

# Supporting Information

## **Covalently anchored tertiary amine functionalized ionic liquid on silica coated nano-Fe<sub>3</sub>O<sub>4</sub> as a novel, efficient and magnetically recoverable catalyst for the unsymmetrical Hantzsch reaction and Knoevenagel condensation**

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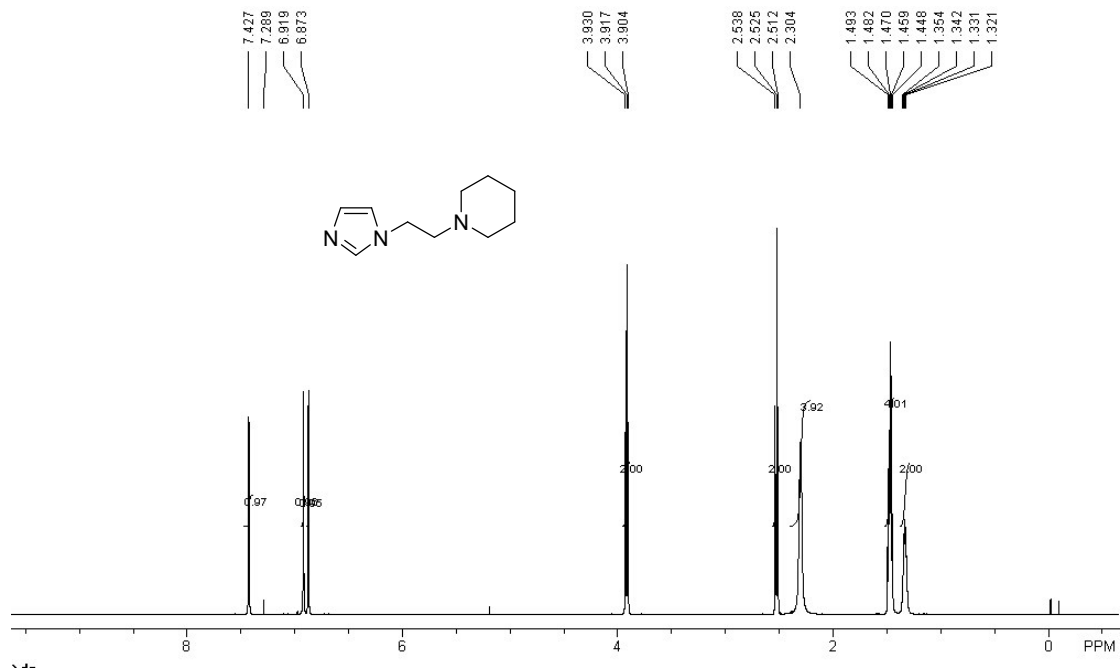
**Part 1 NMR spectra for the synthesis of BIL**

**Part 2 NMR spectra of the polyhydroquinolines**

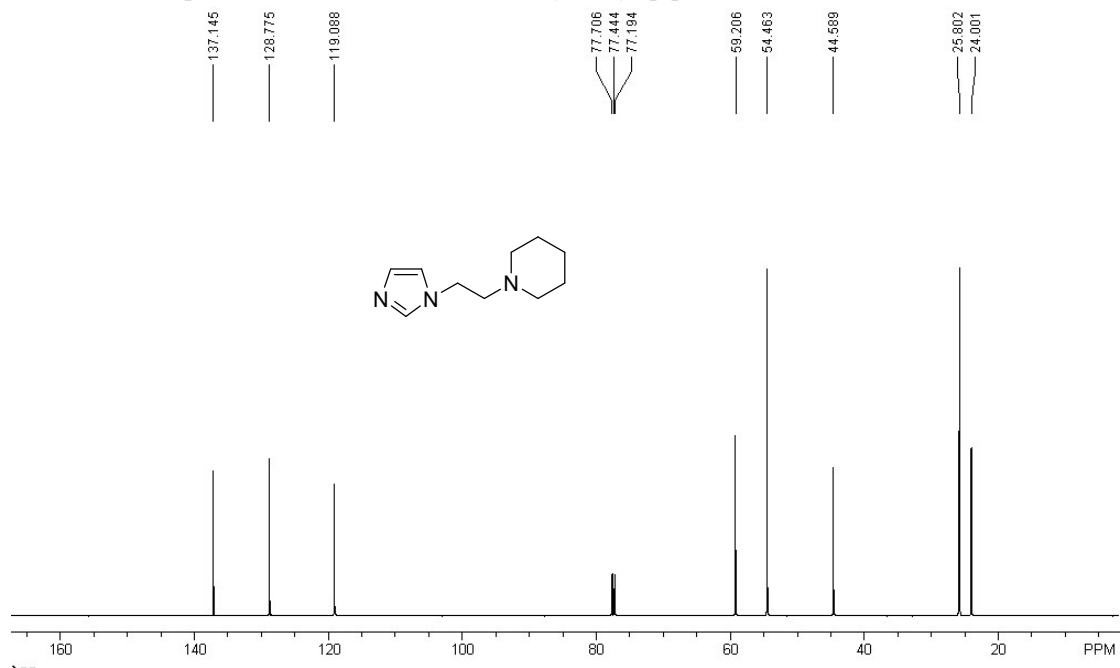
**Part 3 NMR spectra for the products of Knoevenagel condensation**

## Part 1 NMR spectrum for the synthesis of BIL

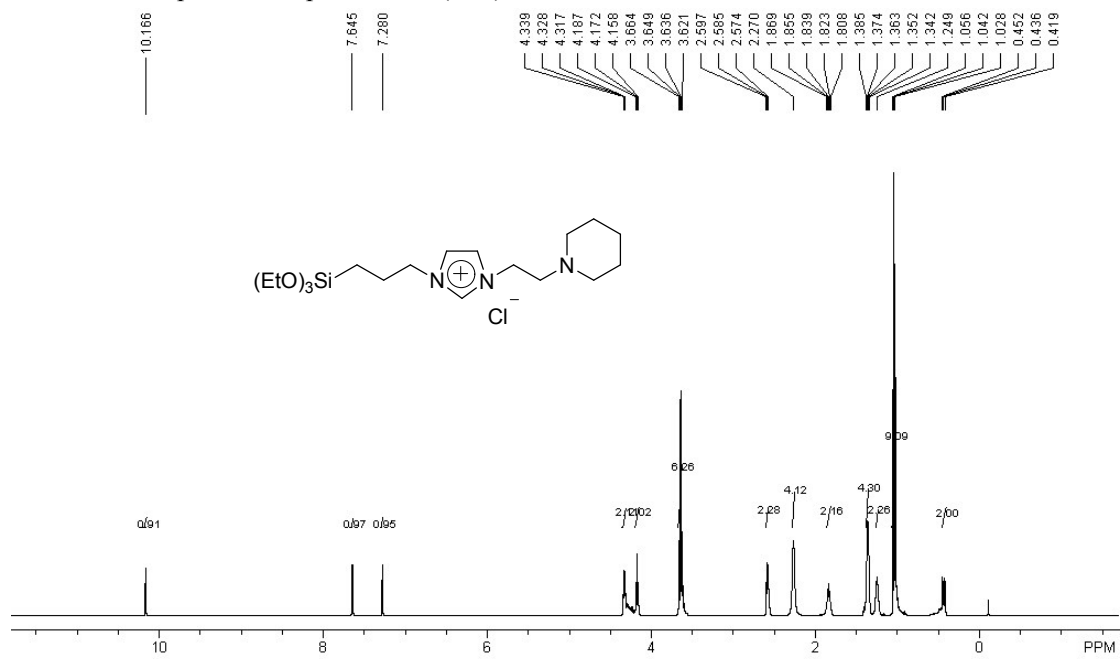
### 1. $^1\text{H}$ NMR spectrum of 1-(2-(1*H*-imidazol-1-yl)ethyl)piperidine (**1**)



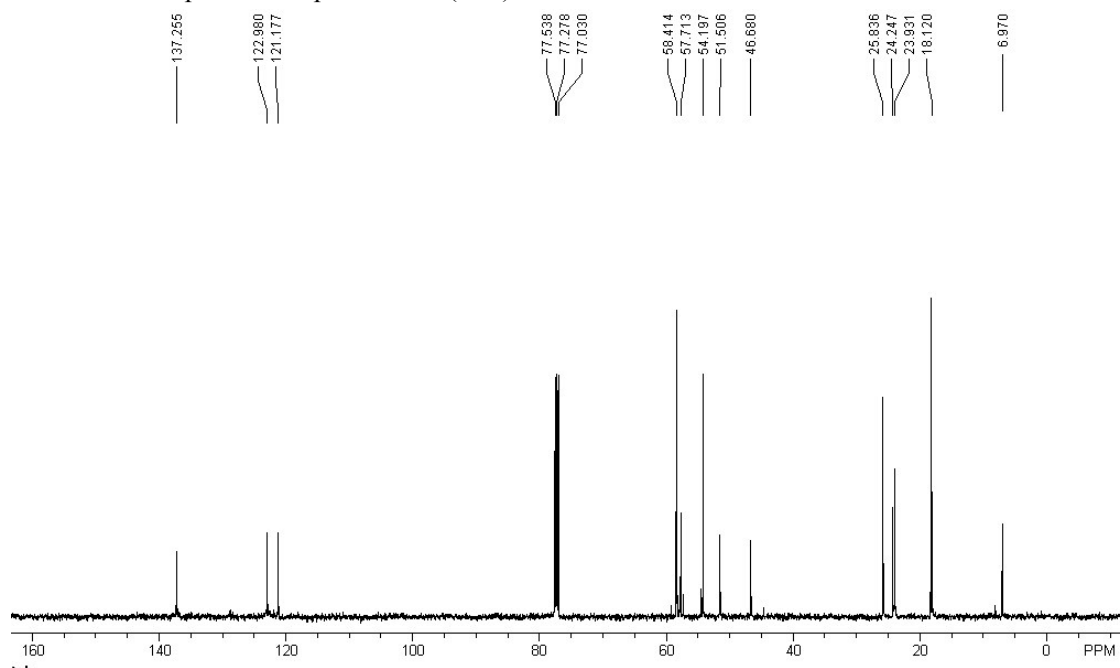
### 2. $^{13}\text{C}$ NMR spectrum of 1-(2-(1*H*-imidazol-1-yl)ethyl)piperidine (**1**)



3.  $^1\text{H}$  NMR spectrum of precursor 2 (BIL)

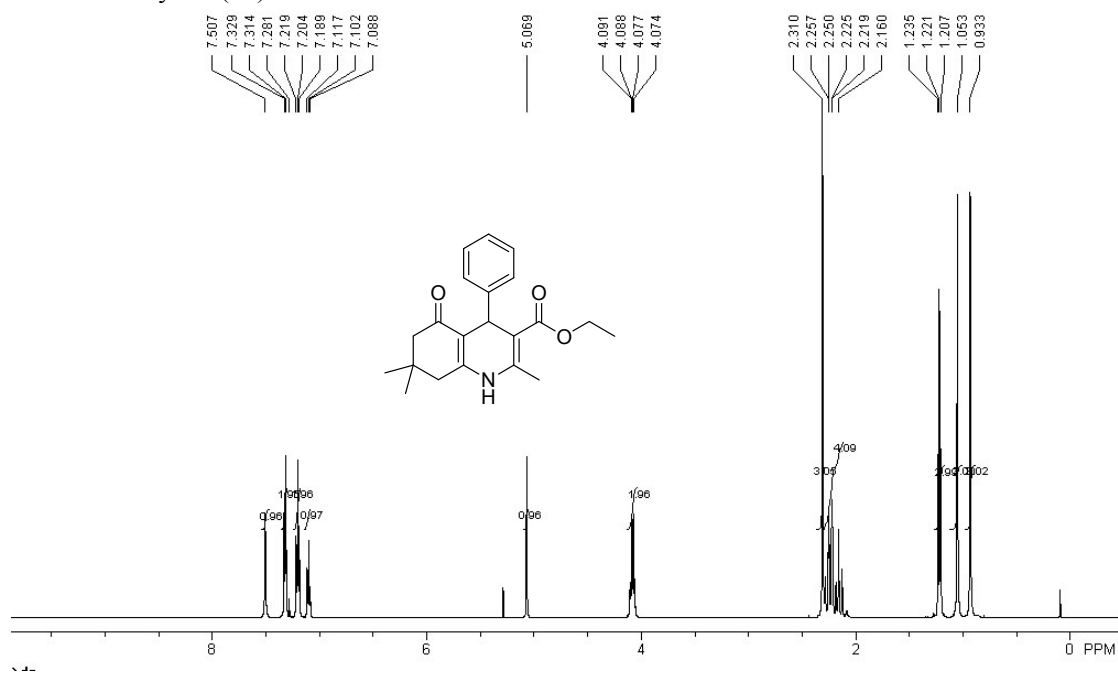


4.  $^{13}\text{C}$  NMR spectrum of precursor 2 (BIL)

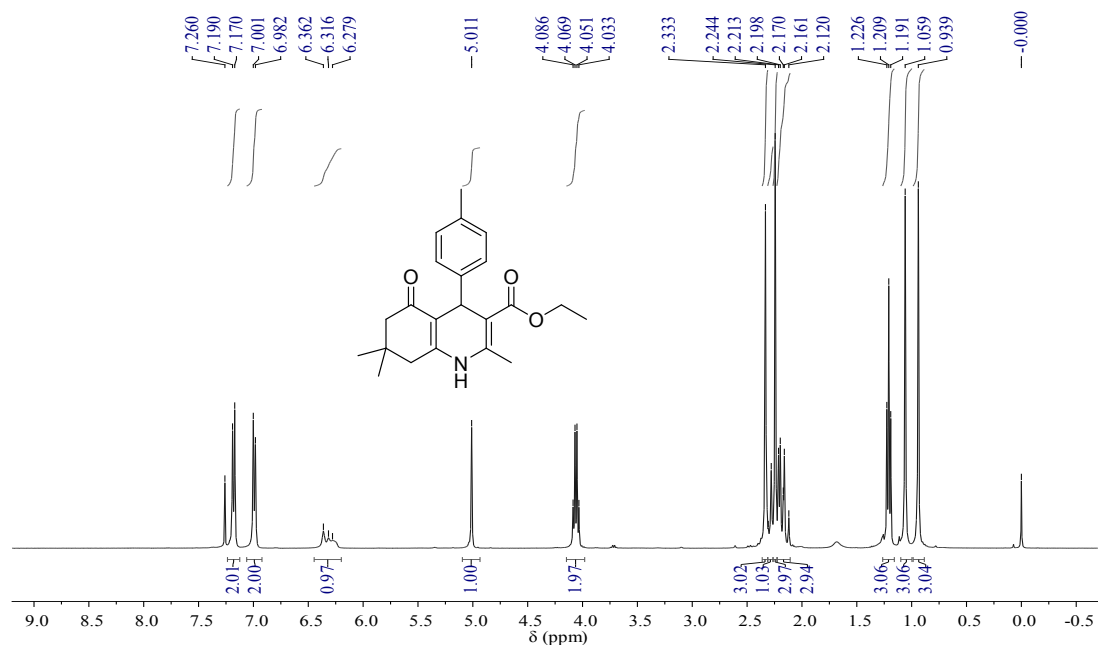


## Part 2 NMR spectrum of the polyhydroquinolines

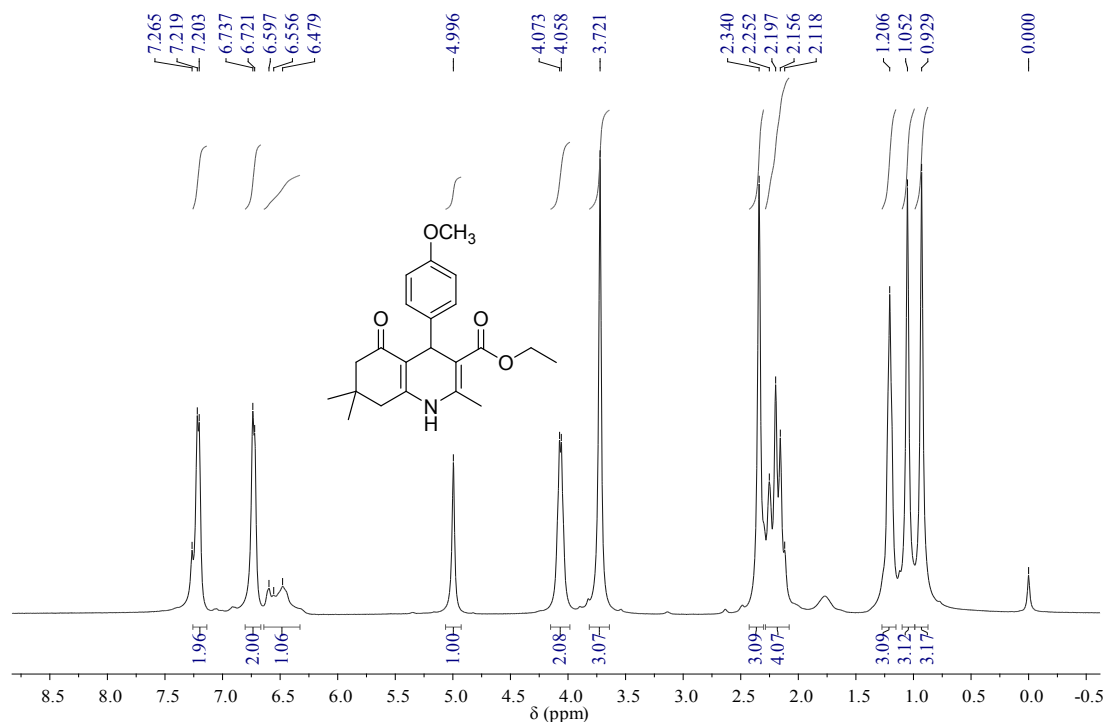
5.  $^1\text{H}$  NMR spectrum of ethyl 2,7,7-trimethyl-5-oxo-4-phenyl-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4a**)



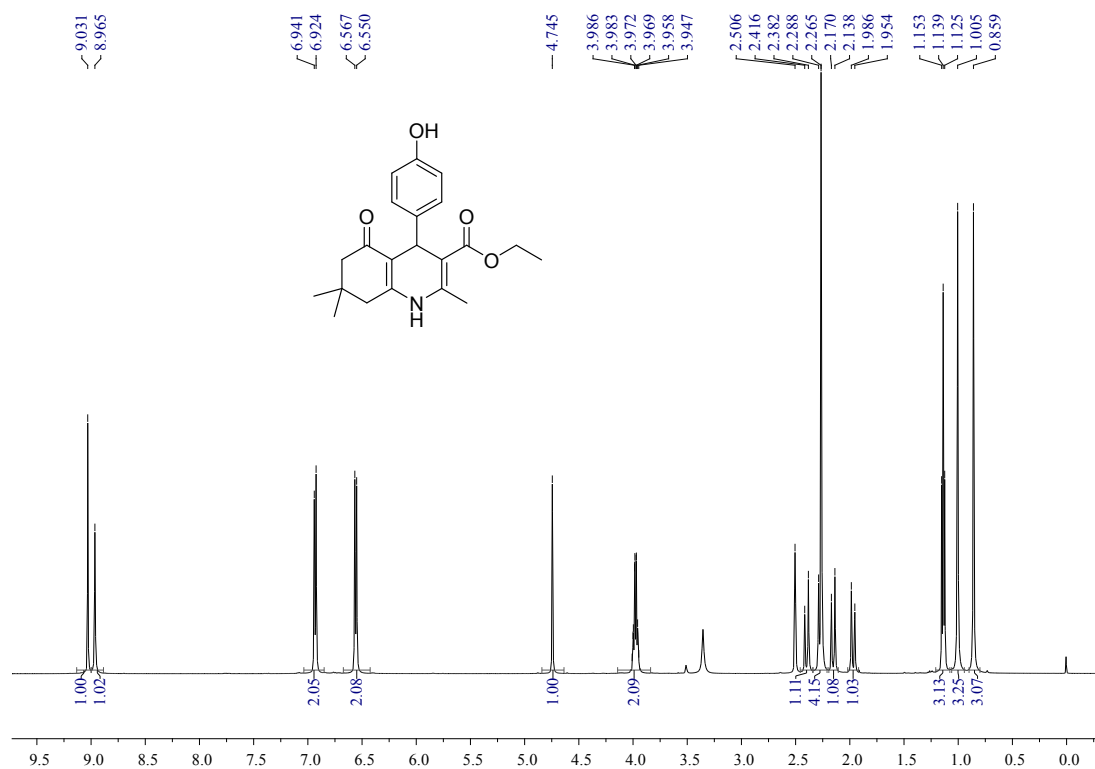
6.  $^1\text{H}$  NMR spectrum of ethyl 2,7,7-trimethyl-5-oxo-4-(p-tolyl)-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4b**)



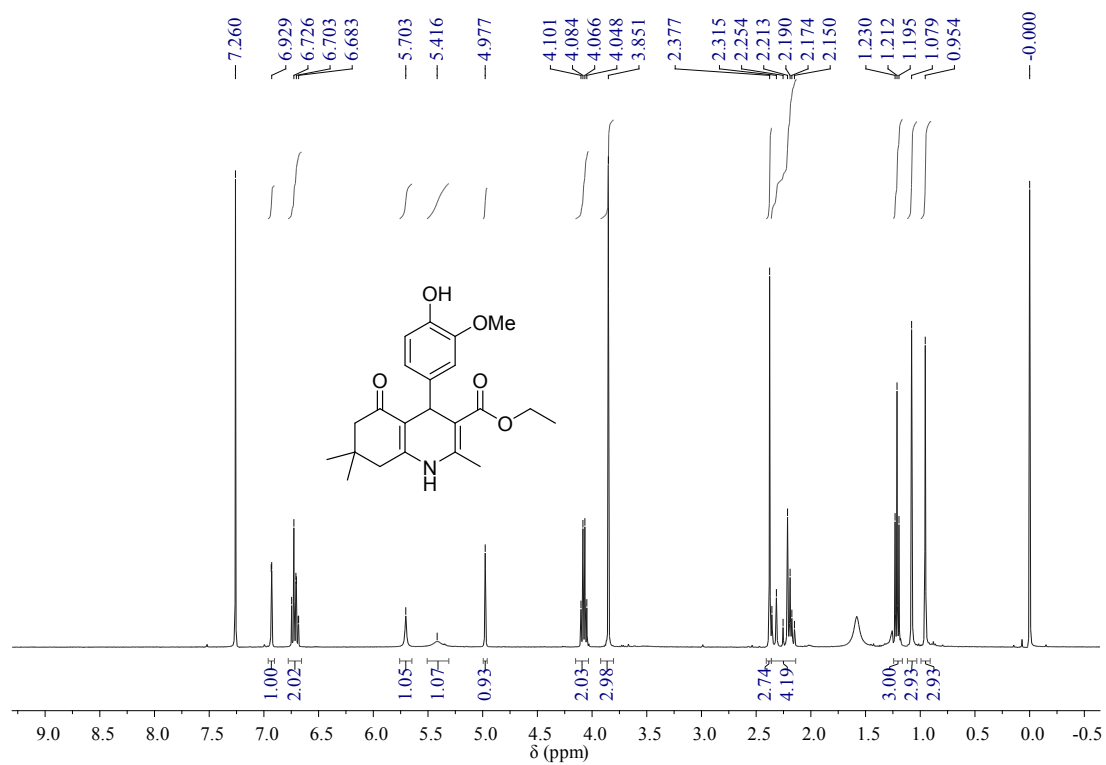
7.  $^1\text{H}$  NMR spectrum of ethyl 4-(4-methoxyphenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4c**)



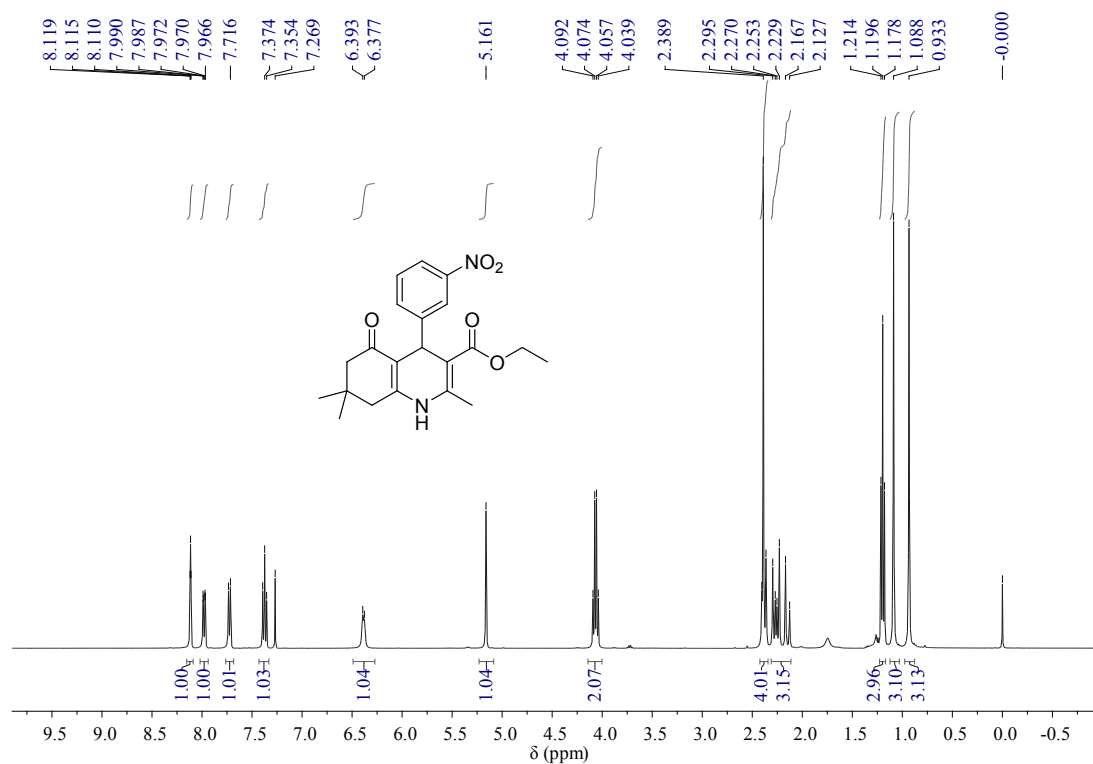
8.  $^1\text{H}$  NMR spectrum of ethyl 4-(4-hydroxyphenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4d**)



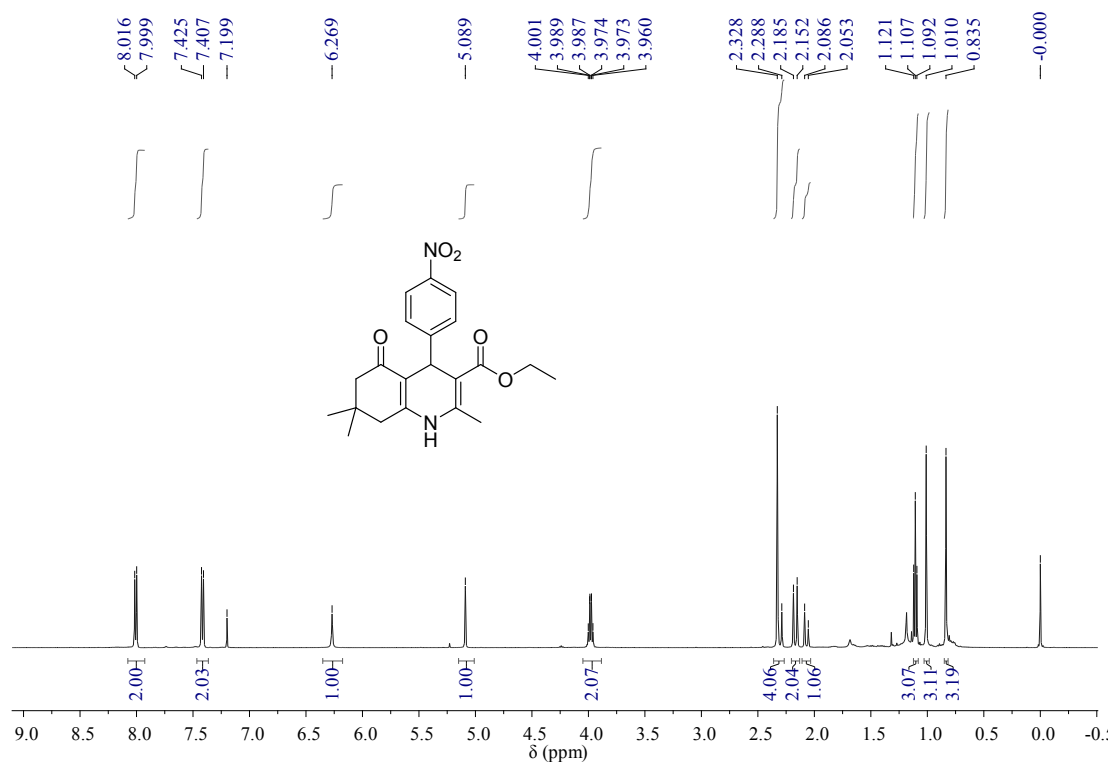
9.  $^1\text{H}$  NMR spectrum of ethyl 4-(4-hydroxy-3-methoxyphenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4e**)



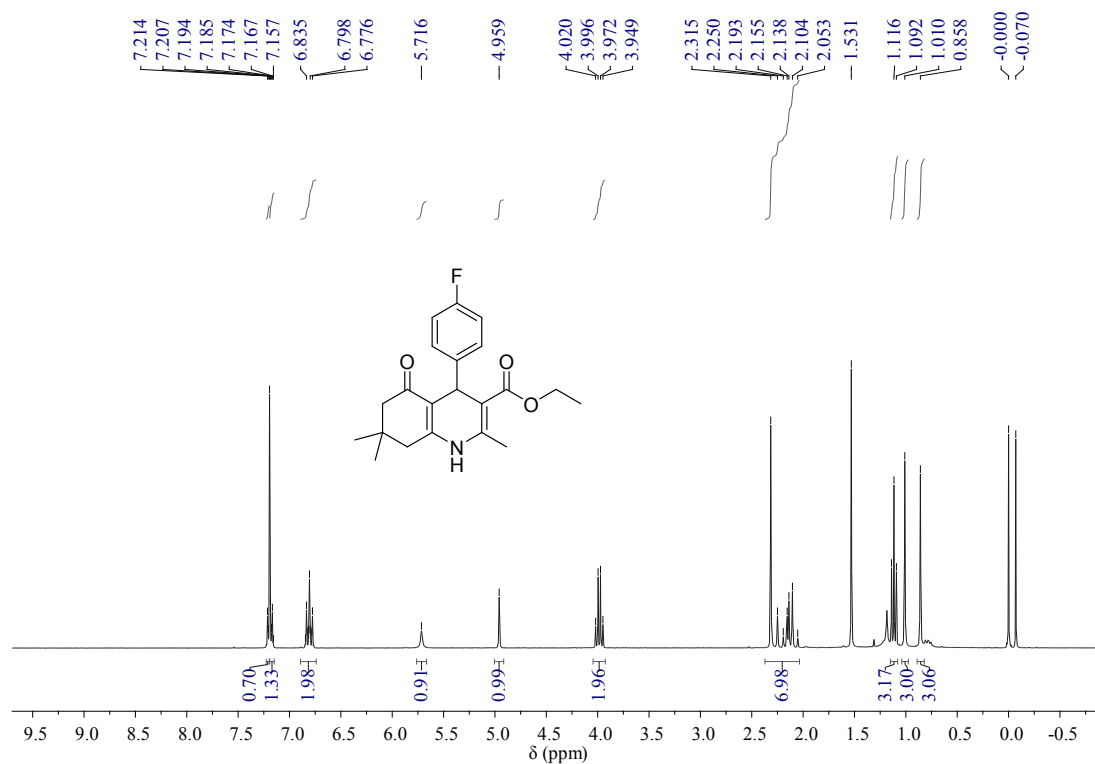
10.  $^1\text{H}$  NMR spectrum of ethyl 2,7,7-trimethyl-4-(3-nitrophenyl)-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4f**)



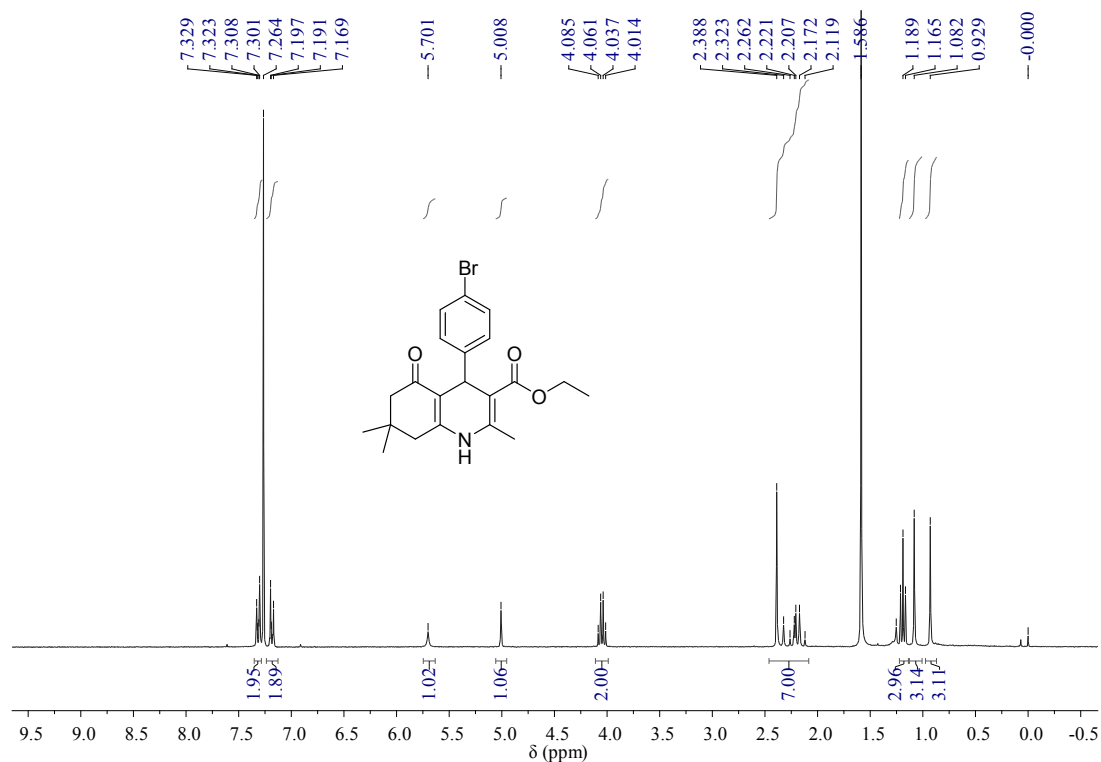
11.  $^1\text{H}$  NMR spectrum of ethyl 2,7,7-trimethyl-4-(4-nitrophenyl)-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4g**)



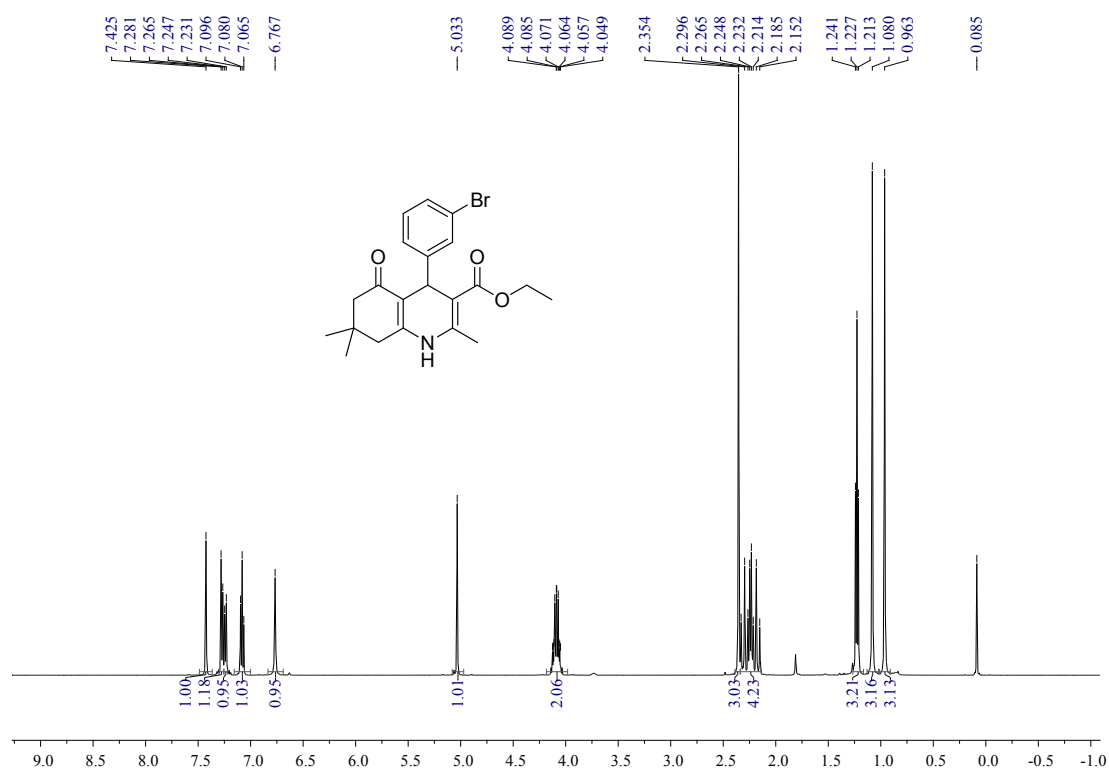
12.  $^1\text{H}$  NMR spectrum of ethyl 4-(4-fluorophenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4h**)



13.  $^1\text{H}$  NMR spectrum of ethyl 4-(4-bromophenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4i**)

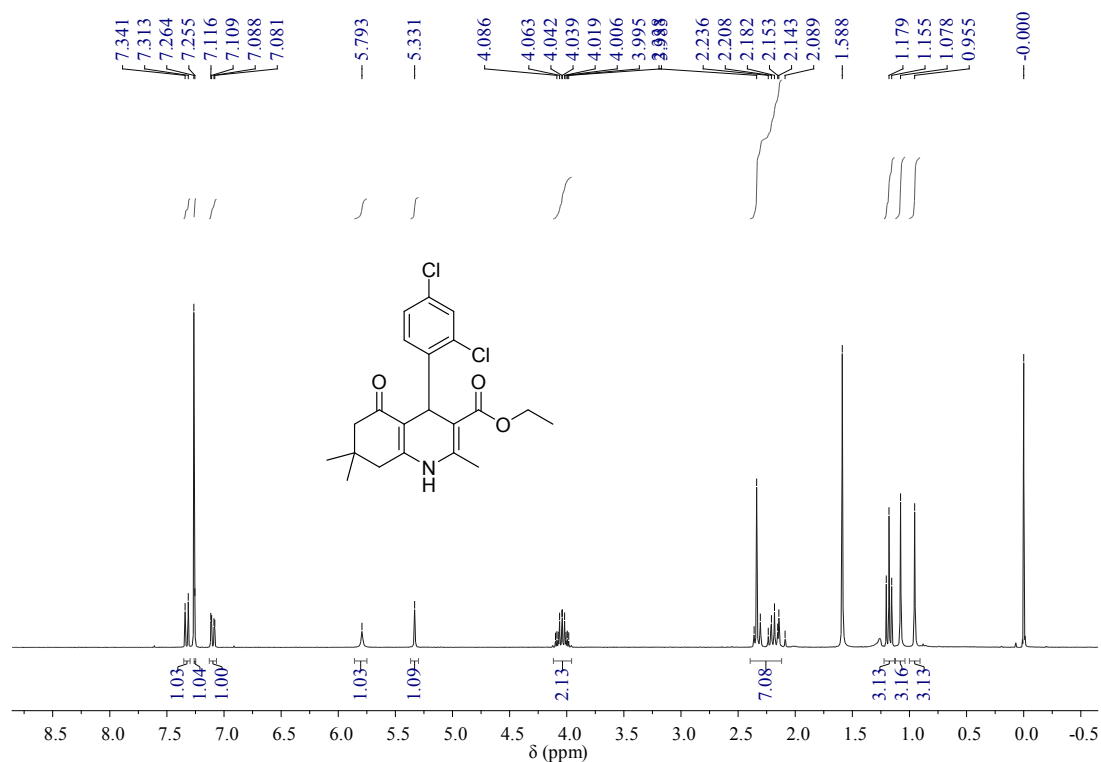


14.  $^1\text{H}$  NMR spectrum of ethyl 4-(3-bromophenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4j**)

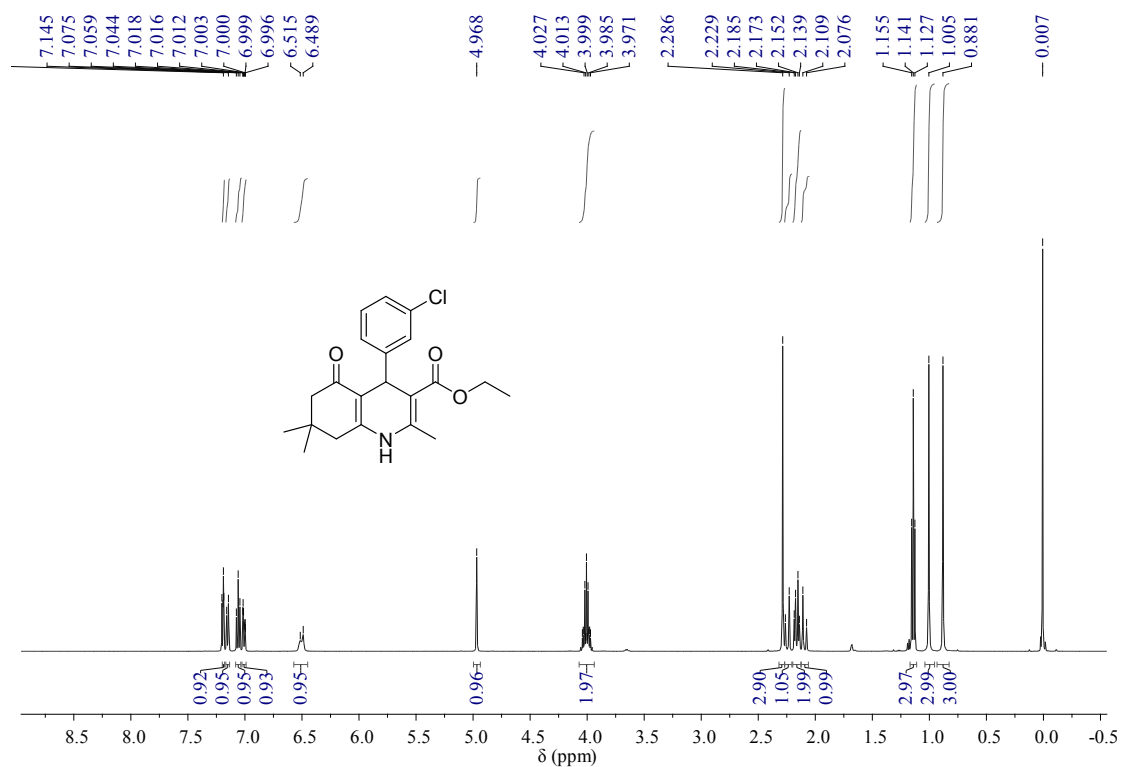




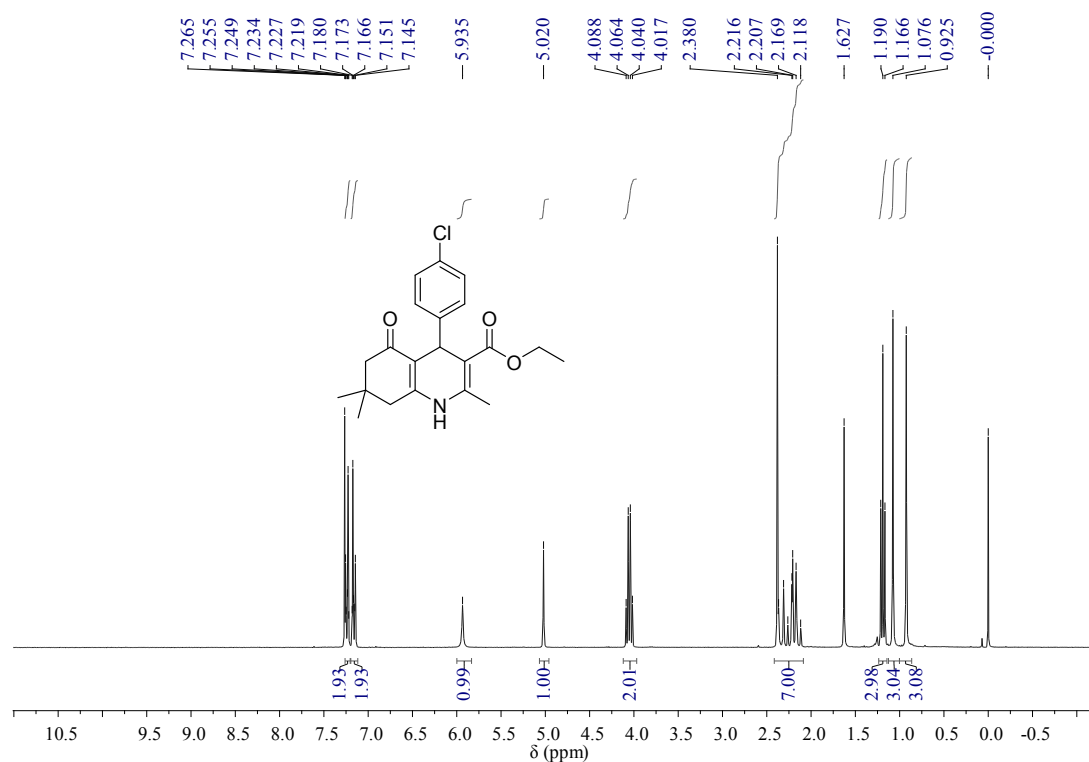
15.  $^1\text{H}$  NMR spectrum of ethyl 4-(2,4-dichlorophenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4k**)



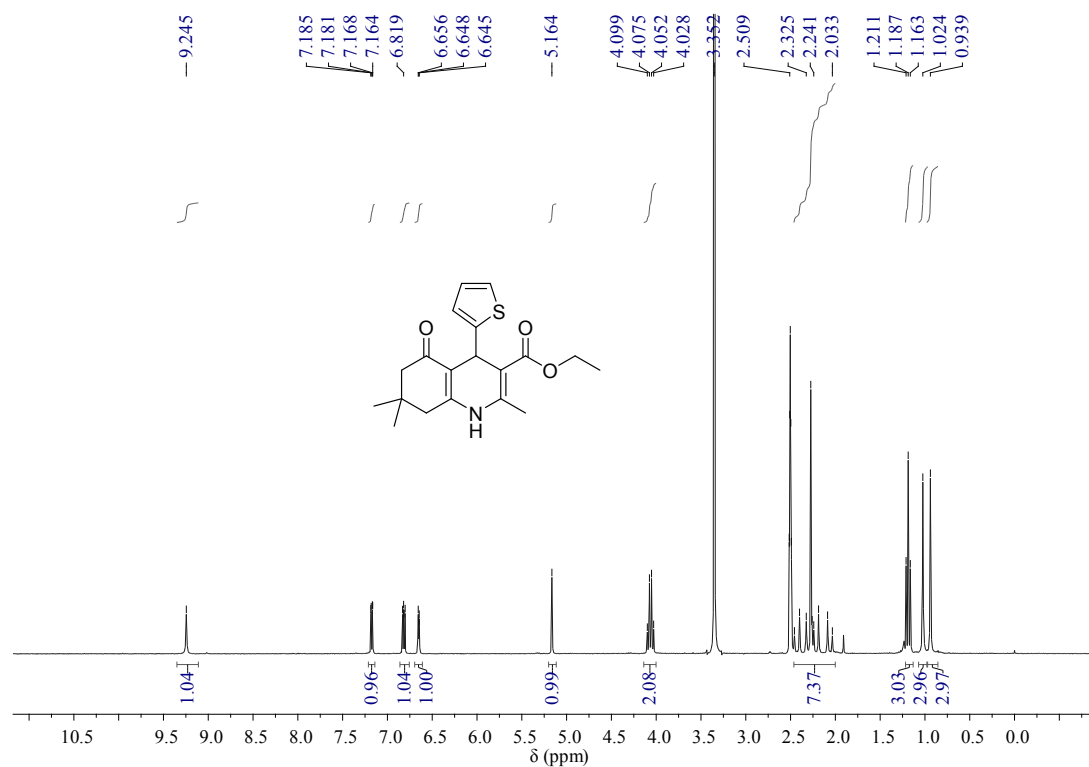
16.  $^1\text{H}$  NMR spectrum of ethyl 4-(3-chlorophenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4l**)



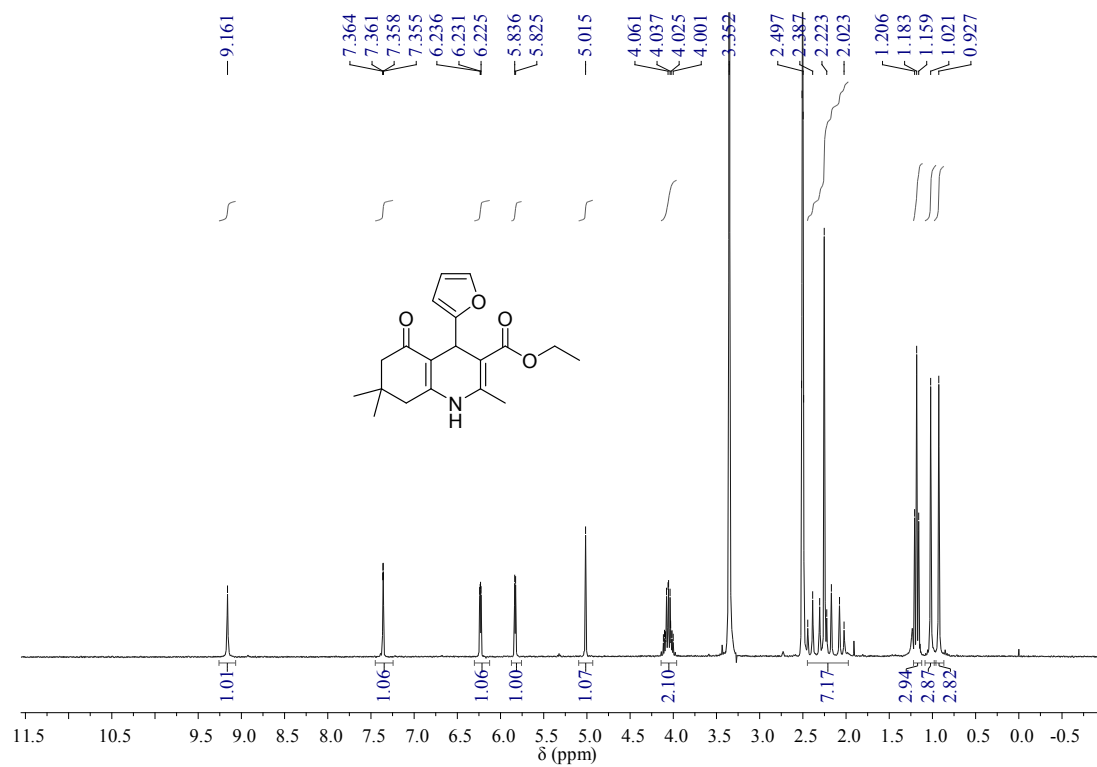
17.  $^1\text{H}$  NMR spectrum of ethyl 4-(4-chlorophenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4m**)



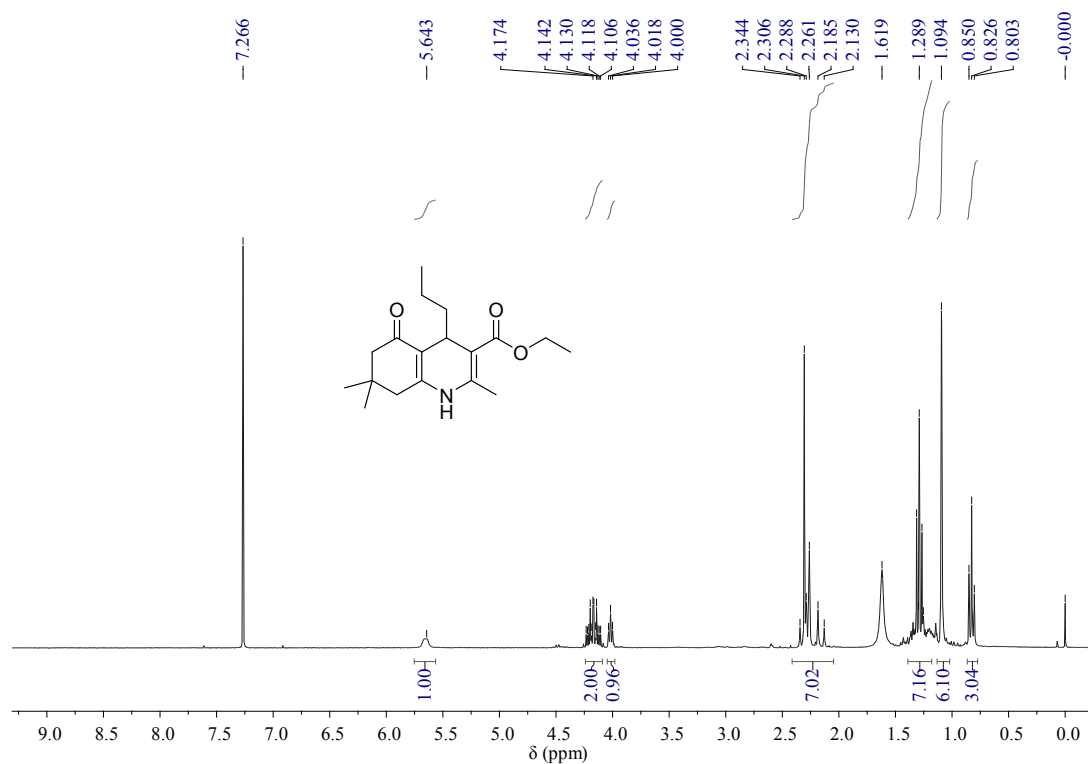
18.  $^1\text{H}$  NMR spectrum of ethyl 2,7,7-trimethyl-5-oxo-4-(thiophen-2-yl)-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4n**)



19.  $^1\text{H}$  NMR spectrum of ethyl 4-(furan-2-yl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4o**)

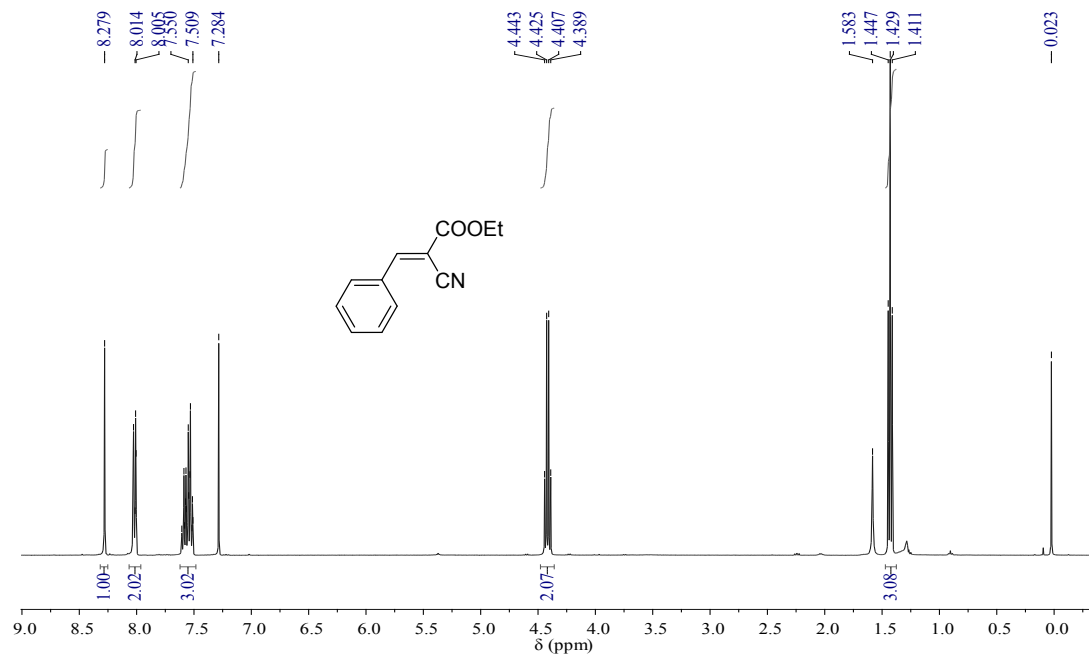


20.  $^1\text{H}$  NMR spectrum of ethyl 2,7,7-trimethyl-5-oxo-4-propyl-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**4p**)

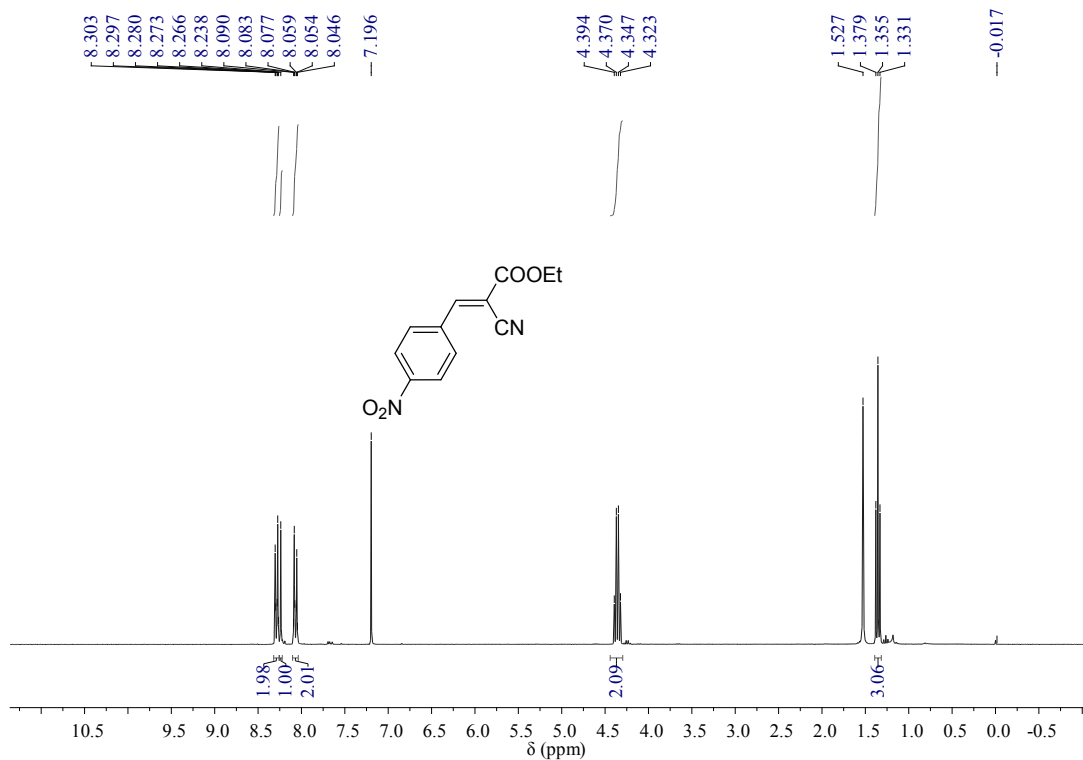


### Part 3 NMR spectrum for the products of Knoevenagel condensation

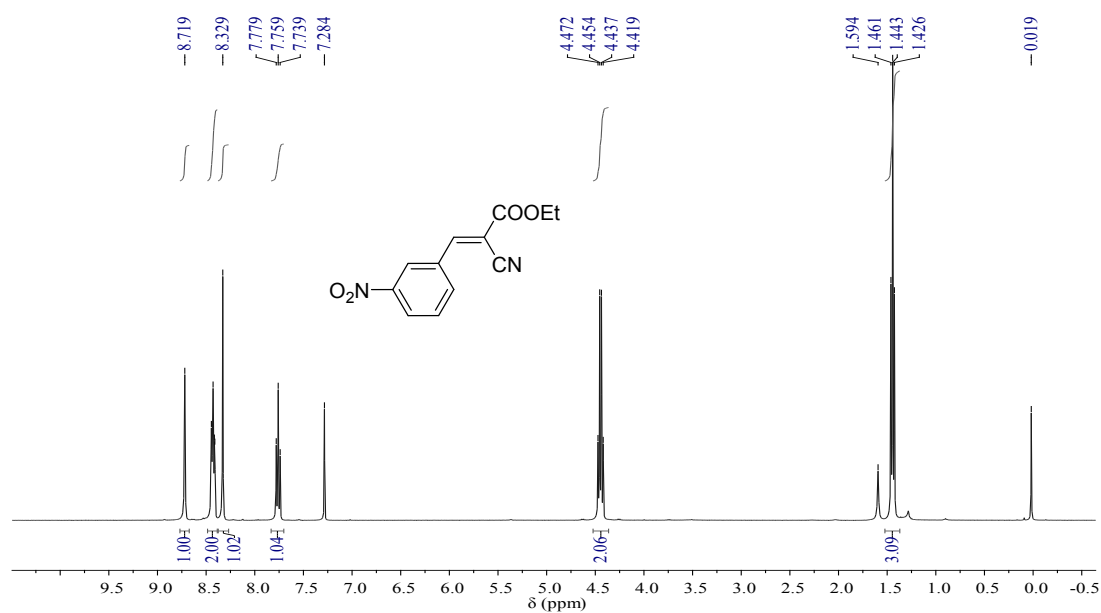
21.  $^1\text{H}$  NMR spectrum of ethyl (*E*)-2-cyano-3-phenylacrylate (**5a**)



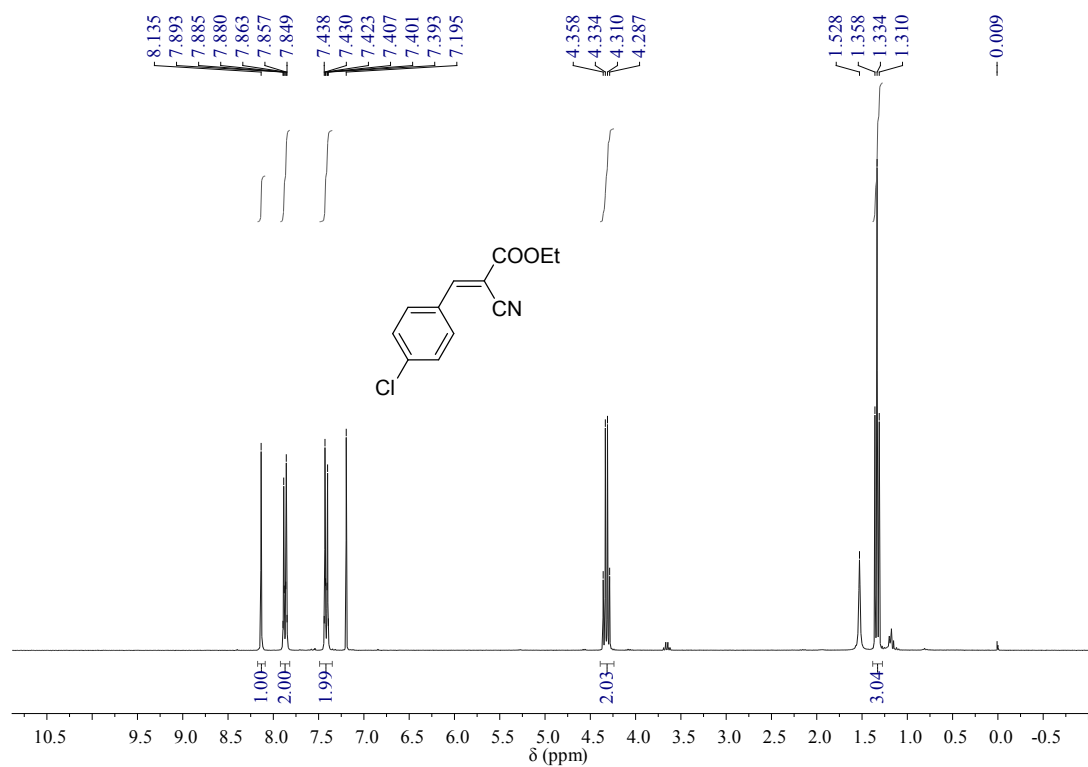
22.  $^1\text{H}$  NMR spectrum of ethyl (*E*)-2-cyano-3-(4-nitrophenyl)acrylate (**5b**)



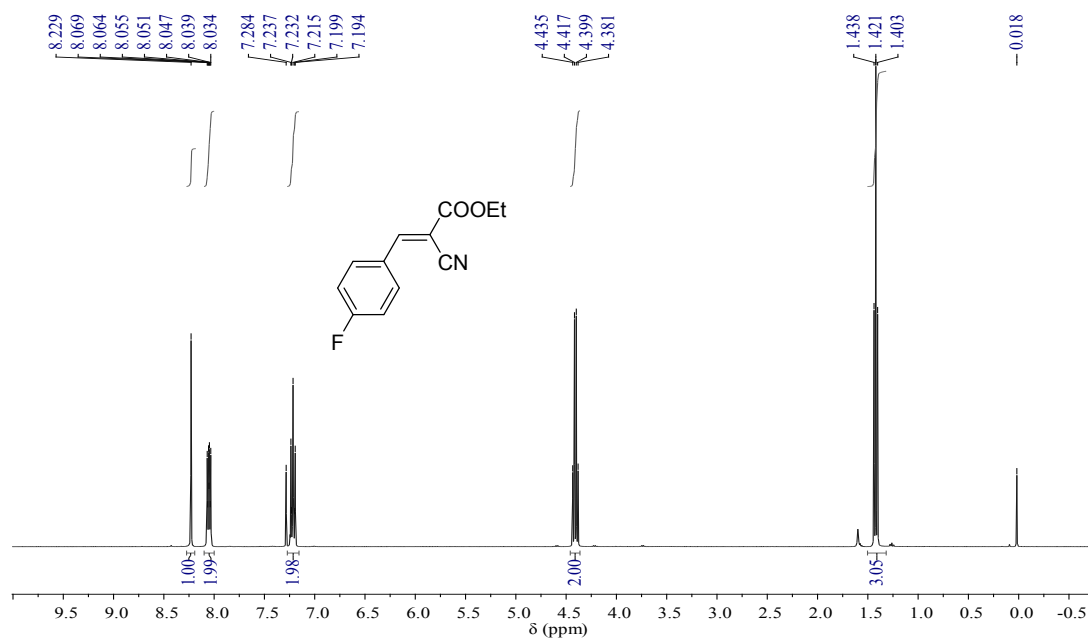
23.  $^1\text{H}$  NMR spectrum of ethyl (*E*)-2-cyano-3-(3-nitrophenyl)acrylate (**5c**)



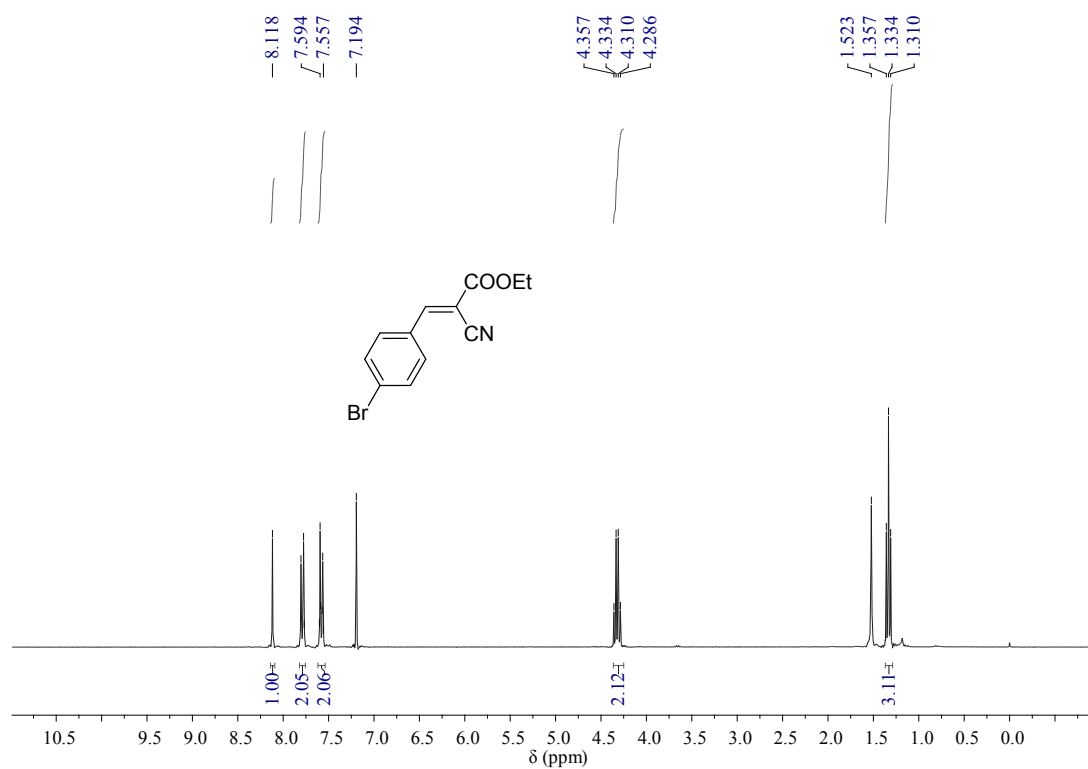
24.  $^1\text{H}$  NMR spectrum of ethyl (*E*)-3-(4-chlorophenyl)-2-cyanoacrylate (**5d**)



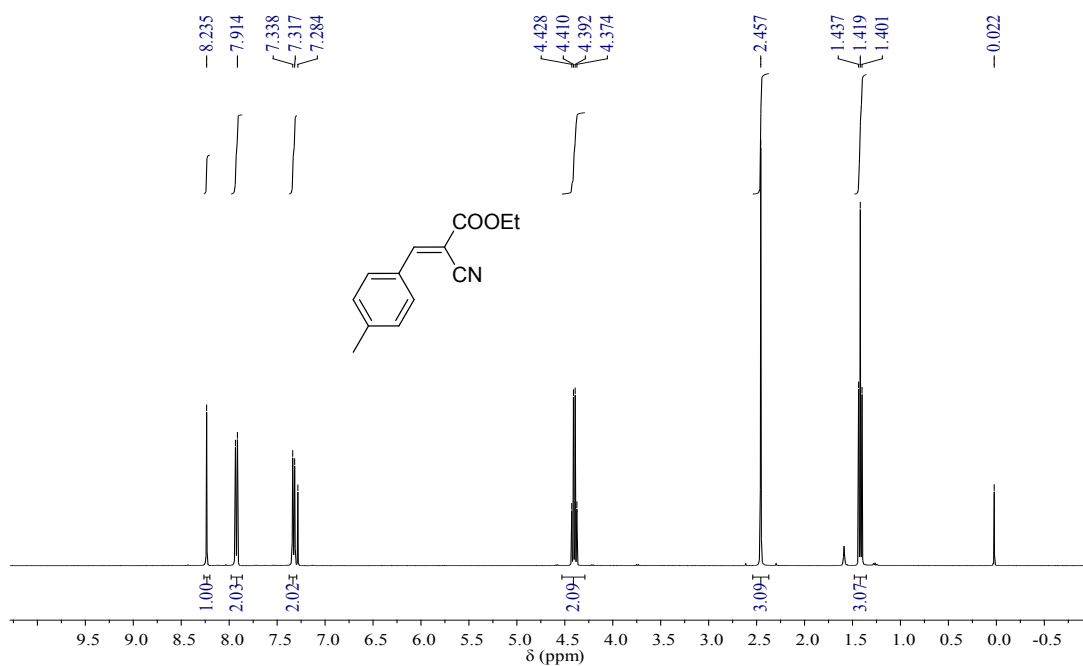
25.  $^1\text{H}$  NMR spectrum of ethyl (*E*)-2-cyano-3-(4-fluorophenyl)acrylate (**5e**)



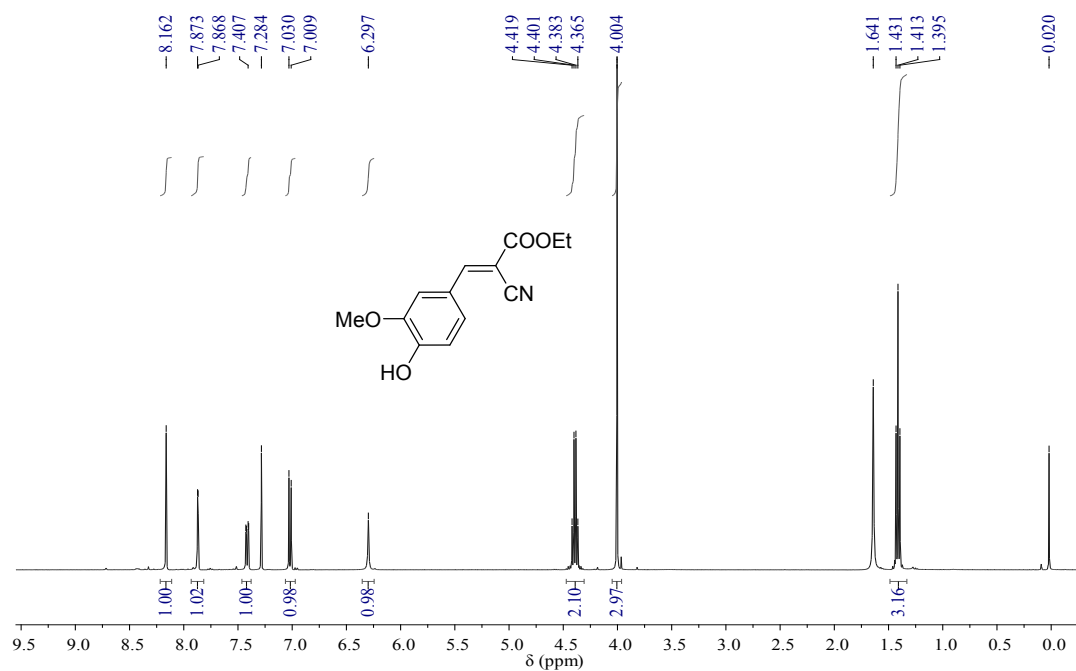
26.  $^1\text{H}$  NMR spectrum of ethyl (*E*)-3-(4-bromophenyl)-2-cyanoacrylate (**5f**)



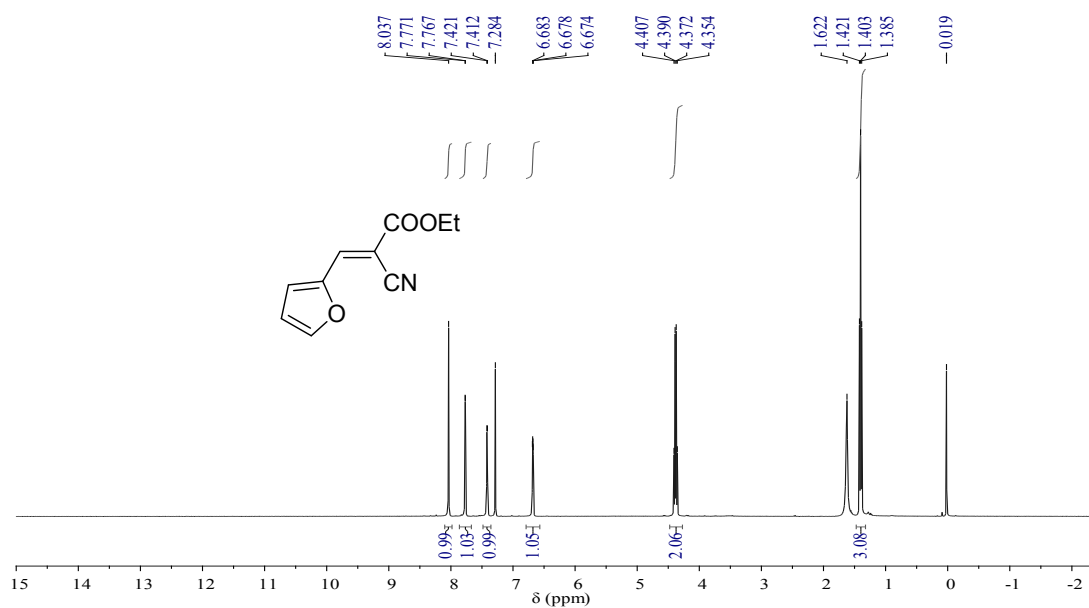
27. <sup>1</sup>H NMR spectrum of ethyl (*E*)-2-cyano-3-(*p*-tolyl)acrylate (**5g**)



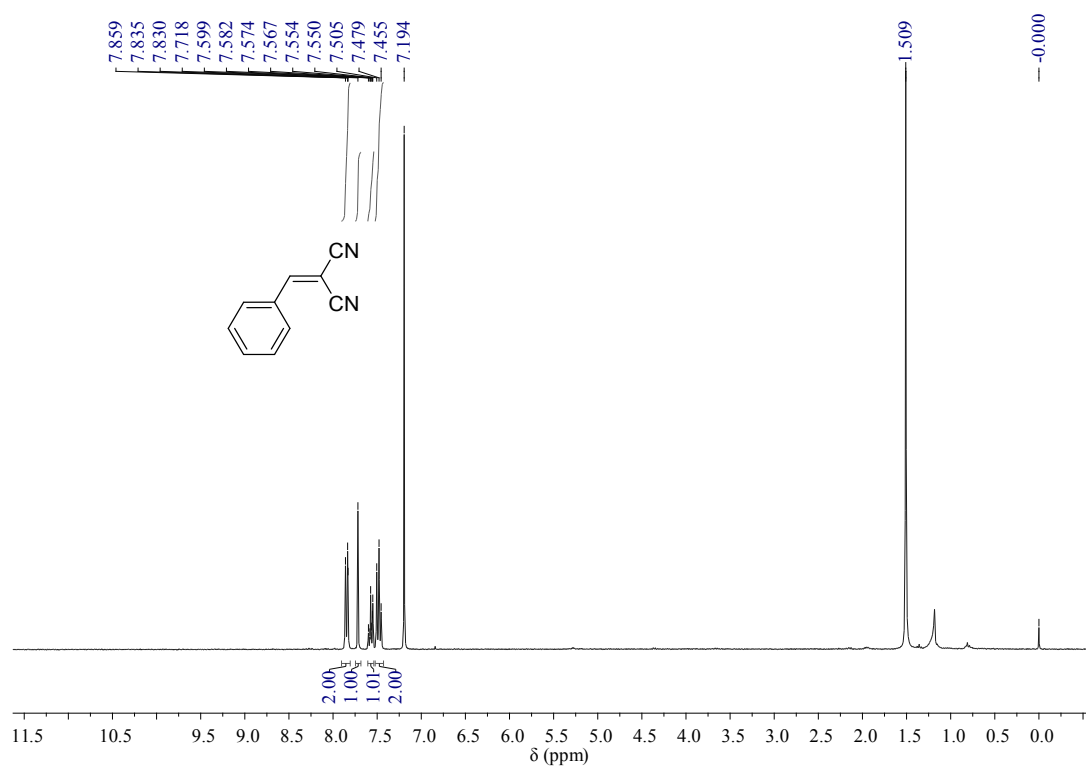
28. <sup>1</sup>H NMR spectrum of ethyl (*E*)-2-cyano-3-(4-hydroxy-3-methoxyphenyl)acrylate (**5h**)



29. <sup>1</sup>H NMR spectrum of ethyl (*E*)-2-cyano-3-(furan-2-yl)acrylate (**5i**)

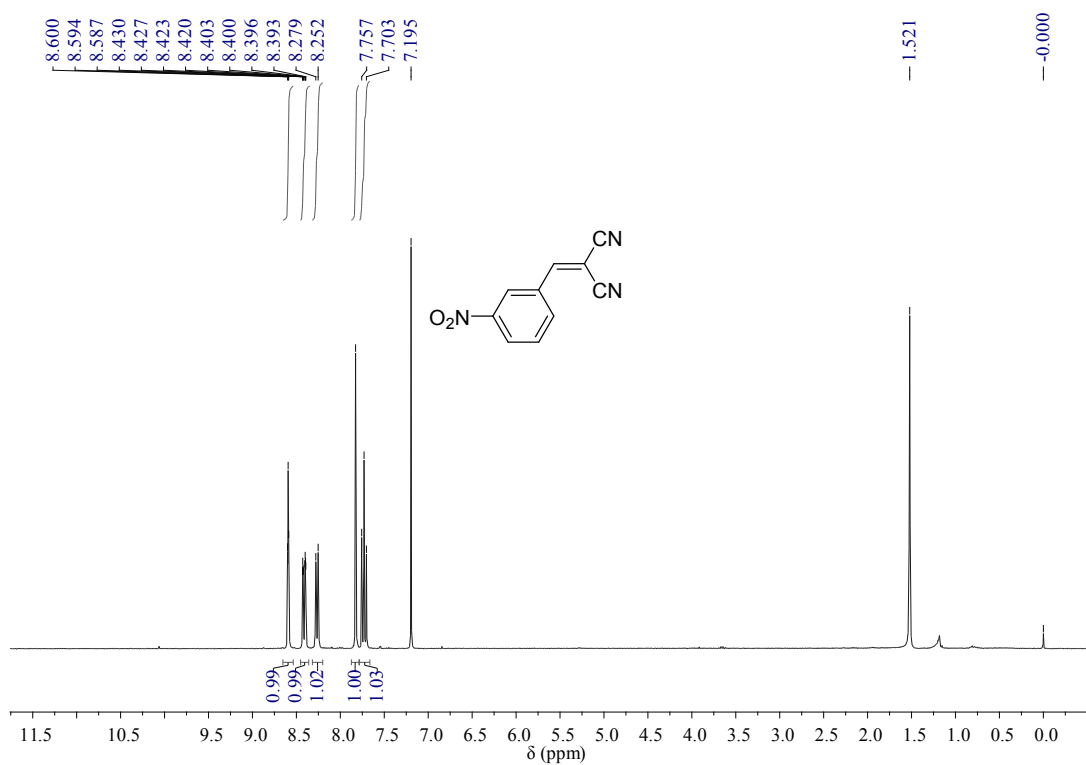


30. <sup>1</sup>H NMR spectrum of 2-benzylidenemalononitrile (**5j**)





31.  $^1\text{H}$  NMR spectrum of 2-(3-nitrobenzylidene)malononitrile (**5k**)



32.  $^1\text{H}$  NMR spectrum of 2-(4-Methoxybenzylidene)malononitrile (**5l**)

