

Stereoselective cyclopropanation of serine- and threonine-derived oxazines to access new morpholine-based scaffolds†

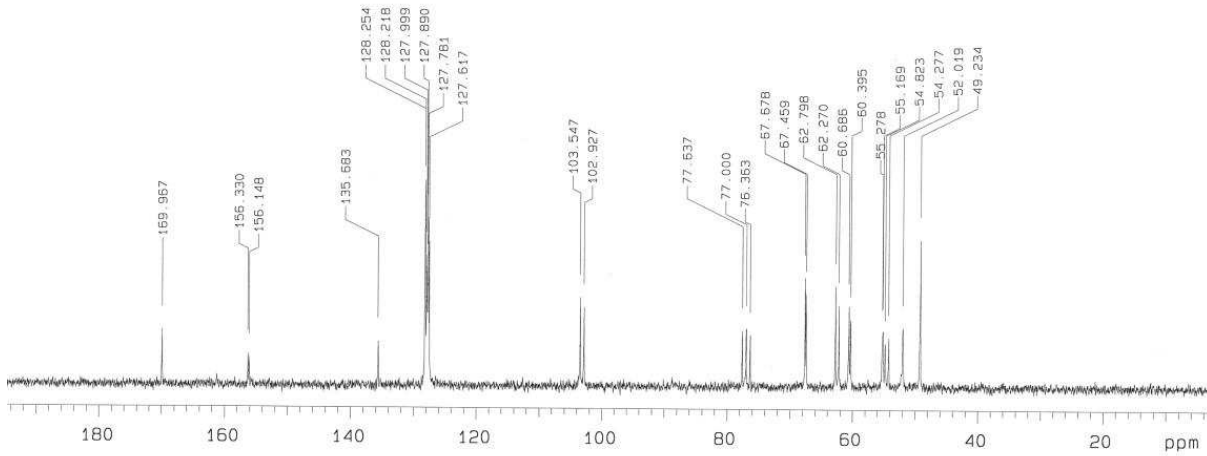
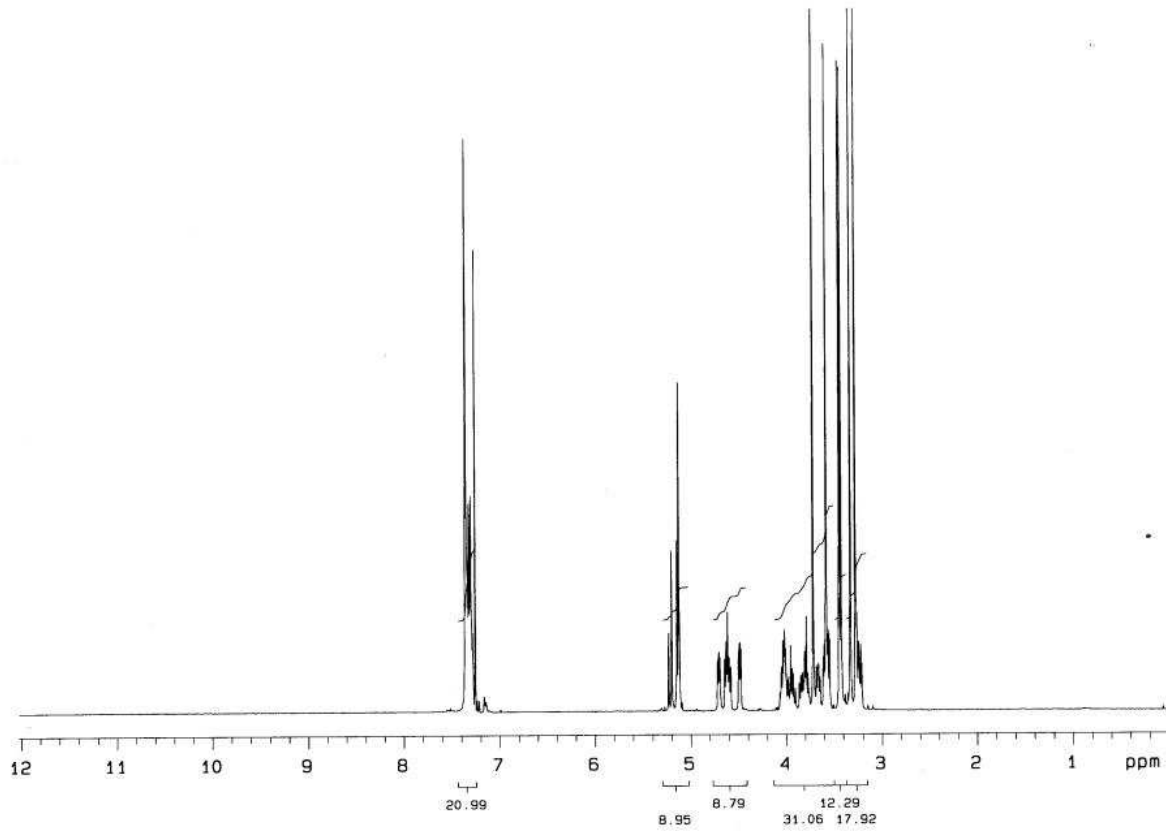
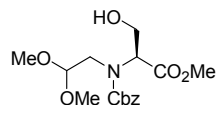
Filippo Sladojevich,^a Andrea Trabocchi*^a and Antonio Guarna^a

Department of Organic Chemistry “Ugo Schiff”, University of Florence, Polo Scientifico e Tecnologico, Via della Lastruccia 13, I-50019 Sesto Fiorentino (FI), Italy. Fax: +39 055 4573531; Tel: +39 055 4573507; E-mail: andrea.trabocchi@unifi.it

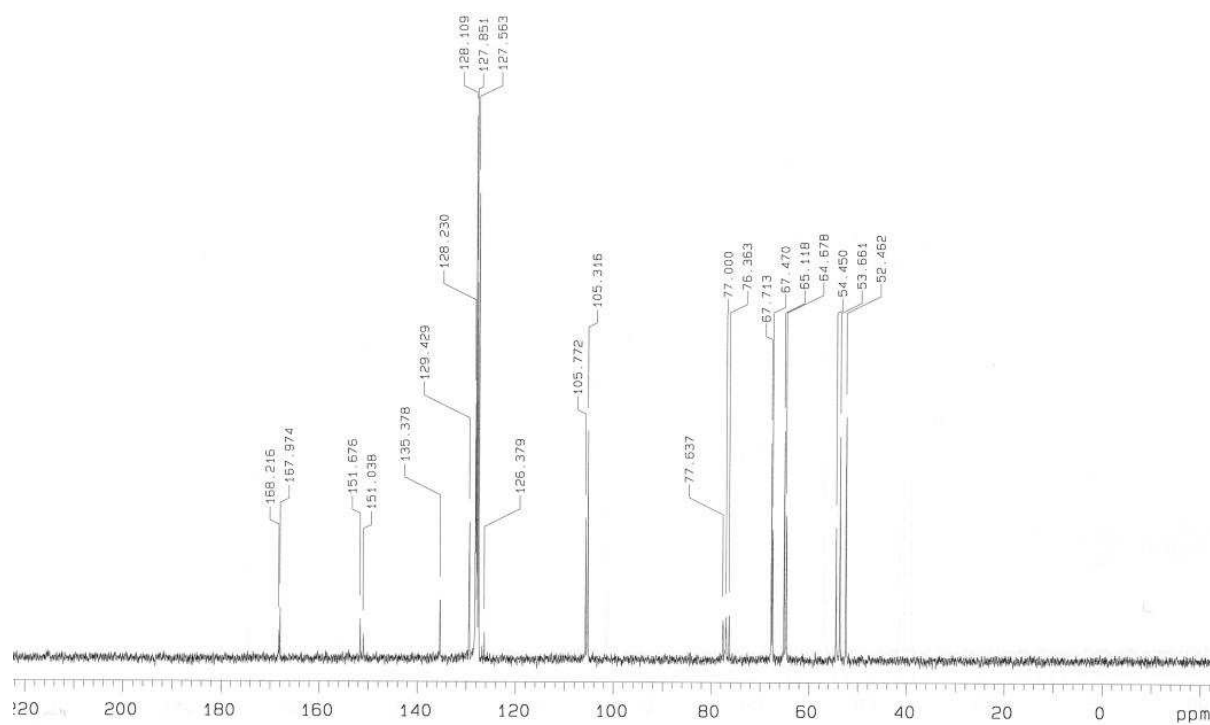
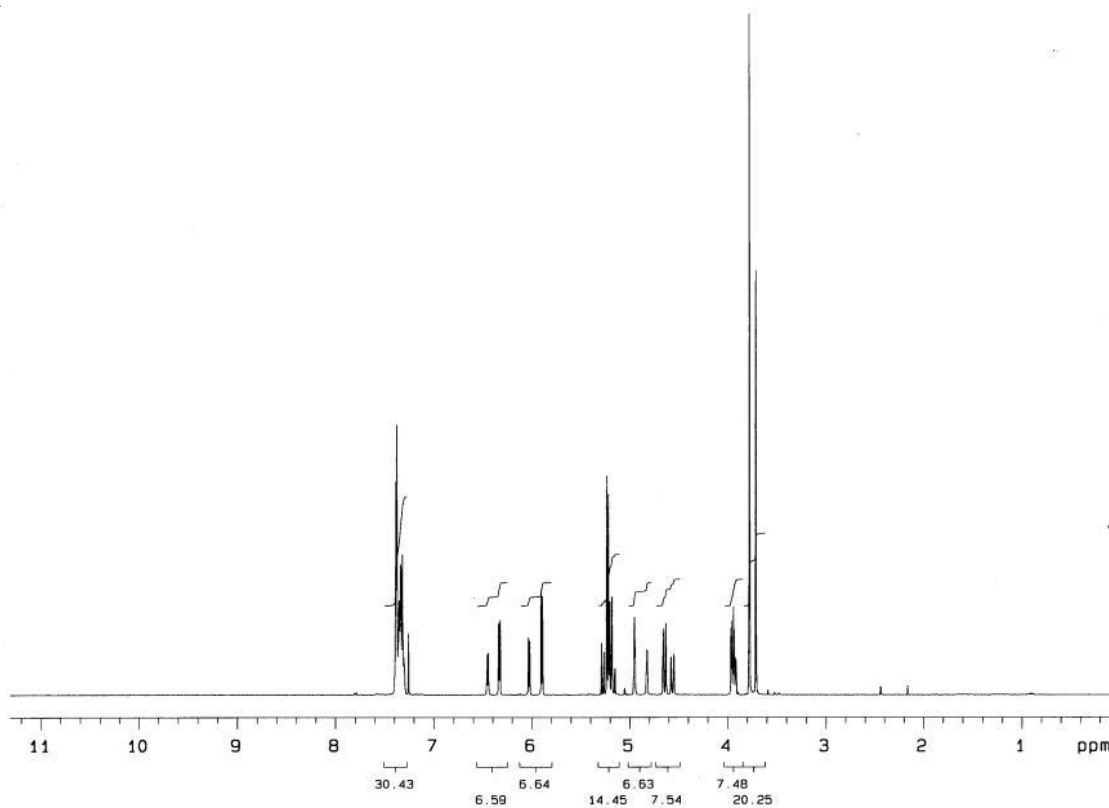
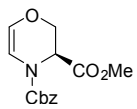
ELECTRONIC SUPPLEMENTARY INFORMATION

I.	¹ H and ¹³ C NMR spectra of compounds 4 , 5 , Cbz-8 , 10 , 11 , 12 , 13	S2-S8
II.	¹ H and ¹³ C NMR spectra of compounds 14a , 14b , 15a , 15b , 18 , 19 , 20	S9-S15
III.	Molecular modeling methods	S16
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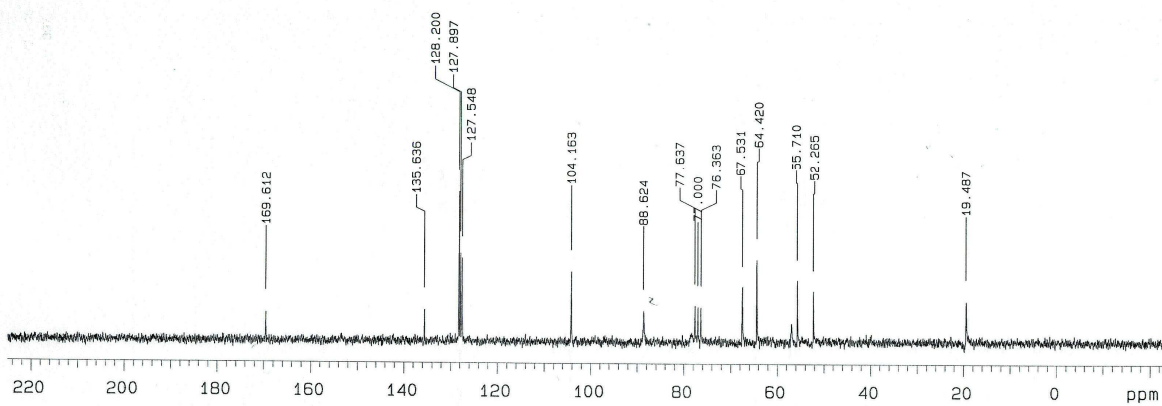
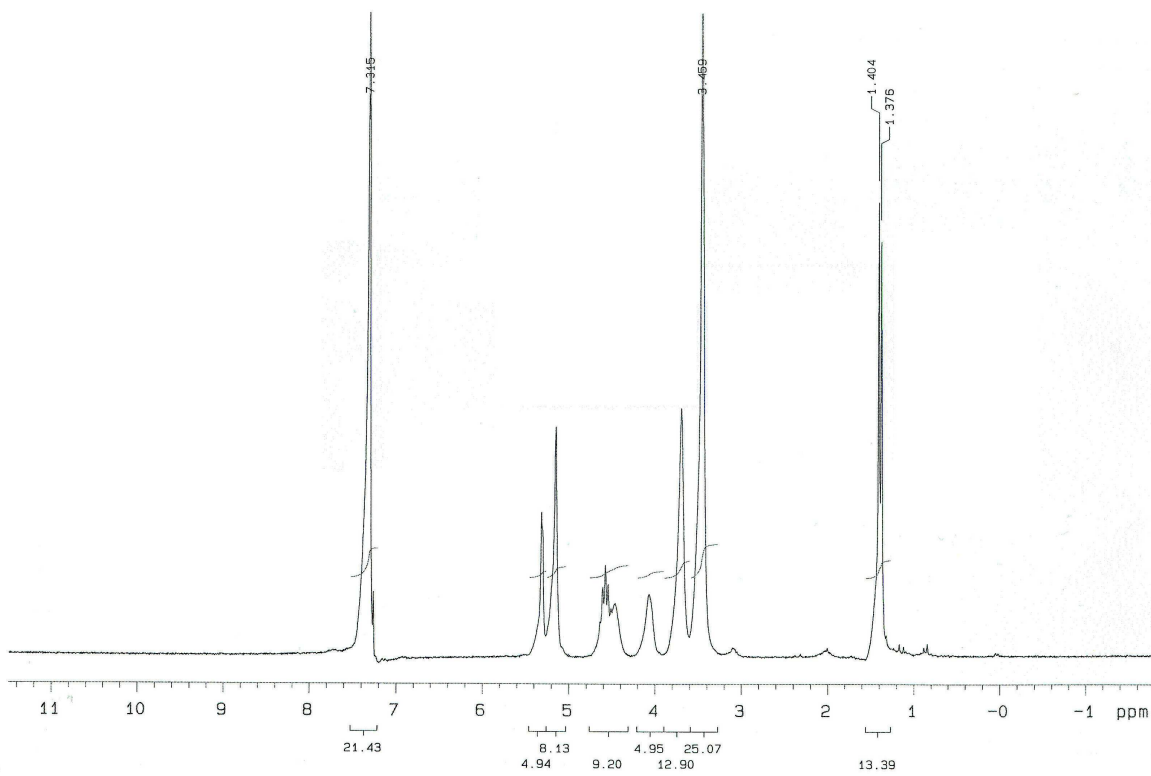
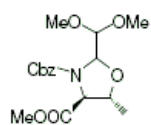
Compound 4



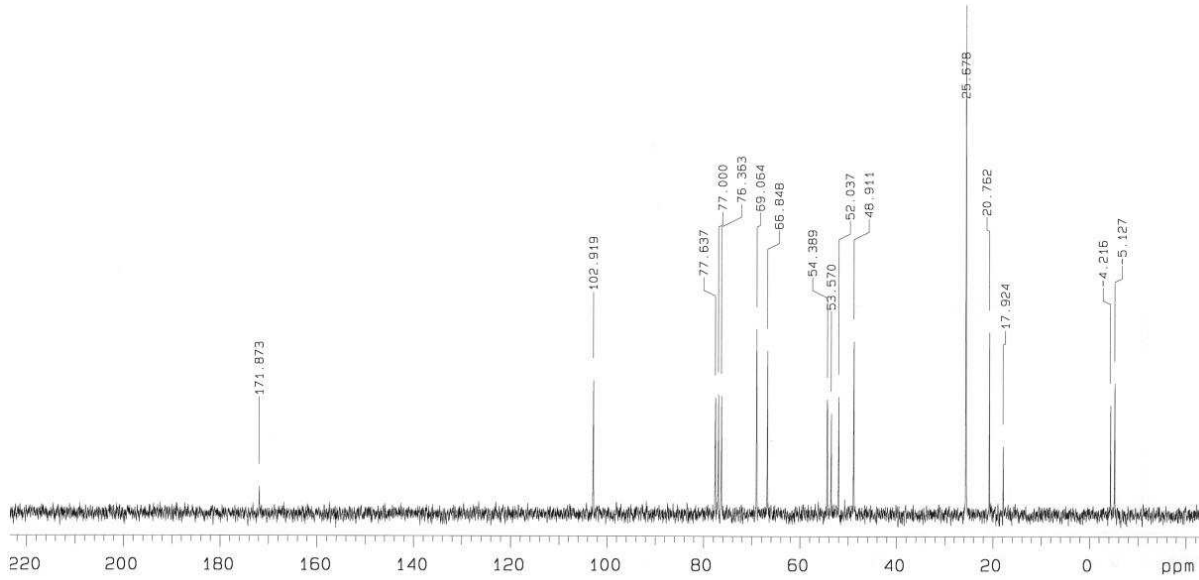
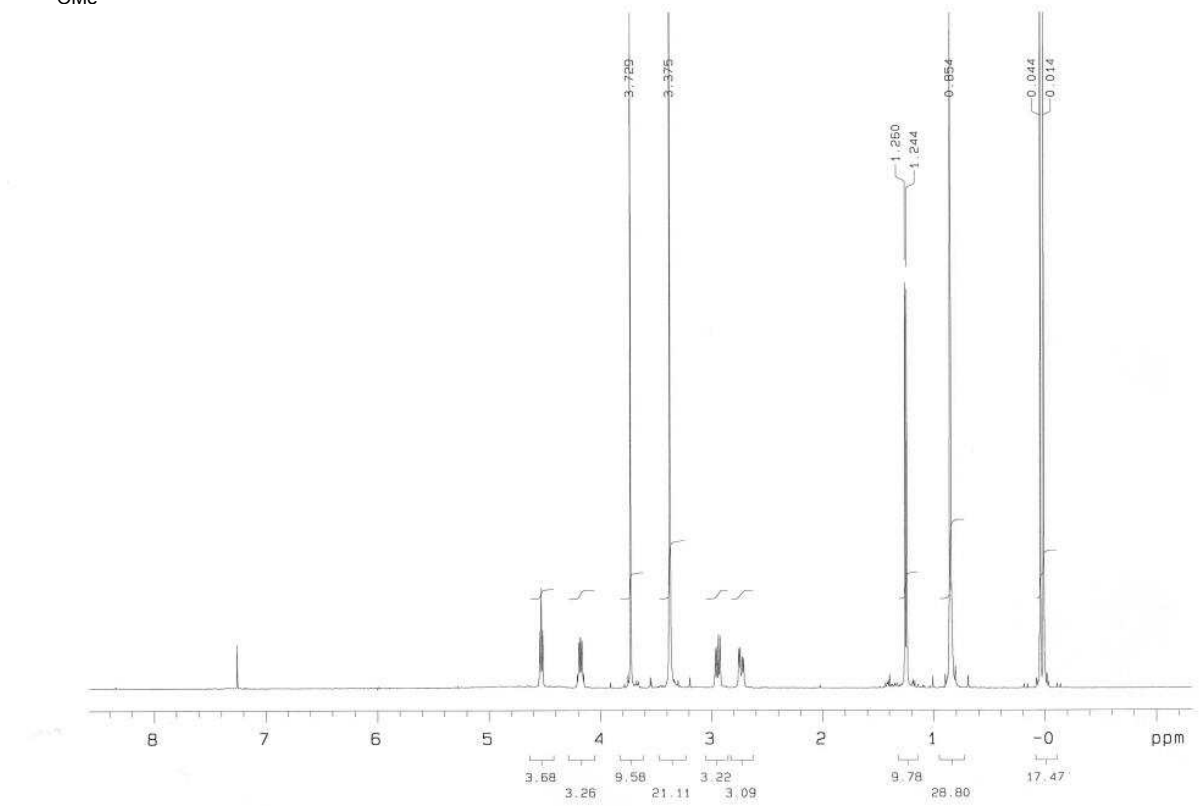
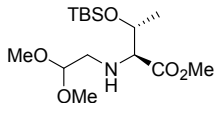
Compound 5



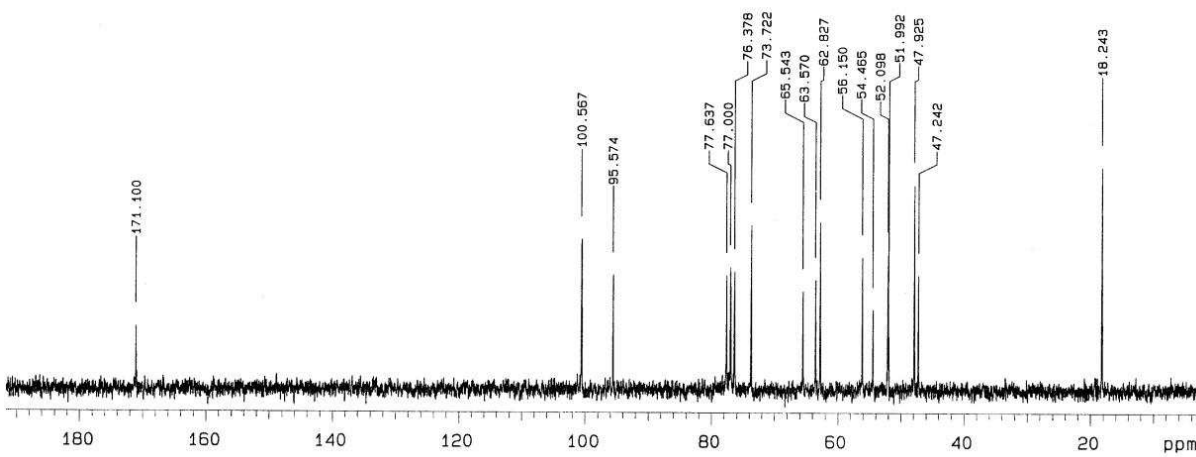
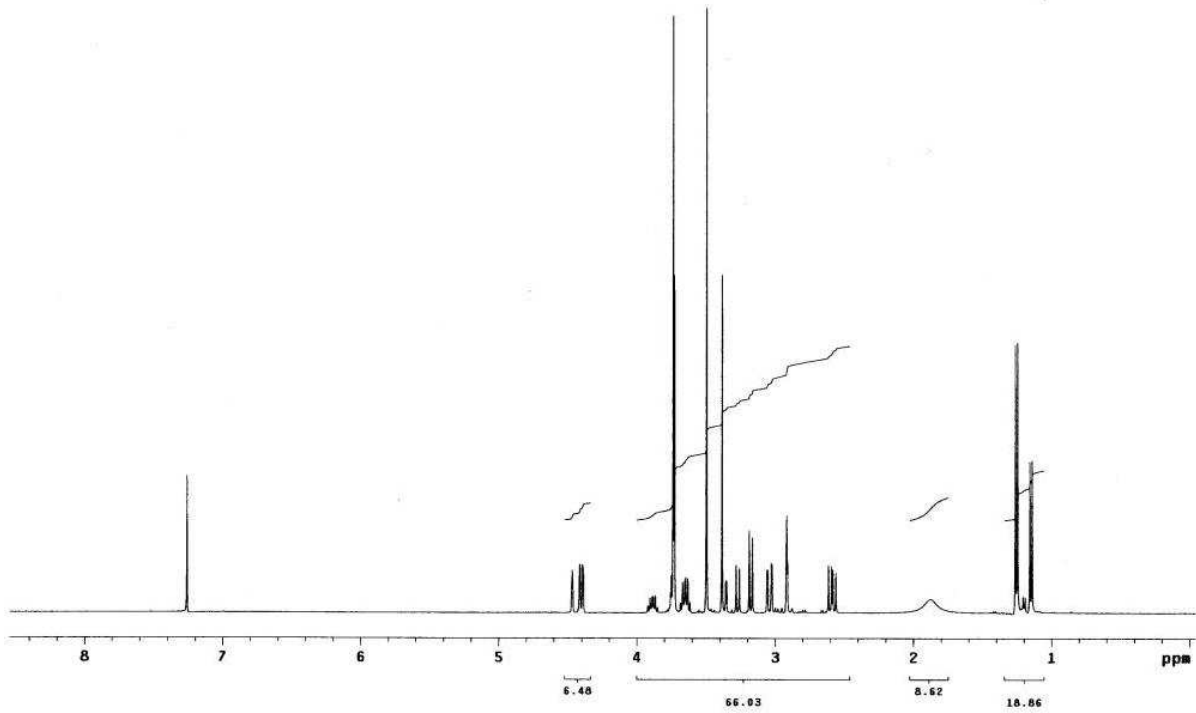
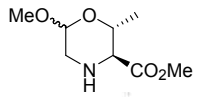
Cbz-8

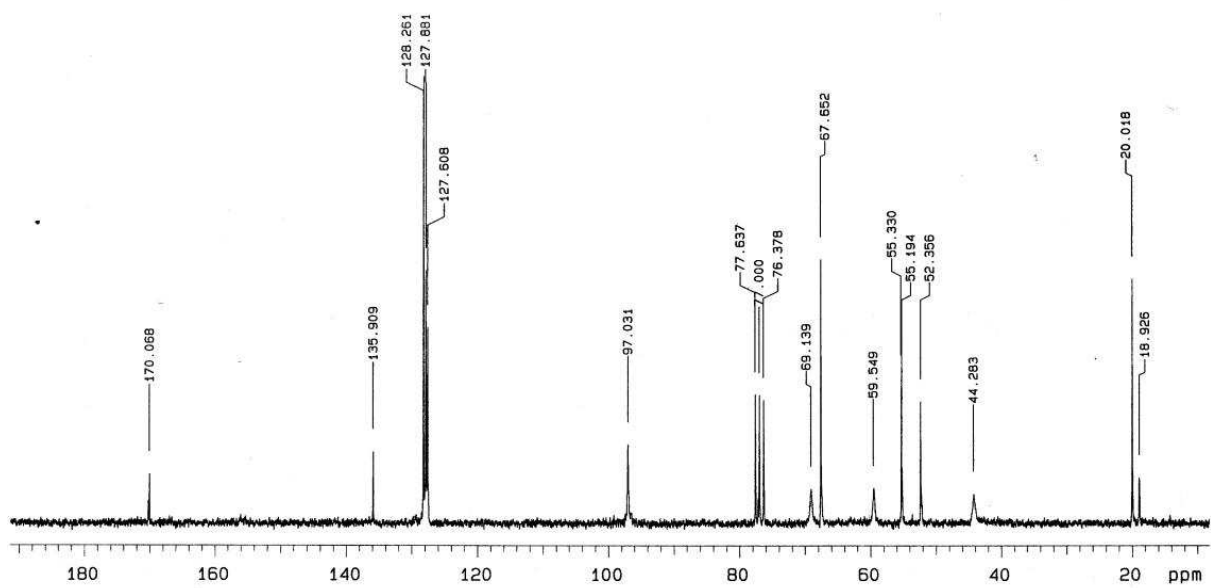
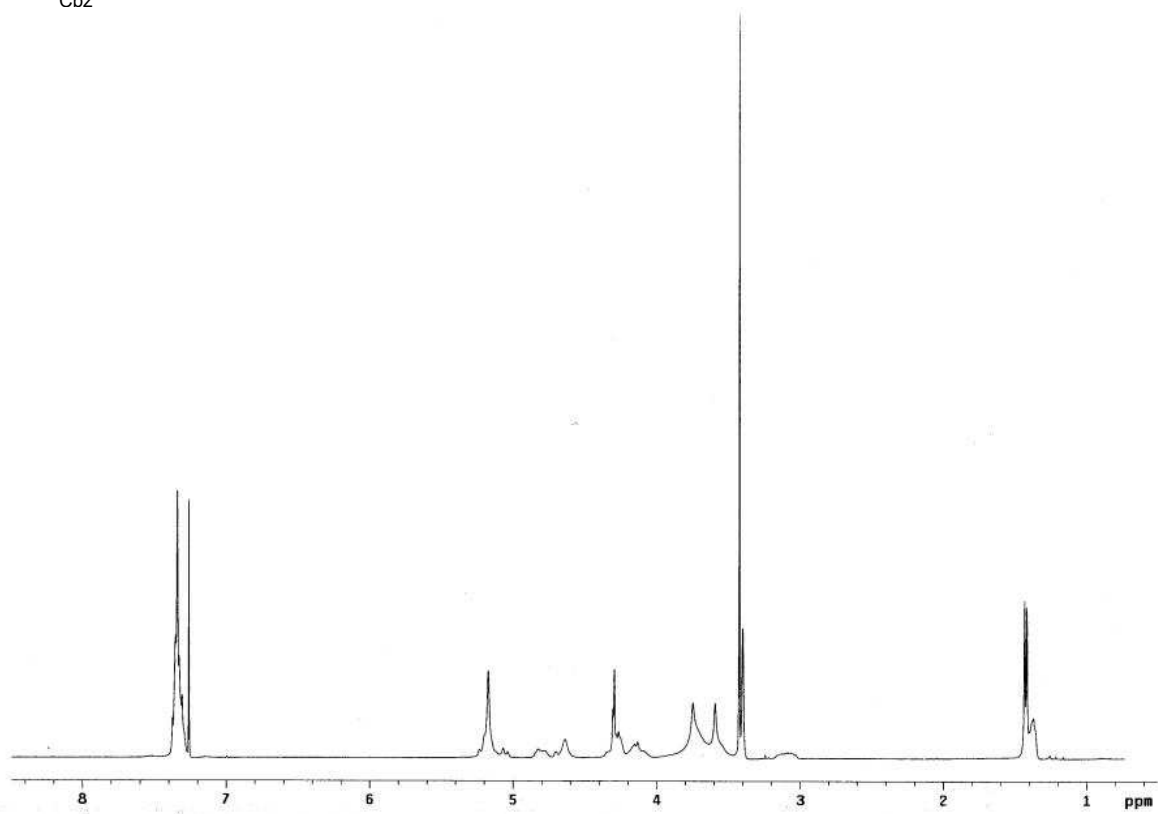
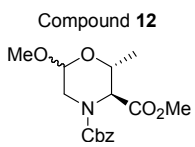


Compound 10

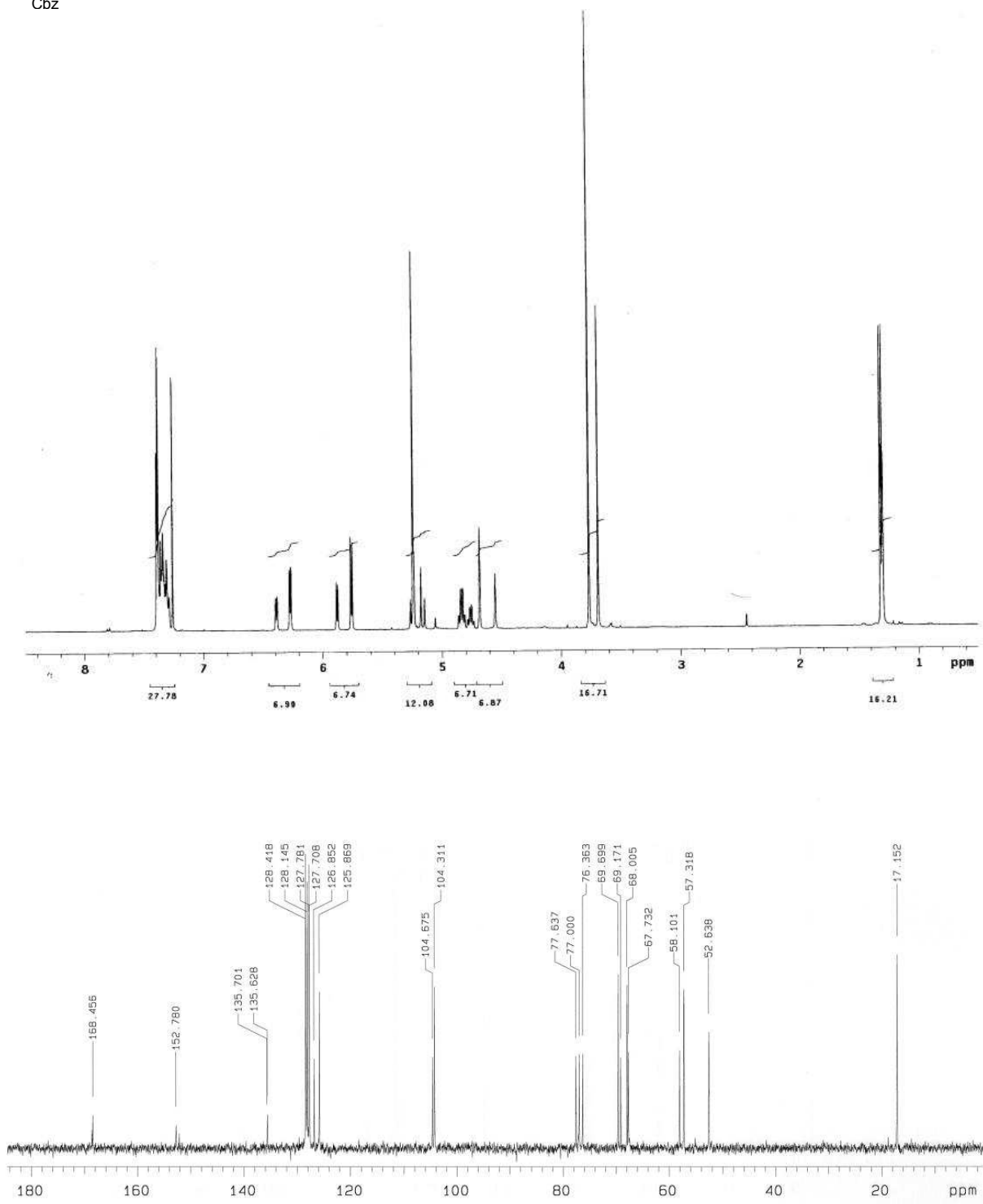
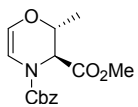


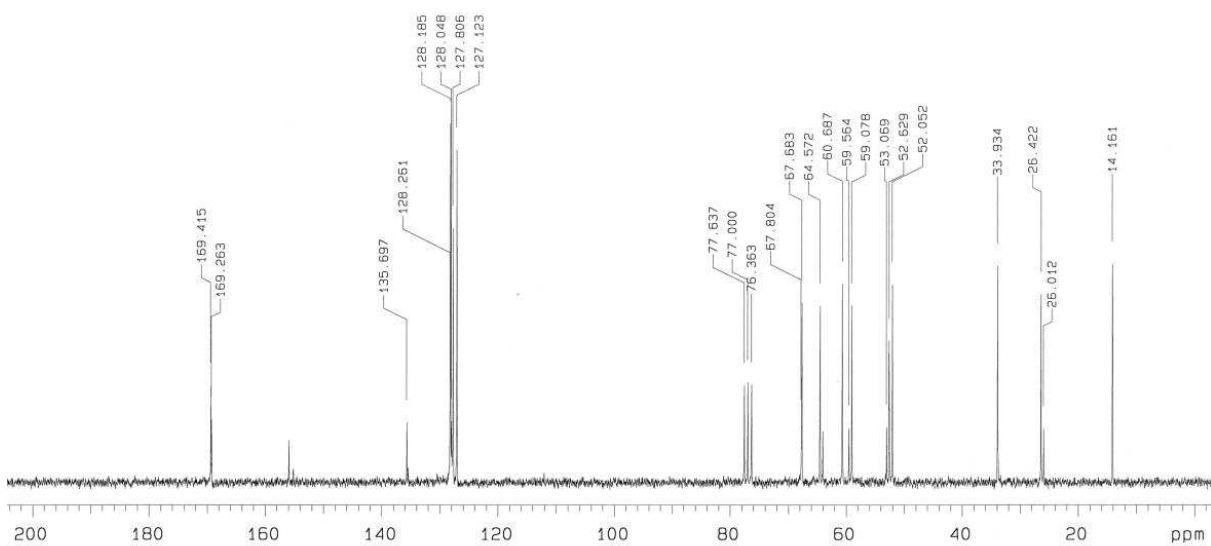
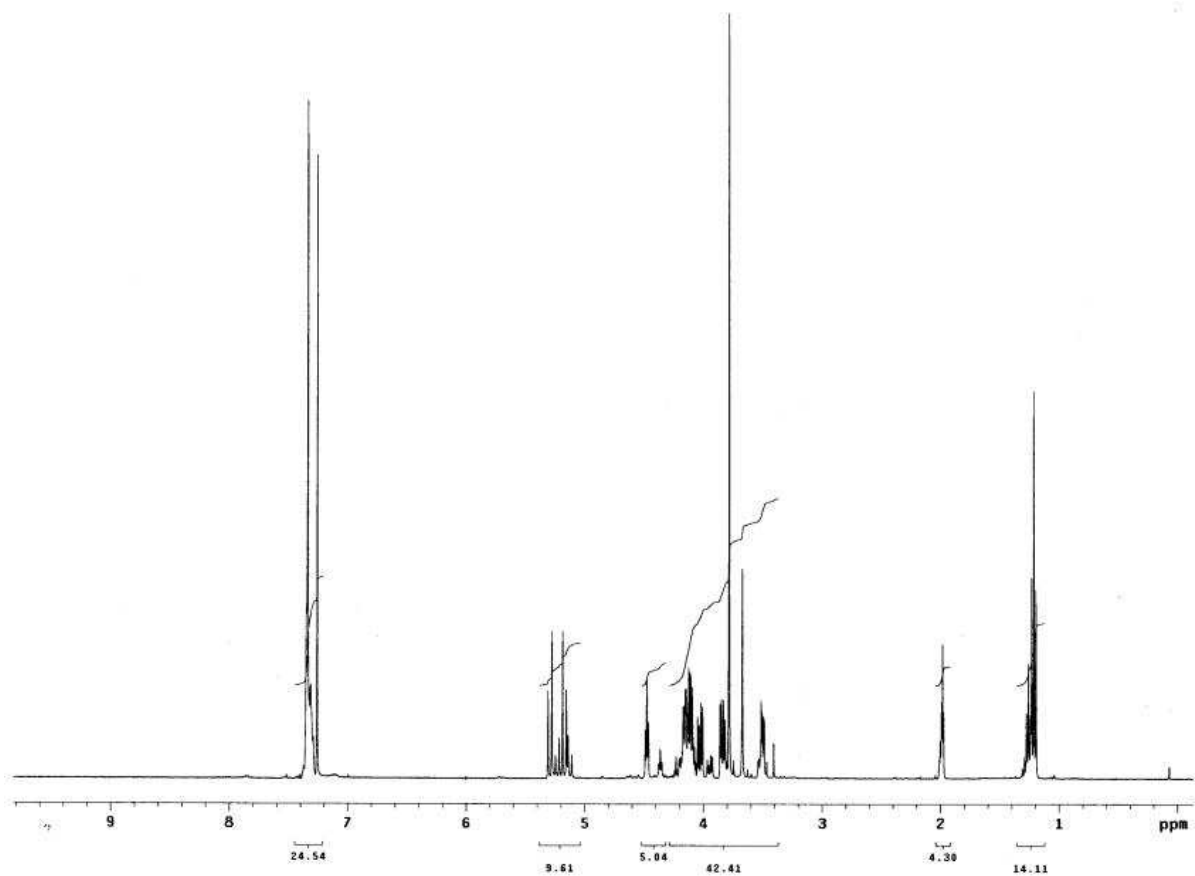
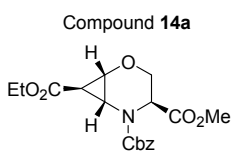
Compound 11

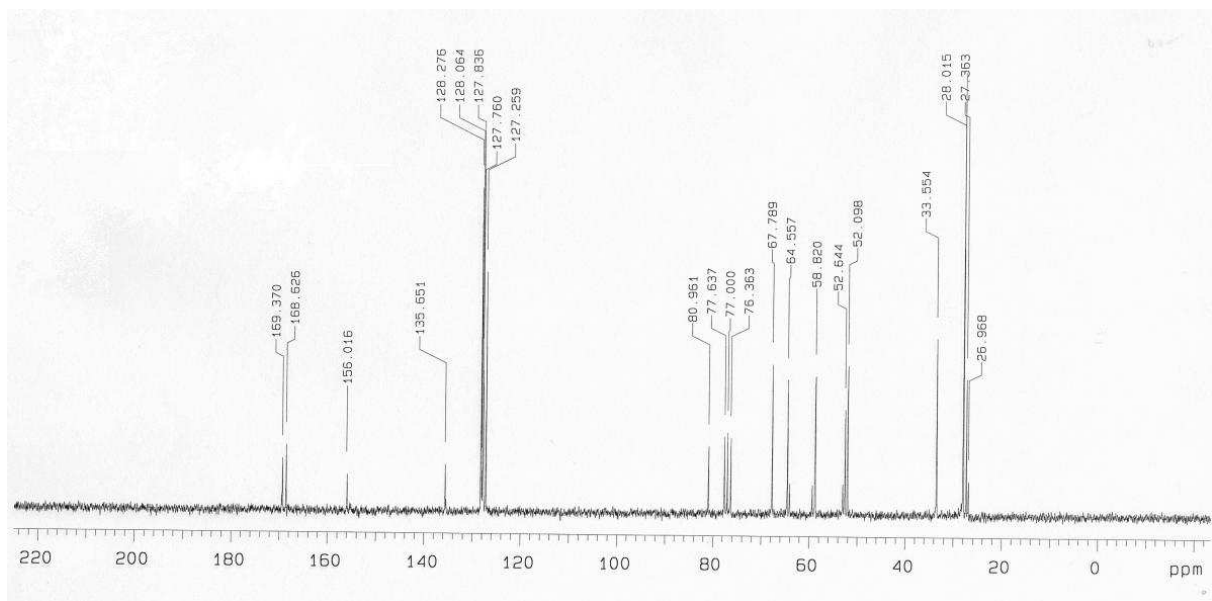
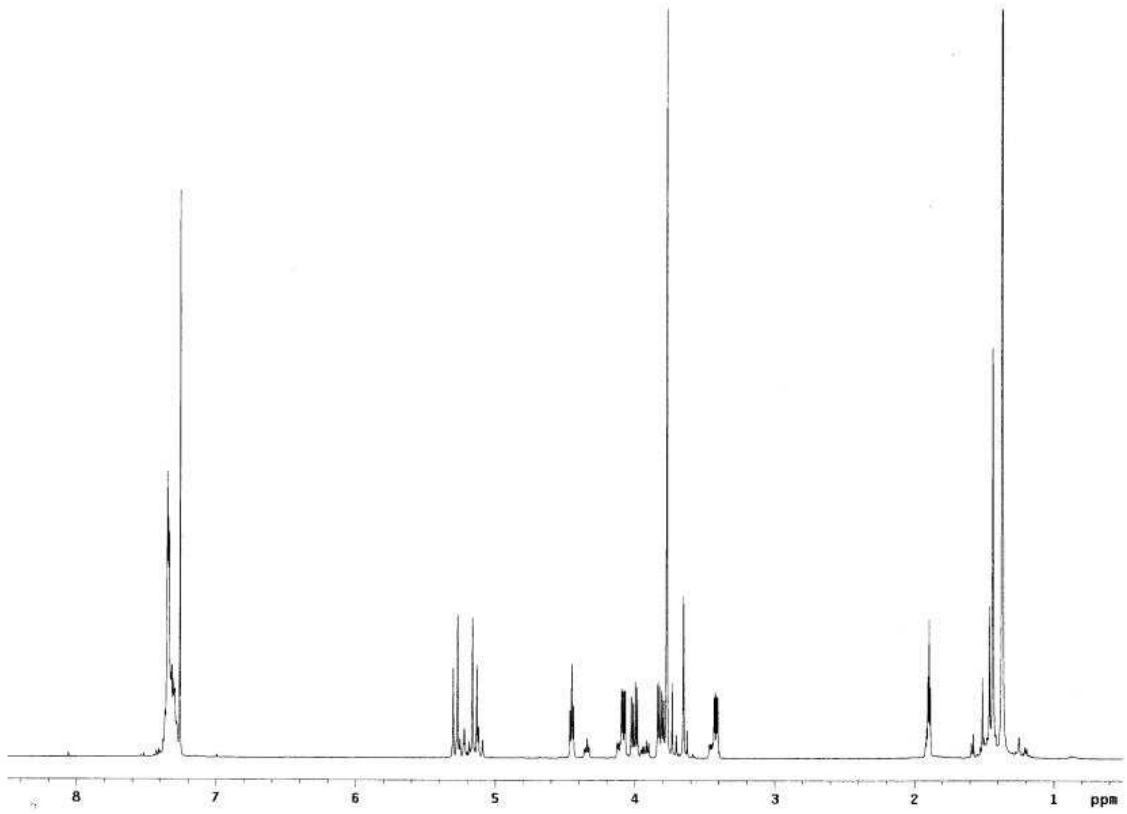
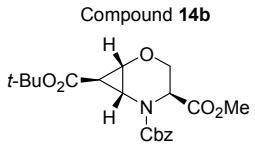


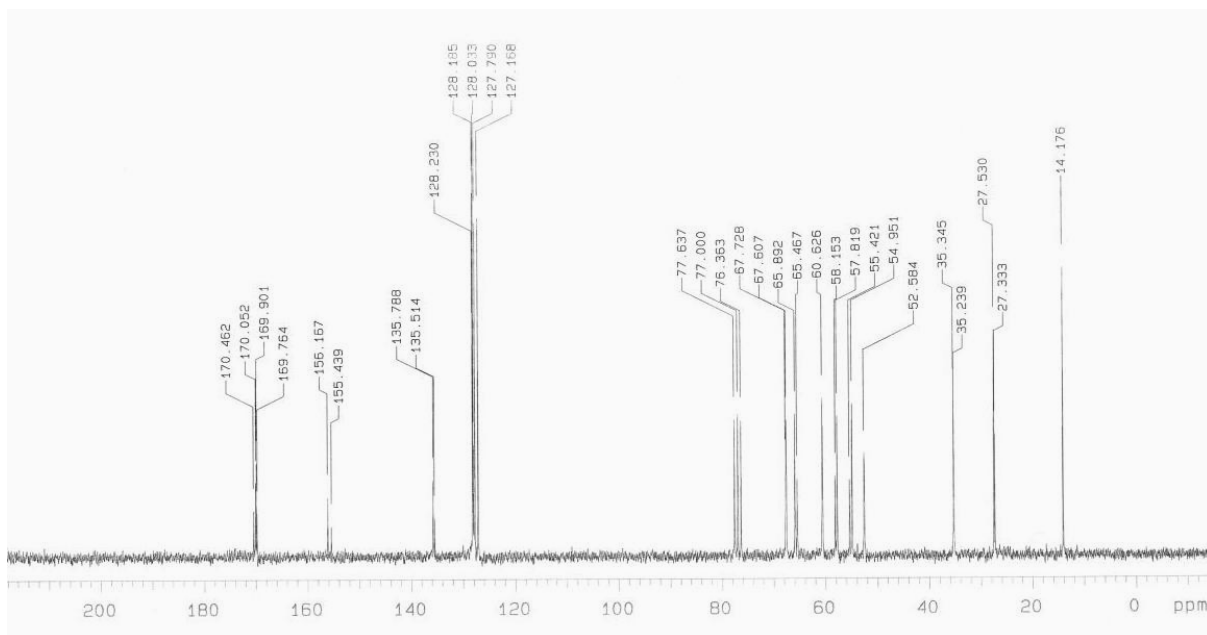
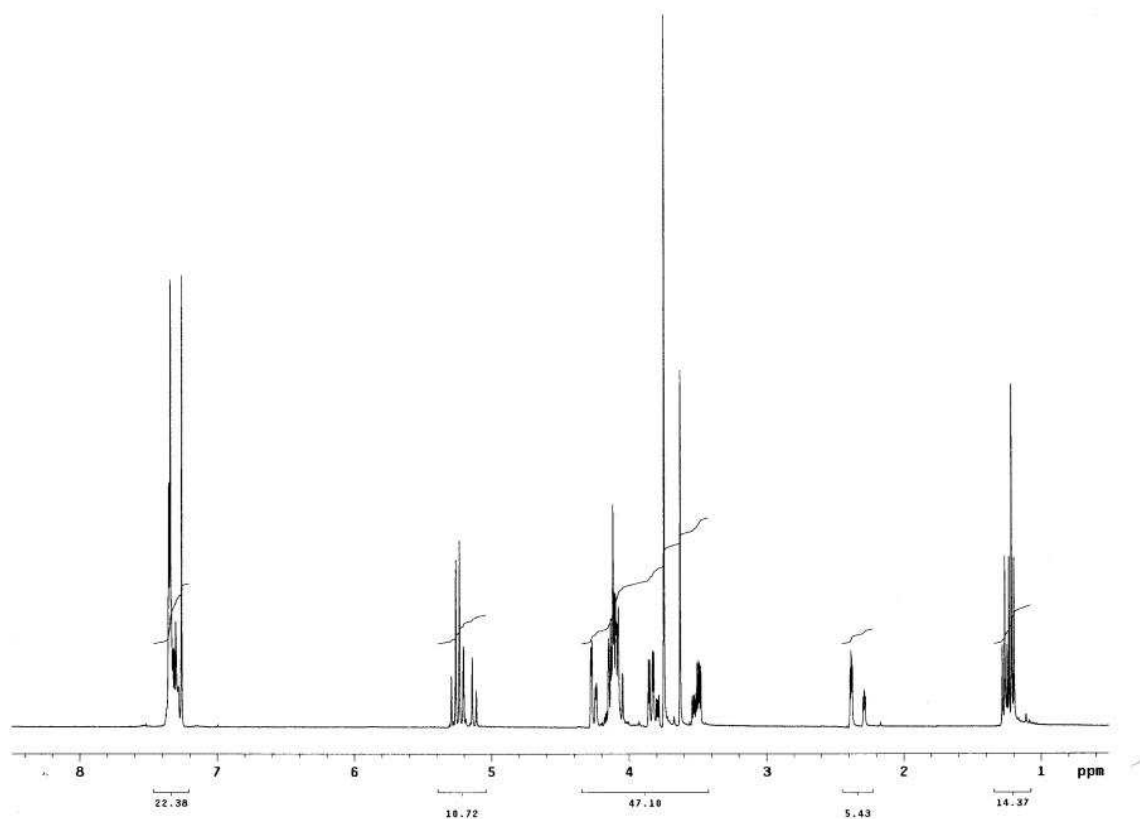
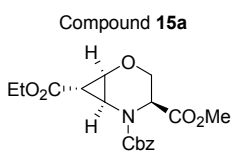


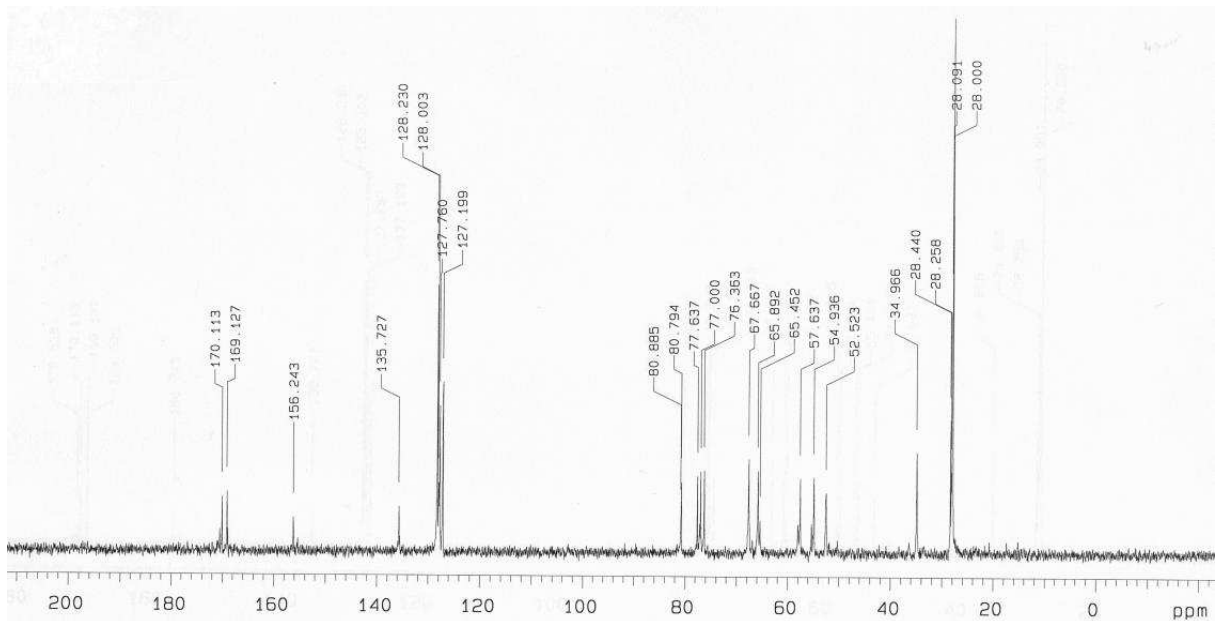
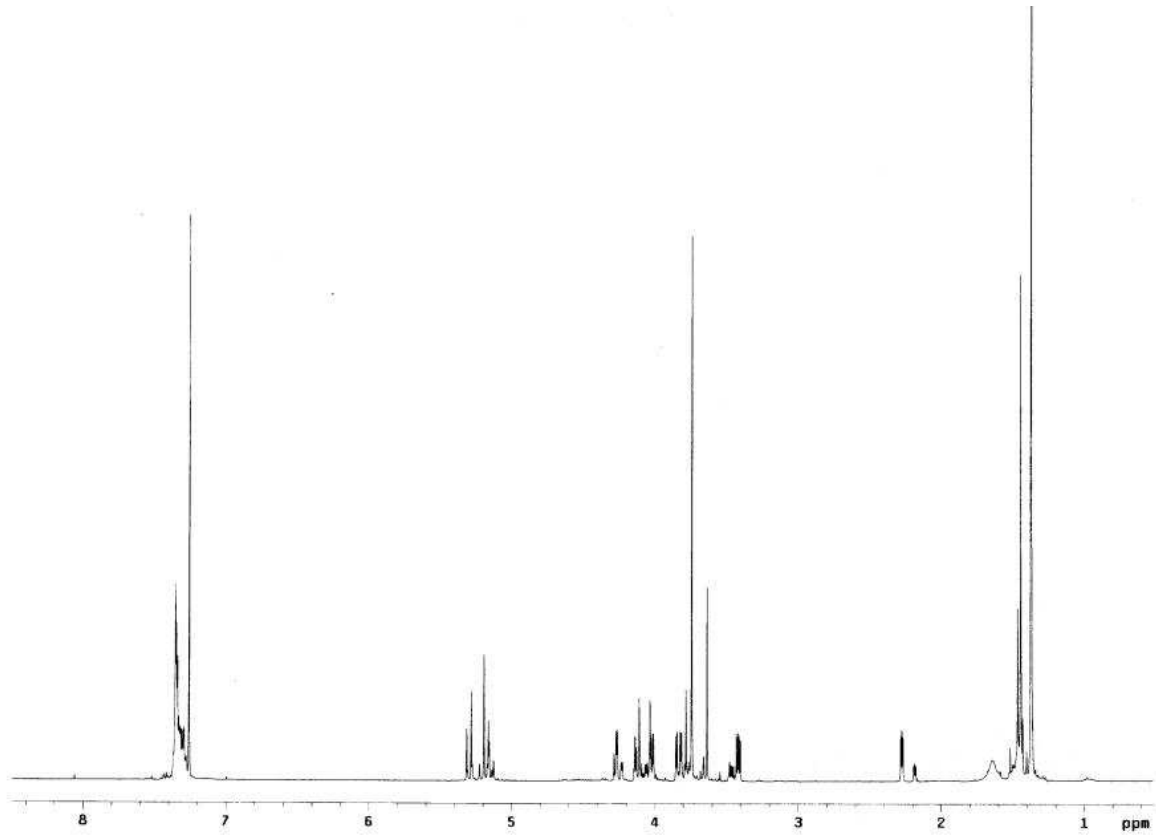
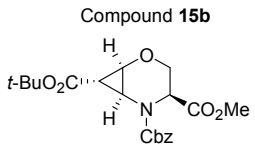
Compound 13

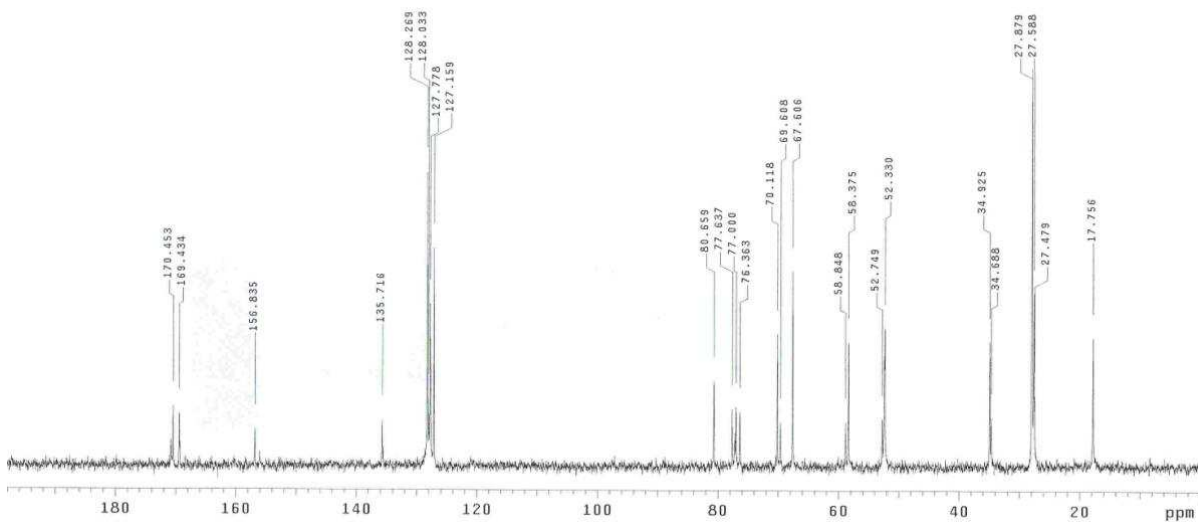
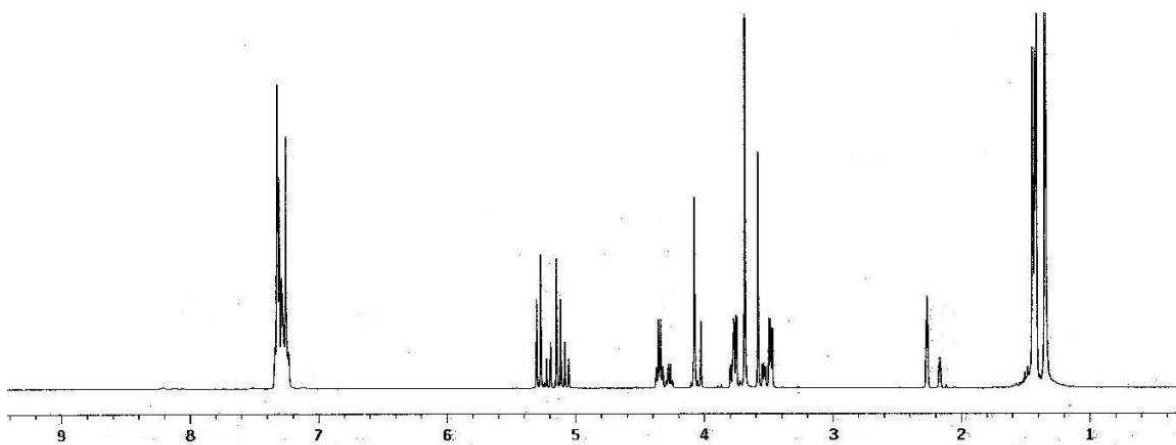
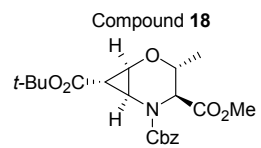


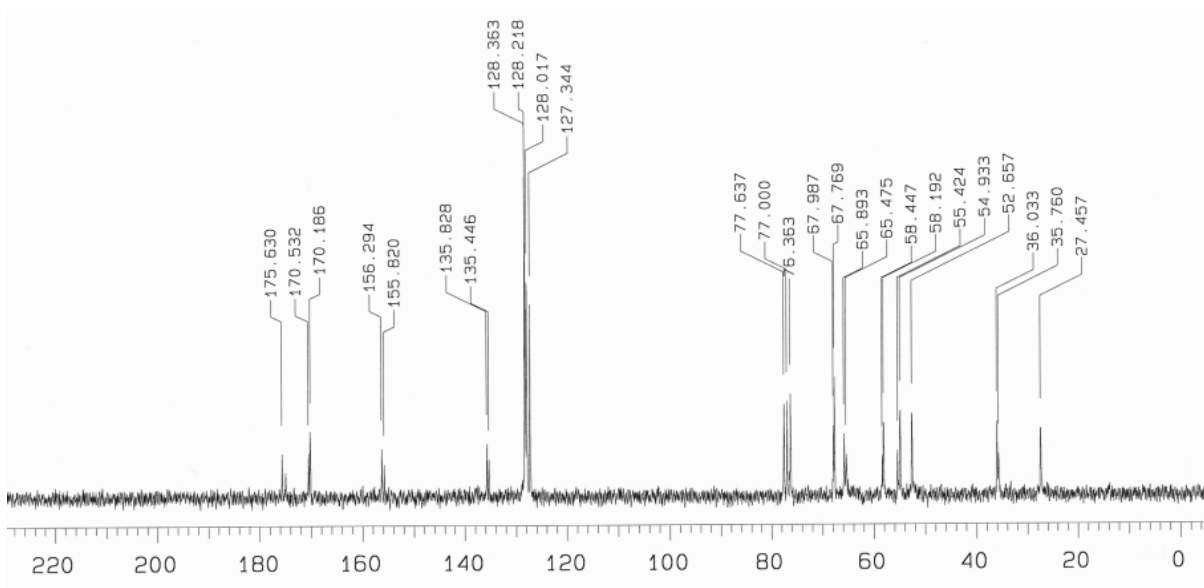
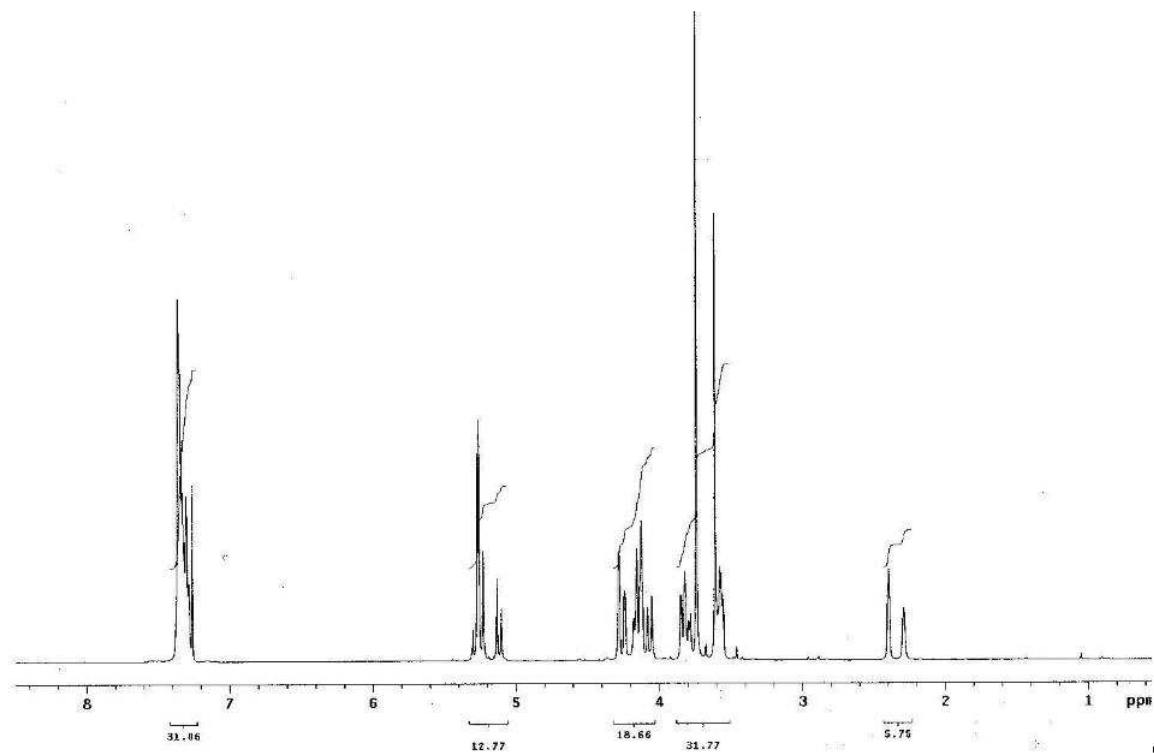
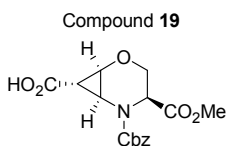


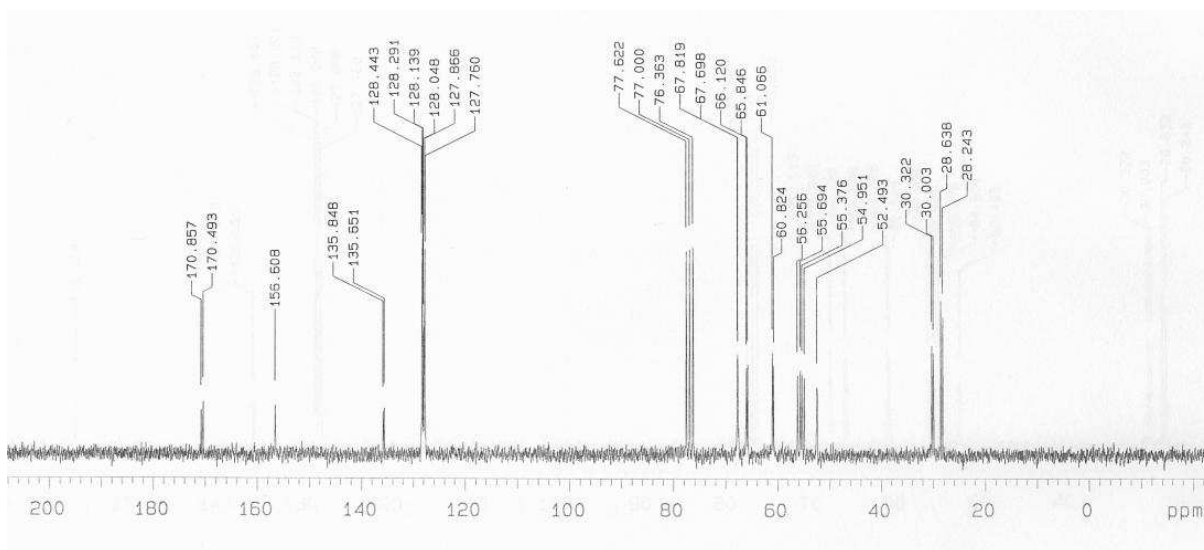
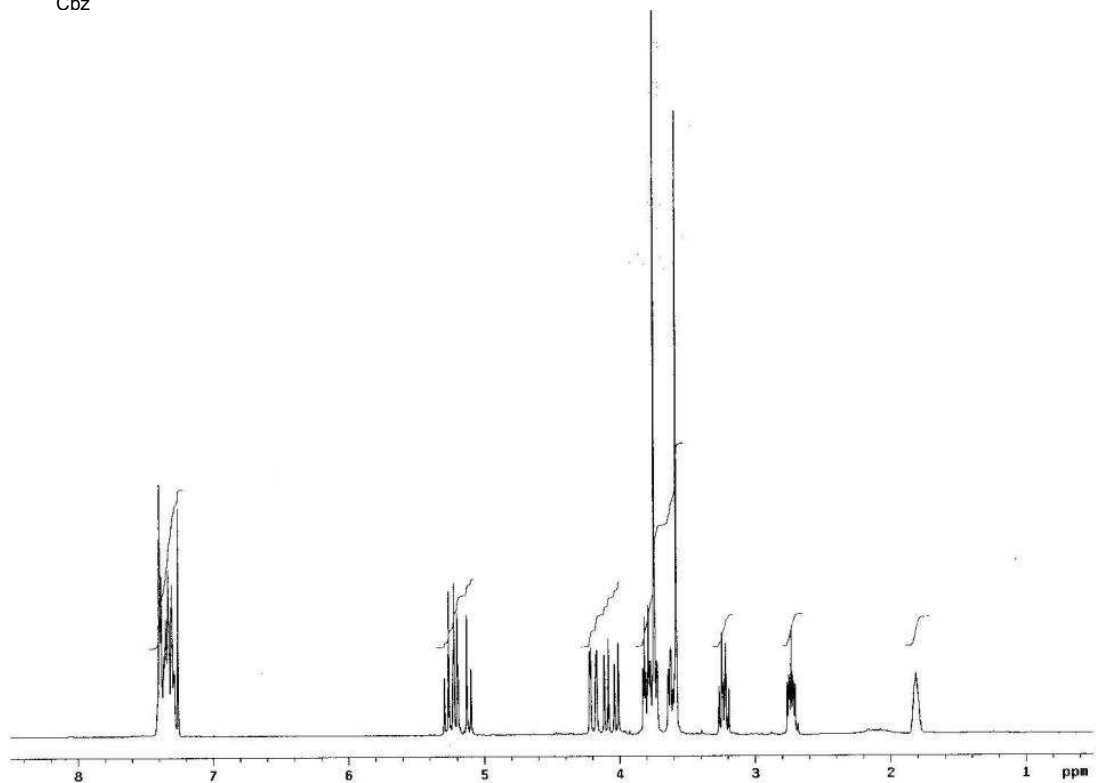
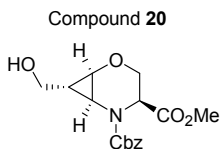












Molecular Modeling Methods

Calculations were performed using SPARTAN Version 5.1¹ running on a SGI IRIX 6.5 workstation. Conformational searches of **20** were carried out using Monte Carlo method within MMFF94 force field,² and the AM1 semiempirical method³ was used to optimize the global minimum conformer. The geometry of the most abundant minimum energy conformer was successively subjected to *ab initio* single point energy calculation at the 3-21G*/ HF level⁴ of quantum chemical theory.

1. Wavefunction, Inc., Irvine, CA.
2. (a) Halgren, T. A. *J. Comput. Chem.* **1996**, *17*, 490-519. (b) Halgren, T. A. *J. Comput. Chem.* **1996**, *17*, 520-552. (c) Halgren, T. A. *J. Comput. Chem.* **1996**, *17*, 553-586. (d) Halgren, T. A.; Nachbar, R. B. *J. Comput. Chem.* **1996**, *17*, 587-615. (e) Halgren, T. A. *J. Comput. Chem.* **1996**, *17*, 616-641.
3. Dewar, M. J. S.; Zoebisch, E. G.; Healy, E. F.; Stewart, J. J. P. *J. Am. Chem. Soc.* **1985**, *107*, 3902 – 3909.

Hehre, W. J.; Radam, L.; Schleyer, P. R.; Pople, J. A. *Ab initio molecular orbital theory*; Wiley: New York, 1986.

Axial conformer: E(HF) = -1381.7068749 a.u. (-867034.881068499 kcal/mol)

Equatorial conformer: E(HF) = -1381.6956637 a.u. (-867027.845928387 kcal/mol)

ΔE (ax-eq) = -7.03 kcal/mol

Cartesian Coordinates for axial conformer of **20**

ATOM	X	Y	Z
O(1)	2.483	0.904	-1.355
C(2)	0.026	0.396	-1.028
C(3)	1.603	0.195	0.859
N(4)	0.284	-0.027	0.310
C(5)	2.716	0.069	-0.218
C(6)	1.198	0.795	-1.906
C(9)	1.773	1.537	1.570
O(10)	2.910	1.559	2.330
C(11)	3.175	2.767	3.048
O(15)	1.056	2.536	1.553
C(16)	-0.801	-0.313	1.139
O(17)	-0.456	-0.498	2.460
C(18)	-1.499	-0.955	3.341
O(21)	-1.981	-0.453	0.784
C(24)	0.192	1.848	-1.475
C(26)	-0.753	2.348	-2.499
O(27)	-1.207	1.721	-3.460
O(28)	-1.097	3.647	-2.286
C(29)	-2.035	4.319	-3.166
C(30)	2.909	-1.375	-0.633
C(34)	-1.569	-2.445	3.373
C(35)	-1.755	-5.232	3.468
C(36)	-2.339	-3.131	2.426

C(37)	-0.891	-3.161	4.364
C(38)	-0.986	-4.551	4.411
C(39)	-2.430	-4.521	2.475
C(45)	-3.388	3.628	-3.135
C(49)	-1.480	4.400	-4.578
C(53)	-2.137	5.716	-2.554
H(23)	-0.818	-0.178	-1.478
H(7)	1.786	-0.603	1.645
H(8)	3.673	0.489	0.214
H(22)	1.252	0.469	-2.963
H(12)	2.348	2.965	3.772
H(13)	3.275	3.619	2.335
H(14)	4.138	2.553	3.573
H(19)	-2.484	-0.511	3.037
H(20)	-1.169	-0.537	4.332
H(25)	0.499	2.617	-0.732
H(31)	3.737	-1.439	-1.381
H(32)	1.980	-1.784	-1.099
H(33)	3.174	-1.995	0.256
H(44)	-1.830	-6.329	3.505
H(40)	-2.863	-2.561	1.640
H(41)	-0.282	-2.626	5.108
H(42)	-0.452	-5.111	5.193
H(43)	-3.037	-5.056	1.729
H(46)	-3.330	2.631	-3.635
H(47)	-4.138	4.259	-3.666
H(48)	-3.718	3.482	-2.078
H(50)	-1.454	3.387	-5.047
H(51)	-0.445	4.816	-4.561
H(52)	-2.129	5.067	-5.193
H(54)	-2.843	6.329	-3.160
H(55)	-1.134	6.205	-2.545
H(56)	-2.511	5.648	-1.505

Cartesian Coordinates for equatorial conformer of **20**

ATOM	X	Y	Z
O(1)	-1.056	-0.172	-2.570
C(2)	-1.959	-0.693	-0.279
C(3)	0.486	-0.401	-0.613
N(4)	-0.650	-0.373	0.243
C(5)	0.254	-0.296	-2.106
C(6)	-2.035	-0.899	-1.824
C(8)	-1.569	0.559	3.635
C(12)	-1.763	2.037	3.686
C(13)	-2.110	4.806	3.845
C(14)	-0.670	2.895	3.509

C(15) -3.030 2.573 3.937
C(16) -3.202 3.954 4.018
C(17) -0.846 4.275 3.589
O(25) -1.657 0.063 2.286
C(26) -0.484 0.036 1.563
O(27) 0.584 0.360 2.105
C(28) -2.521 -1.982 0.330
O(29) -3.853 -1.875 0.613
C(30) -4.479 -3.023 1.190
O(34) -1.951 -3.050 0.545
C(35) -3.381 -0.417 -2.335
C(39) 0.759 -1.603 -1.522
C(41) 2.179 -1.953 -1.759
O(42) 2.358 -3.297 -1.874
C(43) 3.683 -3.854 -2.074
C(44) 4.274 -3.373 -3.389
C(48) 4.586 -3.520 -0.899
C(52) 3.416 -5.358 -2.130
O(56) 3.131 -1.175 -1.861
H(23) -2.658 0.152 0.014
H(24) 1.372 0.103 -0.158
H(7) 0.903 0.327 -2.755
H(11) -1.897 -1.996 -2.049
H(9) -0.586 0.265 4.092
H(10) -2.415 0.016 4.140
H(22) -2.247 5.895 3.909
H(18) 0.324 2.467 3.298
H(19) -3.893 1.903 4.069
H(20) -4.199 4.372 4.217
H(21) 0.015 4.945 3.449
H(31) -3.986 -3.278 2.158
H(32) -4.412 -3.886 0.486
H(33) -5.538 -2.697 1.341
H(36) -3.498 -0.699 -3.408
H(37) -3.457 0.693 -2.248
H(38) -4.193 -0.893 -1.731
H(40) 0.095 -2.489 -1.475
H(45) 3.543 -3.529 -4.217
H(46) 5.203 -3.950 -3.611
H(47) 4.527 -2.287 -3.330
H(49) 4.085 -3.793 0.060
H(50) 4.822 -2.428 -0.884
H(51) 5.538 -4.095 -0.988
H(53) 2.935 -5.697 -1.182
H(54) 4.384 -5.895 -2.266
H(55) 2.737 -5.596 -2.981