Supporting Information

Palladium nanoparticles supported on carbazole functionalized mesoporous organic polymer: synthesis and their application as efficient catalysts for Suzuki–Miyaura cross coupling reaction

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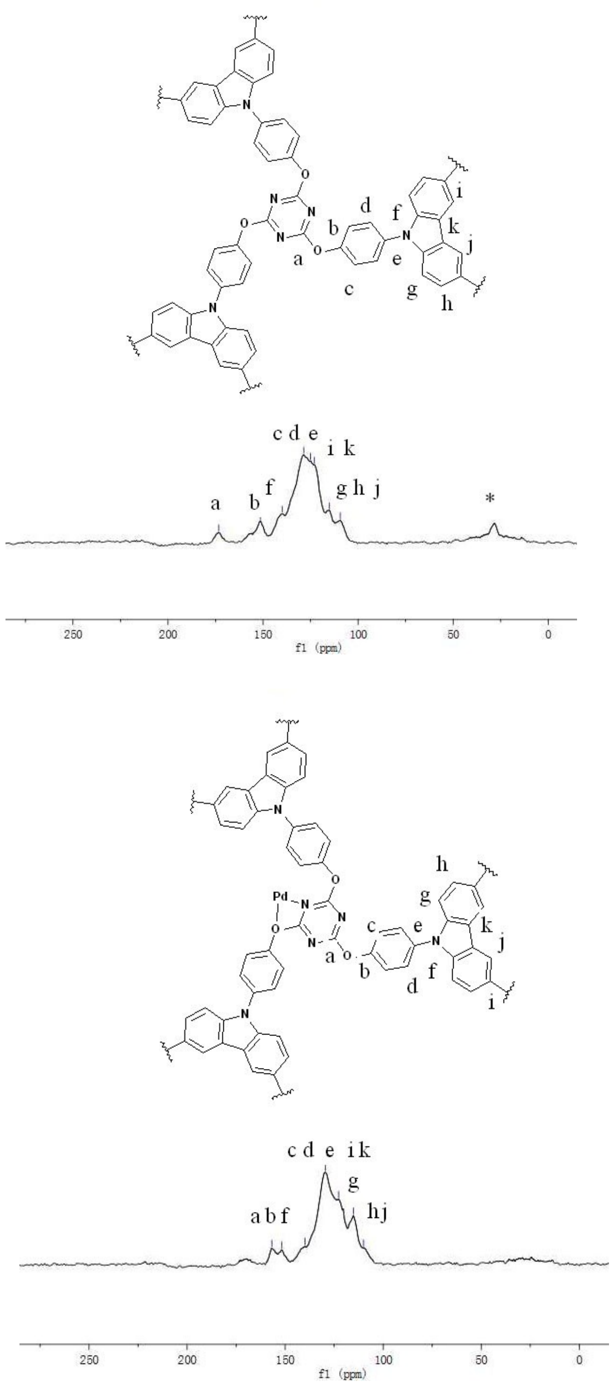


Fig. S1 ^{13}C CP-MAS NMR of CzMOP (top) and Pd@CzMOP (bottom)**.**

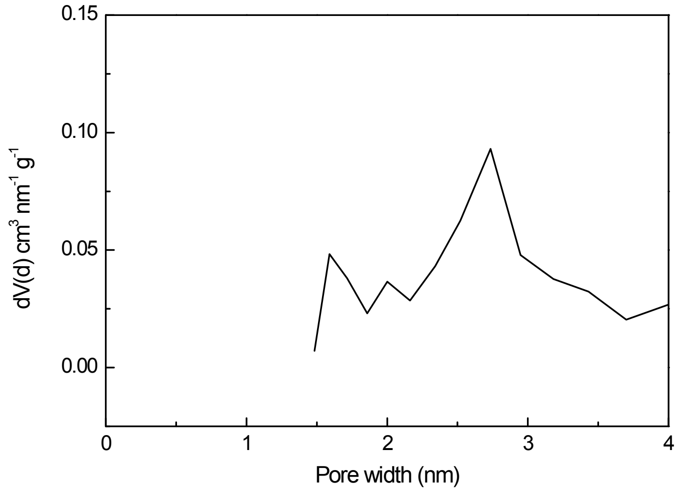


Fig. S2 Pore size distrution of Pd@CzMOP**.**

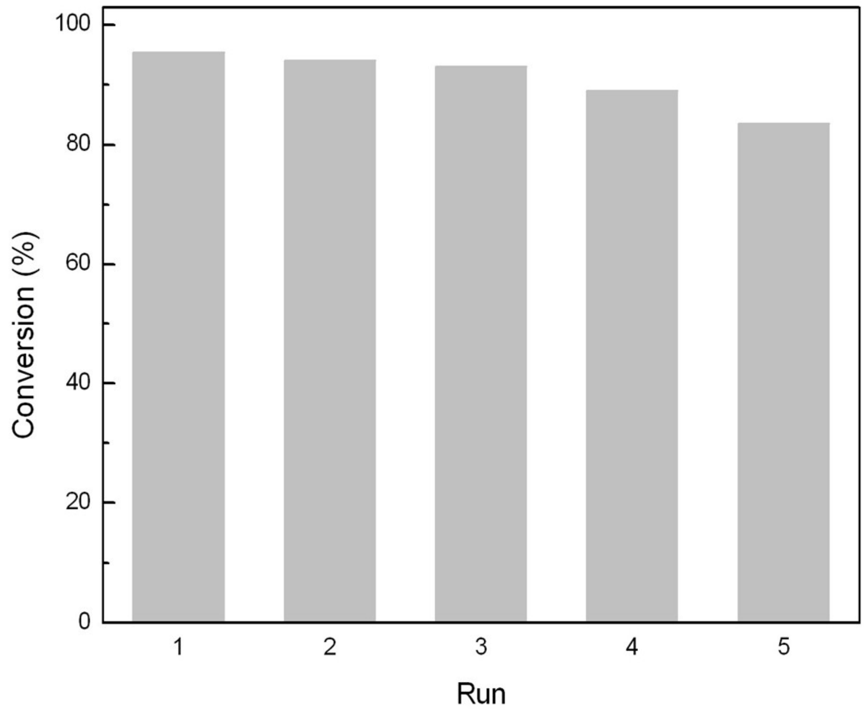


Fig. S3 Reusability of Pd@CzMOP for Suzuki coupling reaction**.**

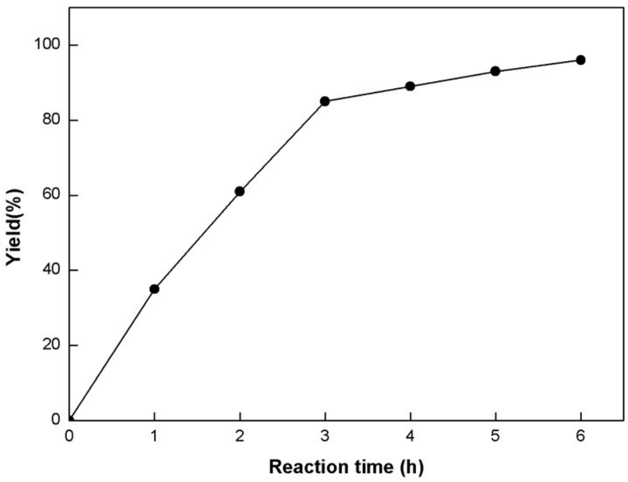
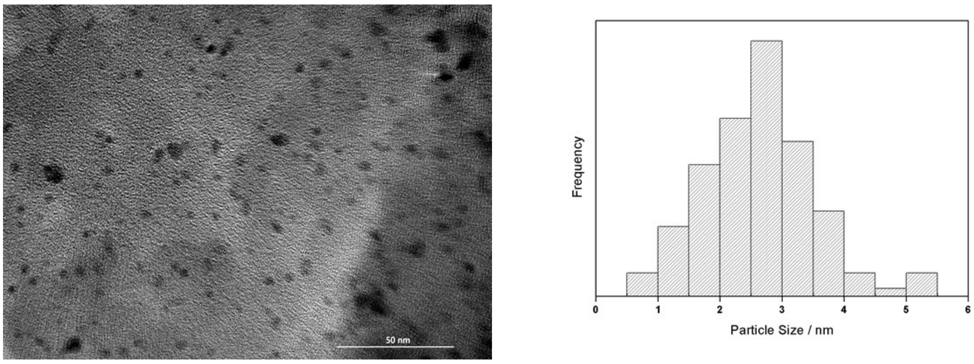


Fig. S4 Effect of reaction time on the percentage conversion in the Pd@CzMOP catalysed reaction.



a b

Fig. S5 HR-TEM images of Pd@CzMOP after five cycles (a)**.** Pd NPs size distribution of Pd@CzMOP after five cycles (b)**.**

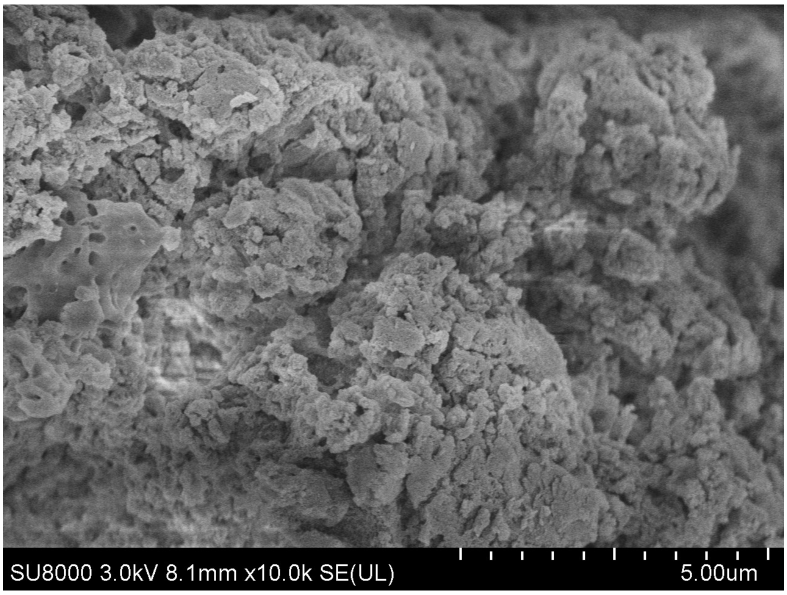


Fig. S6 SEM image of Pd@CzMOP for Suzuki coupling reaction after five cycles**.**

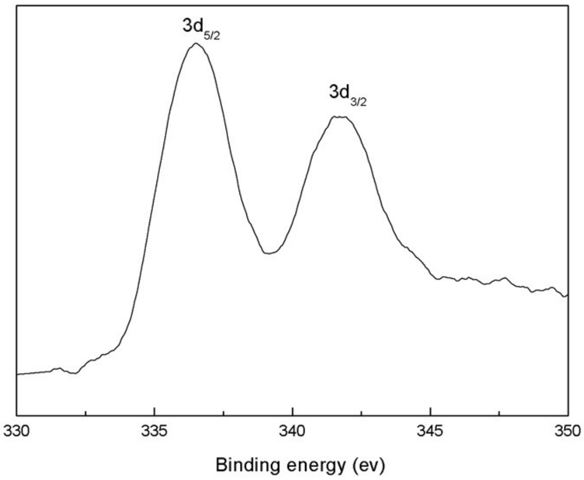


Fig. S7 XPS spectra of Pd@CzMOP (metallic Pd) after five cycles**.**

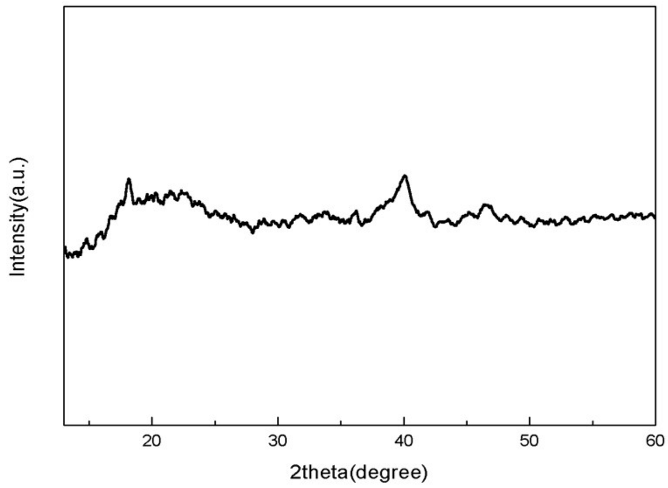
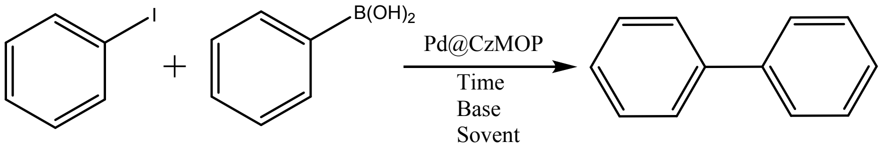


Fig. S8 XRD patterns of Pd@CzMOP for Suzuki coupling reaction after five cycles**.**

Table S1 Effect of the reaction condition on Suzuki coupling reaction using Pd@CzMOP[a].



Entry	Solvent	Time (h)	Base	Yield(%)[b]
1	DMF	6	K_2CO_3	96
2	THF	6	K_2CO_3	94
3	EtOH	6	K_2CO_3	96
4	toluene	6	K_2CO_3	91
5	dioxane	6	K_2CO_3	88
6	DMF	6	Na_2CO_3	90
7	DMF	6	KOH	85
8	DMF	3	K_2CO_3	85
9	DMF	1	K_2CO_3	35

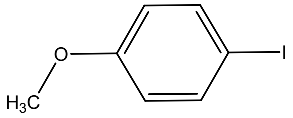
[a] PhI (0.5 mmol), phenylboronic acid (0.75 mmol), K_2CO_3 (1.5 equiv), Solvent (5 mL), and Pd@CzMOP (5 mg). [b] Isolated yield based on PhI.

Table S2 Hot filtration test[a]

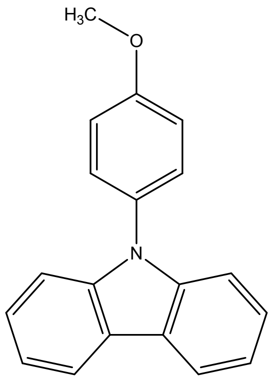
	Yield(%)[b]	
Catalyst	3 h	(3+3) h
Pd@CzMOP	85	85

[a] PhI (0.5 mmol), phenylboronic acid (0.75 mmol), K_2CO_3 (1.5 equiv), Solvent (5 mL), and Pd@CzMOP (5 mg). [b] Isolated yield based on PhI.

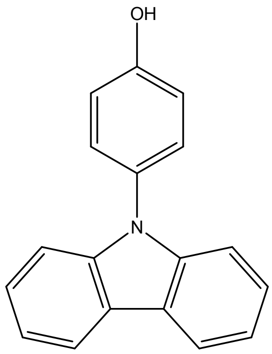
Spectral Data



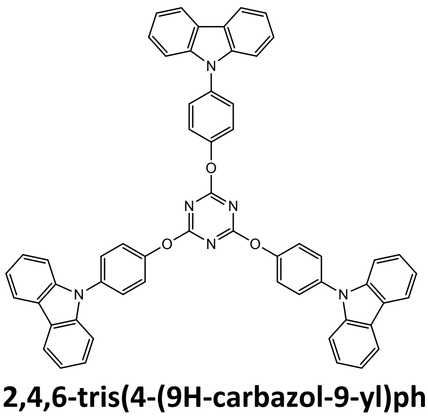
1-iodo-4-methoxybenzene: White solid (yield, 97 %). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.56 (d, J = 4 Hz, 2H), 6.78 (d, J = 8 Hz, 2H), 3.78 (s, 3H) ppm.



9-(4-methoxyphenyl)-9H-carbazole: White solid (yield, 90%). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.13 (d, J = 8 Hz, 2H), 7.48–7.28 (m, 8H), 7.12 (d, J = 4 Hz, 2H), 3.92 (s, 3H) ppm.

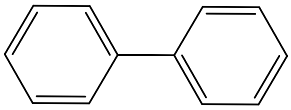


4-(9H-carbazol-9-yl)phenol: White solid (yield, 93%). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.14 (d, J = 8 Hz, 2H), 7.42–7.26 (m, 8H), 7.04 (d, J = 8 Hz, 2H), 5.01 (s, 1H) ppm.

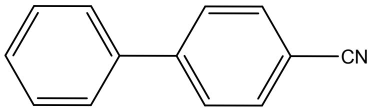


2,4,6-tris(4-(9H-carbazol-9-yl)phenoxy)-1,3,5-triazine: White solid (yield, 86%).^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.10 (d, J = 4 Hz, 6H), 7.63 (d, J = 8 Hz, 6H), 7.49

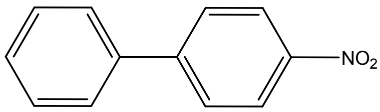
(d, J = 8 Hz, 6H), 7.38 (d, J = 12 Hz, 6H), 7.26–7.20 (m, 12H) ppm.



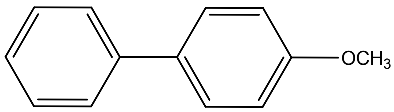
1,1'-biphenyl: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.63 (d, J = 4 Hz, 4H), 7.50–7.44 (t, J = 8 Hz, 4H), 7.40-7.35 (t, J = 8 Hz, 2H) ppm.



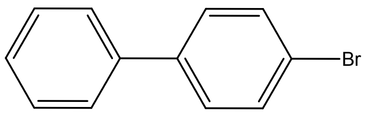
[1,1'-biphenyl]-4-carbonitrile: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.75–7.66 (m, 4H), 7.61–7.57 (m, 2H), 7.52–7.45 (m, 2H), 7.45–7.40 (m, 1H) ppm.



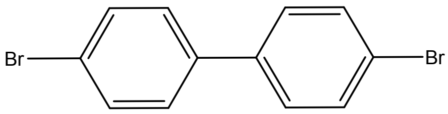
4-nitro-1,1'-biphenyl: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.32–8.28 (m, 2H), 7.76–7.72 (m, 2H), 7.65–7.61 (m, 2H), 7.53–7.42 (m, 3H) ppm.



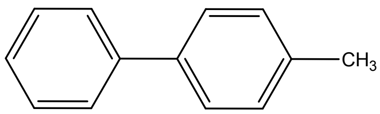
4-methoxy-1,1'-biphenyl: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.57–7.51 (m, 4H), 7.44–7.38 (t, J = 8 Hz, 2H), 7.33–7.27 (t, J = 8 Hz, 1H), 6.98 (d, J = 8 Hz, 2H), 3.85 (s, 3H) ppm.



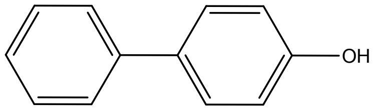
4-bromo-1,1'-biphenyl: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.58–7.53 (m, 4H), 7.48–7.41 (m, 4H), 7.39–7.33 (t, J = 8 Hz, 1H) ppm.



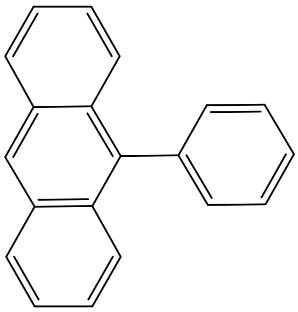
4,4'-dibromo-1,1'-biphenyl: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.59–7.53(d, J = 8 Hz, 4H), 7.44–7.38 (d, J = 8 Hz, 4H) ppm.



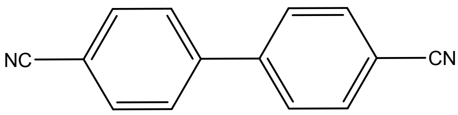
4-methyl-1,1'-biphenyl: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.60–7.55 (d, J = 8 Hz, 2H), 7.52–7.46 (d, J = 8 Hz, 2H), 7.45–7.39 (t, J = 8 Hz, 2H), 7.35–7.29 (t, J = 8 Hz, 1H), 7.27–7.23 (d, *J* = 8 Hz, 2H), 2.40 (s, 3H) ppm.



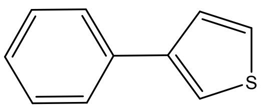
[1,1'-biphenyl]-4-ol: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.62–7.57 (d, *J* = 4 Hz, 2H), 7.54–7.49 (d, *J* = 8 Hz, 2H), 7.47–7.41 (t, *J* = 8 Hz, 2H), 7.38–7.31 (t, *J* = 8 Hz, 1H), 6.65–6.59 (d, *J* = 8 Hz, 2H), 4.82 (s, 1H) ppm.



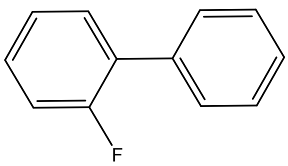
9-phenylanthracene: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.51 (s, 1H), 8.05 (d, *J* =8 Hz, 2H), 7.69–7.65 (d, *J* = 8 Hz, 2H), 7.61–7.53 (m, 3H), 7.49–7.42 (m, 4H), 7.38–7.32 (m, 2H) ppm.



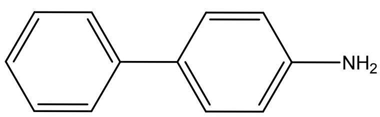
[1,1'-biphenyl]-4,4'-dicarbonitrile: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.85 (d, *J* = 8 Hz, 4H), 7.37 (d, *J* = 8 Hz, 4H) ppm.



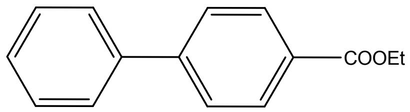
3-phenylthiophene: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.60 (d, *J* = 8 Hz, 2H), 7.47–7.36 (m, 5H), 7.32–7.26 (t, *J* = 8 Hz, 1H) ppm.



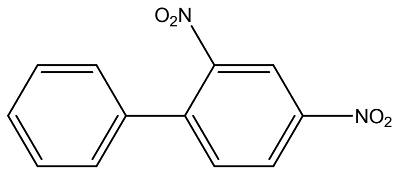
2-fluoro-1,1'-biphenyl: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.49–7.35 (m, 7H), 7.35–7.31 (m, 1H), 7.31–7.26 (m, 1H) ppm.



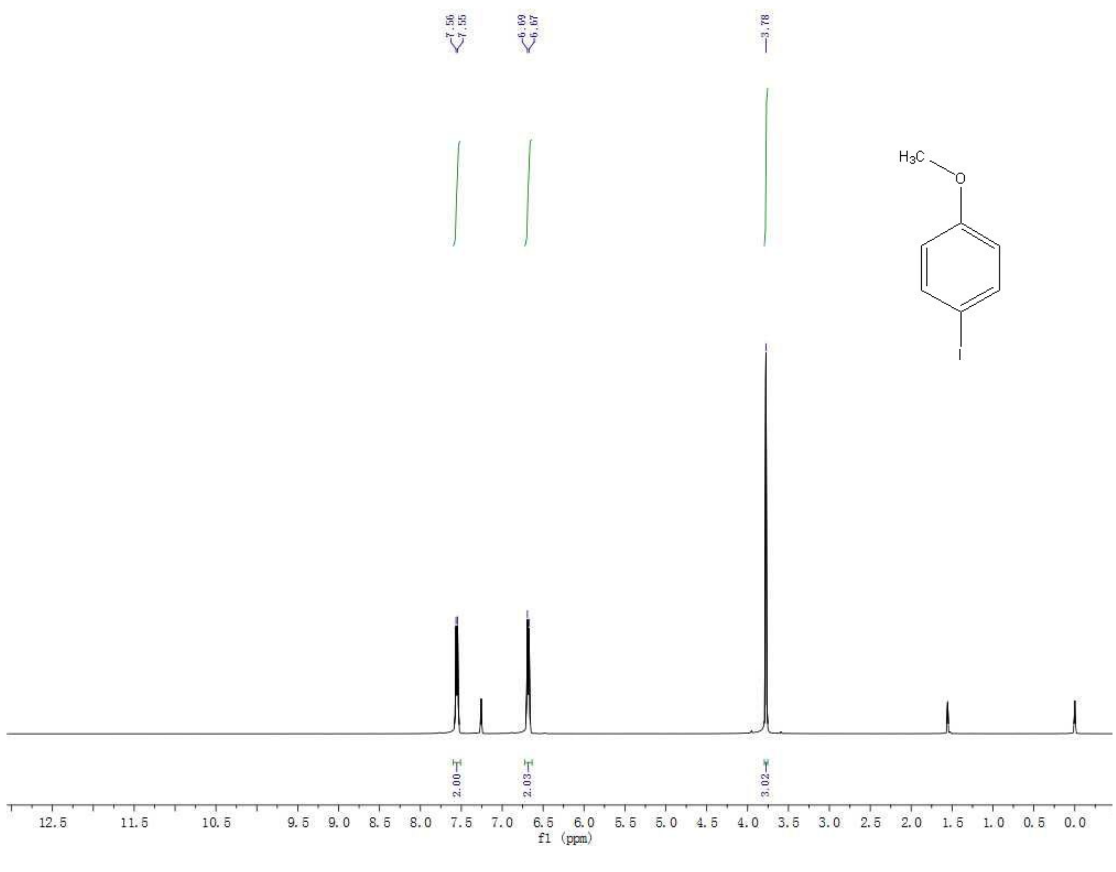
[1,1'-biphenyl]-4-amine: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.56–7.50 (d, *J* = 8 Hz, 2H), 7.44–7.35 (q, 4H), 7.29–7.22 (d, *J* = 16 Hz, 1H), 6.78–6.72 (d, *J* = 8 Hz, 2H), 3.72 (s, 2H) ppm.

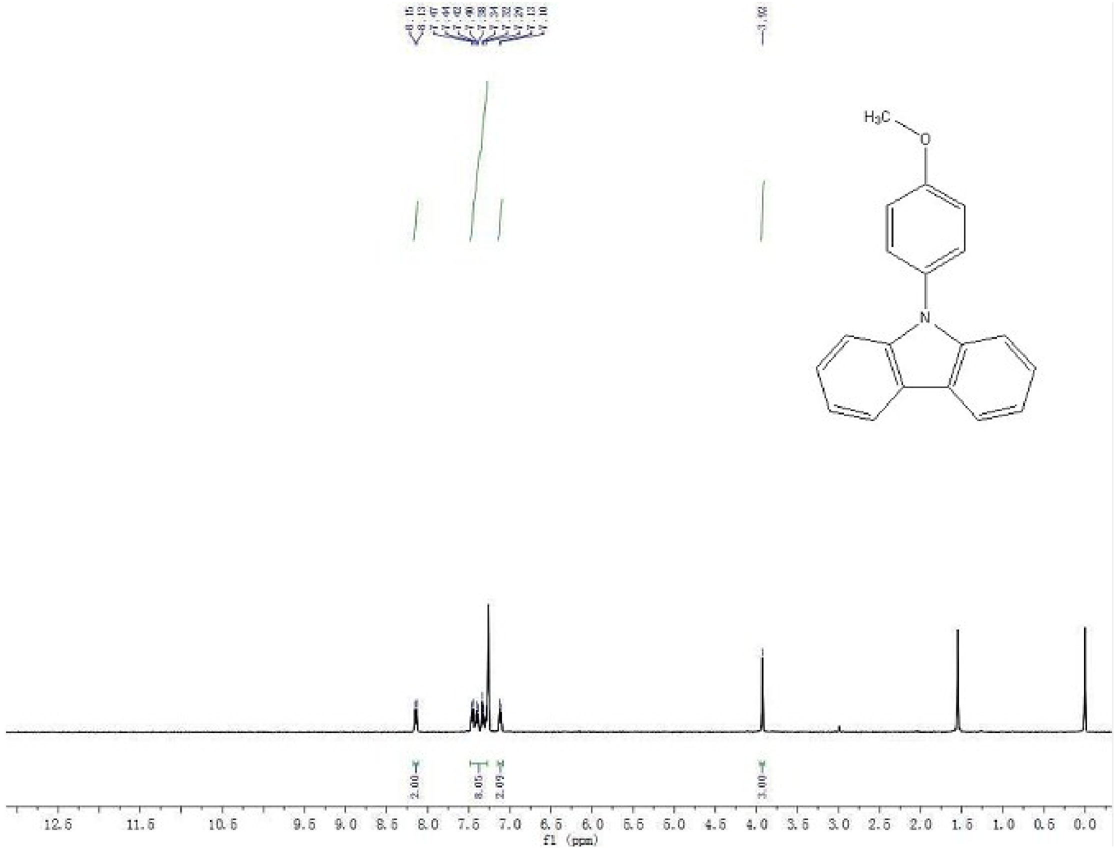


ethyl [1,1'-biphenyl]-4-carboxylate: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.13–8.09 (d, J = 8 Hz, 2H), 7.68–7.60 (q, 4H), 7.50–7.43 (t, J = 8 Hz, 2H), 7.42–7.36 (t, J = 8 Hz, 1H), 4.44–4.36 (q, 2H), 1.44–1.39 (t, J = 8 Hz, 3H) ppm.



2,4-nitro-1,1'-biphenyl: ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.69 (d, J = 2.7 Hz, 1H), 8.26 – 8.21 (m, 2H), 8.19 (d, J = 2.7 Hz, 1H), 7.64 – 7.55 (m, 1H), 7.54 – 7.46 (m, 2H), 7.00 (d, J = 9.5 Hz, 1H).





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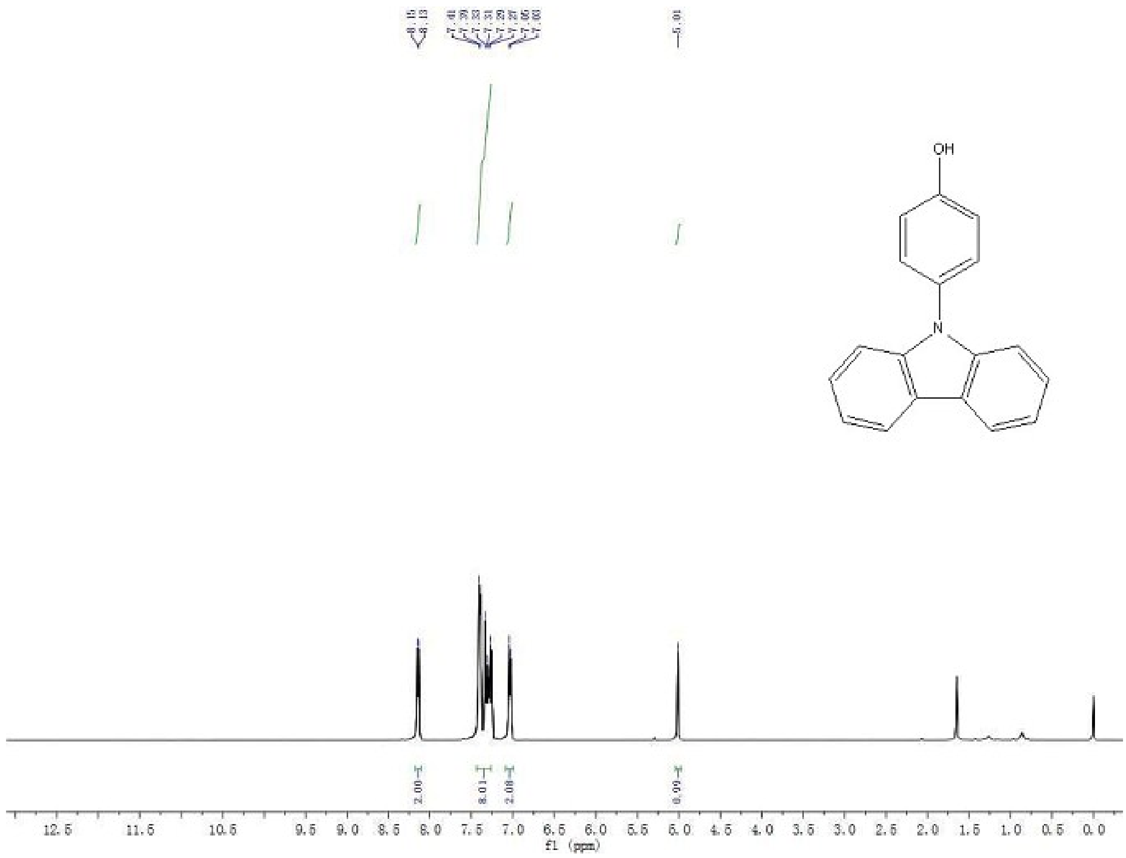

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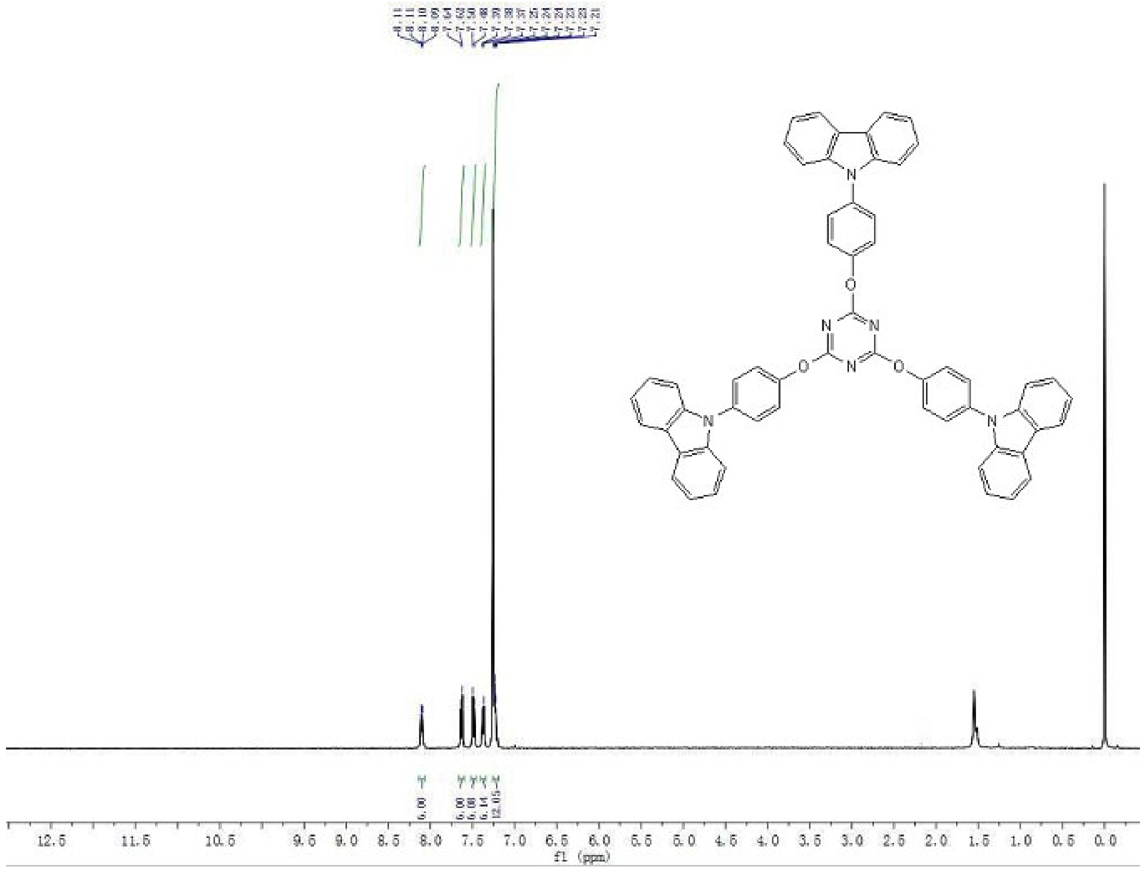

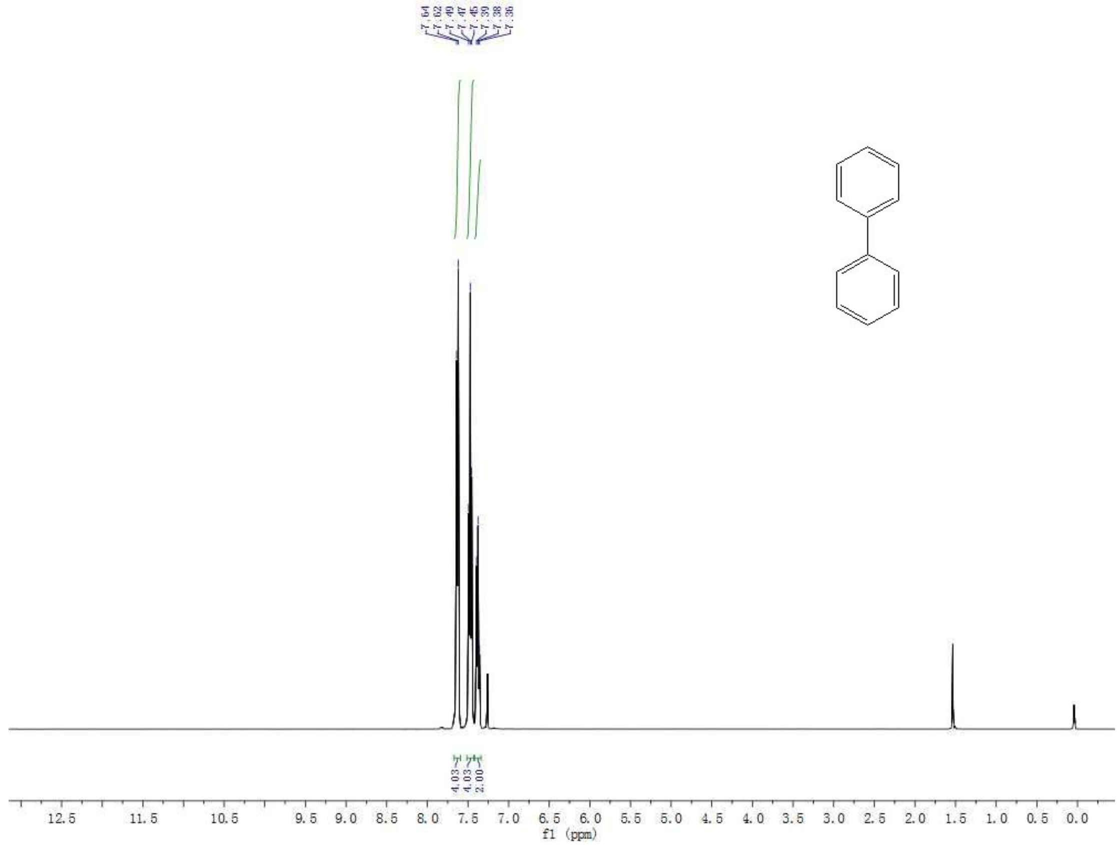

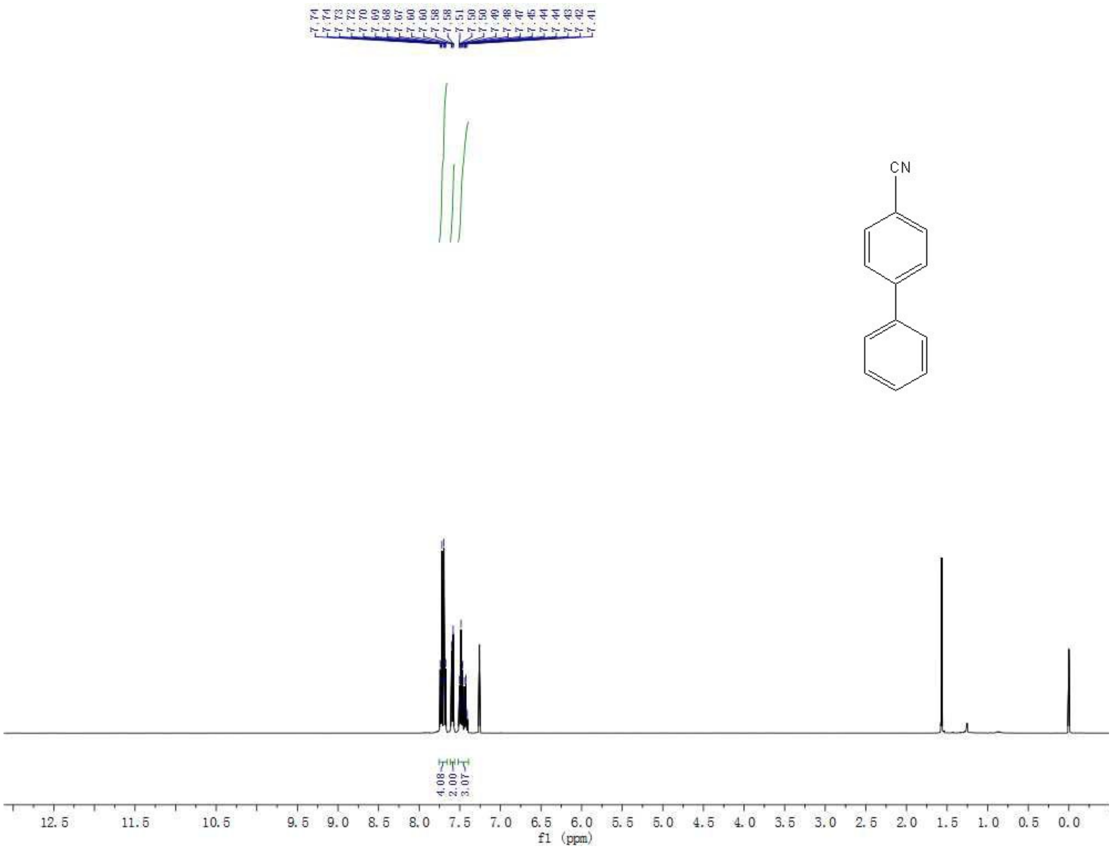

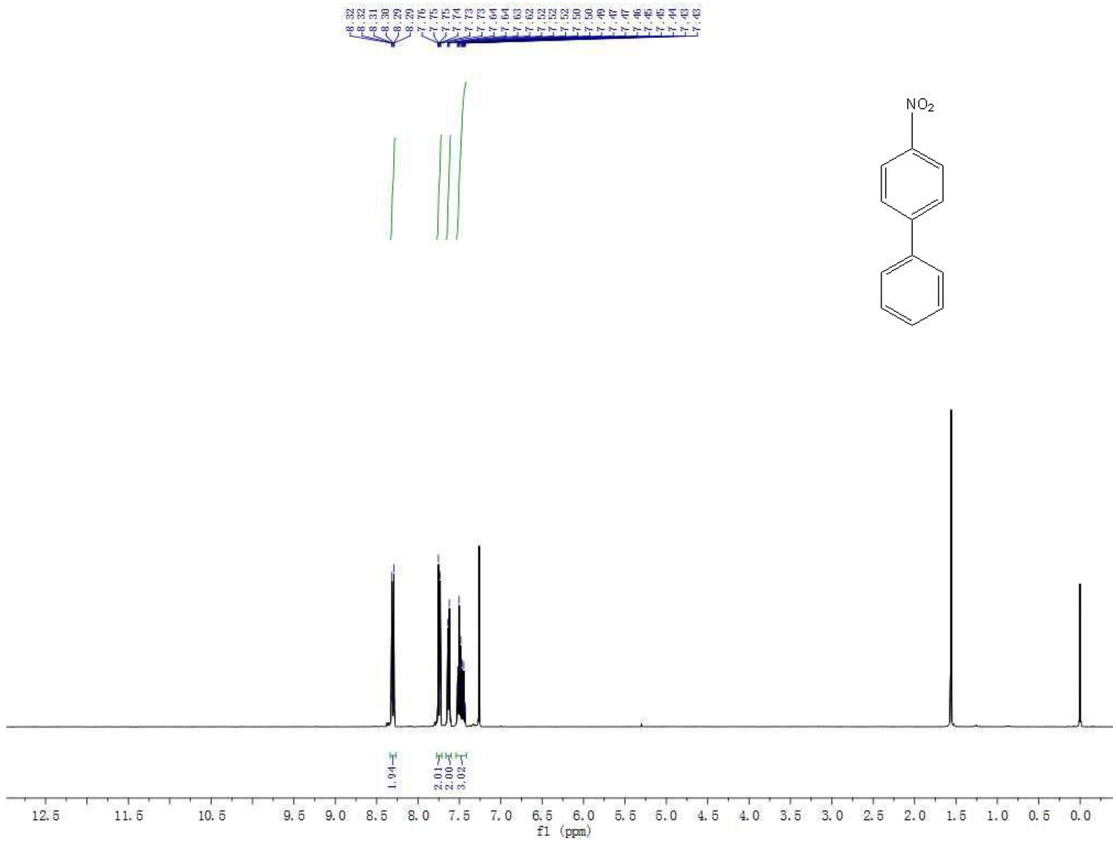

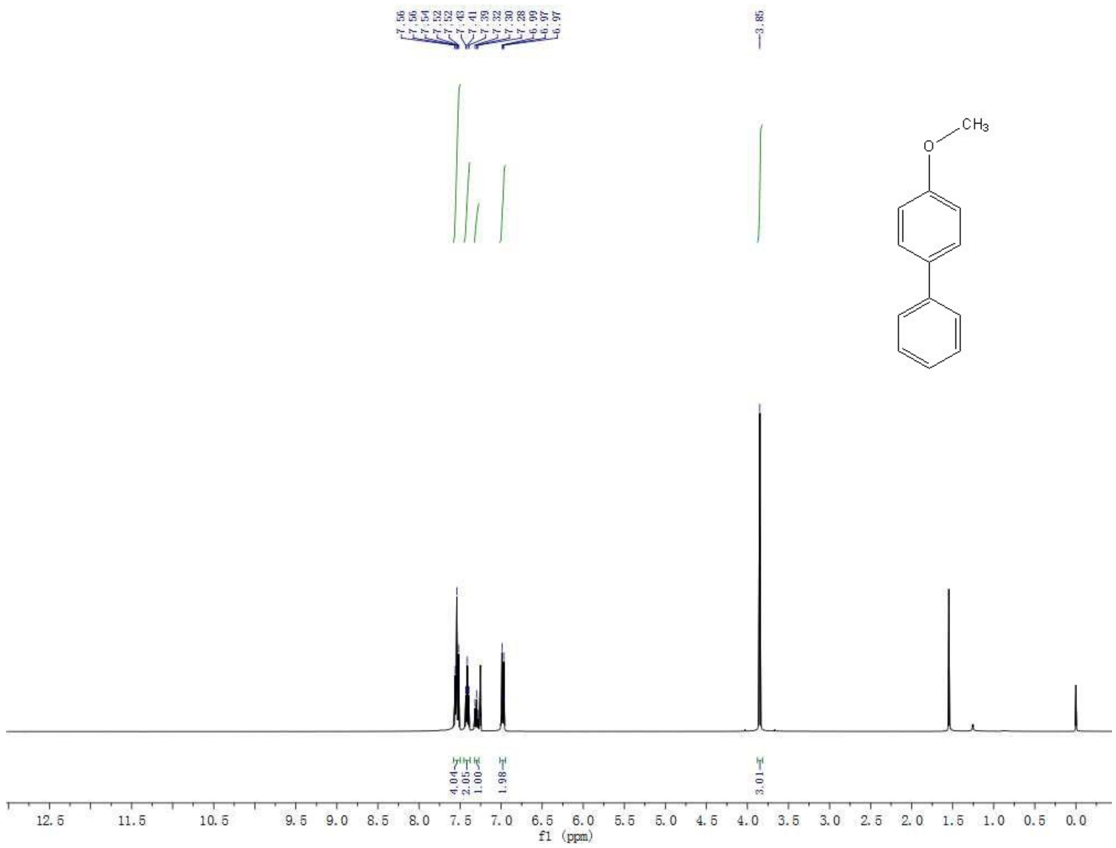

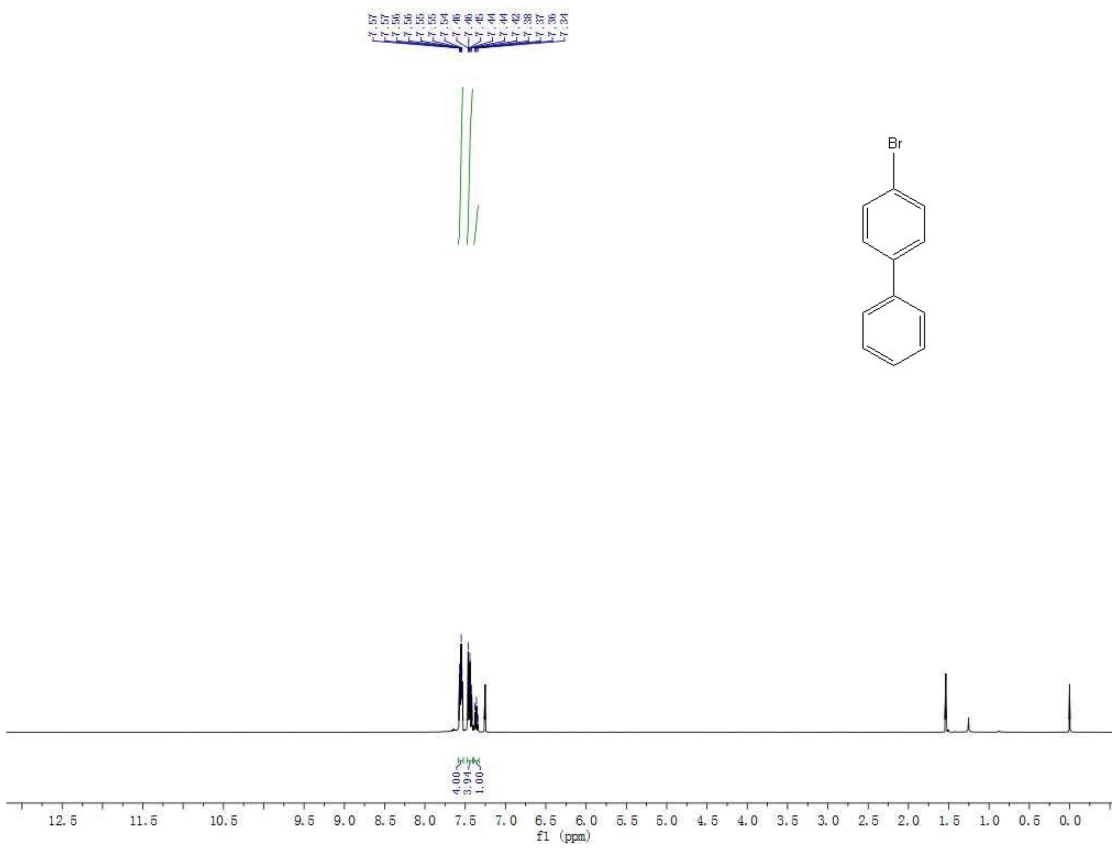

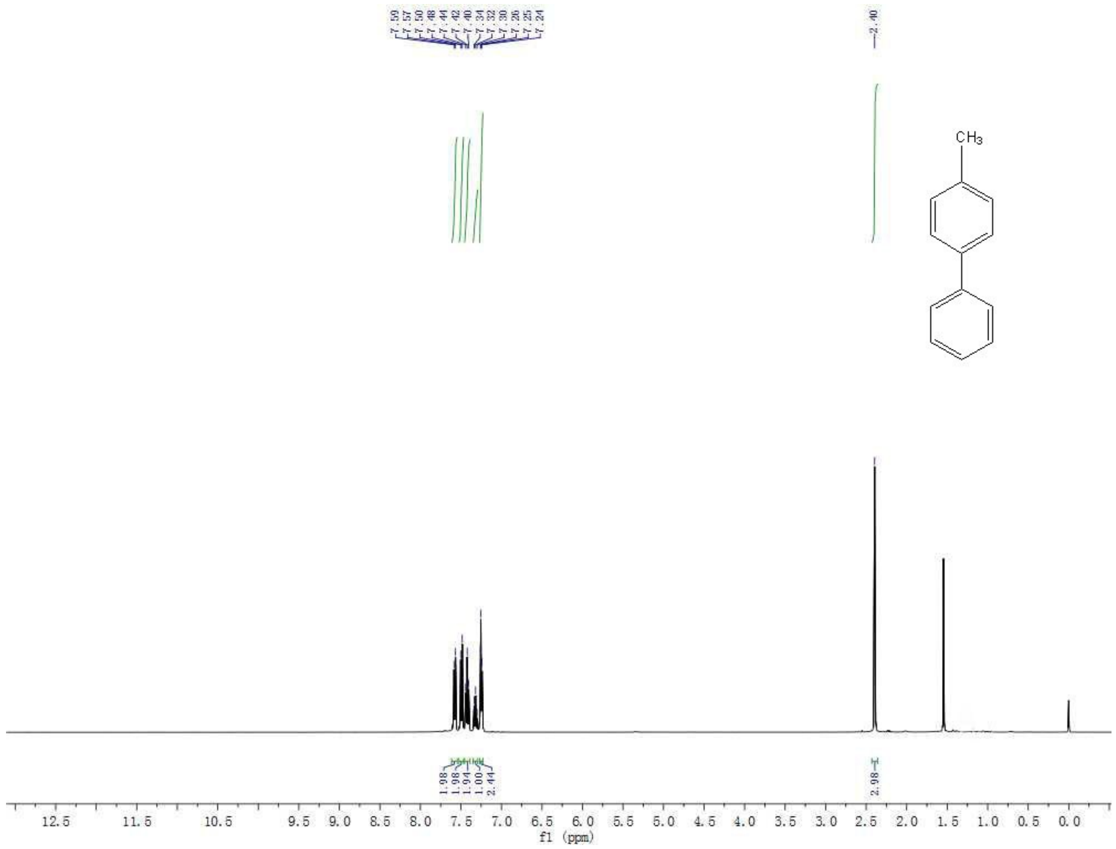

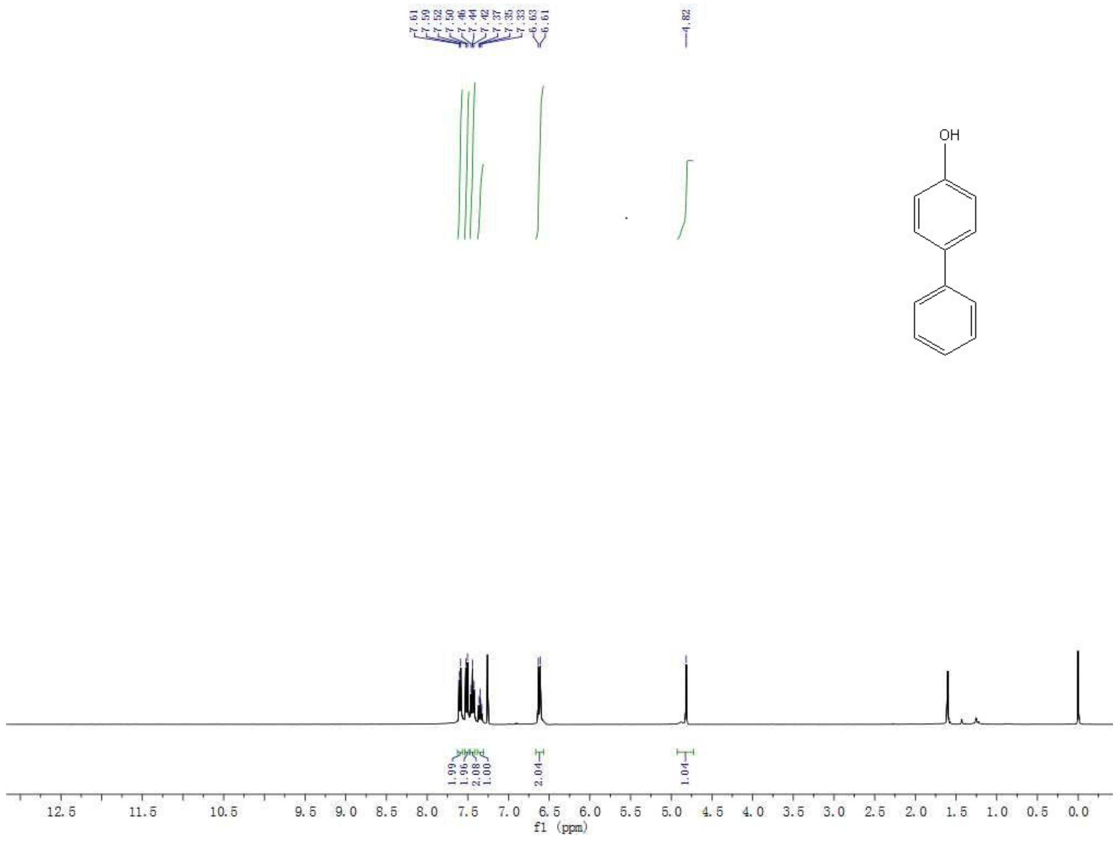

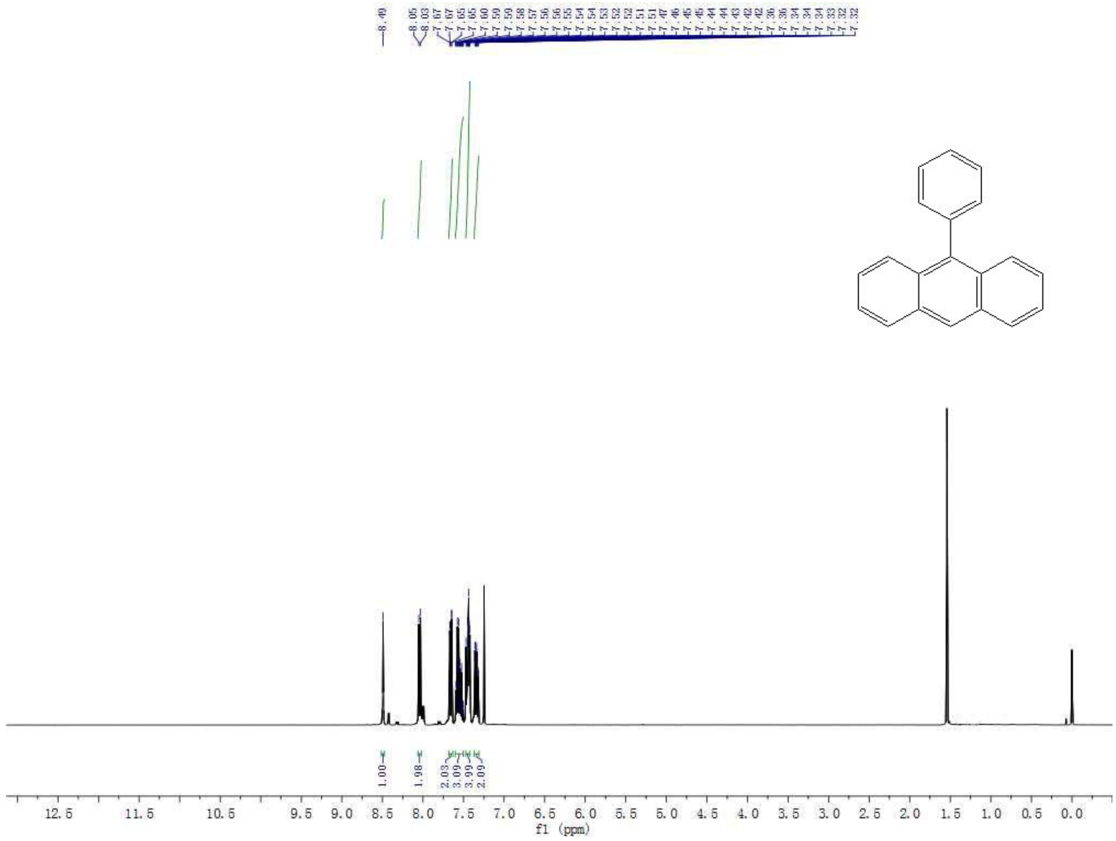
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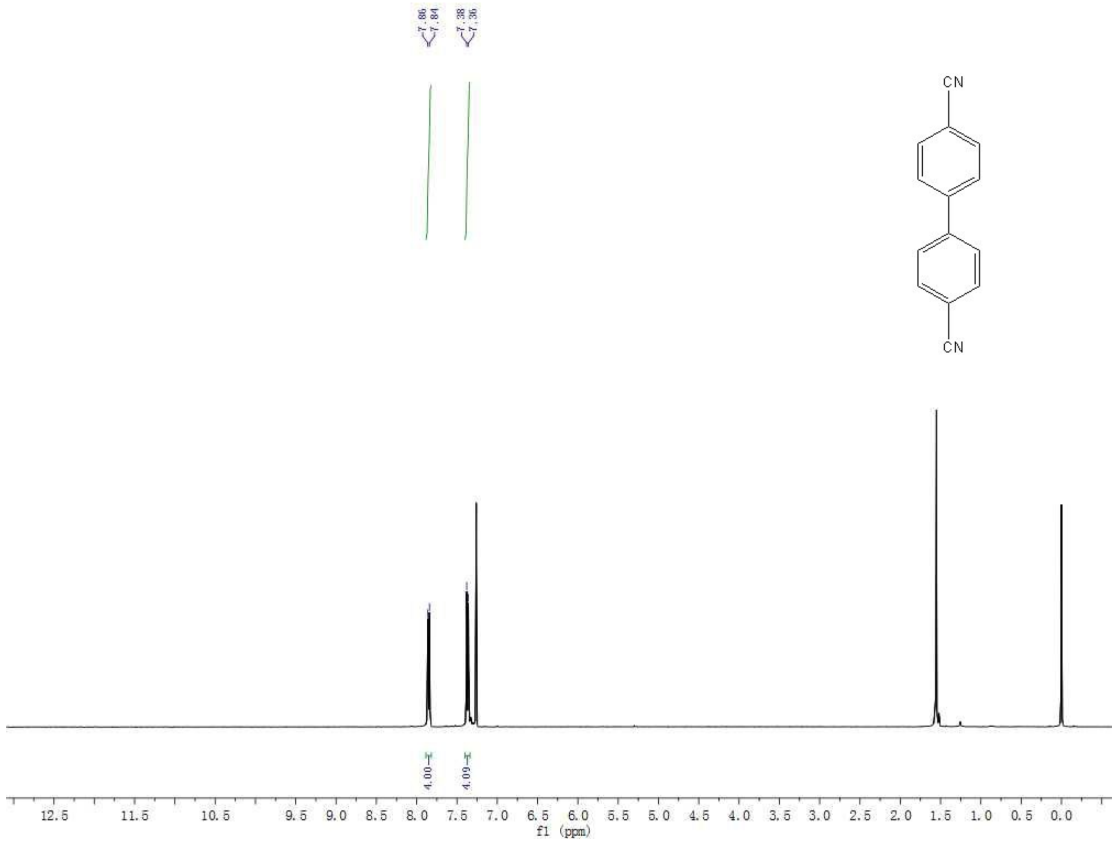
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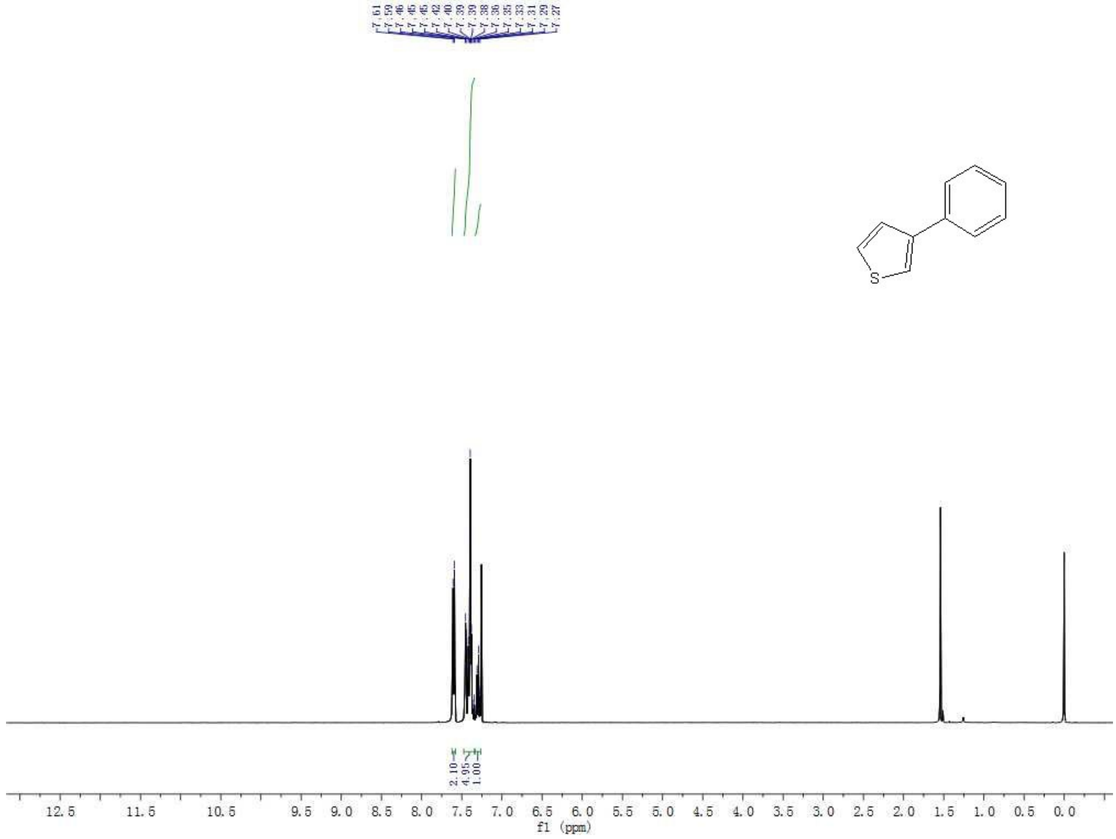
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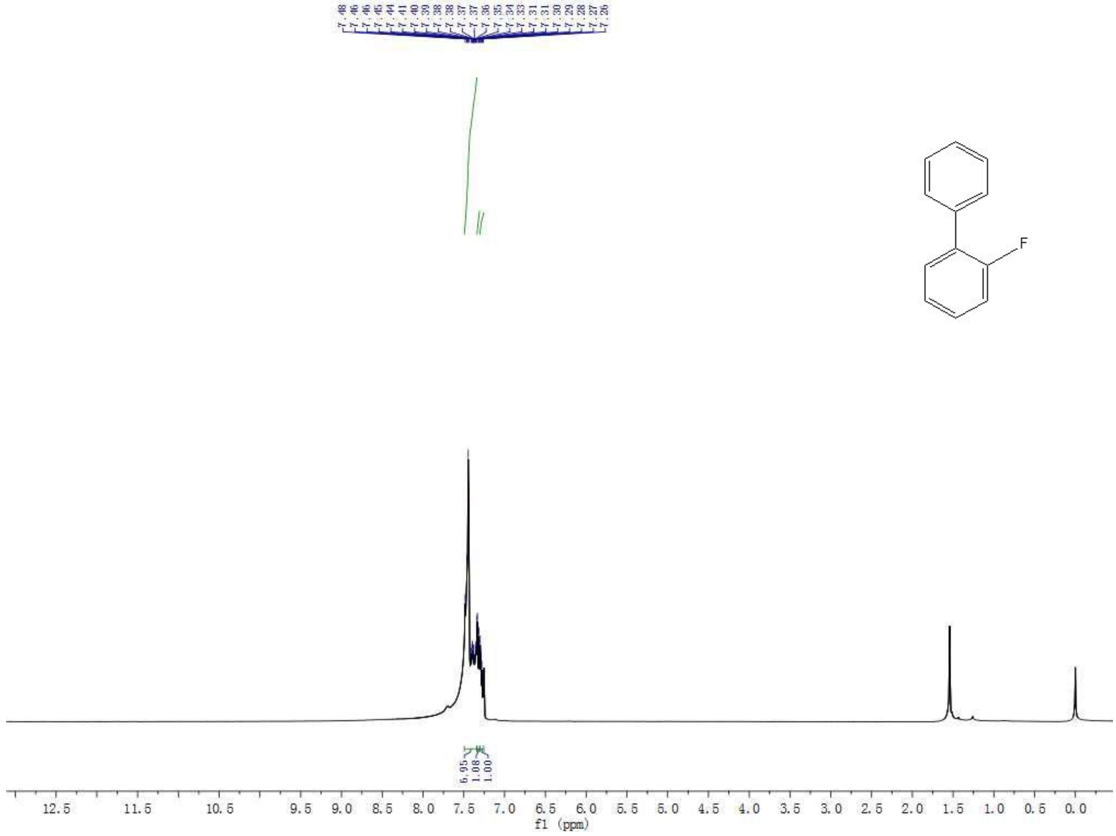
f1 (ppm)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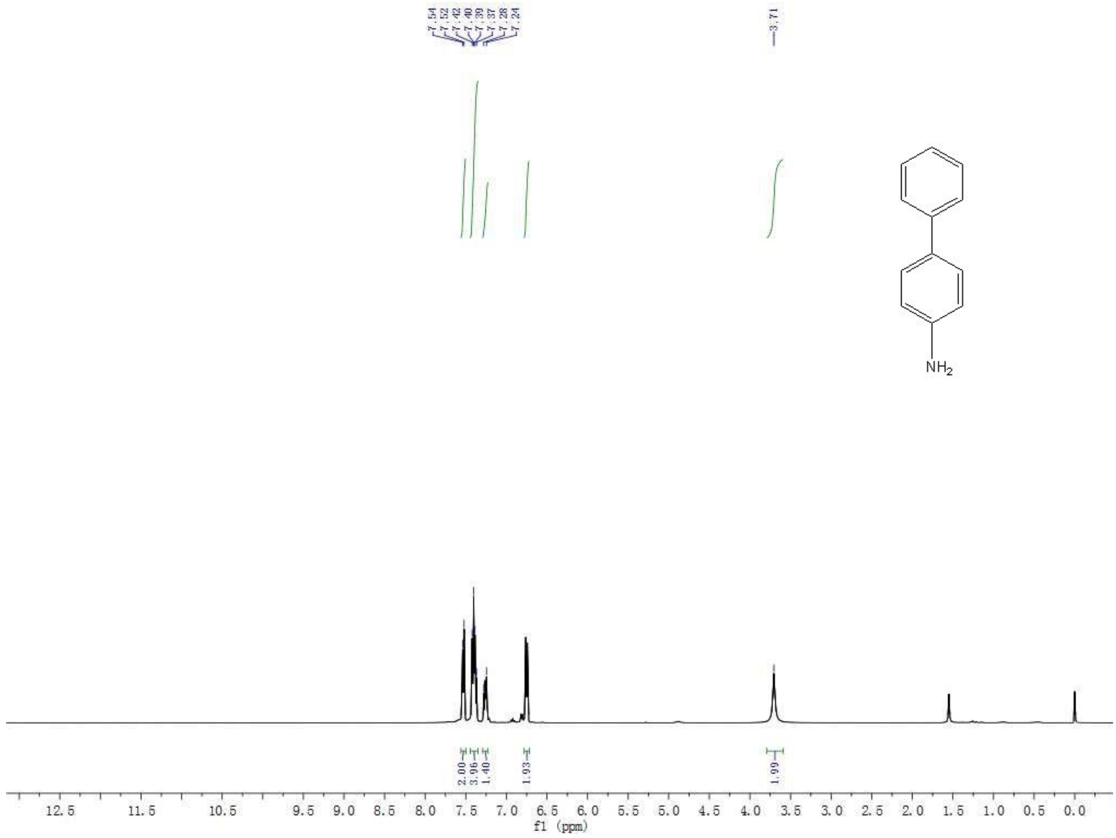
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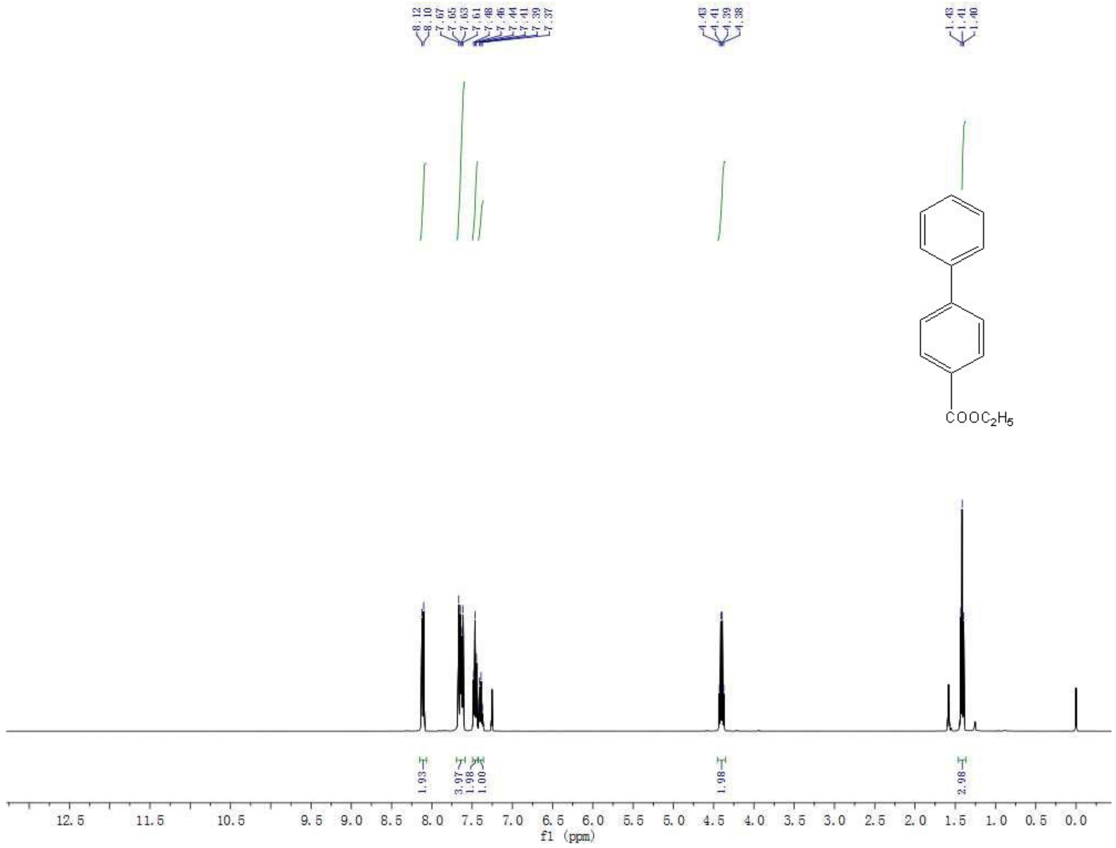
f1 (ppm)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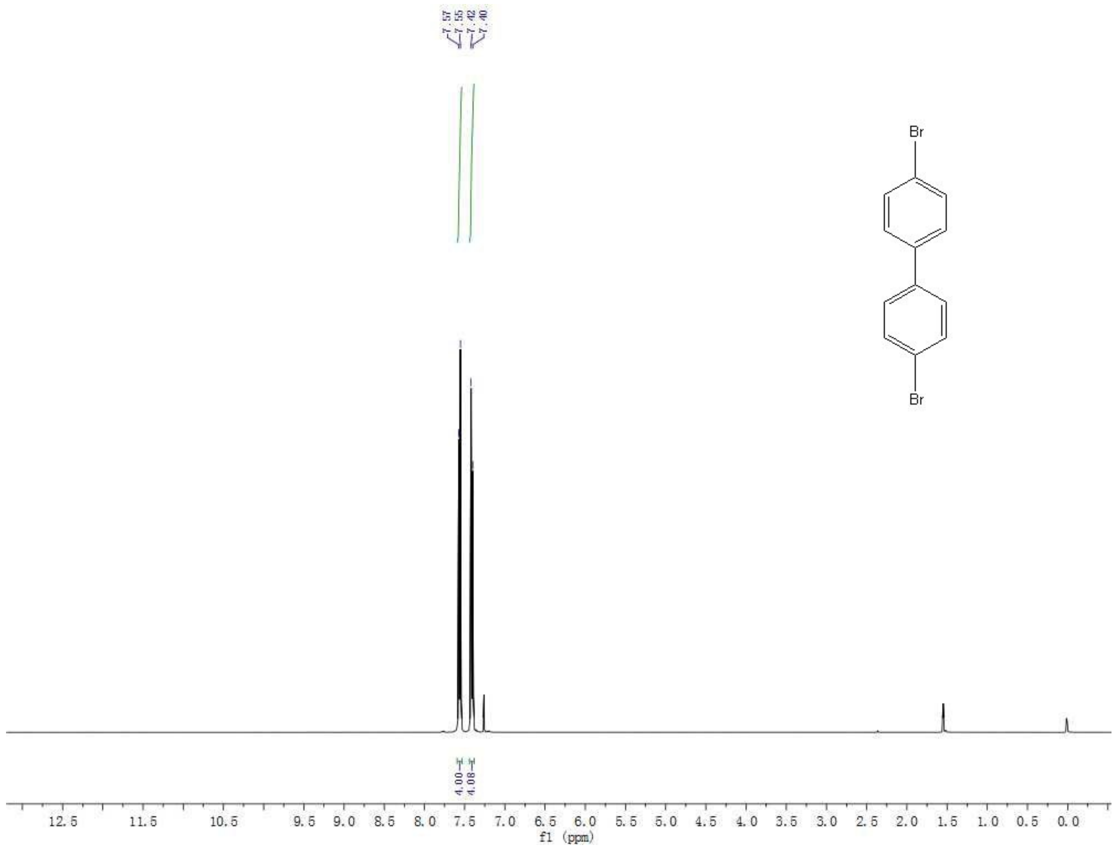
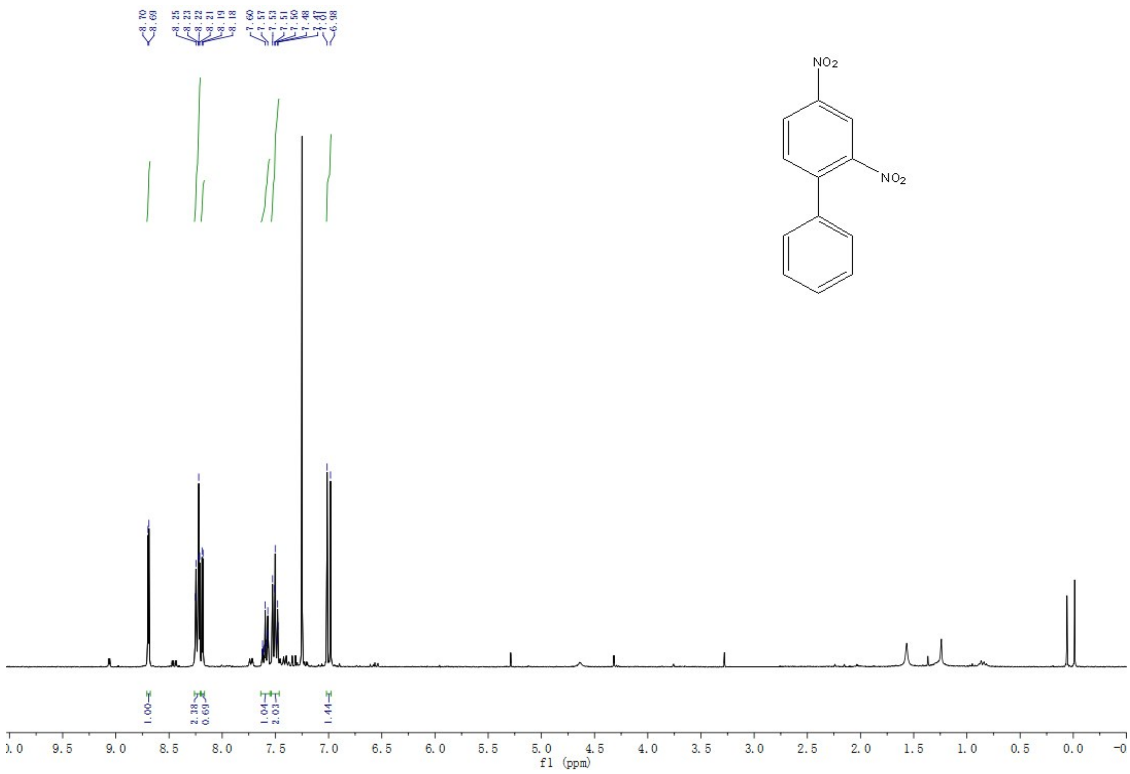
1.98
2.98
12.5 11.5 10.5 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


7.57
7.55
7.42
7.40
Br
Br
4.00
4.08
f1 (ppm)


8.70
8.69
8.25
8.23
8.22
8.21
8.19
8.18
7.60
7.57
7.53
7.51
7.50
7.48
6.98
NO2
NO2
1.00
2.28
0.69
1.04
2.03
1.44
f1 (ppm)