Supplementary Information

Design and development of sulfenylated 5-aminopyrazoles as the inhibitors of acetylcholinesterase and butyrylcholinesterase: Exploring the implication on $A\beta_{1-42}$ aggregation inhibition in Alzheimer's disease

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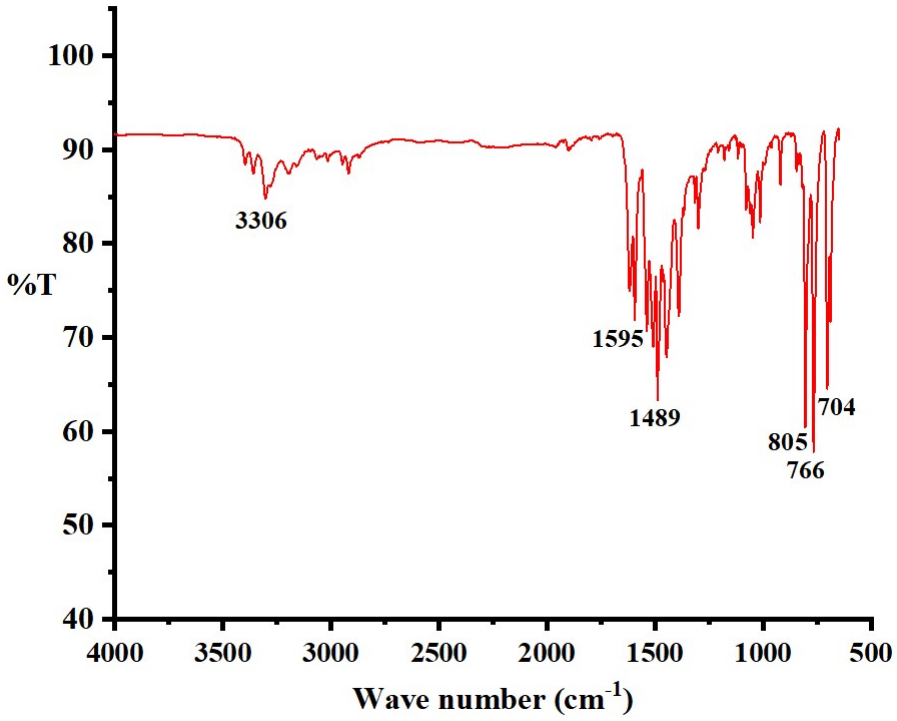


Figure S 1: FT-IR of *3-methyl-1-phenyl-4-(p-tolylthio)-1H-pyrazol-5-amine* **(3a)**

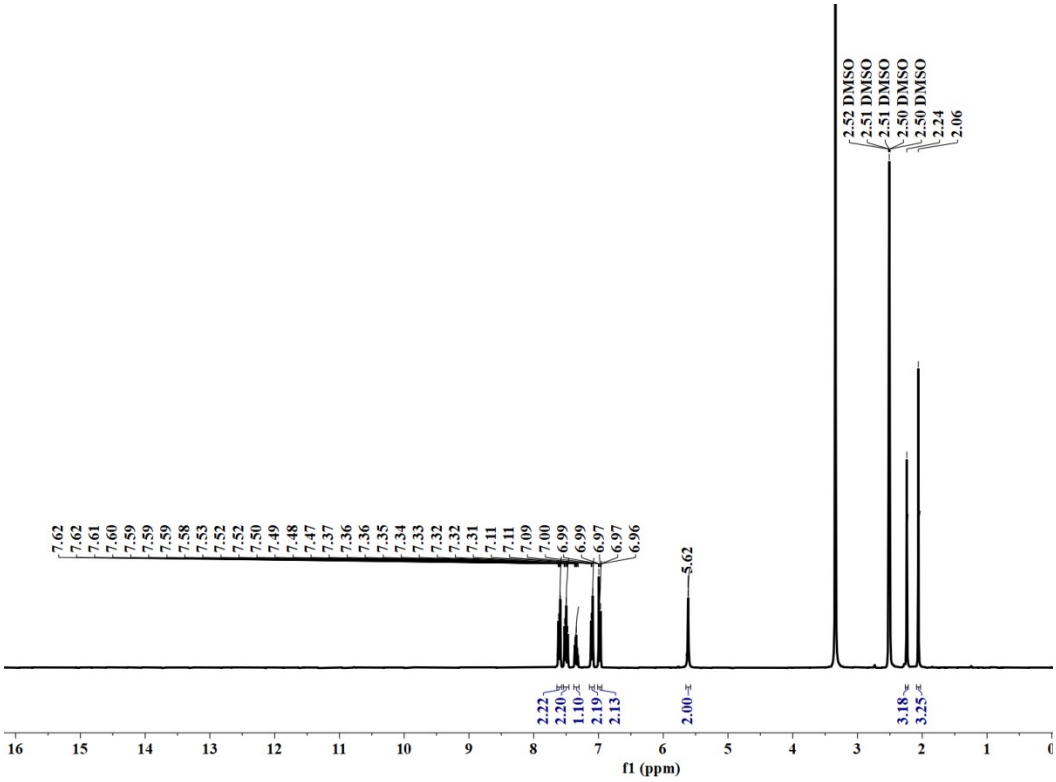


Figure S 2: [1]H NMR of *3-methyl-1-phenyl-4-(p-tolylthio)-1H-pyrazol-5-amine* **(3a)**

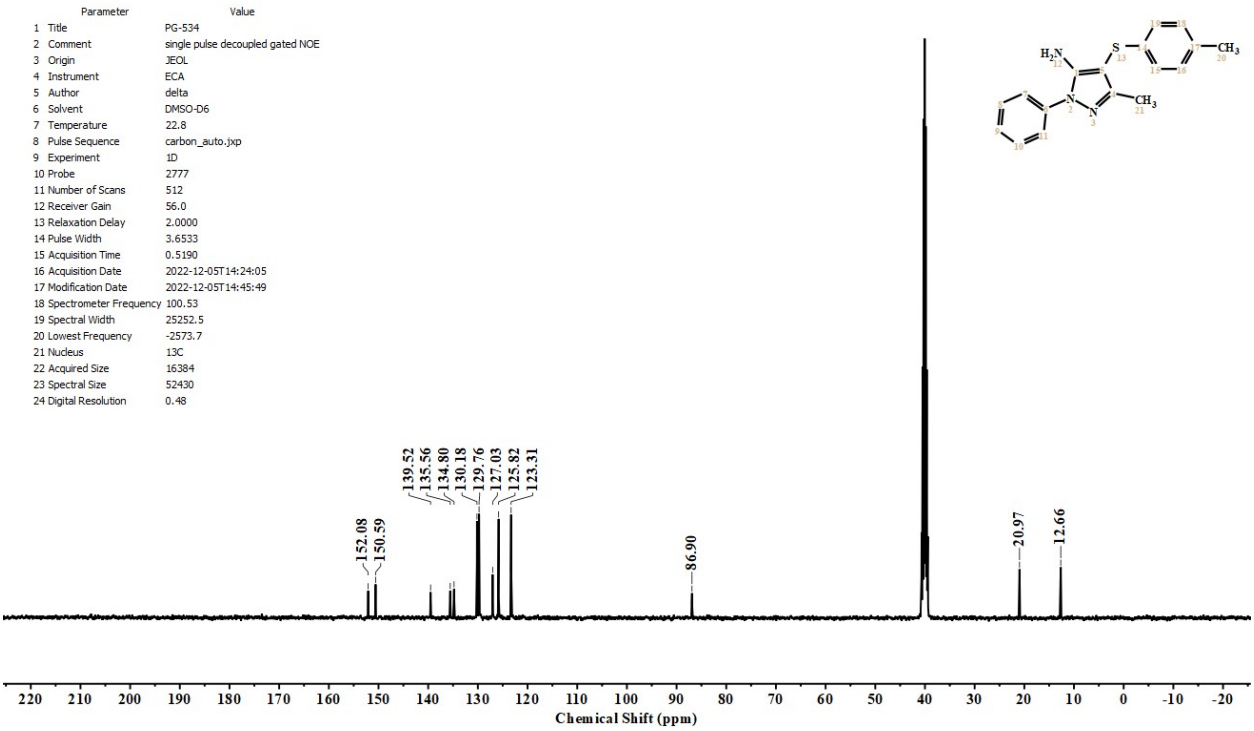


Figure S 3: ^{13}C NMR of *3-methyl-1-phenyl-4-(p-tolylthio)-1H-pyrazol-5-amine* **(3a)**

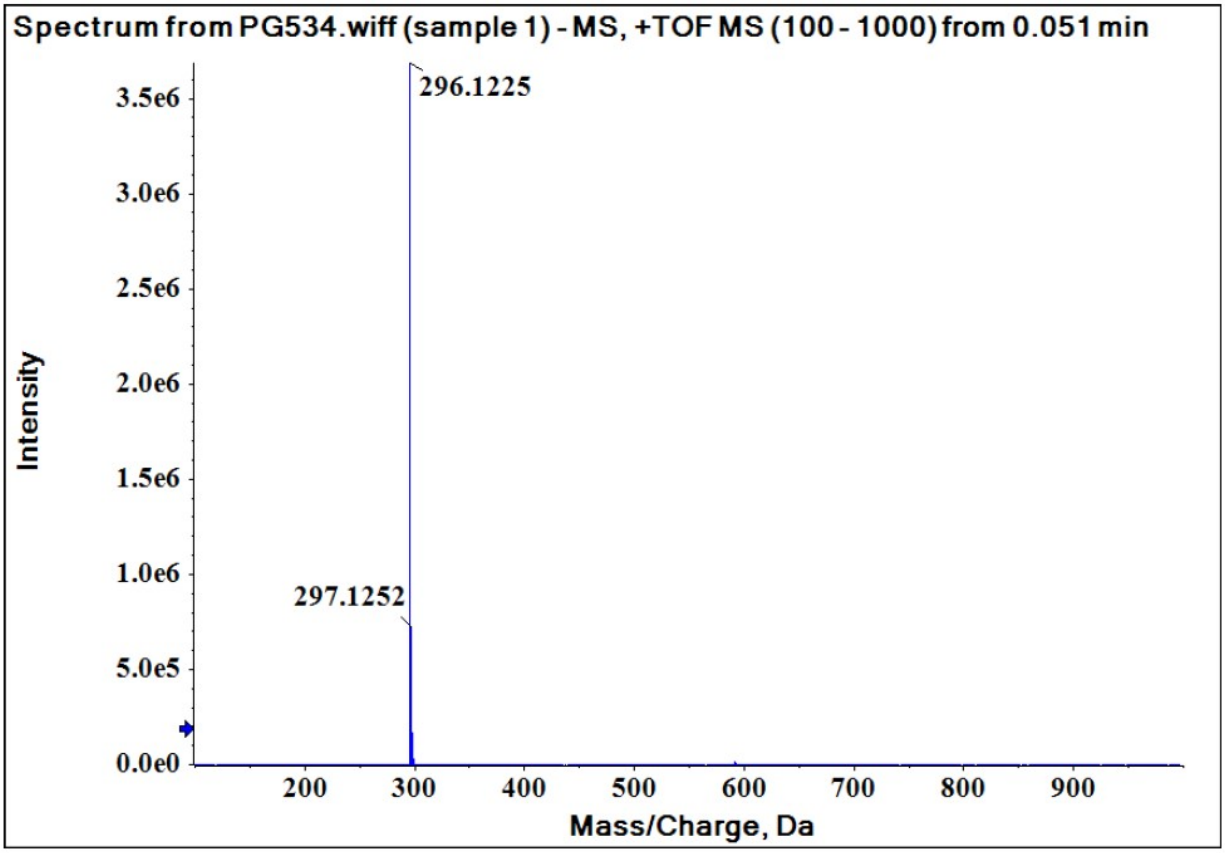


Figure S 4: Mass spectrometry of *3-methyl-1-phenyl-4-(p-tolylthio)-1H-pyrazol-5-amine* **(3a)**

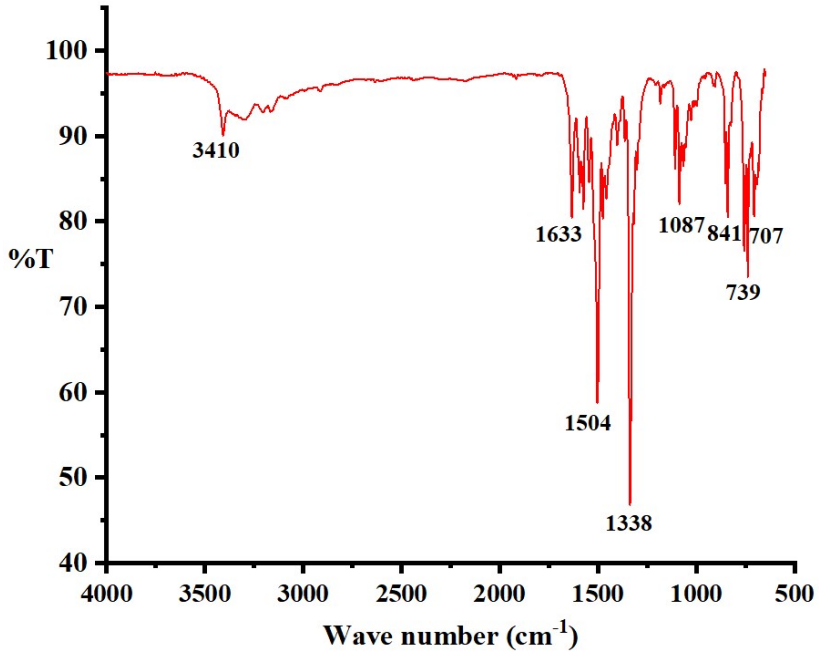


Figure S 5: FT-IR of 3-methyl-4-((4-nitrophenyl)thio)-1-phenyl-1*H*-pyrazol-5-amine **(3b)**

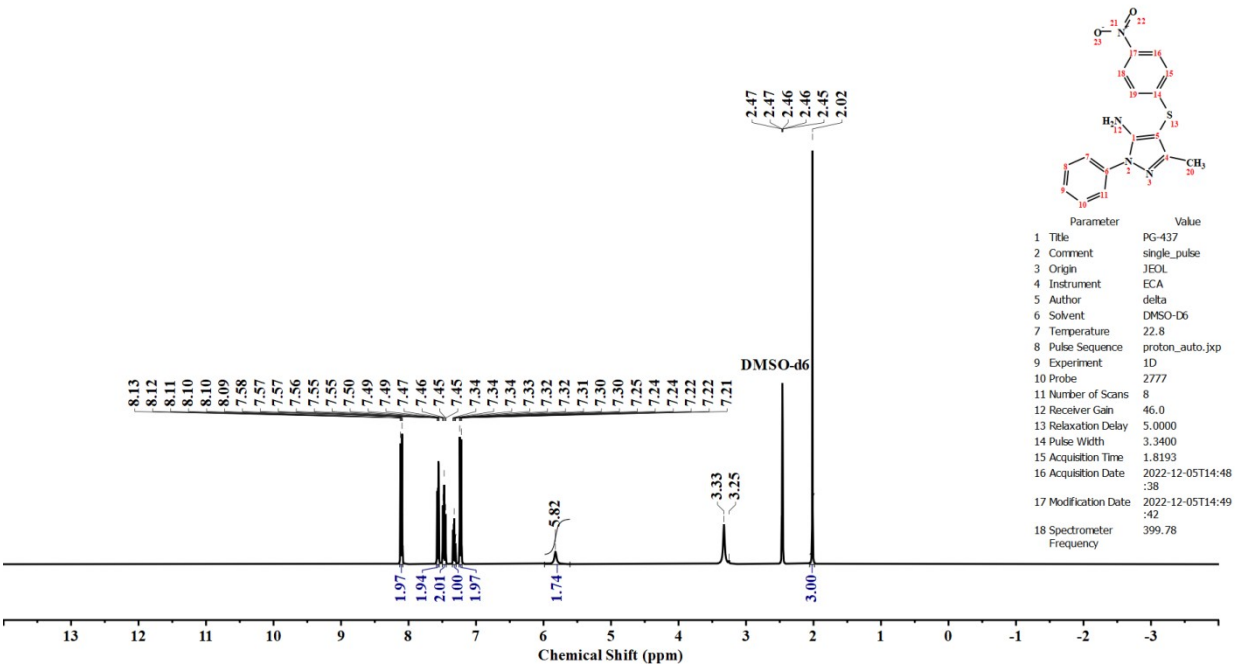


Figure S 6: [1]H NMR of 3-methyl-4-((4-nitrophenyl)thio)-1-phenyl-1*H*-pyrazol-5-amine **(3b)**

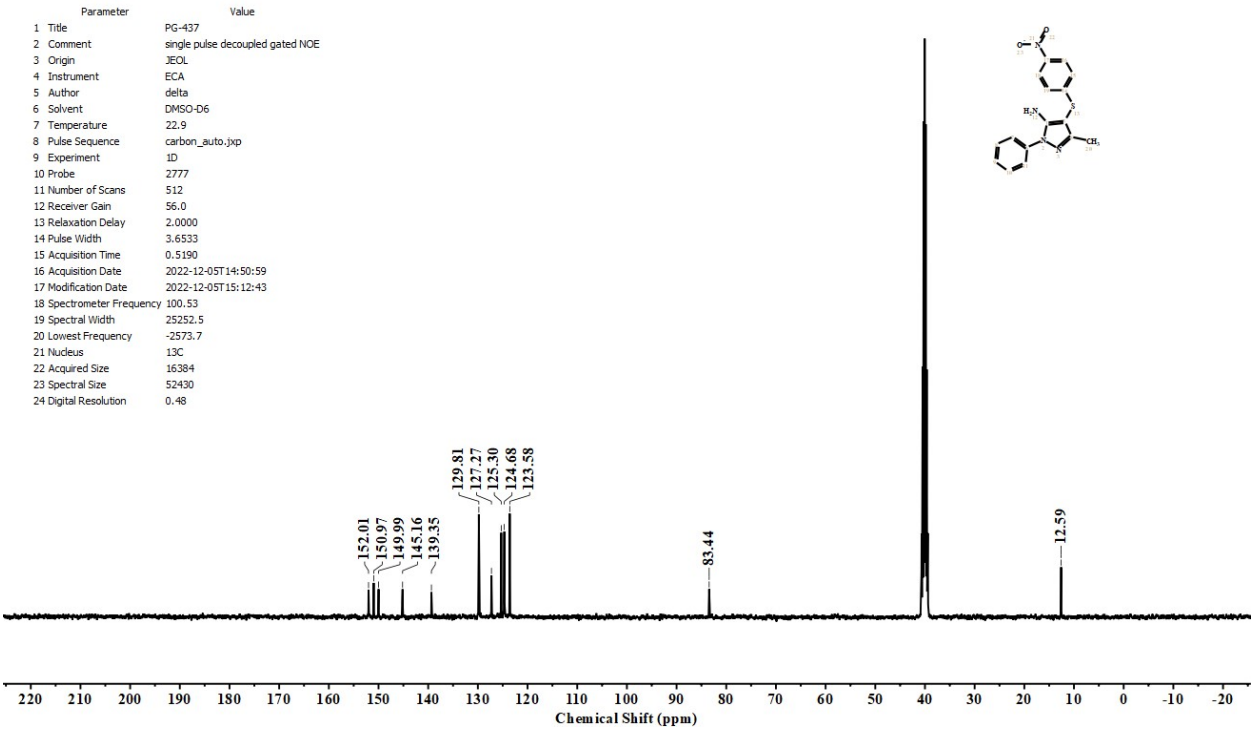


Figure S 7: ^{13}C NMR of 3-methyl-4-((4-nitrophenyl)thio)-1-phenyl-1*H*-pyrazol-5-amine **(3b)**

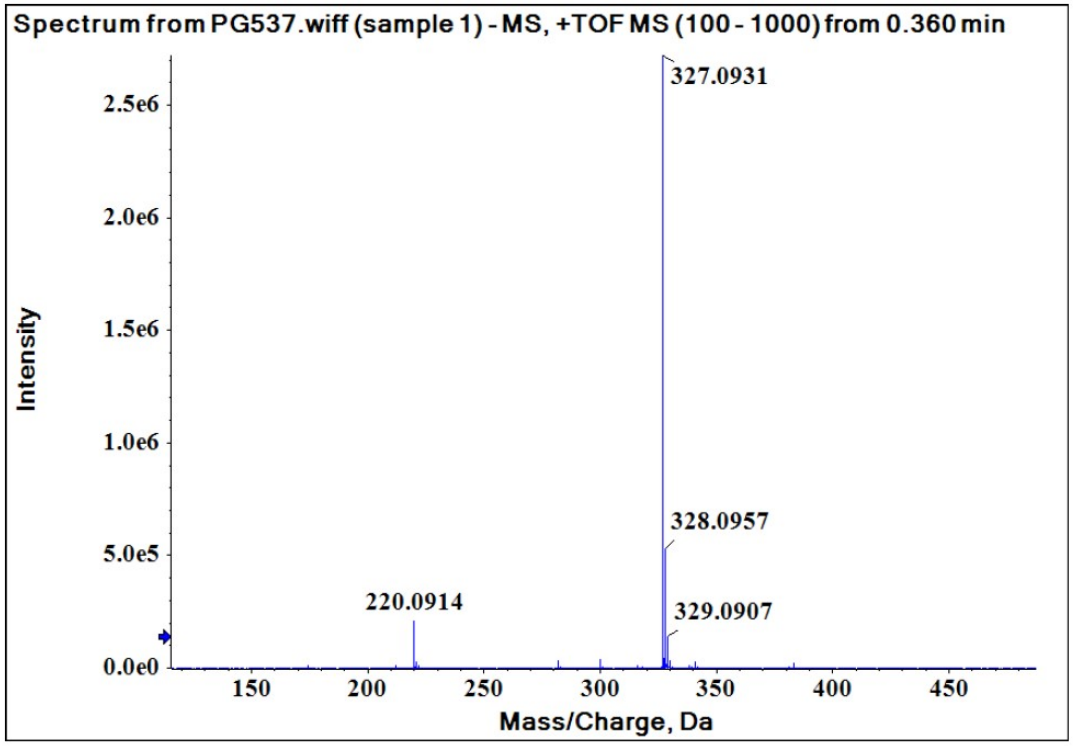


Figure S 8: Mass spectrometry of 3-methyl-4-((4-nitrophenyl)thio)-1-phenyl-1*H*-pyrazol-5-amine **(3b)**

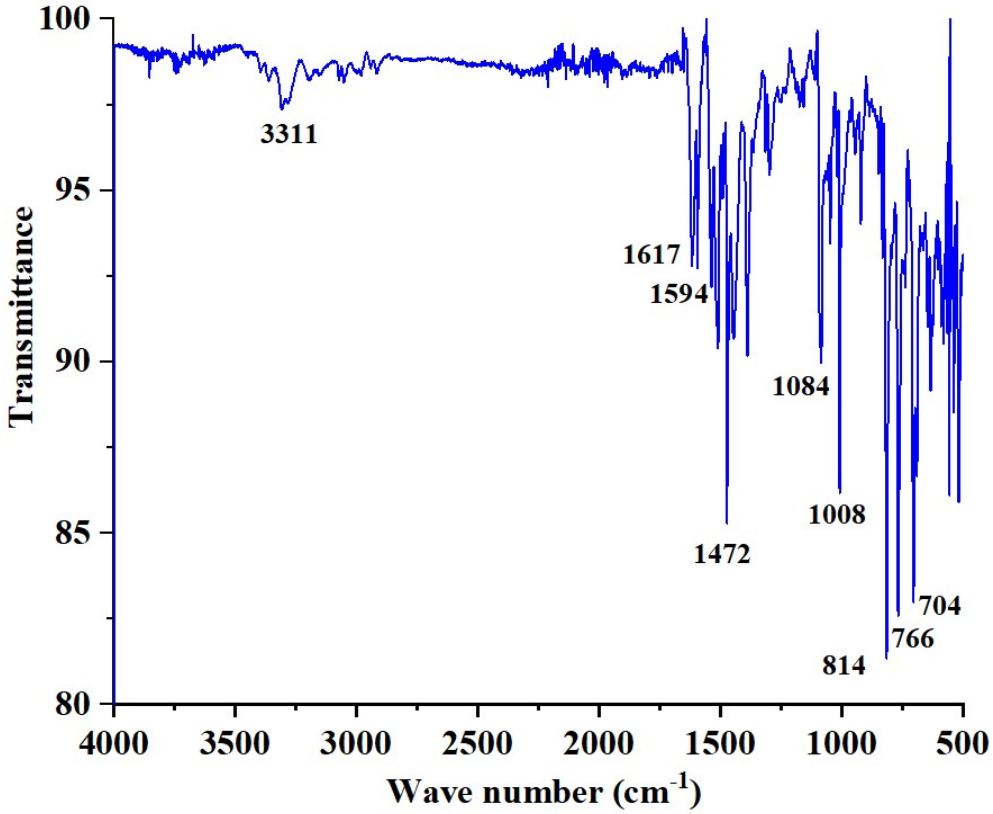


Figure S 9: FT-IR of 4-((4-chlorophenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3c)**

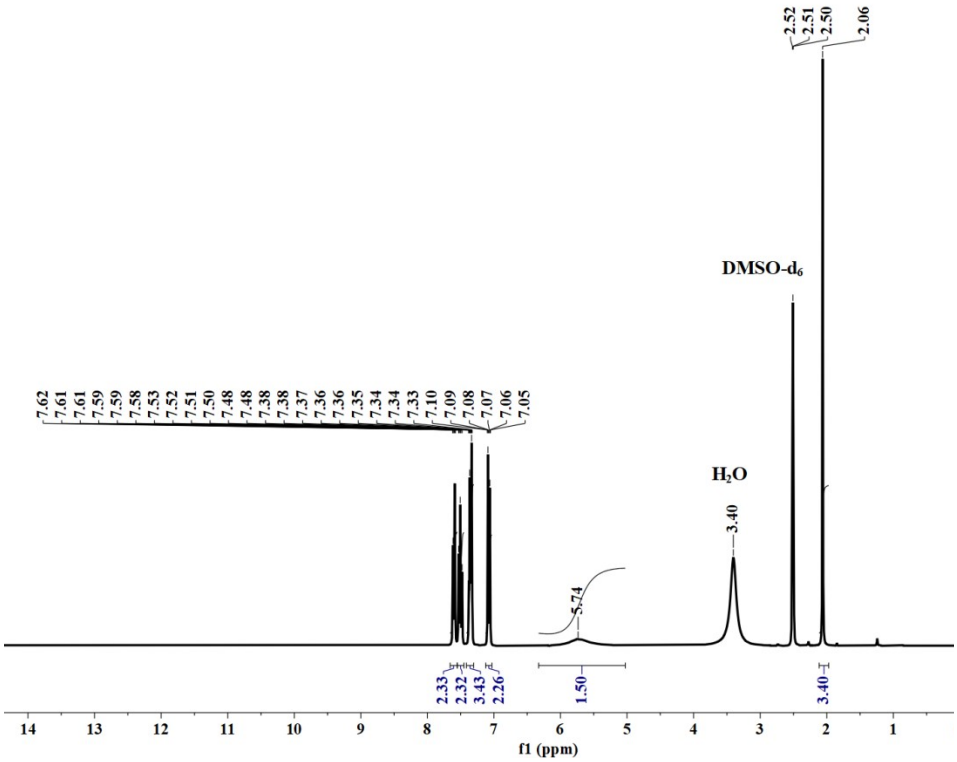


Figure S 10: [1]H NMR of 4-((4-chlorophenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3c)**

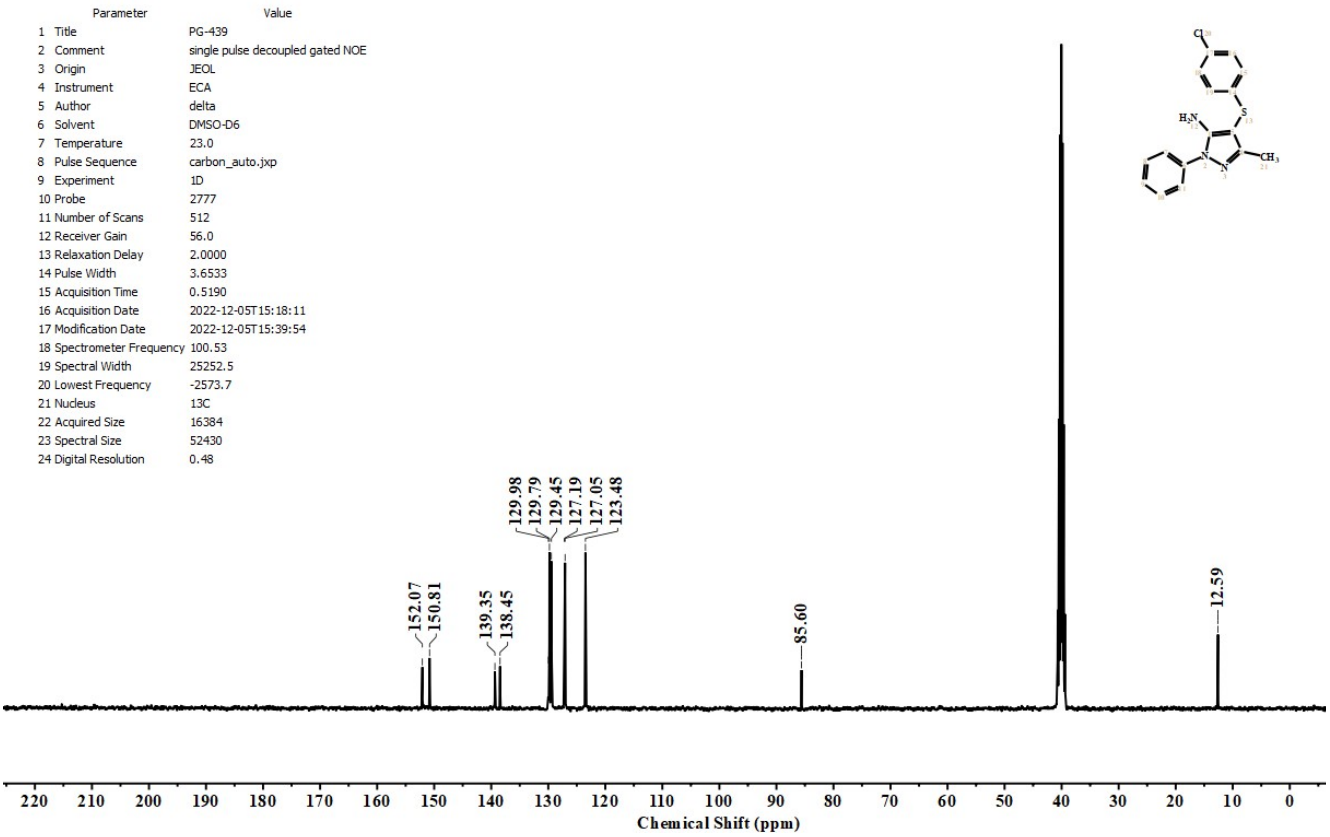


Figure S 11: ^{13}C NMR of *4-((4-chlorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3c)**

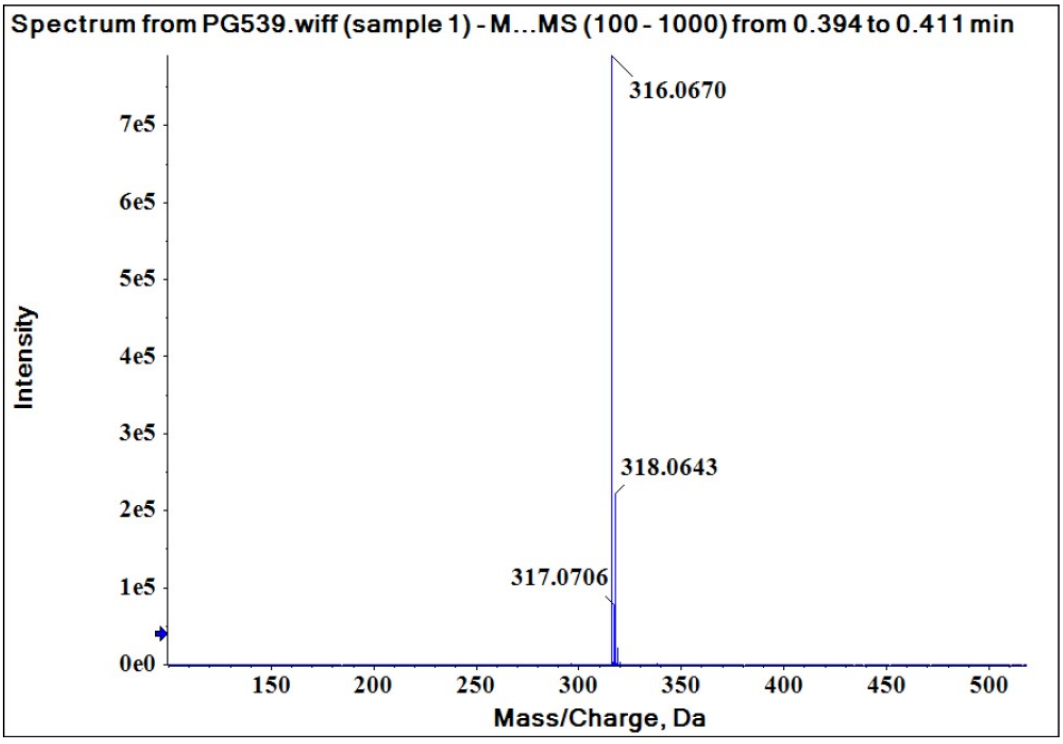


Figure S 12: Mass spectrometry of *4-((4-chlorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3c)**

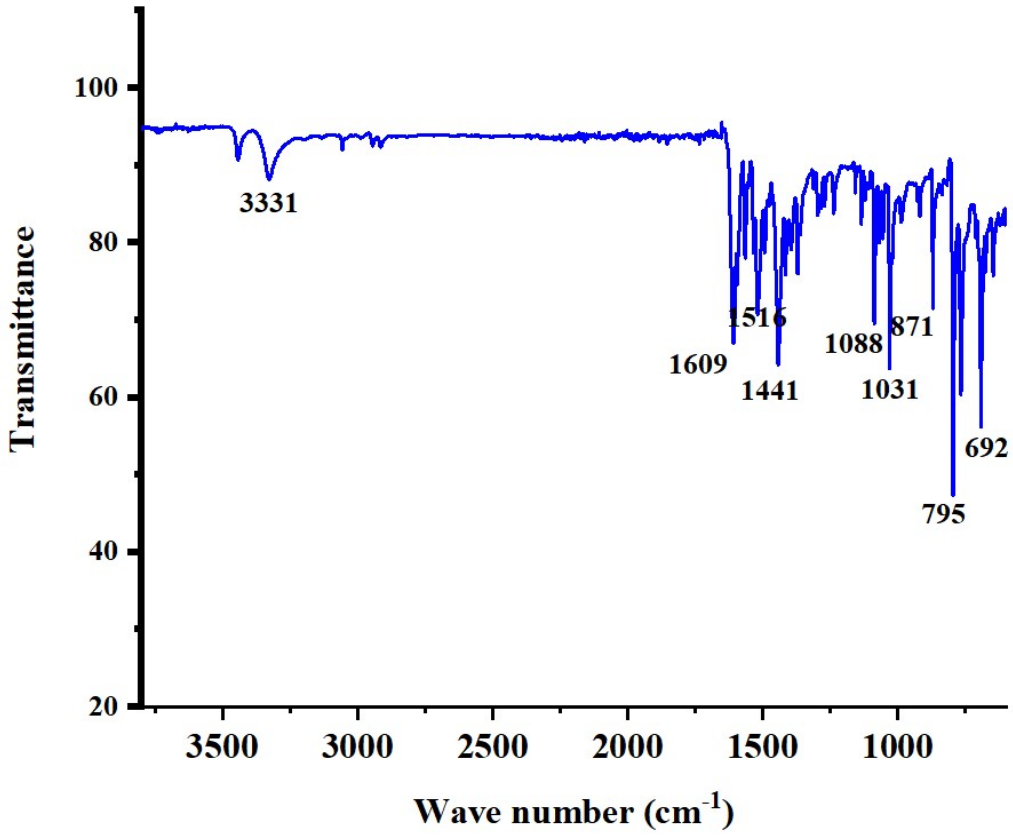


Figure S 13: FT-IR of 4-((2,5-dichlorophenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3d)**

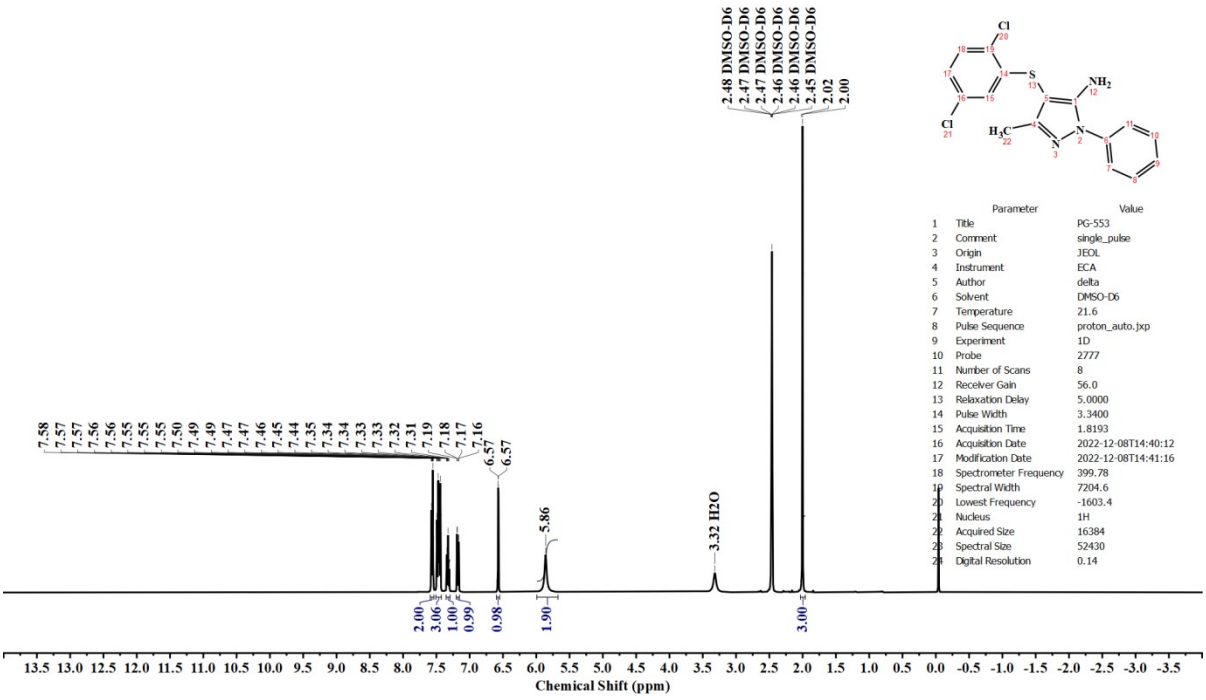


Figure S 14: [1]H NMR of 4-((2,5-dichlorophenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3d)**

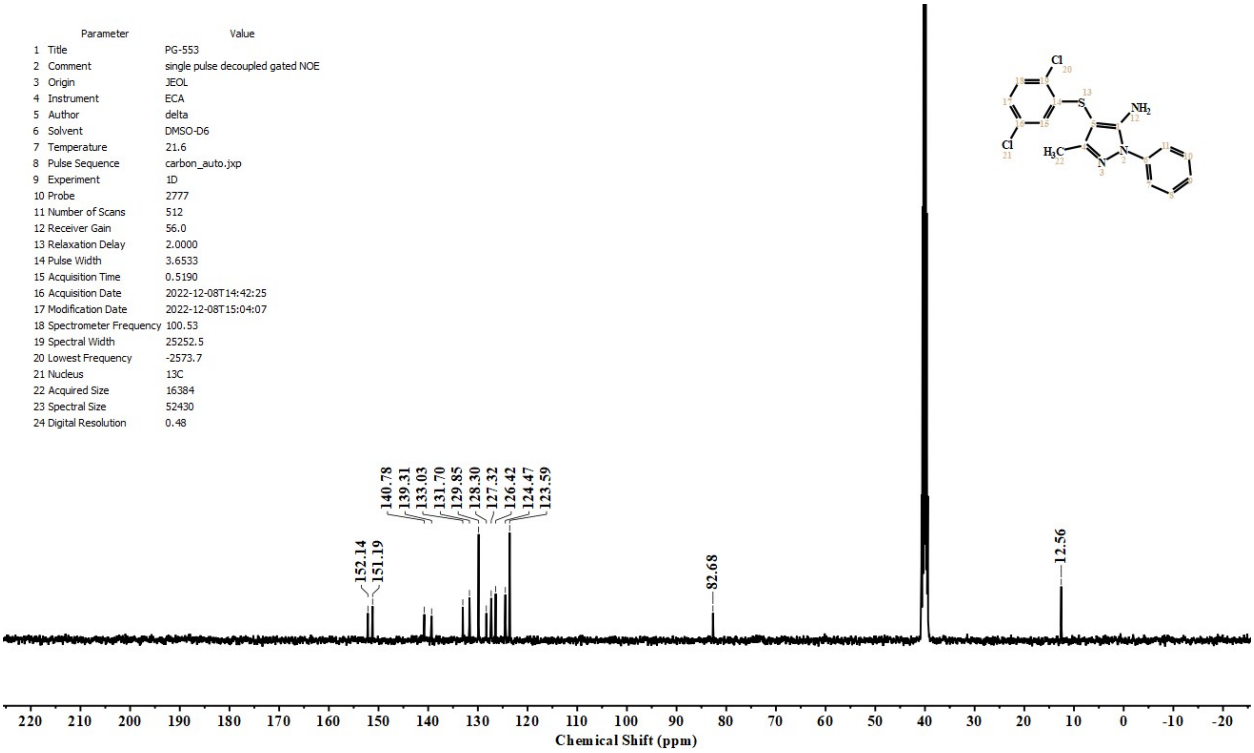


Figure S 15: ^{13}C NMR of 4-((2,5-dichlorophenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3d)**

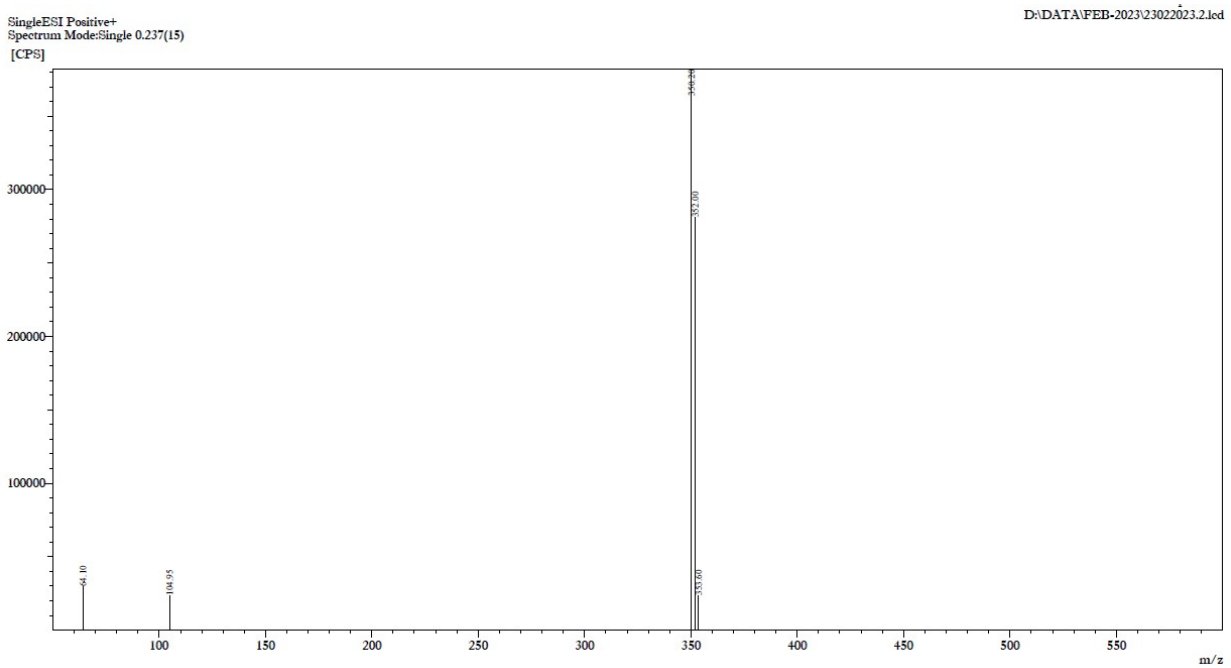


Figure S 16: Mass spectrometry of 4-((2,5-dichlorophenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3d)**

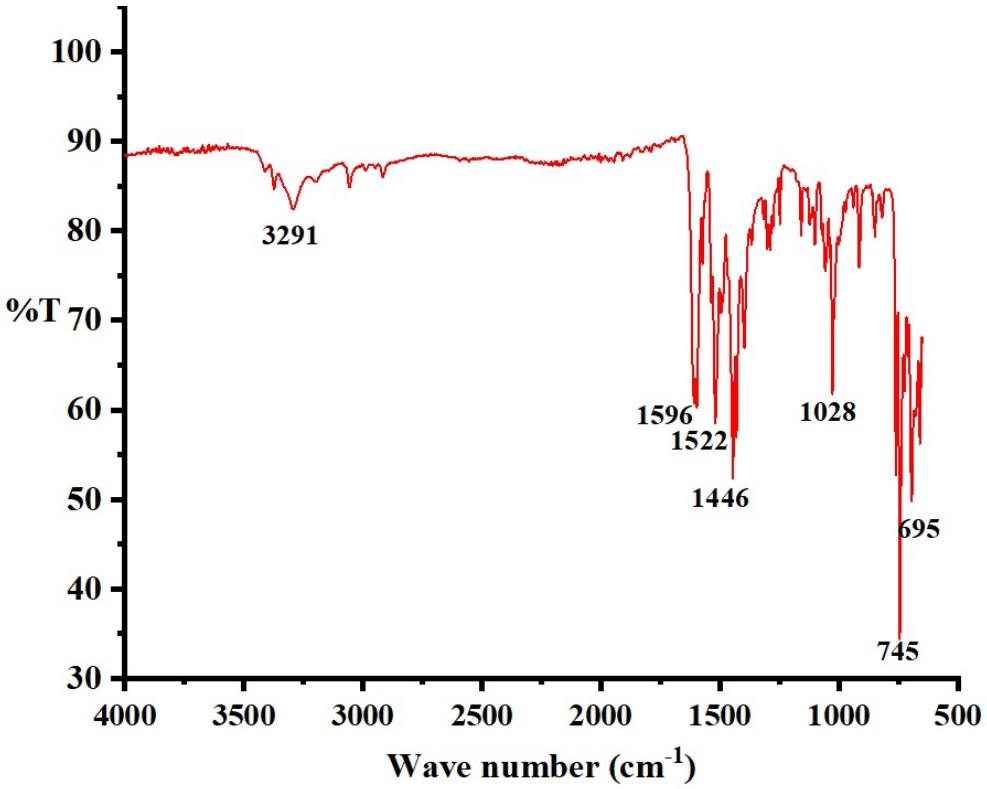


Figure S 17: FT-IR of 4-((2-chlorophenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3e)**

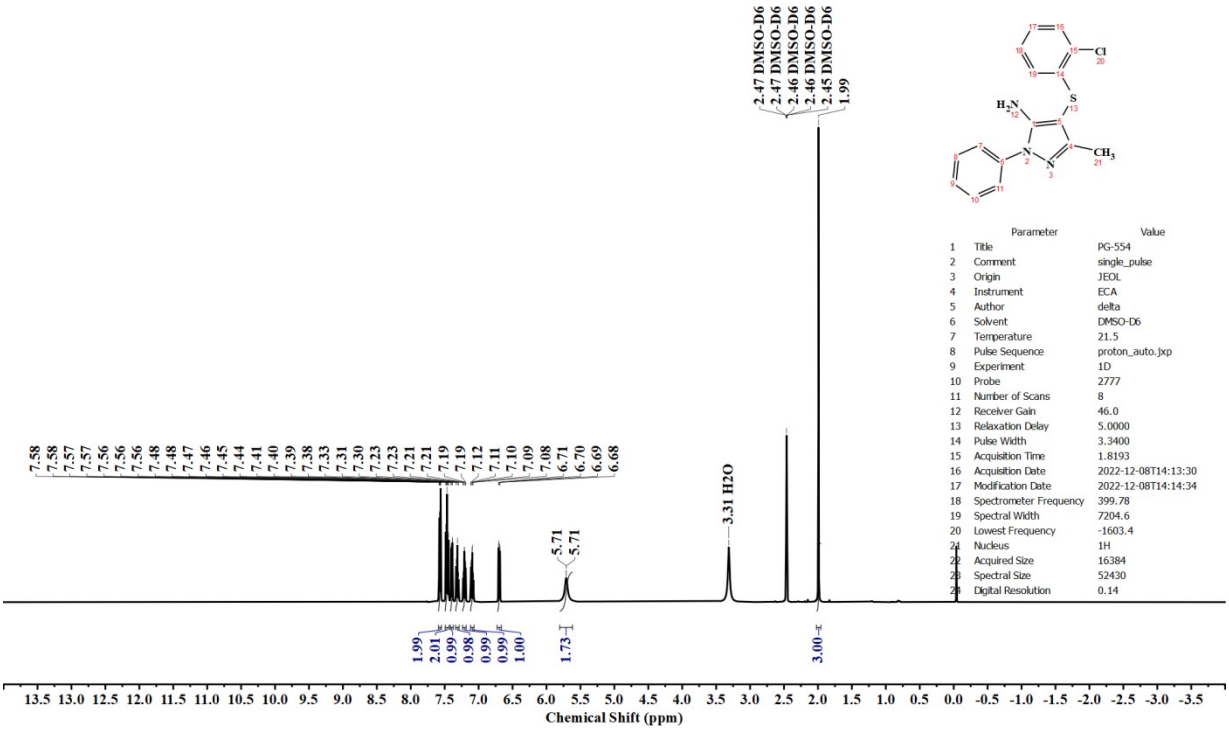


Figure S 18: [1]H NMR of 4-((2-chlorophenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3e)**

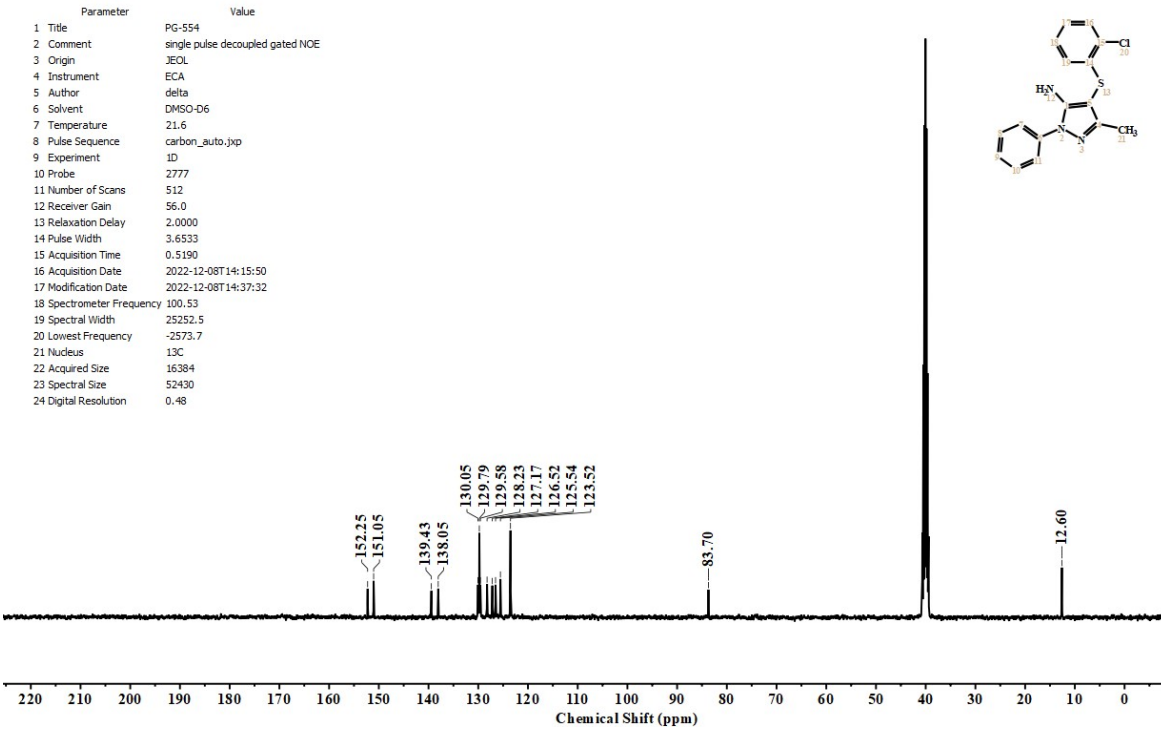


Figure S 19: ^{13}C NMR of *4-((2-chlorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3e)**

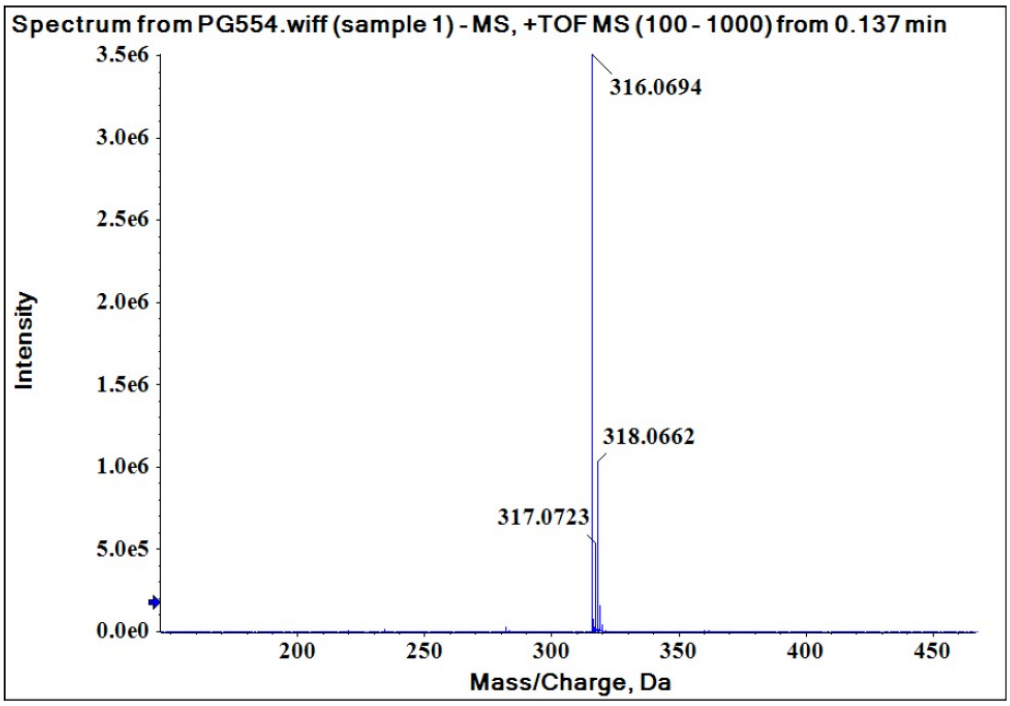


Figure S 20: Mass spectrometry of *4-((2-chlorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3e)**

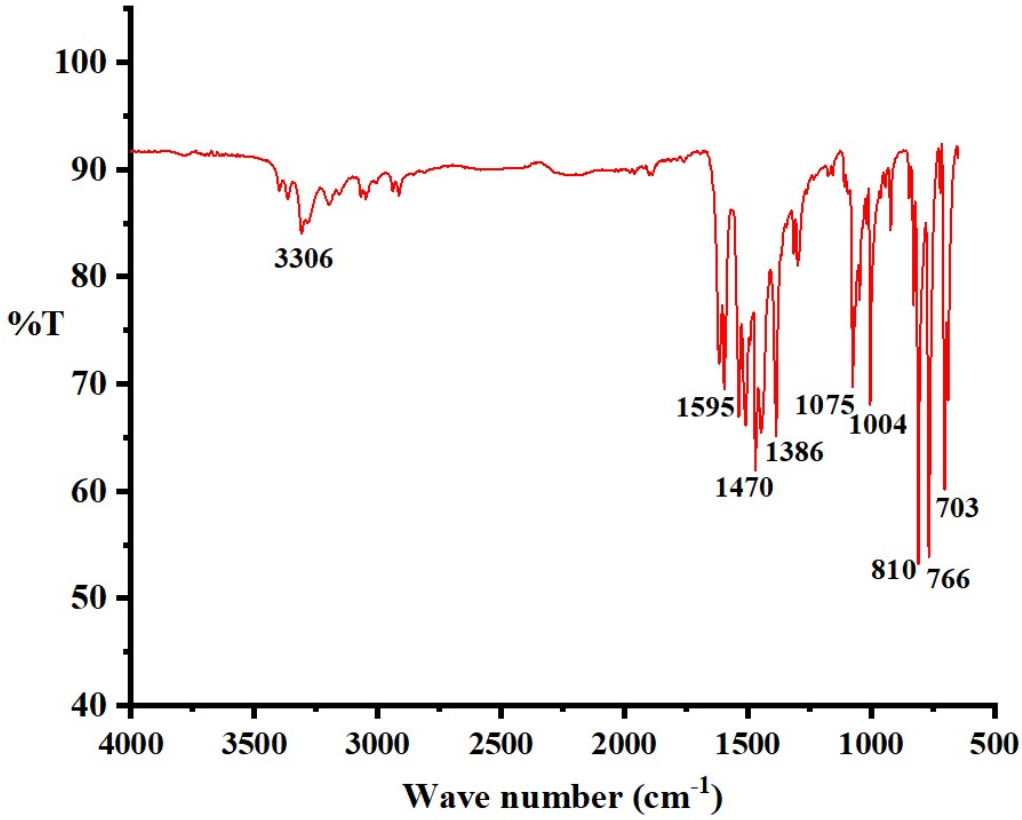


Figure S 21: FT-IR of *4-((4-bromophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3f)**

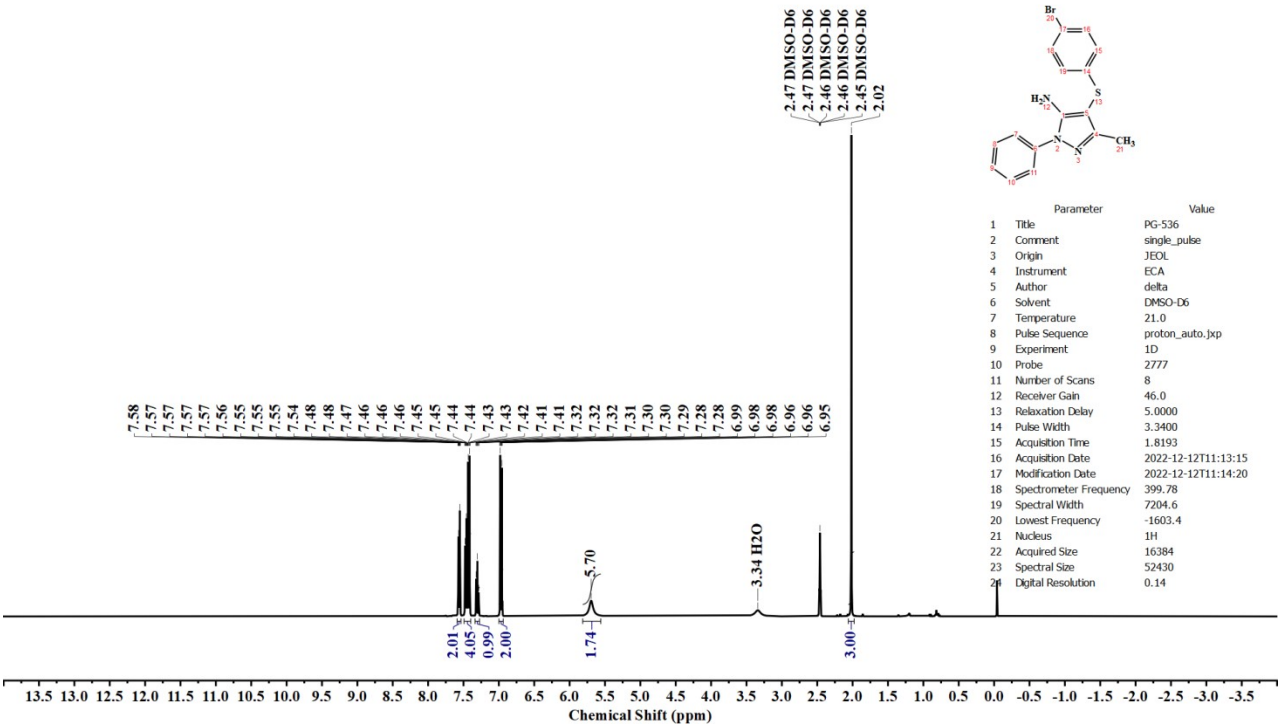


Figure S 22: ^{1}H NMR of *4-((4-bromophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3f)**

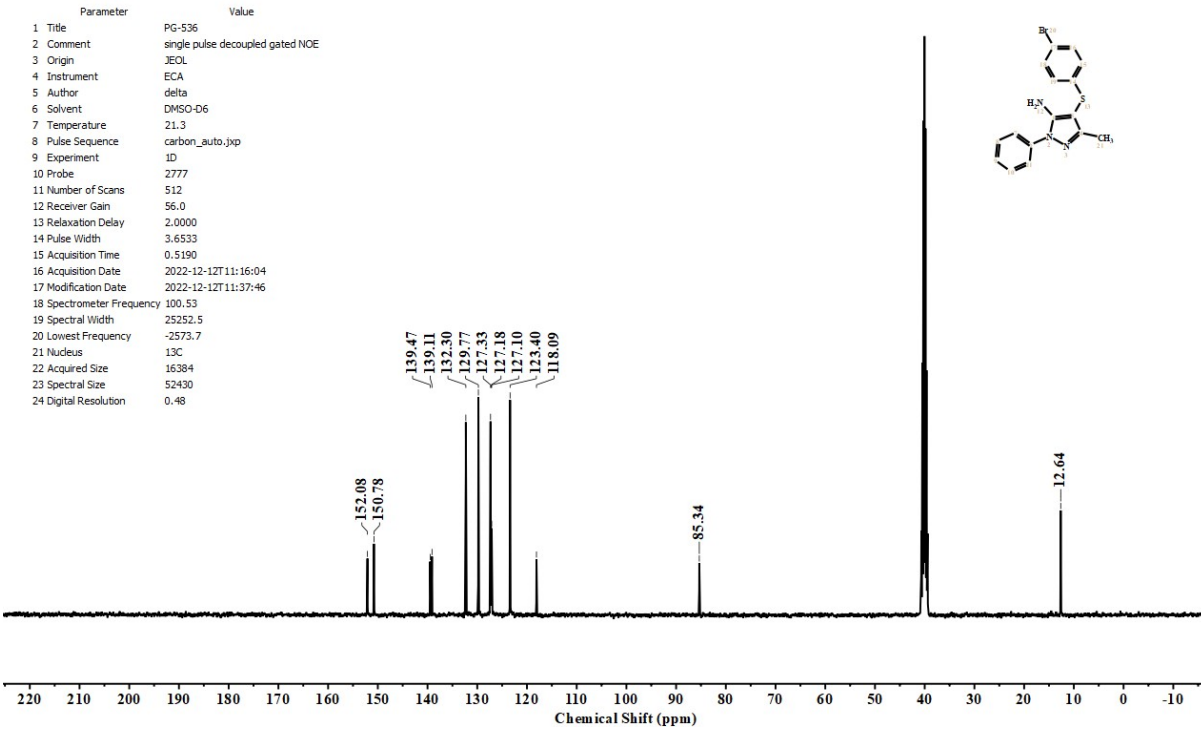


Figure S 23: ^{13}C NMR of *4-((4-bromophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3f)**

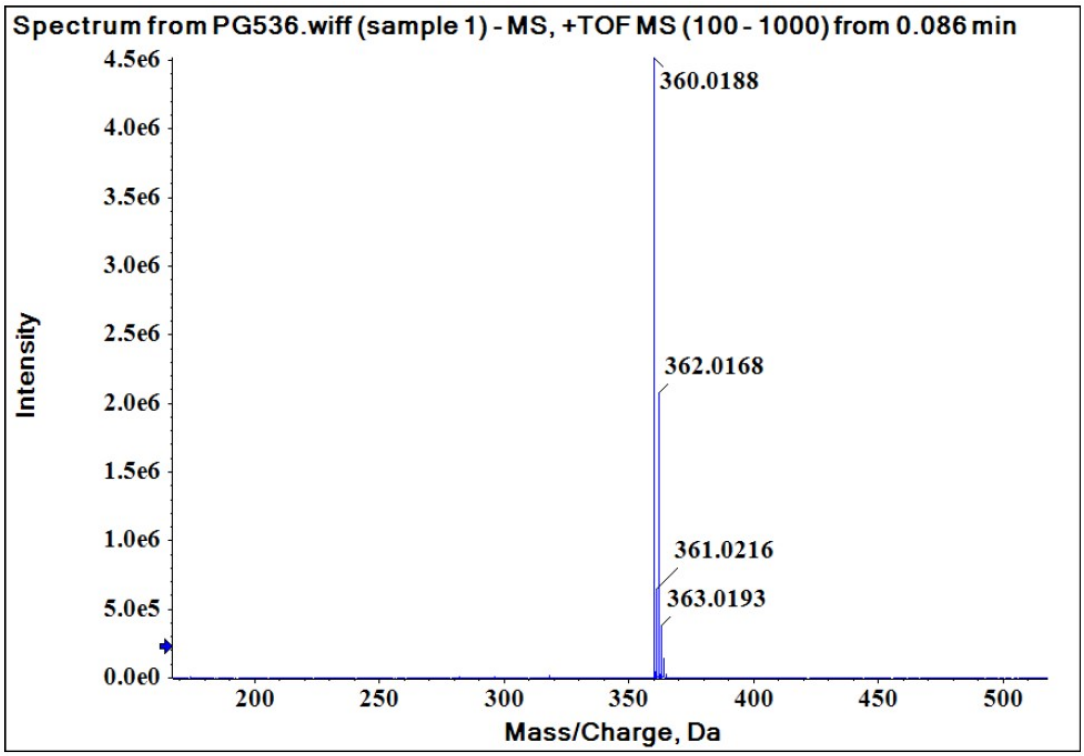


Figure S 24: Mass spectrometry of *4-((4-bromophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3f)**

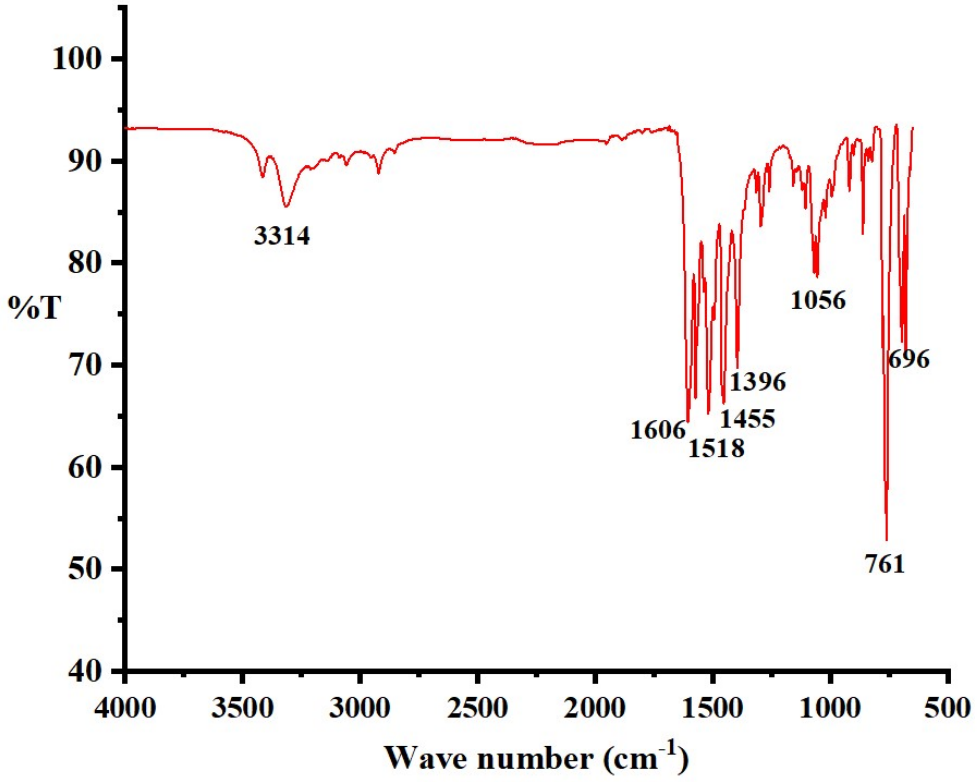


Figure S 25: FT-IR of *4-((3-chlorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3g)**

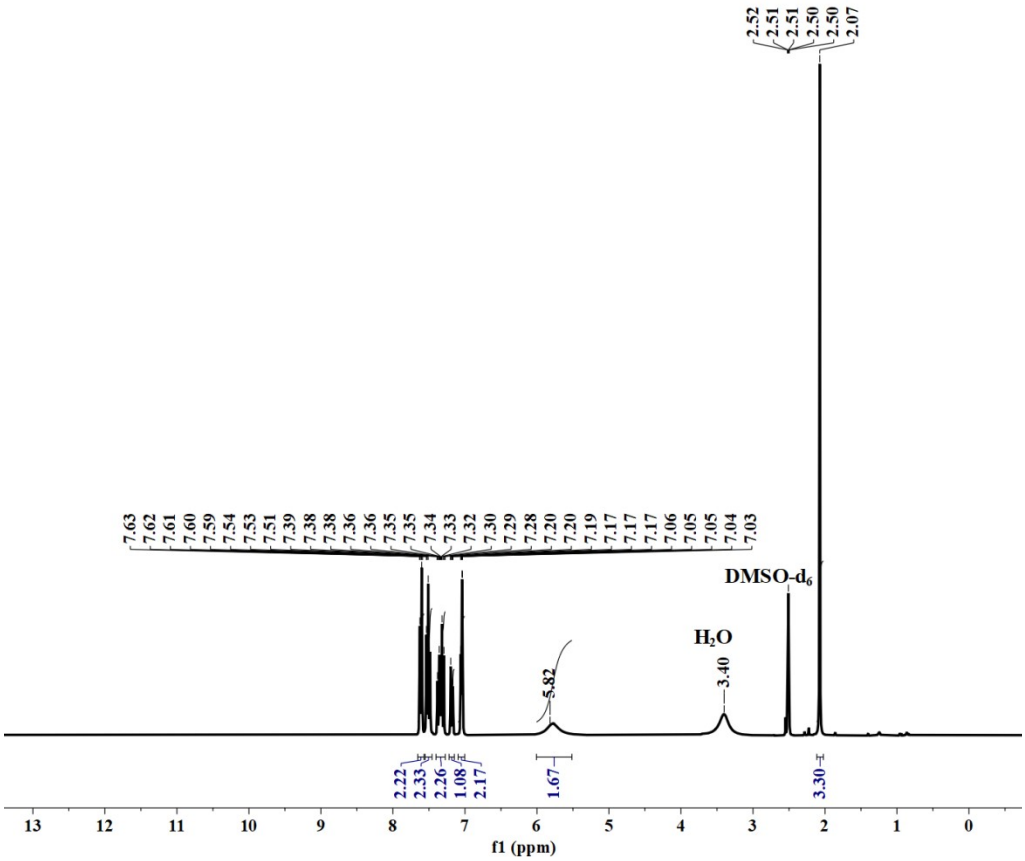


Figure S 26: ^{1}H NMR of *4-((3-chlorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3g)**

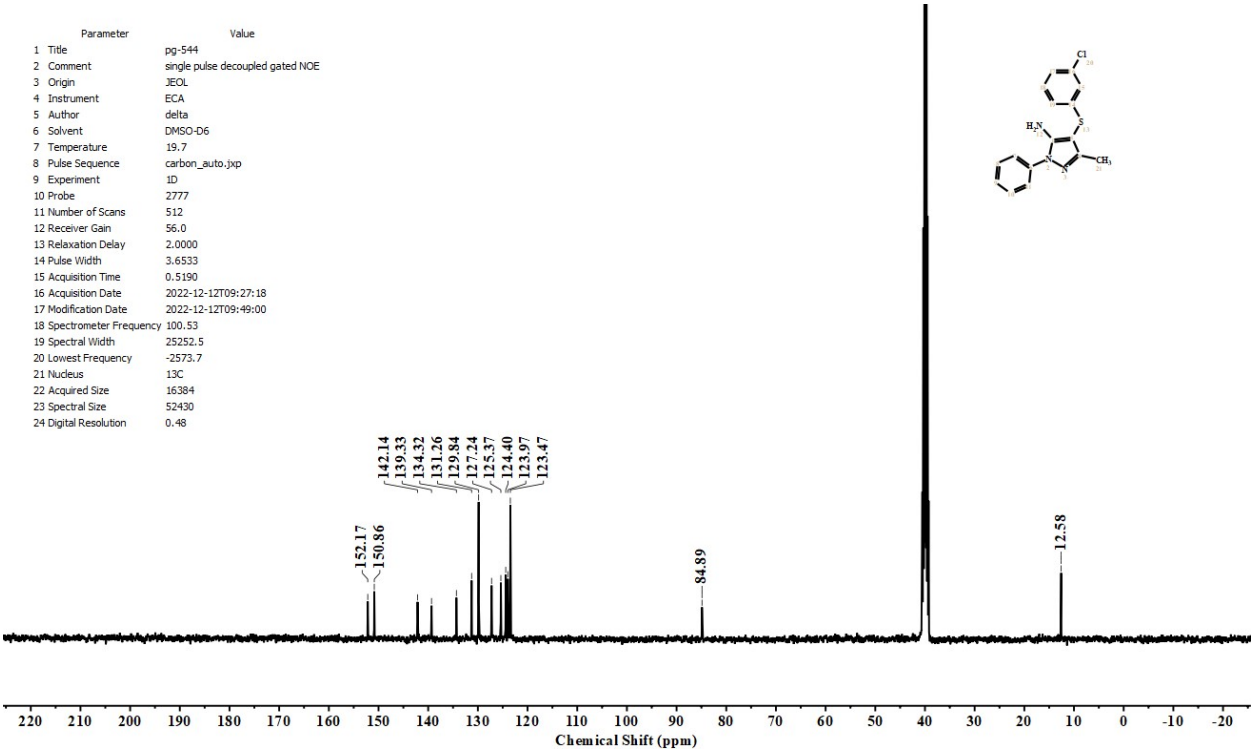


Figure S 27: ^{13}C NMR of *4-((3-chlorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3g)**

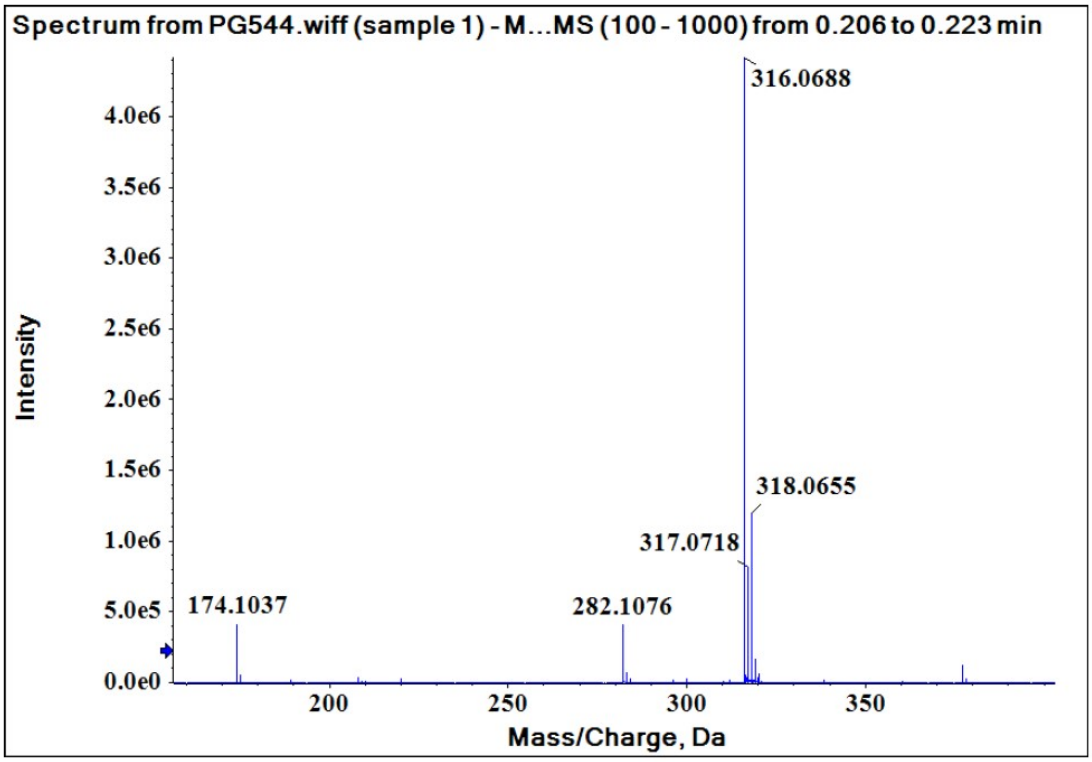


Figure S 28: Mass spectrometry of *4-((3-chlorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3g)**

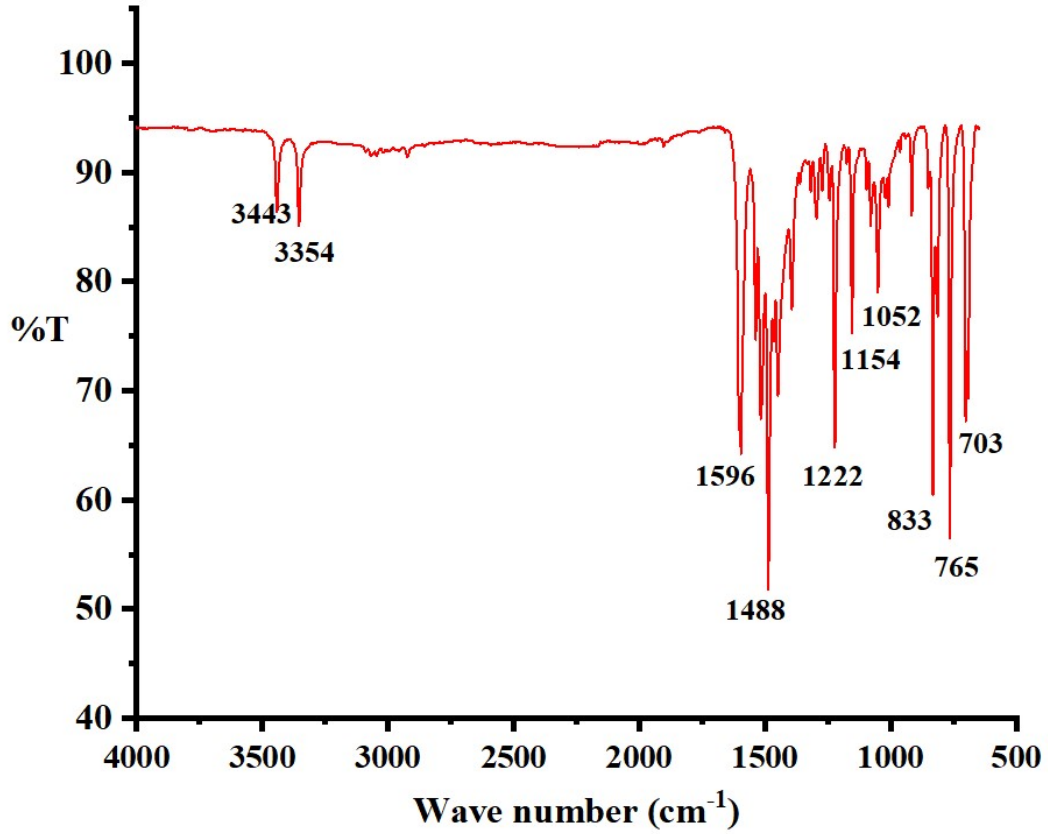


Figure S 29: FT-IR of *4-((4-fluorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3h)**

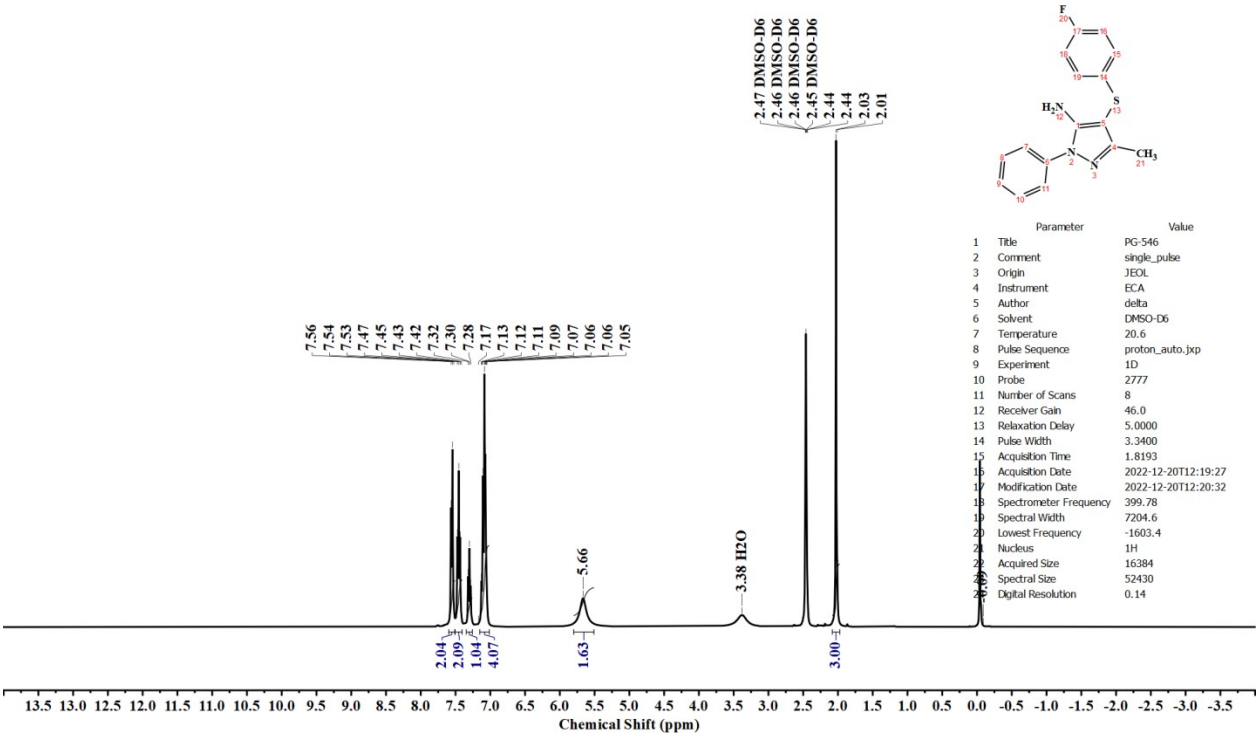


Figure S 30: ^{1}H NMR of *4-((4-fluorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3h)**

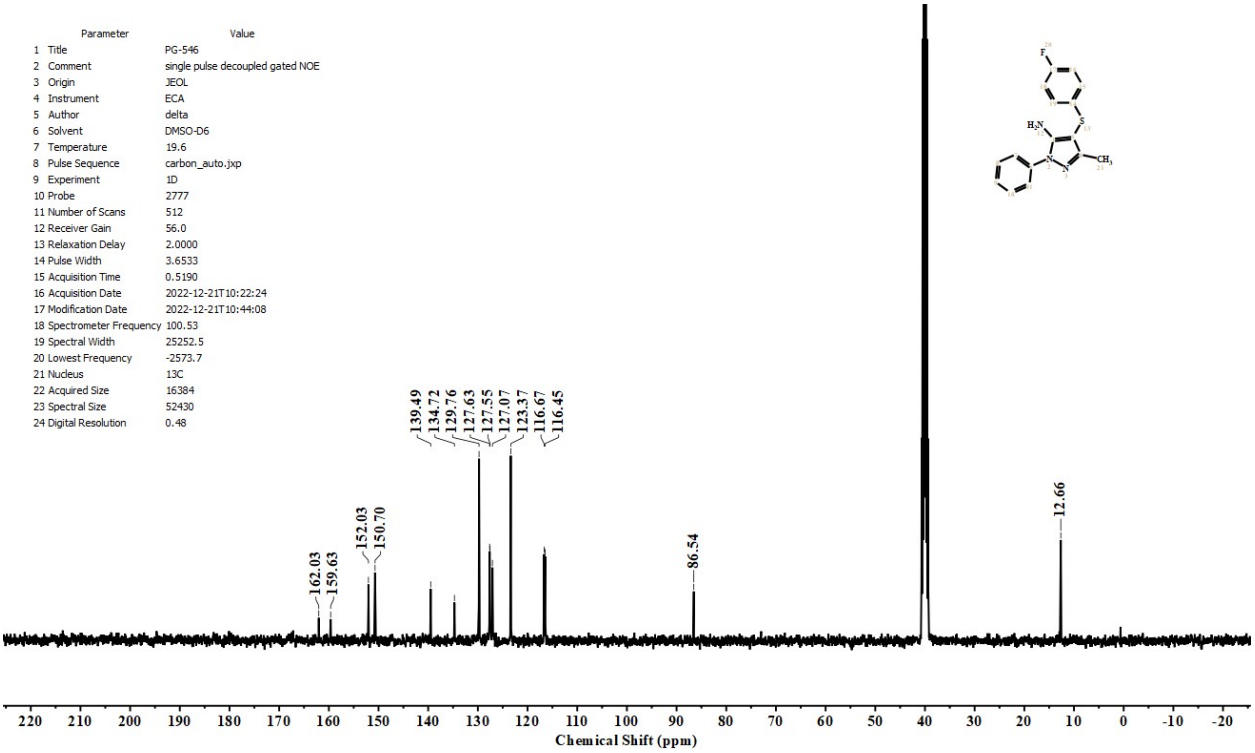


Figure S 31: ^{13}C NMR of *4-((4-fluorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3h)**

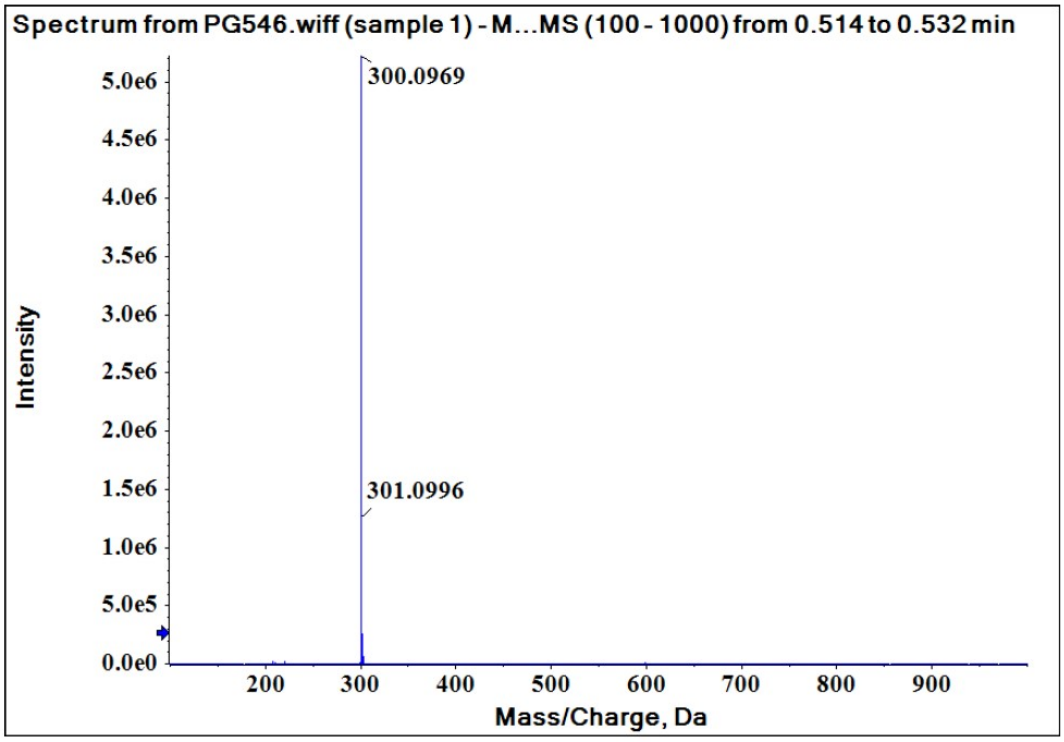


Figure S 32: Mass spectrometry of *4-((4-fluorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3h)**

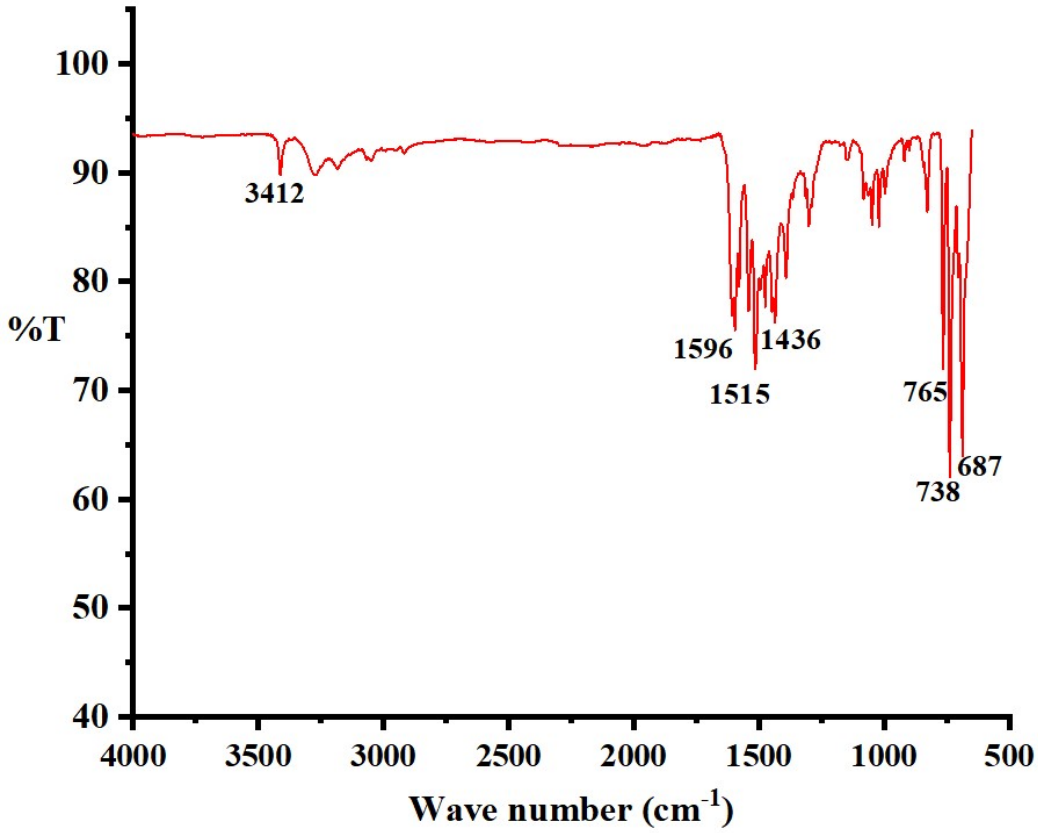


Figure S 33: FT-IR of *3-methyl-1-phenyl-4-(phenylthio)-1H-pyrazol-5-amine* **(3i)**

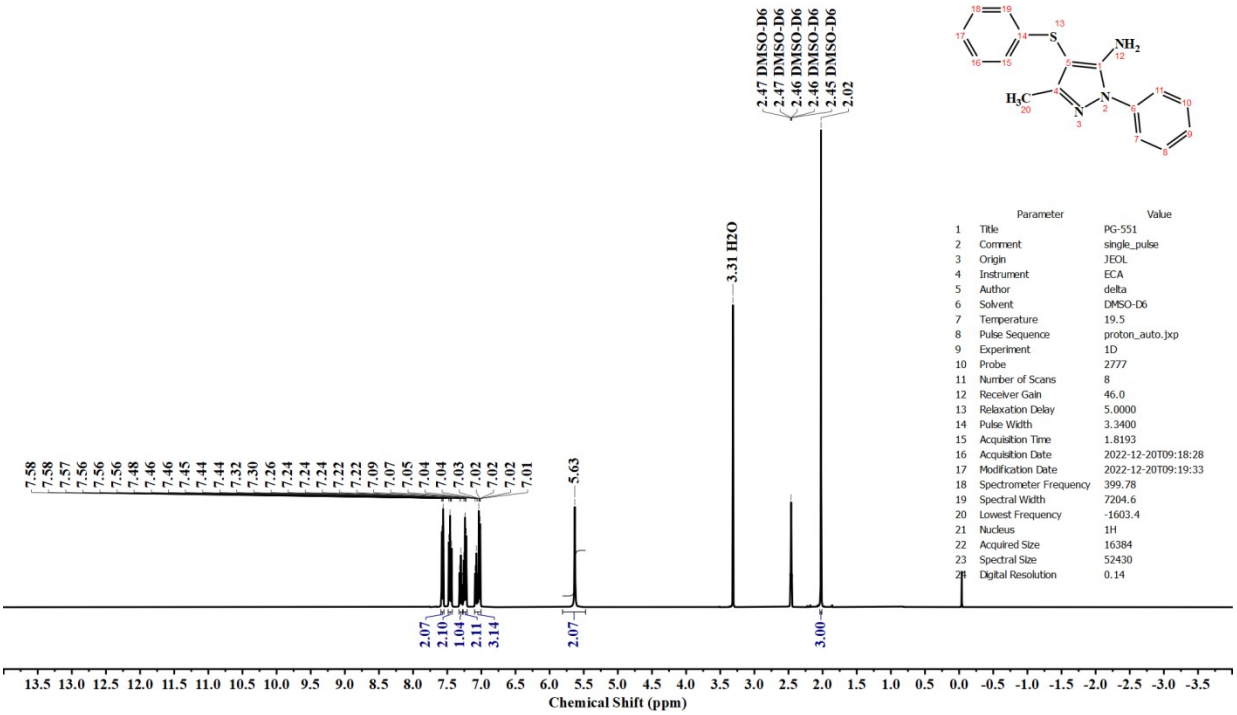


Figure S 34: ^{1}H NMR of *3-methyl-1-phenyl-4-(phenylthio)-1H-pyrazol-5-amine* **(3i)**

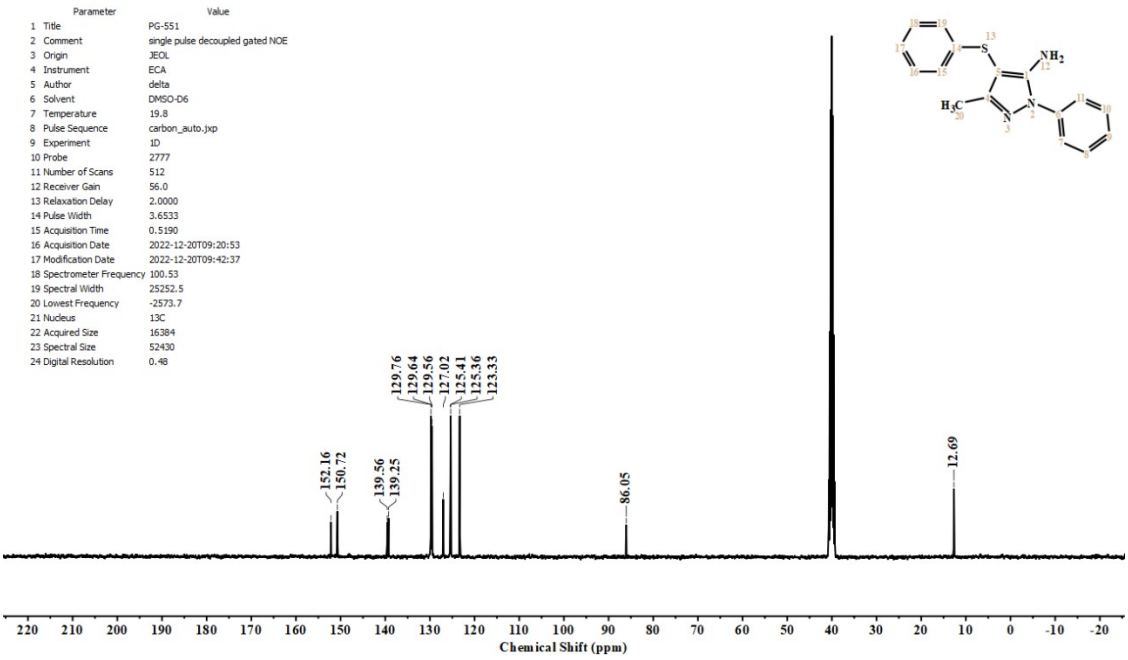


Figure S 35: ^{13}C NMR of *3-methyl-1-phenyl-4-(phenylthio)-1H-pyrazol-5-amine* **(3i)**

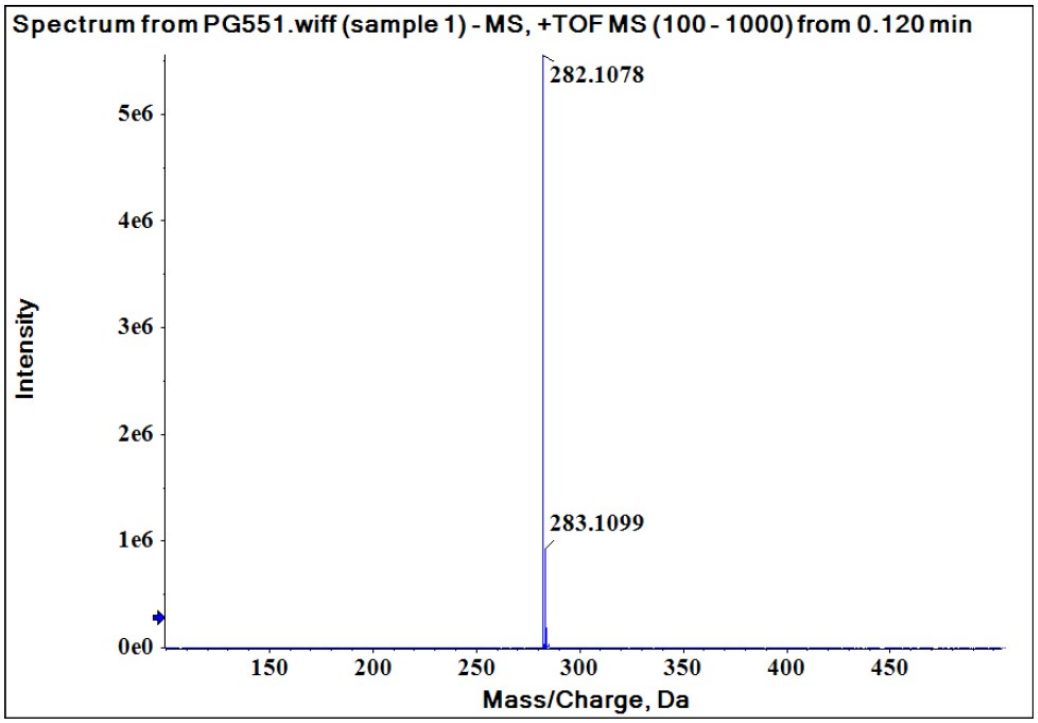


Figure S 36: Mass spectrometry of *3-methyl-1-phenyl-4-(phenylthio)-1H-pyrazol-5-amine* **(3i)**

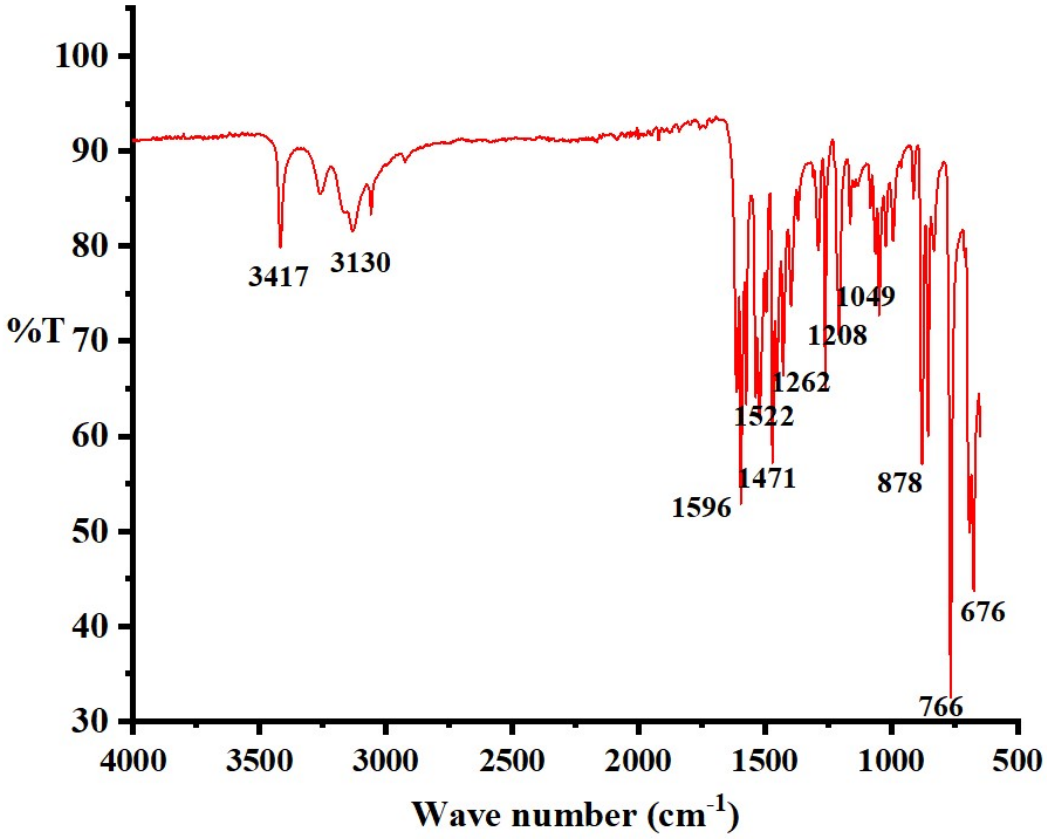


Figure S 37: FT-IR of *4-((3-fluorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3j)**

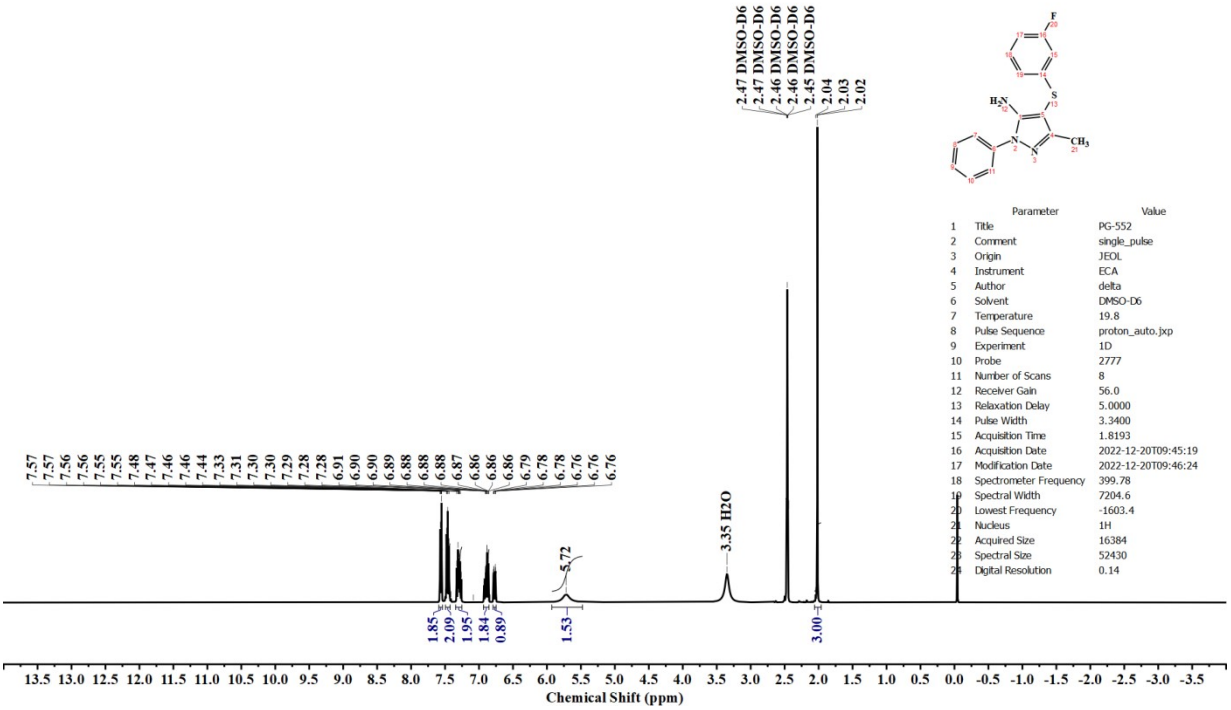


Figure S 38: ^{1}H NMR of *4-((3-fluorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3j)**

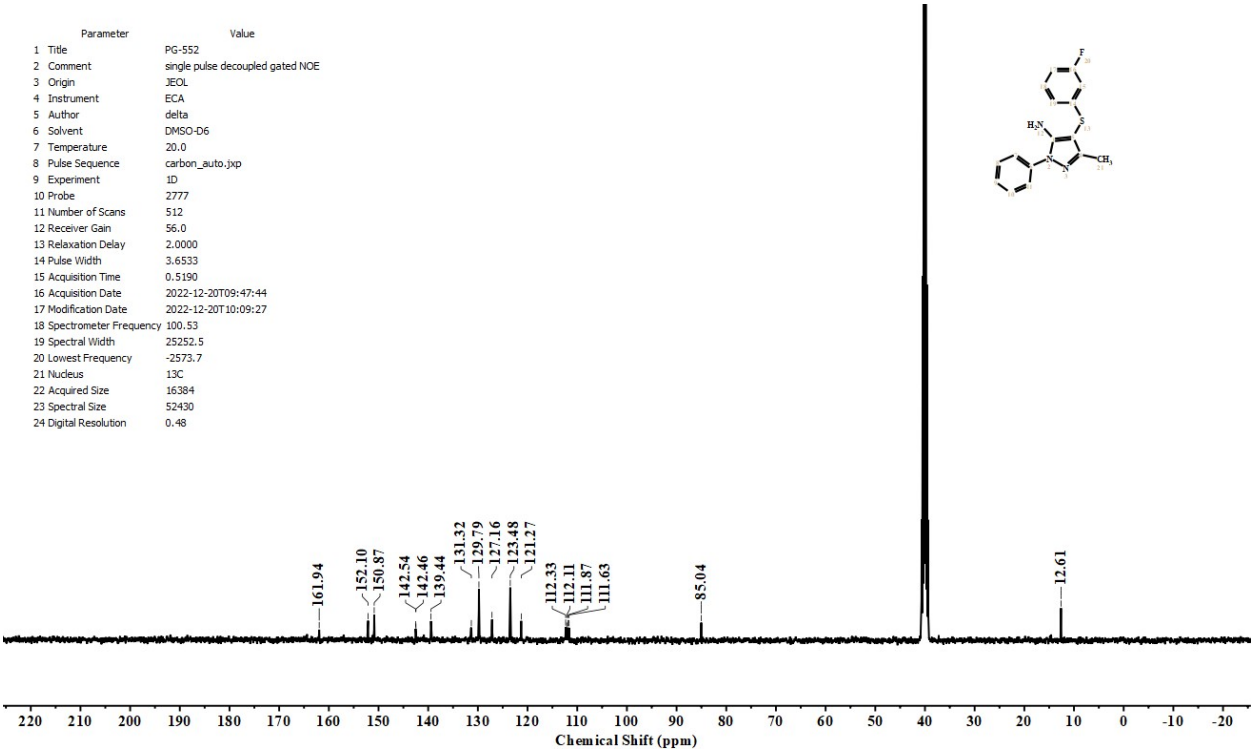


Figure S 39: ^{13}C NMR of *4-((3-fluorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3j)**

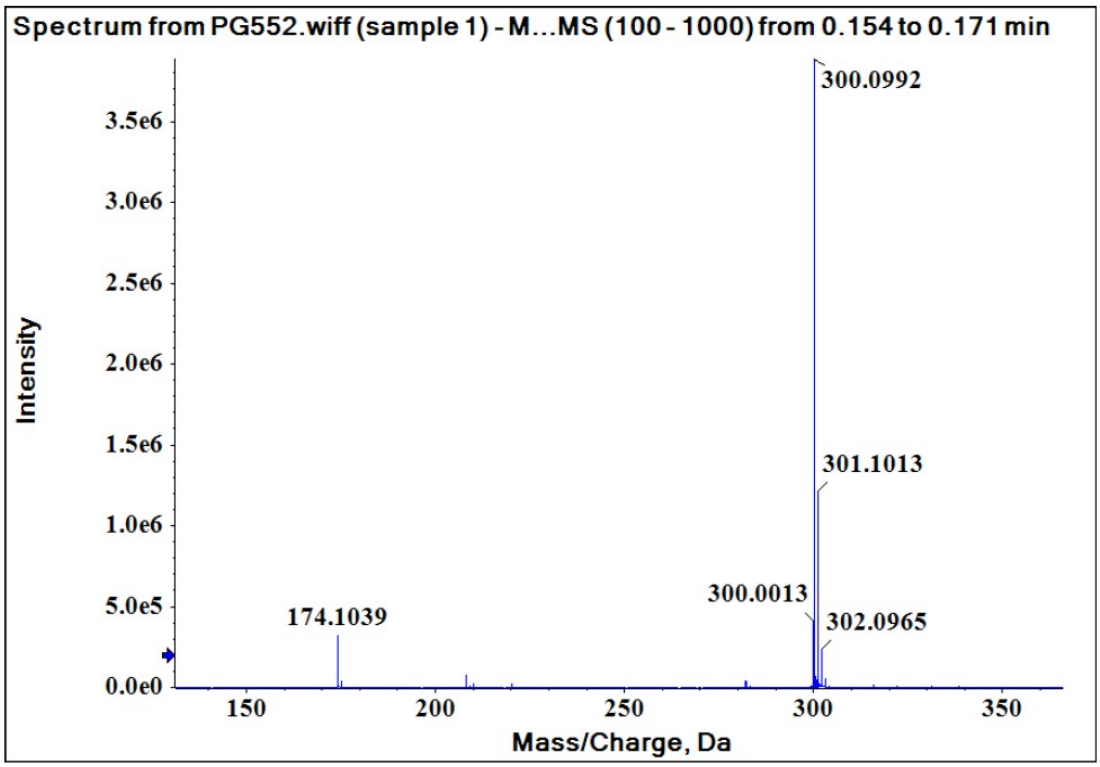


Figure S 40: Mass spectrometry of *4-((3-fluorophenyl)thio)-3-methyl-1-phenyl-1H-pyrazol-5-amine* **(3j)**

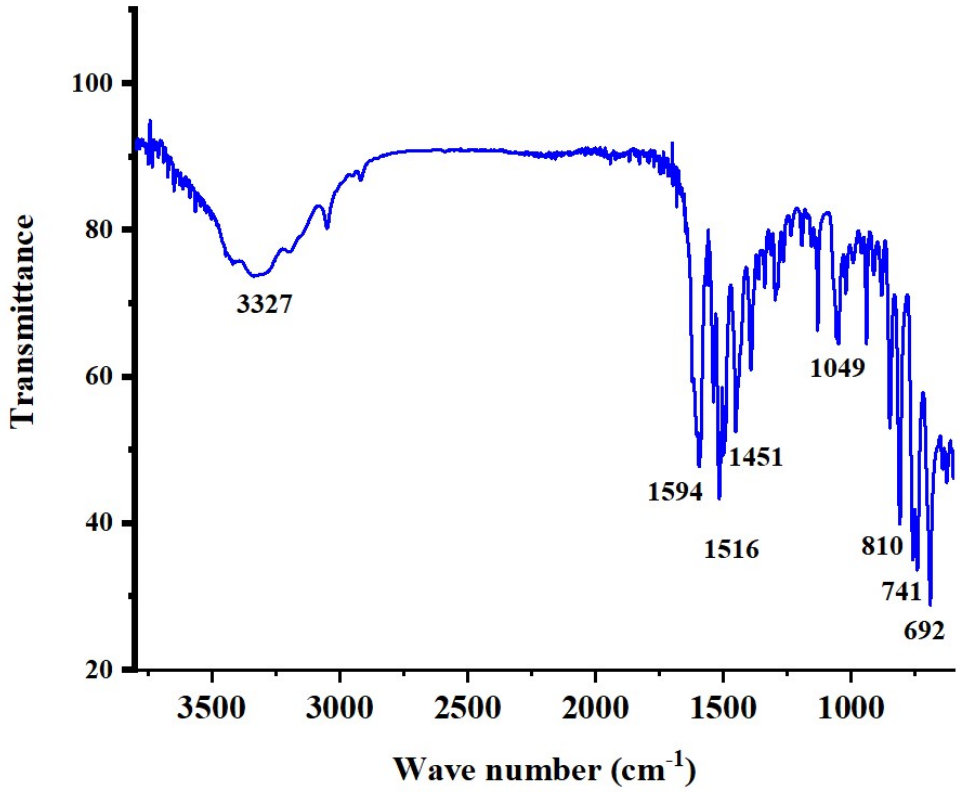


Figure S 41: FT-IR of *3-methyl-4-(naphthalen-2-ylthio)-1-phenyl-1H-pyrazol-5-amine* **(3k)**

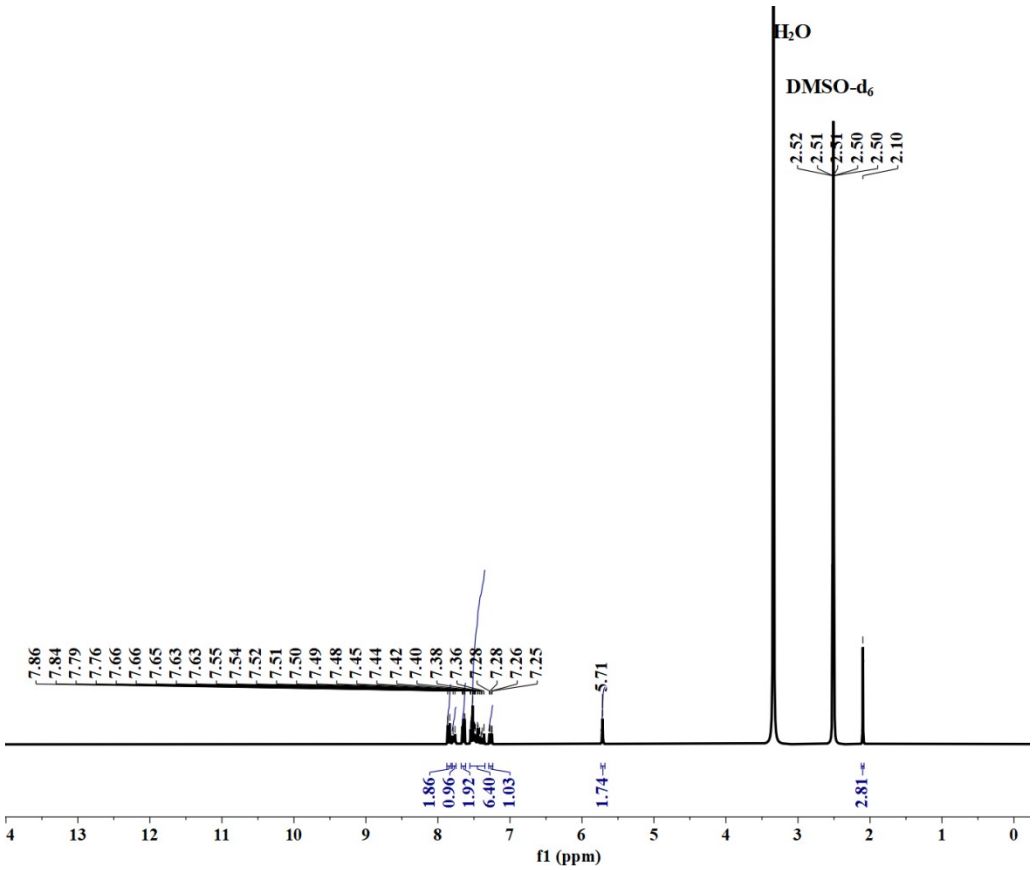


Figure S 42: [1]H NMR of *3-methyl-4-(naphthalen-2-ylthio)-1-phenyl-1H-pyrazol-5-amine* **(3k)**

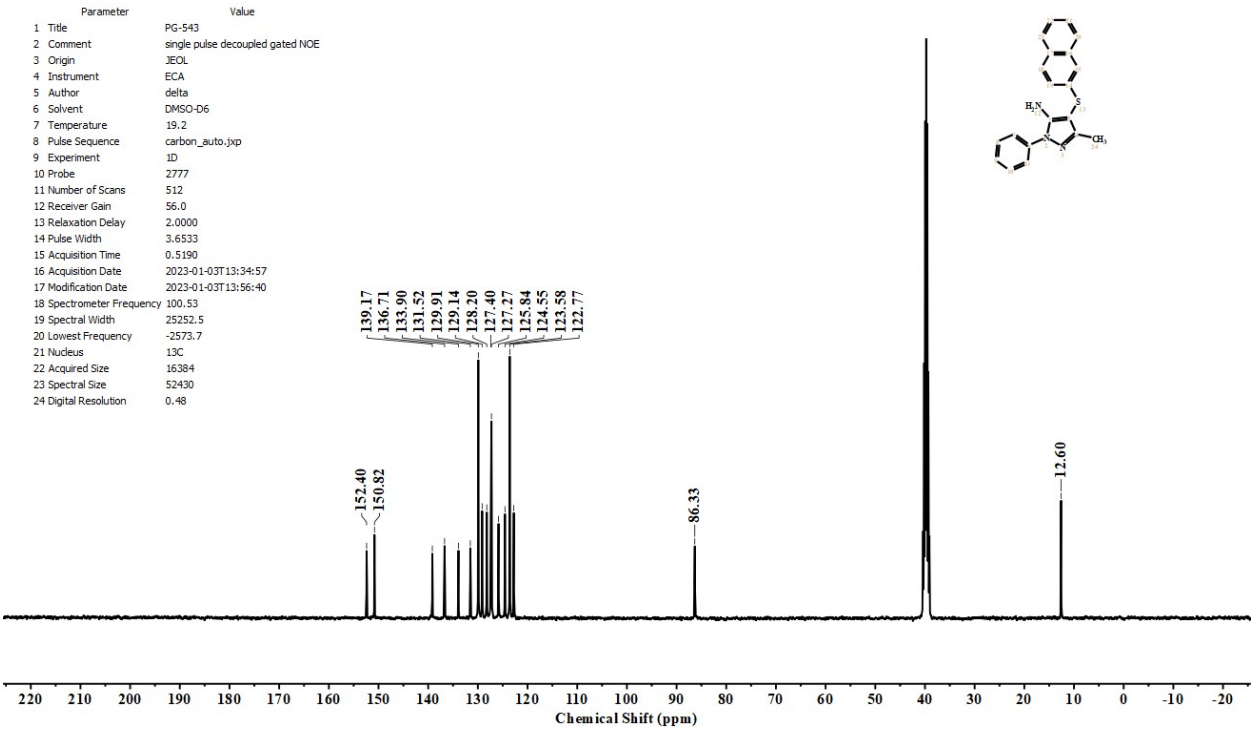


Figure S 43: ^{13}C NMR of *3-methyl-4-(naphthalen-2-ylthio)-1-phenyl-1H-pyrazol-5-amine* **(3k)**

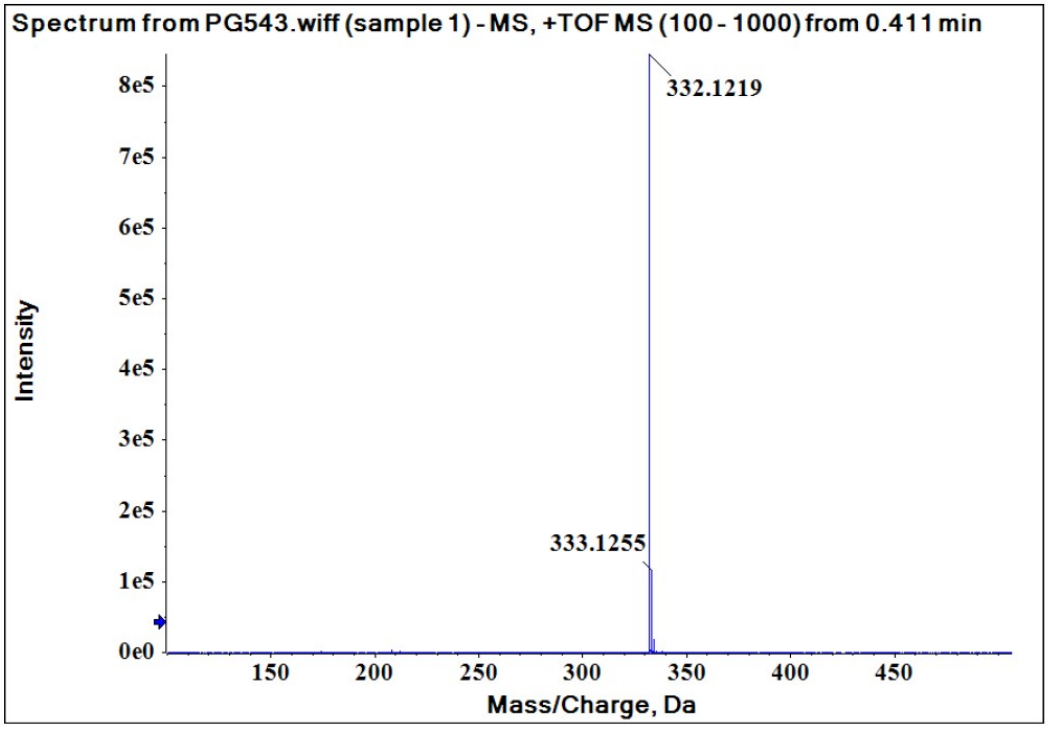


Figure S 44: Mass spectrometry of 3-methyl-4-(naphthalen-2-ylthio)-1-phenyl-1*H*-pyrazol-5-amine **(3k)**

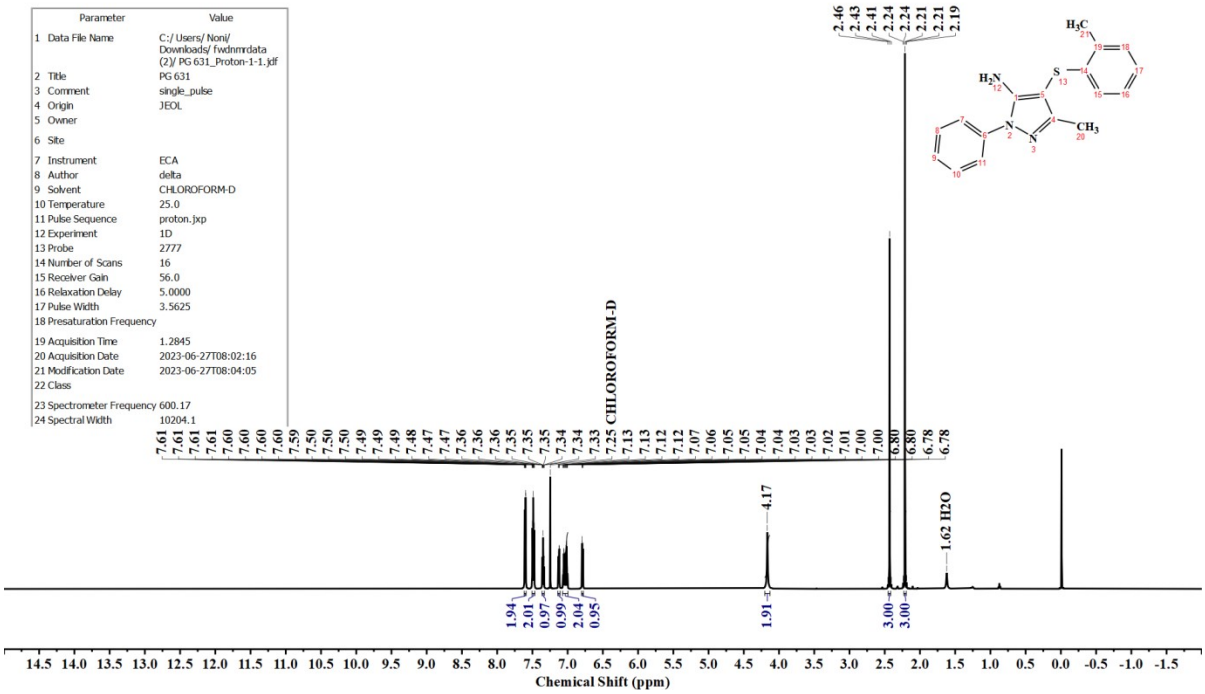


Figure S 45: ^{1}H NMR of 3-methyl-1-phenyl-4-(*o*-tolylthio)-1*H*-pyrazol-5-amine **(3l)**

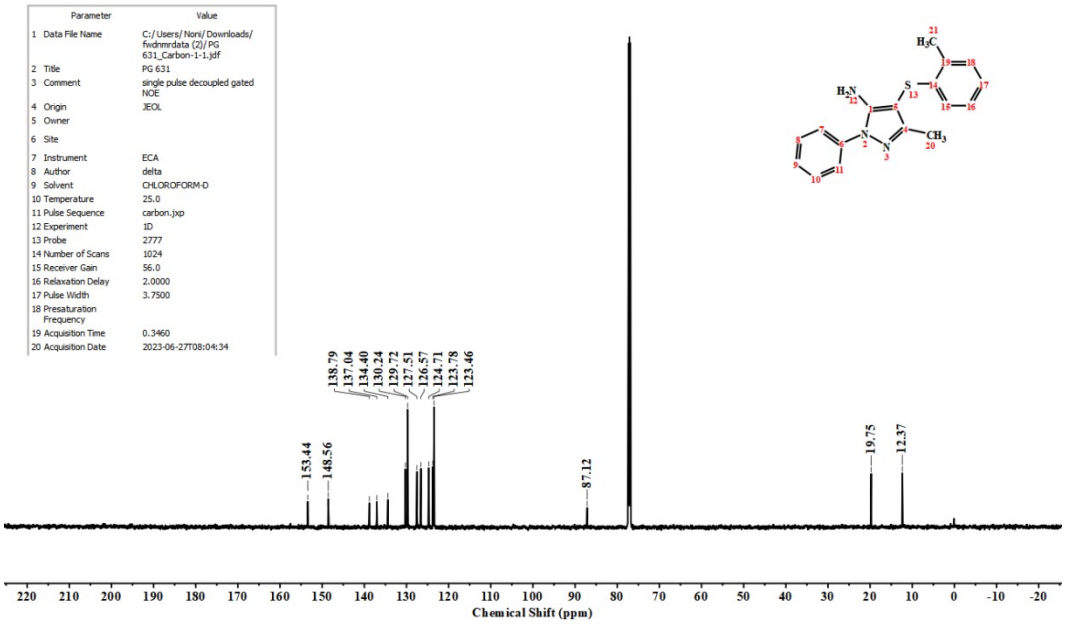


Figure S 46: ^{13}C NMR of 3-methyl-1-phenyl-4-(*o*-tolylthio)-1*H*-pyrazol-5-amine **(3l)**

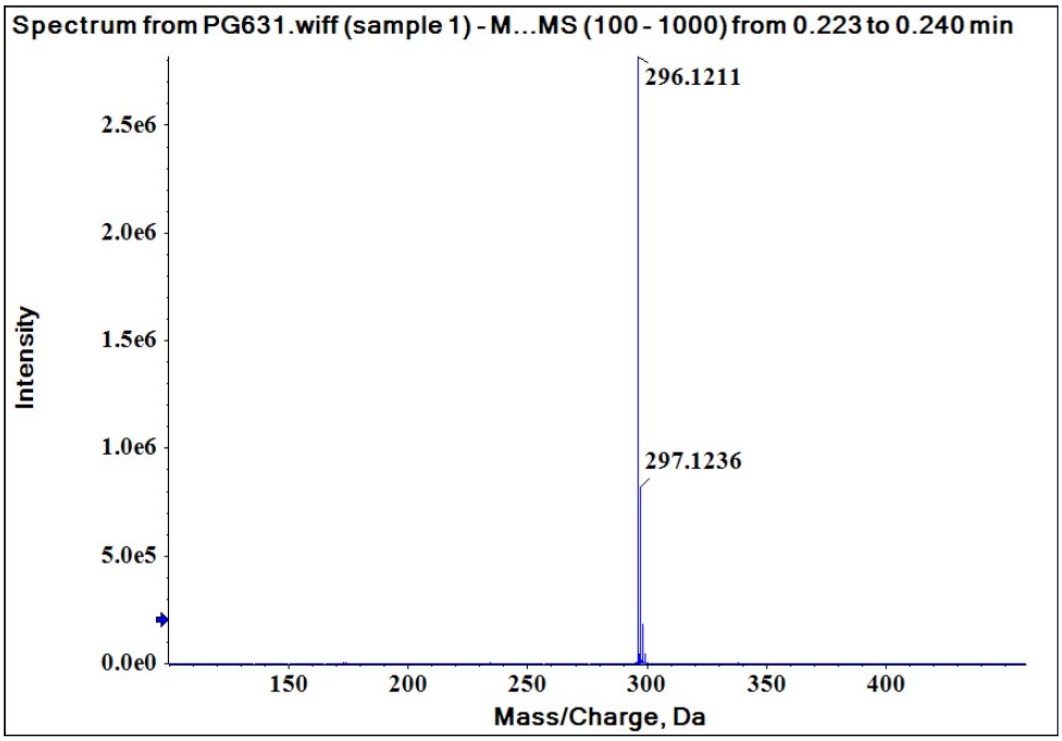


Figure S 47: Mass spectrometry of 3-methyl-1-phenyl-4-(*o*-tolylthio)-1*H*-pyrazol-5-amine **(3l)**

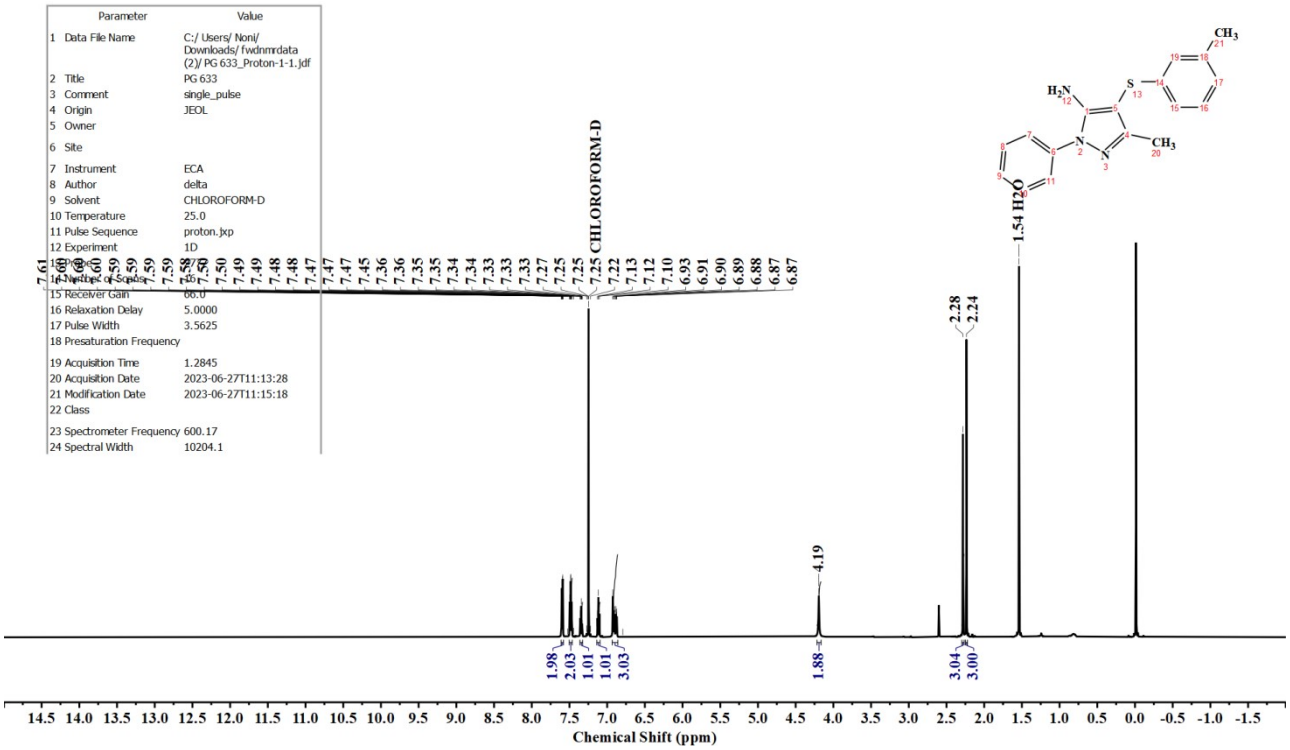


Figure S 48: ^{1}H NMR of 4-((3-methylphenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3m)**

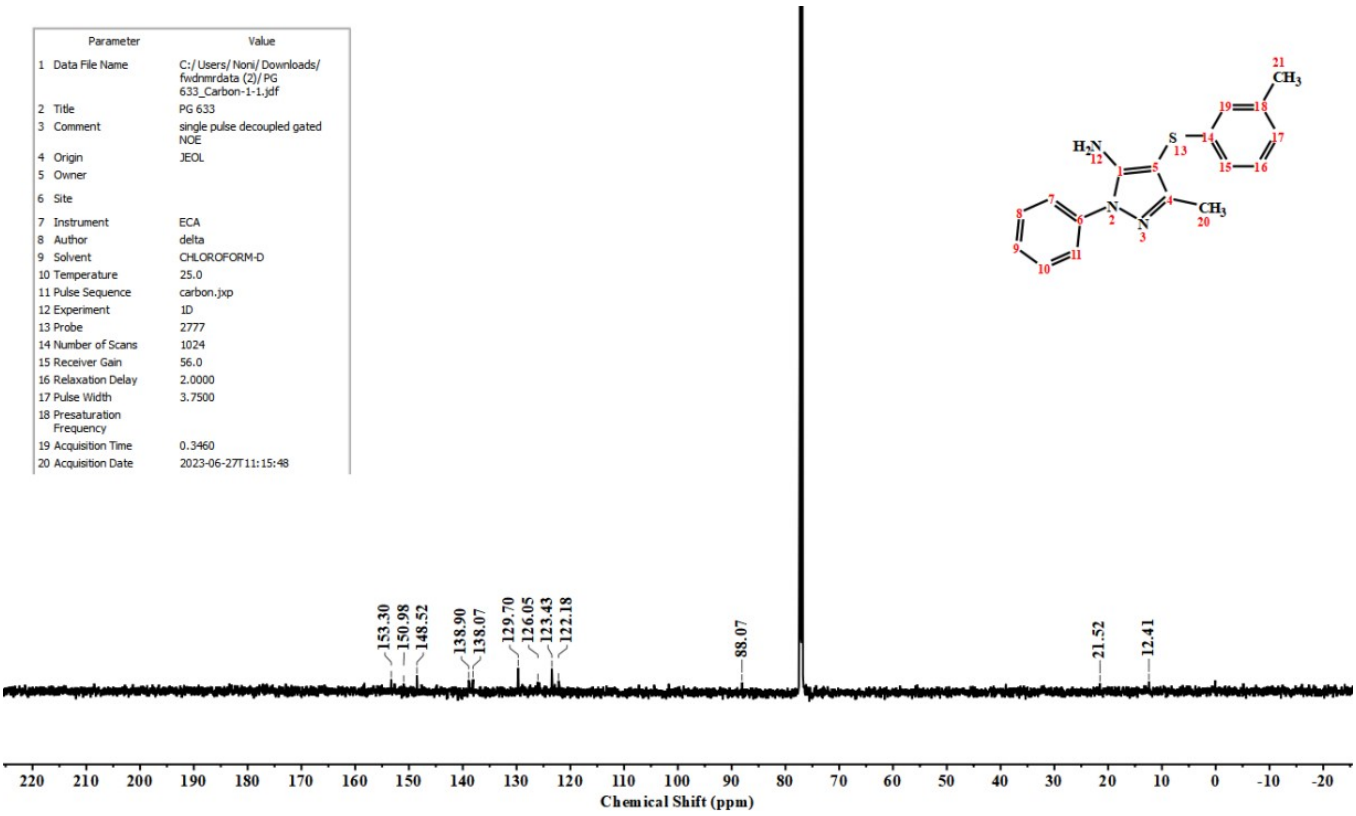


Figure S 49: ^{13}C NMR of 4-((3-methylphenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3m)**

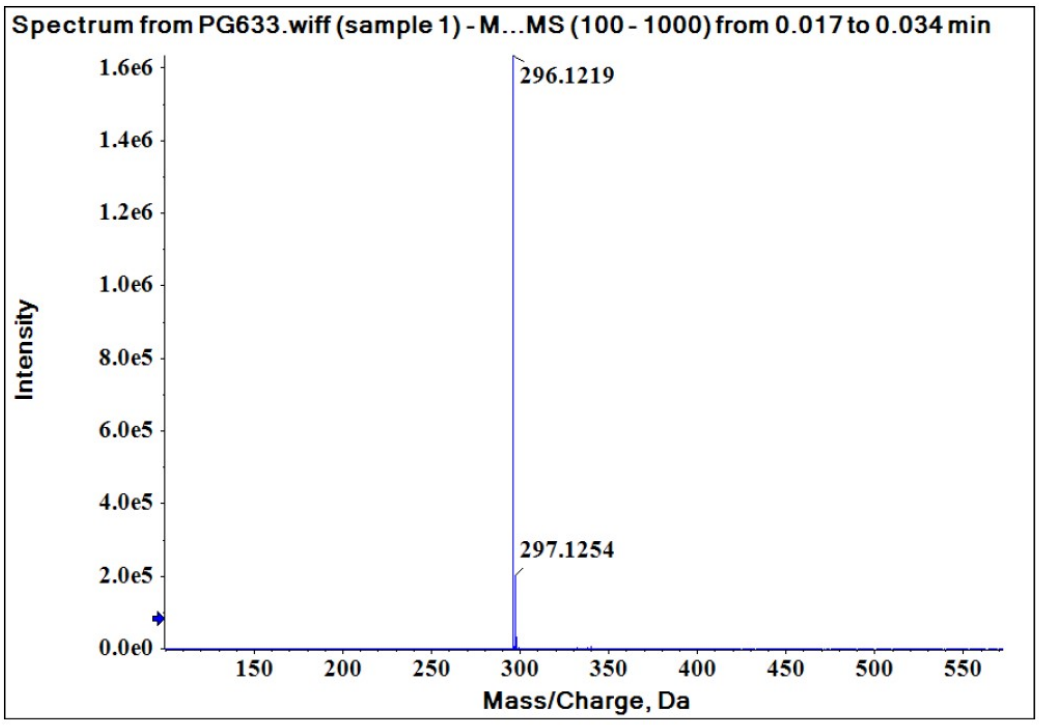


Figure S 50: Mass spectrometry of 4-((3-methylphenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3m)**

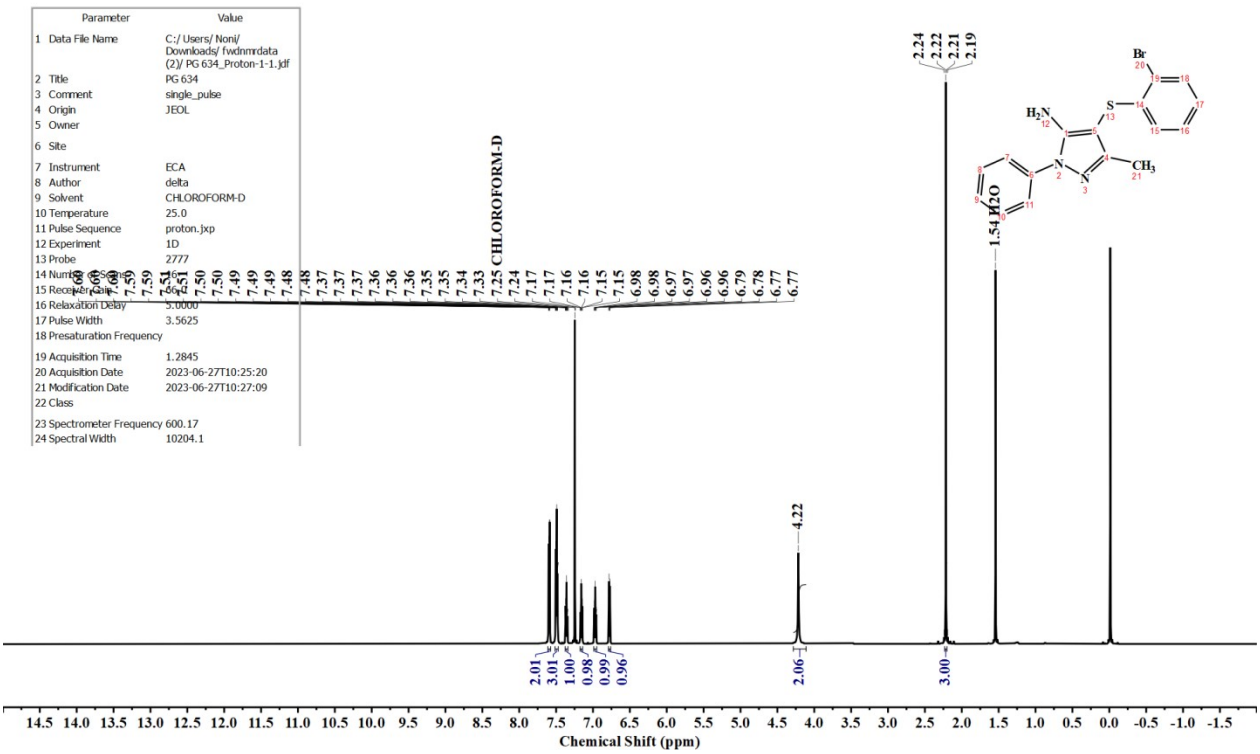


Figure S 51: [1]H NMR of 4-((2-bromophenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3n)**

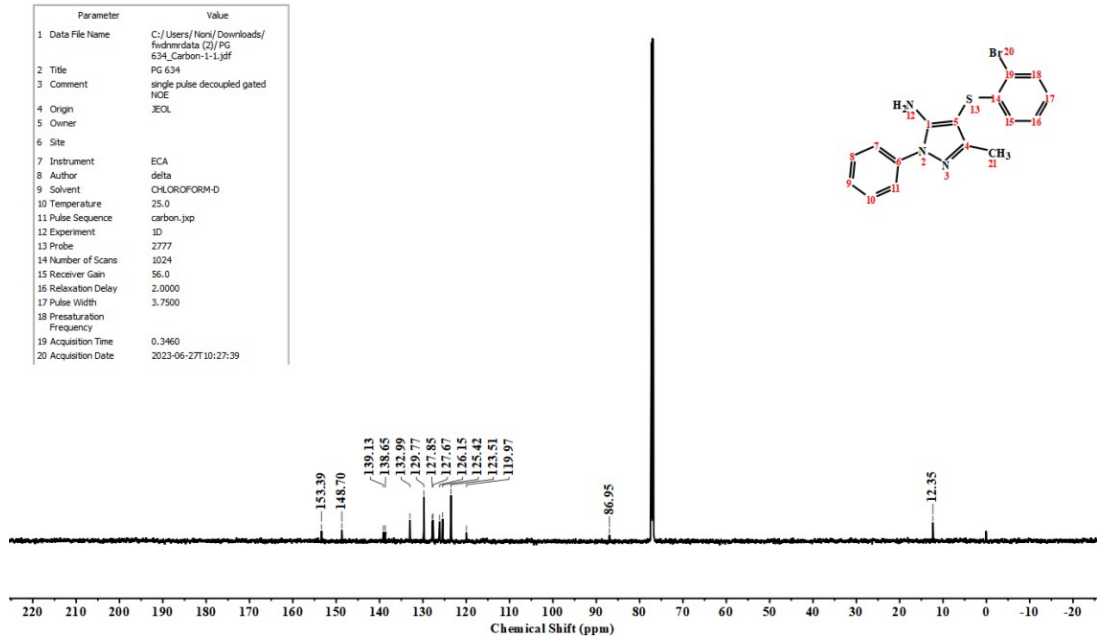


Figure S 52: [13]C NMR of 4-((2-bromophenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3n)**

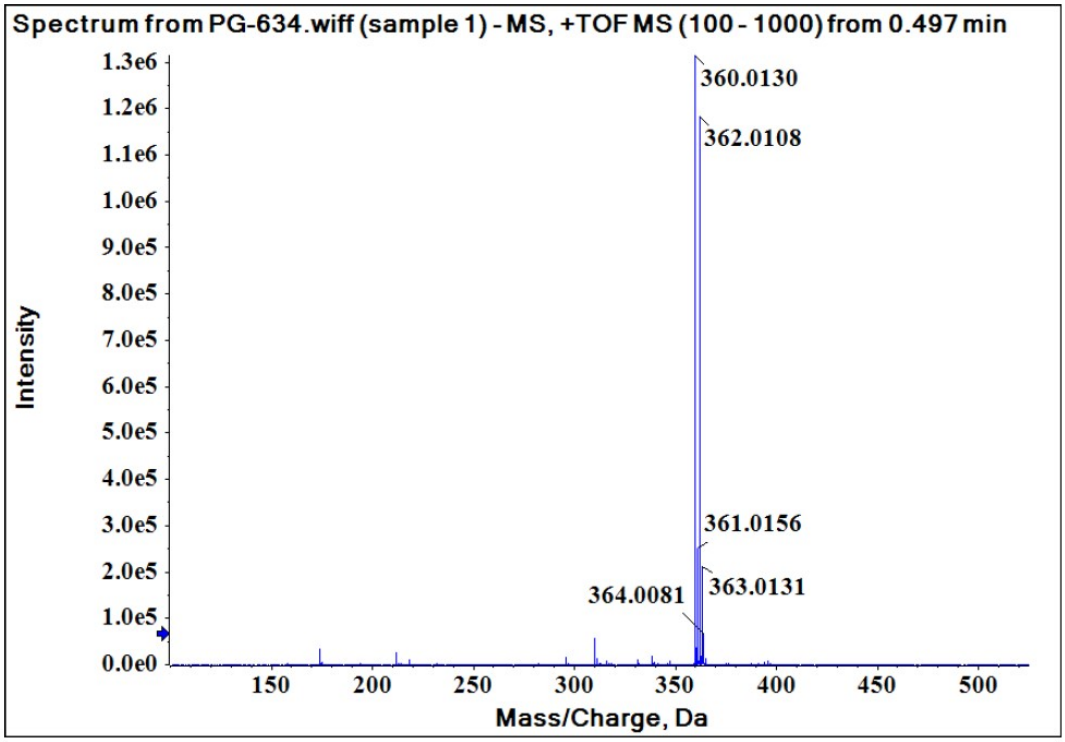


Figure S 53: Mass spectrometry of 4-((2-bromophenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3n)**

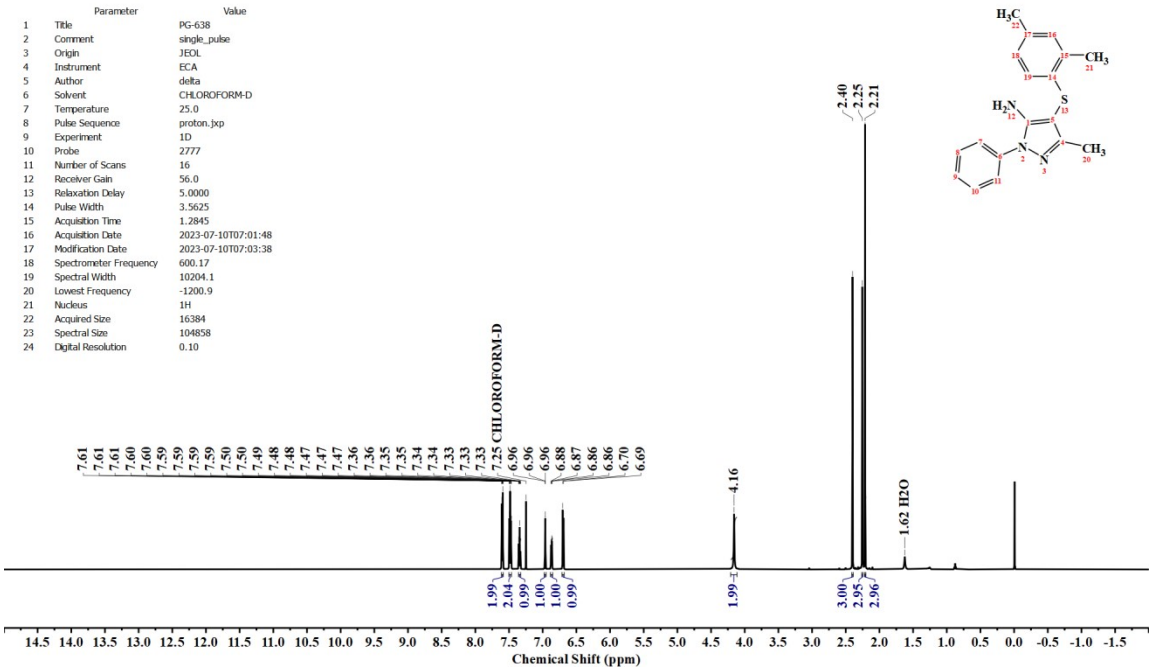


Figure S 54: [1]H NMR of 4-((2,4-dimethylphenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3o)**

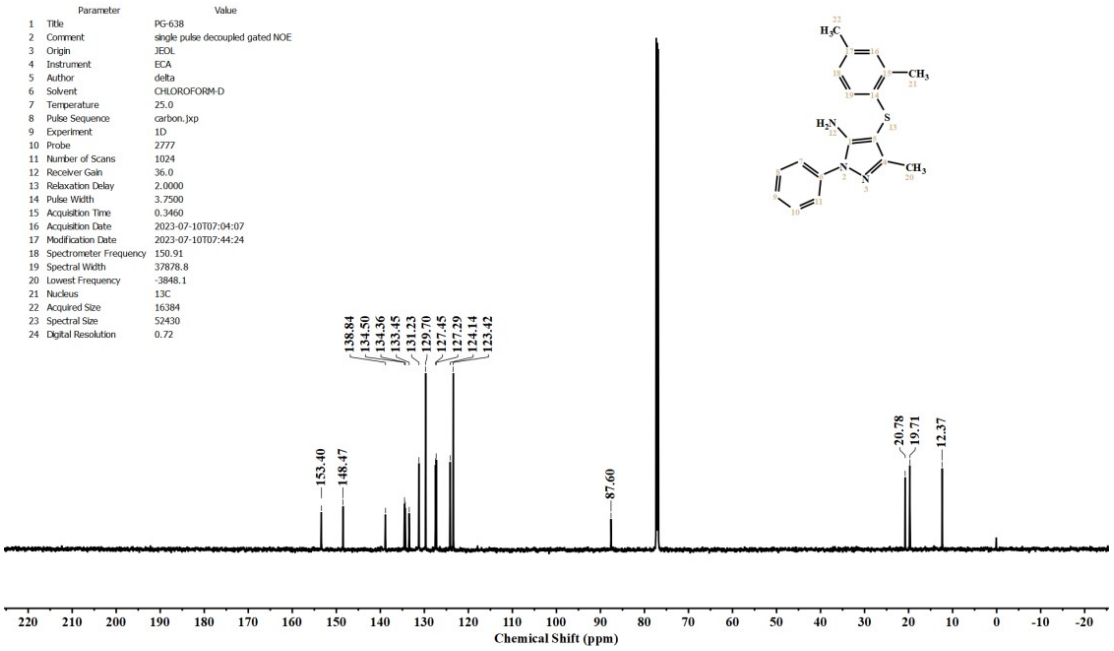


Figure S 55: ^{13}C NMR of 4-((2,4-dimethylphenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3o)**

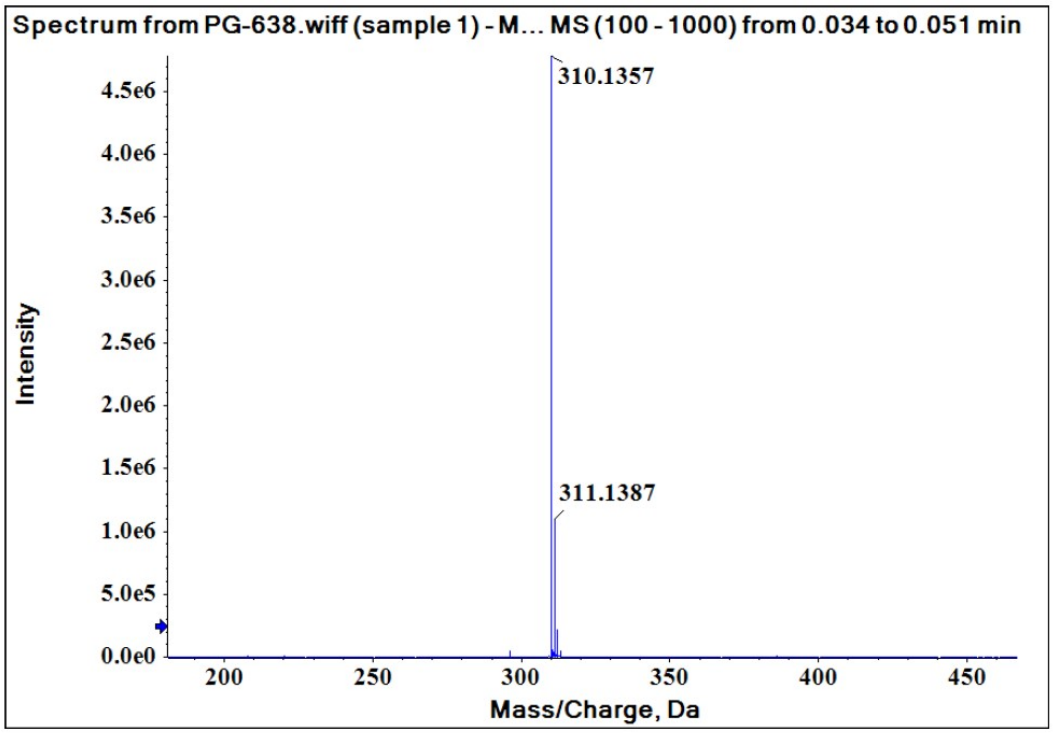


Figure S 56: Mass spectrometry of 4-((2,4-dimethylphenyl)thio)-3-methyl-1-phenyl-1*H*-pyrazol-5-amine **(3o)**

Single crystal X-ray diffraction studies

Suitable single crystals of **3i** were selected for X-ray diffraction studies. A Supernova single source at offset/far, HyPix3000 diffractometer was used for diffraction studies. All the data was collected at 293(2) K. Olex2 program was utilised for solving X-ray structure using Charge Flipping. All the data refinements were performed using the same package by employing the Gauss-Newton minimization. The crystallographic data for structure **3i** have been deposited with the Cambridge Crystallographic Data Centre under CCDC No. 2305521.

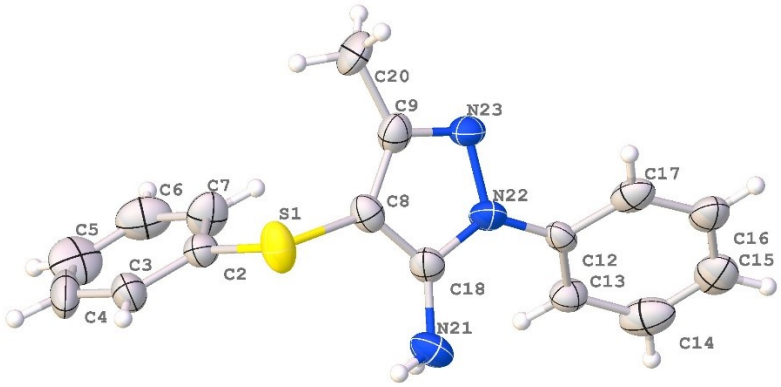
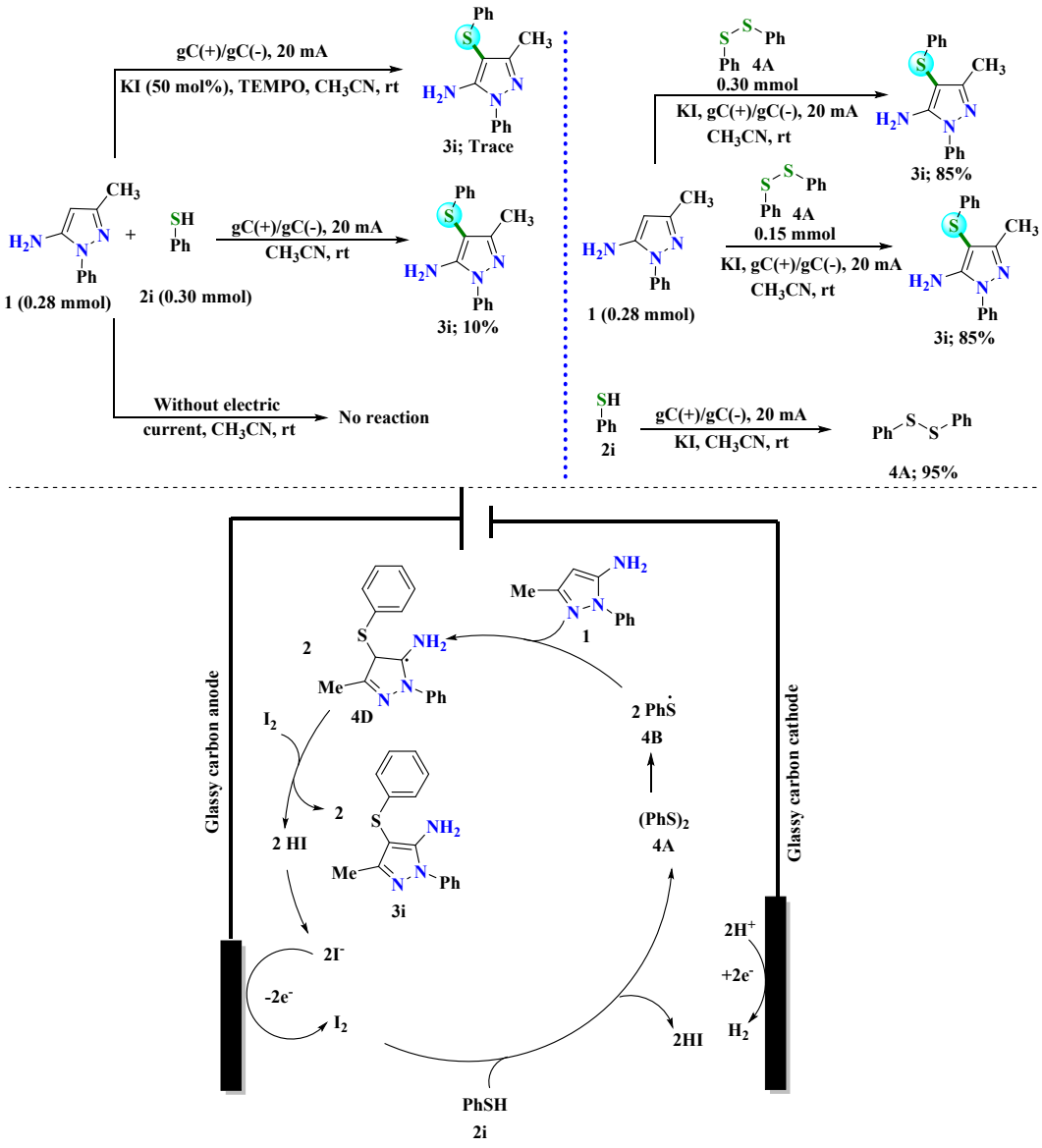


Figure S 57: Ortep diagram of **3i**

Table S1: Crystal data and structure refinement parameters for **3i**

Empirical formula	$C_{16}H_{15}N_3S$ **(3i)**
Formula weight	281.37
Temperature/K	293(2)
Crystal system	orthorhombic
Space group	$Pna2_1$
a/Å	11.7569(10)
b/Å	9.4089(9)
c/Å	26.936(3)
α/°	90
β/°	90
γ/°	90
Volume/Å^3	2979.6(5)
Z	8
ρ_{calc}g/cm^3	1.254
μ/mm^{-1}	0.211
F(000)	1184.0
Crystal size/mm^3	0.16 × 0.14 × 0.12
Radiation	Mo Kα (λ = 0.71073)

2Θ range for data collection/°	6.318 to 52.746
Index ranges	$-13 \le h \le 14, -11 \le k \le 8, -30 \le l \le 33$
Reflections collected	11829
Independent reflections	4866 [R_{int}= 0.2698, R_{sigma}= 0.1505]
Data/restraints/parameters	4866/7/365
Goodness-of-fit on F^2	0.984
Final R indexes [I>=2σ (I)]	R_1= 0.0949, wR_2= 0.2448
Final R indexes [all data]	R_1= 0.1829, wR_2= 0.3321
Largest diff. peak/hole / e $Å^{-3}$	0.41/-0.42



Scheme S1: Controlled experiments and plausible reaction mechanism for the electro-organo catalyzed sulfenylation of aminopyrazole