

# Facile Synthesis of NH-Free 5-(Hetero)Aryl-Pyrrole-2-Carboxylates by Catalytic C–H Borylation and Suzuki Coupling

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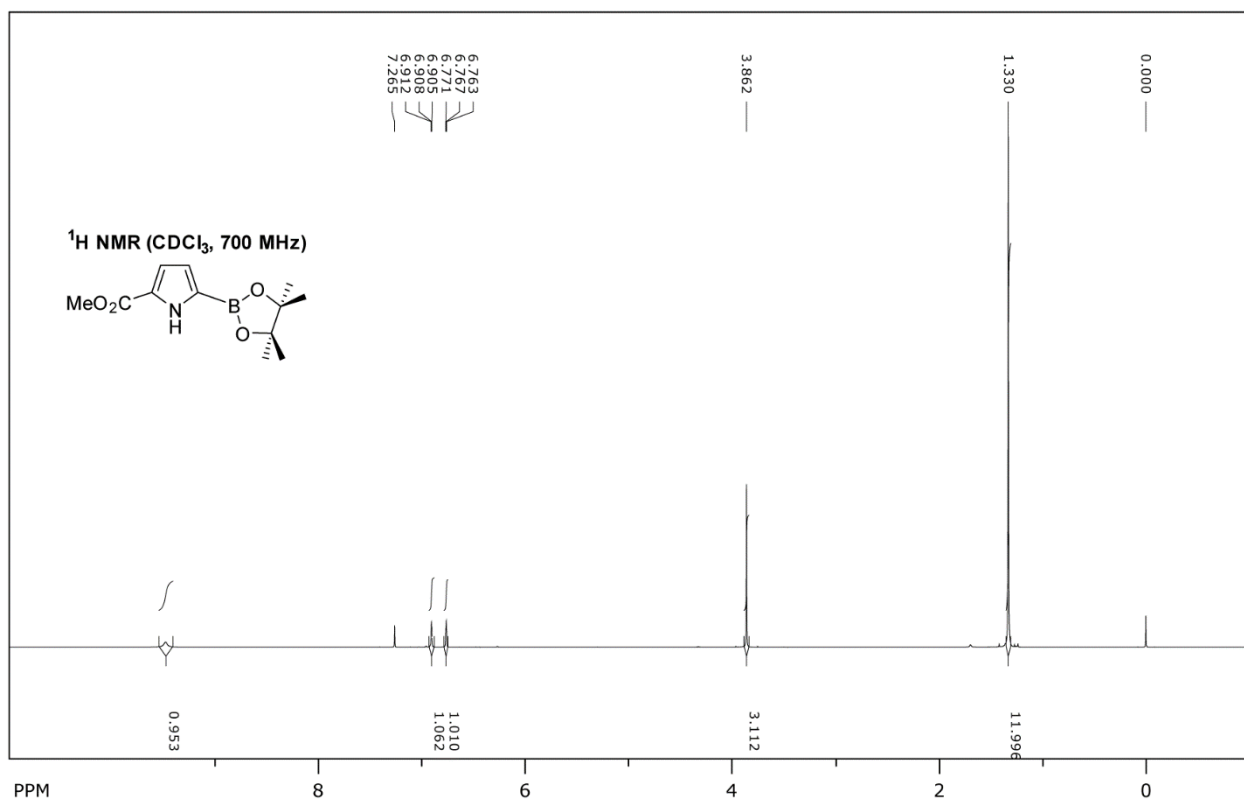
Email: ghayoor.abbas@lums.edu.pk

## Supporting Information

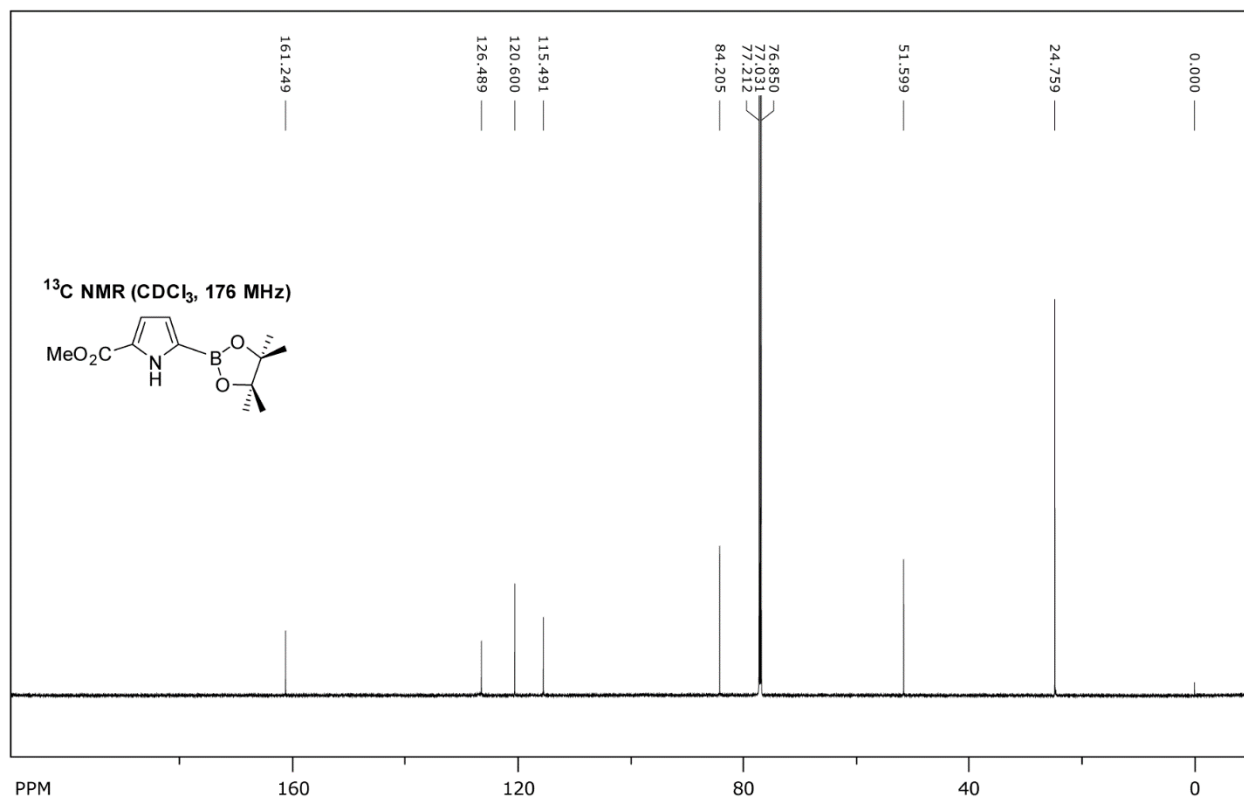
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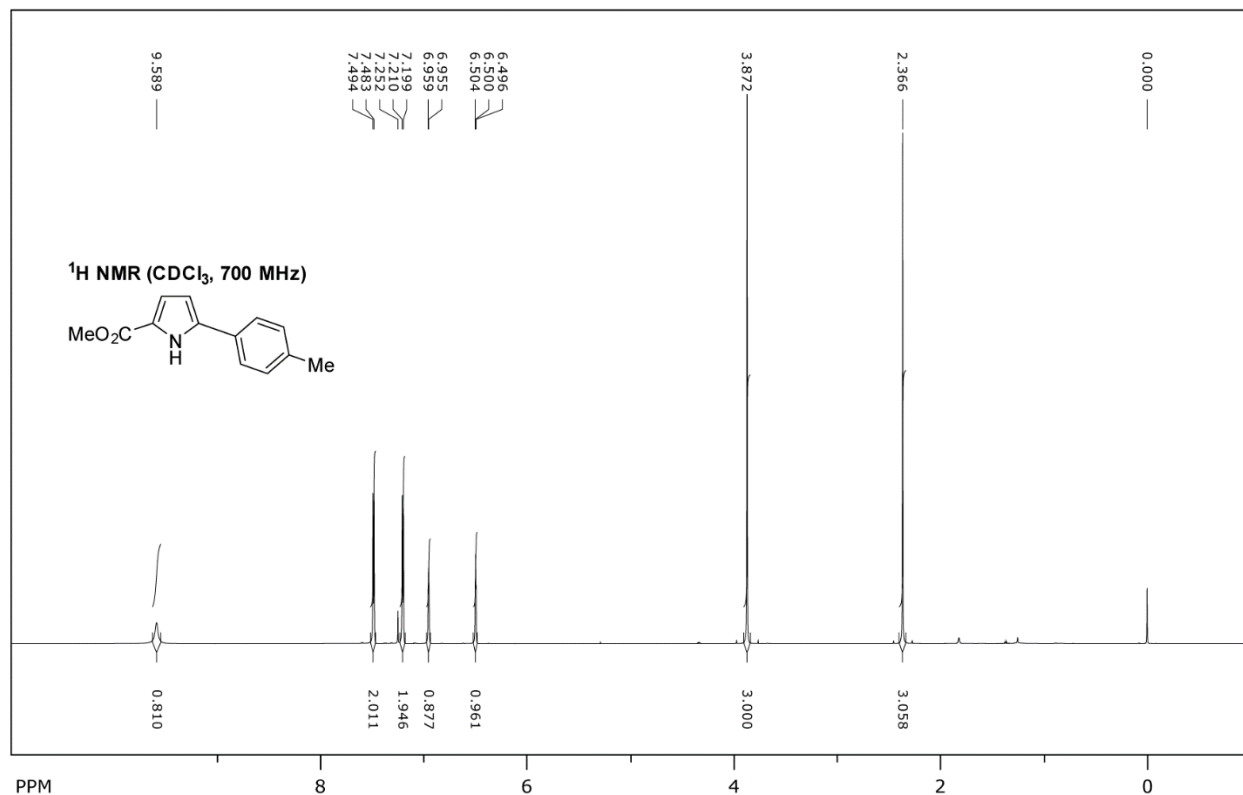
## <sup>1</sup>H & <sup>13</sup>C NMR Spectra



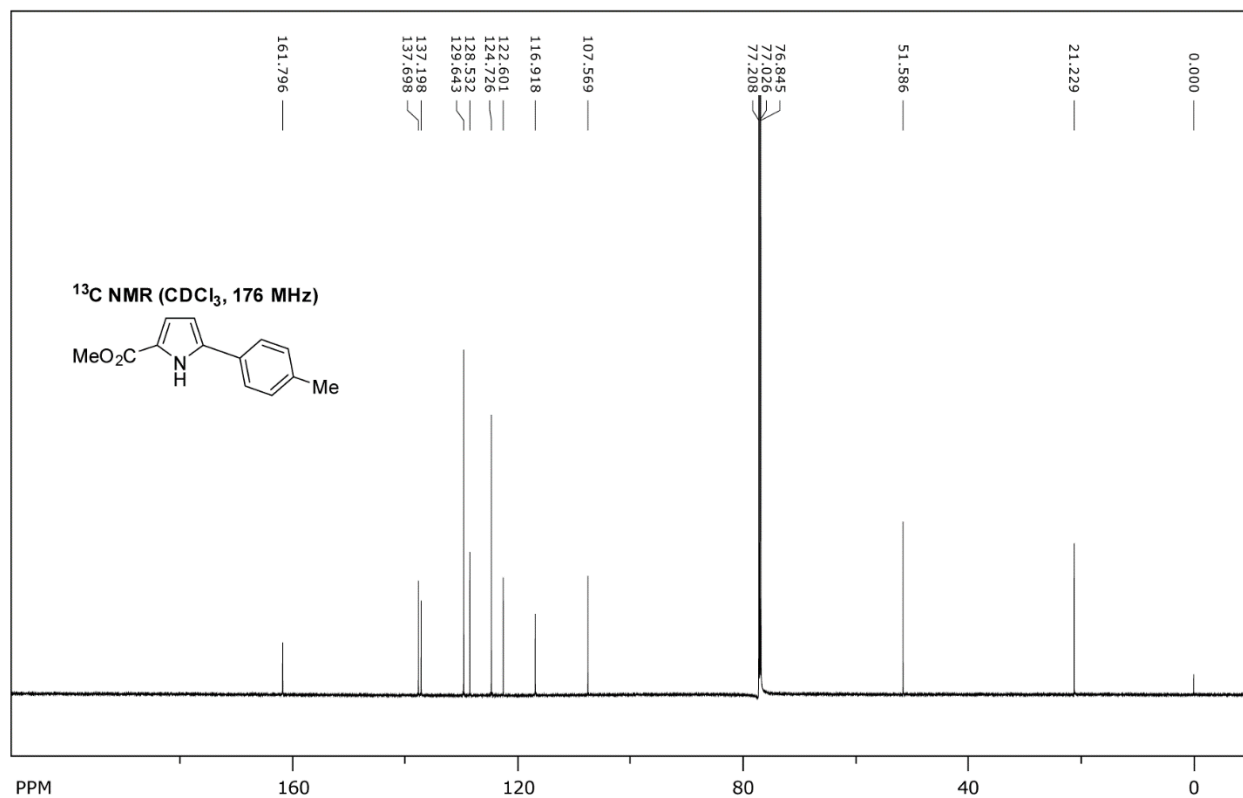
**Compound 1:** <sup>1</sup>H NMR spectrum of methyl 5-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-1H-pyrrole-2-carboxylate



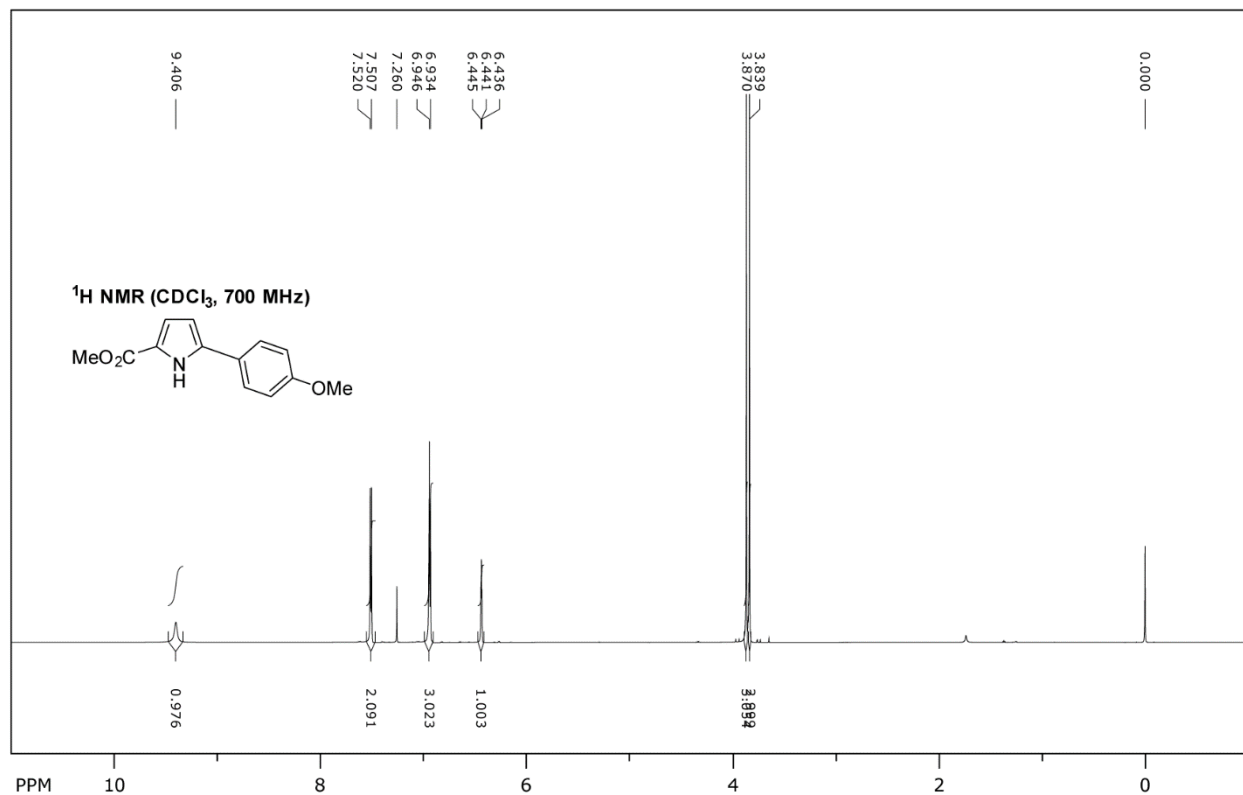
**Compound 1:** <sup>13</sup>C NMR spectrum of methyl 5-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-1H-pyrrole-2-carboxylate



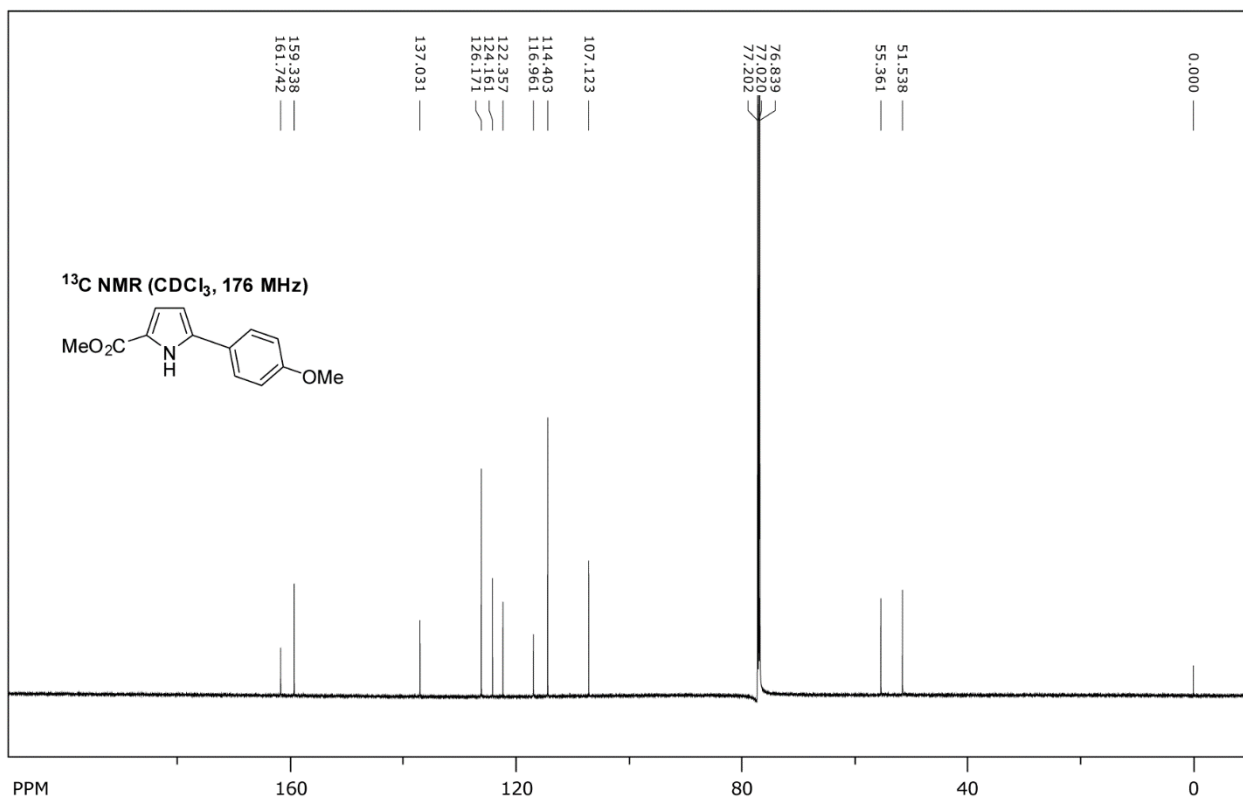
**Compound 2a: <sup>1</sup>H NMR spectrum of methyl 5-(p-tolyl)-1H-pyrrole-2-carboxylate**



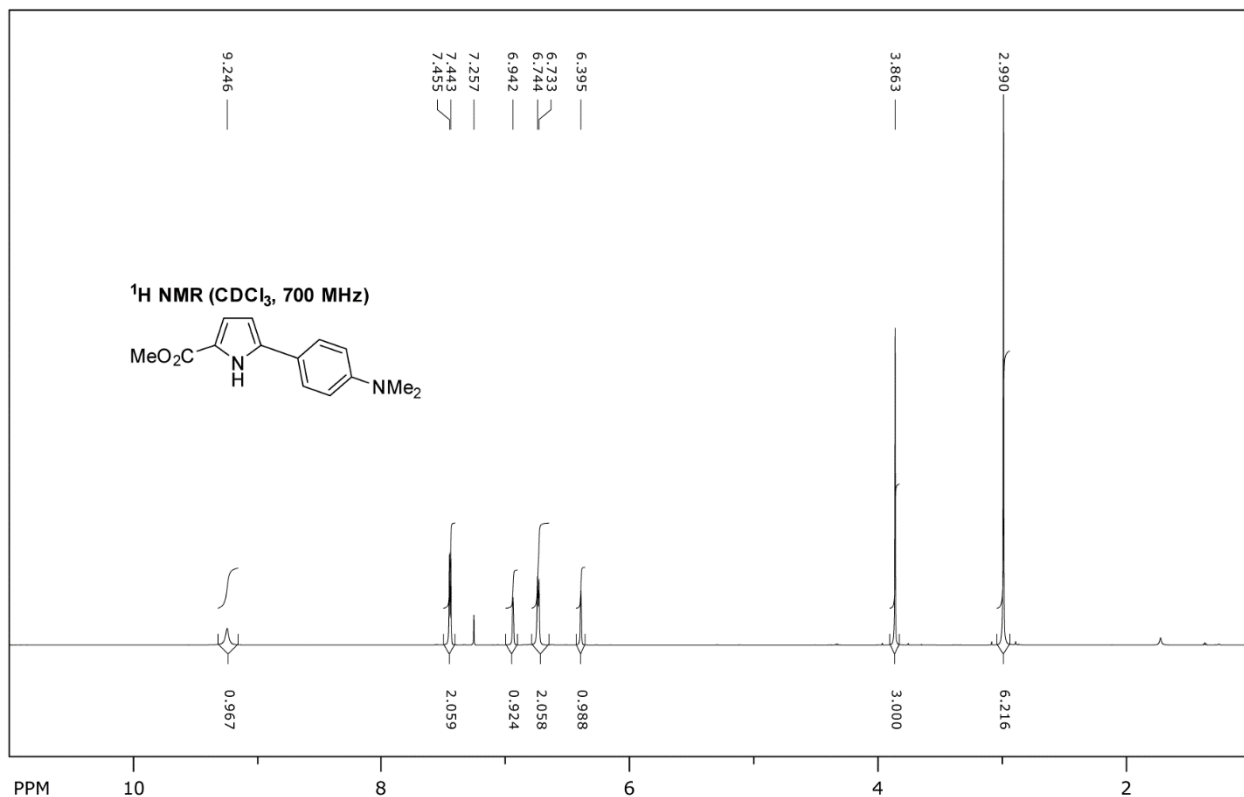
**Compound 2a: <sup>13</sup>C NMR spectrum of methyl 5-(p-tolyl)-1H-pyrrole-2-carboxylate**



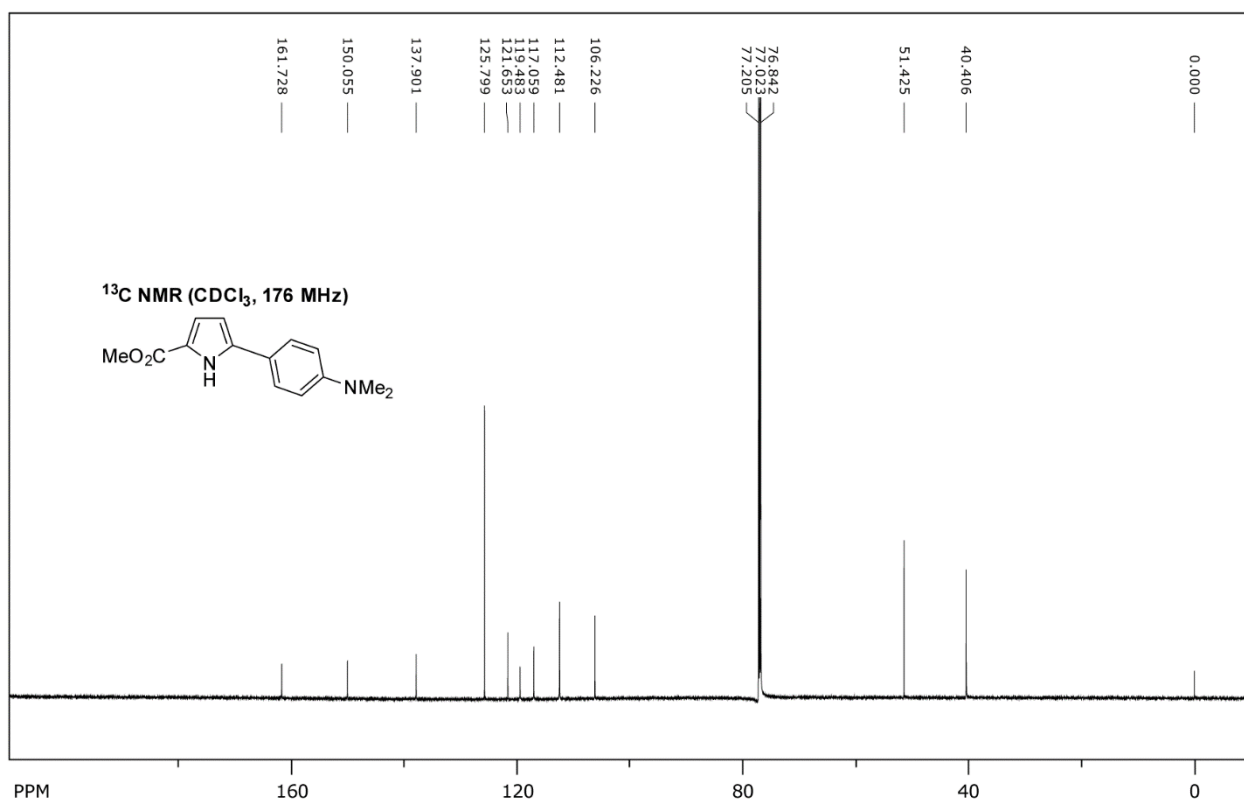
**Compound 2b: <sup>1</sup>H NMR spectrum of methyl 5-(4-methoxyphenyl)-1*H*-pyrrole-2-carboxylate**



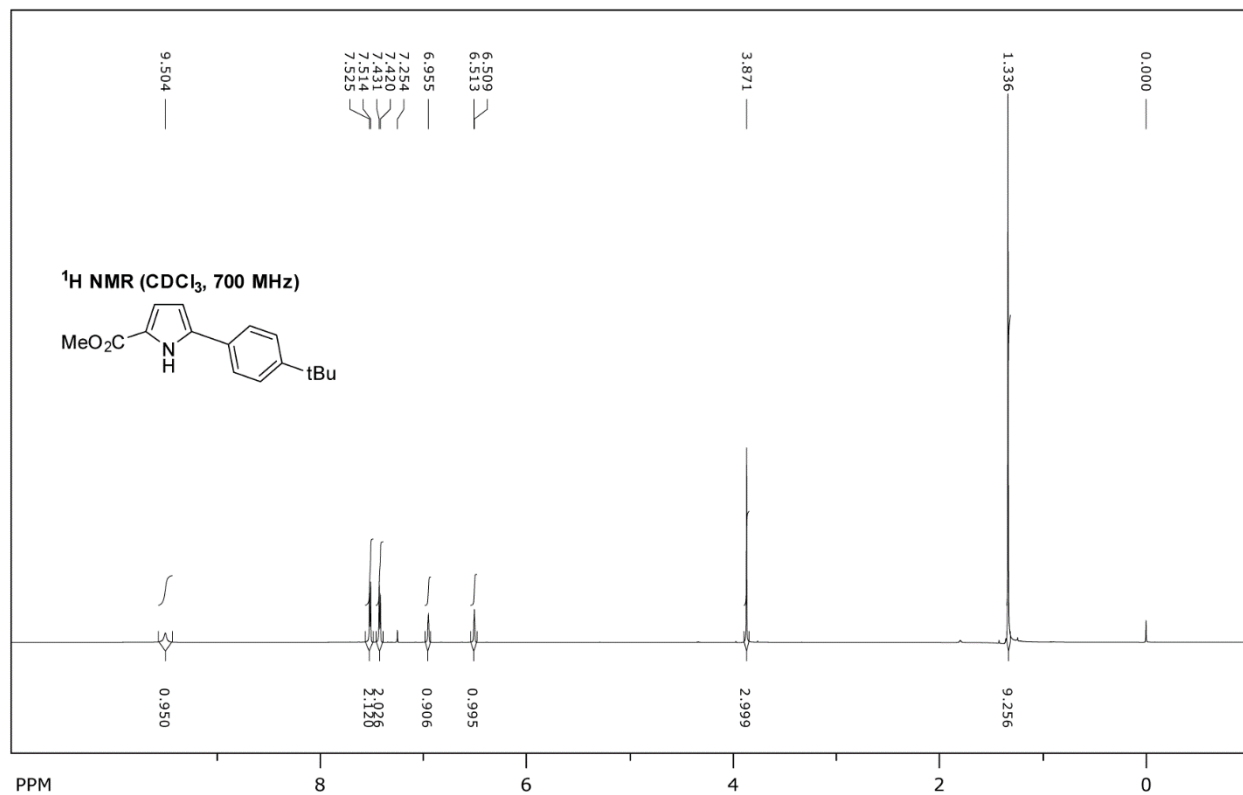
**Compound 2b: <sup>13</sup>C NMR spectrum of methyl 5-(4-methoxyphenyl)-1*H*-pyrrole-2-carboxylate**



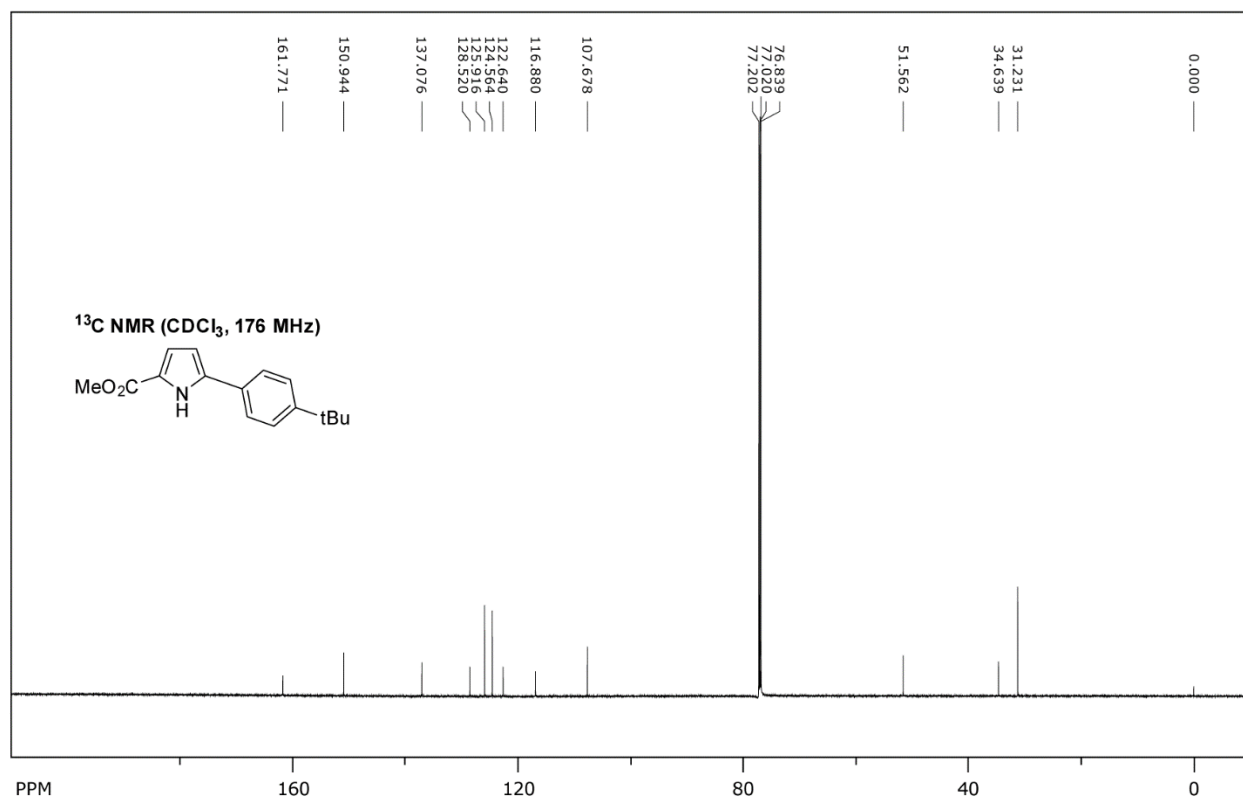
**Compound 2c: <sup>1</sup>H NMR spectrum of methyl 5-(4-(dimethylamino)phenyl)-1*H*-pyrrole-2-carboxylate**



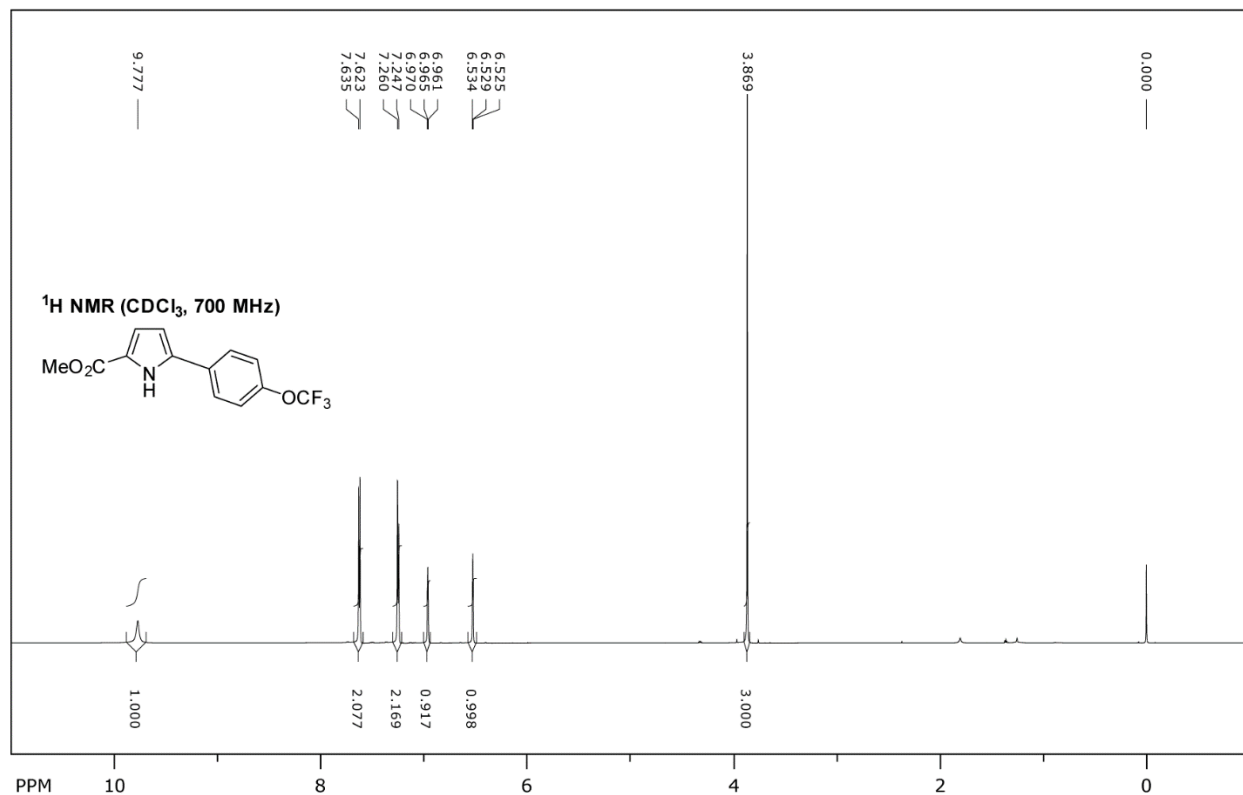
**Compound 2c: <sup>13</sup>C NMR spectrum of methyl 5-(4-(dimethylamino)phenyl)-1*H*-pyrrole-2-carboxylate**



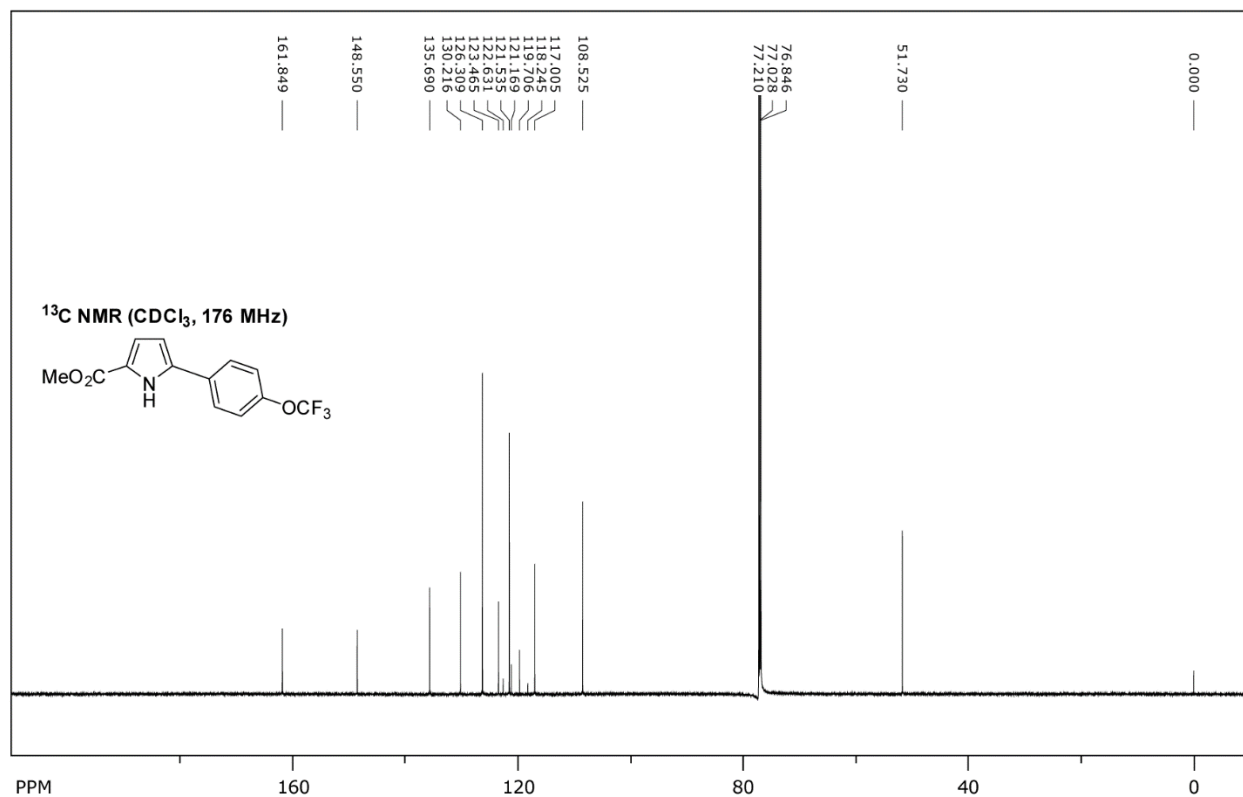
**Compound 2d: <sup>1</sup>H NMR spectrum of methyl 5-(4-(tert-butyl)phenyl)-1*H*-pyrrole-2-carboxylate**



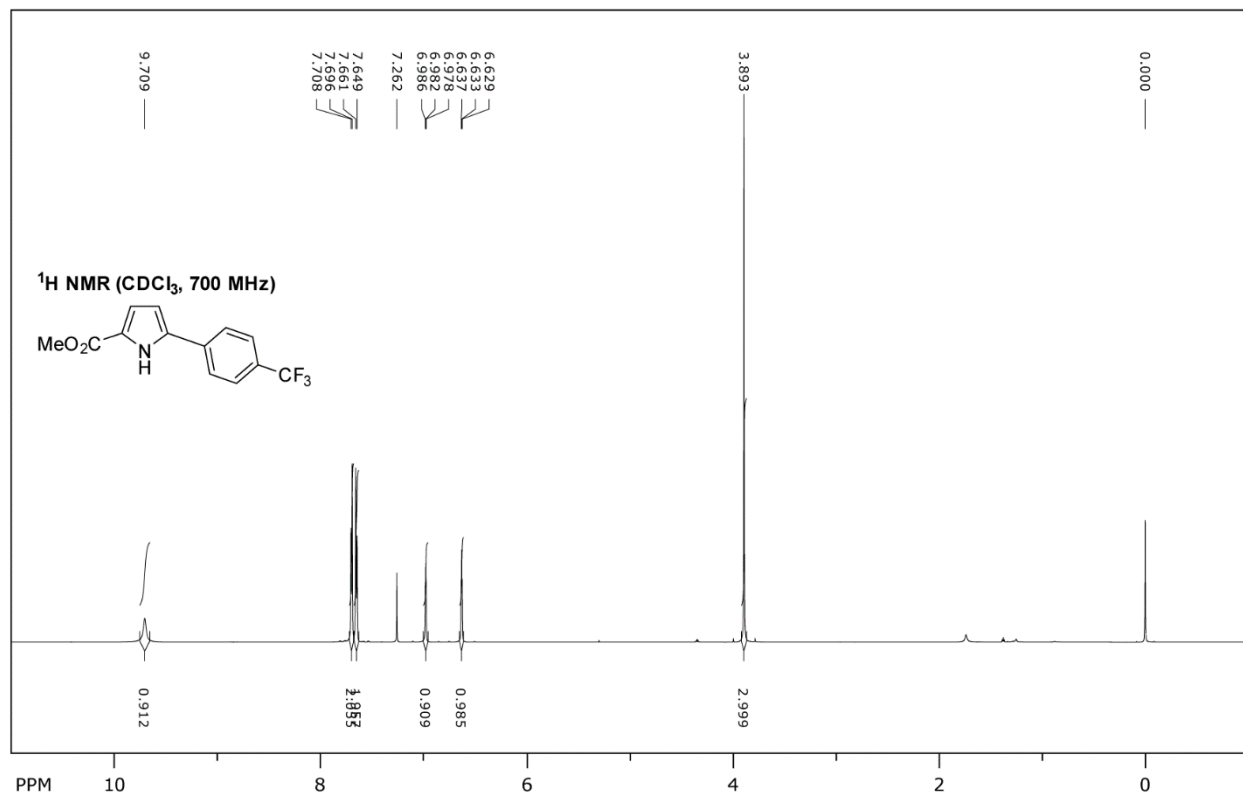
**Compound 2d: <sup>13</sup>C NMR spectrum of methyl 5-(4-(tert-butyl)phenyl)-1*H*-pyrrole-2-carboxylate**



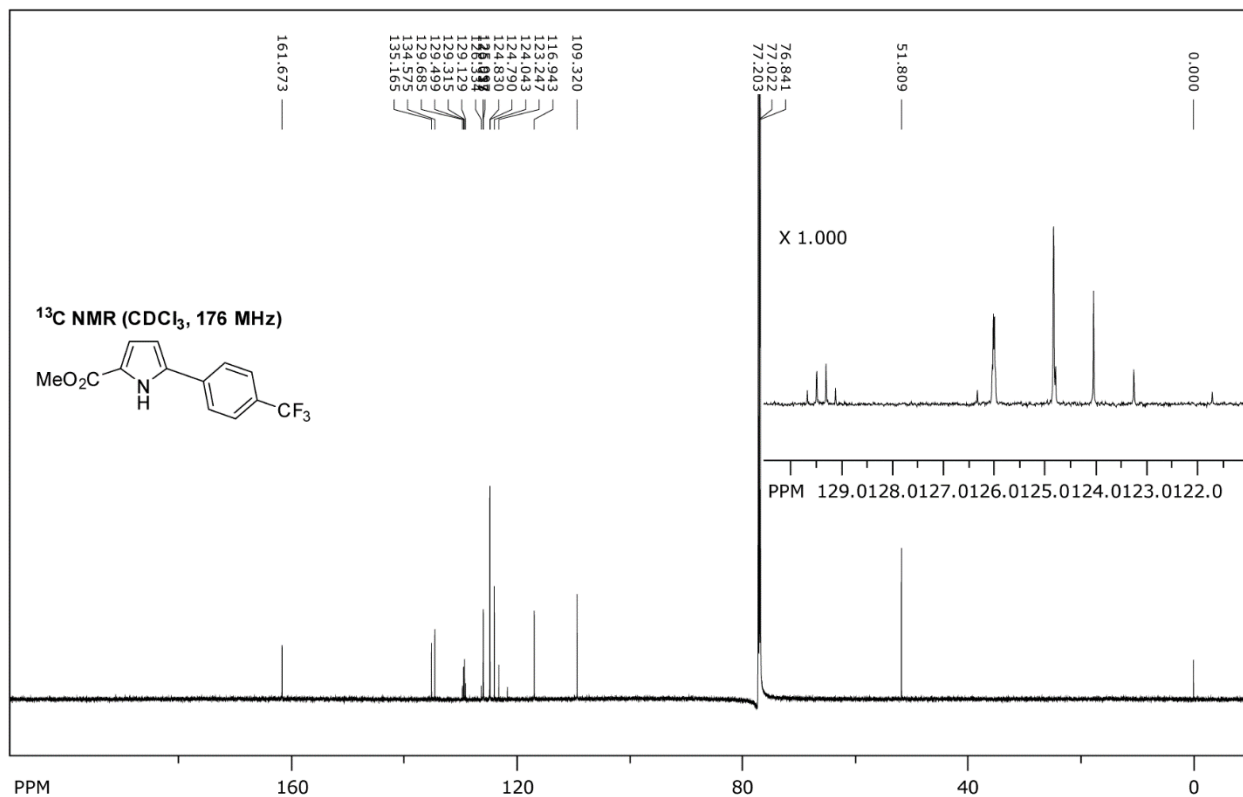
**Compound 2e: <sup>1</sup>H NMR spectrum of methyl 5-(4-(trifluoromethoxy)phenyl)-1*H*-pyrrole-2-carboxylate**



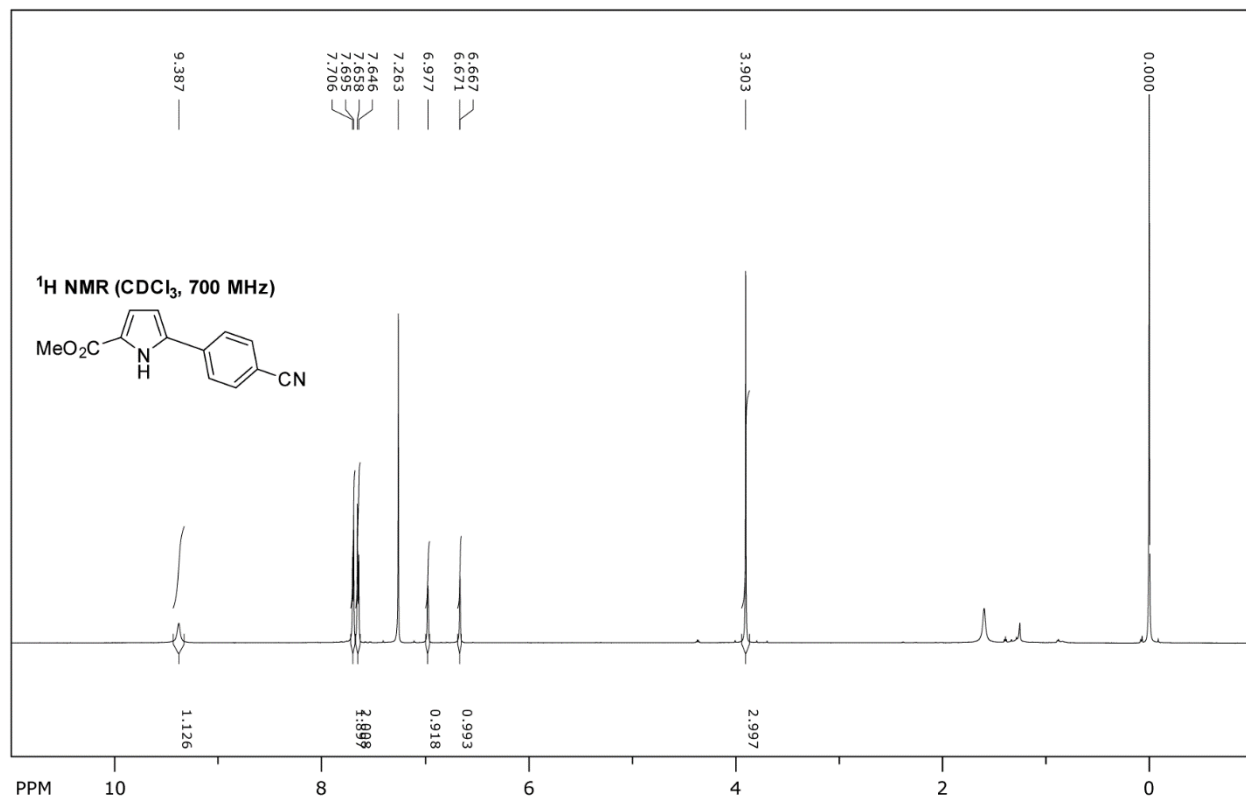
**Compound 2e: <sup>13</sup>C NMR spectrum of methyl 5-(4-(trifluoromethoxy)phenyl)-1*H*-pyrrole-2-carboxylate**



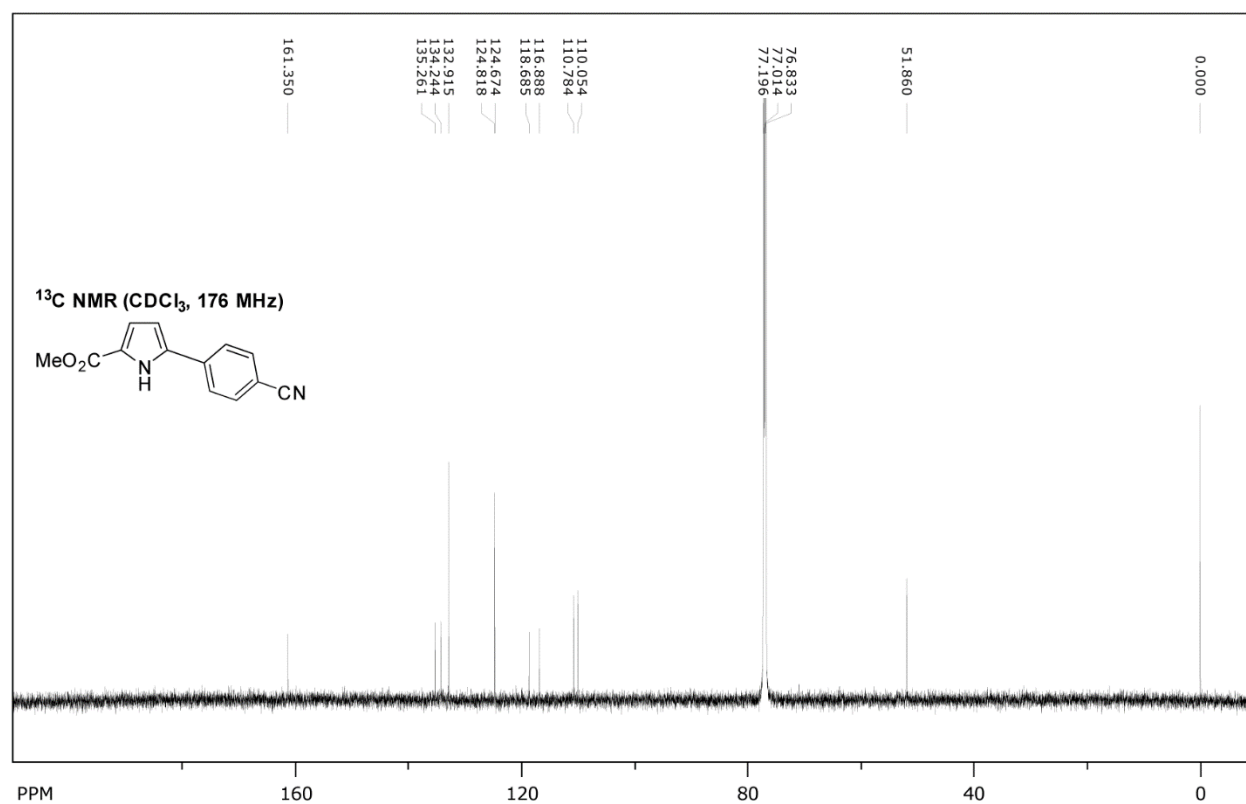
**Compound 2f: <sup>1</sup>H NMR spectrum of methyl 5-(4-(trifluoromethyl)phenyl)-1H-pyrrole-2-carboxylate**



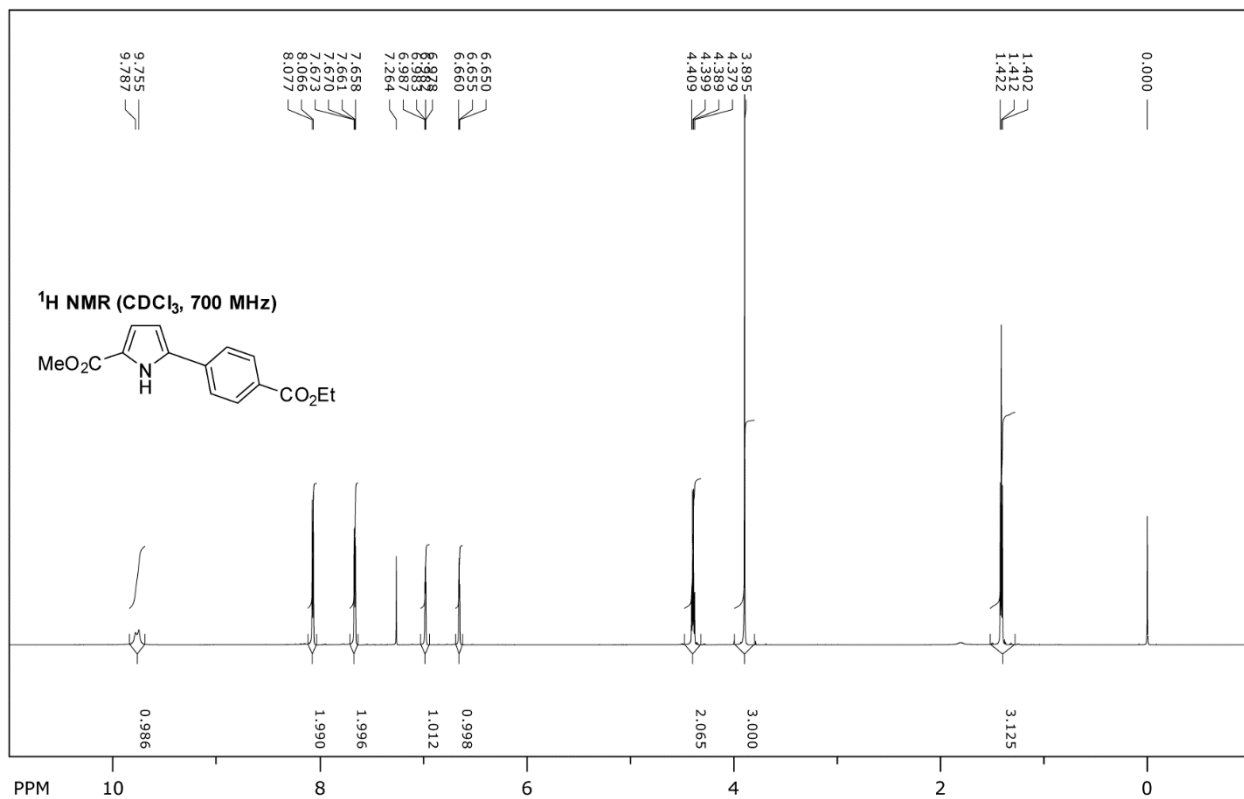
**Compound 2f: <sup>13</sup>C NMR spectrum of methyl 5-(4-(trifluoromethyl)phenyl)-1H-pyrrole-2-carboxylate**



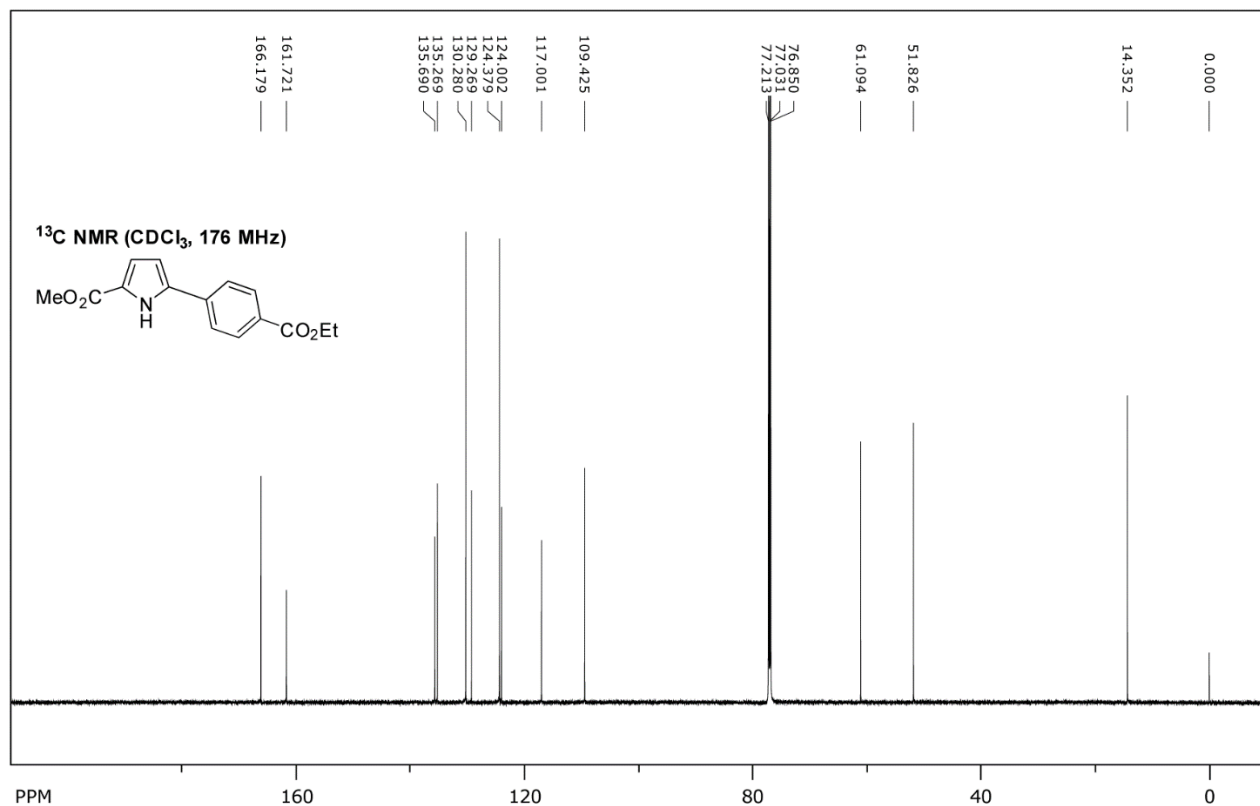
**Compound 2g: <sup>1</sup>H NMR spectrum of methyl 5-(4-cyanophenyl)-1H-pyrrole-2-carboxylate**



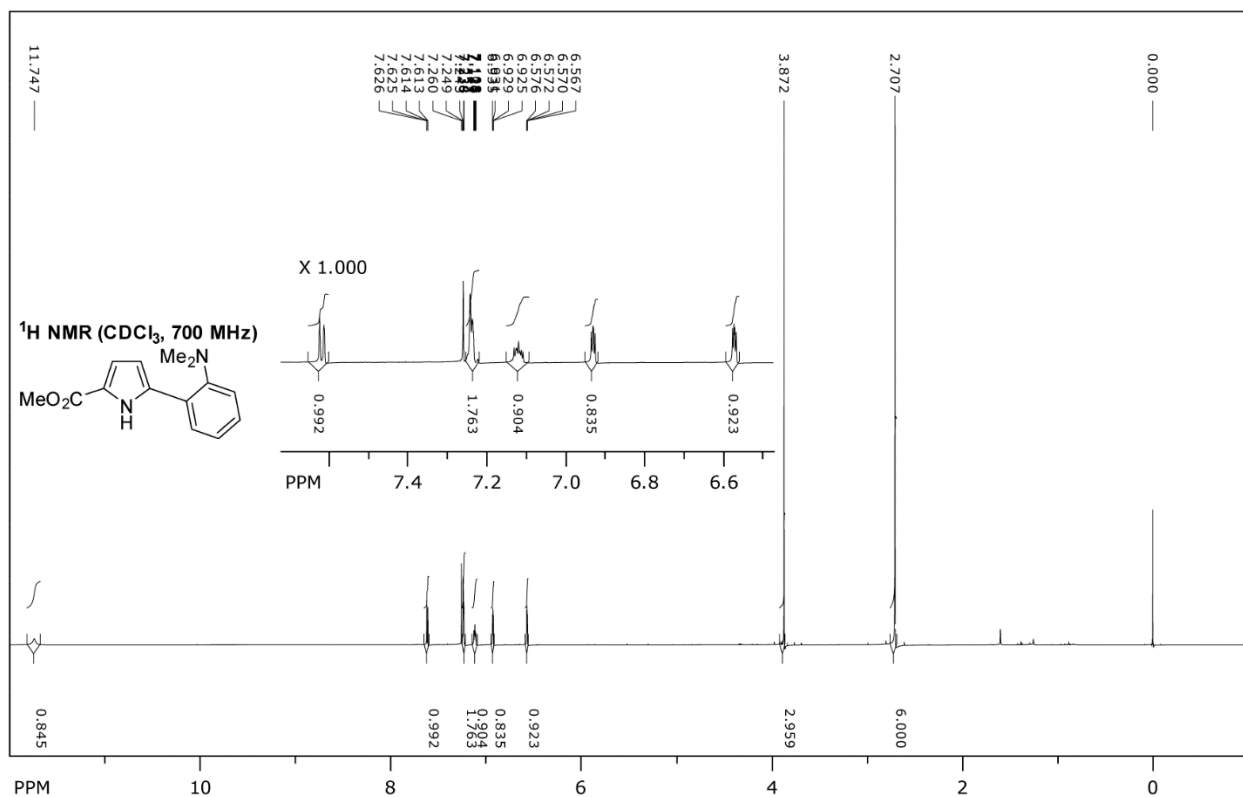
**Compound 2g: <sup>13</sup>C NMR spectrum of methyl 5-(4-cyanophenyl)-1H-pyrrole-2-carboxylate**



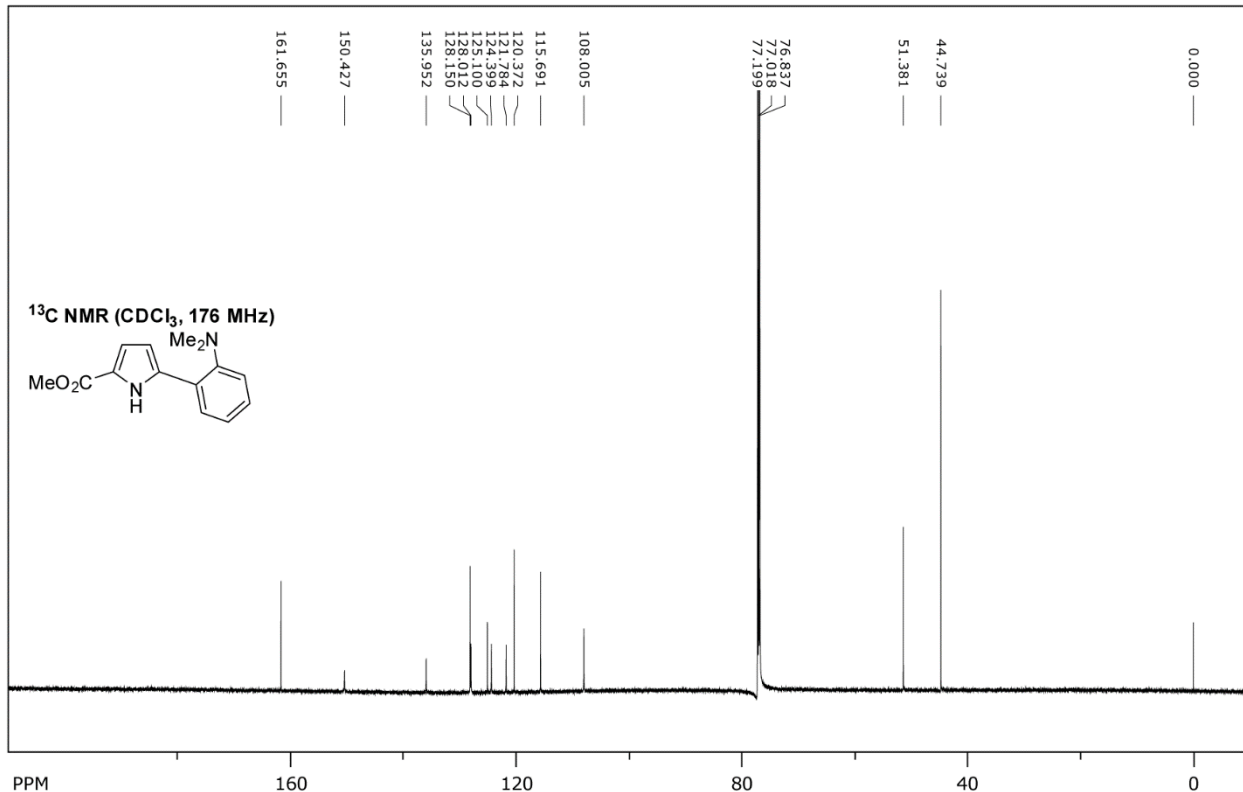
**Compound 2h: <sup>1</sup>H NMR spectrum of methyl 5-(4-(ethoxycarbonyl)phenyl)-1H-pyrrole-2-carboxylate**



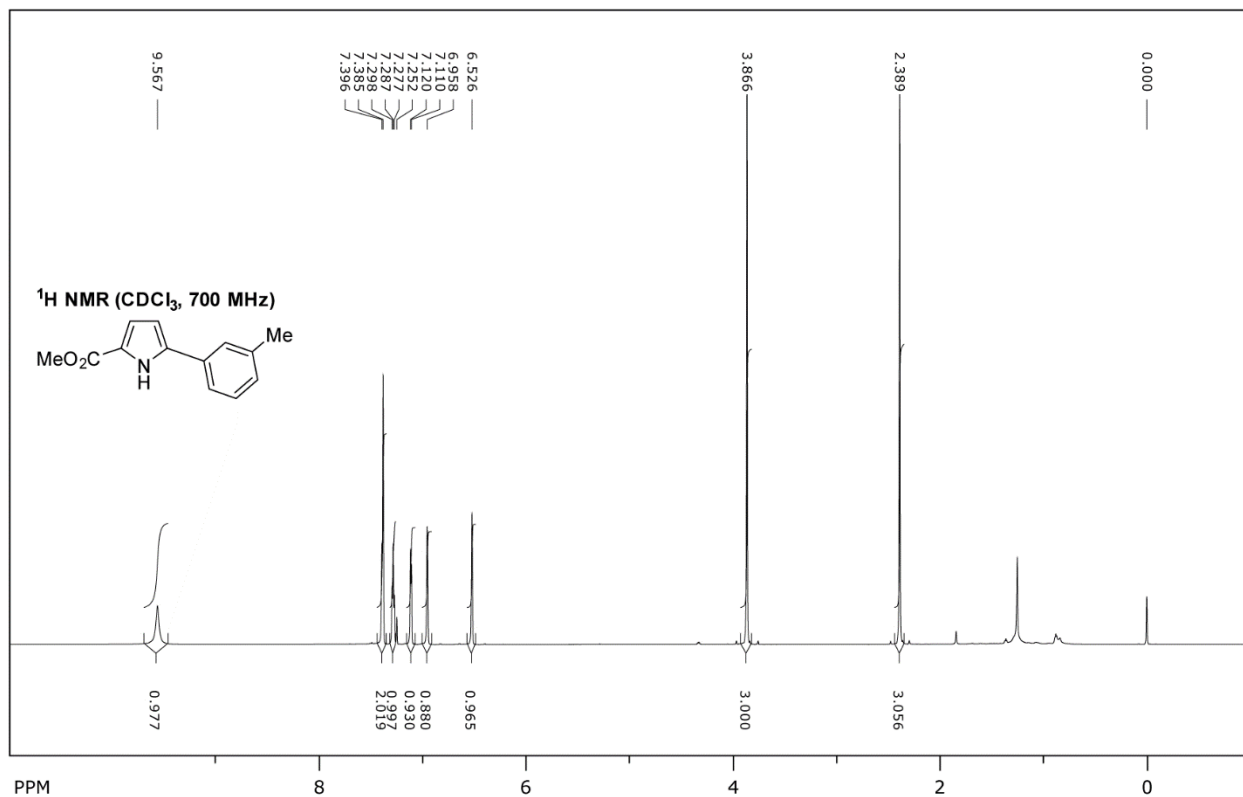
**Compound 2h: <sup>13</sup>C NMR spectrum of methyl 5-(4-(ethoxycarbonyl)phenyl)-1H-pyrrole-2-carboxylate**



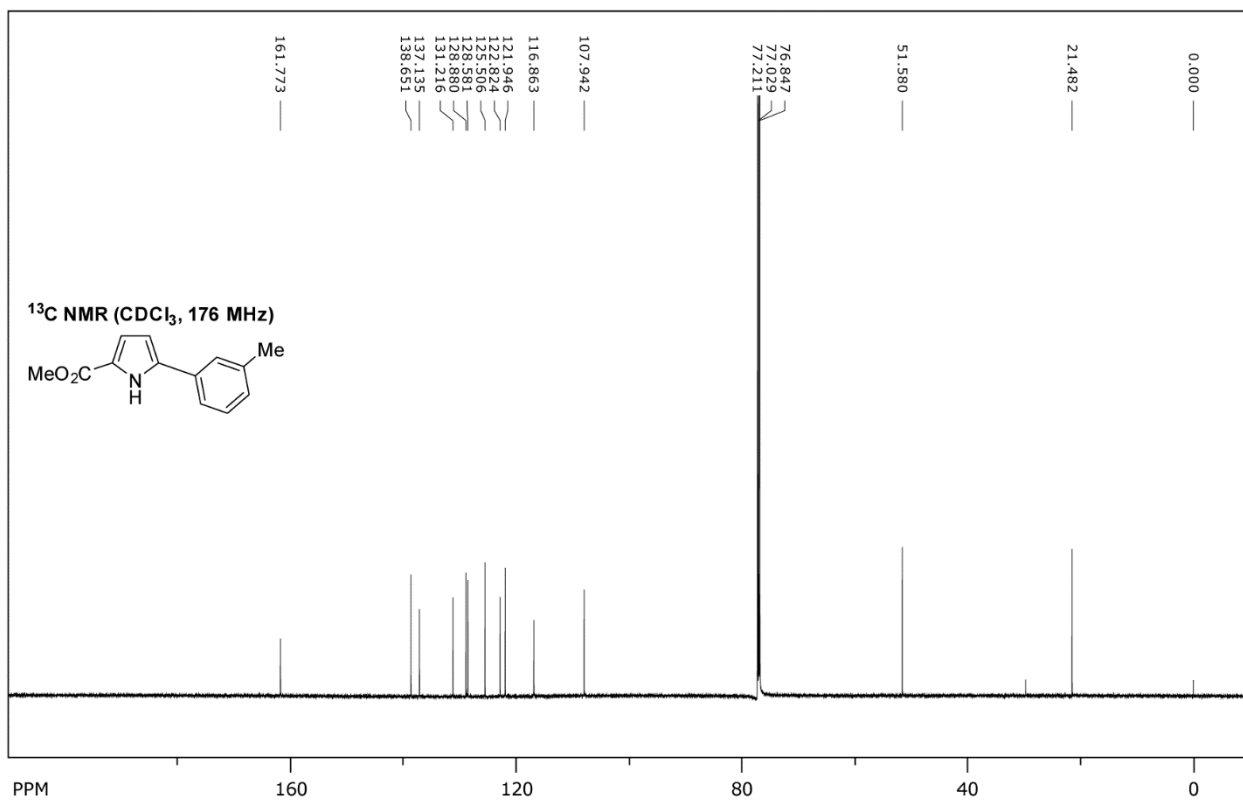
**Compound 2i: <sup>1</sup>H NMR spectrum of methyl 5-(2-(dimethylamino)phenyl)-1*H*-pyrrole-2-carboxylate**



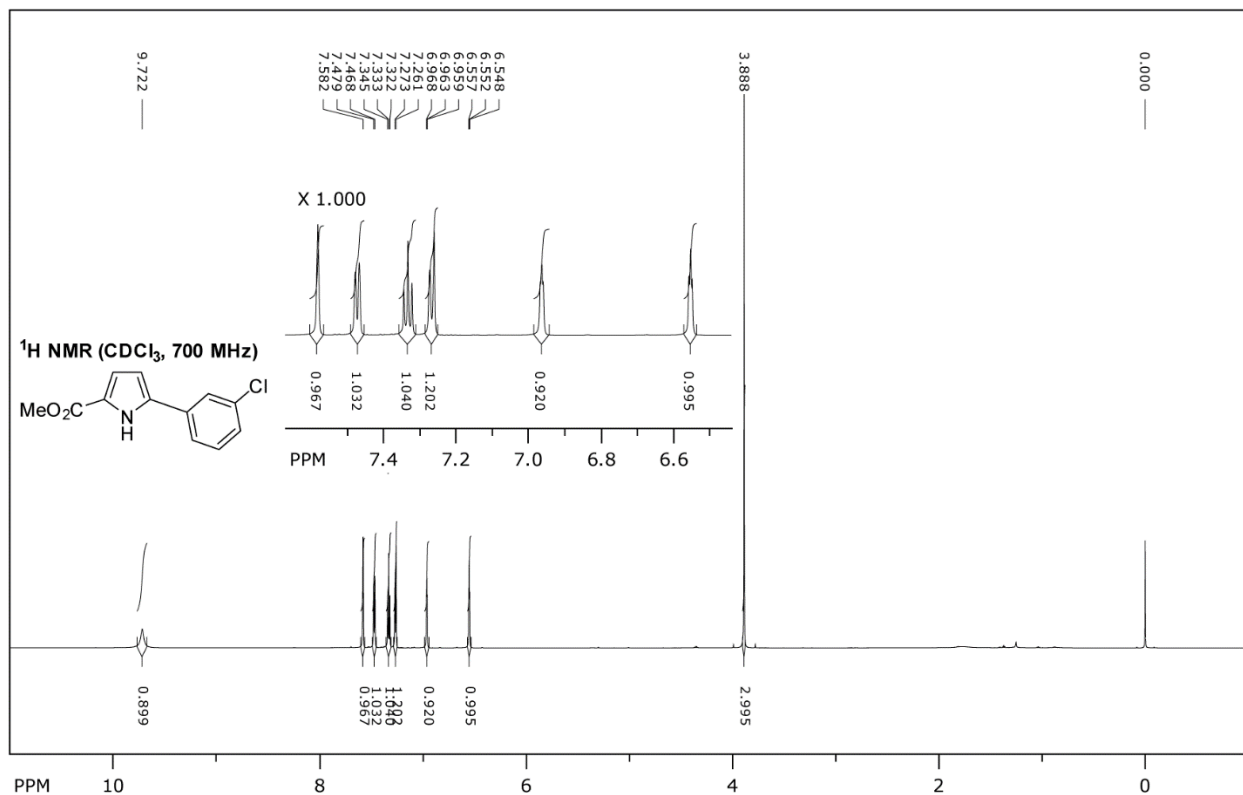
**Compound 2i:  $^{13}\text{C}$  NMR spectrum of methyl 5-(2-(dimethylamino)phenyl)-1*H*-pyrrole-2-carboxylate**



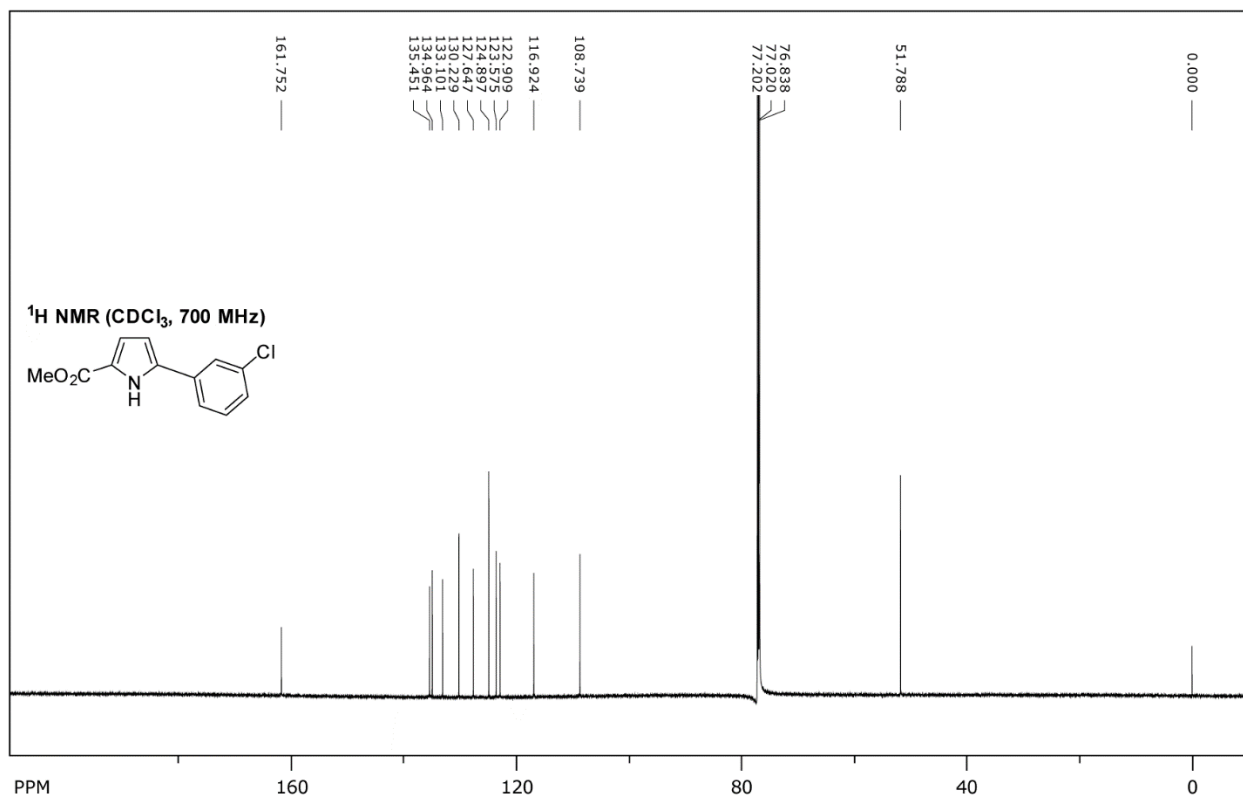
**Compound 2j: <sup>1</sup>H NMR spectrum of methyl 5-(m-tolyl)-1H-pyrrole-2-carboxylate**



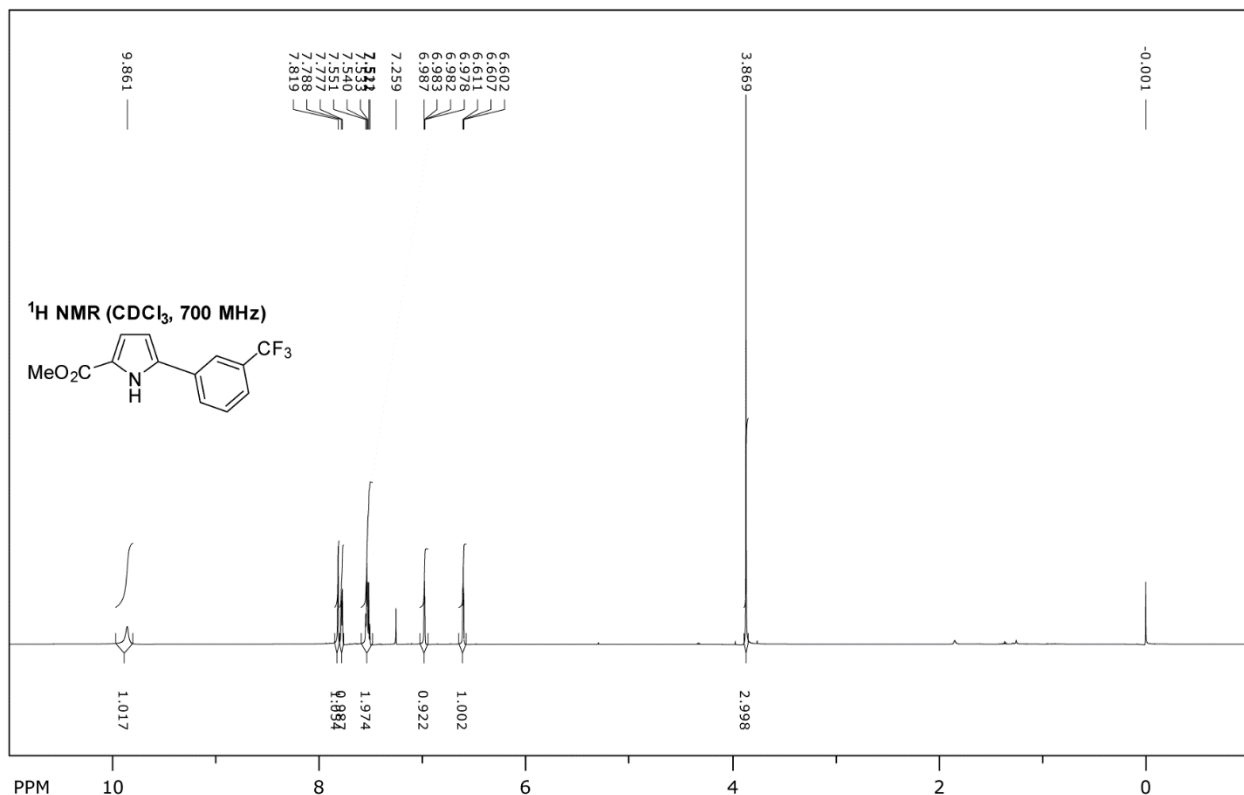
**Compound 2j: <sup>13</sup>C NMR spectrum of methyl 5-(m-tolyl)-1H-pyrrole-2-carboxylate**



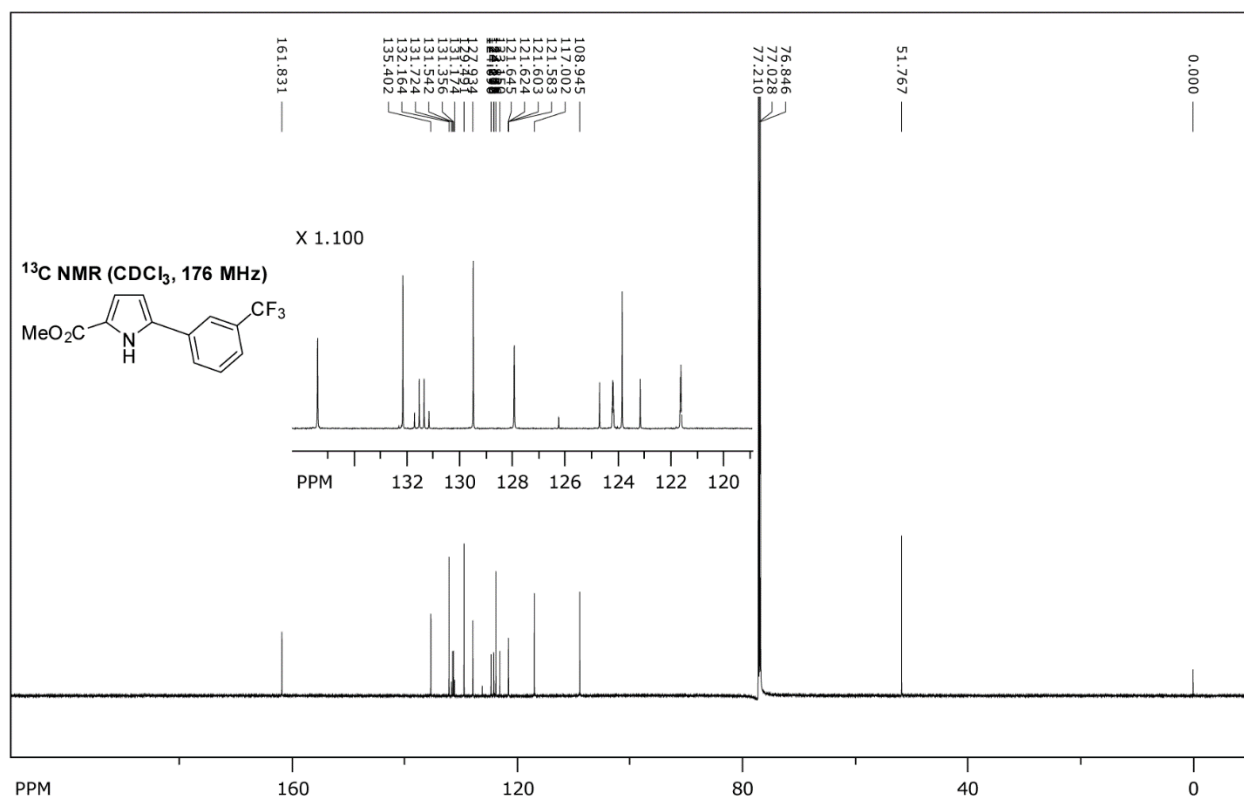
Compound 2k: <sup>1</sup>H NMR spectrum of methyl 5-(3-chlorophenyl)-1*H*-pyrrole-2-carboxylate



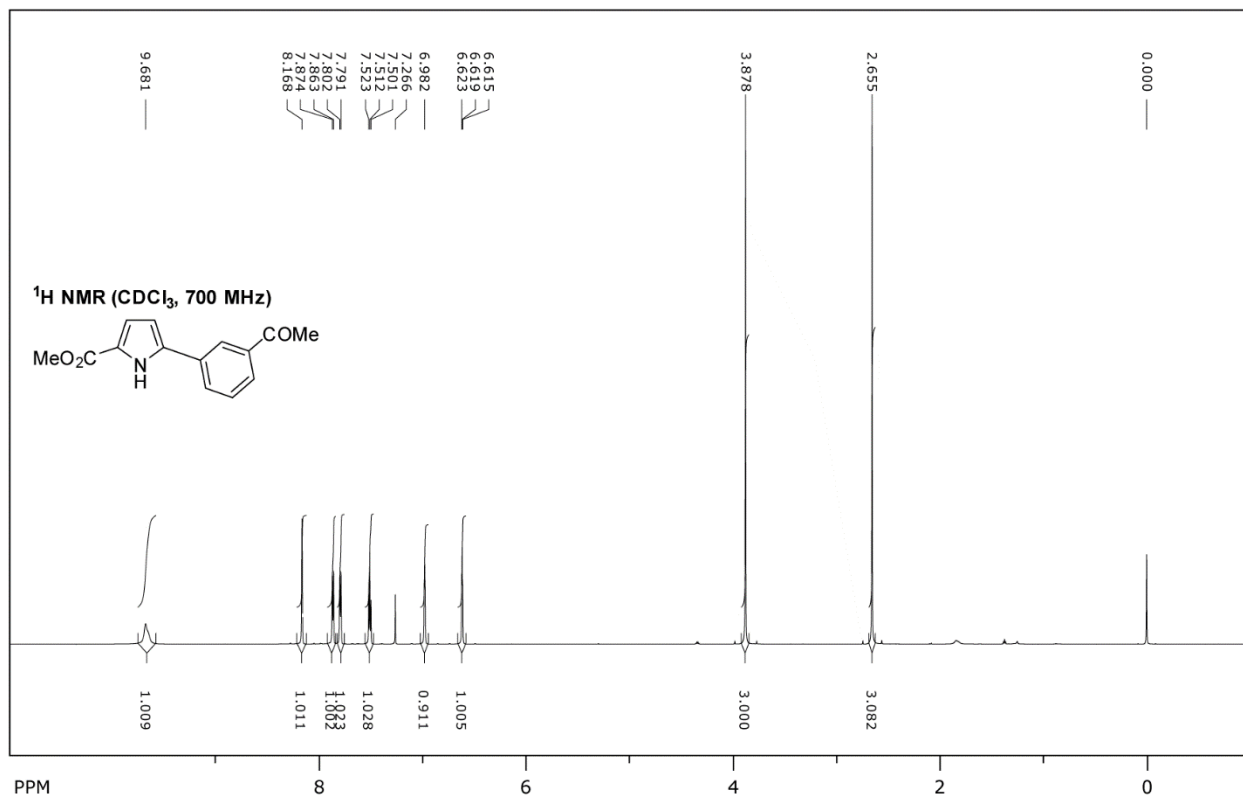
Compound 2k: <sup>13</sup>C NMR spectrum of methyl 5-(3-chlorophenyl)-1*H*-pyrrole-2-carboxylate



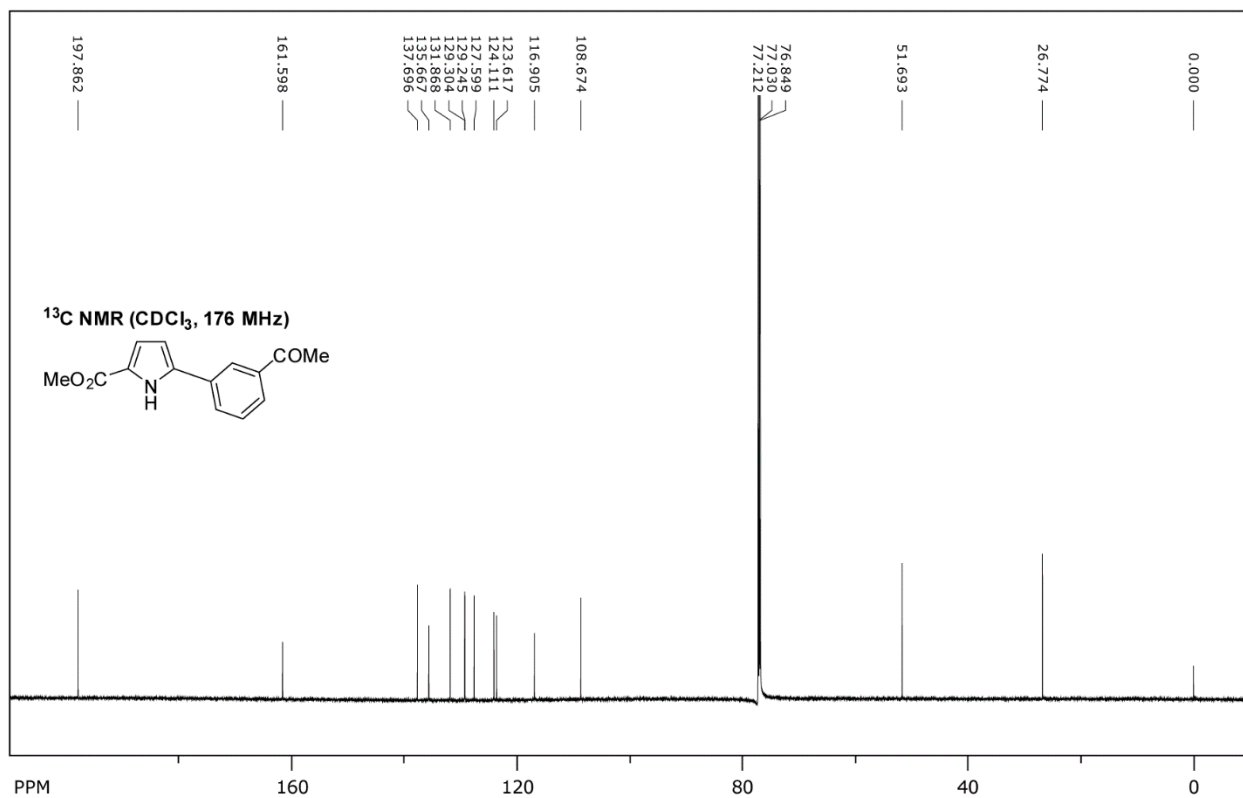
**Compound 2l: <sup>1</sup>H NMR spectrum of methyl 5-(3-(trifluoromethyl)phenyl)-1*H*-pyrrole-2-carboxylate**



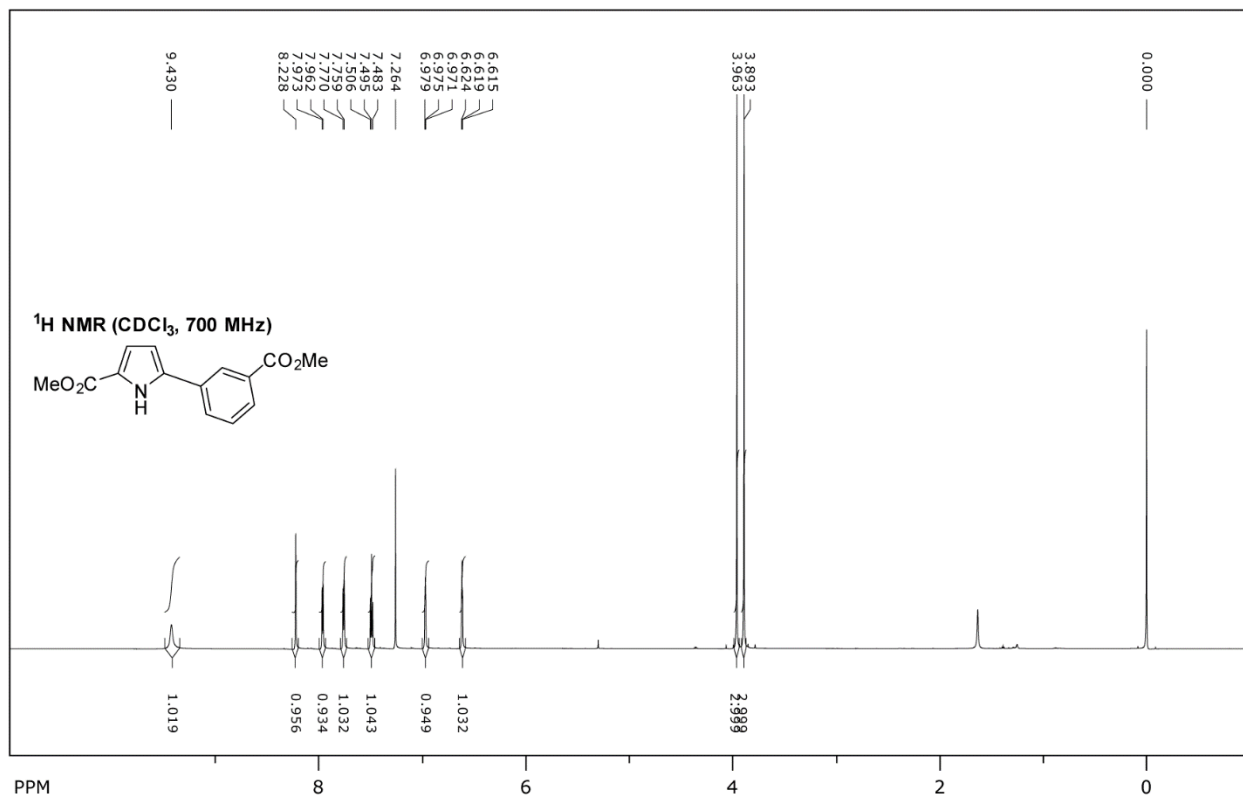
**Compound 2l: <sup>13</sup>C NMR spectrum of methyl 5-(3-(trifluoromethyl)phenyl)-1*H*-pyrrole-2-carboxylate**



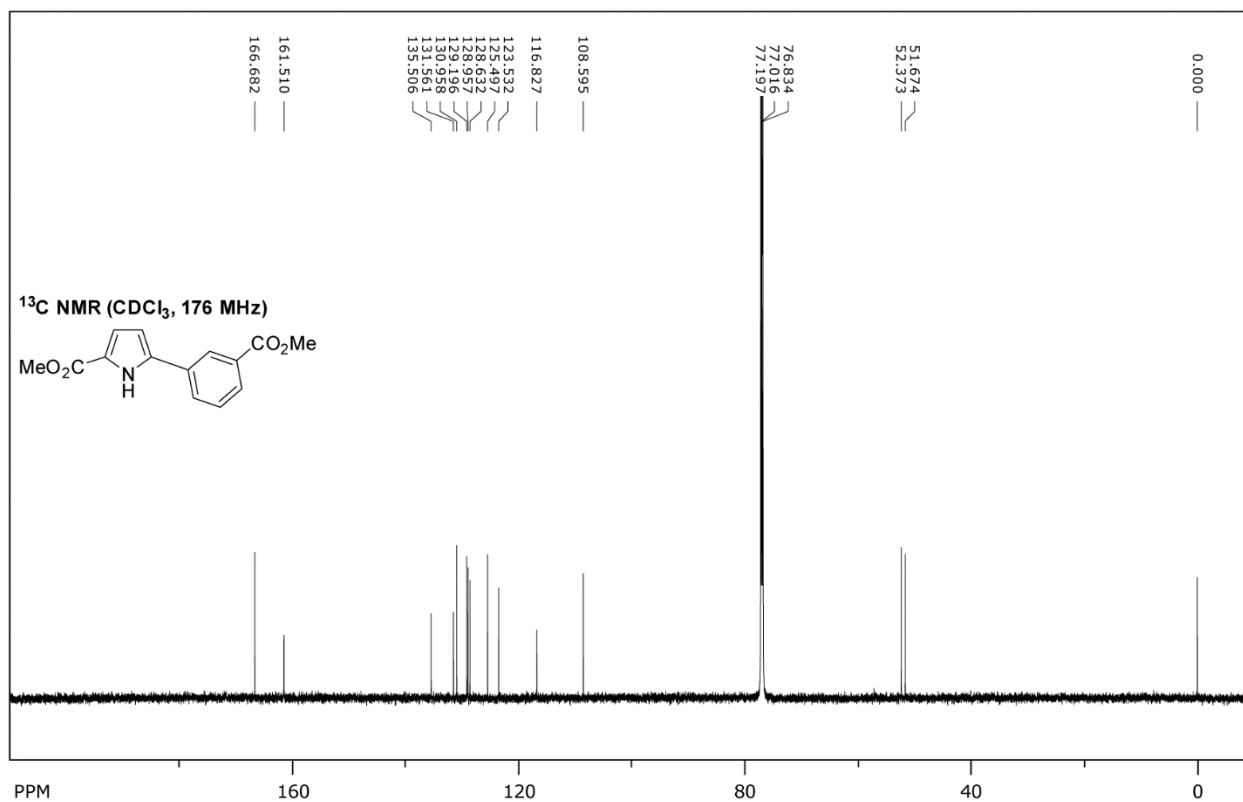
Compound 2m: <sup>1</sup>H NMR spectrum of methyl 5-(3-acetylphenyl)-1*H*-pyrrole-2-carboxylate



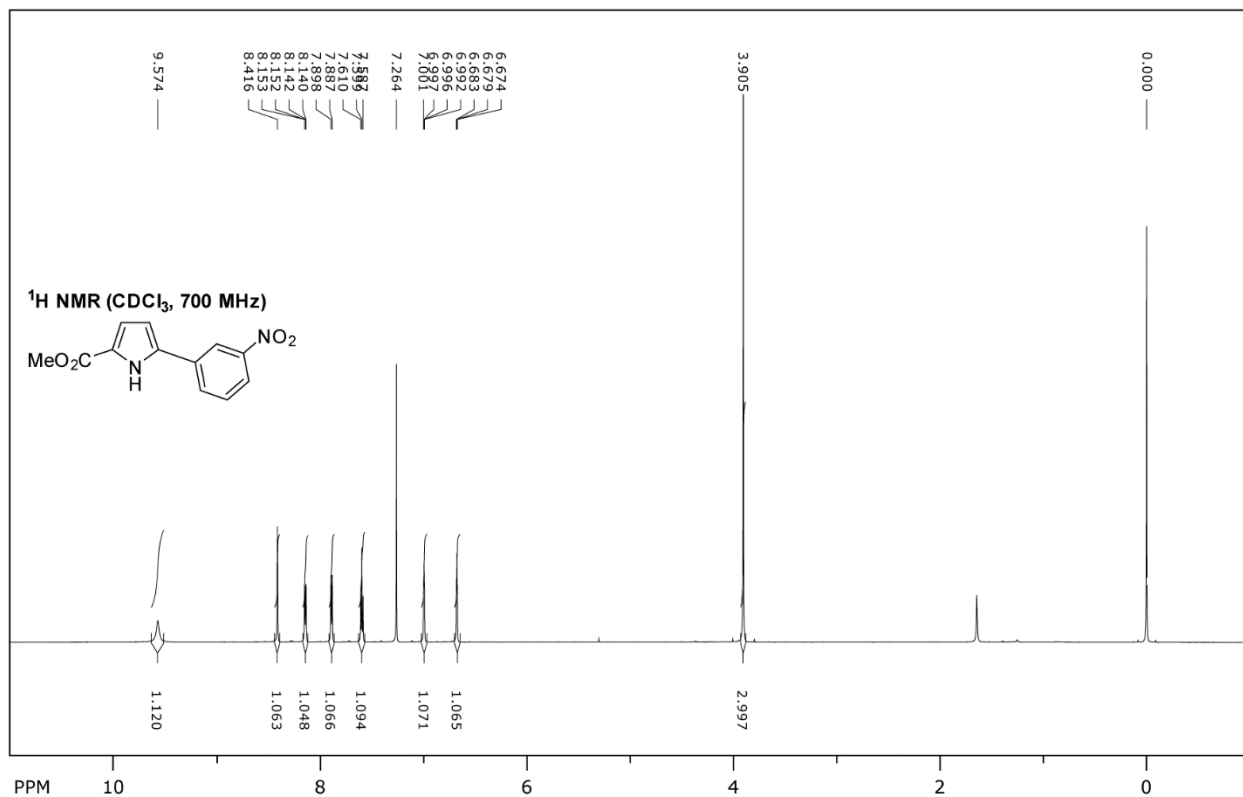
Compound 2m: <sup>13</sup>C NMR spectrum of methyl 5-(3-acetylphenyl)-1*H*-pyrrole-2-carboxylate



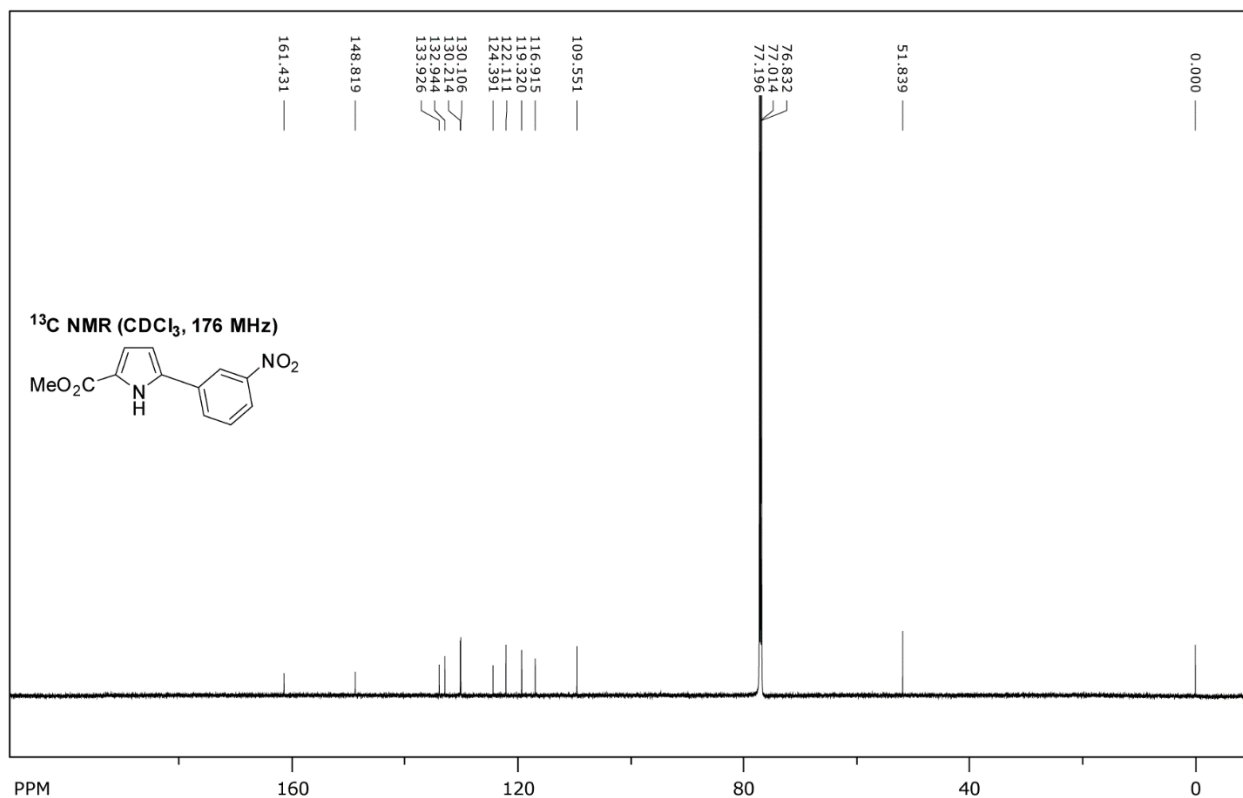
**Compound 2n: <sup>1</sup>H NMR spectrum of methyl 5-(3-(methoxycarbonyl)phenyl)-1*H*-pyrrole-2-carboxylate**



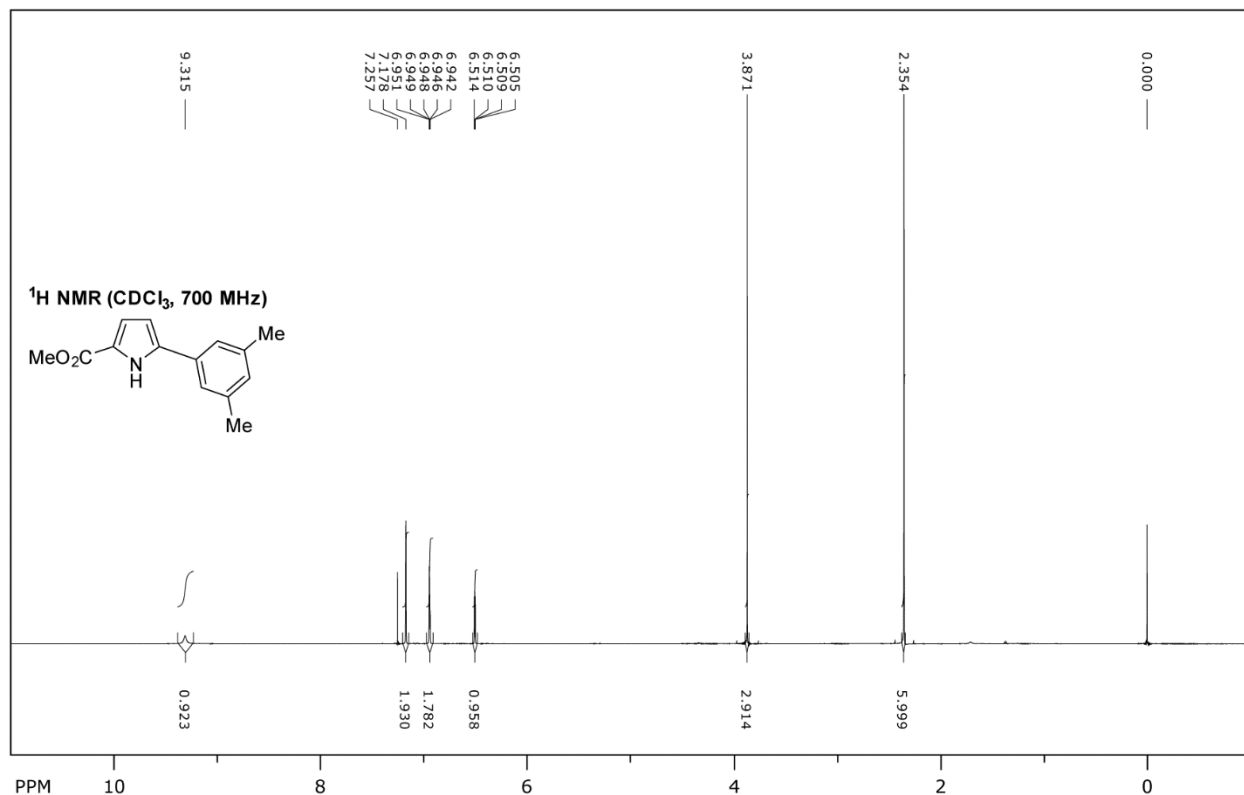
**Compound 2n: <sup>13</sup>C NMR spectrum of methyl 5-(3-(methoxycarbonyl)phenyl)-1*H*-pyrrole-2-carboxylate**



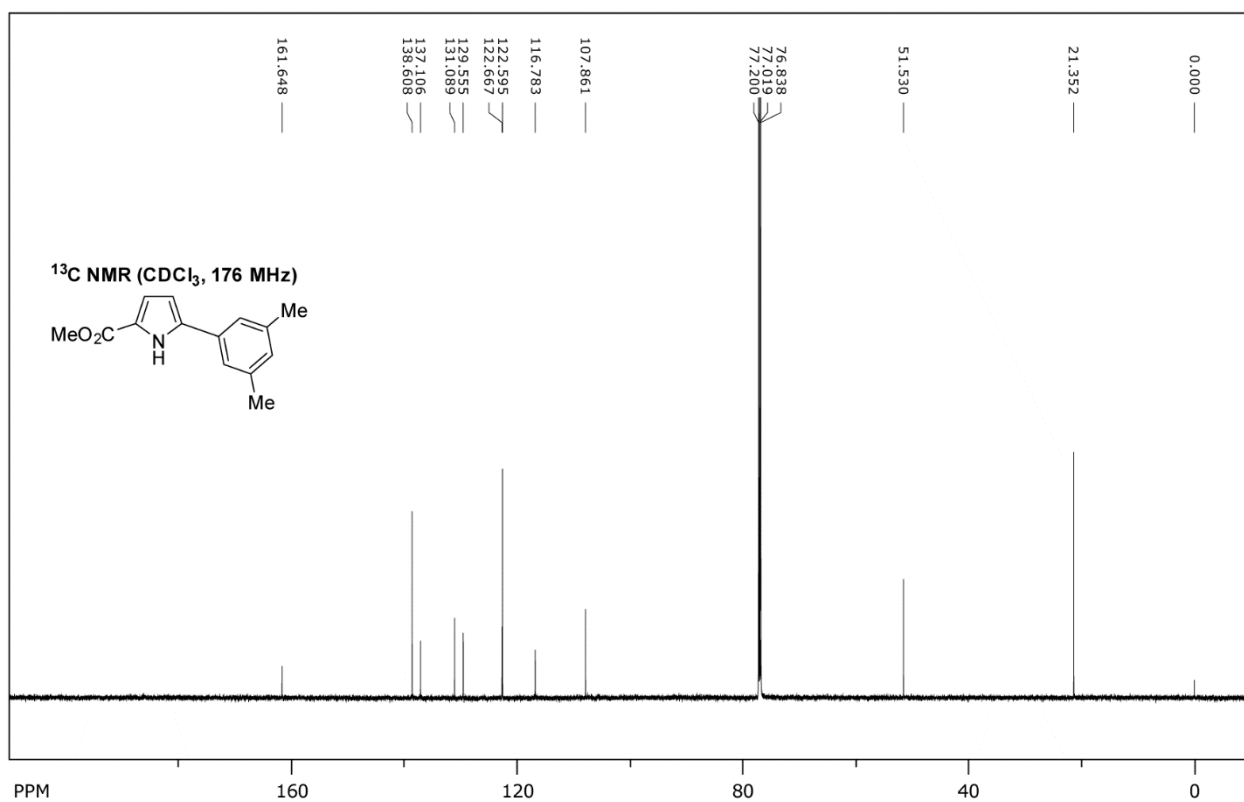
**Compound 2o: <sup>1</sup>H NMR spectrum of methyl 5-(3-nitrophenyl)-1*H*-pyrrole-2-carboxylate**



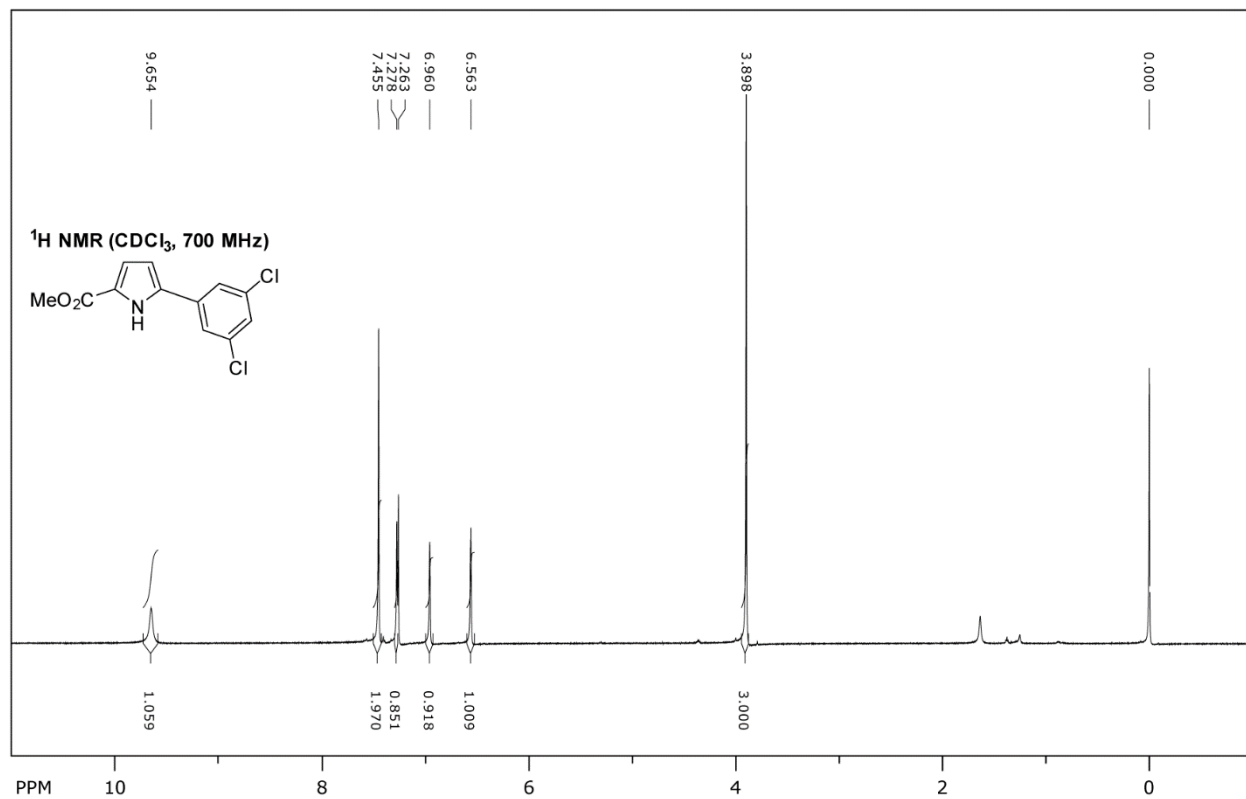
**Compound 2o: <sup>13</sup>C NMR spectrum of methyl 5-(3-nitrophenyl)-1*H*-pyrrole-2-carboxylate**



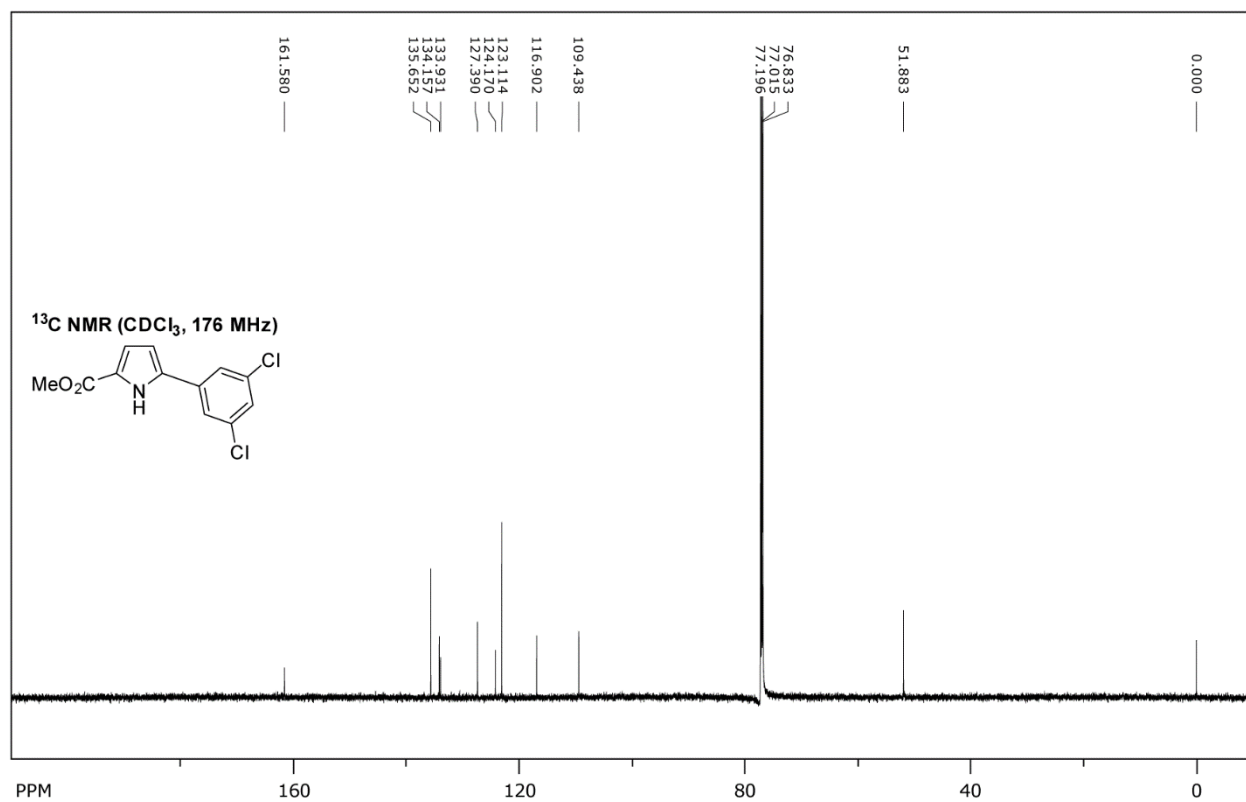
**Compound 2p: <sup>1</sup>H NMR spectrum of methyl 5-(3,5-dimethylphenyl)-1*H*-pyrrole-2-carboxylate**



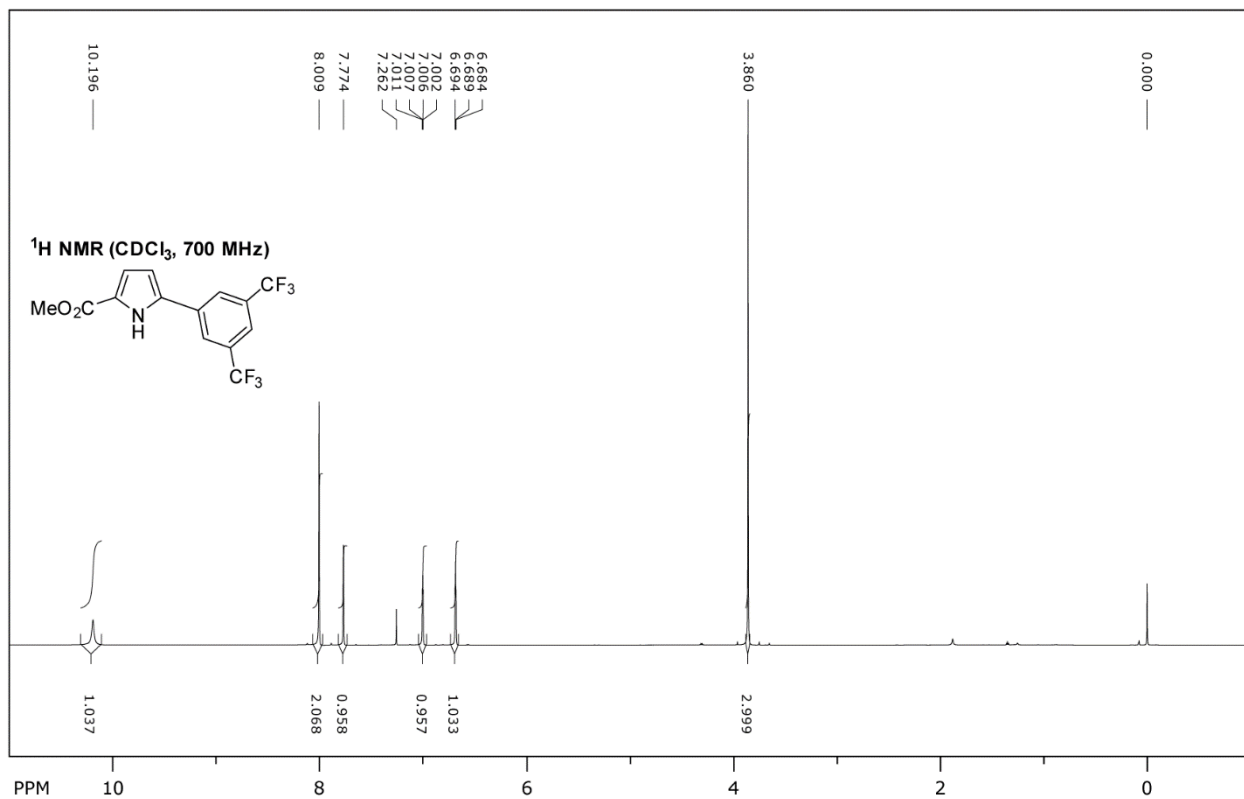
**Compound 2p: <sup>13</sup>C NMR spectrum of methyl 5-(3,5-dimethylphenyl)-1*H*-pyrrole-2-carboxylate**



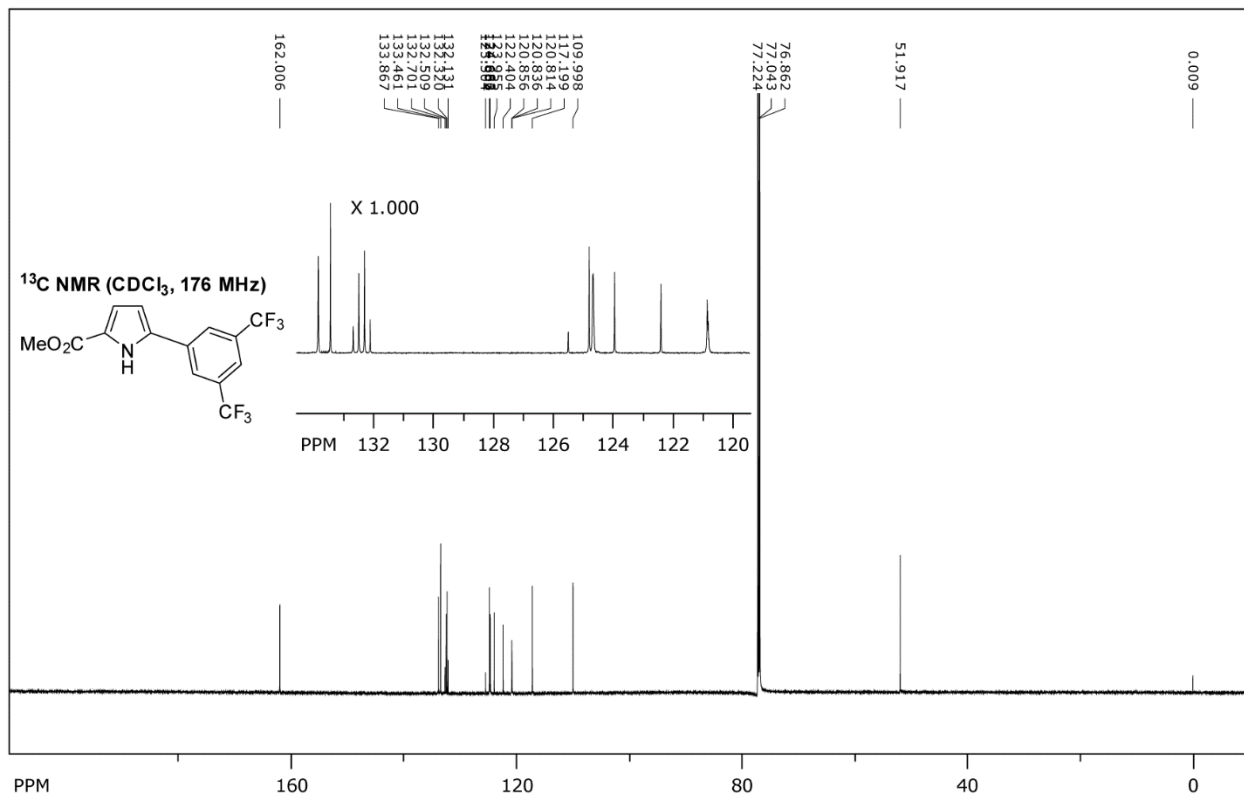
**Compound 2q: <sup>1</sup>H NMR spectrum of methyl 5-(3,5-dichlorophenyl)-1H-pyrrole-2-carboxylate**



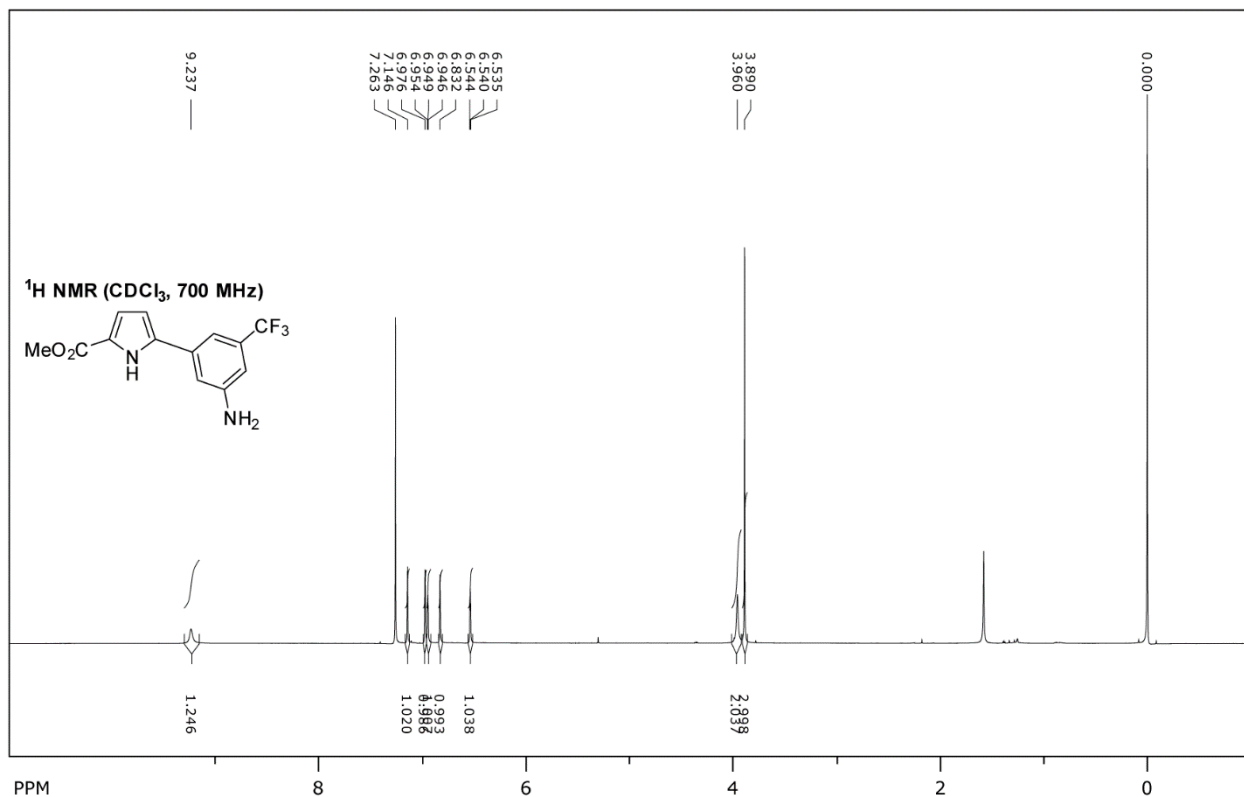
**Compound 2q: <sup>13</sup>C NMR spectrum of methyl 5-(3,5-dichlorophenyl)-1H-pyrrole-2-carboxylate**



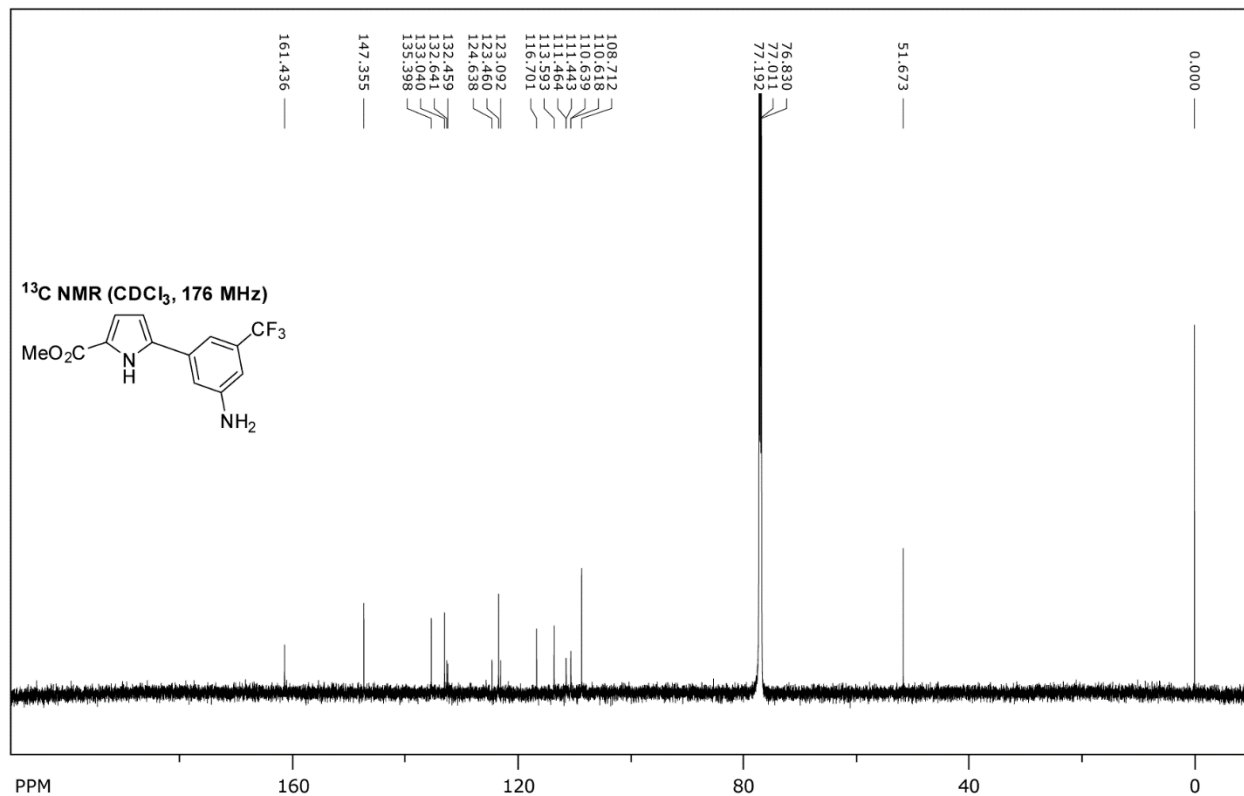
**Compound 2r: <sup>1</sup>H NMR spectrum of methyl 5-(3,5-bis(trifluoromethyl)phenyl)-1*H*-pyrrole-2-carboxylate**



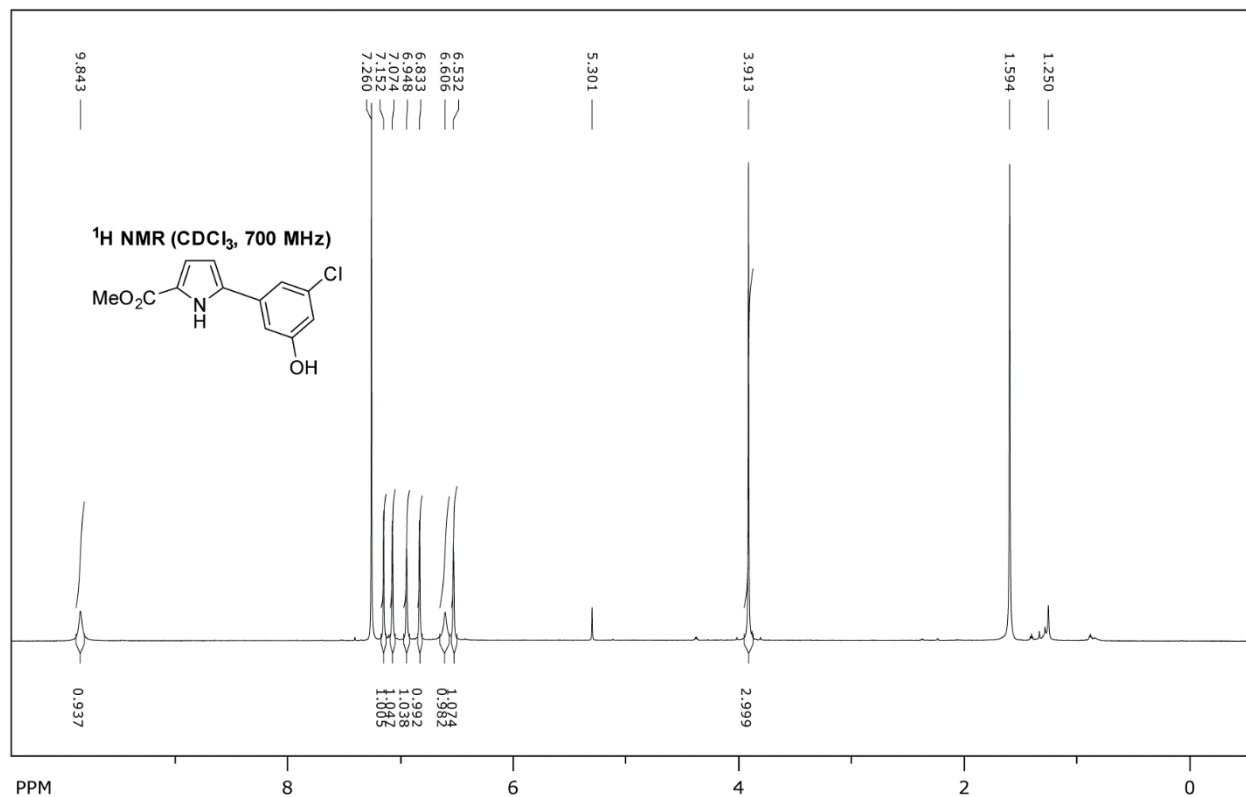
**Compound 2r: <sup>13</sup>C NMR spectrum of methyl 5-(3,5-bis(trifluoromethyl)phenyl)-1*H*-pyrrole-2-carboxylate**



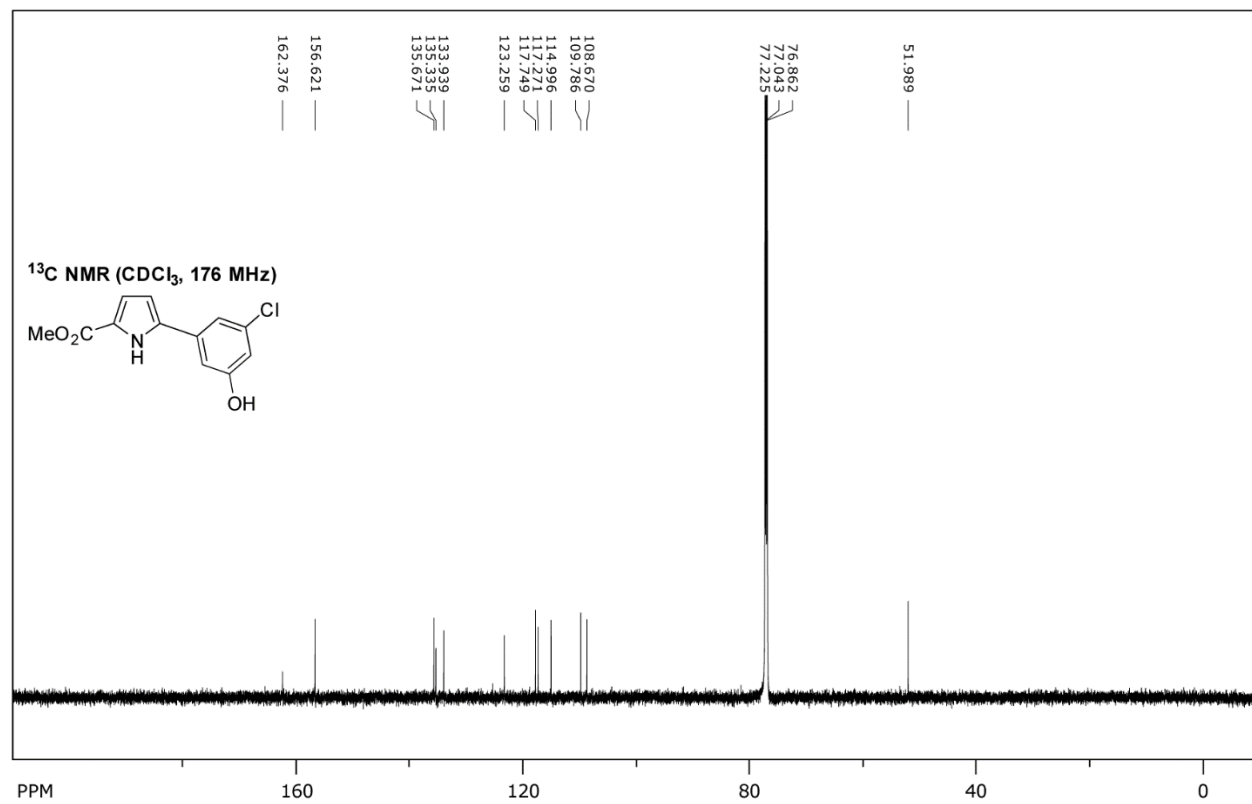
**Compound 2s: <sup>1</sup>H NMR spectrum of methyl 5-(3-amino-5-(trifluoromethyl)phenyl)-1*H*-pyrrole-2-carboxylate**



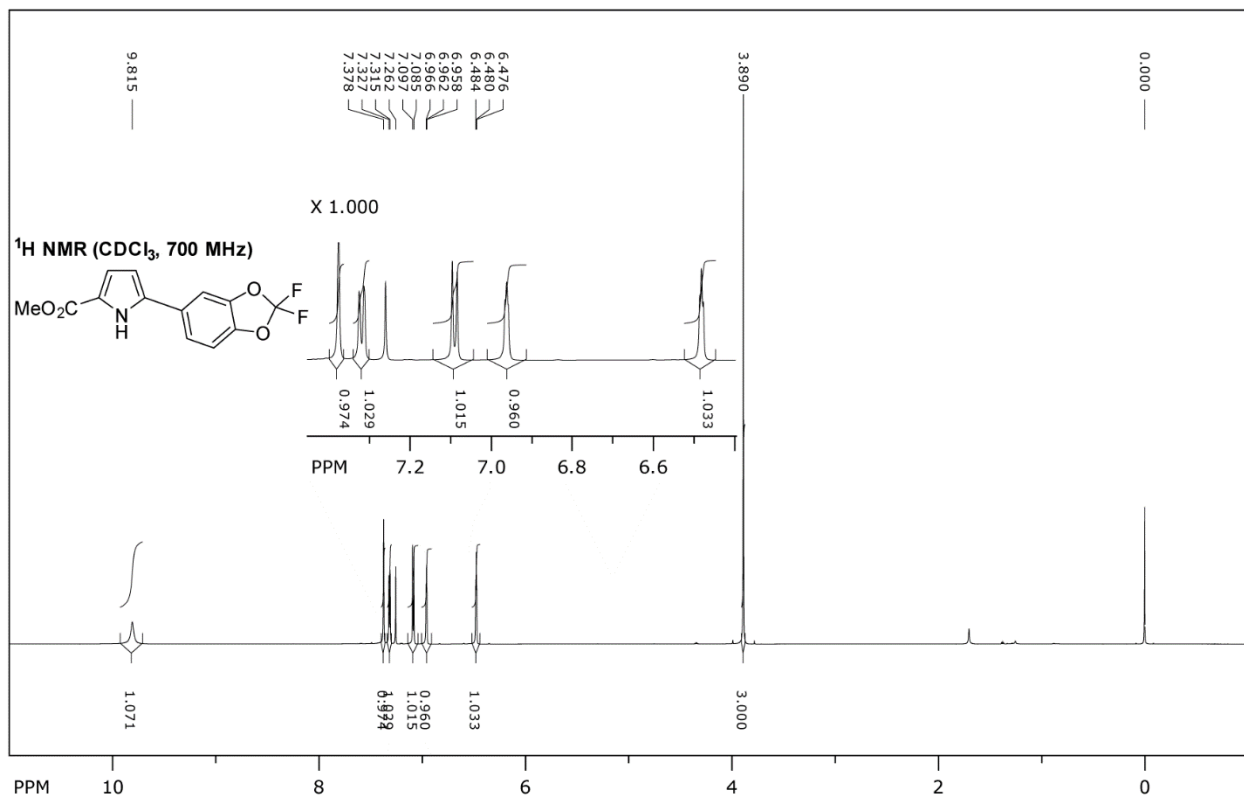
**Compound 2s:  $^{13}\text{C}$  NMR spectrum of methyl 5-(3-amino-5-(trifluoromethyl)phenyl)-1*H*-pyrrole-2-carboxylate**



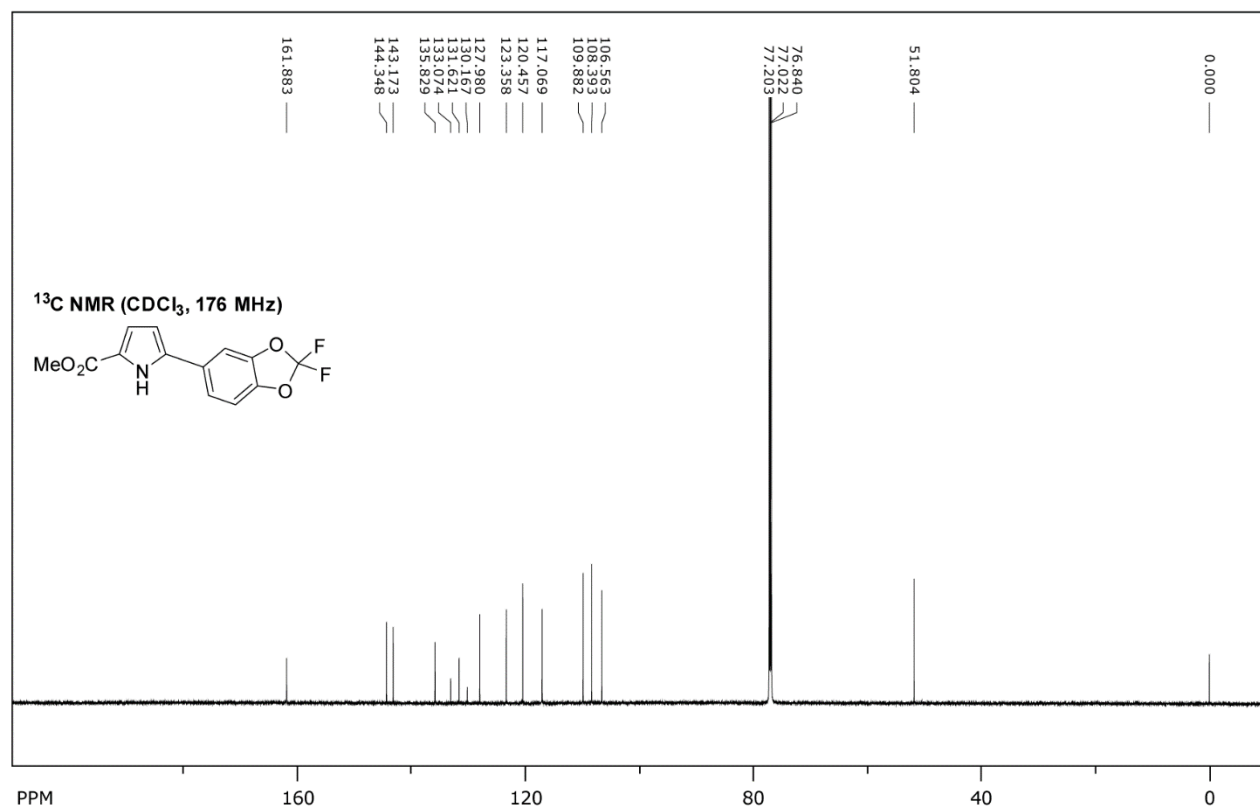
**Compound 2t: <sup>1</sup>H NMR spectrum of methyl 5-(3-chloro-5-hydroxyphenyl)-1*H*-pyrrole-2-carboxylate**



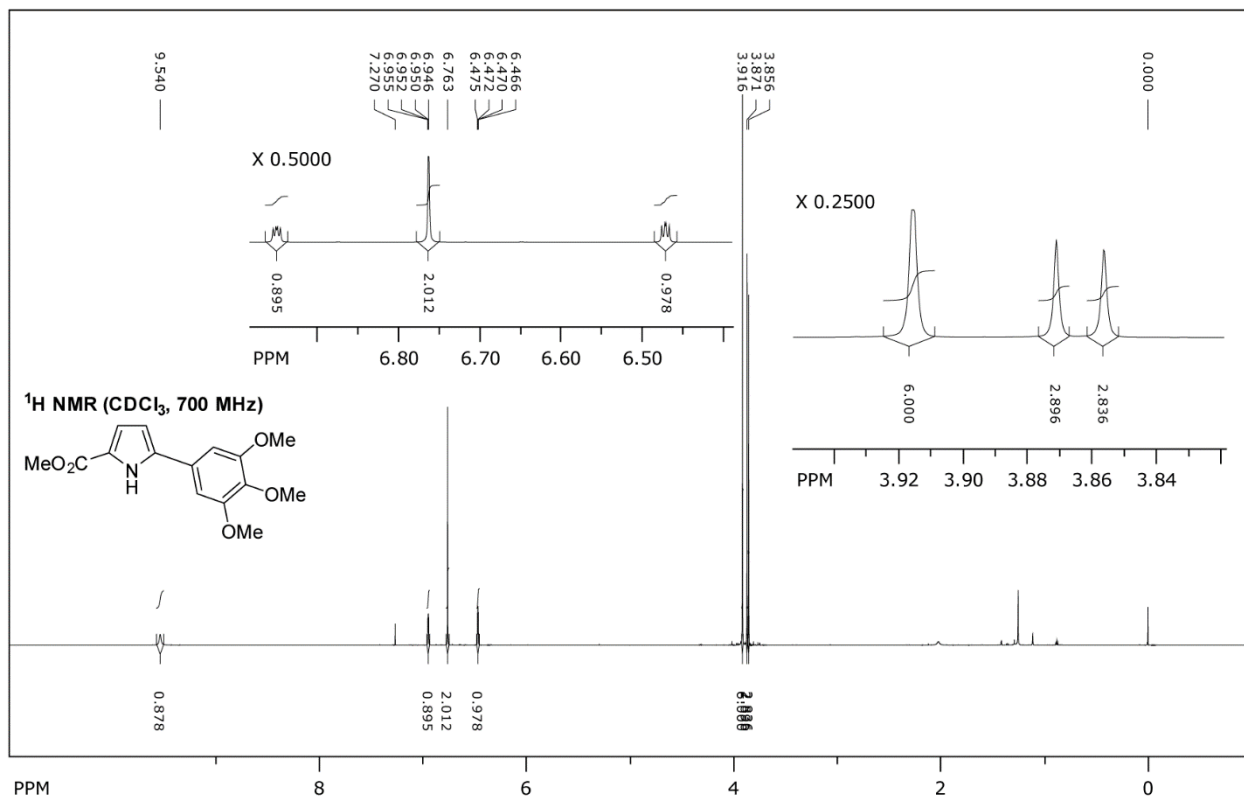
**Compound 2t: <sup>13</sup>C NMR spectrum of methyl 5-(3-chloro-5-hydroxyphenyl)-1*H*-pyrrole-2-carboxylate**



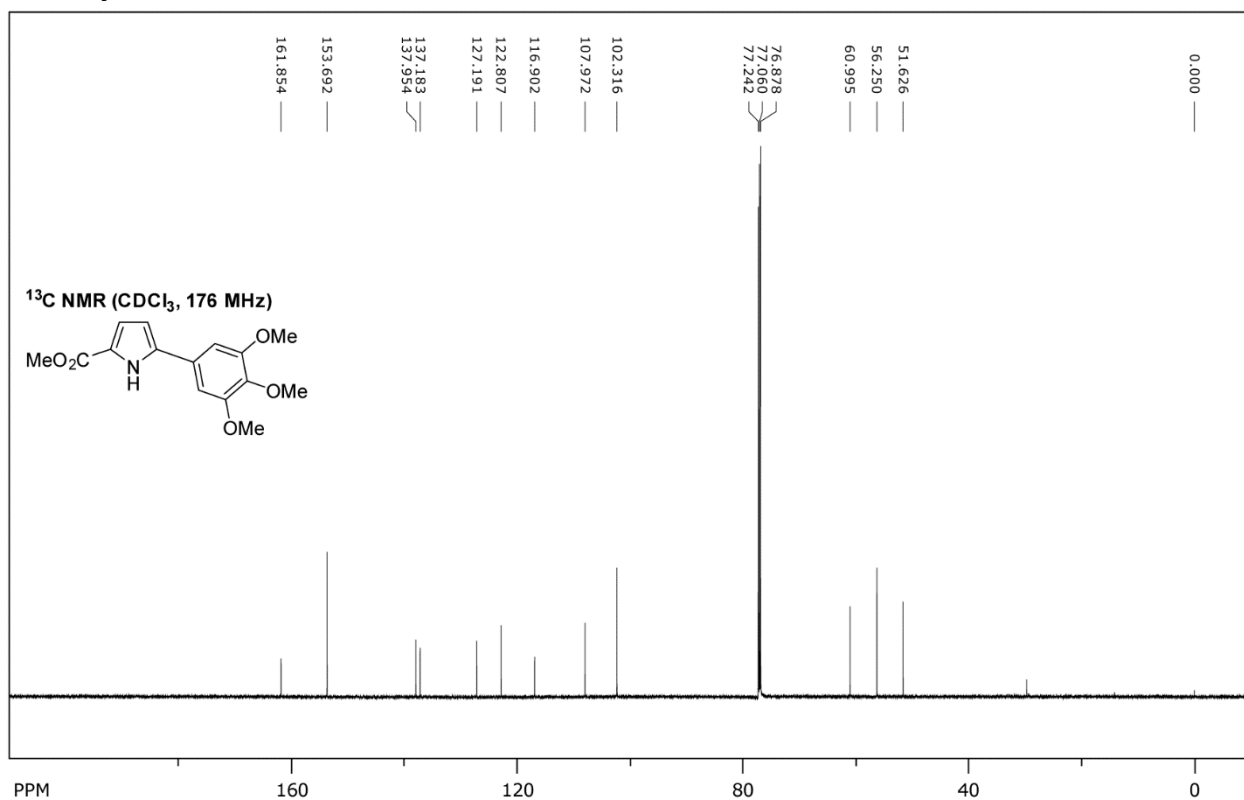
**Compound 2u: <sup>1</sup>H NMR spectrum of methyl 5-(2,2-difluorobenzo[d][1,3]dioxol-5-yl)-1H-pyrrole-2-carboxylate**



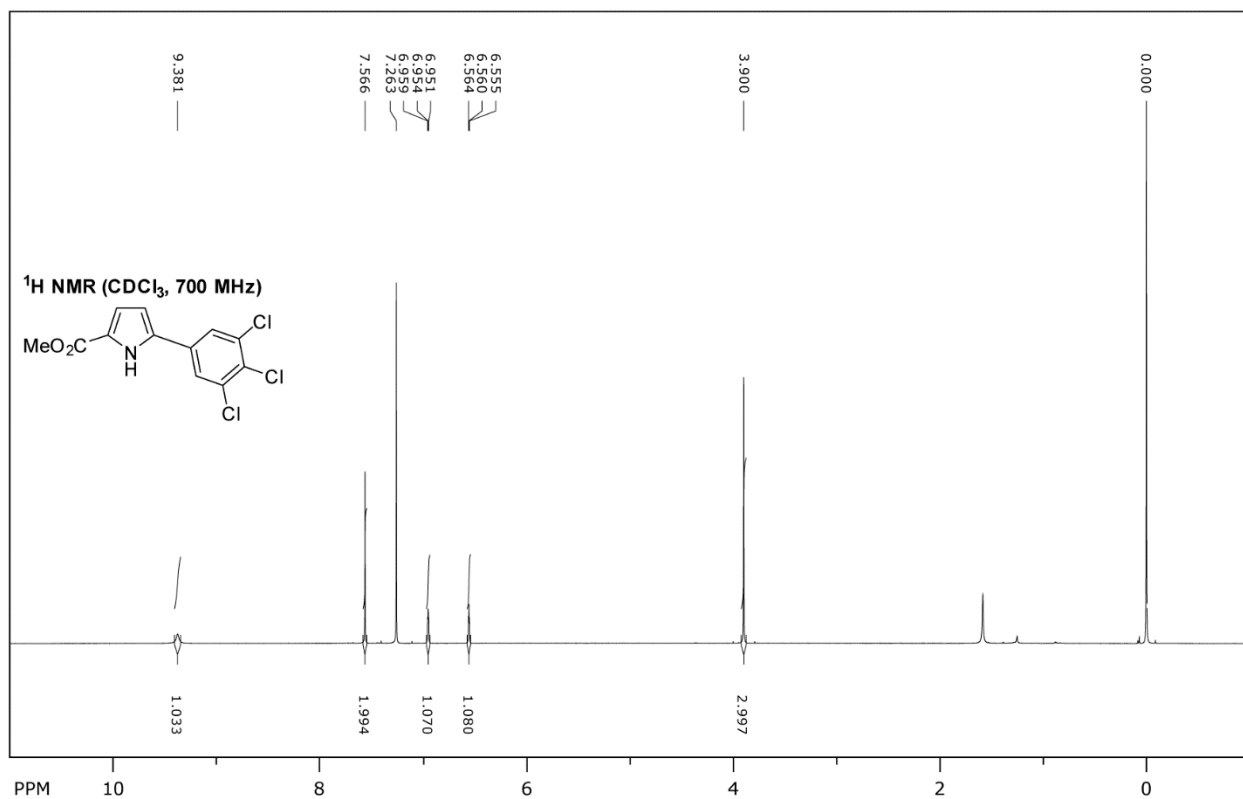
**Compound 2u: <sup>13</sup>C NMR spectrum of methyl 5-(2,2-difluorobenzo[d][1,3]dioxol-5-yl)-1H-pyrrole-2-carboxylate**



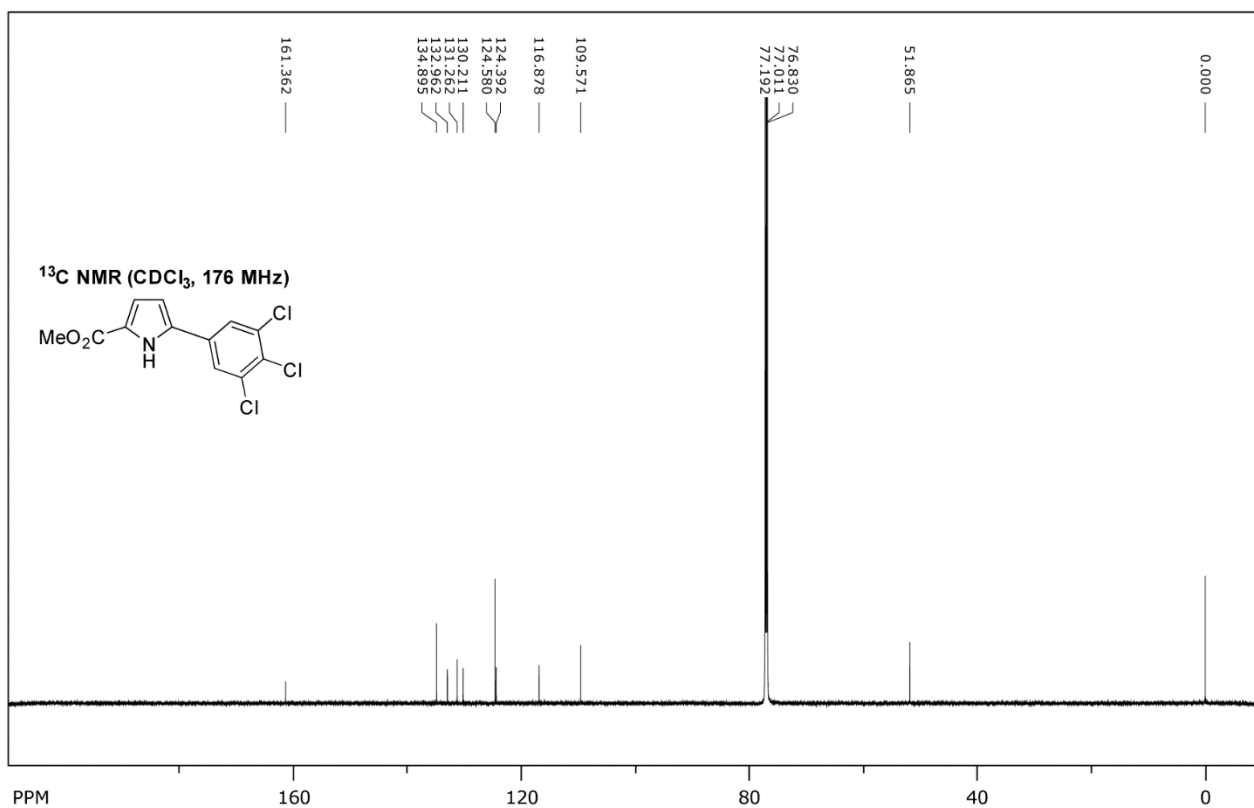
**Compound 2v: <sup>1</sup>H NMR spectrum of methyl 5-(3,4,5-trimethoxyphenyl)-1H-pyrrole-2-carboxylate**



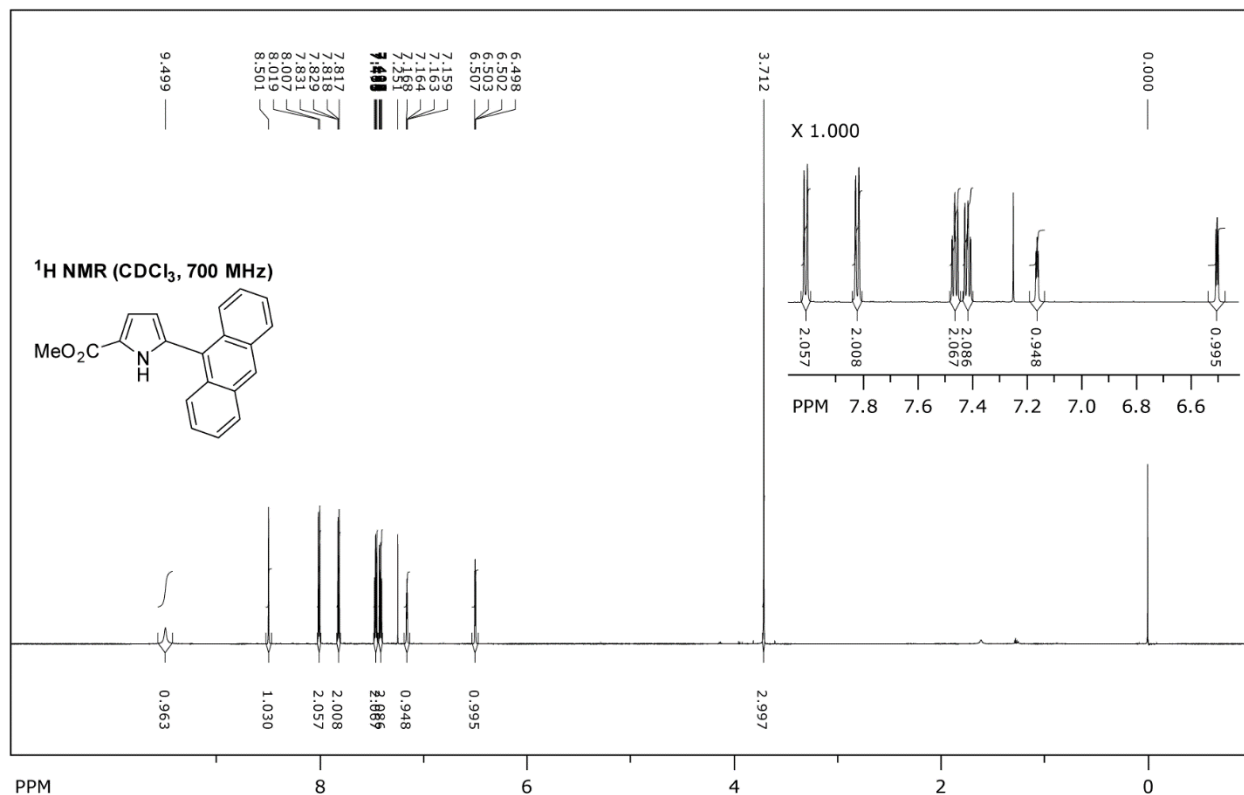
**Compound 2v: <sup>13</sup>C NMR spectrum of methyl 5-(3,4,5-trimethoxyphenyl)-1H-pyrrole-2-carboxylate**



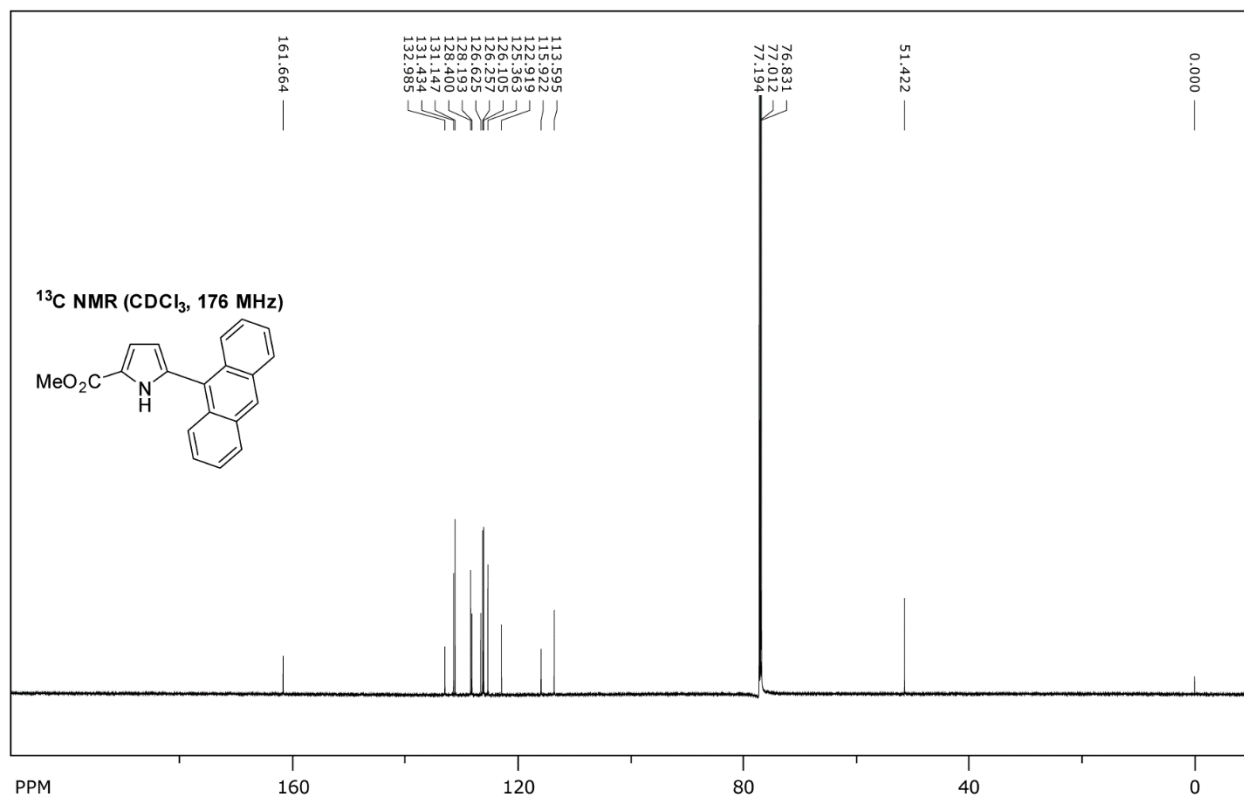
**Compound 2w: <sup>1</sup>H NMR spectrum of methyl 5-(3,4,5-trichlorophenyl)-1H-pyrrole-2-carboxylate**



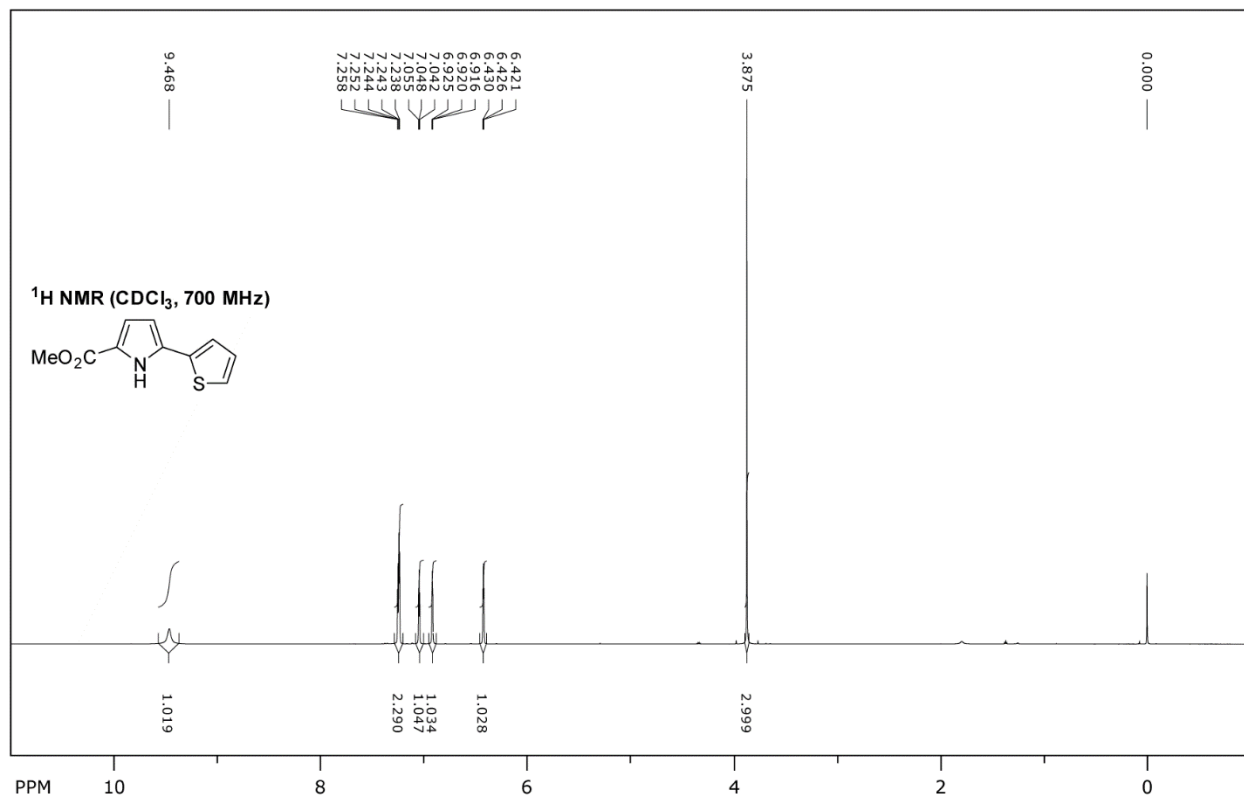
**Compound 2w: <sup>13</sup>C NMR spectrum of methyl 5-(3,4,5-trichlorophenyl)-1H-pyrrole-2-carboxylate**



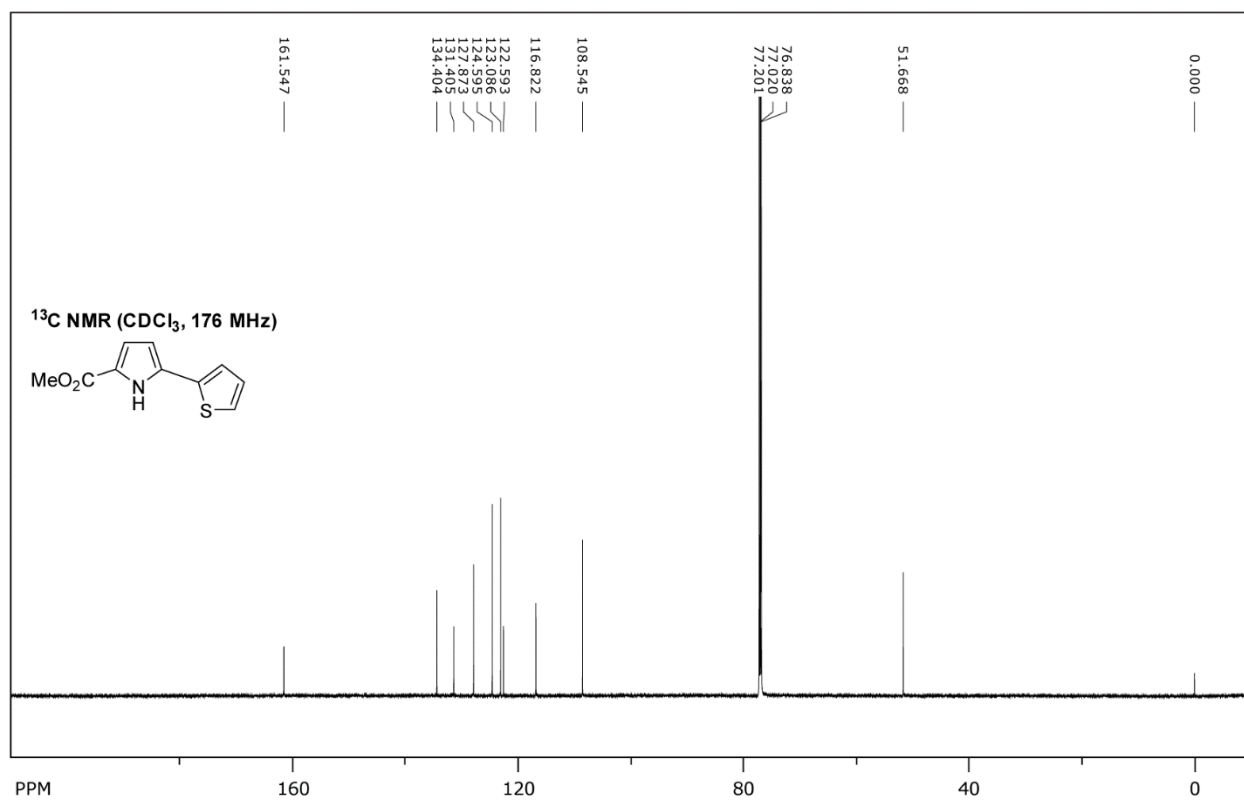
**Compound 2x: <sup>1</sup>H NMR spectrum of methyl 5-(anthracen-9-yl)-1*H*-pyrrole-2-carboxylate**



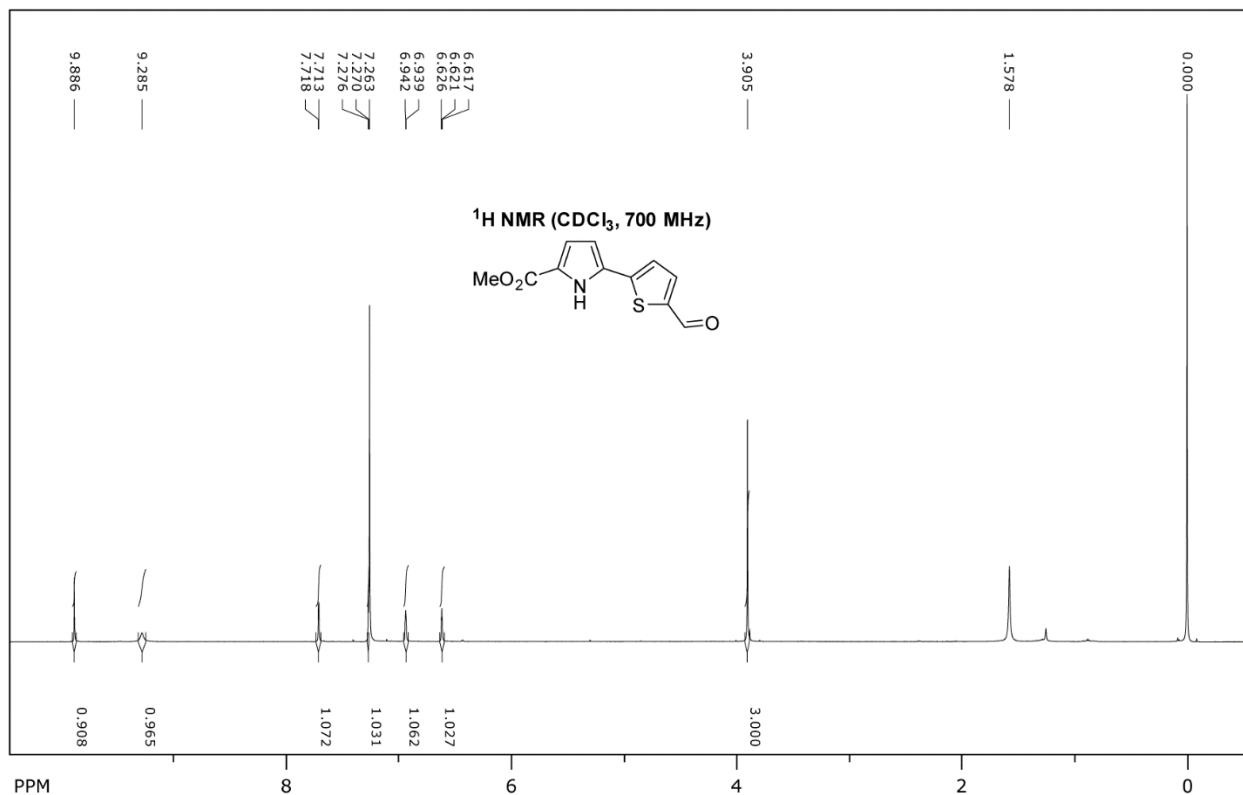
**Compound 2x: <sup>13</sup>C NMR spectrum of methyl 5-(anthracen-9-yl)-1*H*-pyrrole-2-carboxylate**



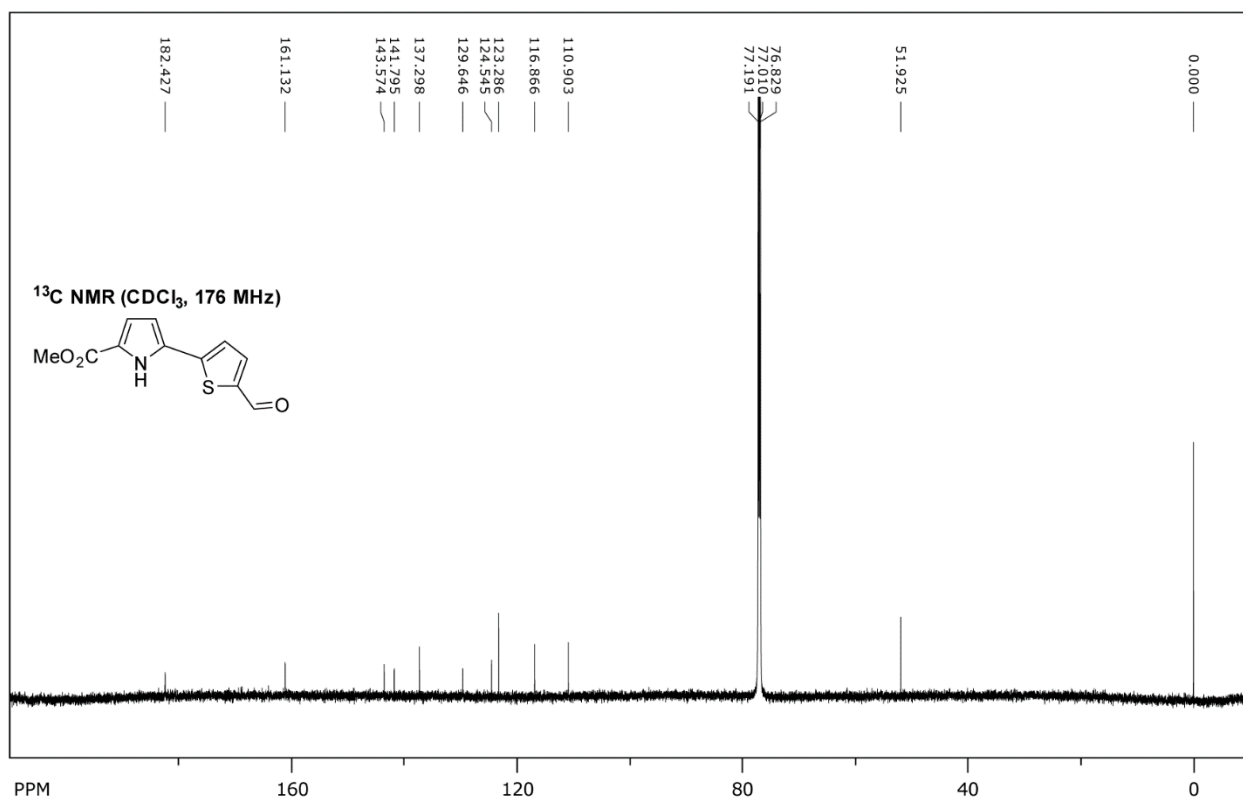
**Compound 3a: <sup>1</sup>H NMR spectrum of methyl 5-(thiophen-2-yl)-1*H*-pyrrole-2-carboxylate**



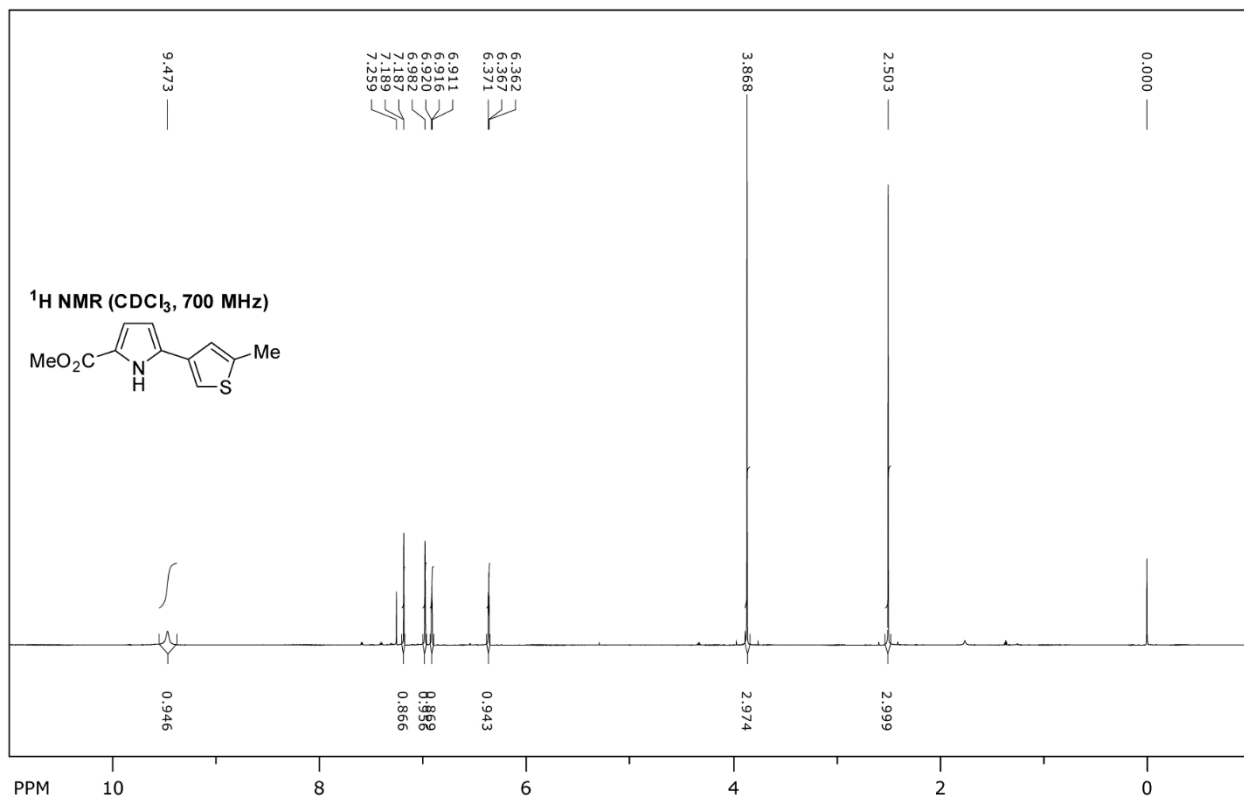
**Compound 3a: <sup>13</sup>C NMR spectrum of methyl 5-(thiophen-2-yl)-1*H*-pyrrole-2-carboxylate**



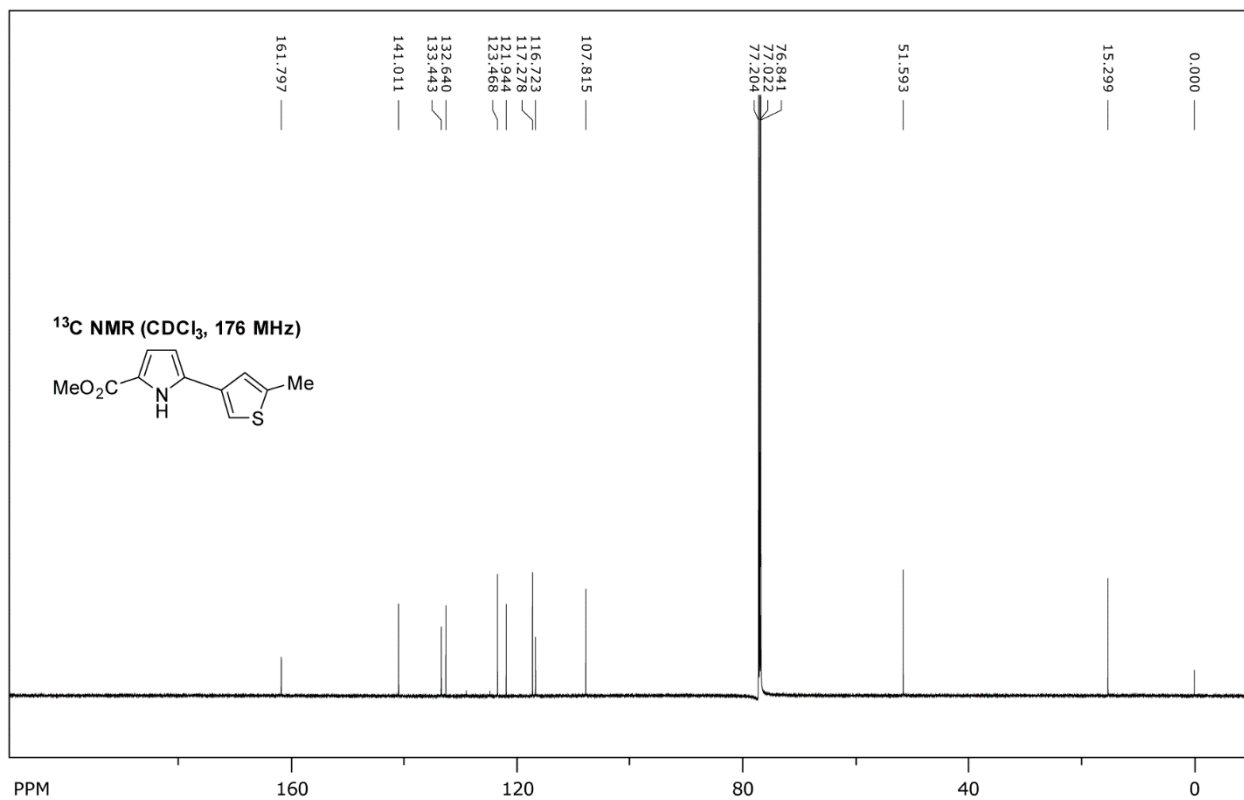
**Compound 3b: <sup>1</sup>H NMR spectrum of methyl 5-(5-formylthiophen-2-yl)-1H-pyrrole-2-carboxylate**



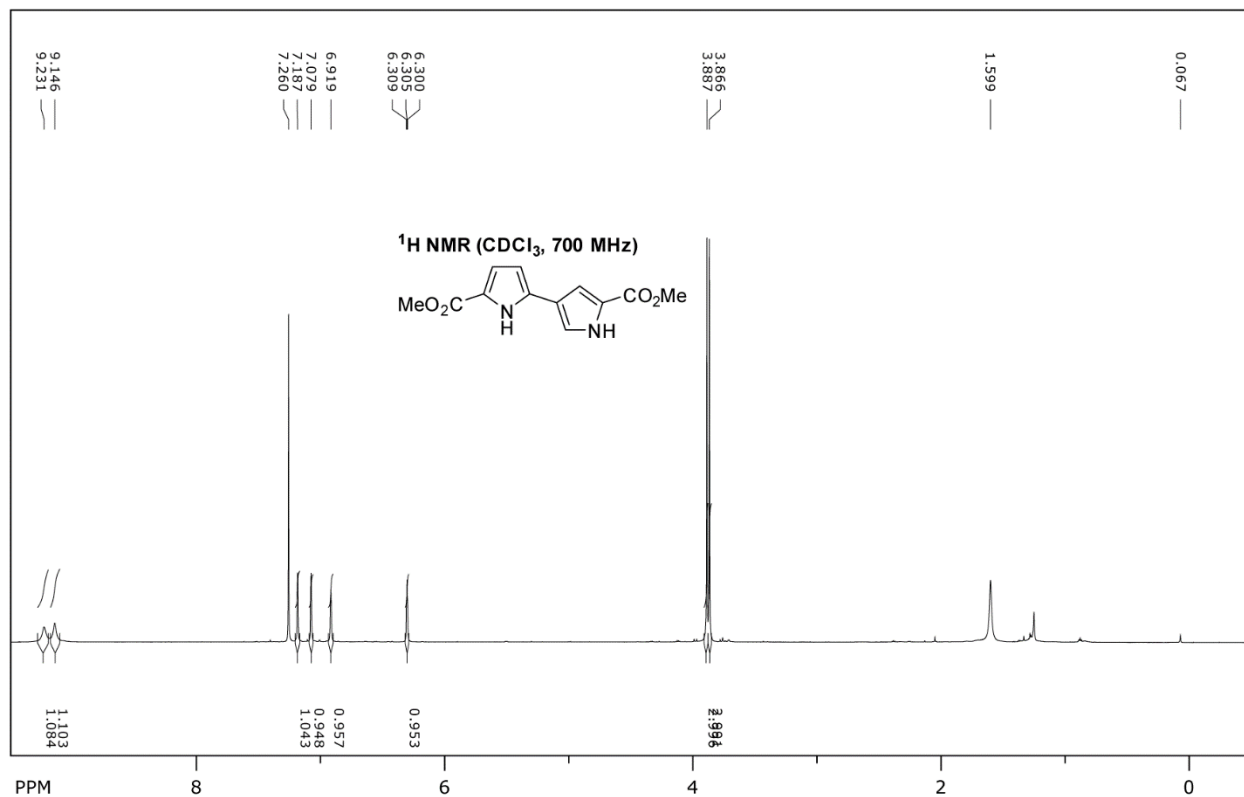
**Compound 3b: <sup>13</sup>C NMR spectrum of methyl 5-(5-formylthiophen-2-yl)-1H-pyrrole-2-carboxylate**



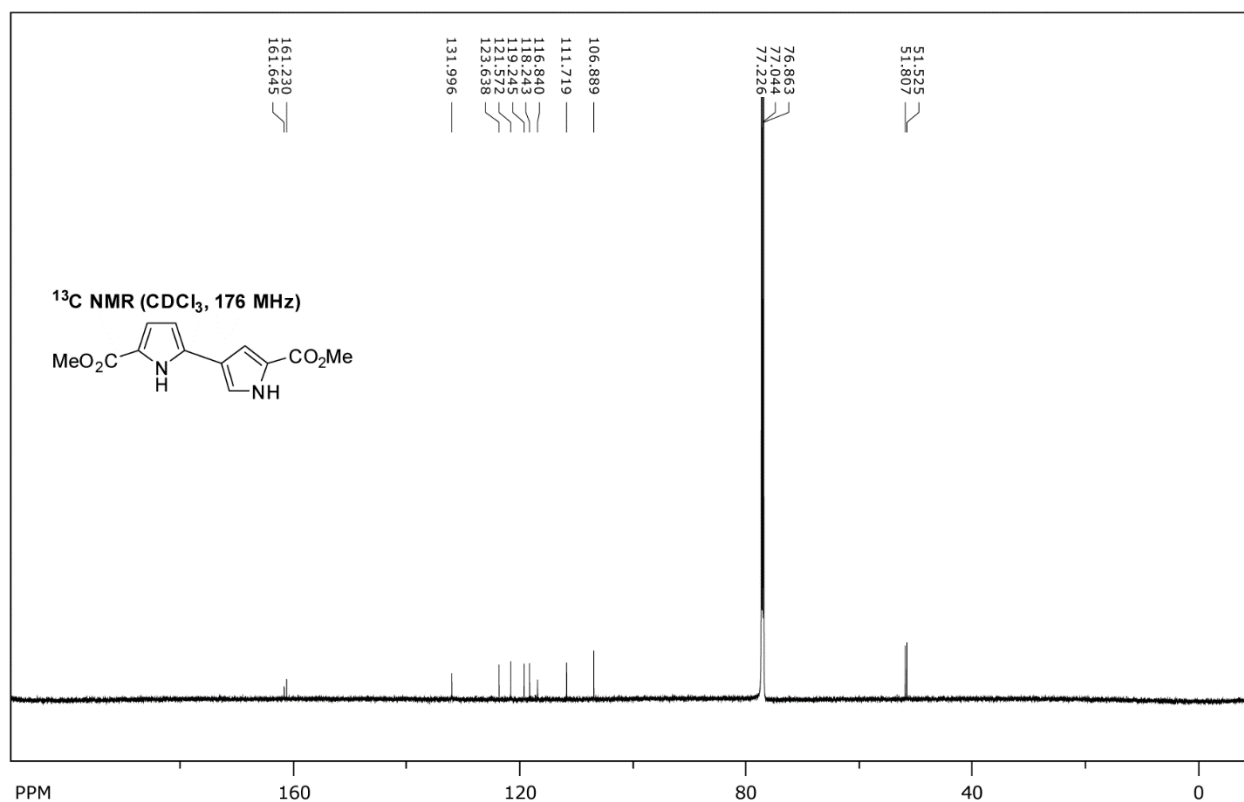
**Compound 3c: <sup>1</sup>H NMR spectrum of methyl 5-(5-methylthiophen-3-yl)-1*H*-pyrrole-2-carboxylate**



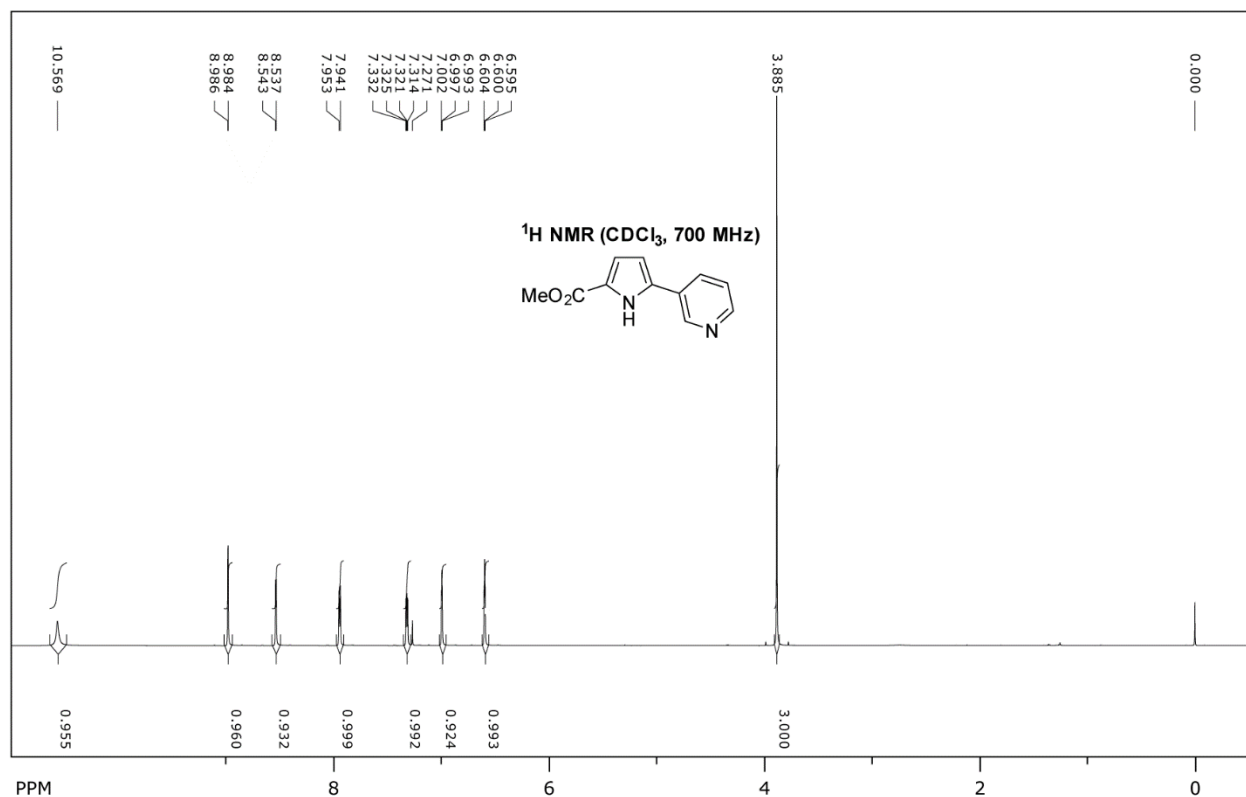
**Compound 3c: <sup>13</sup>C NMR spectrum of methyl 5-(5-methylthiophen-3-yl)-1*H*-pyrrole-2-carboxylate**



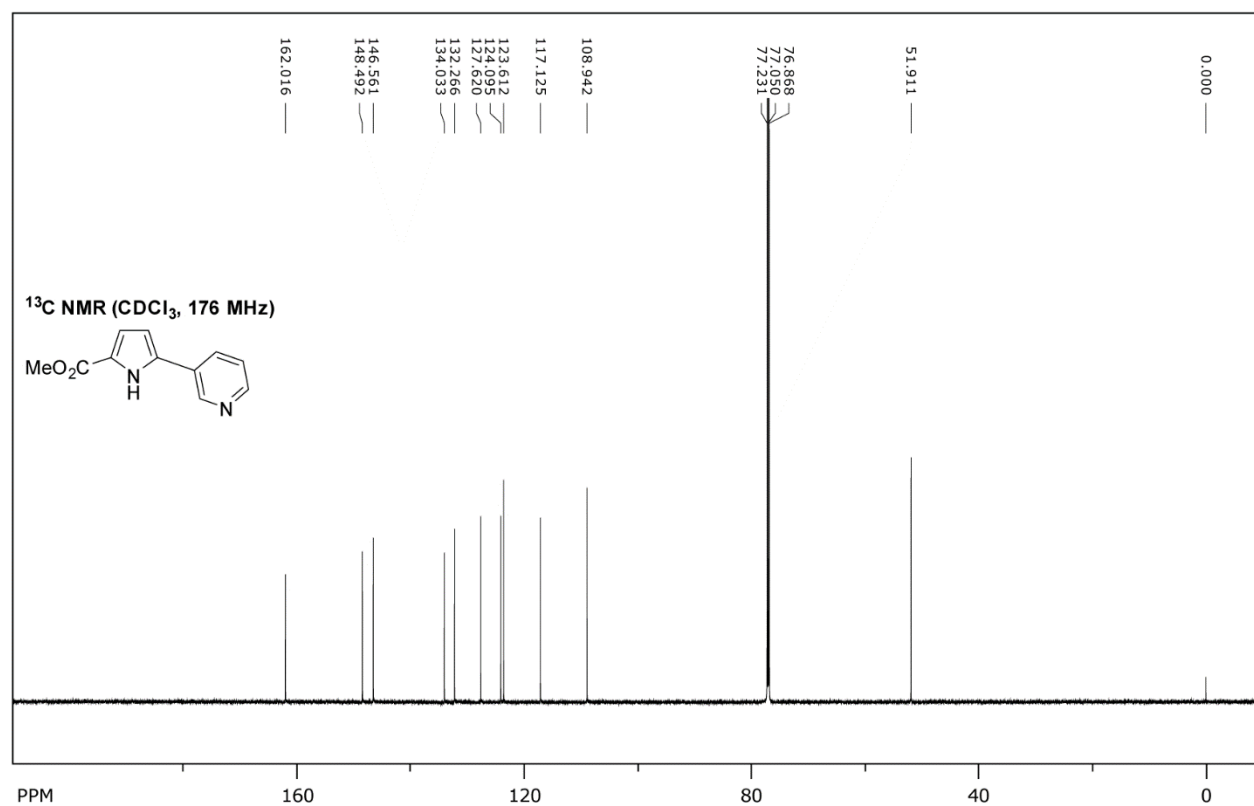
**Compound 3d: <sup>1</sup>H NMR spectrum of dimethyl 1*H*,1'*H*-[2,3'-bipyrrole]-5,5'-dicarboxylate**



**Compound 3d: <sup>13</sup>C NMR spectrum of dimethyl 1*H*,1'*H*-[2,3'-bipyrrole]-5,5'-dicarboxylate**



Compound 3e: <sup>1</sup>H NMR spectrum of methyl 5-(pyridin-3-yl)-1*H*-pyrrole-2-carboxylate



Compound 3e: <sup>13</sup>C NMR spectrum of methyl 5-(pyridin-3-yl)-1*H*-pyrrole-2-carboxylate