Supporting Information
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Supporting Information For:

Bifunctional AgOAc-Catalyzed Asymmetric Mannich-Type Reactions

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1. General.

All reactions were carried out under an atmosphere of nitrogen using standard Schlenk techniques, unless otherwise noted. 1H NMR, 13C NMR and 31P NMR spectra were recorded on Bruker DRX-400 spectrometers. The chemical shifts for 1H NMR were recorded in ppm downfield from tetramethylsilane (TMS) with the solvent resonance as the internal standard. The chemical shifts for 13C NMR were recorded in ppm downfield using the central peak of deuterochloroform (77.23 ppm) as the internal standard. Coupling constants (J) are reported in Hz and refer to apparent peak multiplications. Optical rotations were measured with JASCO P-1010 polarimeter. Flash column chromatography was performed on silica gel (200-300 mesh). TLC analysis was performed using glass-backed plates coated with 0.2 mm silica.

Commercially available reagents were used throughout without further purification other than those detailed below. THF, Et2O and toluene were distilled over sodium benzophenone ketyl under nitrogen. Methylene chloride was distilled over calcium hydride.

N-Boc1 and N-Ts imines2, benzophenone iminoglycine esters3 and dicyanoalkylidenes4 were prepared by literature procedure.

2. Asymmetric Mannich Reactions of Acetyl Acetone and N-Boc Aldimines Catalyzed by AgOAc
Ligand (0.0075 mmol) and AgOAc (1.2 mg, 0.007 mmol) were placed in a dried Schlenk tube under a nitrogen atmosphere and Et₂O (1.0 mL) was added. The mixture was stirred at room temperature for about 0.5 h. After it was cooled to the indicated temperature, N-Boc imine substrate (0.23 mmol) was added as a solution in Et₂O (1.0 mL) followed by acetyl acetone (0.276 mmol). Progress of the Ag-catalyzed Mannich reaction was typically monitored by TLC analysis. Upon consumption of the limiting reagent, the pure adducts were purified by column chromatography on silica gel. Absolute configurations were determined by correlation to literature optical rotation values² where indicated.

### Table

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### Notes

- (2a) (known compound⁵): white solid; Rᵣ = 0.23 (hexane/EtOAc = 5/1); 88% ee, [α]²⁰ D = 32.2 (c 0.61, CHCl₃); ¹H NMR (400 MHz, CDCl₃): δ 7.19 (2H, d, J = 8.0 Hz), 6.84 (2H, d, J = 8.2 Hz), 5.68 (1H, brs), 5.40 (1H, brs), 4.17 (1H, brs), 3.78 (3H, s), 2.17 (3H, s), 2.13 (3H, s), 1.39 (9H, s). HPLC (Chiralpak AD-H column, i-PrOH/hexane 10/90, detector: 210 nm, 30 °C, 0.8 mL/min, tᵣ = 20.3 and 21.6 min).

- (2b) (known compound⁵): white solid; Rᵣ = 0.23 (hexane/EtOAc = 5/1); 86% ee, [α]²⁰ D = 11.8 (c 0.45, CHCl₃); ¹H NMR (400 MHz, CDCl₃): δ 7.23-7.35 (5H, m), 5.79 (1H, br), 5.50 (1H, br), 4.21 (1H, d, J = 5.2 Hz), 2.20 (3H, s), 2.11 (3H, s), 1.40 (9H, s). HPLC (Chiralpak AD-H column, i-PrOH/hexane 20/80, detector: 210 nm, 30 °C, 0.8 mL/min, tᵣ = 9.0 and 9.7 min).
HN\(\text{Boc}\)Ac\(\text{Ac}\) (known compound 5): white solid; \(R_f = 0.25\) (hexane/EtOAc = 5/1); 88\% ee, \([\alpha]_{D}^{20.7} = 25.6\) (c 0.58, CHCl\(_3\)); \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 7.11-7.16 (4H, m), 5.72 (1H, brs), 5.46 (1H, brs), 4.20 (1H, brs), 2.34 (3H, s), 2.18 (3H, s), 2.12 (3H, s), 1.39 (9H, s). HPLC (Chiralpak AS-H column, \(i\)-PrOH/hexane 20/80, detector: 210 nm, 30 °C, 0.8 mL/min, \(t_r = 5.8\) and 7.6 min).

HN\(\text{Boc}\)Ac\(\text{Ac}\)\(\text{F}\) (known compound 5): white solid; \(R_f = 0.20\) (hexane/EtOAc = 5/1); 91\% ee, \([\alpha]_{D}^{21.3} = 10.8\) (c 0.71, CHCl\(_3\)); \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 7.24-7.28 (2H, m), 6.98-7.04 (2H, m), 5.78 (1H, brs), 5.46 (1H, brs), 4.17 (11H, brs), 2.19 (3H, s), 2.11 (3H, s), 1.39 (9H, s). HPLC (Chiralpak AD-H column, \(i\)-PrOH/hexane 20/80, detector: 210 nm, 30 °C, 0.8 mL/min, \(t_r = 7.5\) and 9.0 min).

HN\(\text{Boc}\)Ac\(\text{Ac}\)\(\text{Br}\) (known compound 5): white solid; \(R_f = 0.20\) (hexane/EtOAc = 5/1); 90\% ee, \([\alpha]_{D}^{21.3} = 7.5\) (c 0.69, CHCl\(_3\)); \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 7.42-7.45 (2H, m), 7.14 (2H, \(d, J = 8.4\) Hz), 5.78 (1H, brs), 5.42 (1H, brs), 4.15 (1H, \(d, J = 4.7\) Hz), 2.20 (3H, s), 2.09 (3H, s), 1.38 (9H, s). HPLC (Chiralpak AD-H column, \(i\)-PrOH/hexane 20/80, detector: 210 nm, 30 °C, 0.8 mL/min, \(t_r = 8.7\) and 10.5 min).

HN\(\text{Boc}\)Ac\(\text{Ac}\) (known compound 5): white solid; \(R_f = 0.35\) (hexane/EtOAc = 5/1); 88\% ee, \([\alpha]_{D}^{20.7} = 67.5\) (c 0.61, CHCl\(_3\)); \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 7.15-7.19 (4H, m), 5.70 (2H, brs), 4.14 (1H, \(d, J = 5.6\) Hz), 2.51 (3H, s), 2.14 (6H, s), 1.38 (9H, s). HPLC (Chiralpak AD-H column, \(i\)-PrOH/hexane 20/80, detector: 210 nm, 30 °C, 0.8 mL/min, \(t_r = 7.5\) and 8.0 min).

HN\(\text{Boc}\)Ac\(\text{Ac}\) (known compound 5): white solid; \(R_f = 0.21\) (hexane/EtOAc = 5/1); 88\% ee, \([\alpha]_{D}^{20.7} = -33.9\) (c 0.78, CHCl\(_3\)); \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 8.17 (1H, \(d, J = 8.4\) Hz), 7.88 (1H, \(d, J = 8.0\) Hz), 7.76-7.80 (1H, m), 7.61 (1H, \(t, J = 7.2\) Hz), 7.50 (1H, \(t, J = 7.2\) Hz),
7.37-7.44 (2H, m), 6.31 (1H, brs), 6.16 (1H, brs), 4.42 (1H, d, J = 4.8 Hz), 2.32 (3H, s), 1.98 (3H, s), 1.39 (9H, s). HPLC (Chiralpak AD-H column, i-PrOH/hexane 20/80, detector: 254 nm, 30 °C, 0.8 mL/min, t_r = 9.1 and 12.4 min).

(2h) (unknown compound): white solid; R_f = 0.38 (hexane/EtOAc = 5/1); 80% ee, [α]_D^21.3 = 19.5 (c 0.58, CHCl₃); ^1^H NMR (400 MHz, CDCl₃): δ 7.30 (1H, d, J = 1.0 Hz), 6.29 (1H, dd, J = 3.2 Hz, 1.8 Hz), 5.64 (1H, br), 5.58 (1H, br), 4.34 (1H, d, J = 6.1 Hz), 2.25 (3H, s), 2.19 (3H, s), 1.45 (9H, s); ^13^C NMR (100 MHz, CDCl₃): δ 28.4, 30.0, 30.3, 48.4, 68.9, 80.5, 107.1, 110.9, 142.1, 152.6, 155.4, 202.5, 204.2. HRMS Calculated for C₁₂H₂₀NO₅ (M+1) 194.1341, found 294.1331. HPLC (Chiralpak AD-H column, i-PrOH/hexane 20/80, detector: 210 nm, 30 °C, 0.8 mL/min, t_r = 7.5 and 8.9 min).

### 3. Asymmetric Mannich Reactions of Glycine Derivatives and N-Ts Aldimines Catalyzed by AgOAc.

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<th>D_r</th>
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<th>E_r (% anti)</th>
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Ligand (0.0075 mmol) and AgOAc (1.2 mg, 0.007 mmol) were placed in a dried Schlenk tube under a nitrogen atmosphere and Et₂O (2.0 mL) was added. The mixture was stirred at room temperature for about 0.5 h. After it was cooled to the indicated temperature, benzophenone imineglycine ester (0.23 mmol) was added followed by N-Ts imines (0.276 mmol). Progress of the Ag-catalyzed Mannich reaction was typically monitored by TLC analysis. Upon consumption of the limiting reagent, the reaction was isolated by a short column of silica gel chromatography directly. The ratio (syn/anti) was determined by the NMR spectroscopic analysis of crude product. The crude adducts were then purified by column chromatography on silica gel.

(5a) (known compound): ^1^H NMR (400 MHz, CDCl₃): δ 7.60-6.85 [m, 17H (syn), 19H (anti)], 6.41 (1H, d, J = 8.5 Hz, syn), 6.34 (1H, d, J = 7.0 Hz, anti), 5.80 (2H, d, J
= 7.5 Hz, syn), 5.17 (1H, dd, J = 8.4, 2.0 Hz, syn), 4.71 (1H, t, J = 6.7 Hz, anti), 4.35 (1H, d, J = 6.0 Hz, anti), 4.14 (1H, d, J = 2.0 Hz, syn), 3.51 (3H, s, syn), 3.49 (3H, s, anti), 2.25 (3H, s, syn), 2.14 (3H, s, anti).

2-BrC₆H₄\(\text{NHTs}\) (5b) (known compound\(^6\)): \(^1\)H NMR (400 MHz, CDCl₃): \(\delta\) 7.68-6.84 [m, 16 H (syn), 18 H (anti)], 6.50 (1H, d, J = 8.4 Hz, syn), 6.39 (1H, d, J = 4.8 Hz, anti), 6.17 (2H, d, J = 6.0 Hz, syn), 5.50 (1H, d, J = 8.0 Hz, anti), 4.81 (1H, t, J = 5.4 Hz, anti), 4.50 (1H, d, J = 6.0 Hz, anti), 4.33 (1H, d, J = 2.0 Hz, syn), 3.46 [s, 3H (syn), 3H (anti)], 2.35 (3H, s, syn), 2.24 (3H, s, anti).

3-ClC₆H₄\(\text{NHTs}\) (5c) (known compound\(^6\)): \(^1\)H NMR (400 MHz, CDCl₃): \(\delta\) 6.88-7.68 [m, 16 H (syn), 18 H (anti)], 6.35 (3H, m, syn), 5.73 (1H, d, J = 7.2 Hz, anti), 5.04 (1H, dd, J = 8.4, 2.0 Hz, syn), 4.74 (1H, t, J = 6.8 Hz, anti), 4.35 (1H, d, J = 6.0 Hz, anti), 4.15 (1H, d, J = 2.2 Hz, syn), 3.54 (3H, s, syn), 3.52 (3H, s, anti), 2.37 (3H, s, syn), 2.31 (3H, s, anti).

4-MeOC₆H₄\(\text{NHTs}\) (5d) (known compound\(^6\)): \(^1\)H NMR (400 MHz, CDCl₃): \(\delta\) 6.64-7.62 [m, 16H(syn), 18H (anti)], 6.43 (2H, d, J = 6.8 Hz, syn), 6.34 (1H, d, J = 8.4 Hz, syn), 5.66 (1H, d, J = 7.4 Hz, anti), 5.10 (1H, dd, J = 8.4, 2.0 Hz, syn), 4.67 (1H, t, J = 6.4 Hz, anti), 4.35 (1H, d, J = 5.8 Hz, anti), 4.13 (1H, d, J = 1.6 Hz, syn), 3.73 [s, 3H (syn), 3H (anti)], 3.49 [s, 3H (syn), 3H (anti)], 2.34 (3H, s, syn), 2.28 (3H, s, anti).

2-Naphthyl\(\text{NHTs}\) (5e) (known compound\(^6\)): \(^1\)H NMR (400 MHz, CDCl₃): \(\delta\) 6.85-7.72 [m, 19H (syn), 21 H (anti)], 6.51 (1H, d, J = 8.4 Hz, syn), 6.27 (2H, d, J = 6.4Hz, syn), 5.86 (1H, d, J = 7.8 Hz, anti), 5.31 (1H, d, J = 8.4 Hz, syn), 4.90 (1H, t, J = 7.2 Hz, anti), 4.48 (1H, d, J = 6.0Hz, anti), 4.28 (1H, d, J = 2.1 Hz, syn), 3.54 (3H, s, syn), 3.48 (3H, s, anti), 2.20 (3H, s, syn), 2.12 (3H, s, anti).

\(\text{i-Pr}\)\(\text{NHTs}\) (5f) (known compound\(^6\)): \(^1\)H NMR (400 MHz, CDCl₃): \(\delta\) 7.03-7.78 (14 H, m), 6.03 (1H, d, J = 8.8 Hz), 4.08 (1H, d, J = 1.6 Hz), 3.74 (1H, t, J = 8.0 Hz), 3.29 (3H, s), 2.39
(3H, s), 1.70-1.77 (m, 1H), 0.84 (3H, d, J = 6.8 Hz), 0.72 (3H, d, J = 6.4 Hz).

\[
\text{N} \text{CO}_2 \text{Me} \quad \text{Cy} \text{NHTs}
\]
\[
\text{Ph}_2 \text{C} \equiv \text{N} \quad \text{(5g)} \quad \text{(known compound \(^6\))}
\]

\(^1\text{H} \text{NMR} (400 \text{ MHz, CDCl}_3): \delta 7.02-7.77 (14 \text{ H, m}), 5.95 (1\text{H, d, J} = 9.0 \text{ Hz}), 4.10 (1\text{H, d, J} = 1.4 \text{ Hz}), 3.75 (1\text{H, t, J} = 9.2 \text{ Hz}), 3.25 (3\text{H, s}), 2.39 (3\text{H, s}), 0.78-1.77 (11\text{H, m}).

4. Asymmetric Mannich Reaction of \(\alpha,\alpha\)-Dicyanoolefins with \(N\)-Boc Aldimines Catalyzed by AgOAc.

\[
\begin{align*}
\text{NC} & \quad \text{CN} \\
\text{R}_1 & \quad \text{Ar} & \quad \text{N} & \quad \text{Boc} \\
\text{6} & \quad + & \quad \text{AgOAc}/\text{L5} & \quad \text{Et}_2\text{O}, \text{-25 °C} & \quad \text{7} \\
\text{NC} & \quad \text{CN} \\
\text{Ar} & \quad \text{NH} & \quad \text{Boc} \\
\text{6a} & & \text{6b} & & \text{6c} & & \text{6d}
\end{align*}
\]

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<tr>
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<td>96 (7h)</td>
<td>&gt;95/5</td>
<td>59</td>
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Ligand (0.0075 mmol) and AgOAc (1.2 mg, 0.007 mmol) were placed in a dried Schlenk tube under a nitrogen atmosphere and Et\(_2\)O (2.0 mL) was added. The mixture was stirred at room temperature for about 0.5 h. After it was cooled to the indicated temperature, benzophenone dicyanoalkylidene (0.23 mmol) was added followed by \(N\)-Boc imines (0.276 mmol). Progress of the Ag-catalyzed vinylogous Mannich reaction was typically monitored by TLC analysis. Upon consumption of the limiting reagent, the reaction was isolated by a short column of silica gel chromatography directly. The ratio (\(\text{syn}/\text{anti}\)) was determined by the NMR spectroscopic analysis of crude product. The crude adducts were then purified by column chromatography on silica gel.
(7a) (known compound): white solid, 64% ee, [α]_D^23 = -82.9 (c 1.03, CHCl₃); ^1H NMR (400 MHz, CDCl₃): δ 8.06 (d, J = 7.9 Hz, 1H), 7.51 (t, J = 7.4 Hz, 1H), 7.41-7.24 (m, 7H), 4.94-4.92 (m, 1H), 4.53 (t, J = 10.4 Hz, 1H), 3.72-3.68 (m, 1H), 2.89-2.85 (m, 1H), 2.70-2.66 (m, 1H), 1.93-1.89 (m, 1H), 1.51-1.47 (m, 1H), 1.42 (s, 9H); 13C NMR (100 MHz, CDCl₃): δ 175.1, 154.7, 140.0, 138.9, 133.5, 129.4, 128.7, 128.6, 127.0, 126.9, 114.2, 115.6, 82.1, 80.2, 57.5, 49.1, 28.3, 25.9, 25.2; HPLC (Chiralpak AD-H column, i-PrOH/hexane 95/5, detector: 254 nm, 0.8 mL/min, 30 °C, τ_m = 8.2 min, τ_maj = 13.6 min.

(7b) (known compound): yellow solid, 64% ee, [α]_D^23 = -88.0 (c 0.89, CHCl₃); ^1H NMR (400 MHz, CDCl₃): δ 8.32 (d, J = 8.1 Hz, 1H), 7.54 (t, J = 7.7 Hz, 1H), 7.46-7.34 (m, 5H), 7.11 (t, J = 7.7 Hz, 1H), 6.99 (d, J = 8.3 Hz, 1H), 5.02 (d, J = 9.0 Hz, 1H), 4.92 (t, J = 9.9 Hz, 1H), 4.13 (dd, J = 12.4, 2.1 Hz, 1H), 3.94 (d, J = 12.3 Hz, 1H), 3.31 (d, J = 10.6 Hz, 1H), 1.39 (s, 9H); 13C NMR (100 MHz, CDCl₃): δ 166.1, 156.4, 154.8, 138.4, 137.1, 129.7, 129.1, 128.5, 127.3, 122.2, 118.5, 116.4, 114.4, 113.8, 80.5, 66.5, 55.3, 47.5, 28.7, 28.4; HPLC (Chiralpak AD-H column, i-PrOH/hexane 95/5, detector: 254 nm, 0.8 mL/min, 30 °C, τ_m = 8.9 min, τ_maj = 16.2 min.

(7c) (known compound): white solid, 47% ee, [α]_D^23 = +59.3 (c 1.00, CHCl₃); ^1H NMR (400 MHz, CDCl₃): δ 7.55-7.52 (m, 3H), 7.47-7.44 (m, 2H), 7.39-7.30 (m, 3H), 7.27-7.21 (m, 2H), 5.02-4.99 (m, 1H), 4.68 (t, J = 9.9 Hz, 1H), 3.60-3.52 (m, 1H), 1.41 (s, 9H), 0.80 (d, J = 6.1 Hz, 3H); 13C NMR (100 MHz, CDCl₃): δ 183.3, 154.8, 139.6, 134.1, 130.9, 129.2, 129.4, 128.6, 127.6, 127.2, 112.8, 112.0, 89.5, 80.7, 58.4, 47.8, 28.5, 17.0; HPLC (Chiralpak AS-H column, i-PrOH/hexane 95/5, detector: 254 nm, 0.8 mL/min, 30 °C, τ_min = 10.5 min, τ_maj = 14.3 min.

(7d) (known compound): white solid, 25% ee, [α]_D^23 = +16.6 (c 0.99, CHCl₃); ^1H NMR (400 MHz, CDCl₃): δ 7.43-7.34 (m, 3H), 7.15 (d, J = 7.1 Hz, 2H), 5.02 (t, J = 10.2 Hz, 1H), 4.84 (d, J = 9.4 Hz, 1H), 3.36-3.33 (m, 1H), 2.96 (m, 2H), 2.12 (d, J = 12.9 Hz, 1H), 1.74-1.62 (m, 1H), 1.57-1.43 (m, 4H), 1.41 (s, 9H); 13C NMR (100 MHz, CDCl₃): δ 186.4, 155.3, 139.1, 129.7, 128.8, 127.1, 112.6, 111.7, 85.3, 80.7, 56.3, 49.8, 32.0, 29.1, 28.4, 27.5, 20.0; HPLC (Chiralpak AD-H column, i-PrOH/hexane 95/5, detector: 254 nm, 0.8 mL/min, 30 °C, τ_min = 5.5 min, τ_maj = 6.6 min.

(7e) (known compound): white solid, 82% ee, [α]_D^23 = -87.1 (c 0.95, CHCl₃); ^1H NMR (400 MHz, CDCl₃): δ 8.04 (d, J = 7.9 Hz, 1H), 7.50 (t, J = 7.4 Hz, 1H), 7.39 (t, J = 7.6 Hz, 1H), 7.24 (t, J = 8.1 Hz, 1H), 6.90 (d, J = 8.6 Hz, 2H), 4.88 (d, J = 8.8 Hz, 1H), 4.48 (t, J = 10.0 Hz, 1H), 3.81 (s, 3H), 3.68-3.64 (m, 1H), 2.89-2.83 (m, 1H), 2.70-2.65 (m, 1H), 1.95-1.89 (m, 1H), 1.51-1.42 (m, 1H), 1.42 (s, 9H); 13C
NMR (100 MHz, CDCl$_3$): δ 175.4, 159.8, 154.8, 140.2, 133.6, 131.1, 130.0, 129.6, 128.9, 128.3, 127.1, 114.8, 114.4, 113.8, 82.2, 80.2, 75.1, 55.5, 49.4, 28.4, 26.0, 25.4; HPLC (Chiralpak OD-H column, i-PrOH/hexane 95/5, detector: 254 nm, 0.8 mL/min, 30°C, τ$_\text{minor}$ = 9.2 min, τ$_\text{major}$ = 11.3 min.

(7f) (known compound$^8$): white solid, 70% ee, [α]$^\text{23}$$_D$ = -98.2 (c 0.97, CHCl$_3$); $^1$H NMR (400 MHz, CDCl$_3$): δ 8.03 (d, $J = 7.9$ Hz, 1H), 7.52 (t, $J = 7.5$ Hz, 1H), 7.40 (t, $J = 7.7$ Hz, 1H), 7.31-7.26 (m, 3H), 7.09 (t, $J = 8.5$ Hz, 2H), 4.88 (d, $J = 8.7$ Hz, 1H), 4.53 (t, $J = 10.0$ Hz, 1H), 3.69-3.64 (m, 1H), 2.89-2.84 (m, 1H), 2.73-2.68 (m, 1H), 1.98-1.90 (m, 1H), 1.48-1.42 (m, 1H), 1.42 (s, 9H); $^{13}$C NMR (100 MHz, CDCl$_3$): δ 174.9, 163.8, 161.3, 154.6, 139.9, 134.8, 133.6, 129.7, 129.4, 128.8, 127.1, 116.4, 116.2, 114.2, 113.6, 82.2, 80.3, 56.7, 48.9, 28.2, 25.7, 25.1; HPLC (Chiralpak AD-H column, i-PrOH/hexane 95/5, detector: 254 nm, 0.8 mL/min, 30°C, τ$_\text{minor}$ = 9.6 min, τ$_\text{major}$ = 17.6 min.

(7g) (known compound$^8$): white solid, 61% ee, [α]$^\text{23}$$_D$ = -81.1 (c 0.92, CHCl$_3$); $^1$H NMR (400 MHz, CDCl$_3$): δ 8.03 (d, $J = 7.9$ Hz, 1H), 7.53 (d, $J = 7.5$ Hz, 3H), 7.40 (t, $J = 7.3$ Hz, 1H), 7.26 (m, 1H), 7.19 (d, $J = 7.5$ Hz, 2H), 4.88 (d, $J = 8.7$ Hz, 1H), 4.50 (t, $J = 9.7$ Hz, 1H), 3.68-3.64 (m, 1H), 2.89-2.85 (m, 1H), 2.73-2.69 (m, 1H), 1.97-1.92 (m, 1H), 1.49-1.47 (m, 1H), 1.41 (s, 9H); $^{13}$C NMR (100 MHz, CDCl$_3$): δ 174.8, 154.7, 140.0, 138.1, 133.9 132.7, 129.7, 129.5, 129.0, 128.9, 127.3, 122.7, 114.3, 113.7, 82.4, 80.6, 56.9, 48.8, 28.4, 25.8, 25.2; HPLC (Chiralpak AD-H column, i-PrOH/hexane 95/5, detector: 254 nm, 0.8 mL/min, 30°C, τ$_\text{minor}$ = 10.6 min, τ$_\text{major}$ = 19.9 min.

(7h) (known compound$^8$): white solid, 59% ee, [α]$^\text{23}$$_D$ = -74.5 (c 0.91, CHCl$_3$); $^1$H NMR (400 MHz, CDCl$_3$): δ 8.03 (d, $J = 7.7$ Hz, 1H), 7.50 (t, $J = 7.3$ Hz, 1H), 7.40-7.35 (m, 2H), 7.30-7.18 (m, 4H), 4.86-4.76 (m, 2H), 3.93-3.88 (m, 1H), 2.80-2.73 (m, 1H), 2.67-2.61 (m, 1H), 2.25 (s, 3H), 2.03-1.94 (m, 1H), 1.45 (s, 9H); $^{13}$C NMR (100 MHz, CDCl$_3$): δ 175.4, 155.0, 140.3, 137.1, 136.7, 133.5, 131.5, 130.4, 129.6, 128.5, 127.3, 125.8, 114.4, 113.8, 82.9, 80.3, 53.4, 48.5, 28.5, 26.7, 25.2, 19.9; HPLC (Chiralpak AD-H column, i-PrOH/hexane 95/5, detector: 254 nm, 0.8 mL/min, 30°C, τ$_\text{minor}$ = 9.0 min, τ$_\text{major}$ = 12.1 min.

5. References:


6. Copy of NMR and HPLC for Products of Asymmetric Mannich Reactions of Acetyl Acetone and N-Boc Aldimines Catalyzed by AgOAc.

2c \(^1\)H NMR (CDCl\(_3\), 400MHz)

2d \(^1\)H NMR (CDCl\(_3\), 400MHz)
$2e$ $^1$H NMR (CDCl$_3$, 400MHz)

$2f$ $^1$H NMR (CDCl$_3$, 400MHz)
$2h$ $^1H$ NMR (CDCl$_3$, 400MHz)

$2h$ $^{13}C$ NMR (CDCl$_3$, 400MHz)
Elemental Composition Report

Tolerance = 5.0 PPM / DBE: min = -1.5, max = 200.0
Selected filters: None

Monoisotopic Mass, Odd and Even Electron Ion:
66 formula(s) evaluated with 2 results within limits (up to 10 closest results for each mass)
Elements Used:
C: 10-30 H: 10-30 N: 0-5 O: 0-5

668
0790064 14 (0.533) AM (Gen.4, 80.00, Ar,5000,0,3000,05,1,00,LS,10); Sm (SG, 2x3.00); Cm (14:18)
294.1331

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Miz
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000

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Totals : 510.5308 15.21708

Results obtained with enhanced integrator!

*** End of Report ***
**Area Percent Report**

**Sorted By**: Signal
**Multiplier**: 1.0000
**Dilution**: 1.0000

**Signal 1**: UV-1 A, Wavelength=210 nm

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**Totals**: 885.61273 22.10986

Results obtained with enhanced integrator!

*** End of Report ***

Area Percent Report

Sorted By: Signal
Multiplier: 1.0000
Dilution: 1.0000

Signal 1: UV1A, Wavelength=210 nm

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Totals: 1093.33039 65.75125

Results obtained with enhanced integrator!

*** End of Report ***
Sample Name: W2-5-60A

Injection Date: 2/26/2007 11:05:22 AM
Sample Name: W2-5-60A
Location: Vial 1

Acq. Operator: VANG
Acq. Method: C:\HPCHEM1\METHODS\2012.M
Last changed: 2/26/2007 10:32:12 AM by VANG
(modified after loading)

Analytic Method: C:\HPCHEM1\METHODS\2012.M
Last changed: 8/28/2007 4:02:57 PM by VANG
(modified after loading)

Area Percent Report

Signal 1: W101 A, Wavelength=210 nm

Peak RetTime Type Width Area Height Area
# (min) (min) mAU vs f(AU) %
1 6.878 min 0.2290 125.7464 9.153 6.6650
2 9.670 min 0.2545 1760.9775 115.3315 93.3380

Totals: 1886.72700 124.50960

Results obtained with enhanced integrator!

*** End of Report ***
Sample Name: W2-5-59C(R)

Injection Date: 2/26/2007 1:46:24 PM

Sample Name: W2-5-59C(R)

Analyzer Method: C:\HPCHEM1\METHODS\2012.X

Last changed: 2/26/2007 11:24:10 AM by VAHG

(annotated after loading)

Analytic Method: C:\HPCHEM1\METHODS\2012.X

Last changed: 2/26/2007 4:06:10 PM by VAHG

(annotated after loading)

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Sorted By: Signal
Multiplier: 1.0000
Dilution: 1.0000

Signal: WUV 1 A, Wavelength=210 nm

| Peak RetTime Type Width | Area | Height | Area | % | %
|------------------------|------|--------|------|---|--
| 1 5.571 MIN 0.1700 208.77562 28.3120 53.0615
| 2 7.743 MIN 0.2979 255.86379 14.3161 45.9785

Totals: 544.63956 42.62930

Results obtained with enhanced integrator.

*** End of Report ***
Sample Name: WZ-5-62A(R)

Injection Date: 3/1/2007 2:11:12 PM
Sample Name: WZ-5-62A(R)
Location: Vial 1

Acq. Operator: HANG
Acq. Method: C: \HPCHEM \METHODS \2012.M
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Analytic Method: C: \HPCHEM \METHODS \2012.M
Last changed: 8/28/2007 4:07:52 PM by HANG
(modified after loading)

--W1A Wavelength=210 nm (CMO000000000000)

Peak RetTime Type Width Area Height Area
# [min] [min] nA/nV nA/nV
1 7.550 min 0.1923 641.9009 55.6256 52.262
2 9.020 min 0.2220 587.7809 94.1342 47.797

Totals: 1239.6409 99.7590

Results obtained with enhanced integrator!

*** End of Report ***
S21
Data File C:\HPLC\DATA\ZG00-079Y2004393.D
Sample Date: 5/25/2007
Sample Name: WZ-5-648(R)
Injection Date: 3/7/2007 11:26:16 AM
Location: Vial 1

Injection Date: 3/7/2007 11:26:16 AM
Location: Vial 1

Injection Date: 3/7/2007 10:51:45 AM by WANG
(modified after loading)

Injection Date: 0/28/2007 4:10:07 PM by WANG
(modified after loading)

Area Percent Report

Sorted By: Signal
Multiplier: 1.0000
Dilution: 1.0000

Signal 1: WUV A, Wavelength=210 nm

Peak Ret Time Type Width Area Height Area
# Width Area Height Area
1 6.678 EP 0.2376 1092.3212 70.5892 50.3913
2 10.306 EP 0.283 1078.7871 56.3942 49.6187

Results obtained with enhanced integrator!

*** End of Report ***

Instrument 1 5/25/2007 4:10:54 PM WANG
Data File C:\HPChem\DATA\2200-07192004394.D
Sample Name: W2-5-65A

Injection Date: 3/7/2007 11:41:00 AM
Sample Name: W2-5-65A
Location: Vial 1
Acc. Operator: NANG
Acc. Method: C:\HPChem\METHODS\2012.M
Last changed: 3/7/2007 10:51:45 AM by NANG
(modified after loading)
Analytic Method: C:\HPChem\METHODS\2012.M
Last changed: 8/20/2007 4:12:26 PM by NANG
(modified after loading)

(VWD 1) Wavelength=210 nm (24000.0 Hz 0.00000)

Signal 1: VWD 1, Wavelength=210 nm

Sorted By: Signal
Multiplier: 1.0000
Dilution: 1.0000

Peak RetTime Type Width Area Height Area
# [min] [min] mAU vs fAU % %
---|---|---|---|---|---|
1 6.677 min 0.2537 556.49921 62.84763 95.1097
2 10.303 min 0.2635 69.18117 3.11008 5.8803
Totals: 1005.68037 65.95772

Results obtained with enhanced integrator!

*** End of Report ***

Instrument 1 8/25/2007 4:12:59 PM NANG

Page 1 of 1
Area Percent Report

Signal 1: Wavelength=210 nm

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Totals: 4700.52759 378.22614

Results obtained with enhanced integrator!

*** End of Report ***
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Injection Date: 2/26/2007 11:30:26 AM
Sample Name: W2-5-60B
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Loc. Method: C:\HPECHEM1\METHODS\2012.M
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(modified after loading)
Mod. Method: C:\HPECHEM1\METHODS\2012.M
Last changed: 2/26/2007 11:20:10 AM by WANG
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Windsor 1 Wavelength=210 nm (21000 D:21000 D)

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Totals: 2343.64086, 172.97449

Results obtained with enhanced integrator!

*** End of Report ***
Area Percent Report

Sorted By: Signal
Multiplier: 1.0000
Dilution: 1.0000

Signal 1: Wavelength=254 nm

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Totals: 574.26969 30.82298

Results obtained with enhanced integrator!

*** End of Report ***
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Injection Date: 3/9/2007 4:49:20 PM  Location: Vial 1
Sample Name: 2V-5-66B

ACS. Creator : WANG
ACS. Method : C:\HPCHEM\METHODS\2012.M
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(modified after loading)

Analysis Method : C:\HPCHEM\METHODS\2012.M
Last changed: 6/3/2009 10:36:03 PM by WANG
(modified after loading)

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Area Percent Report
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Sorted By: Signal
Multiplier: 1.0000
Dilution: 1.0000

Signal 1: 254 A, Wavelength=254 nm

Peak Ret Time Width Area Height Area
# Value  Value mAU % %

1 9.133 0.2325 523.2113 34.42561 94.0228
2 12.726 0.3150 53.26122 1.55985 3.9772

Totals: 556.47253 36.02849

Results obtained with enhanced integrator!

*** End of Report ***

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Acc. Operator: WANG  Acc. Method: C:\HPCHEM1\METHODS\2012.0
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(modified after loading)
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Signal 1: W01 A, Wavelength=210 nm

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Totals: 1447.61591 115.59674

Results obtained with enhanced integrator!

*** End of Report ***
ACN, H/PrOH 95/5, 0.5 mL/min, 210NM

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(modified after loading)
Analytic Method : C:\HPChem1\METHODS2002.M
Last changed : 8/28/2007 4:14:04 PM by WANG
(modified after loading)

Signal 1: WVO1 A, Wavelength=210 nm

Signal obtained with enhanced integrator!

Results obtained with enhanced integrator!

*** End of Report ***
7. Copy of NMR and HPLC for Products of Asymmetric Mannich Reactions of Glycine Derivatives and N-Ts Aldimines Catalyzed by AgOAc.
AD-H, H/i-PrOH=85/15, 0.8 mL/min

Injection Date: 5/31/2006 2:44:15 PM
Sample Name: WZ-4-60B
Location: Vial 1

Acc. Operator: WANG
Acc. Method: C:HPChem1\METHODS\2012.M
Last changed: 5/31/2006 2:46:31 PM by WANG
(modified after loading)

Analytic Method: C:HPChem1\METHODS\2012.M
(modified after loading)

WIT A Wavelength=254 nm (C=0.0000)

Peak RetTime Type Width Area Height Area
# [min] [min] mAU vs [mAU] %
1 14.796 ER 0.3703 152.24686 7.59783 2.6581
2 21.368 ER 0.3513 102.33418 2.83028 1.4236
3 24.099 ER 0.6464 328.09786 79.06675 45.7864
4 57.280 ER 0.7175 363.10864 79.47300 50.1379

Totals: 718.54674 169.39376
Results obtained with enhanced integrator!

*** End Of Report ***
Signal 1: WOD 1, Wavelength=254 nm

Peak Ret Time  Type  Width  Area  Height  Area
% [min]  [min]  [au]  [au]  [au]  [au]
1  15.610  ER  0.4920  225.4546  6.7697  30.5513
2  29.011  ER  0.6397  122.5293  2.8133  17.9589
3  56.302  VH  0.8732  237.1609  3.2181  35.1492
4  80.919  VH  0.8798  182.5074  1.9821  19.6636

Totals: 739.7126  14.5269

Results obtained with enhanced integrator!

Data File C:\HPChem\DATA\2006\06\J2003670.D
Sample Name: WZ-4-S9A
Injection Date: 6/16/2006 5:40:43 PM
Sample Name: WZ-4-S9A
Location: Vial 1

Acq. Operator: WANG
Acq. Method: C:\HPChem\METHODS\2012.M
Last changed: 6/16/2006 5:36:54 PM by WANG
(modified after loading)

Analytic Method: C:\HPChem\METHODS\2012.M
Last changed: 6/16/2006 5:25:30 PM by WANG
(modified after loading)
OD-H, N/i-PrOH=93/7, 0.8 mL/min

Injection Date: 6/17/2006 6:27:11 PM
Sample Name: W2-4-54B
Location: Vial 1

Acc. Operator: NANG
Last Changed: 6/17/2006 4:00:48 PM by NANG
(modified after loading)

Analytic Method: C:\HPCDATA\METHODS\2012.2.m
(modified after loading)

Signal 1: W001 A, Wavelength=254 nm

Peak RetTime Type Width Area Height Area
0.10 696 1.0000 61.9651 2.3643 0.7550
11.8 61 0.5601 123.3515 3.3801 1.3829
13.6 64 0.7646 463.4586 92.6156 43.9203
14.6 622 1.0000 4679.1107 50.4231 45.3407

Totals: 9483.27177 163.75350

Results obtained with enhanced integrator!

*** End of Report ***
Area Percent Report

Signal 1: WVID A, Wavelength=254 nm

<table>
<thead>
<tr>
<th>Peak Ret Time Type</th>
<th>Width</th>
<th>Area (%)</th>
<th>Height</th>
<th>Area (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.345</td>
<td>0.6814</td>
<td>3.02123</td>
<td>2.4581</td>
</tr>
<tr>
<td>2</td>
<td>1.041</td>
<td>0.8015</td>
<td>4.31463</td>
<td>6.1774</td>
</tr>
<tr>
<td>3</td>
<td>2.810</td>
<td>0.9230</td>
<td>5.74027</td>
<td>51.4563</td>
</tr>
<tr>
<td>4</td>
<td>21.138</td>
<td>1.3921</td>
<td>25.013986</td>
<td>26.60966</td>
</tr>
</tbody>
</table>

Results obtained with enhanced integrator!

*** End of Report ***
2-Naphthyl-
NHTs
Ph2C=N
CO2Me
5e

January 24, 2010

Sample Name: 52-5-60A

Sample: 2-Naphthyl

Analytical Method: 2-Naphthyl NHTs Ph2C=N CO2Me 5e

Sigma: 1.0000
Dilution: 1.0000

Results obtained with enhanced integrator!

*** End of Report ***
AD-III, N/i-PrOH=90/10, 1.0 mL/min

Injection Date: 6/17/2006 2:29:54 PM
Sample Name: WZ-4-5S
Acc. Operator: NG
Acc. Method: C:\HPCHEM\1.METHODS\2012.M
Last checked: 6/17/2006 2:29:54 PM by NG

Analytic Method: C:\HPCHEM\1.METHODS\2012.M
Last checked: 6/17/2006 2:29:54 PM by NG

WVD1 A Wavelength=254 nm (CMOS 600, C254000, 000)

Signal: WVD1 A, Wavelength=254 nm

Peak RetTime Type Width Area Height Area
° fainl fainl mAU vs fAU
1 13.847 EE 0.3578 423.01620 18.30620 50.3638
2 17.434 EF 0.4501 418.90550 14.32901 45.6352

Totals:
839.32151 32.67521

Results obtained with enhanced integrator!

*** End of Report ***
% 1: W01 A, Wavelength=254 nm

Signal 1: W01 A, Wavelength=254 nm

Results obtained with enhanced integrator!

*** End of Report ***

Page 1 of 1
**Injection Date:** 7/5/2006 1:07:35 PM
**Sample Name:** WZ-4-64C
**Location:** Vial 1

**Analytical Method:** [HPChem 11 Methods] 2012 M
**Last changed:** 7/5/2006 1:05:42 PM by WANG (modified after loading)
**Last changed:** 8/30/2007 3:35:53 PM by WANG (modified after loading)

**Signal 1:** UV1 A, Wavelength=254 nm

<table>
<thead>
<tr>
<th>Peak RetTime Type Width Area Height Area</th>
<th>%</th>
<th>%</th>
<th>mAU</th>
<th>%</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 11.39P FV</td>
<td>0.4015</td>
<td>15.30175 4.62075e-1</td>
<td>0.4653</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 12.61V VV</td>
<td>0.5838</td>
<td>26.17933 1.95627 2.9283</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 14.237 VH</td>
<td>0.6603</td>
<td>36.49625 7.41631 10.2450</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 16.500 VH</td>
<td>0.9414</td>
<td>46.59327 46.97204 86.3094</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Totals:** 3284.46972 56.70729

Results obtained with enhanced integrator!

*** End of Report ***
8. Copy of NMR and HPLC for Products of Asymmetric Mannich Reaction of \( \alpha,\alpha \)-Dicyanoolefins with N-Boc Aldimines Catalyzed by AgOAc

![NMR spectra for 7a](image)

**7a**

\[ ^1\text{H}\text{ NMR (CDCl}_3,\text{ 400MHz)} \]

\[ ^{13}\text{C}\text{ NMR (CDCl}_3,\text{ 400MHz)} \]

S43
$\textbf{7b} \quad ^1\text{H NMR (CDCl}_3$, 400 MHz)

$\text{NMR (CDCl}_3$, 400 MHz)
$\text{NC} \quad \text{CN}$

$\text{NHBoc}$

7c $^1$H NMR (CDCl$_3$, 400MHz)

$^{13}$C NMR (CDCl$_3$, 400MHz)

13C NMR GC-2-4D in CDCl$_3$
$\text{NHBoc}$

$\textbf{7e} \ \textsuperscript{1}H \text{ NMR (CDCl}_3, 400\text{MHz)}$

$\text{^13C NMR (CDCl}_3, 400\text{MHz)}$

$\text{NHBoc}$

$\textbf{OMe}$
$7f \quad ^1H$ NMR (CDCl$_3$, 400MHz)

$13C$ NMR (CDCl$_3$, 400MHz)
$^{1}H$ NMR (CDCl$_3$, 400MHz) 
$^{13}C$ NMR (CDCl$_3$, 400MHz)

[Chemical structure image]
$7\text{h}^1\text{H NMR (CDCl}_3, 400\text{MHz)}$

$^{13}\text{C NMR (CDCl}_3, 400\text{MHz)}$
AD-II, N/i-ProOH = 95/5, 0.8 mL/min

Injection Date: 3/11/2009 1:47:12 PM
Sample Name: QC-2-44
Analyzer: WANG
Analyzer Method: C:\HPCHEM\1\METHODS\2012.M
Last changed: 3/11/2009 1:39:26 PM by WANG
(modified after loading)

Analytical Method: C:\HPCHEM\1\METHODS\2012.M
Last changed: 6/3/2009 8:57:09 PM by WANG
(modified after loading)

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Sorted By: Signal
Multiplier: 1.0000
Dilution: 1.0000

Signal 1: W001 A, Wavelength=254 nm

<table>
<thead>
<tr>
<th>Peak RetTime Type</th>
<th>Width</th>
<th>Area</th>
<th>Height</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.060</td>
<td>314.32</td>
<td>50.71</td>
<td>15.36</td>
</tr>
<tr>
<td>2</td>
<td>13.485</td>
<td>390.75</td>
<td>15.32</td>
<td>49.75</td>
</tr>
</tbody>
</table>

Totals: 785.3176 45.30581

Results obtained with enhanced integrator!

*** End of Report ***
Area Percent Report

Sorted By: Signal
Multiplier: 1.0000
Dilution: 1.0000

Signal 1: Wavelength=254 nm

Peak Ret.Time Type Width Area Height Area %

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8.235 EF</td>
<td>0.1980</td>
<td>126.84</td>
<td>153.2</td>
<td>9.9655</td>
</tr>
<tr>
<td>2</td>
<td>15.532 EN</td>
<td>0.3846</td>
<td>144.74</td>
<td>144.74</td>
<td>23.5539</td>
</tr>
</tbody>
</table>

Totals: 711.88628 33.61910

Results obtained with enhanced integrator!

*** End of Report ***
Data File: C:\HPChem\DATA\2H09-09Y2006248.D
Sample Name: QC-2-48

API-H, Buffer=95/5, 0.8 ml/min

Injection Date: 3/18/2009 2:39:09 PM
Sample Name: QC-2-48
Location: Vial 1

ACS Operator: WANG
ACS Method: C:\HPChem\METHODS\2012.M
Last changed: 3/18/2009 2:39:42 PM by WANG
(modified after loading)

Analysis Method: C:\HPChem\METHODS\2012.M
Last changed: 6/3/2009 10:00:52 AM by WANG
(modified after loading)

---

Signal 1: UV1 A, Wavelength=254 nm

Peak Ret.Time Type Width Area Height Area
# (min) (%) (mAU) (%) (mAU) %
---|---|---|---|---|---|---|---|
1 | 8.502 | EP | 0.1960 | 305.19985 | 23.67146 | 50.1377 |
2 | 10.400 | EMA | 0.4198 | 320.95027 | 11.15642 | 49.8623 |

Totals: 604.13226 34.82987

Results obtained with enhanced integrator!

*** End of Report ***
Injection Date: 3/18/2009 2:19:30 PM
Sample Name: QC-2-SE
ACS. Operator: WANG
ACS. Method: C:\HPChem\METHODS\2012.M
Last changed: 3/18/2009 2:19:19 PM by WANG
(Analyzed after loading)
Analysis Method: C:\HPChem\METHODS\2012.M
Last changed: 6/3/2009 10:02:53 PM by WANG
(modified after loading)

Area Percent Report

Signal: Wavelength = 254 nm

Peak Ret.Time Type Width Area Height Area
| 1 | 8.882 | HP | 0.2111 | 96.23420 | 7.05933 | 15.2166 |
| 2 | 16.327 | EN | 0.4310 | 442.17178 | 15.92053 | 51.7634 |

Totals: 539.42598 23.01447

Results obtained with enhanced integrator!

*** End of Report ***
Data File: C:\HPCHEM\DATA\2009-09\Y20096255.D
Sample Name: QC-2-6D

A3-N, H2-PrOH = 95/5, 0.8 ml/min

Injection Date: 3/19/2009 3:02:57 PM
Sample Name: QC-2-6D
Location: Vial 1

ACS Operator: GANG
ACS Method: C:\HPCHEM\1\METHODS\2012.M
Last changed: 3/19/2009 3:01:42 PM by GANG
(modified after loading)

Analysis Method: C:\HPCHEM\1\METHODS\2012.M
(modified after loading)

---

Graphical representation of a compound with the following data:

**Signal 1:** Wavelength=254 nm

**Peaks:**
- **Peak:** RetTime Type Width Area Height
  - **1:** 10.350 MIN 0.498 495.3878 15.2280 73.3025
  - **2:** 14.570 MIN 0.738 180.8454 3.4177 26.6375

**Totals:** 676.63135 18.64577

Results obtained with enhanced integrator!

*** End of Report ***

Page 1 of 1
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000

Signal 1: UV1 A, Wavelength=254 nm

<table>
<thead>
<tr>
<th>Peak Ret.Time Type</th>
<th>Width</th>
<th>Area</th>
<th>Height</th>
<th>mAU</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.698</td>
<td>0.1301</td>
<td>507.00674</td>
<td>60.17621</td>
<td>50.0718</td>
</tr>
<tr>
<td>2</td>
<td>5.570</td>
<td>0.1518</td>
<td>555.55234</td>
<td>50.47649</td>
<td>49.9252</td>
</tr>
</tbody>
</table>

Totals : 1012.5968 110.66245

Results obtained with enhanced integrator!

*** End of Report ***
Area Percent Report

Signal 1: Wavelength=254 nm

Peak Ret.Time Type Width Area Height Area

<table>
<thead>
<tr>
<th>#</th>
<th>name</th>
<th>value</th>
<th>value</th>
<th>value</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.546 VE</td>
<td>0.1247</td>
<td>229.83531</td>
<td>28.04944</td>
<td>37.3805</td>
</tr>
<tr>
<td>2</td>
<td>6.552 BF</td>
<td>0.1544</td>
<td>385.01619</td>
<td>30.59826</td>
<td>52.6195</td>
</tr>
</tbody>
</table>

Totals : 614.83550 66.59769

Results obtained with enhanced integrator!

*** End of Report ***
**Area Percent Report**

**Signal 1:** Wavelength=254 nm

<table>
<thead>
<tr>
<th>Peak Ret Time Type</th>
<th>Width</th>
<th>Area</th>
<th>Height</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.059</td>
<td>341.68459</td>
<td>16.24472</td>
<td>45.9241</td>
</tr>
<tr>
<td>2</td>
<td>11.270</td>
<td>358.40039</td>
<td>15.74572</td>
<td>55.0739</td>
</tr>
</tbody>
</table>

**Totals:** 728.16488 29.99044

Results obtained with enhanced integrator!

*** End of Report ***

---


---

S59
Area Percent Report

Signal 1: Wavelength=254 nm

<table>
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<tr>
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<th>Area</th>
<th>Height</th>
<th>Area</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>(mAU)</td>
<td>(mAU)</td>
<td>(%  )</td>
</tr>
<tr>
<td>1</td>
<td>9.164</td>
<td>84.99087</td>
<td>3.9102</td>
<td>8.912L</td>
</tr>
<tr>
<td>2</td>
<td>11.301</td>
<td>867.53253</td>
<td>51.0764</td>
<td>91.0829</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>952.43940</td>
<td>35.8866</td>
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</tbody>
</table>

Results obtained with enhanced integrator!

*** End of Report ***
Injection Date: 3/26/2009 9:44:03 AM
Sample Name: QC-2-11A
Ass. Creator: HANG
Ass. Method: C:\\HECHM1\METHODS\2012.M
Last changed: 3/26/2009 9:42:07 AM by HANG (modified after loading)
Analysis Method: C:\\HECHM1\METHODS\2012.M
Last changed: 6/3/2009 10:18:30 PM by HANG (modified after loading)

---

Signal 1: UV/Vis, Wavelength=254 nm

<table>
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<th>Peak RetTime Type</th>
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<th>Area</th>
<th>Height</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.384</td>
<td>197.77814</td>
<td>14.33195</td>
<td>45.4454</td>
</tr>
<tr>
<td>2</td>
<td>16.752</td>
<td>210.30051</td>
<td>7.46617</td>
<td>51.3396</td>
</tr>
</tbody>
</table>

Totals: 407.97875 217.9812

Results obtained with enhanced integrator!

---

*** End of Report ***

---

Sample Name: QC-2-11A

---

Area Percent Report

---

Sorted By: Signal
Multiplier: 1.0000
Dilution: 1.0000

---

Signal 1: UV/Vis, Wavelength=254 nm

<table>
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<tr>
<th>Peak RetTime Type</th>
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<th>Area</th>
<th>Height</th>
<th>Area</th>
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<tr>
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<td>9.384</td>
<td>197.77814</td>
<td>14.33195</td>
<td>45.4454</td>
</tr>
<tr>
<td>2</td>
<td>16.752</td>
<td>210.30051</td>
<td>7.46617</td>
<td>51.3396</td>
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</tbody>
</table>

Totals: 407.97875 217.9812

Results obtained with enhanced integrator!

---

*** End of Report ***

---


---

S61
Injection Date : 3/26/2009 9:23:27 AM
Sample Name : QC-2-10A
Accr. Operator : HANG
Accr. Method : C:\HPChem\1\METHODS\2010.M
(Accessed after loading)
Analysis Method : C:\HPChem\1\METHODS\2010.M
Last changed : 6/3/2009 15:19:02 PM by HANG
(Accessed after loading)

---

Area Percent Report
---

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000

Signal 1: Wavelength=254 nm

<table>
<thead>
<tr>
<th>Peak RetTime Type</th>
<th>Width</th>
<th>Area</th>
<th>Height</th>
<th>Area</th>
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</thead>
<tbody>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>9.359</td>
<td>EP</td>
<td>0.2278</td>
<td>108.82756</td>
</tr>
<tr>
<td>2</td>
<td>17.394</td>
<td>EN</td>
<td>0.4958</td>
<td>655.77965</td>
</tr>
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</table>

Totals : 714.60619 26.96280

Results obtained with enhanced integrator!
---

*** End of Report ***
Area Percent Report

Signal 1: UV C1 A, Wavelength=254 nm

<table>
<thead>
<tr>
<th>Peak Ret. Time</th>
<th>Width</th>
<th>Area</th>
<th>Height</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 10.740</td>
<td>0.255</td>
<td>255.63724</td>
<td>15.41972</td>
<td>50.0300</td>
</tr>
<tr>
<td>2 20.035</td>
<td>0.615</td>
<td>258.32901</td>
<td>6.51478</td>
<td>49.9700</td>
</tr>
</tbody>
</table>

Totals: 512.96625 223.0449

Results obtained with enhanced integrator!

*** End of Report ***
Signal 1: Wavelength=254 nm

Peak RetTime Type Width Area Height Area
-----|--------|----------|-----------|----------|-----------|-----------|----------|-----------|-----------|
1   10.594 EP  0.2471 97.4076 6.03333 15.5364
2   19.910 EN  0.3841 452.9417 10.5502 26.4926

Totals: 530.58933 16.6882

Results obtained with enhanced integrator!

*** End of Report ***
**Area Percent Report**

Sorted By: Signal
Multiplier: 1.0000
Dilution: 1.0000

Signal 1: UV1 A, Wavelength=254 nm

Peak Ret.Time Type Width Area Height Area
# (n/s) [min] mAU % [mAU] %
---|---|---|---|---|---|---|
1 6.882 EN 0.2545 357.00087 20.34197 50.0980
2 12.094 EN 0.4294 355.70999 12.49157 49.9020

Totals: 672.86996 32.83385

Results obtained with enhanced integrator!

*** End of Report ***
Injection Date: 3/26/2009 11:00:53 AM  
Sample Name: QC-2-100  
Location: Vial 1  
ACS. Creator: VANG  
ACS. Method: C:\HPChem\METHODS\2012.M  
Last changed: 3/26/2009 11:00:47 AM by VANG  
Analysis Method: C:\HPChem\METHODS\2012.M  
Last changed: 6/3/2009 10:25:00 PM by VANG  
(modified after loading)

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Sorted By: Signal
Multiplier: 1.0000
Dilution: 1.0000

Signal 1: UV1 A, Wavelength=254 nm

<table>
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<tr>
<th>Peak Ret Time Type</th>
<th>Width</th>
<th>Area</th>
<th>Height</th>
<th>Area</th>
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<tbody>
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<td></td>
</tr>
<tr>
<td>L</td>
<td>8.884</td>
<td>0.253</td>
<td>113.02757</td>
<td>6.75323</td>
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<tr>
<td>R</td>
<td>12.069</td>
<td>0.4231</td>
<td>434.50765</td>
<td>13.57793</td>
</tr>
</tbody>
</table>

Totals: 547.53816 22.77116

Results obtained with enhanced integrator!

---

*** End of Report ***

---