Supporting Information
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Supporting Information

Rh(III)-Catalyzed Synthesis of Pyridine from $\alpha,\beta$-Unsaturated Ketoximes and Internal Alkynes

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1. General

2. Synthesis of $\alpha,\beta$-unsaturated ketoxime derivatives:
   2.1. Preparation of $\alpha,\beta$-unsaturated ketoximes 1a and 1i
   2.2. Preparation of $\alpha,\beta$-unsaturated ketoximes 1b-1h and 1j
   2.3. Preparation of $\alpha,\beta$-unsaturated ketoximes 1k
   2.4. Preparation of $\alpha,\beta$-unsaturated ketoximes 1l
   2.5. Preparation of $\alpha,\beta$-unsaturated ketoximes 1m

3. Rh(III)-catalyzed synthesis of isoquinolines: a typical procedure

Appendix: $^1$H and $^{13}$C NMR charts for new compounds
1. General

$^1$H NMR (400MHz) spectra were recorded on a Bruker Avance 400 spectrometers and JEOL ECA400 spectrometers in CDCl$_3$ [using (CH$_3$)$_3$Si (for $^1$H, $\delta$ = 0.00) as internal standard] or Acetone-d$_6$ [using (CH$_3$)$_2$CO (for $^1$H, $\delta$ = 2.05) as internal standard]. $^{13}$C NMR (100 MHz) spectra on a Bruker Avance 400 spectrometers in CDCl$_3$ [using CDCl$_3$ (for $^{13}$C, $\delta$ = 77.0) as internal standard] or Acetone-d$_6$ [using (CD$_3$)$_2$CO (for $^{13}$C, $\delta$ = 29.0) as internal standard]. The following abbreviations were used to explain the multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, sept = septet, m = multiplet, brs = broad singlet. IR spectra were recorded on a Shimazu IR Prestige-21 FT-IR Spectrometer. High-resolution mass spectra were obtained with a Finnigan MAT 95 XP mass spectrometer (Thermo Electron Corporation). Melting points were uncorrected and were recorded on a Buchi B-54 melting point apparatus.

Flash column chromatography was performed using Merck silica gel 60 with distilled solvents. Methanol (MeOH) was distilled from magnesium and stored over MS 3A. [Cp*RhCl$_2$]$_2$ (97%) was purchased from Sigma-Aldrich Co., Inc.

2. Synthesis of $\alpha,\beta$-unsaturated ketoxime derivatives:
2.1. Preparation of $\alpha,\beta$-unsaturated ketoximes 1a and 1i: a typical procedure for synthesis of (2E,3E)-4-phenylbut-3-en-2-one oxime (1a).

![Chemical structure of 1a](image)

To a solution of (E)-4-phenylbut-3-en-2-one (3.0 g, 20.5 mmol) and pyridine (4.1 mL, 51.3 mmol) in EtOH (20 mL) was added NH$_2$OH•HCl (2.14 g, 30.8 mmol) in one portion and the reaction mixture was stirred at 60 °C for 1 h. The reaction was quenched by adding water and the organic materials were extracted twice with ethyl acetate. The combined extracts were washed with 1N aqueous HCl and brine, and dried over MgSO$_4$. Volatile materials were removed in vacuo to give (2E,3E)-4-phenylbut-3-en-2-one oxime (1a) in quantitative yield.

**White solid;** $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 2.16 (3H, t, $J$ = 0.8 Hz), 6.86 (1H, dt, $J$ = 16.4, 1.6 Hz), 6.91 (1H, d, $J$ = 16.4 Hz), 7.28 (1H, t, $J$ = 7.2 Hz), 7.35 (2H, dd, $J$ = 7.2, 7.6 Hz), 7.47 (2H, d, $J$ = 7.6 Hz); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 9.7, 125.7, 126.9, 128.4, 128.7, 133.4, 136.3, 156.8.

**White solid;** $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.06 (1H, dd, $J$ = 16.4, 0.8 Hz), 7.20 (1H, d, $J$ = 16.4 Hz), 7.28–7.33 (2H, m), 7.34–7.44 (5H, m), 7.49 (1H, dd, $J$ = 16.8, 0.8 Hz), 7.61 (2H, d, $J$ = 7.6 Hz), 7.66 (2H, d, $J$ = 7.6 Hz); $^{13}$C NMR

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2.2. Preparation of α,β-unsaturated ketoximes 1b-1h and 1j: a typical procedure for synthesis of (2E,3E)-4-(4-methoxyphenyl)but-3-en-2-one oxime (1b).

To a stirred solution of 4-methoxybenzaldehyde (1.36 g, 10 mmol) and acetone (5.2 mL, 4.06 g, 70 mmol) in EtOH (10 mL) was added dropwise an aqueous solution of NaOH (5% in H\textsubscript{2}O, 25 mL) and the reaction mixture stirred for 2 h (monitored by TLC). The reaction was quenched with H\textsubscript{2}O and neutralized with 3 N HCl. The residue was extracted with EtOAc and the combined organic layers were washed with brine and dried with MgSO\textsubscript{4}. After removal of the solvent, the white crystal was used for the next hydroxylamination without further purification. The experimental procedure is same as Section 2.1. The corresponding (2E,3E)-4-(4-methoxyphenyl)but-3-en-2-one oxime (1b) was obtained in 56% yield (2 steps).

(2E,3E)-4-(4-Methoxyphenyl)but-3-en-2-one oxime (1b)

White solid; \textsuperscript{1}H NMR (400 MHz, CDCl\textsubscript{3}) \(\delta\) 2.12 (3H, s), 3.83 (3H, s), 6.70 (1H, d, \(J = 16.4\) Hz), 6.85 (1H, d, \(J = 16.4\) Hz), 6.89 (2H, d, \(J = 8.8\) Hz), 7.41 (2H, d, \(J = 8.4\) Hz); \textsuperscript{13}C NMR (100 MHz, CDCl\textsubscript{3}) \(\delta\) 9.6, 55.3, 114.2, 123.6, 128.2, 129.1, 132.9, 156.9, 159.9.

(2E,3E)-4-(2-Methoxyphenyl)but-3-en-2-one oxime (1c)

Prepared from 2-methoxybenzaldehyde and purified by flash column chromatography (Si gel, hexane:ethyl acetate = 95:5) in 47% yield; White solid; mp. 126–128 °C; IR (NaCl) 3271, 1597, 1489, 1466, 1435, 1242, 1026 cm\textsuperscript{-1}; \textsuperscript{1}H NMR (400 MHz, CDCl\textsubscript{3}) \(\delta\) 2.17 (3H, s), 3.88 (3H, s), 6.85–6.90 (2H, m), 6.95 (1H, t, \(J = 7.2\) Hz), 7.25–7.30 (2H, m), 7.54 (1H, d, \(J = 8.0\) Hz); \textsuperscript{13}C NMR (100 MHz, CDCl\textsubscript{3}) \(\delta\) 9.7, 55.5, 110.9, 120.8, 125.3, 126.0, 126.7, 128.1, 129.1, 132.9, 156.9, 157.4; ESIHRMS: Found: m/z 192.1025. Calcd for C\textsubscript{11}H\textsubscript{14}NO\textsubscript{2}: (M+H)\textsuperscript{+} 192.1025.

(2E,3E)-4-(m-Tolyl)but-3-en-2-one oxime (1d)

Prepared from 3-methylbenzaldehyde and purified by flash column chromatography (Si gel, hexane:ethyl acetate = 95:5) in 52% yield; White solid; $^1$H NMR (400 MHz, CDCl$_3$) δ 2.15 (3H, d, $J$ = 4.8 Hz), 2.36 (3H, s), 6.84–6.93 (2H, m), 7.10 (1H, d, $J$ = 6.4 Hz), 7.22–7.30 (3H, m), 9.25 (1H, brs); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 9.7, 21.4, 124.1, 125.5, 127.5, 128.6, 129.3, 133.6, 136.2, 138.3, 156.8.

(2E,3E)-4-(4-Bromophenyl)but-3-en-2-one oxime (1e)

Prepared from 4-bromobenzaldehyde and purified by flash column chromatography (Si gel, hexane:ethyl acetate = 95:5) in 47% yield; White solid; mp. 143–145 °C; IR (NaCl) 3264, 1489, 1420, 1396, 1373, 1072 cm$^{-1}$; $^1$H NMR (400 MHz, CDCl$_3$) δ 2.14 (3H, s), 6.82 (2H, s), 7.33 (2H, dt, $J$ = 8.4, 2.0 Hz), 7.47 (2H, dt, $J$ = 8.4, 2.0 Hz), 8.97 (1H, brs); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 9.6, 122.3, 126.5, 128.3, 131.9, 132.1, 135.2, 156.6; ESIHRMS: Found: m/z 240.0027. Calcd for C$_{10}$H$_{11}$NO$_7$9Br: (M+H)$^+$ 240.0024.

(2E,3E)-4-(Naphthalen-2-yl)but-3-en-2-one oxime (1f)

Prepared from 2-naphthaldehyde and purified by flash column chromatography (Si gel, hexane:ethyl acetate = 95:5) in 35% yield; White solid; mp. 152–154 °C; IR (NaCl) 3464, 3256, 3194, 1589, 1512, 1366, 1018 cm$^{-1}$; $^1$H NMR (400 MHz, CDCl$_3$) δ 2.20 (3H, s), 6.98 (1H, d, $J$ = 16.4 Hz), 7.08 (1H, d, $J$ = 16.4 Hz), 7.46–7.50 (2H, m), 7.72 (1H, d, $J$ = 10.4 Hz), 7.74 (1H, s), 7.84 (1H, d, $J$ = 8.4 Hz), 7.89 (1H, d, $J$ = 7.6 Hz), 8.17 (1H, d, $J$ = 8.0 Hz), 9.82 (1H, brs); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 9.7, 123.4, 126.1, 126.3, 126.5, 127.4, 127.7, 128.1, 128.5, 133.36, 133.43, 133.5, 133.8, 156.9; ESIHRMS: Found: m/z 212.1077. Calcd for C$_{14}$H$_{14}$NO: (M+H)$^+$ 212.1075.

(2E,3E)-4-(Naphthalen-1-yl)but-3-en-2-one oxime (1g)

Prepared from 1-naphthaldehyde and purified by flash column chromatography (Si gel, hexane:ethyl acetate = 95:5) in 36% yield; White solid; mp. 144–146 °C; IR (NaCl) 3264, 1512, 1396, 1373, 1350, 1304, 841 cm$^{-1}$; $^1$H NMR (400 MHz, CDCl$_3$) δ 2.30 (3H, s), 6.97 (1H, d, $J$ = 16.4 Hz), 7.47–7.59 (3H, m), 7.72 (1H, d, $J$ = 10.4 Hz), 7.74 (1H, s), 7.84 (1H, d, $J$ = 8.4 Hz), 7.89 (1H, d, $J$ = 7.6 Hz), 8.17 (1H, d, $J$ = 8.0 Hz), 9.82 (1H, brs); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 10.0, 123.4, 124.0, 125.6, 125.9, 126.3, 128.5, 128.7, 128.8, 130.3, 131.1, 133.6, 133.7, 156.9; ESIHRMS: Found: m/z 212.1072. Calcd for C$_{14}$H$_{14}$NO: (M+H)$^+$ 212.1075.

(2E,3E)-4-(Thiophen-2-yl)but-3-en-2-one oxime (1h)
Prepared by employing slightly modified procedure of the aldol-condensation. To a solution of thiophene-2-carbaldehyde (2.24 g, 20 mmol) and acetone (4 mL) in 2 mL of H₂O was added 0.5 mL of 10% NaOH(0.01) over a period of 15 mins. The corresponding oxime was purified by flash column chromatography (Si gel, hexane:ethyl acetate = 95:5) in 35% yield; Yellow solid; mp. 115–117 °C; IR (NaCl) 3264, 1620, 1427, 1373, 1304, 702 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ 2.10 (3H, s), 6.65 (1H, d, J = 16.0 Hz), 7.00–7.04 (2H, m), 7.09 (1H, d, J = 3.2 Hz), 7.24 (1H, d, J = 5.2 Hz), 8.00 (1H, brs); ¹³C NMR (100 MHz, CDCl₃) δ 9.6, 125.2, 125.7, 126.3, 127.2, 127.7, 141.8, 156.4; ESIHRMS: Found: m/z 168.0480. Calcd for C₈H₁₀NOS: (M+H)⁺ 168.0483.

**(1E)-4-Methyl-1-phenylpent-1-en-3-one oxime (1j)**

Prepared by employing slightly modified procedure of the aldol-condensation. MeOH was used instead of EtOH and purified by flash column chromatography (Si gel, hexane:ethyl acetate = 95:5) in 34% yield; White solid; mp. 68–78 °C; IR (NaCl) 3264, 2970, 2932, 1628, 1450, 1335, 972, 694 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ 1.23 (6H, s), 2.19 (3H, s), 2.19 (3H, s), 7.02 (1H, d, J = 16.4 Hz), 7.06 (1H, d, J = 16.4 Hz), 7.23–7.40 (3H×0.45+3H×0.55, m), 7.54 (2H×0.45, d, J = 8.8 Hz), 8.93 (1H×0.45+1H×0.55, brs); ¹³C NMR (100 MHz, CDCl₃) δ 1.91, 21.1, 25.9, 29.7, 115.9, 121.8, 126.9, 127.4, 128.3, 128.66, 128.71, 128.9, 133.1, 135.6, 136.45, 136.51, 159.9, 162.8; ESIHRMS: Found: m/z 190.1229. Calcd for C₁₂H₁₆NO: (M+H)⁺ 190.1232.

**2.3. Preparation of α,β-unsaturated ketoximes 1k**

![Chemical reaction diagram]

To a stirred solution of benzaldehyde (2.7 g, 25 mmol) and 2-butanol (4.5 mL, 3.6 g, 50 mmol) in acetic acid (20 mL) was added slowly concentrated H₂SO₄ (2.4 g) at room temperature. The reaction was allowed to stirred for 20 h and then quenched with H₂O and neutralized with 25% aqueous NaOH. The residue was extracted with EtOAc and the combined organic layers were washed with aqueous NaHCO₃, brine and dried with MgSO₄. After removal of the solvent, the crude material was purified by flash column chromatography (Si gel, hexane:ethyl acetate = 95:5) to give the corresponding α,β-unsaturated ketone in 96% yield. The α,β-unsaturated ketone was then subjected to hydroxylamination according to the experimental procedure in Section 2.1 and (2E,3E)-3-methyl-4-phenylbut-3-en-2-one oxime (1k) was obtained in 65% yield.

**(2E,3E)-3-Methyl-4-phenylbut-3-en-2-one oxime (1k)**

White solid; mp. 99–101 °C; IR (NaCl) 3287, 2924, 1489, 1443, 1373, 1026, 926 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ 2.09 (3H, s), 2.19 (3H, s), 6.94 (1H, s), 7.26 (1H, dd, J = 7.2, 7.2 Hz), 7.31 (2H, d, J =
7.2 Hz), 7.36 (2H, dd, J = 8.0, 7.2 Hz), 9.82 (1H, brs); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 10.3, 14.2, 127.1, 128.2, 129.3, 131.2, 134.4, 137.1, 158.0; ESIHRMS: Found: m/z 176.1081. Calcd for C$_{11}$H$_{14}$NO: (M+H)$^+$ 176.1075.

2.4. Preparation of α,β-unsaturated ketoximes 1l

![Chemical structure](image)

Trifluoroacetic anhydride (38.9 mL, 280 mmol) was added directly to the acetic acid (4.0 mL, 69.9 mmol) and the reaction mixture was stirred at room temperature for 10 min. To the reaction mixture at 0 °C was added 85% phosphoric acid (8.56 g, 69.9 mmol) and followed by cyclohexene (7.1 mL, 69.9 mmol). Then, the reaction mixture allowed stirring at room temperature for 2 h. The reaction was then quenched with water and the organic materials were extracted twice with CH$_2$Cl$_2$. The combined extracts were washed with 30% aqueous NaOH and brine, and dried over MgSO$_4$. Volatile materials were removed in vacuo. The residue was purified by silica gel column chromatography (hexanes-ethyl acetate = 95:5) to afford 1-(cyclohex-1-en-1-yl)ethanone in 35% yield. 1-(Cyclohex-1-en-1-yl)ethanone was then subjected to hydroxylamination according to the experimental procedure in Section 2.1 and (E)-1-(Cyclohex-1-en-1-yl)ethanone oxime (1l) was obtained in 76% yield.

**(E)-1-(Cyclohex-1-en-1-yl)ethanone oxime (1l)**

![Chemical structure](image)

White solid; $^1$H NMR (400 MHz, CDCl$_3$) δ 1.57–1.69 (4H, m), 2.02 (3H, s), 2.16–2.21 (2H, m), 2.26–2.29 (2H, m), 6.20 (1H, t, $J = 4.0$ Hz), 9.60 (1H, brs); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 9.7, 22.0, 22.4, 24.3, 26.0, 130.0, 134.4, 156.8.

2.5. Preparation of α,β-unsaturated ketoximes 1m

![Chemical structure](image)

To a stirred solution of formaldehyde (4.8 g, 60 mmol) and a catalytic amount of morpholine (3-5 drops) was added a solution of benzylacetone (3.0 g, 20 mmol) in acetic acid (18 mL). The resulting reaction mixture was refluxed for 2 d and cooled to room temperature and neutralized with 0.1 N aqueous NaOH. The residue was extracted with EtOAc and the combined organic layers were washed with aqueous NaHCO$_3$, brine and dried with MgSO$_4$. After removal of the solvent, the crude material was purified by flash column chromatography (Si gel, hexane:ethyl acetate = 95:5) to give the corresponding α,β-unsaturated ketone in 13% yield. The α,β-unsaturated ketone was then subjected to
hydroxylamination according to the experimental procedure in Section 2.1 and (2E,3E)-3-methyl-4-phenylbut-3-en-2-one oxime (1k) was obtained in 91% yield.

(E)-3-Benzylbut-3-en-2-one oxime (1m)
White solid; mp. 120–122 °C; IR (NaCl) 3287, 2916, 1620, 1605, 1450, 1373, 1018 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ 2.06 (3H, s), 3.66 (2H, s), 5.10 (1H, s), 5.53 (1H, s), 7.17–7.21 (3H, m), 7.25–7.30 (2H, m), 8.71 (1H, brs); ¹³C NMR (100 MHz, CDCl₃) δ 10.4, 38.1, 118.5, 126.0, 128.2, 129.1, 139.5, 144.5, 156.2; ESIHRMS: Found: m/z 176.1082. Calcd for C₁₁H₁₄NO: (M+H)⁺ 176.1075.

3. Rh(III)-catalyzed synthesis of pyridines:
3.1. A typical procedure for the reaction of (2E,3E)-4-phenylbut-3-en-2-one oxime (1a) and diphenylacetylene (2a) (Table 1, entry 6).

![Chemical structure diagram]

To a MeOH solution (2.5 mL) of (2E,3E)-4-phenylbut-3-en-2-one oxime (1a) (80.5 mg, 0.50 mmol) and diphenylacetylene (2a) (106.9 mg, 0.60 mmol) were added [Cp*RhCl₂]₂ (7.7 mg, 0.0125 mmol) and CsOPiv (35.1 mg, 0.15 mmol), and the reaction mixture was stirred at 60 °C under air for 7 h. After cooled to room temperature, the solvent was removed in vacuo, and the resulting crude material was subjected to flash column chromatography (hexane : ethyl acetate = 90 : 10) to afford 6-methyl-2,3,4-triphenylpyridine (3aa) (126.4 mg, 0.393 mmol) in 79% yield.

6-Methyl-2,3,4-triphenylpyridine (3aa)
White solid; mp. 128–129 °C; IR (NaCl) 3024, 2955, 1574, 1535, 1489, 1443, 1373 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ 2.72 (3H, s), 6.86–6.89 (2H, m), 7.02–7.10 (5H, m), 7.18–7.23 (7H, m), 7.27–7.29 (2H, m); ¹³C NMR (100 MHz, CDCl₃) δ 24.4, 123.2, 126.3, 127.1, 127.2, 127.5, 127.6, 127.8, 129.2, 129.8, 131.4, 131.5, 137.9, 139.6, 140.9, 149.9, 156.9, 157.8; ESIHRMS: Found: m/z 322.1600. Calcd for C₂₄H₂₉N: (M+H)⁺ 322.1596.

2,3-Bis(4-methoxyphenyl)-6-methyl-4-phenylpyridine (3ab)

![Chemical structure diagram]

Colorless crystal; mp. 154–155 °C; IR (NaCl) 2940, 2839, 1605, 1512, 1288, 1180, 1034 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ 2.66 (3H, s), 3.70 (3H, s), 3.72 (3H, s), 6.59 (2H, dt, J = 8.8, 2.4 Hz), 6.72 (2H, dt, J = 8.8, 1.6 Hz), 6.75 (2H, dt, J = 8.8, 2.4 Hz), 7.03–7.08 (2H, m), 7.14 (1H, s), 7.18–7.22 (5H, m); ¹³C NMR (100 MHz, CDCl₃) δ 24.4, 55.0, 55.2, 113.1, 113.2, 122.9, 127.0, 127.8, 129.2, 130.3, 130.8, 131.2, 132.5, 133.6, 139.9, 150.1, 156.5, 157.5, 158.0, 158.7; ESIHRMS: Found: m/z 382.1807. Calcd for C₂₆H₂₄NO₂: (M+H)⁺ 382.1807.

6-Methyl-4-phenyl-2,3-bis(4-(trimethylsilyl)phenyl)pyridine (3ac)
2,3-Bis(3-bromophenyl)-6-methyl-4-phenylpyridine (3ad)

Colorless crystal; mp. 128–129 °C; IR (NaCl) 2963, 1582, 1558, 1535, 1474, 887 cm⁻¹; ¹H NMR (400 MHz, CDCl₃)  δ 2.69 (3H, s), 6.78 (1H, dt, J = 8.0, 1.2 Hz), 6.93 (1H, t, J = 8.0 Hz), 6.99–7.07 (5H, m), 7.21–7.25 (5H, m), 7.34 (1H, dt, J = 7.2, 1.6 Hz), 7.55 (1H, t, J = 1.6 Hz); ¹³C NMR (100 MHz, CDCl₃) δ 24.4, 121.7, 122.0, 123.7, 127.6, 128.0, 128.4, 129.07, 129.13, 129.2, 129.8, 130.0, 130.2, 130.5, 132.9, 134.2, 138.8, 139.6, 142.4, 150.2, 156.0, 157.6; ESIHRMS: Found: m/z 479.9789. Calcd for C₂₄H₁₈N⁺Br₂: (M+H)⁺ 479.9786.

6-Methyl-4-phenyl-2,3-dipropylpyridine (3ae)

Yellow oil; IR (NaCl) 2955, 2932, 2870, 1589, 1543, 1497, 1450, 1381 cm⁻¹; ¹H NMR (400 MHz, CDCl₃)  δ 0.77 (3H, t, J = 7.2 Hz), 1.05 (3H, t, J = 7.2 Hz), 1.37 (2H, tq, J = 8.0, 7.2 Hz), 1.77 (2H, tq, J = 8.0, 7.2 Hz), 2.50 (2H, t, J = 8.0 Hz), 2.50 (3H, s), 2.79 (2H, t, J = 8.0 Hz), 6.80 (1H, s), 7.23–7.26 (2H, m), 7.36–7.42 (3H, m); ¹³C NMR (100 MHz, CDCl₃) δ 14.3, 14.4, 23.8, 24.0, 24.3, 30.6, 37.5, 122.1, 127.3, 128.0, 128.4, 129.9, 140.6, 150.4, 154.2, 160.3; ESIHRMS: Found: m/z 254.1902. Calcd for C₁₈H₂₄N: (M+H)⁺ 254.1909.

2,3-Bis(tert-butyldimethylsiloxymethyl)-6-methyl-4-phenylpyridine (3af)

White solid; mp. 85–87 °C; IR (NaCl) 2955, 2932, 2855, 1589, 1466, 1258, 1065, 841 cm⁻¹; ¹H NMR (400 MHz, CDCl₃)  δ -0.03 (6H, s), 0.10 (6H, s), 0.86 (9H, s), 0.90 (9H, s), 2.56 (3H, s), 4.70 (2H, s), 4.98 (2H, s), 7.00 (1H, s), 7.38–7.42 (5H, m); ¹³C NMR (100 MHz, CDCl₃) δ -5.5, -5.0, 18.3, 18.4.
24.1, 25.8, 25.9, 58.1, 123.4, 127.9, 128.1, 128.6, 129.0, 139.2, 151.1, 156.2, 159.1; ESIHRMS: Found: m/z 458.2914. Calcd for C_{26}H_{44}NO_{2}Si_{2}: (M+H)^+ 458.2911.

3,6-Dimethyl-2,4-diphenylpyridine (3ag)

White solid; mp. 65–67 °C; IR (NaCl) 2955, 1589, 1551, 1489, 1450, 1420, 1381 cm\(^{-1}\); \(^{1}\)H NMR (400 MHz, CDCl\(_{3}\)) \(\delta\) 2.13 (3H, m), 2.59 (3H, m), 7.02 (1H, s), 7.34–7.47 (8H, m), 7.51–7.54 (2H, m); \(^{13}\)C NMR (100 MHz, CDCl\(_{3}\)) \(\delta\) 17.5, 24.1, 122.8, 125.1, 127.65, 127.68, 128.1, 128.3, 128.7, 129.0, 140.1, 141.4, 151.0, 154.8, 159.2; ESIHRMS: Found: m/z 260.1437. Calcd for C_{19}H_{18}N: (M+H)^+ 260.1439.

2,6-Dimethyl-3,4-diphenylpyridine (3ag-isomer)

White solid; mp. 105–106 °C; IR (NaCl) 2940, 1589, 1543, 1443, 1381, 1011, 872 cm\(^{-1}\); \(^{1}\)H NMR (400 MHz, CDCl\(_{3}\)) \(\delta\) 2.39 (3H, s), 2.61 (3H, s), 7.03–7.06 (5H, m), 7.14–7.17 (3H, m), 7.19–7.25 (3H, m); \(^{13}\)C NMR (100 MHz, CDCl\(_{3}\)) \(\delta\) 23.9, 24.2, 121.7, 126.7, 127.1, 127.7, 128.0, 129.1, 130.3, 132.3, 138.4, 139.5, 149.1, 156.1, 156.2; ESIHRMS: Found: m/z 260.1435. Calcd for C_{19}H_{18}N: (M+H)^+ 260.1439.

Ethyl 2,4-diphenyl-6-methylpyridine-3-carboxylate (3ah)

Colourless solid; \(^{1}\)H NMR (400 MHz, CDCl\(_{3}\)) \(\delta\) 0.84 (3H, t, \(J = 7.2\) Hz), 2.67 (3H, s), 3.92 (2H, q, \(J = 7.2\) Hz), 7.16 (1H, s), 7.39–7.43 (8H, m), 7.60–7.62 (2H, m); \(^{13}\)C NMR (100 MHz, CDCl\(_{3}\)) \(\delta\) 13.4, 24.1, 61.2, 122.3, 125.9, 128.0, 128.3, 128.4, 128.46 (overlapped), 128.55, 138.4, 139.9, 148.8, 156.5, 158.9, 168.7.

Ethyl 3,4-diphenyl-6-methylpyridine-2-carboxylate (3ah-isomer)

Yellow oil; IR (NaCl) 2986, 1736, 1589, 1450, 1381, 1342, 1273 cm\(^{-1}\); \(^{1}\)H NMR (400 MHz, CDCl\(_{3}\)) \(\delta\) 0.95 (3H, t, \(J = 7.2\) Hz), 2.68 (3H, s), 4.08 (2H, q, \(J = 7.2\) Hz), 7.04–7.08 (4H, m), 7.19–7.23 (6H, m), 7.30 (1H, s); \(^{13}\)C NMR (100 MHz, CDCl\(_{3}\)) \(\delta\) 13.6, 24.1, 61.4, 125.7, 127.3, 127.7, 127.9, 128.0, 129.2, 138.3, 139.9, 148.8, 156.5, 158.9, 168.7.

129.9, 131.5, 136.4, 138.2, 150.0 150.8, 157.4, 167.6; ESIHRMS: Found: m/z 318.1496. Calcd for C$_{21}$H$_{20}$NO$_2$: (M+H)$^+$ 318.1494.

3-(4-Methoxyphenyl)-6-methyl-4-phenyl-2-(4-(trifluoromethyl)phenyl)pyridine (3ai)

![Chemical structure of 3ai]

Colorless oil; IR (NaCl) 2963, 2839, 1612, 1574, 1512, 1327, 1250, 1165 cm$^{-1}$; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 2.67 (3H, s), 3.70 (3H, s), 6.59 (2H, dt, $J = 8.8$, 2.0 Hz), 6.74 (2H, dt, $J = 8.8$, 2.0 Hz), 7.05–7.08 (2H, m), 7.20–7.23 (4H, m), 7.39 (2H, d, $J = 8.4$ Hz), 7.45 (2H, d, $J = 8.4$ Hz); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 24.3, 55.0, 113.4, 123.9, 124.2 ($J_{C-F} = 170.3$ Hz), 124.6 ($J_{C-F} = 6.7$ Hz), 127.3, 127.9, 129.1 ($J_{C-F} = 32.0$ Hz), 129.2, 129.4, 130.2, 131.4, 132.4, 139.4, 144.8, 150.3, 156.4, 157.0, 158.3; ESIHRMS: Found: m/z 420.1575. Calcd for C$_{26}$H$_{21}$NO$_{19}$F$_3$: (M+H)$^+$ 420.1575.

2-(4-Methoxyphenyl)-6-methyl-4-phenyl-3-(4-(trifluoromethyl)phenyl)pyridine (3ai-isomer)

![Chemical structure of 3ai-isomer]

White solid; mp. 138–140 °C; IR (NaCl) 2963, 2839, 1612, 1589, 1512, 1327, 1126 cm$^{-1}$; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 0.79 (3H, t, $J = 7.2$ Hz), 1.04 (3H, t, $J = 7.2$ Hz), 1.37 (2H, tq, $J = 8.4$, 7.2 Hz), 1.76 (2H, tq, $J = 8.4$, 7.2 Hz), 2.49 (3H, s), 2.52 (2H, t, $J = 8.4$ Hz), 2.78 (2H, t, $J = 8.4$ Hz), 3.86 (3H, s), 6.78 (1H, s), 6.94 (2H, d, $J = 8.8$ Hz), 7.18 (2H, d, $J = 8.8$ Hz); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 14.37, 14.43, 23.8, 24.0, 24.3, 30.6, 37.5, 55.2, 113.5, 122.3, 129.6, 130.2, 133.0, 150.1, 154.2, 158.9, 160.2; ESIHRMS: Found: m/z 420.1575. Calcd for C$_{26}$H$_{21}$NO$_{19}$F$_3$: (M+H)$^+$ 420.1575.

4-(4-Methoxyphenyl)-6-methyl-2,3-dipropylpyridine (3be)

![Chemical structure of 3be]

Colorless oil; IR (NaCl) 2963, 2932, 1612, 1512, 1466, 1288, 1250, 1034 cm$^{-1}$; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 0.79 (3H, t, $J = 7.2$ Hz), 1.04 (3H, t, $J = 7.2$ Hz), 1.37 (2H, tq, $J = 8.4$, 7.2 Hz), 1.76 (2H, tq, $J = 8.4$, 7.2 Hz), 2.49 (3H, s), 2.52 (2H, t, $J = 8.4$ Hz), 2.78 (2H, t, $J = 8.4$ Hz), 3.86 (3H, s), 6.78 (1H, s), 6.94 (2H, d, $J = 8.8$ Hz), 7.18 (2H, d, $J = 8.8$ Hz); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 14.37, 14.43, 23.8, 24.0, 24.3, 30.6, 37.5, 55.2, 113.5, 122.3, 129.6, 130.2, 133.0, 150.1, 154.2, 158.9, 160.2; ESIHRMS: Found: m/z 284.2015. Calcd for C$_{19}$H$_{26}$NO: (M+H)$^+$ 284.2014.
4-(2-Methoxyphenyl)-6-methyl-2,3-dipropylpyridine (3ce)

\[
\text{\begin{align*}
\text{O} & \text{Me} \\
\text{Me} & \text{N} \\
\text{Pr} & \text{Pr}
\end{align*}\}
\]

Colorless oil; IR (NaCl) 2955, 2870, 1605, 1589, 1497, 1435, 1242 cm\(^{-1}\); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 0.73 (3H, t, \(J = 7.2\) Hz), 1.04 (3H, t, \(J = 7.2\) Hz), 1.20–1.40 (2H, m), 1.78 (2H, tq, \(J = 8.8, 7.2\) Hz), 2.27–2.50 (2H, m), 2.49 (3H, s), 2.78 (2H, t, \(J = 8.8\) Hz), 3.74 (3H, s), 6.76 (1H, s), 6.95 (1H, d, \(J = 8.4\) Hz), 6.99 (1H, d, \(J = 7.6, 7.2\) Hz), 7.07 (1H, dd, \(J = 7.6, 2.0\) Hz), 7.35 (1H, ddd, \(J = 7.6, 7.2, 1.6\) Hz); \(^1^3\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) 14.4 (overlapped), 23.7, 23.8, 24.0, 31.1, 37.5, 55.3, 110.6, 120.3, 122.4, 129.0, 129.3, 130.4, 131.0, 147.3, 154.1, 155.9, 159.7; ESIHRMS: Found: m/z 284.2012. Calcd for C\(_{19}\)H\(_{26}\)NO: (M+H)\(^+\) 284.2014.

6-Methyl-2,3-diphenyl-4-(m-tolyl)pyridine (3da)

\[
\text{Me} \\
\text{Ph} \\
\text{Ph} \\
\text{N} \\
\text{Ph} \\
\text{Me}
\]

White solid; mp. 100–102 °C; IR (NaCl) 2955, 1589, 1535, 1489, 1443, 1427 cm\(^{-1}\); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 2.22 (3H, s), 2.69 (3H, s), 6.81 (1H, d, \(J = 7.2\) Hz), 6.83–6.88 (2H, m), 6.91 (1H, s), 6.98–7.08 (5H, m), 7.13–7.18 (3H, m), 7.20 (1H, s), 7.22–7.28 (2H, m); \(^1^3\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) 21.3, 24.4, 123.2, 126.3, 126.4, 127.1, 127.5, 127.56, 127.60, 127.9, 129.9, 130.0, 131.6, 131.6, 137.4, 138.0, 139.5, 141.0, 150.0, 156.8, 157.8; ESIHRMS: Found: m/z 336.1750. Calcd for C\(_{25}\)H\(_{22}\)N: (M+H)\(^+\) 336.1752.

4-(4-Bromophenyl)-6-methyl-2,3-diphenylpyridine (3ea)

\[
\text{Br} \\
\text{Ph} \\
\text{N} \\
\text{Me} \\
\text{Ph} \\
\text{Ph}
\]

Colorless crystal; mp. 162–164 °C; IR (NaCl) 2963, 1589, 1574, 1489, 1443, 1420, 1373 cm\(^{-1}\); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 2.68 (3H, s), 6.84 (2H, d, \(J = 7.2\) Hz), 6.92 (2H, d, \(J = 8.4\) Hz), 7.01–7.10 (3H, m), 7.13–7.20 (4H, m), 7.21–7.27 (2H, m), 7.30 (2H, d, \(J = 8.4\) Hz); \(^1^3\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) 24.4, 121.6, 122.9, 126.6, 127.2, 127.6, 127.8, 129.8, 130.9, 131.0, 131.31, 131.34, 137.5, 138.5, 140.7, 148.6, 157.0, 158.0; ESIHRMS: Found: m/z 400.0699. Calcd for C\(_{24}\)H\(_{19}\)N\(^{79}\)Br: (M+H)\(^+\) 400.0701.

6-Methyl-4-(naphthalen-2-yl)-2,3-diphenylpyridine (3fa)
White solid; mp. 159–160 °C; IR (NaCl) 3055, 2955, 1574, 1535, 1504, 1443, 856 cm\(^{-1}\); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 2.70 (3H, s), 6.89 (2H, dd, \(J = 8.0, 1.6\) Hz), 6.95–7.05 (4H, m), 7.16–7.19 (3H, m), 7.26–7.29 (2H, m), 7.31 (1H, s), 7.43–7.47 (2H, m), 7.57 (1H, d, \(J = 8.4\) Hz), 7.70 (1H, s), 7.72–7.77 (2H, m); \(^13\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) 24.5, 123.5, 126.1, 126.2, 126.4, 127.1, 127.2 (overlapped), 127.57, 126.61, 127.7, 128.0, 128.4, 129.9, 131.5, 131.7, 132.3, 133.0, 137.3, 137.8, 141.0, 149.8, 157.0, 158.0; ESIHRMS: Found: m/z 372.1752. Calcd for C\(_{28}\)H\(_{22}\)N: (M+H\(^+\)) 372.1752.

**6-Methyl-4-(naphthalen-2-yl)-2,3-dipropylpyridine (3fe)**

![Chemical structure of 6-Methyl-4-(naphthalen-2-yl)-2,3-dipropylpyridine (3fe)](image)

Yellow oil; IR (NaCl) 2955, 2932, 2870, 1589, 1551, 1505, 1466, 1450 cm\(^{-1}\); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 0.74 (3H, t, \(J = 7.2\) Hz), 1.06 (3H, t, \(J = 7.2\) Hz), 1.40 (2H, tq, \(J = 8.0, 7.1\) Hz), 1.80 (2H, tq, \(J = 8.0, 7.2\) Hz), 2.53 (3H, s), 2.55 (2H, t, \(J = 8.4\) Hz), 2.82 (2H, t, \(J = 8.0\) Hz), 6.88 (1H, s), 7.38 (1H, dd, \(J = 8.4, 1.6\) Hz), 7.50–7.55 (2H, m), 7.71 (1H, s), 7.84–7.90 (3H, m); \(^13\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) 14.3, 14.4, 23.8, 24.0, 24.4, 30.7, 37.5, 122.3, 126.1, 126.4, 126.8, 127.3, 127.6, 127.7, 128.0, 130.1, 132.4, 133.0, 138.2, 150.3, 154.3, 160.4; ESIHRMS: Found: m/z 304.2068. Calcd for C\(_{22}\)H\(_{26}\)N: (M+H\(^+\)) 304.2065.

**6-Methyl-4-(naphthalen-1-yl)-2,3-diphenylpyridine (3ga)**

![Chemical structure of 6-Methyl-4-(naphthalen-1-yl)-2,3-diphenylpyridine (3ga)](image)

White solid; mp. 122–124 °C; IR (NaCl) 3009, 2963, 1589, 1574, 1535, 1443, 1420, 802 cm\(^{-1}\); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 2.70 (3H, s), 6.73–6.85 (5H, m), 7.07 (1H, d, \(J = 6.8\) Hz), 7.14–7.18 (3H, m), 7.20 (1H, s), 7.26 (1H, t, \(J = 7.6\) Hz), 7.31–7.35 (2H, m), 7.35–7.43 (2H, m), 7.67 (2H, dd, \(J = 9.2, 8.8\) Hz), 7.77 (1H, dd, \(J = 7.2, 2.0\) Hz); \(^13\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) 24.4, 124.1, 124.7, 125.6, 125.9, 126.0, 126.2, 127.16, 127.23, 127.3, 127.59, 127.65, 128.1, 129.9, 130.6, 131.4, 133.0, 133.2, 137.2, 137.8, 140.9, 149.0, 156.4, 157.8; ESIHRMS: Found: m/z 372.1752. Calcd for C\(_{28}\)H\(_{22}\)N: (M+H\(^+\)) 372.1752.

**6-Methyl-2,3-diphenyl-4-(thiophen-2-yl)pyridine (3ha)**

![Chemical structure of 6-Methyl-2,3-diphenyl-4-(thiophen-2-yl)pyridine (3ha)](image)

White solid; mp. 161–163 °C; IR (NaCl) 2963, 1582, 1535, 1443, 1420 cm\(^{-1}\); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 2.68 (3H, s), 6.71 (1H, dd, \(J = 3.6, 1.2\) Hz), 6.85 (1H, dd, \(J = 4.8, 3.6\) Hz), 7.00 (2H, dd, \(J = 8.0, 2.0\) Hz), 7.12–7.18 (6H, m), 7.21–7.25 (3H, m), 7.36 (1H, s); \(^13\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) 24.4, 122.2, 126.9, 127.08, 127.09, 127.1, 127.5, 128.0, 128.1, 129.7, 130.9, 131.3, 137.9, 140.8, 140.9, 142.3, 157.1, 158.4; ESIHRMS: Found: m/z 328.1163. Calcd for C\(_{28}\)H\(_{18}\)NS: (M+H\(^+\)) 328.1160.

**E-2,3,4-Triphenyl-6-styrylpyridine (3ia)**
White solid; mp. 184–186 °C; IR (NaCl) 3063, 2970, 1574, 1528, 1497, 1443, 1381, 972 cm\(^{-1}\); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 6.88 (2H, dd, \(J = 7.6, 1.6\) Hz), 7.01–7.07 (3H, m), 7.08–7.13 (2H, m), 7.17–7.24 (6H, m), 7.26–7.40 (6H, m), 6.47 (1H, s), 7.60 (2H, d, \(J = 7.6\) Hz), 7.72 (1H, d, \(J = 16.4\) Hz); \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) 121.6, 126.5, 127.1, 127.30, 127.35, 127.56, 127.61, 127.9, 128.1, 128.2, 128.7, 129.2, 130.0, 131.4, 132.9, 133.0, 136.8, 137.8, 139.6, 140.9, 140.2, 154.2, 158.2; ESIHRMS: Found: m/z 410.1905. Calcd for C\(_{31}\)H\(_{24}\)N: (M+H\(^{+}\)) 410.1909.

6-Isopropyl-2,3,4-triphenylpyridine (3ja)

White solid; mp. 134–136 °C; IR (NaCl) 2963, 2870, 1582, 1566, 1535, 1489, 1381 cm\(^{-1}\); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 1.41 (6H, d, \(J = 7.2\) Hz), 3.22 (1H, sept, \(J = 7.2\) Hz), 6.86 (2H, d, \(J = 6.4\) Hz), 6.99–7.10 (5H, m), 7.13–7.23 (7H, m), 7.25–7.31 (2H, m); \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) 22.7, 36.3, 120.1, 126.3, 127.08, 127.10, 127.5, 127.6, 127.8, 129.3, 130.0, 131.5, 131.7, 138.1, 140.1, 141.1, 150.0, 157.2, 165.9; ESIHRMS: Found: m/z 350.1905. Calcd for C\(_{26}\)H\(_{24}\)N: (M+H\(^{+}\)) 350.1909.

(1E,3Z)-4-Methyl-1-phenylpenta-1-en-3-one oxime (syn-1j)

White solid; mp. 110–114 °C; IR (NaCl) 3264, 2970, 2932, 2870, 1489, 1450, 1381, 941 cm\(^{-1}\); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 1.26 (6H, d, \(J = 6.8\) Hz), 3.04 (1H, sept, \(J = 6.8\) Hz), 7.01 (1H, d, \(J = 16.8\) Hz), 7.32 (1H, d, \(J = 7.2\) Hz), 7.37 (2H, dd, \(J = 7.2, 7.2\) Hz), 7.46 (1H, d, \(J = 16.8\) Hz), 7.54 (2H, d, \(J = 7.2\) Hz), 9.28 (1H, brs); \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) 21.1, 29.6, 115.9, 127.4, 128.7, 128.9, 135.5, 136.5, 159.9; ESIHRMS: Found: m/z 190.1240. Calcd for C\(_{12}\)H\(_{16}\)NO: (M+H\(^{+}\)) 190.1232.

2,3-Dimethyl-4,5,6-triphenylpyridine (3ka)\(^5\)

White solid; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 2.10 (3H, s), 2.69 (3H, s), 6.75–6.82 (2H, m), 6.91–6.97 (5H, m), 7.11–7.22 (6H, m), 7.23–7.29(2H, m); \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) 16.8, 23.6, 125.9, 126.7, 126.9, 127.2, 127.5, 127.7, 128.0, 129.4, 129.9, 131.2, 132.8, 138.7, 138.9, 141.1, 149.8, 154.3, 156.1.

1-Methyl-3,4-diphenyl-5,6,7,8-tetrahydroisoquinoline (3la)

White solid; mp. 142–144 °C; IR (NaCl) 3055, 2940, 2862, 1558, 1427, 1412, 1335 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ 1.66–1.71 (2H, m), 1.82–1.87 (2H, m), 2.44 (2H, t, J = 6.4 Hz), 2.56 (3H, s), 2.74 (2H, t, J = 6.4 Hz), 7.01–7.07 (2H, m), 7.08–7.16 (3H, m), 7.17–7.27 (5H, m); ¹³C NMR (100 MHz, CDCl₃) δ 22.4, 22.51, 22.54, 26.6, 28.8, 126.6, 126.7, 127.4, 128.0, 128.4, 129.3, 129.8, 130.4, 133.3, 138.7, 141.1, 144.7, 153.4, 155.7; ESIHRMS: Found: m/z 300.1753. Calcd for C₂₂H₂₂N: (M+H)⁺ 300.1752.

3-Benzyl-2-methyl-5,6-diphenylpyridine (3ma)

White solid; ¹H NMR (400 MHz, CDCl₃) δ 2.59 (3H, s), 4.06 (2H, s), 7.12–7.14 (2H, m), 7.19–7.24 (9H, m), 7.29–7.36 (4H, m), 7.42 (1H, s); ¹³C NMR (100 MHz, CDCl₃) δ 22.5, 38.5, 126.4, 126.8, 127.4, 127.8, 128.2, 128.6, 128.7, 129.6, 129.9, 132.5, 133.5, 139.1, 139.7, 140.0, 140.2, 154.3, 155.9.

6-Methyl-3,4-diphenyl-2-(5,6,7,8-tetraphenyl)naphthalen-1-yl)pyridine (4aa)

White solid; mp. 128–130 °C; IR (NaCl) 3055, 3024, 2932, 1582, 1535, 1497, 1443, 1381, 1366 cm⁻¹; ¹H NMR (400 MHz, CDCl₃) δ 2.42 (3H, s), 6.51 (1H, d, J = 7.2 Hz), 6.61–6.66 (4H, m), 6.71–6.85 (10H, m), 6.85–7.00 (5H, m), 7.01–7.10 (4H, m), 7.12–7.18 (5H, m), 7.21–7.28 (3H, m), 7.37 (1H, d, J = 6.8 Hz), 7.43 (1H, d, J = 8.4 Hz); ¹³C NMR (100 MHz, CDCl₃) δ 24.0, 122.5, 124.3, 124.9, 125.1, 125.3, 125.5, 126.1, 126.2, 126.30, 126.32, 126.4, 126.6, 127.0, 127.1, 127.2, 127.5, 127.8, 129.1, 130.6, 130.7, 130.90, 130.94, 131.0, 131.17, 131.20, 131.22, 131.26, 131.34, 133.1, 133.7, 137.2, 137.6, 137.9, 138.2, 139.0, 139.86, 139.89, 140.1, 140.57, 140.62, 140.7, 148.2, 155.7, 159.6; ESIHRMS: Found: m/z 676.3000. Calcd for C₅₂H₃₈N: (M+H)⁺ 676.3004.

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compound 1b

[Chemical Structure Image]
XJ-0018-product 13C BBPD1 400MHz

(compound Id)

Me-\蕙\蕙

[ppm]
compound 1e

Br

N

OH

PC-2050-Exptl-Oxime-pure 1H BBFO1 400MHz
YJ-0020-product 1H BBFO1 400MHz

compound 1f

[Chemical structure image]

ppm

ppm
Compound 1f

\[ \text{N}^\text{OH} \]

\[ \text{Me} \]
PC-2057-product 2st recrys 1H AV400 CDCl3

compound 1h

N-\text{OH}

\begin{align*}
\text{ppm} & \quad 10 \quad 9 \quad 8 \quad 7 \quad 6 \quad 5 \quad 4 \quad 3 \quad 2 \quad 1 \\
0.96 & \quad 1.04 \quad 1.04 \quad 1.00 \quad 3.02
\end{align*}
compound 12

**YJ-0010-product 1H BBFOI 400MHz**

Ph

\[
\text{Ph} \rightarrow \text{N} \rightarrow \text{Cl}
\]
compound i

anti : syn = 55 : 45
compound 1k

Ph\[N-OH\]

Me
PC-2060-Oxime-crude 1H, BBFO2, 400MHz

Compound 1m

Molecular Structure: 

- Chemical Shifts: 
  - 9.710 ppm
  - 7.295 ppm
  - 7.262 ppm
  - 7.258 ppm
  - 7.208 ppm
  - 7.193 ppm
  - 7.173 ppm
  - 5.529 ppm
  - 5.101 ppm
  - 3.664 ppm
  - 2.056 ppm

- Additional Peaks: 
  - 1.08 ppm
  - 2.15 ppm
  - 3.20 ppm
  - 3.18 ppm
  - 2.27 ppm
  - 1.00 ppm

- Integration: 
  - Ph: 100
  - Me: 3.18
  - N-OH: 2.27
compound
syn-ij

[pH]
Compound 3aa
compound 3ab
Compound 3aC
compound 3ac
PC-2068-product 1H AV400 CDC13

compound 3af

TRSO
Ph

ppm
compound 3ag
compound 3a2
compound 3be
Noji-0023-product 1H, BBFO2, 400MHz
YJ-0031-product 1H BBFO1 400MHz

compound 3ha

Ph

Ph

3.09

3.02

2.07

1.02

3.29

6.07
compound 36a
YJ-0035-product $^1$H BBFO1 400MHz

compound 3i

$\text{pH} \text{pH}$
compound 3
Noji-0026-product 1H, BBFO2, 400MHz

compound 3ka

Ph

Ph

Ph

M2

M2
PC-2066-2 1H (Re) AV100 CDCl3

[Chemical structure diagram]

Compound 4aa

[Chemical structure diagram]
compound 4a

[pic: 1H NMR spectrum with peaks at 77.3211, 77.1031, and compound 4a structure]