

**Metal-Free Photoredox Catalyzed Direct α -Oxygenation of *N,N*-dibenzylanilines to Imides
Under Visible Light**

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1. General considerations:

The ^1H and ^{13}C NMR spectra were recorded in CDCl_3 on Bruker spectrometers 300 MHz NMR spectrometer with TMS as an internal standard. Mass spectra were recorded on Xevo G2S Q-TOF spectrometer. The light source for photochemical reactions was Kessil 456nm Blue LED (model number: KSPR160L-456-EU). Different wave lengths containing LEDs such as 370nm, 390nm, 467nm and 527nm were purchased from Kessil and used. Reaction tubes made of borosilicate glass were used as reaction vessels. The distance between the light source and the reaction vessel was 8 cm. TLC was performed on using Merck pre-coated TLC plates (Merck 60 F254) and detected under UV light. Column chromatographic separation was carried out with silica gel (100-200 mesh). Reagents and solvents were purified as per standard procedures and used.

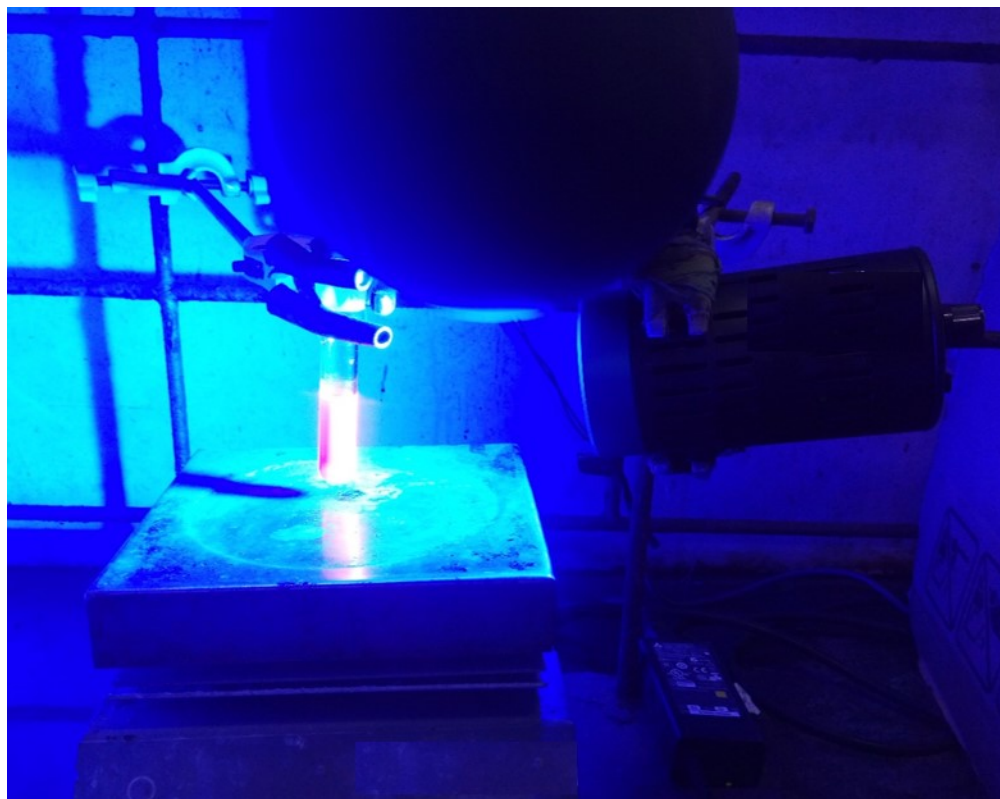
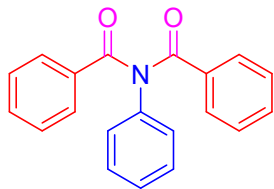


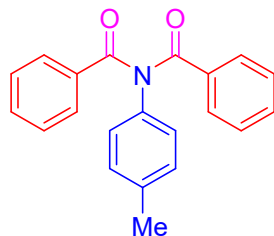
Figure S1: Reaction setup with Kessil PR160L-456nm Blue LED

2. Characterization data for the products



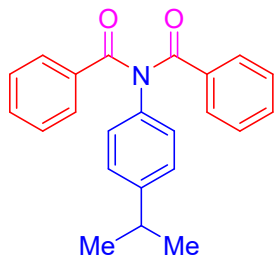
N-benzoyl-*N*-phenylbenzamide **2a**¹.

2a (81 mg) was obtained from **1a** (98 mg) following general procedure B; White solid; 75% yield (eluent: EtOAc/Hexanes= 1:9); ¹H NMR (300 MHz, CDCl₃): δ_H 8.11 (d, *J*= 7.2 Hz, 2H), 7.71 (t, *J*= 4.2 Hz, 2H), 7.58 (t, *J*= 7.5 Hz, 1H), 7.47-7.38 (m, 4H), 7.35-7.28 (m, 4H), 7.26 (d, *J*= 7.5 Hz, 1H), 7.19-7.16 (m, 1H). ¹³C NMR (75 MHz, CDCl₃): δ_C 173.4, 140.2, 135.0, 132.1, 129.4, 129.2, 128.4, 127.8, 127.5.



N-benzoyl-*N*-(*p*-tolyl)benzamide **2b**.

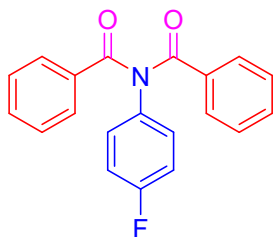
2b (68 mg) was obtained from **1b** (107 mg) following general procedure B; White solid; 60% yield (eluent: EtOAc/Hexanes= 1:9); ¹H NMR (300 MHz, CDCl₃): δ_H 7.71 (t, *J*= 7.2 Hz, 4H), 7.43-7.38 (m, 2H), 7.33-7.24 (dd, *J*= 7.5 Hz, 11.4 Hz, 4H), 7.13 (d, *J*= 8.2 Hz, 2H), 7.05 (d, *J*= 8.1 Hz, 2H). ¹³C NMR (75 MHz, CDCl₃): δ_C 173.5, 137.6, 135.2, 132.1, 130.2, 129.3, 128.4, 127.7, 21.0; HRMS: (M+H)⁺ calculated for C₂₁H₁₇NO₂: 316.1338, found: 316.1327.



N-benzoyl-*N*-(4-(*tert*-butyl)phenyl)benzamide **2c**.

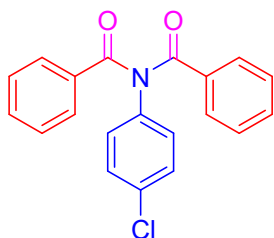
2c (86 mg) was obtained from **1c** (113 mg) following general procedure B; White solid; 70% yield (eluent: EtOAc/Hexanes= 1:9); ¹H NMR (300 MHz, CDCl₃): δ_H 7.73 (d, *J*= 7.5 Hz, 4H), 7.40 (t,

$J= 7.2$ Hz, 2H), 7.30 (t, $J= 7.8$ Hz, 4H), 7.19 (d, $J= 8.1$ Hz, 2H), 7.10 (d, $J= 8.4$ Hz, 2H). 2.87 (t, $J= 6.9$ Hz, 1H), 1.21 (d, $J= 6.9$ Hz, 6H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 173.5, 148.4, 137.8, 135.3, 132.1, 129.3, 128.4, 127.6, 127.5, 33.7, 23.8; HRMS: $(\text{M}+\text{H})^+$ calculated for $\text{C}_{23}\text{H}_{21}\text{NO}_2$: 344.1650, found: 344.1638.



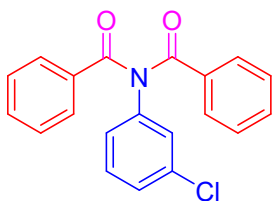
***N*-benzoyl-*N*-(4-fluorophenyl)benzamide **2d**.**

2d (86 mg) was obtained from **1d** (104 mg) following general procedure B; White solid; 75% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 7.71 (d, $J= 7.2$ Hz, 4H), 7.41 (t, $J= 7.5$ Hz, 2H), 7.31 (t, $J= 7.8$ Hz, 4H), 7.18- 7.14 (m, 2H), 7.03 (t, $J= 7.2$ Hz, 2H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 173.2, 163.3, 160.0, 134.8, 132.3, 129.6, 129.5, 129.5, 129.2, 128.5, 128.4, 116.6, 116.3; HRMS: $(\text{M}+\text{H})^+$ calculated for $\text{C}_{20}\text{H}_{14}\text{FNO}_2$: 320.1081, found: 320.1077.



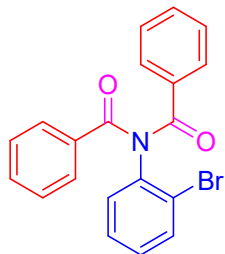
***N*-benzoyl-*N*-(4-chlorophenyl)benzamide **2e**.**

2e (102 mg) was obtained from **1e** (110 mg) following general procedure B; White solid; 85% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 8.10 (d, $J= 7.2$ Hz, 1H), 7.71 (d, $J= 7.2$ Hz, 3H), 7.48-7.29 (m, 8H), 7.11 (d, $J= 8.4$ Hz, 1H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 173.1, 138.7, 134.7, 133.6, 132.4, 130.1, 129.6, 129.0, 128.4; HRMS: $(\text{M}+\text{H})^+$ calculated for $\text{C}_{20}\text{H}_{14}\text{ClNO}_2$: 336.0791, found: 336.0785.



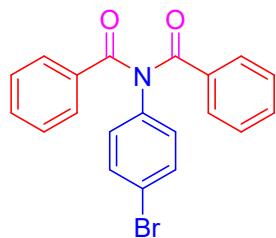
***N*-benzoyl-*N*-(3-chlorophenyl)benzamide 2f.**

2f (111 mg) was obtained from **1f** (110 mg) following general procedure B; White solid; 92% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 7.72 (d, $J= 7.2$ Hz, 4H), 7.44-7.39 (m, 3H), 7.31 (t, $J= 7.8$ Hz, 4H), 7.27- 7.23 (m, 2H), 7.08-7.05 (m, 1H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 173.1, 141.4, 135.1, 134.8, 132.5, 130.3, 129.3, 128.6, 128.1, 127.9, 126.2; HRMS: $(\text{M}+\text{H})^+$ calculated for $\text{C}_{20}\text{H}_{14}\text{ClNO}_2$: 336.0791, found: 336.0783.



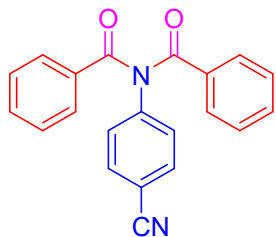
***N*-benzoyl-*N*-(2-bromophenyl)benzamide 2g.**

2g (102 mg) was obtained from **1g** (126 mg) following general procedure B; White solid; 75% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 7.80 (d, $J= 7.2$ Hz, 4H), 7.66 (d, $J= 7.5$ Hz, 1H), 7.41 (t, $J= 7.2$ Hz, 2H), 7.32 (t, $J= 7.2$ Hz, 4H), 7.22 (t, $J= 5.7$ Hz, 1H), 7.13-7.10 (dd, $J= 2.7$ Hz, 2.4 Hz, 2H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 172.6, 139.5, 134.7, 133.8, 132.3, 130.8, 129.5, 129.1, 128.5, 128.4, 122.6; HRMS: $(\text{M}+\text{H})^+$ calculated for $\text{C}_{20}\text{H}_{14}\text{BrNO}_2$: 380.0286, found: 336.0258.



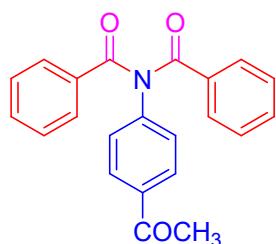
***N*-benzoyl-*N*-(4-bromophenyl)benzamide 2h.**

2h (95 mg) was obtained from **1h** (126 mg) following general procedure B; White solid; 70% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 7.86 (d, $J= 7.8$ Hz, 3H), 7.77 (s, 1H), 7.55-7.53 (t, $J= 8.7$ Hz, 5H), 7.50 (d, $J= 5.7$ Hz, 4H), 7.46 (d, $J= 1.8$ Hz, 1H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 173.0, 139.2, 134.7, 132.6, 132.4, 129.3, 129.2, 128.5, 121.4.



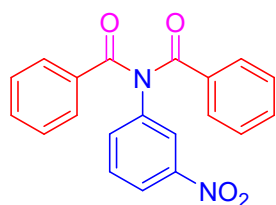
***N*-benzoyl-*N*-(4-cyanophenyl)benzamide **2i**.**

2i (45 mg) was obtained from **1i** (107 mg) following general procedure B; White solid; 39% yield (eluent: EtOAc/Hexanes= 1:9); $^1\text{H NMR}$ (300 MHz, CDCl_3): δ_{H} 8.01 (d, $J= 7.2$ Hz, 4H), 7.63-7.53 (dd, $J= 7.5$ Hz, 8.1 Hz, 2H), 7.37 (t, $J= 7.2$ Hz, 3H), 7.27-7.19 (m, 5H). $^{13}\text{C NMR}$ (75 MHz, CDCl_3): δ_{C} 172.8, 144.3, 134.3, 133.2, 132.8, 129.3, 128.7, 128.2, 117.8, 111.2.



***N*-(4-acetylphenyl)-*N*-benzoylbenzamide **2j**.**

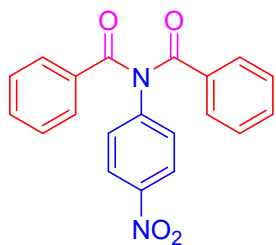
2j (55 mg) was obtained from **1j** (113 mg) following general procedure B; White solid; 45% yield (eluent: EtOAc/Hexanes= 1:9); $^1\text{H NMR}$ (300 MHz, CDCl_3): δ_{H} 7.83 (d, $J= 8.4$ Hz, 2H), 7.63 (d, $J= 7.2$ Hz, 4H), 7.34 (t, $J= 6.6$ Hz, 2H), 7.23 (d, $J= 7.8$ Hz, 3H), 7.20 (d, $J= 8.1$ Hz, 2H), 7.16 (d, $J= 6.9$ Hz, 1H), 2.49 (s, 3H). $^{13}\text{C NMR}$ (75 MHz, CDCl_3): δ_{C} 196.6, 173.0, 144.4, 135.9, 134.6, 132.6, 129.5, 129.3, 128.6, 127.6, 26.3.



***N*-benzoyl-*N*-(3-nitrophenyl)benzamide **2k**.**

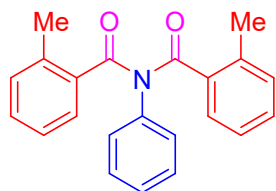
2k (37 mg) was obtained from **1k** (114 mg) following general procedure B; White solid; 30% yield (eluent: EtOAc/Hexanes= 1:9); $^1\text{H NMR}$ (300 MHz, CDCl_3): δ_{H} 8.15 (d, $J= 5.1$ Hz, 2H), 7.72-7.70 (t, $J= 7.2$ Hz, 3H), 7.54-7.52 (m, 1H), 7.47-7.42 (t, $J= 7.5$ Hz, 2H), 7.35 (d, $J= 7.8$ Hz, 3H), 7.32-

7.30 (t, $J=1.5$ Hz, 3H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 172.9, 148.9, 134.4, 133.7, 132.8, 130.1, 129.3, 128.7, 127.0, 122.9, 122.3.



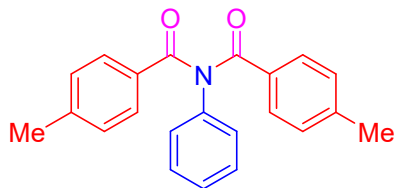
***N*-benzoyl-*N*-(4-nitrophenyl)benzamide 2l.**

2l (37 mg) was obtained from **1l** (114 mg) following general procedure B; White solid; 30% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 8.24 (d, $J=9$ Hz, 1H), 8.14 (d, $J=7.5$ Hz, 3H), 7.74 (d, $J=7.2$ Hz, 2H), 7.62 (d, $J=7.5$ Hz, 1H), 7.49 (t, $J=7.5$ Hz, 4H) 7.39-7.27 (m, 2H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 172.8, 145.8, 133.6, 132.9, 130.2, 129.3, 128.7, 128.4, 124.8.



2-methyl-*N*-(2-methylbenzoyl)-*N*-phenylbenzamide 4a².

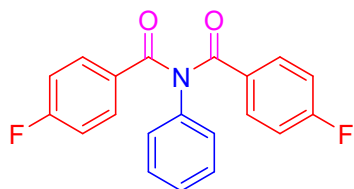
4a (78 mg) was obtained from **3a** (108 mg) following general procedure B; White solid; 66% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 7.39 (d, $J=7.2$ Hz, 2H), 7.28 (d, $J=7.2$ Hz, 2H), 7.19 (d, $J=8.1$ Hz, 3H), 7.09 (d, $J=7.2$ Hz, 2H), 7.02-6.95 (dd, $J=7.2$ Hz, 7.5 Hz, 4H), 2.30 (s, 6H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 173.2, 139.5, 137.7, 136.1, 131.1, 130.6, 129.3, 127.9, 127.7, 127.6, 125.3, 19.8.



4-methyl-*N*-(4-methylbenzoyl)-*N*-phenylbenzamide 4b².

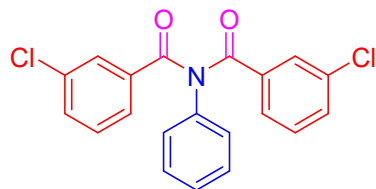
4b (65 mg) was obtained from **3b** (108 mg) following general procedure B; White solid; 55% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 7.52 (d, $J=8.1$ Hz, 2H), 7.44 (d,

$J= 7.2$ Hz, 2H), 7.23 (d, $J= 9.9$ Hz, 1H), 7.18 (d, $J= 8.1$ Hz, 3H), 7.15-7.03 (m, 5H), 2.35 (s, 6H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 172.9, 137.8, 135.8, 132.5, 131.2, 130.8, 129.4, 127.5, 125.3, 19.7.



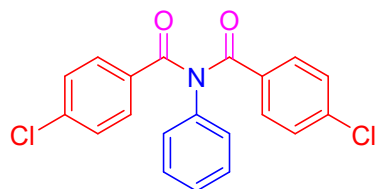
4-fluoro-*N*-(4-fluorobenzoyl)-*N*-phenylbenzamide **4c²**.

4c (80 mg) was obtained from **3c** (111 mg) following general procedure B; White solid; 66% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 7.76-7.75 (t, $J= 5.4$ Hz, 4H), 7.38-7.33 (t, $J= 6.6$ Hz, 2H), 7.29-7.25 (t, $J= 7.2$ Hz, 2H), 7.16 (d, $J= 7.5$ Hz, 2H), 7.04 (t, $J= 8.4$ Hz, 3H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 172.1, 166.8, 163.4, 140.1, 131.9, 131.8, 130.8, 129.6, 129.1, 127.8, 127.7, 115.9, 115.6.



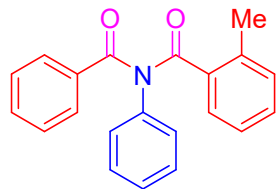
3-chloro-*N*-(3-chlorobenzoyl)-*N*-phenylbenzamide **4d²**.

4d (93 mg) was obtained from **3f** (123 mg) following general procedure B; White solid; 70% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 7.69 (s, 2H), 7.56 (d, $J= 7.8$ Hz, 2H), 7.42-7.34 (dd, $J= 8.1$ Hz, 7.5 Hz, 4H), 7.31-7.23 (m, 3H), 7.15 (d, $J= 7.2$ Hz, 2H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 171.7, 139.4, 136.3, 134.8, 132.3, 129.7, 129.7, 129.3, 128.1, 127.8, 127.0.



4-chloro-*N*-(4-chlorobenzoyl)-*N*-phenylbenzamide **4e²**.

4e (90 mg) was obtained from **3g** (123 mg) following general procedure B; White solid; 68% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 8.06 (d, $J= 7.8$ Hz, 2H), 7.69 (d, $J= 7.5$ Hz, 3H), 7.48 (d, $J= 7.5$ Hz, 2H), 7.35 (d, $J= 8.1$ Hz, 4H), 7.17 (d, $J= 6.3$ Hz, 2H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 172.2, 138.9, 133.0, 131.6, 130.7, 129.7, 128.9, 128.9, 127.8.



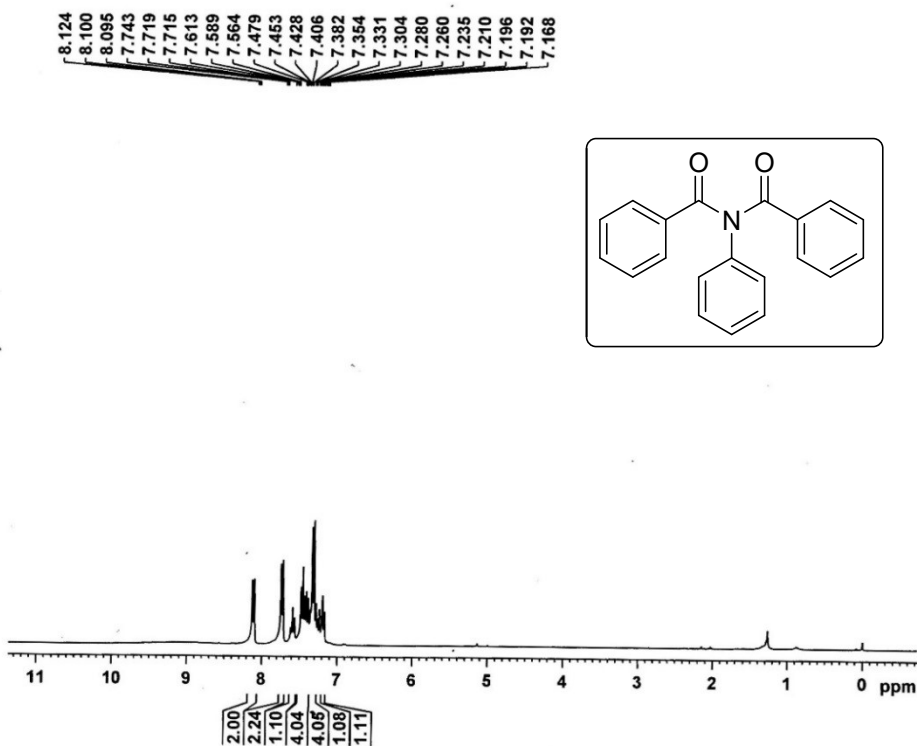
***N*-benzoyl-2-methyl-*N*-phenylbenzamide 4f.**

4f (60 mg) was obtained from **3c** (103 mg) following general procedure B; White solid; 53% yield (eluent: EtOAc/Hexanes= 1:9); ^1H NMR (300 MHz, CDCl_3): δ_{H} 7.70 (d, $J= 7.2$ Hz, 2H), 7.53 (d, $J= 7.5$ Hz, 1H), 7.44-7.32 (m, 4H), 7.29- 7.22 (m, 5H), 7.14 (t, $J= 6.3$ Hz, 2H), 2.50 (s, 3H). ^{13}C NMR (75 MHz, CDCl_3): δ_{C} 171.6, 171.3, 138.0, 136.1, 133.9, 133.5, 130.3, 129.4, 128.8, 127.5, 127.3, 126.5, 126.0, 125.8, 123.6, 18.0.

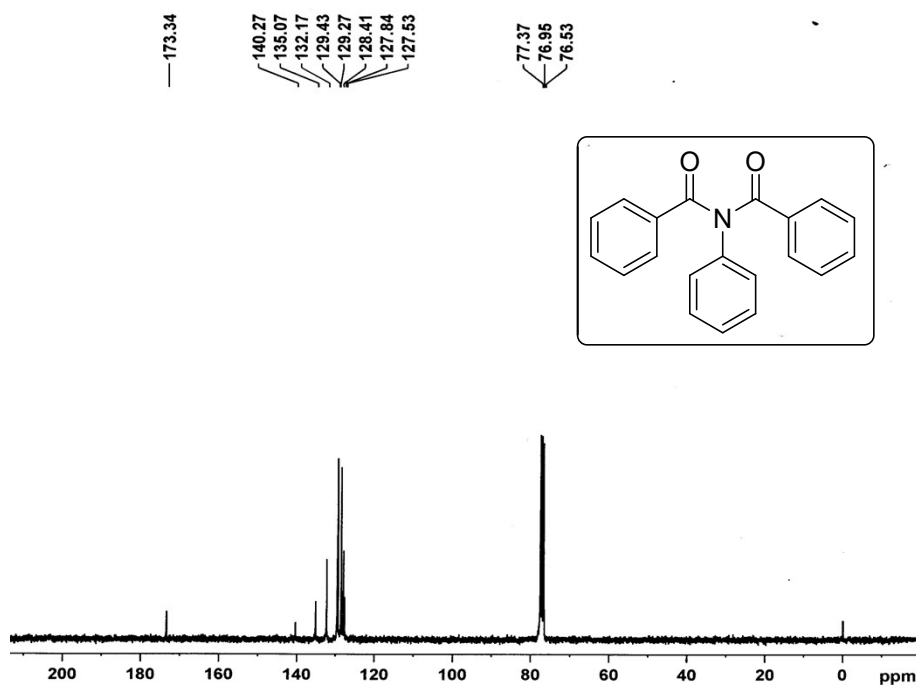
3. References

1. A. Ben-Haida, P. Hodge and H. M. Colquhoun, *Macromolecules*, 2005, **38**, 722-729.
2. A. A. Kadam, T. L. Metz, Y. Qian and L. M. Stanley, *ACS Catal.*, 2019, **9**, 5651-5656.

4. ^1H , ^{13}C NMR and HRMS spectra of products



^1H NMR (300 MHz) Spectrum of compound **2a**



^{13}C NMR (75 MHz) Spectrum of compound **2a**



NAME RA-M4-164
EXPNO 1
PROCNO 1
Date_ 20190603
Time 20.42
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
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RG 14
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
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TDO 1

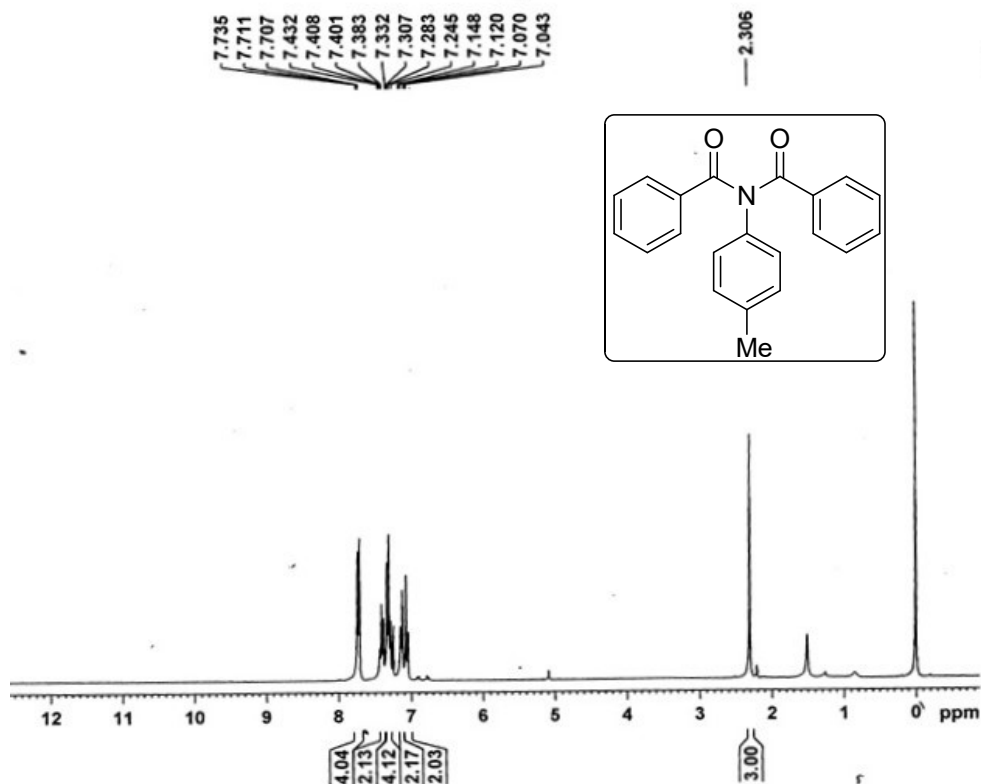
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WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



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PROCNO 1
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DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
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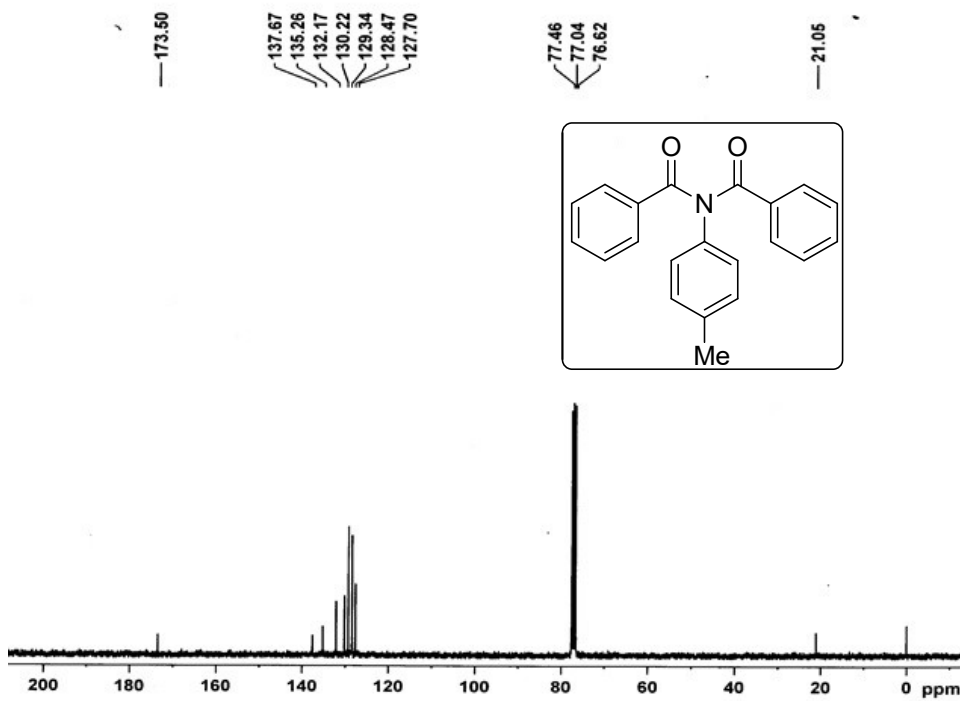
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PCPD2 80.00 usec
PL2 -1.00 dB
PL12 15.48 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.29870972 W
PL13W 0.26500207 W
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SSB 0
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NAME RA-NL-1-116A
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 INSTRUM spect
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 PULPROG zg30
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 DS 2
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 FIDRES 0.094190 Hz
 AQ 5.3084660 sec
 RG 256
 DW 81.000 usec
 DE 6.50 usec
 TE 300.0 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
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 P1 12.00 usec
 PL1 -1.00 dB
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 DW 27.800 usec
 DE 6.50 usec
 TE 300.0 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1

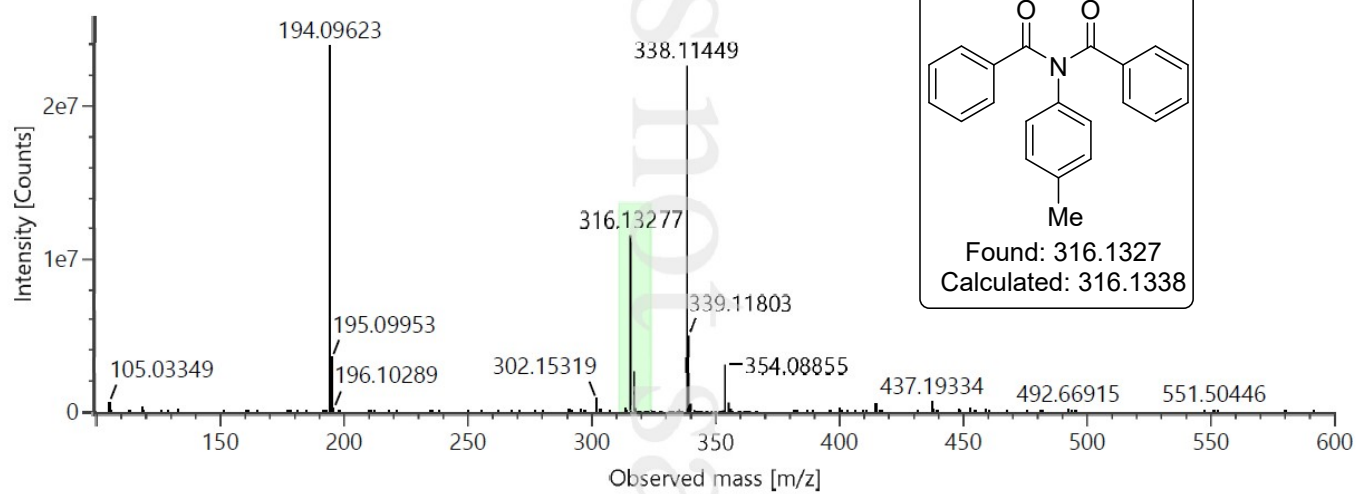
===== CHANNEL f1 =====
 NUC1 13C
 P1 10.68 usec
 PL1 0.00 dB
 PL1W 31.39858055 W
 SFO1 75.4752953 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 -1.00 dB
 PL12 15.48 dB
 PL13 16.00 dB
 PL2W 13.28156662 W
 PL12W 0.29870972 W
 PL13W 0.26500207 W
 SFO2 300.1312005 MHz
 SI 32768
 SF 75.4677417 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40

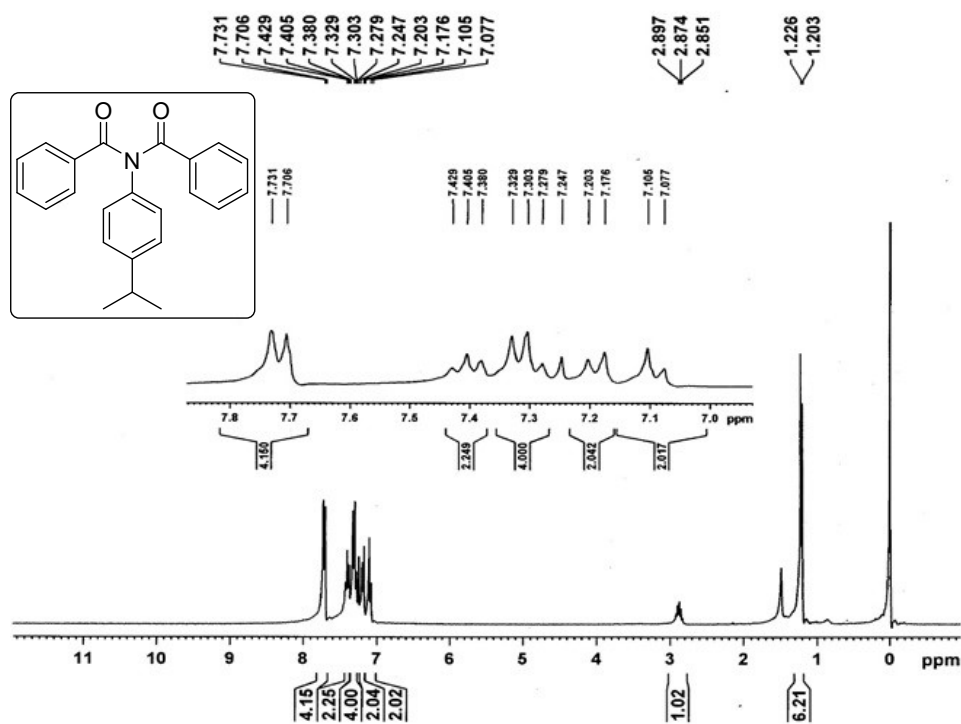
¹³C NMR (75 MHz) Spectrum of compound 2b

Item name: MSR-6A-316
Item description:

Channel name: Low energy : Time 0.2851 +/- 0.0677 minutes



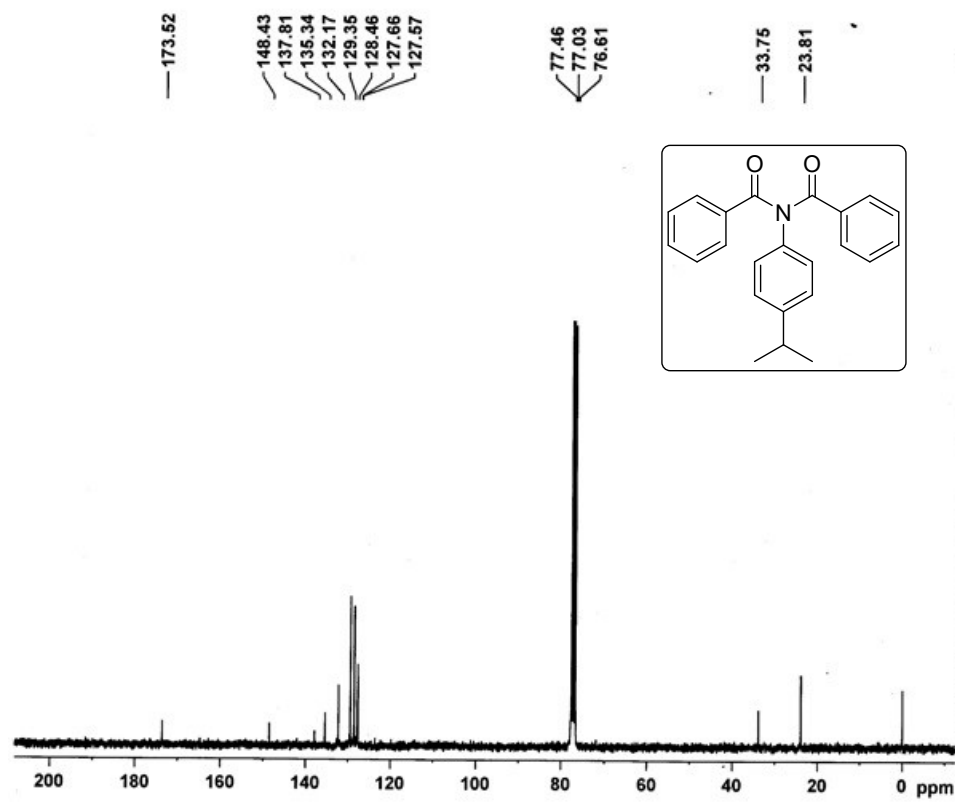
HRMS spectrum of compound 2b



NAME RA-NL-1-105A
 EXPNO 2
 PROCNO 1
 Date_ 20190329
 Time_ 0.52
 INSTRUM spect
 PROBHD 5 mm DUL 13C-1
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 2
 SWH 6172.839 Hz
 FIDRES 0.094190 Hz
 AQ 5.3084660 sec
 RG 322.5
 DW 81.000 usec
 DE 6.50 usec
 TE 300.0 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -1.00 dB
 PL1W 13.28156662 W
 SFO1 300.1318534 MHz
 SI 32768
 SF 300.1300099 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

¹H NMR (300 MHz) Spectrum of compound 2c



NAME RA-NL-1-105A
 EXPNO 1
 PROCNO 1
 Date_ 20190329
 Time_ 0.10
 INSTRUM spect
 PROBHD 5 mm DUL 13C-1
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 2197
 DS 4
 SWH 17985.611 Hz
 FIDRES 0.274439 Hz
 AQ 1.8219508 sec
 RG 2896.3
 DW 27.800 usec
 DE 6.50 usec
 TE 300.0 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1

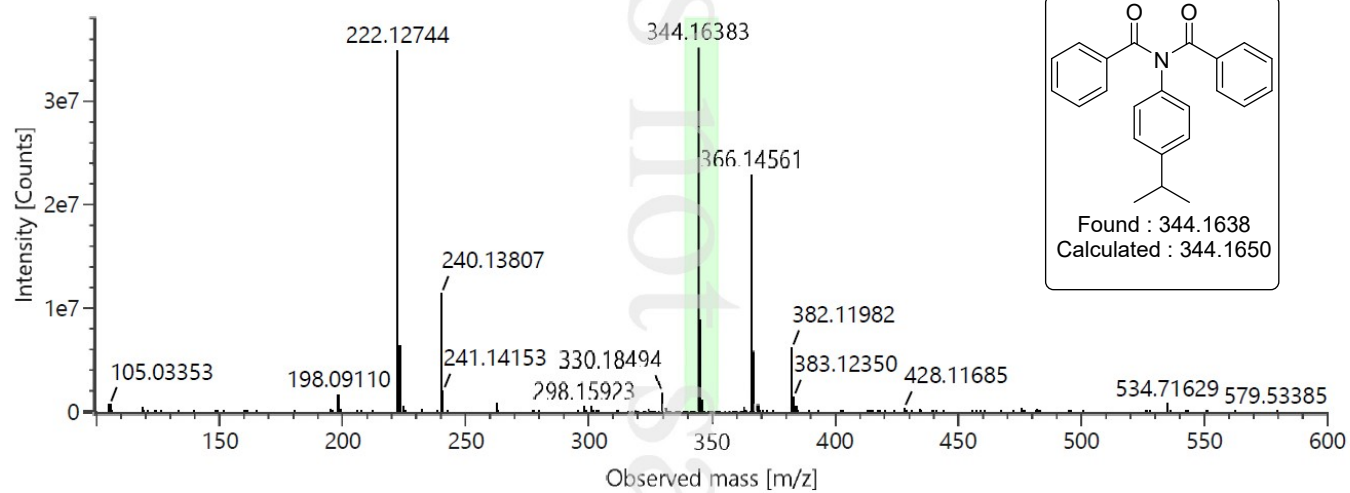
===== CHANNEL f1 =====
 NUC1 13C
 P1 10.68 usec
 PL1 0.00 dB
 PL1W 31.39658055 W
 SFO1 75.4752953 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 -1.00 dB
 PL12 15.48 dB
 PL13 16.00 dB
 PL2W 13.28156662 W
 PL12W 0.29870972 W
 PL13W 0.26500207 W
 SFO2 300.1312005 MHz
 SI 32768
 SF 75.4677411 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40

¹³C NMR (75 MHz) Spectrum of compound 2c

Item name: MSR-5A-344
Item description:

Channel name: Low energy : Time 0.2888 +/- 0.2033 minutes

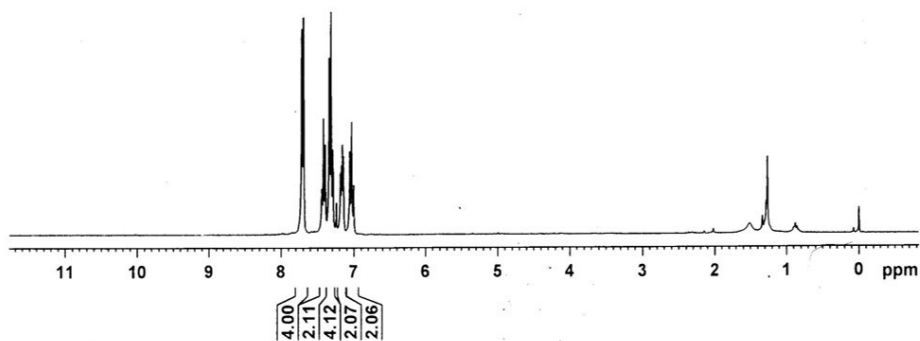
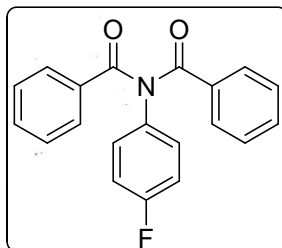


HRMS Spectrum of compound 2c

7.717
7.693
7.444
7.419
7.395
7.340
7.314
7.290
7.189
7.173
7.166
7.159
7.143
7.058
7.031
7.002



NAME RA-NL-1-85A
EXPNO 2
PROCNO 1
Date_ 20190619
Time 18.22
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3064680 sec
RG 228.1
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TD0 1

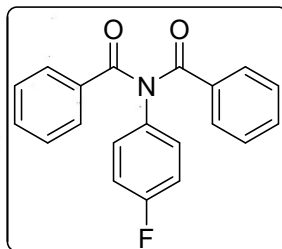


===== CHANNEL f1 =====
NUC1 1H
P1 12.00 usec
PL1 -1.00 dB
PL1W 13.28156662 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300117 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

¹H NMR (300 MHz) Spectrum of compound **2d**

173.27
163.34
160.06
134.89
132.32
129.63
129.52
129.23
128.49
128.43
116.61
116.31

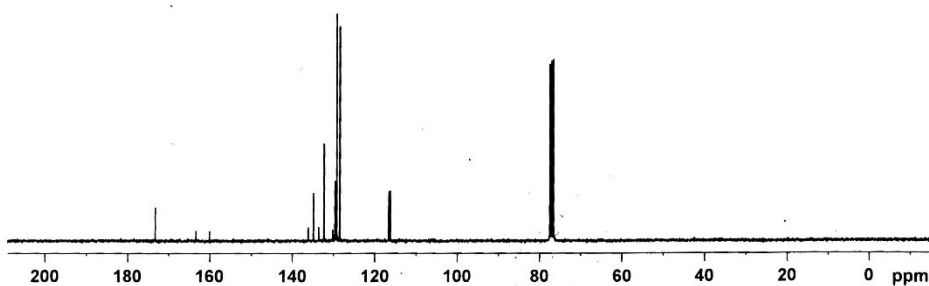
77.39
76.97
76.54



NAME RA-NL-1-245
EXPNO 2
PROCNO 1
Date_ 20190715
Time 12.45
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 847
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 2896.3
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 10.68 usec
PL1 0.00 dB
PL1W 31.39858055 W
SFO1 75.4752953 MHz

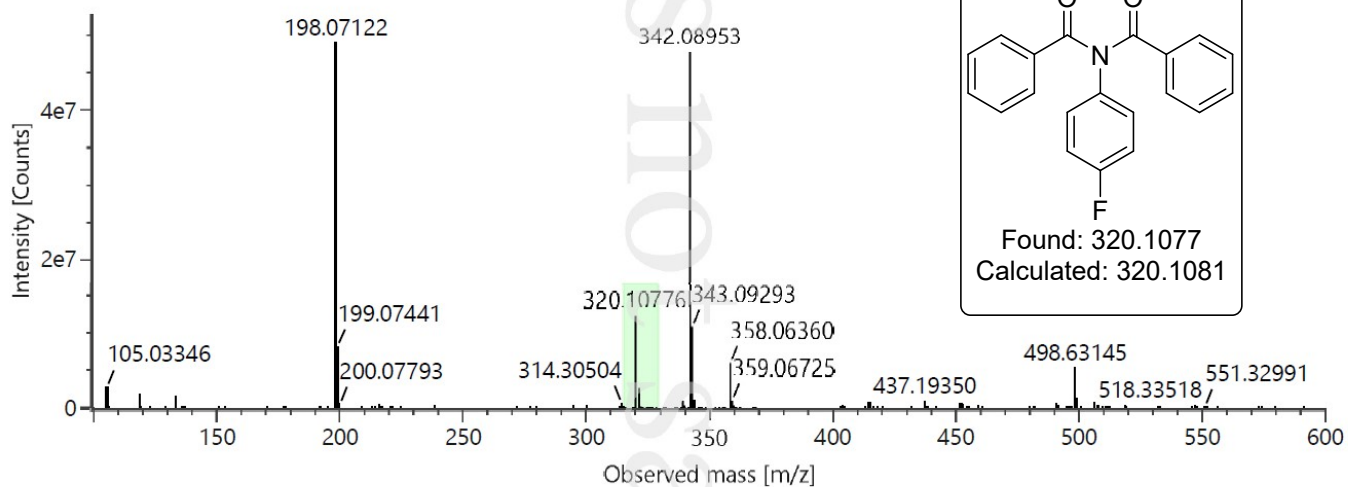
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 15.48 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.29870972 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



¹³C NMR (75 MHz) Spectrum of compound **2d**

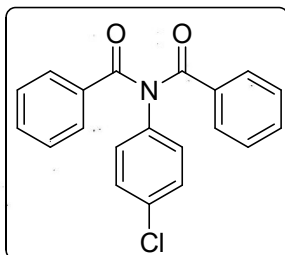
Item name: MSR-03A-320
Item description:

Channel name: Low energy : Time 0.2956 +/- 0.0677 minutes



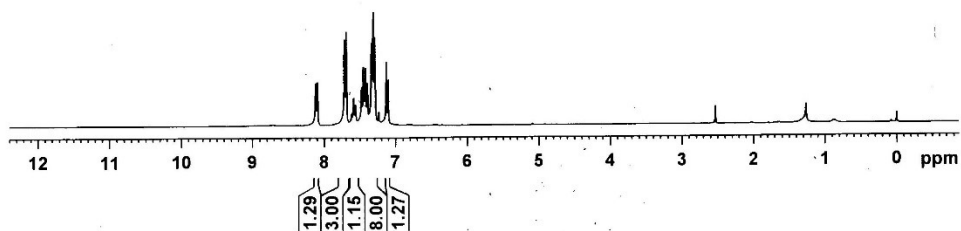
HRMS Spectrum of compound 2d

8.121
8.097
7.718
7.694
7.591
7.566
7.481
7.455
7.429
7.422
7.398
7.340
7.314
7.294
7.131
7.103



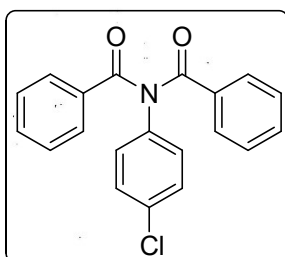
NAME RA-NL-1-210
EXPNO 6
PROCNO 1
Date 20190711
Time 18.19
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084660 sec
RG 161.3
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 12.00 usec
PL1 -1.00 dB
PL1W 13.28156662 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300129 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



¹H NMR (300 MHz) Spectrum of compound 2e

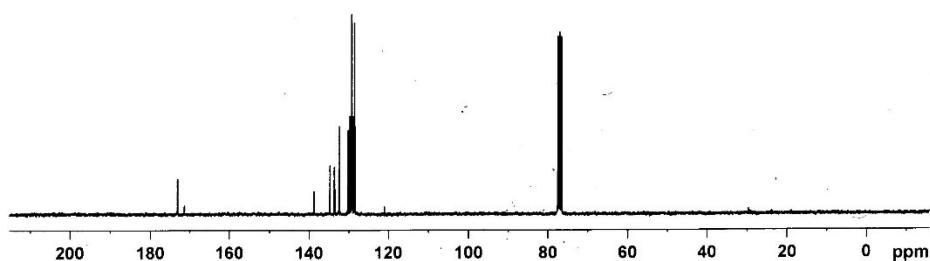
173.15
138.74
134.77
133.63
132.43
130.17
129.69
129.05
128.42
77.39
76.97
76.55



NAME RA-NL-1-210
EXPNO 5
PROCNO 1
Date 20190711
Time 18.13
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1024
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 4098
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 10.68 usec
PL1 0.00 dB
PL1W 31.39858055 W
SFO1 75.4752953 MHz

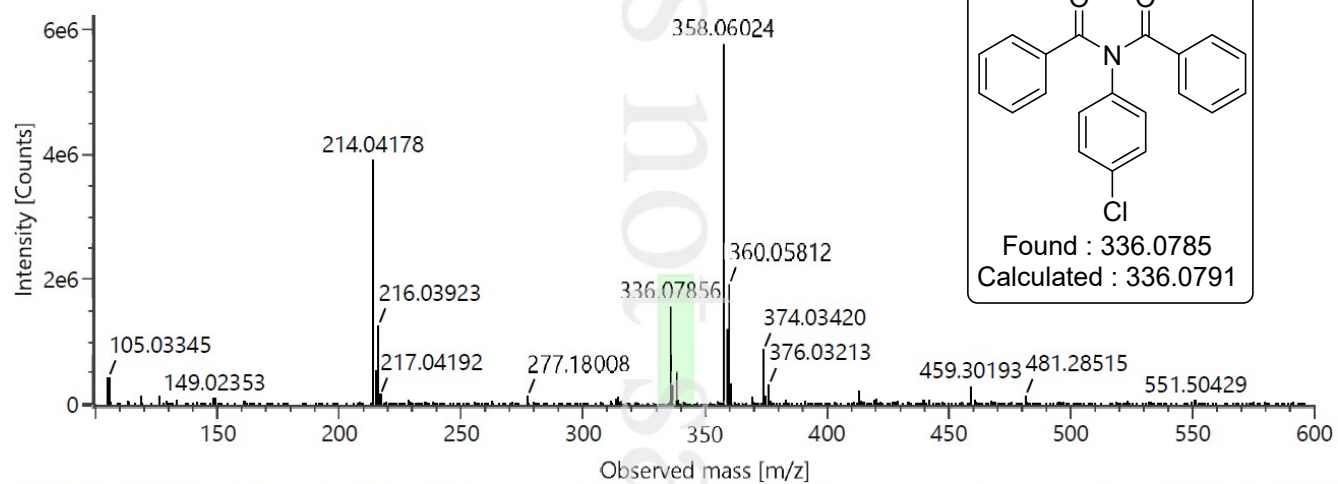
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 15.48 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.29870972 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



¹³C NMR (75 MHz) Spectrum of compound 2e

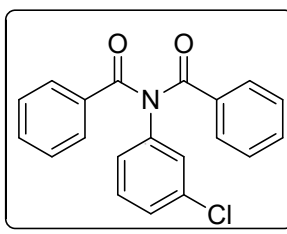
Item name: MSR-7A-336
Item description:

Channel name: Low energy : Time 0.2850 +/- 0.0700 minutes

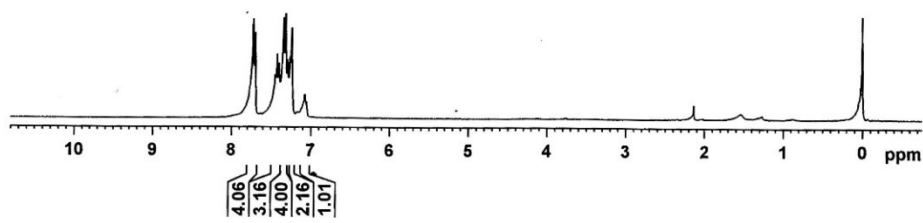


HRMS Spectrum of compound 2e

7.721
7.697
7.446
7.442
7.421
7.397
7.340
7.314
7.290
7.275
7.258
7.238
7.080
7.072
7.065
7.061
7.052



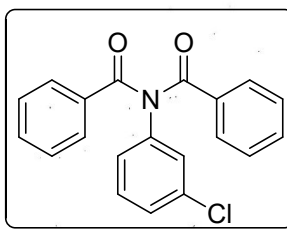
NAME RA-NL-1-111
EXPNO 7
PROCNO 1
Date_ 20190326
Time 12.48
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084660 sec
RG 128
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TD0 1



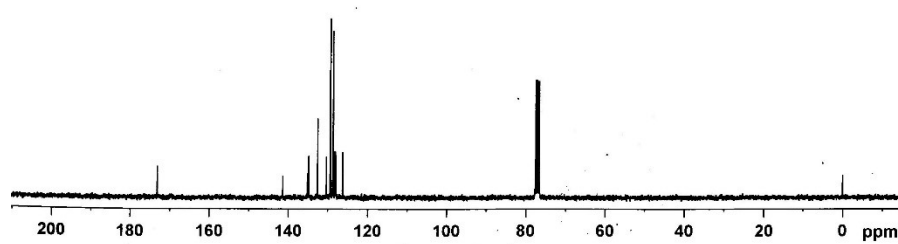
===== CHANNEL f1 =====
NUC1 1H
P1 12.00 usec
PL1 -1.00 dB
PL1W 13.28156662 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300125 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

¹H NMR (300 MHz) Spectrum of compound 2f

173.13
141.41
135.13
134.81
132.56
130.35
129.34
128.63
128.12
127.93
126.20



NAME RA-NL-1-111
EXPNO 6
PROCNO 1
Date_ 20190326
Time 12.45
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 520
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 5792.6
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1



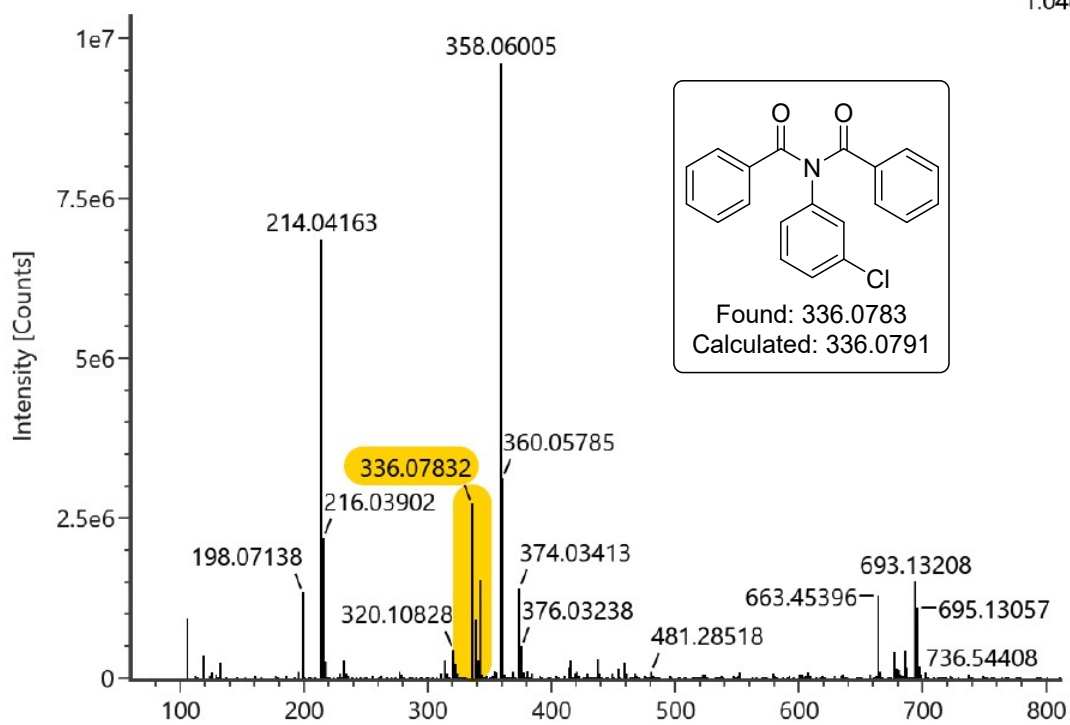
===== CHANNEL f1 =====
NUC1 13C
P1 10.68 usec
PL1 0.00 dB
PL1W 31.39858055 W
SFO1 75.4752953 MHz
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 15.48 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.29870972 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677435 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

¹³C NMR (75 MHz) Spectrum of compound 2f

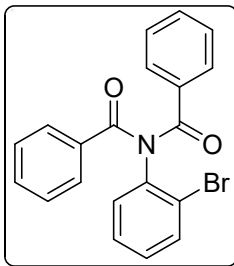
Item name: MSR-4A-336
Item description:

Channel name: Low energy : Time 0.2880 +/- 0.0657 minutes

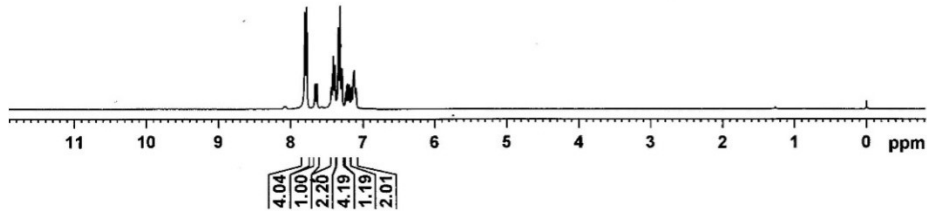
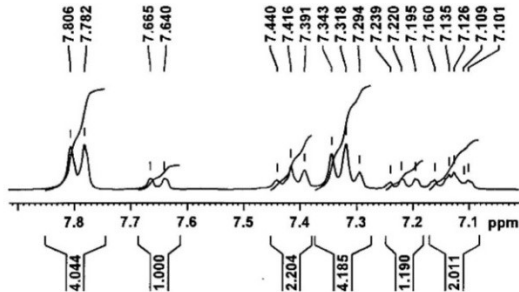
1.04e7



HRMS Spectrum of compound 2f



7.806
7.782
7.665
7.640
7.440
7.416
7.391
7.343
7.318
7.294
7.239
7.220
7.195
7.160
7.135
7.126
7.109
7.101



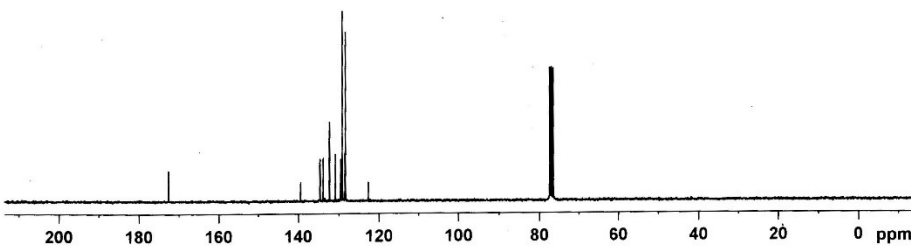
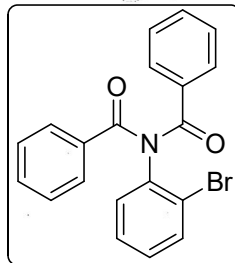
¹H NMR (300 MHz) Spectrum of compound **2g**



NAME RA-NL-1-259A
EXPNO 3
PROCNO 1
Date_ 20190718
Time 16.18
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084660 sec
RG 228.1
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 12.00 usec
PL1 -1.00 dB
PL1W 13.28156662 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300131 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

172.66
139.52
134.73
133.87
132.31
130.86
129.56
129.19
128.48
128.41
122.68
77.40
76.97
76.55



¹³C NMR (75 MHz) Spectrum of compound **2g**

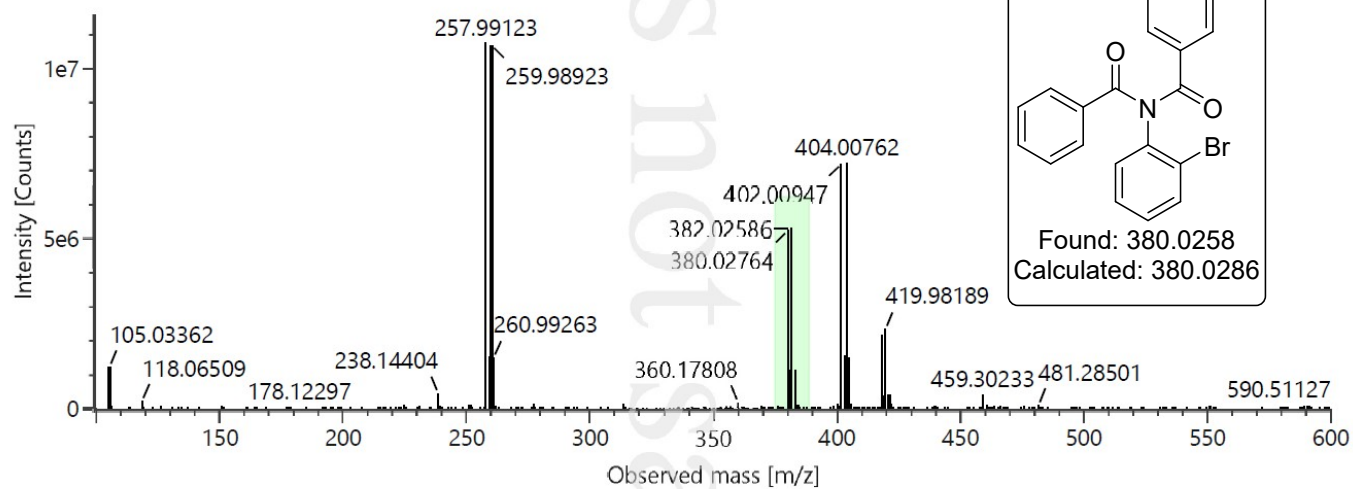
NAME RA-NL-1-259A
EXPNO 2
PROCNO 1
Date_ 20190718
Time 16.10
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 874
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 7298.2
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 10.68 usec
PL1 0.00 dB
PL1W 31.39858055 W
SFO1 75.4752953 MHz

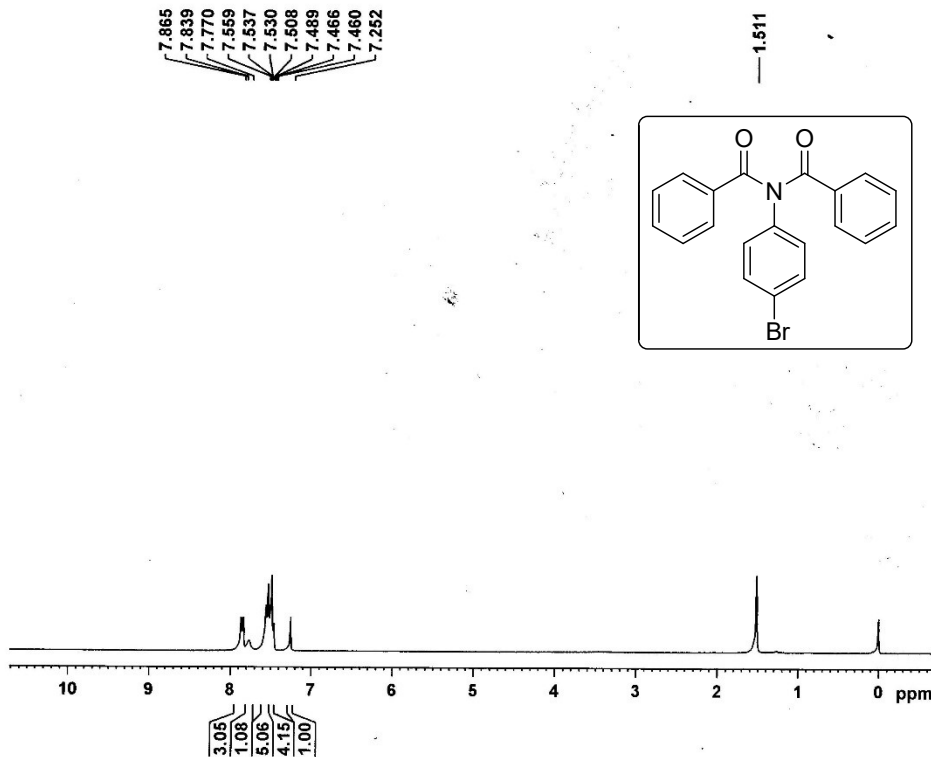
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 15.48 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.29870972 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.467490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

Item name: MSR-2A-380
Item description:

Channel name: Low energy : Time 0.2863 +/- 0.0657 minutes



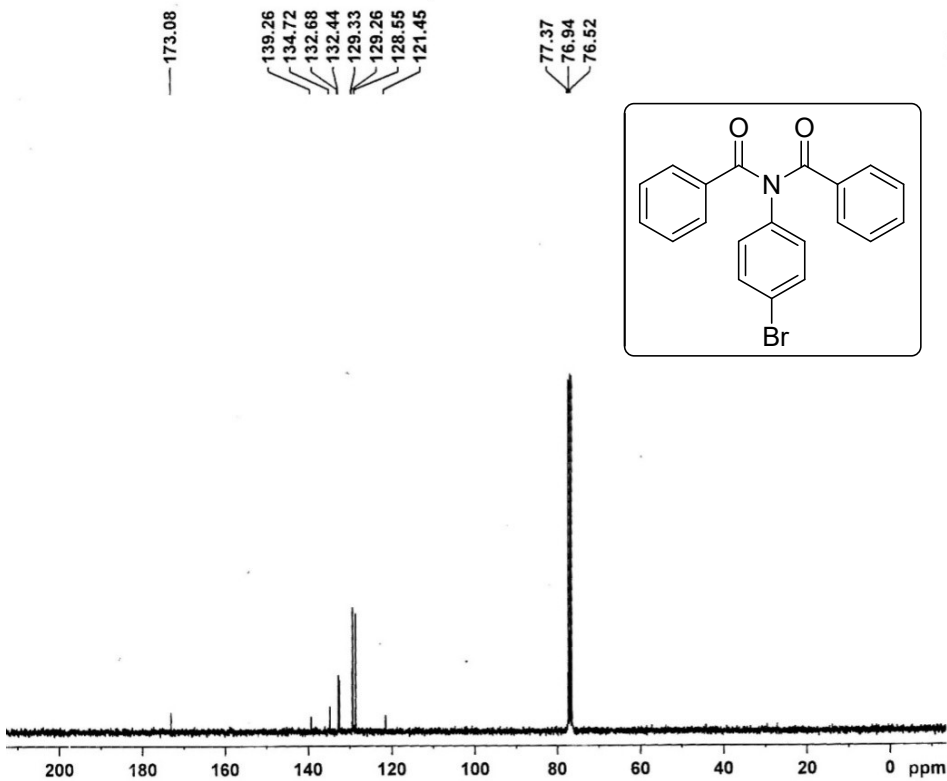
HRMS Spectrum of compound 2g



NAME RA-NL-4-50A
EXPNO 2
PROCNO 1
Date_ 20211101
Time 9.58
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.838 Hz
FIDRES 0.094190 Hz
AQ 5.3084660 sec
RG 574.7
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TDD 1

===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 16.72050095 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300087 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

¹H NMR (300 MHz) Spectrum of compound **2h**



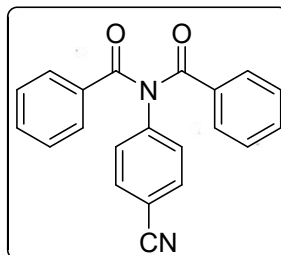
NAME RA-NL-2-4(1A)
EXPNO 2
PROCNO 1
Date_ 20190926
Time 23.57
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 604
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 2298.8
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TDD 1

===== CHANNEL f1 =====
NUC1 13C
P1 10.68 usec
PL1 0.00 dB
PL1W 31.39858055 W
SFO1 75.4752953 MHz

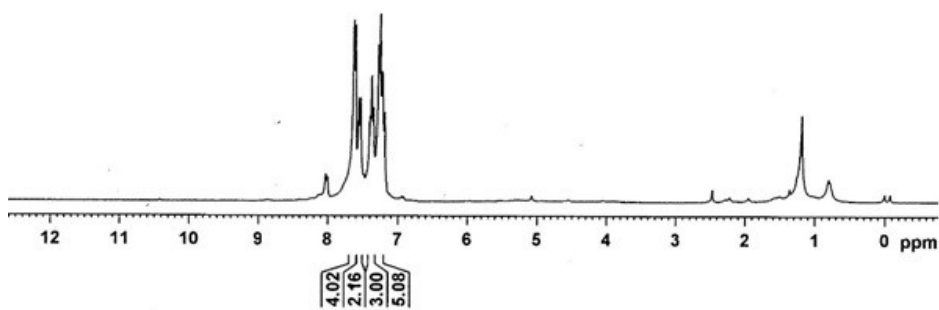
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 15.48 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.29870972 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

¹³C NMR (75 MHz) Spectrum of compound **2h**

8.031
8.007
7.633
7.608
7.559
7.532
7.399
7.375
7.352
7.279
7.254
7.227
7.219
7.191



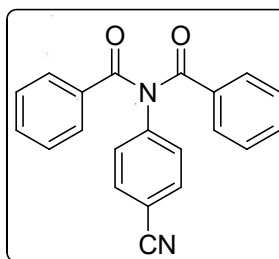
NAME RA-NL-1-225A
EXPNO 5
PROCNO 1
Date 20190711
Time 15.23
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084660 sec
RG 128
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TDO 1



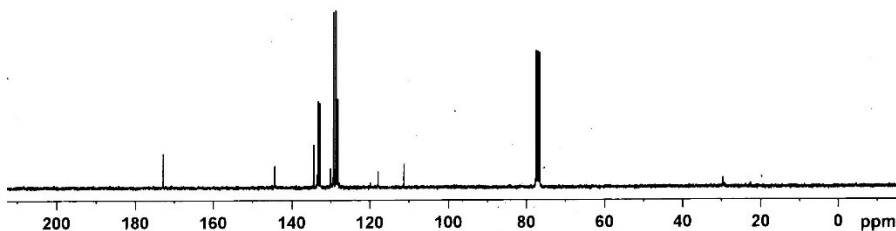
===== CHANNEL f1 =====
NUC1 1H
P1 12.00 usec
PL1 -1.00 dB
PL1W 13.28156662 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300336 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

¹H NMR (300 MHz) Spectrum of compound **2i**

172.87
144.35
134.39
133.27
132.84
129.30
128.71
128.27
117.89
111.29
77.42
77.00
76.58

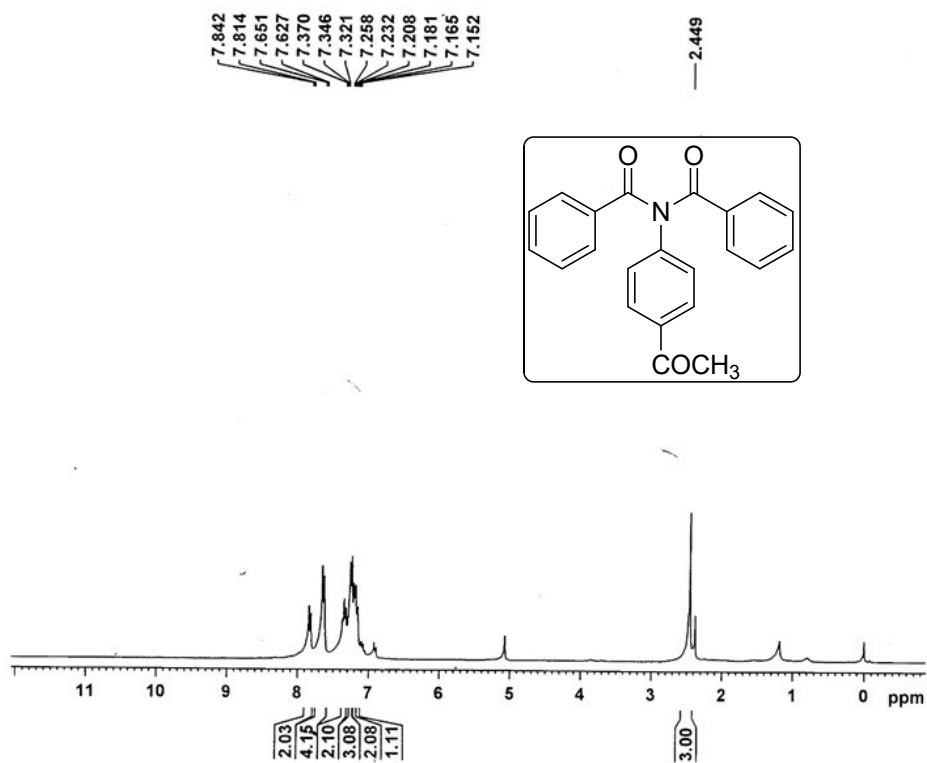


NAME RA-NL-1-225A
EXPNO 6
PROCNO 1
Date 20190711
Time 16.32
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1024
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 2580.3
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TDO 1



===== CHANNEL f1 =====
NUC1 13C
P1 10.68 usec
PL1 0.00 dB
PL1W 31.39858055 W
SFO1 75.4752953 MHz
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 15.48 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.29870972 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677480 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

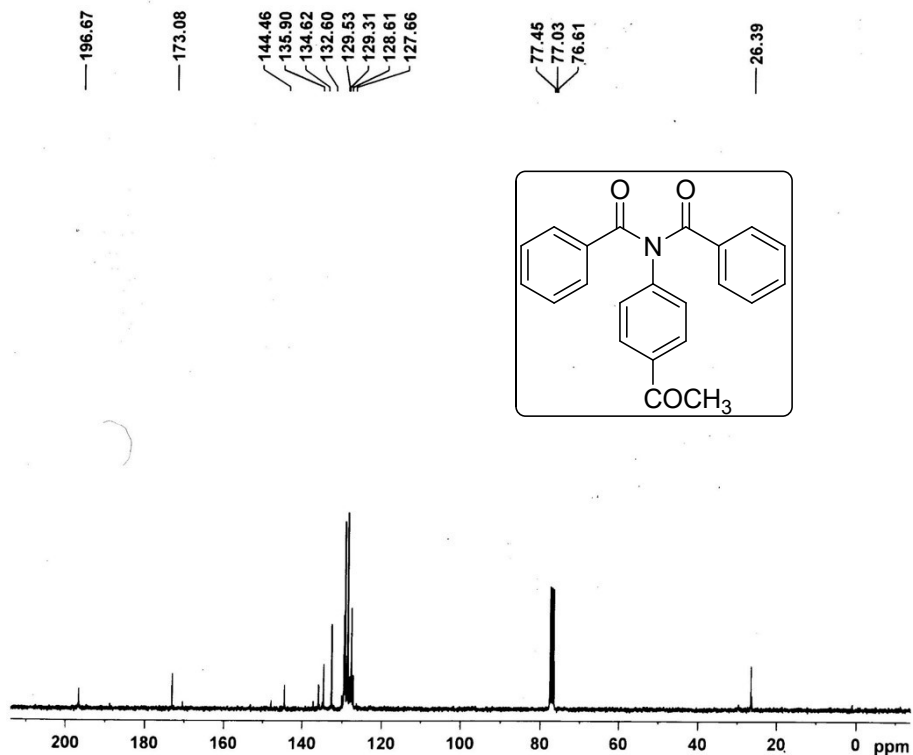
¹³C NMR (75 MHz) Spectrum of compound **2i**



NAME RA-NL-1-299
EXPNO 7
PROCNO 1
Date_ 20190817
Time 18.08
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084660 sec
RG 90.5
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 12.00 usec
PL1 -1.00 dB
PL1W 13.28156662 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300346 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

¹H NMR (300 MHz) Spectrum of compound **2j**



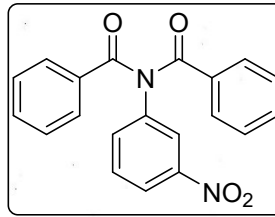
NAME RA-NL-1-299
EXPNO 6
PROCNO 1
Date_ 20190817
Time 18.03
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 753
DS 4
SWH 17935.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 2896.3
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 10.68 usec
PL1 0.00 dB
PL1W 31.39858055 W
SFO1 75.4752953 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 15.48 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.29870972 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

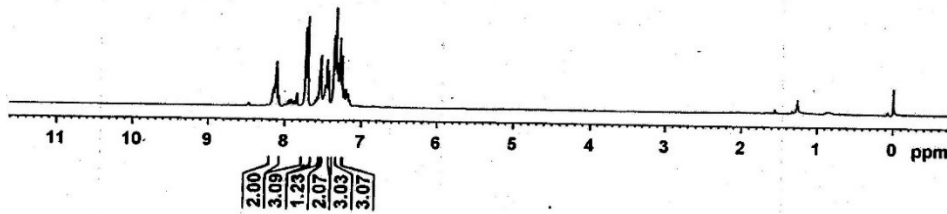
¹³C NMR (75 MHz) Spectrum of compound **2j**

8.135
8.125
8.108
7.839
7.726
7.702
7.697
7.546
7.540
7.533
7.528
7.524
7.486
7.471
7.466
7.446
7.422
7.359
7.333
7.320
7.314
7.309
7.293
7.281
7.252
7.223
7.198
7.180
7.175



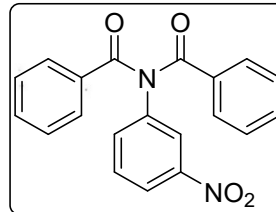
NAME RA-NL-4-51C
EXPNO 1
PROCNO 1
Date_ 20211027
Time 16.19
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.308460 sec
RG 256
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.0000000 sec
D0 1

CHANNEL f1
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 16.72050095 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300091 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



¹H NMR (300 MHz) Spectrum of compound **2k**

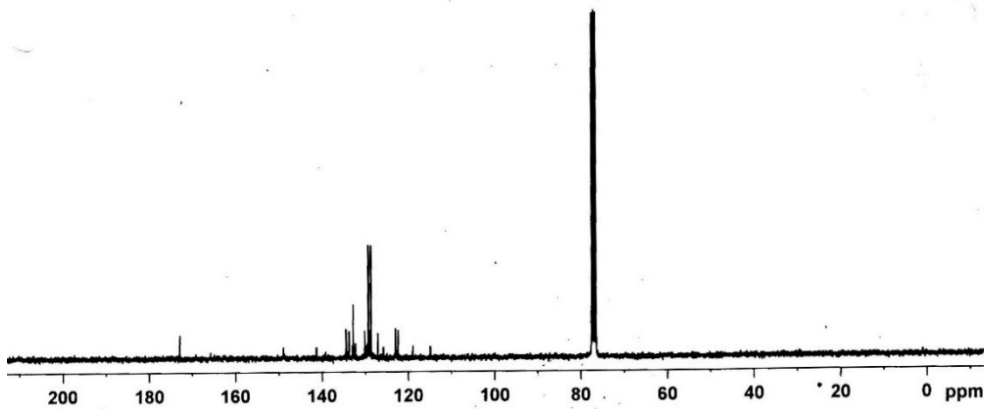
172.93
148.96
134.44
133.74
132.81
130.13
129.30
128.71
127.09
122.97
122.38
77.38
76.96
76.54



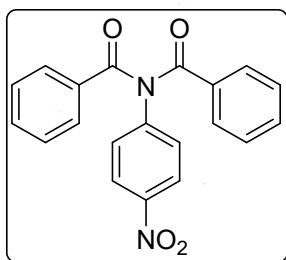
NAME RA-NL-1-276
EXPNO 3
PROCNO 1
Date_ 20190801
Time 23.51
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1671
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 4597.6
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
D0 1

CHANNEL f1
NUC1 13C
P1 10.68 usec
PL1 0.00 dB
PL1W 31.39858055 W
SFO1 75.4752953 MHz

CHANNEL f2
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 15.48 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.29870972 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

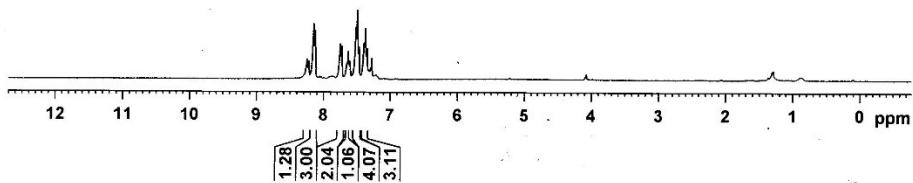


¹³C NMR (75 MHz) Spectrum of compound **2k**

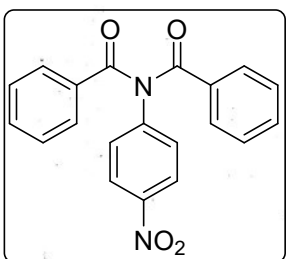


8.255
8.225
8.155
8.130
7.756
7.732
7.633
7.608
7.521
7.496
7.471
7.399
7.378
7.349
7.288
7.278

NAME RA-NL-1-267A
EXPNO 1
PROCNO 1
Date_ 20201022
Time 22.38
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084660 sec
RG 574.7
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.0000000 sec
TD0 1

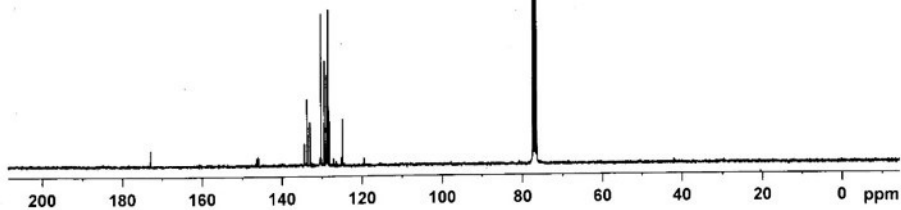


¹H NMR (300 MHz) Spectrum of compound 2I



172.88
145.85
133.67
132.96
130.21
129.36
128.78
128.46
124.82
77.40
76.97
76.55

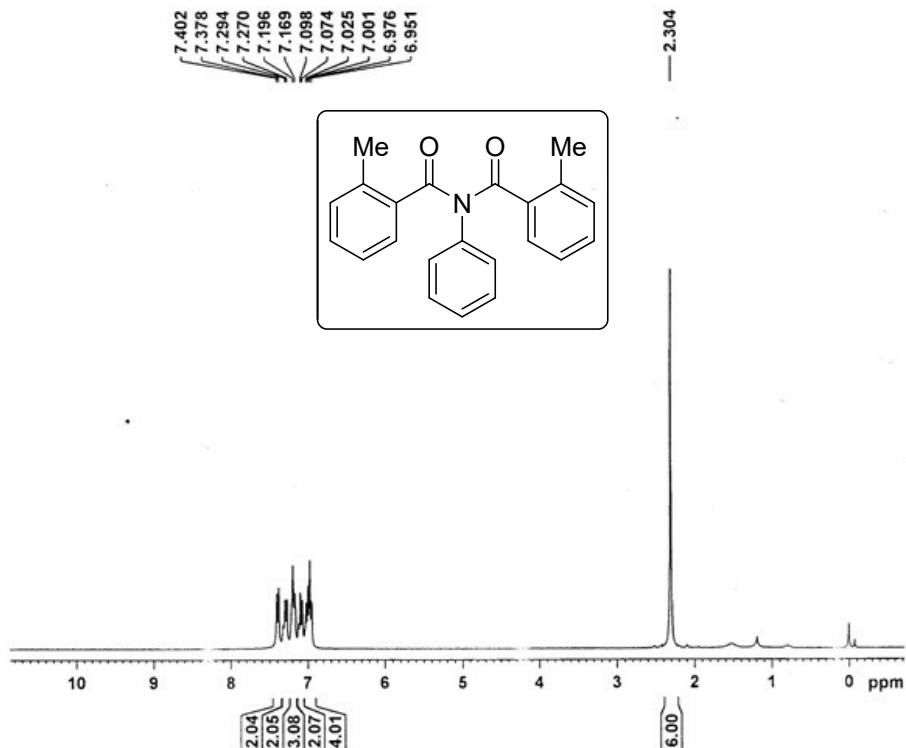
NAME RA-NL-1-267A
EXPNO 2
PROCNO 1
Date_ 20201110
Time 7.00
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 7000
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 4597.6
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.0000000 sec
D11 0.0300000 sec
TD0 1



===== CHANNEL f1 =====
NUC1 13C
P1 12.75 usec
PL1 -1.00 dB
PL1W 39.52846909 W
SFO1 75.4752953 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 14.46 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.37778899 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677460 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

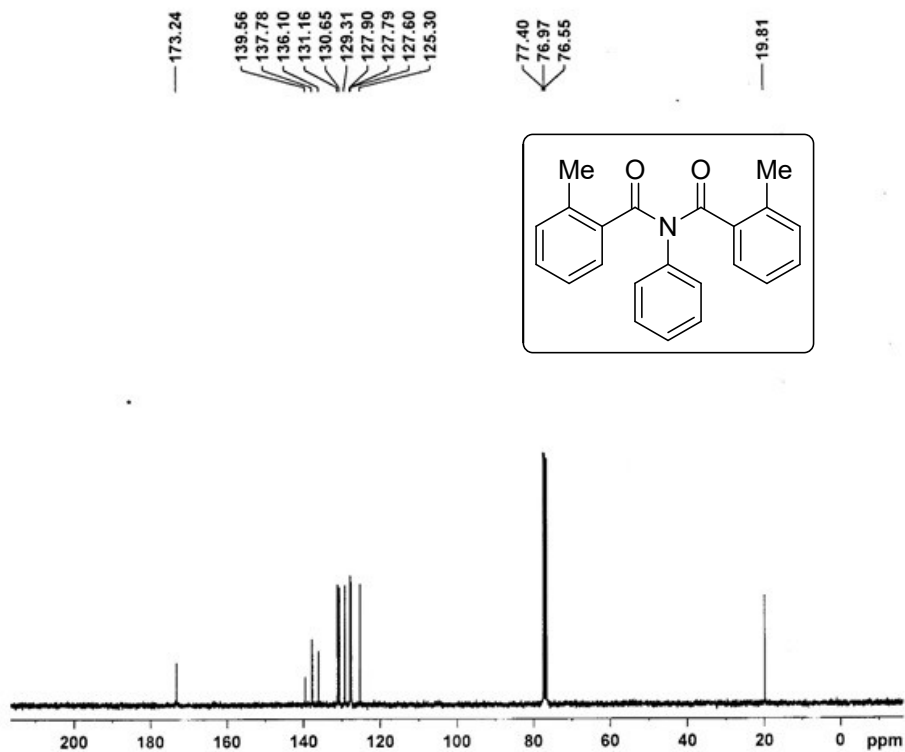
¹³C NMR (75 MHz) Spectrum of compound 2I



NAME RA-NL-2-43A
 EXPNO 2
 PROCNO 1
 Date_ 20191019
 Time 13.59
 INSTRUM spect
 PROBHD 5 mm DUL 13C-1
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 2
 SWH 6172.839 Hz
 FIDRES 0.094190 Hz
 AQ 5.3084660 sec
 RG 161.3
 DW 81.000 usec
 DE 6.50 usec
 TE 300.0 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -1.00 dB
 PL1W 13.28156662 W
 SFO1 300.1318534 MHz
 SI 32768
 SF 300.1300366 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

¹H NMR (300 MHz) Spectrum of compound 4a

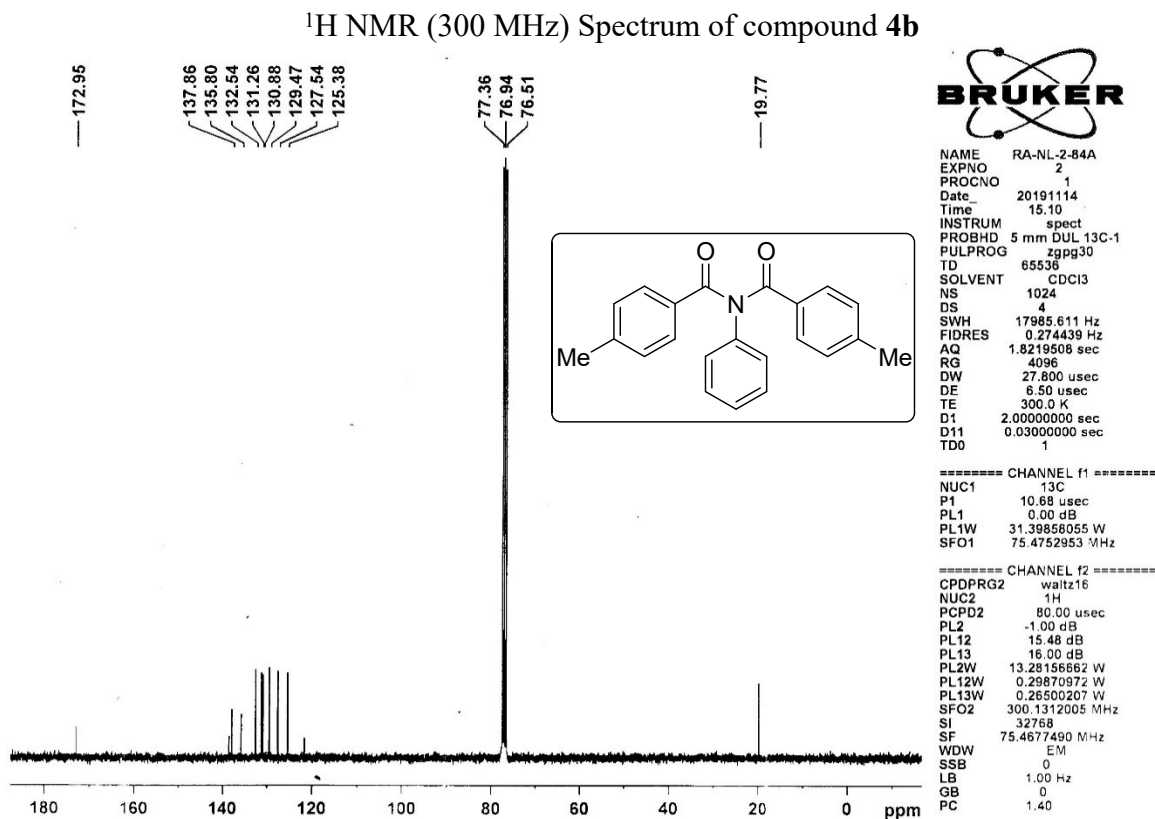
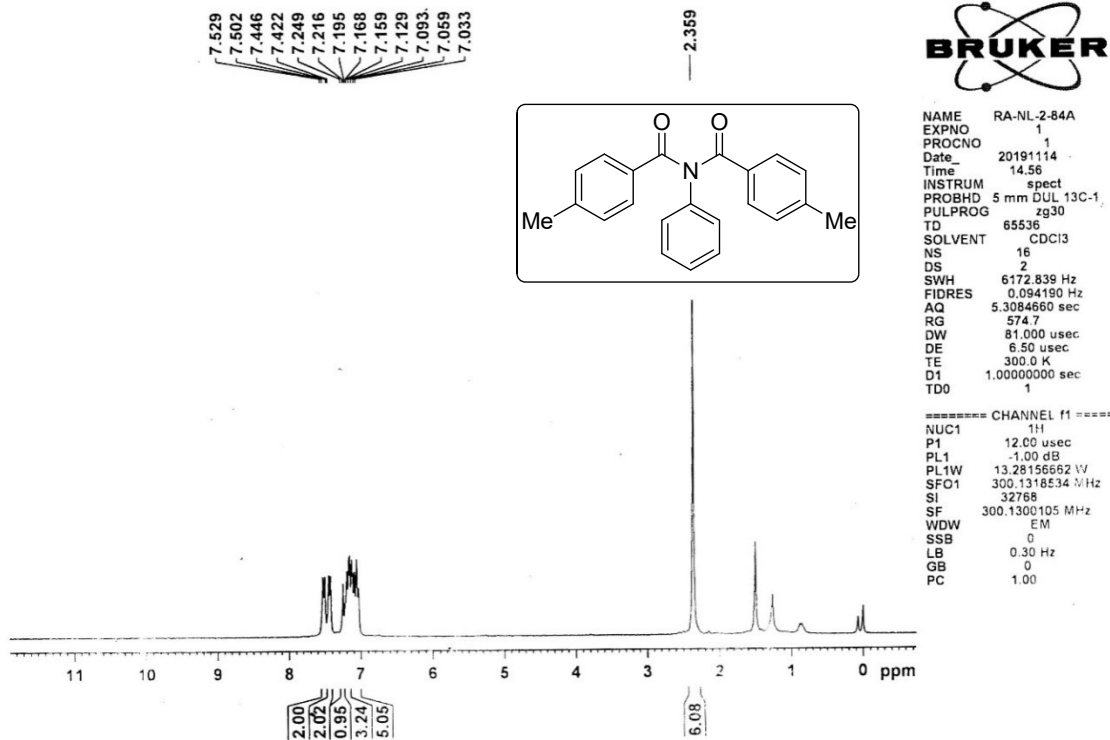


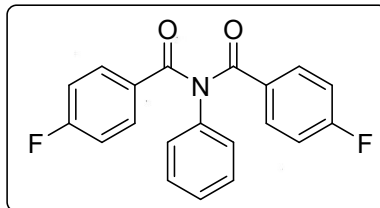
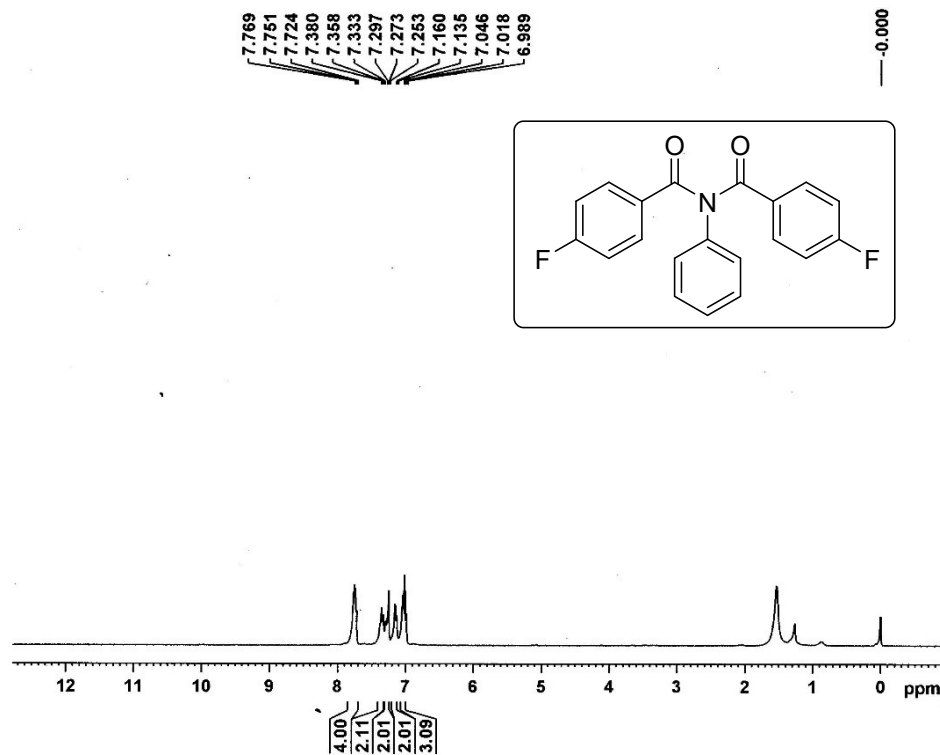
NAME RA-NL-2-43A
 EXPNO 1
 PROCNO 1
 Date_ 20191019
 Time 13.51
 INSTRUM spect
 PROBHD 5 mm DUL 13C-1
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 506
 DS 4
 SWH 17985.611 Hz
 FIDRES 0.274439 Hz
 AQ 1.8219508 sec
 RG 3649.1
 DW 27.800 usec
 DE 6.50 usec
 TE 300.0 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 13C
 P1 10.88 usec
 PL1 0.00 dB
 PL1W 31.39858055 W
 SFO1 75.4752953 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 -1.00 dB
 PL12 15.48 dB
 PL13 16.00 dB
 PL2W 13.28156662 W
 PL12W 0.28870972 W
 PL13W 0.26500207 W
 SFO2 300.1312005 MHz
 SI 32788
 SF 75.4677490 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40

¹³C NMR (75 MHz) Spectrum of compound 4a

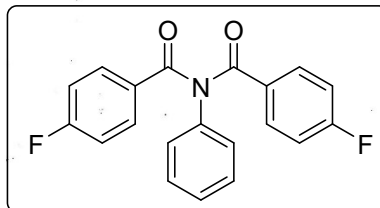
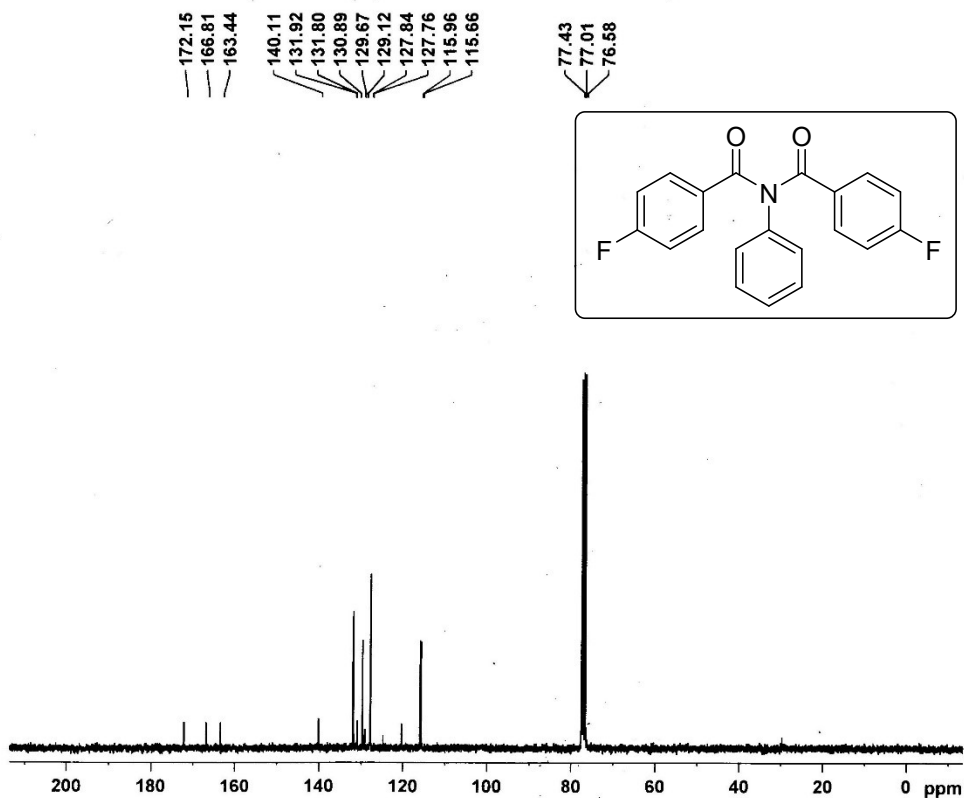




NAME RA-NL-4-56
EXPNO 5
PROCNO 1
Date_ 20211125
Time 15.53
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084660 sec
RG 456.1
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TDO 1

===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 16.72050095 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300089 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

¹H NMR (300 MHz) Spectrum of compound 4c



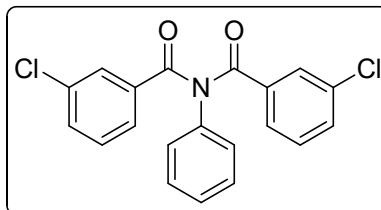
NAME RA-NL-2-352D
EXPNO 2
PROCNO 1
Date_ 20210713
Time 21.29
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1144
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 2298.8
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TDO 1

===== CHANNEL f1 =====
NUC1 13C
P1 12.75 usec
PL1 -1.00 dB
PL1W 39.52846909 W
SFO1 75.4752953 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 14.46 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.37778899 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677453 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

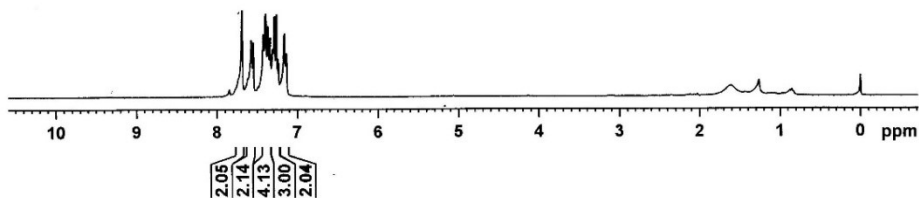
¹³C NMR (75 MHz) Spectrum of compound 4c

7.692
7.577
7.561
7.427
7.400
7.367
7.342
7.310
7.289
7.263
7.249
7.237
7.163
7.139



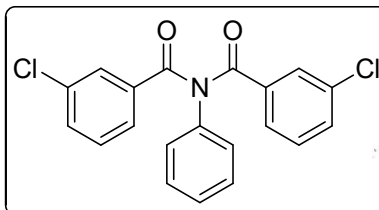
NAME RA-NL-2-125A
EXPNO 2
PROCNO 1
Date_ 20191212
Time 15.20
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084660 sec
RG 322.5
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.0000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 12.00 usec
PL1 -1.00 dB
PL1W 13.28156662 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300097 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



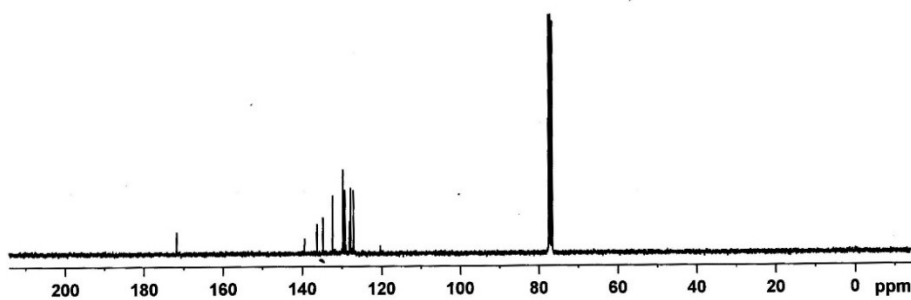
¹H NMR (300 MHz) Spectrum of compound 4d

171.77
139.45
136.36
134.82
132.36
129.74
129.70
129.30
128.12
127.83
127.08
77.38
76.95
76.53

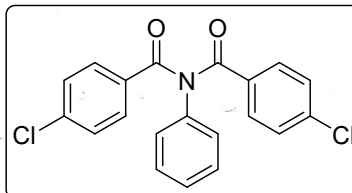
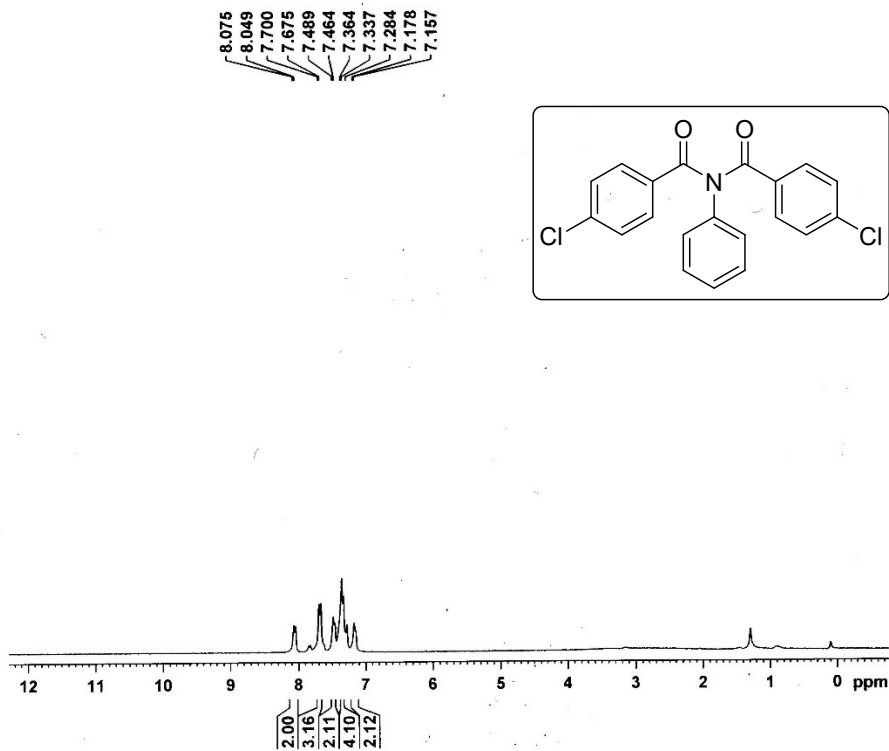


NAME RA-NL-2-125A
EXPNO 3
PROCNO 1
Date_ 20191212
Time 16.27
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1024
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 9195.2
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.0000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 10.68 usec
PL1 0.00 dB
PL1W 31.39858055 W
SFO1 75.4752953 MHz
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 15.48 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.29870972 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



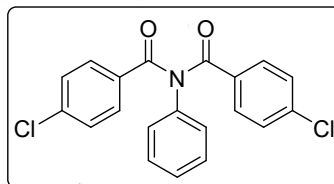
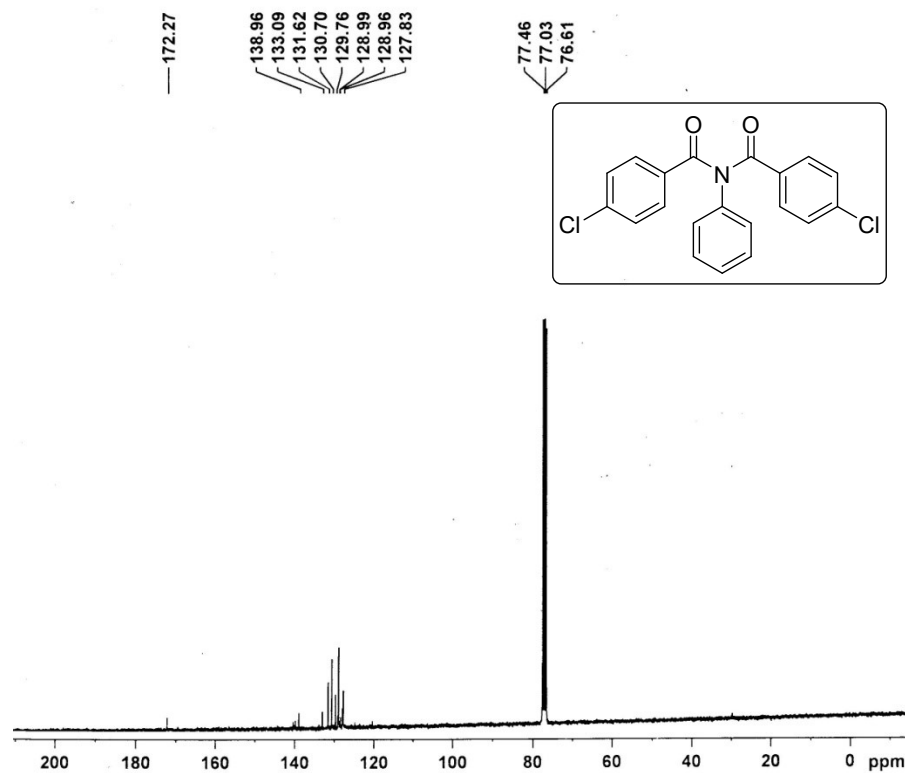
¹³C NMR (75 MHz) Spectrum of compound 4d



NAME RA-NL-2-344A
EXPNO 1
PROCNO 1
Date 20201021
Time 12.43
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084680 sec
RG 812.7
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 13.50 usec
PL1 -1.00 dB
PL1W 13.28156662 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300011 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

¹H NMR (300 MHz) Spectrum of compound 4e

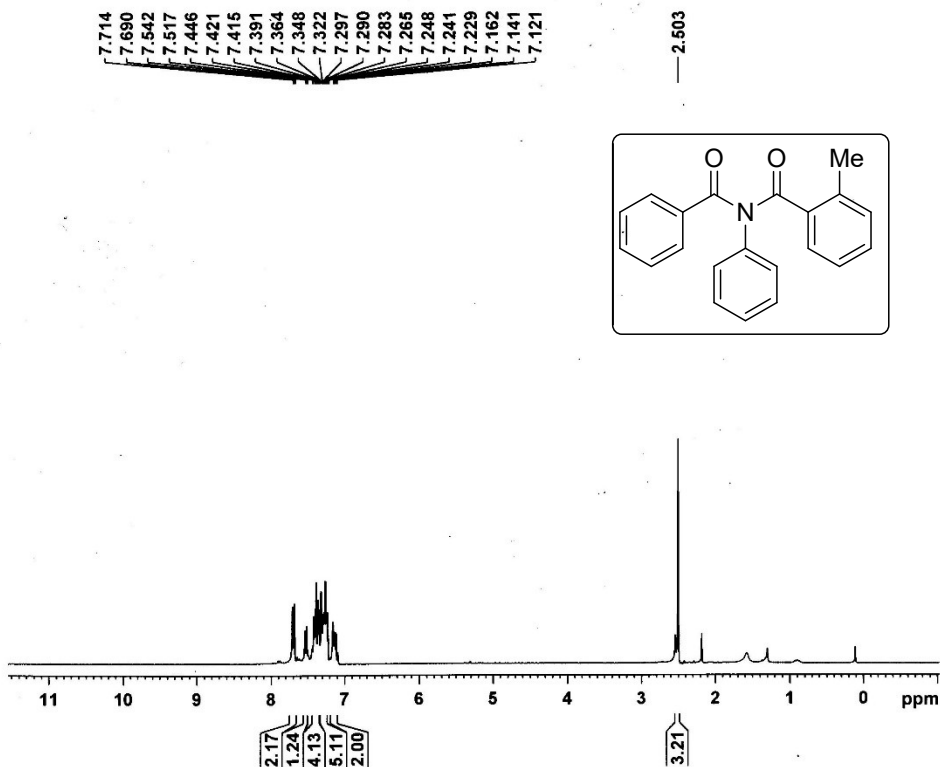


NAME RA-NL-2-344
EXPNO 1
PROCNO 1
Date 20201105
Time 10.10
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 4000
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 3251
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 12.75 usec
PL1 -1.00 dB
PL1W 39.52846909 W
SFO1 75.4752953 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 14.46 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.37778899 W
PL13W 0.28500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677414 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

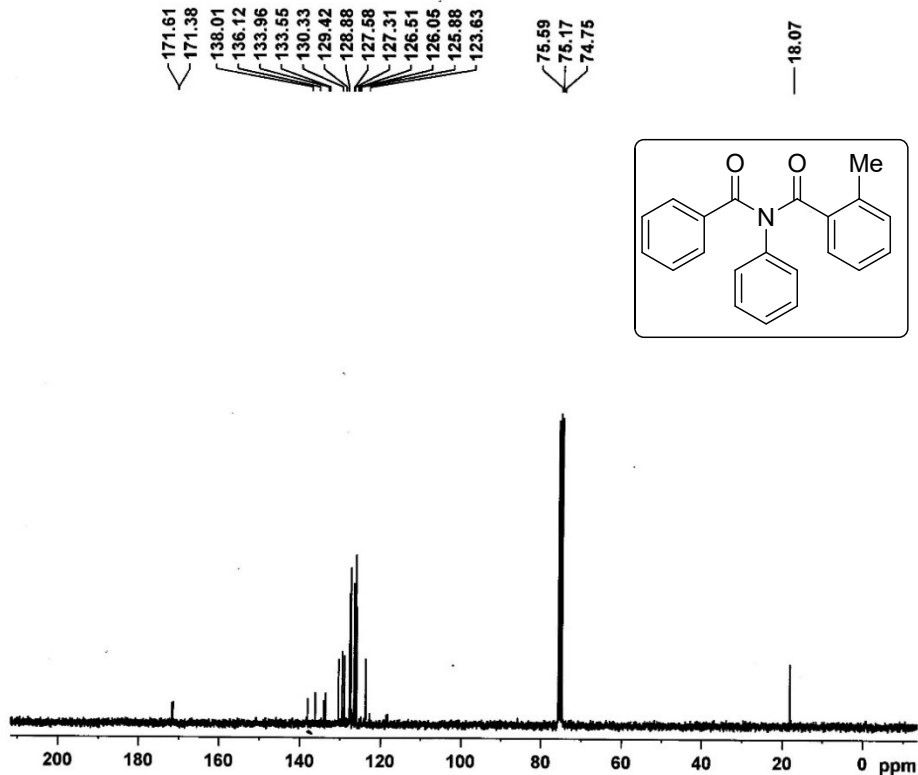
¹³C NMR (75 MHz) Spectrum of compound 4e



NAME RA-NL-2-139
EXPNO 1
PROCNO 1
Date_ 20200109
Time 21.22
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084860 sec
RG 256
DW 81.000 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 13.50 usec
PL1 -1.00 dB
PL1W 13.28156662 W
SFO1 300.1318534 MHz
SI 32768
SF 300.1300000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

¹H NMR (300 MHz) Spectrum of compound 4f



NAME RA-NL-2-139
EXPNO 2
PROCNO 1
Date_ 20200110
Time 14.39
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1037
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 5160.6
DW 27.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 12.75 usec
PL1 -1.00 dB
PL1W 39.52846909 W
SFO1 75.4752953 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 -1.00 dB
PL12 14.46 dB
PL13 16.00 dB
PL2W 13.28156662 W
PL12W 0.37778899 W
PL13W 0.26500207 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4678338 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

¹³C NMR (75 MHz) Spectrum of compound 4f