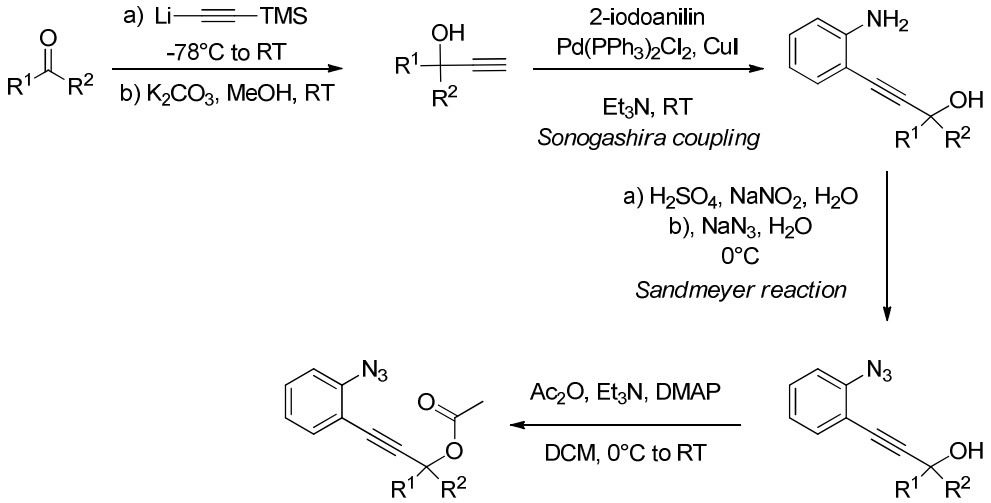
Quinolines synthesis from azidophenylalkynyl acetates

1. General procedures

General procedure 4.1:



Preparation:

Addition on the ketone

1.0 equiv. of a solution of butyllithium in hexanes is added to a solution of 1.1 equiv. of ethynyltrimethylsilane in THF at -78°C. The mixture is stirred at -78°C for 30 minutes. 1.0 equiv. of the ketone is then added and the resulting mixture stirred at -78°C and monitored by TLC. (The mixture's temperature can be raised to 0°C or RT depending on the duration of the addition). When the reaction is complete, $NH_4Cl_{(sat)}$ is added to the solution and the temperature is allowed to raise to RT. The phases are separated and the aqueous phase is extracted twice with diethyl ether. The combined organic phases are washed with brine and dried over Magnesium sulfate. After filtration, the solvents are evaporated and the crude is analyzed by NMR.

The crude can be used in the second step without further purification.

Deprotection of the silyl group

The substrate is dissolved in MeOH (0.5M) and 0.3 equiv. of K_2CO_3 is added. The mixture is stirred at RT until TLC shows no remaining starting material. The solvent is then evaporated under low pressure. $NH_4Cl_{(sat)}$ and diethyl ether are added to the mixture. The phases are separated and the aqueous phase is extracted twice with diethyl ether. The combined organic phases are washed with water, brine and dried over Magnesium sulfate. After filtration, the solvents are evaporated and the crude is analyzed by NMR. The product is purified by column chromatography using petroleum ether:ethyl acetate (80:20) as eluent.

Sonogashira coupling

1.0 equiv. of 2-iodoanilin is dissolved in triethylamine (0.3 M) and the solution is degased by bubbling N_2 for one hour. 0.02 equiv. of $Pd(PPh_3)_2Cl_2$ and 0.04 equiv. of copper iodide are then added and the mixture stirred for 5 minutes. 1.0 equiv. of the alkyne obtained in the previous step is then added pure or in a 1M solution in triethylamine (if solid). The reaction mixture is stirred at RT until TLC shows no starting alkyne remaining (2h to overnight). $NH_4Cl_{(sat)}$ and diethyl ether are added to the mixture. The phases are separated and the aqueous phase is extracted twice with diethyl ether. The combined organic phases are washed with water, brine and dried over Magnesium sulfate. After filtration, the solvents are evaporated and the crude is analyzed by NMR. The product is then purified by column chromatography using petroleum ether:ethyl acetate (85:15) as eluent.

Sandmeyer reaction

The anilin obtained in the previous step is dissolved in a sulphuric acid solution (10% in water). Acetonitrile can be added when the substrate is not soluble in the aqueous phase (up to 5mL). The mixture is stirred at 0°C and a 1.5M solution of 1.2 equiv. of sodium nitrite in water is added dropwise over 15 minutes. The resulting mixture is stirred at 0°C for 30 minutes. Then, 1.2 equiv. of a 1.5M solution of sodium azide in water is added dropwise over 15 minutes. The reaction mixture is stirred at 0°C for 30 minutes starting when no nitrogen degasing can be seen anymore.

The reaction is quenched by $Na_2S_2O_{3(sat)}$ and diethyl ether is added. The phases are separated and the aqueous phase is extracted twice with diethyl ether. The combined organic phases are washed with water, brine and dried over Magnesium sulfate. After filtration, the solvents are evaporated and the crude is analyzed by NMR.

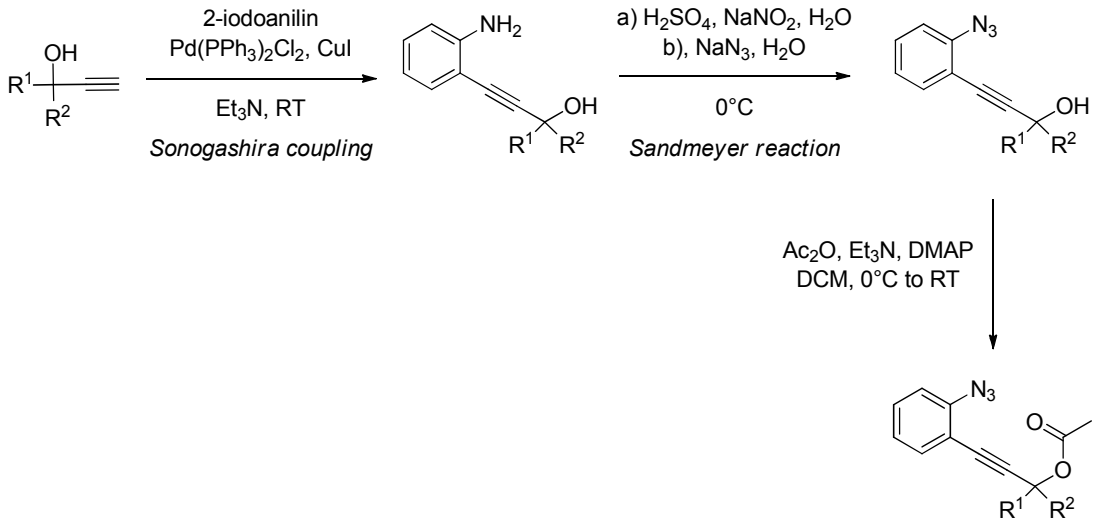
In most cases the next step can be carried out without further purification.

Acetylation

1.0 equiv. of the substrate is dissolved in dichloromethane (0.25M) and the solution is stirred under N_2 atmosphere at 0°C. 1.5 equiv. of triethylamine, 0.1 equiv. of DMAP and 1.5 equiv. of acetic anhydride are added. The reaction mixture is then heated to 40°C and stirred at this temperature until completion. $NH_4Cl_{(sat)}$ is then added to the mixture. The phases are separated and the aqueous phase is extracted twice with dichloromethane. The combined organic phases are washed with water, brine and dried over Magnesium sulfate. After filtration, the solvent is evaporated and the crude is analyzed by NMR.

The product is then purified on column chromatography using petroleum ether:ethyl acetate (98:2) as eluent.

General procedure 4.2 (when the propargyl alcohol is comercially available)



Sonogashira coupling

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Sandmeyer reaction

The anilin obtained in the previous step is dissolved in a sulphuric acid solution (10% in water). Acetonitrile can be added when the substrate is not soluble in the aqueous phase (up to 5mL). The mixture is stirred at 0°C and a 1.5M solution of 1.2 equiv. of sodium nitrite in water is added dropwise over 15 minutes. The resulting mixture is stirred at 0°C for 30 minutes. Then, 1.2 equiv. of a 1.5M solution of sodium azide in water is added dropwise over 15 minutes. The reaction mixture is stirred at 0°C for 30 minutes starting when no nitrogen degasing can be seen anymore.

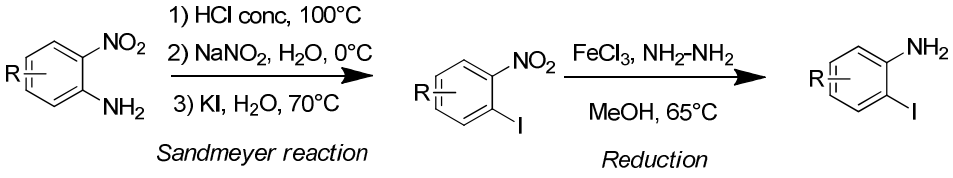
The reaction is quenched by $Na_2S_2O_{3(sat)}$ and diethyl ether is added. The phases are separated and the aqueous phase is extracted twice with diethyl ether. The combined organic phases are washed with water, brine and dried over Magnesium sulfate. After filtration, the solvents are evaporated and the crude is analyzed by NMR. In most cases the next step can be carried out without further purification.

Acetylation

1.0 equiv. of the substrate is dissolved in dichloromethane (0.25M) and the solution is stirred under N_2 atmosphere at 0°C. 1.5 equiv. of triethylamine, 0.1 equiv. of DMAP and 1.5 equiv. of acetic anhydride are added. The reaction mixture is then heated to 40°C and stirred at this temperature until completion. $NH_4Cl_{(sat)}$ is then added to the mixture. The phases are separated and the aqueous phase is extracted twice with dichloromethane. The combined organic phases are washed with water, brine and dried over Magnesium sulfate. After filtration, the solvent is evaporated and the crude is analyzed by NMR.

The product is then purified on column chromatography using petroleum ether:ethyl acetate (98:2) as eluent.

General procedure 4.3 (starting from the 2-nitroanilin)



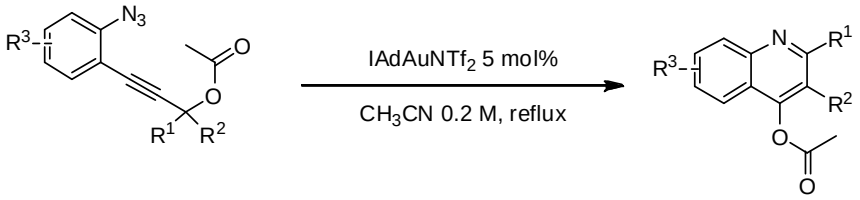
Sandmeyer reaction (iodation)

A suspension of 2-nitroaniline (6.0 mmol) in concentrated HCl (1.5 mL) was heated to 100 °C for 10 minutes. Then the solution was cooled to 0 °C and $NaNO_2$ (7.2 mmol, 497 mg) in 1.5 mL H_2O was added dropwise with a syringe at 0 °C. The reaction mixture was stirred for 30 minutes at 0 °C. Afterwards the solution was added slowly to an aqueous solution of KI (9.0 mmol, 1.5 g in 1.5 mL H2O) at 0 °C. The resulting mixture was heated to 70 °C for 2 hours. After cooling to rt, H_2O (10 mL) was added and the crude product was extracted with EtOAc (2×15.0 mL). The combined organic phases were washed with aqueous HCl (10%), aqueous NaOH (1 N), saturated aqueous $NaSO_3$-solution and brine. After drying over Magnesium sulfate, the organic solvent was evaporated under reduced pressure and the desired compounds were obtained as brown or light-yellow solids.

Reduction of the nitro group

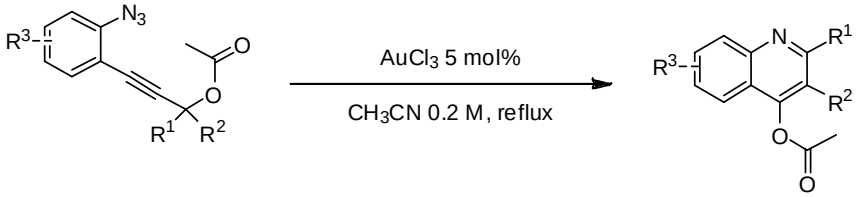
To a solution of FeCl3×6 H2O (4.0 mg, 15.0 μmol, 1.5 mol%) in 5.0 mL MeOH were added 1-iodo-2-nitrobenzene (1.0 mmol) and active carbon (4.0 mg, 0.2 mmol, 20 mol%). The mixture was heated to reflux and hydrazin monohydrate (100.0 mg, 0.1 mL, 2.0 mmol) was added dropwise by a syringe. Stirring at reflux was continued for further 2 h and monitored byTLC-analysis. After all starting material has been consumed the reaction mixture was cooled to rt and the solvent was removed *in vacuo*. The aniline was purified by column chromatography using petroleum ether:ethyl acetate as eluent (90:10)

General procedure 4.4



In an NMR tube, 1.0 equiv. (0.1 mmol) of the subtrate is dissolved in 0.5mL of acetonitrile-d^3. 5 mol% of $IAdAuNTf_2$ (0.005 mmol) is then added to the solution and the reaction mixture is heated at reflux. The reaction is monitored by 1H NMR until completion. The solvent is evaporated and the product purified by column chromatography on silica using petroleum ether:ethyl acetate (80:20) as the eluent.

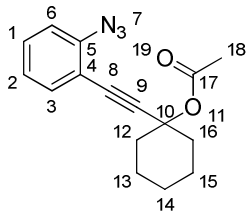
General procedure 4.5



In an NMR tube, 1.0 equiv. (0.1 mmol) of the subtrate is dissolved in 0.5mL of acetonitrile-d^3. 5 mol% of $AuCl_3$ (0.005 mmol) is then added to the solution and the reaction mixture is heated at reflux. The reaction is monitored by 1H NMR until completion. The solvent is evaporated and the product purified by column chromatography on silica using petroleum ether:ethyl acetate (80:20) as the eluent.

2. Preparation of the substrates

1-[2-(2-azidophenyl)ethynyl]cyclohexyl acetate (4.23) $C_{16}H_{17}N_3O_2$ **MW = 283.3g.mol^{-1}**



Procedure: see general procedure 4.2

Product: yellow oil

Yield: 66 % over 3 steps (m = 563 mg, n = 1.99 mmol)

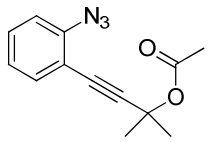
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.43 (dd, *J* = 1.3 Hz, *J* = 7.6 Hz, 1H, **H3**), 7.30 (ddd, *J* = 1.6 Hz, *J* = 7.5 Hz, *J* = 8.2 Hz, 1H, **H6**), 7.08-7.04 (m, 1H, **H2**), 7.28-7.23 (m, 1H, **H1**), 2.07 (s, 3H, **H18**), 1.95-1.88 (m, 4H, **H12 and H16**), 1.78-1.54 (m, 5H, **H13 to H15**), 1.41-1.32 (m, 1H, **H14**).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.3 (**C17**), 141.1 (**C5**), 134.0 (**C3**), 129.5 (**C1**), 124.5 (**C6**), 118.8 (**C1**), 115.3 (**C4**), 95.3 (**C8**), 81.9 (**C9**), 75.9 (**C10**), 37.1 (2C, **C12 and C16**), 25.3 (**C14**), 22.8 (2C, **C13 and C15**), 22.0 (**C18**).

HRMS: $C_{16}H_{17}N_3O_2$ [M^+]; calculated: 283.1321, found 283.1313.

IR (CCl_4): ν (cm^{-1}) 2939, 2862, 2118, 1747, 1571, 1489, 1447, 1366, 1297, 1234, 1023.

4-(2-azidophenyl)-2-methylbut-3-yn-2-yl acetate (4.29) $C_{13}H_{13}N_3O_2$ **MW = 243.3 g.mol^{-1}**



Procedure: see general procedure 4.2

Product: yellow oil

Yield: over 3 steps: 49% (m = 359 mg, n = 1.48 mmol)

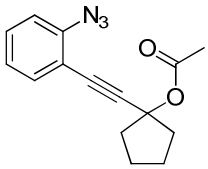
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.41 (dd, *J* = 1.5 Hz, *J* = 8.0 Hz, 1H), 7.29 (ddd, *J* = 1.5 Hz, *J* = 6.7 Hz, *J* = 8.9 Hz, 1H), 7.07-7.03 (m, 2H), 2.05 (s, 3H), 1.77 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.3, 140.8, 134.0, 129.5, 124.5, 118.9, 115.0, 96.3, 79.5, 72.3, 28.8 (2C), 21.9.

HRMS: $C_{13}H_{13}N_3O_2$ [M^+]; calculated: 243.1008, found 243.1019.

IR (CCl_4): ν (cm^{-1}) 2989, 2940, 2125, 1747, 1572, 1489, 1438, 1366, 1299, 1264, 1242, 1133, 1015.

1-[2-(2-azidophenyl)ethynyl]cyclopentyl acetate (4.33) $C_{15}H_{15}N_3O_2$ **MW = 269.3 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: yellow oil

Yield: over 5 steps: **56%** (m = 449 mg, n = 1.67 mmol)

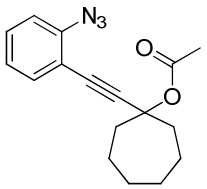
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.41 (dd, *J* = 1.3 Hz, *J* = 7.9 Hz, 1H), 7.29 (dt, *J* = 1.2 Hz, *J* = 7.2 Hz, 1H), 7.07-7.03 (m, 2H), 2.32-2.26 (m, 4H), 2.06 (s, 3H), 1.84-1.77 (m, 4H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.5, 140.8, 133.9, 129.4, 124.4, 118.9, 115.2, 95.8, 80.8, 80.1, 40.3 (2C), 23.4 (2C), 21.7.

HRMS: $C_{15}H_{15}N_3O_2$ [M^+]; calculated: 269.1164, found 269.1178.

IR (CCl_4): ν (cm^{-1}) 2963, 2877, 2119, 1747, 1572, 1489, 1446, 1367, 1302, 1238, 1181, 1013.

1-[2-(2-azidophenyl)ethynyl]cycloheptyl acetate (4.35) $C_{17}H_{19}N_3O_2$ **MW = 297.4 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: colorless oil

Yield: over 5 steps: **48%** (m = 430 mg, n = 1.45 mmol)

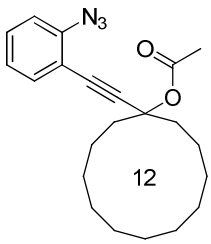
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.41 (dd, *J* = 1.5 Hz, *J* = 8.0 Hz, 1H), 7.28 (*J* = 1.5 Hz, *J* = 7.8 Hz, *J* = 8.4 Hz, 1H), 7.06-7.02 (m, 2H),2.39-2.33 (m, 2H), 2.20-2.13 (m, 2H), 2.04 (s, 3H), 1.72-1.56 (m, 8H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.2, 141.0, 134.0, 129.5, 124.5, 118.9, 115.3, 96.5, 81.1, 79.3, 40.2 (2C), 28.3 (2C), 22.4 (2C), 22.1.

HRMS: $C_{17}H_{19}N_3O_2$ [M^+]; calculated: 297.1477, found 297.1480.

IR (CCl_4): ν (cm^{-1}) 3068, 3037, 2103, 1744, 1571, 1489, 1440, 1369, 1300, 1223, 1014.

1-[2-(2-azidophenyl)ethynyl]cyclododecyl acetate (4.37) $C_{22}H_{29}N_3O_2$ **MW = 367.5 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: yellow oil

Yield: over 5 steps: 56% (m = 510 mg, n = 1.39 mmol)

^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.40 (d, *J* = 8.1 Hz, 1H), 7.28 (ddd, *J* = 1.5 Hz, *J*

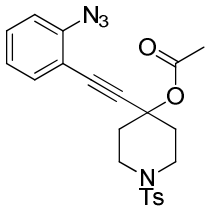
= 8.1 Hz, *J* = 8.8 Hz, 1H), 7.06-7.03 (m, 2H), 2.27-2.20 (m, 2H), 2.04 (s, 3H), 1.95-1.89 (m, 2H), 1.65-1.58 (m, 2H), 1.44-1.34 (m, 16H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.1, 141.0, 134.1, 129.5, 124.5, 118.8, 115.3, 95.7, 81.2, 78.2, 32.9 (2C), 26.1, 25.9 (2C), 22.3 (2C), 22.1 (2C), 21.8, 19.3 (2C).

HRMS: $C_{22}H_{29}N_3O_2$ [M^+]; calculated: 367.2260, found 367.2250.

IR (CCl_4): ν (cm^{-1}) 2932, 2865, 2854, 2124, 1743, 1558, 1555, 1550, 1546, 1542, 1489, 1471, 1446, 1365, 1304, 1233, 1216, 1013.

4-[2-(2-azidophenyl)ethynyl]-1-[(4-methylbenzene)sulfonyl]piperidin-4-yl acetate (4.42) $C_{22}H_{22}N_4O_4S$ **MW = 438.5 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: colorless oil

Yield: over 5 steps: 49% (m = 650 mg, n = 1.48 mmol)

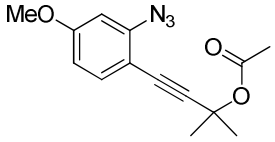
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.72 (d, *J* = 8.3 Hz, 2H), 7.38-7.33 (m, 3H), 7.28 (dd, *J* = 1.1 Hz, *J* = 7.6 Hz, 1H), 7.09-7.05 (m, 2H), 3.57 (dt, *J* = 4.1 Hz, *J* = 9.4 Hz, 2H), 3.07 (ddd, *J* = 2.8 Hz, *J* = 10.4 Hz, *J* = 12.6 Hz, 2H), 2.46 (s, 3H), 2.45-2.40 (m, 2H), 2.17 (ddd, *J* = 3.8 Hz, *J* = 10.2 Hz, *J* = 13.6 Hz, 2H), 2.08 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.1, 143.7, 141.2, 133.6, 133.4, 129.9, 129.7, 127.7, 124.5, 118.5, 114.2, 92.4, 83.7, 73.0, 43.1, 36.1, 21.8, 21.6.

HRMS: $C_{22}H_{22}N_4O_4S$ [M^+]; calculated: 438.1362, found 428.1348.

IR (CCl_4): ν (cm^{-1}) 2938, 2859, 2119, 2089, 1748, 1490, 1362, 1298, 1226, 1169, 1096, 1018.

4-(2-azido-4-methoxyphenyl)-2-methylbut-3-yn-2-yl acetate (4.48) $C_{14}H_{15}N_3O_3$ **MW = 273.3 g.mol^{-1}**



Procedure: see general procedure 4.3 then 4.2

Product: colorless oil

Yield: over 3 steps: **62%** (m = 340 mg, n = 1.245 mmol)

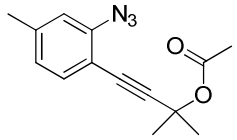
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.32 (d, *J* = 8.6 Hz, 1H), 6.60 (dd, *J* = 2.4 Hz, *J* = 8.6 Hz, 1H), 6.54 (d, *J* = 2.4 Hz, 1H), 3.80 (s, 3H), 2.03 (s, 3H), 1.75 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.4, 160.7, 142.2, 135.1, 110.7, 107.5, 104.8, 94.9, 79.5, 72.6, 55.5, 29.0 (2C), 22.1.

HRMS: $C_{14}H_{15}N_3O_3$ [M^+]; calculated: 273.1113, found 273.1112.

IR (CCl_4): ν (cm^{-1}) 3485, 3387, 2939, 2111, 1747, 1610, 1571, 1488, 1297, 1229, 1213, 1172, 1132, 1048, 1004.

4-(2-azido-4-methylphenyl)-2-methylbut-3-yn-2-yl acetate (4.50) $C_{14}H_{15}N_3O_2$ **MW = 257.3 g.mol^{-1}**



Procedure: see general procedure 4.2

Product: colorless oil

Yield: over 3 steps: **74% (**m = 380 mg, n = 1.47 mmol)

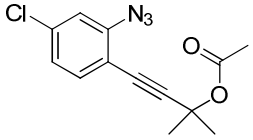
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.28 (d, *J* = 7.8 Hz, 1H), 6.86-6.84 (m, 2H), 2.32 (s, 3H), 2.04 (s, 3H), 1.76 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.4, 140.7, 140.2, 133.8, 125.6, 119.5, 112.1, 95.6, 79.7, 72.6, 29.0, 22.0, 21.5.

HRMS: $C_{14}H_{15}N_3O_2$ [M^+]; calculated: 257.1164, found 257.1161.

IR (CCl_4): ν (cm^{-1}) 2989, 2924, 2115, 1744, 1609, 1502, 1408, 1294, 1234, 1134, 1015.

4-(2-azido-4-chlorophenyl)-2-methylbut-3-yn-2-yl acetate (4.52) $C_{13}H_{12}ClN_3O_2$ **MW = 277.7 g.mol^{-1}**



Procedure: see general procedure **4.3** then **4.2**

Product: colorless oil

Yield: over 3 steps: 90% (m = 500 mg, n = 1.802 mmol)

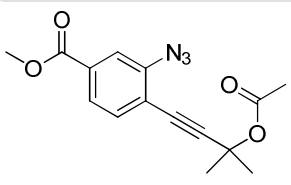
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.31 (d, *J* = 8.8 Hz, 1H), 7.03-7.01 (m, 2H), 2.04 (s, 3H), 1.74 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.4, 142.0, 135.2, 134.8, 124.9, 119.3, 113.7, 97.3, 78.7, 72.3, 28.8 (2C), 22.0.

HRMS: $C_{13}H_{12}ClN_3O_2$ [M^+]; calculated: 277.0618, found 277.0630.

IR (CCl_4): ν (cm^{-1}) 2990, 2941, 2110, 1748, 1590, 1485, 1398, 1366, 1285, 1238, 1134, 1015

methyl 4-[3-(acetyloxy)-3-methylbut-1-yn-1-yl]-3-azidobenzoate (4.54) $C_{15}H_{15}N_3O_4$ **MW = 301.3 g.mol^{-1}**



Procedure: see general procedure 4.2

Product: colorless oil

Yield: over 3 steps: 40% (m= 235 mg, n= 0.79 mmol)

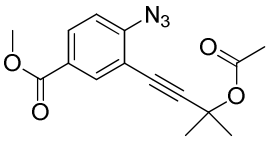
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.71-7.69 (m, 2H), 7.46 (d, *J* = 7.9 Hz, 1H), 3.91 (s, 3H), 2.05 (s, 3H), 1.76 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.4, 165.8, 141.3, 134.0, 131.0, 125.4, 119.9, 119.4, 99.2, 79.2, 72.2, 52.5, 28.8, 28.7, 21.9.

HRMS: $C_{15}H_{15}N_3O_4$ [M^+]; calculated: 301.1063, found 301.1055.

IR (CCl_4): ν (cm^{-1}) 2990, 2953, 2847, 2117, 1747, 1603, 1499, 1401, 1366, 1292, 1238, 1133, 1112, 1015.

methyl 3-[3-(acetyloxy)-3-methylbut-1-yn-1-yl]-4-azidobenzoate (4.56) $C_{15}H_{15}N_3O_4$ **MW = 301.3 g.mol^{-1}**



Procedure: see general procedure 4.2

Product: colorless oil

Yield: over 3 steps: **56%** (m = 335 mg, n = 1.11 mmol)

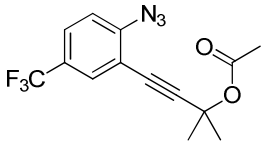
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.07 (d, *J* = 2.0 Hz, 1H), 7.94 (dd, *J* = 2.0 Hz, *J* = 8.5 Hz, 1H), 7.09 (d, *J* = 8.5 Hz, 1H), 3.89 (s, 3H), 2.05 (s, 3H), 1.76 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.6, 165.7, 145.2, 135.5, 130.7, 126.5, 118.9, 115.1, 97.1, 78.8, 72.2, 52.3, 28.9 (2C), 22.0.

HRMS: $C_{15}H_{15}N_3O_4$ [M^+]; calculated: 301.1063, found 301.1063.

IR (CCl_4): ν (cm^{-1}) 2925, 1776, 1632, 1505, 1367, 1199, 1175, 1083.

4-[2-azido-5-(trifluoromethyl)phenyl]-2-methylbut-3-yn-2-yl acetate (4.58) $C_{14}H_{12}F_3N_3O_2$ **MW = 311.3 g.mol^{-1}**



Procedure: see general procedure 4.3 then 4.2

Product: colorless oil

Yield: 41 % (m = 382 mg, n = 1.23 mmol)

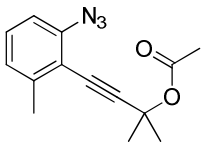
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.66 (d, *J* = 1.7 Hz, 1H), 7.52 (dd, *J* = 1.9 Hz, *J* = 8.5 Hz, 1H), 7.13 (d, *J* = 8.5 Hz, 1H), 2.06 (s, 3H), 1.76 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.4, 144.3, 131.1 (q, *J* = 3.8 Hz), 126.9 (q, *J* = 33.3 Hz), 126.3 (q, *J* = 3.7 Hz), 123.5 (q, *J* = 272.0 Hz), 119.3, 115.6, 97.9, 78.4, 72.1, 28.8, 22.0.

HRMS: $C_{14}H_{12}F_3N_3O_2$ [M^+]; calculated: 311.0882, found 311.0866.

IR (CCl_4): ν (cm^{-1}) 2990, 2126, 2097, 1748, 1611, 1336, 1241, 1135.

4-(2-azido-6-methylphenyl)-2-methylbut-3-yn-2-yl acetate (4.60) $C_{14}H_{15}N_3O_2$ **MW = 257.3 g.mol^{-1}**



Procedure: see general procedure 4.3 then 4.2

Product: colorless oil

Yield: over 5 steps 29 % (m = 223 mg, n = 0.87 mmol)

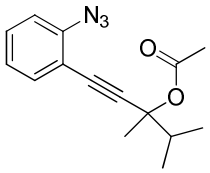
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.19 (dd, *J* = 7.6 Hz, *J* = 8.0Hz, 1H), 6.97 (d, *J* = 7.6 Hz, 1H), 6.91 (d, *J* = 8.0 Hz, 1H)2.40 (s, 3H), 2.05 (s, 3H), 1.78 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.3, 143.0, 141.0, 128.9, 125.7, 116.0, 114.8, 100.6, 78.4, 72.4, 29.0, 22.0, 20.8.

HRMS: $C_{14}H_{15}N_3O_2$ [M^+]; calculated: 257.1164, found 257.1158.

IR (CCl_4): ν (cm^{-1}) 2989, 2941, 2216, 2118, 1744, 1572, 1461, 1367, 1242, 1132.

1-(2-azidophenyl)-3,4-dimethylpent-1-yn-3-yl acetate (4.62) $C_{15}H_{17}N_3O_2$ **MW = 271.3 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: colorless oil

Yield: over 5 steps: 67% (m = 541 mg, n = 2.00 mmol)

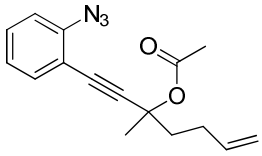
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.43 (dd, *J* = 1.4 Hz, *J* = 7.7 Hz, 1H), 7.30 (ddd, *J* = 1.6 Hz, *J* = 7.5 Hz, *J* = 8.2 Hz, 1H), 7.08-7.04 (m, 2H), 2.28 (sept, *J* = 6.8 Hz, 1H), 2.05 (s, 3H), 1.73 (s, 3H), 1.13 (d, *J* = 6.7 Hz, 3H), 1.08 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.4, 141.2, 134.1, 129.5, 124.5, 118.8, 115.2, 94.6, 81.2, 79.4, 37.6, 23.2, 22.0, 17.6, 17.3.

HRMS: $C_{15}H_{17}N_3O_2$ [M^+]; calculated: 271.1321, found 271.1324.

IR (CCl_4): ν (cm^{-1}) 2973, 2939, 2106, 1748, 1571, 1489, 1442, 1369, 1299, 1242, 1148, 1122, 1049.

1-(2-azidophenyl)-3-methylhept-6-en-1-yn-3-yl acetate (4.63) $C_{16}H_{17}N_3O_2$ **MW = 283.3 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: colorless oil

Yield: over 5 steps: 17% (m = 95 mg, n = 0.34 mmol)

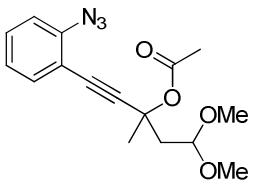
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.42 (dd, *J* = 0.9 Hz, *J* = 8.0 Hz, 1H), 7.31 (ddd, *J* = 1.5 Hz, *J* = 8.0 Hz, *J* = 8.7 Hz, 1H), 7.08-7.05 (m, 2H), 5.88 (tdd, *J* = 6.5 Hz, *J* = 10.2 Hz, *J* = 16.8 Hz, 1H), 5.08 (dd, *J* = 1.5 Hz, *J* = 17.1 Hz, 1H), 5.00 (dd, *J* = 1.2 Hz, *J* = 10.2 Hz, 1H), 2.42-2.31 (m, 2H), 2.14 (ddd, *J* = 7.0 Hz, *J* = 9.5 Hz, *J* = 13.5 Hz, 1H), 2.06 (s, 3H), 1.99 (ddd, *J* = 6.6 Hz, *J* = 10.1 Hz, *J* = 13.5 Hz, 1H), 1.79 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.3, 141.1, 137.9, 134.0, 129.7, 124.6, 118.9, 115.0, 114.9, 95.2, 80.9, 75.4, 40.8, 28.8, 26.5, 22.0.

HRMS: $C_{16}H_{17}N_3O_2$ [M^+]; calculated: 283.1321, found 283.1327.

IR (CCl_4): ν (cm^{-1}) 2981, 2938, 2122, 2093, 1744, 1642, 1489, 1439, 1367, 1301, 1238, 1149, 1013.

1-(2-azidophenyl)-5,5-dimethoxy-3-methylpent-1-yn-3-yl acetate (4.66) $C_{16}H_{19}N_3O_4$ **MW = 317.3 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: colorless oil

Yield: over 5 steps: 40 % (m = 380 mg, n = 1.2 mmol)

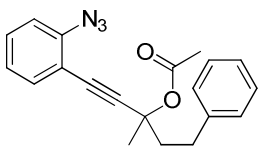
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.41 (dd, *J* = 1.6 Hz, *J* = 7.7 Hz, 1H), 7.31 (ddd, *J* = 1.6 Hz, *J* = 7.4 Hz, *J* = 8.1 Hz, 1H), 7.08-7.04 (m, 2H), 4.82 (t, *J* = 5.0 Hz, 1H), 3.36 (s, 3H), 3.35 (s, 3H), 2.43 (dd, *J* = 4.7 Hz, *J* = 14.2 Hz, 1H), 2.28 (dd, *J* = 5.4 *J* = 14.2 Hz, 1H), 2.04 (s, 3H), 1.81 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.3, 141.2, 134.0, 129.8, 124.6, 118.8, 114.8, 101.9, 94.8, 81.2, 73.7, 53.1, 52.8, 43.3, 27.2, 22.1.

HRMS: $C_{16}H_{19}N_3O_4$ [M^+]; calculated: 317.1376 (- OAc: 257.1164), found 257.1181.

IR (CCl_4): ν (cm^{-1}) 2941, 2126, 2093, 1748, 1572, 1489, 1366, 1301, 1234, 1122.

1-(2-azidophenyl)-3-methyl-5-phenylpent-1-yn-3-yl acetate (4.68) $C_{20}H_{19}N_3O_2$ **MW = 333.4 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: colorless oil

Yield: over 3 steps **78 %** (m = 779 mg, n = 2.34 mmol)

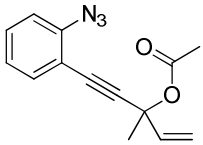
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.46 (dd, *J* = 1.3 Hz, *J* = 7.6 Hz, 1H), 7.35-7.26 (m, 5H), 7.21 (tt, *J* = 1.5 Hz, *J* = 7.0 Hz, 1H), 7.11-7.07 (m, 2H), 2.96 (dd, *J* = 8.4 Hz, *J* = 8.9 Hz, 2H), 2.39 (ddd, *J* = 7.8 Hz, *J* = 9.3 Hz, *J* = 13.6 Hz, 1H), 2.21 (ddd, *J* = 7.7 Hz, *J* = 9.4 Hz, *J* = 13.6 Hz, 1H), 2.06 (s, 3H), 1.85 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.4, 141.7, 141.3, 134.1, 129.8, 128.6 (2C), 128.5 (2C), 126.0, 124.6, 118.9, 115.0, 95.2, 81.1, 75.5, 43.5, 30.9, 26.6, 22.0.

HRMS: $C_{20}H_{19}N_3O_2$ [M^+]; calculated: 333.1477, found 333.1490.

IR (CCl_4): ν (cm^{-1}) 3029, 2939, 2122, 1745, 1572, 1489, 1367, 1300, 1237, 1170.

5-(2-azidophenyl)-3-methylpent-1-en-4-yn-3-yl acetate (4.71) $C_{14}H_{13}N_3O_2$ **MW = 255.3 g.mol^{-1}**



Procedure: see general procedure 4.2

Product: yellow oil

Yield: over 3 steps: 34 % (m = 257 mg, n = 1.02 mmol)

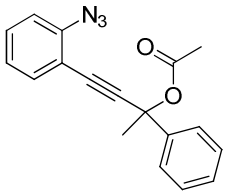
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.45 (dd, *J* = 1.5 Hz, *J* = 7.6 Hz, 1H), 7.32 (ddd, *J* = 1.5 Hz, *J* = 7.4 hz, *J* = 8.2 Hz, 1H), 7.10-7.05 (m, 2H), 6.08 (dd, *J* = 10.3 Hz, *J* = 17.0 Hz, 1H), 5.72 (d, *J* = 17.0 Hz, 1H), 5.29 (d, *J* = 10.3 Hz, 1H), 2.07 (s, 3H), 1.81 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.0, 141.2, 138.5, 134.0, 129.8, 124.5, 118.7, 115.9, 114.6, 93.3, 82.2, 74.8, 28.3, 21.9.

HRMS: $C_{14}H_{13}N_3O_2$ [M^+]; calculated: 255.1008 (- N_3: 195.0796), found 195.0789.

IR (CCl_4): ν (cm^{-1}) 2990, 2121, 1752, 1572, 1489, 1367, 1299, 1234, 1063.

4-(2-azidophenyl)-2-phenylbut-3-yn-2-yl acetate (4.74) $C_{18}H_{15}N_3O_2$ **MW = 305.3 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: colorless oil

Yield: over 5 steps: **45%** (m = 410 mg, n = 1.34 mmol)

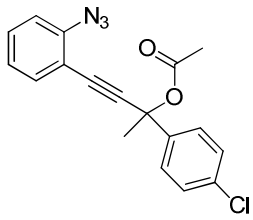
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.70 (d, *J* = 8.0 Hz, 2H), 7.51 (dd, *J* = 1.0 Hz, *J* = 7.7 Hz, 1H), 7.42-7.30 (m, 4H), 7.14-7.08 (m, 2H), 2.11 (s, 3H), 2.01 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.6, 142.6, 141.4, 134.0, 129.9, 128.5 (2C), 127.9, 125.1 (2C), 124.61, 118.8, 114.9, 94.5, 83.0, 76.1, 32.0, 21.9.

HRMS: $C_{18}H_{15}N_3O_2$ [M^+]; calculated: 305.1164, not found. (carbocation too stable, we must lose the acetate group).

IR (CCl_4): ν (cm^{-1}) 2131, 2110, 1752, 1541, 1489, 1449, 1366, 1303, 1234, 1218, 1061.

4-(2-azidophenyl)-2-(4-chlorophenyl)but-3-yn-2-yl acetate (4.78) $C_{18}H_{14}ClN_3O_2$ **MW = 339.8 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: colorless oil

Yield: over 5 steps: **49% (**m = 499 mg, n = 1.47 mmol)

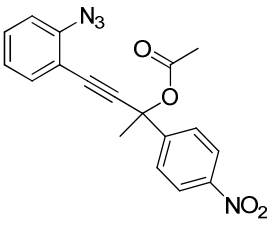
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.65-7.62 (m, 2H), 7.49 (dd, *J* = 1.5 Hz, *J* = 7.7 Hz, 1H), 7.38-7.33 (m, 3H), 7.14-7.08 (m, 2H), 2.10 (s, 3H), 1.97 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.6, 141.5, 141.2, 134.0, 133.8, 130.0, 128.6 (2C), 126.7 (2C), 124.6, 118.8, 114.6, 93.8, 83.3, 75.6, 31.9, 21.8.

HRMS: $C_{18}H_{14}ClN_3O_2$ [M^+]; calculated: 339.0775, found 339.0772.

IR (CCl_4): ν (cm^{-1}) 2994, 2112, 1753, 1489, 1448, 1366, 1299, 1230, 1154, 1095, 1062.

4-(2-azidophenyl)-2-(4-nitrophenyl)but-3-yn-2-yl acetate (4.82) $C_{18}H_{14}N_4O_4$ **MW = 350.3 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: colorless oil

Yield: over 5 steps: 26% (m = 276 mg, n = 0.79 mmol)

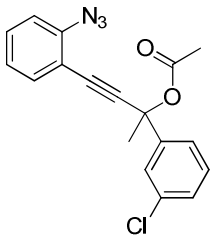
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.26-8.22 (m, 2H), 7.88-7.84 (m, 2H), 7.49 (dd, *J* = 1.5 Hz, *J* = 7.7 Hz, 1H), 7.38 (ddd, *J* = 1.5 Hz, *J* = 7.7 Hz, *J* = 8.3 Hz, 1H), 7.15-7.09 (m, 2H), 2.12 (s, 3H), 1.99 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.5, 149.8, 147.5, 141.6, 133.9, 130.3, 126.2 (2C), 124.7, 123.8 (2C), 118.8, 114.1, 92.9, 83.9, 75.3, 31.9, 21.6.

HRMS: $C_{18}H_{14}N_4O_4$ [M^+]; calculated: 350.1015, found 350.1010.

IR (CCl_4): ν (cm^{-1}) 2995, 2128, 2109, 1756, 1608, 1529, 1490, 1448, 1351, 1298, 1260, 1229, 1215, 1154, 1064, 1013.

4-(2-azidophenyl)-2-(3-chlorophenyl)but-3-yn-2-yl acetate (4.86) $C_{18}H_{15}ClN_3O_2$ **MW = 339.8 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: colorless oil

Yield: over 5 steps: 45 % (m = 457 mg, n = 1.35 mmol)

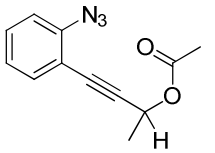
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.78 (t, *J* = 1.7 Hz, 1H), 7.55 (dtd, *J* = 0.6 Hz, *J* = 1.6 Hz, *J* = 7.2 Hz, 1H), 7.49 (dd, *J* = 1.3 H , *J* = 7.7 Hz, 1H), 7.38-7.27 (m, 5H), 7.14 (d, *J* = 8.2 Hz, 1H), 7.10 (dt, *J* = 0.8 Hz, *J* = 7.5 Hz, 1H), 2.11 (s, 3H), 1.97 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.6, 144.8, 141.7, 134.4, 133.9, 130.0, 129.7, 128.1, 125.8, 124.6, 123.2, 118.7, 114.5, 93.6, 83.4, 75.5, 32.0, 21.8.

HRMS: $C_{18}H_{15}ClN_3O_2$ [M^+]; calculated: 339.0775, found 339.0763.

IR (CCl_4): ν (cm^{-1}) 2994, 2122, 1755, 1597, 1489, 1303, 1215, 1063.

4-(2-azidophenyl)but-3-yn-2-yl acetate (4.96) $C_{12}H_{11}N_3O_2$ **MW = 229.2 g.mol^{-1}**



Procedure: see general procedure 4.2

Product: colorless oil

Yield: over 3 steps: 85 % (m = 389 mg, n = 1.7 mmol)

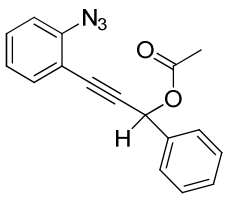
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.41 (dd, *J* = 1.4 Hz, *J* = 7.6 Hz, 1H), 7.33 (ddd, *J* = 1.3 Hz, *J* = 7.7 Hz, *J* = 8.4 Hz, 1H),7.09-7.05 (m, 2H), 5.72 (d, *J* = 6.7 Hz, 1H), 2.10 (s, 3H), 1.60 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 170.0, 141.3, 134.0, 129.9, 124.6, 118.9, 114.5, 93.4, 80.2, 60.9, 21.4 (2C), 21.2.

HRMS: $C_{12}H_{11}N_3O_2$ [M^+]; calculated: 229.0851, found 229.0854.

IR (CCl_4): ν (cm^{-1}) 2992, 2130, 1747, 1571, 1489, 1448, 1371, 1307, 1230, 1083.

3-(2-azidophenyl)-1-phenylprop-2-yn-1-yl acetate (4.99) $C_{17}H_{13}N_3O_2$ **MW = 291.3 g.mol^{-1}**



Procedure: see general procedure 4.2

Product: yellow oil

Yield: over 5 steps: 75% (m = 654 mg, n = 2.24 mmol)

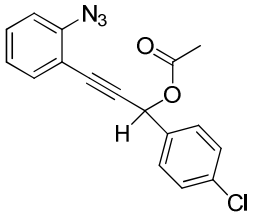
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.64 (dd, *J* = 1.5 Hz, *J* = 7.8 Hz, 2H), 7.46 (dd, *J* = 1.4 Hz, *J* = 7.7 Hz, 1H), 7.44-7.38 (m, 3H), 7.35 (ddd, J=1.6Hz, J=7.5Hz, J=8.2Hz, 1H), 7.13-7.06 (m, 2H), 6.74 (s, 1H), 2.14 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.8, 141.6, 136.9, 134.0, 130.1, 129.1, 128.8 (2C), 128.0 (2C), 124.6, 118.7, 114.3, 91.4, 82.8, 66.6, 21.2.

HRMS: $C_{17}H_{13}N_3O_2$ [M^+]; calculated: 291.1008, found 291.1007.

IR (CCl_4): ν (cm^{-1}) 2934, 2861, 2120, 1744, 1571, 1489, 1446, 1366, 1299, 1238, 1179, 1011.

3-(2-azidophenyl)-1-(4-chlorophenyl)prop-2-yn-1-yl acetate (4.102) $C_{17}H_{12}ClN_3O_2$ **MW = 325.7 g.mol^{-1}**



Procedure: see general procedure 4.1

Product: colorless oil

Yield: over 5 steps: **87%** (m = 570 mg, n = 1.75 mmol)

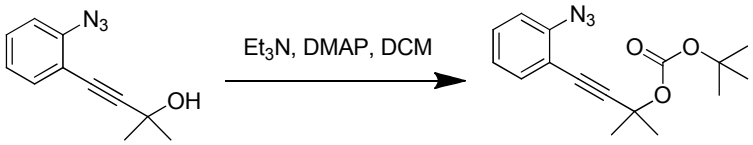
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.60-7.56 (m, 2H), 7.45 (dd, *J* = 1.4 Hz, *J* = 7.7 Hz, 1H), 7.40-7.34 (m, 3H), 7.12-7.07 (m, 2H), 6.70 (s, 1H), 2.13 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.8, 141.7, 135.5, 135.0, 134.0, 130.3, 129.4 (2C), 129.0 (2C), 124.6, 118.7, 114.0, 90.8, 83.1, 65.4, 21.1.

HRMS: $C_{17}H_{12}ClN_3O_2$ [M^+]; calculated: 325.0618, found 325.0625.

IR (CCl_4): ν (cm^{-1}) 2936, 2130, 2101, 1745, 1597, 1490, 1448, 1369, 1298, 1222, 1094, 1015.

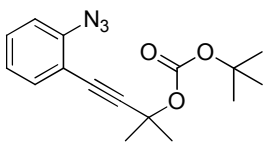
4-(2-azidophenyl)-2-methylbut-3-yn-2-yl *tert*-butyl carbonate (4.105) $C_{16}H_{19}N_3O_2$ **MW = 301.3 g.mol^{-1}**



Procedure: 1.0 equiv. of the starting susbtrate (1mmol) is dissolved in dichloromethane (0.5M) and the solution is stirred under N_2 atmosphere. 1.5 equiv. of triethylamine, 0.1 equiv. of DMAP and 1.5 equiv. of *tert*-Butylcarbamate anhydride are added. The reaction mixture is stirred at room temperature for 3 hours. $NH_4Cl_{(sat)}$ is then added to the mixture. The phases are separated and the aqueous phase is extracted twice with dichloromethane. The combined organic phases are washed

with water, brine and dried over Magnesium sulfate. After filtration, the solvent is evaporated and the crude is analyzed by NMR.

The product is then purified on column chromatography using petroleum ether:ethyl acetate (98:2) as eluent.



Product: colorless oil

Yield: 90% (m = 272 mg, n = 0.903 mmol)

^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.39 (dd, *J* = 1.4 Hz, *J* = 7.9 Hz, 1H), 7.30 (ddd, *J* = 1.4 Hz, *J* = 7.8 Hz, *J* = 8.8 Hz, 1H), 7.07-7.03 (m, 2H), 1.79 (s, 6H), 1.51 (s, 9H).

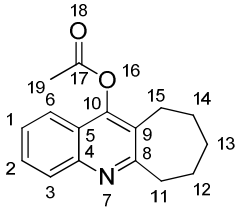
^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 151.4, 141.0, 133.8, 129.6, 124.5, 118.9, 96.0, 82.1, 79.8, 73.8, 28.9, 27.8.

HRMS: $C_{16}H_{19}N_3O_2$ [M^+]; calculated: 301.1426, found 301.1433.

IR (CCl_4): ν (cm^{-1}) 2984, 2938, 2124, 2096, 1749, 1489, 1447, 1369, 1301, 1281, 1259, 1176, 1126.

3. Catalysis and preparation of the products

***6H,7H,8H,9H,10H*-cyclohepta*[b]*quinolin-11-yl acetate (4.24)**	$C_{16}H_{17}NO_2$	**MW = 255.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: general procedure **4.4**: yield = **92%** (m = 23.4 mg, n = 0.0918mmol), general procedure **4.5**: yield = **80%** (m = 20.4 mg, n = 0.0800 mmol)

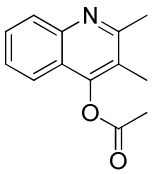
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.01 (d, *J* = 8.4 Hz, 1H **H3**), 7.68 (dd, *J* = 0.9 Hz, *J* = 8.1 Hz , 1H **H6**), 7.64 (ddd, *J* = 1.4 Hz, *J* = 7.0 Hz, *J* = 8.4 Hz, 1H **H2**), 7.48 (ddd, *J* = 1.1 Hz , *J* = 7.0 Hz, *J* = 8.1 Hz, 1H **H1**), 3.26-3.23 (batman, 1H **H11**), 2.82-2.79 (batman, 2H **H15**), 2.50 (s, 3H I), 1.91-1.79 (m, 4H **H12-H14**), 1.74-1.68 (m, 2H **H13**).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.4 (C **C10**), 166.0 (C=O **C17**), 150.5 (C **C8**), 147.2 (C **C4**), 129.1 (CH **C2**), 128.8,(CH **C3**) 127.6 (C **C5**), 126.3 (CH **C1**), 121.5 (C **C9**), 121.0 (CH **C6**), 40.3 (CH_2 **C11**), 32.1 (CH_2 **C12 ou C14**), 27.5 (CH_2 **C13**), 26.8 (CH_2 **C15+C12 ou C14**), 20.6 (CH_3 **C19**).

HRMS: $C_{16}H_{17}NO_2$ [M^+]; calculated: 255.1259, found 255.1263.

IR (CCl_4): ν (cm^{-1}) 2928, 2855, 1777, 1625, 1605, 1493, 1368, 1208, 1189, 1164, 1044.

2,3-dimethylquinolin-4-yl acetate (4.30) $C_{13}H_{13}NO_2$ **MW = 215.2 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: general procedure **4.4**: yield = **90%,** general procedure **4.5**: yield = **79%**

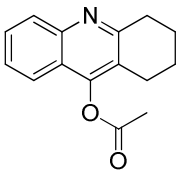
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.01 (d, *J* = 8.4 Hz, 1H), 7.69 (d, *J* = 8.3 Hz, 1H), 7.64 (ddd, *J* = 1.3 Hz, *J* = 7.0 Hz, *J* = 8.4 Hz, 1H), 7.48 (ddd, *J* = 1.0 Hz, *J* = 7.1 Hz, *J* = 8.1 Hz, 1H), 2.72 (s, 3H), 2.49 (s, 3H), 2.25 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.1, 160.1, 151.6, 147.3, 129.1, 128.7, 126.2, 121.6, 121.4, 120.8, 24.2, 20.6, 12.8.

HRMS: $C_{13}H_{13}NO_2$ [M^+]; calculated: 215.0946, found 215.0940.

IR (CCl_4): ν (cm^{-1}) 3068, 2925, 1775, 1558, 1541, 1494, 1367, 1198, 1171, 1083, 1012.

1,2,3,4-tetrahydroacridin-9-yl acetate (4.34) $C_{15}H_{15}NO_2$ **MW = 241.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: general procedure **4.4**: yield = **93%,** general procedure **4.5**: yield = **82%**

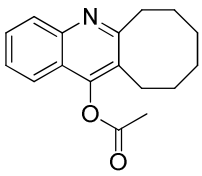
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.00 (d, *J* = 8.5 Hz, 1H), 7.69 (d, *J* = 8.3 Hz, 1H), 7.63 (ddd, *J* = 1.3 Hz, *J* = 6.9 Hz, *J* = 8.3 Hz, 1H), 7.46 (ddd, *J* = 0.7 Hz, *J* = 7.2 Hz, *J* = 7.8 Hz, 1H), 3.14 (t, *J* = 6.5 Hz, 2H), 2.76 (t, *J* = 6.4 Hz, 2H), 2.48 (s, 3H), 2.00-1.94 (m, 2H), 1.90-1.84 (m, 2H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 167.9, 160.4, 151.7, 147.5, 129.2, 128.6, 126.1, 122.5, 121.3, 120.6, 33.8, 23.5, 22.8, 22.1, 20.6.

HRMS: $C_{15}H_{15}NO_2$ [M^+]; calculated: 241.1103, found 241.1106.

IR (CCl_4): ν (cm^{-1}) 3071, 2943, 2866, 1774, 1626, 1558, 1492, 1368, 1348, 1198, 1171, 1063, 1004.

***6H,7H,8H,9H,10H,11H*-cycloocta*[b]*quinolin-12-yl acetate (4.36)** $C_{17}H_{19}NO_2$ **MW = 269.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: orange amorphous solid

Yield: general procedure **4.4**:, **Yield = 90%** (m = 24.1 mg, n = 0.895 mmol), general procedure **4.5**: yield = **85%**

^{1}H NMR (400 MHz, CD_3CN): δ (ppm) 8.04 (d, *J* = 8.5 Hz, 1H), 7.80 (dd, *J* = 0.6 Hz, *J* = 8.4 Hz, 1H), 7.72 (ddd, *J* = 1.3 Hz, *J* = 6.9 Hz, *J* = 8.4 Hz, 1H), 7.56 (ddd, *J* = 1.0 Hz, *J* = 7.1 Hz, *J* = 8.1 Hz, 1H), 3.22-3.18 (m, 2H), 2.94-2.91 (m, 2H), 2.51 (s, 3H), 1.88-1.82 (m, 2H), 1.74-1.68 (m, 2H), 1.46-1.34 (m, 4H).

^{13}C NMR (100 MHz, CD_3CN): δ (ppm) 170.1, 165.8, 153.2, 147.7, 130.5, 128.7, 127.7, 127.4, 122.6, 122.4, 36.0, 31.8, 30.5, 26.8, 26.7, 25.6, 20.9.

^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.05 (dd, *J* = 0.9 Hz, *J* = 8.9 Hz, 1H), 7.66-7.62 (m, 2H), 7.47 (ddd, *J* = 1.1 Hz, *J* = 6.9 Hz, *J* = 7.9 Hz, 1H), 3.21-3.18 (m, 2H), 2.90-2.87 (m, 2H), 2.50 (s, 3H), 1.93-1.87 (m, 2H), 1.75-1.69 (m, 2H), 1.48-1.36 (m, 4H).

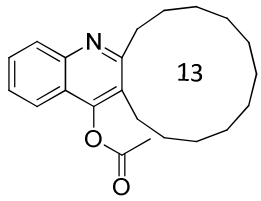
^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.7, 164.7, 151.5, 147.8, 129.0, 128.8, 126.1, 125.8, 121.5, 120.8, 35.9, 31.0, 29.8, 26.2, 26.0, 25.2, 20.6.

HRMS: $C_{17}H_{19}NO_2$ [M^+]; calculated: 269.1416, found 269.1433.

IR (CCl_4): ν (cm^{-1}) 3070, 2929, 2857, 1774, 1625, 1602, 1494, 4470, 1446, 1368, 1353, 1198, 1168, 1094, 1054, 1038.

6H,7H,8H,9H,10H,11H,12H,13H,14H,15H,16H-cyclotrideca*[b]*quinolin-17-yl acetate (4.38)

$C_{22}H_{29}NO_2$ **MW = 339.5 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: pale yellow oil

Yield: general procedure **4.4:**, yield = **71% (indole as a by-product, global yield = 80%)** (m = 24.1 mg, n = 0.071mmol)**,** general procedure **4.5:** yield = **83%** (m = 28.3 mg, n = 0.0834 mmol)**.**

^{1}H NMR (400 MHz, CD_3CN): δ (ppm) 7.99 (d, *J* = 8.5 Hz, 1H), 7.76 (dd, *J* = 0.7 Hz, *J* = 8.4 Hz, 1H), 7.69 (ddd, *J* = 1.4 Hz, *J* = 6.9 Hz, *J* = 8.4 Hz, 1H), 7.53 (ddd, *J* = 1.0 Hz, *J* = 7.0 Hz, *J* = 8.2 Hz, 1H) 2.98-2.94 (m, 2H), 2.67-2.63 (m, 2H), 2.48 (s, 3H), 1.87-1.80 (m, 2H), 1.67-1.26 (m, 16H).

^{13}C NMR (100 MHz, CD_3CN): δ (ppm) 168.7, 163.3, 152.9, 146.0, 129.3, 127.2, 126.3, 125.9, 121.2, 121.1, 33.9, 26.2, 26.2, 26.1, 25.8, 25.0, 24.1, 23.9, 23.5, 23.1, 22.7, 19.6.

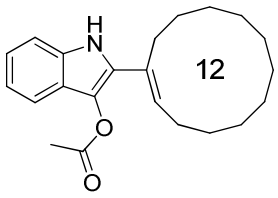
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.03 (d, *J* = 8.2 Hz, 1H), 7.65-7.61 (m, 2H), 7.46 (dd, *J* = 6.6 hz, *J* = 8.2 Hz, 1H), 3.00-2.96 (m, 2H), 2.67-2.63 (m, 2H), 2.49 (s, 3H), 1.93-1.86 (m, 2H), 1.73-1.49 (m, 10H), 1.42-1.32 (m, 6H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.7, 163.9, 152.4, 147.7, 129.0, 128.8, 126.2, 125.8, 121.5, 120.9, 35.1, 27.1, 26.8, 26.7, 26.5, 25.6, 25.0, 24.4, 24.1, 23.5, 23.2, 20.6.

HRMS: $C_{22}H_{29}NO_2$ [M^+]; calculated: 339.2198, found 339.2198.

IR (CCl_4): ν (cm^{-1}) 2933, 2864, 1775, 1558, 1554, 1550, 1541, 1368, 1198, 1167, 1039.

2-[*(1E)*-cyclododec-1-en-1-yl]-*1H*-indol-3-yl acetate (4.39) $C_{22}H_{29}NO_2$ **MW = 339.5 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: general procedure **4.4**: yield = **9% (by-product to the quinoline)**

^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.74 (bs, 1H), 7.32 (d, *J* = 7.8 Hz, 1H), 7.15 (ddd, *J* = 1.1 Hz, *J* = 7.2 Hz, *J* = 8.2 Hz, 1H), 7.08 (dd, *J* = 7.1 Hz, *J* = 7.8 Hz, 1H), 5.81 (t, *J* = 7.9 Hz, 1H), 2.55 (t, *J* = 6.7 Hz, 2H), 2.35 (s, 3H), 2.29 (dd, *J* = 7.1 Hz, *J* = 14.5 Hz, 2H), 1.59-1.34 (m, 14H).

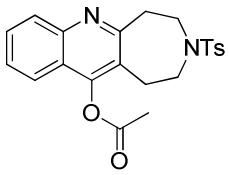
^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.3, 132.8, 132.4, 130.2, 128.3, 126.4, 122.5, 122.2, 120.1, 117.4, 111.0, 27.2, 25.9, 25.3, 25.1, 25.0, 24.8, 24.5, 24.0, 22.6, 22.3, 20.7.

HRMS: $C_{22}H_{29}NO_2$ [M^+]; calculated: 339.2198, found 339.2185.

IR (CCl_4): ν (cm^{-1}) 3477, 2931, 2860, 1767, 1558, 1540, 1468, 1318, 1204, 1009.

.

3-[(4-methylbenzene)sulfonyl]-*1H,2H,3H,4H,5H*-azepino*[4,5-b]*quinolin-11-yl acetate (4.43) $C_{22}H_{22}N_2O_4S$ **MW = 410.5 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: creamy solid

Yield: general procedure **4.4**: yield = **52%** (m = 21.5 mg, n = 0.0524 mmol)**,** general procedure **4.5**: yield = **88%** (m = 36.2 mg, n = 0.0883 mmol)

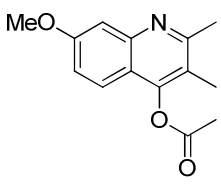
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.98 (d, *J* = 8.4 Hz, 1H), 7.70-7.62 (m, 4H), 7.51 (ddd, *J* = 1.0 Hz, *J* = 7.1 Hz, *J* = 8.1 Hz, 1H), 7.25 (d, *J* = 9.3 Hz, 2H), 3.50-3.44 (m, 4H), 3.40-3.33 (m, 2H), 3.02 (dd, *J* = 4.4 Hz, *J* = 5.7 Hz, 2H), 2.50 (s, 3H), 2.36 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.4, 162.7, 151.2, 147.4, 143.6, 135.0, 129.8 (3C), 128.9, 127.2 (2C), 127.0, 125.0, 121.3, 121.1, 47.582, 46.8, 40.9, 27.7, 21.5, 20.6.

HRMS: $C_{22}H_{22}N_2O_4S$ [M^+]; calculated: 410.1300, found 410.1302.

IR (CCl_4): ν (cm^{-1}) 2925, 2856, 1779, 1495, 1360, 1345, 1184, 1167, 1095.

7-methoxy-2,3-dimethylquinolin-4-yl acetate (4.49) $C_{14}H_{15}NO_3$ **MW = 245.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: general procedure **4.4:** yield = **81%** (m = 19.8 mg, n = 0.0808 mmol)

general procedure **4.5:** yield = **87%** (m = 21.4 mg, n = 0.0873 mmol)

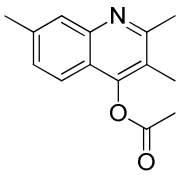
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.57 (d, *J* = 9.1 Hz, 1H), 7.35 (d, *J* = 2.3 Hz, 1H), 7.12 (dd, *J* = 2.3 Hz, *J* = 9.1 Hz, 1H), 3.91 (s, 3H), 2.67 (s, 3H), 2.47 (s, 3H), 2.21 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.1, 160.5, 160.5, 151.8, 149.0, 122.0, 119.3, 119.3, 116.3, 106.9, 55.6, 24.1, 20.6, 12.5.

HRMS: $C_{14}H_{15}NO_3$ [M^+]; calculated: 245.1052, found 245.1054.

IR (CCl_4): ν (cm^{-1}) 2957, 1776, 1628, 1505, 1367, 1231, 1198, 1156, 1084.

2,3,6-trimethylquinolin-4-yl acetate (4.51) $C_{14}H_{15}NO_2$ **MW = 229.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: 4.4: yield = **99%** (m = 22.8 mg, n = 0.099 mmol)**, 4.5**: yield = **88%** (m = 20.2 mg, n = 0.088 mmol)

^{1}H NMR (400 MHz, CD_3CN): δ (ppm) 7.73 (bs, 1H), 7.68 (d, *J* = 8.5 Hz, 1H), 7.37 (dd, *J* = 1.2 Hz, *J* = 8.5 Hz, 1H), 2.65 (s, 3H), 2.51 (s, 3H), 2.47 (s, 3H), 2.21 (s, 3H).

^{13}C NMR (100 MHz, CD_3CN): δ (ppm) 169.4, 161.1, 152.7, 147.7, 140.6, 129.4, 127.8, 122.1, 121.8, 120.3, 24.0, 21.7, 20.7, 12.5.

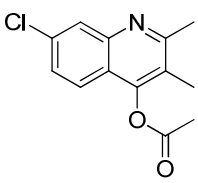
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.80 (s, 1H), 7.57 ((d, *J* = 8.5 Hz, 1H), 7.30 (dd, *J* = 1.1 Hz, *J* = 8.5 Hz, 1H), 2.69 (s, 3H), 2.51 (s, 3H), 2.48 (s, 3H), 2.22 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.1, 160.0, 151.6, 147.5, 139.3, 128.4, 127.7, 120.6, 120.5, 119.4, 24.1, 21.8, 20.6, 12.7.

HRMS: $C_{14}H_{15}NO_2$ [M^+]; calculated: 229.1103, found 229.1092.

IR (CCl_4): ν (cm^{-1}) 2925, 2859, 1776, 1632, 1504, 1438, 1367, 1199, 1175, 1084, 1022.

7-chloro-2,3-dimethylquinolin-4-yl acetate (4.53) $C_{13}H_{12}ClNO_2$ **MW = 249.7 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: general procedure **4.4**: yield = **88%**(m = 21.8 mg, n = 0.0876 mmol), general procedure **4.5**: yield = **85%** (m = 21.2 mg, n = 0.0851 mmol)

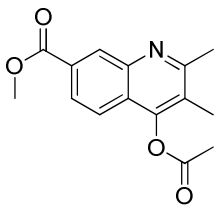
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.05 (d, *J* = 1.9 Hz, 1H), 7.67 (d, *J* = 8.9 Hz, 1H), 7.46 (dd, *J* = 1.9 Hz, *J* = 8.9 Hz, 1H), 2.75 (s, 3H), 2.54 (s, 3H), 2.28 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 167.9, 161.6, 151.5, 147.7, 134.9, 127.8, 127.2, 122.3, 122.0, 120.0, 24.2, 20.6, 12.8.

HRMS: $C_{13}H_{12}ClNO_2$ [M^+]; calculated: 249.0557, found 249.0556.

IR (CCl_4): ν (cm^{-1}) 2926, 1778, 1624, 1490, 1367, 1195, 1168, 1085, 1071, 1013.

methyl 4-(acetyloxy)-2,3-dimethylquinoline-7-carboxylate (4.55) $C_{15}H_{15}NO_4$ **MW = 273.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: general procedure **4.4**: yield = **83%**, general procedure **4.5**: yield = **76%**

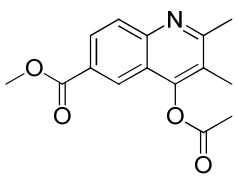
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.73 (d, *J* = 1.3 Hz, 1H), 8.07 (dd, *J* = 1.6 Hz, *J* = 8.7 Hz, 1H), 7.74 (d, *J* = 8.7 Hz, 1H), 3.97 (s, 3H), 2.74 (s, 3H), 2.51 (s, 3H), 2.27 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 167.9, 166.8, 161.4, 151.3, 146.6, 131.4, 130.6, 125.8, 124.1, 123.8, 121.2, 52.5, 24.2, 20.6, 13.0.

HRMS: $C_{15}H_{15}NO_4$ [M^+]; calculated: 273.1001, found 273.0995.

IR (CCl_4): ν (cm^{-1}) 2953, 1779, 1727, 1614, 1437, 1321, 1278, 1250, 1194, 1086, 1014.

methyl 4-(acetyloxy)-2,3-dimethylquinoline-6-carboxylate (4.57) $C_{15}H_{15}NO_4$ **MW = 273.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: general procedure **4.4**: yield = **83%** (m = 22.7 mg, n = 0.0829 mmol), general procedure **4.5**: yield = **76%** (m = 20.8 mg, n = 0.0762 mmol),

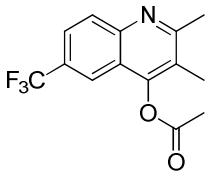
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.44 (d, *J* = 1.8 Hz, 1H), 8.22 (dd, *J* = 1.9 Hz, *J* = 8.8 Hz, 1H), 8.02 (d, *J* = 8.8 Hz, 1H), 3.96 (s, 3H), 2.73 (s, 3h), 2.53 (s, 3H), 2.25 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.0, 166.6, 162.9, 152.3, 149.1, 129.0, 128.7, 127.7, 124.1, 122.6, 121.0, 52.4, 24.4, 20.7, 12.9.

HRMS: $C_{15}H_{15}NO_4$ [M^+]; calculated: 273.1001, found 273.1005.

IR (CCl_4): ν (cm^{-1}) 2953, 2927, 1179, 1727, 1630, 1459, 1436, 1367, 1273, 1254, 1189, 1102, 1082.

2,3-dimethyl-6-(trifluoromethyl)quinolin-4-yl acetate (4.59) $C_{14}H_{12}F_3NO_2$ **MW = 283.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: yellow amorphous solid

Yield: general procedure **4.4**: yield = **88%** (m = 25.0 mg, n = 0.0883 mmol)**,** general procedure **4.5**: yield = **91%** (m = 25.8 mg, n = 0.091 mmol)

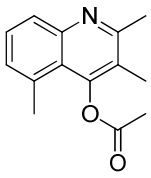
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.11 (d, *J* = 8.8 Hz, 1H), 7.99 (s, 1H), 7.81 (dd, *J* = 1.9 Hz, *J* = 8.8 Hz, 1H), 2.75 (s, 3H), 2.54 (s, 3H), 2.27 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 167.9, 162.9, 151.9, 148.2, 129.9, 128.0 (q, *J* = 32.9 Hz), 124.8 (q, *J* = 3.0 Hz), 124.1 (q, *J* = 272.4 Hz), 123.2, 120.8, 119.0 (q, *J* = 4.5 Hz) 24.5, 20.6, 13.0.

HRMS: $C_{14}H_{12}F_3NO_2$ [M^+]; calculated: 283.0820, found 283.0823.

IR (CCl_4): ν (cm^{-1}) 2926, 1781, 1638, 1615, 1466, 1369, 1296, 1188, 1134.

2,3,5-trimethylquinolin-4-yl acetate (4.61) $C_{14}H_{15}NO_2$ **MW = 229.3 g.mol^{-1}**



Procedure: see general procedures 4.4

Product: white amorphous solid

Yield: general procedure **4.4**: **72 %** (8 h, 80 % conv, bloqué, m = 16.4 mg, n = 0.0716 mmol)

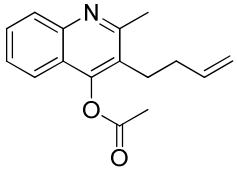
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.86 (d, *J* = 8.4 Hz, 1H), 7.48 (dd, *J* = 7.1 Hz, *J* = 8.4 Hz, 1H), 7.23 (d, *J* = 7.1 Hz, 1H), 2.73 (s, 3H), 2.70 (s, 3H), 2.45 (s, 3H), 2.21 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.3, 159.3, 152.5, 148.8, 132.1, 129.1, 128.6, 127.6, 122.1, 121.1, 24.1, 23.1, 21.3, 12.8.

HRMS: $C_{14}H_{15}NO_2$ [M^+]; calculated: 229.1103, found 229.1102.

IR (CCl_4): ν (cm^{-1}) 2930, 1766, 1605, 1400, 1368, 1262, 1199, 1081.

3-(but-3-en-1-yl)-2-methylquinolin-4-yl acetate (4.64) $C_{16}H_{17}NO_2$ **MW = 255.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: general procedure **4.4:** yield = **40% (67% brsm)** (m = 10.3 mg, n = 0.0404 mmol) (other isomer: yield = **18% (31%brsm)** (m = 4.8 mg, n = 0.0188 mmol))

global **98% brsm**, general procedure **4.5**: m = 16.4 mg, n = 0.0644 mmol, yield = **64%**

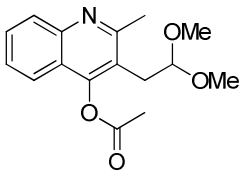
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.03 (d, *J* = 8.7 Hz, 1H), 7.67-7.63 (m, 2H), 7.51-7.47 (m, 1H), 5.90 (tdd, *J* = 6.6 Hz, *J* = 10.1 Hz, *J* = 16.9 Hz, 1H), 5.08 (d, *J* = 17.1 Hz, 1H), 5.03 (d, *J* = 10.1 Hz, 1H), 2.81-2.77 (m, 5H), 2.50 (s, 3H), 2.34-2.29 (m, 2H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.5, 159.7, 152.1, 147.5, 137.4, 129.3, 128.7, 126.3, 125.2, 121.5, 121.0, 115.5, 33.0, 26.8, 23.6, 20.7.

HRMS: $C_{16}H_{17}NO_2$ [M^+]; calculated: 255.1259, found 255.1261.

IR (CCl_4): ν (cm^{-1}) 2927, 1775, 1627, 1494, 1366, 1261, 1197, 1167, 1073, 1012.

3-(2,2-dimethoxyethyl)-2-methylquinolin-4-yl acetate (4.67) $C_{16}H_{19}NO_4$ **MW = 289.3 g.mol^{-1}**



Procedure: see general procedures 4.4

Product: yellow oil

Yield: general procedure **4.4**: **89%** (m = 26.0 mg, n = 0.0886 mmol)

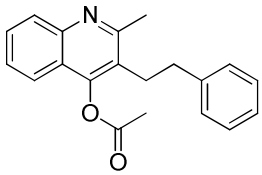
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.04 (d, *J* = 8.4 Hz, 1H), 7.69 (d, *J* = 8.3 Hz, 1H), 7.64 (ddd, *J* = 1.3 Hz, *J* = 6.9 Hz, *J* = 8.3 Hz, 1H)), 7.49 (ddd, *J* = 1.0 Hz, *J* = 7.0 Hz, *J* = 8.1 Hz, 1H), 5.01 (t, *J* = 5.7 Hz, 1H), 3.40 (s, 6H), 3.33 (d, *J* = 5.7 Hz, 2H), 2.50 (s, 3H), 2.32 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.1, 159.0, 151.8, 147.3, 129.0, 126.5, 122.4, 121.4, 120.8, 105.4, 54.5, 40.5, 20.6, 12.7.

HRMS: $C_{16}H_{19}NO_4$ [M^+]; calculated: 289.1314, found 289.1311.

IR (CCl_4): ν (cm^{-1}) 2935, 2832, 1776, 1604, 1494, 1366, 1197, 1121.

3-methyl-2-(2-phenylethyl)quinolin-4-yl acetate (4.70) $C_{20}H_{19}NO_2$ **MW = 305.4g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: 59 %

^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.19 (d, *J* = 8.2 Hz, 1H), 7.73-7.67 (m, 3H), 7.54 (dd, *J* = 7.5 Hz, *J* = 7.6 Hz, 1H), 7.32-7.28 (m, 2H), 7.26-7.21 (m, 1H), 7.18-7.15 (m, 2H), 3.00 (dd, *J* = 6.1 Hz, *J* = 9.9 Hz, 2H), 2.87 (dd, *J* = 6.2 Hz, *J* = 9.9 Hz, 2H), 2.76 (s, 3H), 2.52 (s, 3H).

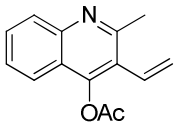
^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.3, 159.6, 153.2, 146.3, 140.9, 130.0, 128.7 (2C), 128.3 (2C), 127.8, 126.9, 126.5, 125.5, 121.6, 121.1, 35.2, 29.5, 22.8, 20.7.

IR (CCl_4): ν (cm^{-1}) 3028, 2955, 2360, 1775, 1603, 1494, 1367, 1197, 1163.

HRMS: $C_{20}H_{19}NO_2$ [M^+]; calculated: 305.1416, found 305.1411

The other isomer could not be isolated and therefore is not characterized

3-ethenyl-2-methylquinolin-4-yl acetate (4.73) $C_{14}H_{13}NO_2$ **MW = 227.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: colorless oil

Yield: general procedure **4.4**: yield = **79%** (m = 17.9 mg, n = 0.079 mmol)**,** general procedure **4.5**: yield = **44%** (m = 10.0 mg, n = 0.044 mmol)

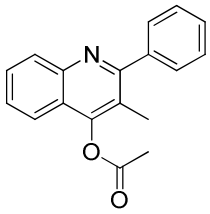
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.01 (d, *J* = 8.4 Hz, 1H), 7.76 (d, *J* = 8.3 Hz, 1H), 7.68 (ddd, *J* = 1.0 Hz, *J* = 7.0 Hz, *J* = 8.2 Hz, 1H), 7.50 (t, *J* = 7.6 Hz, 1H), 6.68 (dd, *J* = 11.7 Hz, *J* = 17.8 Hz, 1H), 5.67 (dd, *J* = 1.3 Hz, *J* = 7.0 Hz, 1H), 5.63 (dd, *J* = 1.4 Hz, *J* = 13.2 Hz, 1H), 2.73 (s, 3H), 2.43 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.1, 158.8, 151.0, 147.9, 129.8, 129.8, 128.7, 126.5, 123.7, 121.7, 121.5, 121.3, 24.7, 21.1.

HRMS: $C_{14}H_{13}NO_2$ [M^+]; calculated: 227.0946, found 227.0952.

IR (CCl_4): ν (cm^{-1}) 3070, 1777, 1623, 1489, 1366, 1195, 1171, 1052, 908.

3-methyl-2-phenylquinolin-4-yl acetate (4.75) $C_{18}H_{15}NO_2$ **MW = 277.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: yellow oil

Yield: general procedure **4.4**: yield = **39 %,** general procedure **4.5**: yield = **80 %**

^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.11 (d, *J* = 8.5 Hz, 1H), 7.77 (d, *J* = 8.3 Hz, 1H), 7.74-7.71 (m, 1H), 7.55-7.52 (m, 1H), 7.49-7.42 (m, 3H), 7.29-7.27 (m, 2H), 2.54 (s, 3H), 2.06 (s, 3H).

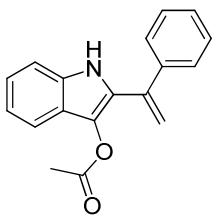
^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.3, 159.2, 151.8, 148.3, 134.8, 130.0, 129.4 (2C), 128.7, 128.6 (2C), 128.0, 127.7, 126.6, 121.4 (1C+1CH), 24.7, 20.3.

HRMS: $C_{18}H_{15}NO_2$ [M^+]; calculated: 277.1103, found 277.1110.

IR (CCl_4): ν (cm^{-1}) 3065, 1777, 1625, 1597, 1541, 1489, 1365, 1193, 1068.

The minor isomer in which the phenyl and the methyl have been exchanged could not be isolated by itself and, thus will not be described.

2-(1-phenylethenyl)-*1H*-indol-3-yl acetate (4.77) $C_{18}H_{15}NO_2$ **MW = 277.3 g.mol^{-1}**



Procedure: see general procedures 4.4

Product: bright yellow oil

Yield: general procedure **4.4:** yield = **40%** (m = 11.1 mg, n = 0.040 mmol) (by-product: **4.75**)

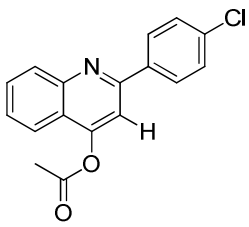
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.82 (bs, 1H), 7.43-7.36 (m, 6H), 7.29 (dt, *J* = 0.8 Hz, *J* = 8.2 Hz, 1H), 7.20 (ddd, *J* = 1.1 Hz, *J* = 7.1 Hz, *J* = 8.2 Hz, 1H), 7.11 (ddd, *J* = 1.0 Hz, *J* = 7.0 Hz, *J* = 8.0 Hz, 1H), 5.61 (d, *J* = 0.7 Hz, 1H), 5.51 (d, *J* = 0.7 Hz, 1H), 1.98 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 169.1, 139.6, 139.3, 133.2, 128.4 (2C), 128.3, 128.2 (2C), 125.9, 125.1, 123.4, 122.0, 120.4, 117.9, 115.6, 111.3, 20.2.

HRMS: $C_{18}H_{15}NO_2$ [M^+]; calculated: 277.1103, found 277.1091.

IR (CCl_4): ν (cm^{-1}) 3467, 3064, 2928, 2855, 2131, 2106, 1770, 1621, 1492, 1448, 1368, 1344, 1199, 1010.

2-(4-chlorophenyl)-3-methylquinolin-4-yl acetate (4.79) $C_{17}H_{14}ClNO_2$ **MW = 311.8 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

Yield: general procedure **4.4**: yield = **33%,** general procedure **4.5**: yield = **76% (80% brsm)** (m = 23.5 mg, n = 0.0756 mmol)

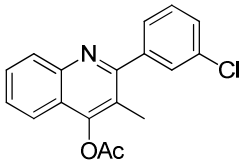
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.09 (d, *J* = 8.4 Hz, 1H), 7.77-7.71 (m, 2H), 7.54 (ddd, *J* = 1.0 Hz, *J* = 6.9 Hz, *J* = 8.1 Hz, 1H), 7.47-7.44 (m, 2H), 7.24-7.21 (m, 2H), 2.52 (s, 3H), 2.11 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.2, 158.8, 151.7, 148.5, 134.2, 133.3, 130.9 (2C), 130.2, 128.9 (2C), 126.7, 126.6, 121.4, 121.2, 24.8, 20.4.

HRMS: $C_{17}H_{14}ClNO_2$ [M^+]; calculated: 311.0713, found 311.0728.

IR (CCl_4): ν (cm^{-1}) 2928, 1777, 1600, 1563, 1489, 1366, 1146, 1092, 1006.

2-(3-chlorophenyl)-3-methylquinolin-4-yl acetate (4.87) $C_{18}H_{14}ClNO_2$ **MW = 311.8 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

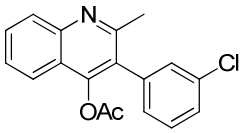
Yield: general procedure **4.4**: yield = **24 %** (m = 7.46 mg, n = 0.024 mmol)

^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.14 (d, *J* = 8.4 Hz, 1H), 7.79 (d, *J* = 8.4 Hz, 1H), 7.71 (t, *J* = 7.3 Hz, 1H), 7.61 (s, 1H), 7.60-7.56 (m, 1H), 7.49-7.42 (m, 3H), 2.54 (s, 3H), 2.26 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 166.9, 159.0, 151.9, 146.5, 141.0, 133.4, 128.6, 128.6, 128.6, 128.2, 127.6, 126.2 (2C), 120.7, 120.0, 119.7, 19.6, 13.0.

HRMS: $C_{18}H_{14}ClNO_2$ [M^+]; calculated: 311.0713, found 311.0707.

3-(3-chlorophenyl)-2-methylquinolin-4-yl acetate (4.88) $C_{18}H_{14}ClNO_2$ **MW = 311.8 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: white amorphous solid

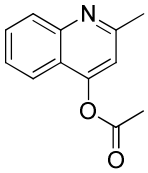
Yield: general procedure **4.4**: yield = **31 %** (m = 9.46 mg, n = 0.031 mmol)

^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.09 (d, *J* = 8.4 Hz, 1H), 7.81 (d, *J* = 8.3 Hz, 1H), 7.74 (td, *J* = 1.3 Hz, *J* = 7.7 Hz, 1H), 7.55 (t, *J* = 7.6 Hz, 1H), 7.42-7.41 (m, 2H), 7.30 (s, 1H), 7.20-7.17 (m, 1H), 2.53(s, 3H), 2.12 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.3, 158.6, 151.7, 148.6, 136.7, 134.4, 130.3, 129.9, 129.5, 128.9, 128.3, 127.8, 126.7, 126.3, 121.4, 121.2, 24.8, 20.4.

HRMS: $C_{18}H_{14}ClNO_2$ [M^+]; calculated: 311.0713, found 311.0704.

2-methylquinolin-4-yl acetate (4.97) $C_{12}H_{11}NO_2$ **MW = 201.2 g.mol^{-1}**



Procedure: see general procedures 4.4

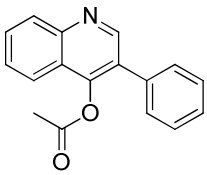
Product: yellow amorphous solid

Yield: general procedure **4.4**: yield = **36%** (m = 7.3 mg, n = 0.362 mmol)

^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.03 (d, *J* = 8.5 Hz, 1H), 7.88 (dd, *J* = 0.6 Hz, *J* = 8.3 Hz, 1H), 7.71 (ddd, *J* = 1.3 Hz, *J* = 7.0 Hz, *J* = 8.4 Hz, 1H), 7.51 (ddd, *J* = 0.6 Hz, *J* = 6.8 Hz, *J* = 7.9 Hz, 1H), 7.19 (s, 1H), 2.75 (s, 3H), 2.48 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.3, 159.9, 154.1, 149.5, 130.12, 128.8, 126.1, 121.0, 120.6, 113.7, 25.6, 21.2.

3-phenylquinolin-4-yl acetate (4.100) $C_{17}H_{13}NO_2$ **MW = 263.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: colorless oil

Yield: following general procedure **4.4** (by-product: **co210-2**) **yield = 51%** (m = 13.5 mg, n = 0.0513 mmol)

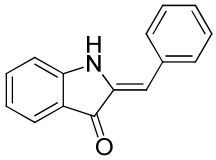
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.21 (d, *J* = 8.4 Hz, 1H), 8.16-8.13 (m, 2H), 7.77 (s, 1H), 7.76 (ddd, *J* = 1.4 Hz, *J* = 7.0 Hz, *J* = 8.4 Hz, 1H), 7.67-7.45 (m, 4H), 2.52 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.3, 158.3, 154.8, 149.9, 139.2, 130.3, 129.8, 129.7, 128.9 (2C), 127.7 (2C), 126.6, 121.2, 121.1, 111.0, 21.2.

HRMS: $C_{17}H_{13}NO_2$ [M^+]; calculated: 263.0946, found 263.0951.

IR (CCl_4): ν (cm^{-1}) 3067, 2929, 1782, 1603, 1560, 1494, 1369, 1349, 1190, 1153, 1083, 1015.

_(2Z)_-2-(phenylmethylidene)-2,3-dihydro-_1H_-indol-3-one (4.101) $C_{15}H_{11}NO$ **MW = 221.1 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: colorless oil

Yield: following general procedure **4.4** (by-product: **co210-1) yield = 46%** (m = 10.3 mg, n = 0.046 mmol)

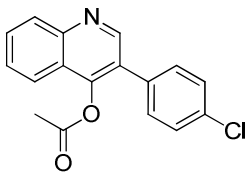
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.76 (d, *J* = 7.7 Hz, 1H), 7.55 (d, *J* = 7.5 Hz, 2H), 7.50-7.43 (m, 3H), 7.34 (dt app, *J* = 1.1 Hz, *J* = 7.4 Hz, 1H), 7.00-6.96 (m, 2H), 6.87 (s, 1H), 6.85 (bs, 1H).

(No carbon NMR posssible because product degrades rapidly)

HRMS: $C_{15}H_{11}NO$ [M^+]; calculated: 221.0841, found 221.0831.

IR (CCl_4): ν (cm^{-1}) 3447, 2925, 1706, 1614, 1576, 1482, 1470, 1377, 1314, 1191, 1134, 1096

3-(4-chlorophenyl)quinolin-4-yl acetate (4.103) $C_{17}H_{12}ClNO_2$ **MW = 297.7 g.mol^{-1}**



Procedure: see general procedures 4.4

Product: white amorphous solid

Yield: general procedure **4.4**: yield = **40%** (m = 12.0 mg, n = 0.040 mmol)

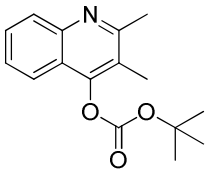
^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.17 (d, *J* = 8.5 Hz, 1H), 8.09 (d, *J* = 8.6 Hz, 2H), 7.93 (dd, *J* = 0.7 Hz, *J* = 8.3 Hz, 1H), 7.78-7.73 (m, 2H), 7.56 (ddd, *J* = 1.0 Hz, *J* = 7.0 Hz, *J* = 8.1 Hz, 1H), 7.49 (d, *J* = 8.6 Hz, 2H), 2.52 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 168.3, 156.9, 154.9, 149.9, 137.6, 135.9, 130.5, 129.8, 129.1, 128.9, 126.8, 121.3, 121.1, 110.6, 21.2.

HRMS: $C_{17}H_{12}ClNO_2$ [M^+]; calculated: 297.0557, found 297.0560.

IR (CCl_4): ν (cm^{-1}) 3072, 2963, 1782, 1601, 1492, 1421, 1370, 1348, 1261, 1188, 1096, 1083, 1013.

tert-butyl 2,3-dimethylquinolin-4-yl carbonate (4.106) $C_{16}H_{19}NO_3$ **MW = 273.3 g.mol^{-1}**



Procedure: see general procedures 4.4 and 4.5

Product: colorless oil

Yield: general procedure **4.4 for 15 min**: yield = **38%** (m = 10.4 mg, n = 0.0381 mmol)**,** general procedure **4.5 for 5 min**: yield = **62%** (m = 16.9 mg, n = 0.0618 mmol)

^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.01 (d, *J* = 8.4 Hz, 1H), 7.82 (dd, *J* = 0.6 Hz, *J* = 8.3 Hz, 1H), 7.65 (ddd, *J* = 1.2 Hz, *J* = 6.9 Hz, *J* = 8.3 Hz, 1H), 7.50 (ddd, *J* = 0.9 Hz, *J* = 7.0 Hz, *J* = 8.1 Hz, 1H), 2.73 (s, 3H), 2.32 (s, 3H), 1.59 (s, 9H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) (13C sur la vieille) 160.1, 151.4, 150.5, 147.2, 129.0, 128.4, 126.2, 121.6 (1C+1C), 120.6, 84.4, 27.6 (3C), 24.0, 12.4.

HRMS: $C_{16}H_{19}NO_3$ [M^+]; calculated: 273.1365, found 273.1367.

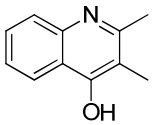
IR (CCl_4): ν (cm^{-1}) 2985, 1764, 1629, 1496, 1395, 1371, 1277, 1248, 1152, 1105.

2,3-dimethylquinolin-4-ol (4.107) $C_{11}H_{11}NO$ **MW = 173.2 g.mol^{-1}**

Procedure:

- procedure 1: In an NMR tube, 1.0 equiv. (0.1 mmol) of the subtrate is dissolved in 0.5mL of acetonitrile-d^3. 5 mol% of $IAdAuNTf_2$ (0.005 mmol) is then added to the solution and the reaction mixture is heated at reflux. The reaction is monitored by 1H NMR until completion. Internal standard is put to attest of a NMR yield in quinoline. No alcohol can be seen in NMR as it is not soluble in chloroform. The mixture is filtrated using chloroform. The solid proves to be the pure alcohol. The remaining solvents in the filtrate is evapored and the acetylated quinoline purified on column chromatography using petroleum ether:ethyl acetate as aluent (85:15).
- Procedure 2: In an NMR tube, 1.0 equiv. (0.1 mmol) of the subtrate is dissolved in 0.5mL of acetonitrile-d^3. 5 mol% of $AuCl_3$ (0.005 mmol) is then added to the solution and the reaction mixture is heated at reflux. The reaction is monitored by 1H NMR until completion. Internal standard is put to attest of a NMR yield in quinoline. No alcohol can be seen in NMR as it is not soluble in chloroform. The mixture is filtrated using chloroform. The solid proves to be the pure alcohol. The remaining solvents in the filtrate is evapored and the acetylated quinoline purified on column chromatography using petroleum ether:ethyl acetate as aluent (85:15) to dichloromethane:methanol (95:5).

The reaction has been performed one more time and the reaction mixture heated until no quinoline could be seen by NMR. All quinoline $$ had been deprotected to alcohol $$.



Product: gray solid

Yield: general procedure **4.4 for 15 min:** yield = **32%** (m = 5.6 mg, n = 0.0324 mmol) (general procedure **4.4 for 1h**: yield = **82%,** m = 14.1 mg, n = 0.0815 mmol), general procedure **4.4 for 15 min:** yield = **32%** (m = 5.6 mg, n = 0.0324 mmol) (general procedure **4.4 for 1h**: yield = **82%,** m = 14.1 mg, n = 0.0815 mmol)

^{1}H NMR (400 MHz, d^{6}-DMSO): δ (ppm) 11.45-11.38 (bs, 1H), 8.05 (d, *J* = 8.1 Hz, 1H), 7.56 (d, *J* = 7.3 Hz, 1H), 7.46 (d, *J* = 8.1 Hz, 1H), 7.23 (d, *J* = 7.3 Hz, 1H), 2.37 (s, 3H), 1.96 (s, 3H).

^{13}C NMR (100 MHz, d^{6}-DMSO): δ (ppm) 175.7, 145.8, 139.0, 130.8, 125.0, 123.0, 122.2, 117.4, 114.0, 18.0, 10.4.