New Journal of Chemistry

Supplementary Materials

Poly(amic acid) salt-supported silver nanoparticles as efficient and recyclable quasi-homogeneous catalysts for the aqueous hydration of nitriles to amides

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1. Characterization of the Ag NPs after redispersion.

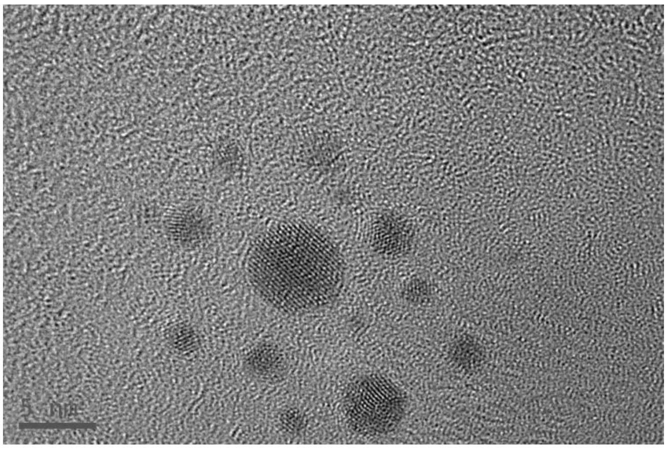


Fig. S1 TEM image of Ag NPs after redispersion.

2. Characterization of the Ag NPs after eight batches.

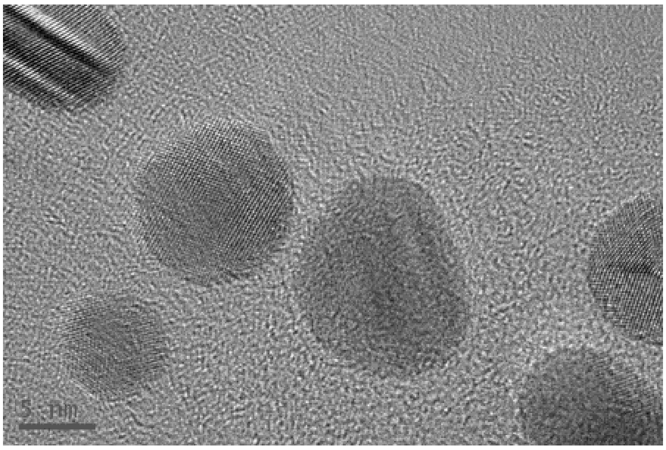
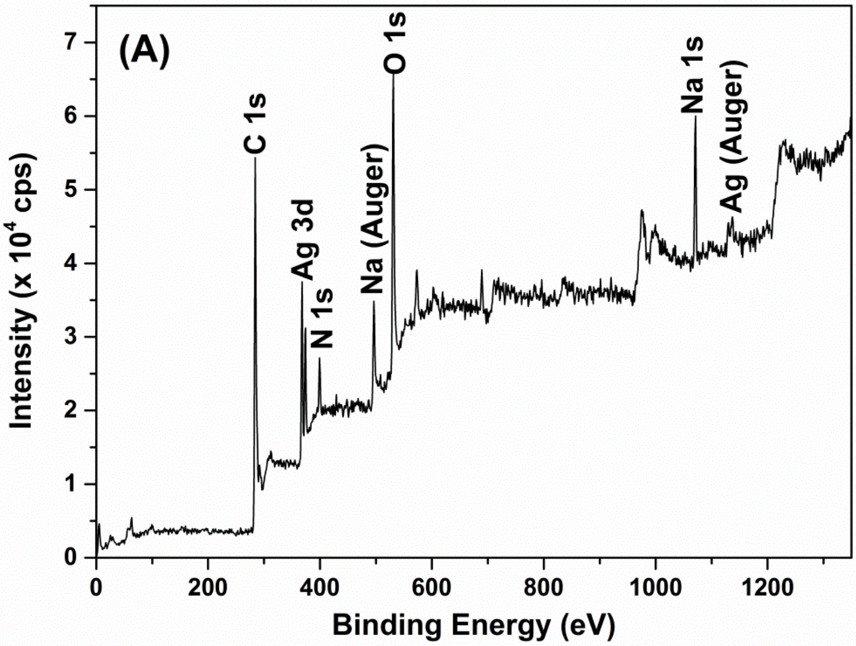


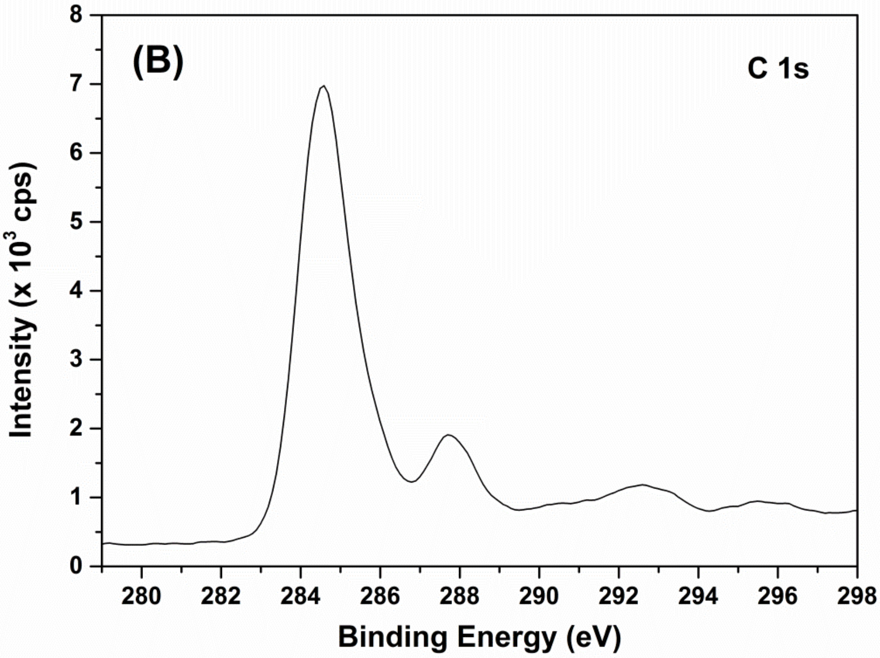
Fig. S2 TEM image of PAAS-stabilized Ag NPs after eight batches.

3. XPS analysis of Ag-PAA.

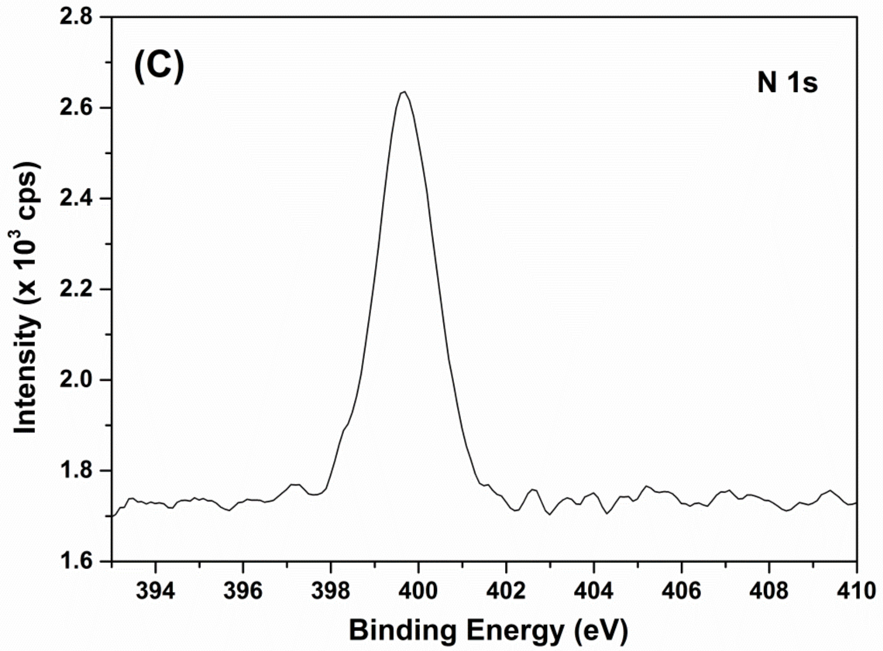
XPS spectra were recorded on a Thermo Scientific x-ray photoelectron spectrometer (model K-Alpha 1063, Waltham, MA), which is equipped with a micro-focused monochromatic Al Kα x-ray source. The Ag-PAA sample was prepared by the acidic precipitation method similar to that used in the preparation of the XRD sample. Signals corresponding to carbon, oxygen, nitrogen from the stabilizer poly(amic acid) can be easily recognized. Moreover, the Ag 3d and Ag Auger electron peaks clearly indicate the existence of zero-valent silver in the Ag-PAA composites.

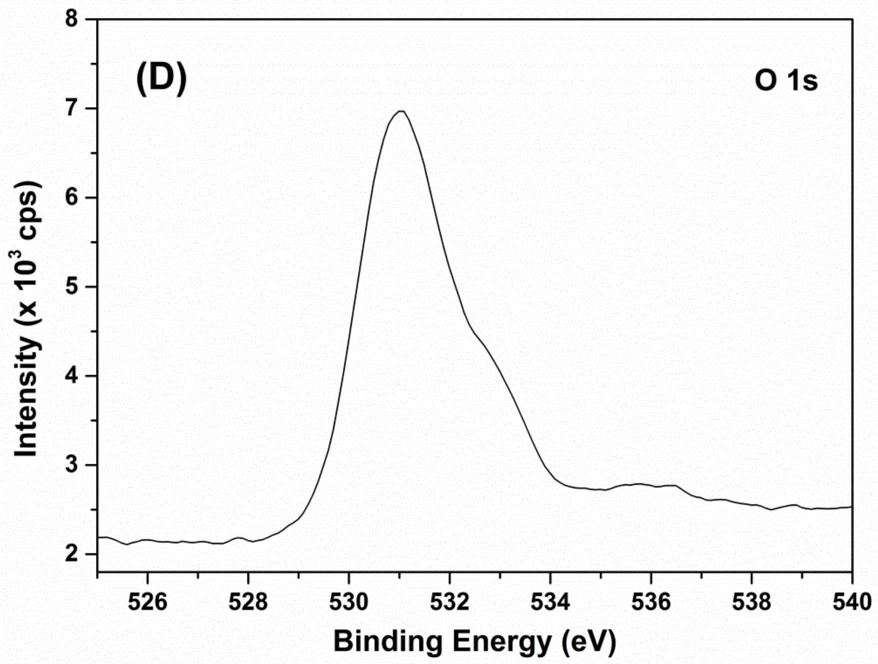


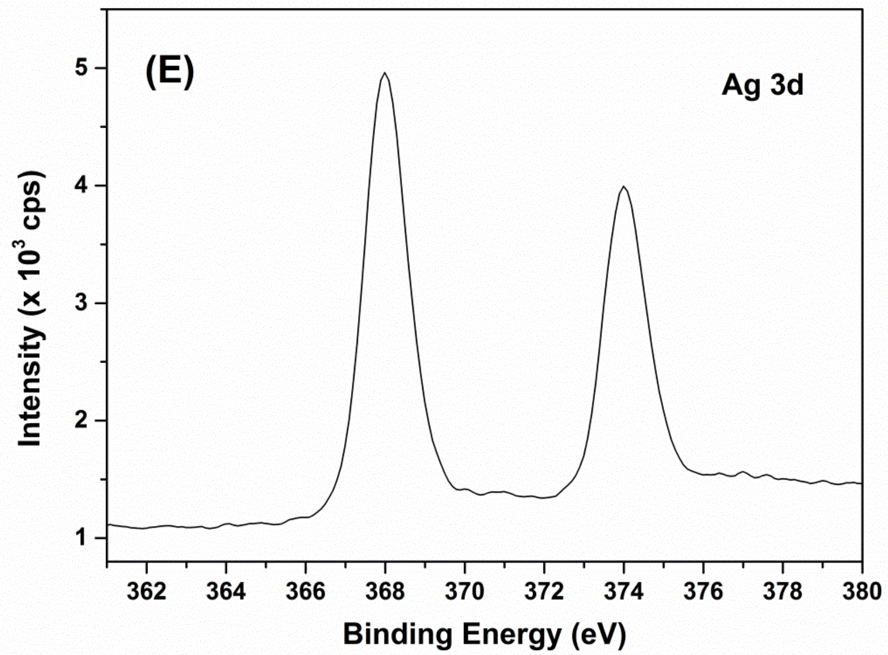
(A)
C 1s
Ag 3d
N 1s
Na (Auger)
O 1s
Na 1s
Ag (Auger)
Intensity (x 10^4 cps)
Binding Energy (eV)



(B)
C 1s
Intensity (x 10^3 cps)
Binding Energy (eV)


(C)
N 1s
Intensity (x 10^3 cps)
Binding Energy (eV)
2.8
2.6
2.4
2.2
2.0
1.8
1.6
394
396
398
400
402
404
406
408
410


(D)
O 1s
Intensity (x 10^3 cps)
Binding Energy (eV)
8
7
6
5
4
3
2
526
528
530
532
534
536
538
540



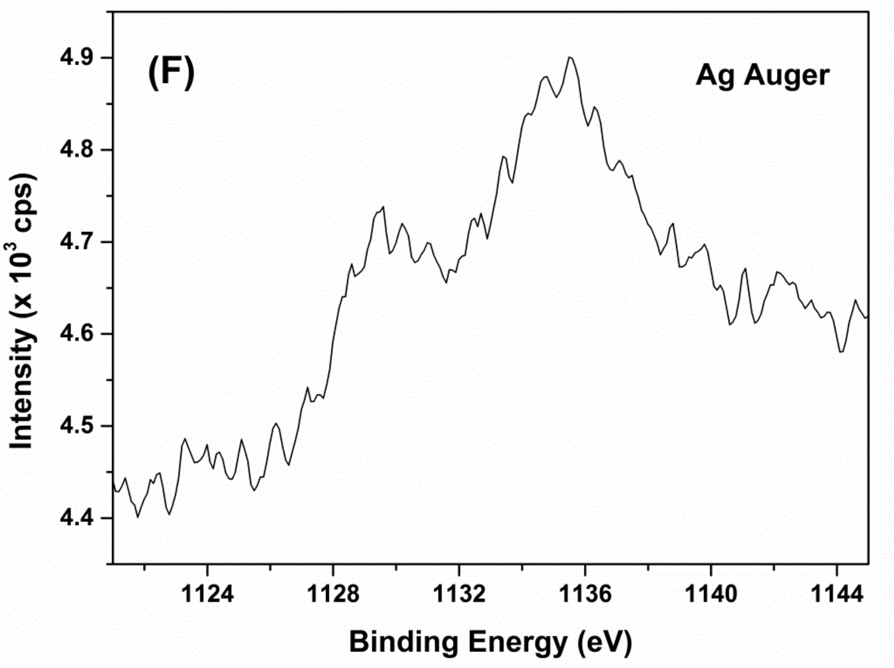
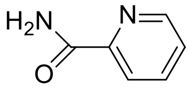
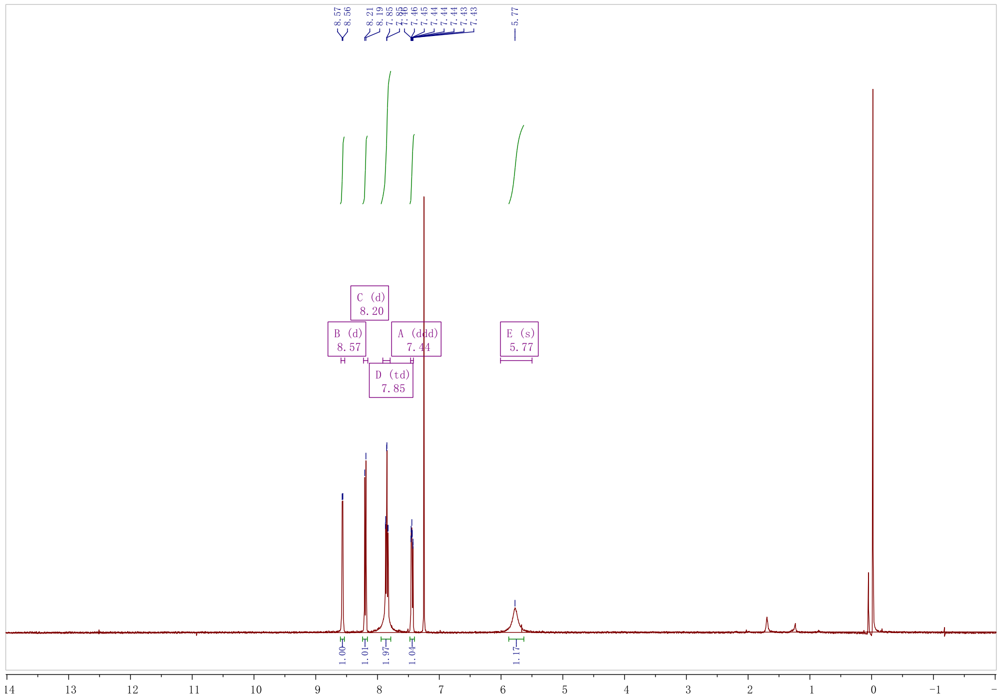


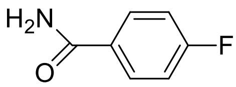
Fig. S3 XPS spectra of Ag-PAAS: (A) wide scan; (B) C 1s region; (C) N 1s region; (D) O 1s region; (E) Ag 3d region; (F) Ag Auger electron peaks.

4. [1]H NMR characterization of amide products.

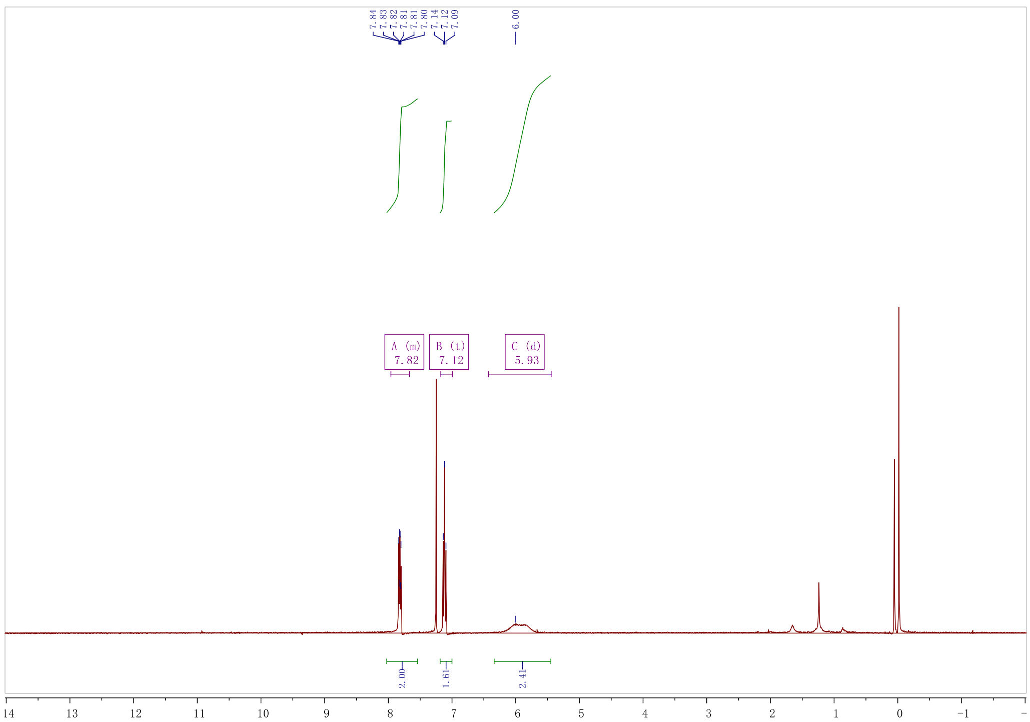
① 

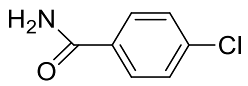
(Table 2, entry 13). [1]H NMR (400 MHz, $CDCl_3$) δ 8.57 (d, *J* = 4.7 Hz, 1H), 8.20 (d, *J* = 7.7 Hz, 1H), 7.85 (td, *J* = 7.7, 1.7 Hz, 2H), 7.44 (ddd, *J* = 7.7, 4.7, 1.0 Hz, 1H), 5.77 (s, 1H).

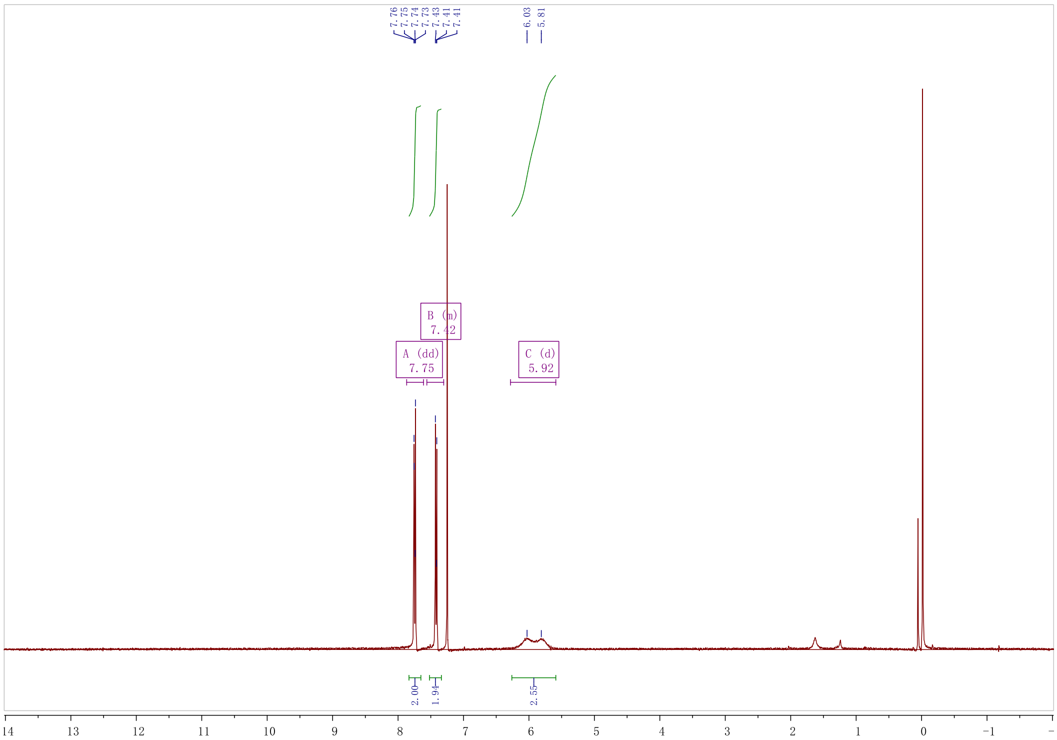


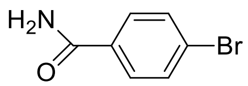
② 

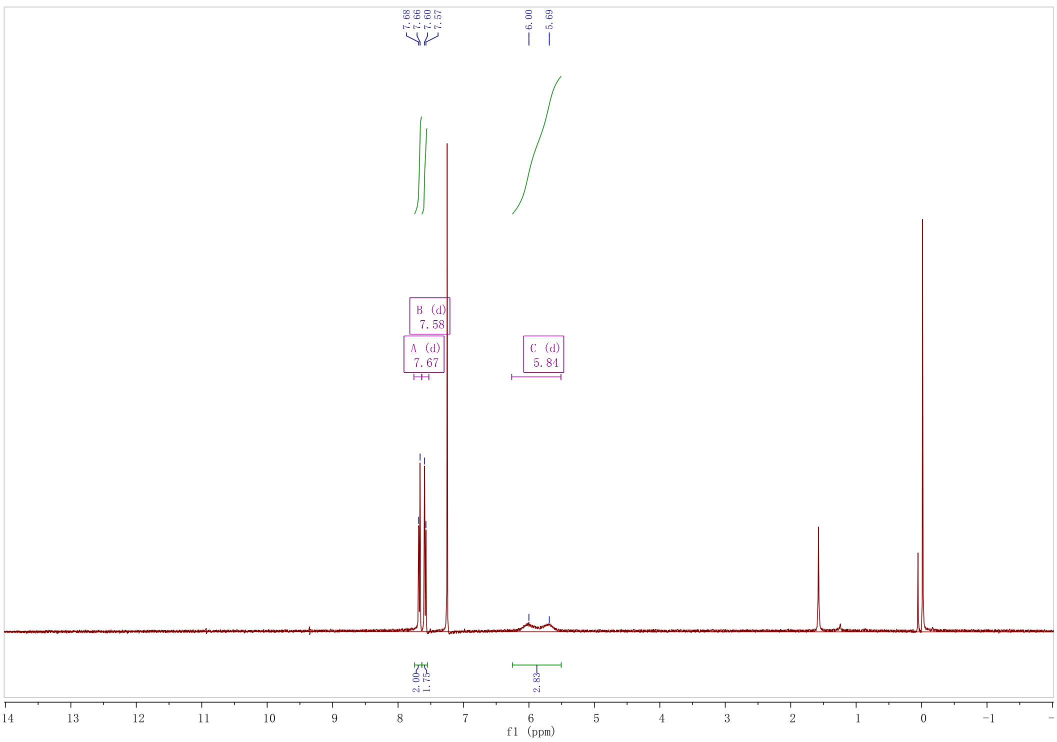
(Table 2, entry 4). [1]H NMR (400 MHz, $CDCl_3$) δ 7.96 – 7.67 (m, 2H), 7.12 (t, *J* = 8.5 Hz, 2H), 5.93 (d, *J* = 56.3 Hz, 2H).

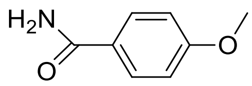


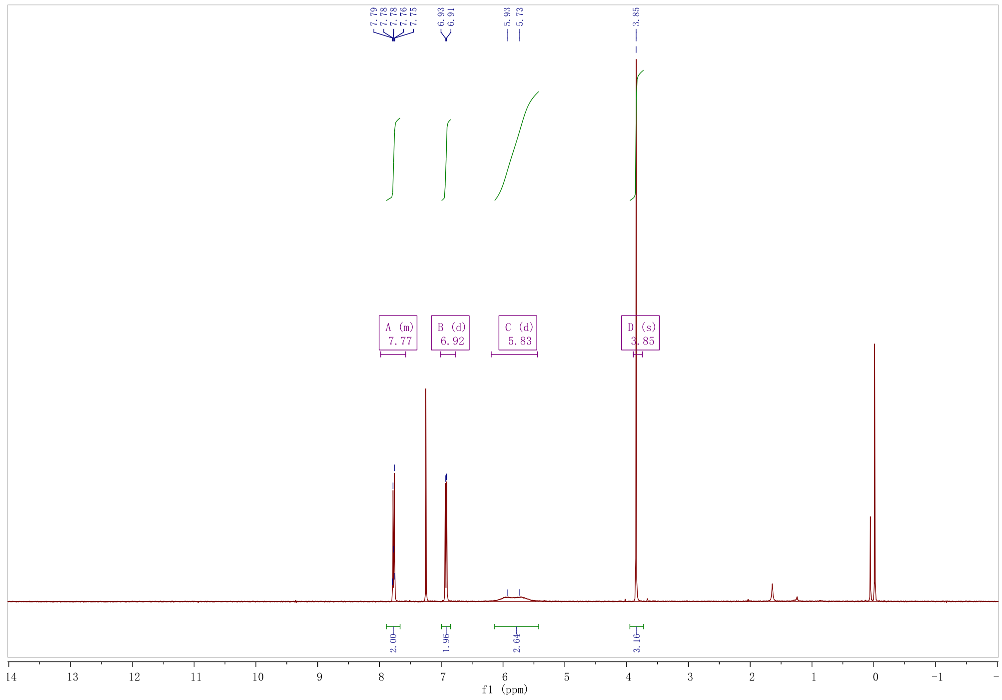
③  **(Table 2, entry 5).** [1]H NMR (400 MHz, $CDCl_3$) δ 7.75 (dd, *J* = 7.3, 1.5 Hz, 2H), 7.56 – 7.30 (m, 2H), 5.92 (d, *J* = 87.1 Hz,2H).

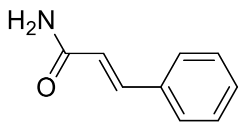


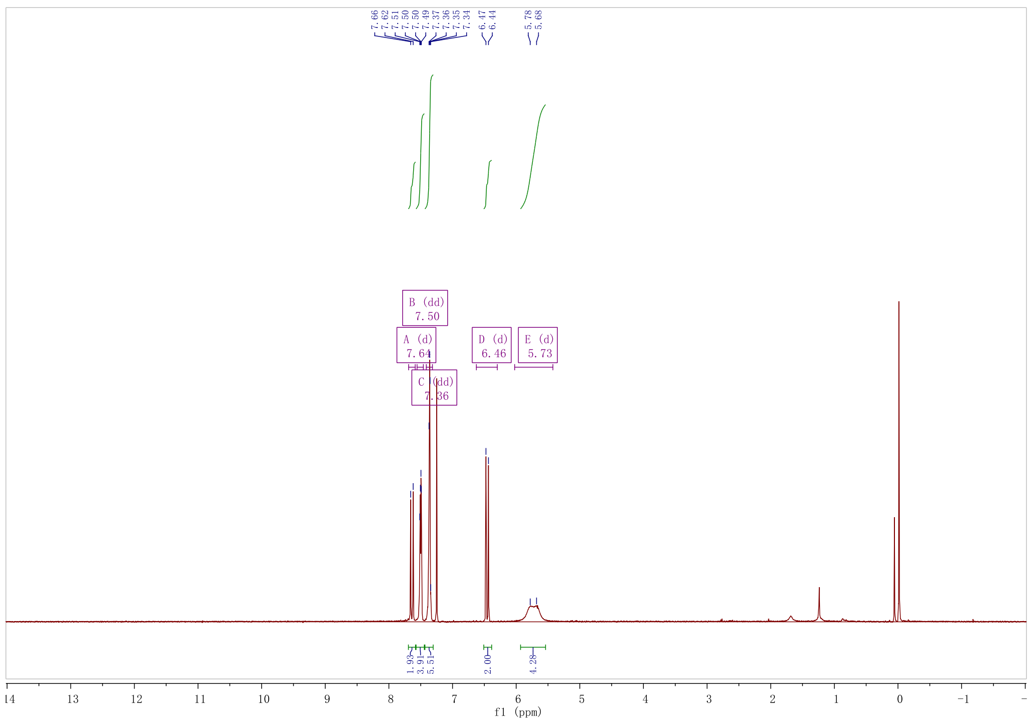
④  **(Table 2, entry 6).** [1]H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 8.6 Hz, 2H), 7.58 (d, *J* = 8.6 Hz, 2H), 5.84 (d, *J* = 124.3 Hz, 2H).

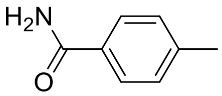


⑤  **(Table 2, entry 3).** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 – 7.58 (m, 2H), 6.92 (d, J = 8.8 Hz, 2H), 5.83 (d, J = 81.6 Hz, 2H), 3.85 (s, 3H).

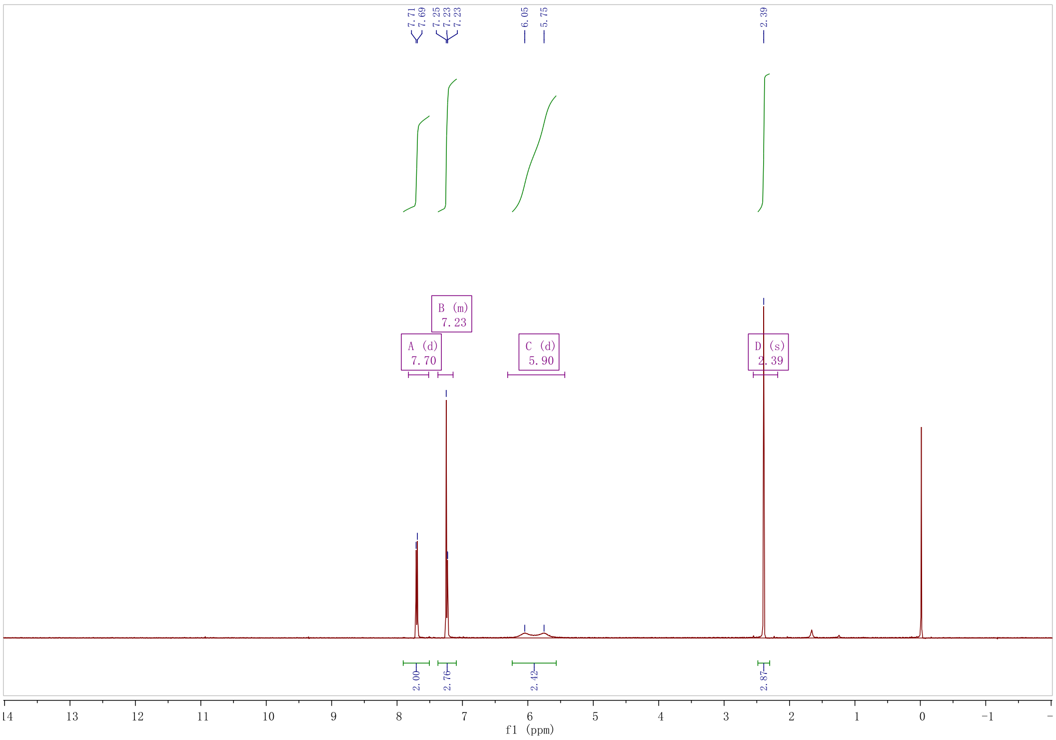


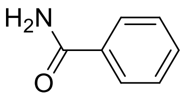
⑥  **(Table 2, entry 10).** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 15.7 Hz, 1H), 7.50 (dd, J = 6.5, 3.1 Hz, 2H), 7.36 (dd, J = 6.3, 4.0 Hz, 3H), 6.46 (d, J = 15.7 Hz, 1H), 5.73 (d, J = 39.7 Hz, 2H).



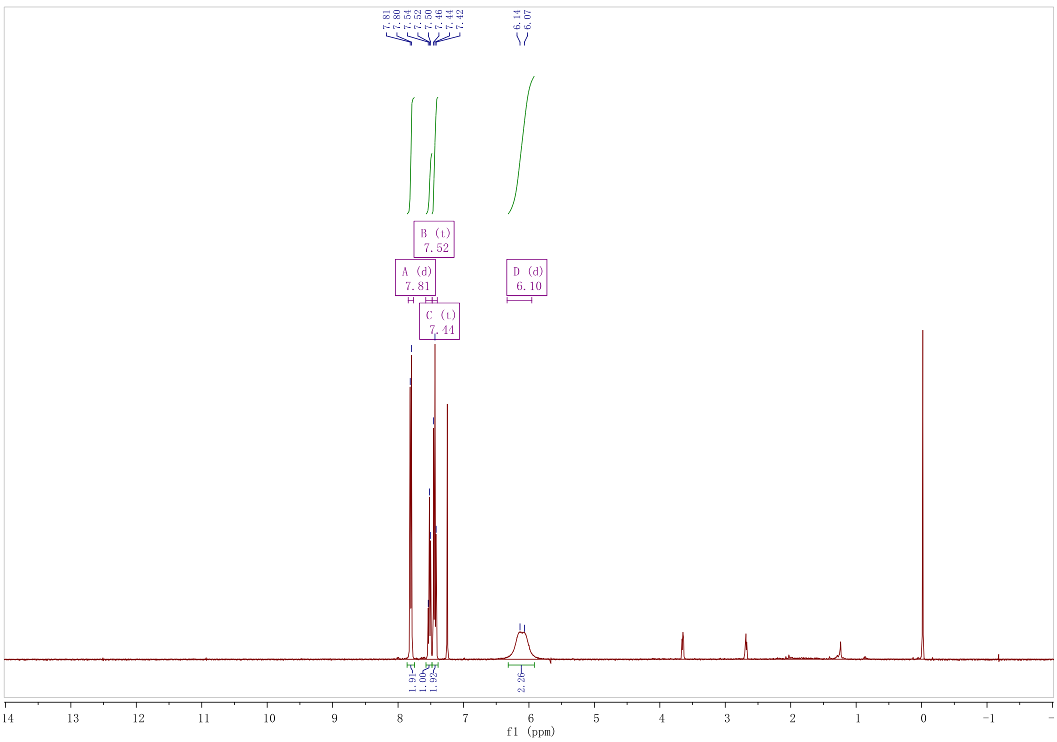
⑦ 

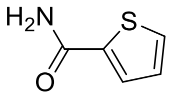
(Table 2, entry 2). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, J = 8.1 Hz, 2H), 7.37 – 7.14 (m, 2H), 5.90 (d, J = 118.0 Hz, 2H), 2.39 (s, 3H).

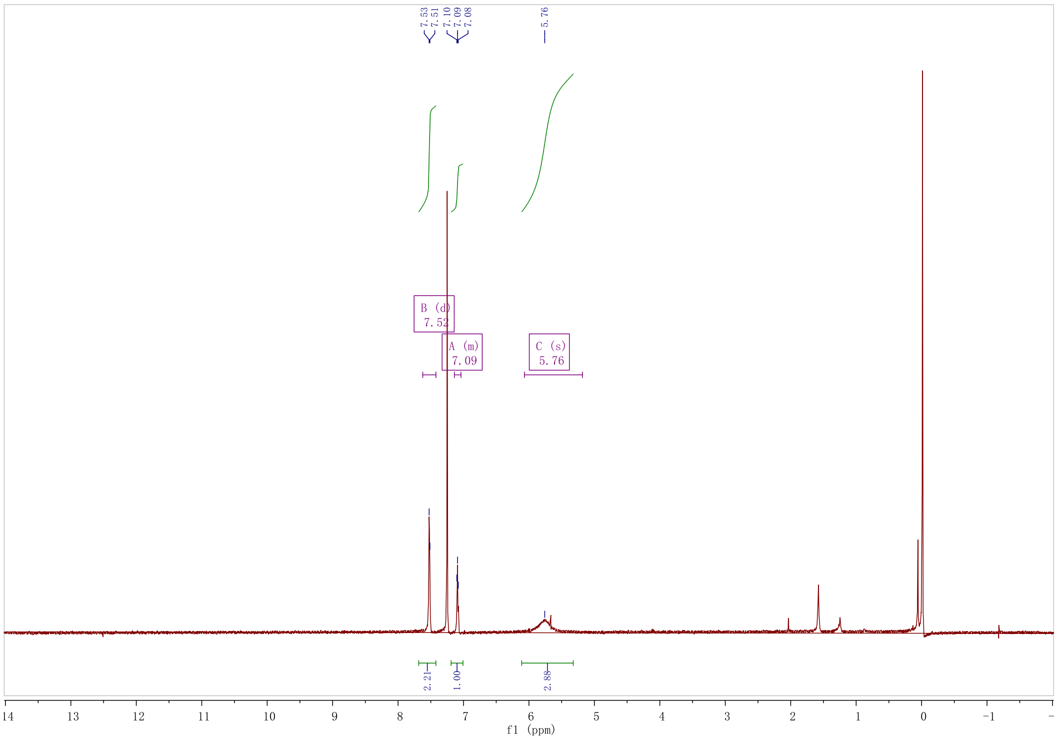


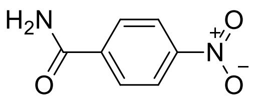
⑧ 

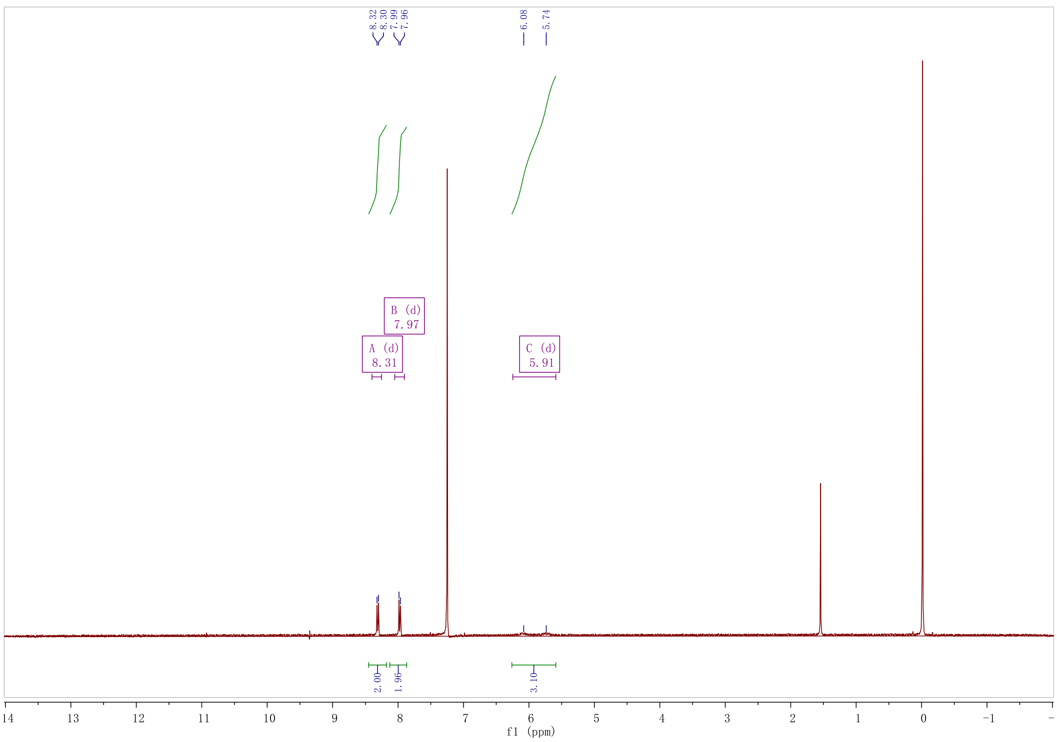
(Table 2, entry 1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.81 (d, J = 7.4 Hz, 2H), 7.52 (t, J = 7.4 Hz, 1H), 7.44 (t, J = 7.4Hz, 2H), 6.10 (d, J = 27.2 Hz, 2H).

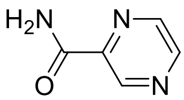


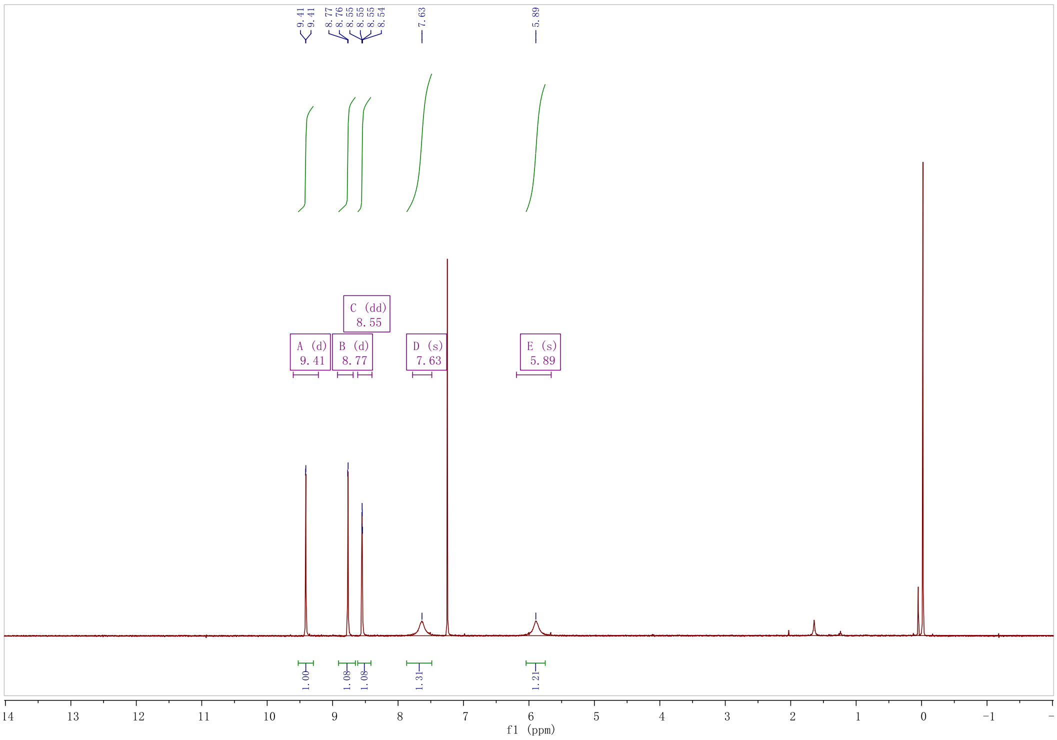
⑨  **(Table 2, entry 11).** ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52 (d, *J* = 4.7 Hz, 2H), 7.14 – 7.04 (m, 1H), 5.76 (s, 2H).

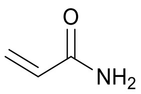


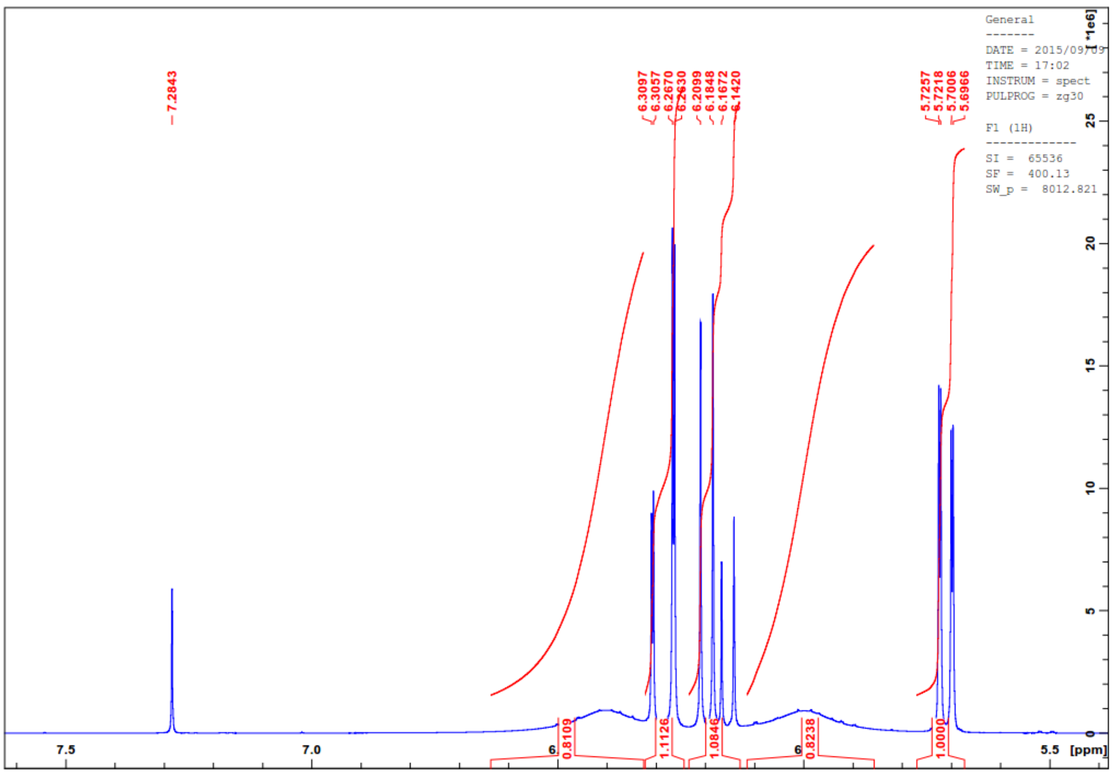
⑩  **(Table 2, entry 7).** ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.31 (d, *J* = 8.7 Hz, 2H), 7.97 (d, *J* = 8.7 Hz, 2H), 5.91 (d, *J* = 137.5 Hz, 2H).

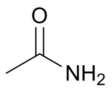


⑪  **(Table 2, entry 12).** ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.41 (d, J = 1.4 Hz, 1H), 8.77 (d, J = 2.4 Hz, 1H), 8.55 (dd, J = 2.4, 1.5 Hz, 1H), 7.63 (s, 1H), 5.89 (s, 1H).



⑫  **(Table 2, entry 9).** ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.50 – 6.33 (m, 1H), 6.29 (dd, J = 17.1, 1.6 Hz, 1H), 6.18 (dd, J = 17.1, 10.1 Hz, 1H), 6.12 – 5.87 (m, 1H), 5.71 (dd, J = 10.0, 1.6 Hz, 1H).





⑬ (Table 2, entry 8). [1]H NMR (400 MHz, $CDCl_3$) δ 6.05 (d, *J* = 86.8 Hz, 2H), 1.99 (s, 3H).