Supporting Information

Direct Arylation of Pyridines without the Use of Transition Metal Catalyst

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I. General information:
All manipulations were carried out under argon using standard Schlenk techniques. All glassware was oven or flame dried immediately prior to use. All solvents were purified and dried according to standard methods prior to use, unless stated otherwise.

Unless otherwise, all reagents were obtained from commercial sources and used without further purification. 1H NMR spectra were obtained at 400 MHz and recorded relative to the tetramethylsilane signal (0 ppm) or residual protio-solvent. 13C NMR spectra were obtained at 100 MHz, and chemical shifts were recorded relative to the solvent resonance (CDCl3, 77.0 ppm). Data for 1H NMR are reported as follows: chemical shift (δ, ppm), multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet or unresolved, br = broad singlet, coupling constant in Hz, integration). Data for 13C NMR are reported in terms of chemical shift (δ, ppm). High-resolution mass spectra were obtained on a JEOL JMS.DX303HF spectrometer (ESI).

II. Experimental Procedure

A mixture of pyridine (2 ml), 4-methoxyphenylhydrazine hydrochloride (0.5 mmol), was stirred at rt for 24 h. The reaction mixture was washed with EtOAc, and concentrated in vacuo. The resulting residue was purified by PTLC using hexanes:EtOAc (3:1 to 1:1, depending on different substrates) as the eluent. The isomer ratio was calculated from the isolated yield of isomers. Known compounds are characterized by 1H NMR and their comparison to literature. Unknown compounds are characterized by 1H NMR, 13C NMR and HRMS.
A mixture of pyrazine (500mg, 6.26mmol), 4-methoxyphenylhydrazine hydrochloride (0.5 mmol), and 1Ml DMF was stirred at 25°C for 24h. in sealed tube. The reaction mixture was washed with EtOAc, and concentrated in vacuo. The resulting residue was purified by PTLC using hexanes:EtOAc (3:1 to 1:1, depending on different substrates) as the eluent to yield product (3).

1. Data of products

2-p-Tolyl-pyridine\(^{[1]}\) Yellow oil,\(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.68 (d, \(J = 4.8\) Hz, 1H), 7.89 (d, \(J = 8.1\) Hz, 2H), 7.79 – 7.66 (m, 2H), 7.29 (d, \(J = 8.0\) Hz, 2H), 7.20 (ddd, \(J = 6.6, 4.9, 1.7\) Hz, 1H), 2.41 (s, 3H).

3-p-Tolyl-pyridine\(^{[2]}\), Yellow oil,\(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.84 (s, 1H), 8.57 (d, \(J = 3.7\) Hz, 1H), 7.91 – 7.81 (m, 1H), 7.49 (d, \(J = 8.1\) Hz, 2H), 7.35 (dd, \(J = 7.7, 4.8\) Hz, 1H), 7.29 (d, \(J = 7.9\) Hz, 2H), 2.41 (s, 3H).

2-m-Tolyl-pyridine\(^{[1]}\), Yellow oil,\(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.69 (d, \(J = 4.6\) Hz, 1H), 7.84 (s, 1H), 7.79 – 7.69 (m, 3H), 7.37 (t, \(J = 7.6\) Hz, 1H), 7.23 (dd, \(J = 9.1, 4.4\) Hz, 2H), 2.44 (s, 3H)

3-m-Tolyl-pyridine\(^{[2]}\), Yellow oil,\(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.87 (s, 1H), 8.61 (d, \(J = 4.3\) Hz, 1H), 7.94 – 7.85 (m, 1H), 7.46 – 7.35 (m, 4H), 7.26 (d, \(J = 4.0\) Hz, 1H), 2.46 (s, 3H).

2-(4-Methoxy-phenyl)-pyridine\(^{[1]}\), White solid \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.68 (d, \(J = 4.8\) Hz, 1H), 7.97 (d, \(J = 8.8\) Hz, 2H), 7.73 (ddd, \(J = 16.5, 11.4, 4.8\) Hz, 2H), 7.22 – 7.16 (m, 1H), 7.01 (t, \(J = 8.2\) Hz, 2H), 3.89 (s, 3H).

3-(4-Methoxy-phenyl)-pyridine\(^{[2]}\), White solid \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.81 (d, \(J = 1.7\) Hz, 1H), 8.57 – 8.51 (m, 1H), 7.86 – 7.81 (m, 1H), 7.52 (d, \(J = 8.7\) Hz, 2H), 7.34 (dd, \(J = 7.8, 4.8\) Hz, 1H), 7.02 (d, \(J = 8.7\) Hz, 2H), 3.86 (s, 3H).
2-(3-Methoxy-phenyl)-pyridine$^5$, White solid. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.69 (d, $J$ = 4.6 Hz, 1H), 7.79 – 7.69 (m, 2H), 7.59 (s, 1H), 7.54 (d, $J$ = 7.7 Hz, 1H), 7.39 (t, $J$ = 7.9 Hz, 1H), 7.23 (d, $J$ = 5.0 Hz, 1H), 6.97 (dd, $J$ = 8.1, 2.0 Hz, 1H), 3.90 (s, 3H).

3-(3-Methoxy-phenyl)-pyridine$^6$, White solid. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.84 (d, $J$ = 1.7 Hz, 1H), 8.59 (d, $J$ = 3.9 Hz, 1H), 7.87 (d, $J$ = 7.9 Hz, 1H), 7.38 (dt, $J$ = 7.8, 6.4 Hz, 2H), 7.17 (d, $J$ = 7.6 Hz, 1H), 7.11 (s, 1H), 6.96 (dd, $J$ = 8.3, 2.3 Hz, 1H), 3.88 (s, 3H).

2-(2-Methoxy-phenyl)-pyridine$^3$, Yellow oil. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.73 (d, $J$ = 4.6 Hz, 1H), 7.83 (d, $J$ = 8.0 Hz, 1H), 7.78 (dd, $J$ = 13.9, 7.9 Hz, 1H), 7.46 – 7.31 (m, 2H), 7.13 (td, $J$ = 8.3, 2.0 Hz, 1H).

3-(2-Methoxy-phenyl)-pyridine$^4$, Yellow oil. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.79 (s, 1H), 8.58 (d, $J$ = 4.7 Hz, 1H), 7.88 (d, $J$ = 8.0 Hz, 1H), 7.45 – 7.31 (m, 3H), 7.09 (t, $J$ = 7.4 Hz, 1H), 7.04 (d, $J$ = 8.4 Hz, 1H), 3.85 (s, 3H).

2-(3-Fluoro-phenyl)-pyridine$^7$, Brown solid. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.72 (d, $J$ = 4.7 Hz, 1H), 7.83 – 7.71 (m, 3H), 7.46 (dd, $J$ = 13.9, 7.9 Hz, 1H), 7.31 – 7.26 (m, 2H), 7.13 (td, $J$ = 8.3, 1.8 Hz, 1H).

3-(3-Fluoro-phenyl)-pyridine$^2$, Brown solid. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.80 (s, 1H), 8.62 (s, 1H), 7.90 – 7.82 (m, 1H), 7.48 – 7.41 (m, 1H), 7.41 – 7.34 (m, 2H), 7.28 (dd, $J$ = 12.1, 2.0 Hz, 1H), 7.10 (td, $J$ = 8.3, 2.0 Hz, 1H).

2-(4-Fluoro-phenyl)-pyridine$^{10}$, Brown liquid. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.71 (s, 1H), 8.01 (s, 1H), 7.87 (dd, $J$ = 6.5, 2.0 Hz, 1H), 7.78 (td, $J$ = 7.9, 1.7 Hz, 1H), 7.71 (d, $J$ = 7.9 Hz, 1H), 7.43 – 7.36 (m, 2H), 7.27 (d, $J$ = 9.4 Hz, 1H).

3-(4-Fluoro-phenyl)-pyridine$^{11}$, Brown liquid. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.83 (s, 1H), 8.63 (s, 1H), 7.86 (d, $J$ = 7.9 Hz, 1H), 7.57 (s, 1H), 7.50 – 7.35 (m, 4H).

2-(4-Chloro-phenyl)-pyridine$^{10}$, Brown liquid. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.68 (d, $J$ = 4.2 Hz, 1H), 8.03 – 7.93 (m, 2H), 7.75 (td, $J$ = 7.9, 1.7 Hz, 1H), 7.68 (d, $J$ = 7.9 Hz, 1H), 7.23 (dd, $J$ = 6.7, 5.5 Hz, 1H), 7.16 (t, $J$ = 8.7 Hz, 2H).

3-(4-Chloro-phenyl)-pyridine$^{9}$, Brown liquid. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.81 (s, 1H), 8.59 (s, 1H), 7.84 (d, $J$ = 8.0 Hz, 1H), 7.55 (dd, $J$ = 8.7, 5.3 Hz, 2H), 7.37 (dd, $J$ = 7.9, 4.8 Hz, 1H), 7.18 (t, $J$ = 8.6 Hz, 2H).
2-(4-Bromo-phenyl)-pyridine \[^{12}\], Brown solid. \(^1H\) NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.69 (d, \(J = 4.1\) Hz, 1H), 7.88 (d, \(J = 8.6\) Hz, 2H), 7.79 – 7.73 (m, 1H), 7.70 (d, \(J = 7.9\) Hz, 1H), 7.60 (d, \(J = 8.6\) Hz, 2H), 7.28 – 7.23 (m, 1H).

3-(4-Bromo-phenyl)-pyridine \[^{13}\], Brown solid. \(^1H\) NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.82 (s, 1H), 8.61 (s, 1H), 7.85 (d, \(J = 7.9\) Hz, 1H), 7.61 (d, \(J = 8.5\) Hz, 2H), 7.45 (d, \(J = 8.4\) Hz, 2H), 7.38 (dd, \(J = 7.5, 4.8\) Hz, 1H).

4-Pyridin-2-yl-benzonitrile \[^{14}\], Yellow solid. \(^1H\) NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.73 (d, \(J = 4.5\) Hz, 1H), 8.12 (d, \(J = 8.4\) Hz, 2H), 7.82 (td, \(J = 7.7, 1.5\) Hz, 1H), 7.77 (d, \(J = 8.4\) Hz, 3H), 7.37 – 7.29 (m, 1H).

4-Pyridin-3-yl-benzonitrile \[^{2}\], Yellow solid. \(^1H\) NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.86 (d, \(J = 1.7\) Hz, 1H), 8.68 (d, \(J = 3.7\) Hz, 1H), 7.89 (d, \(J = 7.9\) Hz, 1H), 7.79 (d, \(J = 8.3\) Hz, 2H), 7.70 (d, \(J = 8.3\) Hz, 2H), 7.43 (dd, \(J = 7.8, 4.9\) Hz, 1H).

2-(4-Trifluoromethoxy-phenyl)-pyridine \[^{15}\], colorless oil. \(^1H\) NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.71 (s, 1H), 8.01 (s, 1H), 7.87 (dd, \(J = 6.5, 2.0\) Hz, 1H), 7.78 (td, \(J = 7.9, 1.7\) Hz, 1H), 7.71 (d, \(J = 7.9\) Hz, 1H), 7.44 – 7.36 (m, 2H), 7.27 (d, \(J = 10.3\) Hz, 1H).

3-(4-Trifluoromethoxy-phenyl)-pyridine \[^{16}\], colorless oil. \(^1H\) NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.85 (s, 1H), 8.65 (s, 1H), 7.88 (d, \(J = 7.9\) Hz, 1H), 7.59 (s, 1H), 7.53 – 7.37 (m, 4H).

2-(4-Methoxy-phenyl)-4-methyl-pyridine \[^{19}\], Brown solid. \(^1H\) NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.53 (d, \(J = 4.9\) Hz, 1H), 7.96 (d, \(J = 8.8\) Hz, 2H), 7.51 (s, 1H), 7.02 (t, \(J = 6.1\) Hz, 3H), 3.93 – 3.87 (s, 3H), 2.42 (s, 3H).

3-(4-Methoxy-phenyl)-4-methyl-pyridine, Brown solid. \(^1H\) NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.42 (d, \(J = 3.1\) Hz, 2H), 7.25 (d, \(J = 8.8\) Hz, 2H), 7.18 (d, \(J = 5.0\) Hz, 1H), 6.99 (d, \(J = 8.6\) Hz, 2H), 3.86 (s, 3H), 2.30 (s, 3H). \(^13C\) NMR (101 MHz, CDCl\(_3\)) \(\delta\) 159.16, 150.06, 147.96, 144.63, 137.40,
2-(2,4-Dichloro-phenyl)-4-methyl-pyridine, Yellow solid. $^1$H NMR (400 MHz, CDCl$_3$) δ 8.59 (d, $J = 5.0$ Hz, 1H), 7.54 (d, $J = 8.3$ Hz, 1H), 7.52 (d, $J = 1.9$ Hz, 1H), 7.46 (s, 1H), 7.36 (dd, $J = 8.3, 2.0$ Hz, 1H), 7.15 (d, $J = 4.6$ Hz, 1H), 2.45 (s, 3H). $^{13}$C NMR (126 MHz, CDCl$_3$) δ 149.26, 132.92, 132.41, 129.85, 129.01, 128.66, 127.43, 127.31, 125.66, 124.90, 123.70, 29.47, 21.17. HRMS (ESI-TOF) m/z Calcd for 238.1176, C$_{11}$H$_7$N $^{[M+H]^+}$ found 238.1178.

3-(2,4-Dichloro-phenyl)-4-methyl-pyridine, Yellow solid. $^1$H NMR (400 MHz, CDCl$_3$) δ 8.50 (d, $J = 5.0$ Hz, 1H), 8.32 (s, 1H), 7.52 (d, $J = 2.0$ Hz, 1H), 7.34 (dd, $J = 8.2, 2.0$ Hz, 1H), 7.21 (d, $J = 5.0$ Hz, 1H), 7.17 (d, $J = 8.2$ Hz, 1H), 2.15 (s, 3H). $^{13}$C NMR (126 MHz, CDCl$_3$) δ 149.52, 149.12, 145.75, 135.33, 134.76, 134.66, 131.94, 130.35, 129.55, 127.27, 125.67, 29.69, 19.30. HRMS (ESI-TOF) m/z Calcd for 238.1176, C$_{11}$H$_7$N $^{[M+H]^+}$ found 238.1178.

4-(4-Methyl-pyridin-2-yl)-benzonitrile, Yellow solid. $^1$H NMR (400 MHz, CDCl$_3$) δ 8.61 (d, $J = 4.9$ Hz, 1H), 8.12 (d, $J = 8.4$ Hz, 2H), 7.78 (d, $J = 8.4$ Hz, 2H), 7.61 (s, 1H), 7.17 (d, $J = 4.6$ Hz, 1H), 2.47 (s, 3H). $^{13}$C NMR (101 MHz, CDCl$_3$) δ 155.16, 149.81, 148.26, 143.68, 132.52, 127.49, 124.32, 121.99, 118.87, 112.33, 21.25. HRMS (ESI-TOF) m/z Calcd for 195.0900, C$_{11}$H$_7$N $^{[M+H]^+}$ found 195.0905.

4-(4-Methyl-pyridin-3-yl)-benzonitrile, Yellow solid. $^1$H NMR (400 MHz, CDCl$_3$) δ 8.52 (d, $J = 4.5$ Hz, 1H), 8.43 (s, 1H), 7.76 (d, $J = 8.1$ Hz, 2H), 7.45 (d, $J = 8.2$ Hz, 2H), 7.25 (d, $J = 6.8$ Hz, 1H), 2.29 (s, 3H). $^{13}$C NMR (126 MHz, CDCl$_3$) δ 149.39, 149.20, 142.62, 132.31, 130.09, 128.50, 125.51, 118.54, 111.84, 110.31, 19.73. HRMS (ESI-TOF) m/z Calcd for 195.0900, C$_{11}$H$_7$N $^{[M+H]^+}$ found 195.0896.

2-(4-Methoxy-phenyl)-3-methyl-pyridine$^{[18]}$, White solid $^1$H NMR (400 MHz, CDCl$_3$) δ 8.50 (d, $J = 4.4$ Hz, 1H), 7.56 (d, $J = 7.5$ Hz, 1H), 7.48 (d, $J = 8.7$ Hz, 2H), 7.14 (dd, $J = 7.5, 4.8$ Hz, 1H), 6.98 (d, $J = 8.7$ Hz, 2H), 3.86 (s, 3H), 2.37 (s, 3H).

2-(4-Methoxy-phenyl)-5-methyl-pyridine$^{[20]}$, White solid $^1$H NMR (400 MHz, CDCl$_3$) δ 8.50 (s, 1H), 7.94 (d, $J = 8.8$ Hz, 2H), 7.57 (dd, $J = 18.0, 8.1$ Hz, 2H), 7.01 (d, $J = 8.8$ Hz, 2H), 3.88 (s, 3H), 2.38 (s, 3H).
2-(4-Methoxy-phenyl)-pyrazine \(^{(21)}\), Brown solid. \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 9.01 (s, 1H), 8.62 (s, 1H), 8.47 (s, 1H), 8.01 (d, \(J = 7.7\) Hz, 2H), 7.06 (d, \(J = 7.9\) Hz, 2H), 3.91 (s, 3H).

2-(4-Methoxy-phenyl)-3,5-dimethyl-pyridine, White solid. \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.33 (s, 1H), 7.46 (d, \(J = 8.7\) Hz, 2H), 7.38 (s, 1H), 6.97 (d, \(J = 8.7\) Hz, 2H), 3.85 (s, 3H), 2.33 (s, 6H).

\(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 159.29, 155.49, 147.16, 139.33, 132.95, 131.17, 130.28, 130.14, 113.54, 55.32, 20.05, 17.92. HRMS (ESI-TOF) \(m/z\) Calcd for 214.0812, \(C_{11}H_7N\) [M+H]\(^+\) found 214.0810.

2-(4-Methoxy-phenyl)-quinoline \(^{(22)}\), White solid. \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.19 (d, \(J = 8.6\) Hz, 1H), 8.14 (d, \(J = 8.8\) Hz, 3H), 7.82 (dd, \(J = 13.3, 8.4\) Hz, 2H), 7.71 (t, \(J = 7.6\) Hz, 1H), 7.50 (t, \(J = 7.1\) Hz, 1H), 7.05 (d, \(J = 8.8\) Hz, 2H), 3.89 (s, 3H).

2. Prepared arylation of pyridines on a gram scale

\[
\begin{array}{c}
\text{\(4\)-Fluoro-phenyl)hydrazine hydrochloride} \\
+ \\
\text{pyridine}
\end{array}
\xrightarrow{48\text{h}}
\begin{array}{c}
\text{\(4\)-Fluoro-phenyl)hydrazine} \\
\text{hydrochloride}
\end{array}
\]

To a 100 mL sealed tube, were added (4-Fluoro-phenyl)hydrazine hydrochloride (1g, 6.71mmol), and pyridine (40 mL). The tube was capped then stirred at 25\(^\circ\)C for 48 h. The reaction mixture was washed with EtOAc, and the filtrate was concentrated invacuo. The resulting residue was purified by silica gel column using hexanes:EtOAc (3:1 to 1:1) as the eluent to give a desired product, 0.38 g (36 % yield). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.68 (d, \(J = 4.2\) Hz, 1H), 8.03 – 7.93 (m, 2H), 7.75 (td, \(J = 7.9, 1.7\) Hz, 1H), 7.68 (d, \(J = 7.9\) Hz, 1H), 7.23 (dd, \(J = 6.7, 5.5\) Hz, 1H), 7.16 (t, \(J = 8.7\) Hz, 2H).

3. Competition Experiments and Hydrochloride or Kinetic Isotope Effects

3.1 Competition Reaction

\[
\begin{array}{c}
\text{4-Methoxyphenylhydrazine hydrochloride} \\
+ \\
\text{4-Cyanophenylhydrazine hydrochloride (50 mg, 0.28mmol)}
\end{array}
\xrightarrow{24\text{h}}
\begin{array}{c}
\text{4-Methoxyphenylhydrazine} \\
\text{hydrochloride} \\
\text{4-Cyanophenylhydrazine hydrochloride}
\end{array}
\]

To a 20 mL sealed tube, were added 4-methoxyphenylhydrazine hydrochloride(50 mg, 0.28mmol) and 4-cyanophenylhydrazine hydrochloride (47.6mg, 0.28mmol) and pyridine (3 mL). The tube was capped then stirred at 25\(^\circ\)C for 24 h. The reaction mixture was washed with EtOAc, and the filtrate was concentrated invacuo. The resulting residue was purified by silica gel column using hexanes:EtOAc (3:1 to 1:1) as the eluent. The product ratio was determined by isolated yield.
3.2 Hydrochloride or Kinetic Isotope Effects

3.2.1 Hydrochloride Effects

\[
\begin{align*}
\text{NH}_2 & \text{H} \quad \text{N} \quad \text{H} \quad \text{N} \quad \text{H} \\
& \text{NHNNH}_2 \\
\text{N} & \text{Cl} \\
\end{align*}
\]

To a 20 mL sealed tube, were added phenylhydrazine (50 mg, 0.46 mmol) and pyridine (2 mL). The tube was capped then stirred at 25°C for 24 h. The reaction mixture was washed with EtOAc, and the filtrate was concentrated invacuo. However, trace amounts of the desired product was observed.

\[
\begin{align*}
\text{NH}_2 & \text{H} \quad \text{N} \\
& \text{NHNNH}_2 \\
\text{N} & \text{Cl} \\
\end{align*}
\]

3.2.2 Kinetic Isotope Effects

\[
\begin{align*}
\text{D} & \text{D} \quad \text{D} \quad \text{D} \\
\text{H} & \text{N} \\
& \text{NHNNH}_2 \text{Cl} \\
\text{D} & \text{D} \quad \text{D} \quad \text{D} \\
& \text{D} \\
\end{align*}
\]

To a 20 mL sealed tube, were added phenylhydrazine (50 mg, 0.46 mmol), Tempo (54 mg, 0.46 mmol) and pyridine (2 mL). The tube was capped then stirred at 25°C for 24 h. The reaction mixture was washed with EtOAc, and the filtrate was concentrated invacuo. However, trace amounts of the desired product was observed.

\[
\begin{align*}
\text{D} & \text{D} \quad \text{D} \quad \text{D} \\
\text{H} & \text{N} \\
& \text{NHNNH}_2 \text{Cl} \\
\text{D} & \text{D} \quad \text{D} \quad \text{D} \\
& \text{D} \\
\end{align*}
\]

To a 20 mL sealed tube, were added 4-methoxyphenylhydrazine hydrochloride (50 mg, 0.28 mmol), pyridine (1.5 mL, 18.75 mmol) and d_5-pyridine (1.5 mL, 18.75 mmol). The tube was capped then stirred at 25 °C for 24 h. The reaction mixture was washed with EtOAc, and the filtrate was concentrated invacuo. The resulting residue was purified by PTLC using hexanes : EtOAc (3:1) as the eluent. The 2-(4-Methoxy-phenyl)-pyridine ratio (3c_1 and d_4-3c_1) was analyzed by 1H NMR. The yield of 3c_1, was determined by integration of the H_a signal of 3c_1, which appeared as a doublets (approximately 8.65 ppm). The total yield of 3c_1 and d_4-3c_1, was determined by integration of H_c of 3c_1 and d_4-3c_1, which appeared as doublets at the same chemical shift (7.95 ppm for both 3c_1 and d_4-3c_1). The yield of d_4-3c_1 could then be determined from the following formula: d_4-3c_1 = X_{total} - 3c_1.

Then K_H/K_D = 0.53/0.47 = 1.13
References

[20] Liu, Chun and Yang, Weibo, Chemical Communications (Cambridge, United Kingdom), 2009, 41,
IV. $^1$H NMR Spectra of the compounds