7 (2C, CH), 127.7 (CH), 127.2 (CH), 126.5 (2C, CH), 117.8 (CH), 113.2 (2C, CH), 46.4 (CH₂). HRMS (ESI): m/z Calcd for C₁₅H₁₅N−H⁺ [M−H]⁺ 208.1121; Found 208.1120. The ¹H and ¹³C{¹H} spectra are consistent with those reported in the literature.²²

N-benzylaniline (54): The representative procedure was followed, using substrate 54a (0.037 g, 0.204 mmol) and the reaction mixture was stirred at 50 °C for 20 h. Purification by column chromatography on silica gel (petroleum ether/EtOAc: 30/1) yielded 54 (0.034 g, 91%) as
yellow oil. $^1$H-NMR (400 MHz, CDCl$_3$): $\delta$ = 7.38-7.31 (m, 4H, Ar–H), 7.28-7.24 (m, 1H, Ar–H), 7.16 (dd, $J$ = 8.6, 7.4 Hz, 2H, Ar–H), 6.71 (t, $J$ = 7.3 Hz, 1H, Ar–H), 6.62 (dd, $J$ = 8.6, 0.9 Hz, 2H, Ar–H), 4.31 (s, 2H, CH$_2$), 4.00 (br s, 1H, NH). $^{13}$C{$^1$H}-NMR (100 MHz, CDCl$_3$): $\delta$ = 148.3 (C$q$), 139.6 (C$q$), 129.4 (2C, CH), 128.8 (2C, CH), 127.7 (2C, CH), 127.4 (CH), 117.7 (CH), 113.0 (2C, CH), 48.5 (CH$_2$). HRMS (ESI): $m/z$ Calcd for C$_{13}$H$_{13}$N + H$^+$ [M + H]$^+$ 184.1121; Found 184.1120. The $^1$H and $^{13}$C{$^1$H} spectra are consistent with those reported in the literature.$^{22}$

7. Mechanistic Experiments

Procedure for Deuterium Labelling Experiment. A standard catalytic hydrogenation reaction was performed using CD$_3$OD as a solvent. After completion of reaction time, the reaction mixture was evaporated under vacuo. Purification by column chromatography provided the semi-hydrogenated product 4-[D] with 92% deuterium incorporation (Figure S1).

This finding suggests that one of the hydrogen sources for hydrogenation is the methanol, and incorporation of two D at $\alpha$-position supports the reversible protonation of substrate.

\[ \text{Mn-3 (5 mol\%)} + \text{K}_3\text{PO}_4 (10 \text{ mol\%}) \] 
\[ \text{CD}_3\text{OD, RT, 1h} \] 
\[ \text{(4a)} \quad \text{+ H$_2$ (5 bar)} \] 
\[ \rightarrow \] 
\[ \text{No D incorporation} \] 
\[ \text{H} \quad \text{H} \quad \text{O} \] 
\[ \text{(4-[D])} \quad \text{(92\% D incorporation)} \]
Figure S1. $^1$H NMR of Compound 4-[D].

Figure S2. $^3$H NMR of 4-[D] in CHCl$_3$. 
Experiment to Understand Non-innocent Behaviour of Ligand NH.

a) Reaction with Catalytic Mn-3Me: A standard hydrogenation reaction was performed using Mn-3Me as catalyst. After 5 h of the reaction time, the reaction mixture was analysed by GC that ensured no formation of hydrogenated product. This experiment suggests the NH moiety in the manganese catalyst is necessary to generate active de-aromatized catalyst in the presence of base (K₃PO₄) that would activate the H₂ molecule.
b) **Synthesis of Dearomatized Active Complex (A):** In a dry J-Young NMR tube, **Mn-3** (0.02 mmol) and KO'Bu (0.04 mmol) was added inside the glove box. To this, 0.6 mL THF was added and the tube was agitated to make a homogeneous mixture. Within few seconds orange to brown color change was noticed. Reaction was analysed by $^{31}\text{P}\{^1\text{H}\}$-NMR in different time intervals. After 1 h of reaction time two new peaks were observed at 174.9 and 161.1 ppm along with some decoordinated ligand at 70.8 ppm, and the original peaks for **Mn-3** were disappeared. Further heating the same reaction mixture at 50 °C for 1 h, a sharp singlet was observed at 174.8 ppm (Spectrum 3, Figure S4), which could be tentatively assigned to complex A. This experiment suggest that the reaction proceeds via metal-ligand cooperation through dearomatization-aromatization while using complex **Mn-3**. In addition, the observed single peak for A at 174.8 ppm supports the existence of an isomeric mixtures of precatalyst **Mn-3**.
Figure S4. $^{31}$P{¹H} NMR spectra for the reaction mixture of Mn-3 with KO'Bu. **Spectrum 1:** Mn-3 in THF with trace de coordinated ligand. **Spectrum 2:** After 1 h at room temperature. **Spectrum 3:** After heating at 50 °C for 1 h.
**Attempted Hydrogenation of (E)-1,3-Diphenylprop-2-en-1-ol:** Under standard hydrogenation conditions, the compound (E)-1,3-diphenylprop-2-en-1-ol was attempted for hydrogenation. The GC analysis of the reaction mixture does not show the formation of alkene hydrogenation product. This experiment suggests that the hydrogenation of (E)-chalcone (4) does not proceed *via* the 1,2-addition. Hence this reaction proceed *via* the 1,4-addition of hydrogen.
8. DFT Calculations

All the calculations in this study have been performed with density functional theory (DFT), with the aid of the Turbomole 7.5 suite of programs, using the PBE functional, along with dispersion correction (DFT-D3). The def2-SVP basis set for Mn and the TZVP basis set for all other atoms have been employed. The resolution of identity (RI), along with the multipole accelerated resolution of identity (marij) approximations have been employed for an accurate and efficient treatment of the electronic Coulomb term in the DFT calculations. A solvent correction was incorporated with optimization calculations using the COSMO model, with methanol (ε = 32.7) as the solvent. The values reported are ΔG values, with zero-point energy corrections, internal energy, and entropic contributions included through frequency calculations on the optimized minima, with the temperature is taken to be 298.15 K. Harmonic frequency calculations were performed for all stationary points to confirm them as local minima or transition state structures.

Energy span model (ESM)- The Turnover frequency (TOF) of the catalytic cycle can be calculated through the Energetic Span Model (ESM) and put into practical use by Shaik and co-workers. The ESM imparts an easy method to determine the turnover frequencies (TOFs) of catalytic cycles based on their computed energy profiles. In most cases, the TOF is calculated by the TOF-determining transition state (TDTS), the TOF-determining intermediate (TDI), and by the reaction energy, ΔG, as shown below

\[
\text{TOF} = \frac{k_B T}{h} e^{-\delta E/RT}
\]

where ΔE is the energy span and is defined as the Gibbs energy difference between the TDTS and the TDI, with the addition of the ΔG when the TDTS appears before the TDI. ΔE is the effective activation energy barrier of the global reaction. The TDTS and TDI are the intermediate and the transition state, respectively, that maximize ΔE, according to equation 1.

\[
\delta E = \begin{cases} 
\text{TDTS - TDI}, & \text{if TDTS appears after TDI} \\
\text{TFTS - TDI + ΔGr}, & \text{if TDTS appears before TDI}
\end{cases}
\]

(1)
This model has been used to calculate the TOFs (at 298.15 K). The ESM can be applied in a user-friendly way with the recently developed AUTOF computer program.\textsuperscript{36-38}

9. X-ray Structural Data

X-ray intensity data measurements of compound **Mn-2** was carried out on a Bruker D8 VENTURE Kappa Duo PHOTON II CPAD diffractometer equipped with Incoatech multilayer mirrors optics. The intensity measurements were carried out with Mo micro-focus sealed tube diffraction source (MoK\(_\alpha\) = 0.71073 Å) at 100(2) K temperature. The X-ray generator was operated at 50 kV and 1.4 mA. A preliminary set of cell constants and an orientation matrix were calculated from three matrix sets of 36 frames (each matrix run consists of 12 frames). Data were collected with \(\omega\) scan width of 0.5° at different settings of \(\phi\) and 2\(\theta\) with a frame time of 10-20 sec depending on the diffraction power of the crystals keeping the sample-to-detector distance fixed at 5.00 cm. The X-ray data collection was monitored by APEX3 program (Bruker, 2016).\textsuperscript{39} All the data were corrected for Lorentzian, polarization and absorption effects using SAINT and SADABS programs (Bruker, 2016). Using the APEX3 (Bruker) program suite, the structure was solved with the ShelXS-97 (Sheldrick, 2008)\textsuperscript{40} structure solution program, using direct methods. The model was refined with a version of ShelXL-2018/3 (Sheldrick, 2015)\textsuperscript{41} using Least Squares minimization. All the hydrogen atoms were placed in a geometrically idealized position and constrained to ride on their parent atoms. An \textit{ORTEP} III\textsuperscript{42} view of the compounds was drawn with 50% probability displacement ellipsoids, and H atoms are shown as small spheres of arbitrary radii.

**Procedure of crystallization:** Equimolar ratio of L2 (0.005 g) and Mn(CO)\(_5\)Br (0.005 g) was taken in a dry NMR tube and added dry THF (0.5 mL). Then the tube was closed with cap and kept inside the glove box for three days to form orange crystal on the wall of the tube.
Table S2. Crystal Data of Compound Mn-2.

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<td>Wavelength (Å)</td>
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<td>$wR2$ [$I&gt;2\sigma(I)$]</td>
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<td>$wR2$ [all data]</td>
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Table S3. Bond Lengths (Å) for Compound Mn-2.

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Table S4. Bond Angles (°) for Compound Mn-2.

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S42
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**Table S5.** Torsion Angles (°) for Compound Mn-2.

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<td>N3-N2-C6-C7</td>
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<td>C14-P1-C11-C13</td>
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<td>Mn1-P1-C11-C13</td>
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<td>Mn1-P1-C14-C16</td>
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<td>C11-P1-C14-C15</td>
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<td>Mn1-P1-C14-C15</td>
<td>-164.6(2)</td>
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10. References


11. $^1$H, $^{13}$C$^1$H, $^{31}$P$^1$H-NMR, Mass and IR Spectra of Manganese Complexes

$^1$H-NMR spectrum of $N$-(diisopropylphosphaneyl)-6-$(1H$-pyrazol-1-yl)pyridin-2-amine ($L_2$)

$^{13}$C$^1$H-NMR spectrum of $N$-(diisopropylphosphaneyl)-6-$(1H$-pyrazol-1-yl)pyridin-2-amine ($L_2$)
$^{31}\text{P}\{^1\text{H}\}$-NMR spectrum of $N$-(diisopropylphosphaneyl)-6-(1H-pyrazol-1-yl)pyridin-2-amine (L2)
$^1$H-NMR spectrum of $N$-(di-tert-butylphosphaneyl)$-N$-methyl-6-$\text{H}$-pyrazol-1-yl)pyridin-2-amine ($L_3^{\text{Me}}$)

$^{13}$C-${^1}$H-NMR spectrum of $N$-(di-tert-butylphosphaneyl)$-N$-methyl-6-$\text{H}$-pyrazol-1-yl)pyridin-2-amine ($L_3^{\text{Me}}$)
$^{31}$P-$^{1}$H-NMR spectrum of $N$-(di-tert-butylyphosphaneyl)-$N$-methyl-6-($1H$-pyrazol-1-yl)pyridin-2-amine ($L_3^{Me}$)
$^1$H-NMR spectrum of Mn-1 complex (mixture of two isomers)

$^{13}$C$^{'1}$H$^{'1}$-NMR spectrum of Mn-1 complex (mixture of two isomers)
$^{31}$P{$^1$H}-NMR spectrum of Mn-1 complex (mixture of two isomers)

IR spectrum of Mn-1 complex
ESI-MS (–ve mode) of Mn-1 complex
$^1$H-NMR spectrum of Mn-2 complex (mixture of two isomers)

$^{13}$C{$^1$H}-NMR spectrum of Mn-2 complex (mixture of two isomers)
$^3$P{$^1$H}-NMR spectrum of Mn-2 complex (mixture of two isomers)

IR spectrum of Mn-2 complex
ESI-MS (–ve mode) of Mn-2 complex
$^1$H-NMR spectrum of Mn-3 complex (mixture of two isomers)

$^{31}$P{$^1$H}-NMR spectrum of Mn-3 complex (mixture of two isomers)
IR spectrum of Mn-3 complex

ESI-MS (–ve mode) of Mn-3 complex
$^1$H-NMR spectrum of Mn-3$^{Me}$ complex in acetone-$d_6$.

$^1$H-NMR spectrum of Mn-3$^{Me}$ complex in DMSO-$d_6$. 
$^{13}$C{\(^1\)H}-NMR spectrum of Mn-$^{3\text{Me}}$ complex

$^{31}$P{\(^1\)H}-NMR spectrum of Mn-$^{3\text{Me}}$ complex
IR spectrum of $\text{Mn-3}^{\text{Me}}$ complex
12. $^1$H and $^{13}$C{$^1$H}-NMR Spectra of Starting Compound

$^1$H-NMR spectrum of (Z)-2-(4-acetylphenoxy)-1,3-diphenylprop-2-en-1-one (40a)

$^{13}$C{$^1$H}-NMR spectrum of (Z)-2-(4-acetylphenoxy)-1,3-diphenylprop-2-en-1-one (40a)
13. \(^1\)H and \(^{13}\)C\(^{1}\)H-NMR Spectra of Hydrogenated Compounds

\(^1\)H-NMR spectrum of 1,3-diphenylpropan-1-one (4)

\(^{13}\)C \(^{1}\)H-NMR spectrum of 1,3-diphenylpropan-1-one (4)
$^1$H-NMR spectrum of 3-phenyl-1-(p-tolyl)propan-1-one (5)

$^{13}$C{$^1$H}-NMR spectrum of 3-phenyl-1-(p-tolyl)propan-1-one (5)
$^1$H-NMR spectrum of 1-(4-isobutylphenyl)-3-phenylpropan-1-one (6)

$^{13}$C{$^1$H}-NMR spectrum of 1-(4-isobutylphenyl)-3-phenylpropan-1-one (6)
$^1$H-NMR spectrum of 1-(4-methoxyphenyl)-3-phenylpropan-1-one (7)

$^{13}$C{$^1$H}-NMR spectrum of 1-(4-methoxyphenyl)-3-phenylpropan-1-one (7)
$^1$H-NMR spectrum of 1-(4-chlorophenyl)-3-phenylpropan-1-one (8)

$^{13}$C-$^1$H-NMR spectrum of 1-(4-chlorophenyl)-3-phenylpropan-1-one (8)
\textsuperscript{1}H-NMR spectrum of 1-(4-bromophenyl)-3-phenylpropan-1-one (9)

\textsuperscript{13}C\{\textsuperscript{1}H\}-NMR spectrum of 1-(4-bromophenyl)-3-phenylpropan-1-one (9)
$^{1}$H-NMR spectrum of 1-(4-iodophenyl)-3-phenylpropan-1-one (10)

$^{13}$C-$^{1}$H-NMR spectrum of 1-(4-iodophenyl)-3-phenylpropan-1-one (10)
$^1$H-NMR spectrum of 3-phenyl-1-(4-(trifluoromethyl)phenyl)propan-1-one (11)

$^{13}$C{${^1}$H}-NMR spectrum of 3-phenyl-1-(4-(trifluoromethyl)phenyl)propan-1-one (11)
$^1$H-NMR spectrum of 3-phenyl-1-(o-tolyl)propan-1-one (12)

$^{13}$C{$^1$H}-NMR spectrum of 3-phenyl-1-(o-tolyl)propan-1-one (12)
$^1$H-NMR spectrum of 3-phenyl-1-(2-(trifluoromethyl)phenyl)propan-1-one (13)

$^{13}$C{$^{1}$H} -NMR spectrum of 3-phenyl-1-(2-(trifluoromethyl)phenyl)propan-1-one (13)
$^1$H-NMR spectrum of 1-(3-hydroxyphenyl)-3-phenylpropan-1-one (14)

$^{13}$C-$^1$H-NMR spectrum of 1-(3-hydroxyphenyl)-3-phenylpropan-1-one (14)
\(^1\)H-NMR spectrum of 1-(3-(allyloxy)phenyl)-3-phenylpropan-1-one (15)

\[^{13}\text{C}[^{1}\text{H}]-\text{NMR spectrum of 1-(3-(allyloxy)phenyl)-3-phenylpropan-1-one (15)\)
1H-NMR spectrum of 3-phenyl-1-(3-(prop-2-yn-1-yloxy)phenyl)propan-1-one (16)

13C{1H}-NMR spectrum of 3-phenyl-1-(3-(prop-2-yn-1-yloxy)phenyl)propan-1-one (16)
$^1$H-NMR spectrum of 1-(3-(oxiran-2-ylmethoxy)phenyl)-3-phenylpropan-1-one (17)

$^{13}$C{$[^1]$H}-NMR spectrum of 1-(3-(oxiran-2-ylmethoxy)phenyl)-3-phenylpropan-1-one (17)
$^1$H-NMR spectrum of 1-(naphthalen-2-yl)-3-phenylpropan-1-one (18)

$^{13}$C-$^1$H-NMR spectrum of 1-(naphthalen-2-yl)-3-phenylpropan-1-one (18)
$^1$H-NMR spectrum of 1-(naphthalen-1-yl)-3-phenylpropan-1-one (19)

$^{13}$C {$^1$H}-NMR spectrum of 1-(naphthalen-1-yl)-3-phenylpropan-1-one (19)
$^1$H-NMR spectrum of 3-([1,1'-biphenyl]-4-yl)-1-phenylpropan-1-one (20)

$^{13}$C{$^1$H}-NMR spectrum of 3-([1,1'-biphenyl]-4-yl)-1-phenylpropan-1-one (20)
\(^1\)H-NMR spectrum of 3-(4-methoxyphenyl)-1-phenylpropan-1-one (21)

\(^{13}\)C\(^{1}\)H\(^{1}\)-NMR spectrum of 3-(4-methoxyphenyl)-1-phenylpropan-1-one (21)
$^1$H-NMR spectrum of 3-(4-(benzyloxy)phenyl)-1-phenylpropan-1-one (22)

$^{13}$C{$[^1]$H}-NMR spectrum of 3-(4-(benzyloxy)phenyl)-1-phenylpropan-1-one (22)
$^1$H-NMR spectrum of 3-(4-chlorophenyl)-1-phenylpropan-1-one (23)

$^{13}$C{$^1$H}-NMR spectrum of 3-(4-chlorophenyl)-1-phenylpropan-1-one (23)
$^1$H-NMR spectrum of 1-phenyl-3-(4-(trifluoromethyl)phenyl)propan-1-one (24)

$^{13}$C-$^1$H-NMR spectrum of 1-phenyl-3-(4-(trifluoromethyl)phenyl)propan-1-one (24)
$^1$H-NMR spectrum of 3-((dimethylamino)phenyl)-1-phenylpropan-1-one (25)

$^{13}$C-$^1$H-NMR spectrum of 3-((dimethylamino)phenyl)-1-phenylpropan-1-one (25)
$^1$H-NMR spectrum of 4-(3-oxo-3-phenylpropyl)benzonitrile (26)

$^{13}$C{$^1$H}-NMR spectrum of 4-(3-oxo-3-phenylpropyl)benzonitrile (26)
$^1$H-NMR spectrum of 3-(3-fluorophenyl)-1-phenylpropan-1-one (27)

$^{13}$C-$^1$H-NMR spectrum of 3-(3-fluorophenyl)-1-phenylpropan-1-one (27)
$^1$H-NMR spectrum of 3-(3-nitrophenyl)-1-phenylpropan-1-one (28)

$^{13}$C\{${^1}$H\}-NMR spectrum of 3-(3-nitrophenyl)-1-phenylpropan-1-one (28)
$^1$H-NMR spectrum of 3-(naphthalen-2-yl)-1-phenylpropan-1-one (29)

$^{13}$C{$^1$H}-NMR spectrum of 3-(naphthalen-2-yl)-1-phenylpropan-1-one (29)
$^1$H-NMR spectrum of 3-(furan-2-yl)-1-phenylpropan-1-one (30)

$^{13}$C{$^1$H}-NMR spectrum of 3-(furan-2-yl)-1-phenylpropan-1-one (30)
$^1$H-NMR spectrum of 1-phenyl-3-(thiophen-2-yl)propan-1-one (31)

$^{13}$C($^1$H)-NMR spectrum of 1-phenyl-3-(thiophen-2-yl)propan-1-one (31)
$^1$H-NMR spectrum of 3-($^1$H-indol-5-yl)-1-phenylpropan-1-one (32)

$^{13}$C$\{^1$H$\}$-NMR spectrum of 3-($^1$H-indol-5-yl)-1-phenylpropan-1-one (32)
$^1$H-NMR spectrum of 3-phenyl-1-(pyridin-2-yl)propan-1-one (33)

$^{13}$C$^1\text{H}$-NMR spectrum of 3-phenyl-1-(pyridin-2-yl)propan-1-one (33)
\(^1\)H-NMR spectrum of 3-(1H-pyrrol-2-yl)-1-(thiophen-2-yl)propan-1-one (34)

\(^{13}\)C\(^{1\ H}\)-NMR spectrum of 3-(1H-pyrrol-2-yl)-1-(thiophen-2-yl)propan-1-one (34)
$^1$H-NMR spectrum of 3-(furan-2-yl)-1-(thiophen-2-yl)propan-1-one (35)

$^{13}$C\{$^1$H}-NMR spectrum of 3-(furan-2-yl)-1-(thiophen-2-yl)propan-1-one (35)
$^1$H-NMR spectrum of 3-Ferrocenyl-1-phenylpropan-1-one (36)

$^{13}$C-$^1$H-NMR spectrum of 3-Ferrocenyl-1-phenylpropan-1-one (36)
$^1$H-NMR spectrum of (E)-1,5-diphenylpent-4-en-1-one (37)

$^{13}$C{$^1$H}-NMR spectrum of (E)-1,5-diphenylpent-4-en-1-one (37)
\[ ^1 \text{H-NMR spectrum of } (E)-1,5\text{-diphenylpent-1-en-3-one (38)} \]

\[ ^{13} \text{C}\{^1\text{H}\} \text{-NMR spectrum of } (E)-1,5\text{-diphenylpent-1-en-3-one (38)} \]
$^1$H-NMR spectrum of 2-methyl-1,3-diphenylpropan-1-one (39)

$^{13}$C{$^1$H}-NMR spectrum of 2-methyl-1,3-diphenylpropan-1-one (39)
$^1$H-NMR spectrum of 2-(4-acetylphenoxy)-1,3-diphenylpropan-1-one (40)

$^{13}$C($^1$H)-NMR spectrum of 2-(4-acetylphenoxy)-1,3-diphenylpropan-1-one (40)
\( ^1 \text{H-NMR} \) spectrum of 1-phenyloctan-1-one (41)

\( ^{13} \text{C}\{^1 \text{H}\}-\text{NMR} \) spectrum of 1-phenyloctan-1-one (41)
$^1$H-NMR spectrum of (E)-3-phenylprop-2-en-1-ol (42)

$^{13}$C{$^1$H}-NMR spectrum of (E)-3-phenylprop-2-en-1-ol (42)
$^1$H-NMR spectrum of (E)-3-(4-methoxyphenyl)prop-2-en-1-ol (43)

$^{13}$C{$^1$H}-NMR spectrum of (E)-3-(4-methoxyphenyl)prop-2-en-1-ol (43)
$^1$H-NMR spectrum of (E)-2-methyl-3-phenylprop-2-en-1-ol (44)

$^{13}$C {$^1$H}-NMR spectrum of (E)-2-methyl-3-phenylprop-2-en-1-ol (44)
$^1$H-NMR spectrum of (4-(prop-1-en-2-yl)cyclohex-1-en-1-yl)methanol (45)

$^{13}$C\{$^1$H\}-NMR spectrum of (4-(prop-1-en-2-yl)cyclohex-1-en-1-yl)methanol (45)
$^1$H-NMR spectrum of (E/Z)-3,7-dimethylocta-2,6-dien-1-ol (46)

$^{13}$C\{\textbf{1}H\}-NMR spectrum of (E/Z)-3,7-dimethylocta-2,6-dien-1-ol (46)
$^1$H-NMR spectrum of 1,4-phenylenedimethanol (47)

$^{13}$C{$^1$H}-NMR spectrum of 1,4-phenylenedimethanol (47)
$^1$H-NMR spectrum of (4-(benzyloxy)phenyl)methanol (48)

$^{13}$C{$^1$H}-NMR spectrum of (4-(benzyloxy)phenyl)methanol (48)
$^1$H-NMR spectrum of (4-nitrophenyl)methanol (49)

$^{13}$C\left\{$^1$H\right\}-NMR spectrum of (4-nitrophenyl)methanol (49)
$^1$H-NMR spectrum of 3-(hydroxymethyl)phenol (50)

$^{13}$C{$^1$H}-NMR spectrum of 3-(hydroxymethyl)phenol (50)
$^1$H-NMR spectrum of ferrocenemethanol (51)

$^{13}$C-$^1$H-NMR spectrum of ferrocenemethanol (51)
$^1$H-NMR spectrum of (1$H$-pyrrol-2-yl)methanol (52)

$^{13}$C{$^1$H}-NMR spectrum of (1$H$-pyrrol-2-yl)methanol (52)
$^1$H-NMR spectrum of N-cinnamylaniline (53)

$^{13}$C-$^1$H-NMR spectrum of N-cinnamylaniline (53)
$^1$H-NMR spectrum of N-benzylaniline (54)

$^{13}$C-$^1$H-NMR spectrum of N-benzylaniline (54)