Metal-free remote-site C-H alkenylation: regio- and diastereoselective synthesis of solvatochromic dyes

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Supplementary Information

General

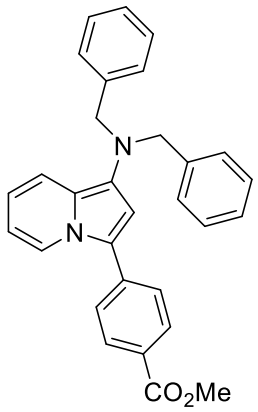
All the starting materials and other reagents were commercially available of the best grade (Aldrich, Acros, Alfa Aesar) and were used without further purification. All reactions were carried out on a multireactor apparatus using the corresponding reactor tubes. Melting points were obtained with a Reichert Thermovar apparatus and are uncorrected. NMR spectra were recorded on Bruker Avance 300 and 400 spectrometers (300 and 400 MHz for ^{1}H NMR; 75 and 101 MHz for ^{13}C NMR); chemical shifts are given in (δ) parts per million and coupling constants (J) in Hertz. Infrared analysis was performed with a Jasco 4100LE (Pike MIRacle ATR) spectrophotometer; wavenumbers ($\tilde{\upsilon}$) are given in cm^{-1}. Mass spectra (EI) were obtained at 70 eV on Agilent 5763 (GC) and Agilent 5973 (DIP) spectrometers; fragment ions in *m/z* with relative intensities (%) in parentheses. HRMS analyses (EI) were also carried out at 70 eV on an Agilent 7200-QTOF spectrometer. Elemental analyses were performed on a Thermo Finnigan Flash 1112 microanalyser. The purity of volatile compounds and the chromatographic analyses (GLC) were determined with an Agilent 6890N instrument equipped with a flame ionisation detector and a HP-5MS 30 m capillary column (0.32 mm diameter, 0.25 μm film thickness), using nitrogen (2 mL/min) as carrier gas, $T_{injector}$ = 270 ºC, T_{column} = 60 ºC (3 min) and 60–270 ºC (15 ºC/min); retention times (t_R) are given in min. Analytical thin-layer chromatography (TLC) was carried out on ALUGRAM® Xtra SIL G UV$_{254}$ aluminium sheets. Column chromatography was performed using silica gel 60 of 40–60 microns (hexane/EtOAc as eluent).

General procedure for the synthesis of the indolizines 1

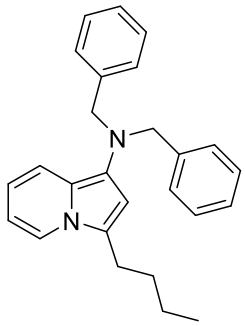
The starting indolizines were prepared according to our previously published procedure,[1] as follows: the aldehyde (0.5 mmol), amine (0.5 mmol), and alkyne (0.5 mmol) were added to a reactor tube containing CuNPs/C (20 mg, *ca.* 0.5 mol%) and dichloromethane (1.0 mL). The reaction mixture was warmed to 70 ºC without the exclusion of air and monitored by TLC and/or GLC until total or steady conversion of the starting materials. The solvent was removed in vacuo; EtOAc (2 mL) was added to the resulting mixture followed by filtration through Celite and washing with additional EtOAc (4 mL). The reaction crude obtained after evaporation of the solvent was purified by column chromatography (silica gel, hexane/EtOAc) or preparative TLC (silica gel, hexane/EtOAc) to give the corresponding indolizine **1**. Indolizine **1f** was prepared by using CuI (9.5 mg, 10 mol%) instead of CuNPs/C in the absence of solvent, following the same work-up as above.

[1] Albaladejo, M. J.; Alonso, F.; González-Soria, M. J. *ACS Catal.* **2015**, *5*, 3446–3456.

Characterisation of the new indolizines 1

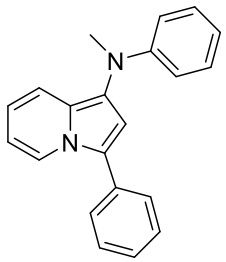


Methyl 4-[1-(dibenzylamino)indolizin-3-yl]benzoate (1e). Yellow solid (123 mg, 55%); R_f 0.60 (hexane/EtOAc, 8:2); m.p. 133.8–136.2 ºC; IR (neat) $\tilde{\upsilon}$ 3027, 2942, 2922, 2847, 1718, 1601, 1514, 1433, 1283, 1178, 1108, 859, 754, 737, 696; ^{1}H NMR (400 MHz, C_6D_6) δ 3.54 (s, 3H; CH_3), 4.15 (s, 4H; 2 × CH_2), 5.95–5.99 (m, 1H; ArH), 6.33 (ddd, J = 9.0, 6.4, 0.8 Hz, 1H; ArH), 6.69 (s, 1H; ArH), 7.03–7.07 (m, 2H; 2 × ArH), 7.13–7.18 (m, 6H; 6 × ArH), 7.38–7.39 (m, 4H; 4 × ArH), 7.52 (dt, J = 9.0, 1.1 Hz, 1H; ArH), 7.74 (d, J = 7.2 Hz, 1H; ArH), 8.12 (d, J = 8.5 Hz, 2H; 2 × ArH); ^{13}C NMR (101 MHz, C_6D_6) δ 51.6 (CH_3), 59.9 (2 × CH_2), 109.8, 111.5, 116.1, 118.2, 122.0, 127.1, 127.3, 128.5, 128.9, 130.5 (19 × CH), 122.1, 128.2, 128.7, 129.0, 138.1, 139.8 (7 × ArC), 166.5 (C=O); MS (DIP) *m/z* 447 (M^++1, 8), 446 (M^+, 25), 356 (25), 355 (100), 251 (15), 91 (39). HRMS (EI) *m/z* calcd for $C_{30}H_{26}N_2O_2$ 446.1994, found 446.1978.

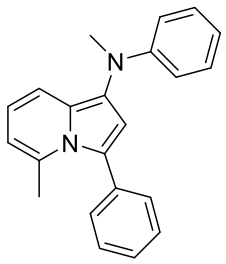


***N,N*-Dibenzyl-3-butylindolizin-1-amine (1f).** Yellow solid (129 mg, 70%); t_R 21.76; R_f 0.76 (hexane/EtOAc, 8:2); m.p. 55.8–57.6 ºC; IR (neat) $\tilde{\upsilon}$ 3023, 2952, 2921, 2823, 2796, 1623, 1551, 1450, 1427, 1344, 1316, 1244, 1148, 1027, 1001, 978, 809, 727, 696; ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.92 (t, J = 7.3 Hz, 3H; CH_3), 1.34 (dq, J = 14.5, 7.3 Hz, 2H; CH_2), 1.28–1.41 (m, 2H; CH_2), 2.68 (t, J = 7.3 Hz, 2H; CH_2), 4.15 (s, 4H; 2 × CH_2), 6.35–6.42 (m, 3H; 3 × ArH), 7.14–7.26 (m, 6H; 6 × ArH), 7.33 (d, J = 7.2 Hz, 4H; 4 × ArH), 7.40 (d, J = 8.3 Hz, 1H; ArH), 7.51 (d, J = 6.6 Hz, 1H; ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.1 (CH_3) 22.6, 25.7, 29.4, 59.6 (5 × CH_2), 106.3, 109.8, 112.9, 117.7, 121.1, 126.8, 128.1, 128.8 (15

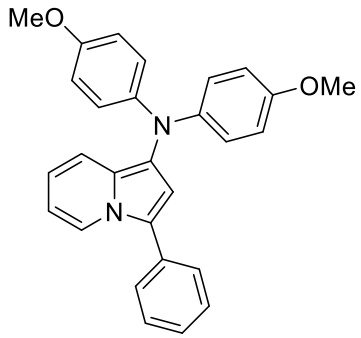
× CH), 121.8, 125.1, 126.5, 139.9 (5 × ArC); MS (GC) *m/z* 369 (M^++1, 8), 368 (M^+, 31), 278 (23), 277 (100), 233 (20), 130 (13), 91 (19). HRMS (EI) *m/z* calcd for $C_{26}H_{28}N_2$ 368.2252, found 368.2257.



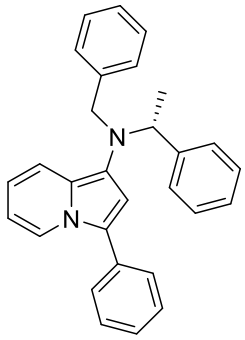
***N*-Methyl-*N*,3-diphenylindolizin-1-amine (1k).** Yellow oil (82 mg, 55%); t_R 18.43; R_f 0.71 (hexane/EtOAc, 8:2); IR (neat) $\tilde{\upsilon}$ 3056, 3032, 2877, 2808, 1597, 1497, 1432, 1310, 1211, 1114, 1037, 741, 692; ^{1}H NMR (400 MHz, $CDCl_3$) δ 3.33 (s, 3H; CH_3), 6.41 (br, 1H; ArH), 6.55 (br, 1H; ArH), 6.69–6.76 (m, 4H; 4 × ArH), 7.13–7.18 (m, 3H; 3 × ArH), 7.27–7.30 (m, 1H; ArH), 7.41–7.44 (m, 2H; 2 × ArH), 7.54–7.55 (m, 2H; 2 × ArH), 8.24 (br, 1H; ArH); ^{13}C NMR (101 MHz, $CDCl_3$) δ 40.8 (CH_3), 111.0, 112.1, 113.1, 116.8, 117.6, 122.3, 127.2, 128.0, 129.0, 129.1 (15 × CH), 122.9, 123.8, 128.5, 132.3, 150.3 (5 × ArC); MS (GC) *m/z* 299 (M^++1, 24), 298 (M^+, 100), 284 (19), 283 (85), 181 (55), 149 (14), 141 (13), 78 (31), 77 (47), 51 (16). HRMS (EI) *m/z* calcd for $C_{21}H_{18}N_2$ 298.1470, found 298.1469.



***N*,5-Dimethyl-*N*,3-diphenylindolizin-1-amine (1l).** Yellow oil (78 mg, 50%); t_R 18.99; R_f 0.72 (hexane/EtOAc, 8:2); IR (neat) $\tilde{\upsilon}$ 3054, 3023, 2923, 2808, 1597, 1496, 1477, 1293, 1110, 762, 747, 691; ^{1}H NMR (400 MHz, C_6D_6) δ 1.84 (s, 3H; CH_3), 3.17 (s, 3H; CH_3), 5.93 (d, J = 6.5 Hz, 1H; ArH), 6.37 (dd, J = 8.9, 6.5 Hz, 1H; ArH), 6.64 (s, 1H; ArH), 6.78–6.81 (m, 1H; ArH), 6.87–6.89 (m, 2H; 2 × ArH), 7.03–7.07 (m, 3H; 2 × ArH), 7.14–7.23 (m, 5H; 5 × ArH); ^{13}C NMR (101 MHz, C_6D_6) δ 22.9, 40.7 (2 × CH_3), 112.7, 113.7, 115.3, 115.9, 116.9, 117.4, 127.2, 127.4, 129.3, 131.3 (14 × CH), 122.9, 125.1, 130.4, 134.9, 136.0, 150.9 (6 × ArC); MS (GC) *m/z* 313 (M^++1, 24), 312 (M^+, 100), 311 (32), 298 (12), 297 (49), 235 (12), 204 (11), 195 (44), 156 (15), 148 (13), 102 (10), 92 (31), 77 (39), 65 (17). HRMS (EI) *m/z* calcd for $C_{22}H_{20}N_2$ 312.1626, found 312.1618.



***N,N*-Bis(4-methoxyphenyl)-3-phenylindolizin-1-amine (1m).** Yellow solid (126 mg, 60%); R_f 0.38 (hexane/EtOAc, 8:2); m.p. 46.5–47.1 ºC; IR (neat) $\tilde{\upsilon}$ 3058, 3027, 2963, 2867, 1593, 1495, 1432, 1299, 1231, 1114, 738, 695; ^{1}H NMR (400 MHz, C_6D_6) δ 3.34 (s, 6H; 2 × CH_3), 5.98–6.02 (m, 1H; ArH), 6.25 (dd, J = 9.0, 6.4 Hz, 1H; ArH), 6.76 (d, J = 9.0 Hz, 2H; 2 × ArH), 6.84 (s, 1H; ArH), 7.05–7.09 (m, 1H; ArH), 7.14–7.20 (m, 7H; 7 × ArH), 7.23 (d, J = 9.0 Hz, 1H; ArH) 7.32–7.34 (m, 2H; 2 × ArH), 7.97 (d, J = 7.2 Hz, 1H; ArH); ^{13}C NMR (101 MHz, C_6D_6) δ 55.1 (2 × CH_3), 111.2, 112.9, 114.9, 116.5, 118.5, 122.3, 123.1, 127.2, 128.2, 129.2 (14 × CH), 123.3, 124.3, 132.6, 143.0, 155.0 (6 × ArC); MS (DIP) *m/z* 421 (M^++1, 31), 420 (M^+, 100), 405 (17), 210 (16), 205 (13); HRMS (EI) *m/z* calcd for $C_{28}H_{24}N_2O_2$ 420.1838, found 420.1839.



(*R*)-*N*-Benzyl-3-phenyl-*N*-(1-phenylethyl)indolizin-1-amine (1n). Yellow oil (149 mg, 74%); R_f 0.67 (hexane/EtOAc, 6:4); IR (neat) $\tilde{\upsilon}$ 3060, 3025, 2971, 2817, 1599, 1509, 1492, 1450, 1346, 1301, 1239, 1073, 1027, 737, 695; ^{1}H NMR (400 MHz, $CDCl_3$) δ 1.34 (d, J = 6.7, 3H; CH_3), 3.96–4.14 (m, 2H; CH_2), 4.30 (br s, 1H), 6.33 (br s, 1H; ArH), 6.50 (br s, 1H; ArH), 6.66 (s, 1H; ArH), 7.06–7.10 (m, 1H; ArH), 7.15 (t, J = 7.4, 2H; ArH), 7.23–7.28 (m, 4H; 4 × ArH), 7.35 (t, J = 7.5, 2H; 2 × ArH), 7.41–7.50 (m, 7H; 7 × ArH), 8.13 (br s, 1H; ArH); ^{13}C NMR (101 MHz, $CDCl_3$) δ 19.8 (CH_3), 56.7 (CH_2), 63.4 (CH), 110.6, 111.1, 115.4, 118.2, 121.7, 126.4, 126.8, 127.0, 127.9, 128.0, 128.3, 128.6, 128.9 (20 × ArCH), 122.9, 125.0, 130.1, 132.8, 140.5, 144.6 (6 × ArC); MS (GC) *m/z* 403 (M^++1, 4), 402 (M^+, 12), 298 (24), 297 (100), 193 (19), 91 (22). HRMS (EI) *m/z* calcd for $C_{29}H_{26}N_2$ 402.2096, found 402.2100.

General procedure for the synthesis of the dyes 2 from the indolizines 1

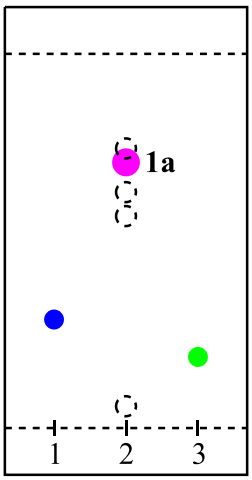
A solution of the starting indolizine **1** (0.5 mmol) in glacial acetic acid (3.0 mL) was stirred for 6–14 h at room temperature (see Table 2). The resulting mixture was neutralised with a saturated solution of sodium bicarbonate and extracted with ethyl acetate (3 × 10 mL). The organic phase was washed with a saturated solution of sodium bicarbonate (3 × 20 mL), followed by decantation and drying with anhydrous magnesium sulfate. The reaction crude obtained after solvent evaporation was purified by column chromatography (silica gel, hexane/ethyl acetate) or submitted to recrystallisation in absolute ethanol to give the corresponding indolizine dyes **2**.

Typical procedure for the one-pot multicomponent synthesis of the dye 2a

Pyridine-2-carbaldehyde (0.5 mmol), dibenzylamine (0.5 mmol), and phenylacetylene (0.5 mmol) were added to a reactor tube containing CuNPs/C (20 mg, *ca.* 0.5 mol%) and dichloromethane (1.0 mL). The reaction mixture was warmed to 70 ºC without the exclusion of air and monitored by TLC and/or GLC until total conversion of the starting materials (*ca.* 10 h). The solvent was removed in vacuo followed by the addition of glacial acetic acid (3.0 mL) and stirring for 6 h at room temperature. The same work-up protocol as in the above general procedure was followed to obtain the pure dye **2a**.

Typical procedure for the multi-gram scale synthesis of the dye 2a

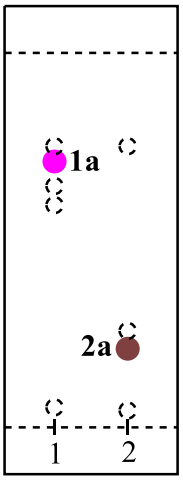
A two-necked 250 mL round-bottom flask equipped with a condenser and a thermometer was charged with pyridine-2-carbaldehyde (20.00 g, 186.70 mmol), dibenzylamine (40.50 g, 205.29 mmol), phenylacetylene (22.88 g, 224.03 mmol) and copper iodide (1.78 g, 9.35 mmol, 5 mol%). The mixture was warmed at 80 ºC; the reaction temperature spontaneously reached 140 ºC after the first 10 min, indicating an exothermic process. The heating can be switched off for a while and switched on again once the temperature of 80 ºC is reached, maintaining the latter overnight (*ca.* 16 h). TLC monitoring confirmed the absence of the starting aldehyde and amine and the presence of **1a**.



- Eluent: hexane/EtOAc 4:1
- UV lamp observation and phosphomolybdic acid development

1- pyridine-2-carbaldehyde
2- reaction sample
3- dibenzylamine

Once the reaction crude temperature was 40–50 ºC, acetic acid (150 mL) was carefully added; magnetic stirring was more difficult if the addition of the acetic acid was carried out at room temperature. Then, the mixture was allowed to reach 25 ºC and stirred for 6 h. Under these conditions, all indolizine **1a** was consumed as confirmed by TLC.



- Eluent: hexane/EtOAc 4:1
- UV lamp observation and phosphomolybdic acid development

1- previous step
2- reaction sample

Ethyl acetate (100 mL) was added to the resulting deep red reaction crude, followed by filtration through a pad of Celite (*ca.* 3 cm thickness) and washing with different portions of EtOAc (400 mL in total). The resulting solution was washed thrice with 2 N NaOH according to the following table:

Washing	**2N NaOH**	**pH**	**Colour of the aqueous phase**
1	400 mL	4	greenish
2	400 mL	5–6	greenish
3	400 mL	13–14	yellow emulsion

The remaining CuI in the organic phase was removed by washing thrice with 400 mL of an aqueous solution of ammonia (100 mL of conc. NH_3 in 300 mL of H_2O).

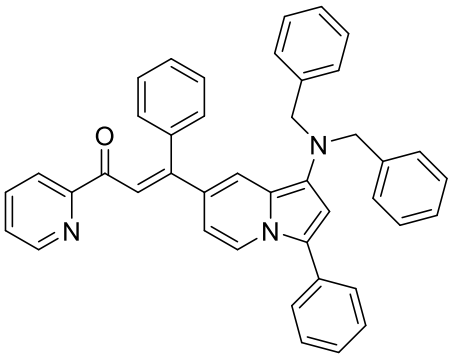
Washing	Aqueous NH_3	Colour of the aqueous phase
1	400 mL	bluish
2	400 mL	slightly bluish
3	400 mL	colourless

Finally, the organic phase was washed with distilled water (2 × 400 mL) and brine (400 mL), dried over $MgSO_4$, filtered and the solvent evaporated to obtain 85.6 g of a tar-like crude. Purification by recrystallisation was performed as follows:

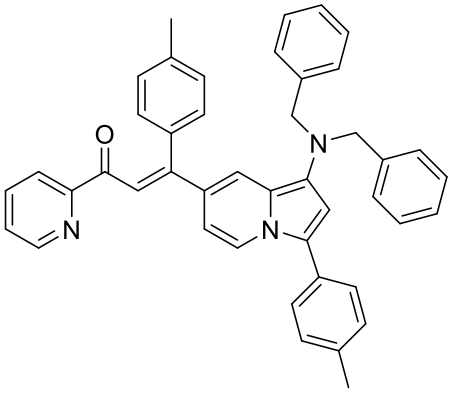
Recrystallisation 1: the aforementioned crude was dissolved in isopropanol (684 mL, 8 volumes) and refluxed (82 ºC internal temperature) until complete dissolution (difficult to observe because of the intense colour, *ca.* 2 h). Then, the mixture was allowed to reach room temperature and stirred at 700 rpm (16 h). The resulting precipitate was filtrated through a Büchner funnel, successively washed with isopropanol (5 × 75 mL) and hexane (2 × 75 mL), and dried in the oven (4 h at 80 ºC) to furnish a red solid (42.87 g). A second crystallisation was applied in order to remove the small amount of dibenzylamine detected by ^{1}H NMR.

Recrystallisation 2: the red solid (42.87 g) was dissolved in isopropanol (250 mL, 6 volumes) and refluxed until complete dissolution (*ca.* 1 h). Then, the mixture was allowed to reach room temperature and stirred at 400 rpm. The resulting precipitate was filtrated through a Büchner funnel, successively washed with isopropanol (3 × 50 mL) and hexane (2 × 50 mL), and dried in the oven (8 h at 80 ºC) to furnish the pure dye **2a** as red solid (39.90 g, 72% yield).

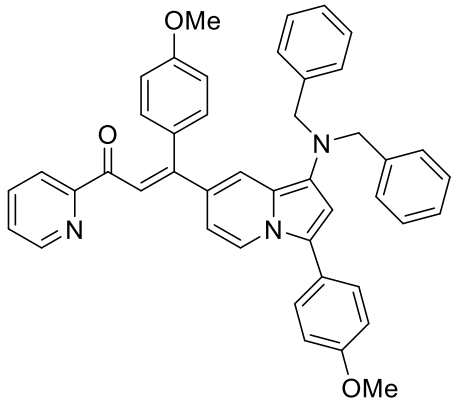
Characterisation of the dyes 2



(*E*)-3-[1-(Dibenzylamino)-3-phenylindolizin-7-yl]-3-phenyl-1-(pyridin-2-yl)prop-2-en-1-one (2a). Orange solid (104 mg, 70%); R_f 0.66 (hexane/EtOAc, 6:4); m.p. 138.9–140.4 ºC (EtOH); IR (neat) $\tilde{\upsilon}$ 3104, 3084, 3055, 3025, 2995, 2833, 1662 (C=O), 1560, 1541, 1490, 1469, 1360, 1207, 1139, 1049, 1026, 993, 873, 799, 747, 738, 695, 682, 661, 618; *NMR data of the major rotamer*: ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.15 (s, 4H; 2 × CH_2), 6.55 (s, 1H; ArH), 6.87 (dd, J = 7.8, 1.8, 1H; ArH), 7.17–7.51 (m, 22H; 22 × ArH), 7.76 (td, J = 7.8, 1.8, 1H; ArH), 7.99 (d, J = 8.1, 1H; ArH), 8.04 (d, J = 7.8, 1H; ArH), 8.12 (s, 1H; CHCO), 8.68 (d, J = 4.8, 1H; ArH); *selected NMR data of the minor rotamer*: ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.19 (s, 4H; 2 × CH_2), 6.35 (dd, J = 7.5, 1.8 Hz, 1H; ArH), 8.65 (d, J = 4.7 Hz, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (101 MHz, $CDCl_3$) δ 58.8, 58.9 (CH_2), 107.9, 108.1, 109.3, 113.8, 115.8, 120.2, 120.3, 121.3, 122.1, 122.5, 122.7, 122.8, 126.3, 126.4, 126.8, 126.9, 127.2, 127.5, 127.8, 127.9, 128.1, 128.2, 128.3, 128.4, 128.9, 129.0, 129.1, 129.2, 129.6, 129.9, 136.9, 148.6, 148.8 (CH), 125.7, 126.0, 126.7, 131.8, 133.4, 139.0, 139.2, 139.4, 142.4, 155.6, 155.8, 156.1, 157.5 (ArC), 188.7, 189.5 (CO); MS (DIP) *m/z* 596 (M^++1, 24), 595 (M^+, 53), 505 (28), 504 (100), 399 (21), 398 (67), 397 (21), 383 (13), 237 (18), 91 (66). Elemental analysis calcd. for $C_{42}H_{33}N_3O$: C 84.68, H 5.58, N 7.05, found: C 84.92, H 5.58, N 7.19.

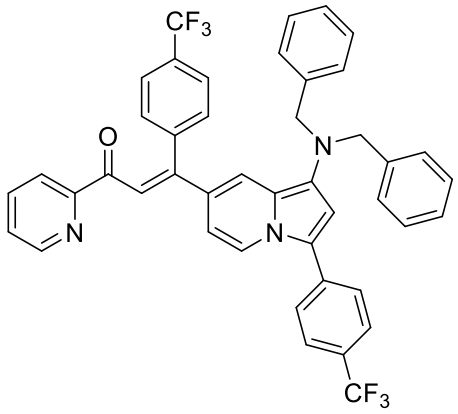


(*E*)-3-[1-(Dibenzylamino)-3-(*p*-tolyl)indolizin-7-yl]-1-(pyridin-2-yl)-3-(*p*-tolyl)prop-2-en-1-one (2b). Orange solid (129 mg, 83%); R_f 0.34 (hexane/EtOAc, 8:2); m.p. 174.3–175.4 ºC (EtOH); IR (neat) $\tilde{\upsilon}$ 3100, 3060, 3026, 2962, 2922, 2826, 1661 (C=O), 1559, 1544, 1507, 1470, 1377, 1361, 1205, 1138, 1047, 1029, 993, 874, 811, 800, 776, 746, 732, 697; *NMR data of the major rotamer*: ^{1}H NMR (400 MHz, $CDCl_3$) δ 2.39, 2.42 (2s, 6H; 2 × CH_3), 4.17 (s, 4H; 2 × CH_2), 6.50 (s, 1H; ArH), 6.84 (dd, J = 7.8, 1.2, 1H; ArH), 7.10–7.26 (m, 16H; 16 × ArH), 7.32–7.40 (m, 4H; 4 × ArH), 7.74 (td, J = 7.8, 1.2, 1H; ArH), 7.95–8.03 (m, 2H; 2 × ArH), 8.08 (s, 1H; CHCO), 8.68 (d, J = 4.8, 1H; ArH); *selected NMR data of the minor rotamer:* ^{1}H NMR (400 MHz, $CDCl_3$) δ 2.38, 2.40 (2s, 6H; 2 × CH_3), 4.19 (s, 4H; 2 × CH_2), 6.34 (dd, J = 7.5, 1.6 Hz, 1H; ArH), 6.51 (s, 1H; ArH), 8.12 (s, 1H; ArH), 8.64 (d, J = 4.2 Hz, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (101 MHz, $CDCl_3$) δ 21.4, 21.5, 21.7 (CH_3), 58.7, 58.9 (CH_2), 107.5, 107.8, 109.4, 113.8, 115.6, 119.3, 120.2, 121.3, 122.1, 122.5, 122.6, 122.7, 126.2, 126.8, 126.9, 127.8, 127.9, 128.2, 128.3, 128.4, 128.9, 129.1, 129.6, 129.7, 129.8, 136.9, 139.9, 148.6, 148.7 (CH), 125.2, 126.0, 126.7, 133.4, 136.3, 137.5, 139.0, 139.2, 155.9, 156.6 (ArC), 188.6, 189.4 (CO); MS (DIP) *m/z* 624 (M^++1, 24), 623 (M^+, 48), 533 (41), 532 (100), 427 (20), 426 (58), 425 (17), 412 (10), 411 (12), 251 (12), 91 (83). Elemental analysis calcd. for $C_{44}H_{37}N_3O$: C 84.72, H 5.98, N 6.74; found: C 84.61, H 6.02, N 6.61.



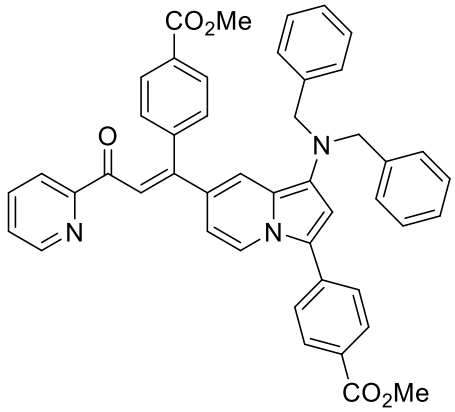
(*E*)-3-[1-(Dibenzylamino)-3-(4-methoxyphenyl)indolizin-7-yl]-3-(4-methoxyphenyl)-1-(pyridin-2-yl)prop-2-en-1-one (2c). Orange solid (123 mg, 75%); R_f 0.43 (hexane/EtOAc, 6:4); m.p. 157.1–158.8 ºC (EtOH); IR (neat) $\tilde{\upsilon}$ 3084, 3065, 3025, 2995, 2927, 2829, 1654 (C=O), 1608, 1556, 1540, 1506, 1469, 1362, 1286, 1249, 1234, 1206, 1175, 1138, 1026, 832, 808, 778, 750, 731, 700; *NMR data of the major rotamer:* ^{1}H NMR (400 MHz, $CDCl_3$) δ 3.84 (s, 6H; 2 × OCH_3), 4.19 (s, 4H; 2 × CH_2), 6.47 (s, 1H; ArH), 6.81 (dd, J = 7.7, 1.8, 1H; ArH), 6.90 (d, 2H; J = 8.8, 2 × ArH), 6.97 (d, 2H; J = 8.8, 2 × ArH), 7.14–7.26 (m, 12H; 12 × ArH), 7.35–7.46 (m, 4H; 4 × ArH), 7.75 (td, J = 7.7, 1.7, 1H; ArH), 8.00 (dd, J =

8.0, 0.8, 1H; ArH), 8.02 (dd, *J* = 8.0, 0.8, 1H; ArH), 8.03 (s, 1H, CHCO), 8.67–8.69 (m, 1H; ArH); *selected NMR data of the minor rotamer:* ^{1}H NMR (400 MHz, $CDCl_3$) δ 3.85 (s, CH_3), 4.20 (CH_2), 6.34 (dd, *J* = 7.5, 1.8 Hz; ArH), 8.65 (d, *J* = 4.7 Hz; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (101 MHz, $CDCl_3$) δ 55.2, 55.5 (CH_3), 58.7, 58.9 (CH_2), 107.2, 107.5, 109.6, 113.5, 113.7, 113.8, 114.4, 114.5, 115.5, 118.2, 120.1, 122.3, 121.1, 122.1, 122.7, 126.2, 126.8, 126.9, 128.1, 128.2, 128.3, 128.4, 129.3, 129.5, 130.8, 131.4, 136.9, 148.6, 148.7 (CH), 124.3, 124.9, 125.8, 126.7, 131.3, 131.9, 133.4, 134.8, 139.0, 139.2, 155.9, 156.1, 156.4, 157.7, 158.9, 159.1, 159.5, 161.1 (ArC), 188.7, 189.1 (CO); MS (DIP) *m/z* 656 (M^++1, 20), 655 (M^+, 42), 565 (41), 564 (100), 459 (13), 458 (37), 443 (19), 91 (100). Elemental analysis calcd. for $C_{44}H_{37}N_3O_3$: C 80.59, H 5.69, N 6.41; found: C 80.14, H 5.68, N 6.43.

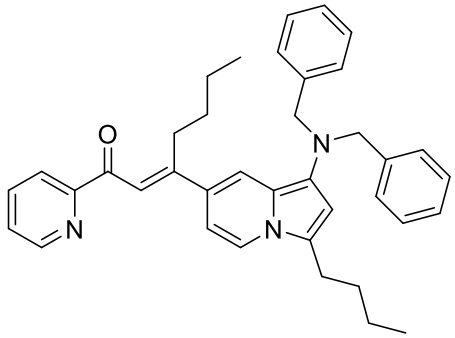


(*E*)-3-{1-(Dibenzylamino)-3-[4-(trifluoromethyl)phenyl]indolizin-7-yl}-1-(pyridin-2-yl)-3-[4-(trifluoromethyl)phenyl]prop-2-en-1-one (2d). Orange solid (91 mg, 50%); R_f 0.37 (hexane/EtOAc, 8:2); m.p. 198.4–200.0 ºC (EtOH); IR (neat) $\tilde{\upsilon}$ 3084, 3065, 3025, 2937, 2829, 1662 (C=O), 1614, 1562, 1512, 1321, 1208, 1164, 1119, 1105, 1065, 1026, 993, 846, 752, 743, 733, 697; *NMR data of the major rotamer*: ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.18 (s, 4H; 2 × CH_2), 6.59 (s, 1H; ArH), 6.90 (dd, *J* = 7.8, 2.0, 1H; ArH), 7.12–7.34 (m, 13H; 13 × ArH), 7.44 (ddd, *J* = 7.5, 4.8, 1.2, 1H; ArH), 7.58–7.72 (m, 6H; 6 × ArH), 7.80 (td, *J* = 7.7, 1.7, 1H; ArH), 7.98 (d, *J* = 7.8, 1H; ArH), 8.07 (d, *J* = 7.5, 1H; ArH), 8.18 (s, 1H; CHCO), 8.70–8.72 (m, 1H; ArH); *selected NMR data of the minor rotamer*: ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.23 (s, 4H, 2 × CH_2), 6.36 (dd, *J* = 7.5, 1.8 Hz, 1H; ArH), 8.21 (s, 1H; ArH), 8.75 (d, *J* = 4.7 Hz, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (101 MHz, $CDCl_3$) δ 58.6, 58.8 (CH_2), 108.2, 109.6, 116.9, 121.4, 122.5, 122.6, 123.2, 123.3, 124.8, 126.7, 127.0, 127.2, 127.3, 127.7, 127.9, 128.1, 128.3, 128.5, 128.7, 128.9, 129.4, 129.9, 137.1, 137.3, 148.7, 149.1 (CH), 124.8, 125.8, 126.5, 134.2, 135.2, 138.7, 138.9, 143.3, 153.9, 155.4 (ArC), 125.2 (q, $^{3}J_{C\text{-}F}$ = 3.3 Hz; *C*HCCF$_3$), 125.9 (q, $^{3}J_{C\text{-}F}$ = 3.7

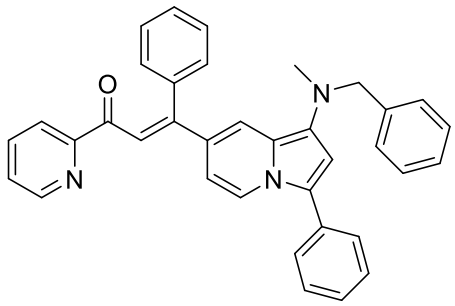
Hz; *C*HCCF$_3$), 126.2 (q, $^3J_{C\text{-}F}$ = 3.3; *C*HCCF$_3$), 188.6, 189.3 (CO); MS (DIP) *m/z* 732 (M^++1, 20), 731 (M^+, 42), 641 (39), 640 (93), 535 (26), 534 (79), 533 (25), 519 (16), 363 (10), 306 (31), 106 (15), 91 (100), 78 (26). Elemental analysis calcd. for $C_{44}H_{31}F_6N_3O$: C 72.22, H 4.27, N 5.74; found: C 72.13, H 4.49, N 5.62.



Methyl (*E*)-4-{1-[1-(dibenzylamino)-3-(4-(methoxycarbonyl)phenyl)indolizin-7-yl]-3-oxo-3-(pyridin-2-yl)prop-1-en-1-yl}benzoate (2e). Deep brown solid (92 mg, 52%); R_f 0.12 (hexane/EtOAc, 8:2); m.p. 199.3–200.0 ºC (EtOH); IR (neat) $\tilde{\upsilon}$ 3053, 3030, 2999, 2949, 2876, 1713 (C=O), 1654 (C=O), 1537, 1272, 1101, 1031, 766, 694; *NMR data of the major rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.94 (s, 3H; CH_3), 3.99 (s, 3H; CH_3), 4.18 (s, 4H; 2 × CH_2), 6.59 (s, 1H; ArH), 6.95 (dd, *J* = 7.8, 1.9 Hz, 1H; ArH), 7.12–7.28 (m, 10H, ArH), 7.43 (ddd, *J* = 7.5, 4.8, 1.2 Hz, 1H; ArH), 7.55 (d, *J* = 8.5 Hz, 2H, ArH), 7.79 (td, *J* = 7.7, 1.7 Hz, 1H; ArH), 7.98 (d, *J* = 7.8 Hz, 1H; ArH), 8.05 (d, *J* = 8.5 Hz, 2H; ArH), 8.04–8.14 (m, 5H; 5 × ArH), 8.13 (d, *J* = 8.0 Hz, 1H; ArH), 8.20 (s, 1H; ArH), 8.70 (dd, *J* = 4.7, 0.7 Hz, 1H; ArH); *selected NMR data of the minor rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.93, 3.97 (2s, 6 H; 2 × CH_3), 4.21 (s, 4H; 2 × CH_2), 6.38 (dd, *J* = 7.5, 1.9 Hz, 1H; ArH), 6.63 (s, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (75 MHz, $CDCl_3$) δ 52.1, 52.2 (CH_3), 58.4, 58.8 (CH_2), 108.6, 109.5, 116.3, 121.6, 122.5, 122.6, 126.5, 127.0, 127.1, 127.9, 128.2, 128.3, 128.4, 128.9, 129.6, 130.3, 130.4, 137.1, 148.7 (CH), 125.2, 125.9, 126.6, 129.4, 134.3, 136.0, 138.6, 144.6, 154.4, 155.4, 166.7, 167.0, 188.3 (ArC); Elemental analysis calcd. for $C_{46}H_{37}N_3O_5$: C 77.62, H 5.24, N 5.90, found C 77.98, H 5.35, N 5.92.

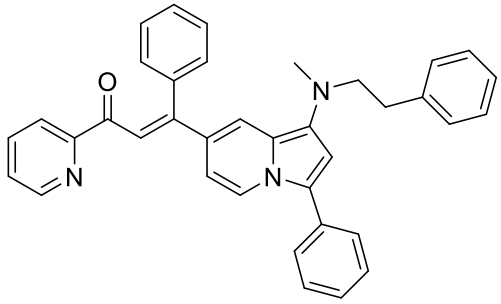


(*E*)-3-[3-Butyl-1-(dibenzylamino)indolizin-7-yl]-1-(pyridin-2-yl)hept-2-en-1-one (2f). Purple semisolid (75 mg, 54%); R_f 0.38 (hexane/EtOAc, 8:2); IR (neat) $\tilde{\upsilon}$ 3027, 2956, 2928, 2870, 1644 (C=O), 1560, 1535, 1494, 1452, 1348, 1214, 1062, 995, 740, 696; ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.93 (t, J = 7.3 Hz, 3H; CH_3), 0.95 (t, J = 7.1 Hz, 3H; CH_3), 1.25–1.69 (m, 8H; 4 × CH_2), 2.71 (br s, 2H; CH_2), 3.12 (br s, 2H; CH_2), 4.30 (s, 4H; 2 × CH_2), 6.31 (s, 1H; ArH), 6.85 (d, J = 7.4 Hz, 1H; ArH), 7.20–7.43 (m, 11H; ArH), 7.41 (ddd, J = 7.5, 4.8, 1.2 Hz, 1H; ArH), 7.78 (s, 1H; ArH), 7.83 (td, J = 7.7, 1.7 Hz, 1H; ArH), 8.00 (s, 1H; ArH), 8.14 (dd, J = 7.9, 0.9 Hz, 1H; ArH), 8.68 (ddd, J = 4.8, 1.7, 0.9 Hz, 1H; ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ 13.9, 14.1 (CH_3), 22.4, 23.3, 25.6, 29.3, 29.6, 32.5, 59.1 (CH_2), 106.2, 108.3, 114.9, 118.2, 120.5, 122.3, 125.9, 126.9, 128.2, 136.8, 148.4 (CH), 124.2, 125.3, 139.2, 156.3, 160.4 (ArC), 189.1 (CO); MS (DIP) *m/z* 556 (M^++1, 25), 555 (M^+, 59), 505 (40), 480 (18), 465 (37), 464 (100), 462 (10), 373 (27), 344 (10), 330 (27), 329 (1), 315 (19), 285 (16), 267 (36), 210 (20), 209 (12), 182 (12), 91 (67), 78 (17). HRMS (EI) *m/z* calcd for $C_{38}H_{41}N_3O$ 555.3250, [M^+–91] 464.2702, found 464.2688.

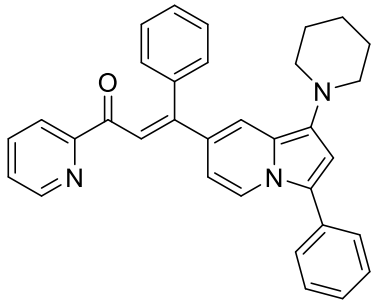


(*E*)-3-{1-[Benzyl(methyl)amino]-3-phenylindolizin-7-yl}-3-phenyl-1-(pyridin-2-yl)prop-2-en-1-one (2g). Orange solid (73 mg, 56%); R_f 0.49 (hexane/EtOAc, 6:4); m.p. 125.6–127.1 ºC (EtOH); IR (neat) $\tilde{\upsilon}$ 3084, 3055, 3025, 2986, 2946, 2808, 2779, 1661 (C=O), 1562, 1540, 1491, 1470, 1450, 1357, 1199, 1030, 770, 753, 697, 675; *NMR data of the major rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 2.67 (s, 3H; CH_3), 4.04 (s, 2H; CH_2), 6.56 (s, 1H; ArH), 6.93 (dd, J = 7.8, 2.0, 1H; ArH), 7.10–7.60 (m, 17H; 17 × ArH), 7.76 (td, J = 7.7, 1.7, 1H; ArH), 7.99 (dt, J = 7.8, 1.1, 1H; ArH), 8.11 (dd, J = 7.7, 0.5, 1H; ArH),

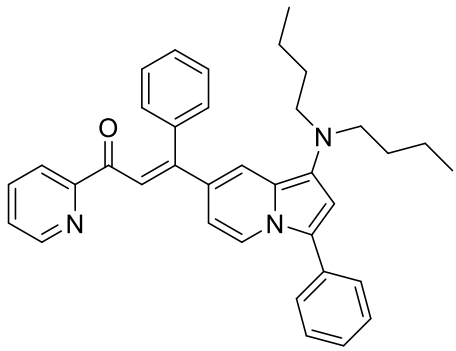
8.16 (s, 1H; ArH), 8.69 (ddd, *J* = 4.8, 1.7, 0.9, 1H; ArH); *selected NMR data of the minor rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 2.71 (s, 2H; CH_2), 4.14 (s, 3H; CH_3), 6.38 (dd, *J* = 7.5, 1.9 Hz, 1H; ArH), 6.61 (s, 1H; ArH), 8.65 (ddd, *J* = 4.8, 1.7, 0.9 Hz, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (75 MHz, $CDCl_3$) δ 41.0, 42.2 (CH_3), 62.5, 62.6 (CH_2), 106.1, 109.4, 113.9, 115.7, 120.0, 120.2, 121.3, 122.2, 122.6, 122.7, 126.3, 126.4, 127.1, 127.2, 127.6, 127.9, 128.0, 128.2, 128.3, 128.4, 128.5, 129.0, 129.2, 129.9, 136.9, 148.6, 148.8 (CH), 124.2, 125.9, 126.3, 131.8, 135.6, 138.6, 139.4, 155.6, 155.8, 156.0, 157.7 (ArC), 188.6, 189.3 (CO); MS (DIP) *m/z* 520 (M^++1, 17), 519 (M^+, 45), 429 (33), 428 (100), 322 (24), 78 (9); Elemental analysis calcd. for $C_{36}H_{29}N_3O$: C 83.21, H 5.63, N 8.09, found C 83.12, H 5.67, N 7.91.



(*E*)-3-{1-[Methyl(phenethyl)amino]-3-phenylindolizin-7-yl}-3-phenyl-1-(pyridin-2-yl)prop-2-en-1-one (2h). Violet semisolid (45 mg, 34%); R_f 0.57 (hexane/EtOAc, 6:4); IR (neat) $\tilde{\upsilon}$ 3056, 3023, 2934, 2840, 2790, 1655 (C=O), 1599, 1534, 1509, 1489, 1472, 1358, 1205, 1048, 1025, 995, 940, 802, 748, 697, 674; *NMR data of the major rotamer*: ^{1}H RMN (300 MHz, $CDCl_3$) δ 2.68–2.74 (m, 2H; C*H*$_2$CH$_2$N), 2.79 (s, 3H; CH_3), 3.13–3.24 (m, 2H; CH_2N), 6.54 (s, 1H; ArH), 6.86 (dd, *J* =7.8, 1.9, 1H; ArH), 7.03–7.61 (m, 17H; 17 × ArH), 7.75 (td, *J* = 7.7, 1.7, 1H; ArH), 8.00 (d, *J* =7.8, 1H; ArH), 8.09 (d, *J* = 7.7, 1H; ArH), 8.14 (s, 1H; ArH), 8.66–8.73 (m, 1H; ArH); *selected NMR data of the minor rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 2.84 (s, 3H; CH_3), 6.38 (dd, *J* =7.5, 1.9 Hz, 1H; ArH), 6.65 (s, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (75 MHz, $CDCl_3$) δ 33.9, 34.0, 59.4, 59.9 (CH_2), 42.3, 43.4 (CH_3), 106.0, 106.5, 109.5, 113.9, 115.9, 119.9, 120.2, 121.3, 122.0, 122.6, 122.7, 125.9, 126.1, 126.2, 126.4, 127.6, 127.8, 127.9, 128.2, 128.3, 128.4, 128.8, 129.0, 129.1, 129.2, 129.7, 129.8, 136.9, 148.6, 148.7, 148.9 (CH), 124.2, 126.0, 126.3, 131.8, 134.6, 139.4, 139.9, 140.2, 155.8, 156.1 (ArC), 188.6, 189.0 (CO); MS *m/z* 534 (M^++1, 20), 533 (M^+, 51), 443 (35), 442 (100), 427 (11), 206 (11), 78 (7); Elemental analysis calcd. for $C_{37}H_{31}N_3O$: C 83.27, H 5.86, N 7.87, found C 83.75, H 5.56, N 7.79.

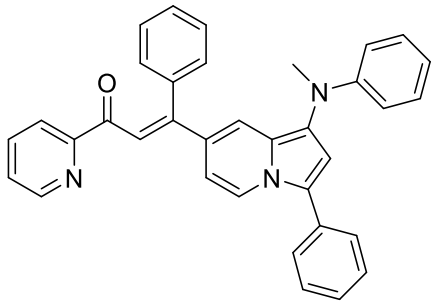


(*E*)-3-{1-[Methyl(phenethyl)amino]-3-phenylindolizin-7-yl}-3-phenyl-1-(pyridin-2-yl)prop-2-en-1-one (2i). Orange solid (27 mg, 22%); R_f 0.60 (hexane/EtOAc, 6:4); m.p. 137.1–139.9 ºC (EtOH); IR (neat) $\tilde{\upsilon}$ 3055, 2928, 2848, 1655 (C=O), 1557, 1472, 1464, 1378, 1343, 1203, 1048, 1024, 994, 762, 697; *NMR data of the major rotamer*: ^{1}H RMN (300 MHz, $CDCl_3$) δ 1.46–1.56 (m, 2H; C*H*$_2$CH$_2$CH$_2$N), 1.58–1.73 (m, 4H; 2 × C*H*$_2$CH$_2$N), 2.93 (s, 4H; 2 × CH$_2$N), 6.56 (s, 1H; ArH), 6.84 (dd, *J* = 7.7, 1.8, 1H; ArH), 7.25–7.60 (m, 12H; 12 × ArH), 7.78 (dd, *J* = 7.7, 1.7, 1H; ArH), 8.00 (dt, *J* = 7.9, 1.0, 1H; ArH), 8.06–8.13 (m, 1H; ArH), 8.16 (s, 1H; CHCO), 8.69 (ddd, *J* = 4.8, 1.7, 0.8, 1H; ArH); *selected NMR data of the minor rotamer*: ^{1}H RMN (300 MHz, $CDCl_3$) δ 6.33 (dd, *J* = 7.8 Hz, 1H; ArH), 6.62 (s, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (75 MHz, $CDCl_3$) δ 24.4, 26.1, 29.8, 54.7 (CH_2), 106.0, 109.6, 115.9, 121.3, 122.2, 122.6, 122.7, 126.3, 126.4, 126.5, 127.5, 127.6, 127.8, 127.9, 128.1, 128.4, 128.7, 129.0, 129.1, 129.2, 129.6, 129.7, 136.9, 148.6, 148.8 (CH), 131.9, 136.1, 139.5, 155.6, 155.8, 156.2 (ArC), 188.7 (CO); MS *m/z* 484 (M^++1, 40), 483 (M^+, 100), 413 (5), 377 (7), 242 (6), 227 (5), 78 (5); Elemental analysis calcd. for $C_{33}H_{29}N_3O$: C 81.96, H 6.04, N 8.69, found C 81.66, H 6.15, N 8.80.

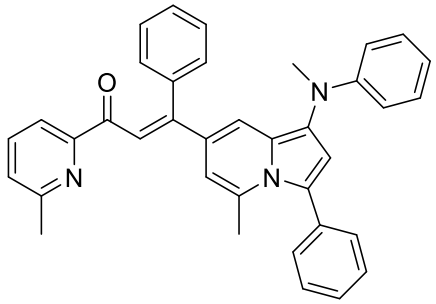


(*E*)-3-[1-(Dibutylamino)-3-phenylindolizin-7-yl]-3-phenyl-1-(pyridin-2-yl)prop-2-en-1-one (2j). Violet semisolid (30 mg, 23%); R_f 0.71 (hexane/EtOAc, 6:4); IR (neat) $\tilde{\upsilon}$ 3060, 2956, 2929, 2869, 1671 (C=O), 1625, 1596, 1561, 1516, 1489, 1466, 1363, 1298, 1272, 1241, 1206, 1048, 1025, 994, 921, 767, 697; *NMR data of the major rotamer*: ^{1}H NMR (400 MHz, $CDCl_3$) δ 0.84 (t, *J* = 7.3, 6H; 2 × CH$_3$), 1.11–1.24 (m, 4H; 2 × C*H*$_2$CH$_2$CH$_2$N), 1.29–1.45 (m, 4H; 2 × C*H*$_2$CH$_2$N), 2.93 (t, *J* = 7.5, 4H; 2 × CH$_2$N), 6.51 (s, 1H; ArH), 6.88

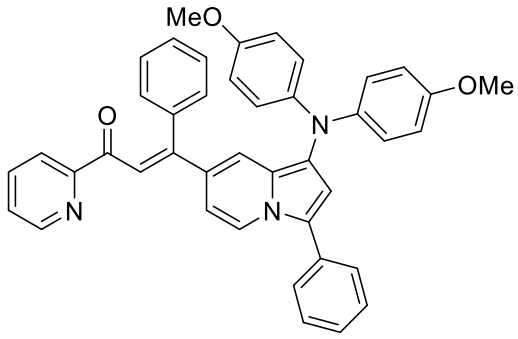
(dd, *J* = 7.8, 2.0, 1H; ArH), 7.19–7.63 (m, 12H; 12 × ArH), 7.73–7.80 (m, 1H; ArH), 8.00 (dt, *J* = 7.9, 1.1, 1H; ArH), 8.07 (d, *J* = 7.8, 1H; ArH), 8.13 (s, 1H; ArH), 8.69 (ddd, *J* = 4.8, 1.7, 0.9, 1H; ArH); *NMR data of the minor rotamer:* ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.40 (d, *J* = 6.9 Hz, 1H; ArH), 6.62 (s, 1H; ArH), 8.16 (dd, *J* = 7.9, 0.9 Hz, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (101 MHz, $CDCl_3$) δ 14.2 (CH_3), 20.4, 20.5, 30.3, 55.3, 56.1 (CH_2), 93.7, 106.7, 109.2, 115.5, 121.3, 122.2, 122.6, 122.7, 123.3, 126.2, 126.4, 126.5, 126.6, 127.5, 127.6, 127.9, 128.2, 128.4, 128.7, 129.0, 129.1, 129.6, 129.7, 130.1, 132.8, 136.9, 137.2, 148.6, 148.8, 149.4 (CH), 125.4, 126.1, 126.3, 131.9, 134.2, 139.6, 149.9, 155.9, 156.3 (ArC), 188.5 (CO); MS (DIP) *m/z* 528 (M^++1, 41), 527 (M^+, 100), 470 (14), 442 (11), 427 (11), 322 (11), 321 (12), 206 (10), 78 (7); Elemental analysis calcd. for $C_{36}H_{37}N_3O$: C 81.94, H 7.07, N 7.96, found C 81.67, H 6.96, N 7.87.



(*E*)-3-{1-[Methyl(phenyl)amino]-3-phenylindolizin-7-yl}-3-phenyl-1-(pyridin-2-yl)prop-2-en-1-one (2k). Purple solid (95 mg, 75%); R_f 0.28 (hexane/EtOAc, 3:7); m.p. 125.6–128.8 ºC (EtOH); IR (neat) $\tilde{\upsilon}$ 3060, 3049, 2994, 2870, 1662 (C=O), 1596, 1492, 1212, 1025, 748, 693; *NMR data of the major rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.28 (s, 3H; CH_3), 6.78 (d, *J* = 8.1 Hz, 2H; 2 × ArH), 6.81 (s, 1H; ArH), 6.86 (dd, *J* = 7.7, 2.0 Hz, 1H; ArH), 7.09–7.24 (m, 5H; 5 × ArH), 7.34–7.54 (m, 8H; 8 × ArH), 7.61 (m, 2H; 2× ArH), 7.78 (td, *J* = 7.8, 1.7 Hz, 1H; ArH), 8.00 (dt, *J* = 7.9, 1.0 Hz, 1H; ArH), 8.11 (s, 1H; ArH), 8.24 (dd, *J* = 7.7, 0.6 Hz, 1H; ArH), 8.71 (ddd, *J* = 4.7, 1.7, 0.9 Hz, 1H; ArH); *selected NMR data of the minor rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.28 (s, 3H; CH_3), 6.45 (dd, *J* = 7.4, 1.9 Hz, 1H; ArH), 8.03 (dt, *J* = 7.9, 1.1 Hz, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (75 MHz, $CDCl_3$) δ 40.9 (CH_3), 110.2, 112.5, 113.4, 113.9, 114.1, 117.1, 117.8, 118.1, 120.0, 120.5, 121.1, 121.9, 122.5, 122.7, 122.8, 126.5, 126.6, 127.5, 127.8, 128.0, 128.1, 128.2, 128.4, 128.8, 128.9, 129.1, 129.2, 129.5, 129.8, 136.9 (CH), 126.2, 127.7, 127.8, 129.1, 131.7, 132.1, 138.9, 141.8, 148.7, 148.8, 149.7, 155.6, 155.9 (ArC), 189.2, 189.7 (CO); MS (DIP) *m/z* 506 (M^++1, 39), 505 (M^+, 100), 491 (12), 490 (29), 252 (11), 230 (12), 78 (12), 77 (13); Elemental analysis calcd. for $C_{35}H_{27}N_3O$: C 82.14, H 5.38, N 8.31, found C 82.31, H 5.49, N 8.08.

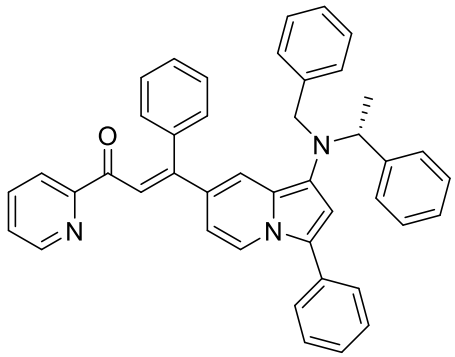


(*E*)-3-{5-Methyl-1-[methyl(phenyl)amino]-3-phenylindolizin-7-yl}-1-(6-methylpyridin-2-yl)-3-phenylprop-2-en-1-one (2l). Purple solid (33 mg, 25%); R_f 0.22 (hexane/EtOAc, 8:2); m.p. 127.1–134.9 ºC; IR (neat) $\tilde{\upsilon}$ 3050, 2915, 2869, 1652 (C=O), 1543, 1496, 1293, 1267, 1049, 772, 748, 694; *NMR data of the major rotamer:* ^{1}H NMR (300 MHz, $CDCl_3$) δ 2.15 (s, 3H; CH_3), 2.62 (s, 3H; CH_3), 3.26 (s, 3H; CH_3), 6.56 (s, 1H; ArH), 6.65 (s, 1H; ArH), 6.73 (d, J = 8.7 Hz, 2H; 2 × ArH), 7.03–7.25 (m, 7H; 7 × ArH), 7.30–7.50 (m, 8H; 8 × ArH), 7.63 (t, J = 7.7 Hz, 1H; ArH), 7.66 (d, J = 7.0 Hz, 1H; ArH), 8.05 (s, 1H; ArH); *NMR data of the minor rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 2.08, 2.58, 3.26 (3s, 9H; 3 × CH_3), 6.19 (s, 1H; ArH), 6.62 (s, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (75 MHz, $CDCl_3$) δ 23.0, 23.2, 24.5, 24.6, 40.8, 40.9 (CH_3), 111.4, 113.3, 113.9, 114.9, 115.2, 115.4, 116.7, 117.5, 117.9, 118.3, 118.4, 119.8, 119.9, 121.7, 126.1, 127.1, 127.3, 127.6, 127.9, 128.0, 128.1, 128.2, 128.8, 128.9, 129.3, 129.5, 129.6, 130.9, 131.1, 137.0 (CH), 124.7, 126.7, 127.2, 129.1, 129.2, 129.4, 134.3, 135.0, 135.4, 139.1, 149.8, 155.0, 155.1, 155.8, 156.4, 157.6 (ArC), 189.6 (CO); MS (DIP) *m/z* 534 (M^++1, 40), 533 (M^+, 100), 518 (12), 416 (10), 397 (6), 266 (11), 251 (12), 92 (21); Elemental analysis calcd. for $C_{37}H_{31}N_3O$: C 83.27, H 5.86, N 7.87, found C 83.41, H 5.72, N 7.88.



(*E*)-3-{1-[Bis(4-methoxyphenyl)amino]-3-phenylindolizin-7-yl}-3-phenyl-1-(pyridin-2-yl)prop-2-en-1-one (2m). Deep blue solid (114 mg, 73%); R_f 0.58 (hexane/EtOAc, 6:4); m.p. 95.3–96.7 ºC (EtOH); IR (neat) $\tilde{\upsilon}$ 3054, 2953, 2927, 2854, 2833, 1656 (C=O), 1599, 1500, 1467, 1235, 1027, 823, 730, 697; *NMR data of the major rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.78 (s, 6H; 2 × CH_3), 6.65–6.74 (m, 5H; 5 × ArH), 6.86–7.02 (m, 7H; 7 ×

ArH), 7.25–7.41 (m, 6H; 6 × ArH), 7.47 (t, *J* = 7.5 Hz, 2H; 2 × ArH), 7.55–7.60 (m, 2H; 2 × ArH), 7.71–7.83 (m, 1H; ArH), 7.95 (d, *J* = 7.9 Hz, 1H; ArH), 8.05 (s, 1H; ArH), 8.17 (d, *J* = 7.7 Hz, 1H; ArH), 8.67 (dd, *J* = 4.7, 0.7 Hz, 1H; ArH); *selected NMR data of the minor rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.73 (s, 3H; CH_3), 6.42 (dd, *J* = 7.5, 1.6 Hz, 1H; ArH), 8.01 (d, *J* = 7.9 Hz, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (75 MHz, $CDCl_3$) δ 55.6 (CH_3), 109.4, 111.7, 114.4, 114.5, 116.9, 121.8, 122.4, 122.7, 122.8, 123.3, 126.3, 126.5, 127.6, 127.7, 127.9, 128.1, 128.3, 128.8, 129.1, 129.2, 129.6, 136.9, 137.0, 148.6 (CH), 126.4, 127.8, 131.6, 138.8, 141.7, 154.7, 155.6, 155.7 (ArC), 188.9 (CO); MS (DIP) *m/z* 628 (M^++1, 44), 627 (M^+, 100), 313 (30), 299 (9), 78 (6); Elemental analysis calcd. for $C_{42}H_{33}N_3O_3$: C 84.36, H 5.30, N 6.69, found C 84.61, H 5.69, N 6.79.



(*E*)-3-{5-Methyl-1-[methyl(phenyl)amino]-3-phenylindolizin-7-yl}-1-(6-methylpyridin-2-yl)-3-phenylprop-2-en-1-one (2n). Red solid (116 mg, 74%); R_f 0.58 (hexane/EtOAc, 6:4); m.p. 132.7–133.8 ºC (EtOH); IR (neat) $\tilde{\upsilon}$ 3054, 2953, 2927, 2854, 2833, 1656 (C=O), 1599, 1500, 1467, 1235, 1027, 823, 730, 697; *NMR data of the major rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.27 (d, *J* = 6.8 Hz, 3H; CH_3), 3.89, 4.03 (AB system, *J* = 14.2 Hz, 2H; CH_2), 4.25 (q, *J* = 6.5 Hz, 1H; C*H*CH_3), 6.63 (s, 1H; ArH), 6.90 (dd, *J* = 7.7, 1.9 Hz, 1H; ArH), 7.07–7.53 (m, 21H; 21 × ArH), 7.79 (td, *J* = 7.7, 1.9 Hz, 1H; ArH), 8.01 (d, *J* = 7.8 Hz, 1H; ArH), 8.08 (d, *J* = 7.8 Hz, 1H; ArH), 8.15 (s, 1H; ArH), 8.70 (ddd, *J* = 4.7, 1.5, 0.8 Hz, 1H; ArH); *selected NMR data of the minor rotamer*: ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.32 (d, *J* = 6.8 Hz, 3H; CH_3), 3.94, 4.08 (AB system, *J* = 14.2 Hz, 2H; CH_2), 6.34 (dd, *J* = 7.4, 1.9 Hz, 1H; ArH), 6.60 (s, 1H; ArH), 7.77 (s, 1H; ArH), 8.68 (ddd, *J* = 4.7, 1.5, 0.8 Hz, 1H; ArH); *NMR data of the mixture of rotamers*: ^{13}C NMR (75 MHz, $CDCl_3$) δ 18.6, 19.3 (CH_3), 55.4, 56.0 (CH_2), 63.3, 109.2, 111.3, 111.4, 113.6, 116.4, 120.4, 120.8, 121.4, 121.6, 122.3, 122.7, 122.8, 126.4, 126.5, 126.9, 127.0, 127.4, 127.8, 127.9, 128.0, 128.1, 128.2, 128.3, 128.4, 128.9, 129.1, 129.2, 137.0, 148.7, 148.8 (CH), 126.0, 126.2, 127.7, 129.5, 129.6, 129.7, 130.4, 132.0, 139.6, 140.0, 140.2, 142.2, 143.8, 143.9, 155.6, 155.8, 156.0 (ArC), 188.8, 189.8 (CO); MS (DIP) *m/z* 628 (M^++1, 44), 627 (M^+, 100), 313 (30), 299 (9),

78 (6); Elemental analysis calcd. for $C_{43}H_{35}N_3O$: C 84.07, H 5.79, N 6.89, found C 84.17, H 5.92, N 6.79.

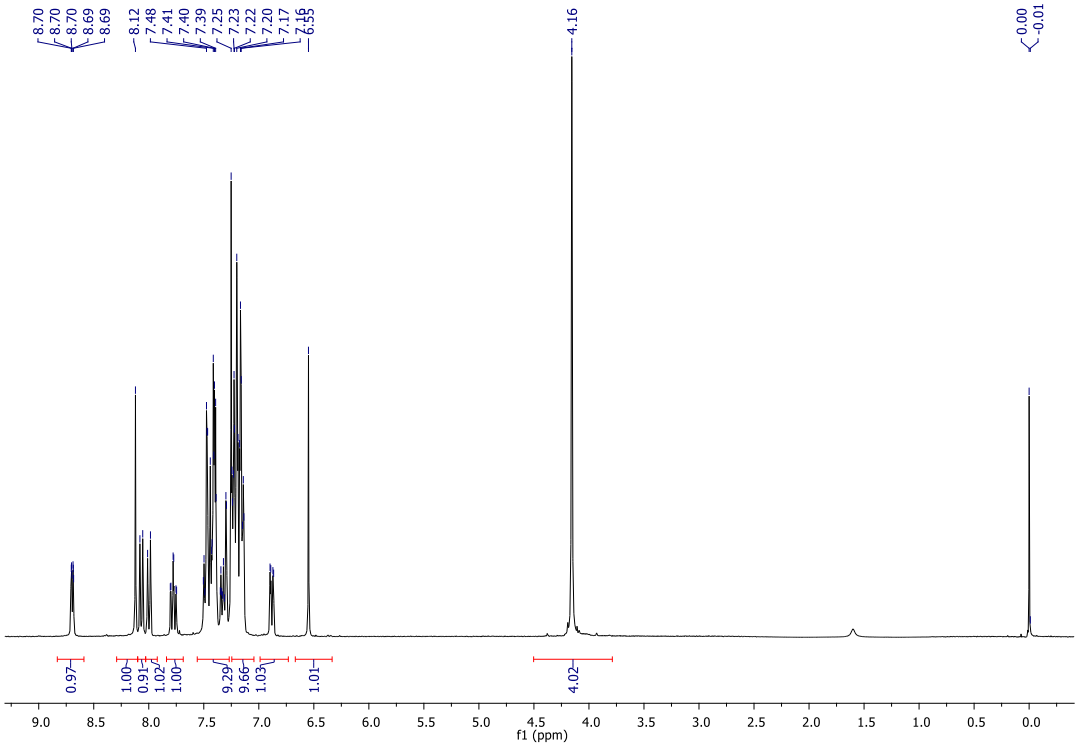


Figure S1. ^{1}H NMR spectrum of the pure rotamer **A** of the dye **2a** (solid **2a** was dissolved in $CDCl_3$ just before running the NMR experiment).

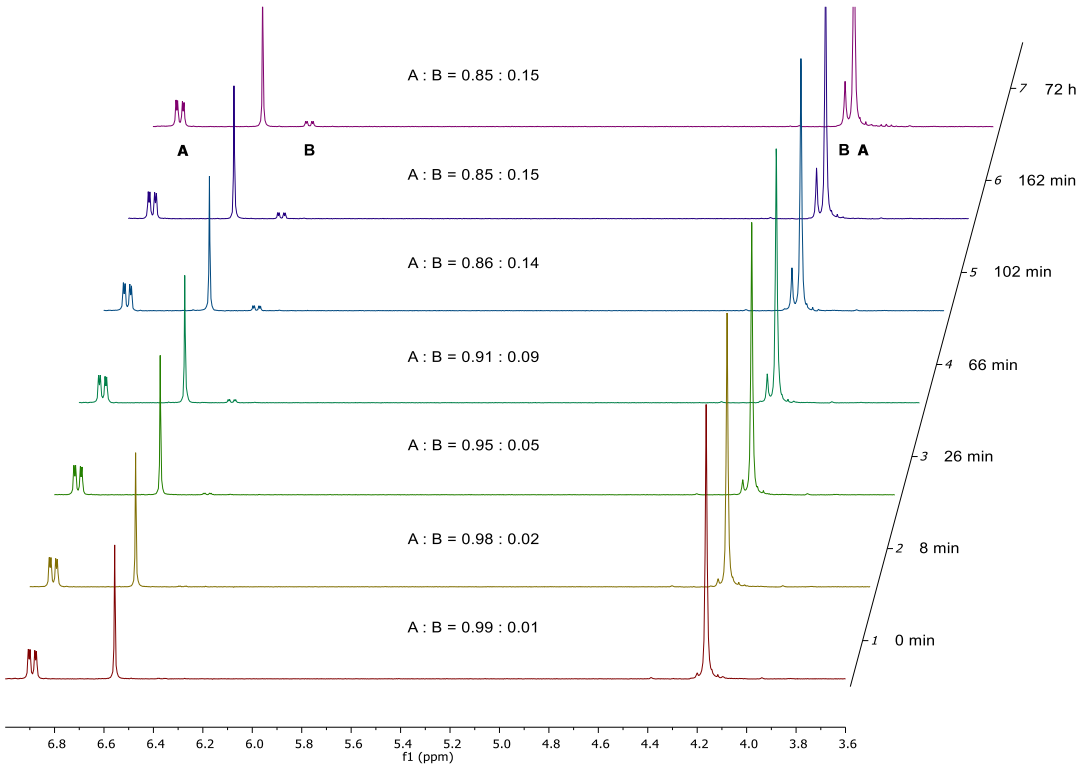


Figure S2. In-situ ^{1}H NMR analysis of the rotamer **A** of the dye **2a** in $CDCl_3$.

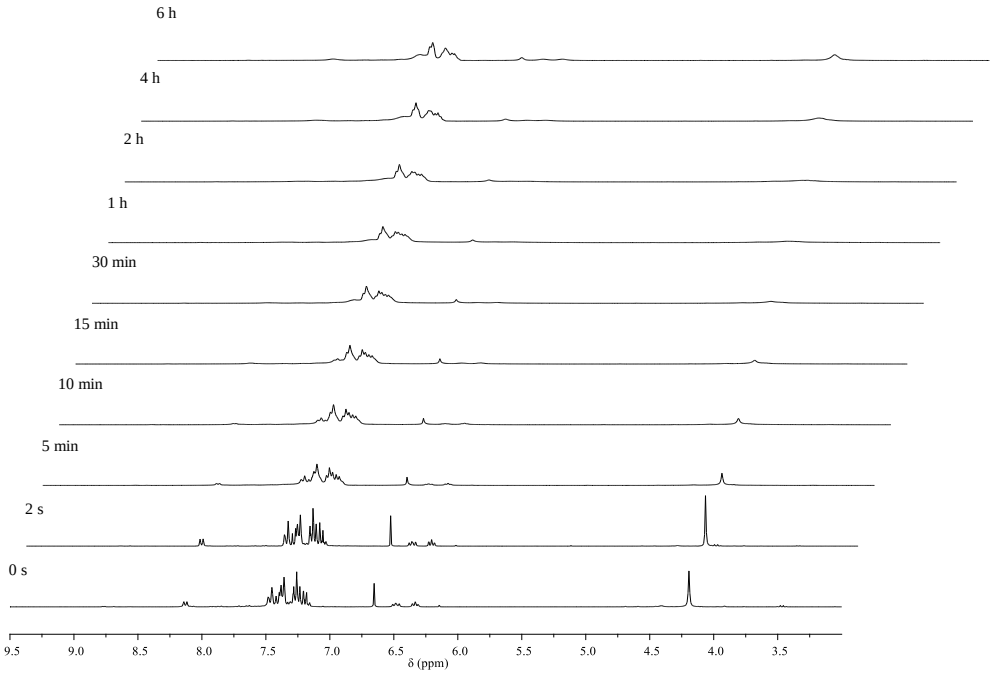


Figure S3. In-situ ^{1}H RMN analysis of the indolizine **1a** in $CDCl_3$ after the addition of 20 equiv. of CD_3CO_2D.

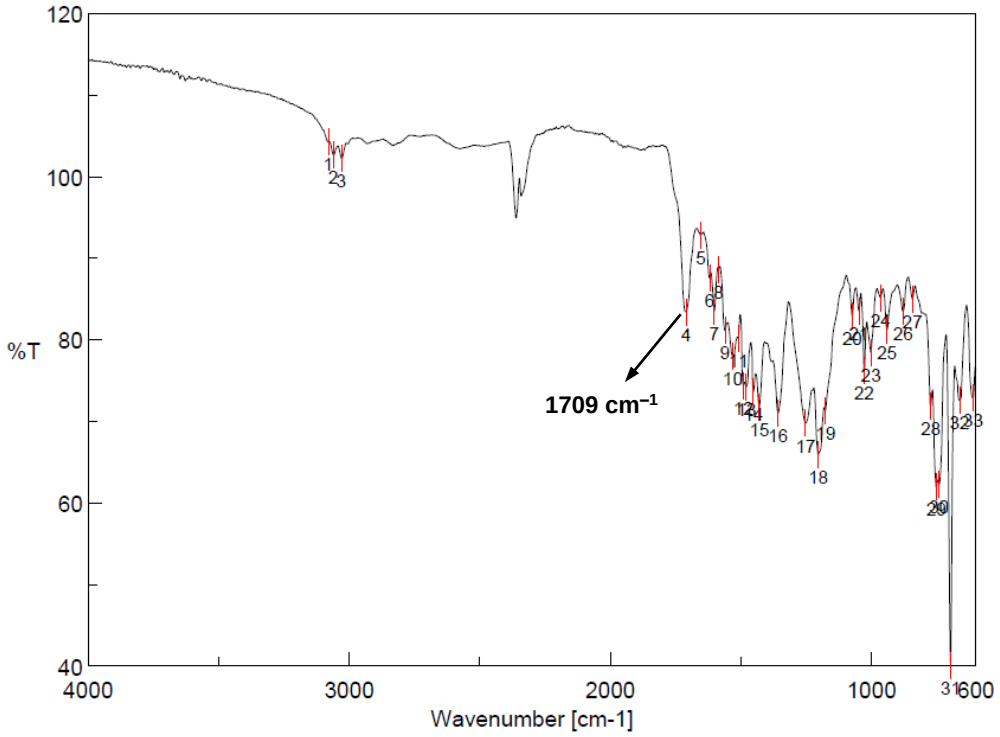


Figure S4. IR spectrum of a sample obtained after treatment of **1a** with HOAc, followed by acid evaporation, which supports the participation of an intermediate of the type **3a**.

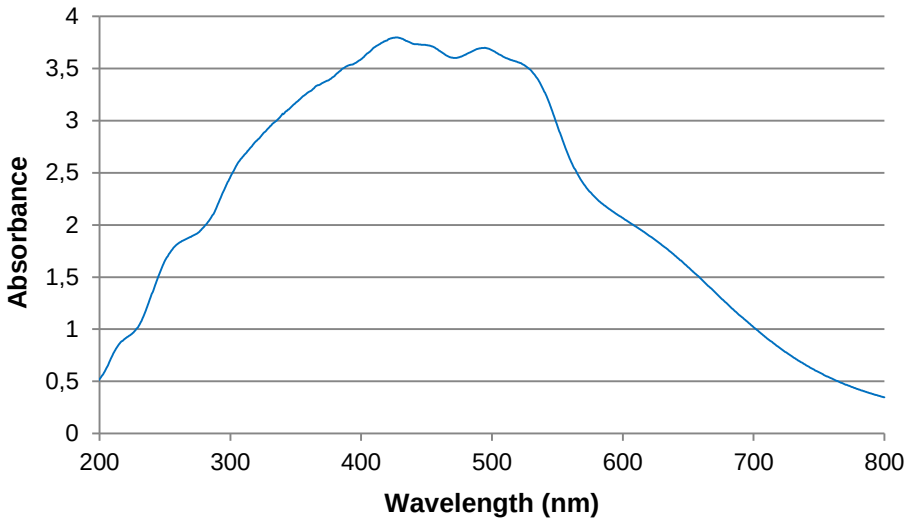


Figure S5. UV-Vis spectrum of solid **2a** as obtained after crystallisation.

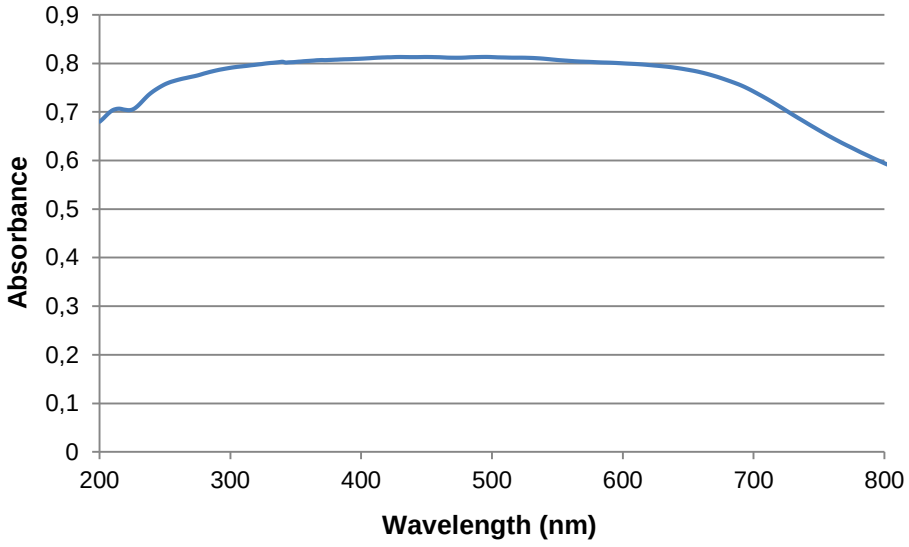


Figure S6. UV-Vis spectrum of solid **2a** after being ground.

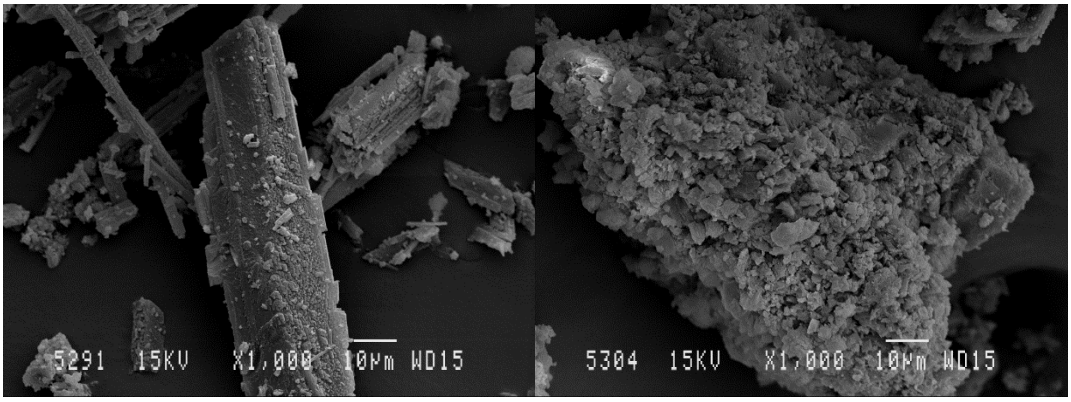


Figure S7. SEM images of solid **2a** as obtained after crystallisation (left) and after being ground (right).

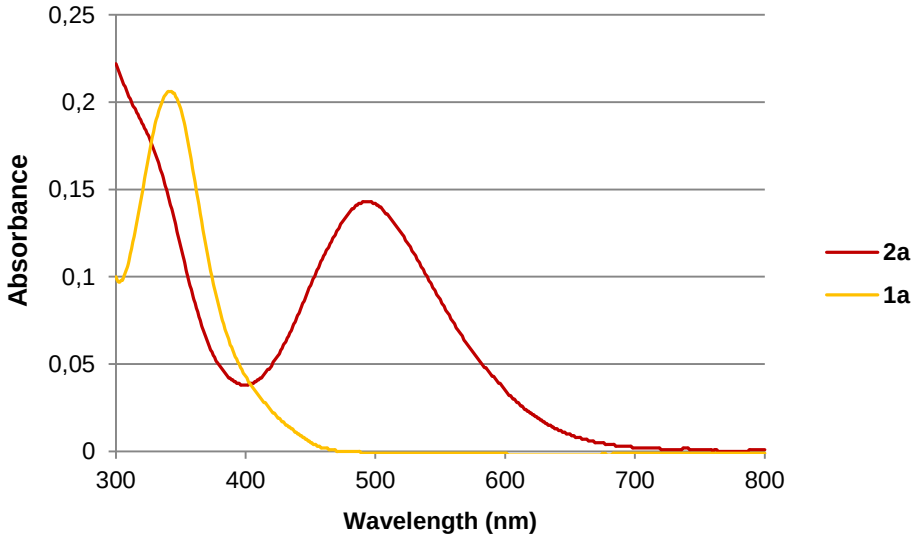


Figure S8. UV-Vis absorption spectra of **1a** and **2a** in MeCN (2.0×10^{-5} M).

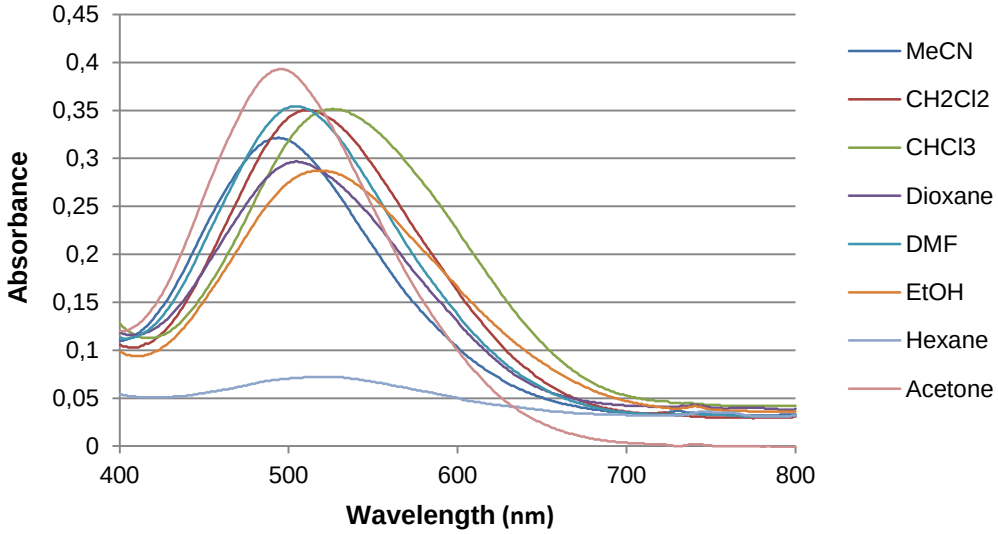


Figure S9. Visible absorption spectra of **2a** in different solvents (2.0×10^{-5} M).

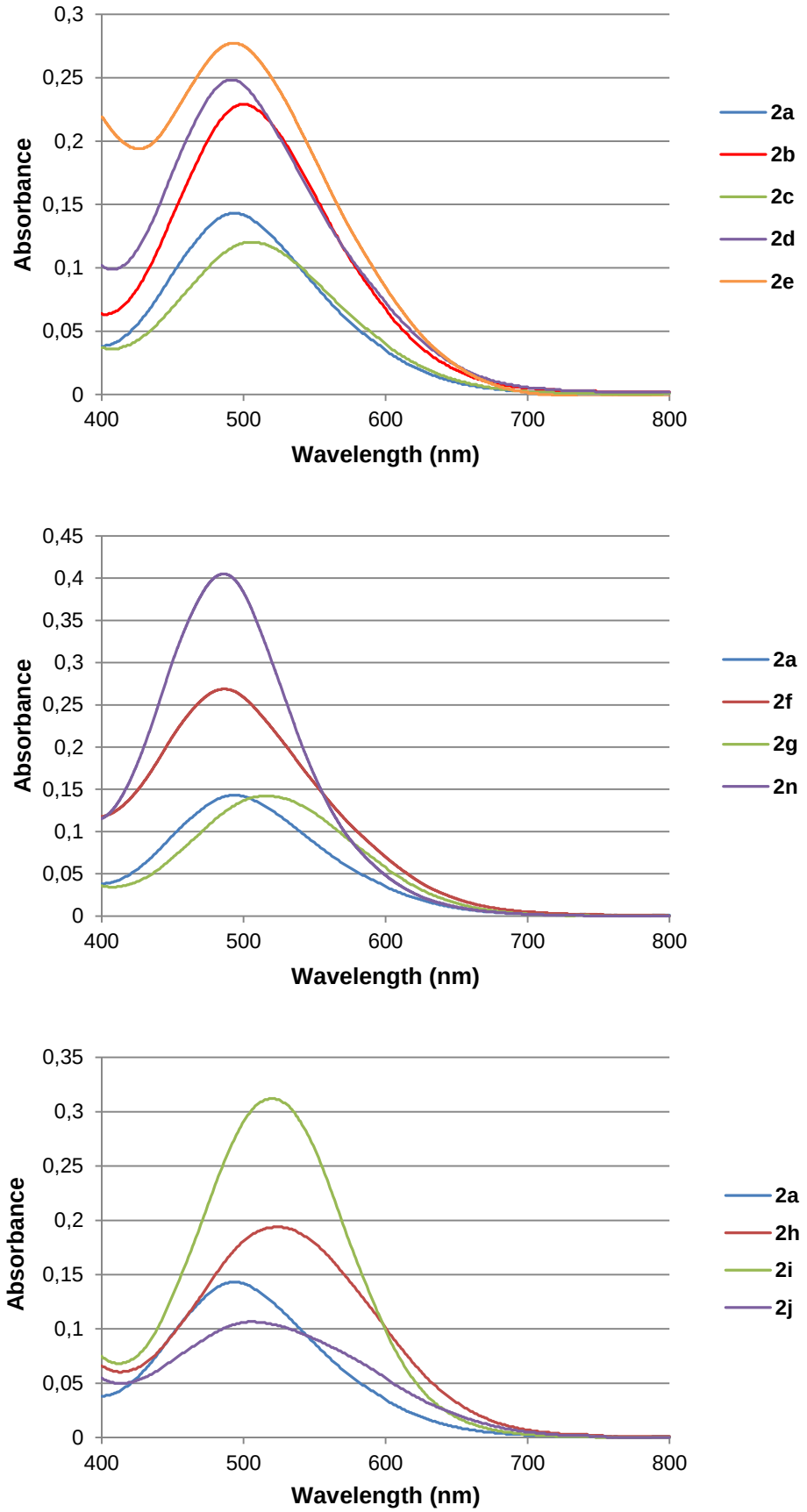


Figure S10. Visible absorption spectra of the dyes **2a-2j** and **2n** in MeCN (2.0×10^{-5} M).

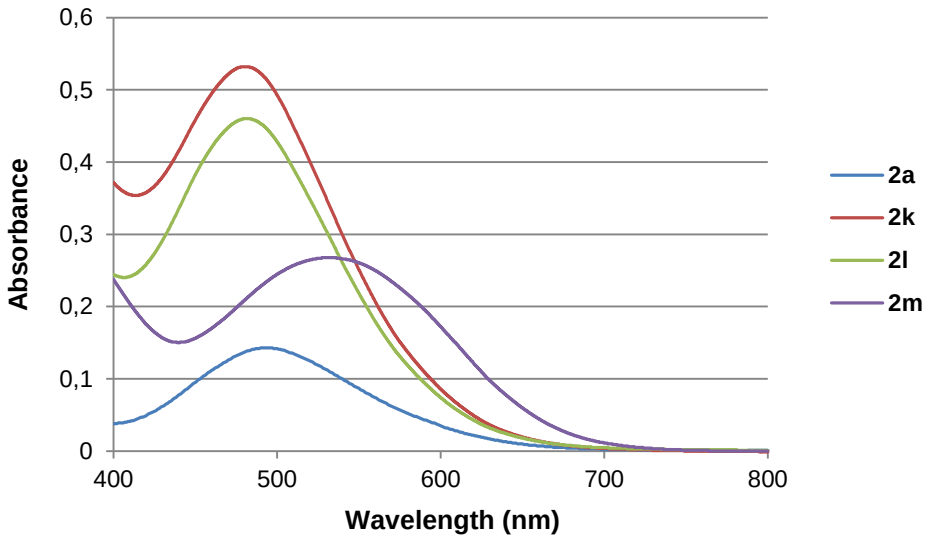
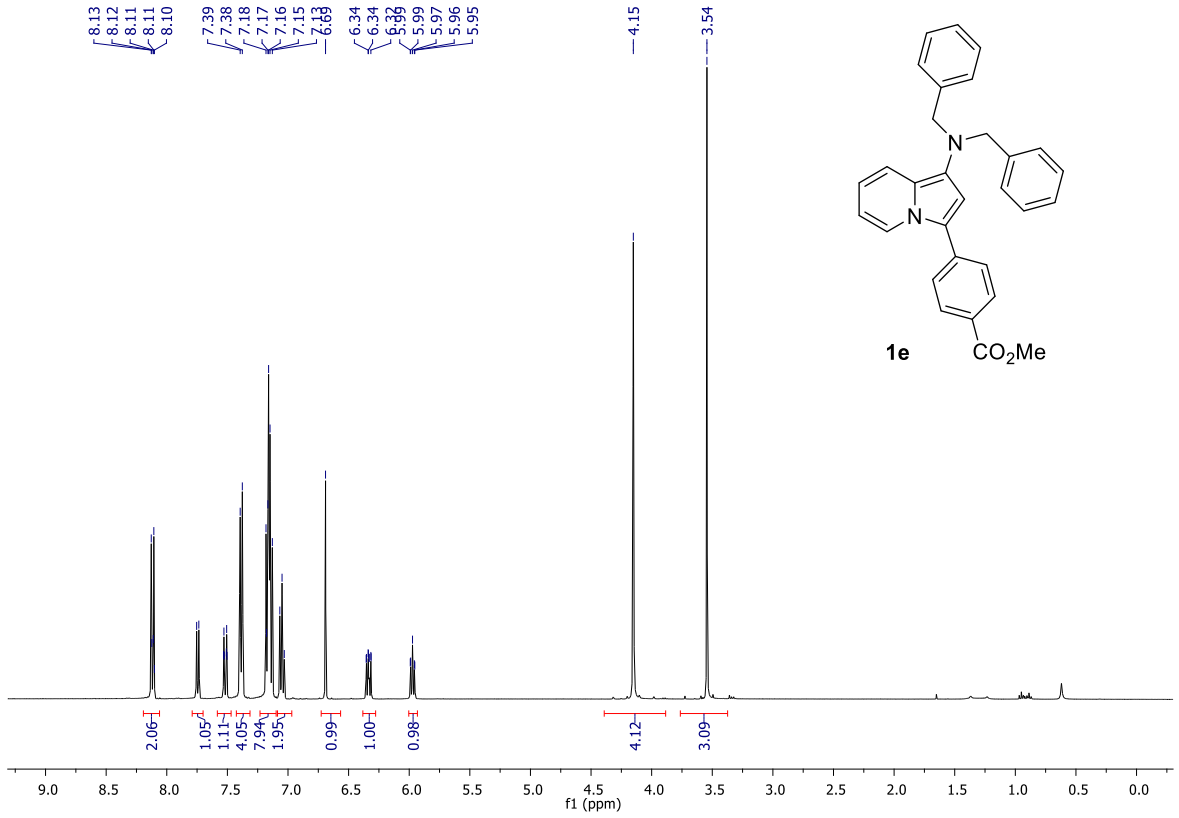


Figure S11. Visible absorption spectra of the dyes **2a** and **2k**-**2m** in MeCN (2.0×10^{-5} M).

Procedure for the injection of 2a into plastics

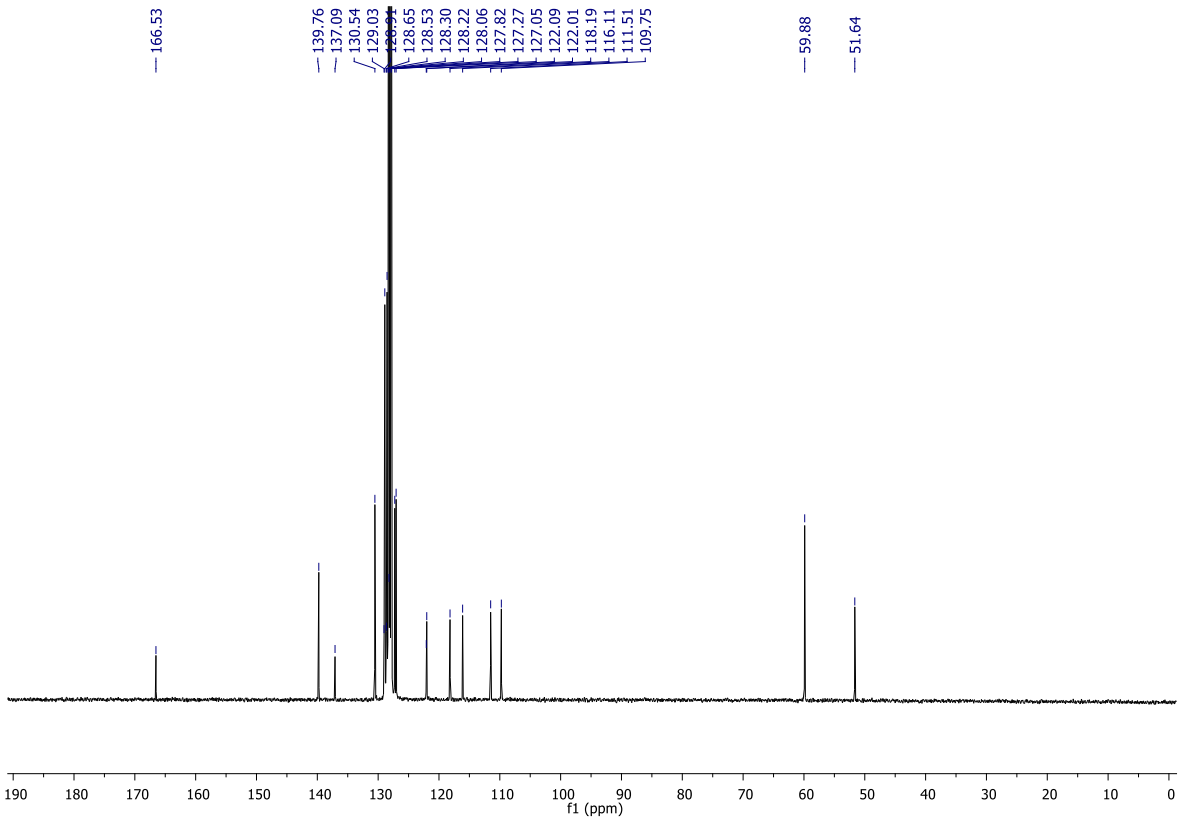
The injection of **2a** into plastics was carried out at Colotech Química S.L. (Ibi, Alicante, Spain). The dye **2a** (0.2 wt%) was injected into high-impact polystyrene SB (HIPS, Total 6540) using a BOY 22D machine at 220 ºC in the absence or presence of TiO_2 (0.5 wt%). The same machine was used to inject **2a** (0.05 wt%) into polypropylene homopolymer (PP) at 200 ºC.

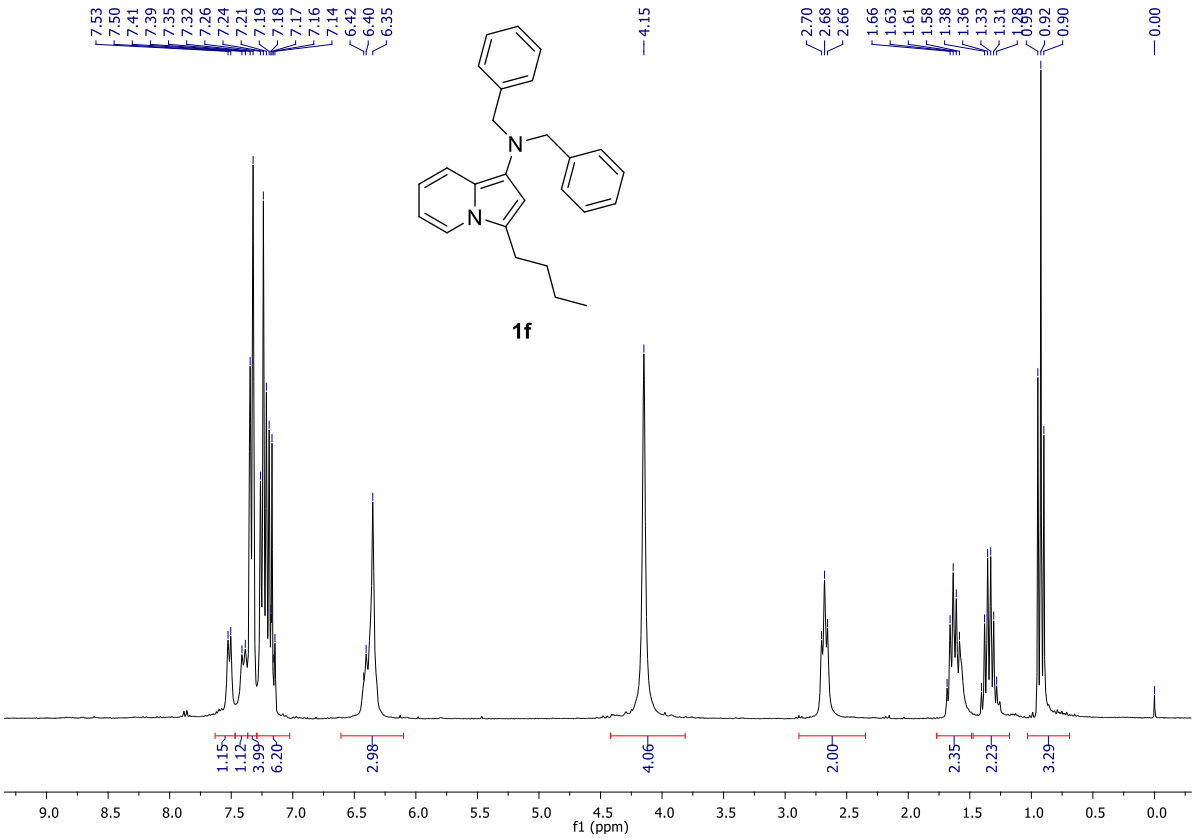
NMR spectra of the indolizines 1



^{1}H NMR (400 MHz, C_6D_6)

^{13}C NMR (101 MHz, C_6D_6)

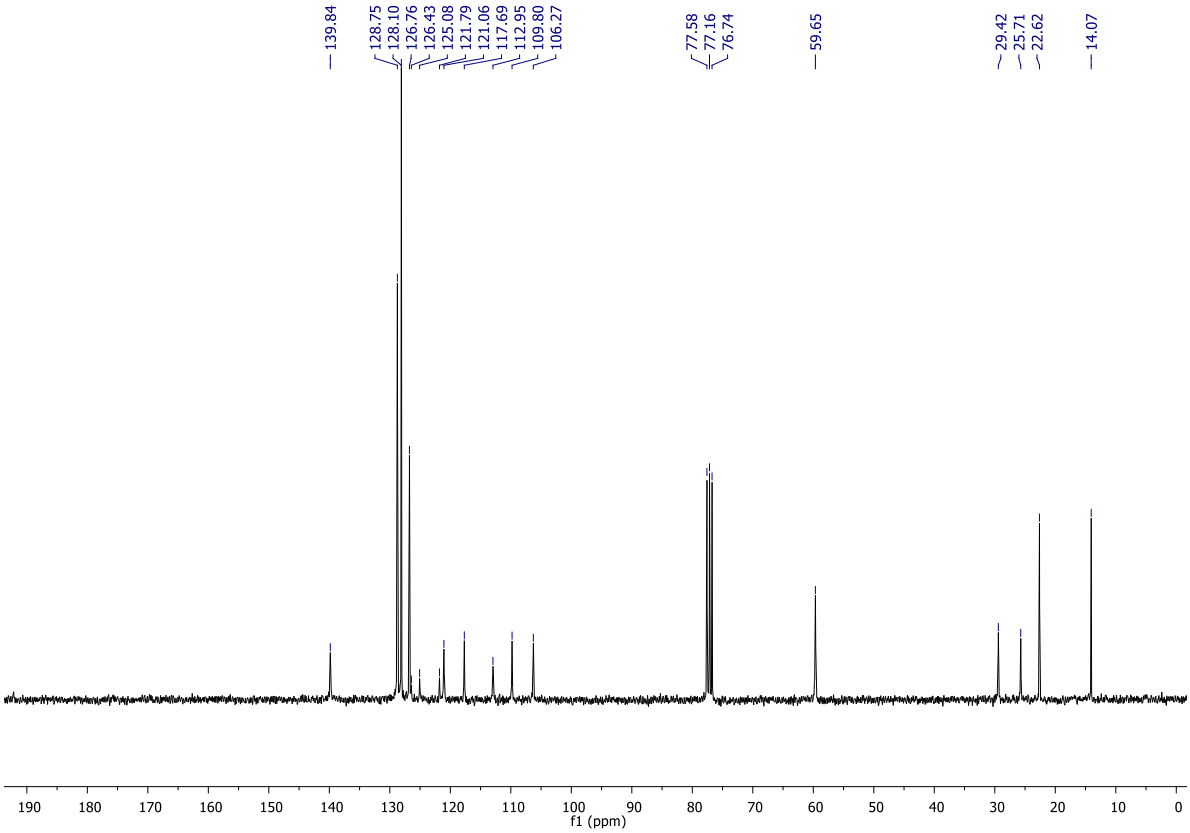


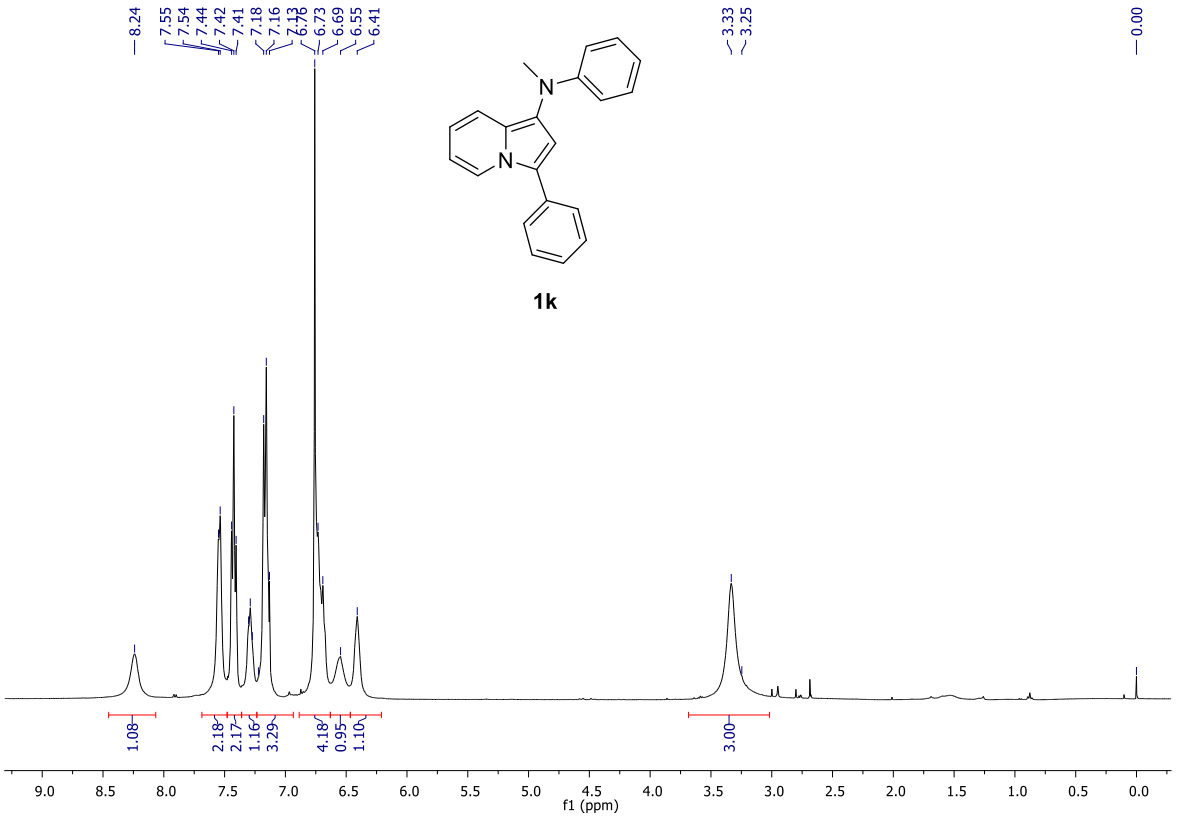


1f

^{1}H NMR (300 MHz, $CDCl_3$)

^{13}C NMR (75 MHz, $CDCl_3$)

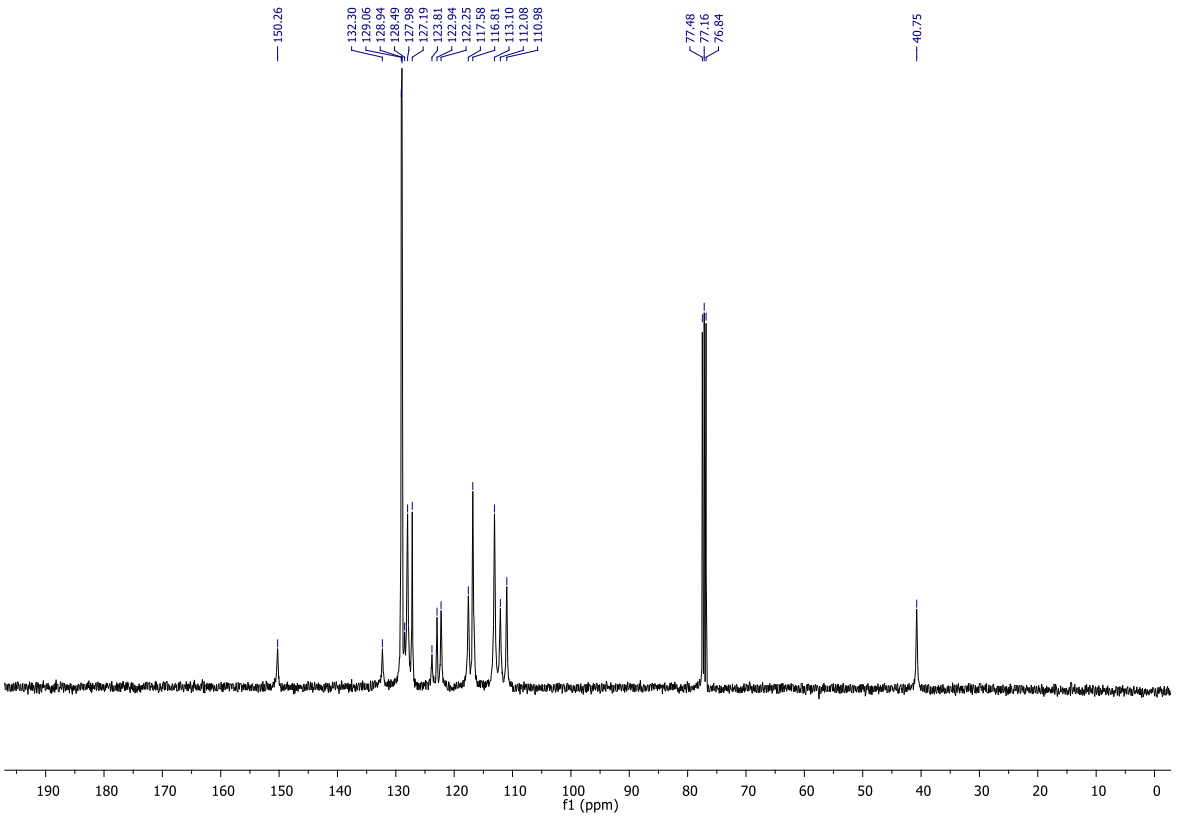


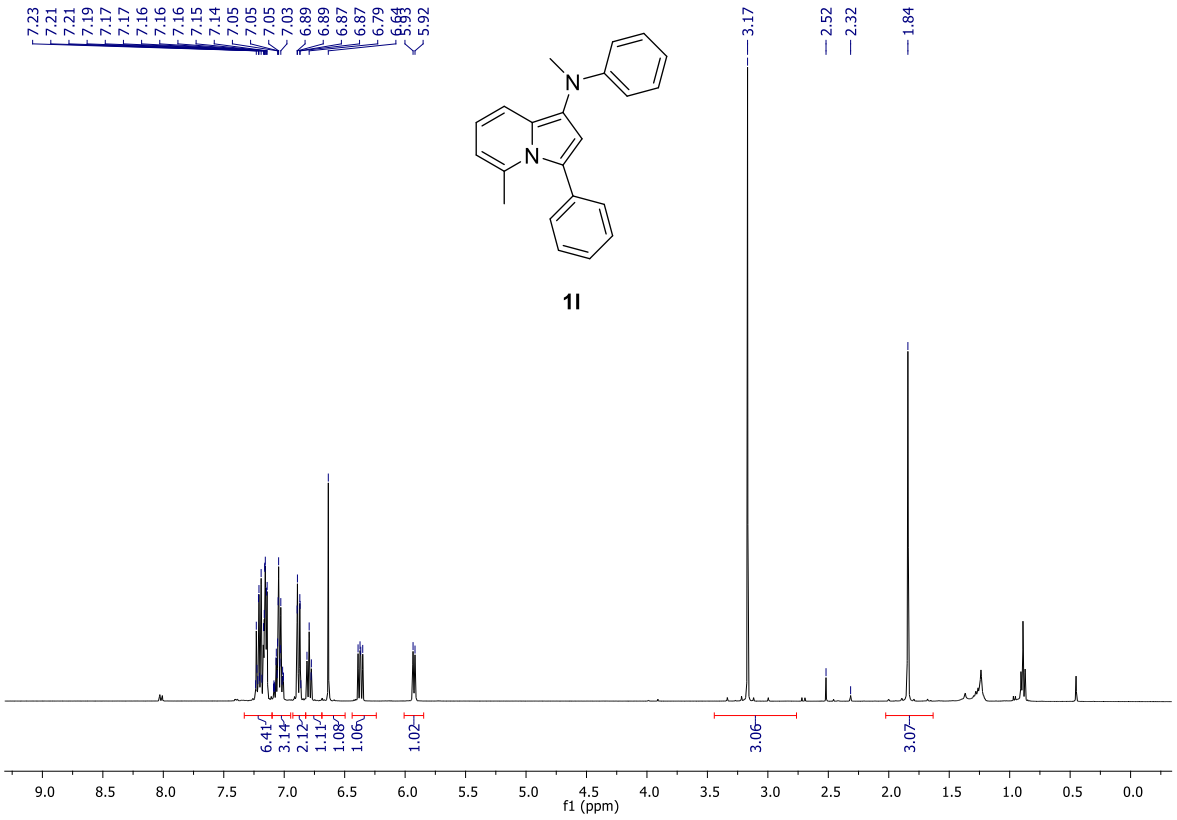


1k

^{1}H NMR (400 MHz, $CDCl_3$)

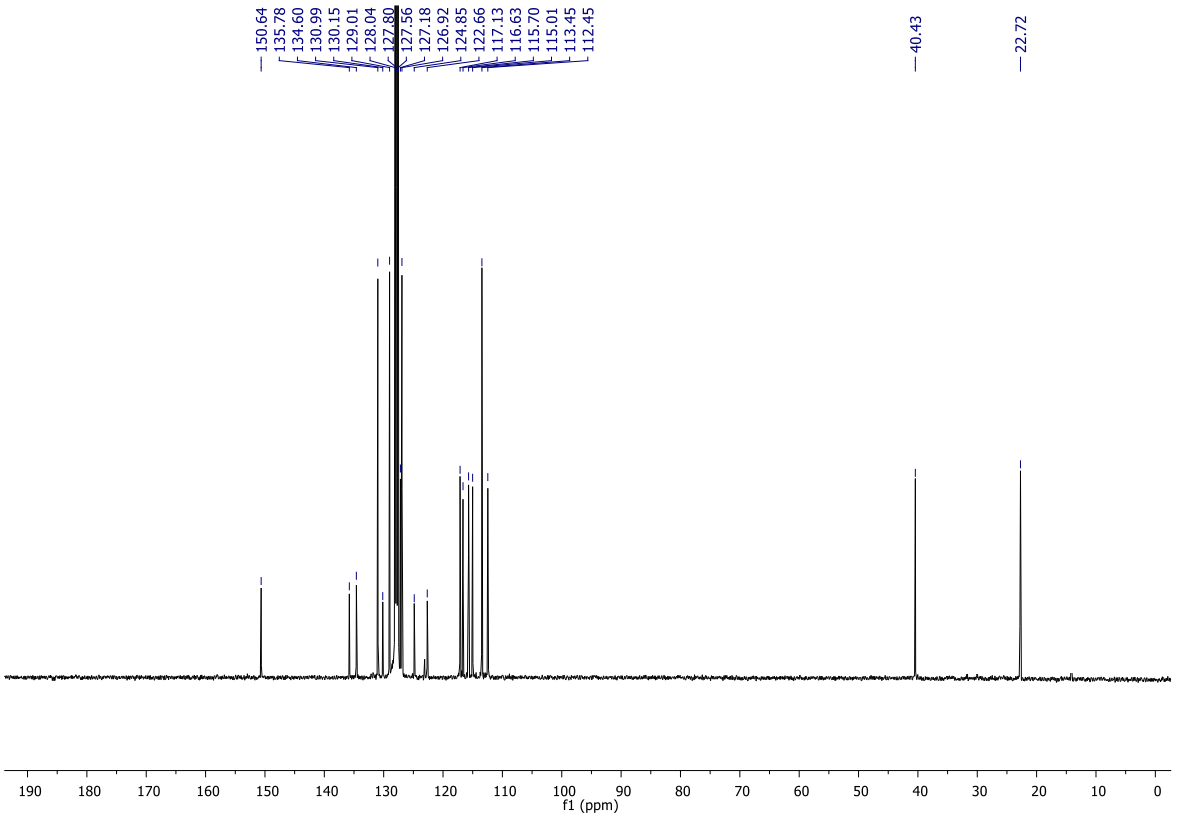
^{13}C NMR (101 MHz, $CDCl_3$)

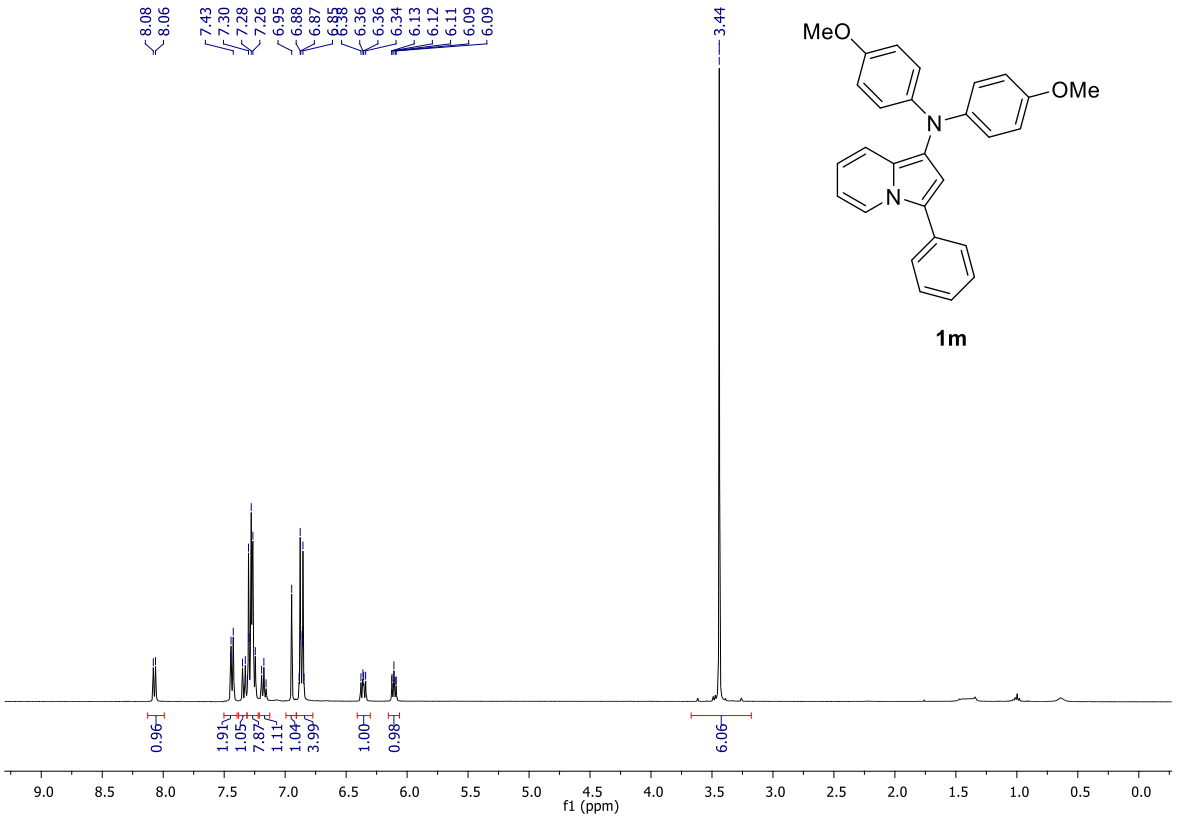




^{1}H NMR (400 MHz, C_6D_6)

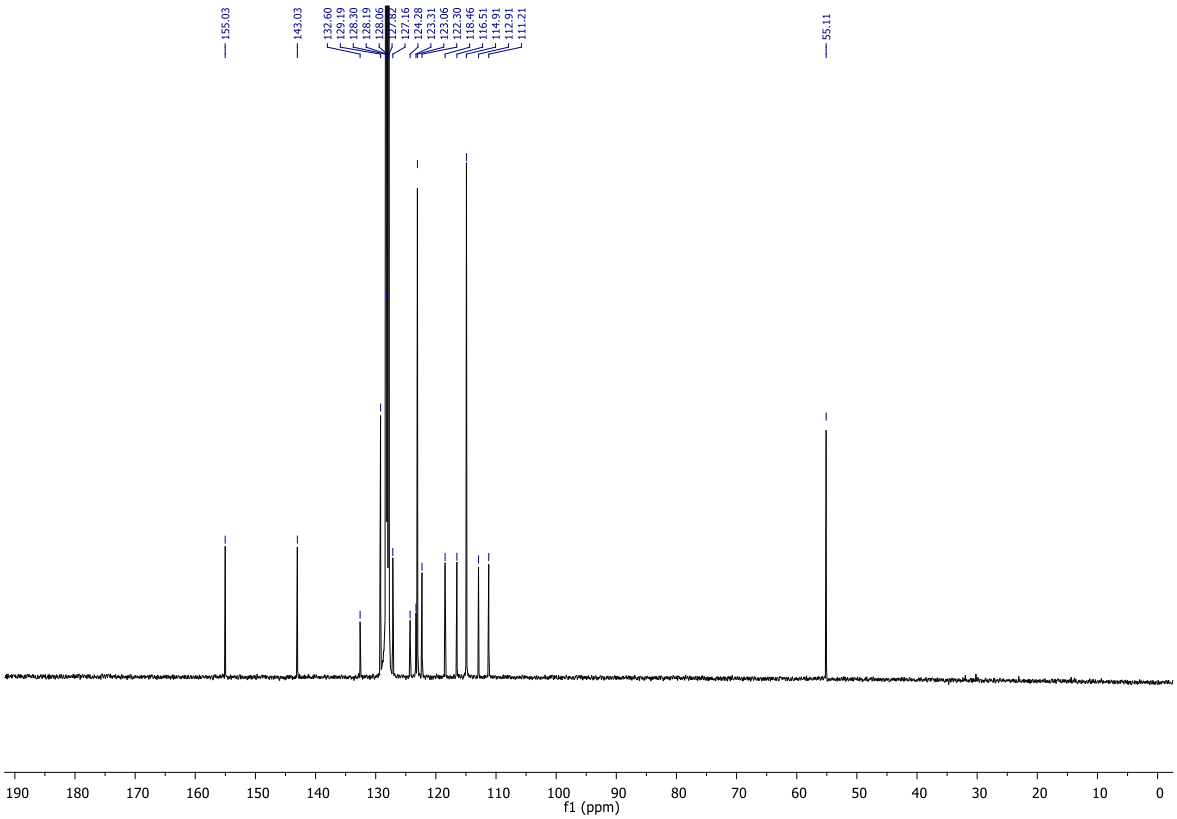
^{13}C NMR (101 MHz, C_6D_6)

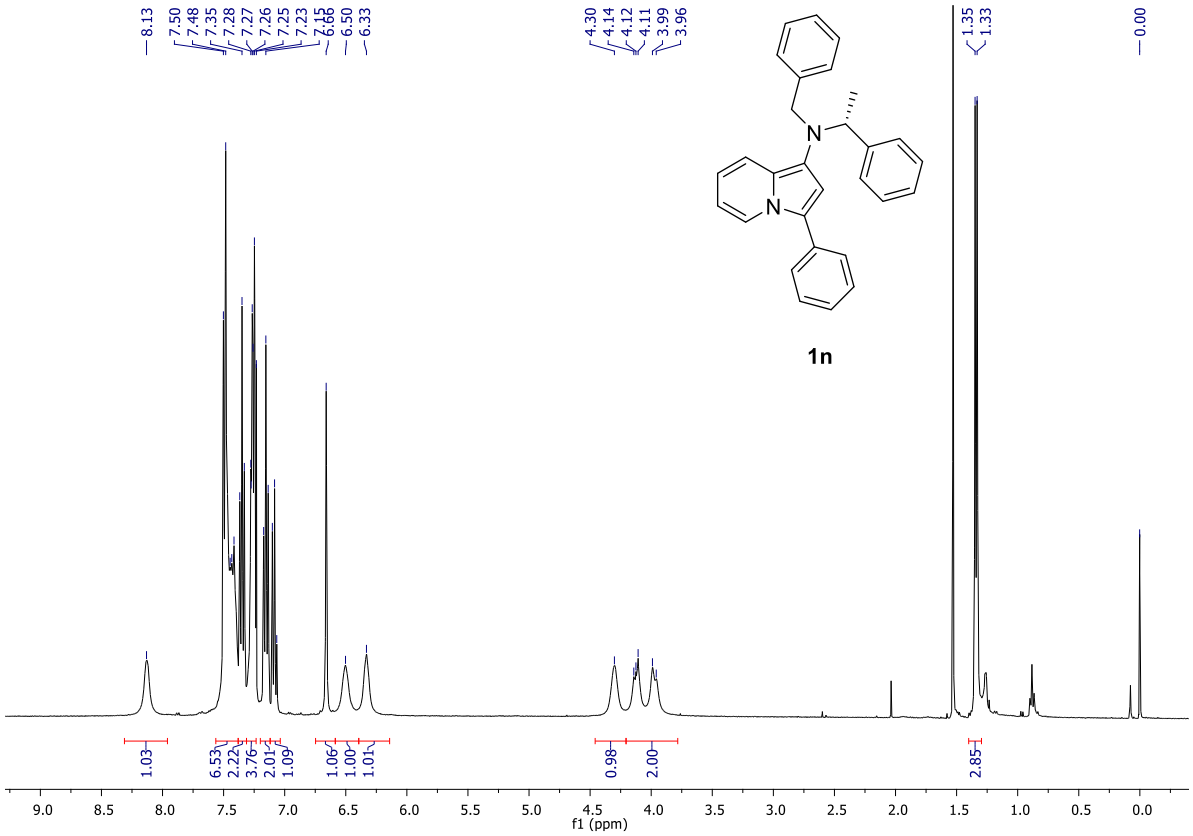




^{1}H NMR (400 MHz, C_6D_6)

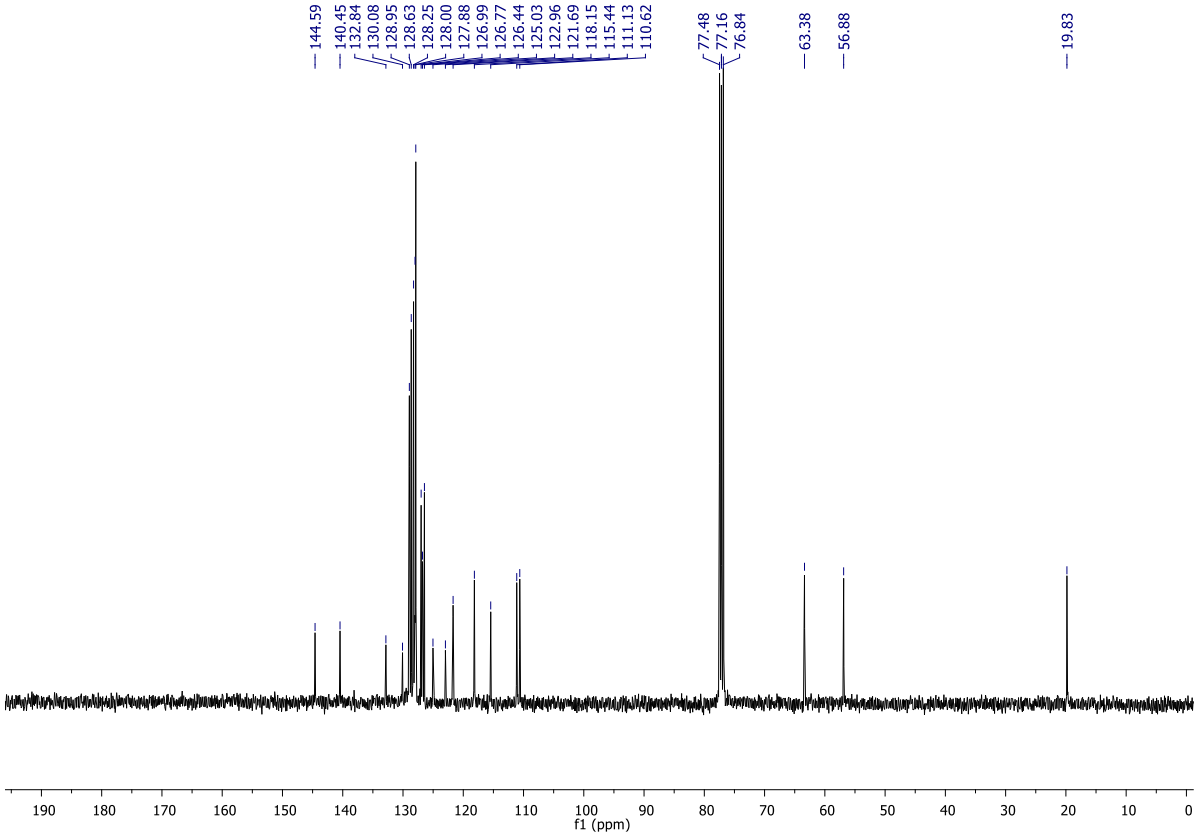
^{13}C NMR (101 MHz, C_6D_6)



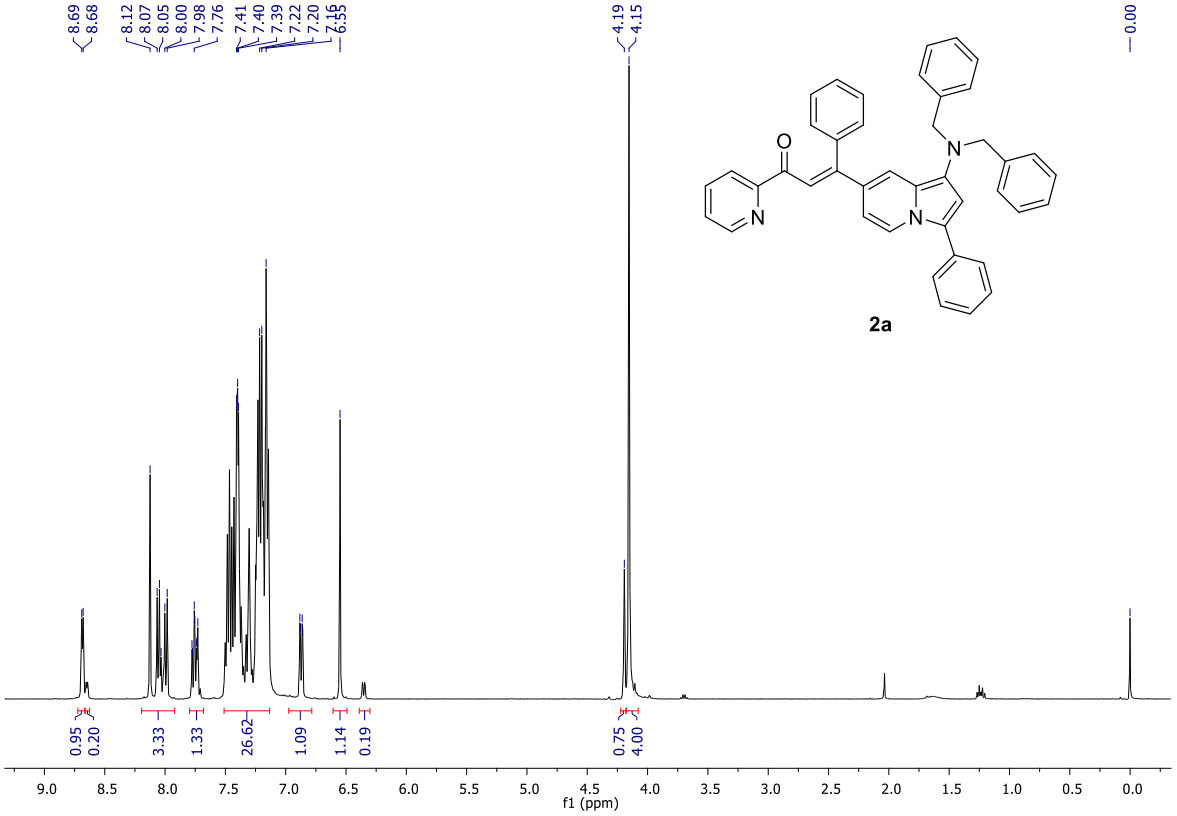


^{1}H NMR (400 MHz, $CDCl_3$)

^{13}C NMR (101 MHz, $CDCl_3$)

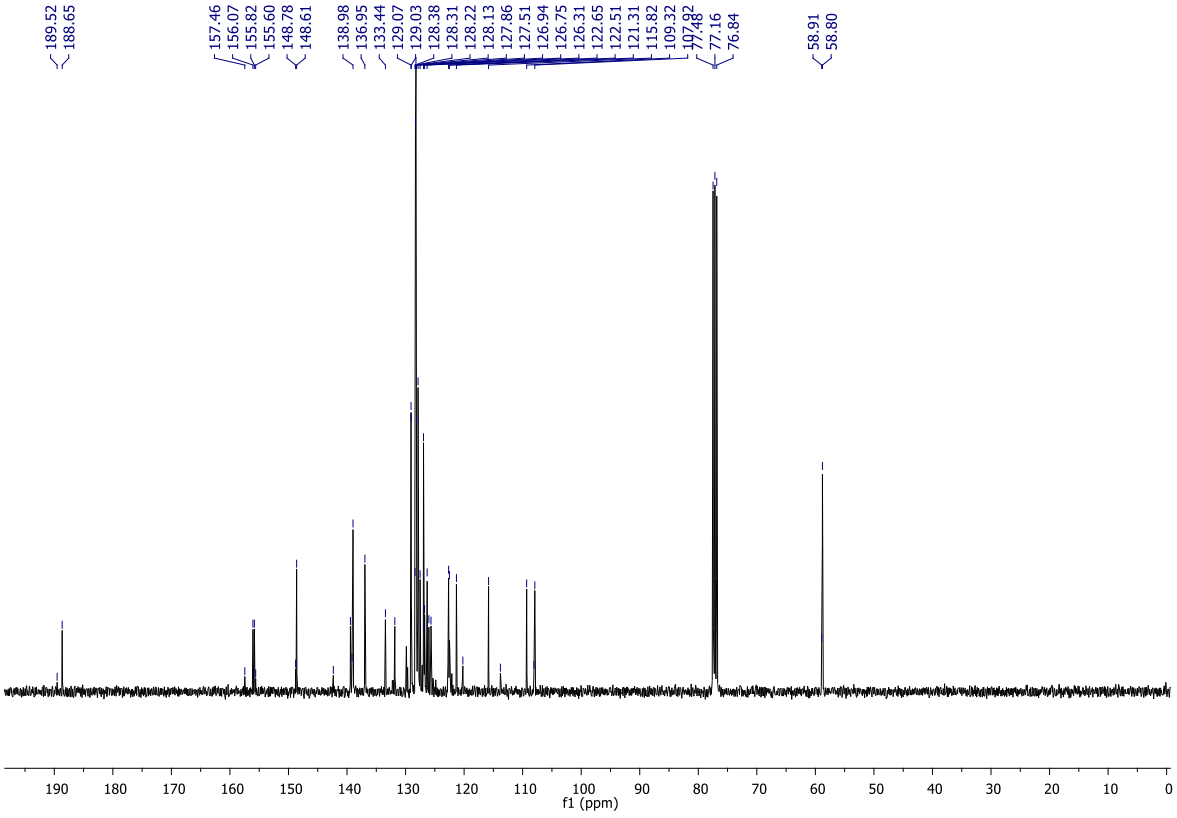


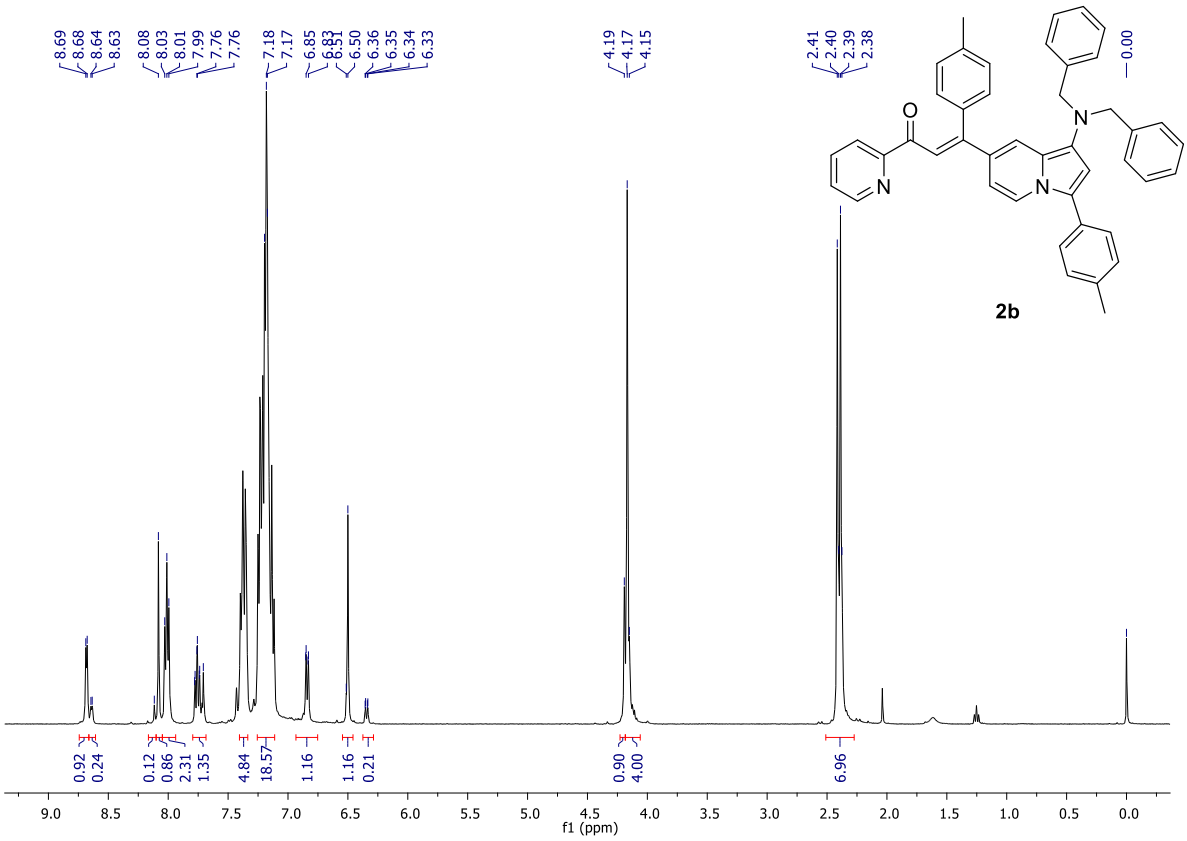
NMR spectra of the dyes 2 (the structure of the major rotamer is shown)



^{1}H NMR (400 MHz, $CDCl_3$)

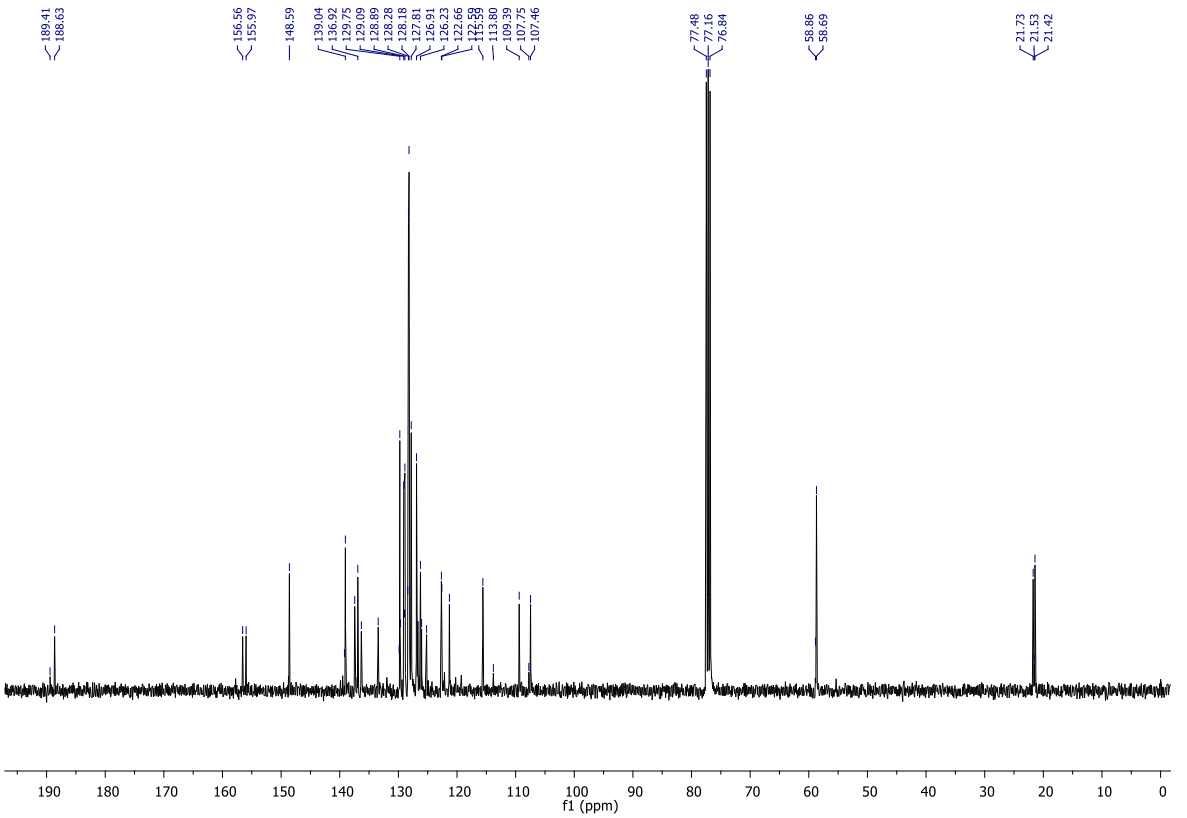
^{13}C NMR (101 MHz, $CDCl_3$)

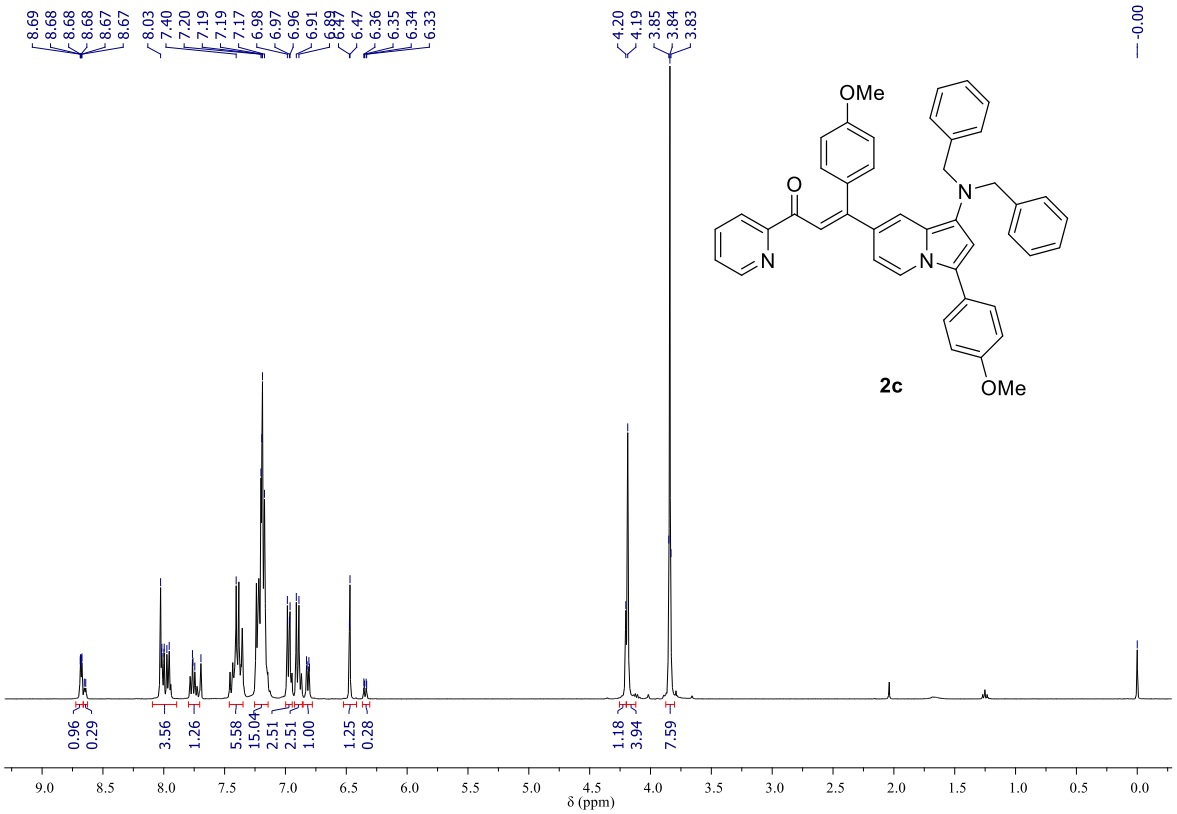




^{1}H NMR (400 MHz, $CDCl_3$)

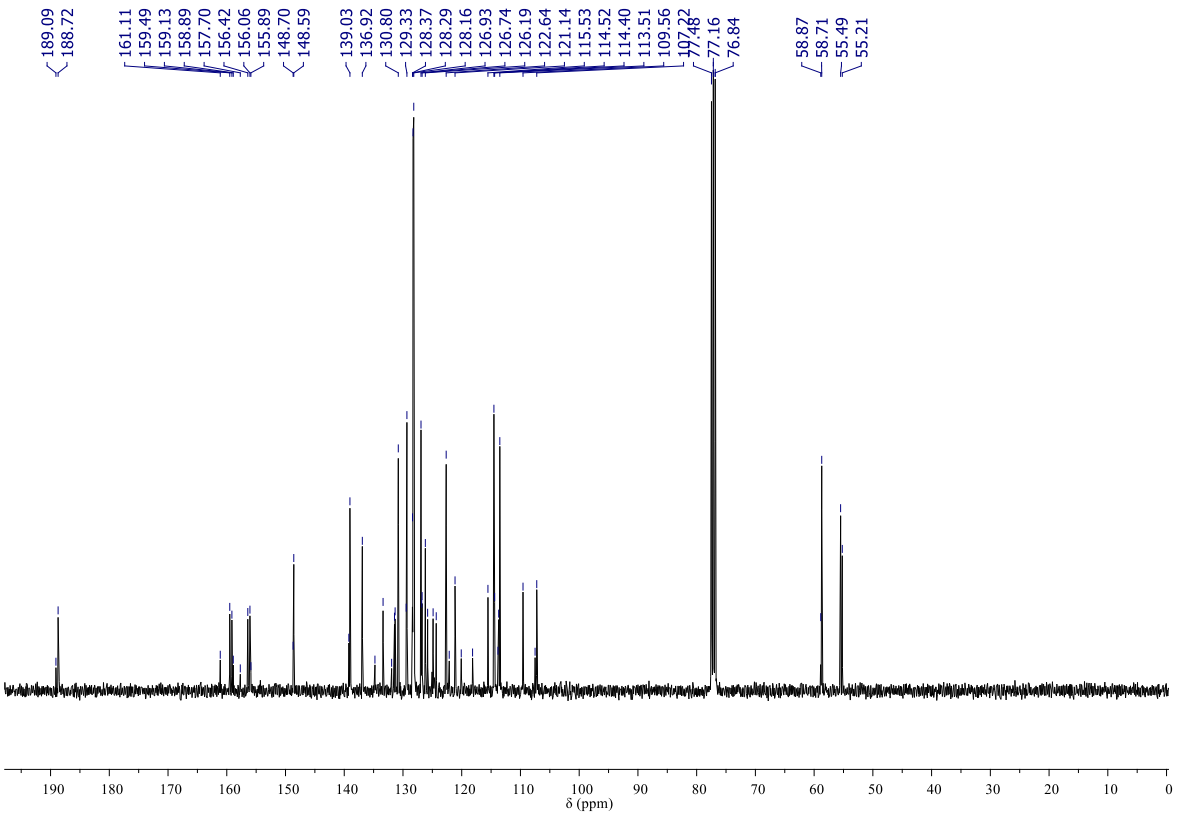
^{13}C NMR (101 MHz, $CDCl_3$)

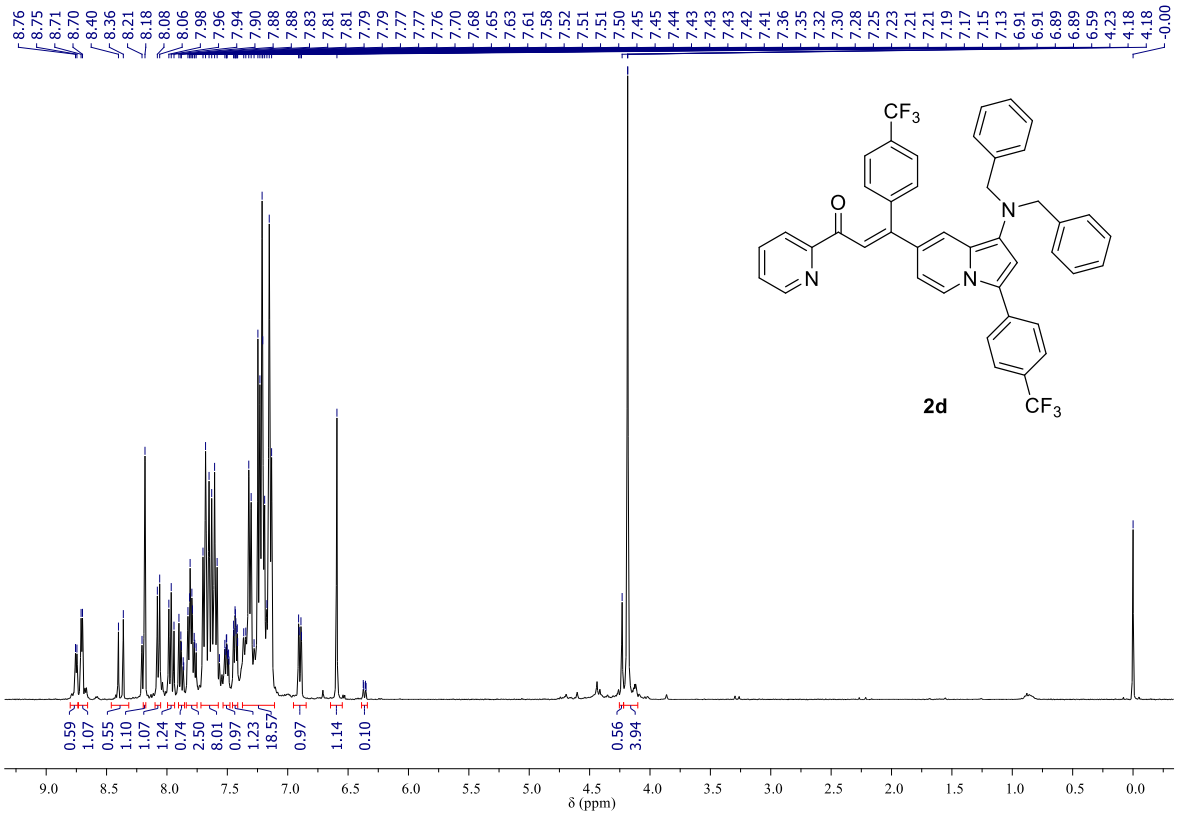




^{1}H NMR (400 MHz, $CDCl_3$)

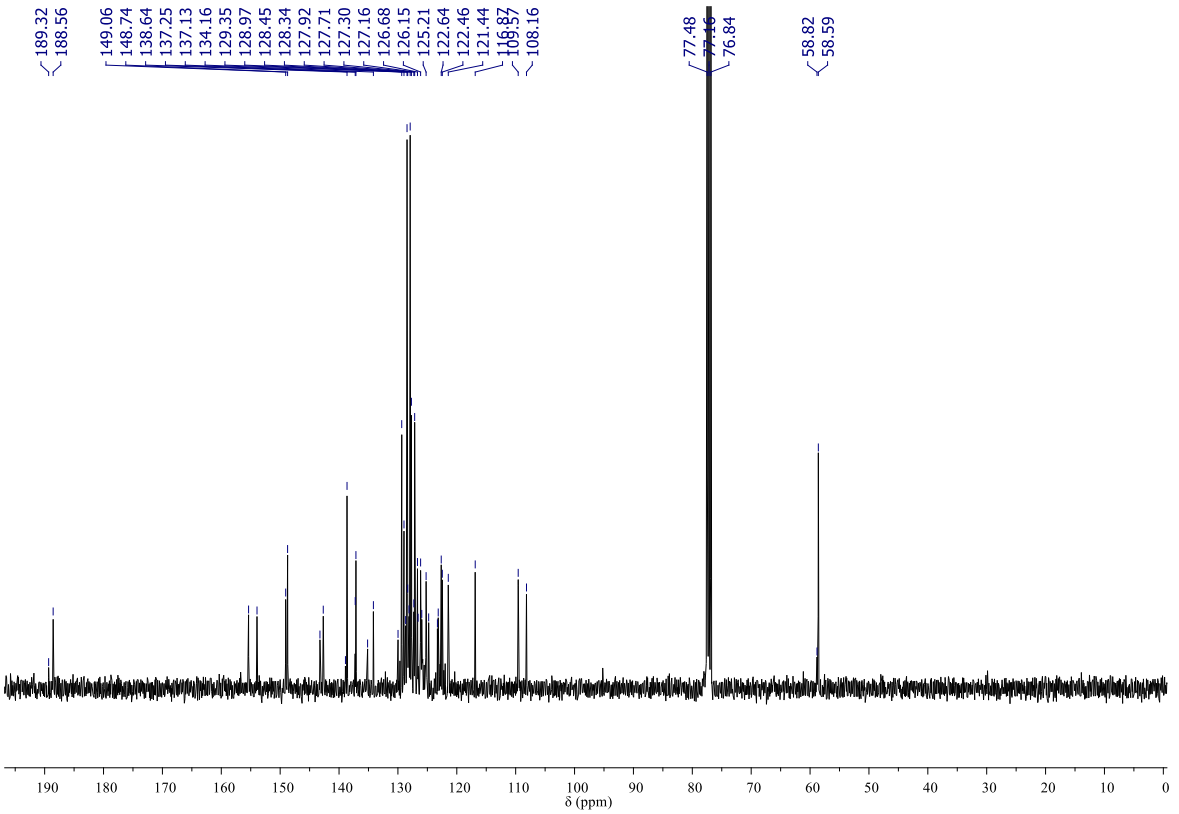
^{13}C NMR (101 MHz, $CDCl_3$)

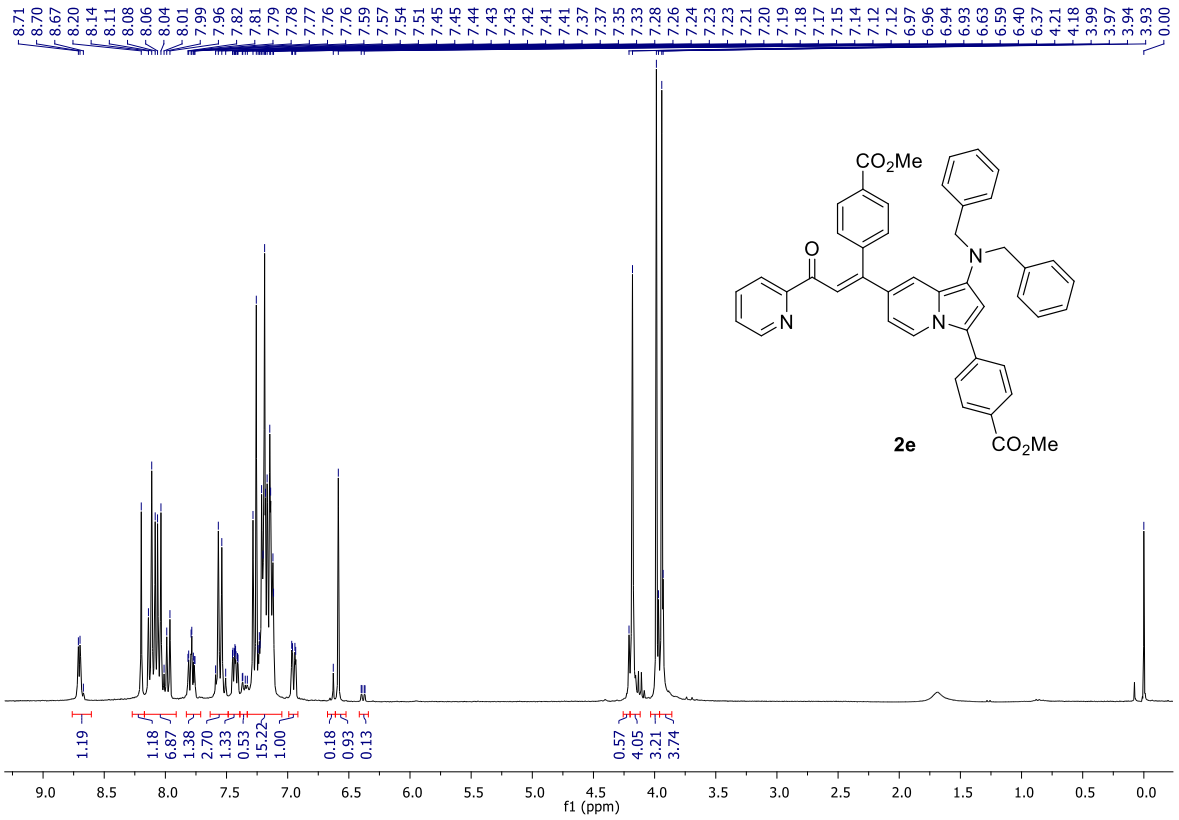




^{1}H NMR (400 MHz, $CDCl_3$)

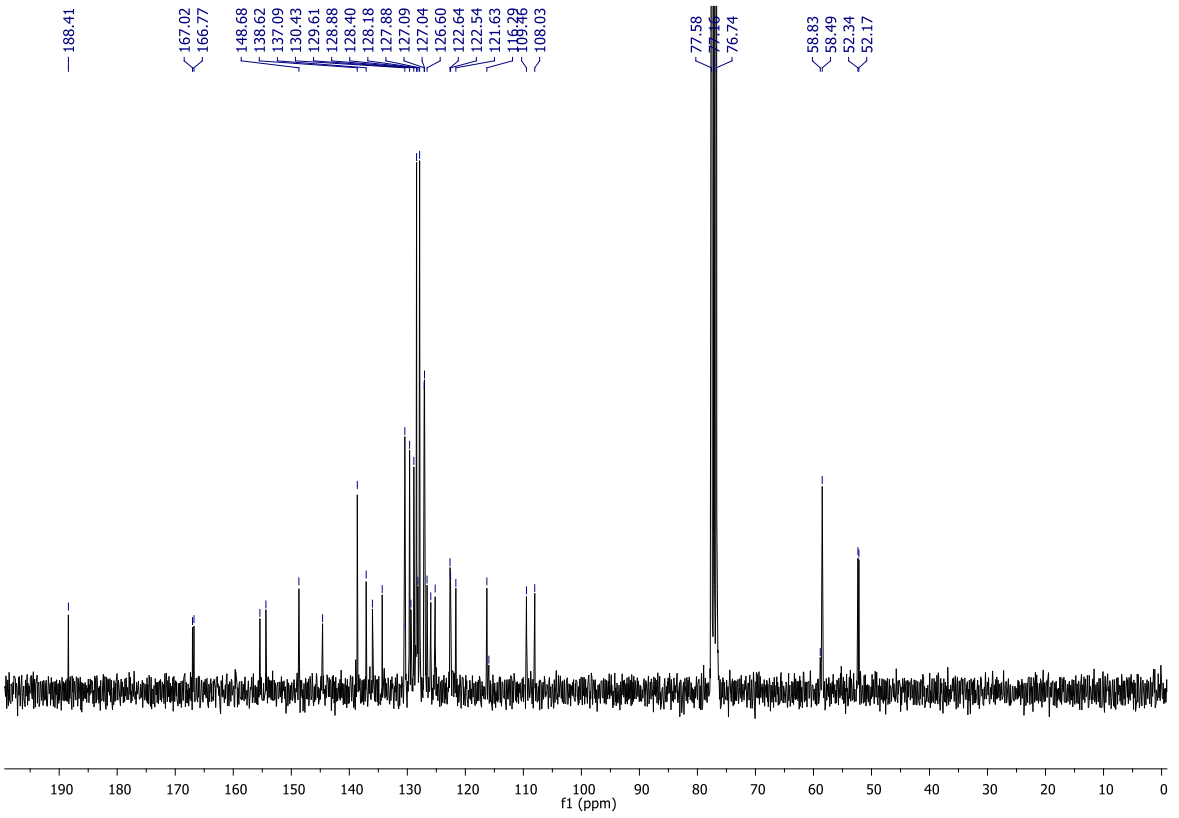
^{13}C NMR (101 MHz, $CDCl_3$)

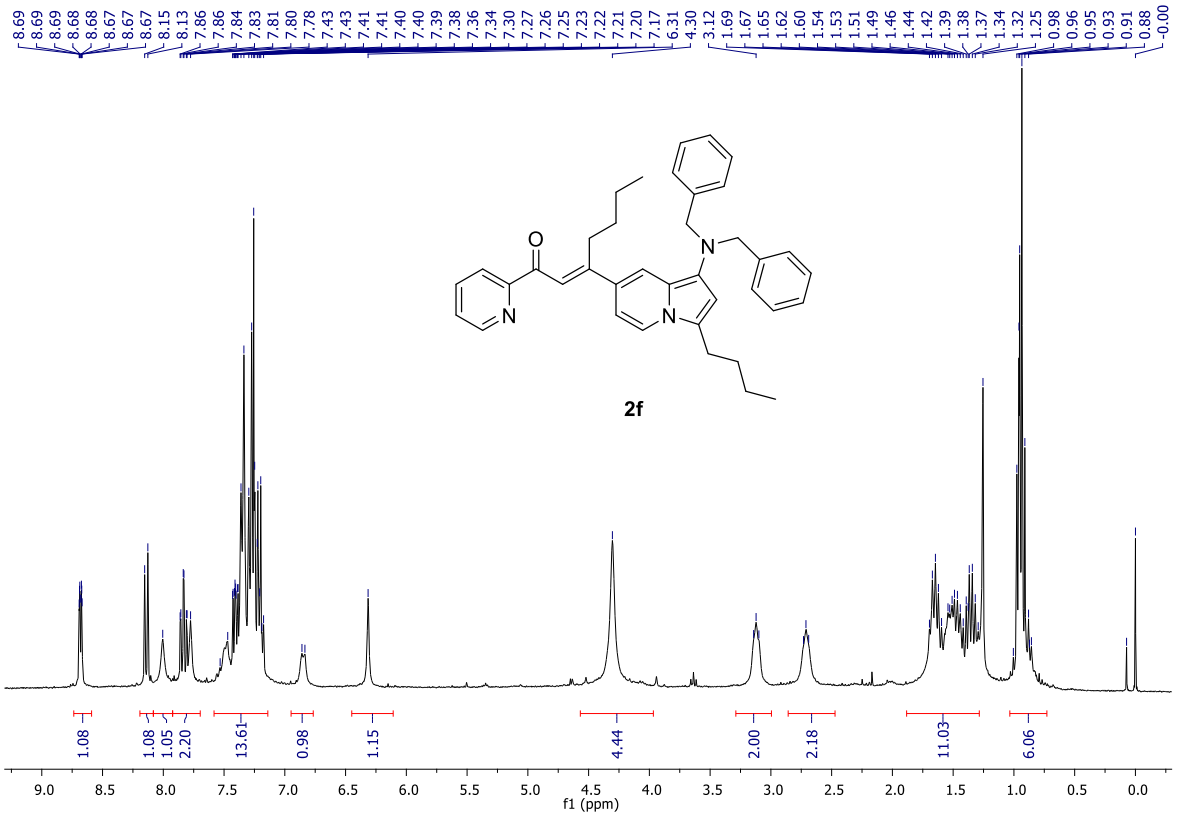




^{1}H NMR (300 MHz, $CDCl_3$)

^{13}C NMR (75 MHz, $CDCl_3$)





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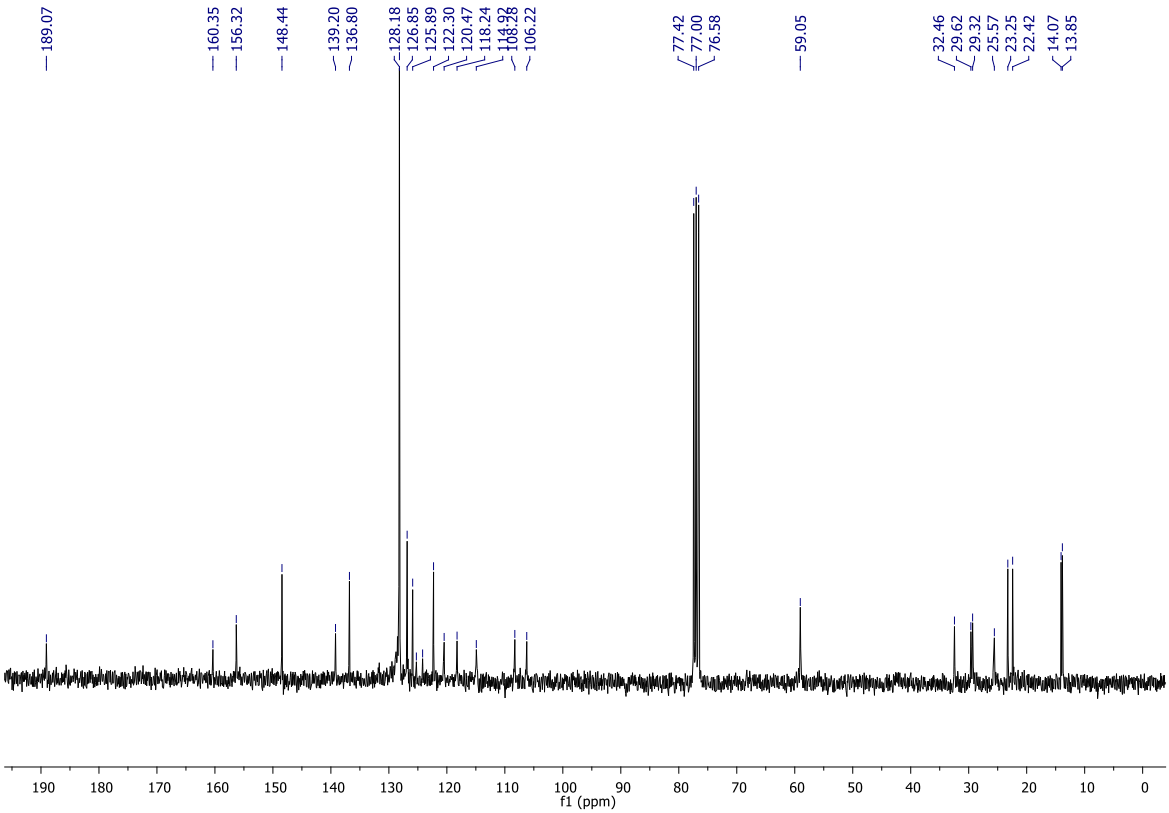
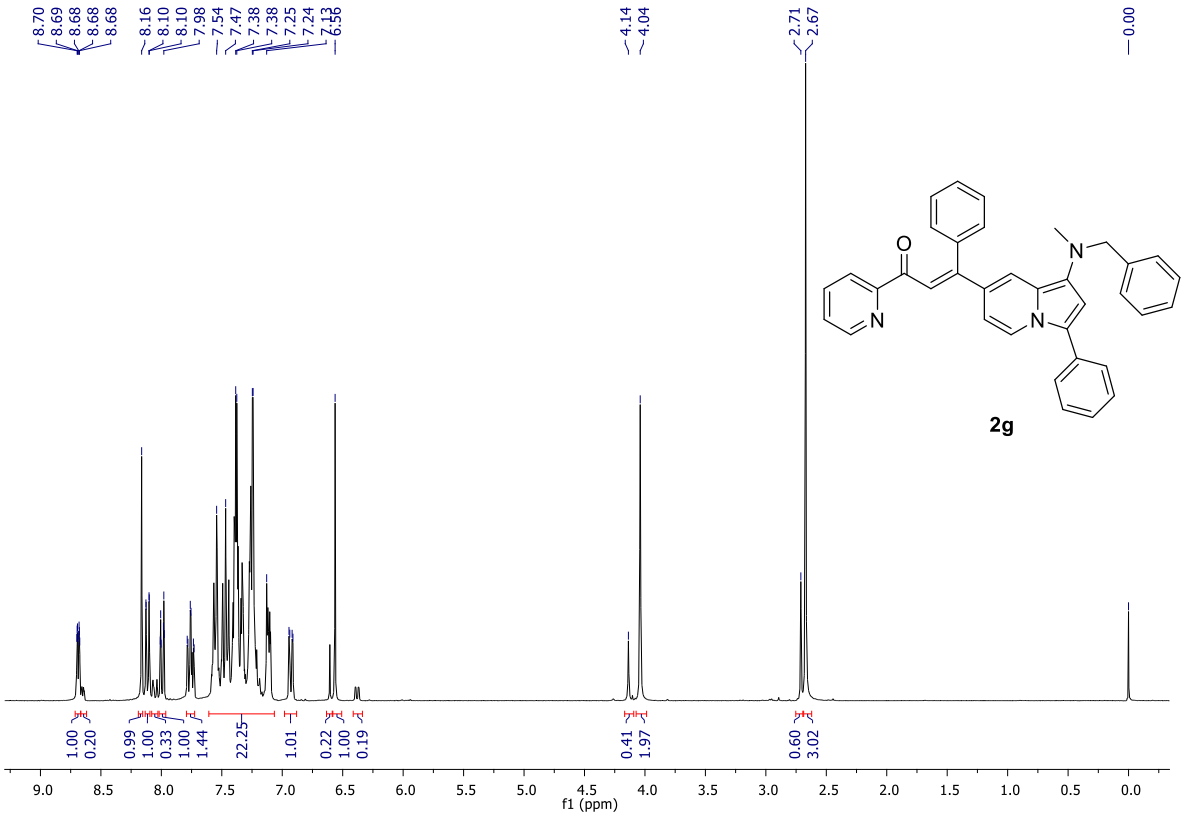
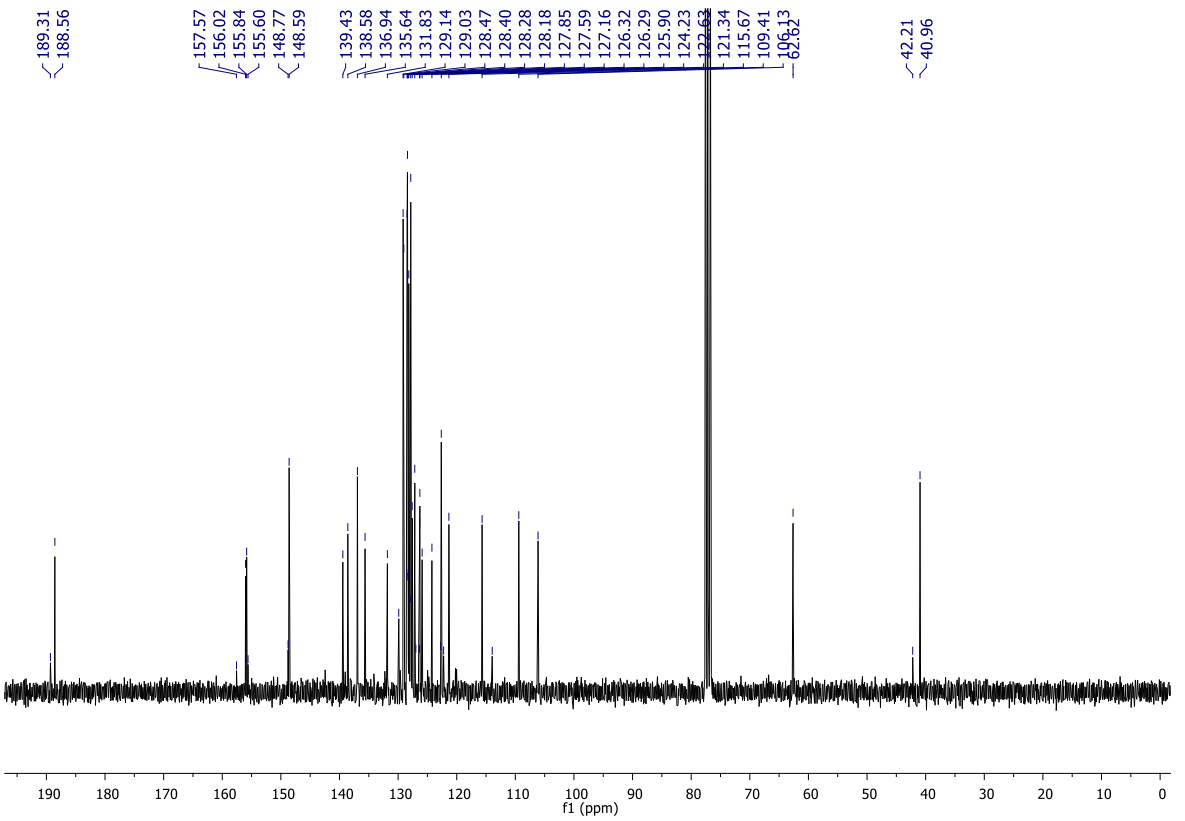
^{13}C NMR (75 MHz, $CDCl_3$)

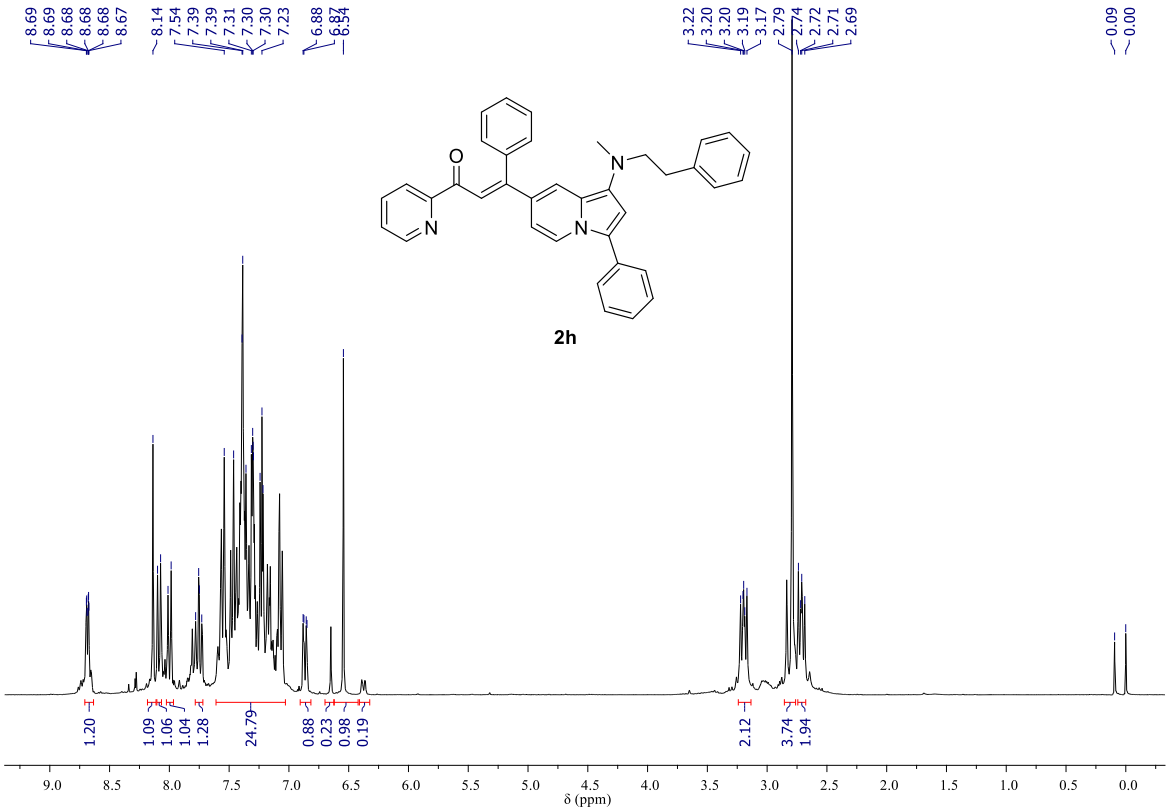




^{1}H NMR (300 MHz, $CDCl_3$)

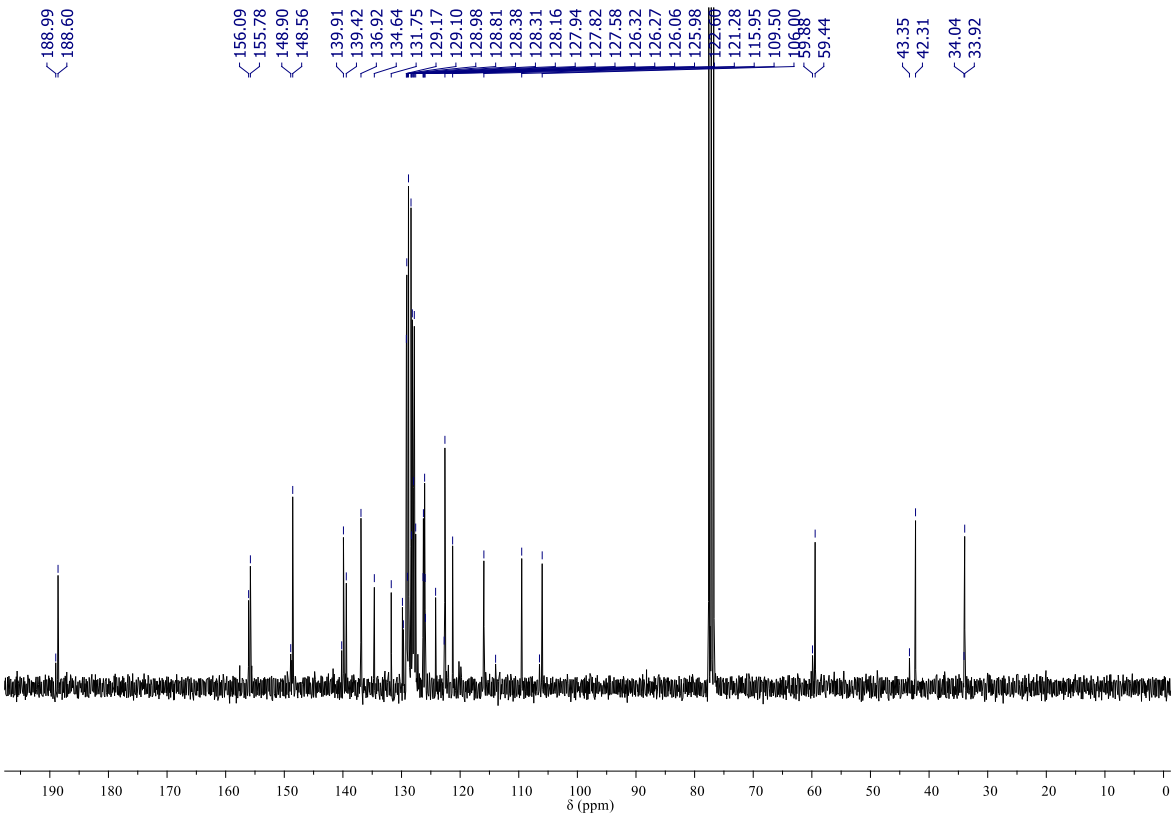
^{13}C NMR (75 MHz, $CDCl_3$)

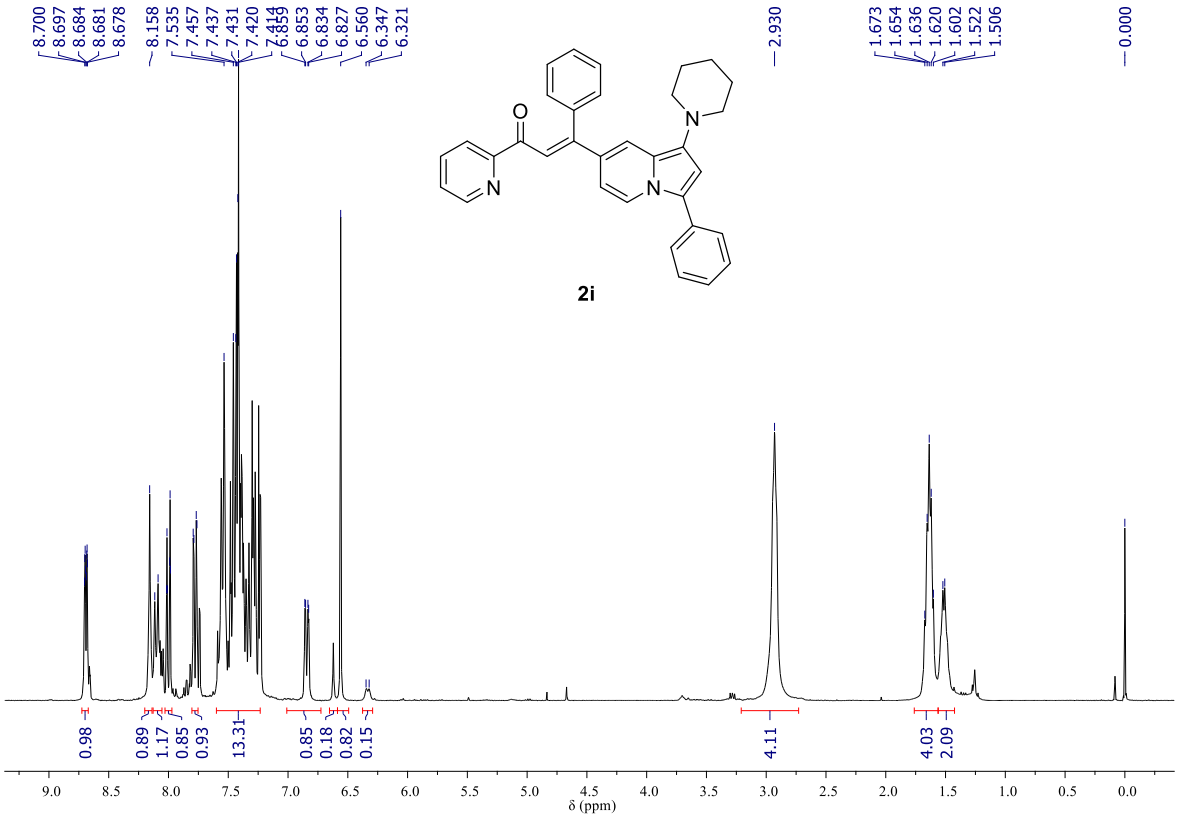




^{1}H NMR (300 MHz, $CDCl_3$)

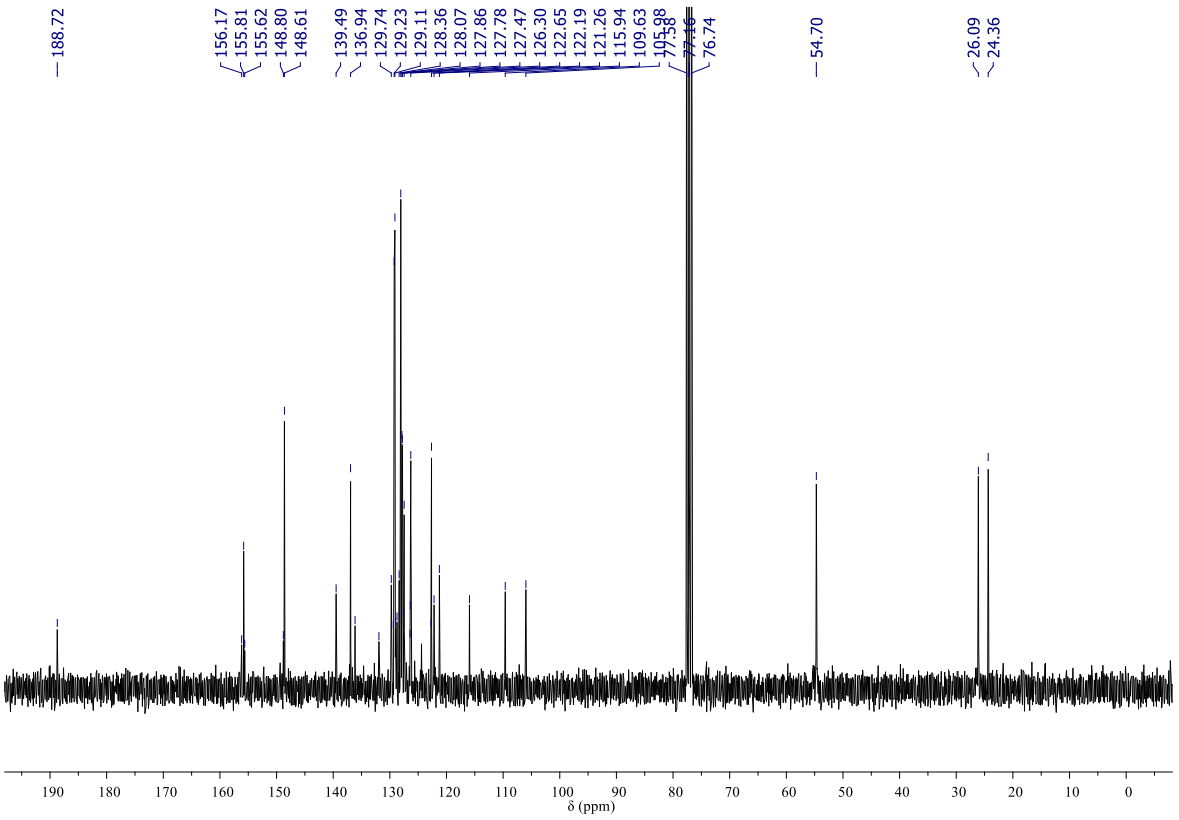
^{13}C NMR (75 MHz, $CDCl_3$)

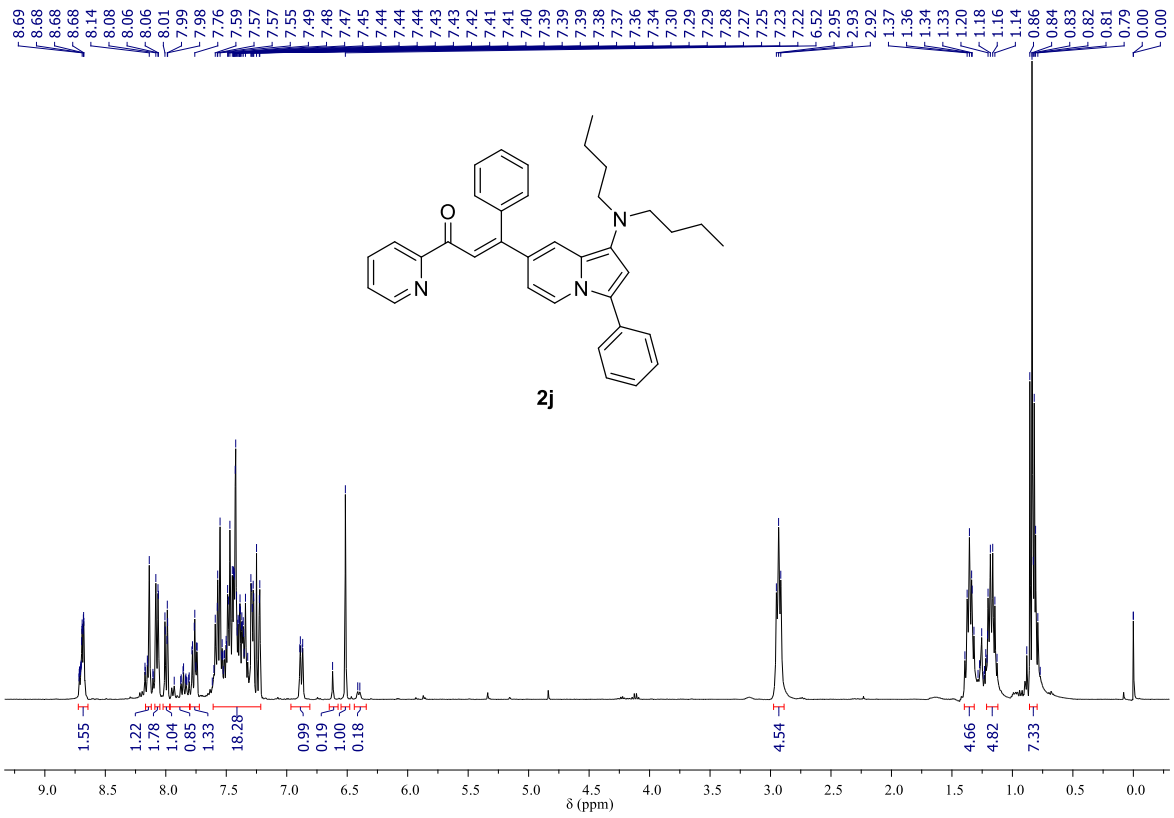




^{1}H NMR (300 MHz, $CDCl_3$)

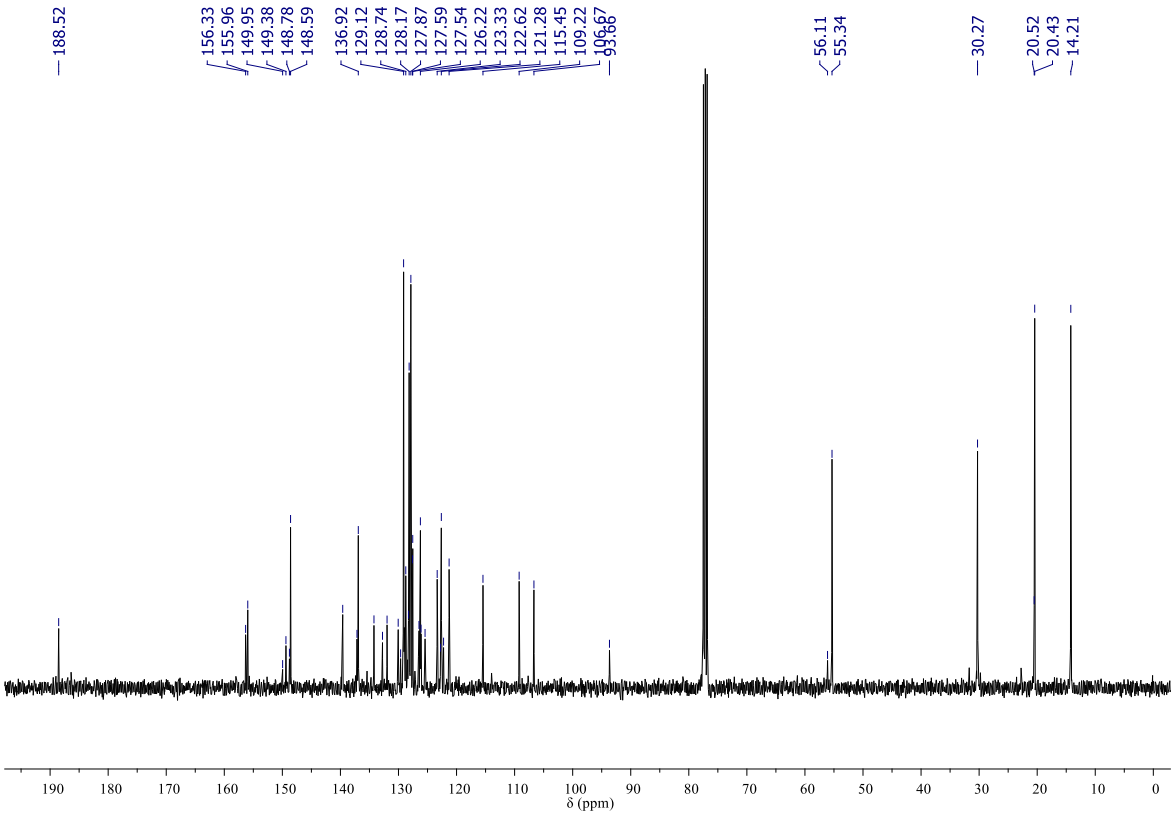
^{13}C NMR (75 MHz, $CDCl_3$)

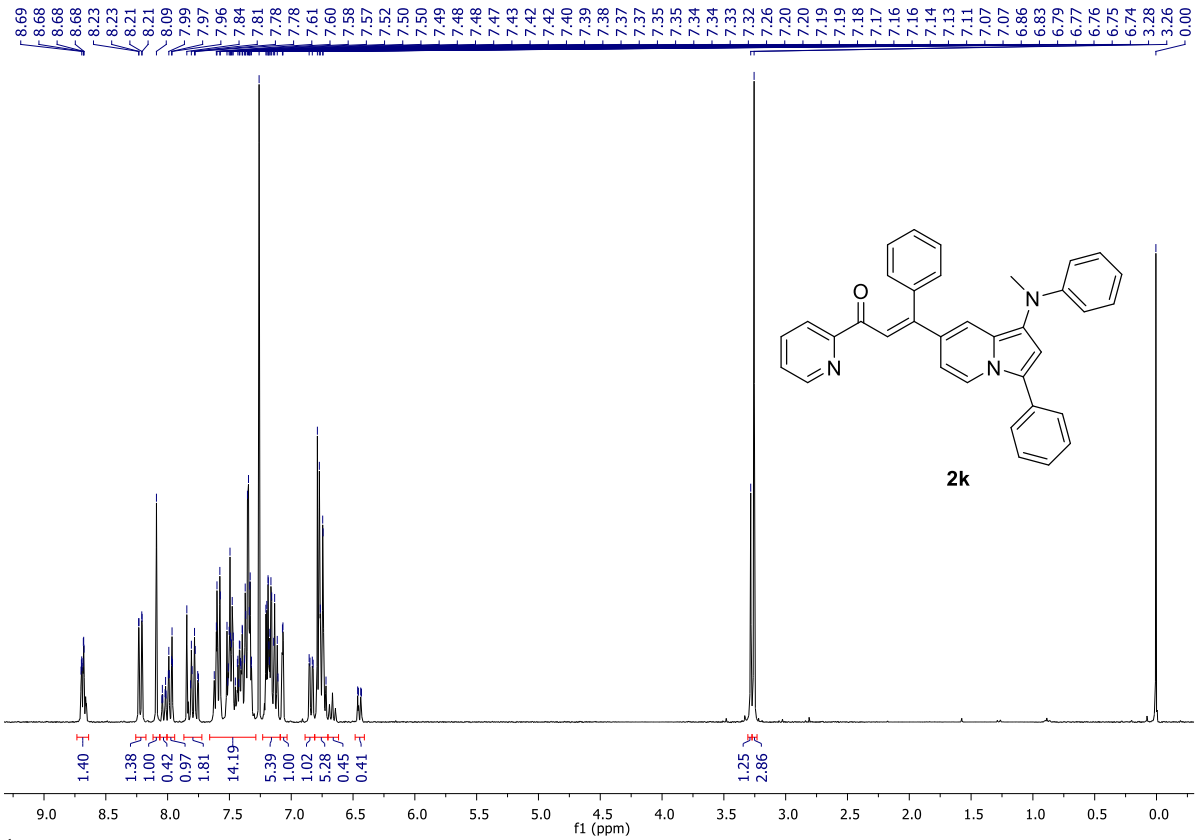




^{1}H NMR (400 MHz, $CDCl_3$)

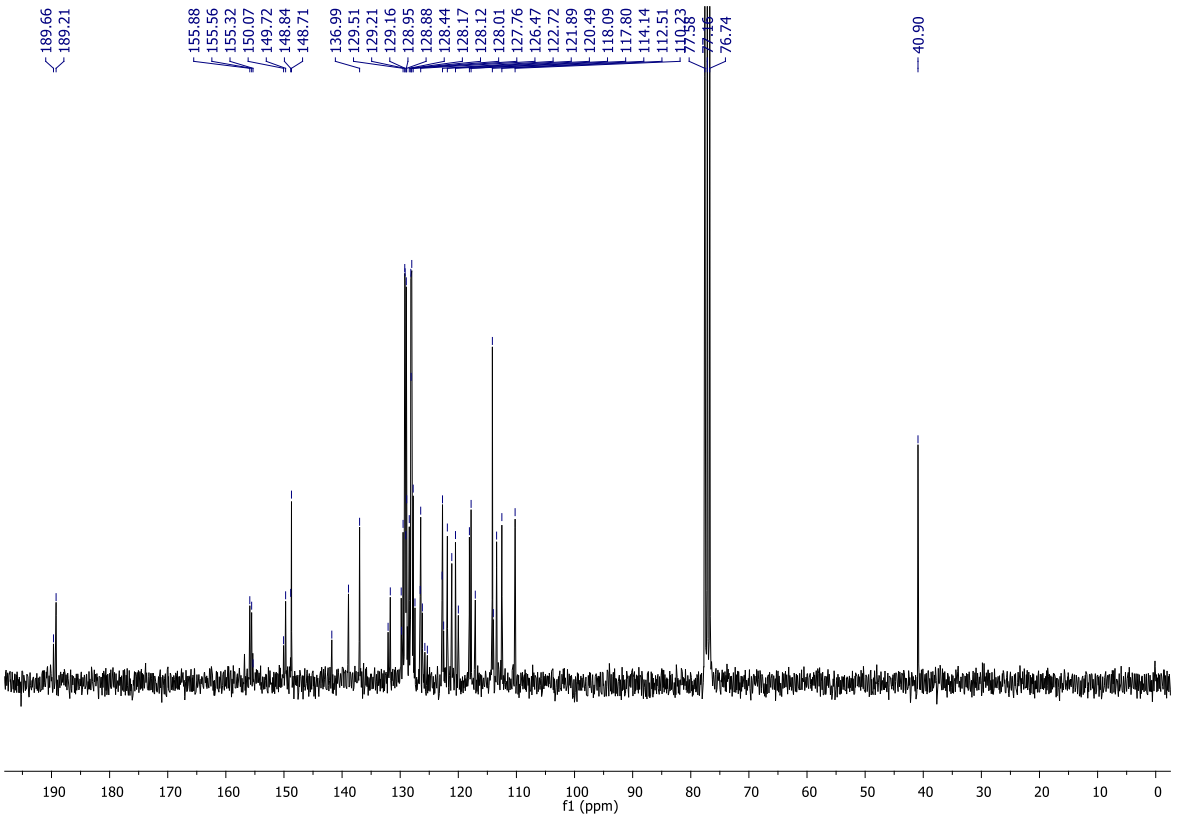
^{13}C NMR (101 MHz, $CDCl_3$)

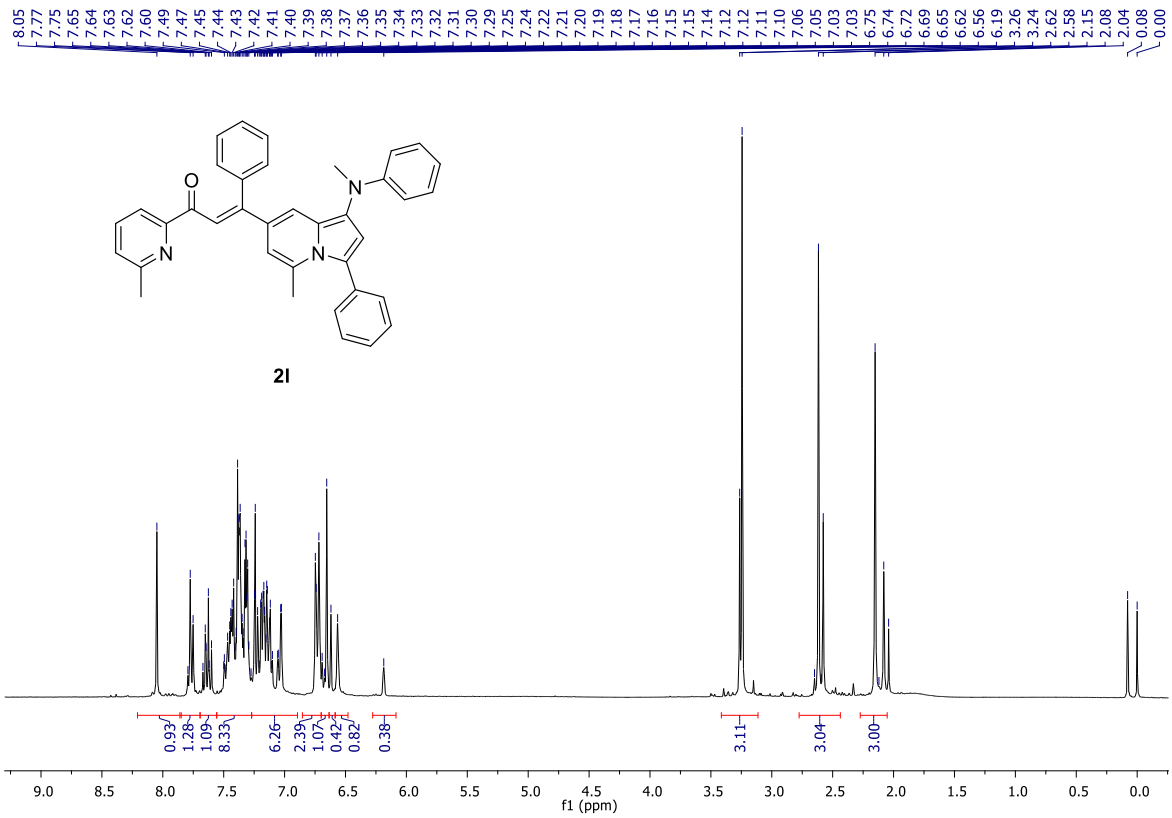




^{1}H NMR (300 MHz, $CDCl_3$)

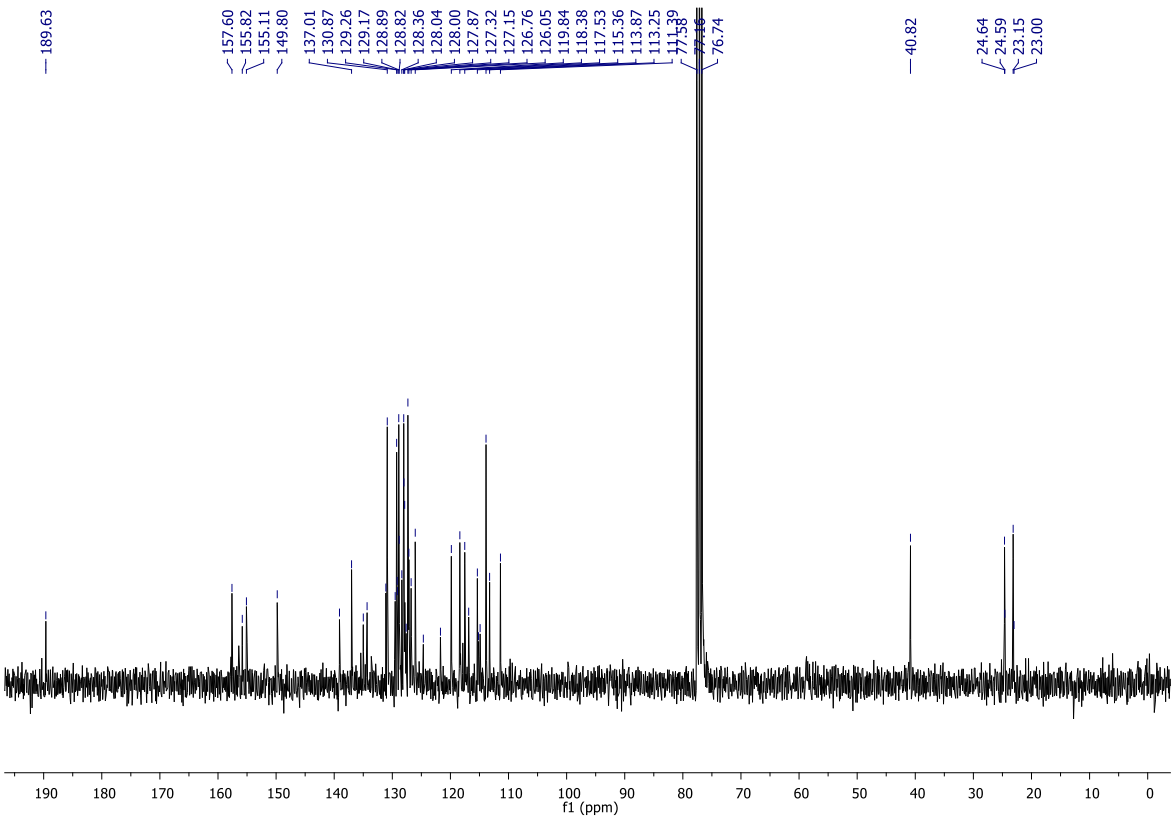
^{13}C NMR (75 MHz, $CDCl_3$)

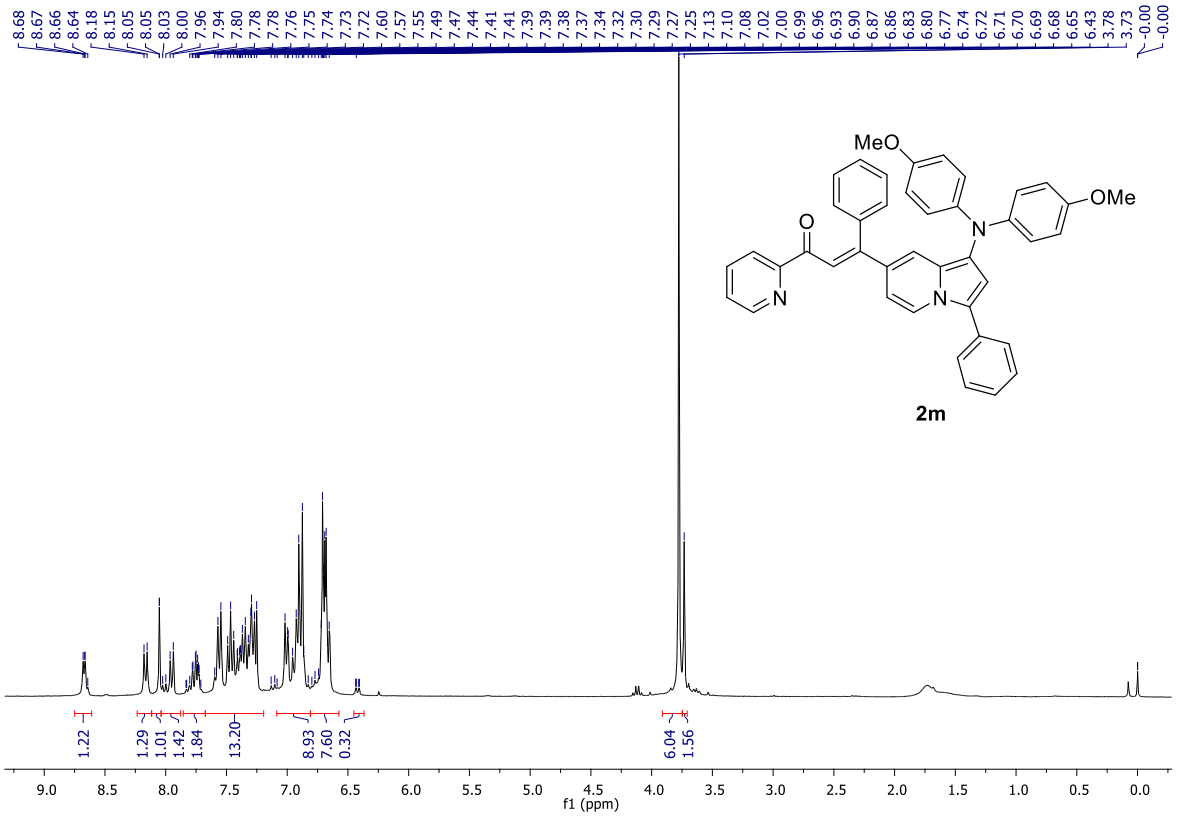




^{1}H NMR (300 MHz, $CDCl_3$)

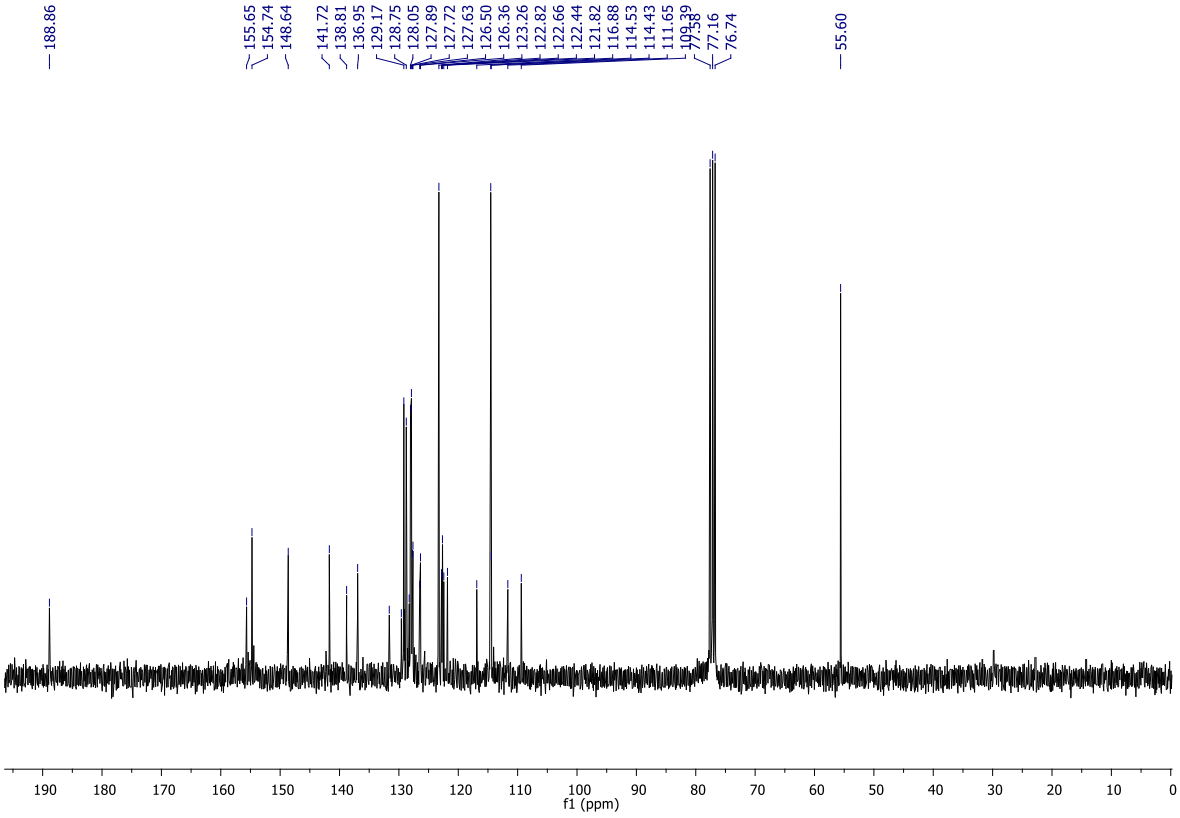
^{13}C NMR (75 MHz, $CDCl_3$)

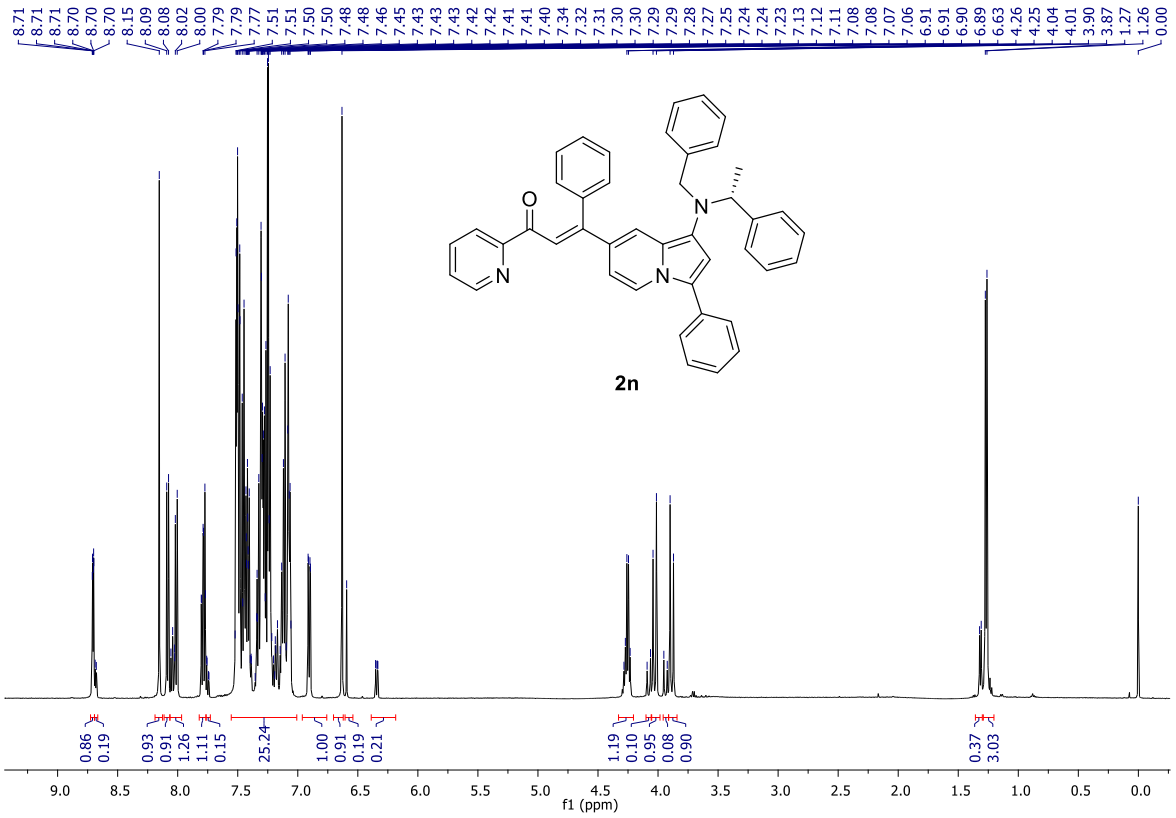




^{1}H NMR (300 MHz, $CDCl_3$)

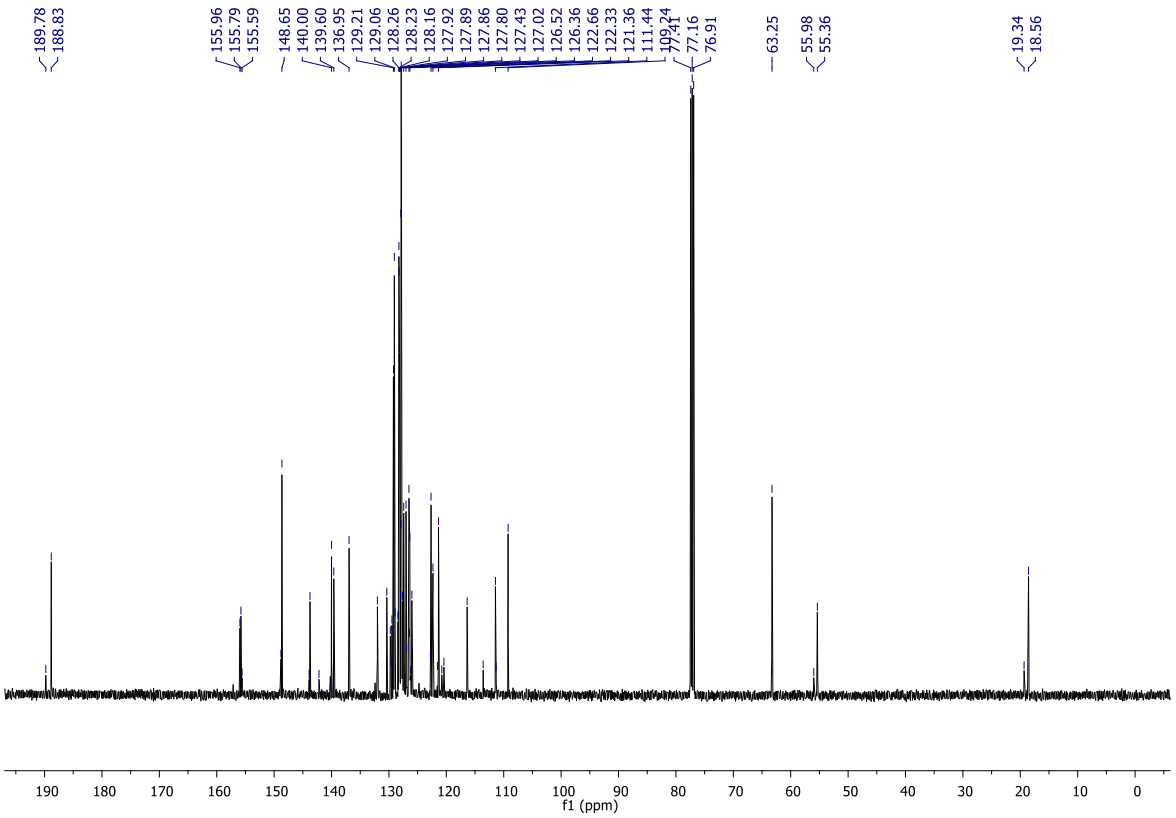
^{13}C NMR (75 MHz, $CDCl_3$)





^{1}H NMR (300 MHz, $CDCl_3$)

^{13}C NMR (75 MHz, $CDCl_3$)



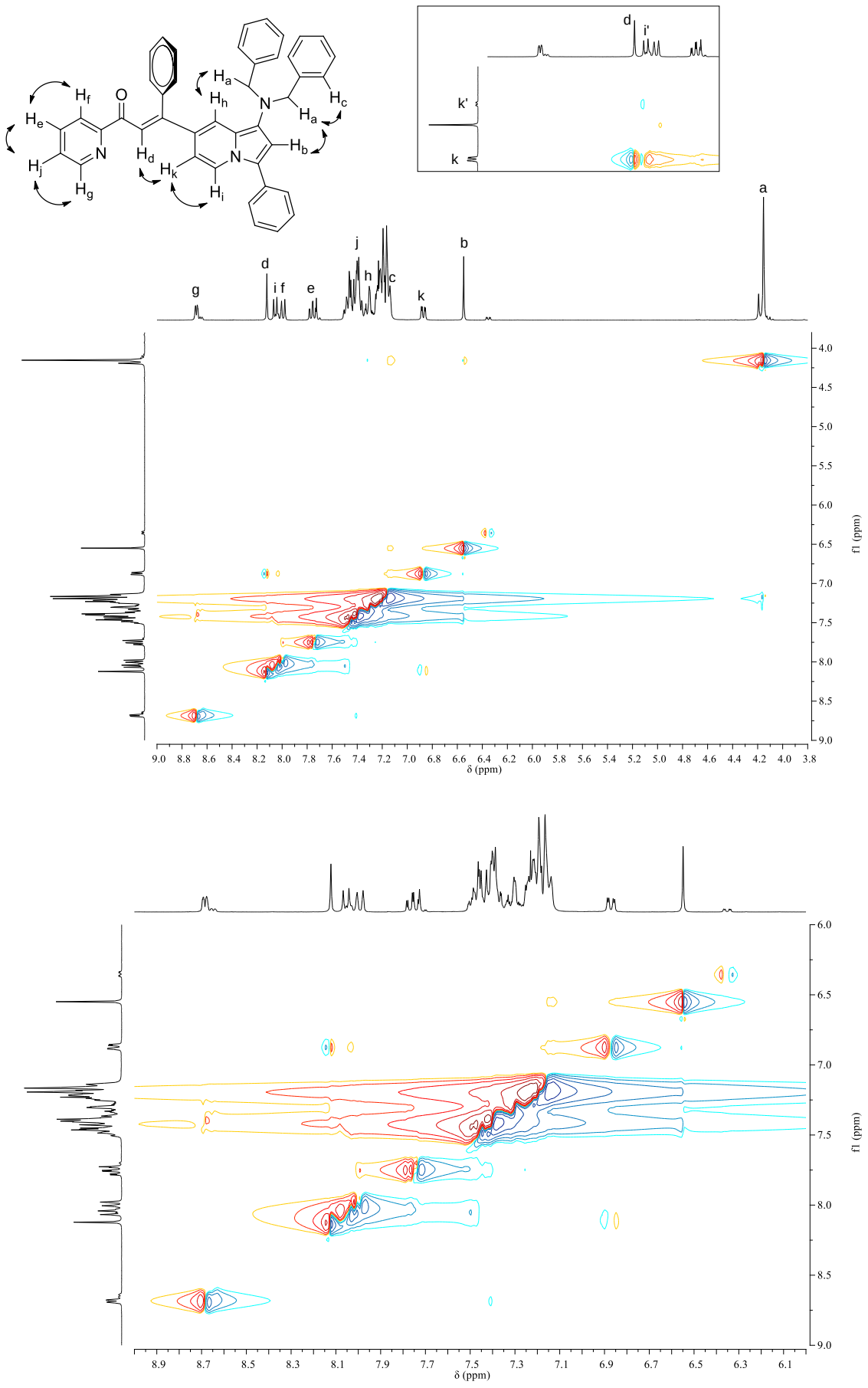


Figure S12. NOESY spectra of **2a**.

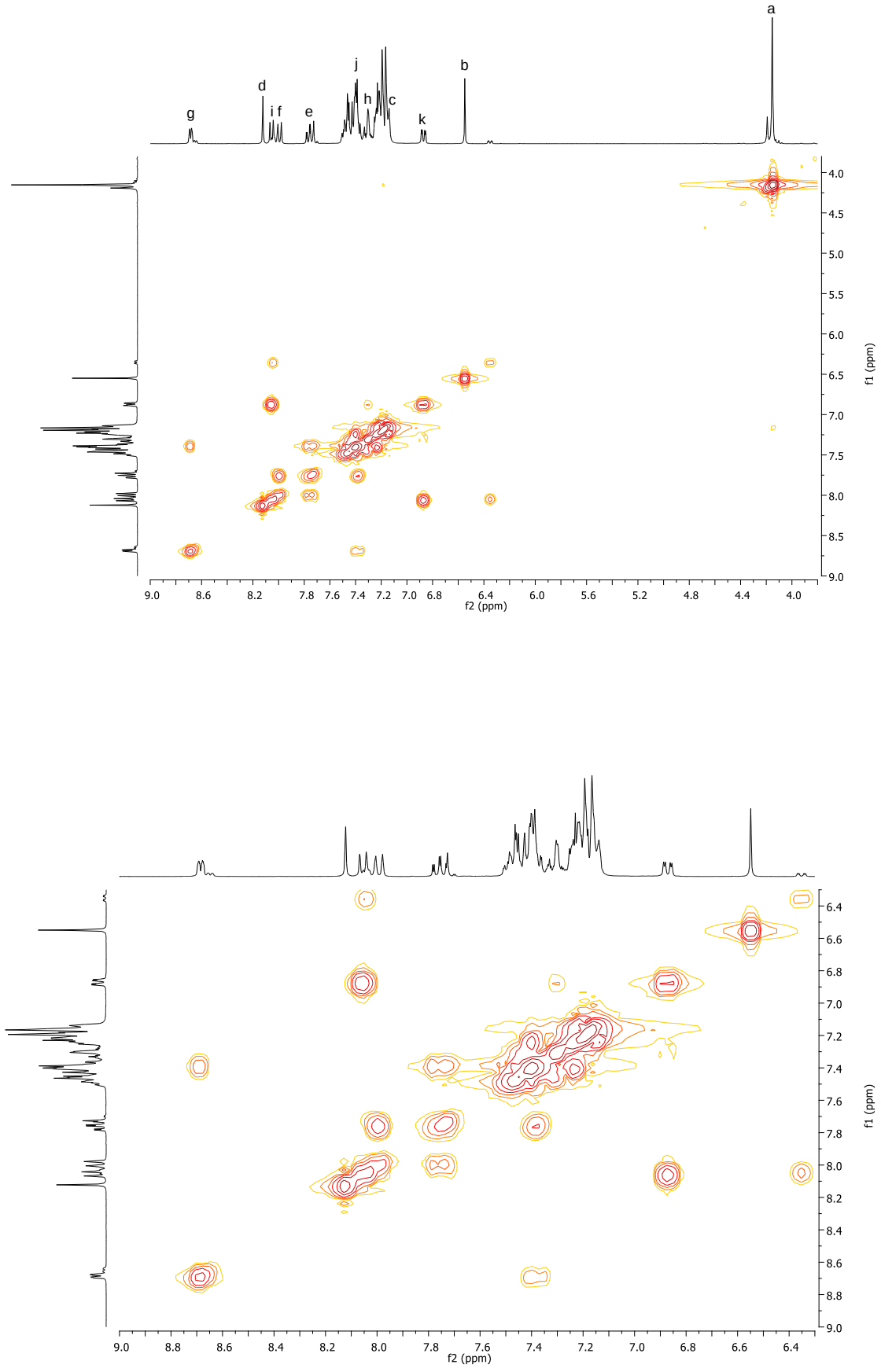


Figure S13. COSY spectra of **2a**.

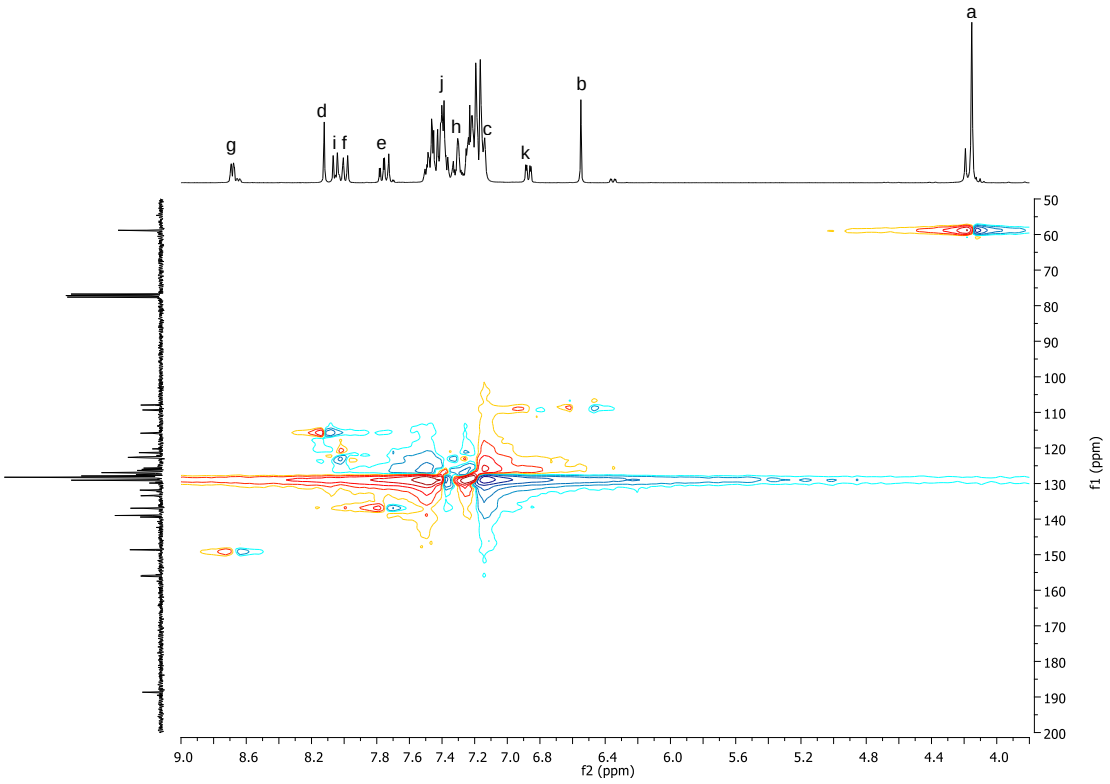


Figure S14. HSQC spectrum of **2a**.

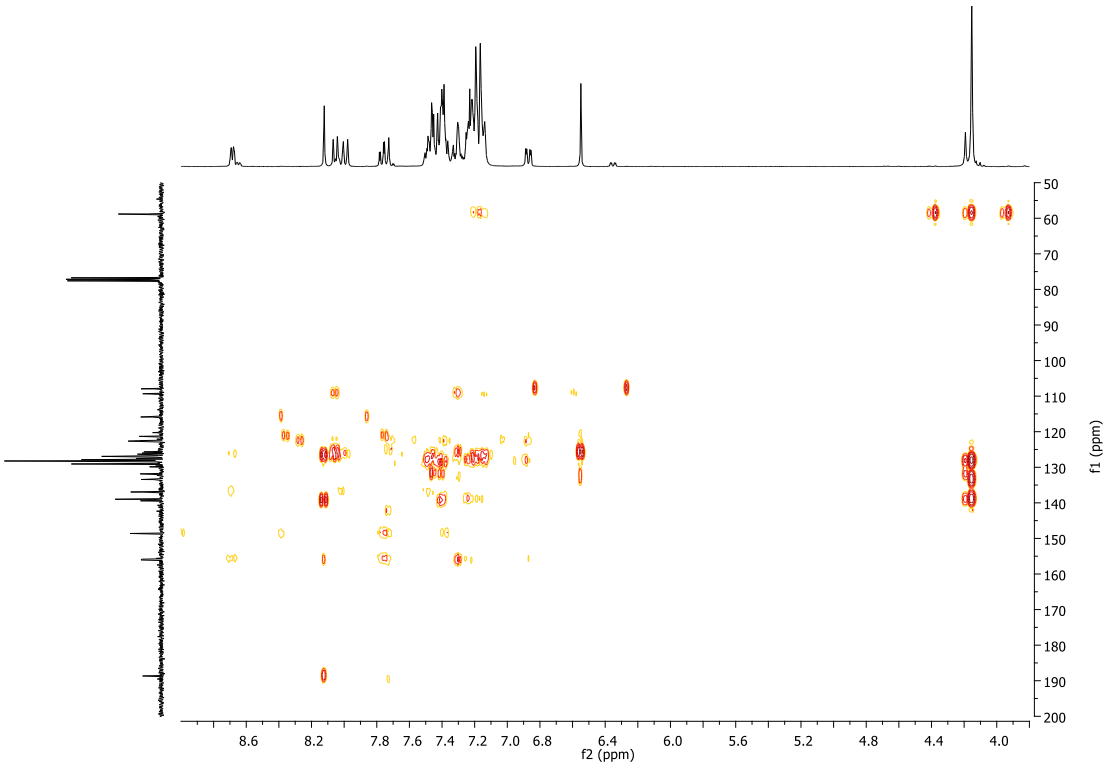


Figure S15. HMQC spectrum of **2a**.