

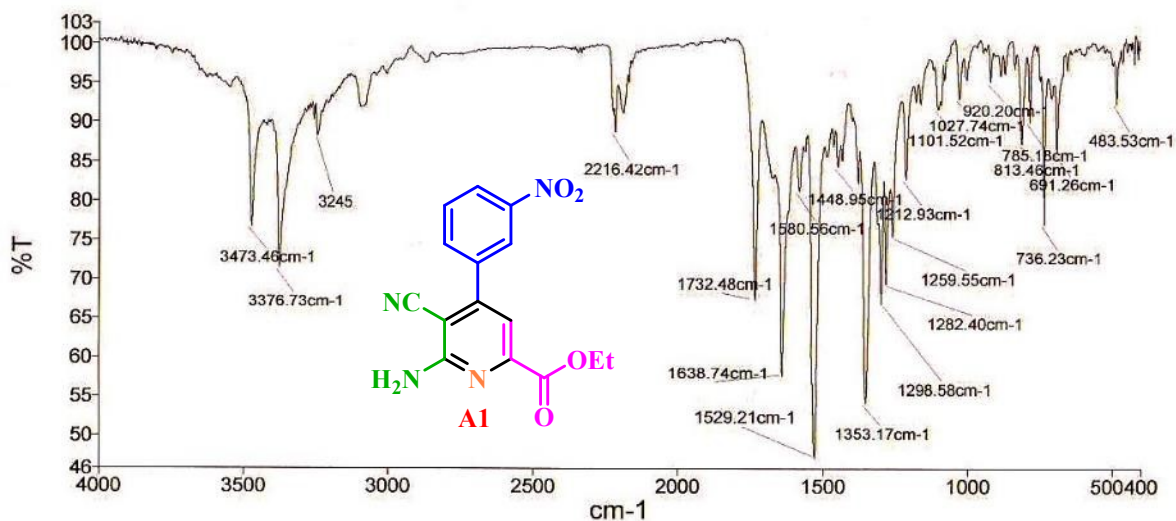
**Synthesis of picolinate via a cooperative vinylogous anomeric-based oxidation using
UiO-66(Zr)-N(CH₂PO₃H₂)₂ as a catalyst**

Saeed Babae,^a Hassan Sepehrmansourie,^a Mahmoud Zarei,^{b*} Mohammad Ali Zolfigol^{a*}
and Mojtaba Hosseinfard^c

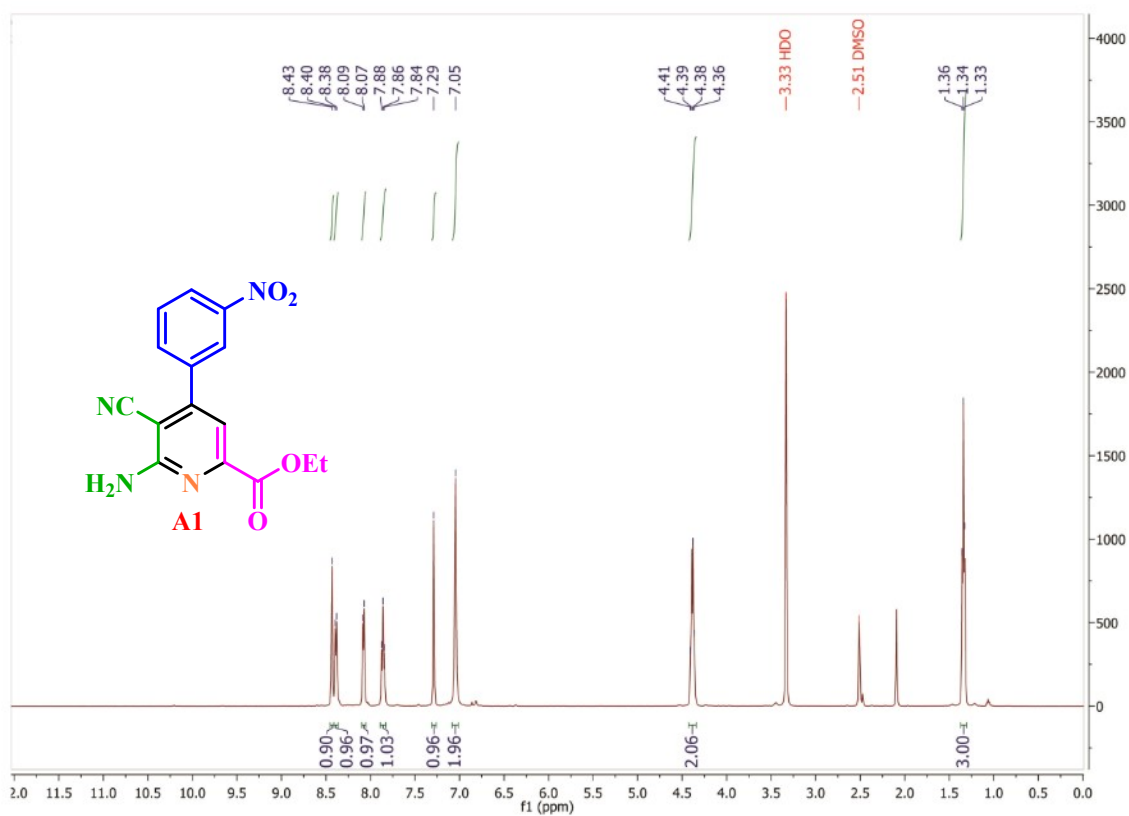
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^b Department of Chemistry, Faculty of Science, University of Qom, Qom, 37185-359, Iran. E-mail: mahmoud8103@yahoo.com (M. Zarei).

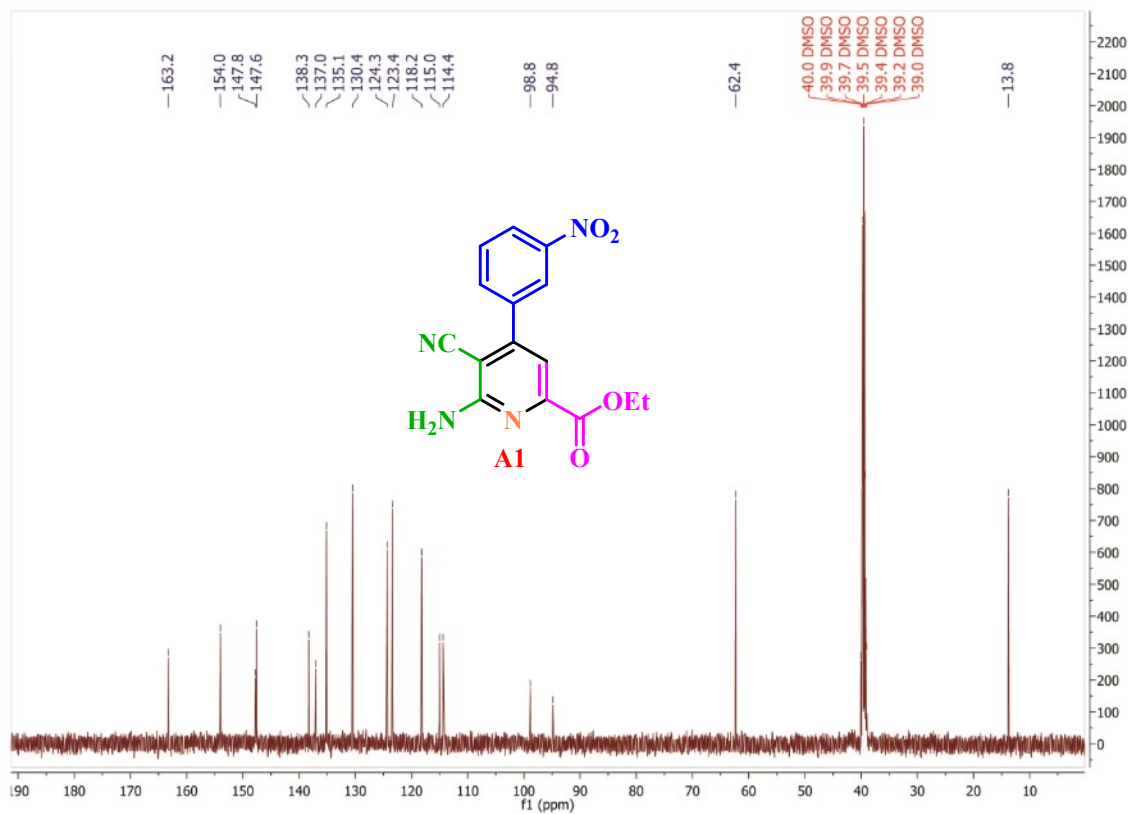
^c Department of Energy, Materials and Energy Research Center, P.O. Box 31787-316, Karaj, Iran.



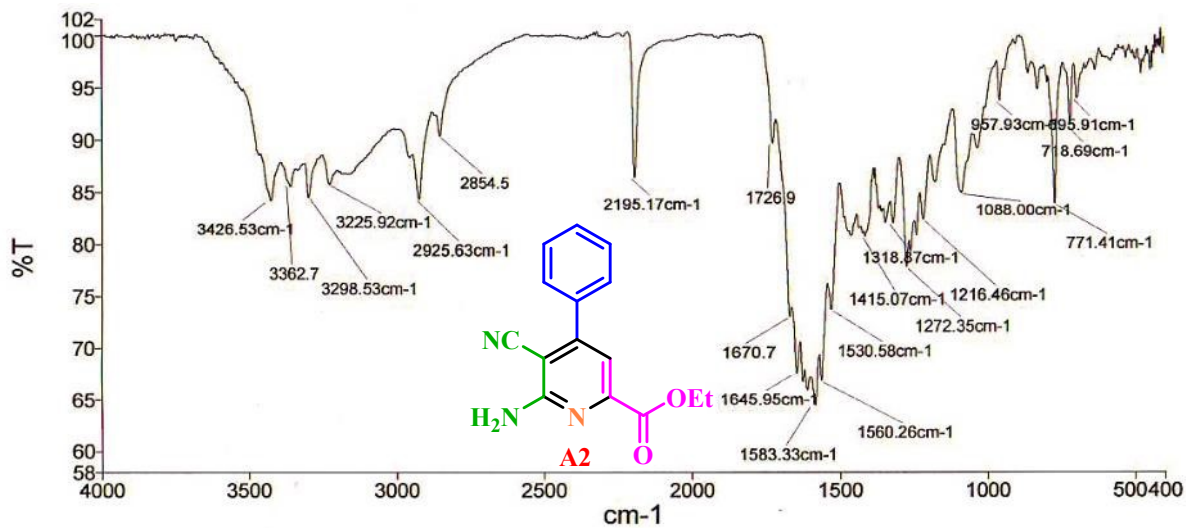
FT-IR spectrum of ethyl 6-amino-5-cyano-4-(3-nitrophenyl)picolinate (A1).



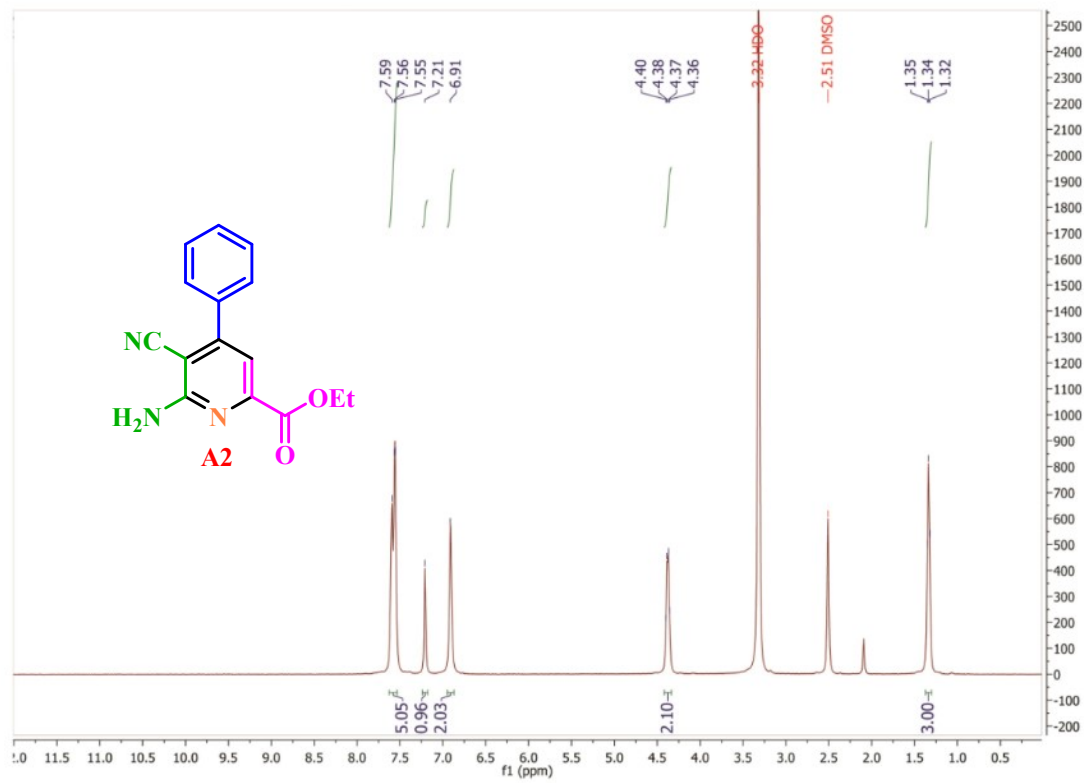
¹H NMR spectrum of ethyl 6-amino-5-cyano-4-(3-nitrophenyl)picolinate (A1).



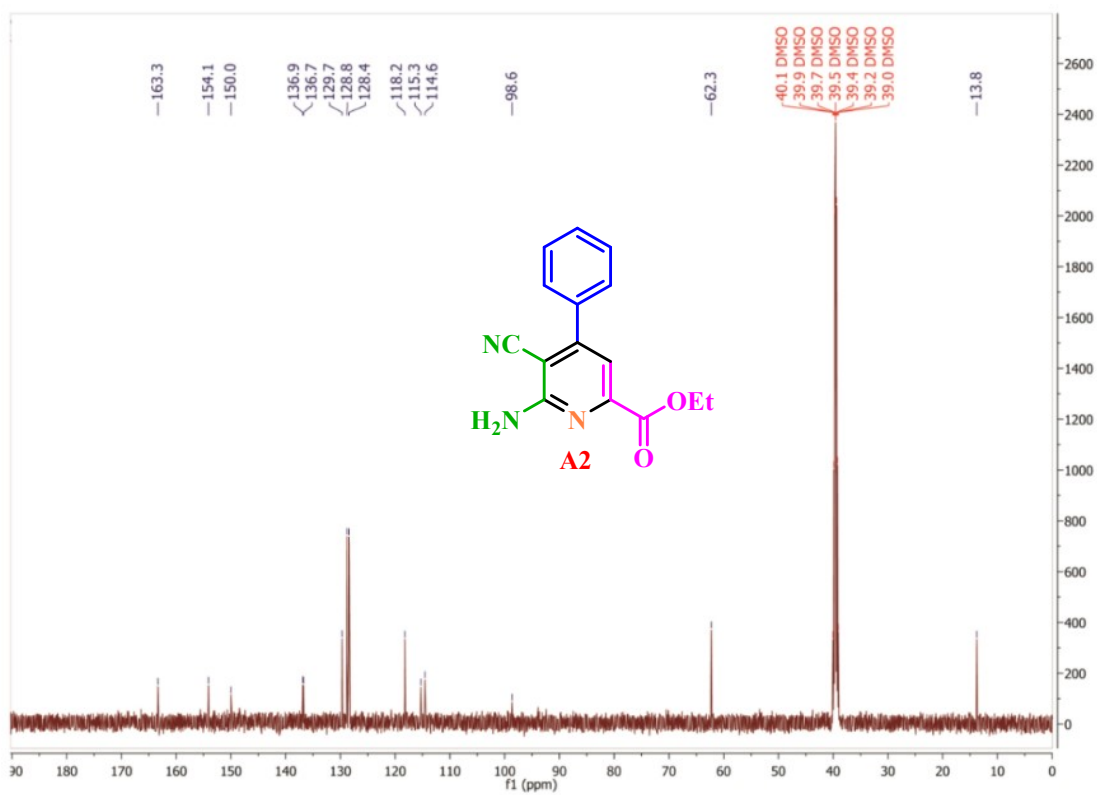
¹³C NMR spectrum of ethyl 6-amino-5-cyano-4-(3-nitrophenyl)picolinate (A1).



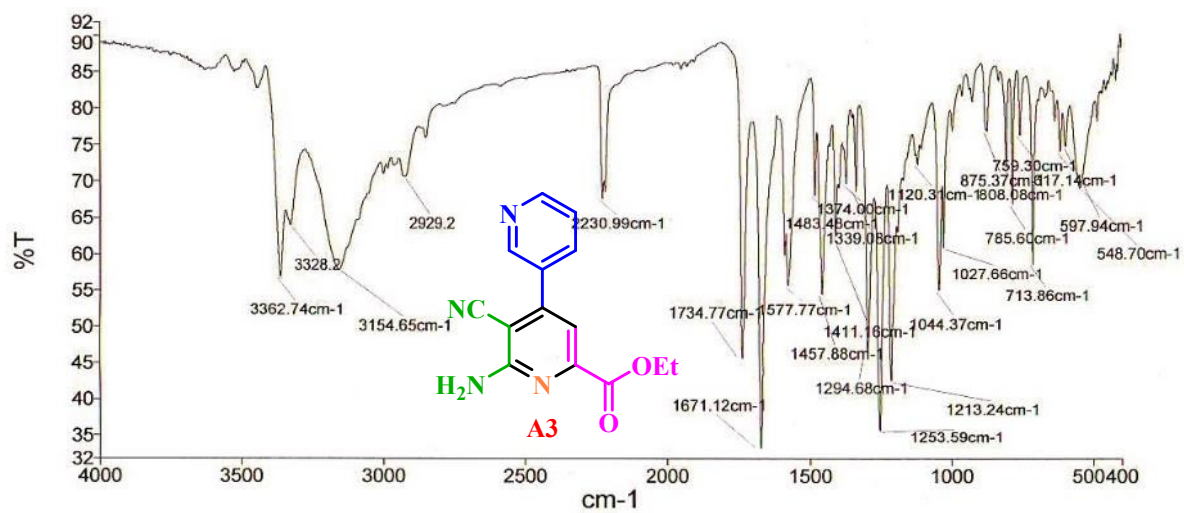
FT-IR spectrum of ethyl 6-amino-5-cyano-4-phenylpicolinate (A2).



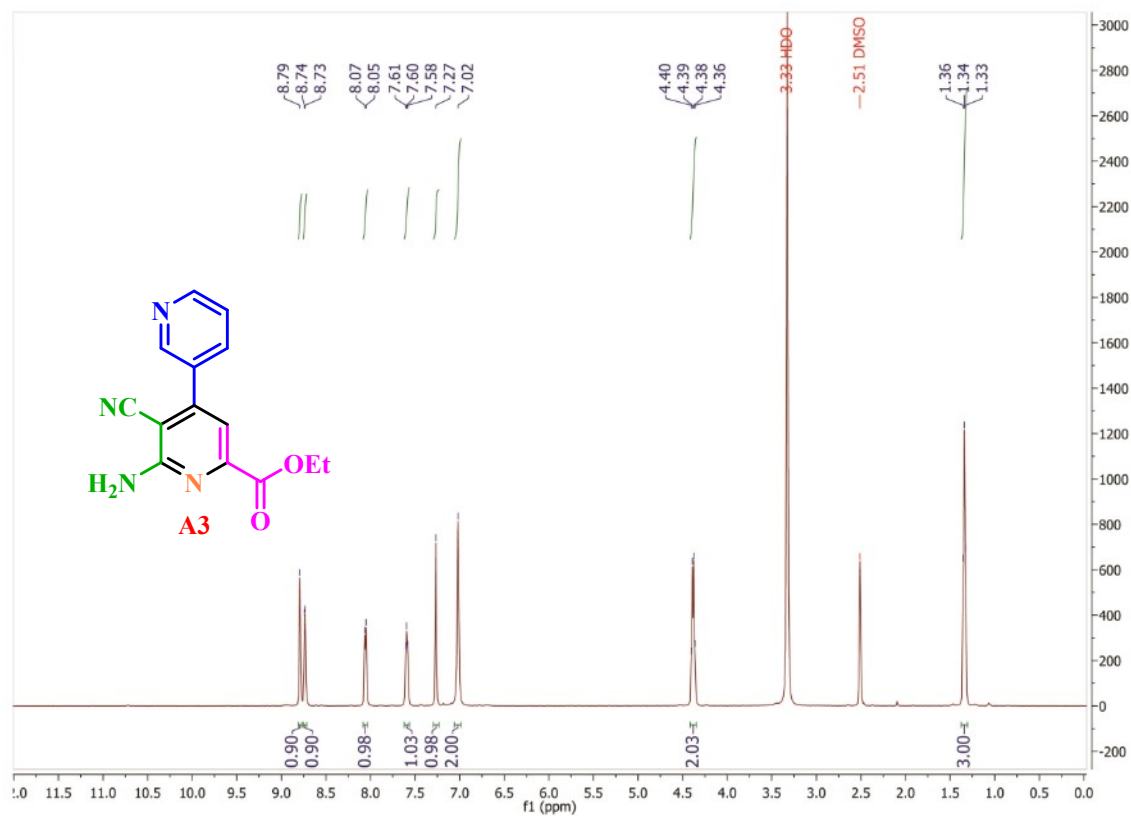
¹H NMR spectrum of ethyl 6-amino-5-cyano-4-phenylpicolinate (A2).



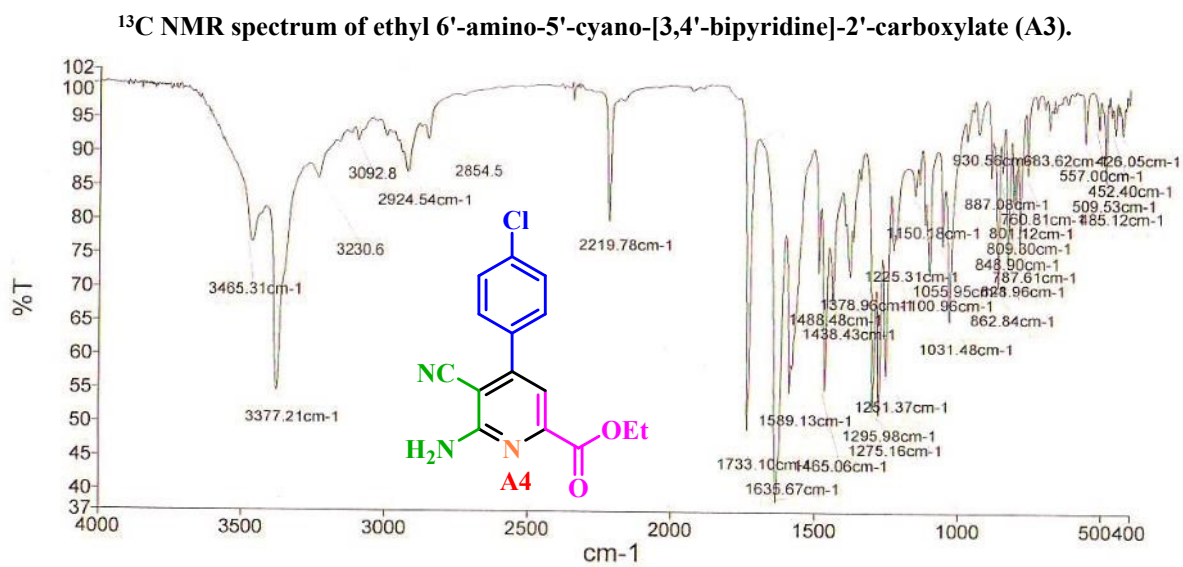
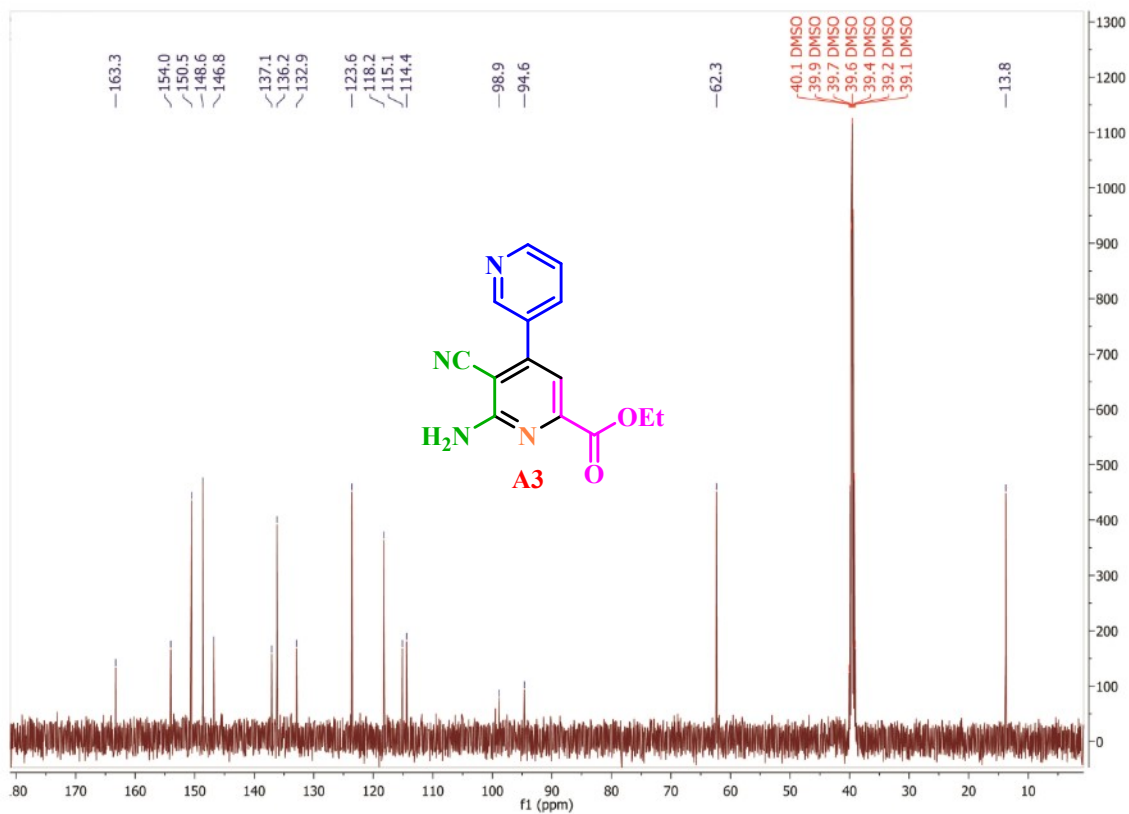
¹³C NMR spectrum of ethyl 6-amino-5-cyano-4-phenylpicolinate (A2).



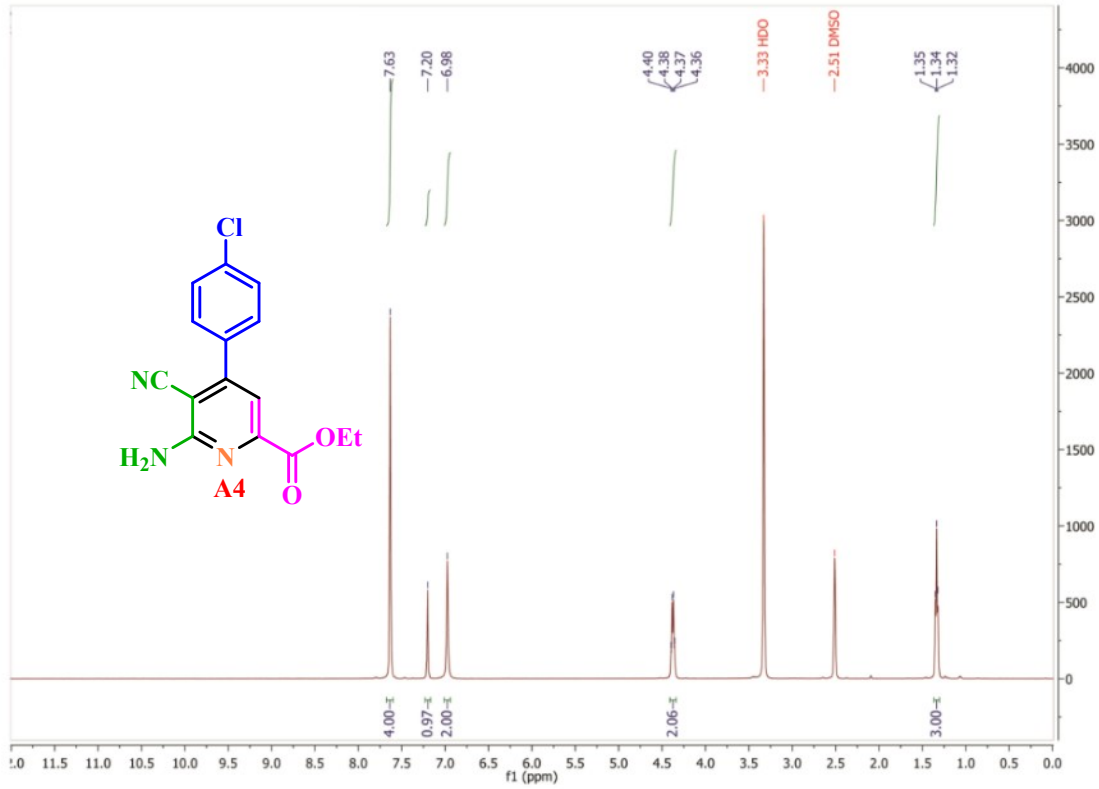
FT-IR spectrum of 6'-amino-5'-cyano-[3,4'-bipyridine]-2'-carboxylate (A3).



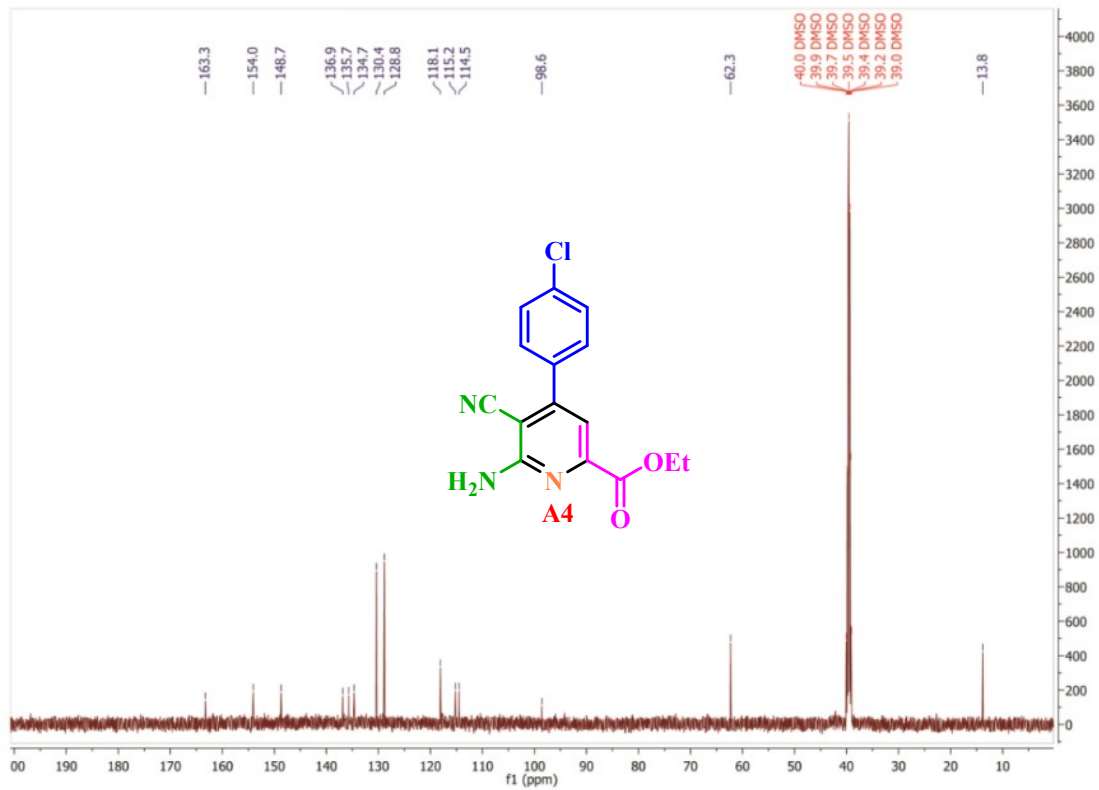
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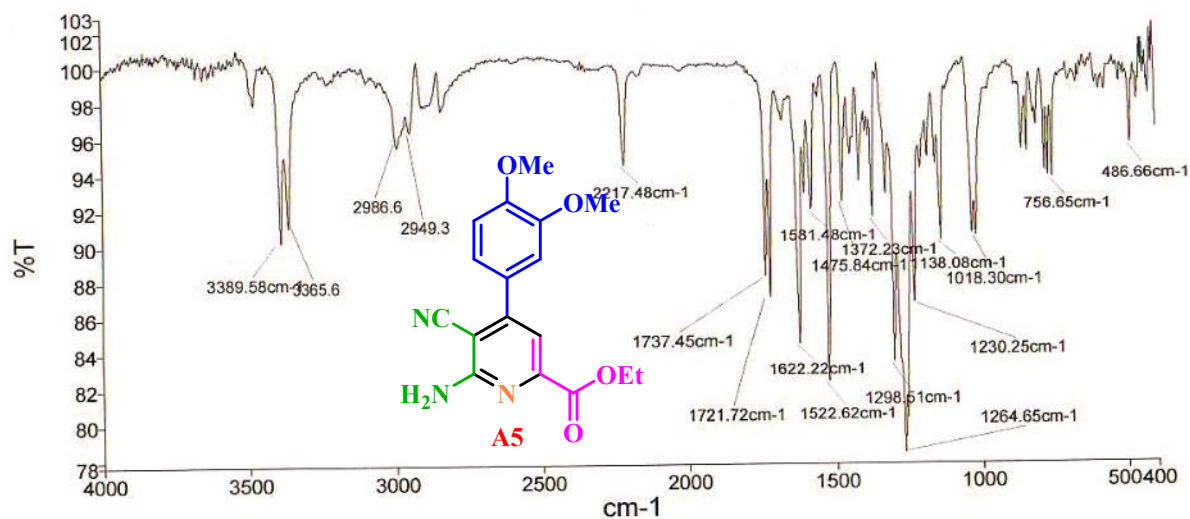
FT-IR spectrum of ethyl 6-amino-4-(4-chlorophenyl)-5-cyanopicolinate (A4).



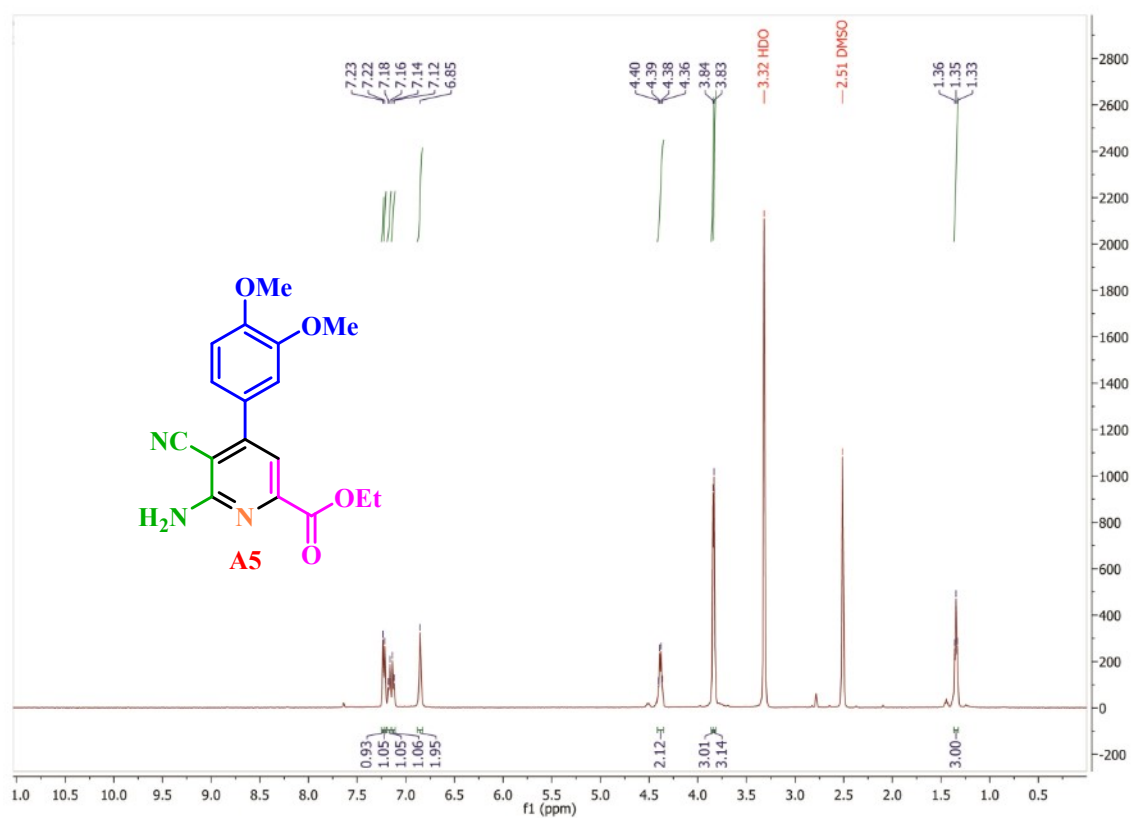
¹H NMR spectrum of ethyl 6-amino-4-(4-chlorophenyl)-5-cyanopicolinate (A4).



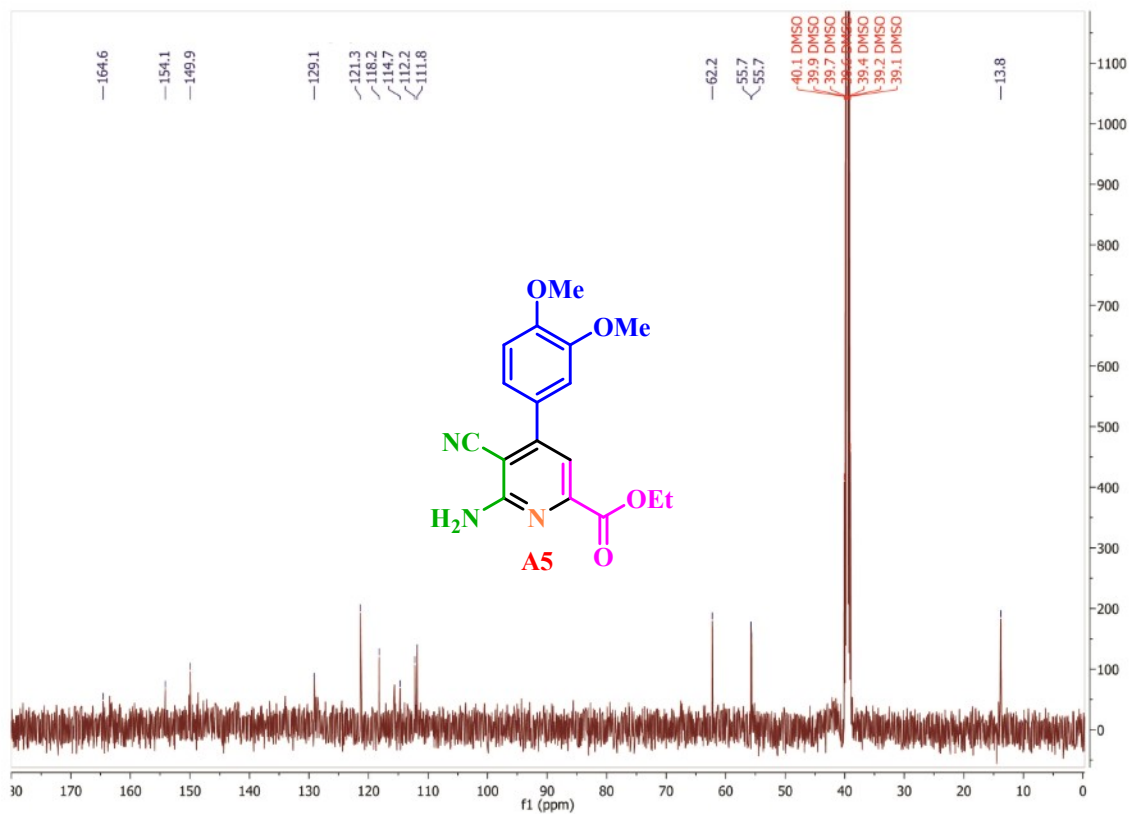
¹³C NMR spectrum of ethyl 6-amino-4-(4-chlorophenyl)-5-cyanopicolinate (A4).



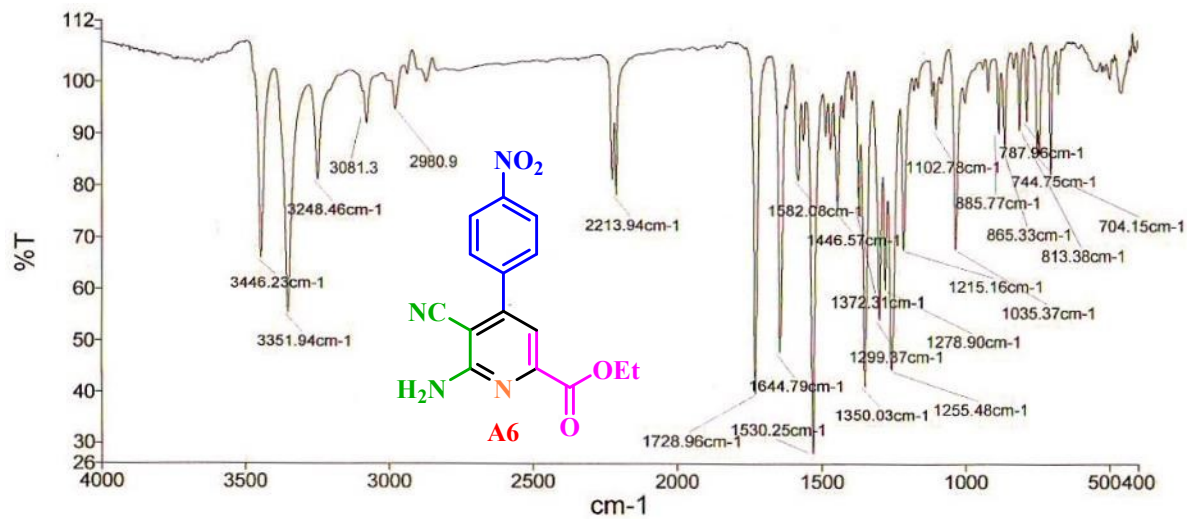
FT-IR spectrum of ethyl 6-amino-5-cyano-4-(3,4-dimethoxyphenyl) picolinate (A5).



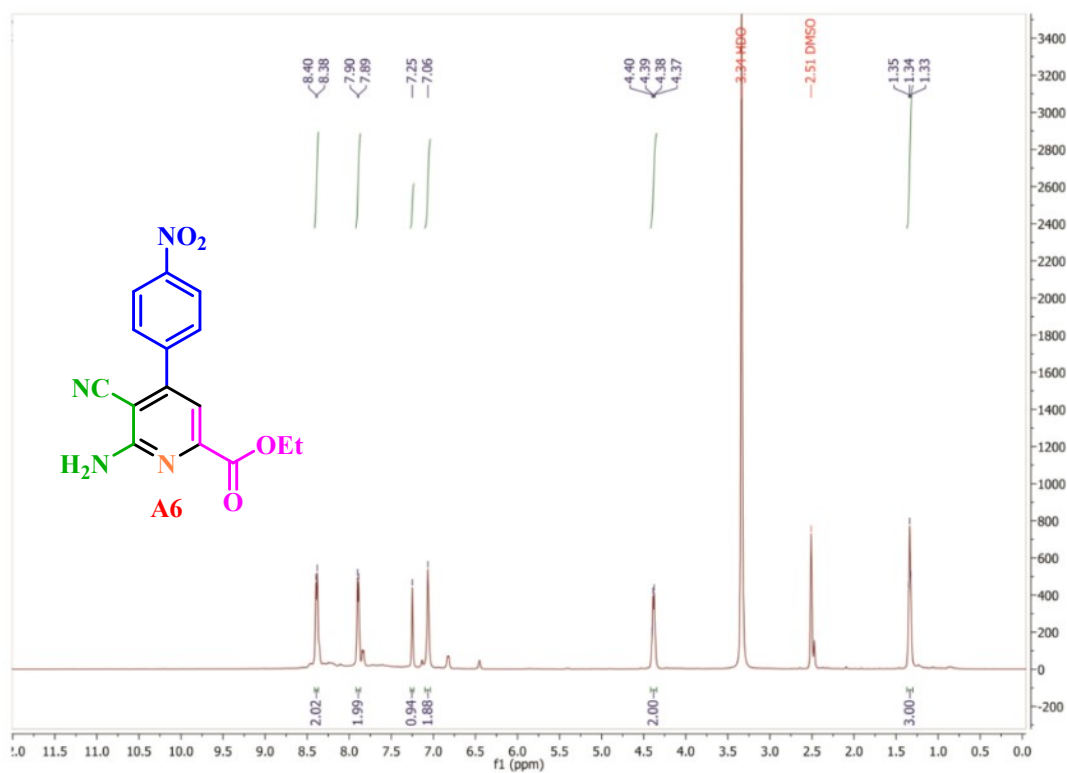
¹H NMR spectrum of ethyl 6-amino-5-cyano-4-(3,4-dimethoxyphenyl) picolinate (A5).



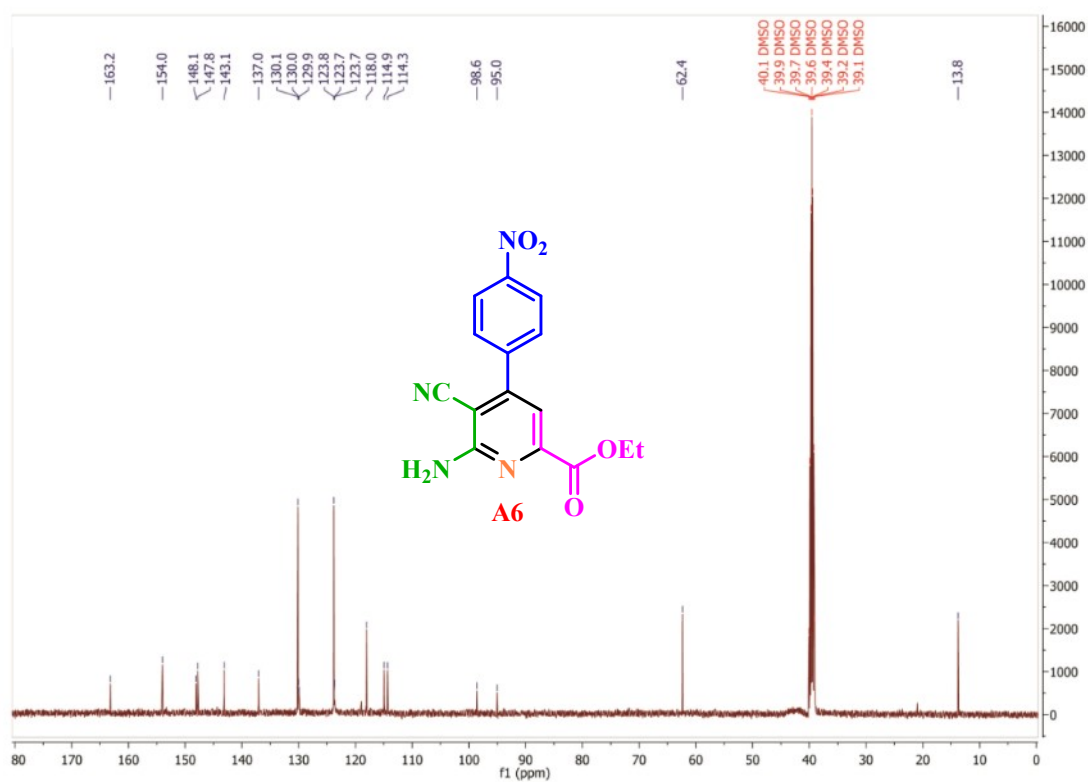
¹³C NMR spectrum of ethyl 6-amino-5-cyano-4-(3,4-dimethoxyphenyl)picolinate (A5).



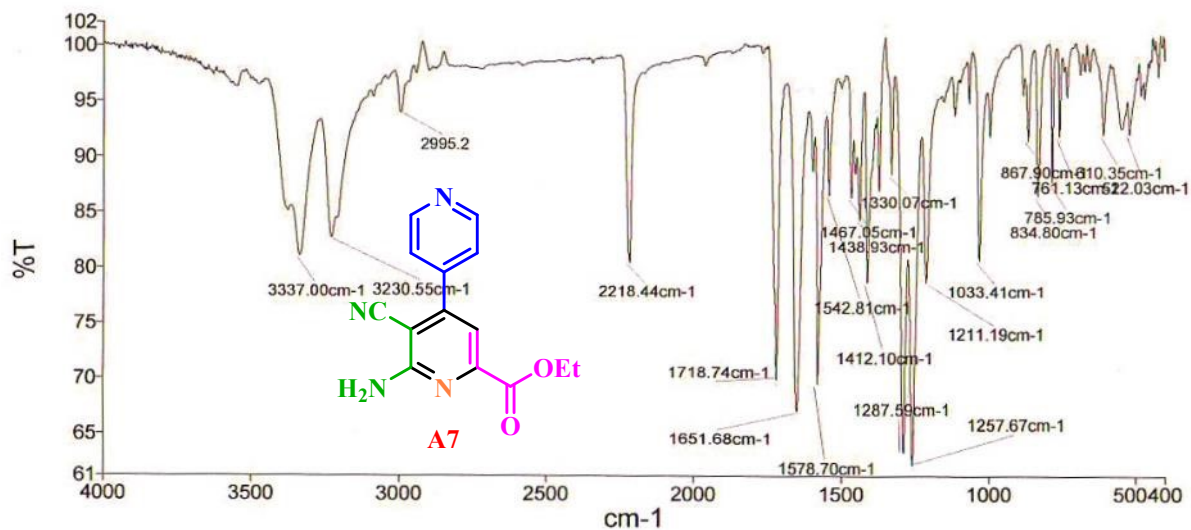
FT-IR spectrum of ethyl 6-amino-5-cyano-4-(4-nitrophenyl)picolinate (A6).



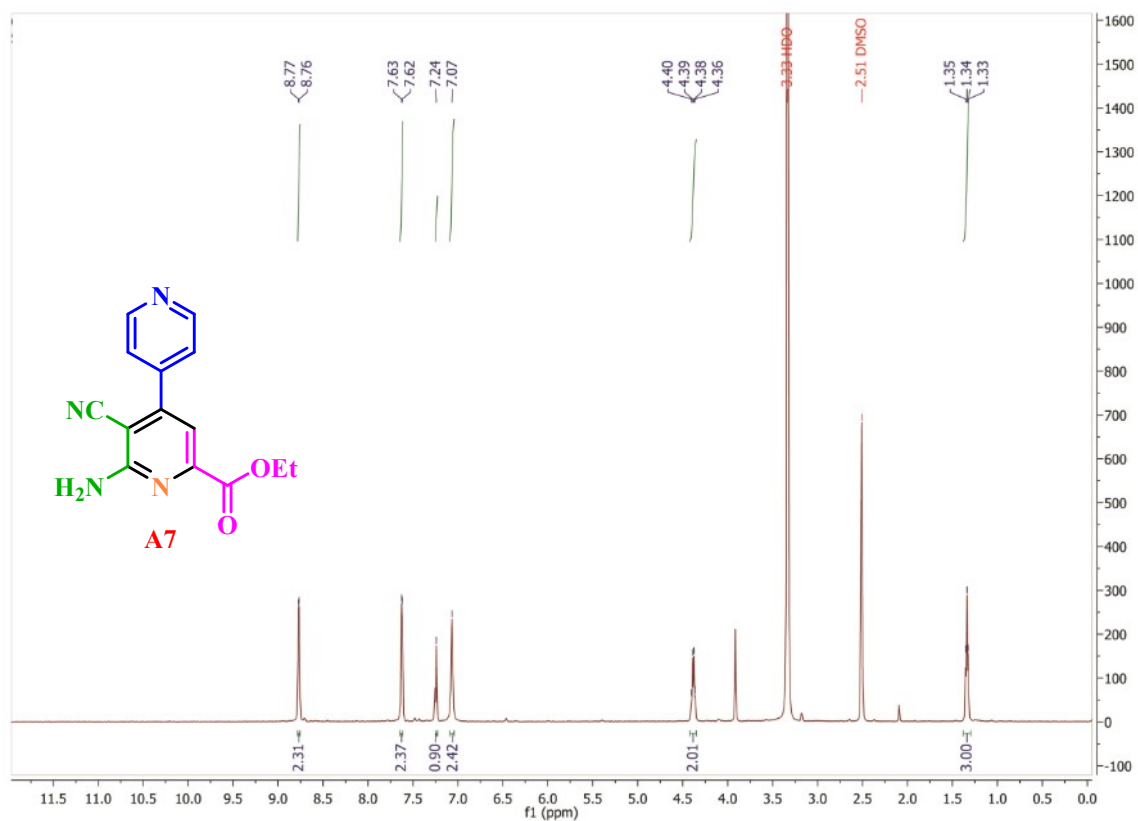
¹H NMR spectrum of ethyl 6-amino-5-cyano-4-(4-nitrophenyl)picolinate (A6).



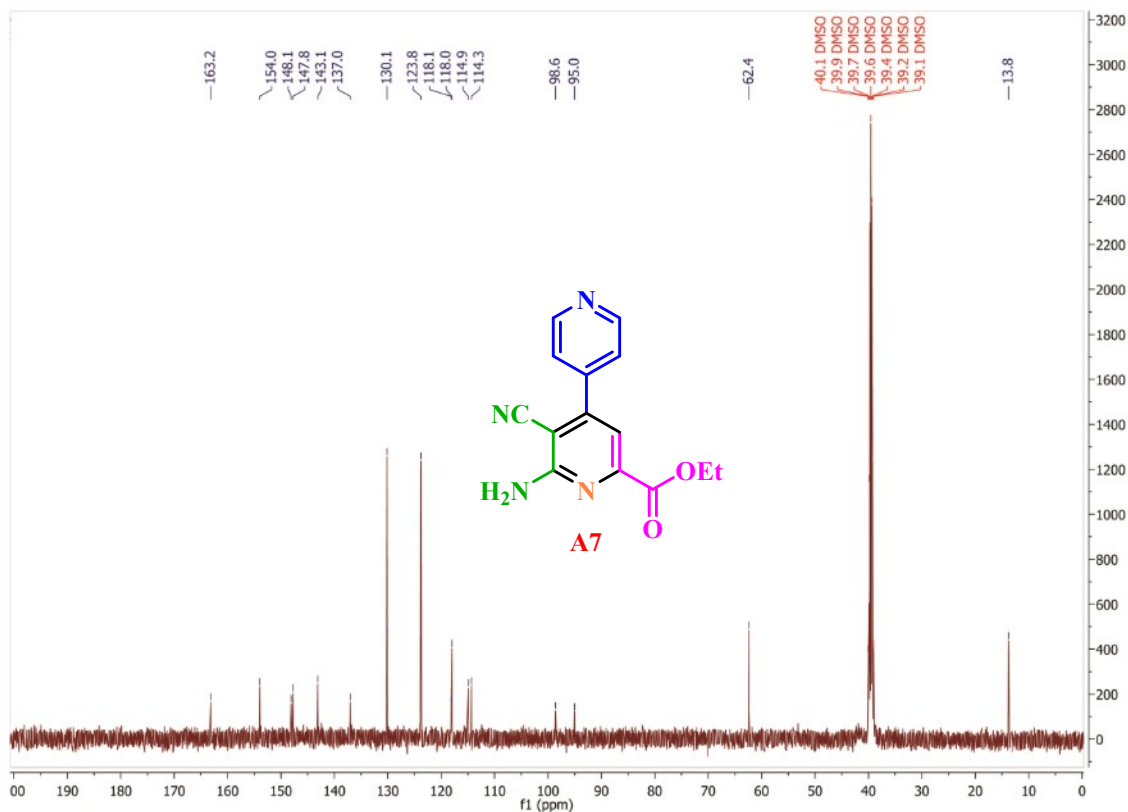
¹³C NMR spectrum of ethyl 6-amino-5-cyano-4-(4-nitrophenyl)picolinate (A6).



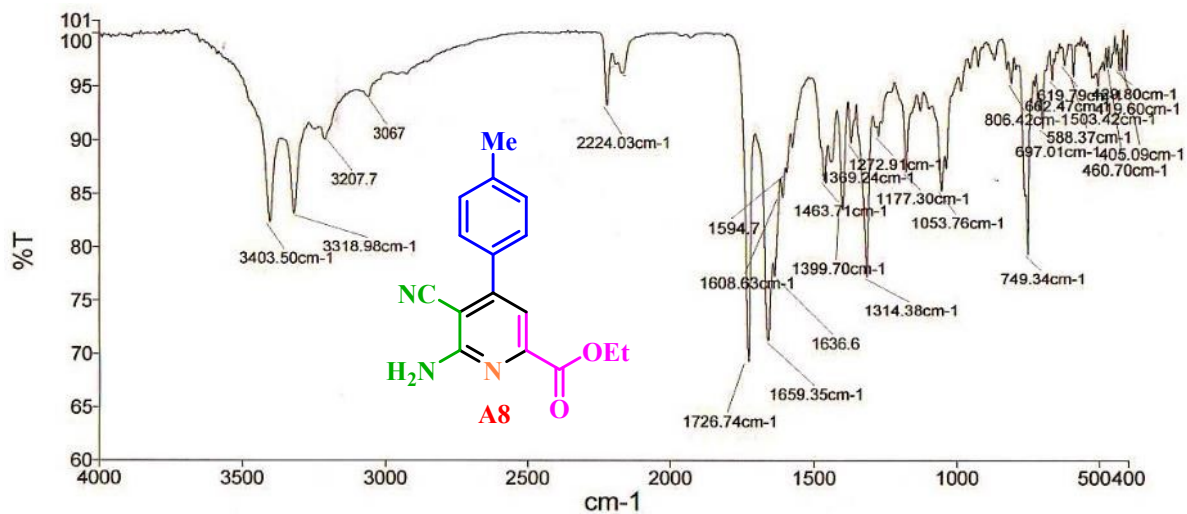
FT-IR spectrum of 6-amino-5-cyano-[4,4'-bipyridine]-2-carboxylate (A7).



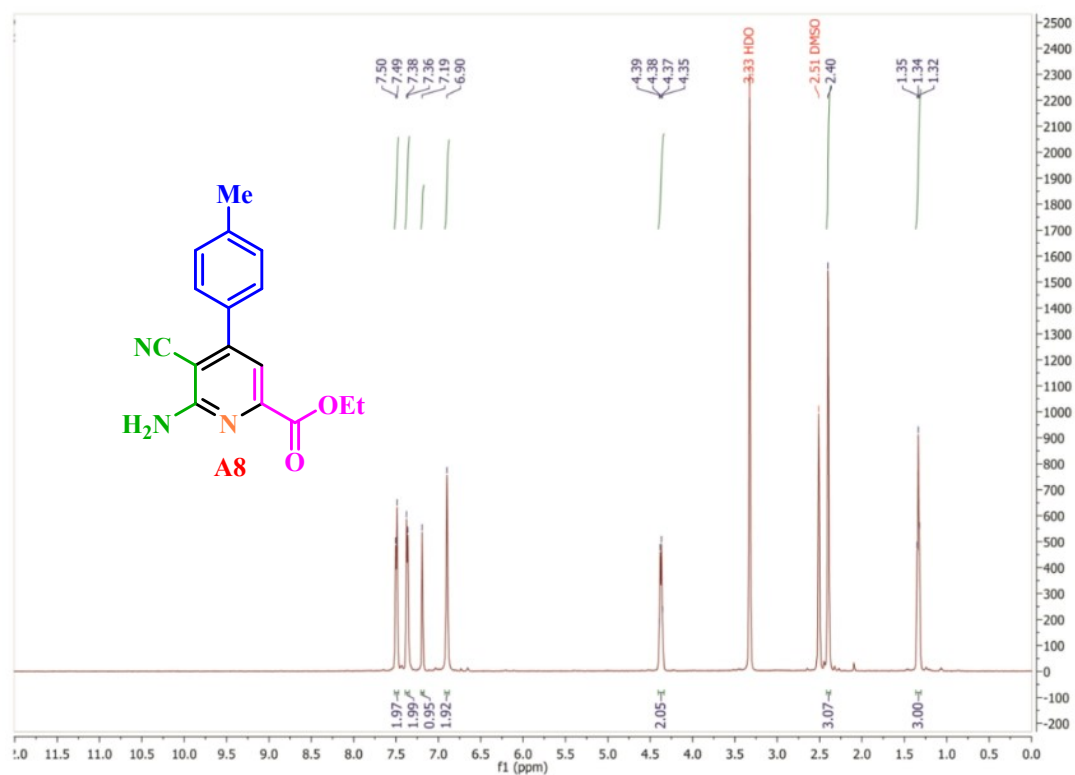
¹H NMR spectrum of ethyl 6-amino-5-cyano-[4,4'-bipyridine]-2-carboxylate (A7).



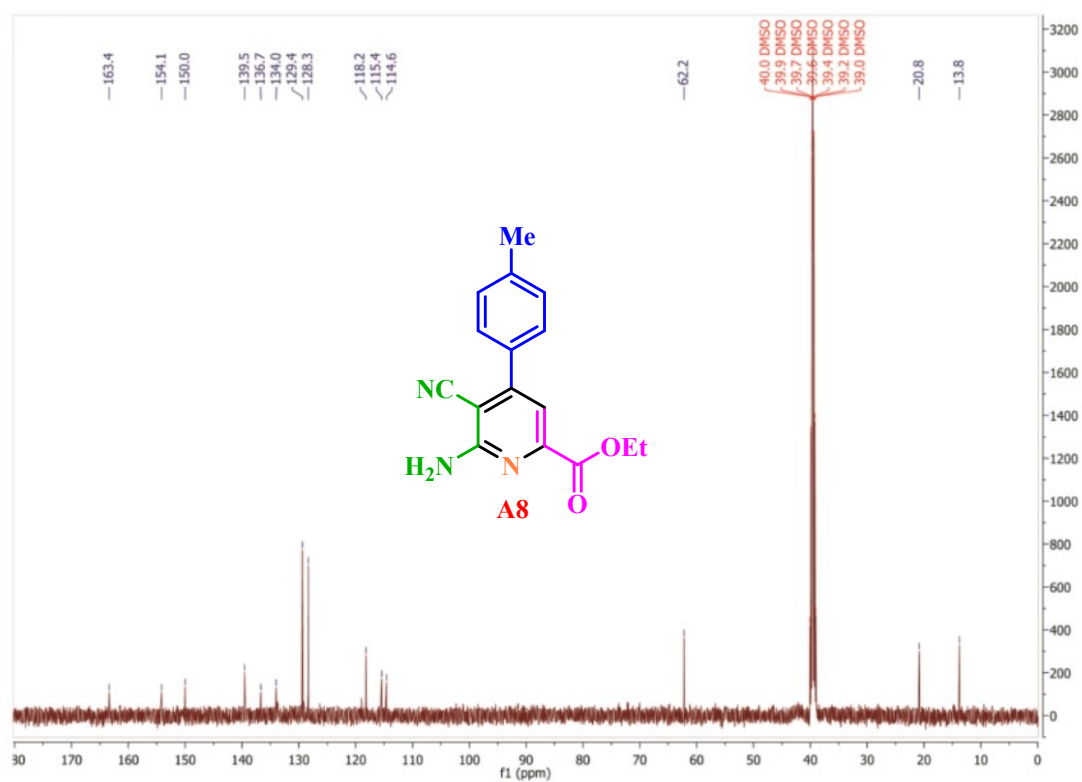
¹³C NMR spectrum of ethyl 6-amino-5-cyano-[4,4'-bipyridine]-2-carboxylate (A7).



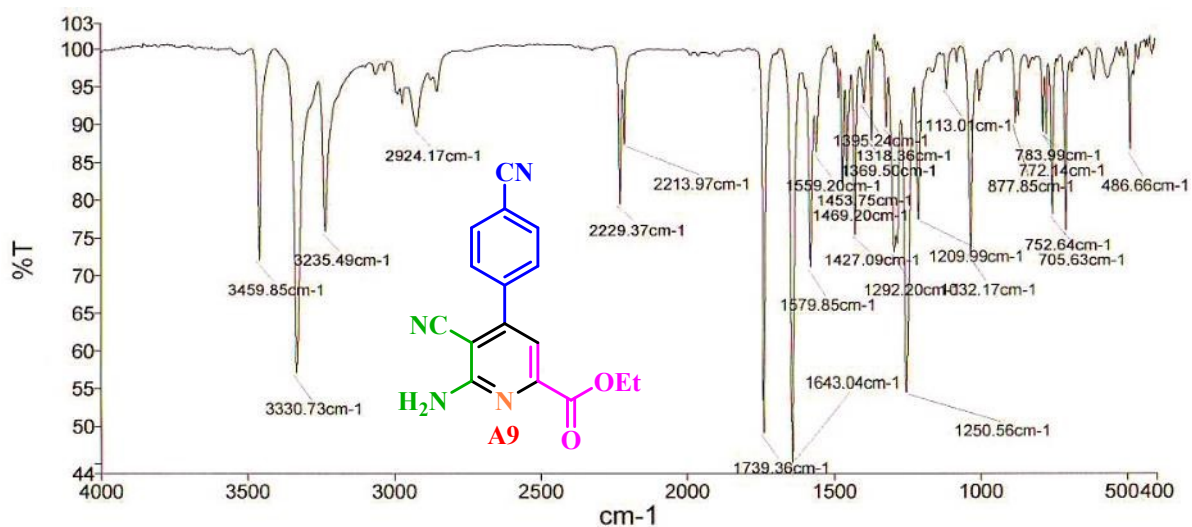
FT-IR spectrum of ethyl 6-amino-5-cyano-4-(p-tolyl)picolinate (A8).



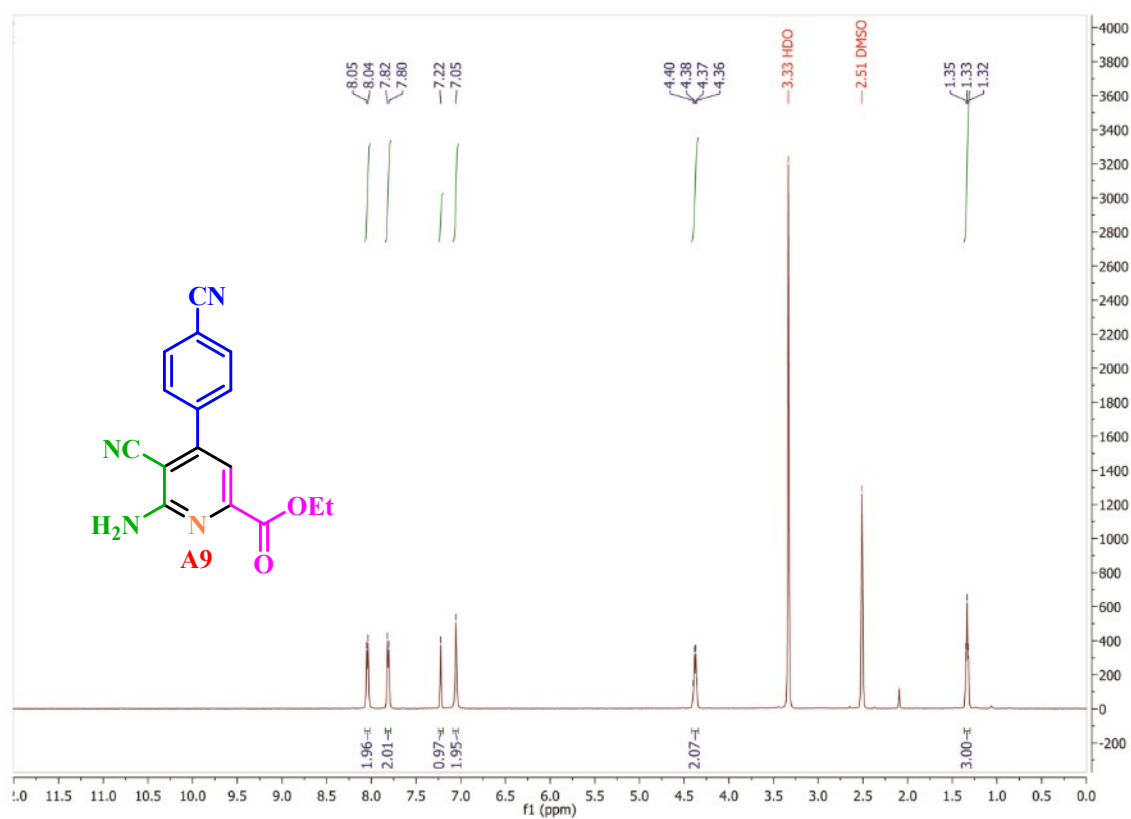
¹H NMR spectrum of ethyl 6-amino-5-cyano-4-(p-tolyl)picolinate (A8).



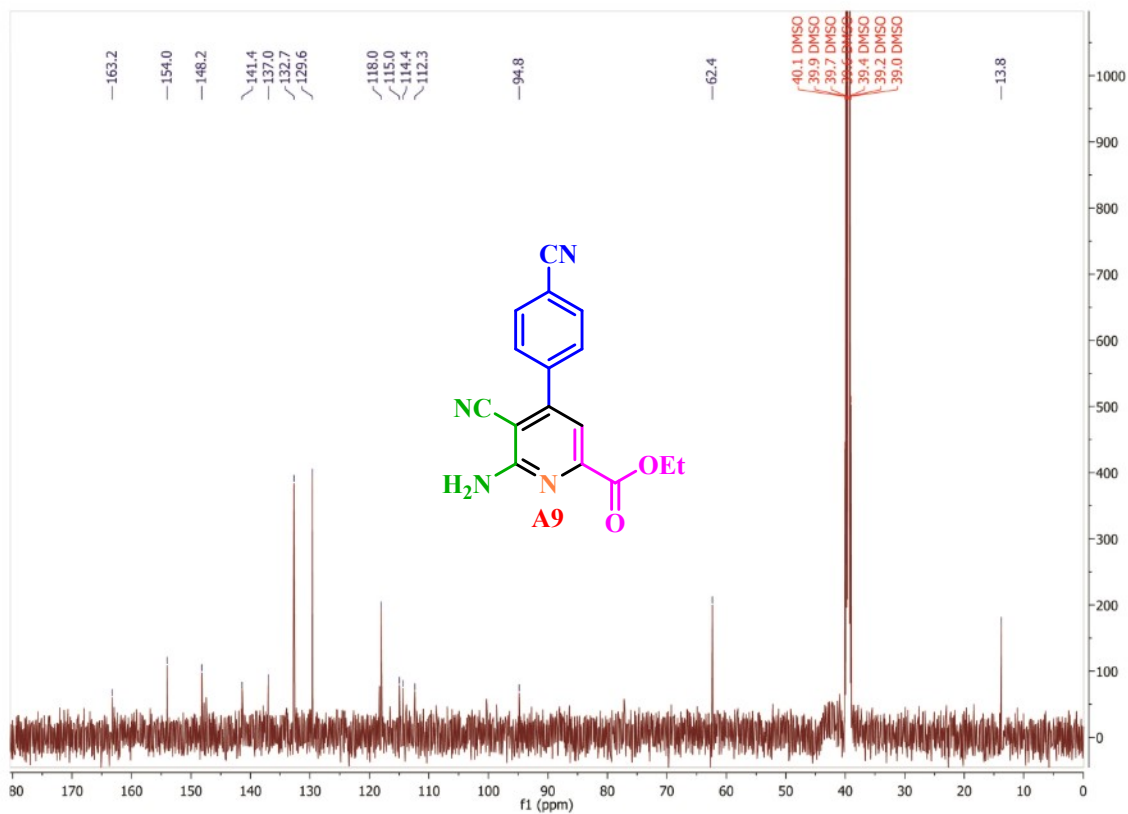
¹³C NMR spectrum of ethyl 6-amino-5-cyano-4-(p-tolyl)picolinate (A8).



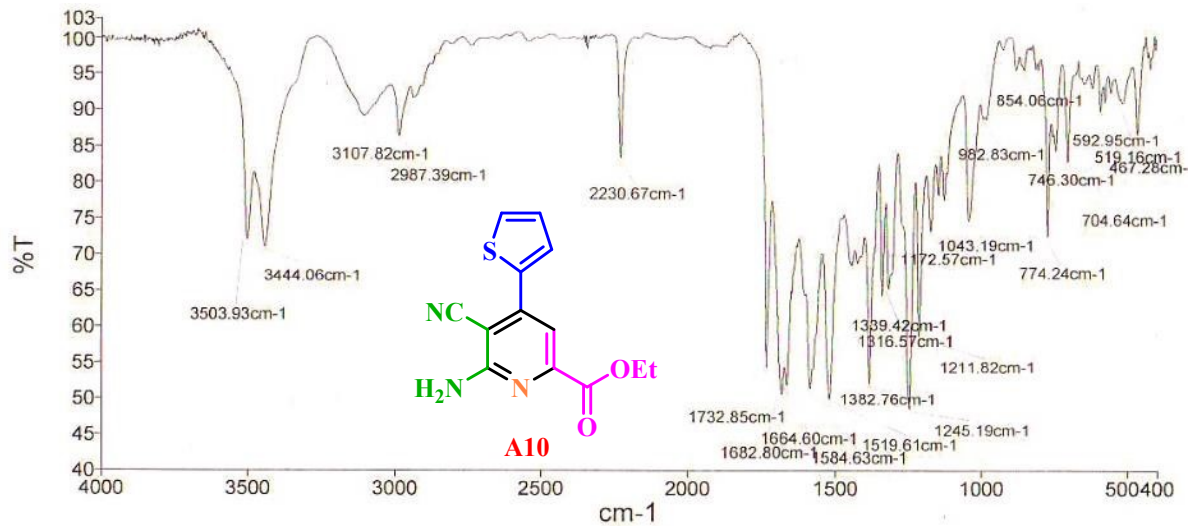
FT-IR spectrum of ethyl 6-amino-5-cyano-4-(4-cyanophenyl)picolinate (A9).



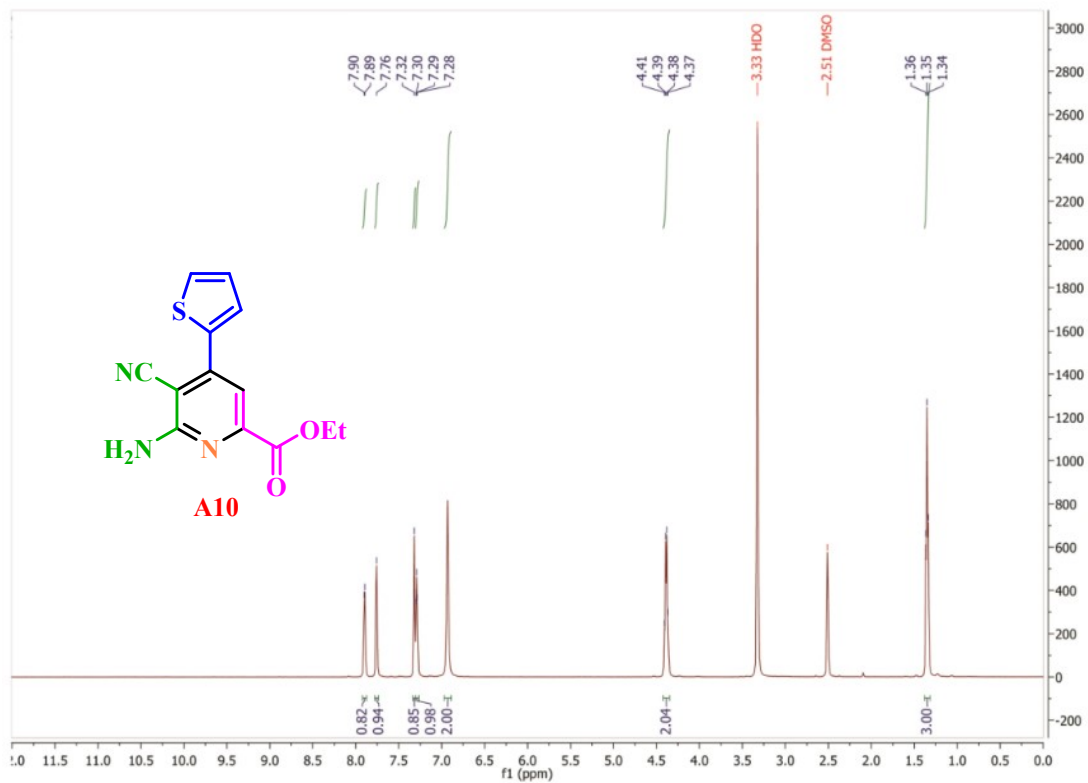
¹H NMR spectrum of ethyl 6-amino-5-cyano-4-(4-cyanophenyl)picolinate (A9).



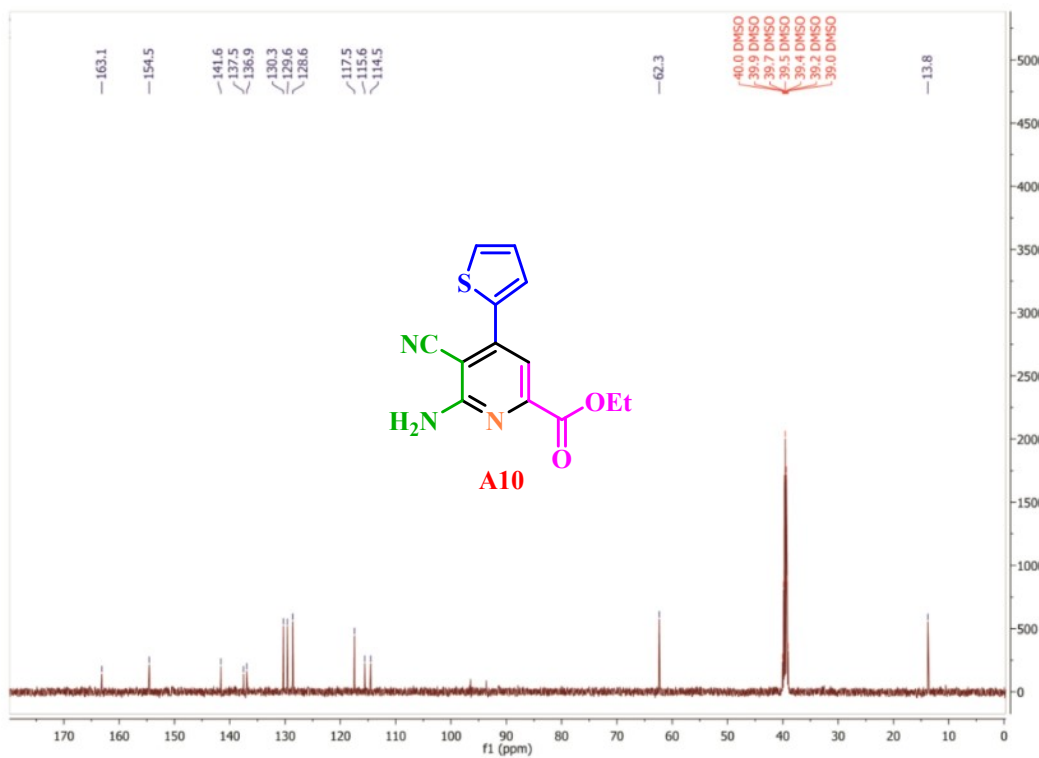
¹³C NMR spectrum of ethyl 6-amino-5-cyano-4-(4-cyanophenyl)picolinate (A9).



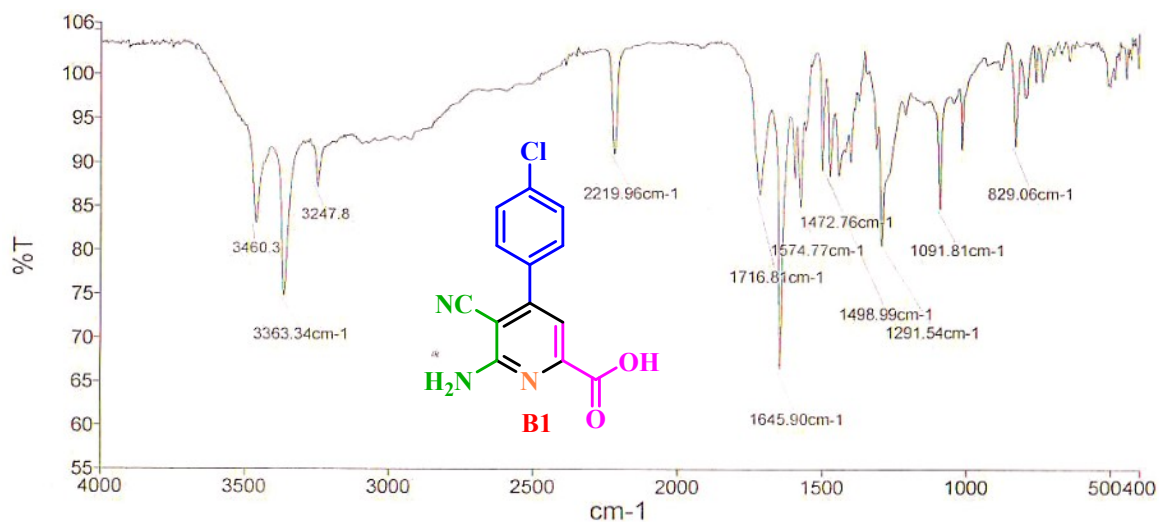
FT-IR spectrum of ethyl 6-amino-5-cyano-4-(thiophen-2-yl)picolinate (A10).



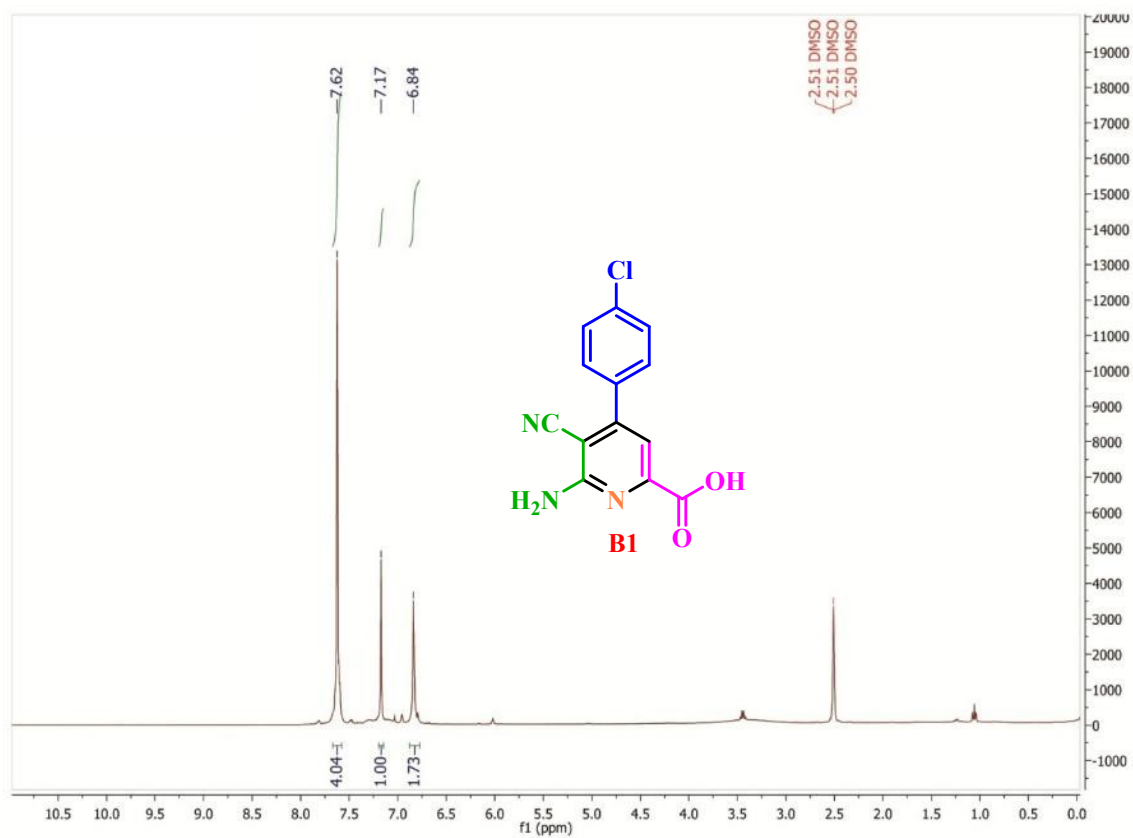
¹H NMR spectrum of ethyl 6-amino-5-cyano-4-(thiophen-2-yl)picolinate (A10).



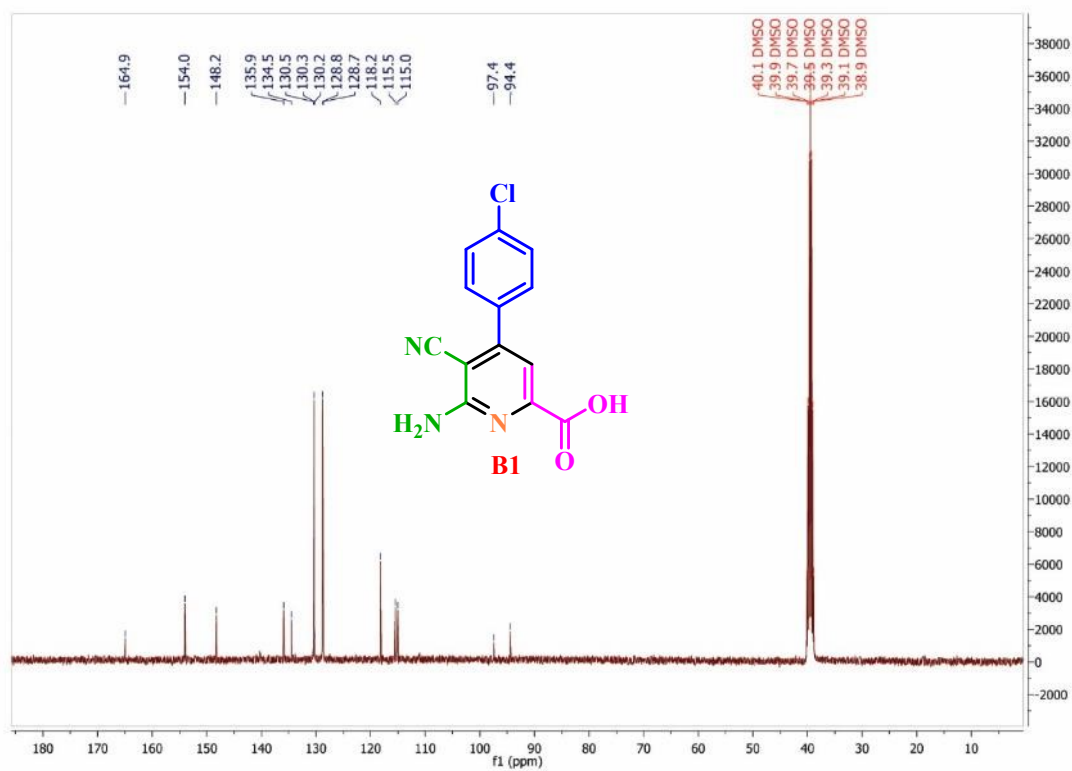
¹³C NMR spectrum of ethyl 6-amino-5-cyano-4-(thiophen-2-yl)picolinate (A10).



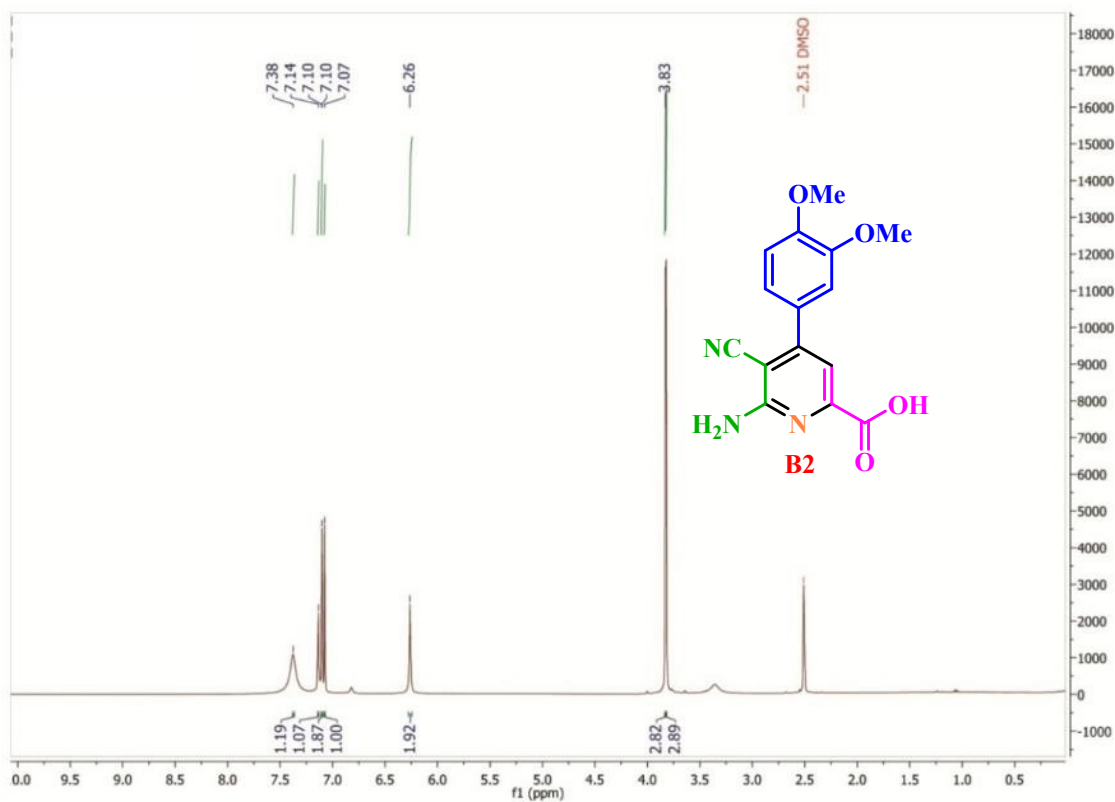
FT-IR spectrum of 6-amino-4-(4-chlorophenyl)-5-cyanopicolinic acid (B1).



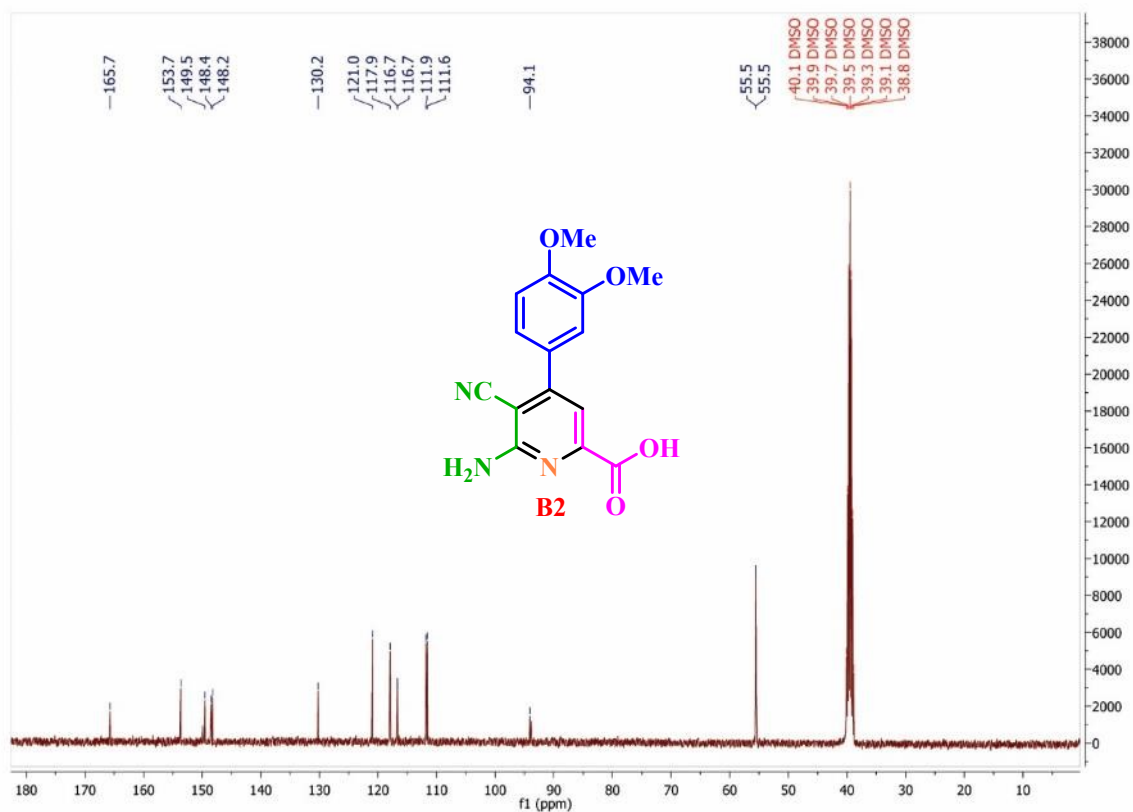
¹H NMR spectrum of 6-amino-4-(4-chlorophenyl)-5-cyanopicolinic acid (B1).



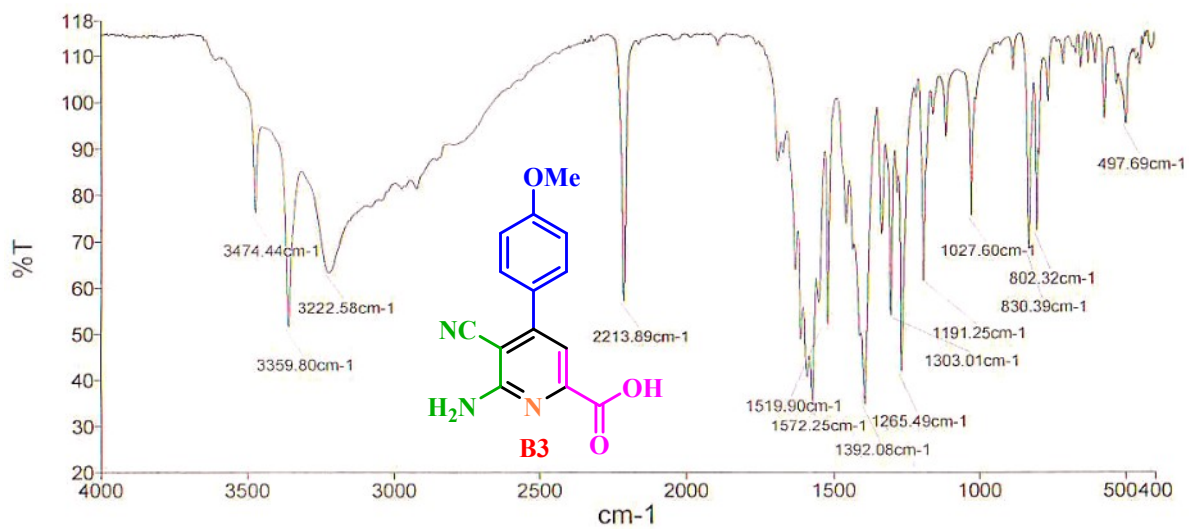
¹³C NMR spectrum of 6-amino-4-(4-chlorophenyl)-5-cyanopicolinic acid (B1).



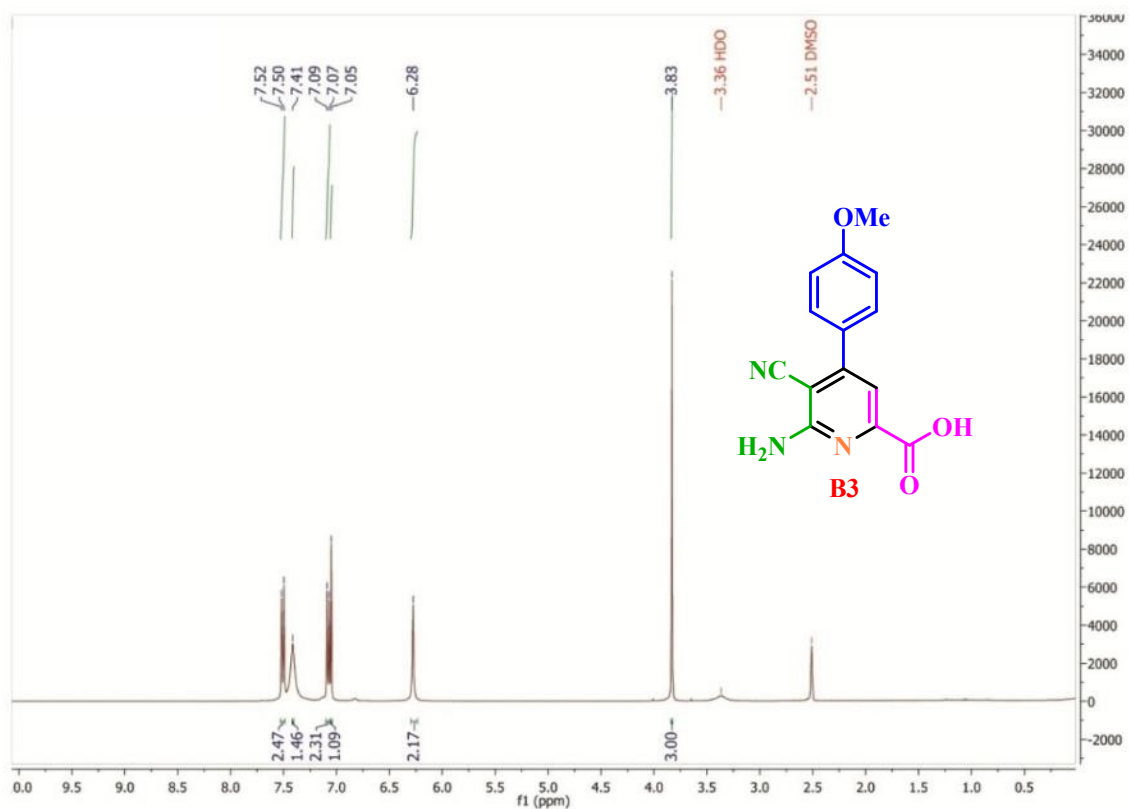
¹H NMR spectrum of 6-amino-5-cyano-4-(3,4-dimethoxyphenyl)picolinic acid (B2).



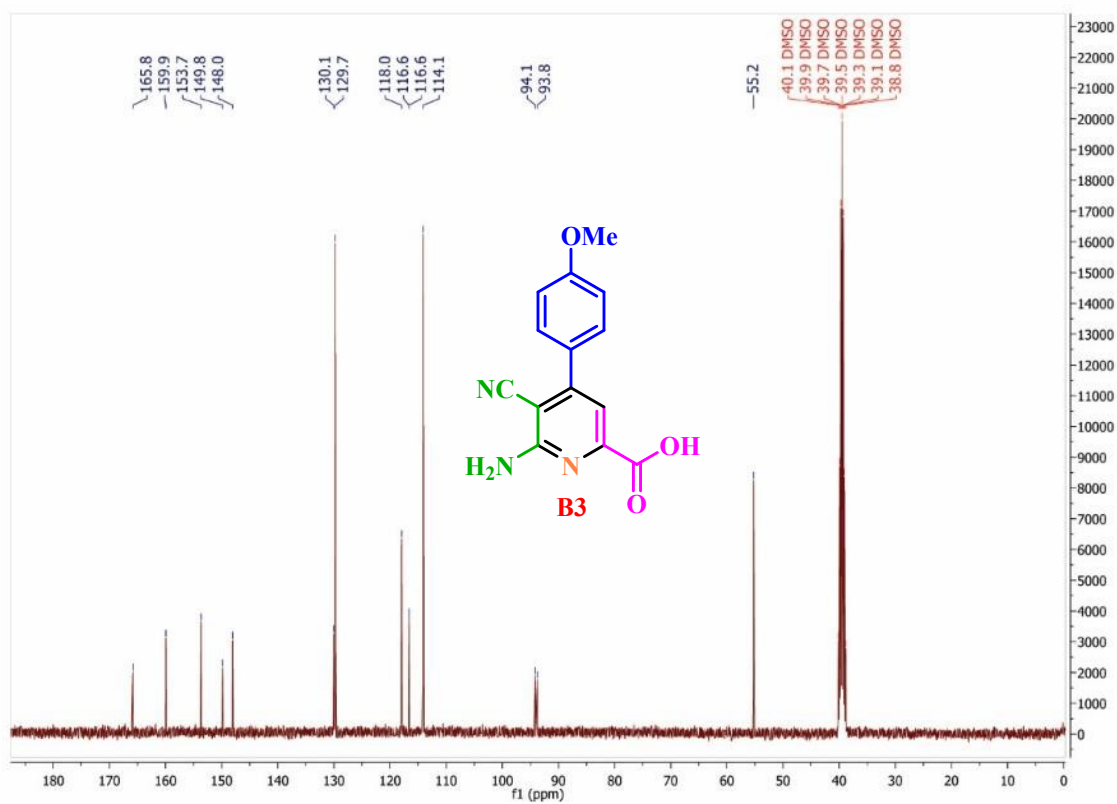
¹³C NMR spectrum of 6-amino-5-cyano-4-(3,4-dimethoxyphenyl)picolinic acid (B2).



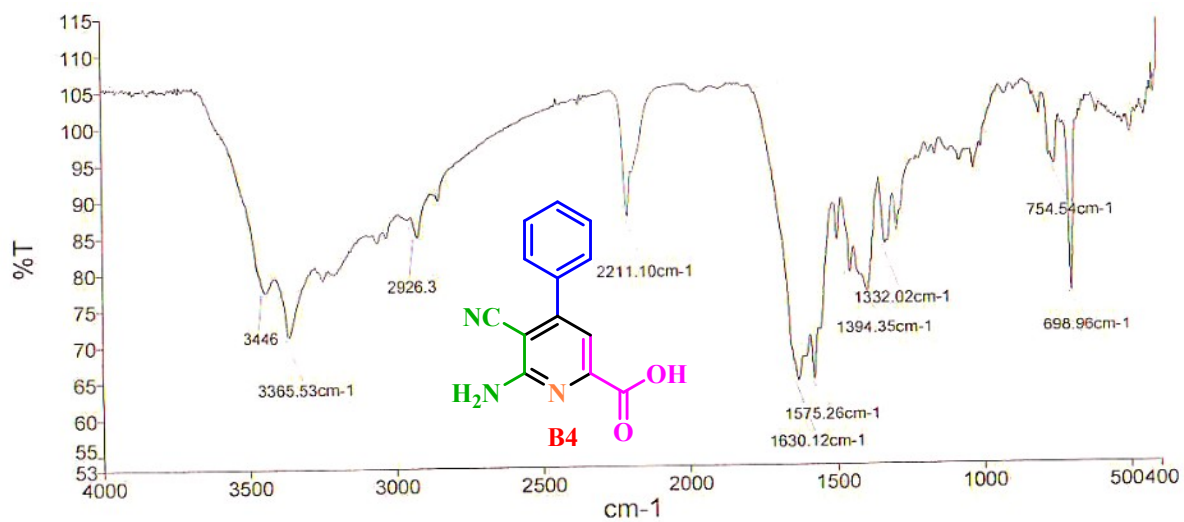
FT-IR spectrum of 6-amino-5-cyano-4-(4-methoxyphenyl)picolinic acid (B3).



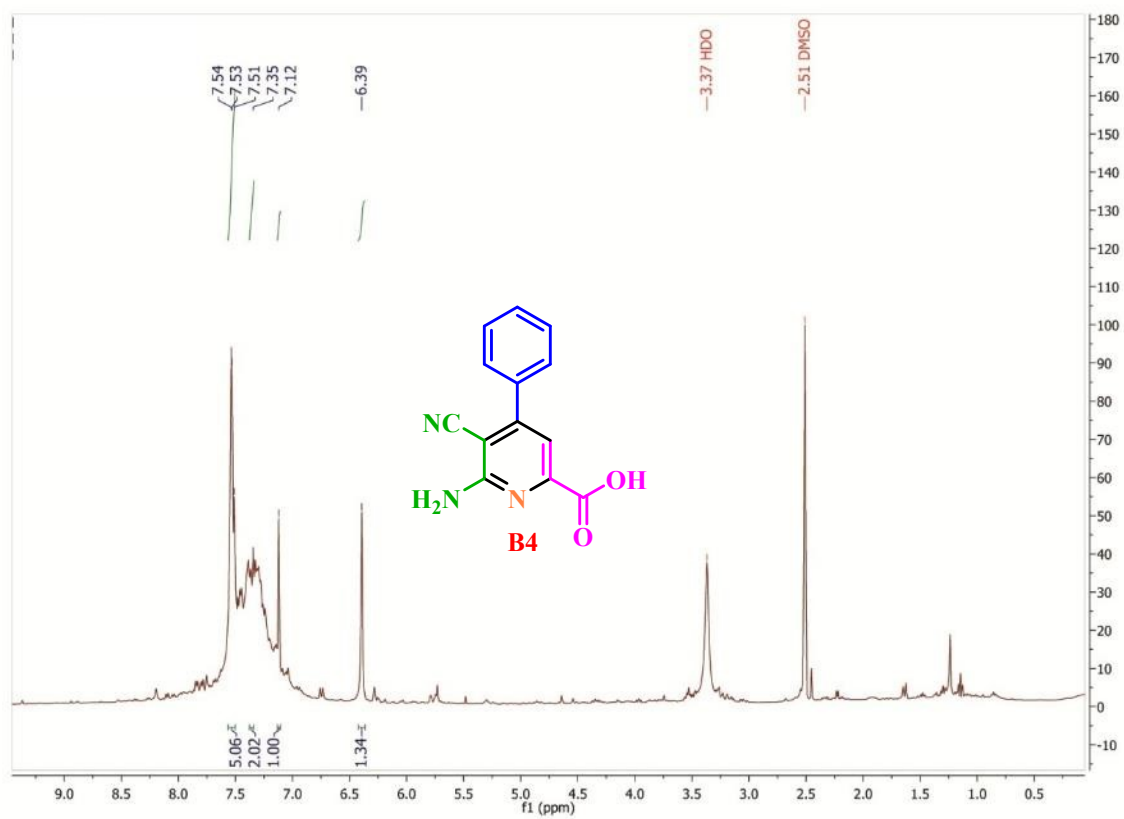
¹H NMR spectrum of 6-amino-5-cyano-4-(4-methoxyphenyl)picolinic acid (B3).



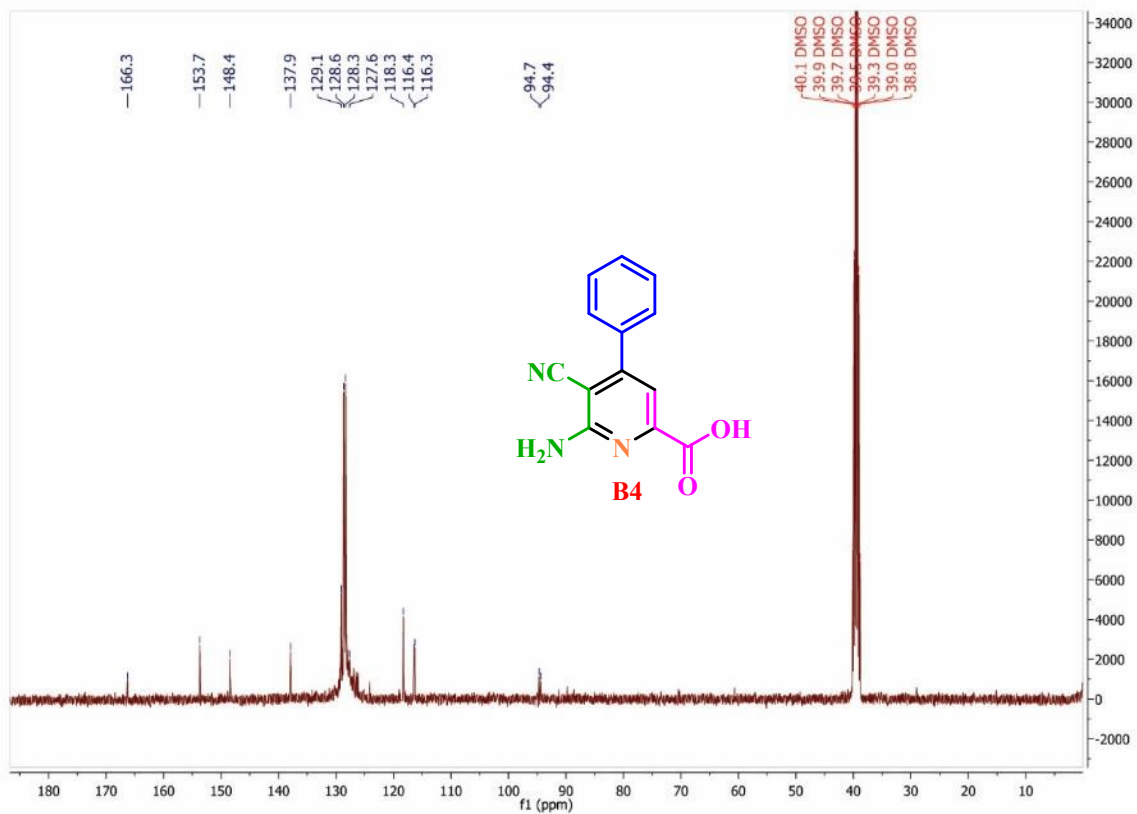
¹³C NMR spectrum of 6-amino-5-cyano-4-(4-methoxyphenyl)picolinic acid (B3).



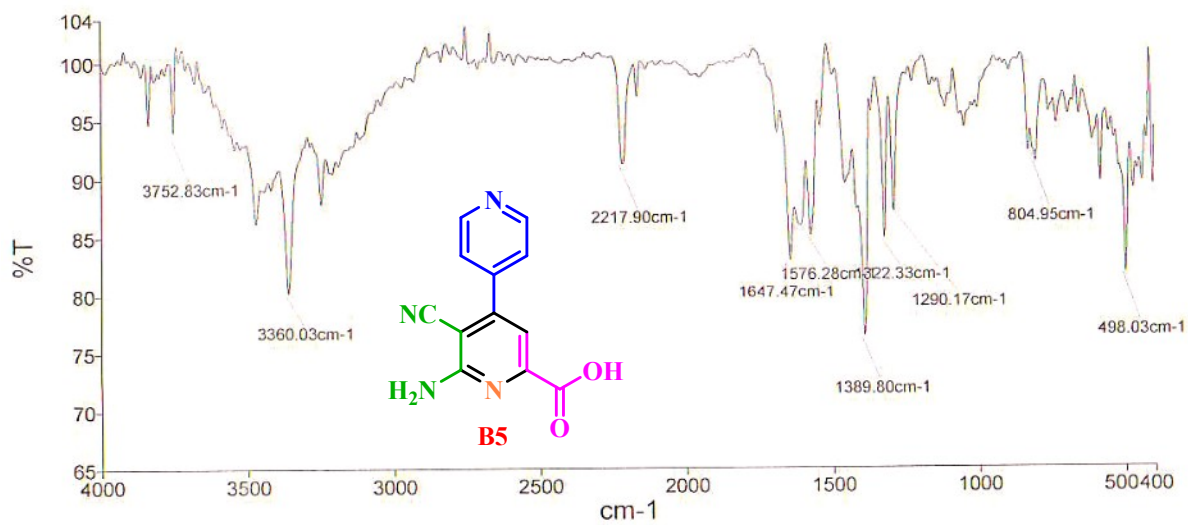
FT-IR spectrum of 6-amino-5-cyano-4-phenylpicolinic acid (B4).



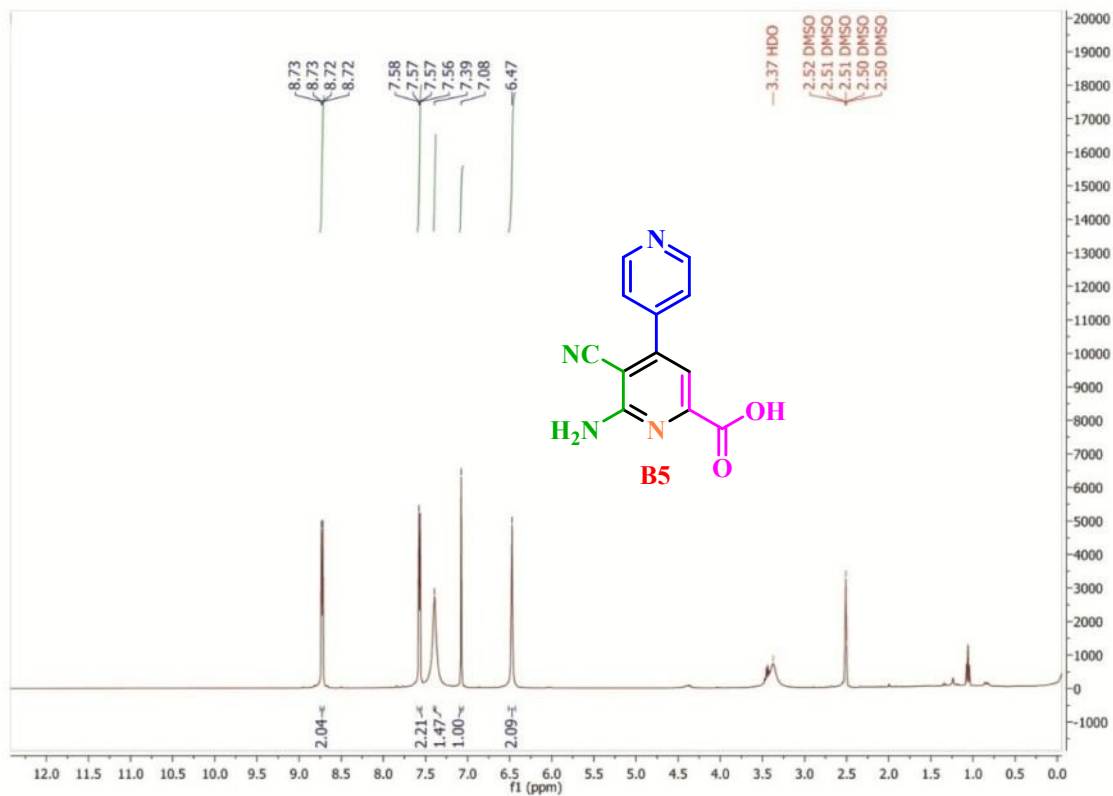
¹H NMR spectrum of 6-amino-5-cyano-4-phenylpicolinic acid (B4).



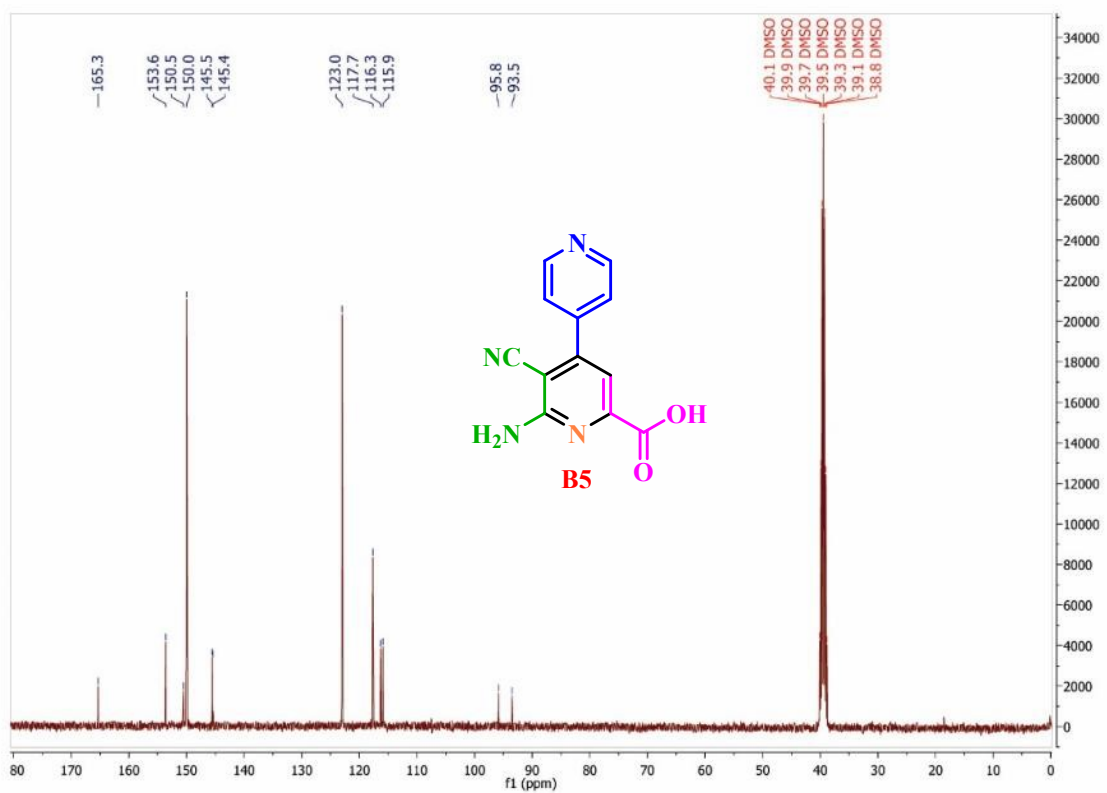
¹³C NMR spectrum of 6-amino-5-cyano-4-phenylpicolinic acid (B4).



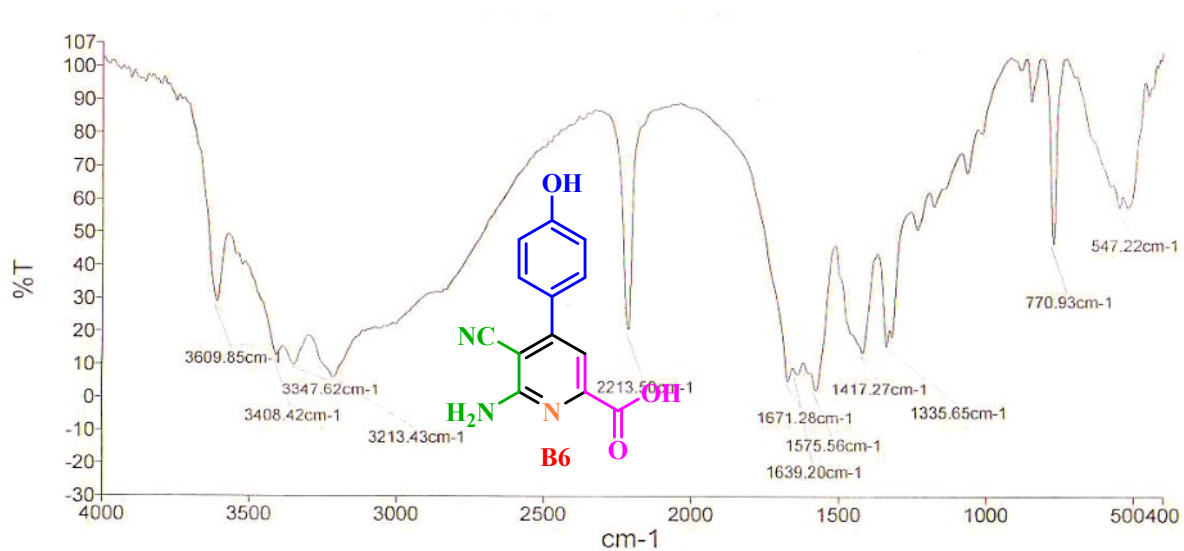
FT-IR spectrum of 6-amino-5-cyano-[4,4'-bipyridine]-2-carboxylic acid (B5).



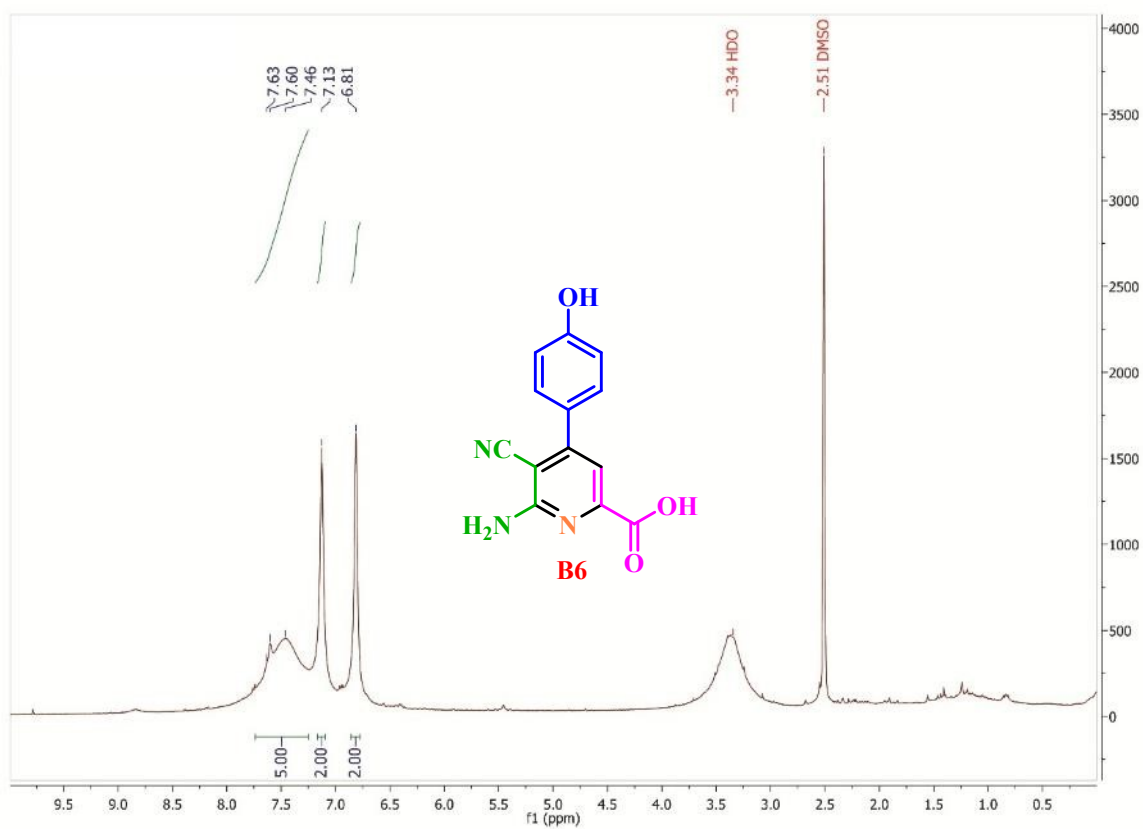
¹H NMR spectrum of 6-amino-5-cyano-[4,4'-bipyridine]-2-carboxylic acid (B5).



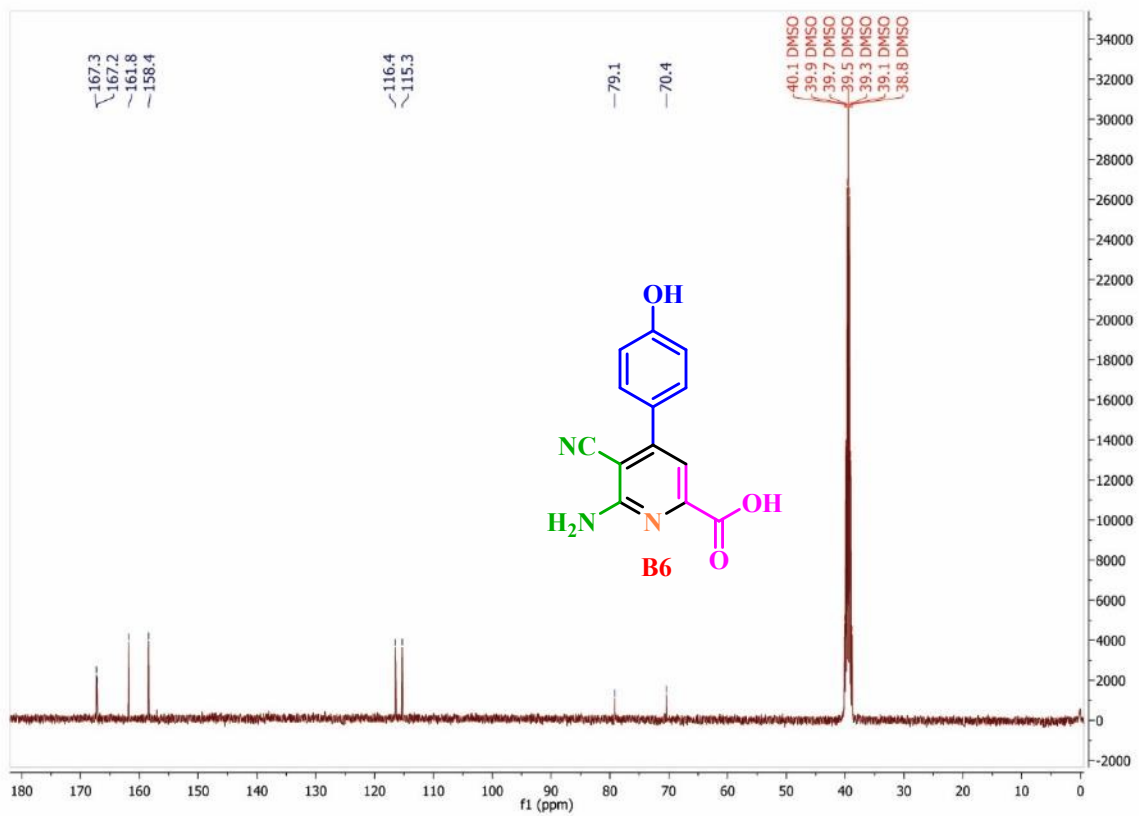
¹³C NMR spectrum of 6-amino-5-cyano-[4,4'-bipyridine]-2-carboxylic acid (B5).



FT-IR spectrum of 6-amino-5-cyano-4-(4-hydroxyphenyl)picolinic acid (B6).



¹H NMR spectrum 6-amino-5-cyano-4-(4-hydroxyphenyl)picolinic acid (B6).



¹³C NMR spectrum 6-amino-5-cyano-4-(4-hydroxyphenyl)picolinic acid (B6).