

## **Supplementary Information (SI)**

### **Unveiling the dual-function applications of magnetically retrievable chemically grafted Schiff base Cu-complex on graphene oxide for catalytic and biological applications**

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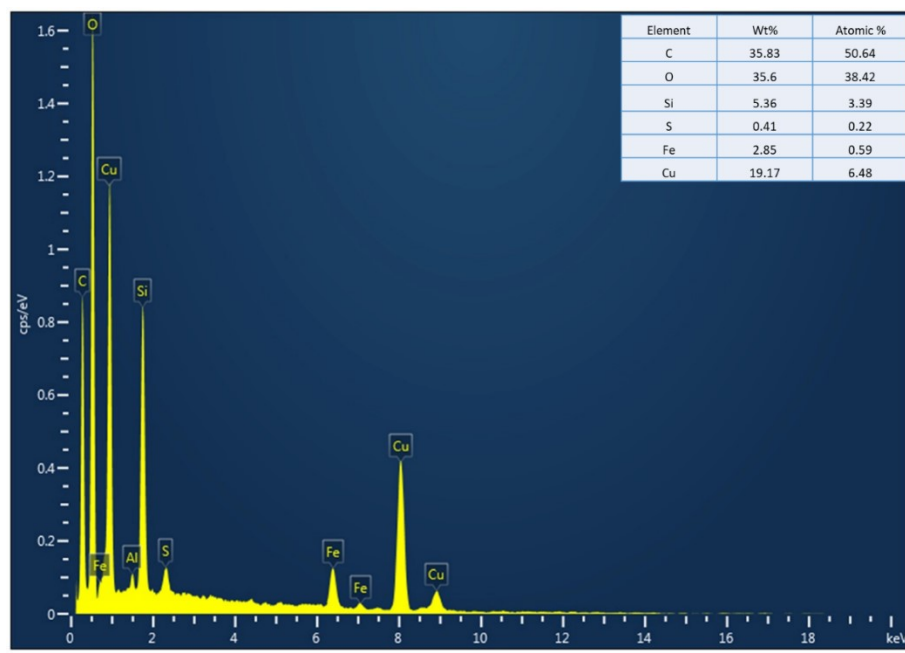


Fig.S1 EDX spectra of CuSB-GO/FO.

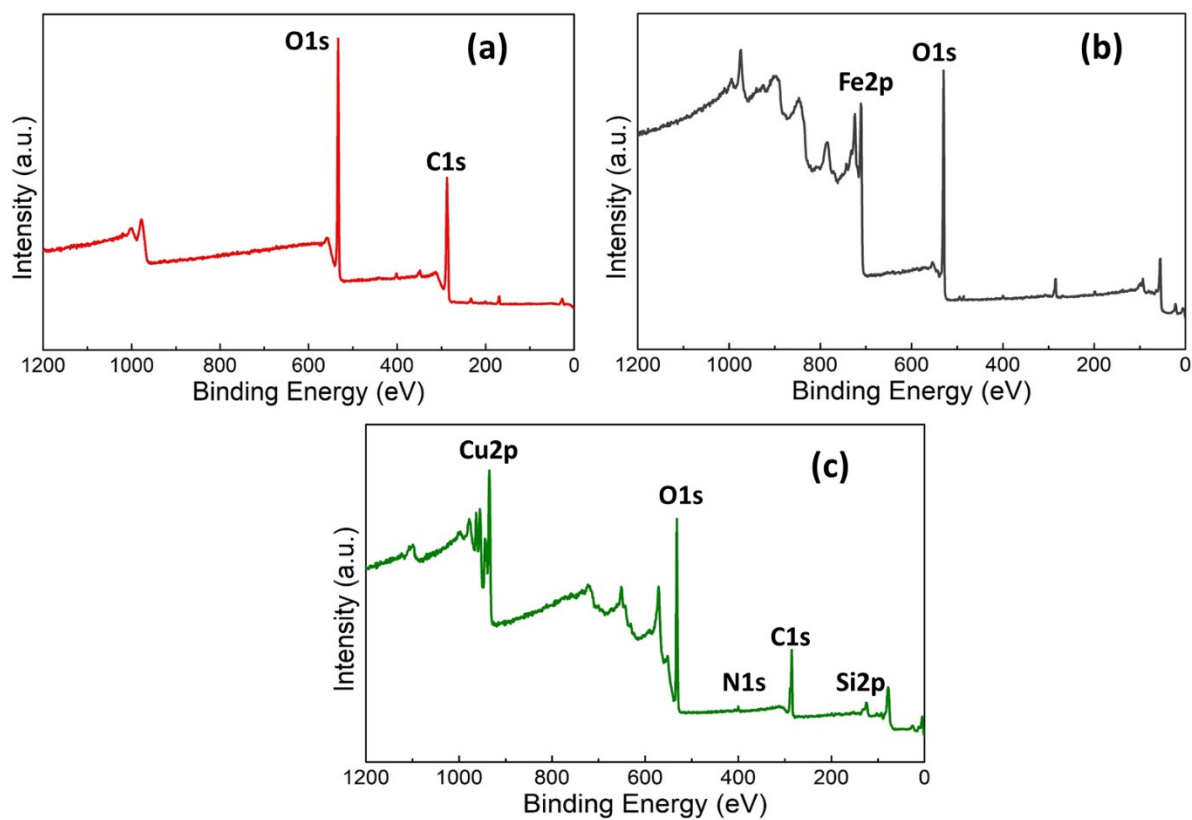


Fig.S2 XPS spectra of (a) GO, (b) FO, (c) CuSB-GO.

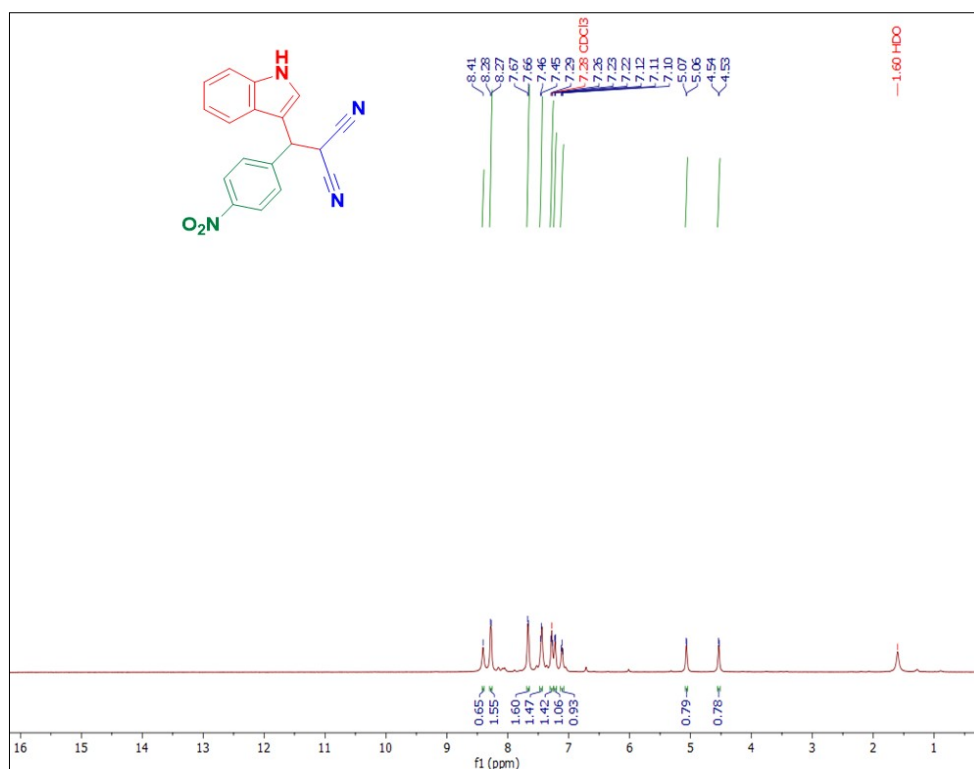


Fig.S3a <sup>1</sup>H-NMR of compound I1.

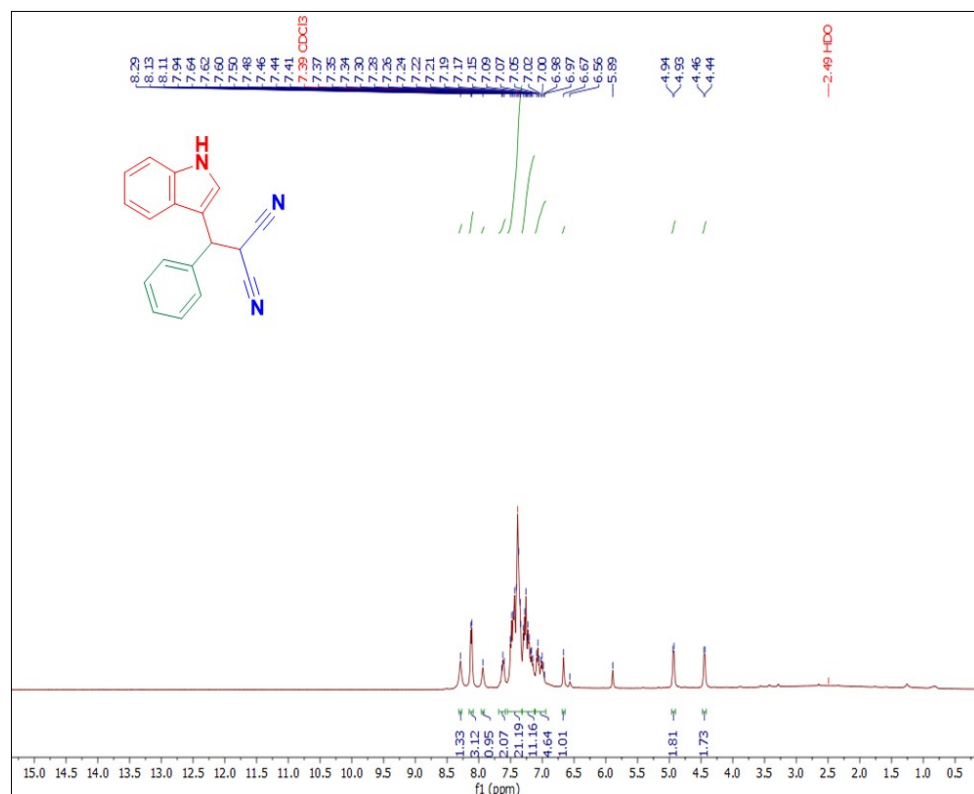


Fig.S3b <sup>1</sup>H-NMR of compound I2.

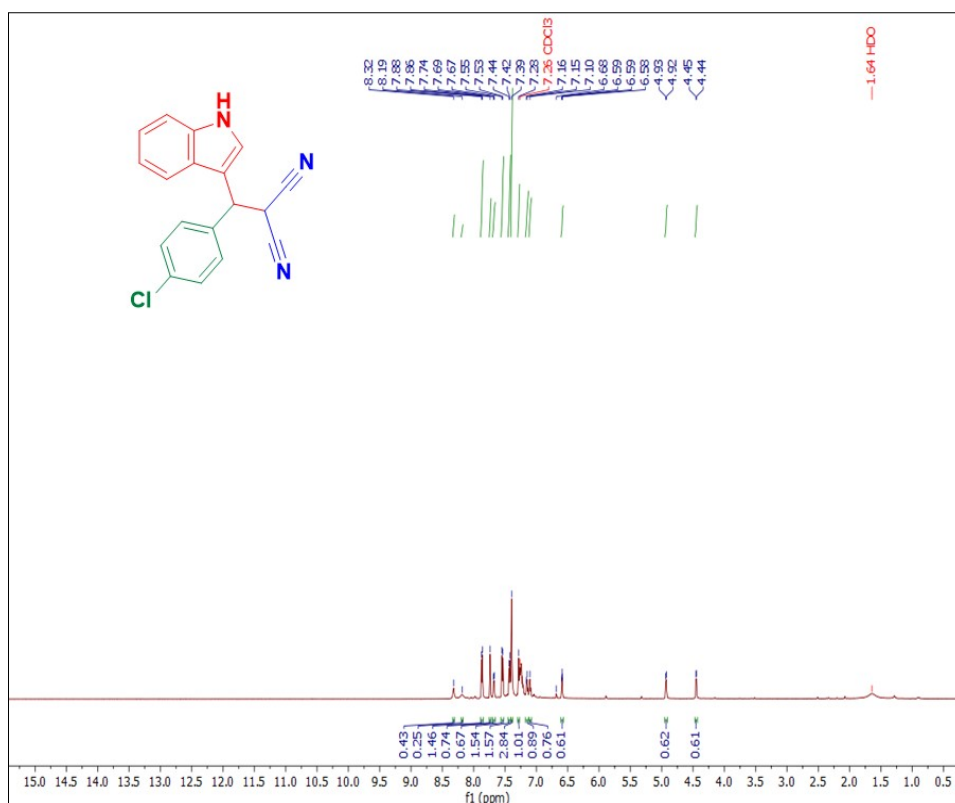


Fig.S3c <sup>1</sup>H-NMR of compound I3.

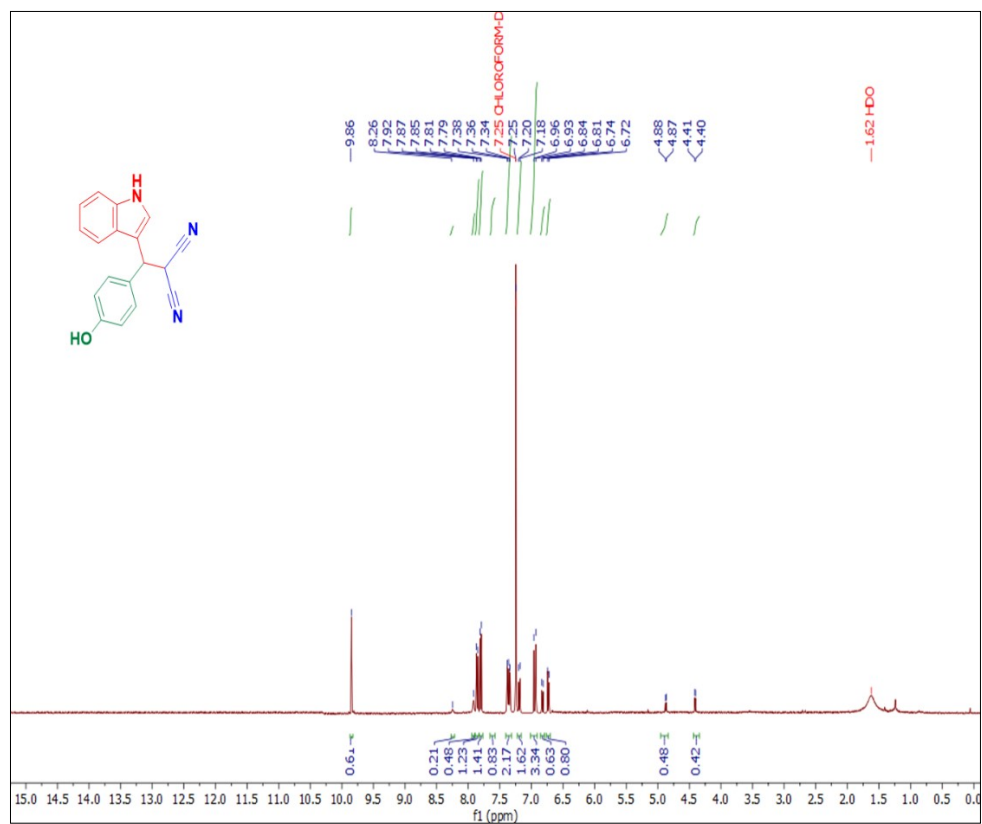


Fig.S3d <sup>1</sup>H-NMR of compound I4.

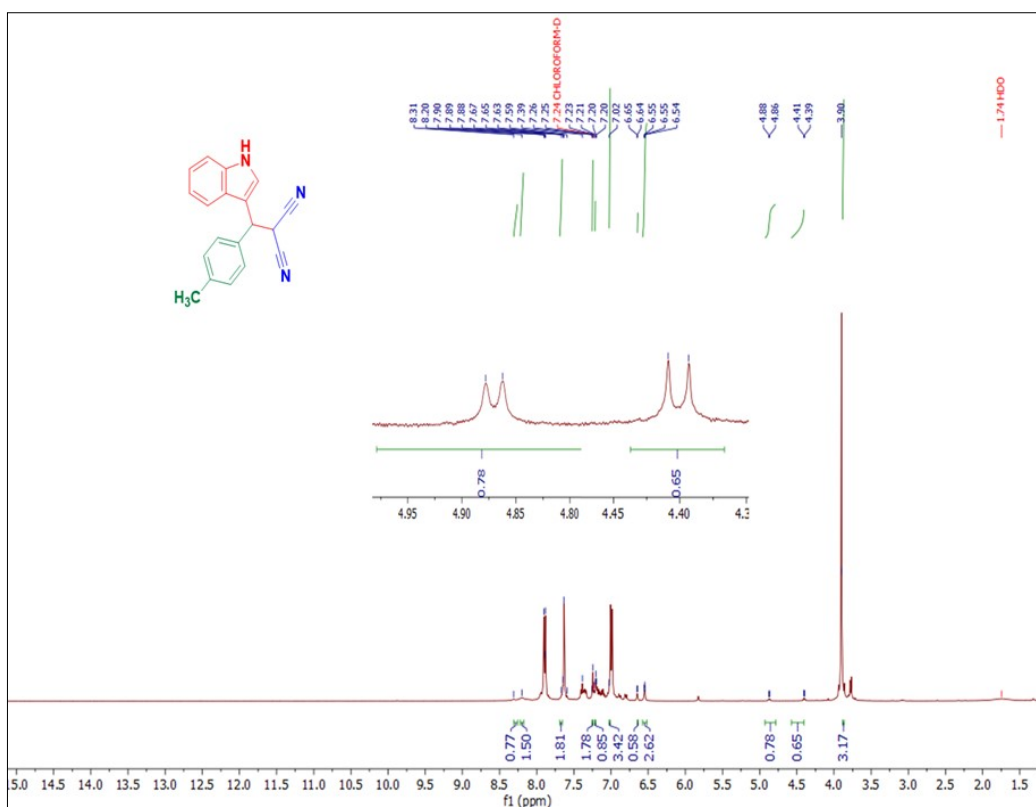


Fig.S3e <sup>1</sup>H-NMR of compound I5.

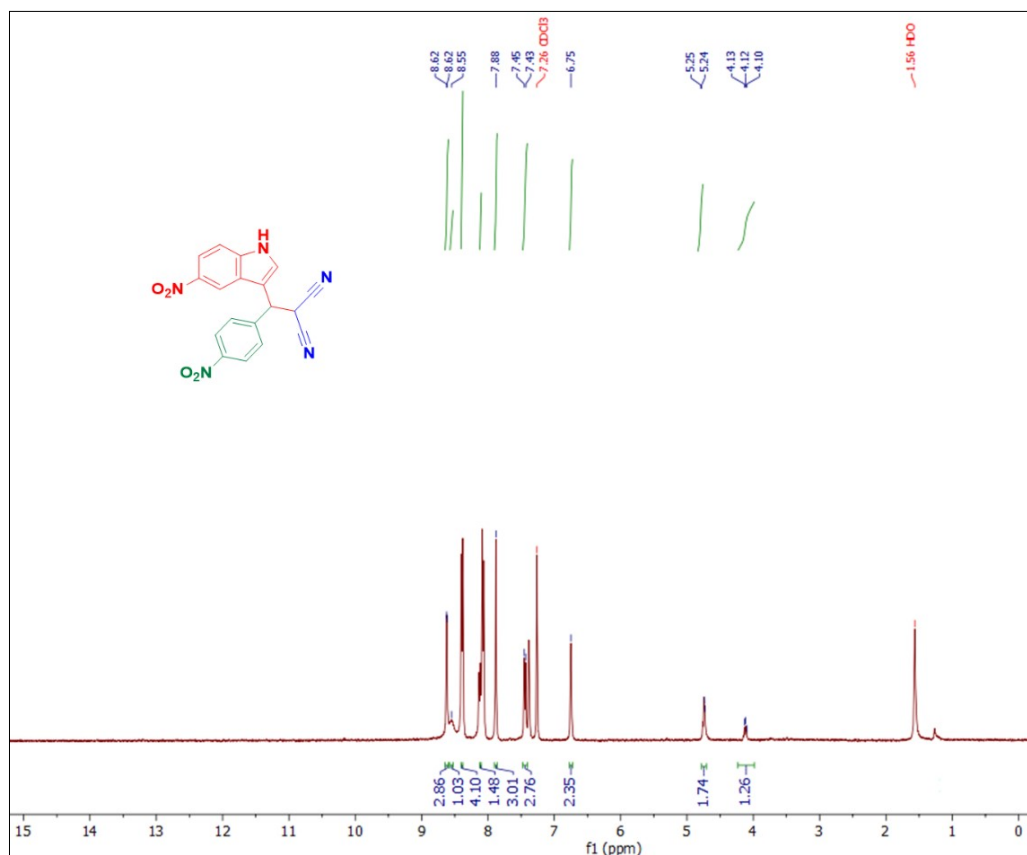


Fig.S3f <sup>1</sup>H-NMR of compound I6.

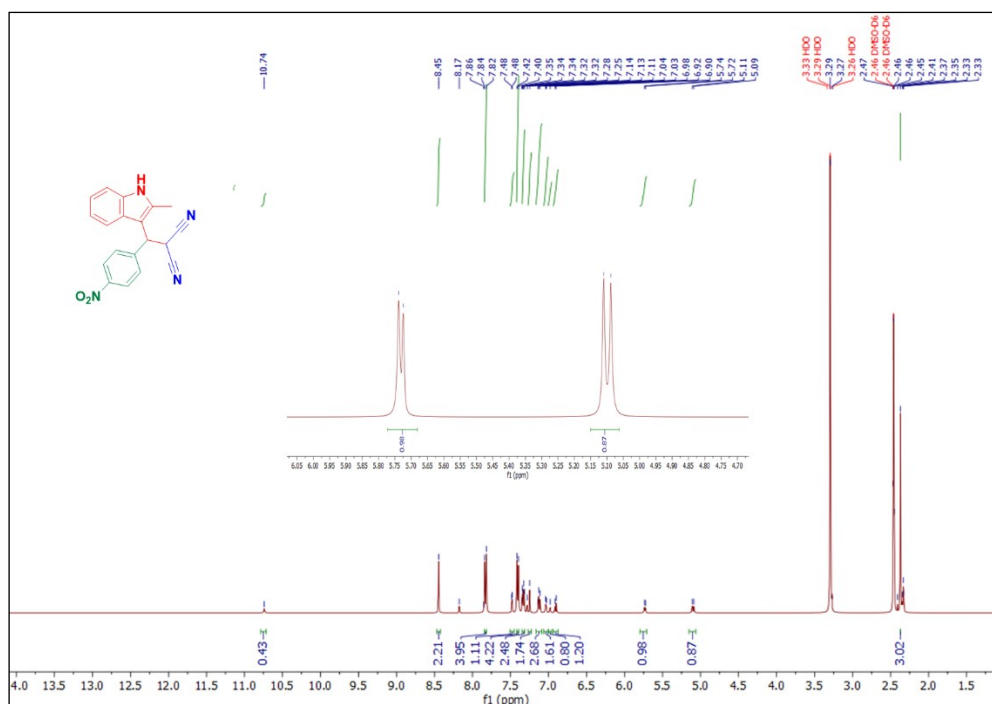


Fig.S3g <sup>1</sup>H-NMR of compound I7.

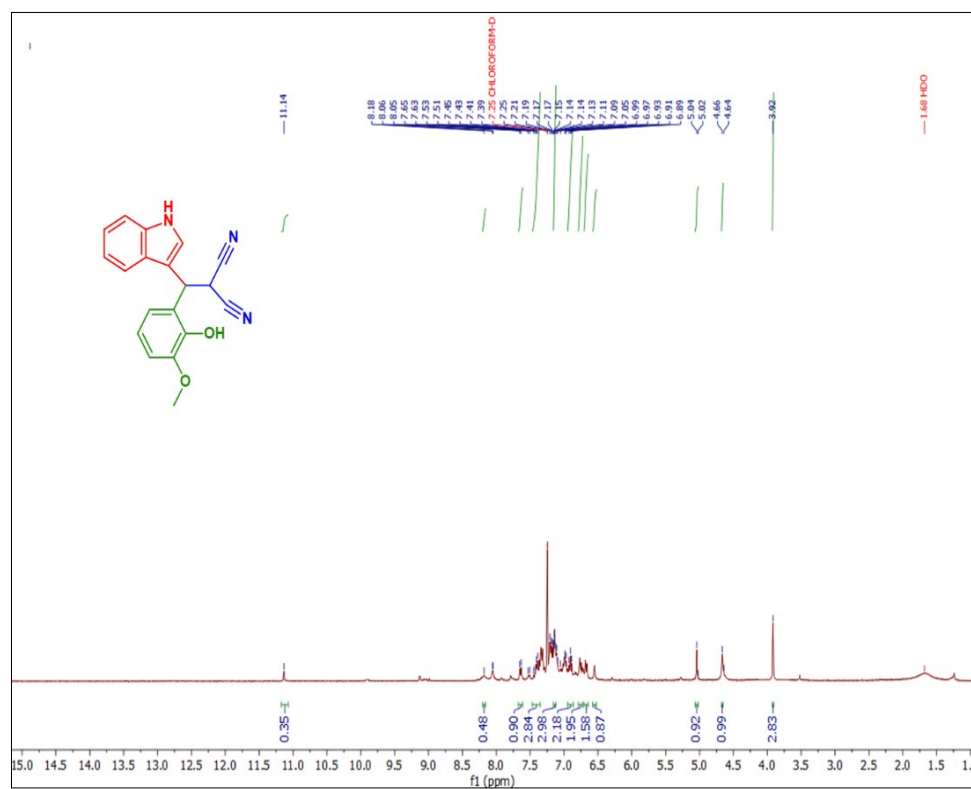


Fig.S3h <sup>1</sup>H-NMR of compound I8.

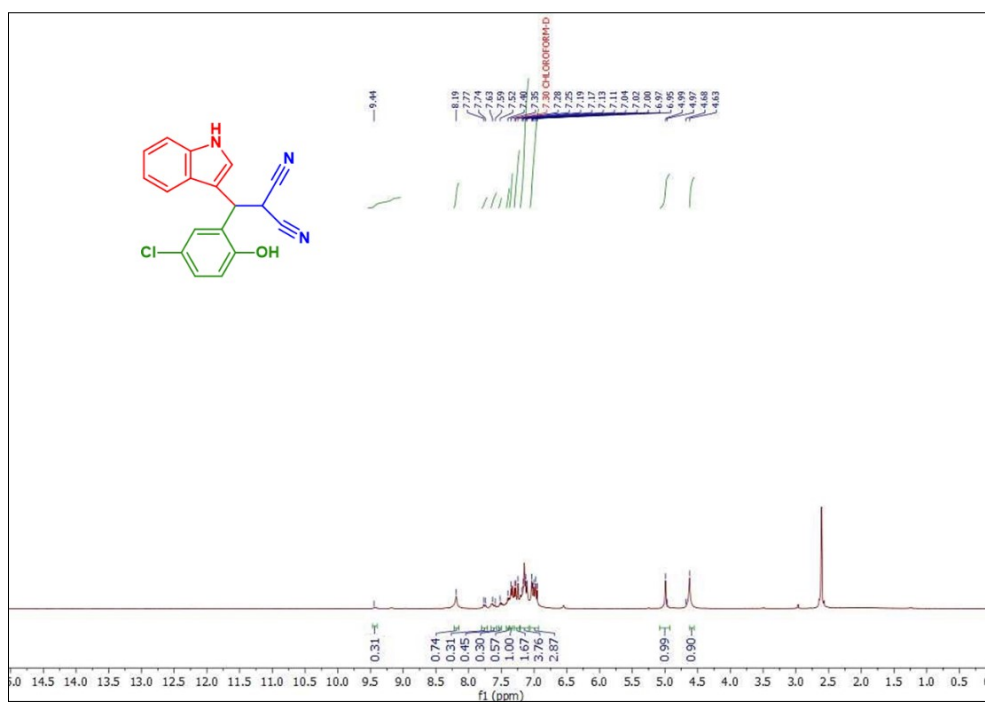
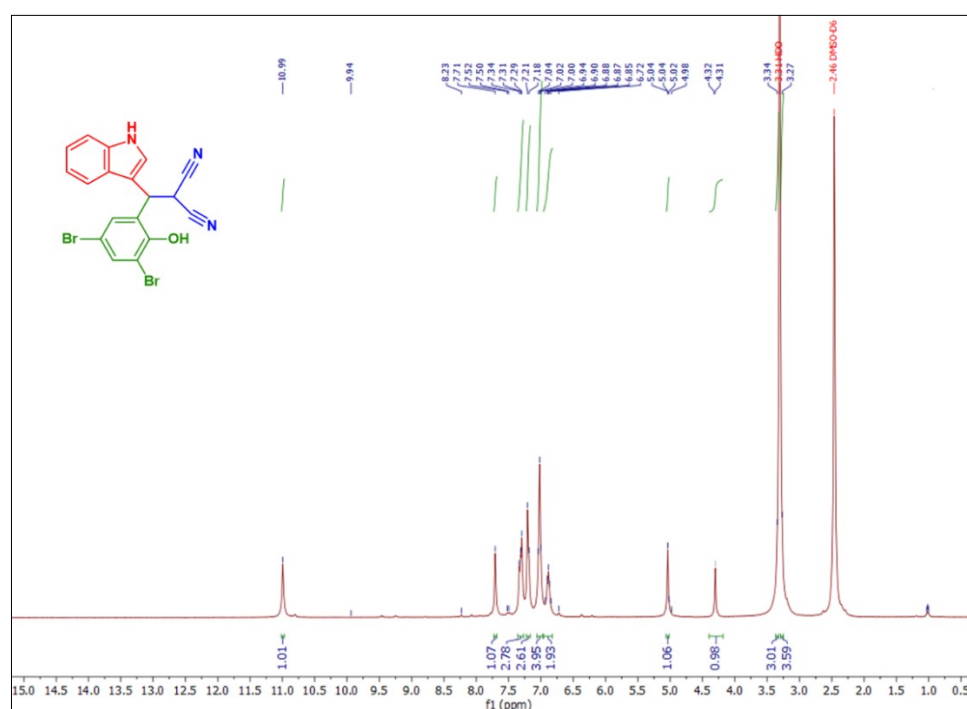
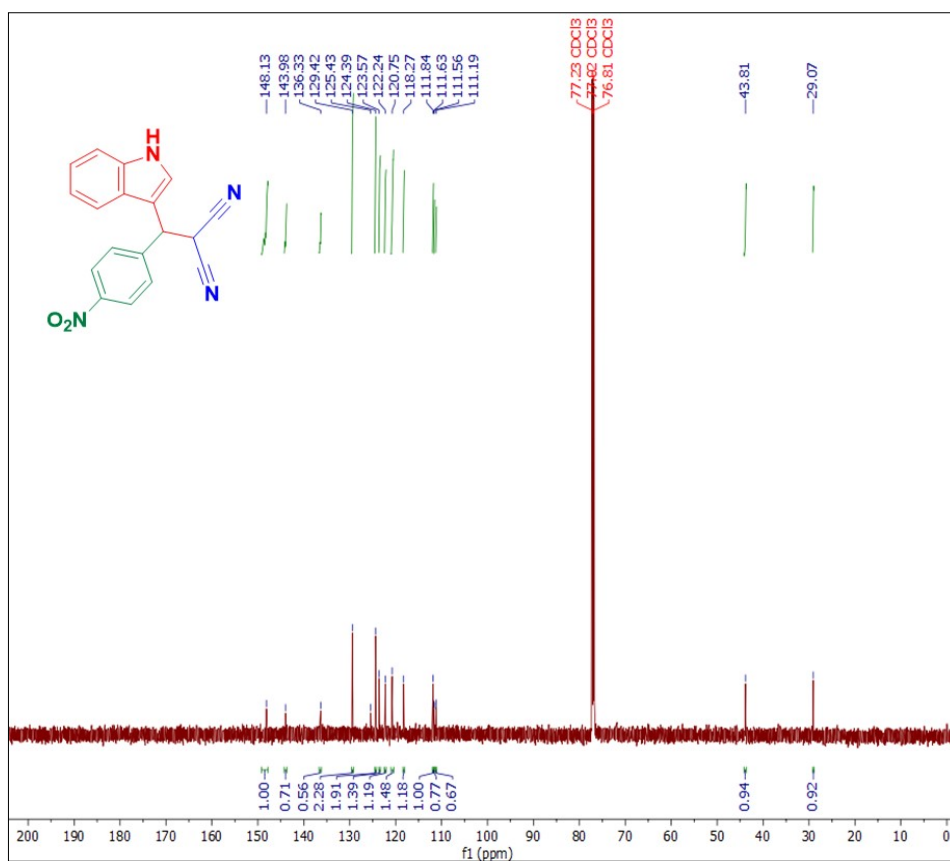
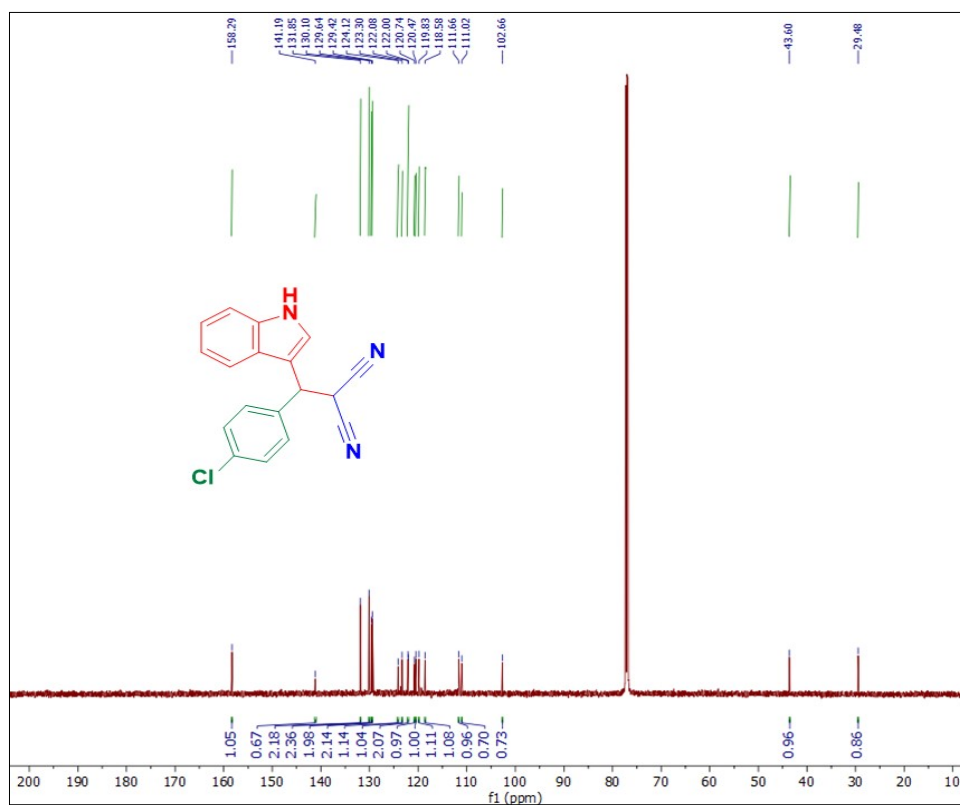


Fig.S3i 1H-NMR of compound I9.





**Fig.S4a** <sup>13</sup>C-NMR of compound I1.



**Fig.S4b** <sup>13</sup>C-NMR of compound I2.



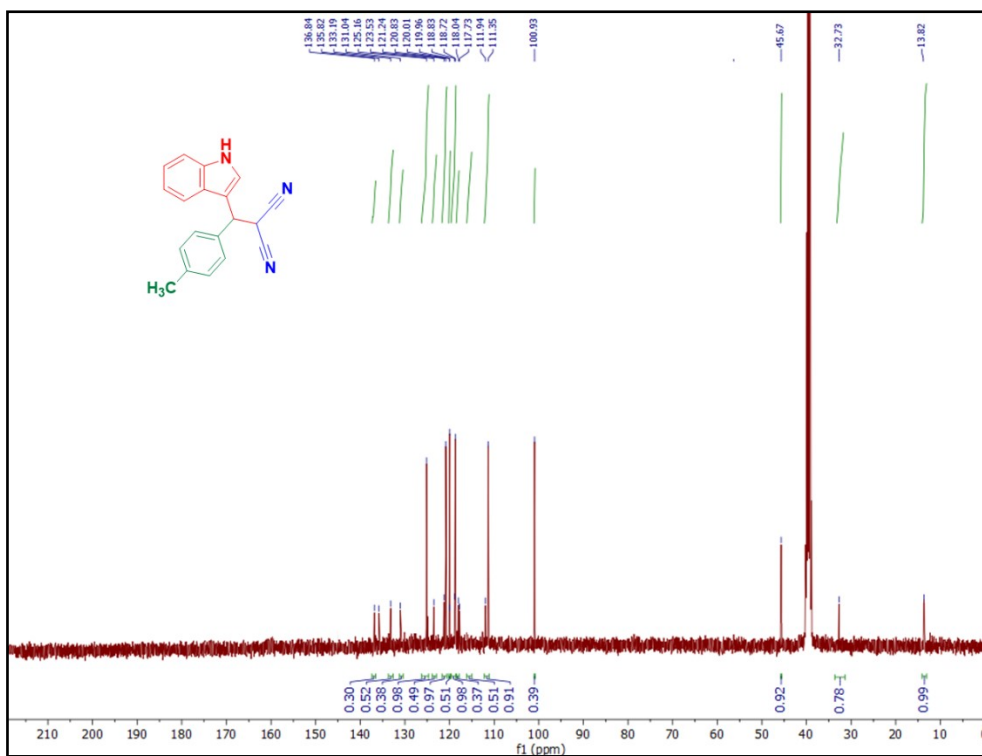


Fig.S4c <sup>13</sup>C-NMR of compound I5.

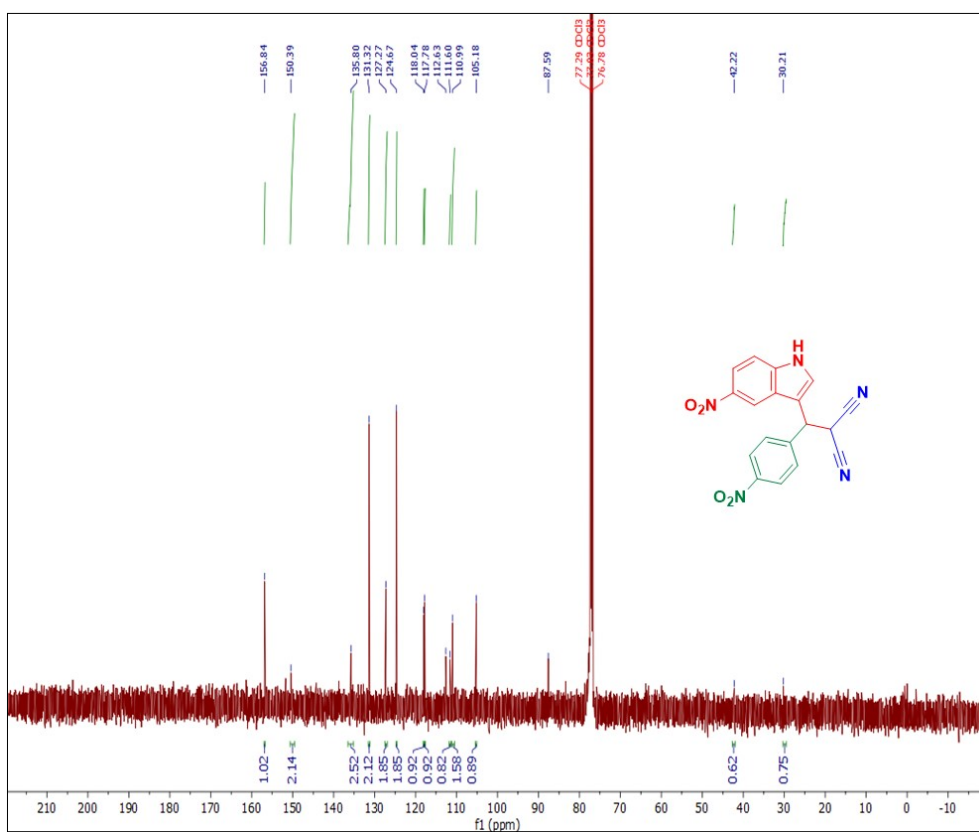


Fig.S4d <sup>13</sup>C-NMR of compound I6.

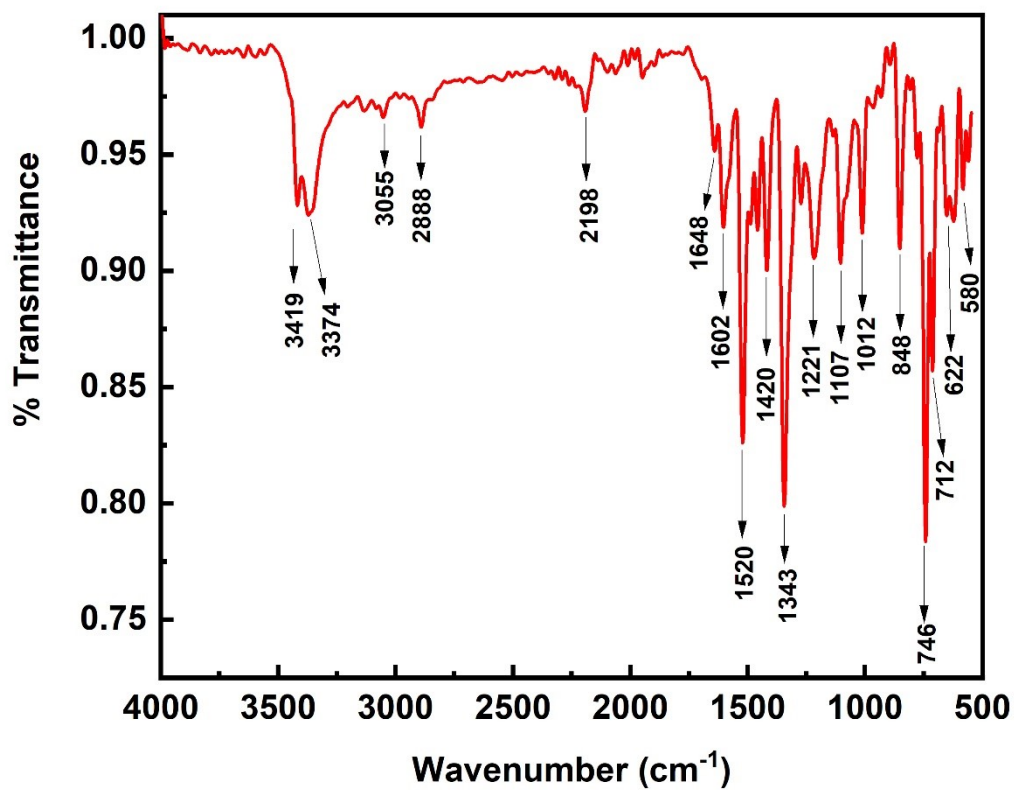


Fig.S5a FT-IR spectra of compounds I1.

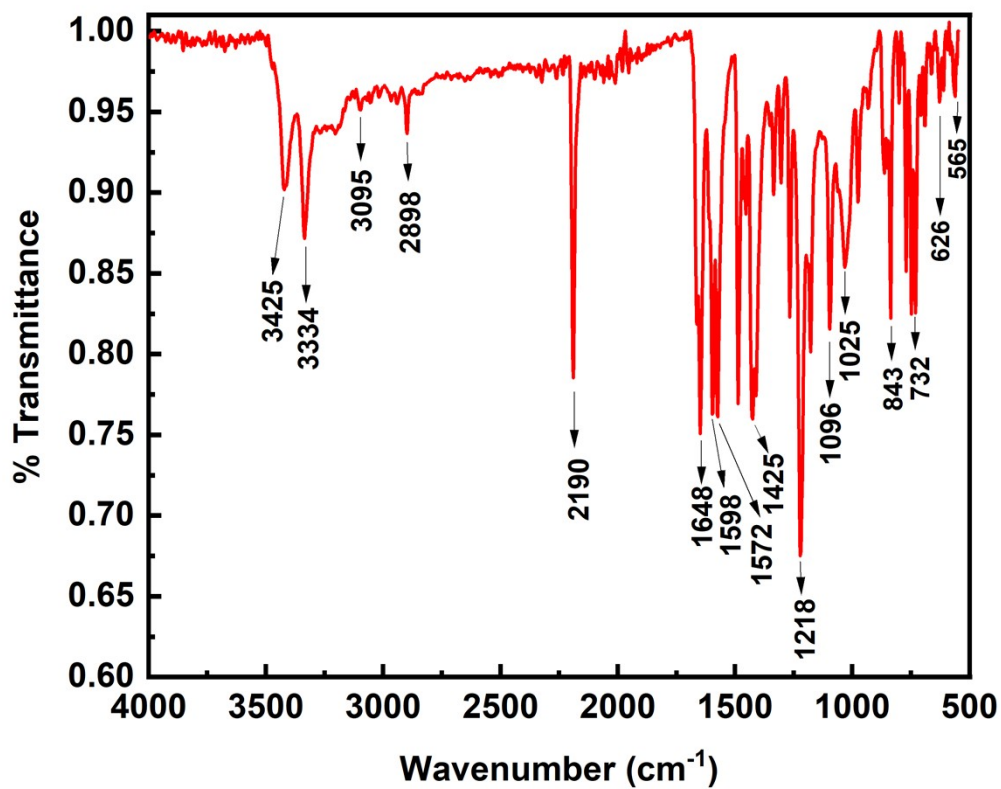


Fig.S5b FT-IR spectra of compounds I2.

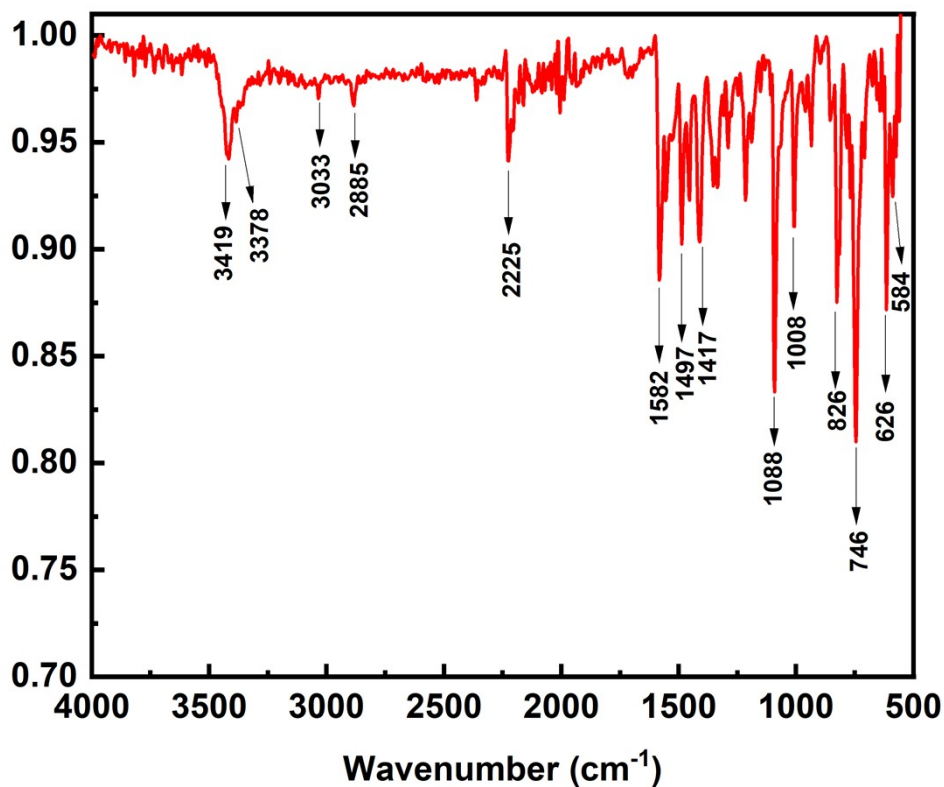


Fig.S5c FT-IR spectra of compounds I3.

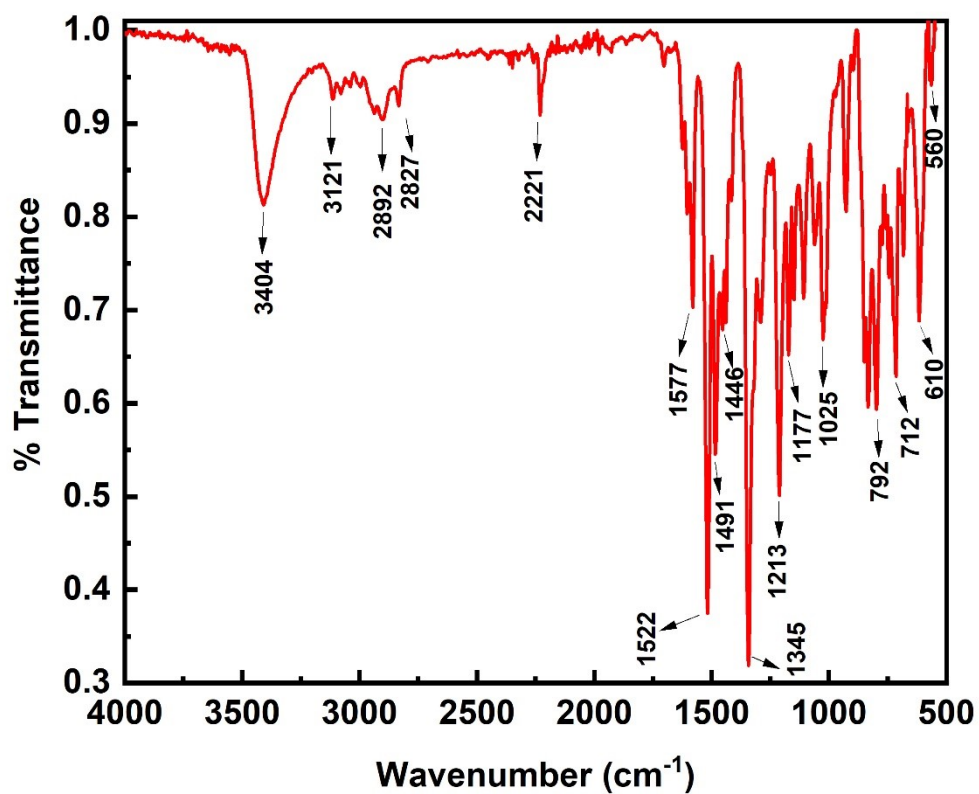


Fig.S5d FT-IR spectra of compounds I4.

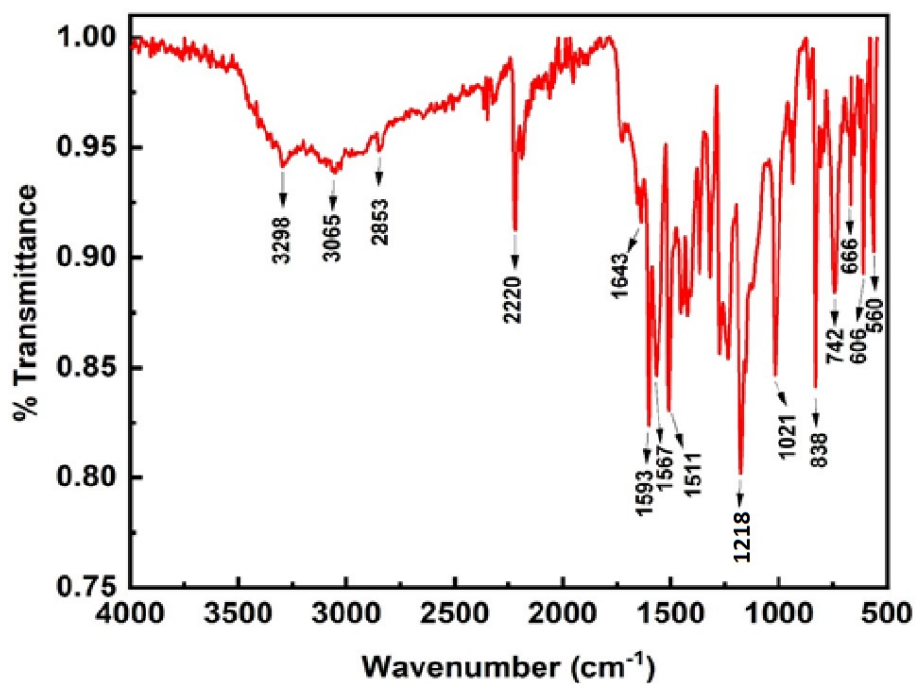


Fig.S5e FT-IR spectra of compounds I5.

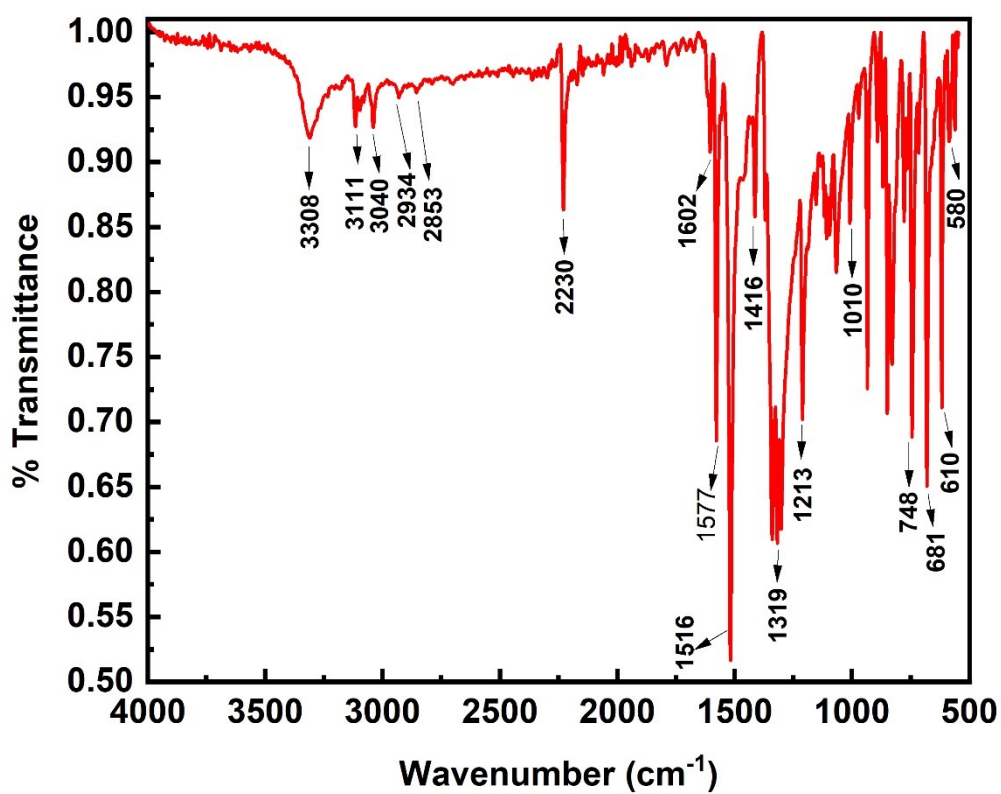


Fig.S5f FT-IR Spectra of compound I6.

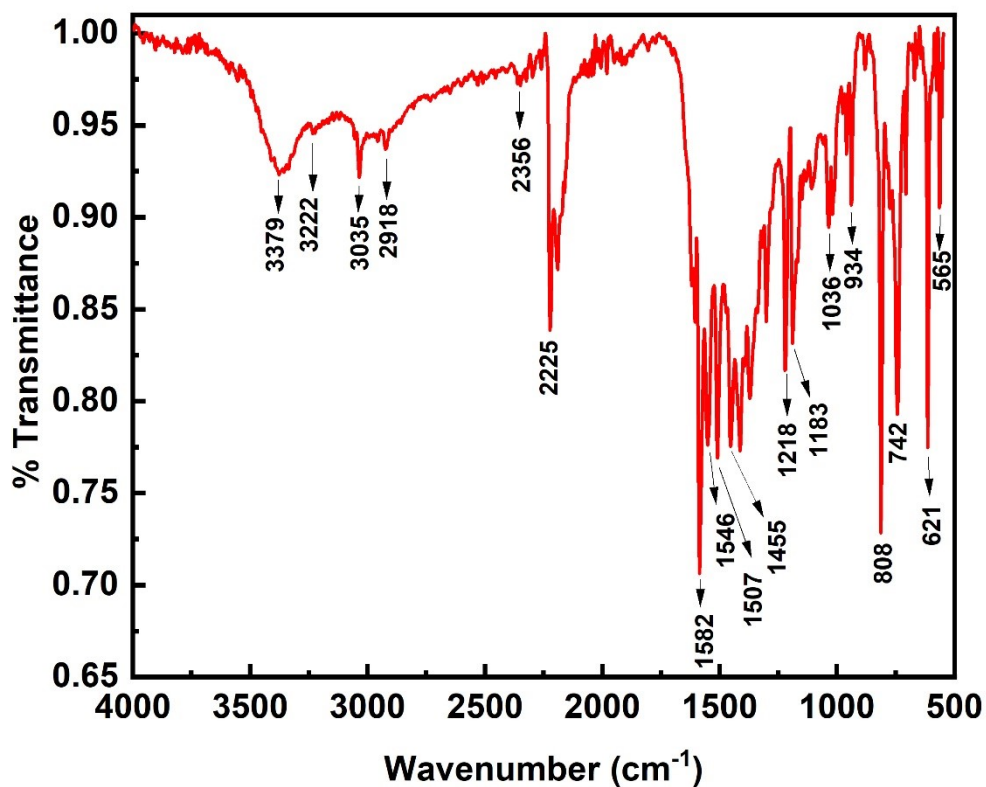


Fig.S5g FT-IR Spectra of compound I7.

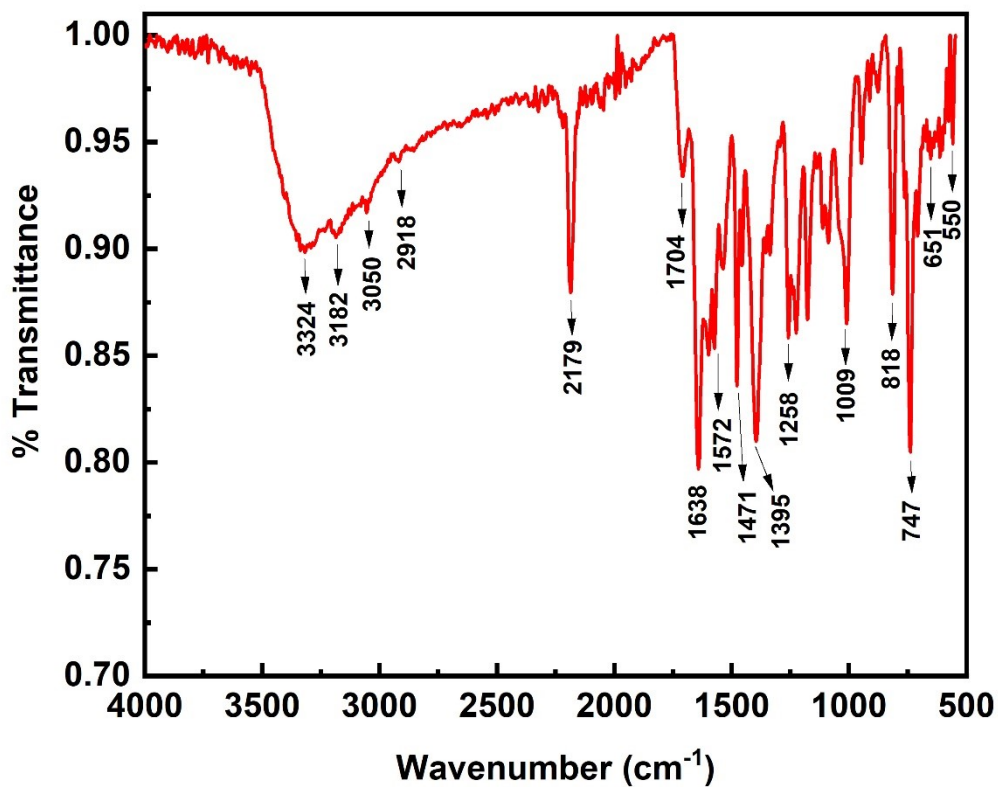


Fig.S5h FT-IR Spectra of compound I8.

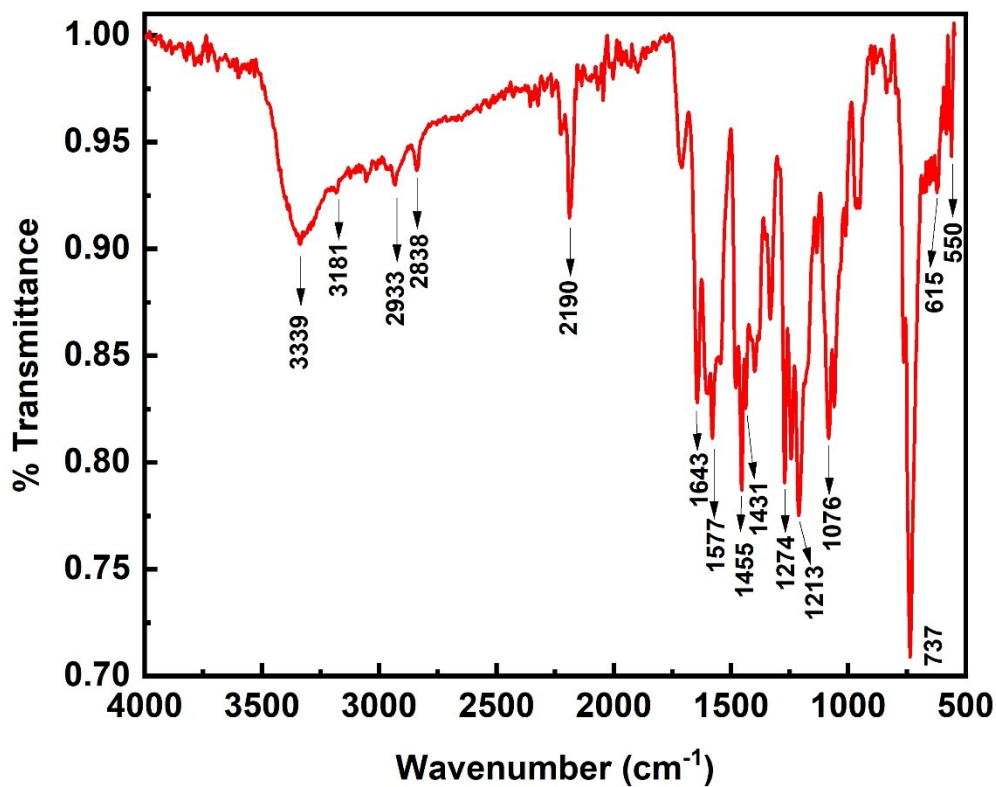


Fig.S5i FT-IR Spectra of compound I9.

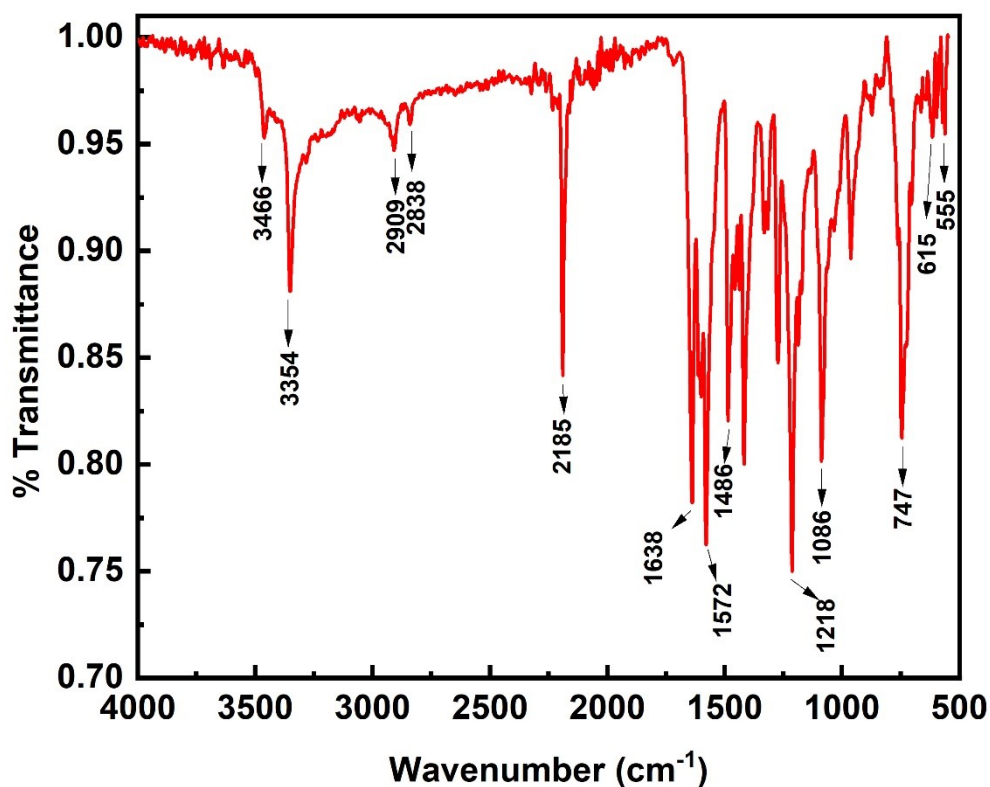


Fig. S5j FT-IR Spectra of compound I10.

Spectral details of the compounds listed in Table 2

Characterization data of the synthesized 2-amino-4-H-chromene derivatives

2-((1H-indol-3-yl)(4-nitrophenyl)methyl)malononitrile (I1):

Pale yellow, <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ(ppm): 5.06 (d, 1H, CH), 4.54 (d, 1H, CH) 8.41 (s, 1H, NH), 7.10-8.28 (m, HAr); <sup>13</sup>C-NMR (CDCl<sub>3</sub>) δ(ppm): 29.07, 43.81, 111.19, 111.56, 111.63, 111.84, 120.75, 122.24, 123.57, 124.39, 125.43, 129.42, 136.42, 143.98, 148.13; FT-IR (cm<sup>-1</sup>): 3419, 3374, 3055, 2888, 2198, 1648, 1602, 1420, 1343, 1221, 1107, 1012, 848, 746, 712, 622, 580.

2-((1H-indol-3-yl)(phenyl)methyl)malononitrile (I2):

White, <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ(ppm): 4.94 (d, 1H, CH), 4.45 (d, 1H, CH) 8.29 (s, 1H, NH), 6.56-8.13 (m, HAr); FT-IR (cm<sup>-1</sup>): 3425, 3334, 3095, 2898, 2190, 1648, 1598, 1572, 1425, 1218, 1096, 1025, 843, 732, 626, 565.

2-((4-chlorophenyl)(1H-indol-3-yl)methyl)malononitrile (I3):

Yellow, <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ(ppm): 4.45 (d, 1H, CH) 4.93 (d, 1H, CH) 8.32 (s, 1H, NH), 6.58-8.19 (m, HAr); <sup>13</sup>C NMR : 29.48, 43.60, 102.66, 111.02, 111.66, 118.58, 119.83, 120.47, 120.74, 122, 122.08, 123.30, 124.12, 129.42, 129.64, 130.10, 131.85, 141.19, 158.29, FT-IR (cm<sup>-1</sup>): 3419, 3378, 3033, 2885, 2225, 1582, 1497, 1417, 1088, 1008, 826, 746, 626, 584.

2-((4-hydroxyphenyl)(1H-indol-3-yl)methyl)malononitrile (I4):

Creamy-white, <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ(ppm): 4.88 (d, 1H, CH), 4.41 (d, 1H, CH) 9.86 (s, 1H, OH), 8.26 (s, 1H, NH), 6.72-7.92 (m, HAr); FT-IR (cm<sup>-1</sup>): 3404, 3121, 2892, 2827, 2221, 1577, 1522, 1491, 1446, 1345, 1213, 1177, 1025, 792, 712, 610, 560.

2-((1H-indol-3-yl)(p-tolyl)methyl)malononitrile (I5):

Cream, <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ(ppm): 4.87 (d, 1H, CH), 4.40 (d, 1H, CH) 8.31 (s, 1H, NH), 3.90 (s, 3H, CH<sub>3</sub>) 6.54-8.20 (HAr); <sup>13</sup>C NMR: 13.82, 32.73, 45.67, 100.93, 111.35, 111.94, 117.73, 118.04, 118.72, 118.83, 119.96, 120.01, 120.83, 121.24, 123.53, 125.16, 131.04, 133.19, 135.82, 136.84; FT-IR (cm<sup>-1</sup>): 3298, 3065, 2853, 220, 1643, 1593, 1567, 1511, 1021, 838, 742, 666, 606, 560.

2-((5-nitro-1H-indol-3-yl)(4-nitrophenyl)methyl)malononitrile (I6):

Brown, <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ(ppm): 4.13 (1H, CH), 5.25 (d, 1H, CH), 8.62 (s, 1H, NH), 6.75-8.55 (HAr); <sup>13</sup>C NMR: 30.21, 42.22, 87.59, 105.18, 110.99, 111.60, 112.63, 117.78, 118.04, 124.67, 127.27, 131.32, 135.80, 150.39, 156.84; FT-IR (cm<sup>-1</sup>): 3308, 3111, 3040, 2934, 2853, 2230, 1602, 1577, 1516, 1416, 1319, 1213, 1010, 748, 681, 610, 580.

2-((2-methyl-1H-indol-3-yl)(4-nitrophenyl)methyl)malononitrile (I7):

Straw colour, <sup>1</sup>H NMR (DMSO-d<sub>6</sub>) δ(ppm): 5.10 (1H, CH), 5.73 (d, 1H, CH), 2.37 (s, 3H, CH<sub>3</sub>) 10.74 (s, 1H, NH), 6.90-8.45 (HAr); FT-IR (cm<sup>-1</sup>): 3379, 3222, 3035, 3035, 2918, 2356, 2225, 1582, 1546, 1507, 1455, 1218, 1183, 1036, 934, 808, 742, 621, 565.

2-((2-hydroxy-3-methoxyphenyl)(1H-indol-3-yl)methyl)malononitrile (I8):

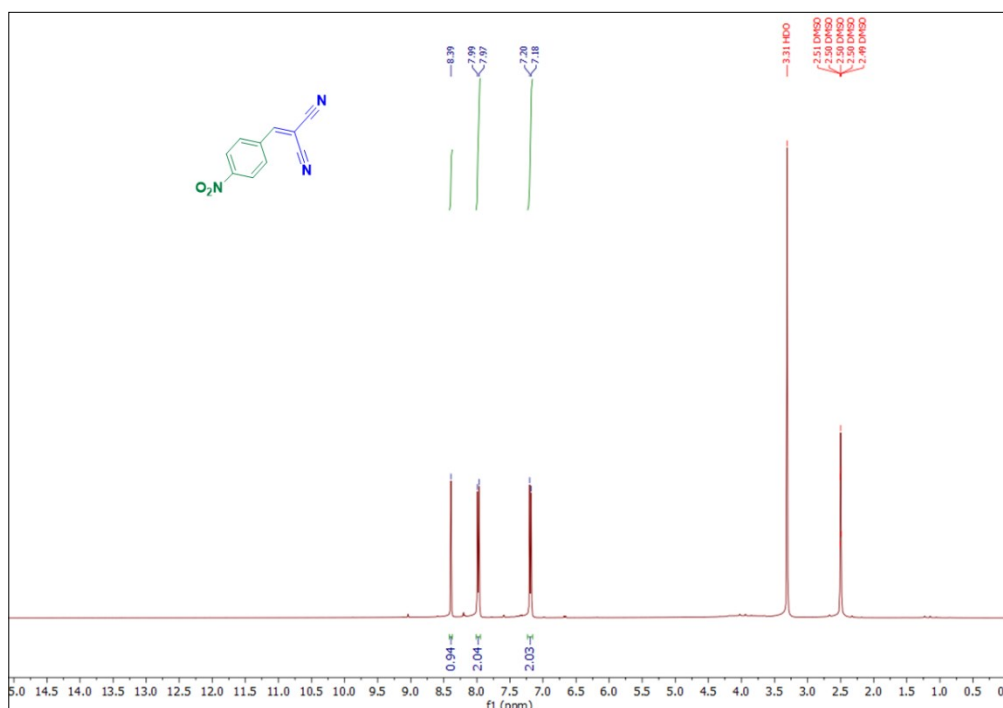
Orange, <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ(ppm): 4.65 (d, 1H, CH), 5.03 (d, 1H, CH), 11.14 (s, 1H, OH) 8.18 (s, 1H, NH), 6.89-8.06 (HAr); FT-IR (cm<sup>-1</sup>): 3324, 3182, 3050, 2918, 2179, 1704, 1638, 1572, 1471, 1395, 1258, 1009, 818, 747, 651, 550.

2-((5-chloro-2-hydroxy-4-nitrophenyl)(1H-indol-3-yl)methyl)malononitrile (I9):

Yellow, <sup>1</sup>HNMR (CDCl<sub>3</sub>) δ(ppm): 4.67 (d, 1H, CH), 4.98 (d, 1H, CH), 9.44 (s, 1H, OH) 8.19 (s, 1H, NH), 6.95-7.77 (HAr); FT-IR (cm<sup>-1</sup>): 3339, 3181, 2933, 2838, 2190, 1643, 1577, 1455, 1431, 1274, 1213, 1076, 737, 615, 550.

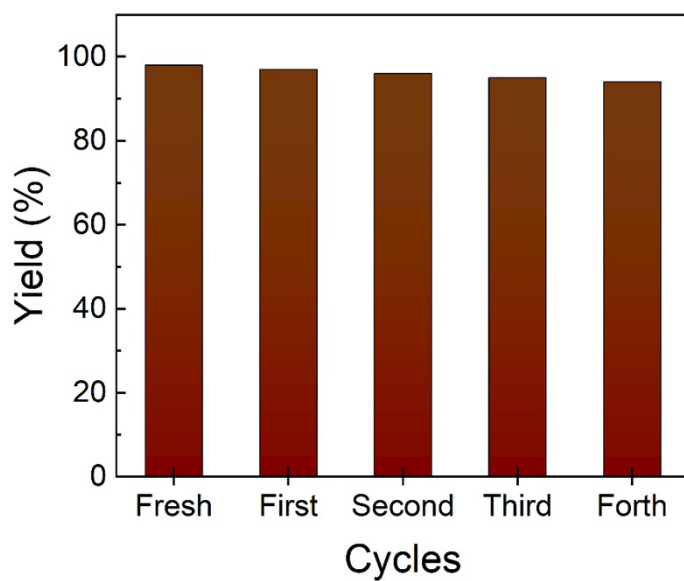
2-(((3,5-dibromo-2-hydroxyphenyl)(1H-indol-3-yl)methyl)malononitrile (I10):

Yellow, <sup>1</sup>HNMR (DMSO-d<sub>6</sub>) δ(ppm): 4.31 (d, 1H, CH), 5.04 (d, 1H, CH), 10.99 (s, 1H, OH) 9.94 (s, 1H, NH), 6.72-8.23 (HAr); FT-IR (cm<sup>-1</sup>): 3466, 3354, 2909, 2838, 2185, 1638, 1572, 1486, 1218, 1086, 747, 615, 555.

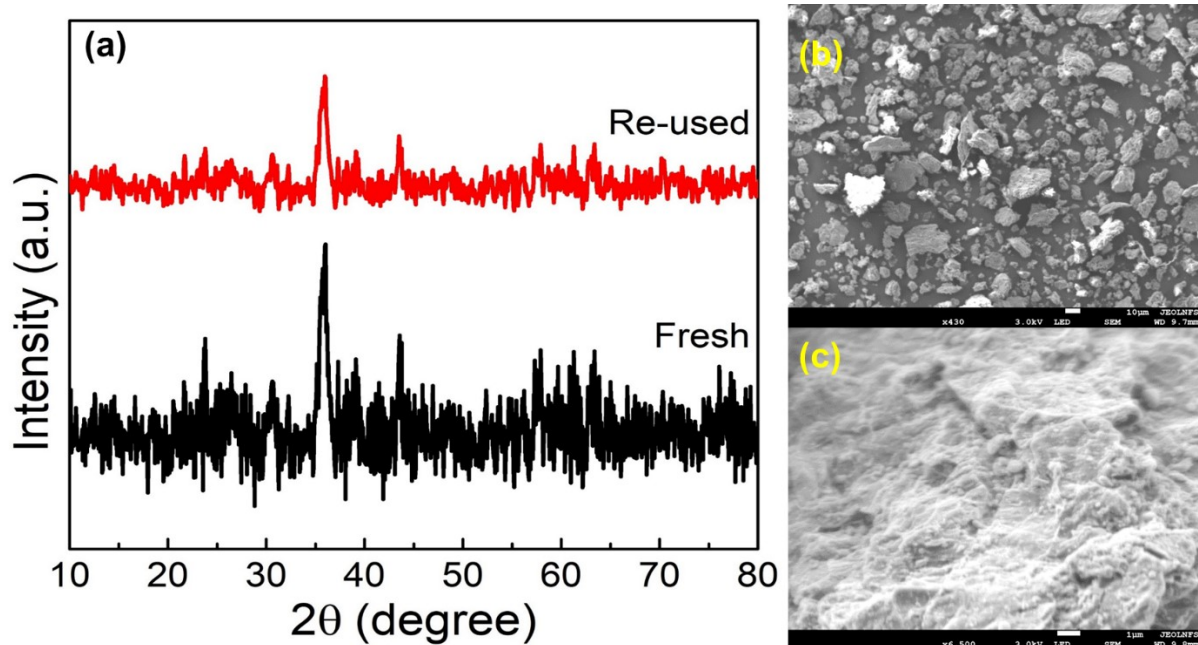


**Fig. S6** <sup>1</sup>H-NMR of alkene intermediate (I).





**Fig. S7** Recyclability of CuSB-GO/FO for the catalytic production of 3-substituted indole up to 4 cycles.



**Fig. S8** Recyclable catalyst (a) XRD; (b-c) SEM.

**Table S1** The bactericidal activity of GO, GO-NH, and CuSB-GO/FO

Sl. No	Compounds	<i>Staphylococcus aureus</i> Concentration ( $\mu\text{g/mL}$ ) / Zone of Inhibition (mm)				<i>E coli</i> Concentration ( $\mu\text{g/mL}$ ) / Zone of Inhibition (mm)			
		25	50	75	100	25	50	75	100
1	Ampicillin	17	18	19	21	16	18	19	21
2	GO	0	9	9	12	0	0	6	7
3	GO-NH	9	11	13	15	4	8	9	11
4	CuSB-GO/FO	2	11	15	18	0	8	10	15