Electronic Supplementary Material (ESI) for Green Chemistry.

Supporting information

Cobalt-catalysed CH-alkylation of indoles with alcohols by borrowing hydrogen methodology

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S1. Materials and methods

All indoles and alcohols were obtained commercially from various chemical companies. Unless otherwise stated all reagents were used directly without purification. Cobalt(II) nitrate hexahydrate (cat no. 239267-100G; ≥98%), zinc nitrate hexahydrate (cat no. 228737-500G; 98%) and silica suspension (Silica LUDOX® HS-40 colloidal silica, cat no. 420816-1L; 40 wt. % suspension in H_2O) were purchased from Sigma Aldrich. 2,6-Diaminopyridine (cat no. A12295 -100G) was purchased from Alfa Aesar. The pyrolysis experiments were carried out in Dekema Austromat 624 oven.

XRD powder pattern were recorded on a Panalytical X'Pert diffractometer equipped with a Xcelerator detector using automatic divergence slits and Cu kα1/α2 radiation (40 kV, 40 mA; λ= 0.15406 nm, 0.154443 nm). Cu beta-radiation was excluded using a nickel filter foil. The measurements were performed in 0.0167° steps and 100 s of data collecting time per step. The samples were mounted on silicon zero background holders. The obtained intensities were converted from automatic to fixed divergence slits (0.25°) for further analysis. Peak positions and profile were fitted with Pseudo-Voigt function using the High Score Plus software package (Panalytical). Phase identification was done by using the PDF-2 database of the International Center of Diffraction Data (ICDD).

Scanning Transmission Electron Microscopy (STEM) was performed with a probe aberration corrected JEM-ARM 200F (JEOL) equipped high angle annular dark field (HAADF) and annular bright field (ABF) detectors and energy dispersive x-ray spectroscopy (EDXS), Dry60SGD (JEOL), for chemical analysis. Attached to the microscope is an electron energy loss spectrometer (EELS), Enfinium ER (Gatan). The specimen was dry deposited onto a Cu grid (mesh 300) covered by a holey carbon film.

The XPS (X-ray Photoelectron Spectroscopy) measurements were performed on an ESCALAB 220iXL (Thermo Fisher Scientific) with monochromated Al Kα radiation (E = 1486.6 eV). Samples are prepared on a stainless-steel holder with conductive double-sided adhesive carbon tape. The electron binding energies were obtained without charge compensation leading to a binding energy of 284.7 eV of the main C 1s core level. For quantitative analysis the peaks were deconvoluted with Gaussian-Lorentzian curves using the software Unifit 2021. The peak areas were normalized by the transmission function of the spectrometer and the element specific sensitivity factor of Scofield.

GC and GC-MS analysis were performed on Agilent 6890N instrument. GC conversion and yields were determined by GC-FID, HP6890 chromatograph with FID detector, column HP530 m x 250 mm x 0.25 µm. NMR spectra were recorded using Bruker 300 Fourier, Bruker AV 300 and Bruker AV 400 spectrometers. Chemical shifts are reported in ppm relative to the deuterated solvent. Coupling constants are expressed in Hertz (Hz). The following abbreviations are used: s = singlet, d = doublet, t = triplet and m = multiple. The residual solvent signals were used as references for ^{1}H and ^{13}C NMR spectra ($CDCl_3$: δH = 7.26 ppm, δC = 77.12 ppm; DMSO-d_6: δH = 2.50 ppm, δC = 39.52 ppm).

All catalytic experiments were carried out in ACS pressure tubes.

S2 Procedure for the preparation of catalysts

In a 100 mL oven-dried single-necked round-bottom flask, 1.20 g colloidal silica aqueous solution (Ludox HS-40, 40 wt. % suspension in H_2O) was dissolved in 30 mL deionized water and stirred for 30 minutes at room temperature. To the above solution, $Co(NO_3)_2 \cdot 6H_2O$ (291.03 mg, 2,6-diaminopyridine (DAP; 1636.95 mg) and $Zn(NO_3)_2 \cdot 6H_2O$ (297.49 mg) were added and continued stirring for 20 hours at room temperature. Then, the solvent of the reaction mixture was removed by freeze dryer. The obtained solid material was ground to a fine powder, transferred to a ceramic crucible, and placed in a pyrosis oven. Afterward, the furnace was heated to the defined temperature (700 ^oC, 800 ^oC, and 900 ^oC) for 3 h at the heating rate of 5 ^oC/min under argon atmosphere. After the pyrolysis, the oven was cooled down to room temperature and the material was removed from the oven. Next, the obtained samples were etched in 5 M NH_4HF_2 aqueous solution at RT for 24 h to remove the SiO_2 template and larger particles. Finally, the resulting catalytic material was filtered and washed subsequently with deionized water and ethanol for three times and finally dried under vacuum overnight.

S3 Characterization of catalysts

XRD patterns

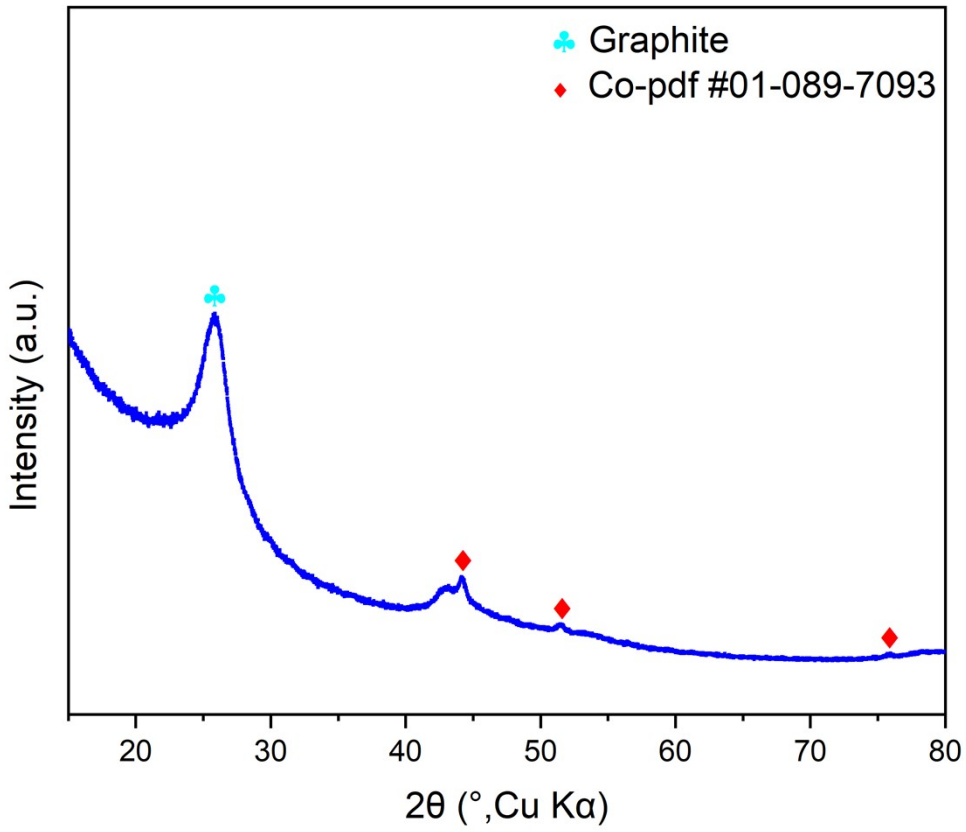


Fig. S1. XRD pattern of Co@NC-900 catalyst.

STEM images

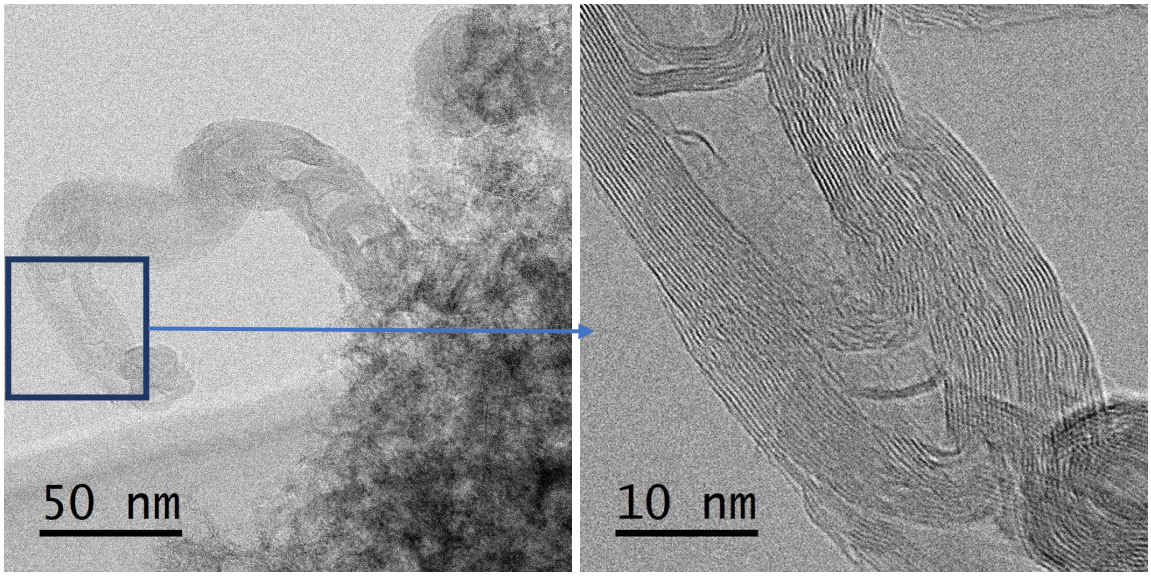


Fig. S2. ABF-STEM images of Co@NC-900 catalyst showing highly ordered graphitic carbon in the form of a carbon nano tube attached to a disordered carbon phase.

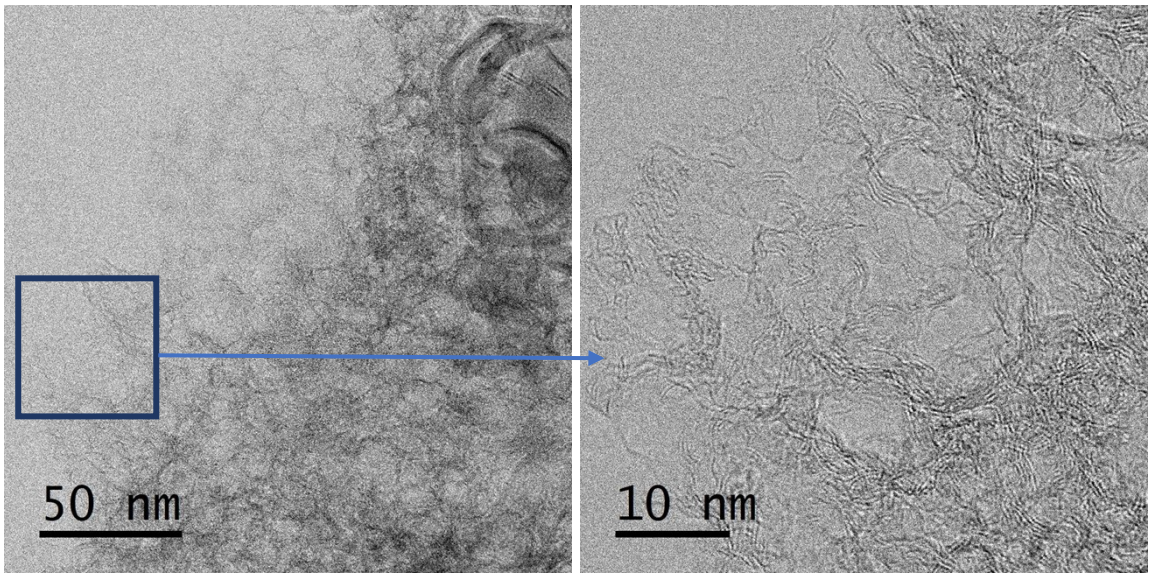


Fig. S3. ABF-STEM images of Co@NC-900 catalyst showing the disordered carbon phase in more detail.

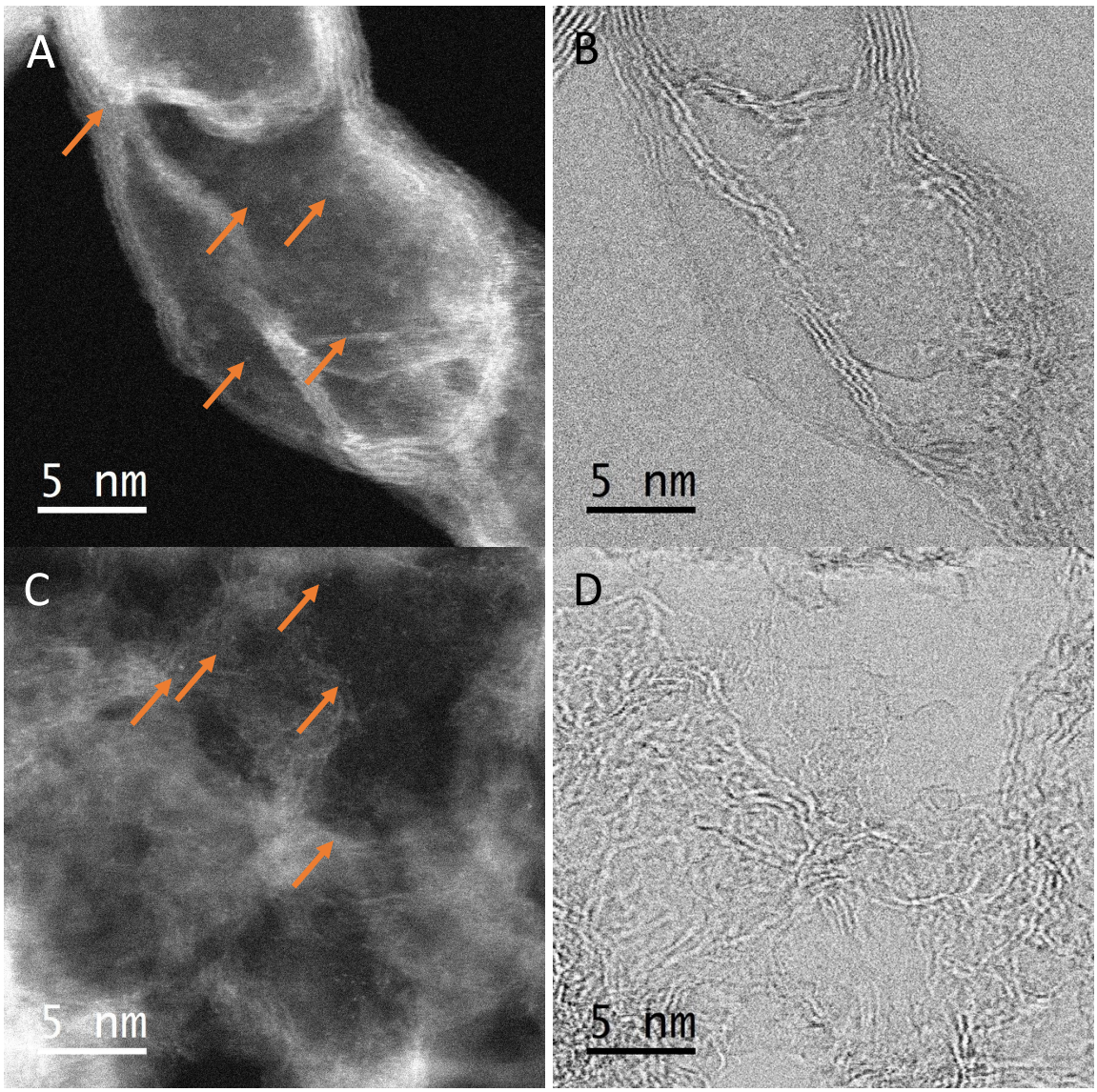


Fig. S4. HAADF-STEM images (A and C) of ordered carbon (A) and disordered carbon (C) with bright dots (some marked by arrows) potentially representing K atoms remaining on the surface and corresponding ABF-STEM images (B and D) highlighting the carbon structure.

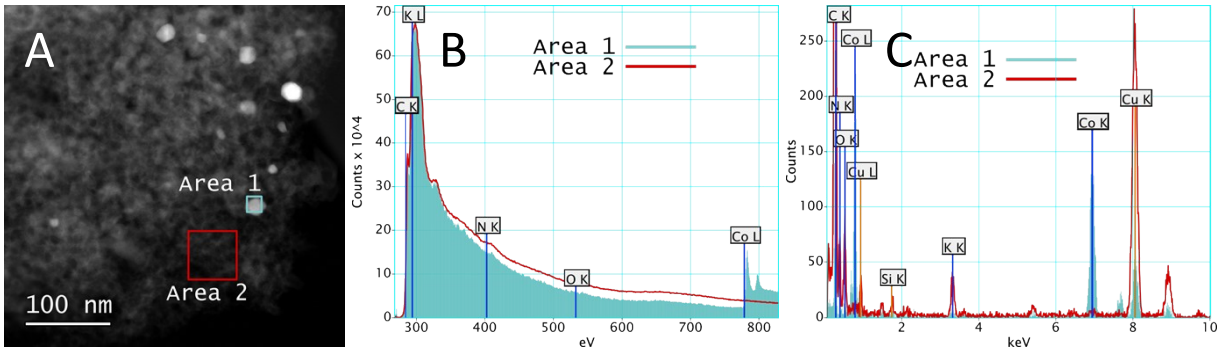


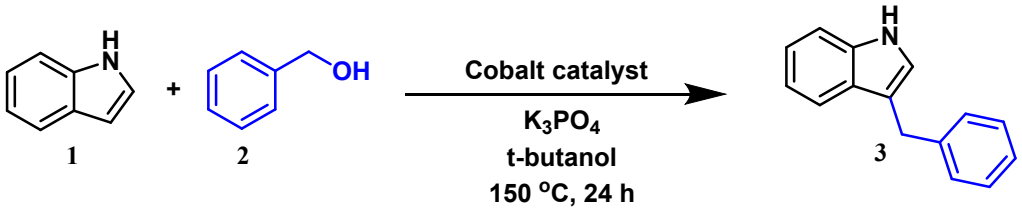
Fig. S5. ADF-STEM image (A) marked with reference frames from where the electron energy loss spectra (B) and the energy dispersive x-ray spectra (C) have been extracted from the spectrum image dataset. EDXS nicely shows the presence of K in areas where there are no Co particles. As there is also no Co signal of potentially dispersed Co atoms in area 2 this indicates the bright dots in S4 might stem from dispersed K atoms. EELS also indicates the metallic state of the Co particle in area 1 by the almost complete absence of an oxygen signal.

S4. General procedure for the C3-alkylation of indoles with alcohols

S4.1 C3-Alkylation of indoles with alcohols

In a 20 mL pressure tube fitted with magnetic stirring bar, 0.5 mmol of indole and 1 mmol alcohol, 50 mg catalyst (Co@NC-900) and 0.5 mmol K_3PO_4 were added. Then, 2 mL tert-butanol was added, and the pressure tube was flushed with argon 3 times and fitted with screw cap. The pressure tube containing reaction mixture was placed in aluminum block and reaction was carried out under stirred condition at 150 °C for desired time. After the completion of the reaction, the pressure tube was cooled to room temperature. Then, the samples were removed from pressure tube, and the solid catalyst was filtered off and washed thoroughly with ethyl acetate. The reaction products were analyzed by GC-MS. The corresponding C3-alkylated indoles were purified by column chromatography (silica; pentene-ethyl acetate mixture) and characterized by NMR spectral analysis. Following procedure is applied for determining the conversions and yields by GC: after completion of the reaction, n-hexadecane (50 µL) as standard was added to the reaction pressure tube and the reaction products were diluted with ethyl acetate followed by filtration using plug of silica and then analyzed by GC.

Table S1. C3-Alkylation of indole with benzyl alcohol: Evaluation of Co catalysts. [a]

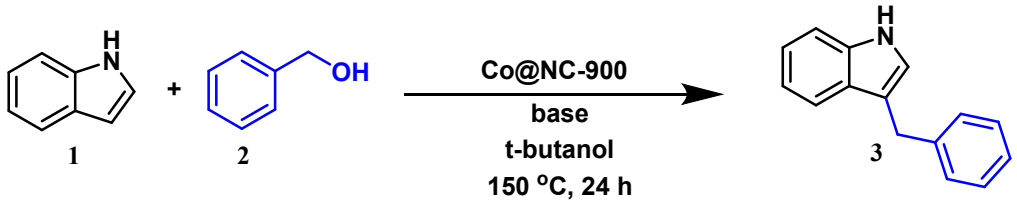


Entry	Catalyst	Conversion of 1 (%)	Yield of 3 (%)
1	Co@NC-SiO_2-900	40	39
2	Co@NC-900	>99	97
3	Co@NC-700	80	77
4	Co@NC-800	88	85
5	Co@NC-900 (Prepared without $Zn(NO_3)_2$)	74	70
6	Co-NPs[b]	59	56
7	$Co(NO_3)_2$- $Zn(NO_3)_2$-SiO_2	<2	<1
8	$Co(NO_3)_2$-$Zn(NO_3)_2$-DAP	<2	<1
9	$Co(NO_3)_2$-DAP	<2	<1
10	Without catalyst	<2	<1
11[c]	Co@NC-900	60	56
12[d]	Co@NC-900	91	90

13	NC-900	<2	<1

[a] Reaction conditions: 0.5 mmol indole, 1 mmol benzyl alcohol, 50 mg catalyst (1.26 mol% Co), 0.5 mmol K_3PO_4 (1 equiv.), 2 mL t-butanol, 150 °C, 24 h, conversions and yields are based on indole and determined by GC using n-hexadecane standard. [b] Co-NPs were prepared by the pyrolysis of $Co(NO_3)_2 \cdot 6H_2O$, $Zn(NO_3)_2 \cdot 6H_2O$ and colloidal silica at 900 °C and then silica was removed. [c]130 °C. [d] 140 °C.

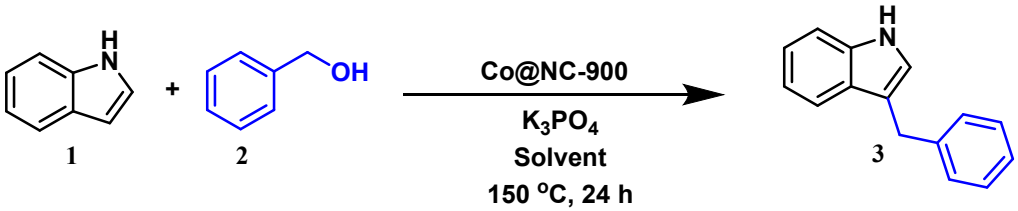
Table S2. C3-Alkylation of indole with benzyl alcohol: Testing of different bases.



Entry	Base	Conv. (%)	Yield 3 (%)
1	K_2CO_3 (1 equiv.)	62%	55%
2	KOH (1 equiv.)	90%	87%
3	t-BuOK (1 equiv.)	>99%	96%
4	K_3PO_4 (1 equiv.)	>99%	94%
5	K_3PO_4 (0.7 equiv.)	71%	67%
6	K_3PO_4 (0.5 equiv.)	49%	38%
7	K_3PO_4 (1.5 equiv.)	>99%	95%

Reaction conditions: 0.5 mmol indole, 1 mmol benzyl alcohol, 50 mg catalyst (1.26 mol% Co), 2 mL t-butanol, 150 °C, 24 h. Conversions and yields are based on indole and determined by GC using n-hexadecane standard.

Table S3. C3-Alkylation of indole with benzyl alcohol: Testing of different solvents.

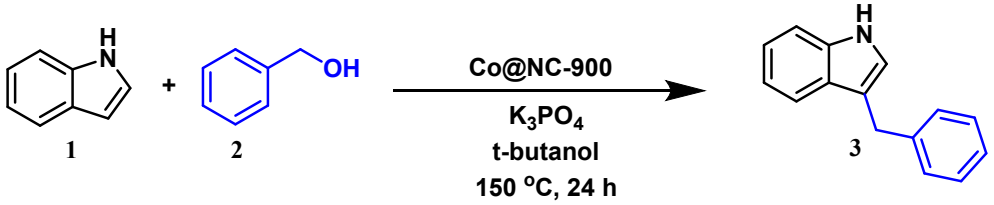


Entry	Solvent	Conv. (%)	Yield 3 (%)
1	THF	65%	61%
2	toluene	84%	80%
3	dioxane	73%	70%
4	t-butanol	>99%	94%

5	isopropanol	85%	82%
6	tert-amyl alcohol	86%	82%

Reaction conditions: 0.5 mmol indole, 1 mmol benzyl alcohol, 50 mg catalyst (1.26 mol% Co), 2 mL t-butanol, 150 °C, 24 h. Conversions and yields are based on indole and determined by GC using n-hexadecane standard.

Table S4. C3-Alkylation of indole with benzyl alcohol: Testing of different alcohol amount.



Entry	Alcohol amount	Conv. (%)	Yield 3 (%)
1	0.5 mmol (1 equiv.)	71%	68%
2	0.75mmol (1.5 equiv.)	80%	77%
3	1 mmol (2 equiv.)	>99%	94%

Reaction conditions: 0.5 mmol indole, 1 mmol benzyl alcohol, 50 mg catalyst (1.26 mol% Co), 2 mL t-butanol, 150 °C, 24 h. Conversions and yields are based on indole and determined by GC using n-hexadecane standard.

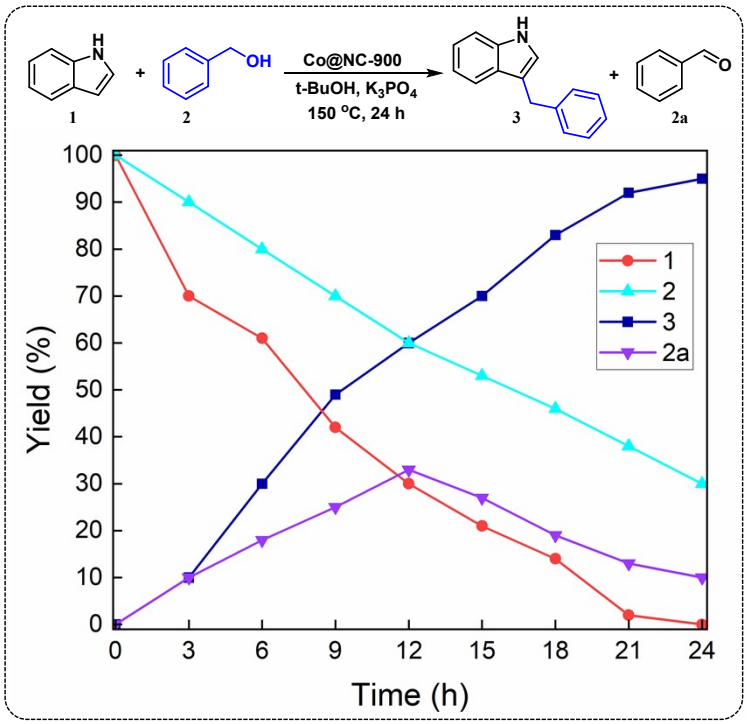
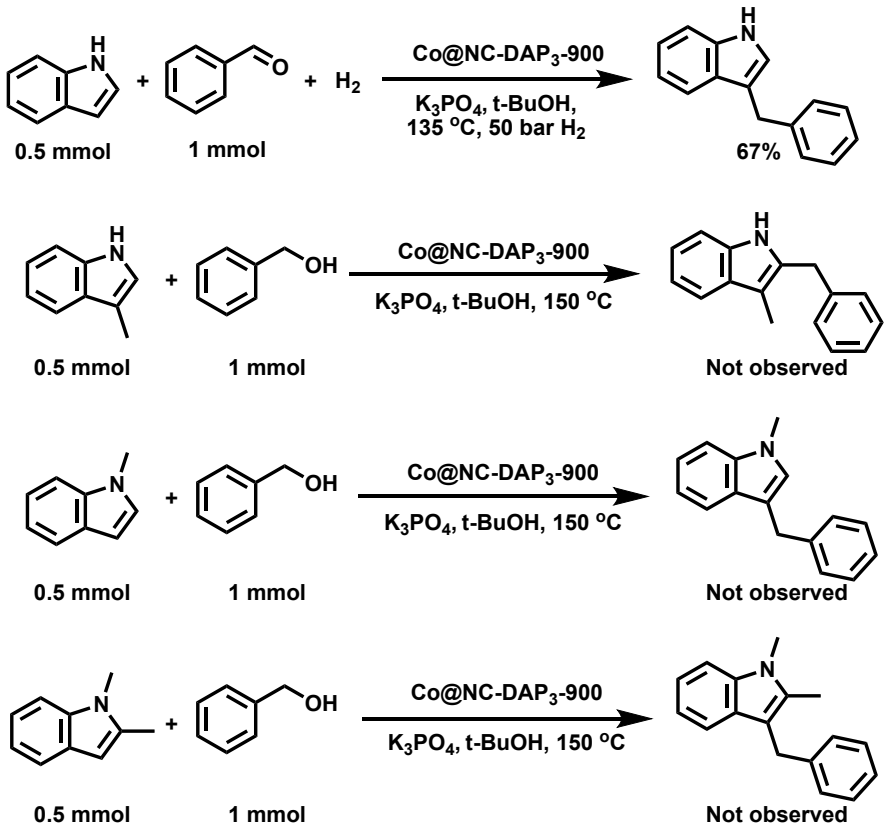


Fig. S6. C3-alkylation of indole with benzyl alcohol: reaction progress with time.

Reaction conditions: 0.5 mmol indole, 1 mmol benzyl alcohol, 50 mg catalyst (1.26 mol% Co), 2 mL t-butanol, 150 °C, 24 h. Conversions and yields are based on indole and determined by GC using n-hexadecane standard.



Scheme S1. Control reactions.

S4.2 Methylation of indoles

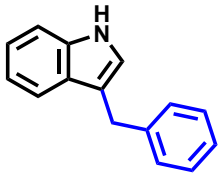
The magnetic stirring bar, 0.5 mmol indole, 70 mg Co@NC-900 and 1 mmol t-BuOK were transferred to 20 mL pressure tube. Then 1 mL methanol and 1 mL t-butanol were added to the above mixture. Then, the pressure tube was flushed with argon for 3 times and closed with screw cap. The pressure tube containing reaction mixtures were placed into aluminum block and allowed to progress at 160 °C for desired time. After the completion of the reaction, the pressure tube was cooled to room temperature. Then, the samples were removed from pressure tube, and the solid catalyst was filtered off and washed thoroughly with ethyl acetate. The reaction products were analyzed by GC-MS. The corresponding C3-alkylated products were purified by column chromatography (silica; pentene-ethyl acetate mixture) and characterized by NMR and GC-MS analysis.

S5 Catalyst recycling

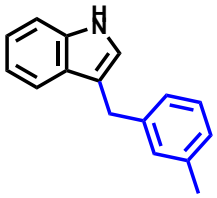
The magnetic stirring bar, 1 mmol indole and 2 mmol benzyl alcohol, 100 mg Co@NC-900 and 1 mmol K_3PO_4 were transferred to 20 mL pressure tube and 3 mL tert-butanol was added. The pressure tube was flushed with argon for 3 times and closed with screw cap. Then, it was placed into an aluminum block and heated to 150 °C for 24 h. After the completion of the reaction, the pressure tube was cooled down to room temperature. To the reaction products, 100 µL n-hexadecane as standard was added. The catalyst was then separated by centrifugation and the centrifugate containing reaction products was subjected to GC analysis. The separated catalyst was

then washed with water, methanol, and ethyl acetate, dried under vacuum and used without further purification or reactivation for the next run.

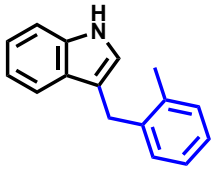
S6 NMR data



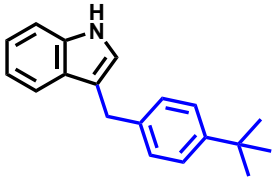
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.92 (bs, 1H), 7.54 (dq, *J* = 7.8, 0.9 Hz, 1H), 7.41 – 7.16 (m, 7H), 7.10 (ddd, *J* = 8.0, 7.0, 1.1 Hz, 1H), 6.92 (dt, *J* = 2.2, 1.0 Hz, 1H), 4.14 (s, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 141.23, 136.47, 128.72, 128.36, 127.49, 125.90, 122.35, 122.07, 119.39, 119.19, 115.87, 111.09, 31.62.



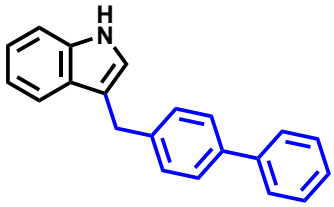
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.64 (bs, 1H), 7.41 (dd, *J* = 7.8, 1.1 Hz, 1H), 7.17 (dt, *J* = 8.1, 1.0 Hz, 1H), 7.08 – 6.94 (m, 5H), 6.88 (d, *J* = 7.4 Hz, 1H), 6.70 (dt, *J* = 2.2, 1.0 Hz, 1H), 3.94 (s, 2H), 2.17 (s, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 141.27, 137.96, 136.49, 129.57, 128.32, 126.74, 125.83, 122.43, 122.07, 122.04, 119.41, 119.24, 115.94, 111.16, 111.13, 102.62, 31.59, 21.53.



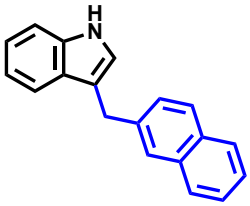
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.90 (bs, 1H), 7.67 – 7.61 (m, 1H), 7.41 (dt, J = 8.1, 0.9 Hz, 1H), 7.28 – 7.17 (m, 6H), 6.76 (dt, J = 2.2, 1.1 Hz, 1H), 4.14 (d, J = 1.1 Hz, 2H), 2.40 (s, 3H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 139.13, 136.52, 136.48, 130.17, 129.45, 127.59, 126.23, 125.99, 122.45, 122.08, 119.37, 119.10, 115.20, 111.13, 29.29, 19.56.



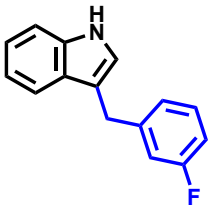
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.77 (bs, 1H), 7.52 – 7.47 (m, 1H), 7.29 – 7.21 (m, 3H), 7.18 – 7.13 (m, 2H), 7.12 – 7.09 (m, 1H), 7.02 (ddd, *J* = 8.0, 7.0, 1.1 Hz, 1H), 6.82 (dt, *J* = 2.0, 0.9 Hz, 1H), 4.02 (d, *J* = 0.9 Hz, 2H), 1.24 (s, 9H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 148.67, 138.23, 136.47, 128.34, 127.59, 125.27, 122.35, 122.04, 119.36, 119.24, 116.03, 111.11, 34.41, 31.49, 31.03.



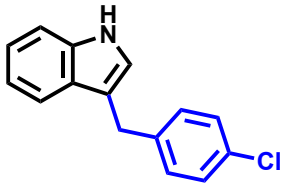
^{1}H NMR (300 MHz, DMSO) δ 10.87 (s, 1H), 7.58 (dd, *J* = 18.7, 7.5 Hz, 4H), 7.50 – 7.27 (m, 7H), 7.21 (d, *J* = 2.1 Hz, 1H), 7.10 – 7.00 (m, 1H), 6.94 (t, *J* = 7.4 Hz, 1H), 4.08 (s, 2H).
^{13}C NMR (75 MHz, DMSO) δ 141.64, 140.58, 138.03, 136.88, 129.43, 129.33, 127.58, 127.44, 126.97, 126.94, 123.65, 121.41, 119.01, 118.76, 114.15, 111.87, 31.11.



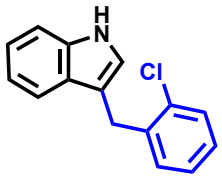
^{1}H NMR (400 MHz, DMSO-d6) δ 10.91 (s, 1H), 7.86 – 7.77 (m, 4H), 7.50 – 7.34 (m, 5H), 7.23 (d, J = 2.4 Hz, 1H), 7.06 (ddd, J = 8.1, 6.9, 1.2 Hz, 1H), 6.93 (ddd, J = 8.0, 7.0, 1.0 Hz, 1H), 4.22 (s, 2H).
^{13}C NMR (101 MHz, DMSO-d6) δ 139.94, 136.94, 133.63, 132.03, 128.09, 128.05, 127.93, 127.79, 127.52, 126.54, 126.41, 125.63, 123.78, 121.44, 119.02, 118.78, 114.13, 111.91, 31.79.



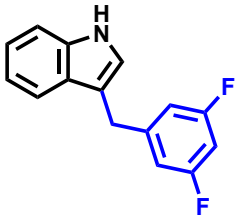
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.87 (bs, 1H), 7.46 (ddt, J = 7.9, 1.3, 0.7 Hz, 1H), 7.31 (dt, J = 8.1, 1.0 Hz, 1H), 7.21 – 7.13 (m, 2H), 7.10 – 6.99 (m, 2H), 6.99 – 6.77 (m, 3H), 4.07 (t, J = 0.7 Hz, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 163.03 (d, J = 245.1 Hz), 143.95 (d, J = 6.9 Hz), 136.48, 129.72 (d, J = 8.3 Hz), 127.33, 124.32 (d, J = 2.8 Hz), 122.47, 122.22, 119.53, 119.09, 115.68, 115.40, 114.98, 112.83 (d, J = 21.1 Hz), 111.20, 31.39 (d, J = 1.7 Hz).
^{19}F NMR (376 MHz, Chloroform-*d*) δ -113.76 (td, J = 9.1, 5.7 Hz).



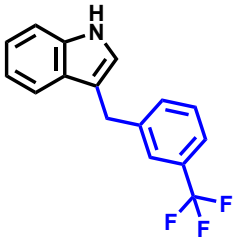
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.83 (s, 1H), 7.36 (ddt, *J* = 7.9, 1.4, 0.8 Hz, 1H), 7.14 – 7.05 (m, 5H), 6.97 (ddd, *J* = 8.0, 7.0, 1.1 Hz, 1H), 6.79 (dt, *J* = 2.2, 1.0 Hz, 1H), 3.99 – 3.92 (m, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 139.70, 136.48, 131.61, 130.03, 128.72, 128.44, 127.28, 122.38, 122.22, 119.50, 119.07, 115.28, 111.17, 31.02.



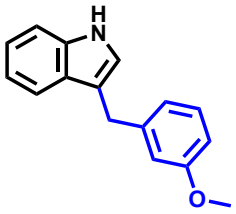
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.97 (bs, 1H), 7.57 (dq, J = 7.9, 0.9 Hz, 1H), 7.42 – 7.35 (m, 2H), 7.24 – 7.19 (m, 2H), 7.17 – 7.09 (m, 3H), 6.95 (dt, J = 2.1, 1.0 Hz, 1H), 4.23 (t, J = 0.8 Hz, 2H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 138.75, 136.39, 134.02, 130.58, 129.37, 127.43, 127.38, 126.75, 122.76, 122.13, 119.49, 119.13, 114.02, 111.15, 29.09.



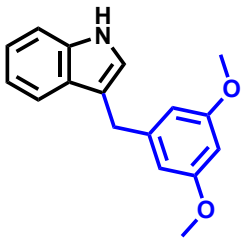
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.02 (bs, 1H), 7.47 (ddt, *J* = 7.9, 1.4, 0.8 Hz, 1H), 7.38 (dt, *J* = 8.1, 1.0 Hz, 1H), 7.22 (ddd, *J* = 8.2, 7.1, 1.3 Hz, 1H), 7.10 (ddd, *J* = 8.1, 7.1, 1.1 Hz, 1H), 6.99 (dd, *J* = 2.3, 1.1 Hz, 1H), 6.90 – 6.70 (m, 2H), 6.63 (tdd, *J* = 9.0, 2.6, 2.1 Hz, 1H), 4.11 – 4.09 (m, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 164.77, 161.49, 136.48, 127.16, 122.54, 122.34, 119.66, 118.93, 114.09, 111.52, 111.42, 111.22, 111.19, 101.73, 101.40, 101.06, 31.39.
^{19}F NMR (282 MHz, $CDCl_3$) δ -110.73 (t, *J* = 8.3 Hz).



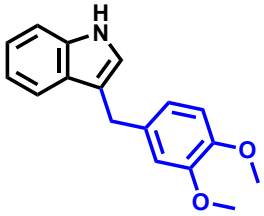
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.86 (bs, 1H), 7.48 (d, *J* = 2.2 Hz, 1H), 7.44 – 7.32 (m, 3H), 7.31 – 7.21 (m, 2H), 7.18 – 7.06 (m, 1H), 7.06 – 6.95 (m, 1H), 6.91 – 6.72 (m, 1H), 4.08 (s, 2H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 142.17, 136.48, 132.08, 130.62 (q, *J* = 31.9 Hz), 128.78, 127.24, 125.68, 125.39 (q, *J* = 3.9 Hz), 122.88 (q, *J* = 3.8 Hz), 122.49, 122.29, 119.60, 118.96, 114.83, 111.22, 31.47.
^{19}F NMR (376 MHz, Chloroform-*d*) δ -62.39 (d, *J* = 2.6 Hz).



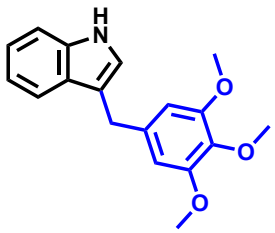
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.81 (bs, 1H), 7.44 (ddt, *J* = 7.8, 1.4, 0.7 Hz, 1H), 7.23 (dt, *J* = 8.1, 1.0 Hz, 1H), 7.13 – 7.06 (m, 2H), 7.02 – 6.96 (m, 1H), 6.83 – 6.74 (m, 3H), 6.65 (dddd, *J* = 8.2, 2.7, 1.0, 0.5 Hz, 1H), 4.00 (s, 2H), 3.66 (s, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 159.69, 142.96, 136.47, 129.33, 127.49, 122.41, 122.06, 121.24, 119.40, 119.16, 115.60, 114.59, 111.20, 111.12, 55.17, 31.68.



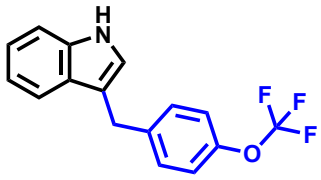
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.96 (bs, 1H), 7.65 – 7.51 (m, 1H), 7.35 (dt, *J* = 8.1, 0.9 Hz, 1H), 7.25 – 7.16 (m, 1H), 7.11 (ddd, *J* = 8.0, 7.0, 1.1 Hz, 1H), 6.93 (dt, *J* = 2.1, 1.0 Hz, 1H), 6.50 (dt, *J* = 2.3, 0.6 Hz, 2H), 6.35 (t, *J* = 2.3 Hz, 1H), 4.09 – 4.07 (m, 2H), 3.77 (s, 6H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 160.78, 143.77, 136.46, 127.49, 122.42, 122.05, 119.40, 119.13, 115.40, 111.11, 106.95, 97.88, 55.29, 31.92.



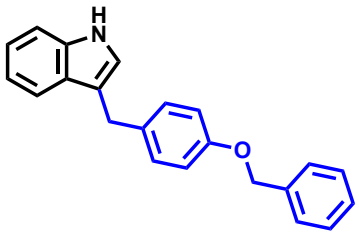
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.99 (bs, 1H), 7.54 (ddt, *J* = 7.9, 1.4, 0.7 Hz, 1H), 7.36 (dt, *J* = 8.1, 1.0 Hz, 1H), 7.23 – 7.16 (m, 1H), 7.09 (ddd, *J* = 8.1, 7.0, 1.1 Hz, 1H), 6.92 – 6.77 (m, 4H), 4.09 – 4.07 (m, 2H), 3.86 (s, 3H), 3.82 (s, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 148.84, 147.24, 136.50, 133.82, 127.44, 122.26, 122.06, 120.59, 119.35, 119.14, 116.15, 112.11, 111.17, 111.10, 55.94, 55.82, 31.24.



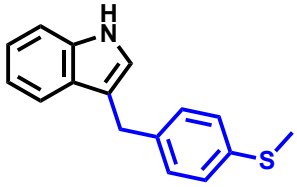
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.02 (bs, 1H), 7.56 (ddt, *J* = 7.8, 1.4, 0.7 Hz, 1H), 7.37 (dt, *J* = 8.1, 1.0 Hz, 1H), 7.20 (dddd, *J* = 8.1, 7.1, 1.3, 0.4 Hz, 1H), 7.13 – 7.07 (m, 1H), 6.93 (dd, *J* = 2.3, 1.1 Hz, 1H), 6.53 (d, *J* = 0.6 Hz, 2H), 4.07 – 4.06 (m, 2H), 3.83 (s, 3H), 3.80 (s, 6H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 153.12, 136.93, 136.48, 127.43, 122.32, 122.11, 119.40, 119.07, 115.72, 111.12, 105.75, 60.88, 56.07, 32.00.



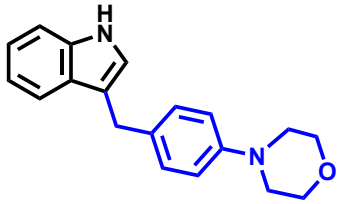
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.97 (bs, 1H), 7.50 (ddt, *J* = 7.9, 1.5, 0.8 Hz, 1H), 7.38 (dt, *J* = 8.2, 0.9 Hz, 1H), 7.31 (dt, *J* = 1.5, 0.8 Hz, 1H), 7.30 – 7.28 (m, 1H), 7.22 (ddd, *J* = 8.2, 7.0, 1.3 Hz, 1H), 7.17 – 7.07 (m, 3H), 6.94 (dt, *J* = 2.2, 1.0 Hz, 1H), 4.13 (q, *J* = 0.8 Hz, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 147.48, 139.99, 136.49, 129.85, 127.28, 122.42, 122.25, 120.90, 119.53, 119.04, 118.85, 115.19, 111.19, 30.94.
^{19}F NMR (282 MHz, Chloroform-*d*) δ -57.87.



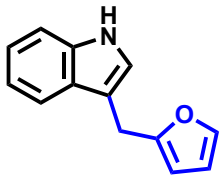
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.93 (bs, 1H), 7.53 (dq, J = 7.9, 0.9 Hz, 1H), 7.45 – 7.30 (m, 6H), 7.23 – 7.17 (m, 3H), 7.09 (ddd, J = 8.0, 7.0, 1.0 Hz, 1H), 6.94 – 6.88 (m, 3H), 5.04 (s, 2H), 4.07 (s, 2H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 157.10, 137.25, 136.49, 133.62, 129.62, 128.58, 127.91, 127.51, 127.45, 122.23, 122.04, 119.35, 119.20, 116.26, 114.73, 111.07, 70.08, 30.73.



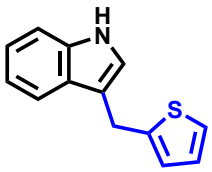
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.99 (bs, 1H), 7.57 (ddt, *J* = 7.9, 1.4, 0.7 Hz, 1H), 7.39 (dt, *J* = 8.1, 1.0 Hz, 1H), 7.29 – 7.22 (m, 5H), 7.15 (ddd, *J* = 8.0, 7.0, 1.0 Hz, 1H), 6.94 (dd, *J* = 2.2, 1.1 Hz, 1H), 4.15 – 4.11 (m, 2H), 2.51 (s, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 138.45, 136.50, 135.37, 129.72, 129.27, 127.41, 127.15, 123.76, 122.40, 122.11, 119.41, 119.15, 115.63, 111.17, 31.11, 16.34.



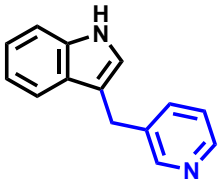
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.96 (bs, 1H), 7.52 (dq, J = 7.9, 0.9 Hz, 1H), 7.35 (dt, J = 8.2, 0.9 Hz, 1H), 7.25 – 7.14 (m, 3H), 7.07 (ddd, J = 8.0, 7.0, 1.0 Hz, 1H), 6.91 (dd, J = 2.3, 1.1 Hz, 3H), 4.07 – 4.03 (m, 2H), 3.88 (s, 4H), 3.14 (t, J = 4.8 Hz, 4H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 143.75, 136.50, 129.50, 129.24, 127.45, 122.26, 122.02, 119.31, 119.18, 116.37, 116.11, 111.08, 66.73, 50.21, 30.72.



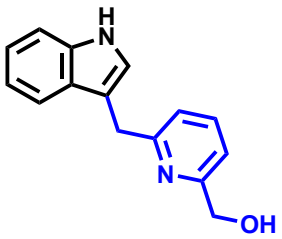
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.92 (bs, 1H), 7.63 – 7.59 (m, 1H), 7.39 – 7.33 (m, 2H), 7.23 (ddd, *J* = 8.2, 7.0, 1.2 Hz, 1H), 7.15 (ddd, *J* = 8.0, 7.0, 1.1 Hz, 1H), 7.04 (dt, *J* = 2.2, 1.0 Hz, 1H), 6.32 (dd, *J* = 3.2, 1.9 Hz, 1H), 6.06 (dq, *J* = 3.0, 0.9 Hz, 1H), 4.16 (d, *J* = 1.1 Hz, 2H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 154.93, 141.11, 136.34, 127.27, 122.38, 122.14, 119.49, 119.10, 112.64, 111.17, 110.32, 105.72, 24.50.



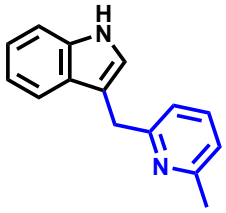
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.85 (bs, 1H), 7.49 (ddt, J = 7.8, 1.4, 0.8 Hz, 1H), 7.30 – 7.25 (m, 1H), 7.18 – 7.08 (m, 1H), 7.07 – 6.99 (m, 2H), 6.94 (dt, J = 2.1, 1.0 Hz, 1H), 6.88 – 6.78 (m, 2H), 4.24 (t, J = 1.0 Hz, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 144.69, 136.39, 127.13, 126.73, 124.75, 123.44, 122.28, 122.19, 119.50, 119.07, 115.31, 111.17, 25.97.



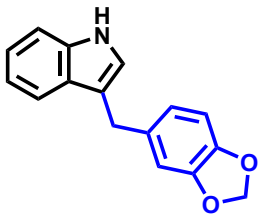
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.63 – 8.43 (m, 2H), 8.37 (bs, 1H), 7.53 (dddt, J = 24.7, 7.9, 1.4, 0.8 Hz, 2H), 7.36 (dt, J = 8.1, 0.9 Hz, 1H), 7.24 – 7.16 (m, 2H), 7.09 (ddd, J = 8.0, 7.0, 1.1 Hz, 1H), 6.93 (dt, J = 2.2, 1.0 Hz, 1H), 4.12 (s, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 149.83, 147.19, 136.82, 136.56, 136.41, 127.12, 123.45, 122.55, 122.25, 119.55, 118.85, 114.35, 111.28, 28.88.



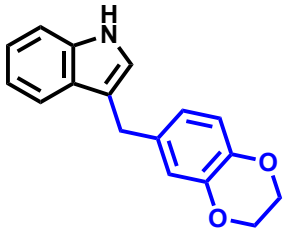
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.42 (bs, 1H), 7.59 – 7.45 (m, 2H), 7.32 (dt, *J* = 8.1, 1.0 Hz, 1H), 7.23 – 7.01 (m, 4H), 6.97 (d, *J* = 2.3 Hz, 1H), 4.77 (s, 2H), 4.61 (bs, 1H), 4.30 (s, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 160.29, 158.18, 137.36, 136.47, 127.43, 122.92, 122.03, 121.40, 119.41, 119.08, 118.01, 113.40, 111.32, 63.94, 34.14.



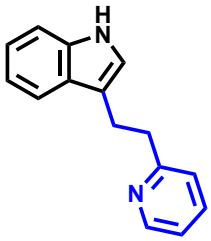
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.25 (bs, 1H), 7.53 (dt, *J* = 7.9, 0.9 Hz, 1H), 7.42 (t, *J* = 7.7 Hz, 1H), 7.35 (dd, *J* = 8.1, 0.9 Hz, 1H), 7.18 (ddd, *J* = 8.2, 7.0, 1.1 Hz, 1H), 7.13 – 6.85 (m, 4H), 4.30 (s, 2H), 2.59 (s, 3H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 160.54, 157.48, 136.96, 136.46, 127.52, 122.83, 122.03, 120.72, 119.73, 119.39, 119.26, 113.78, 111.13, 34.31, 24.40.



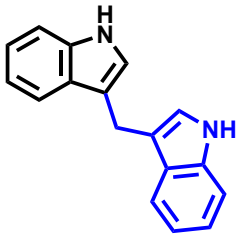
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.89 (bs, 1H), 7.59 – 7.55 (m, 1H), 7.36 (dt, J = 8.1, 0.9 Hz, 1H), 7.24 (ddd, J = 8.2, 7.0, 1.2 Hz, 1H), 7.14 (ddd, J = 8.0, 7.0, 1.1 Hz, 1H), 6.92 (dt, J = 2.2, 1.0 Hz, 1H), 6.84 – 6.76 (m, 3H), 5.93 (s, 2H), 4.08 (s, 2H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 147.64, 145.73, 136.52, 135.23, 127.40, 122.33, 122.12, 121.44, 119.44, 119.20, 115.94, 111.17, 109.31, 108.13, 100.82, 31.38.



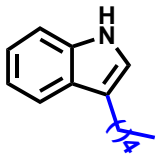
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.94 (bs, 1H), 7.54 (ddt, *J* = 7.8, 1.3, 0.7 Hz, 1H), 7.38 – 7.32 (m, 1H), 7.19 (dddd, *J* = 8.2, 7.1, 1.3, 0.4 Hz, 1H), 7.09 (ddd, *J* = 8.1, 7.0, 1.1 Hz, 1H), 6.93 (dt, *J* = 2.2, 1.0 Hz, 1H), 6.83 – 6.76 (m, 3H), 4.22 (s, 4H), 4.02 (t, *J* = 0.9 Hz, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 143.29, 141.70, 136.48, 134.67, 127.44, 122.25, 122.02, 121.59, 119.35, 119.18, 117.33, 116.99, 115.94, 111.07, 64.41, 64.34, 30.85.



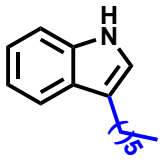
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.67 – 8.54 (m, 1H), 7.61 (ddd, *J* = 7.8, 1.3, 0.8 Hz, 1H), 7.50 (td, *J* = 7.7, 1.8 Hz, 1H), 7.41 – 7.31 (m, 1H), 7.24 – 7.01 (m, 3H), 7.01 – 6.79 (m, 2H), 6.41 (dd, *J* = 3.2, 0.9 Hz, 1H), 4.58 (t, *J* = 7.1 Hz, 2H), 3.29 (t, *J* = 7.1 Hz, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 158.27, 149.24, 136.80, 135.79, 128.59, 127.86, 123.85, 121.85, 121.44, 120.95, 119.29, 109.31, 101.12, 46.10, 38.72.



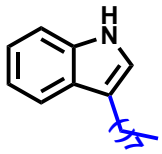
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.88 (bs, 2H), 7.64 (ddt, *J* = 7.8, 1.4, 0.8 Hz, 2H), 7.36 (ddd, *J* = 8.1, 0.8 Hz, 2H), 7.24 – 7.16 (m, 2H), 7.10 (ddd, *J* = 7.8, 7.0, 1.1 Hz, 2H), 6.96 – 6.89 (m, 2H), 4.25 (t, *J* = 1.0 Hz, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 136.48, 127.59, 122.22, 121.90, 119.24, 119.19, 115.70, 111.06, 21.22.



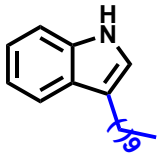
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.89 (bs, 1H), 7.62 (ddt, *J* = 7.8, 1.3, 0.6 Hz, 1H), 7.40 – 7.31 (m, 1H), 7.23 – 7.07 (m, 2H), 6.98 (dt, *J* = 2.1, 1.0 Hz, 1H), 2.80 – 2.71 (m, 2H), 1.80 – 1.66 (m, 2H), 1.49 – 1.27 (m, 4H), 0.96 – 0.83 (m, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 148.43, 136.35, 124.59, 121.82, 120.98, 119.04, 117.26, 111.01, 31.88, 29.87, 25.13, 22.61, 14.13.



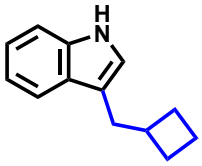
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.88 (bs, 1H), 7.68 – 7.55 (m, 1H), 7.36 (dt, *J* = 8.1, 1.0 Hz, 1H), 7.25 – 7.03 (m, 2H), 7.01 – 6.93 (m, 1H), 2.89 – 2.62 (m, 2H), 1.83 – 1.64 (m, 2H), 1.45 – 1.25 (m, 6H), 0.97 – 0.82 (m, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 136.35, 128.25, 127.66, 121.82, 120.98, 119.04, 117.26, 111.01, 31.81, 30.16, 29.37, 25.18, 22.72, 14.16.



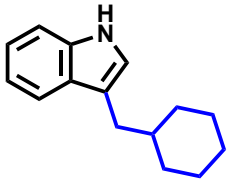
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.79 (bs, 1H), 7.54 (ddt, *J* = 7.7, 1.4, 0.7 Hz, 1H), 7.32 – 7.22 (m, 1H), 7.14 – 7.00 (m, 2H), 6.89 (dt, *J* = 2.2, 1.0 Hz, 1H), 2.67 (ddt, *J* = 8.6, 7.0, 0.8 Hz, 2H), 1.71 – 1.55 (m, 2H), 1.44 – 0.90 (m, 10H), 0.84 – 0.77 (m, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 136.37, 127.67, 121.82, 120.97, 119.04, 117.27, 111.00, 31.81, 30.16, 29.70, 29.55, 29.36, 25.18, 22.71, 14.14.



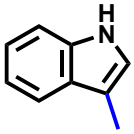
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.82 (bs, 1H), 7.67 (dq, *J* = 7.7, 0.9 Hz, 1H), 7.37 (dt, *J* = 8.1, 1.0 Hz, 1H), 7.29 – 7.11 (m, 2H), 6.97 (dd, *J* = 2.3, 1.1 Hz, 1H), 2.94 – 2.70 (m, 2H), 1.88 – 1.66 (m, 2H), 1.51 – 1.26 (m, 14H), 1.08 – 0.80 (m, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 136.39, 127.70, 121.85, 121.05, 119.08, 117.24, 111.08, 32.01, 30.26, 29.77, 29.75, 29.66, 29.45, 25.23, 22.78, 14.21.



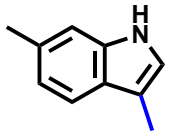
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.89 (bs, 1H), 7.61 (d, J = 7.8 Hz, 1H), 7.35 (d, J = 8.0 Hz, 1H), 7.24 – 7.04 (m, 2H), 6.94 (d, J = 2.3 Hz, 1H), 2.85 (d, J = 7.4 Hz, 2H), 2.72 (dt, J = 15.2, 7.7 Hz, 1H), 2.18 – 2.01 (m, 2H), 1.88 (dddd, J = 12.3, 10.6, 4.8, 3.3 Hz, 2H), 1.81 – 1.71 (m, 2H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 136.25, 127.82, 121.81, 121.13, 119.07, 119.03, 115.56, 110.97, 36.27, 32.31, 28.45, 18.29.



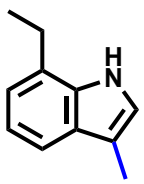
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.90 (bs, 1H), 7.61 (ddt, *J* = 7.7, 1.5, 0.7 Hz, 1H), 7.41 – 7.30 (m, 1H), 7.19 (ddd, *J* = 8.2, 7.0, 1.3 Hz, 1H), 7.15 – 7.07 (m, 1H), 6.95 (dd, *J* = 2.1, 1.0 Hz, 1H), 2.64 (dd, *J* = 6.9, 0.8 Hz, 2H), 1.82 – 1.56 (m, 7H), 1.21 – 1.15 (m, 2H), 1.05 – 0.91 (m, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 136.27, 128.08, 121.88, 121.70, 119.24, 119.01, 115.53, 110.98, 38.80, 33.57, 33.13, 26.66, 26.40.



^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.83 (bs, 1H), 7.62 (ddd, *J* = 7.6, 1.4, 0.8 Hz, 1H), 7.41 – 7.32 (m, 1H), 7.27 – 7.12 (m, 2H), 6.97 (s, 1H), 2.37 (d, *J* = 1.1 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 136.30, 128.32, 121.90, 121.60, 119.15, 118.86, 111.76, 110.97, 9.69.

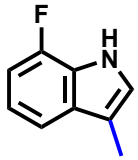


1H NMR (300 MHz, Chloroform-*d*) δ 7.69 (bs, 1H), 7.50 (d, *J* = 8.0 Hz, 1H), 7.15 – 7.13 (m, 1H), 7.00 (ddt, *J* = 7.6, 1.5, 0.6 Hz, 1H), 6.90 (dq, *J* = 2.2, 1.1 Hz, 1H), 2.51 (s, 3H), 2.36 (d, *J* = 1.1 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 136.76, 131.65, 126.22, 120.95, 120.92, 118.53, 111.56, 110.97, 21.76, 9.77.

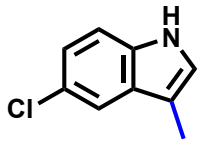


^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.81 (bs, 1H), 7.49 (ddq, *J* = 7.7, 1.2, 0.6 Hz, 1H), 6.98 (tq, *J* = 2.5, 1.1 Hz, 1H), 2.88 (qt, *J* = 7.5, 0.6 Hz, 2H), 2.38 (d, *J* = 1.1 Hz, 3H), 1.40 (t, *J* = 7.6 Hz, 3H).

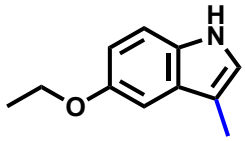
^{13}C NMR (75 MHz, Chloroform-*d*) δ 135.13, 128.07, 126.39, 121.24, 120.47, 119.49, 116.64, 112.22, 24.06, 13.91, 9.85.



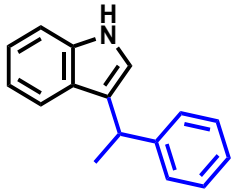
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.04 (bs, 1H), 7.34 (dq, *J* = 7.9, 0.8 Hz, 1H), 7.08 – 6.96 (m, 2H), 6.90 (dddd, *J* = 11.2, 7.8, 0.9, 0.4 Hz, 1H), 2.34 (d, *J* = 1.1 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 149.55 (d, *J* = 243.4 Hz), 132.11, 122.25, 119.33 (d, *J* = 6.1 Hz), 114.62 (d, *J* = 3.4 Hz), 112.62, 106.83, 106.62, 9.74.



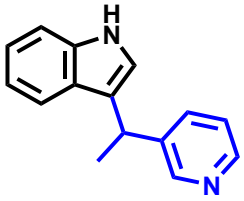
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.86 (bs, 1H), 7.57 (dt, *J* = 2.0, 0.7 Hz, 1H), 7.25 (dd, *J* = 8.6, 0.6 Hz, 1H), 7.16 (ddd, *J* = 8.6, 2.0, 0.4 Hz, 1H), 7.04 – 6.93 (m, 1H), 2.31 (d, *J* = 1.1 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 134.60, 129.46, 124.89, 123.07, 122.14, 118.44, 111.98, 111.58, 9.57.



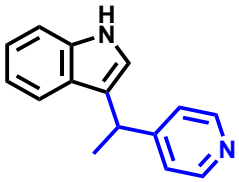
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.78 (bs, 1H), 7.23 (dd, *J* = 8.8, 0.6 Hz, 1H), 7.05 (d, *J* = 2.4 Hz, 1H), 7.00 – 6.82 (m, 2H), 4.13 (q, *J* = 7.0 Hz, 2H), 2.32 (d, *J* = 1.1 Hz, 3H), 1.47 (t, *J* = 7.0 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 153.11, 131.50, 128.68, 122.48, 112.64, 111.66, 111.39, 101.96, 64.33, 15.15, 9.76.



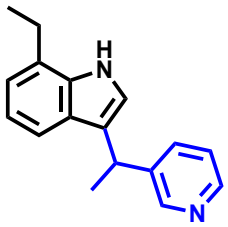
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.86 (bs, 1H), 7.63 (ddt, *J* = 7.7, 1.6, 0.8 Hz, 1H), 7.38 – 7.30 (m, 2H), 7.24 – 7.09 (m, 5H), 6.97 – 6.95 (m, 1H), 6.53 (ddd, *J* = 3.1, 2.1, 1.0 Hz, 1H), 4.34 (qd, *J* = 7.2, 1.0 Hz, 1H), 1.68 (d, *J* = 7.1 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 146.85, 136.65, 128.35, 127.49, 125.96, 124.17, 122.00, 121.12, 120.77, 119.75, 119.24, 111.06, 102.65, 36.98, 22.45.



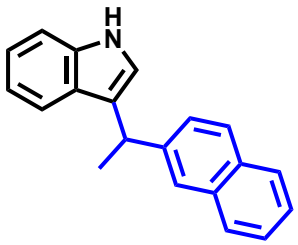
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.62 (s, 1H), 8.44 (d, *J* = 4.7 Hz, 1H), 8.24 (s, 1H), 7.56 (dt, *J* = 7.9, 1.8 Hz, 1H), 7.42 – 7.28 (m, 2H), 7.24 – 7.11 (m, 2H), 7.09 – 6.93 (m, 2H), 4.41 (q, *J* = 7.3 Hz, 1H), 1.73 (d, *J* = 7.2 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 148.90, 147.07, 136.70, 135.26, 126.47, 123.55, 122.23, 121.27, 119.96, 119.44, 119.36, 111.22, 34.55, 22.11.



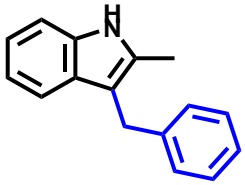
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.56 – 8.40 (m, 2H), 8.17 (bs, 1H), 7.37 (dt, *J* = 8.2, 0.9 Hz, 1H), 7.29 (ddt, *J* = 8.0, 1.5, 0.8 Hz, 1H), 7.25 – 7.12 (m, 3H), 7.09 – 6.97 (m, 2H), 4.36 (q, *J* = 7.2 Hz, 1H), 1.71 (d, *J* = 7.2 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 149.37, 123.01, 122.32, 121.36, 119.51, 119.31, 111.23, 36.45, 21.56.



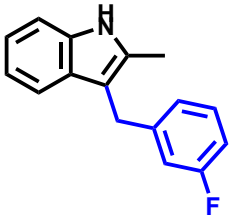
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.62 (d, *J* = 2.3 Hz, 1H), 8.44 (dd, *J* = 4.9, 1.7 Hz, 1H), 8.11 (bs, 1H), 7.61 (dddd, *J* = 7.9, 2.2, 1.6, 0.6 Hz, 1H), 7.26 – 7.13 (m, 2H), 7.09 – 6.91 (m, 3H), 4.42 (q, *J* = 7.2 Hz, 1H), 2.86 (q, *J* = 7.6 Hz, 2H), 1.73 (d, *J* = 7.2 Hz, 3H), 1.36 (t, *J* = 7.6 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 156.86, 148.29, 146.40, 138.47, 135.88, 126.61, 123.70, 120.86, 120.83, 120.28, 119.83, 117.04, 34.64, 23.99, 22.07, 13.79.



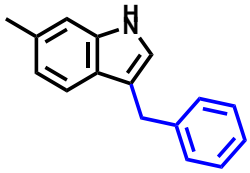
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.98 (bs, 1H), 7.82 – 7.71 (m, 4H), 7.47 – 7.32 (m, 5H), 7.15 (ddd, *J* = 8.2, 7.0, 1.2 Hz, 1H), 7.07 – 6.93 (m, 2H), 4.55 (q, *J* = 7.1 Hz, 1H), 1.80 (d, *J* = 7.1 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 144.32, 136.68, 133.65, 132.22, 127.91, 127.72, 127.58, 126.95, 126.56, 125.76, 125.30, 125.16, 122.01, 121.38, 121.22, 119.73, 119.27, 111.01, 37.09, 22.30.



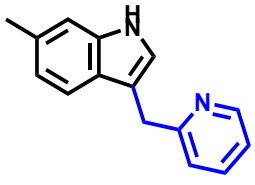
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.80 (bs, 1H), 7.43 (ddt, *J* = 7.7, 1.5, 0.8 Hz, 1H), 7.33 – 7.25 (m, 5H), 7.21 – 7.11 (m, 2H), 7.10 – 7.05 (m, 1H), 4.11 (s, 2H), 2.41 (s, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 141.68, 135.31, 131.66, 128.93, 128.30, 127.18, 125.68, 121.02, 119.27, 118.40, 110.58, 110.15, 30.12, 11.83.



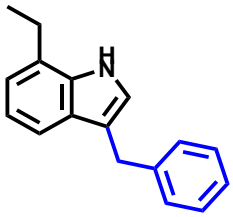
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.64 (bs, 1H), 7.20 (dd, *J* = 7.8, 1.0 Hz, 1H), 7.12 (dt, *J* = 8.0, 0.9 Hz, 1H), 7.03 (td, *J* = 7.9, 6.0 Hz, 1H), 6.95 (ddd, *J* = 8.2, 7.1, 1.3 Hz, 1H), 6.90 – 6.83 (m, 2H), 6.74 – 6.64 (m, 2H), 3.90 (s, 2H), 2.22 (s, 3H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 163.03 (d, *J* = 245.1 Hz), 144.38 (d, *J* = 6.9 Hz), 135.31, 131.80, 129.62 (d, *J* = 8.2 Hz), 128.73, 123.89 (d, *J* = 2.7 Hz), 121.17, 119.40, 118.22, 115.08 (d, *J* = 21.3 Hz), 112.58 (d, *J* = 21.1 Hz), 110.22, 109.89, 29.86 (d, *J* = 1.8 Hz), 11.79.
^{19}F NMR (282 MHz, Chloroform-*d*) δ -113.88 (ddd, *J* = 10.1, 8.8, 6.0 Hz).



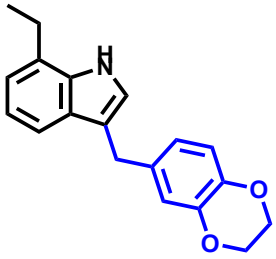
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.72 (bs, 1H), 7.38 (d, *J* = 8.1 Hz, 1H), 7.30 – 7.15 (m, 5H), 7.11 (dt, *J* = 1.5, 0.8 Hz, 1H), 6.91 (dd, *J* = 8.2, 1.4 Hz, 1H), 6.80 (dt, *J* = 2.1, 1.0 Hz, 1H), 4.09 (d, *J* = 1.0 Hz, 2H), 2.45 (s, 3H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 141.38, 136.96, 131.87, 128.71, 128.35, 125.87, 125.40, 121.75, 121.16, 118.87, 115.64, 111.09, 31.69, 21.76.



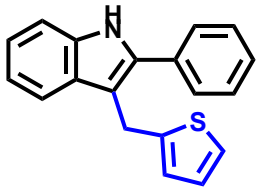
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.56 (ddd, *J* = 4.9, 1.9, 0.9 Hz, 1H), 8.08 (bs, 1H), 7.54 (td, *J* = 7.7, 1.9 Hz, 1H), 7.43 – 7.33 (m, 1H), 7.22 – 7.05 (m, 3H), 7.05 – 6.97 (m, 1H), 6.91 (ddd, *J* = 8.1, 1.5, 0.6 Hz, 1H), 4.30 (d, *J* = 0.8 Hz, 2H), 2.44 (t, *J* = 0.7 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 161.27, 148.79, 136.95, 136.74, 131.91, 125.28, 122.88, 122.12, 121.22, 121.14, 118.82, 113.52, 111.13, 34.44, 21.70.



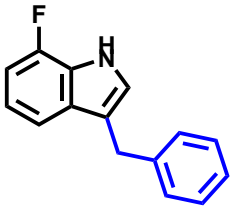
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.88 (bs, 1H), 7.55 – 7.12 (m, 6H), 7.09 – 6.99 (m, 2H), 6.89 (dt, *J* = 2.2, 1.0 Hz, 1H), 4.10 (d, *J* = 1.0 Hz, 2H), 2.84 (qd, *J* = 7.6, 0.8 Hz, 2H), 1.36 (td, *J* = 7.6, 4.3 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 141.30, 135.31, 128.73, 128.33, 127.23, 126.44, 125.86, 121.94, 120.60, 119.69, 116.94, 116.35, 31.74, 24.02, 13.83.



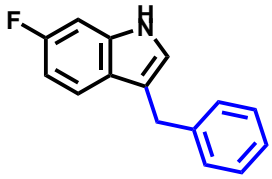
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.91 (bs, 1H), 7.45 (dd, *J* = 7.2, 2.0 Hz, 1H), 7.19 – 6.99 (m, 2H), 6.99 – 6.72 (m, 4H), 4.24 (s, 4H), 4.05 (q, *J* = 1.0 Hz, 2H), 2.87 (q, *J* = 7.6 Hz, 2H), 1.40 (td, *J* = 7.6, 1.1 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 143.33, 141.72, 135.35, 134.83, 127.23, 126.49, 121.94, 121.66, 120.58, 119.70, 117.40, 117.02, 116.97, 116.40, 64.44, 64.37, 31.02, 24.04, 13.91.



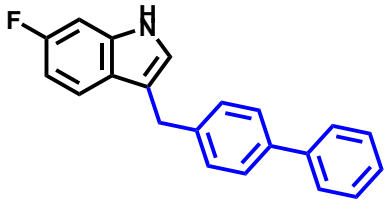
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.22 – 8.02 (m, 1H), 7.60 – 7.52 (m, 3H), 7.50 – 7.37 (m, 4H), 7.22 (ddd, *J* = 8.1, 7.1, 1.2 Hz, 1H), 7.15 – 7.08 (m, 2H), 6.91 (dd, *J* = 5.1, 3.4 Hz, 1H), 6.83 (dq, *J* = 3.5, 1.2 Hz, 1H), 4.40 (d, *J* = 1.2 Hz, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 145.37, 135.93, 132.70, 128.97, 127.96, 127.94, 126.79, 124.39, 123.30, 122.52, 119.92, 119.46, 111.22, 110.82, 91.81, 25.34.



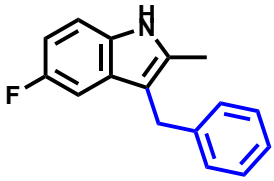
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.09 (bs, 1H), 7.35 – 7.27 (m, 5H), 7.26 – 7.20 (m, 1H), 7.01 (tdd, *J* = 7.9, 4.8, 0.9 Hz, 1H), 6.97 – 6.89 (m, 2H), 4.13 (s, 2H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 149.59 (d, *J* = 243.7 Hz), 140.87, 131.22 (d, *J* = 5.1 Hz), 128.69, 128.45, 126.07, 124.78 (d, *J* = 13.1 Hz), 123.04, 119.66 (d, *J* = 6.1 Hz), 116.71 (d, *J* = 2.3 Hz), 114.99 (d, *J* = 3.5 Hz), 106.93 (d, *J* = 16.1 Hz), 31.63.
^{19}F NMR (376 MHz, Chloroform-*d*) δ -135.43 – -135.51 (m).



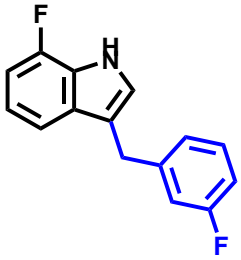
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.89 (bs, 1H), 7.38 (ddt, *J* = 8.6, 5.3, 0.6 Hz, 1H), 7.32 – 7.14 (m, 5H), 7.01 (ddd, *J* = 9.7, 2.3, 0.5 Hz, 1H), 6.90 – 6.75 (m, 2H), 4.08 (d, *J* = 1.0 Hz, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 160.06 (d, *J* = 237.5 Hz), 140.92, 136.29, 128.65, 128.40, 126.02, 122.56 (d, *J* = 3.6 Hz), 119.90 (d, *J* = 10.2 Hz), 115.96, 108.14 (d, *J* = 24.5 Hz), 97.38 (d, *J* = 26.0 Hz), 31.59.
^{19}F NMR (282 MHz, Chloroform-*d*) δ -121.26, -121.29 (d, *J* = 4.1 Hz), -121.33 (d, *J* = 4.1 Hz), -121.35, -121.38.



^{1}H NMR (300 MHz, DMSO-d_6) δ 10.96 (bs, 1H), 7.65 – 7.53 (m, 4H), 7.47 – 7.40 (m, 3H), 7.39 – 7.29 (m, 3H), 7.24 – 7.19 (m, 1H), 7.13 (ddd, *J* = 10.2, 2.4, 0.5 Hz, 1H), 6.81 (ddd, *J* = 9.8, 8.7, 2.4 Hz, 1H), 4.07 (s, 2H).
13C NMR (75 MHz, DMSO-d_6) δ 159.32 (d, J = 233.8 Hz), 141.39, 140.56, 138.11, 136.80, 136.63, 129.38 (d, J = 7.4 Hz), 127.60, 126.98 (d, J = 4.5 Hz), 124.33, 124.26 (d, J = 3.6 Hz), 119.98 (d, J = 10.2 Hz), 114.44, 107.41, 107.09, 97.82 (d, J = 25.4 Hz), 31.00.

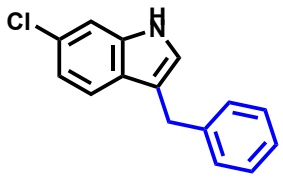


^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.77 (bs, 1H), 7.27 – 7.14 (m, 6H), 7.02 (dd, *J* = 9.8, 2.5 Hz, 1H), 6.83 (ddd, *J* = 9.4, 8.7, 2.5 Hz, 1H), 4.02 (s, 2H), 2.39 (s, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ ^{13}C NMR (75 MHz, $CDCl_3$) δ 157.81 (d, *J* = 233.6 Hz), 141.22, 133.66, 131.73, 128.38, 128.21, 125.84, 110.59 (d, *J* = 9.7 Hz), 109.19, 108.84, 103.47 (d, *J* = 23.5 Hz), 30.13, 11.95.
^{19}F NMR (282 MHz, Chloroform-*d*) δ -125.02 (td, *J* = 9.5, 4.4 Hz).

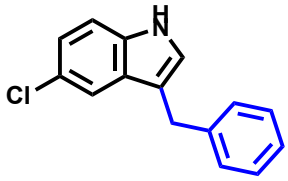


^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.15 (bs, 1H), 7.29 – 7.21 (m, 2H), 7.07 (ddd, *J* = 7.6, 1.7, 0.9 Hz, 1H), 7.04 – 6.85 (m, 5H), 4.11 (t, *J* = 0.7 Hz, 2H).

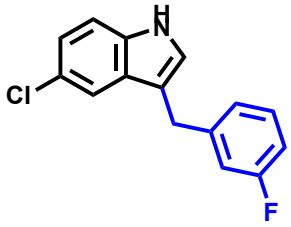
^{13}C NMR (101 MHz, Chloroform-*d*) δ 163.02 (d, *J* = 245.2 Hz), 149.59 (d, *J* = 243.7 Hz), 143.51 (d, *J* = 7.1 Hz), 131.02 (d, *J* = 5.1 Hz), 129.78 (d, *J* = 8.4 Hz), 124.80 (d, *J* = 13.0 Hz), 124.25 (d, *J* = 2.8 Hz), 123.11, 119.79 (d, *J* = 6.1 Hz), 115.84 (d, *J* = 2.2 Hz), 115.60, 115.39, 114.85 (d, *J* = 3.5 Hz), 112.96 (d, *J* = 21.1 Hz), 107.05 (d, *J* = 16.1 Hz), 31.35.
^{19}F NMR (376 MHz, Chloroform-*d*) δ -113.56 – -113.74 (m), -135.41 (dt, *J* = 11.1, 4.1 Hz).



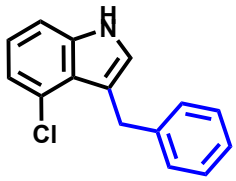
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.95 (bs, 1H), 7.39 (dt, *J* = 8.4, 0.6 Hz, 1H), 7.35 (dd, *J* = 1.8, 0.6 Hz, 1H), 7.30 – 7.22 (m, 5H), 7.03 (dd, *J* = 8.4, 1.8 Hz, 1H), 6.92 (dt, *J* = 2.2, 1.0 Hz, 1H), 4.08 (dt, *J* = 1.0, 0.6 Hz, 2H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 140.82, 136.80, 128.62, 128.41, 128.03, 126.09, 126.04, 122.96, 120.14, 120.07, 116.02, 111.01, 31.49.



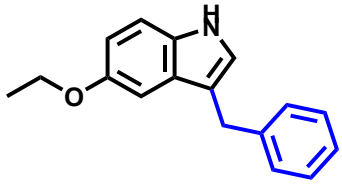
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.93 (bs, 1H), 7.54 (dq, *J* = 7.9, 0.9 Hz, 1H), 7.37 (dt, *J* = 8.2, 0.9 Hz, 1H), 7.31 – 7.28 (m, 3H), 7.23 – 7.17 (m, 2H), 7.09 (ddd, *J* = 8.0, 7.0, 1.0 Hz, 1H), 6.92 (dt, *J* = 2.3, 1.0 Hz, 1H), 4.13 (d, *J* = 1.0 Hz, 2H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 141.22, 136.46, 128.71, 128.34, 127.48, 125.89, 122.33, 122.07, 119.38, 119.18, 115.87, 111.08, 31.61.



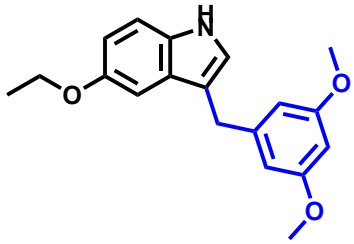
^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.00 (bs, 1H), 7.43 (dt, *J* = 2.0, 0.7 Hz, 1H), 7.28 – 7.21 (m, 2H), 7.13 (ddd, *J* = 8.6, 2.0, 0.4 Hz, 1H), 7.03 (ddq, *J* = 7.6, 1.6, 0.8 Hz, 1H), 6.98 – 6.95 (m, 1H), 6.95 – 6.84 (m, 2H), 4.05 (p, *J* = 0.7 Hz, 2H).
^{13}C NMR (75 MHz, $CDCl_3$) δ 163.03 (d, *J* = 245.7 Hz), 143.41, 134.80, 129.81 (d, *J* = 8.2 Hz), 128.43, 125.30, 124.20 (d, *J* = 2.8 Hz), 123.83, 122.55, 118.54, 115.56, 115.28, 114.80, 113.13, 112.86, 112.16, 31.14 (d, *J* = 1.7 Hz).
^{19}F NMR (282 MHz, Chloroform-*d*) δ -113.61 (d, *J* = 4.0 Hz), -113.62 – -113.66 (m), -113.67.



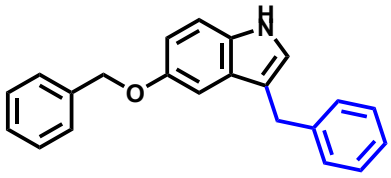
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.95 (bs, 1H), 7.53 (ddt, *J* = 7.9, 1.3, 0.7 Hz, 1H), 7.39 – 7.34 (m, 1H), 7.32 – 7.26 (m, 3H), 7.23 – 7.17 (m, 2H), 7.12 – 7.05 (m, 1H), 6.92 (dt, *J* = 2.2, 0.9 Hz, 1H), 4.45 – 3.92 (m, 2H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 141.21, 136.47, 128.70, 128.33, 125.88, 122.32, 122.06, 119.37, 119.17, 115.88, 111.06, 31.61.



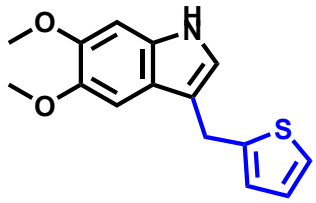
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.85 (bs, 1H), 7.42 – 7.15 (m, 6H), 7.03 (dt, *J* = 2.5, 0.6 Hz, 1H), 6.95 – 6.86 (m, 2H), 4.15 – 4.13 (m, 2H), 4.09 (q, *J* = 7.0 Hz, 2H), 1.47 (t, *J* = 7.0 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 153.16, 141.26, 131.70, 128.75, 128.41, 127.95, 125.94, 123.27, 115.44, 112.73, 111.83, 102.29, 64.28, 31.67, 15.11.



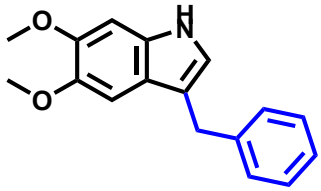
^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.92 (bs, 1H), 7.24 (dd, *J* = 8.7, 0.6 Hz, 1H), 7.03 (dd, *J* = 2.5, 0.6 Hz, 1H), 6.97 – 6.81 (m, 2H), 6.49 (dt, J = 2.3, 0.6 Hz, 2H), 6.34 (t, J = 2.3 Hz, 1H), 4.13 – 4.03 (m, 4H), 3.78 (s, 6H), 1.45 (t, *J* = 7.0 Hz, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 160.78, 153.16, 143.72, 131.65, 127.92, 123.25, 115.02, 112.71, 111.76, 106.91, 106.39, 102.19, 97.88, 64.26, 55.28, 31.90, 15.08.



^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.70 (bs, 1H), 7.41 – 7.32 (m, 2H), 7.32 – 7.25 (m, 2H), 7.25 – 7.15 (m, 5H), 7.14 – 7.09 (m, 2H), 6.96 (dd, *J* = 2.5, 0.6 Hz, 1H), 6.88 – 6.79 (m, 1H), 6.78 – 6.73 (m, 1H), 4.96 (s, 2H), 3.98 (d, *J* = 0.9 Hz, 2H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 153.14, 141.20, 137.72, 131.83, 128.73, 128.56, 128.41, 127.89, 127.83, 127.71, 125.94, 123.30, 115.56, 112.91, 111.84, 102.78, 71.00, 31.67.



^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.94 (bs, 1H), 7.13 (dd, *J* = 5.1, 1.2 Hz, 1H), 6.98 (s, 1H), 6.96 – 6.86 (m, 3H), 6.83 (s, 1H), 4.28 (d, *J* = 1.0 Hz, 2H), 3.89 (s, 3H), 3.88 (s, 3H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 147.13, 144.88, 144.83, 130.69, 126.73, 124.68, 123.42, 120.91, 119.93, 114.97, 100.83, 94.70, 56.39, 56.18, 26.11.



^{1}H NMR (300 MHz, Chloroform-*d*) δ 7.81 (bs, 1H), 7.29 – 7.08 (m, 5H), 6.86 (s, 1H), 6.76 (s, 1H), 6.71 (dt, *J* = 2.1, 1.0 Hz, 1H), 4.02 (d, *J* = 0.9 Hz, 2H), 3.81 (s, 3H), 3.80 (s, 3H).
^{13}C NMR (75 MHz, Chloroform-*d*) δ 147.07, 144.81, 141.27, 130.75, 128.71, 128.37, 125.92, 121.02, 120.30, 115.52, 100.97, 94.66, 56.38, 56.20, 31.76.

S7 NMR spectra

210408.301.10.fid
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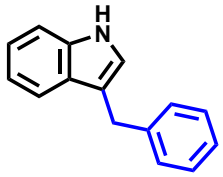

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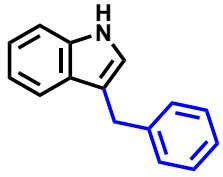

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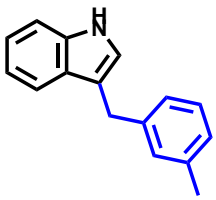

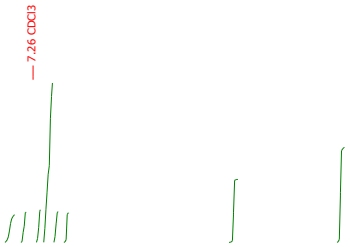

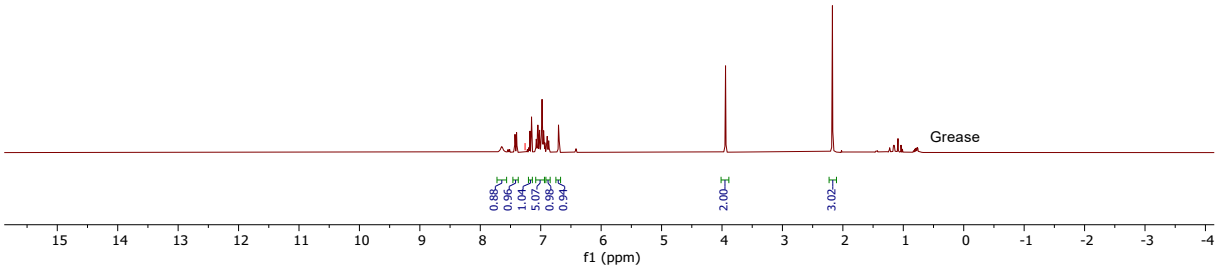

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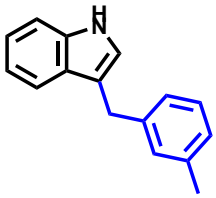

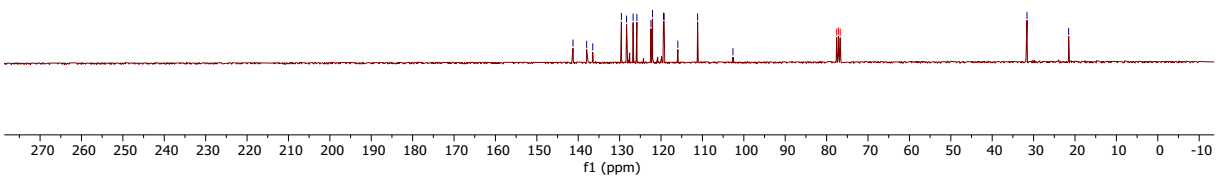

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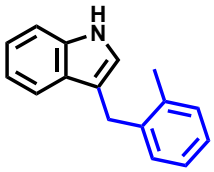

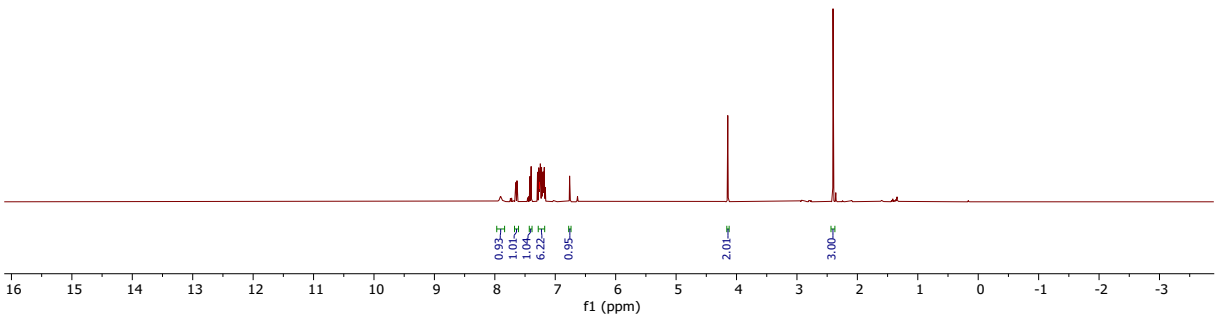

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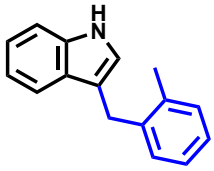

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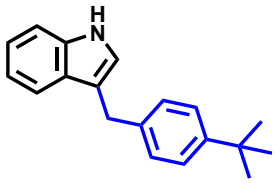

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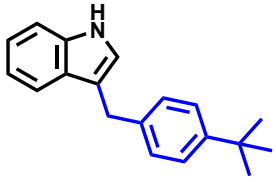

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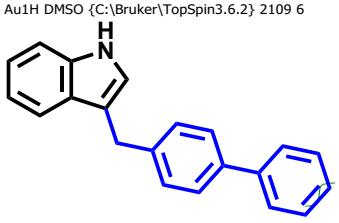

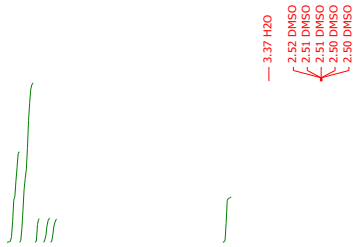

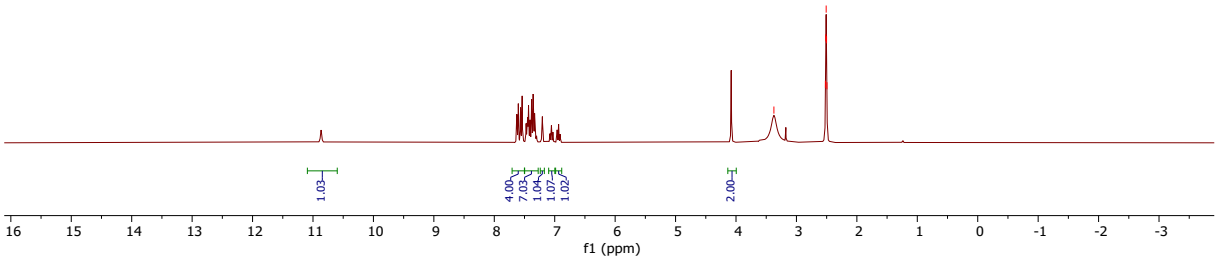

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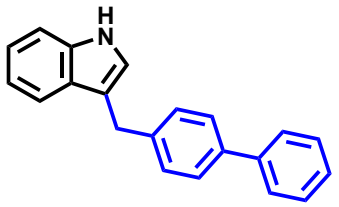
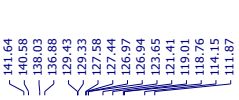
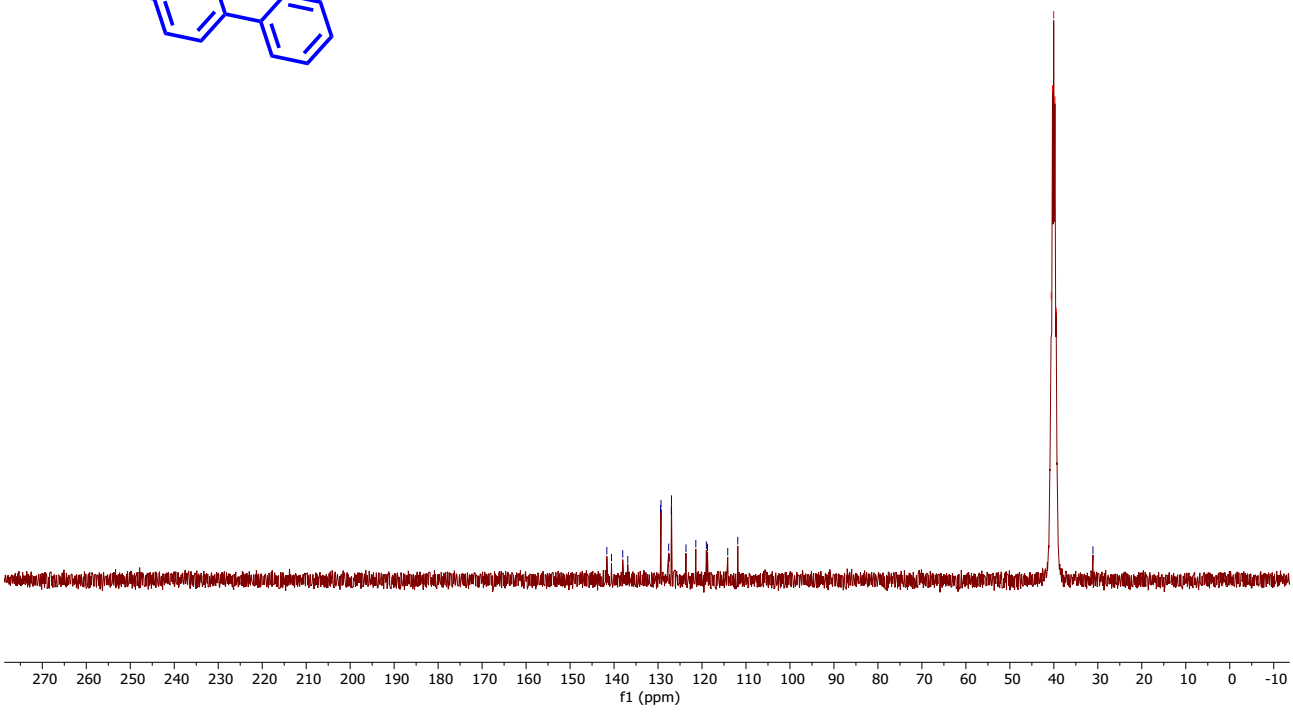
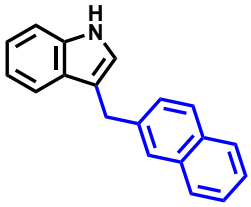
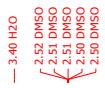


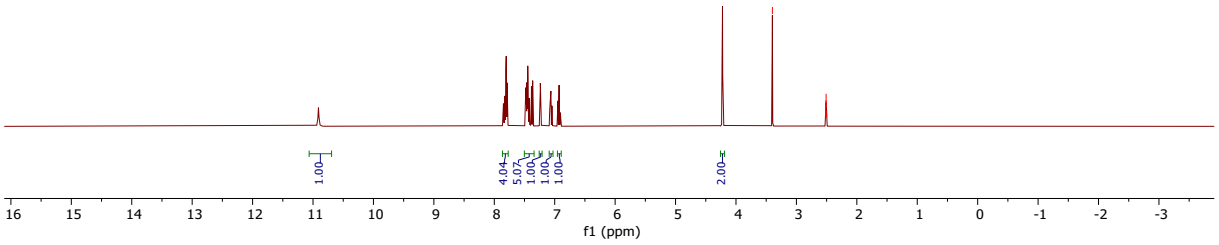




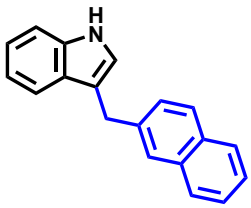
210525.434.10.fid
Zhou/ Bei 21-42
Au1H DMSO {C:\Bruker\TopSpin3.5pl6} 2105 34

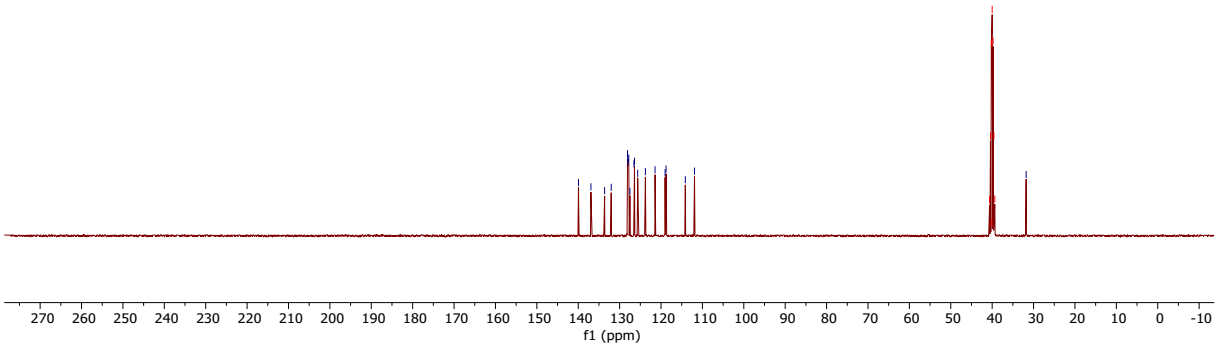




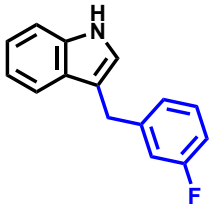


210525.434.11.fid
Zhou/ Bei 21-42
Au13C DMSO {C:\Bruker\TopSpin3.5pl6} 2105 34

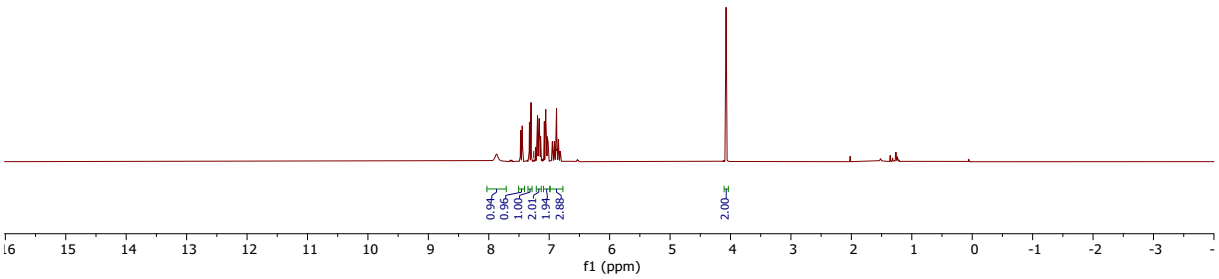




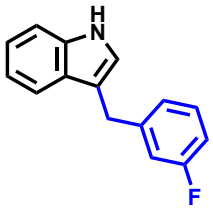
210531.317.10.fid
Bei Zhou Bei 21-47
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2105 17



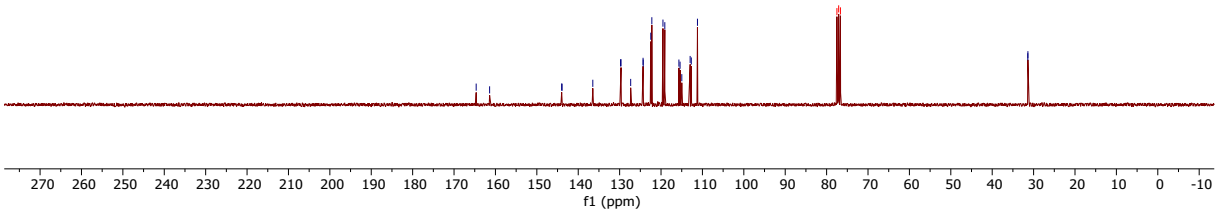
7.26 CDCl3



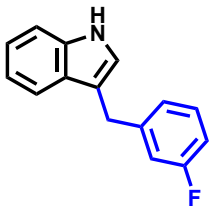
210531.317.11.fid
Bei Zhou Bei 21-47
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2105 17



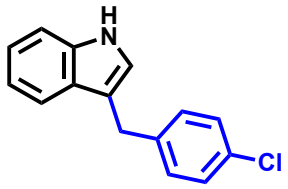
164.65
161.41
144.00
143.91
136.48
129.77
129.66
127.33
124.34
124.30
122.47
122.22
119.53
119.09
115.68
115.40
114.98
112.97
112.69
111.20
77.51 CDCl3
77.09 CDCl3
76.66 CDCl3
31.40
31.38



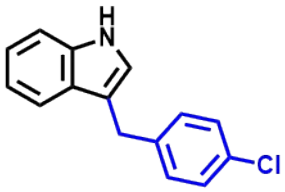
210608.457.10.fid
Bei Zhou Bei 21-47
F19 CDCl3 {C:\Bruker\TopSpin3.5pl6} 2106 57



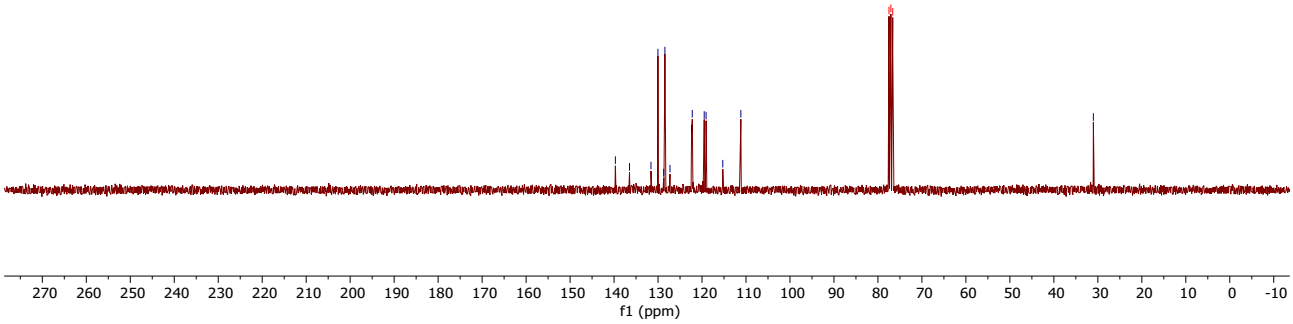
210316.330.10.fid
Bei Zhou Bei 21-28-3
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2103 30



210316.330.11.fid
Bei Zhou Bei 21-28-3
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2103 30

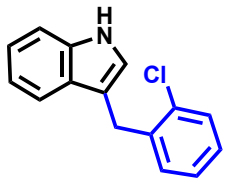


139.70
136.48
131.61
130.03
128.72
128.44
127.28
122.38
122.22
119.50
119.07
115.28
111.17
77.48 CDCl3
77.06 CDCl3
76.64 CDCl3
31.02

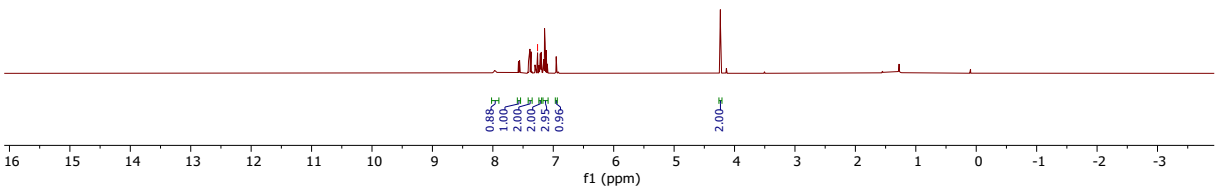


270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

210427.439.10.fid
Bei Zhou Bei 21-49-1
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2104 39



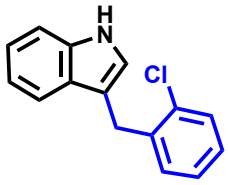
7.26 CDCl3

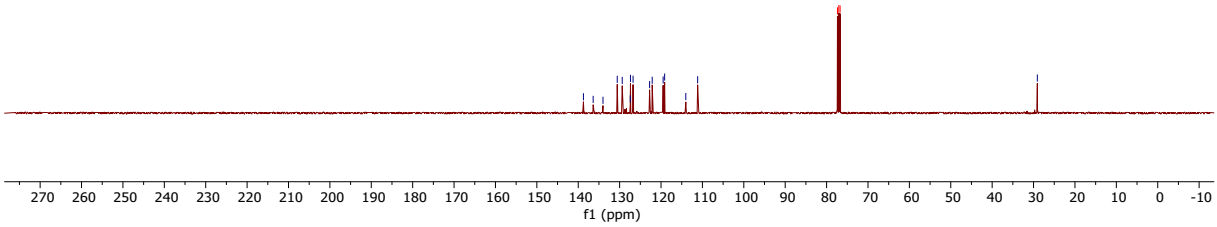


0.88
1.00
2.00
2.00
2.95
0.96
2.00

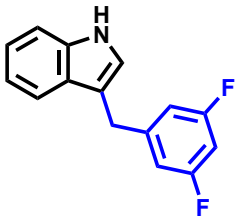
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2 -3
f1 (ppm)

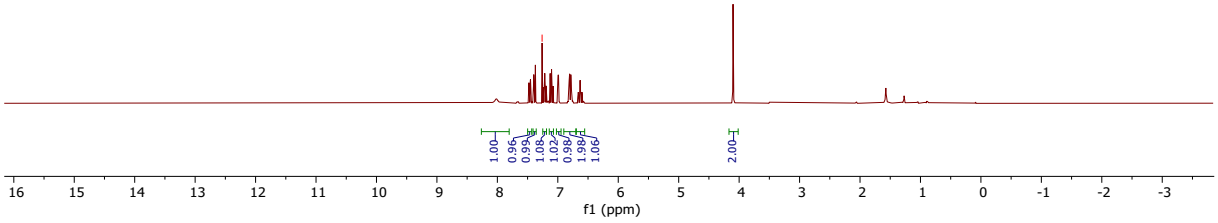
210427.439.11.fid
Bei Zhou Bei 21-49-1
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2104 39



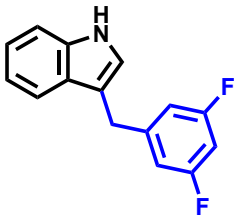


210705.f314.10.fid
Bei Zhou Bei 21-96-1
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 14

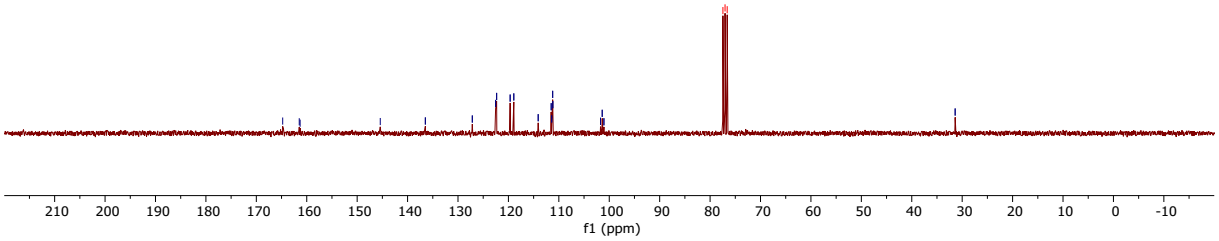




210705.f314.11.fid
Bei Zhou Bei 21-96-1
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 14

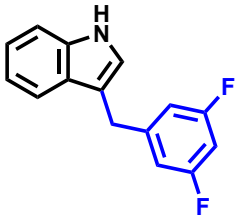


164.77
161.49
161.32
145.42
136.48
136.48
127.16
127.16
122.54
122.54
122.34
122.34
119.66
119.66
118.93
118.93
114.09
114.09
111.52
111.52
111.42
111.42
111.22
111.22
111.19
111.19
101.73
101.73
101.40
101.40
101.06
101.06
77.46 CDCl3
77.03 CDCl3
76.61 CDCl3
31.39
31.39

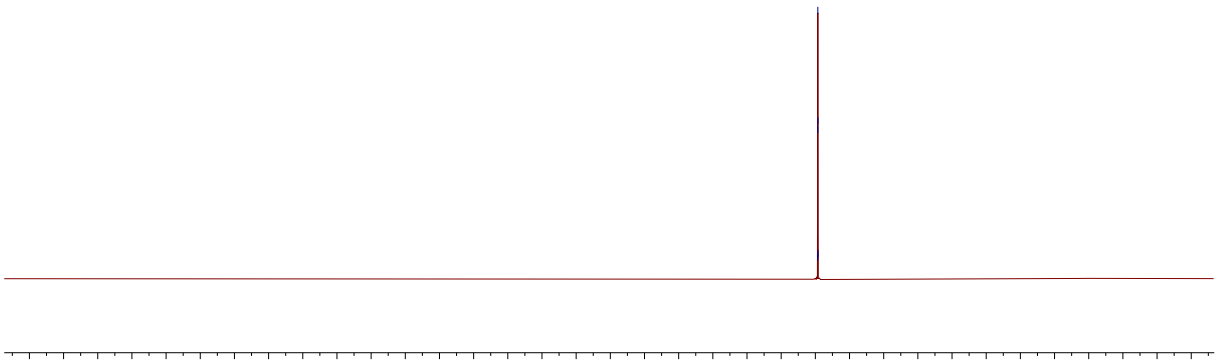


210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

211004.318.10.fid
Bei Zhou Bei 21-96
Au19F CDCl3 {C:\Bruker\TopSpin3.6.2} 2110 18

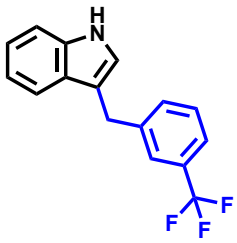


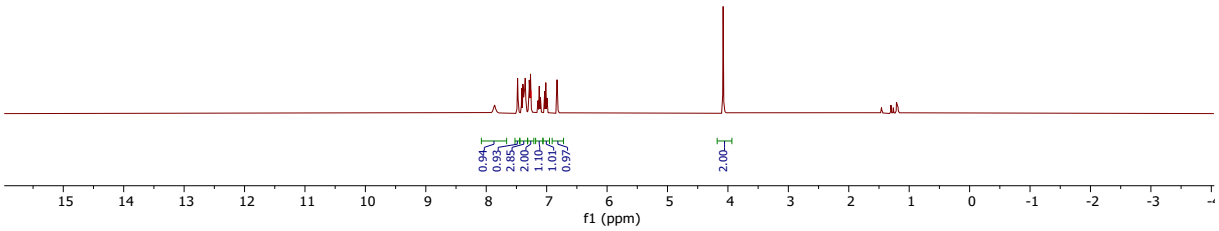
-110.68
-110.70
-110.73
-110.76
-110.77



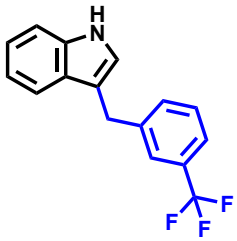
120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -220
f1 (ppm)

210519.456.10.fid
Zhou/ Bei-21-51
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 56

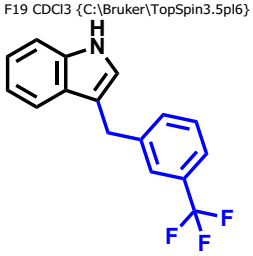




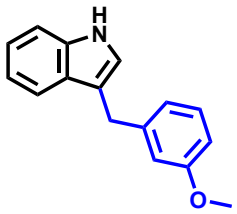
210519.456.11.fid
Zhou/ Bei-21-51
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 56

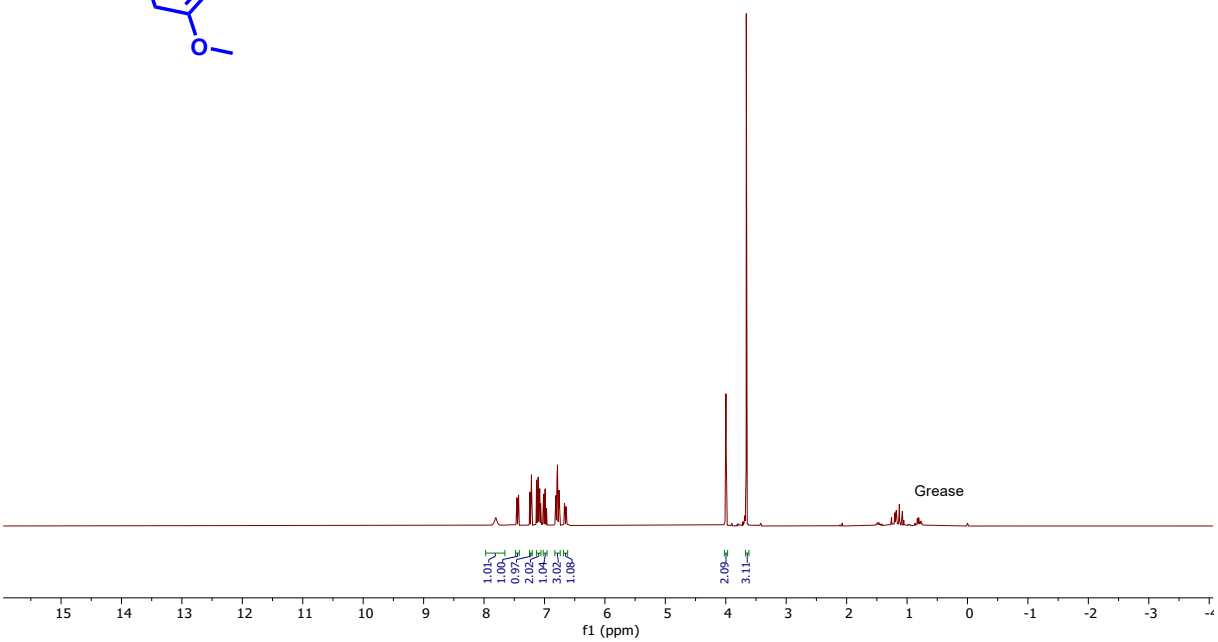


210525.427.10.fid
Zhou/ Bei 21-51
F19 CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 27



210316.334.10.fid
Bei Zhou Bei 21-32
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2103 34





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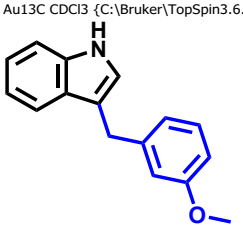
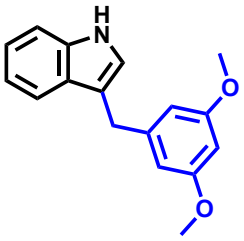
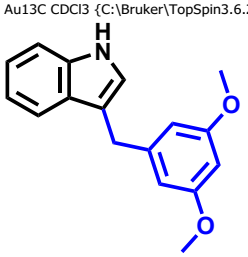
Bei Zhou Bei 21-32
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2103 34



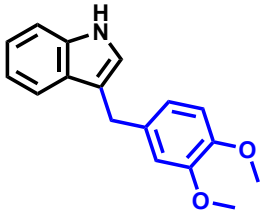
210719.302.10.fid
Bei Zhou 21-97
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 2

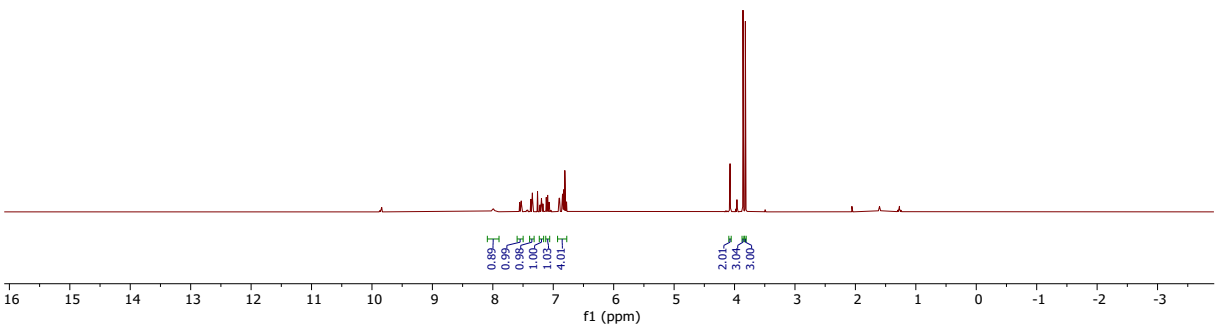


210719.302.11.fid
Bei Zhou 21-97
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 2



210701.312.10.fid
Bei Zhou Bei 21-92
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 12





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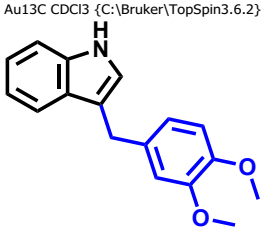
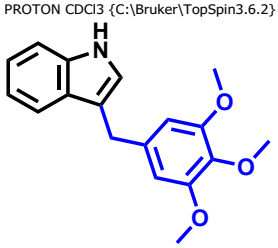
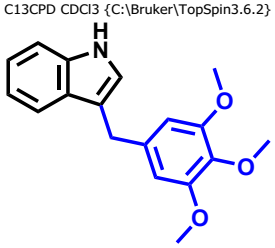
Bei Zhou Bei 21-92
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 12



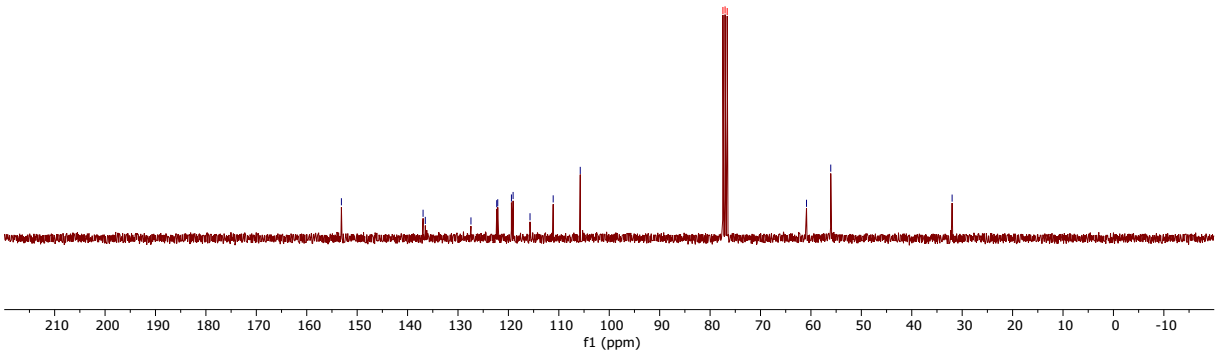
210809.f328.10.fid
Bei Zhou Bei 21-99-1
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 28



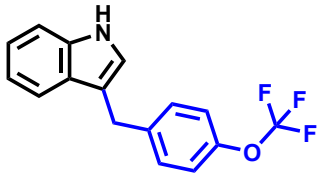
210809.f328.11.fid
Bei Zhou Bei 21-99-1
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 28



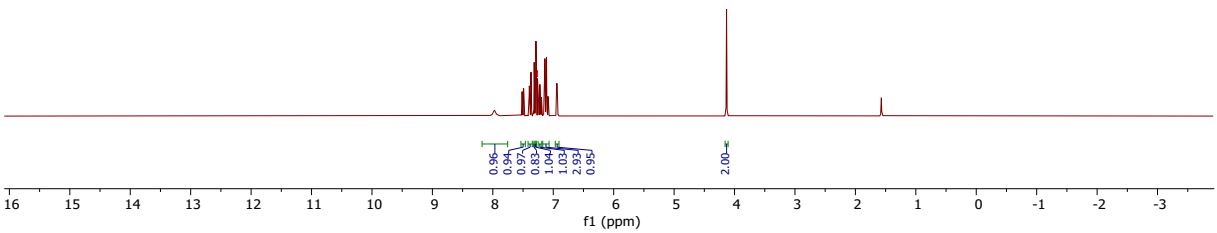
153.12
136.93
136.48
127.43
122.32
122.11
119.40
119.07
115.72
111.12
105.75
77.45 CDCl3
77.03 CDCl3
76.61 CDCl3
60.88
56.07
32.00



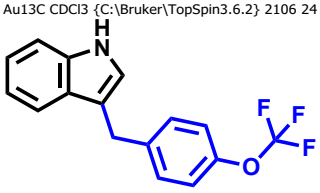
210628.324.10.fid
Bei Zhou Bei 21-94-3
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 24



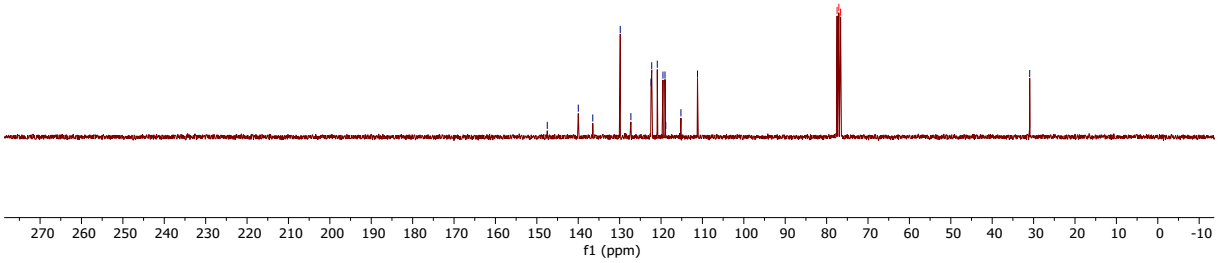
7.26 CDCl3



210628.324.11.fid
Bei Zhou Bei 21-94-3
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 24



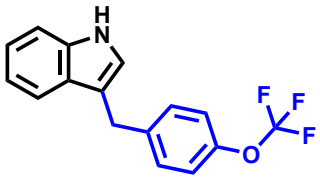
147.48
139.99
136.49
129.85
127.28
122.42
122.25
120.90
119.53
119.04
118.85
115.19
111.19
77.47 CDCl3
77.05 CDCl3
76.62 CDCl3
30.94

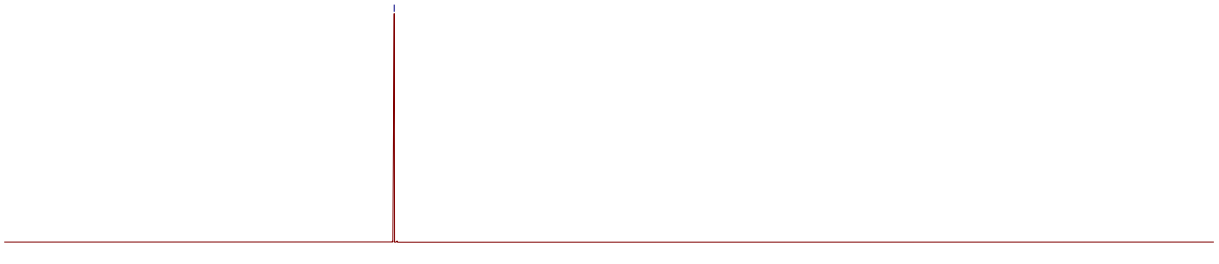


270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

210630.f351.10.fid
Bei Zhou Bei 21-94
F19 CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 51

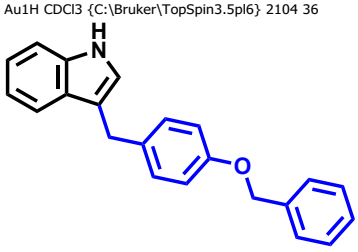
-57.87

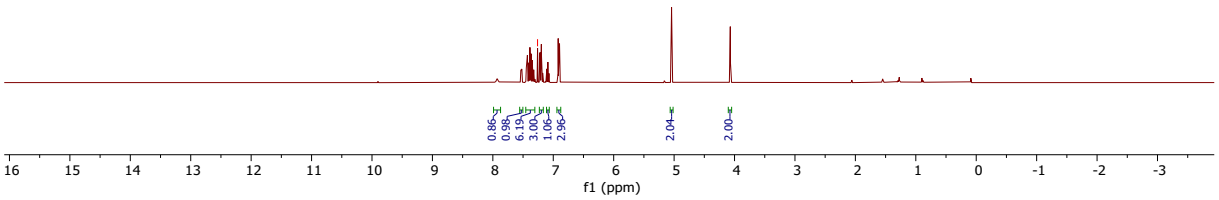




10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

210427.436.10.fid
Bei Zhou Bei 21-39
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2104 36





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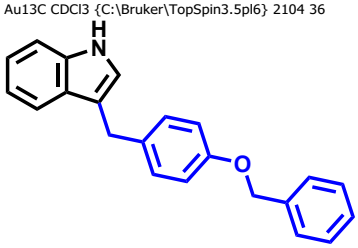
Bei Zhou Bei 21-39
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2104 36



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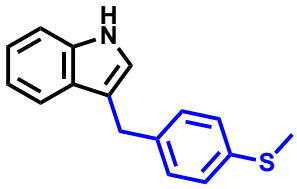
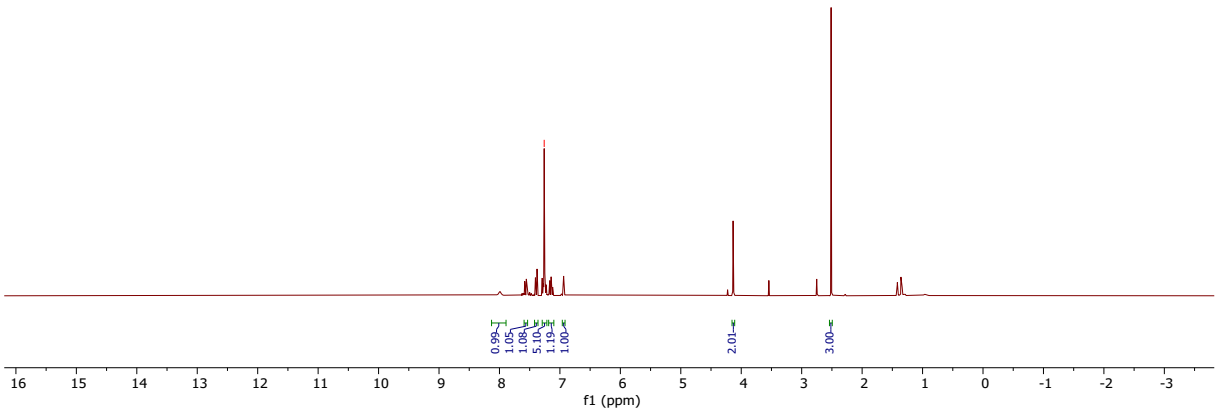
Bei Zhou Bei 21-52
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2103 34





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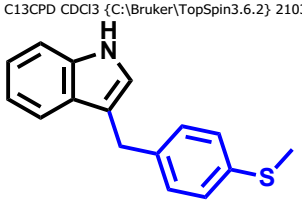
Bei Zhou Bei 21-52
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2103 34



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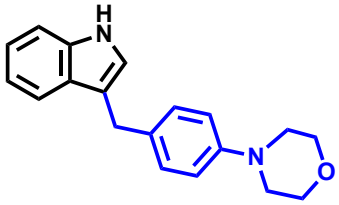
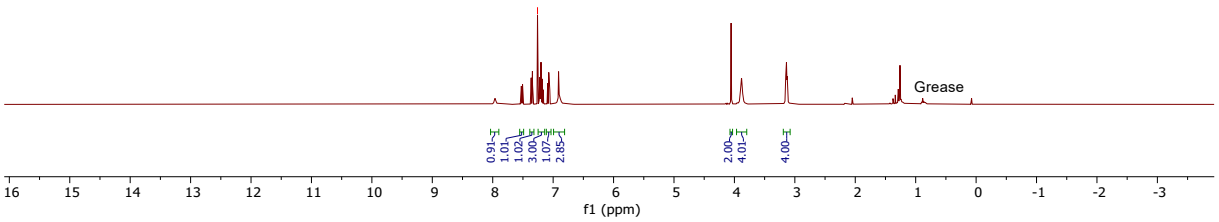
Zhou/ Bei 21-41
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 33





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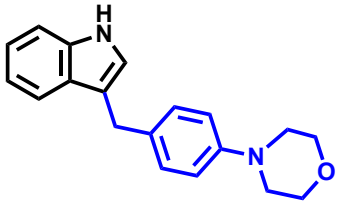
Bei Zhou Bei 21-41
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2110 25



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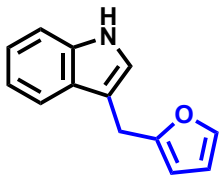
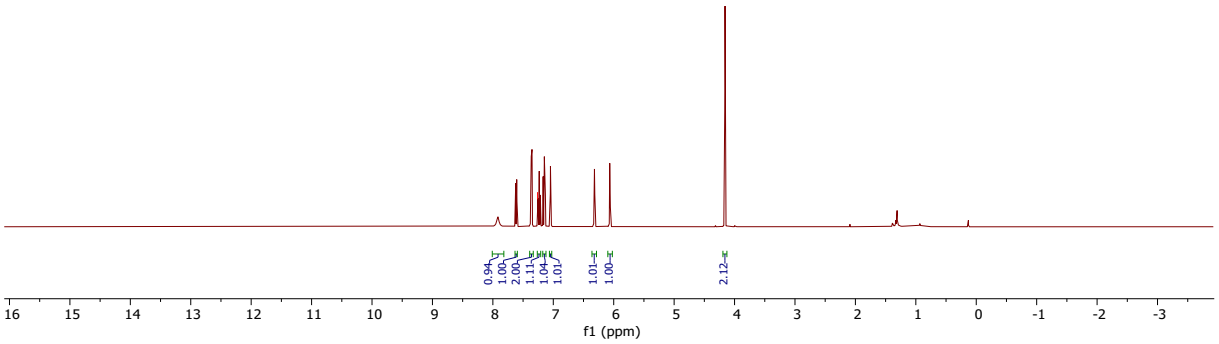
Bei Zhou Bei 21-31
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2104 35





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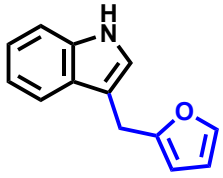
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2104 35



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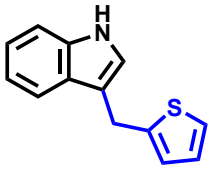
Bei Zhou Bei 21-40-2
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 14



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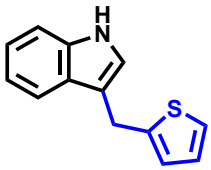
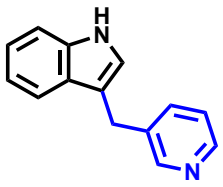
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 14



210727.f348.10.fid
Bei Zhou Bei 21-38-1
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 48



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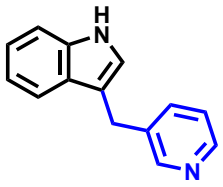
Bei Zhou Bei 21-38-1
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 48



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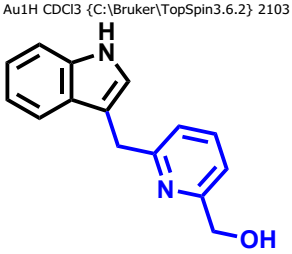
Bei Zhou / Bei 21-36
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2103 15



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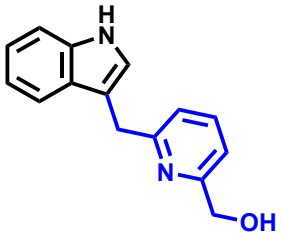
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2103 15



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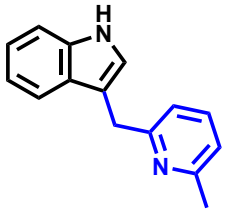
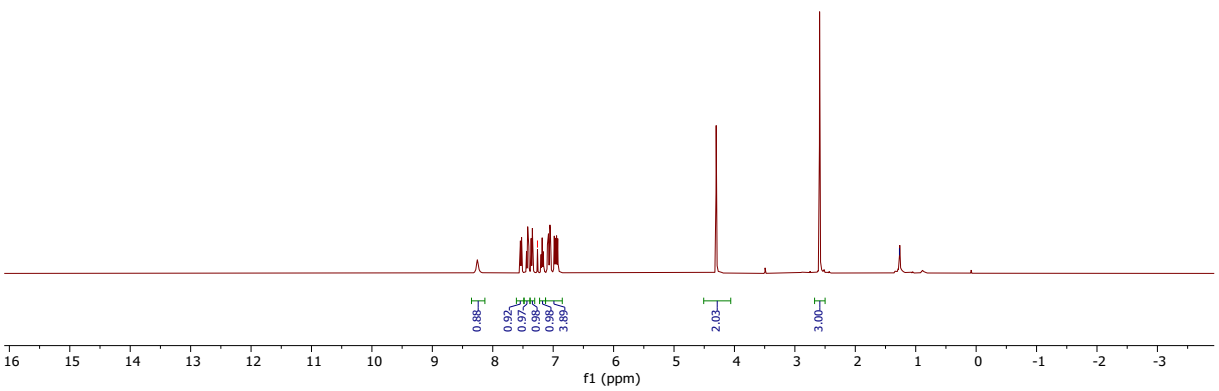
Zhou/ Bei-21-83
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 57





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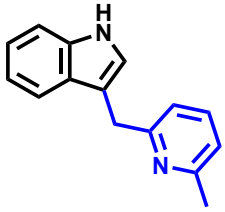
Zhou/ Bei-21-83
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 57



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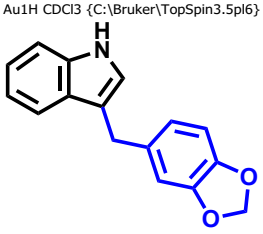
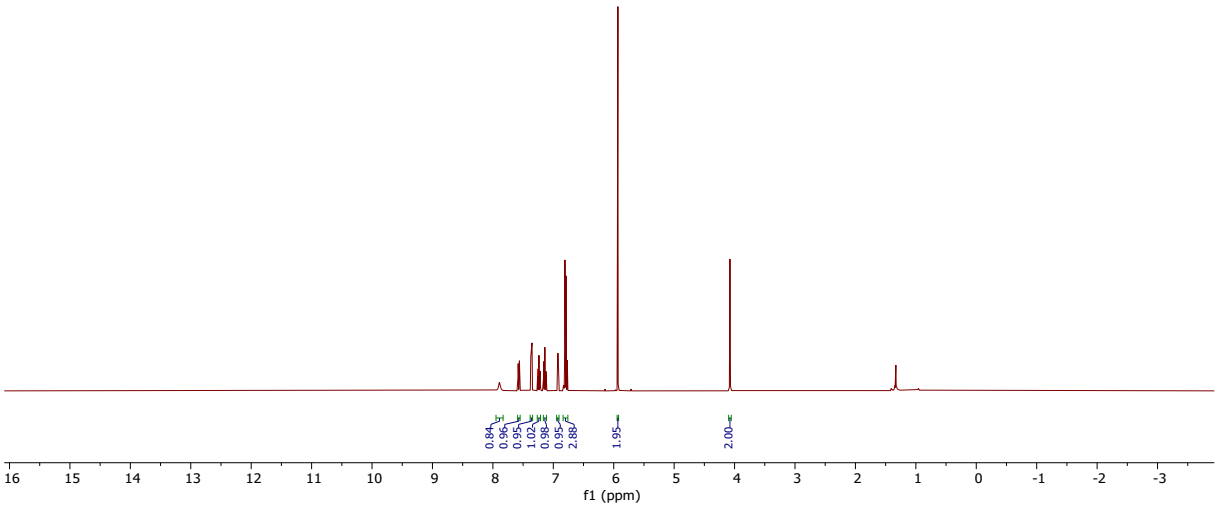
Bei Zhou Bei 21-48
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2104 38





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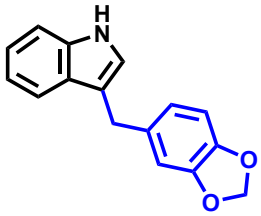
Bei Zhou Bei 21-48
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2104 38



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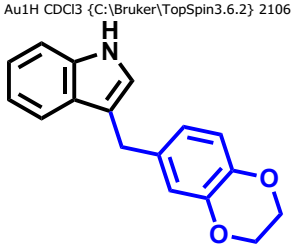
Bei Zhou Bei 21-95
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 25



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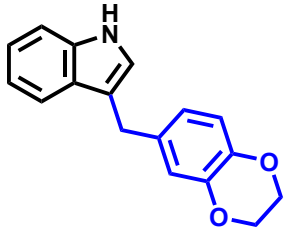
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 25



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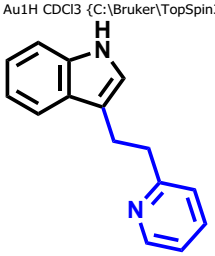
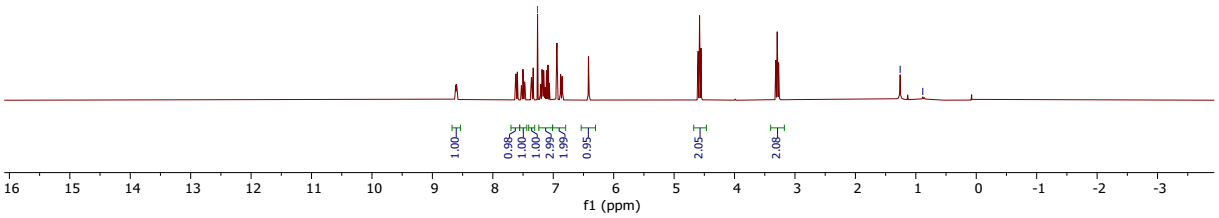
Bei Zhou Bei 21-76
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 3





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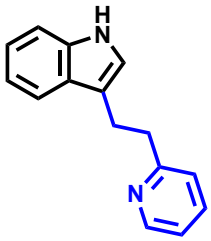
Bei Zhou Bei 21-76
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 3



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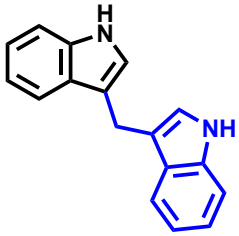
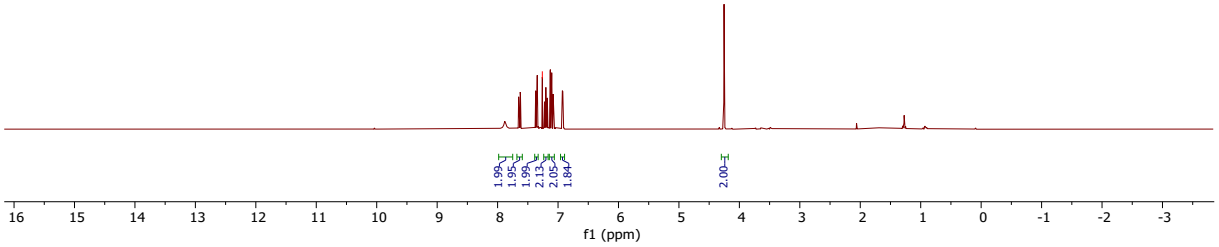
Bei Zhou Bei 21-37
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 6





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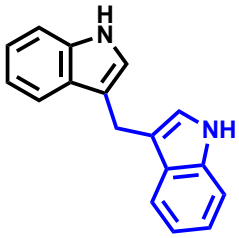
Bei Zhou Bei 21-37
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 6



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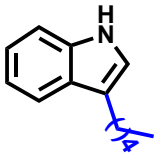
Bei Zhou Bei 21-90
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 25



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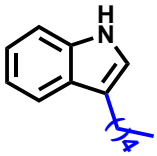
Bei Zhou Bei 21-90
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 25



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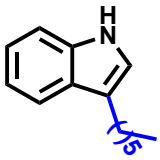
Bei Zhou Bei 21-54-2
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 33



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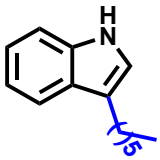
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 33



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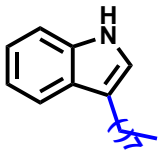
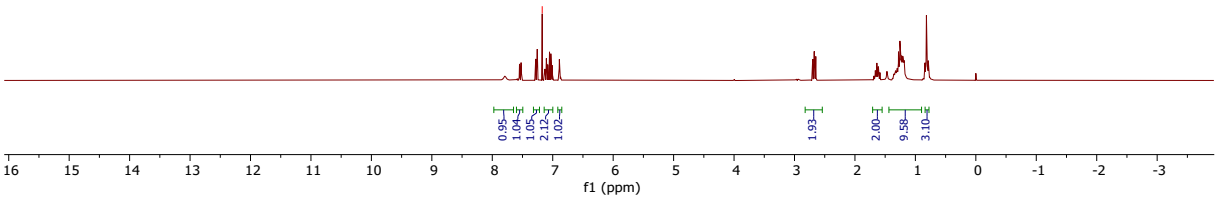
Bei Zhou 21-72
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 21





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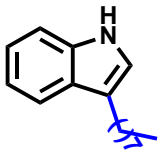
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 21



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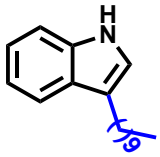
Bei Zhou 21-68
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 14



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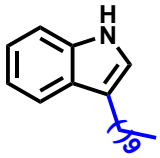
Bei Zhou 21-68
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 14



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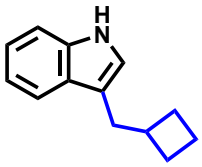
Zhou/ Bei-21-44
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 55



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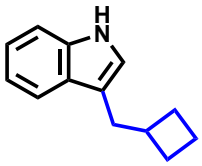
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 55



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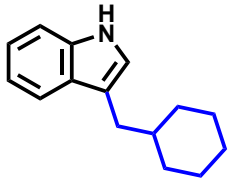
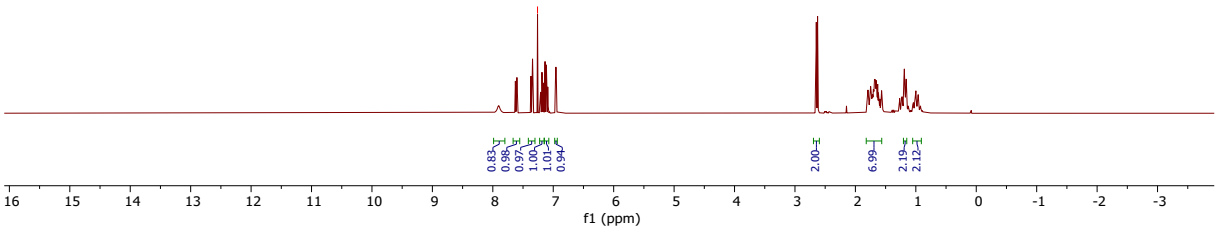
Bei Zhou Bei 21-67
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 13





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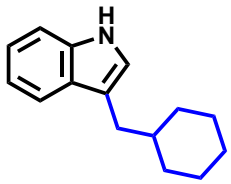
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 13



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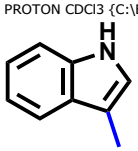
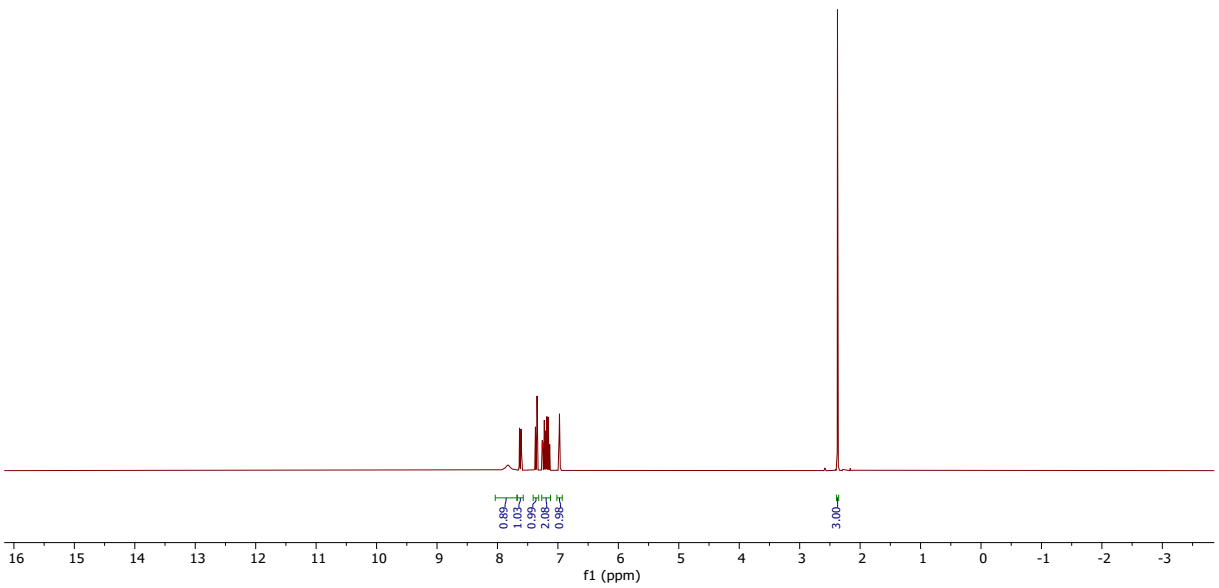
Bei Zhou Bei 20-1
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 38





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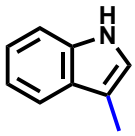
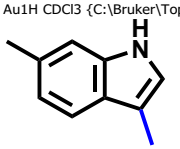
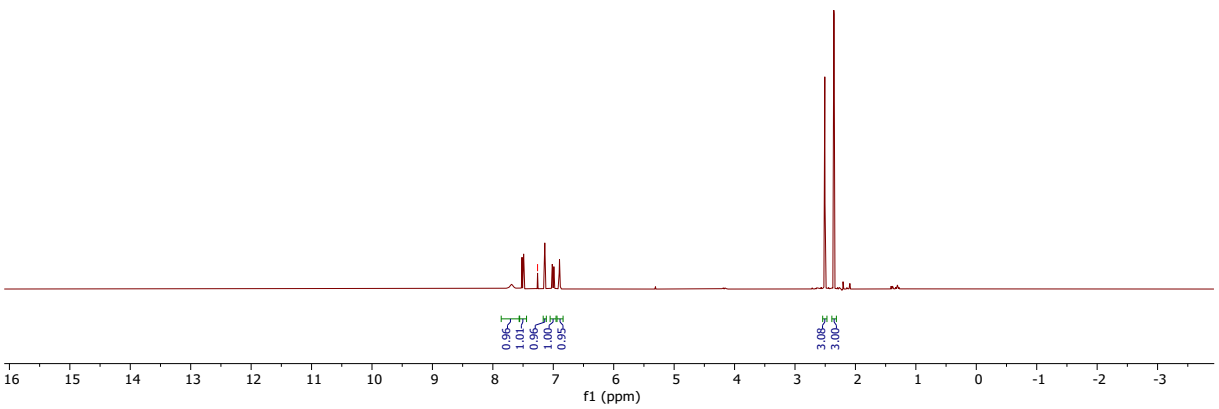
Bei Zhou Bei 20-1
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 38

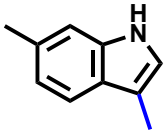


210825.301.10.fid
Bei Zhou Bei 20-3
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 1

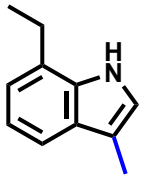


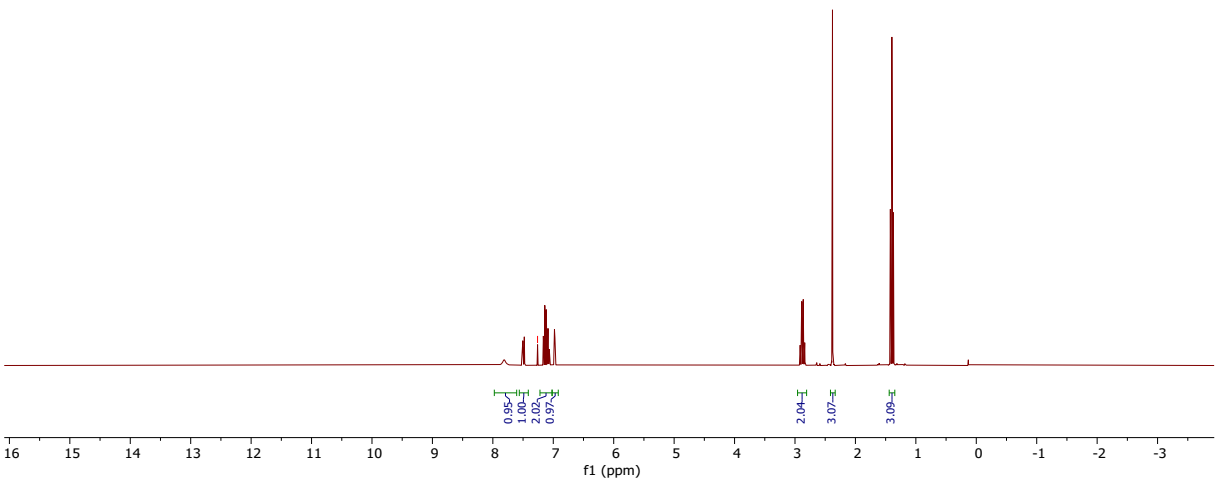


210825.301.11.fid
Bei Zhou Bei 20-3
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 1

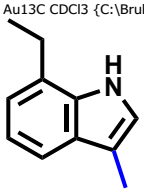


210825.305.10.fid
Bei Zhou Bei 20-5
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 5





210825.305.11.fid
Bei Zhou Bei 20-5
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 5



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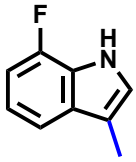
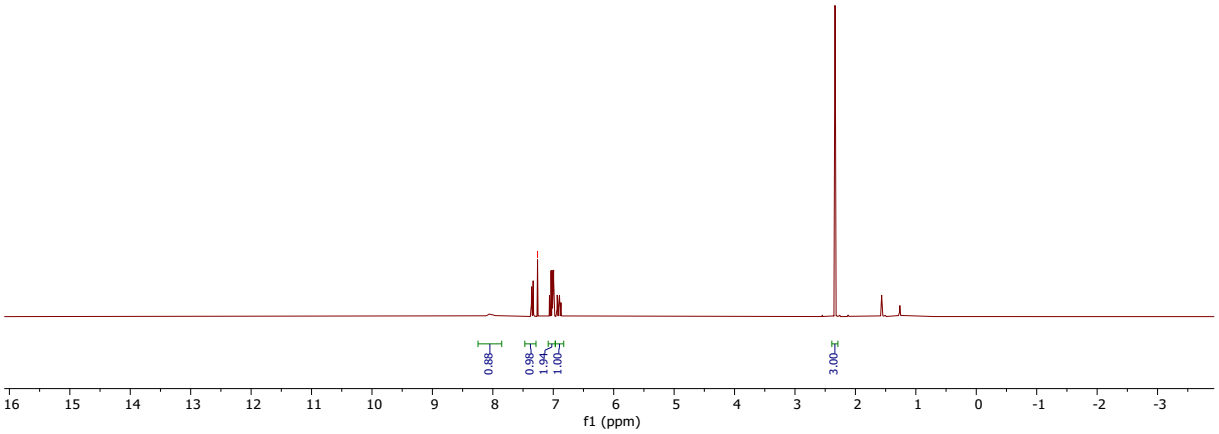
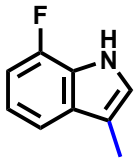
Bei Zhou Bei 20-4
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 4

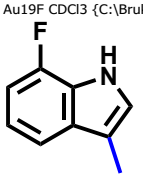




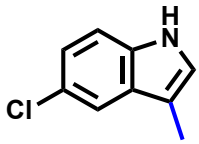
210825.304.11.fid
Bei Zhou Bei 20-4
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 4



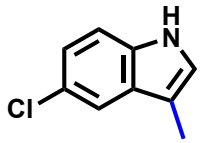
210826.310.10.fid
Bei Zhou 20-4
Au19F CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 10



210906.301.10.fid
Bei Zhou Bei 20-7
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2109 1



210906.301.11.fid
Bei Zhou Bei 20-7
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2109 1



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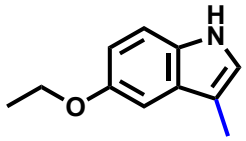
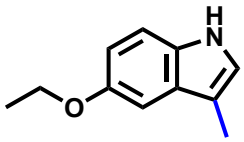
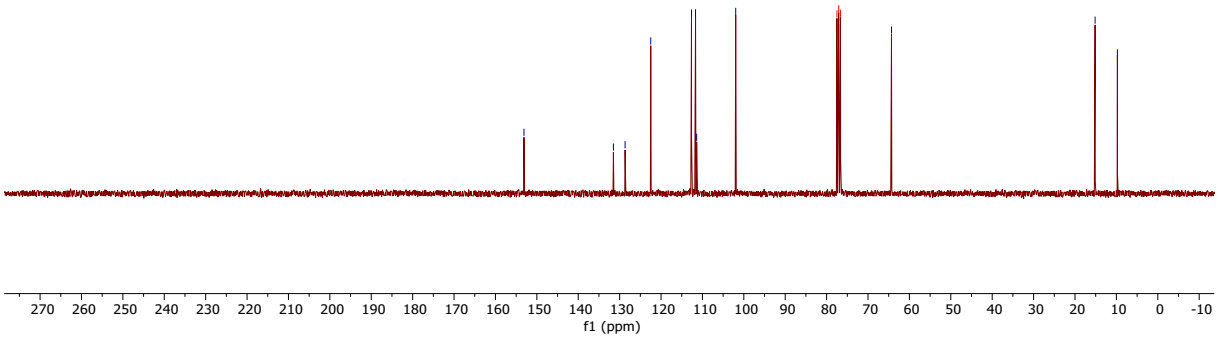
Bei Zhou 20-6
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 11



210826.311.11.fid
Bei Zhou 20-6
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 11

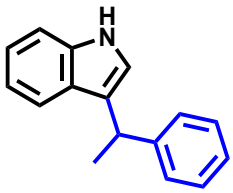


153.11
131.50
128.68
122.48
112.64
111.66
111.39
101.96
77.50 CDCl3
77.08 CDCl3
76.66 CDCl3
64.33
15.15
9.76

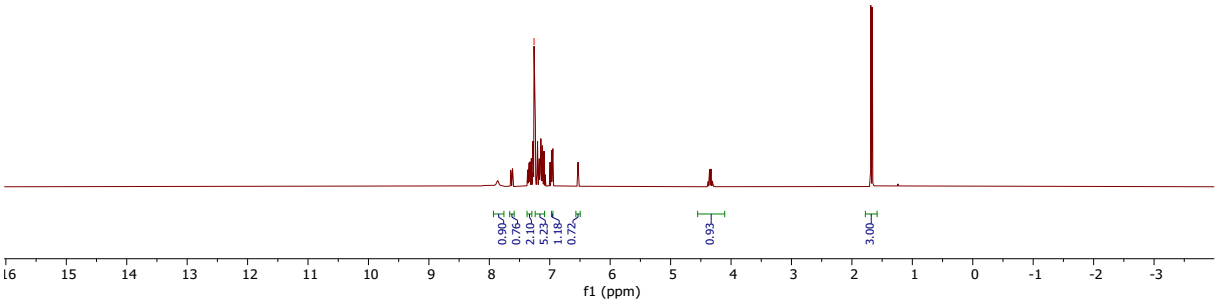


270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

211018.314.10.fid
Bei Zhou Bei 21-57
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2110 14

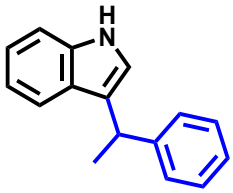


7.26 CDCl3

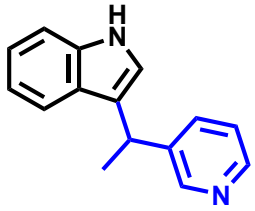


16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2 -3
f1 (ppm)

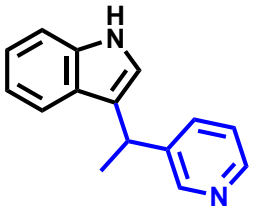
211018.314.11.fid
Bei Zhou Bei 21-57
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2110 14



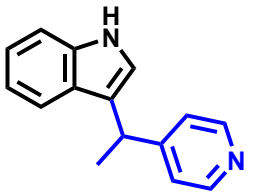
210818.302.10.fid
Bei Zhou Bei 21-6-1
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 2



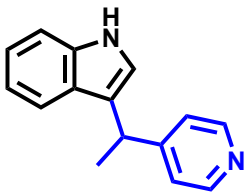
210818.302.11.fid
Bei Zhou Bei 21-6-1
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 2



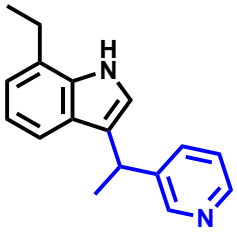
210819.f323.10.fid
Bei Zhou Bei 21-7-1
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 23



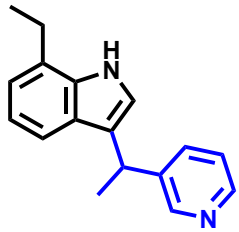
210819.f323.11.fid
Bei Zhou Bei 21-7-1
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 2



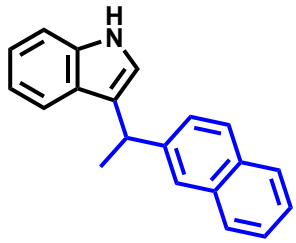
210805.327.10.fid
Bei Zhou Bei 21-11
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 27



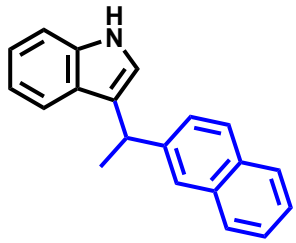
210805.327.11.fid
Bei Zhou Bei 21-11
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 27

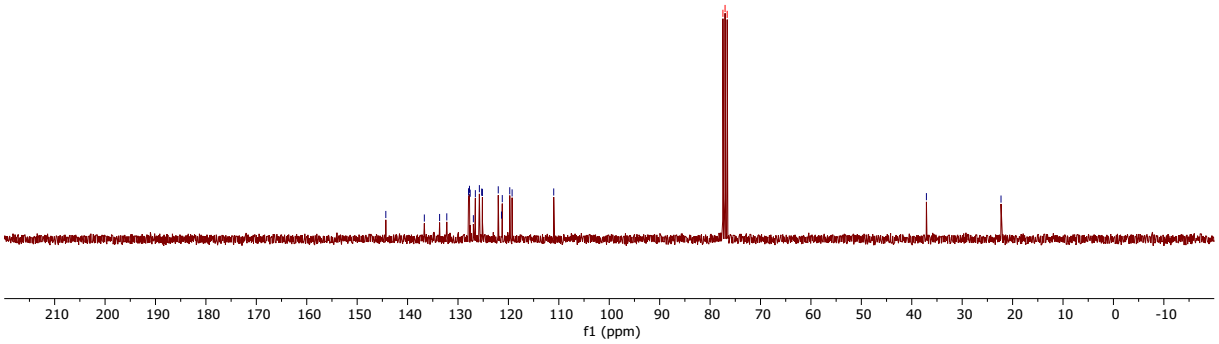


210715.f315.10.fid
Bei Zhou 21-1-2
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 15

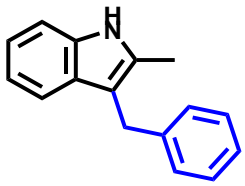


210715.f315.11.fid
Bei Zhou 21-1-2
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 15

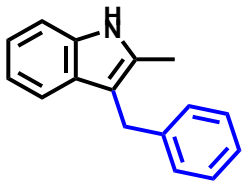




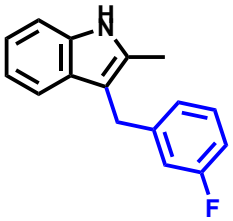
210628.317.10.fid
Bei Zhou Bei 21-112
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 17



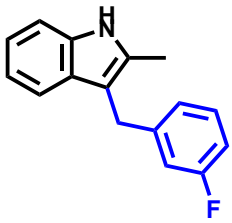
210628.317.11.fid
Bei Zhou Bei 21-112
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 17



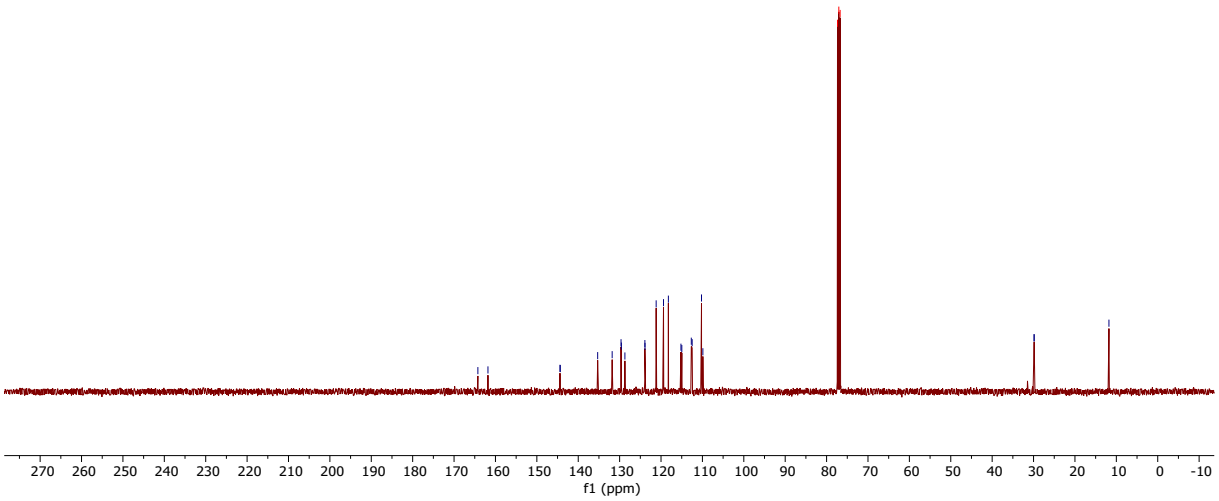
210621.434.10.fid
Bei Zhou Bei 21-131
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2106 34



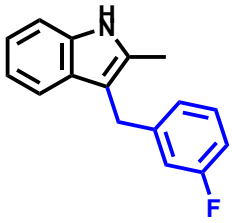
210621.434.11.fid
Bei Zhou Bei 21-131
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2106 34



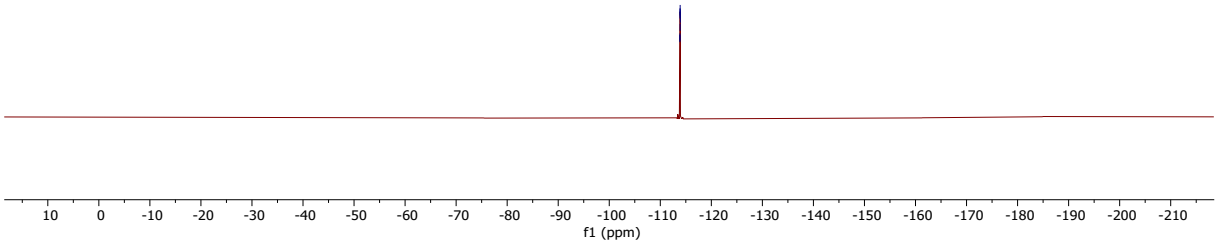
164.25
161.81
144.41
144.34
135.31
131.80
129.66
129.58
128.73
123.90
123.87
121.17
119.40
118.22
115.19
114.98
112.69
112.48
110.22
109.89
77.36 CDCl3
77.05 CDCl3
76.73 CDCl3
29.87
29.85
11.79



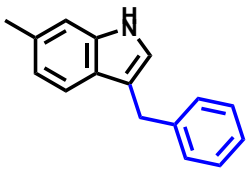
210624.f336.10.fid
Bei Zhou Bei 21-131
F19 CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 36

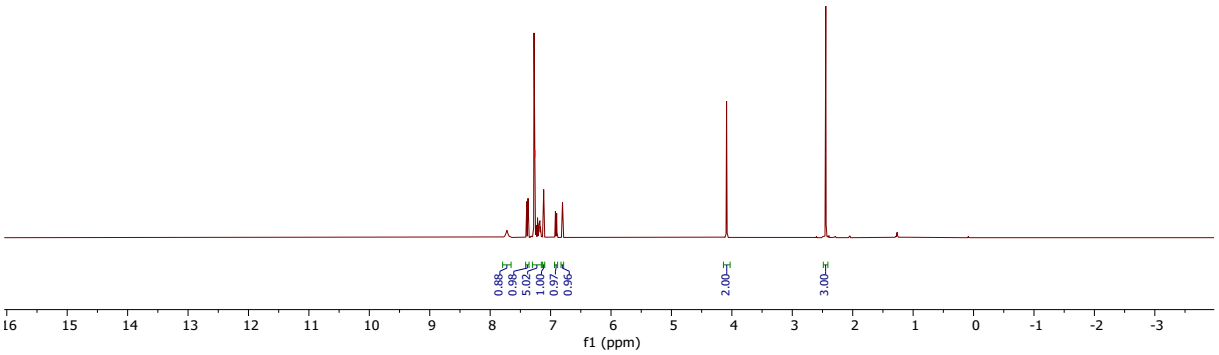


-113.83
-113.86
-113.87
-113.87
-113.89
-113.89
-113.90
-113.92

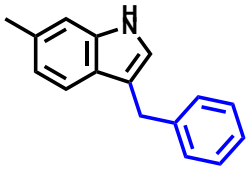


210525.432.10.fid
Zhou/ Bei 21-114
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 32

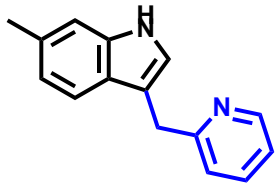




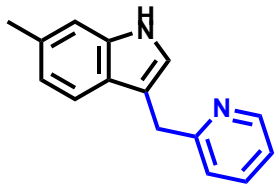
210525.432.11.fid
Zhou/ Bei 21-114
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 32



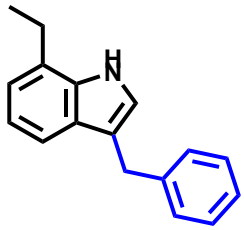
210906.304.10.fid
Bei Zhou Bei 21-134
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2109 4

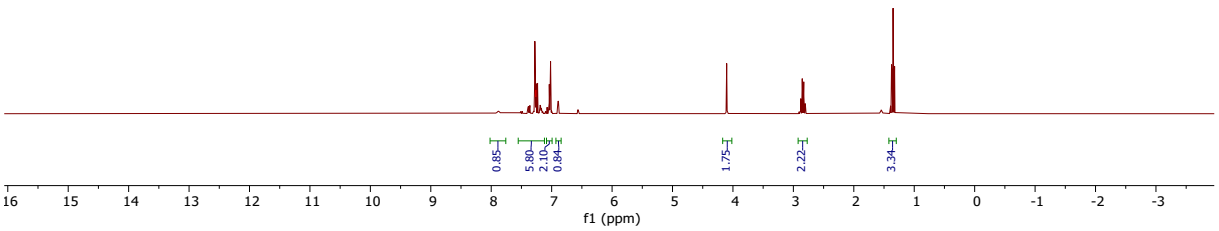


210906.304.11.fid
Bei Zhou Bei 21-134
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2109 4

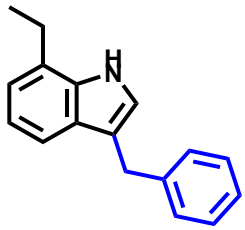


211015.306.10.fid
Bei Zhou 21-127
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2110 6

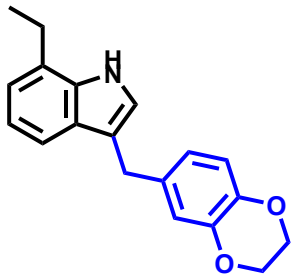




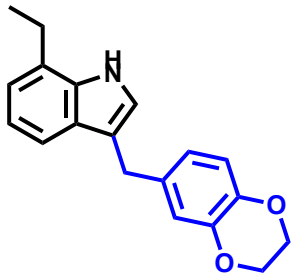
211015.306.11.fid
Bei Zhou 21-127
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2110 6



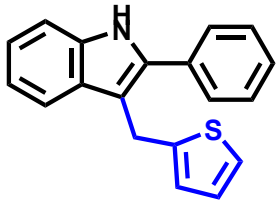
210726.309.10.fid
Bei Zhou Bei 21-143
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 9



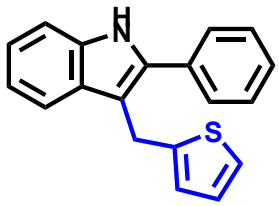
210726.309.11.fid
Bei Zhou Bei 21-143
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 9



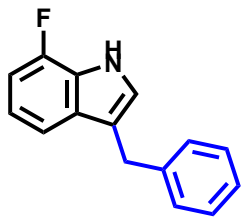
210729.f344.10.fid
Bei Zhou Bei 21-136
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 44



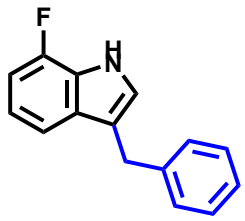
210729.f344.11.fid
Bei Zhou Bei 21-136
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 44



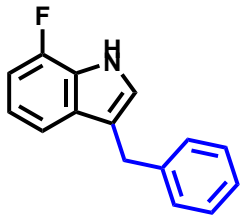
210519.459.10.fid
Zhou/ Bei-21-110
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 59



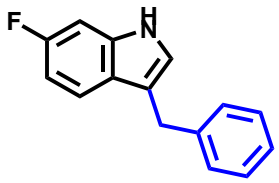
210519.459.11.fid
Zhou/ Bei-21-110
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 59



210525.426.10.fid
Zhou/ Bei 21-110
F19 CDCl3 {C:\Bruker\TopSpin3.5pl6} 2105 26



210830.318.10.fid
Bei Zhou 21-124
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 18



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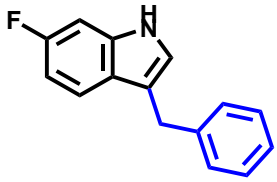
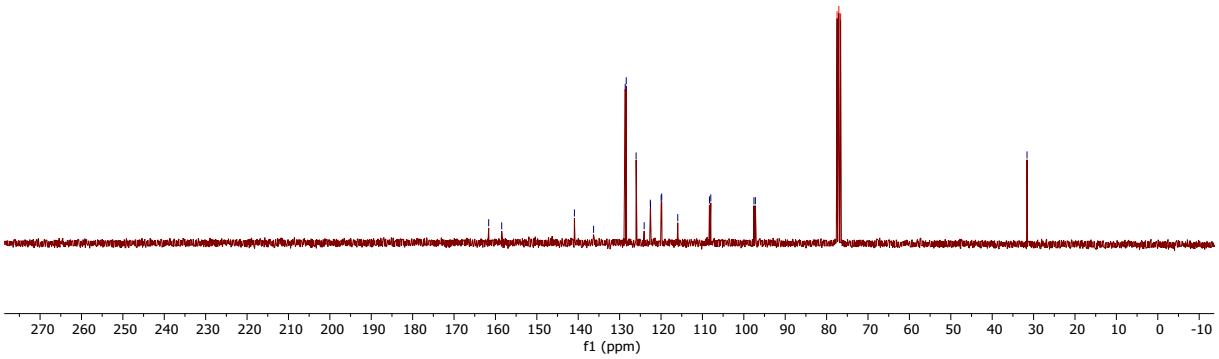
Bei Zhou 21-124
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 18

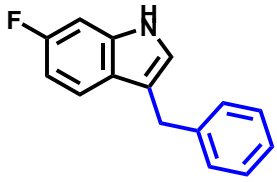


161.63
158.49
140.92
136.29
128.65
128.40
126.02
124.08
122.59
122.54
119.97
119.83
115.96
108.30
107.98
97.55
97.21
77.47 CDCl3
77.05 CDCl3
76.63 CDCl3
31.59

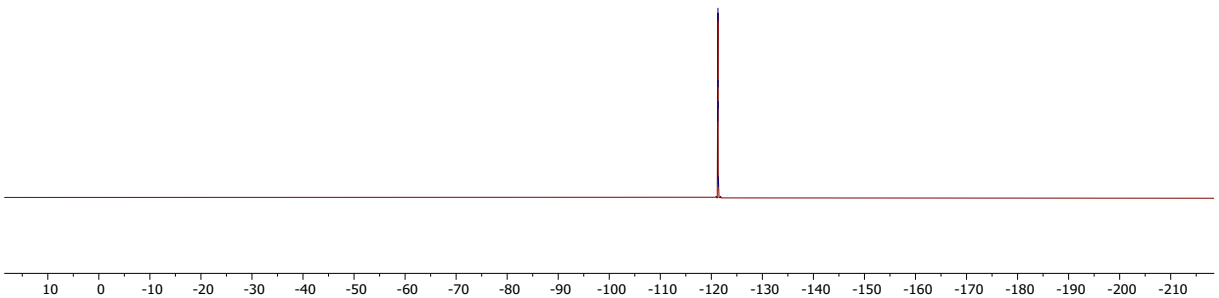


270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

210831.f319.10.fid
Bei Zhou 21-124
F19 CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 19

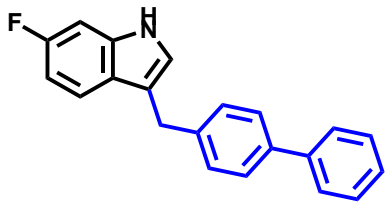


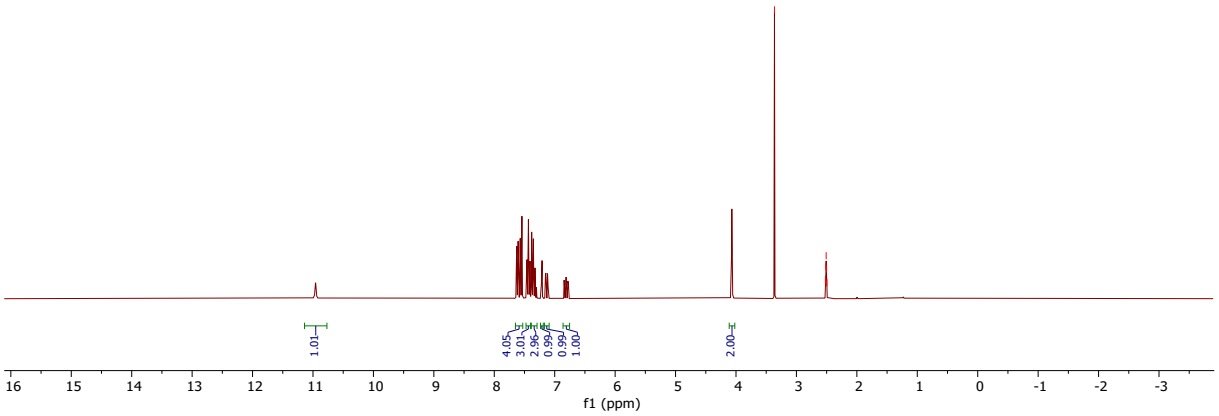
-121.26
-121.28
-121.30
-121.32
-121.33
-121.35
-121.37
-121.38



10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

210804.320.10.fid
Bei Zhou Bei 21-141-1
Au1H DMSO {C:\Bruker\TopSpin3.6.2} 2108 20





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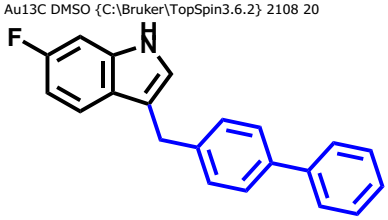
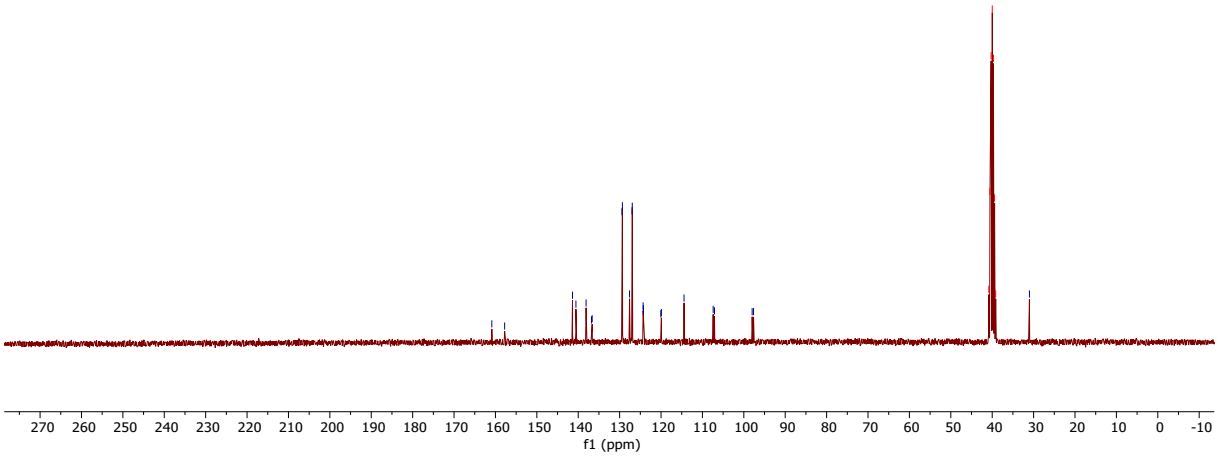
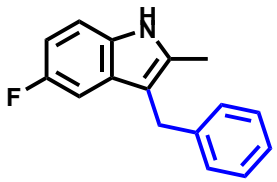
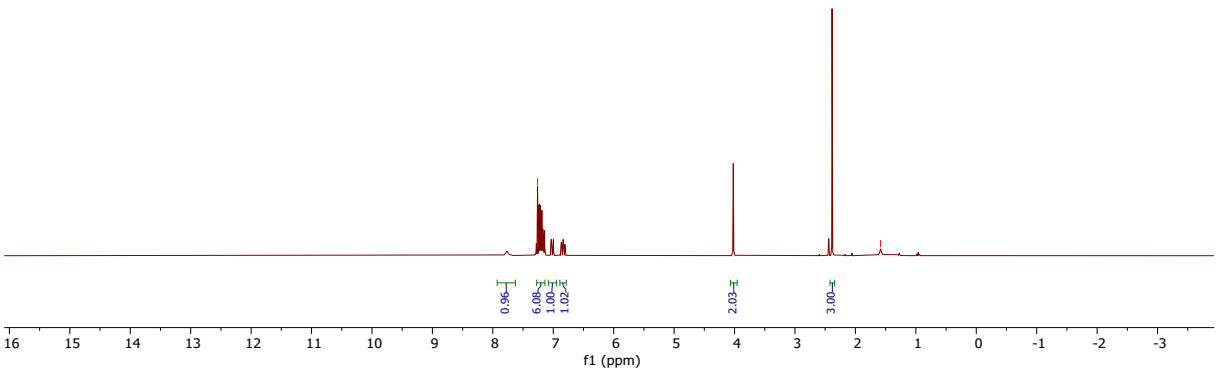
Bei Zhou Bei 21-141-1
Au13C DMSO {C:\Bruker\TopSpin3.6.2} 2108 20





210830.317.10.fid
Bei Zhou 21-123
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 17





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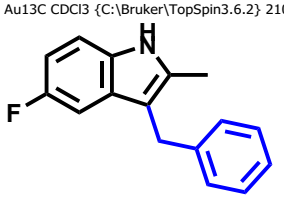
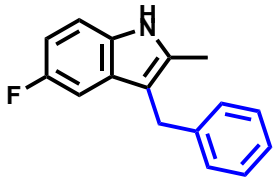
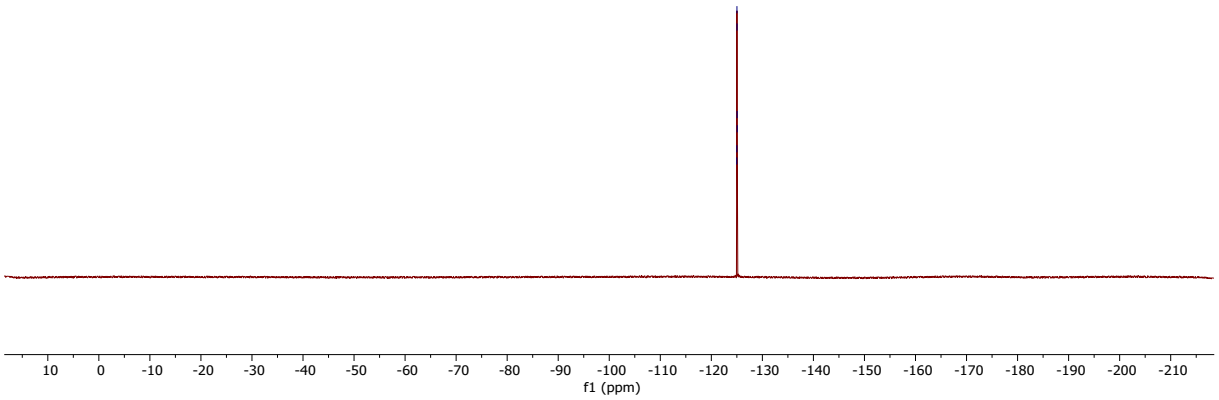
Bei Zhou 21-123
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 17

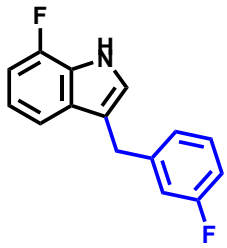


210831.f318.10.fid
Bei Zhou 21-123
F19 CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 18





210610.418.10.fid
Bei Zhou Bei 21-130
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2106 18



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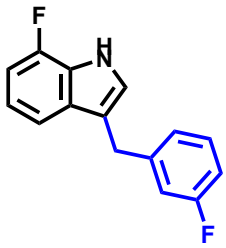
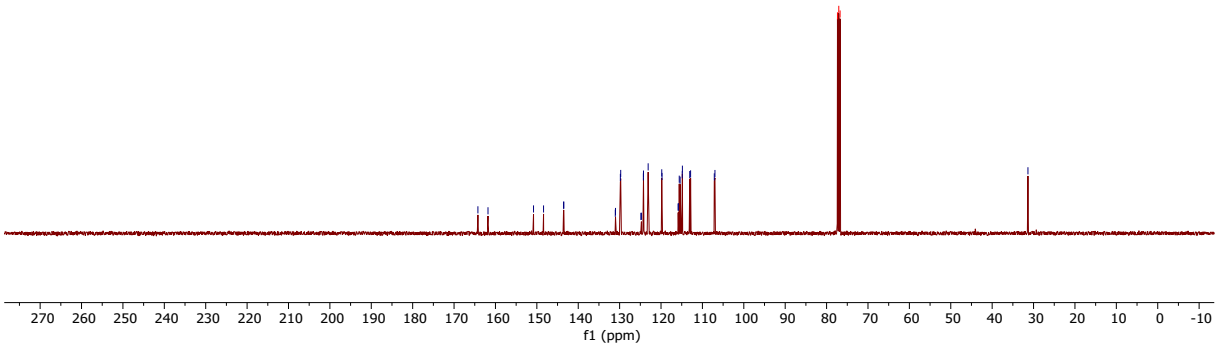
Bei Zhou Bei 21-130
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2106 18





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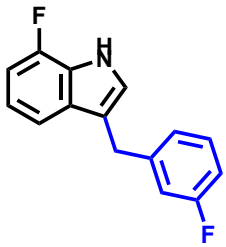
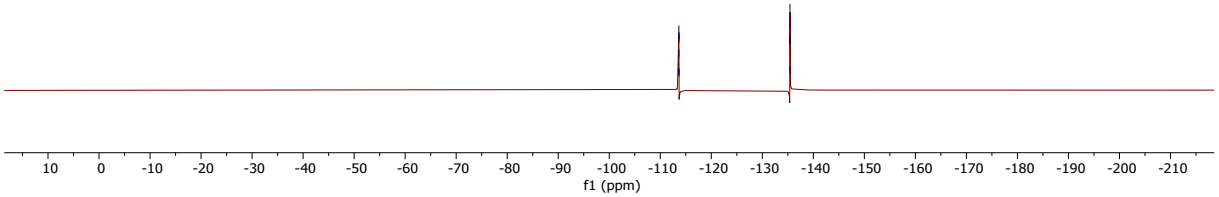
Bei Zhou Bei 21-130
F19 CDCl3 {C:\Bruker\TopSpin3.5pl6} 2106 28





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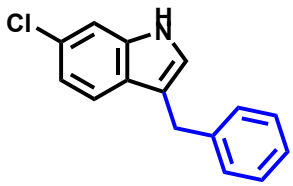
Bei Zhou Bei 21-102
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 32



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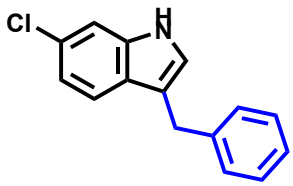
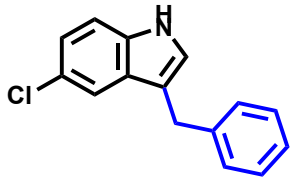
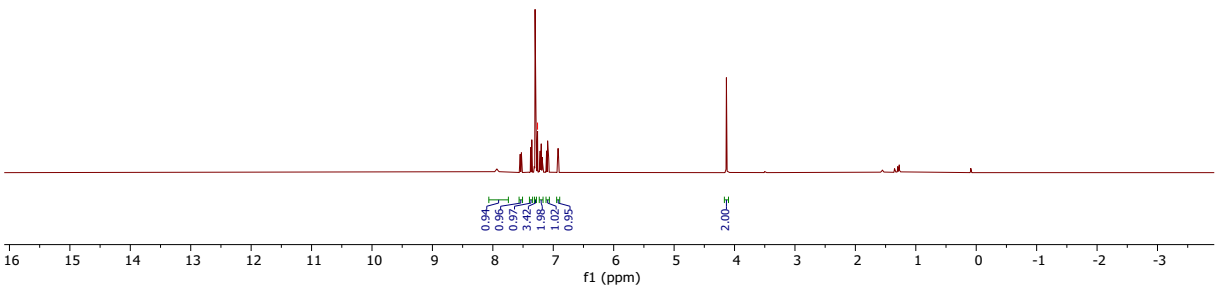
Bei Zhou Bei21-102
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2106 32



210430.436.10.fid
Bei Zhou Bei21-101-2
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2104 36





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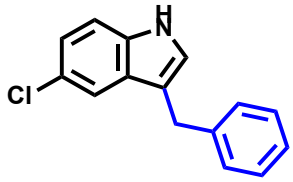
Bei Zhou Bei21-101-2
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2104 36



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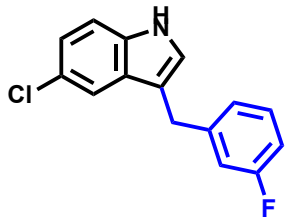
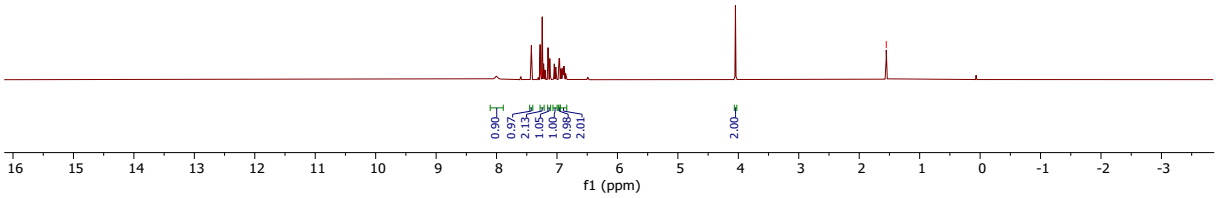
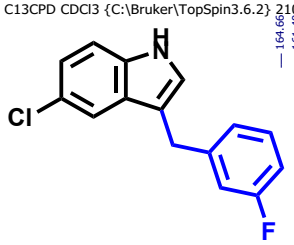
Bei Zhou Bei 21-132-2
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 34



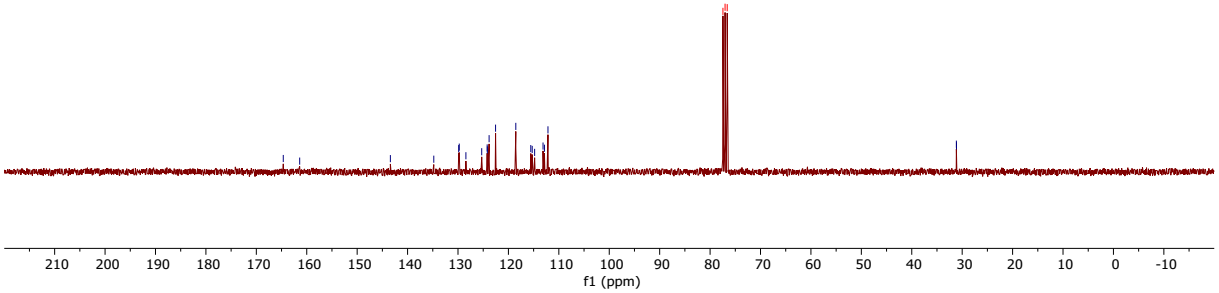
7.26 CDCl3
1.55 H2O



210629.f334.11.fid
Bei Zhou Bei 21-132-2
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 34



164.66
161.40
143.41
134.80
129.86
129.75
128.43
125.30
124.21
124.18
123.83
122.55
118.94
115.56
115.28
114.80
113.13
112.86
112.16
77.45 CDCl3
77.03 CDCl3
76.60 CDCl3
31.15
31.13



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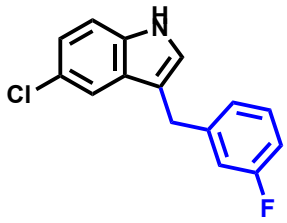
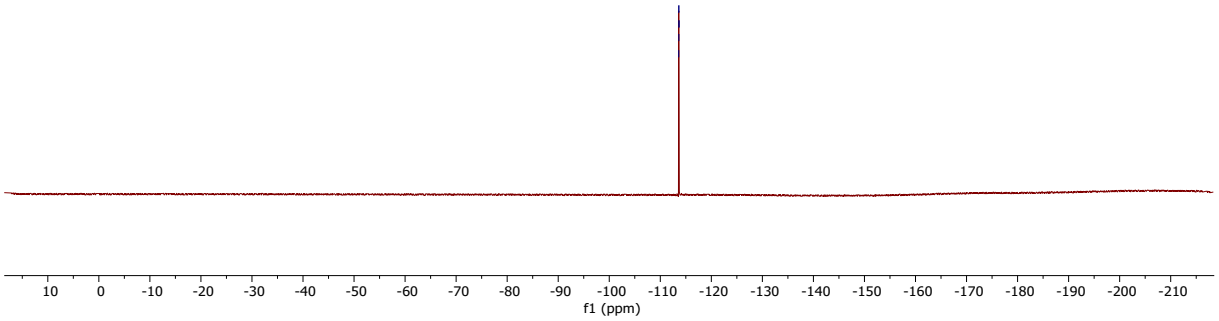
Bei Zhou Bei 21-132
F19 CDCl3 {C:\Bruker\TopSpin3.6.2} 2106 52





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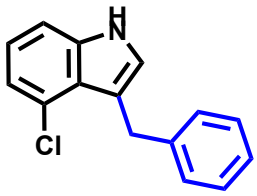
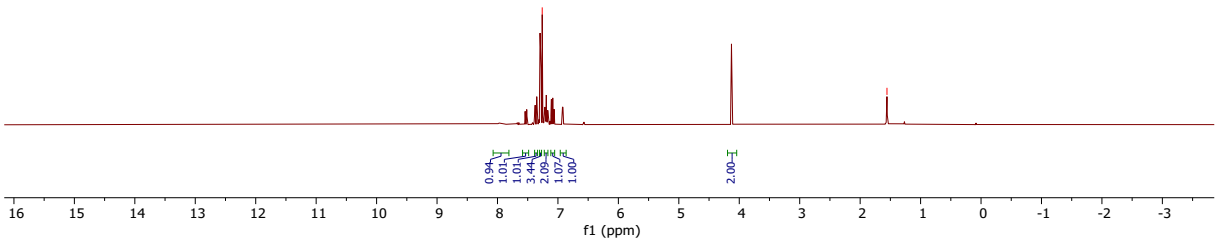
Bei Zhou Bei 21-111-1
PROTON CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 38





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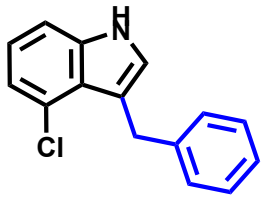
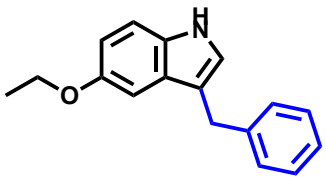
Bei Zhou Bei 21-111-1
C13CPD CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 38



210726.303.10.fid
Bei Zhou Bei 21-128
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 3



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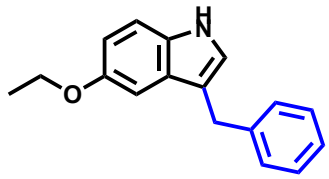
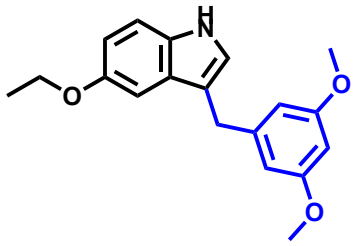
Bei Zhou Bei 21-128
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 3



210726.307.10.fid
Bei Zhou Bei 21-144
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 7



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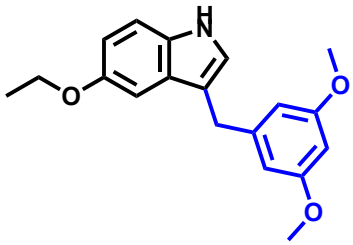
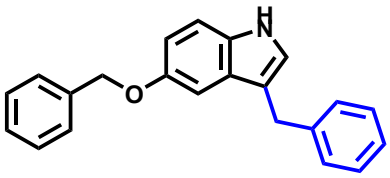
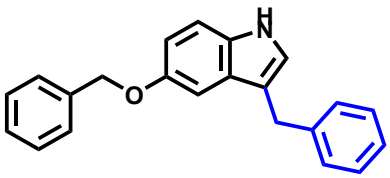
Bei Zhou Bei 21-144
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2107 7



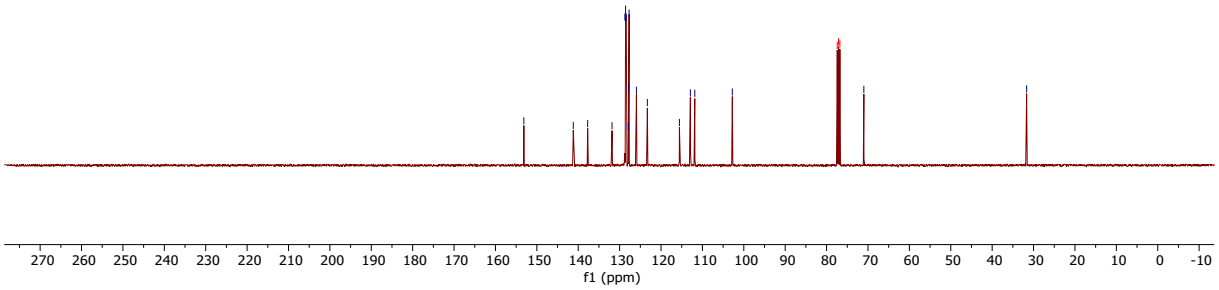
210811.404.10.fid
Bei Zhou Bei 21-116-1
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2108 4



210811.404.11.fid
Bei Zhou Bei 21-116-1
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2108 4

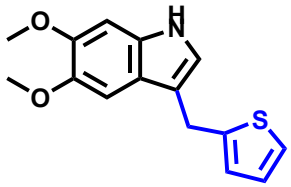


153.14
141.20
137.72
131.83
128.73
128.56
128.41
127.89
127.83
127.71
125.94
123.30
115.56
112.91
111.84
102.78
77.43 CDCl3
77.11 CDCl3
76.79 CDCl3
71.00
31.67

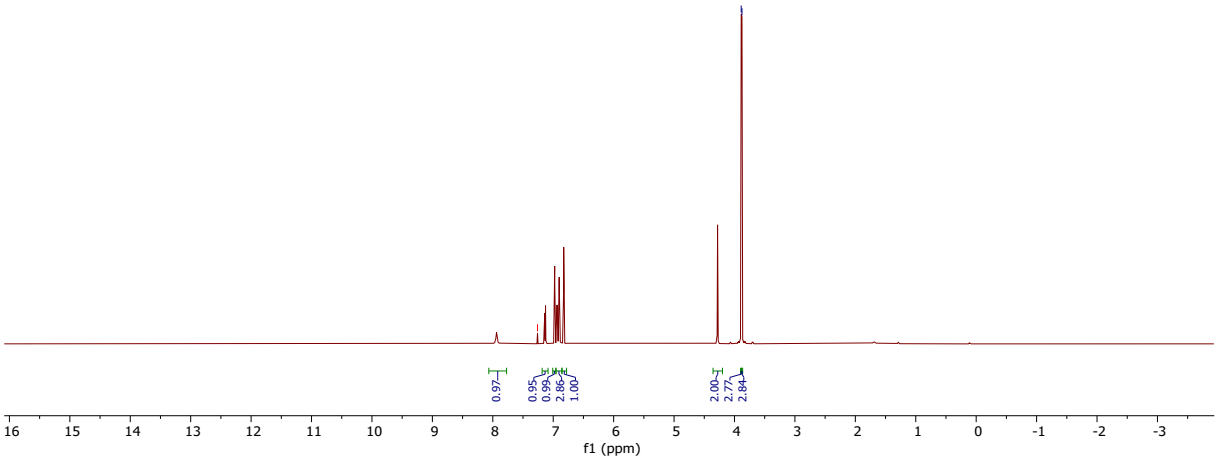


270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

210621.436.10.fid
Bei Zhou Bei 21-137-2
Au1H CDCl3 {C:\Bruker\TopSpin3.5pl6} 2106 36



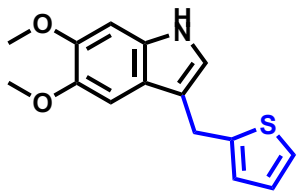
7.26 CDCl3
3.89
3.88



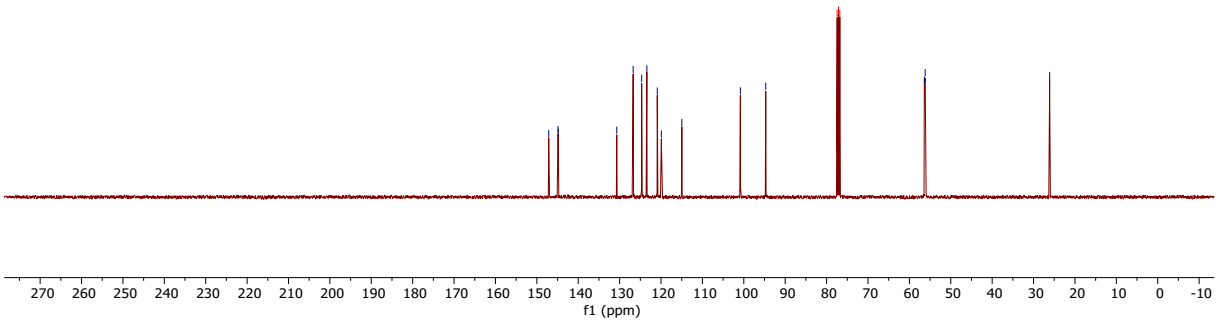
0.97
0.95
0.99
2.86
1.00
2.00
2.77
2.84

16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2 -3
f1 (ppm)

210621.436.11.fid
Bei Zhou Bei 21-137-2
Au13C CDCl3 {C:\Bruker\TopSpin3.5pl6} 2106 36

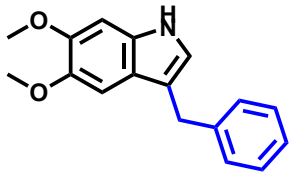


147.13
144.88
144.83
130.69
126.73
124.68
123.42
120.91
119.93
114.97
100.83
94.70
77.44 CDCl3
77.12 CDCl3
76.81 CDCl3
56.39
56.18
26.11

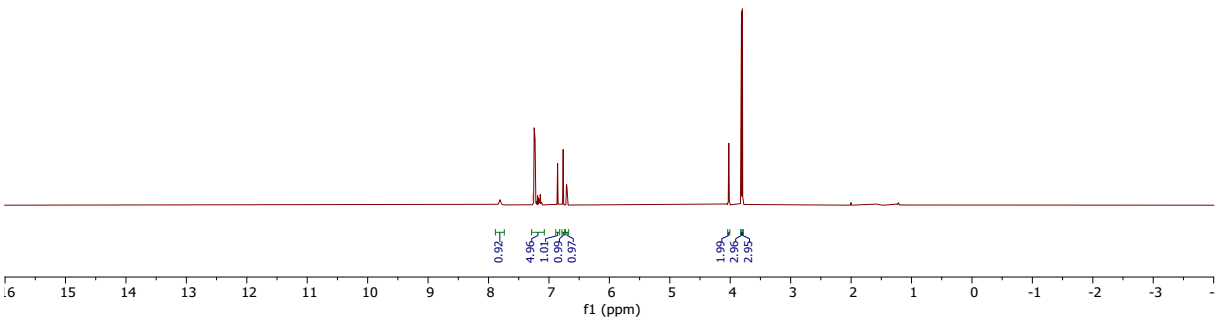


270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

210804.330.10.fid
Bei Zhou Bei 21-118
Au1H CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 30



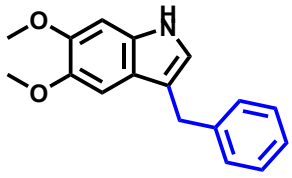
7.26 CDCl3



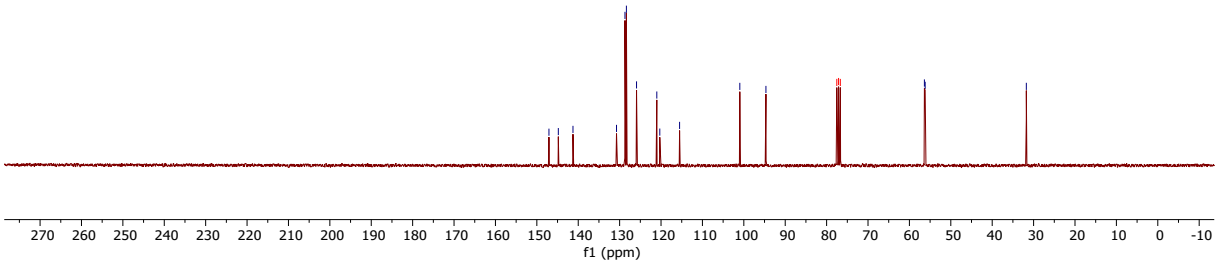
0.92
4.96
1.01
0.99
0.97
1.99
2.96
2.95

16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2 -3 -
f1 (ppm)

210804.330.11.fid
Bei Zhou Bei 21-118
Au13C CDCl3 {C:\Bruker\TopSpin3.6.2} 2108 30



147.07
144.81
141.27
130.75
128.71
128.37
125.92
121.02
120.30
115.52
100.97
94.66
77.54 CDCl3
77.11 CDCl3
76.69 CDCl3
56.38
56.20
31.76



270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)