

Urea-riched porous organic polymer as a hydrogen bond catalyst for Knoevenagel condensation reaction and synthesis of 2,3-dihydroquinazolin-4(1*H*)-ones

Narges Zarei, Meysam Yarie*, Morteza Torabi, Mohammad Ali Zolfigol*

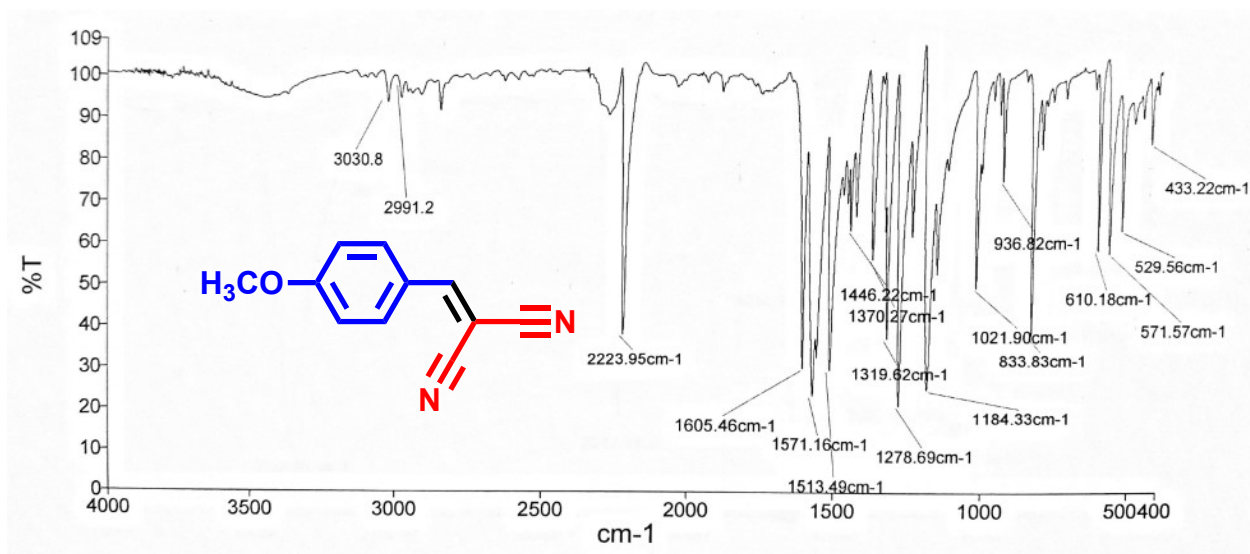
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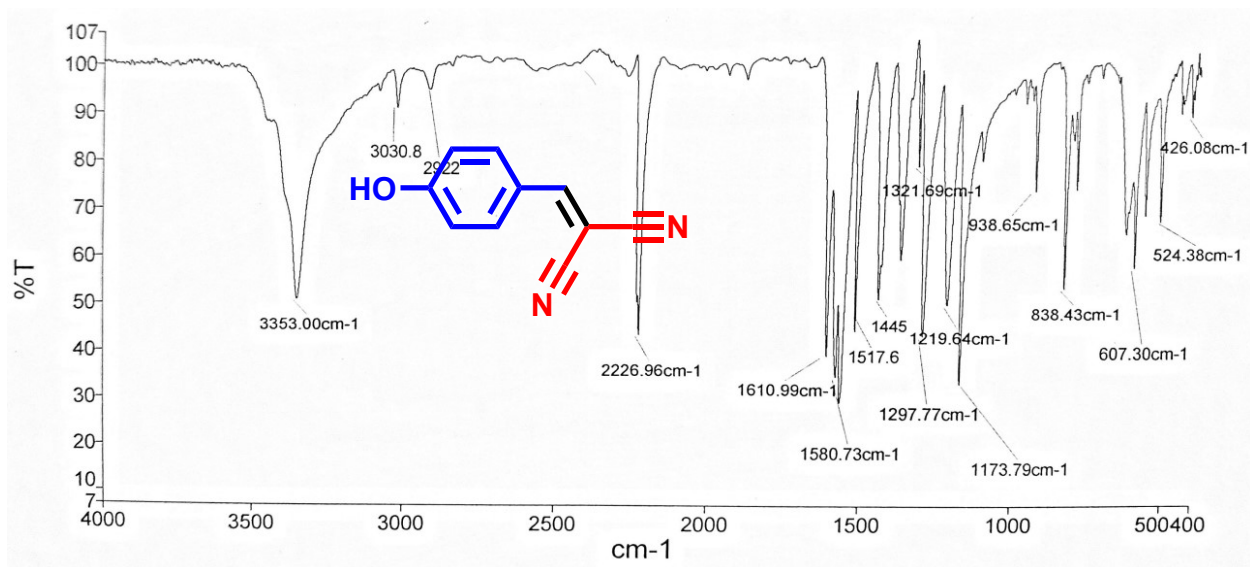
- 1: FT-IR spectrum of 2-(4-methoxybenzylidene)malononitrile.
- 2: FT-IR spectrum of 2-(4-hydroxybenzylidene)malononitrile.
- 3: ¹H NMR spectrum of 2-(4-hydroxybenzylidene)malononitrile.
- 4: ¹³C NMR spectrum of 2-(4-hydroxybenzylidene)malononitrile.
- 5: FT-IR spectrum of 2-(3-hydroxybenzylidene)malononitrile.
- 6: FT-IR spectrum of 2-(3-fluorobenzylidene)malononitrile.
- 7: ¹H NMR spectrum of spectrum of 2-(3-fluorobenzylidene)malononitrile.
- 8: ¹³C NMR spectrum of spectrum of 2-(3-fluorobenzylidene)malononitrile.
- 9: FT-IR spectrum of 2-([1,1'-biphenyl]-4-ylmethylene)malononitrile.
- 10: ¹H NMR spectrum of 2-([1,1'-biphenyl]-4-ylmethylene)malononitrile.
- 11: ¹³C NMR spectrum of 2-([1,1'-biphenyl]-4-ylmethylene)malononitrile.
- 12: FT-IR spectrum of 2-(4-methylbenzylidene)malononitrile.
- 13: ¹H NMR spectrum of 2-(4-methylbenzylidene)malononitrile.
- 14: ¹³C NMR spectrum of 2-(4-methylbenzylidene)malononitrile.
- 15: FT-IR spectrum of (*E*)-2-(1*H*-indole-3-carbonyl)-3-(4-methoxyphenyl)acrylonitrile.
- 16: FT-IR spectrum of (*E*)-3-(4-hydroxyphenyl)-2-(1*H*-indole-3-carbonyl)acrylonitrile.
- 17: FT-IR spectrum of (*E*)-3-(4-bromophenyl)-2-(1*H*-indole-3-carbonyl)acrylonitrile.
- 18: FT-IR spectrum of ethyl (*E*)-2-cyano-3-phenylacrylate.
- 19: FT-IR spectrum of ethyl (*E*)-2-cyano-3-(4-hydroxyphenyl)acrylate.
- 20: ¹H NMR spectrum of ethyl (*E*)-2-cyano-3-(4-hydroxyphenyl)acrylate.
- 21: ¹³C NMR spectrum of ethyl (*E*)-2-cyano-3-(4-hydroxyphenyl)acrylate.
- 22: FT-IR spectrum of methyl (*E*)-2-cyano-3-(2,6-dichlorophenyl)acrylate.
- 23: FT-IR spectrum of ethyl (*E*)-3-(4-bromophenyl)-2-cyanoacrylate.
- 24: ¹H NMR spectrum of ethyl *E*-3-(4-bromophenyl)-2-cyanoacrylate.

- 25: ^{13}C NMR spectrum of ethyl *E*-3-(4-bromophenyl)-2-cyanoacrylate.
- 26: FT-IR spectrum of ethyl (*E*)-2-cyano-3-(4-nitrophenyl) acrylate.
- 27: FT-IR spectrum of 2-phenyl-2,3-dihydroquinazolin-4(1*H*)-one.
- 28: FT-IR spectrum of 4-(4-oxo-1,2,3,4-tetrahydroquinazolin-2-yl)benzonitrile.
- 29: FT-IR spectrum of 2-(naphthalen-2-yl)-2,3-dihydroquinazolin-4(1*H*)-one.
- 30: ^1H NMR spectrum of 2-(naphthalen-2-yl)-2,3-dihydroquinazolin-4(1*H*)-one.
- 31: ^{13}C NMR spectrum of 2-(naphthalen-2-yl)-2,3-dihydroquinazolin-4(1*H*)-one.
- 32: FT-IR spectrum of 2-([1,1'-biphenyl]-4-yl)-2,3-dihydroquinazolin-4(1*H*)-one.
- 33: ^1H NMR spectrum of 2-([1,1'-biphenyl]-4-yl)-2,3-dihydroquinazolin-4(1*H*)-one.
- 34: ^{13}C NMR spectrum of 2-([1,1'-biphenyl]-4-yl)-2,3-dihydroquinazolin-4(1*H*)-one.
- 35: FT-IR spectrum of 2-(4-fluorophenyl)-2,3-dihydroquinazolin-4(1*H*)-one.
- 36: FT-IR spectrum of 2-(*p*-tolyl)-2,3-dihydroquinazolin-4(1*H*)-one.
- 37: ^1H NMR spectrum of 2-(*p*-tolyl)-2,3-dihydroquinazolin-4(1*H*)-one.
- 38: ^{13}C NMR spectrum of 2-(*p*-tolyl)-2,3-dihydroquinazolin-4(1*H*)-one.
- 39: ^{13}C NMR spectrum of 2-(*p*-tolyl)-2,3-dihydroquinazolin-4(1*H*)-one.
- 40: FT-IR spectrum of recovered urea-riched POP

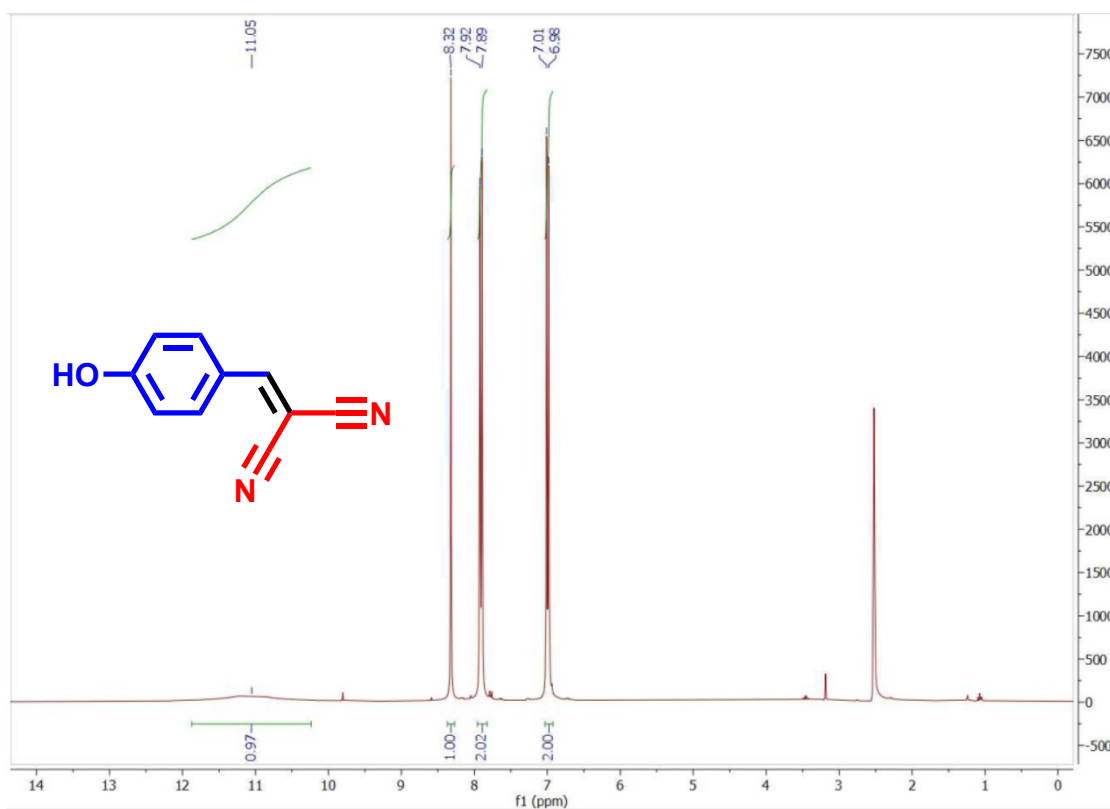
1: FT-IR spectrum of 2-(4-methoxybenzylidene)malononitrile.



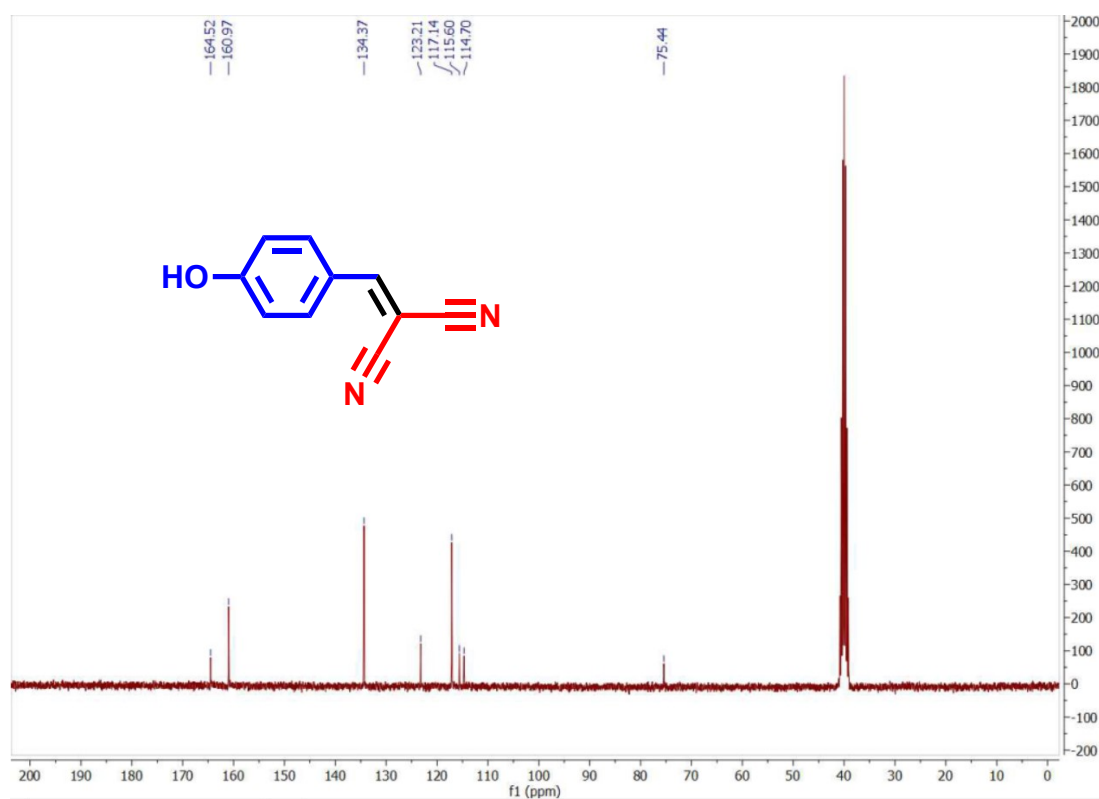
2: FT-IR spectrum of 2-(4-hydroxybenzylidene)malononitrile.



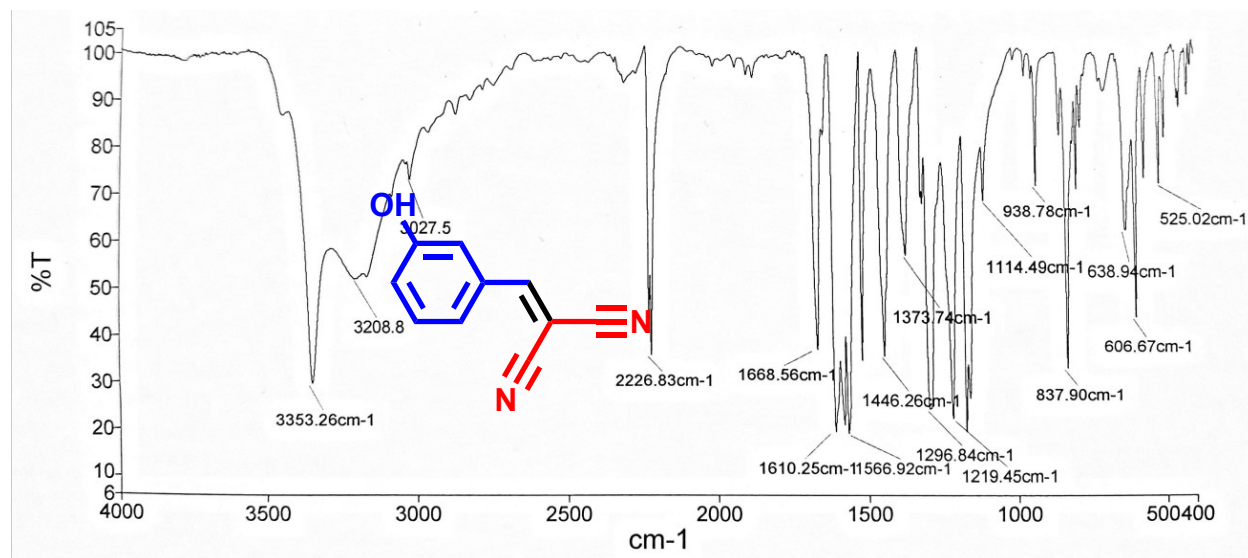
3: ^1H NMR spectrum of 2-(4-hydroxybenzylidene)malononitrile.



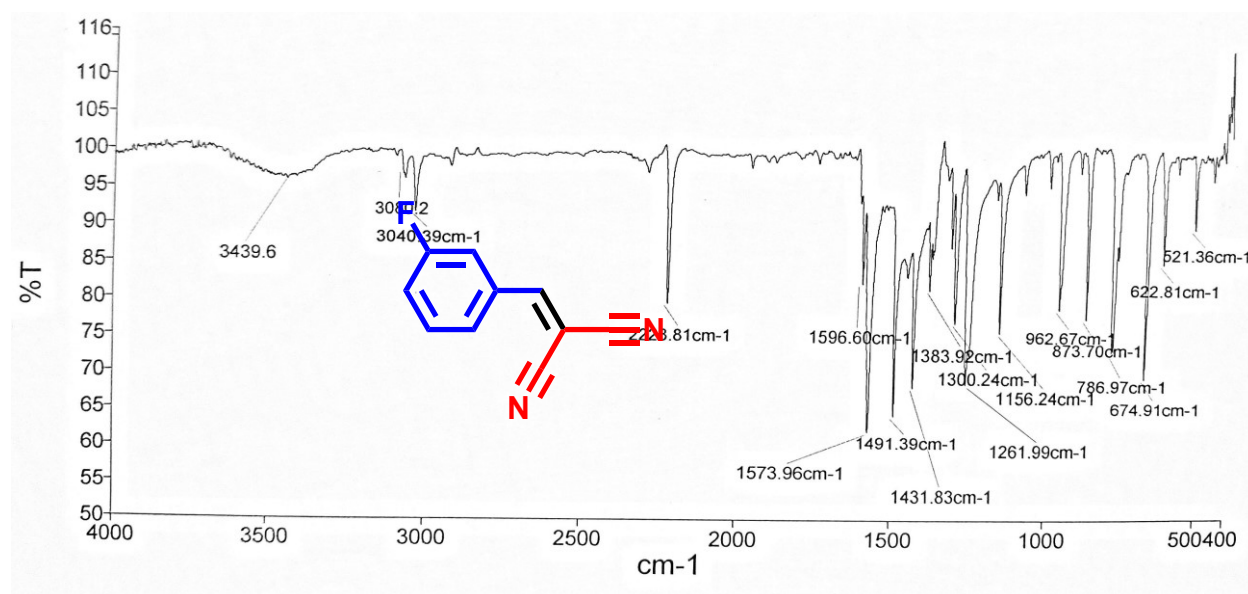
4: ^{13}C NMR spectrum of 2-(4-hydroxybenzylidene)malononitrile.



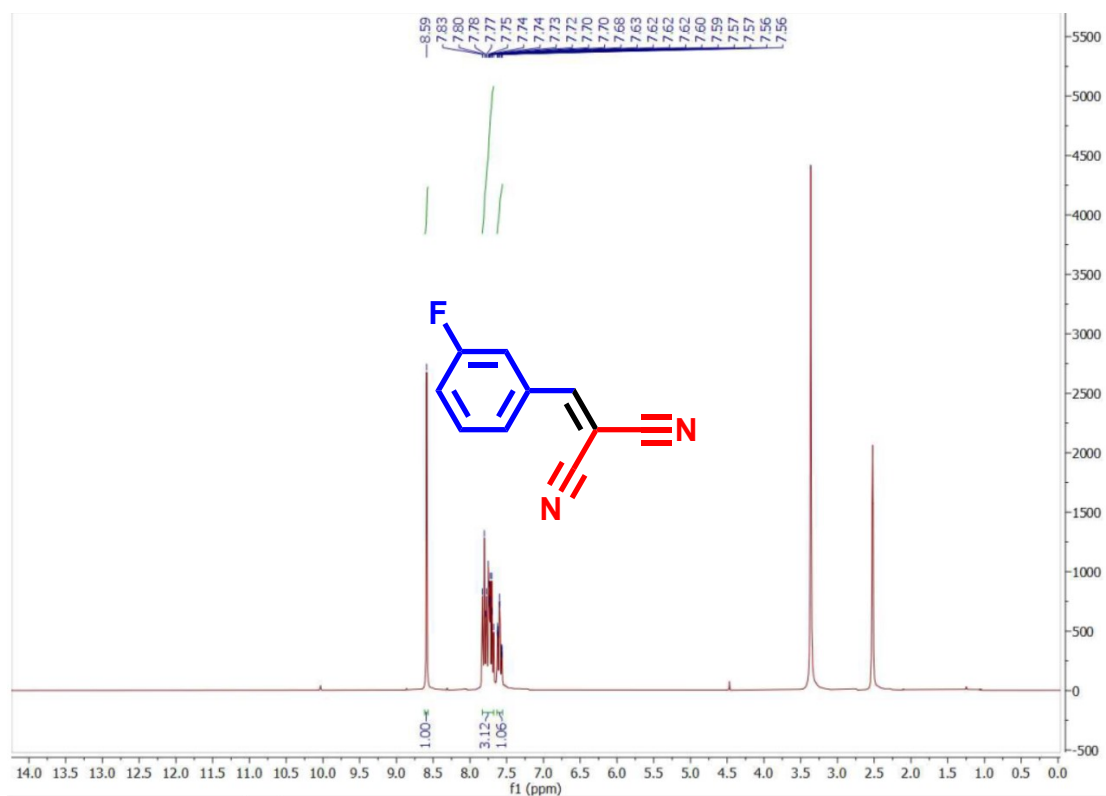
5: FT-IR spectrum of 2-(3-hydroxybenzylidene)malononitrile.



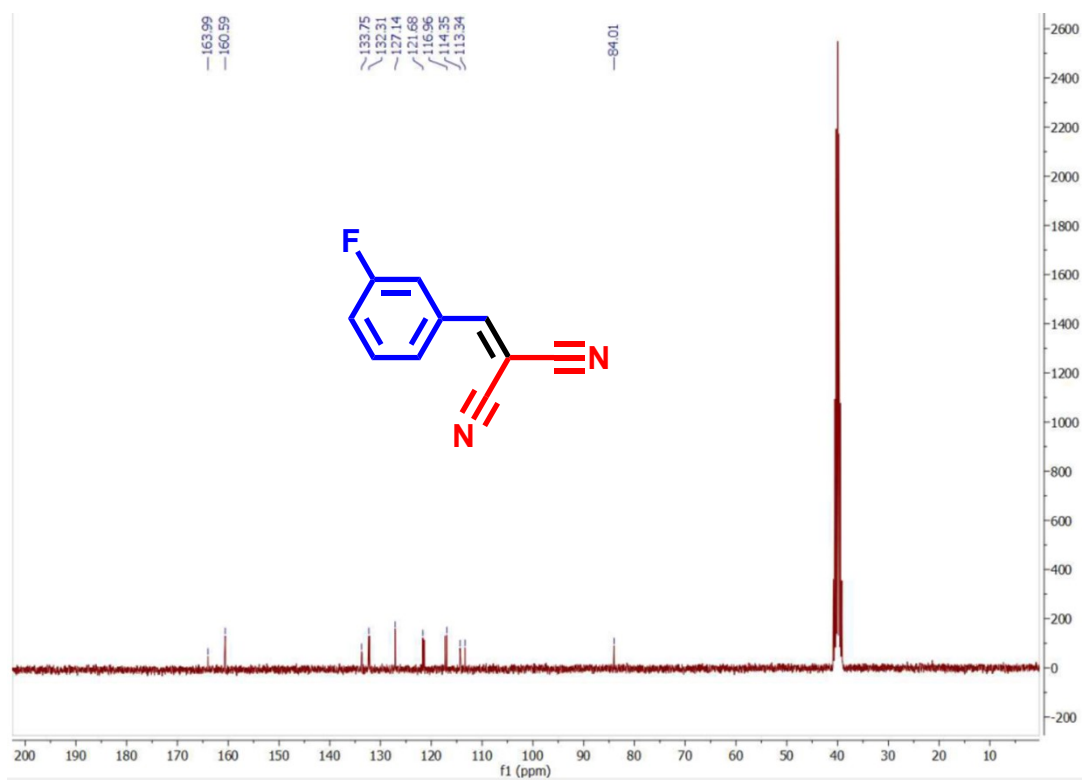
6: FT-IR spectrum of 2-(3-fluorobenzylidene)malononitrile.



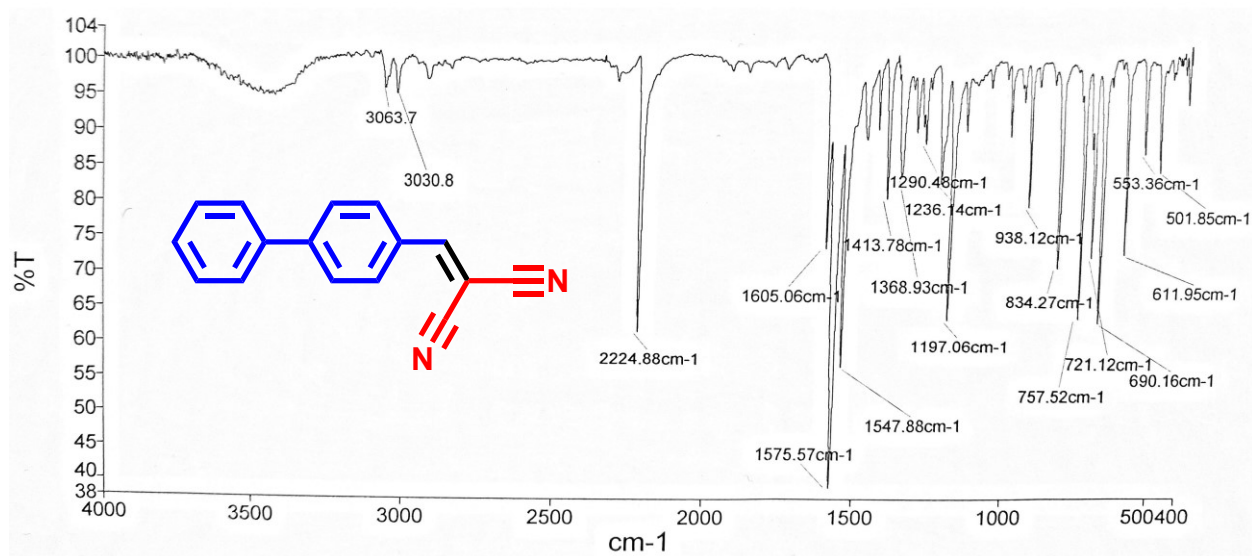
7: ^1H NMR spectrum of spectrum of 2-(3-fluorobenzylidene)malononitrile.



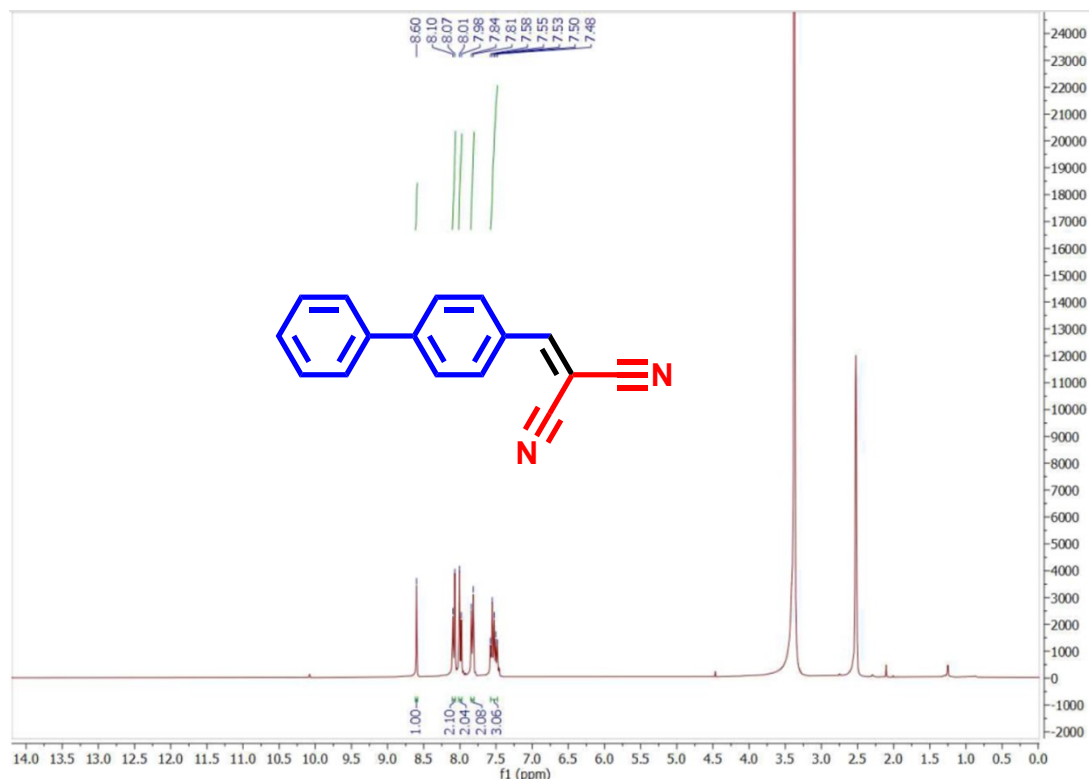
8: ^{13}C NMR spectrum of spectrum of 2-(3-fluorobenzylidene)malononitrile.



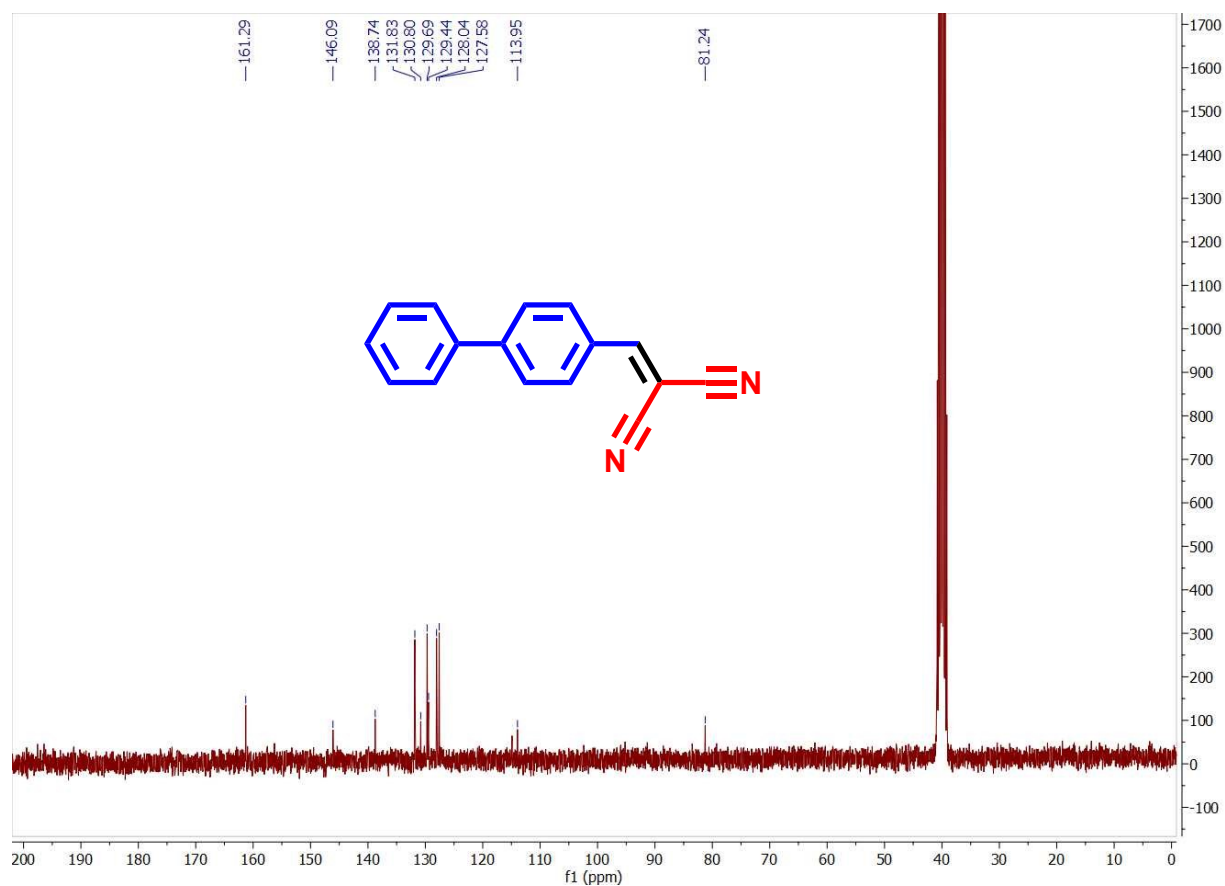
9: FT-IR spectrum of 2-([1,1'-biphenyl]-4-ylmethylene)malononitrile.



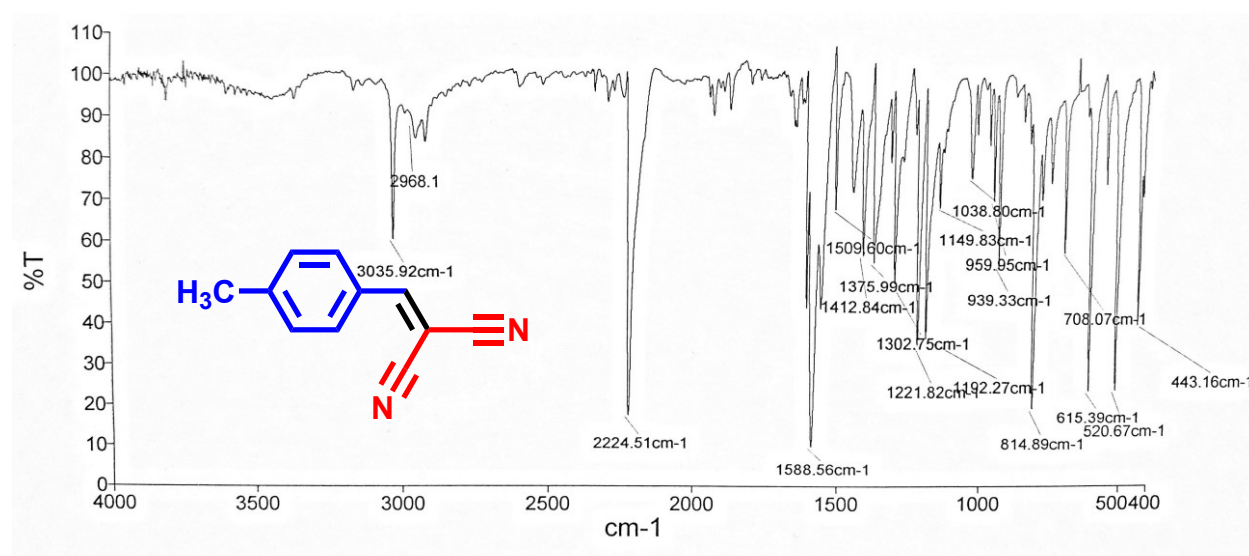
10: ¹H NMR spectrum of 2-([1,1'-biphenyl]-4-ylmethylene)malononitrile.



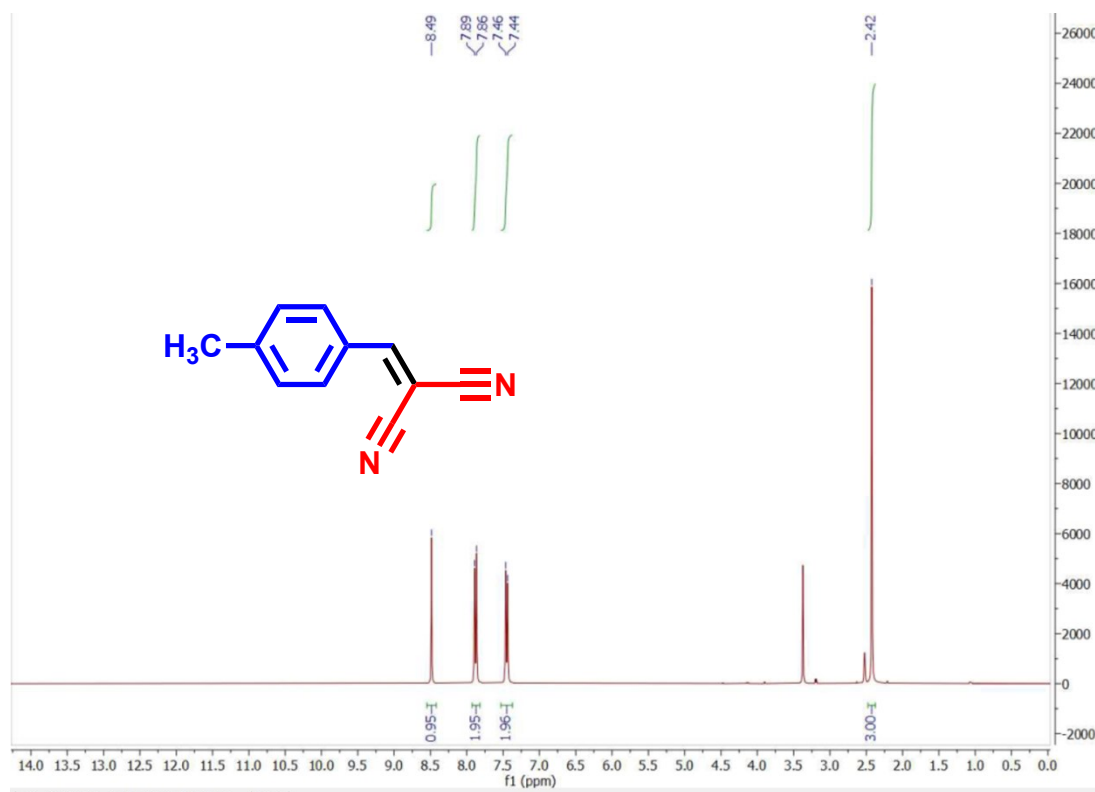
11: ^{13}C NMR spectrum of 2-([1,1'-biphenyl]-4-ylmethylene)malononitrile.



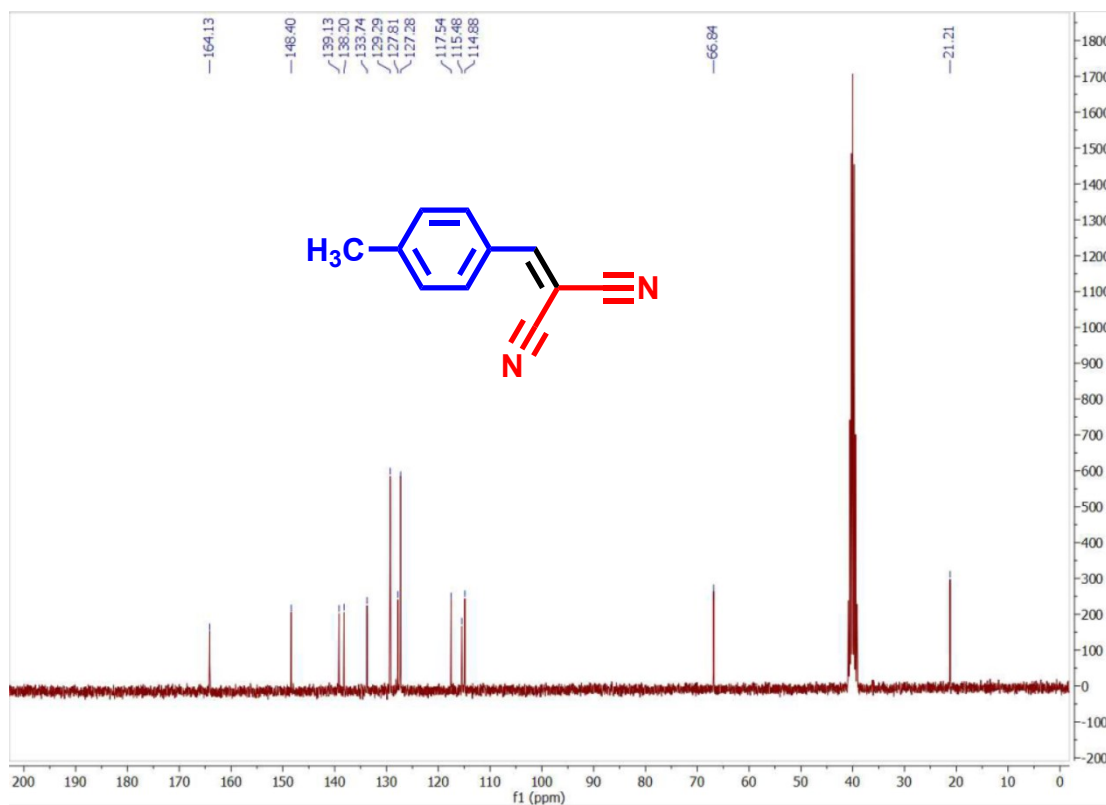
12: FT-IR spectrum of 2-(4-methylbenzylidene)malononitrile.



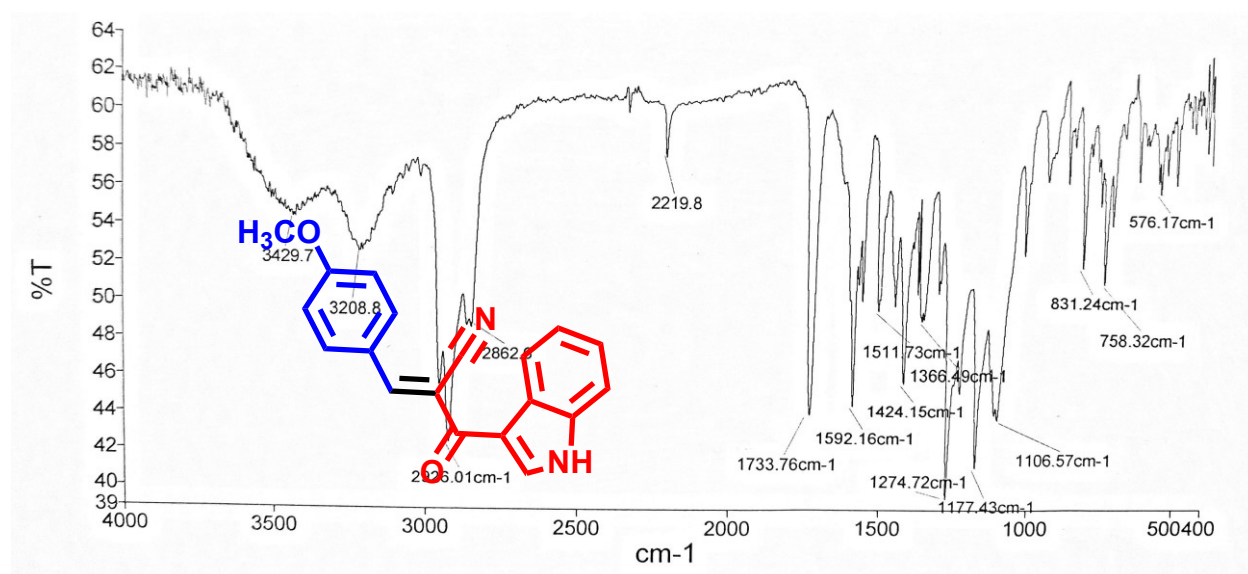
13: ^1H NMR spectrum of 2-(4-methylbenzylidene)malononitrile.



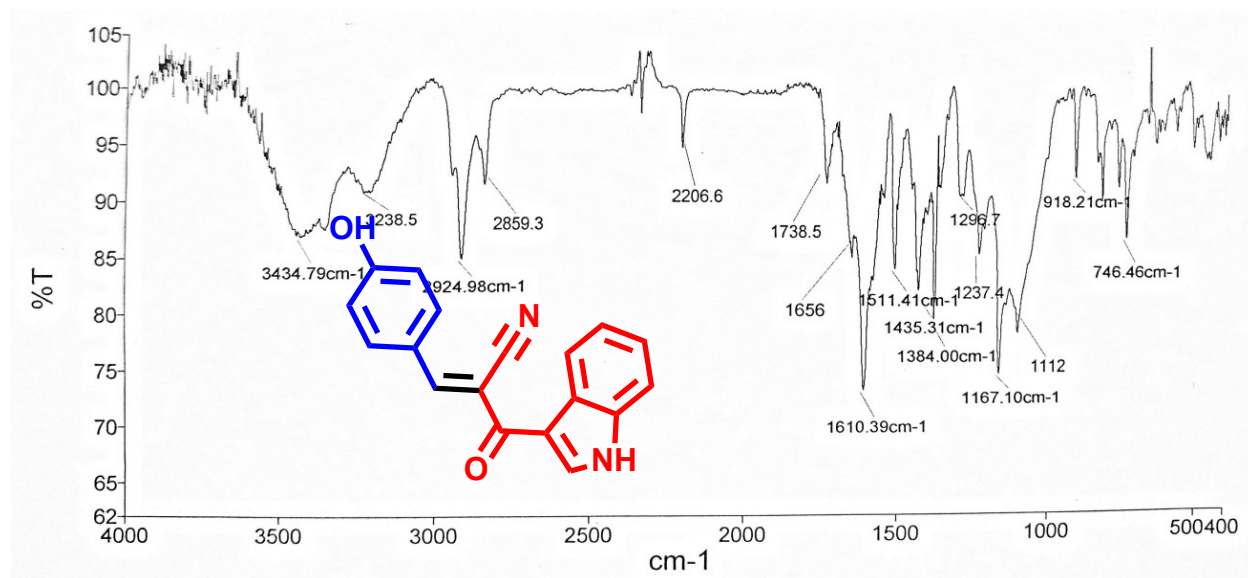
14: ^{13}C NMR spectrum of 2-(4-methylbenzylidene)malononitrile.



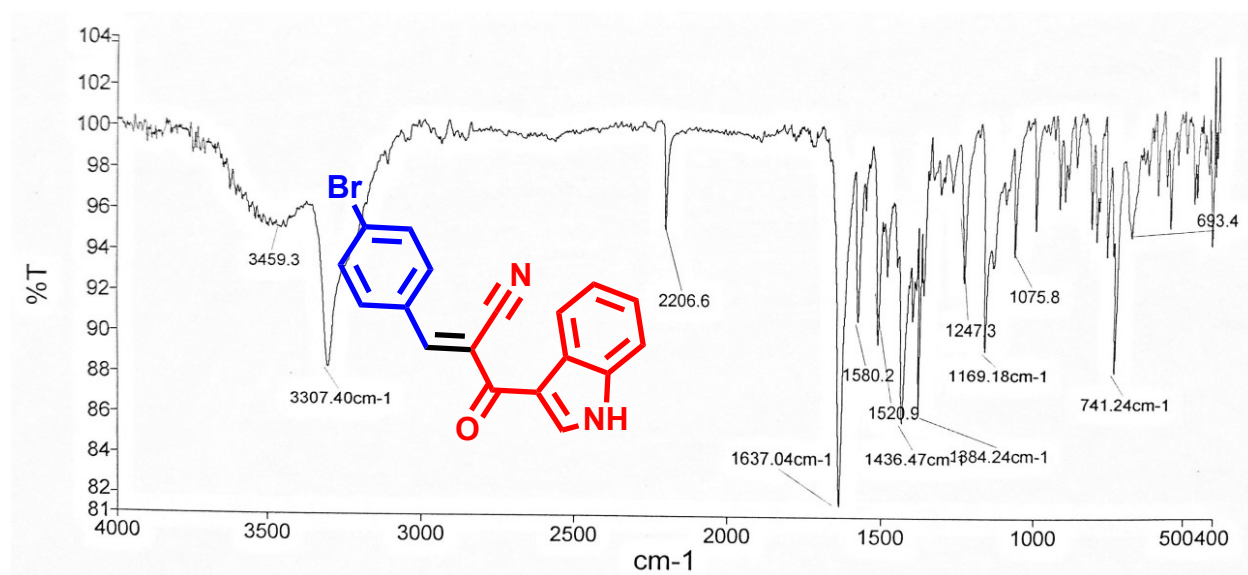
15: FT-IR spectrum of (*E*)-2-(1*H*-indole-3-carbonyl)-3-(4-methoxyphenyl)acrylonitrile.



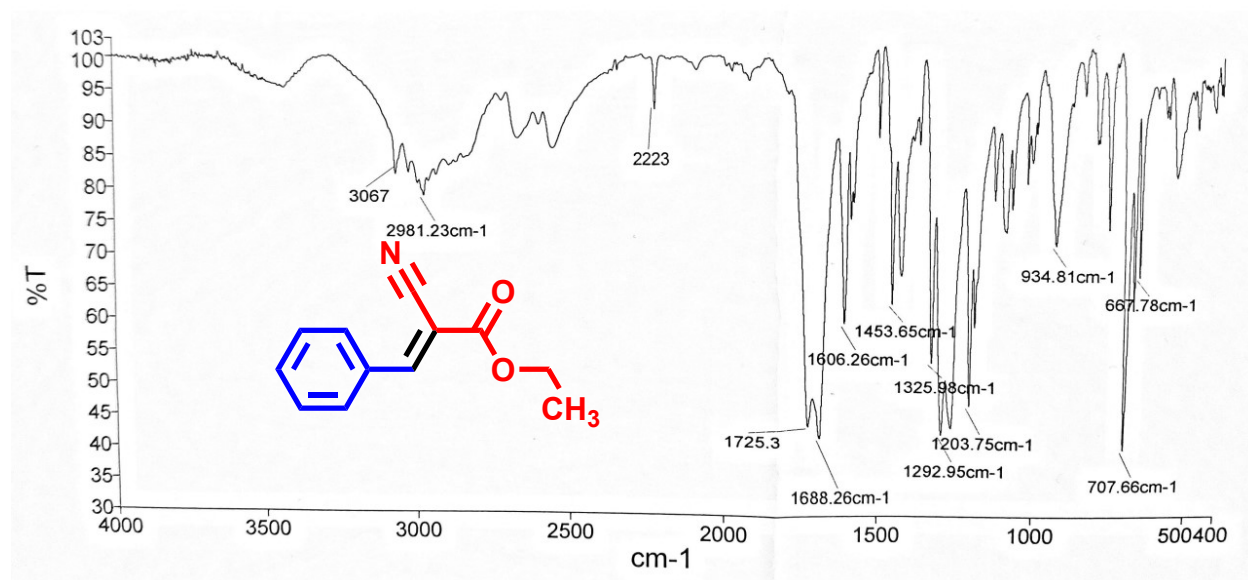
16: FT-IR spectrum of (*E*)-3-(4-hydroxyphenyl)-2-(1*H*-indole-3-carbonyl)acrylonitrile.



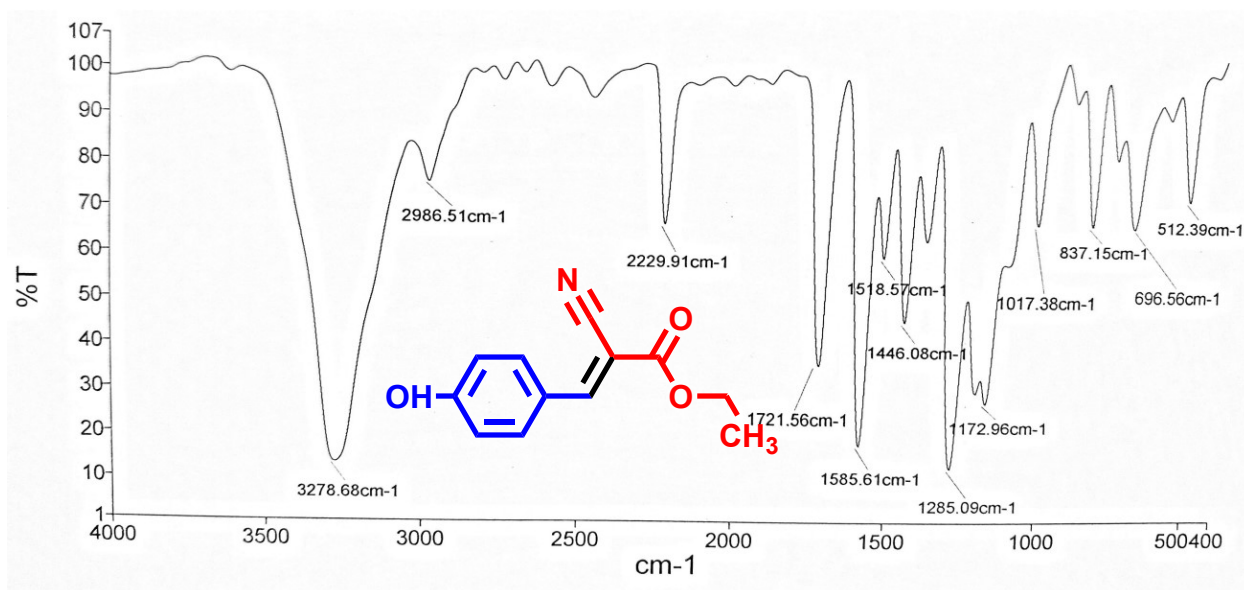
17: FT-IR spectrum of (*E*)-3-(4-bromophenyl)-2-(1*H*-indole-3-carbonyl)acrylonitrile.



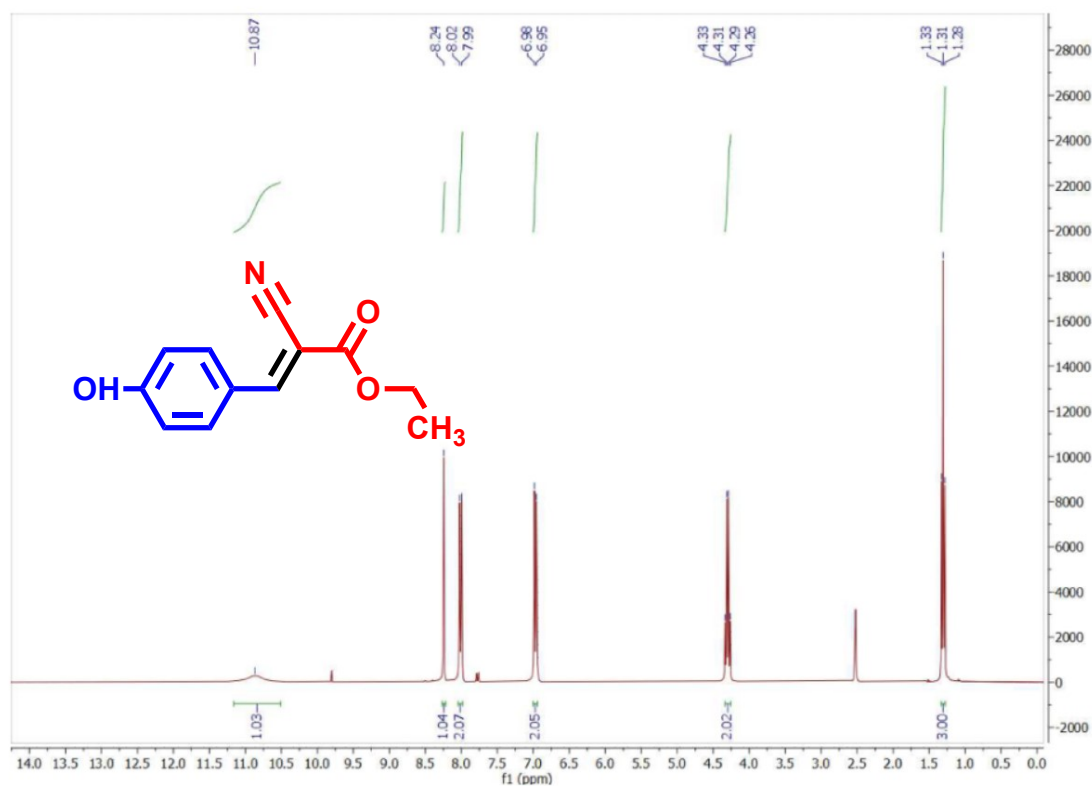
18: FT-IR spectrum of ethyl (*E*)-2-cyano-3-phenylacrylate.



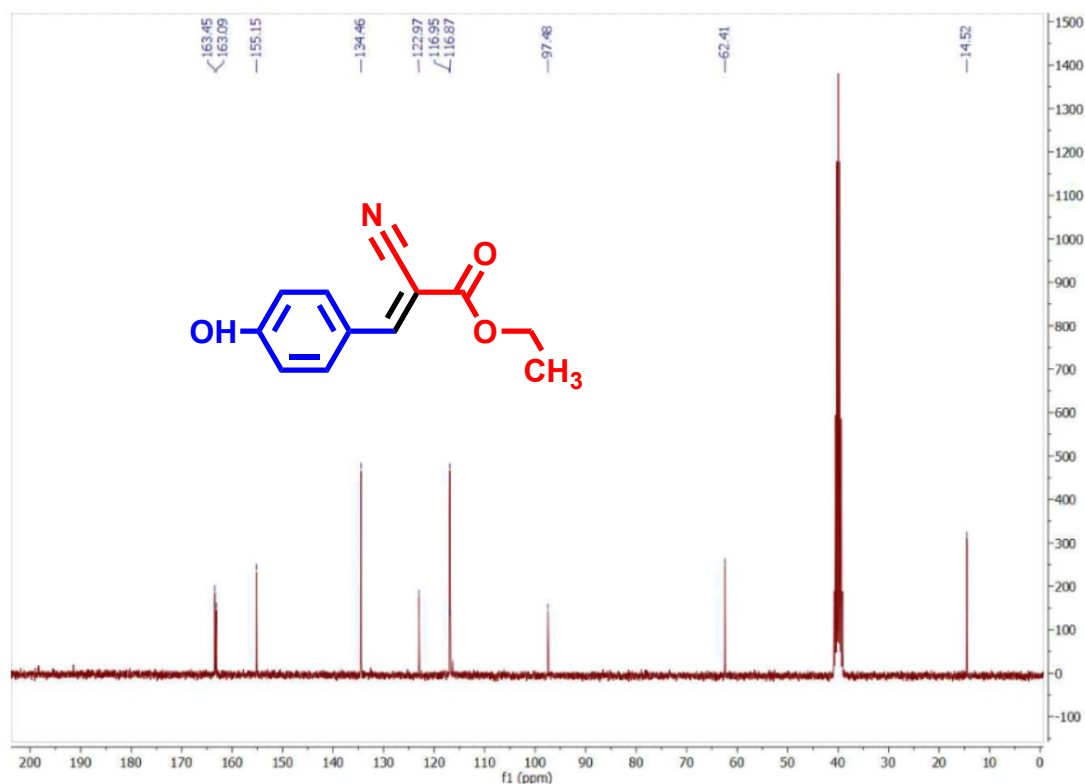
19: FT-IR spectrum of ethyl (*E*)-2-cyano-3-(4-hydroxyphenyl)acrylate.



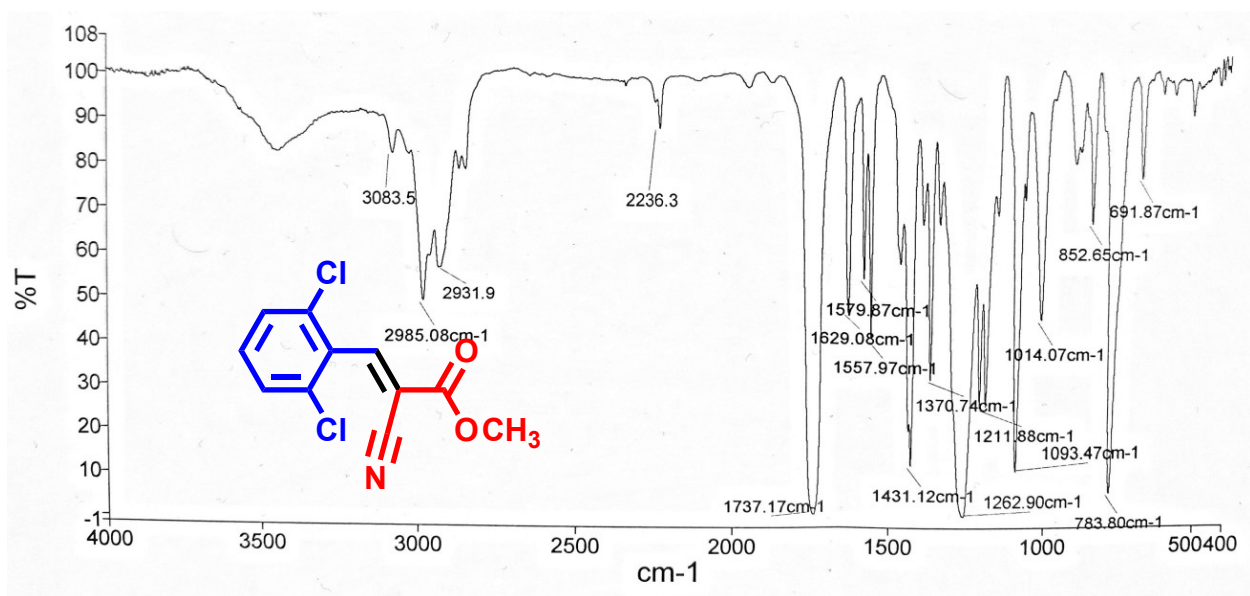
20: ¹H NMR spectrum of ethyl (*E*)-2-cyano-3-(4-hydroxyphenyl)acrylate.



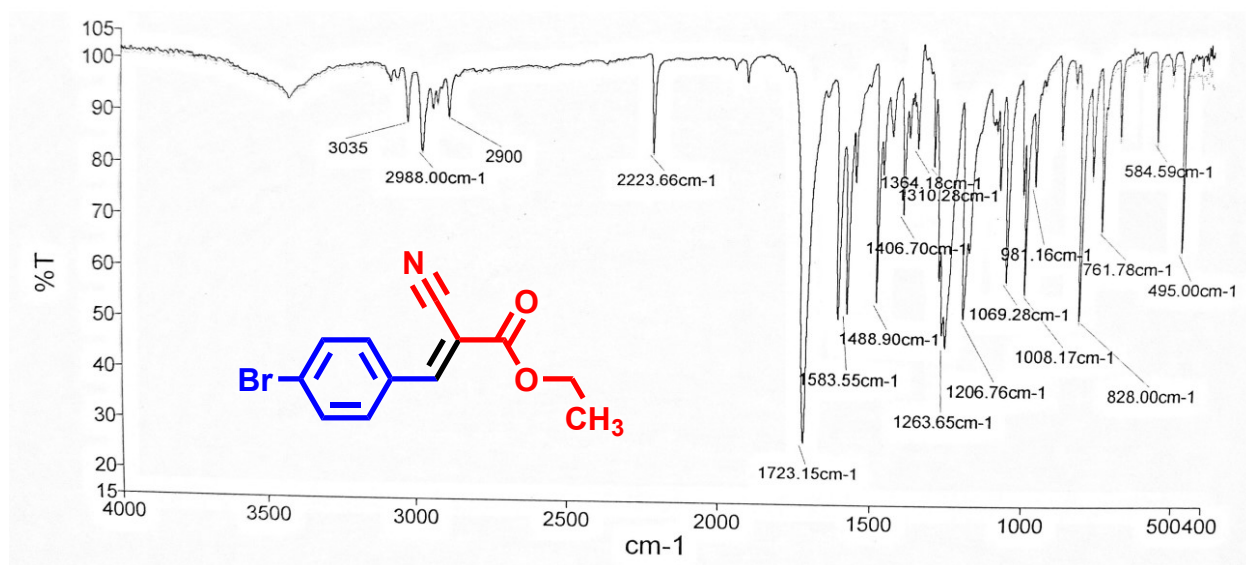
21: ^{13}C NMR spectrum of ethyl (*E*)-2-cyano-3-(4-hydroxyphenyl)acrylate.



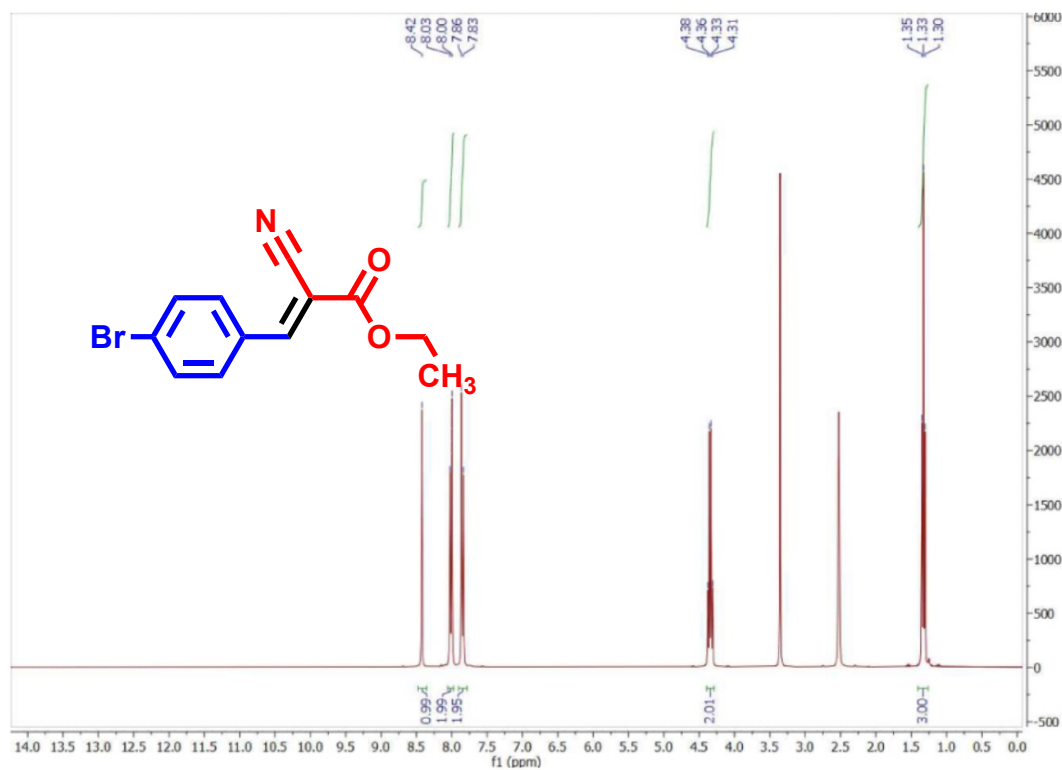
22: FT-IR spectrum of methyl (*E*)-2-cyano-3-(2,6-dichlorophenyl)acrylate.



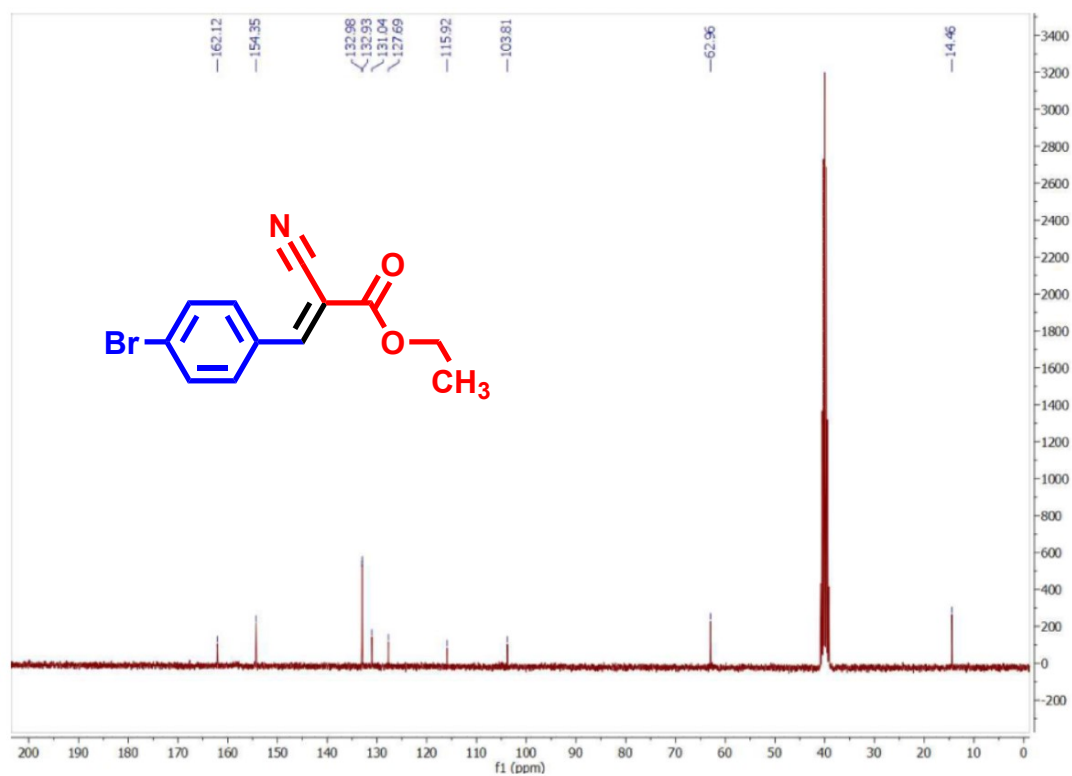
23: FT-IR spectrum of ethyl (*E*)-3-(4-bromophenyl)-2-cyanoacrylate.



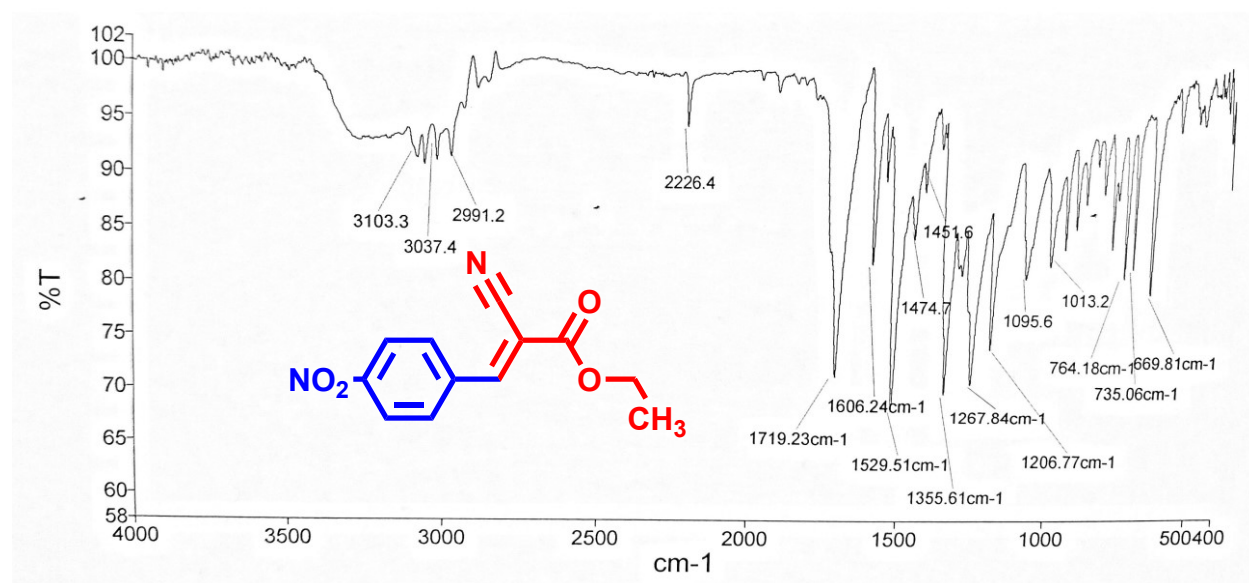
24: ¹H NMR spectrum of ethyl *E*-3-(4-bromophenyl)-2-cyanoacrylate.



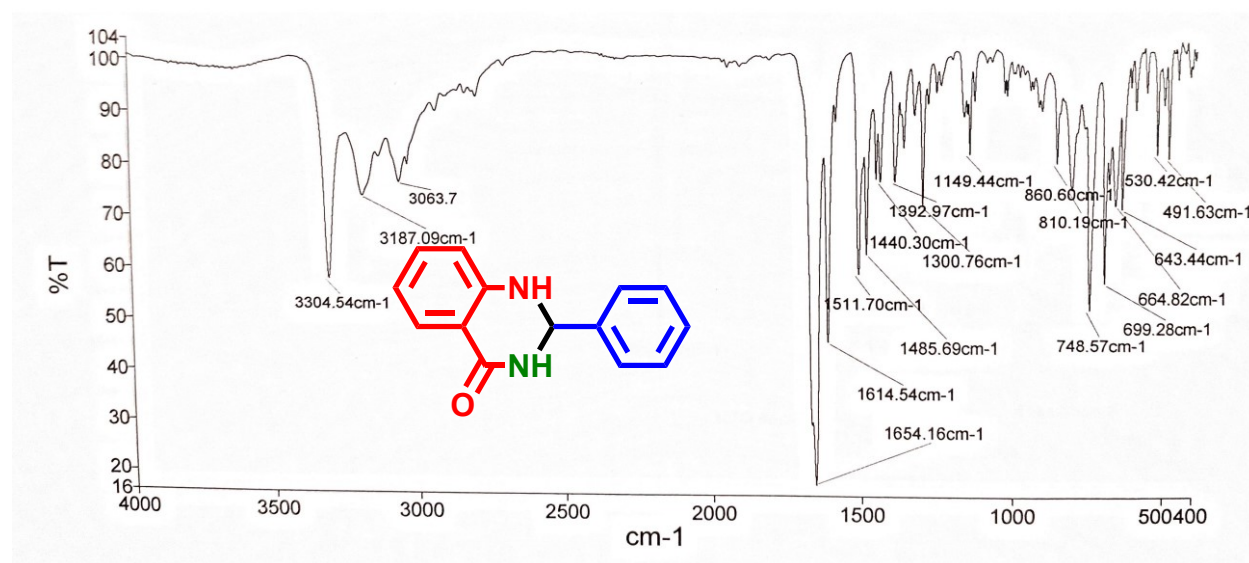
25: ^{13}C NMR spectrum of ethyl *E*-3-(4-bromophenyl)-2-cyanoacrylate.



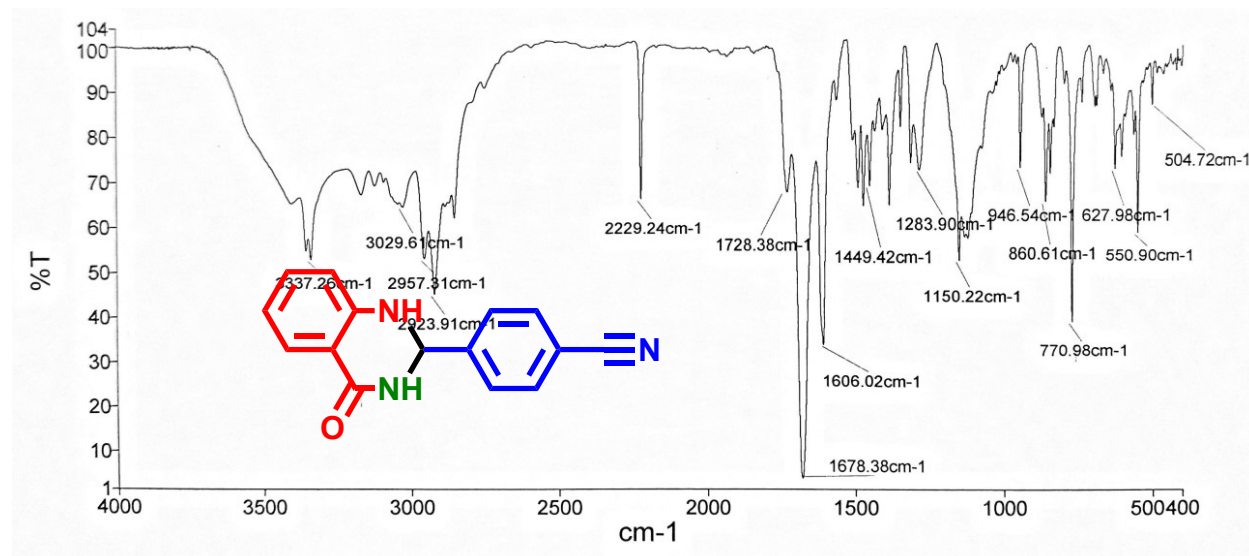
26: FT-IR spectrum of ethyl (*E*)-2-cyano-3-(4-nitrophenyl)acrylate.



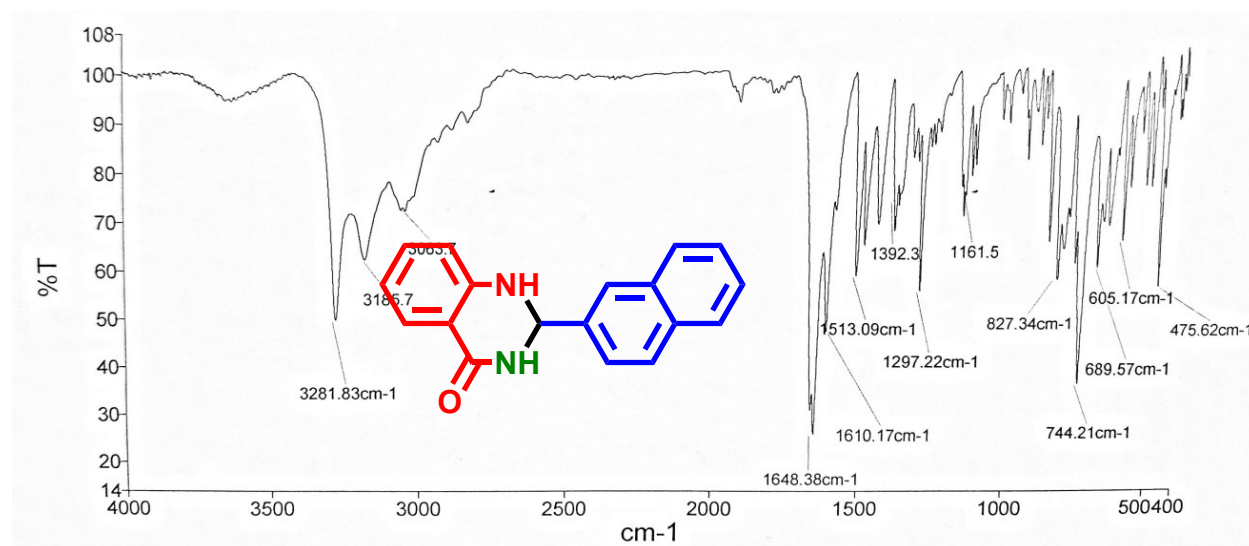
27: FT-IR spectrum of 2-phenyl-2,3-dihydroquinazolin-4(1H)-one.



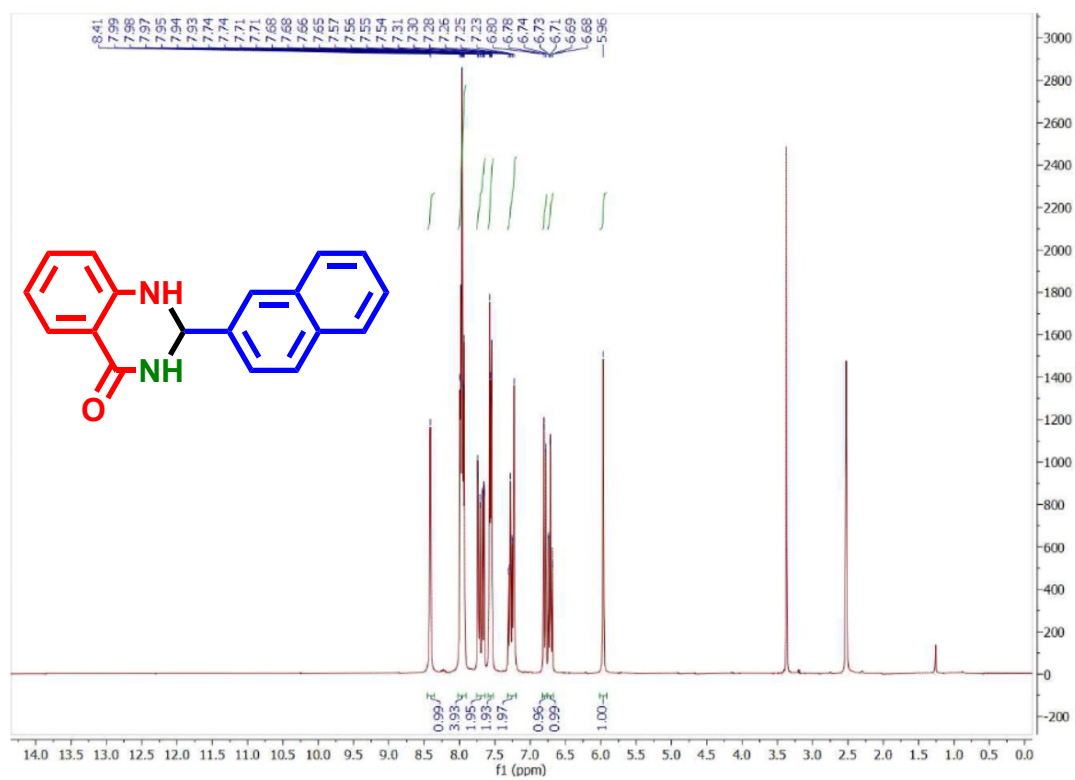
28: FT-IR spectrum of 4-(4-oxo-1,2,3,4-tetrahydroquinazolin-2-yl)benzonitrile.



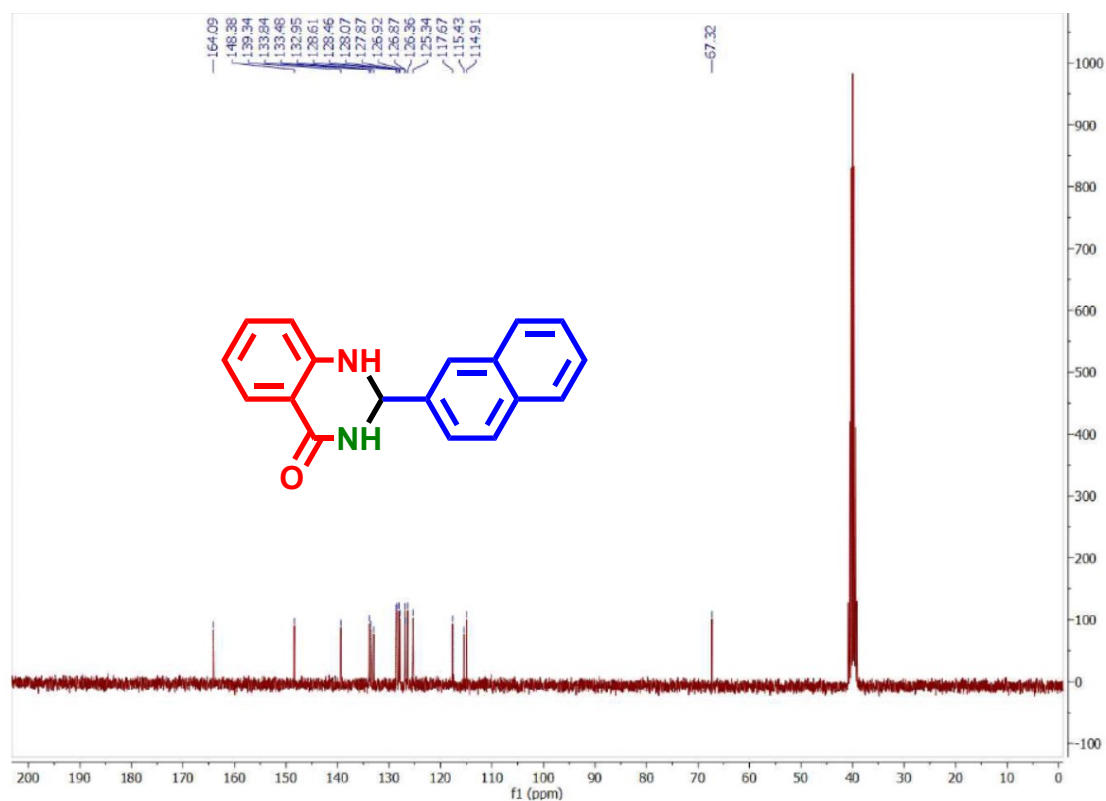
29: FT-IR spectrum of 2-(naphthalen-2-yl)-2,3-dihydroquinazolin-4(1*H*)-one.



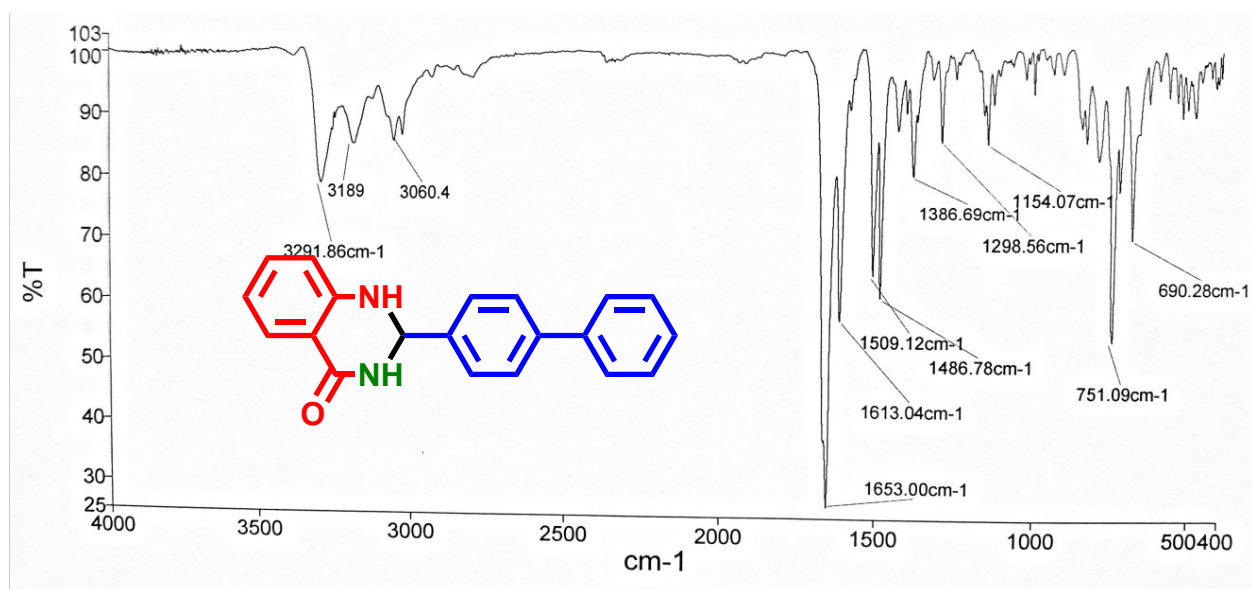
30: ¹H NMR spectrum of 2-(naphthalen-2-yl)-2,3-dihydroquinazolin-4(1*H*)-one.



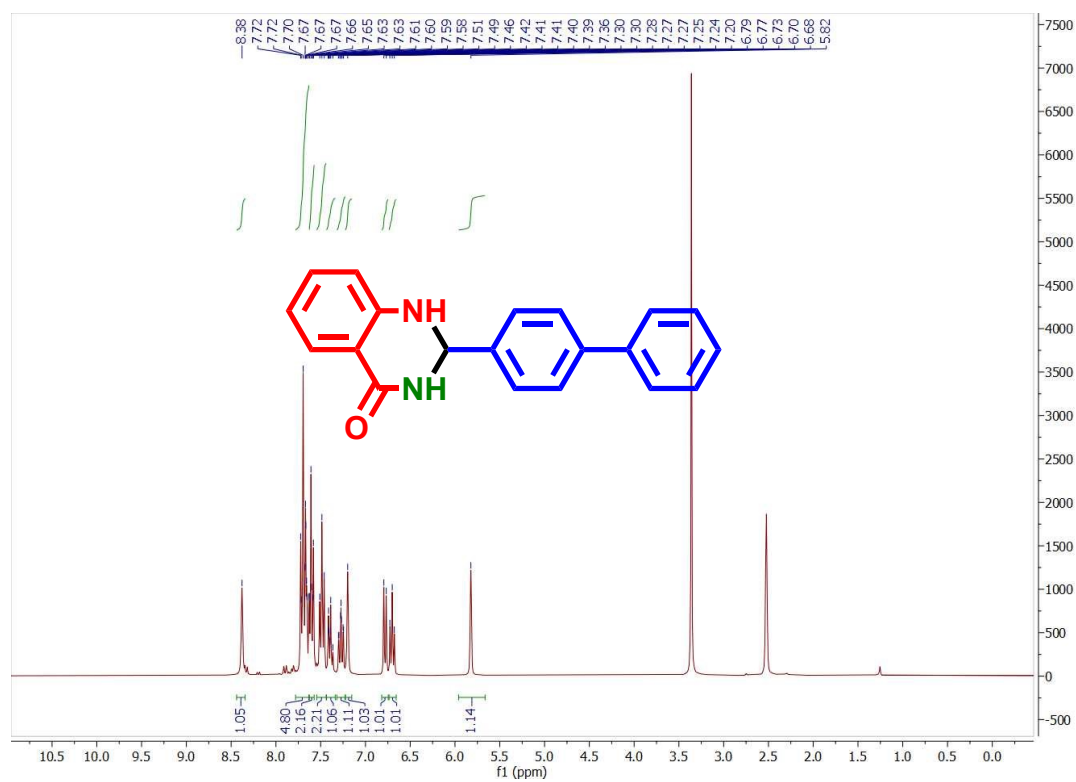
31: ^{13}C NMR spectrum of 2-(naphthalen-2-yl)-2,3-dihydroquinazolin-4(1*H*)-one.



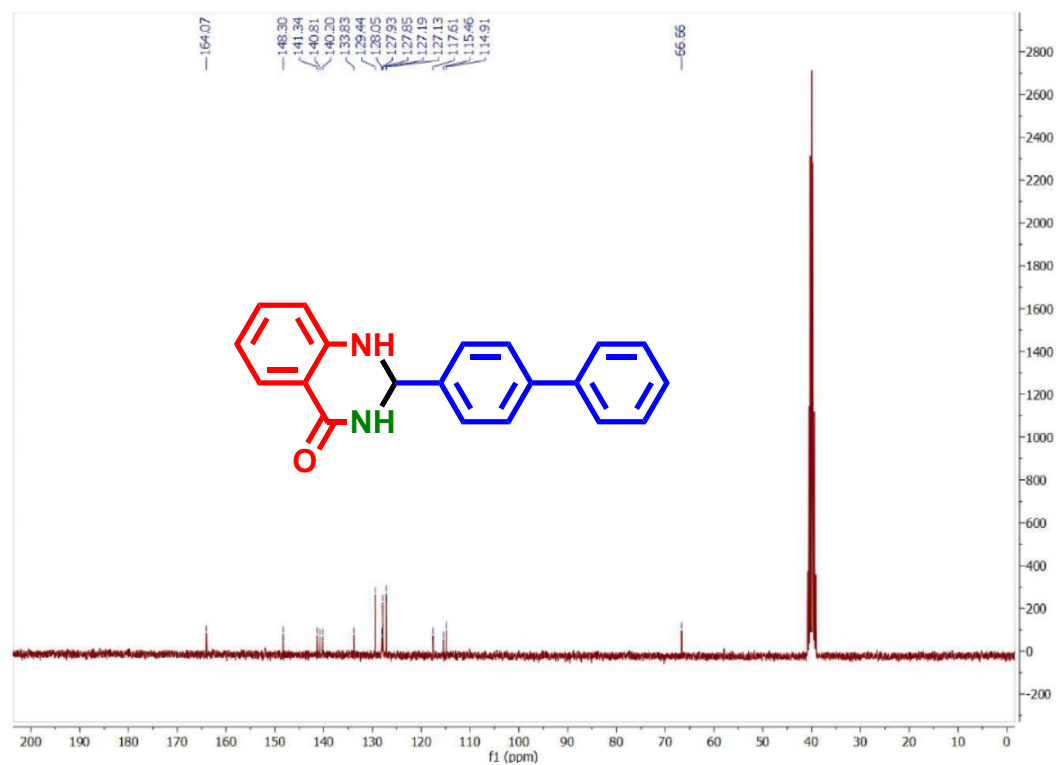
32: FT-IR spectrum of 2-([1,1'-biphenyl]-4-yl)-2,3-dihydroquinazolin-4(1*H*)-one.



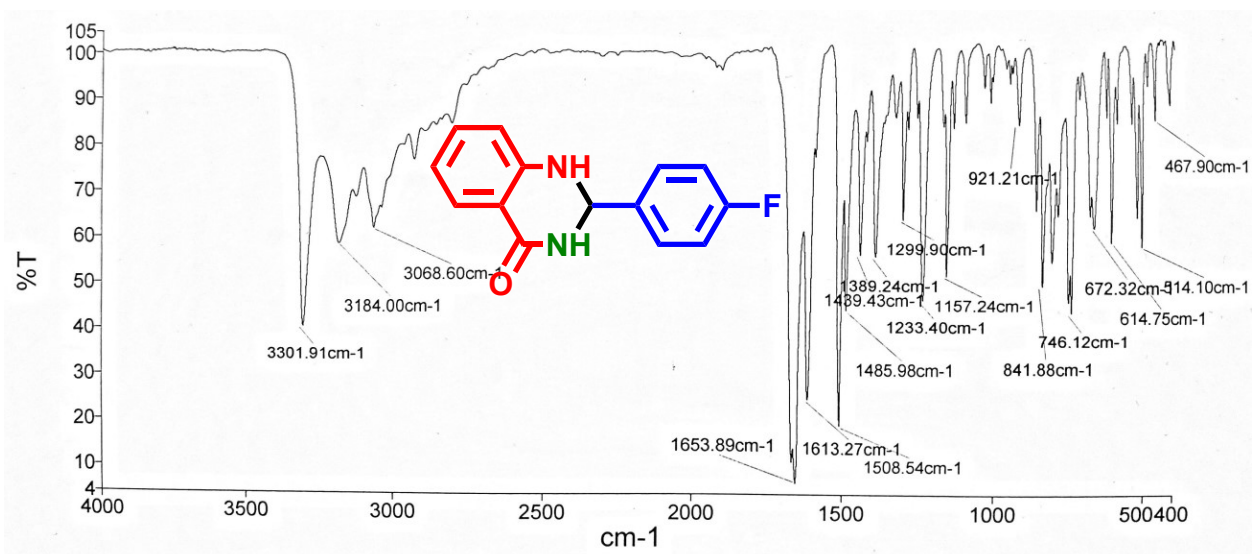
33: ^1H NMR spectrum of 2-([1,1'-biphenyl]-4-yl)-2,3-dihydroquinazolin-4(1*H*)-one.



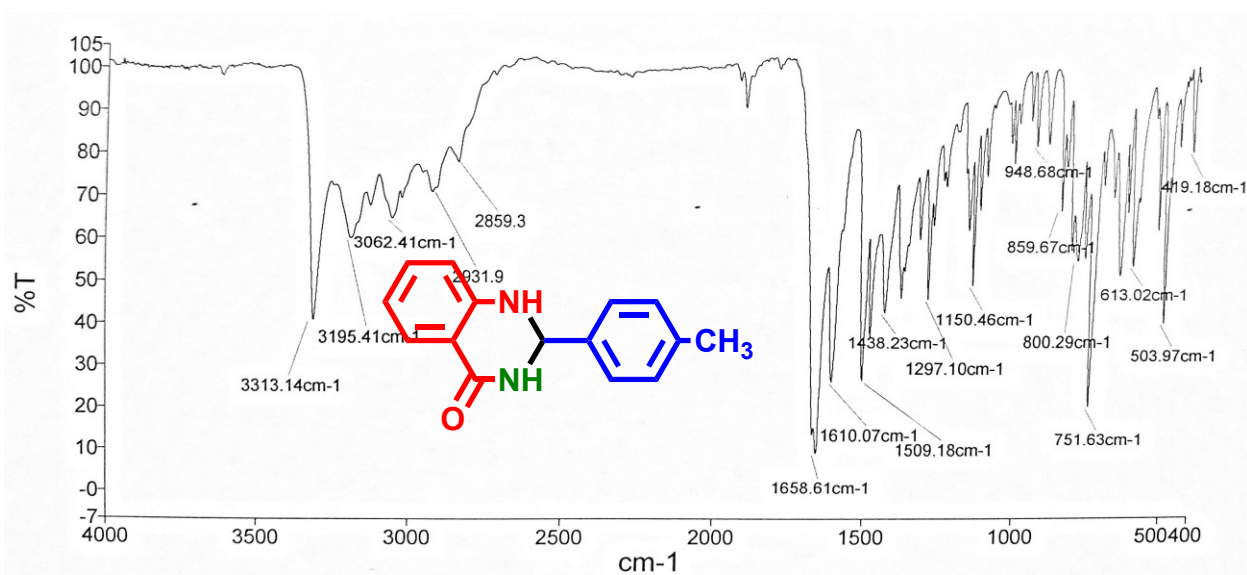
34: ^{13}C NMR spectrum of 2-([1,1'-biphenyl]-4-yl)-2,3-dihydroquinazolin-4(1*H*)-one.



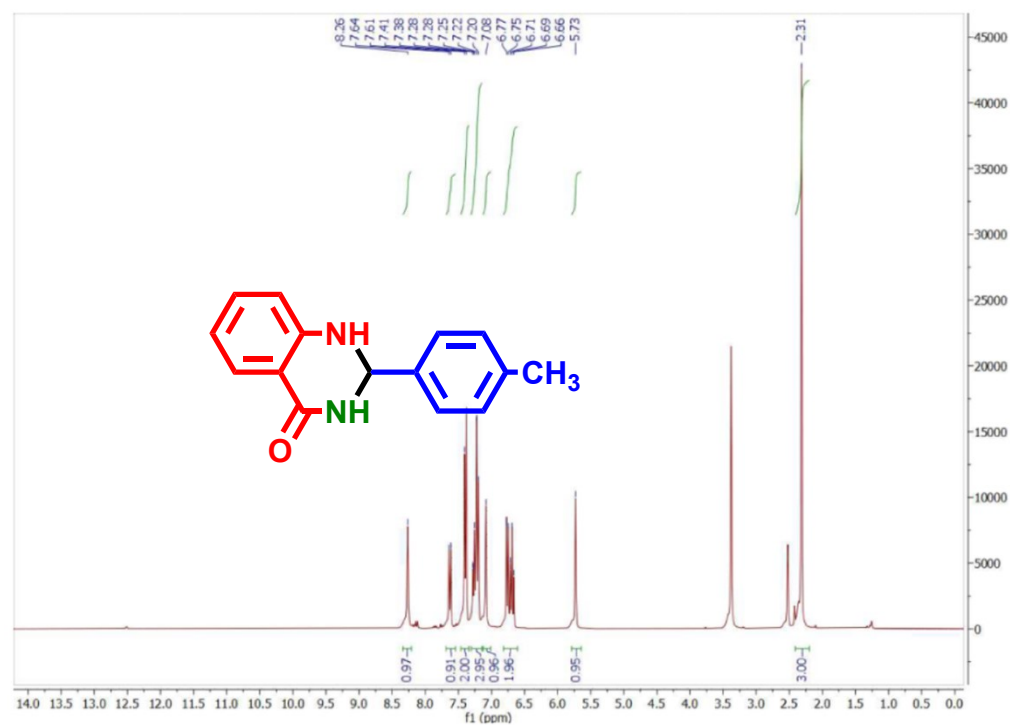
35: FT-IR spectrum of 2-(4-fluorophenyl)-2,3-dihydroquinazolin-4(1H)-one.



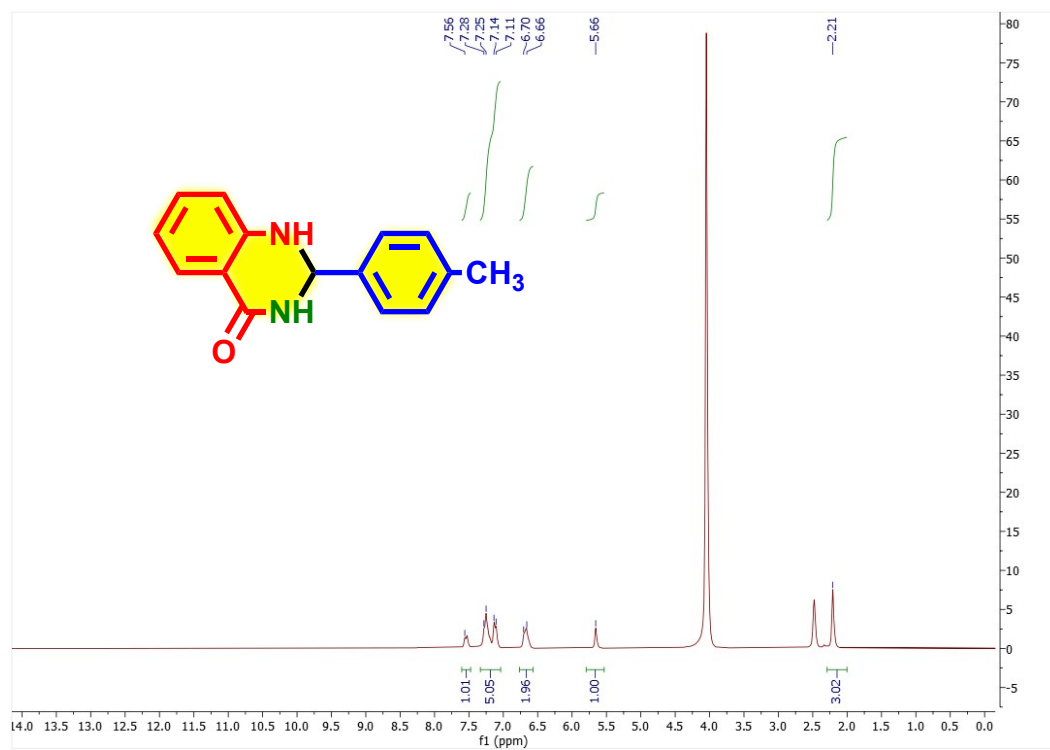
36: FT-IR spectrum of 2-(p-tolyl)-2,3-dihydroquinazolin-4(1H)-one.



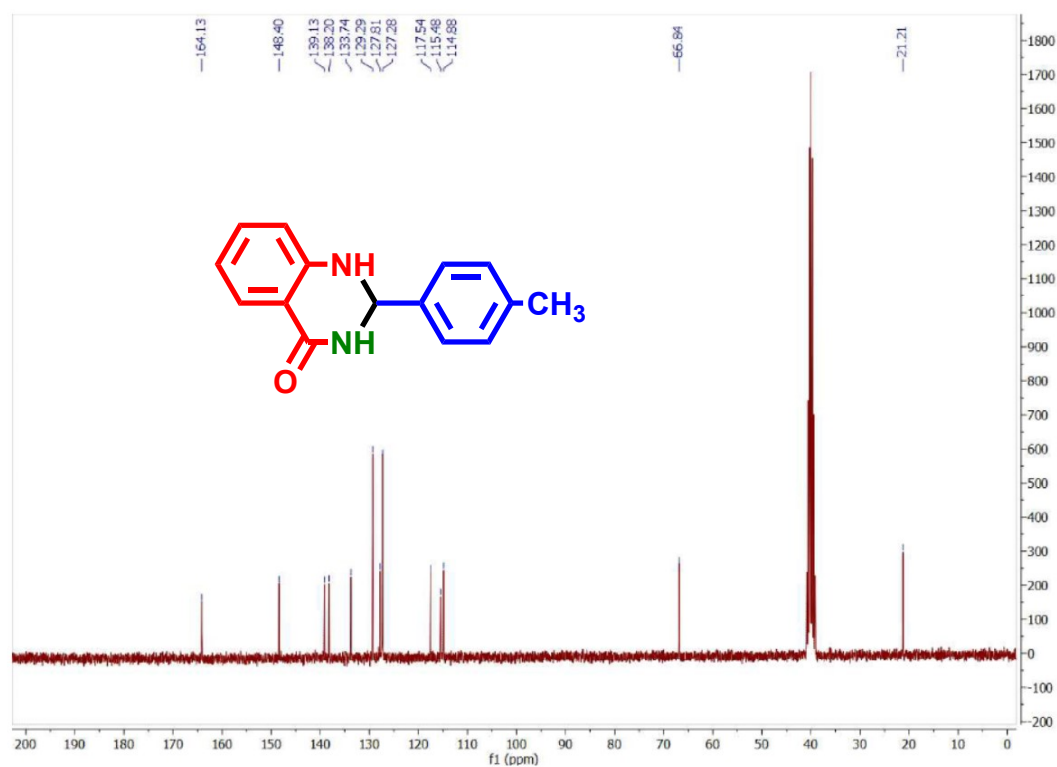
37: ^1H NMR spectrum of 2-(*p*-tolyl)-2,3-dihydroquinazolin-4(1*H*)-one.



38: ^1H NMR (D_2O exchange) spectrum of 2-(*p*-tolyl)-2,3-dihydroquinazolin-4(1*H*)-one.



39: ^{13}C NMR spectrum of 2-(*p*-tolyl)-2,3-dihydroquinazolin-4(1*H*)-one.



40: FT-IR spectrum of recovered urea-rich POP

