

Supporting Information

(RSC Advances)

The protocatechuic acid-based deep eutectic solvent-mediated green synthesis of 1,2,4,5-tetrasubstituted imidazoles

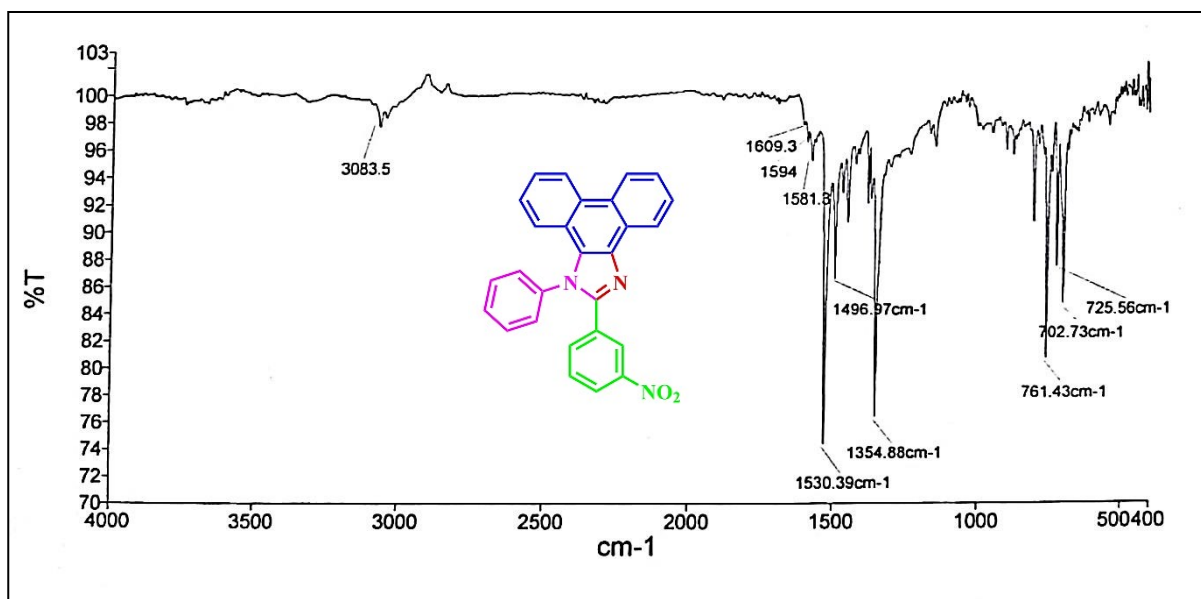
Hadis Goudarzi, Davood Habibi*, Arezo Monem

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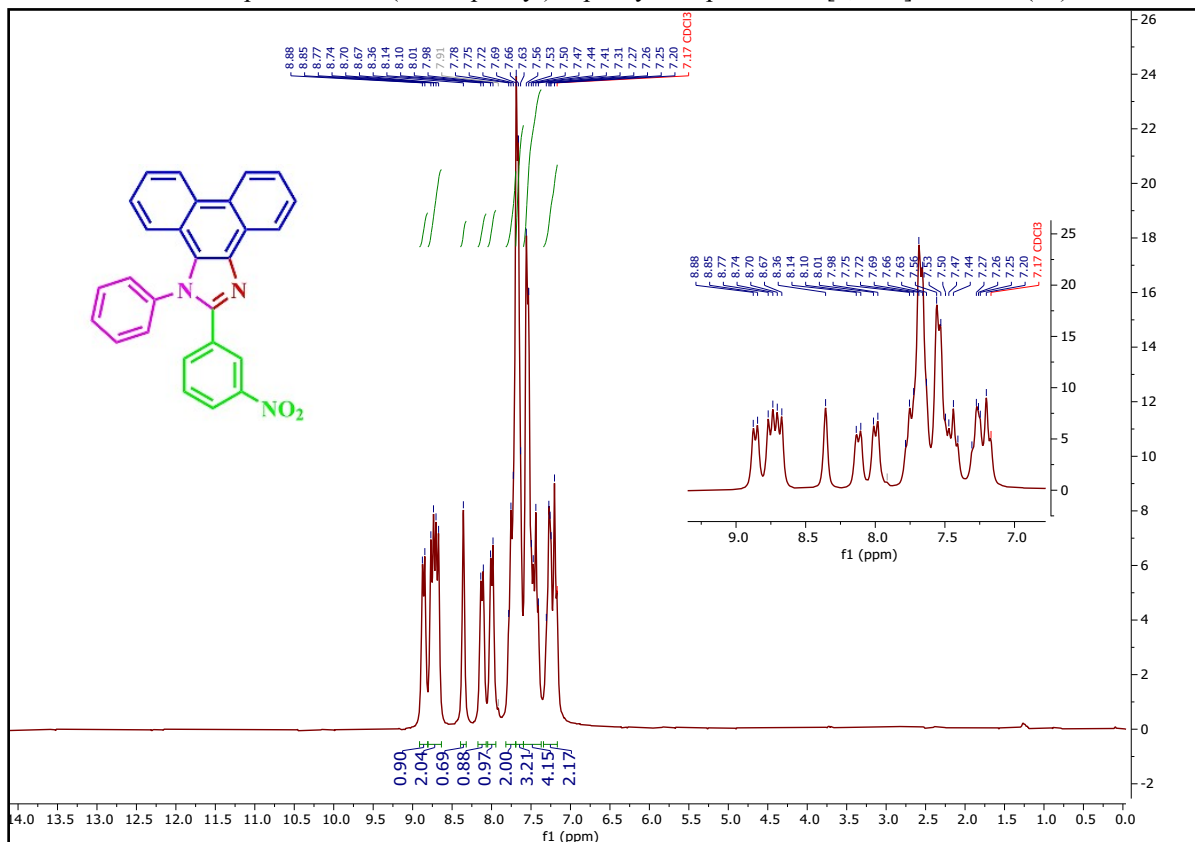
*Corresponding author email: davood.habibi@gmail.com (& dhabibi@basu.ac.ir), Tel: +98 81 38380922; Fax: +98 81 31408025

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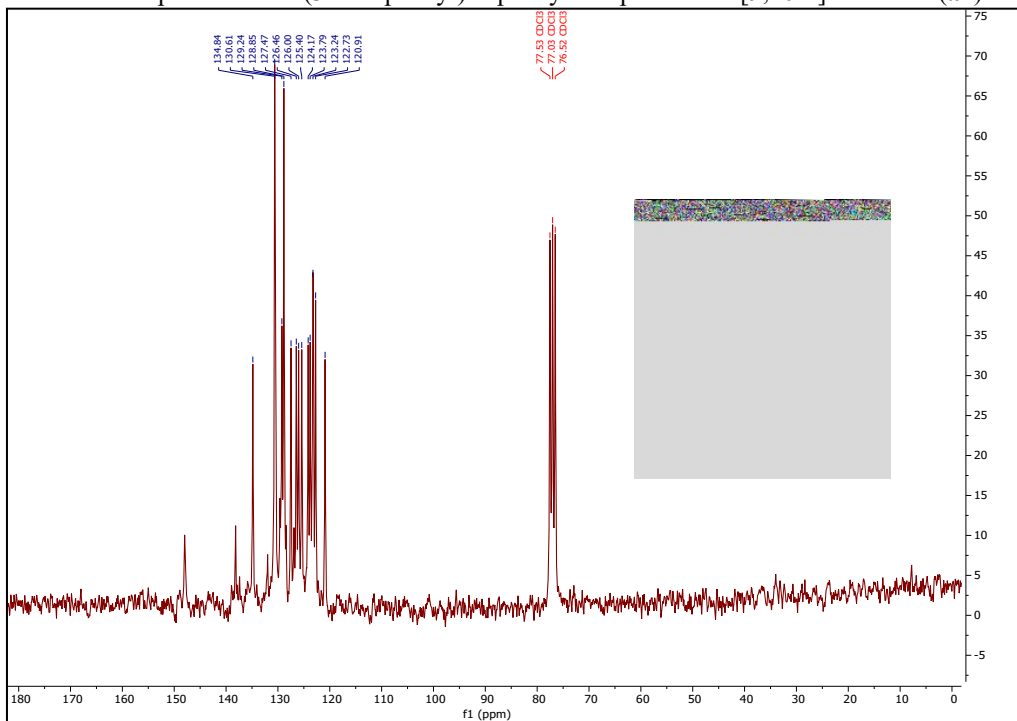
FT-IR spectrum of 2-(3-nitrophenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole (**a1**):



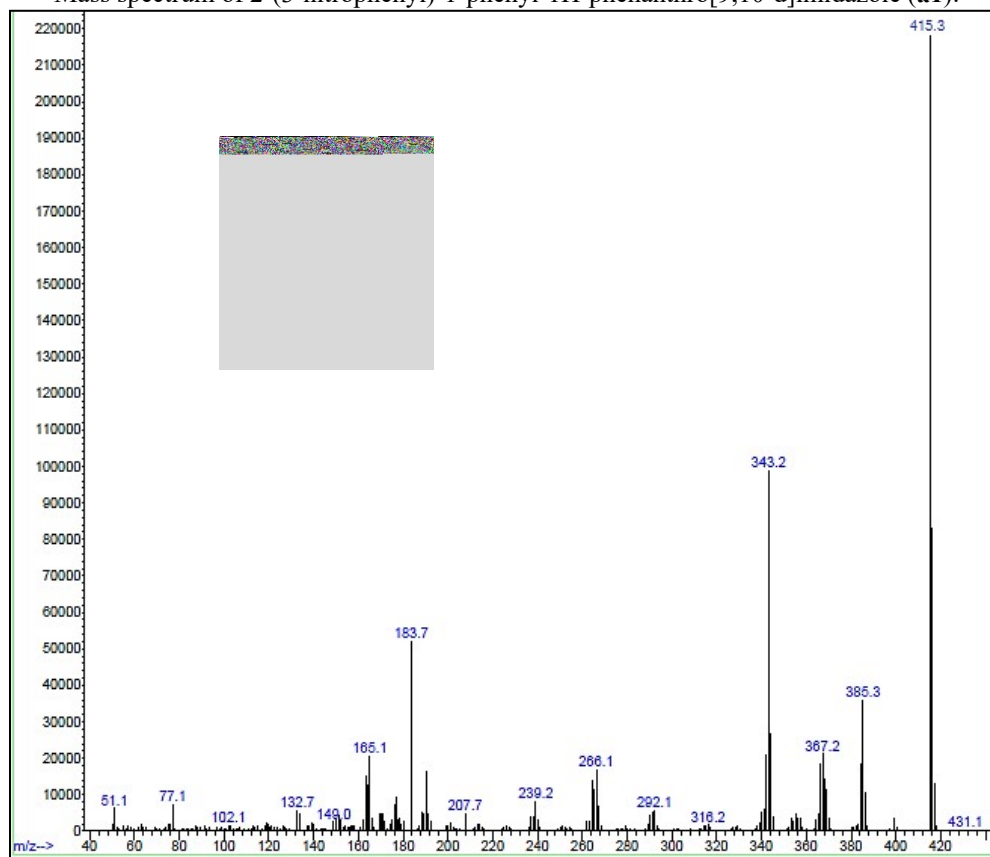
^1H NMR spectrum of 2-(3-nitrophenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole (**a1**):



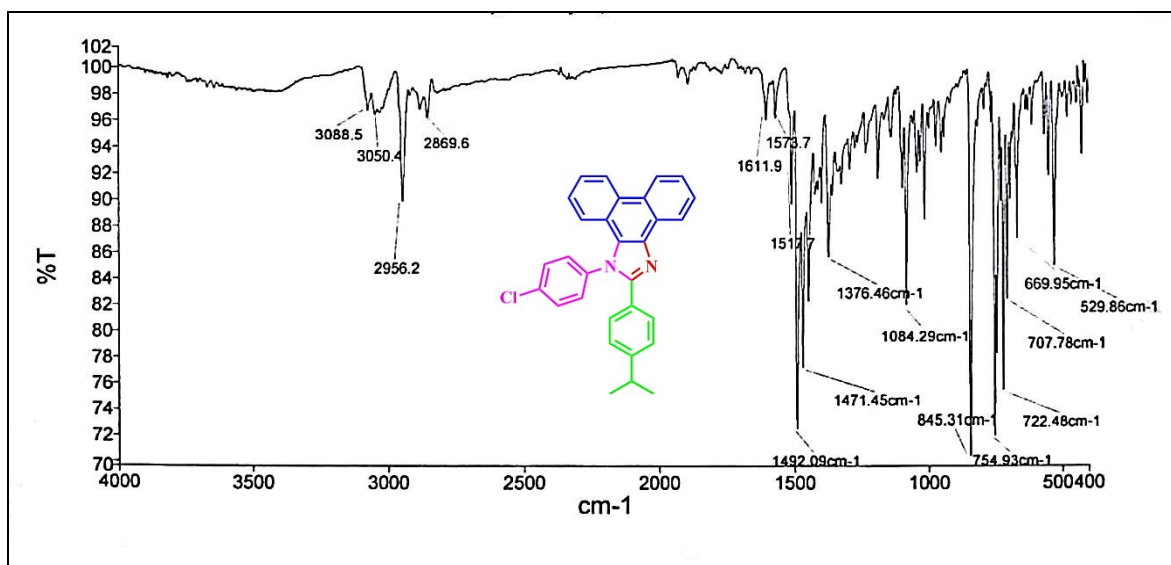
^{13}C NMR spectrum of 2-(3-nitrophenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole (**a1**):



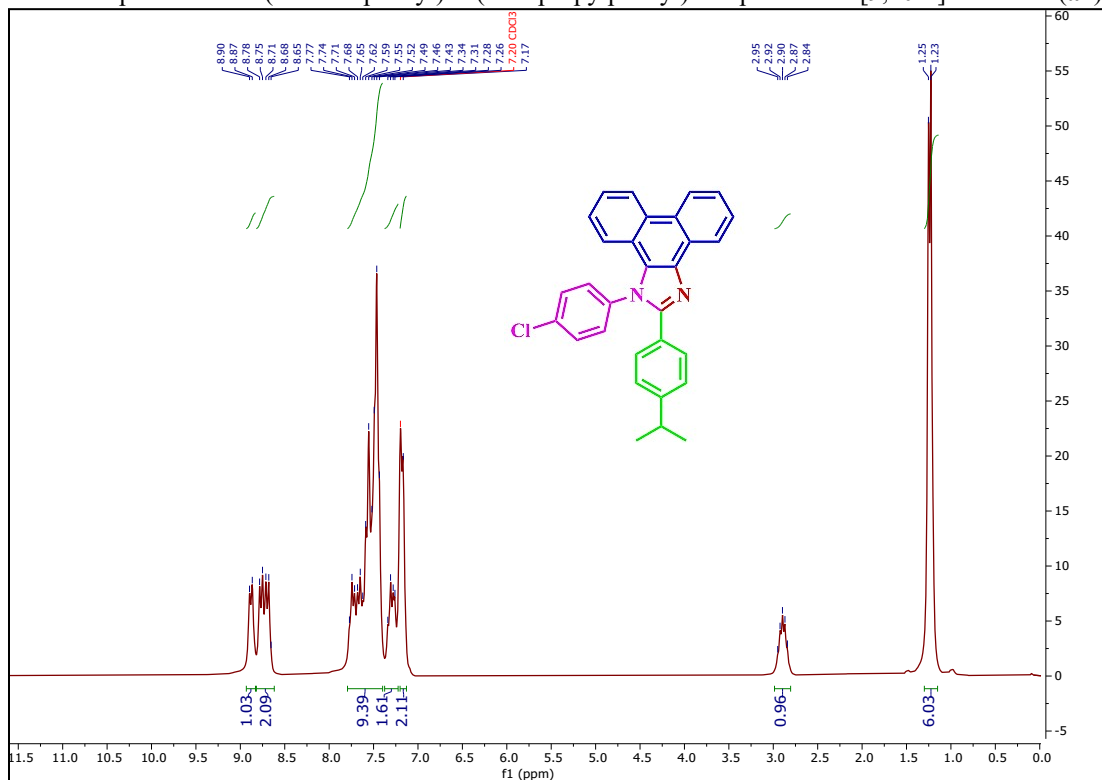
Mass spectrum of 2-(3-nitrophenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole (**a1**):



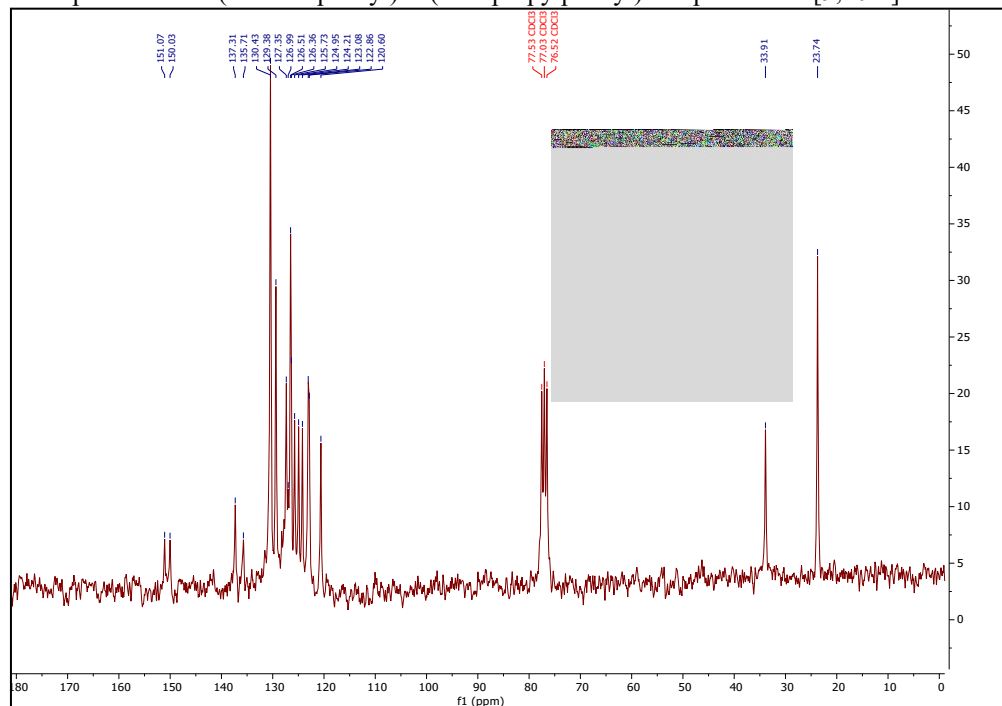
FT-IR spectrum of 1-(4-chlorophenyl)-2-(4-isopropylphenyl)-1H-phenanthro[9,10-d]imidazole (**a2**):



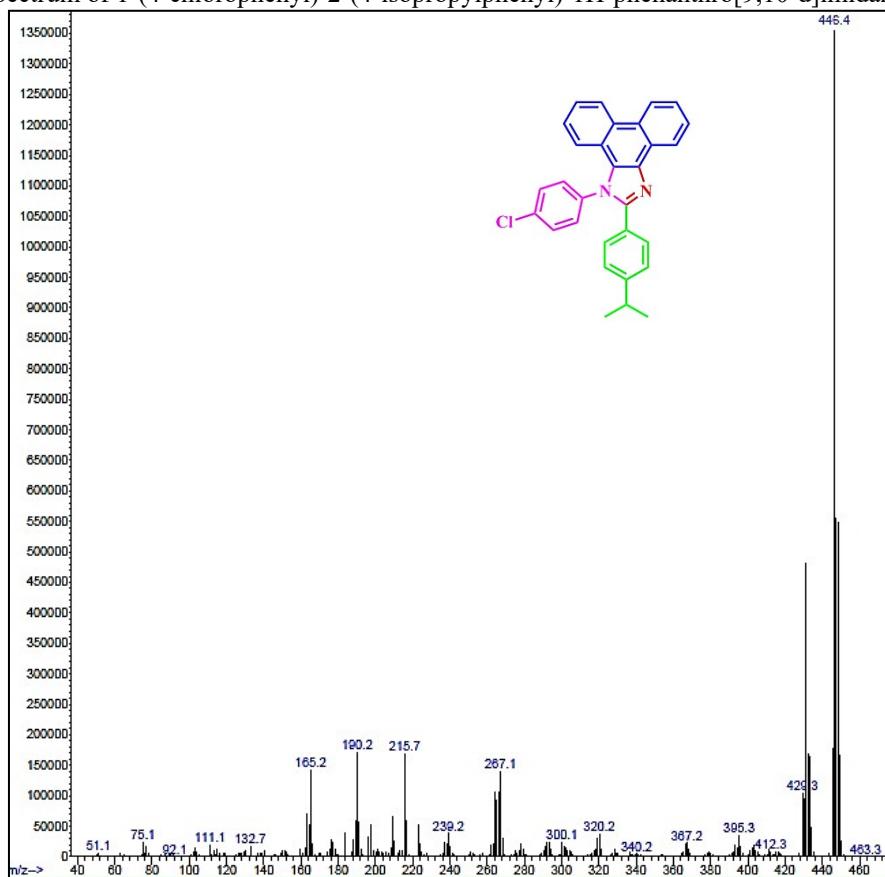
¹H NMR spectrum of 1-(4-chlorophenyl)-2-(4-isopropylphenyl)-1H-phenanthro[9,10-d]imidazole (**a2**):



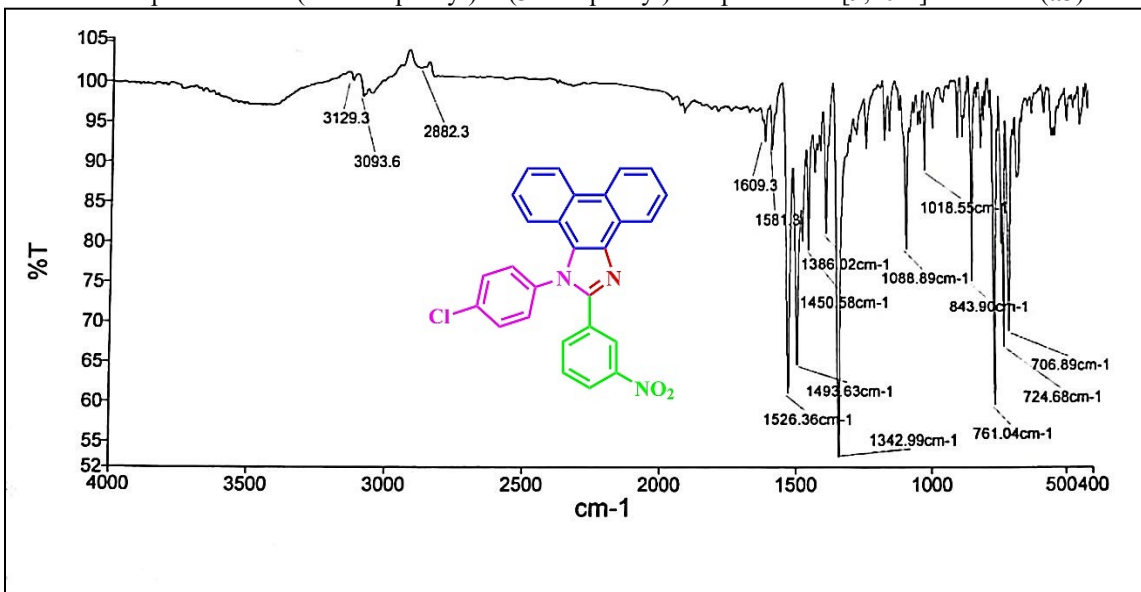
^{13}C NMR spectrum of 1-(4-chlorophenyl)-2-(4-isopropylphenyl)-1H-phenanthro[9,10-d]imidazole (**a2**):



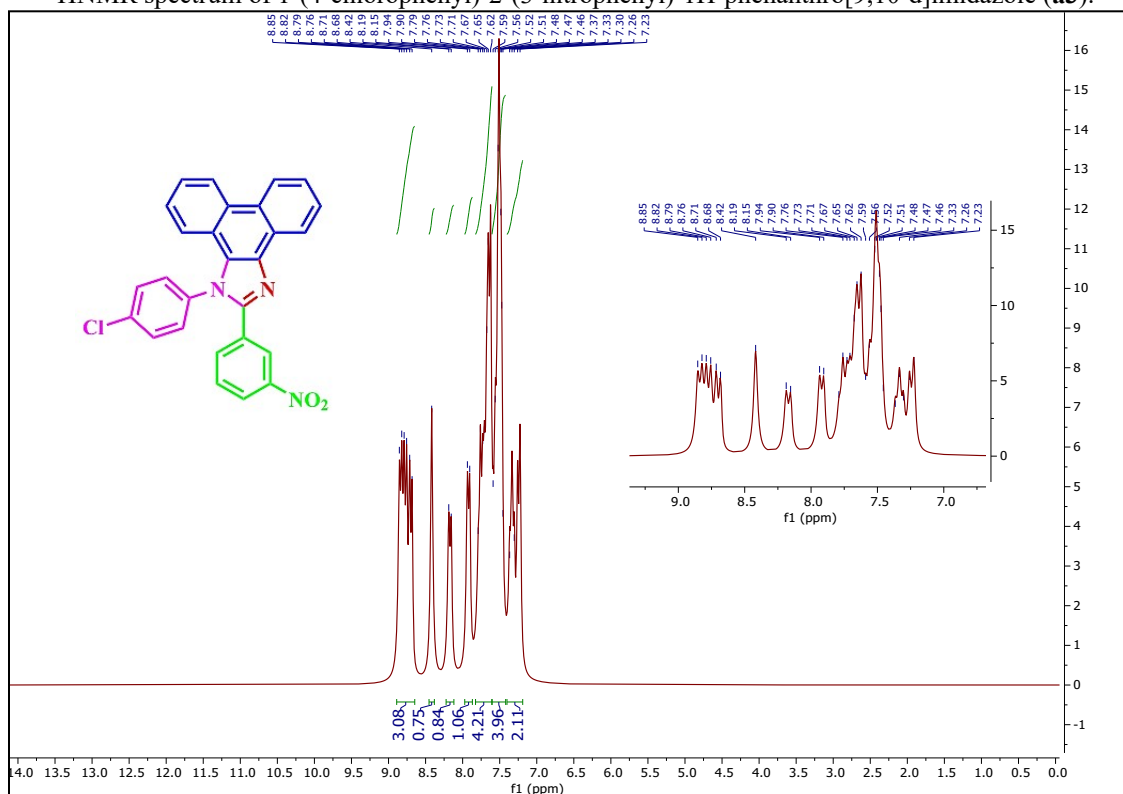
Mass spectrum of 1-(4-chlorophenyl)-2-(4-isopropylphenyl)-1H-phenanthro[9,10-d]imidazole (**a2**):



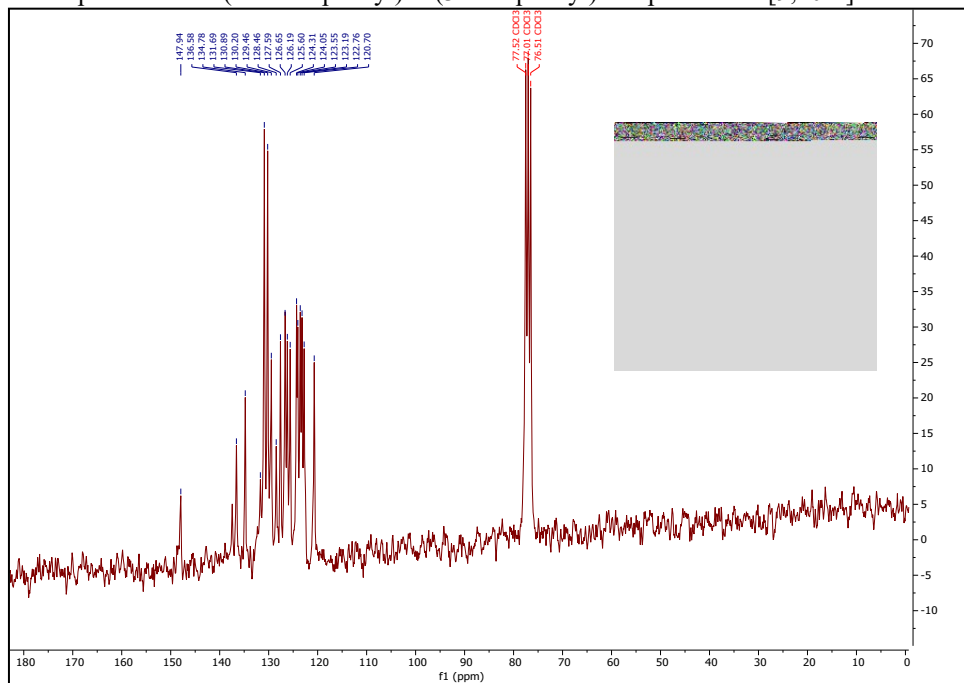
FT-IR spectrum of 1-(4-chlorophenyl)-2-(3-nitrophenyl)-1H-phenanthro[9,10-d]imidazole (**a3**):



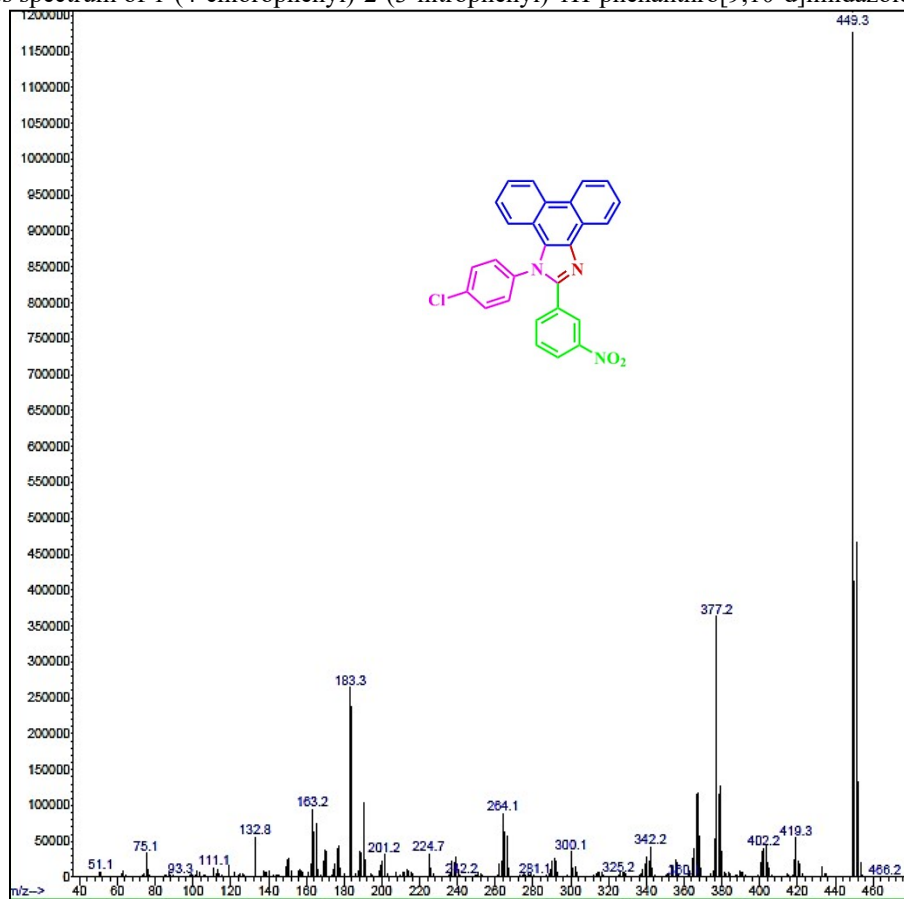
¹HNMR spectrum of 1-(4-chlorophenyl)-2-(3-nitrophenyl)-1H-phenanthro[9,10-d]imidazole (**a3**):



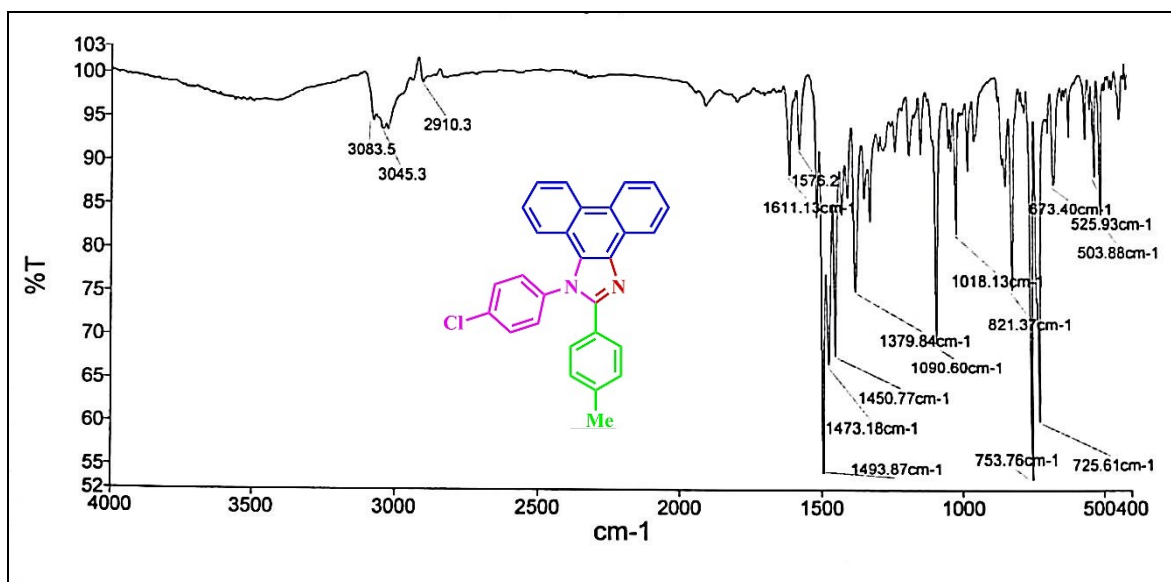
^{13}C NMR spectrum of 1-(4-chlorophenyl)-2-(3-nitrophenyl)-1H-phenanthro[9,10-d]imidazole (**a3**):



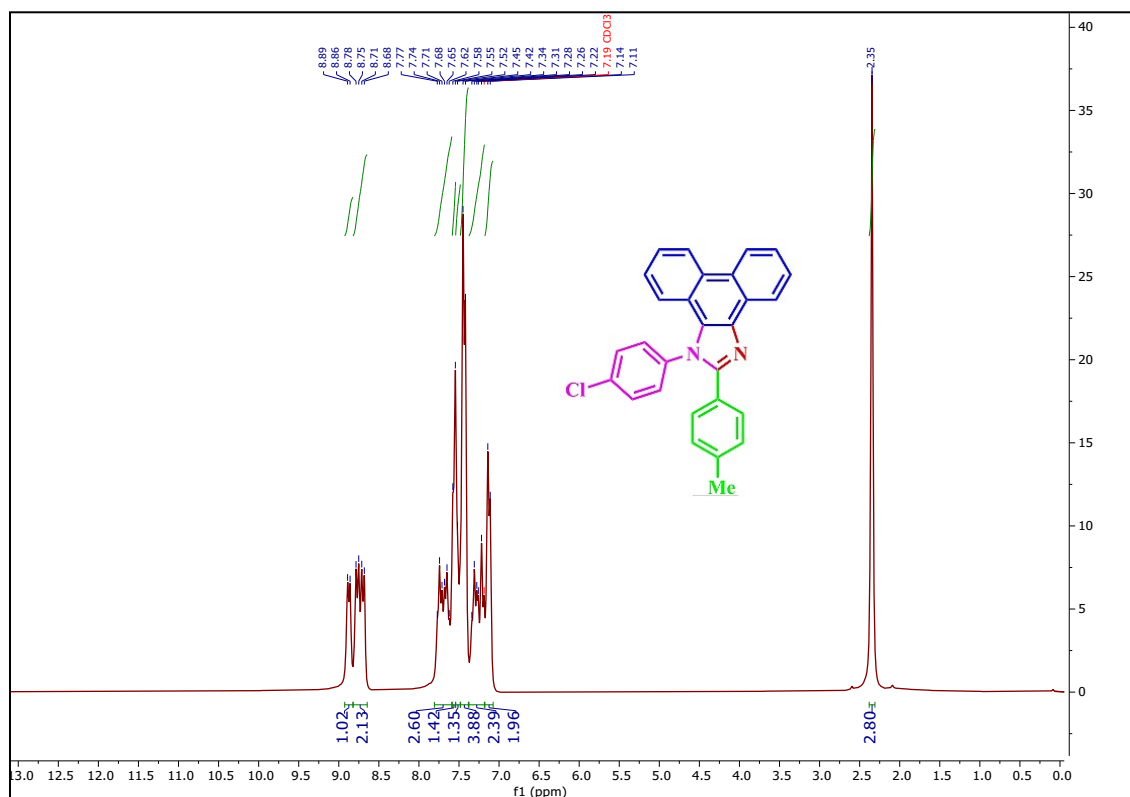
Mass spectrum of 1-(4-chlorophenyl)-2-(3-nitrophenyl)-1H-phenanthro[9,10-d]imidazole (**a3**):



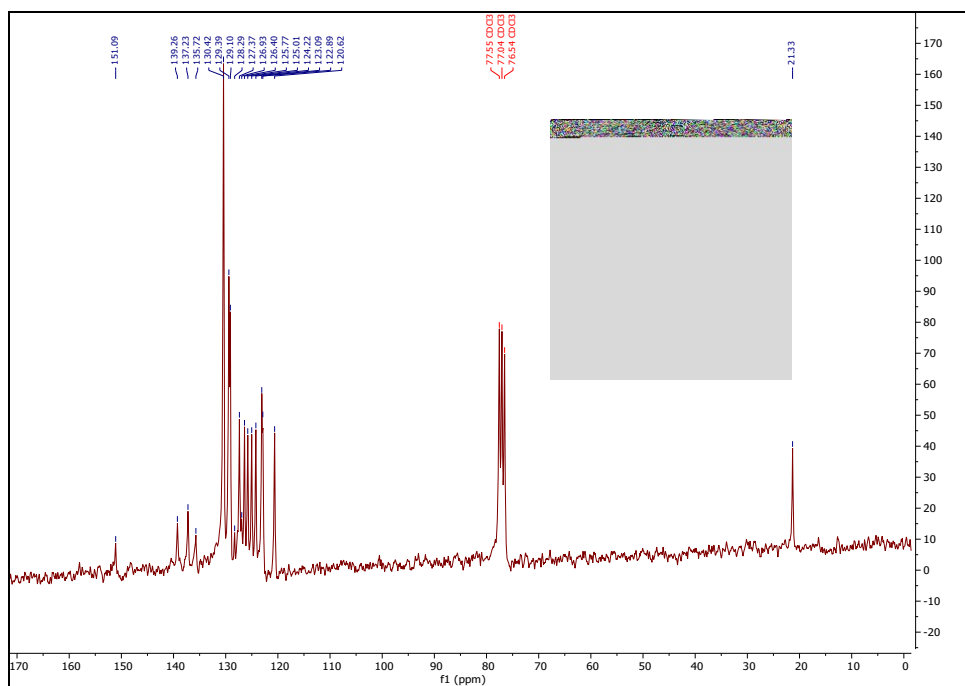
FT-IR spectrum of 1-(4-chlorophenyl)-2-(p-tolyl)-1H-phenanthro[9,10-d]imidazole (**a4**):



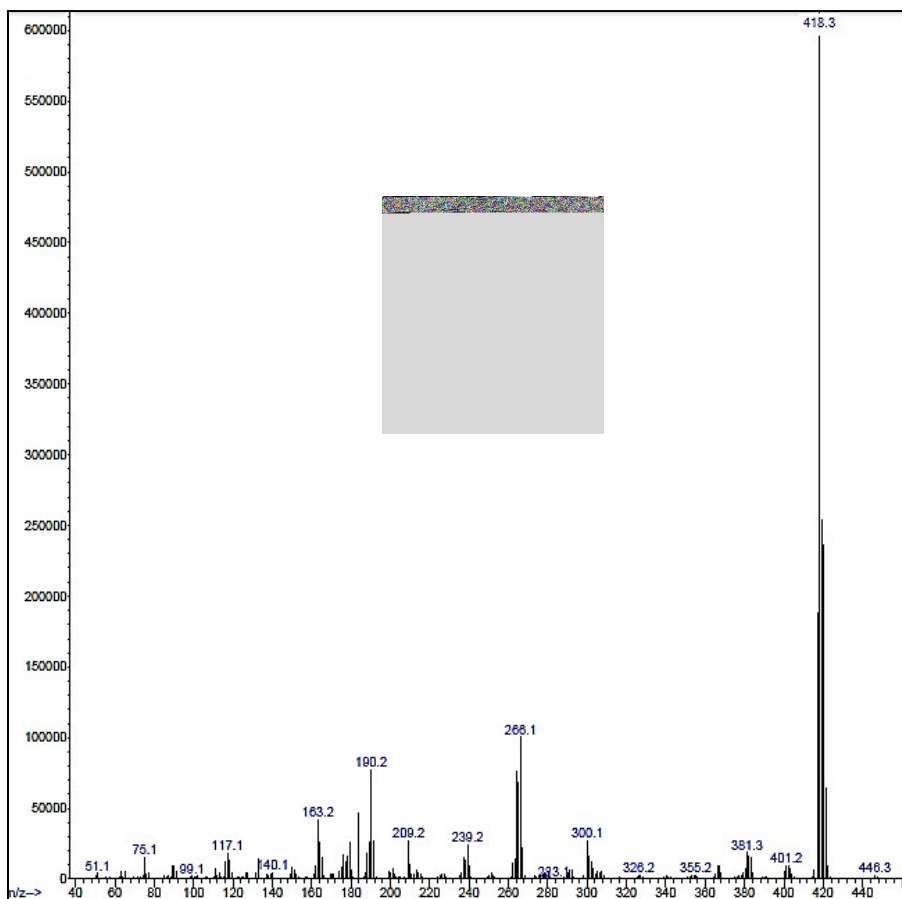
¹H NMR spectrum of 1-(4-chlorophenyl)-2-(p-tolyl)-1H-phenanthro[9,10-d]imidazole (**a4**):



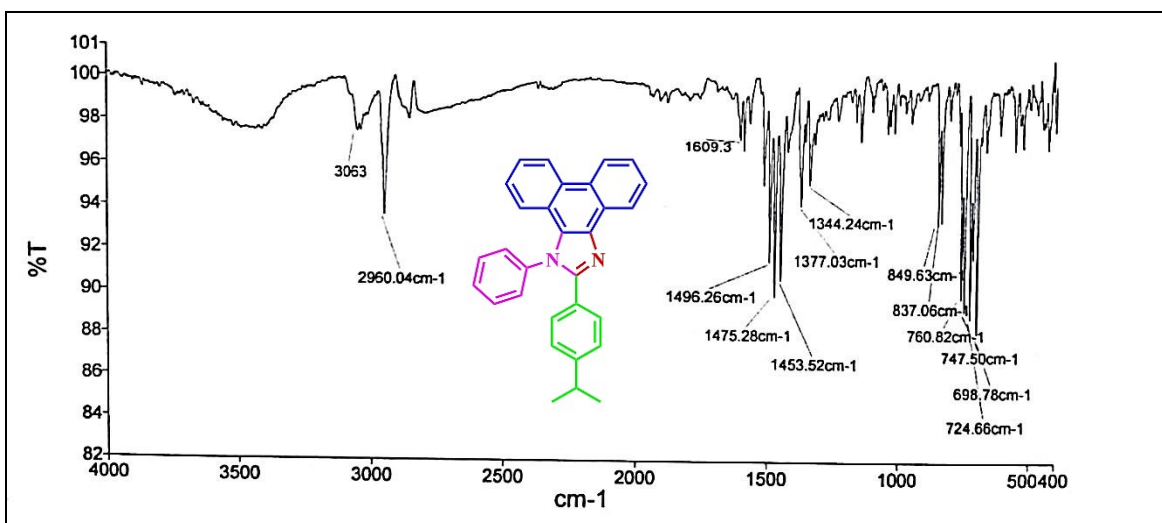
^{13}C NMR spectrum of 1-(4-chlorophenyl)-2-(p-tolyl)-1H-phenanthro[9,10-d]imidazole (**a4**):



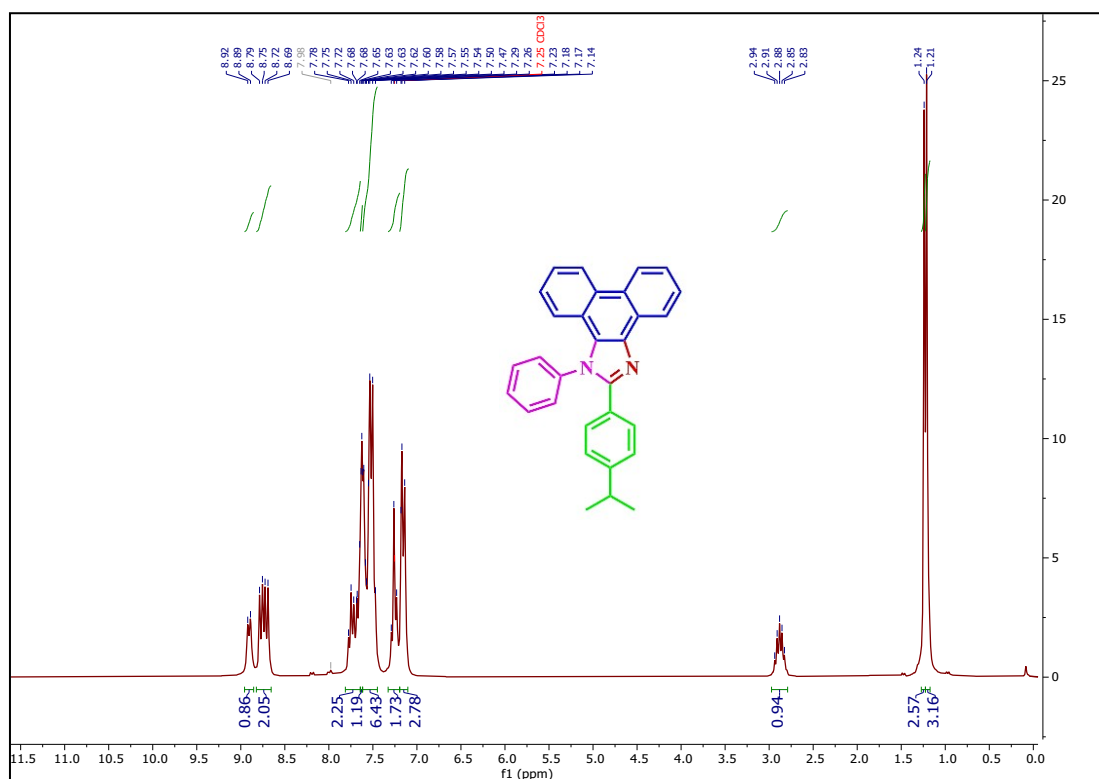
Mass spectrum of 1-(4-chlorophenyl)-2-(p-tolyl)-1H-phenanthro[9,10-d]imidazole (**a4**):



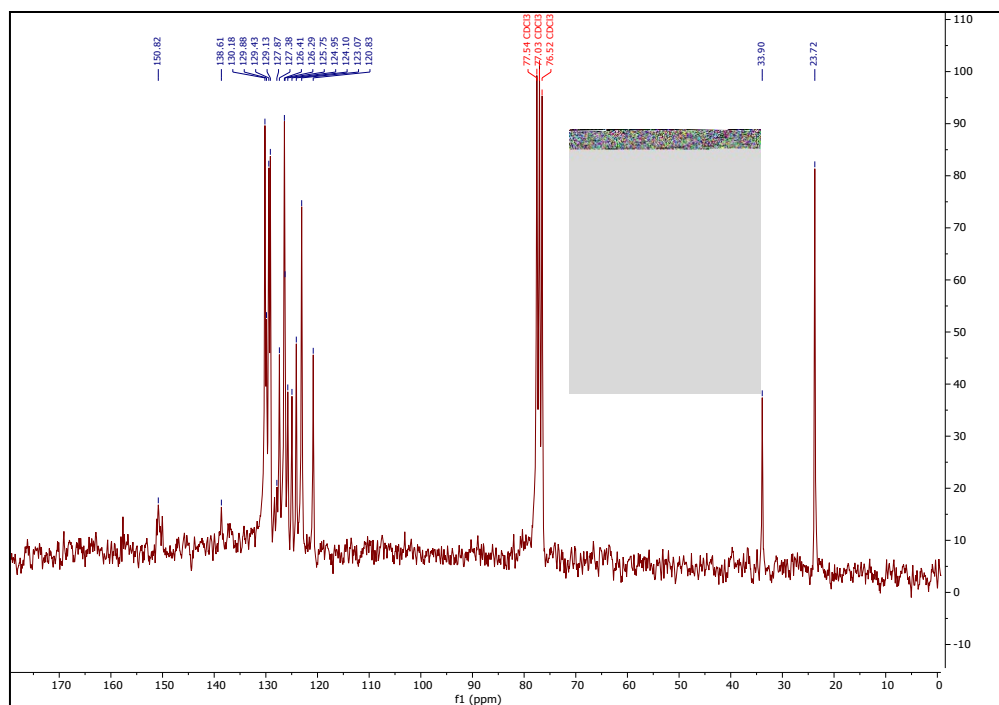
FT-IR spectrum of 2-(4-isopropylphenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole (**a5**):



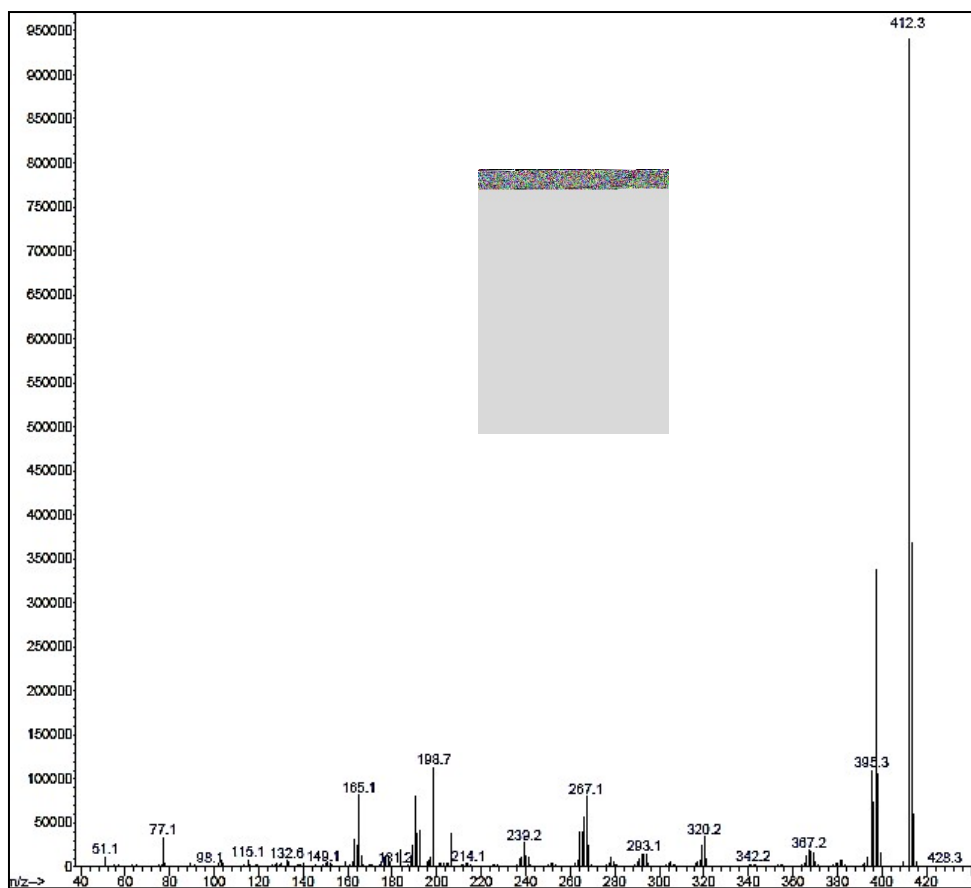
^1H NMR spectrum of 2-(4-isopropylphenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole (**a5**):



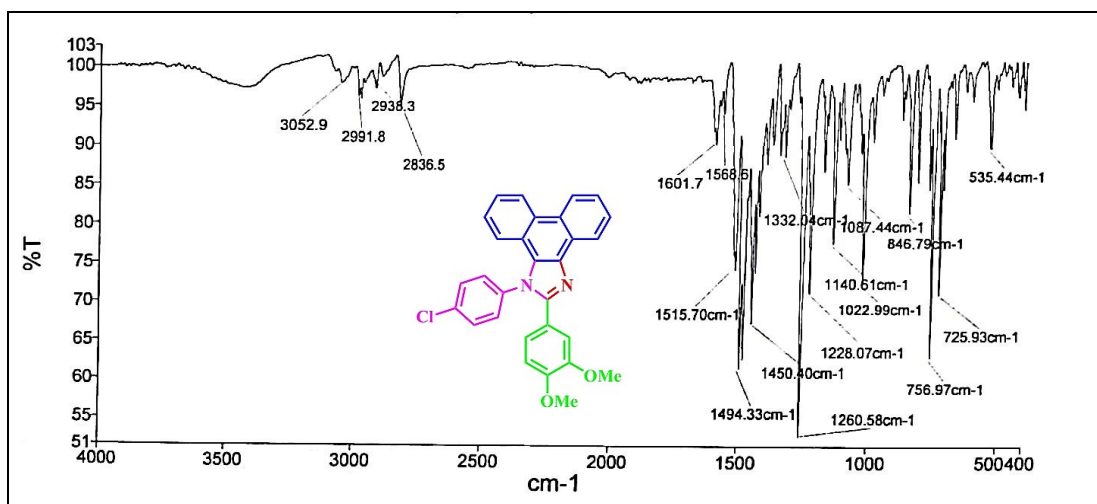
¹³CNMR spectrum of 2-(4-isopropylphenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole (**a5**):



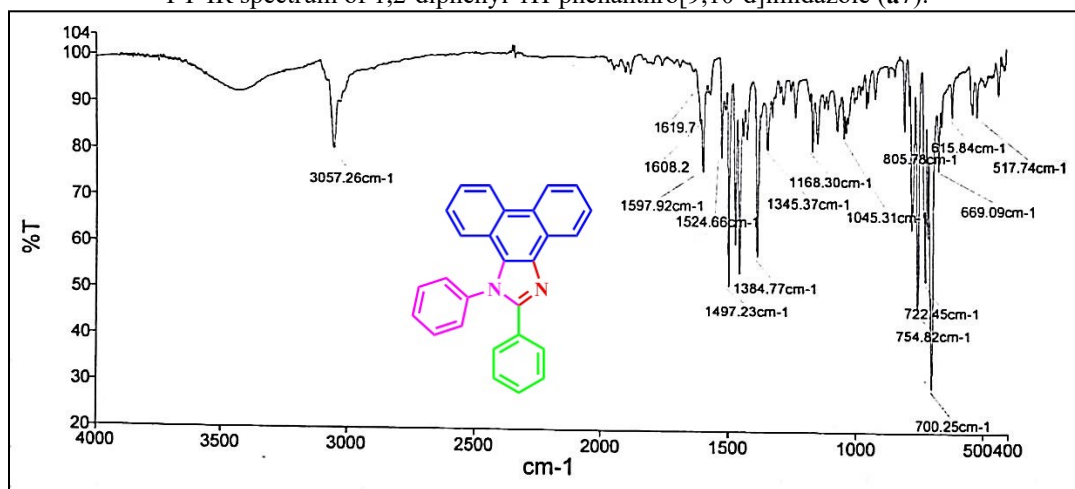
Mass spectrum of 2-(4-isopropylphenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole (**a5**):



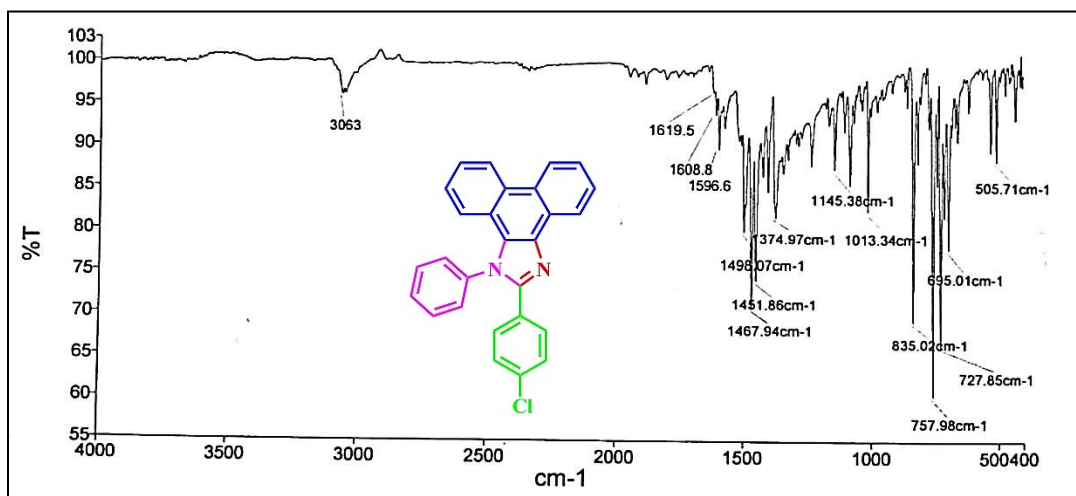
FT-IR spectrum of 1-(4-chlorophenyl)-2-(3,4-dimethoxyphenyl)-1H-phenanthro[9,10-d]imidazole (**a6**):



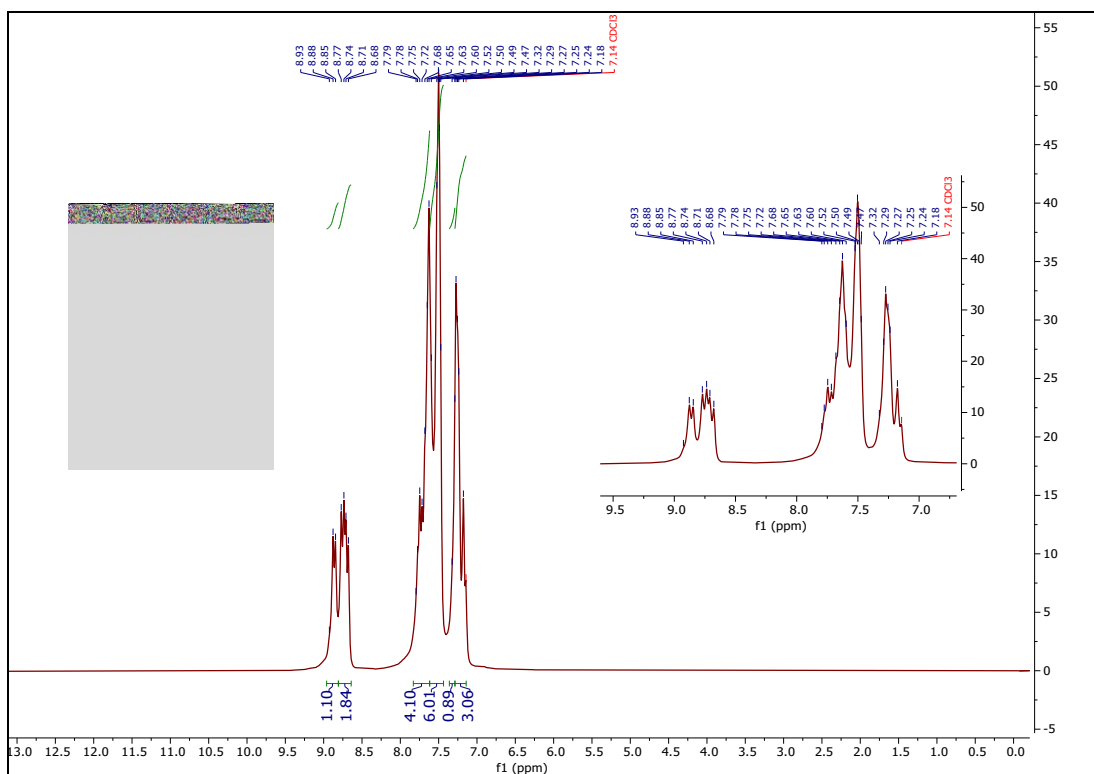
FT-IR spectrum of 1,2-diphenyl-1H-phenanthro[9,10-d]imidazole (**a7**):



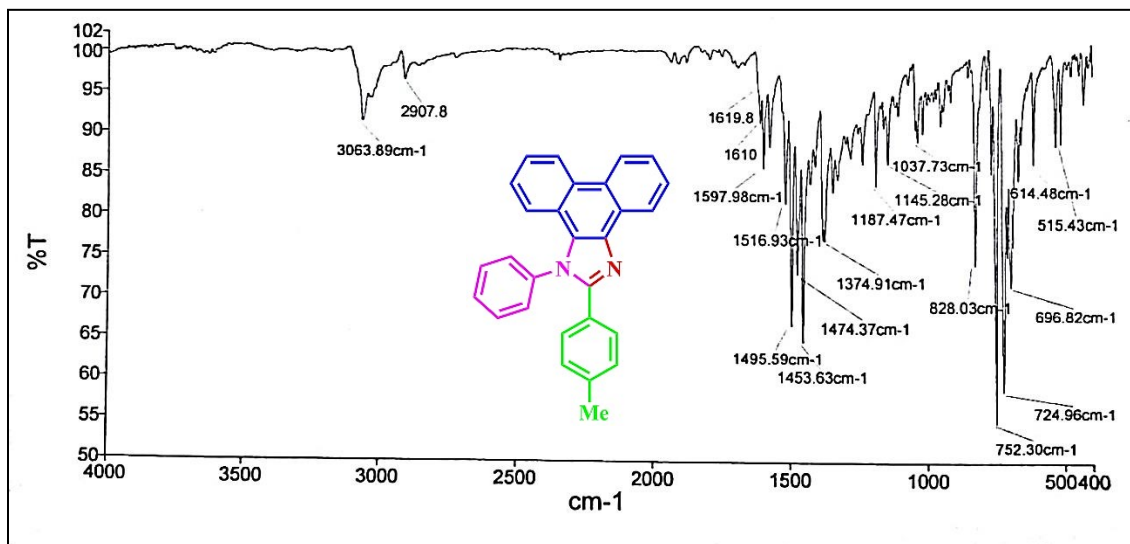
FT-IR spectrum of 2-(4-chlorophenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole (**a8**):



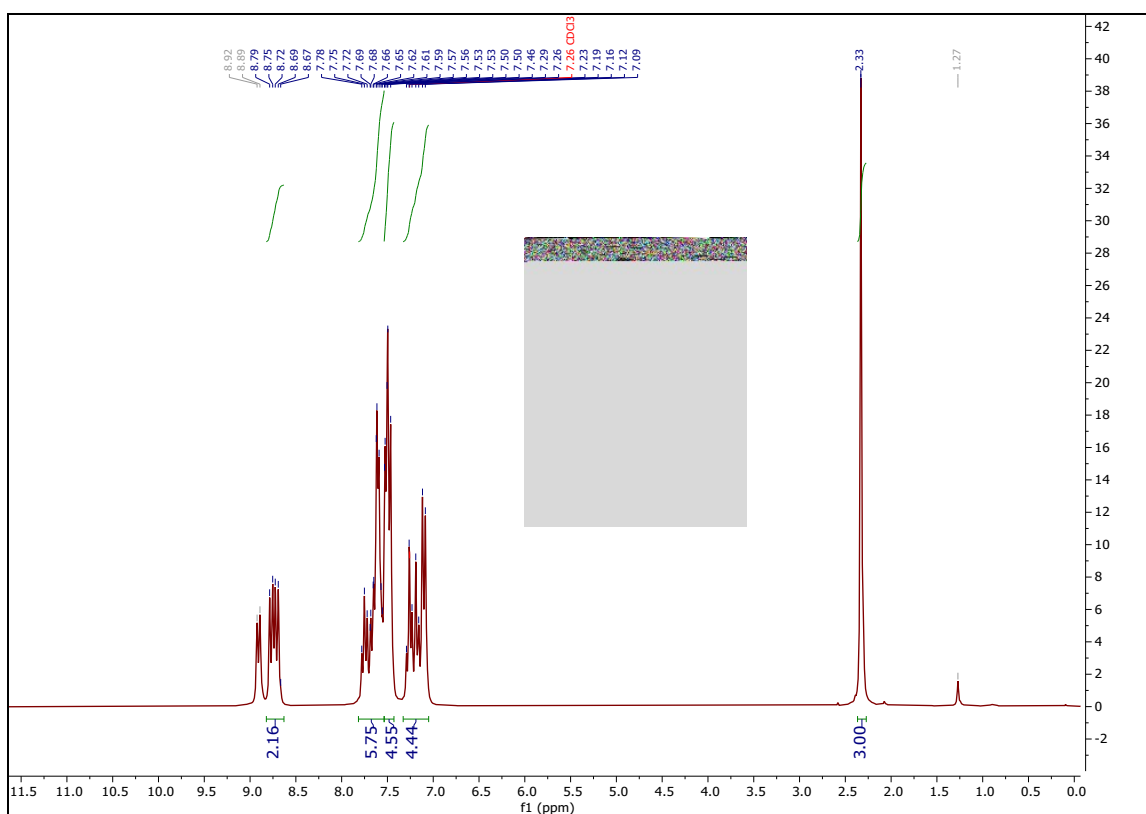
¹HNMR spectrum of 2-(4-chlorophenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole (**a8**):



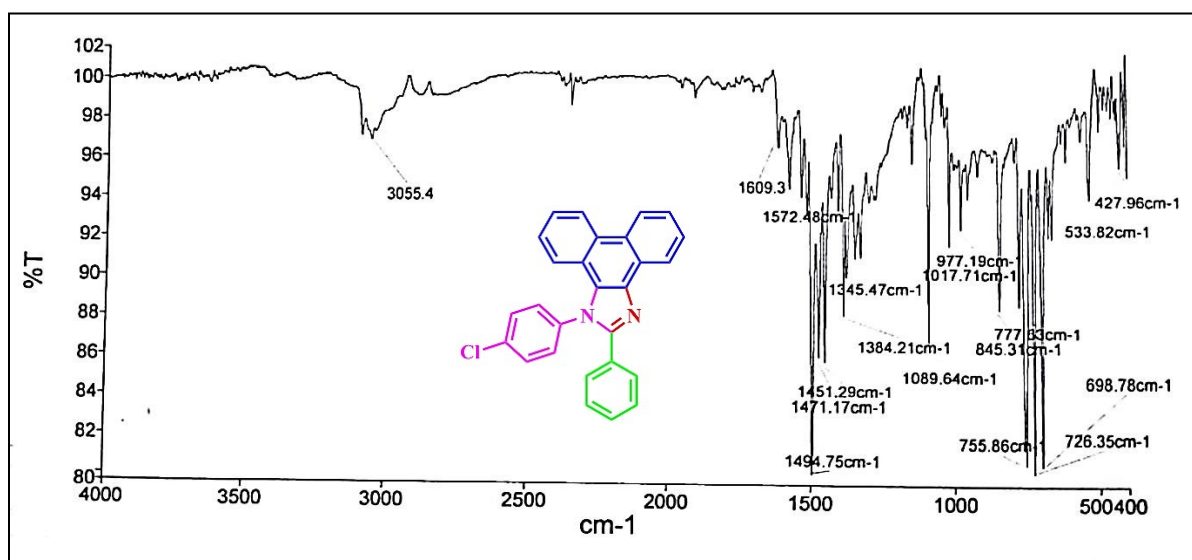
FT-IR spectrum of 1-phenyl-2-(p-tolyl)-1H-phenanthro[9,10-d]imidazole (**a9**):



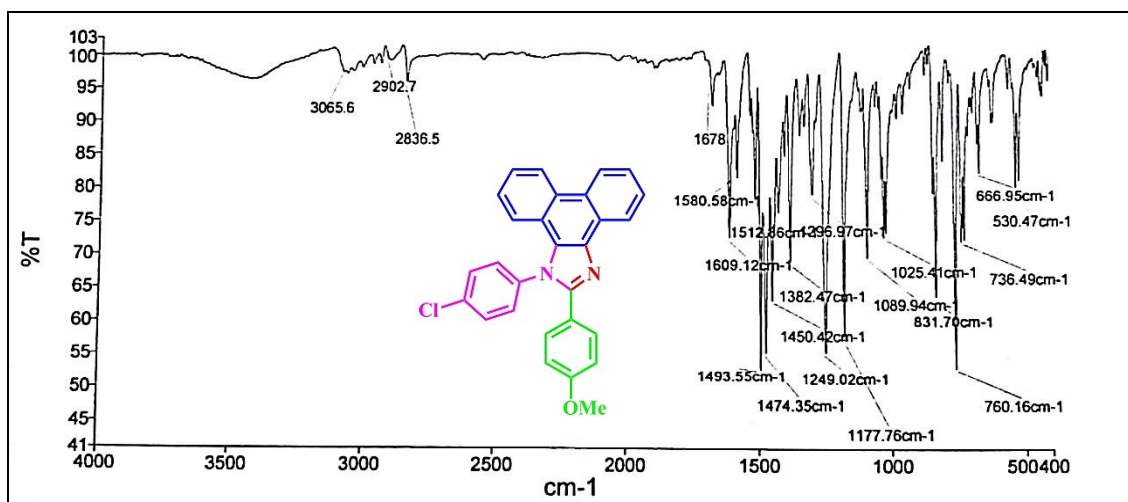
^1H NMR spectrum of 1-phenyl-2-(p-tolyl)-1H-phenanthro[9,10-d]imidazole (**a9**):



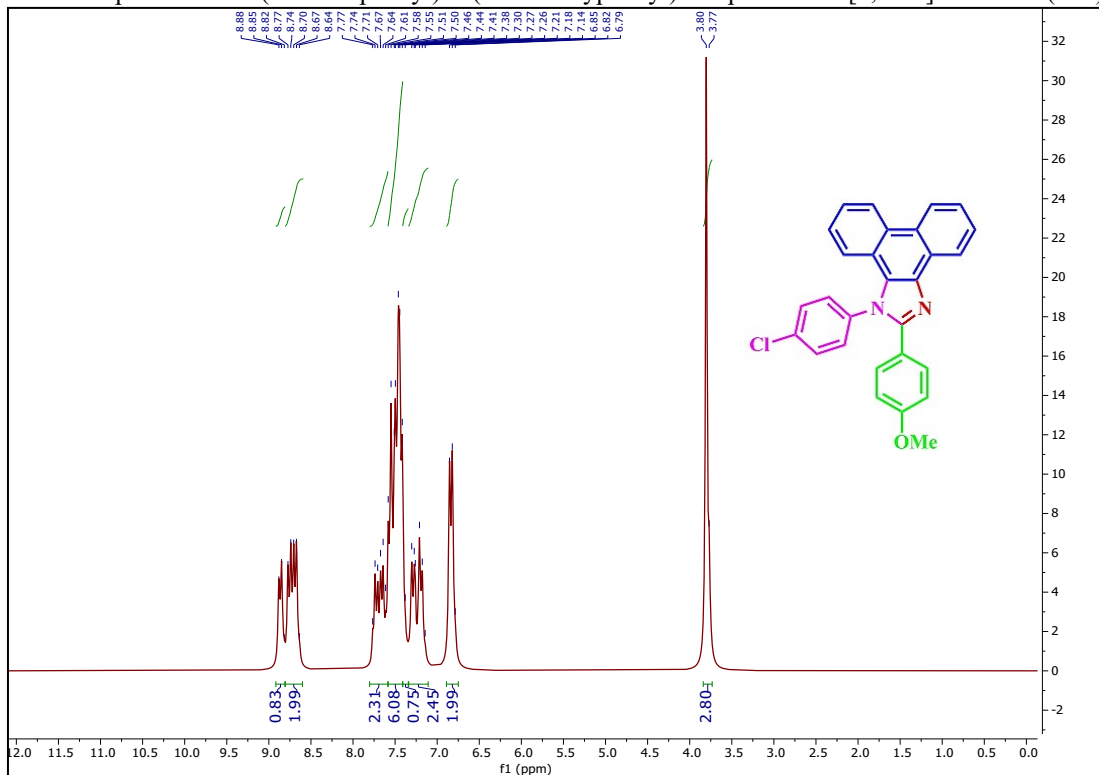
FT-IR spectrum of 1-(4-chlorophenyl)-2-phenyl-1H-phenanthro[9,10-d]imidazole (**a10**):



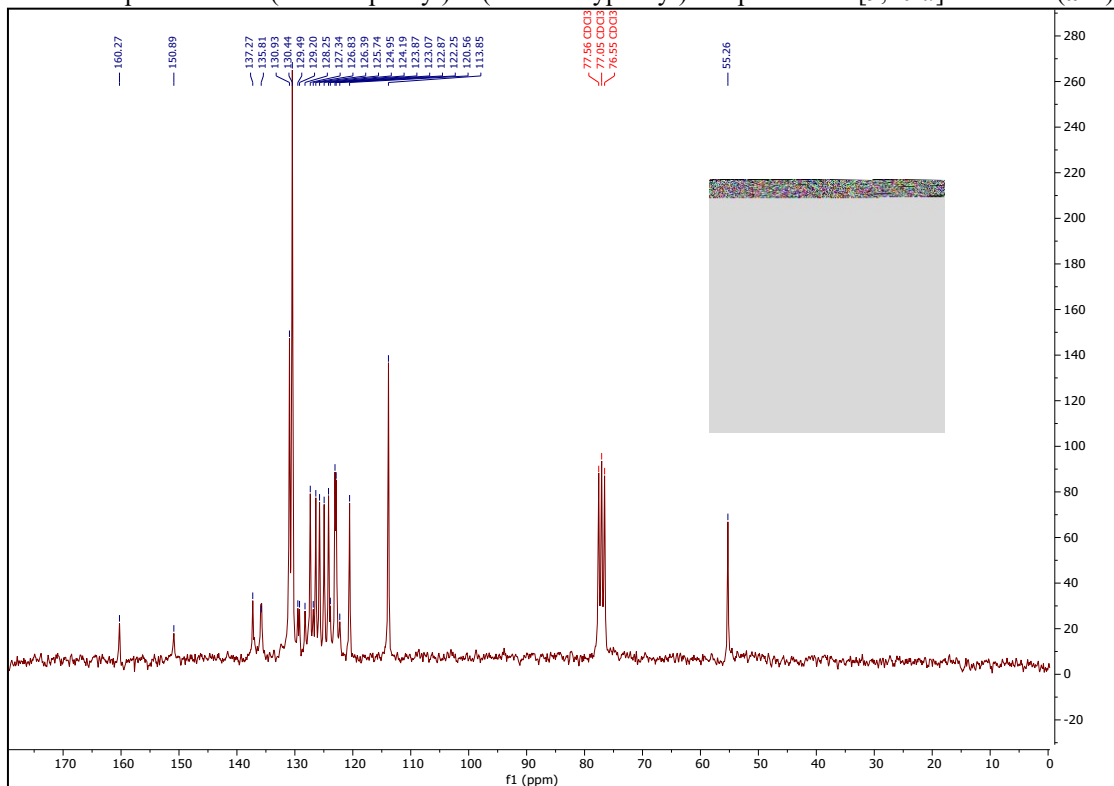
FT-IR spectrum of 1-(4-chlorophenyl)-2-(4-methoxyphenyl)-1H-phenanthro[9,10-d]imidazole (**a11**):



¹H NMR spectrum of 1-(4-chlorophenyl)-2-(4-methoxyphenyl)-1H-phenanthro[9,10-d]imidazole (**a11**):



¹³CNMR spectrum of 1-(4-chlorophenyl)-2-(4-methoxyphenyl)-1*H*-phenanthro[9,10-*d*]imidazole (**a11**):



FT-IR spectrum of 4-(1-(4-chlorophenyl)-1*H*-phenanthro[9,10-*d*]imidazol-2-yl)-*N,N*-dimethylaniline (**a12**):

