

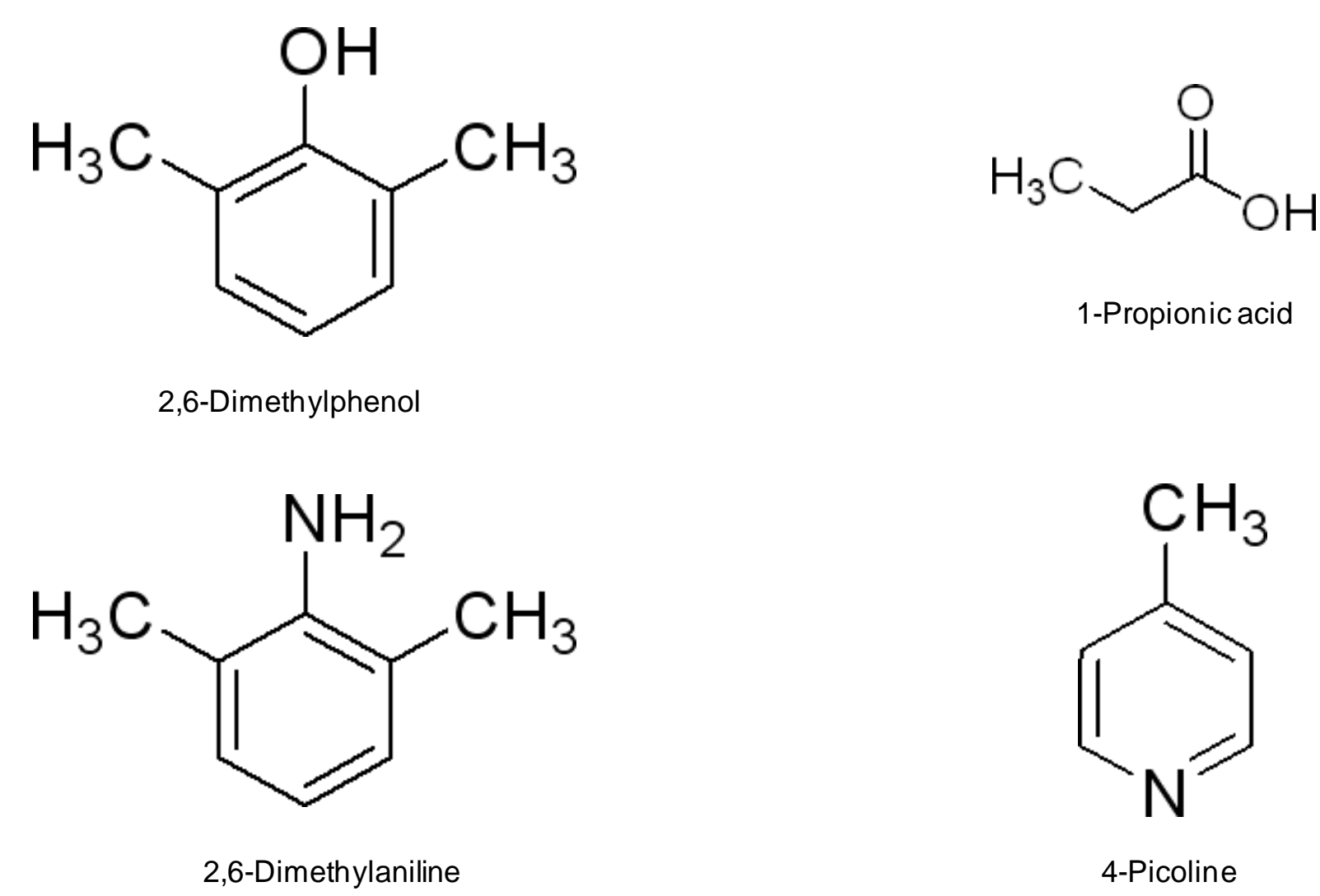
Abstract

Gas chromatographic methods for active analytes require columns that deliver both low bleed profiles and high inertness. Manufacturing processes for GC columns now typically control bleed profiles well. Column activity or level of inertness is a different story, particularly for active analytes. Currently, few manufacturers meet the challenge of working with active analyte sets by verifying inertness performance with demanding probes such as propionic acid, trimethyl phosphate and 4-picoline. Fewer still are individually testing each column with demanding probes and shipping proof of inertness performance in each box.

The best use of inertness verified columns are in applications where acidic and basic species are part of the analyte set such as semi-volatiles, drugs of abuse, or organo-phosphorous pesticides. Trace and ultra trace analyses, also benefit from the use of these columns as low-level analytes can easily disappear on active sites on less inert columns. These columns work hand in hand with GC-QQQ approaches to achieve impressive levels of detection and quantitation. Work with challenging matrixes and/or unknown samples are excellent uses for these columns.

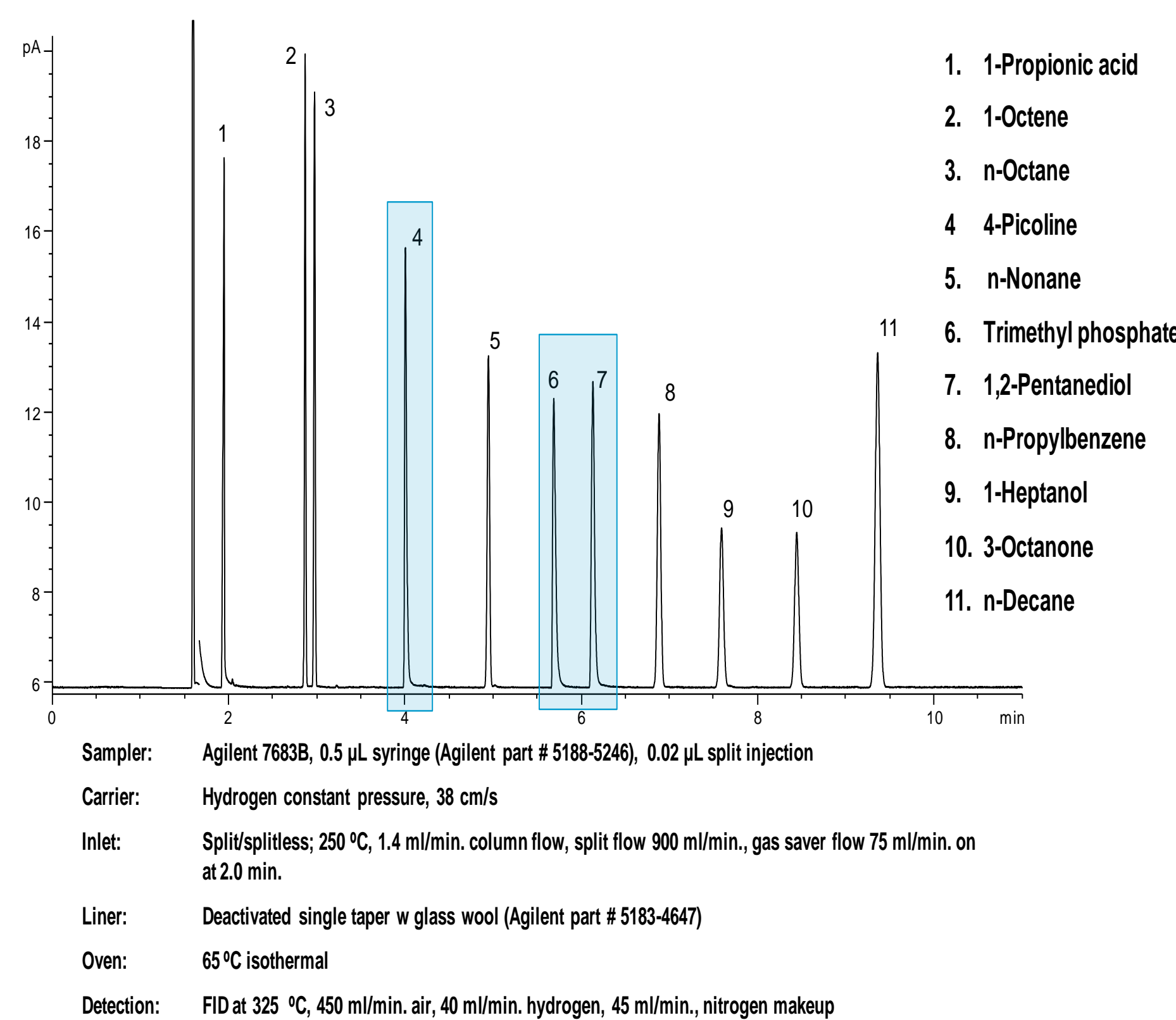
Semi-volatile analysis, drugs of abuse, multi-residue pesticide analysis, and GC-QQQ chromatograms help illustrate the peak shapes, recoveries and quantitation achievable with inertness verified columns. These columns are finding their way into applications across a wide variety of industries, including food analysis, consumer products and oil exploration.

Strong Vs. Weak Probes



Ultra Inert Test Mix Results

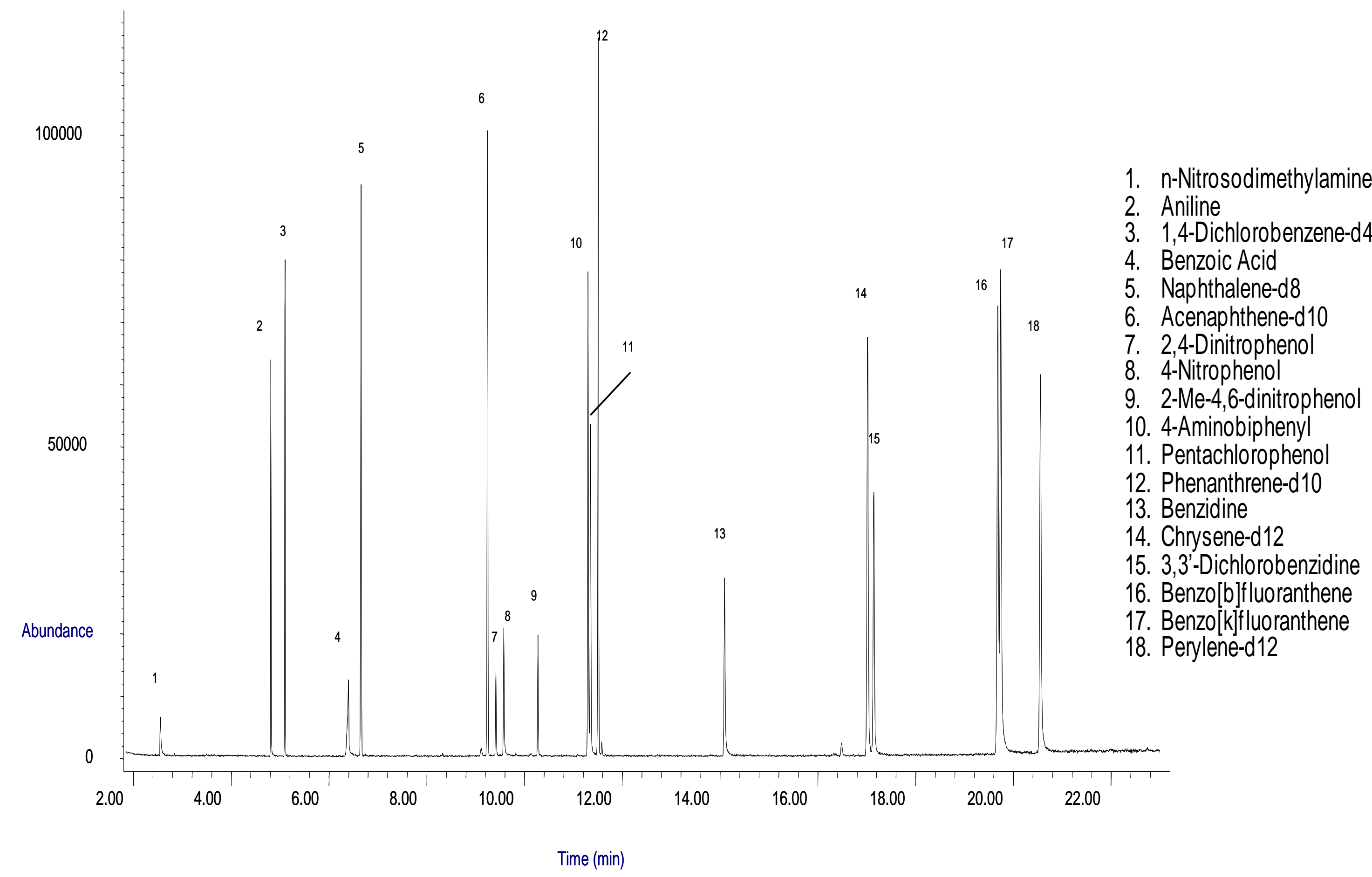
Agilent J&W DB-5ms Ultra Inert



Application Examples

Semi-Volatiles Application

Agilent J&W HP-5ms Ultra Inert 20m x 0.18mm x 0.18µm column



Sample: 0.5 ng on column loading of Short Mix components with STD
Column: Agilent J&W HP-5ms Ultra Inert 20m x 0.18mm x 0.18µm (Agilent part # 19091S-577UI)
Carrier: He, 37cm/sec, Ramped flow; 0.7ml/min (0.1min) to 1.3ml/min (15ml/min²)
Oven: 35 °C (2.5 min) to 80 °C (40 °C/min), 15 °C/min to 200 °C, 8 °C/min to 275 °C (2 min)
Injection: 0.5µl, Splitless, 280 °C, purge flow 30ml/min at 0.75 min
MSD: Transfer Line 290 °C, Source 300 °C, Quad 180 °C

Phthalates in Toys Application

Agilent J&W DB-5ms Ultra Inert 30m x 0.25mm x 0.25µm column

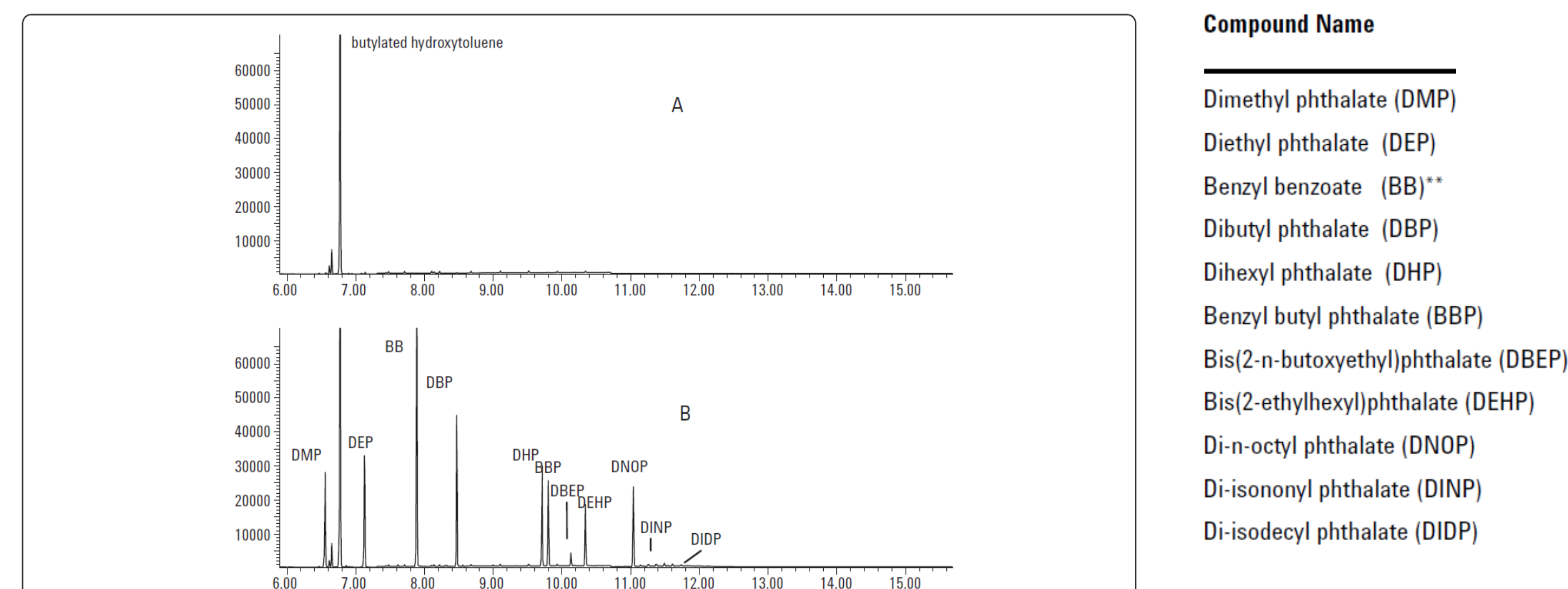


Figure 7. TIC of infant pacifier extract (A) and sample #2 (pacifier) extract spiked with 2-ppm phthalate mixture (B).

GC Conditions
Column: Agilent J&W DB-5ms Ultra Inert capillary column, 30 m x 0.25 mm, 0.25 µm (p/n 122-5532UI)
Inlet Temperature: 290 °C
Carrier Gas: Helium at 1 mL/min
Injection Mode: Splitless, pulse injection at 35 psi for 0.5 min, splitless injection liner (Agilent p/n 5188-3316).
Injection Volume: 1 µL
Oven Program: 50 °C for 1 min to 280 °C at 30 °C/min to 310 °C at 15 °C/min hold for 4 min

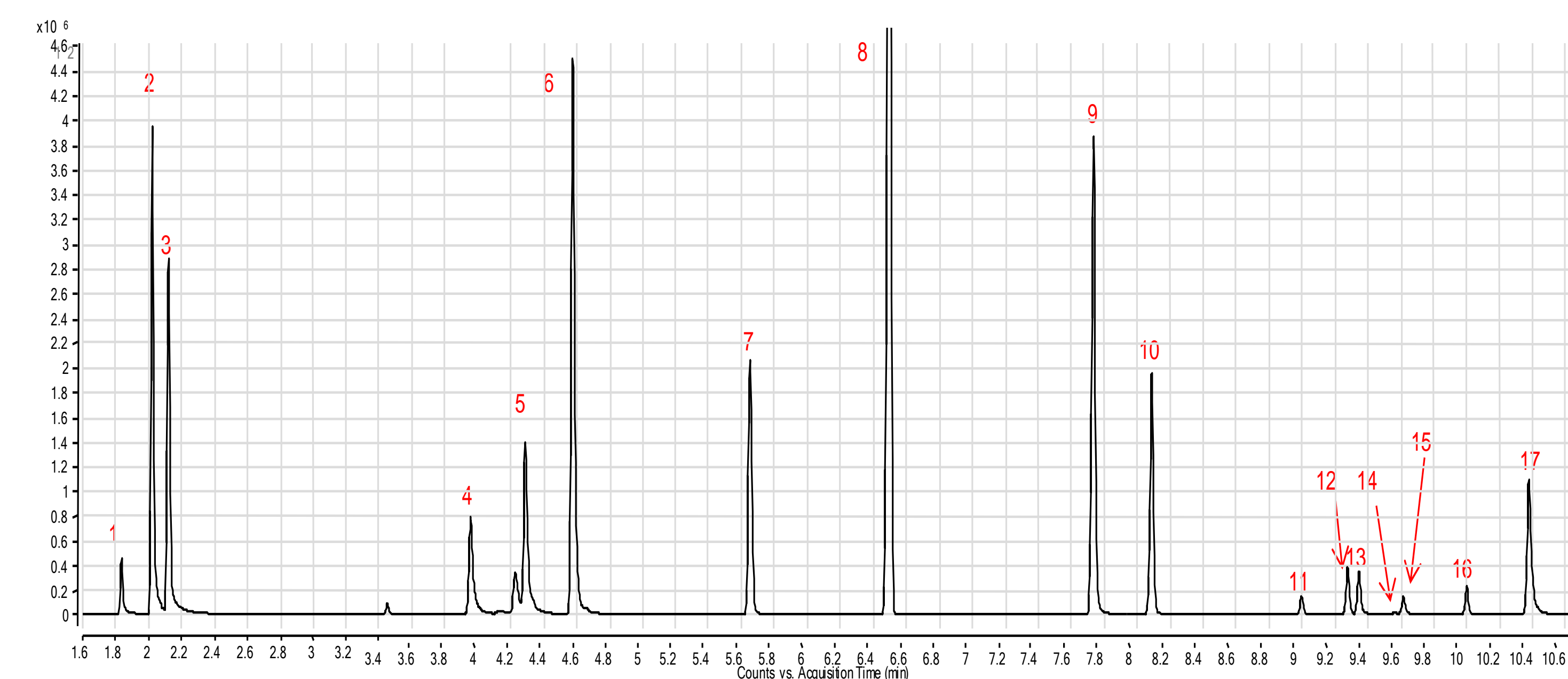
Compound Name

Dimethyl phthalate (DMP)
 Diethyl phthalate (DEP)
 Benzyl benzoate (BB)**
 Dibutyl phthalate (DBP)
 Dihexyl phthalate (DHP)
 Benzyl butyl phthalate (BBP)
 Bis(2-n-butoxyethyl)phthalate (DBEP)
 Bis(2-ethylhexyl)phthalate (DEHP)
 Di-n-octyl phthalate (DNOP)
 Di-isononyl phthalate (DINP)
 Di-isodecyl phthalate (DIDP)

Drugs of Abuse Application

Agilent J&W DB-5ms Ultra Inert 15m x 0.25mm x 0.25µm column

TIC of the Agilent 7000A Triple Quad GC/MS system in MRM mode. Standard solution of 1 ng/µL.



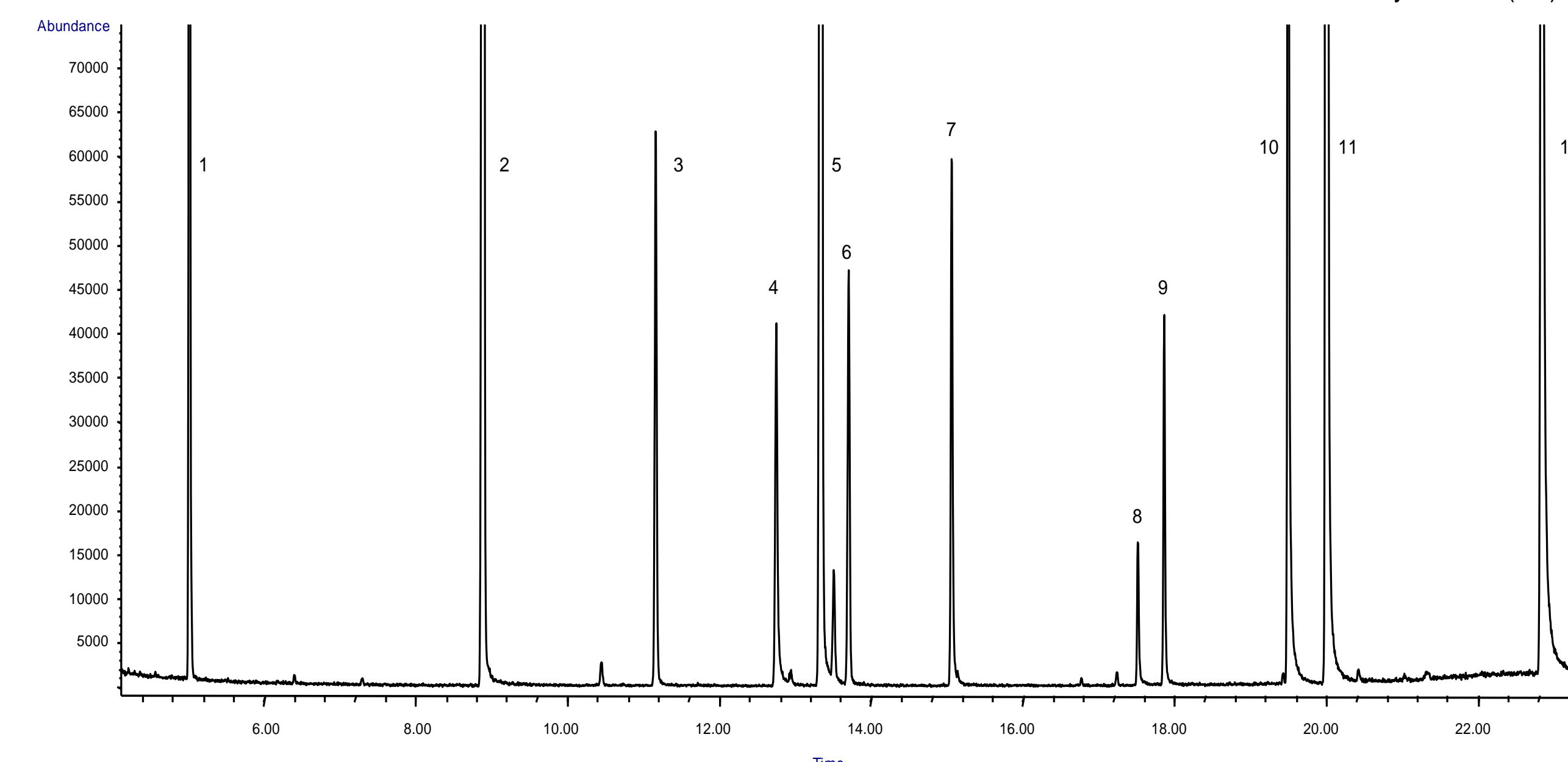
Peak identifications:

1 Amphetamine	6 MDEA	11 Codeine
2 Phentermine	7 Meperidine	12 Hydrocodone
3 Methamphetamine	8 PCP (phencyclidine)	13 THC
4 MDA	9 Methadone	14 6-Acetylmorphine
5 MDMA (ecstasy)	10 Cocaine	15 Oxycodone
		16 Heroin
		17 Fentanyl

Organophosphorous Pesticide Standard Application

Agilent J&W DB-5ms Ultra Inert 30m x 0.25mm x 0.25µm

GC/MSD Conditions
Sample: 1ng on column 507 Mix A Standard, 5ng on column IS/SS 525.2 IS/SS Standard
Column: Agilent J&W DB-5ms Ultra Inert 30m x 0.25mm x 0.25µm (Agilent part # 122-5532UI)
Carrier: Helium 44cm/sec, constant flow
Oven: 40 °C (1min) to 110 °C (50 °C/min), 7 °C/min to 190 °C (0 min), 12 °C/min to 285 °C (2 min)
Injection: Pulsed Splitless, 250 °C, Pulse pressure 40psi until 0.75min, Purge flow 50ml/min at 1min
MSD: Transfer Line 280 °C, Source 250 °C, Quad 150 °C



1	1,3-Dimethyl-2-nitrobenzene(SS)
2	Acenaphthene-d10(S)
3	Cycloate
4	Prometron
5	Phenanthrene-d10(S)
6	Disulfoton
7	Ametryn
8	Fenamiphos
9	Tribufos (DEF)
10	Triphenyl phosphate(SS)
11	Chrysene-d12(S)
12	Perylene-d12(SS)

Best Uses for Inertness Verified Columns

- Active analyte analysis
- Trace and ultra trace analysis
- Sample limited analyses
- Unknowns

Conclusions

- Testing with aggressive probes is necessary for consistent inertness performance
- Use Ultra Inert columns for active analytes
- Excellent performance over a range of applications
- Best choice for trace level analysis
- Ultra inert columns consistently deliver less activity, better Peak Shape, and better signal-to-noise ratios

For Additional Information

To learn more about Agilent J&W GC/MS and Ultra Inert columns – or other Agilent products and services – visit us online at:

www.agilent.com/chem/UltraInert_5ms
 or www.agilent.com/chem/UltraInert_1ms

For the specifics on the applications cited here enter the Agilent Publication (XXXX-XXXXEN) number in the part number field for free display or download of the application note

Pertinent References

Semi-volatile Organics Analysis Using an Agilent J&W HP-5ms Ultra Inert Capillary GC Column, Doris Smith and Ken Lynam 5990-3416EN

Semi-volatile Analysis Using an Inertness Performance Tested Agilent J&W DB-5ms Ultra Inert Column, Ken Lynam 5989-8616EN

A Direct 5 ms Column Performance Comparison for Active Semi-Volatile Analytes, Ken Lynam and Doris Smith 5990-4041EN

Toxicology Screening of Whole Blood Extracts Using GC/Triple Quadrupole/MS, Bruce Quimby and Mike Szelewski 5990-3640EN

Low Part-per-Billion Level Pesticides Screening in Traditional Chinese Medicine Using the Agilent 7000A GC/MS/MS, Wei Luan, Melissa Churley, and Mike Szelewski 5990-3568EN

Organophosphorus Pesticides Analysis Using an Agilent J&W DB-5ms Ultra Inert Capillary GC Column, Doris Smith and Ken Lynam 5989-9879EN

Determination of Phthalate Concentration in Toys and Children's Products, Yun Zou and Min Cai 5990-4683EN

Lavender Oil Characterization Using Agilent J&W DB-1ms Ultra Inert Capillary GC Columns, Ken Lynam and Doris Smith 5990-3700EN