Palladium-Catalyzed Multicomponent Reaction of Alkynes, Carboxylic Acids, and Isocyanides: A Direct Approach to Captodative Olefins

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Supporting Information

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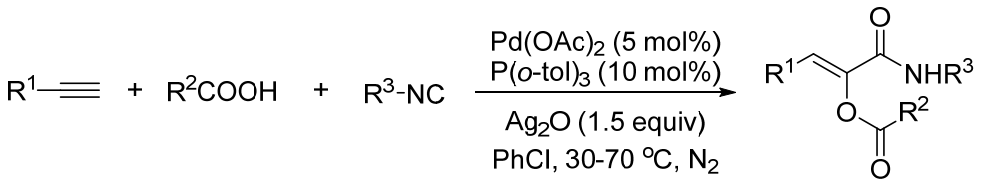
1. General Information

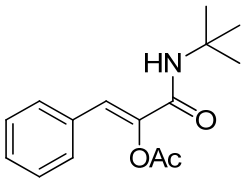
All reagents and metal catalysts were obtained from commercial sources without further purification, and commercially available solvents were purified before use. All new compounds were fully characterized. All melting points were taken on a WRS-1A or a WRS-1B Digital Melting Point Apparatus without correction. Infrared spectra were obtained using an AVATAR 370 FT-IR spectrometer. ^{1}H, ^{13}C, and ^{19}F NMR spectra were recorded with a Bruker AV-500 spectrometer operating at 500 MHz, 125 MHz and 470 MHz, respectively, with chemical shift values being reported in ppm relative to chloroform (δ = 7.26 ppm), acetone (δ = 2.05 ppm) or TMS (δ = 0.00 ppm) for ^{1}H NMR; chloroform (δ = 77.16 ppm) or acetone (δ = 29.84, 206.26 ppm) for ^{13}C NMR; and C_6F_6 (δ = -164.9 ppm) for ^{19}F NMR. Mass spectra and high resolution mass spectra were recorded with an Agilent 5975N using an Electron impact (EI) or Electrospray ionization (ESI) techniques. Silica gel plate GF254 was used for thin layer chromatography (TLC) and silica gel H or 300-400 mesh was used for flash column chromatography. Yields refer to chromatographically and spectroscopically pure compounds, unless otherwise indicated. Isocyanides are purchased commercially or prepared according to the literature reported procedures, for example, 1-isocyanoadamantane.[1]

2. Synthesis and Characterization of Compounds 4 and 5



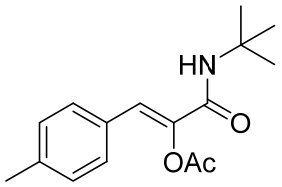
General Method A: To a test tube were added $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), isocyanide (0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL). The mixture was stirred at 30 ^oC under N_2 atmosphere. Alkyne (0.3 mmol) in PhCl (0.5 mL) was then added *via* syringe pump for 3 h. The reaction was kept stirring at 30 ^oC for another 2 h. Upon completion monitored by TLC, the reaction was cooled down to room temperature and filtered. The filtrate was washed with H_2O and brine. The aqueous phase was then extracted with ethyl acetate (3 × 10 mL) and the combined organic phase was dried over Na_2SO_4. After removal of the solvent under reduced pressure, the crude product was purified by flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate) to give the pure product.

General Method B: To a test tube were added $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), Ag_2O (104.3 mg, 0.45 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), carboxylic acid (0.9 mmol) and PhCl (1.0 mL). The mixture was stirred at 70 ^oC under N_2 atmosphere for 30 min. Then isocyanide (0.6 mmol) was added in one portion and alkyne (0.3mmol) in PhCl (0.5 mL) was added *via* syringe pump for 3 h. The mixture was kept stirring at 70 ^oC for another 12 h. Upon completion monitored by TLC, the reaction was cooled down to room temperature and filtered. The filtrate was washed with H_2O and brine. The aqueous phase was then extracted with ethyl acetate (3 × 10 mL) and the combined organic phase was dried over Na_2SO_4. After removal of the solvent under reduced pressure, the crude product was purified by flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate) to give the pure product.

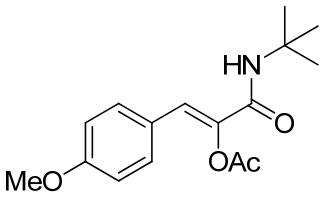


(*Z*)-3-(*tert*-Butylamino)-3-oxo-1-phenylprop-1-en-2-yl acetate (4a): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1a** (33 μL, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^{o}C for 3 h. The reaction was kept stirring at 30 ^{o}C for another 2 h, and the desired product **4a** was afforded as a white solid (65.4 mg, 83%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 130-131 ^{o}C. IR (KBr, cm^{-1}): 3351, 3060, 2970, 2927, 1766, 1636, 1546, 1449, 1363, 1294, 1200, 1113, 1041, 1008, 935, 876, 766, 687, 614; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.48 (d, *J* = 7.0 Hz, 2H), 7.39-7.28 (m, 3H), 7.11 (s, 1H), 5.83 (br, 1H), 2.29 (s, 3H), 1.41 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 167.9, 161.9, 140.7, 132.6, 129.4, 129.0, 128.7, 122.4, 51.6, 28.7, 20.9; LC-MS (ESI) m/z: 262 [M^+H]; HRMS (DART Positive) m/z: calcd for $C_{15}H_{20}NO_3$ [M^+H] 262.1438, found 262.1432.

1.0 mmol scale reaction for preparation of 4a: To a test tube were added $Pd(OAc)_2$ (11.2 mg, 0.05 mmol), tri(2-methylphenyl)phosphine (30.4 mg, 0.1 mmol), Ag_2O (347.6 mg, 1.5 mmol), ^{t}BuNC (227 μL, 2.0 mmol), AcOH (172 μL, 3.0 mmol) and PhCl (3.0 mL). The mixture was stirred at 30 ^{o}C under N_2 atmosphere. Phenylacetylene (110 μL, 1.0 mmol) in PhCl (2.0 mL) was then added *via* syringe pump for 12 h. The reaction was kept stirring at 30 ^{o}C for another 2.5 h. Upon completion monitored by TLC, the reaction was cooled down to room temperature and filtered. The filtrate was washed with saturated $NaHCO_3$ aqueous and brine. The aqueous phase was then extracted with ethyl acetate (3 × 20 mL) and the combined organic phase was dried over Na_2SO_4. After removal of the solvent under reduced pressure, the crude product was purified by flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate = 5:1) to give the pure product **4a** (180.4 mg, 69%).

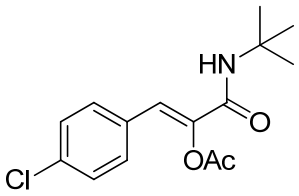


(*Z*)-3-(*tert*-Butylamino)-3-oxo-1-(*p*-tolyl)prop-1-en-2-yl acetate (4b): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1b** (38 μL, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^{o}C for 3 h. The reaction was kept stirring at 30 ^{o}C for another 2 h, and the desired product **4b** was afforded as a white solid (63.6 mg, 77%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 153-154 ^{o}C. IR (KBr, cm^{-1}): 3324, 2966, 2924, 1769, 1633, 1540, 1447, 1366, 1310, 1193, 1009, 937, 812; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.37 (d, J = 8.0 Hz, 2H), 7.16 (d, J = 8.0 Hz, 3H), 7.09 (s, 1H), 5.82 (br, 1H), 2.34 (s, 3H), 2.29 (s, 3H), 1.41 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 168.0, 162.1, 140.1, 139.4, 129.8, 129.6, 129.5, 122.6, 51.7, 28.8, 21.5, 21.0; LC-MS (ESI) m/z: 276 [M^+H]; HRMS (DART Positive) m/z: calcd for $C_{16}H_{22}NO_3$ [M^+H] 276.1594, found 276.1588.

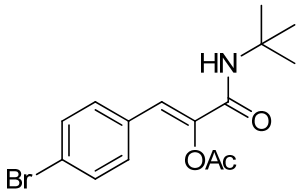


(*Z*)-3-(*tert*-Butylamino)-1-(4-methoxyphenyl)-3-oxoprop-1-en-2-yl acetate (4c): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1c** (39 μL, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^{o}C for 3 h. The reaction was kept stirring at 30 ^{o}C for another 2 h, and the desired product **4c** was afforded as a white solid (64.6 mg, 74%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 99-100 ^{o}C. IR (KBr, cm^{-1}): 3397, 2972, 2931, 1752, 1675, 1643, 1603, 1518, 1453, 1367, 1296, 1252, 1183,

1105, 1024, 831, 537; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.43 (d, J = 9.0 Hz, 2H), 7.07 (s, 1H), 6.87 (d, J = 9.0 Hz, 2H), 5.80 (br, 1H), 3.81 (s, 3H), 2.29 (s, 3H), 1.40 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 168.1, 162.2, 160.3, 139.2, 131.1, 125.3, 122.3, 114.3, 55.4, 51.6, 28.8, 21.0; LC-MS (ESI) m/z: 292 [M^+H]; HRMS (DART Positive) m/z: calcd for $C_{16}H_{22}NO_4$ [M^+H] 292.1543, found 292.1537.

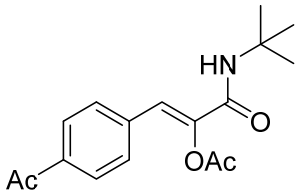


(*Z*)-3-(*tert*-Butylamino)-1-(4-chlorophenyl)-3-oxoprop-1-en-2-yl acetate (4d): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1d** (42 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 50 ^{o}C for 3 h. The reaction was kept stirring at 50 ^{o}C for another 2 h, and the desired product **4d** was afforded as a white solid (58.3 mg, 74%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 155-156 ^{o}C. IR (KBr, cm^{-1}): 3352, 3060, 2981, 1767, 1629, 1538, 1456, 1364, 1360, 1196, 1105, 1010, 939, 830, 753, 668, 584, 491; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.41 (d, J = 8.5 Hz, 2H), 7.33 (d, J = 8.5 Hz, 2H), 7.06 (s, 1H), 5.81 (br, 1H), 2.34 (s, 3H), 2.29 (s, 3H), 1.41 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 167.8, 161.7, 141.2, 135.0, 131.2, 130.7, 129.1, 121.3, 51.8, 28.8, 21.0; LC-MS (ESI) m/z: 318 [M^+Na]; HRMS (DART Positive) m/z: calcd for $C_{15}H_{19}NO_3Cl$ [M^+H] 296.1048, found 296.1046.

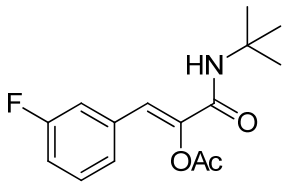


(*Z*)-1-(4-Bromophenyl)-3-(*tert*-butylamino)-3-oxoprop-1-en-2-yl acetate (4e): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol),

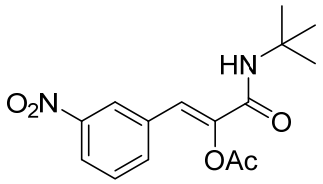
^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1e** (56 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 50 ^{o}C for 3 h. The reaction was kept stirring at 50 ^{o}C for another 2 h, and the desired product **4e** was afforded as a white solid (60.2 mg, 59%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 166-168 ^{o}C. IR (KBr, cm^{-1}): 3361, 2969, 1764, 1632, 1534, 1455, 1364, 1305, 1198, 1110, 1008, 939, 827, 580, 492; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.49 (d, J = 8.5 Hz, 2H), 7.34 (d, J = 8.5 Hz, 2H), 7.04 (s, 1H), 5.80 (br, 1H), 2.29 (s, 3H), 1.41 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 167.6, 161.6, 141.2, 132.0, 131.5, 130.8, 123.2, 121.3, 51.7, 28.6, 20.9; LC-MS (ESI) m/z: 340 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{15}H_{19}NO_3Br$ [M^{+}H] 340.0543, found 340.0542.



(*Z*)-1-(4-Acetylphenyl)-3-(*tert*-butylamino)-3-oxoprop-1-en-2-yl acetate (4f): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1f** (43 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 50 ^{o}C for 3 h. The reaction was kept stirring at 50 ^{o}C for another 2 h, and the desired product **4f** was afforded as a yellow solid (44.7 mg, 50%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 130-131 ^{o}C. IR (KBr, cm^{-1}): 3394, 2974, 2931, 1769, 1677, 1637, 1514, 1459, 1408, 1365, 1269, 1177, 1106, 1010,913, 829, 579; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.94 (d, J = 8.5 Hz, 2H), 7.56 (d, J = 8.5 Hz, 2H), 7.14 (s, 1H), 5.85 (br, 1H), 2.60 (s, 3H), 2.30 (s, 3H), 1.42 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 197.5, 167.6, 161.4, 142.2, 137.3, 136.9, 129.4, 128.6, 121.2, 51.8, 28.6, 26.6 20.9; LC-MS (ESI) m/z: 304 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{17}H_{22}NO_4$ [M^{+}H] 304.1543, found 304.1542.

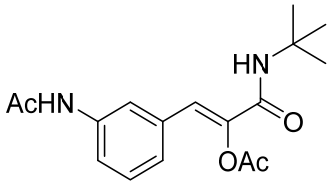


(*Z*)-3-(*tert*-Butylamino)-1-(3-fluorophenyl)-3-oxoprop-1-en-2-yl acetate (4g): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1g** (38 μL, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 50 ^{o}C for 3 h. The reaction was kept stirring at 50 ^{o}C for another 2 h, and the desired product **4g** was afforded as a white solid (50.3 mg, 60%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 123-125 ^{o}C. IR (KBr, cm^{-1}): 3329, 3073, 2988, 1772, 1630, 1544, 1456, 1420, 1365, 1314, 1228, 1194, 1109, 938, 839; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.37-7.29 (m, 1H), 7.25-7.17 (m, 2H), 7.06 (s, 1H), 7.04-6.99 (m, 1H), 5.82 (br, 1 H), 2.30 (s, 3H), 1.41 (s, 9H); ^{19}F ($CDCl_3$, 470 MHz): δ -112.5 (m, Ar-F); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 167.8, 162.9 (d, $^1J_{C\text{-}F}$ = 244.5 Hz), 161.7, 141.7, 134.8 (d, $^3J_{C\text{-}F}$ = 8.1 Hz), 130.3 (d, $^3J_{C\text{-}F}$ = 8.4 Hz), 125.5 (d, $^4J_{C\text{-}F}$ = 2.7 Hz), 121.3 (d, $^4J_{C\text{-}F}$ = 2.5 Hz), 116.1 (d, $^2J_{C\text{-}F}$ = 21.1 Hz), 115.8 (d, $^2J_{C\text{-}F}$ = 22.2 Hz), 51.9, 28.8, 21.0; LC-MS (ESI) m/z: 280 [M^+H]; HRMS (ESI) m/z: calcd for $C_{15}H_{19}NO_3F$ [M^+H] 280.1343, found 280.1346.

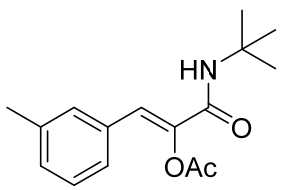


(*Z*)-3-(*tert*-Butylamino)-1-(3-nitrophenyl)-3-oxoprop-1-en-2-yl acetate (4h): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1h** (44 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 50 ^{o}C for 3 h. The reaction was kept stirring at 50 ^{o}C for another 2 h, and the desired product **4h** was afforded as a white solid (55.2 mg, 60%) after flash column chromatography

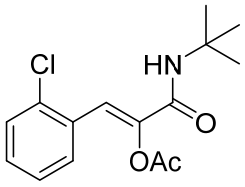
purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 84-85 ^{o}C. IR (KBr, cm^{-1}): 3739, 3412, 3281, 3064, 2972, 2928, 1768, 1632, 1533, 1447, 1355, 1206, 1118, 1007, 911, 675; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.43 (s, 1H), 8.16 (d, J = 8.0 Hz, 1H), 7.73 (d, J = 8.0 Hz, 1H), 7.54 (t, J = 8.0 Hz, 1H), 7.16 (s, 1H), 5.90 (br, 1H), 2.35 (s, 3H), 1.42 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 167.5, 161.1, 148.4, 142.7, 135.5, 134.3, 129.8, 123.5, 123.3, 119.8, 51.9, 28.6, 20.9; LC-MS (ESI) m/z: 307 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{15}H_{19}N_2O_5$ [M^{+}H] 307.1288, found 307.1290.



(*Z*)-1-(3-Acetamidophenyl)-3-(*tert*-butylamino)-3-oxoprop-1-en-2-yl acetate (4i): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1i** (48 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^{o}C for 3 h. The reaction was kept stirring at 30 ^{o}C for another 2 h, and the desired product **4i** was afforded as a white solid (45.7 mg, 48%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 103-104 ^{o}C. IR (KBr, cm^{-1}): 3306, 2973, 1768, 1678, 1533, 1439, 1368, 1309, 1194, 1109, 1011, 904, 789, 689, 533; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.92 (s, 1H), 7.80-7.65 (m, 1H), 7.31-7.20 (m, 2H), 7.18-7.11 (d, J = 7.0 Hz, 1H), 7.07 (s, 1H), 5.91 (br, 1H), 2.35 (s, 3H), 2.16 (s, 3H), 1.40 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 168.7, 168.3, 162.0, 140.7, 138.6, 133.2, 129.2, 125.5, 122.4, 120.2, 120.1 51.7, 28.7, 24.6, 20.9; LC-MS (ESI) m/z: 319 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{17}H_{23}N_2O_4$ [M^{+}H] 319.1652, found 319.1651.

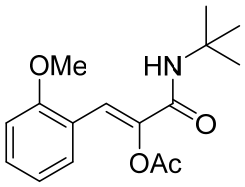


(Z)-3-(*tert*-Butylamino)-3-oxo-1-(m-tolyl)prop-1-en-2-yl acetate (4j): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1j** (36 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^{o}C for 3 h. The reaction was kept stirring at 30 ^{o}C for another 2 h, and the desired product **4j** was afforded as a white solid (69.1 mg, 84%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 116-117 ^{o}C. IR (KBr, cm^{-1}): 3316, 3059, 2967, 2920, 1766, 1634, 1541, 1479, 1442, 1364, 1312, 1193, 1113, 1008, 907, 784, 689; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.29 (d, J = 7.5 Hz, 1H), 7.27 (s, 1H), 7.24 (t, J = 7.5 Hz, 1H), 7.12 (d, J = 7.5 Hz, 1 H), 7.09 (s, 1H), 5.82 (br, 1H), 2.34 (s, 3H), 2.28 (s, 3H), 1.41 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 167.9, 161.9, 140.5, 138.3, 132.5, 130.2, 129.9, 128.6, 126.3, 122.6, 51.6, 28.7, 21.4, 20.9; LC-MS (ESI) m/z: 276 [M^+H]; HRMS (DART Positive) m/z: calcd for $C_{16}H_{22}NO_3$ [M^+H] 276.1594, found 276.1589.

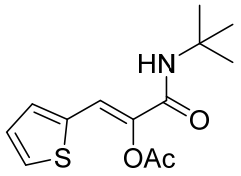


(Z)-3-(*tert*-Butylamino)-1-(2-chlorophenyl)-3-oxoprop-1-en-2-yl acetate (4k): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1k** (43 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 50 ^{o}C for 3 h. The reaction was kept stirring at 50 ^{o}C for another 2 h, and the desired product **4k** was afforded as a white solid (49.8 mg, 56%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 123-124 ^{o}C. IR (KBr, cm^{-1}): 3851, 3740, 3352, 3061, 2982, 1767, 1630, 1538, 1456, 1364, 1307, 1197, 1105, 939, 830, 585; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.56-7.50 (m, 1H), 7.43-7.38 (m, 1H), 7.32 (s, 1H), 7.26-7.21 (m, 2H), 5.86 (br, 1H), 2.21 (s, 3H), 1.42 (s, 9H); ^{13}C NMR

($CDCl_3$, 125 MHz): δ 167.8, 161.6, 142.2, 134.3, 131.1, 129.9, 129.8, 129.7, 126.7, 118.7, 51.8, 28.6, 20.8; LC-MS (ESI) m/z: 296 [M^+H]; HRMS (ESI) m/z: calcd for $C_{15}H_{19}NO_3Cl$ [M^+H] 296.1048, found 296.1048.

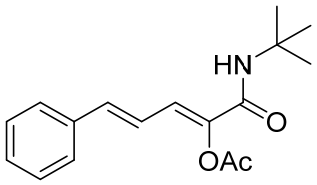


(*Z*)-3-(*tert*-Butylamino)-1-(2-methoxyphenyl)-3-oxoprop-1-en-2-yl acetate (4l): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1l** (41 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^{o}C for 3 h. The reaction was kept stirring at 30 ^{o}C for another 2 h, and the desired product **4l** was afforded as a white solid (79.0 mg, 90%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 109-111 ^{o}C. IR (KBr, cm^{-1}): 3326, 2967, 2929, 1774, 1664, 1631, 1524, 1491, 1452, 1399, 1365, 1295, 1254, 1180, 1106, 1018, 926, 751, 668; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.52 (dd, J = 8.0, 1.5 Hz, 1H), 7.39 (s, 1H), 7.32-7.26 (m, 1H), 6.92 (t, J = 7.5 Hz, 1H), 6.88 (d, J = 8.5 Hz, 1H), 5.84 (br, 1H), 3.84 (s, 3H), 2.24 (s, 3H), 1.41 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 168.1, 162.1, 157.5, 140.8, 130.4, 129.2, 121.5, 120.4, 117.0, 110.8, 55.5, 51.6, 28.7, 20.9; LC-MS (ESI) m/z: 314 [M^+Na]; HRMS (DART Positive) m/z: calcd for $C_{16}H_{22}NO_4$ [M^+H] 292.1543, found 292.1537.

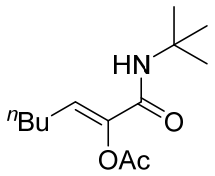


(*Z*)-3-(*tert*-Butylamino)-3-oxo-1-(thiophen-2-yl)prop-1-en-2-yl acetate (4m): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1m** (34

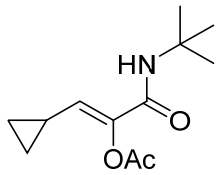
mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 50 ^{o}C for 3 h. The reaction was kept stirring at 50 ^{o}C for another 2 h, and the desired product **4m** was afforded as a yellow solid (35.3 mg, 44%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 156-157 ^{o}C. IR (KBr, cm^{-1}): 3320, 2972, 2925, 1769, 1624, 1533, 1446, 1365, 1301, 1177, 1099, 1042, 1007, 934, 858, 703; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.43-7.40 (m, 2H), 7.23 (d, J = 3.5 Hz, 1H), 7.05 (dd, J = 5.0, 4.0 Hz, 1H), 5.73 (br, 1H), 2.41 (s, 3H), 1.40 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 168.1, 161.4, 138.4, 134.8, 131.5, 129.2, 127.2, 117.0, 51.7, 28.7, 21.3; LC-MS (ESI) m/z: 268 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{13}H_{18}NO_3S$ [M^{+}H] 268.1002, found 268.1002.



(2*Z*,4*E*)-1-(*tert*-Butylamino)-1-oxo-5-phenylpenta-2,4-dien-2-yl acetate (4n): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1n** (38.4 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 50 ^{o}C for 3 h. The reaction was kept stirring at 50 ^{o}C for another 2 h, and the desired product **4n** was afforded as a white solid (48.8 mg, 57%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 114-115 ^{o}C. IR (KBr, cm^{-1}): 3276, 3058, 2968, 2926, 2766, 1767, 1645, 1543, 1454, 1363, 1327, 1300, 1201, 1103, 975, 746, 686; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.43 (d, J = 7.5 Hz, 2H), 7.37-7.31 (m, 2H), 7.31-7.27 (m, 1H), 6.96 (d, J = 11.0 Hz, 1 H), 6.85 (d, J = 15.5 Hz, 1H), 6.70 (dd, J = 16.0, 11.5 Hz, 1H), 5.73 (br, 1H), 2.35 (s, 3H), 1.40 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 168.2, 161.4, 140.2, 138.9, 136.3, 128.9, 128.7, 127.1, 123.5, 120.2, 51.6, 28.7, 20.6; LC-MS (ESI) m/z: 288 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{17}H_{22}NO_3$ [M^{+}H] 288.1594, found 288.1591.

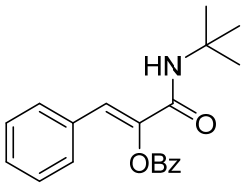


(*Z*)-1-(*tert*-Butylamino)-1-oxohept-2-en-2-yl acetate (4o): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)-phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1o** (35 μL, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^{o}C for 3 h. The reaction was kept stirring at 30 ^{o}C for another 2 h, and the desired product **4o** was afforded as a white solid (50.8 mg, 70%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 10:1). M.p. 78-80 ^{o}C. IR (KBr, cm^{-1}): 3063, 2962, 2870, 1764, 1534, 1540, 1458, 1368, 1315, 1211, 1150, 1089, 942; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 6.31 (t, J = 7.5 Hz, 1H), 5.67 (br, 1H), 2.25 (s, 3H), 2.01 (q, J = 7.0 Hz, 2H), 1.43-1.30 (m, 13H), 0.89 (t, J = 7.5 Hz, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 168.0, 161.3, 141.1, 126.2, 51.4, 30.3, 28.7, 25.8, 22.3, 20.5, 13.8; LC-MS (ESI) m/z: 242 [M$^+$H]; HRMS (ESI) m/z: calcd for $C_{13}H_{24}NO_3$ [M$^+$H] 242.1751, found 242.1750.

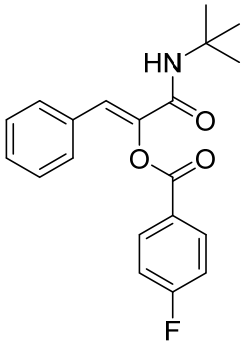


(*Z*)-3-(*tert*-Butylamino)-1-cyclopropyl-3-oxoprop-1-en-2-yl acetate (4p): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), ^{t}BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), **1p** (26 μL, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^{o}C for 3 h. The reaction was kept stirring at 30 ^{o}C for another 2 h, and the desired product **4p** was afforded as a white solid (45.6 mg, 67%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 131-132 ^{o}C. IR (KBr, cm^{-1}): 3298, 3065, 2981, 1765, 1629, 1543, 1449, 1370, 1317, 1217, 1099, 967, 879; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 5.82 (d, J = 11.0 Hz, 1H), 5.63 (br, 1H), 2.28 (s, 3H),

1.43-1.30 (m, 10H), 0.92-0.87 (m, 2H), 0.63-0.57 (m, 2H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 168.1, 161.3, 140.5, 131.5, 51.4, 28.8, 20.7, 9.5, 8.0; LC-MS (ESI) m/z: 226 [M^+H]; HRMS (ESI) m/z: calcd for $C_{12}H_{20}NO_3$ [M^+H] 226.1438, found 226.1436.

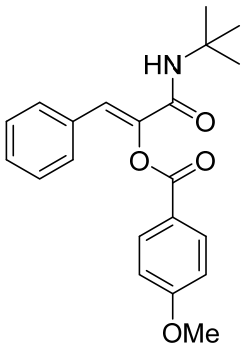


(*Z*)-3-(*tert*-Butylamino)-3-oxo-1-phenylprop-1-en-2-yl benzoate (5a): Following the *General Method B*, the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), Ag_2O (104.3 mg, 0.45 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), benzoic acid (110 mg, 0.9 mmol) and PhCl (1.0 mL) was stirred at 70 ^{o}C under N_2 atmosphere for 30 min. Then ^{t}BuNC (68 μL, 0.6 mmol) was added in one portion and phenylacetylene (33 μL, 0.3mmol) in PhCl (0.5 mL) was added *via* syringe pump for 3 h. The mixture was kept stirring at 70 ^{o}C for another 12 h and afforded the desired product **5a** as a white solid (80.0 mg, 82%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 145-146 ^{o}C. IR (KBr, cm^{-1}): 3324, 3067, 2970, 1743, 1637, 1546, 1452, 1314, 1251, 1119, 1056, 1022, 910, 756, 700; ^{1}H NMR (Acetone, 500 MHz): δ 8.18 (d, J = 7.5 Hz, 2H), 7.75 (t, J = 7.5 Hz, 1H), 7.66-7.57 (m, 4H), 7.36-7.26 (m, 3H), 7.17 (s, 1H), 7.08 (br, 1H), 1.38 (s, 9H); ^{13}C NMR (Acetone, 125 MHz): δ 164.6, 162.6, 142.8, 134.9, 133.9, 131.0, 130.3, 130.0, 129.8, 129.7, 129.6, 122.1, 52.1, 28.9; LC-MS (ESI) m/z: 324 [M^+H]; HRMS (DART Positive) m/z: calcd for $C_{20}H_{22}NO_3$ [M^+H] 324.1594, found 324.1587.



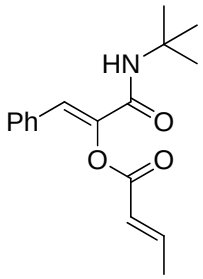
(*Z*)-3-(*tert*-Butylamino)-3-oxo-1-phenylprop-1-en-2-yl 4-fluorobenzoate (5b): Following the *General Method B*, the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol),

Ag_2O (104.3 mg, 0.45 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), 4-fluorobenzoic acid (126 mg, 0.9 mmol) and PhCl (1.0 mL) was stirred at 70 ^oC under N_2 atmosphere for 30 min. Then ^{t}BuNC (68 μL, 0.6 mmol) was added in one portion and phenylacetylene (33 μL, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump for 3 h. The mixture was kept stirring at 70 ^oC for another 12 h and afforded the desired product **5b** as a white solid (87.9 mg, 86%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 128-130 ^oC. IR (KBr, cm^{-1}): 3326, 3063, 2971, 1744, 1633, 1604, 1537, 1511, 1453, 1393, 1363, 1300, 1251, 1117, 1059, 761; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.24-8.19 (m, 2H), 7.53-7.45 (m, 2H), 7.32-7.26 (m, 3H), 7.25-7.17 (m, 3H), 5.85 (br, 1H), 1.40 (s, 9H); ^{19}F ($CDCl_3$, 470 MHz): δ -103.0 (m, Ar-F); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 167.5, 165.5, 162.7 (d, $^1J_{C\text{-}F}$ = 119.0 Hz), 140.6, 133.0 (d, $^3J_{C\text{-}F}$ = 9.0 Hz), 132.4, 129.5, 129.1, 128.7, 124.7 (d, $^4J_{C\text{-}F}$ = 3.0 Hz), 122.8, 116.3 (d, $^2J_{C\text{-}F}$ = 22.0 Hz), 51.7, 28.7; LC-MS (ESI) m/z: 342 [M^+H]; HRMS (ESI) m/z: calcd for $C_{20}H_{21}NO_3F$ [M^+H] 342.1500, found 342.1500.

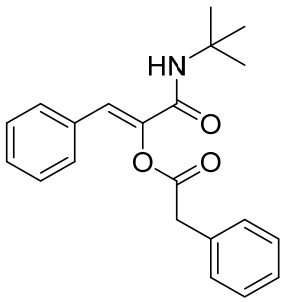


(*Z*)-3-(*tert*-Butylamino)-3-oxo-1-phenylprop-1-en-2-yl 4-methoxybenzoate (5c): Following the *General Method B*, the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), Ag_2O (104.3 mg, 0.45 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), 4-methoxybenzoic acid (137 mg, 0.9 mmol) and PhCl (1.0 mL) was stirred at 70 ^oC under N_2 atmosphere for 30 min. Then ^{t}BuNC (68 μL, 0.6 mmol) was added in one portion and phenylacetylene (33 μL, 0.3mmol) in PhCl (0.5 mL) was added *via* syringe pump for 3 h. The mixture was kept stirring at 70 ^oC for another 12 h and afforded the desired product **5c** as a white solid (72.8 mg, 68%) after flash column

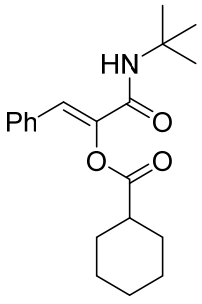
chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 145-146 ^{o}C. IR (KBr, cm^{-1}): 3740, 3422, 3059, 2972, 2923, 2835, 1740, 1673, 1637, 1602, 1510, 1452, 1363, 1249, 1169, 1104, 1042, 1006, 844, 760, 688, 558, 452; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.15 (d, J = 9.0 Hz, 2H), 7.53-7.48 (m, 2H), 7.29-7.25 (m, 3H), 7.01 (d, J = 9.0 Hz, 2H), 5.89 (br, 1H), 3.91 (s, 3H), 1.39 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 164.4, 163.3, 162.0, 140.5, 132.6, 132.5, 129.5, 129.0, 128.7, 122.9, 120.6, 114.3, 55.6, 51.6, 28.7; LC-MS (ESI) m/z: 354 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{21}H_{24}NO_4$ [M^{+}H] 354.1700, found 354.1700.



(*Z*)-3-(*tert*-Butylamino)-3-oxo-1-phenylprop-1-en-2-yl (*E*)-but-2-enoate (5d): Following the *General Method B*, the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), Ag_2O (104.3 mg, 0.45 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), (*E*)-but-2-enoic acid (77.5 mg, 0.9 mmol) and PhCl (1.0 mL) was stirred at 70 ^{o}C under N_2 atmosphere for 30 min. Then ^{t}BuNC (68 μL, 0.6 mmol) was added in one portion and phenylacetylene (33 μL, 0.3mmol) in PhCl (0.5 mL) was added *via* syringe pump for 3 h. The mixture was kept stirring at 70 ^{o}C for another 12 h and afforded the desired product **5d** as a white solid (62.6 mg, 73%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 120-121 ^{o}C. IR (KBr, cm^{-1}): 3472, 3314, 3065, 2966, 2872, 2771, 1747, 1640, 1546, 1448, 1389, 1365, 1316, 1225, 1151, 980, 930, 755, 685; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.47 (d, J = 7.0 Hz, 2H), 7.35-7.26 (m, 3H), 7.25-7.17 (m, 2H), 6.07 (dd, J = 15.5, 1.5 Hz, 1H), 5.83 (br, 1H), 1.99 (dd, J = 7.0, 1.5 Hz, 3H), 1.40 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 163.1, 161.9, 149.0, 140.3, 132.6, 129.5, 129.0, 128.6, 122.7, 120.9, 51.5, 28.7, 18.5; LC-MS (ESI) m/z: 288 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{17}H_{22}NO_3$ [M^{+}H] 288.1594, found 288.1593.

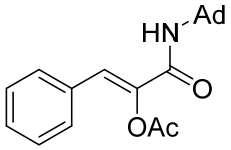


(*Z*)-3-(*tert*-Butylamino)-3-oxo-1-phenylprop-1-en-2-yl 2-phenylacetate (5e): Following the *General Method B*, the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), Ag_2O (104.3 mg, 0.45 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), 2-phenylacetic acid (122 mg, 0.9 mmol) and PhCl (1.0 mL) was stirred at 70 ^oC under N_2 atmosphere for 30 min. Then ^{t}BuNC (68 μL, 0.6 mmol) was added in one portion and phenylacetylene (33 μL, 0.3mmol) in PhCl (0.5 mL) was added *via* syringe pump for 3 h. The mixture was kept stirring at 70 ^oC for another 12 h and afforded the desired product **5e** as a white solid (48.1 mg, 47%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 132-134 ^oC. IR (KBr, cm^{-1}): 3853, 3742, 3412, 3298, 3064, 2972, 1762, 1700, 1624, 1535, 1448, 1358, 1307, 1216, 1104, 933, 763, 690, 517; ^1H NMR ($CDCl_3$, 500 MHz): δ 7.43-7.32 (m, 7H), 7.31-7.27 (m, 3H), 7.21 (s, 1H), 5.44 (br, 1H), 3.82 (s, 2H), 1.21 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 167.9, 161.4, 140.1, 132.7, 132.5, 129.4, 129.3, 129.2, 129.0, 128.7, 127.9, 123.1, 51.4, 41.7, 28.4; LC-MS (ESI) m/z: 338 [M^+H]; HRMS (ESI) m/z: calcd for $C_{21}H_{23}NO_3$ [M^+H] 338.1751, found 338.1738.



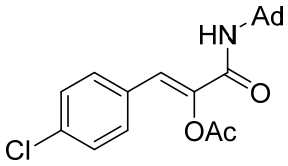
(*Z*)-3-(*tert*-Butylamino)-3-oxo-1-phenylprop-1-en-2-yl cyclohexanecarboxylate (5f): Following the *General Method B*, the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), Ag_2O (104.3 mg, 0.45 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), cyclohexanecarboxylic acid (115 mg, 0.9 mmol) and PhCl (1.0 mL) was

stirred at 70 °C under N_2 atmosphere for 30 min. Then ^{t}BuNC (68 μL, 0.6 mmol) was added in one portion and phenylacetylene (33 μL, 0.3mmol) in PhCl (0.5 mL) was added *via* syringe pump for 3 h. The mixture was kept stirring at 70 °C for another 12 h and afforded the desired product **5f** as a white solid (64.7 mg, 65%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 79-80 °C. IR (KBr, cm^{-1}): 3317, 3063, 2935, 2859, 1751, 1631, 1541, 1450, 1360, 1311, 1224, 1164, 1116, 1018, 929, 754, 692; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.46 (d, *J* = 7.0 Hz, 2H), 7.34 (t, *J* = 7.0 Hz, 2H), 7.29 (t, *J* = 7.0 Hz, 1H), 7.17 (s, 1H), 5.80 (br, 1H), 2.64-2.55 (m, 1H), 2.07-1.97 (m, 2H), 1.87-1.77 (m, 2H), 1.74-1.65 (m, 1H), 1.60-1.50 (m, 2H), 1.49-1.19 (m, 13H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 172.6, 161.9, 140.5, 132.7 129.4, 128.9, 128.6, 122.6, 51.5, 43.2, 28.9, 28.7, 25.6, 25.3; LC-MS (ESI) m/z 330 [M^+H]; HRMS (ESI) m/z calcd for $C_{20}H_{28}NO_3$ [M^+H] 330.2064, found 330.2065.

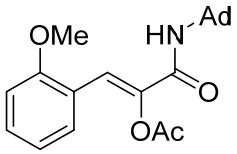


(*Z*)-3-(((3*r*)-Adamantan-1-yl)amino)-3-oxo-1-phenylprop-1-en-2-ylmacetate (5g): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), AdNC (96.7 mg, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), phenylacetylene (33 μL, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 °C for 3 h. The reaction was kept stirring at 30 °C for another 2 h, and the desired product **5g** was afforded as a yellow solid (79.4 mg, 79%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 169-171 °C. IR (KBr, cm^{-1}): 3333, 3064, 2907, 2850, 2658, 1773, 1627, 1535, 1447, 1364, 1305, 1250, 1186, 1130, 1101, 1003, 918, 768, 691, 596, 475; ^{1}H NMR ($CDCl_3$, 500 MHz): *δ* 7.47 (d, *J* = 7.5 Hz, 2H), 7.35(t, *J* = 7.0 Hz, 2H), 7.31 (t, *J* = 7.0 Hz, 1H), 7.09 (s, 1H), 5.69 (br, 1H), 2.29 (s, 3H), 2.11 (s, 3H), 2.06 (s, 6H), 1.70 (s, 6H); ^{13}C NMR ($CDCl_3$, 125 MHz): *δ* 167.9, 161.5, 140.8, 132.6, 129.4, 129.0, 128.7, 122.3, 52.3, 41.5, 36.3, 29.4, 20.9; LC-MS (ESI) m/z: 362 [M^+Na]; HRMS (ESI) m/z: calcd

for $C_{21}H_{26}NO_3$ [M^+H] 340.1907, found 340.1909.

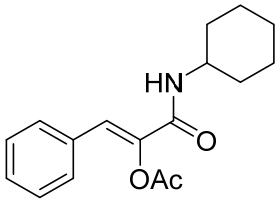


(*Z*)-3-(((3*r*)-Adamantan-1-yl)amino)-1-(4-chlorophenyl)-3-oxoprop-1-en-2-yl acetate (5h): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), AdNC (96.7 mg, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), 1-chloro-4-ethynylbenzene (42 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^oC for 3 h. The reaction was kept stirring at 30 ^oC for another 2 h, and the desired product **5h** was afforded as a white solid (67.1 mg, 60%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 159-160 ^oC. IR (KBr, cm^{-1}): 3395, 2910, 2854, 1764, 1640, 1448, 1363, 1302, 1246, 1196, 1134, 1091, 1008, 824, 620; ^1H NMR ($CDCl_3$, 500 MHz): δ 7.43 (d, J = 8.5 Hz, 2H), 7.35 (d, J = 8.5 Hz, 2H), 7.06 (s, 1H), 5.70 (br, 1H), 2.31 (s, 3H), 2.13 (s, 3H), 2.07 (s, 6H), 1.72 (s, 6H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 167.7, 161.2, 141.1, 134.8, 131.1, 130.5, 129.0, 121.1, 52.4, 41.4, 36.3, 29.4, 20.9; LC-MS (ESI) m/z: 374 [M^+H]; HRMS (ESI) m/z: calcd for $C_{21}H_{25}NO_3Cl$ [M^+H] 374.1517, found 374.1507.

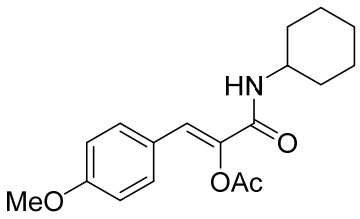


(*Z*)-3-(((3*r*)-Adamantan-1-yl)amino)-1-(2-methoxyphenyl)-3-oxoprop-1-en-2-yl acetate (5i): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), AdNC (96.7 mg, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), 1-ethynyl-2-methoxybenzene (41.0 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^oC for 3 h. The reaction was kept stirring at 30 ^oC for another 2 h, and the desired product **5i** was afforded as a white solid (68.0 mg, 61%) after flash column chromatography purification (eluent: petroleum ether/ether acetate =

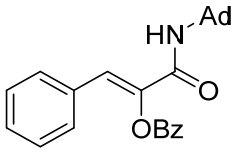
5:1). M.p. 165-167 ^{o}C. IR (KBr, cm^{-1}): 3439, 3327, 3064, 2909, 2852, 1774, 1668, 1634, 1531, 1485, 1443, 1368, 1300, 1249, 1167, 1085, 1016, 758; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.52 (d, J = 7.5 Hz, 2H), 7.38 (s, 1H), 7.28 (t, J = 7.5 Hz, 1H), 6.92 (t, J = 7.0 Hz, 1H), 6.88 (d, J = 8.5 Hz, 1H), 5.70 (br, 1H), 3.83 (s, 3H), 2.24 (s, 3H), 2.10 (s, 3H), 2.07 (s, 6H), 1.70 (s, 6H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 168.1, 161.7, 157.5, 140.8, 130.3, 129.2, 121.6, 120.4, 116.8, 110.8, 55.6, 52.2, 41.5, 36.3, 29.5, 20.9; LC-MS (ESI) m/z: 370 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{22}H_{28}NO_4$ [M^{+}H] 370.2013, found 370.1997.



(*Z*)-3-(Cyclohexylamino)-3-oxo-1-phenylprop-1-en-2-yl acetate (5j): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), isocyanocyclohexane (65 mg, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), phenylacetylene (33 μL, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^{o}C for 3 h. The reaction was kept stirring at 30 ^{o}C for another 2 h, and the desired product **5j** was afforded as a yellow solid (38.3 mg, 44%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 146-147 ^{o}C. IR (KBr, cm^{-1}): 3908, 3328, 3092, 3032, 2935, 2854, 2665, 1765, 1667, 1633, 1530, 1445, 1371, 1325, 1289, 1255, 1190, 1121, 1076, 1011, 894, 759, 685; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.49 (d, J = 7.0 Hz, 2H), 7.36 (t, J = 7.0 Hz, 2H), 7.34-7.30 (m, 1H), 7.16 (s, 1H), 5.84 (d, J = 8.0 Hz, 1H), 3.92-3.82 (m, 1H), 2.30 (s, 3H), 2.01-1.94 (m , 2H), 1.76-1.69 (m, 2H), 1.67-1.60 (m, 1H), 1.46-1.35 (m, 2H), 1.25-1.14 (m, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 167.9, 161.7, 140.2, 132.5, 129.4, 129.1, 128.7, 123.1, 48.6, 33.0, 25.5, 24.8, 20.9; LC-MS (ESI) m/z: 288 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{17}H_{22}NO_3$ [M^{+}H] 288.1594, found 288.1595.

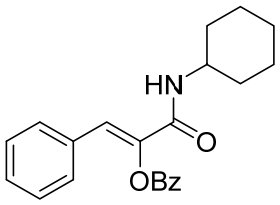


(*Z*)-3-(Cyclohexylamino)-1-(2-methoxyphenyl)-3-oxoprop-1-en-2-yl acetate (5k): Following the *General Method A*, to the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), Ag_2O (104.3 mg, 0.45 mmol), isocyanocyclohexane (68.0 mg, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol) and PhCl (1.0 mL), 1-ethynyl-4-methoxybenzene (40.0 mg, 0.3 mmol) in PhCl (0.5 mL) was added *via* syringe pump at 30 ^oC for 3 h. The reaction was kept stirring at 30 ^oC for another 2 h, and the desired product **5k** was afforded as a white solid (50.4 mg, 53%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 185-186 ^oC. IR (KBr, cm^{-1}): 3305, 3041, 2931, 2850, 1754, 1619, 1524, 1452, 1377, 1337, 1252, 1213, 1175, 1126, 1082, 1025, 951, 879, 832, 679, 531; ^1H NMR ($CDCl_3$, 500 MHz): δ 7.45 (d, J = 8.8 Hz, 2H), 7.12 (s, 1H), 6.88 (d, J = 8.8 Hz, 2H), 5.83 (d, J = 7.7 Hz, 1H), 3.90-3.83 (m, 1H), 3.81 (s, 3H), 2.30 (s, 3H), 1.97-1.94 (m, 2H), 1.73-1.68 (m, 4H), 1.41-1.38 (m, 2H), 1.19-1.17 (m, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 168.1, 162.0, 160.3, 138.7, 131.2, 125.2, 123.0, 114.3, 55.4, 48.6, 33.2, 25.6, 24.9, 21.0; LC-MS (ESI) m/z: 318 [M^+H]; HRMS (ESI) m/z: calcd for $C_{18}H_{24}NO_4$ [M^+H] 318.1700, found 318.1689



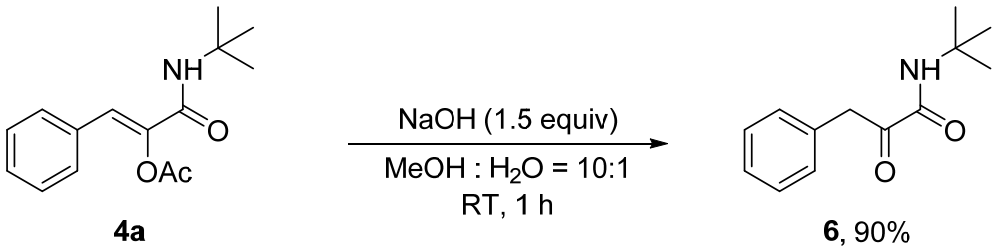
(*Z*)-3-(((3*r*)-Adamantan-1-yl)amino)-3-oxo-1-phenylprop-1-en-2-yl benzoate (5l): Following the *General Method B*, the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), Ag_2O (104.3 mg, 0.45 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), benzoic acid (110.0 mg, 0.9 mmol) and PhCl (1.0 mL) was stirred at 70 ^oC under N_2 atmosphere for 30 min. Then AdNC (96.7 mg, 0.6 mmol) was added in one portion and phenylacetylene (33 μL, 0.3mmol) in PhCl (0.5 mL) was added *via* syringe pump for 3 h. The mixture was kept stirring at 70 ^oC for another 12 h and afforded the

desired product **5l** as a white solid (88.1 mg, 73%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 164-166 ^{o}C. IR (KBr, cm^{-1}): 3268, 3057, 2907, 2852, 1732, 1630, 1538, 1448, 1354, 1308, 1248, 1099, 1055, 700; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.19 (d, J = 7.5 Hz, 2H), 7.68 (t, J = 7.5 Hz, 1H), 7.54 (t, J = 8.0 Hz, 2H), 7.52-7.49 (m, 2H), 7.29-7.25 (m, 4H), 5.75 (br, 1H), 2.08 (s, 3H), 2.04 (s, 6H), 1.68 (s, 6H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 163.6, 161.4, 140.5, 134.2, 132.5, 130.3, 129.5, 129.0, 128.9, 128.7, 128.4, 122.9, 52.3, 41.4, 36.3, 29.4; LC-MS (ESI) m/z: 402 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{26}H_{28}NO_3$ [M^{+}H] 402.2064, found 402.2046.



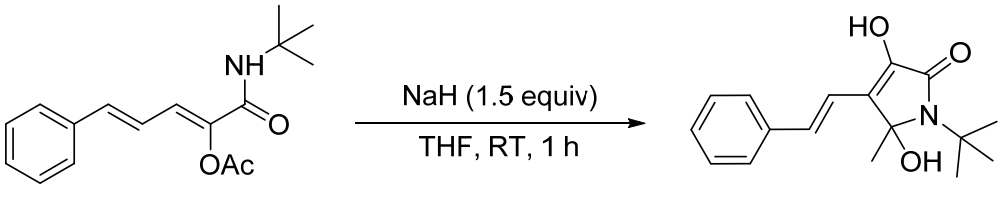
(*Z*)-3-(Cyclohexylamino)-3-oxo-1-phenylprop-1-en-2-yl benzoate (5m): Following the *General Method B*, the mixture of $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), Ag_2O (104.3 mg, 0.45 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), benzoic acid (110.0 mg, 0.9 mmol) and PhCl (1.0 mL) was stirred at 70 ^{o}C under N_2 atmosphere for 30 min. Then isocyanocyclohexane (65.0 mg, 0.6 mmol) was added in one portion and phenylacetylene (33.0 μL, 0.3mmol) in PhCl (0.5 mL) was added *via* syringe pump for 3 h. The mixture was kept stirring at 70 ^{o}C for another 12 h and afforded the desired product **5m** as a white solid (77.0 mg, 74%) after flash column chromatography purification (eluent: petroleum ether/ether acetate = 5:1). M.p. 158-159 ^{o}C. IR (KBr, cm^{-1}): 3739, 3306, 3062, 2927, 2853, 1743, 1631, 1533, 1449, 1329, 1248, 1133, 1084, 1050, 923, 754, 695; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.20 (d, J = 7.5 Hz, 2H), 7.70 (t, J = 7.5 Hz, 1H), 7.60-7.48 (m, 4H), 7.34 (s, 1H), 7.31-7.25 (m, 3H), 5.89 (d, J = 7.0 Hz, 1H), 3.96-3.83 (m, 1H), 1.99-1.92(m, 2H), 1.73-1.64 (m, 2H), 1.64-1.55 (m, 2H), 1.44-1.31 (m, 2H), 1.20-1.08 (m, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 163.6, 161.7, 140.0, 134.3, 132.4, 130.3, 129.6, 129.1, 129.0, 128.7, 128.4, 123.7, 48.6, 32.9, 25.5, 24.7; LC-MS (ESI) m/z: 350 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{22}H_{24}NO_3$ [M^{+}H] 350.1751, found 350.1742.

3. Further Transformation of Compounds 4a and 4n



4a **6**, 90%

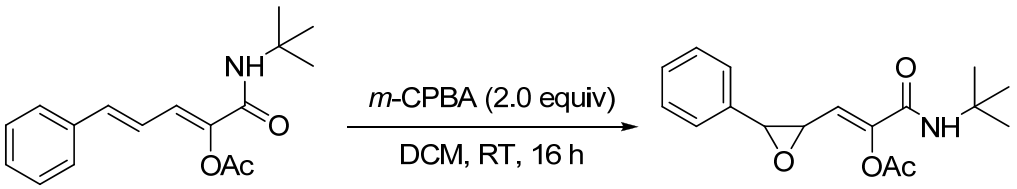
***N*-(*tert*-Butyl)-2-oxo-3-phenylpropanamide (6):**[2] To a test tube were added **4a** (26.1 mg, 0.1 mmol), NaOH (6.0 mg, 0.15 mmol), MeOH/H_2O (10:1, 1.10 mL). The mixture was stirred at room temperature for 1 h. Upon the completion of the reaction, the solvent was removed under reduced pressure. The residue was diluted with ethyl acetate and washed with brine. The organic phase was then dried over anhydrous Na_2SO_4. After removal of the solvent, the crude product was purified by flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate = 5:1) to give the pure compound **6** as a white solid (21.7 mg, 90%). M.p. 47-48 ^oC. IR (KBr, cm^{-1}): 3387, 2925, 2859, 1685, 1604, 1520, 1459, 1402, 1364, 1224, 1084, 825, 705, 603. ^1H NMR ($CDCl_3$, 500 MHz): δ 7.33 (t, J = 7.5 Hz, 2H), 7.29-7.22 (m, 3H), 6.82 (br, 1H), 4.20 (s, 2H), 1.38 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 197.1, 159.2, 133.0, 129.8, 128.6, 127.1, 51.4, 42.5, 28.3; LC-MS (ESI) m/z: 220 [M^+H].



4n **7**, 57%

(*E*)-1-(*tert*-Butyl)-3,5-dihydroxy-5-methyl-4-styryl-1,5-dihydro-2*H*-pyrrol-2-one (7): To a test tube were added **4n** (86.0 mg, 0.3 mmol), NaH (60% dispersion in mineral oil, 18 mg, 0.45 mmol) and THF (3.0 mL). The mixture was stirred at room temperature for 1 h under N_2 atmosphere. Upon the completion of the reaction, the solvent was removed under reduced pressure. The residue was diluted with ethyl acetate and washed with 5% NH_4Cl aqueous and brine. The organic phase was then dried over anhydrous Na_2SO_4. After removal of the solvent, the crude product was

purified by flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate = 2:1) to give the pure compound **7** as a white solid (49.0 mg, 57%). M.p. 69-70 ^{o}C. IR (KBr, cm^{-1}): 3661, 3620, 3172, 2923, 2858, 1665, 1525, 1365, 1079, 976, 926, 784, 688; ^{1}H NMR (Acetone-d$_6$, 500 MHz): δ 8.68 (br, 1H), 7.54 (d, J = 7.5 Hz, 2H), 7.35 (t, J = 7.5 Hz, 2H), 7.25 (t, J = 7.5 Hz, 1H), 7.19 (d, J = 16.5 Hz, 1H), 6.88 (d, J = 16.5 Hz, 1H), 5.03 (br, 1H), 1.80 (s, 3H), 1.62 (s, 9H); ^{13}C NMR (Acetone-d$_6$, 125 MHz): δ 166.2, 143.3, 138.8, 133.0, 129.6, 128.4, 127.0, 123.7, 117.7, 91.0, 56.6, 29.3, 27.3; LC-MS (ESI) *m/z*: 288 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{17}H_{22}NO_3$ [M^{+}H] 288.1594, found 288.1593.

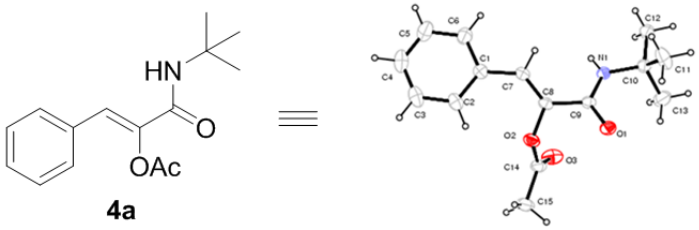


4n **8**, 64%

(*Z*)-3-(*tert*-Butylamino)-3-oxo-1-(3-phenyloxiran-2-yl)prop-1-en-2-yl acetate (8)：

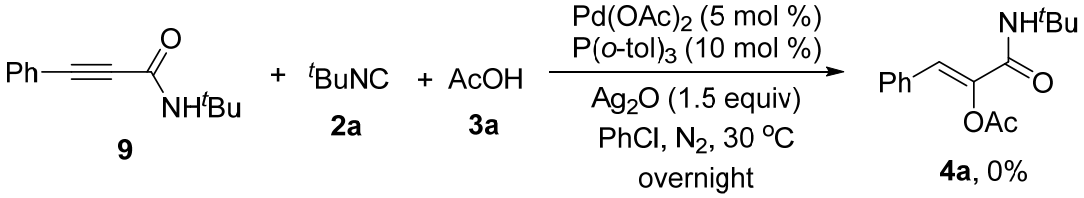
To a test tube were added **4n** (57.4 mg, 0.2 mmol), *m*-CPBA (70% purity, 98.6 mg, 0.4 mmol) and DCM (2.0 ml). The mixture was stirred at room temperature for 16 h. Upon the completion of the reaction, the mixture was filtered. The filtrate was concentrated and purified by flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate = 5:1) to give the pure compound **8** as a white solid (38.9 mg, 64%). M.p. 149-151 ^{o}C. IR (KBr, cm^{-1}): 3291, 3068, 2970, 2924, 2859, 1766, 1637, 1547, 1458, 1366, 1320, 1213, 1165, 1088, 1012, 947, 895, 853, 756, 696; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.39-7.32 (m, 3H), 7.27 (d, J = 6.5 Hz, 2H), 6.08 (d, J = 7.5 Hz, 1H), 5.75 (br, 1H), 3.89 (d, J = 1.5 Hz, 1H), 3.45 (dd, J = 8.0, 2.0 Hz, 1H), 2.23 (s, 3H), 1.38 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 167.9, 160.4, 145.2, 136.1, 128.6, 128.5, 125.5, 121.1, 59.6, 57.2, 51.7, 28.6, 20.5; LC-MS (ESI) *m/z*: 304 [M^{+}H]; HRMS (ESI) m/z: calcd for $C_{17}H_{22}NO_4$ [M^{+}H] 304.1543, found 304.1539.

4. X-Ray Crystallographic Analysis for Compound 4a

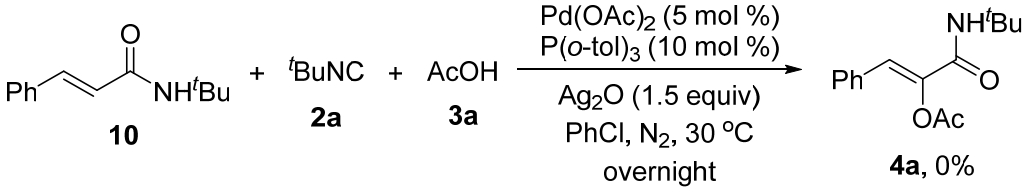


Crystallographic data for compound **4a**: $C_{15}H_{19}NO_3$, M = 261.31, Orthorhombic F 2dd (No. 43), a = 32.25 (3) Å, b = 17.433 (18) Å, c = 10.608 (11) Å, V = 5963 (11) $Å^3$, Z = 16, Crystal size: 0.29 × 0.21 × 0.14 mm, T = 295 K, ρ_{calcd} = 1.164 $g \cdot cm^{-3}$, R_1 = 0.0374 (I>4σ(I)), wR_2 = 0.1118 (all data), GOF = 1.044, reflections collected/unique: 9066 / 3273 (Rint = 0.0175), Data: 2623, restraints: 0, parameters: 177. CCDC 1836502 contains the supplementary crystallographic data for this paper. The data can be obtained free of charge from The Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk/data_request/cif.

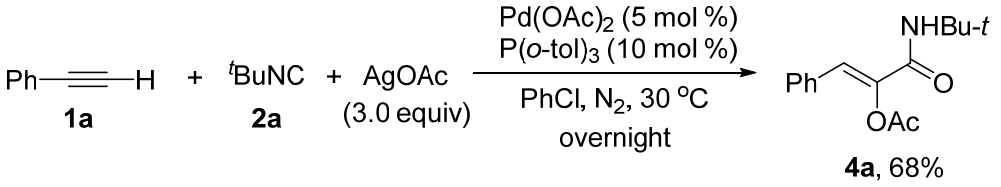
5. Mechanistic Studies



To a test tube were added $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), Ag_2O (104.3 mg, 0.45 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), *t*BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol), *N*-(*tert*-butyl)-3-phenylpropiolamide **9** (38.7 mg, 0.3 mmol) and PhCl (1.5 mL). The reaction was degassed and refilled with N_2 atmosphere for three times. After the mixture was stirred at 30 °C overnight, no desired product could be observed from the reaction.



To a test tube were added $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), Ag_2O (104.3 mg, 0.45 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), *t*BuNC (68 μL, 0.6 mmol), AcOH (54.0 mg, 0.9 mmol), *N*-(*tert*-butyl)cinnamamide **10** (61 mg, 0.3 mmol) and PhCl (1.5 mL). The reaction was degassed and refilled with N_2 atmosphere for three times. After the mixture was stirred at 30 °C overnight, no desired product could be observed from the reaction.

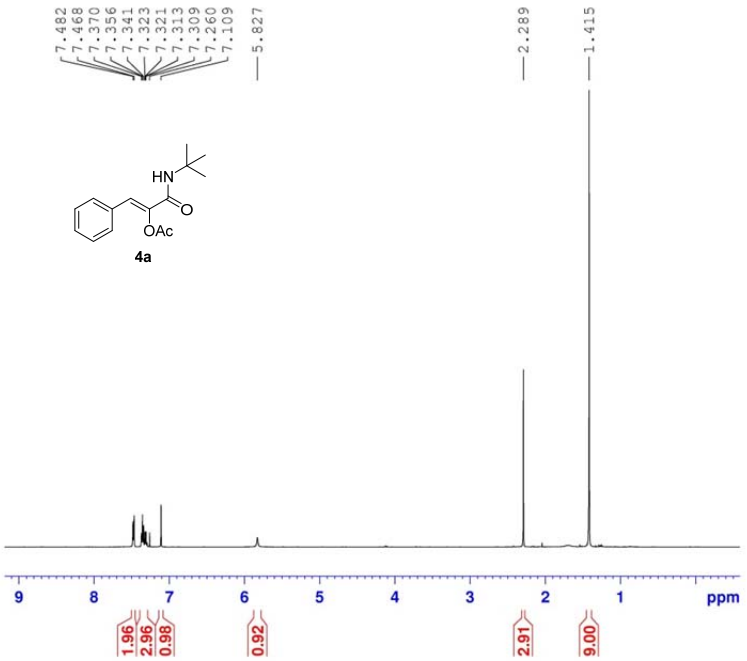


To a test tube were added $Pd(OAc)_2$ (3.4 mg, 0.015 mmol), AgOAc (150.2 mg, 0.9 mmol), tri(2-methylphenyl)phosphine (9.1 mg, 0.03 mmol), *t*BuNC (68 μL, 0.6 mmol) and PhCl (1.0 mL). The mixture was stirred at 30 °C under N_2 atmosphere. Phenylacetylene **1a** (33 μL, 0.3 mmol) in PhCl (0.5 mL) was then added *via* syringe pump for 3 h. The reaction was kept stirring at 30 °C for another 2 h. Upon completion monitored by TLC, the reaction was cooled down to room temperature and filtered. The filtrate was washed with H_2O and brine. The aqueous phase was then extracted with ethyl acetate (3 × 10 mL) and the combined organic phase was dried over Na_2SO_4. After removal of the solvent under reduced pressure, the crude product was purified by flash column chromatography on silica gel to give the pure product **4a** (52.4 mg, 68%).

6. Reference

1. Peng, J.; Zhao, J.; Hu, Z.; Liang, D.; Huang, J.; Zhu, Q. *Org. Lett.* **2012**, *14*, 4966.
2. Steuer, C.; Gege, C.; Fischl, W.; Heinonen, K. H.; Bartenschlager, R.; Klein, C. D. *Bioorg. Med. Chem.* **2011**, *19*, 4067.

7. Copies of ^{1}H, ^{13}C and ^{19}F NMR Spectra for All Compounds

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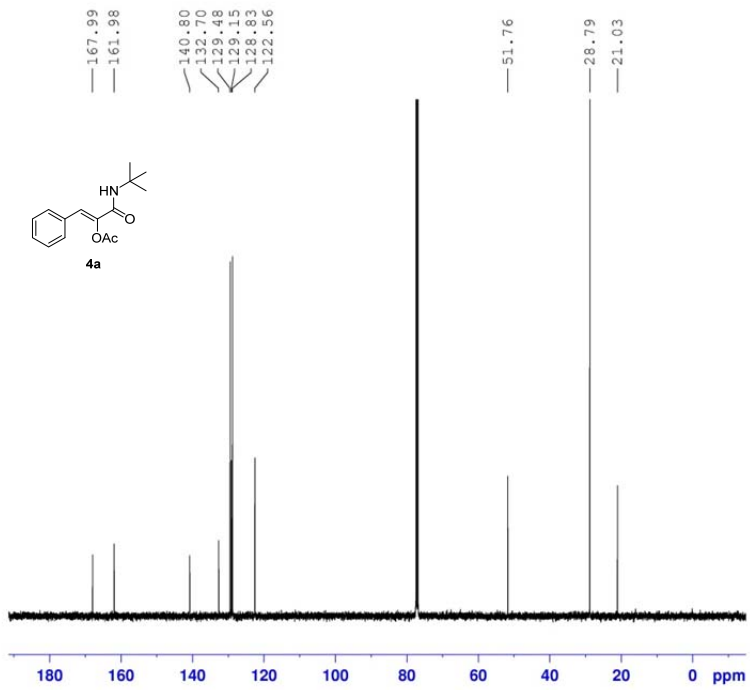
WJ-2-75
PROTON CDCl3

NAME          XB20140926
EXPNO                  2
PROCNO                 1
Date_           20140926
Time                9.09
INSTRUM            spect
PROBHD   5 mm PATXO 19F
PULPROG             zg30
TD                 65536
SOLVENT            CDCl3
NS                    16
DS                     2
SWH            10330.578 Hz
FIDRES         0.157632 Hz
AQ             3.1720407 sec
RG                   256
DW                48.400 usec
DE                 6.00 usec
TE                296.0 K
D1           1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                 14.14 usec
PL1                1.00 dB
SFO1         500.1330885 MHz
SI                 32768
SF           500.1300126 MHz
WDW                   no
SSB                    0
LB                 0.00 Hz
GB                     0
PC                 1.00
```




```
4a
C13CPD CDCl3

NAME          XB20180820
EXPNO                 18
PROCNO                 1
Date_           20180820
Time               12.21
INSTRUM            spect
PROBHD   5 mm PATXO 19F
PULPROG          zgpg30
TD                 65536
SOLVENT            CDCl3
NS                   512
DS                     4
SWH            30030.029 Hz
FIDRES         0.458222 Hz
AQ             1.0912410 sec
RG                 20642.5
DW                16.650 usec
DE                 6.50 usec
TE                296.9 K
D1           2.00000000 sec
d11          0.03000000 sec
DELTA        1.89999998 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  13C
P1                 9.50 usec
PL1               -0.50 dB
SFO1         125.7703643 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2             80.00 usec
PL2                1.00 dB
PL12              15.99 dB
PL13              16.50 dB
SFO2         500.1320005 MHz
SI                 32768
SF           125.7577745 MHz
WDW                   EM
SSB                    0
LB                 1.00 Hz
GB                     0
PC                 1.40
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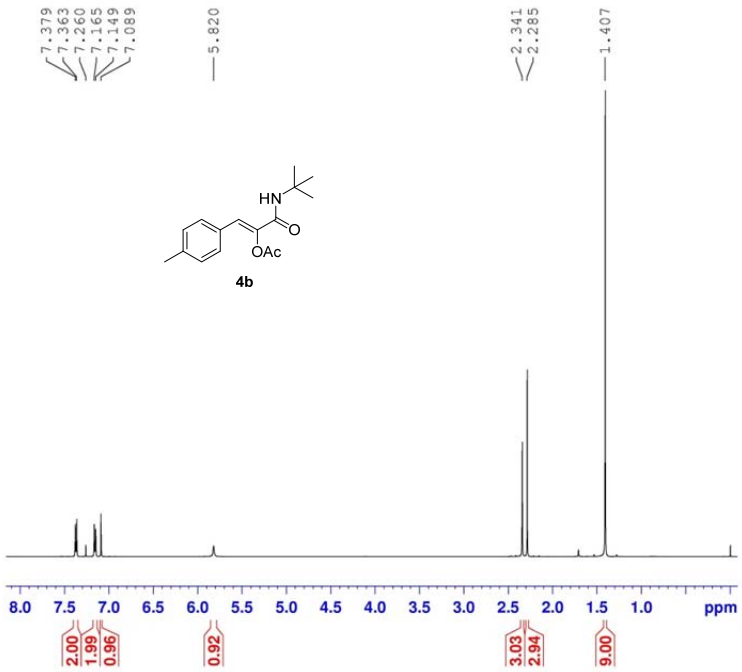


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WJ-3-77-1
PROTON CDCl3

NAME          XB20150313
EXPNO                  9
PROCNO                 1
Date_           20150313
Time               10.51
INSTRUM            spect
PROBHD   5 mm PATXO 19F
PULPROG             zg30
TD                 65536
SOLVENT            CDCl3
NS                    16
DS                     2
SWH           10330.578 Hz
FIDRES        0.157632 Hz
AQ            3.1720407 sec
RG                143.7
DW               48.400 usec
DE                6.00 usec
TE                296.3 K
D1           1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                14.14 usec
PL1                1.00 dB
SFO1        500.1330885 MHz
SI                 32768
SF          500.1300126 MHz
WDW                   no
SSB                    0
LB                0.00 Hz
GB                     0
PC                 1.00
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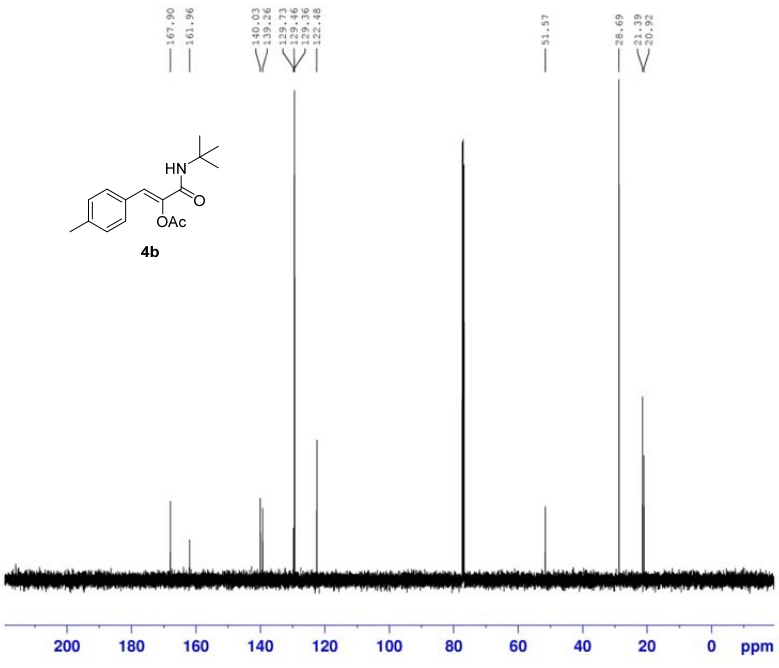


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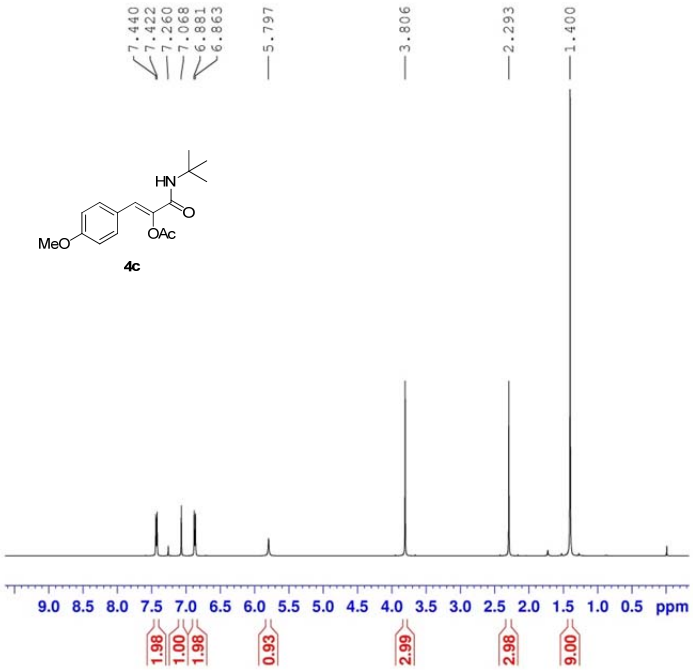
WJ-3-77-1
C13CPD CDCl3

NAME          XB20150313
EXPNO                 14
PROCNO                 1
Date_           20150313
Time               15.57
INSTRUM            spect
PROBHD   5 mm PATXO 19F
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                   128
DS                     4
SWH           30030.029 Hz
FIDRES        0.458222 Hz
AQ            1.0912410 sec
RG                287.4
DW               16.650 usec
DE                6.00 usec
TE                297.5 K
D1           2.00000000 sec
d11          0.03000000 sec
DELTA        1.89999998 sec
TD0                    1

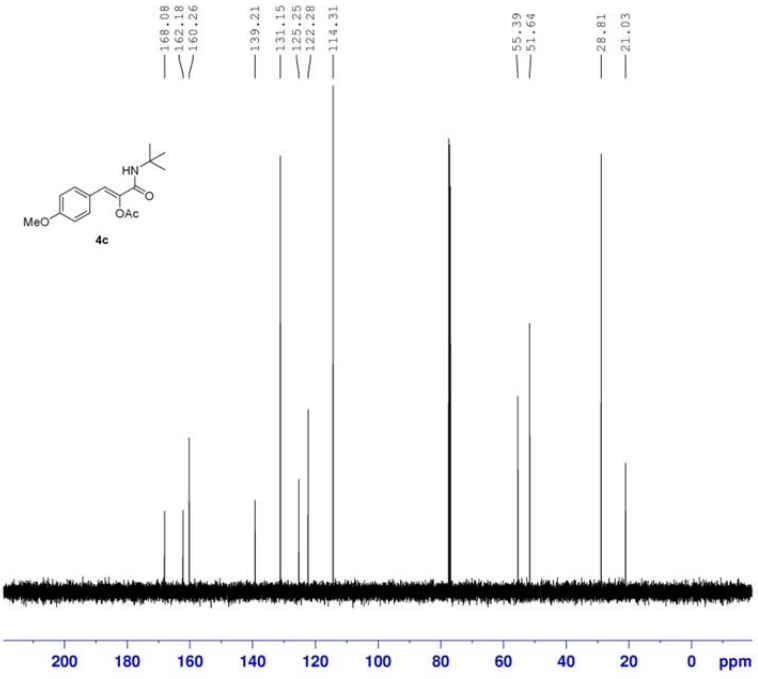
======== CHANNEL f1 ========
NUC1                  13C
P1                 9.50 usec
PL1               -0.50 dB
SFO1        125.7703643 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                  1H
PCPD2             80.00 usec
PL2                1.00 dB
PL12              16.05 dB
PL13              16.50 dB
SFO2        500.1320005 MHz
SI                 32768
SF          125.7577890 MHz
WDW                   no
SSB                    0
LB                0.00 Hz
GB                     0
PC                 1.40
```



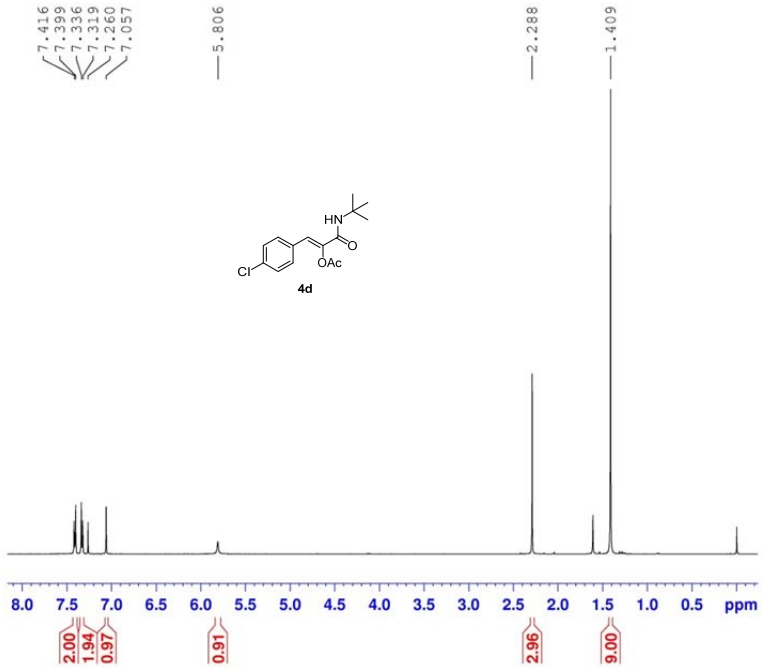
WJ-3-77-2
PROTON CDCl3

NAME	XB20150313
EXPNO	10
PROCNO	1
Date_	20150313
Time	10.57
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	143.7
DW	48.400 usec
DE	6.00 usec
TE	296.3 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300126 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



WJ-3-77-2
C13CPD CDCl3

NAME	1c
EXPNO	2
PROCNO	1
Date_	20150313
Time	2.30
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	128
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	203.2
DW	16.650 usec
DE	6.00 usec
TE	297.6 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577754 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.40

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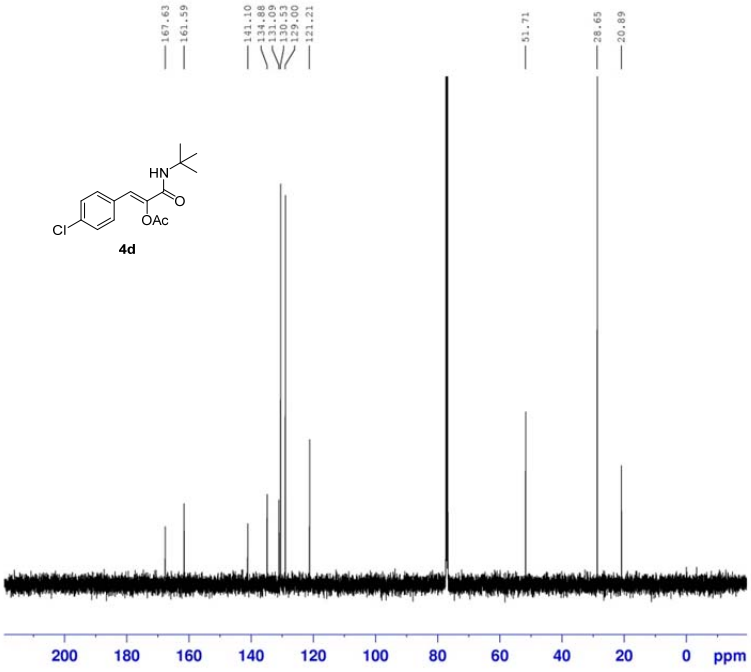
WJ-3-102-1
PROTON CDC13

NAME          XB20150414
EXPNO              1
PROCNO             1
Date_          20150414
Time               9.39
INSTRUM           spect
PROBHD   5 mm PATXO 19F
PULPROG            zg30
TD                65536
SOLVENT           CDC13
NS                   16
DS                    2
SWH           10330.578 Hz
FIDRES            0.157632 Hz
AQ            3.1720407 sec
RG                 287.4
DW                48.400 usec
DE                 6.00 usec
TE                296.5 K
D1            1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
NUC1                  1H
P1                14.14 usec
PL1                1.00 dB
SFO1         500.1330885 MHz
SI                32768
SF           500.1300126 MHz
WDW                  no
SSB                   0
LB                 0.00 Hz
GB                    0
PC                 1.00
```

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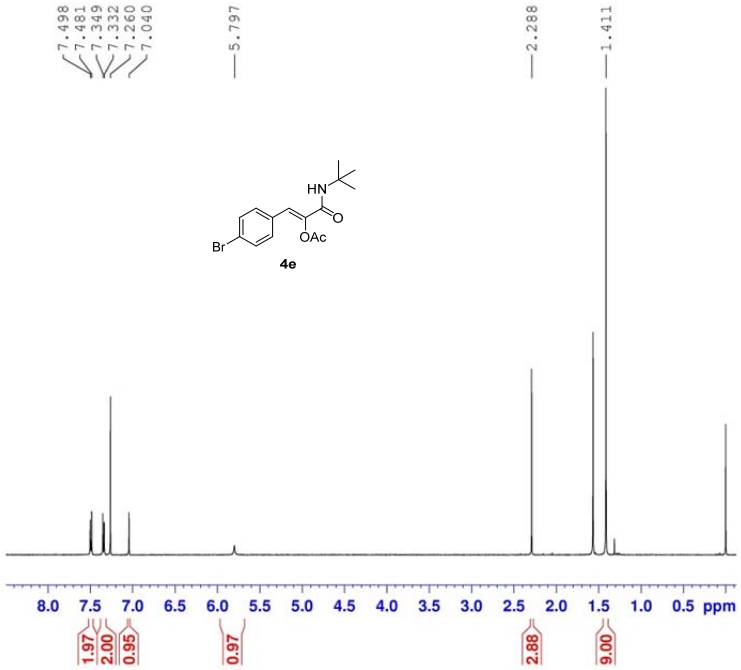
WJ-3-102-1
C13CPD CDC13

NAME          XB20150414
EXPNO              6
PROCNO             1
Date_          20150414
Time              11.00
INSTRUM           spect
PROBHD   5 mm PATXO 19F
PULPROG          zgpg30
TD                65536
SOLVENT           CDC13
NS                  512
DS                    4
SWH           30030.029 Hz
FIDRES            0.458222 Hz
AQ            1.0912410 sec
RG                 574.7
DW                16.650 usec
DE                 6.00 usec
TE                298.2 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0                   1

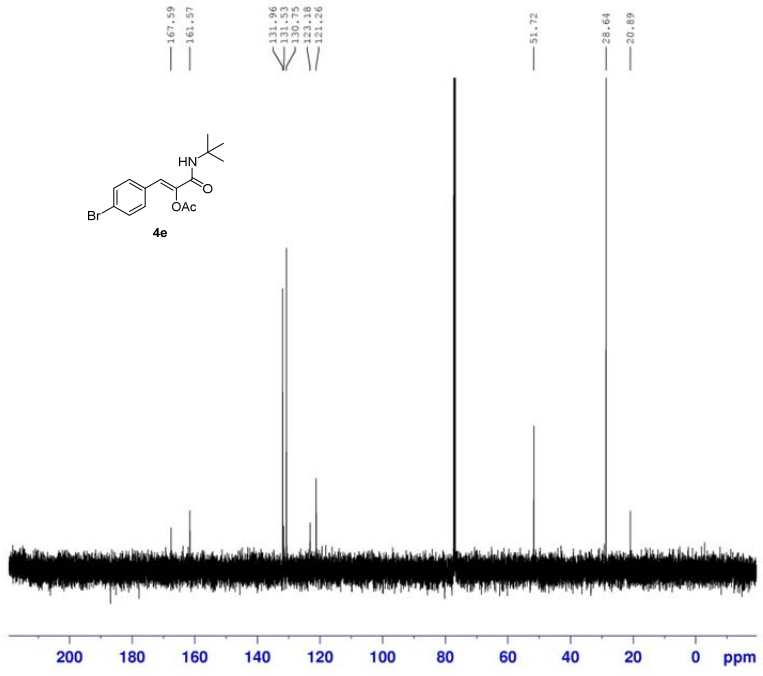
======== CHANNEL f1 ========
NUC1                 13C
P1                 9.50 usec
PL1               -0.50 dB
SFO1         125.7703643 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2             80.00 usec
PL2                1.00 dB
PL12              16.05 dB
PL13              16.50 dB
SFO2         500.1320005 MHz
SI                32768
SF           125.7577890 MHz
WDW                  EM
SSB                   0
LB                 1.00 Hz
GB                    0
PC                 1.40
```



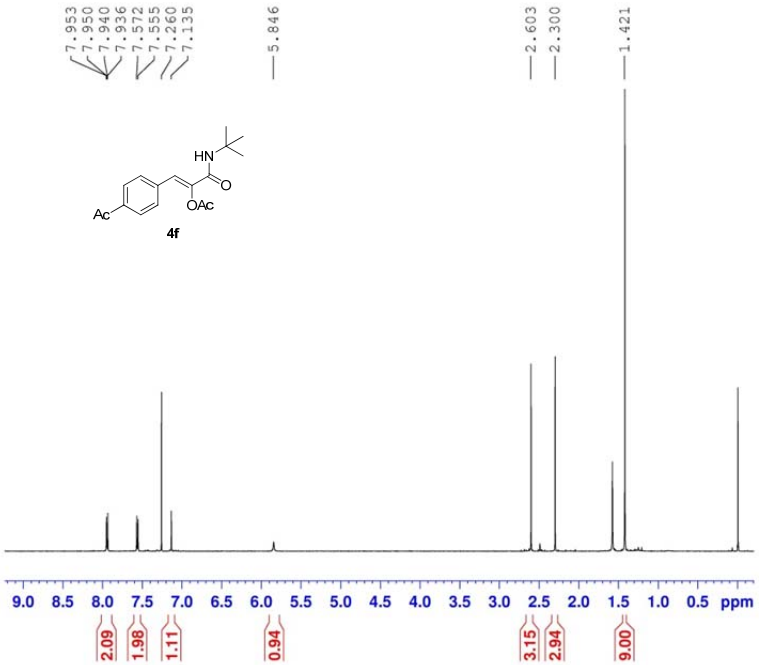
WJ-3-102-2
PROTON CDCl3

NAME	XB20150414
EXPNO	2
PROCNO	1
Date_	20150414
Time	9.45
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	406.4
DW	48.400 usec
DE	6.00 usec
TE	296.5 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300129 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



WJ-3-102-2
C13CPD CDCl3

NAME	XB20150423
EXPNO	5
PROCNO	1
Date_	20150423
Time	11.51
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	256
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	181
DW	16.650 usec
DE	6.00 usec
TE	297.9 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.40

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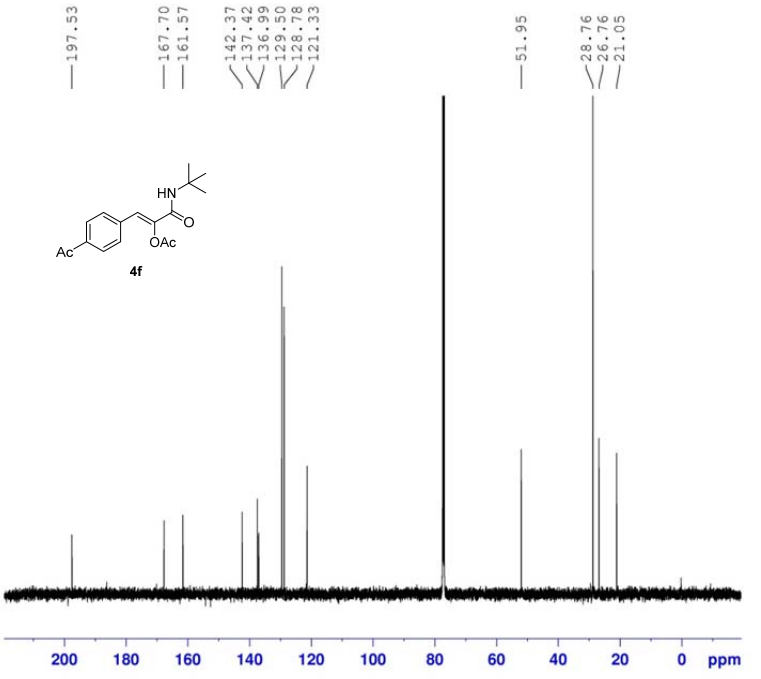
WJ-3-127-P2
PROTON CDC13

NAME          XB20150519
EXPNO                  6
PROCNO                 1
Date_           20150519
Time               12.11
INSTRUM            spect
PROBHD   5 mm PATXO 19F
PULPROG              zg30
TD                  65536
SOLVENT             CDC13
NS                     16
DS                      2
SWH           10330.578 Hz
FIDRES         0.157632 Hz
AQ             3.1720407 sec
RG                    362
DW                48.400 usec
DE                 6.00 usec
TE                295.2 K
D1           1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                14.14 usec
PL1                1.00 dB
SFO1         500.1330885 MHz
SI                  32768
SF           500.1300129 MHz
WDW                   no
SSB                    0
LB                0.00 Hz
GB                     0
PC                 1.00
```




```
ZMF-4F
C13CPD CDC13

NAME          XB20180820
EXPNO                 53
PROCNO                 1
Date_           20180821
Time                7.31
INSTRUM            spect
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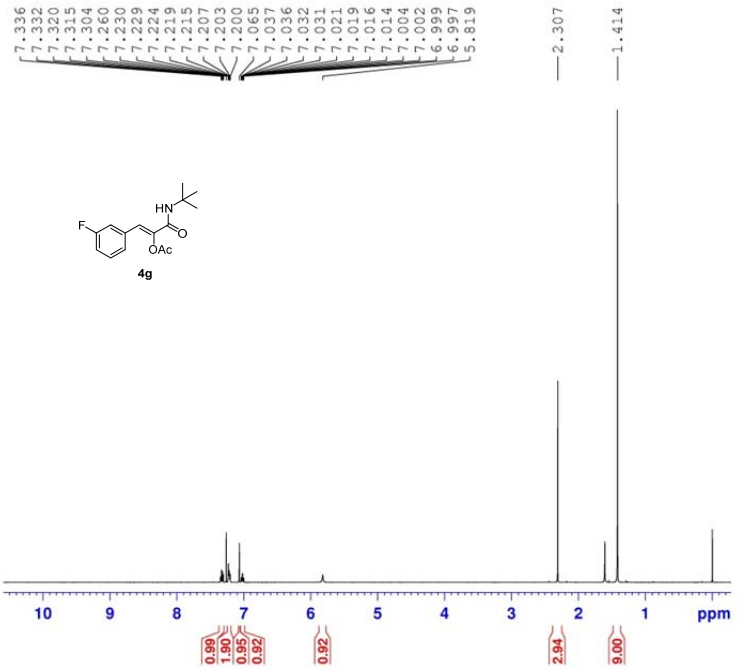
PULPROG           zgpg30
TD                  65536
SOLVENT             CDC13
NS                   2100
DS                      4
SWH           30030.029 Hz
FIDRES         0.458222 Hz
AQ             1.0912410 sec
RG                 23170.5
DW                16.650 usec
DE                 6.50 usec
TE                298.2 K
D1           2.00000000 sec
d11          0.03000000 sec
DELTA        1.89999998 sec
TD0                    1

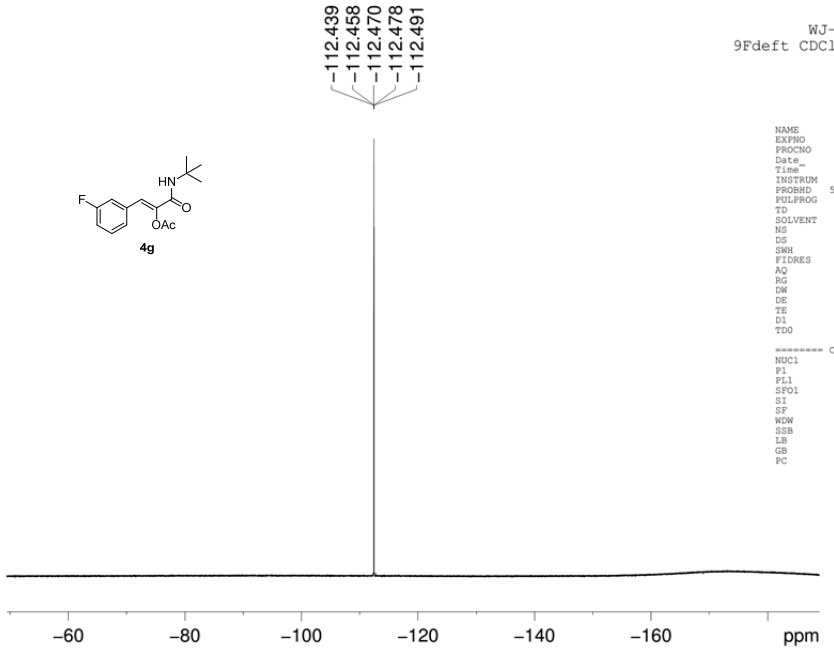
======== CHANNEL f1 ========
NUC1                 13C
P1                 9.50 usec
PL1               -0.50 dB
SFO1         125.7703643 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2             80.00 usec
PL2                1.00 dB
PL12              15.99 dB
PL13              16.50 dB
SFO2         500.1320005 MHz
SI                  32768
SF           125.7577718 MHz
WDW                   EM
SSB                    0
LB                1.00 Hz
GB                     0
PC                 1.40
```



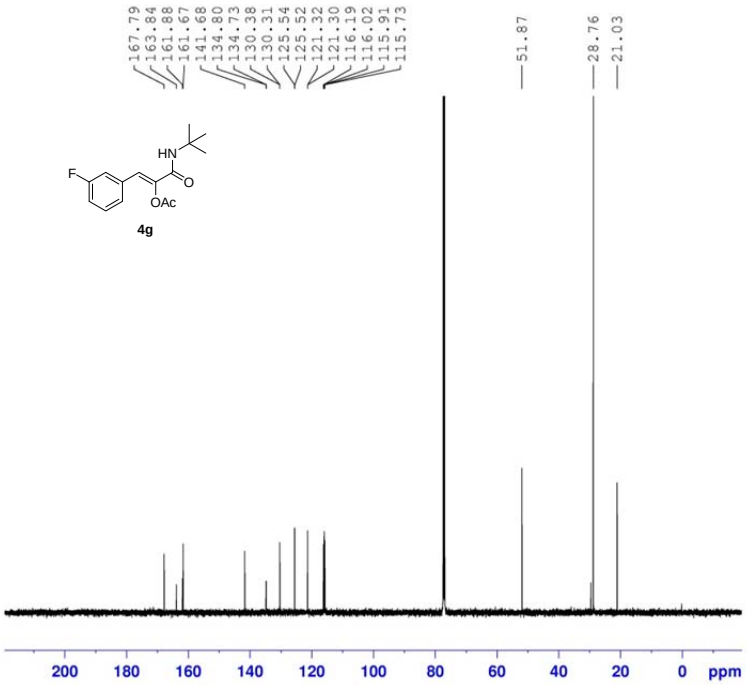
ZMF-2-2
PROTON CDCl3

NAME	XB20180827
EXPNO	9
PROCNO	1
Date_	20180827
Time	16.02
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	362
DW	48.400 usec
DE	6.50 usec
TE	295.2 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.24 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300135 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



WJ-3-124
9Fdeft CDCl3 D:\\ deng 4

NAME	XB20150708
EXPNO	8
PROCNO	1
Date_	20150708
Time	9.30
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg
TD	131072
SOLVENT	CDCl3
NS	16
DS	4
SWH	100000.000 Hz
FIDRES	0.762939 Hz
AQ	0.6554150 sec
RG	287.4
DW	5.000 usec
DE	6.00 usec
TE	295.6 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	19F
P1	19.30 usec
PL1	4.00 dB
SFO1	470.5453180 MHz
SI	65536
SF	470.5923770 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

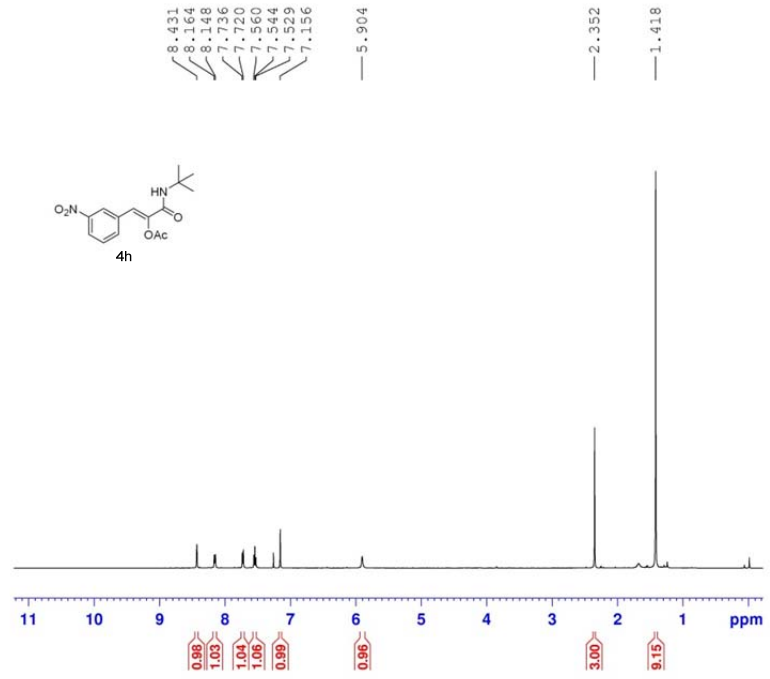



```
ZMF-2-2
C13CPD CDC13 1

NAME                XB20180822
EXPNO                       53
PROCNO                       1
Date_                 20180823
Time                      8.35
INSTRUM                  spect
PROBHD    5 mm PATXO 19F
PULPROG                 zgpg30
TD                       65536
SOLVENT                  CDC13
NS                        1636
DS                           4
SWH                 30030.029 Hz
FIDRES                0.458222 Hz
AQ                    1.0912410 sec
RG                      23170.5
DW                       16.650 usec
DE                        6.50 usec
TE                       297.6 K
D1                    2.00000000 sec
d11                   0.03000000 sec
DELTA                 1.89999998 sec
TD0                          1

======== CHANNEL f1 ========
NUC1                        13C
P1                         9.50 usec
PL1                       -0.50 dB
SFO1                125.7703643 MHz

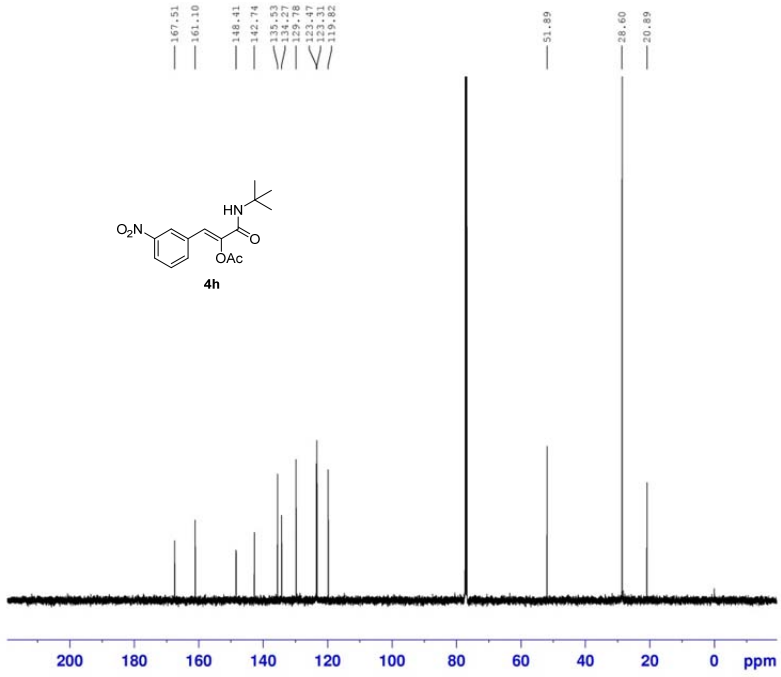
======== CHANNEL f2 ========
CPDPRG2                 waltz16
NUC2                         1H
PCPD2                     80.00 usec
PL2                        1.00 dB
PL12                      15.99 dB
PL13                      16.50 dB
SFO2                500.1320005 MHz
SI                         32768
SF                  125.7577727 MHz
WDW                           EM
SSB                            0
LB                          1.00 Hz
GB                             0
PC                          1.40
```




```
WJ-3-119
PROTON CDC13

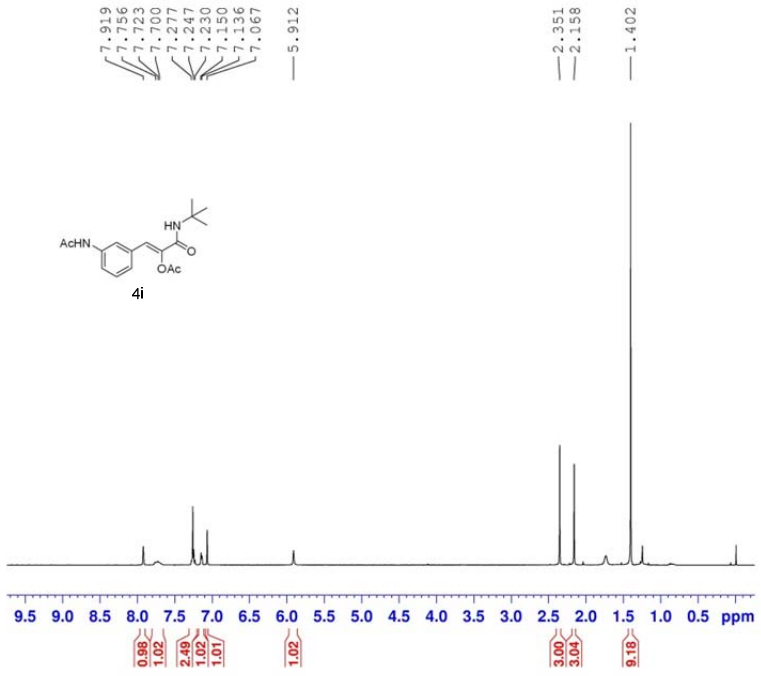
NAME                        1h
EXPNO                        1
PROCNO                       1
Date_                 20150707
Time                     18.19
INSTRUM                  spect
PROBHD    5 mm PATXO 19F
PULPROG                  zg30
TD                       65536
SOLVENT                  CDC13
NS                          16
DS                           2
SWH                 10330.578 Hz
FIDRES                0.157632 Hz
AQ                    3.1720407 sec
RG                       203.2
DW                       48.400 usec
DE                        6.00 usec
TE                       295.0 K
D1                    1.00000000 sec
TD0                          1

======== CHANNEL f1 ========
NUC1                         1H
P1                        14.14 usec
PL1                        1.00 dB
SFO1                500.1330885 MHz
SI                         32768
SF                  500.1300129 MHz
WDW                           EM
SSB                            0
LB                          0.70 Hz
GB                             0
PC                          1.00
```



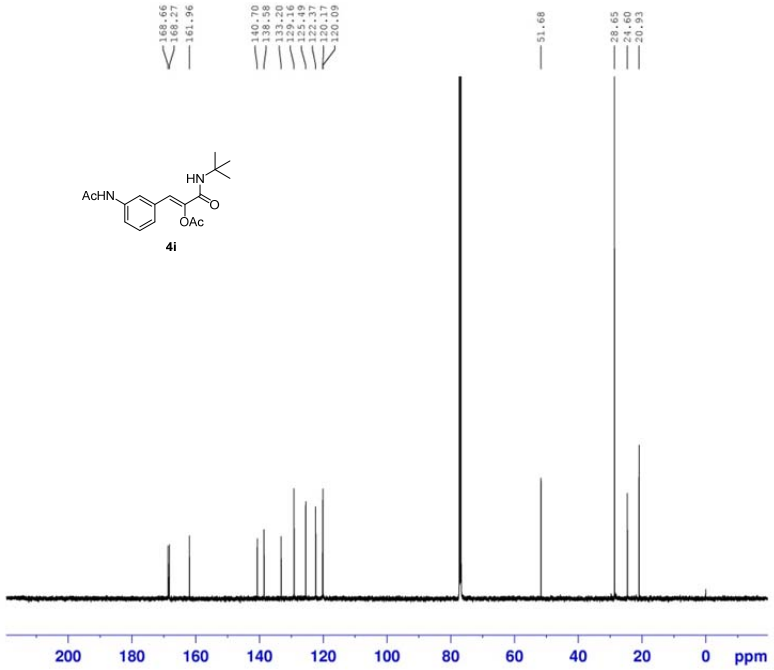
WJ-3-119
C13CPD CDC13

NAME	XB20150710
EXPNO	1
PROCNO	1
Date_	20150710
Time	9.17
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDC13
NS	512
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	114
DW	16.650 usec
DE	6.00 usec
TE	297.6 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



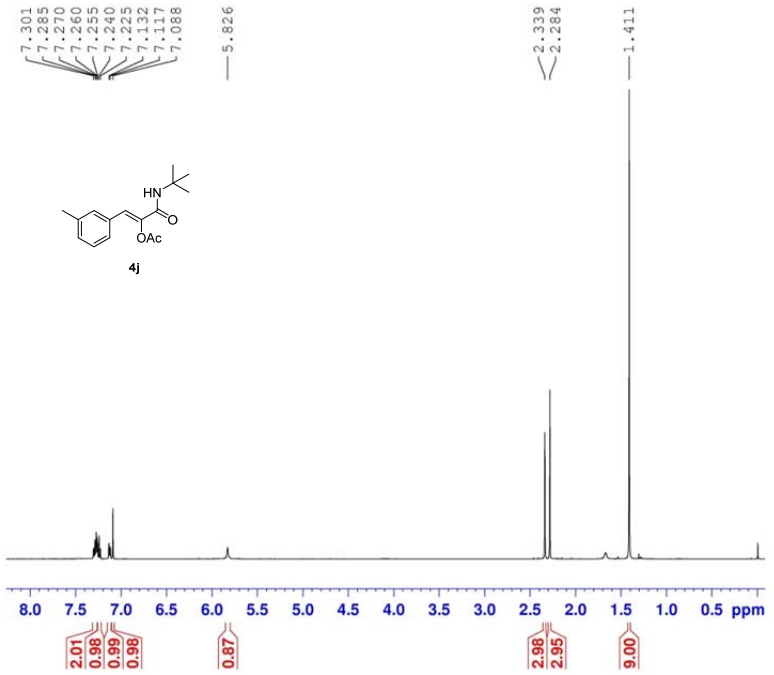
WJ-3-134-P2
PROTON CDCl3

NAME	1i
EXPNO	1
PROCNO	1
Date_	20150706
Time	22.36
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	256
DW	48.400 usec
DE	6.00 usec
TE	295.4 K
D1	1.00000000 sec
TD0	1
========= CHANNEL f1 =========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300129 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	0.50



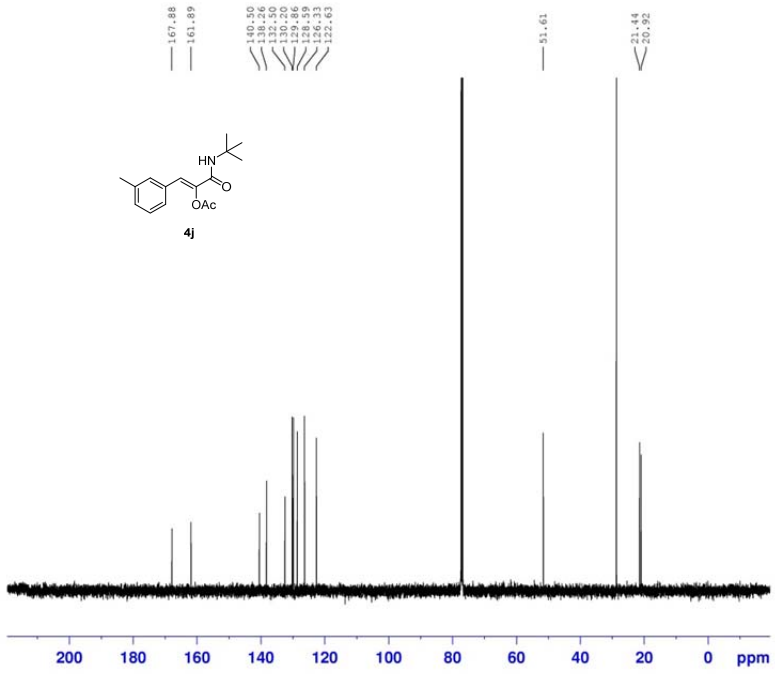
WJ-3-134
C13CPD CDCl3

NAME	XB20150917
EXPNO	12
PROCNO	1
Date_	20150918
Time	5.09
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	3300
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	228.1
DW	16.650 usec
DE	6.00 usec
TE	297.2 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



WJ-3-126
PROTON CDCl3

NAME	XB20150602
EXPNO	14
PROCNO	1
Date_	20150602
Time	15.40
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	181
DW	48.400 usec
DE	6.00 usec
TE	295.9 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300127 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

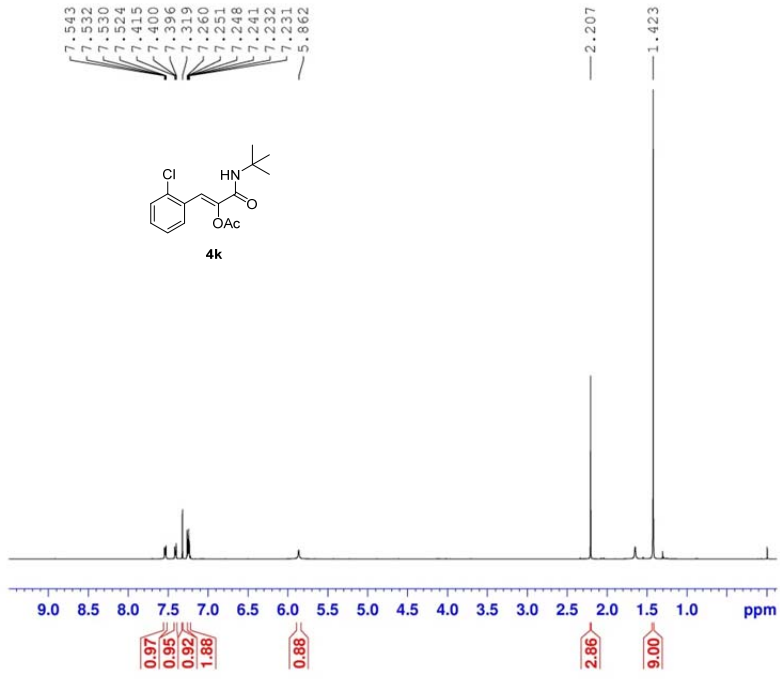



```
WJ-3-126
C13CPD CDCl3

NAME            XB20150613
EXPNO                    1
PROCNO                   1
Date_             20150614
Time                 0.14
INSTRUM             spect
PROBHD   5 mm PATXO 19F
PULPROG           zgpg30
TD                65536
SOLVENT           CDCl3
NS                  256
DS                    4
SWH           30030.029 Hz
FIDRES        0.458222 Hz
AQ            1.0912410 sec
RG                101.6
DW               16.650 usec
DE                6.00 usec
TE                296.9 K
D1           2.00000000 sec
d11          0.03000000 sec
DELTA        1.89999998 sec
TD0                   1

======== CHANNEL f1 ========
NUC1                 13C
P1                 9.50 usec
PL1               -0.50 dB
SFO1        125.7703643 MHz

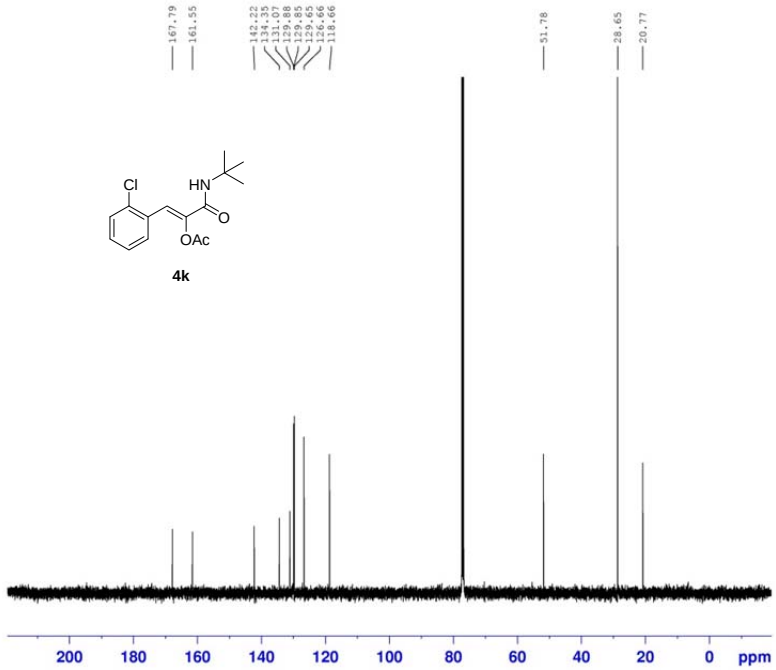
======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                 1H
PCPD2             80.00 usec
PL2                1.00 dB
PL12              16.05 dB
PL13              16.50 dB
SFO2        500.1320005 MHz
SI                32768
SF          125.7577890 MHz
WDW                  EM
SSB                   0
LB                 1.00 Hz
GB                    0
PC                 1.40
```




```
WJ-3-144
PROTON CDCl3

NAME            XB20150907
EXPNO                    3
PROCNO                   1
Date_             20150907
Time                10.35
INSTRUM             spect
PROBHD   5 mm PATXO 19F
PULPROG             zg30
TD                65536
SOLVENT           CDCl3
NS                   16
DS                    2
SWH           10330.578 Hz
FIDRES        0.157632 Hz
AQ            3.1720407 sec
RG                203.2
DW               48.400 usec
DE                6.00 usec
TE                295.2 K
D1           1.00000000 sec
TD0                   1

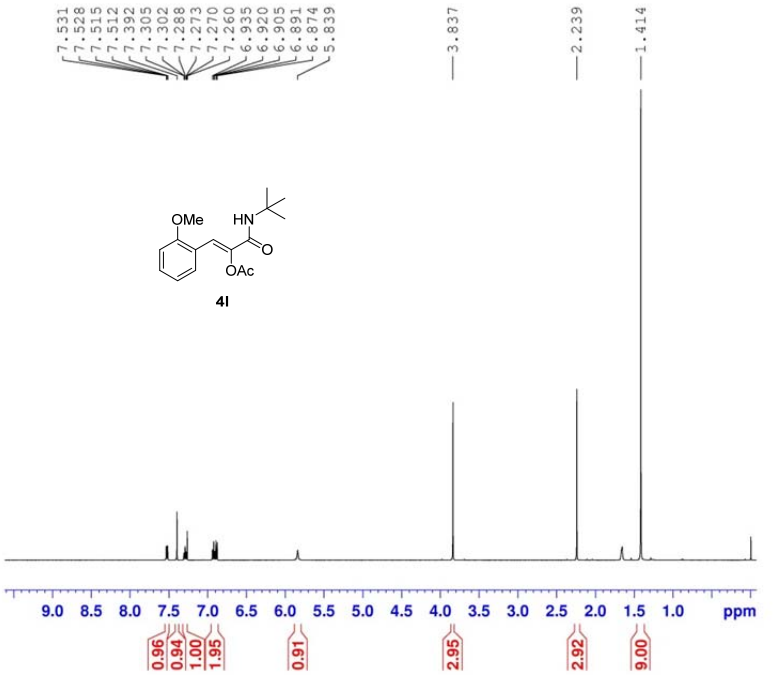
======== CHANNEL f1 ========
NUC1                 1H
P1                14.14 usec
PL1                1.00 dB
SFO1        500.1330885 MHz
SI                32768
SF          500.1300129 MHz
WDW                  no
SSB                   0
LB                 0.00 Hz
GB                    0
PC                 1.00
```



4k

WJ-3-144
C13CPD CDCl3

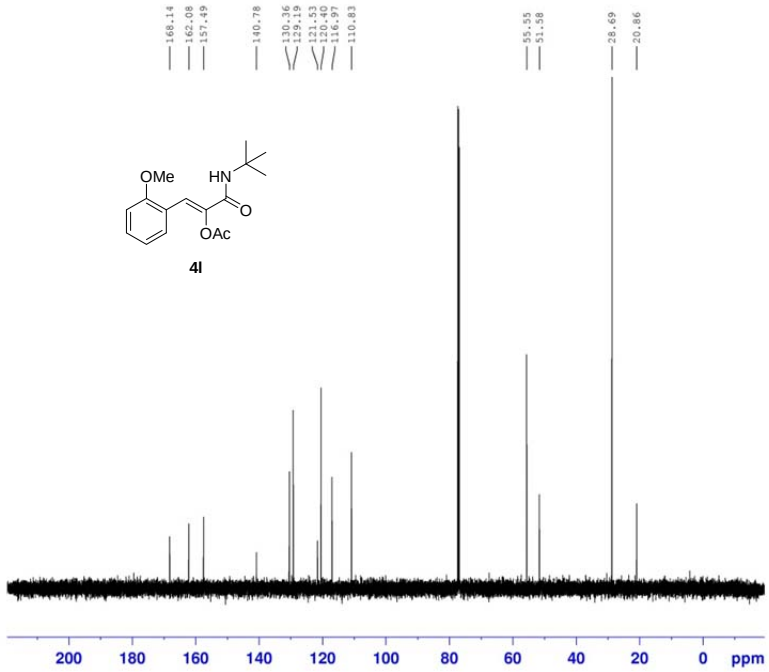
NAME	XB20150908
EXPNO	4
PROCNO	1
Date_	20150908
Time	16.47
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	512
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	128
DW	16.650 usec
DE	6.00 usec
TE	297.2 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



4l

WJ-3-125
PROTON CDCl3

NAME	XB20150602
EXPNO	13
PROCNO	1
Date_	20150602
Time	15.34
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	228.1
DW	48.400 usec
DE	6.00 usec
TE	295.3 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300130 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



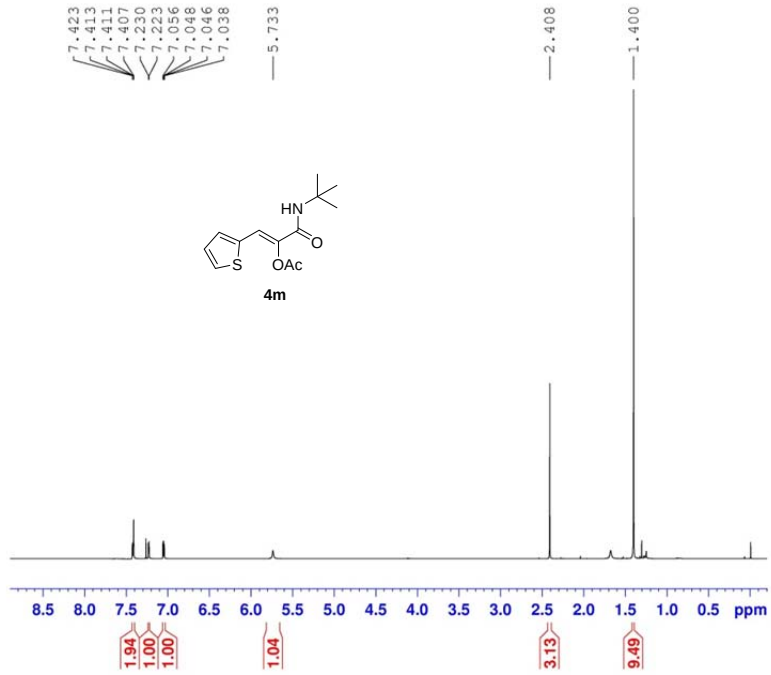
4l

```
WJ-3-125
C13CPD CDC13

NAME            XB20150612
EXPNO                   20
PROCNO                   1
Date_             20150612
Time                 16.27
INSTRUM              spect
PROBHD   5 mm PATXO 19F
PULPROG           zgpg30
TD                 65536
SOLVENT            CDC13
NS                   256
DS                     4
SWH            30030.029 Hz
FIDRES         0.458222 Hz
AQ             1.0912410 sec
RG                 101.6
DW                16.650 usec
DE                 6.00 usec
TE                296.9 K
D1             2.00000000 sec
d11            0.03000000 sec
DELTA          1.89999998 sec
TD0                      1

========== CHANNEL f1 ========
NUC1                   13C
P1                    9.50 usec
PL1                  -0.50 dB
SFO1          125.7703643 MHz

========== CHANNEL f2 ========
CPDPRG2            waltz16
NUC2                    1H
PCPD2                80.00 usec
PL2                   1.00 dB
PL12                 16.05 dB
PL13                 16.50 dB
SFO2          500.1320005 MHz
SI                    32768
SF            125.7577890 MHz
WDW                      no
SSB                       0
LB                 0.00 Hz
GB                        0
PC                     1.40
```

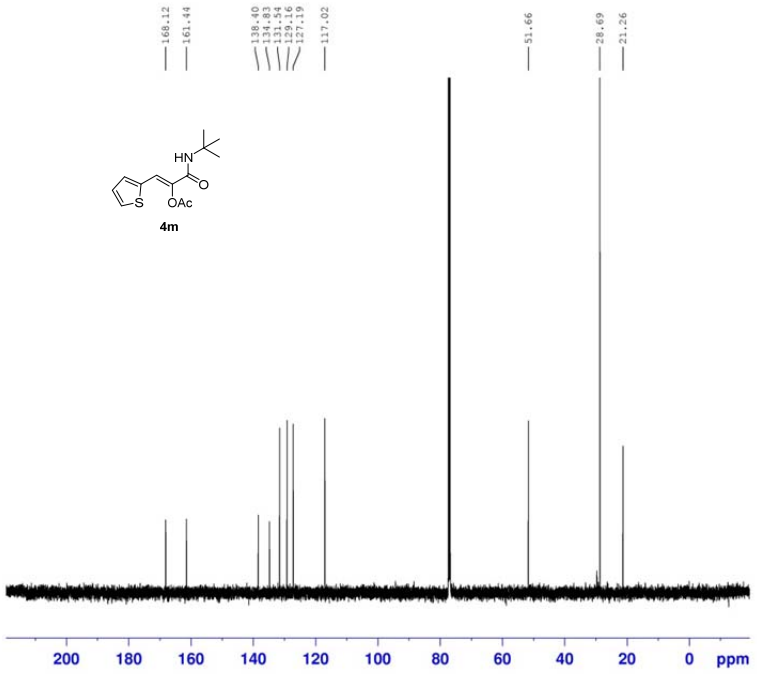


4m

```
WJ-3-130
PROTON CDC13

NAME            XB20150824
EXPNO                    2
PROCNO                   1
Date_             20150824
Time                 10.37
INSTRUM              spect
PROBHD   5 mm PATXO 19F
PULPROG              zg30
TD                 65536
SOLVENT            CDC13
NS                    16
DS                     2
SWH            10330.578 Hz
FIDRES         0.157632 Hz
AQ             3.1720407 sec
RG                 203.2
DW                48.400 usec
DE                 6.00 usec
TE                295.3 K
D1             1.00000000 sec
TD0                      1

========== CHANNEL f1 ========
NUC1                    1H
P1                   14.14 usec
PL1                   1.00 dB
SFO1          500.1330885 MHz
SI                    32768
SF            500.1300129 MHz
WDW                      no
SSB                       0
LB                 0.00 Hz
GB                        0
PC                     1.00
```

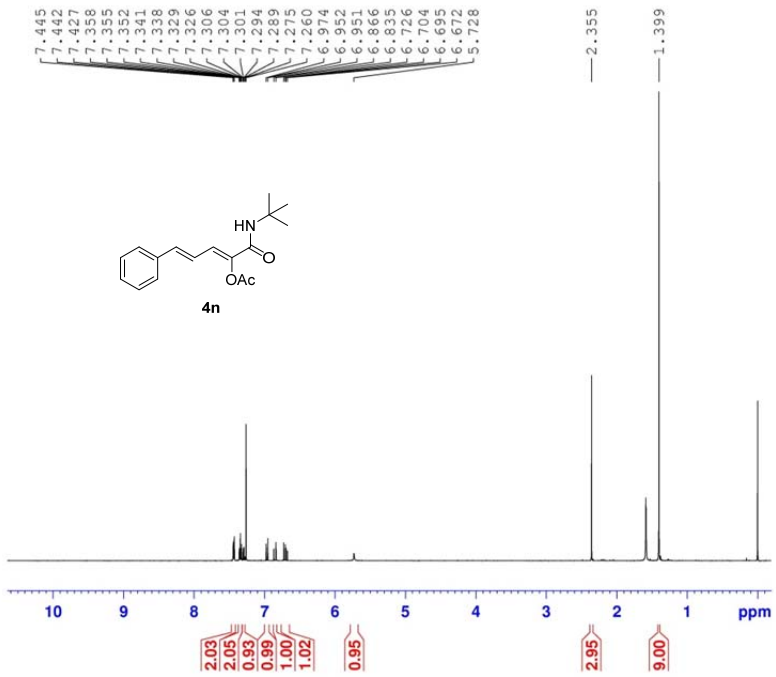



```
WJ-3-130
C13CPD CDCl3

NAME          XB20150824
EXPNO             11
PROCNO             1
Date_          20150824
Time              13.31
INSTRUM           spect
PROBHD   5 mm PATXO 19F
PULPROG         zgpg30
TD              65536
SOLVENT          CDCl3
NS                 512
DS                   4
SWH          30030.029 Hz
FIDRES        0.458222 Hz
AQ            1.0912410 sec
RG                 128
DW              16.650 usec
DE               6.00 usec
TE              297.0 K
D1           2.00000000 sec
d11          0.03000000 sec
DELTA        1.89999998 sec
TD0                  1

======== CHANNEL f1 ========
NUC1               13C
P1                9.50 usec
PL1              -0.50 dB
SFO1       125.7703643 MHz

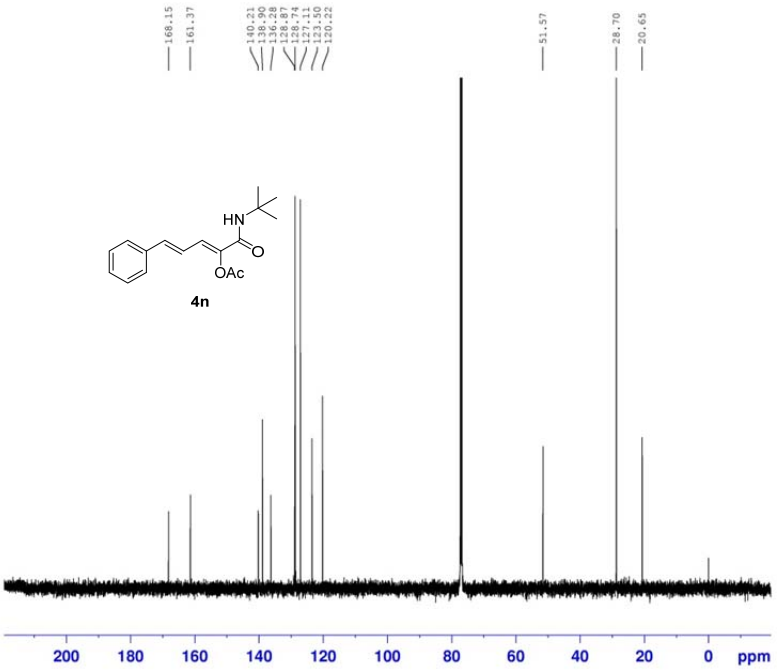
======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2               1H
PCPD2             80.00 usec
PL2               1.00 dB
PL12             16.05 dB
PL13             16.50 dB
SFO2       500.1320005 MHz
SI                32768
SF         125.7577890 MHz
WDW                EM
SSB                 0
LB               1.00 Hz
GB                  0
PC               1.40
```




```
ZMF-2-5
PROTON CDCl3

NAME          XB20180827
EXPNO             10
PROCNO             1
Date_          20180827
Time              16.06
INSTRUM           spect
PROBHD   5 mm PATXO 19F
PULPROG           zg30
TD              65536
SOLVENT          CDCl3
NS                  16
DS                   2
SWH          10330.578 Hz
FIDRES        0.157632 Hz
AQ            3.1720407 sec
RG                 362
DW              48.400 usec
DE               6.50 usec
TE              295.6 K
D1           1.00000000 sec
TD0                  1

======== CHANNEL f1 ========
NUC1               1H
P1               14.24 usec
PL1               1.00 dB
SFO1       500.1330885 MHz
SI                32768
SF         500.1300135 MHz
WDW                no
SSB                 0
LB               0.00 Hz
GB                  0
PC               1.00
```

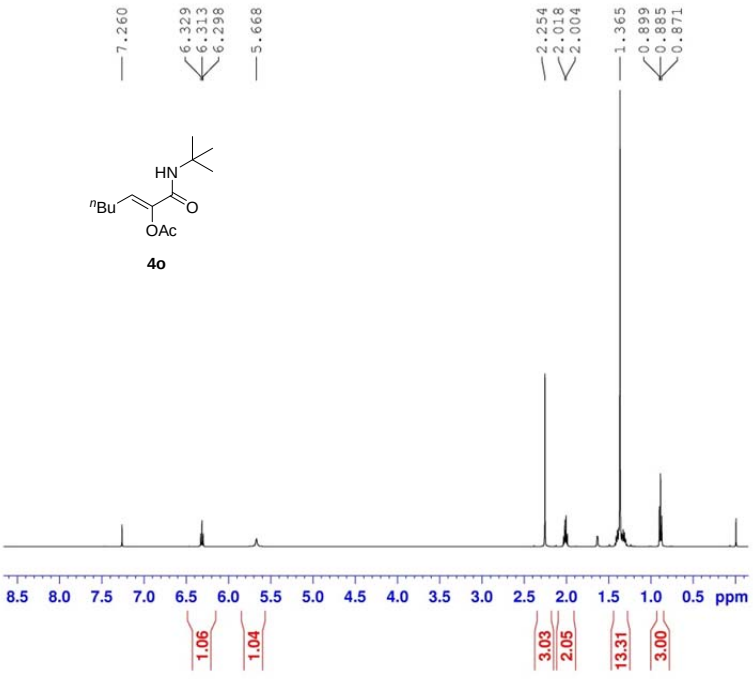



```
WJ-4-142
C13CPD CDCl3

NAME            XB20160112
EXPNO                   16
PROCNO                   1
Date_             20160113
Time                 6.51
INSTRUM             spect
PROBHD   5 mm PATXO 19F
PULPROG             zgpg30
TD                   65536
SOLVENT              CDCl3
NS                    1024
DS                       4
SWH              30030.029 Hz
FIDRES           0.458222 Hz
AQ               1.0912410 sec
RG                     256
DW                16.650 usec
DE                 6.00 usec
TE                297.7 K
D1             2.00000000 sec
d11            0.03000000 sec
DELTA          1.89999998 sec
TD0                      1

======== CHANNEL f1 ========
NUC1                   13C
P1                    9.50 usec
PL1                  -0.50 dB
SFO1          125.7703643 MHz

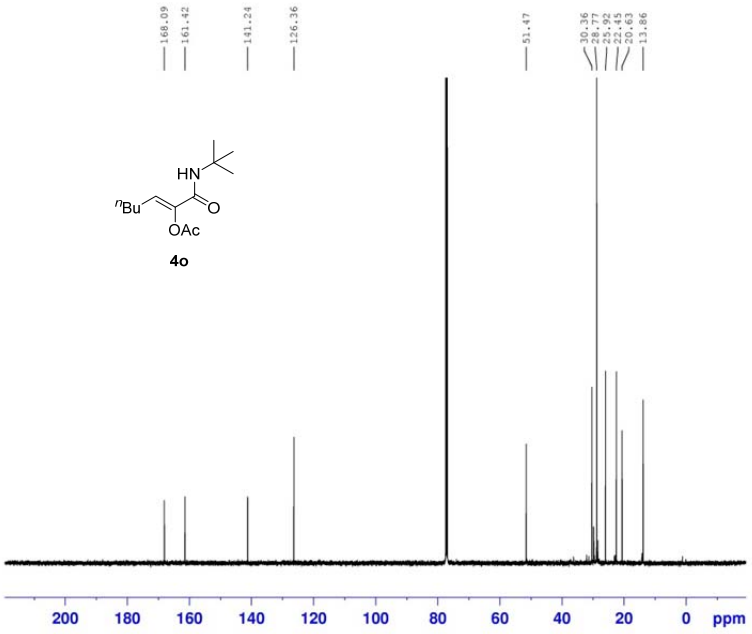
======== CHANNEL f2 ========
CPDPRG2             waltz16
NUC2                    1H
PCPD2                80.00 usec
PL2                   1.00 dB
PL12                 16.05 dB
PL13                 16.50 dB
SFO2          500.1320005 MHz
SI                   32768
SF            125.7577890 MHz
WDW                     EM
SSB                      0
LB                    1.00 Hz
GB                       0
PC                    1.40
```




```
WJ-3-122
PROTON CDCl3

NAME            XB20150519
EXPNO                    3
PROCNO                   1
Date_             20150519
Time                11.54
INSTRUM             spect
PROBHD   5 mm PATXO 19F
PULPROG                zg30
TD                   65536
SOLVENT              CDCl3
NS                      16
DS                       2
SWH              10330.578 Hz
FIDRES           0.157632 Hz
AQ               3.1720407 sec
RG                   228.1
DW                48.400 usec
DE                 6.00 usec
TE                295.5 K
D1             1.00000000 sec
TD0                      1

======== CHANNEL f1 ========
NUC1                    1H
P1                   14.14 usec
PL1                   1.00 dB
SFO1          500.1330885 MHz
SI                   32768
SF            500.1300127 MHz
WDW                     no
SSB                      0
LB                    0.00 Hz
GB                       0
PC                    1.00
```

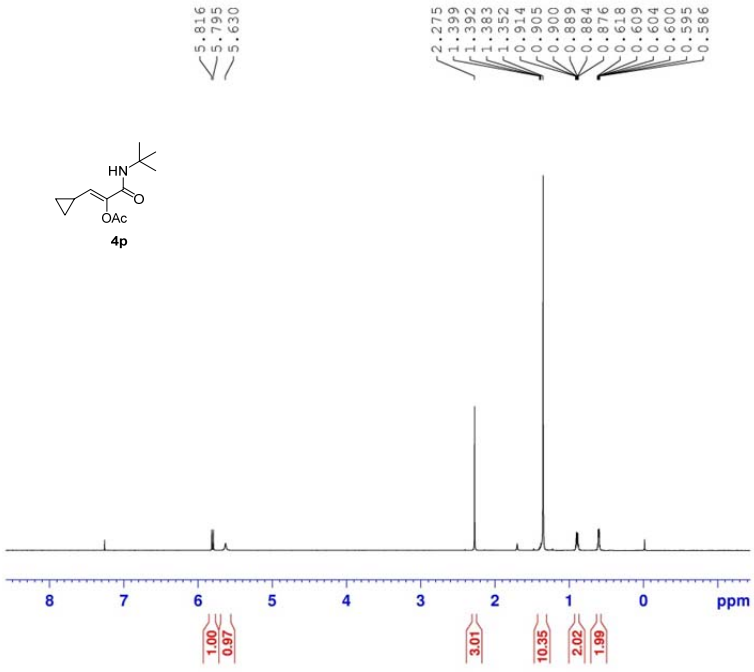



```
4o
C13CPD CDCl3

NAME                XB20180913
EXPNO                        6
PROCNO                       1
Date_                 20180913
Time                     13.28
INSTRUM                  spect
PROBHD     5 mm PATXO 19F
PULPROG                 zgpg30
TD                       65536
SOLVENT                  CDCl3
NS                        1024
DS                           4
SWH                 30030.029 Hz
FIDRES              0.458222 Hz
AQ                  1.0912410 sec
RG                      20642.5
DW                    16.650 usec
DE                     6.50 usec
TE                     297.8 K
D1                  2.00000000 sec
d11                 0.03000000 sec
DELTA               1.89999998 sec
TD0                          1

======== CHANNEL f1 ========
NUC1                       13C
P1                        9.50 usec
PL1                      -0.50 dB
SFO1               125.7703643 MHz

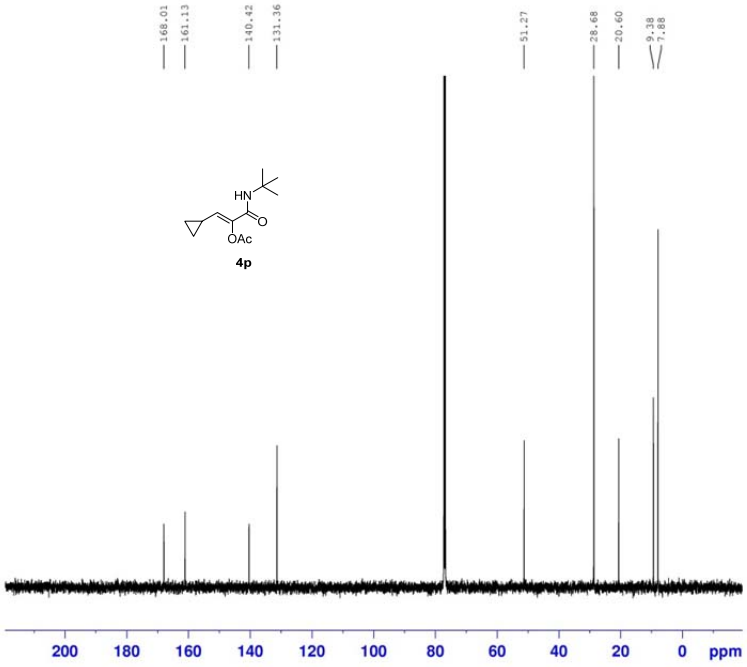
======== CHANNEL f2 ========
CPDPRG2                waltz16
NUC2                       1H
PCPD2                    80.00 usec
PL2                       1.00 dB
PL12                     15.99 dB
PL13                     16.50 dB
SFO2               500.1320005 MHz
SI                        32768
SF                 125.7577745 MHz
WDW                          EM
SSB                           0
LB                        1.00 Hz
GB                            0
PC                         1.40
```




```
WJ-3-123
PROTON CDCl3

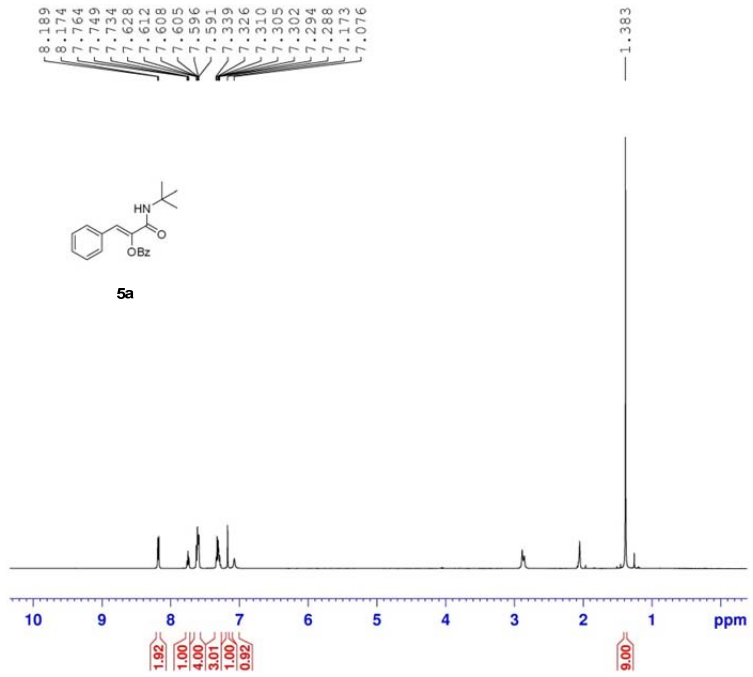
NAME                        1n
EXPNO                        1
PROCNO                       1
Date_                 20150518
Time                     21.00
INSTRUM                  spect
PROBHD     5 mm PATXO 19F
PULPROG                  zg30
TD                       65536
SOLVENT                  CDCl3
NS                          16
DS                           2
SWH                 10330.578 Hz
FIDRES              0.157632 Hz
AQ                  3.1720407 sec
RG                       161.3
DW                    48.400 usec
DE                     6.00 usec
TE                     295.4 K
D1                  1.00000000 sec
TD0                          1

======== CHANNEL f1 ========
NUC1                        1H
P1                       14.14 usec
PL1                       1.00 dB
SFO1               500.1330885 MHz
SI                        32768
SF                 500.1300129 MHz
WDW                          no
SSB                           0
LB                        0.00 Hz
GB                            0
PC                         1.00
```



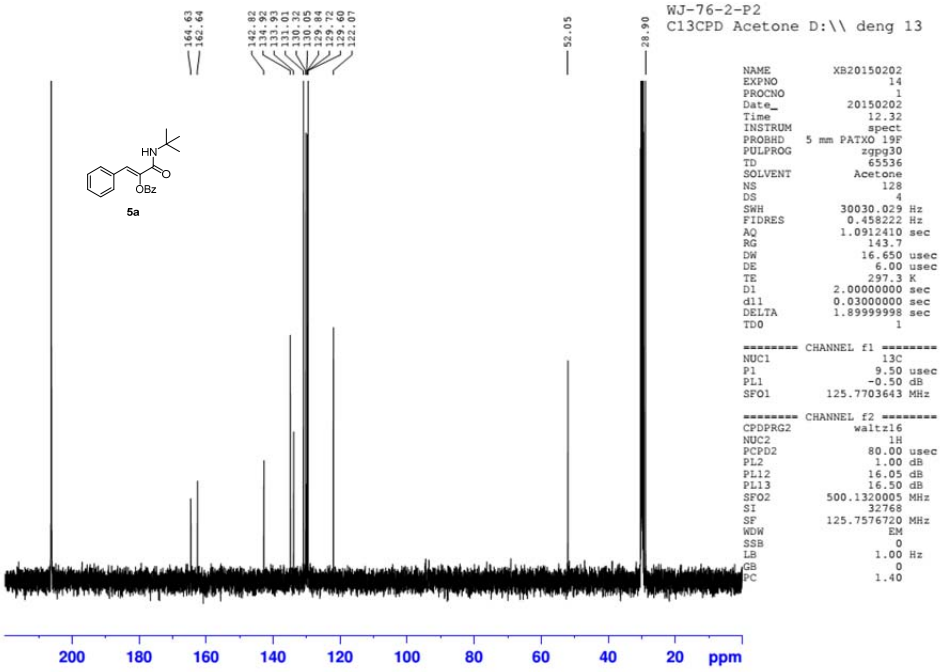
WJ-3-123
C13CPD CDCl3

NAME	XB20150519
EXPNO	12
PROCNO	1
Date_	20150519
Time	15.26
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	256
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	287.4
DW	16.650 usec
DE	6.00 usec
TE	296.8 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.40



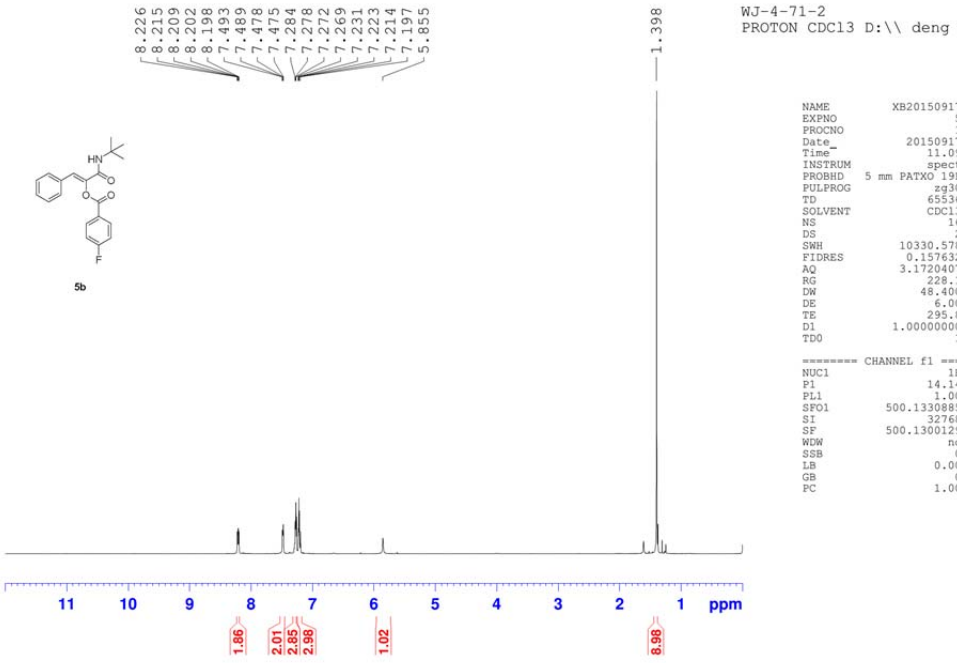
WJ-76-2-P2
PROTON Acetone

NAME	5a
EXPNO	1
PROCNO	1
Date_	20150201
Time	20.23
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	Acetone
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	128
DW	48.400 usec
DE	6.00 usec
TE	296.1 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300095 MHz
WDW	EM
SSB	0
LB	0.70 Hz
GB	0
PC	1.00



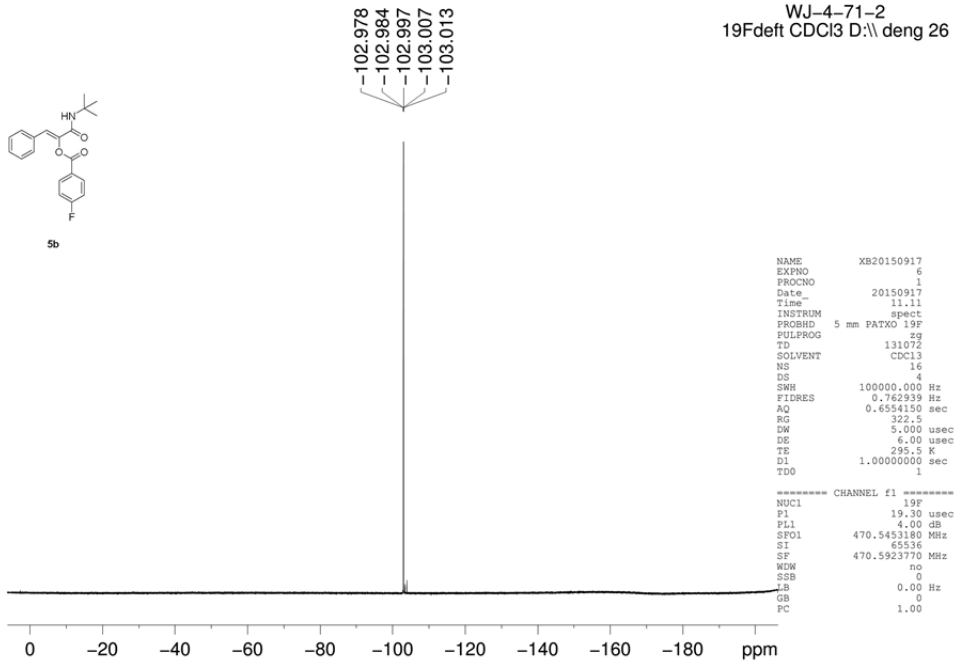
WJ-76-2-P2
C13CPD Acetone D:\\ deng 13

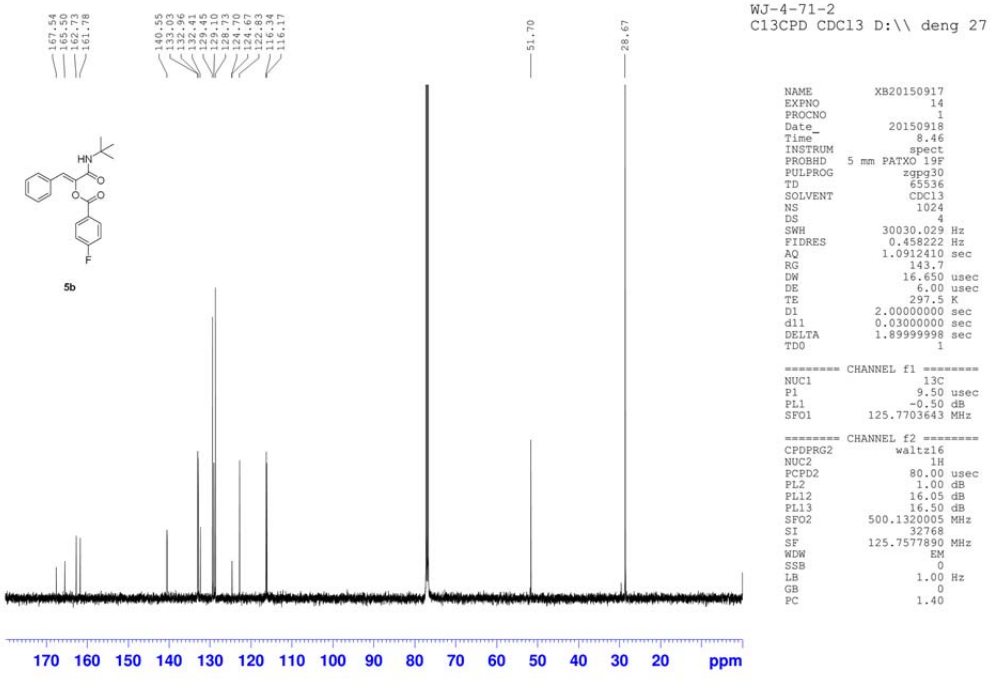
NAME	XB20150202
EXPNO	14
PROCNO	1
Date_	20150202
Time	12.32
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	Acetone
NS	128
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	143.7
DW	16.650 usec
DE	6.00 usec
TE	297.3 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7576720 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

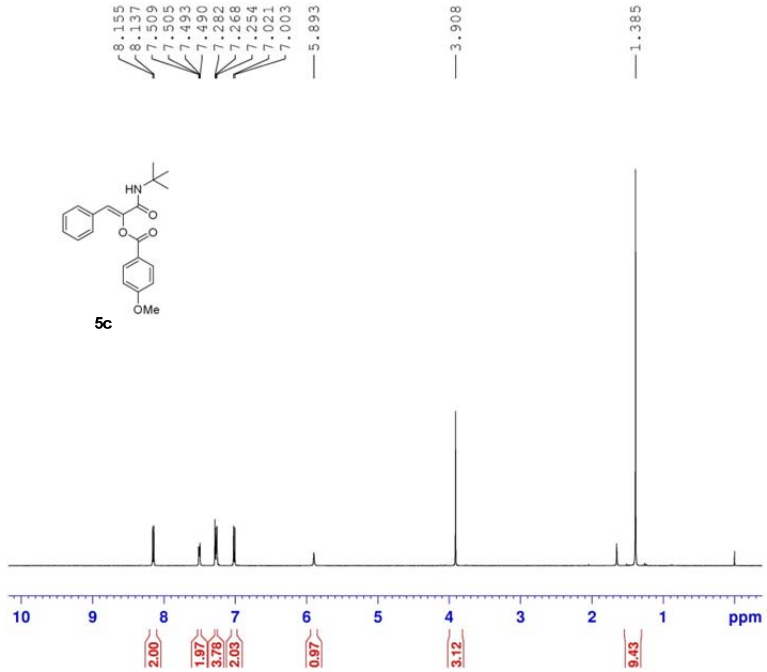


WJ-4-71-2
PROTON CDCl3 D:\\ deng 26

NAME	XB20150917
EXPNO	5
PROCNO	1
Date_	20150917
Time	11.09
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	228.1
DW	48.400 usec
DE	6.00 usec
TE	295.8 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300129 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

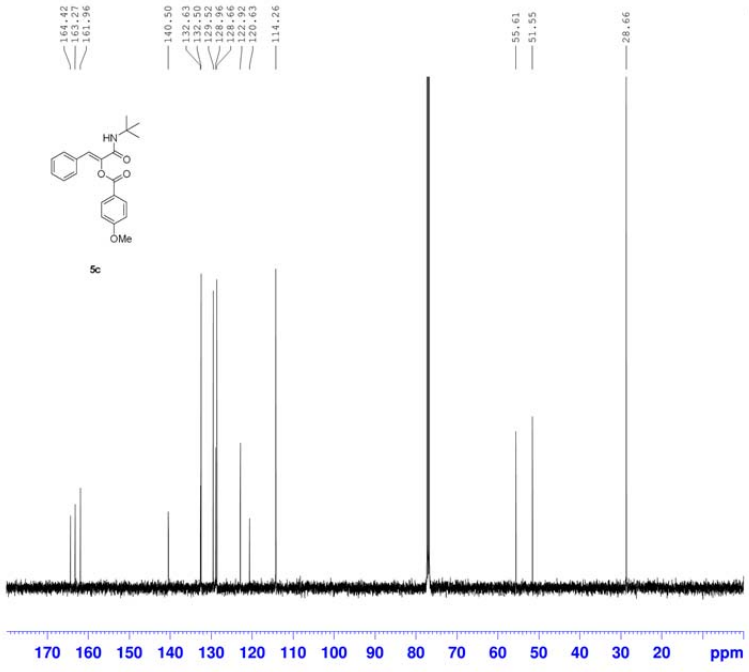

WJ-4-71-2
19Fdeft CDCl3 D:\\ deng 26
-102.978
-102.984
-102.997
-103.007
-103.013
5b
NAME XB20150917
EXPNO 6
PROCNO 1
Date_ 20150917
Time 11.11
INSTRUM spect
PROBHD 5 mm PATXO 19F
PULPROG zg
TD 131072
SOLVENT CDCl3
NS 16
DS 4
SWH 100000.000 Hz
FIDRES 0.762939 Hz
AQ 0.6554150 sec
RG 322.5
DW 5.000 usec
DE 6.00 usec
TE 295.5 K
D1 1.00000000 sec
TD0 1
======== CHANNEL f1 ========
NUC1 19F
P1 19.30 usec
PL1 4.00 dB
SFO1 470.5453180 MHz
SI 65536
SF 470.5923770 MHz
WDW no
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
0 -20 -40 -60 -80 -100 -120 -140 -160 -180 ppm


WJ-4-71-2
C13CPD CDCl3 D:\\ deng 27
167.54
165.50
162.73
161.78
140.55
133.03
132.96
132.41
129.45
129.10
128.73
124.70
124.67
122.83
116.34
116.17
51.70
28.67
5b
NAME XB20150917
EXPNO 14
PROCNO 1
Date_ 20150918
Time 8.46
INSTRUM spect
PROBHD 5 mm PATXO 19F
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1024
DS 4
SWH 30030.029 Hz
FIDRES 0.458222 Hz
AQ 1.0912410 sec
RG 143.7
DW 16.650 usec
DE 6.00 usec
TE 297.5 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
TD0 1
======== CHANNEL f1 ========
NUC1 13C
P1 9.50 usec
PL1 -0.50 dB
SFO1 125.7703643 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 1.00 dB
PL12 16.05 dB
PL13 16.50 dB
SFO2 500.1320005 MHz
SI 32768
SF 125.7577890 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 ppm



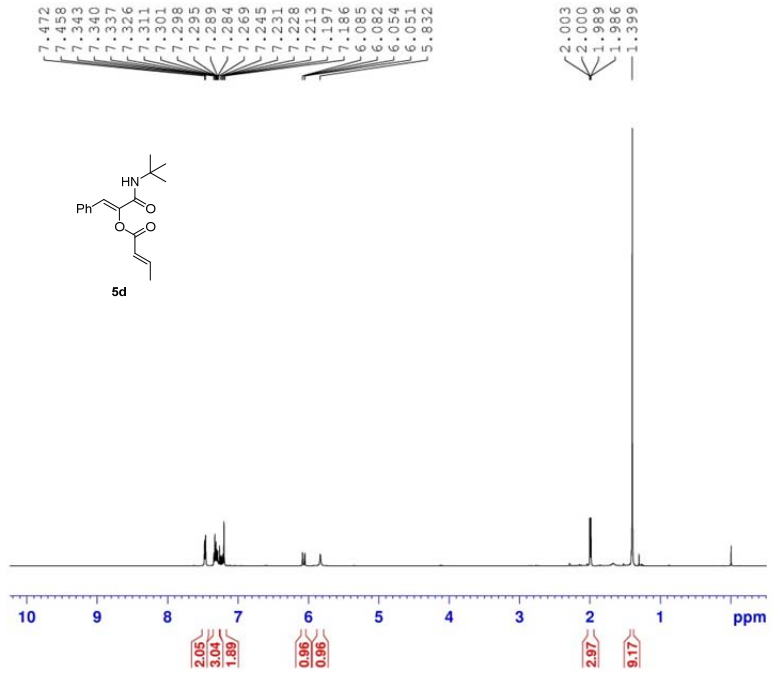
WJ-4-15
PROTON CDC13

NAME	5c
EXPNO	1
PROCNO	1
Date_	20150827
Time	1.33
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDC13
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	203.2
DW	48.400 usec
DE	6.00 usec
TE	295.6 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300126 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



WJ-4-15
C13CPD CDC13 D:\\ deng 60

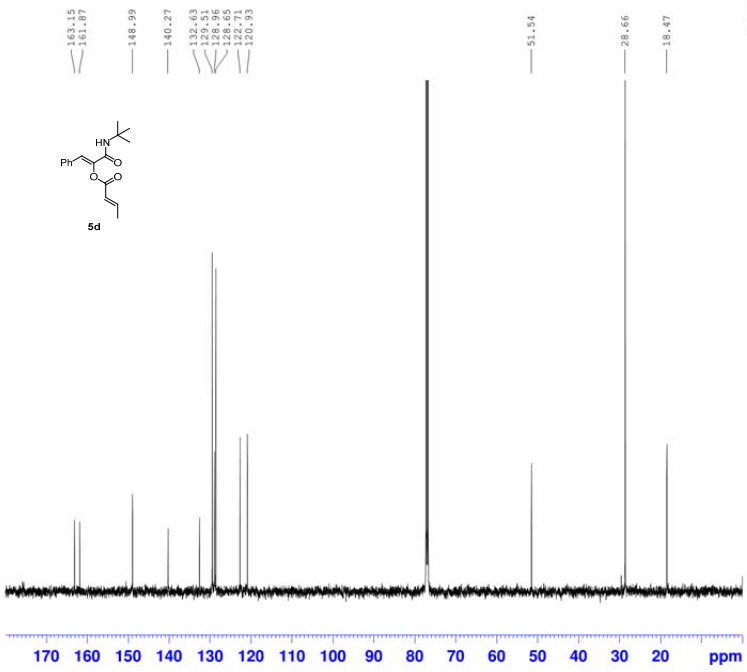
NAME	XB20150827
EXPNO	18
PROCNO	1
Date_	20150828
Time	1.21
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDC13
NS	512
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	128
DW	16.650 usec
DE	6.00 usec
TE	296.9 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40




```
WJ-4-127
PROTON CDC13

NAME                  5f
EXPNO                  1
PROCNO                 1
Date_           20151122
Time               18.06
INSTRUM            spect
PROBHD   5 mm PATXO 19F
PULPROG             zg30
TD                 65536
SOLVENT            CDC13
NS                    16
DS                     2
SWH           10330.578 Hz
FIDRES        0.157632 Hz
AQ            3.1720407 sec
RG                 203.2
DW                48.400 usec
DE                 6.00 usec
TE                294.6 K
D1           1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                14.14 usec
PL1               1.00 dB
SFO1        500.1330885 MHz
SI                 32768
SF          500.1300126 MHz
WDW                   no
SSB                    0
LB                0.00 Hz
GB                     0
PC                1.00
```

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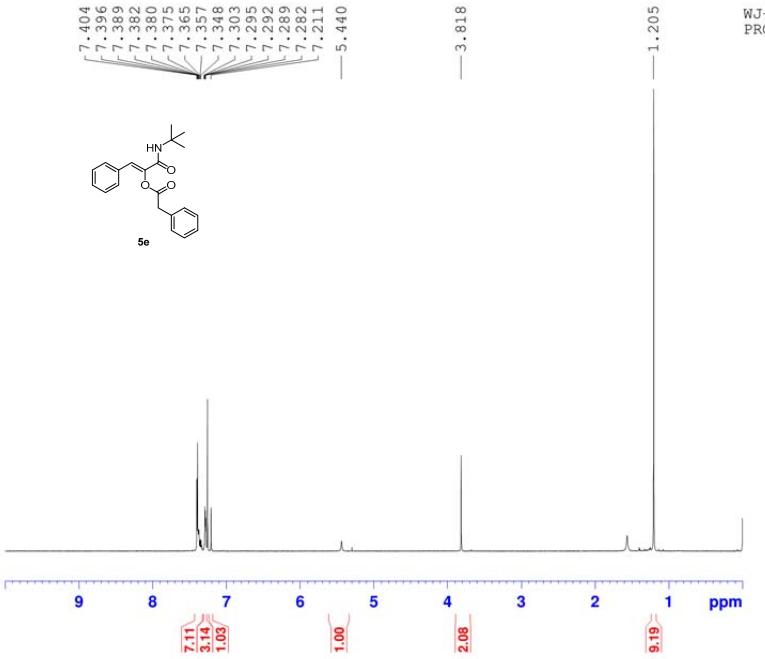
WJ-4-127
C13CPD CDC13 D:\\ deng 49

NAME          XB20160104
EXPNO                 22
PROCNO                 1
Date_           20160105
Time               1.01
INSTRUM            spect
PROBHD   5 mm PATXO 19F
PULPROG          zgpg30
TD                 65536
SOLVENT            CDC13
NS                   512
DS                     4
SWH           30030.029 Hz
FIDRES        0.458222 Hz
AQ            1.0912410 sec
RG                   181
DW                16.650 use
DE                 6.00 use
TE                296.9 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0                    1

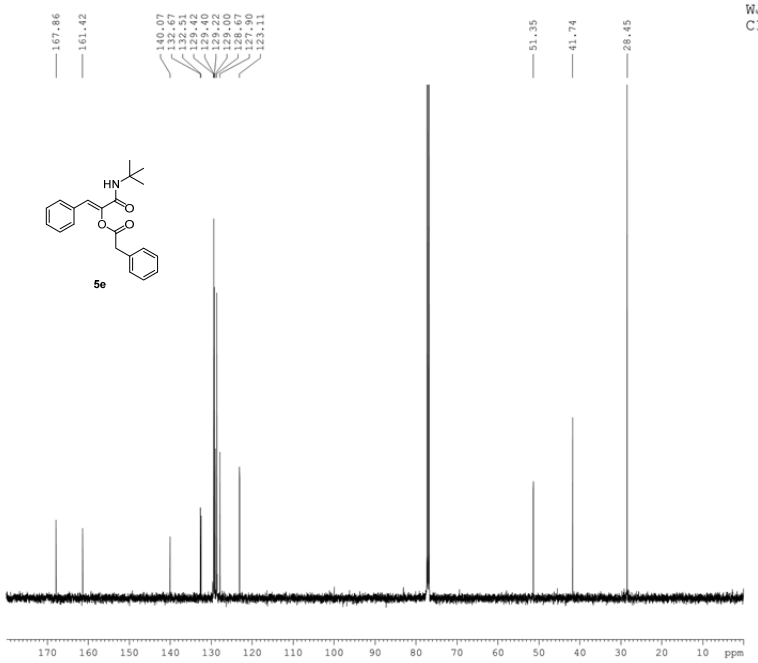
======== CHANNEL f1 ========
NUC1                  13C
P1                 9.50 use
PL1               -0.50 dB
SFO1        125.7703643 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                  1H
PCPD2             80.00 use
PL2               1.00 dB
PL12              16.05 dB
PL13              16.50 dB
SFO2        500.1320005 MHz
SI                 32768
SF          125.7577890 MHz
WDW                   EM
SSB                    0
LB                2.00 Hz
GB                     0
PC                1.40
```



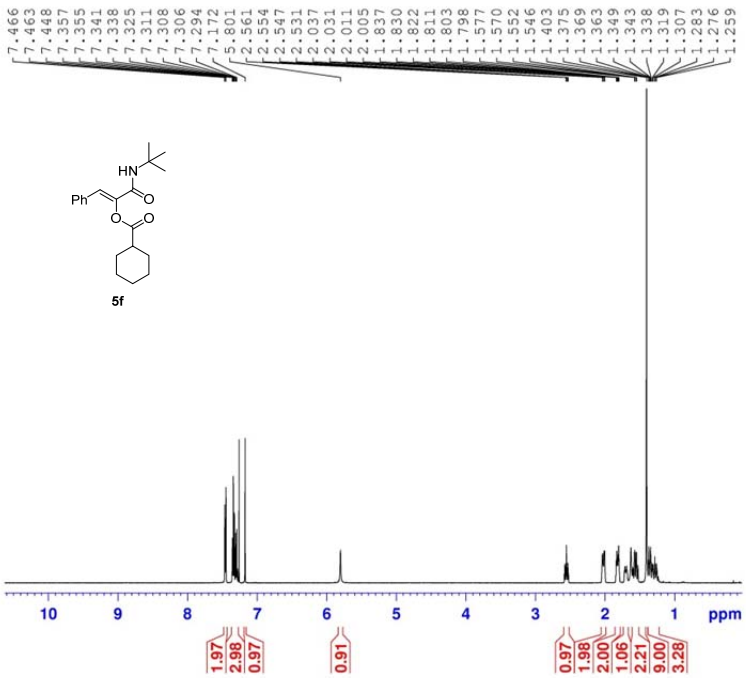
WJ-BYS
PROTON CDCl3 D:\\ deng 2

NAME	XB20160311
EXPNO	6
PROCNO	1
Date_	20160311
Time	11.31
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	322.5
DW	48.400 usec
DE	6.00 usec
TE	294.5 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300129 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



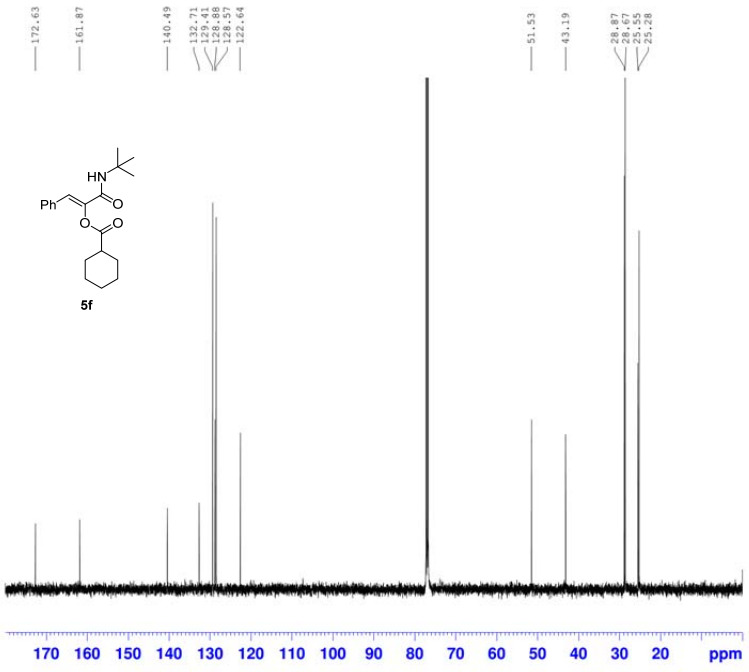
WJ-4-16
C13CPD CDCl3 D:\\ deng 55

NAME	XB20151029
EXPNO	25
PROCNO	1
Date_	20151030
Time	8.00
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	512
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	128
DW	16.650 usec
DE	6.00 usec
TE	297.2 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.13200005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



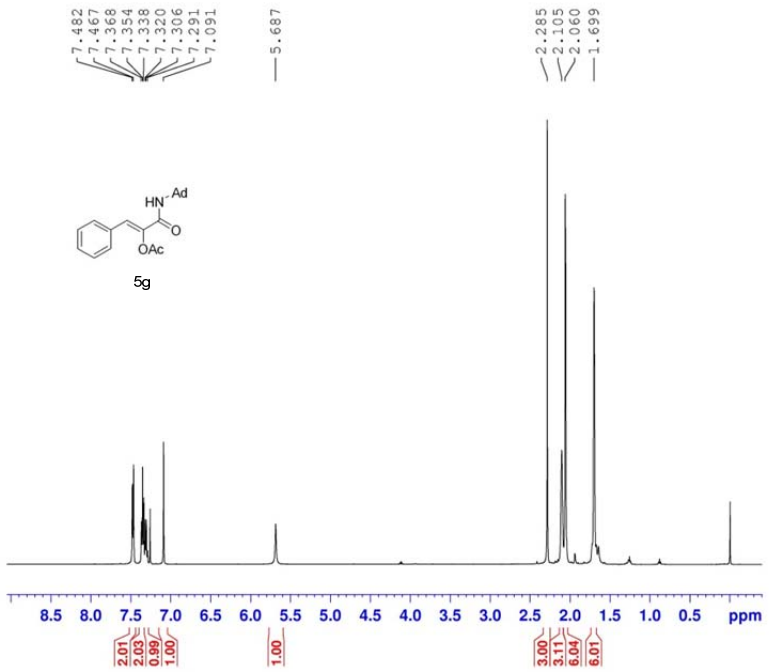
5e
PROTON CDCl3

NAME	XB20180822
EXPNO	16
PROCNO	1
Date_	20180822
Time	14.14
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	287.4
DW	48.400 usec
DE	6.50 usec
TE	296.0 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.24 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300139 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



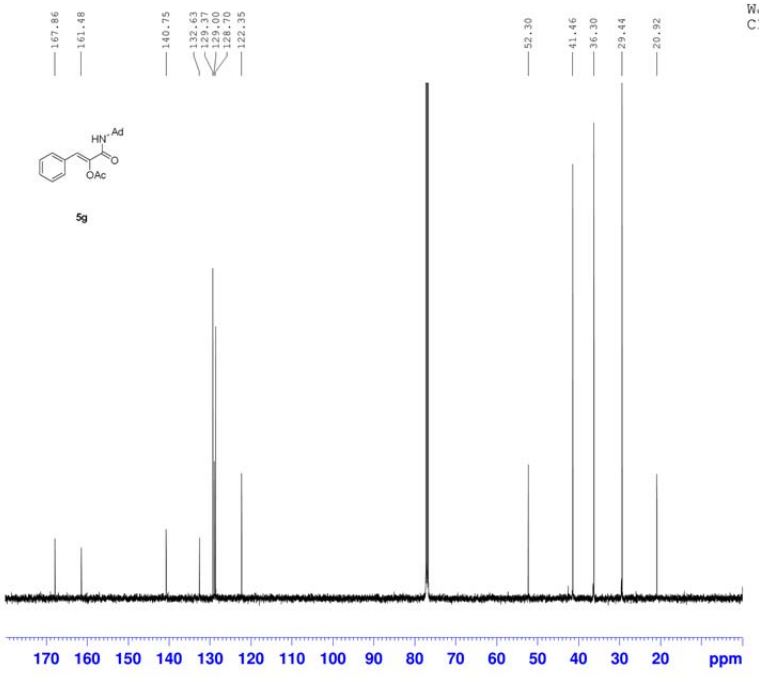
WJ-4-71-1
C13CPD CDCl3 D:\\ deng 2

NAME	XB20151013
EXPNO	19
PROCNO	1
Date_	20151013
Time	22.02
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	1024
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	228.1
DW	16.650 usec
DE	6.00 usec
TE	297.3 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



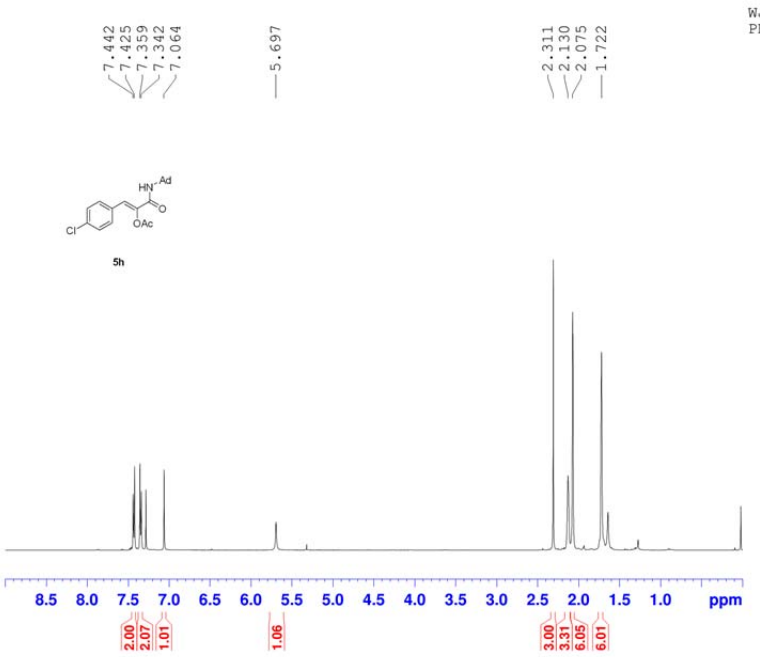
WJ-4-62
PROTON CDC13

NAME	5g
EXPNO	1
PROCNO	1
Date_	20150909
Time	19.34
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDC13
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	181
DW	48.400 usec
DE	6.00 usec
TE	295.5 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300129 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.00



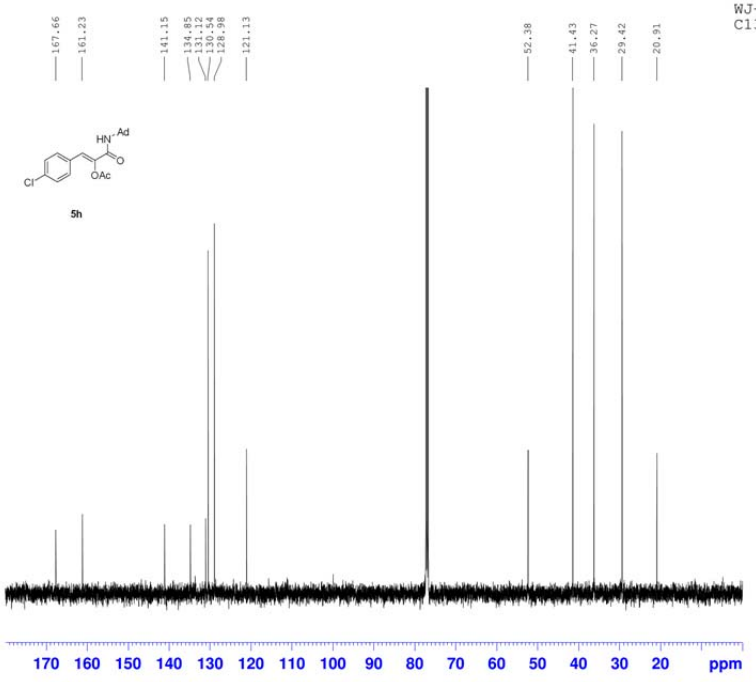
WJ-4-62
C13CPD CDC13 D:\\ deng 18

NAME	XB20150910
EXPNO	22
PROCNO	1
Date_	20150911
Time	5.23
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDC13
NS	1024
DS	4
SWH	30030.029 H:
FIDRES	0.458222 H:
AQ	1.0912410 s
RG	181
DW	16.650 u:
DE	6.00 u:
TE	297.3 K
D1	2.00000000 s
d11	0.03000000 s
DELTA	1.89999998 s
TD0	1
======== CHANNEL f1 =======	
NUC1	13C
P1	9.50 u:
PL1	-0.50 dI
SFO1	125.7703643 MI
======== CHANNEL f2 =======	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 u:
PL2	1.00 dI
PL12	16.05 dI
PL13	16.50 dI
SFO2	500.1320005 MI
SI	32768
SF	125.7577890 MI
WDW	EM
SSB	0
LB	1.00 H:
GB	0
PC	1.40



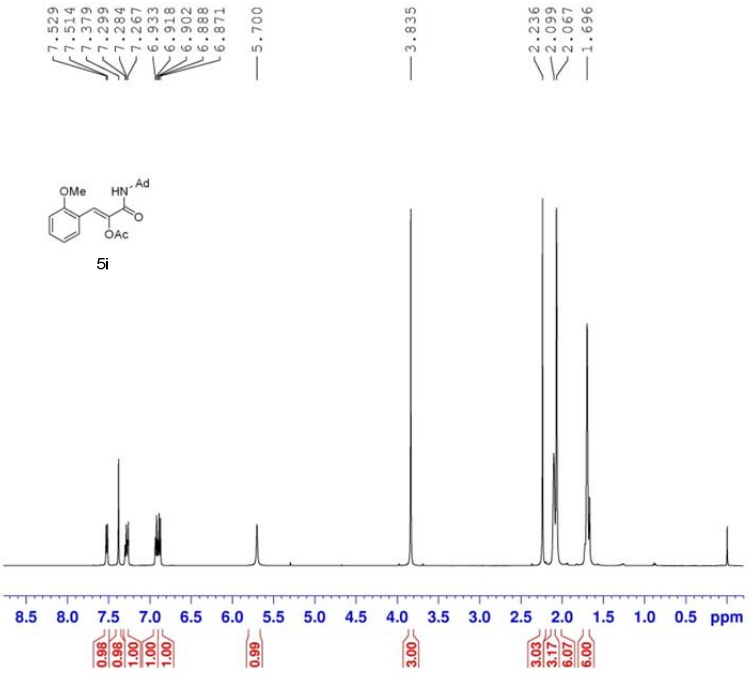
WJ-4-95
PROTON CDCl3 D:\\ deng 59

NAME	XB20151028
EXPNO	12
PROCNO	1
Date_	20151028
Time	15.41
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	228.1
DW	48.400 usec
DE	6.00 usec
TE	294.8 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1299999 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.00



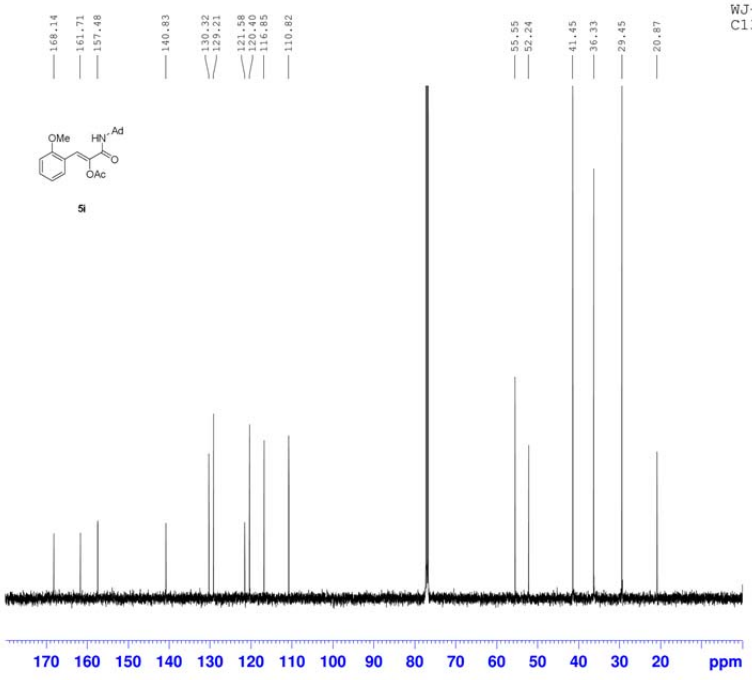
WJ-4-95
C13CPD CDCl3 D:\\ deng 49

NAME	XB20151029
EXPNO	21
PROCNO	1
Date_	20151029
Time	17.51
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	512
DS	4
SWH	30030.029
FIDRES	0.458222
AQ	1.0912410
RG	143.7
DW	16.650
DE	6.00
TE	296.8
D1	2.00000000
d11	0.03000000
DELTA	1.89999998
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50
PL1	-0.50
SFO1	125.7703643
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00
PL2	1.00
PL12	16.05
PL13	16.50
SFO2	500.1320005
SI	32768
SF	125.7577890
WDW	EM
SSB	0
LB	1.00
GB	0
PC	1.40



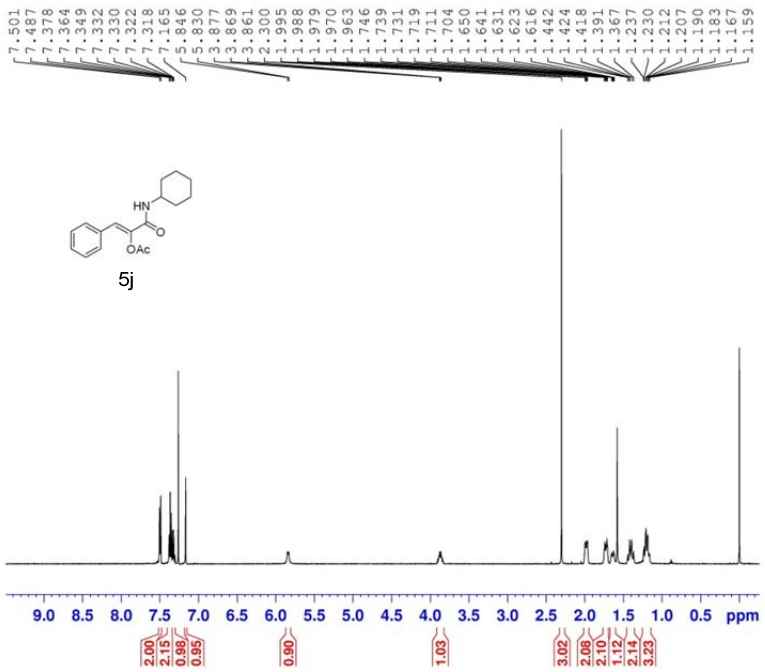
WJ-4-99
PROTON CDCl3

NAME	5i
EXPNO	1
PROCNO	1
Date_	20151020
Time	1.24
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	161.3
DW	48.400 usec
DE	6.00 usec
TE	295.0 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300126 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.00



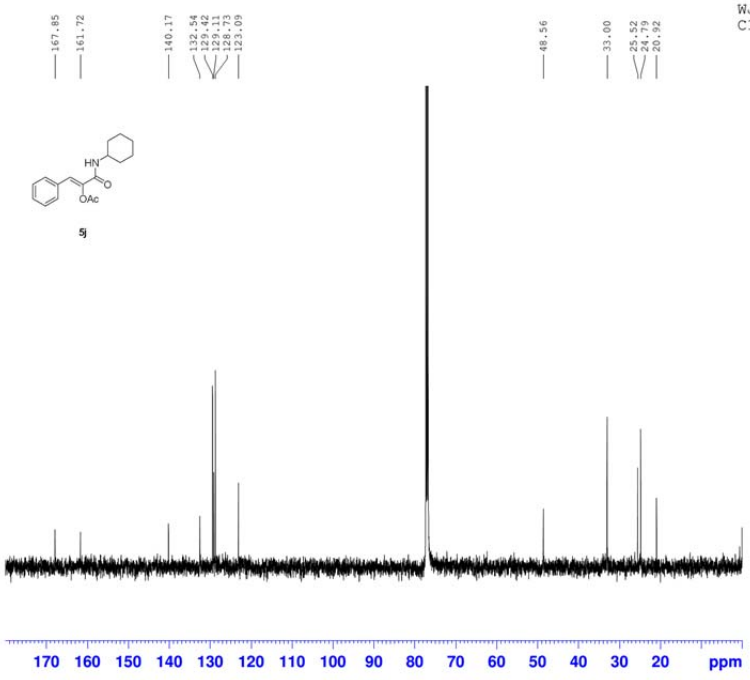
WJ-4-99
C13CPD CDCl3 D:\\ deng 15

NAME	XB20151020
EXPNO	10
PROCNO	1
Date_	20151020
Time	20.32
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	512
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	143.7
DW	16.650 usec
DE	6.00 usec
TE	296.6 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



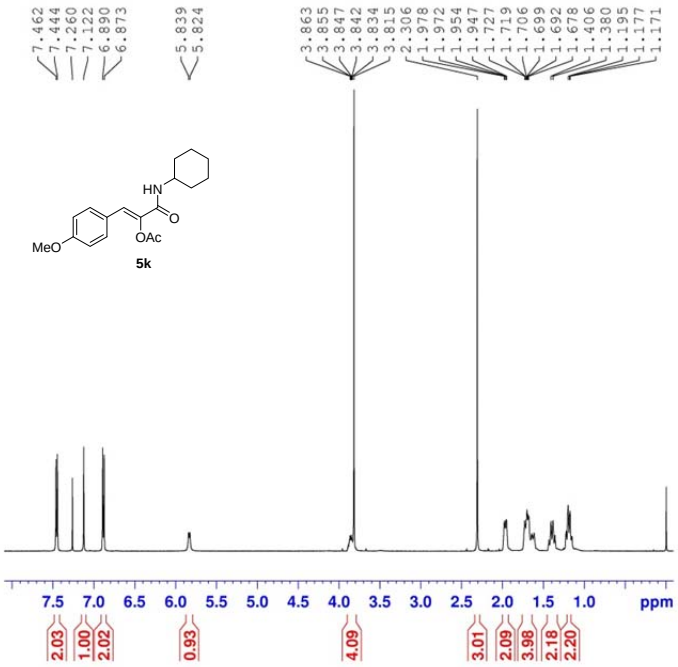
WJ-4-67-P4
PROTON CDCl3

NAME	5j
EXPNO	1
PROCNO	1
Date_	20150909
Time	19.39
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	456.1
DW	48.400 usec
DE	6.00 usec
TE	295.9 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300129 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



WJ-4-67-P4
C13CPD CDCl3 D:\\ deng 16

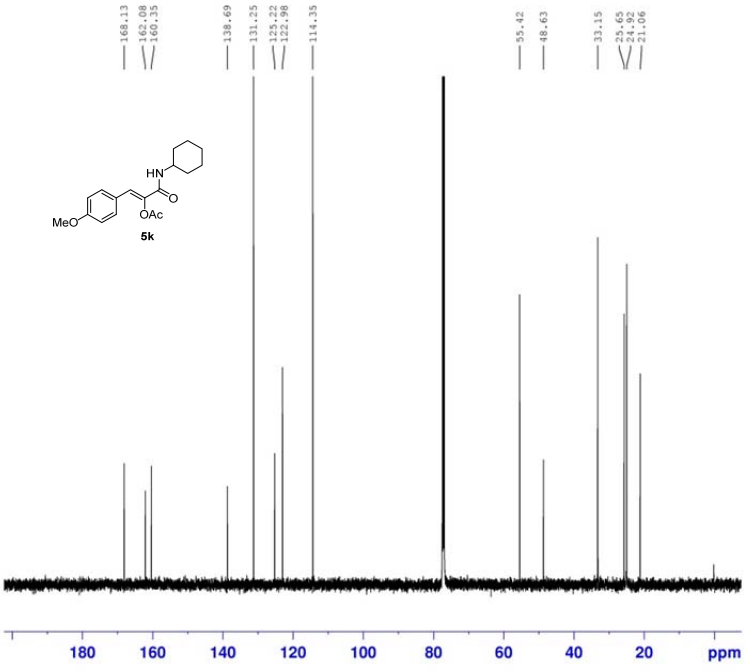
NAME	XB20150910
EXPNO	20
PROCNO	1
Date_	20150911
Time	0.23
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	1024
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	406.4
DW	16.650 usec
DE	6.00 usec
TE	297.4 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.40




```
5K
PROTON CDCl3

NAME          XB20180830
EXPNO              9
PROCNO             1
Date_          20180830
Time              16.37
INSTRUM           spect
PROBHD   5 mm PATXO 19F
PULPROG           zg30
TD                65536
SOLVENT           CDCl3
NS                  16
DS                   2
SWH           10330.578 Hz
FIDRES        0.157632 Hz
AQ            3.1720407 sec
RG                228.1
DW               48.400 usec
DE                6.50 usec
TE               296.4 K
D1            1.00000000 sec
TD0                  1

======== CHANNEL f1 ========
NUC1                 1H
P1                14.24 usec
PL1               1.00 dB
SFO1         500.1330885 MHz
SI                32768
SF           500.1300137 MHz
WDW                  no
SSB                   0
LB                 0.00 Hz
GB                    0
PC                 1.00
```

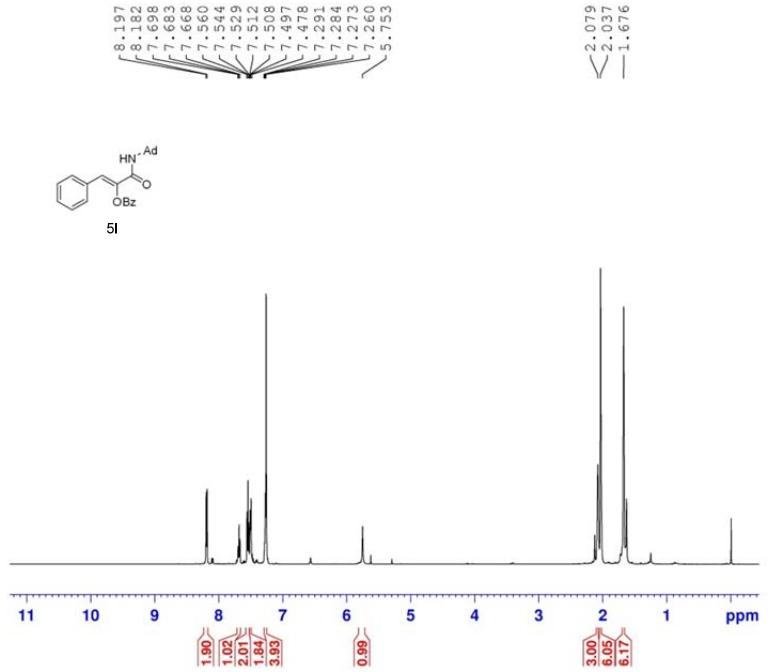



```
5K
C13CPD CDCl3

NAME          XB20180830
EXPNO             17
PROCNO             1
Date_          20180830
Time              23.09
INSTRUM           spect
PROBHD   5 mm PATXO 19F
PULPROG         zgpg30
TD                65536
SOLVENT           CDCl3
NS                 1837
DS                    4
SWH           30030.029 Hz
FIDRES        0.458222 Hz
AQ            1.0912410 sec
RG                14596.5
DW               16.650 usec
DE                6.50 usec
TE               297.9 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0                  1

======== CHANNEL f1 ========
NUC1                13C
P1                9.50 usec
PL1              -0.50 dB
SFO1         125.7703643 MHz

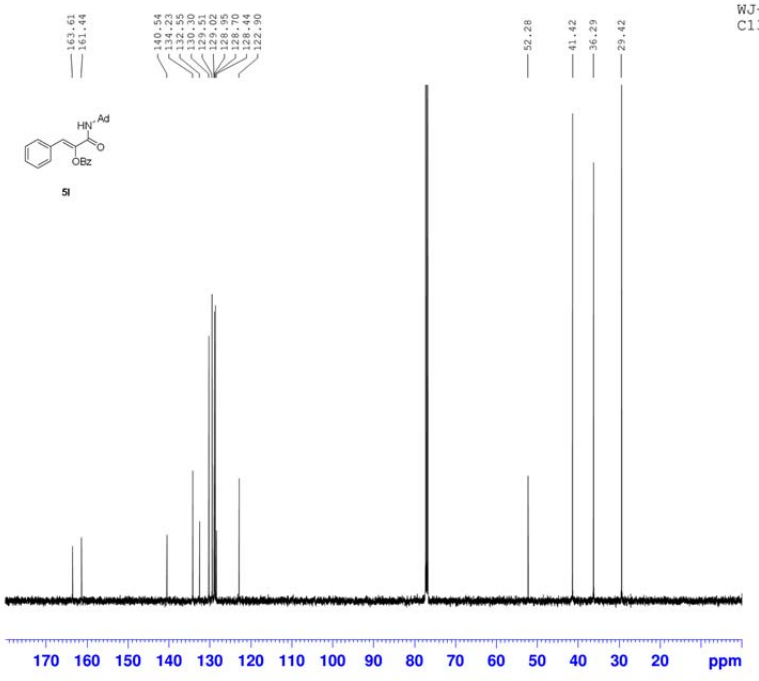
======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                 1H
PCPD2             80.00 usec
PL2               1.00 dB
PL12             15.99 dB
PL13             16.50 dB
SFO2         500.1320005 MHz
SI                32768
SF           125.7577736 MHz
WDW                  EM
SSB                   0
LB                 1.00 Hz
GB                    0
PC                 1.40
```




```
WJ-4-106
PROTON CDCl3

NAME                  51
EXPNO                  1
PROCNO                 1
Date_           20151028
Time                0.46
INSTRUM            spect
PROBHD   5 mm PATXO 19F
PULPROG             zg30
TD                 65536
SOLVENT            CDCl3
NS                    16
DS                     2
SWH           10330.578 Hz
FIDRES        0.157632 Hz
AQ            3.1720407 sec
RG                203.2
DW               48.400 usec
DE                6.00 usec
TE               295.3 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                14.14 usec
PL1                1.00 dB
SFO1        500.1330885 MHz
SI                 32768
SF          500.1300128 MHz
WDW                   EM
SSB                    0
LB                  0.70 Hz
GB                     0
PC                  1.00
```

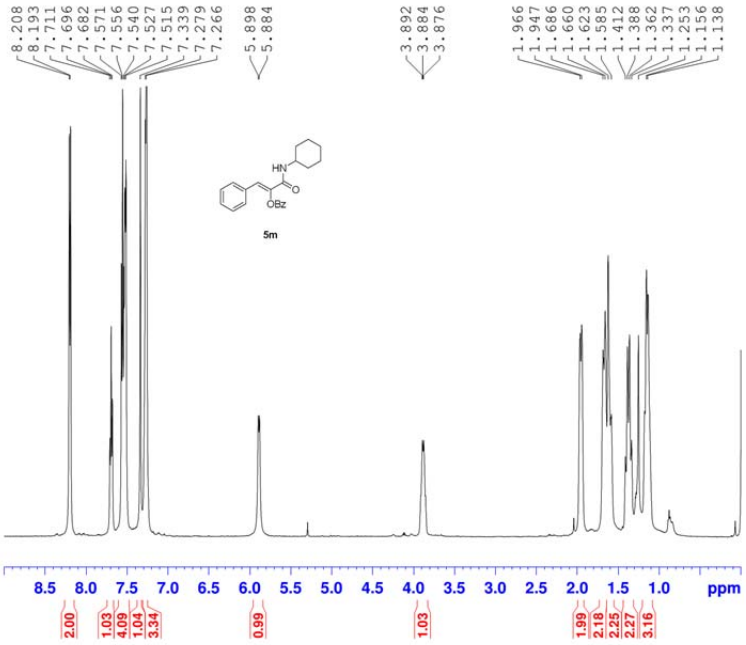



```
WJ-4-106
C13CPD CDCl3 D:\\ deng 56

NAME          XB20151029
EXPNO                 26
PROCNO                 1
Date_           20151030
Time                8.33
INSTRUM            spect
PROBHD   5 mm PATXO 19F
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                   512
DS                     4
SWH           30030.029 Hz
FIDRES        0.458222 Hz
AQ            1.0912410 sec
RG                   128
DW               16.650 usec
DE                6.00 usec
TE               569.8 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0                    1

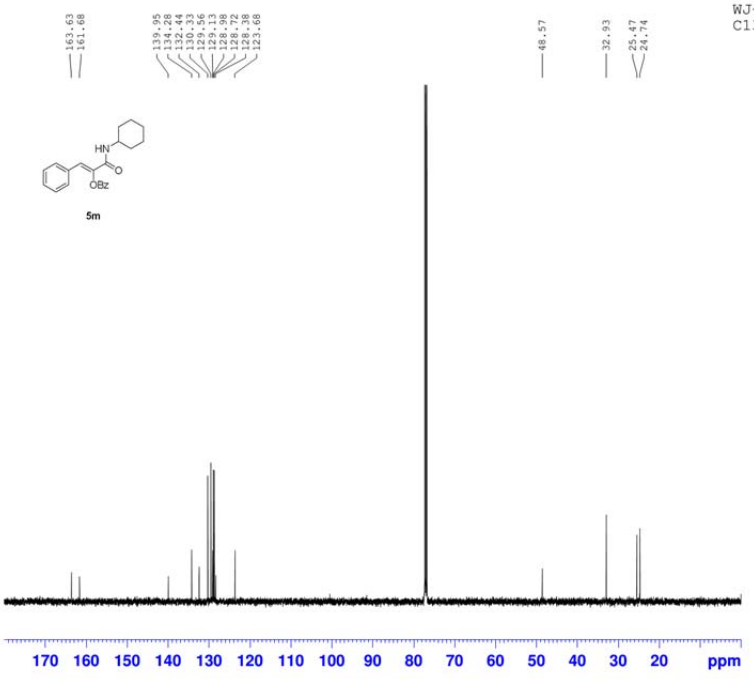
======== CHANNEL f1 ========
NUC1                  13C
P1                 9.50 usec
PL1               -0.50 dB
SFO1        125.7703643 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                  1H
PCPD2             80.00 usec
PL2                1.00 dB
PL12              16.05 dB
PL13              16.50 dB
SFO2        500.1320005 MHz
SI                 32768
SF          125.7577890 MHz
WDW                   EM
SSB                    0
LB                 1.00 Hz
GB                     0
PC                  1.40
```



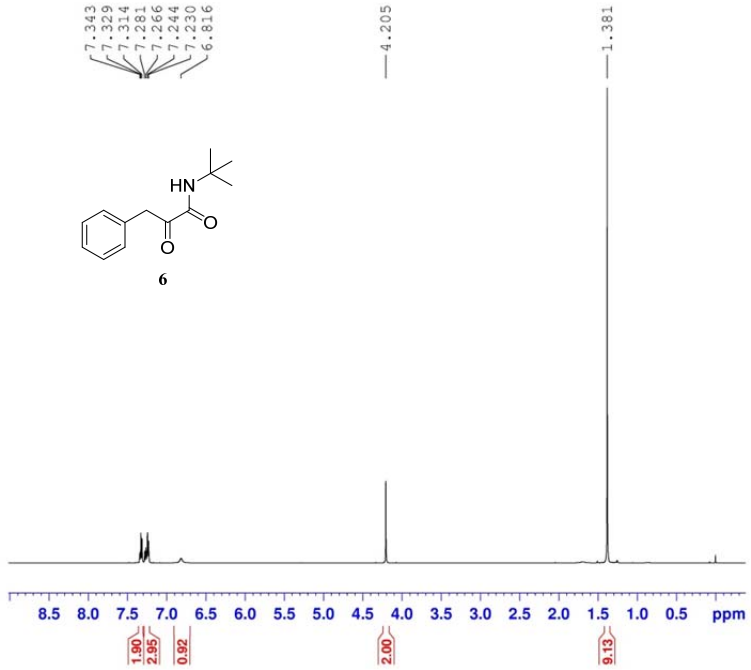
WJ-4-97
PROTON CDCl3

NAME	XB20151021
EXPNO	11
PROCNO	1
Date_	20151021
Time	15.25
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 se
RG	256
DW	48.400 us
DE	6.00 us
TE	295.3 K
D1	1.00000000 se
TD0	1
======== CHANNEL f1 =======	
NUC1	1H
P1	14.14 us
PL1	1.00 dB
SFO1	500.1330885 MH
SI	32768
SF	500.1300126 MH
WDW	EM
SSB	0
LB	1.50 Hz
GB	0
PC	1.00



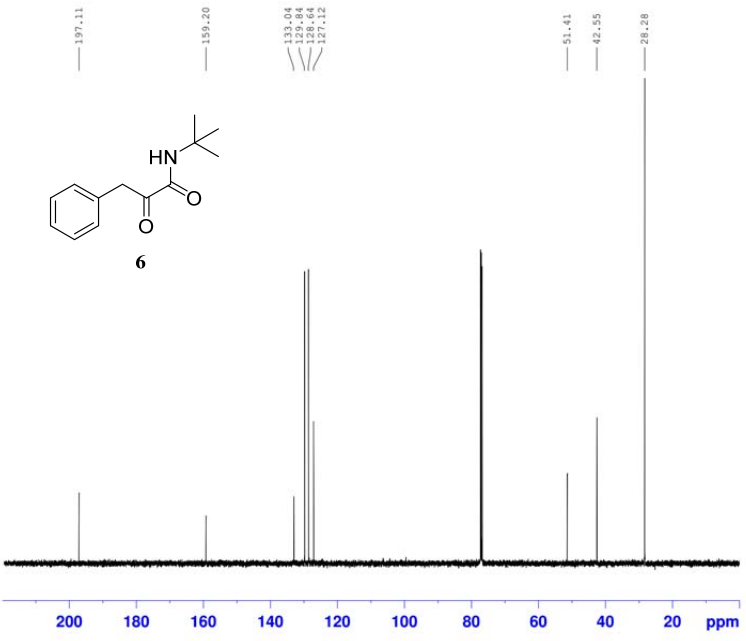
WJ-4-97
C13CPD CDCl3 D:\\ deng 16

NAME	XB20151022
EXPNO	14
PROCNO	1
Date_	20151023
Time	5.36
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	512
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	128
DW	16.650 use
DE	6.00 use
TE	296.7 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 =======	
NUC1	13C
P1	9.50 use
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 =======	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 use
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



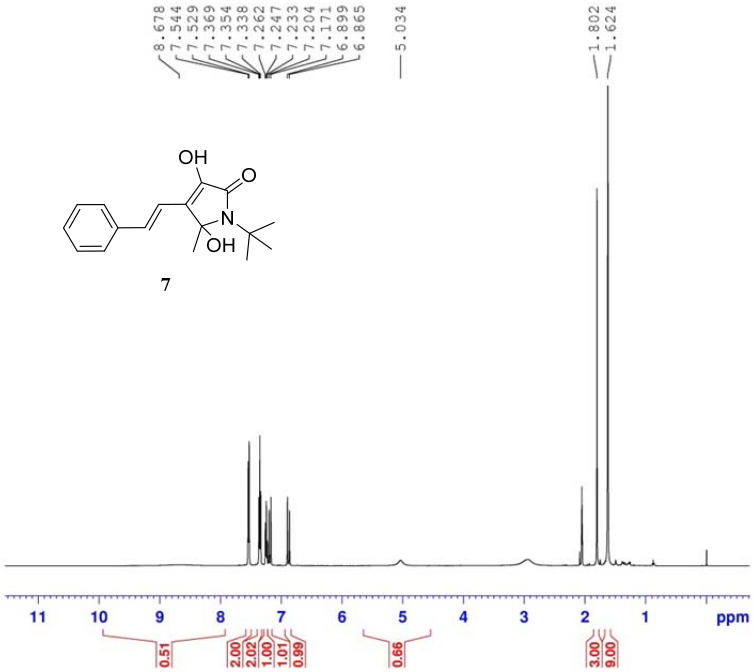
WJ-7A-1
PROTON CDC13

NAME	6a
EXPNO	1
PROCNO	1
Date_	20160616
Time	18.23
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDC13
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	143.7
DW	48.400 usec
DE	6.00 usec
TE	295.2 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.14 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300129 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



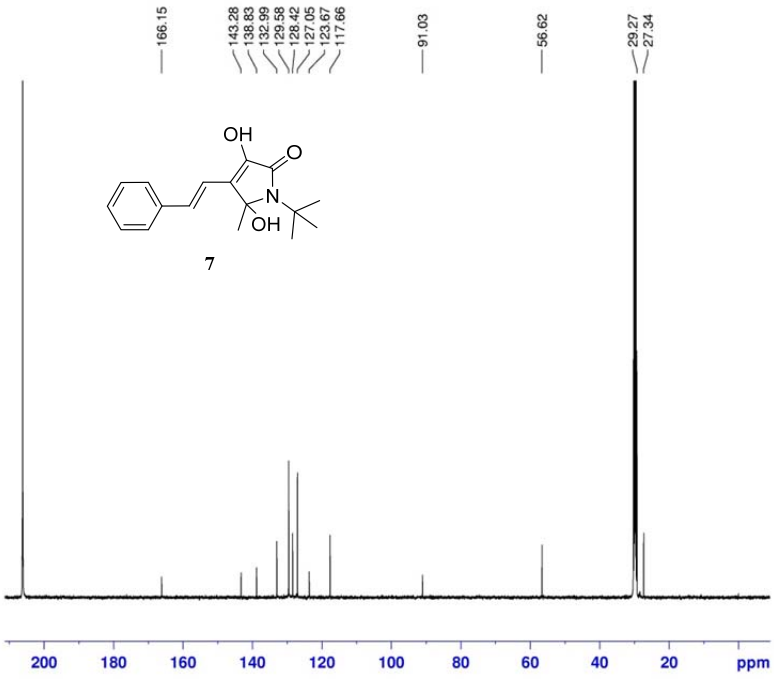
WJ-7A-1
C13CPD CDC13 D:\\ deng 54

NAME	XB20160617
EXPNO	3
PROCNO	1
Date_	20160617
Time	10.41
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDC13
NS	256
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	574.7
DW	16.650 usec
DE	6.00 usec
TE	296.8 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.05 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



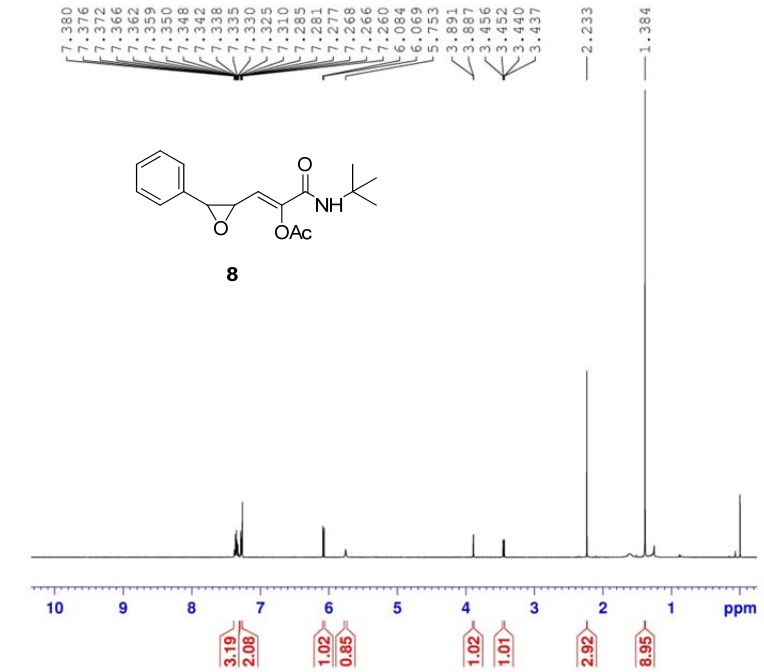
ZMF-7
PROTON Acetone

NAME	XB20181119
EXPNO	22
PROCNO	1
Date_	20181119
Time	0.29
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	Acetone
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	143.7
DW	48.400 usec
DE	6.50 usec
TE	295.9 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.63 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300100 MHz
WDW	EM
SSB	0
LB	0.70 Hz
GB	0
PC	1.00



ZMF-2-61
C13CPD Acetone

NAME	XB20181025
EXPNO	28
PROCNO	1
Date_	20181026
Time	1.10
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	Acetone
NS	2200
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	18390.4
DW	16.650 usec
DE	6.50 usec
TE	298.4 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	15.99 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7576768 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.40



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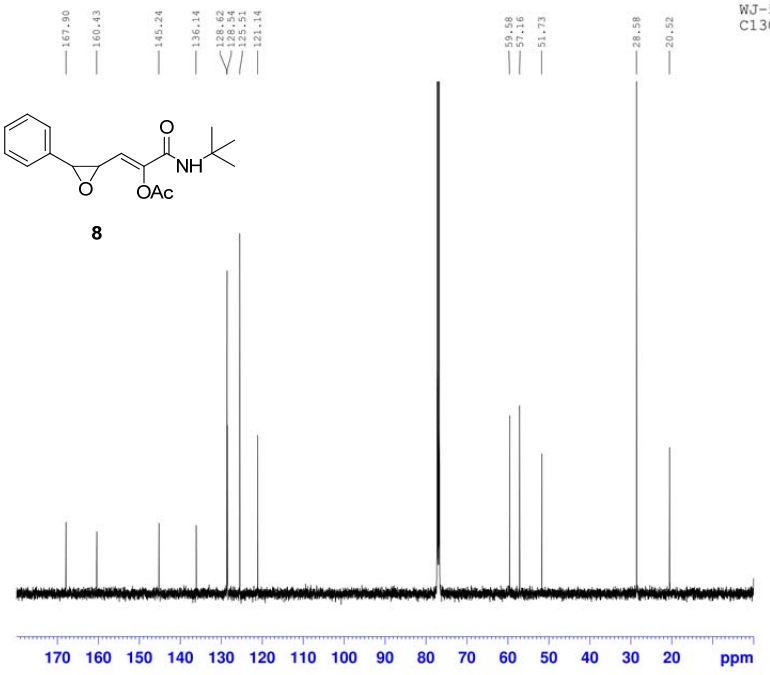
8
PROTON CDCl3

NAME	XB20180822
EXPNO	29
PROCNO	1
Date_	20180822
Time	16.01
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1720407 sec
RG	406.4
DW	48.400 usec
DE	6.50 usec
TE	295.7 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.24 usec
PL1	1.00 dB
SFO1	500.1330885 MHz
SI	32768
SF	500.1300137 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



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WJ-5-78
C13CPD CDCl3 D:\\ deng 13

NAME	XB20160620
EXPNO	25
PROCNO	1
Date_	20160621
Time	1.47
INSTRUM	spect
PROBHD	5 mm PATXO 19F
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	4400
DS	4
SWH	30030.029 Hz
FIDRES	0.458222 Hz
AQ	1.0912410 sec
RG	143.7
DW	16.650 usec
DE	6.00 usec
TE	298.7 K
D1	2.00000000 sec
d11	0.03000000 sec
DELTA	1.89999998 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.50 usec
PL1	-0.50 dB
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	15.99 dB
PL13	16.50 dB
SFO2	500.1320005 MHz
SI	32768
SF	125.7577890 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40