GC Column Technology

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GS-Tek

Dr. Zhenghua Ji

1990

2009

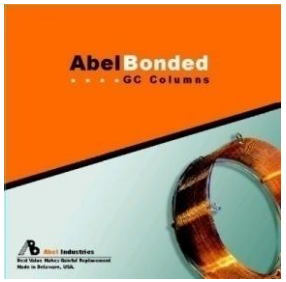
- Dr. Zhenghua Ji, GS-Tek®（General Separation Technologies）President, CTO。
- 1990-2005, HP/Agilent, GC column R&D, GC-MSD R&D DNA/RNA purification andn Microarray/Scanner R&D. 10 patents, HP column developer
- 2006-2009 Abel Industries, Inc. President, AB Column manufacturer
- 2009-present, GS-Tek, GsBP GC column manufacturer and developer, devoting to challenging chromatographic separations and analyese

GS-Tek

Young but long history rooted

1990 career start，HP GC column R&D

2006, own brand



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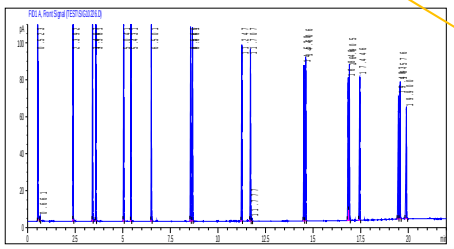
2009 product expansion, GC/HPLC

2011Instrument and collaboration



GS-Tek

Our Broad Products

GsBP

- ***Column Products:***
  - Complete offer of GsBP™-GC columns
  - Complete offer of Venusil ™ HPLC and SPE columns
- ***Lab Instruments***
  - Analyzers, RGA. NAG, LPG, Sim-Dis, PONA, DHA, Residue solvents
  - Instrument spare parts and service parts
- ***Lab Supplies***
  - Cost effective and quality syringe filters
  - Chromatographic consumables & supplies

GS-Tek

We are international w/ our dealers

North America	Asia	Europe	Middle East/Africa
USA	China	Austria	Iraq
Canada	India	Germany	Egypt
Mexico	Taiwan, ROC	France	Lebanon
Chile	Korea	United Kingdom	Kuwait
Argentina	Malaysia	Russia	Saudi Arabia
Brazil	Indonesia	Turkey	South Africa
Columbia	Pakistan	Switzerland	Jordan
	Thailand	Netherlands	Morocco
	Vietnam	Belgium	Israel
	Australia	Czech	UAE
		Greece	
		Italy	
		Hungary	
		Spain	
		Poland	
		Sweden	

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Features of GsBP™ Columns

- Comparable good performance and quality to Agilent columns
- Improved performance for many challenging applications
- Cost effective and better value products

GS-Tek

We GS-Tek deliver your needs

- Quickly
- Performance/quality products，
- Cost effectively
- All time knowledgeable support
- By collaborations

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Gas Chromatography (GC) Capillary Columns

Tubing

- Fused Silica Capillary Tubing (FS)
- Stainless Steel Capillary (SS)
- Glass tubing
- PFTE capillary
- Fused silica lined metal/plastic tubing
- capillary ID: 0.53mm, 0.45mm, 0.32mm 0.25mm, 0.20mm, 0.18mm, 0.15mm, 0.10mm
- Length: 1, 2,5,7.5,10, 12.5, 15, 17.5, 25, 30, 50, 60, 75, 100, 105, 150m
- Bundled itself or commonly onto a metal cage

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GsBP™-Phases

Stationary phase	Composite	Temperature limit ºC
GsBP-1, GsBP-1MS, GsBP-PONA, GsBP-SimDis	100% dimethyl polysiloxane	-60 to 325/350
GsBP-5, GsBP-5MS, GsBP-PAHs, GsBP-5Pesticides	95% dimethyl/ 5% diphenyl polysiloxane	-60 to 325/350
GsBP-XLB, GsBP-XPesticides	Proprietary methyl phenyl polysilaxane	-60 to 325/350
GsBP-35MS, GsBP-3Pesticides	65% dimethyl/ 35% diphenyl polysiloxane	-60 to 325/350
GsBP-50+MS	50% diphenyl, 50%dimethylsiloxane	-60 to 325/350

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GsBP™-Phases

Stationary phase	Composite	Temperature limit ºC
GsBP-1301, GsBP-624, GsBP-VMS, GsBP-FVOC, GsBP-502.2	Approx 6% cyanopropylphenyl/ 94% dimethyl polysiloxane	-20 to 260/280
GsBP-1701, GsBP-1701-MS	14% cyanopropylphenyl/ 86% dimethyl polysiloxane	-20 to 280/300
GsBP-225	50%cyanopropylmethyl 50% phenylmethylpolysiloxane	20 to 220/240
GsBP-Inowax, GsBP-Inowax-MS, GsBP-FAMEWAX	Crosslinked Polyethylene glycol (PEG)	40 to 260/280
GsBP-FFAP	Crosslinked PEG modified w/ acids	40 to 260/280
GsBP-FAME	High content of cyanopropylphenyl polysiloxane	20 to 200/220

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GsBP™-Phases

Stationary phase	Composite	Temperature limit ºC
GsBP-PLOT Al2O3/ "KCl", "S", "M"	Aluminum oxide, modified with KCL, Na2SO4 or Na2MoO4	-60 to 200
GsBP-PLOT Molesieve 5A	Molecular Sieve zeolite, 5A	-60 to 300
GsBP-PLOT Q	Crosslinked divinylbenzene polymer	;-60 to 250/280
GsBP-PLOT U	Crosslinked divinylbenzene ethylene glycol dimethacrylate copolymer	-60 to 190/200
GsBP-PLOT GasPro	Modified porous silica layer	-60 to 300

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Phase Comparison

GS-TEK	Agilent			
GsBP-1	DB-1	HP-1	CP-Sil 5 CB	Rtx-1
GsBP-1MS	DB-1ms	HP-1ms		Rtx-1MS
GsBP-5	DB-5	HP-5	CP-Sil 8 CB	Rtx-5
GsBP-5MS	DB-5ms	HP-5ms		Rtx-5MS
GsBP-XLB	DB-XLB			Rtx-XLB
GsBP-35MS	DB-35ms			Rtx-35
GsBP-50+MS	DB-17ms	HP-50+		Rxt-17MS
GsBP-1701	DB-1701		CP-Sil 19 CB	Rtx-1701
GsBP-1701MS				
GsBP-1301	DB-1301		CP-1301	Rtx-1301
GsBP-624/VMS	DB-624			Rtx-624, VMS
GsBP-225	DB-225		CP-Sil 43 CB	
GsBP-INOWAX	DB-WAX	HP-INNOWax	CP-WAX 52 CB	Stablwax
GsBP-FFAP	DB-FFAP	HP-FFAP	CP-FFAP CB	Stablwax B
GsBP-PLOT Al2O3, KCl	GS-Al2O3	HP-PLOT Al2O3 KCl	CP-Al2O3/KCl	Rtx-Alumina
GsBP-Gaspro	GS-Gaspro			
GsBP-PLOT Q/U	GS-Q	HP-PLOT Q/U	CP-PoraBond Q/U	Rx-Q

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Column Dimensions

- Capillary:
- Stationary Phase
- Film thickness
- Column ID
- Column Length

- Packed column:
- Packing material(mesh size)
- Liquid phase (stationary phase) % w/w
- Column ID (1/16, 1/8, ¼)
- Column Length, foot or meter

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Column QC: Quality and Performance

We guarantee column performance and quality thru 100% column testing with industrial stringent test samples for:

- K value: stationary phase film thickness for reproducibility
- RI: stationary phase to ensure brand equivalence
- Plate number: film thickness uniformity lead to good separations
- Peak height ratio: column inertness for accurate quantitation
- Bleed : phase thermal stability to prolong column life time
- Length and ID, to commit our specification and interchangeability

To ensure equivalence performance of GsBP ™ columns to other major brand columns

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Column QC: Specifications

GsBP GC columns are specified in the following same as Agilent ones:

K', +- 10% of center points, to brand name ones.
RI, +-0.5unit for siloxane phases, +-1unit for PEG
Theoretical plates:
Bleed: <4pA (FID) at high temp for 0.25mm columns

GsBP-5	DB-5	HP-5
5.8—7.0	5.8—7.0	5.8—7.0

0.25	0.32	0.53
>3800	>2800	>1000

Note: bleed, peak height ratio and theoretical plates are instrument and method dependent. They may not be reproduced in customer instrument

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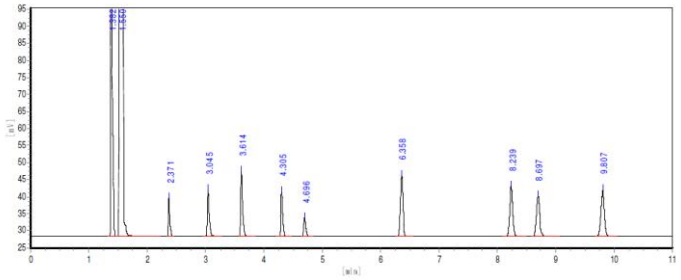
Column QC Report

GsBP GC COLUMN
TEST PERFORMANCE SUMMARY

Column Information ***Test Conditions***

Catalog No.:	1525-3002UI	**Oven Temp.:**	135 °C	**Injector:**	S/S, 275 °C
Serial No.:	11061662	**Carrier Gas**	Hydrogen	**Detector:**	FID, 325 °C
Stationary Phase:	**GsBP-5MSInert**	**Head Pressure:**	9psi	**Injection:**	1ul
Column Length:	30m	**Split Flow:**	80ml/min	**Holdup Time:**	1.382(min)
Column ID:	0.25mm	**Bleed Temperature**	325 °C		
Film Thickness:	0.25um	**Bleed Measured**	1.5pA		



Peak No.	Compound	Retention Time (min)	Partition Ratio (k')	Theoretical Plates/m	Peak Height Ratio	Retention Index (RI)
1	Undecane	2.371	0.715	2296		
2	4-Chlorophenol	3.045	1.203	2148	Pass 2/1	
3	1-Decylamine	3.614	1.615	2847	Pass 3/1	
4	Tridecane	4.305	2.115	3079		
5	Methyl decanoate	4.696	2.398	3087		1323.6
6	Tetradecane	6.358	3.6	3550		
7	Acenaphthylene	8.239	4.962	3684		1460.9
8	1-Dodecanol	8.697	5.293	4002	Pass 8/6	1473.2
9	Pentadecane	9.807	***6.096***	***4038***	**Pass k', n**	

www.gs-tek.com ***Made in USA***

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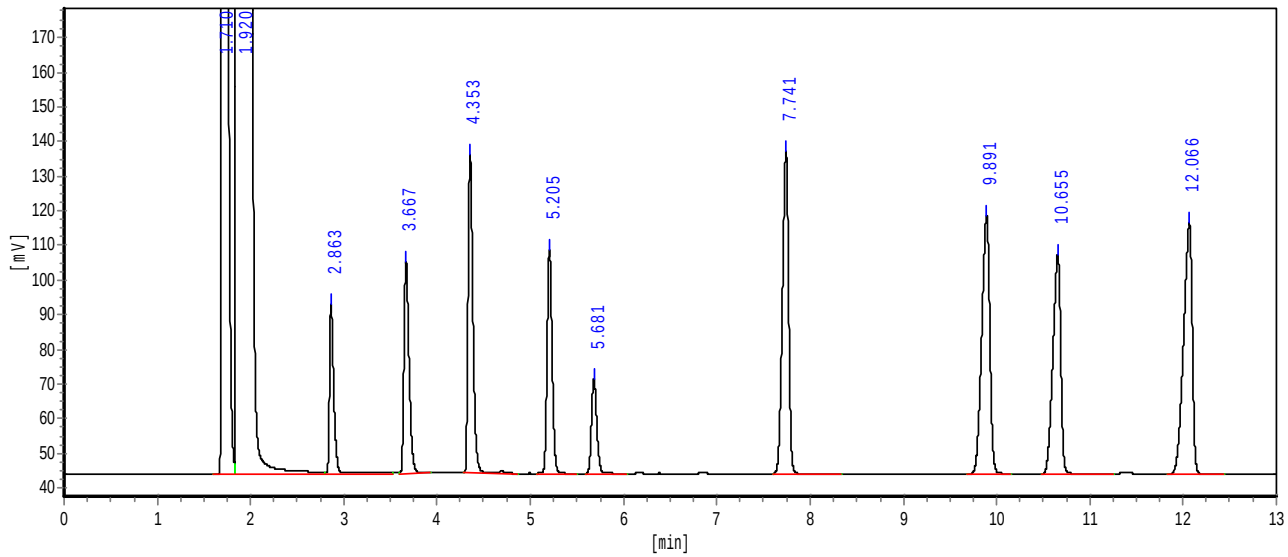
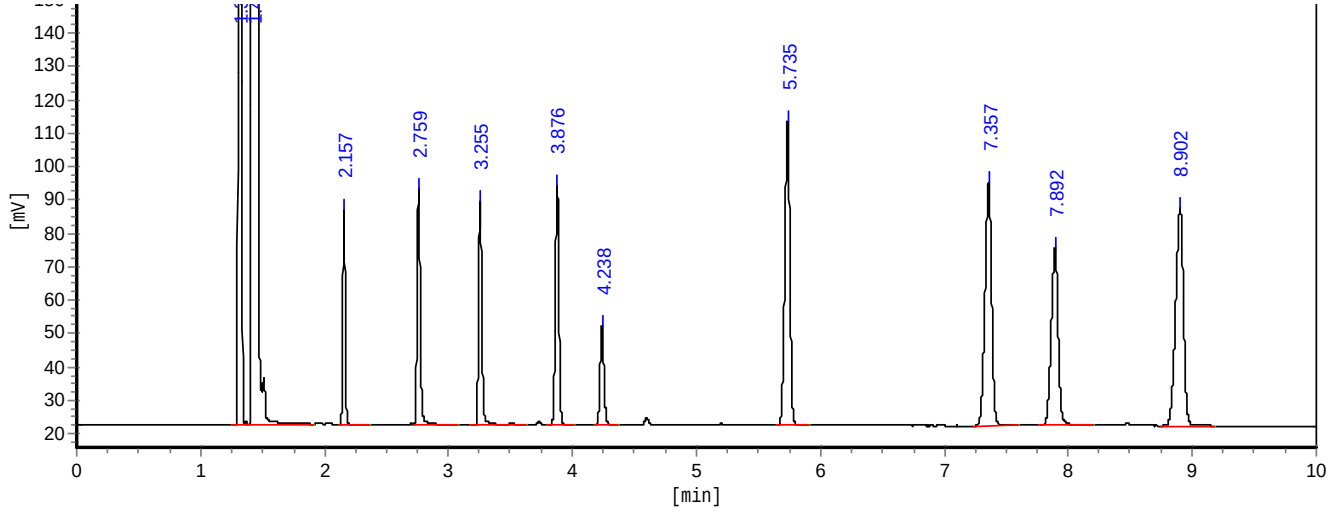
Column Performance Comparison



GsBP-5



HP-5

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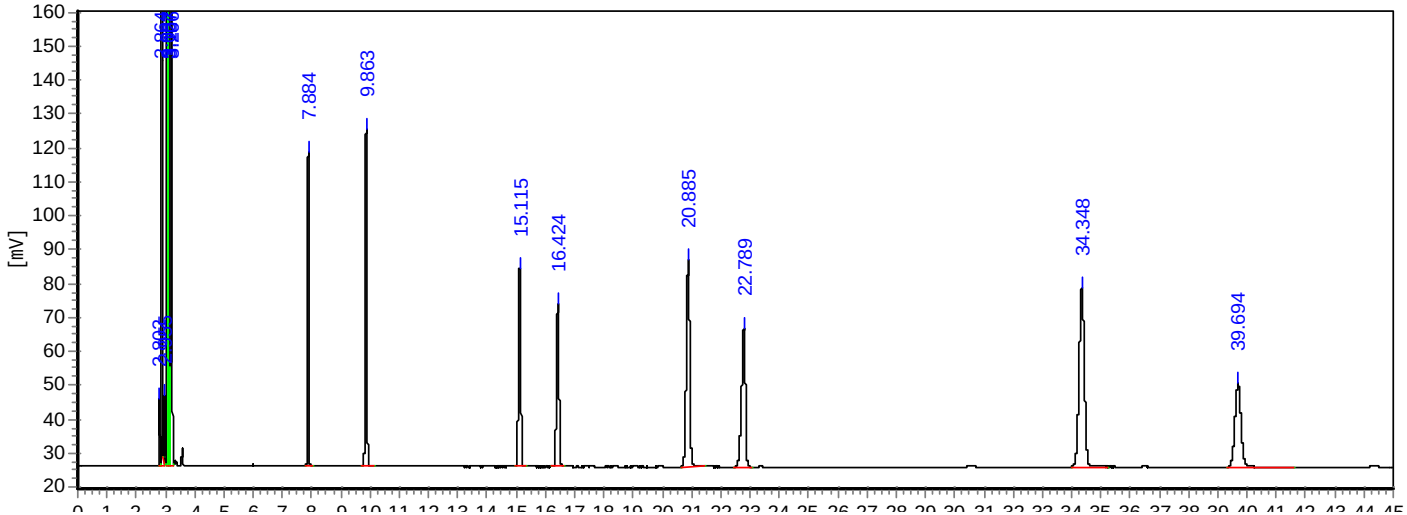
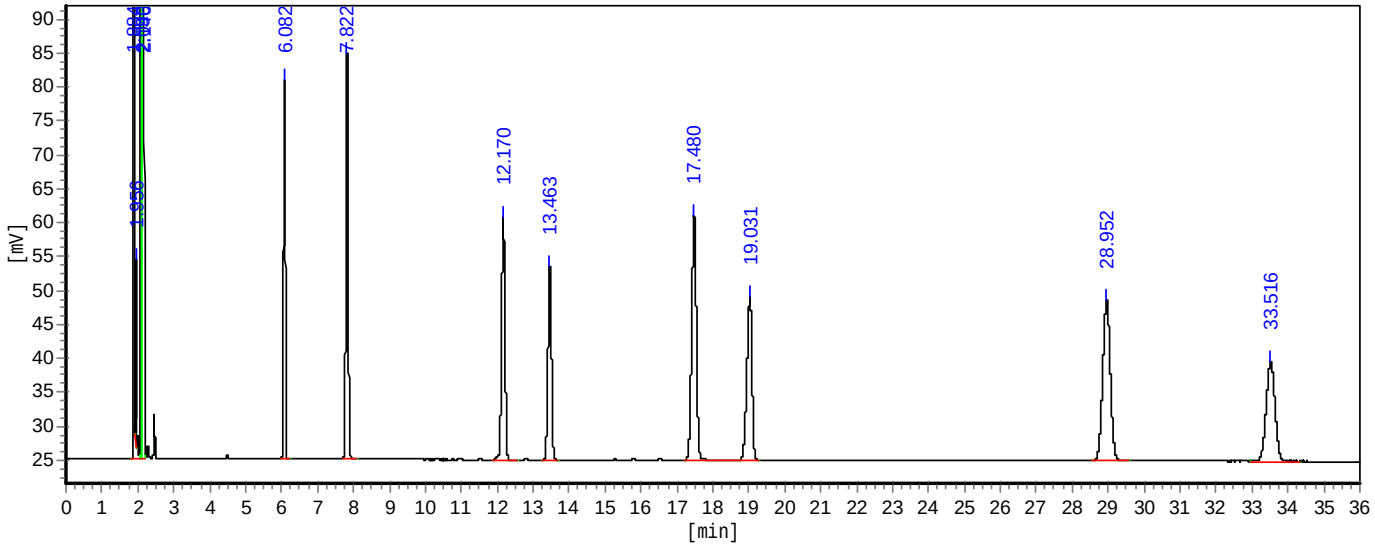
Column Performance Comparison



GsBP-Inowax



HP-InnoWax

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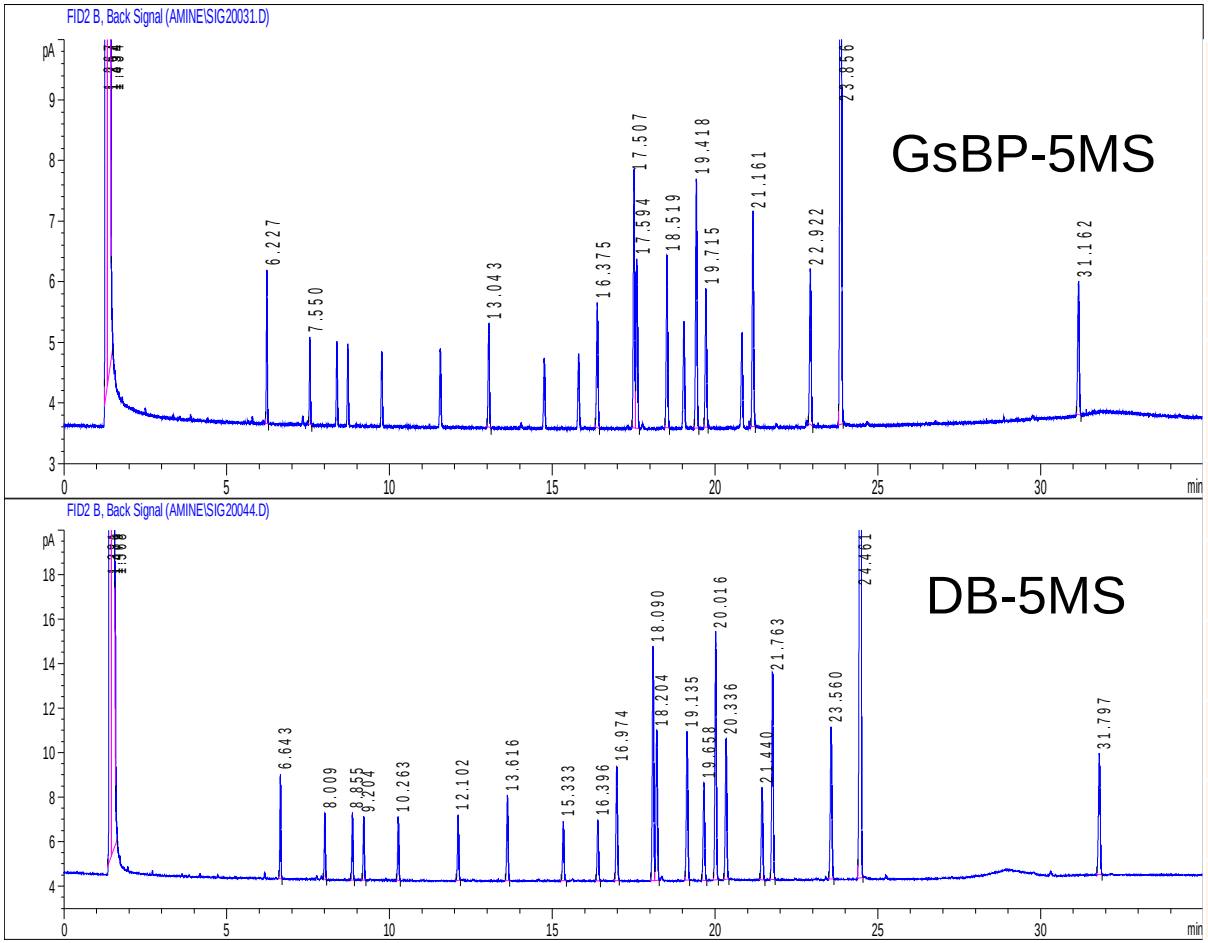
Application comparison: 22 Chlorinated Pesticides



1	2,4,5,6-Tetrachloro-m-xylene(IS)	12	Dieldrin
2	α-BHC	13	p,p'-DDE
3	β-BHC	14	Endrin
4	γ-BHC	15	Endosulfan II
5	δ-BHC	16	p,p'-DDD
6	Heptachlor	17	Endrin aldehyde
7	Aldrin	18	Endosulfan sulfate
8	Heptachlor epoxide	19	p,p'-DDT
9	γ-Chlordane	20	Endrin ketone
10	Endosulfan I	21	Methoxychlor
11	α-Chlordane	22	Decachlorobiphenyl(IS)

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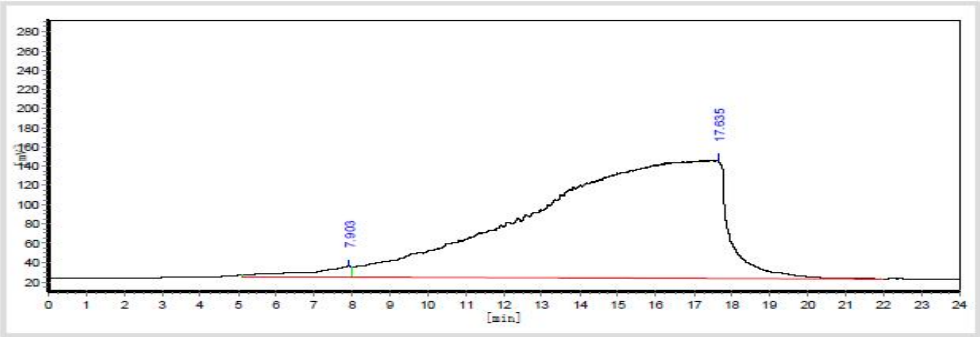
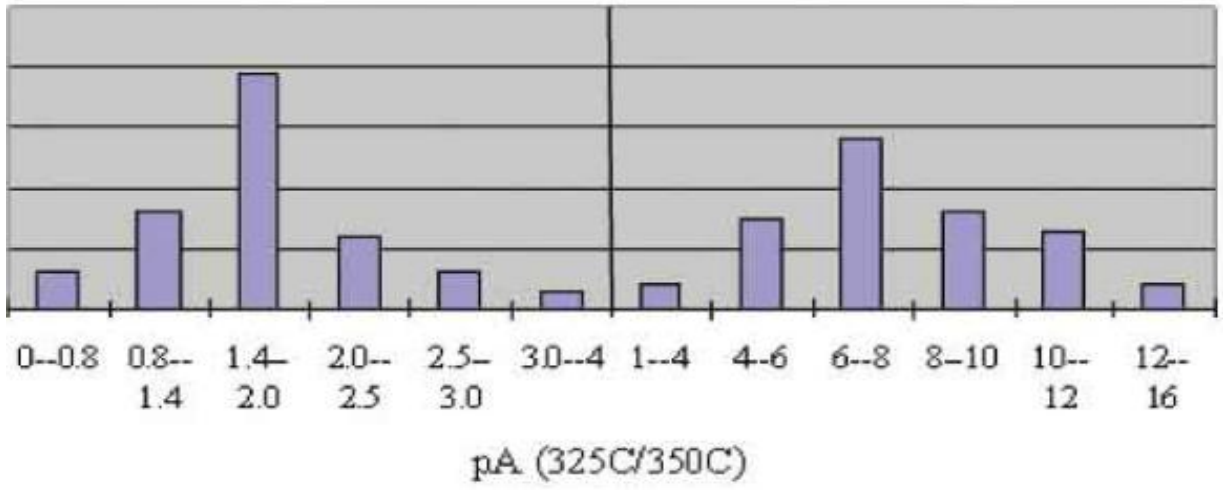
Phase stability test



Column: GsBP-PLOT Q
Oven: 60C (1min) 15C/min to 300C (5min)

GsBP-5MS Column Bleed

(0.25mm x 30m x 0.25um, 1525-3002)



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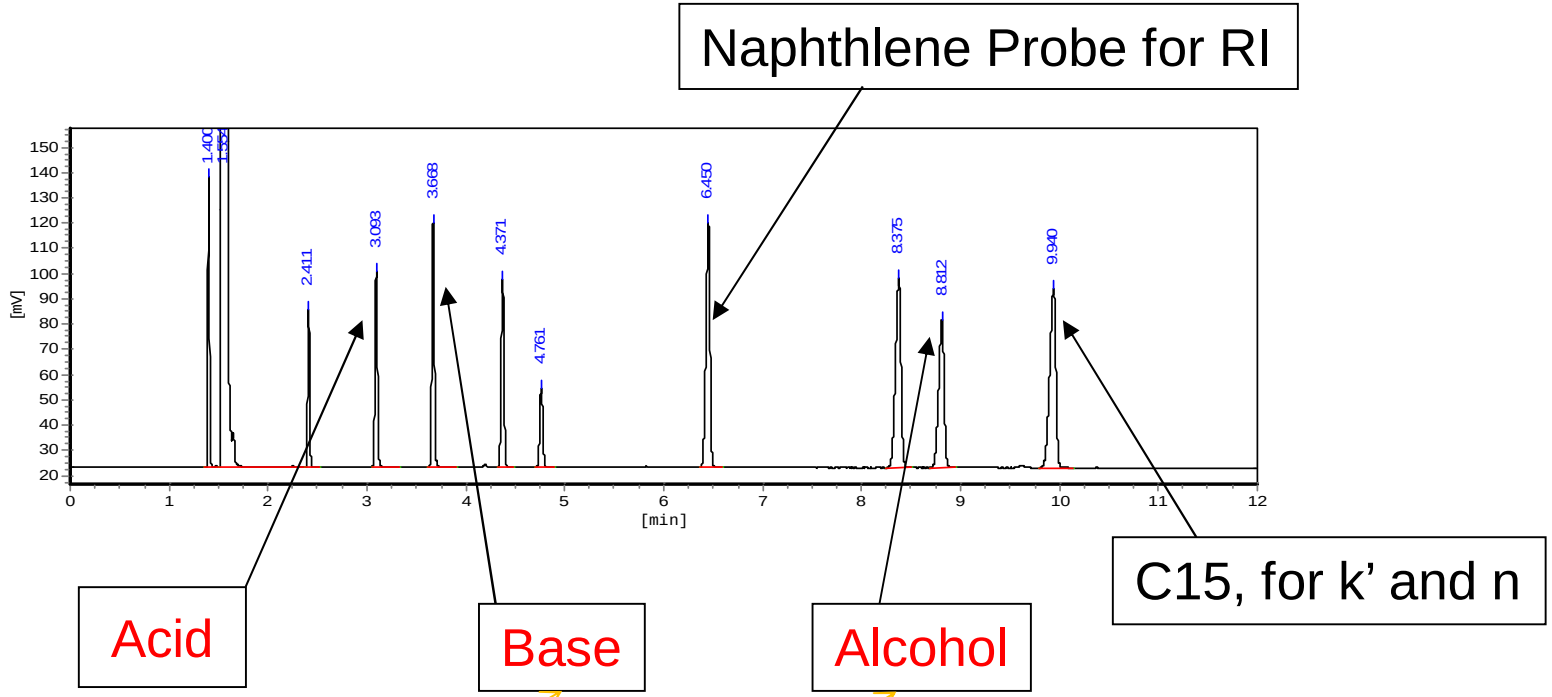
Column Inertness Test

Test samples contains probes of acidic, basic, alcohol for column inertness, hydrocarbons as marker for retention times, column selectivity and theoretical plates



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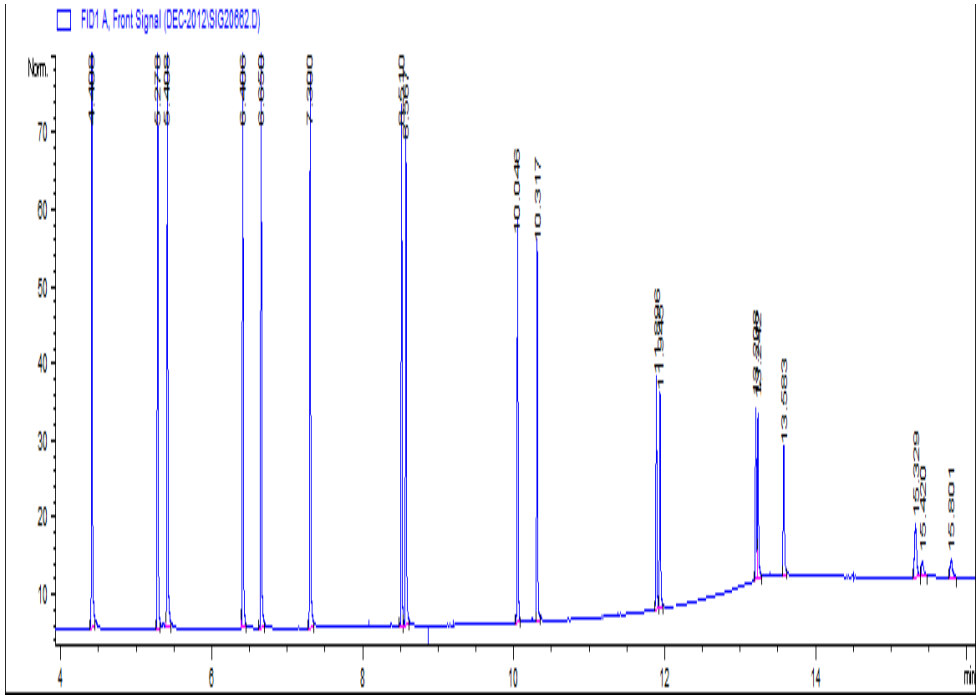
Separation Test for Critical Separations



Peak	RT (min)	Resolution
Naphthalene	4.41	
1-Methylnaphthalene	5.28	
2-Methylnaphthalene	5.41	
Acenaphthylene	6.41	
Acenaphthene	6.65	
Fluorene	7.3	
Phenanthrene	8.51	
Anthracene	8.57	3.77
Fluoranthene	10.05	
Pyrene	10.32	
Benzo[a]anthracene	11.9	
Chrysene	11.94	3
Benzo[b]fluoranthene	13.21	
Benzo[k]fluoranthene	13.24	2.07
Benzo[a]pyrene	13.58	
Dibenzo[a,h]anthracene	15.33	
Benzo[ghi]perylene	15.42	2.76
Indeno[1,2,3-cd]pyrene	15.8	

Column: GsBP-PAH,20 x 0.18mm
Oven: 60 ℃ (1min) 18 ℃ /min 280 ℃ (15min)
2C/min 280C 60min 6C/min 300C 30min
Sample: 18 PAHs

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Try our Columns and Supports

- Give us a chance to work with you
- Thanks for your business
- Help each other
- Build a brand with you, happy and loyal customer

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GsBP™ Petroleum Applications

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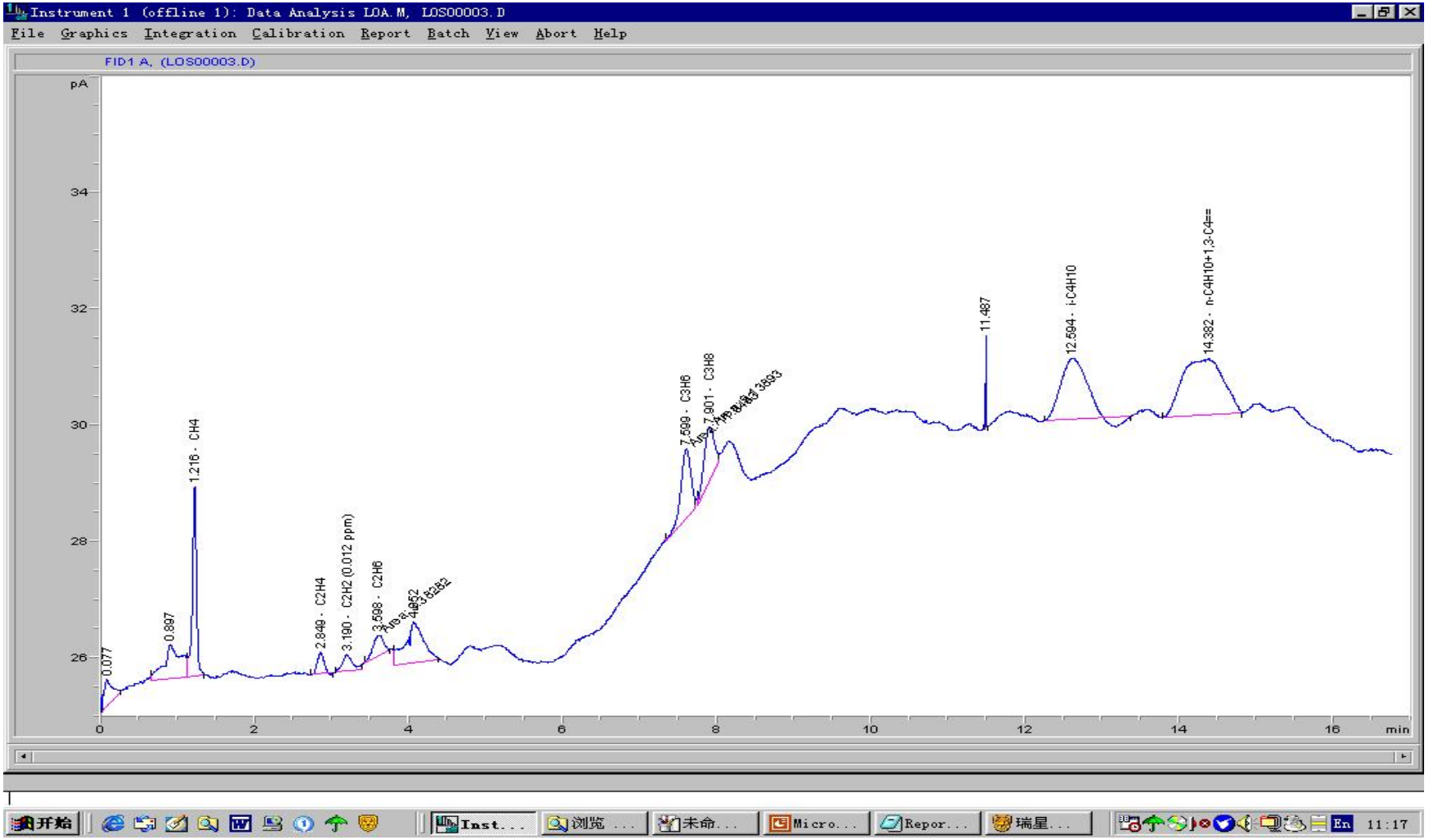
Hydrocarbon impurities in liquid oxygen



Column: 1/8 *20ft SS 20% Sebaconitrile + 1/8 *6ft MS-5A

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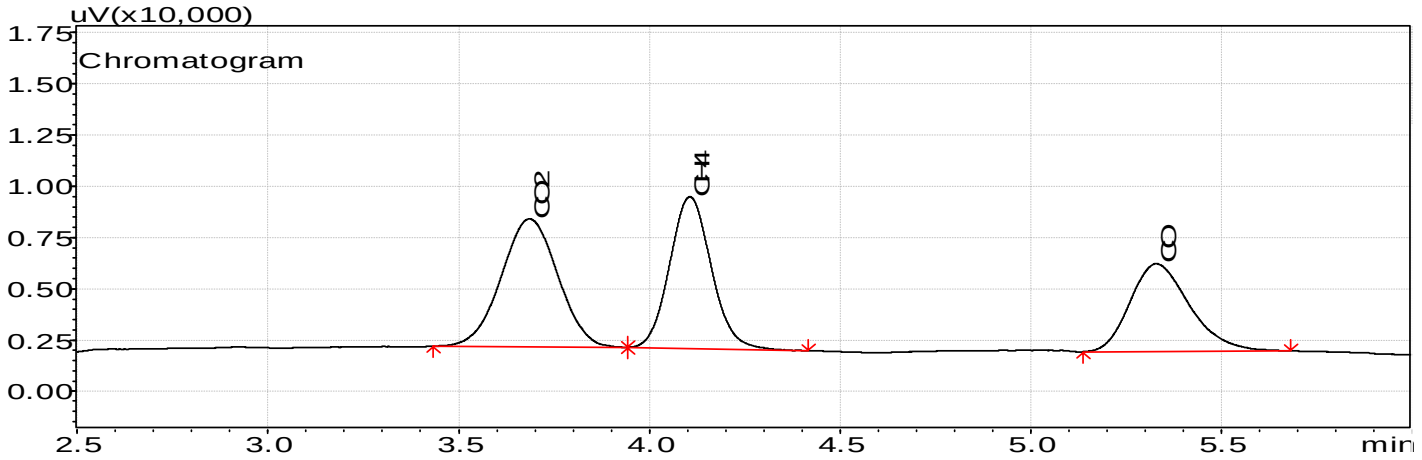
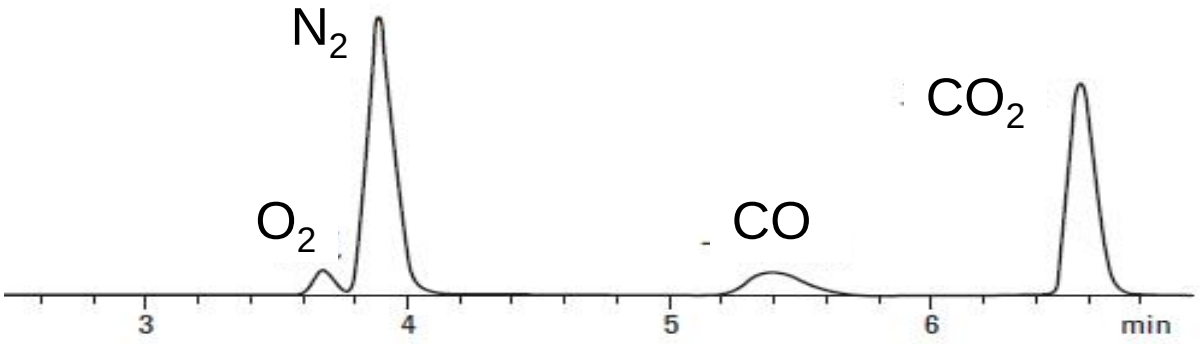
CO/CO2，Packed column MS5A/P-Q





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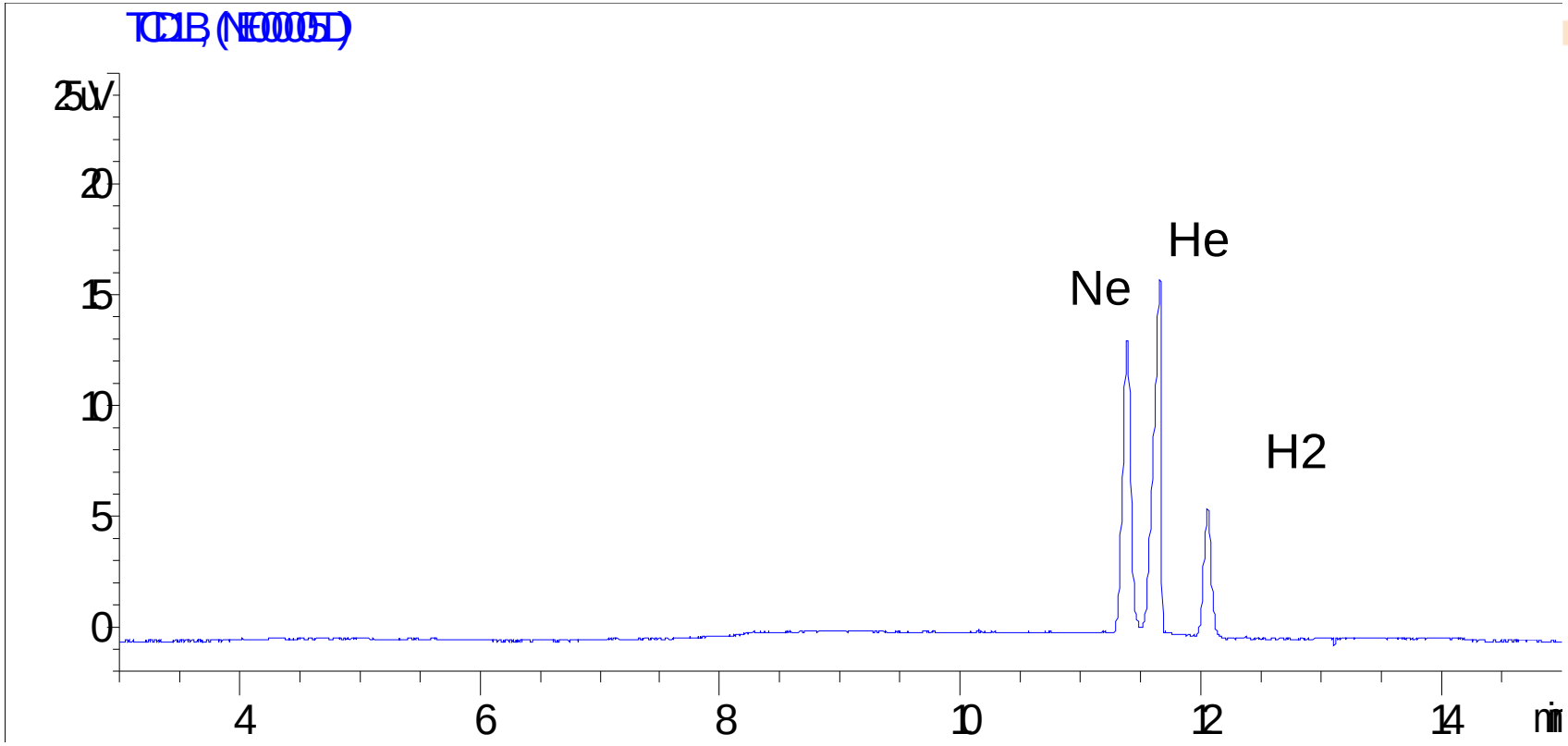
Ne/He/H2 at percentage level



Oven: 35C
Column: GsBP-PLOT MS 5A, 2 x 50m x 0.53mm x 50um
Carrier Gas: Nitrogen

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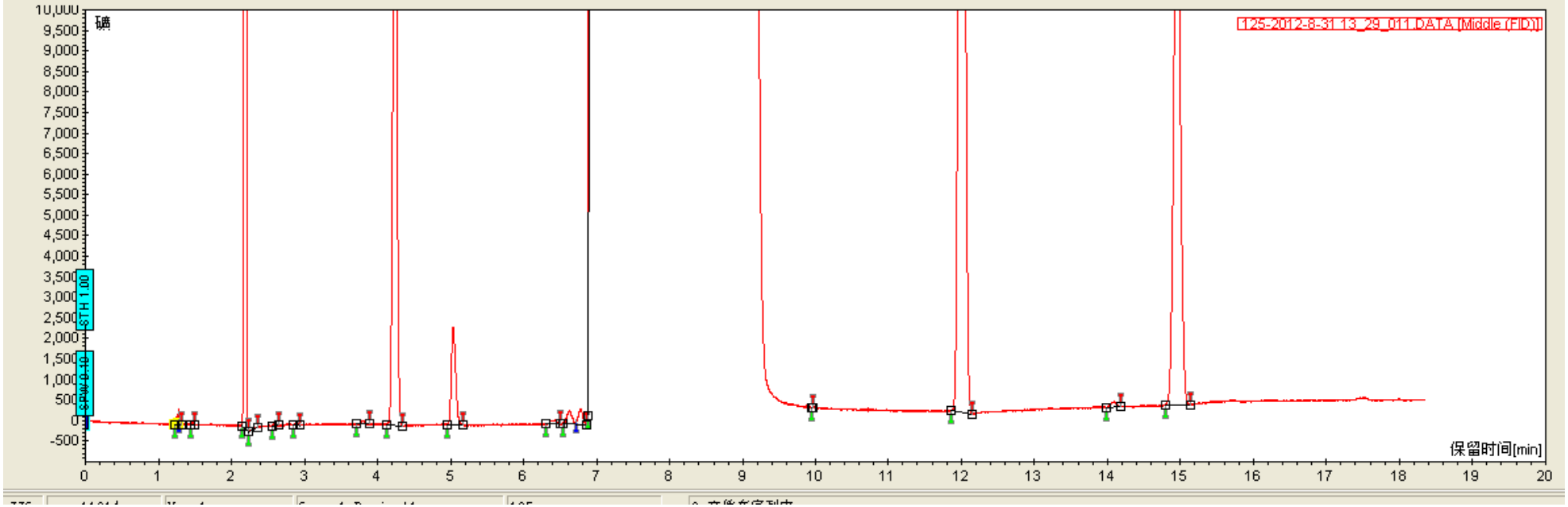
SF6



Column: GsBP-PLOT Al2O3 “S”, 50m, 0.53mm, 15um
Oven: 80C 5min 5C/min to 130C hold

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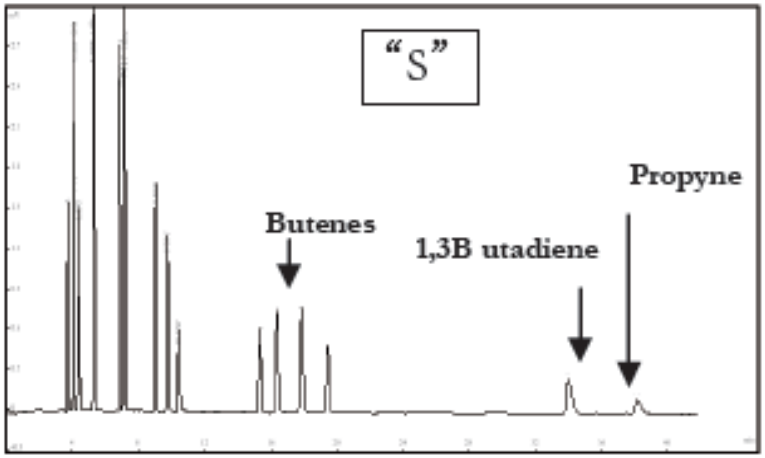
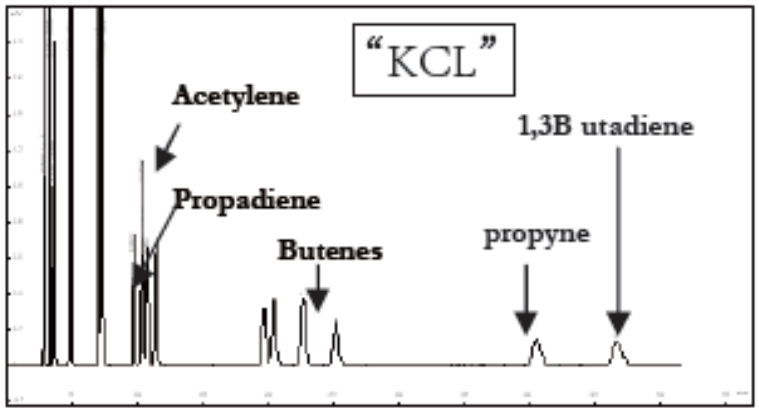
“S” and KCl Al2O3 PLOT



Column	:	GsBP- PLOT "S", 0.53mm x 50m x 1.5um
Part No	:	8253-5015
Oven	:	100C
Detector	:	FID, 250°C
Carrier	:	Hydrogen,
Inlet	:	S/S 250C
Sample	:	10ul Refinery gas sample



Column	:	GsBP- PLOT "KCL", 0.53mm x 50m x 15um
Part No	:	8153-1515
Oven	:	80C
Detector	:	FID, 250°C
Carrier	:	Hydrogen,
Inlet	:	S/S 250C
Sample	:	10ul Refinery gas sample

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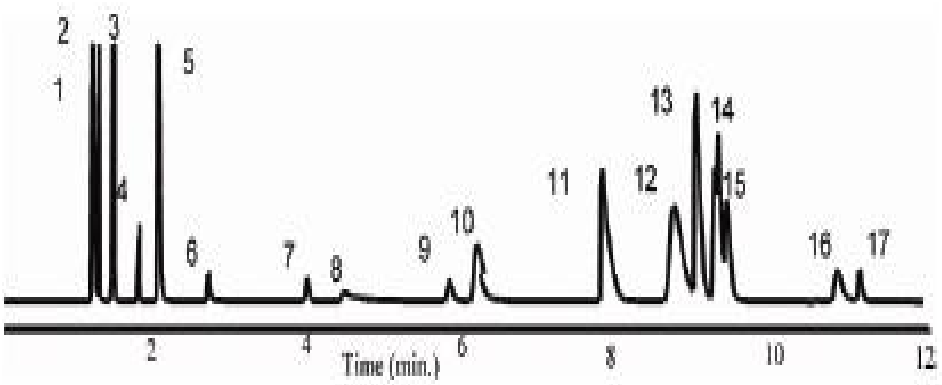
PLOT Q R G A



Peak identification

1. air
2. C1
3. CO2
4. C2=
5. C2
6. H2S
7. COS
8. H2O
9. C3=
10. C3
11. MeOH
12. i-C4
13. N-C4
14. butene
15. butene
16. i-C5
17. N-C5

Column : GsBP- PLOT "Q",
0.53mm x 30m x 30um
Oven : 60°C (5min)20°C/min to 200°C(1min)
Detector : TCD, 250C
Carrier : Hydrogen,
Inlet : S/S 250C
Sample : 10ul Refinery gas sample

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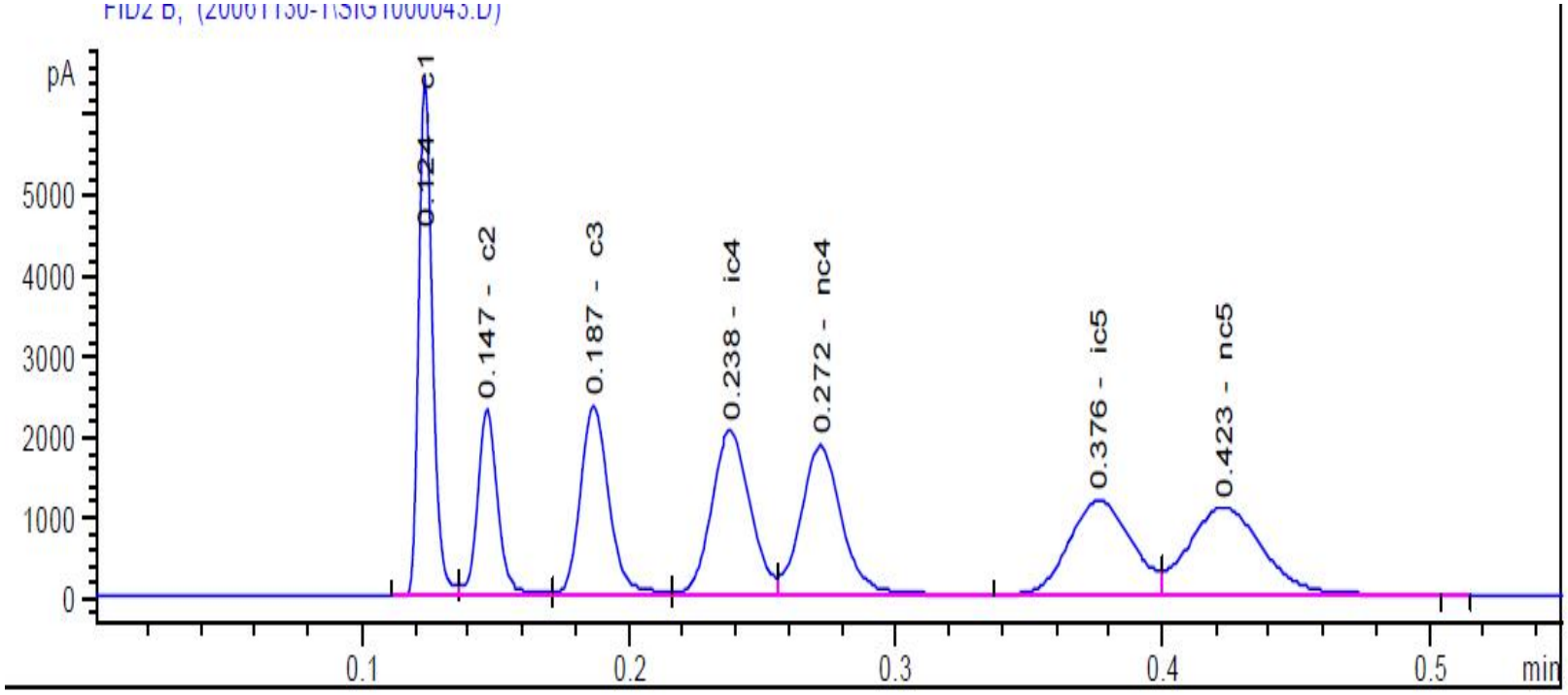
30S C1 to C5Fast Separation



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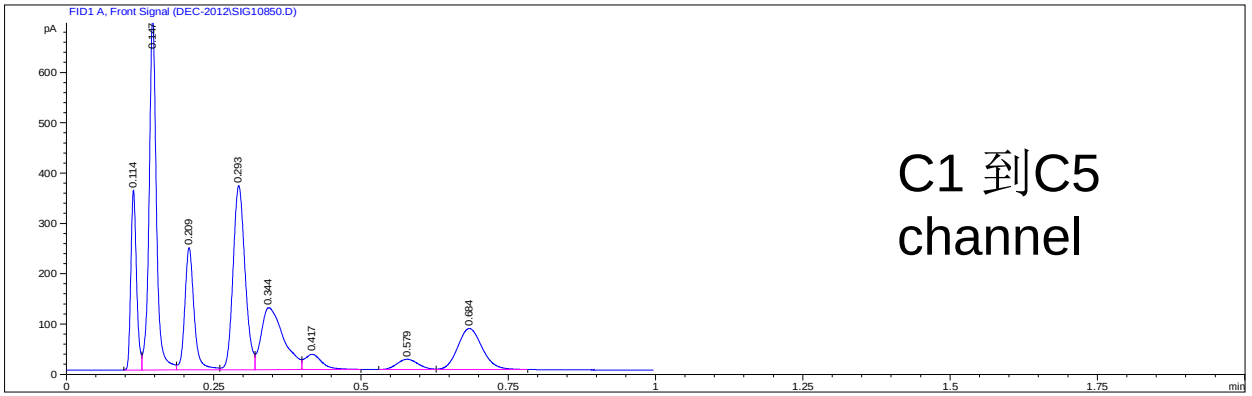
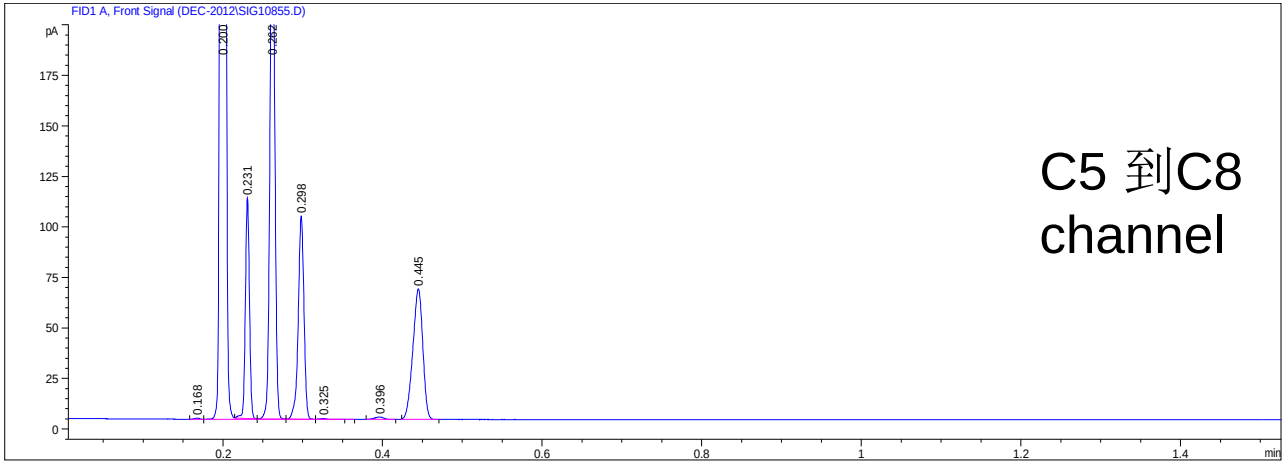
Fast separation of C1 to C8+



C1 到C5 channel

1	Methane
2	Ethane
3	Propane
4	n-Butane
5	1-Butene/t-butene
6	Cis-2-butene
7	Isopentane
8	N-pentane



C5 到C8 channel

1	Pentane (C_5H_{12})
2	Hexane (C_6H_{14})
3	Benzene (C_6H_6)
4	Heptane (C_7H_{16})
5	Octane (C_8H_{18})

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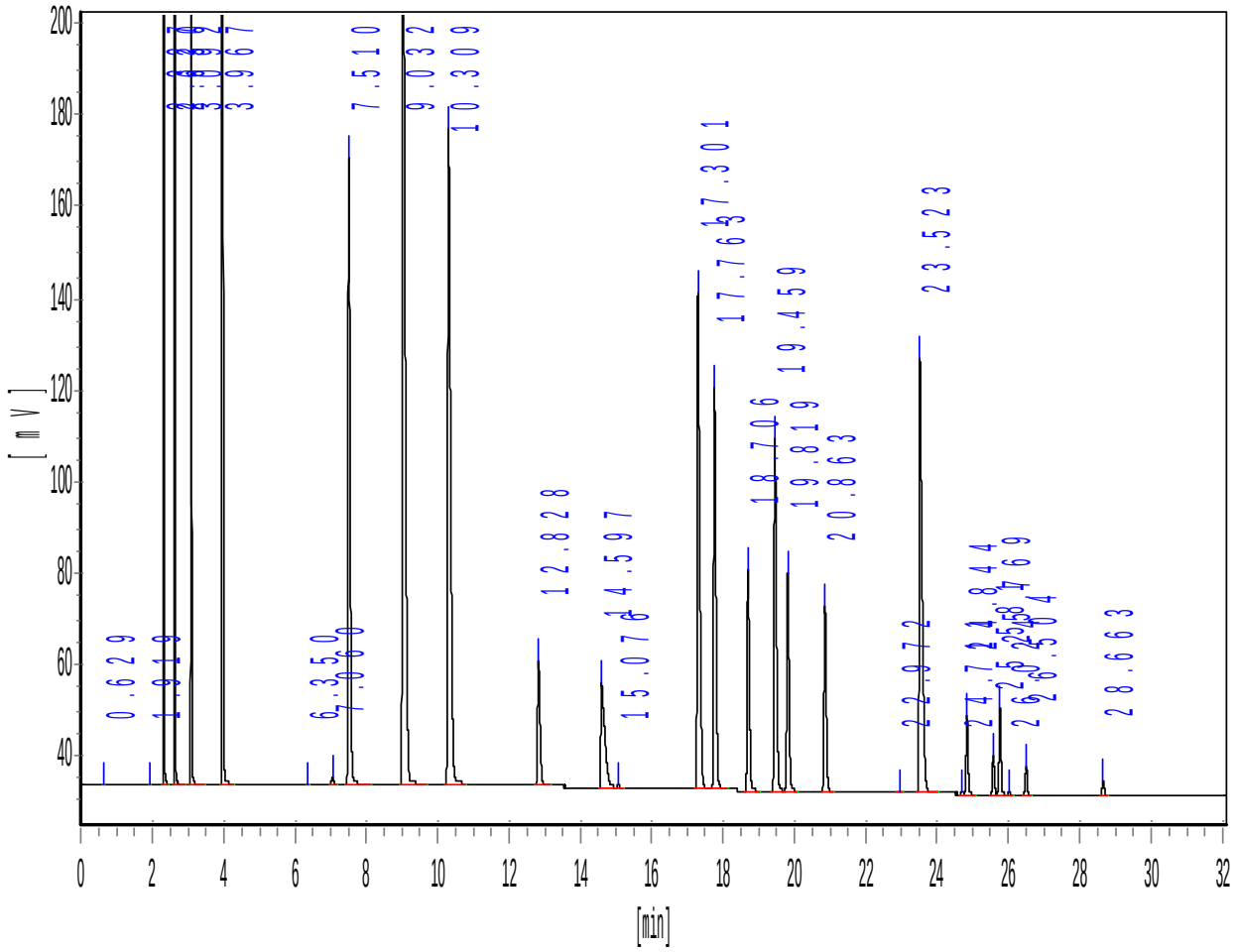
C1 到C6， PLOT/Al2O3



Peak No.	Compound	Retention Time (min)
1	Methane	2.33
2	Ethane	2.63
3	Ethylene	3.09
4	Propane	3.97
5	Cyclopropane	7.06
6	Propylene	7.51
7	Isobutane	9.03
8	N-Butane	10.31
9	Propadiene	12.83
10	Acetylene	14.60
11	Trans-2-Butene	17.30
12	1-Butene	17.76
13	Isobutylene	18.71
14	Cis-2-Butene	19.46
15	Isopentane	19.82
16	N-Pentane	20.86
17	1,3-Butadiene	23.52
18	Methylacetylene	24.71
19	Trans-2-pentene	24.84
20	2-Methyl-2-butene	25.58
21	1-Pentene	25.77
22	Cis-2-pentene	26.50
23	N-Hexane	28.66

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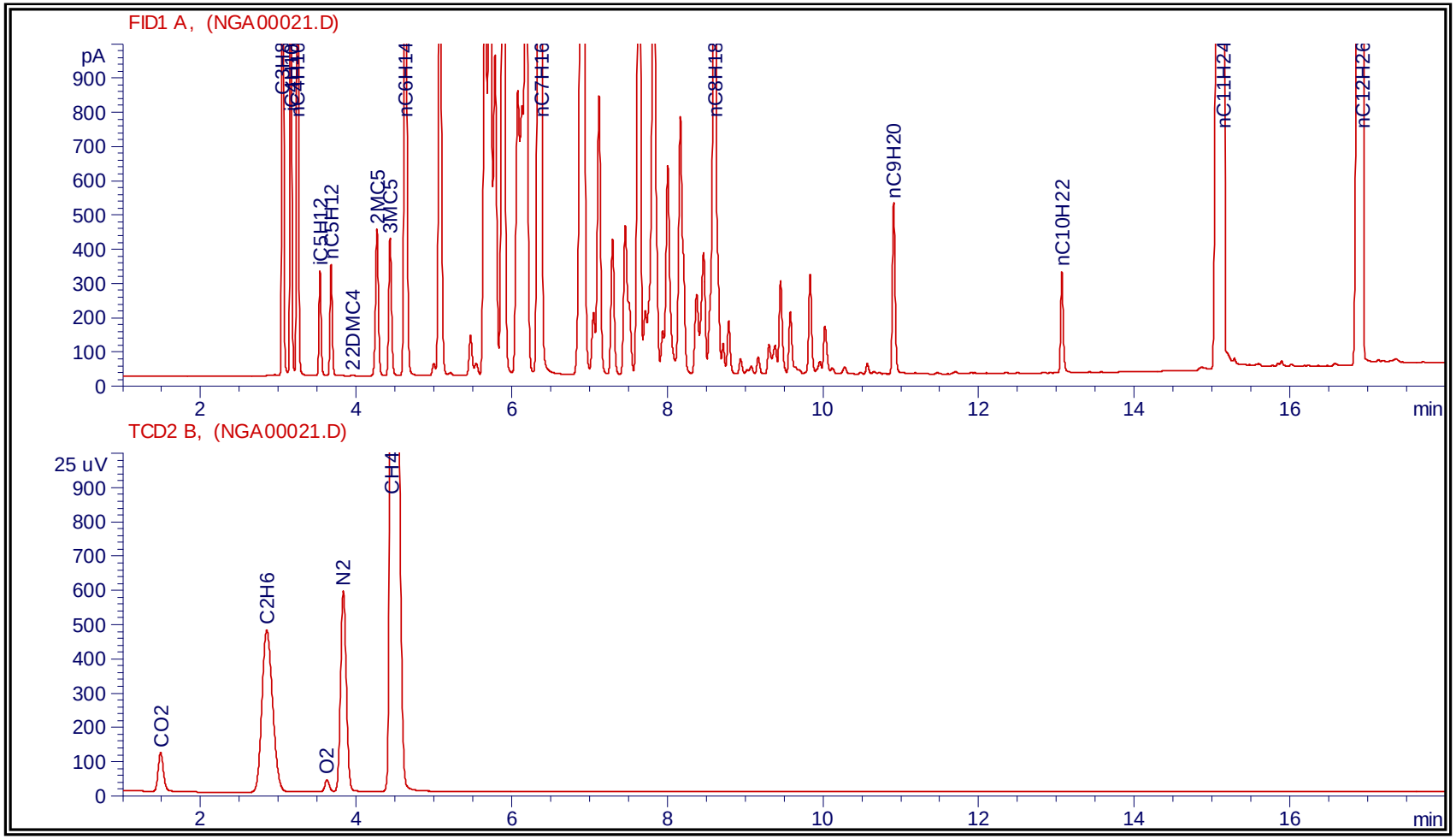
Extended Natural Gas, C1 to C10+



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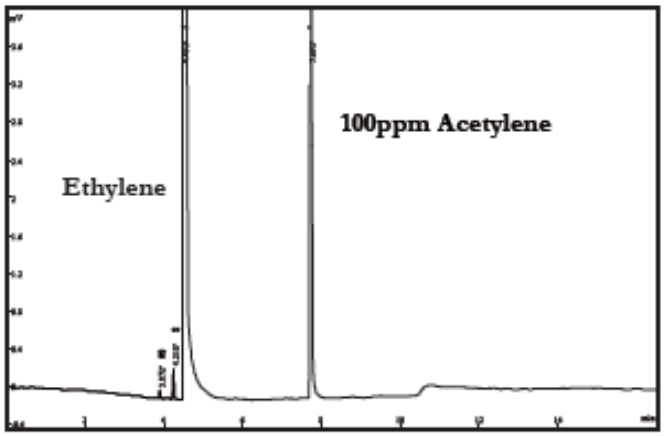
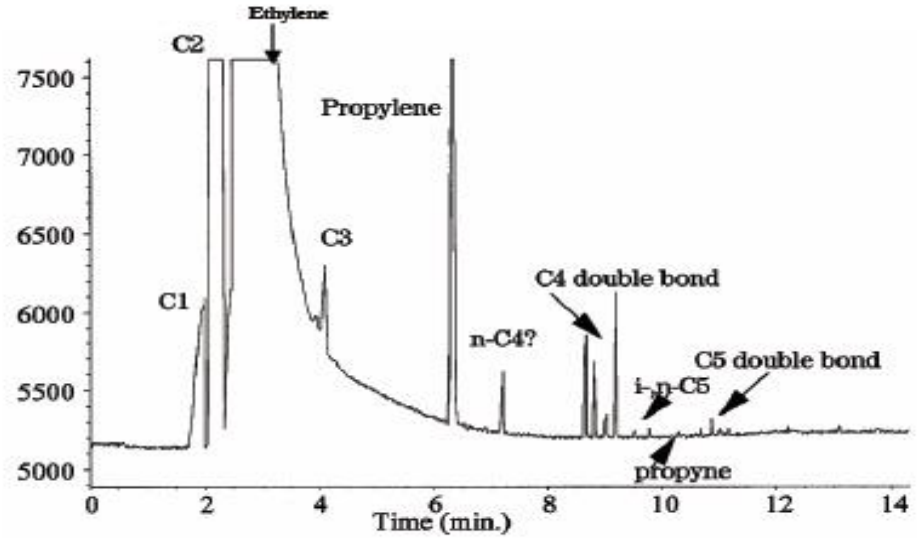
Ethylene



Column : GsBP-Al2O3 PLOT "S",
0.53mm x 15m x 15um
Part No : 8253-1515
Oven : 90°C 1min 15°C/min to 140°C 2min
Detector : FID, 250°C
Carrier : Hydrogen,
Inlet : S/S 250C
Sample : 10ul Refinery gas sample

Ethylene



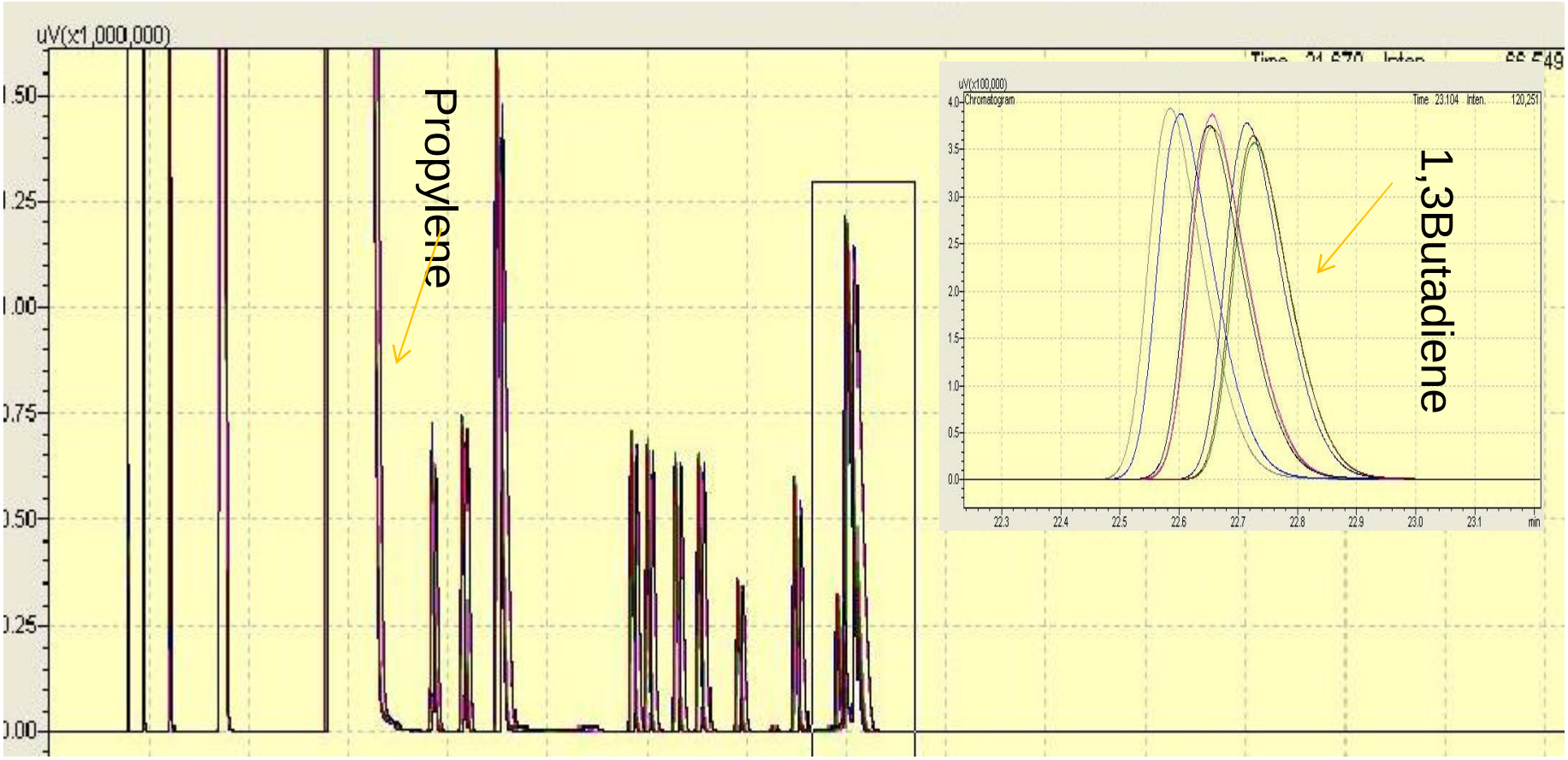
Column : GsBP-PLOT Al2O3"S",0.53mm x 50m x15um
Part No : 8253-5015
Oven : 40°C (3 min)15°C/min to 180°C (2 min)
Detector : FID, 250C
Injection : 0.25cc sample loop, spiltless, 250C
Carrier : Hydrogen, P=6.2psi @40C, const flow
Sample : 99.5% ethylene

NOTES

C1 : <20ppm, C2<0.15%
C3: <5ppm,Propylene<150ppm
Rest<10ppm

1. C1
2. C2
3. Ethylene
4. C3
5. Propylene
6. Butane
7. Butene
8. Iso-,1-pentane
9. Propyne

Propylene



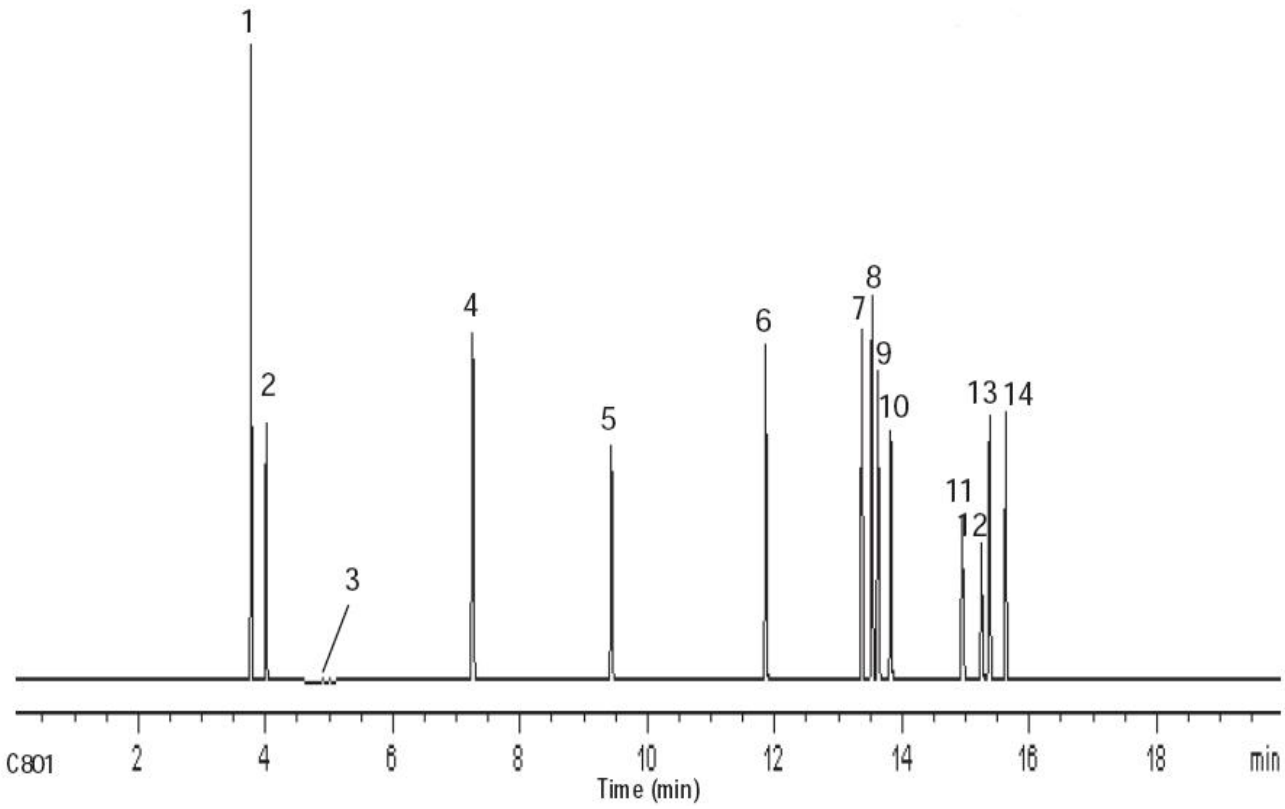
Column: GsBP-PLOT Al2O3, 50m x 0.53mm x 15um

GS-Tek

Butadiene and Methyl Acetylene

GS-Tek

Sulfurs

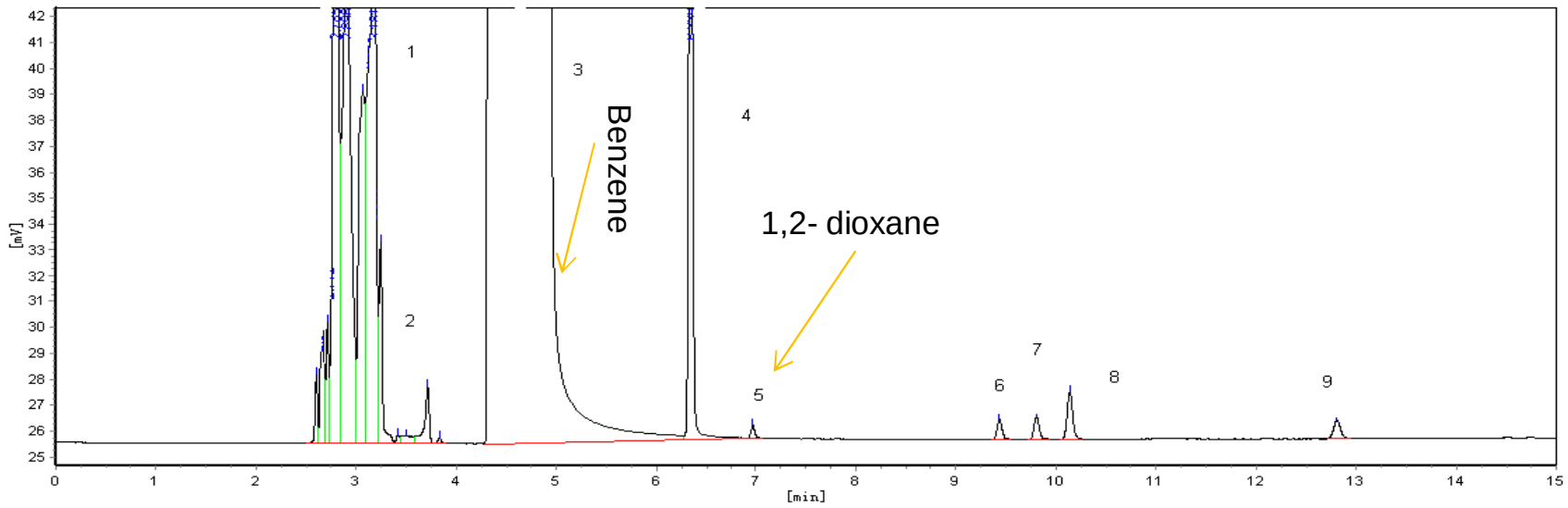


1. COS
2. Hydrogen Sulfide
3. Propylene
4. Carbon Sulfide
5. Methyl mercaptan
6. Ethyl mercaptan
7. Thiofuran
8. Dimethyl sulfide
9. 2-Propyl mercaptan
10. 1- Propyl mercaptan
11. 2-Methyl-2-propyl mercaptan
12. 2-Methyl-1-propyl mercaptan
13. 1-Methyl-1-propyl mercaptan
14. 1- Butyl mercaptan

Col: GsBP-GasPro, 60m x 0.32mm

GS-Tek

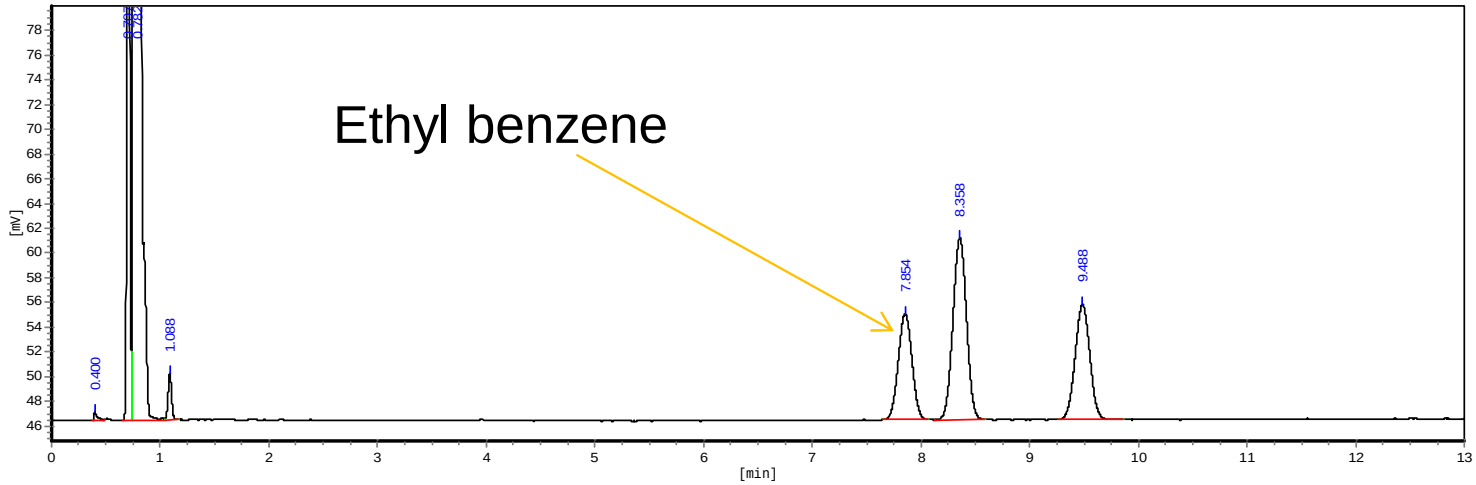
Benzene

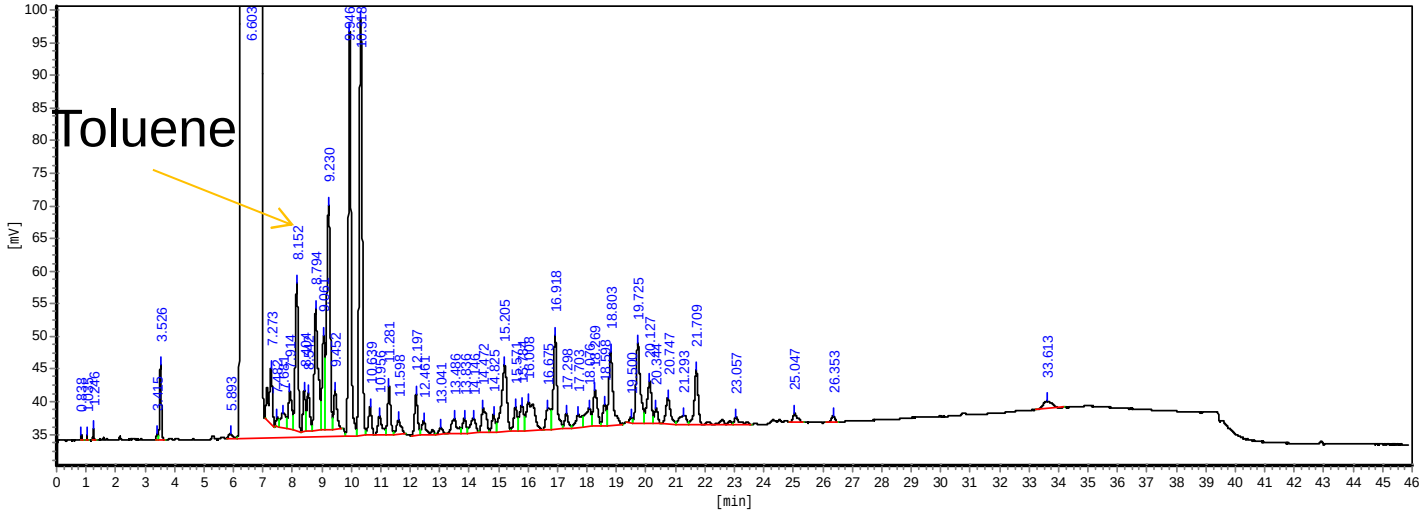


Col: GsBP-Inowax, 60m x 0.32mm x 0.25um

GS-Tek

Aromatics





Column: GsBP-1, 30m x 0.53mm x 3.0um

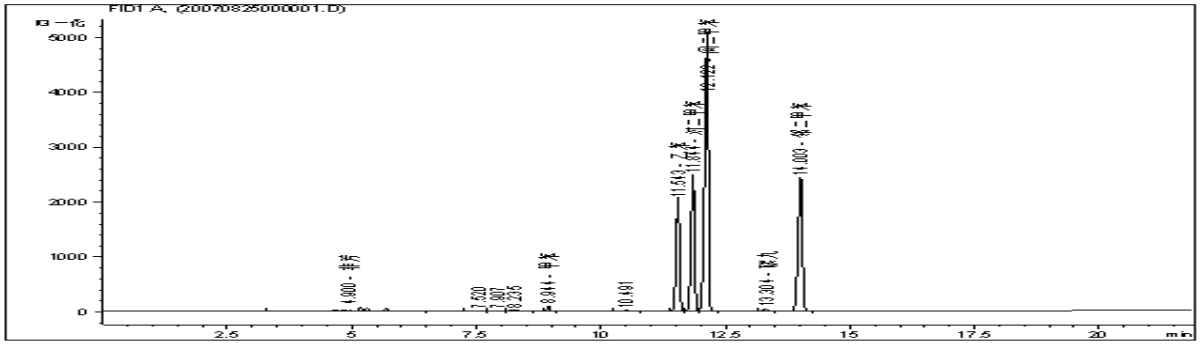
GS-Tek

Aromatics, customer QC

数据文件: C:\CHEM32\1\DATA\20070825000001.D
样品名称: 312-2

操作者 : gyh
仪器 : contents 位置 : 1
进样日期 : 2007-8-25 9:35:25 进样次数 : 1
进样量 : 手动

采集方法 : C:\CHEM32\1\METHODS\二甲苯.M
最后修改 : 2007-8-24 15:56:48 : gyh
分析方法 : C:\CHEM32\1\METHODS\二甲苯.M
最后修改 : 2007-8-25 12:32:30 : gyh
(调用后修改)
方法信息 : This metheod is used for amylis CH and being estblished in 4,18,2007 by zhangshuzhe,



归一化百分比报告

排序 : 信号
校正数据修改时间 : 2007-8-25 12:18:22
乘积因子 : 1.0000
稀释因子 : 1.0000
内标使用乘积因子和稀释因子

信号 1: FID1 A,

保留时间 [min]	类型	峰面积 [pA*s]	含量/峰面积	归一化 %	组	名称
4.900	VBA+	836.99774	1.00000	1.283411		非芳
6.800		-	-	-		苯
8.944	BB	322.00034	1.00000	0.493739		甲苯
11.543	BV	1.00475e4	1.00000	15.406354		乙苯
11.844	VV	1.23448e4	1.00000	18.928930		对二甲苯
12.122	VB	2.69319e4	1.00000	41.296054		间二甲苯
13.304	BB	199.31943	1.00000	0.305627		聚九
13.700		-	-	-		聚九

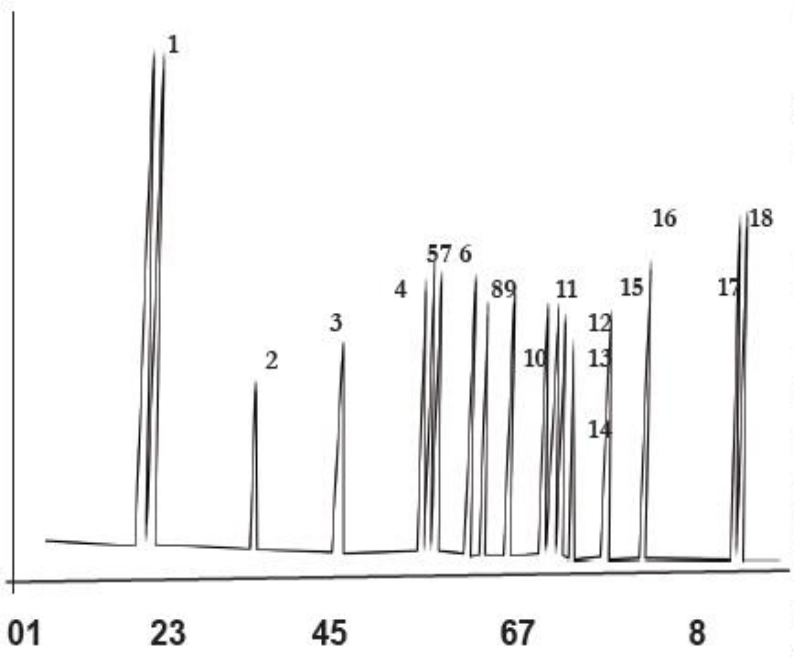
contents 2007-8-25 12:32:43 gyh 页1/2

Col: GsBP-Inowax, 60m x 0.32mm x 0.5um

GS-Tek

Aromatics, C8 to C10

Substituted Aromatics



Column	:	GsBP-Inowax, 60m x 0.32mm x 0.5um,
Part No	:	2032-6005
Injection	:	Split, 250:1,0.5ul injection, 250C
Oven	:	50°C for 1min: 50-75 at 4°C/min, 75-100°C at 10C/ min, (hold 4 min)100-150°C at 10°C/min
Detector	:	FID, 300C
Carrier	:	Hydrogen at 40cm/sec constant pressure

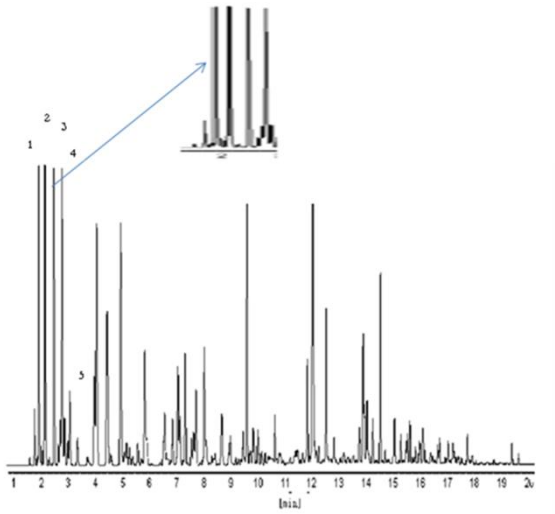
Peak Identification

1. Hexane
2. Benzene
3. Toluene
4. Ethbenzene
5. 1,4-Xylene
6. 1,3-Xylene
7. Cumene
8. 1,2- Xylene
9. benzene
10. tert-Butylbenzene
11. iso-Butylbenzene
12. Mesitylene
13. sec-Butylbenzene
14. Styrene
15. 1,2,4-trimethylbenzene
16. Butylbenzene
17. 1,4-diisopropylbenzene
18. trans-b-Methylstyrene

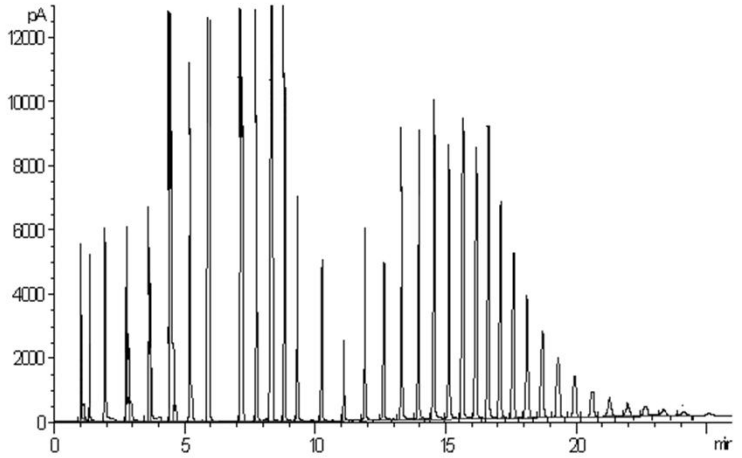
GS-Tek

Oil

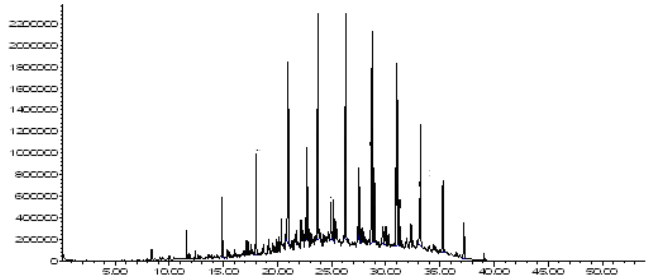
Alcohol in gasoline，C1 to C12s 24min separation



Sim-Dis, C5 to C72

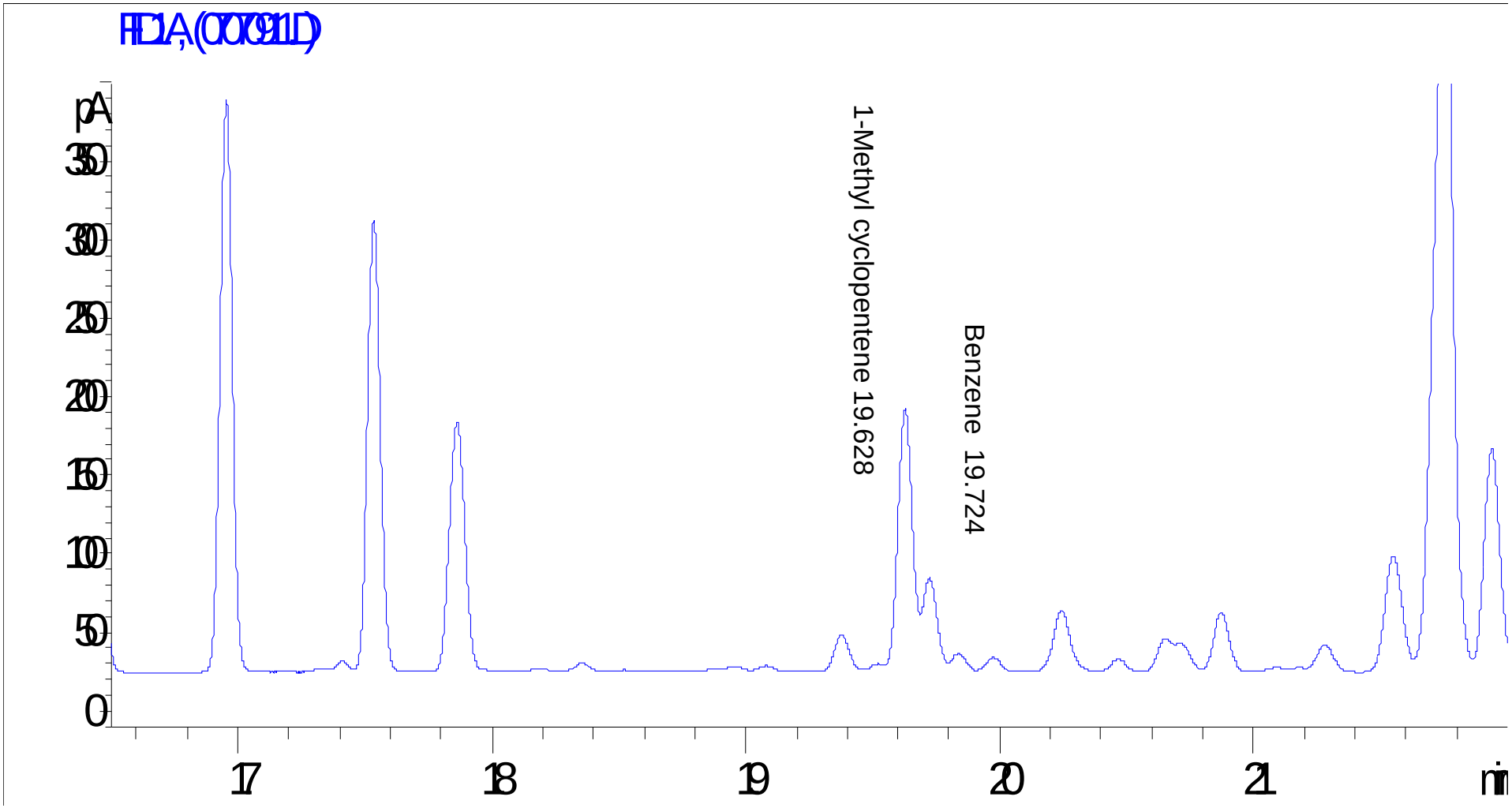


Diesel by GC-MS



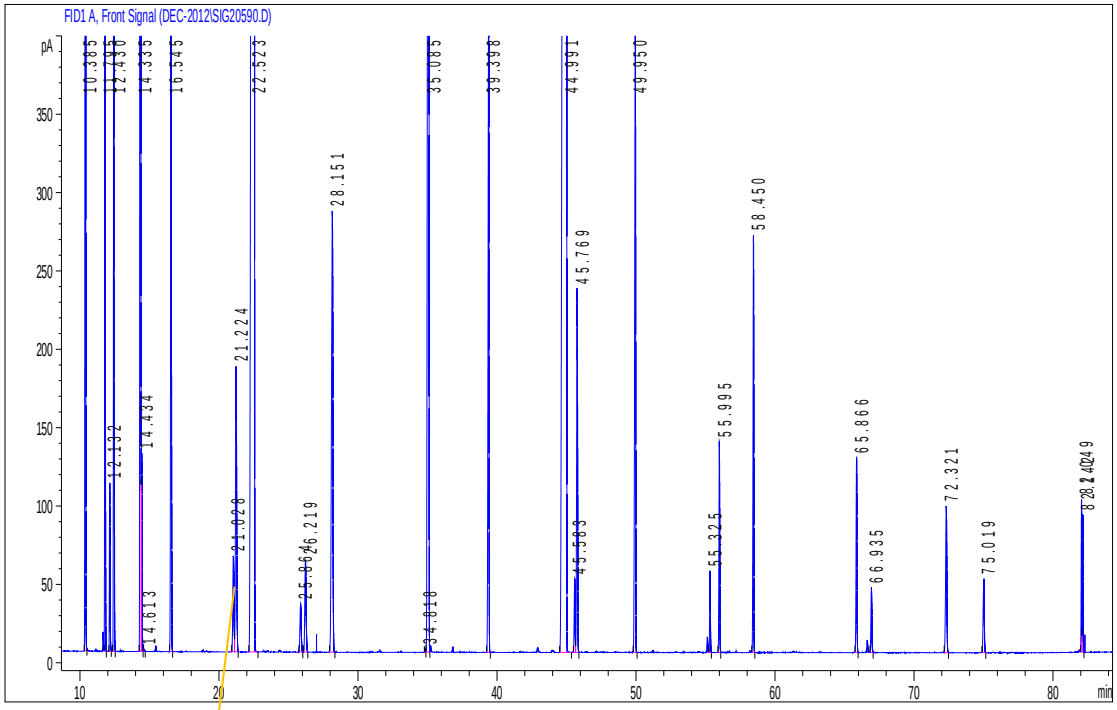
GS-Tek

Benzene in gasoline using pona column



GS-Tek

Benzene, alcohol and related hydrocarbons separation

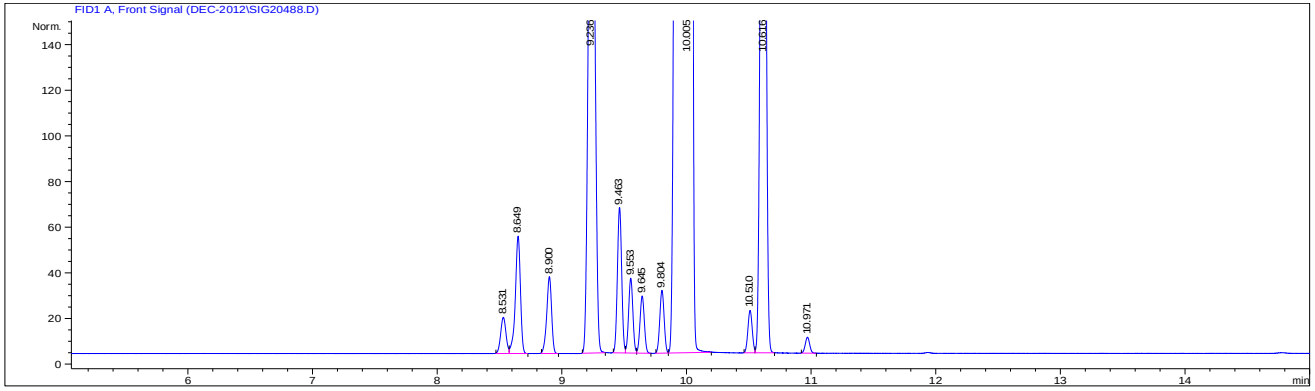


Benzene and1-methyl cyclopentene, resolution=2.8

Peak No.	Compound	Concentration (%)	Retention Time (min)	Partition Ratio (k')	Resolution
1	Ethanol	8%	10.385	0.289	
2	Pentane	2%	11.795	0.464	
3	Tert-butanol	0.50%	12.132	0.506	
4	2-methylbutene-2	2.50%	12.43	0.543	
5	Methyl tert-butyl ether(MTBE)	10%	14.335	0.780	
6	2,3-dimethylbutane	0.50%	14.434	0.792	1.86
7	Hexane	2%	16.545	1.054	
8	1-methylcyclopentene	0.50%	21.028	1.611	
9	Benzene	1%	21.224	1.635	2.81
10	Cyclohexane	28.90%	22.523	1.796	
11	3-ethylpentane	0.20%	25.864	2.211	
12	1-tert-2-dimethylcyclopentane	0.50%	26.219	2.255	4.69
13	Heptane	2%	28.151	2.495	

GS-Tek

Separation of Alcohol in hydrocarbons C1 to C5 (gasoline)



Catalog No.:	9006-PONA	Oven Temp.:	40℃	Injector:	S/S, 260 ℃
Serial No.:	9052413	Carrier Gas	Hydrogen	Detector:	FID, 300 ℃
Stationary Phase:	GsBP-PONA	Head Pressure:	22psi	Injection:	1ul
Column Length:	100m	Split Flow:	80ml/min	Holdup Time:	5.529(min)
Column ID:	0.25mm				
Film Thickness:	0.5um				

Compound	Retention Time (min)
Methane	5.529
Ethylene	5.647
Ethane	5.708
Propylene	6.057
Propane	6.100
Methanol	6.644
Iso-butane	6.682
1-butane	7.022
1-butene	7.172
Tert-butylene	7.333
Cis-2-butylene	7.610
Ethanol	7.886
Iso-pentane	8.901
Isopropyl-ethanol	9.075
Pentane	9.801

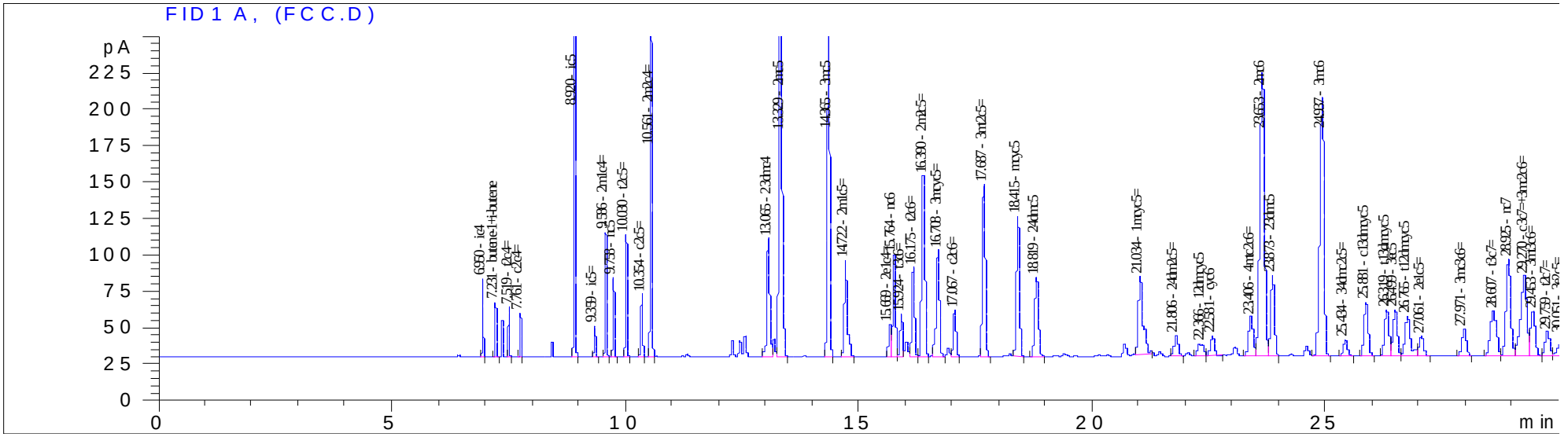
GS-Tek

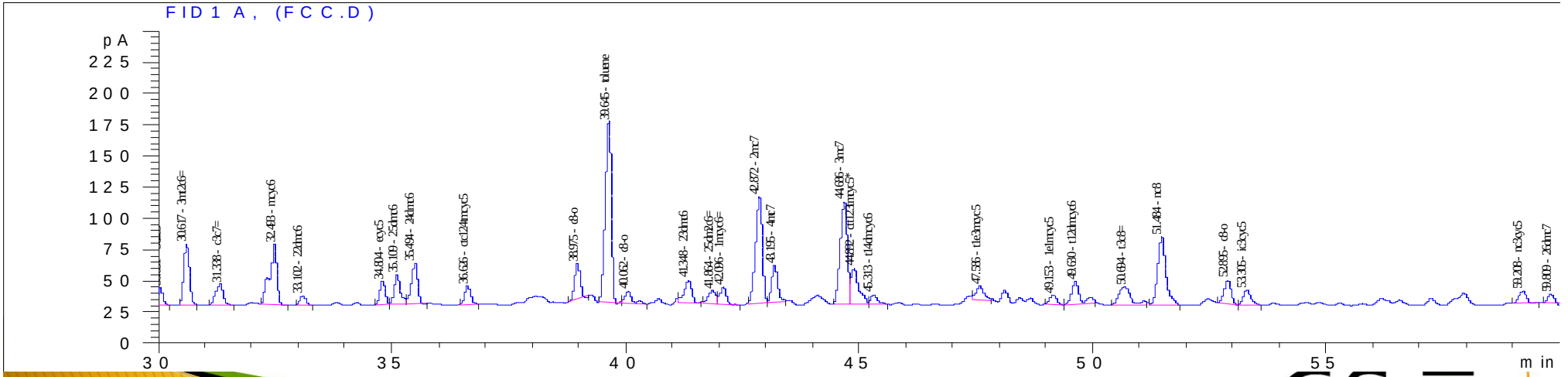
PIONA

Instrument:	Agilent 6890 or 7890GC or similar GC with Split Inlet and Fid	Agilent 6890 or 7890GC or similar GC with Split Inlet and Fid
Column:	50mx0.2mmx0.5um	100mx0.25mmx0.5um
Gas Carrier :	N2 16 psi,	He 40psi
Oven:	35 C, 10 min. Rate :0.5 C/min. Final Temp: 60 C, Rate A :2.0 C/min. Final Temp A: 180 C. Final time A :10 min.	35 C, 13min Rate :10 C/min. Final Temp: 45 C, 15 min. Rate A :1.0 C/min. Final Temp A: 60 C Final time A :15 min. Rate B: 1.9 C/min. Final Temp B: 180 C Final Time B: 5 min.
Injection temperature:	250 C	250 C
Split ratio:	300:1	150:1
Auto sampler:	Recommended	Recommended
Inject volume	0.5 1ul	0.5 ul
Detector temperature:	250 C	250 C

GS-Tek

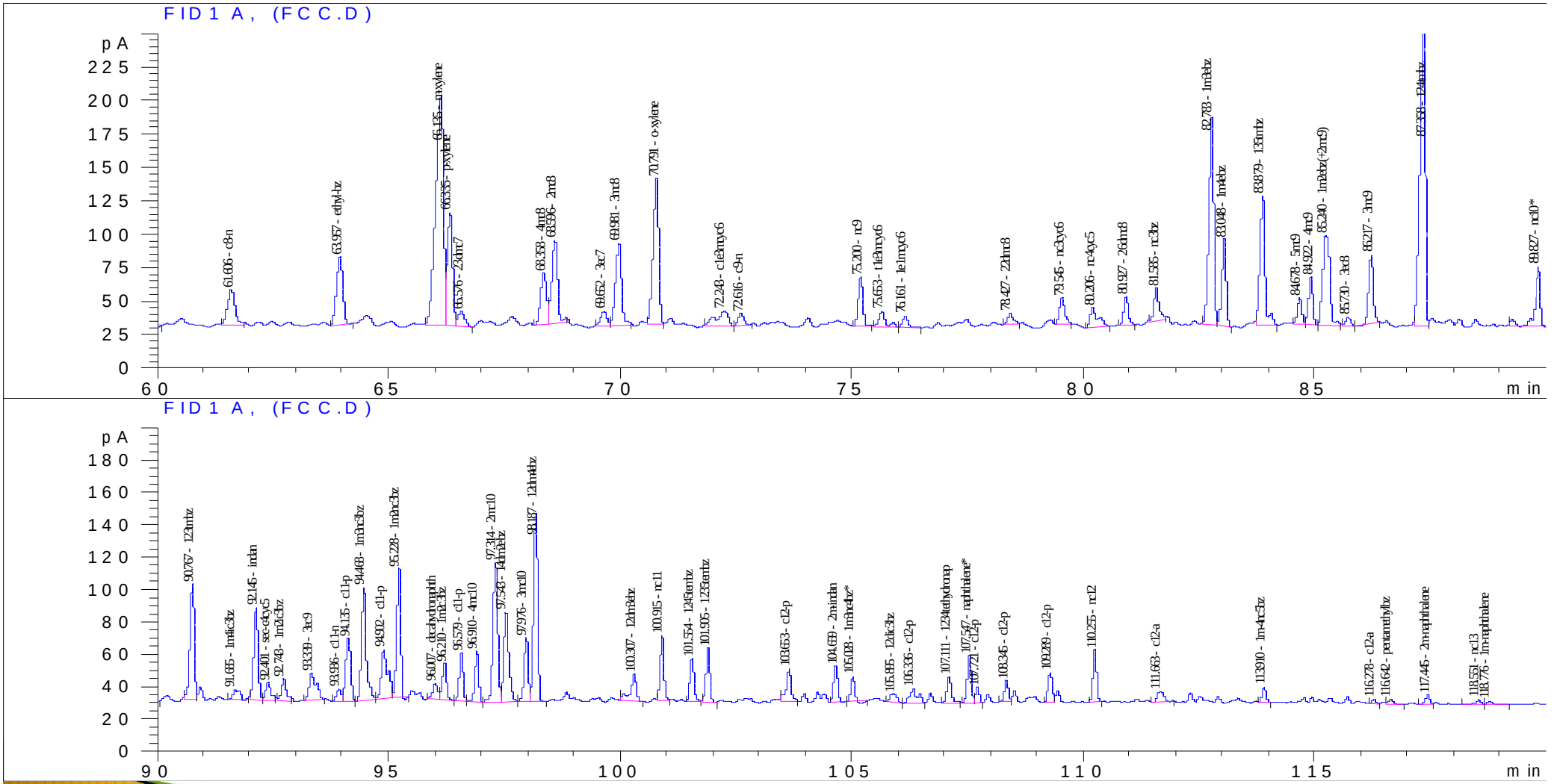
Gasoline separation, PIONA





GS-Tek

Gasoline separation, PIONA



GS-Tek

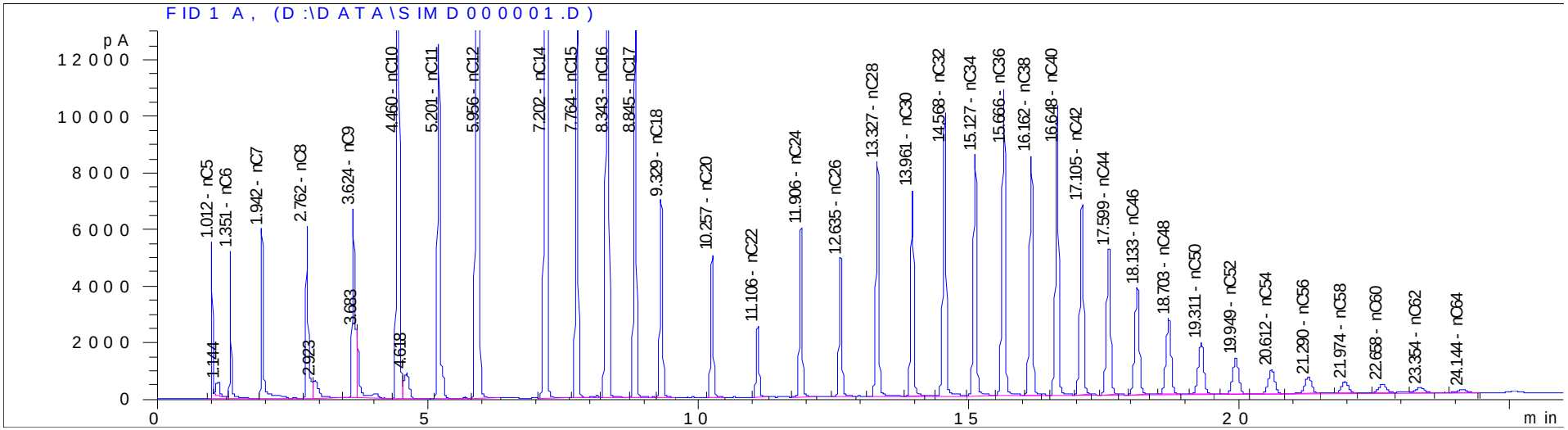
Results

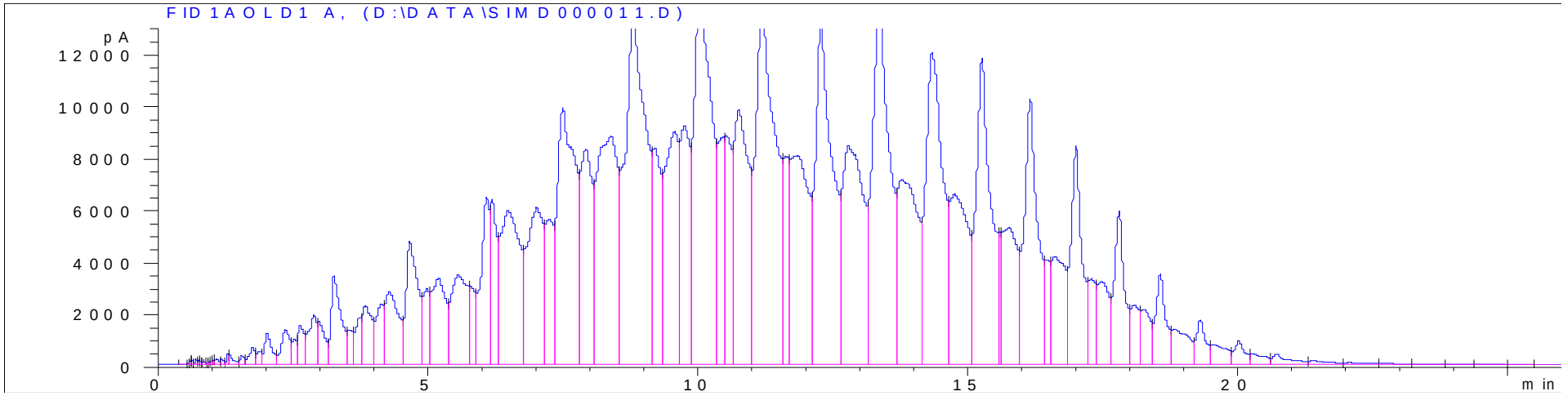
Column	GSBP-PONA	HP-PONA
Peaks	300	301
Actual RON	87.26	87.15
Actual MON	78.18	78.07
C:H	7.33	7.34
ratio	0.8064	0.8062

PONA Columns	GsBP	HP
Compound	Wt%	Wt%
P (paraffin)	3.29	3.28
I(isoparaffin)	25.81	25.69
O (olefin)	9.14	9.40
N (naphtha)	15.74	15.72
A (Aromatics)	46.02	45.91

GS-Tek

Simulated distillation： by GsBP-SimDis Metal colum, 10m x 0.53mm

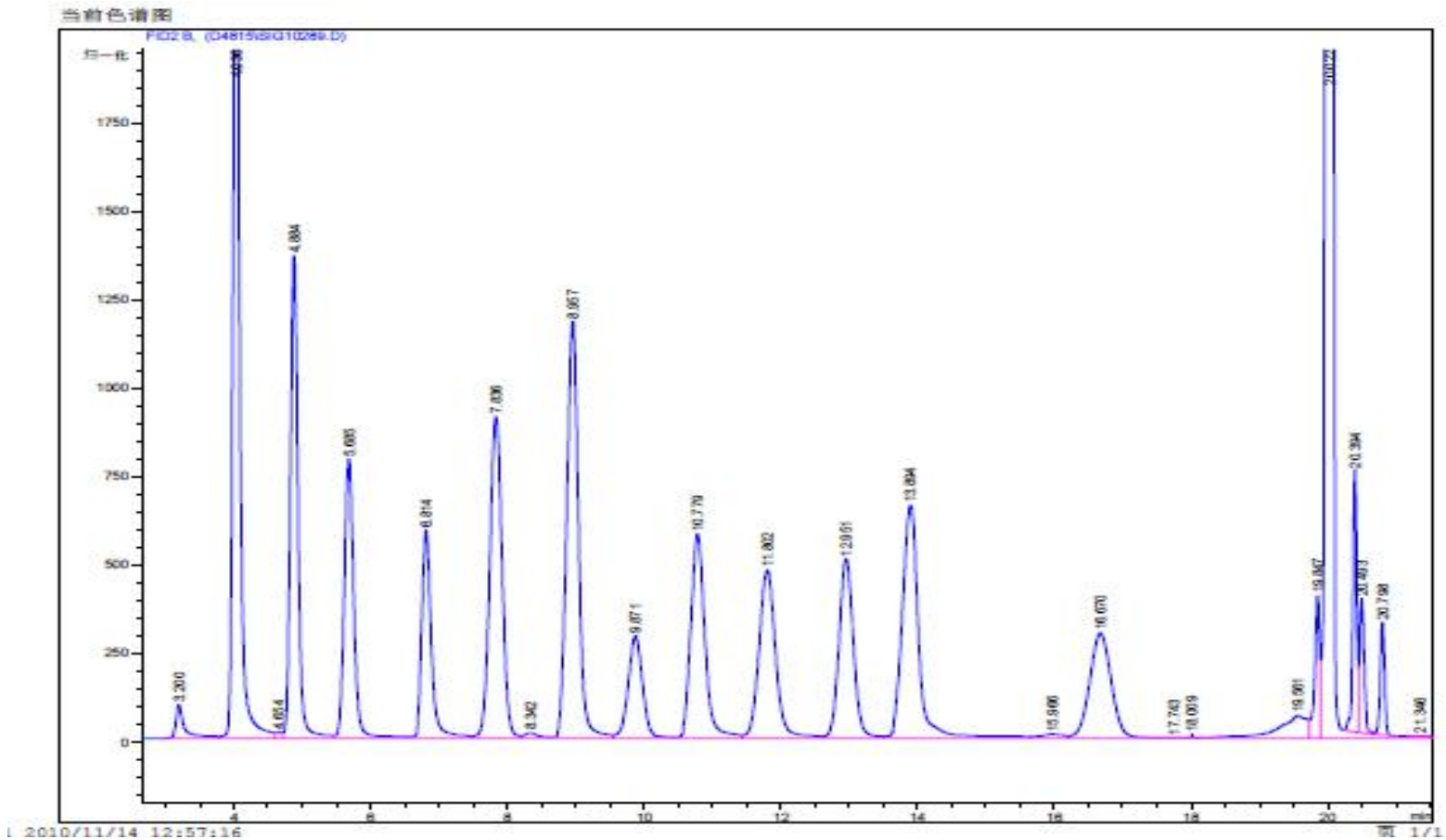




GS-Tek

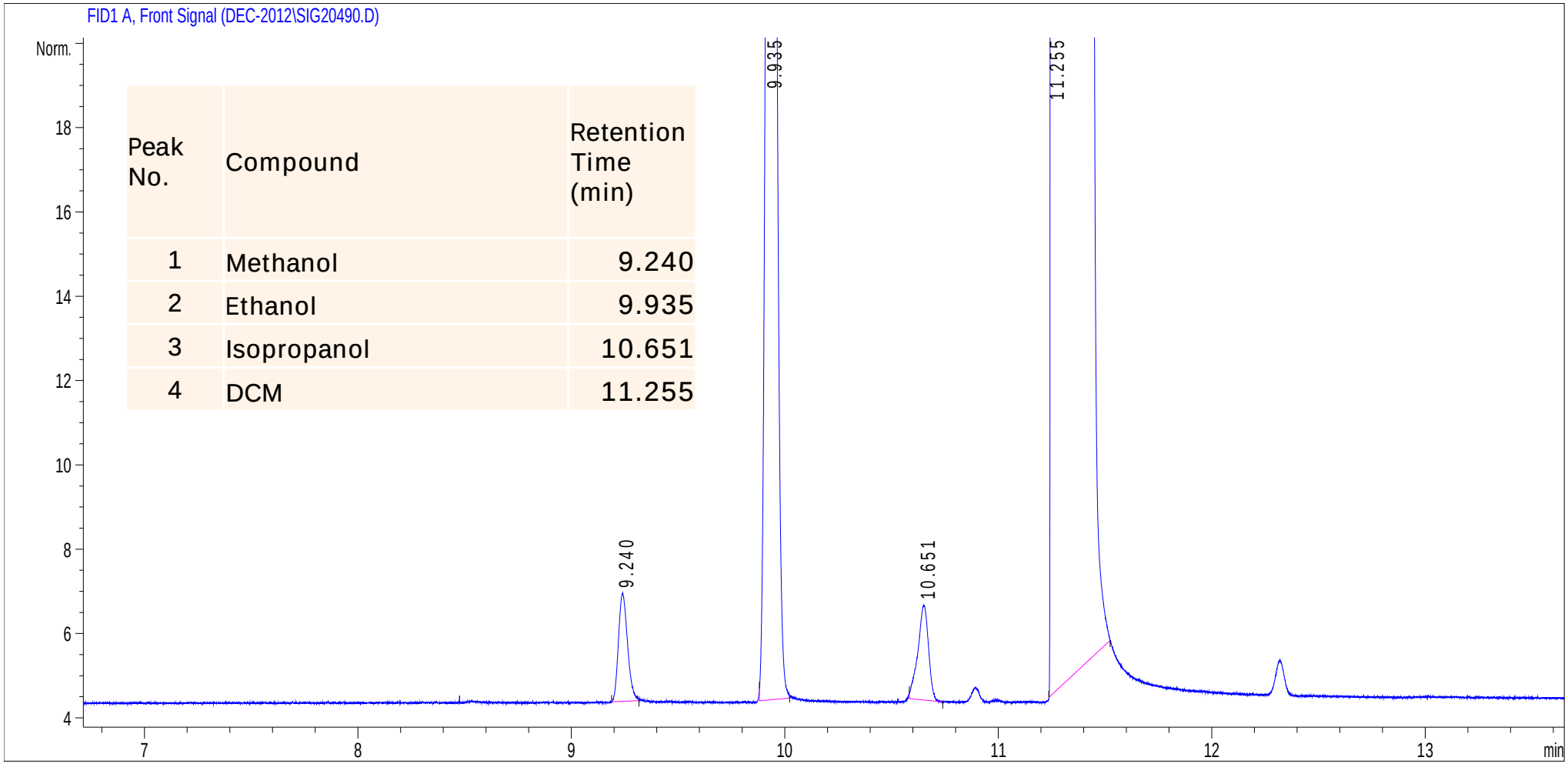
Oxide separation in gasoline upacked

TCEP+GsBP-1, 30m x 0.53mm x 3um



GS-Tek

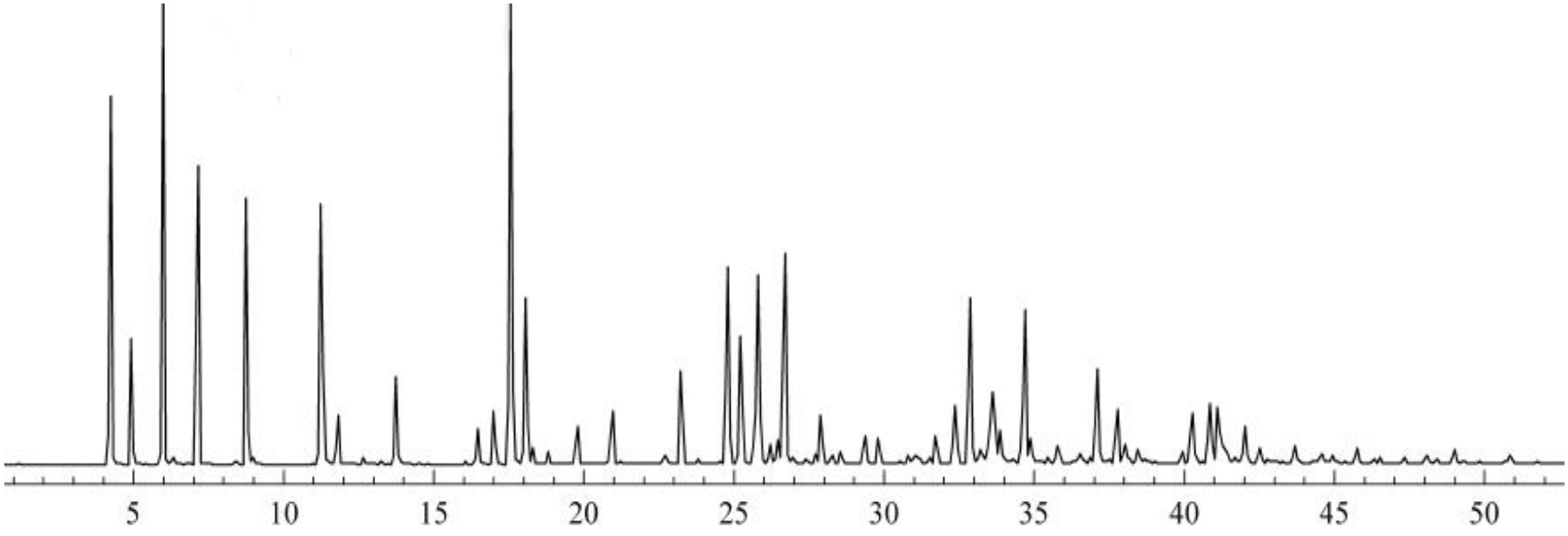
10ppm methanol, A challenge to Column Inertness



Peak No.	Compound	Retention Time (min)
1	Methanol	9.240
2	Ethanol	9.935
3	Isopropanol	10.651
4	DCM	11.255

GS-Tek

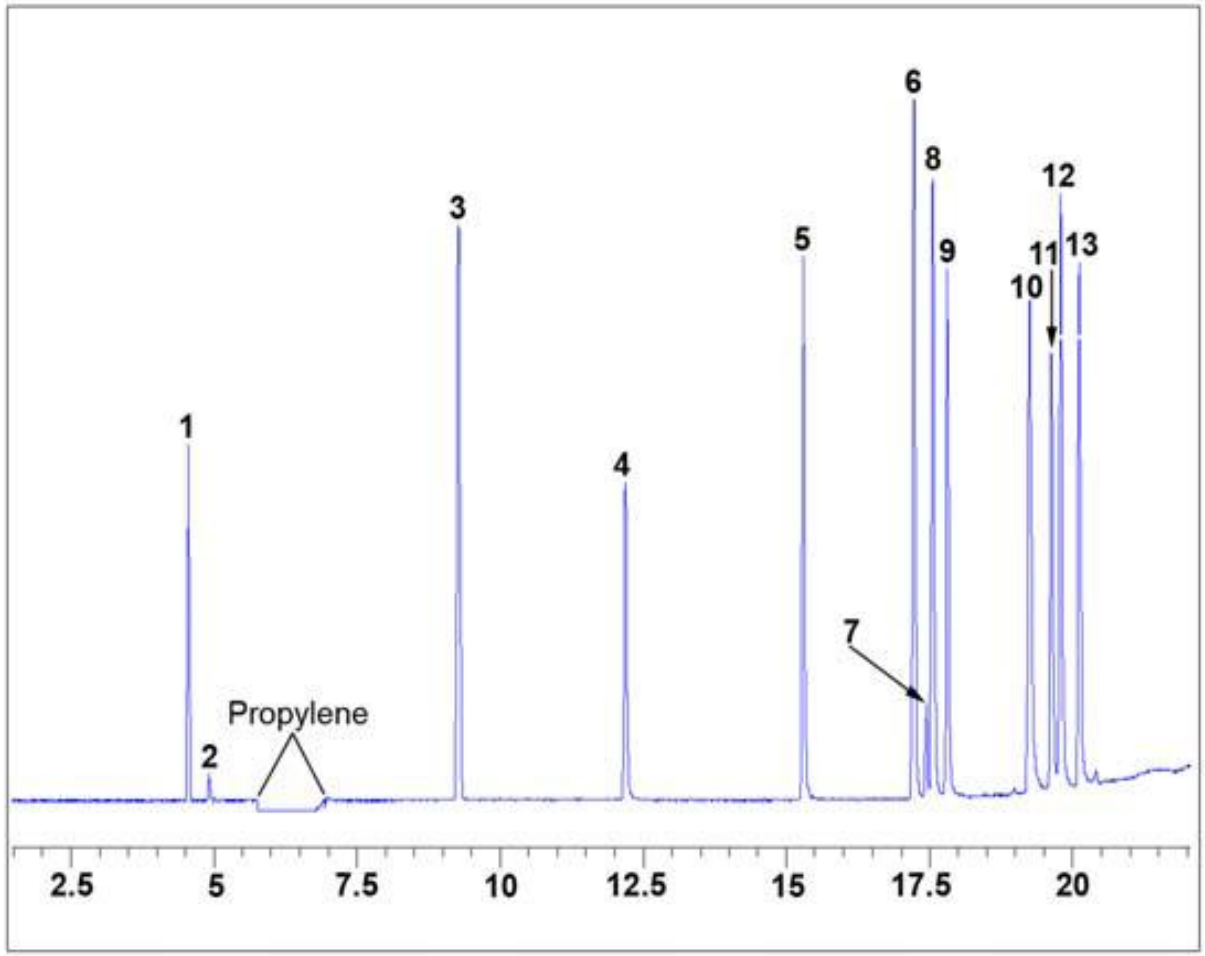
GsBP-PONA, separation of sulfides in gasoline combustion waste



Column: GsBP-PONA, 50m x 0.20mm x 0.5um
Oven: 35C 1min 4C/min to 175C
Detector：SCD

GS-Tek

1 ppmv Sulfurs

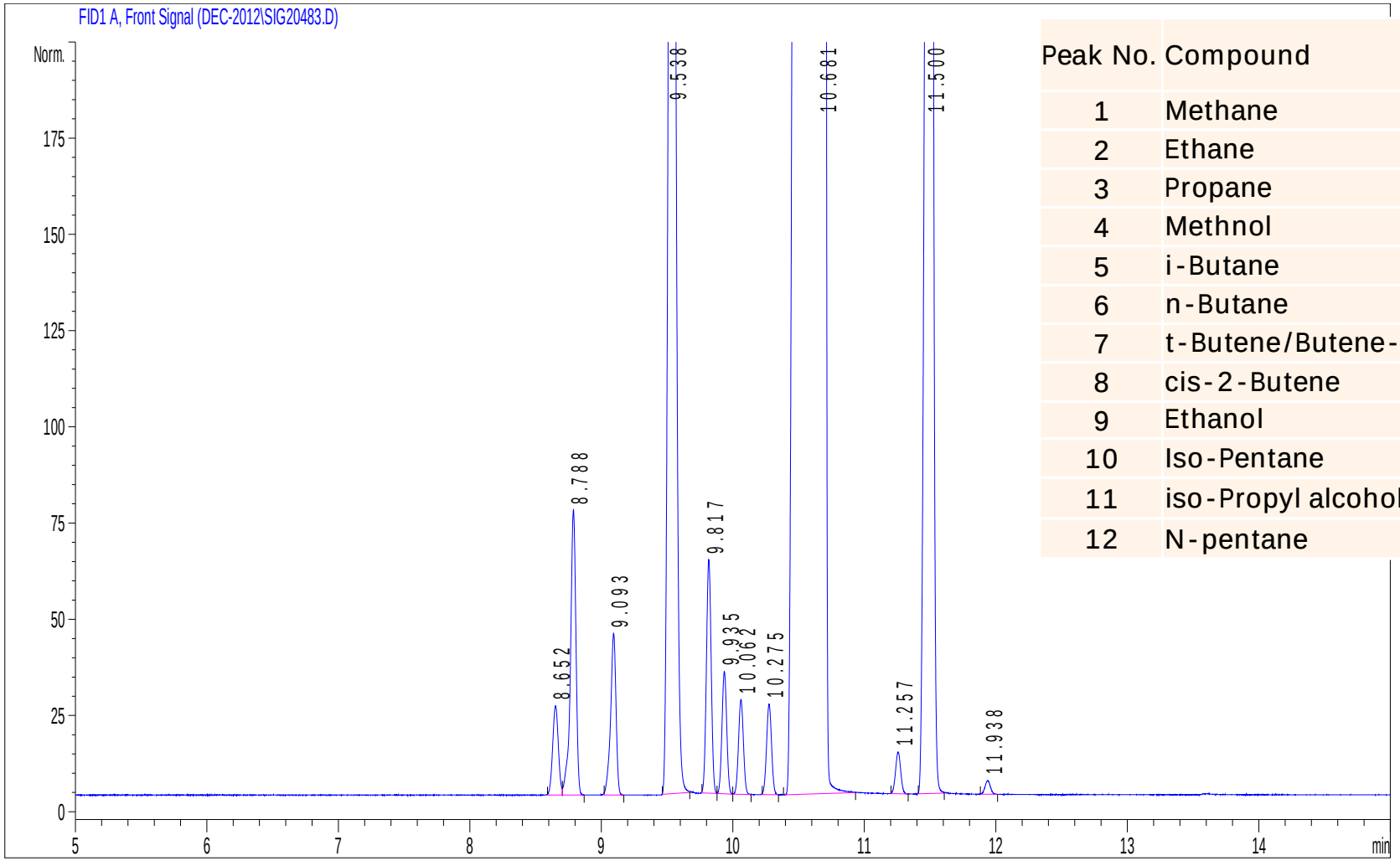


1. COS
2. H_2S
3. CS_2
4. Methylmercaptan
5. Ethylmercaptan
6. Thiophene
7. DMS
8. 2-Propanethiol
9. 1-Propanethiol
10. 2-Methyl-2-propanethiol
11. 2-Methyl-1-propanethiol
12. 1-Methyl-1-propanethiol
13. 1-Butanethiol

Column: GsBP-Gaspro, 60m x 0.32mm x 5um
Oven: 35C 1min 4C/min to 175C
Detector：PFPD

GS-Tek

Alcohols separation from light Hydrocarbons on GsBP-PONA

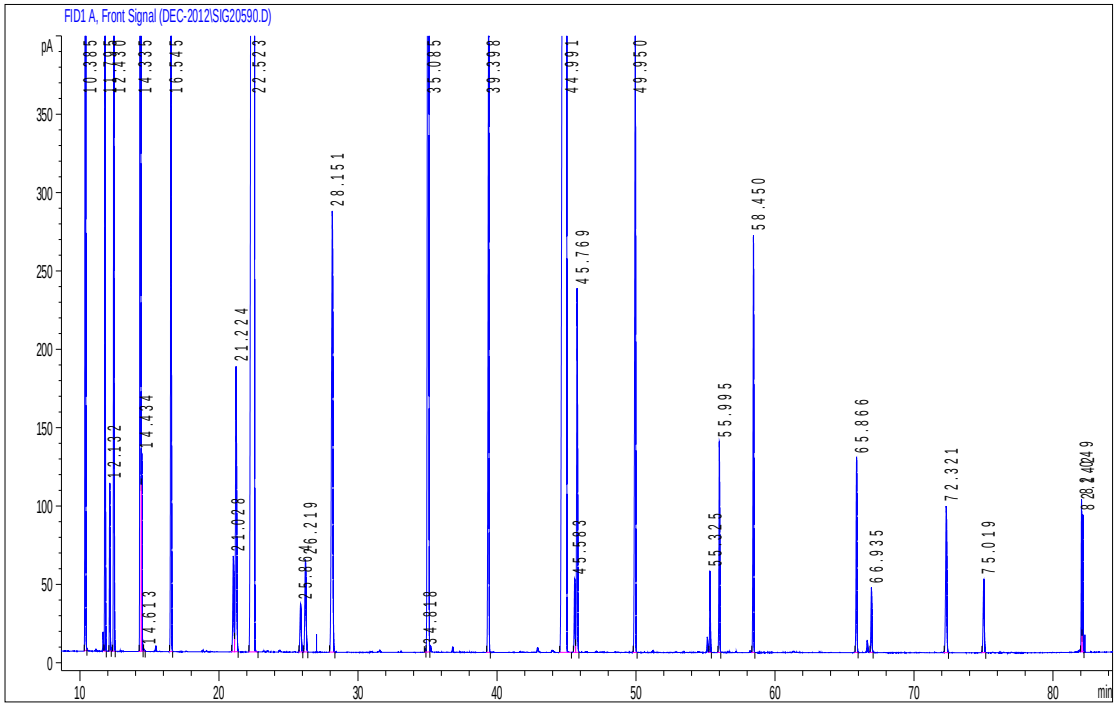


Peak No.	Compound	Retention Time (min)
1	Methane	8.652
2	Ethane	8.788
3	Propane	9.093
4	Methnol	9.538
5	i-Butane	9.817
6	n-Butane	9.935
7	t-Butene/Butene-1	10.062
8	cis-2-Butene	10.275
9	Ethanol	10.681
10	Iso-Pentane	11.257
11	iso-Propyl alcohol	11.500
12	N-pentane	11.938

Oven: 38 ℃

GS-Tek

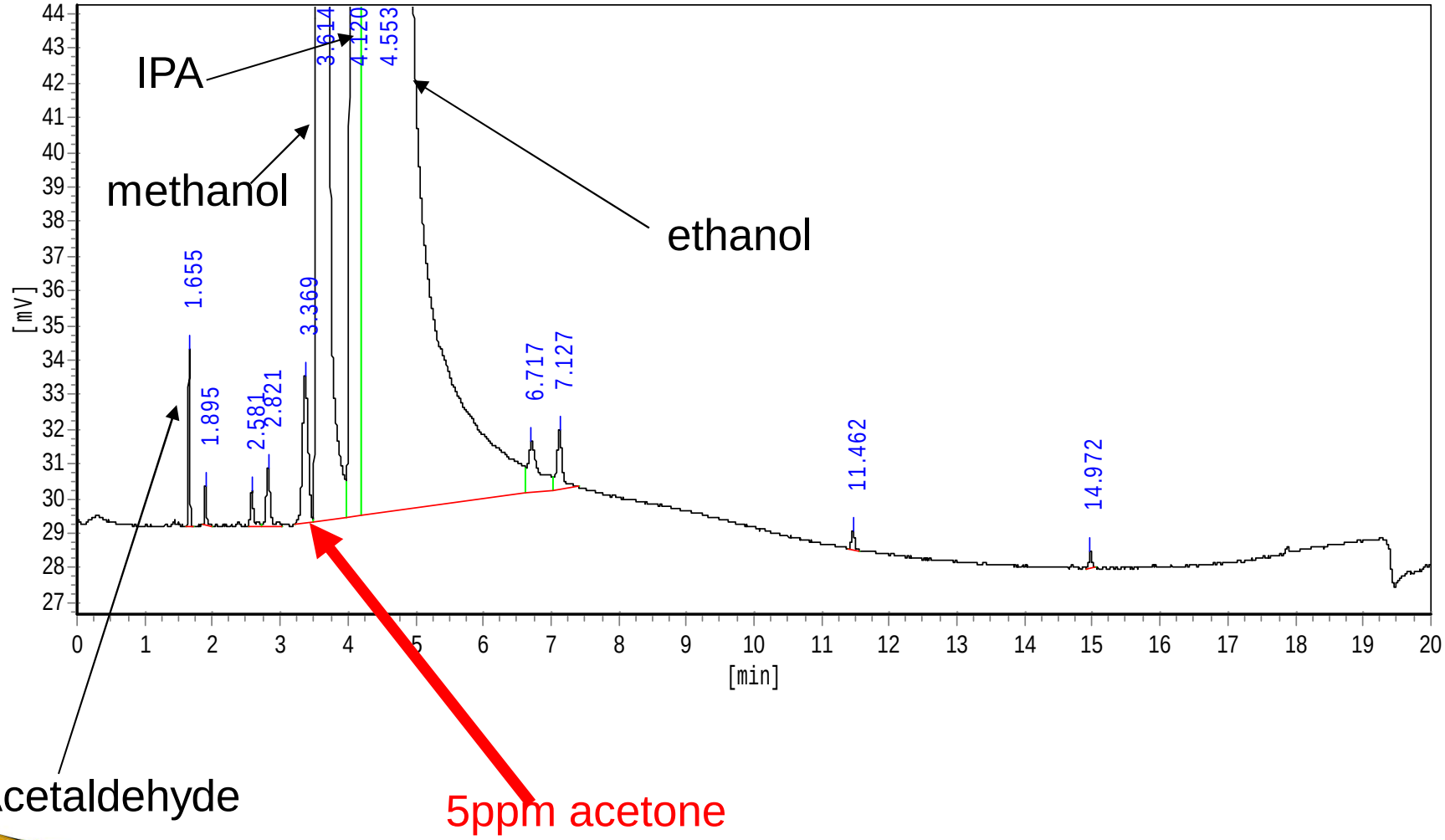
Benzene and Ethanol



Peak No.	Compound	Concentration (%)	Retention Time (min)	Partition Ratio (k')	Resolution
1	Ethanol	8%	10.385	0.289	
2	Pentane	2%	11.795	0.464	
3	Tert-butanol	0.50%	12.132	0.506	
4	2-methylbutene-2	2.50%	12.43	0.543	
5	Methyl tert-butyl ether(MTBE)	10%	14.335	0.780	
6	2,3-dimethylbutane	0.50%	14.434	0.792	1.86
7	Hexane	2%	16.545	1.054	
8	1-methylcyclopentene	0.50%	21.028	1.611	
9	Benzene	1%	21.224	1.635	2.81
10	Cyclohexane	28.90%	22.523	1.796	
11	3-ethylpentane	0.20%	25.864	2.211	
12	1-tert-2-dimethylcyclopentane	0.50%	26.219	2.255	4.69
13	Heptane	2%	28.151	2.495	

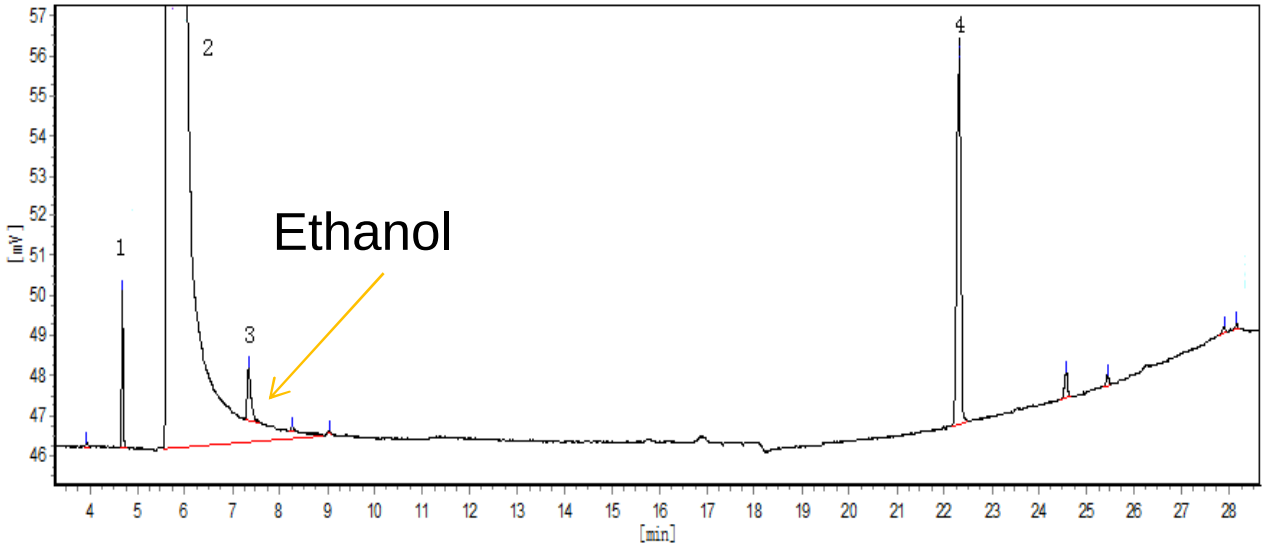
GS-Tek

<1ppm Acetone in High Purity Ethanol on GsBP-Inowax Column, acetone/ethanol separation



GS-Tek

<5ppm Ethanol in Methanol

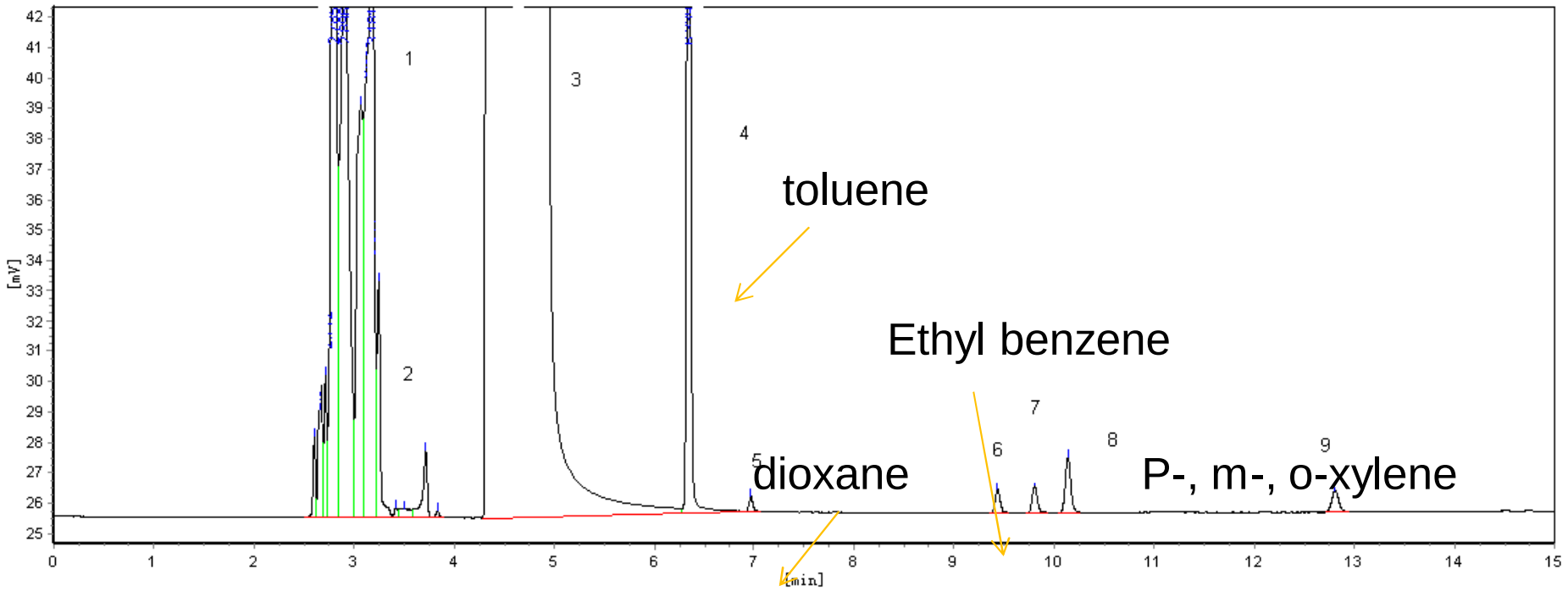


Peak No.	Compound
1	Acetaldehyde
2	Methanol
3	Ethanol
4	Impurity To be identified

Catalog No.:	7132-A500	**Oven Temp.:**	TP
Serial No.:	11081964	**Carrier Gas**	Hydrogen
Stationary Phase:	**GsBP-Methanol**	**Head Pressure:**	10psi
Column Length:	105m	**Split Flow:**	80ml/min
			50 °C (18min)
Column ID:	0.32mm	**TP**	10C/min
Film Thickness:	N/A		to 150C (3min)

GS-Tek

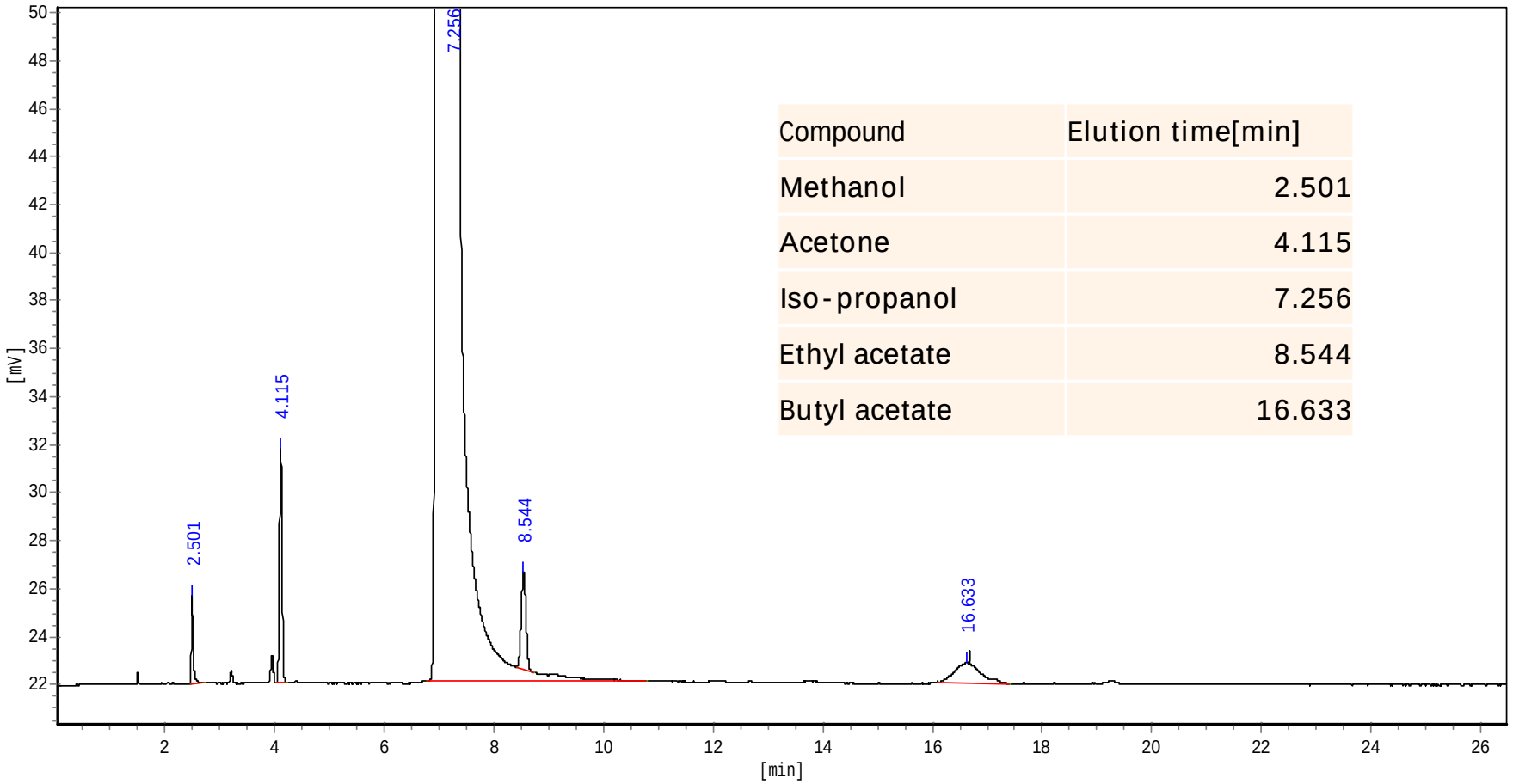
99.9+% Benzene/aromatics



Column: GsBP-Inowax, 60m x 0.32mm x 0.25um

GS-Tek

IPA



Compound	Elution time[min]
Methanol	2.501
Acetone	4.115
Iso-propanol	7.256
Ethyl acetate	8.544
Butyl acetate	16.633

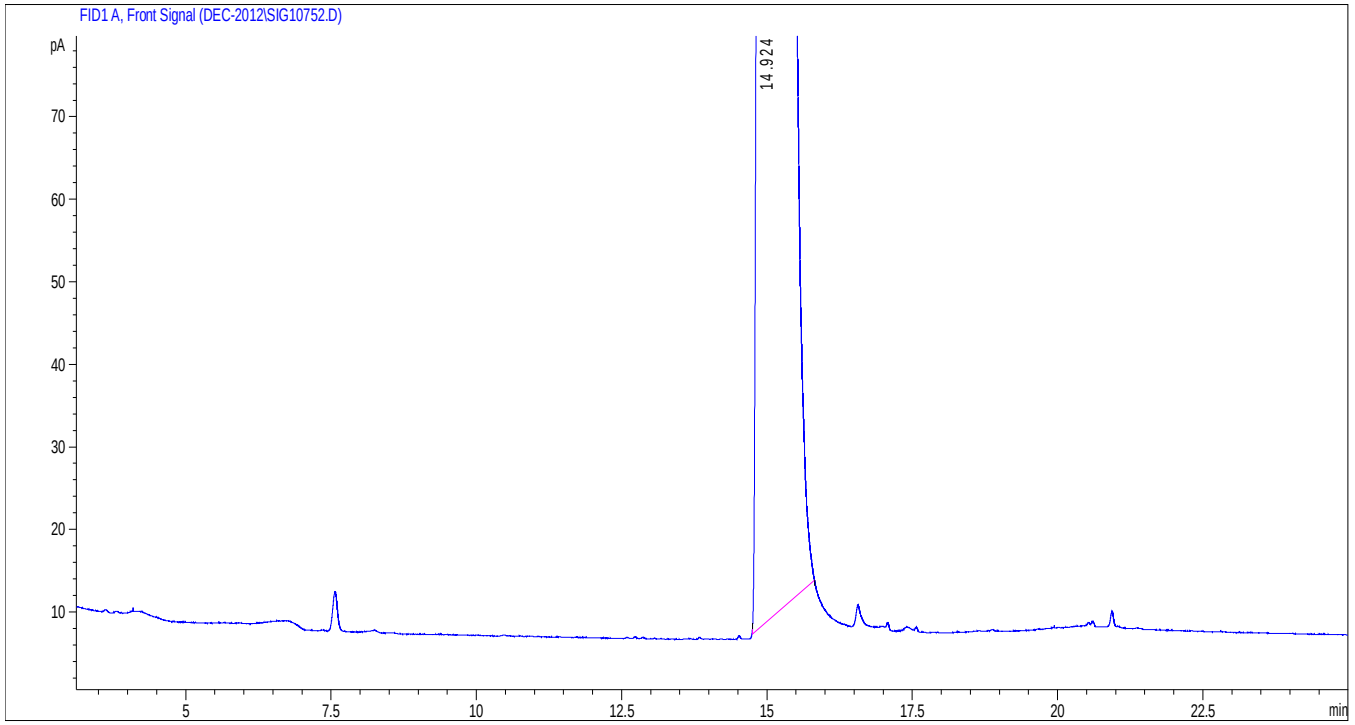
Column：GsBP-624 30m x 0.32mm x 1.8um

Oven：*40C*

Sample: IPA spiked with 10ppm acetates

GS-Tek

99.9+% Acetic acid



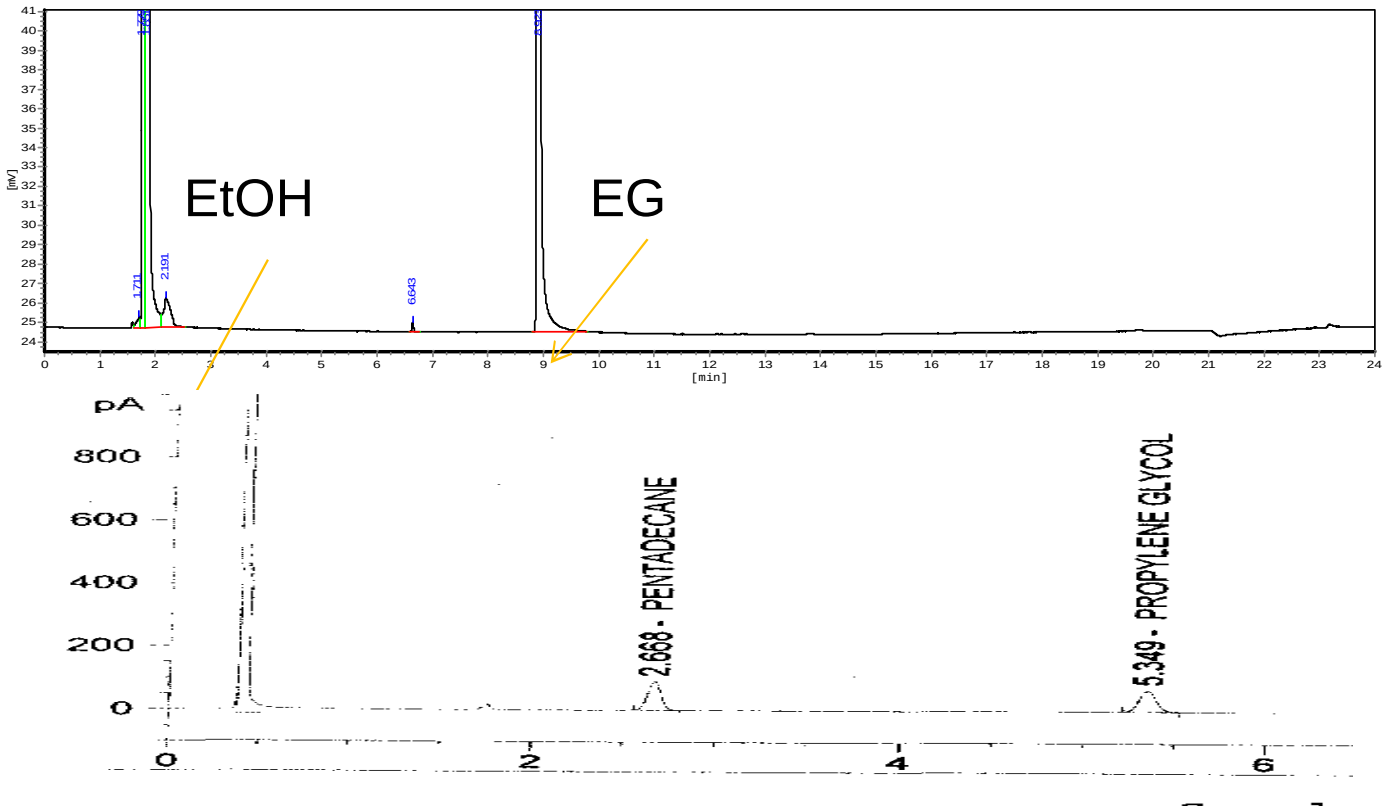
Column：GsBP-FFAP, 30m x 0.53mm x 1um 2153-3010

Oven：*40C (4min) 10C/min to 200C (5min)*

Sample: 99.9+% Acetic acid, 1ul

GS-Tek

Glycol in water/ethanol



Column: GsBP-Inowax, 30m x 0.32mm x 0.25um
Sample: 200ppm EG in 70:30 EtOH:H2O, 1ul
Oven: 80C 1min 10C/min to 250C 5min

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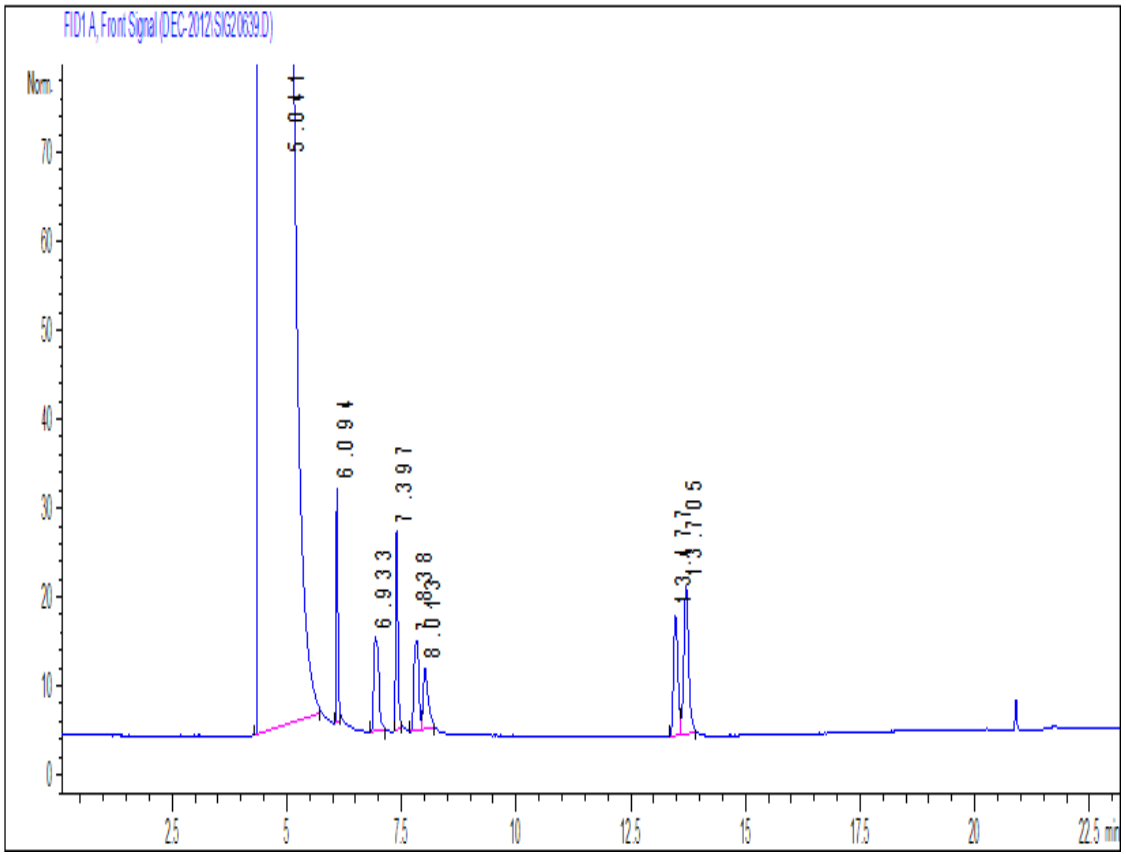
Ppm level Residual Solvents on GSBP-624 Columns



Peak	Name	Conc	RT
	Resolution		
1	Methanol	Solvent	5.04
2	Ethanol	10ppm	6.09
3	Acetone	10ppm	6.93
4	Isopropanol	10ppm	7.40
5	Acetonitrile	10ppm	7.84
6	Dichloromethane	10ppm	8.01
			1.72
7	2-Butanone	10ppm	13.48
8	Ethyl Acetate	10ppm	13.71
			2.06

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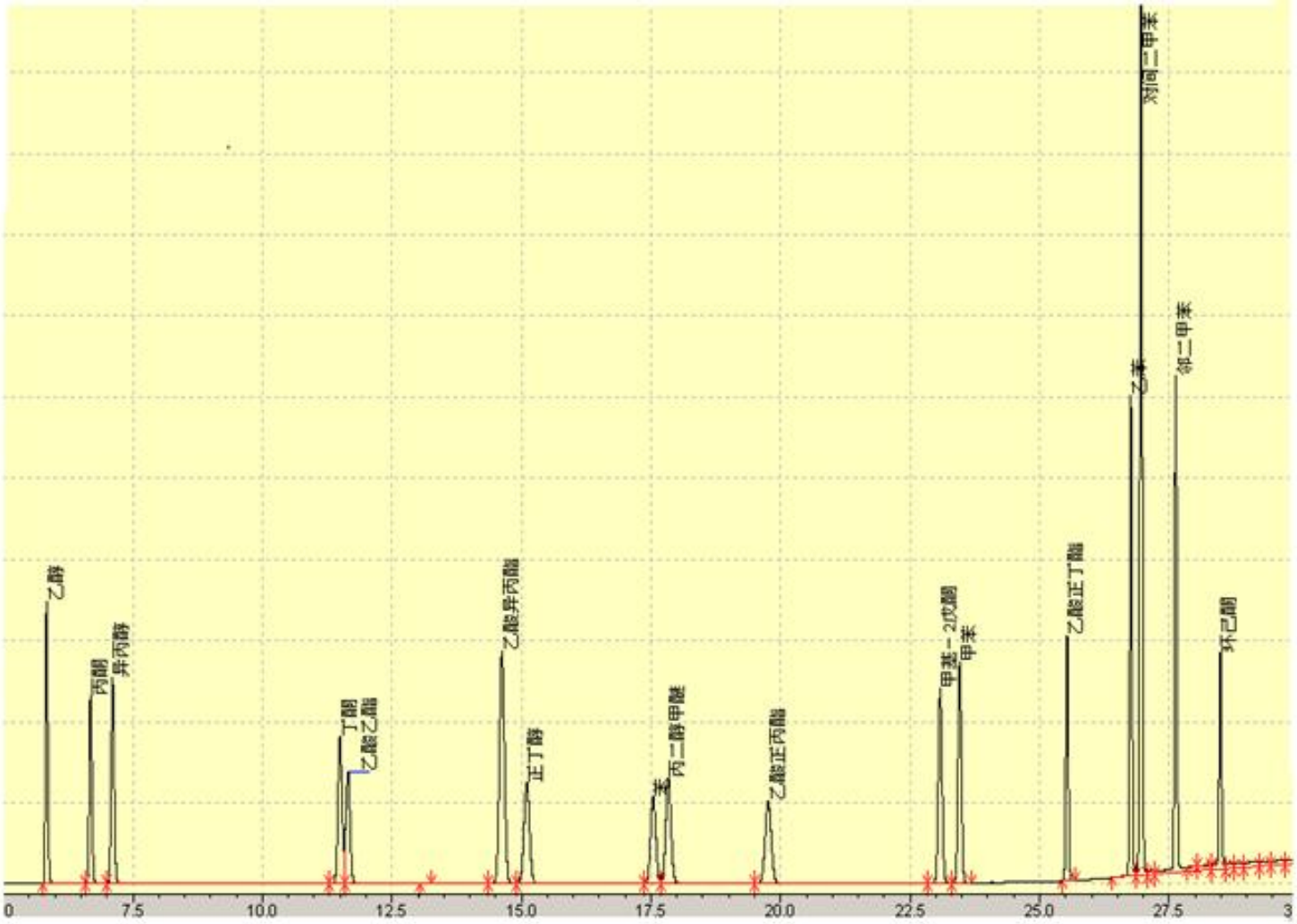
Solvent separation on GsBP-624

1. Ethanol
2. Acetone
3. Isopropanol
4. Butanone
5. Ethyl acetate
6. Isopropyl acetate
7. 1-Butanol
8. Proprylene glycol monomethyl ether
9. 1-propyl acetate
10. Methyl amyl ketone
11. Toluene
12. Butyl acetate
13. Ethyl Benzene
14. p-,m-, Xylene
15. o-Xylene
16. Cyclohexanone



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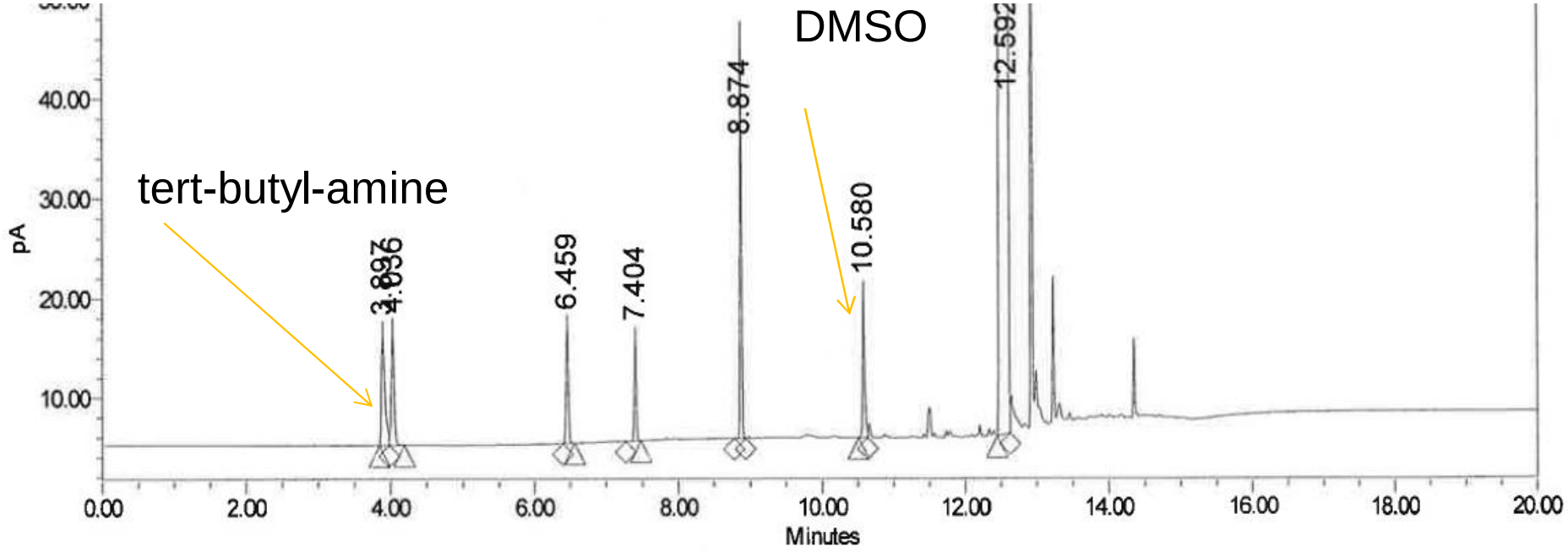
100ppm Amine on GsBP-624 UI



Column: 6225-3014UI, GsBP-624UI, 30m x 0.25mm x 1.4um
Oven: 40C 5min 20C/min to 245C 5min

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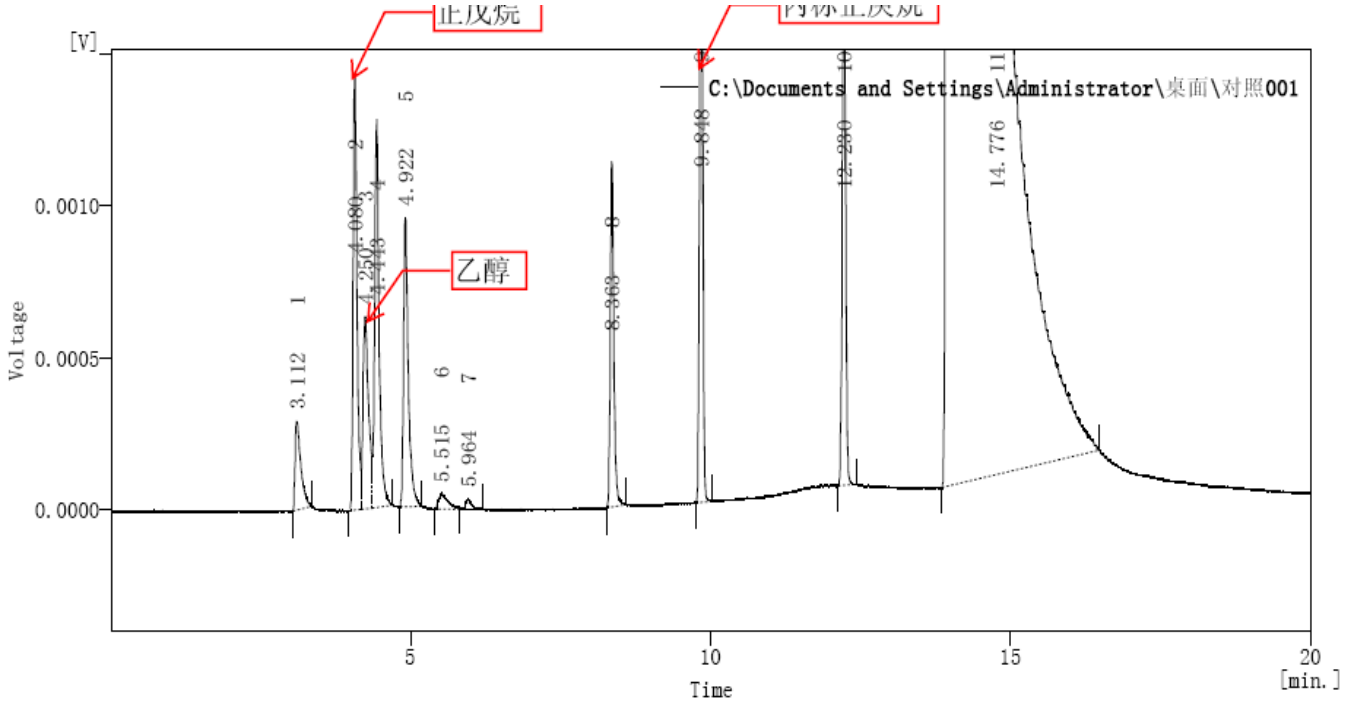
Residue solvents in DMSO



Peak ID Elution order	Acetonitrile
Methanol	Dichloromethane
Pentane	Ethyl acetate
Ethanol	Heptane
Diethyl ether	DMSO
Acetone	

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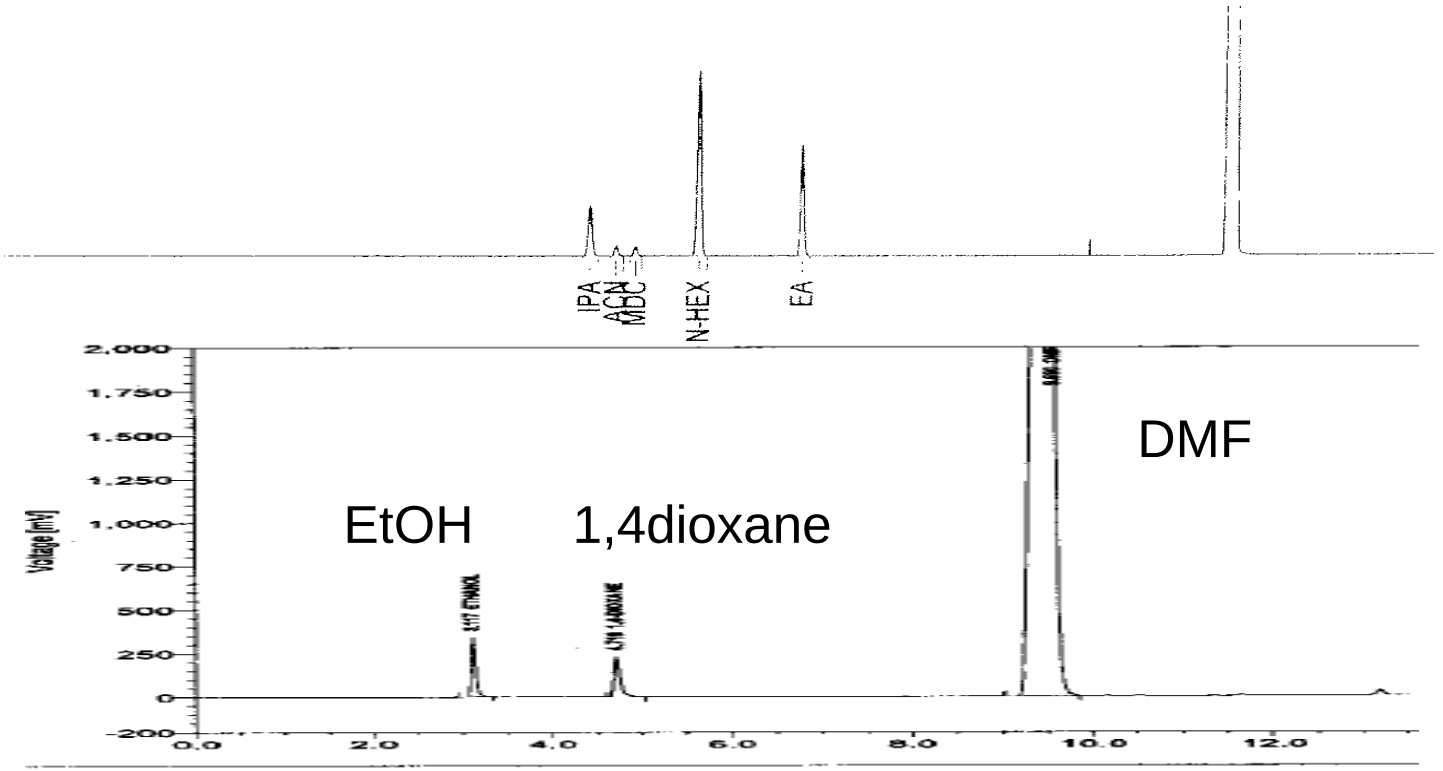
Residual Solvents, Dimethylformamide(DMF)



Column: GsBP-624, 30m x 0.32mm x 1.8um

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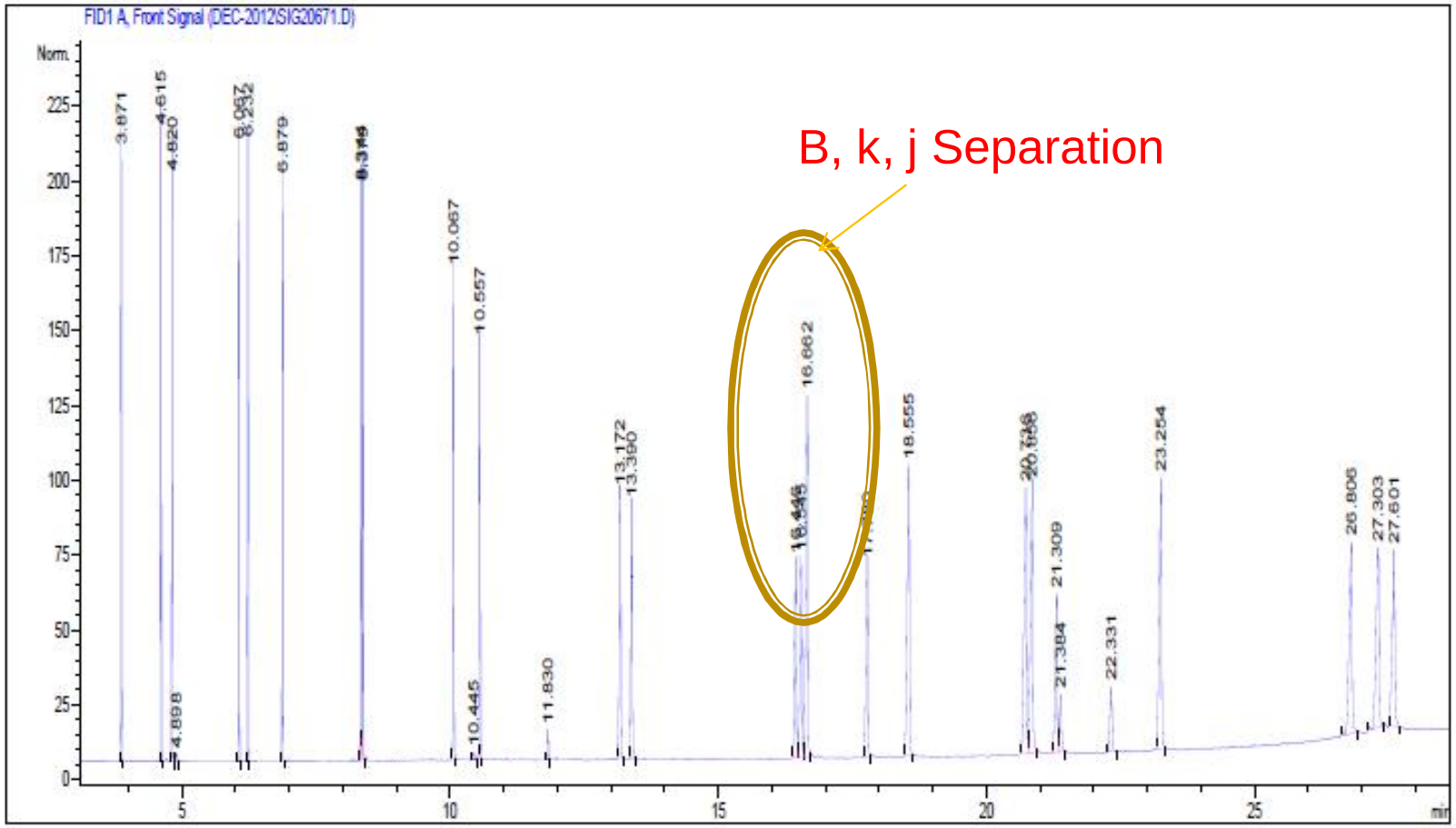
26 PAHs separations



Col GsBP-Select PAH, 30m x 0.25mm, (7125-3002)
Oven: 100C (1min) 15C/min to 285C 5C/min to 340C (10min)

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PAHs Peak ID

Naphthalene	3.87	Benzo(k)fluoranthene	16.55
1-Methylnaphthalene	4.61	Benzo(j)fluoranthene	16.66
2-Methylnapthalene	4.82	Benzo[a]pyrene	17.78
Acenaphthylene	6.07	3-Methylcholanthrene	18.56
Acenaphthene	6.23	Dibenzo(a,h)acridine	20.74
Fluorene	6.88	Dibenzo[a,j]acridine	28.86
Phenanthrene	8.34	Indeno(1,2,3-cd)pyrene	21.31
Anthracene	8.38	Dibenz[a,h]anthracene	21.38
Fluoranthene	10.07	Benzo[ghi]perylene	23.33
Pyrene	10.56	7H-Dibenzo(c,g)carbazole	23.25
Benzo[a]anthracene	13.17	Dibenzo[a,e]pyrene	26.81
Chrysene	13.39	Dibenzo(a,i)pyrene	27.3
Benzo[b]fluoranthene	16.45	Dibenzo(a,h)pyrene	27.6

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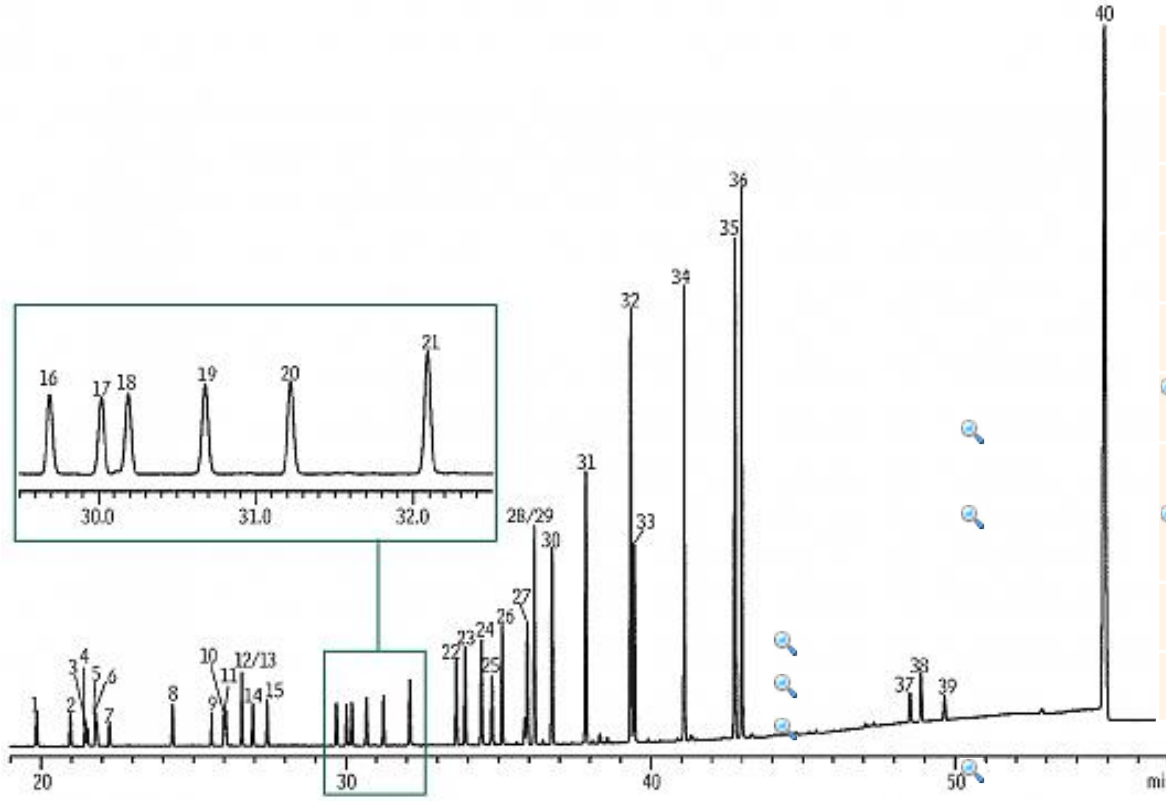
PBDEs



1BDE-10	11BDE-25	21BDE-77	31BDE-153
2BDE-7	12BDE-28	22BDE-100	32BDE-138
3BDE-8	13BDE-33	23BDE-119	33BDE-166
4BDE-11	14BDE-35	24BDE-99	34BDE-183
5BDE-12	15BDE-37	25BDE-116	35BDE-181
6BDE-13	16BDE-75	26BDE-118	36BDE-190
7BDE-15	17BDE-49	27BDE-85	37BDE-208
8BDE-30	18BDE-71	28BDE-155	38BDE-207
9BDE-32	19BDE-47	29BDE-126	39BDE-206
10BDE-17	20BDE-66	30BDE-154	40BDE-209

Column: PBDEColumn, 15m x 0.25mm x 0.1um
Oven: 100C (3min) 5C/min to 320C (15min)
Sample: 100-300 ppb PBDE PAR solution (cat.# EO-5113, Cambridge Isotope Laboratories Inc.), 1ul Splitless

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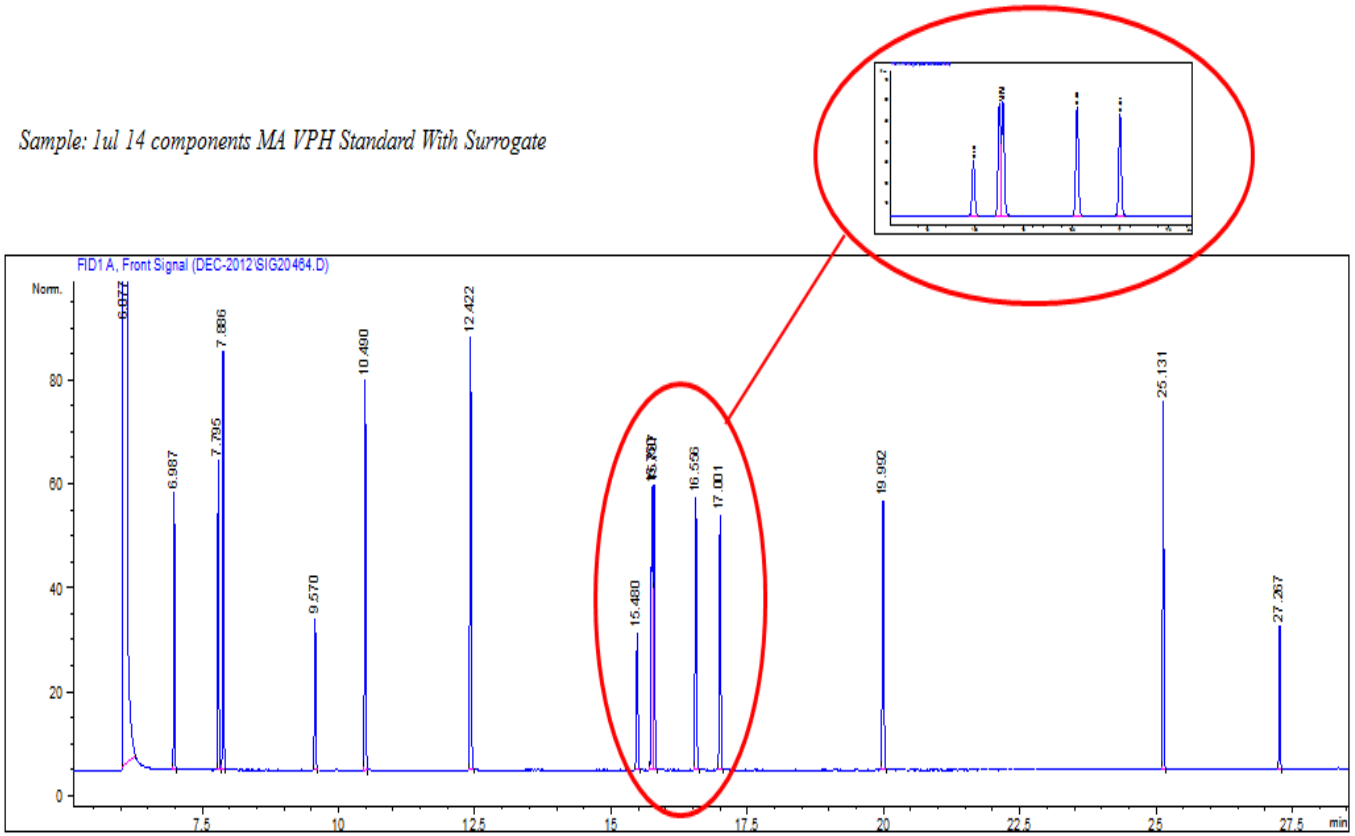
14 VPHs on GsBP-PONA Column, BTEX, BTEX and other light hydrocarbon

Sample: 1ul 14 components MA VPH Standard With Surrogate



Peak Name	RT(min)	Resolution
Methanol	5.984	
Pentane	6.578	
MTBE	7.057	
2-methylpentane	7.115	2.38
Benzene	8.272	
Iso-Octane	8.917	
Toluene	10.605	
Ethylbenzene	13.965	
m-Xylene	14.32	
p-Xylene	14.368	1.2
o-Xylene	15.47	
Nonane	16.136	

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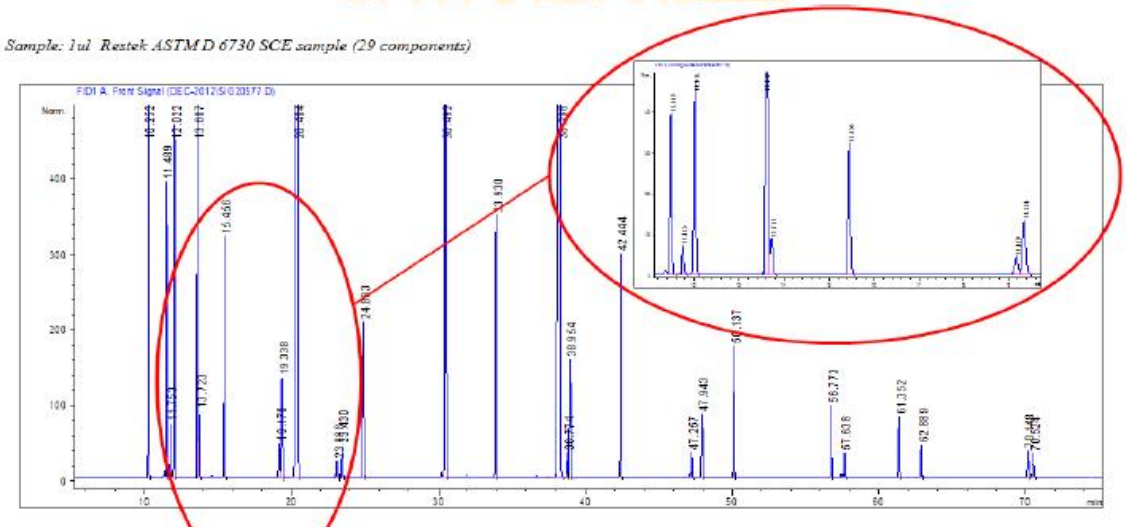
29VOCs on GsBP-PONA Column



Peak #	Component	Concentration	MeasRetTime	Resolution
1	Ethanol	8%	10.252	
2	n-Pentane	2%	11.489	
3	Tert-butanol	0.50%	11.753	
4	2-methylbutene-2	2.50%	12.022	
5	Methyl Tert Butyl Ether (MTBE)	10%	13.607	
6	2,3-Dimethylbutane	0.50%	13.723	2.11
7	n-Hexane	2%	15.456	
8	1-Methylcyclopentene	0.50%	19.17	
9	Benzene	1%	19.338	2.04
10	Cyclohexane	28.90%	20.404	
11	3-Ethylpentane	0.20%	23.088	
12	Trans-1,2-Dimethylcyclopentane	0.50%	23.43	3.70
13	n-Heptane	2%	24.883	
14	2,2,3-Trimethylpentane	0.50%	30.419	

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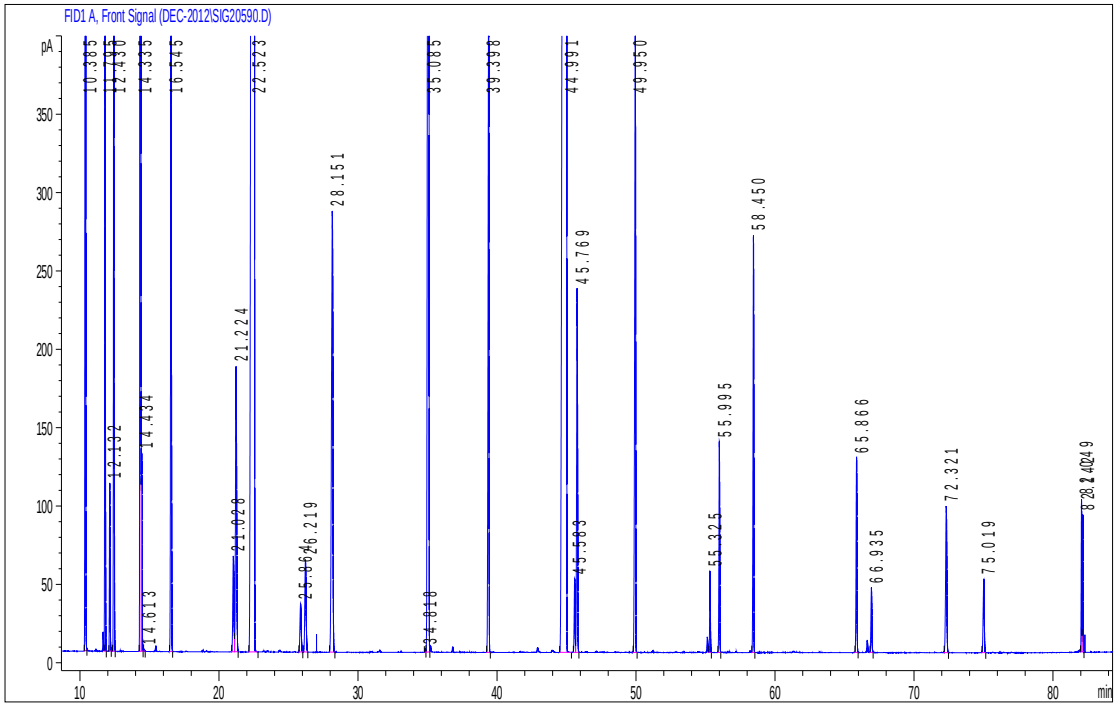
Benzene , Ethanol and MTBE



Peak No.	Compound	Concentration (%)	Retention Time (min)	Partition Ratio (k')	Resolution
1	Ethanol	8%	10.385	0.289	
2	Pentane	2%	11.795	0.464	
3	Tert-butanol	0.50%	12.132	0.506	
4	2-methylbutene-2	2.50%	12.43	0.543	
5	Methyl tert-butyl ether(MTBE)	10%	14.335	0.780	
6	2,3-dimethylbutane	0.50%	14.434	0.792	1.86
7	Hexane	2%	16.545	1.054	
8	1-methylcyclopentene	0.50%	21.028	1.611	
9	Benzene	1%	21.224	1.635	2.81
10	Cyclohexane	28.90%	22.523	1.796	
11	3-ethylpentane	0.20%	25.864	2.211	
12	1-tert-2-dimethylcyclopentane	0.50%	26.219	2.255	4.69
13	Heptane	2%	28.151	2.495	

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Let us know your needs

- We recommend the suitable product to you
- We do cross-reference for you
- We deliver solution to you

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