Supporting Information
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A Dehydrogenative Homocoupling Reaction for the Direct Synthesis of Hydrazines from N-Alkylanilines in Air

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Supporting Information

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Part I  Optimization of Homocoupling Reaction Conditions

Table 1  Screening of Copper Catalysts and Ligands\textsuperscript{a}

<table>
<thead>
<tr>
<th>entry</th>
<th>catalysis</th>
<th>ligand</th>
<th>time (h)</th>
<th>yield [%]\textsuperscript{b}</th>
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<tbody>
<tr>
<td>1</td>
<td>CuBr</td>
<td>-</td>
<td>24</td>
<td>about 1%</td>
</tr>
<tr>
<td>2</td>
<td>CuCl\textsubscript{2}H\textsubscript{2}O</td>
<td>-</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>CuI</td>
<td>-</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Cu(OAc)\textsubscript{2}H\textsubscript{2}O</td>
<td>-</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>CuBr</td>
<td>TMEDA</td>
<td>24</td>
<td>49</td>
</tr>
<tr>
<td>6\textsuperscript{c}</td>
<td>CuBr</td>
<td>TMEDA</td>
<td>48</td>
<td>trace</td>
</tr>
<tr>
<td>7</td>
<td>CuBr</td>
<td>DMEDA</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>CuBr</td>
<td>DMAPA</td>
<td>48</td>
<td>25</td>
</tr>
<tr>
<td>9</td>
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<td>L-proline</td>
<td>48</td>
<td>0</td>
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<tr>
<td>11</td>
<td>CuBr</td>
<td>Salicylaldehyde</td>
<td>48</td>
<td>0</td>
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\textsuperscript{a} A mixture of 1a (1.0 mmol), copper catalyst (0.2 equiv), K\textsubscript{2}CO\textsubscript{3} (2.0equiv), ligand (2.0equiv), and 4 Å MS (0.1g) in DMF (2 mL) was stirred at 95°C for 24-48 h under air.

\textsuperscript{b} Isolated yield.

\textsuperscript{c} The reaction was carried out under N\textsubscript{2} (1 atm).

Table 2  Screening of Metal Oxides\textsuperscript{a}

<table>
<thead>
<tr>
<th>entry</th>
<th>copper catalysis</th>
<th>metal oxide</th>
<th>time (h)</th>
<th>yield [%]\textsuperscript{b}</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>CuBr</td>
<td>CuO</td>
<td>24</td>
<td>84</td>
</tr>
<tr>
<td>2</td>
<td>CuBr</td>
<td>SnO\textsubscript{2}</td>
<td>24</td>
<td>82</td>
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<tr>
<td>3</td>
<td>CuBr</td>
<td>SeO\textsubscript{2}</td>
<td>24</td>
<td>78</td>
</tr>
<tr>
<td>4</td>
<td>CuBr</td>
<td>Fe\textsubscript{2}O\textsubscript{3}</td>
<td>36</td>
<td>75</td>
</tr>
<tr>
<td>5</td>
<td>CuBr</td>
<td>MnO\textsubscript{2}</td>
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<tr>
<td>6</td>
<td>CuBr</td>
<td>MgO</td>
<td>48</td>
<td>50</td>
</tr>
</tbody>
</table>

\textsuperscript{a} A mixture of 1a (1.0 mmol), CuBr (0.2 equiv), K\textsubscript{2}CO\textsubscript{3} (2.0equiv), TMEDA (2.0equiv), and 4 Å MS (0.1g) in DMF (2 mL) was stirred at 95°C for 24-48 h under air.
4Å MS (0.1g) and metal oxide (0.2 equiv) in DMF (2.0mL) was stirred at 95°C for 24-48 h under air.

*b* Isolated yields.

**Table 3** Screening of Transition-metal Catalysts

<table>
<thead>
<tr>
<th>entry</th>
<th>metal catalyst</th>
<th>metal oxide</th>
<th>ligand</th>
<th>yield [%]</th>
</tr>
</thead>
<tbody>
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<td>CuO</td>
<td>TMEDA</td>
<td>84</td>
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<td>CuCl</td>
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<tr>
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<td>CuI</td>
<td>CuO</td>
<td>TMEDA</td>
<td>78</td>
</tr>
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<td>CuCl₂2H₂O</td>
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<td>TMEDA</td>
<td>81</td>
</tr>
<tr>
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<td>CuSO₄·5H₂O</td>
<td>CuO</td>
<td>TMEDA</td>
<td>80</td>
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<td>CuBr₂</td>
<td>CuO</td>
<td>TMEDA</td>
<td>58</td>
</tr>
<tr>
<td>7</td>
<td>Cu(OAc)₂·H₂O</td>
<td>CuO</td>
<td>TMEDA</td>
<td>32</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
<td>CuO</td>
<td>TMEDA</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>FeCl₃</td>
<td>CuO</td>
<td>TMEDA</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>Fe₂(acac)₃</td>
<td>CuO</td>
<td>TMEDA</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>Pd(OAc)₂</td>
<td>CuO</td>
<td>TMEDA</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>PdCl₂</td>
<td>CuO</td>
<td>TMEDA</td>
<td>0</td>
</tr>
</tbody>
</table>

*a* Amixture of 1a (1.0 mmol), K₂CO₃ (2.0 equiv), TMEDA (2.0 equiv), 4Å MS (0.1g) CuO (0.2 equiv) and transition-metal catalyst (0.2 equiv) in DMF (2.0mL) was stirred at 95°C for 24 h under air.

*b* Isolated yields.

**Table 4** Screening of Solvents

<table>
<thead>
<tr>
<th>entry</th>
<th>copper catalyst</th>
<th>solvent</th>
<th>time (h)</th>
<th>yield [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CuBr</td>
<td>CH₃CN</td>
<td>24</td>
<td>80</td>
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<tr>
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<td>CuBr</td>
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<td>3</td>
<td>CuBr</td>
<td>DMSO</td>
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<td>81</td>
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<tr>
<td>4</td>
<td>CuBr</td>
<td>THF</td>
<td>24</td>
<td>63</td>
</tr>
</tbody>
</table>
A mixture of 1a (1.0 mmol), CuBr (0.2 equiv), K$_2$CO$_3$ (2.0 equiv), TMEDA (2.0 equiv), 4Å MS (0.1g) and CuO (0.2 equiv) in different solvents (2.0mL) was stirred at 95°C for 24 h under air.

Isolated yields.

Part II  Dehydrogenative Homocoupling Reaction of N-Alkylanilines

General Information: $^1$H NMR and $^{13}$C NMR spectra were recorded on Bruker ARX-300 MHz spectrometer. ESI-MS spectra was measured on ThermoFisher Scientific LCQ FLEET mass spectrometer.

1. Homocoupling of N-Alkylanilines for Hydrazines 2

   General procedure: To a solution of N-alkylaniline 1 (0.107g, 1.0 mmol) in DMF (2 mL) were added CuBr (0.029g, 0.2 mmol), TMEDA (0.232g, 2.0 mmol), CuO (0.016g, 0.2 mmol), K$_2$CO$_3$ (0.276g, 2.0 equiv) and 4Å MS (0.1g) successively, and the reaction mixture was stirred at 70°C or 95°C for 12-24h in air. After the reaction was completed, the mixture was filtered, and the residue was washed with EtOAc (5mL×3). Then, the combined filtrates were concentrated in vacuum, and the residue was purified by column chromatography (silica gel, petroleum ether/ethyl acetate as eluent) to afford the desired hydrazine 2.

   1, 2-Dimethyl-1, 2-diphenylhydrazine 2a

   ![Image](image1)

   Yield: 84%. $^1$H NMR (CDCl$_3$) δ (ppm): 7.40-7.22 (m, 4 H), 7.00-6.80 (m, 6 H), 3.03 (s, 6 H); MS (ESI) m/z [M+H]$^+$ Calcd for C$_{14}$H$_{16}$N$_2$: 212.13, found: 213.17.

   1, 2-Diethyl-1, 2-diphenylhydrazine 2b

   ![Image](image2)

   Yield: 85%. $^1$H NMR (CDCl$_3$) δ (ppm): 7.28-7.20 (m, 4 H), 6.82-6.65 (m, 6 H), 3.56 (q, $J$ =7.2 Hz, 4 H), 1.30 (t, $J$ =7.2 Hz, 6 H); MS (ESI) m/z [M+H]$^+$ Calcd for C$_{16}$H$_{20}$N$_2$: 240.16, found: 241.25.
1, 2-Diphenyl-1, 2-dipropylhydrazine 2c
Yield: 82%. $^1$H NMR (CDCl$_3$) δ (ppm): 7.30-7.18 (m, 4 H), 6.82-6.65 (m, 6 H), 3.40 (t, J=7.8 Hz, 4 H), 1.85-1.62 (br., 4 H), 0.94 (t, J= 7.5 Hz, 6 H); MS (ESI) m/z [M+H]$^+$ Calcd for C$_{18}$H$_{24}$N$_2$: 268.19, found: 269.42.

1, 2-Dibutyl-1, 2-diphenylhydrazine 2d
Yield: 80%. $^1$H NMR (CDCl$_3$) δ (ppm): 7.30-7.20(m, 4 H), 6.85-6.70 (m, 6 H), 3.48 (t, J=7.8 Hz, 4 H), 1.95-1.60 (br. 4 H), 1.45-1.30 (m, 4  H), 0.98 (t, J = 7.5 Hz, 6 H); MS (ESI) m/z [M+H]$^+$ Calcd for C$_{20}$H$_{28}$N$_2$: 296.23, found: 297.33.

1, 2-Dimethyl-1, 2-di-p-tolylhydrazine 2e
Yield: 86%. $^1$H NMR (CDCl$_3$) δ (ppm): 7.07 (d, J = 9 Hz, 4 H), 6.77 (d, J = 9 Hz, 4 H), 2.94 (s, 6 H), 2.28 (s, 6 H); MS (ESI) m/z [M+H]$^+$ Calcd for C$_{16}$H$_{20}$N$_2$: 240.16, found: 241.25.

1, 2-Diethyl-1, 2-di-p-tolylhydrazine 2f
Yield: 88%. $^1$H NMR (CDCl$_3$) δ (ppm): 7.02 (d, J = 6 Hz, 4 H), 6.67(d, J = 6 Hz, 4 H), 3.50 (q, J=7.2 Hz, 4 H), 2.25(s, 6 H), 1.26 (t, J=7.2 Hz, 6 H ); $^{13}$C NMR (CDCl$_3$) δ(ppm): 146.51, 129.83, 126.90, 112.44, 44.83,20.36, 13.52. MS (ESI) m/z [M+H]$^+$ Calcd for C$_{18}$H$_{24}$N$_2$: 268.19, found: 269.33.

1, 2-Dipropyl-1, 2-di-p-tolylhydrazine 2g
Yield: 78%.$^1$H NMR (CDCl$_3$) δ (ppm): 7.04 (d, J = 9 Hz, 4 H), 6.67 (d, J= 9 Hz, 4 H), 3.38 (t, J=7.8 Hz, 4 H), 2.28 (s, 6 H), 1.90-1.65 (br., 4 H), 0.95 (t, J=7.5 Hz, 6 H); $^{13}$C NMR (CDCl$_3$) δ(ppm): 146.45, 129.83, 126.94, 112.55, 52.89, 21.48, 20.39, 11.72. MS (ESI) m/z [M+H]$^+$ Calcd for C$_{20}$H$_{28}$N$_2$: 296.23, found: 297.33.

1, 2-Dimethyl-1, 2-di-m-tolylhydrazine 2h
Yield: 77%. $^1$H NMR (CDCl$_3$) δ (ppm): 7.30-7.10 (m, 2 H), 6.70-6.60 (m, 6 H), 2.97(s, 6 H), 2.31 (s, 6 H); MS (ESI) m/z [M+H]$^+$ Calcd for C$_{16}$H$_{20}$N$_2$: 240.16, found: 241.3.

1, 2-Diethyl-1, 2-di-m-tolylhydrazine 2i

Yield: 82%. $^1$H NMR (CDCl$_3$) δ (ppm): 7.18-7.00 (m, 2 H), 6.62-6.50 (m, 6 H), 3.53 (q, $J$=7.2 Hz, 4 H) 2.29 (s, 6 H), 1.28 (t, $J$=7.2 Hz, 6 H); $^{13}$C NMR (CDCl$_3$) δ(ppm): 148.70, 139.08, 129.21, 118.85, 112.98, 109.73, 45.06, 22.07, 13.54; MS (ESI) m/z [M+H]$^+$ Calcd for C$_{18}$H$_{24}$N$_2$: 268.19, found: 269.33

1, 2-Bis (3-methoxyphenyl)-1,2-dimethylhydrazine 2j

Yield: 82%. $^1$H NMR (CDCl$_3$) δ (ppm): 7.22-7.15 (m, 2 H), 6.60-6.38 (m, 6H), 3.79 (s, 6 H), 2.99(s, 6 H); $^{13}$C NMR (CDCl$_3$) δ(ppm): 161.08, 150.54, 130.15, 105.60, 103.73, 99.09, 55.30, 34.12; MS (ESI) m/z [M+H]$^+$ Calcd for C$_{16}$H$_{20}$N$_2$O$_2$: 272.15, found: 273.33.

1, 2-Bis (4-chlorophenyl)-1, 2-dimethylhydrazine 2k

Yield: 72%. $^1$H NMR (CDCl$_3$) δ (ppm): 7.20 (d, $J$=9 Hz, 4 H), 6.74 (d, $J$= 9 Hz, 4 H), 2.95 (s, 6 H); MS (ESI) m/z [M+H]$^+$ Calcd for C$_{14}$H$_{14}$N$_2$Cl$_2$: 280.05, found: 281.33.

1, 2-Bis (4-bromophenyl)-1, 2-dimethylhydrazine 2l

Yield: 75%. $^1$H NMR (CDCl$_3$) δ (ppm): 7.30 (d, $J$= 9 Hz, 4H), 6.76 (d, $J$= 9 Hz, 4 H), 2.95 (s, 6 H); MS (ESI) m/z [M+H]$^+$ Calcd for C$_{14}$H$_{14}$N$_2$Br$_2$: 367.95, found: 371.08.
2. Synthesis of o-Semidines from N-Alkylanilines 4

General procedure: To a solution of N-alkylaniline 3 (0.107 g, 1.0 mmol) in DMF (2 mL) were added CuBr (0.029 g, 0.2 mmol), TMEDA (0.232 g, 2.0 mmol), CuO (0.016 g, 0.2 mmol), K$_2$CO$_3$ (0.276 g, 2.0 equiv) and 4 Å MS (0.1 g) successively, and the reaction mixture was stirred at r.t. for 6-12 h in air. After the reaction was completed, the mixture was filtered, and the residue was washed with EtOAc (5 mL x 3). Then, the combined filtrates were concentrated in vacuum, and the residue was purified by column chromatography (silica gel, petroleum ether/ethyl acetate as eluent) to afford o-semidines 4.

4-Methoxy-N$_2$-(4-methoxyphenyl)-N$_1$, N$_2$-dimethylbenzene-1, 2-diamine 4a

Yield: 86%. $^1$H NMR (CDCl$_3$) $\delta$ (ppm): 6.82-6.75 (m, 3 H), 6.75-6.68 (m, 1 H), 6.65-6.60 (m, 3 H), 3.75 (s, 3 H), 3.71 (s, 3 H), 3.13 (s, 3 H), 2.80 (s, 3 H); $^{13}$C NMR (CDCl$_3$) $\delta$ (ppm): 152.52, 151.86, 143.53, 140.70, 136.00, 115.60, 114.54, 113.53, 113.10, 112.27, 111.32, 55.77, 55.78, 55.65, 39.42, 31.22; MS (ESI) $m/z$ [M+H]$^+$ Calcd for C$_{16}$H$_{20}$N$_2$O$_2$: 272.15, found: 273.33.

N$_1$, N$_2$-Diethyl-4-methoxy-N$_2$-(4-methoxyphenyl)benzene-1, 2-diamine 4b

Yield: 87%. $^1$H NMR (CDCl$_3$) $\delta$ (ppm): 6.80-6.75 (m, 4 H), 6.66-6.60 (m, 3 H), 3.75 (s, 3 H), 3.72 (s, 3 H), 3.56 (q, $J$=6.9 Hz, 2 H), 3.13 (q, $J$=7.2 Hz, 2 H), 1.26-1.12 (m, 6 H); $^{13}$C NMR (CDCl$_3$) $\delta$ (ppm): 152.27, 151.91, 142.72, 140.57, 134.12, 115.64, 114.93, 114.76, 112.68, 112.51, 55.93, 55.84, 45.42, 39.26, 15.07, 12.89; MS (ESI) $m/z$ [M+H]$^+$ Calcd for C$_{18}$H$_{24}$N$_2$O$_2$: 300.18, found: 301.42.

4-Methoxy-N$_2$-(4-methoxyphenyl)-N$_1$, N$_2$-dipropylbenzene-1, 2-diamine 4c

Yield: 81%. $^1$H NMR (CDCl$_3$) $\delta$ (ppm): 6.78-6.75 (m, 3 H), 6.68-6.60 (m, 2 H), 6.62-6.58 (m, 2 H), 3.75 (s, 3 H), 3.72 (s, 3 H), 3.47-3.41 (m, 2 H), 3.06-3.01 (t, $J$=7.2 Hz, 2 H), 1.70-1.62 (m, 2
H); 1.58-1.50 (m, 2 H), 0.98-0.85 (m, 6 H); $^{13}$C NMR (CDCl$_3$) δ(ppm): 152.37, 151.87, 142.94, 140.26, 134.37, 115.80, 114.86, 114.78, 112.50, 112.42, 55.97, 55.88, 53.76, 46.61, 22.79, 21.02, 11.67, 11.62; MS (ESI) m/z [M+H]$^+$ Calcd for C$_{20}$H$_{28}$N$_2$O$_2$: 328.22, found: 329.42.

4-Ethoxy-$N_2$-(4-ethoxyphenyl)-$N_1$, $N_2$-dimethylbenzene-1, 2-diamine 4d

Yield: 83%. $^1$H NMR (CDCl$_3$) δ (ppm): 6.80-6.75 (m, 3 H), 6.68-6.60 (m, 4 H), 4.00-3.88 (m, 4 H), 3.12 (s, 3 H), 2.79 (s, 3 H), 1.40-1.32 (m, 6 H), $^{13}$C NMR (CDCl$_3$) δ(ppm): 151.81, 151.16, 143.55, 140.65, 136.10, 115.66, 115.35, 11.97, 113.10, 111.34, 64.11, 63.97, 39.46, 31.28, 15.02; MS (ESI) m/z [M+H]$^+$ Calcd for C$_{18}$H$_{24}$N$_2$O$_2$: 300.18, found: 301.25.

4-Ethoxy-$N_2$-(4-ethoxyphenyl)-$N_1$, $N_2$-diethylbenzene-1, 2-diamine 4e

Yield: 80%. $^1$H NMR (CDCl$_3$) δ (ppm): 6.80-6.75 (m, 3 H), 6.72-6.60 (m, 4 H), 4.02-3.90 (m, 4 H), 3.56 (q, J=7.2 Hz, 2 H), 3.14 (q, J=7.2 Hz, 2 H), 1.42-1.30 (m, 6 H), 1.23-1.14 (m, 6 H); $^{13}$C NMR (CDCl$_3$) δ(ppm): 151.50, 151.05, 142.73, 140.67, 134.04, 115.75, 115.61, 115.51, 113.48, 112.31, 64.17, 64.06, 45.33, 39.15, 15.10, 15.06, 12.85; MS (ESI) m/z [M+H]$^+$ Calcd for C$_{20}$H$_{28}$N$_2$O$_2$: 328.22, found: 329.42.

Reference


Part III  Spectra of $^1$H NMR, $^{13}$C NMR and MS

$^1$H NMR of 1, 2-Dimethyl-1, 2-diphenylhydrazine 2a
MS(ESI) of 1, 2-Dimethyl-1, 2-diphenylhydrazine 2a
H NMR of 1,2-Diethyl-1,2-diphenylhydrazine 2b

[Chemical structure image]

Relative Abundance

n/z

214.17 228.08 261.17 282.00 348.17 351.08 413.25 437.25 488.17

144.83 166.08 347.17 549.08 547.08 546.17 545.17 551.08

200 300 400 500 600 700 800 900 1000

n/z
MS(ESI) of 1, 2-Diethyl-1, 2-diphenylhydrazine 2b
H NMR of 1,2-Diphenyl-1,2-dipropyldiazine 2e
MS(ESI) of 1, 2-Diphenyl-1, 2-dipropylhydrazine 2c
H NMR of 1,2-Dimethyl-1,2-di-p-tolylhydrazine 2c
MS(ESI) of 1, 2-Dimethyl-1, 2-di-p-tolylhydrazine 2e
$^1$H NMR of 1, 2-Diethyl-1, 2-di-p-tolyldrazine $2f$
$^{13}$C NMR of 1, 2-Diethyl-1, 2-di-p-tolylhydrazine \(2f\)
MS(ESI) of 1, 2-Diethyl-1, 2-di-p-tolylhydrazine 2f
$^1$H NMR of 1, 2-Dipropyl-1, 2-di-p-tolylhydrazine 2g
$^{13}$C NMR of 1, 2-Dipropyl-1, 2-di-p-tolylhydrazine 2g
MS(ESI) of 1, 2-Dipropyl-1, 2-di-p-tolylhydrazine 2g

$^1$H NMR of 1, 2-Dimethyl-1, 2-di-m-tolylhydrazine 2h
MS(ESI) of 1, 2-Dimethyl-1, 2-di-m-tolylhydrazine 2h
H NMR of 1,2-Diethyl-1,2-di-m-tolylhydrazine 21
$^{13}$C NMR of 1, 2-Diethyl-1, 2-di-m-tolylhydrazine 2i
MS(ESI) of 1, 2-Diethyl-1, 2-di-m-tolylhydrazine 2i
H NMR of 1, 2-Bis (3-methoxyphenyl)-1, 2-dimethylhydrazine 2j
$^{13}$C NMR of 1, 2-Bis (3-methoxyphenyl)-1,2-dimethylhydrazine 2j
MS(ESI) of 1, 2-Bis (3-methoxyphenyl)-1,2-dimethylhydrazine 2j
$^{1}$$H$ NMR of 4-Methoxy-$N_{2}$-$\left(4$-methoxyphenyl)$N_{1}$-N$_{2}$-dimethylbenzene-1, 2-diamine 4a
$^{13}$C NMR of 4-Methoxy-$N_2$-(4-methoxyphenyl)-$N_2$-dimethylbenzene-1, 2-diamine 4a
$^1$H NMR of $N_1, N_2$-Diethyl-4-methoxy-$N_2$-(4-methoxyphenyl)benzene-1, 2-diamine 4b
$^{13}\text{C}$ NMR of $N_1, N_2$-Diethyl-4-methoxy-$N_2$-(4-methoxyphenyl)benzene-1, 2-diamine 4b
$^1$H NMR of 4-Methoxy-$N_2$-(4-methoxyphenyl)-$N_1$, $N_2$-dipropylbenzene-1, 2-diamine 4c
$^{13}$C NMR of 4-Methoxy-N$_2$-(4-methoxyphenyl)-N$_1$, N$_2$-dipropylbenzene-1, 2-diamine 4c
MS(ESI) of 4-Methoxy-N₂-(4-methoxyphenyl)-N₁, N₂-dipropylbenzene-1, 2-diamine 4c
H NMR of 4-Ethoxy-$N_2$-(4-ethoxyphenyl)-$N_1, N_2$-dimethylbenzene-1, 2-diamine 4d
$^{13}$C NMR of 4-Ethoxy-$N_2$-(4-ethoxyphenyl)-$N_i$,$N_2$-dimethylbenzene-1, 2-diamine 4d
\(^1\)H NMR of 4-Ethoxy-\(N_2\)-(4-ethoxyphenyl)-\(N_2\), \(N_2\)-diethylbenzene-1, 2-diamine 4e
$^{13}$C NMR of 4-Ethoxy-$N_2$-(4-ethoxyphenyl)-$N_1$, $N_2$-diethylbenzene-1, 2-diamine 4e
MS(ESI) of 4-Ethoxy-$N_2$-(4-ethoxyphenyl)-$N_2$, $N_2$-diethylbenzene-1, 2-diamine 4e