Electronic Supplementary Material (ESI) for RSC Advances.

L-proline-modified magnetic nanoparticles: A novel magnetically separable organocatalyst

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Outline

1. **Experimental**
2. **Spectral data for synthesized compounds**
3. **FT-IR spectra of catalysts and intermediate materials**
4. **The reusability test of LPMNP catalyst**
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1. Experimental

1.1. General

Chemicals were purchased from Fluka and Aldrich chemical companies and used without further purification. The known products were characterized by comparison of their spectral and physical data with those reported in the literature. ^{1}H (250 MHz) and ^{13}C NMR (62.9 MHz) spectra were recorded on a Bruker Avance spectrometer in $CDCl_3$ solutions with tetramethylsilane (TMS) as an internal standard. X-ray diffraction (XRD, D8, Advance, Bruker, axs) and FT-I R spectroscopy (Shimadzu F T-IR 8300 spectrophotometer) were employ ed for characterization of the catalyst and products. The scanning electron micrograph (SEM) for the catalyst was obtained by SEM instrumentation (SEM, XL-30 FEG SEM, Philips, at 20 kV). Transmission electron microscopy (TEM) was obtained using a TEM apparatus (CM-10-Philips, 100 kV) for characterization of the NTDSS catalyst. Melting points were determined in open capillary tubes in Barnstead electro-thermal 9100 BZ circulating oil melting point apparatus. The reaction monitoring was accomplished by TLC on silica gel PolyGram SILG/UV254 plates. Column chromatography was carried out on columns of silica gel 60 (70 −230 mesh).

1.2. General Procedure for the synthesis of L-proline-modified magnetic nanoparticles (LPMNPs)

1.2.1. Preparation of Fe_3O_4 nanoparticles

Magnetic nanoparticles were prepared *via* co-precipitation of Fe (III) and Fe (II) ions in the presence of sodium hydroxide. In a canonical flask, a mixture of $FeCl_2.2H_2O$ (16 mmol, 2.6 g) and $FeCl_3.6H_2O$ (30 mmol, 8.1 g) was dissolved in 100 mL of deionized

water. Then, the pH of this solution was increased to 11 by adding a 3 M solution of NaOH as drop wise (in a period of 5 minute) at 40 °C. Subsequently, the temperature of mixture was enhanced to 80 °C and the solution was stirred for 20 minute in this temperature. The magnetic nanoparticles as a dark solid were isolated from the solution by magnetic separation and washed with deionized water until pH 7 reached.

1.2.2. Preparation of Fe_3O_4@SiO_2 nanoparticles

Fe_3O_4@SiO_2 nanoparticles were prepared based on the literature with some modification: to a mixture of 125 mL of heptanes, 25 mL of *i*-PrOH, 20 mL of PEG-300, and 10 mL of water, 2g of Fe_3O_4 was added. Then the mixture was stirred by mechanical stirrer under N_2 gas for 30 minutes. 20 mL of tetraethyl orthosilicate (TEOS) was added to the mixture next and then the solution was stirred for 12 h at 30 °C. After the specified time, 10 mL of ammonia was added and the solution was stirred continuously for another 12 h. The precipitation was washed with ethanol (3 x 10) and collected by external magnetic field. The desired product was dried under vacuum overnight.

1.2.3. Synthesis of vinyl magnetic nanoparticle (VMNP)

In a three-necked flask (100 mL) containing 70 mL of dry chloroform, 5g of Fe_3O_4@SiO_2 was charged. Then trimethoxy(vinyl)silane (0.44 g, 3 mmol) was added to the reaction mixture drop-wise over a period of 5 min at room temperature. When the addition was completed, the mixture was stirred for 12 h at the refluxing temperature of chloroform. Then, the reaction mixture was filtered and the obtained solid was dried in a vacuum at 50 °C to obtain a vinyl MNP (VMNP) substrate (5.31 g).

The presence of vinyl group on the surface of MNPs was recognized using bromine test [1]. The amount of supported vinyl groups on the surface of MNPs were determined

using elemental analysis which was in good agreement with the value that estimated with an iodine test [2]. The results showed that there are 5.6 mmol/g ethylene groups on the surface of MNPs.

1.2.4. Synthesis of MNP-oxiran (MNPO)

A solution of 5g vinyl MNP (VMNP), and H_2O_2 30% (20 mL) were stirred at 50 °C for 12 h. The resulting precipitate was filtered through a celite pad, washed with water, dried in vacuum to afford the MNPO substrate (5.52 g).

The presence of ethylene oxide group on the silica substrate was detected by the bright pink color of the phenolphthalein (as indicator) when air passed through an aqueous solution of NaCl. The quantitative amount of oxirane group on the substrate was identified to be 5.4 mmol/g using elemental analysis, which it showed that a remarkable amount of vinyl groups is converted to oxirane under applied conditions.

1.2.5. Synthesis of L-proline magnetic nanoparticles (LPMNPs) catalyst

For the synthesis of LPMNPs catalyst, 0.6 g of *N*-Boc-protected L-proline was added in to a prepared solution containing 5g of MNPO in 30 mL chloroform. Then, 2 or 3 drop of Et_3N was added to the reaction mixture. Subsequently, the mixture was stirred for 12h at refluxing temperature of chloroform. The resulting precipitate was filtered through a celite pad, washed with water, dried in vacuum to afford the supported *N*-Boc-protected L-proline on MNPs.

N-Boc deprotection of this material was performed based on a reported procedure [3]. To a round-bottomed flask containing water (5 mL), 5 g of obtained *N*-Boc-protected L-proline on MNPs is added and the obtained mixture was stirred and refluxed for 1 h. Then, the reaction mixture was cooled down to room temperature, filtered through a

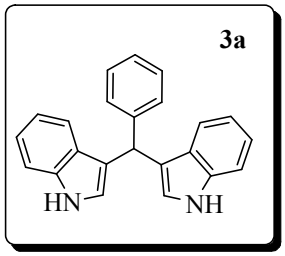
celite pad and washed with water (15 mL, two times) and EtOH (10 mL, two times) and the obtained solid was dried in vacuum for overnight to give LPMNP as a dark powder (5.35 g).

1.3. General Procedure for the synthesis of compounds

A mixture of Indole (2 mmol) and benzaldehyde (1 mmol) in presence of LPMNPs (0.05 g) as catalyst in round bottom flask was stirred at 50 °C in water (2 mL) for appropriate time (Table 1). After completion of the reaction, as indicated by TLC, The catalyst was recovered magnetically by attaching a general magnet to the exterior of the reactor vessel and the reaction mixture was diluted with ethyl acetate (5 mL). The organic layer was dried ($CaCl_2$) and evaporated. The crude product was subjected to column chromatography (EtOAc/*n*-hexane) to obtain the pure product.

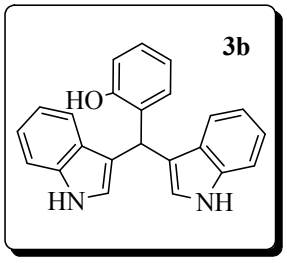
2. Experimental characterization data for compounds:

1. ***3-((1H-indol-3-yl)(phenyl)methyl)-1H-indole*** **(3a)** [4]



Yield: 94% (0.3 g), Pink solid; Mp: 140-142 °C (Lit. Mp: 142-144 °C). ^{1}H-NMR (250 MHz, $CDCl_3$/TMS) δ (ppm): 5.86 (s, 1H, ArCH), 6.66 (s, 2H, Ar), 7.11 (t, 2H, *J* = 6.9 Hz, Ar), 7.14-7.22 (m, 3H, Ar), 7.28-7.31 (m, 2H, Ar), 7.35-7.42 (m, 6H, Ar), 7.93 (br, 2H, NH). ^{13}C-NMR (62.5 MHz, $CDCl_3$/TMS) δ (ppm): 31.6, 110.9, 111.9, 118.4, 119.5, 121.2, 124.0, 126.3, 127.1, 128.5, 128.6, 137.0, 145.2; MS (m/z): 322 (M+). Anal. Calcd. for $C_{23}H_{18}N_2$: C, 85.68; H, 5.63; N, 8.69. Found: C, 85.61; H, 5.54; N, 8.62.

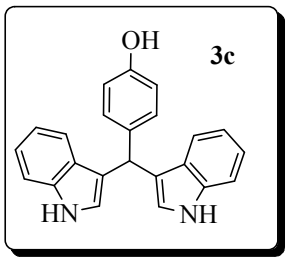
2. ***2-(Di(1H-indol-3-yl)methyl)phenol*** **(3b)**[5]



Yield: 80% (0.27 g), white solid; Mp: 121-123 °C (Lit. Mp: 122-123 °C).

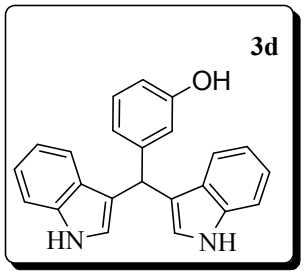
IR (KBr): 3818, 3749, 3494, 2931, 2360, 1743, 1365, 1326, 748 cm^{-1}. ^{1}H-NMR (250 MHz, DMSO-d_6/TMS) δ (ppm): 6.21 (s, 1H, ArCH), 6.65 (t, 1H, *J* = 7.0 Hz, Ar), 6.75 (s, 3H, Ar), 6.85 (t, 3H, *J* = 7.2 Hz, Ar), 6.96-7.09 (m, 4H, Ar), 7.27-7.36 (m, 4H, Ar), 9.42 (s, 1H, OH), 10.75 (s, 2H, NH). ^{13}C-NMR (62.5 MHz, DMSO-d_6/TMS) δ (ppm): 31.4, 111.3, 114.9, 117.9, 118.0, 118.5, 118.9, 120.7, 123.4, 126.5, 126.8, 129.3, 130.8, 136.5, 154.2. Anal. Calcd. for $C_{23}H_{18}N_2O$: C, 81.63; H, 5.36; N, 8.28. Found: C, 81.54; H, 5.29; N, 8.20.

3. ***4-(Di(1H-indol-3-yl)methyl)phenol*** **(3c)** [6]



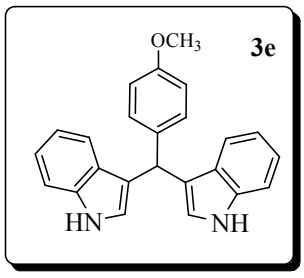
Yield: 83% (0.28 g), Pink solid; Mp: 121-123 ^{o}C (Lit. Mp: 122-124 ^{o}C). IR (KBr): 3834, 3749, 3425, 3402, 3055, 2839, 2360, 1697, 1612, 1512, 1458, 1257, 1087, 786, 748 cm^{-1}. ^{1}H-NMR (250 MHz, DMSO-d_6/TMS) δ (ppm): 5.68 (s, 1H, ArCH), 6.63 (d, 2H, *J* = 7.7 Hz, Ar), 6.75 (s, 2H, Ar), 6.82 (t, 2H, *J* = 7.2 Hz, Ar), 6.99 (t, 2H, *J* = 7.2 Hz, Ar), 7.10 (d, 2H, *J* = 7.5 Hz, Ar),7.23 (d, 2H, *J* = 7.5 Hz, Ar), 7.30 (d, 2H, *J* = 7.5 Hz, Ar), 9.10 (s, 1H, OH), 10.73 (s, 2H, NH).^{13}C-NMR (62.5 MHz, DMSO-d_6/TMS) δ (ppm): 53.7, 111.3, 114.6, 117.9, 118.5, 119.1, 120.7, 123.3, 126.5, 129.0, 135.1, 136.5, 155.1. Anal. Calcd. for $C_{23}H_{18}N_2O$: C, 81.63; H, 5.36; N, 8.28. Found: C, 81.54; H, 5.29; N, 8.20.

4. ***3-(Di(1H-indol-3-yl)methyl)phenol*** **(3d)**



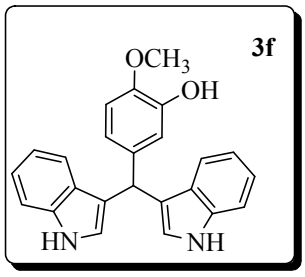
Yield: 85% (0.27 g), white solid; Mp: 104-106 ^{o}C. IR (KBr): 3409, 3278, 3055, 2923, 2854, 1735, 1589, 1450, 1419, 1234, 1103, 748 cm^{-1}. ^{1}H-NMR (250 MHz, DMSO-d_6/TMS) δ (ppm): 5.73 (s, 1H, ArCH), 6.56 (dd, 1H, *J* = 10, 1.5 Hz, Ar), 6.74-6.88 (m, 6H, Ar), 6.99-7.08 (m, 3H, Ar), 7.27 (s, 1H, Ar), 7.30 (s, 1H, Ar), 7.32 (s, 1H, Ar), 7.36 (s, 1H, Ar), 9.16 (s, 1H, OH), 10.80 (s, 2H, NH). ^{13}C-NMR (62.5 MHz, DMSO-d_6/TMS) δ (ppm): 59.7, 111.3, 112.7, 115.1, 117.9, 118.0, 119.0, 120.7, 123.4, 126.6, 128.8, 136.5, 146.4, 157.0. Anal. Calcd. for $C_{23}H_{18}N_2O$: C, 81.63; H, 5.36; N, 8.28. Found: C, 81.52; H, 5.23; N, 8.17.

5. ***3-((1H-indol-3-yl)(4-methoxyphenyl)methyl)-1H-indole*** **(3e)** [4]



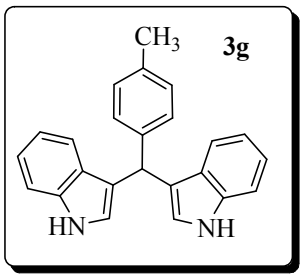
Yield: 92% (0.32 g), Brown solid; Mp: 186-188 ^{o}C (Lit. Mp: 185-187 ^{o}C). ^{1}H-NMR (250 MHz, $CDCl_3$/TMS) δ (ppm): 3.76 (s, 3H, OCH_3), 5.85 (s, 1H, ArCH), 6.68 (s, 2H), 6.91 (d, 2H, *J* = 8.2 Hz, Ar), 7.02 (t, 2H, *J* = 7.3 Hz, Ar), 7.16 (t, 2H, *J* = 7.3 Hz, Ar), 7.20 (m, 2H, Ar), 7.35-7.41 (m, 4H), 7.95 (br, 2H, NH). Anal. Calcd. for $C_{24}H_{20}N_2O$: C, 81.79; H, 5.72; N, 7.95. Found: C, 81.71; H, 5.67; N, 7.88.

6. ***5-(Di(1H-indol-3-yl)methyl)-2-methoxyphenol*** **(3f)** [7]



Yield: 81% (0.3 g), white solid; Mp: 110-112 ^{o}C (Lit. Mp: 111-113 ^{o}C). IR (KBr): 3409, 3055, 2931, 2839, 2306, 1728, 1589, 1504, 1458, 1419, 1334, 1272, 1211, 1126, 1026, 740 cm^{-1}. ^{1}H-NMR (250 MHz, DMSO-d_6/TMS) δ (ppm): 3.68 (s, 3H, CH_3), 5.64 (s, 1H, ArCH), 6.72-6.86 (m, 7H, Ar), 7.00 (t, 2H, *J* = 7.5 Hz, Ar), 7.24 (d, 2H, *J* = 7.7 Hz, Ar), 7.31 (d, 2H, *J* = 7.7 Hz, Ar), 8.72 (s, 1H, OH), 10.74 (s, 2H, NH). ^{13}C-NMR (62.5 MHz, DMSO-d_6/TMS) δ (ppm): 44.9, 55.4, 111.3, 111.7, 115.7, 118.0, 118.3, 119.1, 119.1, 120.7, 123.3, 126.5, 136.4, 137.5, 145.6, 145.8. Anal. Calcd. for $C_{24}H_{20}N_2O_2$: C, 78.24; H, 5.47; N, 7.60;. Found: C, 78.17; H, 5.34; N, 7.52.

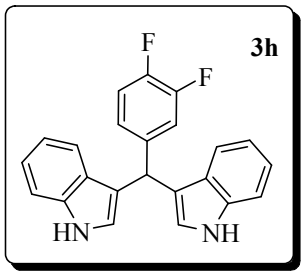
7. ***3-((1H-indol-3-yl)(p-tolyl)methyl)-1H-indole*** **(3g)** [8]



Yield: 92% (0.31 g), Pink solid; Mp: 95-97 ^{o}C (Lit. Mp: 93-94 ^{o}C).

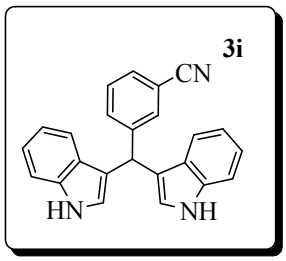
^{1}H-NMR (250 MHz, $CDCl_3$/TMS) δ (ppm): 2.33 (s, 3H, $ArCH_3$), 5.87 (s, 1H, ArCH), 6.69 (s, 2H), 7.04 (t, 2H, *J* = 7.1 Hz, Ar), 7.12 (d, 2H, *J* = 7.1 Hz, Ar), 7.23-7.28 (m, 6H), 7.41 (d, 2H, *J* = 7.2 Hz, Ar), 7.94 (br, 2H, NH). Anal. Calcd. for $C_{24}H_{20}N_2$: C, 85.68; H, 5.99; N, 8.33;. Found: C, 85.61; H, 5.93; N, 7.24.

8. ***3-((3,4-Difluorophenyl)(1H-indol-3-yl)methyl)-1H-indole*** **(3h)**



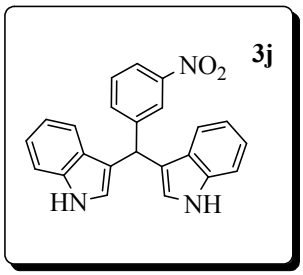
Yield: 93% (0.33 g), white solid; Mp: 185-187 ^{o}C. IR (KBr): 3818, 3749, 3386, 2692, 1627, 1458, 1373, 1218, 1172, 1095, 1033, 964.3, 840.9, 740.6, 424.3 cm^{-1}. ^{1}H-NMR (250 MHz, DMSO-d_6/TMS) δ (ppm): 5.86 (s, 1H, ArCH), 6.86 (t, 4H, *J* = 7.7 Hz, Ar), 7.02 (t, 2H, *J* = 8.0 Hz, Ar), 7.17-7.36 (m, 7H, Ar), 10.87 (s, 2H, NH). ^{13}C-NMR (62.5 MHz, DMSO-d_6/TMS) δ (ppm): 52.3, 111.4, 116.7, 116.9, 117.2, 118.9, 120.9, 123.6, 124.6, 124.7, 126.3, 135.5, 142.8, 151.1. Anal. Calcd. for $C_{23}H_{16}F_2N_2$: C, 77.08; H, 4.50; N, 7.82;. Found: C, 77.01; H, 4.43; N, 7.76.

9. ***3-(Di(1H-indol-3-yl)methyl)benzonitrile*** **(3i)** [9]



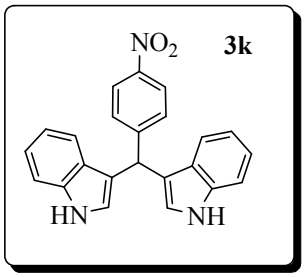
Yield: 91% (0.31 g), Pink solid; Mp: 98-100 °C (Lit. Mp: 102-104 °C). ^{1}H-NMR (250 MHz, $CDCl_3$/TMS) δ (ppm): 6.09 (s, 1H, ArCH), 6.83 (s, 2H, Ar), 6.98-7.07 (m, 4H, Ar), 7.19 (d, 2H, *J* = 7.6 Hz, Ar), 7.42 (d, 2H, *J* = 7.6 Hz, Ar), 7.65-7.87 (m, 4H), 8.02 (br, 2H, NH). Anal. Calcd. for $C_{24}H_{17}N_3$: C, 82.97; H, 4.93; N, 12.10;. Found: C, 82.91; H, 4.84; N, 12.03.

10. ***3-((1H-indol-3-yl)(3-nitrophenyl)methyl)-1H-indole*** **(3j)** [10]



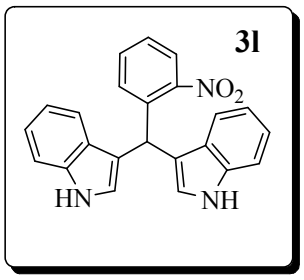
Yield: 90% (0.33 g), Yellow solid; Mp: 220-222 °C (Lit. Mp: 221-223 °C). ^{1}H-NMR (250 MHz, $CDCl_3$/TMS) δ (ppm): 6.23 (s, 1H, ArCH), 7.01 (t, 2H, *J* = 7.3 Hz, Ar), 7.06 (s, 2H, Ar), 7.22 (t, 2H, *J* = 7.0 Hz, Ar), 7.45 (d, 2H, *J* = 7.5 Hz, Ar), 7.53 (d, 2H, *J* = 8.0 Hz, Ar), 7.75 (m, 1H),8.02 (d, 1H, *J* = 7.6 Hz, Ar), 8.26 (d, 1H, *J* = 7.7 Hz, Ar), 8.33 (s, 1H), 8.09 (s, 2H, NH). Anal. Calcd. for $C_{23}H_{17}N_3O_2$: C, 75.19; H, 4.66; N, 11.44;. Found: C, 75.12; H, 4.59; N, 11.37.

11. ***3-((1H-indol-3-yl)(4-nitrophenyl)methyl)-1H-indole*** **(3k)**[8]



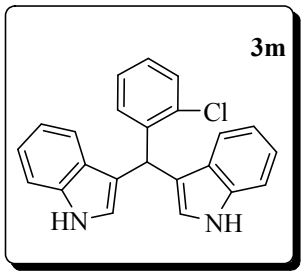
Yield: 94% (0.34 g), Yellow needles; Mp: 217-219 °C (Lit. Mp: 217-220 °C). ^{1}H-NMR (250 MHz, $CDCl_3$/TMS) δ (ppm): 6.01 (s, 1H, ArCH), 6.72 (s, 2H, Ar), 7.02-7.08 (m, 4H, Ar), 7.36 (d, 2H, *J* = 8.1 Hz, Ar), 7.41 (d, 2H, *J* = 8.1 Hz, Ar), 7.49 (d, 2H, *J* = 8.6 Hz, Ar), 8.05 (br, 2H, NH), 8.17 (d, 2H, *J* = 8.6 Hz, Ar). Anal. Calcd. for $C_{23}H_{17}N_3O_2$: C, 75.19; H, 4.66; N, 11.44;. Found: C, 75.12; H, 4.59; N, 11.37.

12. ***3-((1H-indol-3-yl)(2-nitrophenyl)methyl)-1H-indole*** **(3l)** [10]



Yield: 90% (0.33 g), Yellow solid; Mp: 139-141 °C (Lit. Mp: 140-141 °C). ^{1}H-NMR (250 MHz, $CDCl_3$/TMS) δ (ppm): 6.12 (s, 1H, ArCH), 6.91 (s, 2H, Ar), 7.08-7.17 (m, 4H, Ar), 7.29 (d, 2H, *J* = 7.8 Hz, Ar), 7.47 (d, 2H, *J* = 7.9 Hz, Ar), 7.57-7.66 (m, 2H, Ar), 7.79-7.90 (m, 2H), 8.21 (d, 2H, *J* = 8.6 Hz, NH). Anal. Calcd. for $C_{23}H_{17}N_3O_2$: C, 75.19; H, 4.66; N, 11.44;. Found: C, 75.12; H, 4.59; N, 11.37.

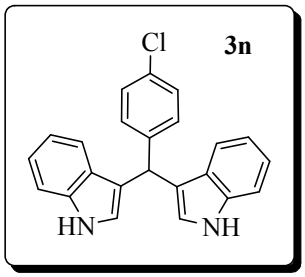
12. ***3-((2-Chlorophenyl)(1H-indol-3-yl)methyl)-1H-indole*** **(3m)** [8]



Yield: 88% (0.31 g), Pink solid; Mp: 74-76 °C (Lit. Mp: 70-71 °C).

^{1}H-NMR (250 MHz, $CDCl_3$/TMS) δ (ppm): 6.32 (s, 1H, ArCH), 6.67 (s, 2H), 7.02 (t, 2H, *J* = 7.8 Hz, Ar), 7.10-7.22 (m, 6H, Ar), 7.38 (m, 4H), 7.98 (br, 2H, NH). Anal. Calcd. for $C_{23}H_{17}ClN_2$: C, 77.41; H, 4.80; Cl, 9.93; N, 7.85;. Found: C, 77.34; H, 4.73; N, 7.78.

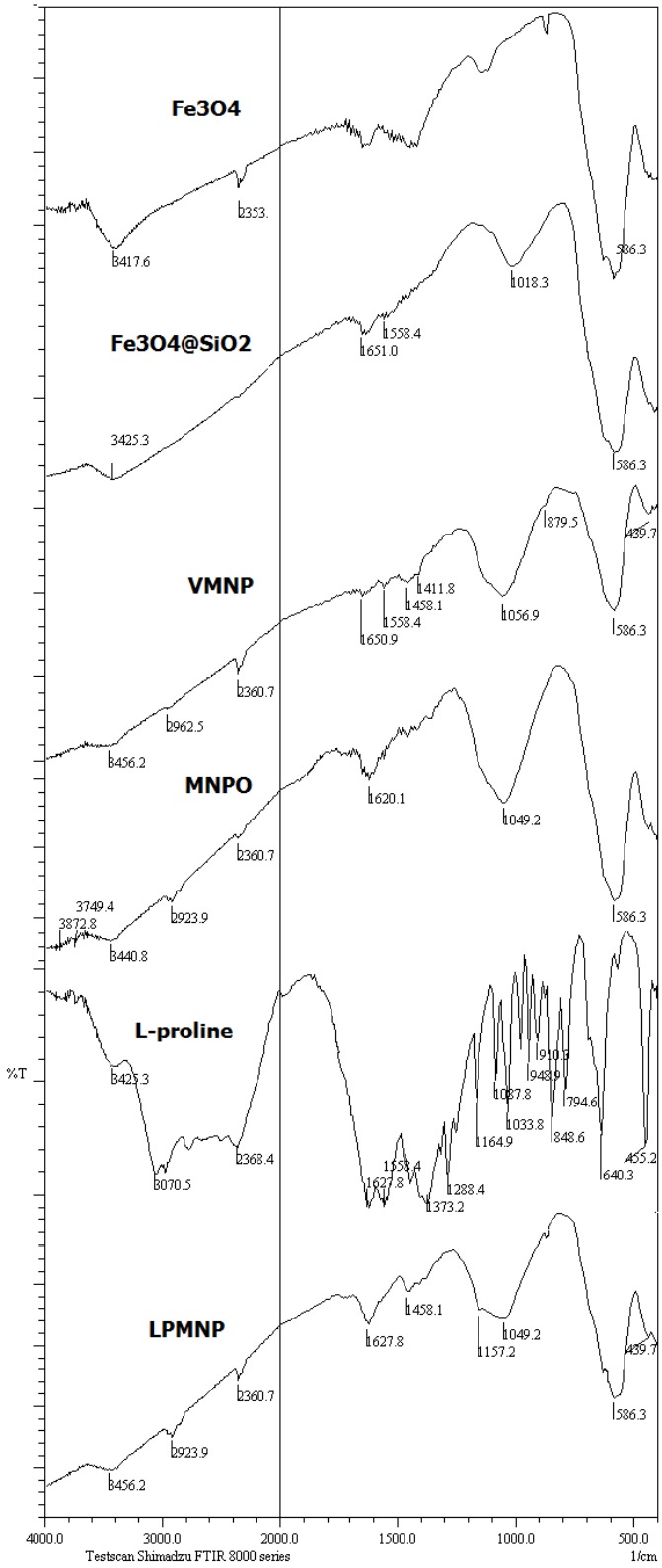
13. ***3-((4-Chlorophenyl)(1H-indol-3-yl)methyl)-1H-indole*** **(3n)** [8]



Yield: 89% (0.32 g), Pink solid; Mp: 78-80 °C (Lit. Mp: 76-77 °C).

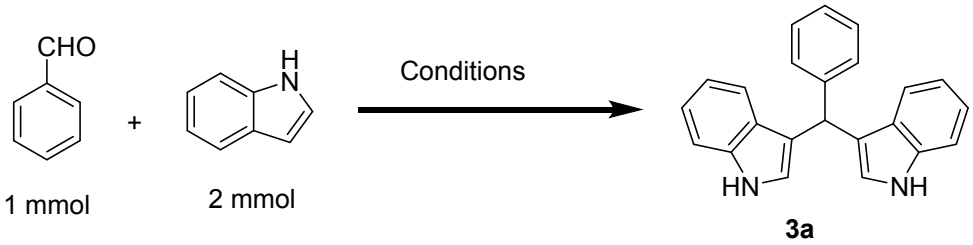
^{1}H-NMR (250 MHz, $CDCl_3$/TMS) δ (ppm): 5.86 (s, 1H, ArCH), 6.65 (s, 2H, Ar), 6.85-7.96 (m, 12H, Ar), 8.00 (br, 2H, NH). Anal. Calcd. for $C_{23}H_{17}ClN_2$: C, 77.41; H, 4.80; Cl, 9.93; N, 7.85. Found: C, 77.34; H, 4.73; N, 7.78.

3. FT-IR spectra of catalysts and intermediate materials (Fig. 1S)



4. Optimization of reaction condition

Table 2S. Optimization of reaction condition[a]



Entry	Catalyst (mol%)	Solvent	Temp. (°C)	Time (h)	Yield (%)[b]
1	-	H_2O	50	12	trace
2	L-proline (10)	H_2O	90	5	75
3	L-proline (10)	H_2O	50	1	55 (60)[c]
4	Fe_3O_4@SiO_2 (0.1 g)	H_2O	50	12	20
5	LPMNP (2.5 mol%)	H_2O	50	1	94 (95)[c]
6	LPMNP (2.5 mol%)	H_2O	90	1	90
7	LPMNP (5 mol%)	H_2O	50	1	95
8	LPMNP (3 mol%)	H_2O	50	1	95
8	LPMNP (2 mol%)	H_2O	50	1	80
8	LPMNP (2.5 mol%)	EtOH	50	1	90
9	LPMNP (2.5 mol%)	$CHCl_3$	50	6	50
10	LPMNP (2.5 mol%)	$PhCH_3$	50	6	40

[a] Reaction conditions: H_2O (2 mL), aldehyde (1.0 mmol) and indole (2.1 mmol). [b] Isolated yield. [c] Reaction yield after 5h.

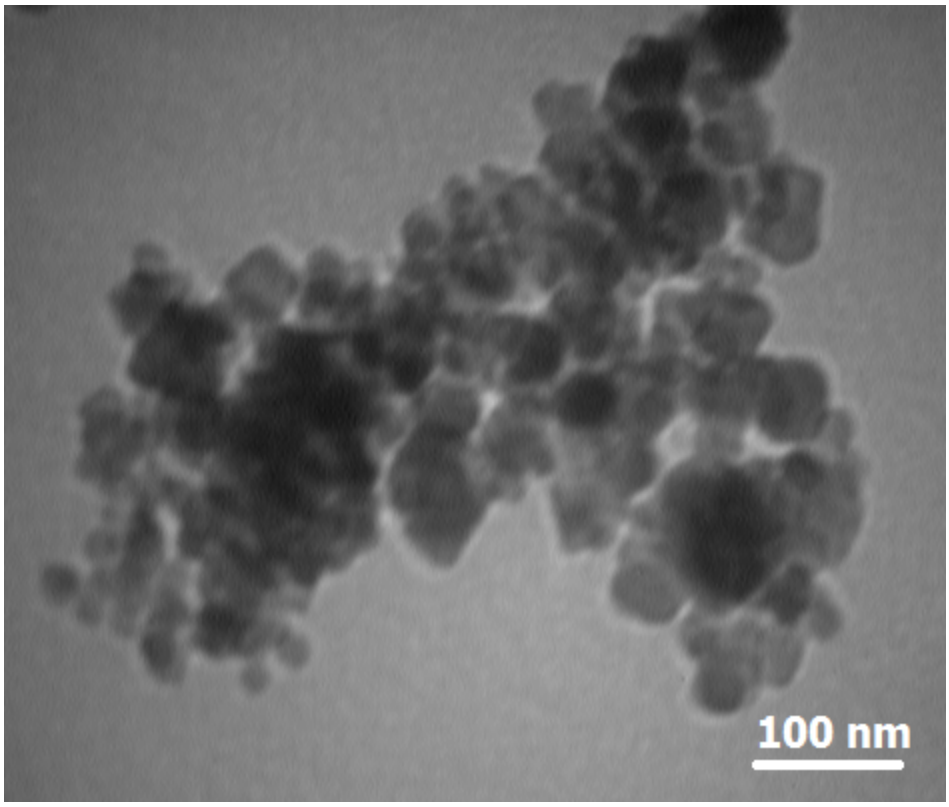
5. The reusability test of LPMNP catalyst

Table 2S. Reusability of the LPMNP catalyst in the reaction of indole and aldehydes for synthesis of bis(indolyl)methanes in water [a]

Entry	Yield of product (%) [b]	Recovery of LPMNP (%)
1	94	99
2	93	>98
3	93	98
4	92	97
5	91	96
6	90	>95
7	89	95
8	88	94

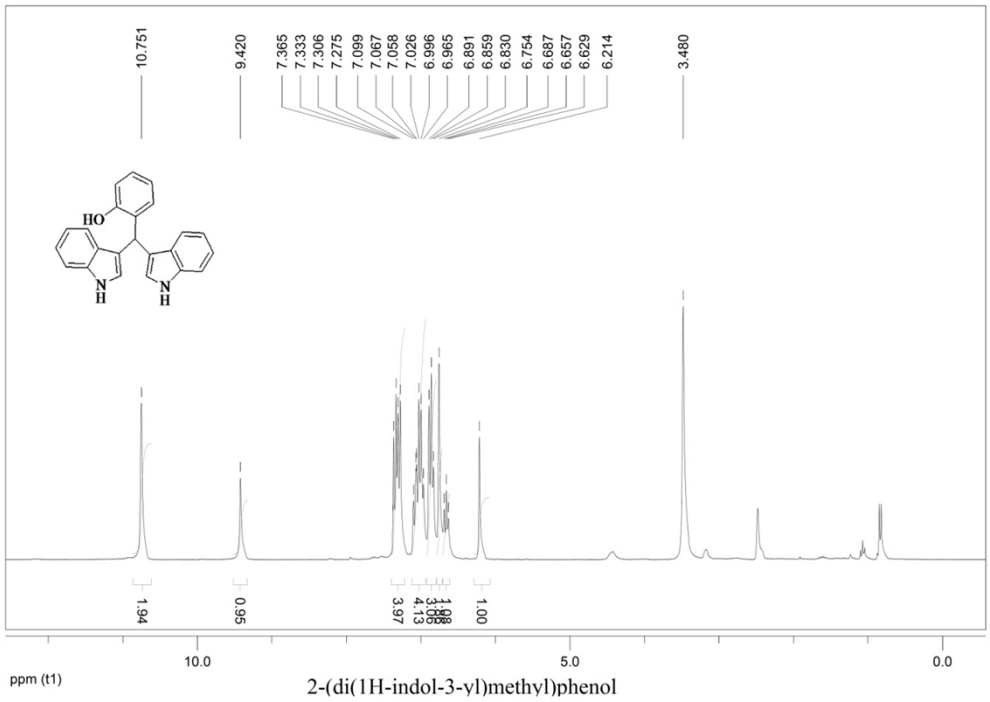
[a] Reaction conditions: Reaction conditions: LPMNP (0.05 g), H_2O (2 mL), aldehyde (1.0 mmol) and indole (2.1 mmol).

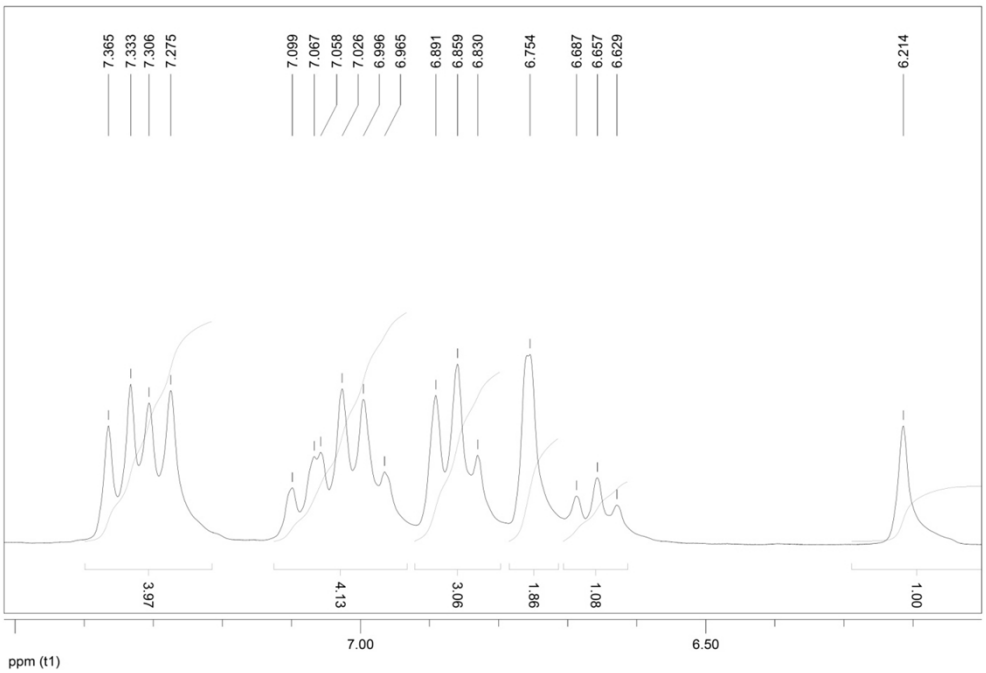
5. TEM image of catalyst after 8 time of reusability

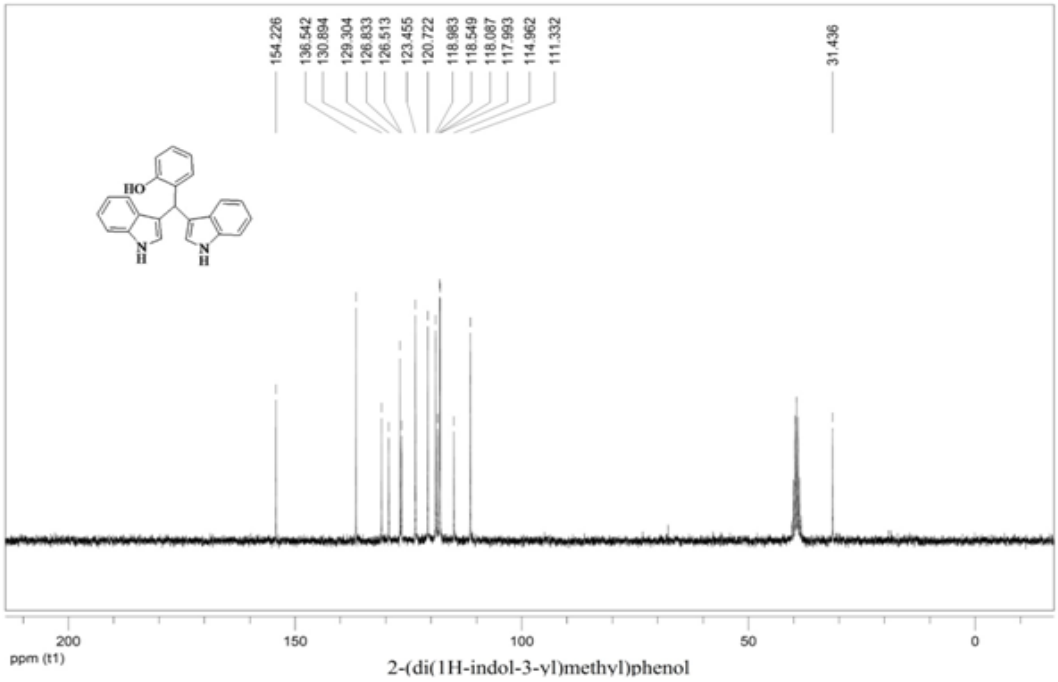


6. Copy of ^{1}H NMR, ^{13}C NMR and IR of synthesized compounds

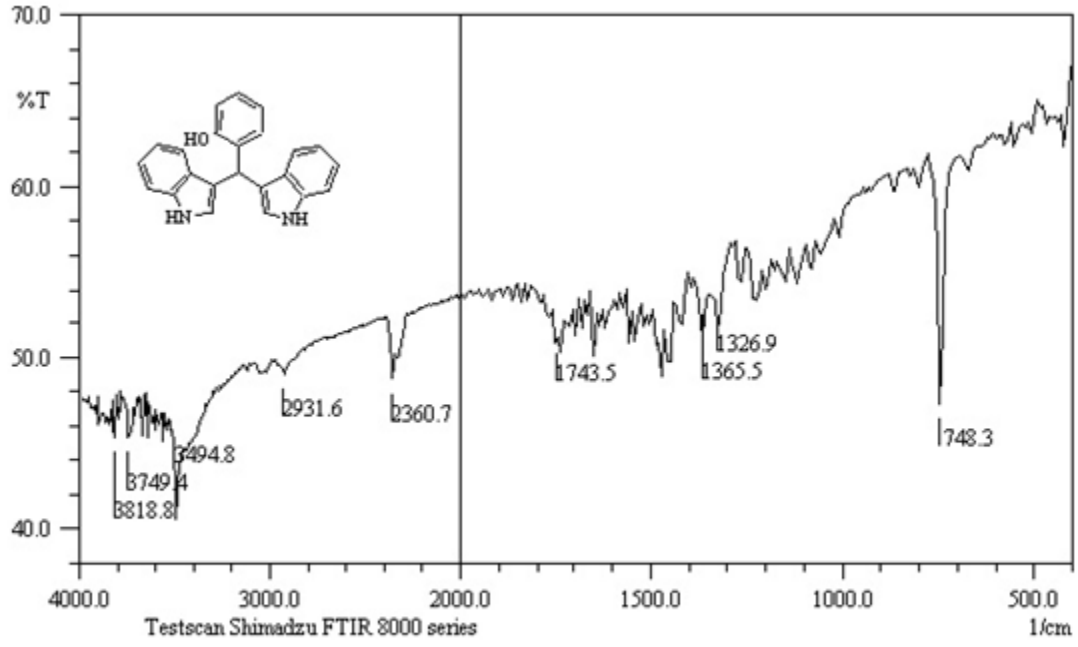
Compound **3b**:





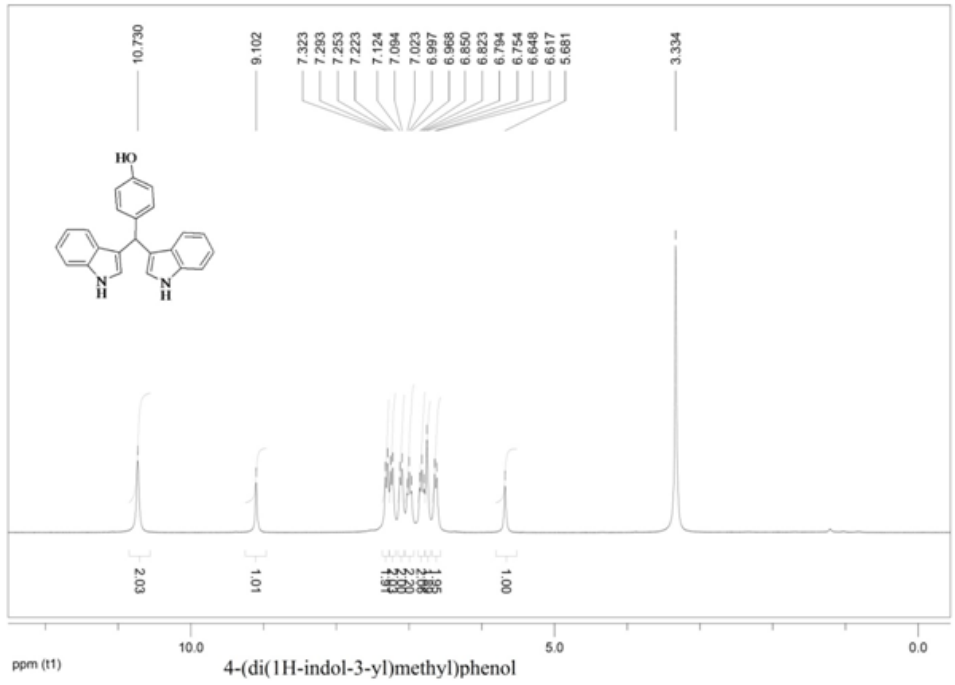


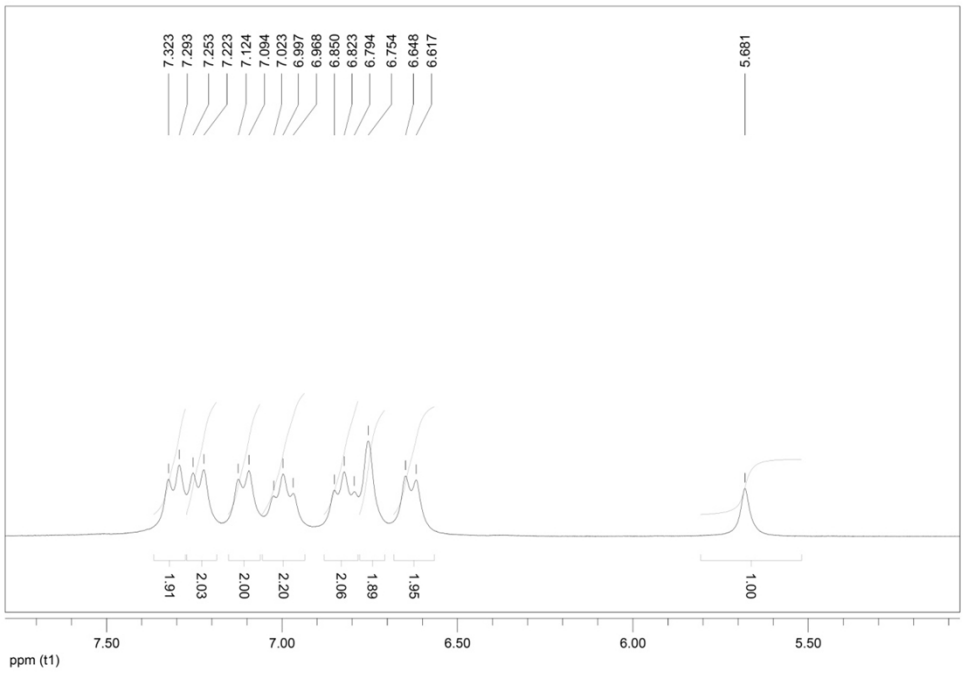
2-(di(1H-indol-3-yl)methyl)phenol

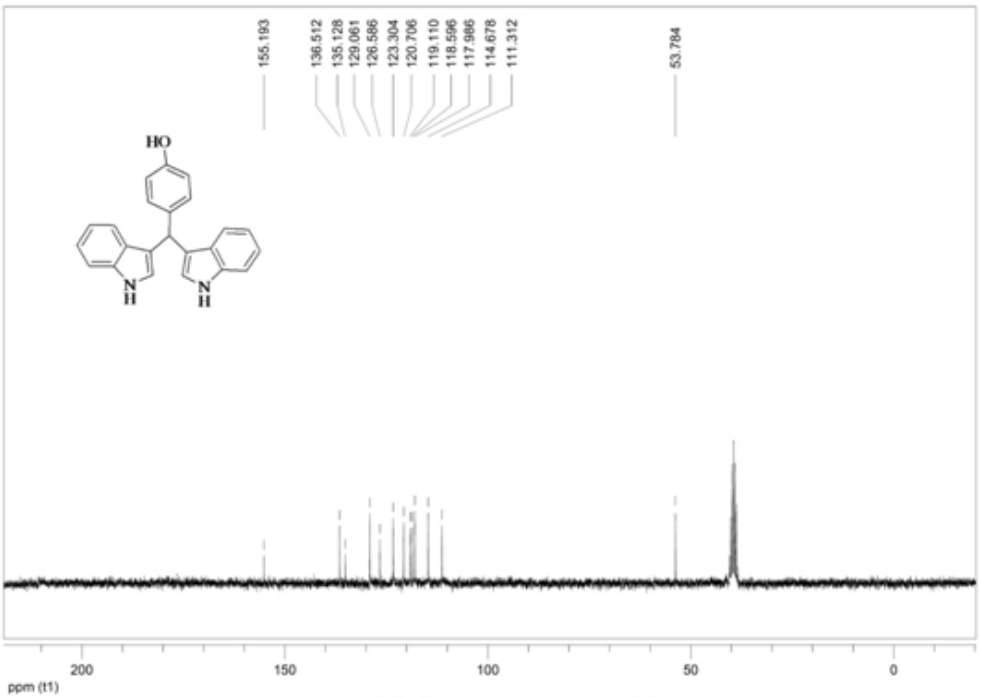


2-(di(1H-indol-3-yl)methyl)phenol

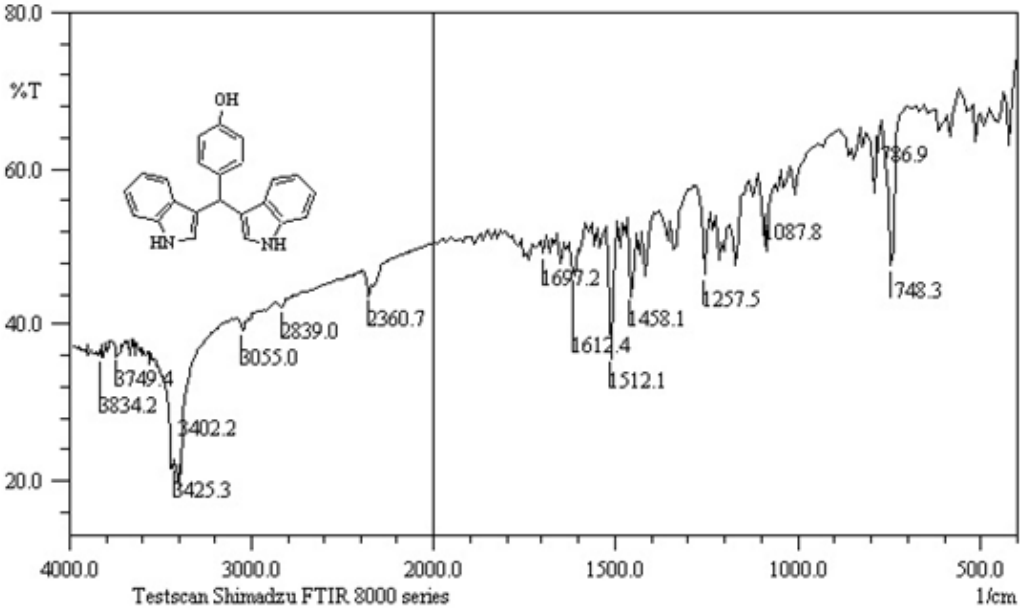
Compound **3c**:


10.730
9.102
7.323
7.293
7.253
7.223
7.124
7.094
7.023
6.997
6.968
6.850
6.823
6.794
6.754
6.648
6.617
5.681
3.334
HO
N
H
N
H
2.03
1.01
1.00
10.0
5.0
0.0
ppm (t1)
4-(di(1H-indol-3-yl)methyl)phenol


7.323
7.293
7.253
7.223
7.124
7.094
7.023
6.997
6.968
6.850
6.823
6.794
6.754
6.648
6.617
5.681
1.91
2.03
2.00
2.20
2.06
1.89
1.95
1.00
7.50
7.00
6.50
6.00
5.50
ppm (t1)

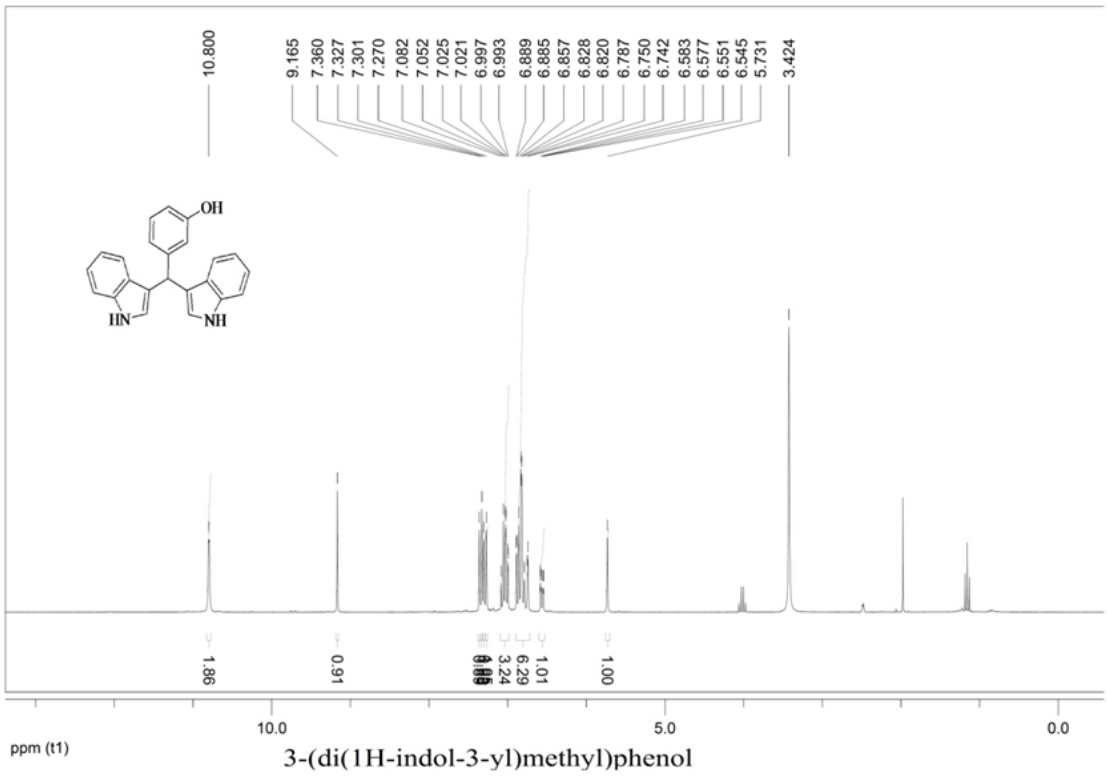


4-(di(1H-indol-3-yl)methyl)phenol

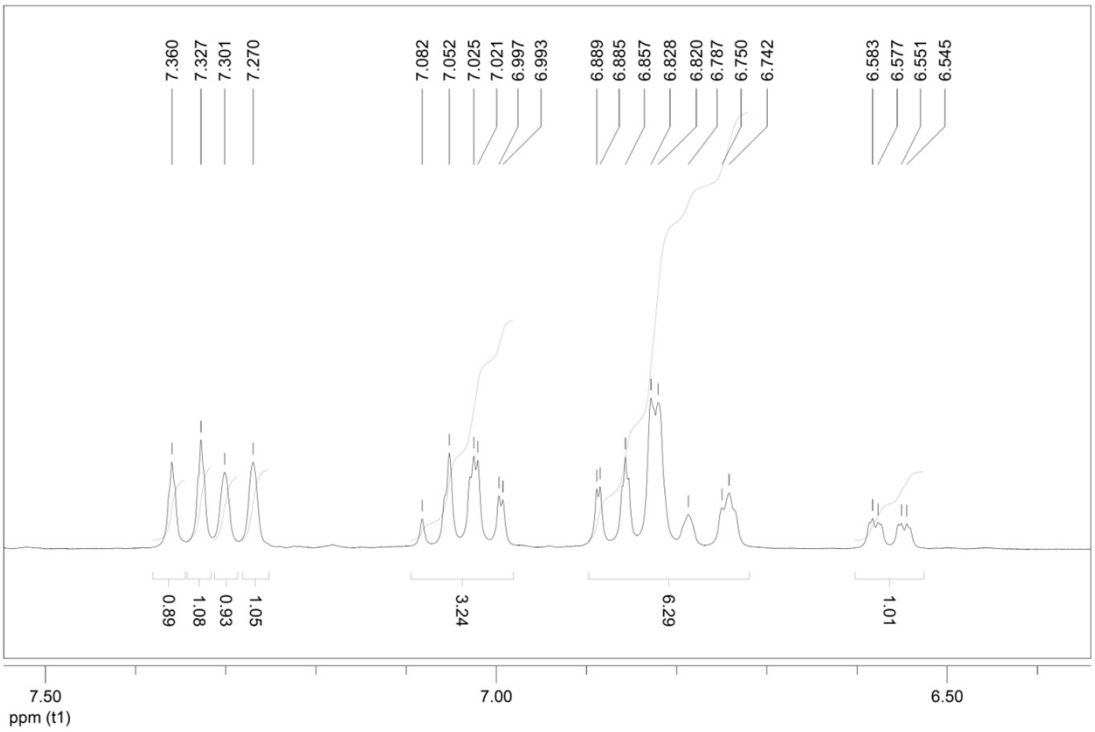


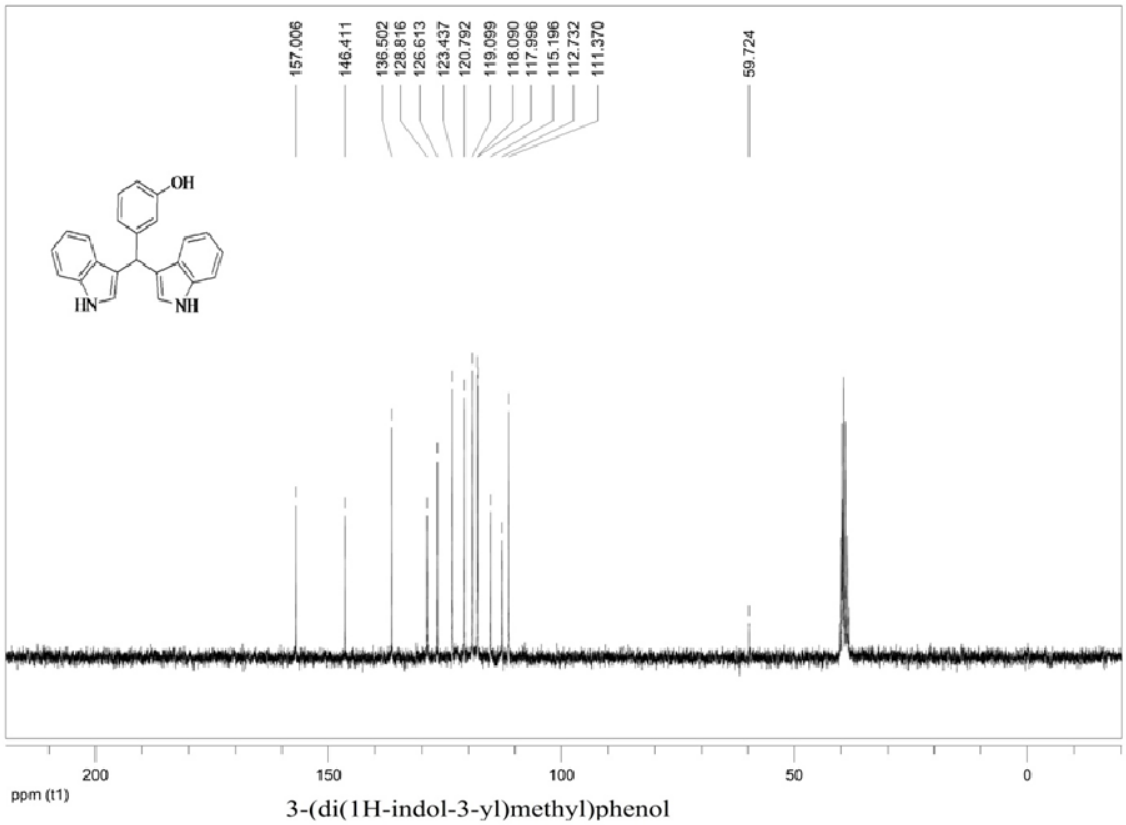
4-(di(1H-indol-3-yl)methyl)phenol

Compound **3d**:

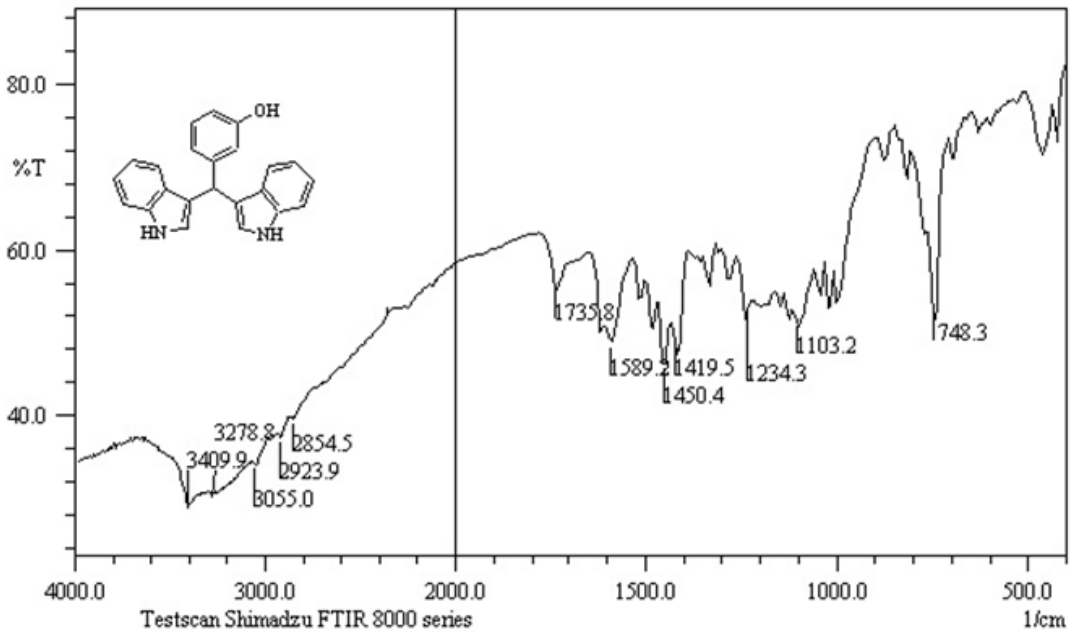


3-(di(1H-indol-3-yl)methyl)phenol



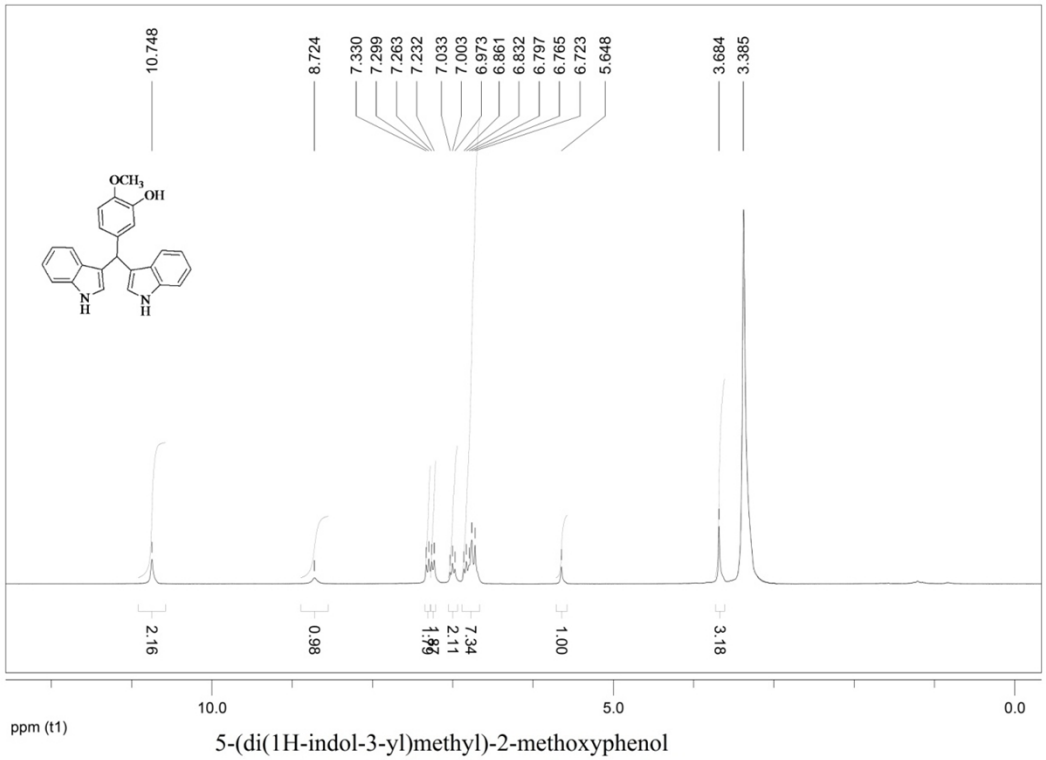


3-(di(1H-indol-3-yl)methyl)phenol

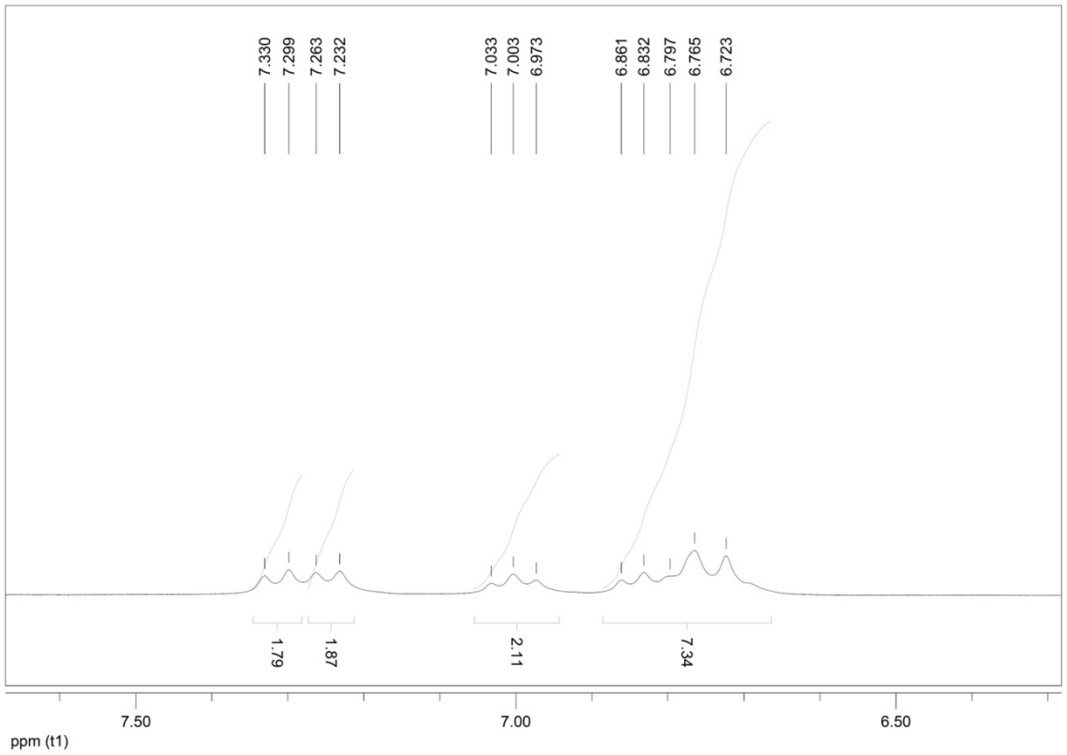


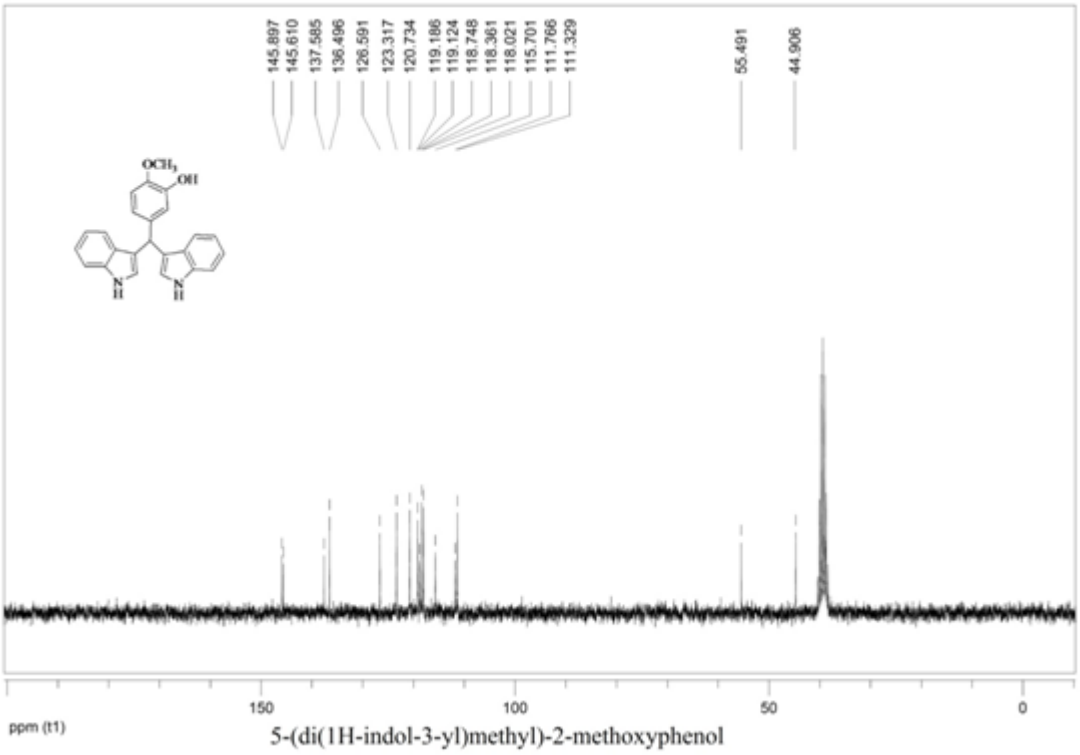
3-(di(1H-indol-3-yl)methyl)phenol

Compound **3f**:

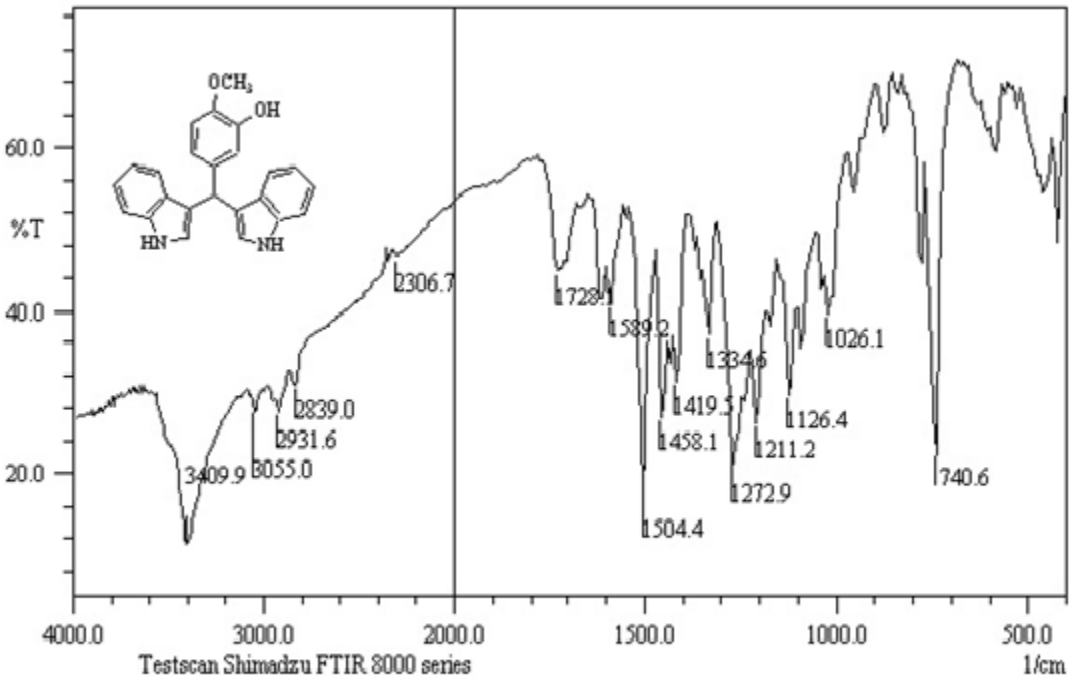


5-(di(1H-indol-3-yl)methyl)-2-methoxyphenol



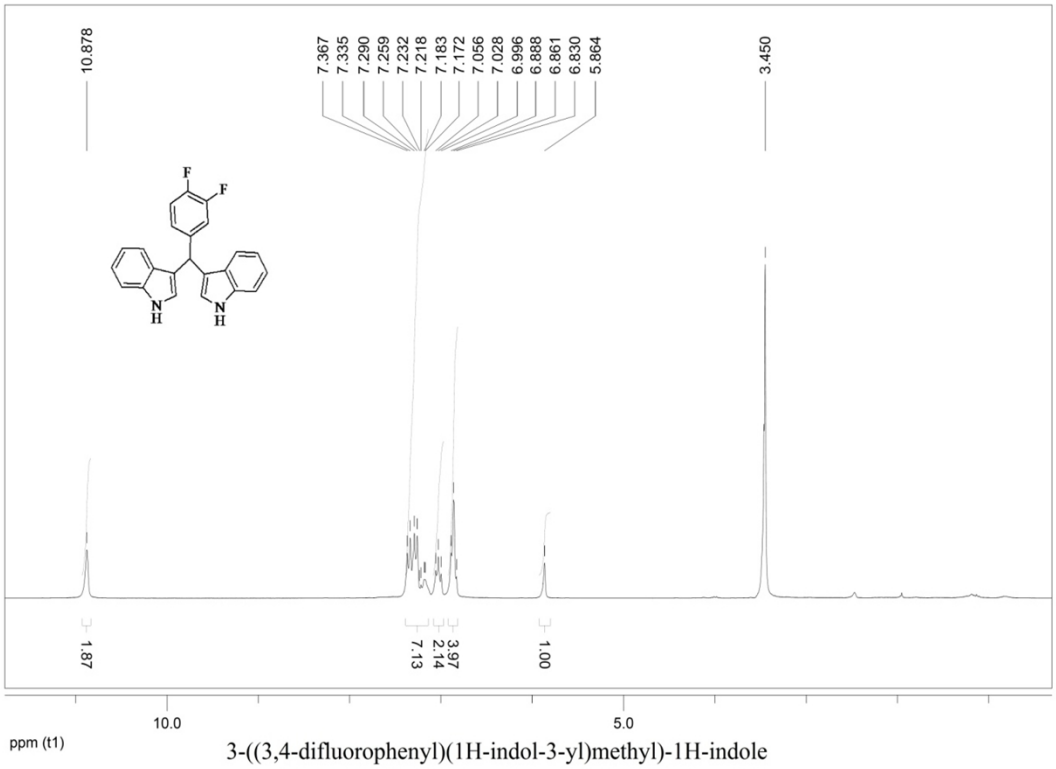


5-(di(1H-indol-3-yl)methyl)-2-methoxyphenol

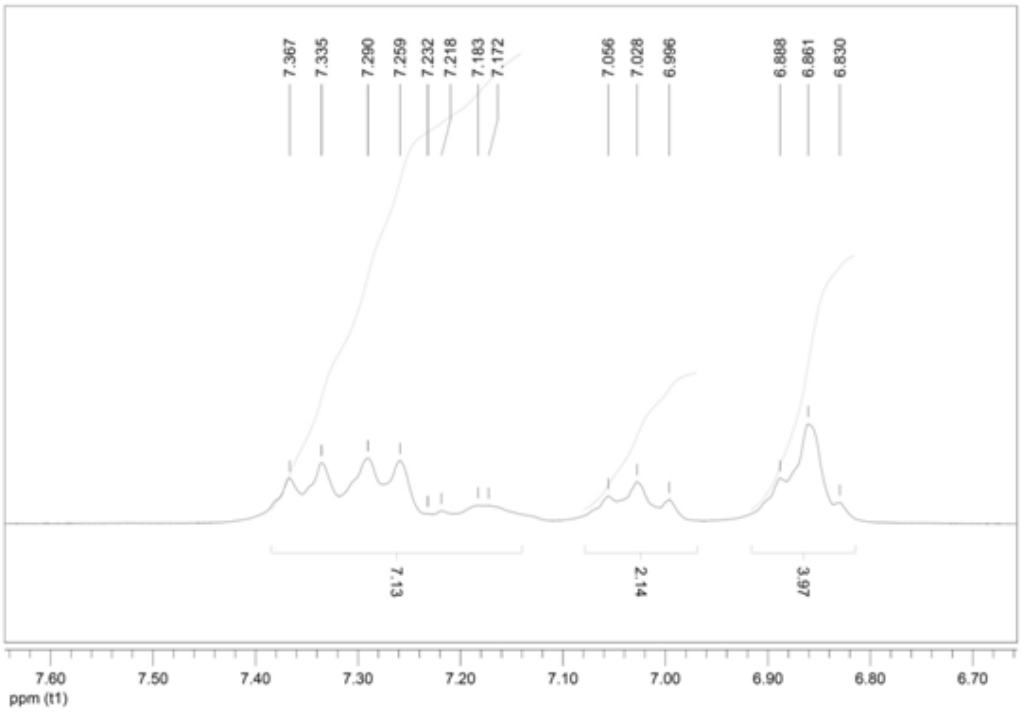


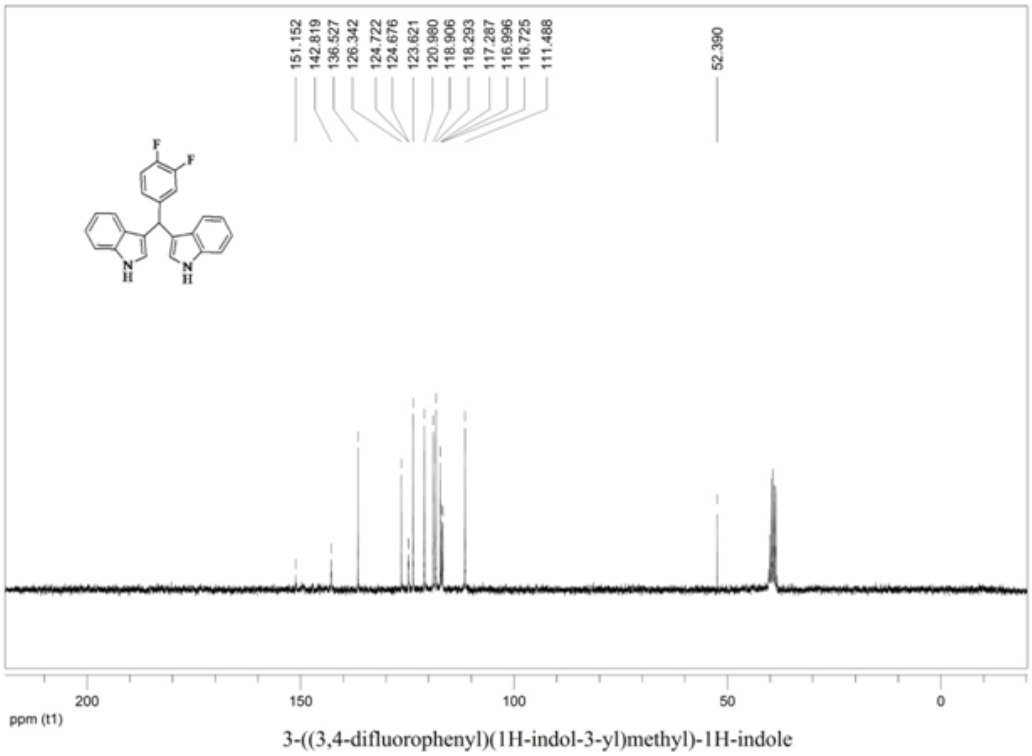
5-(di(1H-indol-3-yl)methyl)-2-methoxyphenol

Compound **3h**:

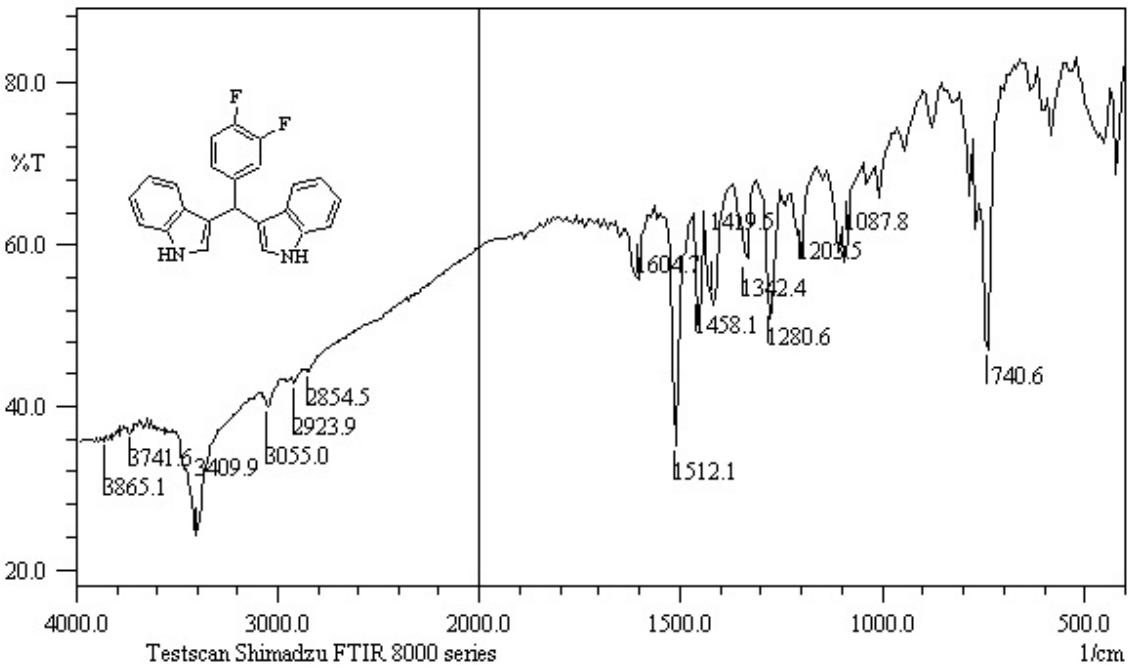


3-((3,4-difluorophenyl)(1H-indol-3-yl)methyl)-1H-indole





3-((3,4-difluorophenyl)(1H-indol-3-yl)methyl)-1H-indole



3-((3,4-difluorophenyl)(1H-indol-3-yl)methyl)-1H-indole

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