Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

An efficient synthesis of 1,3-dimethyl-5-(2-phenyl-4*H*-chromen-4-ylidene)pyrimidine-2,4,6(1*H*,3*H*,5*H*)-triones and investigation of their interactions with β-lactoglobiulin

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Instrumentation

Standard literature procedures were used to dry the solvents used in the experiments. An oven-dried round-bottomed flask was used to perform the reactions and they were conducted under the atmospheric oxygen. Thin-layer chromatography plates (Silica gel G) were visualized by exposure to ultraviolet light and/ or iodine vapor. IR spectra were recorded on a Perkin Elmer FT-IR Spectrophotometer (Spectrum BX II) as KBr pellets. ^{1}H NMR and ^{13}C NMR spectra were recorded in $CDCl_3$ on a Bruker 300MHz or a Bruker 500MHz NMR spectrometer. Chemical shifts (δ) were reported in parts per million (ppm) taking $CHCl_3$ peak at δ 7.26. Coupling constants (*J*) are quoted in hertz (Hz). Mass spectra were recorded on a Jeol MS Station 700 mass spectrometer by the electron spray ionization (ESI). Elemental analyses were done using two Perkin-Elmer 2400 Series II C, H, N analyzers.

Materials

2-Hydroxychalcones and 1,3-dimethylbarbituric acid were used as starting materials for the synthesis of the title compounds. 2-Hydroxychalcones were synthesized by base catalyzed condensation of 2-hydroxybenzaldehydes and acetophenones[1], and 1,3-dimethylbarbiyuric acid was commercially available (TCI chemicals). TLC was done with silica gel G. Starting materials used in the reaction were commercially available.

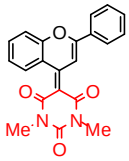
General Procedures for Synthesis of *1,3-Dimethyl-5-(2-phenyl-4H-chromen-4-ylidene)pyrimidine- 2,4,6(1H,3H,5H)-triones*(6)

Solution of 2-hydroxychalcone (**1**) (1 mmol) and 1,3-dimethyl-barbituric acid (1 mmol) in anhydrous toluene (10 mL) was added amberlyst-15 (40 mg) at room temperature. The resulting mixture was refluxed with stirring under atmospheric oxygen for 8 h. After completion of reaction, sufficient amount of dichloromethane was added to dissolve the product and then amberlyst-15 was filtered off. The filtrate was concentrated by removal of solvent and the resulting crude product was purified by crystallization from DCM hexane solvent system.

[1] (a) C. Guha, N. Sepay and A. K. Mallik, *Monatsh. Chem.*, 2015, **146**, 1349; (b) C. Guha, S. Samanta, N. Sepay and A. K. Mallik, *Tetrahedron Lett*., 2015, **56**, 4954.

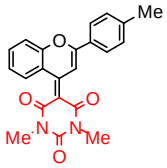
Physical and Spectral data of *1,3-Dimethyl-5-(2-phenyl-4H-chromen-4-ylidene)pyrimidine-2,4,6(1H,3H,5H)-triones* (6) and related compounds

1,3-Dimethyl-5-(2-phenyl-4H-chromen-4-ylidene)pyrimidine-2,4,6(1H,3H,5H)-trione (**6a**):



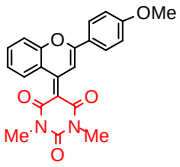
Red crystals (yield: 75 %), m.p. 171-172 °C, IR (KBr pellet): 1700, 1630, 1544, 1467, 1440, 1401, 1358, 1129, 1060, 861, 765 cm^{-1}, ^{1}H NMR (300 MHz, $CDCl_3$): δ 3.43 (6H, s, 2 × $>NCH_3$), 7.43 (1H, t, *J*=8.2 Hz), 7.56-7.61(3H, m, Ar-H), 7.67 (1H, d, *J*=8.4 Hz), 7.78 (1H, t, *J*=8.4 Hz), 8.05-8.11(3H, m, Ar-H), 9.13 (1H, s, H-3 of 2-chromene moiety). ^{13}C NMR (75 MHz, $CDCl_3$): δ 28.4, 99.6, 111.9, 118.0, 121.4, 124.8, 127.2, 129.4, 131.0, 131.8, 132.7, 135.1, 152.0, 154.8, 161.6, 162.6, 162.8, ESMS: *m/z* calculated for $C_{21}H_{17}N_2O_4$ $[M + H]^+$: 361.1188, found 361.1180, Anal. Calcd for $C_{21}H_{16}N_2O_4$: C, 69.99; H, 4.48; N, 7.77. Found: C, 70.13; H, 4.67; N, 7.52.

1,3-Dimethyl-5-(2-p-tolyl-4H-chromen-4-ylidene)pyrimidine-2,4,6(1H,3H,5H)-trione (**6b**):



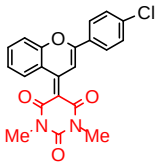
Red crystals (yield: 63 %), m.p. 175-176 °C, IR (KBr pellet): 1699, 1630, 1544, 1509, 1463, 1440, 1356, 1279, 1192, 1128, 1057, 763, 721, 615; ^{1}H NMR (300 MHz, $CDCl_3$): δ 2.47 (3H, s, CH_3), 3.43 (6H, s, 2 × $>NCH_3$), 7.37 (2H, d, *J* = 8.1Hz, Ar-H), 7.42 (1H, t, *J* = 7.5Hz, Ar-H), 7.66 (1H, d, *J* = 8.7Hz, Ar-H), 7.78 (1H, br. t, J=7.2 Hz Ar-H), 8.00 (2H, d, *J* =8.2 Hz, Ar-H), 8.05 (1H, br. d, *J* = 8.4 Hz, Ar-H), 9.07 (1H, s, H-3 of 2-chromene moiety), ^{13}C NMR (75 MHz, $CDCl_3$): δ 21.7, 28.3, 98.9, 111.8, 118.0, 121.5, 124.8, 127.3, 128.1, 130.2, 131.8, 135.0, 144.0, 152.1, 154.7, 162.2, 162.9; Anal. Calcd for $C_{22}H_{18}N_2O_4$: C, 70.58; H, 4.85; N, 7.48. Found: C, 70.72; H, 5.02; N, 7.61.

5-(2-(4-methoxyphenyl)-4H-chromen-4-ylidene)-1,3-dimethylpyri-midine-2,4,6(1H,3H,5H)-trione (6c)



Red crystals (yield: 81 %), m.p. 199-200 °C ^{1}H NMR (500 MHz, $CDCl_3$): δ 3.42 (6H, s, 2 × $>NCH_3$), 3.92 (3H, s, OCH_3), 7.05 (2H,d, *J*=8.5 Hz, H-3′, 5′), 7.42 (1H, t, *J*=8.0 Hz, H-6), 7.65 (1H, d, *J*=8.5 Hz, H-8), 7.76 (1H, t, *J*=7.5 Hz, H-7), 8.05 (1H, d, *J*=8.5 Hz, H-5), 8.08 (2H,d, *J*=8.5 Hz, H-2′, 6′), 9.00 (1H, s, H-3 of 2-chromene moiety). ^{13}C NMR (75 MHz, $CDCl_3$): δ 28.3, 55.7, 98.2, 111.5, 115.0, 117.9, 121.6, 123.1, 124.8, 129.5, 131.8, 134.8, 152.2, 154.6, 162.3, 162.9, 163.8; ESMS: *m/z* calculated for $C_{22}H_{19}N_2O_5$ $[M + H]^+$: 391.1294, found 391.1214. Anal. Calcd for $C_{22}H_{18}N_2O_5$: C, 67.69; H, 4.65; N, 7.18. Found: C, 67.49; H, 4.79; N, 7.03.

5-(2-(4-Chlorophenyl)-4H-chromen-4-ylidene)-1,3-dimethylpyrimi-dine-2,4,6(1H,3H,5H)-trione (**6d**):

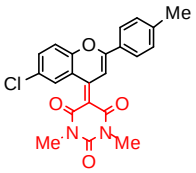


Red crystals (yield:60%), m.p. 217-218 °C, ^{1}H NMR (300 MHz, $CDCl_3$): δ 3.42 (6H, s, 2 × $>NCH_3$), 7.42 (1H, t, *J*=6.9 Hz), 7.53 (2H, d, *J*=8.7 Hz, H-3′& H-5′), 7.64 (1H, d, *J*=8.1Hz, Ar-H), 7.78 (1H, t, *J*=7.5 Hz), 8.01-8.05 (3H, m, Ar-H), 9.12 (1H, s, H-3 of 2-chromene moiety). ^{13}C NMR (75 MHz, $CDCl_3$): δ 28.5, 100.4, 111.6, 119.5, 122.3, 127.2, 129.4, 130.4, 130.7, 130.9, 132.9, 134.9, 151.8, 153.1, 160.8, 161.5, 162.7, Anal. Calcd for $C_{21}H_{15}ClN_2O_4$: C, 63.89; H, 3.83; N, 7.10. Found: C, 64.03; H, 3.76; N, 6.81.

5-(6-Chloro-2-phenyl-4H-chromen-4-ylidene)-1,3-dimethylpyrimi-dine-2,4,6(1H,3H,5H)-trione (**6e**):

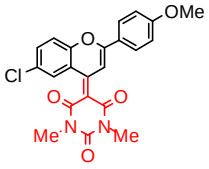
Red crystals (yield: 72%), m.p. 215-206 °C, IR (KBr pellet): 2920, 2850, 1701, 1649, 1627,1515, 1467, 1366, 1262, 1192, 1120, 1022, 836, 753, 702, 641 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$): δ 3.42 (6H, s, 2 × $>NCH_3$), 7.54-7.61(4H, m, Ar-H),7.69 (1H, dd, *J*=8.0 & 2.4 Hz, H-7), 8.01(1H, d, *J*=2.4 Hz, H-5), 8.06 (2H, dd, *J*=8.2 & 2 Hz, H-2′& H-6′), 9.16 (1H, s, H-3 of 2-chromene moiety). ^{13}C NMR (75 MHz, $CDCl_3$): δ 28.5, 99.6, 111.8, 118.0, 119.4, 125.0, 128.3, 129.5,129.6, 131.9, 135.4, 139.1, 153.0, 154.8, 160.0, 161.3, 163.1, Anal. Calcd for $C_{21}H_{15}ClN_2O_4$: C, 63.89; H, 3.83; N, 7.10. Found: C, 63.61; H, 3.67; N, 7.03.

5-(6-Chloro-2-p-tolyl-4H-chromen-4-ylidene)-1,3-dimethylpyrimi-dine-2,4,6(1H,3H,5H)-trione (**6f**):



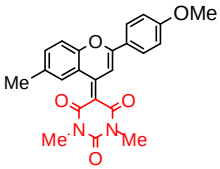
Red crystals (yield: 69%), m.p. 203-204°C;^1H NMR (300 MHz, $CDCl_3$): δ 2.46 (3H, s, CH_3), 3.42 (6H, s, 2 × $>NCH_3$), 7.36 (2H, d, *J*=9 Hz, H-3′, 5′), 7.58 (1H, d, *J*=9 Hz, H-8), 7.68 (1H, dd, *J*=9.0 &2.3 Hz, H-7), 7.96 (2H, d, *J*=8.2 Hz, H-2′, 6′), 8.01 (1H, d, *J*=2.3 Hz, H-5), 9.10 (1H, s, H-3 of 2-chromene moiety). ^{13}C NMR (75 MHz, $CDCl_3$): δ 21.7, 28.4, 99.7, 111.4, 119.4, 122.4, 127.3, 127.8, 130.2, 130.4, 130.9, 134.8, 144.2, 151.9, 153.0, 161.0, 162.0, 162.7. ESMS: *m/z* calculated for $C_{22}H_{18}ClN_2O_4$ $[M + H]^+$: 409.09, found 409.39

5-(6-Chloro-2-(4-methoxyphenyl)-4H-chromen-4-ylidene)-1,3-dimethylpyrimidine2,4,6 (1H,3H,5H)-trione (**6g**):



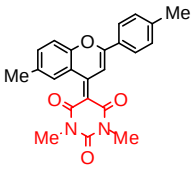
Red crystals (yield: 80%), m.p. 209-210 °C,^1H NMR (300 MHz, $CDCl_3$): δ 3.42 (6H, s, 2 × $>NCH_3$), 3.92 (3H, s, OCH_3), 7.03 (2H, d, *J*=9.0 Hz, H-3′, 5′), 7.58 (1H, d, *J*=9 Hz, H-8), 7.67 (1H, dd, *J*=9 & 2.4 Hz, H-7), 8.00 (1H, br.s, H-5), 8.05 (2H, d, *J*=9 Hz, H-2′, 6′), 9.03 (1H, s, H-3 of 2-chromene moiety). ^{13}C NMR (75 MHz, $CDCl_3$): δ 28.4, 55.7, 99.6, 111.2, 115.0, 119.3, 122.4, 122.8, 129.4, 130.4, 130.9, 134.7, 152.0, 152.9, 161.0, 162.2, 163.9. Anal. Calcd for $C_{22}H_{17}ClN_2O_5$: C, 62.20; H, 4.03; N, 6.59. Found: C, 62.07; H, 4.18; N, 6.68.

5-(2-(4-Methoxyphenyl)-6-methyl-4H-chromen-4-ylidene)-1,3-dimethylpyrimidine-2,4,6 (1H,3H,5H)-trione (**6h**):



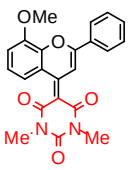
Red crystals (yield: 83%), m.p. 217-218 °C, IR (KBr pellet):1699, 1628, 1551, 1515, 1430, 1466, 1363, 1262, 1224, 1120, 1025, 904, 838, 862, 804, 776, 754, 719, 643 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$): δ 2.47 (3H, s, CH_3), 3.42 (6H, s, 2 × $>NCH_3$), 3.92 (3H, s, OCH_3), 7.04 (2H,d, *J*=9.0 Hz, H-3′, 5′), 7.56 (2H, br.s, H-7 & H-8), 7.82 (1H, br.s, H-5), 8.07(2H,d, *J*=8.9 Hz, H-2′, 6′), 8.93 (1H, s, H-3 of 2-chromene moiety). ^{13}C NMR (75 MHz, $CDCl_3$): δ 21.4, 28.3, 55.7, 97.7, 111.9, 114.9, 117.6, 121.5, 123.1, 129.4, 131.0, 134.9, 136.5, 152.3, 153.1, 162.2, 162.8, 136.0, 163.7 Anal. Calcd for $C_{23}H_{20}N_2O_5$: C, 68.31; H, 4.98; N, 6.93. Found: C, 68.14; H, 4.88; N, 7.11.

1,3-Dimethyl-5-(6-methyl-2-p-tolyl-4H-chromen-4-ylidene)pyrimidine-2,4,6(1H,3H,5H)-trione (**6i**):



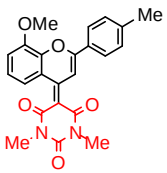
Red crystals (yield: 78%), m.p. 181-182 °C, IR: 1701, 1630, 1546, 1546, 1511, 1358, 1275, 1192, 1131, 1054, 816, 778, 764, 719, 643; ^{1}H NMR (300 MHz, $CDCl_3$): δ 2.46 (3H, s, CH_3), 2.48 (3H, s, CH_3), 3.42 (6H, s, 2 × >NCH_3), 7.36 (2H, d, *J*=7.8 Hz, H-3′, 5′), 7.58 (2H, s, H-7,8), 7.82 (1H, s, H-5), 7.98 (2H, d, *J*=7.8 Hz, H-2′, 6′), 9.00 (1H, s, H-3 of 2-chromene moiety), ^{13}C NMR (75 MHz, $CDCl_3$): δ 21.4, 21.7, 28.3, 98.3, 112.1, 117.7, 121.5. 127.3, 128.1, 130.1, 131.0, 134.9, 136.7, 143.9, 152.2, 153.2, 162.1, 162.8, 163.1 ESMS: *m/z* calculated for $C_{23}H_{20}N_2O_4$ $[M + H]^+$: 389.1501, found 389.1541.

5-(8-Methoxy-2-phenyl-4H-chromen-4-ylidene)-1,3-dimethylpyrimidine-2,4,6(1H,3H,5H)-trione (**6j**):



Red crystals (yield: 81%), m.p. 219-220 °C, IR: 2923, 2852, 1692, 1550, 1501, 1402, 1450682, 701, 723, 755, 775, 802, 863, 1068, 1140, 122874, 1353;^{1}H NMR (300 MHz, $CDCl_3$): δ 3.42 (6H, s, 2 × >NCH_3), 4.06 (3H, s, OCH_3), 7.22 (1H, d, *J*=7.9 Hz, H-7), 7.32 (1H, t, *J*=8.4 Hz, H-6), 7.53-7.59 (4H, m, Ar-H), 8.14(2H, dd, *J*= 7.8 & 2.0 Hz, H-2′, 6′), 9.14 (1H, s, H-3 of 2-chromene moiety). ESMS: *m/z* calculated for $C_{22}H_{18}N_2O_5$ $[M + H]^+$: 391.12, found 391.20.

5-(8-Methoxy-2-p-tolyl-4H-chromen-4-ylidene)-1,3-dimethylpyrimidine-2,4,6(1H,3H,5H)-trione (**6k**):

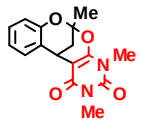


Red crystals (yield: 85%), m.p. 231-232 °C, ^{1}H NMR (300 MHz, $CDCl_3$): δ 2.46 (3H, s, CH_3), 3.41 (6H, s, 2 × >NCH_3), 4.05 (3H, s, OCH_3), 7.20-7.37 (4H, m, Ar-H), 7.54 (1H, d, *J*=8.0 Hz, H-5), 8.04 (2H, d, *J*= 8.1Hz, H-2′, 6′), 9.08 (1H, s, H-3 of 2-chromene moiety), ESMS: *m/z* calculated for $C_{23}H_{20}N_2O_5$ $[M + H]^+$: 405.13, found 405.11

1,3-Dimethyl-5-(2-(thiophen-2-yl)-4H-chromen-4-ylidene)pyrimidine -2,4,6(1H,3H,5H)-trione (**6l**):

Red crystals (yield: 25%), m.p. 243-244 °C,^{1}H NMR (300 MHz, $CDCl_3$): δ 3.42 (6H, s, 2 × >NCH_3), 7.26-7.28 (1H, m,), 7.41 (1H, t, J =7.5 Hz, Ar-H), 7.61 (1H, d, J = 8.1 Hz), 7.72-7.76 (2H, m, Ar-H), 7.96 (1H, d, J = 3.6 Hz, H-5 of thiophene moiety), 8.01 (1H, d, J = 8.3 Hz, Ar-H), 8.93 (1H, s, H-3 of 2-chromene moiety) ^{13}C NMR (125 MHz, $CDCl_3$): δ28.5, 99.1, 111.3, 118.0, 121.6, 124.9, 129.4, 131.0, 132.0, 133.1, 135.1, 152.5, 154.3, 158.2, 162.1, 162.9. HRMS: m/z calculated for $C_{19}H_{15}N_2O_4S$ $[M + H]^+$: 366.0674, found 367.0747

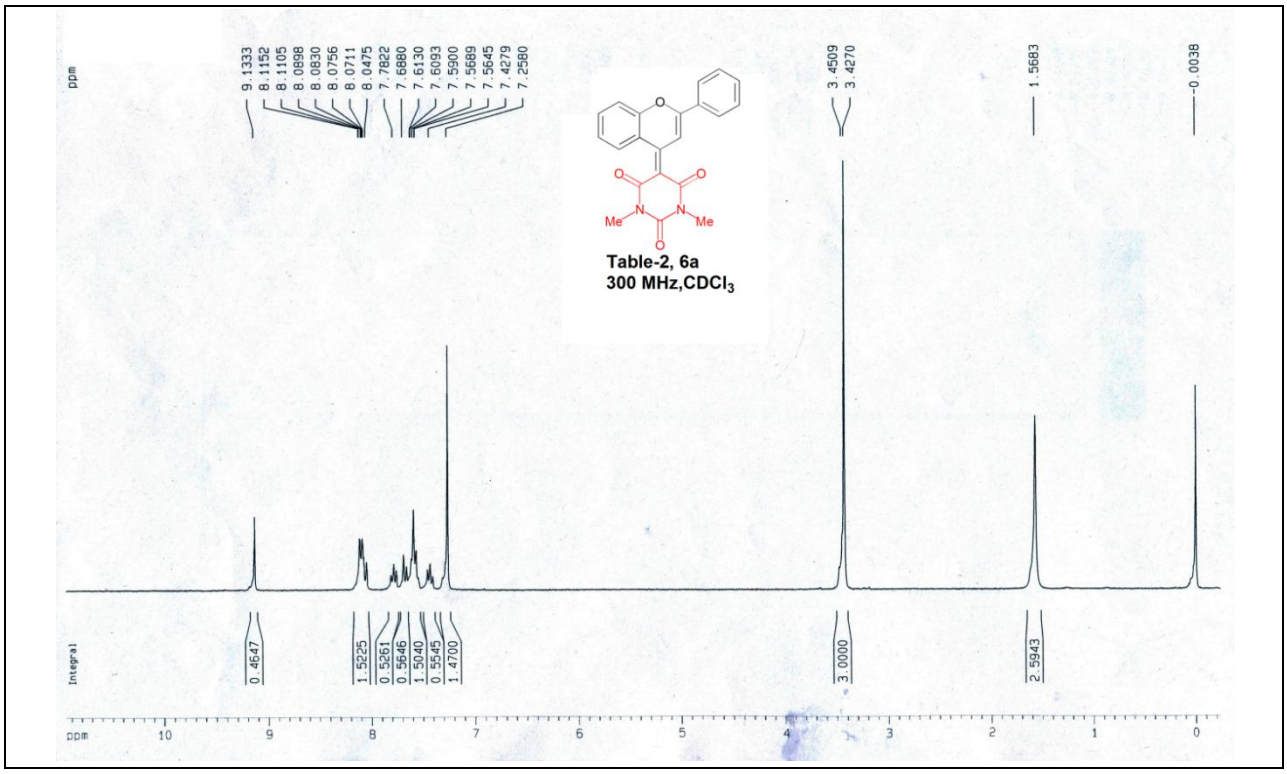
2,4,6-Trimethyl-4,12-dihydro-1H-6,12-methanobenzo[7,8][1,3]di-oxocino[4,5-d]pyrimidine-1,3(2H)-dione (**12**):

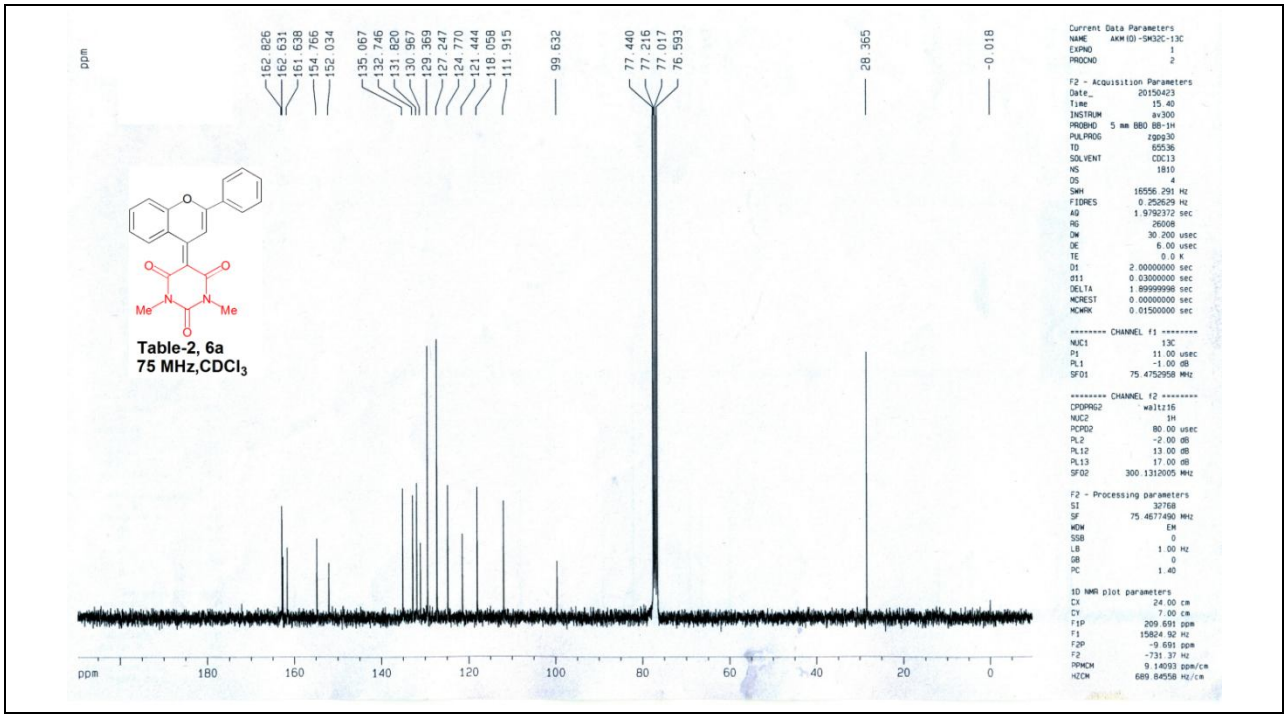


Colourless crystals (yield: 42%), m.p. 98-99 °C, ^{1}H NMR (300 MHz, $CDCl_3$): δ 1.91 (3H, s, CH_3), 2.14 and 2.23 (each 1H, br. d, J =13.5 Hz, CH_2), 3.28 (3H, s, $>NCH_3$), 3.34 (3H, s, $>NCH_3$), 4.21 (1H, br. s, aliph. CH), 6.85 (1H, d, J = 7.4 Hz, Ar-H), 6.91 (1H, t, J = 7.4 Hz, Ar-H), 7.12 (1H, t, J = 7.4 Hz, Ar-H), 7.40 (1H, d, J = 7.5 Hz, Ar-H). ^{13}C NMR (75 MHz, $CDCl_3$): δ 25.5, 26.7, 28.0, 28.7, 31.2, 91.8, 102.3, 116.0, 122.0, 126.3, 127.8, 128.0, 150.7, 155.1, 161.6. HRMS: m/z calculated for $C_{16}H_{17}N_2O_4$ $[M + H]^+$: 301.1110, found 301.1295.

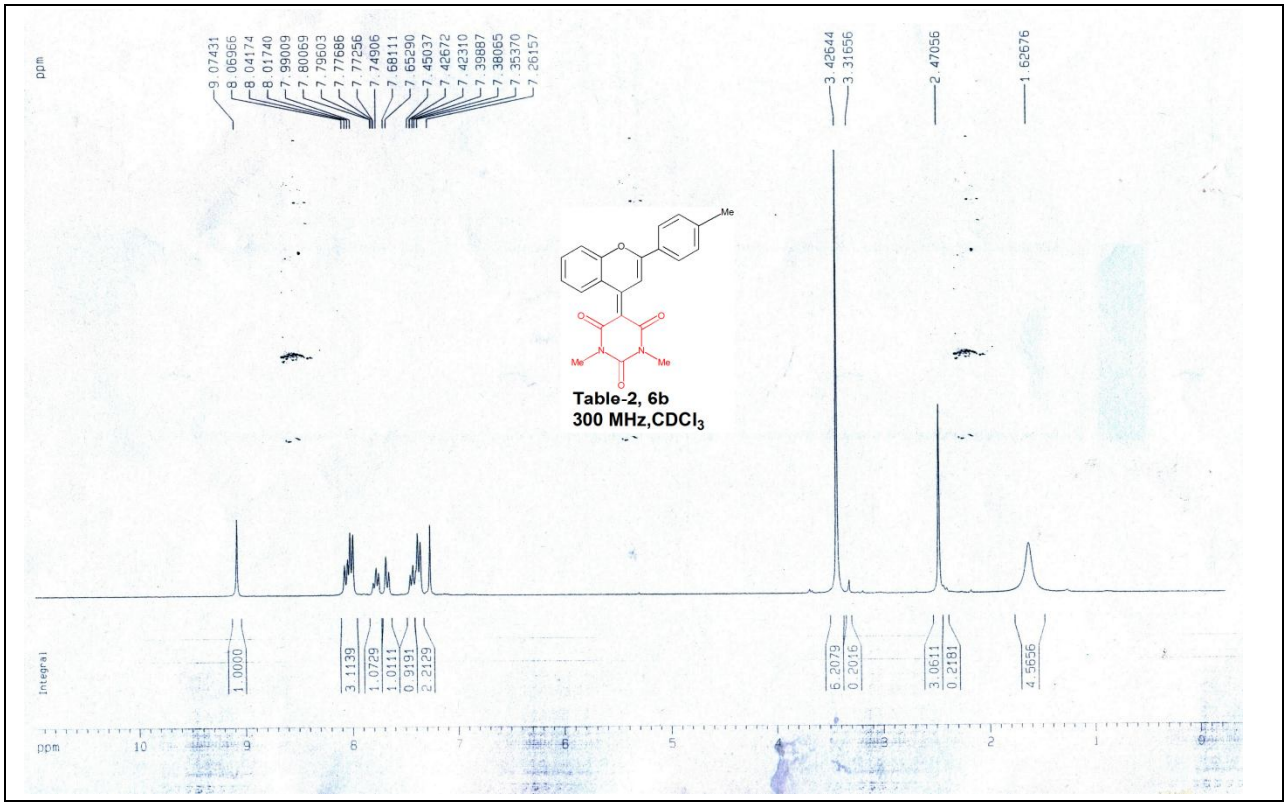
^{1}H and ^{13}C Spectra:

Compound 6a





Compound 6b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7.38065
7.35370
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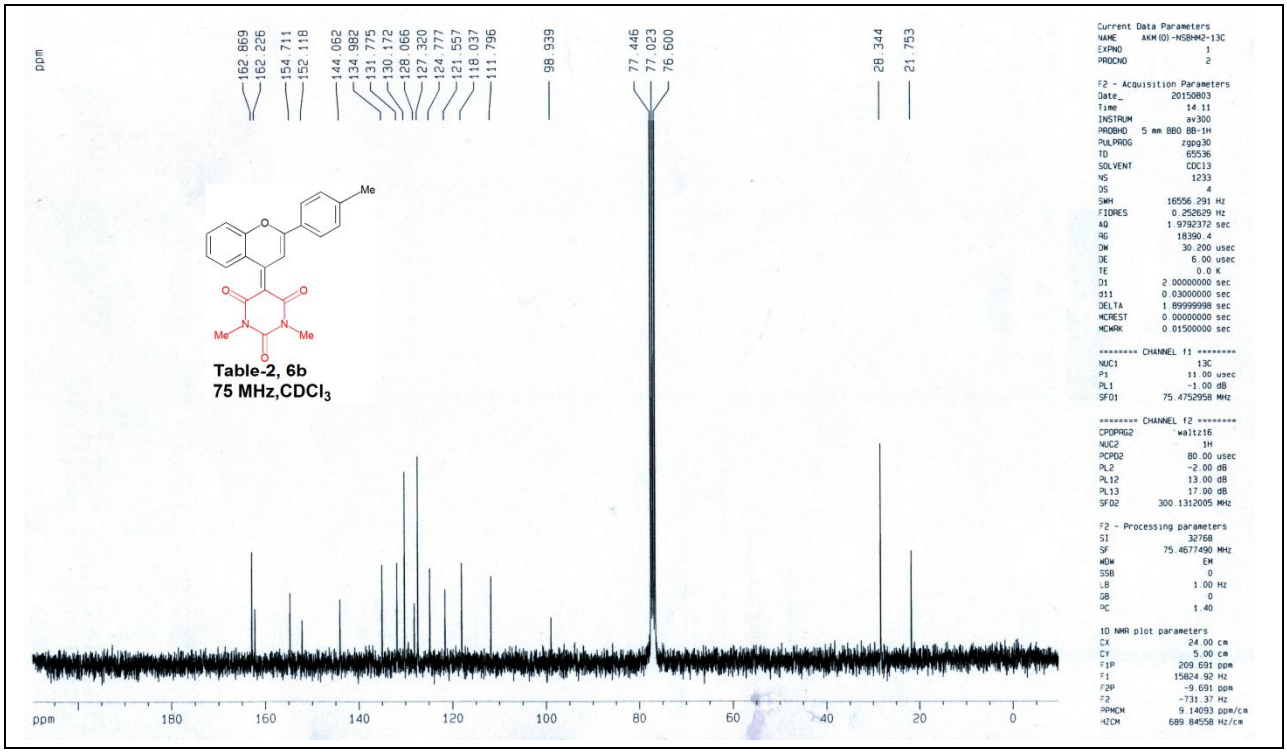
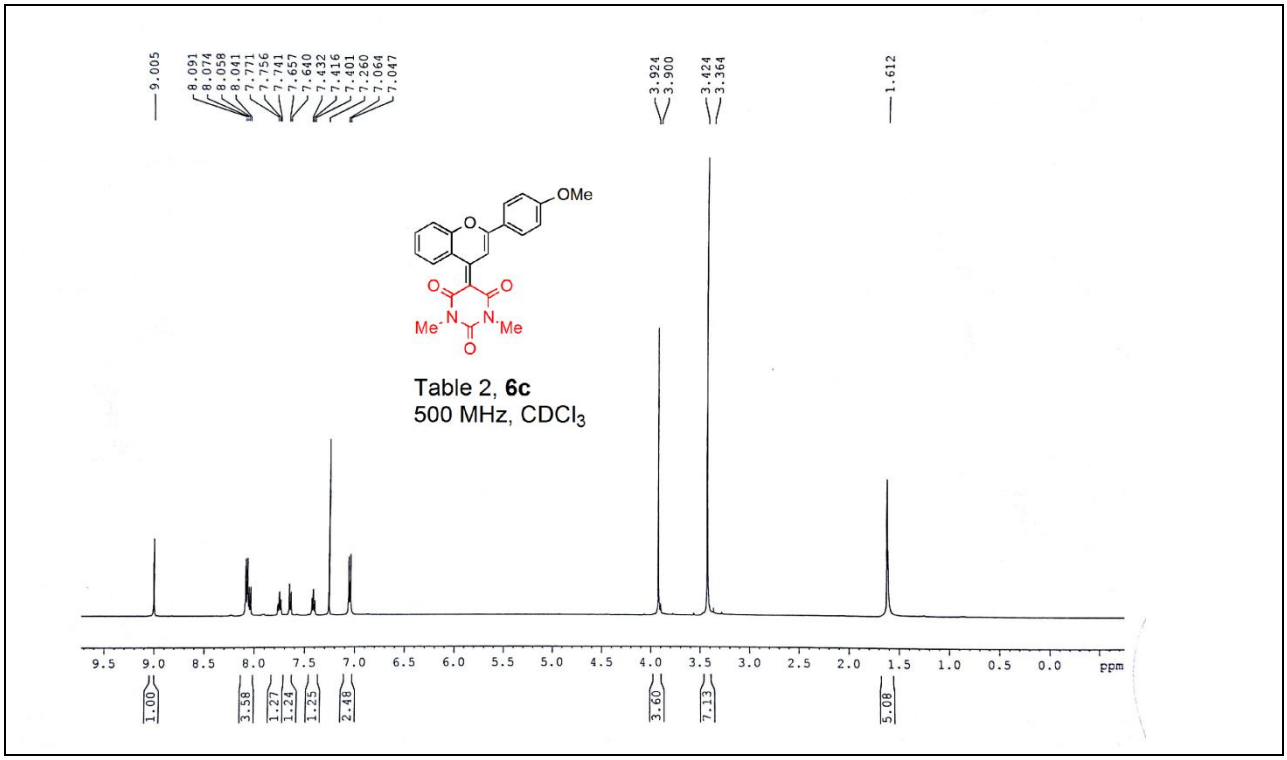
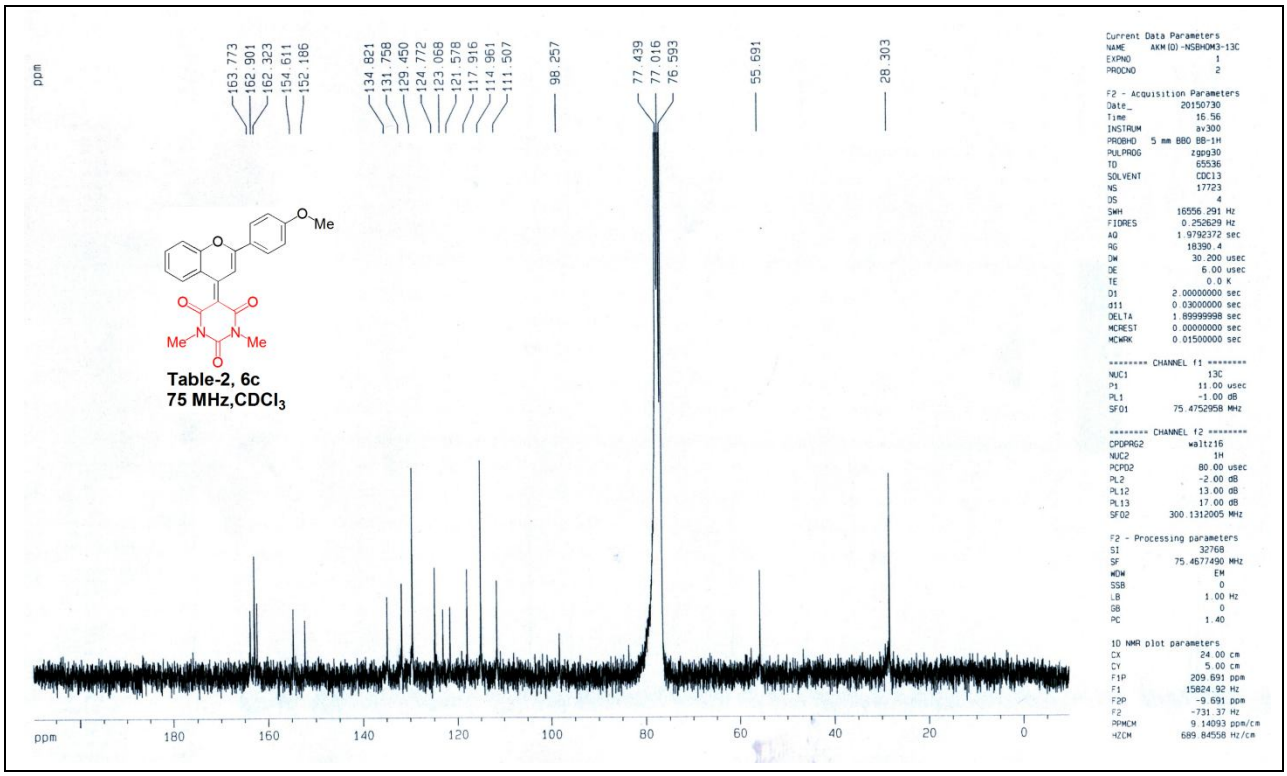
3.42644
3.31656
2.47056
1.62676
Me
Me
Me
Table-2, 6b
300 MHz,CDCl3
Integral
1.0000
3.1139
1.0729
1.0111
0.9191
2.2129
6.2079
0.2016
3.0611
0.2181
4.5656
ppm

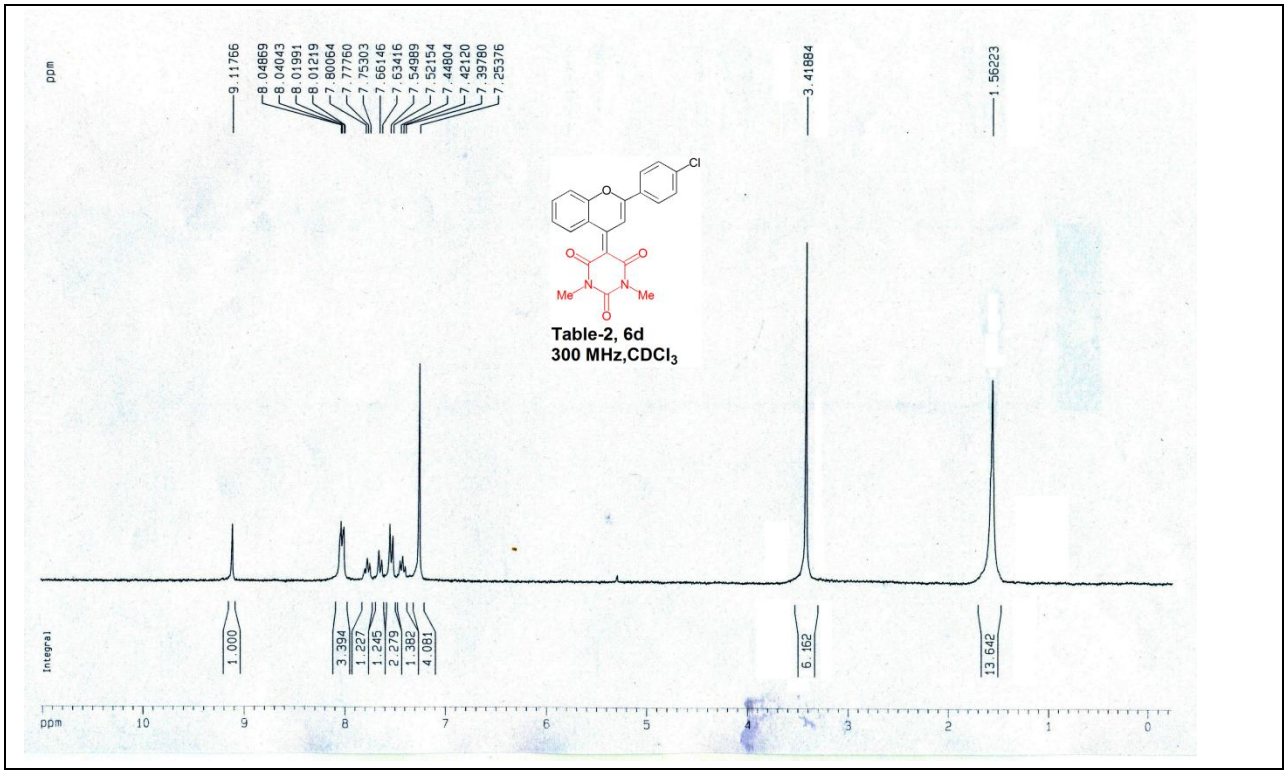

ppm
162.869
162.226
154.711
152.118
144.062
134.982
131.775
130.172
128.066
127.320
124.777
121.557
118.037
111.796
98.939
77.446
77.023
76.600
28.344
21.753
Me
Me
Me
Table-2, 6b
75 MHz,CDCl3
Current Data Parameters
NAME AKM(0)-NSBHM2-13C
EXPNO 1
PROCNO 2
F2 - Acquisition Parameters
Date_ 20150803
Time 14.11
INSTRUM av300
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1233
DS 4
SWH 16556.291 Hz
FIDRES 0.252629 Hz
AQ 1.9792372 sec
RG 18390.4
DW 30.200 usec
DE 6.00 usec
TE 0.0 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 11.00 usec
PL1 -1.00 dB
SF01 75.4752958 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -2.00 dB
PL12 13.00 dB
PL13 17.00 dB
SF02 300.1312005 MHz
F2 - Processing parameters
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
1D NMR plot parameters
CX 24.00 cm
CY 5.00 cm
F1P 209.691 ppm
F1 15824.92 Hz
F2P -9.691 ppm
F2 -731.37 Hz
PPMCM 9.14093 ppm/cm
HZCM 689.84558 Hz/cm
ppm

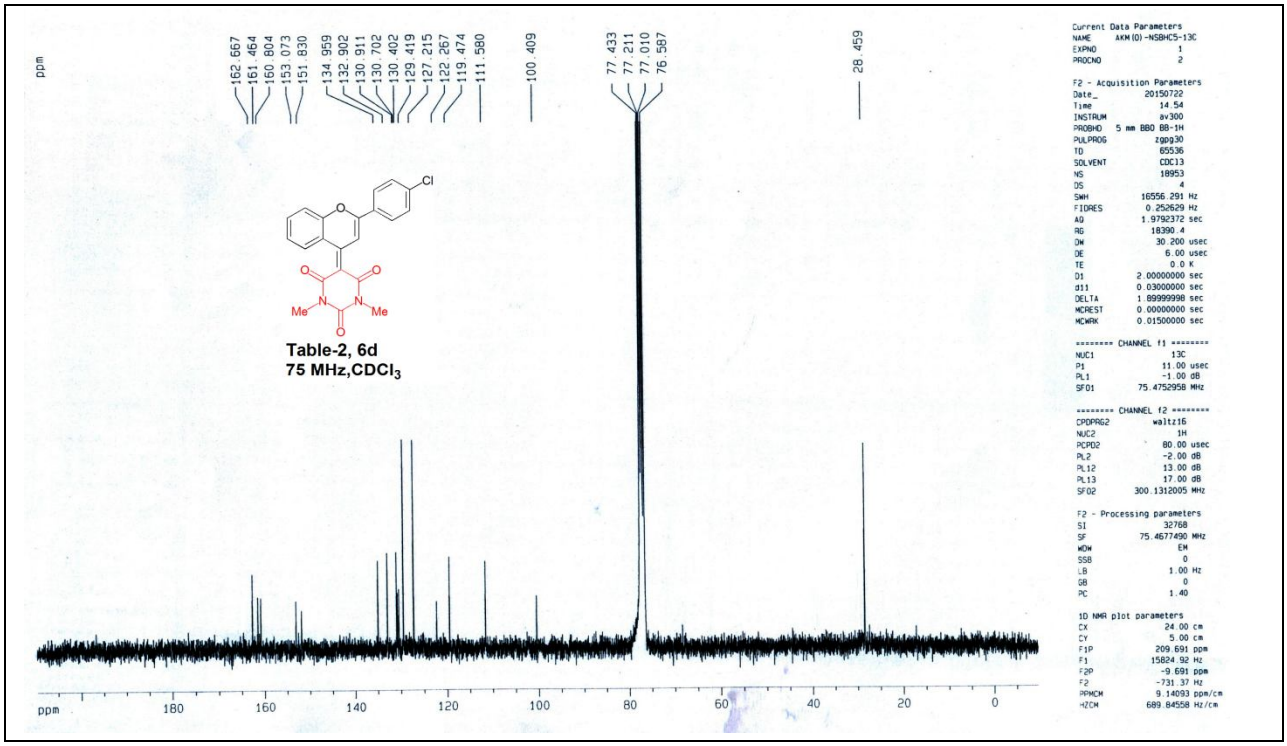
Compound 6c


9.005
8.091
8.074
8.058
8.041
7.771
7.756
7.741
7.657
7.640
7.432
7.416
7.401
7.260
7.064
7.047
3.924
3.900
3.424
3.364
1.612
OMe
Me
Me
Table 2, 6c
500 MHz, CDCl3
ppm
1.00
3.58
1.27
1.24
1.25
2.48
3.60
7.13
5.08

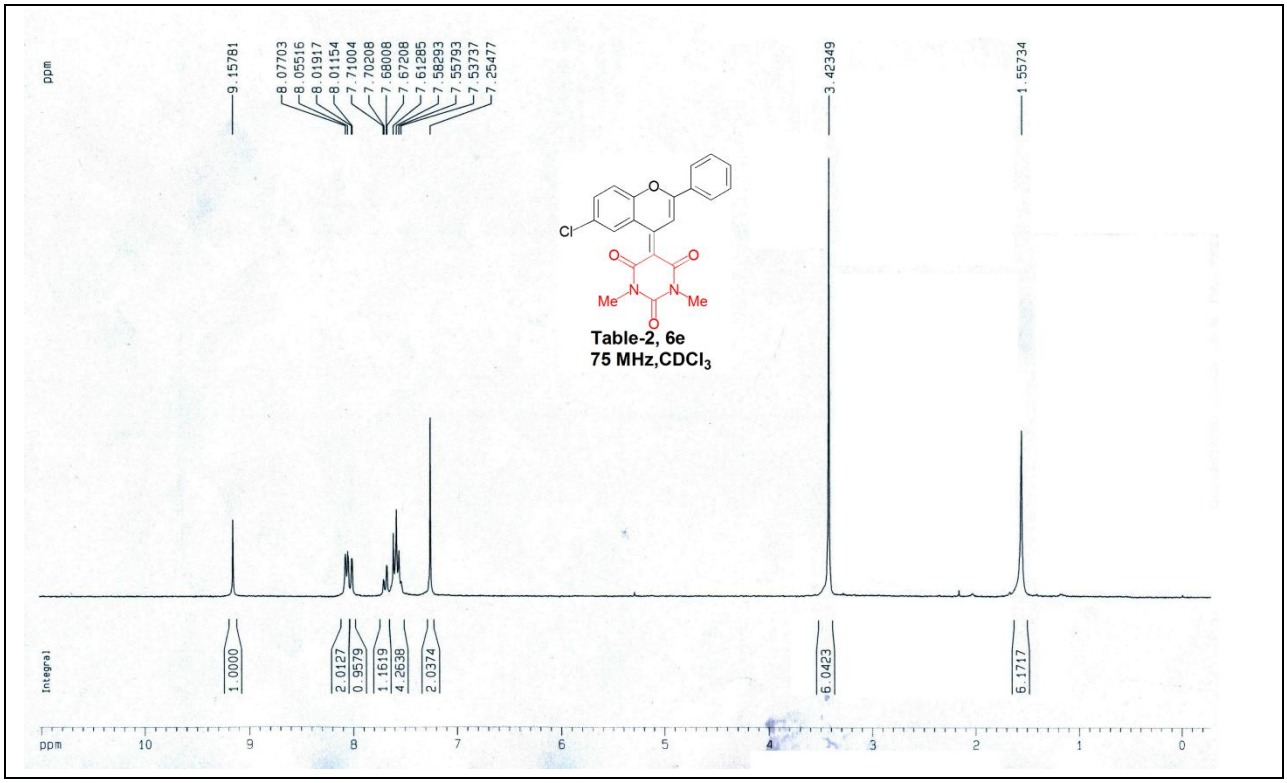

ppm
163.773
162.901
162.323
154.611
152.186
134.821
131.758
129.450
124.772
123.068
121.578
117.916
114.961
111.507
98.257
77.439
77.016
76.593
55.691
28.303
Me
Me
Me
Table-2, 6c
75 MHz,CDCl3
Current Data Parameters
NAME AKM (D) -NSBHOM3-13C
EXPNO 1
PROCNO 2
F2 - Acquisition Parameters
Date_ 20150730
Time 16.56
INSTRUM av300
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 17723
DS 4
SWH 16556.291 Hz
FIDRES 0.252629 Hz
AQ 1.9792372 sec
RG 18390.4
DW 30.200 usec
DE 6.00 usec
TE 0.0 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 11.00 usec
PL1 -1.00 dB
SF01 75.4752958 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -2.00 dB
PL12 13.00 dB
PL13 17.00 dB
SF02 300.1312005 MHz
F2 - Processing parameters
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
1D NMR plot parameters
CX 24.00 cm
CY 5.00 cm
F1P 209.691 ppm
F1 15824.92 Hz
F2P -9.691 ppm
F2 -731.37 Hz
PPMCM 9.14093 ppm/cm
HZCM 689.84558 Hz/cm

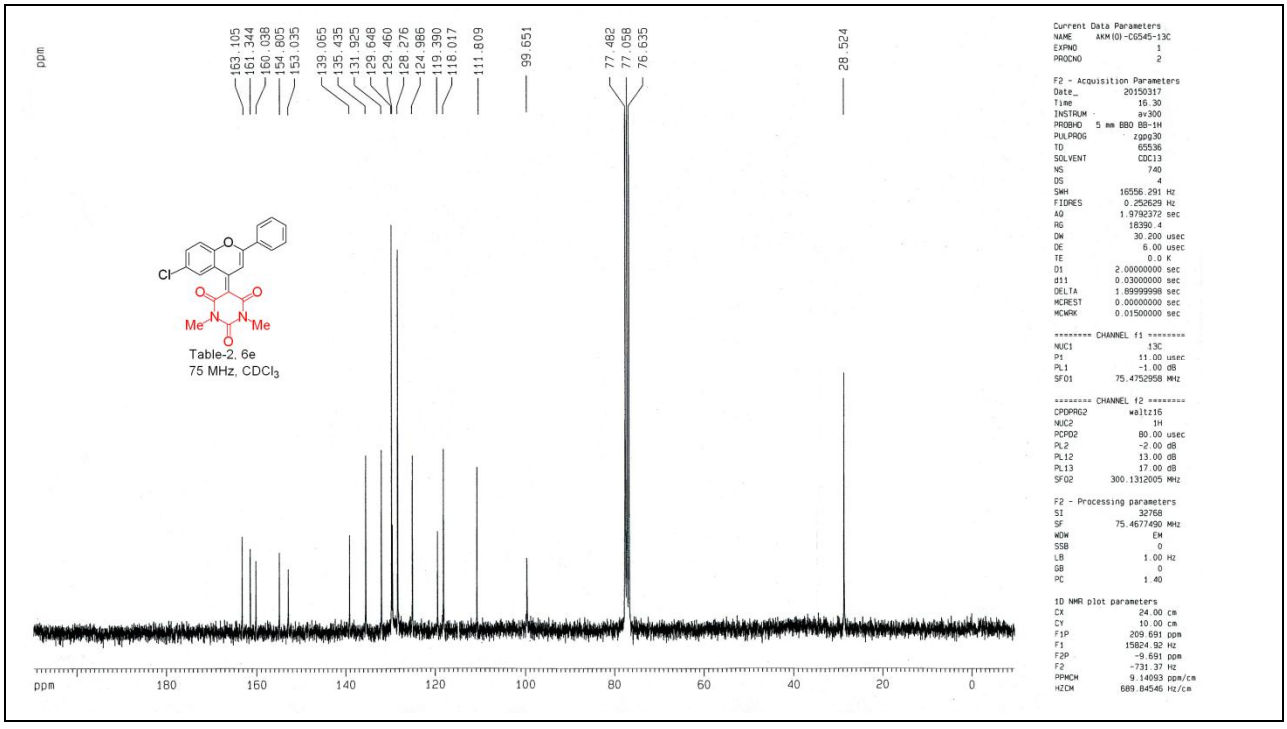
Compound 6d


ppm
9.11766
8.04869
8.04043
8.01991
8.01219
7.80064
7.77760
7.75303
7.66146
7.63416
7.54989
7.52154
7.44804
7.42120
7.39780
7.25376
3.41884
1.56223
Cl
O
O
N
Me
N
Me
O
Table-2, 6d
300 MHz,CDCl3
Integral
1.000
3.394
1.227
1.245
2.279
1.382
4.081
6.162
13.642
ppm
10
9
8
7
6
5
4
3
2
1
0

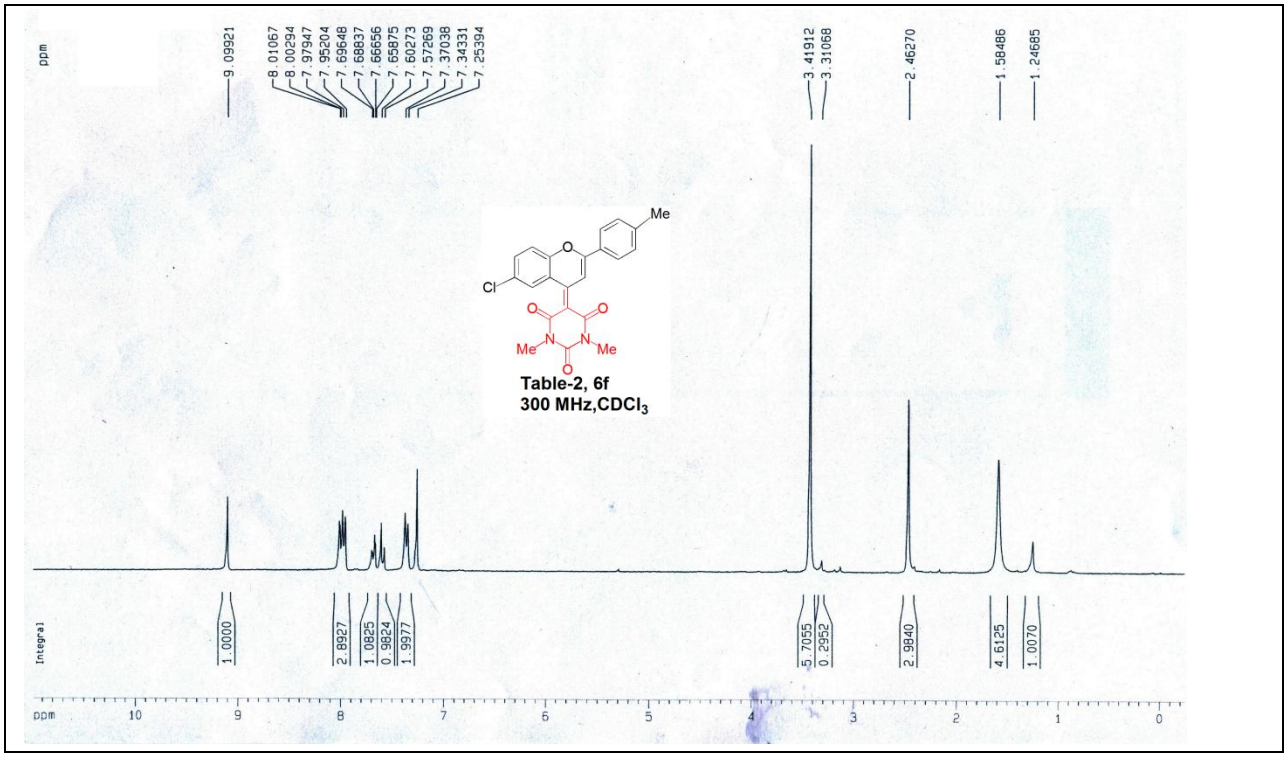

ppm
162.667
161.464
160.804
153.073
151.830
134.959
132.902
130.911
130.702
130.402
129.419
127.215
122.267
119.474
111.580
100.409
77.433
77.211
77.010
76.587
28.459
Cl
O
O
N
Me
N
Me
O
Table-2, 6d
75 MHz,CDCl3
ppm
180
160
140
120
100
80
60
40
20
0
Current Data Parameters
NAME AKM (0) -NSBHC5-13C
EXPNO 1
PROCNO 2
F2 - Acquisition Parameters
Date_ 20150722
Time 14.54
INSTRUM av300
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 18953
DS 4
SWH 16556.291 Hz
FIDRES 0.252629 Hz
AQ 1.979272 sec
RG 18390.4
DW 30.200 usec
DE 6.00 usec
TE 0.0 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 11.00 usec
PL1 -1.00 dB
SF01 75.4752958 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -2.00 dB
PL12 13.00 dB
PL13 17.00 dB
SF02 300.1312005 MHz
F2 - Processing parameters
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
1D NMR plot parameters
CX 24.00 cm
CY 5.00 cm
F1P 209.691 ppm
F1 15824.92 Hz
F2P -9.691 ppm
F2 -731.37 Hz
PPMCM 9.14093 ppm/cm
HZCM 689.84558 Hz/cm

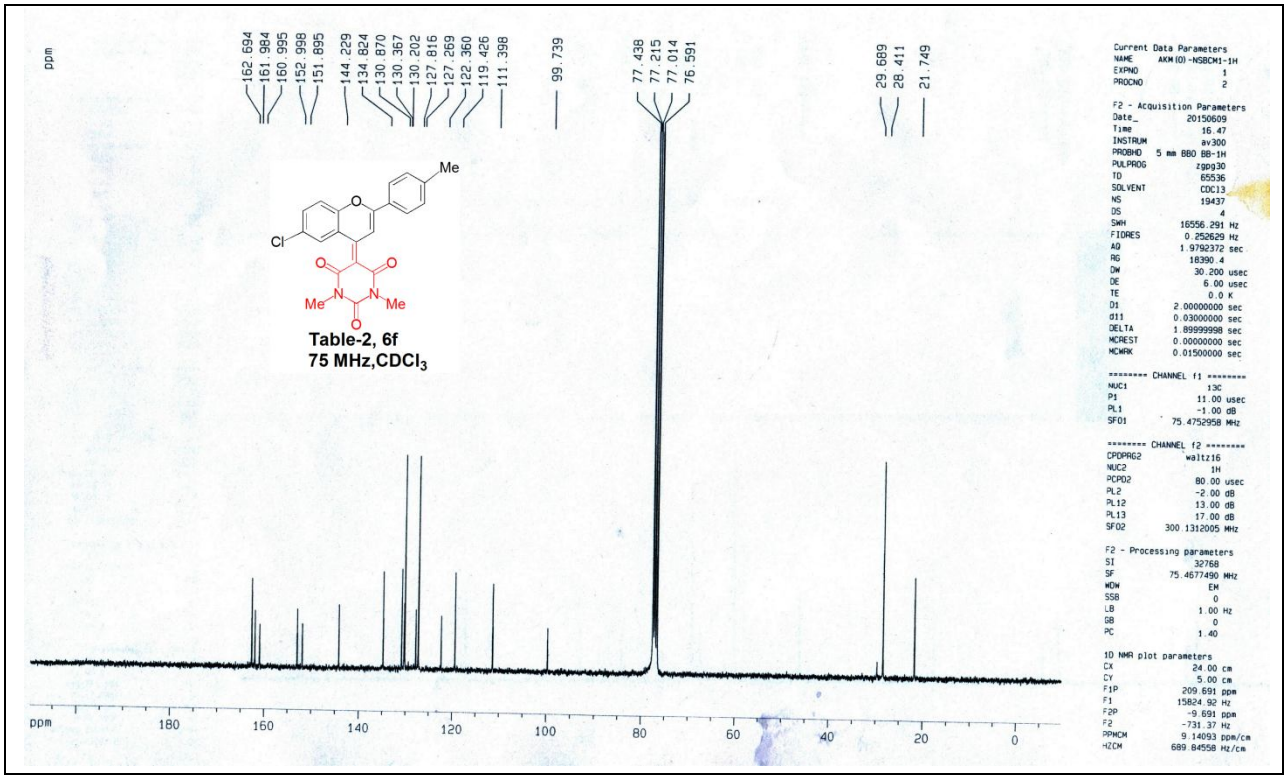
Compound 6e


ppm
9.15781
8.07703
8.05516
8.01917
8.01154
7.71004
7.70208
7.68008
7.67208
7.61285
7.58293
7.55793
7.53737
7.25477
3.42349
1.55734
Cl
O
O
O
N
Me
N
Me
O
Table-2, 6e
75 MHz,CDCl3
Integral
1.0000
2.0127
0.9579
1.1619
4.2638
2.0374
6.0423
6.1717
ppm
10
9
8
7
6
5
4
3
2
1
0

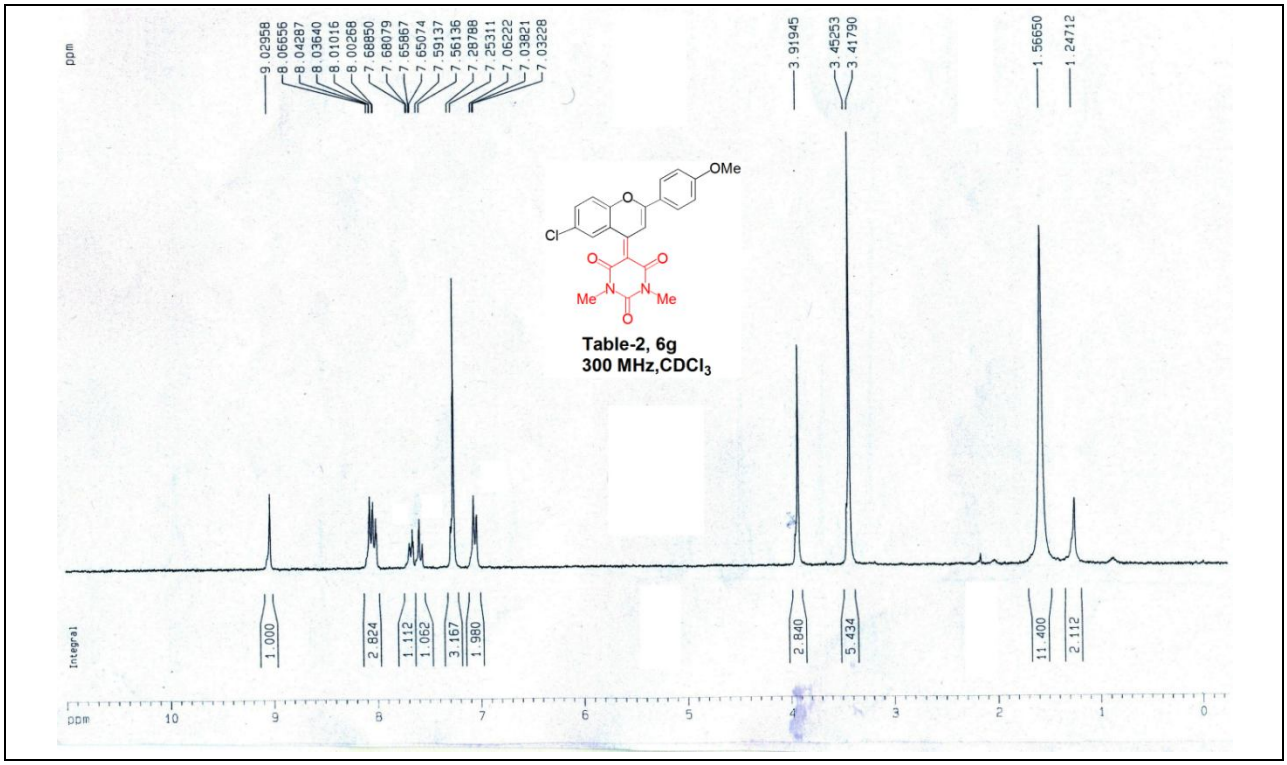

ppm
163.105
161.344
160.038
154.805
153.035
139.065
135.435
131.925
129.648
129.460
128.276
124.986
119.390
118.017
111.809
99.651
77.482
77.058
76.635
28.524
Cl
O
O
O
N
Me
N
Me
O
Table-2, 6e
75 MHz, CDCl3
ppm
180
160
140
120
100
80
60
40
20
0
Current Data Parameters
NAME AKM(0)-C6545-13C
EXPNO 1
PROCNO 2
F2 - Acquisition Parameters
Date_ 20150317
Time 16.30
INSTRUM av300
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 740
DS 4
SWH 16556.291 Hz
FIDRES 0.252629 Hz
AQ 1.9792372 sec
RG 18390.4
DW 30.200 usec
DE 6.00 usec
TE 0.0 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 11.00 usec
PL1 -1.00 dB
SF01 75.4752958 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -2.00 dB
PL12 13.00 dB
PL13 17.00 dB
SF02 300.1312005 MHz
F2 - Processing parameters
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
1D NMR plot parameters
CX 24.00 cm
CY 10.00 cm
F1P 209.691 ppm
F1 15824.92 Hz
F2P -9.691 ppm
F2 -731.37 Hz
PPMCM 9.14093 ppm/cm
HZCM 689.84546 Hz/cm

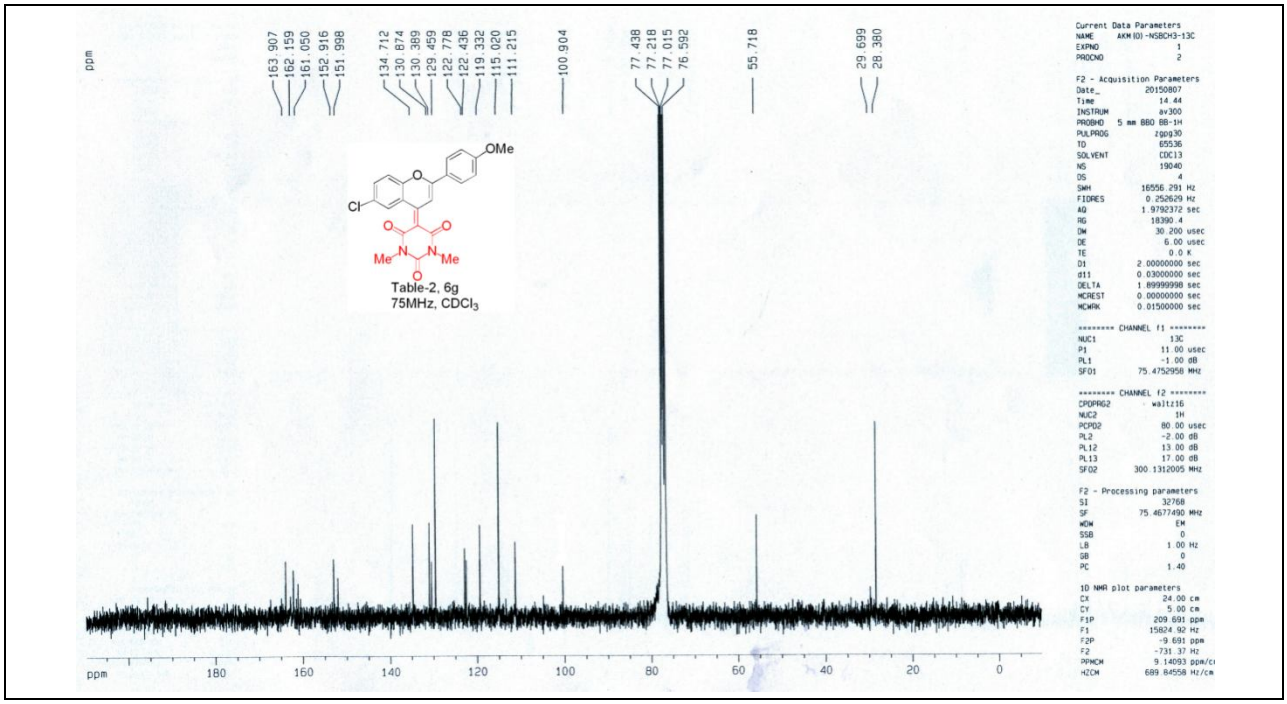
Compound 6f


ppm
9.09921
8.01067
8.00294
7.97947
7.95204
7.69648
7.68837
7.66656
7.65875
7.60273
7.57269
7.37038
7.34331
7.25394
3.41912
3.31068
2.46270
1.58486
1.24685
Me
Cl
O
O
O
N
N
Me
Me
O
Table-2, 6f
300 MHz,CDCl3
Integral
1.0000
2.8927
1.0825
0.9824
1.9977
5.7055
0.2952
2.9840
4.6125
1.0070
ppm
10
9
8
7
6
5
4
3
2
1
0

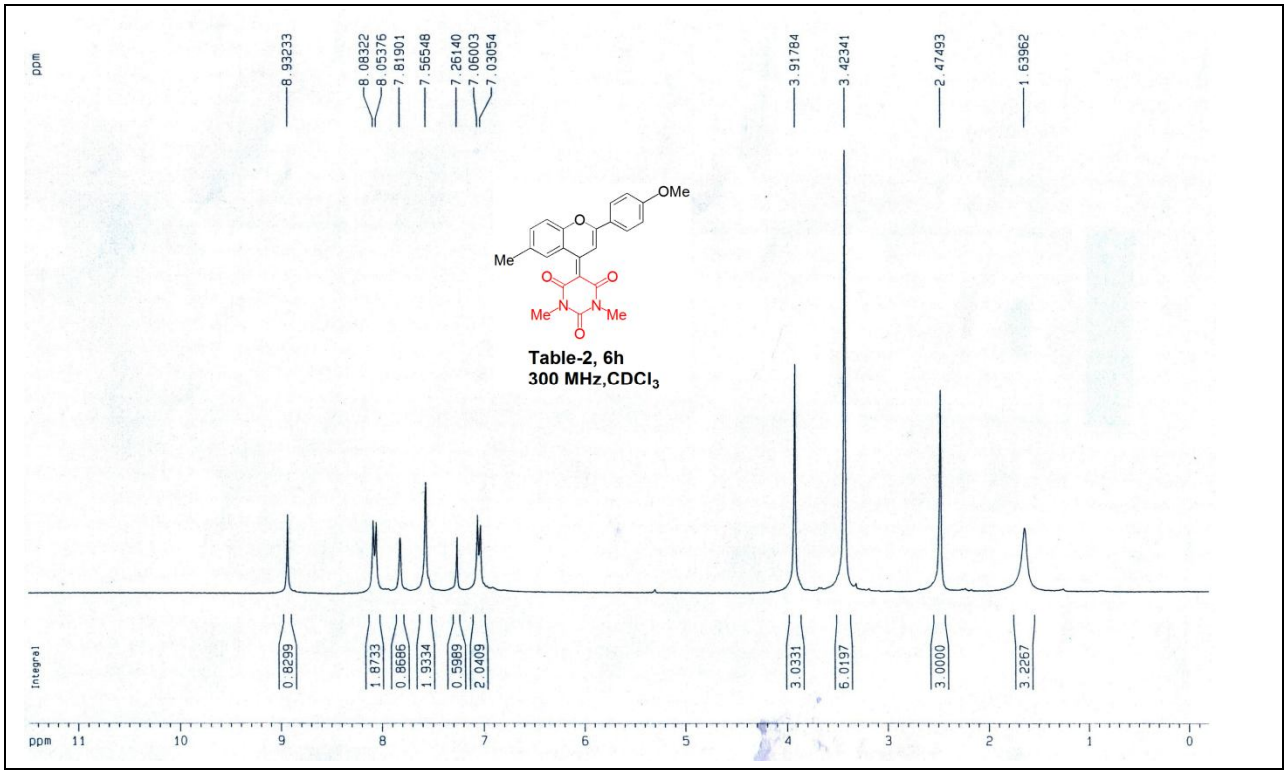

ppm
162.694
161.984
160.995
152.998
151.895
144.229
134.824
130.870
130.367
130.202
127.816
127.269
122.360
119.426
111.398
99.739
77.438
77.215
77.014
76.591
29.689
28.411
21.749
Me
Cl
O
O
O
N
N
Me
Me
O
Table-2, 6f
75 MHz,CDCl3
ppm
180
160
140
120
100
80
60
40
20
0
Current Data Parameters
NAME AKM (0) -NSBCM1-1H
EXPNO 1
PROCNO 2
F2 - Acquisition Parameters
Date_ 20150609
Time 16.47
INSTRUM av300
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 19437
DS 4
SWH 16556.291 Hz
FIDRES 0.252629 Hz
AQ 1.9792372 sec
RG 18390.4
DW 30.200 usec
DE 6.00 usec
TE 0.0 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 11.00 usec
PL1 -1.00 dB
SF01 75.4752958 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -2.00 dB
PL12 13.00 dB
PL13 17.00 dB
SF02 300.1312005 MHz
F2 - Processing parameters
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
1D NMR plot parameters
CX 24.00 cm
CY 5.00 cm
F1P 209.691 ppm
F1 15824.92 Hz
F2P -9.691 ppm
F2 -731.37 Hz
PPMCM 9.14093 ppm/cm
HZCM 689.84558 Hz/cm

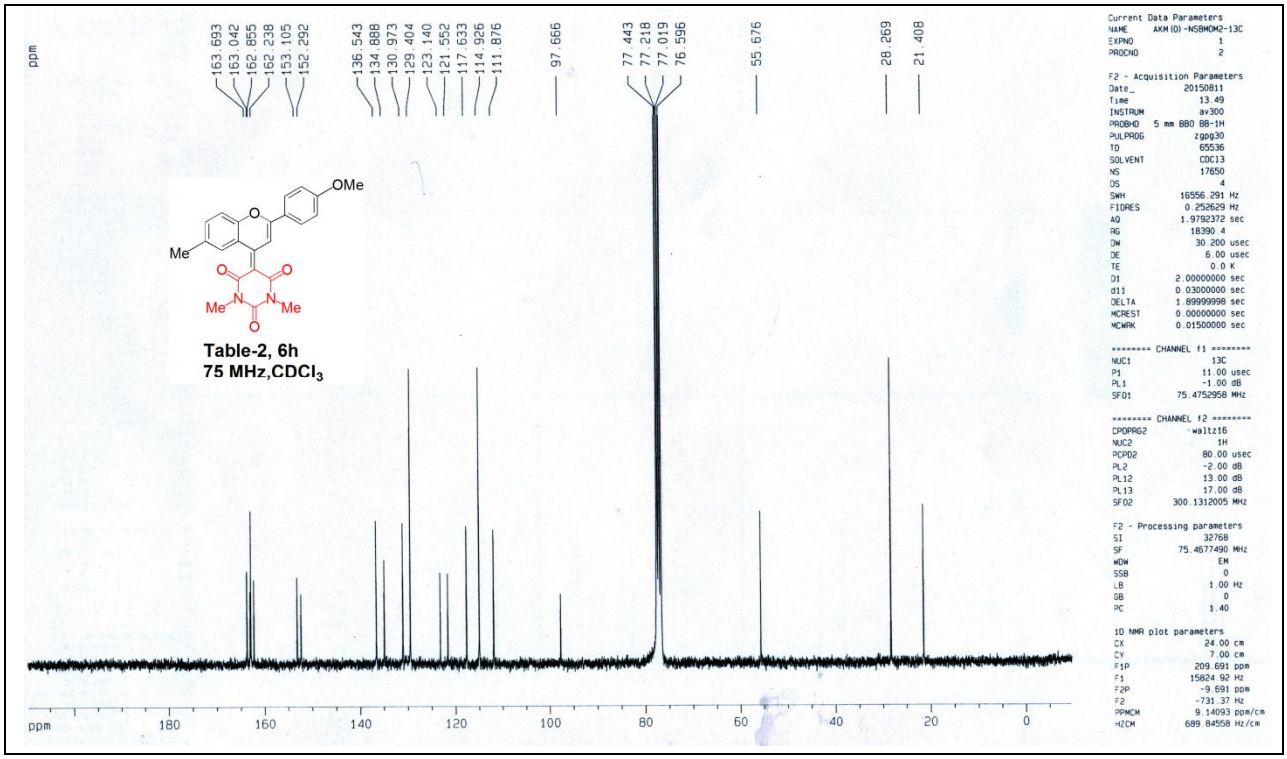
Compound 6g


ppm
9.02958
8.06656
8.04287
8.03640
8.01016
8.00268
7.68850
7.68079
7.65867
7.65074
7.59137
7.56136
7.28788
7.25311
7.06222
7.03821
7.03228
3.91945
3.45253
3.41790
1.56650
1.24712
OMe
Cl
O
Me
N
Me
Table-2, 6g
300 MHz,CDCl3
Integral
1.000
2.824
1.112
1.062
3.167
1.980
2.840
5.434
11.400
2.112
ppm
10
9
8
7
6
5
4
3
2
1
0

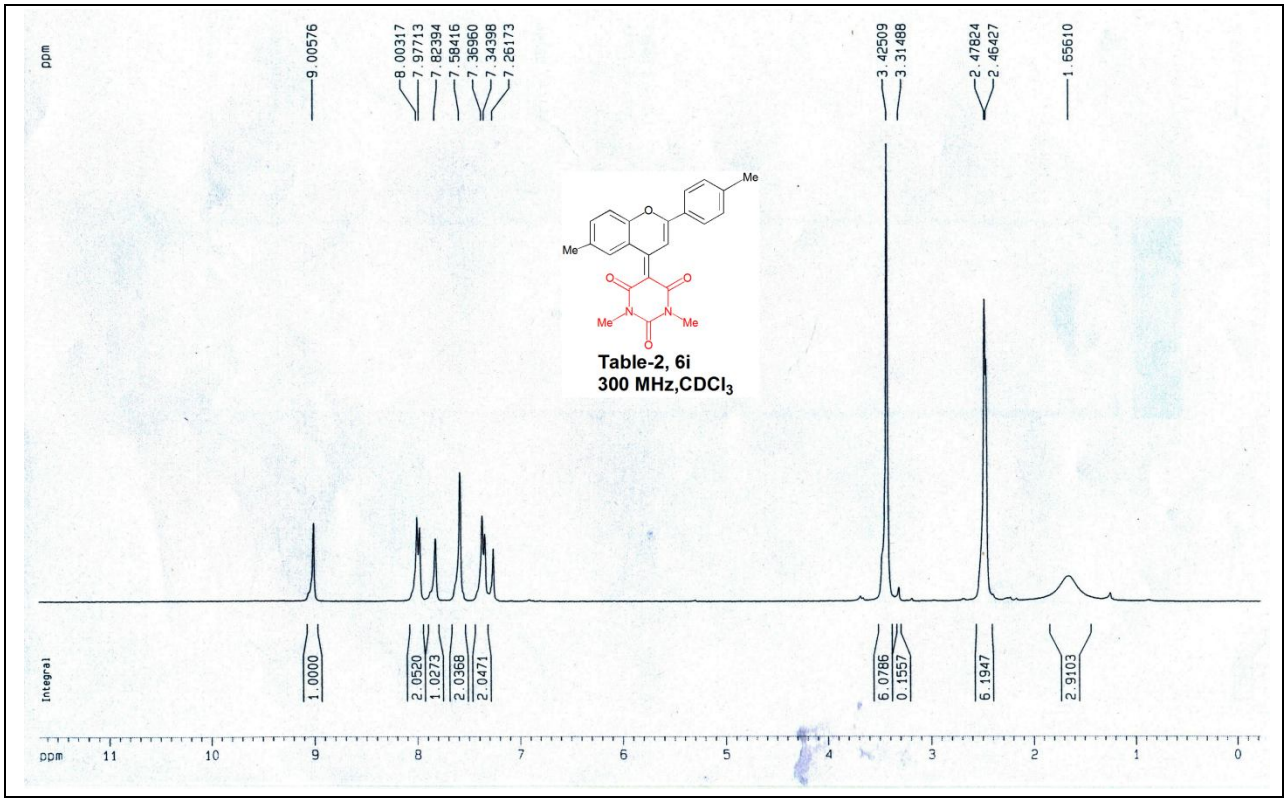

ppm
163.907
162.159
161.050
152.916
151.998
134.712
130.874
130.389
129.459
122.778
122.436
119.332
115.020
111.215
100.904
77.438
77.218
77.015
76.592
55.718
29.699
28.380
OMe
Cl
Me
N
Me
Table-2, 6g
75MHz, CDCl3
Current Data Parameters
NAME AKM (0) -NSBCH3-13C
EXPNO 1
PROCNO 2
F2 - Acquisition Parameters
Date_ 20150807
Time 14.44
INSTRUM av300
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 19040
DS 4
SWH 16556.291 Hz
FIDRES 0.252629 Hz
AQ 1.9792372 sec
RG 18390.4
DW 30.200 usec
DE 6.00 usec
TE 0.0 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 11.00 usec
PL1 -1.00 dB
SFO1 75.4752958 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -2.00 dB
PL12 13.00 dB
PL13 17.00 dB
SFO2 300.1312005 MHz
F2 - Processing parameters
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
1D NMR plot parameters
CX 24.00 cm
CY 5.00 cm
F1P 209.691 ppm
F1 15824.92 Hz
F2P -9.691 ppm
F2 -731.37 Hz
PPMCM 9.14093 ppm/cm
HZCM 689.84558 Hz/cm
ppm
180
160
140
120
100
80
60
40
20
0

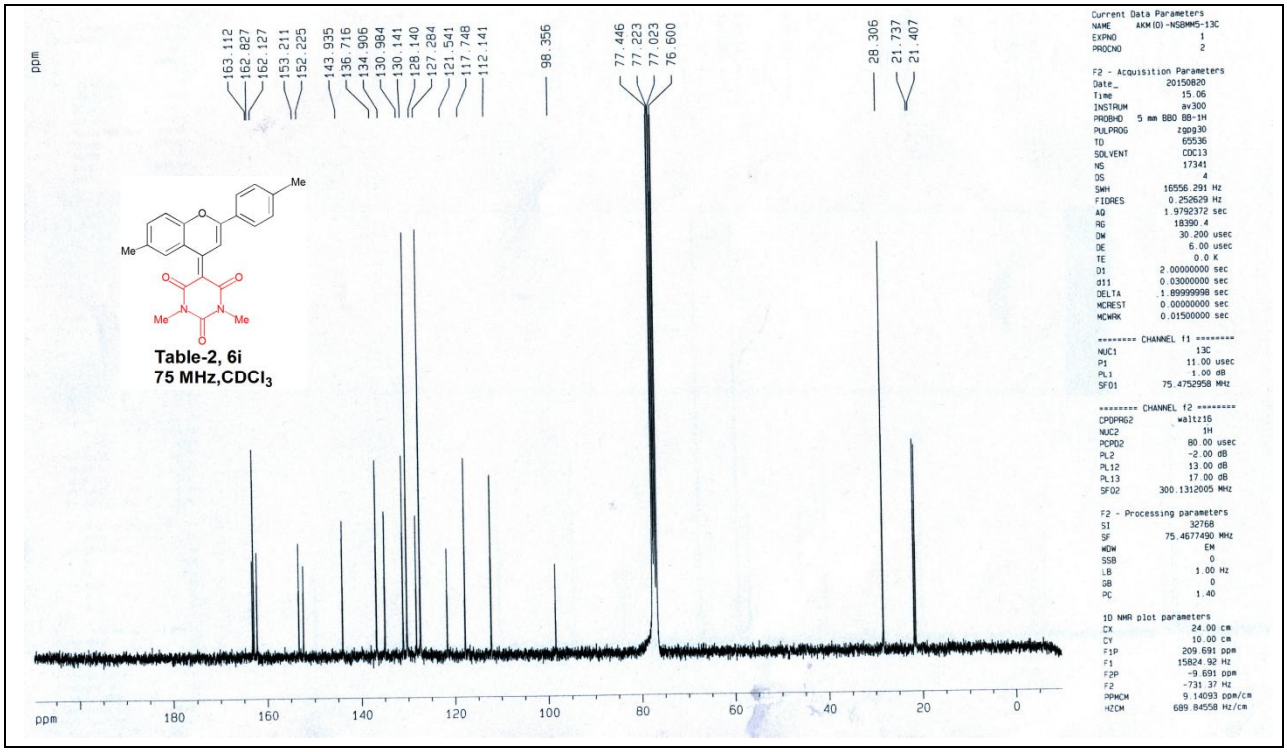
Compound 6h


ppm
8.93233
8.08322
8.05376
7.81901
7.56548
7.26140
7.06003
7.03054
3.91784
3.42341
2.47493
1.63962
OMe
Me
O
O
Me
N
N
Me
O
Table-2, 6h
300 MHz,CDCl3
Integral
0.8299
1.8733
0.8686
1.9334
0.5989
2.0409
3.0331
6.0197
3.0000
3.2267
ppm 11 10 9 8 7 6 5 4 3 2 1 0

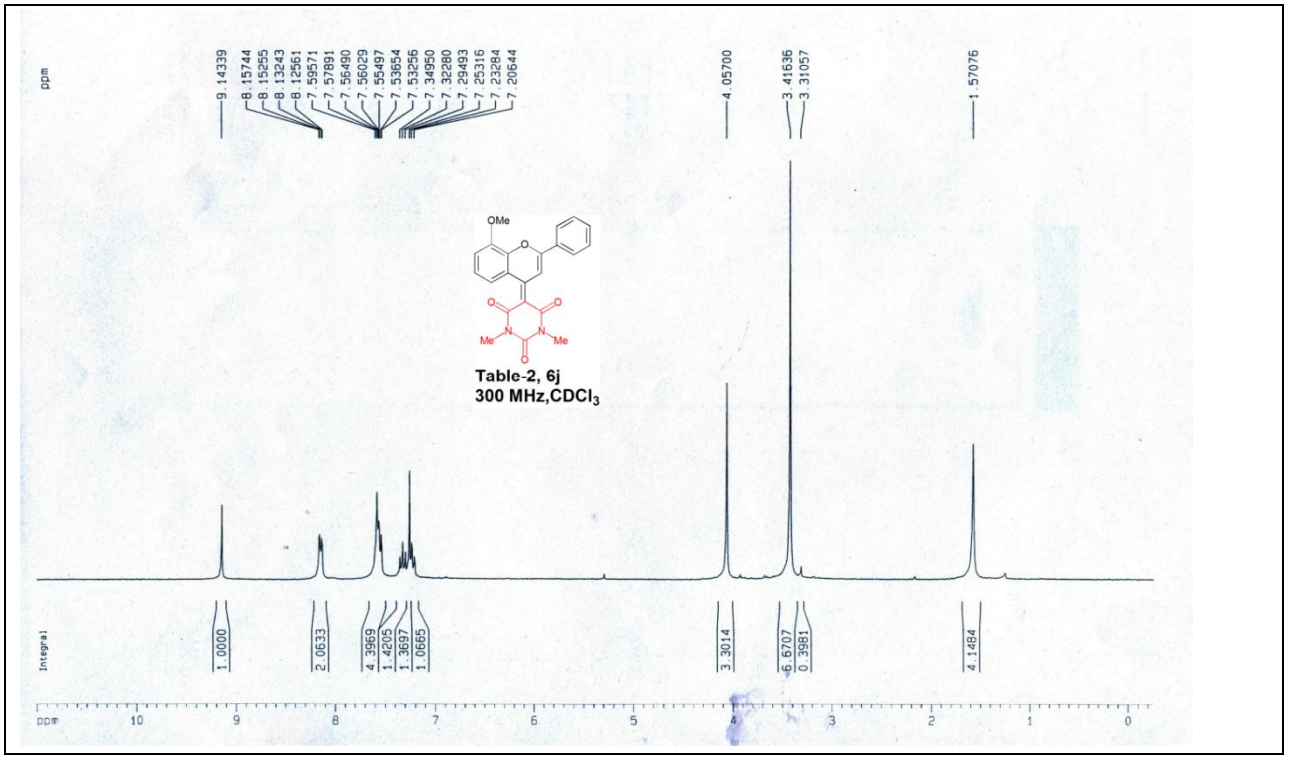

ppm
163.693
163.042
162.855
162.238
153.105
152.292
136.543
134.888
130.973
129.404
123.140
121.552
117.633
114.926
111.876
97.666
77.443
77.218
77.019
76.596
55.676
28.269
21.408
OMe
Me
O
O
Me
N
N
Me
O
Table-2, 6h
75 MHz,CDCl3
ppm 180 160 140 120 100 80 60 40 20 0
Current Data Parameters
NAME AKM(0)-NSBMOM2-13C
EXPNO 1
PROCNO 2
F2 - Acquisition Parameters
Date_ 20150811
Time 13.49
INSTRUM av300
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 17650
DS 4
SWH 16556.291 Hz
FIDRES 0.252629 Hz
AQ 1.9792372 sec
RG 18390.4
DW 30.200 usec
DE 6.00 usec
TE 0.0 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 11.00 usec
PL1 -1.00 dB
SF01 75.4752958 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -2.00 dB
PL12 13.00 dB
PL13 17.00 dB
SF02 300.1312005 MHz
F2 - Processing parameters
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
1D NMR plot parameters
CX 24.00 cm
CY 7.00 cm
F1P 209.691 ppm
F1 15824.92 Hz
F2P -9.691 ppm
F2 -731.37 Hz
PPMCM 9.14093 ppm/cm
HZCM 689.84558 Hz/cm

Compound 6i

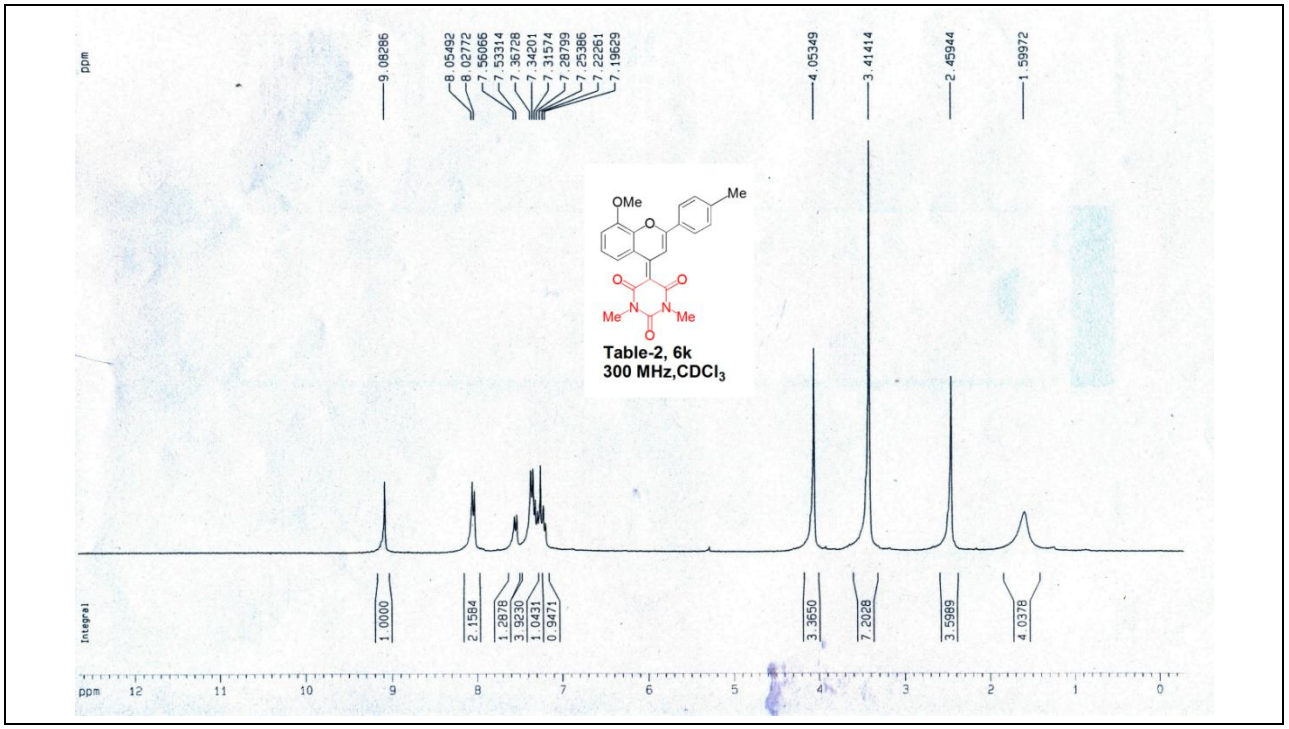

ppm
9.00576
8.00317
7.97713
7.82394
7.58416
7.36960
7.34398
7.26173
3.42509
3.31488
2.47824
2.46427
1.65610
Me
Me
Me
Me
Table-2, 6i
300 MHz,CDCl3
Integral
1.0000
2.0520
1.0273
2.0368
2.0471
6.0786
0.1557
6.1947
2.9103
ppm
11
10
9
8
7
6
5
4
3
2
1
0


ppm
163.112
162.827
162.127
153.211
152.225
143.935
136.716
134.906
130.984
130.141
128.140
127.284
121.541
117.748
112.141
98.356
77.446
77.223
77.023
76.600
28.306
21.737
21.407
Me
Me
Me
Me
Table-2, 6i
75 MHz,CDCl3
ppm
180
160
140
120
100
80
60
40
20
0
Current Data Parameters
NAME AKM(0)-NSBMM5-13C
EXPNO 1
PROCNO 2
F2 - Acquisition Parameters
Date_ 20150820
Time 15.06
INSTRUM av300
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 17341
DS 4
SWH 16556.291 Hz
FIDRES 0.252629 Hz
AQ 1.9792372 sec
RG 18390.4
DW 30.200 usec
DE 6.00 usec
TE 0.0 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 11.00 usec
PL1 1.00 dB
SF01 75.4752958 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -2.00 dB
PL12 13.00 dB
PL13 17.00 dB
SF02 300.1312005 MHz
F2 - Processing parameters
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
1D NMR plot parameters
CX 24.00 cm
CY 10.00 cm
F1P 209.691 ppm
F1 15824.92 Hz
F2P -9.691 ppm
F2 -731.37 Hz
PPMCM 9.14093 ppm/cm
HZCM 689.84558 Hz/cm

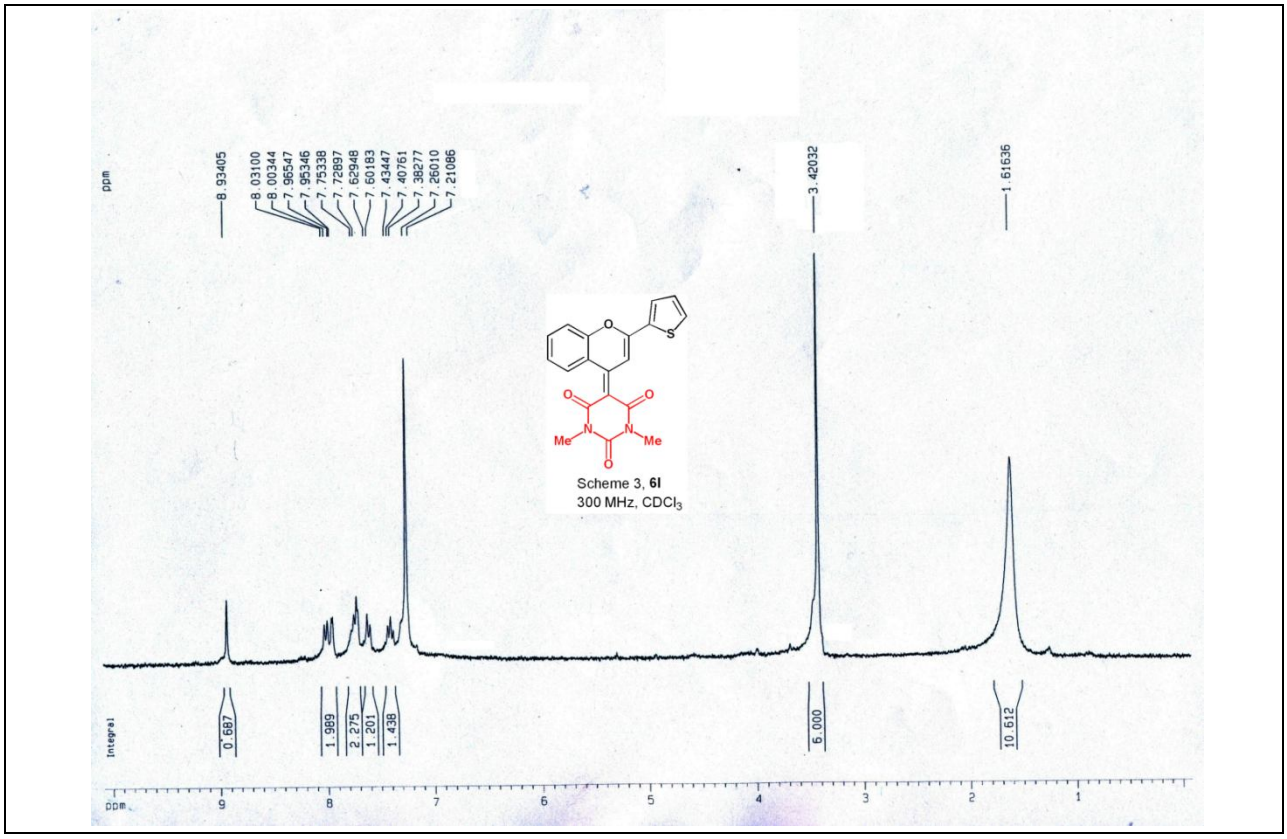
***Compound* 6j**

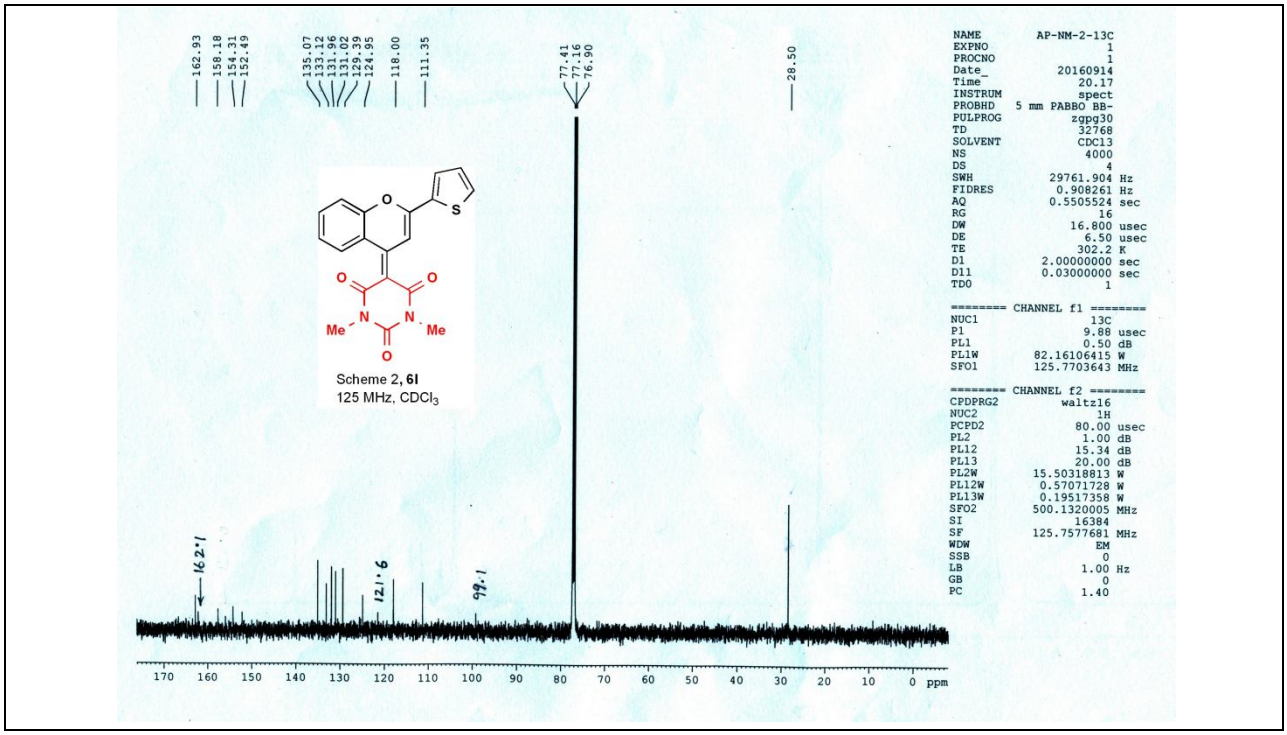


***Compound* 6k**

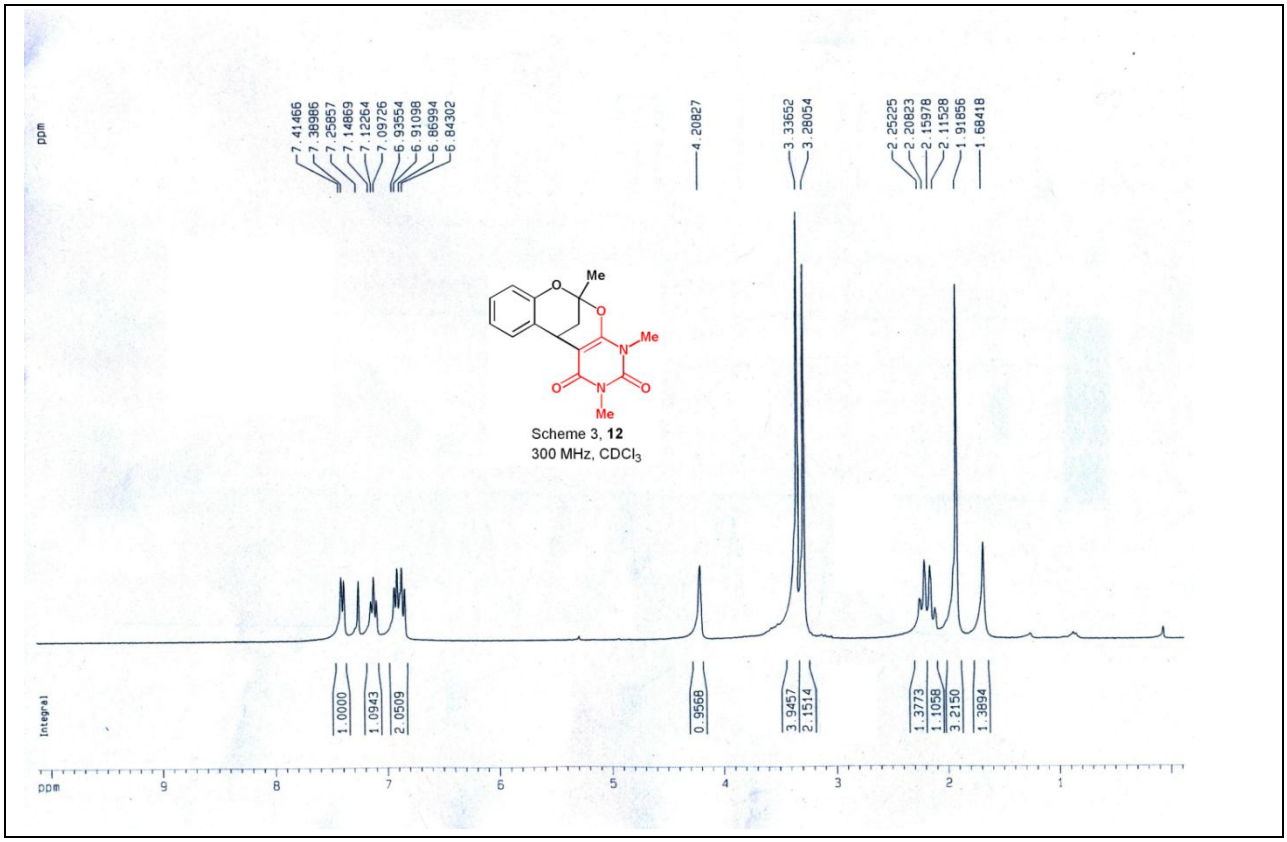


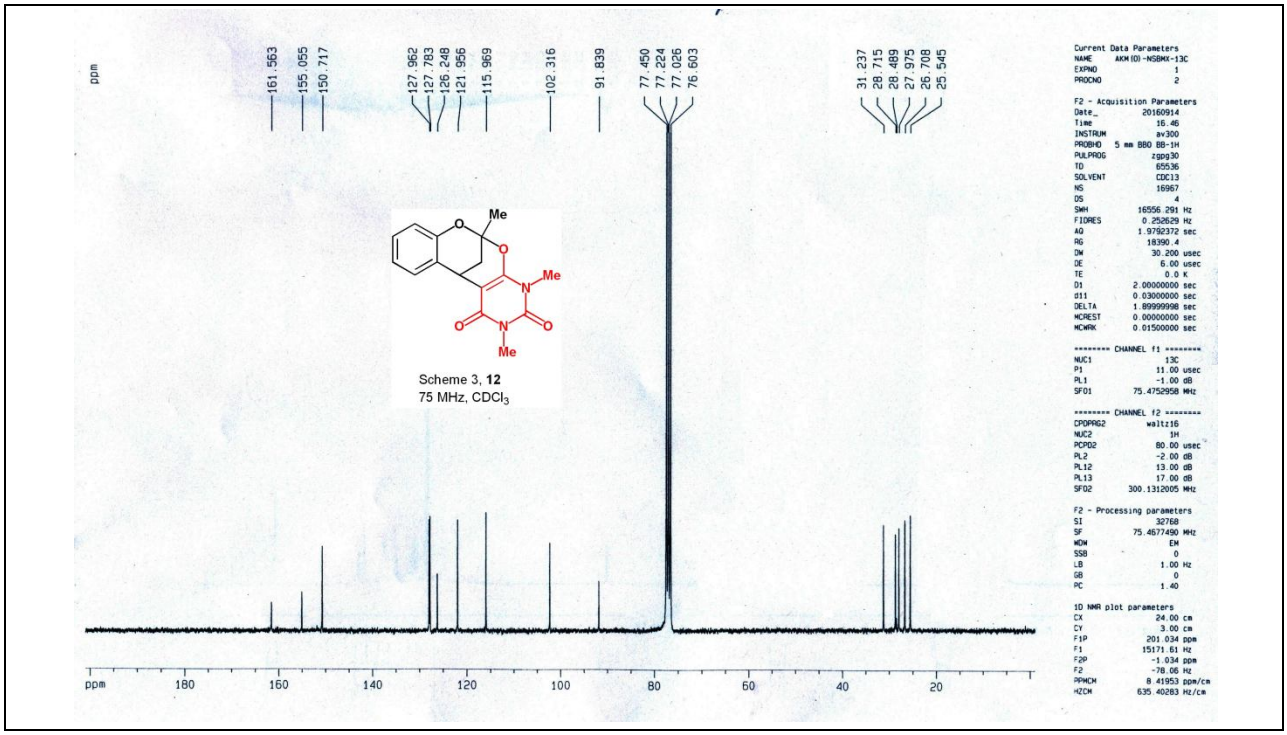
Compound 6l


8.93405
8.03100
8.00344
7.96547
7.95346
7.75338
7.72897
7.62948
7.60183
7.43447
7.40761
7.38277
7.26010
7.21086
3.42032
1.61636
0.687
1.989
2.275
1.201
1.438
6.000
10.612
Integral
ppm
Scheme 3, 6l
300 MHz, CDCl3

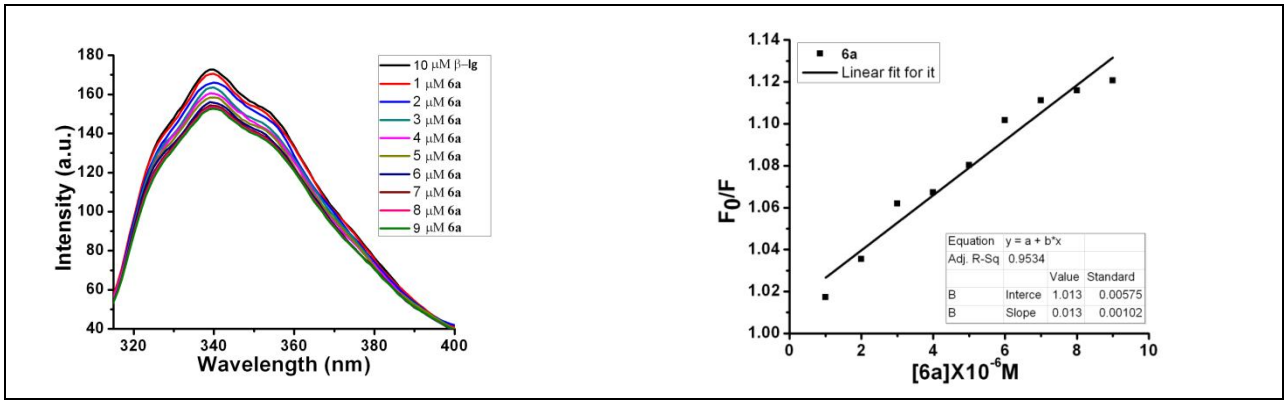

162.93
158.18
154.31
152.49
135.07
133.12
131.96
131.02
129.39
124.95
118.00
111.35
77.41
77.16
76.90
28.50
162.1
121.6
99.1
Scheme 2, 6l
125 MHz, CDCl3
NAME AP-NM-2-13C
EXPNO 1
PROCNO 1
Date_ 20160914
Time 20.17
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 4000
DS 4
SWH 29761.904 Hz
FIDRES 0.908261 Hz
AQ 0.5505524 sec
RG 16
DW 16.800 usec
DE 6.50 usec
TE 302.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
NUC1 13C
P1 9.88 usec
PL1 0.50 dB
PL1W 82.16106415 W
SFO1 125.7703643 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 1.00 dB
PL12 15.34 dB
PL13 20.00 dB
PL2W 15.50318813 W
PL12W 0.57071728 W
PL13W 0.19517358 W
SFO2 500.1320005 MHz
SI 16384
SF 125.7577681 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
ppm

Compound 12

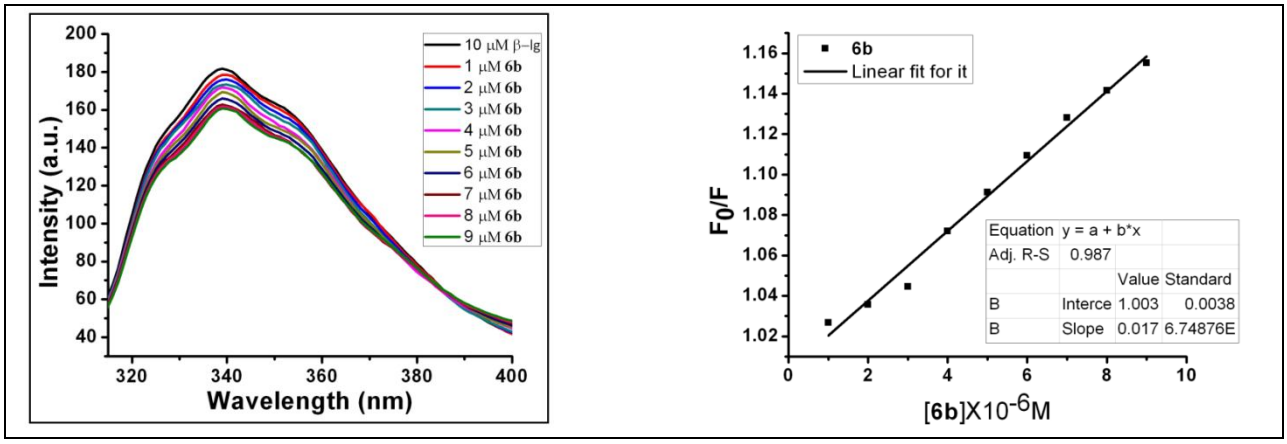

ppm
7.41466
7.38986
7.25857
7.14869
7.12264
7.09726
6.93554
6.91098
6.86994
6.84302
4.20827
3.33652
3.28054
2.25225
2.20823
2.15978
2.11528
1.91856
1.68418
Me
Me
Me
Scheme 3, 12
300 MHz, CDCl3
Integral
1.0000
1.0943
2.0509
0.9568
3.9457
2.1514
1.3773
1.1058
3.2150
1.3894
ppm


ppm
161.563
155.055
150.717
127.962
127.783
126.248
121.956
115.969
102.316
91.839
77.450
77.224
77.026
76.603
31.237
28.715
28.489
27.975
26.708
25.545
Me
Me
Me
Scheme 3, 12
75 MHz, CDCl3
Current Data Parameters
NAME AKM(0)-NSBMX-13C
EXPNO 1
PROCNO 2
F2 - Acquisition Parameters
Date_ 20160914
Time 16.46
INSTRUM av300
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 16967
DS 4
SWH 16556.291 Hz
FIDRES 0.252629 Hz
AQ 1.9792372 sec
RG 18390.4
DW 30.200 usec
DE 6.00 usec
TE 0.0 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 11.00 usec
PL1 -1.00 dB
SF01 75.4752958 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -2.00 dB
PL12 13.00 dB
PL13 17.00 dB
SF02 300.1312005 MHz
F2 - Processing parameters
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
1D NMR plot parameters
CX 24.00 cm
CY 3.00 cm
F1P 201.034 ppm
F1 15171.61 Hz
F2P -1.034 ppm
F2 -78.06 Hz
PPMCM 8.41953 ppm/cm
HZCM 635.40283 Hz/cm
ppm

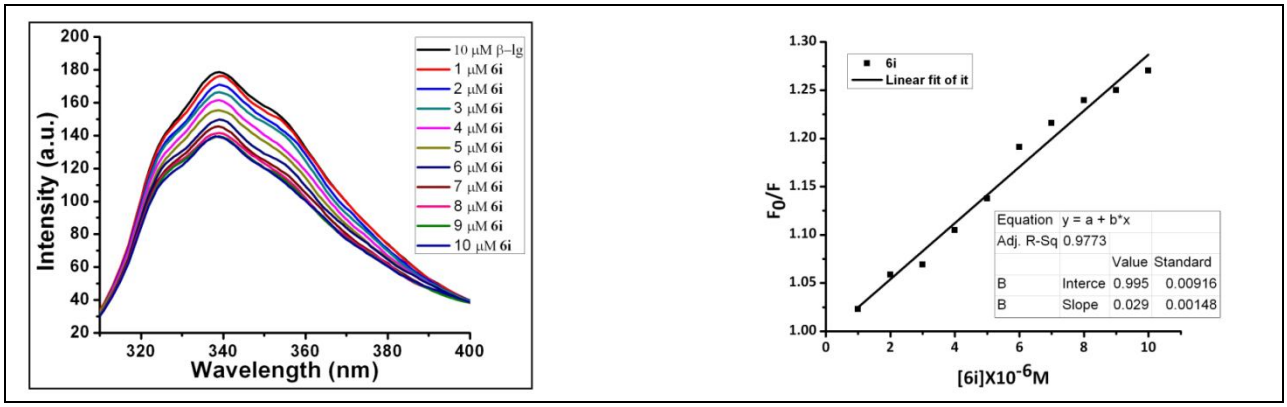
Interaction study of **6a**, **6b** and **6i** with β-lg



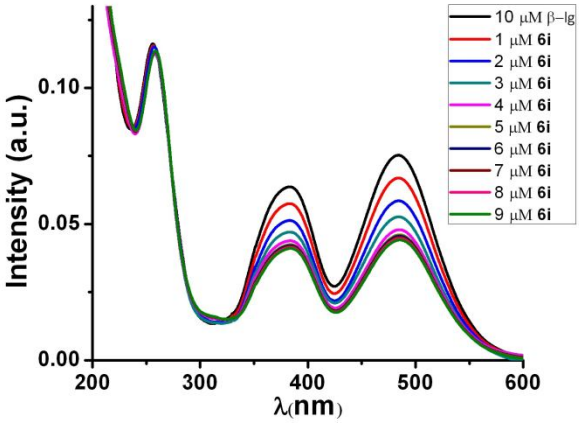
Fluorescence titration of 10μM of *β*-lg with 1-9 μM of **6a** and Plot of F_0/F *vs* [compound **6a**] as per the Stern-Volmer equation



Fluorescence titration of 10μM of *β*-lg with 1-9 μM of **6b** and Plot of F_0/F *vs* [compound **6b**] as per the Stern-Volmer equation



Fluorescence titration of 10μM of *β*-lg with 1-10 μM of **6i** and Plot of F_0/F *vs* [compound **6i**] as per the Stern-Volmer equation



UV-Vis spectrum of **6i** and its change with addition of protein solution