Supplementary Materials

Table S1: Raw replicate inhibition zone diameters (mm) of chalcone and pyrazoline derivatives against *Escherichia coli* (disc diffusion, n = 3)

Compound	Conc. (µg/disc)	Replicate 1	Replicate 2	Replicate 3	Mean ± SD
5a	2	NG	NG	NG	NG
5a	4	24.0	24.8	24.2	24.3 ± 0.6
5a	6	31.8	32.0	32.5	32.1 ± 0.5
5a	8	34.6	35.1	35.2	35.0 ± 0.7
5b	2	9.8	10.5	10.3	10.2 ± 0.5
5b	4	15.4	16.0	16.6	16.0 ± 0.6
5b	6	9.8	10.2	10.4	10.1 ± 0.3
5b	8	7.6	8.0	8.4	8.0 ± 0.4
5c	2	NG	NG	NG	NG
5c	4	19.8	20.3	20.5	20.2 ± 0.4
5c	6	32.6	33.3	34.2	33.4 ± 0.8
5c	8	34.2	35.3	35.6	35.0 ± 0.9
5d	2	19.6	20.2	20.3	20.0 ± 0.5
5d	4	20.4	21.2	21.7	21.1 ± 0.7
5d	6	20.5	21.0	21.5	21.0 ± 0.6
5d	8	22.2	23.1	23.7	23.0 ± 0.8
5e	2	16.6	17.0	17.4	17.0 ± 0.4
5e	4	4.8	5.0	5.2	5.0 ± 0.2
5e	6	NG	NG	NG	NG
5e	8	17.6	18.0	18.4	18.0 ± 0.5
5f	2	NG	NG	NG	NG
5f	4	12.0	12.3	12.4	12.2 ± 0.3
5f	6	12.6	13.0	13.4	13.0 ± 0.4
5f	8	32.4	33.2	33.5	33.0 ± 0.8
5g	2	NG	NG	NG	NG
5g	4	7.9	8.0	8.4	8.1 ± 0.2
5g	6	21.5	22.0	22.6	22.0 ± 0.6
5g	8	30.4	31.0	31.6	31.0 ± 0.7
5h	2	NG	NG	NG	NG
5h	4	NG	NG	NG	NG
5h	6	NG	NG	NG	NG
5h	8	NG	NG	NG	NG
5i	2	NG	NG	NG	NG
5i	4	NG	NG	NG	NG
5i	6	9.7	10.0	10.3	10.0 ± 0.3
5i	8	20.4	21.0	21.6	21.0 ± 0.6
4a	2	NG	NG	NG	NG
4a	4	NG	NG	NG	NG
4a	6	NG	NG	NG	NG
4a	8	7.6	8.0	8.4	8.0 ± 0.4
Amoxicillin	2	9.7	10.0	10.3	10.0 ± 0.3
Amoxicillin	4	12.6	13.0	13.4	13.0 ± 0.4
Amoxicillin	6	14.5	15.0	15.5	15.0 ± 0.5
Amoxicillin	8	17.5	18.0	18.5	18.0 ± 0.5

Table S2: Raw replicate inhibition zone diameters (mm) of chalcone and pyrazoline derivatives against *Staphylococcus aureus* (disc diffusion, n = 3)

Compound	Conc. (μg/disc)	Replicate 1	Replicate 2	Replicate 3	Mean ± SD
5a	2	NG	NG	NG	NG
5a	4	23.6	24.1	24.4	24.0 ± 0.6
5a	6	31.4	32.0	32.6	32.0 ± 0.7
5a	8	34.2	35.0	35.8	35.0 ± 0.8
5b	2	NG	NG	NG	NG
5b	4	24.3	25.0	25.7	25.0 ± 0.7
5b	6	25.4	26.0	26.6	26.0 ± 0.6
5b	8	NG	NG	NG	NG
5c	2	NG	NG	NG	NG
5c	4	NG	NG	NG	NG
5c	6	34.2	35.0	35.8	35.0 ± 0.9
5c	8	37.1	38.0	38.9	38.0 ± 1.0
5d	2	NG	NG	NG	NG
5d	4	NG	NG	NG	NG
5d	6	23.4	24.0	24.6	24.0 ± 0.6
5d	8	33.2	34.0	34.8	34.0 ± 0.8
5e	2	NG	NG	NG	NG
5e	4	NG	NG	NG	NG
5e	6	19.6	20.0	20.4	20.0 ± 0.5
5e	8	29.4	30.0	30.6	30.0 ± 0.7
5f	2	NG	NG	NG	NG
5f	4	22.4	23.0	23.6	23.0 ± 0.6
5f	6	24.3	25.0	25.7	25.0 ± 0.7
5f	8	29.1	30.0	30.9	30.0 ± 0.9
5g	2	12.0	12.4	12.8	12.4 ± 0.5
5g	4	11.9	12.3	12.7	12.3 ± 0.5
5g	6	11.8	12.2	12.6	12.2 ± 0.4
5g	8	11.6	12.0	12.4	12.0 ± 0.4
5h	2	NG	NG	NG	NG
5h	4	NG	NG	NG	NG
5h	6	NG	NG	NG	NG
5h	8	16.6	17.0	17.4	17.0 ± 0.6
5i	2	21.3	22.0	22.7	22.0 ± 0.7
5i	4	32.4	33.0	33.6	33.0 ± 0.8
5i	6	33.1	34.0	34.9	34.0 ± 0.9
5i	8	34.2	35.0	35.8	35.0 ± 0.8
4a	2	NG	NG	NG	NG
4a	4	NG	NG	NG	NG
4a	6	NG	NG	NG	NG
4a	8	19.4	20.0	20.6	20.0 ± 0.6
Amoxicillin	2	19.4	20.0	20.6	20.0 ± 0.6
Amoxicillin	4	22.3	23.0	23.7	23.0 ± 0.7
Amoxicillin	6	28.2	29.0	29.8	29.0 ± 0.8
Amoxicillin	8	29.1	30.0	30.9	30.0 ± 0.9

Table S3: Correlation of ABX protons (H_a, H_b, H_x) with their corresponding carbons for pyrazoline derivatives 5a–5i, based on exact ^{13}C chemical shifts from the characterization data.

Compound	Ha → C_CH_2	Hb → C_CH_2	Hx → C_Hx	O–CH_2	O–CH_2 carbon(s) δC
5a	3.04 (dd, 1H) → 44.26	3.77 (dd, 1H) → 44.26	5.21 (dd, 1H) → 64.41	5.06 (s, 2H)	69.96
5b	3.16 (dd, 1H) → 42.60	4.02 (dd, 1H) → 42.60	5.53 (dd, 1H) → 62.17	5.22 (s, 2H)	69.90
5c	3.21 (dd, 1H) → 43.84	4.06 (dd, 1H) → 43.84	5.29 (dd, 1H) → 64.28	5.21 (s, 2H) + 5.21 (s, 2H)	69.45, 70.29
5d	3.11 (dd, 1H) → 43.90	3.83 (dd, 1H) → 43.90	5.22 (dd, 1H) → 64.07	5.08 (s, 2H)	69.45
5e	3.07 (dd, 1H) → 44.21	3.61 (dd, 1H) → 44.21	5.31 (dd, 1H) → 60.74	4.88 (s, 2H)	69.50
5f	3.01 (dd, 1H) → 43.53	3.73 (dd, 1H) → 43.53	5.11 (dd, 1H) → 63.95	5.00 (s, 2H) ×3	69.16, 70.20, 70.43
5g	3.08 (dd, 1H) → 43.82	3.78 (dd, 1H) → 43.82	5.20 (dd, 1H) → 63.98	4.98 (s, 2H)	69.40 (also 72.72 for additional benzylic site)
5h	3.08 (dd, 1H) → 43.85	3.79 (dd, 1H) → 43.85	5.22 (dd, 1H) → 64.22	5.05 (s, 2H)	69.52
5i	3.19 (dd, 1H) → 44.27	3.89 (dd, 1H) → 44.27	5.31 (dd, 1H) → 64.72	5.17 (s, 2H)	69.81

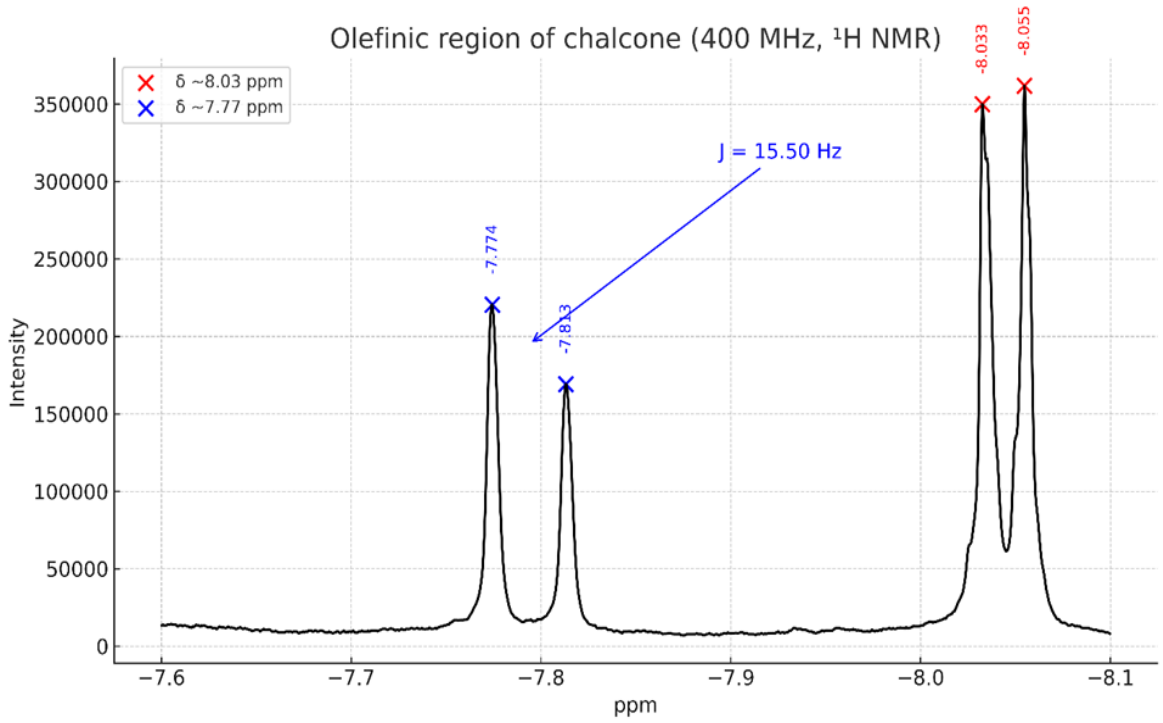

Figure S1: Olefinic region of the 1H NMR spectrum (400 MHz, $CDCl_3$) of the representative chalcone (4a) derivative. The trans-coupled olefinic protons appear at δ 7.77 and 8.03 ppm with a coupling constant of J = 15.5 Hz, confirming the E-configuration of the double bond.

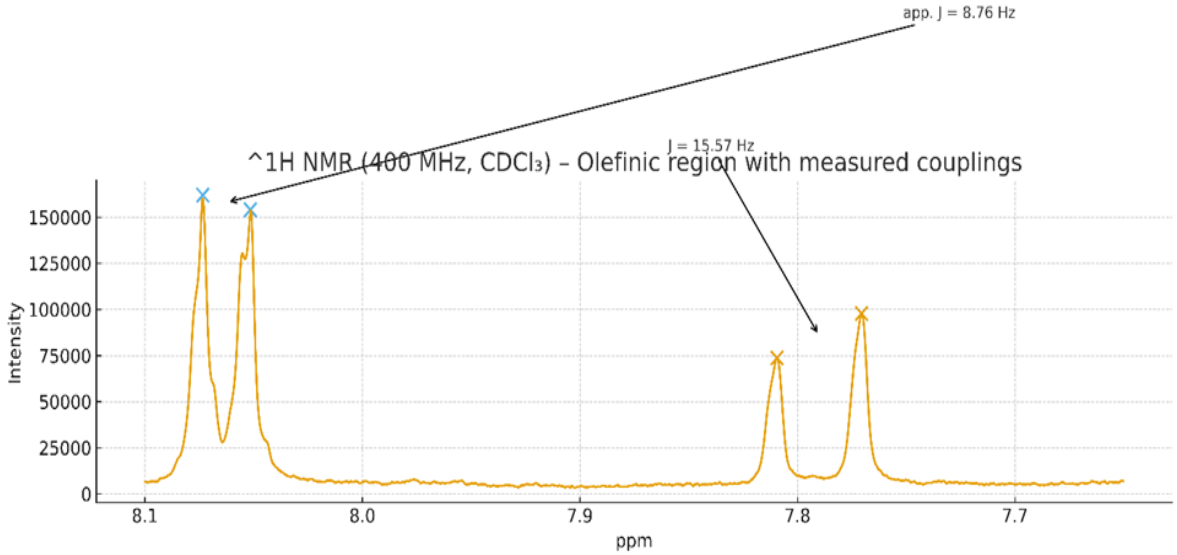

Figure S2: Olefinic region of the 1HNMR spectrum (400 MHz, $CDCl_3$) of the chalcone(4b) derivative, highlighting the measured coupling constants. The trans-vinylic protons resonate at δ ~7.8 and ~8.1 ppm with a coupling constant of J = 15.6 Hz, confirming the E-configuration of the double bond. An additional vicinal coupling (J ≈ 8.8 Hz) is also observed.

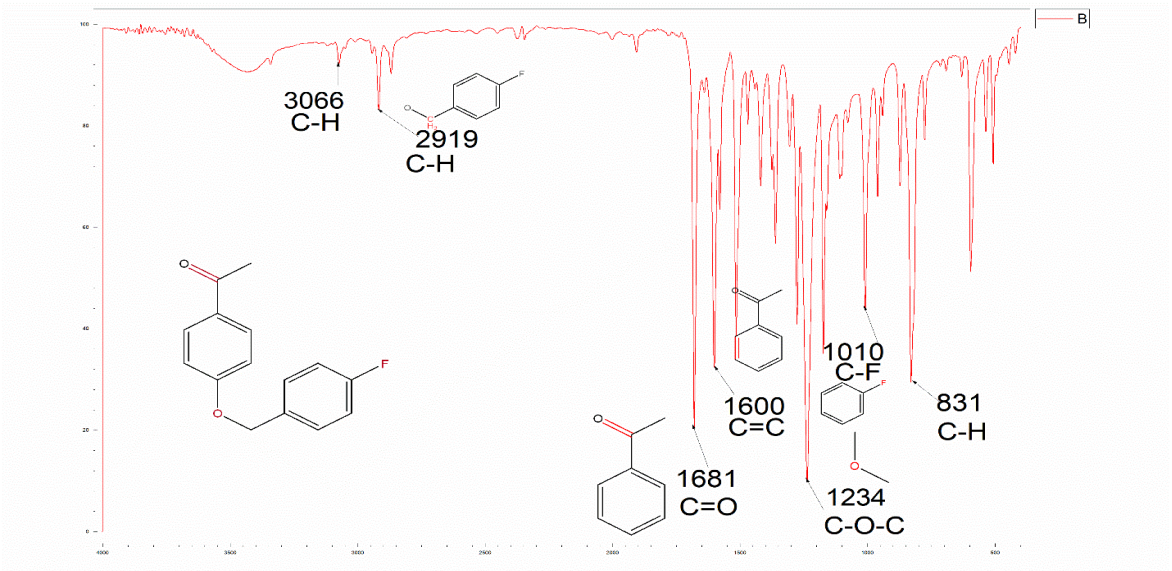

Figure S3: FTIR of 4-(4-Flourobenzyl) oxyacetophenone **(1).**

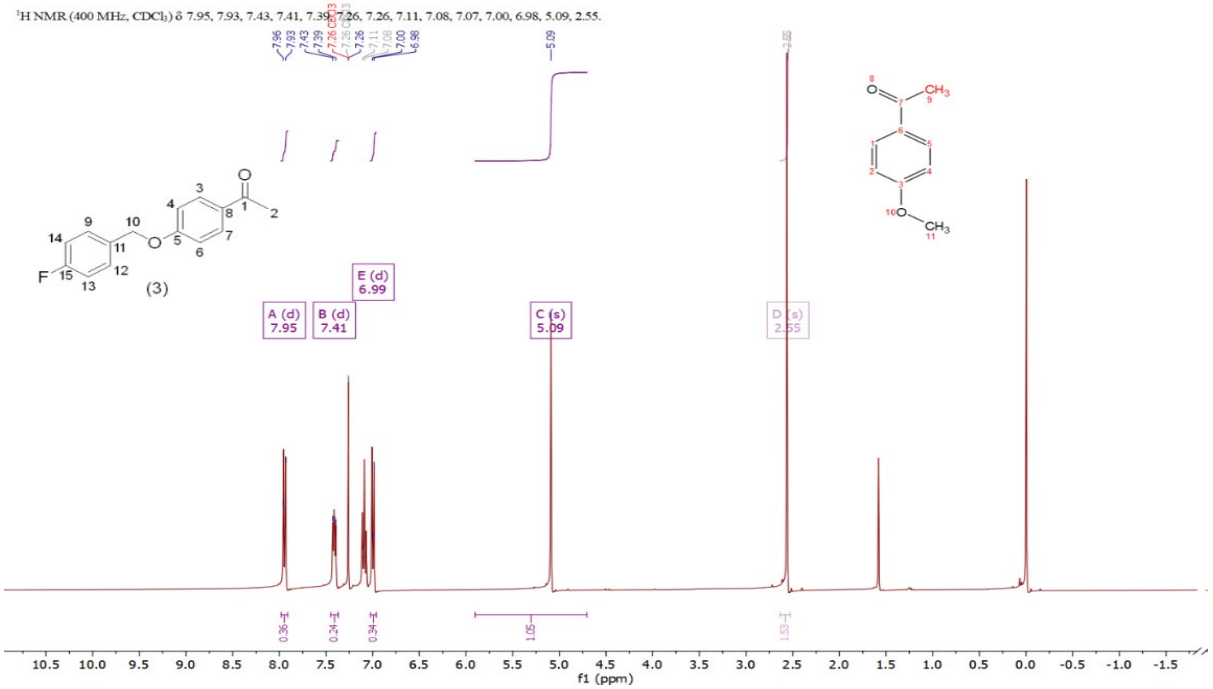

Figure S4: ^{1}H-NMR of 4-(4-Flourobenzyl) oxyacetophenone (1).

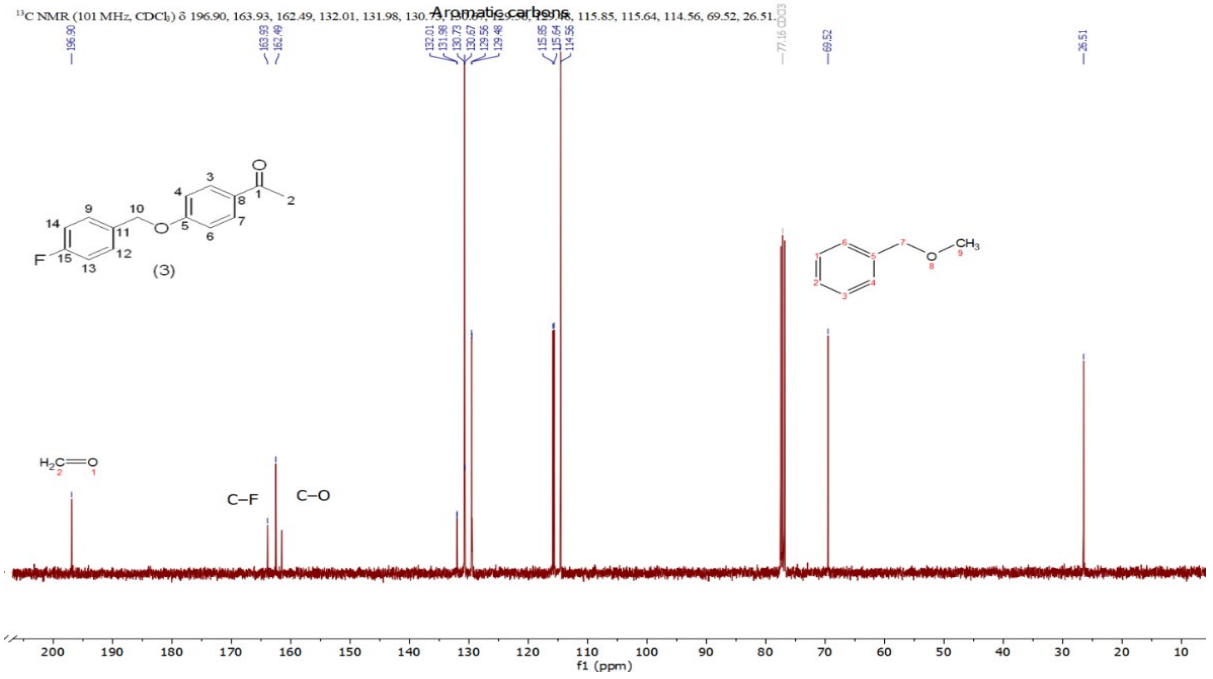

Figure S5: **^{13}C-NMR of** 4-(4-Flourobenzyl) oxyacetophenone(1).

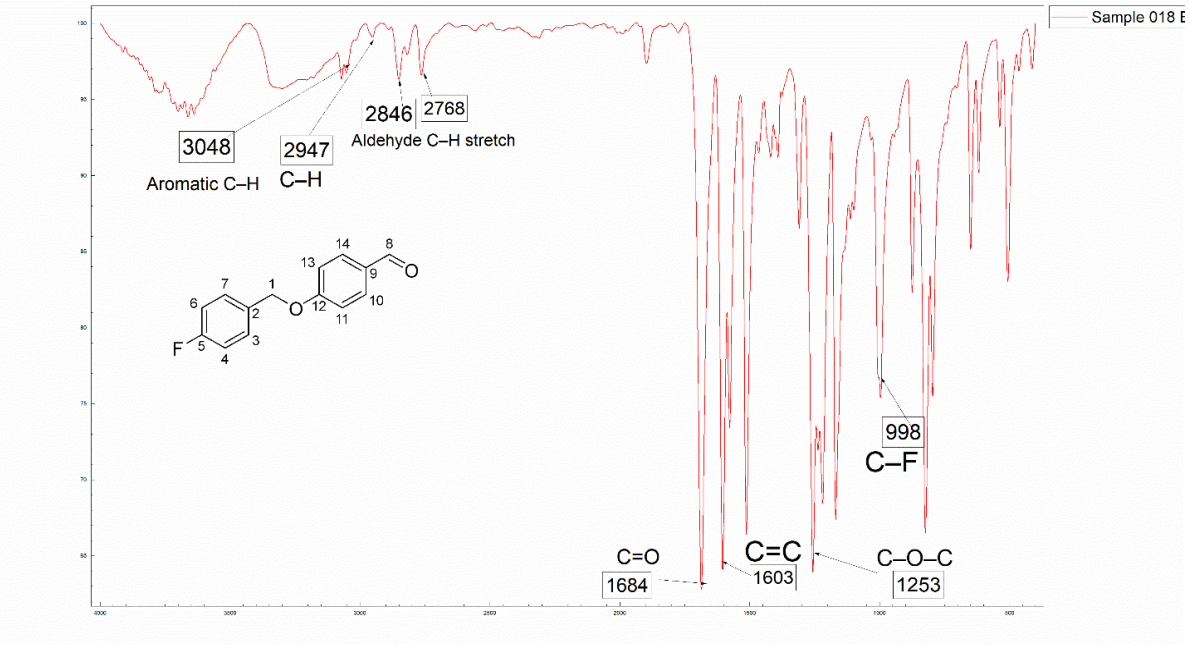

Figure S6: FTIR 4-((4-fluorobenzyl) oxy) benzaldehyde **(2)**.

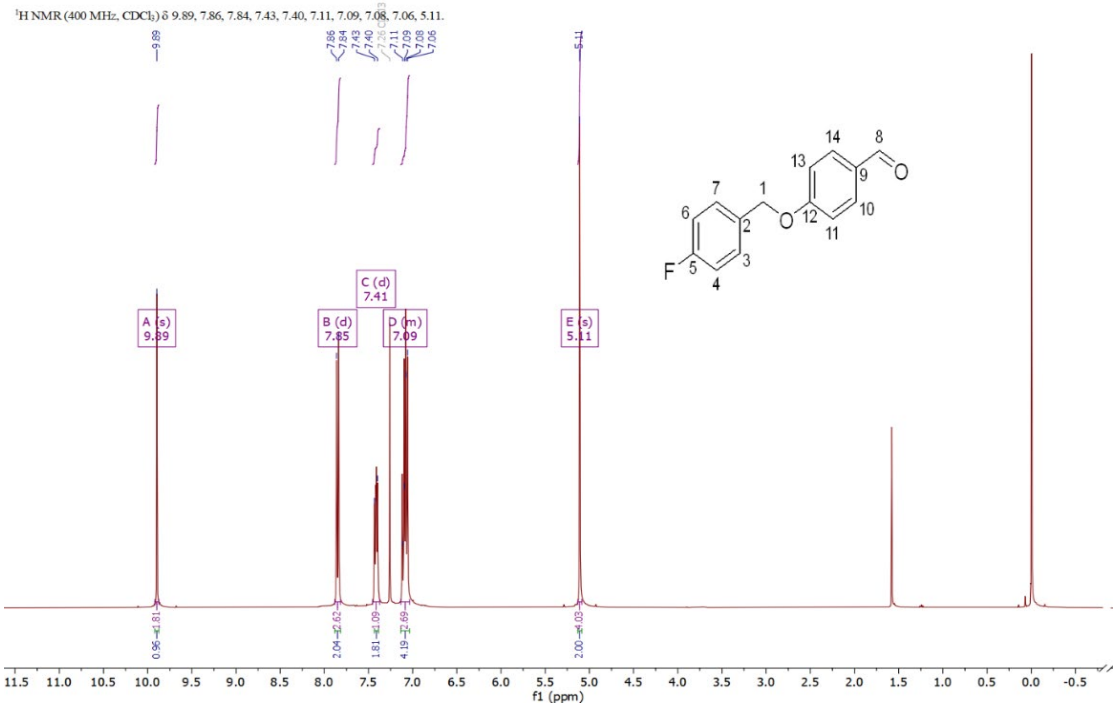

Figure S7: ¹H-NMR of 4-((4-fluorobenzyl) oxy) benzaldehyde (2).

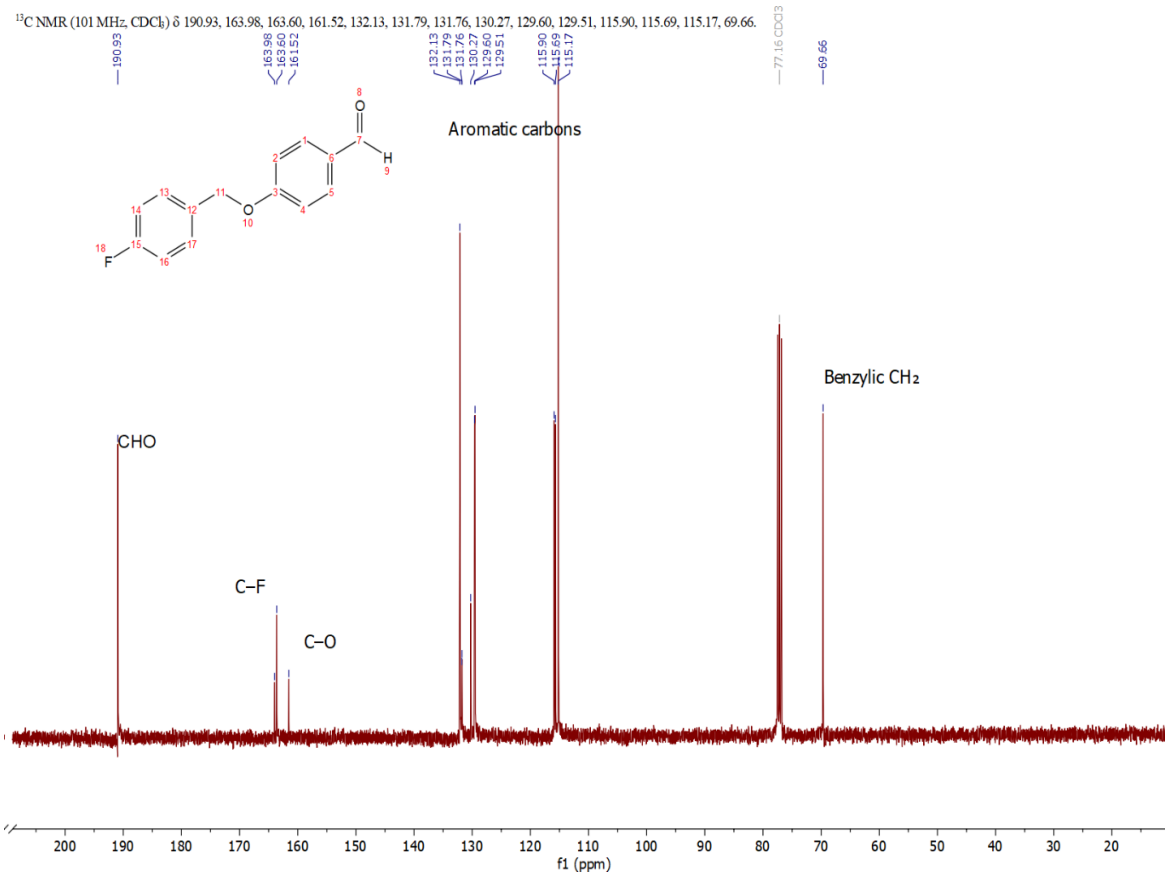

Figure S8: ^{13}C-NMR of 4-((4-fluorobenzyl) oxy) benzaldehyde **(2).**

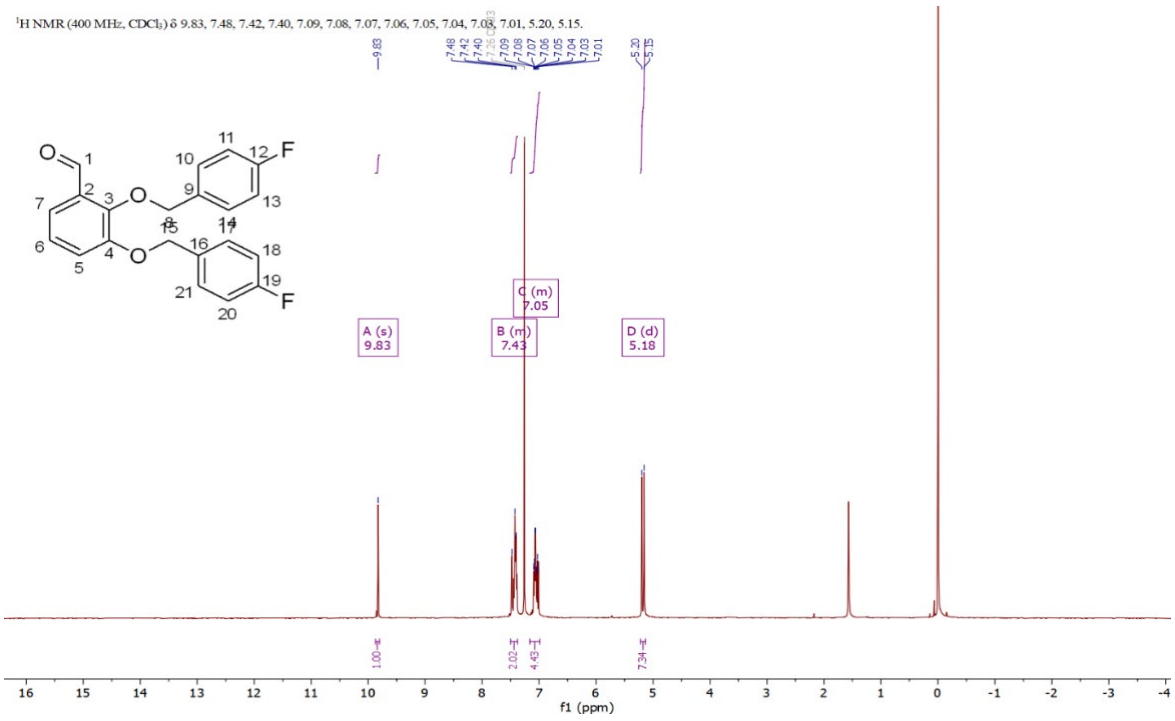

Figure S9: ^{1}H-NMR of 2,3-bis(4-fluorobenzyloxy) benzaldehyde (3).

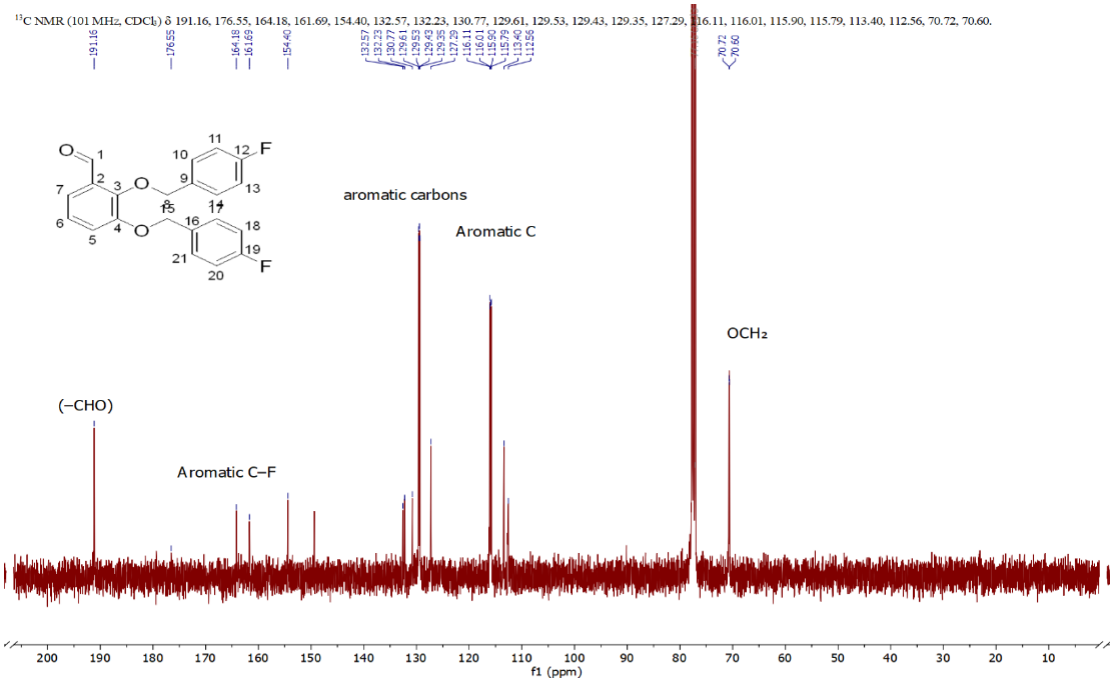

Figure S10: ^{13}C-NMR of 2,3-bis(4-fluorobenzyloxy) benzaldehyde **(3).**

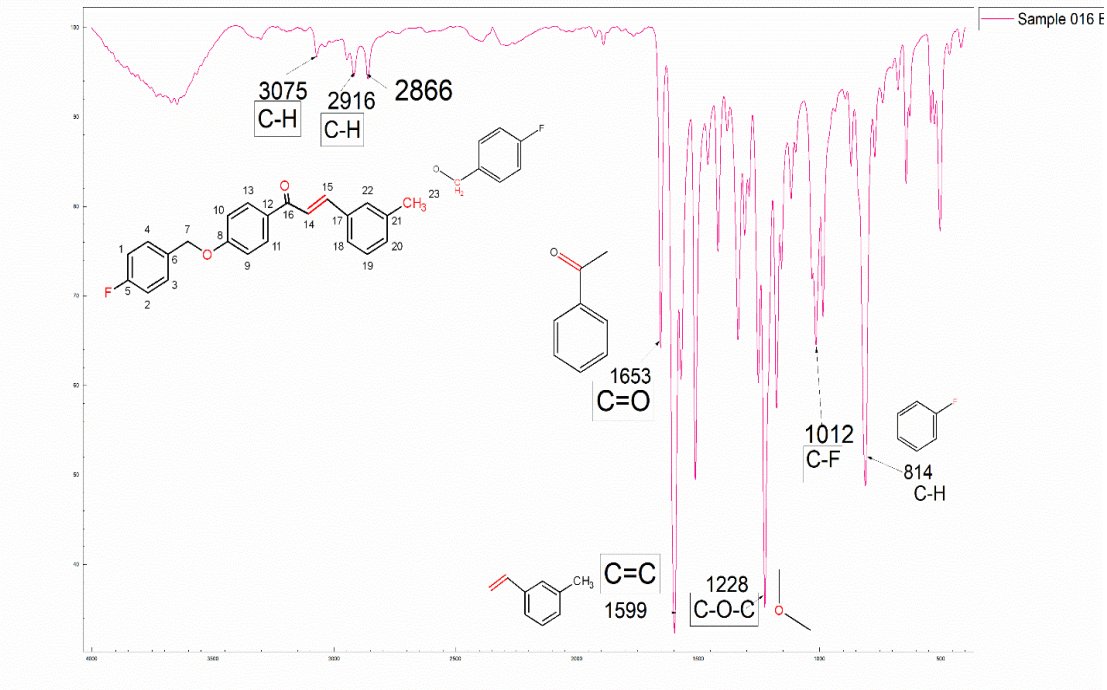

Figure S11: FTIR of (4)(E)-1-(4-((4-fluorobenzyl) oxy) phenyl)-3-(m-tolyl) prop-2-en-1-one**(4a)**

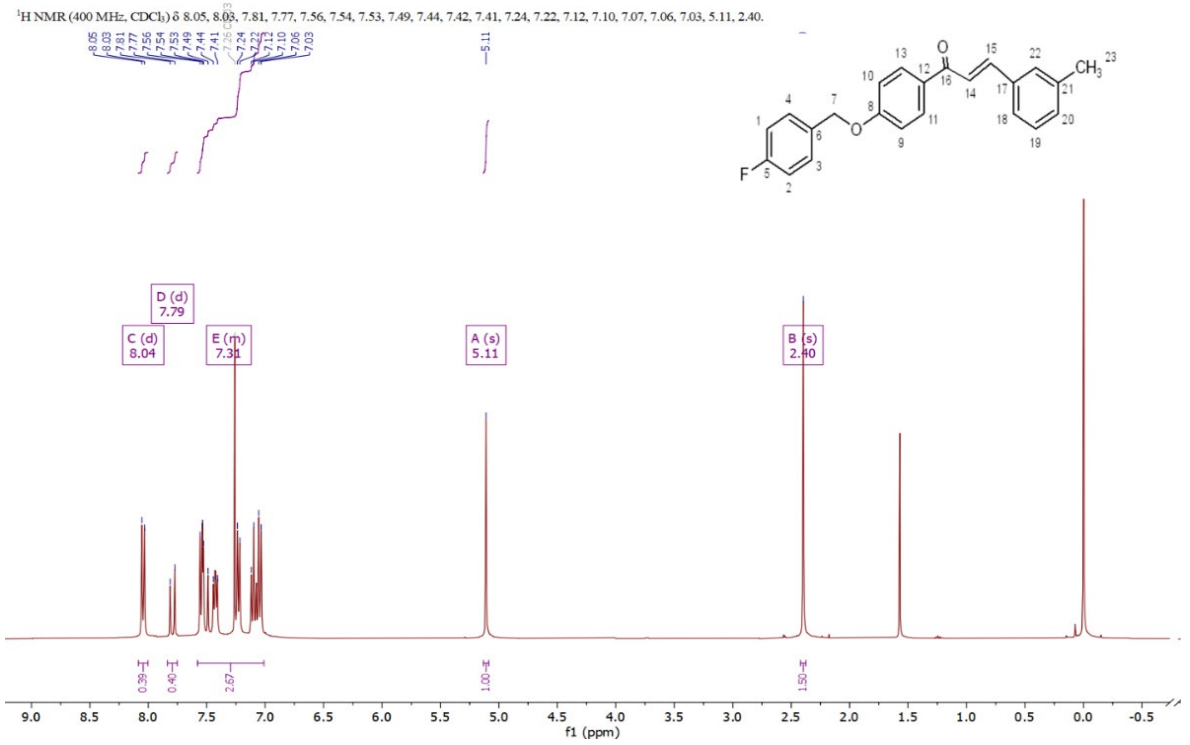

Figure S12: [1]H-NMR of (4)(E)-1-(4-((4-fluorobenzyl) oxy) phenyl)-3-(m-tolyl) prop-2-en-1-one(4a).

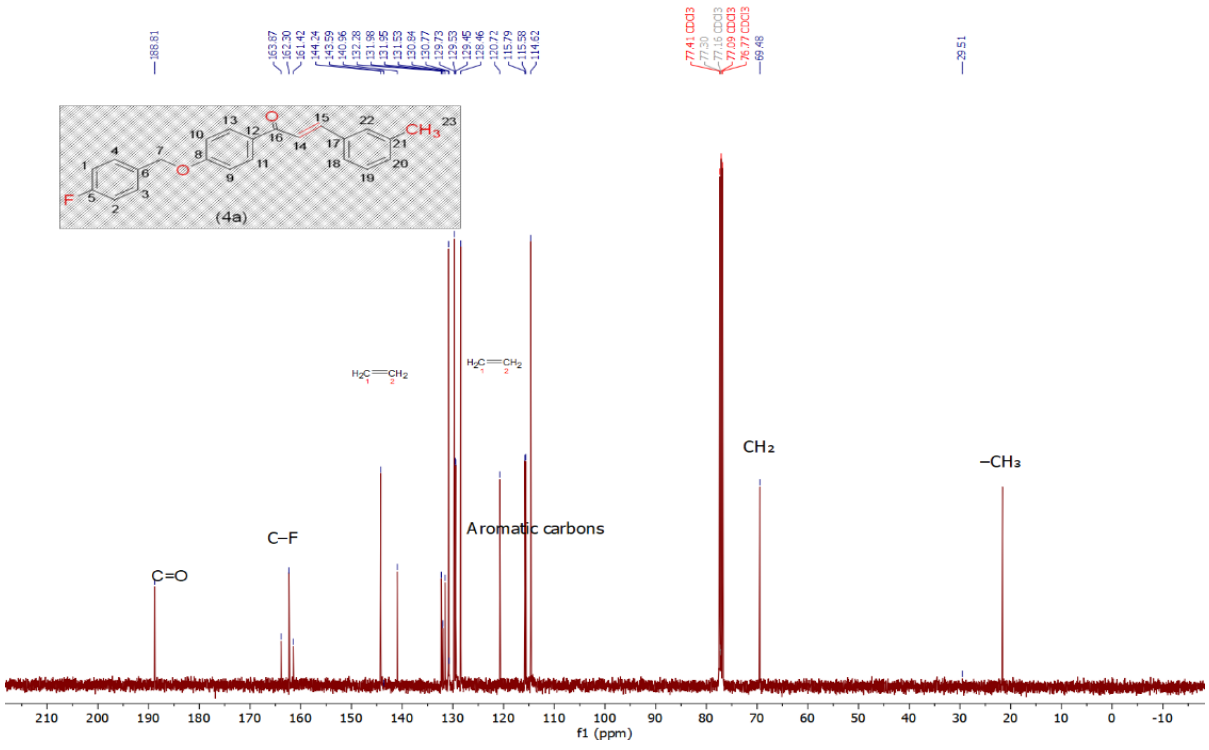

Figure S13: [13]C-NMR of(4)(E)-1-(4-((4-fluorobenzyl) oxy) phenyl)-3-(m-tolyl) prop-2-en-1-one(4a).

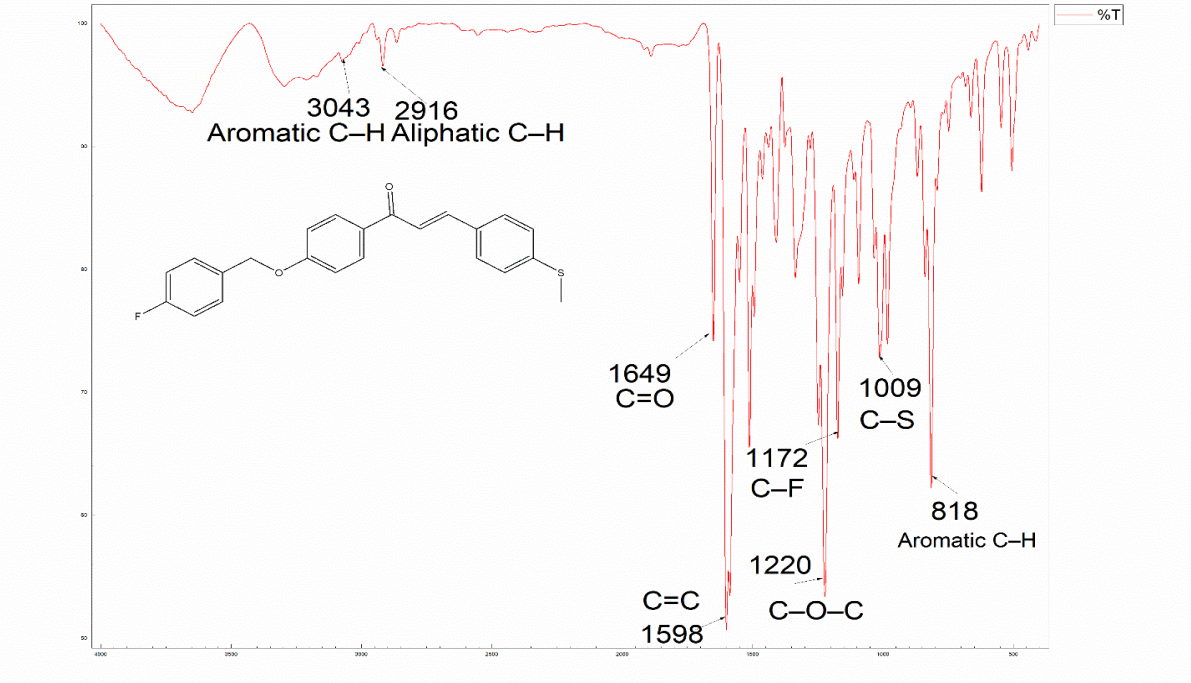

Figure S14: FTIR of (E)-1-(4-((4-fluorobenzyl)oxy)phenyl)-3-(4-(methylthio)phenyl)prop-2-en-1-one ***(4b)***.

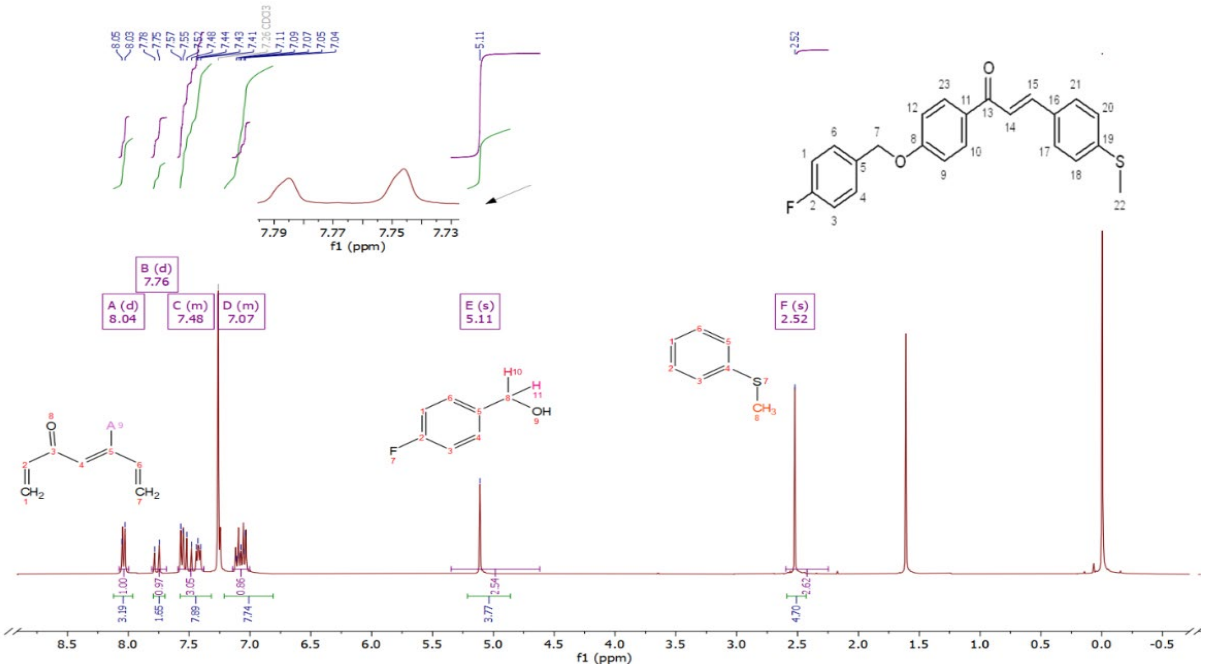

Figure S15: ^{1}H-NMR of(E)-1-(4-((4-fluorobenzyl)oxy)phenyl)-3-(4-(methylthio)phenyl)prop-2-en-1-one ***(4b)***.

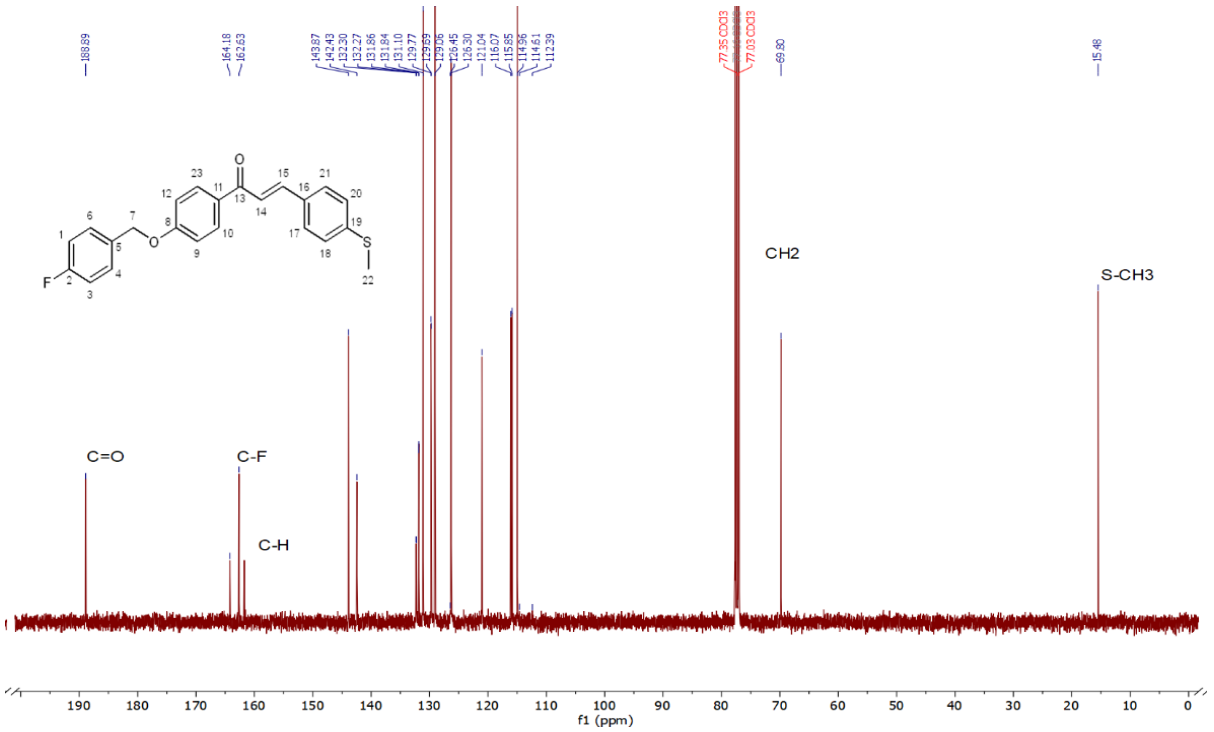

Figure S1: 13C-NMR of (E)-1-(4-((4-fluorobenzyl)oxy)phenyl)-3-(4-(methylthio)phenyl)prop-2-en-1-one ***(4b)***.

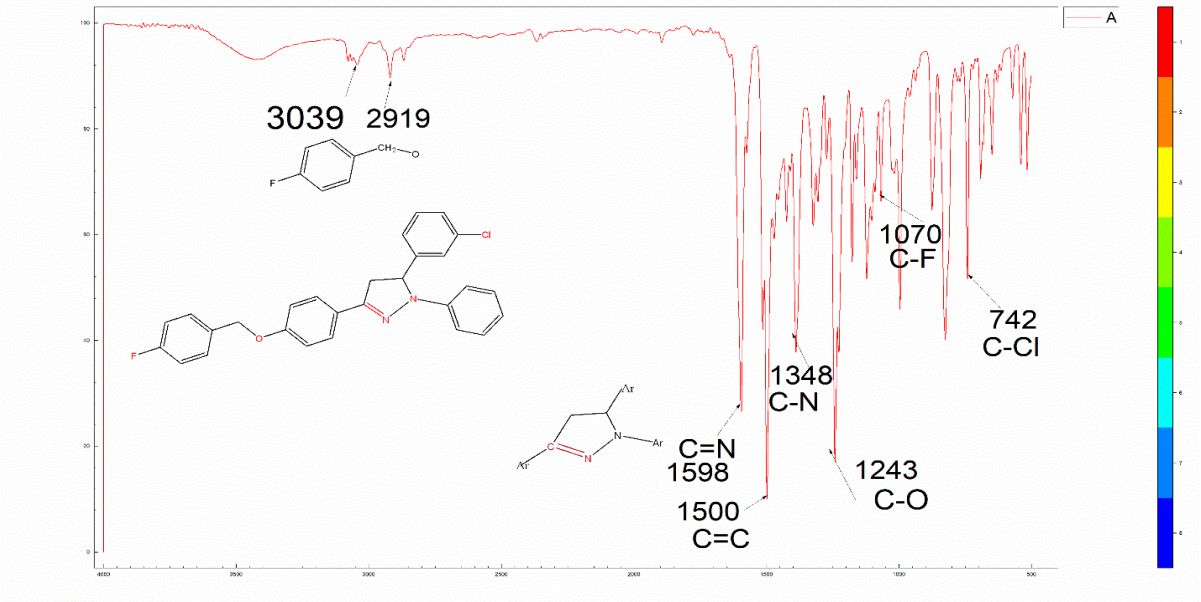

Figure S17: FTIR of 5-(3-chlorophenyl)-3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5a)***.

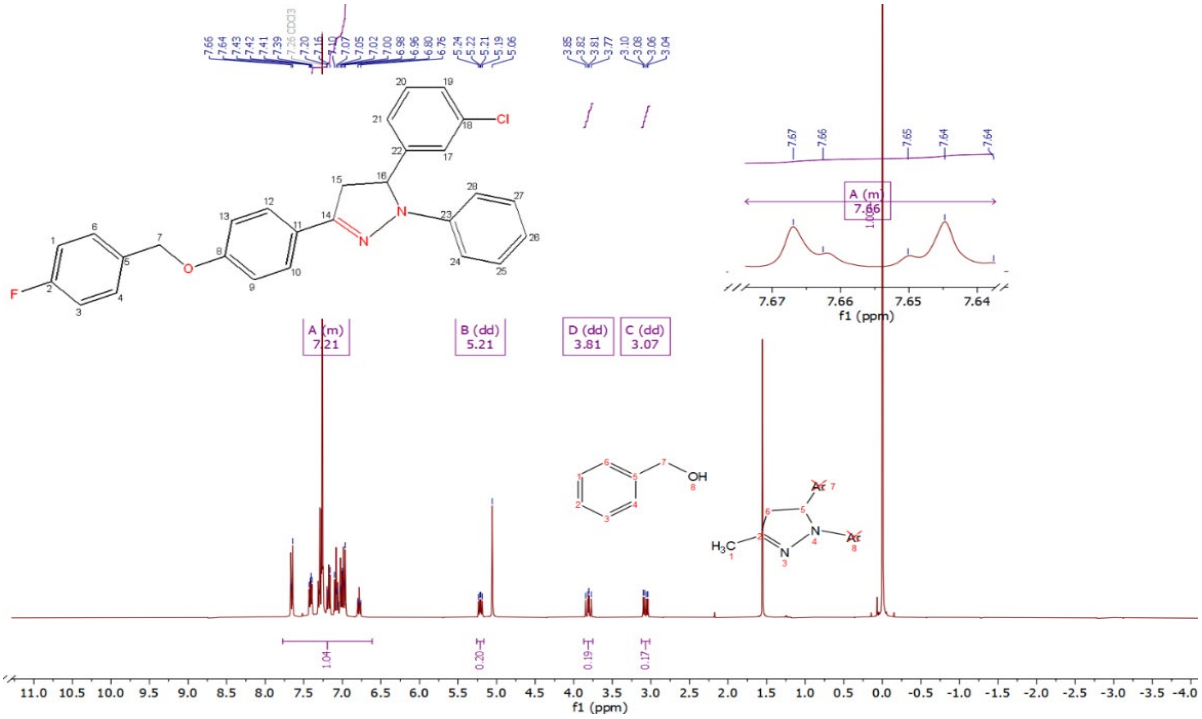

Figure S2: [1]H-NMR of 5-(3-chlorophenyl)-3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5a)***.

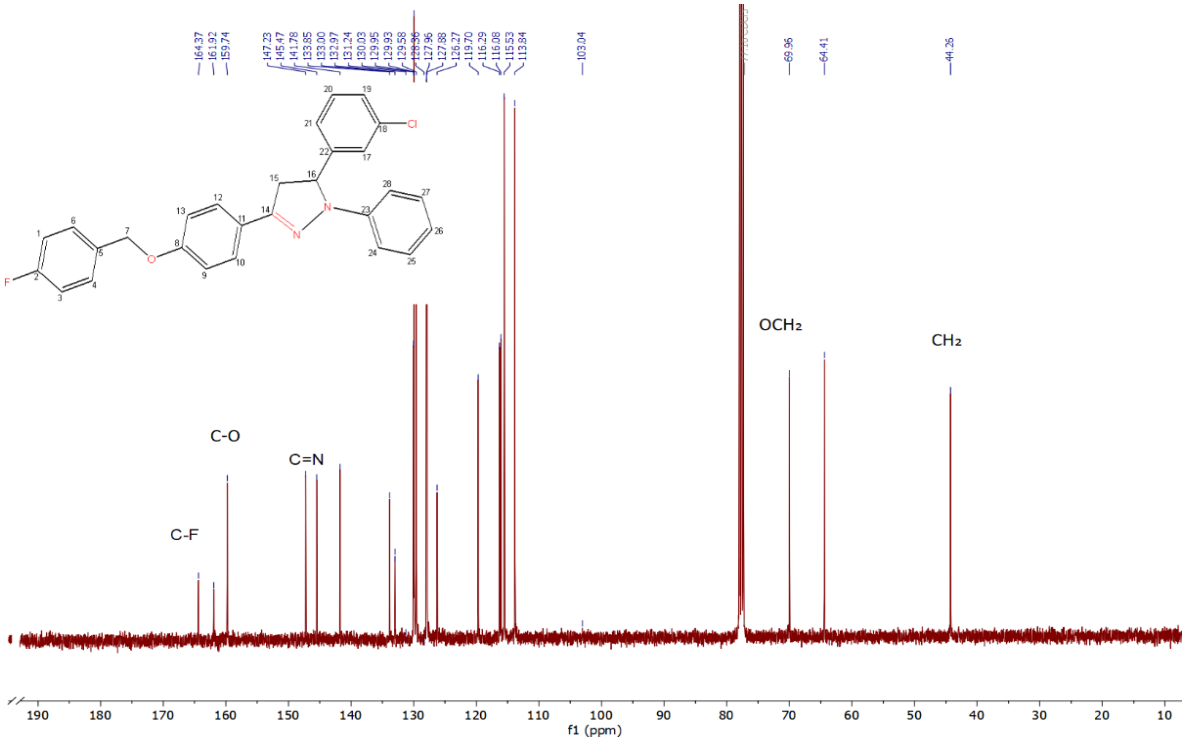

Figure S19: [13]C-NMR of 5-(3-chlorophenyl)-3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5a).***

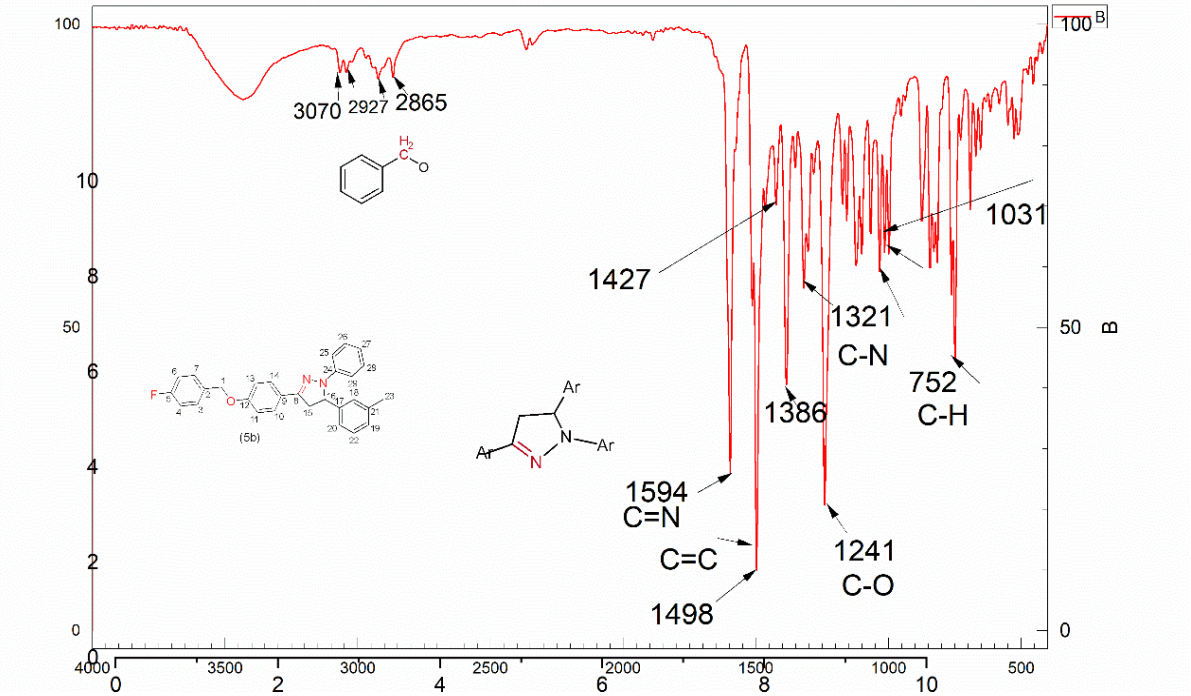

Figure S20: FTIR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-5-(m-tolyl)-4,5-dihydro-1H-pyrazole ***(5b)***.

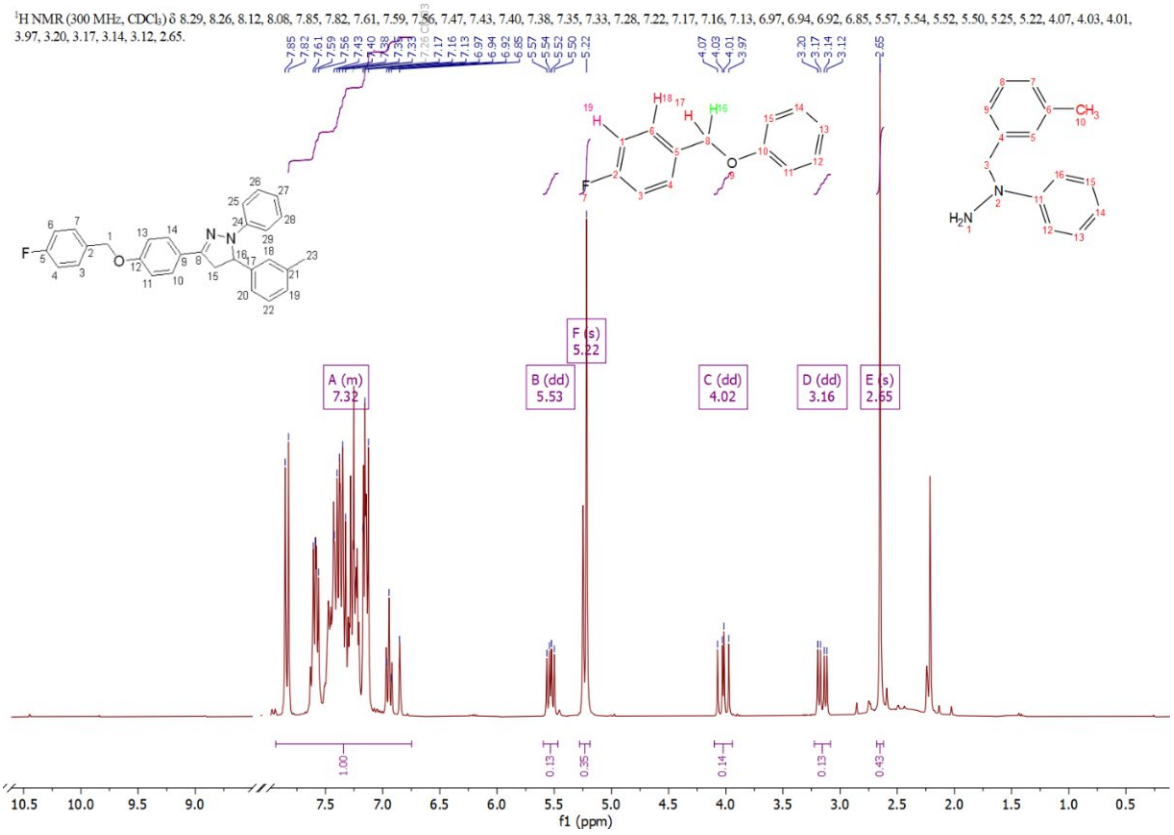

Figure S3: ¹H-NMR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-5-(m-tolyl)-4,5-dihydro-1H-pyrazole ***(5b)***.

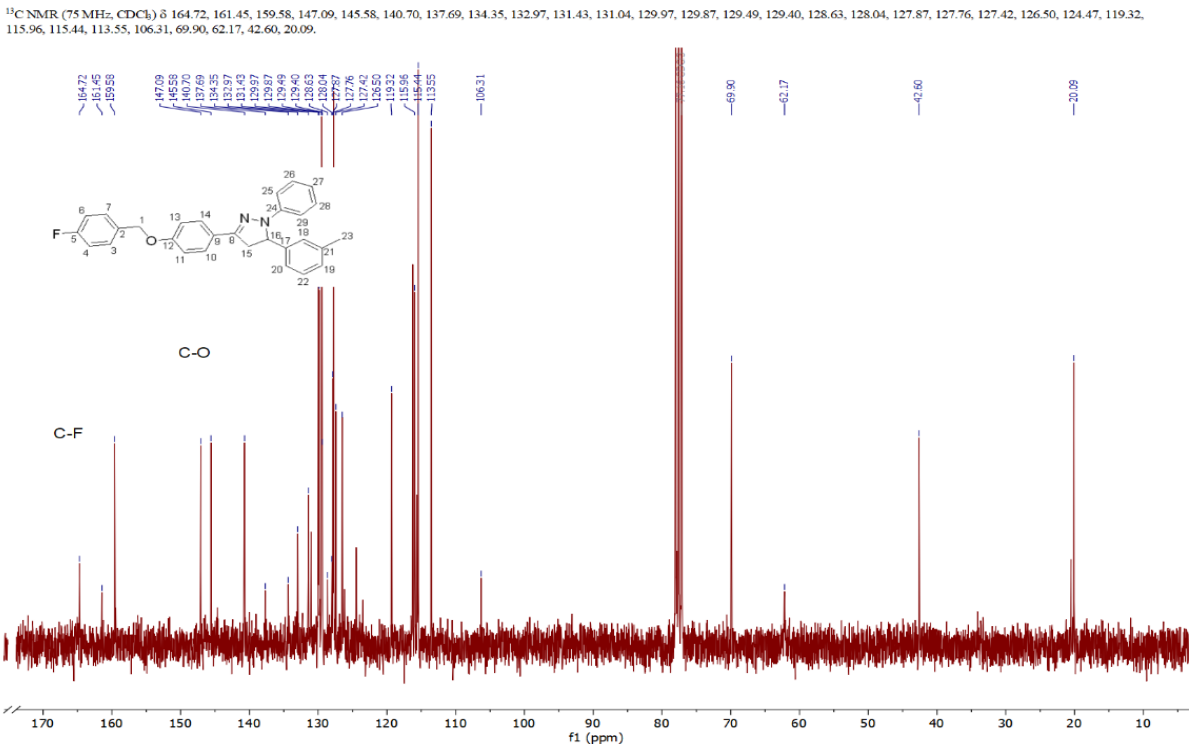

Figure S4: [13]C-NMR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-5-(m-tolyl)-4,5-dihydro-1H-pyrazole ***(5b).***

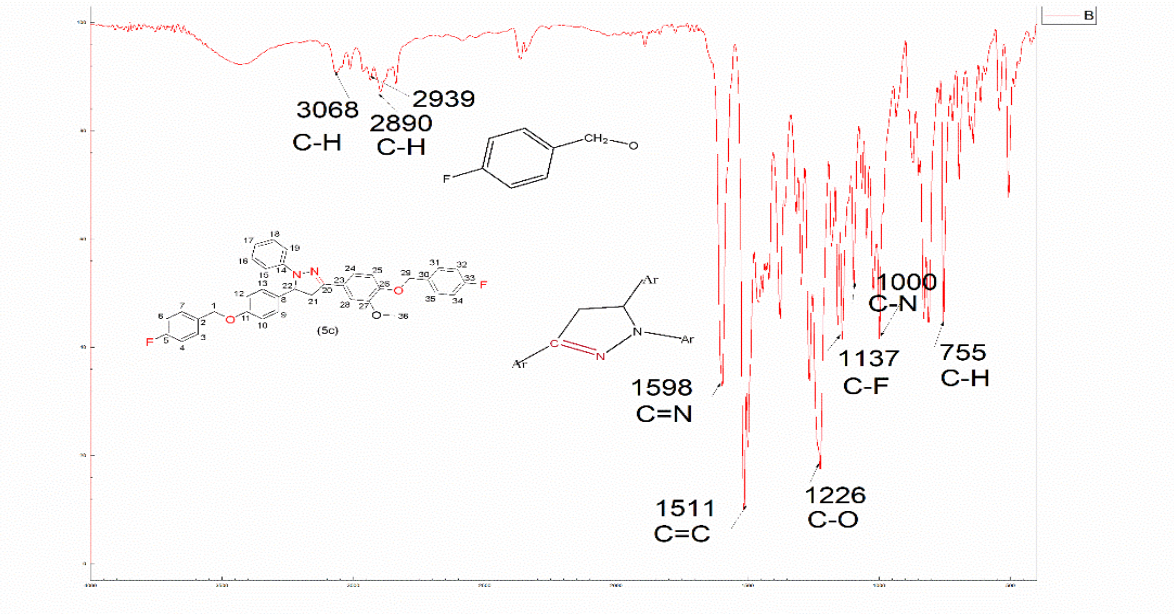

Figure S5: FTIR of 3-(4-((4-fluorobenzyl)oxy)-3-methoxyphenyl)-5-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5c).***

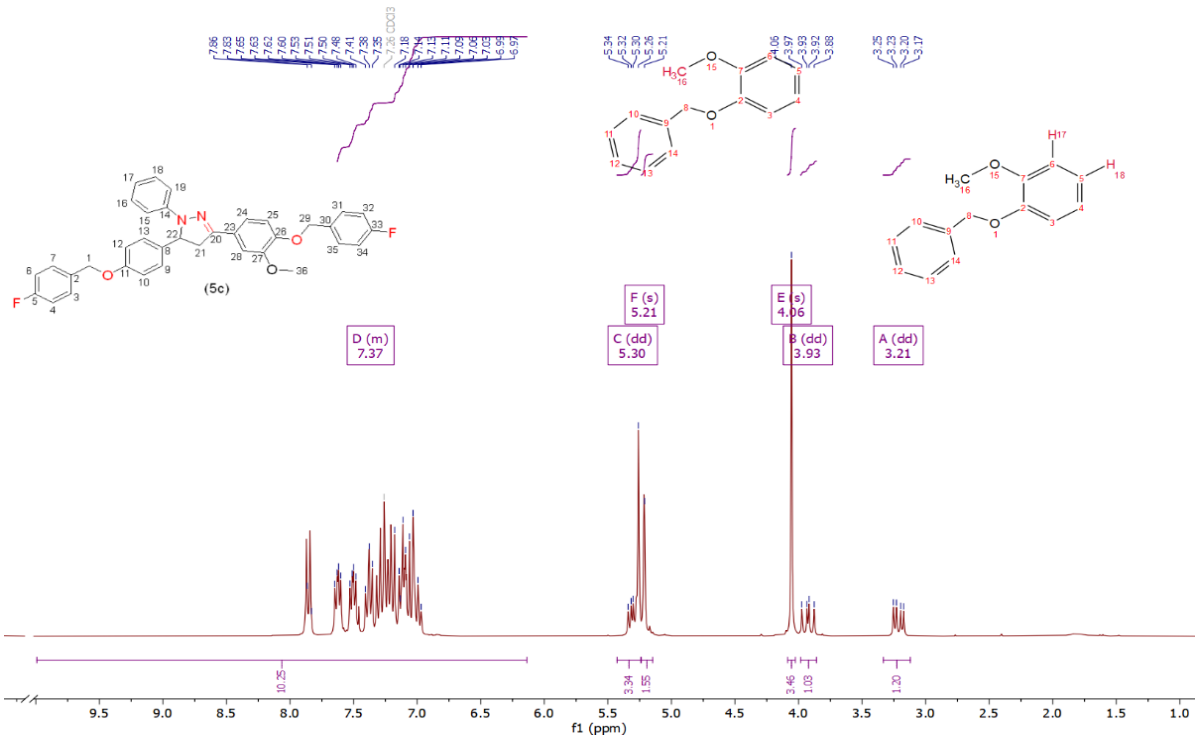

Figure S24: [1]H-NMR of 3-(4-((4-fluorobenzyl)oxy)-3-methoxyphenyl)-5-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5c)***.

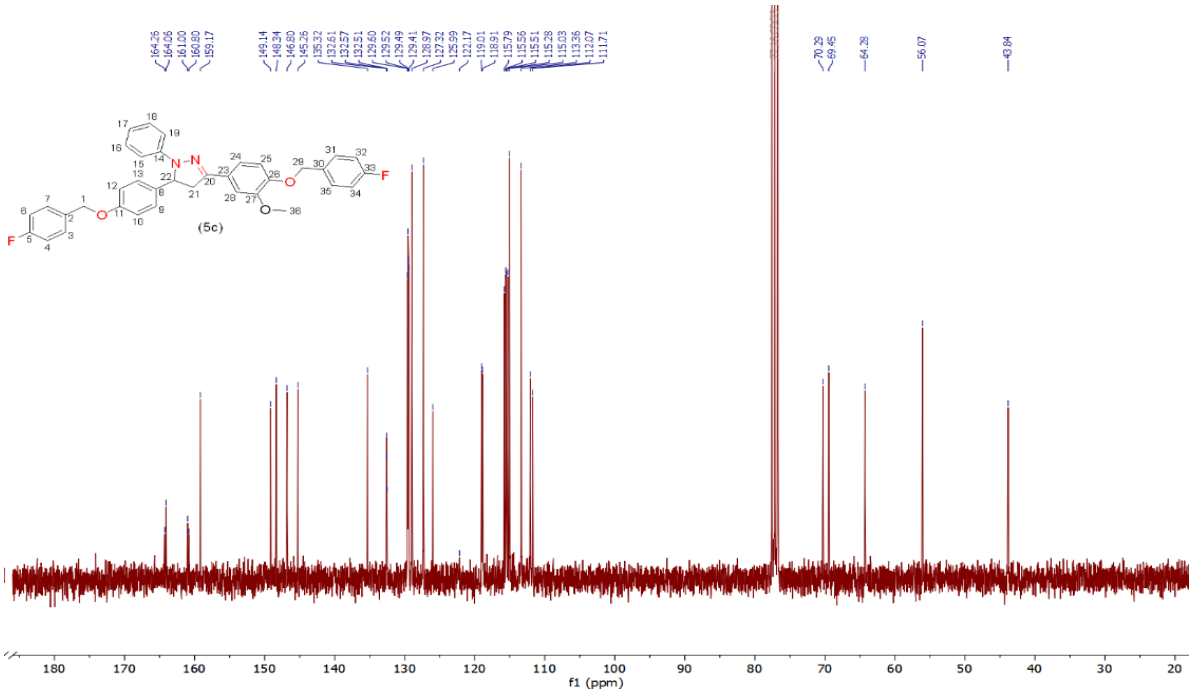

Figure S25: [13]C-NMR of 3-(4-((4-fluorobenzyl)oxy)-3-methoxyphenyl)-5-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole *(5c)*.

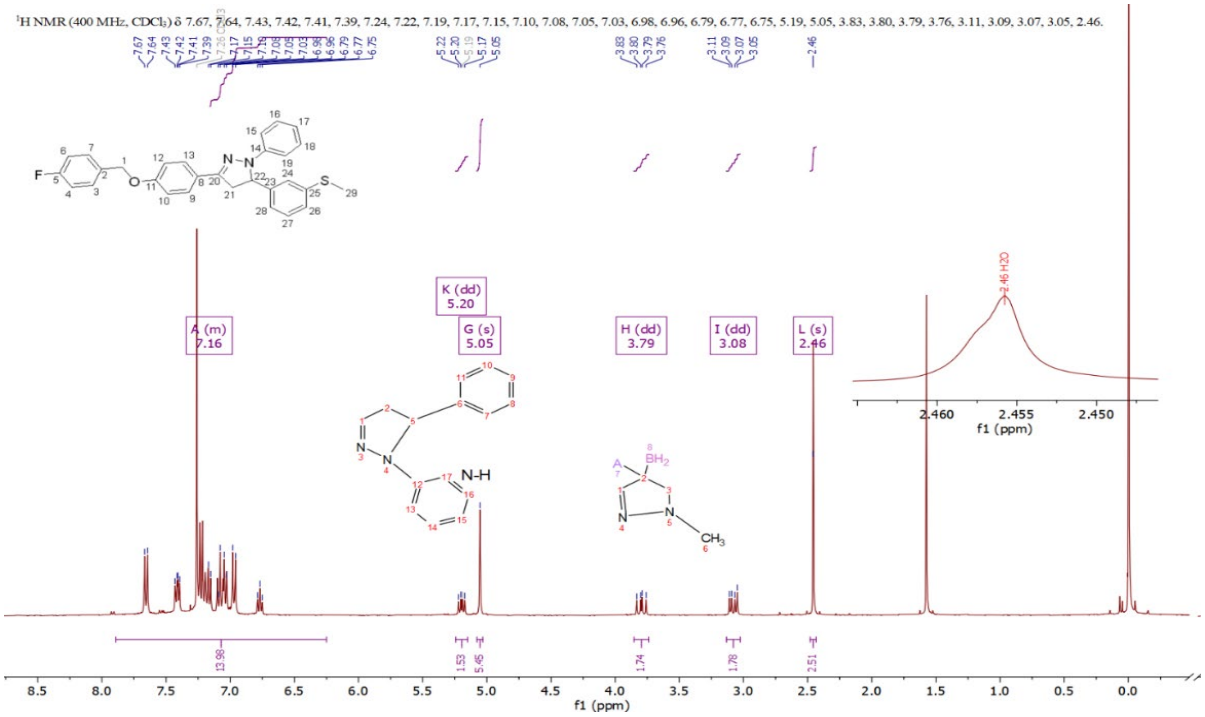

Figure S26: [1]H-NMR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-5-(3-(methylthio)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5h).***

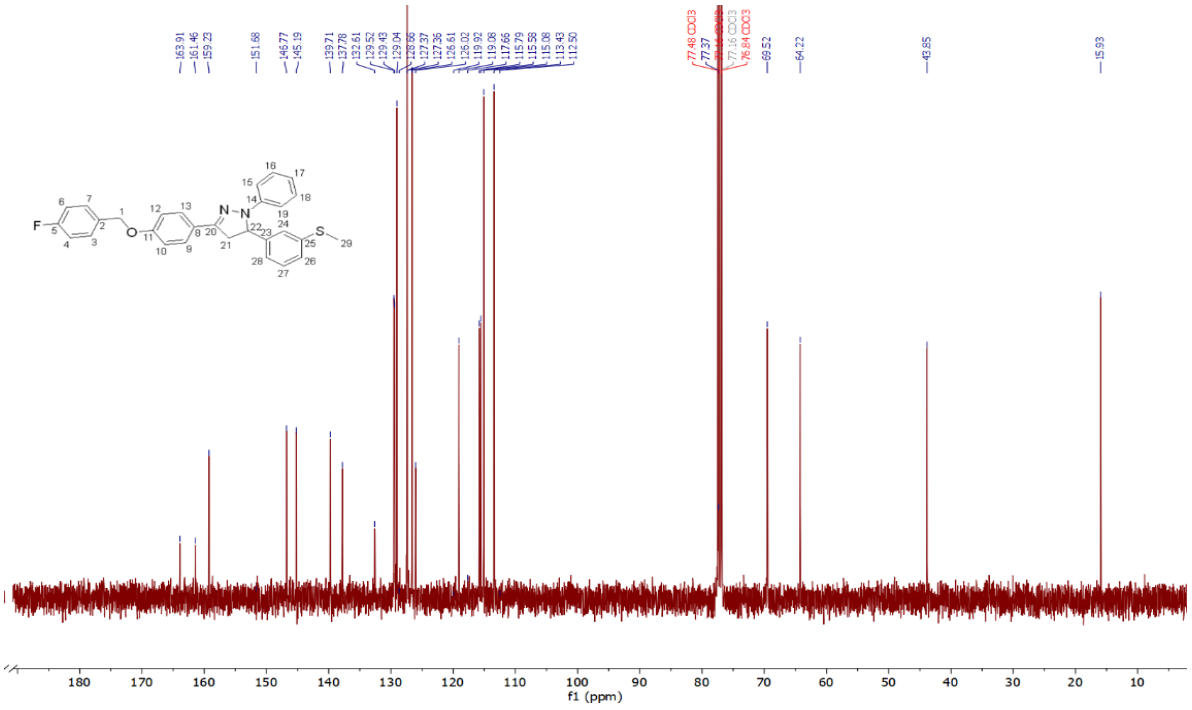

Figure S6: [13]C-NMR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-5-(3-(methylthio)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5h).***

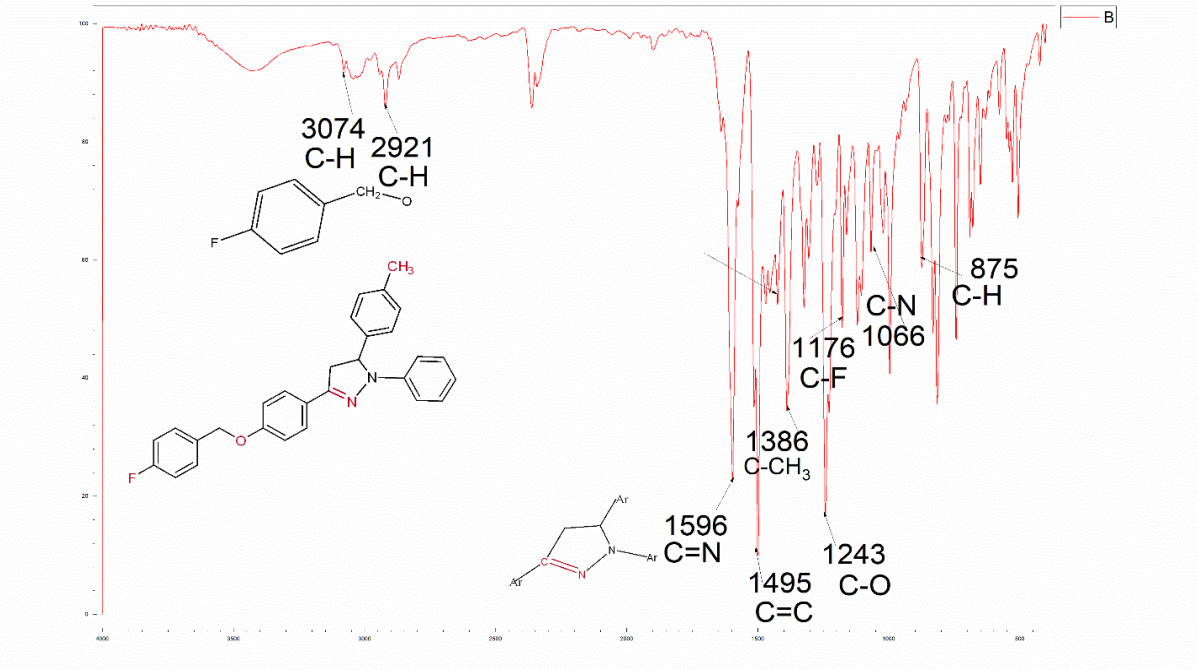

Figure S7: FTIR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-5-(p-tolyl)-4,5-dihydro-1H-pyrazole ***(5i).***

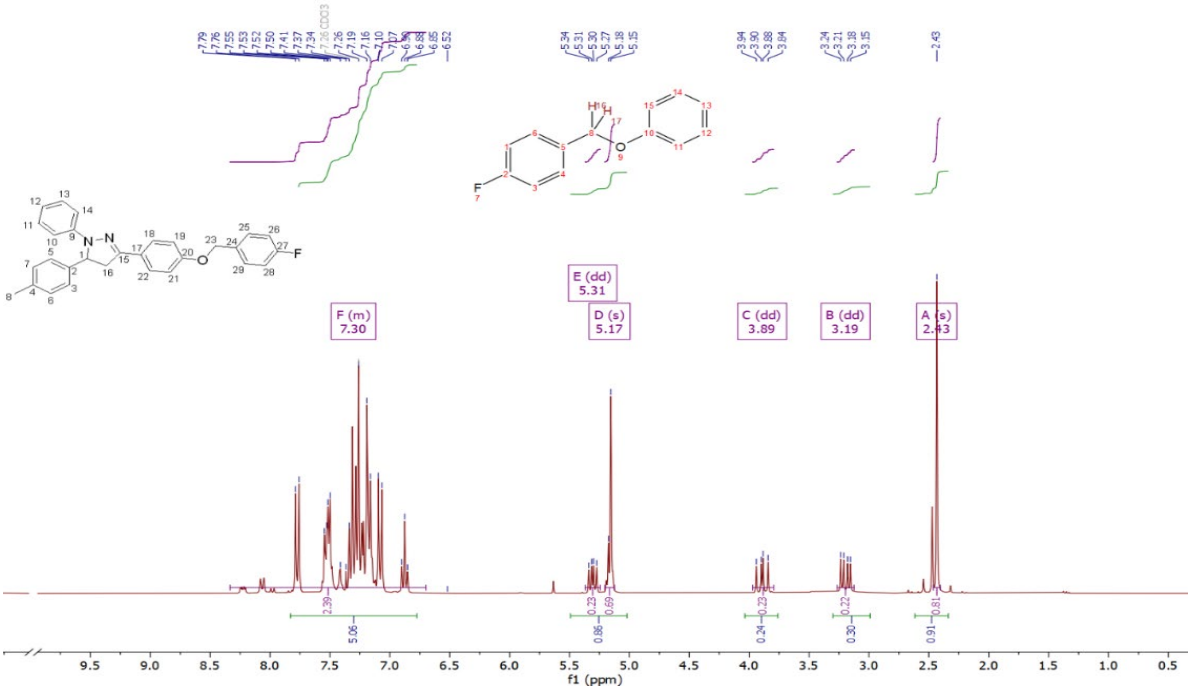

Figure S8: ^{1}H-NMR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-5-(p-tolyl)-4,5-dihydro-1H-pyrazole ***(5i).***

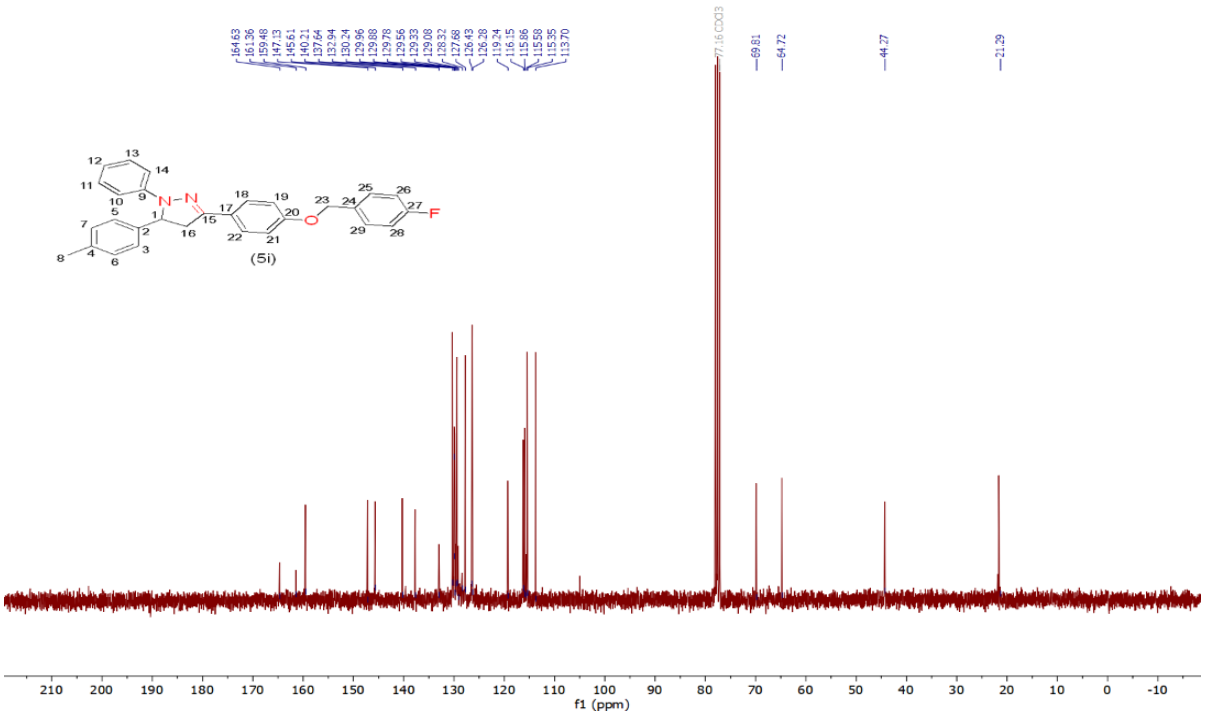

Figure S30: ^{13}C-NMR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-5-(p-tolyl)-4,5-dihydro-1H-pyrazole ***(5i)***.

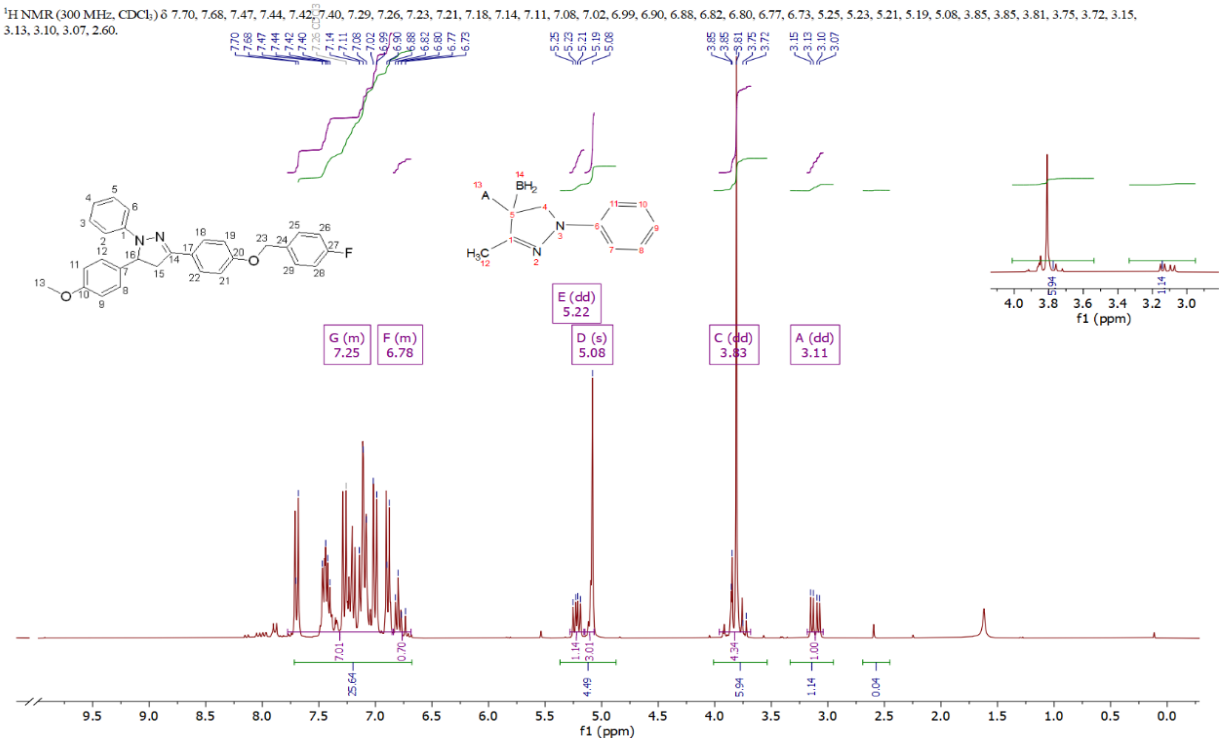

Figure S9: ^{1}H-NMR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-5-(4-methoxyphenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5d)***.

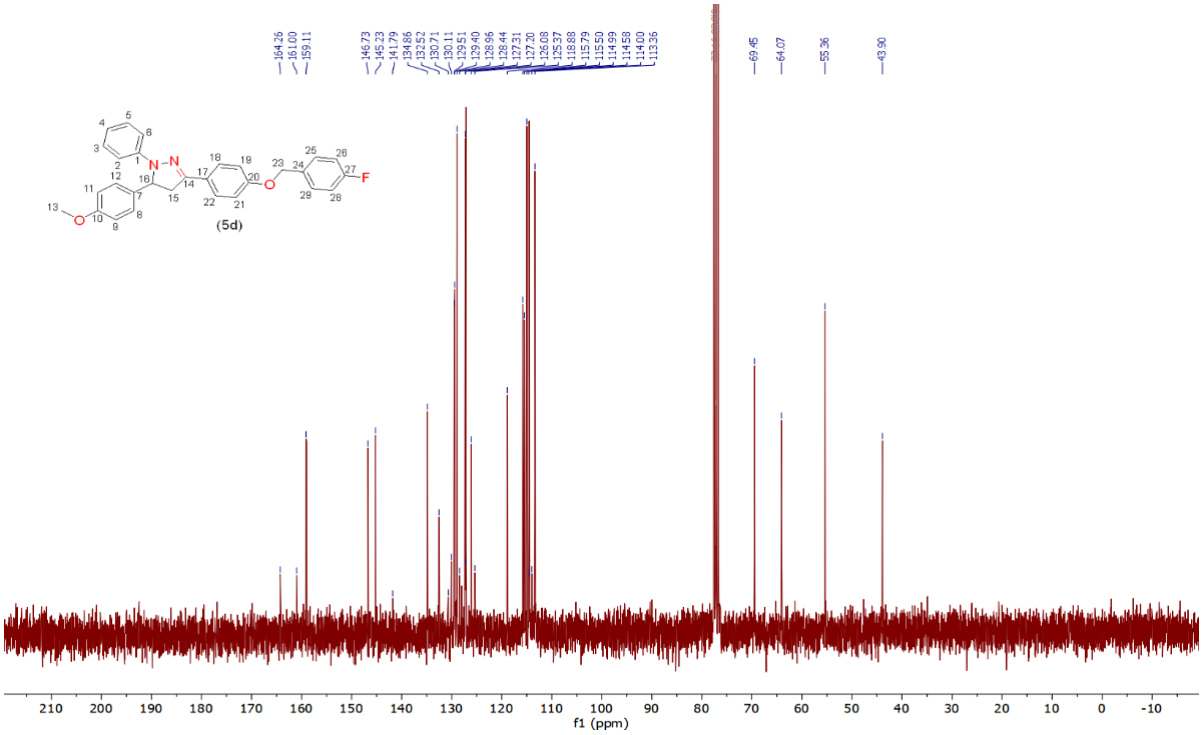

Figure S32: ^{13}C-NMR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-5-(4-methoxyphenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5d)***.

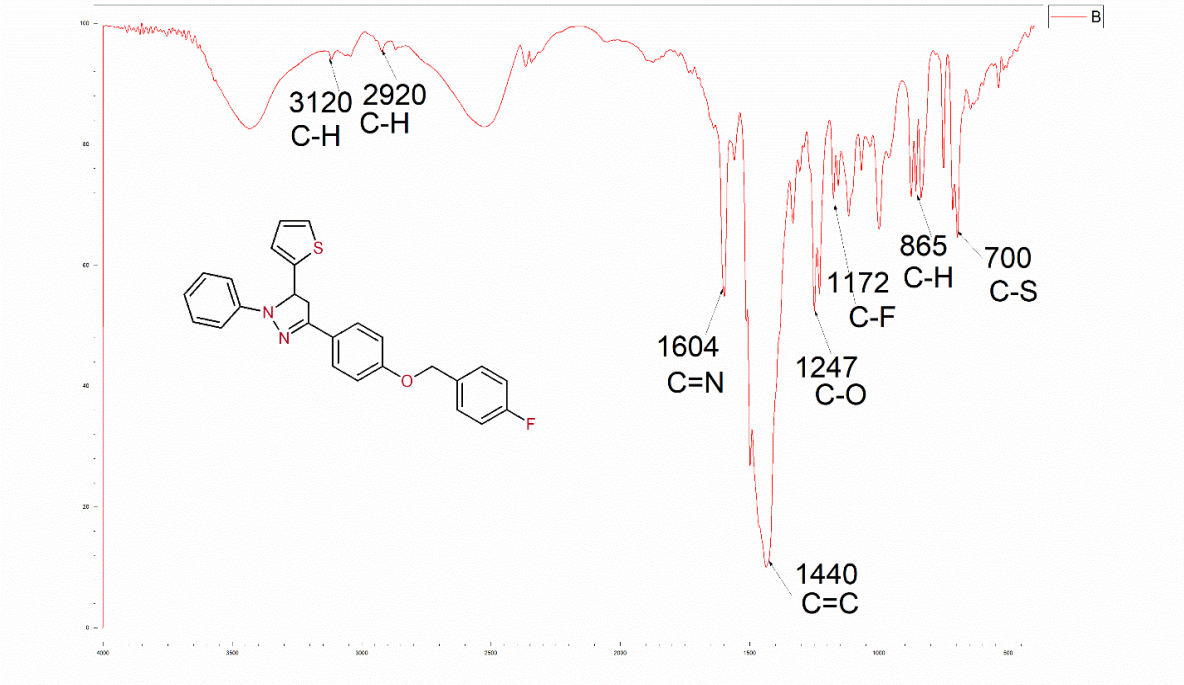

Figure S10: FTIR of3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-5-(thiophen-2-yl)-4,5-dihydro-1H-pyrazole ***(5e)***.

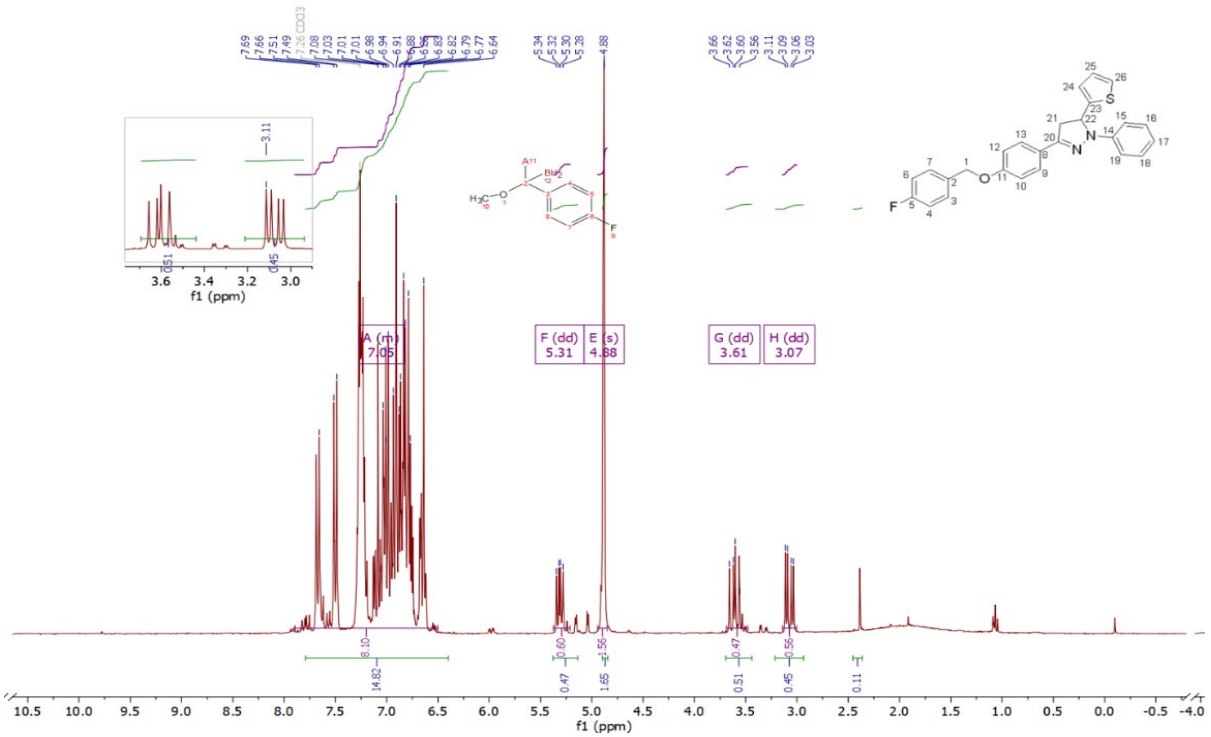

Figure S11: [1]H-NMR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-5-(thiophen-2-yl)-4,5-dihydro-1H-pyrazole ***(5e).***

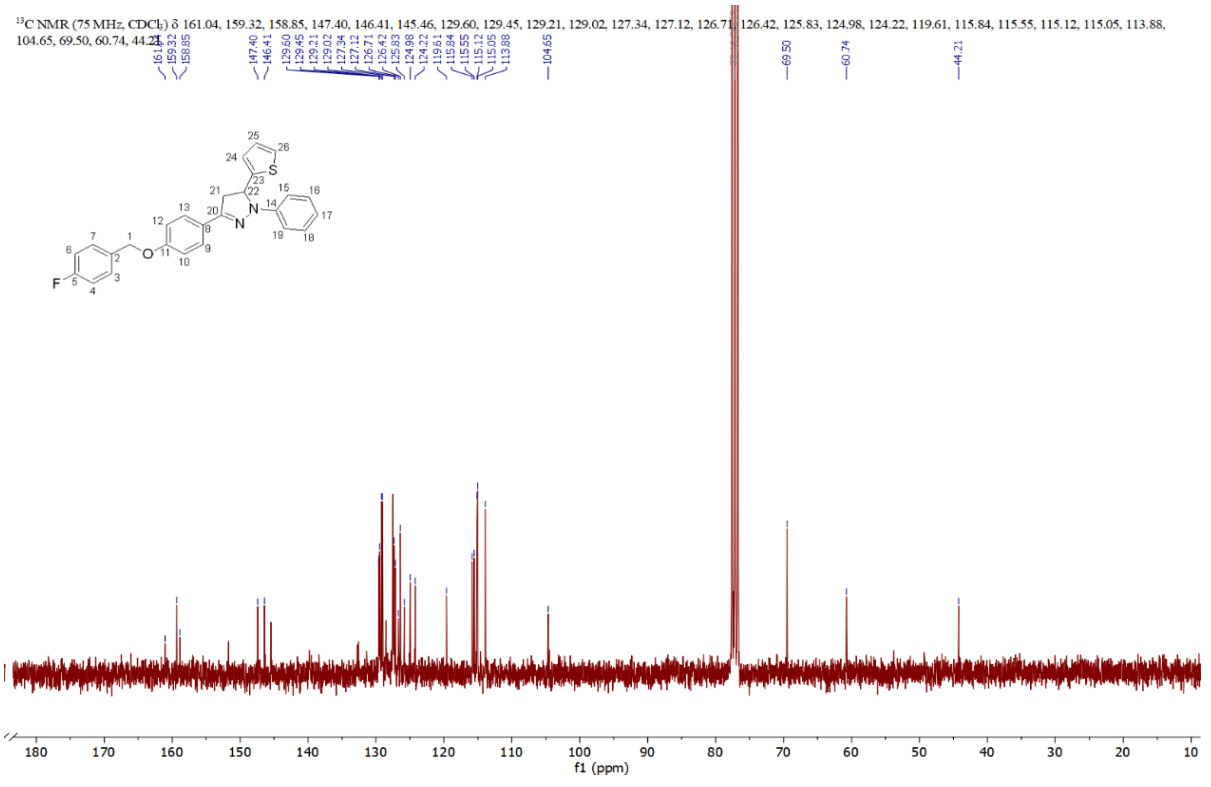

Figure S12: [13]C-NMR of 3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-5-(thiophen-2-yl)-4,5-dihydro-1H-pyrazole ***(5e).***

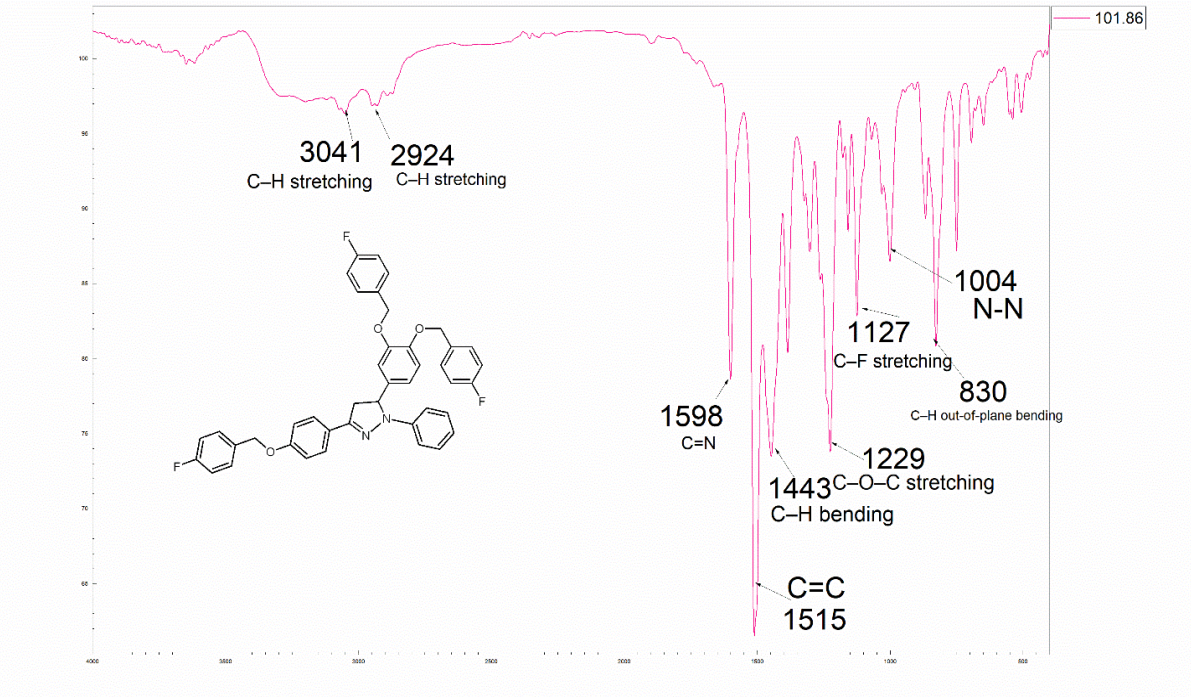

Figure S13: FTIR of 5-(3,4-bis((4-fluorobenzyl)oxy)phenyl)-3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5f)***.

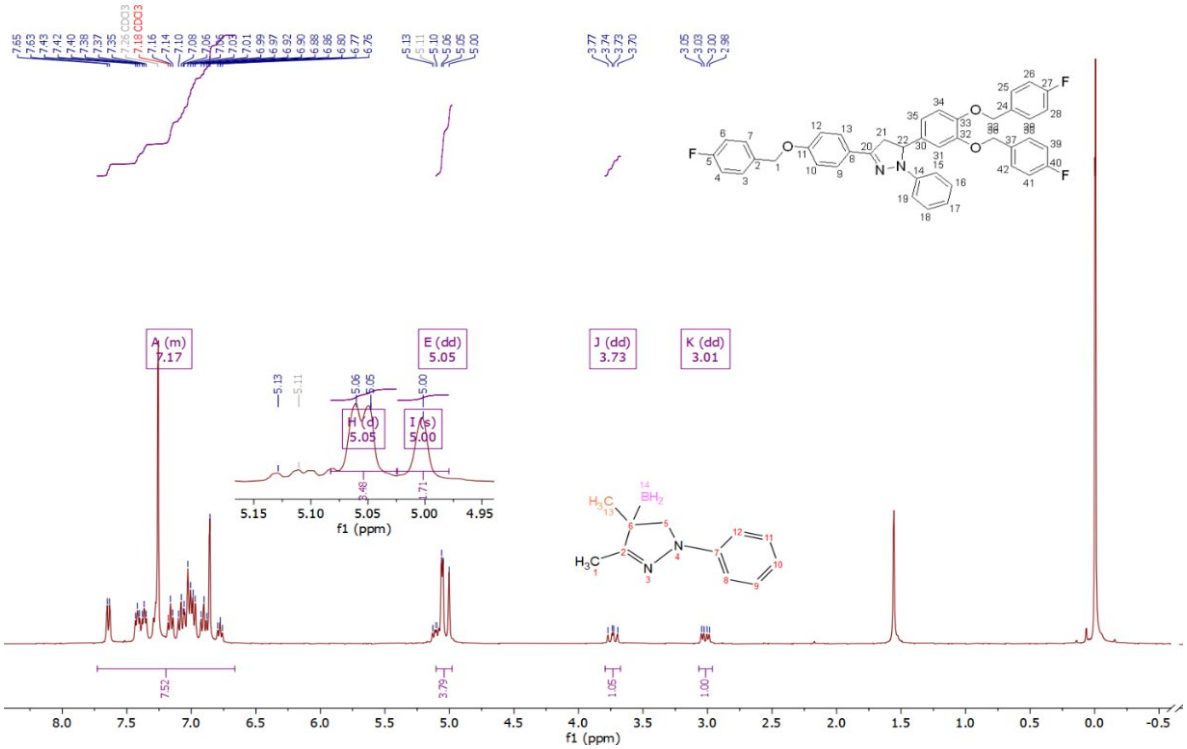

Figure S14: ^{1}H-NMR of 5-(3,4-bis((4-fluorobenzyl)oxy)phenyl)-3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5f)***.

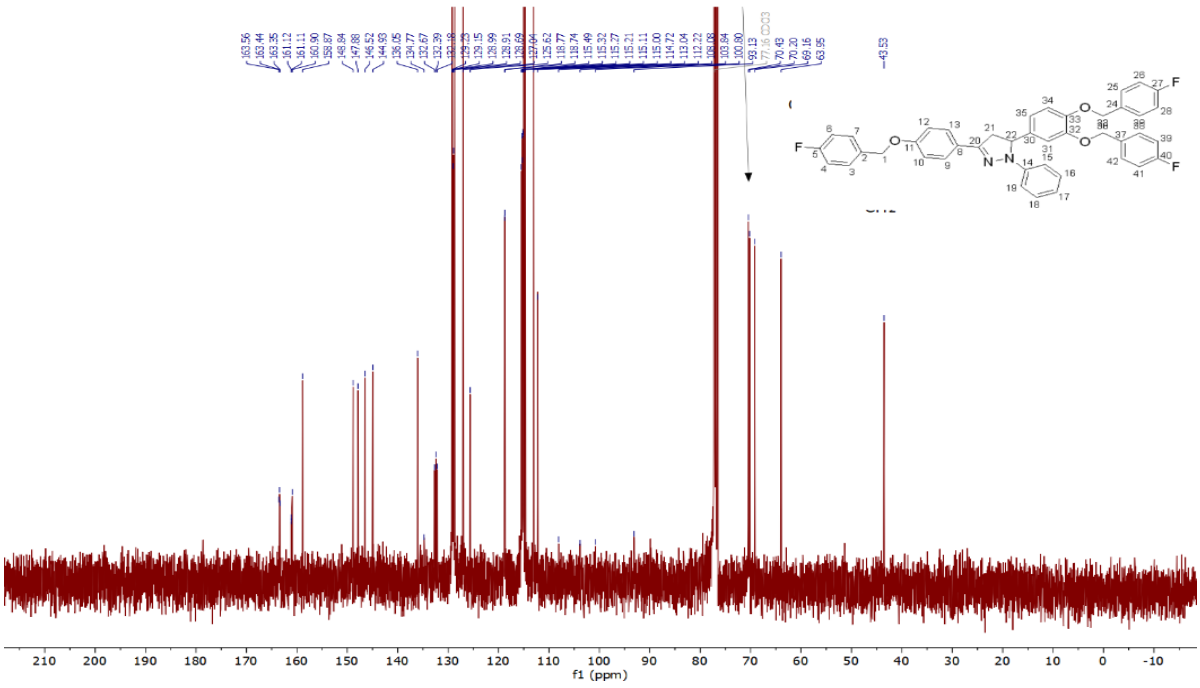

Figure S15: ^{13}C-NMRof5-(3,4-bis((4-fluorobenzyl)oxy)phenyl)-3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5f)***.

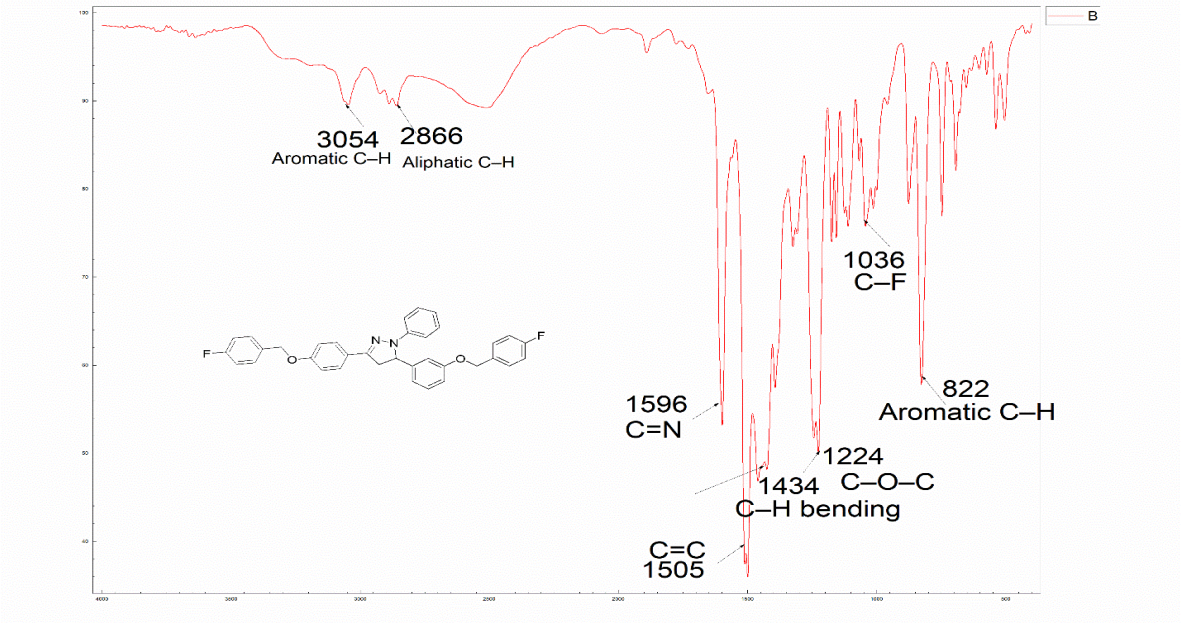

Figure S16: FTIR of 5-(3-((4-fluorobenzyl)oxy)phenyl)-3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5g)***.

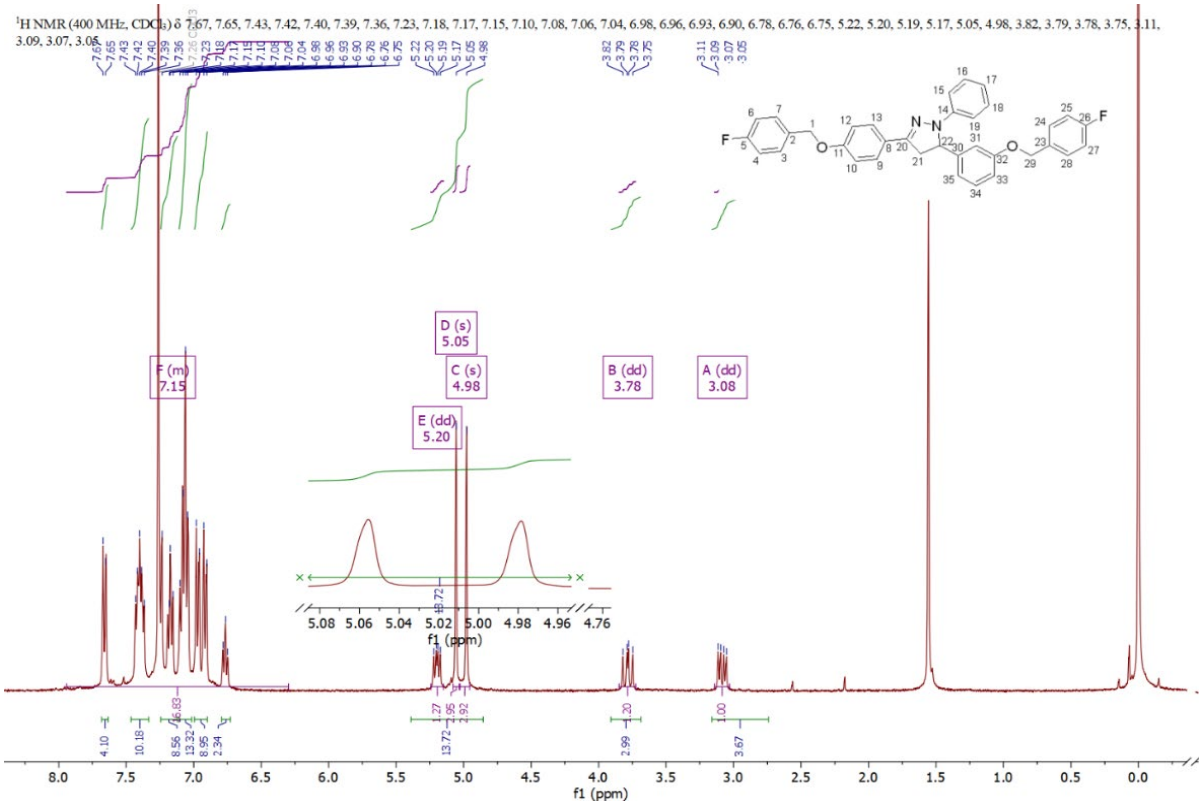

Figure S40: [1]H-NMR of5-(3-((4-fluorobenzyl)oxy)phenyl)-3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole ***(5g).***

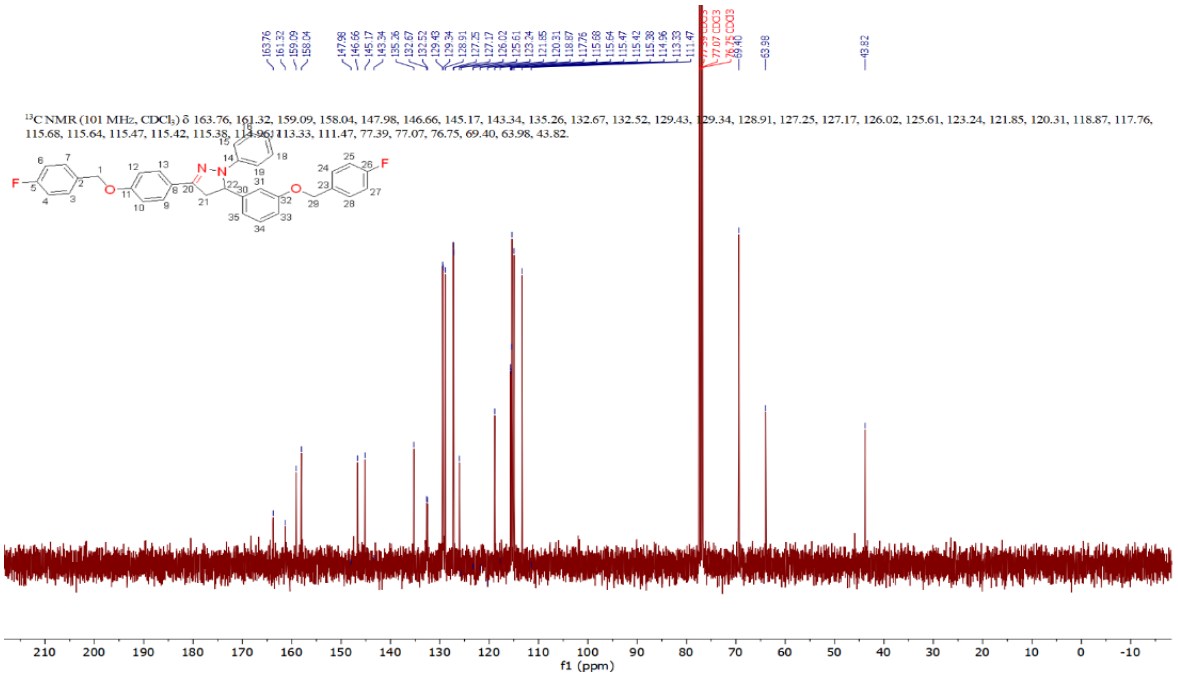

Figure S41: 13C-NMR of5-(3-((4-fluorobenzyl)oxy)phenyl)-3-(4-((4-fluorobenzyl)oxy)phenyl)-1-phenyl-4,5-dihydro-1H-pyrazole (5g).

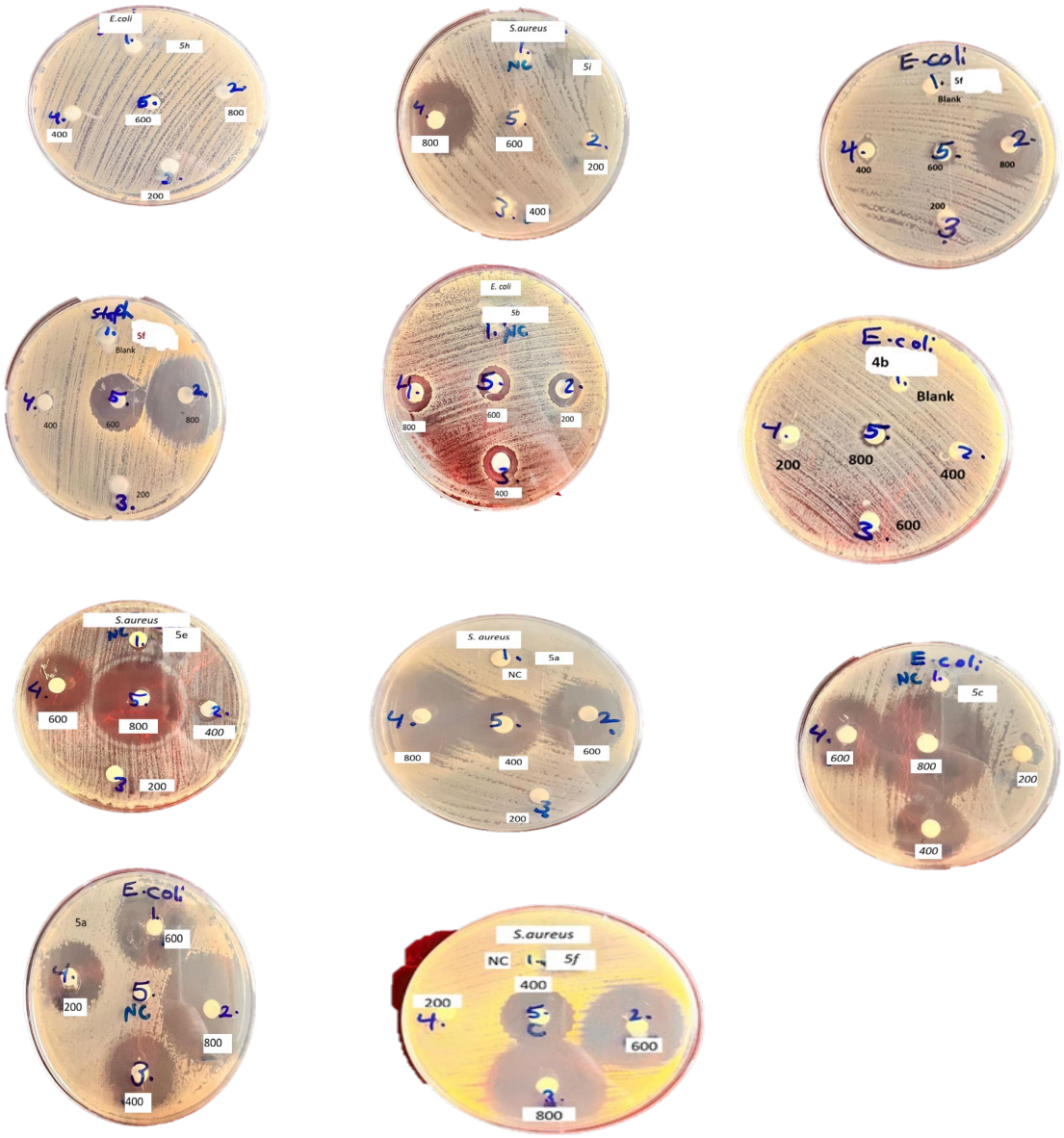

Figure S42: Inhibition zone of Chalcone and Pyrazoline compounds at concentration (200,400,600,800 and 1000) on E. coli and Aureus microorganism.