Supporting Information

Table of Contents

S1. ICP-AES analysis.

Observed data (PPM):

Element	PPM	Atomic ratio
P	65.274	1.05
Mo	1276.227	6.68
W	1907.004	5.18

S2. EDS analysis

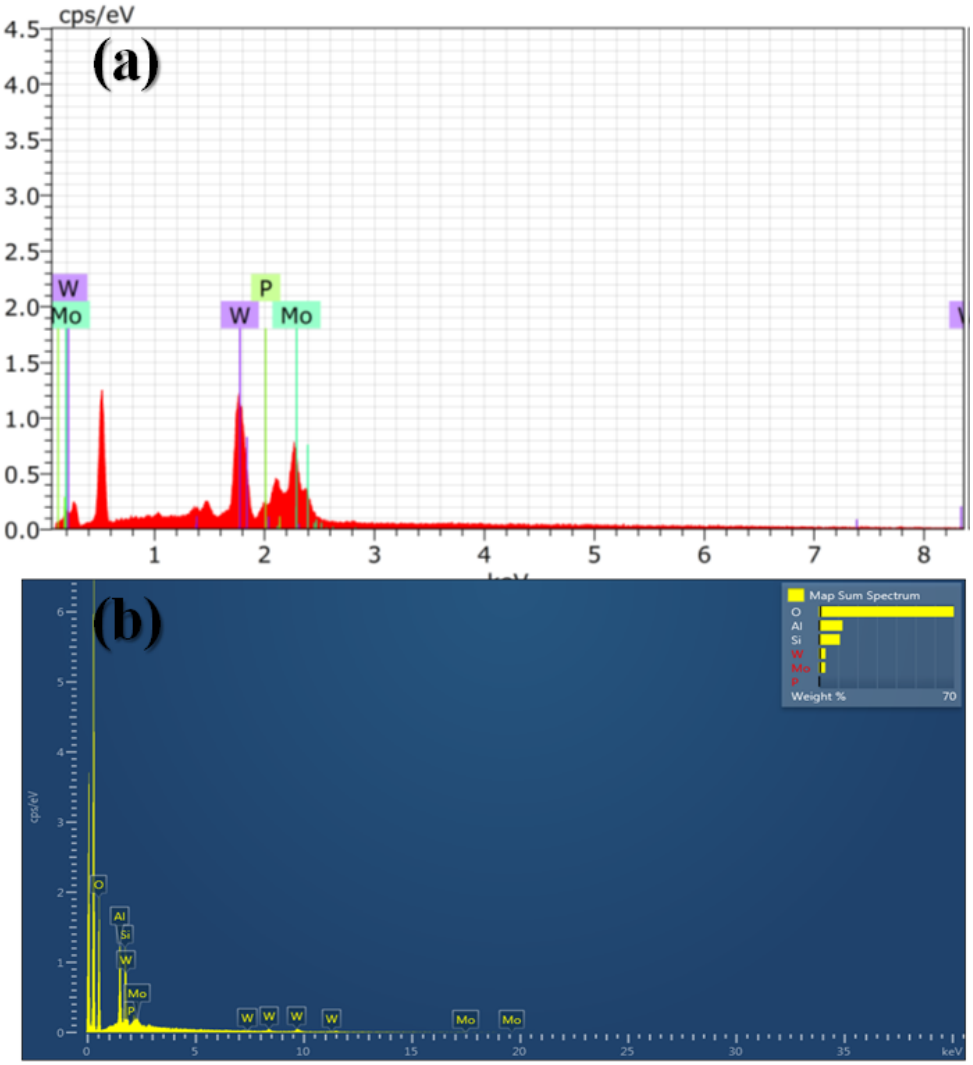
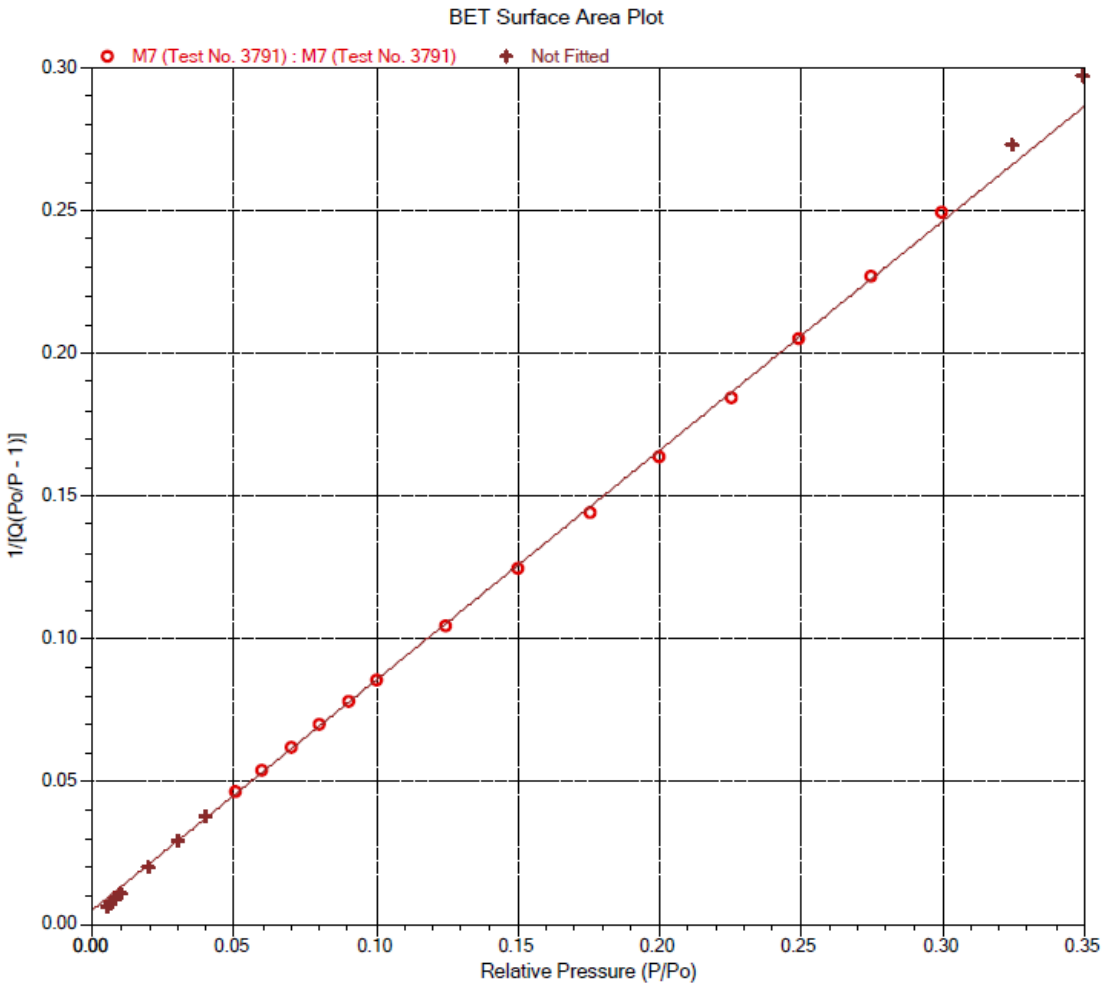
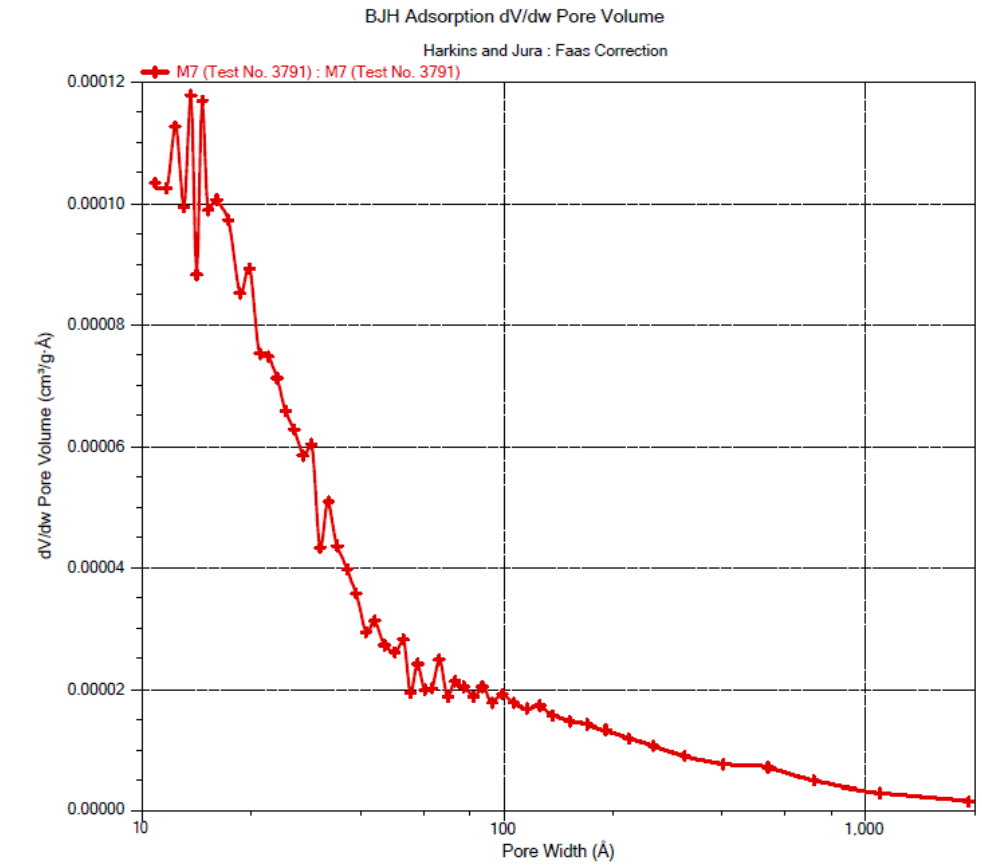


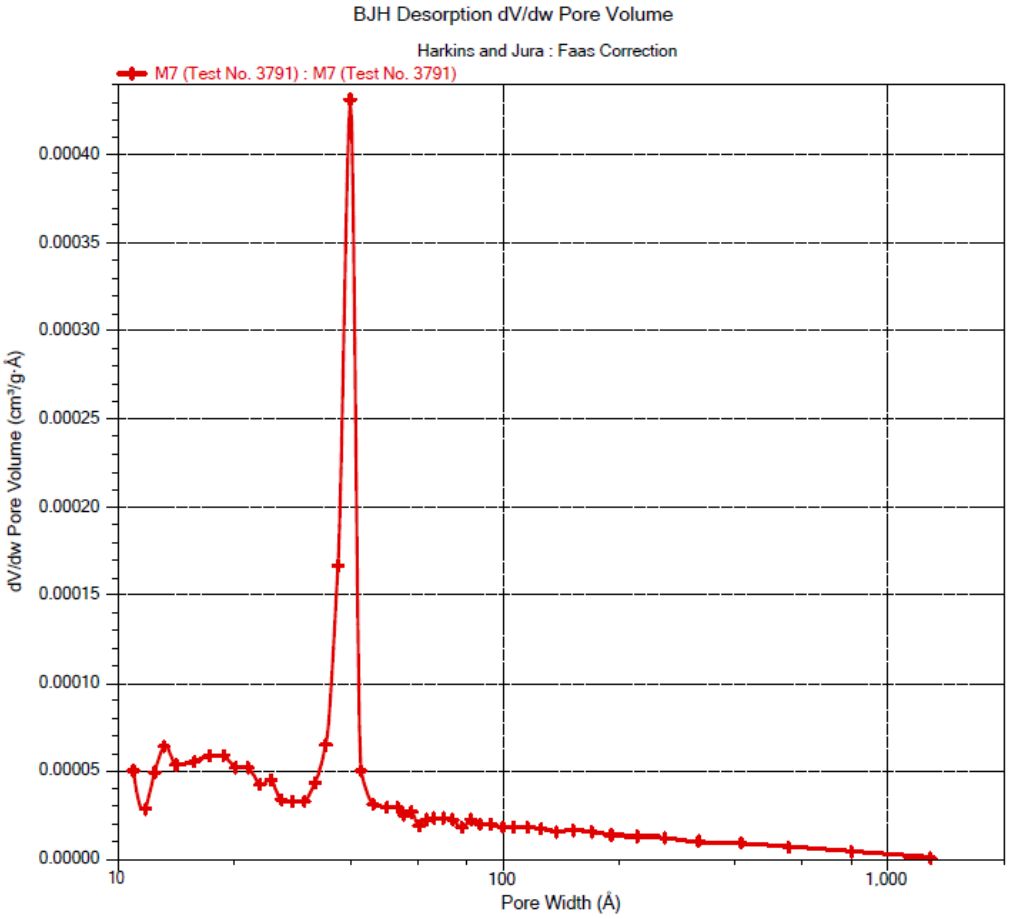
Figure 1. EDS images of (a) bulk PMo_7W_5 (b) 20% PMo_7W_5/Kaolin.

S3. BET analysis

(a) Bulk PMo_7W_5




BJH Adsorption dV/dw Pore Volume
Harkins and Jura : Faas Correction
M7 (Test No. 3791) : M7 (Test No. 3791)
dV/dw Pore Volume (cm³/g·Å)
0.00012
0.00010
0.00008
0.00006
0.00004
0.00002
0.00000
10
100
1,000
Pore Width (Å)

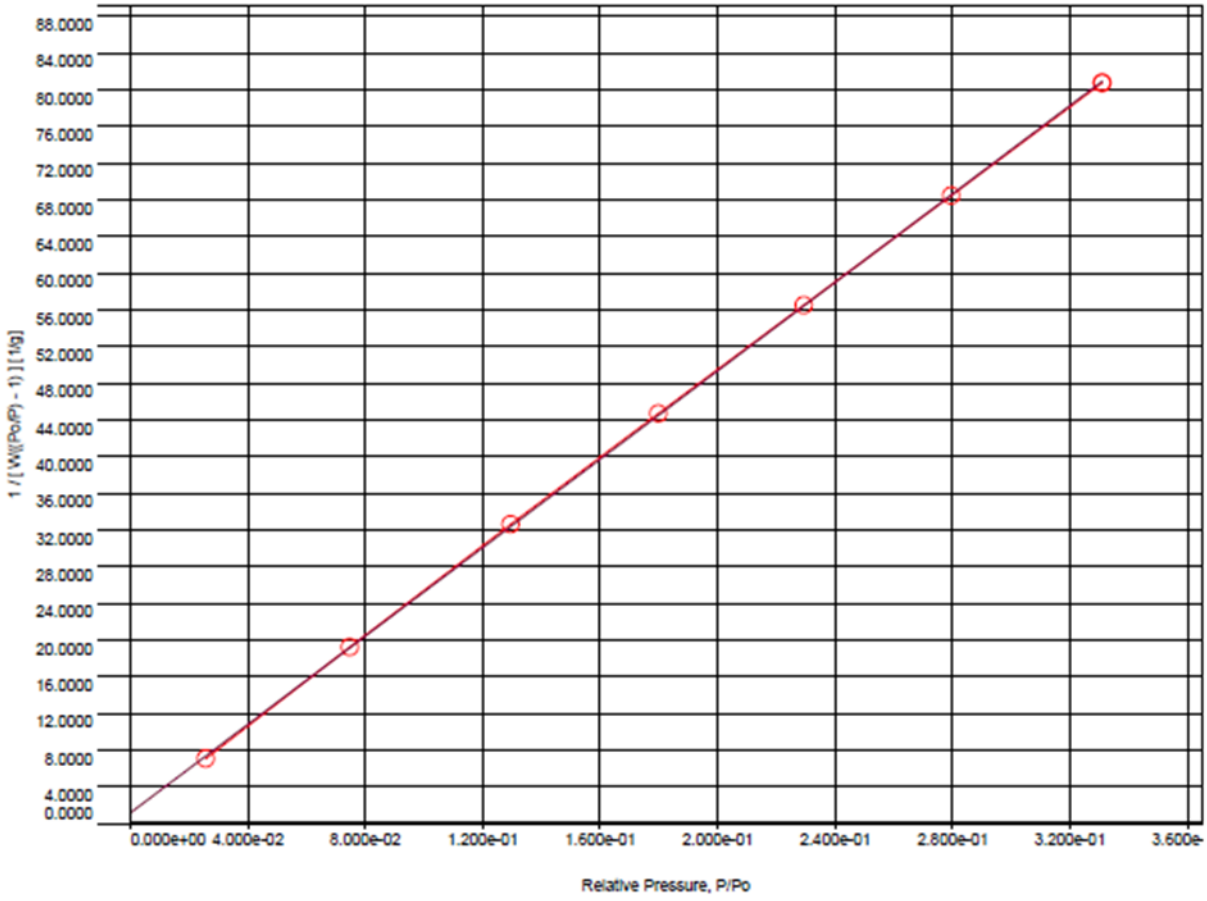

BJH Desorption dV/dw Pore Volume
Harkins and Jura : Faas Correction
M7 (Test No. 3791) : M7 (Test No. 3791)
dV/dw Pore Volume (cm³/g·Å)
0.00040
0.00035
0.00030
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
10
100
1,000
Pore Width (Å)

(b) Pure Karolin clay

Multi-Point BET Plot

Data Reduction Parameters

Adsorbate model	Nitrogen	Temperature	77.350K		
	Molec. Wt.: 28.013	Cross Section:	16.200 Å²	Liquid Density:	0.808 g/cc



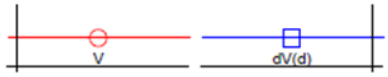
BET summary

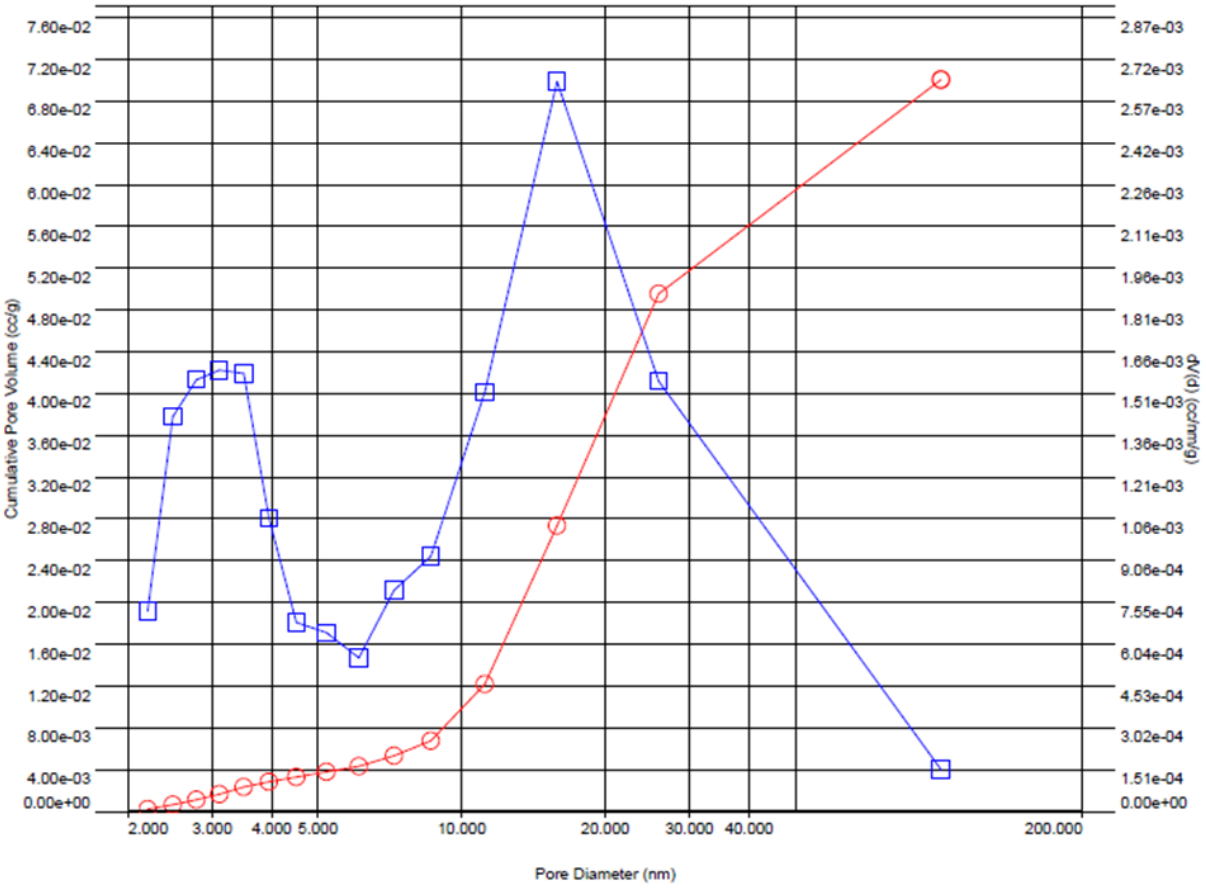
Slope =	240.999 1/g
Intercept =	1.150e+00 1/g
Correlation coefficient, r =	0.999972
C constant=	210.531
Surface Area =	14.382 m²/g

BJH method Desorption dV(d)

Data Reduction Parameters

t-Method	Calc. method: de Boer				
BJH/DH method	Moving pt. avg.: off				
Adsorbate model	Nitrogen	Temperature	77.350K		
	Molec. Wt.: 28.013	Cross Section:	16.200 Å²	Liquid Density:	0.808 g/cc





BJH desorption summary

Surface Area =	16.093 m²/g
Pore Volume =	0.070 cc/g
Pore Diameter Dv(d) =	15.850 nm

(c) 20% PMo_7W_5/Kaolin.

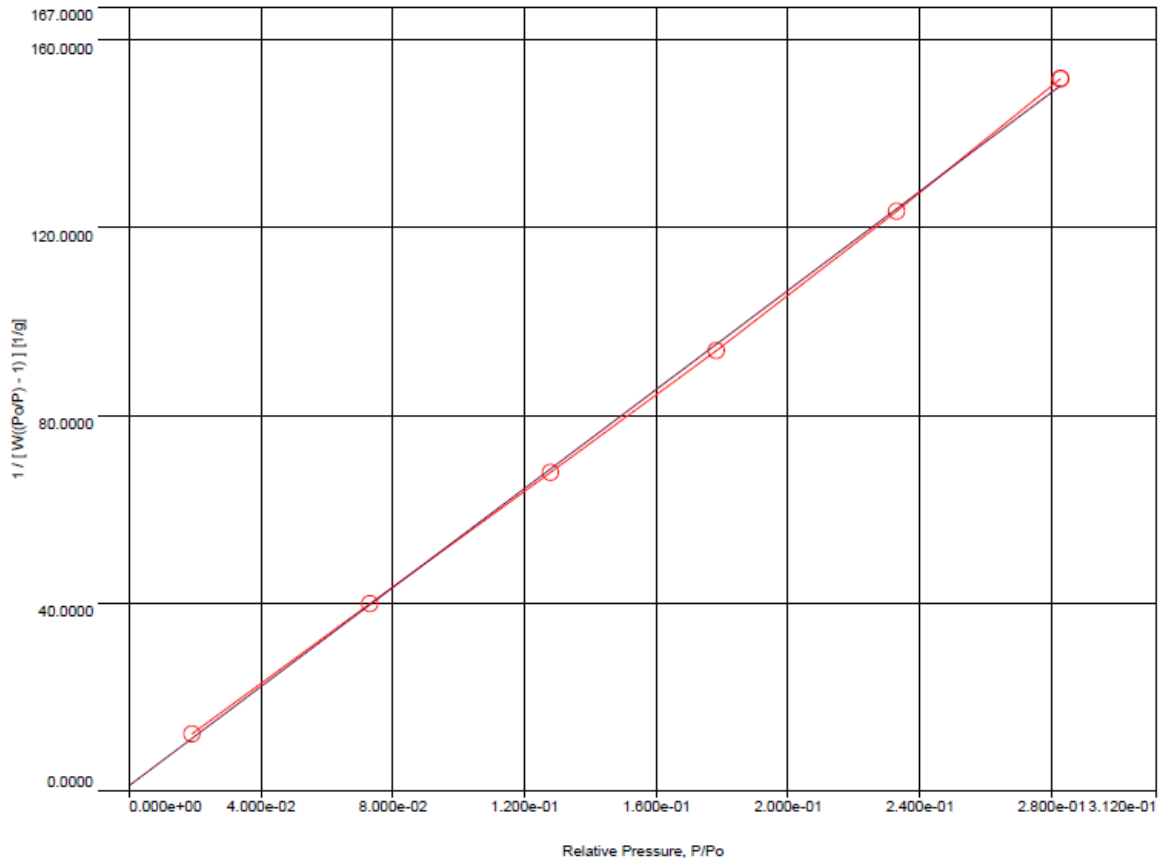
Cell ID: 4

Multi-Point BET Plot

Data Reduction Parameters

Adsorbate model	Nitrogen	Temperature	77.350K		
	Molec. Wt.: 28.013	Cross Section:	16.200 Å²	Liquid Density:	0.808 g/cc

A BF



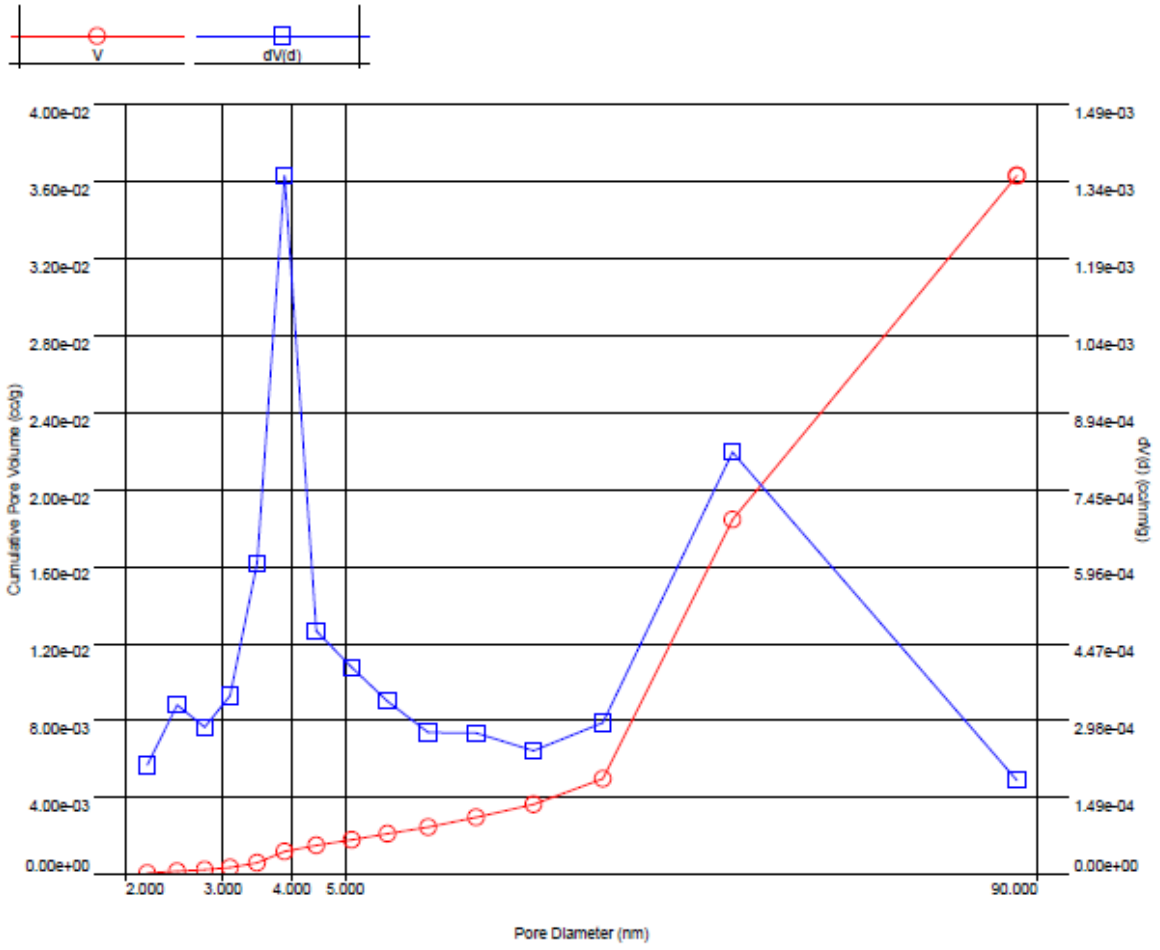
BET summary

Slope =	527.346 1/g
Intercept =	1.159e+00 1/g
Correlation coefficient, r =	0.999793
C constant=	456.148
Surface Area =	6.589 m²/g

BJH method Desorption dV(d)

Data Reduction Parameters

t-Method	Calc. method: de Boer				
BJH/DH method	Moving pt. avg.: off				
Adsorbate model	Nitrogen	Temperature	77.350K		
	Molec. Wt.: 28.013	Cross Section:	16.200 Å²	Liquid Density:	0.808 g/cc

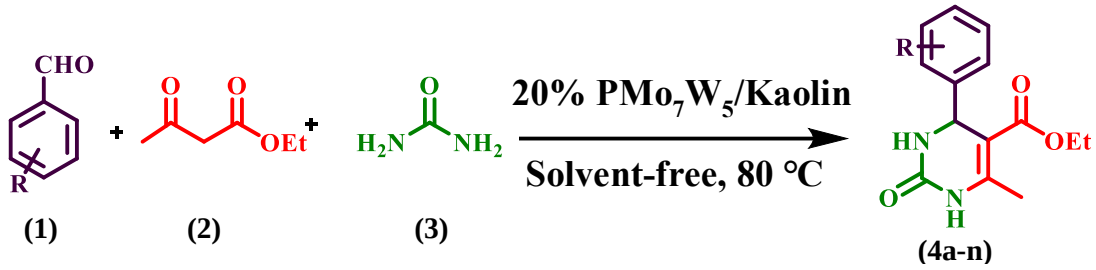


BJH desorption summary

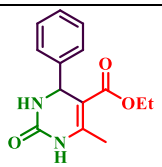
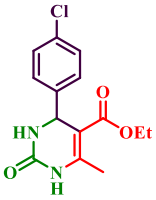
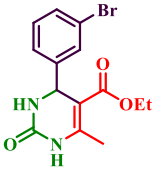
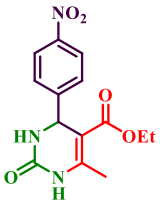
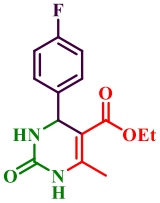
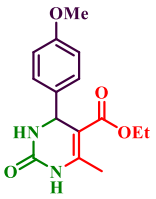
Surface Area =	6.199 m²/g
Pore Volume =	0.036 cc/g
Pore Diameter Dv(d) =	3.882 nm

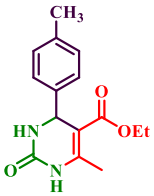
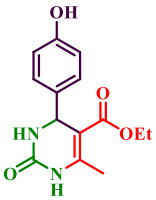
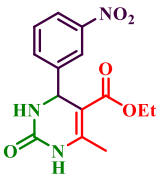
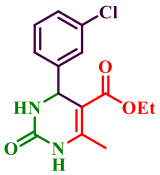
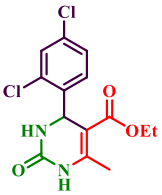
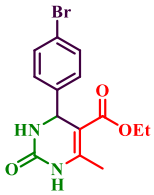
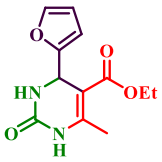
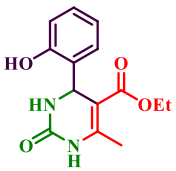
S4. Melting Point of Synthesized Compound

Table 1. Melting point of ethyl 6-methyl-2-oxo-4-aryl-1,2,3,4-tetrahydropyrimidine-5-carboxylate (4a-n)



(1) **(2)** **(3)** **(4a-n)**

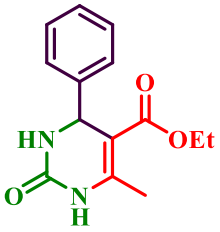
Entry	Aldehydes	Product	Melting points[c] (°C)[Ref]
4a	C_6H_5		201-203/201–203[1,2]
4b	*p*-ClC_6H_4		210-212/212-215[3,4]
4c	*m*-BrC_6H_4		185-187/183-185[5]
4d	*p*-$NO_2C_6H_4$		198-200/208-209[6]
4e	*p*-FC_6H_4		178-180/180-183[1,5]
4f	*p*-$OMeC_6H_4$		200-201/201-203[3]

4g	*p*-MeC_6H_4		210-212/215-217[1]
4h	*p*-OHC_6H_4		225-227/224-226[1]
4i	*m*-$NO_2C_6H_4$		228-230/224-226[1,4]
4j	*m*-ClC_6H_4		193-195/194-196[5]
4k	*o, p*-ClC_6H_4		248-250/ -
4l	*p*-BrC_6H_4		150-152/154-155[1]
4m	*2*-Furyl		205-207/205-206[4,5]
4n	*o*-OHC_6H_4		202-204/199-200[1]

[a]Reaction conditions: Aldehydes (1a-n) (3 mmol), ethyl acetoacetate (3 mmol), and urea (3.2 mmol) in 20% PMo_7W_5/Kaolin (0.1g) stirred at 80 °C; [b]isolated yields, [c]melting points are in good contact with those reported in the literature.

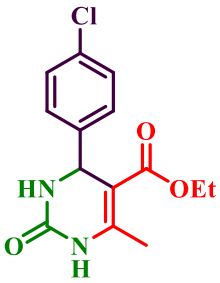
S5. Spectral data of the compounds

4a. ethyl 6-methyl-2-oxo-4-phenyl-1,2,3,4-tetrahydropyrimidine-5-carboxylate



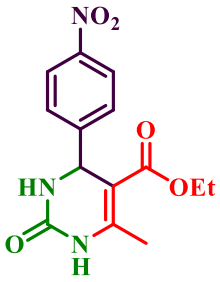
IR (ATR, υ cm^{-1}): 694, 761, 1085, 1215, 1298, 1378, 1459, 1638, 1701, 2929, 2969, 3107, 3230. ^{1}H NMR (400 MHz, DMSO-δ6) δppm= 1.08 (t, J=7.1 Hz, 3 H), 2.24 (s, 3 H), 3.97 (q, J=7.0 Hz, 2 H), 5.14 (d, J=2.8 Hz, 1 H), 7.19 - 7.27 (m, 3 H), 7.28 - 7.35 (m, 2 H), 7.73 (br. s., 1 H), 9.18 (s, 1 H). ^{13}C NMR (100 MHz, DMSO-δ6) δppm= 13.7 (s), 17.4 (s), 53.6 (s), 58.8 (s), 98.9 (s), 125.9 (s), 126.9 (s), 128.0 (s), 144.5 (s), 148.0 (s), 151.8 (s), 165.0 (s).

4b. ethyl 6-methyl-4-(4-Chlorophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate



IR (ATR, υ cm^{-1}): 676, 775, 1010, 1085, 1217, 1285, 1419, 1456, 1640, 1707, 2964, 3110, 3235, 3332. ^{1}H NMR ($CDCl_3$, 400MHz): 1.17(t, J = 7.1 Hz, 3H), 2.33 (s, 3H), 4.07 (q, 2H), 5.37 (d, J = 2.6 Hz, 1H), 5.96 (br. s., 1H), 7.21-7.31 (m, 4H), 8.19 (s, 1H). ^{13}C NMR ($CDCl_3$,100 MHz): 14.1 (s), 18.7 (s), 55.1 (s), 60.1 (s), 101.1 (s), 128.0 (s), 128.9 (s), 133.7 (s), 142.2 (s), 146.5 (s), 153.3 (s), 165.4 (s).

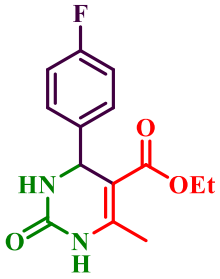
4d. ethyl 6-methyl-4-(4-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate



IR (ATR, υ cm^{-1}): 690, 775, 857, 1087, 1211, 1297, 1347, 1385, 1460, 1517, 1638, 1701, 2979, 3110, 3230. ^{1}H NMR (400 MHz, DMSO-δ6) δppm= 1.09 (t, J=7.1 Hz, 3 H), 2.26 (s, 3 H), 3.98

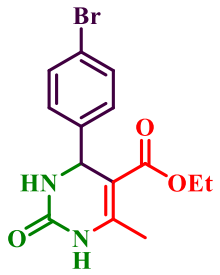
(q, J=7.1 Hz, 2 H), 5.27 (d, J=3.4 Hz, 1 H), 7.46 - 7.56 (m, 2 H), 7.85 - 7.96 (m, 1 H), 8.18 - 8.30 (m, 2 H), 9.32 - 9.42 (m, 1 H). ^{13}C NMR (100 MHz, DMSO-δ6) δppm= 13.6 (s), 17.5 (s), 53.3 (s), 59.0 (s), 97.7 (s), 123.4 (s), 127.2 (s), 146.3 (s), 149.0 (s), 151.3 (s), 151.6 (s), 164.6 (s).

4e. ethyl 4-(4-fluorophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate



IR (ATR, υ cm^{-1}): 945, 1083, 1157, 1215, 1283, 1451, 1602, 3220, 3349. ^{1}H NMR (400 MHz, DMSO- δ6) δppm= 1.08 (t, J=7.1 Hz, 3 H), 2.25 (s, 3 H), 3.97 (q, J=6.8 Hz, 2 H), 5.15 (d, J=2.5 Hz, 1 H), 7.14 (t, J=8.8 Hz, 2 H), 7.26 (dd, J=8.4, 5.6 Hz, 2 H), 7.78 (br. s., 1 H), 9.28 (br. s., 1 H). ^{13}C NMR (100 MHz, DMSO- δ6) δppm =13.9 (s), 17.6 (s), 53.2 (s), 59.1 (s), 99.0 (s), 114.9 (s), 115.1 (s), 128.1 (s), 128.1 (s), 140.9 (s), 141.0 (s), 148.4 (s), 151.9 (s), 159.6 (s), 160.0 (s), 162.4 (s), 165.1 (s)

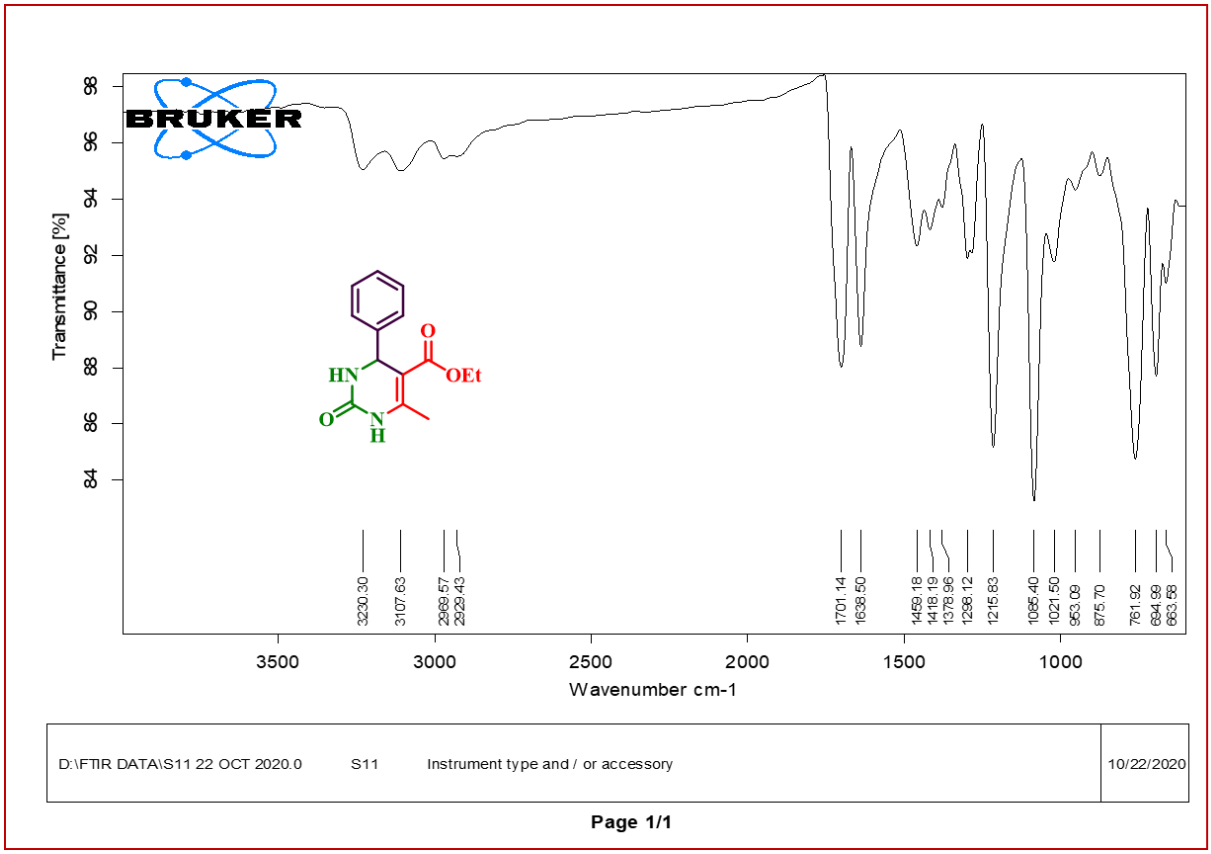
4l. ethyl 4-(4-bromophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate

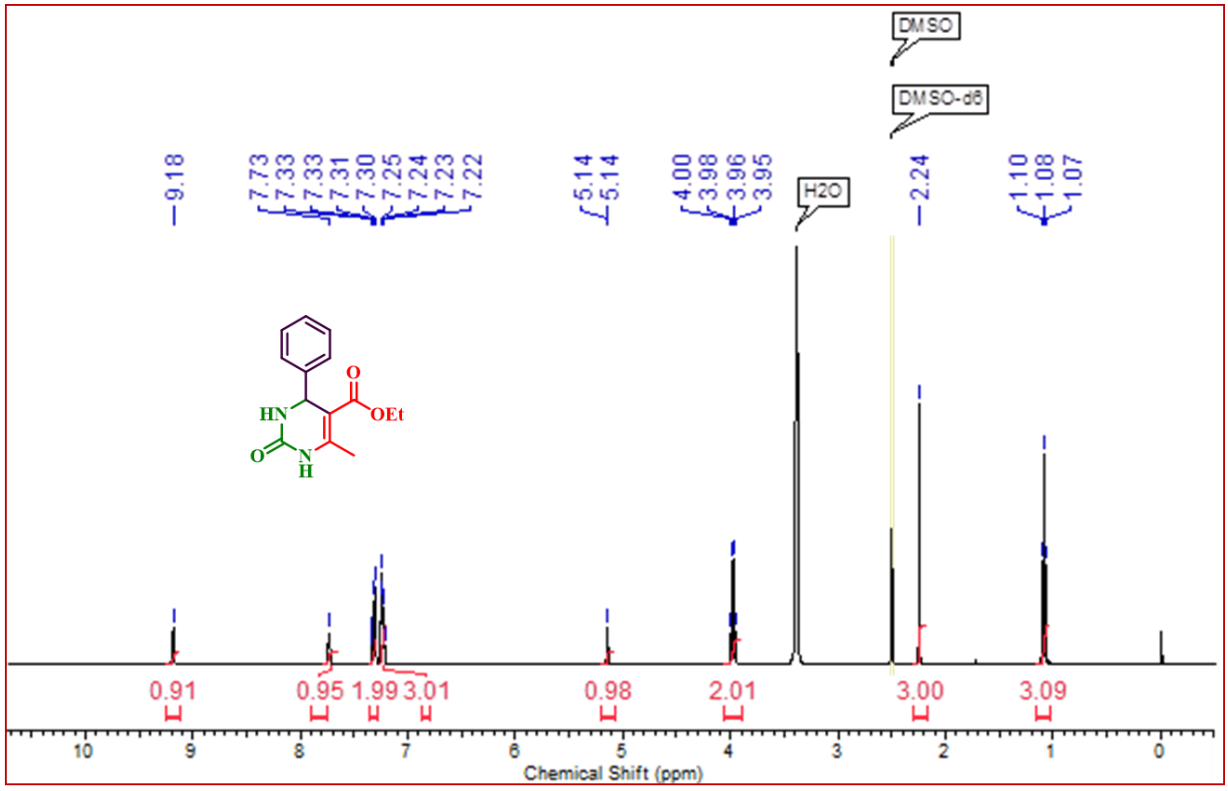


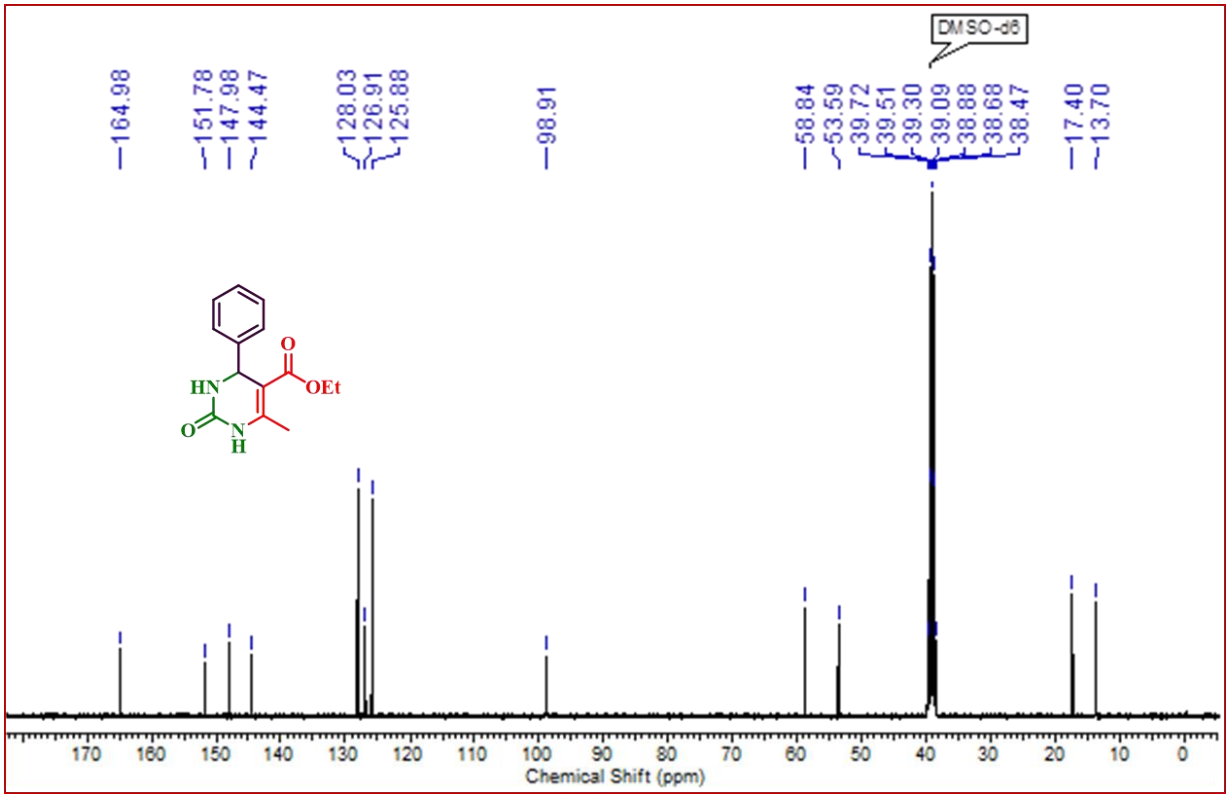
IR (ATR, υ cm^{-1}): 662, 763, 851, 1014, 1079, 1161, 1213, 1283, 1381, 1450, 1630, 2981, 3214, 3342. ^{1}H NMR (400 MHz, DMSO- δ6) δppm = 1.09 (t, J=7.1 Hz, 3 H), 2.25 (s, 3 H), 3.98 (q, J=7.1 Hz, 2 H), 5.13 (d, J=3.1 Hz, 1 H), 7.19 (m, J=8.4 Hz, 2 H), 7.48 - 7.57 (m, 2 H), 7.78 (br. s., 1 H), 9.27 (s, 1 H). ^{13}C NMR (100 MHz, DMSO- δ6) δppm =13.9 (s), 17.6 (s), 53.3 (s), 59.1 (s), 98.6 (s), 120.1 (s), 128.4 (s), 131.1 (s), 144.0 (s), 148.5 (s), 151.8 (s), 159.5 (s), 165.0 (s)

S6. FT-IR, ^{1}H and ^{13}C NMR spectra of the compounds

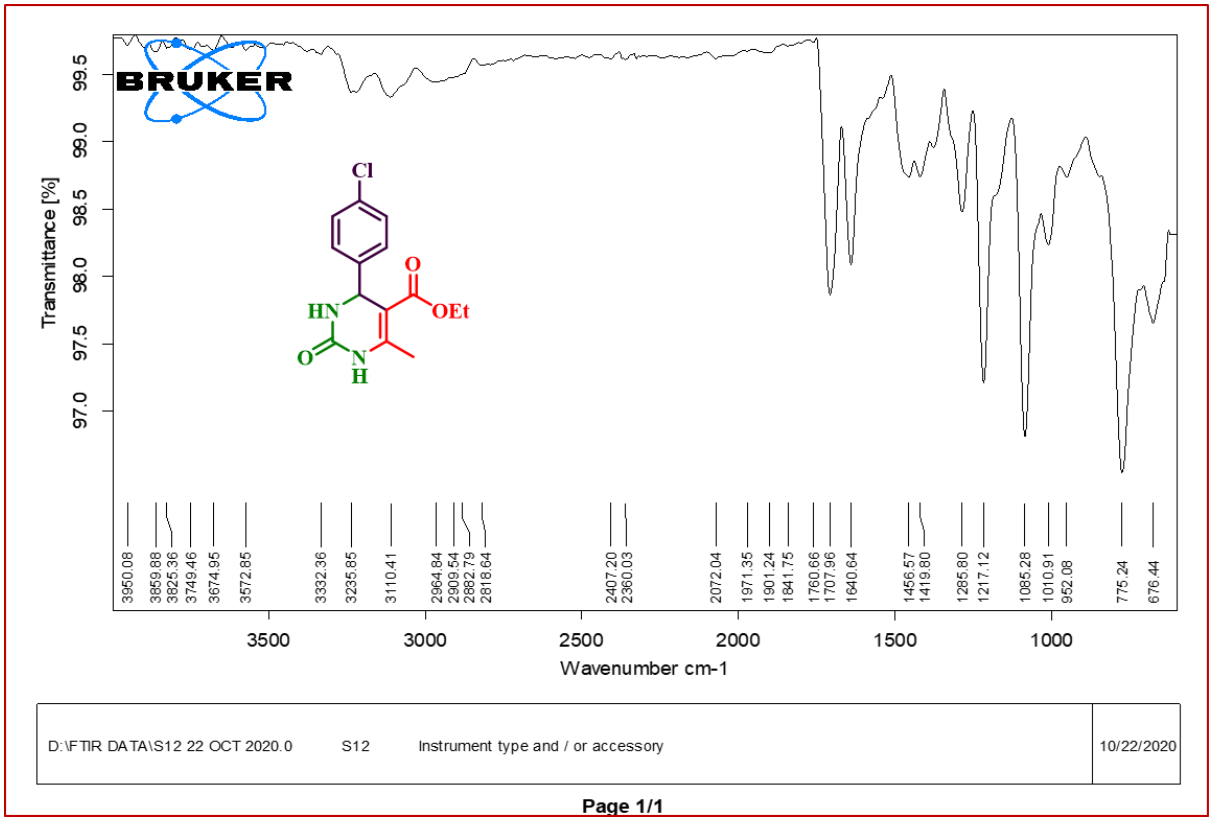
4a. ethyl 6-methyl-2-oxo-4-phenyl-1,2,3,4-tetrahydropyrimidine-5-carboxylate

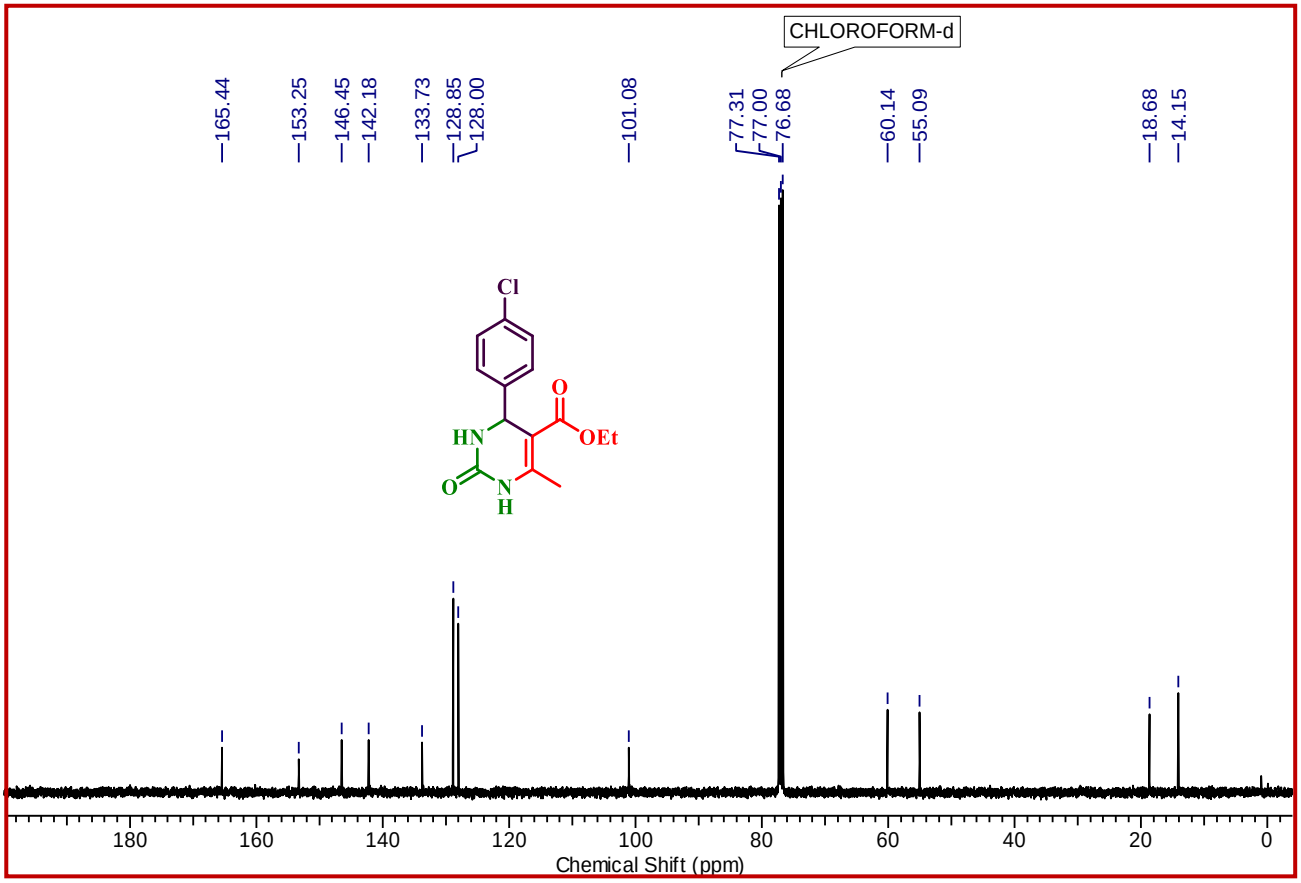


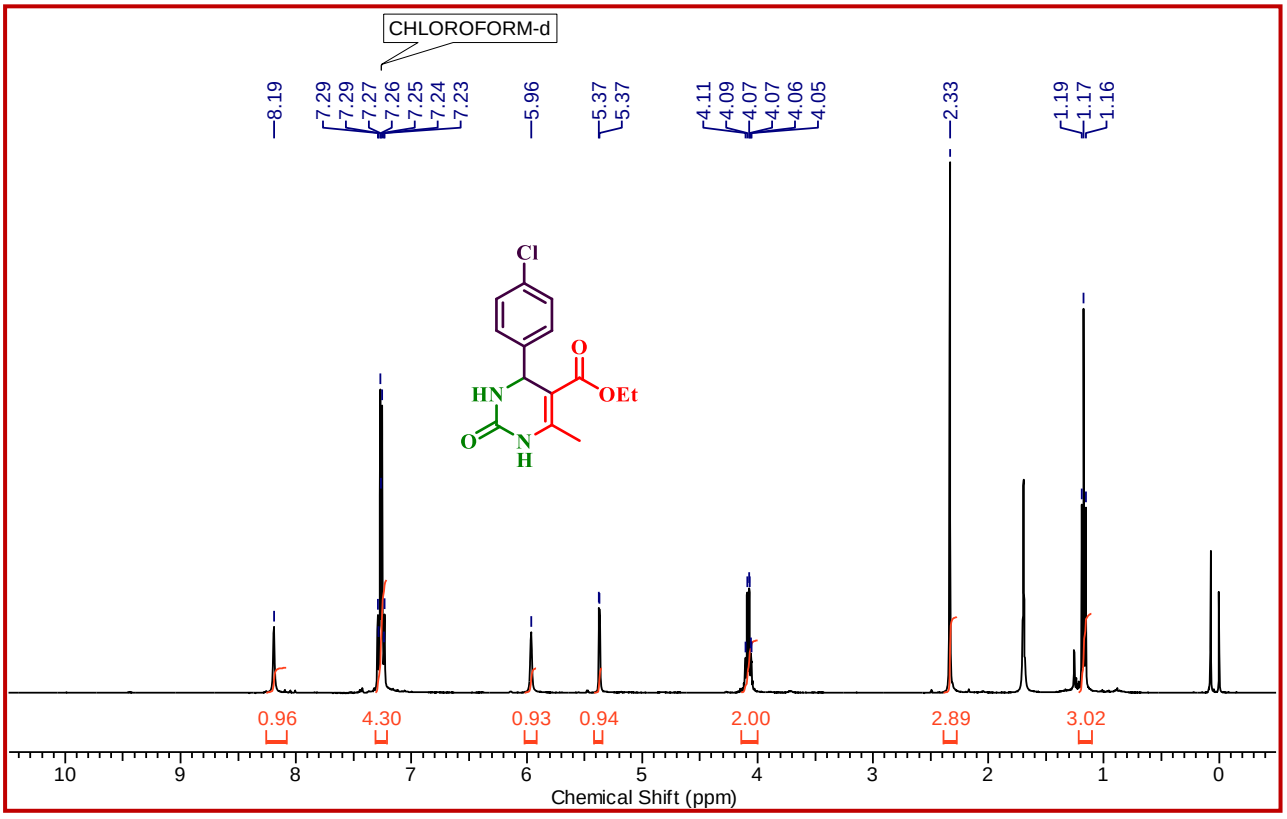




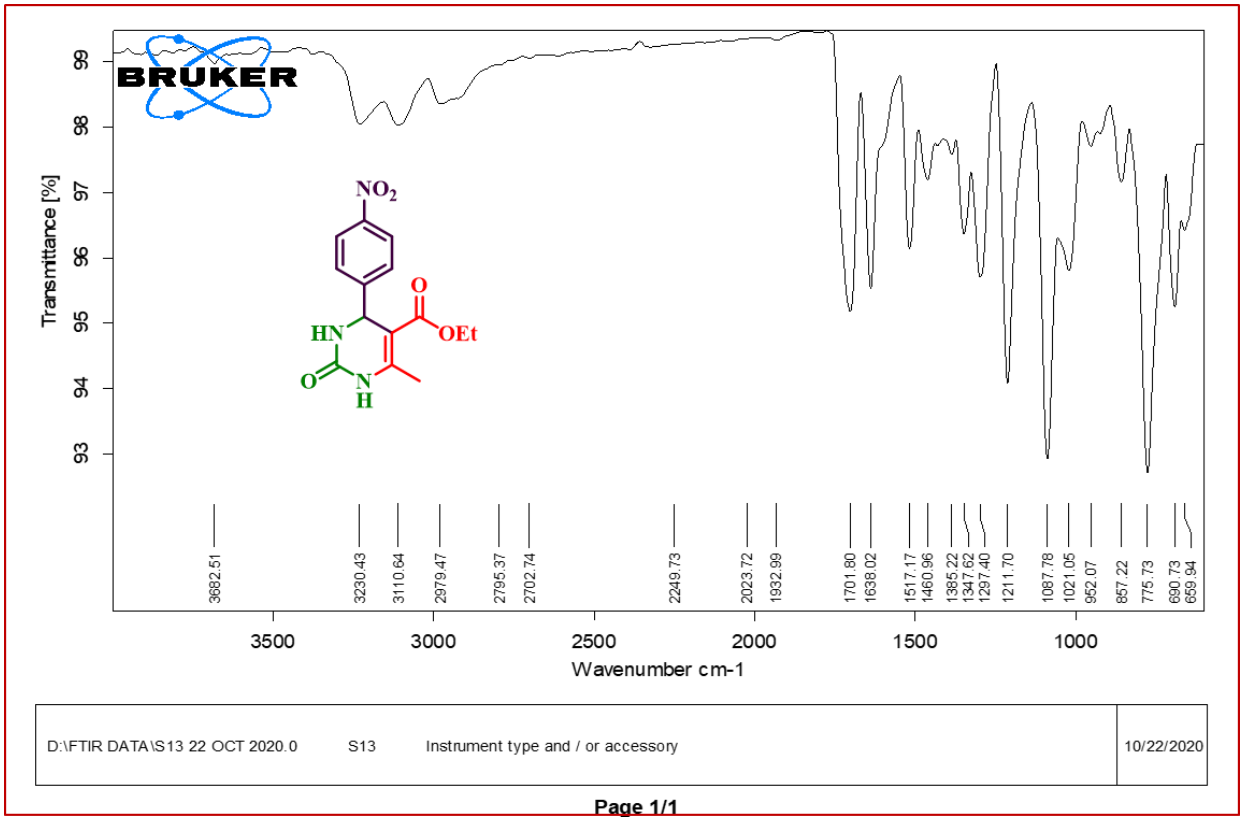
4b. ethyl 6-methyl-4-(4-Chlorophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate

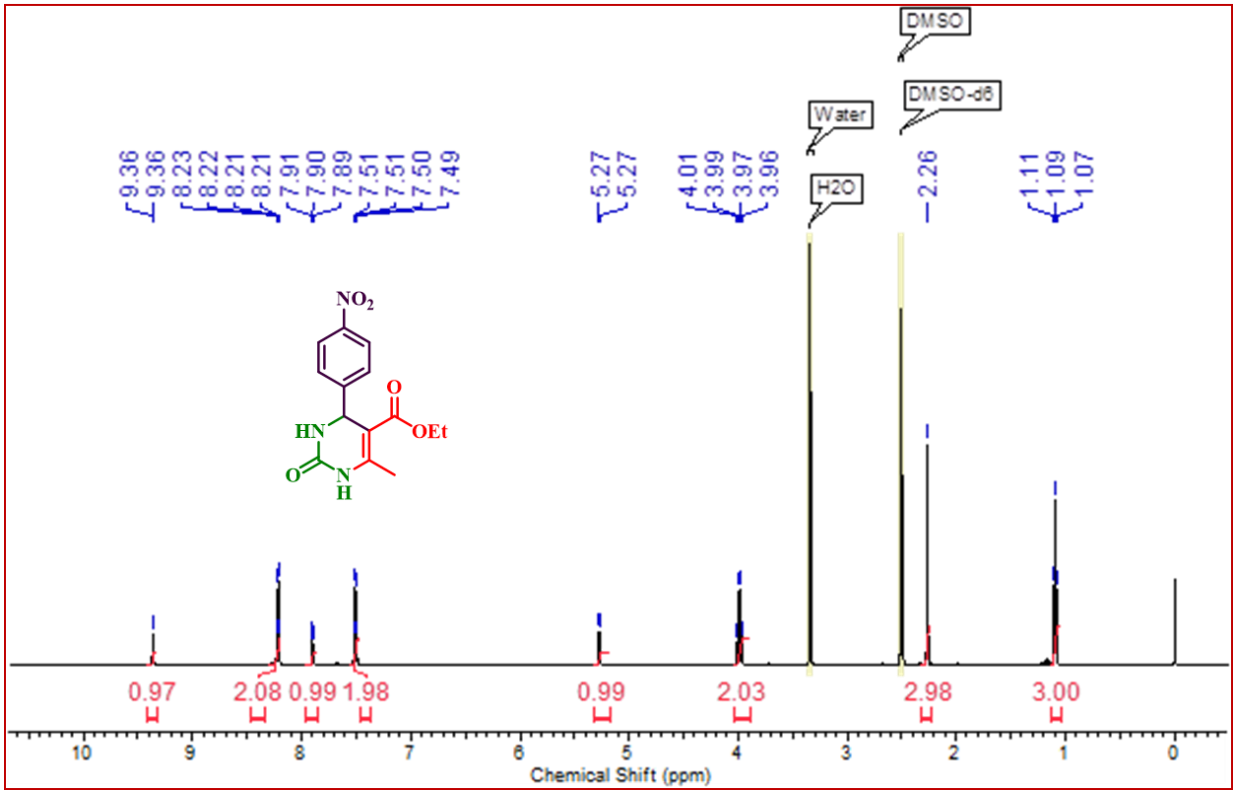


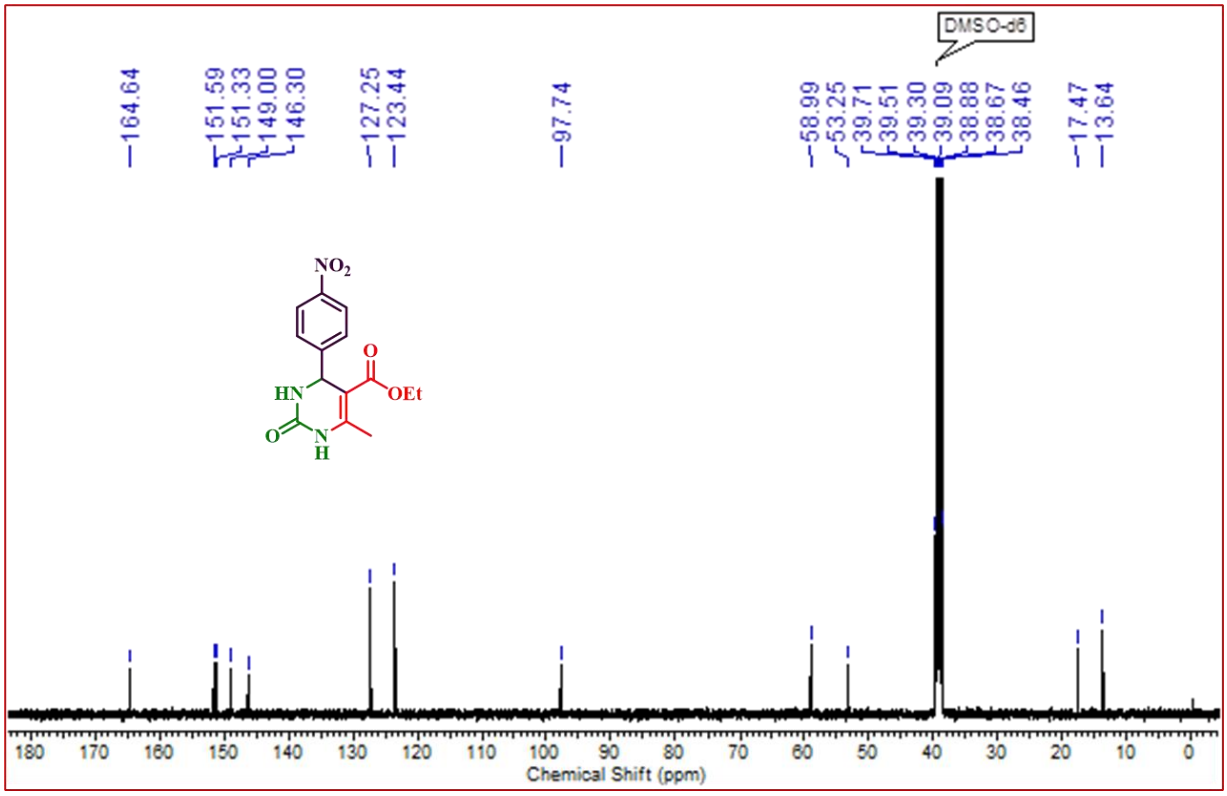

CHLOROFORM-d
165.44
153.25
146.45
142.18
133.73
128.85
128.00
101.08
77.31
77.00
76.68
60.14
55.09
18.68
14.15
Cl
O
OEt
HN
O
N
H
180
160
140
120
100
80
60
40
20
0
Chemical Shift (ppm)


CHLOROFORM-d
8.19
7.29
7.29
7.27
7.26
7.25
7.24
7.23
5.96
5.37
5.37
4.11
4.09
4.07
4.07
4.06
4.05
2.33
1.19
1.17
1.16
Cl
O
OEt
HN
O
N
H
0.96
4.30
0.93
0.94
2.00
2.89
3.02
10
9
8
7
6
5
4
3
2
1
0
Chemical Shift (ppm)

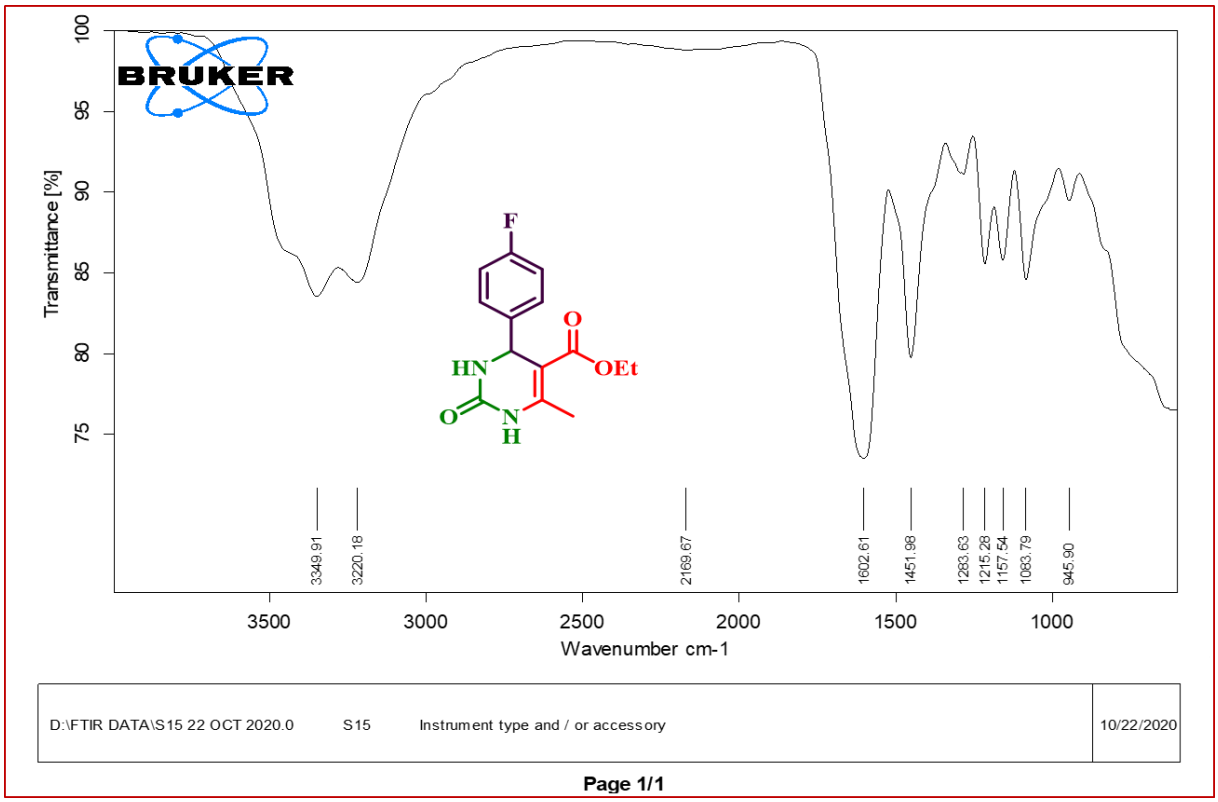
4d. ethyl 6-methyl-4-(4-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate

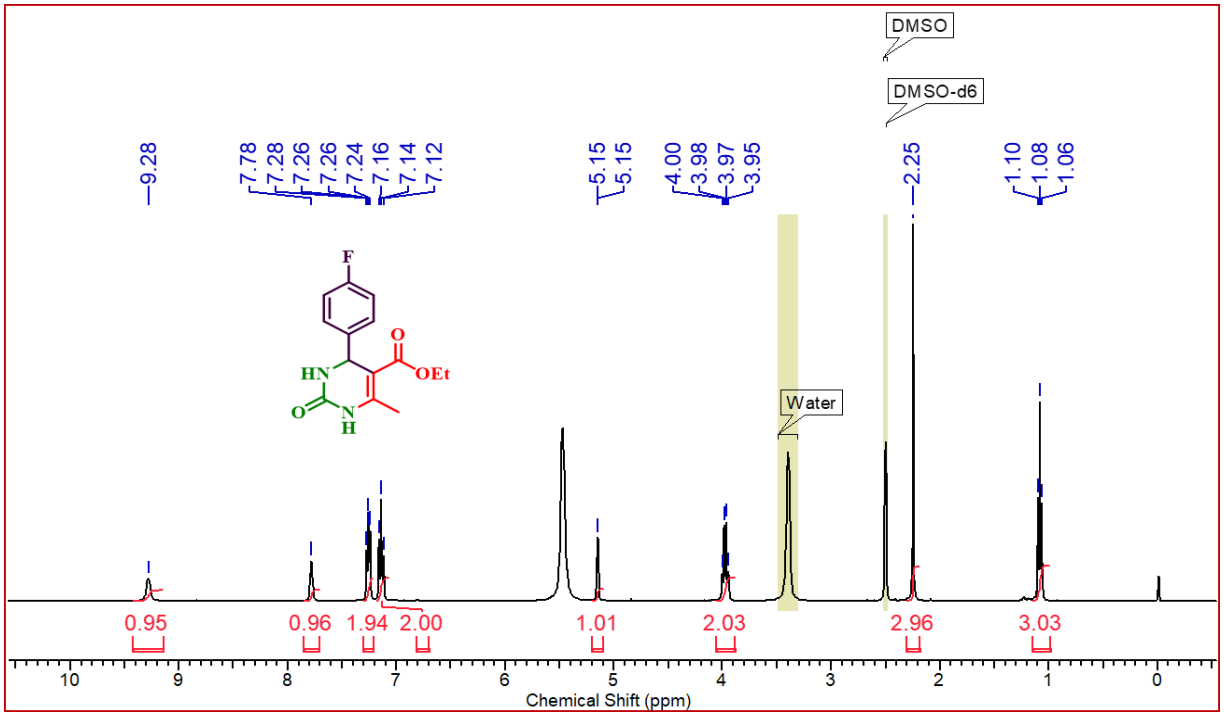


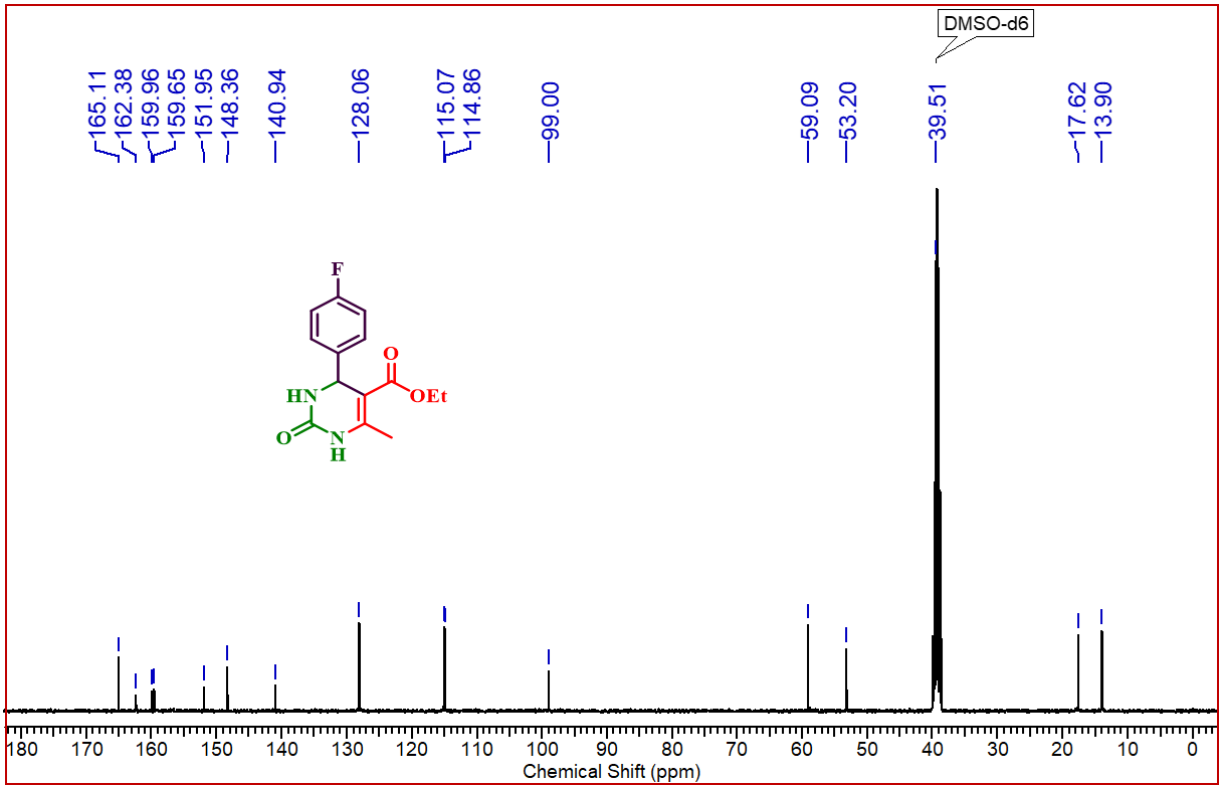




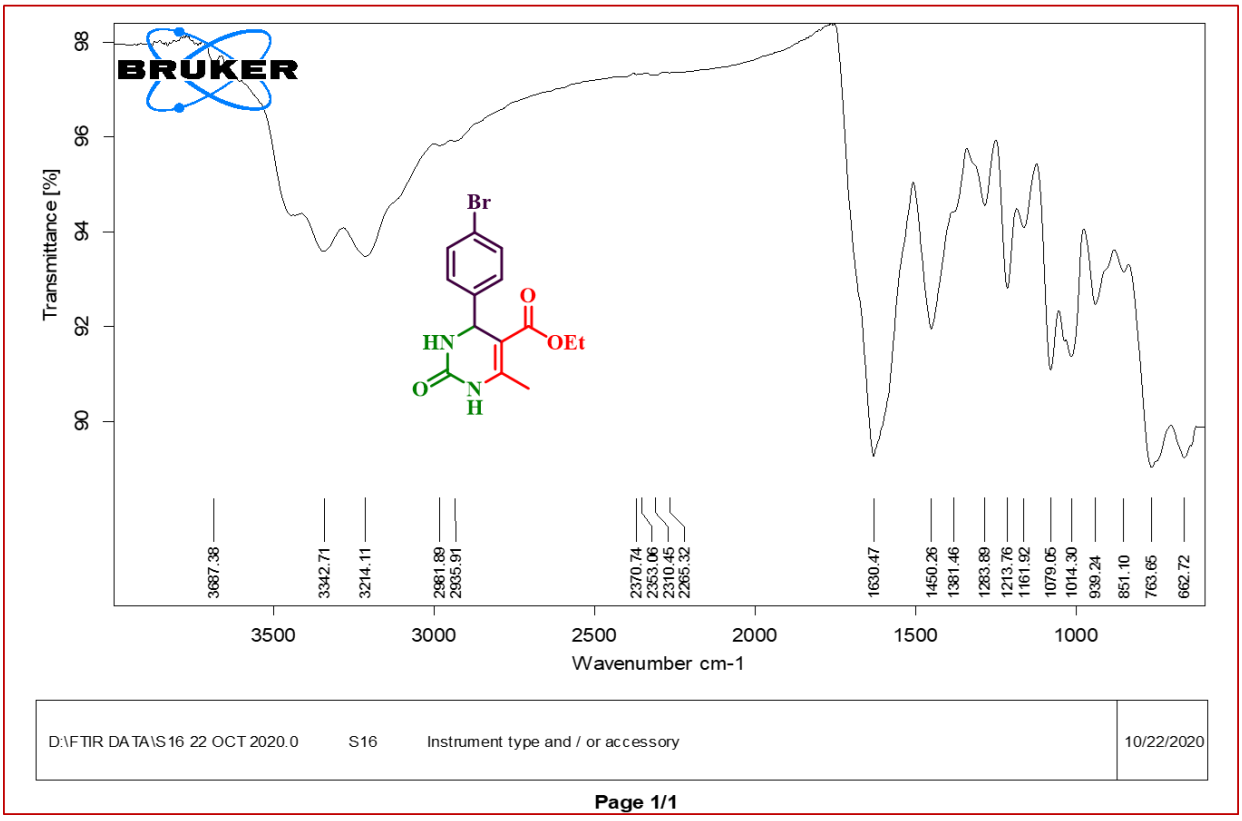
4e. ethyl 4-(4-fluorophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylat







4l. ethyl 4-(4-bromophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate



D:\FTIR DATA\S16 22 OCT 2020.0	S16	Instrument type and / or accessory	10/22/2020

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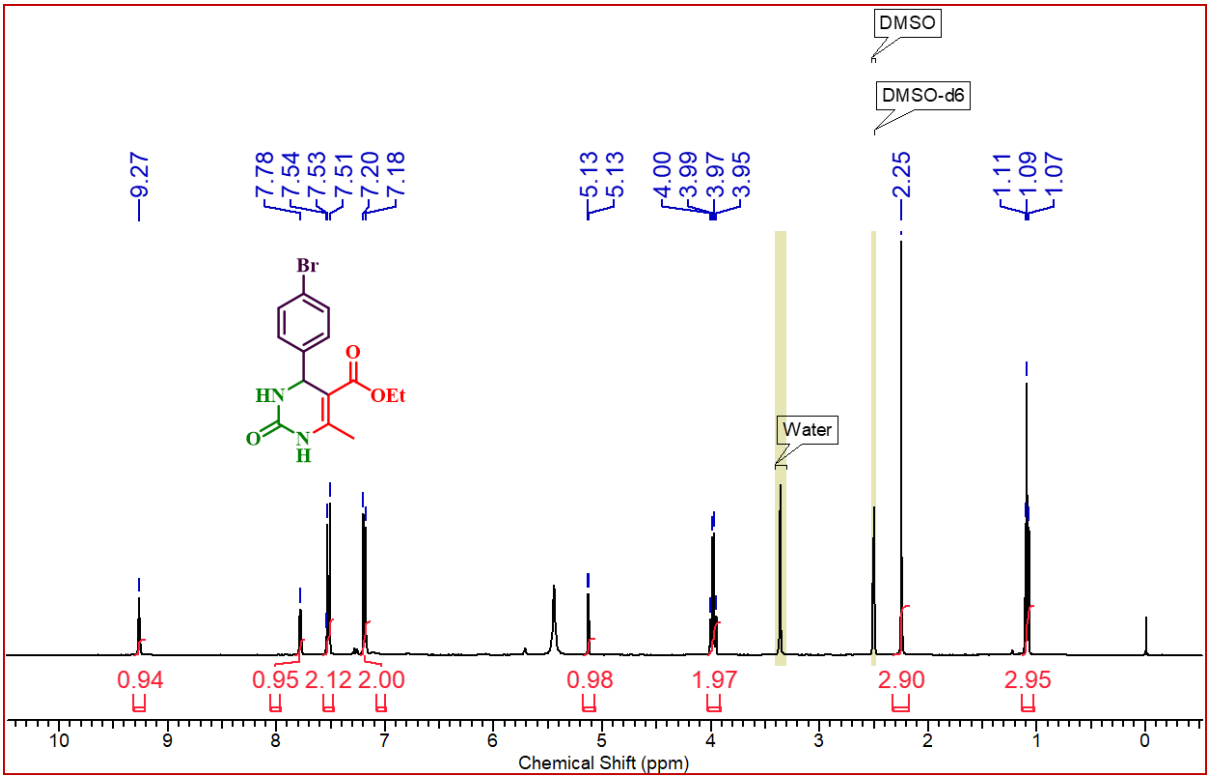

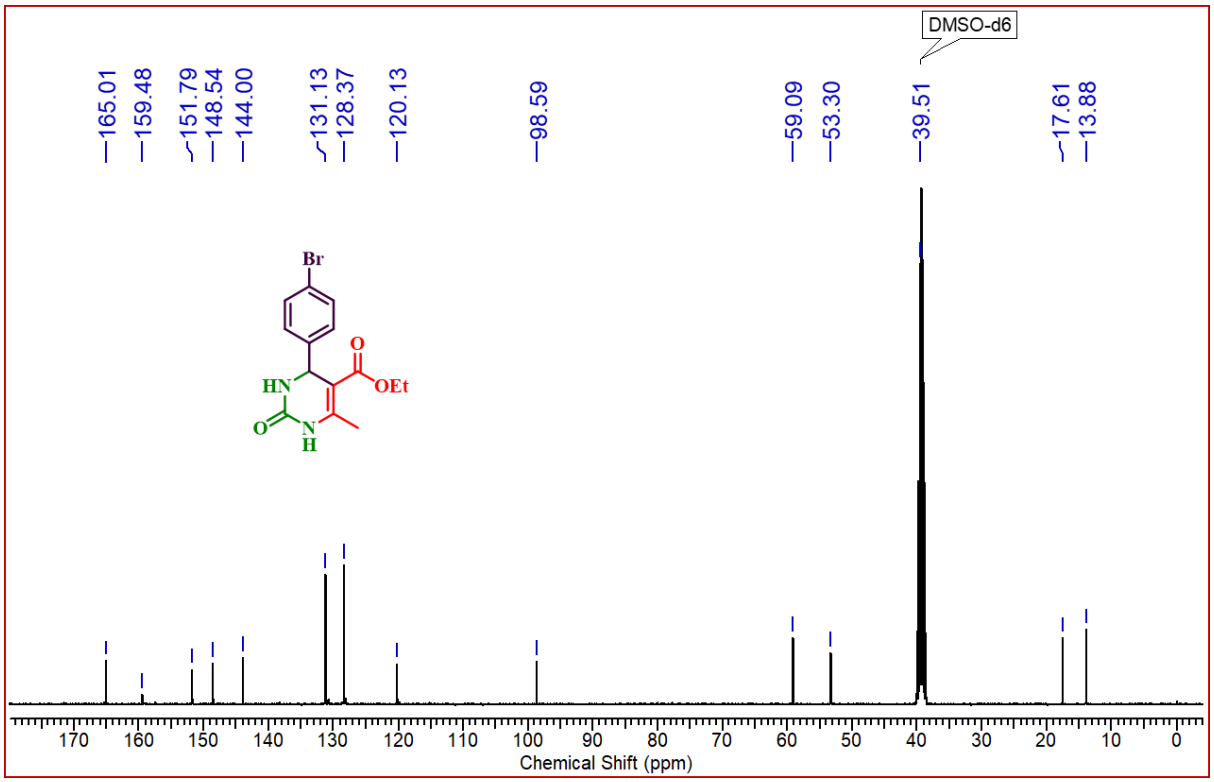

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