

Supplementary Material (ESI) for RSC Adv.

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Supplementary information

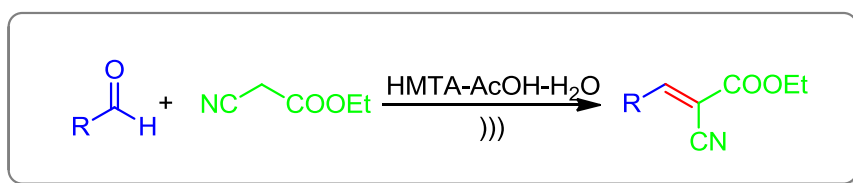
Rapid and efficient Knoevenagel condensation catalyzed by novel protic ionic liquid under ultrasonic irradiation

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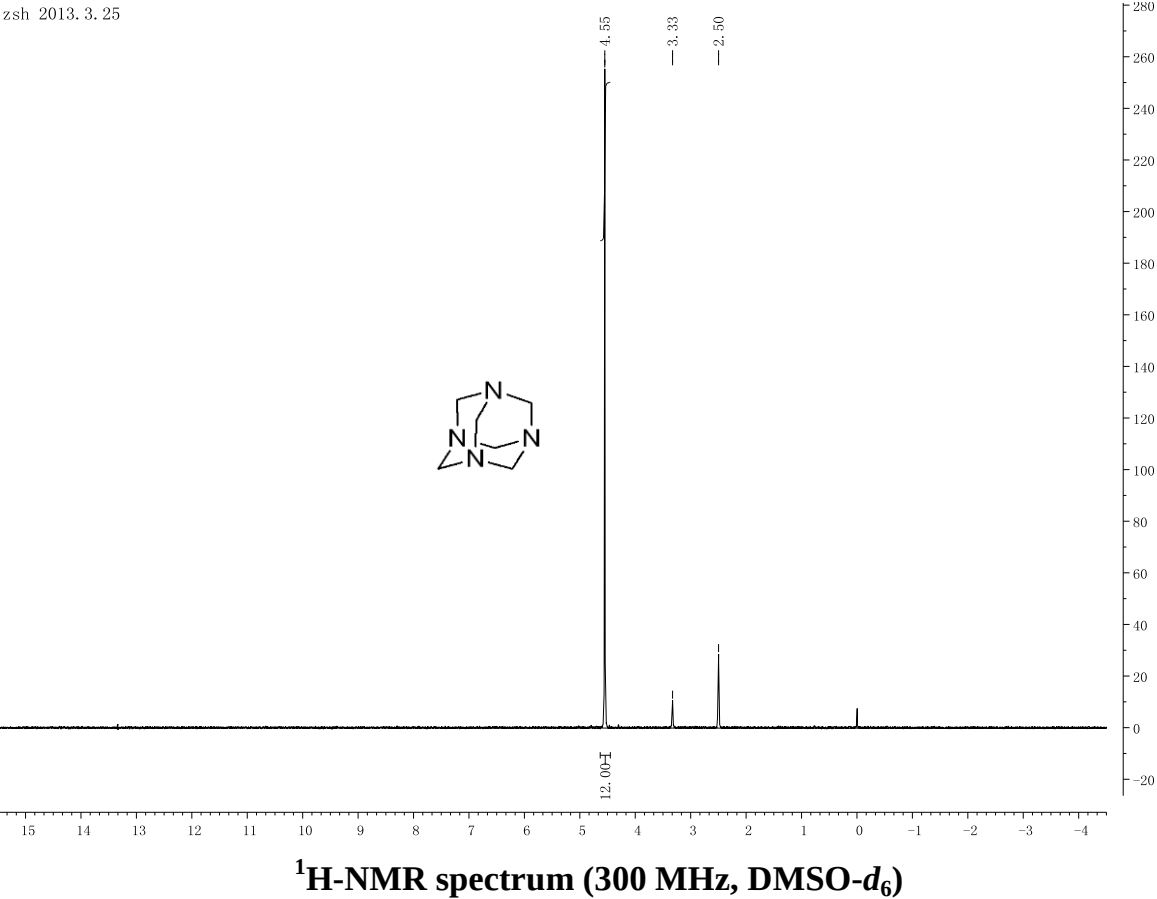
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Corresponding author. Tel.: 8603517018113; fax: 8603517018113;
e-mail: lwzhang@sxu.edu.cn

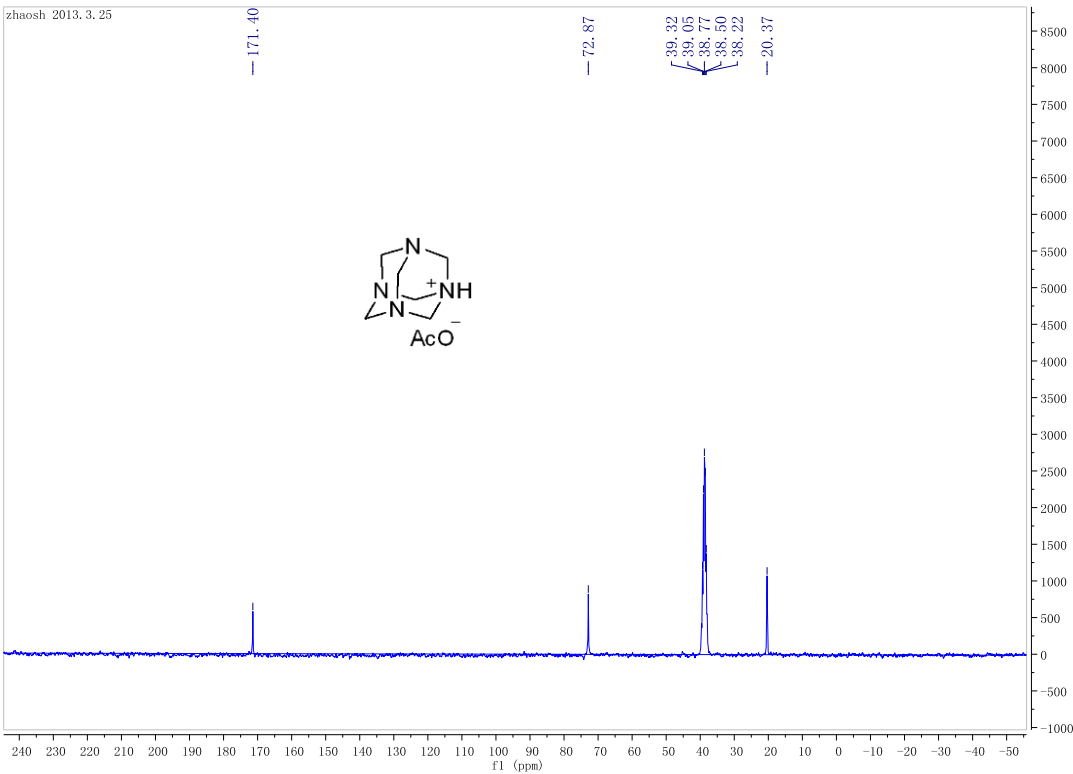
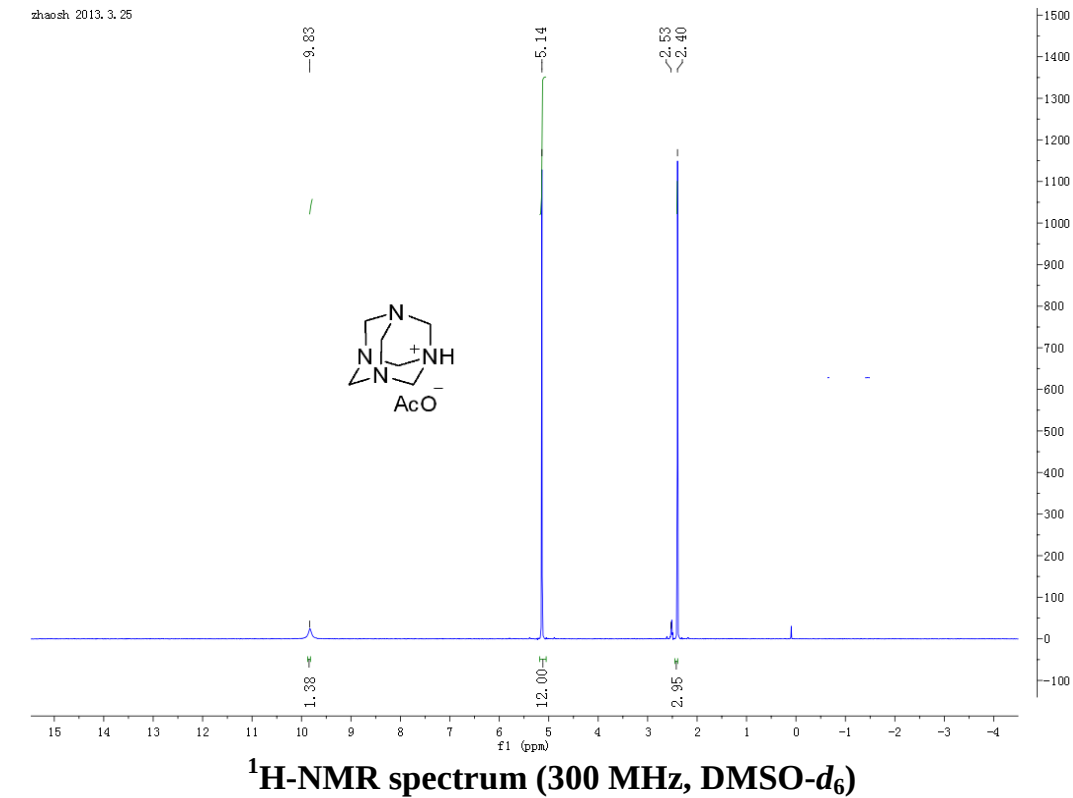


**The NMR spectra for the catalyst HMTA,
HMTA-AcOH and products**

The catalyst HMTA

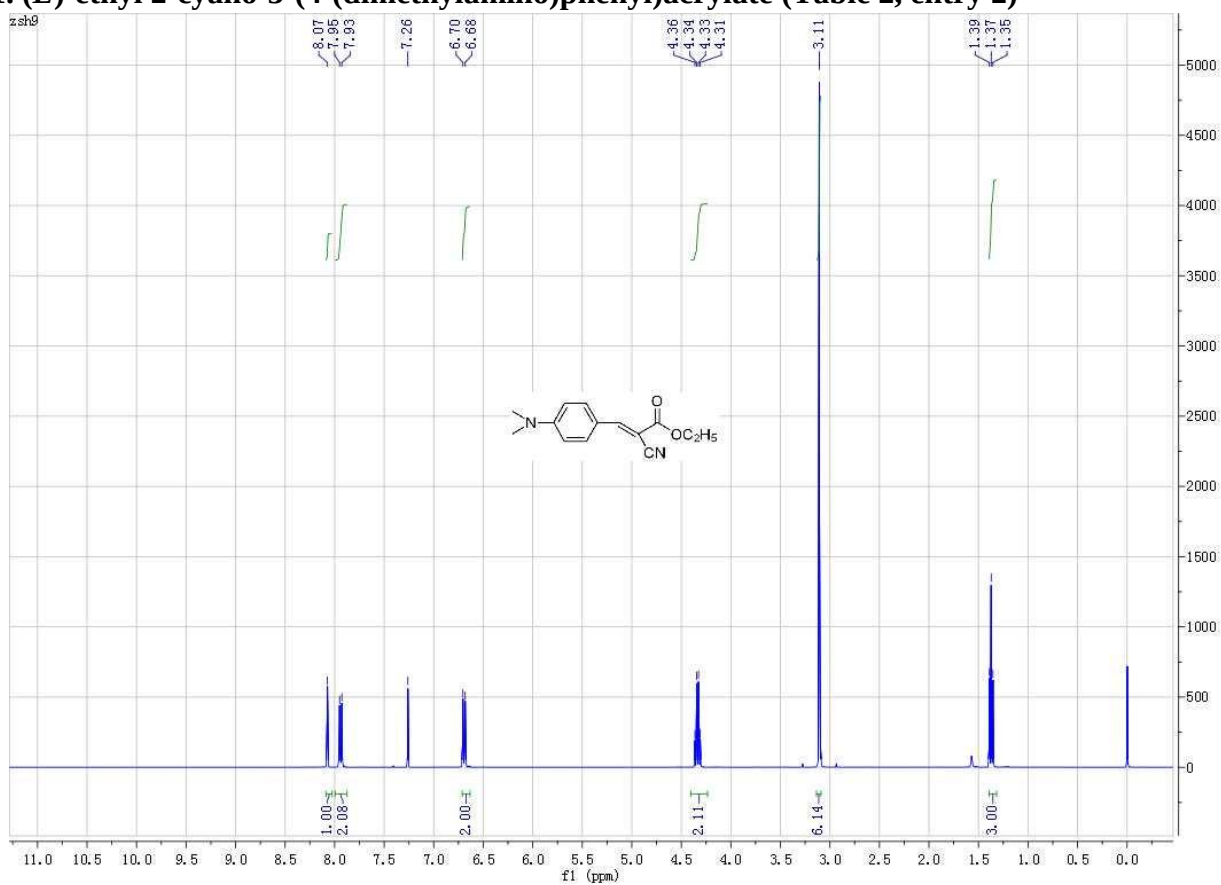


The catalyst HMTA-AcOH

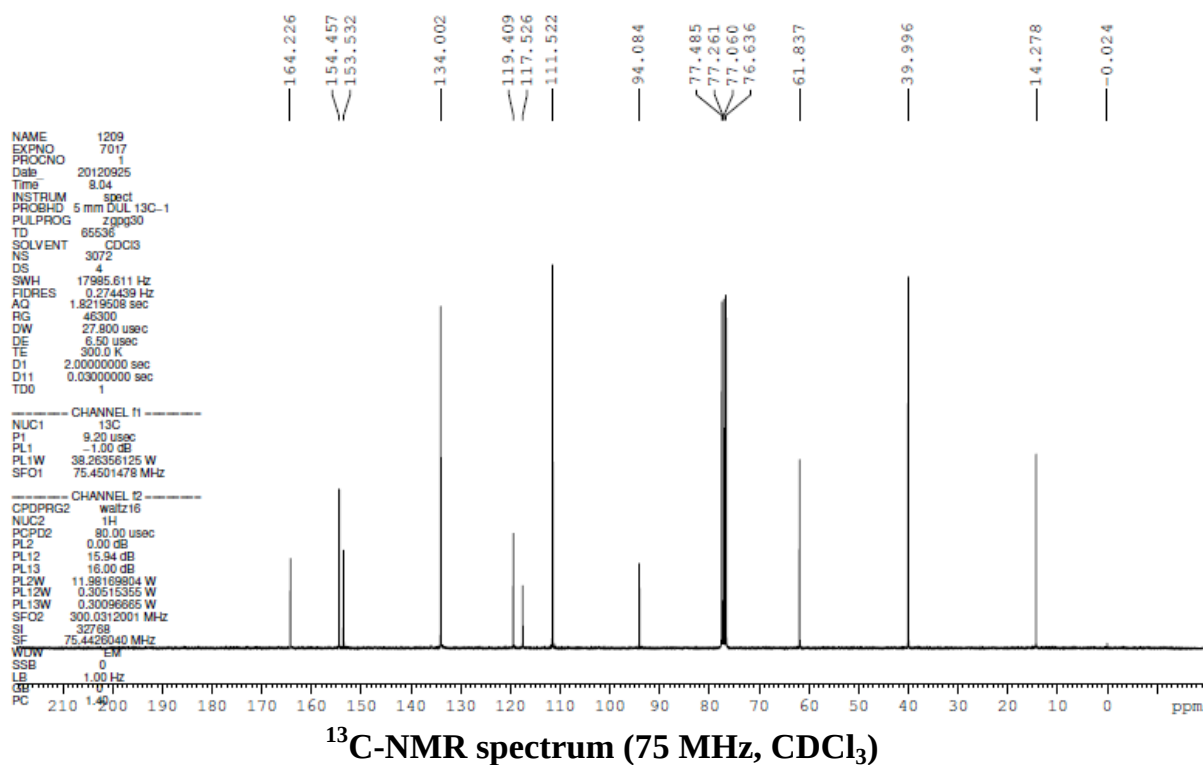


^{13}C -NMR spectrum (75 MHz, $\text{DMSO-}d_6$)

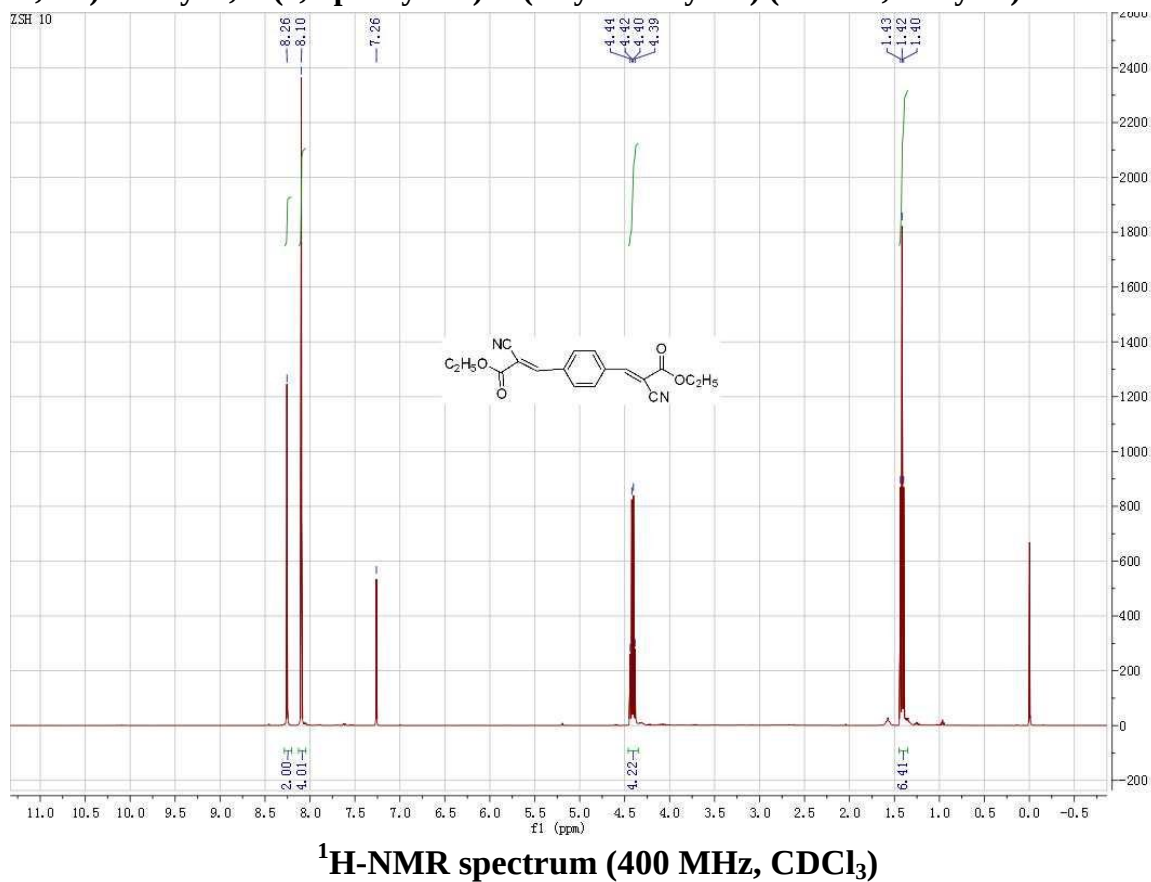
1. (*E*)-ethyl 2-cyano-3-(4-(dimethylamino)phenyl)acrylate (Table 2, entry 2)

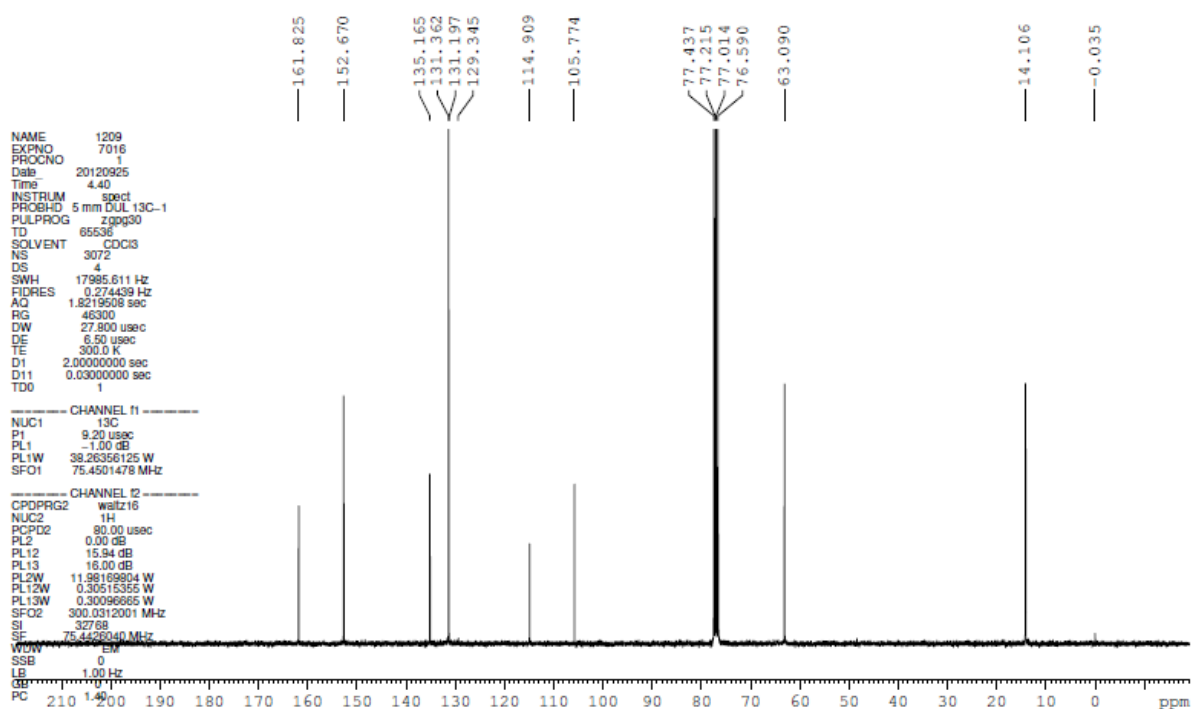


^1H -NMR spectrum (400 MHz, CDCl_3)



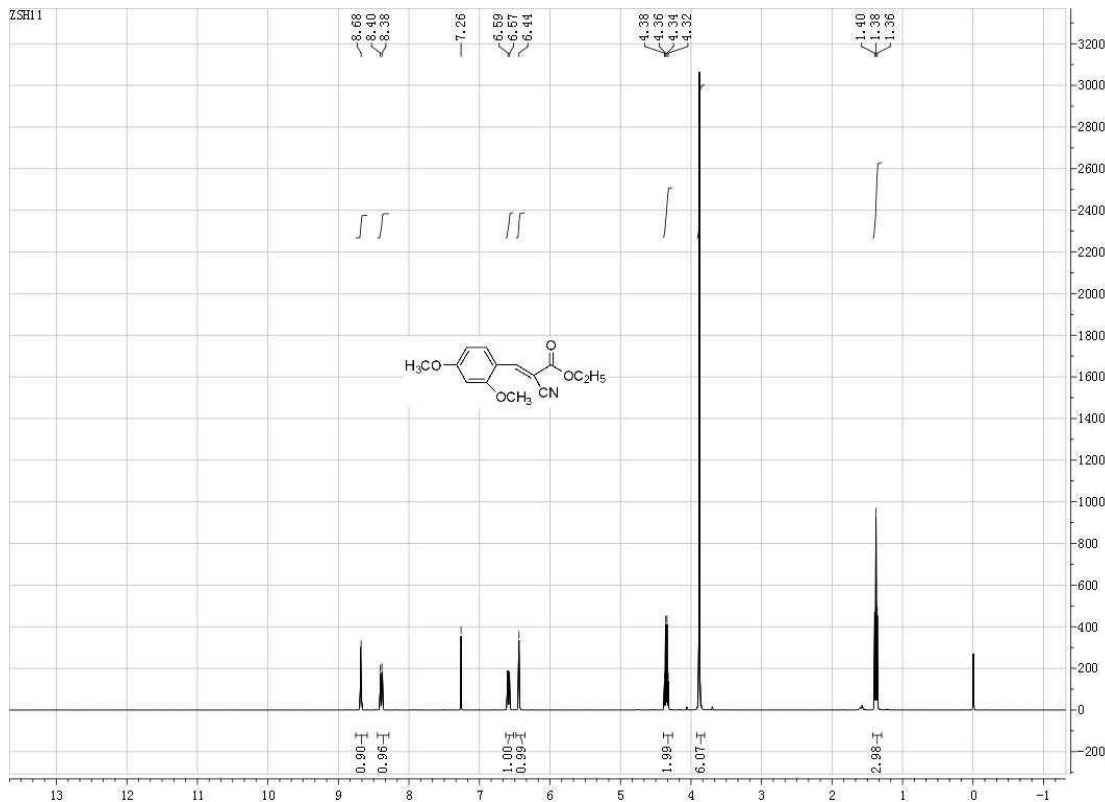
2. (2E,2'E)-diethyl 3,3'-(1,4-phenylene)bis(2-cyanoacrylate) (Table 2, entry 15)



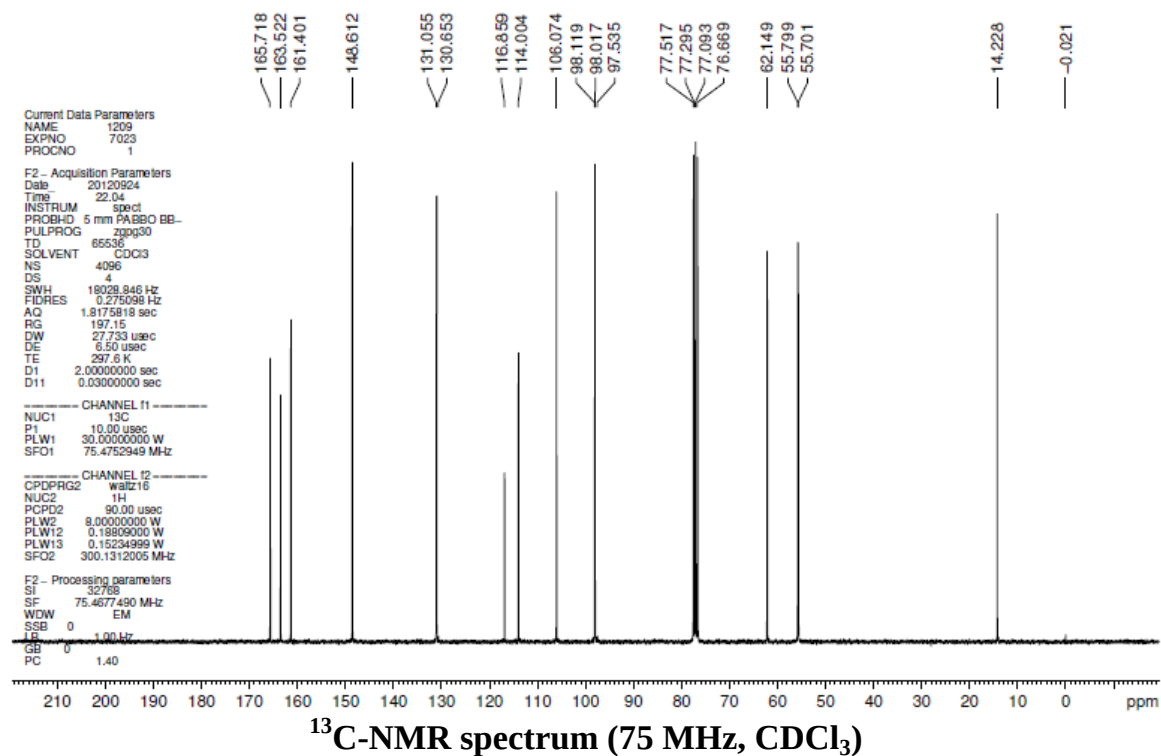


^{13}C -NMR spectrum (75 MHz, CDCl_3)

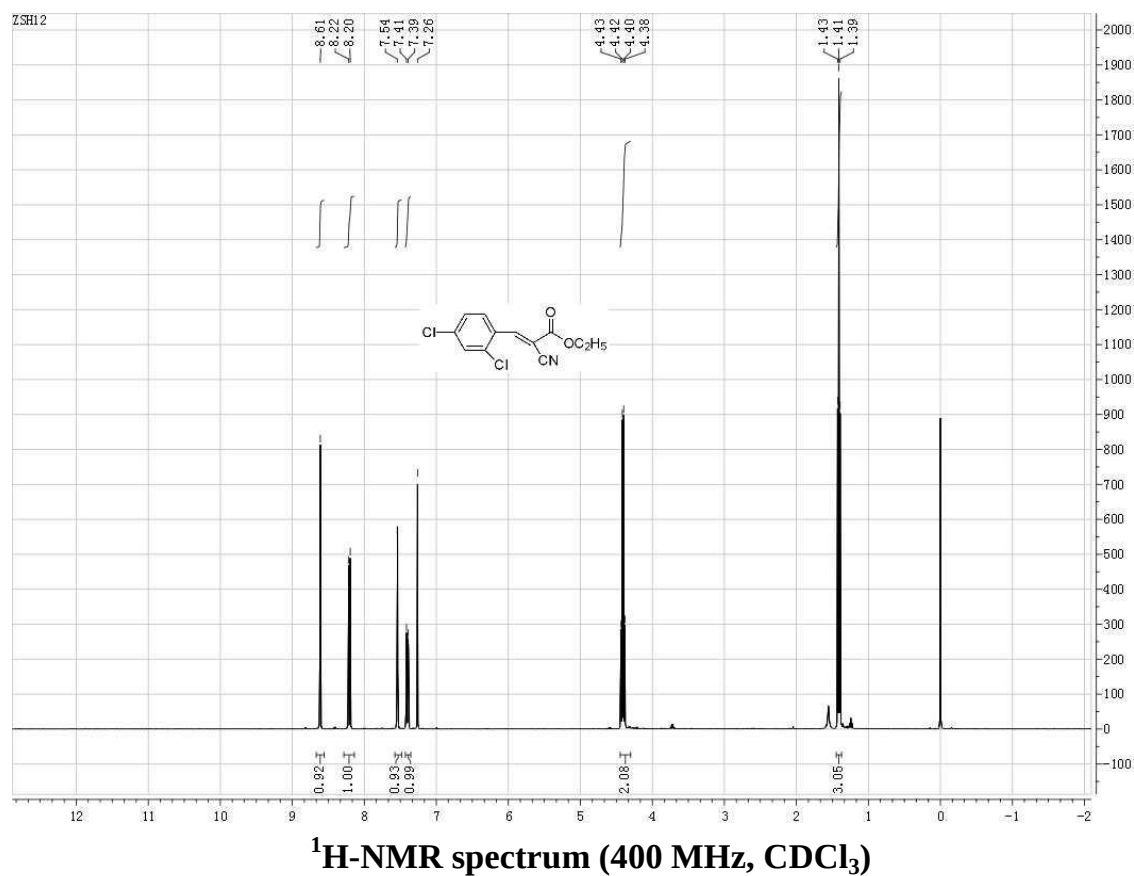
3. (*E*)-ethyl 2-cyano-3-(2,4-dimethoxyphenyl)acrylate (Table 2, entry 7)

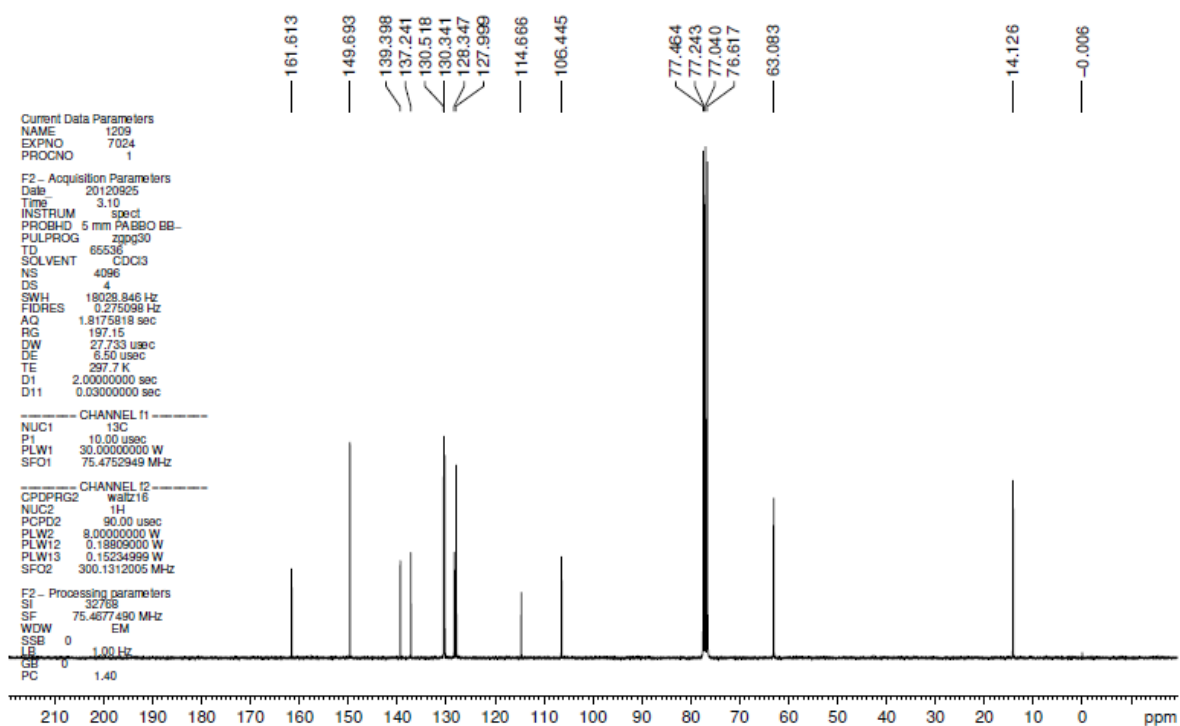


^1H -NMR spectrum (400 MHz, CDCl_3)



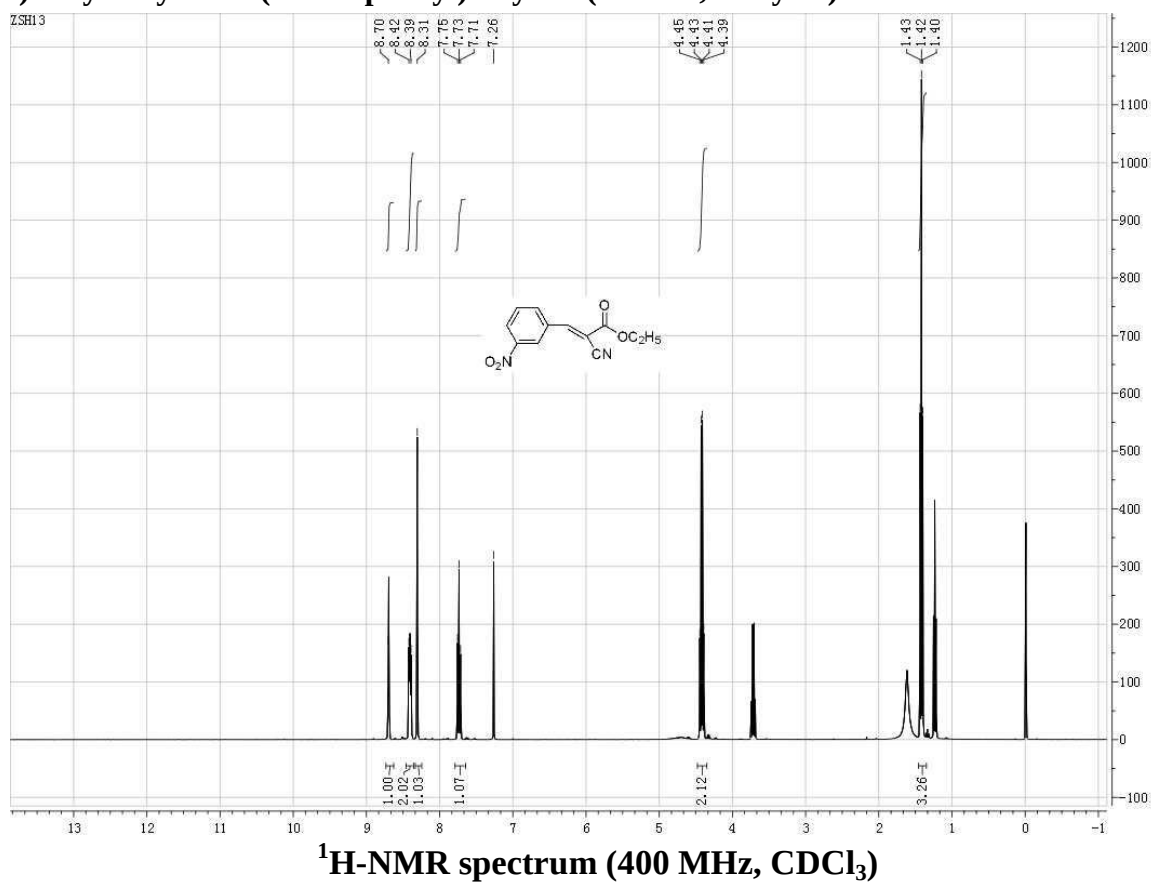
4. (*E*)-ethyl 2-cyano-3-(2,4-dichlorophenyl)acrylate (Table 2, entry 10)



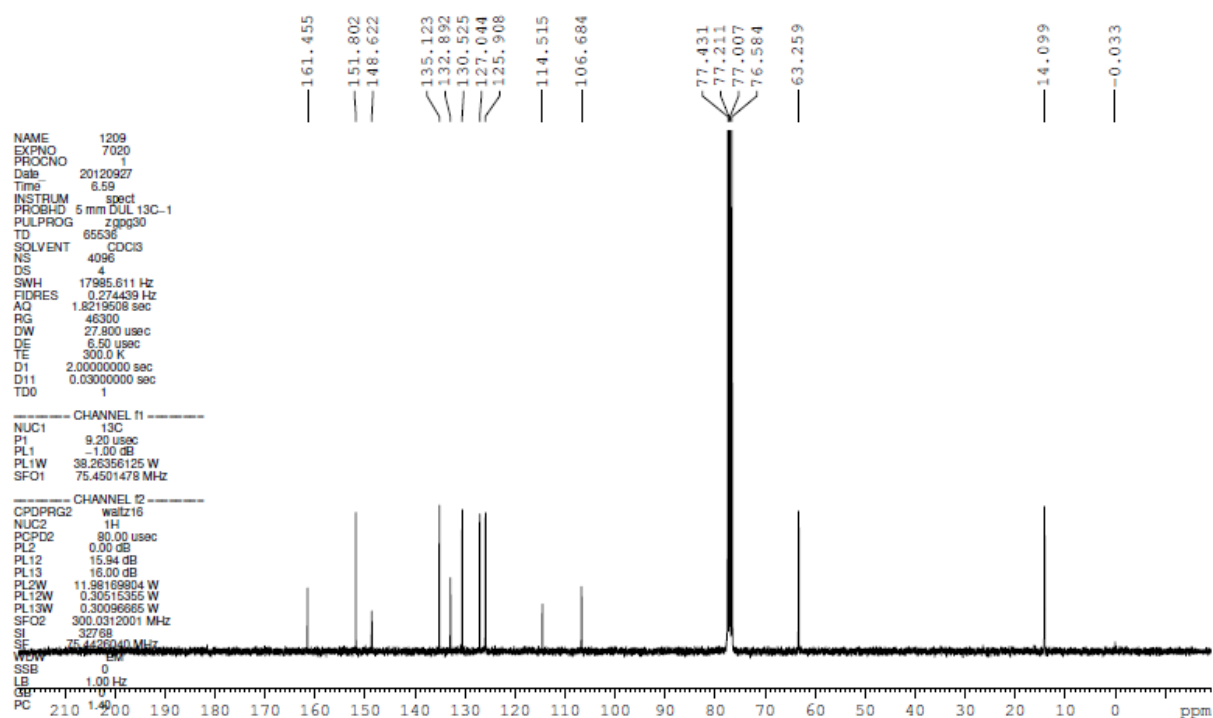


^{13}C -NMR spectrum (75 MHz, CDCl_3)

5. (*E*)-ethyl 2-cyano-3-(3-nitrophenyl)acrylate (Table 2, entry 13)

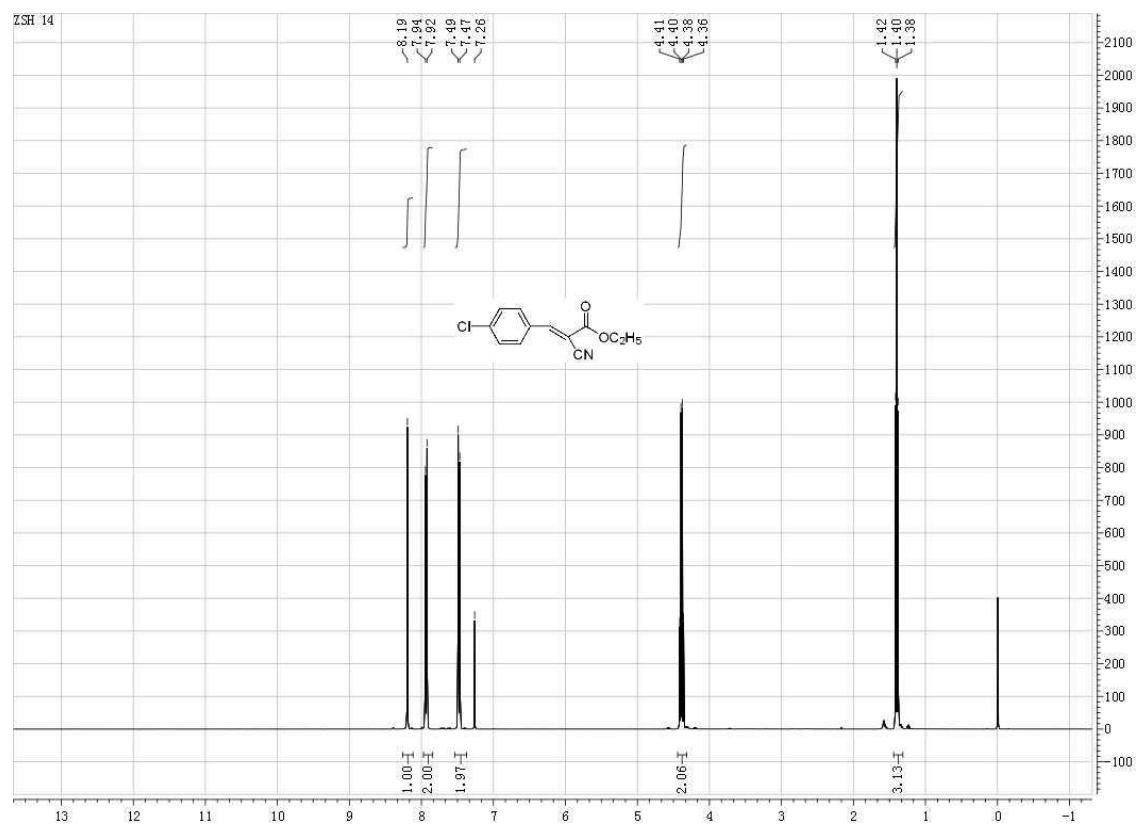


^1H -NMR spectrum (400 MHz, CDCl_3)

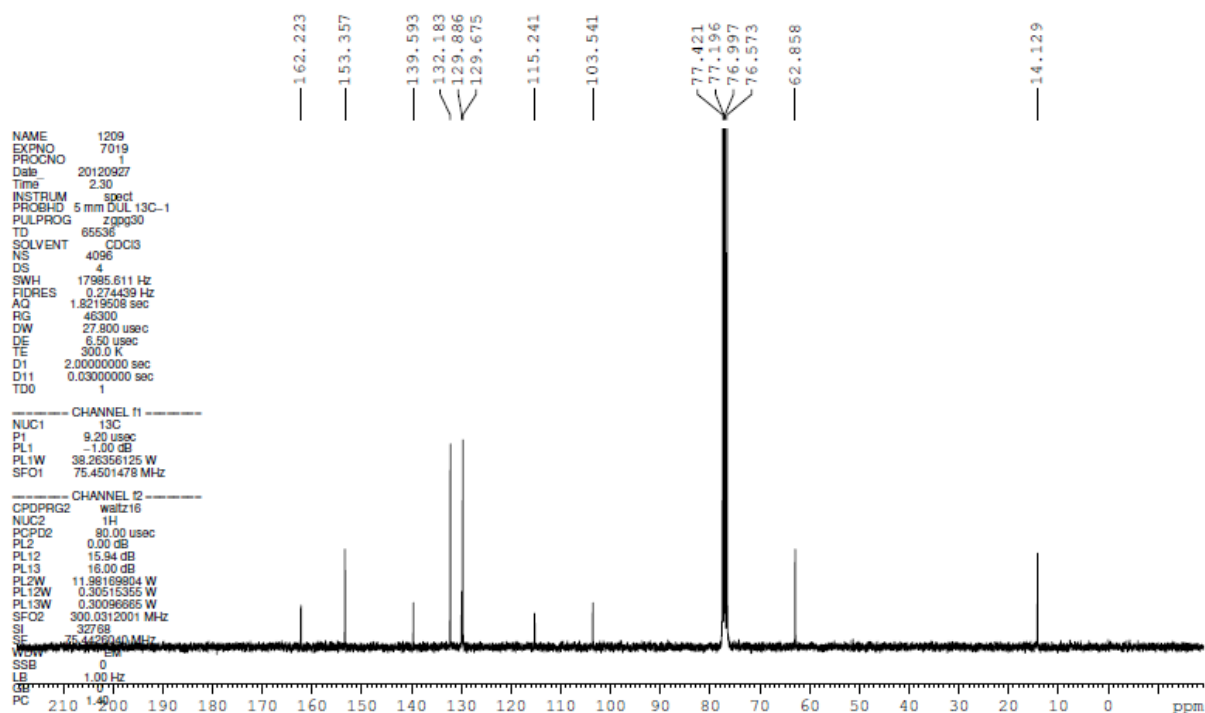


^{13}C -NMR spectrum (75 MHz, CDCl_3)

6. (*E*)-ethyl 3-(4-chlorophenyl)-2-cyanoacrylate (Table 2, entry 9)

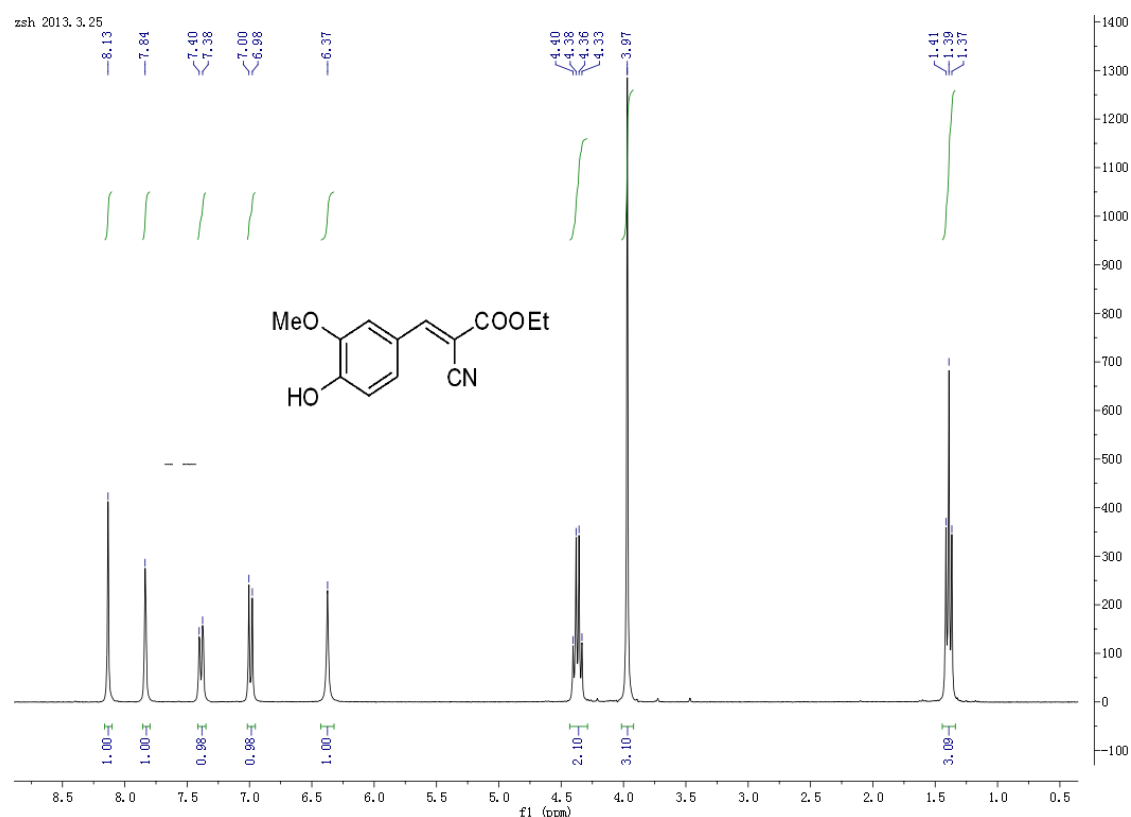


^1H -NMR spectrum (400 MHz, CDCl_3)



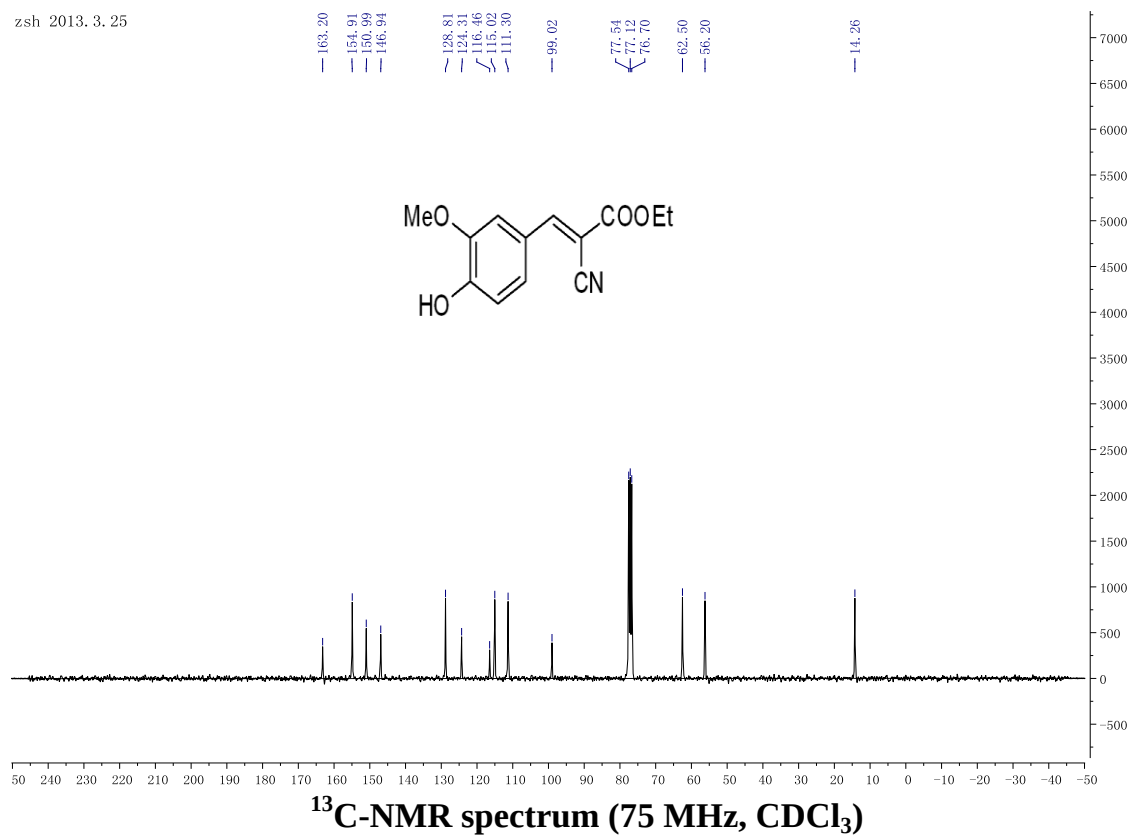
¹³C-NMR spectrum (75 MHz, CDCl₃)

7. (*E*)-ethyl 2-cyano-3-(4-hydroxy-3-methoxyphenyl)acrylate (Table 2, entry 6)

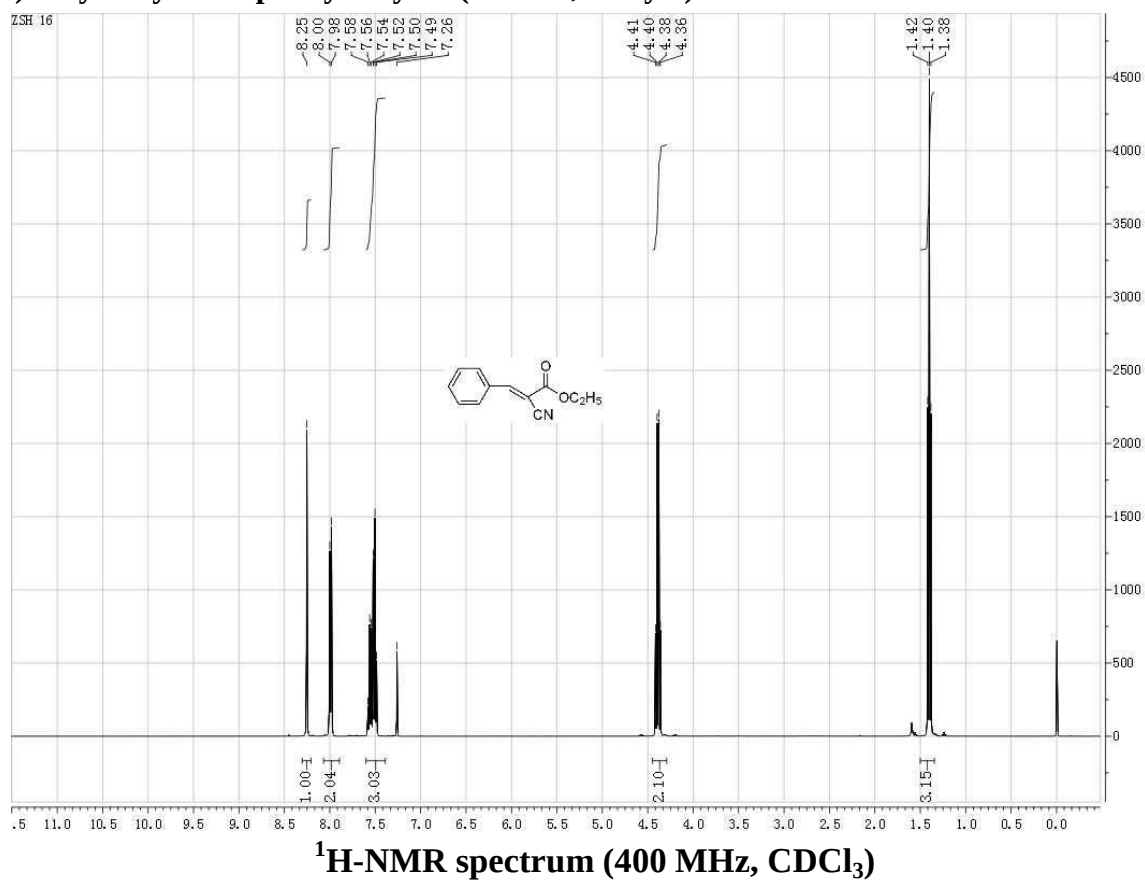


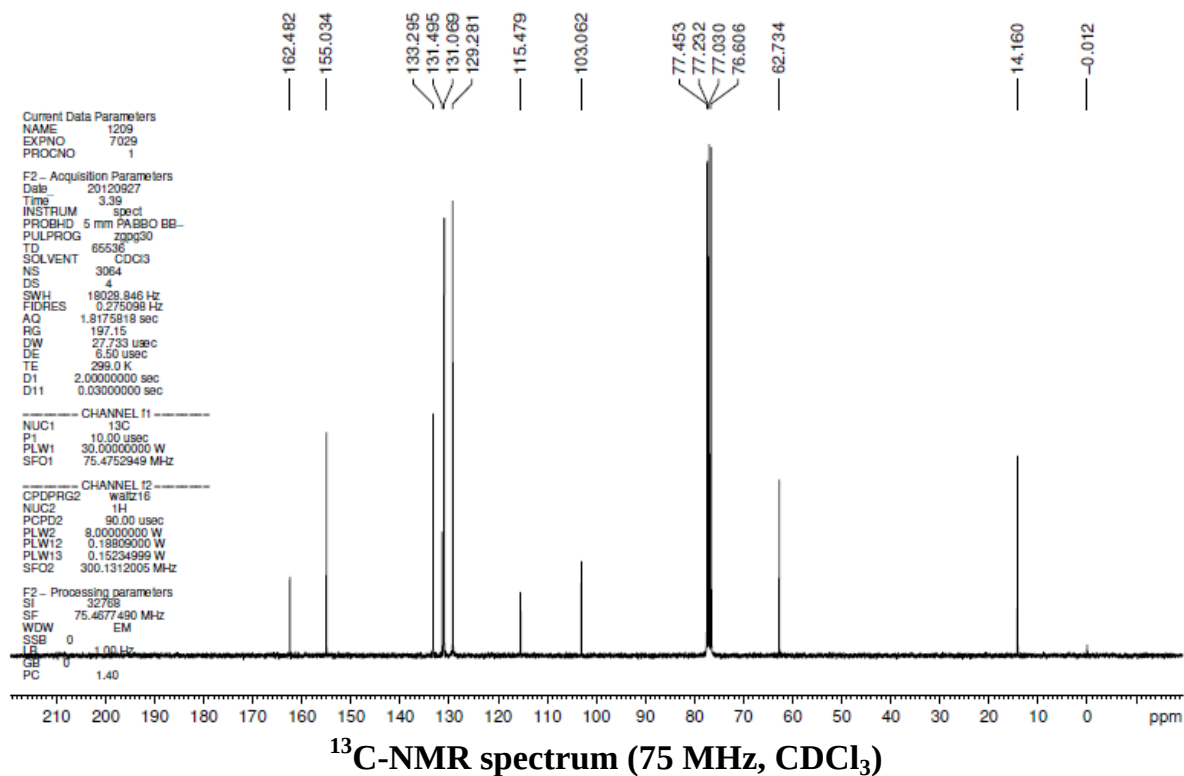
¹H-NMR spectrum (300 MHz, CDCl₃)

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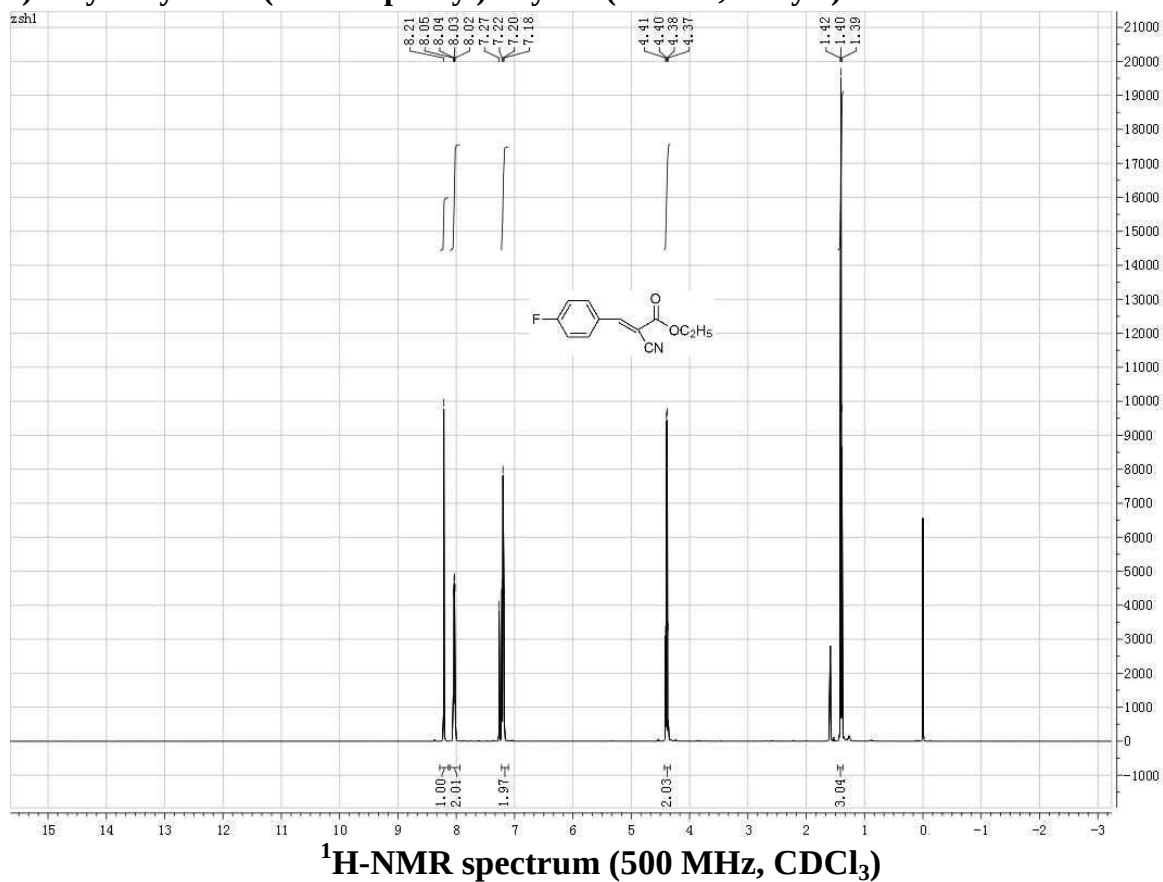


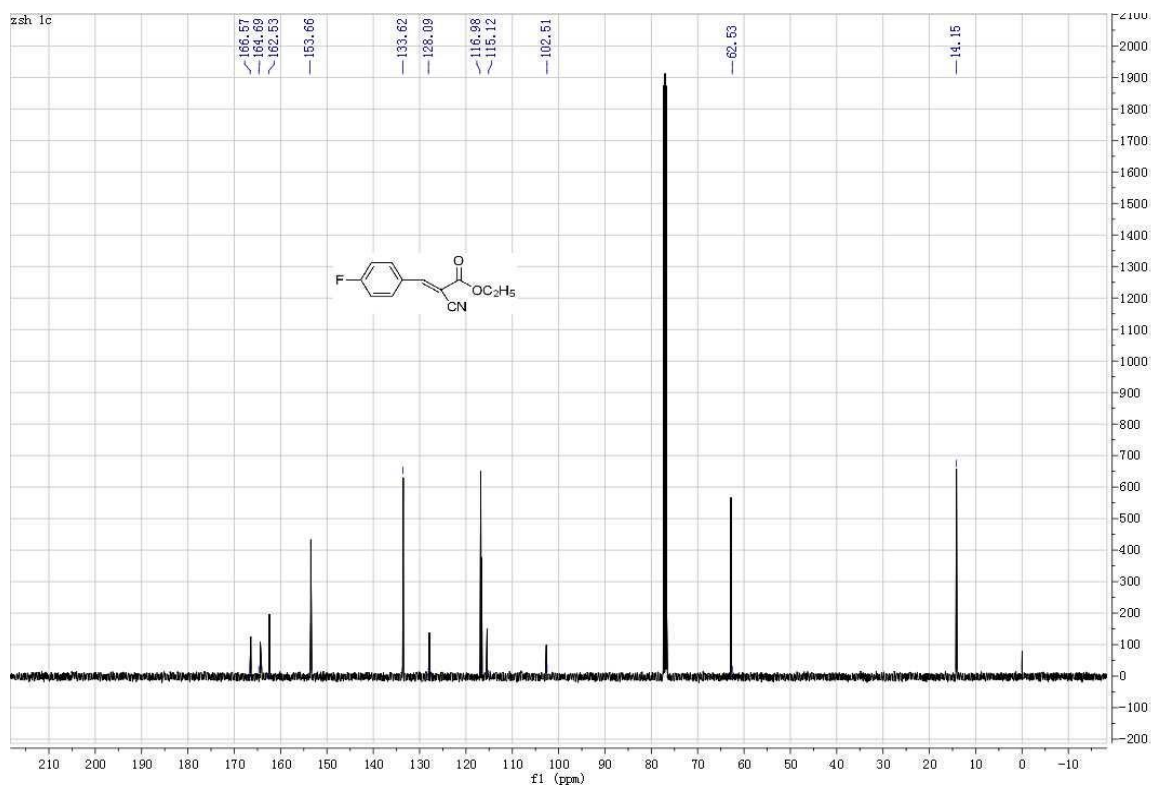
8. (*E*)-ethyl 2-cyano-3-phenylacrylate (Table 2, entry 1)



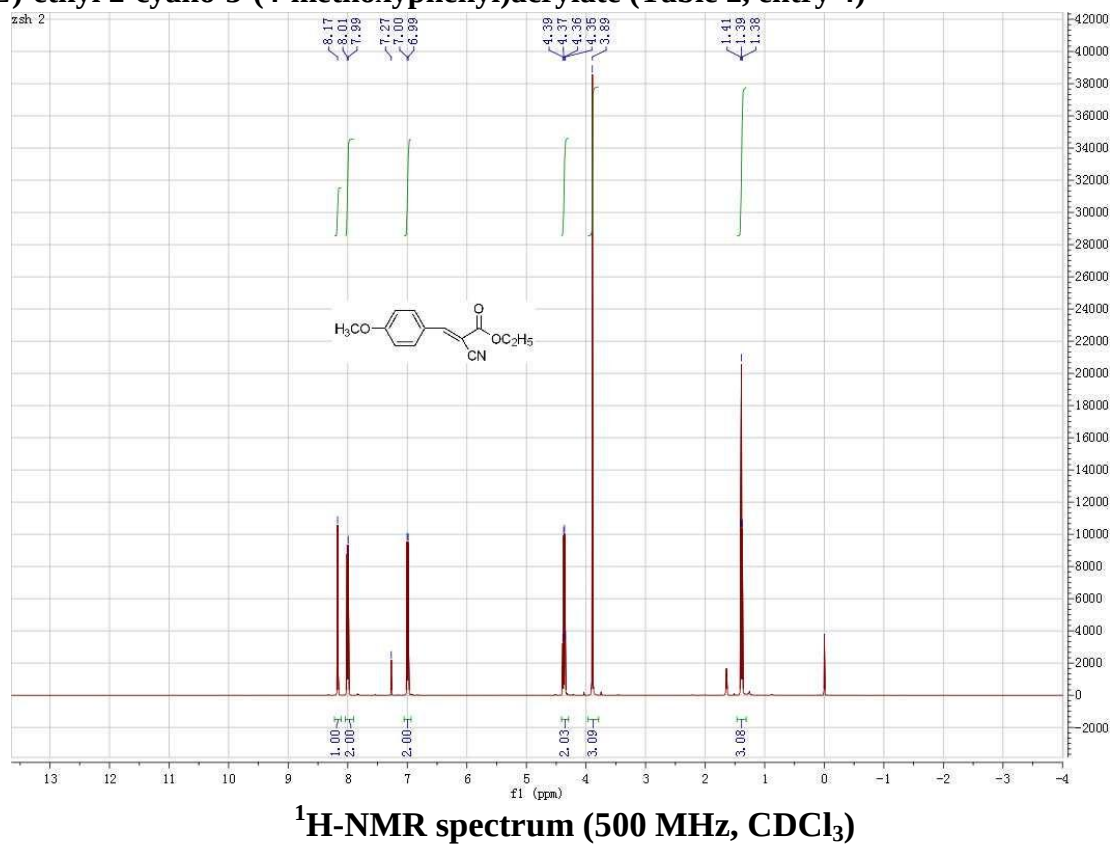


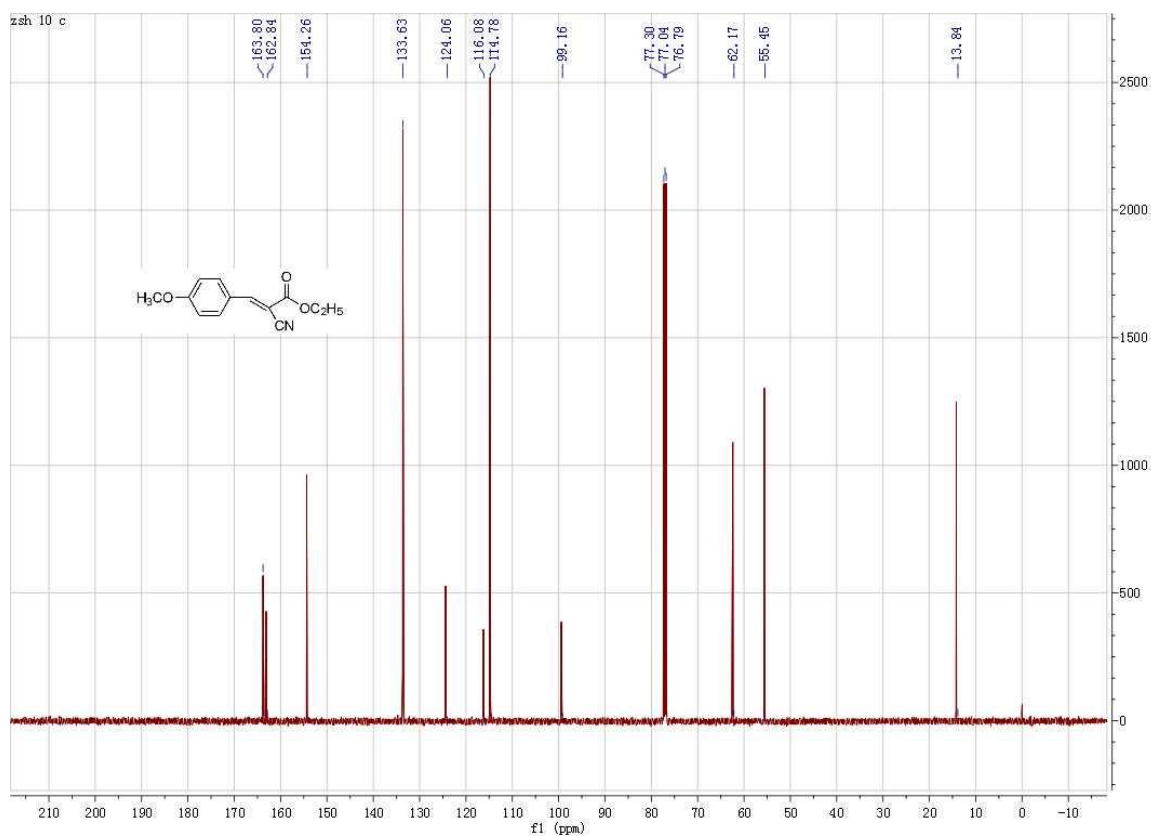
9. (E)-ethyl 2-cyano-3-(4-fluorophenyl)acrylate (Table 2, entry 8)





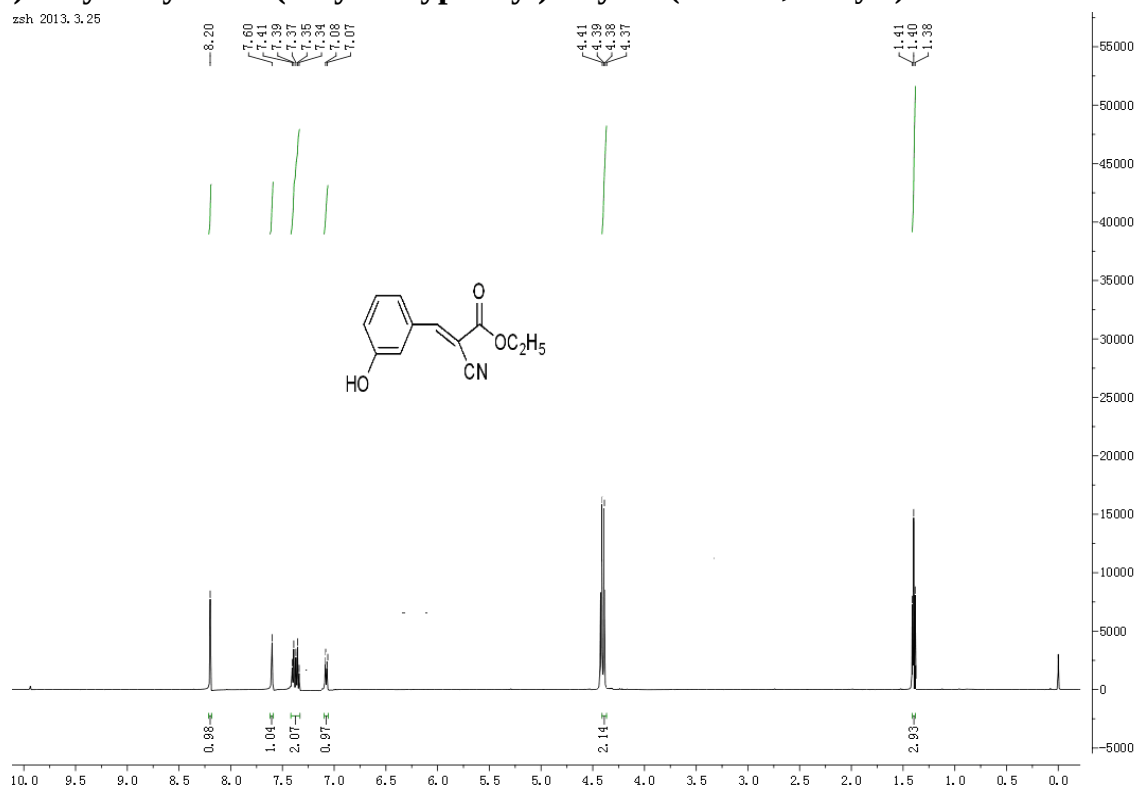
10. (*E*)-ethyl 2-cyano-3-(4-methoxyphenyl)acrylate (Table 2, entry 4)



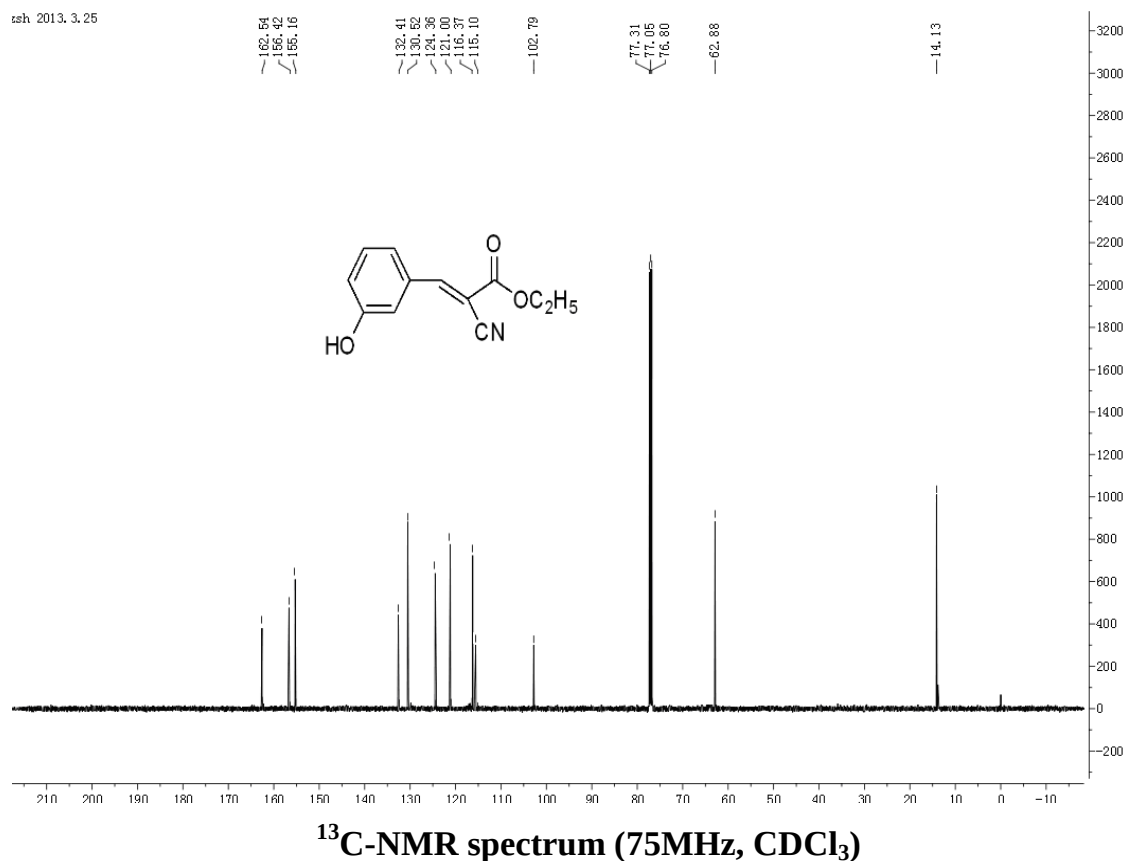


¹³C-NMR spectrum (126MHz, CDCl₃)

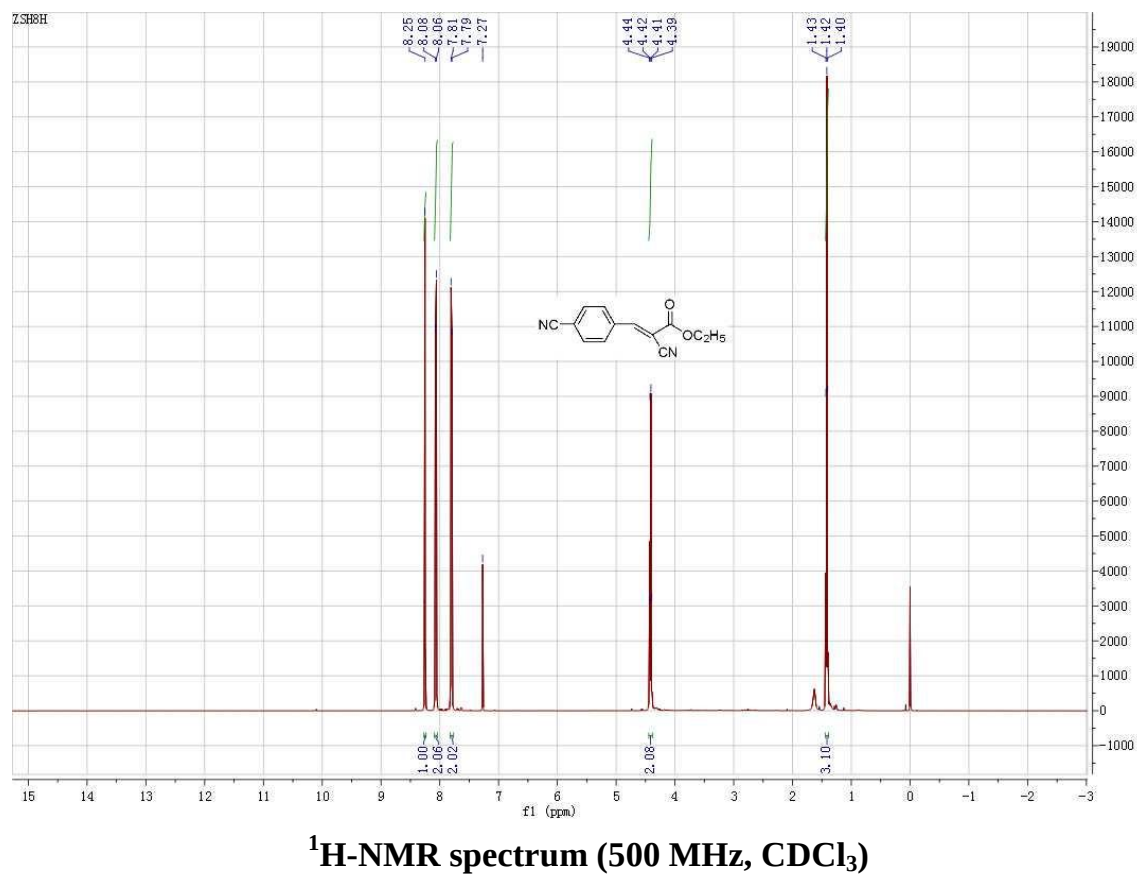
11(*E*)-ethyl 2-cyano-3-(3-hydroxyphenyl)acrylate (Table 2, entry 3)

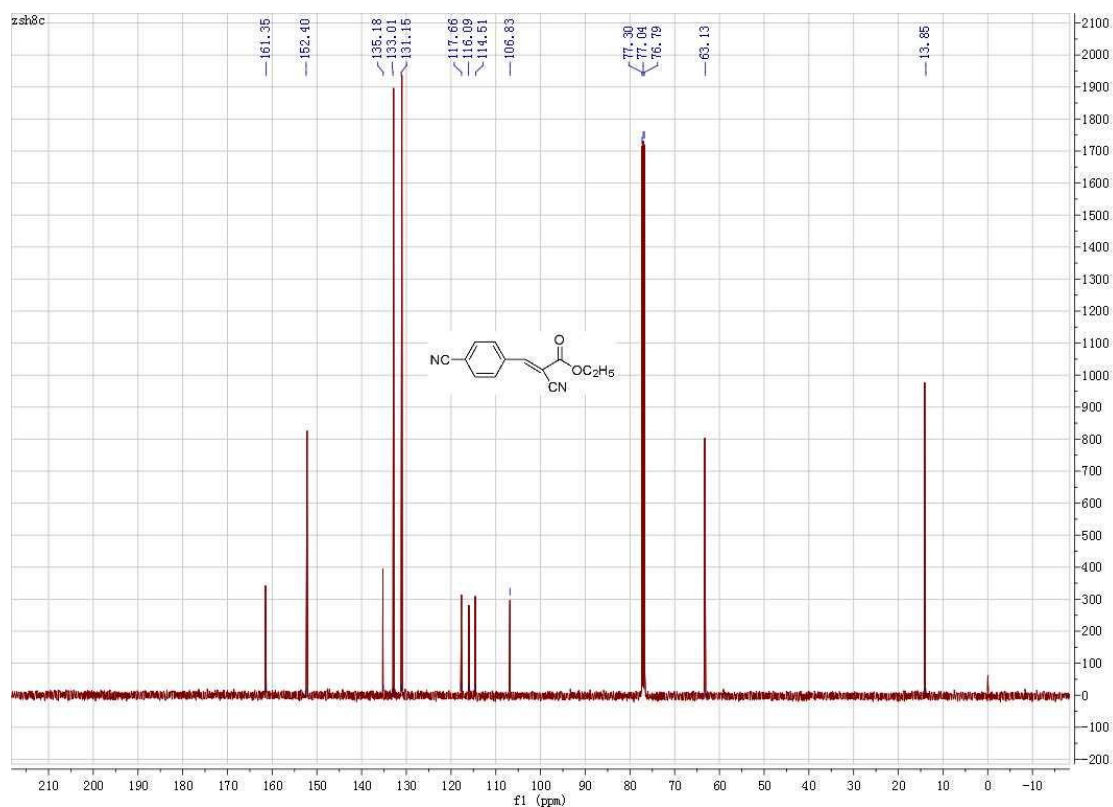


¹H-NMR spectrum (300 MHz, CDCl₃)



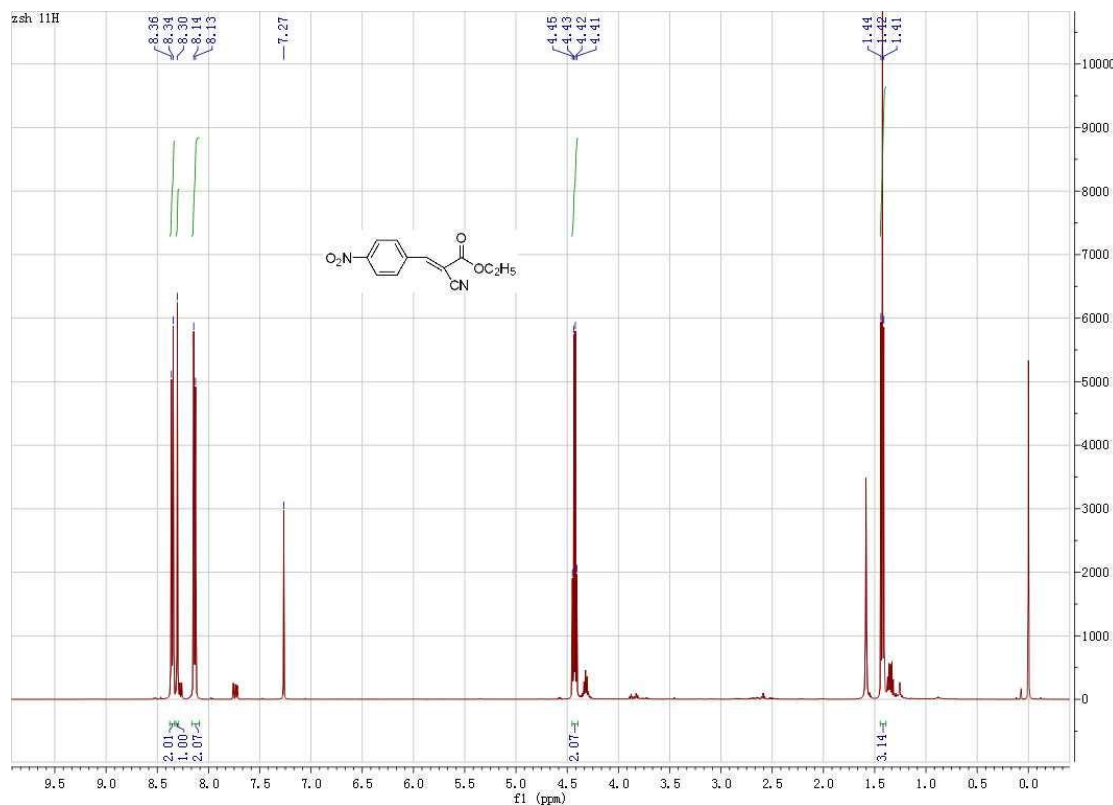
12. (*E*)-ethyl 2-cyano-3-(4-cyanophenyl)acrylate (Table 2, entry 11)



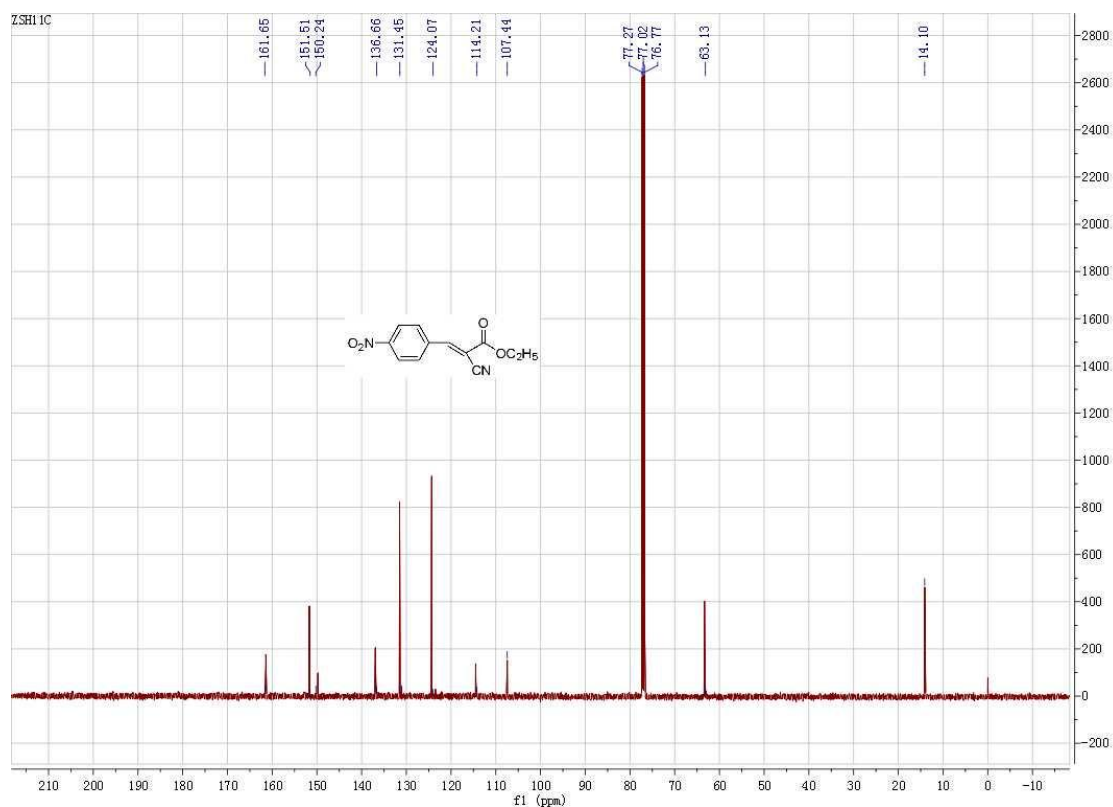


¹³C-NMR spectrum (126MHz, CDCl₃)

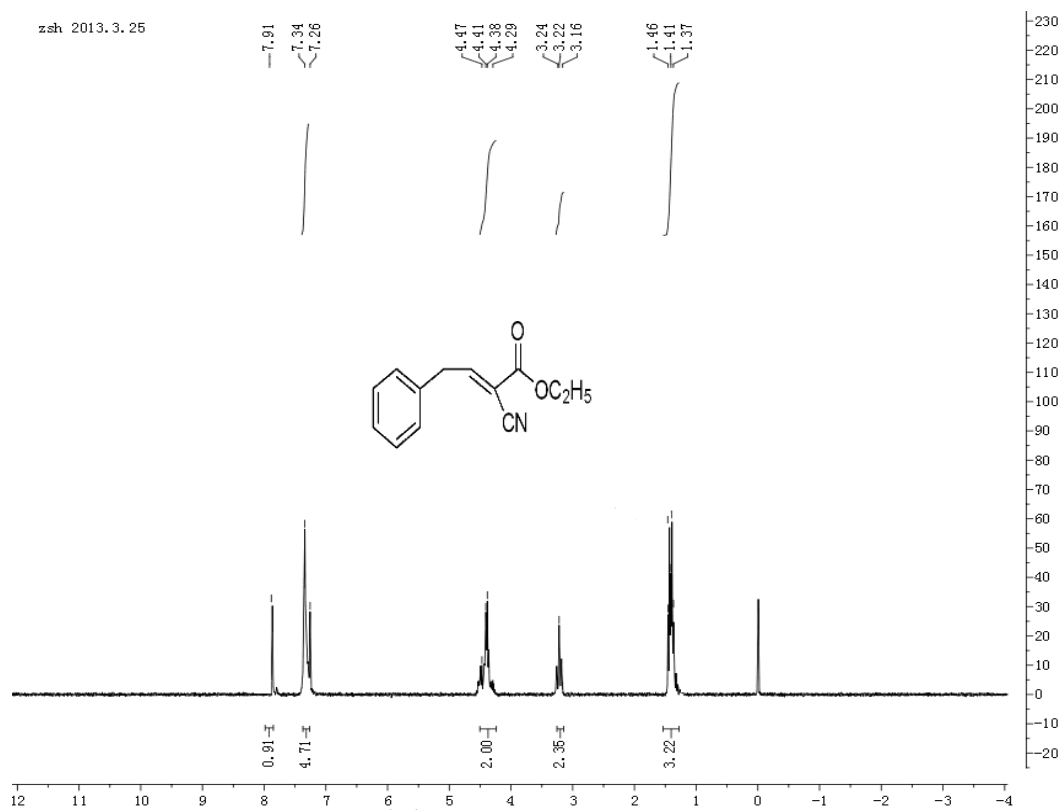
13. (E)-ethyl 2-cyano-3-(4-nitrophenyl)acrylate (Table 2, entry 11)

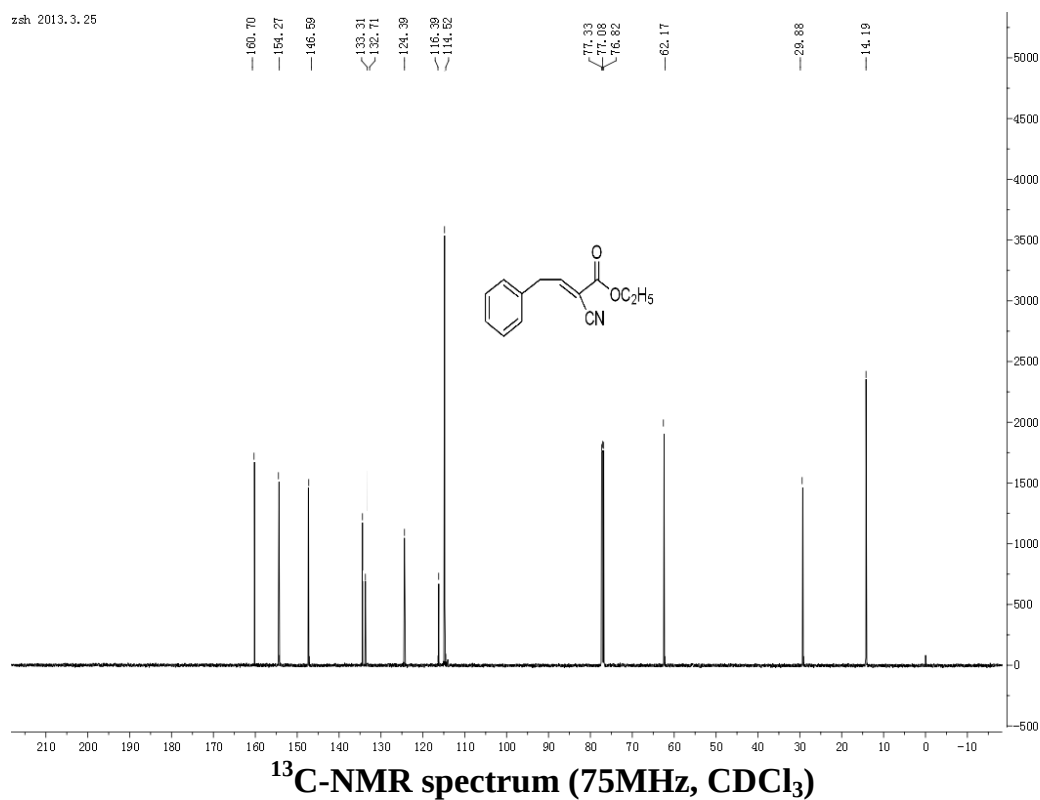


¹H-NMR spectrum (500 MHz, CDCl₃)

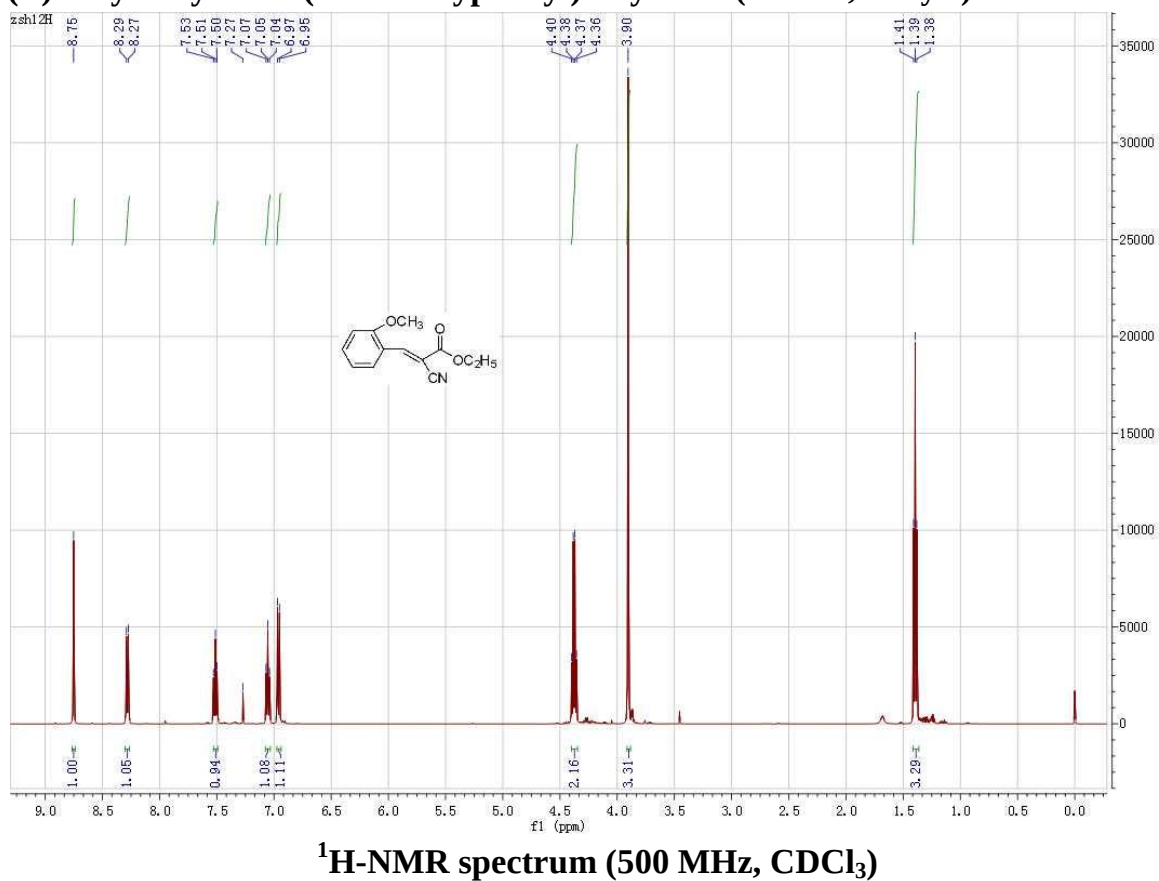


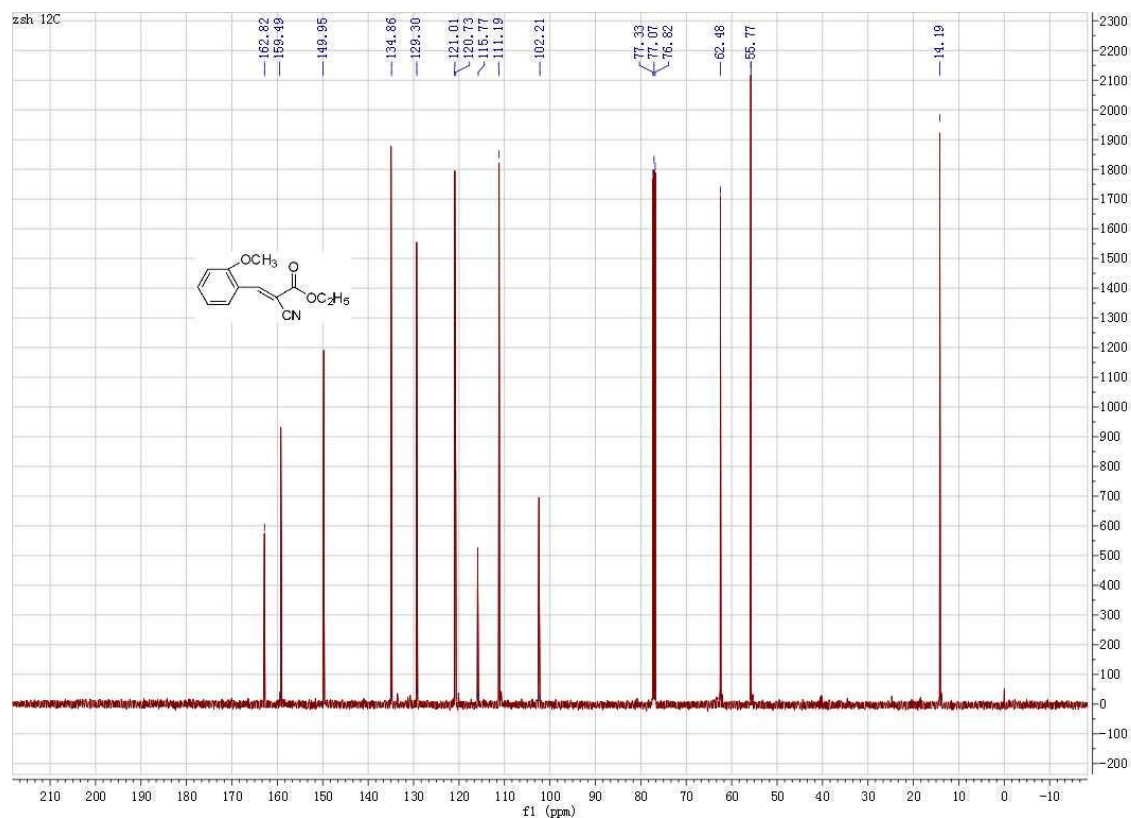
14. (E)-ethyl 2-cyano-4-phenylbut-2-enoate (Table 2, entry 14)





15. (*E*)-ethyl 2-cyano-3-(2-methoxyphenyl)acrylate (Table 2, entry 5)





^{13}C -NMR spectrum (126MHz, CDCl_3)