Supporting Information for

Diverse Catalytic Reactivity of a Dearomatized PN\textsuperscript{3}P*-Nickel Hydride Pincer Complex Towards CO\textsubscript{2} Reduction

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1. General information. All manipulation of air- and/or moisture-sensitive compounds were carried out under an atmosphere of purified argon in a Vacuum Atmospheres glovebox or using standard Schlenk techniques. All solvents were distilled under Ar from appropriate drying agents. Unless otherwise stated, commercial reagents were used as received without purification. NMR spectra were recorded on Bruker Advance 400, Bruker Avance-500, Bruker Avance-600, or Bruker Avance-700 NMR spectrometers in deuterated solvents. \(^1\)H NMR chemical shifts were referenced to the residual hydrogen signals of the deuterated solvents (7.26 ppm, CDCl\(_3\); 7.16 ppm, C\(_6\)D\(_6\); 1.94 ppm, CD\(_3\)CN), and the \(^{13}\)C NMR chemical shifts were referenced to the \(^{13}\)C signals of the deuterated solvents (77.2 ppm, CDCl\(_3\); 128.1 ppm, C\(_6\)D\(_6\); 67.4, 25.2 ppm, THF-d\(_8\)). Data are reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, p = pentet, s = sextet, h = heptet, m = multiplet, br = broad), coupling constants (Hz) and integration. Gas chromatography was performed on Agilent 5975C GC inert XL EI/CI MSD with Triple-Axis MS Detector. The X-ray diffraction data were collected using Bruker AXS KAPPA-APEX II CCD diffractometer (CuK\(_\alpha\), \(\lambda = 1.54178 \text{ Å}\)). Indexing was performed using APEX2 (Difference Vectors method). Data integration and reduction were performed using SaintPlus 6.01. Absorption correction was performed by multi-scan method implemented in SADABS. Space groups were determined using XPREP implemented in APEX2. Structures were solved using SHELXS-97 (direct methods) and refined using SHELXL-97 (full matrix least-squares on F\(^2\)). Elemental analyses were conducted by Flash 2000-Thermo Scientific CHNO Analyzer.


![Diagram](image)

**Synthesis of nickel pincer hydride complex 1, (PN\(^3\)P\(^*\)tBu)NiH.** To a suspension of 2,6-(tBu\(_2\)PNH)\(_2\)C\(_6\)H\(_4\) (L1) (398 mg, 1.0 mmol) in toluene (8.0 mL) was added Ni(COD)\(_2\) (275 mg, 1.0 mmol) under argon atmosphere, and the mixture was stirred at 80 °C for 12 h, then cooled to room temperature. The solution was filtered and the solid was washed with pentane (3\(\times\)3.0 mL), then dried under vacuum. The pale yellow solid (PN\(^3\)P\(^*\)tBu)NiH (1) thus obtained (388 mg, 85%). Crystals of complex (PN\(^3\)P\(^*\)tBu)NiH (1) suitable for X-ray diffraction were obtained by slow evaporation of its pentane solution. \(^1\)H NMR (600 MHz, C\(_6\)D\(_6\)): 6.95 (t, \(J = 7.6\) Hz, 1H), 6.70 (s, 1H), 5.21 (s, 1H), 4.02 (s, 1H), 1.51 (s, 9H), 1.48 (s, 9H), 1.04 (s, 9H), 1.02 (s, 9H), -15.87 (dd, \(J = 58.2, 53.0\) Hz, 1H). \(^{13}\)C NMR (THF-d\(_8\), 176 MHz): 173.3 (s), 161.1 (s), 138.2 (s), 104.3 (d, \(J = 21.9\) Hz), 86.7 (br), 36.6 (s), 36.5 (s), 28.9 (s), 28.7 (s). \(^{31}\)P NMR (243 MHz, C\(_6\)D\(_6\)): 129.1 (d, \(J = 226.1\) Hz), 121.3 (d, \(J = 221.4\) Hz). Elemental analysis (%) for C\(_{21}\)H\(_{41}\)N\(_3\)NiP\(_2\): Calculated: C, 55.29; H, 9.06; N, 9.21. Found: C, 55.21; H, 9.06; N, 9.18.

**Synthesis of nickel pincer hydride complex 2, (MePN\(^3\)P\(^*\)tBu)NiH.** Following the procedure described for the synthesis of complex (PN\(^3\)P\(^*\)tBu)NiH (1), reaction of L2 (411 mg, 1.0 mmol) and
Ni(COD)2 (275 mg, 1.0 mmol) gave (MePN3P*Bu)NiH (2) as a yellow solid (418 mg, 89% yield). Crystals of complex (MePN3P*Bu)NiH (2) suitable for X-ray diffraction were obtained by slow evaporation of its pentane solution. 1H NMR (400 MHz, CD6D6): 7.00 (t, J = 8.3 Hz, 1H), 6.78 (d, J = 8.4, 1H), 5.04 (d, J = 7.4 Hz, 1H), 2.55 (d, J = 3.5 Hz, 3H), 1.51 (s, 9H), 1.47 (s, 9H), 1.18 (s, 9H), 1.15 (s, 9H), -15.62 (dd, J = 60.5, 45.3 Hz, 1H). 13C NMR (CD6D6, 100 MHz): 173.6 (s), 159.7 (s), 138.7 (s), 106.0 (d, J = 21.5 Hz), 86.7 (s), 37.0 (s), 36.8 (s), 29.4 (d, J = 2.8 Hz), 28.6, 28.5. 31P NMR (162 MHz, CD6D6): 138.2 (dd, J = 222.6, 15.3 Hz), 130.2 (dd, J = 222.7, 23.8 Hz). Elemental analysis (%) for C22H43N3NiP2: Calculated: C, 56.19; H, 9.22; N, 8.94. Found: C, 56.26; H, 9.17; N, 8.91.

Synthesis of nickel pincer hydride complex 3, (PN3P*CP)NiH. Following the procedure described for the synthesis of complex (PN3P*Bu)NiH (1), reaction of L3 (446 mg, 1.0 mmol) and Ni(COD)2 (275 mg, 1.0 mmol) gave (PN3P*CP)NiH (3) as a yellow solid (398 mg, 79% yield). 1H NMR (600 MHz, CD3CN): 7.26-7.14 (m, 1H), 6.91 (t, J = 7.9 Hz, 1H), 5.65 (d, J = 7.8 Hz, 2H), 1.90-1.84 (m, 10H), 1.70-1.54 (m, 26H), -16.44 (t, J = 58.1, 1H). 13C NMR (THF-d8, 176 MHz): 138.5 (s), 129.5 (s), 129.1 (s), 128.8 (s), 125.9 (s), 39.0 (s), 38.8 (s), 30.0 (br), 29.4 (s), 27.3 (br), 27.1 (br). 31P NMR (243 MHz, CD6D6): 106.5 (d, J = 221.7 Hz), 98.7 (d, J = 223.5 Hz). Elemental analysis (%) for C25H41N3NiP2: Calculated: C, 59.55; H, 8.20; N, 8.33. Found: C, 59.47; H, 8.27; N, 8.26.

3. General procedures for hydroisilylation of CO2 to methanol: The nickel pincer hydride complex 1, (PN3P*Bu)NiH (4.6 mg, 0.01 mmol), and DMF (2.0 mL) were added into a fresh vial. The vial was sealed, and CO2 was introduced into the vial via a balloon. The reaction was stirred for 30 min at room temperature. Then, Ph2SiH2 (184 mg, 1 mmol) was injected via syringe into the vial. The reaction mixture was heated at 60°C in an oil bath for the specified reaction periods. The reaction was left to cool at room temperature, and 2 equivalents of NaOH/H2O solution was added for the hydrolysis of the silylated methanol. It was stirred for 24 h at room temperature before an aliquot of isopropyl alcohol was added as an internal standard. An aliquot of 0.2 mL was removed from the sample and diluted with CH2Cl2 before the resulting mixture was subjected to GC analysis. A GC calibration curve was constructed with isopropanol and various concentrations of methanol to get the linearity of the CH3OH/isopropanol signal.

4. Typical procedure for the catalytic methylation of amines to methylamines: To a stainless steel autoclave was added the nickel pincer hydride complex Ni1, (PN3P*Bu)NiH (6.8 mg, 0.015 mmol), dibenzylamine 1a (98.5 mg, 0.50 mmol), Ph2SiH2 (460 mg, 2.5 mmol) and 15.0 mL of CH2CN. The resulting solution was purged with CO2 and stirred under 2.7 atm of CO2 at 120 °C for 24 hours. After reaction, the autoclave was cooled to room temperature, and then CO2 was vented. The products were isolated by column chromatography on silica gel.

5. Typical procedure for the catalytic formylation of amines to formamides: To a stainless steel autoclave was added the nickel pincer hydride complex Ni1, (PN3P*Bu)NiH (6.8 mg, 0.015 mmol), dibenzylamine 1a (98.5 mg, 0.50 mmol), Ph2SiH2 (230 mg, 1.25 mmol) and 5.0 mL of CH2CN. The resulting solution was purged with CO2 and stirred under 8.2 atm of CO2 at room temperature for 24 hours. After reaction, the autoclave was cooled to room temperature, and then CO2 was vented. The products were isolated by column chromatography on silica gel.
6. Table S1. Solvent screening for hydrosilylation of CO\textsubscript{2} to methanol.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Solvent</th>
<th>Time [h]\textsuperscript{b}</th>
<th>Yield [%]\textsuperscript{c}</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>THF</td>
<td>20</td>
<td>83</td>
</tr>
<tr>
<td>2</td>
<td>CH\textsubscript{3}CN</td>
<td>28</td>
<td>87</td>
</tr>
<tr>
<td>3\textsuperscript{d}</td>
<td>CH\textsubscript{2}Cl\textsubscript{2}</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4\textsuperscript{d}</td>
<td>Toluene</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Reaction conditions: CO\textsubscript{2} balloon, catalyst, 1.0 mmol of Ph\textsubscript{2}SiH\textsubscript{2}, 2.0 mL of solvent. \textsuperscript{b} Time required for the full consumption of Ph\textsubscript{2}SiH\textsubscript{2} monitored by GC/MS. \textsuperscript{c} Yields of methanol determined by GC based on Si-H. \textsuperscript{d} No methanol was observed.

7. Table S2. Hydrosilane screening for hydrosilylation of CO\textsubscript{2} to methanol.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Hydrosilane (mmol)</th>
<th>Time [h]\textsuperscript{b}</th>
<th>Yield [%]\textsuperscript{c}</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PhSiH\textsubscript{3} (2/3)</td>
<td>24</td>
<td>90</td>
</tr>
<tr>
<td>2\textsuperscript{d}</td>
<td>Et\textsubscript{3}SiH (2)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>3\textsuperscript{d}</td>
<td>(EtO)\textsubscript{3}SiH (2)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4\textsuperscript{d}</td>
<td>i-Pr\textsubscript{3}SiH (2)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Reaction conditions: CO\textsubscript{2} balloon, catalyst, 2.0 mL of DMF. \textsuperscript{b} Time required for the full consumption of hydrosilane monitored by GC/MS. \textsuperscript{c} Yields of methanol determined by GC based on Si-H. \textsuperscript{d} No methanol was observed.

8. Table S3. Catalysts screening for hydrosilylation of CO\textsubscript{2} to methanol.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Catalyst</th>
<th>Catalyst loading [% Si-H]</th>
<th>Time [h]\textsuperscript{b}</th>
<th>Yield [%]\textsuperscript{c}</th>
<th>TON</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ni\textsubscript{1}</td>
<td>1.25</td>
<td>12</td>
<td>91</td>
<td>73</td>
</tr>
<tr>
<td>2</td>
<td>Ni\textsubscript{2}</td>
<td>1.25</td>
<td>12</td>
<td>41</td>
<td>33</td>
</tr>
<tr>
<td>3</td>
<td>Ni\textsubscript{3}</td>
<td>1.25</td>
<td>12</td>
<td>63</td>
<td>50</td>
</tr>
</tbody>
</table>

\textsuperscript{a} CO\textsubscript{2} balloon, catalyst, 1.0 mmol of Ph\textsubscript{2}SiH\textsubscript{2}, 2.0 mL of DMF. \textsuperscript{b} Time required for the full consumption of Ph\textsubscript{2}SiH\textsubscript{2} monitored by GC/MS. \textsuperscript{c} Yields of CH\textsubscript{3}OH determined by GC based on Si-H.
9. Figure S1. Typical time profile.

![Typical time profile.](image)

Conditions: CO₂ balloon, Ni1 (1.25%), 1.0 mmol of Ph₂SiH₂, 2.0 mL of DMF at 60 °C.

10. Table S4. Optimization of the reductive functionalization of dibenzylamine with CO₂ and Ph₂SiH₂ catalyzed by PN³P*-Ni hydride complexes.ᵃ

<table>
<thead>
<tr>
<th>Entry</th>
<th>[Ni-H] catalyst</th>
<th>$P_{CO₂}$ [atm]</th>
<th>$T$ [°C]</th>
<th>Yield [%]ᵇ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2a</td>
</tr>
<tr>
<td>1</td>
<td>Ni1</td>
<td>2.7</td>
<td>100</td>
<td>85</td>
</tr>
<tr>
<td>2</td>
<td>—</td>
<td>2.7</td>
<td>100</td>
<td>&lt;1</td>
</tr>
<tr>
<td>3</td>
<td>Ni1</td>
<td>2.7</td>
<td>120</td>
<td>93</td>
</tr>
<tr>
<td>4</td>
<td>Ni1</td>
<td>5.4</td>
<td>120</td>
<td>62</td>
</tr>
<tr>
<td>5</td>
<td>Ni1</td>
<td>5.4</td>
<td>80</td>
<td>41</td>
</tr>
<tr>
<td>6</td>
<td>Ni1</td>
<td>5.4</td>
<td>80</td>
<td>&lt;1</td>
</tr>
<tr>
<td>7</td>
<td>Ni1</td>
<td>8.2</td>
<td>r.t.</td>
<td>&lt;1</td>
</tr>
<tr>
<td>8</td>
<td>Ni2</td>
<td>2.7</td>
<td>120</td>
<td>81</td>
</tr>
<tr>
<td>9</td>
<td>Ni3</td>
<td>2.7</td>
<td>120</td>
<td>89</td>
</tr>
<tr>
<td>10</td>
<td>Ni2</td>
<td>8.2</td>
<td>r.t.</td>
<td>11</td>
</tr>
<tr>
<td>11</td>
<td>Ni3</td>
<td>8.2</td>
<td>r.t.</td>
<td>7</td>
</tr>
</tbody>
</table>

Condition: ᵃ [Ni-H] complex (0.015 mmol), 1a (0.50 mmol), Ph₂SiH₂ (2.5 mmol), CH₃CN (15.0 mL), 24 h. ᵇ Determined by ¹H NMR spectroscopy of the crude reaction mixture using CH₂Br₂ as the internal standard. ᶜ Without catalyst. ᵈ 2.5 equiv. of Ph₂SiH₂, 5 mL of CH₃CN.
**11. Crystallographic data for nickel hydride PN\textsuperscript{3}P\textsuperscript{-pincer} complexes 1, 2 and 3.**

<table>
<thead>
<tr>
<th></th>
<th>(PN\textsuperscript{3}P\textsuperscript{-Bu})NiH 1</th>
<th>(MePN\textsuperscript{3}P\textsuperscript{-Bu})NiH 2</th>
<th>(PN\textsuperscript{3}P\textsuperscript{ Cp})NiH 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formula</strong></td>
<td>C\textsubscript{21}H\textsubscript{41}N\textsubscript{3}NiP\textsubscript{2}</td>
<td>C\textsubscript{22}H\textsubscript{43}N\textsubscript{3}NiP\textsubscript{2}</td>
<td>C\textsubscript{25}H\textsubscript{47}N\textsubscript{3}NiP\textsubscript{2}</td>
</tr>
<tr>
<td><strong>Formula weight</strong></td>
<td>456.20</td>
<td>470.22</td>
<td>504.26</td>
</tr>
<tr>
<td><strong>Space group</strong></td>
<td>orthorhombic</td>
<td>orthorhombic</td>
<td>tetragonal</td>
</tr>
<tr>
<td><strong>T[K]</strong></td>
<td>293</td>
<td>100</td>
<td>120</td>
</tr>
<tr>
<td><strong>a[Å]</strong></td>
<td>11.1132(4)</td>
<td>21.7707(14)</td>
<td>20.386(4)</td>
</tr>
<tr>
<td><strong>b[Å]</strong></td>
<td>15.6569(6)</td>
<td>8.2148(5)</td>
<td>20.386(4)</td>
</tr>
<tr>
<td><strong>c[Å]</strong></td>
<td>28.2950(12)</td>
<td>14.0657(9)</td>
<td>24.639(5)</td>
</tr>
<tr>
<td><strong>α[deg]</strong></td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td><strong>β[deg]</strong></td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td><strong>γ[deg]</strong></td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td><strong>V[Å\textsuperscript{3}]</strong></td>
<td>4923.3(3)</td>
<td>2515.5(3)</td>
<td>10240(4)</td>
</tr>
<tr>
<td><strong>Z</strong></td>
<td>8</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td><strong>Density[gcm\textsuperscript{-3}]</strong></td>
<td>1.231</td>
<td>1.242</td>
<td>1.308</td>
</tr>
<tr>
<td><strong>F(000)</strong></td>
<td>1968</td>
<td>1016</td>
<td>4320</td>
</tr>
<tr>
<td><strong>θ range (°)</strong></td>
<td>3.1 to 28.8</td>
<td>4.1 to 65.0</td>
<td>2.674 to 33.980</td>
</tr>
<tr>
<td><strong>Data collected (hkl)</strong></td>
<td>-14 ≤ h ≤ 14</td>
<td>-25 ≤ h ≤ 25</td>
<td>-31 ≤ h ≤ 31</td>
</tr>
<tr>
<td></td>
<td>-19 ≤ k ≤ 21</td>
<td>-8 ≤ k ≤ 9</td>
<td>-32 ≤ k ≤ 30</td>
</tr>
<tr>
<td></td>
<td>-37 ≤ l ≤ 37</td>
<td>-16 ≤ l ≤ 16</td>
<td>-36 ≤ l ≤ 38</td>
</tr>
<tr>
<td><strong>Refns collected/unique</strong></td>
<td>30459/5979</td>
<td>31183/4211</td>
<td>306993/10043</td>
</tr>
<tr>
<td><strong>Data/restraints/para</strong></td>
<td>5979/0/248</td>
<td>4211/0/271</td>
<td>10043/0/288</td>
</tr>
<tr>
<td><strong>Goodness-of-fit on F\textsuperscript{2}</strong></td>
<td>1.049</td>
<td>1.007</td>
<td>1.062</td>
</tr>
<tr>
<td><strong>Final R\textsubscript{1}, wR\textsubscript{2} [I&gt;2σ(I)]</strong></td>
<td>0.0391, 0.0982</td>
<td>0.0403, 0.0962</td>
<td>0.0224, 0.0592</td>
</tr>
<tr>
<td><strong>R\textsubscript{1}, wR\textsubscript{2} (all data)</strong></td>
<td>0.0508, 0.1055</td>
<td>0.0430, 0.1106</td>
<td>0.0250, 0.0606</td>
</tr>
<tr>
<td><strong>Δρ\textsubscript{max}, min/e Å\textsuperscript{-3}</strong></td>
<td>0.38, -0.28</td>
<td>1.01, -0.50</td>
<td>0.46, -0.36</td>
</tr>
</tbody>
</table>

**N-methyl dibenzylamine:***[^1] $^1$H NMR (CDCl$_3$, 500 MHz): $\delta$=7.41-7.39 (m, 4H), 7.37-7.34 (m, 4H), 7.29-7.26 (m, 2H), 3.55 (s, 4H), 2.22 (s, 3H). $^{13}$C NMR (CDCl$_3$, 126 MHz): $\delta$=139.4, 129.0, 128.4, 127.1, 62.0, 42.4.

**N,N-dimethyl-1-phenylmethanamine:***[^2] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.36-7.33 (m, 4H), 7.30-7.27 (m, 1H), 3.45 (s, 2H), 2.27 (s, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=138.9, 129.1, 128.3, 127.1, 64.5, 45.4.

**N-cyclohexyl-N-methylocyclohexanamine:***[^3] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=2.44-2.39 (m, 2H), 2.16 (s, 3H), 1.70-1.69 (m, 8H), 1.54-1.51 (m, 2H), 1.20-1.12 (m, 8H), 1.04-0.97 (m, 2H). $^{13}$C NMR (CDCl$_3$, 126 MHz): $\delta$=59.4, 32.9, 30.5, 26.3, 26.2.

**N-dodecyl-N-methyl dodecan-1-amine:***[^4] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=2.23-2.20 (m, 4H), 2.10 (s, 3H), 1.38-1.35 (m, 4H), 1.21-1.16 (m, 36H), 0.78 (t, $J=7.0$ Hz, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=57.9, 42.2, 32.0, 29.8, 29.7, 29.4, 27.7, 27.3, 22.7, 14.1.

**1,2,2,6,6-pentamethyl piperidine:***[^5] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=2.19 (s, 3H), 1.50-1.46 (m, 2H), 1.41-1.40 (m, 4H), 1.00 (s, 12H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=53.8, 41.3, 28.6, 26.4, 18.0.

**N,N-dimethylaniline:***[^2] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.31-7.28 (m, 2H), 6.81-6.77 (m, 3H), 3.00 (s, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=150.8, 129.2, 116.8, 112.8, 40.8.

**N-ethyl-N-methylaniline:***[^6] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.30 (t, $J=7.9$ Hz, 2H), 6.80-6.75 (m, 3H), 3.48-3.45 (m, 2H), 2.97 (s, 3H), 1.19 (t, $J=7.1$ Hz, 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=149.3, 129.3, 116.2, 112.6, 47.0, 37.6, 11.3.

**4-methoxy-N,N-dimethylaniline:***[^2] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=6.86 (d, $J=8.4$ Hz, 2H), 6.77 (d, $J=8.8$ Hz, 2H), 3.78 (s, 3H), 2.88 (s, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=152.1, 145.9, 115.1, 114.8, 55.9, 42.0.

**4-chloro-N,N-dimethylaniline:***[^2] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.21-7.18 (m, 2H), 6.67-6.64 (m, 2H), 2.94 (s, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=149.3, 128.9, 121.5, 113.8, 40.8.

**4-bromo-N,N-dimethylaniline:***[^2] $^1$H NMR (CDCl$_3$, 500 MHz): $\delta$=7.33-7.30 (m, 2H), 6.60-6.58 (m, 2H), 2.94-2.93 (m, 6H). $^{13}$C NMR (CDCl$_3$, 126 MHz): $\delta$=149.6, 131.8, 114.2, 108.6, 40.7.

**4-methoxy-N-(4-methoxyphenyl)-N-methylaniline:***[^5] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.03 (d, $J=8.5$ Hz, 4H), 7.03 (d, $J=8.7$ Hz, 4H), 3.85 (s, 6H), 3.31 (s, 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=154.3, 143.7, 121.5, 114.5, 55.5, 41.0.

**4-methylmorpholine:***[^7] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=3.58-3.57 (m, 4H), 2.27 (br, 4H), 2.15 (s, 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=66.9, 55.4, 46.4.

**1-methyl-1,2,3,4-tetrahydroquino line:***[^8] $^1$H NMR (CDCl$_3$, 500 MHz): $\delta$=7.27-7.23 (m, 1H), 7.12 (d, $J=7.3$ Hz, 1H), 6.80-6.76 (m, 2H), 3.37 (t, $J=5.7$ Hz, 2H), 3.04 (s, 3H), 2.94 (t, $J=6.5$ Hz, 2H), 2.17-2.12 (m, 2H). $^{13}$C NMR (CDCl$_3$, 126 MHz): $\delta$=146.8, 128.9, 127.1, 122.9, 116.3, 111.0, 51.3, 39.2, 27.9, 22.5.
1,2-dimethylindoline:[9] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.11-7.05 (m, 2H), 6.68 (t, $J$ = 7.1 Hz, 1H), 6.47 (d, $J$ = 7.9 Hz, 1H), 3.45-3.38 (m, 1H), 3.09 (q, $J$ = 8.2 Hz, 1H), 2.73 (s, 3H), 2.64-2.59 (m, 1H), 1.34 (d, $J$ = 6.2 Hz, 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=153.7, 129.3, 127.5, 124.1, 117.9, 107.3, 63.0, 37.5, 33.9, 18.9.

1-(4-chlorophenyl)-N,N-dimethylmethanamine:[10] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.28 (d, $J$ = 8.4 Hz, 2H), 7.23 (d, $J$ = 8.5 Hz, 2H), 3.37 (s, 2H), 2.22 (s, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=137.6, 132.8, 130.4, 128.5, 63.7, 45.4.

1-(4-methoxyphenyl)-N,N-dimethylmethanamine:[11] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.19 (d, $J$ = 8.6 Hz, 2H), 6.83 (d, $J$ = 8.7 Hz, 2H), 3.75 (s, 3H), 3.34 (s, 2H), 2.20 (s, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=158.8, 130.7, 130.3, 113.6, 63.7, 55.1, 45.1.

N,N-dimethyl-1,1-diphenylmethanamine:[12] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.51 (d, $J$ = 7.3 Hz, 4H), 7.34 (t, $J$ = 7.6 Hz, 4H), 7.24 (t, $J$ = 7.3 Hz, 2H), 4.15 (s, 1H), 2.28 (s, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=143.6, 128.6, 127.9, 127.0, 78.2, 44.9.

N,N,4-trimethylaniline:[8] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.19-7.17 (m, 2H), 6.82-6.80 (m, 2H), 3.01 (s, 6H), 2.39 (s, 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=149.0, 129.7, 126.1, 113.3, 41.1, 20.4.

N,N,2-trimethylaniline:[12] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.35-7.32 (m, 2H), 7.22-7.20 (m, 1H), 7.14-7.12 (m, 1H), 2.87 (s, 6H), 2.53 (s, 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=152.8, 132.2, 131.2, 126.5, 122.7, 118.4, 44.3, 18.5.

2-methoxy-N,N-dimethylaniline:[3] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.00-6.86 (m, 4H), 3.89 (s, 3H), 2.79 (s, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=152.6, 142.6, 122.6, 120.9, 118.3, 111.1, 55.4, 43.5.

4-fluoro-N,N-dimethylaniline:[2] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.11-7.08 (m, 2H), 6.80-6.78 (m, 2H), 2.99 (s, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=155.6 (d, $J$ = 234.6 Hz), 147.6, 115.3 (d, $J$ = 22.3 Hz), 113.8 (d, $J$ = 6.7 Hz), 41.0.

N,N,3,5-tetramethylaniline:[13] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=6.58-6.57 (m, 3H), 3.08 (s, 6H), 2.47 (s, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=151.0, 138.6, 118.9, 110.9, 40.8, 21.9.

N,N,2,6-tetramethylaniline:[14] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.24-7.22 (m, 2H), 7.19-7.17 (m, 1H), 3.07 (s, 6H), 2.55 (s, 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=149.8, 137.2, 128.9, 124.9, 42.6, 19.3.

2,6-diisopropyl-N,N-dimethylaniline:[14] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.57-7.55 (m, 1H), 7.51-7.50 (m, 2H), 3.81-3.77 (m, 2H), 3.27 (s, 6H), 1.65 (d, $J$ = 7.3 Hz, 12H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=149.3, 147.5, 126.5, 124.2, 44.4, 28.4, 24.6.

N,N,2,4,6-pentamethylaniline:[15] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.05 (s, 2H), 3.04 (s, 6H), 2.51 (s, 6H), 2.48 (s, 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=147.2, 137.1, 134.3, 129.6, 42.7, 20.8, 19.1.

ethyl 4-(dimethylamino)benzoate:[16] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.91 (d, $J$ = 6.8 Hz, 2H), 6.62 (d, $J$ = 6.8 Hz, 2H), 4.31 (q, $J$ = 7.1 Hz, 2H), 3.00 (s, 6H), 1.36 (t, $J$ = 7.2 Hz, 3H). $^{13}$C NMR (CDCl$_3$, 176 MHz): $\delta$=167.1, 153.2, 131.2, 117.2, 110.7, 60.1, 40.1, 14.5.
**N,N-dibenzylformamide:**[17] $^1$H NMR (CDCl$_3$, 500 MHz): δ=8.44 (s, 1H), 7.41-7.31 (m, 6H), 7.23-7.19 (m, 4H), 4.43 (s, 2H), 4.27 (s, 2H). $^{13}$C NMR (CDCl$_3$, 126 MHz): δ=162.9, 136.0, 135.7, 129.0, 128.7, 128.5, 128.2, 127.7, 127.7, 50.2, 44.6.

**N,N-didodecylformamide:** $^1$H NMR (CDCl$_3$, 600 MHz): δ=8.00 (s, 1H), 3.24 (t, J = 7.4 Hz, 2H), 3.15 (t, J = 7.1 Hz, 2H), 1.51-1.48 (m, 4H), 1.25-1.23 (m, 36H), 0.85 (t, J = 6.6 Hz, 6H). $^{13}$C NMR (CDCl$_3$, 126 MHz): δ=162.7, 47.5, 42.2, 32.0, 29.7, 29.4, 29.3, 28.7, 27.4, 27.0, 26.5, 22.8, 14.2. Elemental analysis (%) for C$_{25}$H$_{51}$NO: Calculated: C, 78.67; H, 13.47; N, 3.67. Found: C, 78.71; H, 13.51; N, 3.65.

**morpholine-4-carbaldehyde:**[18] $^1$H NMR (CDCl$_3$, 500 MHz): δ=7.69 (s, 1H), 3.32 (t, J = 5.3 Hz, 2H), 3.28 (d, J = 4.9 Hz, 2H), 3.17 (d, J = 5.5 Hz, 2H), 3.06 (d, J = 5.1 Hz, 2H). $^{13}$C NMR (CDCl$_3$, 126 MHz): δ=160.2, 66.5, 65.6, 45.0, 39.7.

**3,4-dihydroisoquinoline-2(1H)-carbaldehyde:**[19] $^1$H NMR (CDCl$_3$, 600 MHz): δ=8.00, 7.96 (s, total 1H), 7.00-6.95 (m, total 2H), 6.92-6.87 (m, total 2H), 4.43, 4.27 (s, total 2H), 3.53, 3.38 (t, J = 6.2 Hz, and t, J = 5.9 Hz, total 2H), 2.64, 2.60 (t, J = 5.9 Hz, and t, J = 6.2 Hz, total 2H). $^{13}$C NMR (CDCl$_3$, 151 MHz): δ=160.9, 160.5, 133.8, 133.1, 131.9, 131.2, 128.5, 128.3, 126.3, 125.9, 125.3, 46.5, 42.4, 41.5, 37.2, 29.0, 27.3.

**3,4-dihydroquinoline-1(2H)-carbaldehyde:**[20] $^1$H NMR (CDCl$_3$, 600 MHz): δ=8.36, 8.02, 7.93 (s, d, J = 8.2 Hz, and total 1H), 6.81-6.63 (m, total 4H), 3.36, 3.22 (t, J = 5.9 Hz, and t, J = 5.7 Hz, total 2H), 2.45, 2.36 (t, J = 6.7 Hz, and t, J = 6.4 Hz, total 2H), 1.59-1.43 (m, total 2H). $^{13}$C NMR (CDCl$_3$, 151 MHz): δ=160.6, 159.8, 136.3, 135.6, 128.6, 128.3, 127.5, 126.5, 126.0, 125.0, 123.2, 123.1, 121.1, 115.8, 45.0, 39.1, 26.1, 21.9, 21.2.

**2-methylindoline-1-carbaldehyde:**[21] $^1$H NMR (CDCl$_3$, 600 MHz): δ=8.80, 8.42, 8.02 (s, s, and d, J = 8.1 Hz, total 1H), 7.15-6.96 (m, total 4H), 4.66-4.61, 4.39-4.34, 4.06-4.02 (m, total 1H), 3.34-3.24, 2.67-2.51 (m, total 2H), 1.32, 1.27 (d, J = 6.4 Hz, and d, J = 6.4 Hz, total 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): δ=158.5, 156.5, 139.5, 139.3, 129.5, 126.4, 126.3, 125.1, 124.0, 123.2, 123.0, 115.3, 108.6, 53.5, 51.9, 35.0, 34.6, 22.1, 19.2.

**indoline-1-carbaldehyde:**[22] $^1$H NMR (CDCl$_3$, 600 MHz): δ=8.62, 8.20, 7.82 (s, s, and d, J = 7.9 Hz, total 1H), 6.97-6.78 (m, total 4H), 3.76, 3.70 (t, J = 8.4 Hz, and t, J = 8.3 Hz, total 2H), 2.85, 2.80 (t, J = 8.1 Hz, and t, J = 8.6 Hz, total 2H). $^{13}$C NMR (CDCl$_3$, 151 MHz): δ=158.8, 156.9, 140.6, 140.4, 131.6, 131.2, 126.8, 126.7, 125.3, 124.2, 123.7, 123.4, 115.7, 108.8, 46.2, 43.9, 27.0, 26.4.

**N-methyl-N-phenylformamide:**[23] $^1$H NMR (CDCl$_3$, 500 MHz): δ=8.46 (s, 1H), 7.40 (t, J = 7.7 Hz, 2H), 7.26 (t, J = 7.8 Hz, 1H), 7.17-7.15 (m, 2H), 3.31 (s, 3H). $^{13}$C NMR (CDCl$_3$, 126 MHz): δ=162.0, 141.9, 129.4, 126.1, 122.0, 31.7.

**N-ethyl-N-phenylformamide:**[18] $^1$H NMR (CDCl$_3$, 600 MHz): δ=8.10, 8.07 (s, total 1H), 7.13-7.05 (m, total 2H), 7.00-6.94 (m, total 1H), 6.90-6.86 (m, total 2H), 3.58, 3.44 (q, J = 7.2 Hz, and q, J = 7.2 Hz, total 2H), 0.89-0.85 (m, total 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): δ=161.3, 161.1, 140.2, 137.9, 128.9, 128.4, 126.0, 125.2, 123.3, 43.9, 39.2, 14.3, 12.4.

**N-(4-methoxyphenyl)-N-methylformamide:**[24] $^1$H NMR (CDCl$_3$, 500 MHz): δ=8.34 (s, 1H), 7.10-7.09 (m, 2H), 6.93-6.91 (m, 2H), 3.82 (s, 3H), 3.27 (s, 3H). $^{13}$C NMR (CDCl$_3$, 126 MHz): δ=162.4, 158.2, 135.1, 124.5, 114.7, 55.5, 32.6.
N-(4-chlorophenyl)-N-methylformamide: $^1$H NMR (CDCl$_3$, 500 MHz): $\delta$=8.42, 8.32 (s, total 1H), 7.38-7.31 (m, 2H), 7.10-7.07 (m, 2H), 3.32, 3.27 (s, total 3H). $^{13}$C NMR (CDCl$_3$, 126 MHz): $\delta$=162.0, 161.8, 140.5, 138.5, 131.5, 130.9, 129.5, 128.8, 124.3, 123.2, 36.4, 31.7.

N-benzyl-N-phenylformamide:[17] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=8.52, 8.49 (s, total 1H), 7.27-7.21 (m, total 6H), 7.17-7.13 (m, total 2H), 7.05-7.04 (m, total 2H), 4.97, 4.73 (s, total 2H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=162.3, 161.9, 140.6, 138.7, 136.4, 129.2, 128.6, 128.4, 128.2, 127.5, 127.4, 127.0, 126.9, 126.4, 126.2, 124.9, 123.4, 53.3, 48.2.

N-benzylformamide:[19] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=8.05, 7.96, 7.94 (s, total 1H), 7.34-7.17, 6.71 (m and br, total 6H), 4.32, 4.24 (d, $J$ = 6.2 Hz and d, $J$ = 6.4 Hz, total 2H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=164.9, 161.5, 137.7, 137.6, 128.7, 128.5, 127.7, 127.4, 127.3, 126.8, 45.5, 41.8.

N-(4-chlorobenzyl)formamide:[20] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=8.19, 8.09 (s, and d, $J$ = 11.9 Hz, total 1H), 7.30-7.24, 7.17-7.14 (m, total 4H), 6.24, 6.17 (br, total 1H), 4.38, 4.34 (d, $J$ = 6.1 Hz, and d, $J$ = 6.4 Hz, total 2H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=164.9, 161.4, 136.3, 136.2, 133.8, 133.4, 129.1, 128.9, 128.4, 45.1, 41.1.

N-(4-methoxybenzyl)formamide:[20] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=8.01, 7.92 (s, and d, $J$ = 12.0 Hz, total 1H), 7.11-7.04 (m, 2H), 6.80-6.74 (m, 2H), 4.22, 4.16 (d, $J$ = 5.6 Hz, and d, $J$ = 6.3 Hz, total 2H), 3.70, 3.67 (s, total 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=164.8, 161.3, 159.0, 158.7, 129.8, 129.6, 128.8, 128.2, 114.0, 113.8, 55.1, 55.1, 45.0, 41.2.

N-(2-methoxybenzyl)formamide:[20] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.93, 7.87 (s, and d, $J$ = 11.9 Hz, total 1H), 7.45, 6.84-6.82 (br and m, total 1H), 7.14-6.99 (m, total 2H), 6.78-6.67 (m, total 2H), 4.25, 4.09 (d, $J$ = 6.2 Hz, and d, $J$ = 6.4 Hz, total 2H), 3.61, 3.60 (s, total 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=164.8, 161.2, 156.7, 156.6, 128.7, 128.2, 128.1, 128.1, 125.6, 125.3, 120.0, 119.9, 109.7, 54.6, 41.0, 36.8.

N-cyclohexylformamide:[22] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=7.87-7.83 (m, 1H), 7.08, 6.86 (br, total 1H), 3.59-3.53, 3.06-3.05 (m, total 1H), 1.67-1.64 (m, 2H), 1.51-1.48 (m, 2H), 1.40-1.37 (m, 1H), 1.14-1.07, 0.98-0.91 (m, 5H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=163.6, 160.5, 51.8, 46.8, 34.2, 32.5, 25.1, 25.0, 24.7, 24.5.

N-(1-phenylethyl)formamide:[19] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=8.07, 8.06, 8.04, 8.02 (s, total 1H), 7.31-7.22 (m, total 4H), 7.13, 7.02 (br, total 1H), 5.15-5.10, 4.64-4.59 (m, total 1H), 1.51, 1.45 (d, $J$ = 6.9 Hz and d, $J$ = 6.9 Hz, total 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=164.5, 163.3, 160.7, 142.9, 142.8, 128.8, 128.6, 127.6, 127.3, 126.0, 125.7, 51.9, 47.5, 23.4, 21.8.

N-benzhydrylformamide:[19] $^1$H NMR (CDCl$_3$, 600 MHz): $\delta$=8.07, 8.05 (s, total 1H), 7.32-7.21 (m, total 10H), 6.26, 5.70 (d, $J$ = 8.2 Hz, and d, $J$ = 8.6 Hz, total 1H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta$=164.6, 160.6, 141.1, 140.9, 128.9, 128.7, 128.0, 127.5, 127.4, 127.3, 60.0, 55.6.

N-p-tolylformamide:[17] $^1$H NMR (CDCl$_3$, 500 MHz): $\delta$=8.90, 8.88, 8.01 (s, total 1H), 8.64, 8.62, 8.31, 8.31 (s, total 1H), 7.44-7.42, 7.15-7.10, 7.00-6.99 (m, total 4H), 2.33, 2.30 (s, total 3H). $^{13}$C NMR (CDCl$_3$, 126 MHz): $\delta$=163.3, 159.5, 153.2, 134.5, 134.3, 130.3, 129.6, 120.2, 119.1, 21.0, 20.9.
$N$-o-tolylformamide $^{[25]}$ $^1$H NMR (CDCl$_3$, 600 MHz): $\delta=9.19$, 8.51 (d, $J = 10.8$ Hz, and br, total 1H), 8.47, 8.27 (d, $J = 11.2$ Hz, and d, $J = 2.1$ Hz, total 1H), 7.72, 7.19-7.04 (d, $J = 7.9$ Hz and m, total 4H), 2.29, 2.20 (s, total 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta=164.1$, 160.2, 135.1, 134.6, 131.0, 130.4, 130.2, 129.8, 126.8, 126.3, 125.9, 125.4, 123.5, 121.0, 17.6, 17.5.

$N$-(4-methoxyphenyl)formamide $^{[20]}$ $^1$H NMR (CDCl$_3$, 600 MHz): $\delta=9.03$, 8.63 (d, $J = 11.7$ Hz and br, total 1H), 8.48, 8.21 (d, $J = 11.5$ Hz, and d, $J = 2.0$ Hz, total 1H), 7.41, 6.99 (d, $J = 9.0$ Hz, and d, $J = 8.9$ Hz, total 2H), 6.82, 6.78 (d, $J = 8.9$ Hz, and d, $J = 9.1$ Hz, total 2H), 3.74, 3.71 (s, total 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta=163.5$, 159.7, 157.4, 156.5, 130.2, 129.8, 121.9, 121.3, 114.8, 114.1, 55.5, 55.4.

$N$-(4-(tert-butyl)phenyl)formamide $^{[19]}$ $^1$H NMR (CDCl$_3$, 600 MHz): $\delta=9.54$, 9.06 (d, $J = 11.5$ Hz, and s, total 1H), 8.72, 8.35 (d, $J = 11.3$ Hz, and s, total 1H), 7.56 (d, $J = 8.7$ Hz, 1H), 7.38-7.34 (m, 2H), 7.09 (d, $J = 8.5$ Hz, 1H), 1.34, 1.32 (s, total 9H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta=163.4$, 160.0, 147.5, 134.3, 126.4, 125.7, 120.1, 118.6, 34.3, 31.3.

$N$-(2-methoxyphenyl)formamide $^{[20]}$ $^1$H NMR (CDCl$_3$, 600 MHz): $\delta=8.73$, 8.45 (d, $J = 11.6$ Hz and br, total 1H), 8.36, 7.78 (br, total 1H), 7.20-7.18, 7.12-7.05, 6.97-6.88 (m, total 4H), 3.88, 3.86 (s, total 3H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta=161.6$, 158.9, 148.9, 147.9, 126.9, 126.4, 125.4, 124.4, 120.6, 116.8, 111.4, 110.2, 55.9.

$N$-(4-bromophenyl)formamide $^{[26]}$ $^1$H NMR (CDCl$_3$, 600 MHz): $\delta=8.66$, 8.36 (br, total 1H), 7.44-7.41 (m, 4H), 6.99-6.97 (m, 1H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta=162.7$, 159.3, 136.1, 136.0, 132.9, 132.2, 121.7, 120.5, 118.4, 117.6.

$N$-(3,5-dimethylphenyl)formamide $^{[20]}$ $^1$H NMR (CDCl$_3$, 600 MHz): $\delta=9.58$, 9.01 (d, $J = 11.3$ Hz, and s, total 1H), 8.73, 8.34 (d, $J = 11.3$ Hz, and d, $J = 2.1$ Hz, total 1H), 7.26, 6.80, 6.76, 6.75 (br, total 3H), 2.29, 2.27 (s, total 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta=163.2$, 159.9, 139.2, 138.4, 136.9, 136.7, 126.7, 126.2, 117.9, 116.2, 21.0. 21.0.

$N$-(2,6-dimethylphenyl)formamide $^{[27]}$ $^1$H NMR (CDCl$_3$, 600 MHz): $\delta=8.34$, 8.08 (br, and d, $J = 11.9$ Hz, total 1H), 7.38, 7.15-7.06 (br and m, total 4H), 2.30, 2.23 (s, total 6H). $^{13}$C NMR (CDCl$_3$, 151 MHz): $\delta=165.2$, 159.7, 135.4, 133.3, 132.6, 128.9, 128.4, 127.8, 18.9, 18.7.

$N$-(2,6-diisopropylphenyl)formamide $^{[20]}$ $^1$H NMR (CDCl$_3$, 500 MHz): $\delta=8.30$, 8.22 (d, $J = 1.6$ Hz, and d, $J = 11.7$ Hz, total 1H), 8.02, 7.59 (d, $J = 12.0$ Hz, and br, total 1H), 7.35-7.29, 7.22-7.18 (m, total 3H), 3.27-3.19, 3.13-3.05 (m, total 2H), 1.22, 1.18 (d, $J = 6.9$ Hz, and d, $J = 6.7$ Hz, total 12H). $^{13}$C NMR (CDCl$_3$, 126 MHz): $\delta=166.0$, 161.1, 146.8, 146.2, 130.3, 128.9, 123.8, 123.6, 28.8, 28.5, 23.7, 23.7.

ethy l 4-formamidobenzoate $^{[28]}$ $^1$H NMR (CDCl$_3$, 700 MHz): $\delta=8.93-8.91$, 8.86-8.84 (m, total 1H), 8.42, 8.10 (s, total 1H), 8.03-8.02, 8.01-7.99 (m, total 2H), 7.64-7.63 (m, total 1H), 7.15-7.14 (m, 1H), 4.38-4.33 (m, total 2H), 1.39-1.37 (m, total 3H). $^{13}$C NMR (CDCl$_3$, 176 MHz): $\delta=166.3$, 166.1, 162.4, 159.5, 141.2, 141.1, 131.6, 131.0, 127.0, 126.5, 119.2, 117.3, 61.3, 61.2, 14.5.
13. References.

14. NMR spectra.

$^1$H NMR (600 MHz, C$_6$D$_6$)

$^{13}$C NMR (THF-$d_8$, 176 MHz)
$^{31}\text{P NMR (243 MHz, C}_6\text{D}_6)$

$^1\text{H NMR (400 MHz, C}_6\text{D}_6)$
$^{13}$C NMR ($C_6D_6$, 100 MHz)

$^{31}$P NMR (162 MHz, $C_6D_6$)
$^1$H NMR (600 MHz, CD$_3$CN)

$^{13}$C NMR (THF-$d_8$, 176 MHz)
$^{31}$P NMR (243 MHz, C$_6$D$_6$)
$^1$H NMR (CDCl$_3$, 500 MHz)

$^{13}$C NMR (CDCl$_3$, 126 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^{1}H$ NMR (CDCl$_3$, 600 MHz)

$^{13}C$ NMR (CDCl$_3$, 126 MHz)
$\text{H}_3\text{C}($H$_2$C)$_{10}$H$_2$C$\text{N}$

$\text{H}_3\text{C}($H$_2$C)$_{10}$H$_2$C

$^1$H NMR (CDCl$_3$, 600 MHz)

$\text{H}_3\text{C}($H$_2$C)$_{10}$H$_2$C$\text{N}$

$\text{H}_3\text{C}($H$_2$C)$_{10}$H$_2$C

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
\[ ^1H \text{ NMR (CDCl}_3, \text{ 600 MHz)} \]

\[ ^{13}C \text{ NMR (CDCl}_3, \text{ 151 MHz)} \]
$\text{H NMR (CDCl}_3, 600 \text{ MHz)}$

$\text{C NMR (CDCl}_3, 151 \text{ MHz)}$
\[ ^1\text{H NMR (CDCl}_3, 500 \text{ MHz)} \]

\[ ^{13}\text{C NMR (CDCl}_3, 126 \text{ MHz)} \]
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 700 MHz)

$^{13}$C NMR (CDCl$_3$, 176 MHz)
$^1$H NMR (CDCl$_3$, 500 MHz)

$^{13}$C NMR (CDCl$_3$, 126 MHz)
$\text{H}_3\text{C(H}_2\text{C)}_{10}\text{H}_2\text{C}$

$\text{H}_3\text{C(H}_2\text{C)}_{10}\text{H}_2\text{C}$

$^{1}\text{H NMR (CDCl}_3\text{, 600 MHz)}$

$\text{H}_3\text{C(H}_2\text{C)}_{10}\text{H}_2\text{C}$

$\text{H}_3\text{C(H}_2\text{C)}_{10}\text{H}_2\text{C}$

$^{13}\text{C NMR (CDCl}_3\text{, 126 MHz)}$
$^{1}H$ NMR ($CDCl_{3}$, 600 MHz)

$^{13}C$ NMR ($CDCl_{3}$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 500 MHz)

$^{13}$C NMR (CDCl$_3$, 126 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^{1}$H NMR (CDCl$_3$, 500 MHz)

$^{13}$C NMR (CDCl$_3$, 126 MHz)
$^1$H NMR (CDCl$_3$, 500 MHz)

$^{13}$C NMR (CDCl$_3$, 126 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)

560
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^{1}\text{H NMR (CDCl}_3, 600 \text{ MHz)}$

$^{13}\text{C NMR (CDCl}_3, 151 \text{ MHz)}$
$^1$H NMR (CDCl$_3$, 500 MHz)

$^{13}$C NMR (CDCl$_3$, 126 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^{1}H$ NMR (CDCl$_3$, 600 MHz)

$^{13}C$ NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 600 MHz)

$^{13}$C NMR (CDCl$_3$, 151 MHz)
$^1$H NMR (CDCl$_3$, 500 MHz)

$^{13}$C NMR (CDCl$_3$, 126 MHz)
$^1$H NMR (CDCl$_3$, 700 MHz)

$^{13}$C NMR (CDCl$_3$, 176 MHz)