Electronic Supplementary Information

For

Synthesis and characterisation of cycloruthenated benzhydrazone complexes: Catalytic application to selective oxidative cleavage of olefins to aldehydes.

Thimma Sambamoorthy Manikandan,[†] Rengan Ramesh,[*,†] and David Semeril[‡]

[a] *School of chemistry, Bharathidasan University, Tiruchirappalli-620 024, Tamilnadu, India.*

[b] *Laboratory of Molecular Inorganic Chemistry and Catalysis, University of Strasbourg, UMR 7177,CNRS, France.*

*To whom correspondence should be made: Tel: +91-431-2407053, Fax: +91-431-2407045, E-mail: rrameshbdu@gmail.com.

Contents:

1. ^{1}H NMR spectra of the complexes 1-4 S2
2. ^{13}C NMR spectra of the complexes 1-4 S4
3. Table for Crystallographic data and refinement parameters S6
4. Table for Selected bond lengths and bond angles S7
5. GC-MS data for the oxidative cleavage of olefins to aldehyde product S8
6. ^{1}H and ^{13}C NMR spectra of catalytic product S23

1. ^{1}H NMR spectra of complexes

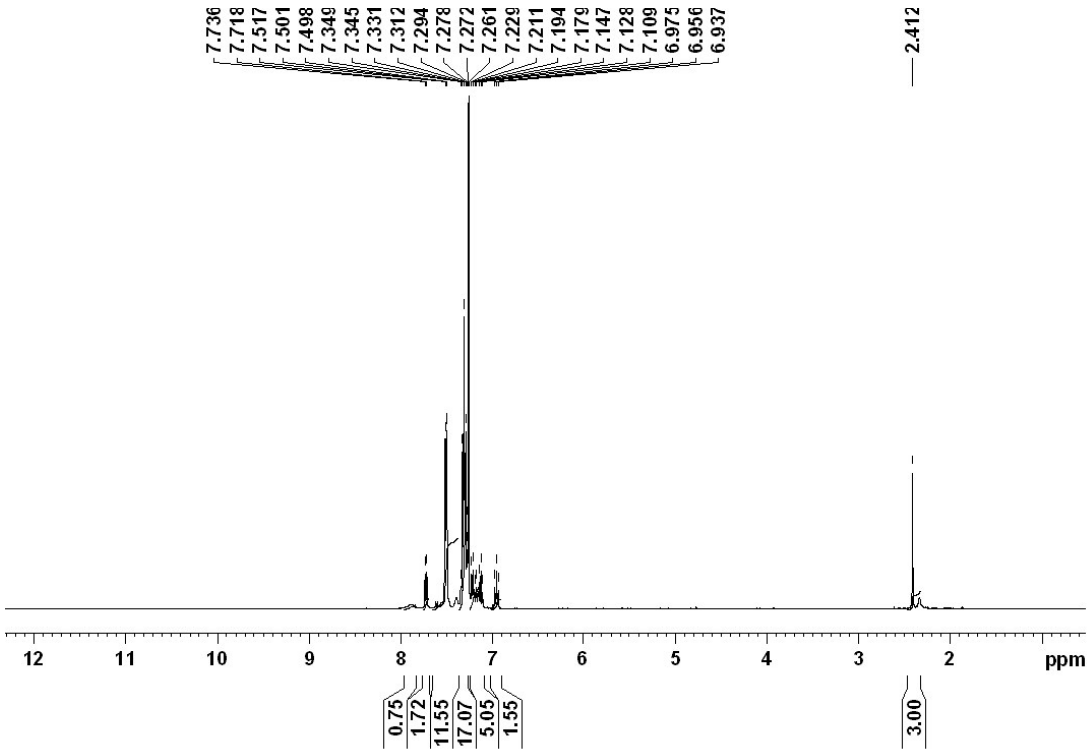


Figure S1. ^{1}H NMR spectrum of complex **(1)**

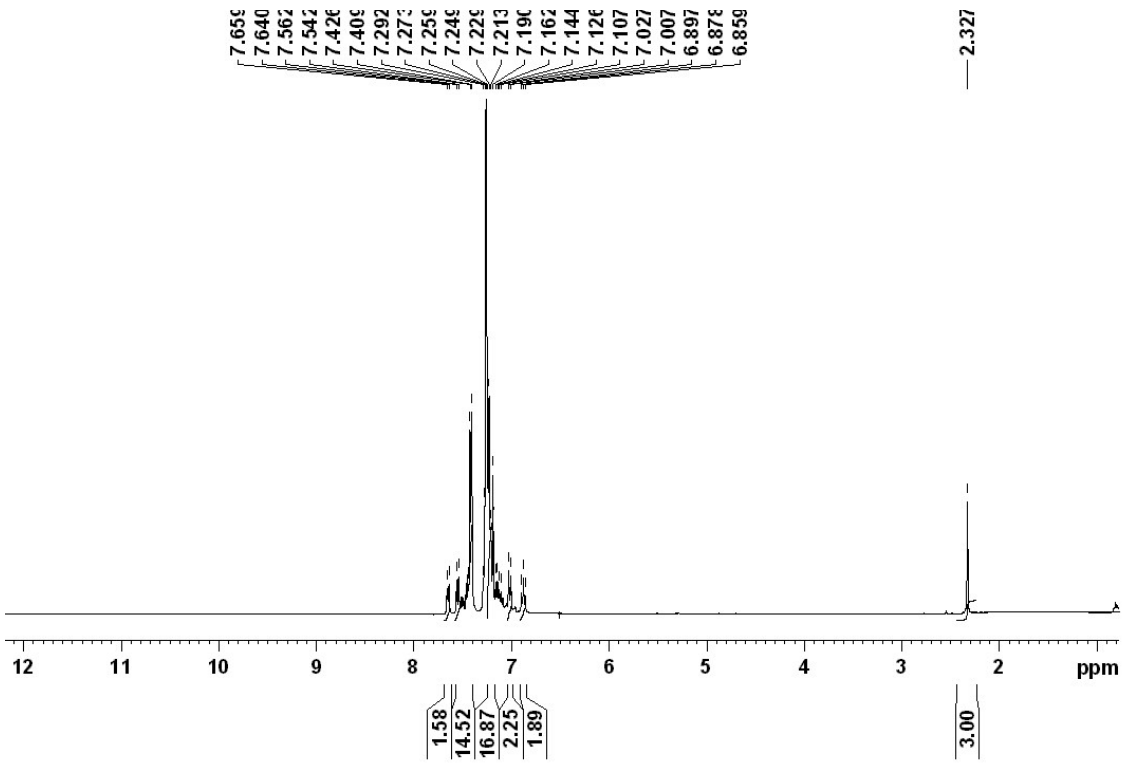


Figure S2. ^{1}H NMR spectrum of complex **(2)**

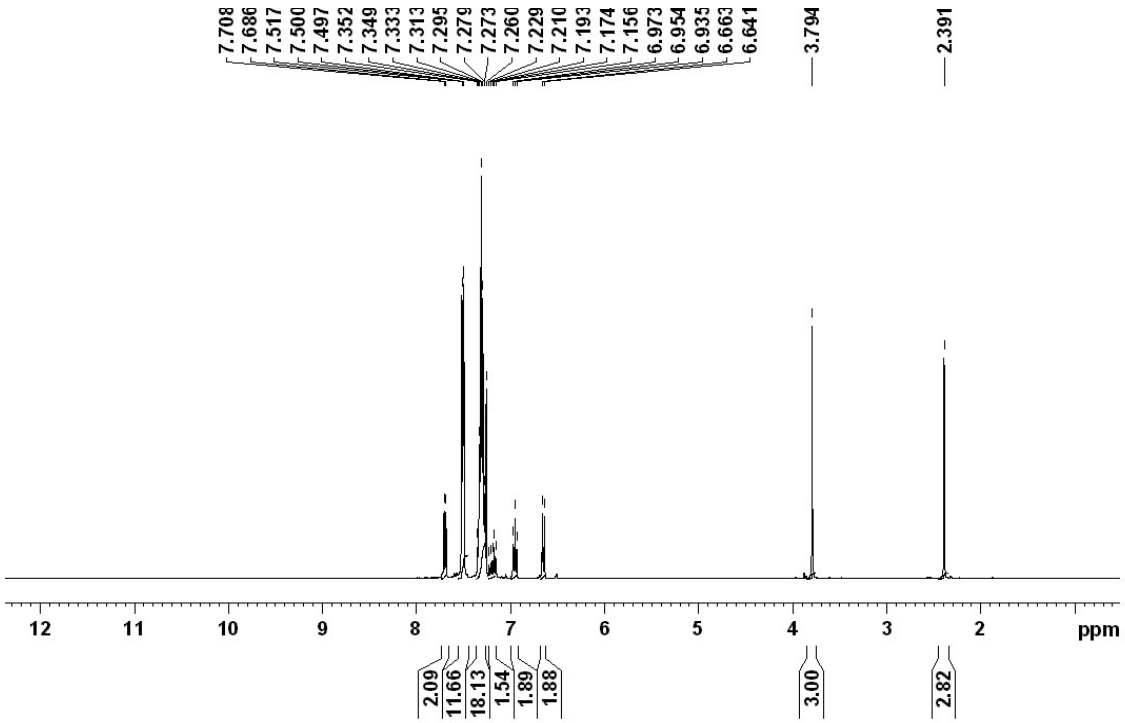


Figure S3. [1]H NMR spectrum of complex **(3)**

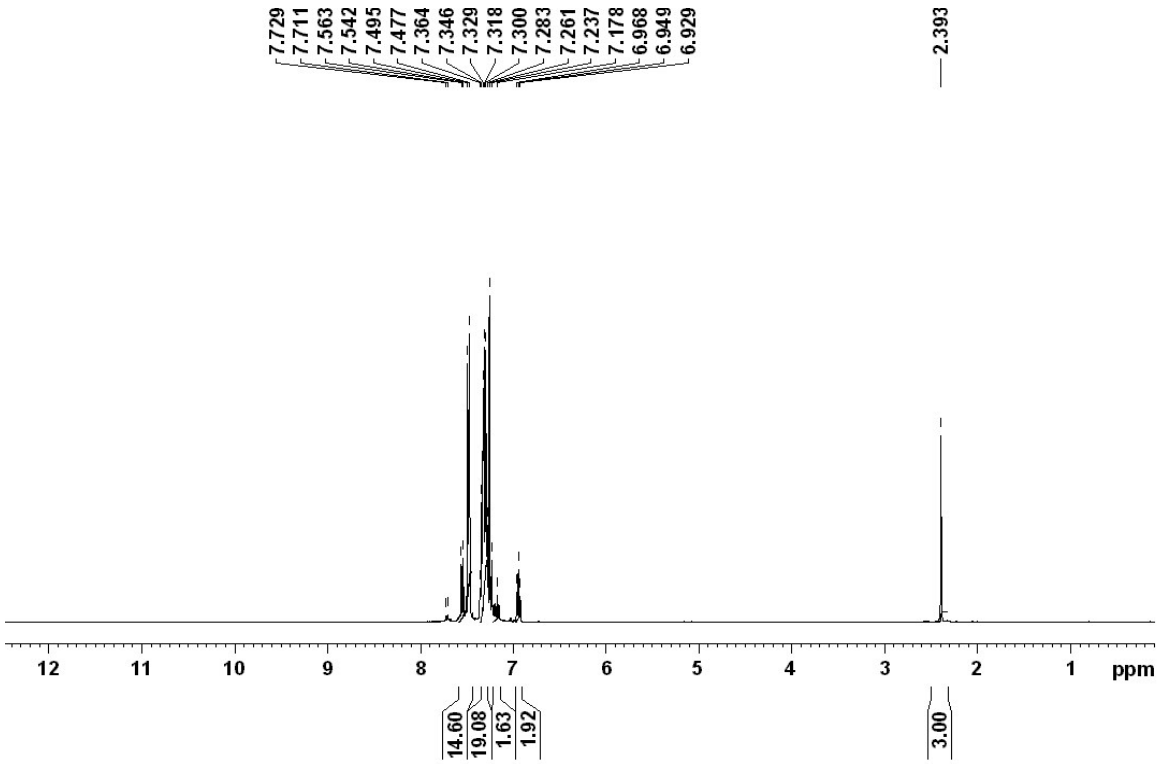


Figure S4. [1]H NMR spectrum of complex **(4)**

2. ^{13}C NMR spectra of complexes

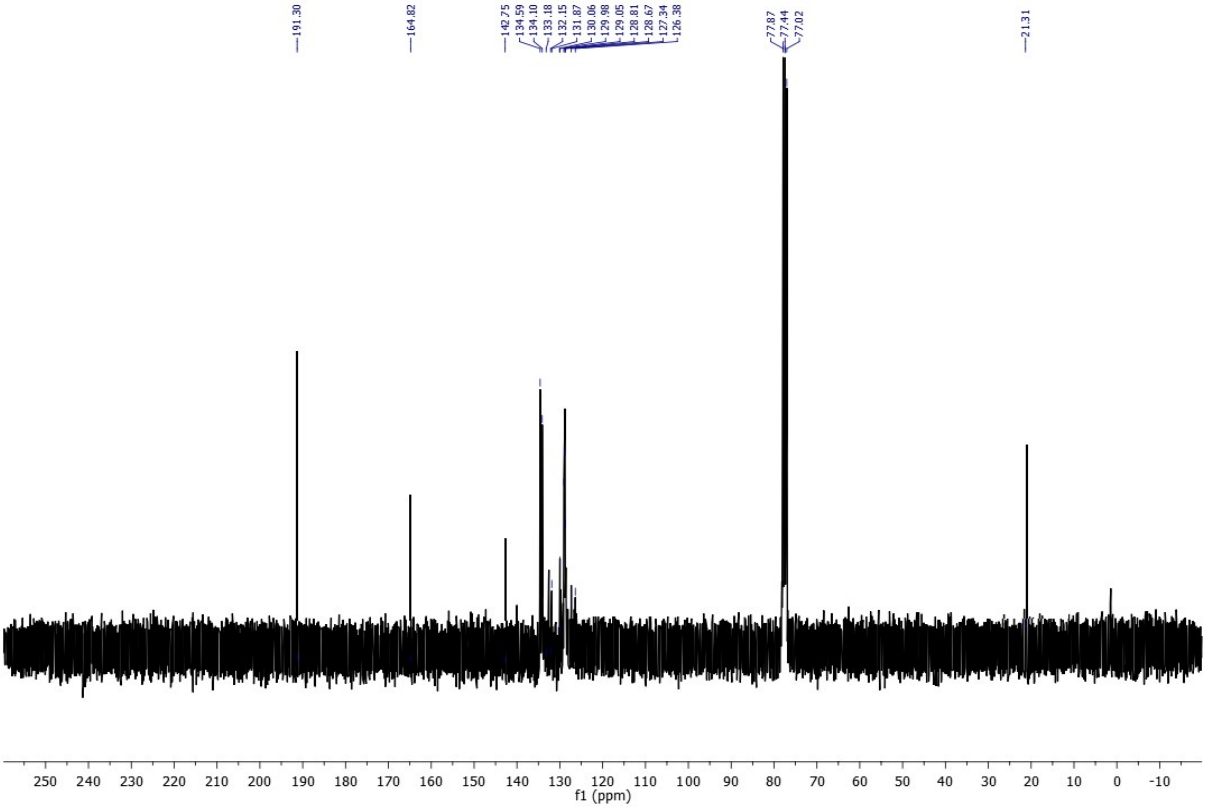


Figure S5. ^{13}C NMR spectrum of complex **(1)**

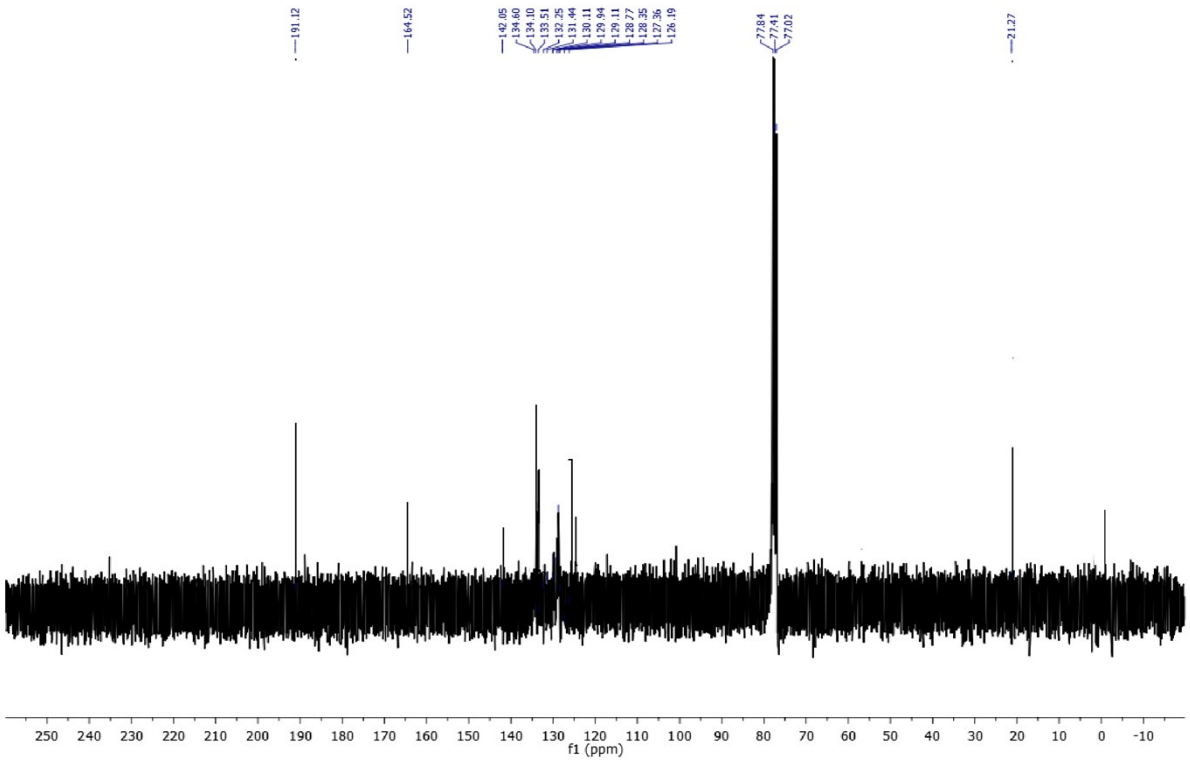


Figure S6. ^{13}C NMR spectrum of complex **(2)**

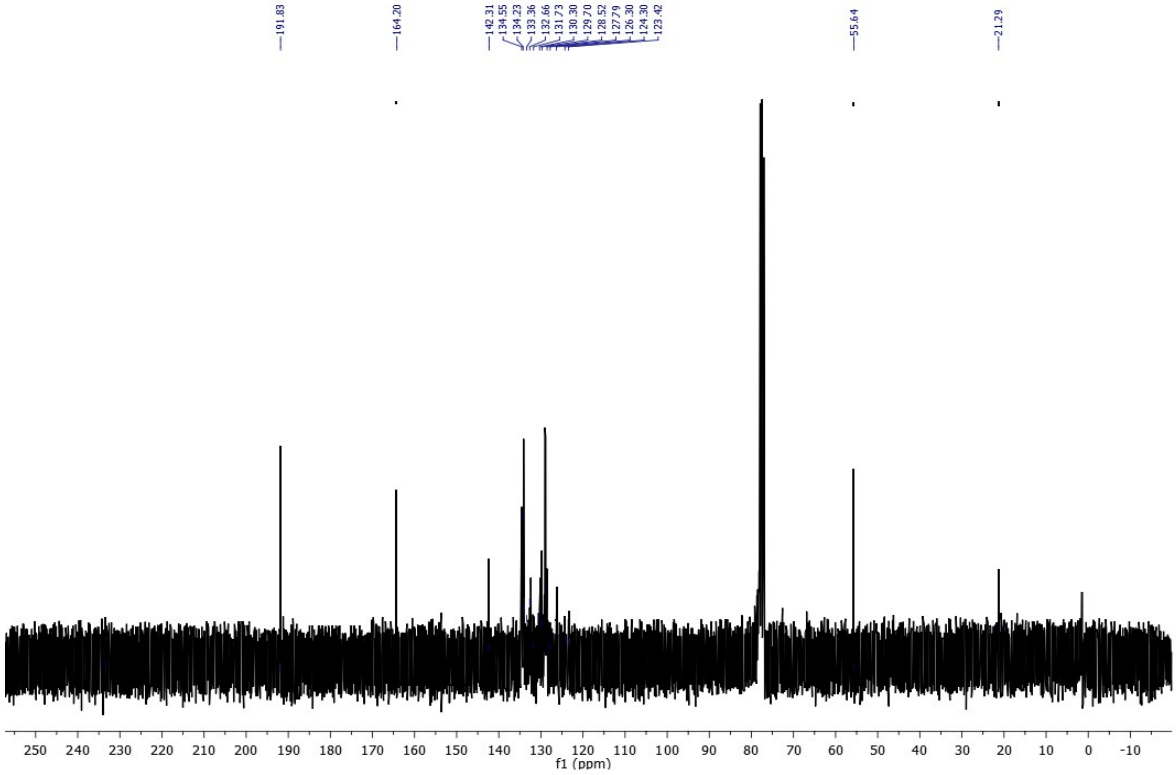


Figure S7. ^{13}C NMR spectrum of complex **(3)**

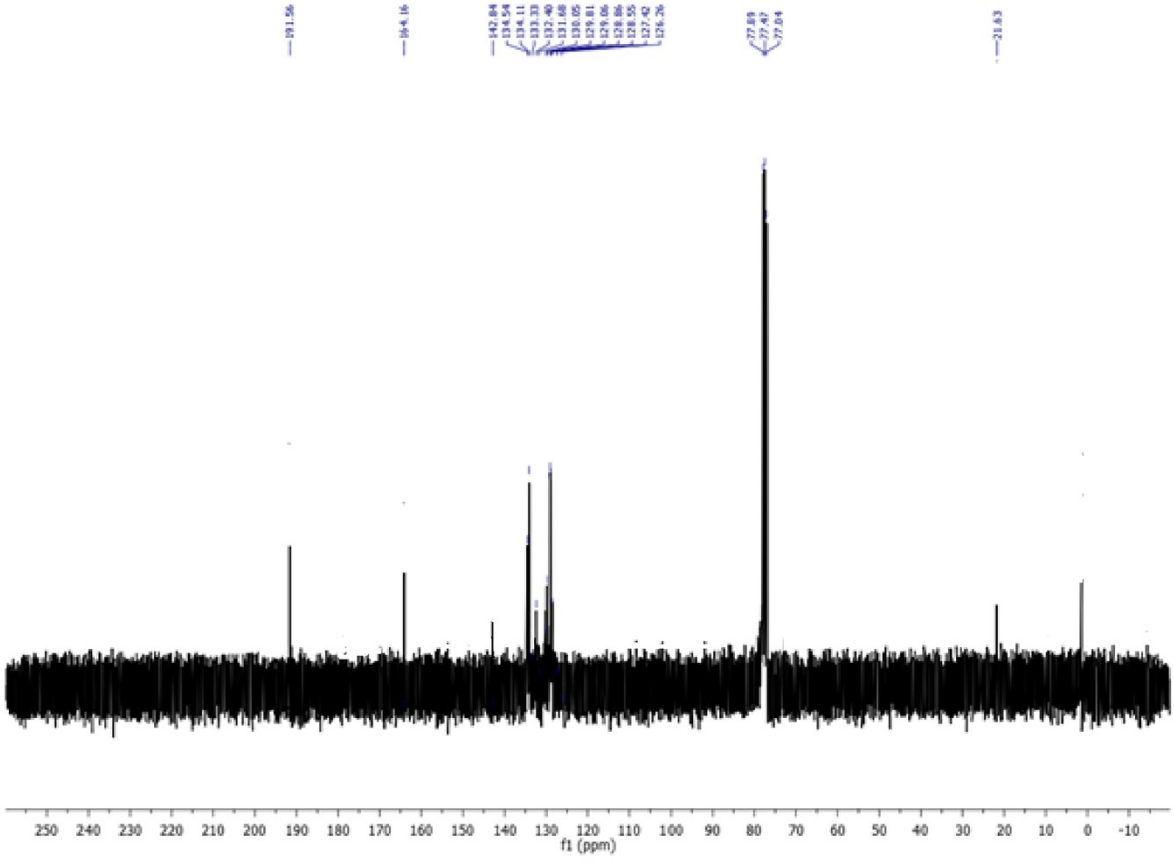


Figure S8. ^{13}C NMR spectrum of complex **(4)**

Table S1 Crystal data and structure refinement for the complexes **3** and **4.**

	Complex **3**	Complex **4**
Empirical formula	$C_{53}H_{44}As_2N_2O_3Ru.CHCl_3$	$C_{52}H_{41}As_2BrN_2O_2Ru.CHCl_3$
Formula weight	1127.18	1176.05
Temperature (K)	296K	296K
Wavelength (Å)	0.71073	0.71073
Crystal system	Monoclinic	Monoclinic
Space group	P21/n	P21/n
a (Å)	15.5853(10)	15.2764(10)
b (Å)	18.6290(12)	18.6423(12)
c (Å)	17.3913(11)	17.4632(12)
α (°)	90	90
β (°)	95.754(4)	95.039(4)
γ (°)	90	90
Volume ($Å^3$)	5023.9(6)	4954.1(6)
Z	4	4
Calculated density (Mg m^{-3})	1.490	1.577
Absorption coefficient (mm^1)	1.823	2.653
F (000)	2272	2344
Crystal size (mm^3)	0.3 x 0.2 x 0.2	0.3 x 0.2 x 0.2
Theta range (°)	1.46 to 28.48	3.207 to 25.999
Limiting indices	-17<=h<=18 -22<=k<=22 -20<=l<=20	-18<=h<=18 -22<=k<=22 -16<=l<=21
Reflections collected/unique	37848/8809	42854/9672
Refinement method	Full-matrix least-square on F^2	Full-matrix least-square on F^2
Data/restraints/parameters	8809/718/736	9672/441/688
Goodness-of –fit on F^2	1.103	1.043
Final R indices[I>2σ(I)]		
R_1, wR_2	0.0567, 0.1569	0.0487, 0.12820
R indices (all data)		
R_1, wR_2	0.0882, 0.1937	0.0752, 0.1489
R (int)	0.0548	0.0551
Largest diff peak, hole (e $Å^{-3}$)	0.886, -1.460	1.116, -0.873

Table S2. Selected bond lengths (Å) for complexes **3** and **4**.

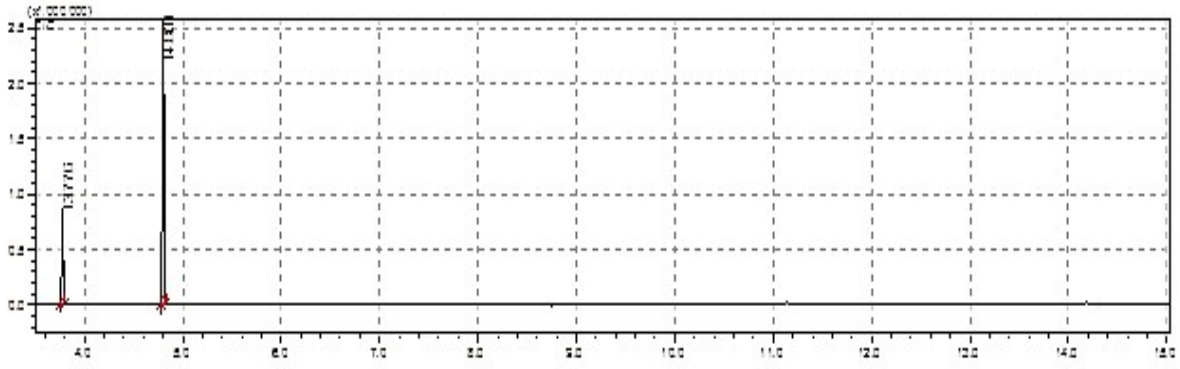
Complex 3		Complex 4	
Ru1–C54	1.929(9)	Ru1–C1	1.893(6)
Ru1–C1	2.044(7)	Ru1–C2	2.052(5)
Ru1–O2	2.183(4)	Ru1–O3	2.175(3)
Ru1–N1	2.059(5)	Ru1–N1	2.052(4)
Ru1-As1	2.4587(8)	Ru1-As1	2.447(6)
Ru1–As2	2.4612(7)	Ru1–As2	2.4435(6)
N1–N2	1.372(7)	N1–N2	1.377(6)

Table S3. Selected bond angles (°) for the complexes **3** and **4**

Complex 3		Complex 4	
C1-Ru1-C54	103.1(3)	C2-Ru1-C1	100.7(2)
C1-Ru1-N1	78.8(2)	C2-Ru1-N1	79.2(2)
C1-Ru1-O2	152.9(2)	C2-Ru1-O3	154.1(2)
C1-Ru1-As1	88.1(2)	C2-Ru1-As1	87.8(1)
C1-Ru1-As2	90.5(2)	C2-Ru1-As2	91.2(1)
C54-Ru1-N1	177.8(3)	C1-Ru1-N1	178.8(2)
C54-Ru1-O2	104.0(3)	C1-Ru1-O2	105.2(2)
C54-Ru1-As1	92.0(2)	C1-Ru1-As1	92.7(2)
C54-Ru1-As2	91.2(2)	C1-Ru1-As2	91.0(2)

3. GC-MS data for the oxidative cleavage of olefins to aldehyde product

Entry No: 1

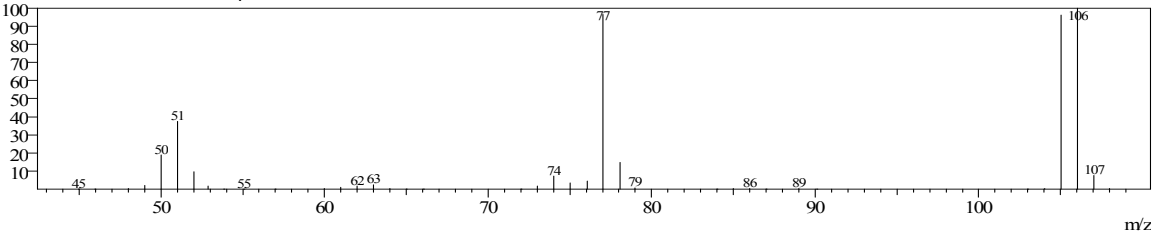


Peak Report

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	3.773	3.765	3.790	79646	3.17	120769	BENZENE, ETHENYL-
2	4.798	4.770	4.835	2434205	96.83	1971010	Benzaldehyde
				2513851	100.00	2091779	

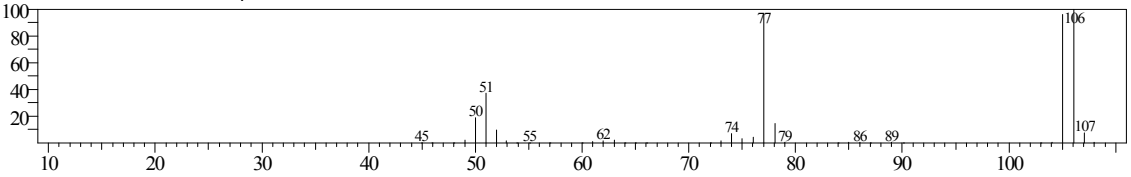
Spectrum

Line#:1 R.Time:4.810(Scan#:263)
MassPeaks:38
RawMode:Averaged 4.805-4.815(262-264) BasePeak:106.05(2073330)
BG Mode:Calc. from Peak Group 1 - Event 1



Library

<< Target >>
Line#:1 R.Time:4.810(Scan#:263) MassPeaks:38
RawMode:Averaged 4.805-4.815(262-264) BasePeak:106.05(2073330)
BG Mode:Calc. from Peak Group 1 - Event 1 Scan



Hit#:1 Entry:2410 Library:NIST11s.lib
SI:99 Formula:C7H6O CAS:100-52-7 MolWeight:106 RetIndex:982
CompName:Benzaldehyde $$ Artificial Almond Oil $$ Benzaldehyde FFC $$ Benzenecarbonal $$ Benzenecarboxaldehyde $$ Benzoic aldehyde $$ Phenyl

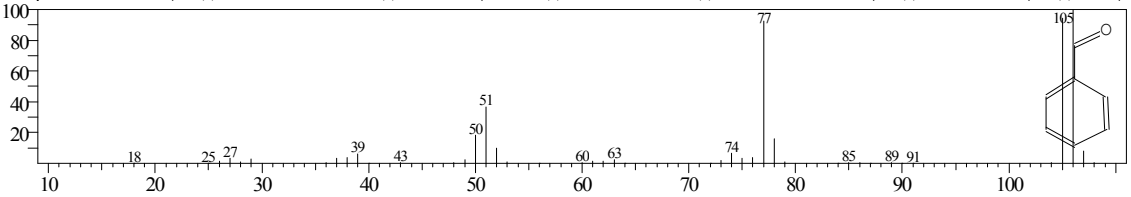
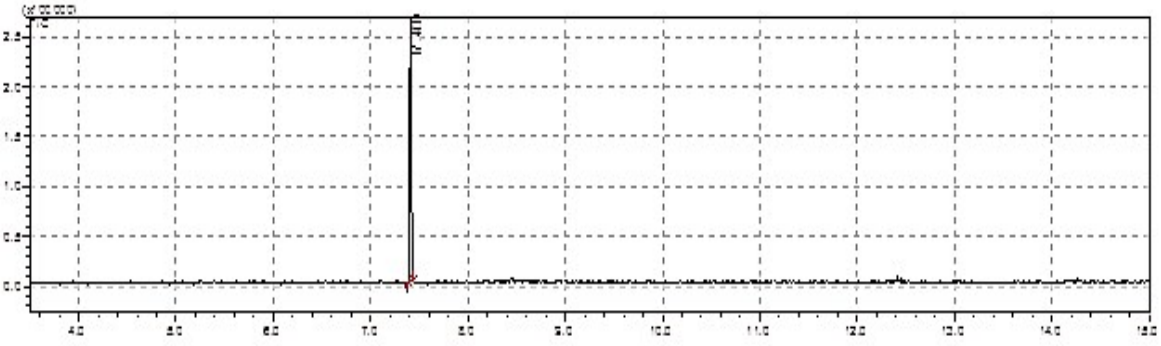


Figure S9. GC-MS Chromatogram for entry **1** in **Table 4**

Entry No: 2

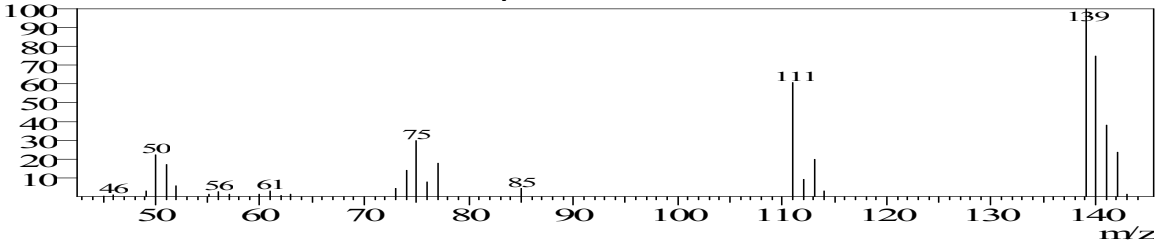


Peak Report

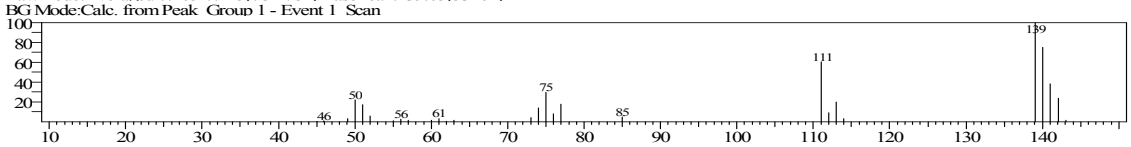
Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	7.409	7.375	7.445	349942	100.00	278129	BENZALDEHYDE, 4-CHLORO-
				349942	100.00	278129	

Spectrum

Line#:1 R.Time:7.410(Scan#:783)
MassPeaks:28
RawMode:Averaged 7.405-7.415(782-784) BasePeak:139.05(53204)
BG Mode:Calc. from Peak Group 1 - Event 1



Library
<< Target >>
Line#:1 R.Time:7.410(Scan#:783) MassPeaks:28
RawMode:Averaged 7.405-7.415(782-784) BasePeak:139.05(53204)
BG Mode:Calc. from Peak Group 1 - Event 1 Scan



Hit#:1 Entry:31119 Library:WILEY8.LIB
SI:97 Formula:C7H5ClO CAS:104-88-1 MolWeight:140 RetIndex:0
CompName:BENZALDEHYDE, 4-CHLORO- $$ 4-CHLOROBENZALDEHYDE $$ 4-CHLORBENZALDEHYD $$ 4-CHLOROBENZENALDEHYDE

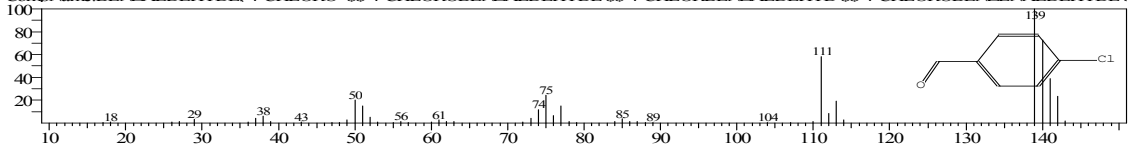
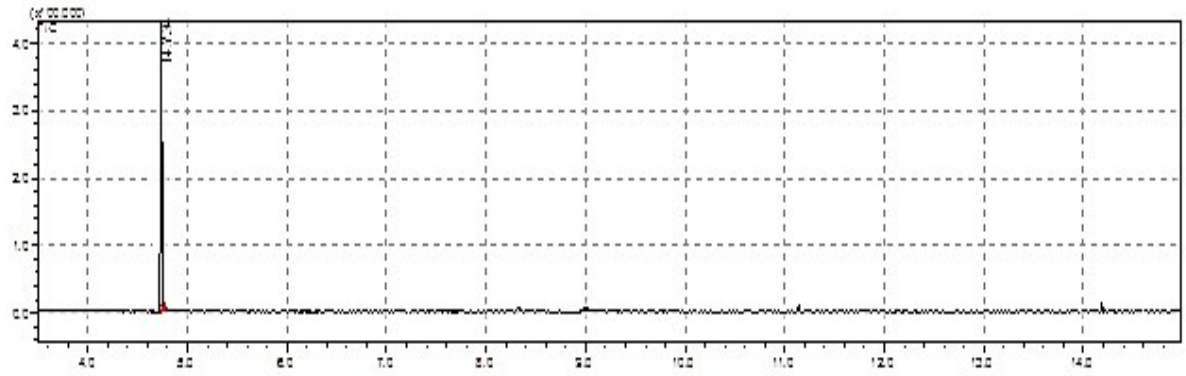


Figure S10. GC-MS Chromatogram for entry **2** in **Table 4**

Entry No: 3

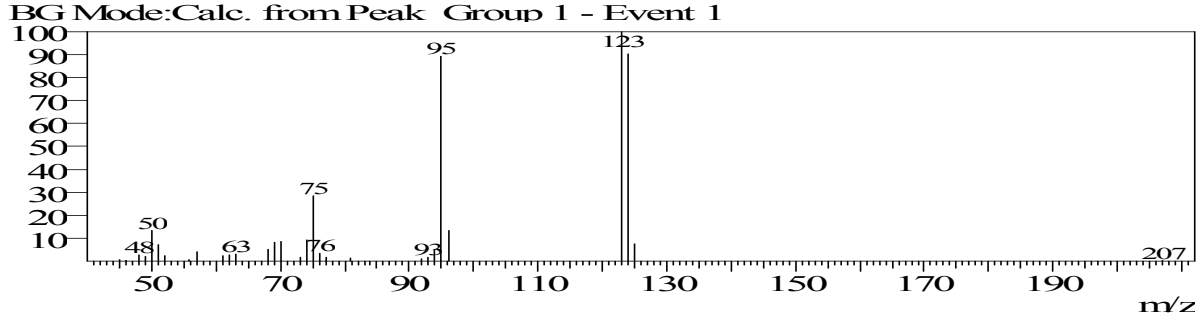


Peak Report

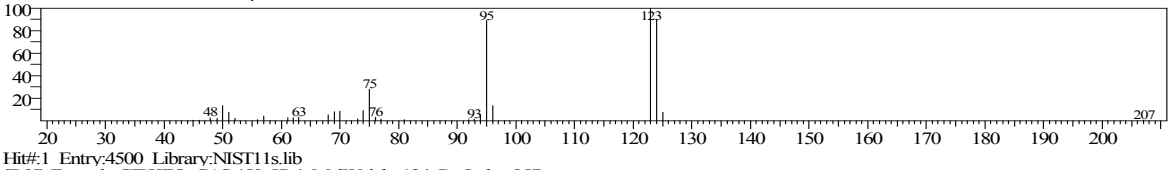
Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	4.734	4.710	4.765	506027	100.00	453368	Benzaldehyde, 4-fluoro-
				506027	100.00	453368	

Spectrum

Line#:1 R.Time:4.735(Scan#:248)
MassPeaks:30
RawMode:Averaged 4.730-4.740(247-249) BasePeak:123.00(93749)
BG Mode:Calc. from Peak Group 1 - Event 1



Library
<< Target >>
Line#:1 R.Time:4.735(Scan#:248) MassPeaks:30
RawMode:Averaged 4.730-4.740(247-249) BasePeak:123.00(93749)
BG Mode:Calc. from Peak Group 1 - Event 1 Scan



Hit#:1 Entry:4500 Library:NIST11s.lib
SI:97 Formula:C7H5FO CAS:459-57-4 MolWeight:124 RetIndex:957
CompName:Benzaldehyde, 4-fluoro- $$ Benzaldehyde, p-fluoro- $$ p-Fluorobenzaldehyde $$ 4-Fluorobenzaldehyde $$ para-Fluorobenzaldehyde $$

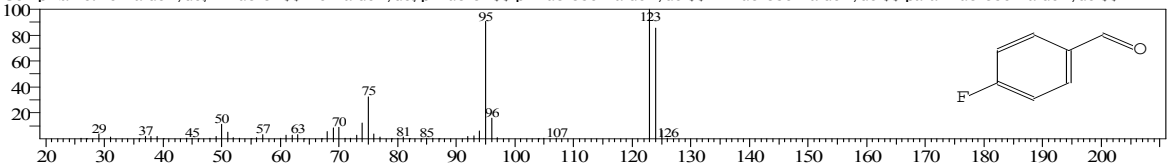
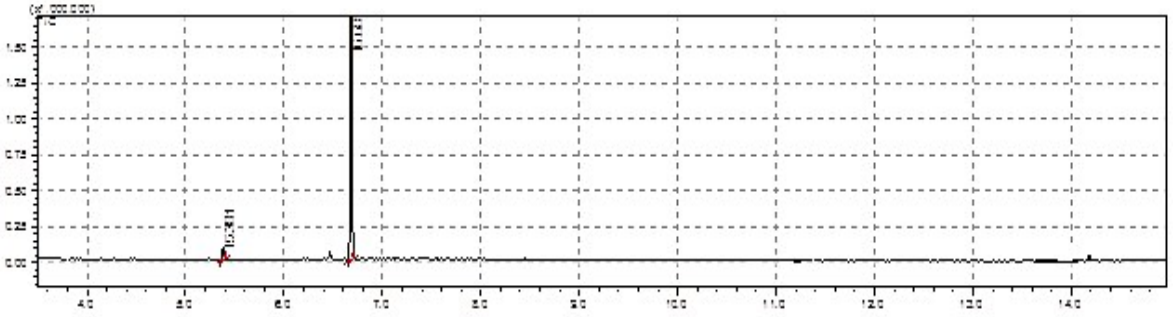


Figure S11. GC-MS Chromatogram for entry **3** in **Table 4**

Entry No: 4



Peak Report

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	5.381	5.340	5.420	91943	3.90	81429	BENZENE, 1-ETHENYL-4-METHYL-
2	6.681	6.650	6.720	2264279	96.10	1780076	Benzaldehyde, 4-methyl-
				2356222	100.00	1861505	

Spectrum

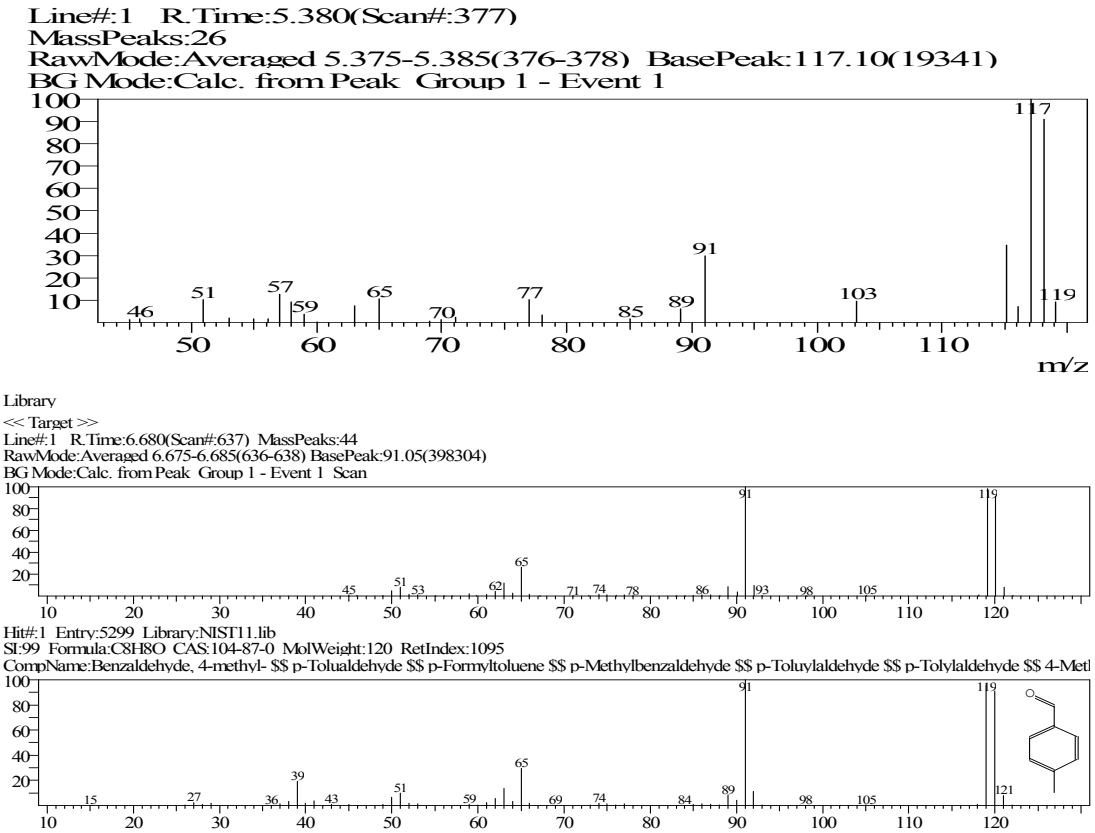
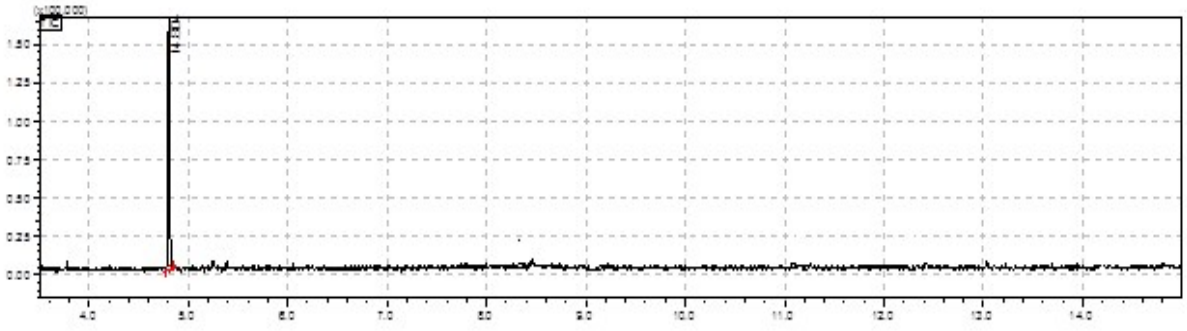


Figure S12. GC-MS Chromatogram for entry **4** in **Table 4**

Entry No: 5

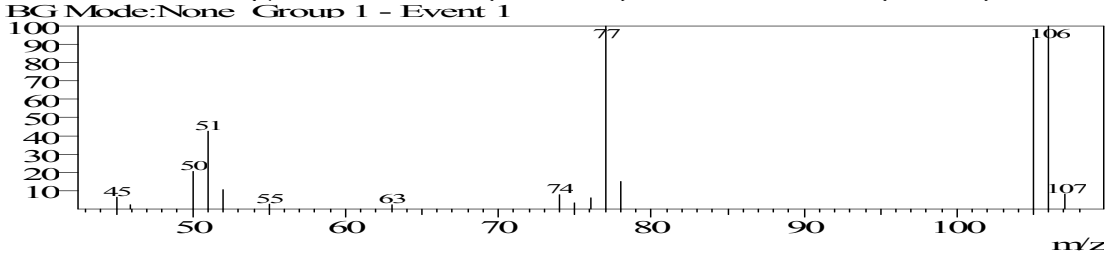


Peak Report

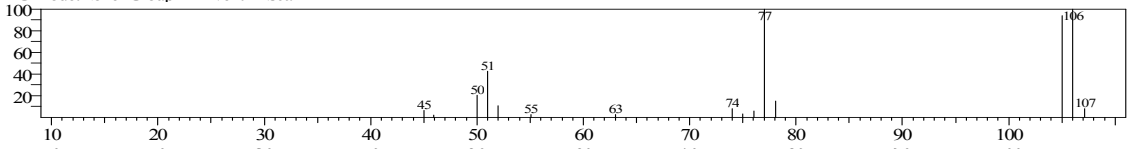
Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	4.804	4.780	4.840	194658	100.00	173258	benzaldehyde
				194658	100.00	173258	

Spectrum

Line#:1 R.Time:4.805(Scan#:262)
MassPeaks:15
RawMode:Averaged 4.805-4.805(262-262) BasePeak:77.00(41822)
BG Mode:None Group 1 - Event 1



Library
<< Target >>
Line#:1 R.Time:4.805(Scan#:262) MassPeaks:15
RawMode:Averaged 4.805-4.805(262-262) BasePeak:77.00(41822)
BG Mode:None Group 1 - Event 1 Scan



Hit#:2 Entry:2410 Library:NIST11s.lib
SI:96 Formula:C7H6O CAS:100-52-7 MolWeight:106 RetIndex:982
CompName:Benzaldehyde $$ Artificial Almond Oil $$ Benzaldehyde FFC $$ Benzenecarbonal $$ Benzenecarboxaldehyde $$ Benzoic aldehyde $$ Phenyl

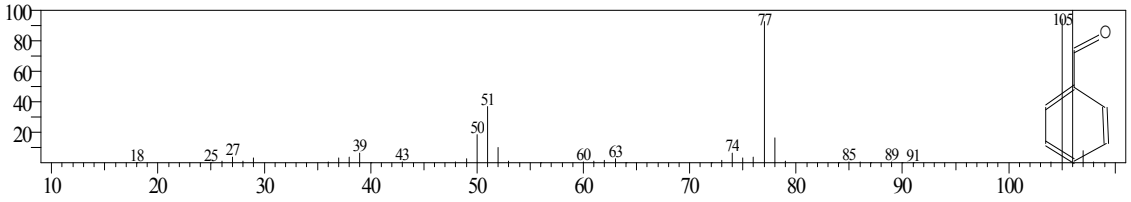
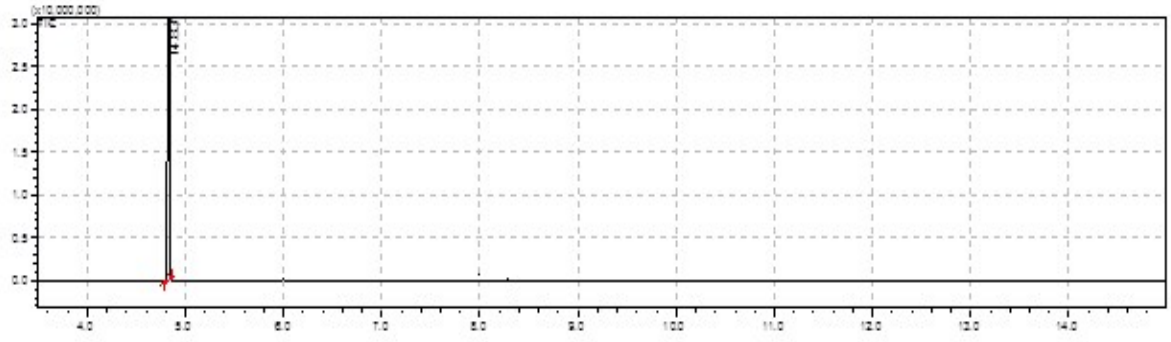


Figure S13. GC-MS Chromatogram for entry **5** in **Table 4**

Entry No: 6

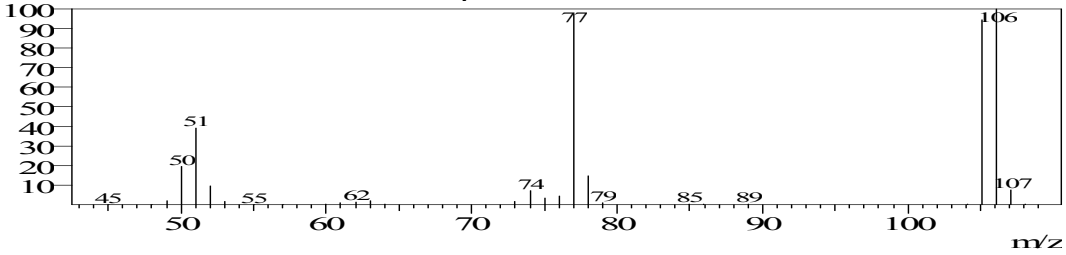


Peak Report

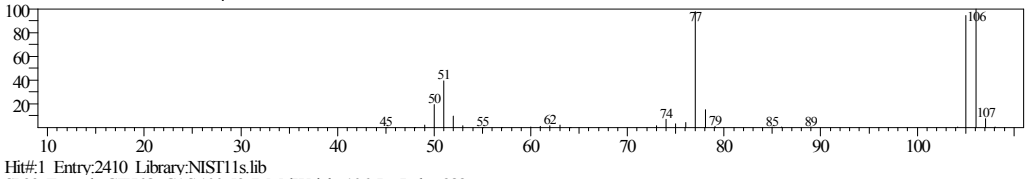
Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	4.798	4.770	4.830	2425473	100.00	1968778	Benzaldehyde
				2425473	100.00	1968778	

Spectrum

Line#:1 R.Time:4.800(Scan#:261)
MassPeaks:29
RawMode:Averaged 4.795-4.805(260-262) BasePeak:106.05(419632)
BG Mode:Calc. from Peak Group 1 - Event 1



Library
<< Target >>
Line#:1 R.Time:4.800(Scan#:261) MassPeaks:29
RawMode:Averaged 4.795-4.805(260-262) BasePeak:106.05(419632)
BG Mode:Calc. from Peak Group 1 - Event 1 Scan



Hit#:1 Entry:2410 Library:NIST11s.lib
SI:99 Formula:C7H6O CAS:100-52-7 MolWeight:106 RetIndex:982
CompName:Benzaldehyde $$ Artificial Almond Oil $$ Benzaldehyde FFC $$ Benzenecarbonal $$ Benzenecarboxaldehyde $$ Benzoic aldehyde $$ Phenyl

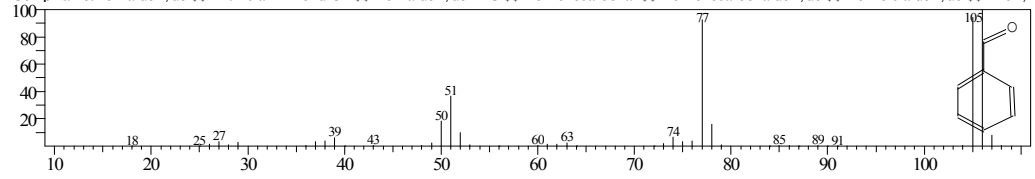
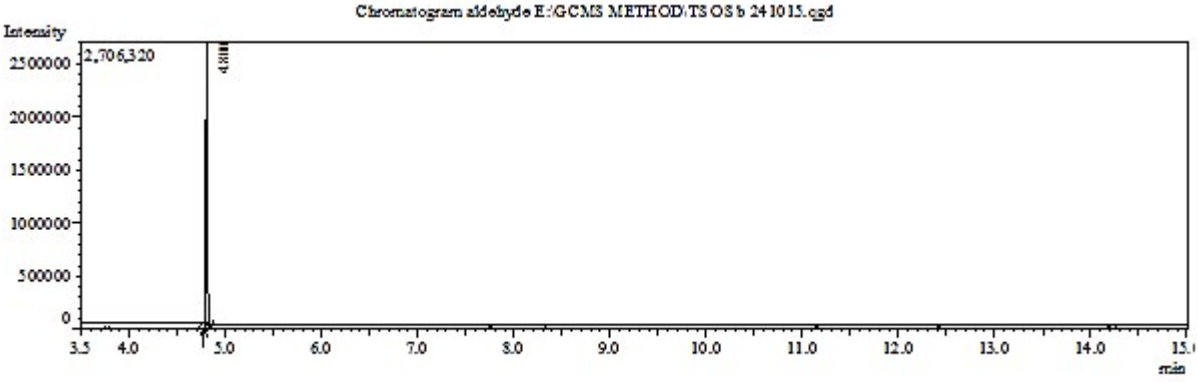


Figure S14. GC-MS Chromatogram for entry **6** in **Table 4**

Entry No: 7



Peak Report

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	4.800	4.770	4.840	3060399	100.00	2697900	Benzaldehyde
				3060399	100.00	2697900	

Spectrum

Line#:1 R.Time:4.800(Scan#:261)
MassPeaks:32
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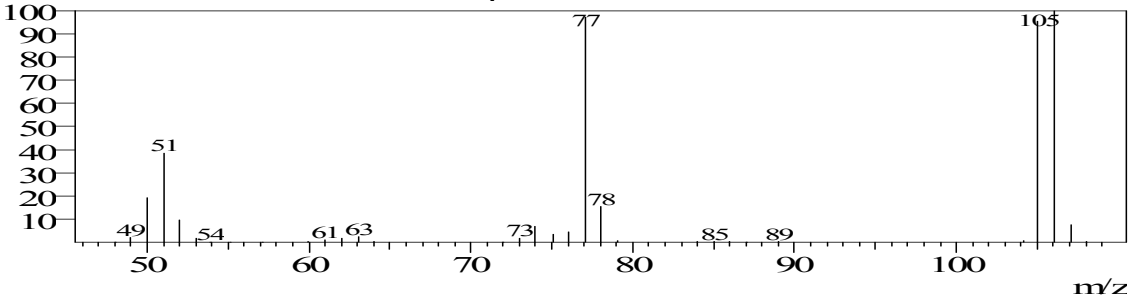
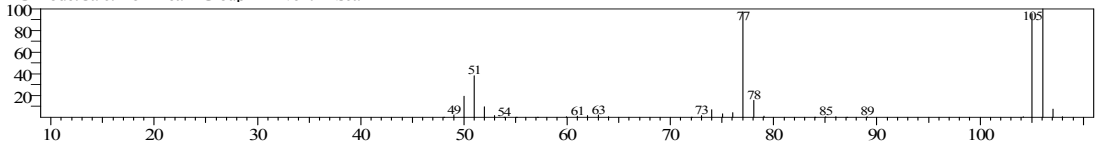
BG Mode:Calc. from Peak Group 1 - Event 1



Library
<< Target >>
Line#:1 R.Time:4.800(Scan#:261) MassPeaks:32
RawMode:Averaged 4.795-4.805(260-262) BasePeak:106.05(563255)
BG Mode:Calc. from Peak Group 1 - Event 1 Scan



Hit#:1 Entry:2410 Library:NIST11s.lib
SI:99 Formula:C7H6O CAS:100-52-7 MolWeight:106 RetIndex:982
CompName:Benzaldehyde $$ Artificial Almond Oil $$ Benzaldehyde FFC $$ Benzenecarbonal $$ Benzenecarboxaldehyde $$ Benzoic aldehyde $$ Phenyl

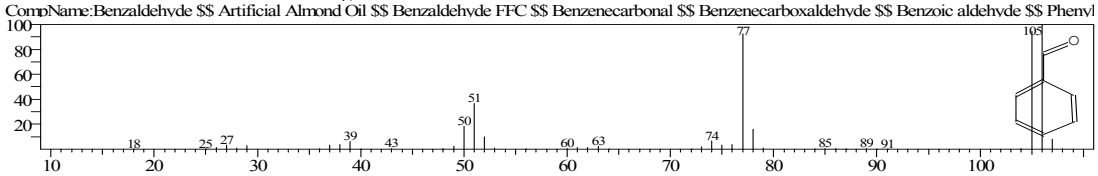
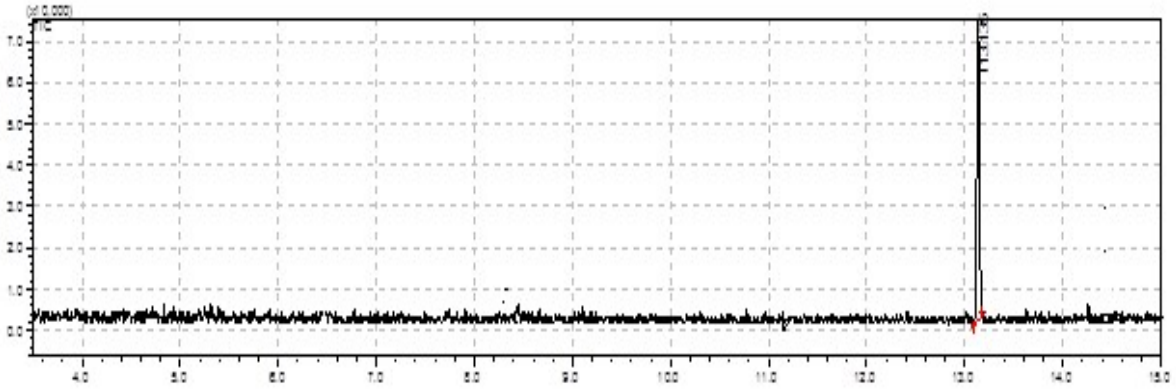


Figure S15. GC-MS Chromatogram for entry **7** in **Table 4**

Entry No: 8

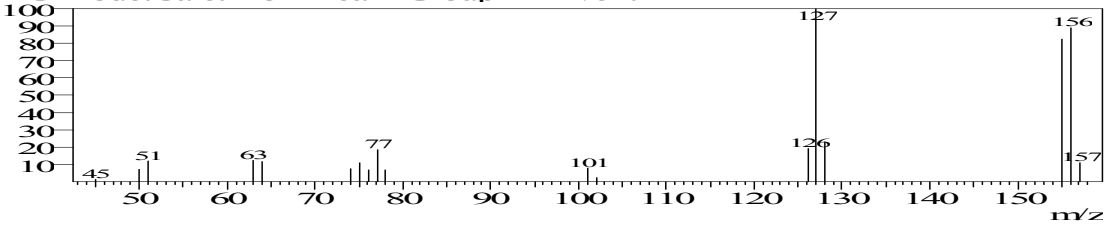


Peak Report

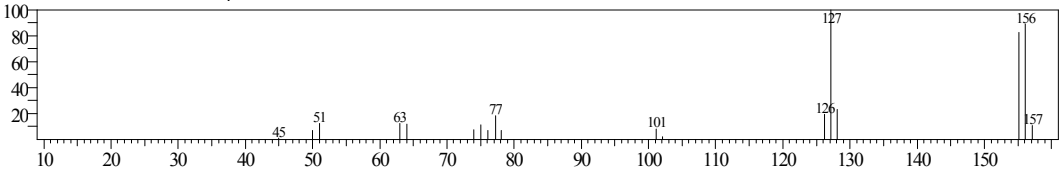
Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	13.135	13.100	13.180	138513	100.00	75967	2-Naphthalenecarboxaldehyde
				138513	100.00	75967	

Spectrum

Line#:1 R.Time:13.135(Scan#:1928)
MassPeaks:18
RawMode:Averaged 13.130-13.140(1927-1929) BasePeak:127.10(16459)
BG Mode:Calc. from Peak Group 1 - Event 1



Library
<< Target >>
Line#:1 R.Time:13.135(Scan#:1928) MassPeaks:18
RawMode:Averaged 13.130-13.140(1927-1929) BasePeak:127.10(16459)
BG Mode:Calc. from Peak Group 1 - Event 1 Scan



Hit#:1 Entry:10371 Library:NIST11s.lib
SI:95 Formula:C11H8O CAS:66-99-9 MolWeight:156 RetIndex:1533
CompName:2-Naphthalenecarboxaldehyde $$ 2-Naphthaldehyde $$ .beta.-Formylnaphthalene $$ .beta.-Naphthaldehyde $$ .beta.-Naphthylaldehyde $$ .b

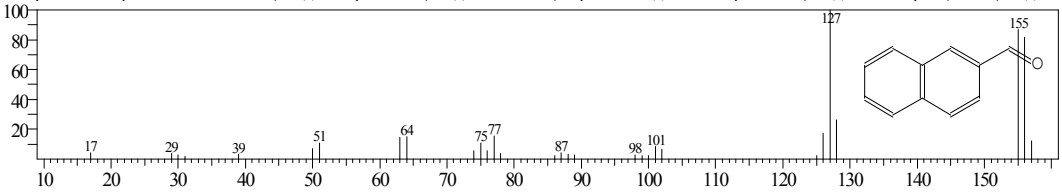
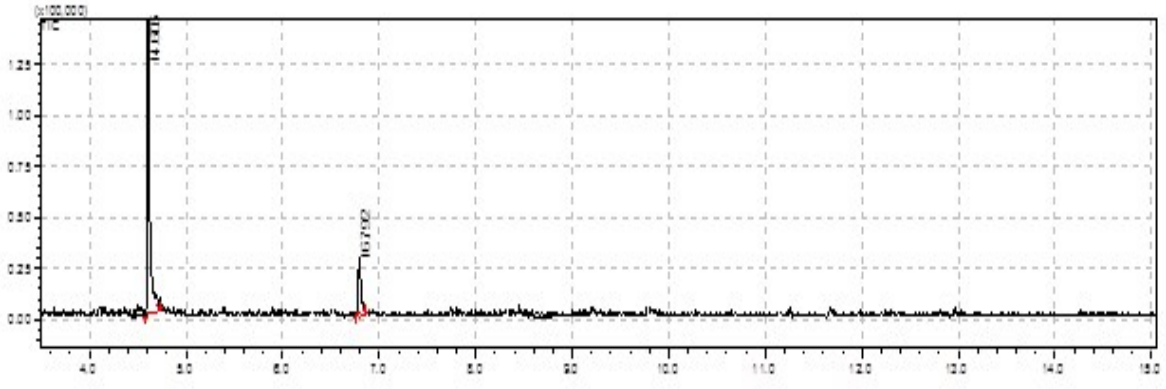


Figure S16. GC-MS Chromatogram for entry **8** in **Table 4**

Entry No: 9

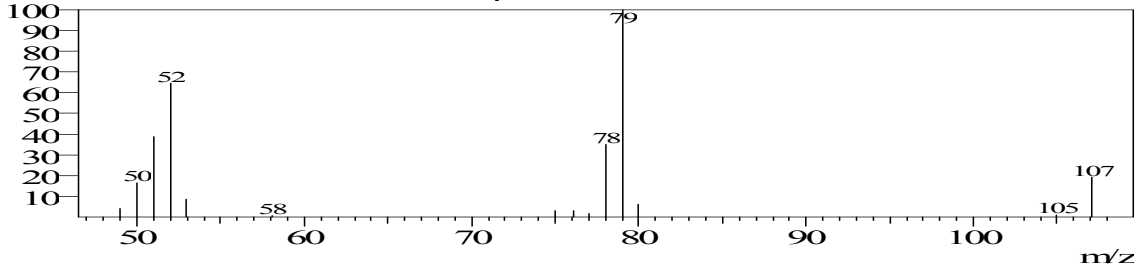


Peak Report

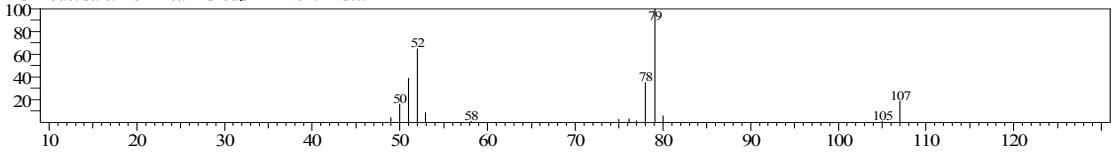
Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	4.605	4.580	4.665	230818	84.71	146915	2-Pyridinecarboxaldehyde
2	6.792	6.775	6.830	41669	15.29	26207	PYRIDINE, 2-ETHENYL-
				272487	100.00	173122	

Spectrum

Line#:1 R.Time:4.605(Scan#:222)
MassPeaks:14
RawMode:Averaged 4.600-4.610(221-223) BasePeak:79.05(43803)
BG Mode:Calc. from Peak Group 1 - Event 1



Library
<< Target >>
Line#:1 R.Time:4.605(Scan#:222) MassPeaks:14
RawMode:Averaged 4.600-4.610(221-223) BasePeak:79.05(43803)
BG Mode:Calc. from Peak Group 1 - Event 1 Scan



Hit#:1 Entry:2704 Library:NIST11.lib
SI:96 Formula:C6H5NO CAS:1121-60-4 MolWeight:107 RetIndex:976
CompName:2-Pyridinecarboxaldehyde $$ Picolinaldehyde $$ 2-Pyridinealdehyde $$ Pyridine-2-carboxaldehyde $$ Pyridine-2-aldehyde $$ 2-Pyridylaldeh

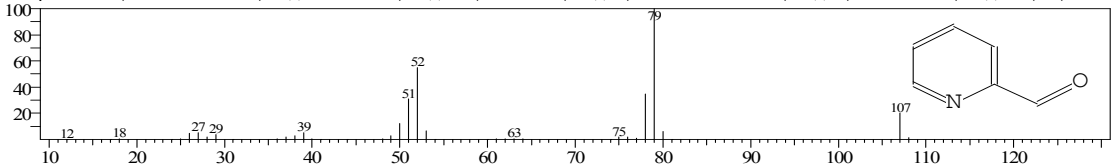
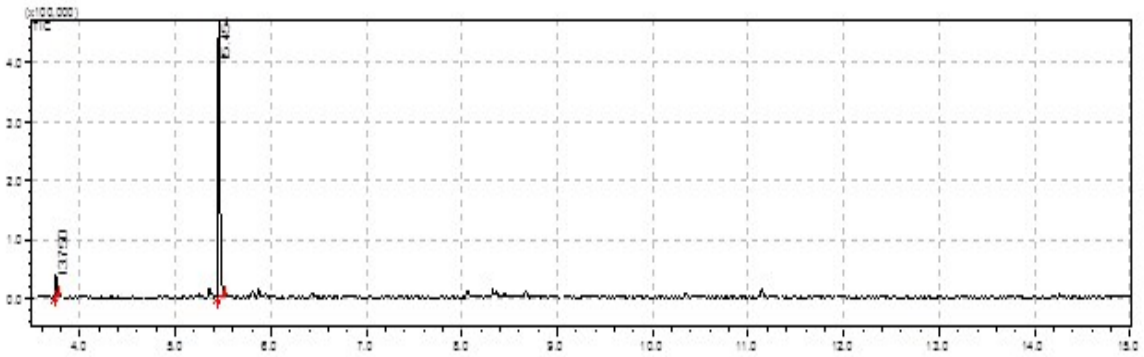


Figure S17. GC-MS Chromatogram for entry **9** in **Table 4**

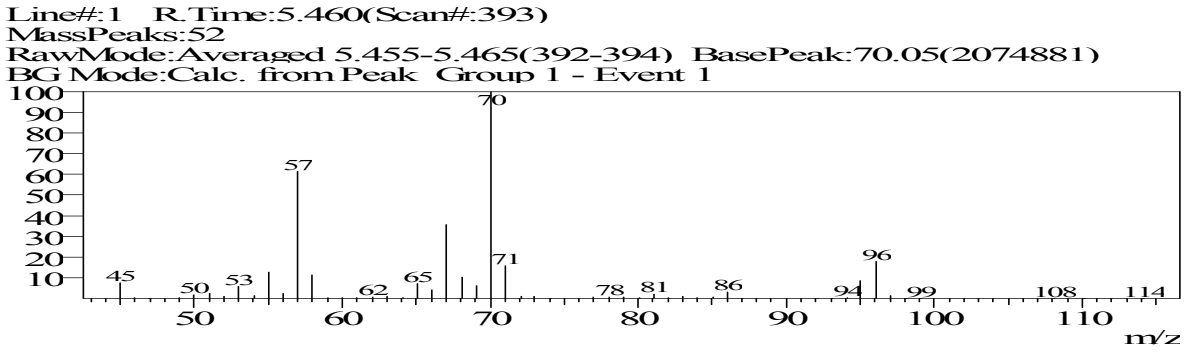
Entry No: 10



Peak Report

Peak#	R. Time	I. Time	F. Time	Area	Area %	Height	Name
1	3.750	3.735	3.780	40700	6.02	36482	1,2-CYCLOHEXANEDIOL
2	5.454	5.435	5.520	635727	93.98	489641	ADIPALDEHYDE
				676427	100.00	526093	

Spectrum



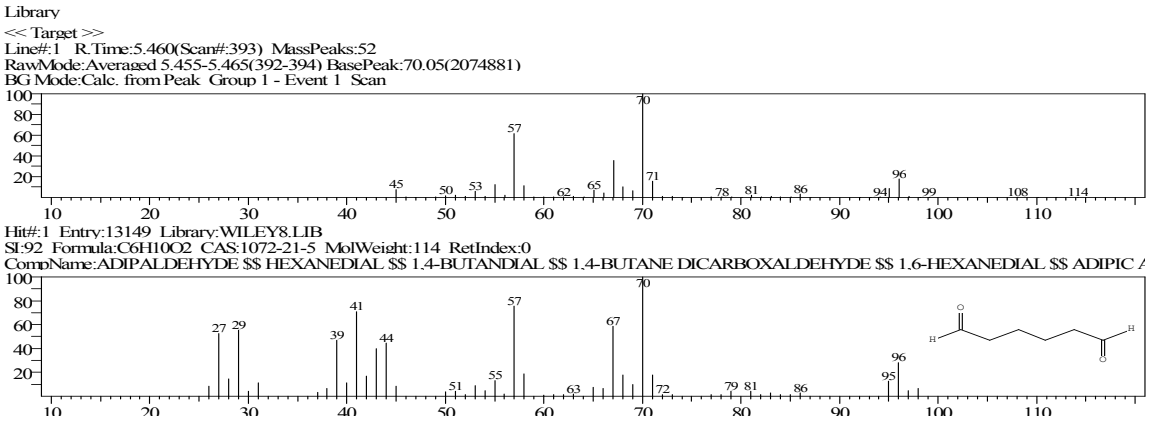
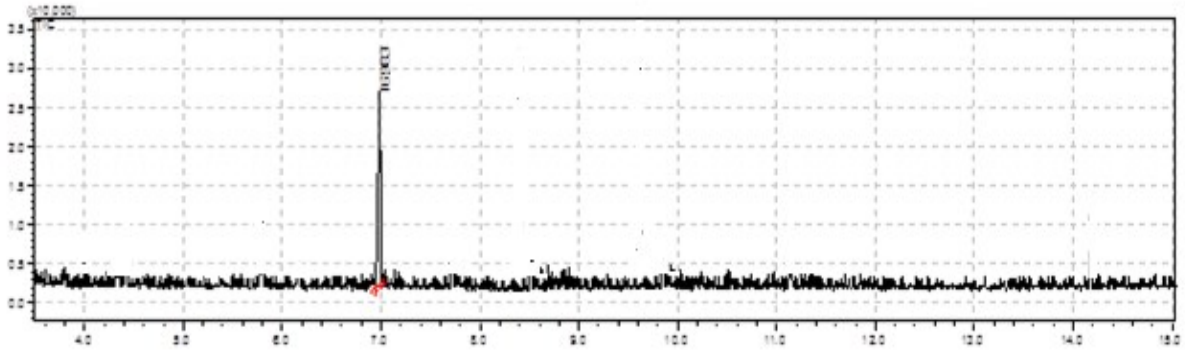


Figure S18. GC-MS Chromatogram for entry **10** in **Table 4**

Entry No: 11

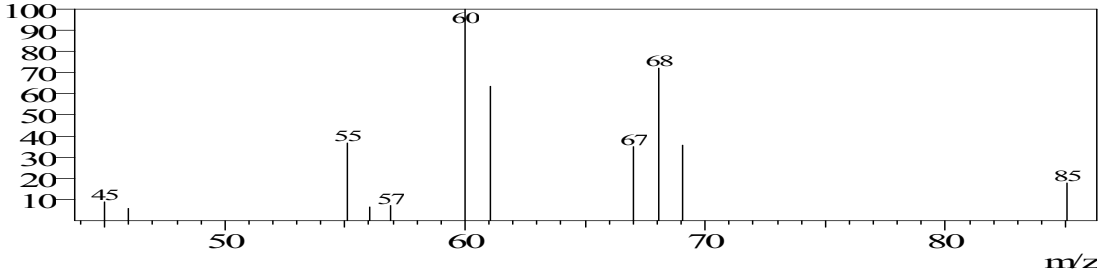


Peak Report

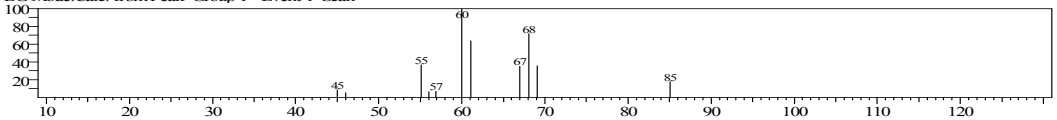
Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	6.983	6.935	7.045	40439	100.00	24057	CYCLOPENTANEACETICACID
				40439	100.00	24057	

Spectrum

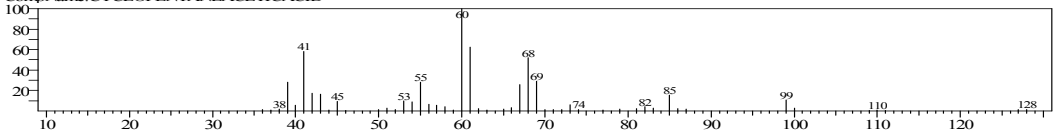
Line#:1 R.Time:6.985(Scan#:698)
MassPeaks:11
RawMode:Averaged 6.980-6.990(697-699) BasePeak:60.00(5304)
BG Mode:Calc. from Peak Group 1 - Event 1



Library
<< Target >>
Line#:1 R.Time:6.985(Scan#:698) MassPeaks:11
RawMode:Averaged 6.980-6.990(697-699) BasePeak:60.00(5304)
BG Mode:Calc. from Peak Group 1 - Event 1 Scan



Hit#:1 Entry:21719 Library:WILEY8.LIB
SI:86 Formula:C7H12O2 CAS:0-00-0 MolWeight:128 RetIndex:0
CompName:CYCLOPENTANEACETICACID



Hit#:2 Entry:5112 Library:NIST11s.lib
SI:86 Formula:C7H12O2 CAS:1123-00-8 MolWeight:128 RetIndex:1116
CompName:Cyclopentaneacetic acid $$ Cyclopentylacetic acid $$

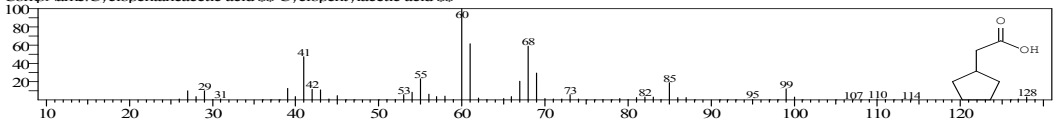
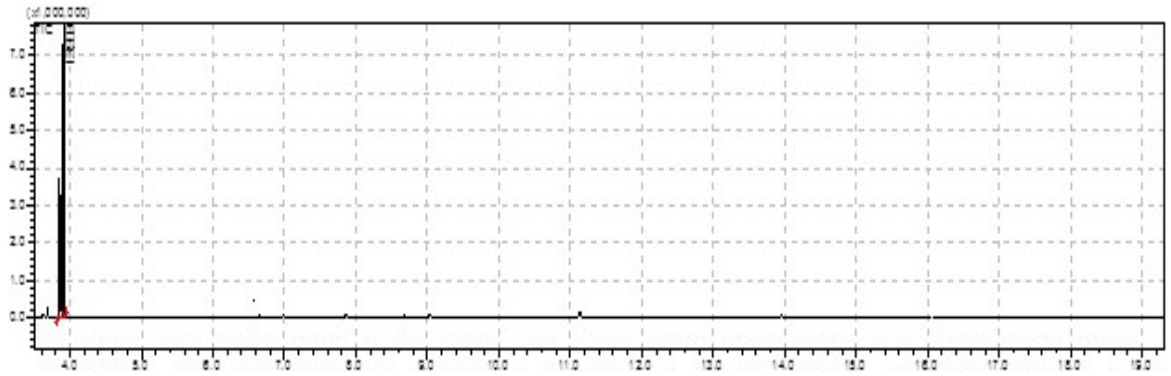


Figure S19. GC-MS Chromatogram for entry **11** in **Table 4**

Entry No: 12

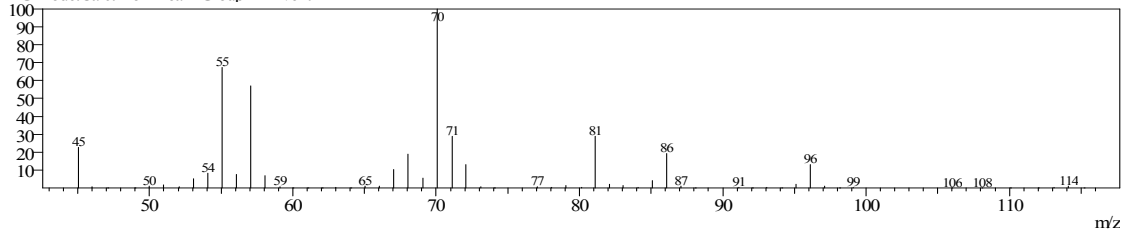


Peak Report

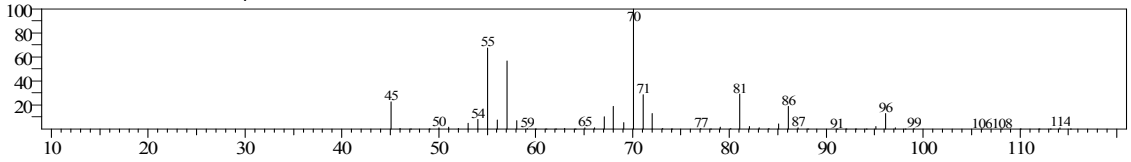
Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	3.909	3.825	3.935	13393543	100.00	8141545	HEPTANAL
				13393543	100.00	8141545	

Spectrum

Line#:1 R.Time:3.910(Scan#:83)
MassPeaks:57
RawMode:Averaged 3.905-3.915(82-84) BasePeak:70.10(1558178)
BG Mode:Calc. from Peak Group 1 - Event 1



Library
<< Target >>
Line#:1 R.Time:3.910(Scan#:83) MassPeaks:57
RawMode:Averaged 3.905-3.915(82-84) BasePeak:70.10(1558178)
BG Mode:Calc. from Peak Group 1 - Event 1 Scan



Hit#:1 Entry:13739 Library:WILEY8.LIB
SI:98 Formula:C7H14O CAS:111-71-7 MolWeight:114 RetIndex:0
CompName:HEPTANAL $$ ENANTHALDEHYDE $$ 1-HEPTALDEHYDE $$ 1-HEPTANAL $$ 2077204001 HEPTANA $$ AI3-02066 $$ ALDEHYD

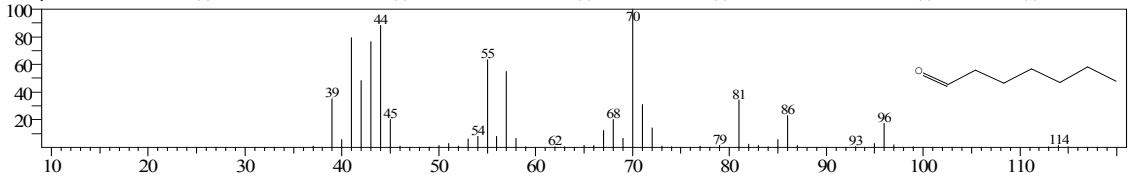
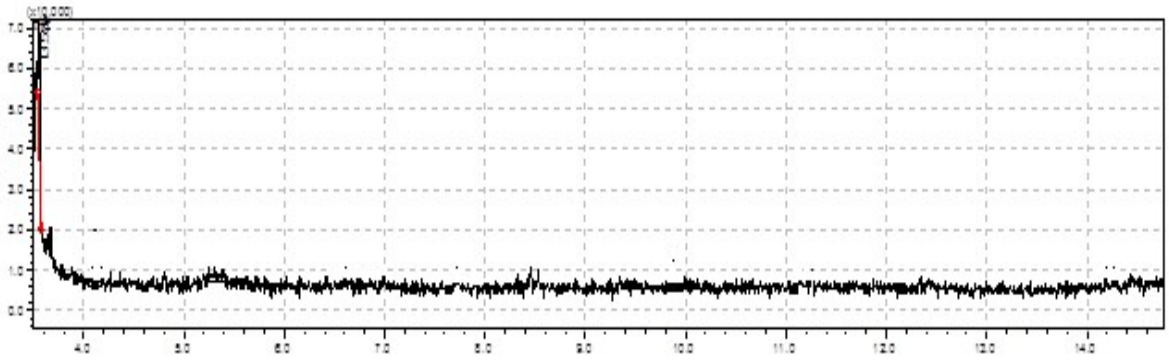


Figure S20. GC-MS Chromatogram for entry **12** in **Table 4**

Entry No: 13



Peak Report

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	3.555	3.540	3.580	52460	100.00	48758	PENTANOIC ACID
				52460	100.00	48758	

Spectrum

Line#:1 R.Time:3.555(Scan#:12)
MassPeaks:9
RawMode:Averaged 3.550-3.560(11-13) BasePeak:60.00(13843)
BG Mode:Calc. from Peak Group 1 - Event 1

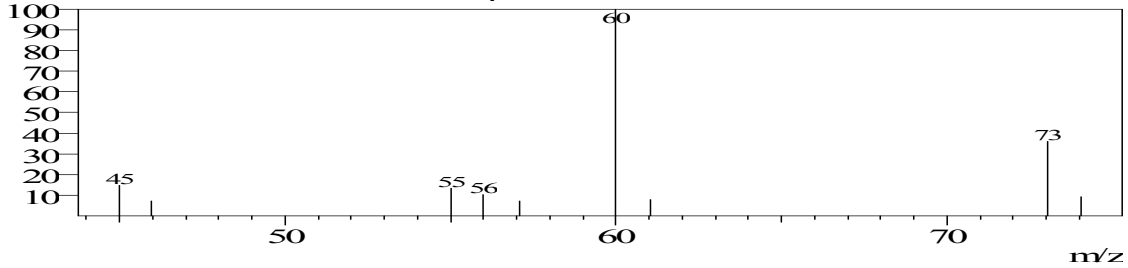
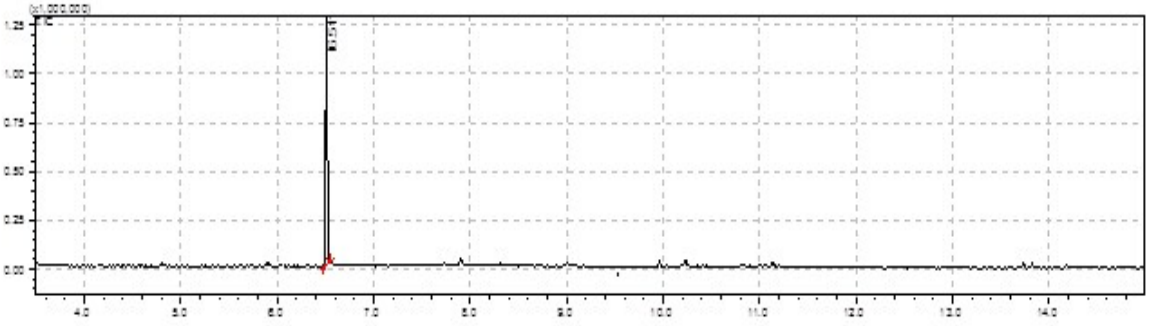


Figure S21. GC-MS Chromatogram for entry **13** in **Table 4**

Entry No: 14

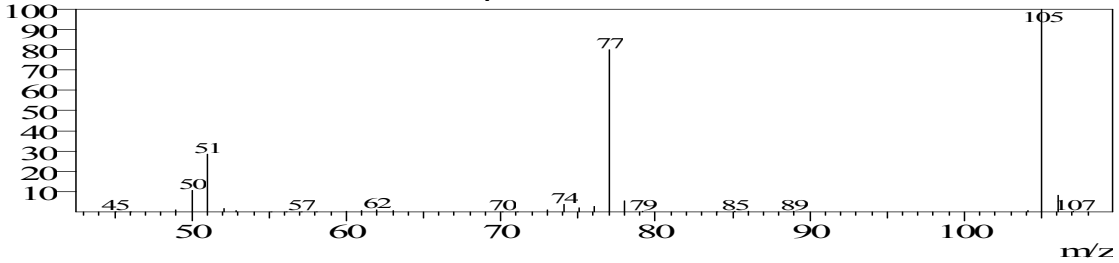


Peak Report

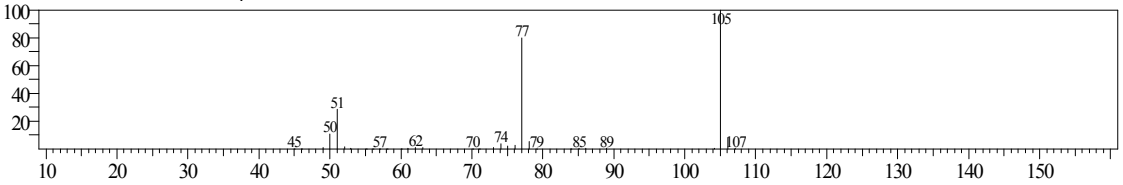
Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	6.511	6.480	6.550	1614740	100.00	1325621	Phenylglyoxal
				1614740	100.00	1325621	

Spectrum

Line#:1 R.Time:6.510(Scan#:603)
MassPeaks:32
RawMode:Averaged 6.505-6.515(602-604) BasePeak:105.05(466179)
BG Mode:Calc. from Peak Group 1 - Event 1



Library
<< Target >>
Line#:1 R.Time:6.510(Scan#:603) MassPeaks:32
RawMode:Averaged 6.505-6.515(602-604) BasePeak:105.05(466179)
BG Mode:Calc. from Peak Group 1 - Event 1 Scan



Hit#:1 Entry:8954 Library:NIST11.lib
SI:98 Formula:C8H6O2 CAS:1074-12-0 MolWeight:134 RetIndex:1217
CompName:Phenylglyoxal $$ Benzeneacetaldehyde, .alpha.-oxo- $$ Glyoxal, phenyl- $$ Benzoylcarboxaldehyde $$ Benzoylformaldehyde $$ Phenylethan

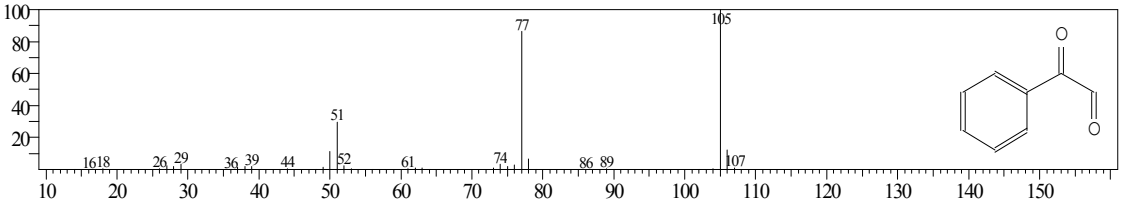
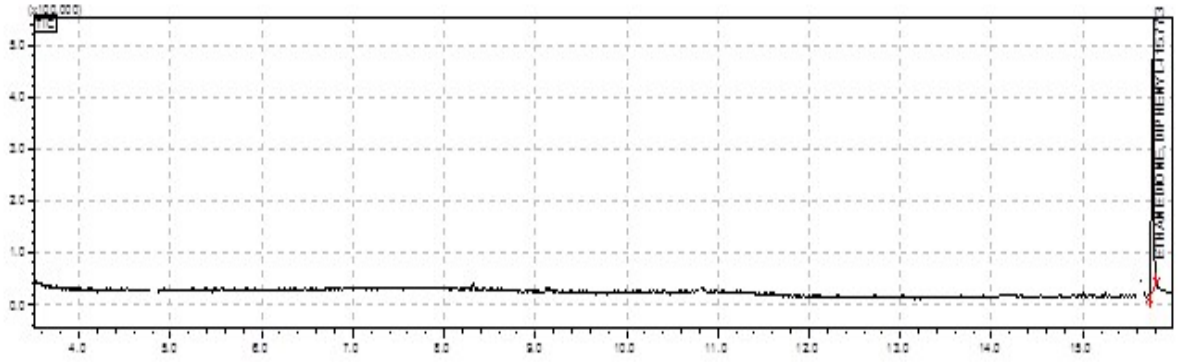


Figure S22. GC-MS Chromatogram for entry **14** in **Table 4**

Entry No: 15

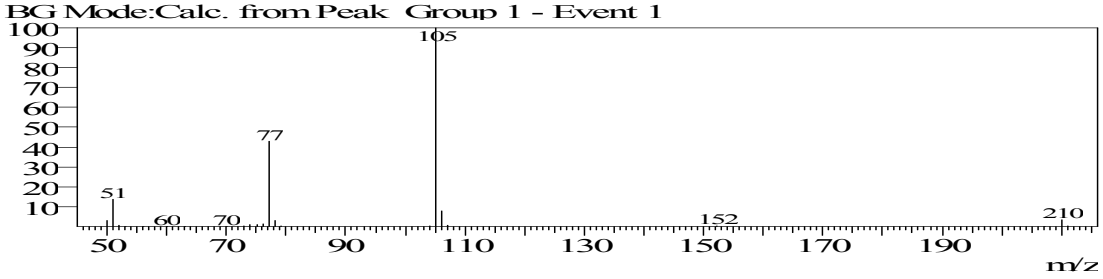


Peak Report

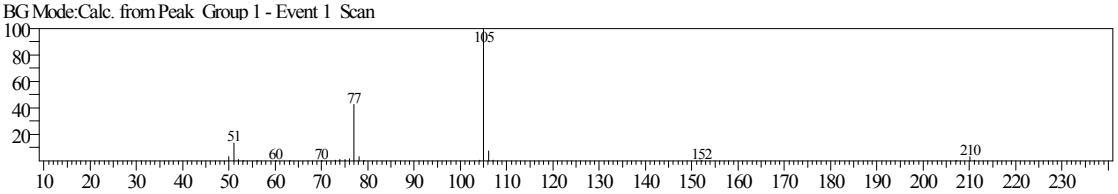
Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name
1	15.773	15.730	15.810	730417	100.00	550067	ETHANEDIONE, DIPHENYL-
				730417	100.00	550067	

Spectrum

Line#:1 R.Time:15.770(Scan#:2455)
MassPeaks:23
RawMode:Averaged 15.765-15.775(2454-2456) BasePeak:105.05(256005)
BG Mode:Calc. from Peak Group 1 - Event 1



Library
<< Target >>
Line#:1 R.Time:15.770(Scan#:2455) MassPeaks:23
RawMode:Averaged 15.765-15.775(2454-2456) BasePeak:105.05(256005)
BG Mode:Calc. from Peak Group 1 - Event 1 Scan



Hit#:1 Entry:118959 Library:WILEY8.LIB
SI:99 Formula:C14H10O2 CAS:134-81-6 MolWeight:210 RetIndex:0
CompName:ETHANEDIONE, DIPHENYL- $$ 1,2-DIPHENYLETHANE-1,2-DIONE $$ 1, 2-DIPHENYLETHANE-1,2-DIONE $$ 1,2-DIPHENYL-ETH

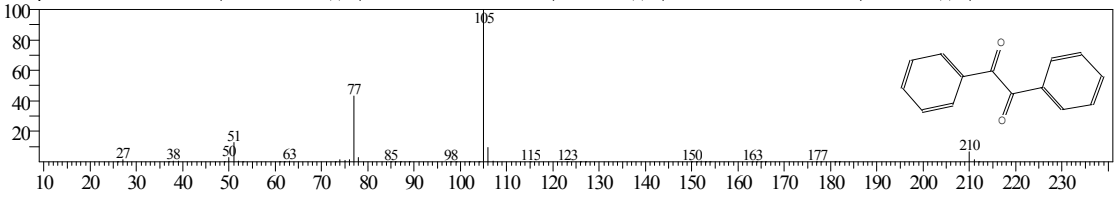


Figure S23. GC-MS Chromatogram for entry **15** in **Table 4**

4. NMR spectra for the oxidative cleavage of alkenes to aldehyde product

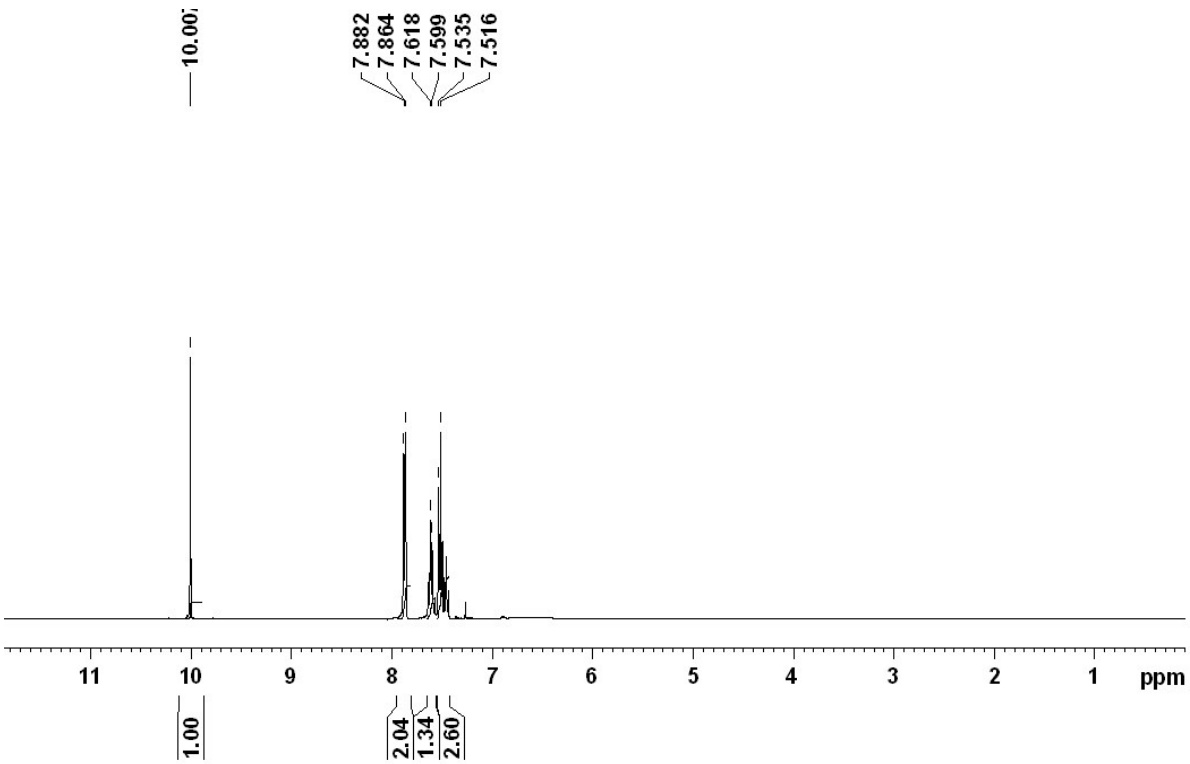


Figure S24. ^{1}H NMR spectrum for entry **1** in **Table 4**

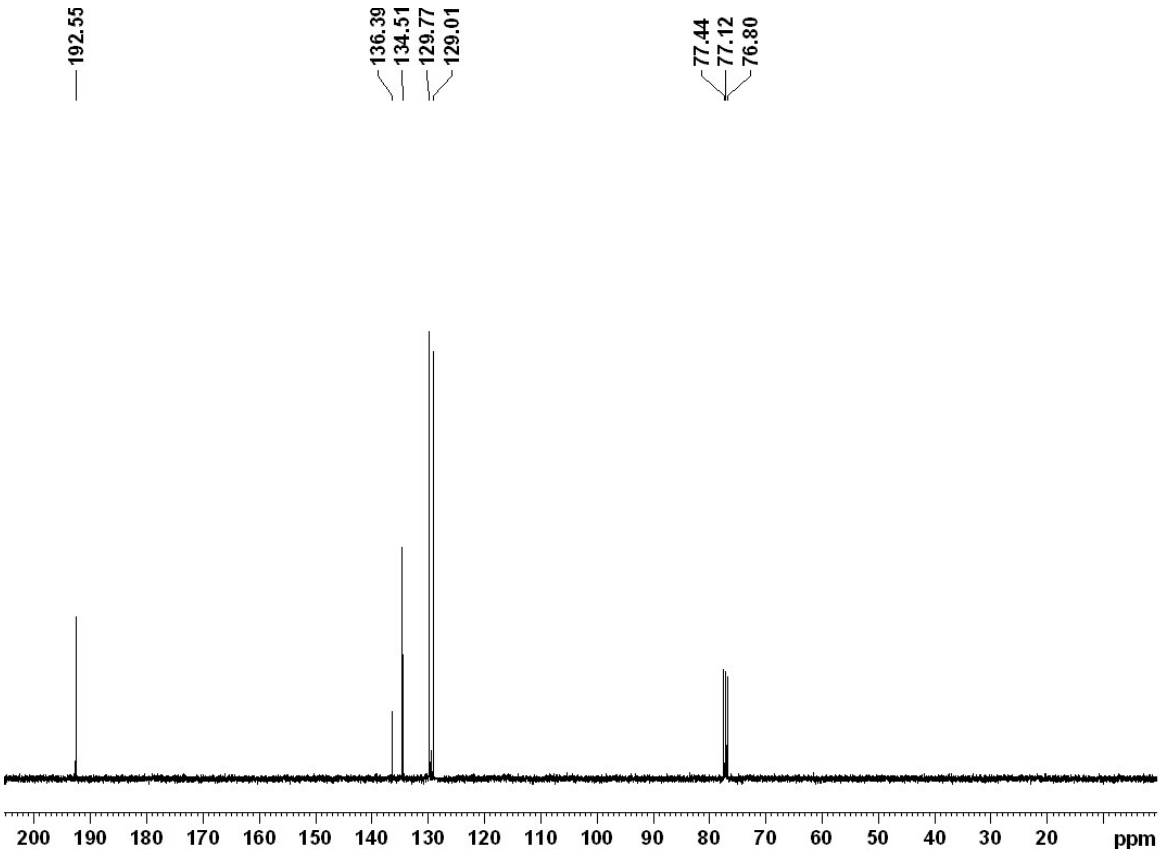


Figure S25. ^{13}C NMR spectrum for entry **1** in **Table 4**

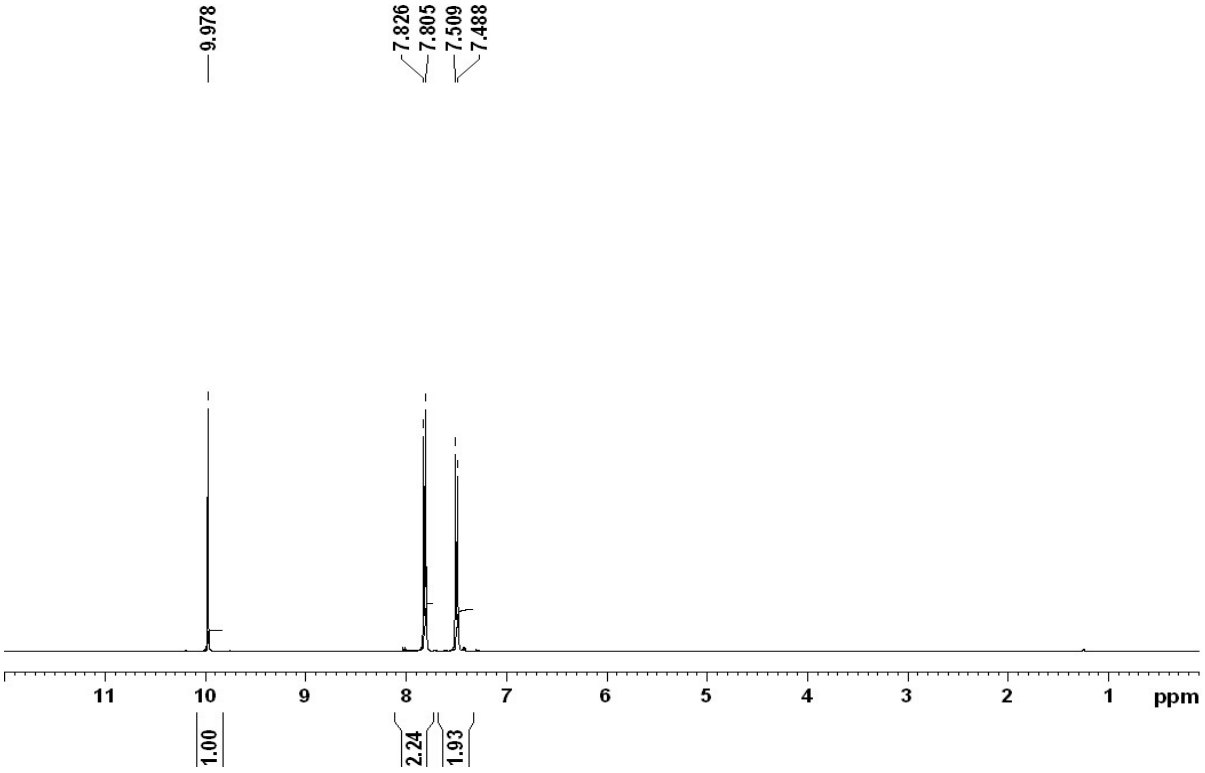


Figure S26. ^{1}H NMR spectrum for entry **2** in **Table 4**

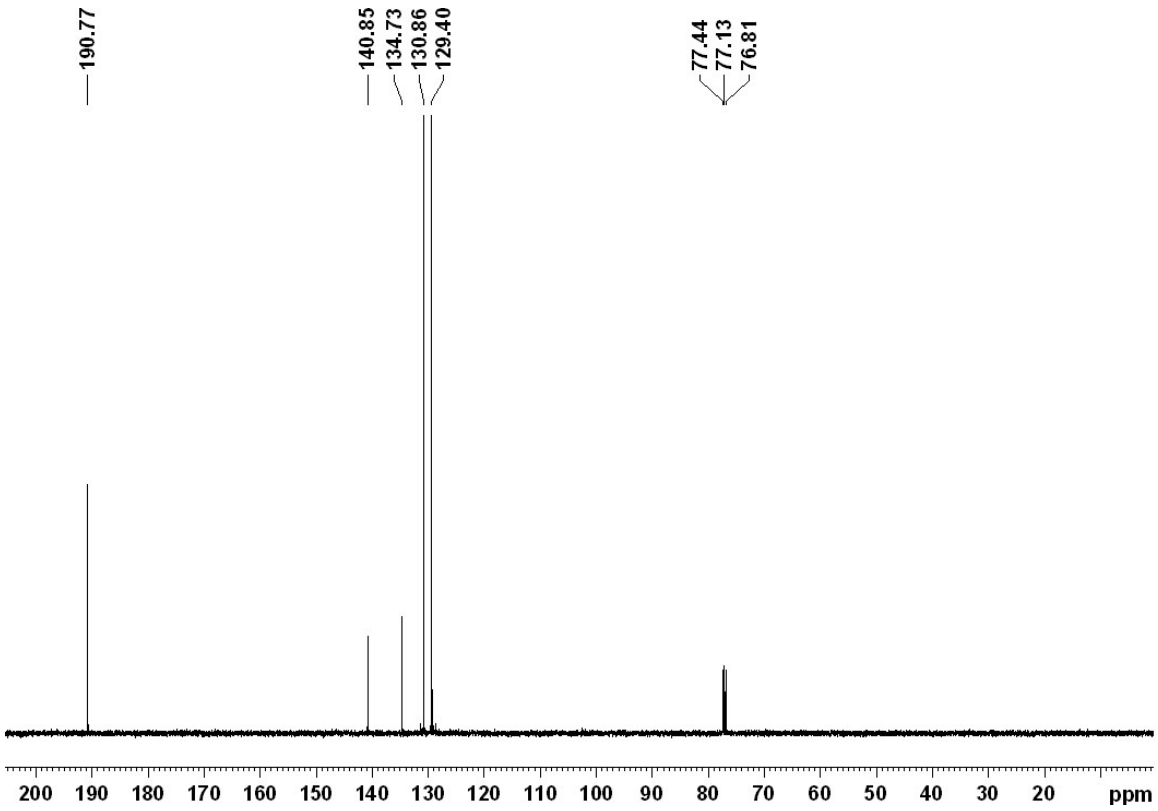


Figure S27. ^{13}C NMR spectrum for entry **2** in **Table 4**

Figure S28. ^{1}H NMR spectrum for entry **3** in **Table 4**

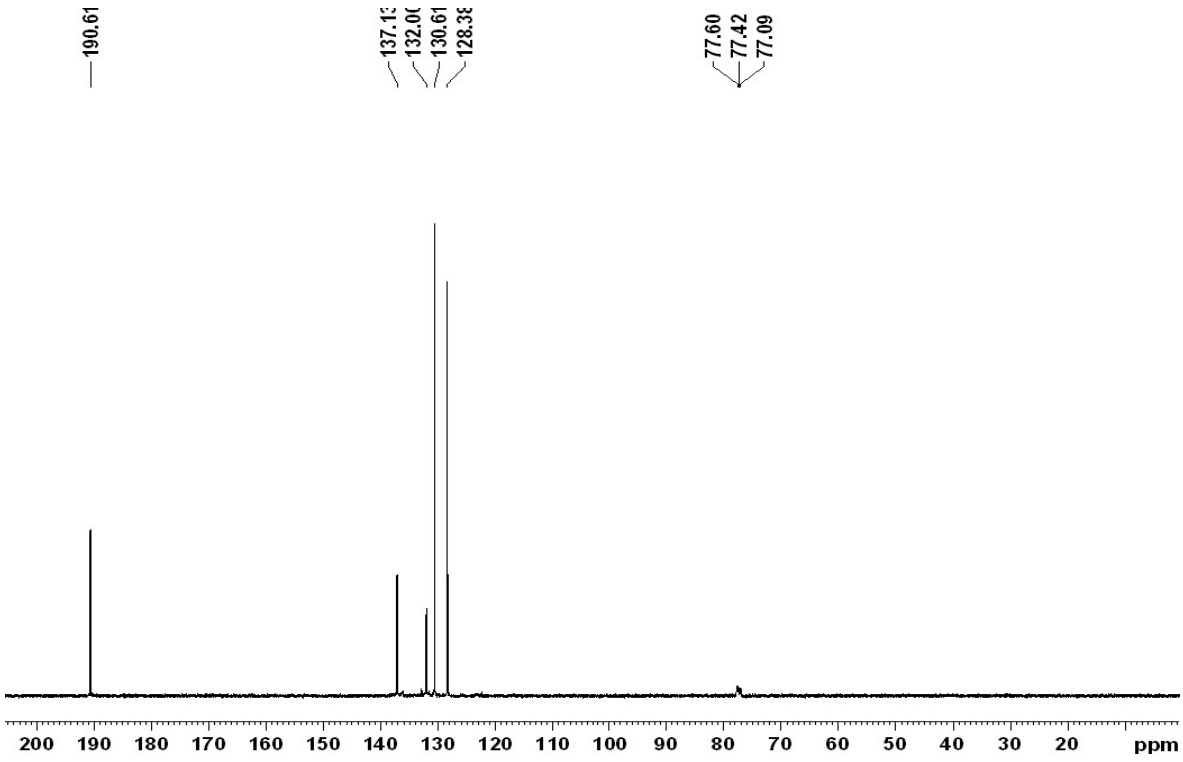


Figure S29. ^{13}C NMR spectrum for entry **3** in **Table 4**

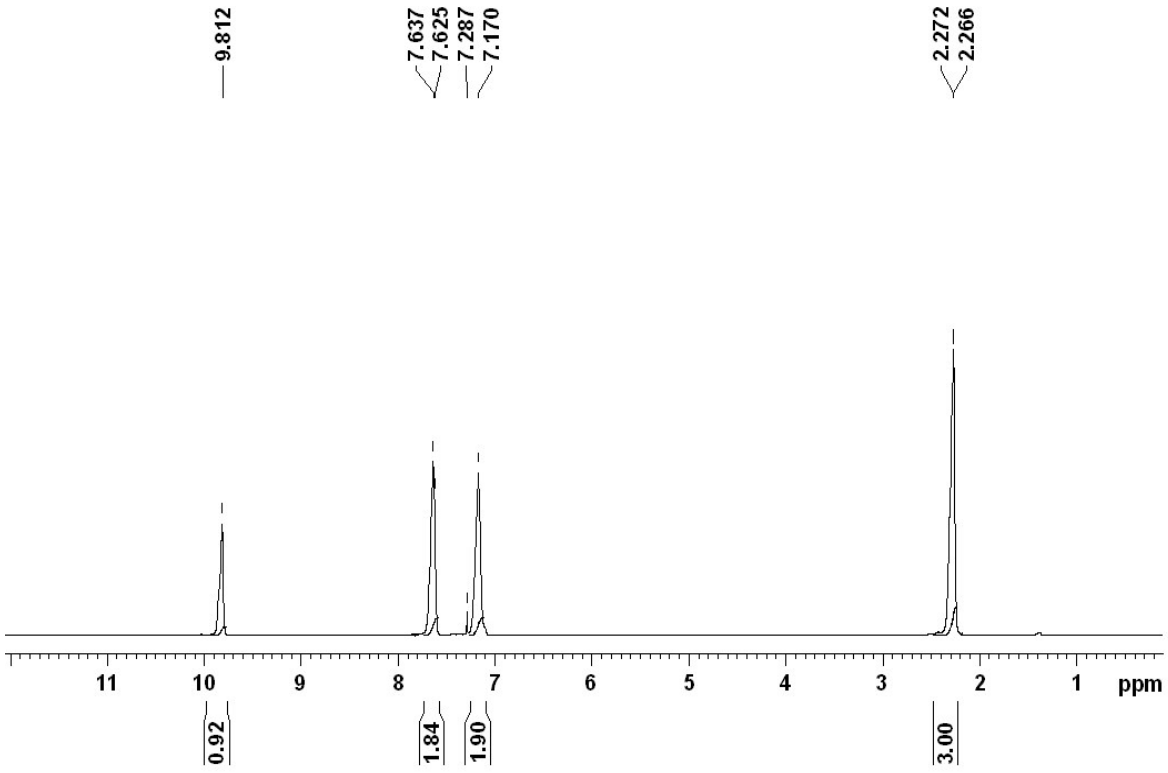


Figure S30. ^{1}H NMR spectrum for entry **4** in **Table 4**

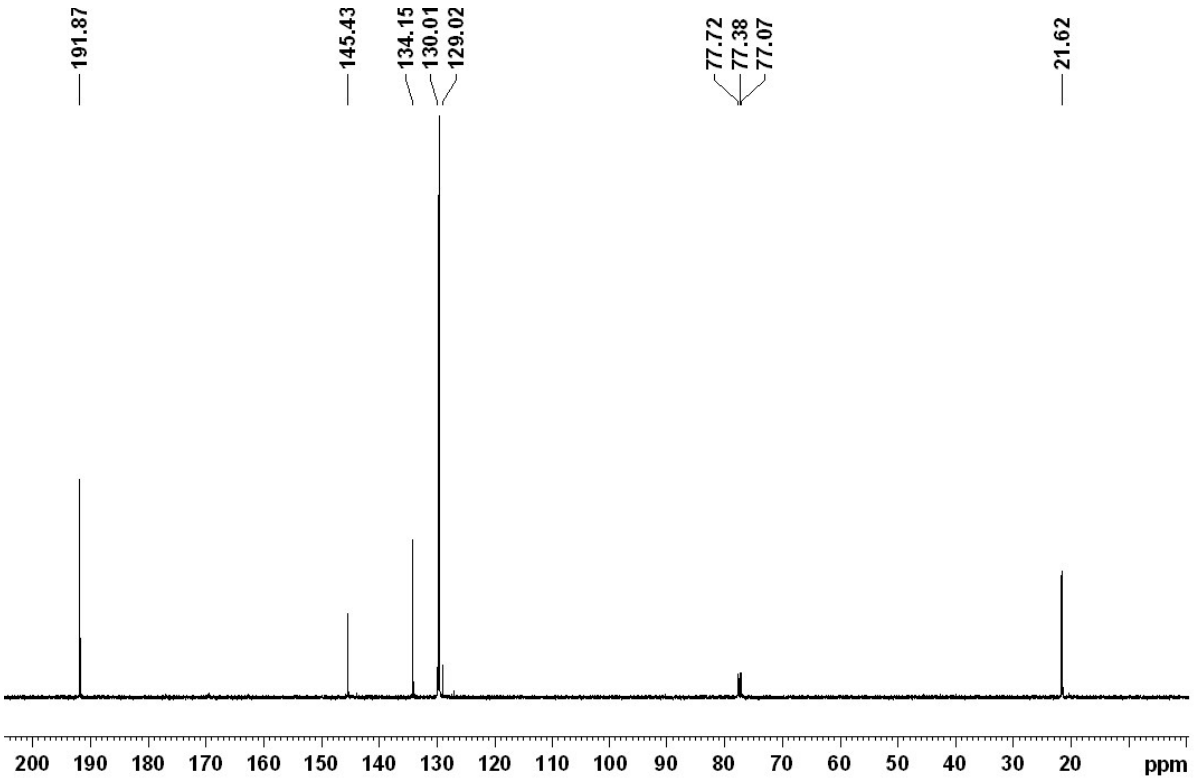


Figure S31. ^{13}C NMR spectrum for entry **4** in **Table 4**

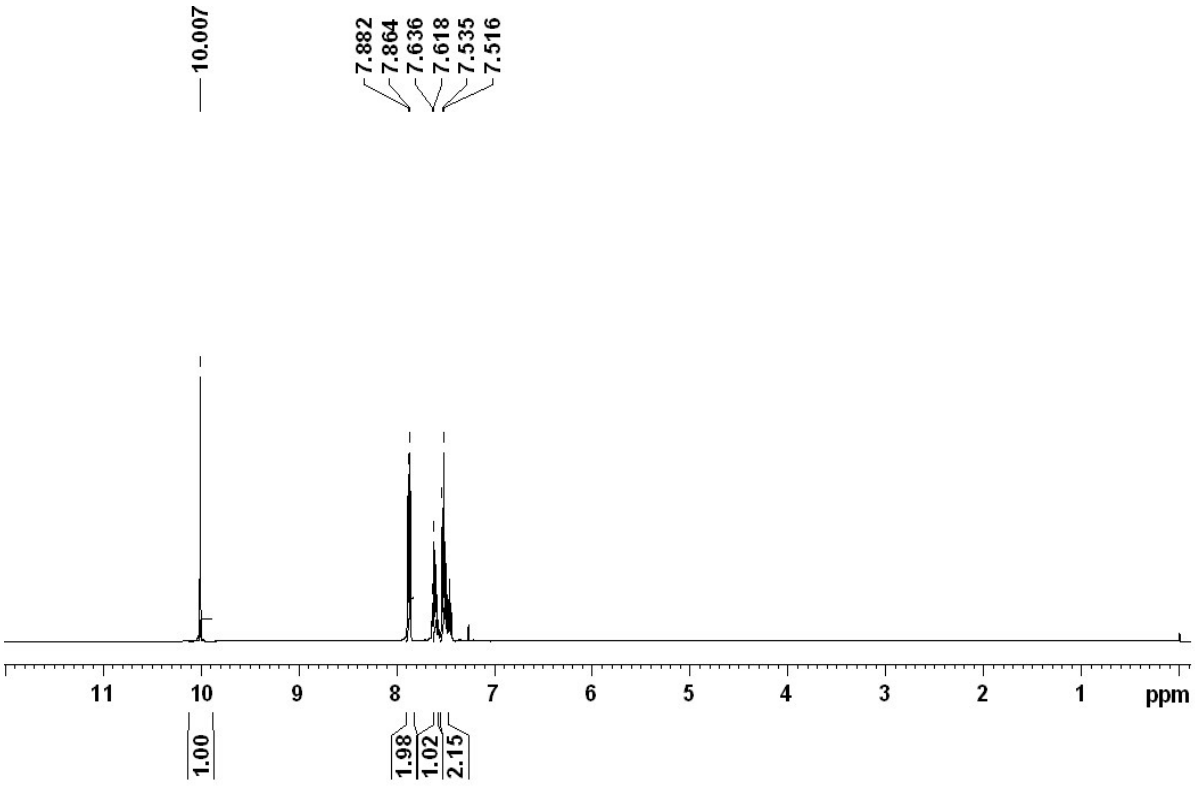


Figure S32. ^{1}H NMR spectrum for entry **5** in **Table 4**

Figure S33. ^{13}C NMR spectrum for entry **5** in **Table 4**

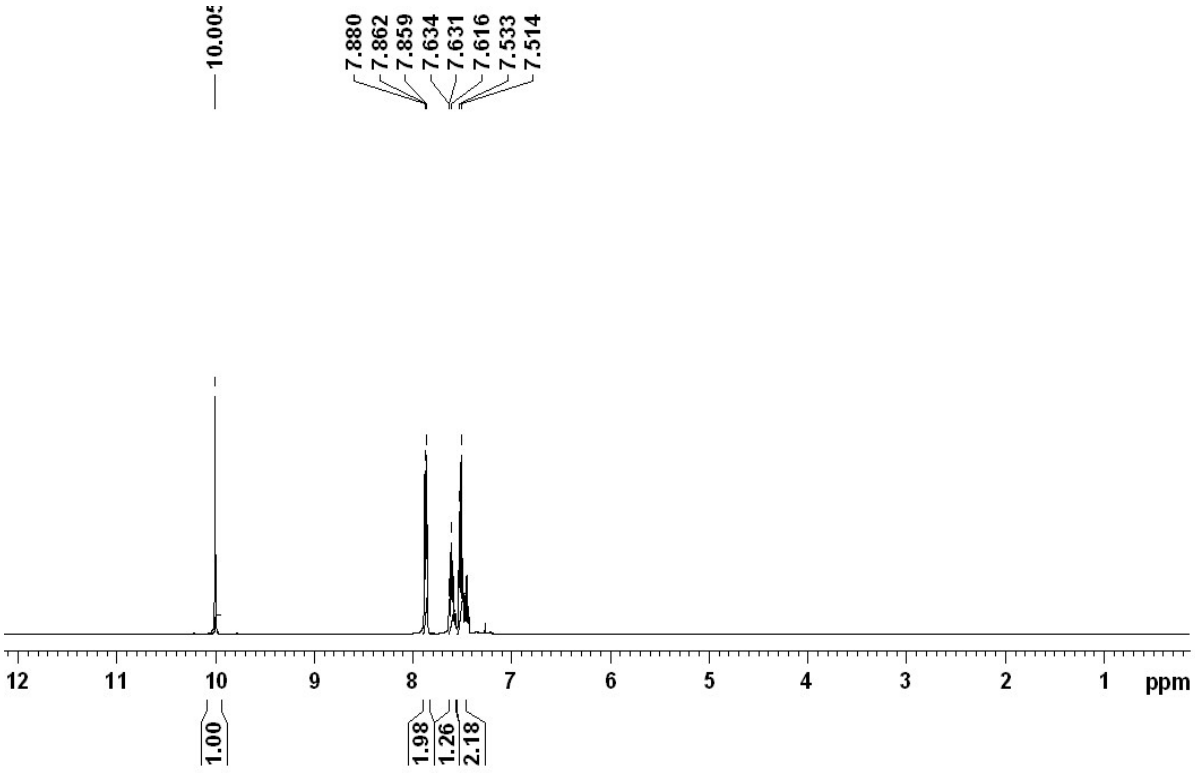


Figure S34. ^{1}H NMR spectrum for entry **6** in **Table 4**

Figure S35. ^{13}C NMR spectrum for entry **6** in **Table 4**

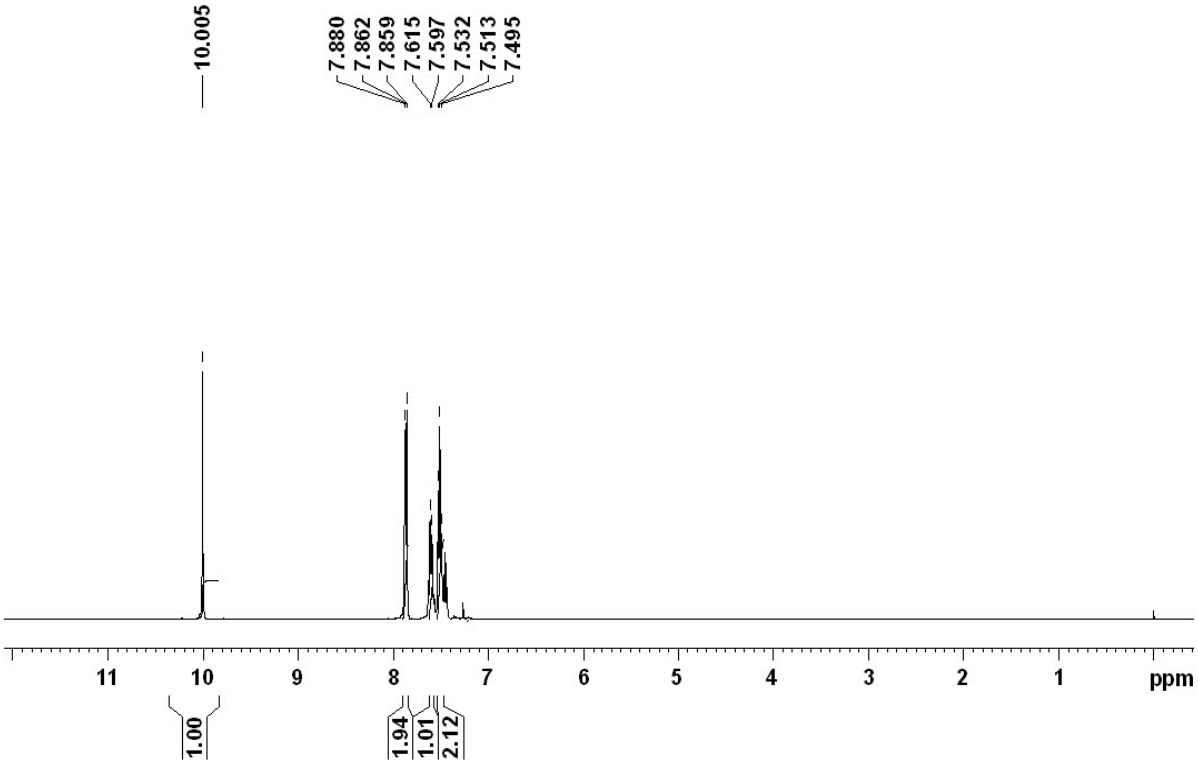


Figure S36. ^{1}H NMR spectrum for entry **7** in **Table 4**

Figure S37. ^{13}C NMR spectrum for entry **7** in **Table 4**

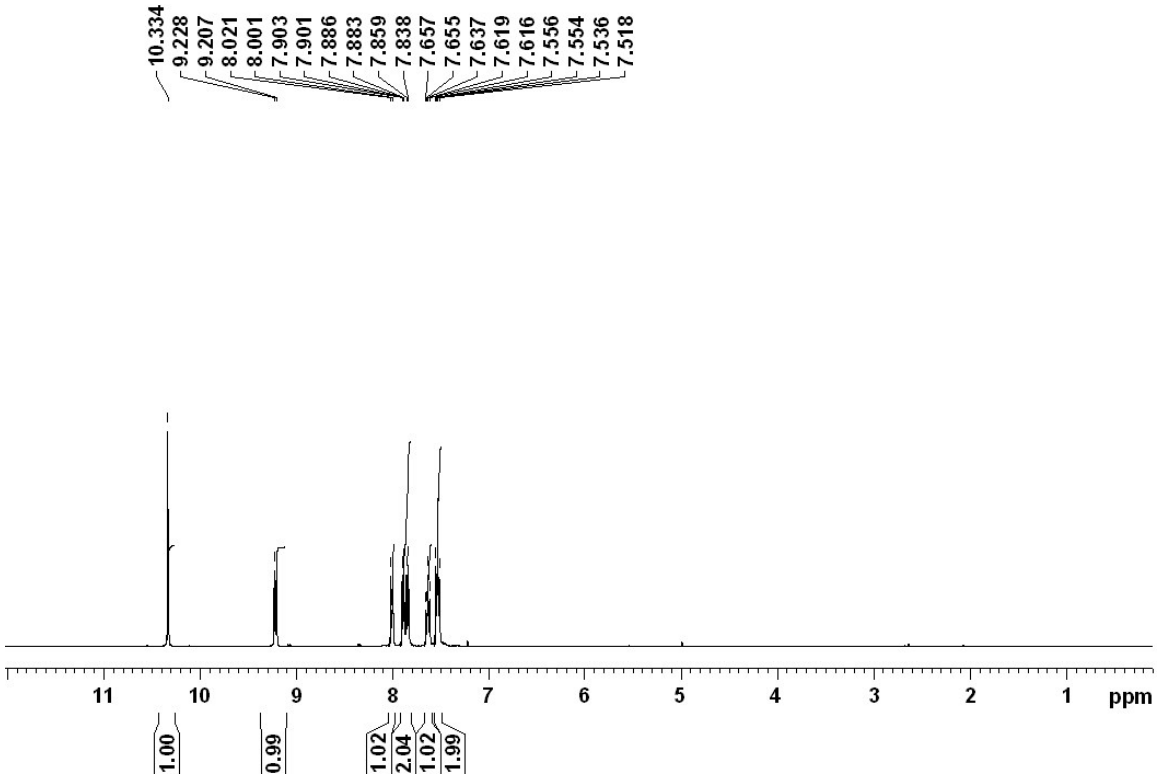


Figure S38. ^{1}H NMR spectrum for entry **8** in **Table 4**

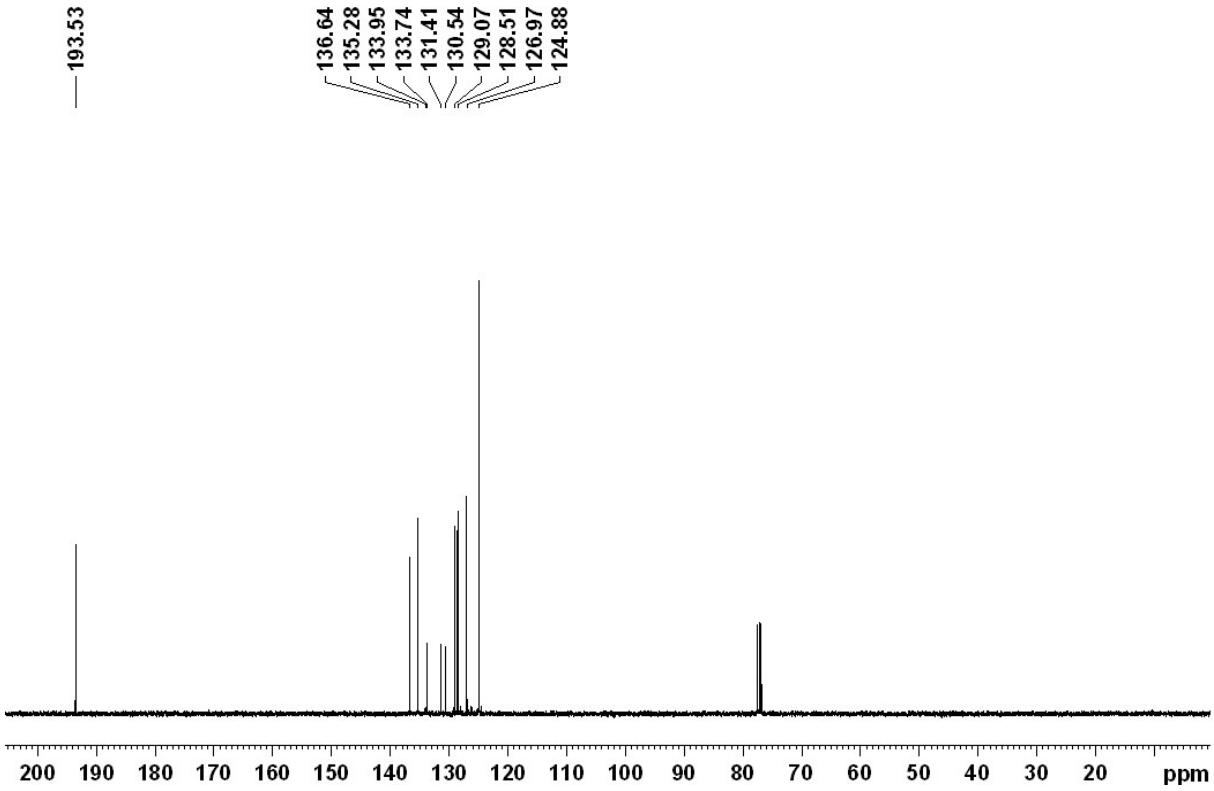


Figure S39. ^{13}C NMR spectrum for entry **8** in **Table 4**

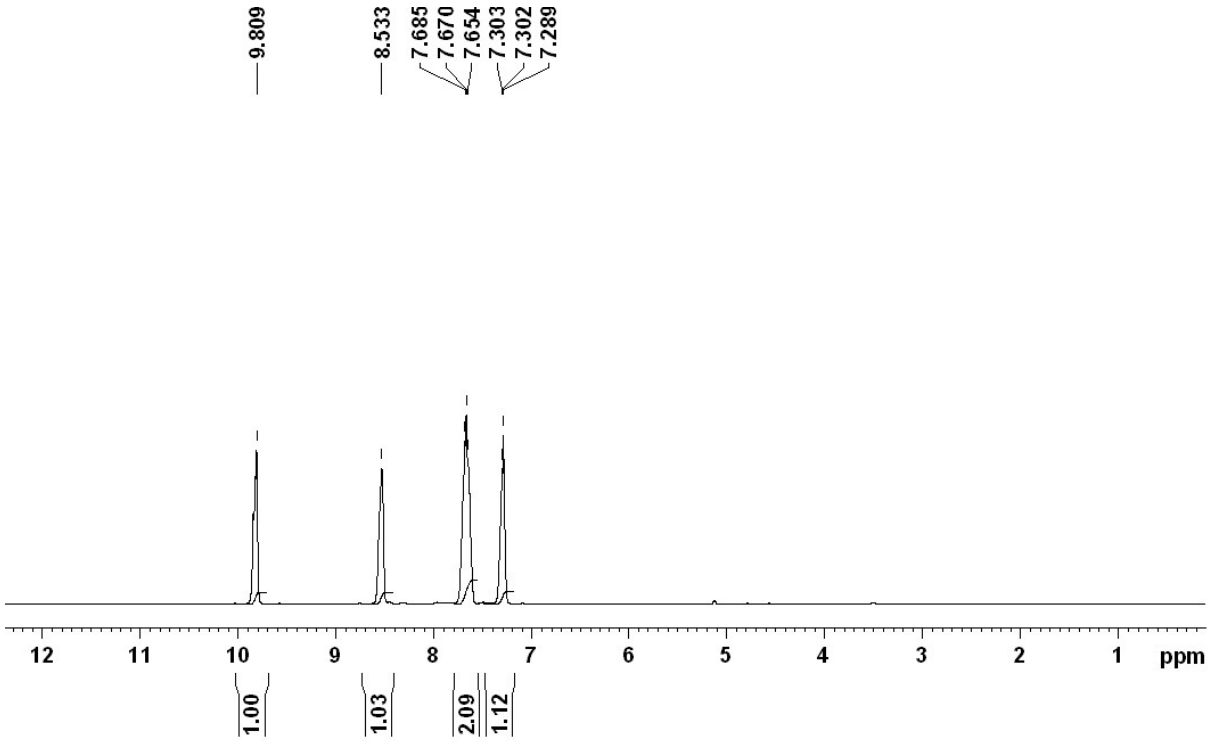


Figure S40. ^{1}H NMR spectrum for entry **9** in **Table 4**

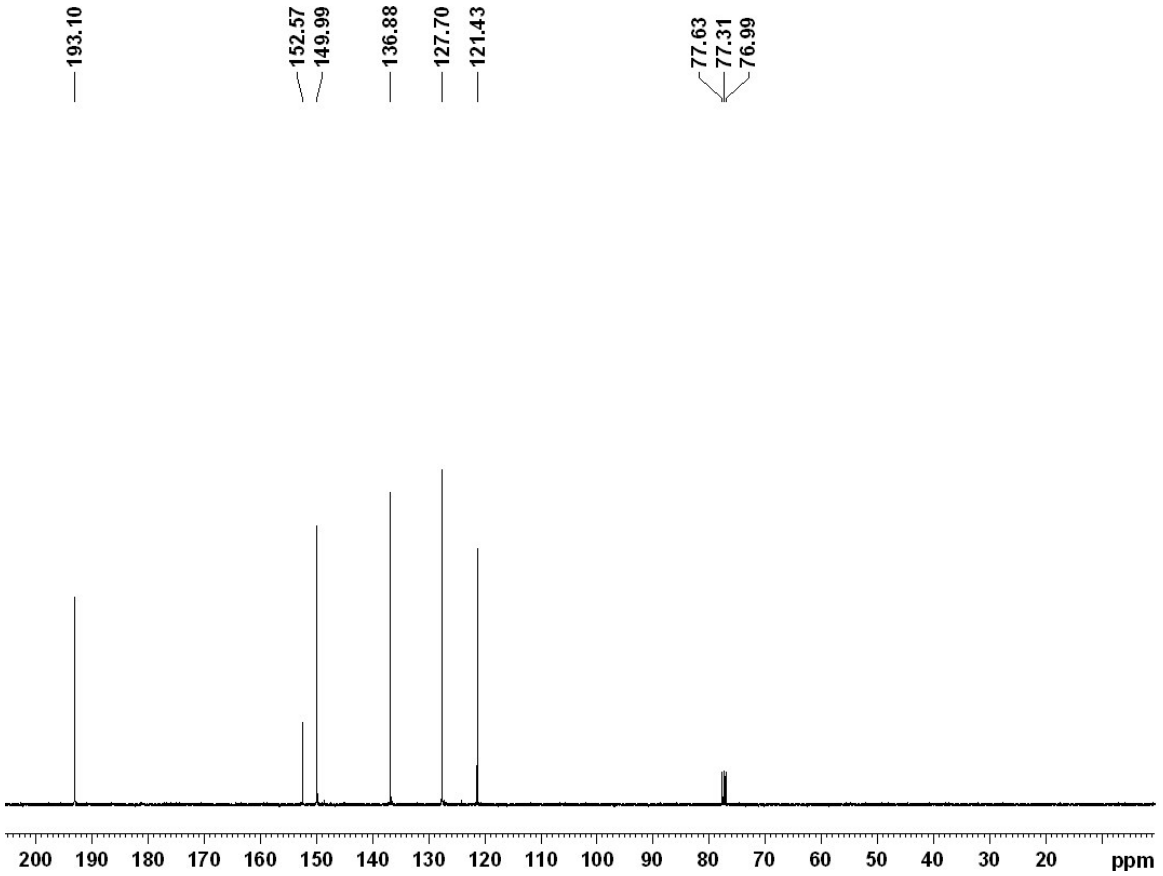


Figure S41. ^{13}C NMR spectrum for entry **9** in **Table 4**

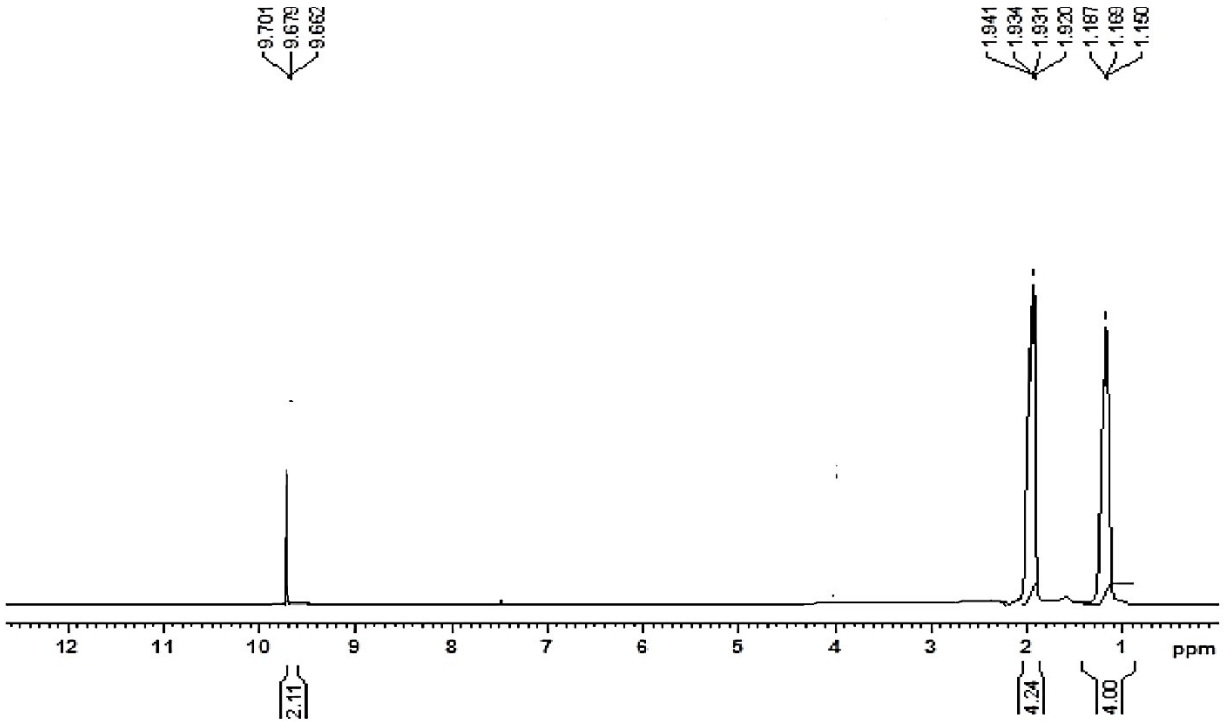


Figure S42: ^{1}H NMR spectrum for entry **10** in **Table 4**

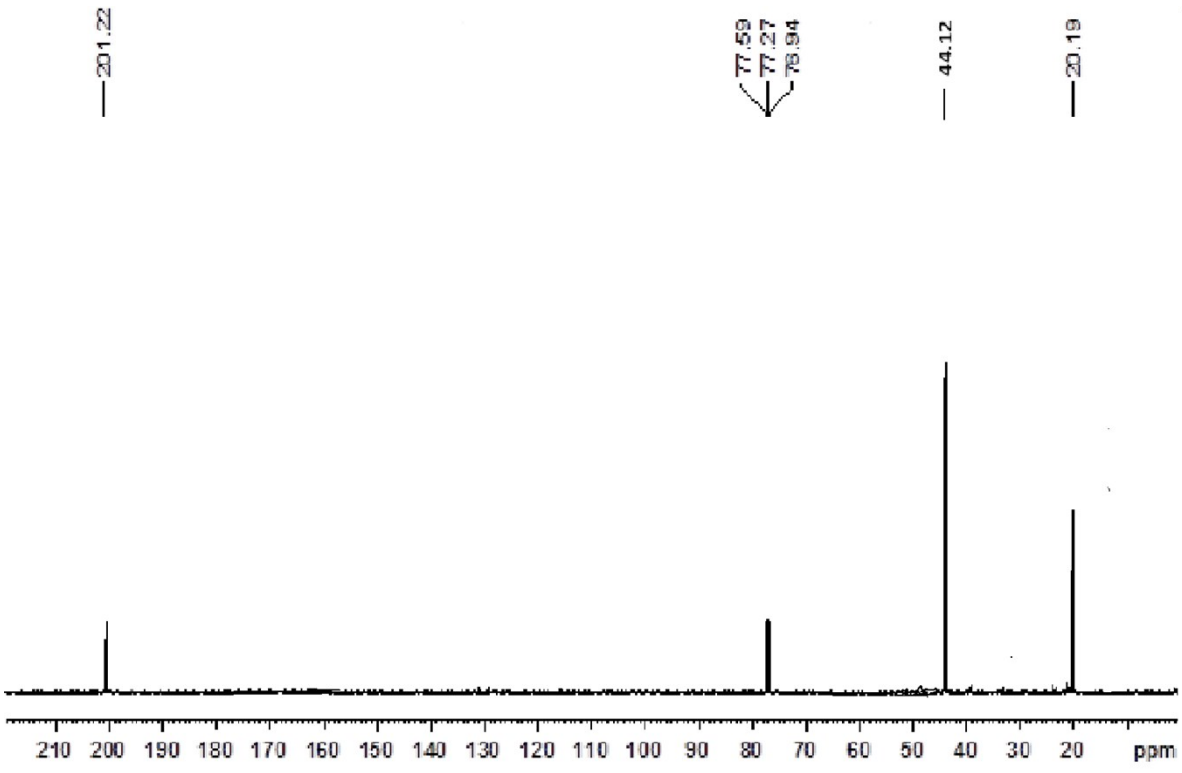


Figure S43. ^{13}C NMR spectrum for entry **10** in **Table 4**

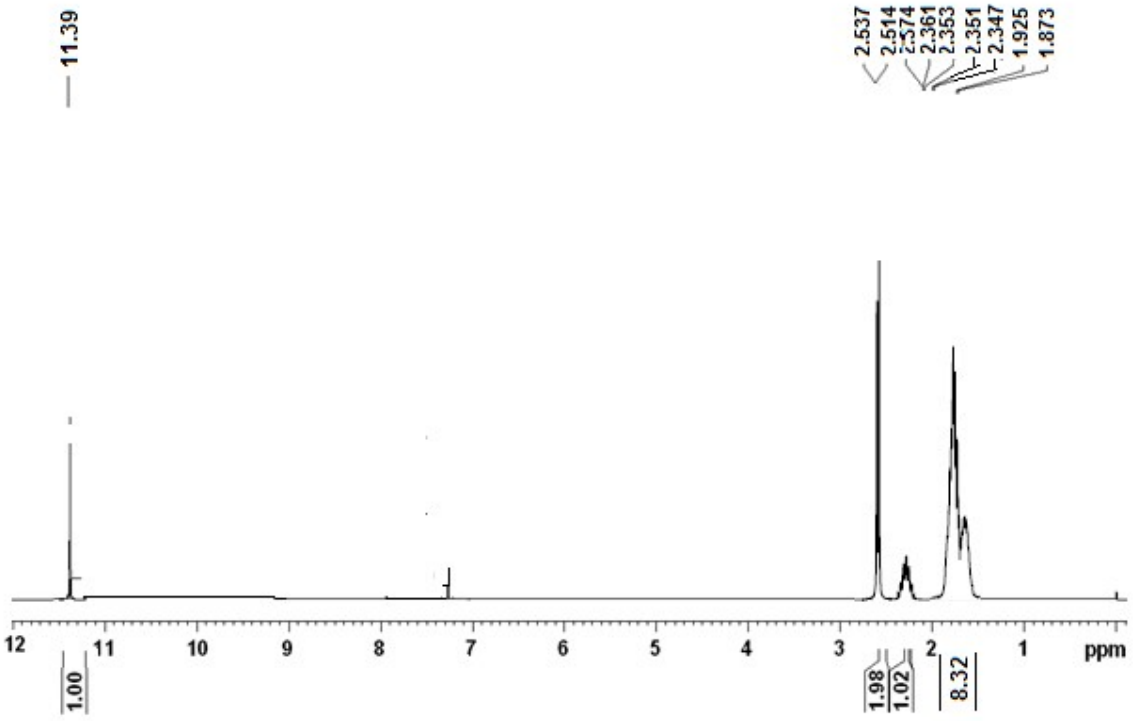


Figure S44. [1]H NMR spectrum for entry **11** in **Table 4**

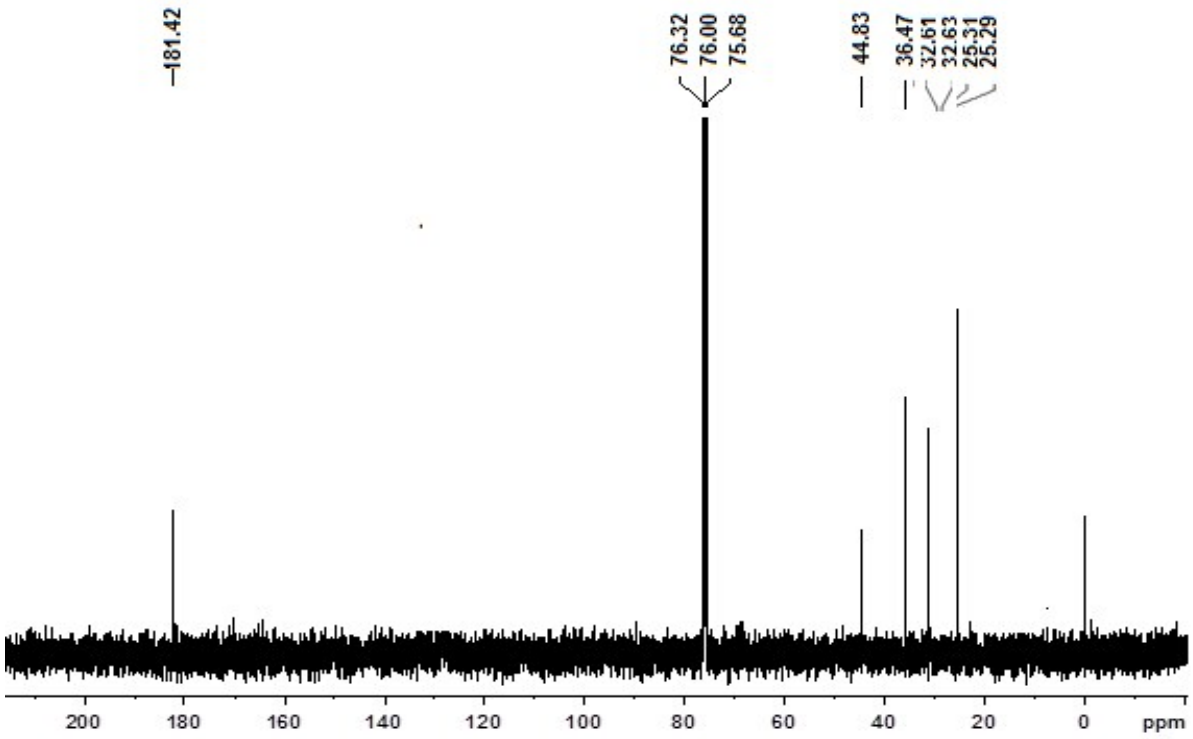


Figure S45. [13]C NMR spectrum for entry **11** in **Table 4**

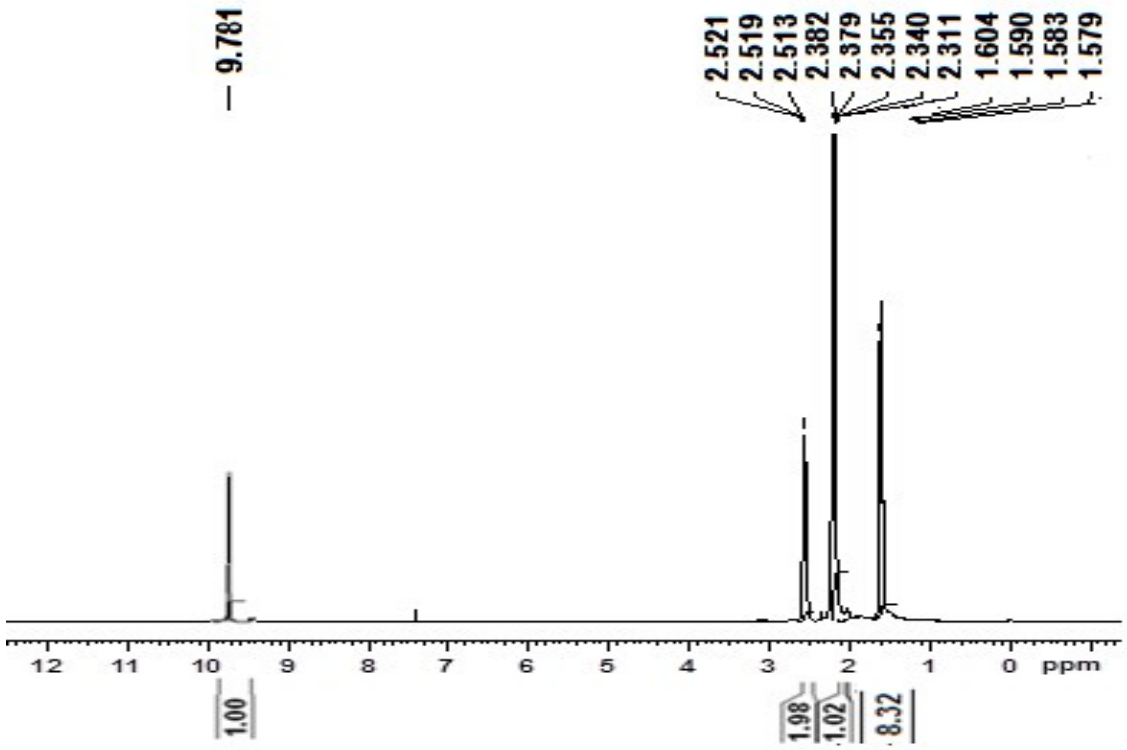


Figure S46. [1]H NMR spectrum for cyclopentane acetaldehyde from entry **11** in **Table 4**

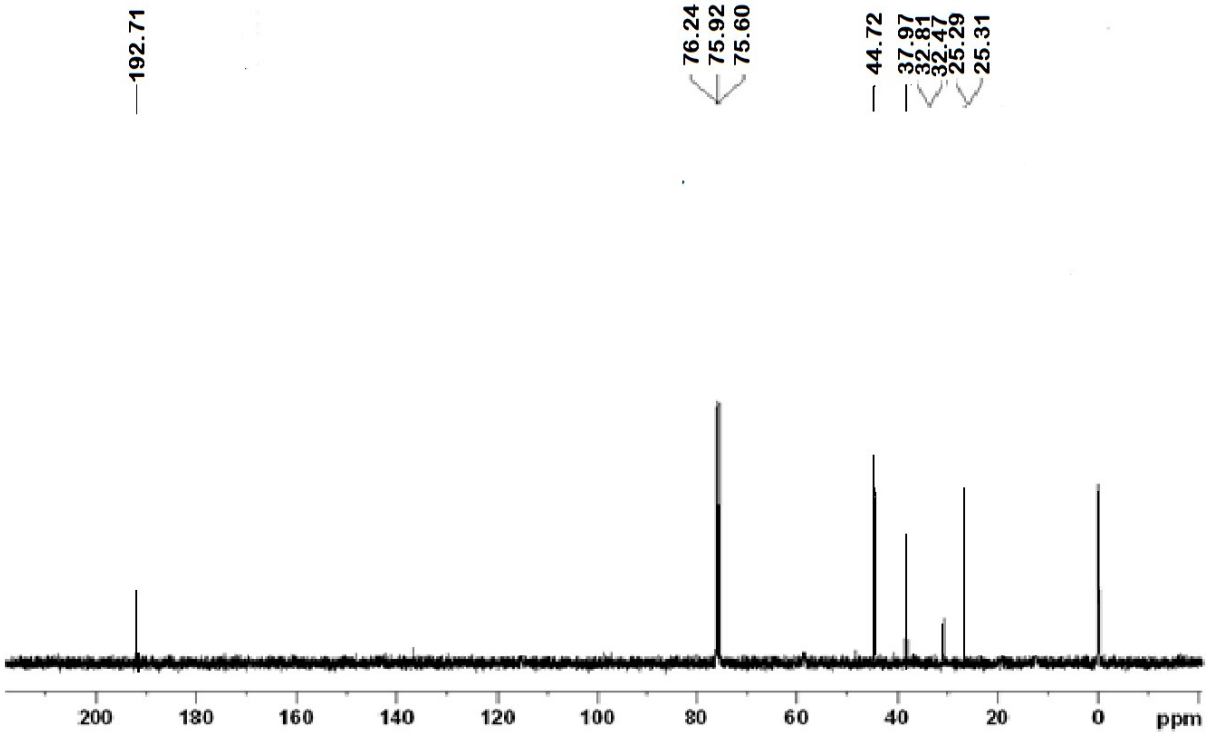


Figure S47. [13]C NMR spectrum for cyclopentane acetaldehyde from entry **11** in **Table 4**

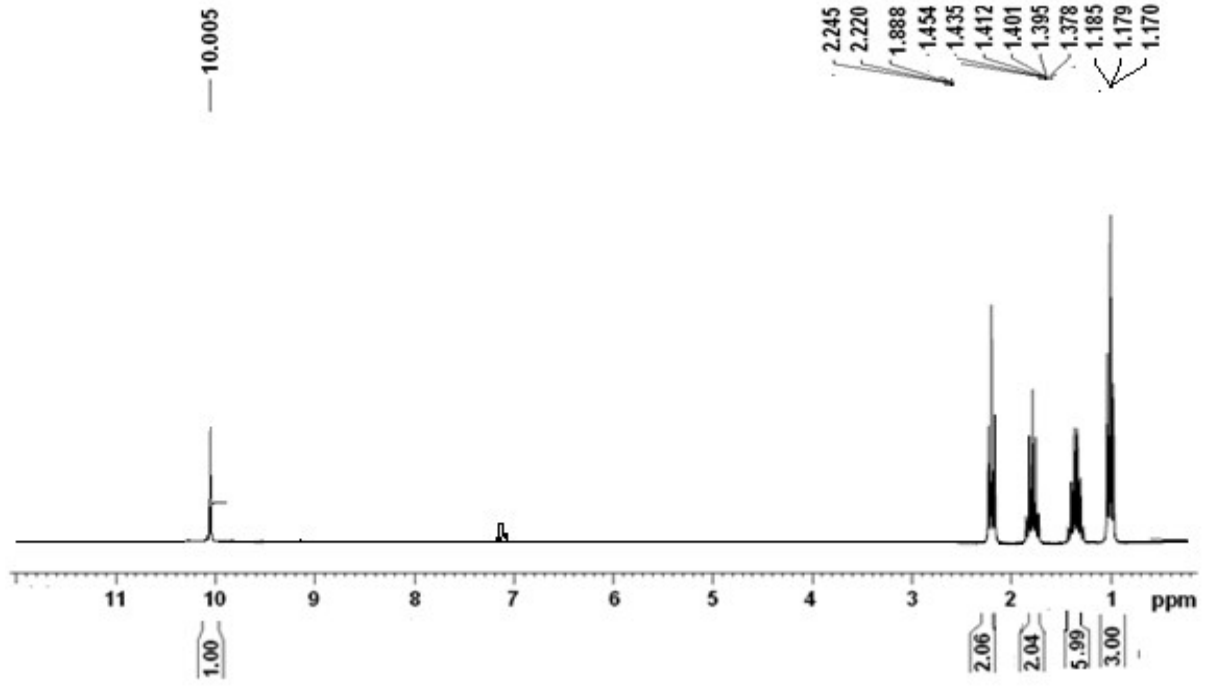


Figure S48: [1]H NMR spectrum for entry **12** in **Table 4**

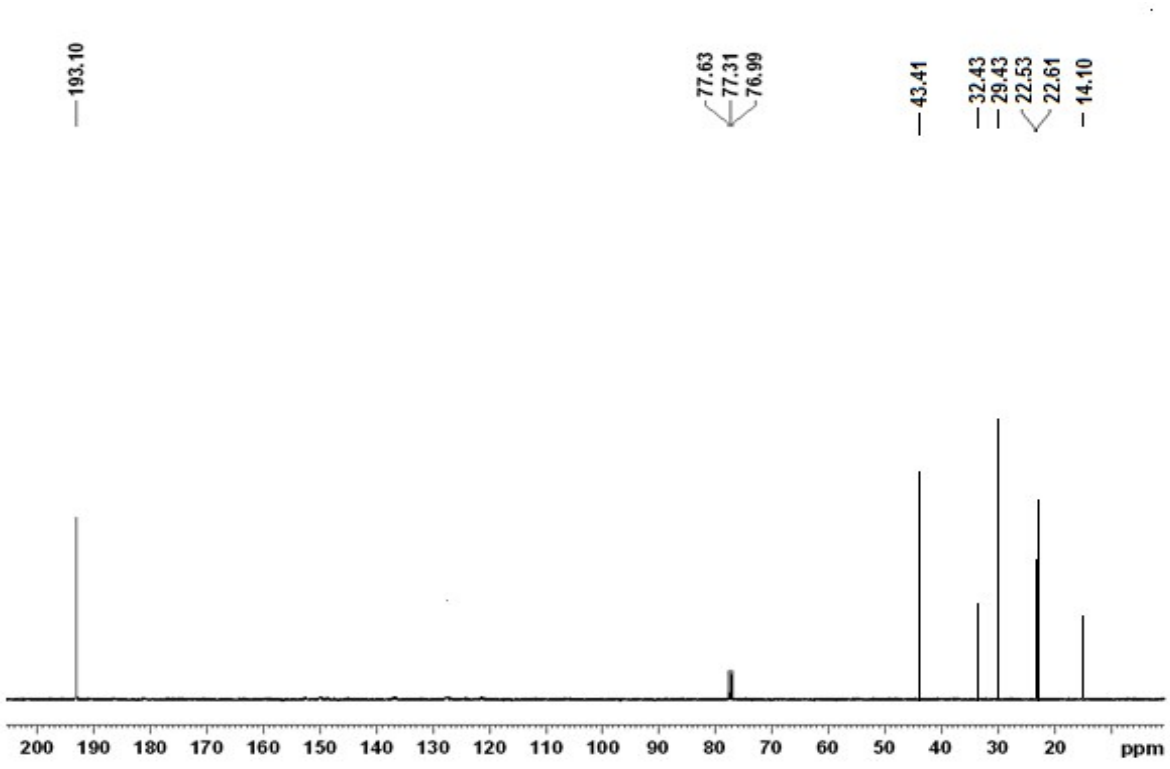


Figure S49: ^{13}C NMR spectrum for entry **12** in **Table 4**

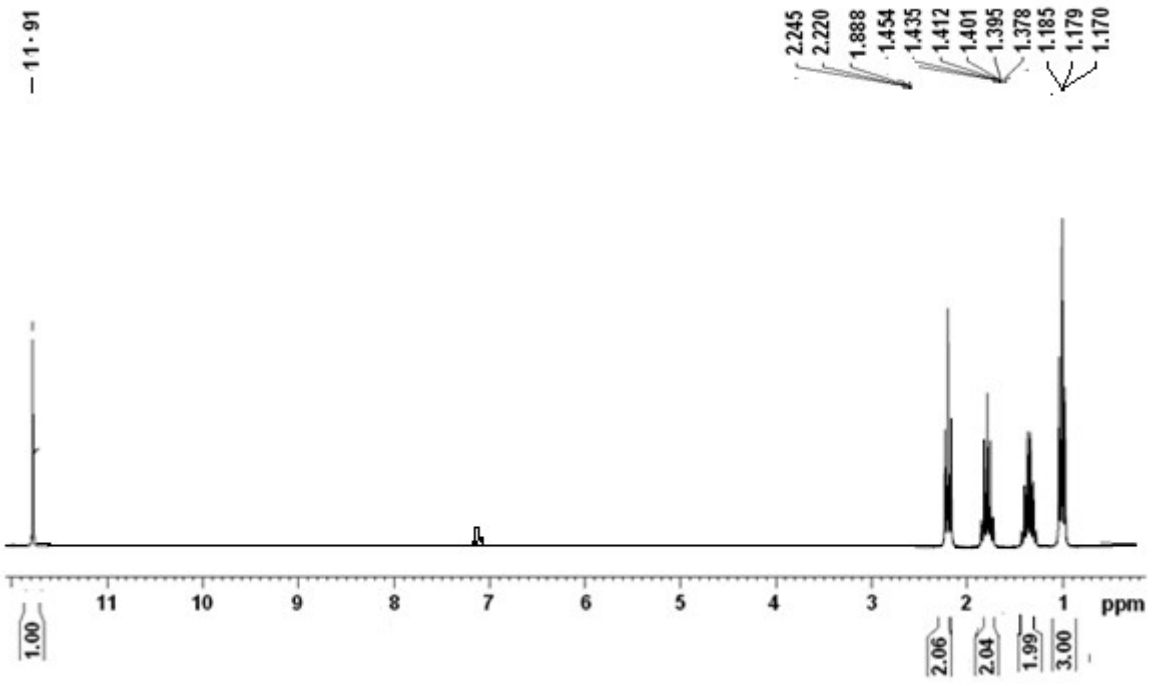


Figure S50: ^{1}H NMR spectrum for entry **13** in **Table 4**

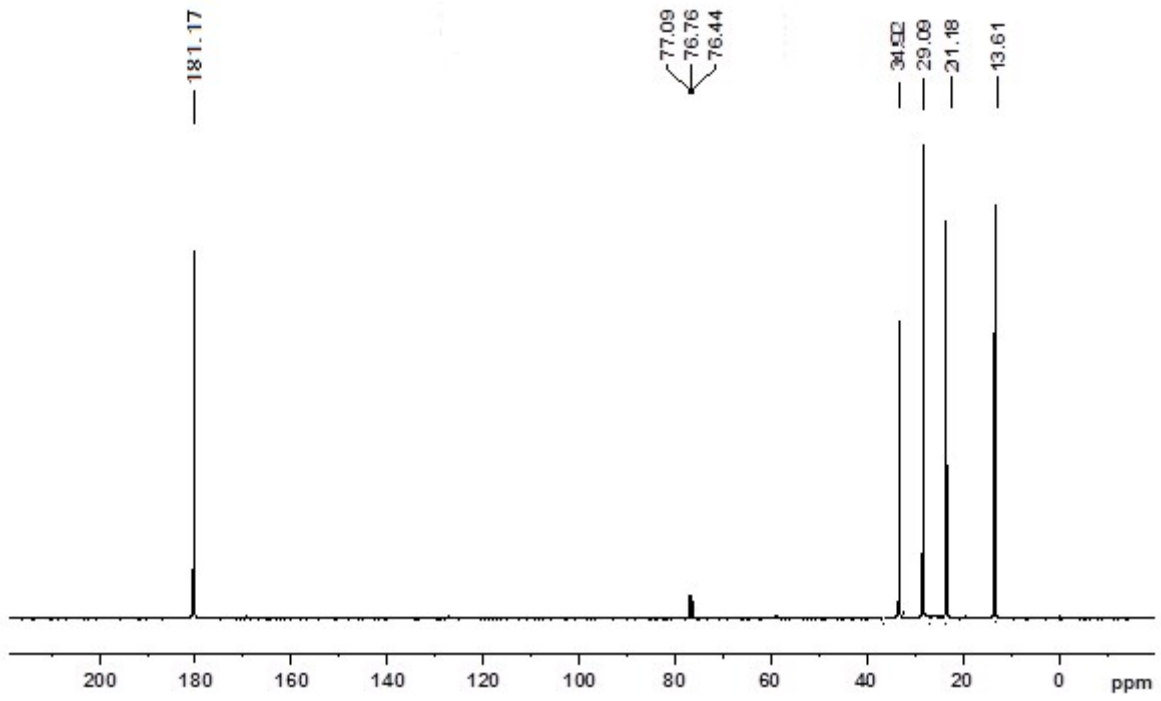


Figure S51: ^{13}C NMR spectrum for entry **13** in **Table 4**

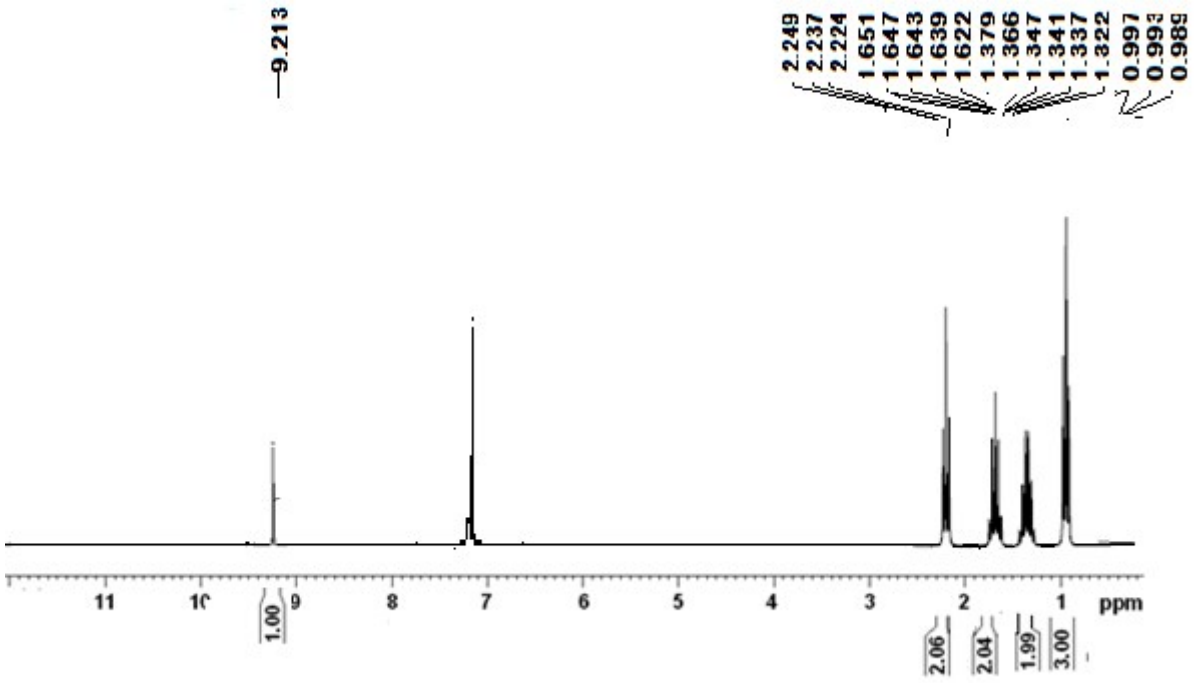


Figure S52: ^{1}H NMR spectrum for pentanal from entry **13** in **Table 4**

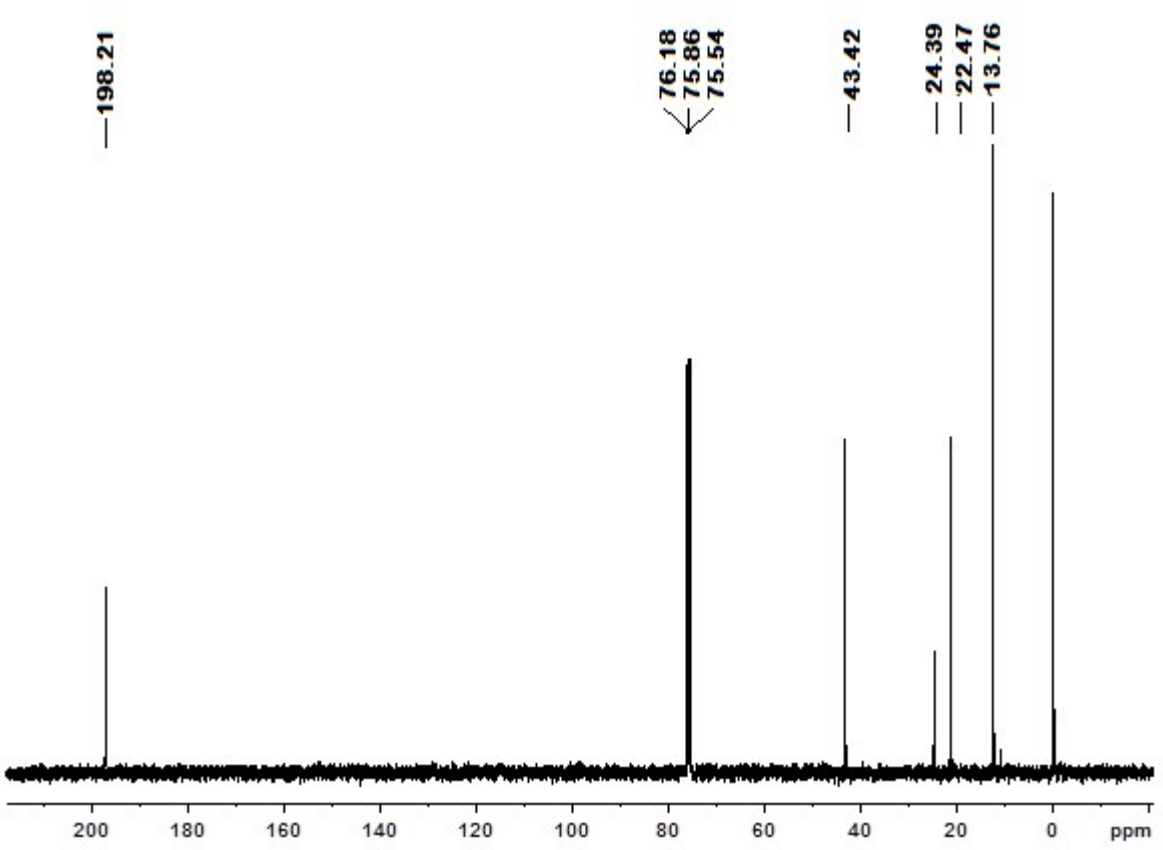


Figure S53: ^{13}C NMR spectrum for pentanal from entry **13** in **Table 4**

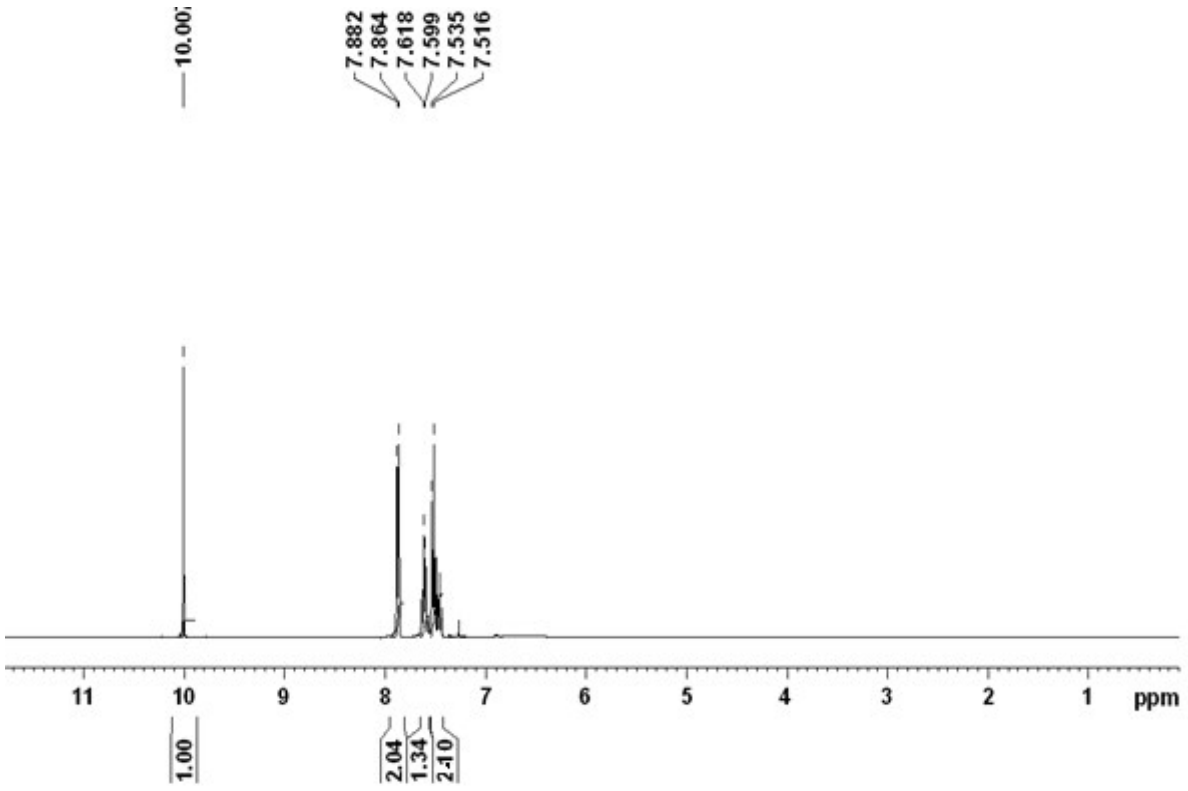


Figure S54: [1]H NMR spectrum for entry **14** in **Table 4**

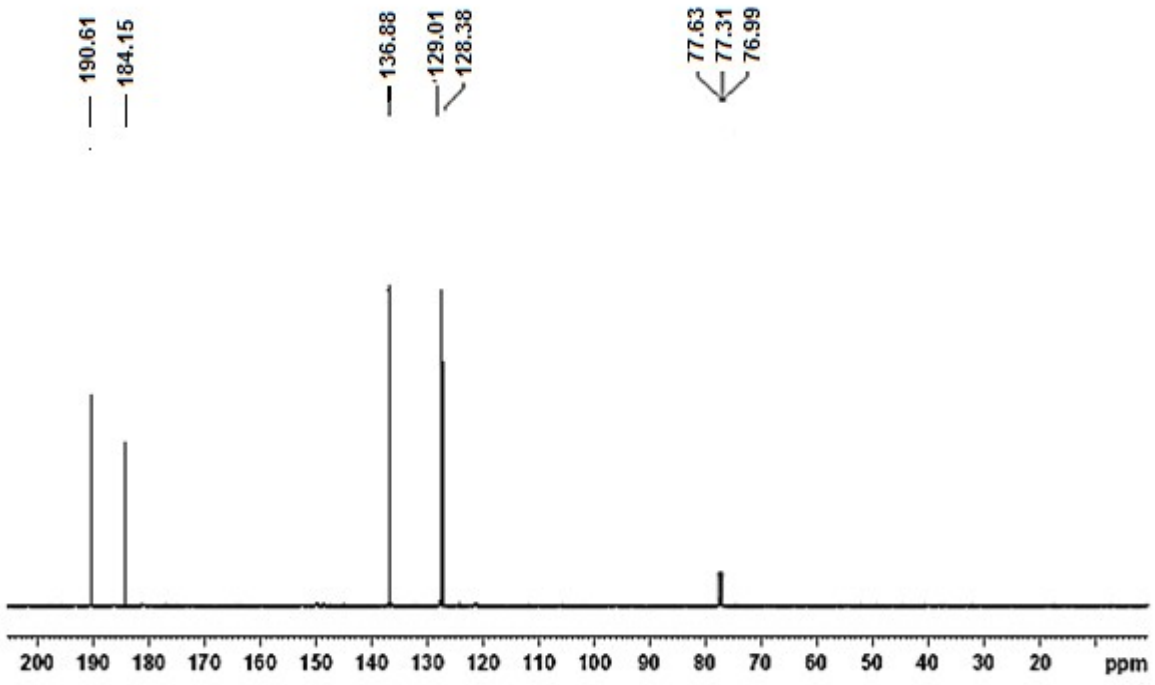


Figure S55: [13]C NMR spectrum for entry **14** in **Table 4**

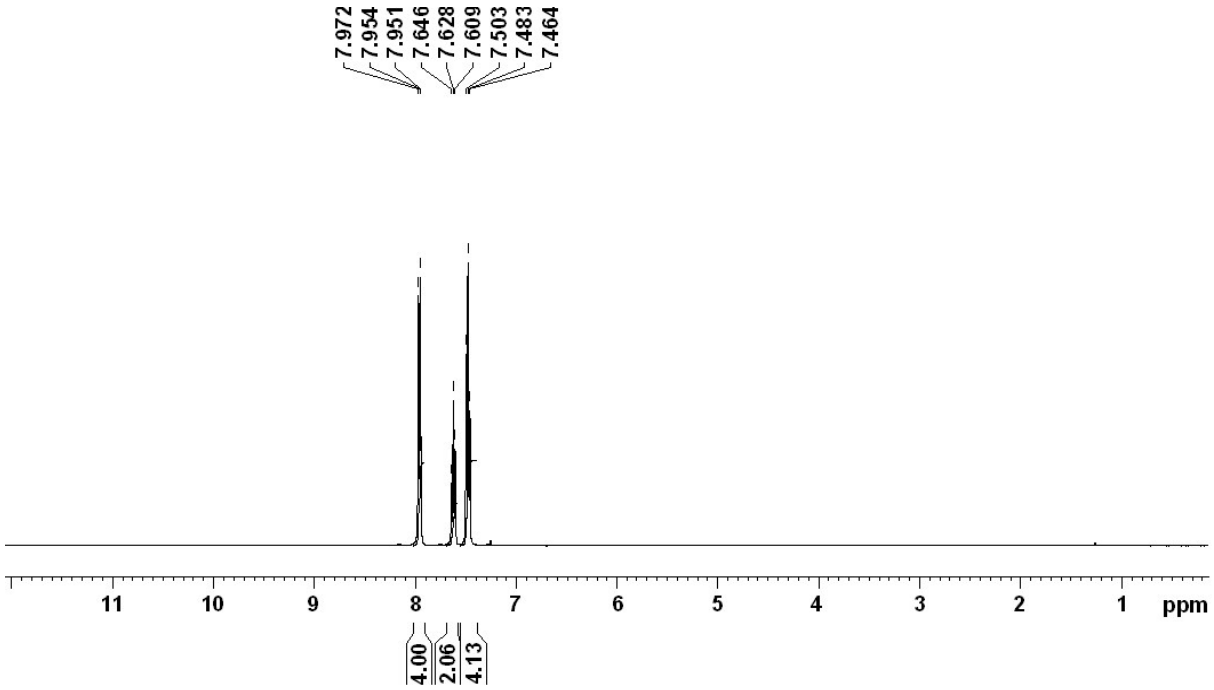


Figure S56: [1]H NMR spectrum for entry **15** in **Table 4**

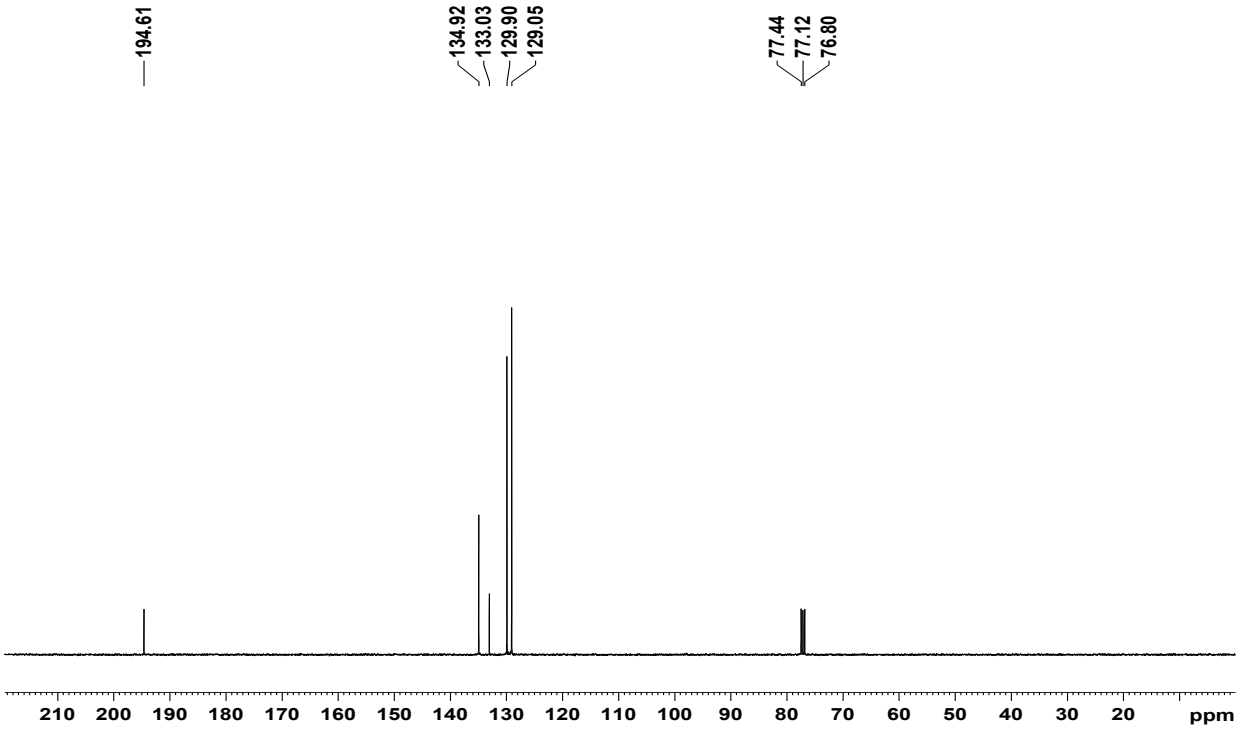


Figure S57: ^{1}H NMR spectrum for entry **15** in **Table 4**