Supporting Information

Catalytic N-methyl Amidation of Carboxylic Acids under Cooperative Conditions

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**General Information:**

Proton nuclear magnetic resonance (\(^1\text{H NMR}\)) spectra and carbon nuclear magnetic resonance (\(^{13}\text{C NMR}\)) spectra were recorded on Bruker 400, 600 MHz spectrometer (400, 600 MHz and 100, 150 MHz). Chemical shifts (\(\delta\)) for protons are reported in parts per million downfield from tetramethylsilane and are referenced to residual protium in the NMR solvent (CDCl\(_3\): 7.26, DMSO: 2.50). Chemical shifts (\(\delta\)) for carbon are reported in parts per million downfield from tetramethylsilane and are referenced to the carbon resonances of the solvent (CDCl\(_3\): 77.0, DMSO: 39.51). Data are represented as follows: chemical shift, integration, multiplicity (br = broad, s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constants in Hertz (Hz). All high resolution mass spectra were obtained on a Waters G2-XSQTof mass spectrometer. Melting points were determined on a Tektronix X-4 melting point apparatus. Analytical TLC was performed using EM separations percolated silica gel 0.2 mm layer UV 254 fluorescent sheets.

**Starting Materials.** All solvents and inorganic reagents were from commercial sources and used without purification unless otherwise noted, Fe\(_3\)O\(_4\) powder was purchased from Shanghai Macklin Biochemical Co., Ltd and directly used for reaction.
General Procedure for Synthesis of 3:

A solution of 1 (1 mmol, 1 eq), 2 (1.1 eq), DABCO (11.2 mg, 0.1 mmol) and Fe₃O₄ (23.2 mg, 0.1 mmol) in 1 mL of MeCN for 48 hours at 85 °C until 1 was completely consumed (monitored by TLC). Upon completion, saturated aqueous NH₄Cl solution was added, and the mixture was extracted with EtOAc. The organic layers were combined, washed with brine, dried over anhydrous Na₂SO₄ and concentrated and purification by flash column chromatography on SiO₂ to give the final product.

The recovery of Fe₃O₄:

<table>
<thead>
<tr>
<th>cycles</th>
<th>additive</th>
<th>time (h)</th>
<th>catalyst</th>
<th>yield</th>
<th>TON</th>
<th>TOF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fe₃O₄</td>
<td>48</td>
<td>DABCO</td>
<td>97.7%</td>
<td>9.77</td>
<td>0.20</td>
</tr>
<tr>
<td>2</td>
<td>Fe₃O₄</td>
<td>48</td>
<td>DABCO</td>
<td>98.1%</td>
<td>9.81</td>
<td>0.20</td>
</tr>
<tr>
<td>3</td>
<td>Fe₃O₄</td>
<td>48</td>
<td>DABCO</td>
<td>97.2%</td>
<td>9.72</td>
<td>0.20</td>
</tr>
<tr>
<td>4</td>
<td>Fe₃O₄</td>
<td>48</td>
<td>DABCO</td>
<td>92.5%</td>
<td>9.25</td>
<td>0.19</td>
</tr>
<tr>
<td>5</td>
<td>Fe₃O₄</td>
<td>48</td>
<td>DABCO</td>
<td>88.6%</td>
<td>8.86</td>
<td>0.18</td>
</tr>
<tr>
<td>6</td>
<td>Fe₃O₄</td>
<td>48</td>
<td>DABCO</td>
<td>86.3%</td>
<td>8.63</td>
<td>0.18</td>
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<tr>
<td>7</td>
<td>Fe₃O₄</td>
<td>48</td>
<td>DABCO</td>
<td>88.8%</td>
<td>8.88</td>
<td>0.19</td>
</tr>
<tr>
<td>8</td>
<td>Fe₃O₄</td>
<td>48</td>
<td>DABCO</td>
<td>88.9%</td>
<td>8.89</td>
<td>0.19</td>
</tr>
<tr>
<td>9</td>
<td>Fe₃O₄</td>
<td>48</td>
<td>DABCO</td>
<td>89.2%</td>
<td>8.92</td>
<td>0.19</td>
</tr>
<tr>
<td>10</td>
<td>Fe₃O₄</td>
<td>48</td>
<td>DABCO</td>
<td>86.6%</td>
<td>8.66</td>
<td>0.18</td>
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</tbody>
</table>

* Reactions were run on 1 mmol 1a and 1.1 mmol 2a with 10 mol % DABCO and 10 mol % Fe₃O₄ in 1 mL of MeCN at 85 °C for 48 hours unless otherwise noted.
<table>
<thead>
<tr>
<th>entry</th>
<th>substrate</th>
<th>conditions</th>
<th>Yield for %</th>
<th>ref</th>
<th>comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Phenylacetic acid</td>
<td>Phenylacetic acid 55 mmol, toluene 25 mL, thionyl chloride (66 mmol, 1.2 equiv), DMF (63 mmol, 1.14 equiv), methylamine solution (275 mmol, 5.0 equiv)</td>
<td>96</td>
<td>5, 9</td>
<td>Additional SOCl₂, TsCl</td>
</tr>
<tr>
<td>2</td>
<td>benzotrichloride</td>
<td>[B12-TiO₂]=10 mg (B12, 2.28×10⁻⁵ m), [benzotrichloride]=3.0 mm, [amine]=90 mm, solvent=MeOH 6 mL under air at RT by UV light irradiation (black light, lmax=365 nm, 1.5 mW cm⁻² at 10 cm distance)</td>
<td>90</td>
<td>10</td>
<td>Generate HCl, UV irradiation</td>
</tr>
<tr>
<td>3</td>
<td>PhCN</td>
<td>nitrile (0.5 mmol), CoBr₂ (7.5 mol %), tris[2-(diphenylphosphino)ethyl]phosphine (PP₃) (7.5 mol %), Cs₂CO₃ (0.5 mmol), KOtBu (0.25 mmol) and water (5.0 mmol) in methanol/m-xylene (2.5 mL, 1:1 v/v)</td>
<td>89</td>
<td>11</td>
<td>Higher temperature</td>
</tr>
<tr>
<td>4</td>
<td>Benzaldehyde</td>
<td>1b (2 mmol), 2n (0.5 mmol), TBHP (7.5 equiv), 120 °C, 48 h.</td>
<td>71</td>
<td>12</td>
<td>External oxidant</td>
</tr>
<tr>
<td>5</td>
<td>Benzaldehyde</td>
<td>N-Methylformamide (3.0 mmol), KO'Bu (3.0 mmol), THF (2.0 mL). benzaldehyde (1.0 mmol), 50 °C</td>
<td>39</td>
<td>13</td>
<td>Low yield</td>
</tr>
<tr>
<td>6</td>
<td>Phenylacetonitrile</td>
<td>10 mg of Ru/C and 10 mL of THF, nitriles (1 mmol), amines (1 mmol). stirred at 25-180 oC for 15-30 h in open air.</td>
<td>91</td>
<td>14</td>
<td>HCN as byproduct</td>
</tr>
<tr>
<td>7</td>
<td>benzamide</td>
<td>1c (1.5 equiv), benzamide (0.2 mmol), CuL (5 mol%), and L1</td>
<td>90</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>Reaction</td>
<td>Conditions</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>------</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 (%)</td>
<td>8</td>
<td>Lignin model (0.125 mmol), copper acetate (0.0125 mmol), amine or ammonia (5 equiv), and DMSO (1 mL), at 25 °C, under air.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Aryl halides (0.5 mmol), carbamoysilane 2 (5, 6 or 7) (0.60 mmol), 0.01 mmol of [(Ph)3P]4Pd(0), 100 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>FeCl3·4H2O (9.9 mg, 0.05 mmol, 10 mol%), methylamine·HCl (67.8 mg, 0.5 mmol, 1 equiv.) and CaCO3 (50.1 mg, 0.5 mmol, 1 equiv.). 1 mL of CH3CN, benzyl alcohol (67 μL, 0.65 mmol, 1.3 equiv) and tertbutylhydroperoxide (70% in H2O, 140 μL, 2 equiv.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Benzoic acid</td>
<td>Benzoic acid (1 mmol, 122 mg) and amine (1 mmol, 0.09 mL) nano-MgO (5 mmol%), 70 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Benzoic acid</td>
<td>Carboxylic acid (3 mmol), urea (6 mmol), Mg(NO3)2·6H2O (10 mol%), octane (3 mL), 130 °C, 24 h.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Benzoic acid</td>
<td>Benzoic acid (1 mmol), heterogeneous catalyst (10 mg), 1 mL anhydrous toluene, amine (1.2 mmol), ultrasound 15–60 min at room temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Spectroscopic Data for Products:

N-methyl-2-phenylacetamide (3a):

White solid, 133 mg, 89% yield, mp 60–61 °C; $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 7.35 (t, $J$ = 7.4 Hz, 2H), 7.29 (t, $J$ = 7.4 Hz, 1H), 7.25 (d, $J$ = 7.1 Hz, 2H), 5.43 (s, 1H), 3.57 (s, 2H), 2.75 (d, $J$ = 4.9 Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 171.6, 134.9, 129.5, 129.0, 127.3, 43.7, 26.5; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_9$H$_{12}$NO 150.0919, found 150.0925.

2-(benzo[d][1,3]dioxol-5-yl)-N-methylacetamide (3b):

White solid, 170 mg, 88% yield, mp 131.4–132.3 °C; $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 6.78 (d, $J$ = 7.8 Hz, 1H), 6.73 (d, $J$ = 1.4 Hz, 1H), 6.69 (d, $J$ = 7.9 Hz, 1H), 5.96 (s, 2H), 5.45 (s, 1H), 3.47 (s, 2H), 2.76 (d, $J$ = 4.9 Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 171.7, 148.1, 146.9, 128.4, 122.7, 109.8, 108.7, 101.1, 43.3, 26.5; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_{10}$H$_{12}$NO$_3$ 194.0817, found 194.0822.

2-(4-chlorophenyl)-N-methylacetamide (3c):

White solid, 137 mg, 84% yield, mp 113–114 °C; $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 7.33–7.30 (m, 2H), 7.20 – 7.18 (m, 2H), 5.45 (s, 1H), 3.52 (s, 2H), 2.76 (d, $J$ = 4.9 Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 171.0, 133.4, 133.3, 130.8, 129.1, 43.0, 26.6; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_9$H$_{11}$ClNO 184.0529, found 184.0534.
2-(3-bromophenyl)-N-methylacetamide (3d):

![Chemical Structure](attachment:3d.png)

white solid, 181.6 mg, 80% yield, mp 102–104 °C; $^1$H NMR (600 MHz, CDCl$_3$) δ 7.42 (dd, $J = 6.6$, 1.5 Hz, 2H), 7.21 (qd, $J = 7.7$, 1.5 Hz, 2H), 5.46 (s, 1H), 3.52 (s, 2H), 2.78 (d, $J = 4.9$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) δ 170.7, 137.1, 132.4, 130.5, 128.1, 122.9, 43.2, 26.6; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_9$H$_{11}$BrNO 228.0024, found 228.0030.

2-(3-methoxyphenyl)-N-methylacetamide (3e):

![Chemical Structure](attachment:3e.png)

white solid, 161 mg, 90% yield, mp 120–121 °C; $^1$H NMR (600 MHz, CDCl$_3$) δ 7.27 (t, $J = 7.9$ Hz, 1H), 6.84 (dd, $J = 6.9$, 4.2 Hz, 2H), 6.80 (d, $J = 1.6$ Hz, 1H), 5.46 (s, 1H), 3.81 (s, 3H), 3.55 (s, 2H), 2.76 (d, $J = 4.9$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) δ 171.4, 160.0, 136.4, 130.1, 121.8, 115.1, 112.8, 55.2, 43.8, 26.5; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_{10}$H$_{14}$NO$_2$ 180.1025, found 180.1028.

2-(4-bromophenyl)-N-methylacetamide (3f):

![Chemical Structure](attachment:3f.png)

white solid, 182 mg, 80% yield, mp 118–120 °C; $^1$H NMR (600 MHz, CDCl$_3$) δ 7.47 (d, $J = 8.3$ Hz, 2H), 7.13 (d, $J = 8.2$ Hz, 2H), 5.44 (s, 1H), 3.50 (s, 2H), 2.76 (d, $J = 4.9$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) δ 170.9, 133.9, 132.1, 131.1, 121.4, 42.9, 26.5; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_9$H$_{11}$BrNO 228.0024, found 228.0035.
2-(2,5-dimethylphenyl)-N-methylacetamide (3g):

![Chemical Structure]

white solid, 171 mg, 96% yield, mp 86–88 °C; $^1$H NMR (600 MHz, CDCl$_3$) δ 7.09 (d, $J = 7.7$ Hz, 1H), 7.03 (d, $J = 7.7$ Hz, 1H), 6.98 (s, 1H), 5.31 (s, 1H), 3.55 (s, 2H), 2.74 (d, $J = 4.9$ Hz, 3H), 2.31 (s, 3H), 2.23 (s, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) δ 171.6, 136.2, 134.1, 133.2, 131.4, 130.7, 128.5, 41.7, 26.5, 20.9, 19.0; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_{11}$H$_{16}$NO 178.1232, found 178.1239.

2-(3,5-dimethoxyphenyl)-N-methylacetamide (3h):

![Chemical Structure]

white solid, 184 mg, 88% yield, mp 85–87 °C; $^1$H NMR (600 MHz, CDCl$_3$) δ 6.83 (d, $J = 7.9$ Hz, 1H), 6.78 – 6.75 (m, 2H), 5.47 (s, 1H), 3.86 (s, 8H), 3.50 (s, 2H), 2.74 (d, $J = 4.9$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) δ 172.0, 149.3, 148.4, 127.4, 121.7, 112.6, 111.6, 55.9, 55.9, 43.3, 26.5; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_{11}$H$_{16}$NO$_3$ 210.1130, found 210.1138.

2-(2-hydroxyphenyl)-N-methylacetamide(3i):

![Chemical Structure]

white solid, 117 mg, 71% yield, mp 104–105 °C; $^1$H NMR (600 MHz, CDCl$_3$) δ 9.88 (s, 1H), 7.18 – 7.14 (m, 1H), 7.02 (dd, $J = 7.4$, 1.1 Hz, 1H), 6.96 (d, $J = 8.0$ Hz, 1H), 6.84 – 6.80 (m, 1H), 6.57 (s, 1H), 3.57 (s, 2H), 2.78 (d, $J = 4.9$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) δ 174.2, 155.9, 130.7, 129.2, 121.6, 120.4, 117.6, 40.5, 26.7; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_9$H$_{12}$NO$_2$ 166.0868, found 166.0868.
2-(3-hydroxy-4-methoxyphenyl)-N-methylacetamide (3j):

brown oil, 168 mg, 86% yield; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 6.78 (t, \(J = 4.9\) Hz, 2H), 6.67 (dd, \(J = 8.2, 2.0\) Hz, 1H), 6.62 (s, 1H), 5.79 (s, 1H), 3.83 (s, 3H), 3.43 (s, 2H), 2.71 (d, \(J = 4.9\) Hz, 3H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 171.5, 145.3, 145.2, 126.7, 120.0, 115.0, 110.3, 54.9, 41.9, 25.5; HRMS (ESI-TOF) m/z \([M + H]^+\) calcd for C\(_{16}\)H\(_{14}\)NO\(_3\) 196.0974, found 196.0976.

N-methyl-2-(naphthalen-1-yl)acetamide (3k):

white solid, 159 mg, 80% yield, mp 123–124 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.95 (d, \(J = 8.2\) Hz, 1H), 7.92 – 7.86 (m, 1H), 7.83 (d, \(J = 8.2\) Hz, 1H), 7.58 – 7.49 (m, 2H), 7.48 – 7.42 (m, 1H), 7.39 (d, \(J = 6.8\) Hz, 1H), 5.32 (s, 1H), 4.02 (s, 2H), 2.66 (d, \(J = 4.9\) Hz, 3H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 171.4, 133.9, 132.0, 131.1, 128.8, 128.5, 128.4, 126.8, 126.2, 125.6, 123.8, 41.6, 26.4; HRMS (ESI-TOF) m/z \([M + H]^+\) calcd for C\(_{13}\)H\(_{14}\)NO 200.1075, found 200.1087.

N-methyl-2-(naphthalen-2-yl)acetamide (3l):

white solid, 163 mg, 82% yield, mp 117–120 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.88 – 7.78 (m, 3H), 7.70 (s, 1H), 7.53 – 7.45 (m, 2H), 7.36 (dd, \(J = 8.4, 1.7\) Hz, 1H), 5.48 (s, 1H), 3.73 (s, 2H), 2.74 (d, \(J = 4.9\) Hz, 3H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 171.6, 133.5, 132.5, 132.4, 128.8, 128.3, 127.7, 127.6, 127.4, 126.5, 126.1, 43.8, 26.5; HRMS (ESI-TOF) m/z \([M + H]^+\) calcd for C\(_{13}\)H\(_{14}\)NO\(_2\) 200.1075, found 200.1084.
N-methyl-3-phenylpropanamide (3m):

\[
\text{NHMe}
\]

white solid, 156 mg, 96% yield, mp 55–57 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.30 – 7.25 (m, 2H), 7.20 (dd, \(J = 10.2, 4.5\) Hz, 3H), 5.49 (s, 1H), 2.98 – 2.94 (m, 2H), 2.76 (d, \(J = 4.8\) Hz, 3H), 2.49 – 2.43 (m, 2H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 172.7, 140.9, 128.5, 128.3, 126.2, 38.4, 31.7, 26.2; HRMS (ESI-TOF) \(m/z\) [M + H]\(^+\) calcd for C\(_{10}\)H\(_{14}\)NO 164.1075, found 164.1087.

(E)-N-methyl-3-(3,4,5-trimethoxyphenyl)acrylamide(3n):

\[
\text{O} \quad \text{O} \quad \text{O} \quad \text{NHMe}
\]

white solid, 191 mg, 76% yield, mp 136–138 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.52 (d, \(J = 15.5\) Hz, 1H), 6.71 (s, 2H), 6.31 (d, \(J = 15.5\) Hz, 1H), 5.78 (s, 1H), 3.86 (d, \(J = 1.2\) Hz, 9H), 2.94 (d, \(J = 4.9\) Hz, 3H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 166.5, 153.4, 140.7, 139.5, 130.4, 119.9, 104.9, 60.9, 56.1, 26.5; HRMS (ESI-TOF) \(m/z\) [M + H]\(^+\) calcd for C\(_{13}\)H\(_{18}\)NO\(_4\) 252.1236, found 252.1239.

N-methylpent-4-enamide(3o):

\[
\text{NHMe}
\]

blandtaste, 79 mg, 70% yield; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 6.58 (s, 1H), 5.73 (tdd, \(J = 16.8, 8.7, 4.0\) Hz, 1H), 4.96 (d, \(J = 17.1\) Hz, 1H), 4.90 (dd, \(J = 10.2, 0.7\) Hz, 1H), 2.69 (d, \(J = 4.8\) Hz, 3H), 2.29 (dd, \(J = 14.1, 6.7\) Hz, 2H), 2.20 (t, \(J = 7.6\) Hz, 2H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 172.5, 136.1, 114.4, 34.6, 28.7, 25.2; HRMS (ESI-TOF) \(m/z\) [M + H]\(^+\) calcd for C\(_{10}\)H\(_{12}\)NO 114.0919, found 114.0932.
N-methylpent-4-ynamide(3p):

white solid, 97 mg, 87% yield, mp 56–57 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 6.14 (s, 1H), 2.78 (d, \(J = 4.8\) Hz, 3H), 2.49 (td, \(J = 7.2, 2.6\) Hz, 2H), 2.37 (t, \(J = 7.2\) Hz, 2H), 1.97 (t, \(J = 2.5\) Hz, 1H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 170.8, 82.02, 68.2, 34.2, 25.3, 13.9; HRMS (ESI-TOF) \(m/z\) [M + H]\(^+\) calcd for C\(_6\)H\(_{10}\)NO 112.0762, found 112.0762.

N-methyl-2-phenylpropanamide(3q):

white solid, 155 mg, 95% yield, mp:121-123 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.36 – 7.32 (m, 2H), 7.29 (dd, \(J = 5.7, 3.7\) Hz, 2H), 7.26 (ddd, \(J = 5.4, 3.4, 1.6\) Hz, 1H), 5.41 (s, 1H), 3.55 (q, \(J = 7.2\) Hz, 1H), 2.73 (d, \(J = 4.9\) Hz, 3H), 1.52 (d, \(J = 7.2\) Hz, 3H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 174.8, 141.4, 128.9, 127.7, 127.2, 47.0, 26.5, 18.5; HRMS (ESI-TOF) \(m/z\) [M + H]\(^+\) calcd for C\(_{10}\)H\(_{13}\)NO 164.1075, found 164.1077.

2-(2,4-dichlorophenoxy)-N-methylpropanamide(3r):

white solid, 217 mg, 88% yield, mp 121–124 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.40 (d, \(J = 2.5\) Hz, 1H), 7.19 (dd, \(J = 8.8, 2.5\) Hz, 1H), 6.83 (d, \(J = 8.8\) Hz, 1H), 6.67 (s, 1H), 4.68 (q, \(J = 6.7\) Hz, 1H), 2.87 (d, \(J = 5.0\) Hz, 3H), 1.60 (d, \(J = 6.7\) Hz, 3H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 171.6, 151.3, 130.3, 128.0, 127.3, 124.4, 115.9, 76.6, 25.9, 18.4; HRMS (ESI-TOF) \(m/z\) [M + H]\(^+\) calcd for C\(_{10}\)H\(_{12}\)Cl\(_2\)NO\(_2\) 248.0245, found 248.0251.
2-(1-(4-chlorobenzoyl)-5-methoxy-2-methyl-1H-indol-3-yl)-N-methylacetamide(3s):

white solid, 333 mg, 90% yield, mp 168–170 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.66 (d, \(J = 8.6\) Hz, 2H), 7.51 – 7.46 (m, 2H), 6.88 (d, \(J = 2.5\) Hz, 1H), 6.85 (d, \(J = 9.0\) Hz, 1H), 6.69 (dd, \(J = 9.0, 2.5\) Hz, 1H), 5.60 (d, \(J = 3.7\) Hz, 1H), 3.82 (s, 3H), 3.64 (s, 2H), 2.75 (d, \(J = 4.9\) Hz, 3H), 2.38 (s, 3H); \(^1^3\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 170.5, 168.3, 156.3, 139.6, 136.4, 133.5, 131.2, 130.9, 130.3, 120.3, 119.6, 112.8, 112.3, 110.8, 55.7, 32.0, 26.5, 13.2; HRMS (ESI-TOF) \(m/z\) [M + H]\(^+\) caledd for C\(_{20}\)H\(_{20}\)ClN\(_2\)O\(_3\) 371.1162, found 371.1163.

2-(3-benzoylphenyl)-N-methylpropanamide(3t):

white solid, 254 mg, 95% yield, mp 94–96 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.82 – 7.76 (m, 2H), 7.74 (t, \(J = 1.6\) Hz, 1H), 7.67 – 7.63 (m, 1H), 7.63 – 7.57 (m, 2H), 7.52 – 7.42 (m, 3H), 5.56 (s, 1H), 3.61 (q, \(J = 7.1\) Hz, 1H), 2.75 (d, \(J = 4.8\) Hz, 3H), 1.54 (d, \(J = 7.2\) Hz, 3H); \(^1^3\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 196.5, 174.1, 141.9, 138.0, 137.4, 132.6, 131.6, 130.0, 129.1, 128.7, 128.3, 46.9, 26.5, 18.6; HRMS (ESI-TOF) \(m/z\) [M + H]\(^+\) caledd for C\(_{17}\)H\(_{18}\)NO\(_2\) 268.1338, found 268.1339.
2-(6-methoxynaphthalen-2-yl)-N-methylpropanamide (3u):

![Structure](image)

white solid, 214 mg, 88% yield, mp 133–135 °C; $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 7.71 (t, $J = 8.9$ Hz, 2H), 7.66 (s, 1H), 7.37 (dd, $J = 8.4$, 1.8 Hz, 1H), 7.18 – 7.07 (m, 2H), 5.40 (s, 1H), 3.92 (s, 3H), 3.69 (q, $J = 7.2$ Hz, 1H), 2.72 (d, $J = 4.9$ Hz, 3H), 1.60 (d, $J = 7.2$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 174.9, 157.7, 136.4, 133.7, 129.2, 128.9, 127.5, 126.4, 126.2, 119.2, 105.6, 55.3, 47.0, 26.5, 18.4; HRMS (ESI-TOF) m/z [M + H]$^+$ calcd for C$_{15}$H$_{18}$NO$_3$ 244.1338, found 244.1339.

N-benzyl-2-phenylacetamide (3v):

![Structure](image)

white solid, 185 mg, 82% yield, mp 118–119 °C; $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 7.36 (t, $J = 7.1$ Hz, 2H), 7.33 – 7.27 (m, 5H), 7.19 (d, $J = 7.6$ Hz, 2H), 5.75 (s, 1H), 4.42 (d, $J = 5.7$ Hz, 2H), 3.64 (s, 2H); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 170.8, 138.1, 134.8, 129.4, 129.0, 128.6, 127.5, 127.4, 127.4, 43.8, 43.6. HRMS (ESI-TOF) m/z [M + H]$^+$ calcd for C$_{15}$H$_{16}$NO 226.1232, found 226.1241.

2-(benzo[d][1,3]dioxol-5-yl)-N-(1-phenylethyl)acetamide (3w):

![Structure](image)

white solid, 226 mg 80% yield, mp: 95-96 °C; $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 7.31 (t, $J = 7.5$ Hz, 2H), 7.26 – 7.22 (m, 1H), 7.22 – 7.18 (m, 2H), 6.78 (d, $J = 7.9$ Hz, 1H), 6.74 (d, $J = 1.6$ Hz, 1H), 6.69 (dd, $J = 7.9$, 1.7 Hz, 1H), 5.96 (s, 2H), 5.69 (d, $J = 6.7$ Hz, 1H), 5.12 (p, $J = 7.0$ Hz, 1H), 3.53 – 3.43 (m, 2H), 1.41 (d, $J = 6.9$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 170.1, 148.1, 146.9, 143.0, 128.6, 128.4, 127.3, 126.0, 122.5, 109.7, 108.6, 101.1, 48.7, 43.4, 21.7; HRMS (ESI-TOF) m/z [M + H]$^+$ calcd for C$_{17}$H$_{15}$NO$_3$ 284.1287, found 284.1285.
N-(4-chlorophenyl)-2-phenylacetamide (3x):

\[
\text{Ph} - \text{O} - \text{N} - \text{Cl}
\]

White solid, 198 mg, 81% yield, mp 158–160 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.31 (ddd, \(J = 20.6, 16.2, 7.5\) Hz, 6H), 7.18 (dd, \(J = 8.3, 7.4\) Hz, 3H), 3.86 – 3.53 (m, 2H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 169.1, 136.2, 134.2, 129.5, 129.4, 129.3, 128.9, 127.8, 121.1, 44.7; HRMS (ESI-TOF) \(m/z\) [M + H]\(^+\) calcd for C\(_{14}\)H\(_{13}\)ClNO 246.0686, found 246.0695.

2-phenyl-N-(p-tolyl)acetamide (3y):

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

White solid, 187 mg, 83% yield, mp 122–123 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.42 – 7.37 (m, 2H), 7.33 (dd, \(J = 7.1, 3.6\) Hz, 3H), 7.29 (d, \(J = 8.4\) Hz, 2H), 7.11 (s, 1H), 7.08 (d, \(J = 8.3\) Hz, 2H), 3.72 (s, 2H), 2.29 (s, 3H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 169.0, 135.0, 134.5, 134.1, 129.5, 129.4, 129.2, 127.6, 119.9, 44.8, 20.8; HRMS (ESI-TOF) \(m/z\) [M + H]\(^+\) calcd for C\(_{15}\)H\(_{16}\)NO 226.1232, found 226.1241.

N-methylbenzamide (3aa):

\[
\text{O} - \text{N} - \text{Me}
\]

White solid, 115 mg, 85% yield, mp 73–74 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.79 – 7.74 (m, 2H), 7.49 (t, \(J = 7.4\) Hz, 1H), 7.42 (dd, \(J = 10.4, 4.7\) Hz, 2H), 6.16 (s, 1H), 3.02 (d, \(J = 4.9\) Hz, 3H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 168.2, 134.7, 131.4, 128.6, 126.8, 26.9; HRMS (ESI-TOF) \(m/z\) [M + H]\(^+\) calcd for C\(_8\)H\(_{10}\)NO 136.0762, found 136.0761.
4-bromo-N-methylbenzamide (3ab):

\[
\begin{align*}
\text{O} & \quad \text{Br} \\
\text{NHMe} & \quad \text{O}
\end{align*}
\]

white solid, 170 mg, 80% yield, mp 157–159 °C; \( ^1H \text{NMR} \) (600 MHz, CDCl\(_3\)) \( \delta \) 7.62 (d, \( J = 8.6 \text{ Hz}, 2H \)), 7.55 (d, \( J = 8.6 \text{ Hz}, 2H \)), 6.25 (s, 1H), 2.99 (d, \( J = 4.9 \text{ Hz}, 3H \)); \( ^{13}\text{C NMR} \) (150 MHz, CDCl\(_3\)) \( \delta \) 167.3, 133.4, 131.8, 128.5, 126.0, 26.9; HRMS (ESI-TOF) \( m/z \ [M + H]^+ \) calcd for C\(_8\)H\(_9\)BrNO 213.9868, found 213.9879.

4-fluoro-N-methylbenzamide (3ac):

\[
\begin{align*}
\text{O} & \quad \text{F} \\
\text{NHMe} & \quad \text{O}
\end{align*}
\]

white solid, 122 mg, 80% yield, mp 111–113 °C; \( ^1H \text{NMR} \) (600 MHz, CDCl\(_3\)) \( \delta \) 7.87 – 7.71 (m, 2H), 7.13 – 7.04 (m, 2H), 6.33 (s, 1H), 2.99 (d, \( J = 4.8 \text{ Hz}, 3H \)); \( ^{13}\text{C NMR} \) (150 MHz, CDCl\(_3\)) \( \delta \) 167.3, 165.4, 130.7 (d, \( J = 3.1 \text{ Hz} \)), 129. (d, \( J = 8.8 \text{ Hz} \)), 115.5 (d, \( J = 21.8 \text{ Hz} \)), 26.9; HRMS (ESI-TOF) \( m/z \ [M + H]^+ \) calcd for C\(_8\)H\(_9\)FNO 154.0668, found 154.0678.

N,4-dimethylbenzamide (3ad):

\[
\begin{align*}
\text{O} & \quad \text{Me} \\
\text{NHMe} & \quad \text{O}
\end{align*}
\]

white solid, 127 mg, 85% yield, mp 136–138 °C; \( ^1H \text{NMR} \) (600 MHz, CDCl\(_3\)) \( \delta \) 7.66 (d, \( J = 8.1 \text{ Hz}, 2H \)), 7.20 (d, \( J = 8.3 \text{ Hz}, 2H \)), 6.31 (s, 1H), 2.98 (d, \( J = 4.8 \text{ Hz}, 3H \)), 2.37 (s, 3H); \( ^{13}\text{C NMR} \) (150 MHz, CDCl\(_3\)) \( \delta \) 168.2, 141.6, 131.7, 129.1, 126.8, 26.7, 21.4; HRMS (ESI-TOF) \( m/z \ [M + H]^+ \) calcd for C\(_9\)H\(_{12}\)NO 150.0919, found 150.0930.
4-methoxy-N-methylbenzamide (3ae):

\[
\text{NHMe} \\
\text{MeO} \\
\text{Me} \\
\text{O} \\
\text{Me} \\
\text{O}
\]

white solid, 142 mg, 86% yield, mp 114–116 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.73 (d, \(J = 8.9\) Hz, 2H), 6.90 (d, \(J = 8.9\) Hz, 2H), 6.24 (s, 1H), 3.84 (s, 3H), 2.99 (d, \(J = 4.8\) Hz, 3H); \(^1\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 167.8, 162.0, 128.6, 126.9, 113.7, 55.3, 26.7; HRMS (ESI-TOF) \(m/z\) [M + H]^+ calcd for C\(_9\)H\(_{12}\)NO\(_2\) 166.0868, found 166.0882.

N-methyl-4-nitrobenzamide (3af):

\[
\text{NHMe} \\
\text{O}_2\text{N} \\
\text{Me}
\]

white solid, 144 mg, 80% yield, mp 225–227 °C; \(^1\)H NMR (600 MHz, DMSO) \(\delta\) 8.76 (d, \(J = 3.6\) Hz, 1H), 8.34 – 8.25 (m, 2H), 8.11 – 7.99 (m, 2H), 2.81 (d, \(J = 4.6\) Hz, 3H); \(^1\)C NMR (150 MHz, DMSO) \(\delta\) 165.0, 148.9, 140.1, 128.6, 123.5, 26.4; HRMS (ESI-TOF) \(m/z\) [M + H]^+ calcd for C\(_8\)H\(_9\)N\(_2\)O\(_3\) 181.0613, found 181.0624.

N-methyl-4-(methylsulfonyl)benzamide (3ag):

\[
\text{NHMe} \\
\text{Me} \\
\text{OSO}\]

white solid, 160 mg, 75% yield, mp 196–198 °C; \(^1\)H NMR (600 MHz, DMSO) \(\delta\) 8.70 (d, \(J = 4.3\) Hz, 1H), 8.07 – 7.98 (m, 4H), 3.26 (s, 3H), 2.81 (d, \(J = 4.6\) Hz, 3H); \(^1\)C NMR (150 MHz, DMSO) \(\delta\) 165.4, 142.8, 139.0, 128.1, 127.1, 43.3, 26.4; HRMS (ESI-TOF) \(m/z\) [M + H]^+ calcd for C\(_9\)H\(_{12}\)NO\(_3\)S 214.0538, found 214.0545.
N-methyl-3,5-dinitrobenzamide (3ah):

white solid, 135 mg, 60% yield, mp 147−150 °C; $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 9.15 (t, $J = 2.1$ Hz, 1H), 8.97 (d, $J = 2.0$ Hz, 2H), 6.72 (s, 1H), 3.11 (d, $J = 4.8$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 163.4, 148.6, 137.9, 127.1, 121.0, 27.3; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_8$H$_8$N$_3$O$_5$ 226.0464, found 226.0472.

4-cyano-N-methylbenzamide (3ai):

white solid, 112 mg, 70% yield, mp 205−206 °C; $^1$H NMR (600 MHz, DMSO) $\delta$ 8.70 (s, 1H), 8.03 – 7.88 (m, 4H), 2.80 (d, $J = 4.6$ Hz, 3H); $^{13}$C NMR (150 MHz, DMSO) $\delta$ 165.6, 138.9, 132.9, 128.4, 118.8, 113.9, 26.8; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_9$H$_9$N$_2$O 161.0715, found 161.0717.

4-bromo-2-fluoro-N-methylbenzamide: (3aj):

white solid, 207 mg, 95% yield, mp 112–113 °C; $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 7.99 (t, $J = 8.5$ Hz, 1H), 7.41 (dd, $J = 8.4, 1.7$ Hz, 1H), 7.31 (dd, $J = 11.3, 1.8$ Hz, 1H), 6.67 (s, 1H), 3.02 (d, $J = 4.8$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 163.0 (d, $J = 3.2$ Hz), 160.1 (d, $J = 250.9$ Hz), 133.21 (d, $J = 2.6$ Hz), 128.3 (d, $J = 3.2$ Hz), 126.2 (d, $J = 10.5$ Hz), 120.0 (d, $J = 11.9$ Hz), 119.5 (d, $J = 28.3$ Hz).26.9; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_8$H$_8$BrFNO 231.9773, found 231.9773.
3-methyl-2-thioxo-2H-benzo[e][1,3]thiazin-4(3H)-one (3ak):

\[
\text{white solid, 207 mg, 99% yield, mp 142–143 °C; } ^1\text{H NMR (600 MHz, CDCl}_3\text{) } \delta 8.33 (dd, } J = 8.1, 0.9 \text{ Hz, 1H), 7.63 – 7.59 (m, 1H), 7.44 (t, } J = 7.7 \text{ Hz, 1H), 7.18 (d, } J = 8.0 \text{ Hz, 1H), 3.92 (s, 3H); } ^{13}\text{C NMR (150 MHz, CDCl}_3\text{) } \delta 192.4, 160.5, 136.3, 134.0, 131.8, 127.9, 122.9, 121.8, 35.0; \text{ HRMS (ESI-TOF) } m/z \ [M + H]^+ \text{ calcd for } C_9H_8NOS}_2 210.0047, \text{ found 210.0038.}
\]

2-bromo-N,4-dimethylbenzamide (3al):

\[
\text{white solid, 175 mg, 77% yield, mp 95.6–98 °C; } ^1\text{H NMR (600 MHz, CDCl}_3\text{) } \delta 7.44 (d, } J = 7.8 \text{ Hz, 1H), 7.42 – 7.38 (m, 1H), 7.13 (dd, } J = 7.8, 0.7 \text{ Hz, 1H), 6.07 (s, 1H), 3.00 (d, } J = 4.9 \text{ Hz, 3H), 2.33 (s, 3H); } ^{13}\text{C NMR (150 MHz, CDCl}_3\text{) } \delta 168.2, 141.9, 134.7, 133.8, 129.7, 128.3, 119.0, 26.7, 20.9. \text{ HRMS (ESI-TOF) } m/z \ [M + H]^+ \text{ calcd for } C_{9}H_{11}BrNO 228.0024, \text{ found 228.0035.}
\]

2-bromo-5-fluoro-N-methylbenzamide (3am):

\[
\text{white solid, 193 mg, 84% yield, mp 132–134 °C; } ^1\text{H NMR (600 MHz, CDCl}_3\text{) } \delta 7.49 (dt, } J = 16.4, 5.2 \text{ Hz, 2H), 7.30 – 7.18 (m, 1H), 6.05 (s, 1H), 3.00 (dt, } J = 7.9, 4.9 \text{ Hz, 3H); } ^{13}\text{C NMR (150 MHz, CDCl}_3\text{) } \delta 166.9, 139.1, 134.5, 133.9, 131.3, 129.7, 117.2, 26.8; \text{ HRMS (ESI-TOF) } m/z \ [M + H]^+ \text{ calcd for } C_{9}H_{8}BrFNO 231.9773, \text{ found 231.9769.}
\]
2-bromo-N,3-dimethylbenzamide (3an):

white solid, 193 mg, 85% yield, mp 115−117 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.33−7.31 (m, 1H), 7.29 (dt, \(J = 9.1, 4.7\) Hz, 2H), 5.93 (s, 1H), 3.06 (d, \(J = 4.9\) Hz, 3H), 2.49 (s, 3H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 169.3, 139.2, 139.2, 131.8, 127.2, 126.3, 121.6, 26.7, 23.6; HRMS (ESI-TOF)\( m/z \) [M + H]\(^+\) calcd for C\(_9\)H\(_{11}\)BrNO 228.0024, found 228.0033.

N-methylthiophene-2-carboxamide (3ao):

white solid, 120 mg, 85% yield, mp 98−100 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.50 (dd, \(J = 3.7, 0.9\) Hz, 1H), 7.44 (dd, \(J = 5.0, 1.0\) Hz, 1H), 7.06 (dd, \(J = 4.9, 3.7\) Hz, 1H), 6.16 (s, 1H), 2.99 (d, \(J = 4.9\) Hz, 3H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 162.6, 138.9, 129.7, 127.9, 127.6, 26.7; HRMS (ESI-TOF)\( m/z \) [M + H]\(^+\) calcd for C\(_6\)H\(_8\)NOS 142.0327, found 142.0339.

N,5-dimethyloxazole-4-carboxamide (3ap):

white solid, 127 mg, 91% yield, mp 104−105 °C; \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.64 (s, 1H), 6.94 (s, 1H), 2.92 (d, \(J = 5.1\) Hz, 3H), 2.63 (s, 3H); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \(\delta\) 162.3, 152.9, 147.8, 128.8, 25.5, 11.4; HRMS (ESI-TOF)\( m/z \) [M + H]\(^+\) calcd for C\(_6\)H\(_9\)N\(_2\)O\(_2\) 141.0664, found 141.0664.
N-methylisonicotinamide (3aq):

white solid, 123 mg, 90% yield, mp 107−108 °C; $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 8.69 (d, $J = 5.4$ Hz, 2H), 7.60 (d, $J = 5.7$ Hz, 2H), 6.77 (s, 1H), 3.00 (d, $J = 4.8$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 166.3, 150.4, 141.7, 120.9, 26.9; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_7$H$_9$N$_2$O 137.0715, found 137.0733.

5-bromo-N-methylnicotinamide (3ar):

white solid, 143 mg, 67% yield, mp 145−146 °C; $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 8.86 (d, $J = 1.5$ Hz, 1H), 8.76 (d, $J = 2.0$ Hz, 1H), 8.25 (t, $J = 2.0$ Hz, 1H), 6.59 (s, 1H), 3.02 (d, $J = 4.8$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 165.0, 153.2, 145.8, 137.8, 131.6, 121.0, 27.0; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_7$H$_8$BrN$_2$O 214.9841, found 214.9841.

N-methyl-4-(5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl)benzamide (3as):

white solid, 249 mg, 92% yield, mp 160−161 °C; $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 8.17 (d, $J = 8.4$ Hz, 2H), 7.90 (d, $J = 8.4$ Hz, 2H), 6.36 (s, 1H), 3.05 (d, $J = 4.8$ Hz, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 168.5, 167.1, 166.1 (q, $J = 44.7$ Hz), 138.0, 128.0, 127.7, 127.5, 115.9 (q, $J = 273.7$ Hz), 27.0; HRMS (ESI-TOF) $m/z$ [M + H]$^+$ calcd for C$_{11}$H$_9$F$_3$N$_3$O$_2$ 272.0647, found 272.0646.
2-methyl-1,2-dihydroisoquinolin-3(4H)-one (4a):

white solid, 132.0 mg, 82% yield, mp 107−108 °C; $^1$H NMR (600 MHz, CDCl$_3$) δ 7.24 (dd, $J = 13.8$, 7.1 Hz, 2H), 7.15 (t, $J = 8.2$ Hz, 2H), 4.50 (s, 2H), 3.62 (s, 2H), 3.11 (s, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) δ 168.9, 132.0 130.7, 127.4, 127.2, 126.5, 125.0, 52.8, 36.7, 34.3; HRMS (ESI-TOF) m/z [M + H]$^+$ calcd for C$_{16}$H$_{12}$NO 162.0919, found 162.0921.
$^1$H and $^{13}$C NMR Spectra:

$^1$H NMR of N-methyl-2-phenylacetamide (3a)

$^{13}$C NMR of N-methyl-2-phenylacetamide (3a)

$^1$H NMR of 2-(benzo[d][1,3]dioxol-5-yl)-N-methylacetamide (3b)
$^{13}$C NMR of 2-(benzo[d][1,3]dioxol-5-yl)-N-methylacetamide (3b)

$^1$H NMR of 2-(4-chlorophenyl)-N-methylacetamide (3c)
$^{13}$C NMR of 2-(4-chlorophenyl)-N-methylacetamide (3c)

$^1$H NMR of 2-(3-bromophenyl)-N-methylacetamide (3d)
$^1$H NMR of 2-(3-methoxyphenyl)-N-methylacetamide (3e)
$^{13}$C NMR of 2-(3-methoxyphenyl)-N-methylacetamide (3e)

$^1$H NMR of 2-(4-bromophenyl)-N-methylacetamide (3f)
$^{13}$C NMR of 2-(4-bromophenyl)-N-methylacetamide (3f)

$^1$H NMR of 2-(2,5-dimethylphenyl)-N-methylacetamide (3g)
$^{13}$C NMR of 2-(2,5-dimethylphenyl)-N-methylacetamide (3g)
$^1$H NMR of 2-(3,5-dimethoxyphenyl)-N-methylacetamide (3h)

$^{13}$C NMR of 2-(3,5-dimethoxyphenyl)-N-methylacetamide (3h)
$^1$H NMR of 2-(2-hydroxyphenyl)-N-methylacetamide (3i)

$^{13}$C NMR of 2-(2-hydroxyphenyl)-N-methylacetamide (3i)

$^1$H NMR of 2-(3-hydroxy-4-methoxyphenyl)-N-methylacetamide (3j)
$^{13}$C NMR of 2-(3-hydroxy-4-methoxyphenyl)-N-methylacetamide(3j)
$^1$H NMR of N-methyl-2-(naphthalen-1-yl)acetamide (3k)

$^{13}$C NMR of N-methyl-2-(naphthalen-1-yl)acetamide (3k)
$^1$H NMR of N-methyl-2-(naphthalen-2-yl)acetamide (3I)

$^{13}$C NMR of N-methyl-2-(naphthalen-2-yl)acetamide (3I)
$^{1}H$ NMR of N-methyl-3-phenylpropanamide (3m)

$^{13}C$ NMR of N-methyl-3-phenylpropanamide (3m)
$^{1}H$ NMR of (E)-N-methyl-3-(3,4,5-trimethoxyphenyl)acrylamide(3n)

$^{13}C$ NMR of (E)-N-methyl-3-(3,4,5-trimethoxyphenyl)acrylamide(3n)
$^1$H NMR of N-methylpent-4-enamide(3o)

$^{13}$C NMR of N-methylpent-4-enamide(3o)
$^1$H NMR of N-methylpent-4-ynamide(3p)

$^{13}$C NMR of N-methylpent-4-ynamide(3p)
$^1$H NMR of N-methyl-2-phenylpropanamide (3q)

$^{13}$C NMR of N-methyl-2-phenylpropanamide (3q)
$^1$H NMR of 2-(2,4-dichlorophenoxy)-N-methylpropanamide(3r)

$^{13}$C NMR of 2-(2,4-dichlorophenoxy)-N-methylpropanamide(3r)
$^1$H NMR of 2-(1-(4-chlorobenzoyl)-5-methoxy-2-methyl-1H-indol-3-yl)-N-methylacetamide(3s):

$^{13}$C NMR of 2-(1-(4-chlorobenzoyl)-5-methoxy-2-methyl-1H-indol-3-yl)-N-methylacetamide(3s):
$^{1}H$ NMR of 2-(3-benzoylphenyl)-N-methylpropanamide(3t)

$^{13}C$ NMR of 2-(3-benzoylphenyl)-N-methylpropanamide(3t)
$^1$H NMR of 2-(6-methoxynaphthalen-2-yl)-N-methylpropanamide (3u)

$^{13}$C NMR of 2-(6-methoxynaphthalen-2-yl)-N-methylpropanamide (3u)
$^1$H NMR of N-benzyl-2-phenylacetamide (3v)

$^{13}$C NMR of N-benzyl-2-phenylacetamide (3v)
$^1$H NMR of 2-(benzo[d][1,3]dioxol-5-yl)-N-(1-phenylethyl)acetamide (3w)

$^{13}$C NMR of 2-(benzo[d][1,3]dioxol-5-yl)-N-(1-phenylethyl)acetamide (3w)
$^1$H NMR of N-(4-chlorophenyl)-2-phenylacetamide (3x)

$^{13}$C NMR of N-(4-chlorophenyl)-2-phenylacetamide (3x)
$^1$H NMR of 2-phenyl-N-(p-tolyl)acetamide (3y)

$^{13}$C NMR of 2-phenyl-N-(p-tolyl)acetamide (3y)
$^1$H NMR of N-methylbenzamide (3aa)

$^{13}$C NMR of N-methylbenzamide (3aa)
$^{1}$H NMR of 4-bromo-N-methylbenzamide (3ab)

$^{13}$C NMR of 4-bromo-N-methylbenzamide (3ab)
$^1$H NMR of 4-fluoro-N-methylbenzamide (3ac)

13C NMR of 4-fluoro-N-methylbenzamide (3ac)
$^1$H NMR of N,4-dimethylbenzamide (3ad)

$^{13}$C NMR of N,4-dimethylbenzamide (3ad)
$^1$H NMR of 4-methoxy-N-methylbenzamide (3ae)

$^{13}$C NMR of 4-methoxy-N-methylbenzamide (3ae)
$^1$H NMR of N-methyl-4-nitrobenzamide (3af)

$^{13}$C NMR of N-methyl-4-nitrobenzamide (3af)
$^1$H NMR of N-methyl-4-(methylsulfonyl)benzamide (3ag)

$^{13}$C NMR of N-methyl-4-(methylsulfonyl)benzamide (3ag)
$^1$H NMR of N-methyl-3,5-dinitrobenzamide (3ah)

$^{13}$C NMR of N-methyl-3,5-dinitrobenzamide (3ah)
$^1$H NMR of 4-cyano-N-methylbenzamide (3ai)

$^{13}$C NRM of 4-cyano-N-methylbenzamide (3ai)
$^1$H NMR of 4-bromo-2-fluoro-N-methylbenzamide:: (3aj)

$^{13}$C NMR of 4-bromo-2-fluoro-N-methylbenzamide:: (3aj)
$^1$H NMR of 3-methyl-2-thioxo-2H-benzo[e][1,3]thiazin-4(3H)-one (3ak)

$^{13}$C NMR of 3-methyl-2-thioxo-2H-benzo[e][1,3]thiazin-4(3H)-one (3ak)
$^1$H NMR of 2-bromo-N,4-dimethylbenzamide (3al)

$^{13}$C NMR of 2-bromo-N,4-dimethylbenzamide (3al)
$^1$H NMR of 2-bromo-5-fluoro-N-methylbenzamide (3am)

$^{13}$C NMR of 2-bromo-5-fluoro-N-methylbenzamide (3am)

$^1$H NMR of 2-bromo-N,3-dimethylbenzamide (3an)
$^{13}$C NMR of 2-bromo-N,3-dimethylbenzamide (3an)

$^1$H NMR of N-methylthiophene-2-carboxamide (3ao)
$^{13}$C NMR of N-methylthiophene-2-carboxamide (3ao)
$^1$H NMR of N,5-dimethyloxazole-4-carboxamide (3ap)

$^{13}$C NMR of N,5-dimethyloxazole-4-carboxamide (3ap)
$^1$H NMR of N-methylisonicotinamide (3aq)

$^{13}$C NMR of N-methylisonicotinamide (3aq)
$^1$H NMR of 5-bromo-N-methyl nicotinamide (3ar)

$^{13}$C NMR of 5-bromo-N-methyl nicotinamide (3ar)
$^1$H NMR of N-methyl-4-((trifluoromethyl)-1,2,4-oxadiazol-3-yl)benzamide (3as)

$^{13}$C NMR of N-methyl-4-((trifluoromethyl)-1,2,4-oxadiazol-3-yl)benzamide (3as)

$^1$H NMR of 2-methyl-1,2-dihydroisoquinolin-3(4H)-one (4a)
$^{13}$C NMR of 2-methyl-1,2-dihydroisoquinolin-3(4H)-one (4a)