

A convenient catalytic method for preparation of new tetrahydropyrido[2,3-*d*]pyrimidines via a cooperative vinylogous anomeric based oxidation

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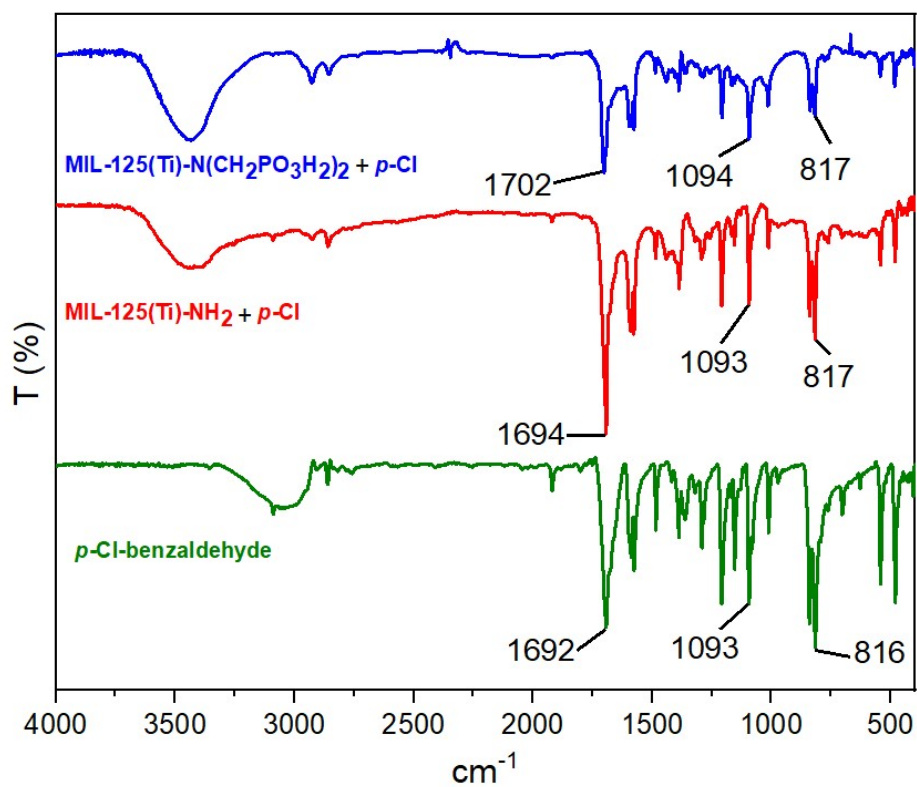
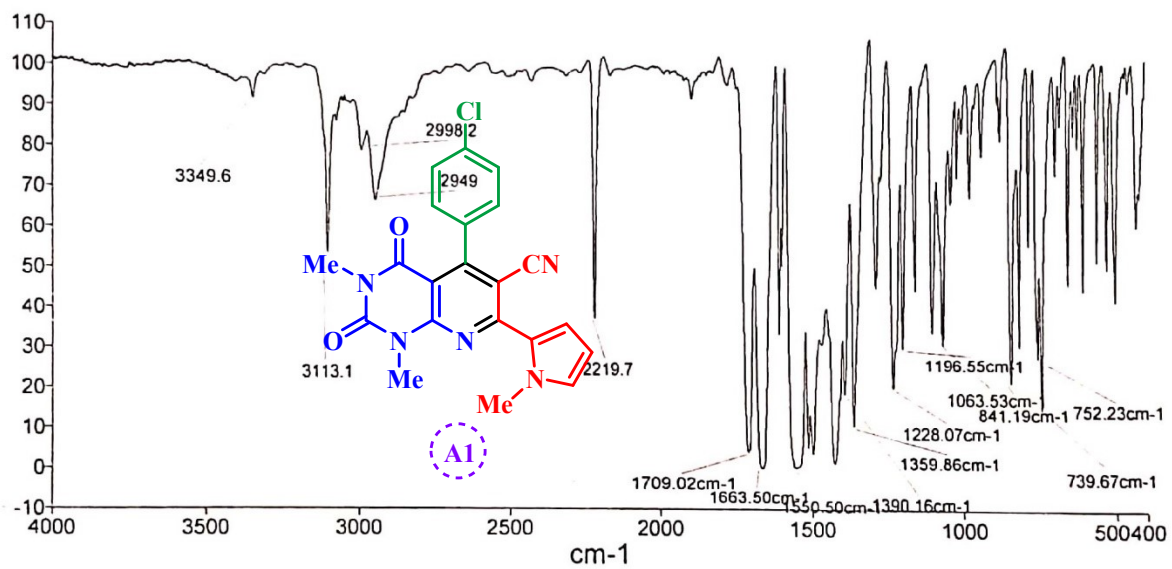
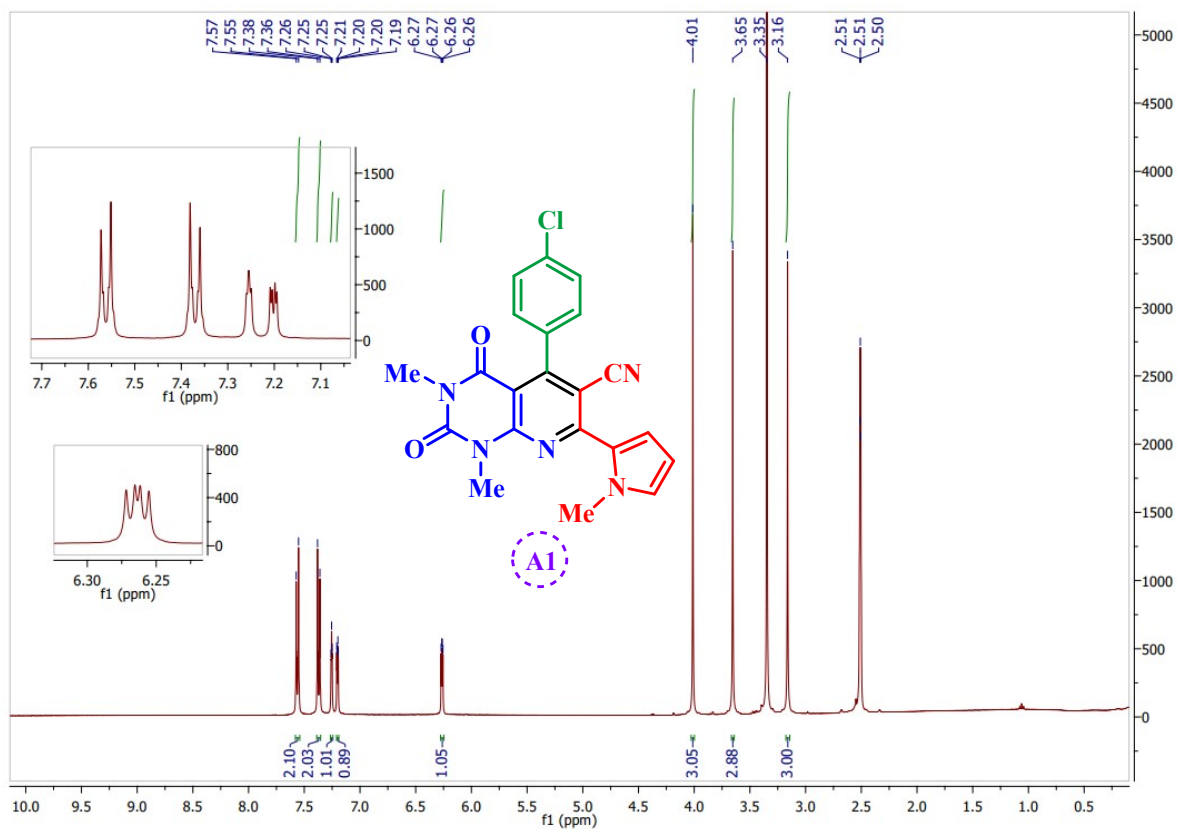


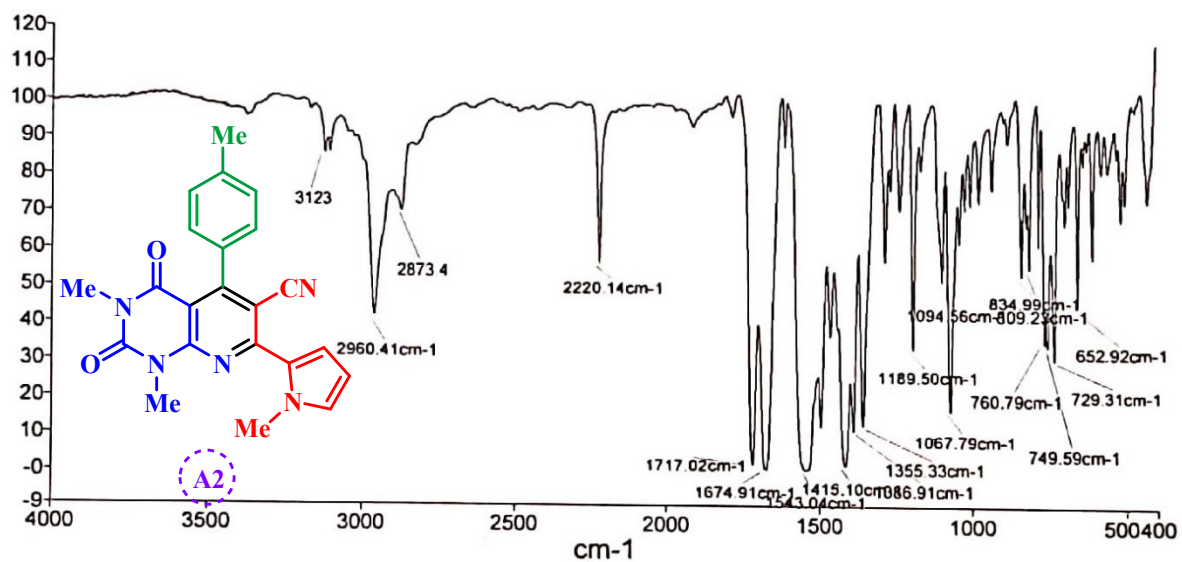
Figure S1: FT-IR spectra of *p*-Cl-benzaldehyde in percent of MIL-125(Ti)-NH₂ and MIL-125(Ti)-N(CH₂PO₃H₂)₂.



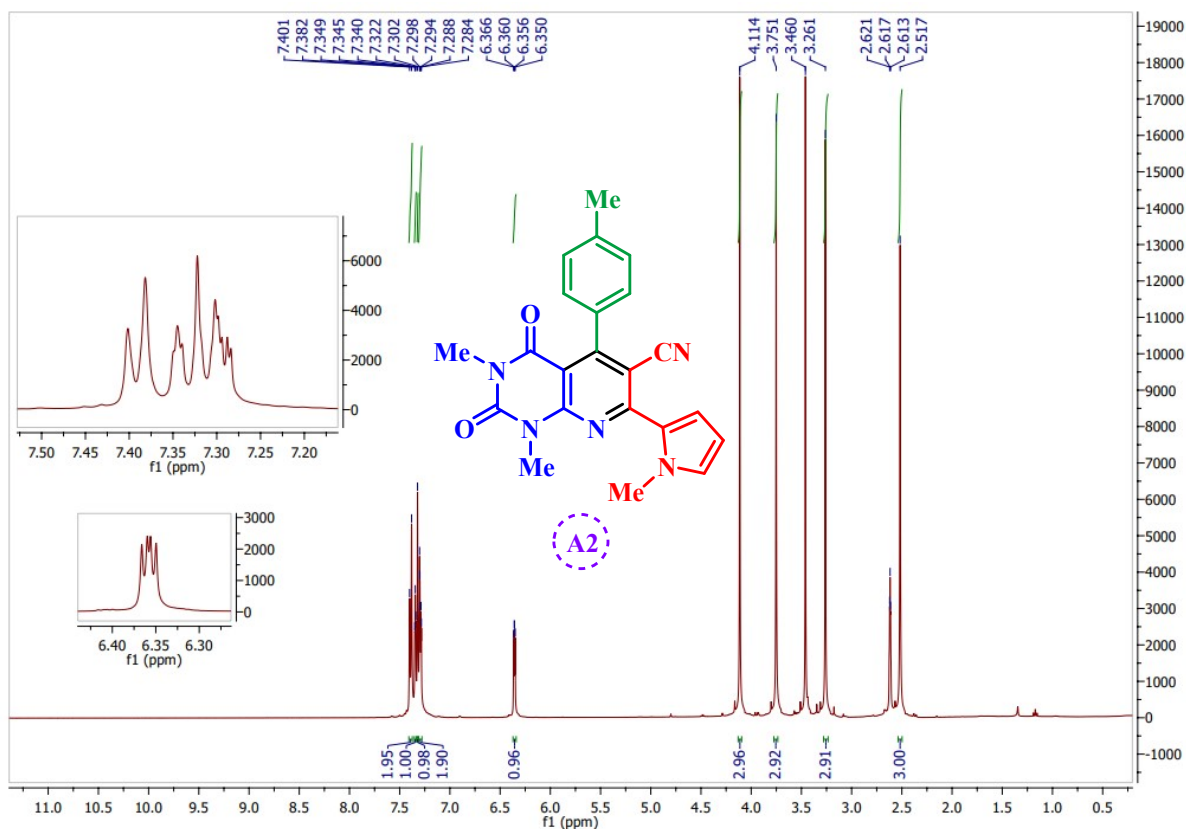
FT-IR spectrum of 5-(4-chlorophenyl)-1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4 tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A1).



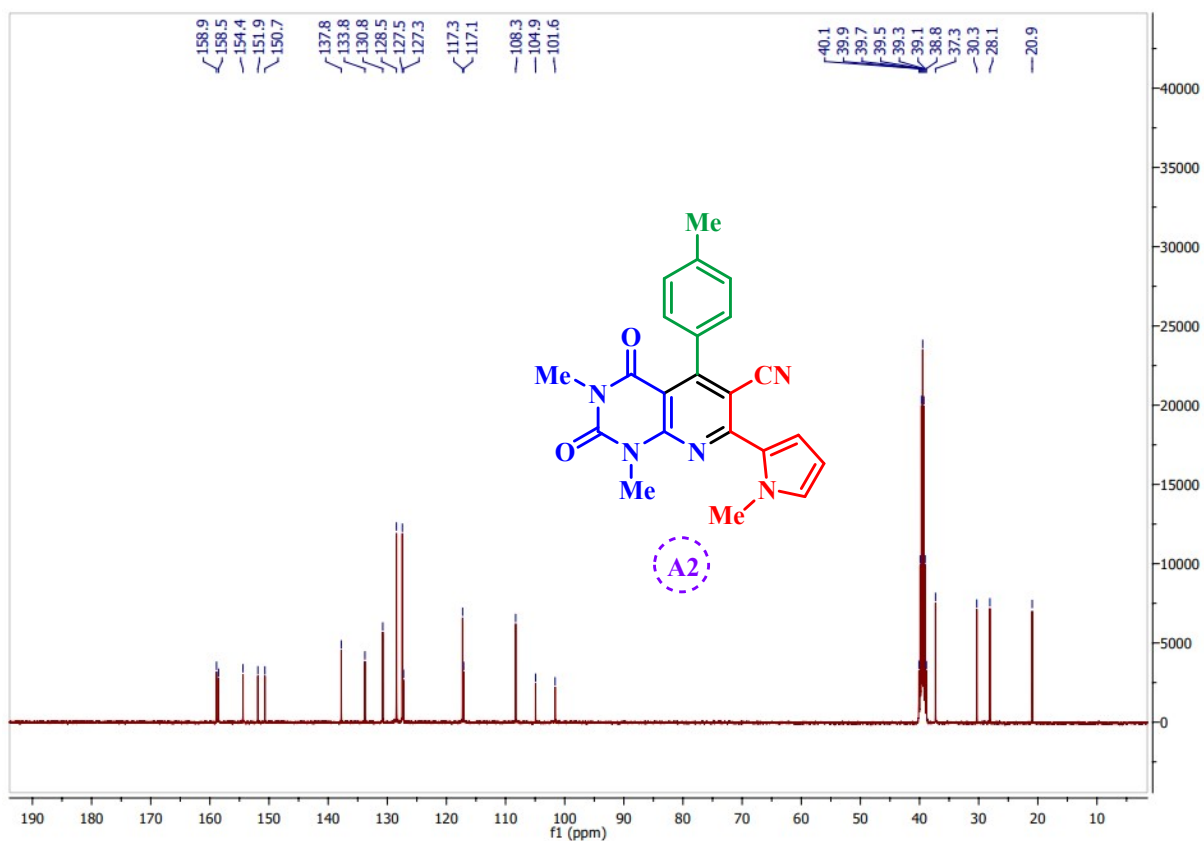
$^1\text{H-NMR}$ spectrum of 5-(4-chlorophenyl)-1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (**A1**).



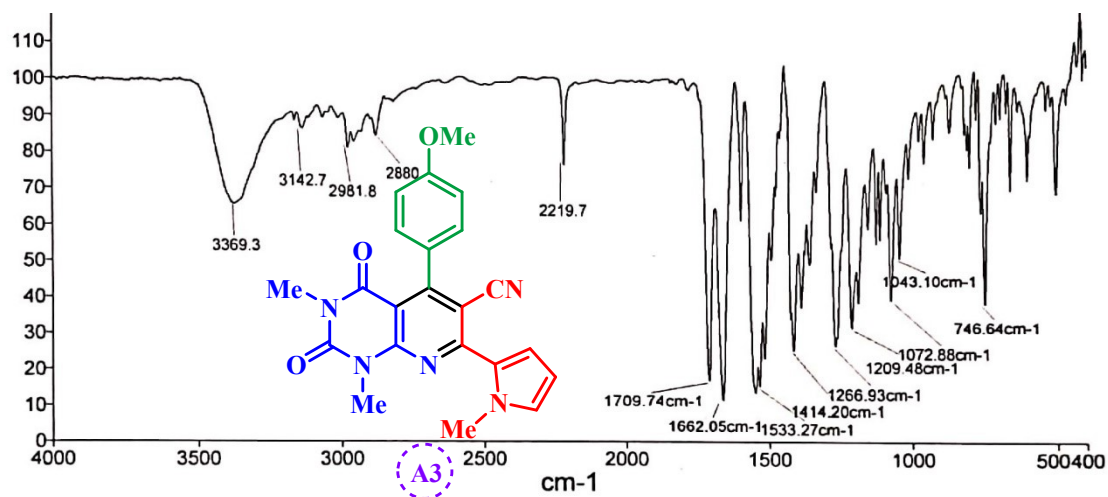
FT-IR spectrum of 1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-5-(p-tolyl)-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A2).



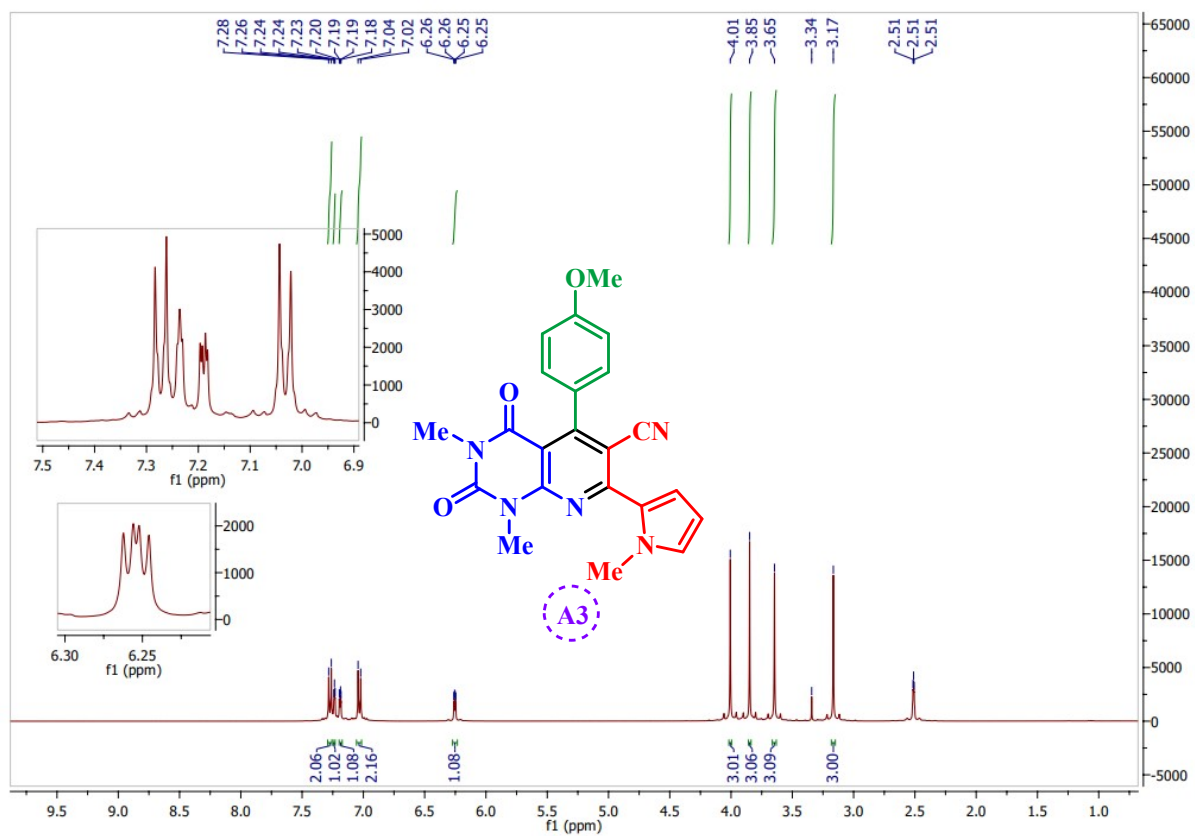
¹H-NMR spectrum of *1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-5-(p-tolyl)-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A2)*.



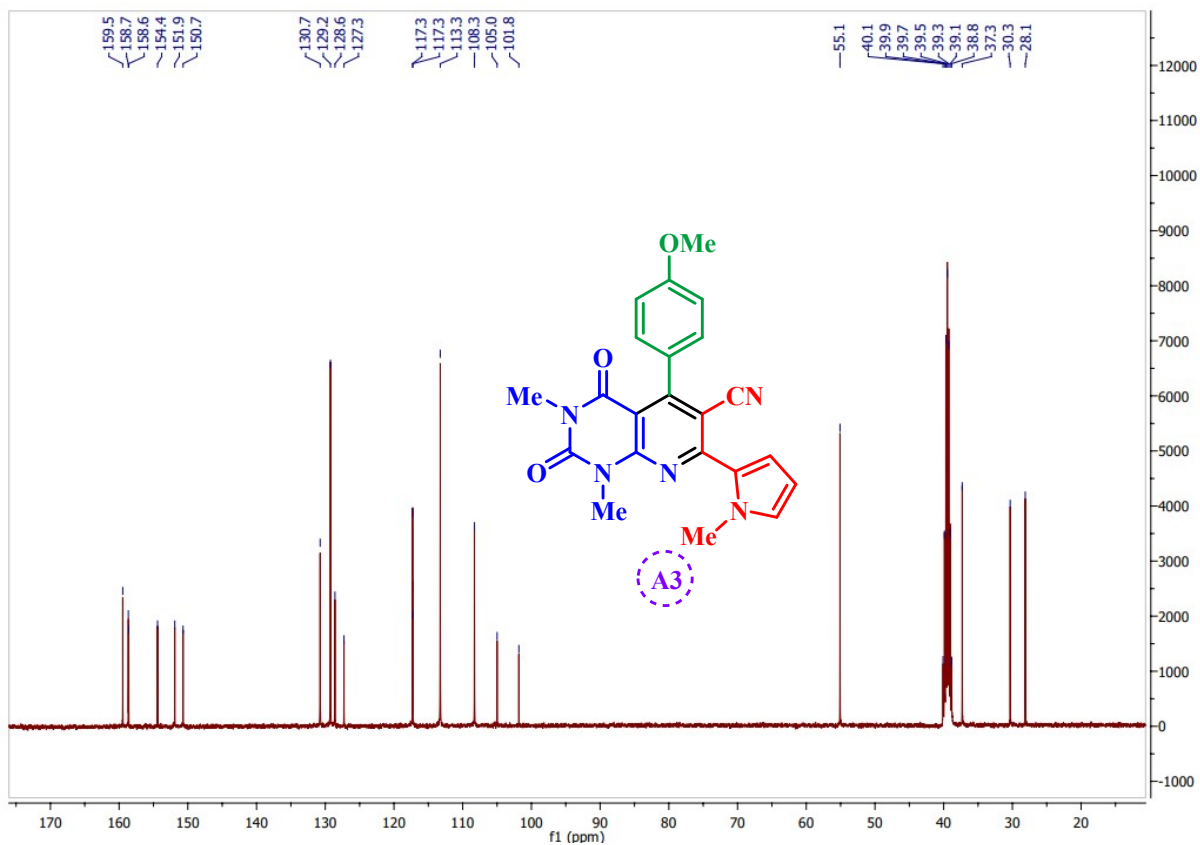
^{13}C -NMR spectrum of 1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-5-(p-tolyl)-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A2).



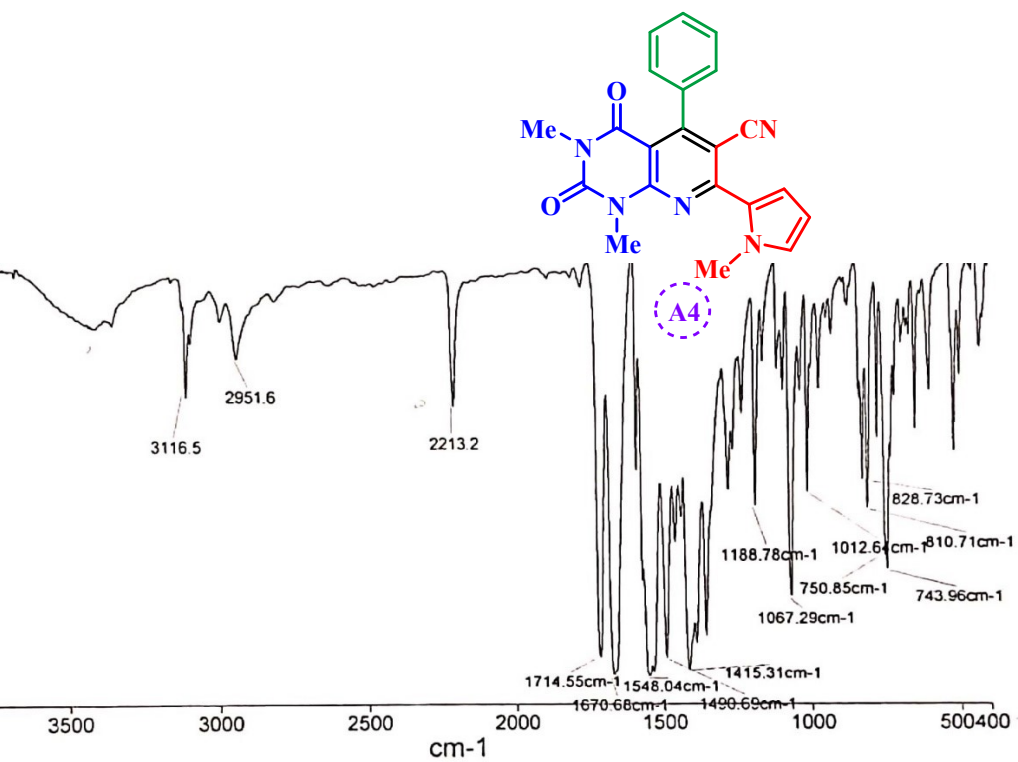
FT-IR spectrum of 5-(4-methoxyphenyl)-1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A3).



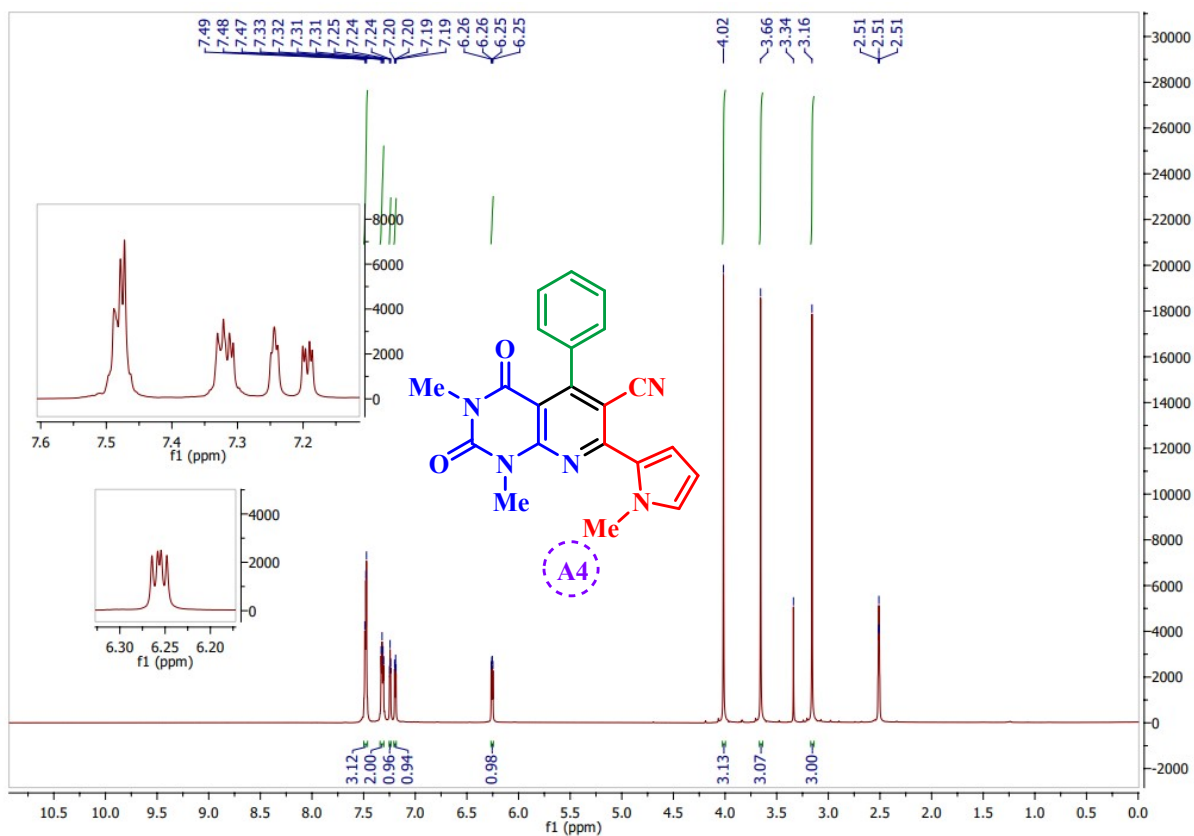
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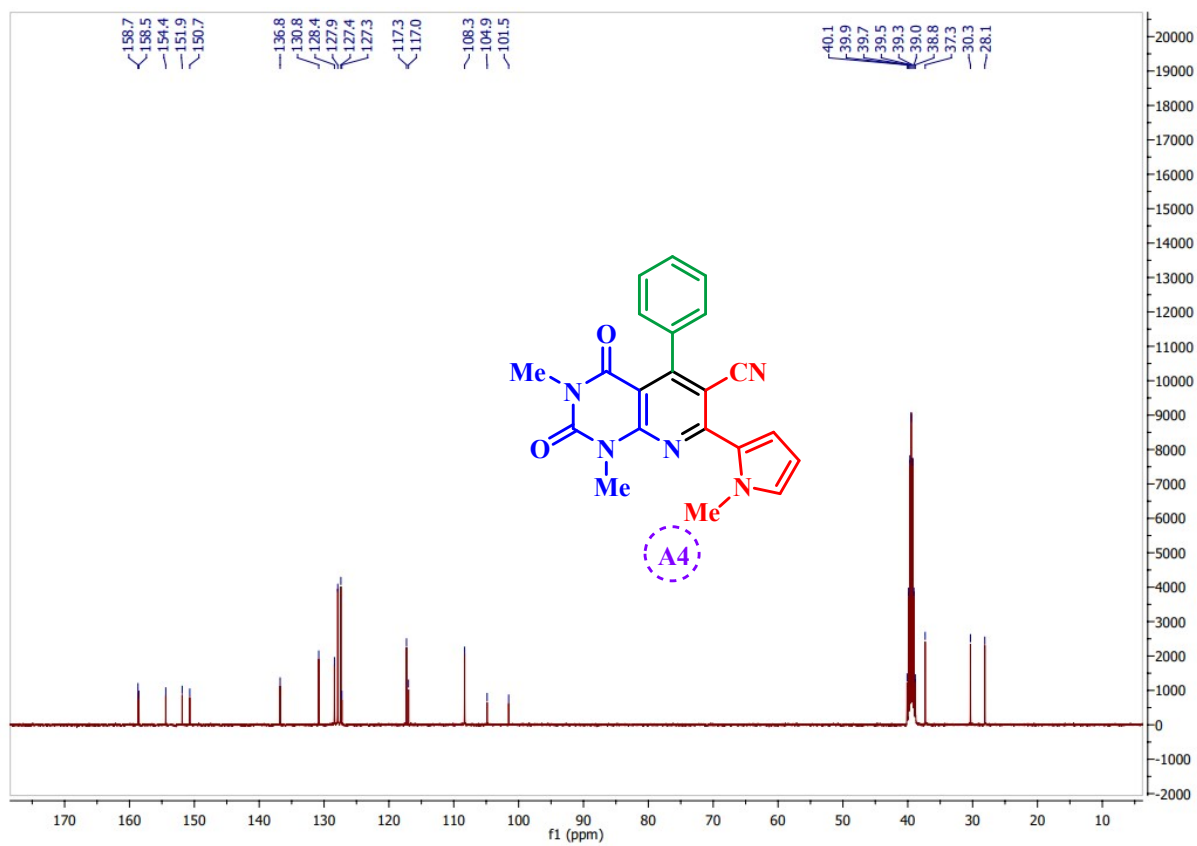
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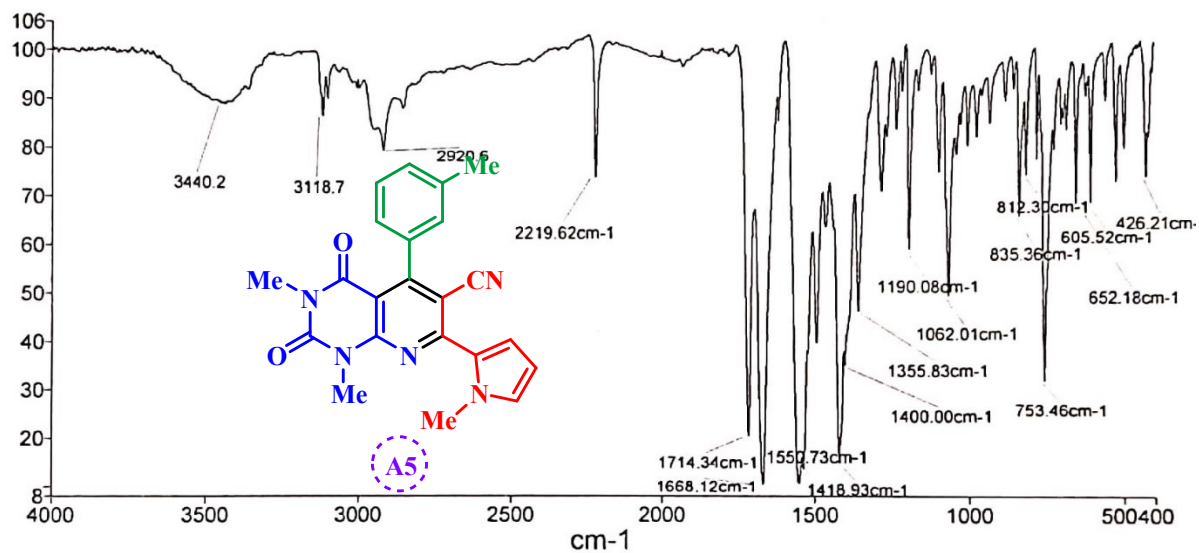
FT-IR spectrum of 1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-5-phenyl-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A4).



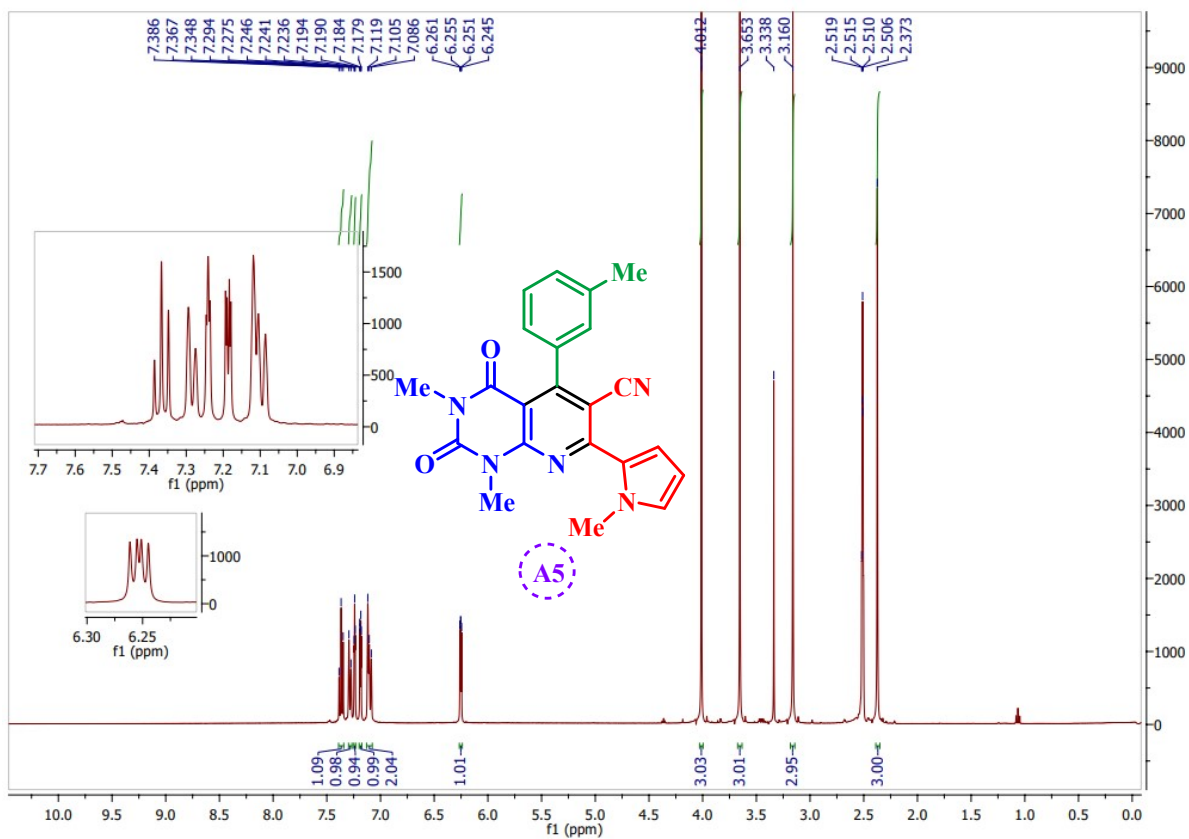
$^1\text{H-NMR}$ spectrum of 1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-5-phenyl-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (**A4**).



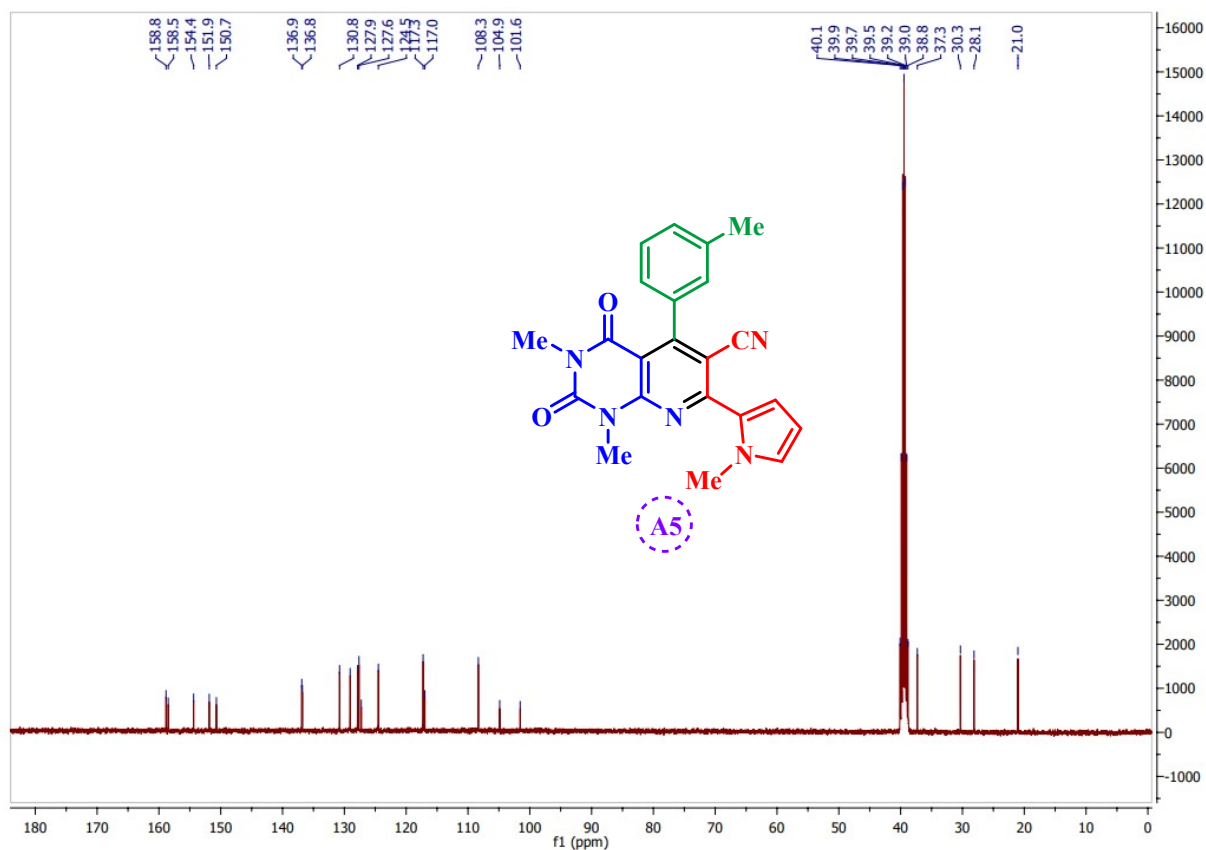
^{13}C -NMR spectrum of 1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-5-phenyl-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A4).



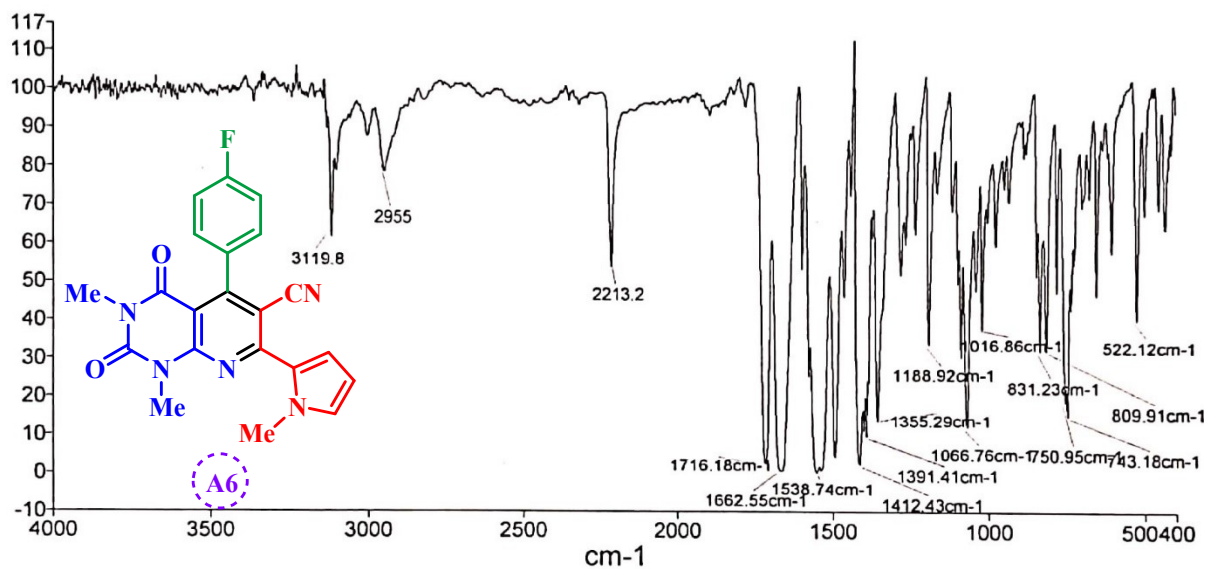
FT-IR spectrum of 1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-5-(m-tolyl)-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A5).



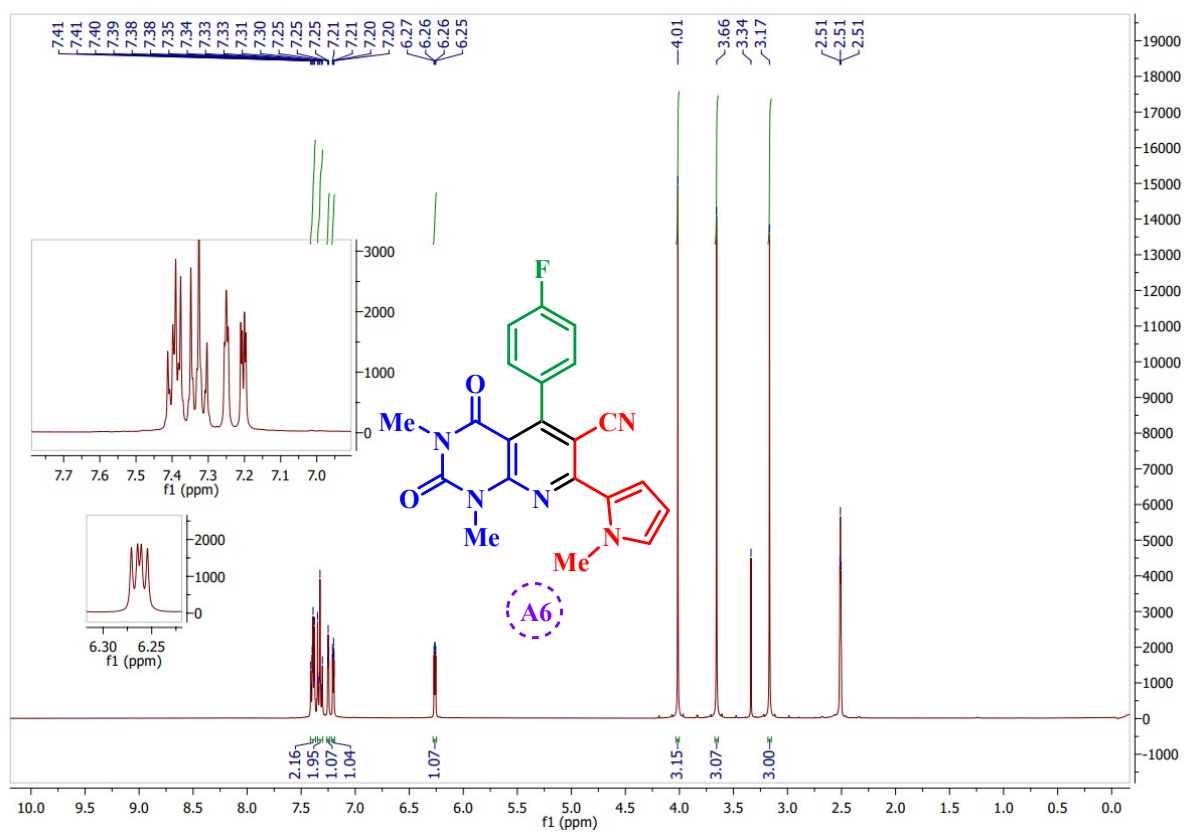
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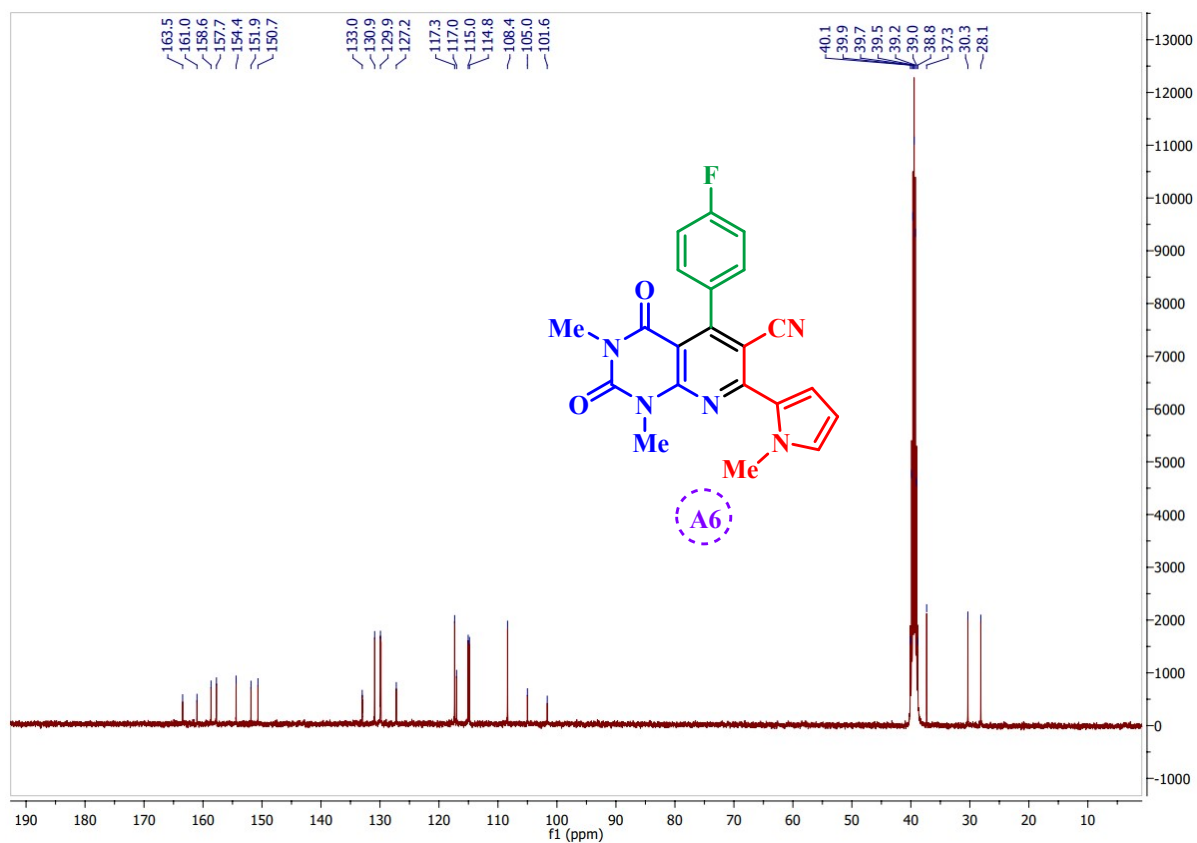
$^{13}\text{C-NMR}$ spectrum of 1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-5-(m-tolyl)-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A5).



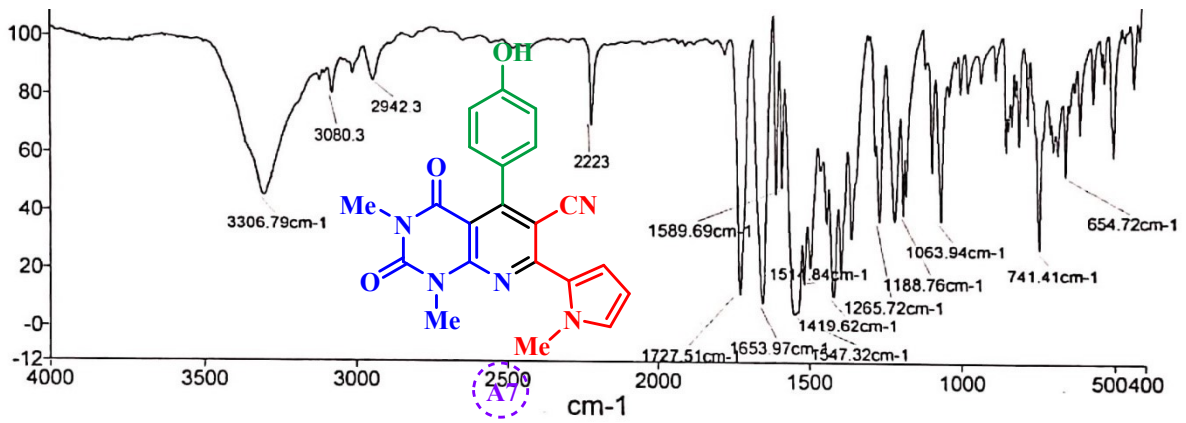
FT-IR spectrum of 5-(4-fluorophenyl)-1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A6).



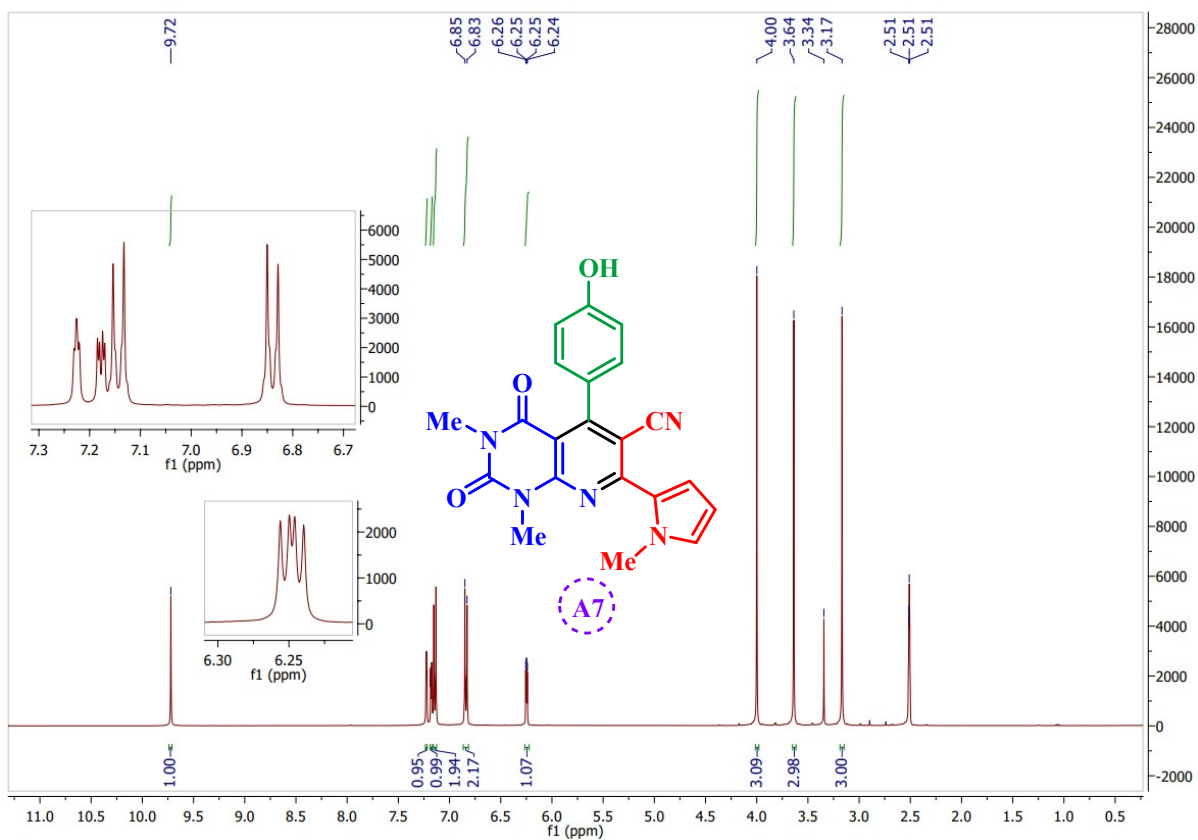
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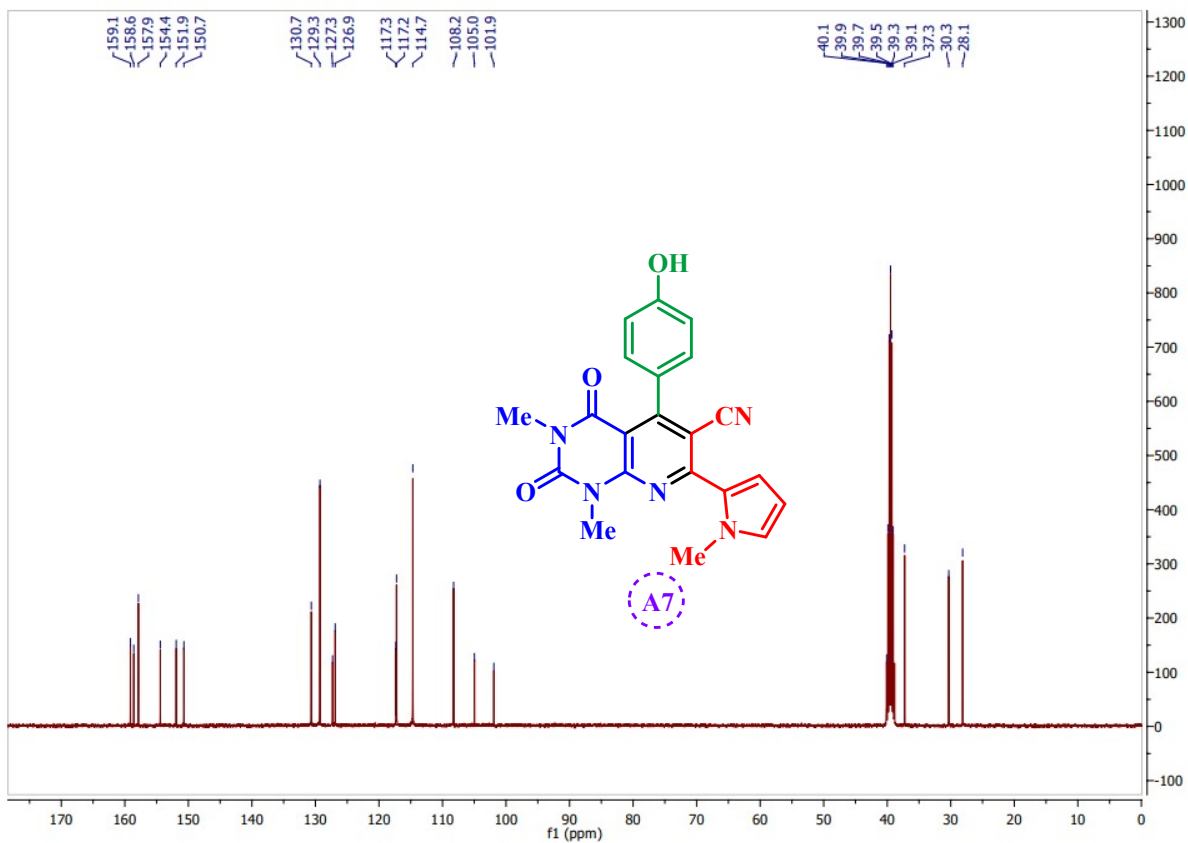
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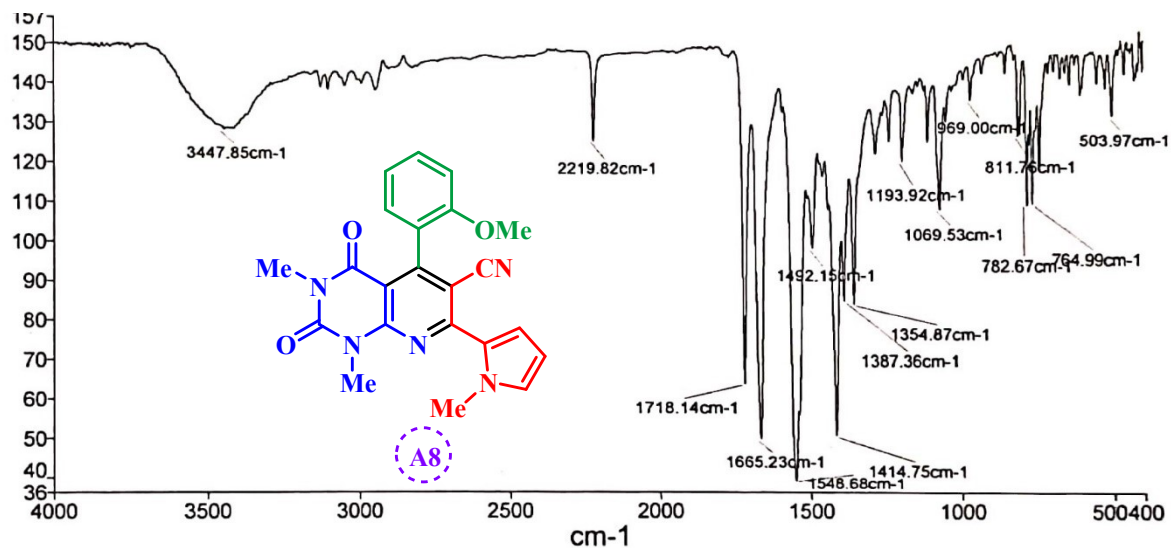
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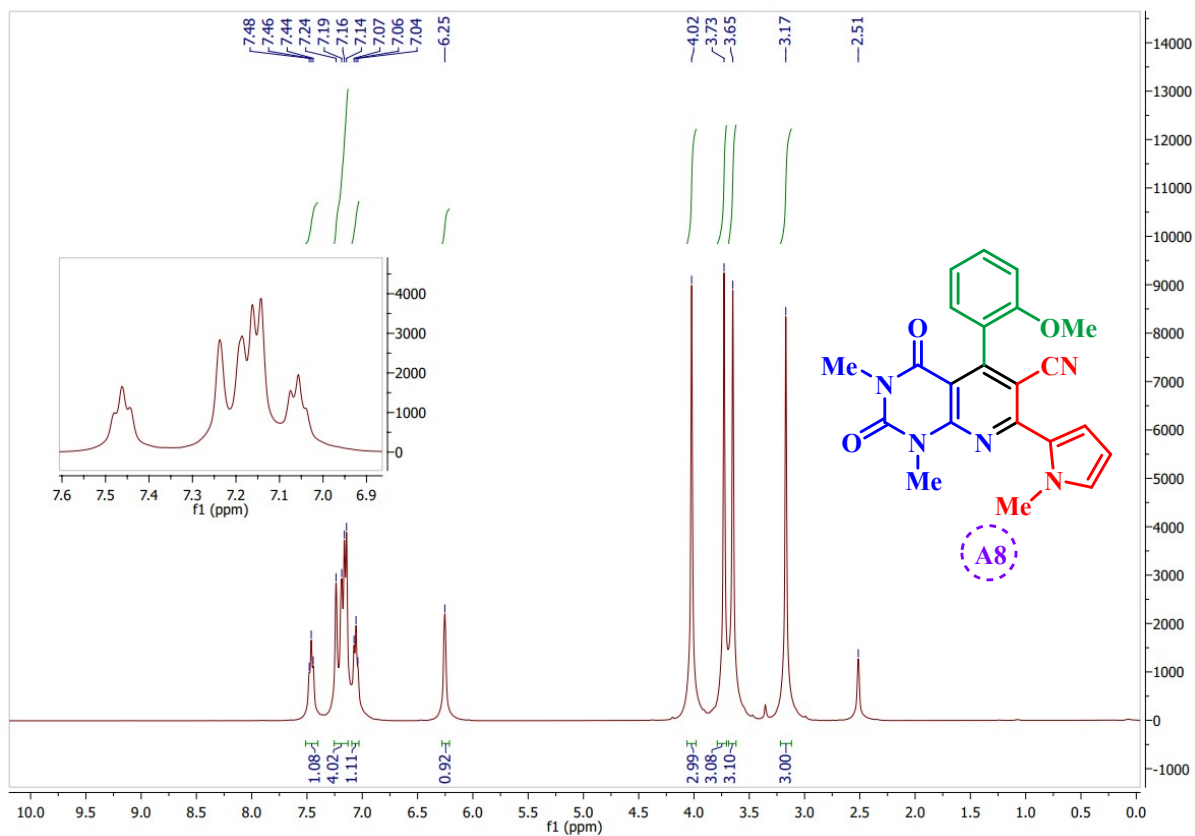
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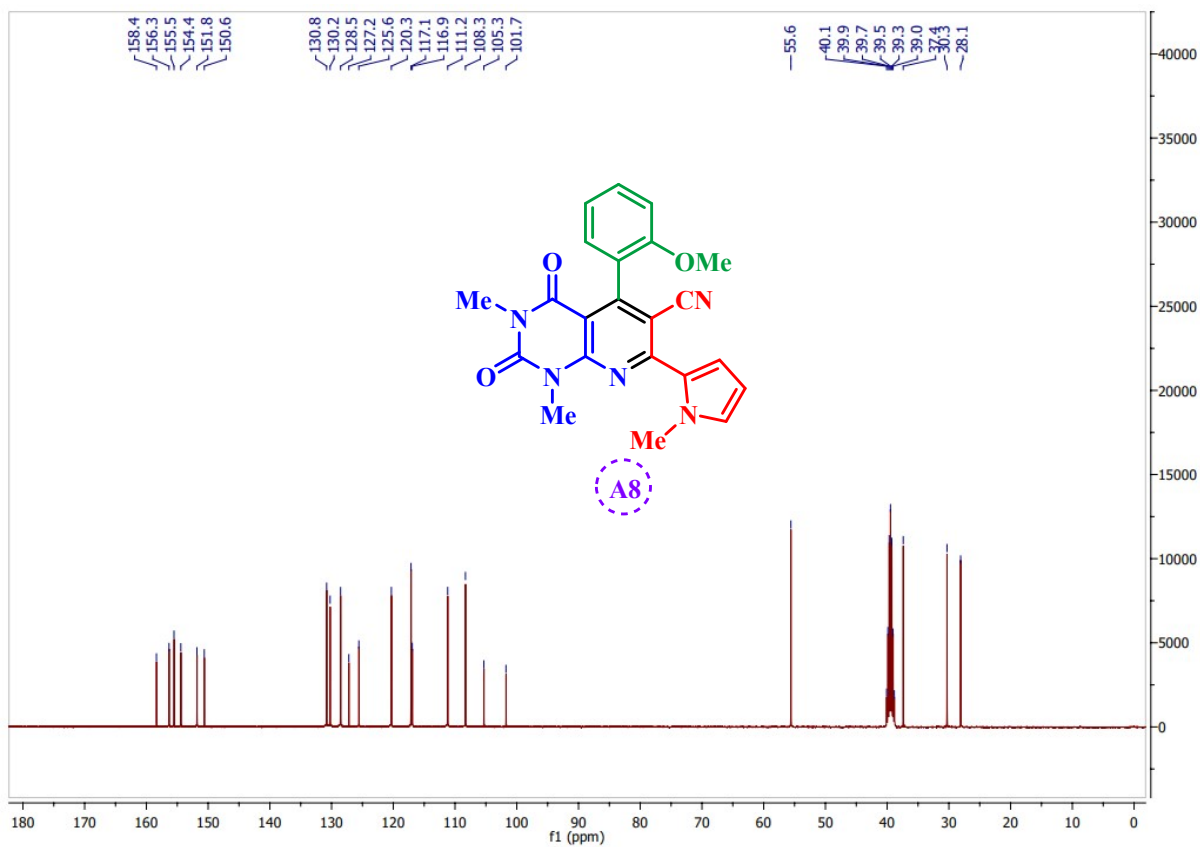
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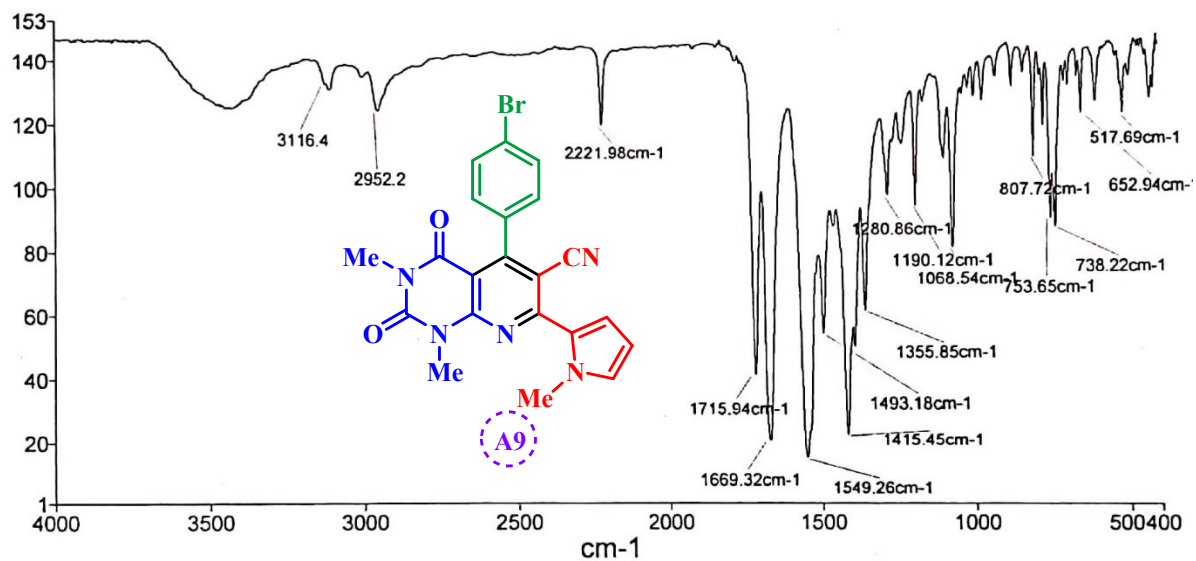
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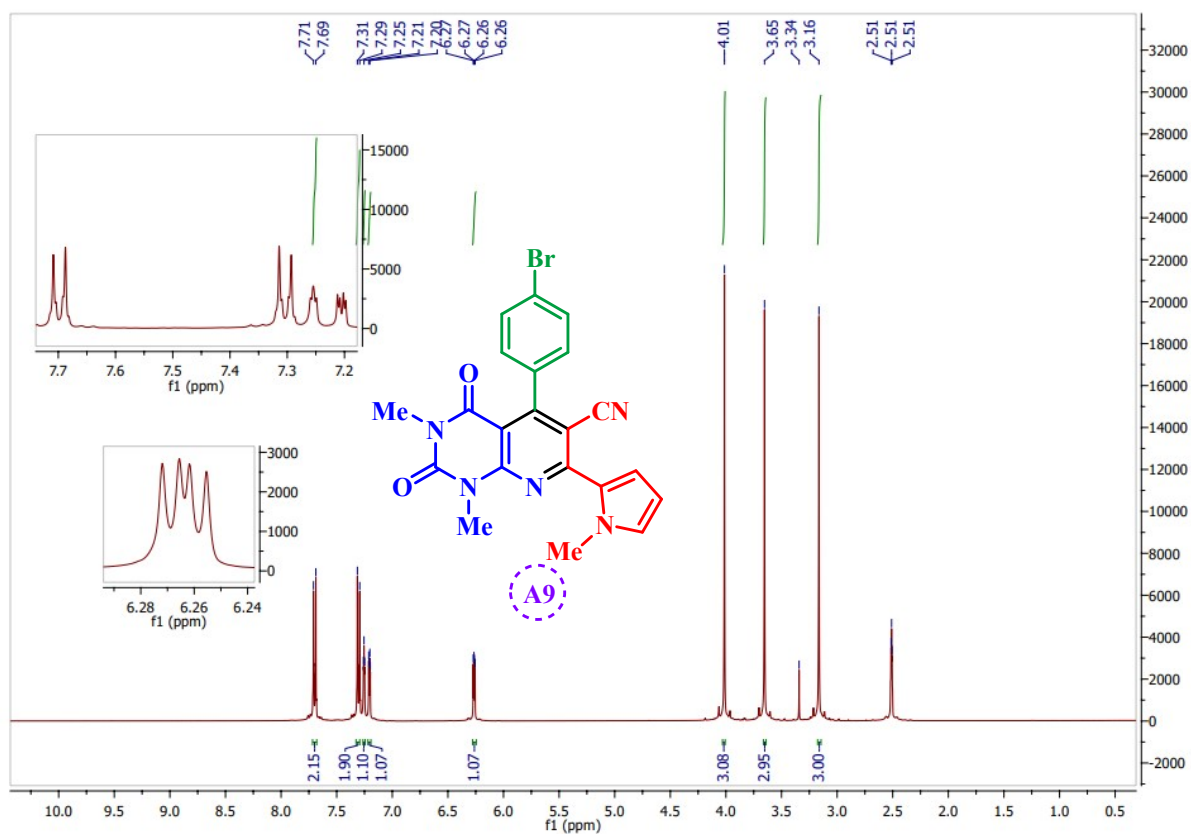
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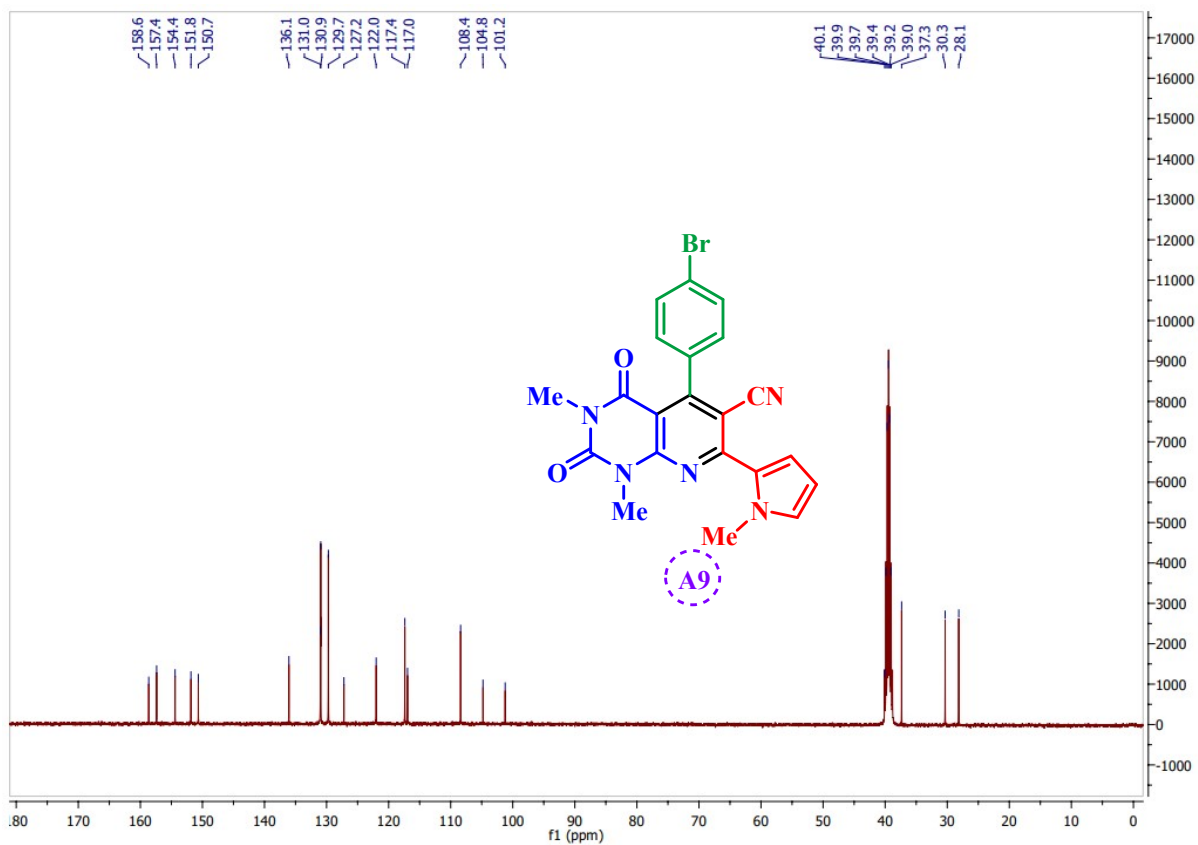
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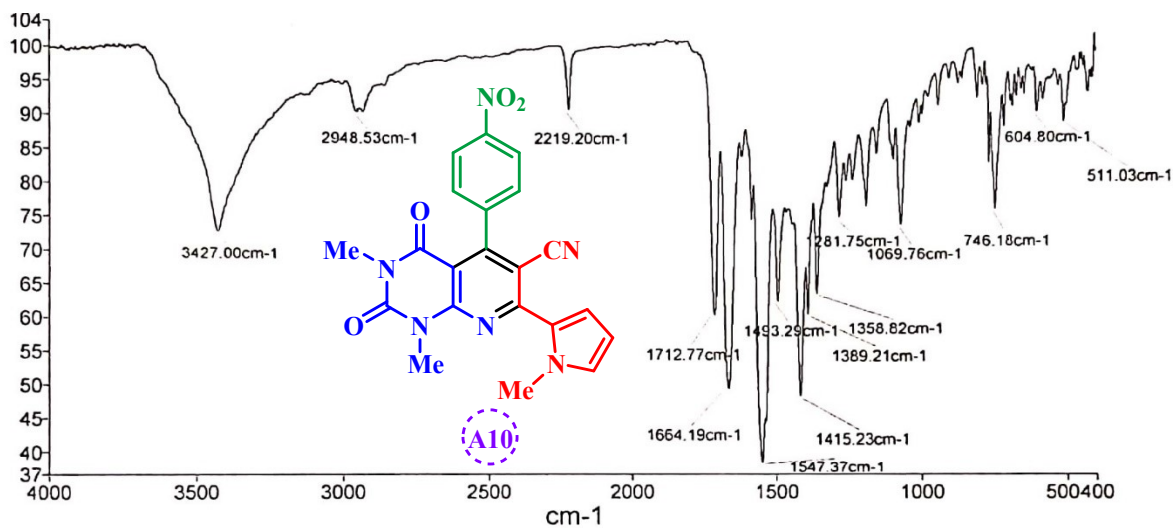
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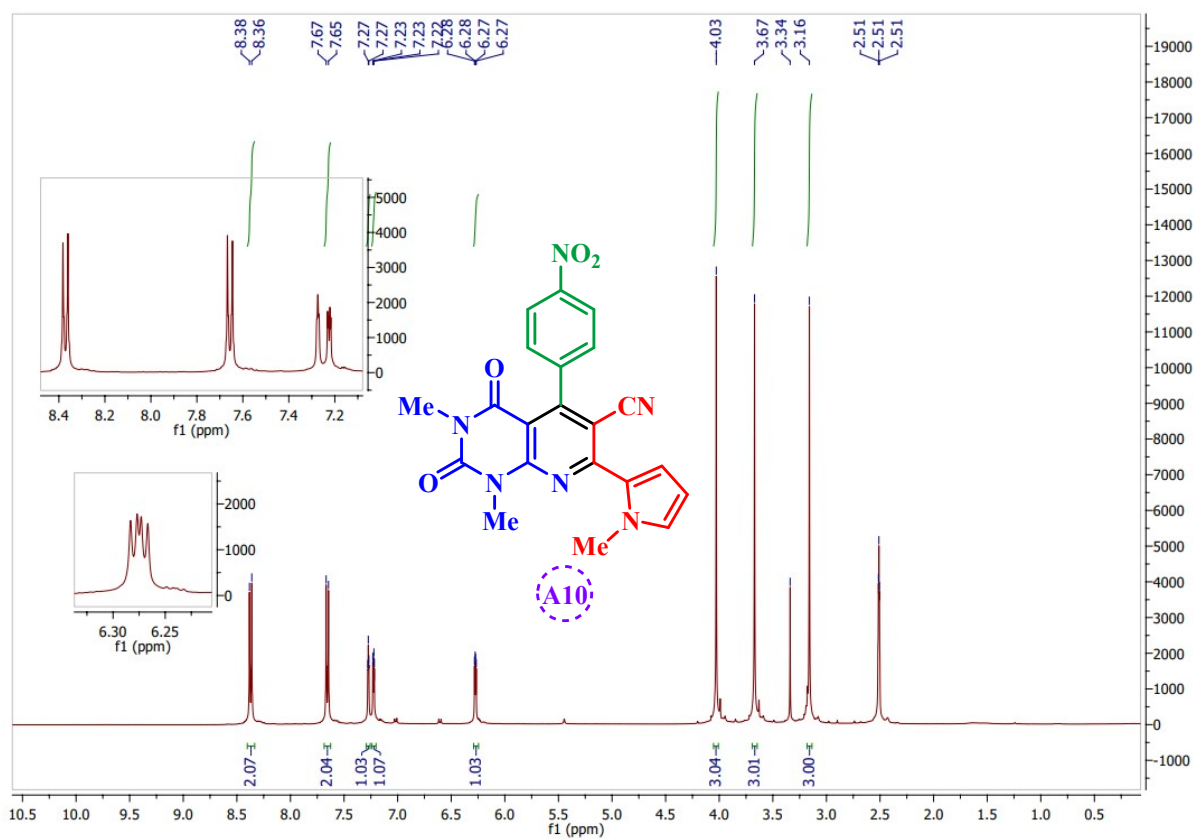
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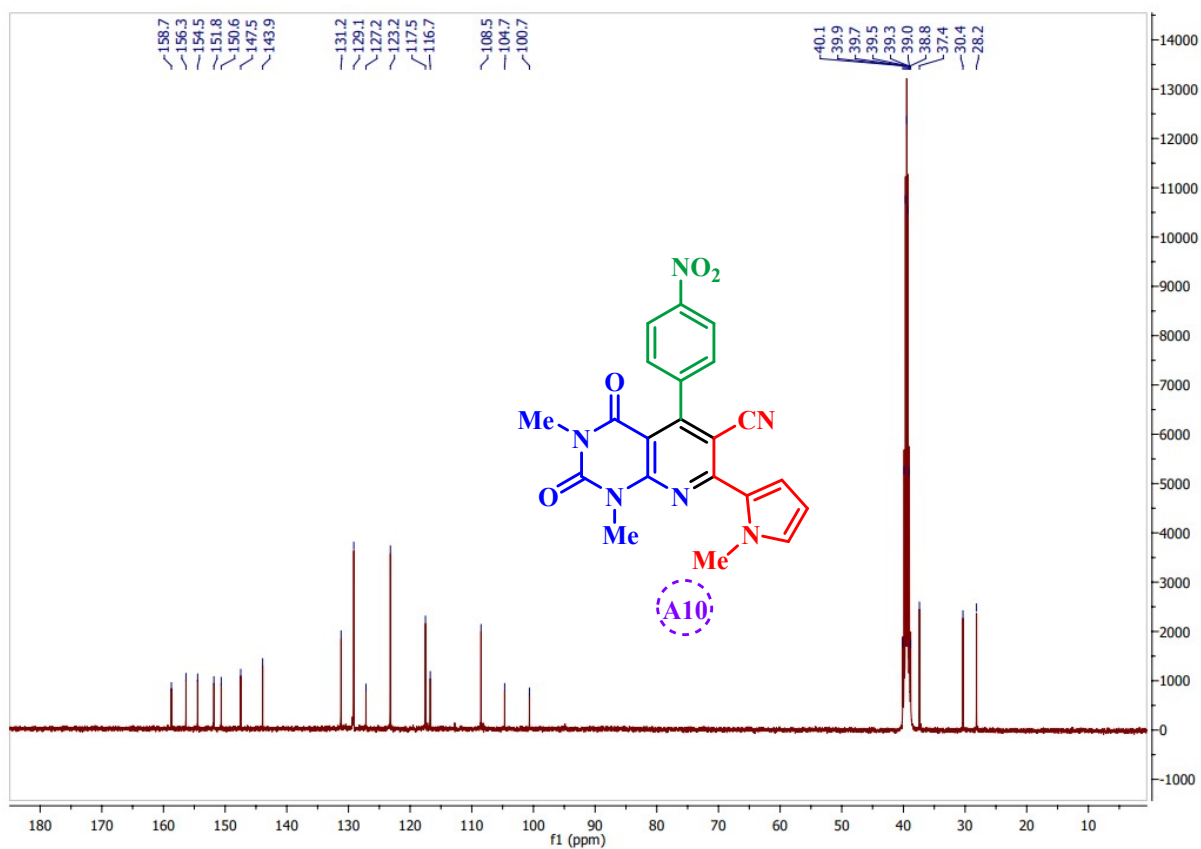
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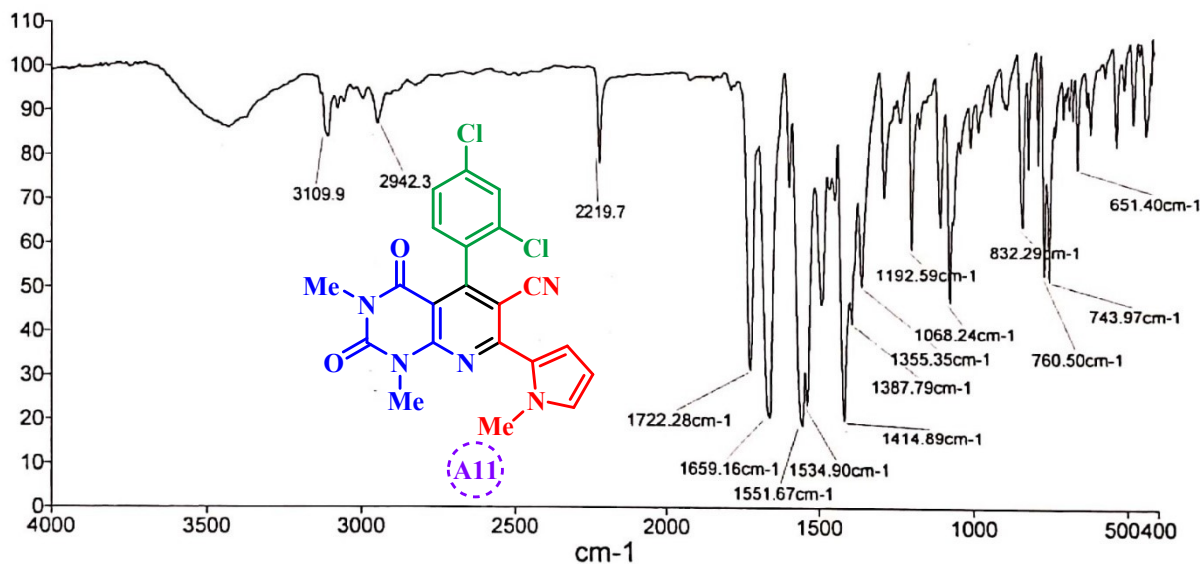
FT-IR spectrum of 1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-5-(4-nitrophenyl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A10).



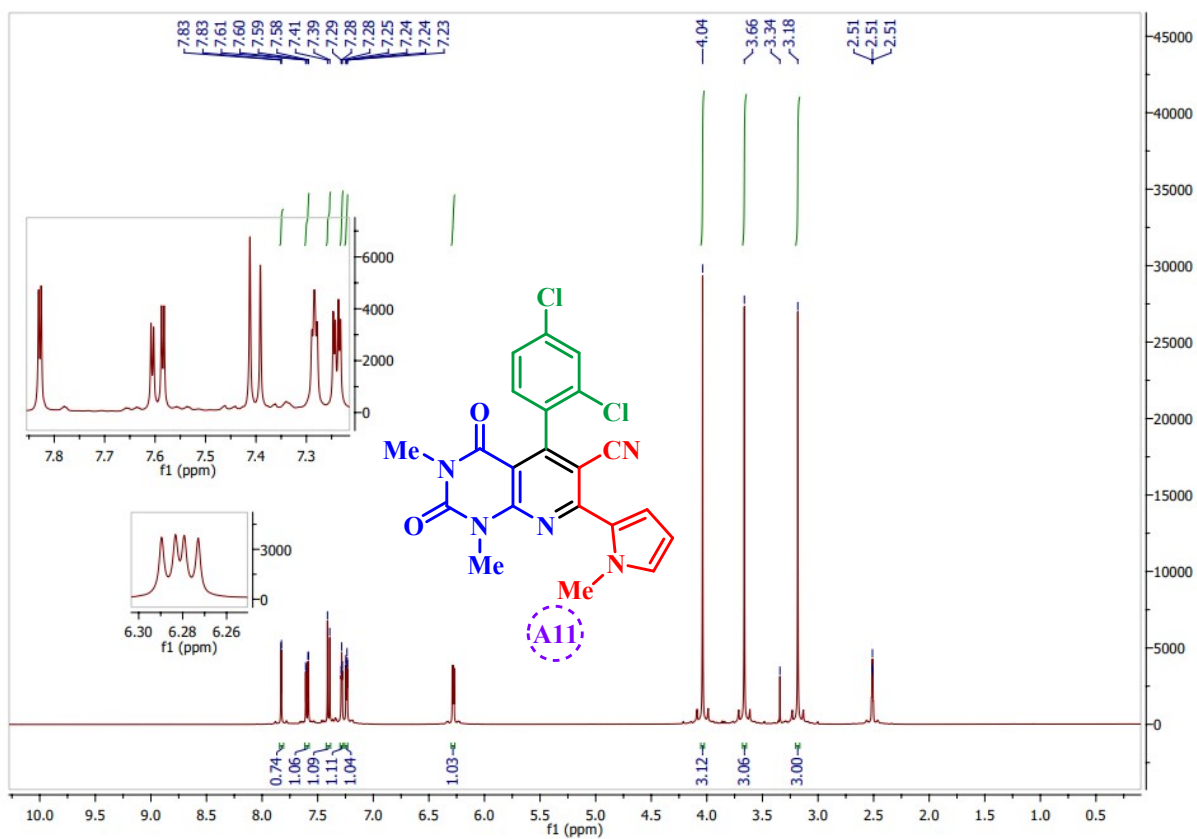
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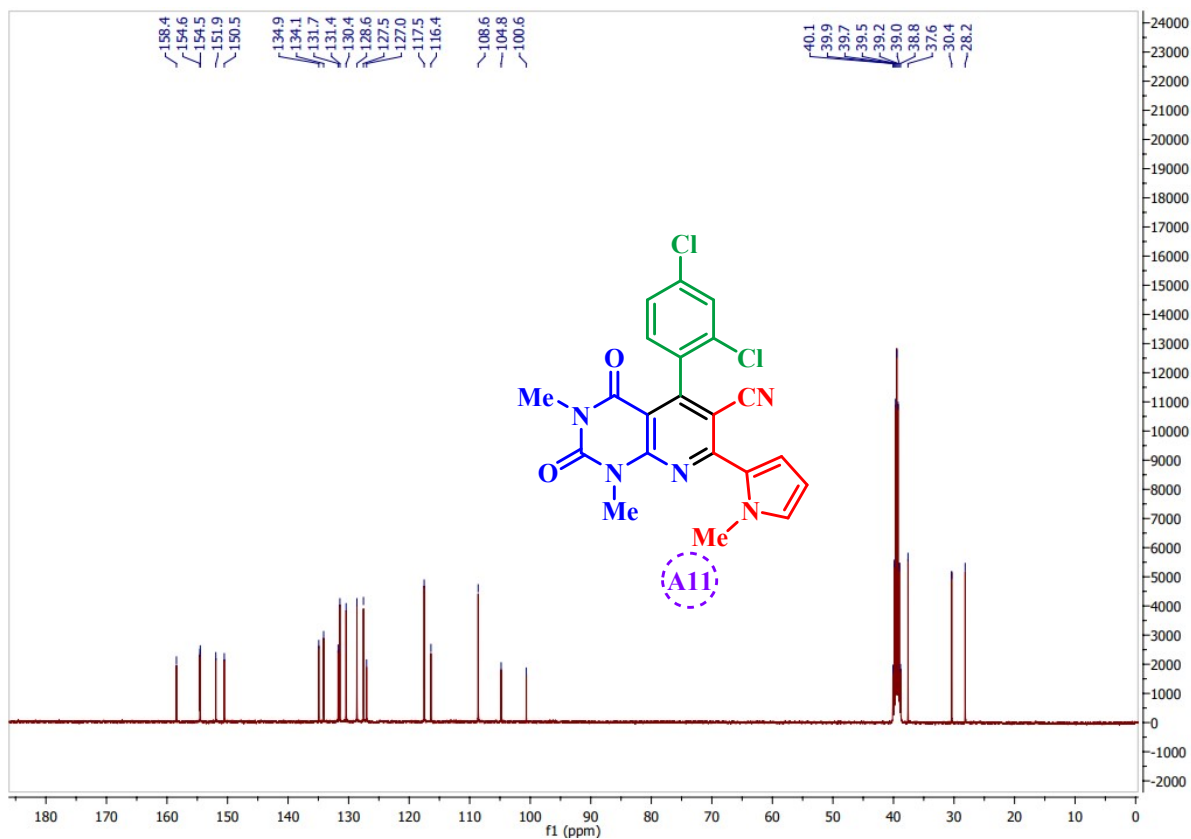
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FT-IR spectrum of 5-(2,4-dichlorophenyl)-1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A11).

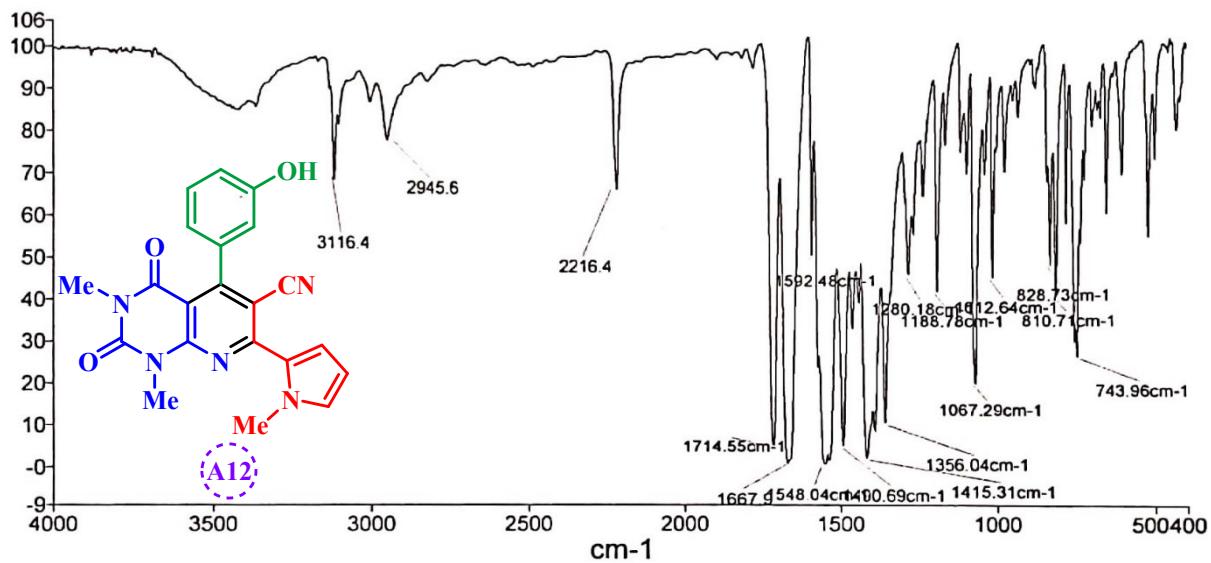


$^1\text{H-NMR}$ spectrum of 5-(2,4-dichlorophenyl)-1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A11).

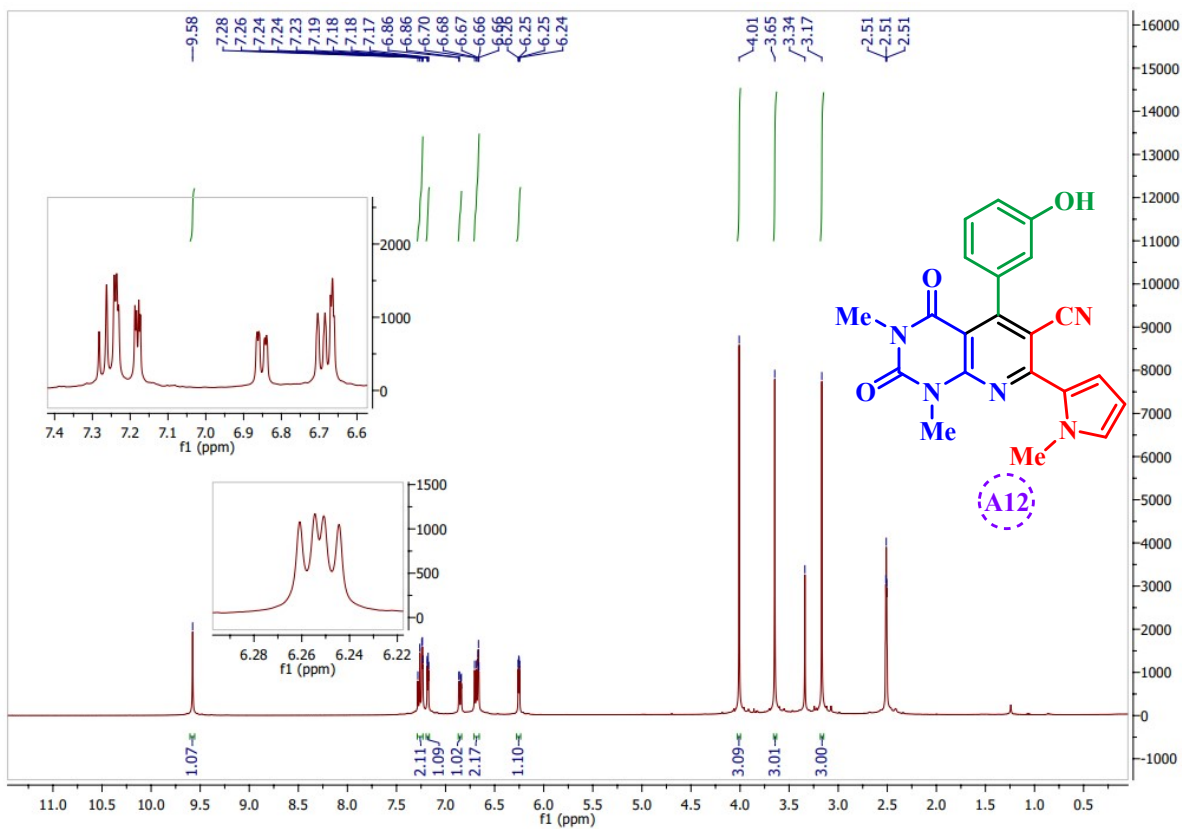


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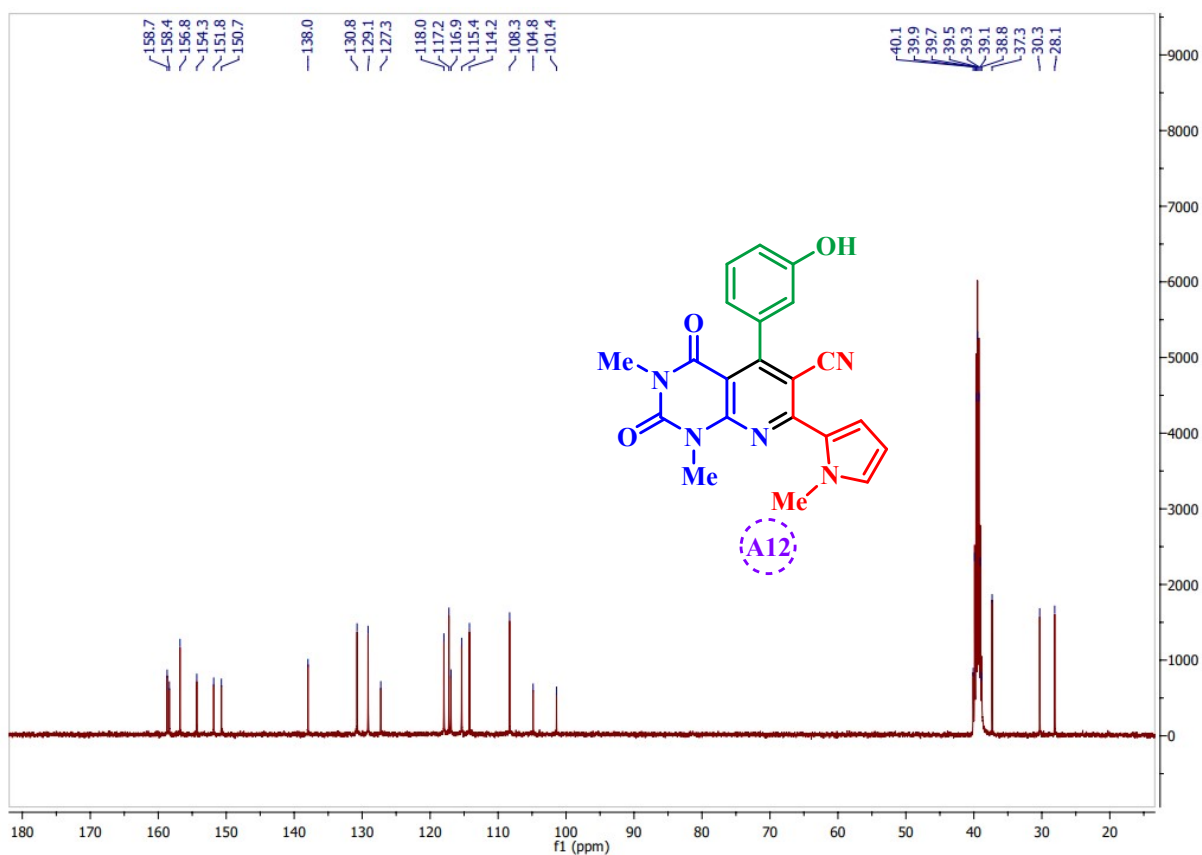
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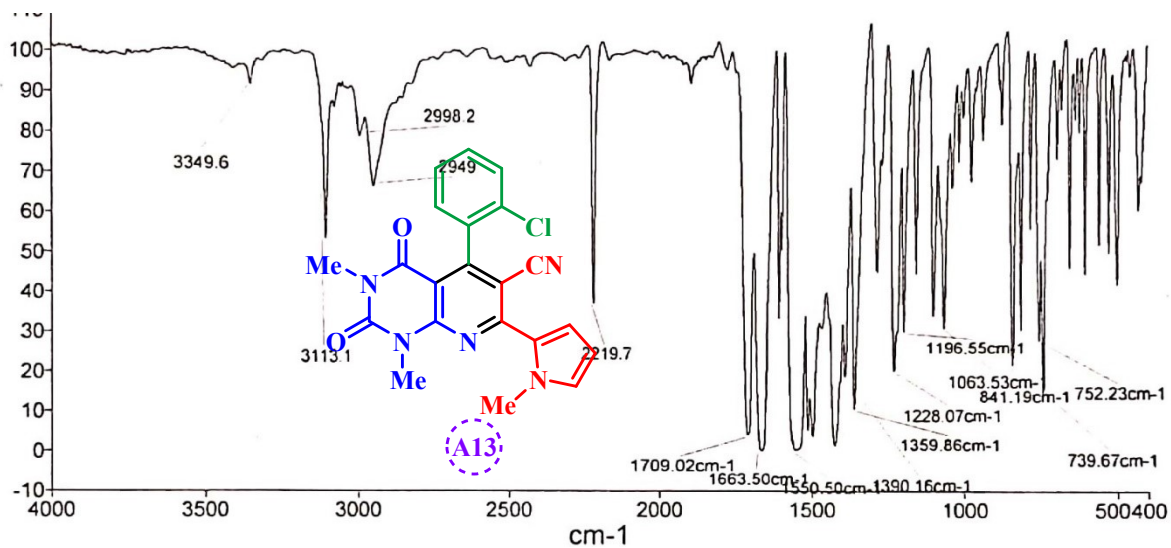
FT-IR spectrum of 5-(3-hydroxyphenyl)-1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A12).



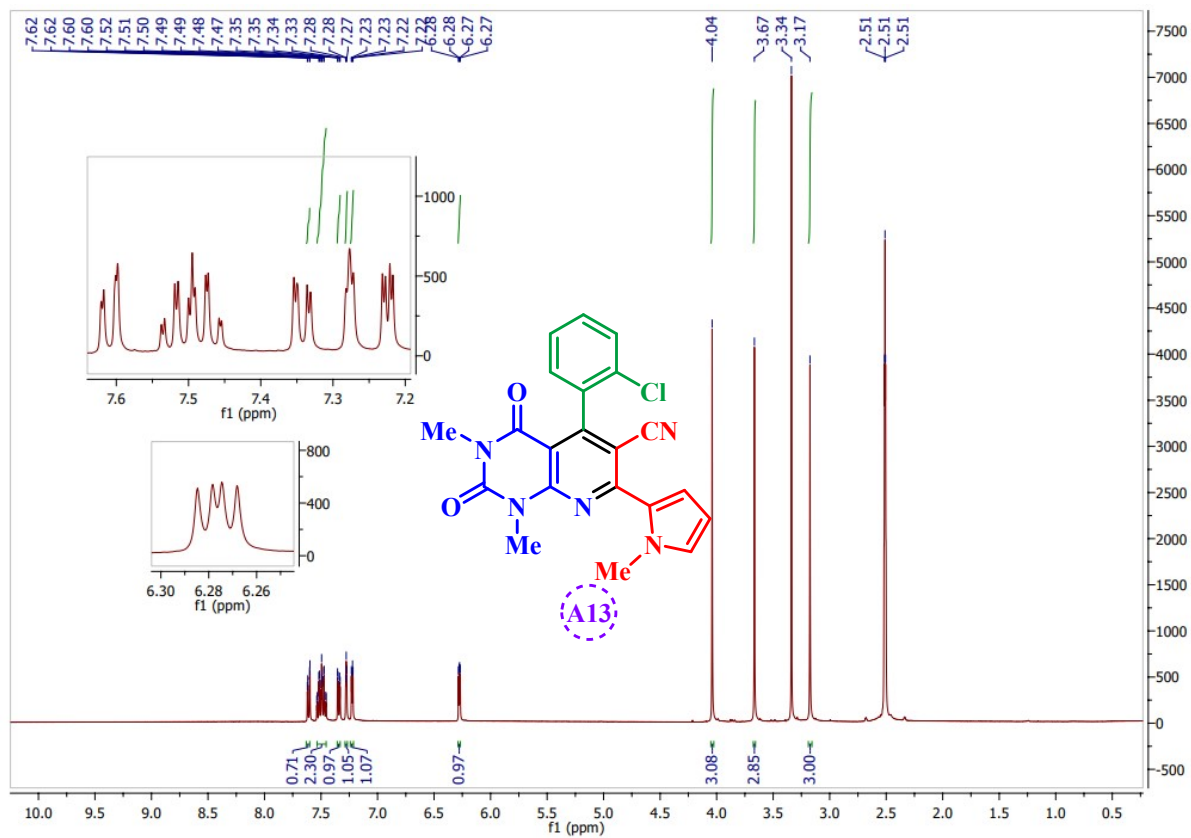
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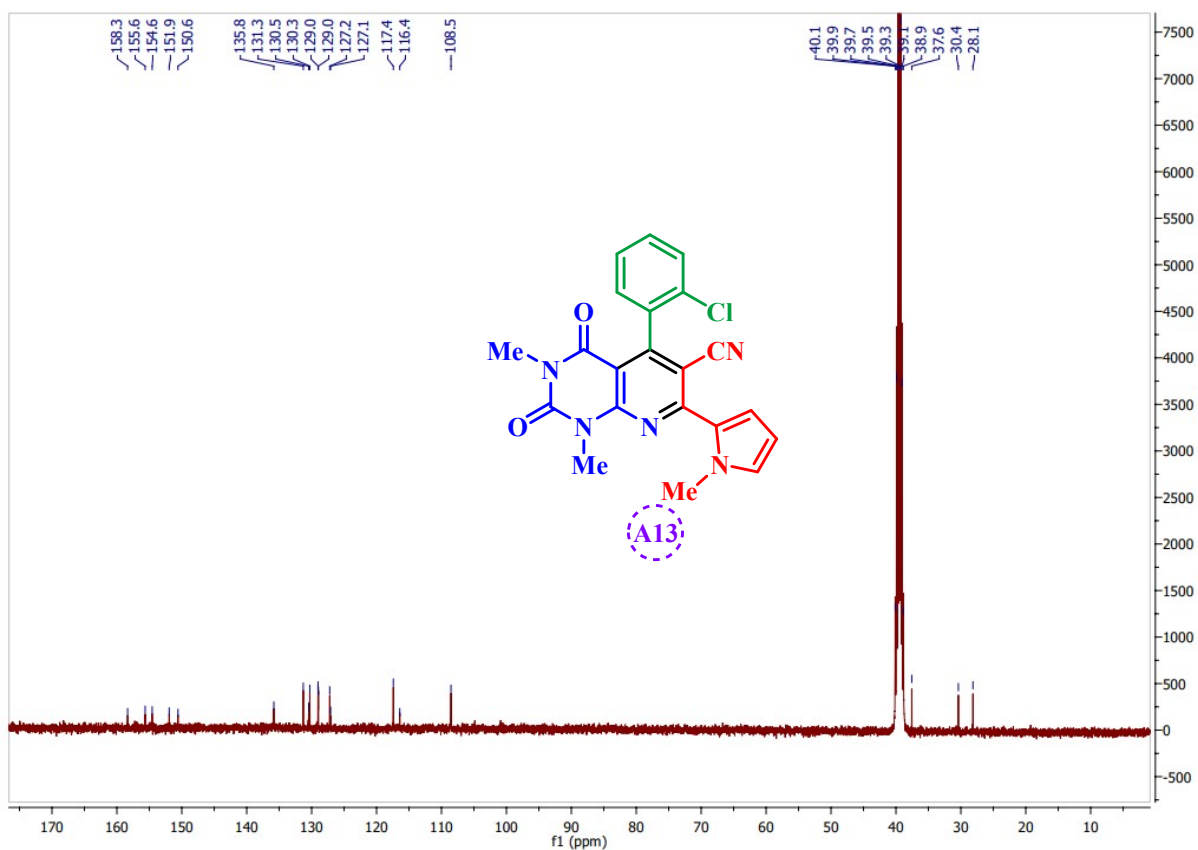
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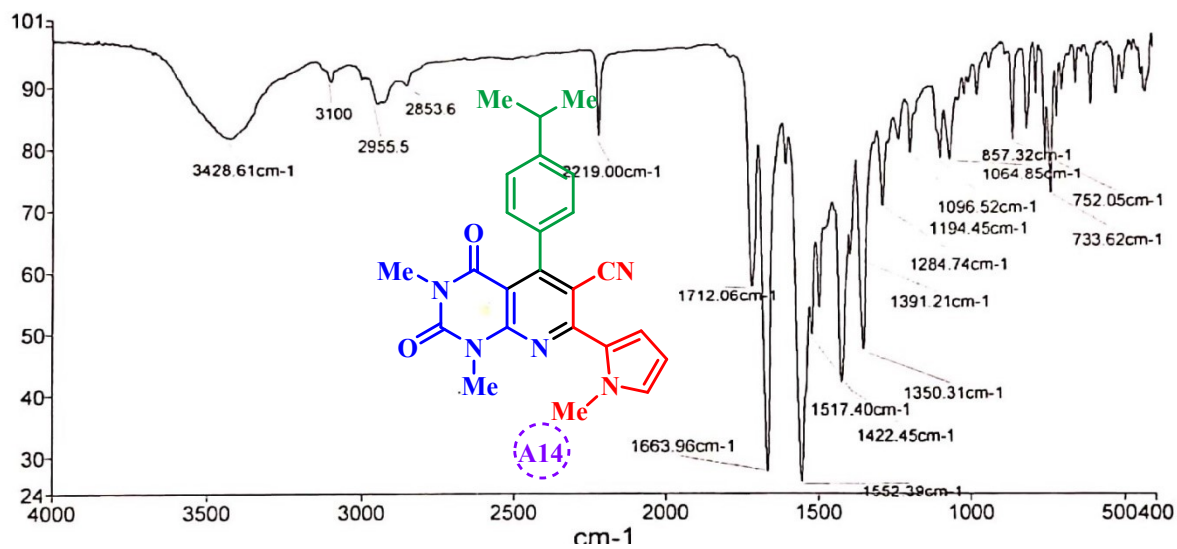
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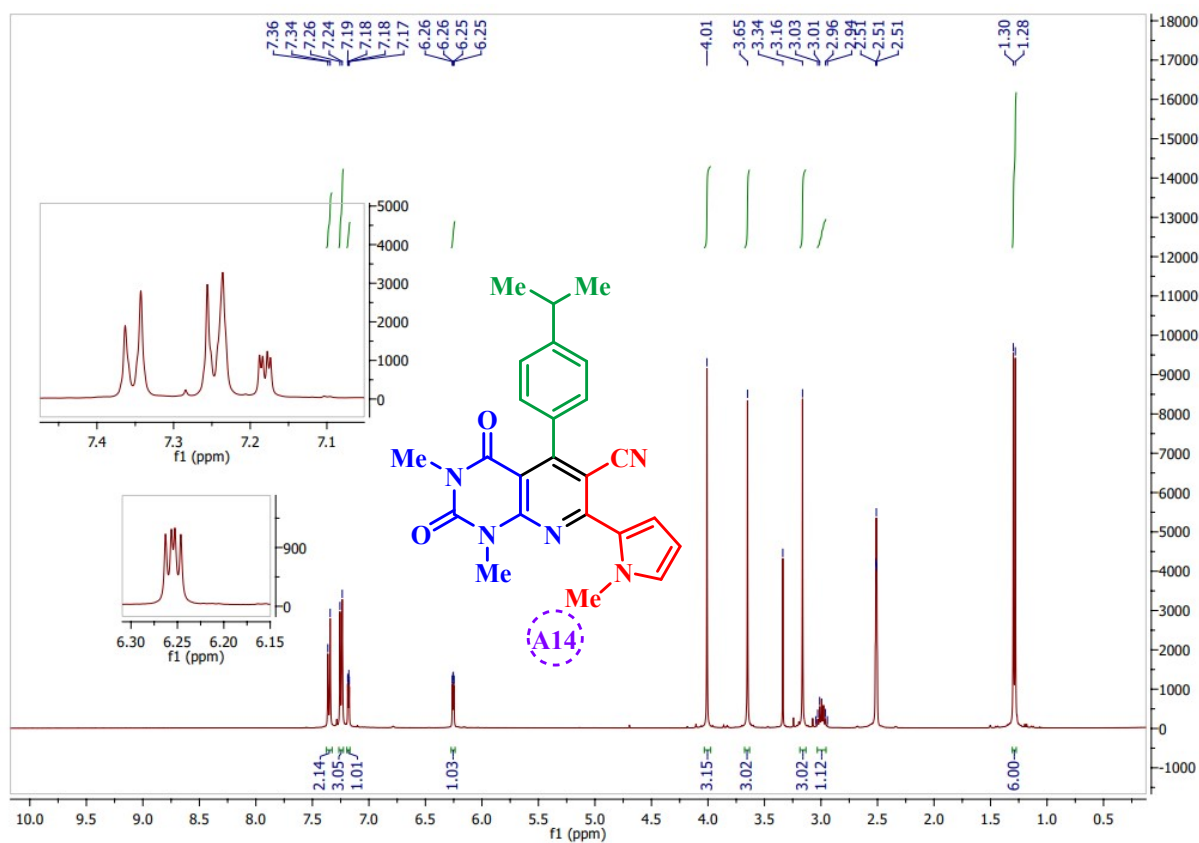
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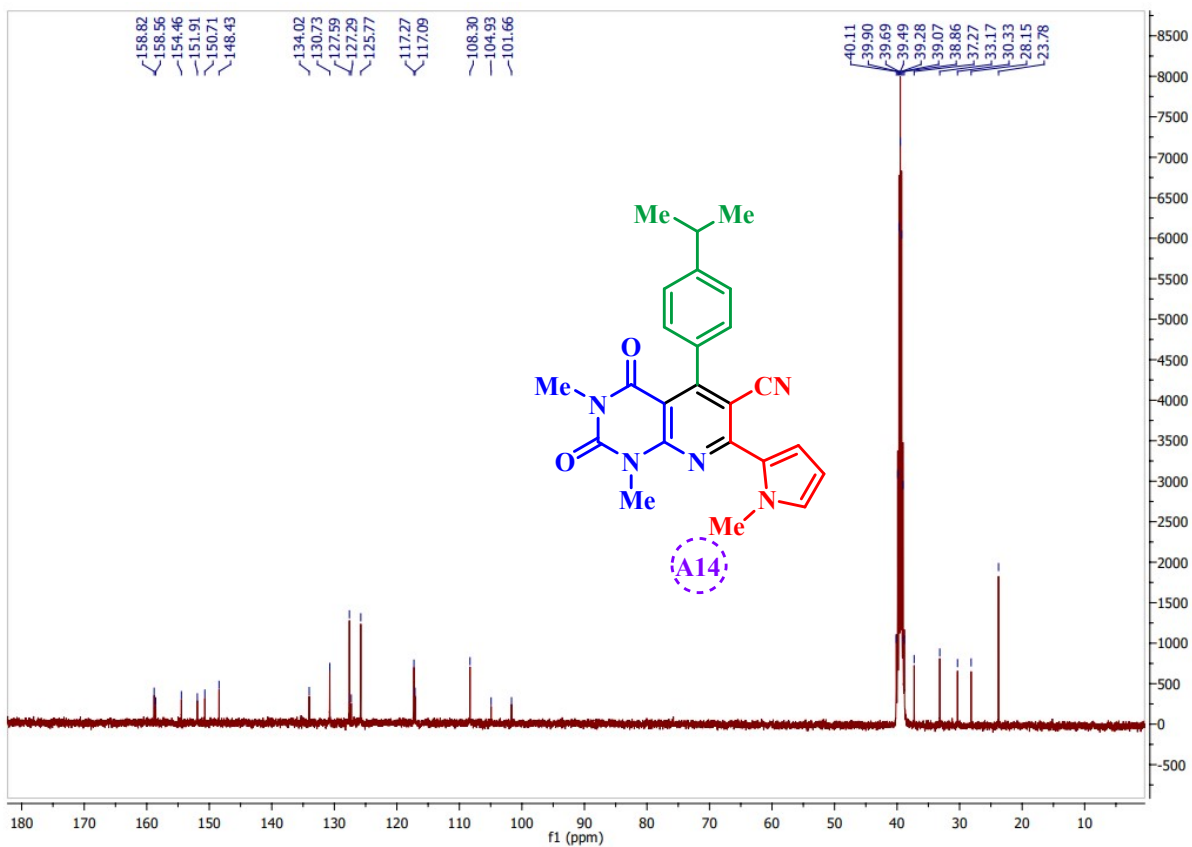
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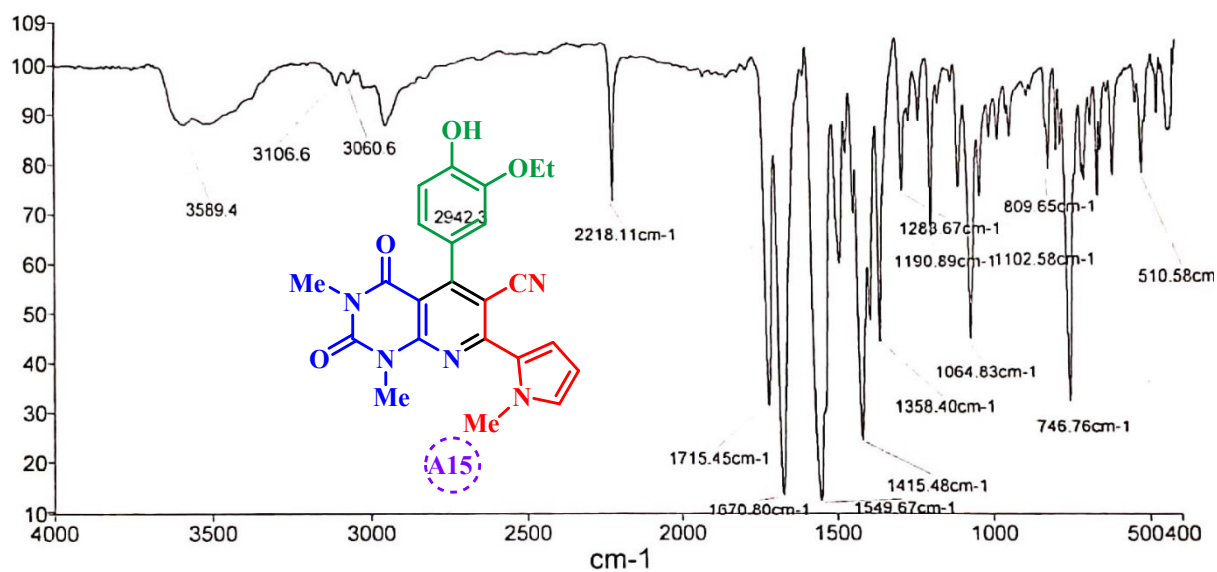
FT-IR spectrum of 5-(4-isopropylphenyl)-1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A14).



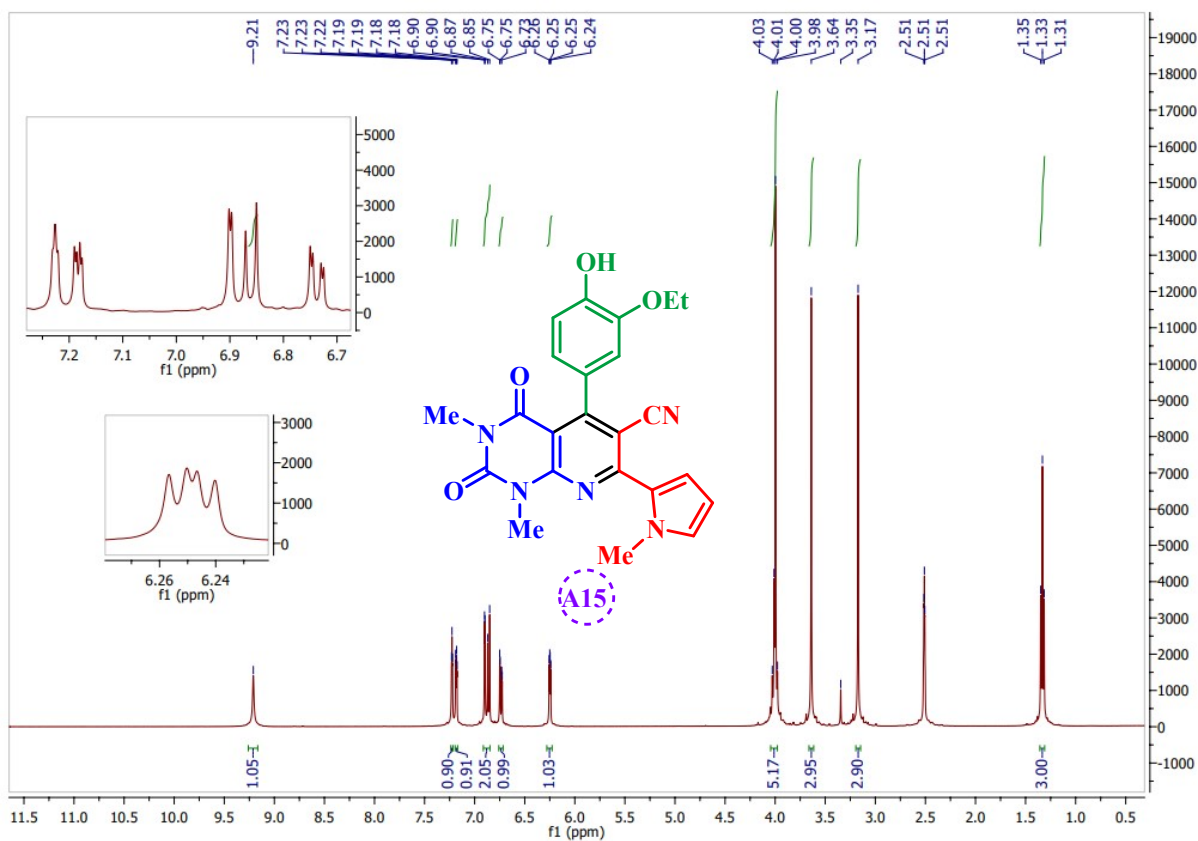
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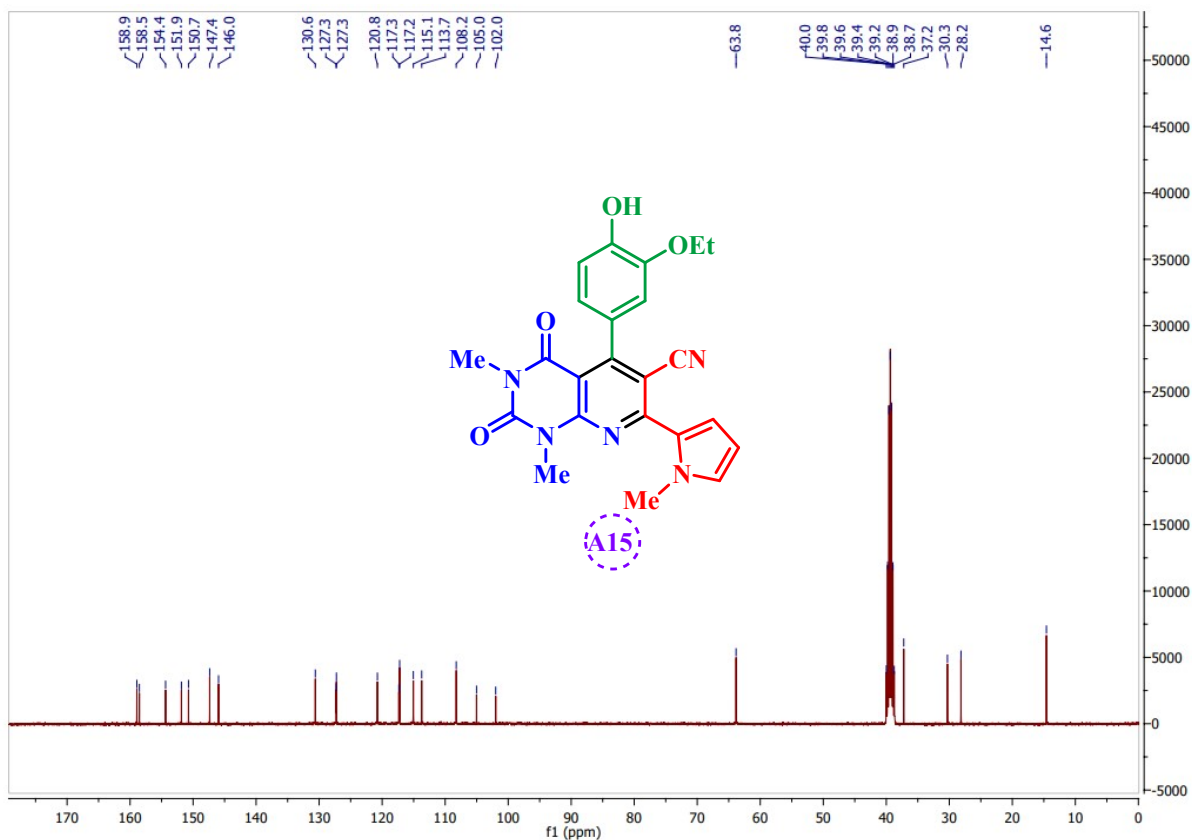
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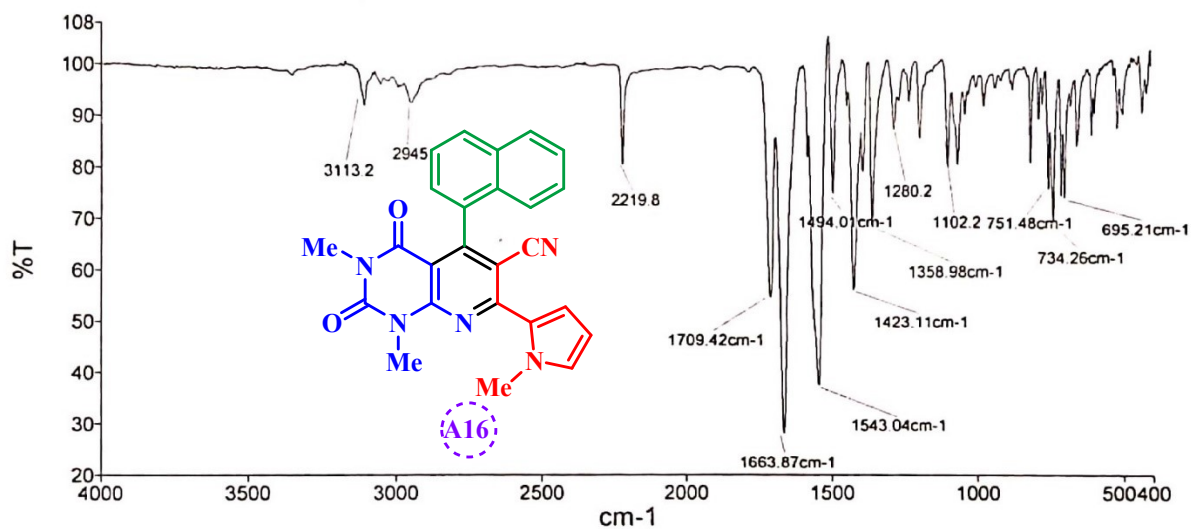
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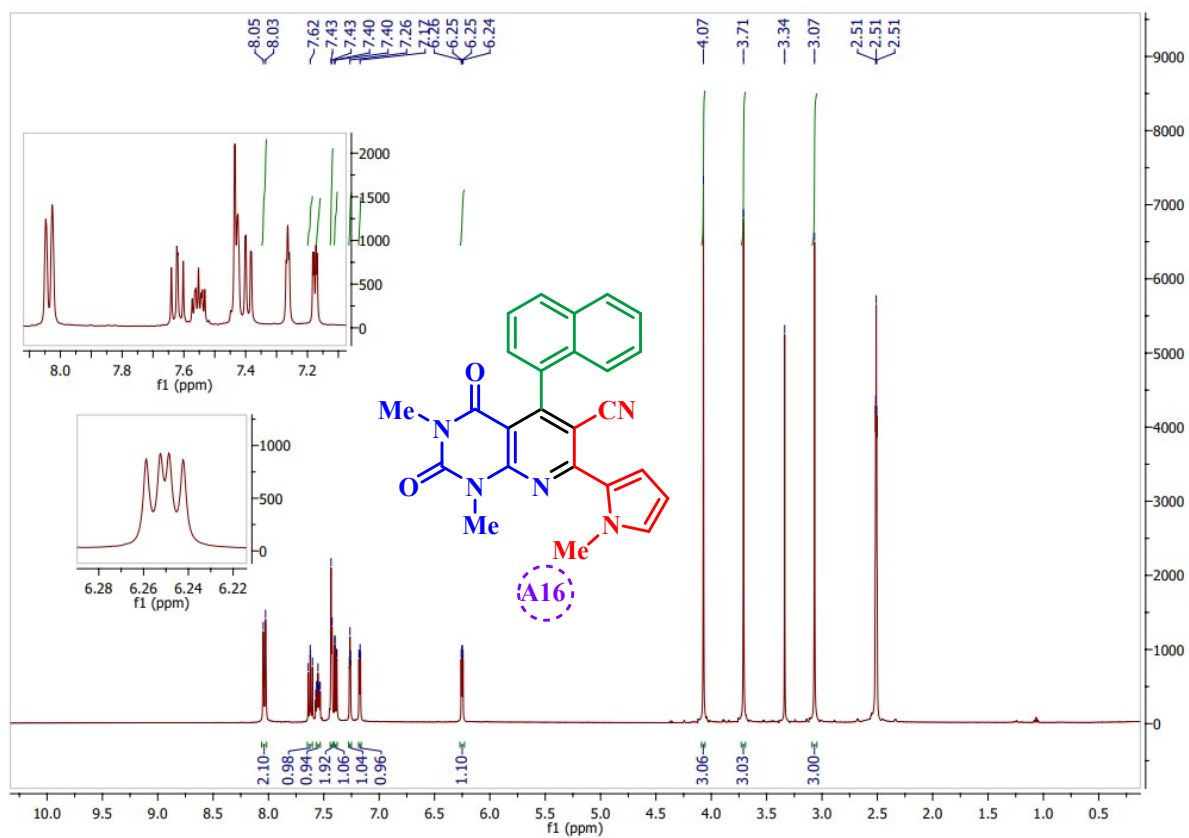
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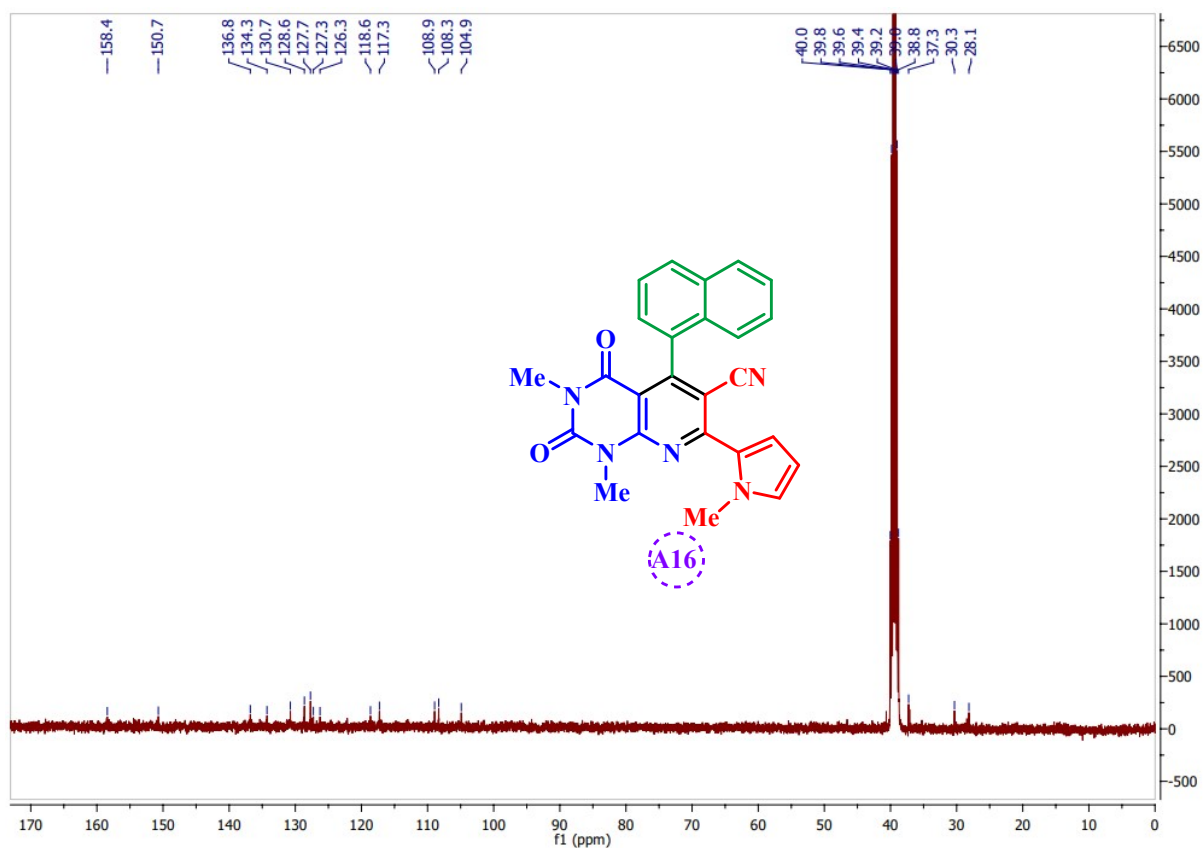
¹³C-NMR spectrum of 5-(3-ethoxy-4-hydroxyphenyl)-1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A15).



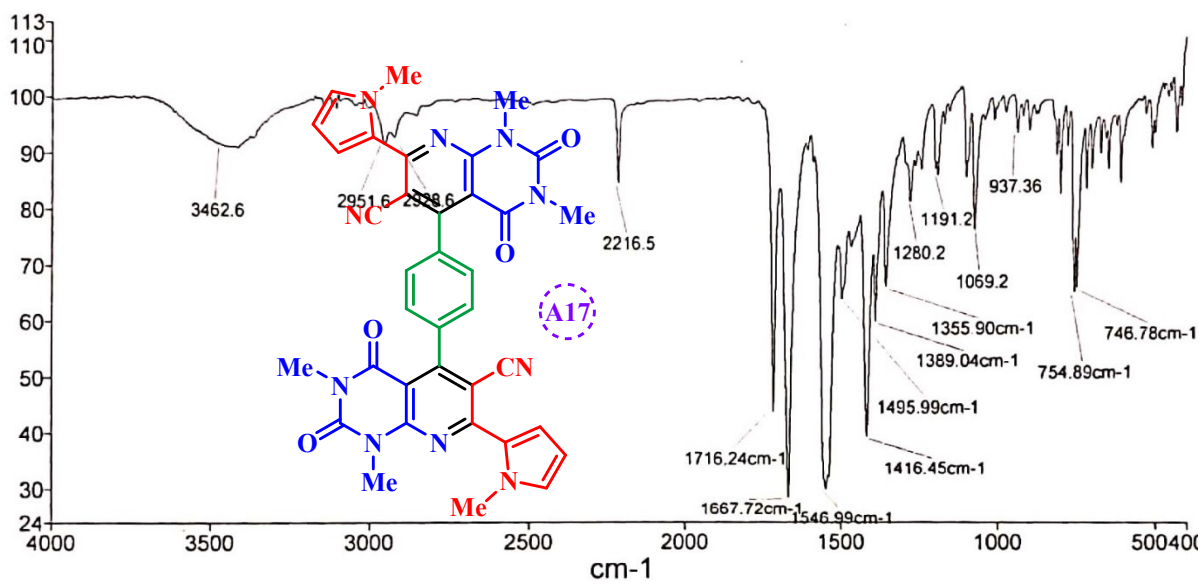
FT-IR spectrum of 1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-5-(naphthalen-1-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A16).



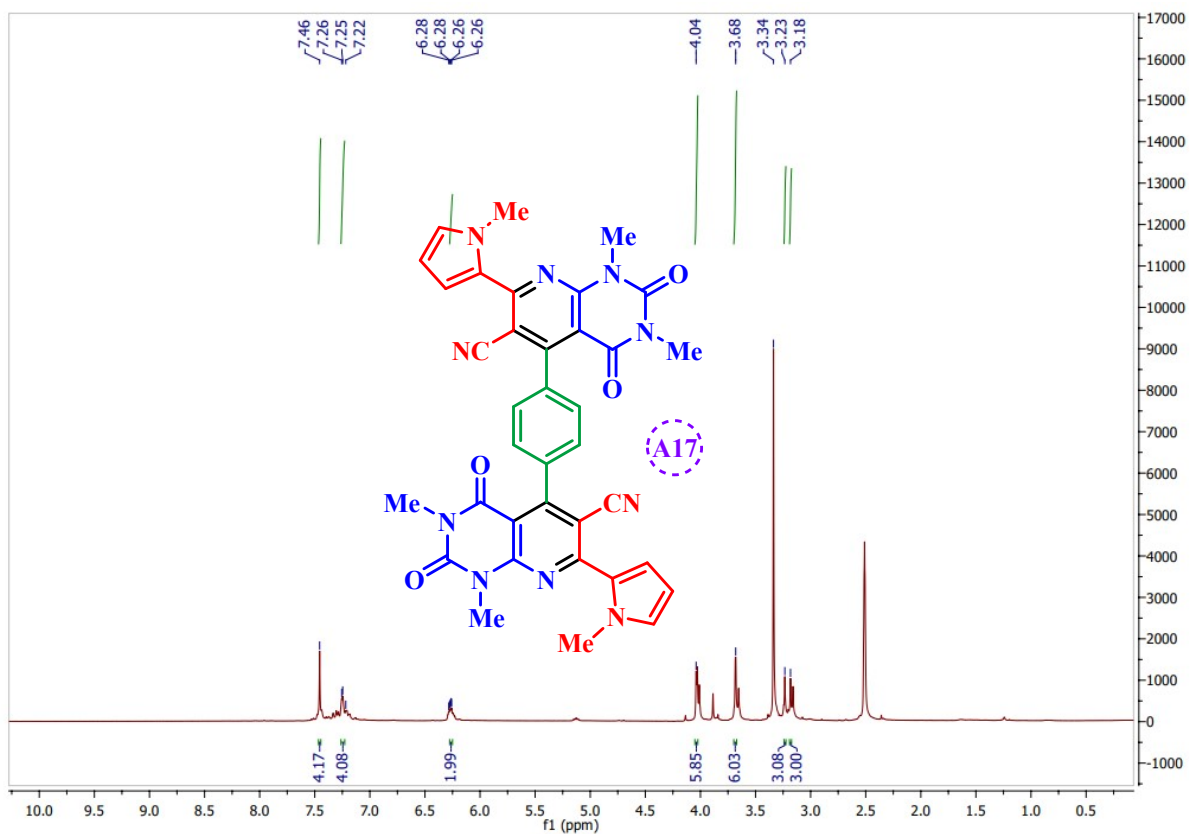
¹H-NMR spectrum of 1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-5-(naphthalen-1-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A16).



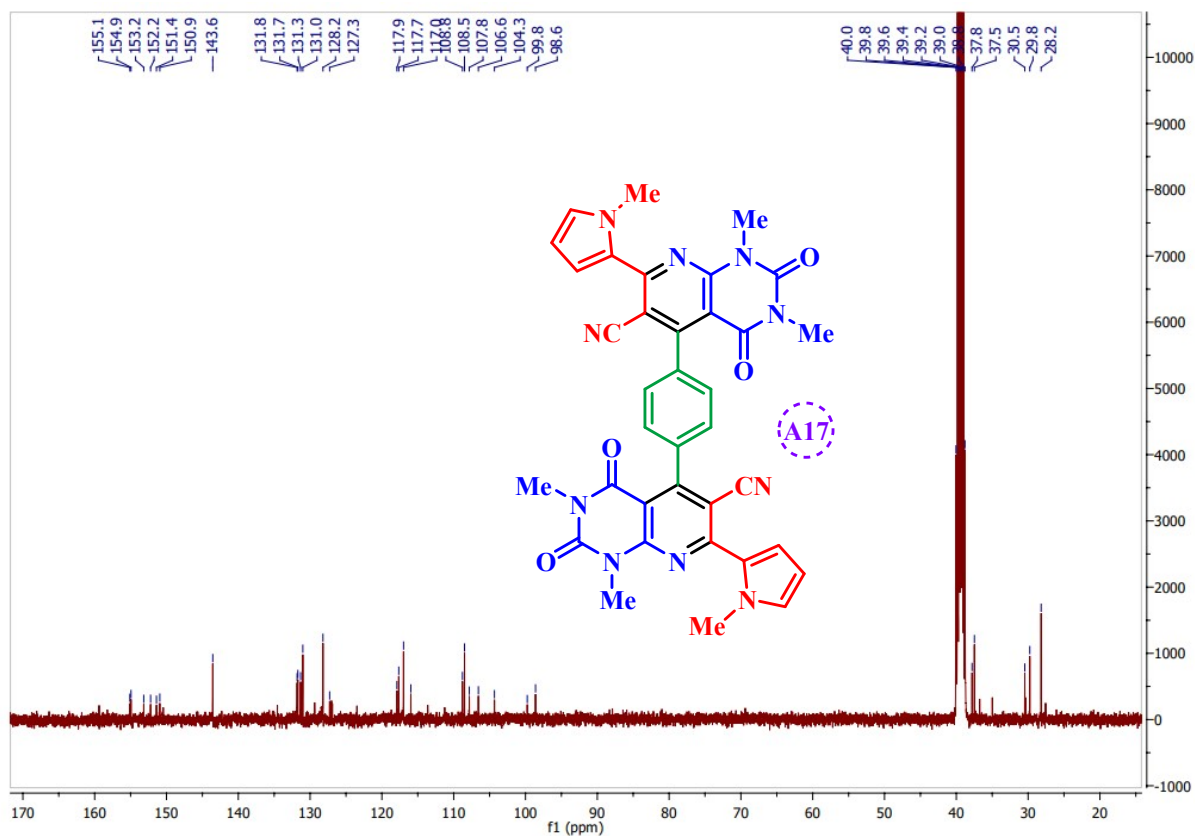
¹³C-NMR spectrum of 1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-5-(naphthalen-1-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile (A16).



FT-IR spectrum of 5,5'-(1,4-phenylene)bis(1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile) (A17).



$^1\text{H-NMR}$ spectrum of 5,5'-(1,4-phenylene)bis(1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile) (A17).



^{13}C -NMR spectrum of 5,5'-(1,4-phenylene)bis(1,3-dimethyl-7-(1-methyl-1H-pyrrol-2-yl)-2,4-dioxo-1,2,3,4-tetrahydropyrido[2,3-d]pyrimidine-6-carbonitrile) (A17).