

Supporting Information

Visible Light-Driven C-3 Functionalization of Indoles over Conjugated Microporous Polymers

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1. Materials

9*H*-carbazole, 1,3,5-tribromobenzene, cyanuric chloride, 1,10-phenanthroline, copper(I) iodide were purchased from Alfa Aesar Chemical Inc. and used as received. Anhydrous FeCl₃ was supplied from Aladdin Industrial Corporation (Shanghai, China). Trichloromethane (CHCl₃), chlorobenzene and 1,2-dichlorobenzene were purchased from Tianjin Guanghua Fine Chemical Research Institute (Tianjin, China), and they are purified by distillation over CaH₂ and stored with 4A molecular sieves prior to use. All other solvents and reagents were purchased from Energy Inc. and used as received.

2. Methods

¹H and ¹³C NMR spectra were recorded at 400 and 500 MHz, respectively. All chemical shifts were reported in units relative to tetramethyl silane (TMS). FT-IR spectra were collected on a VARIAN 1000 FT-IR (scimitar series) spectrometer in the 400-4000 cm⁻¹ region. Samples were prepared by dispersing in anhydrous KBr. (¹³C CP/MAS NMR) spectra were recorded using an AVANCE III 400 MHz spectrometer produced by Bruker. Scanning electron microscopy (SEM) images were recorded on a FEI SIRION200 microscope. The cumulative apparent surface areas for N₂ were calculated on a Micro ASAP 2020 using a Brunauer–Emmett–Teller (BET) model range from 0.01 to 0.1 bar for all samples. The microporous volumes were calculated using the t-plot method, while the total porous volumes were obtained from the N₂ isotherm at P/P₀=0.99. Pore size distributions were derived from the N₂ adsorption isotherms using DFT methods. Inductively coupled plasma-atomic emission spectroscopy (ICP-AES) analysis decided quantitatively metal content of the samples on an IRIS Advantage 1000 instrument. The UV/Vis/NIR absorption spectra of the polymers were recorded on a U-4100 spectrometer (Hitachi Limited, Japan) as powders in the solid state. The fluorescent pictures were obtained by Olympus IX83 fluorescent inverted microscope. The fluorescent spectra of the polymers were measured with a F97PRO fluorescence spectrometer (Lengguang Tech., Shanghai) in the solid state. Time-correlated fluorescence spectroscopy of solid samples was recorded on a FLS-980 fluorescence lifetime spectrometer (Edinburgh Instruments, Britain). Electrochemical measurements of these materials were carried out at room temperature in a three-electrode cell, with the glassy carbon auxiliary electrode as working electrode, the platinum wire as counter electrode. And the Hg/Hg₂Cl₂ electrode was used as reference electrode. Cyclic voltammetry was done at a scan rate of 50 mV/s containing 0.1 M Bu₄NPF₆ as supporting electrolyte. The polymer samples were coated onto the glassy carbon electrode.

3. Preparation procedures

3.1 Synthesis of intermediates and CMP-CSUs

3.1.1 Preparation of 1,4-di(9*H*-carbazol-9-yl)-benzene (DCB)

A mixture of 1-bromo-4-iodobenzene (3g, 10.6 mmol), potassium carbonate (5.3 g, 38.2

mmol), copper iodide (200 mg, 1.1 mmol), 1,10-phenanthroline (190 mg, 1.1 mmol), carbazole (6.4 g, 38.2 mmol) in dry *N,N*-dimethylformamide (80 mL) was stirred for 24h at 145°C under N₂. The progress of the reaction was monitored by TLC, after cooling to room temperature, the reaction mixture was concentrated to remove the solvent and the residue was purified by flash column chromatography, most of the byproduct was removed, and the resulting mixture was suspended in dichloromethane (20 mL) and stirred for 1 h, the mixture was filtered and the solid was collected and dried. The filtrate was concentrated and performed for two times following the above steps. The desired product was obtained as a white solid in 66 % yield. ¹H NMR (400 MHz, CDCl₃): δ 8.23-8.21 (d, 4H), 7.84 (s, 4H), 7.61-7.59 (d, 4H). 7.53-7.50 (t, 4H), 7.39-7.36 (t,3H). ¹³C NMR (400 MHz, CDCl₃): δ 140.79, 136.70, 128.40, 126.16, 123.60, 120.48,120.31, 109.78.

3.1.2 Preparation of CMP-CSU5

To the solution of FeCl₃(3.2 g, 19.5mmol) in CHCl₃ (30 mL), DCB (1.0 g, 2.4mmol) was dissolved in 30 mL of anhydrous chloroform and then injected into the flask with a 50 mL syringe. The solution was stirred at room temperature for 3 days under N₂ protection. And then 100 mL of methanol was added to the reaction mixture and kept stirring for 1 hour. The precipitate was collected using filtration and washed with 250 mL methanol. Solids were stirred vigorously in hydrochloric acid solution (37 %) for 2 h, filtered and followed by soxhlet extraction from methanol (24 h), THF (24 h), CHCl₃ (24 h) and then dried. The desired product was obtained as a yellow solid in 93% yield.

3.1.3 Preparation of 1,3,5-tri(9H-carbazol-9-yl) benzene (TCB)

The synthesis method of TCB was almost the same as that for DCB starting from 1,3,5-tribromo-benze and carbazole. The desired product was obtained as a white solid in 70% yield. ¹H NMR (400 MHz, CDCl₃): δ 8.21-8.20 (d, 6H), 7.84 (s, 3H), 7.72-7.70 (d, 6H). 7.53-7.50 (t, 6H), 7.39-7.36 (t, 6H). ¹³C NMR (400 MHz, CDCl₃): δ 140.82, 140.36, 126.41, 123.88, 123.57, 120.78,120.63, 109.70.

3.1.4 Preparation of CMP-CSU6

The synthesis method of CMP-CSU6 was almost the same as that for CMP-CSU5 starting from TCB and the desired product was obtained as a yellow solid in 92% yield.

3.1.5 Preparation of CMP-CSU6@70

The synthesis method of CMP-CSU-6@70 was almost the same as that for CMP-CSU5 starting from TCB and the desired product was obtained as a dark-yellow solid in 90% yield. The reaction temperature was at 70°C in anhydrous CHCl₃.

3.1.6 Preparation of CMP-CSU6@120

The synthesis method of CMP-CSU-6@120 was almost the same as that for CMP-CSU5 starting from TCB and the desired product was obtained as a dark- yellow solid in 94% yield. The reaction temperature was at 120°C in chlorobenzene.

3.1.7 Preparation of CMP-CSU6@140

The synthesis method of CMP-CSU6@70 was almost the same as that for CMP-CSU5 starting from TCB and the desired product was obtained as a dark- yellow solid in 94% yield. The reaction temperature was at 140°C in 1,2-dichlorobenzene.

3.1.8 Preparation of 2,4,6-tri(9H-carbazol-9-yl)-1,3,5-triazine (TCT)

To a solution of carbazole (3.0 g, 17.9 mmol) in anhydrous THF (20 mL) in a three-necked round-bottom flask, n-Buthyllithium (7.8 mL, 2.5 M in hexane solution) was added dropwise to the carbazole solution at -78 °C and then the mixture was stirred for 1 h at room temperature. A mixture of cyanuric trichloride (1.0 g, 5.43 mmol) in dry THF (10 mL) was injected dropwise into the flask with a 20 mL syringe and the reaction mixture was refluxed for 8 h, After cooling the solution to room temperature, 50 mL of water was added and stirred for 1 h, the product was filtered off. The desired product was obtained as a light yellow solid and by recrystallizing repeatedly from dichloromethane in 70% yield. ¹H NMR (400 MHz, CDCl₃): δ 9.06-9.05 (d, 2H), 8.17-8.16 (d, 2H), 7.56-7.46 (m, 2H). ¹³H NMR (400 MHz, CDCl₃): δ 138.79, 127.14, 126.53, 123.52, 119.79, 117.54.

3.1.9 Preparation of CMP-CSU7

The synthesis method of CMP-CSU7 was almost the same as that for CMP-CSU5 starting from TCT and the polymerization temperature needs to heat to 80 °C. The desired product was obtained as a yellow solid in 92% yield.

3.2 The synthetic route of *N*-protected indoles

3.2.1 General procedure for the synthesis of *N*-protected indoles from substituted indoles with alkyl bromides or iodides

A 50 mL round-bottom flask was charged with substituted indoles (8 mmol), NaOH (16.0 mmol) and 80 mL of THF, after the mixtures was stirred for 0.5 hour, alkyl bromides or iodides (16 mmol) was slowly added. The reaction mixture was stirred at room temperature for five hours. Upon completion, the mixture was concentrated to remove THF and the residues were purified by silica gel chromatography with petroleum ether/EtoAc.

3.2.2 General procedure for the synthesis of 1-Tosylindole

A 50 mL round-bottom flask was charged with substituted indoles (8 mmol), 4-toluene sulfonyl chloride (9.0 mmol), dimethylaminopyridine (0.8 mmol) and 80 mL of DCM. The reaction mixture was stirred at room temperature for 14 hours. Upon completion, the mixture was concentrated to remove DCM and the residues were purified by silica gel chromatography with petroleum ether/EtOAc.

3.2.3 General procedure for the synthesis of *N*-Boc-indole

A 50 mL round-bottom flask was charged with substituted indoles (8 mmol), di-tert-butyl dicarbonate (9.0 mmol), dimethylaminopyridine (0.8 mmol) and 80 mL of DCM. The reaction mixture was stirred at room temperature for 14 hours. Upon completion, the mixture was concentrated to remove DCM and the residues were purified by silica gel chromatography with petroleum ether/EtOAc.

3.3 Functionalization of Indoles based on CMP-CSU catalysts

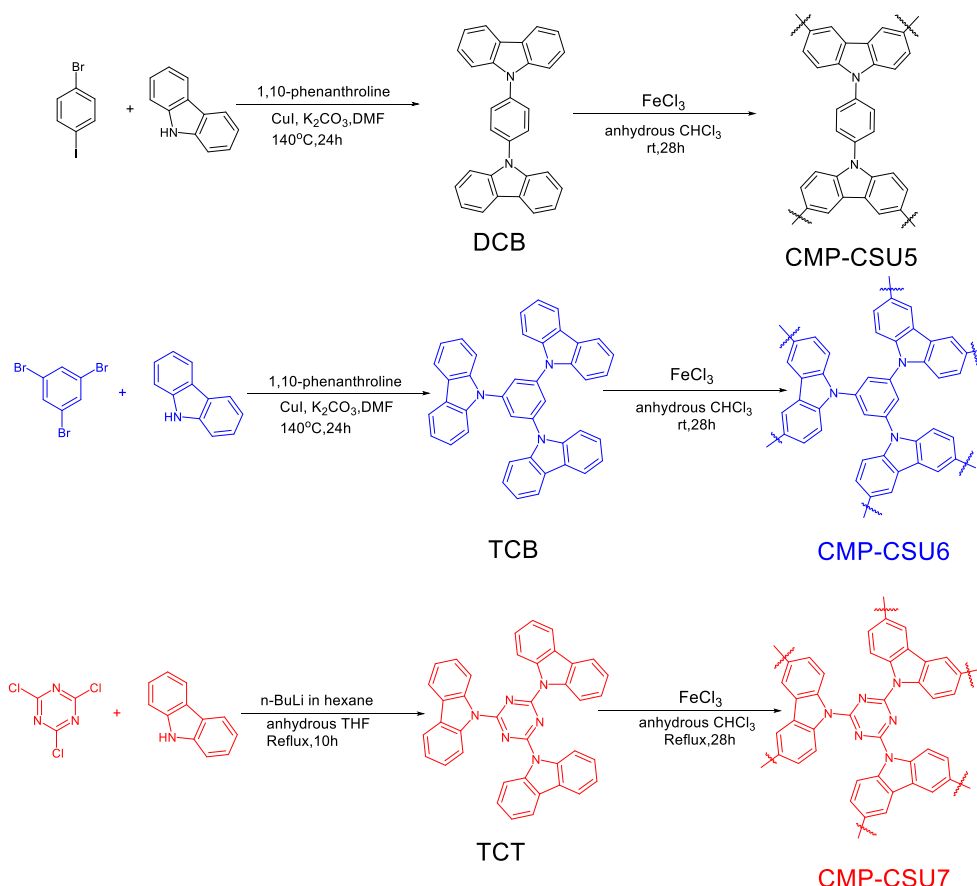
Typical procedure for C-3 Formylation of indoles

25 mL one-necked round-bottom flask was charged with 1-methyl-1H-indole (131.2 mg, 1.0 mmol), TMEDA (300 μ L, 2mmol), CMP–CSU6 (20 mg), KI (664 mg, 2 mmol), MeCN (5.0 mL) and H₂O (50 μ L). The reaction mixture was protected with an O₂ balloon (~0.1MPa). A 14 W blue LED (0.20 W/cm²) was placed at a distance of about 8 cm from the reaction flask. Upon completion monitored by TLC, the reaction mixture was concentrated and purified by silica gel chromatography using PE/EA to give the desired product 3a in 86% yield.

Typical procedure for C-3 thiocyanation of indoles

25 mL one-necked round-bottom flask was charged with 1H-indole (58.5 mg, 0.5 mmol), NH₄SCN (1.0 mmol, 2 equiv), CMP–CSU6 (20 mg) and THF (5 mL). The reaction mixture was protected with an O₂ balloon (~0.1MPa). A 14 W blue LED (0.20 W/cm²) was placed at a distance of about 8 cm from the reaction flask. Upon completion monitored by TLC, the reaction mixture was concentrated and purified by silica gel chromatography using PE/EA to give the desired product 5f in 95% yield.

3.4. The synthetic route of targeted intermediates and CMP-CSUs



Scheme S1. The synthetic route of DCB, CMP-CSU5, TCB, CMP-CSU6, TCT and CMP-CSU7

4. N₂ gas sorption isotherms and the pore size of distribution profiles

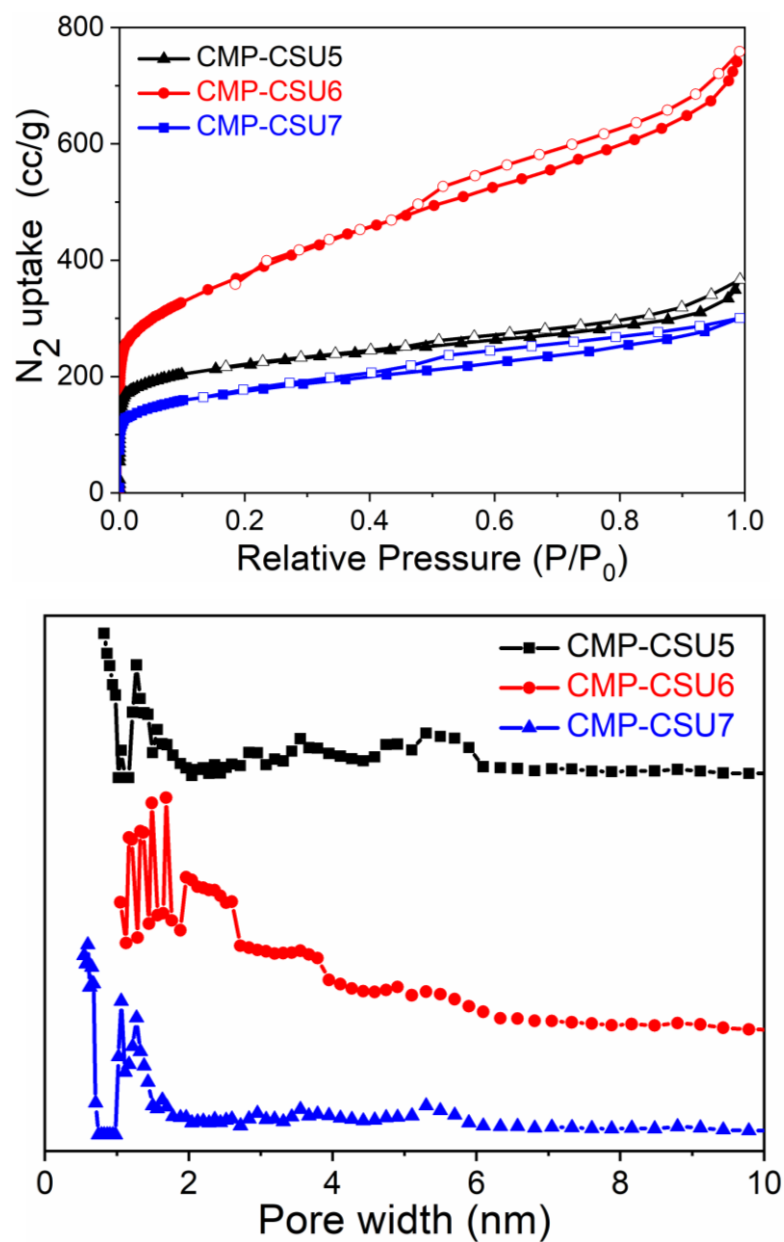


Figure S1. Nitrogen adsorption (solid) and desorption (open) isotherms at 77K and pore size of distribution profiles of CMP-CSU5, CMP-CSU6 and CMP-CSU7

5. FT-IR spectra

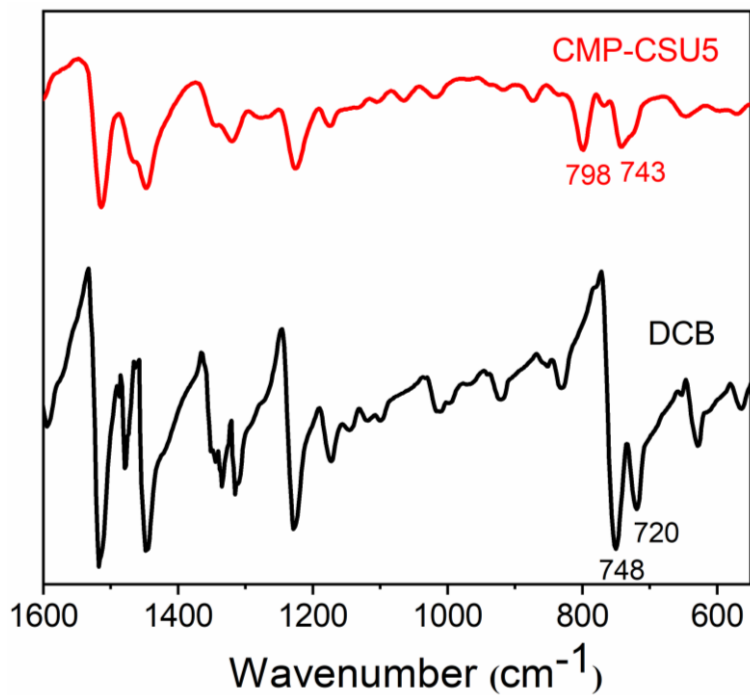


Figure S2. FT-IR spectra of DCB and CMP-CSU5

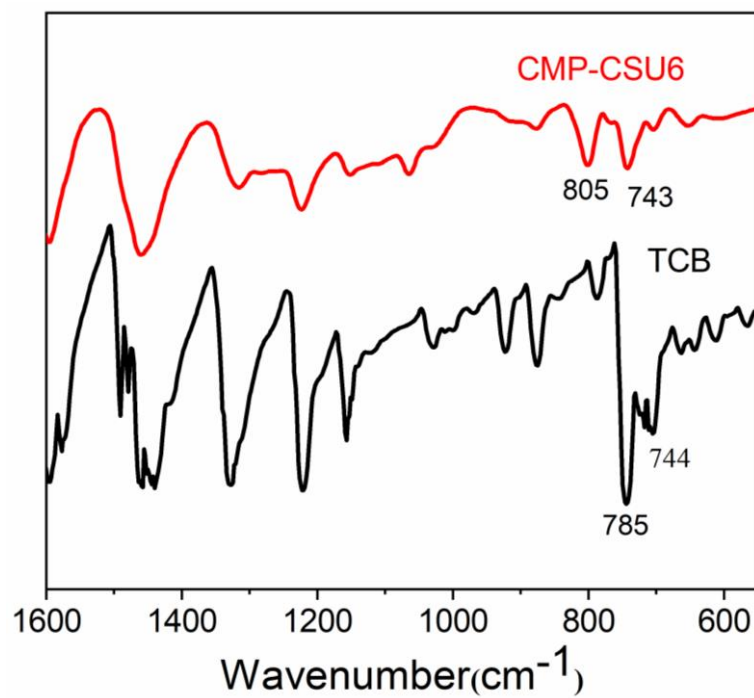


Figure S3. FT-IR spectra of TCB and CMP-CSU6

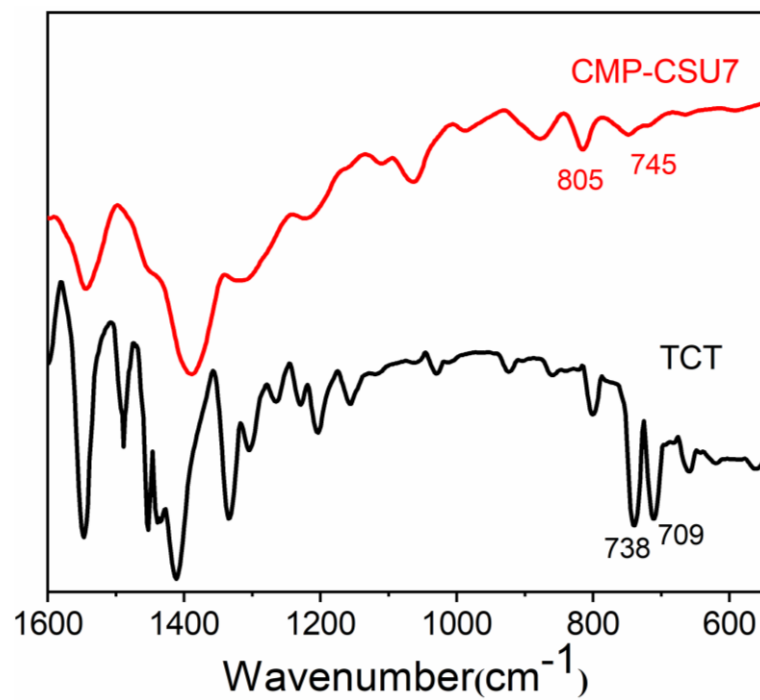


Figure S4. FT-IR spectra of TCT and CMP-CSU7

6. Solid ^{13}C -NMR spectrum

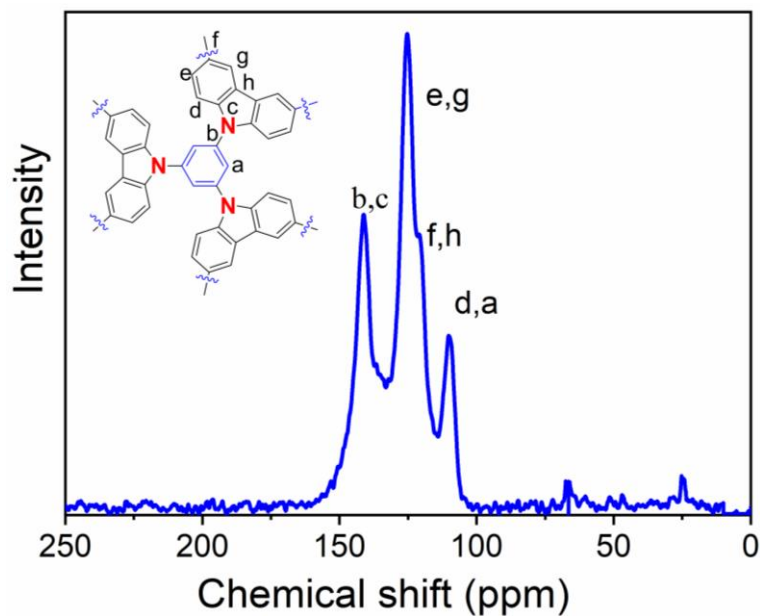


Figure S5. Solid ^{13}C -NMR spectrum of CMP-CSU6

The peaks in the range of 100-150 ppm are due to the presence of aromatic carbon atoms. The peaks at 140 ppm are assigned to the aryl carbons next to the carbazolic nitrogen atom. The signal around 124 ppm can be attributed to unsubstituted aryl carbons, and the peaks at 120, 122 and 125 ppm can be ascribed to the carbon atoms on carbazolic ring. All above is well consistent with the proposed structure of CMP-CSU6.

7. UV-vis absorption spectra

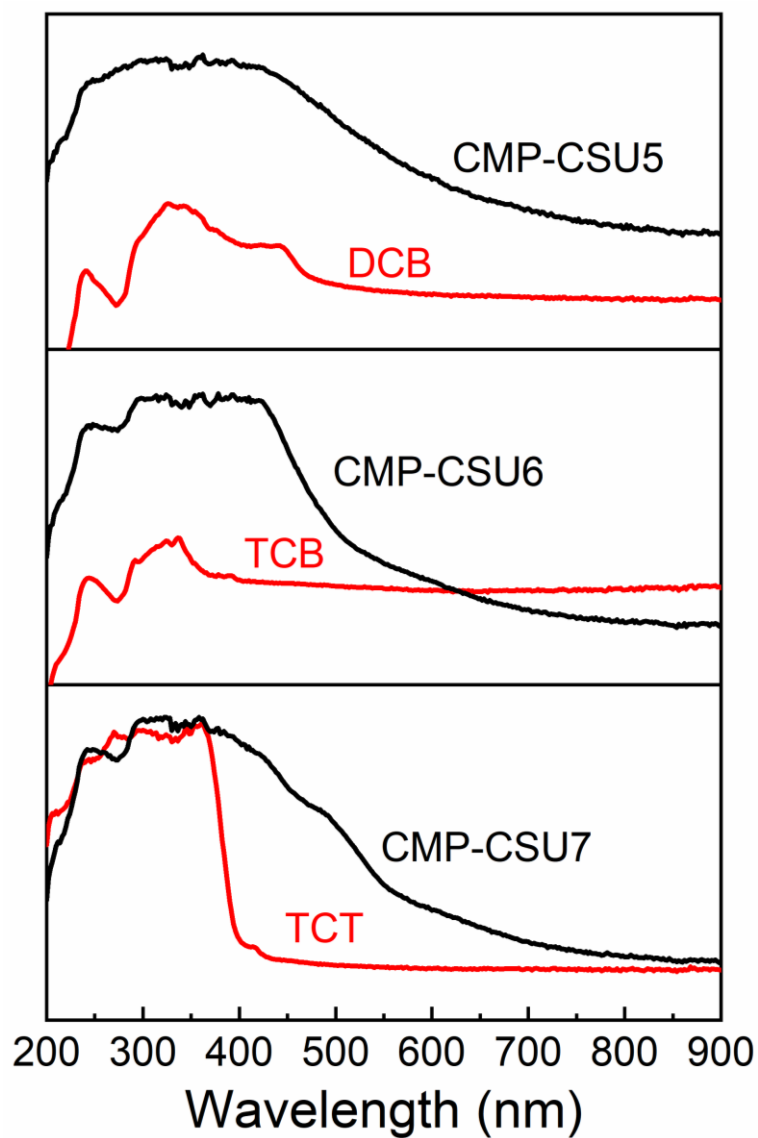


Figure S6. Normalized UV-vis absorption spectra of DCB, TCB, TCT, CMP-CSU5, CMP-CSU6 and CMP-CSU7 (solid state).

8. Cyclic voltammetry of CMP-CSU5, CMP-CSU6 and CMP-CSU7

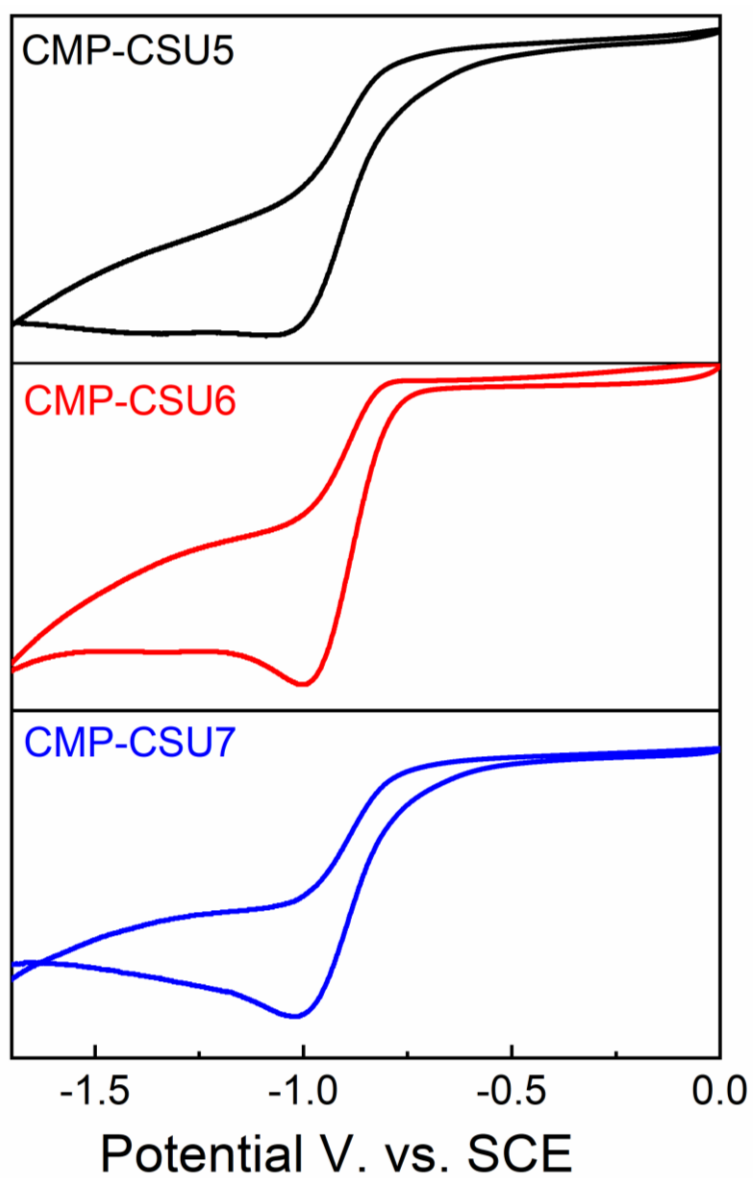


Figure S7. Cyclic voltammetry of CMP-CSU5, CMP-CSU6 and CMP-CSU7 with a scan rate of 0.05Vs^{-1} (from top to bottom)

9. Normalized UV-Vis absorption and photoluminescence spectra

spectra

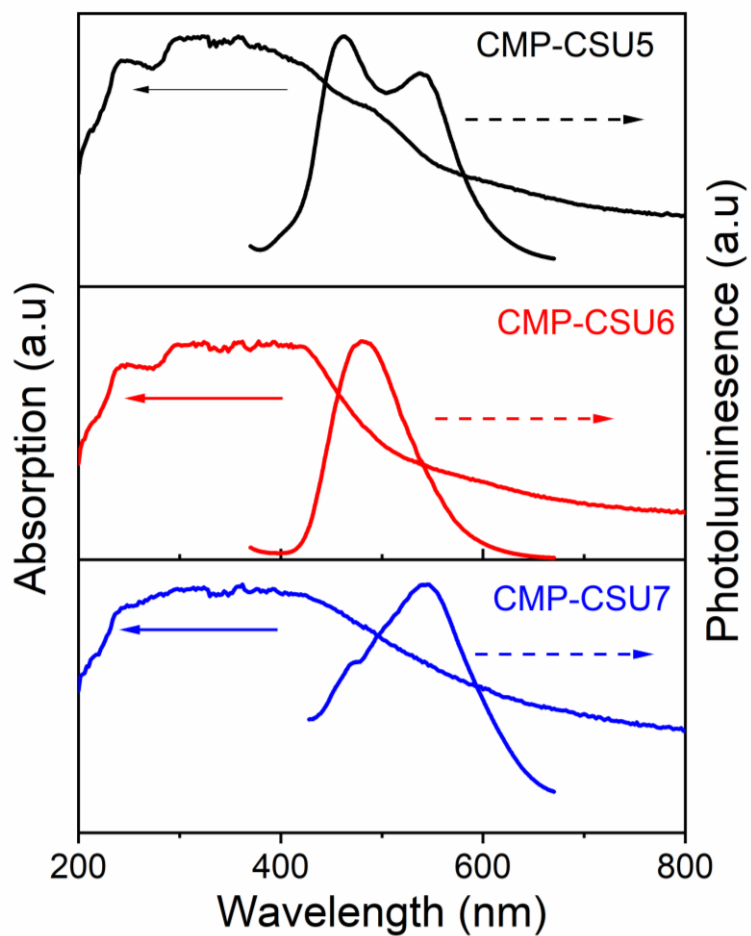
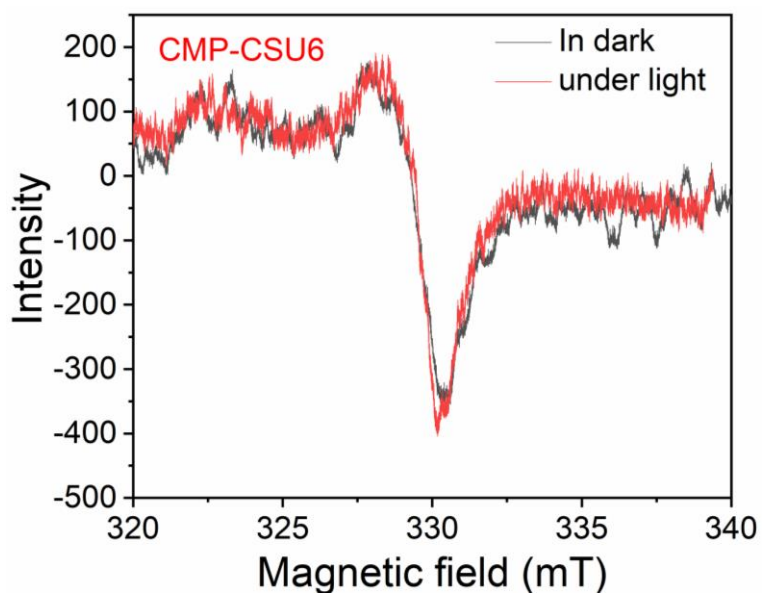
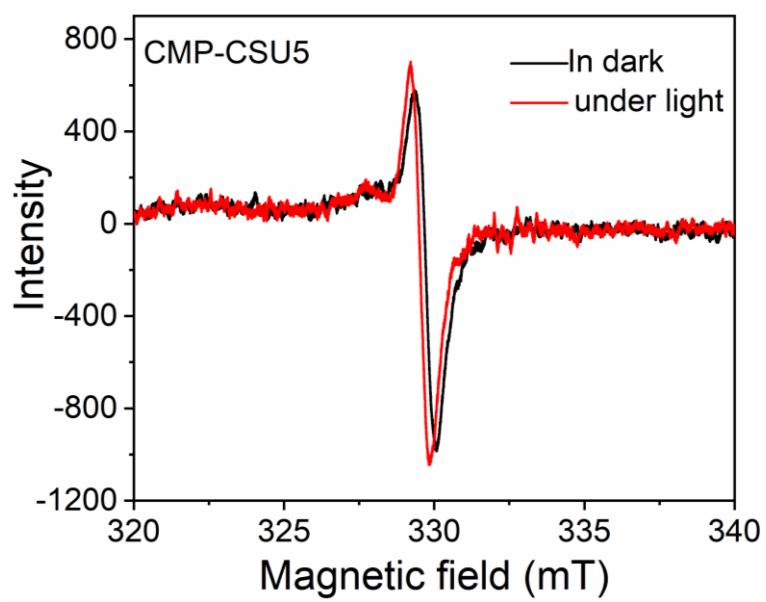


Figure S8. Normalized UV-Vis absorption and photoluminescence spectra of CMP-CSU5, CMP-CSU6, and CMP-CSU7 in the solid state.

10. The EPR spectra of CMP-CSU5, CMP-CSU6 and CMP-CSU7



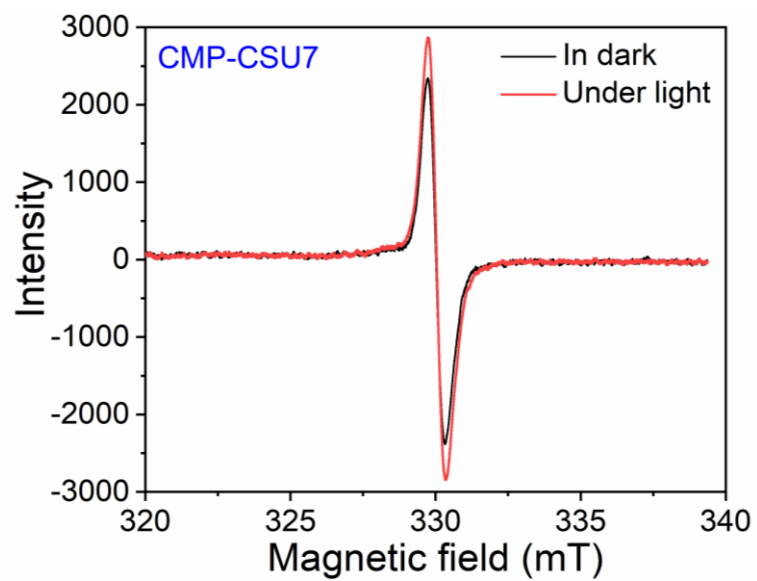


Figure S9. EPR spectra of CMP-CSU5, CMP-CSU6 and CMP-CSU7 obtained in the dark and under visible light irradiation.

11. Cyclic voltammetry of N^1, N^1, N^2, N^2 -tetramethylethane-1,2-diamine and ammonium thiocyanate

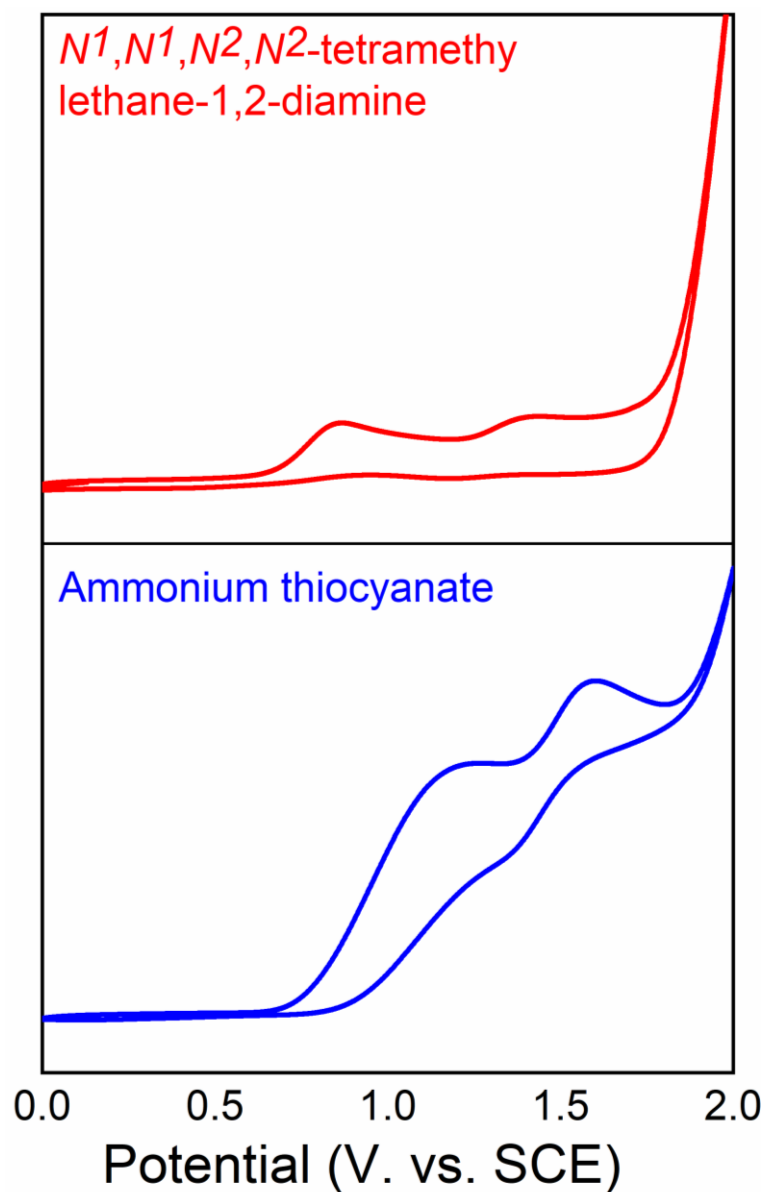


Figure S10. Cyclic voltammetry of N^1, N^1, N^2, N^2 -tetramethylethane-1,2-diamine and ammonium thiocyanate with a scan rate of 0.05Vs^{-1} (from top to bottom)

12. N₂ gas sorption isotherms and the pore size of distribution profiles of CMP-CSU6, CMP-CSU6@70 and CMP-CSU6@140

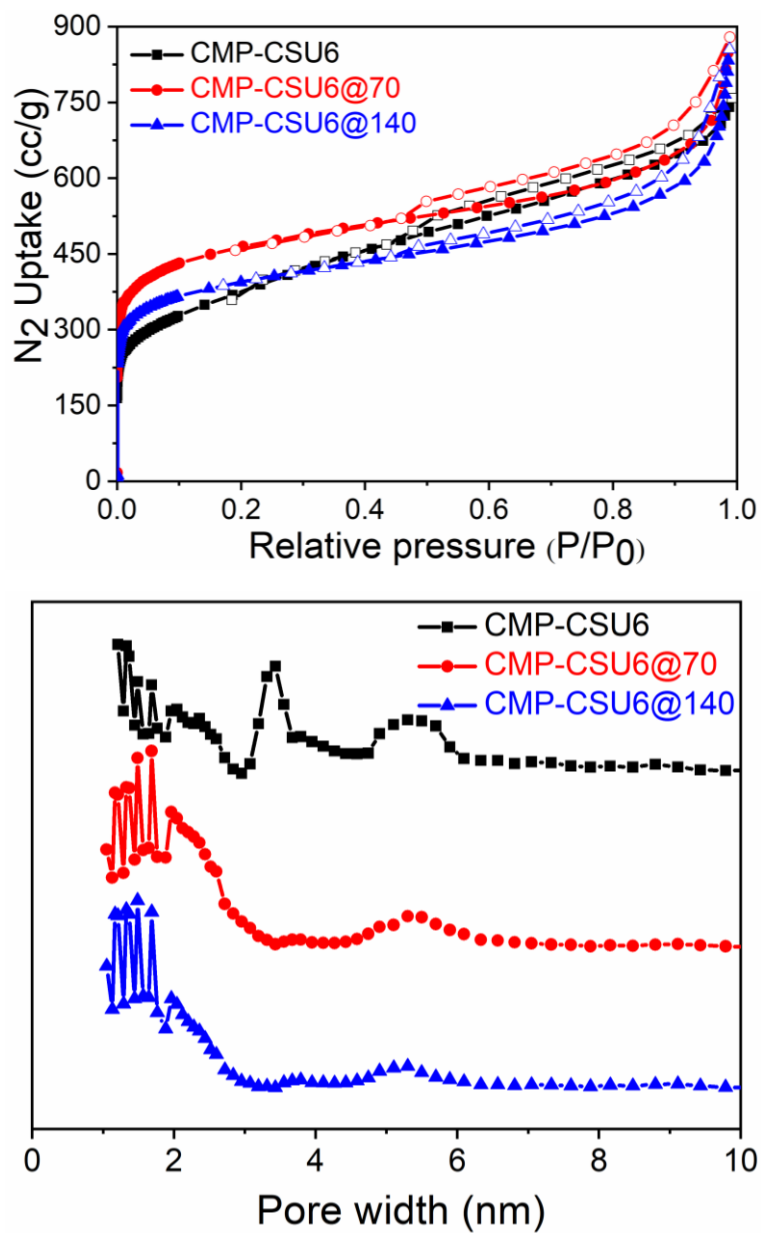


Figure S11. Nitrogen adsorption (solid) and desorption (open) isotherms at 77K and pore size of distribution profiles of CMP-CSU6, CMP-CSU6@70 and CMP-CSU6@140.

13. Probing the intermediates during the C-3 formylation of indole catalysed by CMP-CSU6

LC-MS data of reaction mixture:

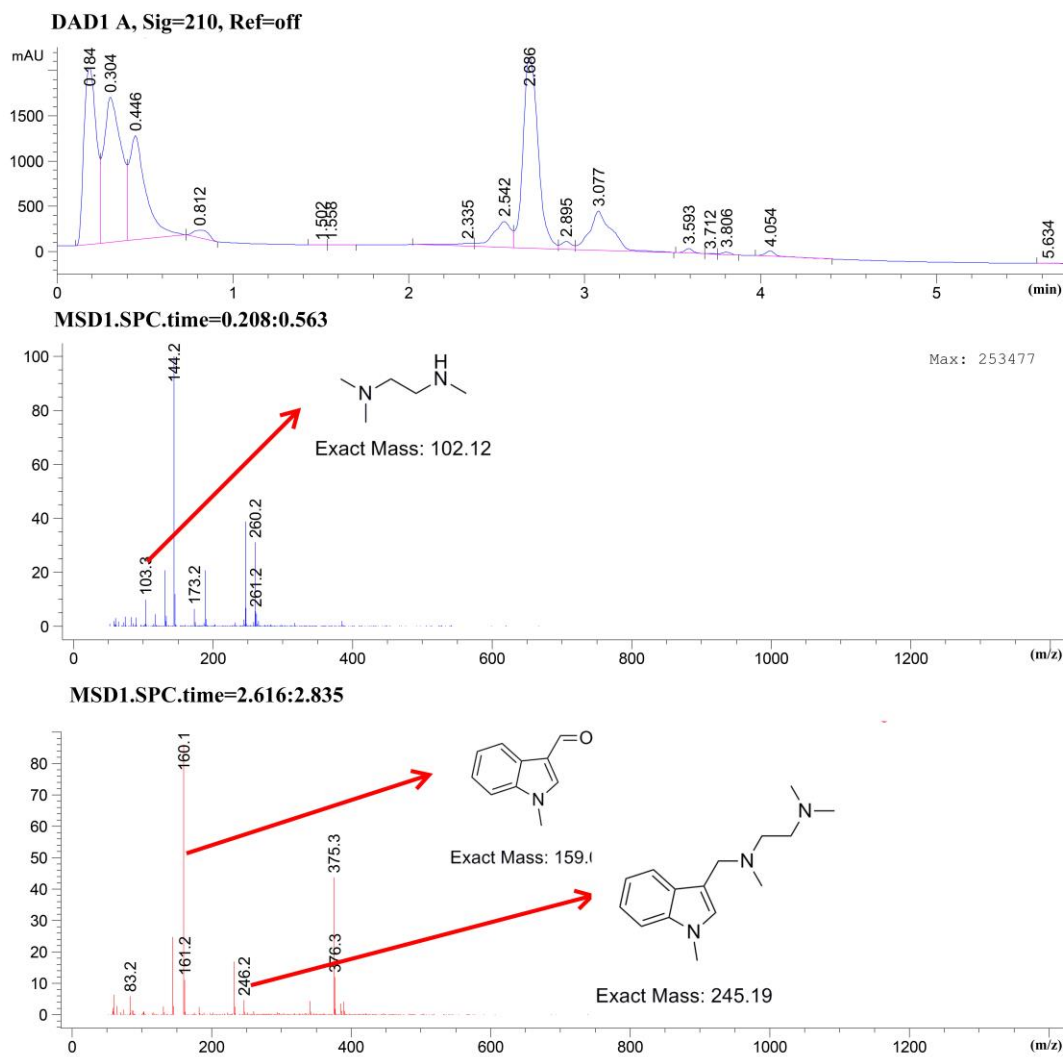


Figure S12. LC-MS for reaction mixture.

14. FT-IR of CMP-CSU6 and its recovered sample after 3 catalysis cycles

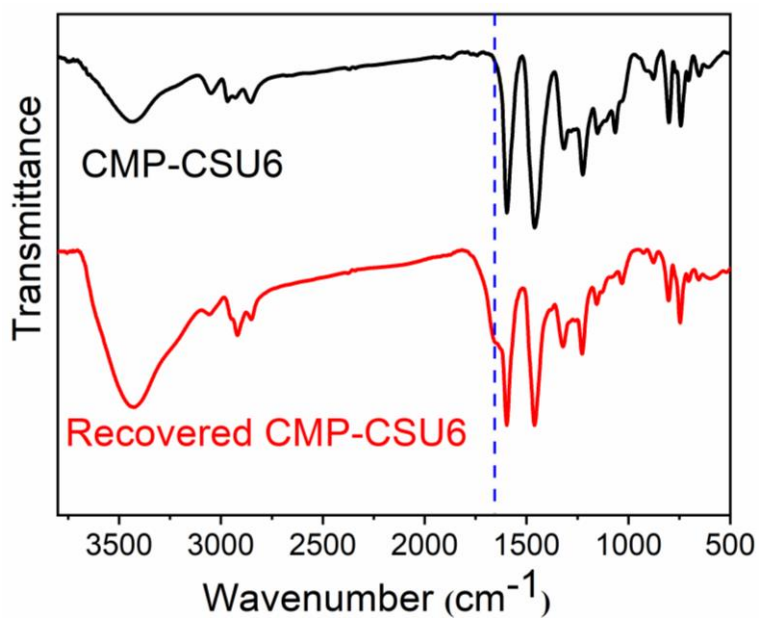


Figure S13. FT-IR spectra of CMP-CSU6 and recovered CMP-CSU6 after 3 catalysis cycles

15. Optimization Table

Table S1 Screening and Control Experiments of the Photocatalytic C-3 Formylation of *N*-Methylindole using CMP-CSU6^a.

CN1C=CC=C2C=CC=CC12 (1) + CN(C)CC(=O)N (2) $\xrightarrow[\text{Solvent/H}_2\text{O, RT, O}_2, \text{KI}]{\text{Photocatalyst, hv}}$ CN1C=CC=C2C=CC=CC12C=O (3a)

entry	catalyst	light	reaction condition variations	yield ^b
1	CMP-CSU6	-	CH ₃ CN/H ₂ O	NR
2	-	+	CH ₃ CN/H ₂ O	Trace
3	CMP-CSU6	+	CH ₃ CN/H ₂ O	11% ^c
4	CMP-CSU6	+	CH ₃ CN/H ₂ O	9% ^d
5	CMP-CSU6	+	N ₂	Trace
6	CMP-CSU6	+	CH ₃ CN/H ₂ O	45% ^e
7	CMP-CSU6	+	CH ₃ CN/H ₂ O	86%
8	CMP-CSU6	+	CH ₃ CN/H ₂ O	84% ^f
9	CMP-CSU6	+	CH ₃ CN/H ₂ O	58% ^g
10	CMP-CSU6	+	CH ₃ CN/H ₂ O	21% ^h
11	CMP-CSU6	+	H ₂ O	<10% ⁱ
12	CMP-CSU6	+	DCM/H ₂ O	60%
13	CMP-CSU6	+	DMF/H ₂ O	25%
14	CMP-CSU6	+	MeOH/H ₂ O	46%
15	CMP-CSU6	+	THF /H ₂ O	27%
16	CMP-CSU6	+	No KI	8%
17	CMP-CSU6	+	CH ₃ CN/H ₂ O	69% ^j
18	CMP-CSU6	+	KI/H ₂ O ₂	trace

^aReaction conditions: *N*-methylindole (0.5 mmol), TMEDA (2 equiv), KI (4 eq), photocatalyst (20 mg), Solvent (5 mL) and 50 μ L of H₂O, RT, O₂ (~0.1MPa), using a 14 W LED lamp (0.20 W/cm²) as the light source, 48h. ^bIsolated yield. ^cTEMPO as a radical scavenger. ^dbenzoquinone as superoxide scavenger. ^eNaN₃ as a ¹O₂ scavenger. ^f 4 mL CH₃CN and 1 mL H₂O. ^g3 mL CH₃CN and 1 mL 2 mL H₂O. ^h 2 mL CH₃CN and 3 mL H₂O, ⁱ 5 mL H₂O. ^j1.0 eq of KI.

The effect of the water amount on the yield for formylation of *N*-methylindole was investigated. At first, with the increase of the water, high yields were retained (Table S1, entries 7 and 8). When the water was up to 2 mL or 3 mL, the yield decreased dramatically (Table S1, entries 9 and 10). A yield lower than 10% was observed when the water was used as the solvent (Table S1, entry 11). The results demonstrated that the amount of H₂O play an important role for the formylation of *N*-methylindole. The effects of different solvents on

the yield of C-3 formylation also have been investigated. It could see from Table S1, the photocatalytic properties in methanol and dichloromethane (entries 12 and 14) were relatively higher than those in dimethylformide and tetrahydrofuran (entries 13 and 15). When reaction was performed by using CH₃CN as solvent, the yield can reach up to 86% (Table S1, entry 7).

16. Plot of the relationship of the amount of KI and product yield.

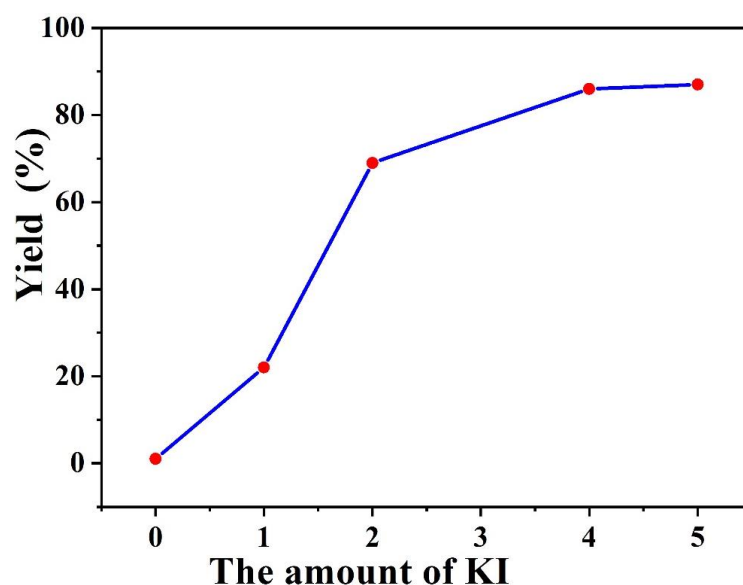


Figure S14. Plot of the amount of KI vs yield 1-methyl-1H-indole-3-carbadehyde

The loading of KI was also optimized, as shown in Figure S14, in the absence of KI, only a trace amount of 3a was detected by TLC (Table S1, entry 4), with the increase of KI loading, the yield increased (up to 86%). It seems that the increasing of KI loading may promote the reaction. We speculated that the KI was oxidized by the trace of H₂O₂ to afford I₂ and the I₂ as catalyst to promote the reaction.^{S1-S3} To demonstrate this possibility, a stoichiometric amount of I₂ instead of KI was added, but the reaction mixture was too messy and only trace of the product was detected by TLC. Therefore, we can conclude that the function of I₂ in this reaction is not used as a catalyst and the role of KI remains unknown.

S1 Shiraishi, Y.; Kanazawa, S.; Kofuji, Y.; Sakamoto, H.; Ichikawa, S.; Tanaka, S.; Hirai, T. Sunlight - Driven Hydrogen Peroxide Production from Water and Molecular Oxygen by Metal - Free Photocatalysts. *Angew. Chemie Int. Ed.* **2014**, *53*, 13454–13459.

S2 Fei, H.; Yu, J.; Jiang, Y.; Guo, H.; Cheng, J. The ammonium-promoted formylation of indoles by DMSO and H₂O. *Org. Biomol. Chem.* **2013**, 11, 7092-7095.

S3 Zhang, B.; Liu, B.; Chen, J.; Wang, J.; Liu, M. I₂-mediated C3-formylation of indoles by tertiary amine and H₂O. *Tetrahedron Lett.* **2014**, 55, 5618–5621.

Table S2. Screening and Control Experiments for C-3 Thiocyanation of 1*H*-indole Using CMP-CS U6^a.



entry	light	reaction condition variations	yield ^b
1	+	-	95%
2	+	-	33% ^c
3	No light	-	NR
4	+	N ₂	29%
5	+	KSCN	39%
6	+	NaSCN	47%
7	+	-	76% ^d
8	+	-	96% ^e
9	+	TEMPO	29% ^f
10	+	DCM	8%
11	+	DMF	12%
12	+	MeOH	22%

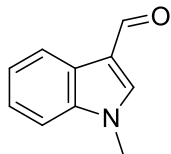
^aReaction conditions: 1*H*-indole (1a, 0.5 mmol), NH₄SCN (1.0 mmol, 2 equiv), catalyst (20 mg), THF (3 mL), room temperature, 10 h, RT, O₂ (~0.1MPa), using a 14 W LED lamp (0.20 W/cm²) as the light source. ^bIsolated yield. ^cNo CMP-CSU6. ^d1 equiv of KSCN was used. ^e3 equiv of KSCN was used. ^fTEMPO as a radical scavenger.

We started our investigation using 1 equiv of 1*H*-indole and 2 equiv of ammonium thiocyanate in the initial reaction screenings. It was proved that oxygen, light and photocatalyst played a critical role in the reaction (Table S2, entries 1, 2, 3 and 4). The thiocyanating agents KSCN and NaSCN instead of NH₄SCN were employed for the reaction. However, only 39% and 47% yields of the product were obtained, respectively (Table S2, entries 5 and 6). Upon increasing the NH₄SCN loading, the yield for thiocyanation was enhanced, and with 2 equiv of NH₄SCN the yield of 5f was obtained in 96% yield (Table S2, entries 6 and 7). A series of solvents were screened, and THF was the most effective medium for the reaction, affording product 5f in 95% yield (Table S2,

entries 1, 10-12). To further study the reaction mechanism of the photocatalytic C-3 thiocyanation of indoles, a control experiment was conducted. When 3 equiv of 2,2,6,6-tetramethylpiperidyl-1-oxyl (TEMPO), a radical scavenger, was added into the reaction, where the intermediate $\text{SCN}\cdot$ was blocked, only 29% yield of product 5f was obtained.

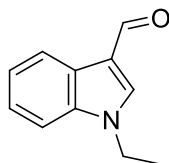
17. Spectral Data

1-Methyl-1H-indole-3-carbaldehyde (3a)



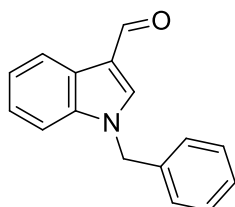
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE:EtOAc=2:1) afforded compound 3a as an off-white solid in 86% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (400 MHz, CDCl₃): δ 10.00 (s, 1H), 8.32-8.30 (m, 1H), 7.69 (s, 1H), 7.39-7.32 (3H), 3.89 (s, 3H).

1-Ethyl-1H-indole-3-carbaldehyde (3b)

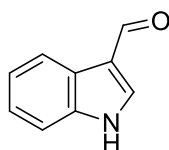


The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3b as an off-white solid in 72% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (500 MHz, CDCl₃): δ 10.00 (s, 1H), 8.32-8.30 (m, 1H), 7.75 (s, 1H), 7.40-7.39 (1H), 7.36-7.29 (2H), 4.26-4.22 (q, 2H), 1.57-1.54 (t, 3H).

1-Benzyl-1H-indole-3-carbaldehyde (3c)



The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3b as an off-white solid in 72% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (500 MHz, CDCl₃): δ 10.00 (s, 1H), 8.32-8.30 (m, 1H), 7.75 (s, 1H), 7.40-7.39 (1H), 7.36-7.29 (2H), 4.26-4.22 (q, 2H), 1.57-1.54 (t, 3H).

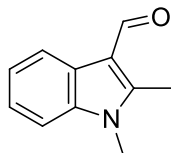


1H-indole-3-carbaldehyde (3f)

The targeted compound was prepared according to the general procedure (3.3).

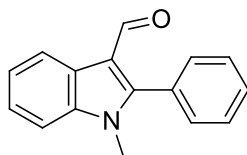
Purification by column chromatography (PE: EtOAc=1:1) afforded compound 3f as a light brown solid in 64% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (400 MHz, DMSO-d₆): δ 12.15 (s, 1H), 9.94(s,1H), 8.30 (s, 1H), 8.10-8.08 (1H), 7.53-7.51 (1H), 7.20-7.17 (2H).

1,2-Dimethyl-1H-indole-3-carbaldehyde (3g)



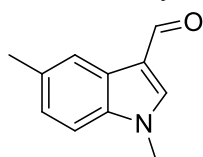
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3g as a light brown solid in 72% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (400 MHz, CDCl₃): δ 10.15 (s, 1H), 8.28-8.26 (s, 1H), 7.36-7.28 (3H), 3.69 (s, 3H), 2.67(s, 3H).

1-Methyl-2-phenyl-1H-indole-3-carbaldehyde (3h)



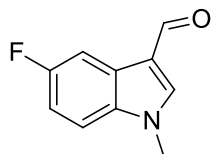
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=4:1) afforded compound 3h as a light brown solid in 70% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (400 MHz, CDCl₃): δ 9.74 (s, 1H), 8.45 (1H), 7.58-7.56 (3H), 7.52-7.49 (2H), 7.43-7.36 (3H), 3.69(s, 3H).

1,5-Dimethyl-1H-indole-3-carbaldehyde (3i)



The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3i as a beige solid in 70% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (500 MHz, CDCl₃): δ 9.96 (s, 1H), 8.11 (s, 1H), 7.63 (s, 1H), 7.24-7.11 (2H), 3.85 (s, 3H), 2.49 (s, 3H).

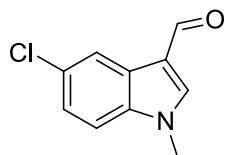
5-Fluoro-1-methyl-1H-indole-3-carbaldehyde (3j)



The targeted compound was prepared according to the general procedure (3.3).

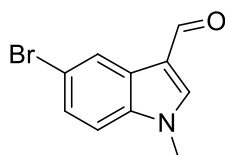
Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3j as a beige solid in 51% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (500 MHz, CDCl₃) δ 9.96 (s, 1H), 7.80-7.96 (m, 1H), 7.70 (s, 1H), 7.27-7.25 (1H), 7.12-7.07 (1H), 3.72 (s, 3H).

5-Chloro-1-methyl-1H-indole-3-carbaldehyde (3k)



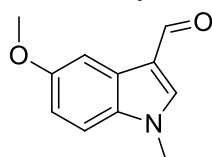
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3k as a beige solid in 38% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (500 MHz, CDCl₃) δ 9.95 (s, 1H), 8.30 (s, 1H), 7.69 (s, 1H), 7.36-7.26 (m, 2H), 3.88 (s, 3H).

5-Bromo-1-methyl-1H-indole-3-carbaldehyde (3l)



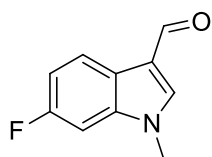
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3l as a beige solid in 41% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (500 MHz, CDCl₃) δ 9.97 (s, 1H), 8.47 (s, 1H), 7.68 (s, 1H), 7.46-7.44 (d, J=10 Hz, 1H), 7.25-7.23 (d, J=10 Hz, 1H), 3.87 (s, 3H).

5-Methoxy-1-methyl-1H-indole-3-carbaldehyde (3m)



The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3m as a brown solid in 55% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (500 MHz, CDCl₃) δ 9.97 (s, 1H), 7.81 (s, 1H), 7.65 (s, 1H), 7.30 (d, 1H), 7.02-6.99 (d, 1H), 3.93 (s, 3H), 3.87 (s, 3H).

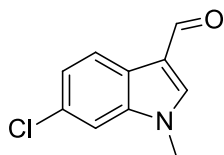
6-Fluoro-1-methyl-1H-indole-3-carbaldehyde (3n)



The targeted compound was prepared according to the general procedure (3.3).

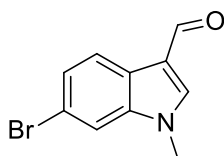
Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3n as a beige solid in 64% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (500 MHz, CDCl₃) δ 9.99 (s, 1H), 8.28-8.26 (m, 1H), 7.70 (s, 1H), 7.12-7.05 (1H), 3.86 (s, 3H).

6-Chloro-1-methyl-1H-indole-3-carbaldehyde (3o)



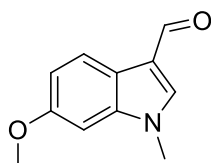
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3o as a beige solid in 64% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (500 MHz, DMSO) δ 9.90 (s, 1H), 8.29 (s, 1H), 8.04-8.02 (1H), 7.88 (s, 1H), 3.89 (s, 3H).

6-Bromo-1-methyl-1H-indole-3-carbaldehyde (3p)



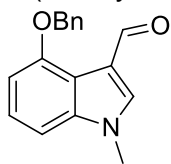
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3p as a beige solid in 67% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (500 MHz, CDCl₃): δ 9.97 (s, 1H), 8.18-8.17 (d, 1H), 7.65 (s, 1H), 7.53 (s, 1H), 7.44-7.43 (d, 1H), 3.85 (s, 3H).

6-Methoxy-1-methyl-1H-indole-3-carbaldehyde (3q)



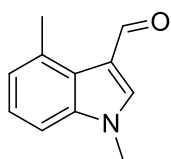
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3q as a brown solid in 64% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (400 MHz, CDCl₃): δ 9.93 (s, 1H), 8.18-8.16 (d, 1H), 7.59 (s, 1H), 7.00-6.96 (1H), 6.81-6.80 (s, 1H), 3.87 (s, 3H), 3.83 (s, 3H).

4-(Benzyloxy)-1-methyl-1H-indole-3-carbaldehyde (3r)



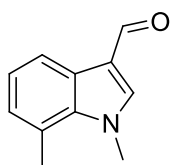
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3r as a brown solid in 54% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (400 MHz, CDCl₃): δ 10.46 (s, 1H), 7.81 (s, 1H), 7.49-7.47 (2H), 7.42-7.34 (3H), 7.26-7.21 (1H), 7.04-7.02 (1H), 6.83-6.81 (1H), 5.27 (s, 2H), 3.85 (s, 3H).

1,4-Dimethyl-1H-indole-3-carbaldehyde (3s)



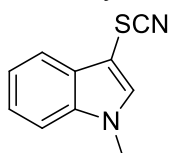
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3s as a beige solid in 66% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (400 MHz, CDCl₃): δ 10.13 (s, 1H), 7.81 (s, 1H), 7.17-7.08 (1H), 7.24-7.20 (2H), 7.11-7.09 (1H), 3.86 (s, 3H), 2.84 (s, 3H).

1,7-Dimethyl-1H-indole-3-carbaldehyde (3t)



The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=3:1) afforded compound 3t as a beige solid in 61% yield which exhibited identical spectral data according to previous report. ¹H NMR Analysis: ¹H NMR (500 MHz, CDCl₃): δ 9.96 (s, 1H), 8.18-8.13 (1H), 7.56-7.53 (1H), 7.26-7.10 (1H), 7.05-7.00 (1H), 4.11 (s, 3H), 2.73 (s, 3H).

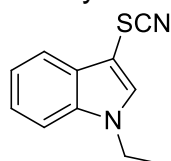
1-Methyl-3-thiocyanato-1H-indole (5a)



The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5a as a brown solid in 98% yield which exhibited identical spectral data according to previous report. ¹H and ¹³C NMR Analysis: ¹H NMR (500 MHz, CDCl₃), 7.83-7.82 (1H), 7.42-7.38

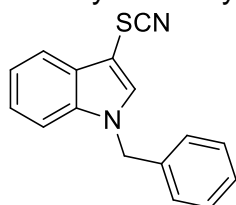
(m, 4H), 3.84 (s, 3H). ¹³C NMR (500 MHz, DMSO): 137.41, 137.07, 128.23, 123.39, 121.76, 118.36, 112.66, 111.67, 88.51, 33.61.

1-Ethyl-3-thiocyanato-1H-indole (5b)



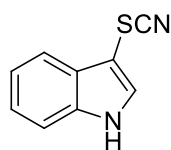
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5b as a brown solid in 96% yield which exhibited identical spectral data according to previous report. ¹H and ¹³C NMR Analysis: ¹H NMR (500 MHz, CDCl₃): 7.84-7.82 (1H), 7.49 (s, 1H), 7.46-7.43 (1H), 7.38-7.32 (2H), 4.26-4.20 (2H), 1.55-1.52 (3H). ¹³CNMR (500 MHz, CDCl₃): 136.41, 133.40, 128.69, 123.33, 121.59, 119.10, 111.92, 110.29, 89.95, 41.75, 15.27.

1-Benzyl-3-thiocyanato-1H-indole (5c)



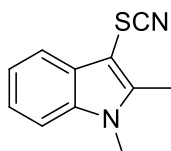
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5c as a brown solid in 94% yield which exhibited identical spectral data according to previous report. ¹H and ¹³C NMR Analysis: ¹H NMR (500 MHz, CDCl₃): 7.86 (1H), 7.47 (s, 1H), 7.38-7.28 (7H), 7.19-7.17 (1H), 5.35 (2H); ¹³CNMR (500 MHz, CDCl₃): 136.83, 135.68, 134.29, 129.10, 128.69, 128.32, 127.16, 123.66, 121.84, 119.15, 111.73, 110.69, 90.97, 50.78.

3-Thiocyanato-1H-indole (5f)



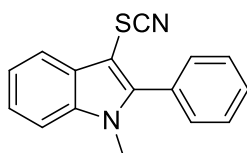
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5f as a brown solid in 95% yield which exhibited identical spectral data according to previous report. ¹H NMR and ¹³CNMR Analysis: ¹H NMR (500 MHz, CDCl₃): δ 8.69 (1H), 7.83-7.79 (3H), 7.54 (1H), 7.46-7.44 (1H), 7.36-7.26 (2H). ¹³CNMR (500 MHz, CDCl₃): 136.04, 130.90, 127.71, 123.94, 121.96, 118.82, 112.06, 111.79, 92.51.

1,2-Dimethyl-3-thiocyanato-1H-indole (5g)



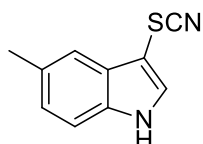
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5g as a brown solid in 97% yield which exhibited identical spectral data according to previous report. ^1H NMR and ^{13}C NMR Analysis: ^1H NMR (500 MHz, CDCl_3): δ 7.75-7.73 (1H), 7.35-7.29 (3H), 3.71 (s, 3H), 2.60 (s, 3H). ^{13}C NMR (500 MHz, CDCl_3): δ 143.38, 136.34, 128.32, 122.66, 121.48, 118.24, 111.83, 111.87, 109.56, 88.00, 30.45, 11.02.

1-Methyl-2-phenyl-3-thiocyanato-1H-indole (5h)



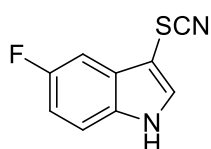
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5h as a brown solid in 95% yield which exhibited identical spectral data according to previous report. ^1H and ^{13}C NMR Analysis: ^1H NMR (500 MHz, CDCl_3): δ 7.88-7.86 (1H), 7.62-7.57 (3H), 7.52-7.46 (3H), 7.44-7.36 (3H), 3.72 (s, 3H). ^{13}C NMR (400 MHz, CDCl_3): δ 146.47, 137.41, 130.66, 129.63, 129.15, 128.77, 128.51, 123.61, 122.01, 118.98, 112.20, 110.32, 89.55, 31.77.

5-Methyl-3-thiocyanato-1H-indole (5i)



The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5i as a brown solid in 91% yield which exhibited identical spectral data according to previous report. ^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.57 (s, 1H), 7.61 (s, 1H), 7.48 (1H), 7.32 (1H), 7.15-7.14 (1H), 2.51 (s, 3H). ^{13}C NMR (400 MHz, CDCl_3): δ 134.46, 131.35, 131.10, 127.93, 125.54, 125.51, 117.9, 111.94, 111.86, 90.54, 21.13.

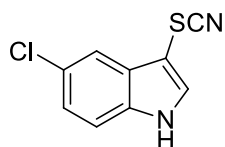
5-Fluoro-3-thiocyanato-1H-indole (5j)



The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5j as a brown solid in 98% yield which exhibited identical spectral data according to previous report. ^1H

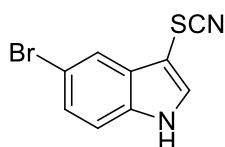
and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.71 (s, 1H), 7.58 (1H), 7.47–7.44 (1H), 7.39–7.36 (1H), 7.10–7.05 (1H). ^{13}C NMR (400 MHz, CDCl_3): δ 160.25, 157.87, 135.1, 132.6, 128.57, 128.47, 113.20, 113.11, 112.80, 112.54, 111.69, 104.17, 103.92, 92.43, 92.39.

5-Chloro-3-thiocyanato-1H-indole (5k)



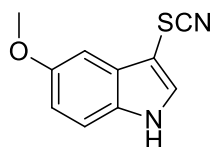
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5k as a brown solid in 97% yield which exhibited identical spectral data according to previous report. ^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.77 (s, 1H), 7.77 (1H), 7.56–7.55 (1H), 7.37–7.36 (1H), 7.28–7.27 (1H). ^{13}C NMR (400 MHz, CDCl_3): δ 134.37, 132.22, 128.84, 128.01, 124.49, 118.37, 113.21, 111.51, 92.26.

5-Bromo-3-thiocyanato-1H-indole (5l)



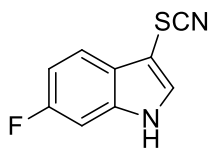
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5l as a brown solid in 95% yield which exhibited identical spectral data according to previous report. ^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.69 (s, 1H), 7.94 (1H), 7.56 (1H), 7.43–7.40 (1H), 7.33–7.31 (1H). ^{13}C NMR (400 MHz, CDCl_3): 134.68, 132.04, 129.42, 127.10, 121.53, 115.50, 113.56, 111.40, 92.09.

5-Methoxy-3-thiocyanato-1H-indole (5m)



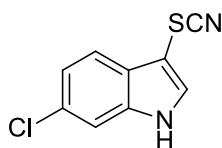
5m: The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5m as a brown solid in 99% yield which exhibited identical spectral data according to previous report. ^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.57 (s, 1H), 7.58 (1H), 7.40–7.39 (1H), 7.32 (s, 1H), 7.04–7.03 (1H), 3.90 (s, 3H). ^{13}C NMR (400 MHz, CDCl_3): δ 155.86, 131.27, 130.82, 128.57, 114.68, 112.96, 111.75, 99.90, 91.92, 55.86.

6-Fluoro-3-thiocyanato-1H-indole (5n)



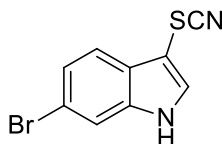
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5n as a brown solid in 98% yield which exhibited identical spectral data according to previous report. ^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.65(s, 1H), 7.77-7.74 (1H), 7.57-7.56 (1H), 7.18-7.09 (2H). ^{13}C NMR (400 MHz, CDCl_3): δ 161.72, 159.80, 136.17, 136.10, 131.38, 124.12, 119.82, 111.02, 98.71, 92.81.

6-chloro-3-thiocyanato-1H-indole (5o)



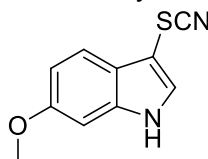
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5o as a brown solid in 96% yield which exhibited identical spectral data according to previous report. ^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.79 (s, 1H), 7.80 (s, 1H), 7.58 (1H), 7.39-7.37(1H), 7.30-7.31 (1H). ^{13}C NMR (400 MHz, CDCl_3): δ 136.38, 131.63, 130.02, 126.25, 122.78, 119.71, 112.12, 111.65, 92.80.

6-Bromo-3-thiocyanato-1H-indole (5p)



The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5p as a brown solid in 97% yield which exhibited identical spectral data according to previous report. ^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.73 (s, 1H), 7.68-7.66 (s, 1H), 7.61 (1H), 7.53(1H), 7.43-7.41 (1H). ^{13}C NMR (400 MHz, CDCl_3): 136.76, 131.39, 126.67, 125.43, 120.14, 117.66, 115.04, 110.40, 86.13.

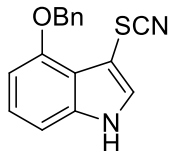
6-Methoxy-3-thiocyanato-1H-indole (5q)



The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5q as a brown solid in 98% yield which exhibited identical spectral data according to previous

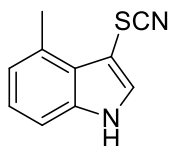
report. ^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.49 (s, 1H), 7.70-7.68 (1H), 7.43 (1H), 7.02-6.98 (1H), 6.92(1H). 3.85 (s, 3H). ^{13}C NMR (400 MHz, CDCl_3): 157.77, 136.92, 129.63, 121.83, 119.52, 95.24, 92.90, 55.73.

4-(Benzyloxy)-3-thiocyanato-1H-indole (5r)



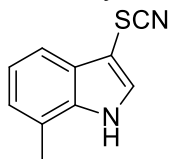
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5r as a brown solid in 97% yield which exhibited identical spectral data according to previous report. ^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.53 (s, 1H), 7.64-7.62 (1H), 7.46-7.36 (4H), 7.22-7.18(1H), 7.06-7.03 (1H), 5.22 (s, 2H). ^{13}C NMR (400 MHz, CDCl_3): δ 152.98, 137.98, 136.92, 128.94, 128.55, 127.87,127.38, 124.85, 117.17, 112.95, 105.24 102.92, 63.4, 70.28.

4-Methyl-3-thiocyanato-1H-indole (5s)



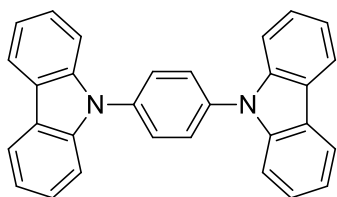
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5s as a brown solid in 92% yield which exhibited identical spectral data according to previous report. ^1H and ^{13}C NMR Analysis: ^1H NMR (500 MHz, CDCl_3): δ 8.64 (s, 1H), 7.54 (1H), 7.29-7.28 (1H), 7.22-7.19 (1H), 7.04-7.02 (1H), 2.96 (s, 3H). ^{13}C NMR (500 MHz, CDCl_3): δ 136.62, 131.92, 130.80,125.81, 123.84, 123.42, 113.24,109.45, 92.16, 19.28.

7-Methyl-3-thiocyanato-1H-indole (5t)



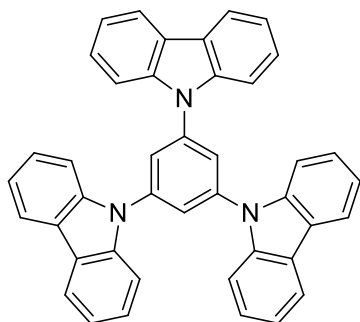
The targeted compound was prepared according to the general procedure (3.3). Purification by column chromatography (PE: EtOAc=1:1) afforded compound 5t as a brown solid in 96% yield which exhibited identical spectral data according to previous report. ^1H and ^{13}C NMR Analysis: ^1H NMR (500 MHz, CDCl_3): δ 8.55 (s, 1H), 7.67-7.66 (1H), 7.56-7.54 (1H), 7.24-7.22 (1H), 7.14-7.12 (1H), 2.48 (s, 3H). δ 135.64, 130.71, 127.34, 124.39, 122.10, 121.45, 116.42, 112.09, ,92.52, 16.38.

1,4-Di(9H-carbazol-9-yl) benzene (DCB)



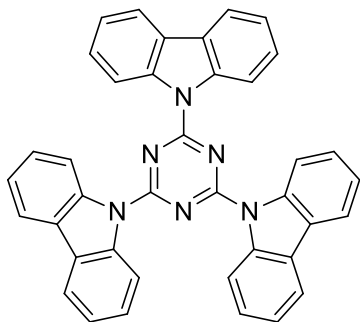
^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.23-8.21 (d, 4H), 7.84 (s, 4H), 7.61-7.59 (d, 4H). 7.53-7.50 (t, 4H), 7.39-7.36 (t, 3H). ^{13}C NMR (400 MHz, CDCl_3): δ 140.79, 136.70, 128.40, 126.16, 123.60, 120.48, 120.31, 109.78.

1,3,5-Tri(9H-carbazol-9-yl)benzene (TCB)



^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 8.21-8.20 (d, 6H), 7.84 (s, 3H), 7.72-7.70 (d, 6H). 7.53-7.50 (t, 6H), 7.39-7.36 (t, 6H). ^{13}C NMR (400 MHz, CDCl_3): δ 140.82, 140.36, 126.41, 123.88, 123.57, 120.78, 120.63, 109.70.

2,4,6-Tri(9H-carbazol-9-yl)-1,3,5-triazine (TCT)

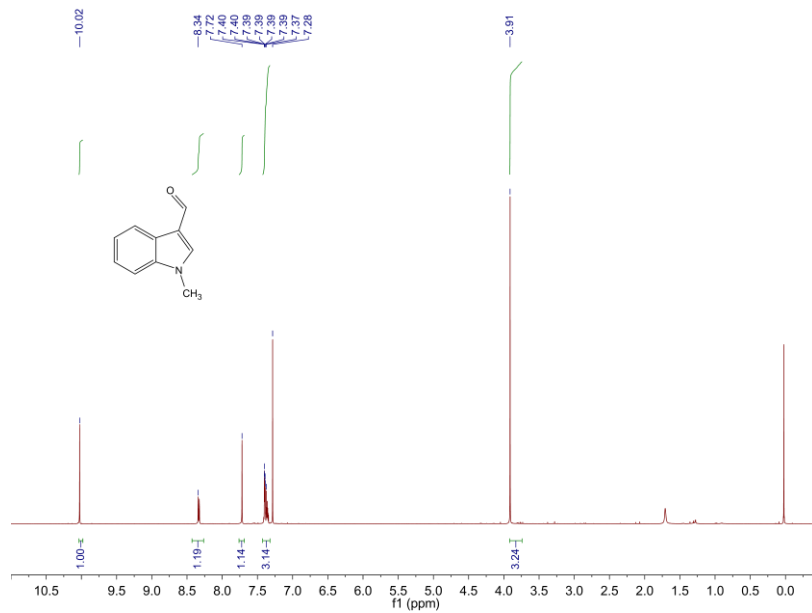


^1H and ^{13}C NMR Analysis: ^1H NMR (400 MHz, CDCl_3): δ 9.06-9.05 (d, 2H), 8.17-8.16 (d, 2H), 7.56-7.46 (m, 2H). ^{13}C NMR (400 MHz, CDCl_3): δ 138.79, 127.14, 126.53, 123.52, 119.79, 117.54.

18. NMR Spectra

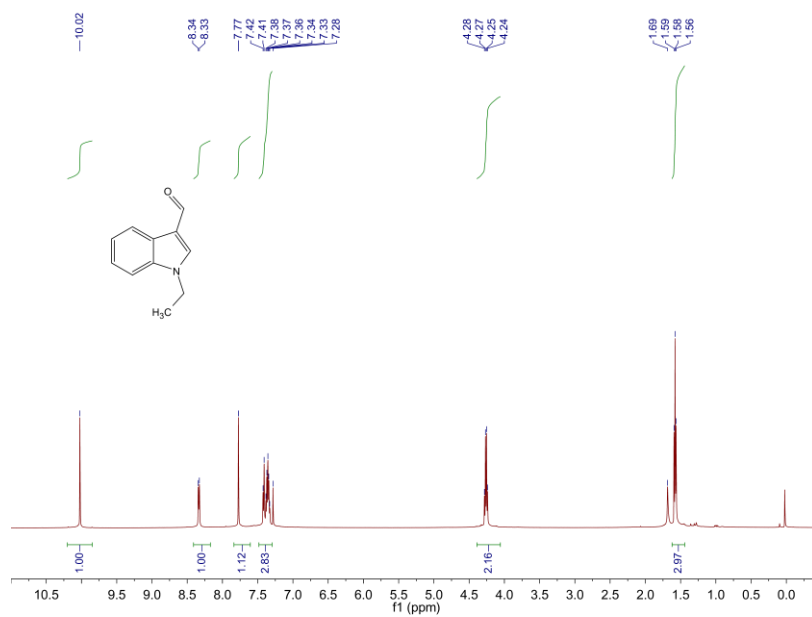
1-Methyl-1*H*-indole-3-carbaldehyde (3a)

¹H NMR, CDCl₃, 400 MHz



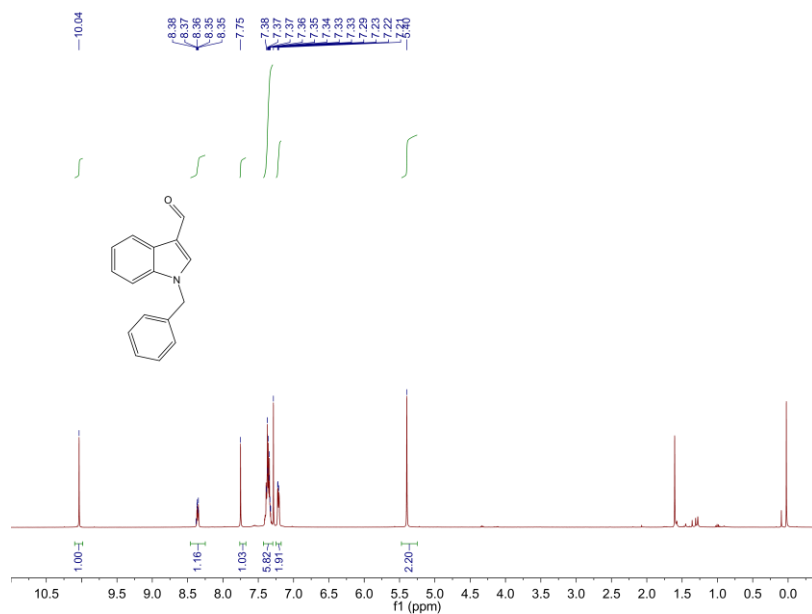
1-Ethyl-1*H*-indole-3-carbaldehyde (3b)

¹H NMR, CDCl₃, 500 MHz



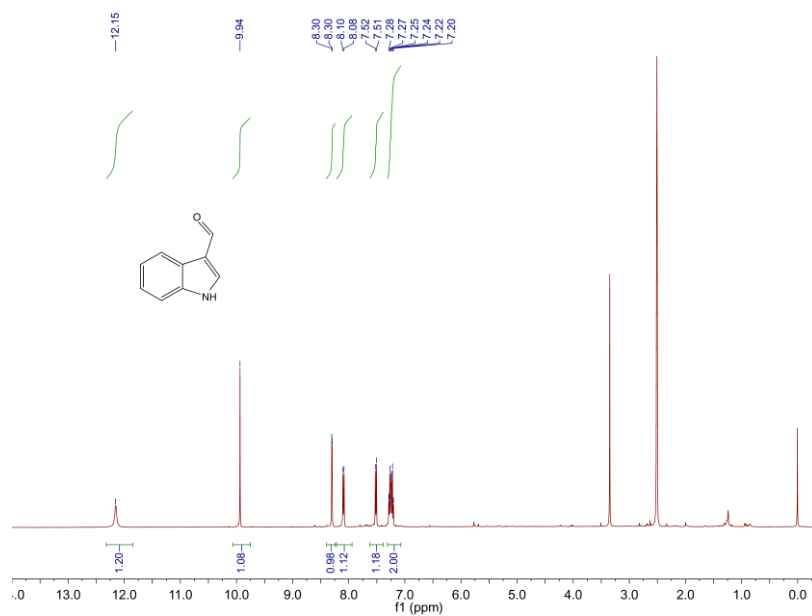
1-Benzyl-1*H*-indole-3-carbaldehyde (3c)

¹H NMR, CDCl₃, 400 MHz



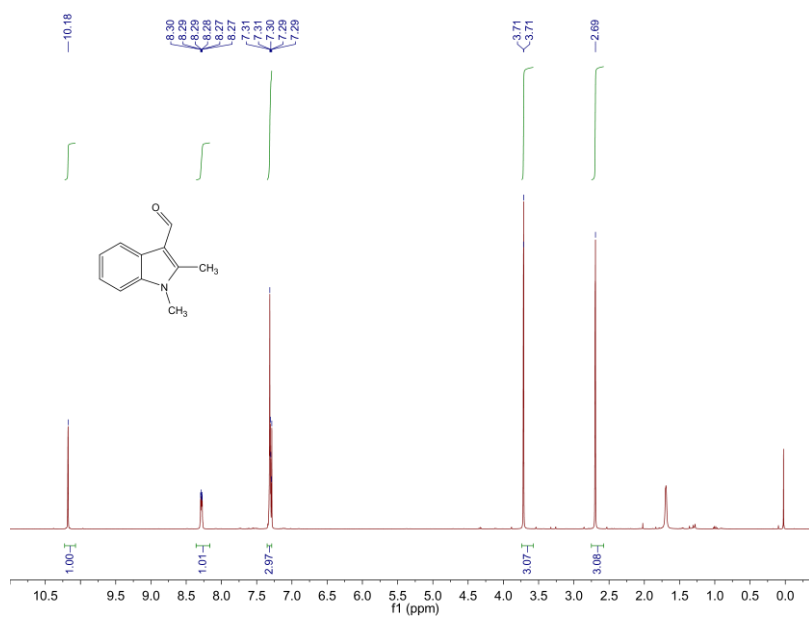
1*H*-indole-3-carbaldehyde (3f)

¹H NMR, DMSO-D₆, 400 MHz



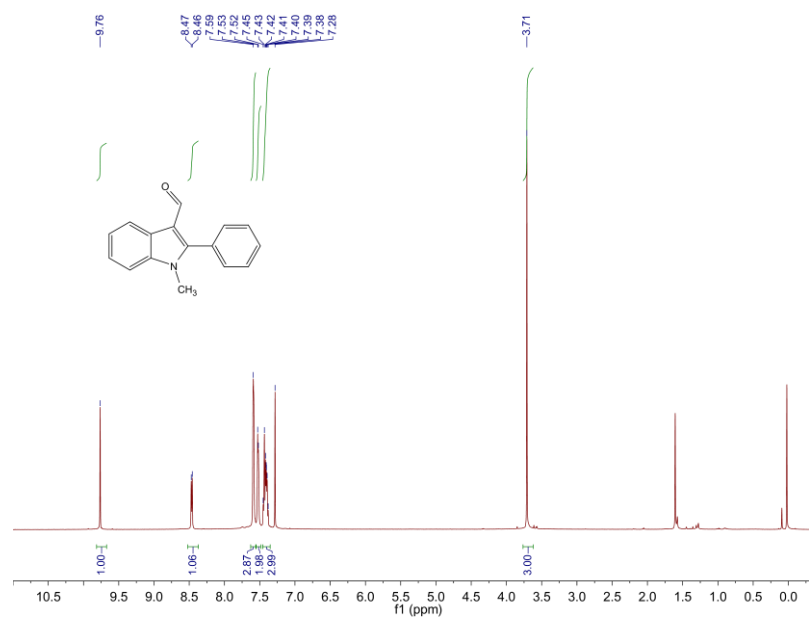
1,2-Dimethyl-1*H*-indole-3-carbaldehyde (3g)

¹H NMR, CDCl₃, 400 MHz



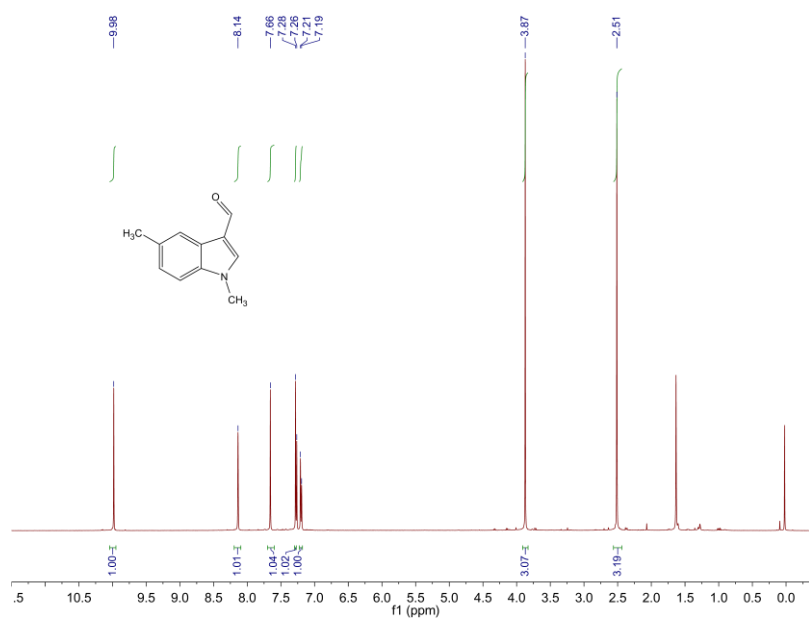
1-Methyl-2-phenyl-1*H*-indole-3-carbaldehyde (3h)

¹H NMR, CDCl₃, 400 MHz



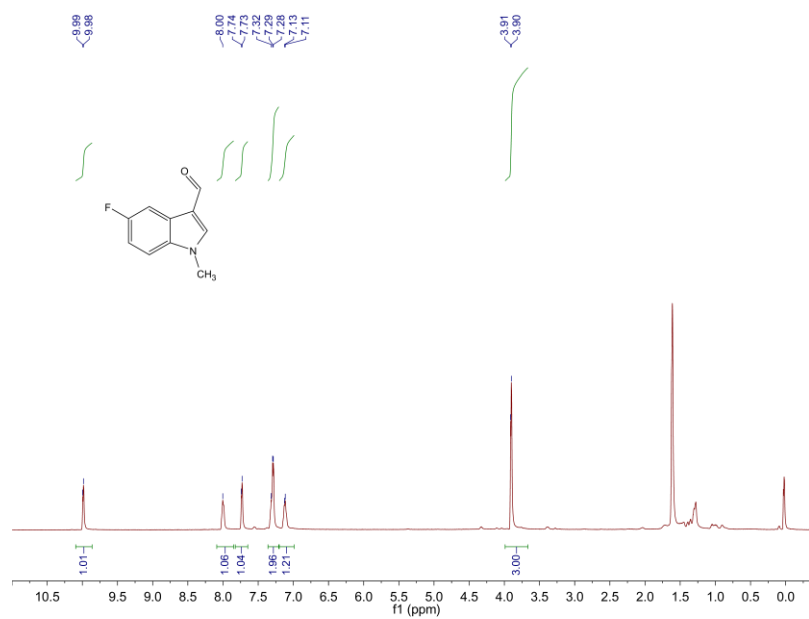
1,5-Dimethyl-1*H*-indole-3-carbaldehyde(3i)

¹H NMR, CDCl₃, 500 MHz



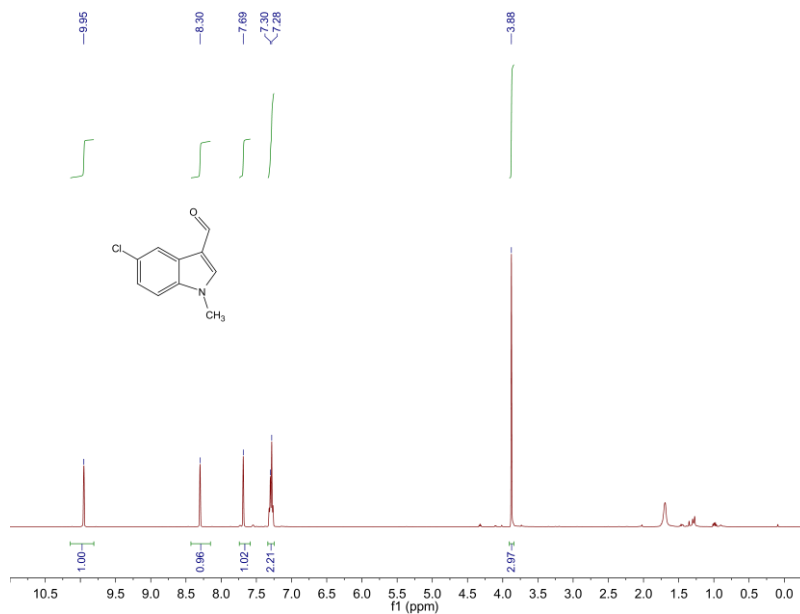
5-Fluoro-1-methyl-1*H*-indole-3-carbaldehyde (3j)

¹H NMR, CDCl₃, 400 MHz



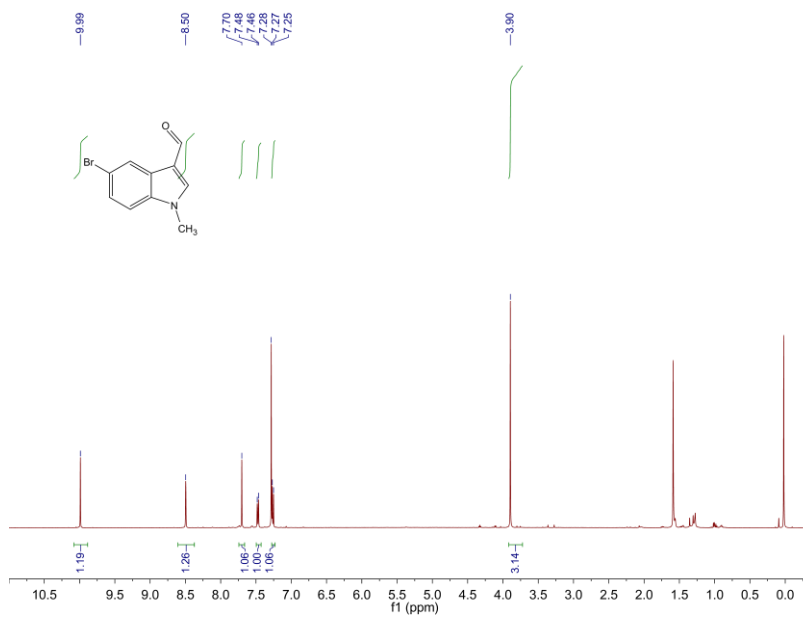
5-Chloro-1-methyl-1H-indole-3-carbaldehyde (3k)

¹H NMR, CDCl₃, 400 MHz



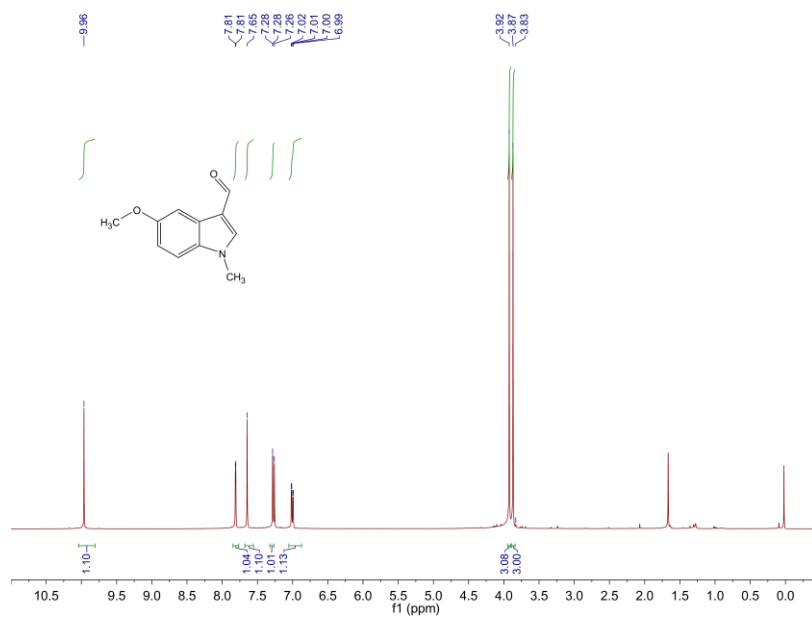
5-Bromo-1-methyl-1H-indole-3-carbaldehyde (3l)

¹H NMR, CDCl₃, 400 MHz



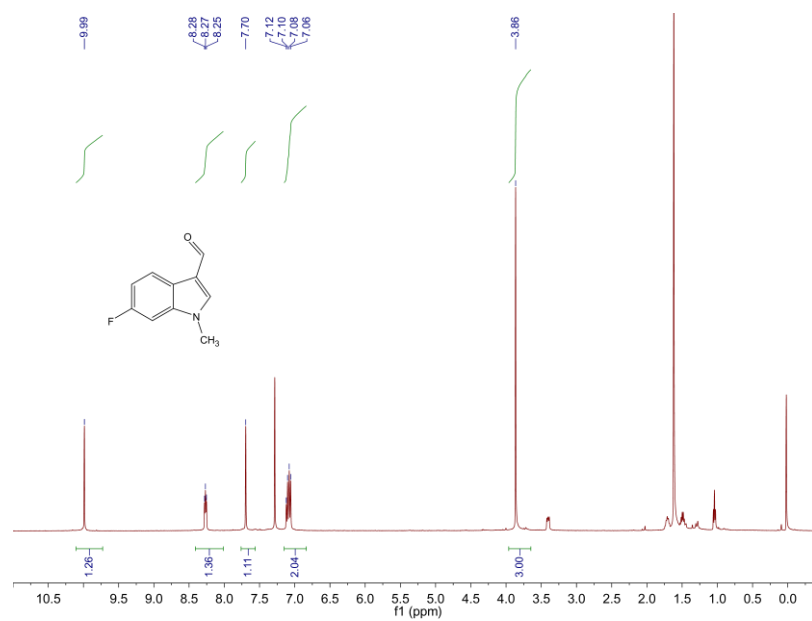
5-Methoxy-1-methyl-1*H*-indole-3-carbaldehyde (3m)

¹H NMR, CDCl₃, 500 MHz



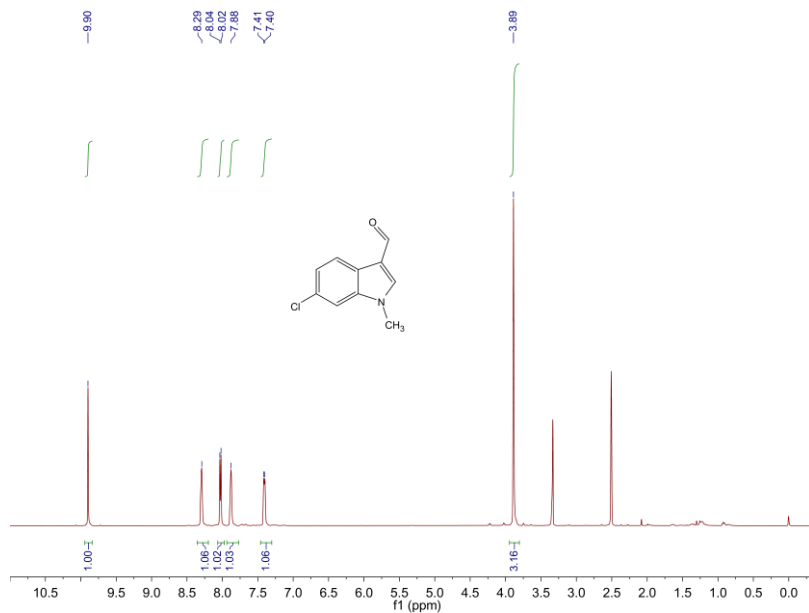
6-Fluoro-1-methyl-1*H*-indole-3-carbaldehyde (3n)

¹H NMR, CDCl₃, 500 MHz



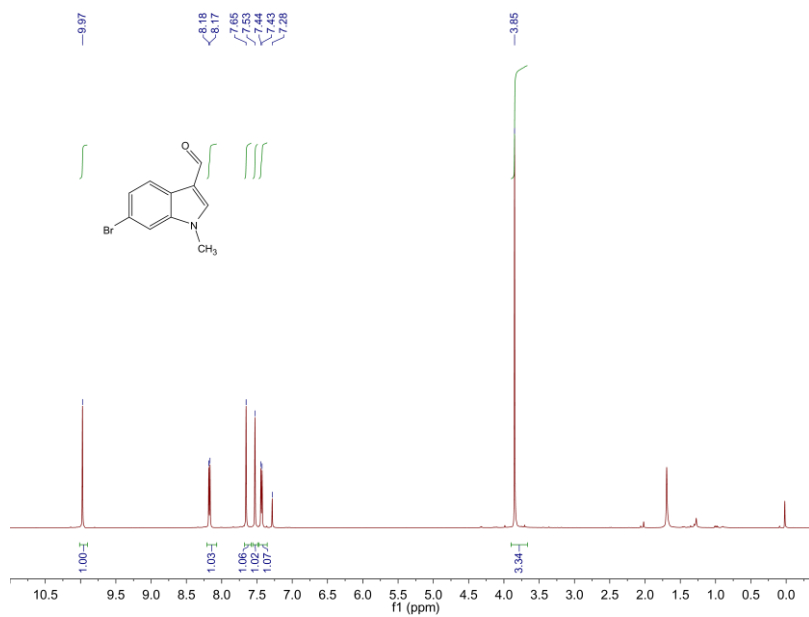
6-Chloro-1-methyl-1H-indole-3-carbaldehyde (3o)

¹H NMR, DMSO-D₆, 500 MHz



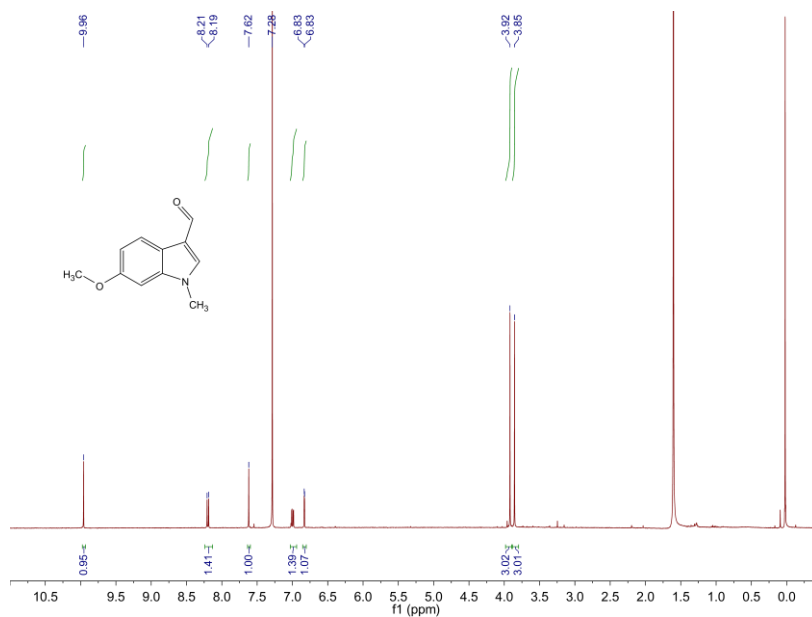
6-Bromo-1-methyl-1H-indole-3-carbaldehyde (3p)

¹H NMR, CDCl₃, 500 MHz



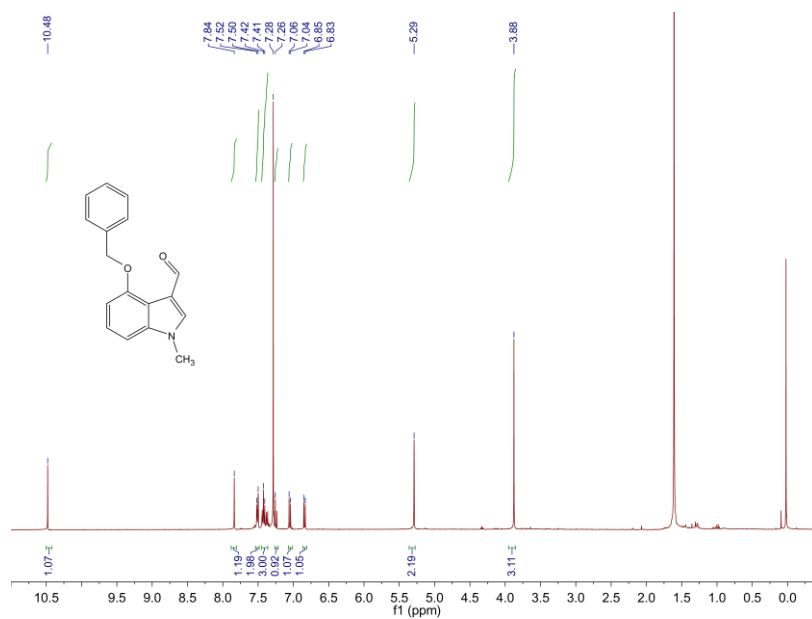
6-Methoxy-1-methyl-1*H*-indole-3-carbaldehyde (3q)

¹H NMR, CDCl₃, 400 MHz



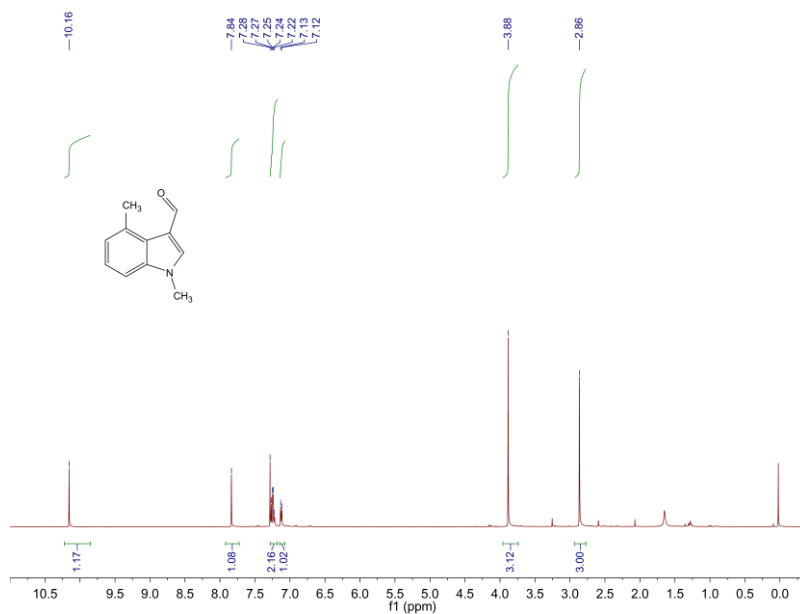
4-(Benzyloxy)-1-methyl-1*H*-indole-3-carbaldehyde (3r)

¹H NMR, CDCl₃, 400 MHz



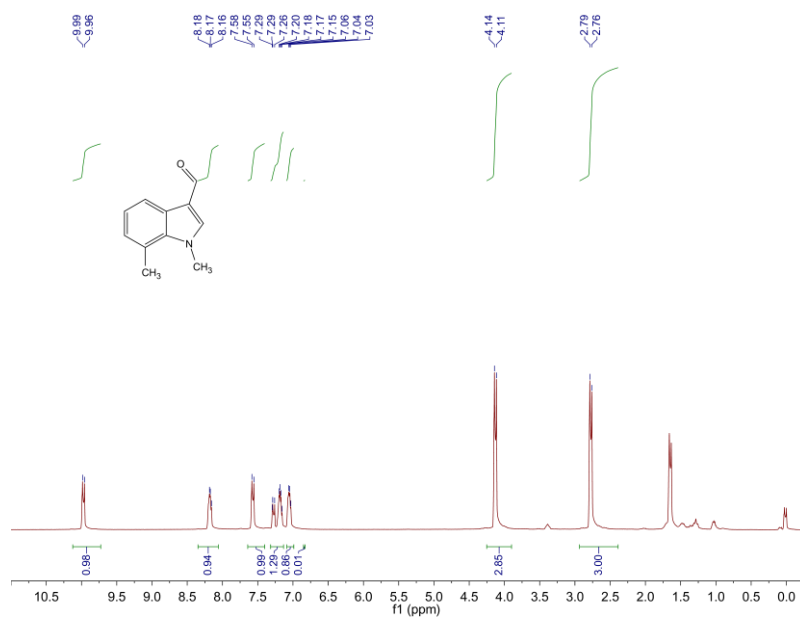
1,4-Dimethyl-1*H*-indole-3-carbaldehyde(3s)

¹H NMR, CDCl₃, 400 MHz



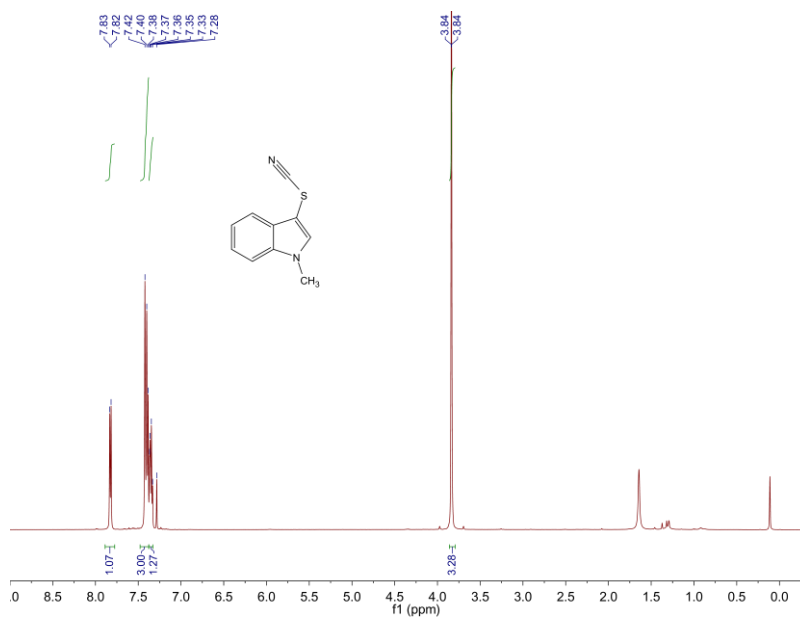
1,7-Dimethyl-1*H*-indole-3-carbaldehyde(3t)

¹H NMR, CDCl₃, 500 MHz

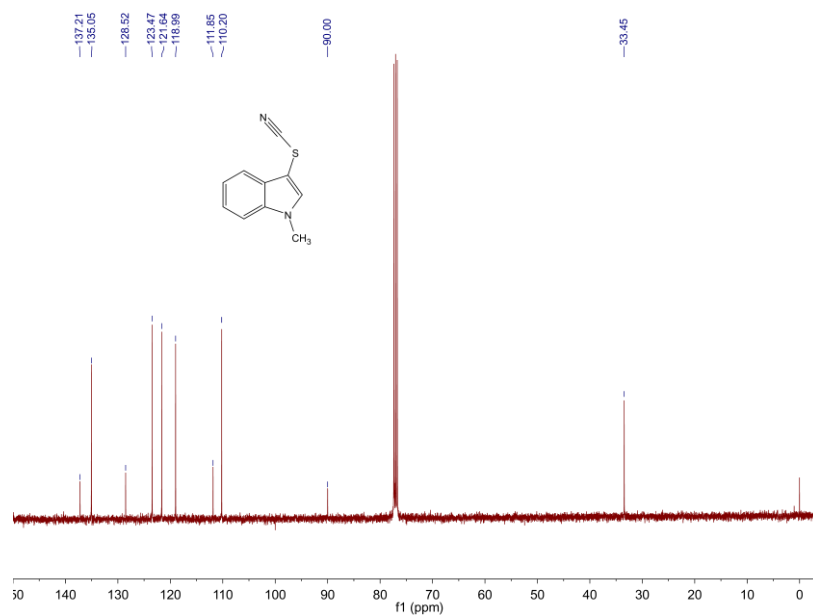


1-Methyl-3-thiocyanato-1H-indole (5a)

^1H NMR, CDCl_3 , 500 MHz

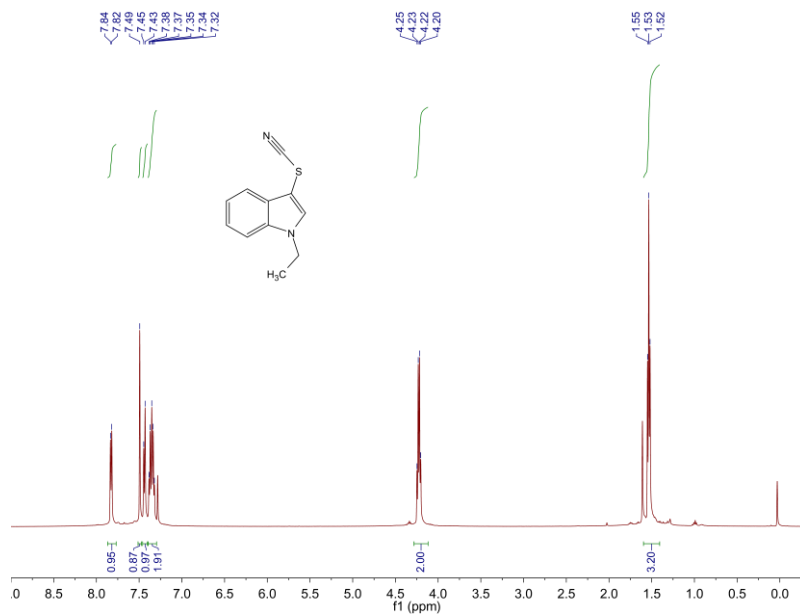


^{13}C NMR, CDCl_3 , 500 MHz

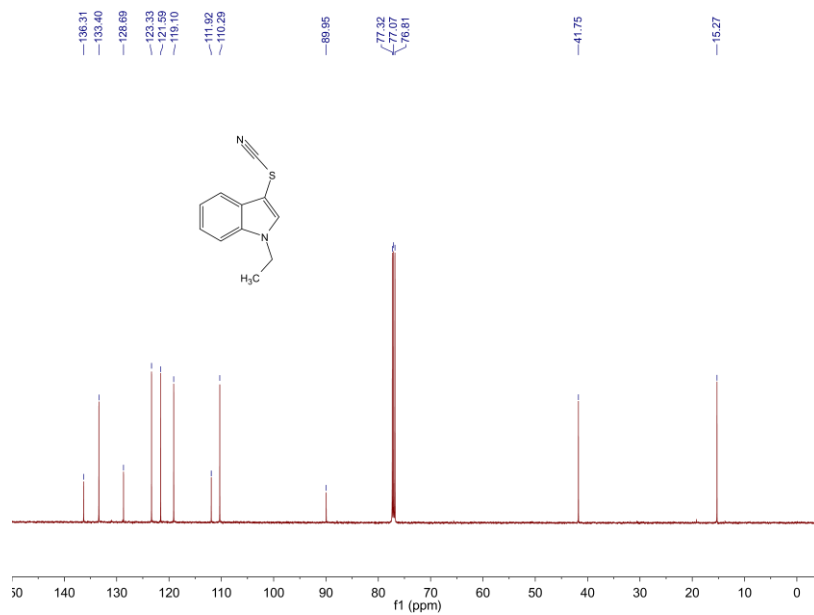


1-Ethyl-3-thiocyanato-1H-indole (5b)

^1H NMR, CDCl_3 , 500 MHz

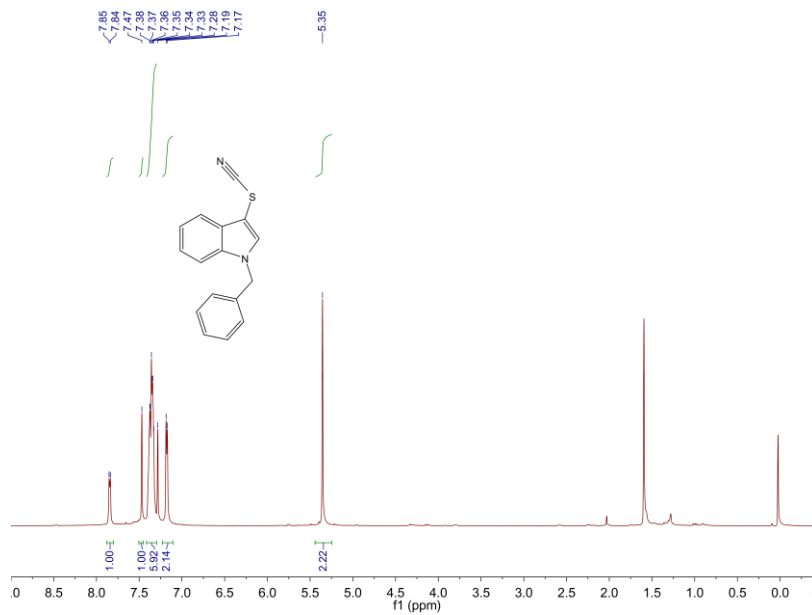


^{13}C NMR, CDCl_3 , 500 MHz

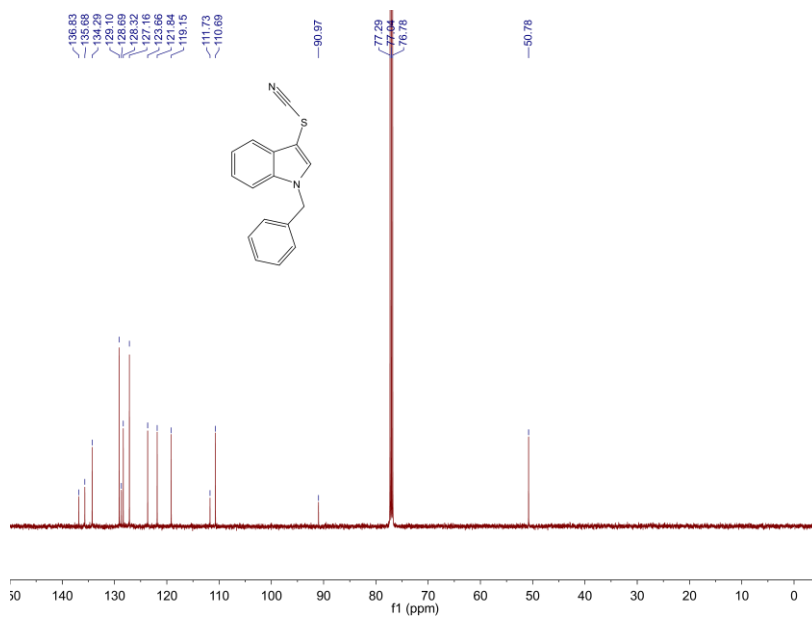


1-Benzyl-3-thiocyanato-1H-indole (5c)

^1H NMR, CDCl_3 , 500 MHz

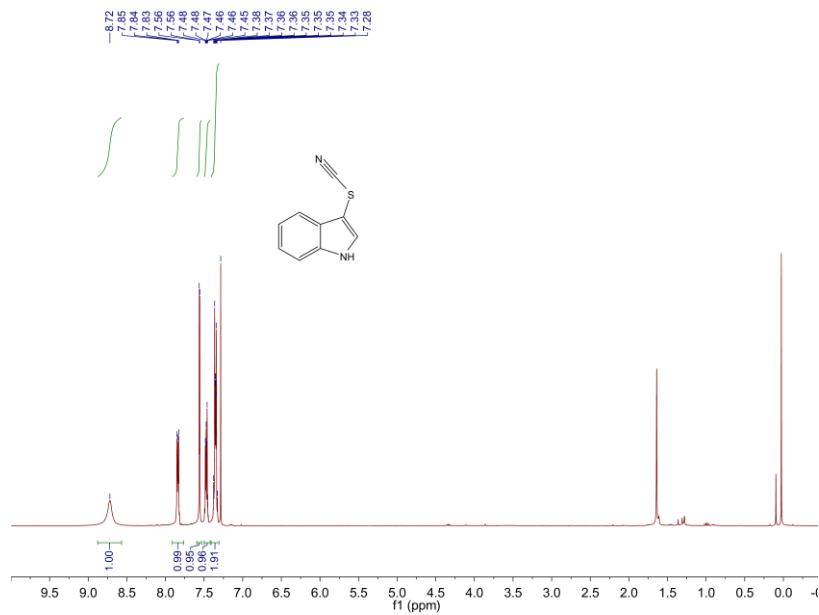


^{13}C NMR, CDCl_3 , 500 MHz

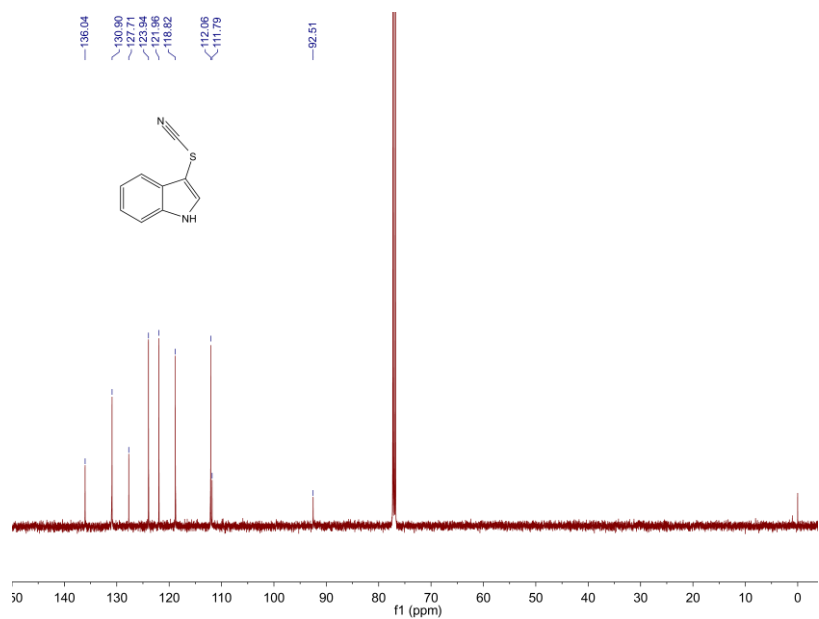


3-Thiocyanato-1H-indole (5f)

^1H NMR, CDCl_3 , 500 MHz

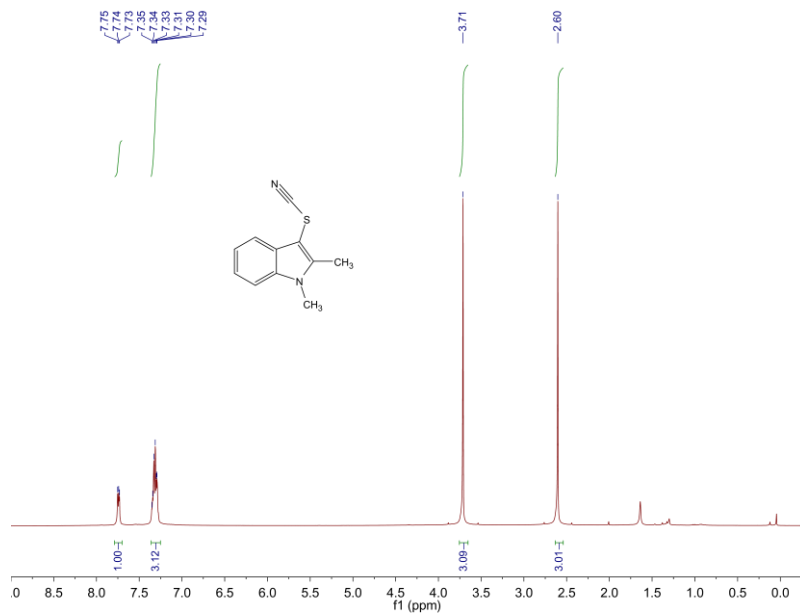


^{13}C NMR, CDCl_3 , 500 MHz

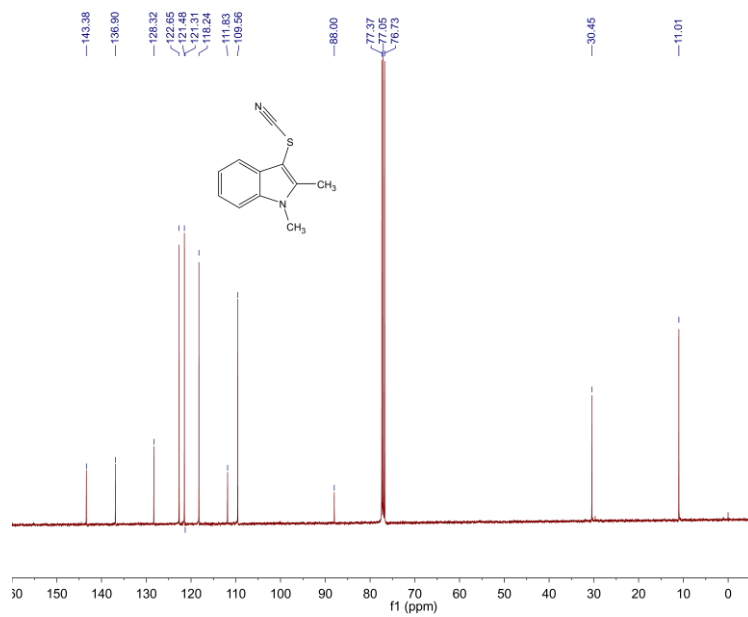


1,2-Dimethyl-3-thiocyanato-1H-indole (5g)

^1H NMR, CDCl_3 , 500 MHz

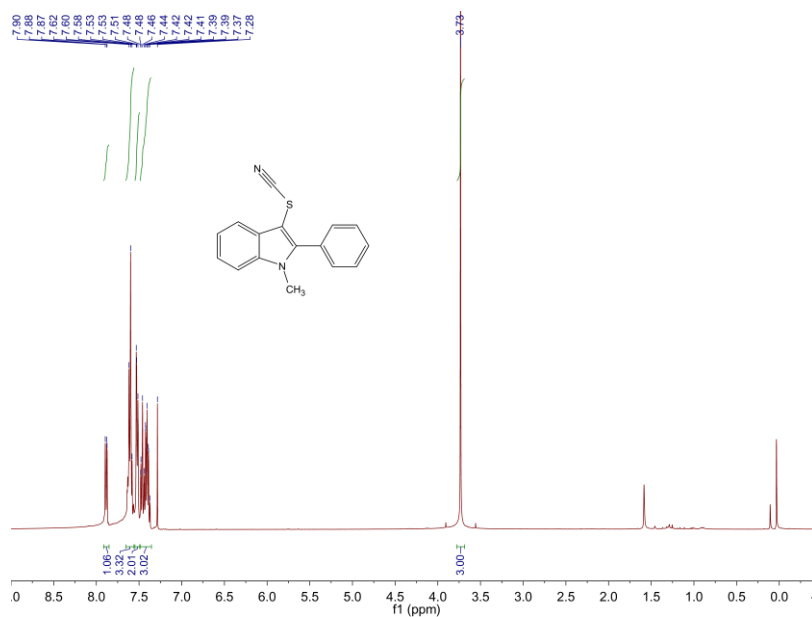


^{13}C NMR, CDCl_3 , 500 MHz

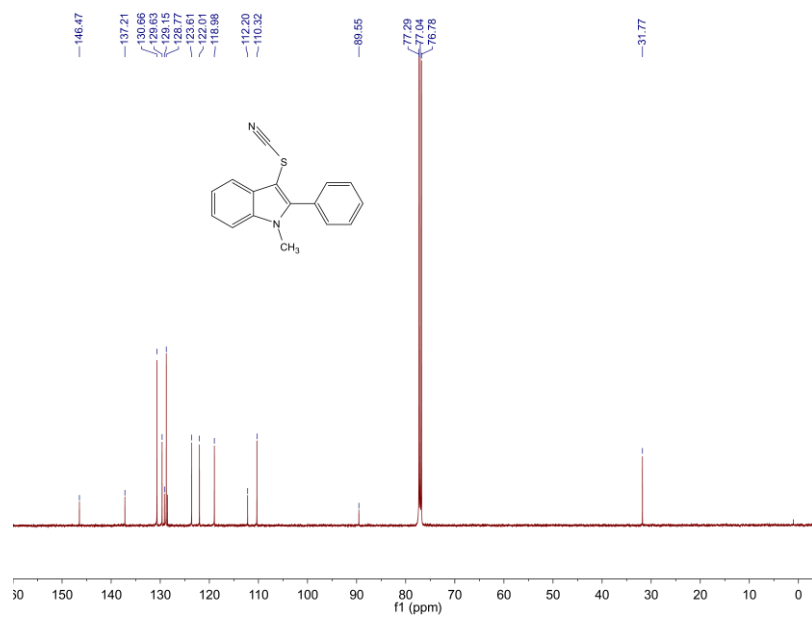


1-Methyl-2-phenyl-3-thiocyanato-1H-indole (5h)

^1H NMR, CDCl_3 , 500 MHz

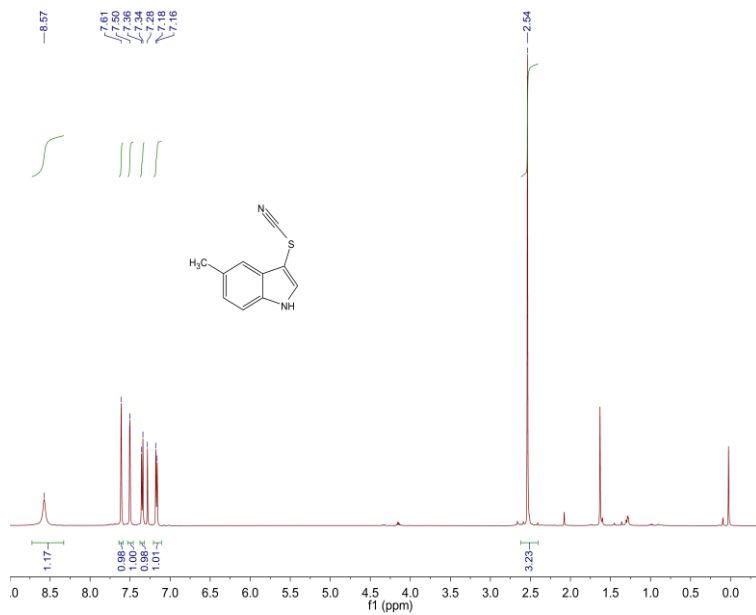


^{13}C NMR, CDCl_3 , 500 MHz

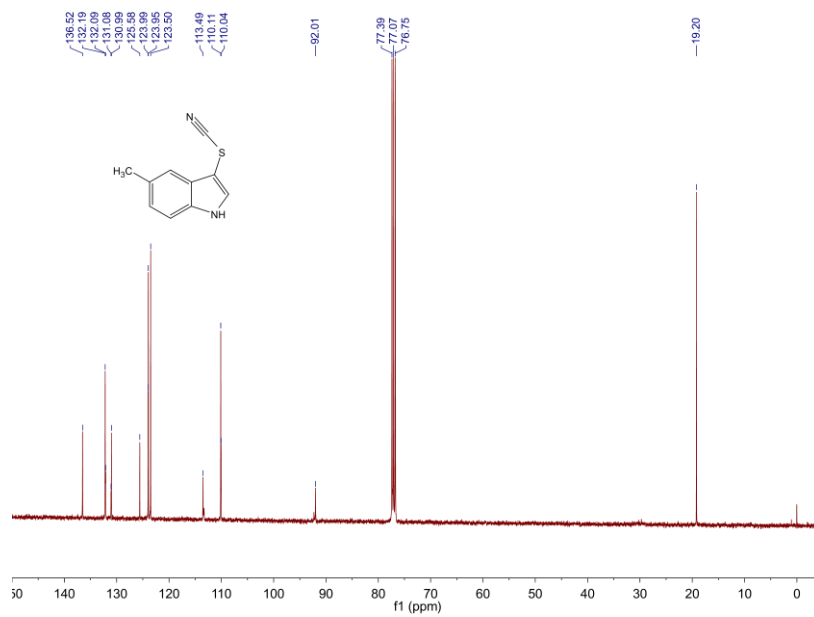


5-Methyl-3-thiocyanato-1H-indole (5i)

¹H NMR, CDCl₃, 400 MHz

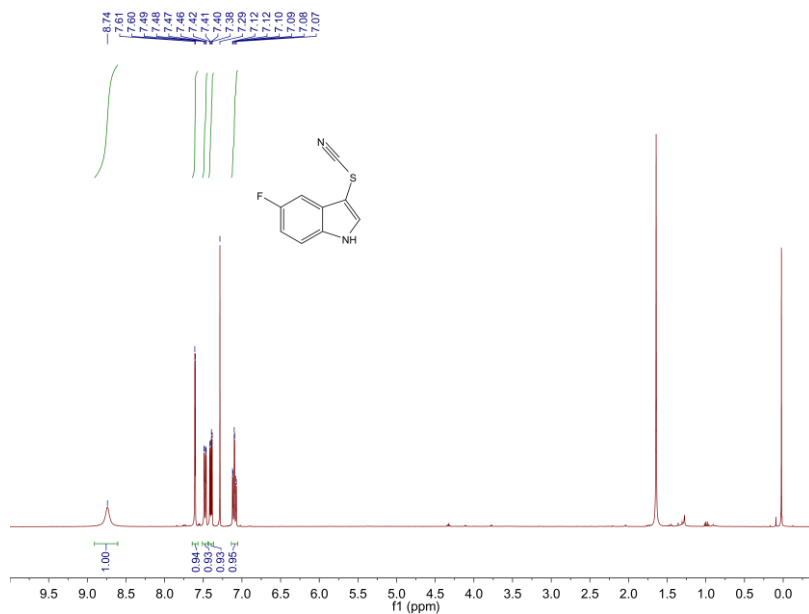


¹³C NMR, CDCl₃, 500 MHz

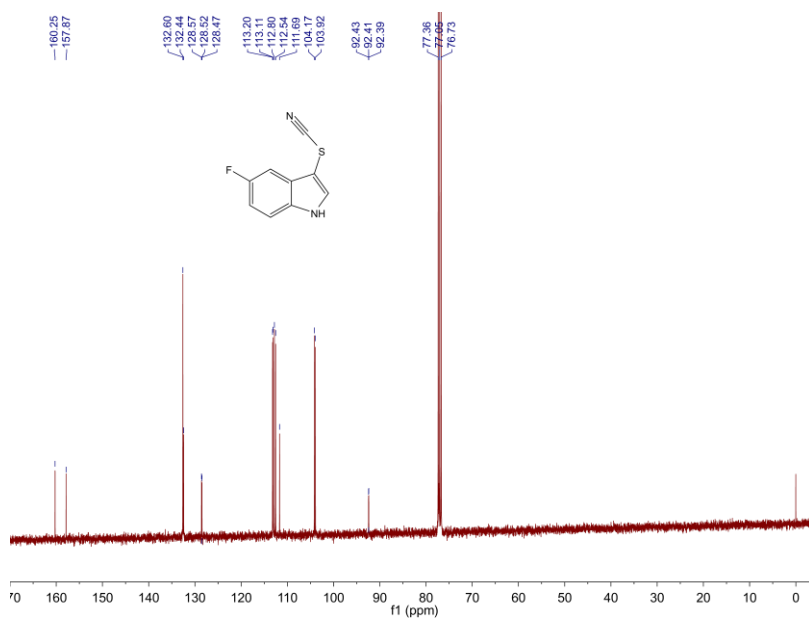


5-Fluoro-3-thiocyanato-1H-indole (5j)

^1H NMR, CDCl_3 , 400 MHz

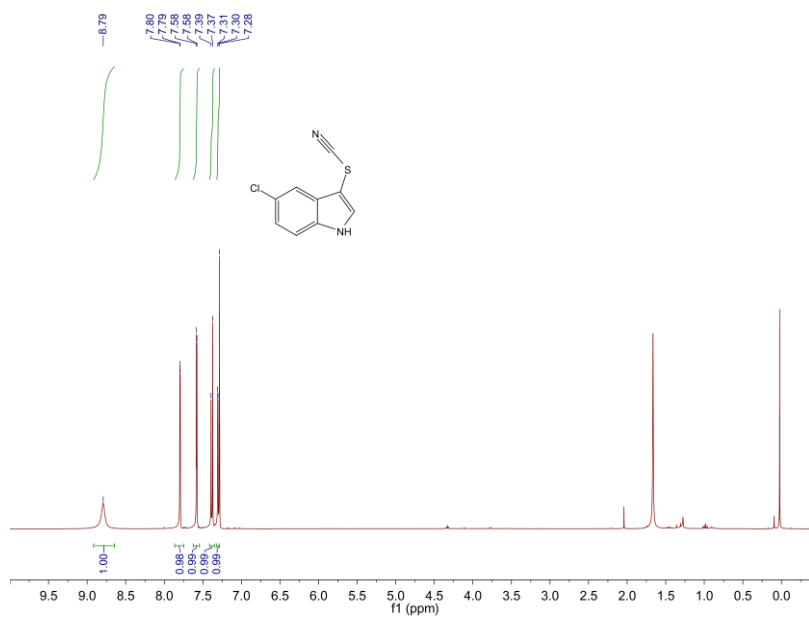


^{13}C NMR, CDCl_3 , 400 MHz

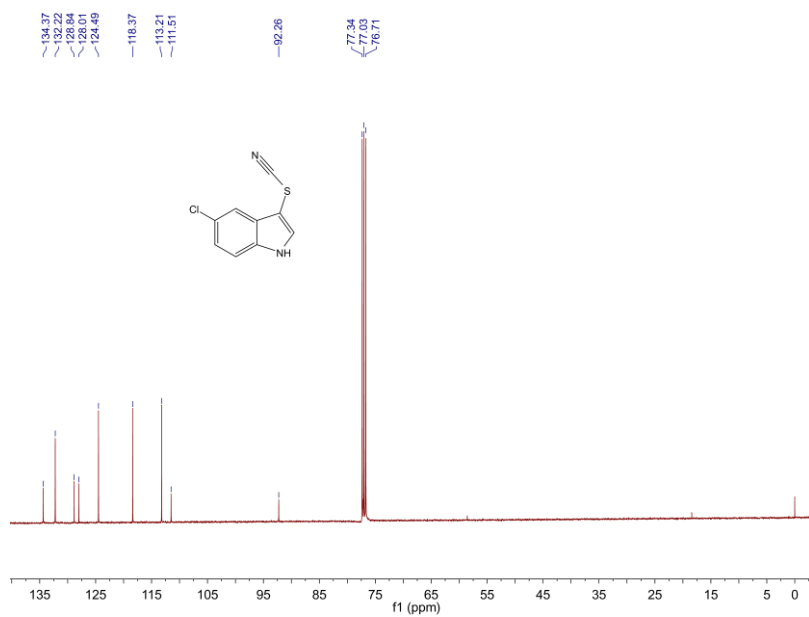


5-Chloro-3-thiocyanato-1H-indole (5k)

^1H NMR, CDCl_3 , 400 MHz

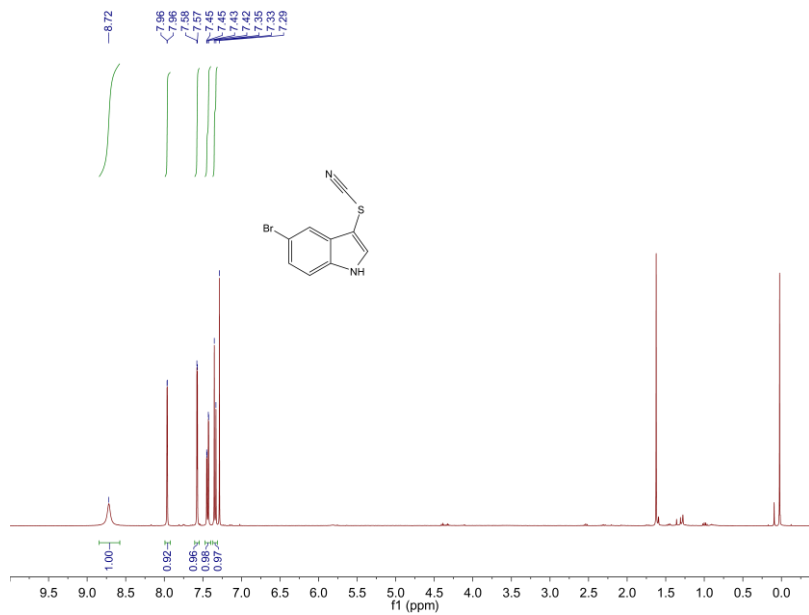


^{13}C NMR, CDCl_3 , 400 MHz

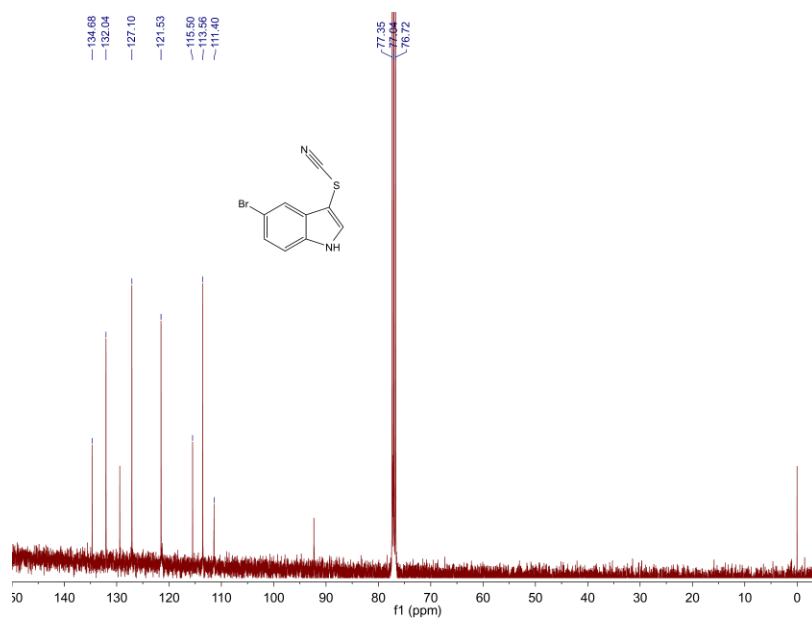


5-Bromo-3-thiocyanato-1H-indole (5I)

^1H NMR, CDCl_3 , 400 MHz

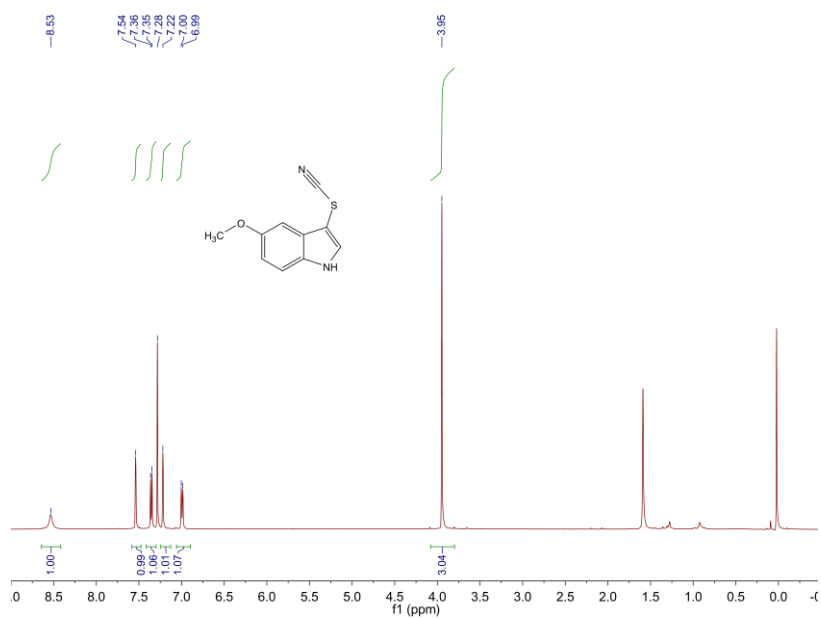


^{13}C NMR, CDCl_3 , 400 MHz

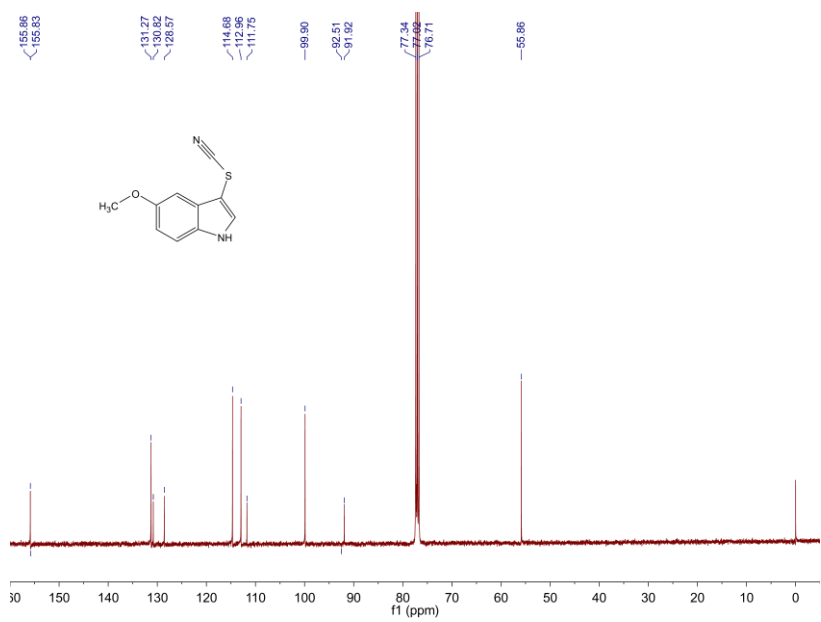


5-Methoxy-3-thiocyanato-1H-indole (5m)

^1H NMR, CDCl_3 , 400 MHz

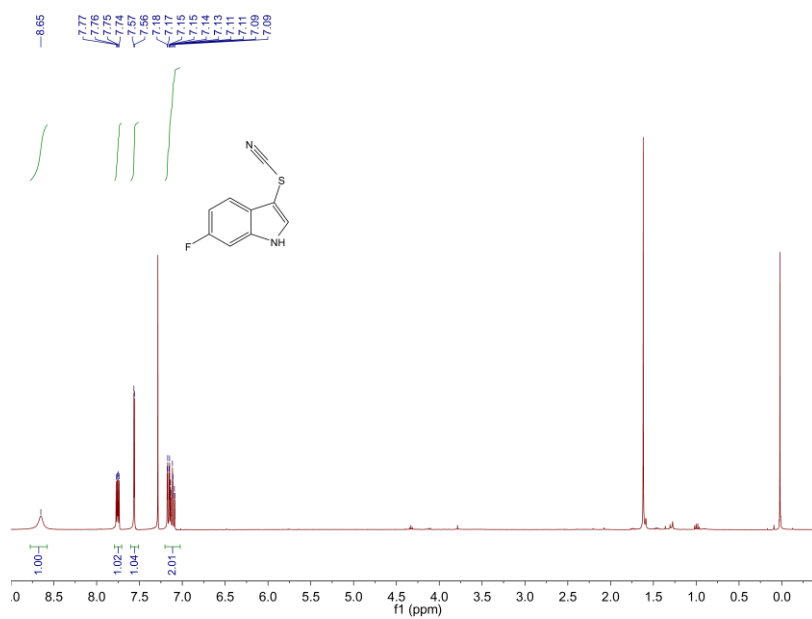


^{13}C NMR, CDCl_3 , 400 MHz

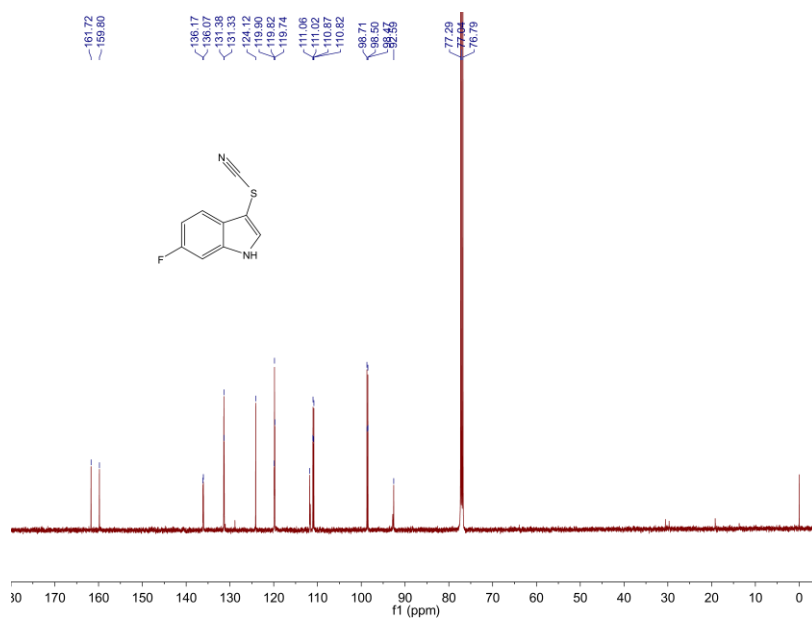


6-Fluoro-3-thiocyanato-1H-indole (5n)

¹H NMR, CDCl₃, 400 MHz

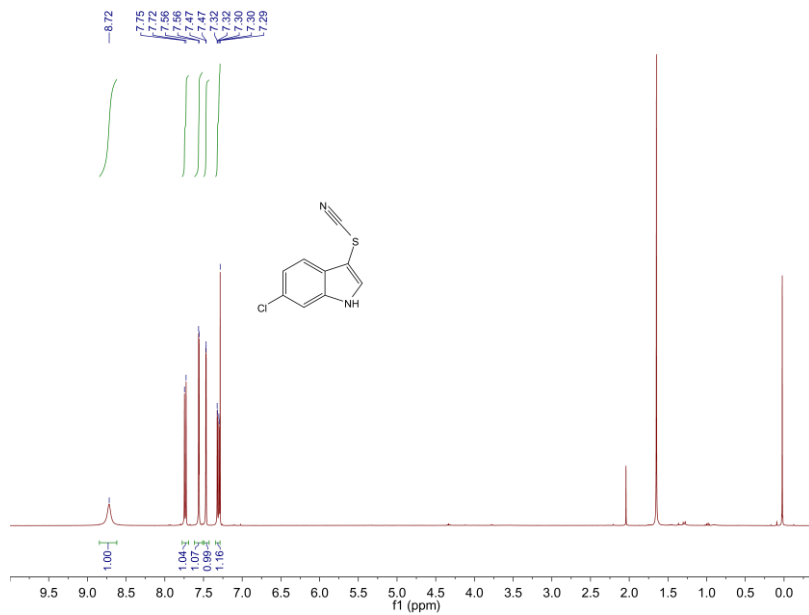


¹³C NMR, CDCl₃, 400 MHz

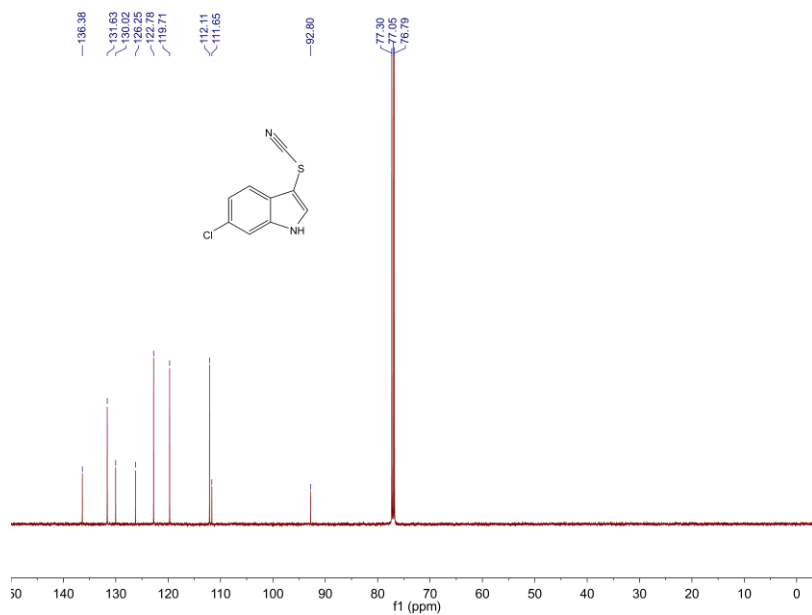


6-Chloro-3-thiocyanato-1H-indole (5o)

¹H NMR, CDCl₃, 400 MHz

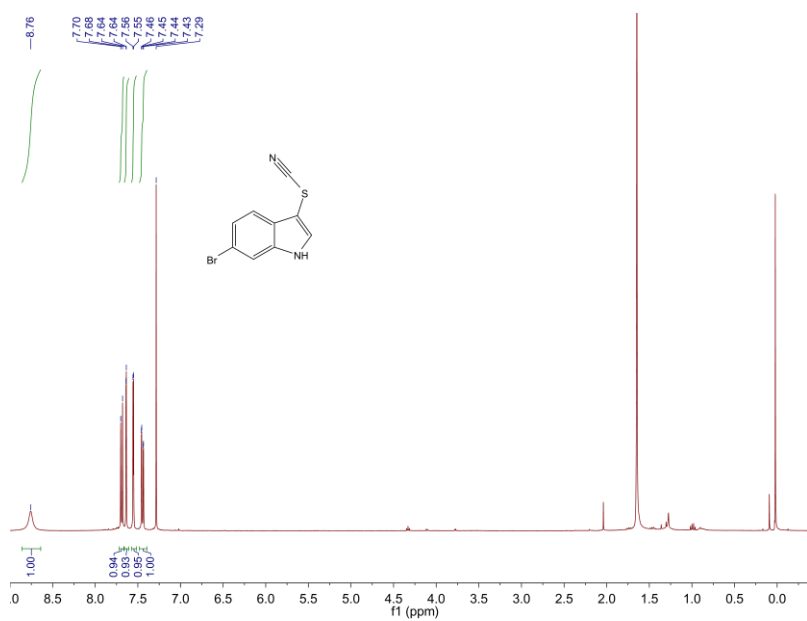


¹³C NMR, CDCl₃, 400 MHz

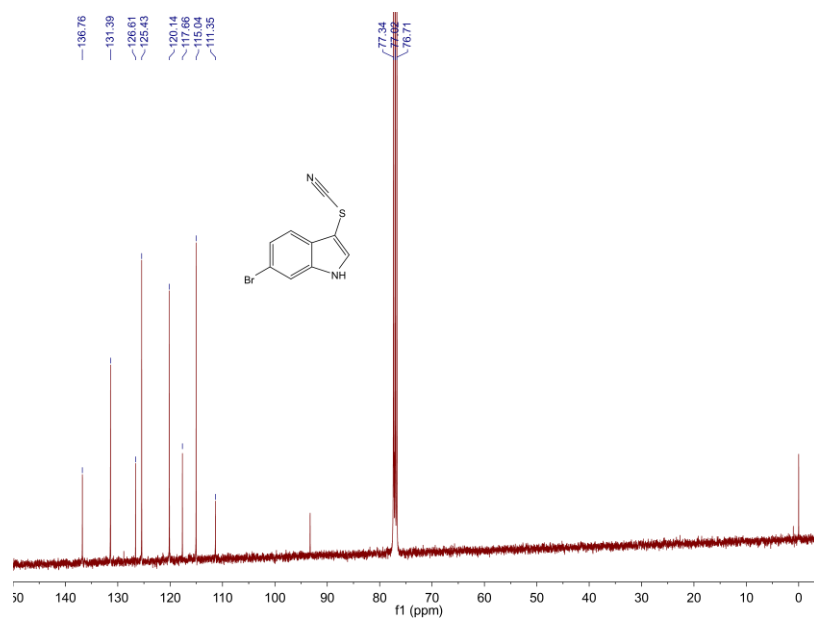


6-Bromo-3-thiocyanato-1H-indole (5p)

^1H NMR, CDCl_3 , 400 MHz

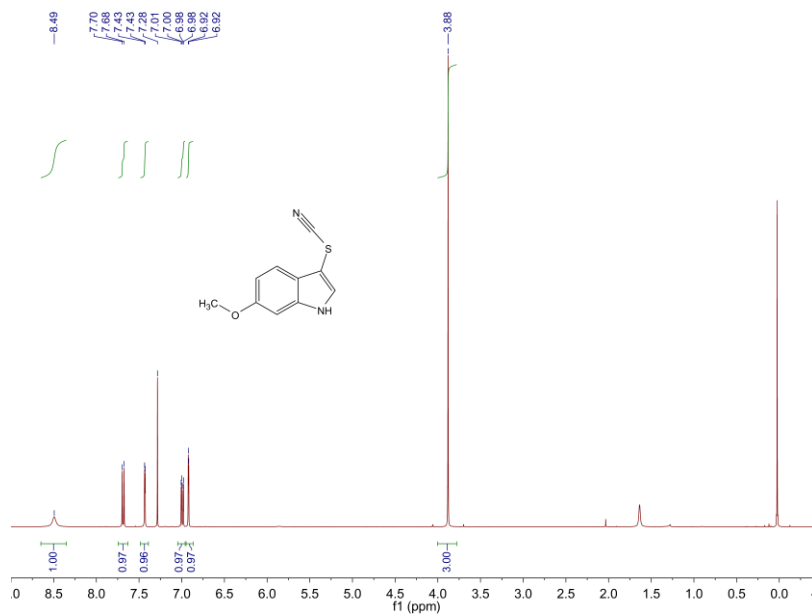


^{13}C NMR, CDCl_3 , 400 MHz

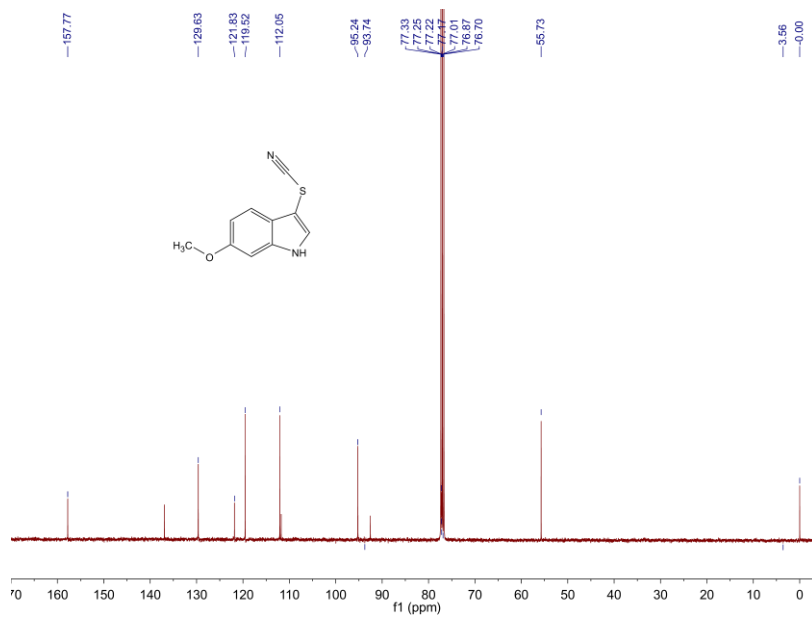


6-Methoxy-3-thiocyanato-1H-indole (5q)

¹H NMR, CDCl₃, 400 MHz

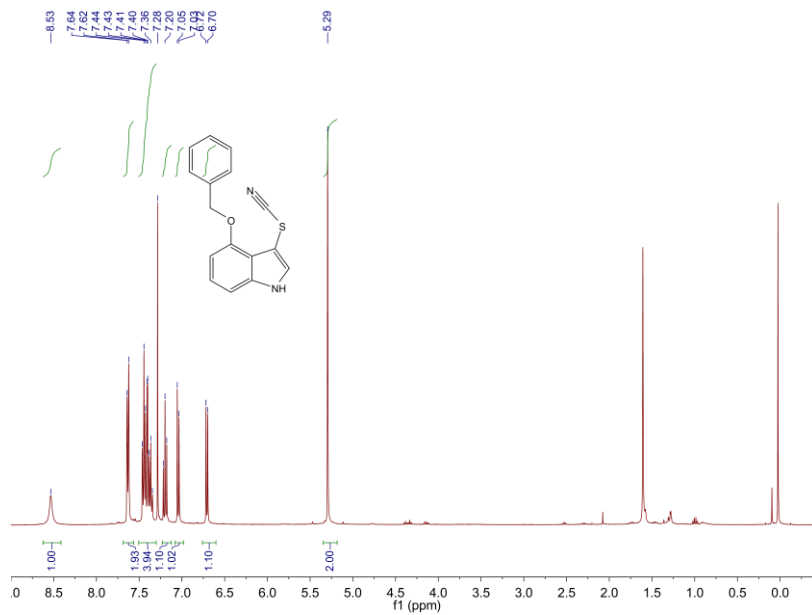


¹³C NMR, CDCl₃, 400 MHz

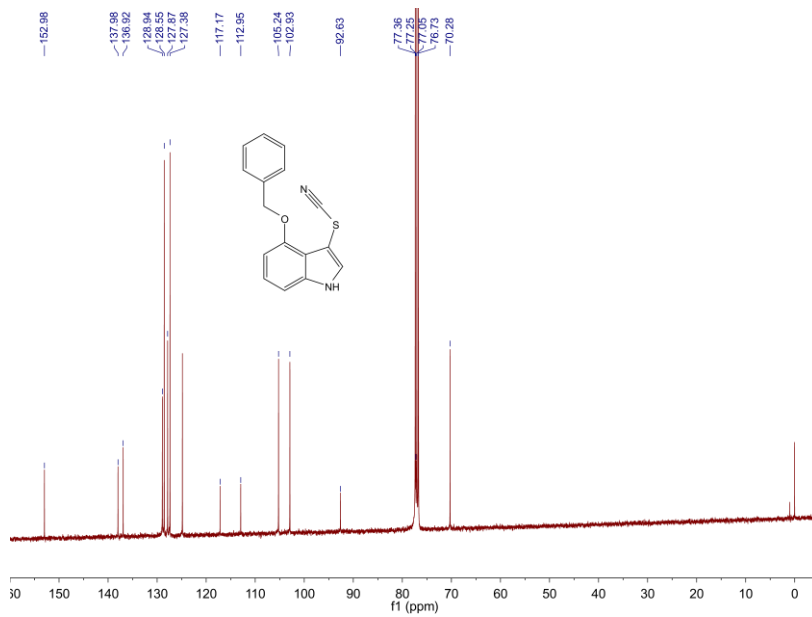


4-(Benzyloxy)-3-thiocyanato-1H-indole (5r)

¹H NMR, CDCl₃, 400 MHz

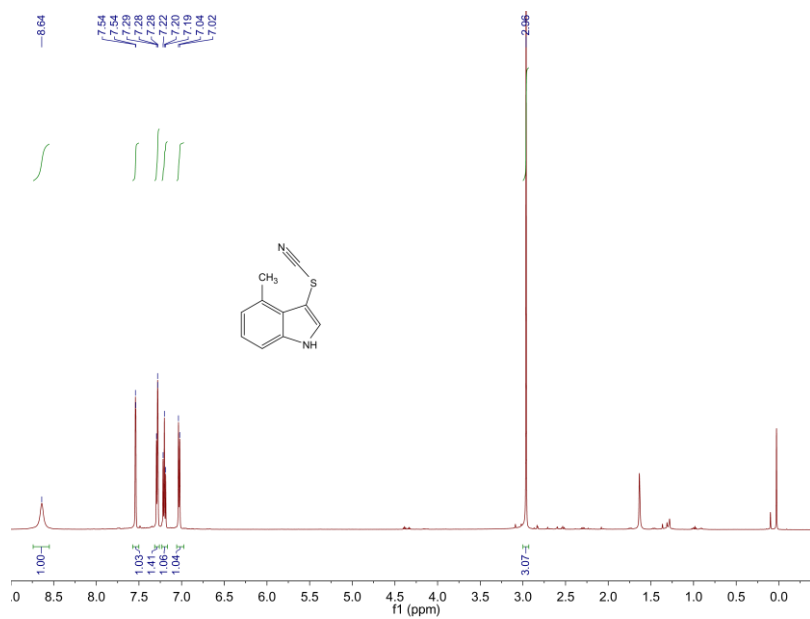


¹³C NMR, CDCl₃, 400 MHz

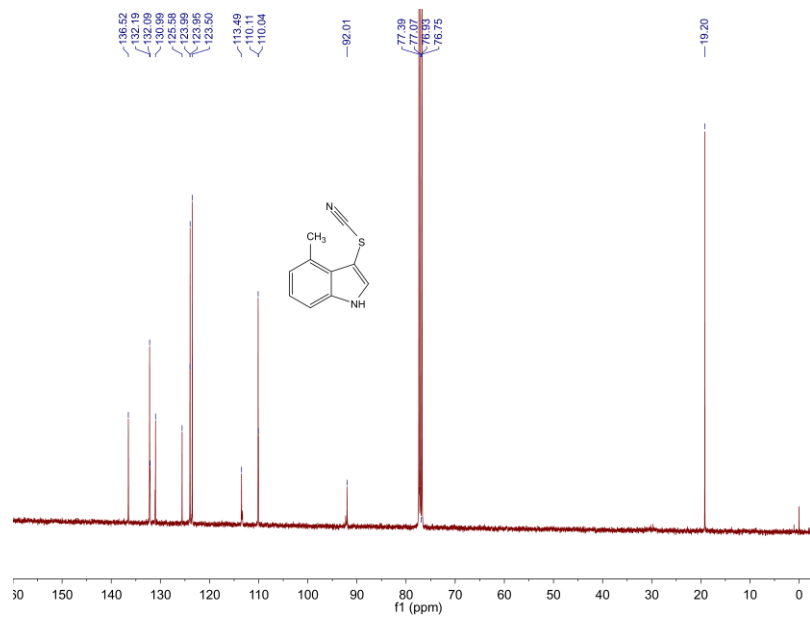


4-Methyl-3-thiocyanato-1H-indole (5s)

¹H NMR, CDCl₃, 400 MHz

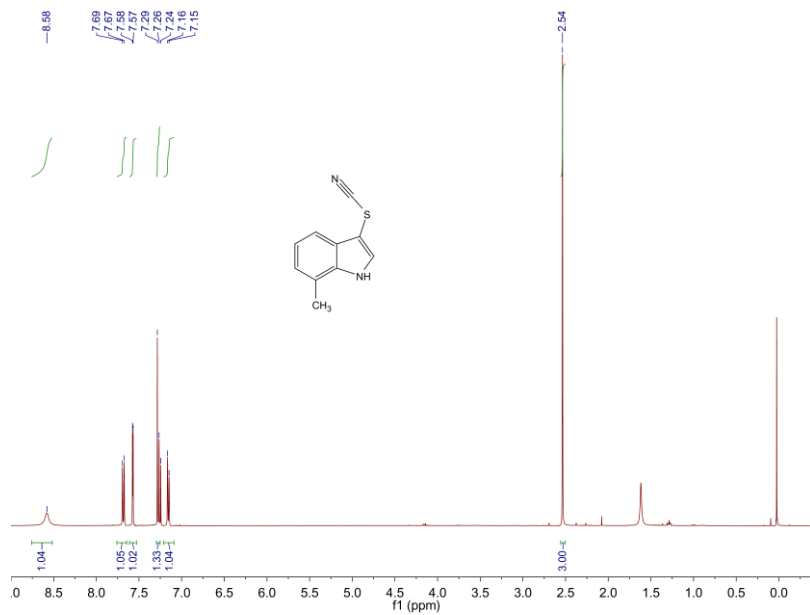


¹³C NMR, CDCl₃, 400 MHz

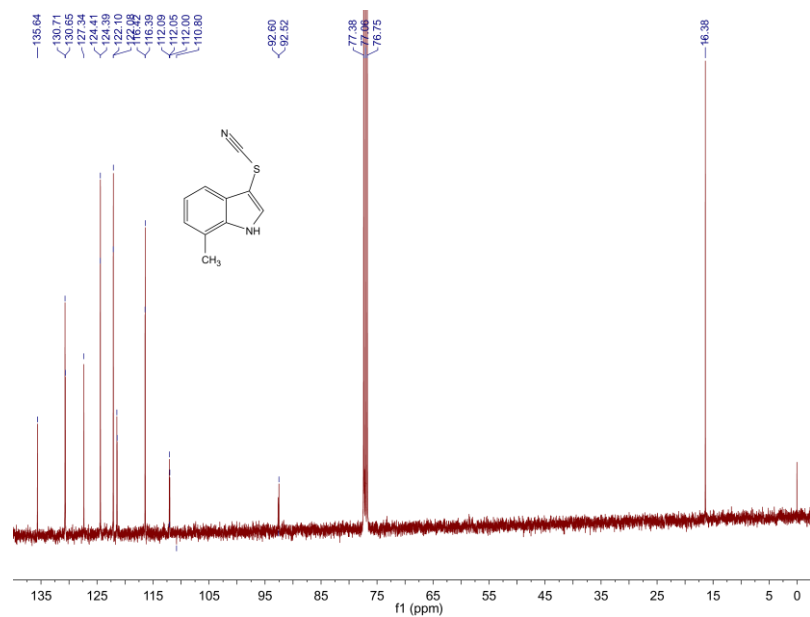


7-methyl-3-thiocyanato-1H-indole (5t)

¹H NMR, CDCl₃, 500 MHz

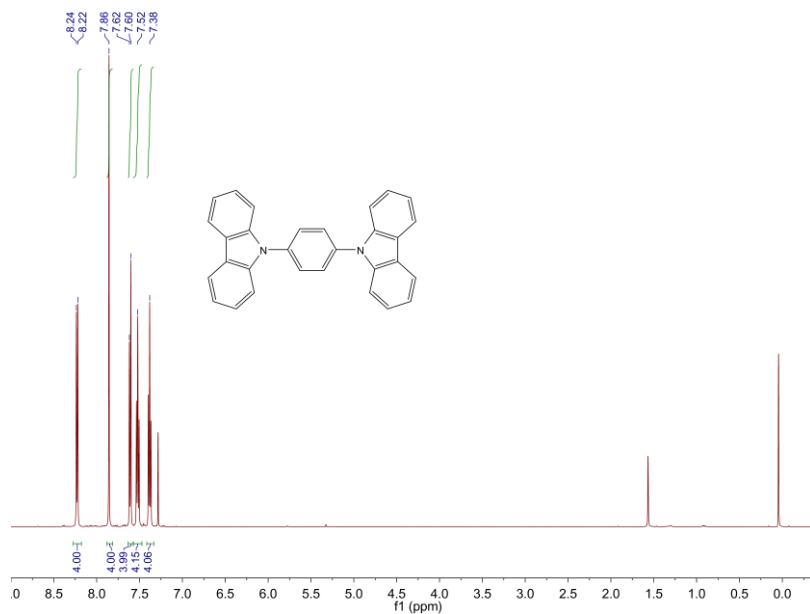


¹³C NMR, CDCl₃, 400 MHz

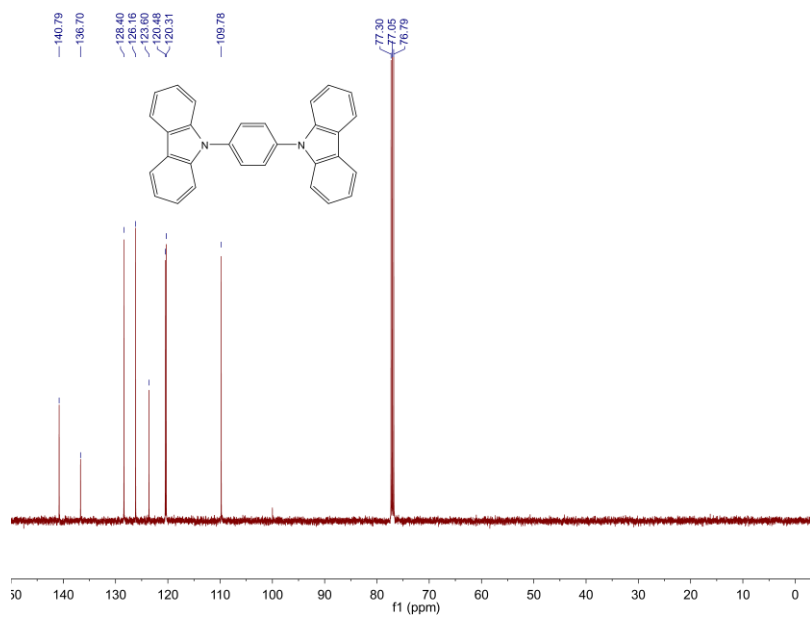


1,4-di(9H-carbazol-9-yl)benzene (DCB)

^1H NMR, CDCl_3 , 400 MHz

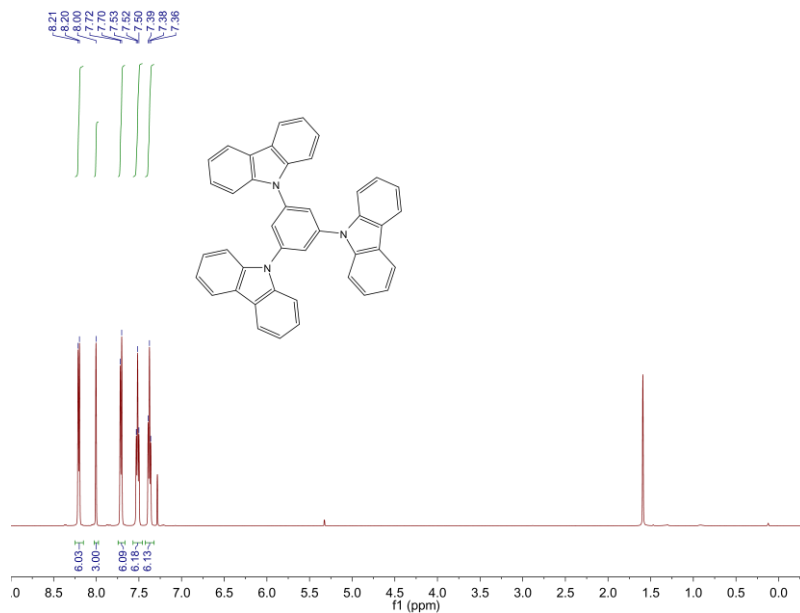


^{13}C NMR, CDCl_3 , 400 MHz

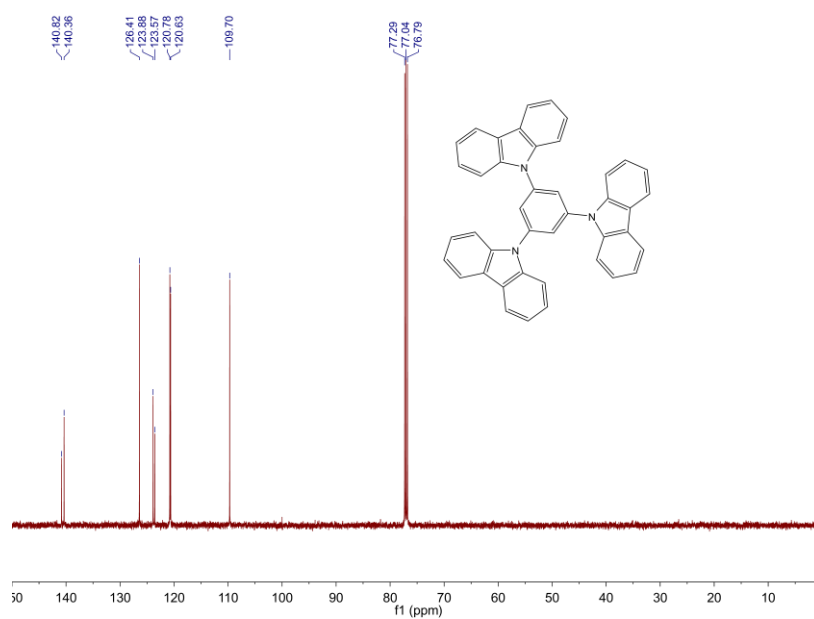


1,3,5-tri(9H-carbazol-9-yl)benzene (TCB)

^1H NMR, CDCl_3 , 400 MHz

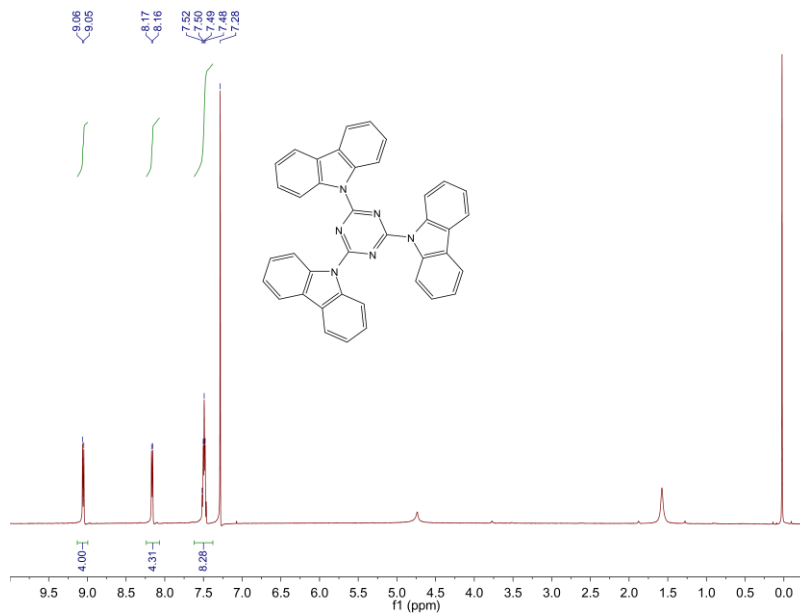


^{13}C NMR, CDCl_3 , 400 MHz



2,4,6-tri(9H-carbazol-9-yl)-1,3,5-triazine (TCT)

¹H NMR, CDCl₃, 400 MHz



¹³C NMR, CDCl₃, 400 MHz

