

Exploration of New Low-Pressure GC Columns for Food and Environmental Emerging Contaminants

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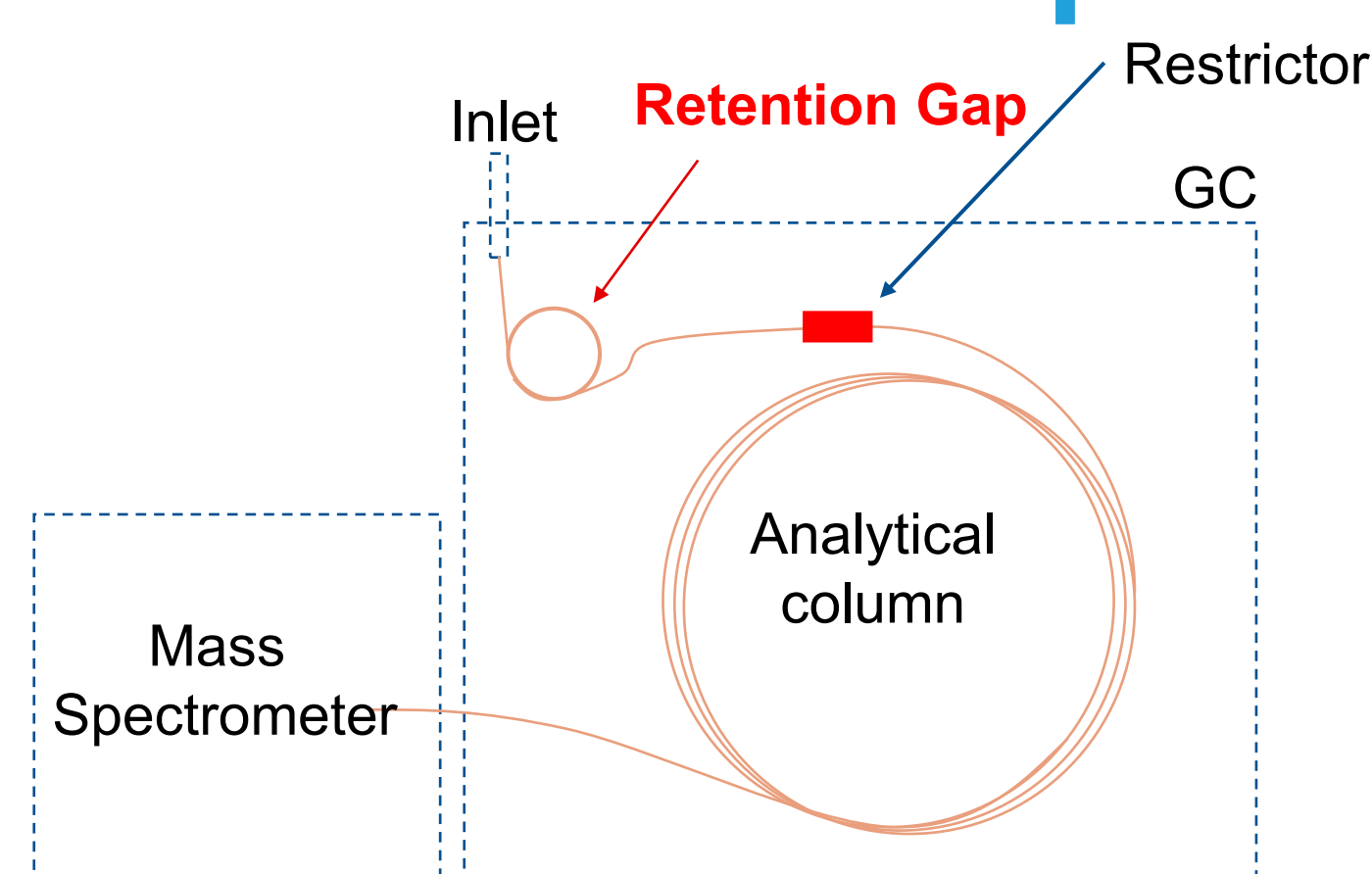
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Introduction

The Low-Pressure GC (LPGC technique) has been successfully used in the past for pesticide residues' analysis. However, the technique is very versatile, and it allows for other applications, especially if different column phases are used. So far, the majority of the applications have been using the "5"-type phase (95% dimethylpolysiloxane, 5% diphenyl polymer). To expand on the previous applications, four additional column phases were selected (cyanopropylphenyl dimethylpolysiloxane; 50% dimethylsiloxane, 50% diphenyl; 65% dimethylsiloxane, 35% diphenyl; and trifluoropropylmethyl polysiloxane phases) to analyze various food and environmental contaminants, such as nitrosamines, alkylfurans, phthalates, arylamines and fluorotelomer alcohols.

The LPGC techniques provided significant reduction in run times (up to 3.3x faster runs) and helium consumption reduction (up to 81% less helium used), while keeping an acceptable resolution.

LPGC Setup



Column set is delivered pre-connected in the box.
Only extra consumable needed is 0.5 mm or 0.8 mm vespel/graphite ferrule for MS transfer line

LPGC Advantages

Fast analysis with short 0.53 mm or 0.32 mm capillaries

- Short analysis times
- Potentially increased sensitivity
- Potentially higher capacity

Peak width enough for any type of MS

Lower elution temperatures

- Elution at 50-80°C lower temperatures
- Lower bleed

All stationary phase chemistries

Standard injection techniques, high volume injections

Limitations of LPGC

Strategies for Addressing Shortcomings

Loss of theoretical plates (compared to conventional column)

- Can be mitigated by selective detection by MS

Greater potential for leaks

- Pre-connected set

More complicated to cut analytical column

- Less need to cut column

Need for MS instrument

Can I use LPGC for my application?

Questions to ask yourself

Is MS a suitable detector?

- Vacuum is needed

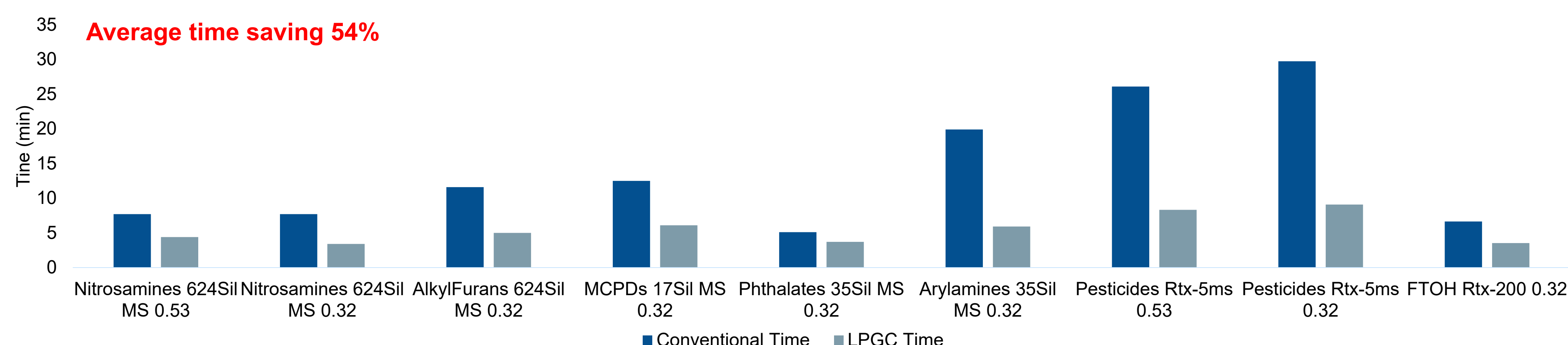
What kind of column is the conventional method using?

- In general, most conventional methods with 30 m column can be translated to LPGC method

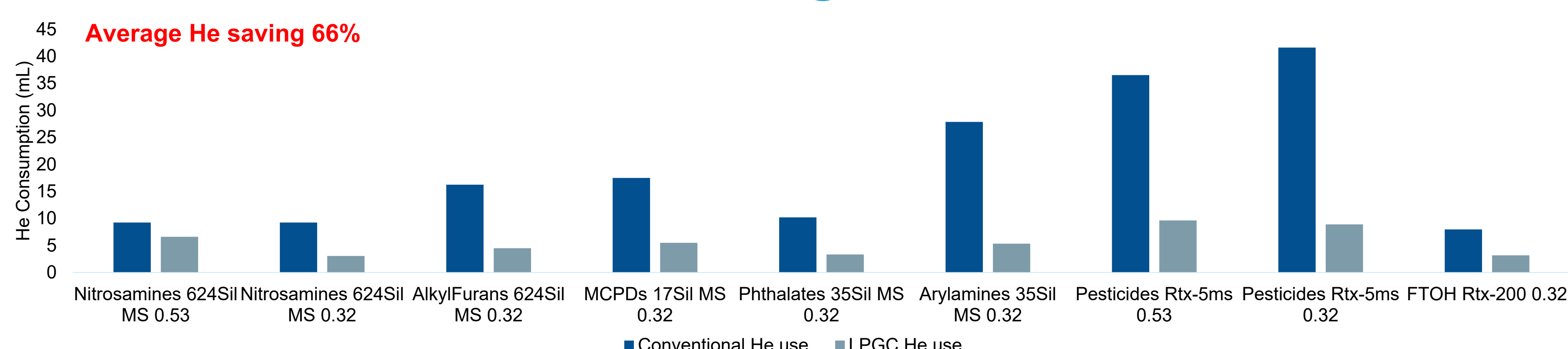
Are there isobars to resolve?

- What level of resolution is needed?
- What is the resolution in the conventional method? If it is above 2.0, usually we can get peaks resolved

Time Savings with LPGC

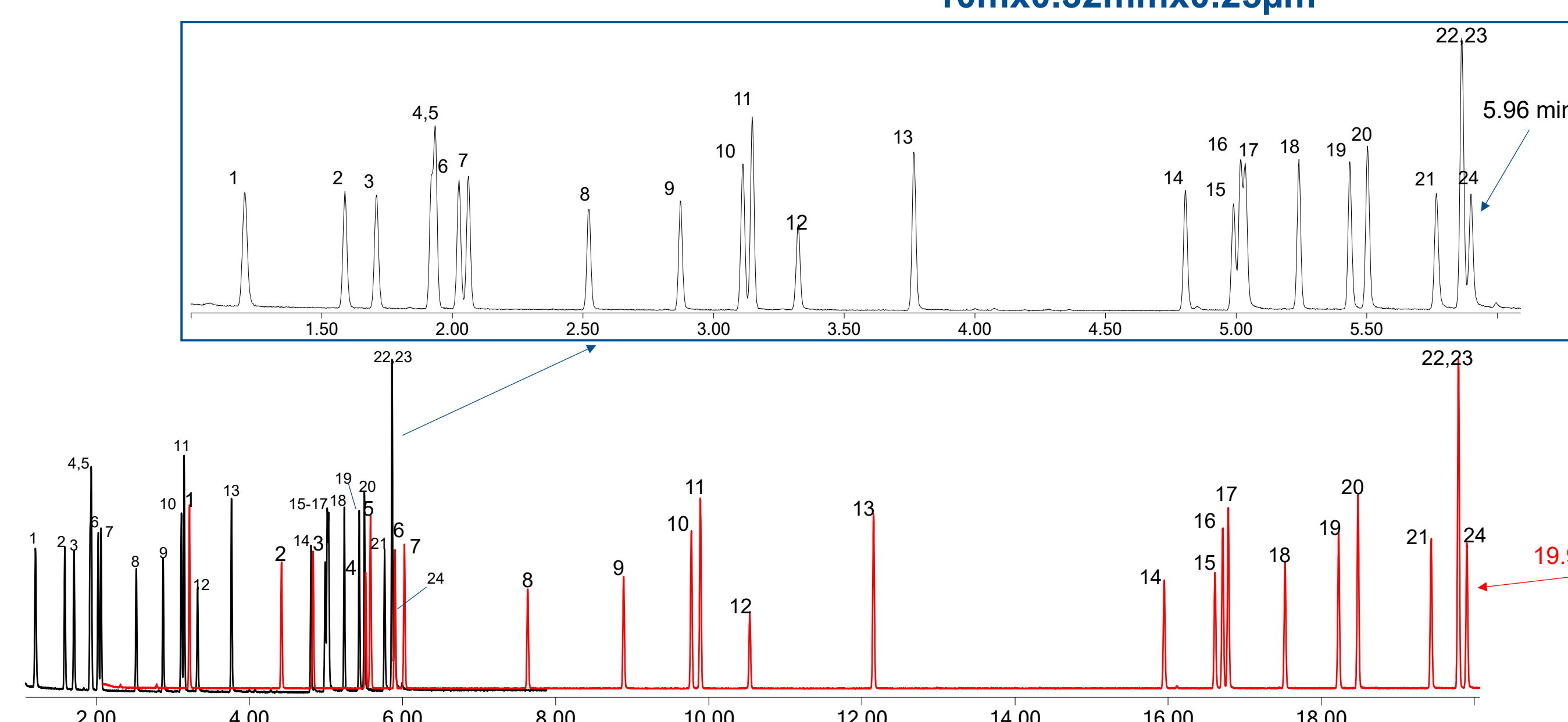


Helium Savings with LPGC



LPGC Rxi-35Sil MS Arylamines

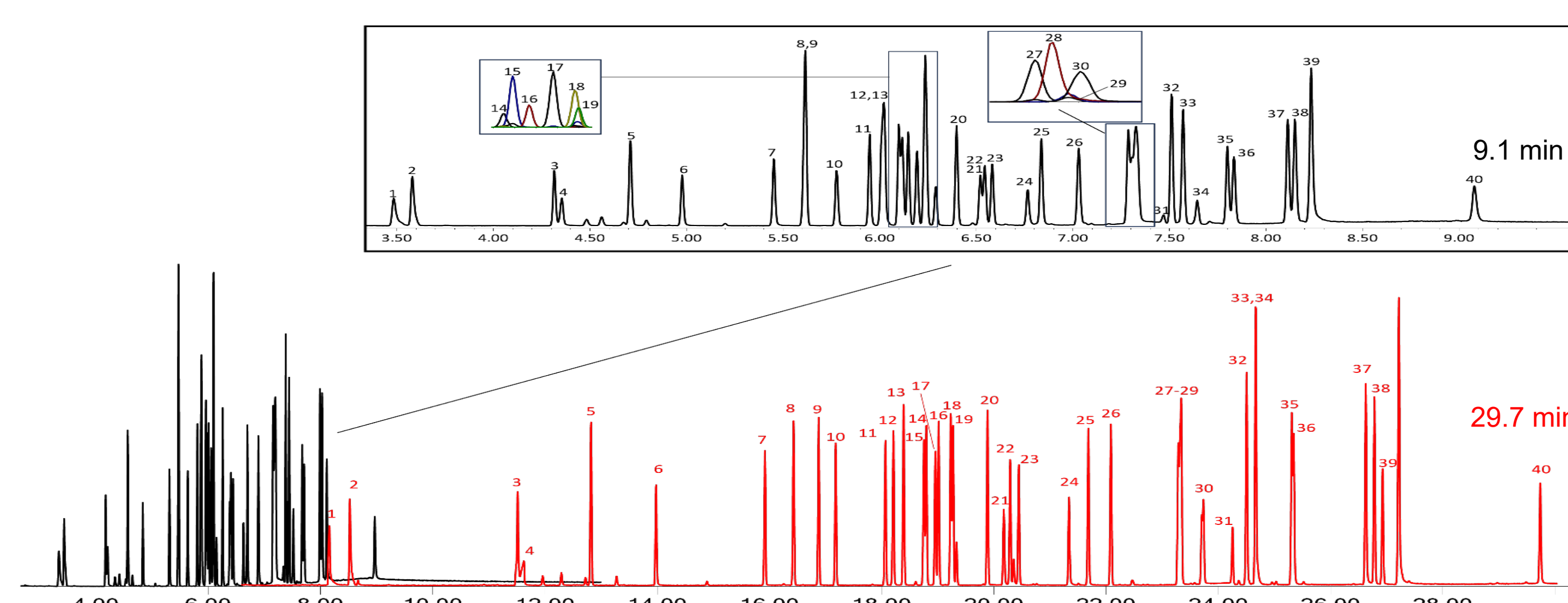
10mx0.32mmx0.25µm



- 1) o-Toluidine
- 2) o-Anisidine
- 3) 4-Chloroaniline
- 4) p-Cresidine
- 5) 2,4,5-Trimethylaniline
- 6) 3-Chloro-o-toluidine
- 7) 4-Chloro-o-toluidine
- 8) 2,4-Diaminotoluene
- 9) 2,4-Diaminoanisole
- 10) 2-Naphthylamine
- 11) 2-Aminobiphenyl
- 12) 2-Amino-4-nitrotoluene
- 13) 4-Aminobiphenyl
- 14) p-Aminoazobenzene
- 15) 4,4'-Oxydianiline
- 16) 4,4'-Diaminodiphenylmethane
- 17) Benzidine
- 18) o-Aminoazotoluene
- 19) 3,3'-Dimethyl-4,4'-diaminodiphenylmethane
- 20) 3,3'-Dimethylbenzidine
- 21) 4,4'-Thiodianiline
- 22) 3,3'-Dichlorobenzidine
- 23) 4,4'-Methylenebis (2-chloroaniline)
- 24) 3,3'-Dimethoxybenzidine

LPGC Rtx-5ms Pesticides

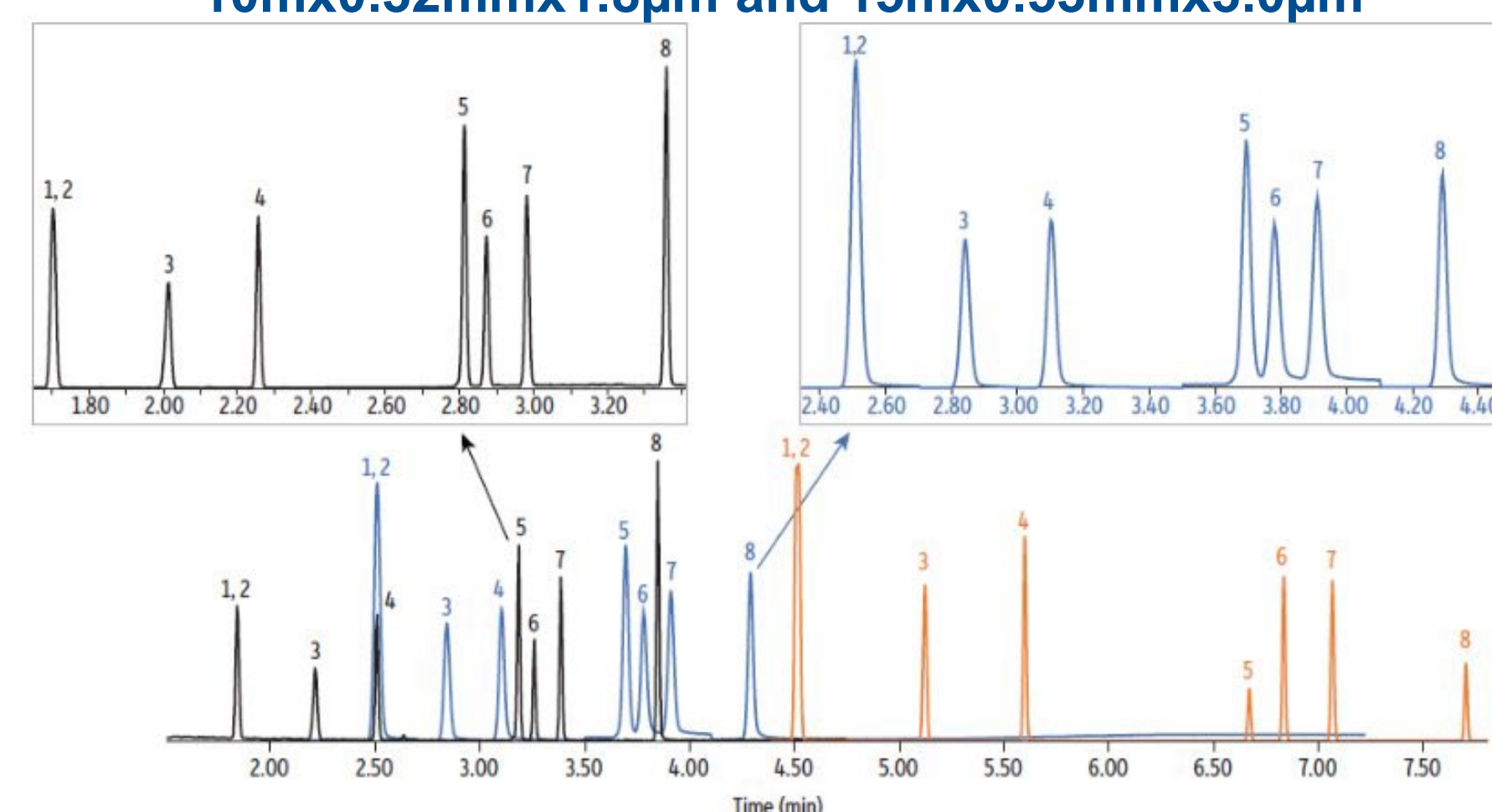
10mx0.32mmx1.0µm



- 1) Methamidophos
- 2) Dichlorvos
- 3) Mevinphos
- 4) Acephate
- 5) o-Phenylphenol
- 6) Omethoate
- 7) Dimethoate
- 8) gamma-BHC
- 9) Diazinon
- 10) Chlorothalonil
- 11) Vinclozolin
- 12) Carbaryl
- 13) Metalaxyl
- 14) Pirimiphos methyl
- 15) Methiocarb
- 16) Malathion
- 17) Dichlofuanid
- 18) Fenthion
- 19) Chlorpyrifos
- 20) Cyprodinil
- 21) Thiabendazole
- 22) Captan
- 23) Folpet
- 24) Imazalil
- 25) Myclobutanil
- 26) Endrin
- 27) 4,4'-DDT
- 28) Endosulfan sulfate
- 29) Fenhexamid
- 30) Propargite
- 31) Dicofof
- 32) Iprodione
- 33) Bifenthrin
- 34) Fenpropathrin
- 35) Phosalone
- 36) Azinphos-methyl
- 37) cis-Permethrin
- 38) trans-Permethrin
- 39) Coumaphos
- 40) Deltamethrin

LPGC Rxi-624Sil MS Nitrosamines

10mx0.32mmx1.8µm and 15mx0.53mmx3.0µm



- 1,2) NDMA, NDMA-d6, 3) NMEA, 4) NDEA, 5) NDPA, 6) NPYR, 7) NPIP, 8) NDPA

Conclusions

Multiple new LPGC column kit were tested

- Analysis up to 3.3x faster
 - Limited by the temperature program
- Up to 81% less helium used
- Acceptable resolution

Expanding the LPGC applications beyond pesticides

No need to change instrumentation

- Now compatible with all instruments

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