

Enantioselective Synthesis of Naturally Occurring Isoquinoline

Alkaloids: (*S*)-(-)-Trolline and (*R*)-(+)-Oleracein E

Weilong Lin,^a and Shengming Ma^{*a,b}

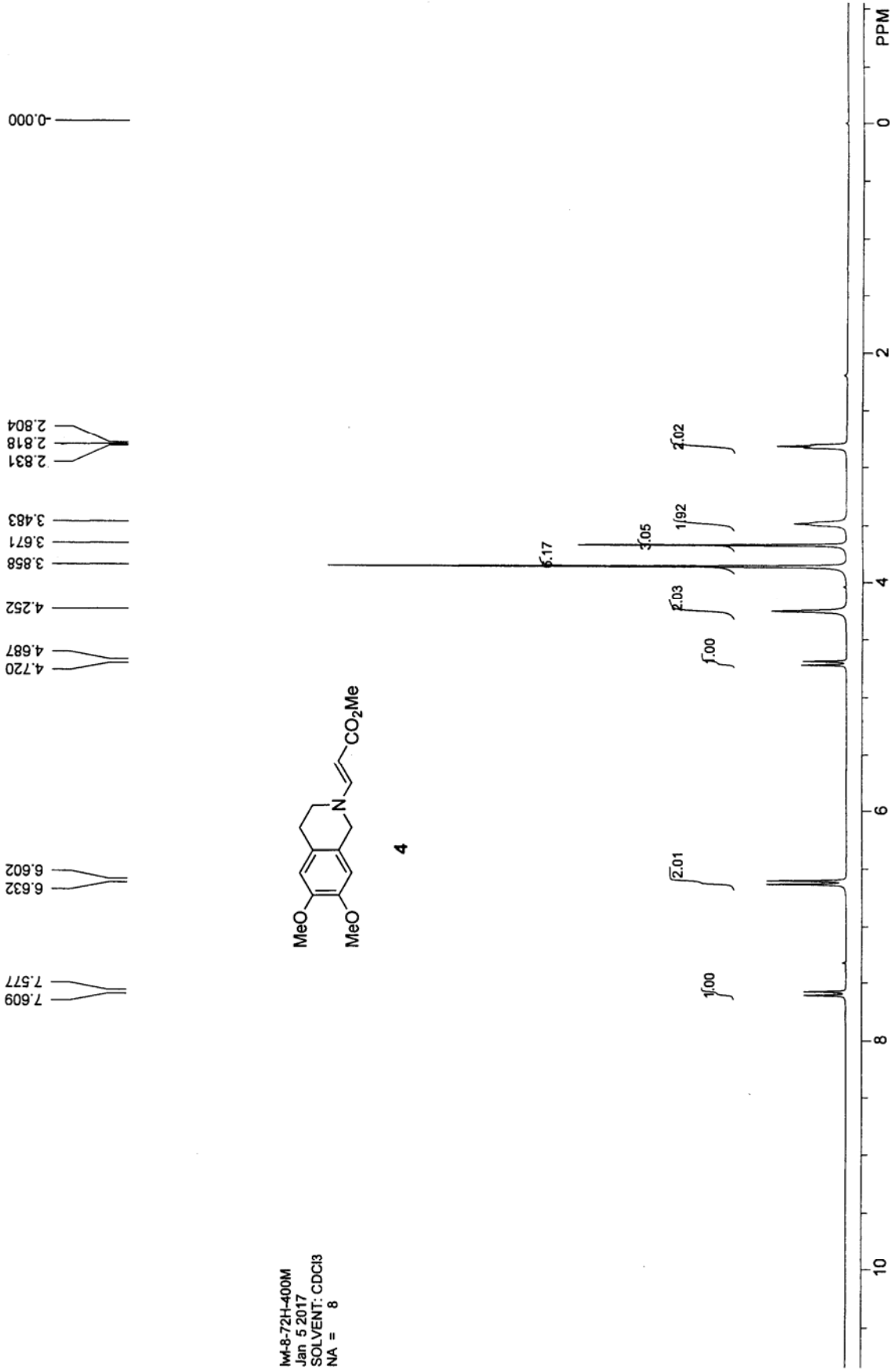
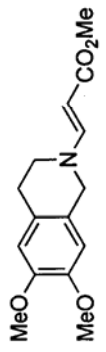
^a State Key Laboratory of Organometallic Chemistry, Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences, 345 Lingling Lu, Shanghai 200032, P. R. China

^b Department of Chemistry, Fudan University, 220 Handan Lu, Shanghai 200433, P.R. China

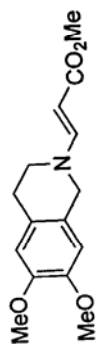
Email: masm@sioc.ac.cn

Supporting Information

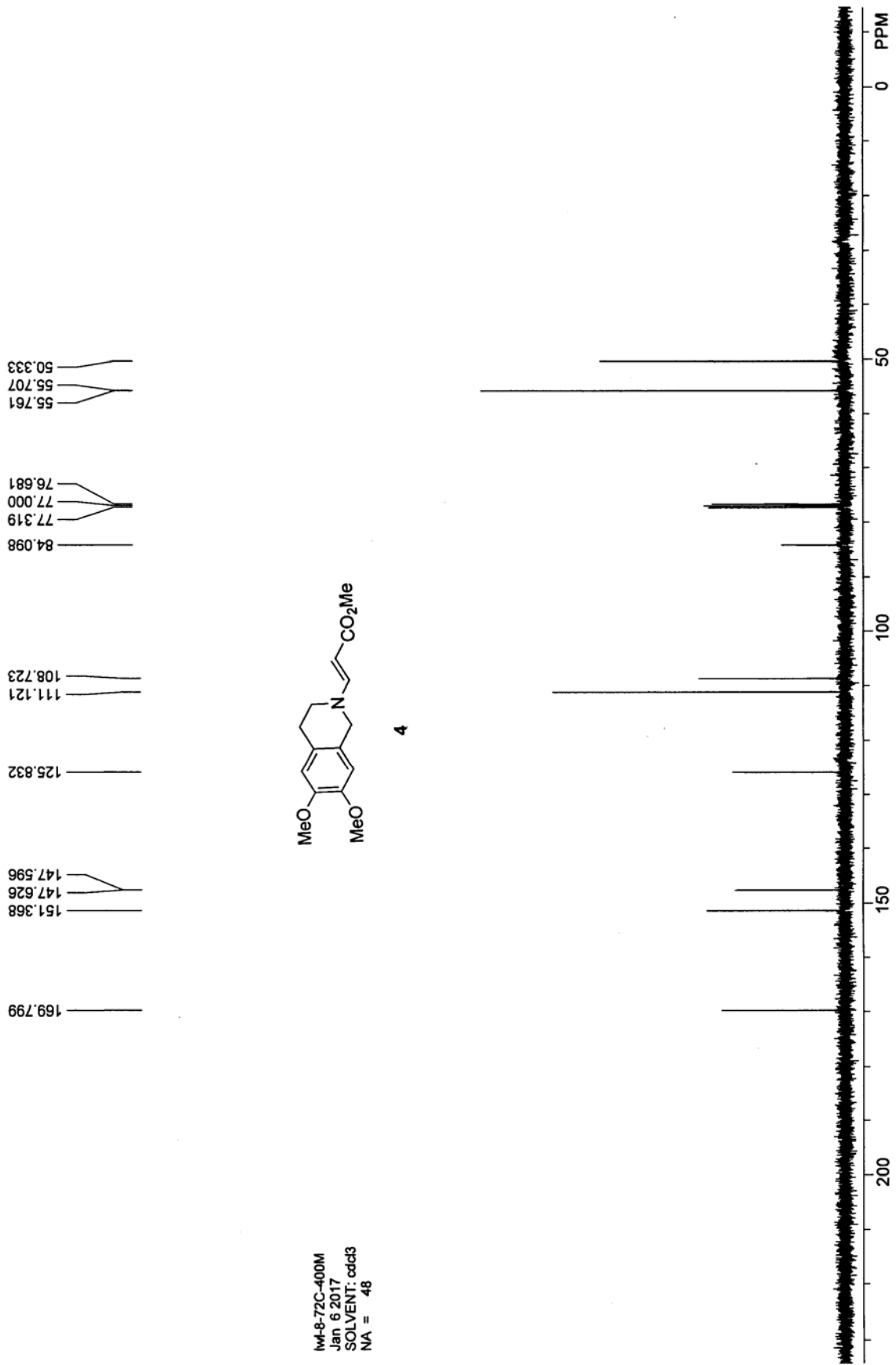
IM-8-72H-400M
Jan 5 2017
SOLVENT: CDCl3
NA = 8



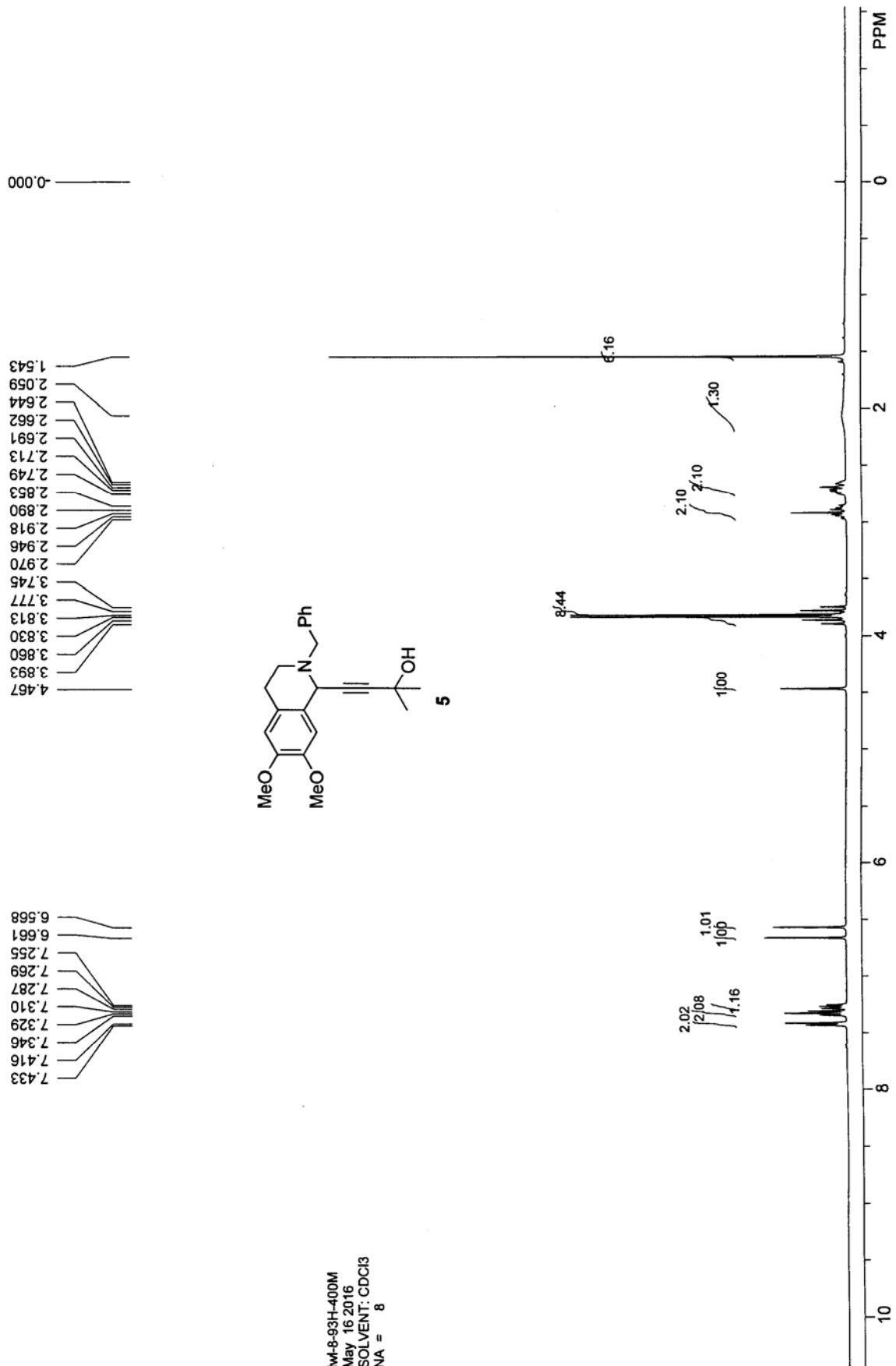
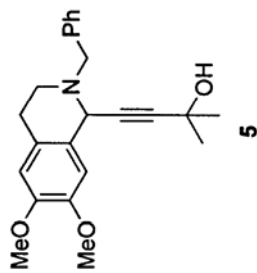
hwt-6-72C-400M
Jan 6 2017
SOLVENT: cdcl3
NA = 48



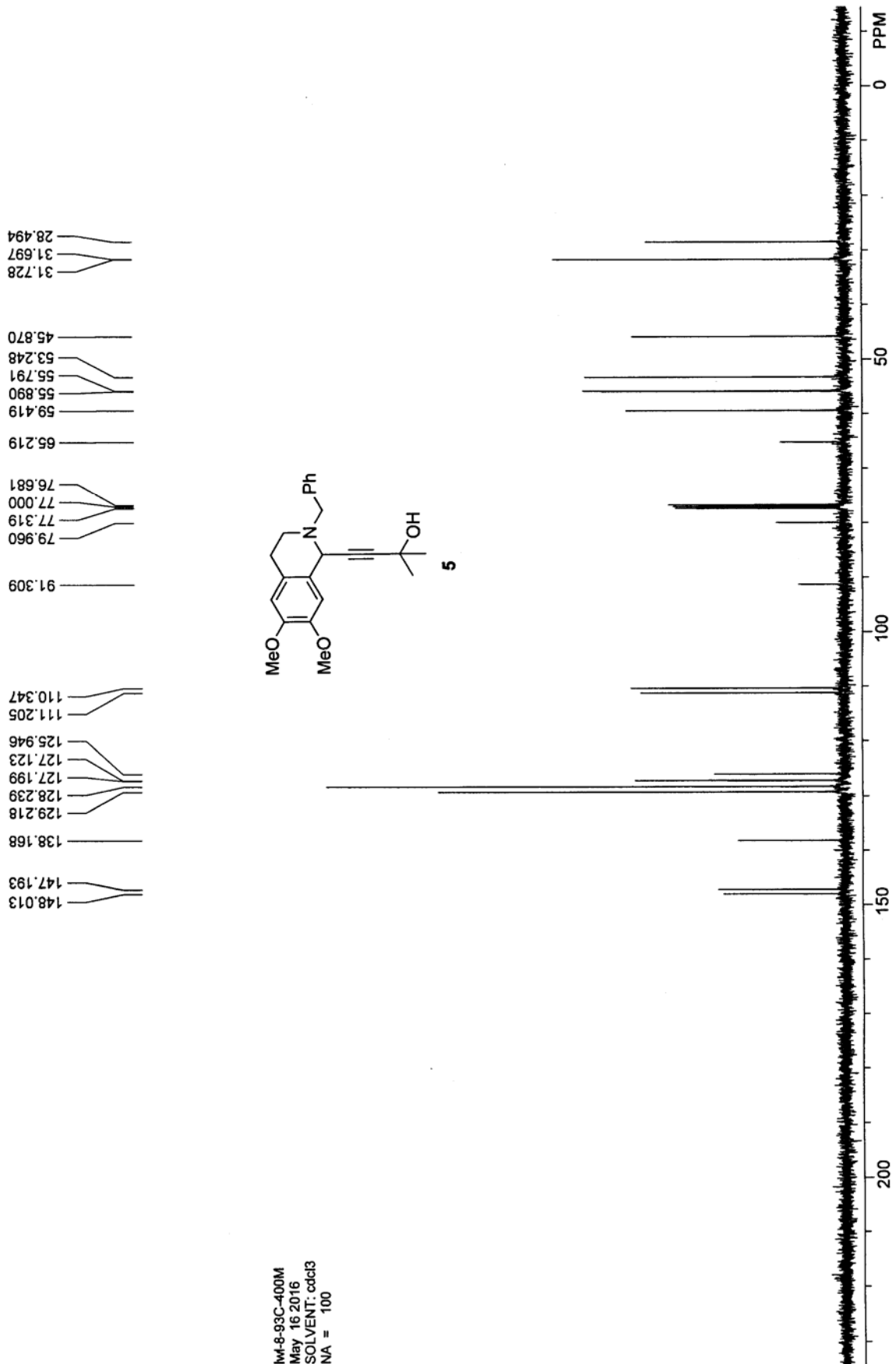
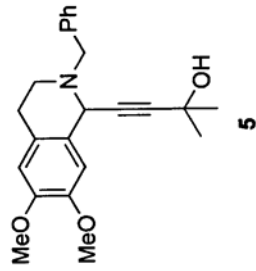
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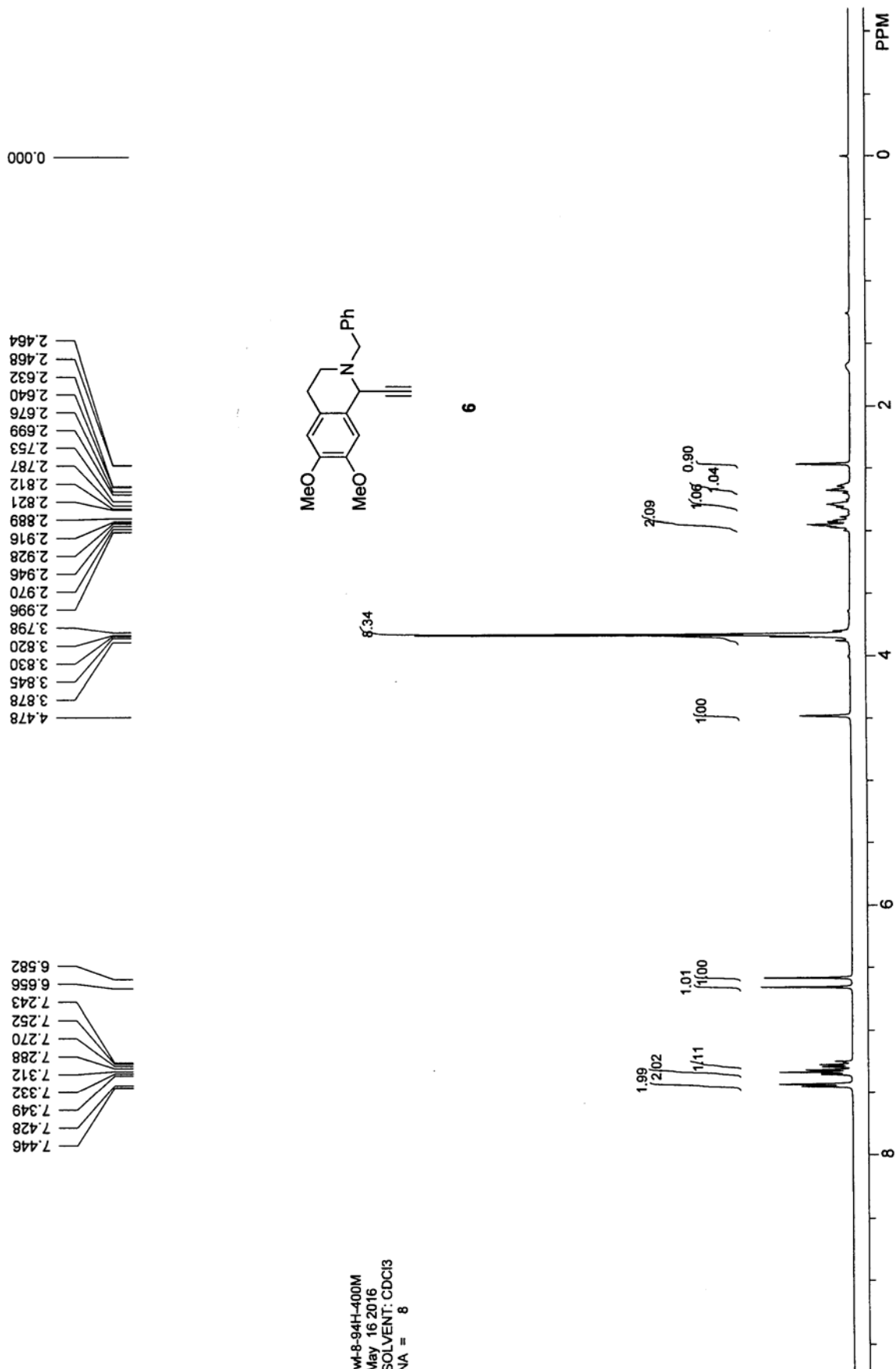
hw-9-93H-400M
May 16 2016
SOLVENT: CDCl3
NA = 8



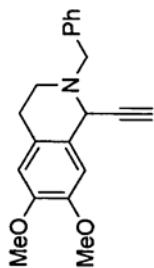
hw-8-93C-400M
May 16 2016
SOLVENT: cdcl3
NA = 100



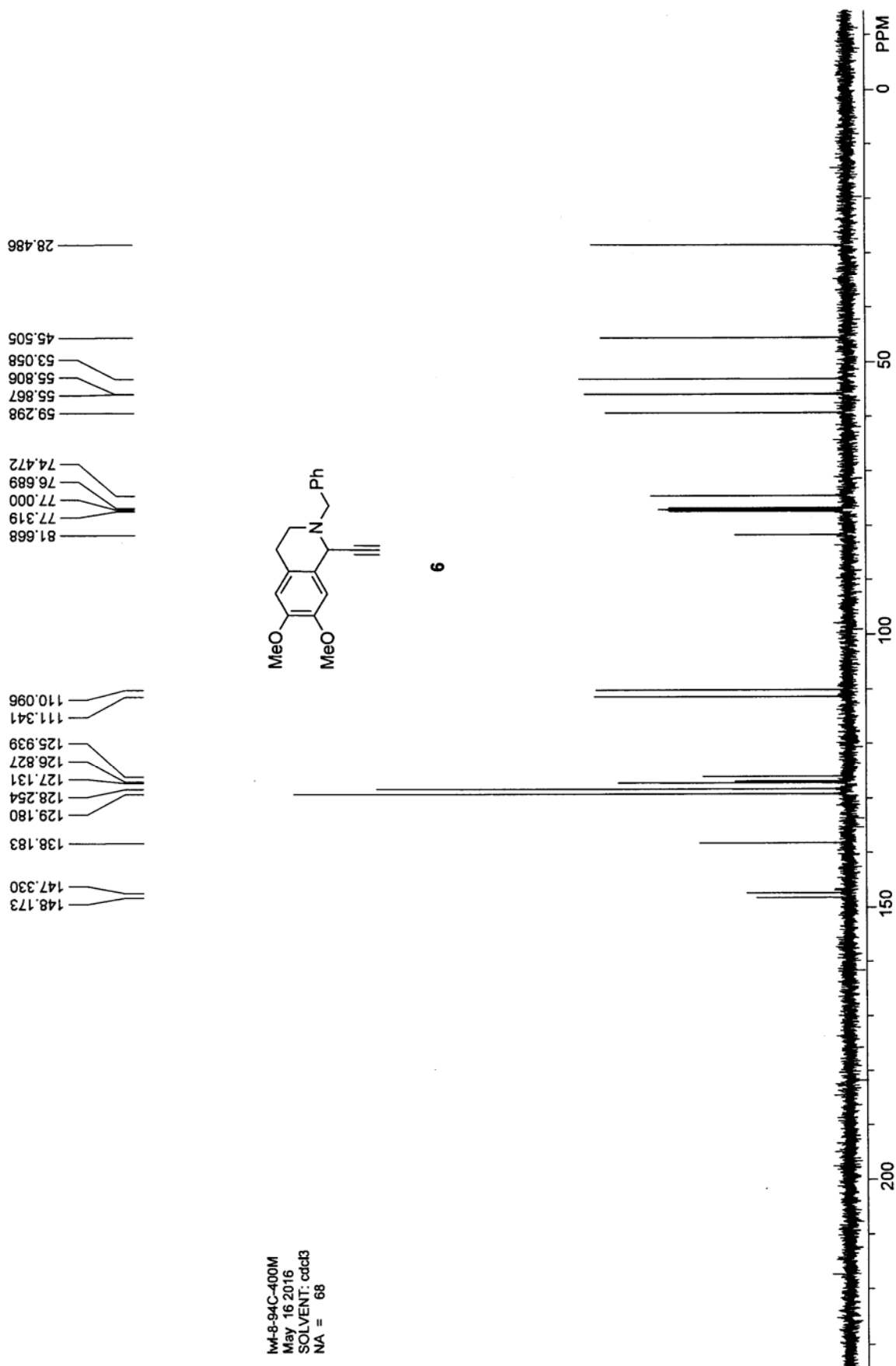
IM-8-94H-400M
May 16 2016
SOLVENT: CDCl3
NA = 8



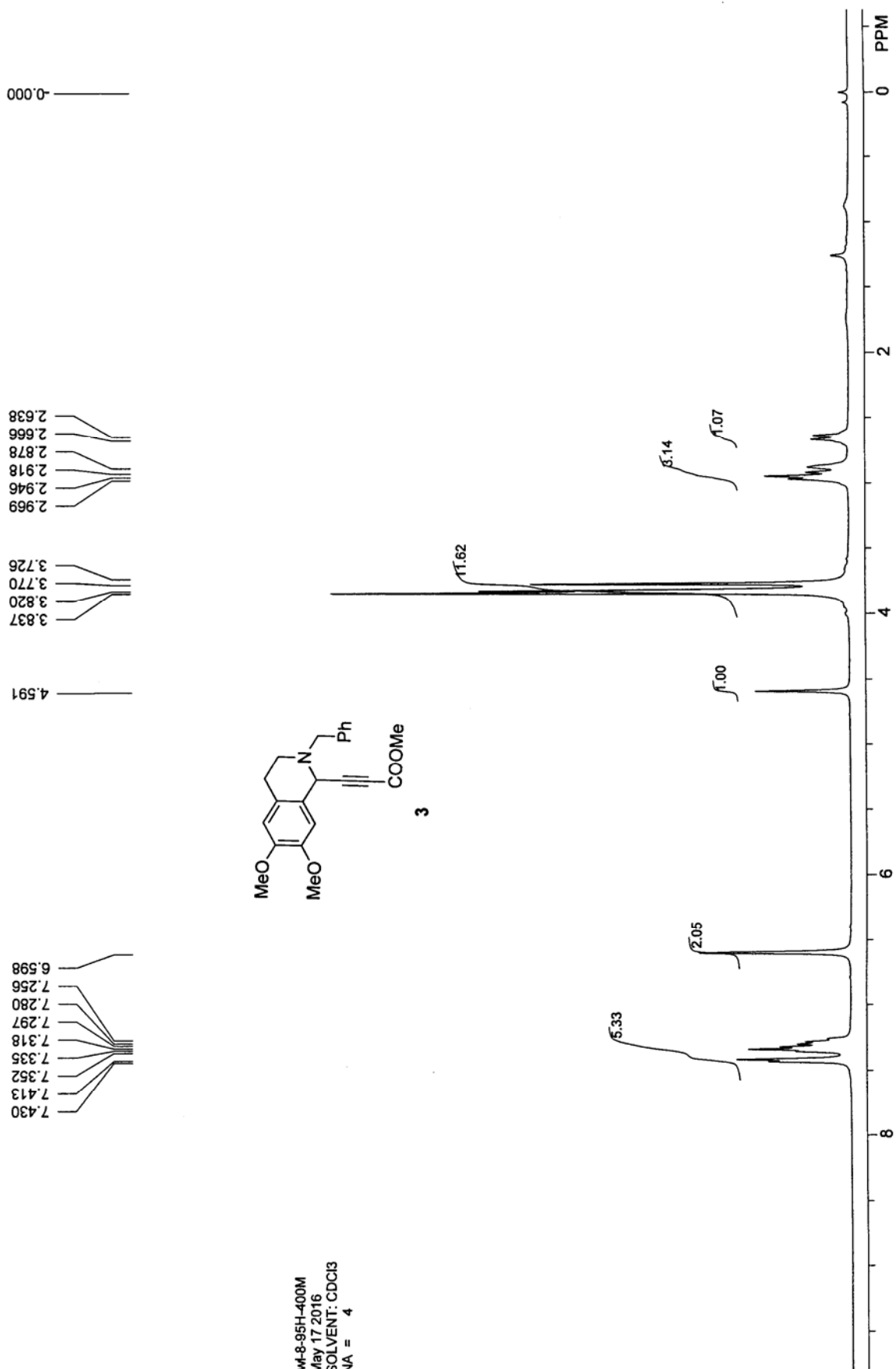
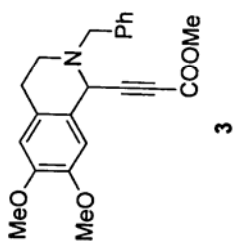
hwf-8-94C-400M
May 16 2016
SOLVENT: cdcl3
NA = 68



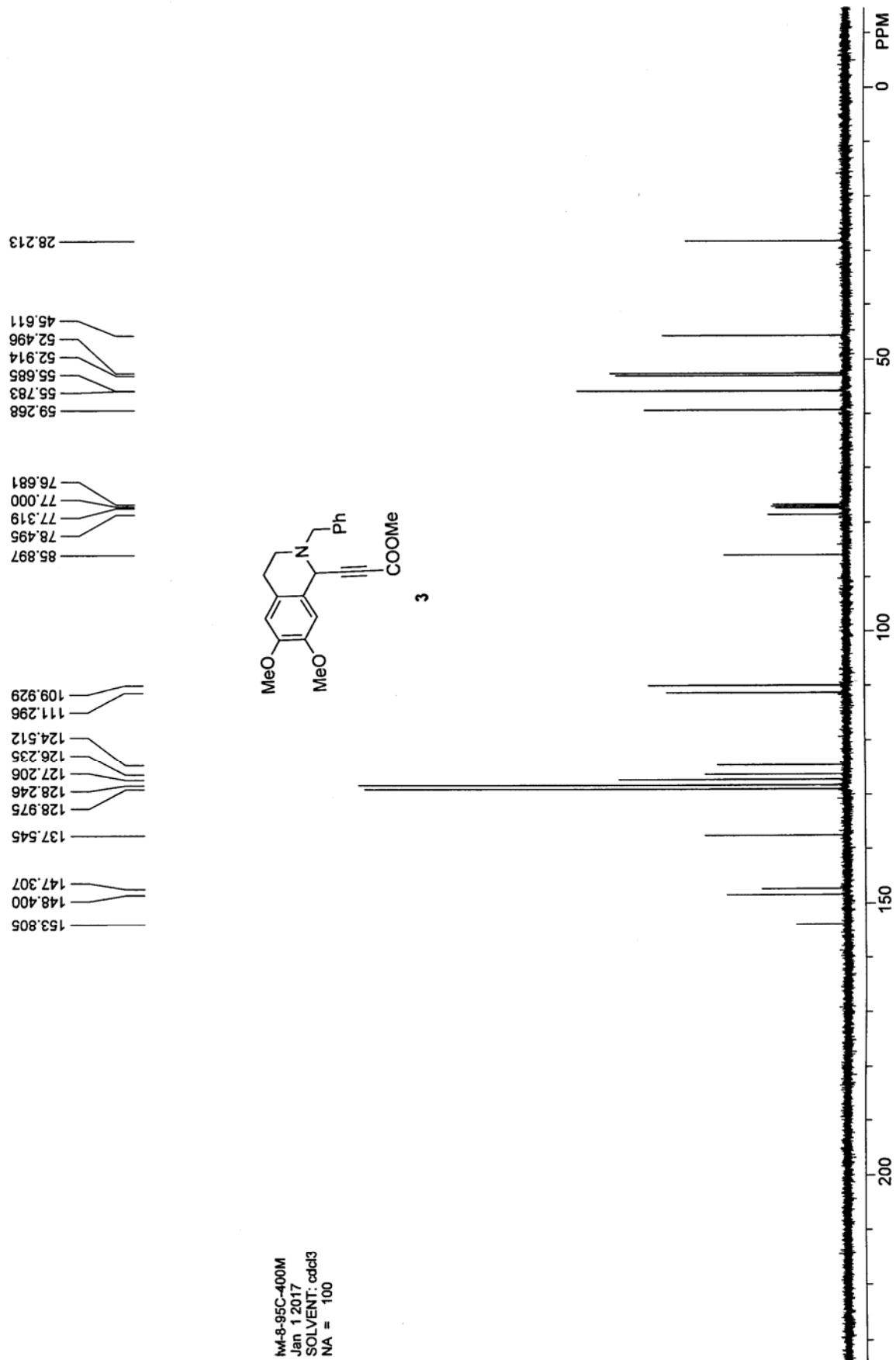
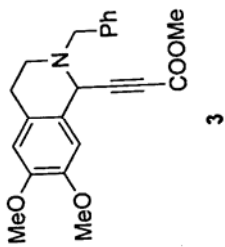
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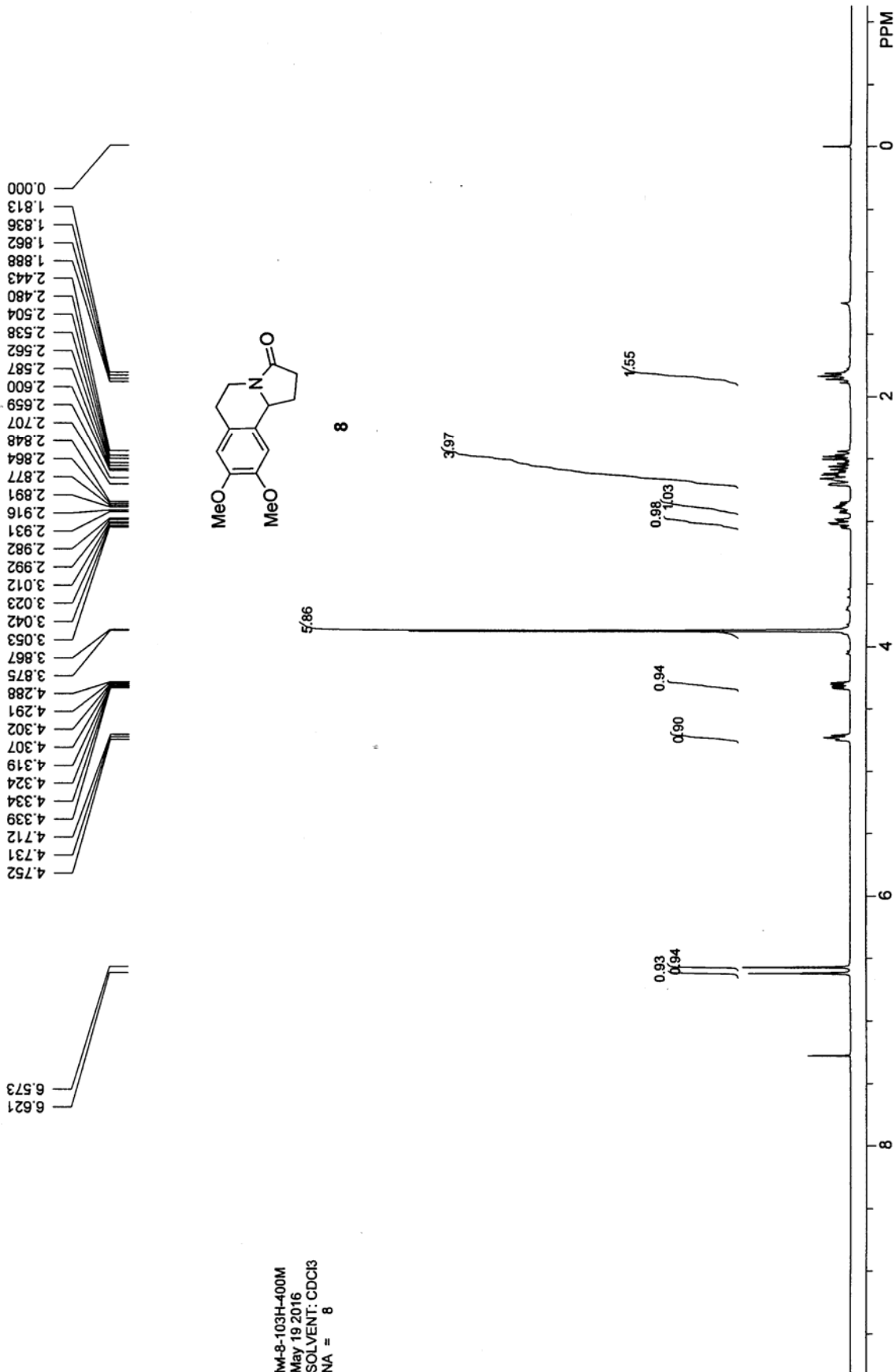
IM-8-95H-400M
May 17 2016
SOLVENT: CDCl3
NA = 4



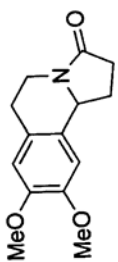
IM-8-95C-400M
Jan 1 2017
SOLVENT: cdcl3
NA = 100



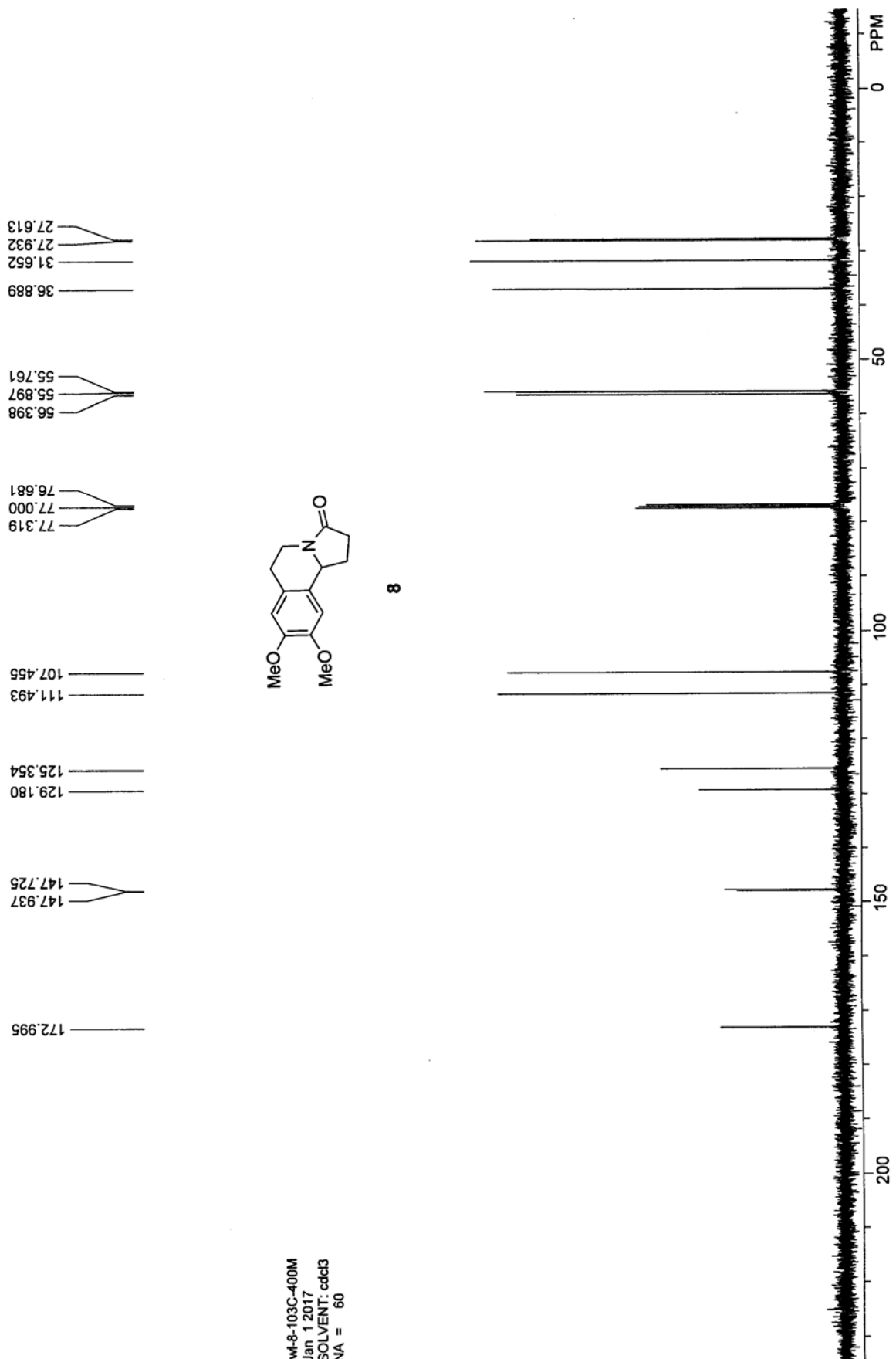
MW-8-103H-400M
 May 19 2016
 SOLVENT: CDCl3
 NA = 8



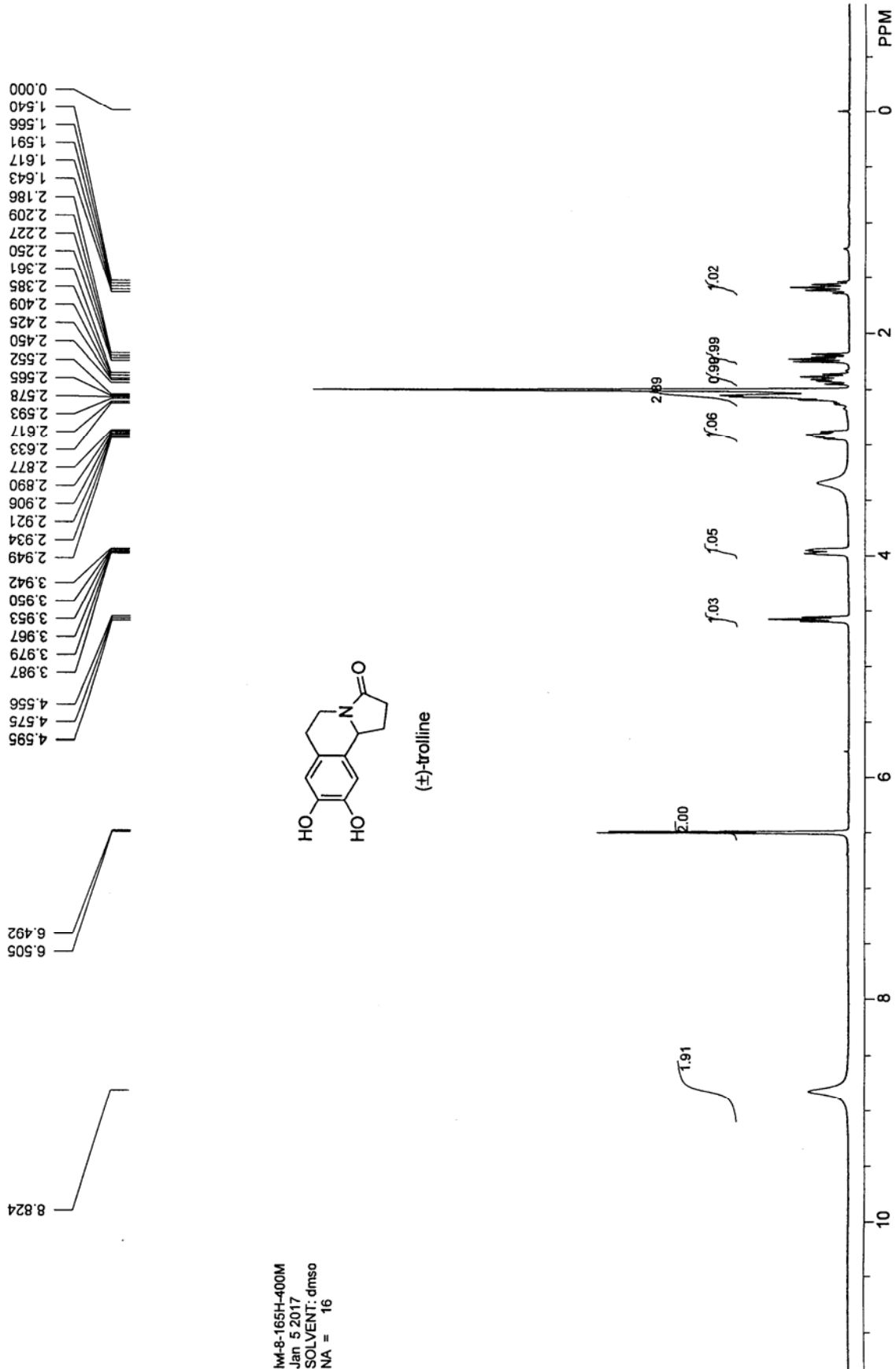
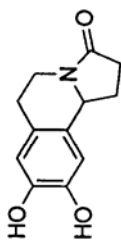
Im-8-103C-400M
Jan 1 2017
SOLVENT: cdcl3
NA = 60



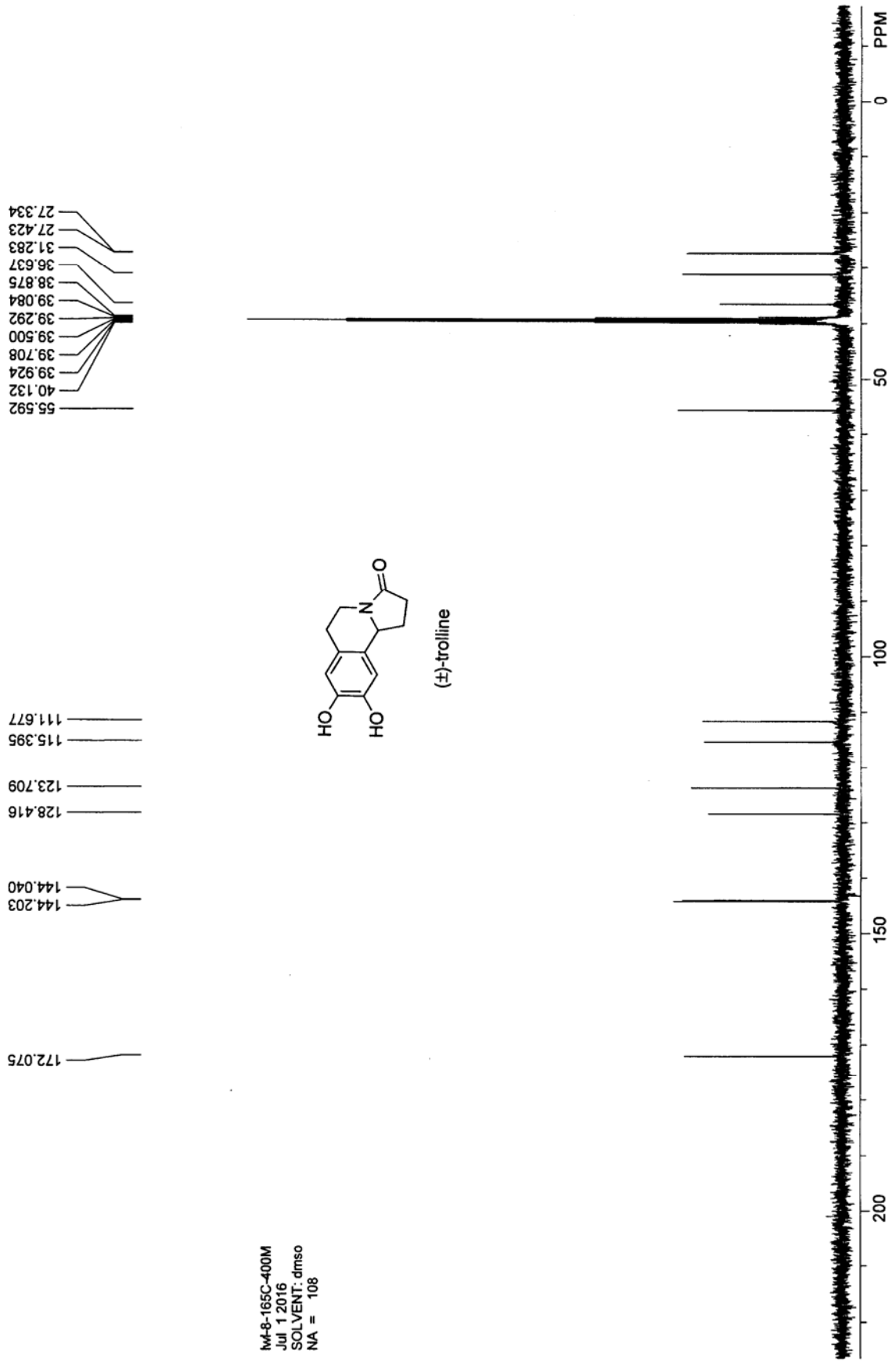
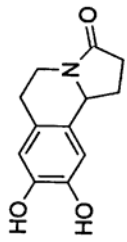
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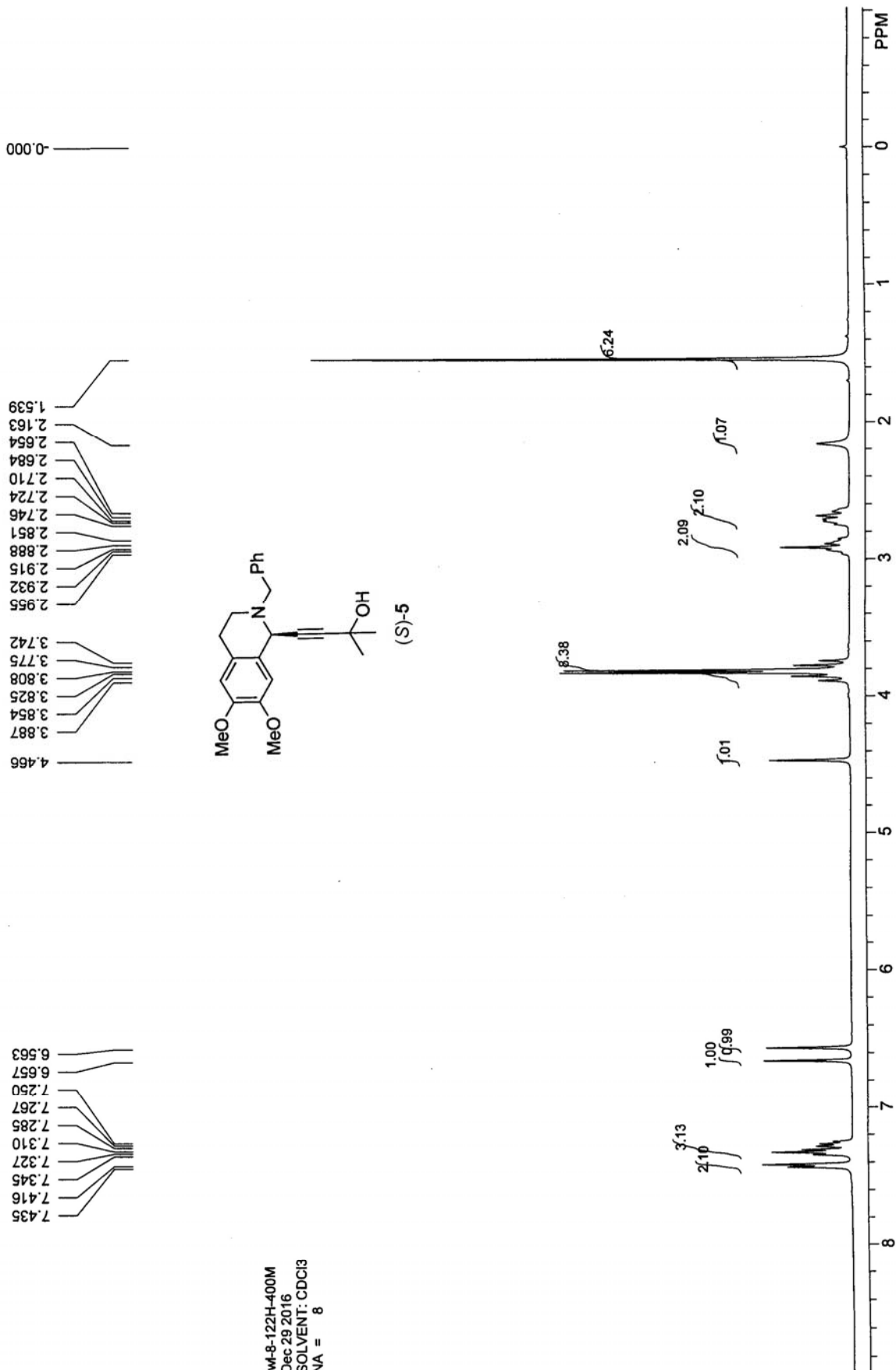


lm-8-165H-400M
Jan 5 2017
SOLVENT: dms0
NA = 16

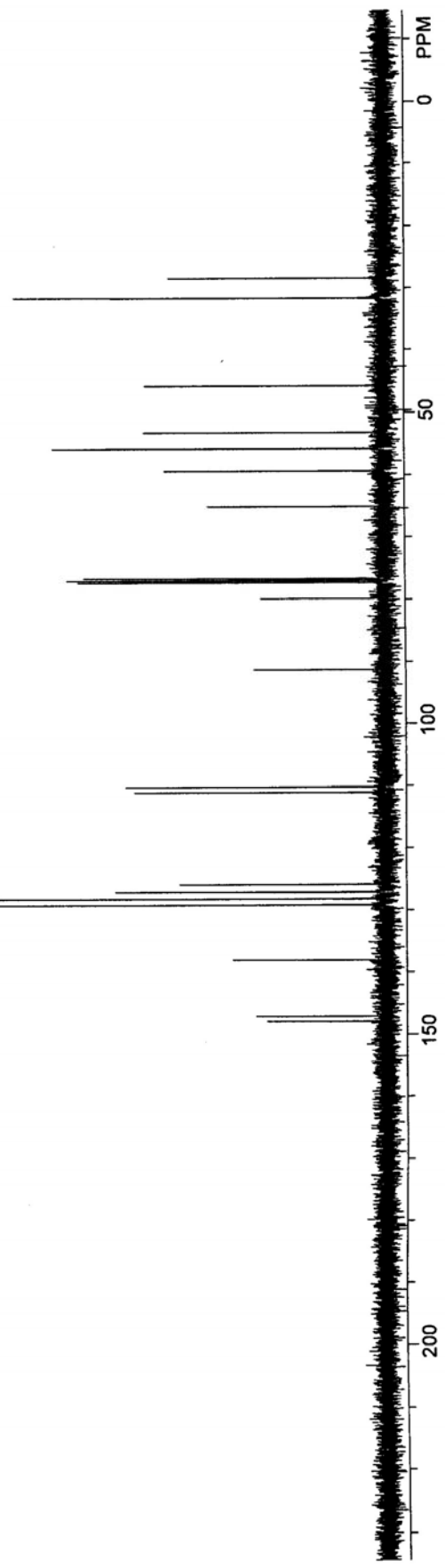
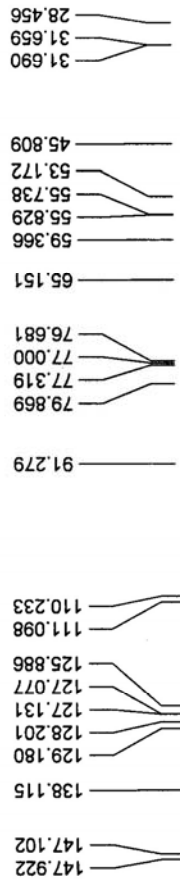
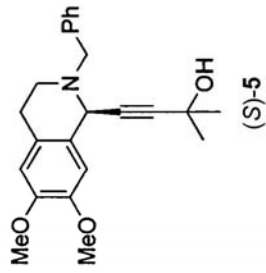


Wf-8-165C-400M
Jul 1 2016
SOLVENT: dmso
NA = 108





IM-8-122C-400M
Dec 29 2016
SOLVENT: cdcl3
NA = 96



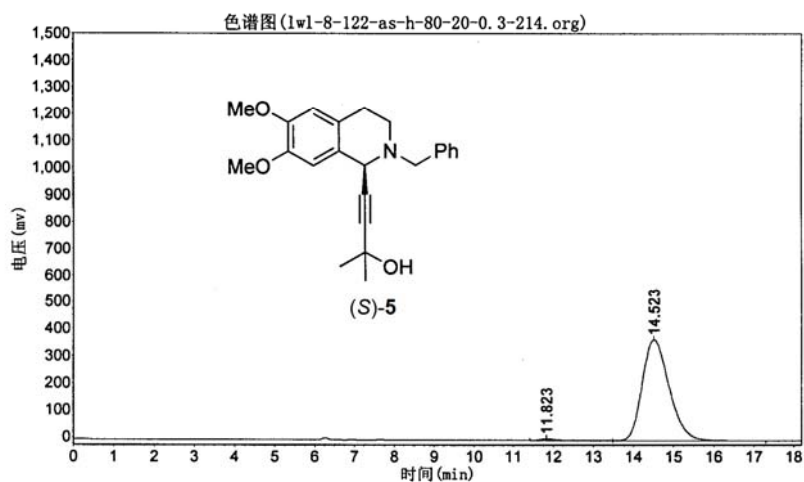
1w1-8-122-as-h-80-20-0. 3-214

实验时间: 2016-06-03, 15:59:40

报告时间: 2016-06-03, 16:19:08

谱图文件: F:\zhuguangjiong\lw1\20160603\lw1-8-122-as-h-80-20-0. 3-214. org

实验内容简介:



分析结果表

峰号	峰名	保留时间	峰高	峰面积	含量
1		11.823	6040.260	169833.516	0.9635
2		14.523	373731.906	17456912.000	99.0365
总计			379772.167	17626745.516	100.0000

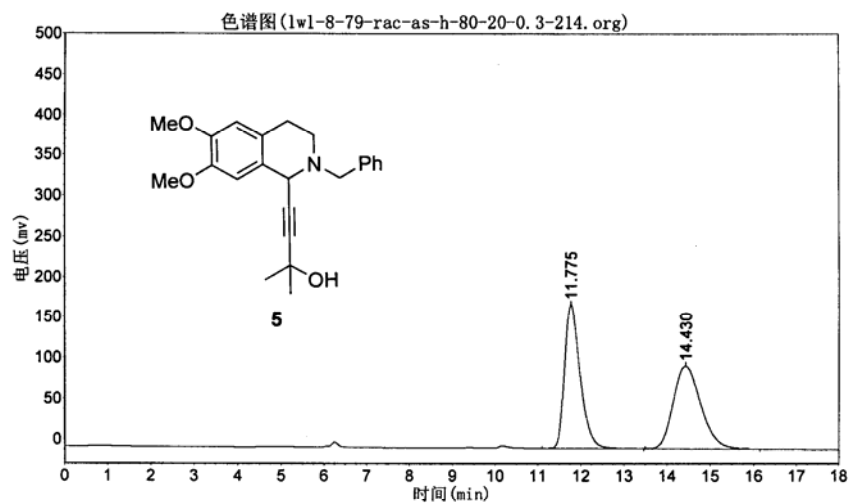
1w1-8-79-rac-as-h-80-20-0.3-214

实验时间: 2016-06-03, 16:17:06

报告时间: 2016-06-03, 16:17:49

谱图文件: F:\zhuguangjiong\lwl\20160603\1w1-8-79-rac-as-h-80-20-0.3-214.org

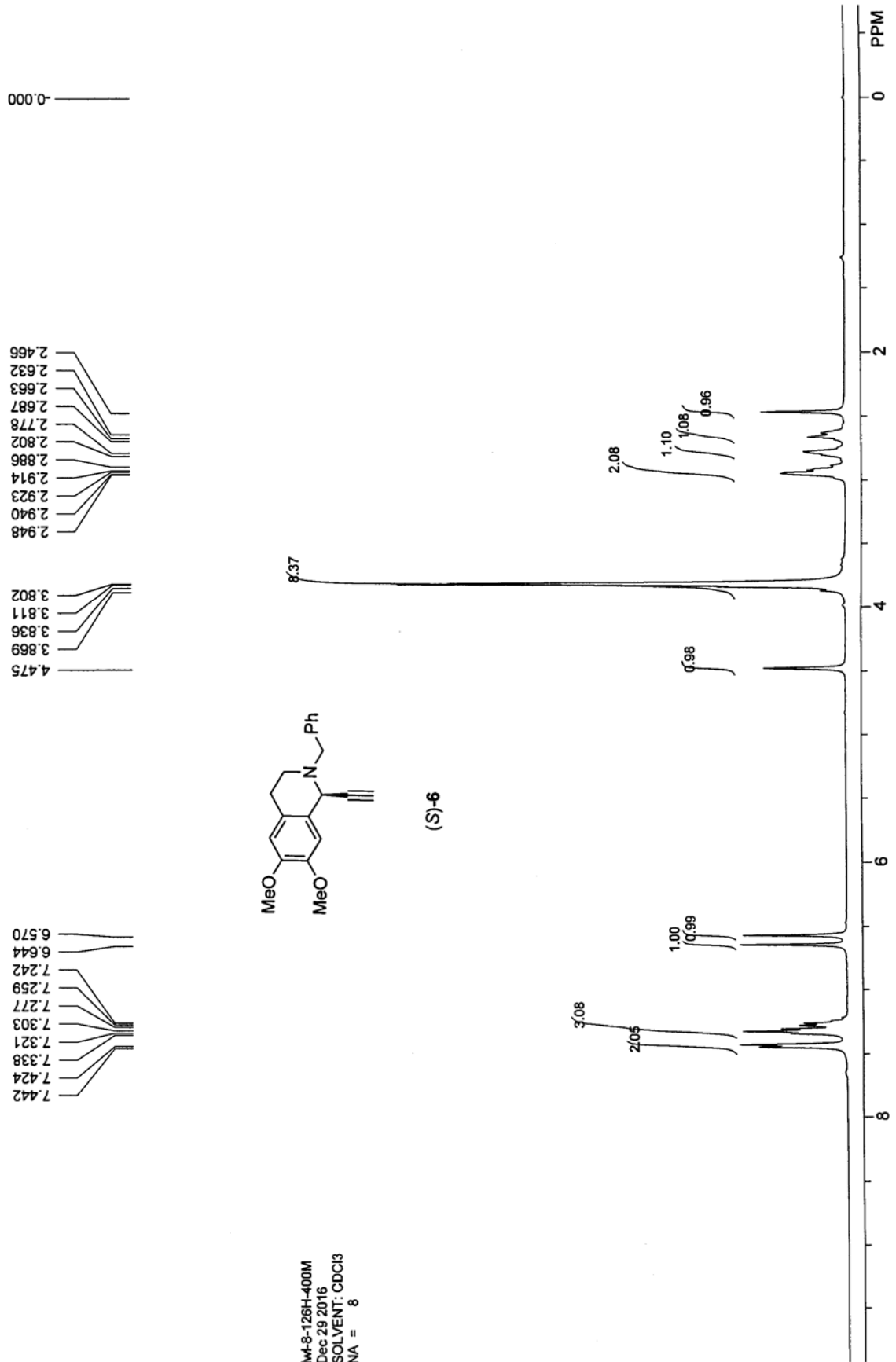
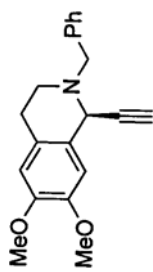
实验内容简介:



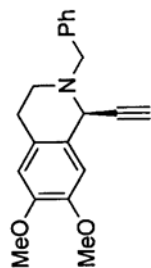
分析结果表

峰号	峰名	保留时间	峰高	峰面积	含量
1		11.775	177004.641	4485496.000	49.7951
2		14.430	101817.898	4522414.500	50.2049
总计			278822.539	9007910.500	100.0000

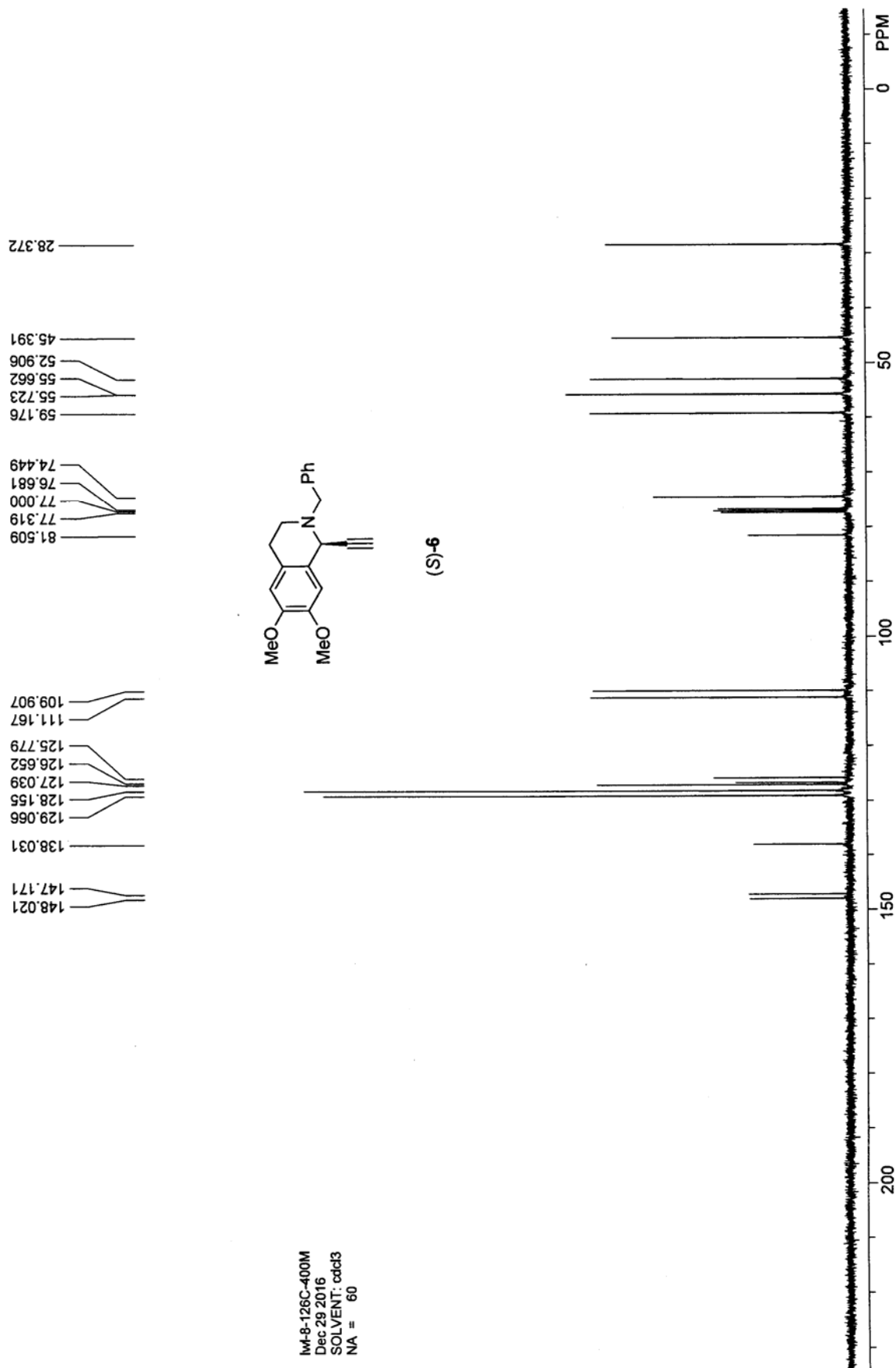
hw-8-126H-400M
Dec 29 2016
SOLVENT: CDCl3
NA = 8



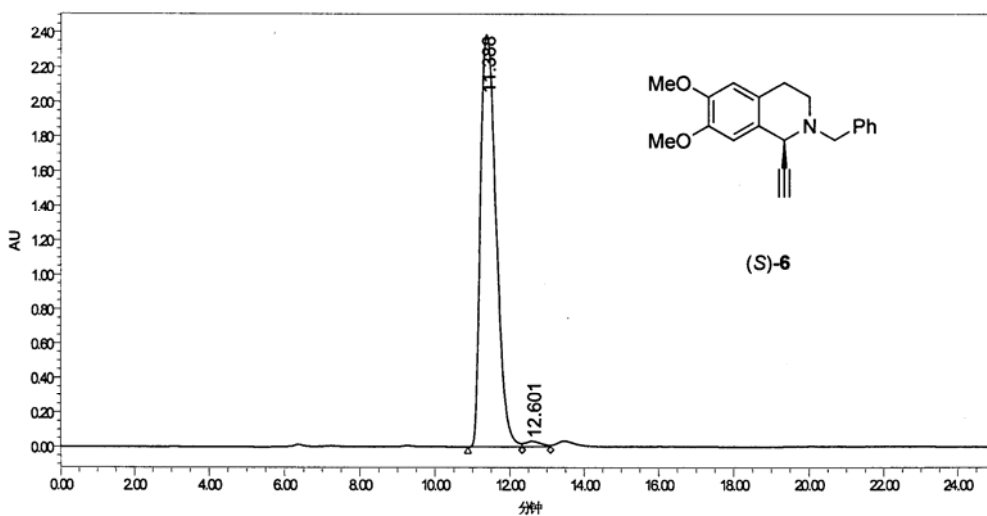
Im-8-126C-400M
Dec 29 2016
SOLVENT: cdcl3
NA = 60



(S)-6



SAMPLE INFORMATION			
Sample Name:	MI-8-126-as-h-95-50.5-214	Acquired By:	Breeze
Sample Type:	未知	Date Acquired:	2016/6/7 14:07:37 CST
Vial:	340	Acq. Method:	zgj95
Injection#:	1	Date Processed:	2016/6/7 14:59:51 CST
Injection Volume:	10.00 uL	Channel Name:	VQ489 ChA
Run Time:	25.00 Minutes	Channel Desc.:	VQ489 ChA.214nm
Column Type:		Sample Set Name:	



	RT (min)	Area (峰面积)	%Area	Hight (峰高)	% Hight
1	11.386	66648416	98.63	2388311	98.70
2	12.601	966266	1.37	31542	1.30

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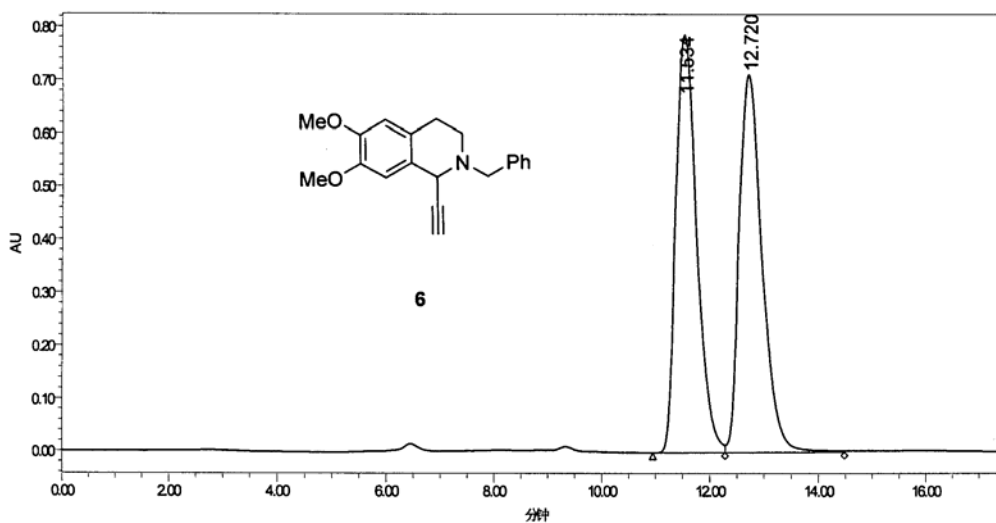
Project Name: defaults for copy

Reported by User: Breeze user (Breeze)

Breeze 2
HPLC System

SAMPLE INFORMATION

Sample Name:	W-894-rac-as-h9550.5-214	Acquired By:	Breeze
Sample Type:	未知	Date Acquired:	2016/6/7 14:40:44 CST
Vial:	341	Acq. Method:	zgj95
Injection #:	1	Date Processed:	2016/6/7 15:00:02 CST
Injection Volume:	10.00 μ l	Channel Name:	VQ2489 ChA
Run Time:	25.00 Minutes	Channel Desc.:	VQ2489 ChA.214mm
Column Type:		Sample Set Name:	



	RT (min)	Area (峰面积)	%Area	Height (峰高)	% Height
1	11.534	21288541	50.26	788188	52.47
2	12.720	21071285	49.74	714016	47.53

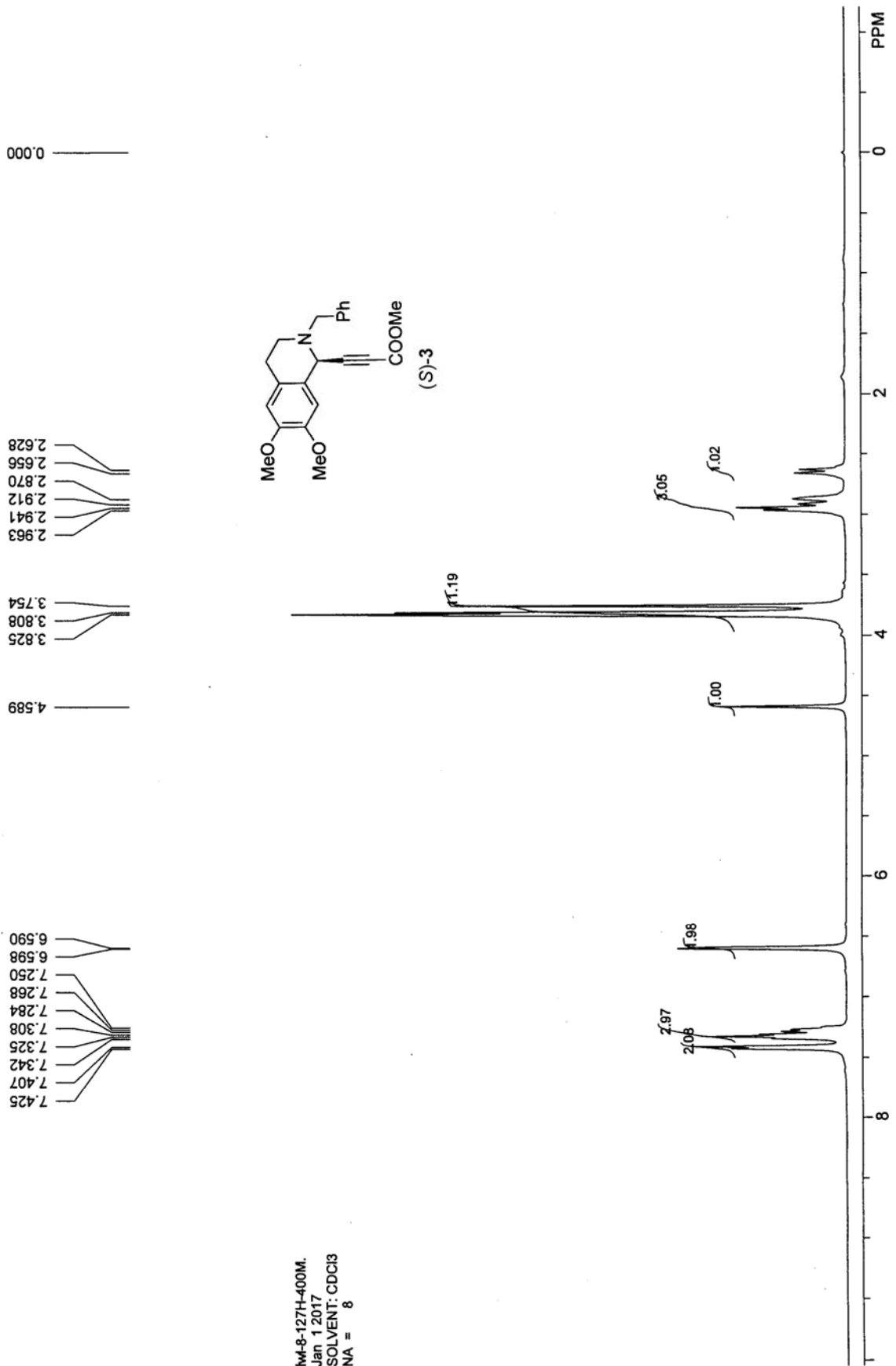
Report Method: Individual Report ASC

Page: 1 (共计 1)

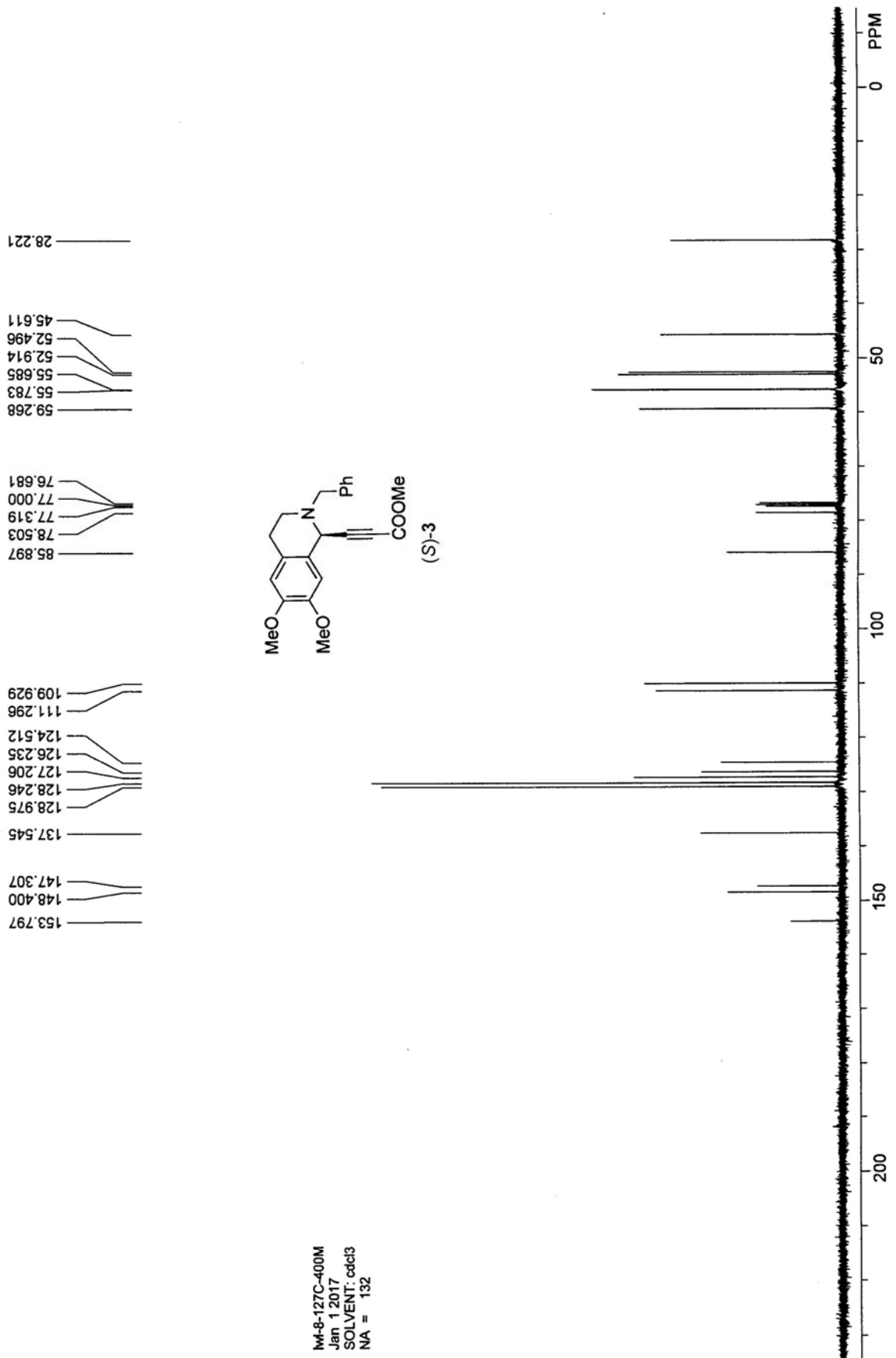
Printed: 2016/6/7

16:02:25 PRC

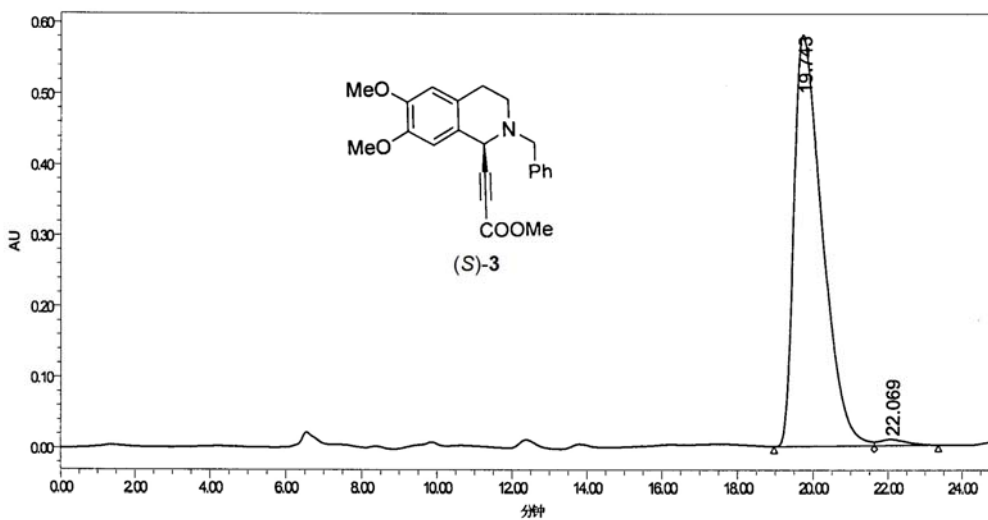
HW-8-127H-400M.
Jan 1 2017
SOLVENT: CDCl3
NA = 8



fw-8-127C-400M
Jan 1 2017
SOLVENT: cdcl3
NA = 132



SAMPLE INFORMATION			
Sample Name:	ML-8-127-es-h95-50.7-214	Acquired By:	Breeze
Sample Type:	未知	Date Acquired:	2016/6/7 15:02:29 CST
Vial:	342	Acq. Method:	zgj95
Injection #:	1	Date Processed:	2016/6/7 16:00:58 CST
Injection Volume:	10.00 μ l	Channel Name:	V0489 ChA
Run Time:	25.00 Minutes	Channel Desc.:	V0489 ChA 214mm
Column Type:		Sample Set Name:	



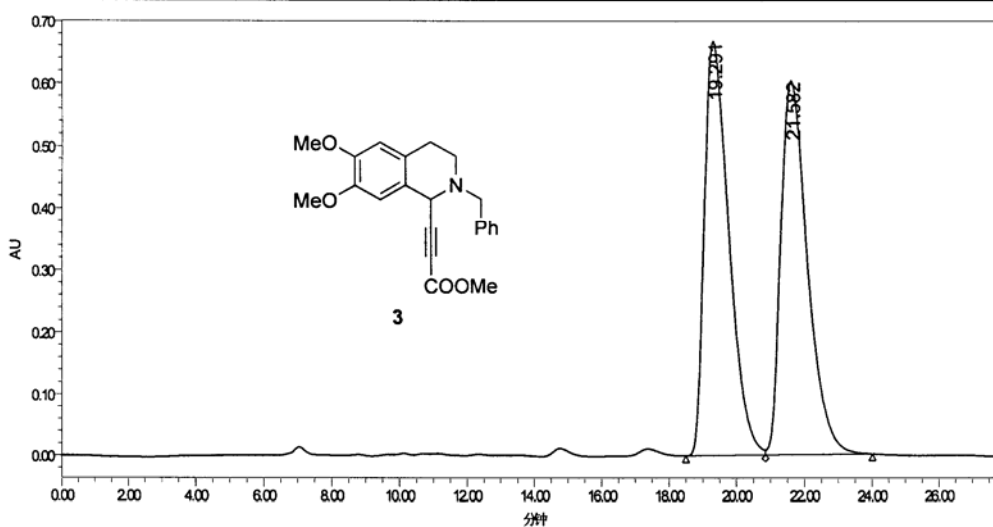
	RT (min)	Area (峰sec)	%Area	Hight (峰)	% Hight
1	19.743	30334430	98.48	580416	98.50
2	22.069	467148	1.52	8863	1.50

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 Project Name: defaults for copy
 Reported by User: Breeze user (Breeze)

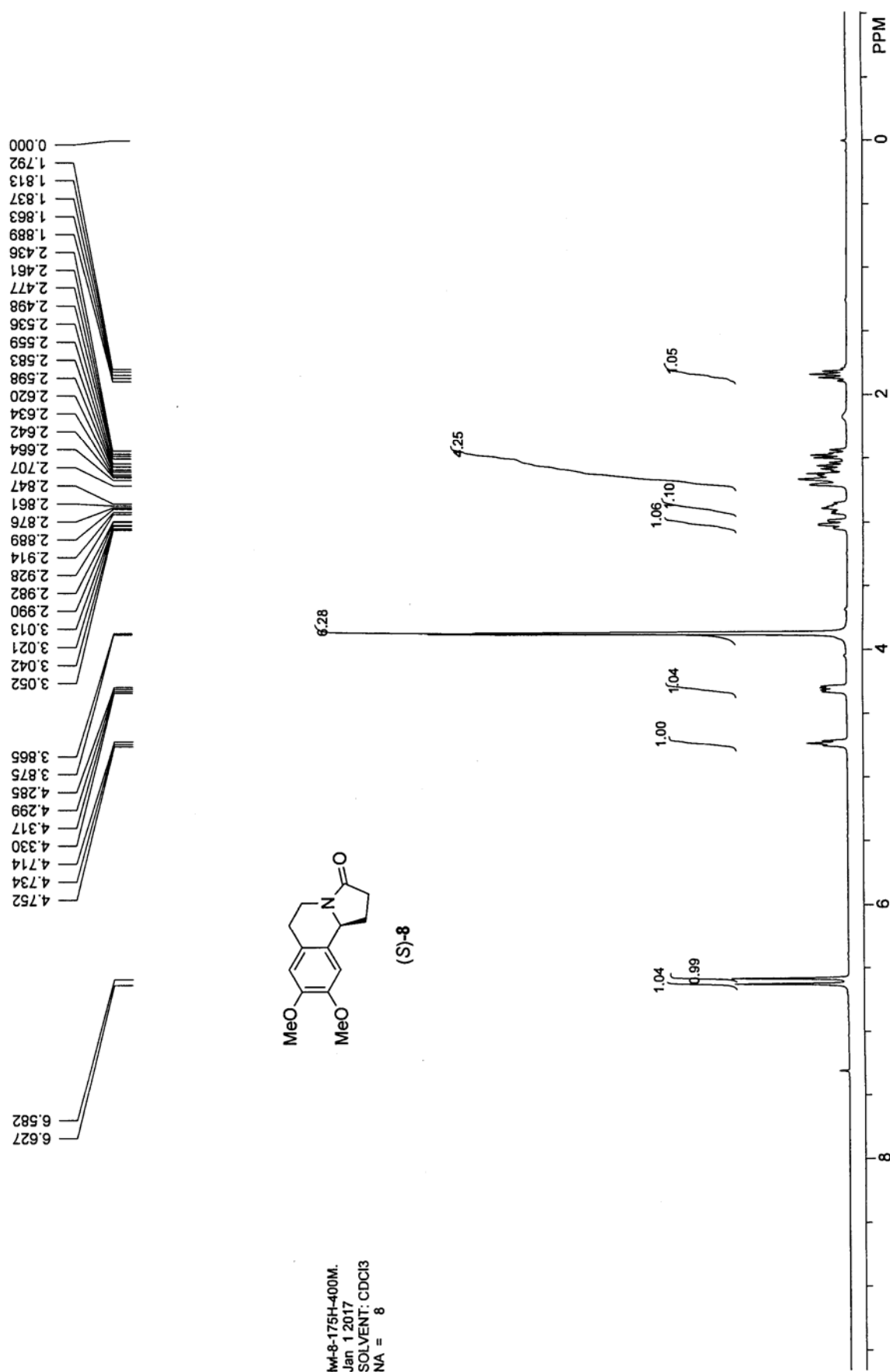


SAMPLE INFORMATION

Sample Name:	W-8-95-rac-as-h-95-50.7-214	Acquired By:	Breeze
Sample Type:	未知	Date Acquired:	2016/7 15:32:54 CST
Val:	343	Acq. Method:	zg95
Injection#:	1	Date Processed:	2016/7 16:01:24 CST
Injection Volume:	10.00 μ l	Channel Name:	W2489 ChA
Run Time:	35.00 Minutes	Channel Desc.:	W2489 ChA.214mm
Column Type:		Sample Set Name:	

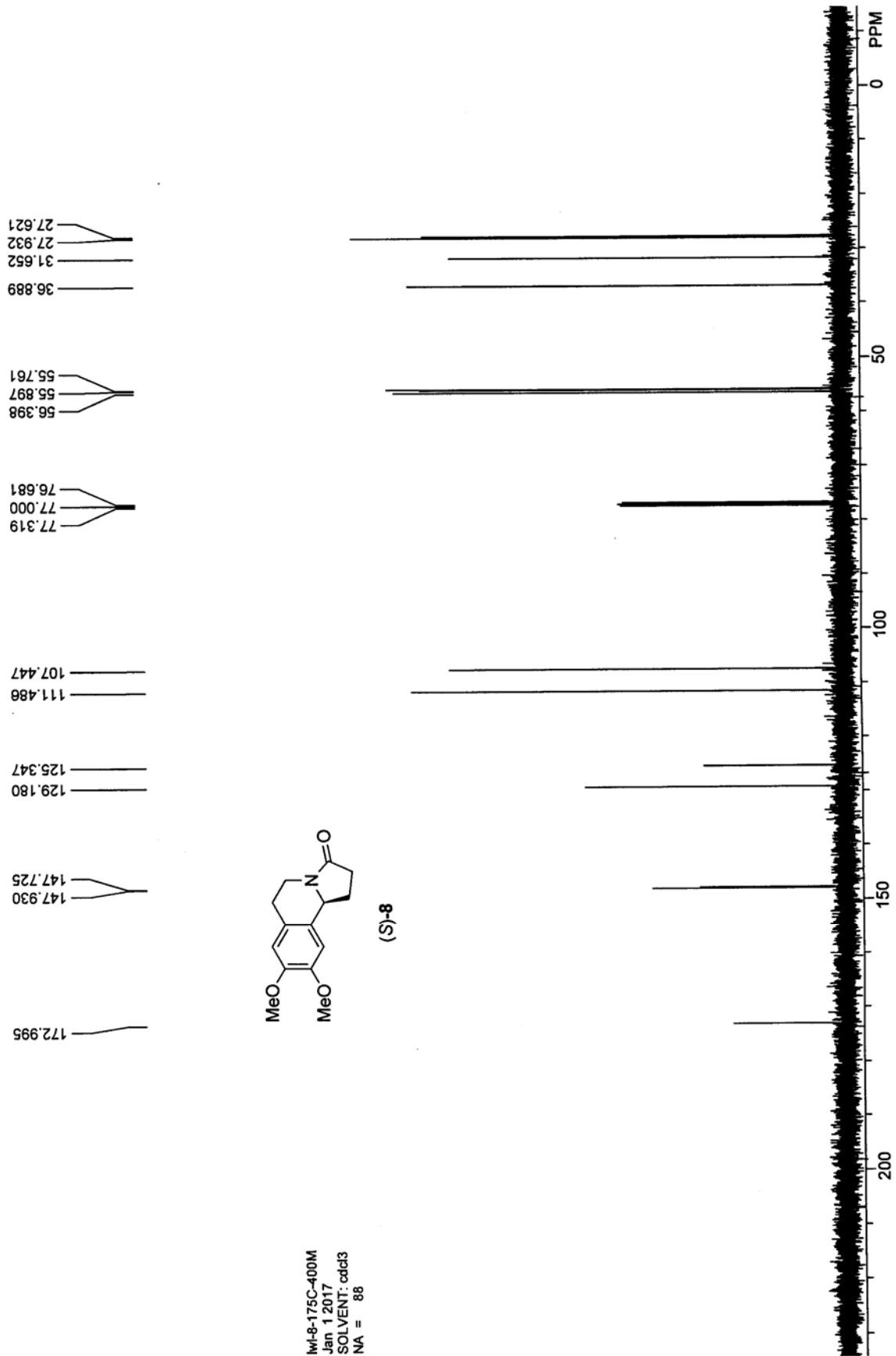
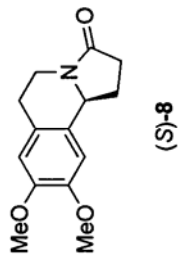


	RT (min)	Area (峰面积)	%Area	Hight (峰高)	% Hight
1	19.291	33729892	50.41	666564	52.52
2	21.582	33185128	49.58	602668	47.48



Mw-8-175H-400M.
 Jan 1 2017
 SOLVENT: CDCl3
 NA = 8

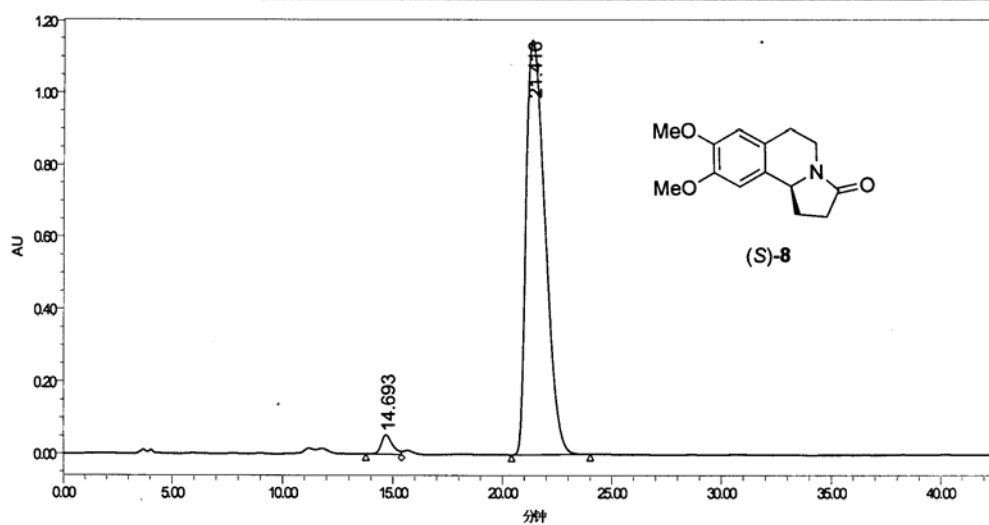
hw-8-175C-400M
Jan 1 2017
SOLVENT: cdd3
NA = 88



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 Project Name: defaults for copy
 Reported by User: Breeze user (Breeze)

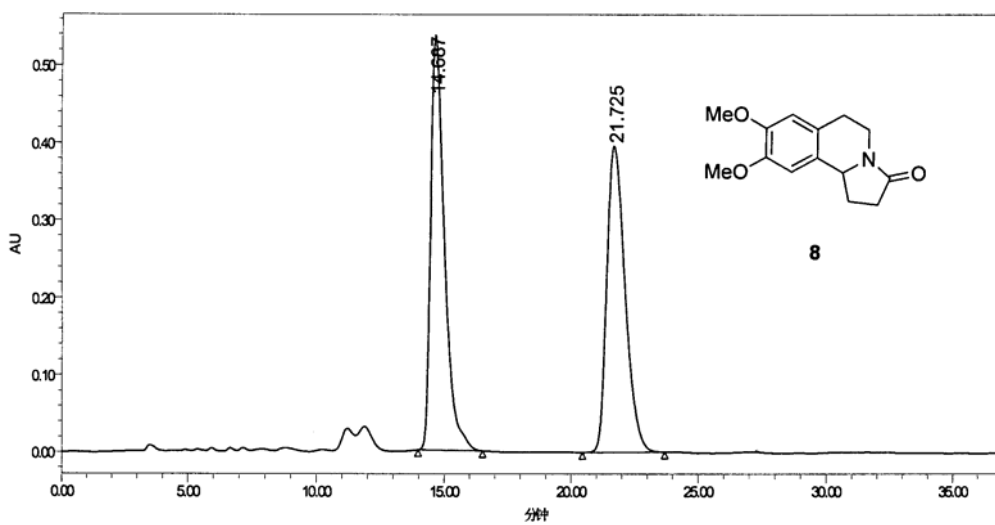


SAMPLE INFORMATION			
Sample Name:	W-8-175-as-h-60-40.0.9-214	Acquired By:	Breeze
Sample Type:	未知	Date Acquired:	2016/7/12 13:10:10 CST
Val:	519	Acq. Method:	zq60
Injection #:	1	Date Processed:	2017/1/5 14:08:20 CST
Injection Volume:	10.00 μ l	Channel Name:	W2489 ChA
Run Time:	60.00 Minutes	Channel Desc.:	W2489 ChA.214nm
Column Type:		Sample Set Name:	



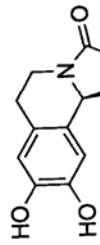
	RT (min)	Area (峰面积)	%Area	Height (峰高)	% Height
1	14.693	1897009	2.66	54344	4.52
2	21.416	6941366	97.34	1148891	95.48

SAMPLE INFORMATION			
Sample Name:	ML-S-103-as-h60-40-0.9-214	Acquired By:	Breeze
Sample Type:	未知	Date Acquired:	2016/7/12 13:55:01 CST
Vol:	520	Acq. Method:	zg60
Injection #:	1	Date Processed:	2016/7/12 14:32:27 CST
Injection Volume:	10.00 μ l	Channel Name:	V2489 ChA
Run Time:	60.00 Minutes	Channel Desc.:	V2489 ChA.214mm
Column Type:		Sample Set Name:	

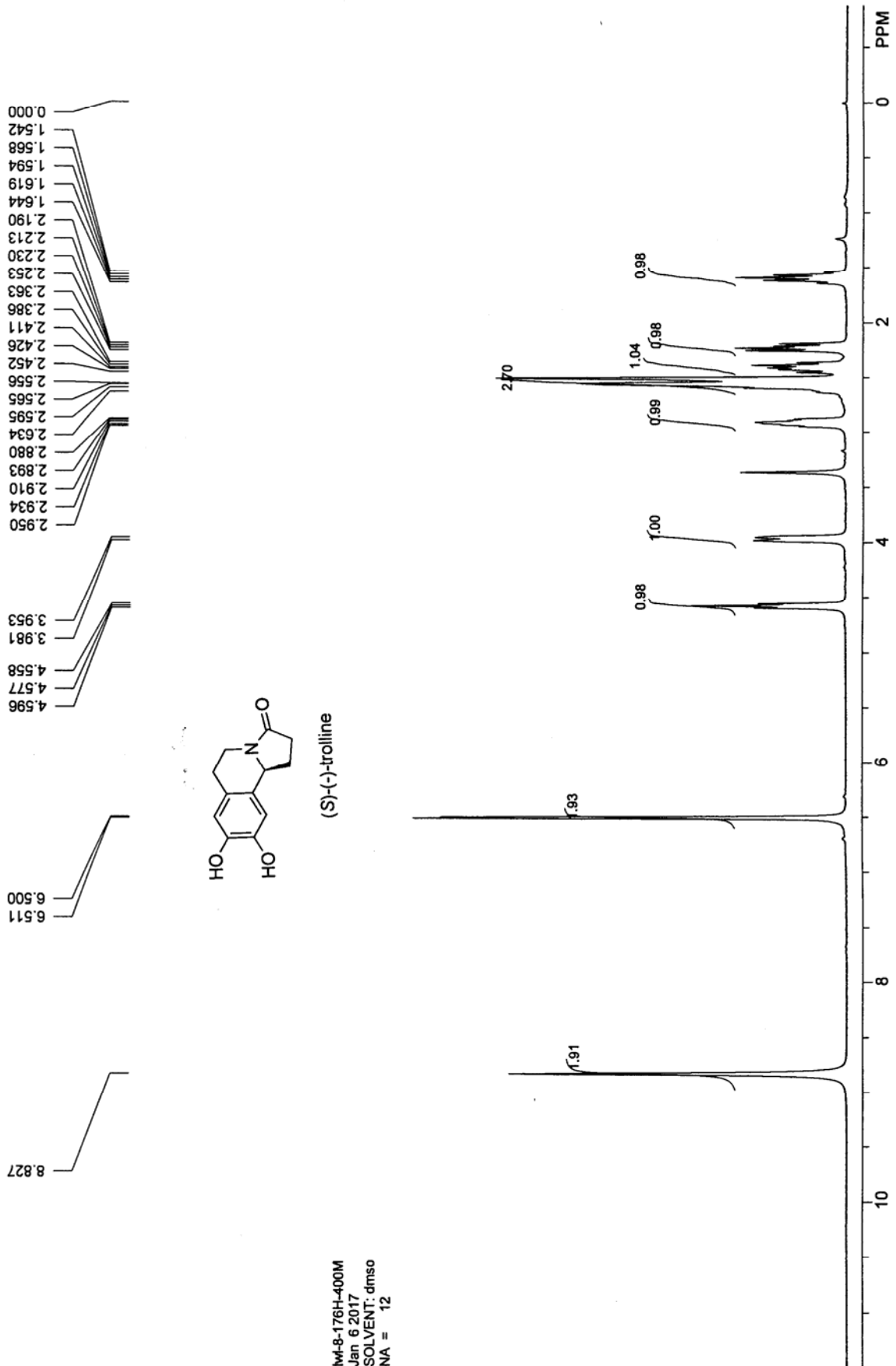


	RT (min)	Area (AreaSec)	%Area	Height (mm)	% Height
1	14.667	20206977	50.43	536311	57.52
2	21.725	19868195	49.57	396141	42.48

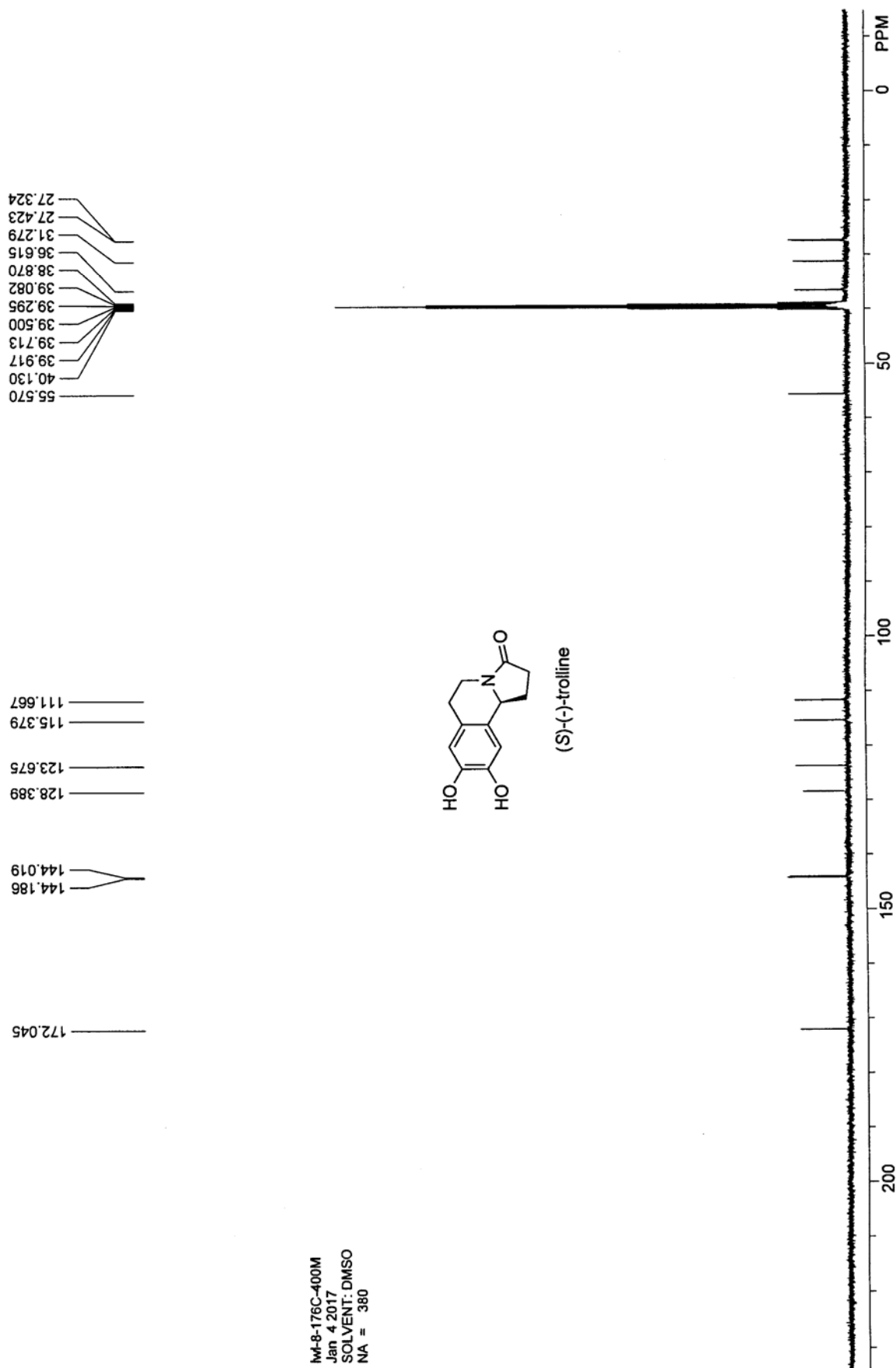
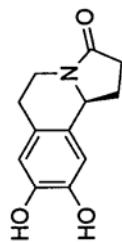
hw-8-176H-400M
Jan 6 2017
SOLVENT: dmso
NA = 12



(S)-(-)-trolline



hwf-8-176C-400M
Jan 4 2017
SOLVENT: DMSO
NA = 380



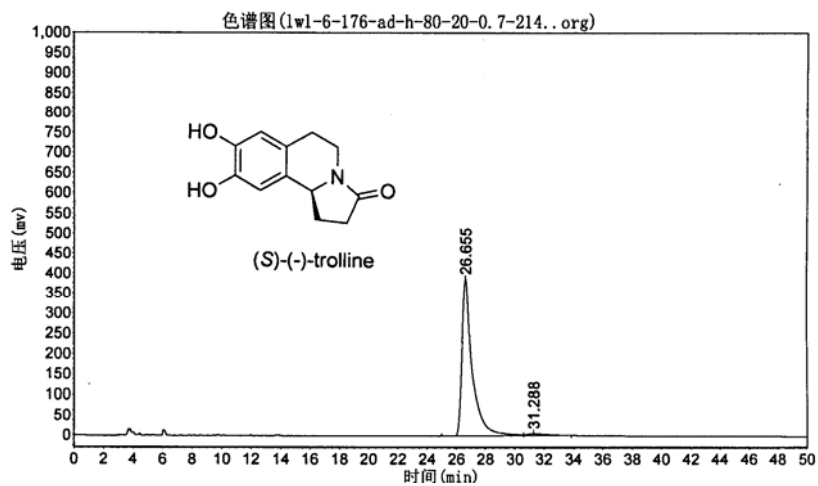
lw1-6-176-ad-h-80-20-0.7-214

实验时间: 2016-07-18, 11:59:04

报告时间: 2016-07-18, 14:21:39

谱图文件: D:\zhuguangjiong\lw1\20160715\lw1-6-176-ad-h-80-20-0.7-214..org

实验内容简介:



分析结果表

峰号	峰名	保留时间	峰高	峰面积	含量
1		26.655	387796.844	19257308.000	97.5543
2		31.288	5129.015	482787.781	2.4457
总计			392925.859	19740095.781	100.0000

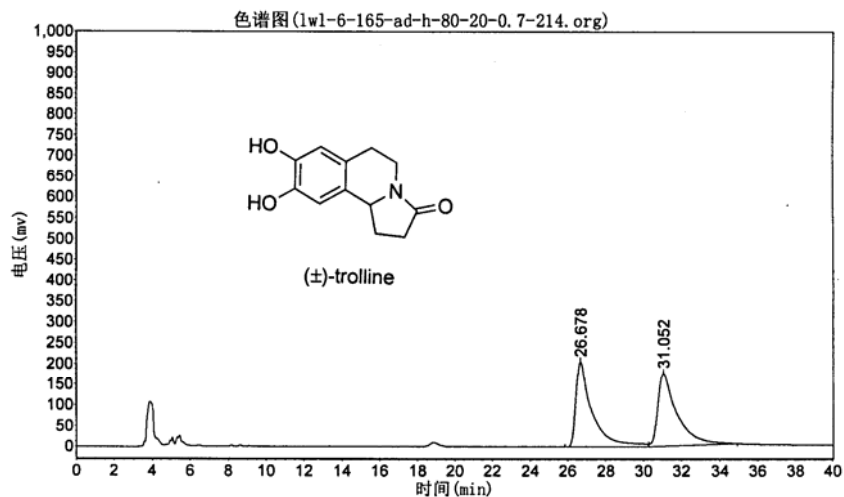
lw1-6-165-ad-h-80-20-0.7-214

实验时间: 2016-07-18, 10:34:35

报告时间: 2016-07-18, 14:19:59

谱图文件: D:\zhuguangjiong\lw1\20160715\lw1-6-165-ad-h-80-20-0.7-214.org

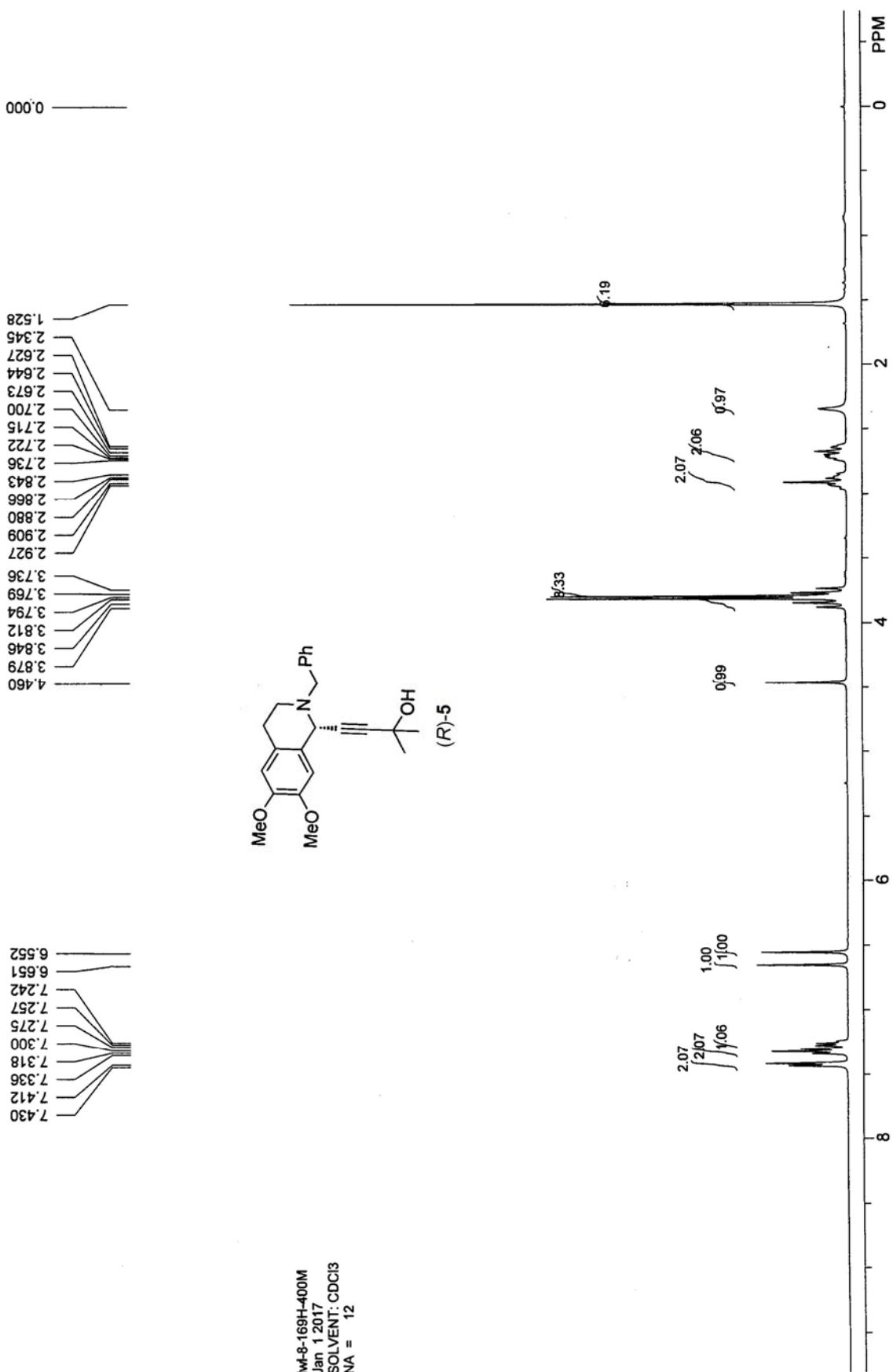
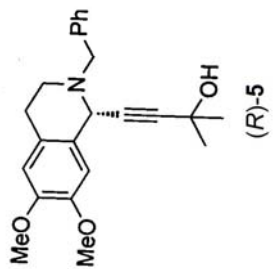
实验内容简介:



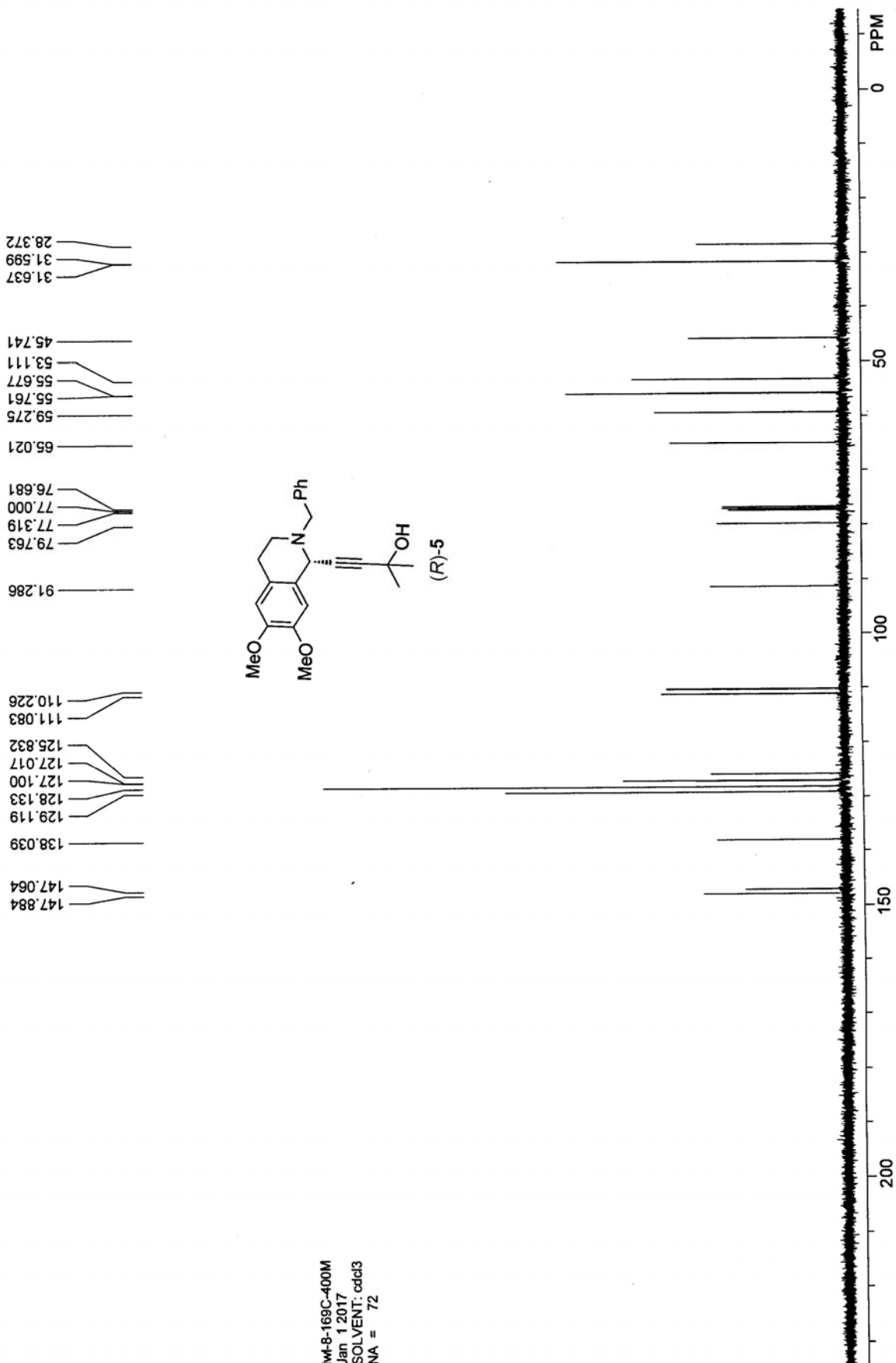
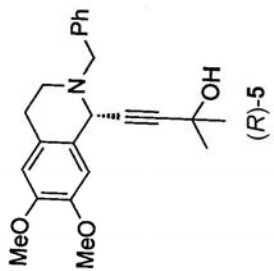
分析结果表

峰号	峰名	保留时间	峰高	峰面积	含量
1		26.678	205491.141	12264055.000	49.9611
2		31.052	176385.266	12283133.000	50.0389
总计			381876.406	24547188.000	100.0000

Int-8-169H-400M
Jan 1 2017
SOLVENT: CDCl3
NA = 12



Inv-8-169C-400M
Jan 1 2017
SOLVENT: cdcl3
NA = 72



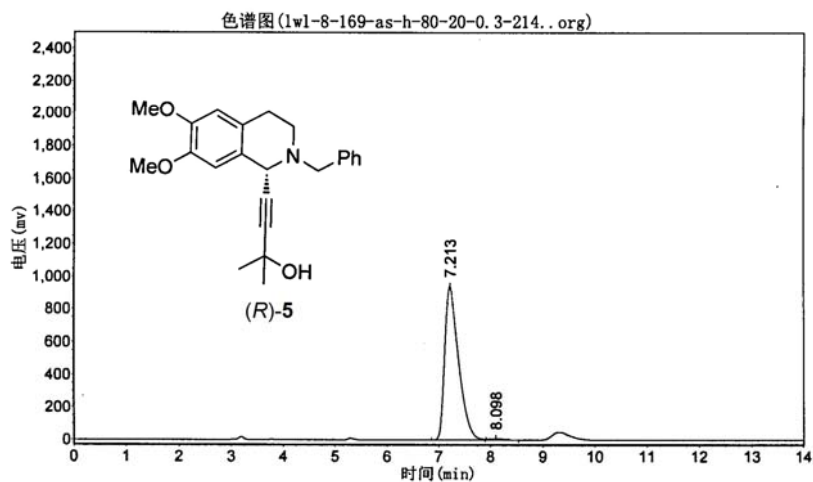
lw1-8-169-as-h-80-20-0.3-214

实验时间: 2016-07-08, 15:31:21

报告时间: 2016-07-08, 16:20:34

谱图文件: D:\zhuguangjiong\lw1\20160708\lw1-8-169-as-h-80-20-0.3-214..org

实验内容简介:



分析结果表

峰号	峰名	保留时间	峰高	峰面积	含量
1		7.213	939515.250	17365022.000	99.1271
2		8.098	7629.566	152906.203	0.8729
总计			947144.816	17517928.203	100.0000

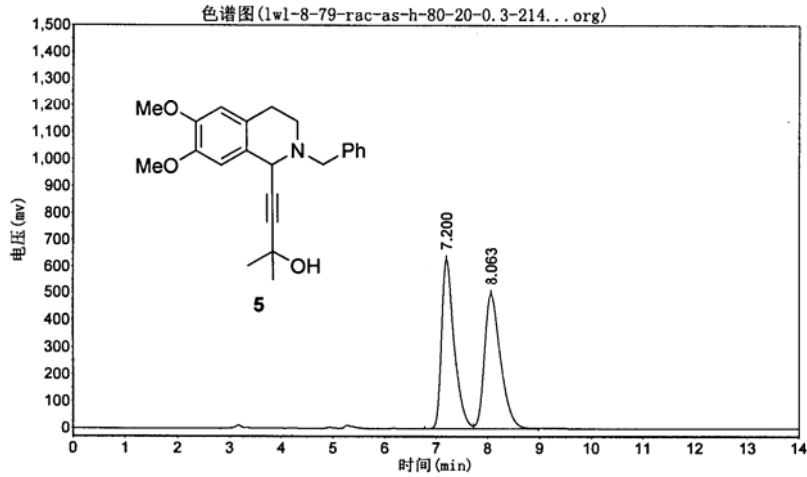
lw1-8-79-rac-as-h-80-20-0.3-214

实验时间: 2016-07-08, 16:04:10

报告时间: 2016-07-08, 16:19:29

谱图文件: D:\zhuguangjiong\lw1\20160708\lw1-8-79-rac-as-h-80-20-0.3-214...org

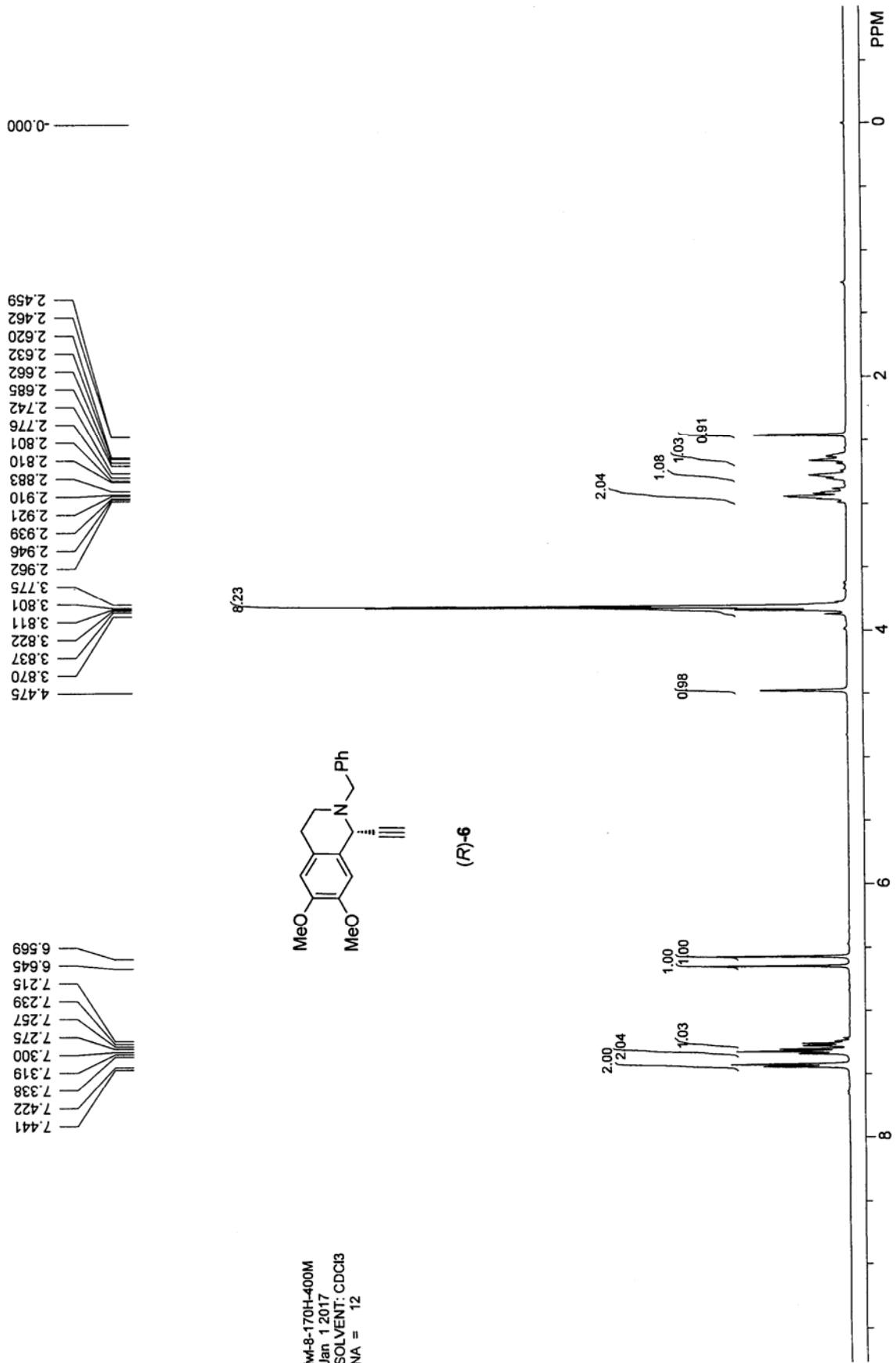
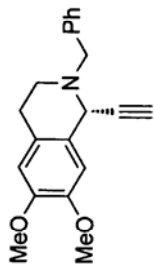
实验内容简介:



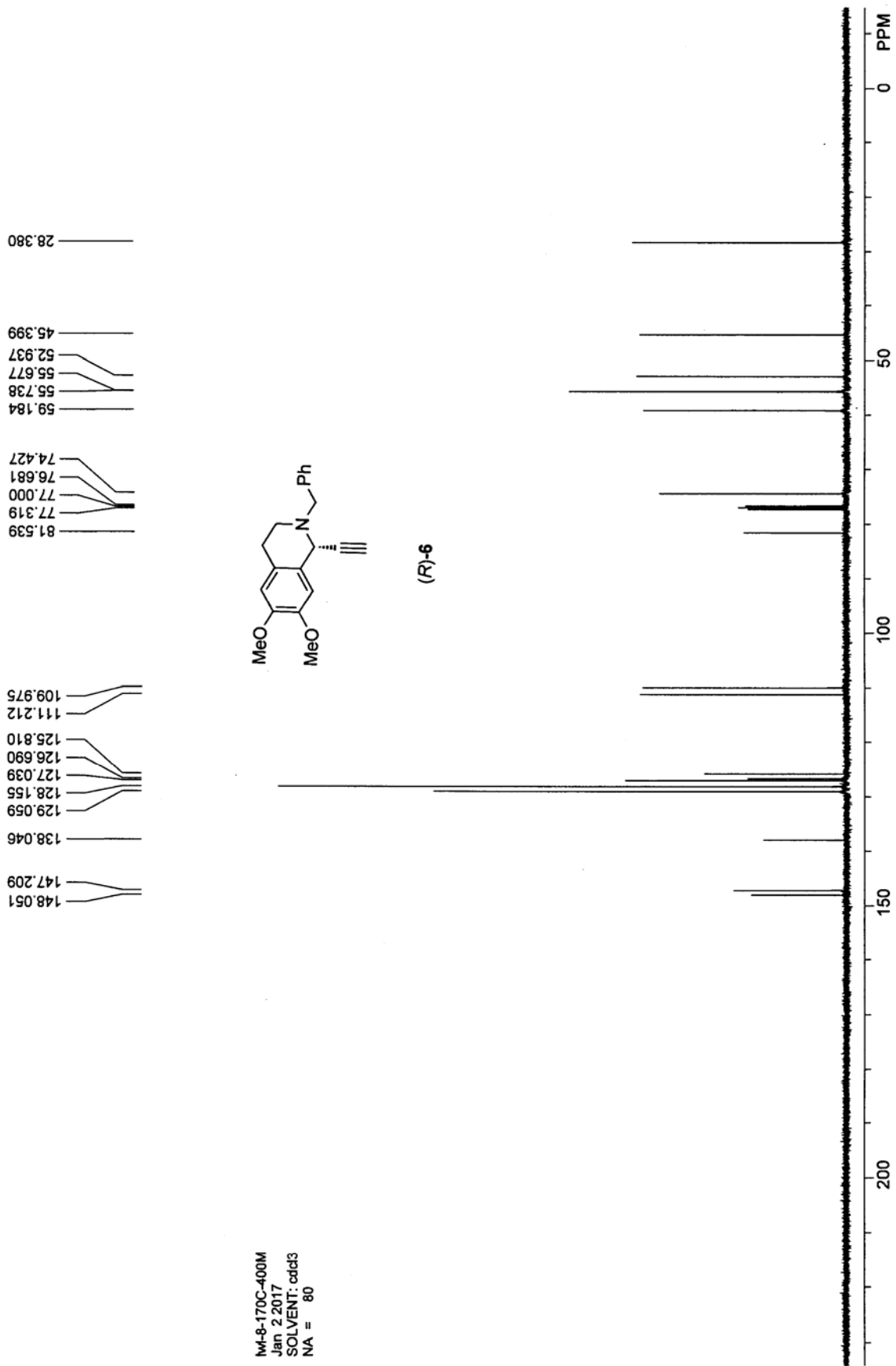
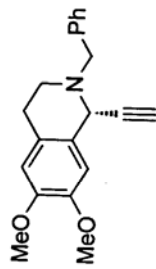
分析结果表

峰号	峰名	保留时间	峰高	峰面积	含量
1		7.200	628420.563	10683695.000	49.6762
2		8.063	496522.750	10822957.000	50.3238
总计			1124943.313	21506652.000	100.0000

hw-8-170H-400M
Jan 1 2017
SOLVENT: CDCl3
NA = 12



WI-B-170C-400M
Jan 2 2017
SOLVENT: cdcl3
NA = 80



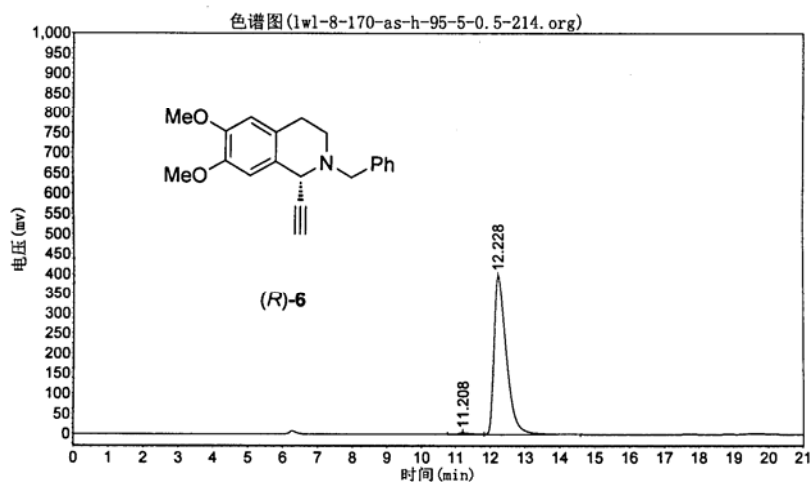
lw1-8-170-as-h-95-5-0.5-214

实验时间: 2016-07-12, 13:09:19

报告时间: 2016-07-12, 16:49:27

谱图文件: D:\zhuguangjiong\lw1\20160712\lw1-8-170-as-h-95-5-0.5-214.org

实验内容简介:



分析结果表

峰号	峰名	保留时间	峰高	峰面积	含量
1		11.208	4008.512	95695.750	0.9643
2		12.228	398254.656	9828306.000	99.0357
总计			402263.169	9924001.750	100.0000

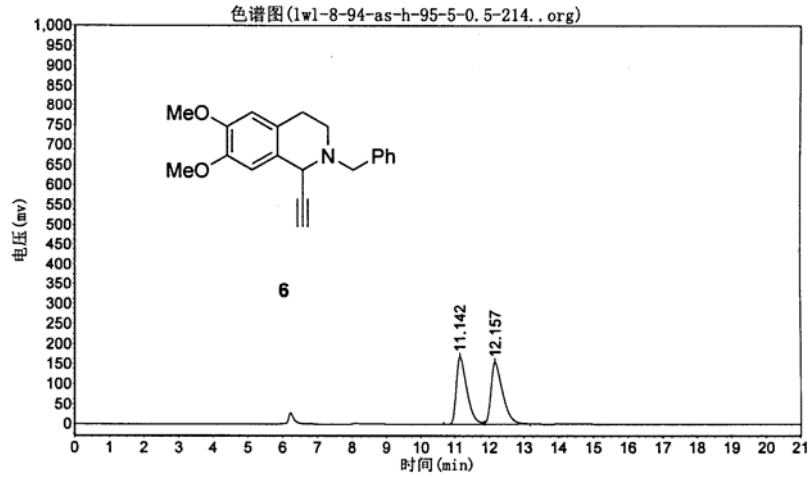
lw1-8-94-as-h-95-5-0.5-214

实验时间: 2016-07-12, 14:28:33

报告时间: 2016-07-12, 16:50:17

谱图文件: D:\zhuguangjiong\lw1\20160712\lw1-8-94-as-h-95-5-0.5-214..org

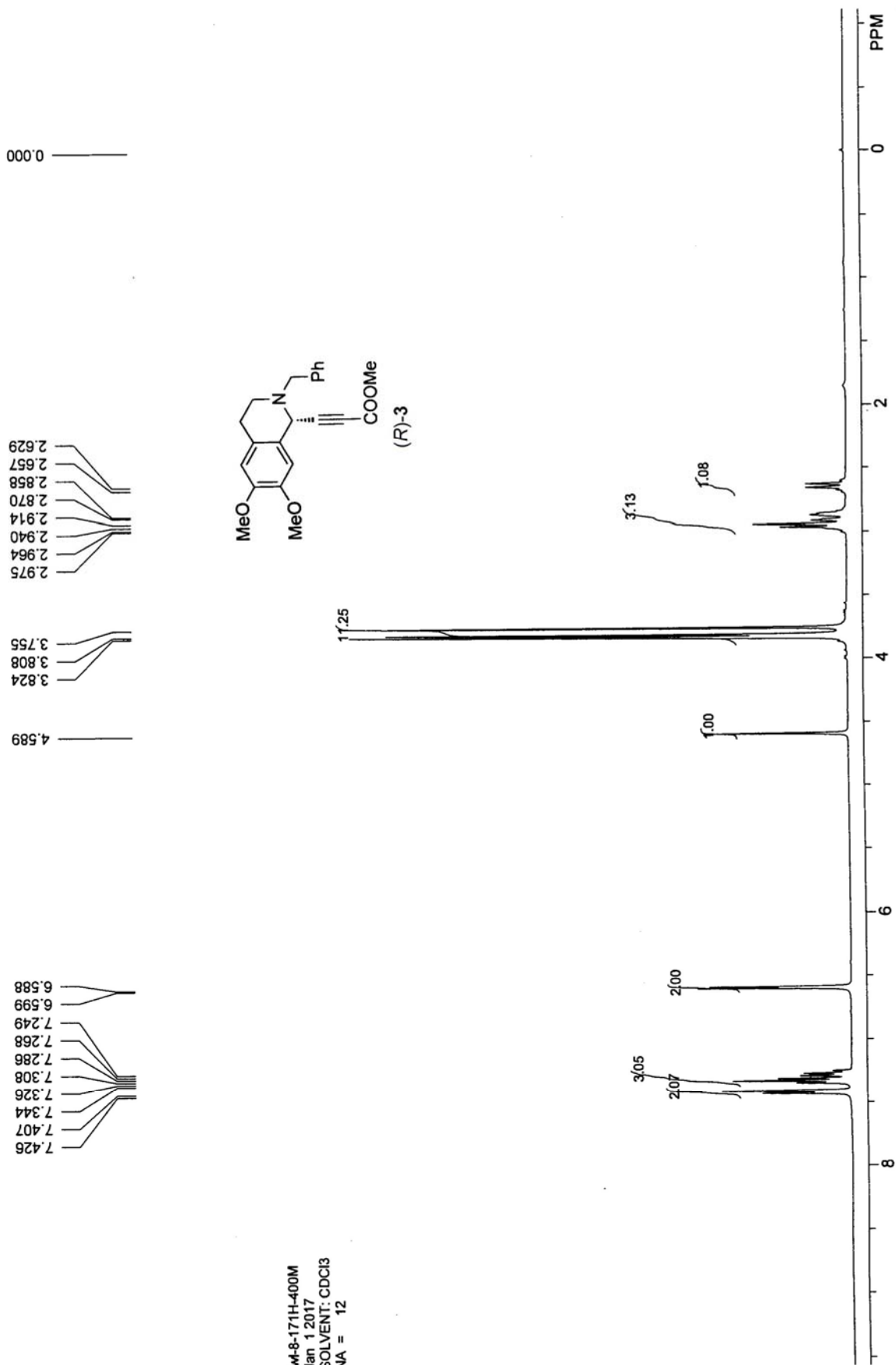
实验内容简介:



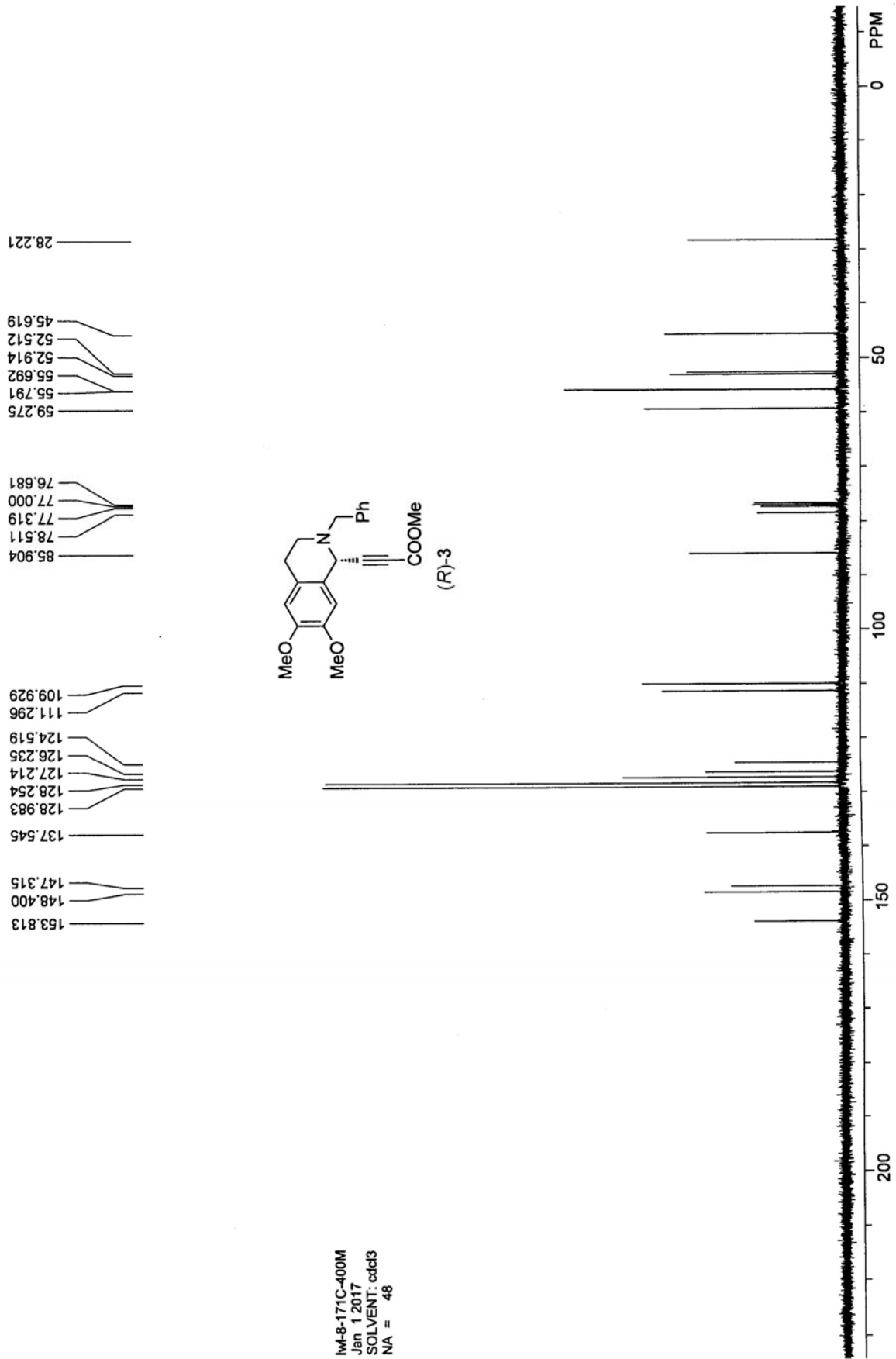
分析结果表

峰号	峰名	保留时间	峰高	峰面积	含量
1		11.142	170422.797	3661086.000	49.8538
2		12.157	155838.422	3682554.750	50.1462
总计			326261.219	7343640.750	100.0000

MF-8-171H-400M
Jan 1 2017
SOLVENT: CDCl3
NA = 12



hw-8-171C-400M
Jan 1, 2017
SOLVENT: cdcl3
NA = 48



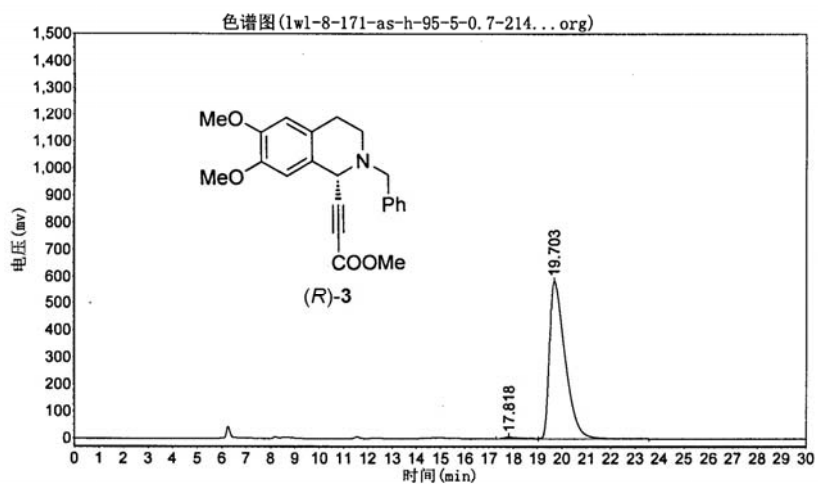
lw1-8-171-as-h-95-5-0.7-214

实验时间: 2016-07-12, 12:24:33

报告时间: 2016-07-12, 16:53:27

谱图文件: D:\zhuguangjiong\lw1\20160712\lw1-8-171-as-h-95-5-0.7-214...org

实验内容简介:



分析结果表

峰号	峰名	保留时间	峰高	峰面积	含量
1		17.818	6508.380	286700.844	1.0883
2		19.703	584125.688	26056760.000	98.9117
总计			590634.068	26343460.844	100.0000

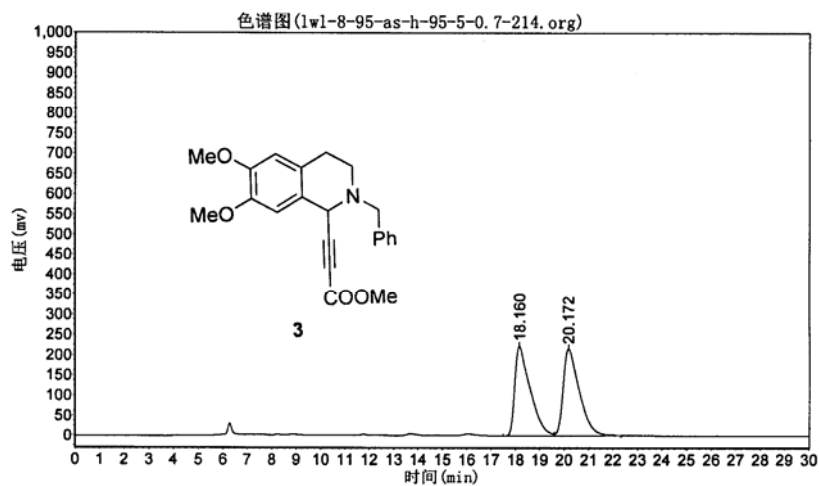
lw1-8-95-as-h-95-5-0.7-214

实验时间: 2016-07-12, 10:27:10

报告时间: 2016-07-12, 16:52:30

谱图文件: D:\zhuguangjiong\lw1\20160712\lw1-8-95-as-h-95-5-0.7-214.org

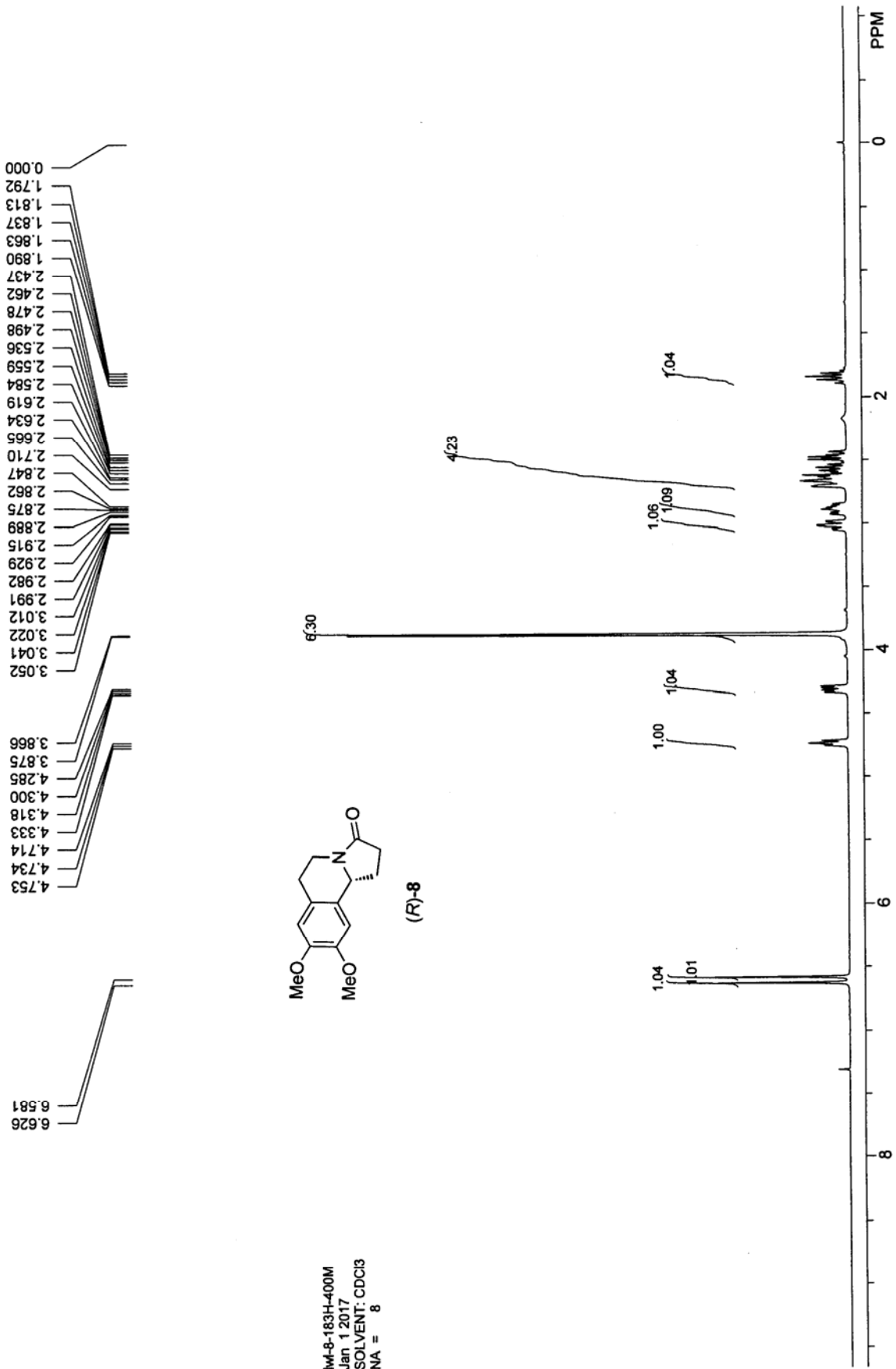
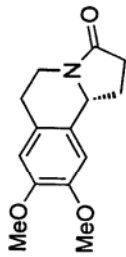
实验内容简介:

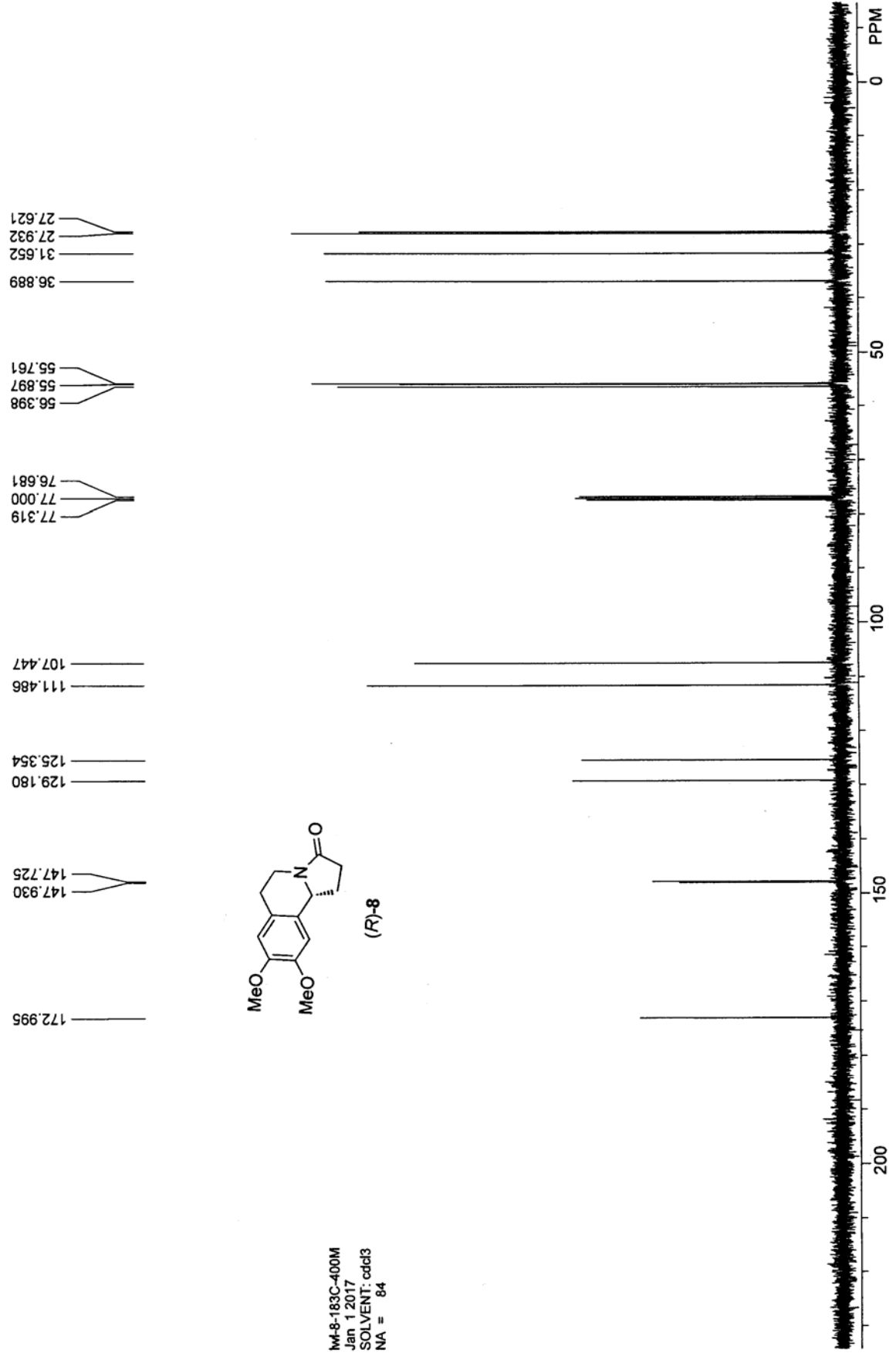


分析结果表

峰号	峰名	保留时间	峰高	峰面积	含量
1		18.160	223219.625	9787908.000	49.5280
2		20.172	216943.656	9974457.000	50.4720
总计			440163.281	19762365.000	100.0000

hw-8-183H-400M
Jan 1 2017
SOLVENT: CDCl3
NA = 8





Wt-8-183C-400M
 Jan 1 2017
 SOLVENT: cdd3
 NA = 84

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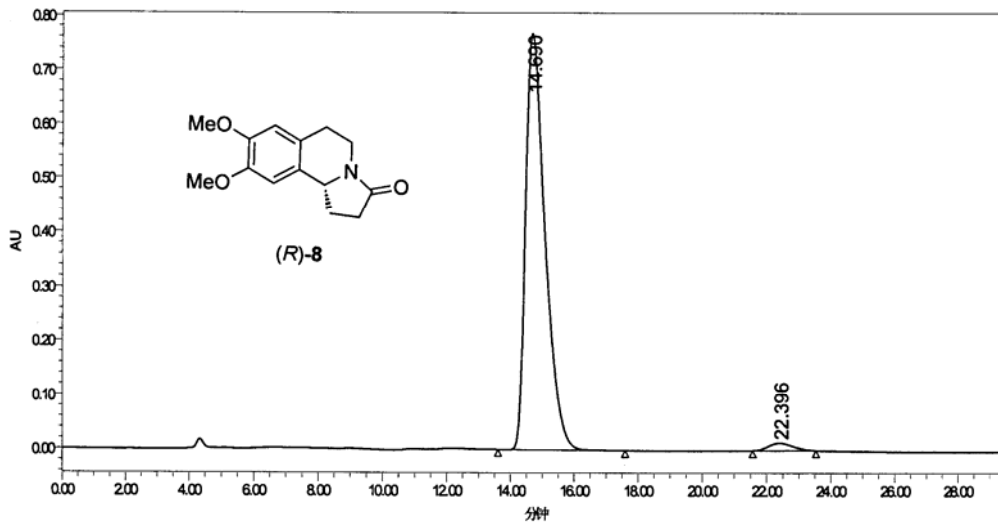
Project Name: defaults for copy

Reported by User: Breeze user (Breeze)



SAMPLE INFORMATION

Sample Name:	W-8-183-as-h-60-40.0.9-214	Acquired By:	Breeze
Sample Type:	未知	Date Acquired:	2016/9/29 16:35:52 CST
Val:	675	Acq. Method:	zq60
Injection #:	1	Date Processed:	2017/1/5 14:11:41 CST
Injection Volume:	10.00 μ l	Channel Name:	W2489 ChA
Run Time:	60.00 Minutes	Channel Desc.:	W2489 ChA.214nm
Column Type:		Sample Set Name:	

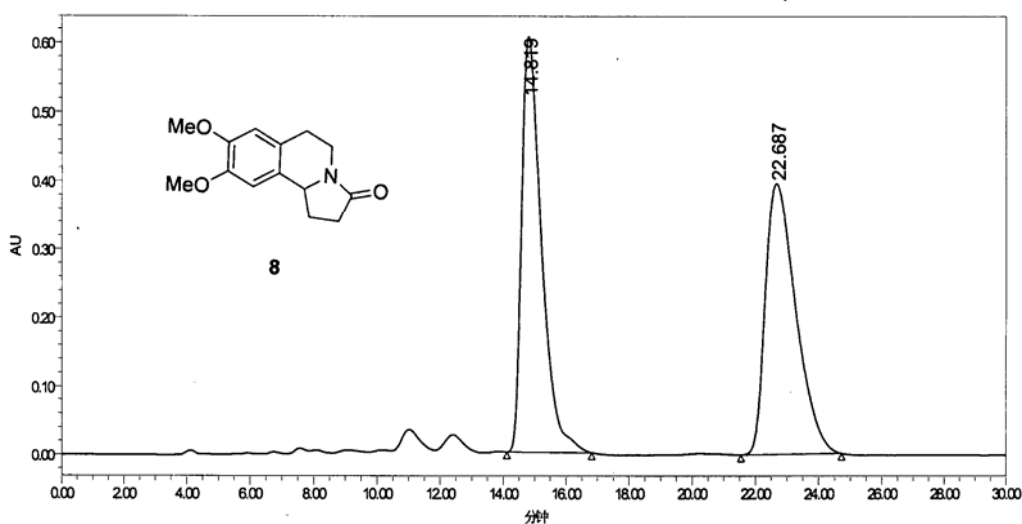


RT (min)	Area (峰面积)	%Area	Height (峰高)	% Height
14.660	32572797	97.75	766672	98.19
22.396	746666	2.25	14197	1.81

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 Project Name: defaults for copy
 Reported by User: Breeze user (Breeze)

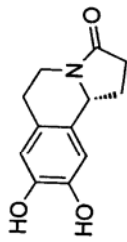


SAMPLE INFORMATION			
Sample Name:	WJ-8-103-rac-ash-60-400.9:214	Acquired By:	Breeze
Sample Type:	未知	Date Acquired:	2016/9/29 17:09:52 CST
Vial:	676	Acq. Method:	zg60
Injection #:	1	Date Processed:	2016/9/29 17:42:52 CST
Injection Volume:	10.00 µl	Channel Name:	V2489 ChA
Run Time:	30.00 Minutes	Channel Desc.:	V2489 ChA.214mm
Column Type:		Sample Set Name:	

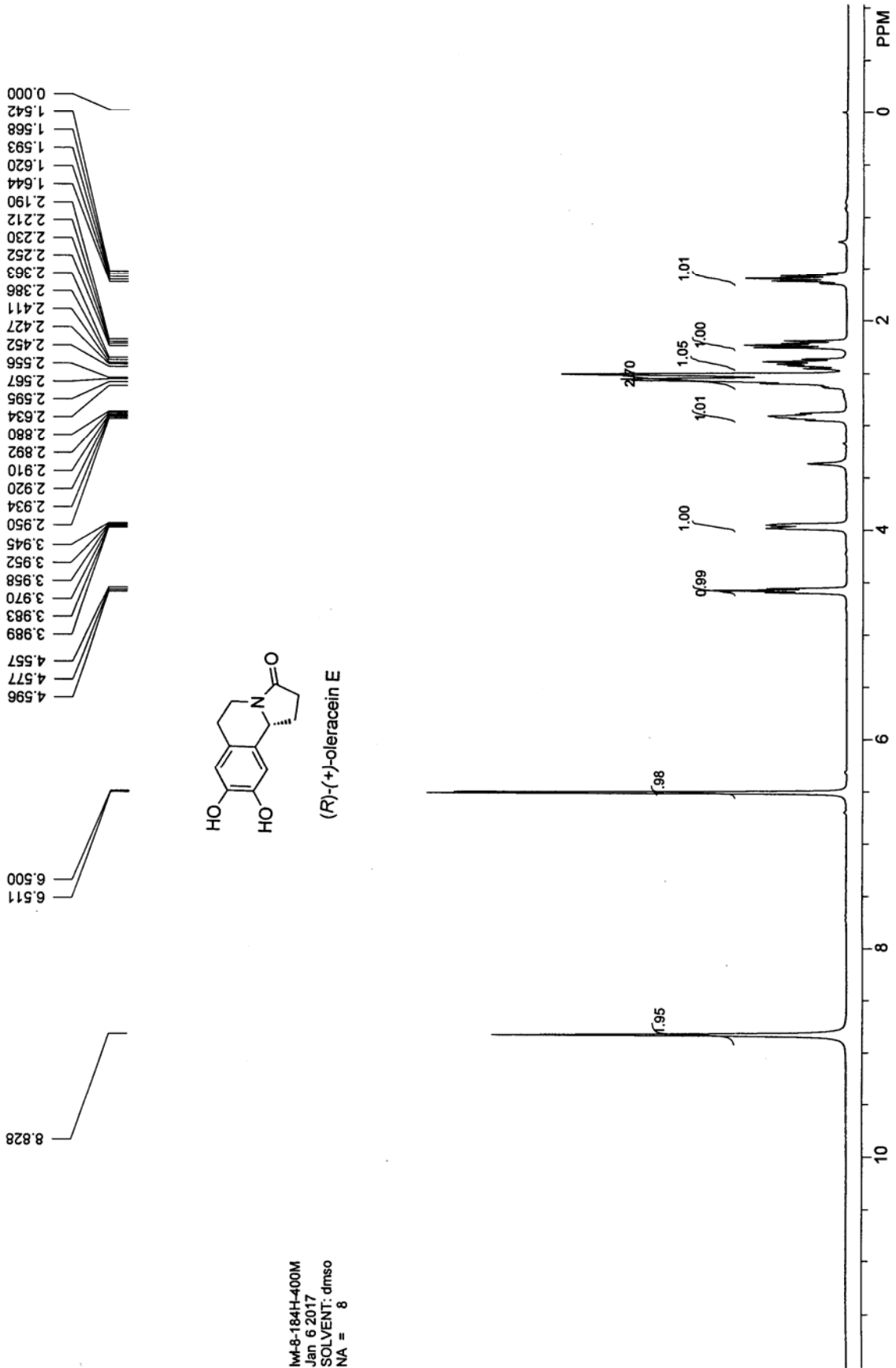


	RT (min)	Area (AU*sec)	%Area	Hight (AU)	% Hight
1	14.819	25744037	50.22	605493	60.45
2	22.687	25513908	49.78	396185	39.55

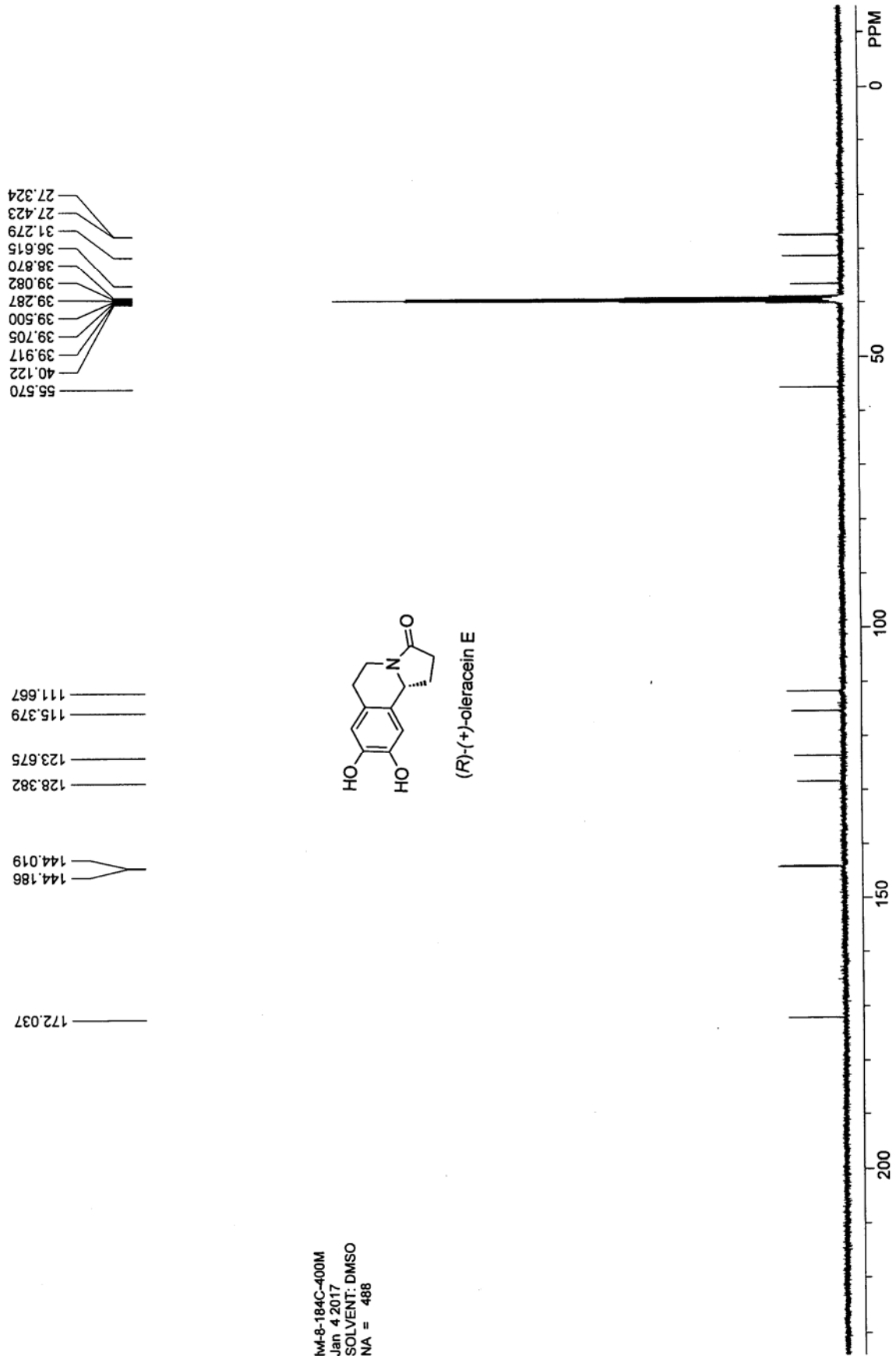
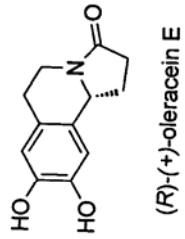
hw-8-184H-400M
Jan 6 2017
SOLVENT: dmso
NA = 8



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HW-8-184C-400M
Jan 4 2017
SOLVENT: DMSO
NA = 488

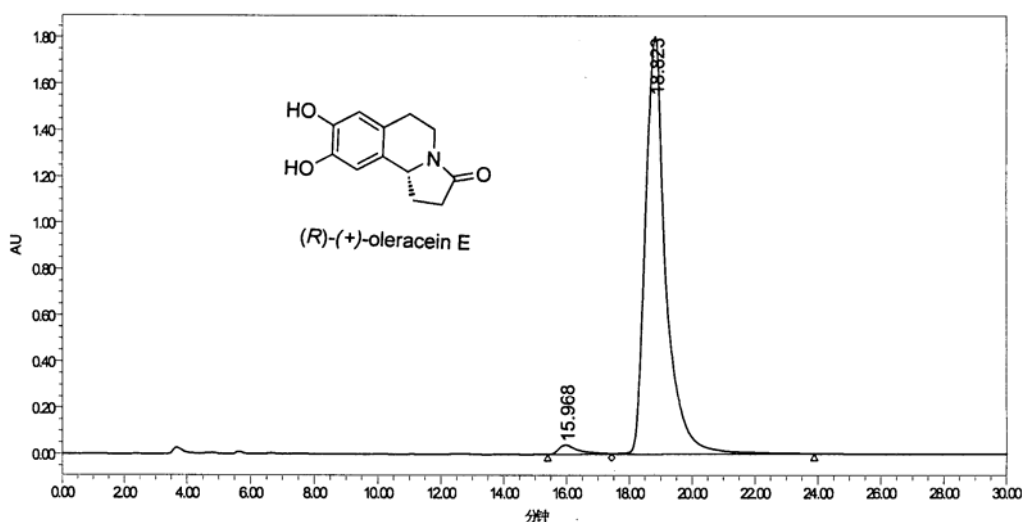


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 Project Name: defaults for copy
 Reported by User: Breeze user (Breeze)



SAMPLE INFORMATION

Sample Name:	W-8-184-adh-80-20-1-214	Acquired By:	Breeze
Sample Type:	未知	Date Acquired:	2016/9/30 17:13:11 CST
Vial:	694	Acq. Method:	zg35
Injection #:	1	Date Processed:	2016/9/30 17:48:30 CST
Injection Volume:	10.00 μ l	Channel Name:	V2489 ChA
Run Time:	30.00 Minutes	Channel Desc.:	V2489 ChA.214mm
Column Type:		Sample Set Name:	

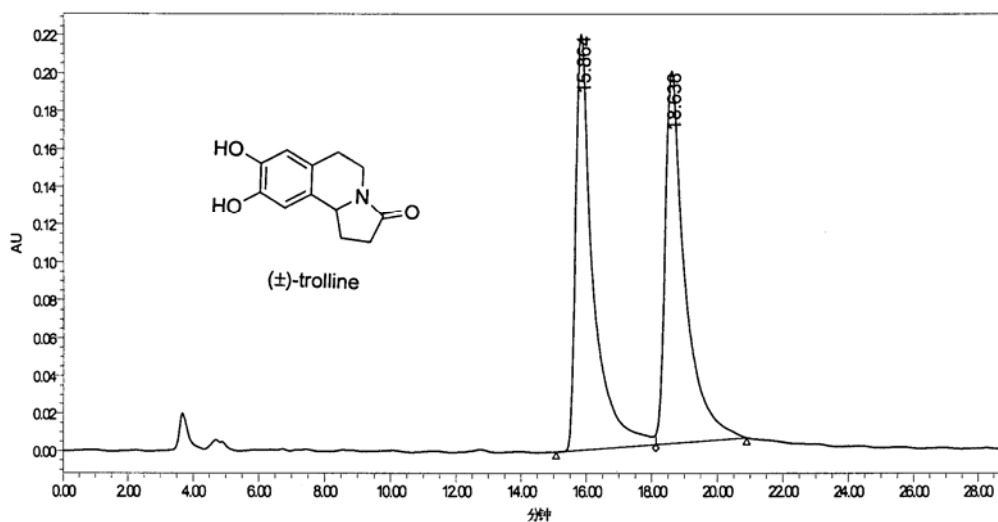


	RT (min)	Area (峰面积)	%Area	Height (峰高)	% Height
1	15.968	1851534	2.22	40872	2.21
2	18.822	81672921	97.78	1806808	97.79

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 Project Name: defaults for copy
 Reported by User: Breeze user (Breeze)



SAMPLE INFORMATION			
Sample Name:	W-8-165-rac-adh-80-20-1-214	Acquired By:	Breeze
Sample Type:	未知	Date Acquired:	2016/9/30 16:43:26 CST
Vial:	663	Acq. Method:	zg85
Injection #:	1	Date Processed:	2016/9/30 17:46:39 CST
Injection Volume:	10.00 μ l	Channel Name:	W2489 ChA
Run Time:	62.00 Minutes	Channel Desc.:	W2489 ChA.214mm
Column Type:		Sample Set Name:	



	RT (min)	Area (峰面积)	% Area	Height (峰高)	% Height
1	15.864	8230316	49.72	219908	52.75
2	18.638	8322817	50.28	197008	47.25