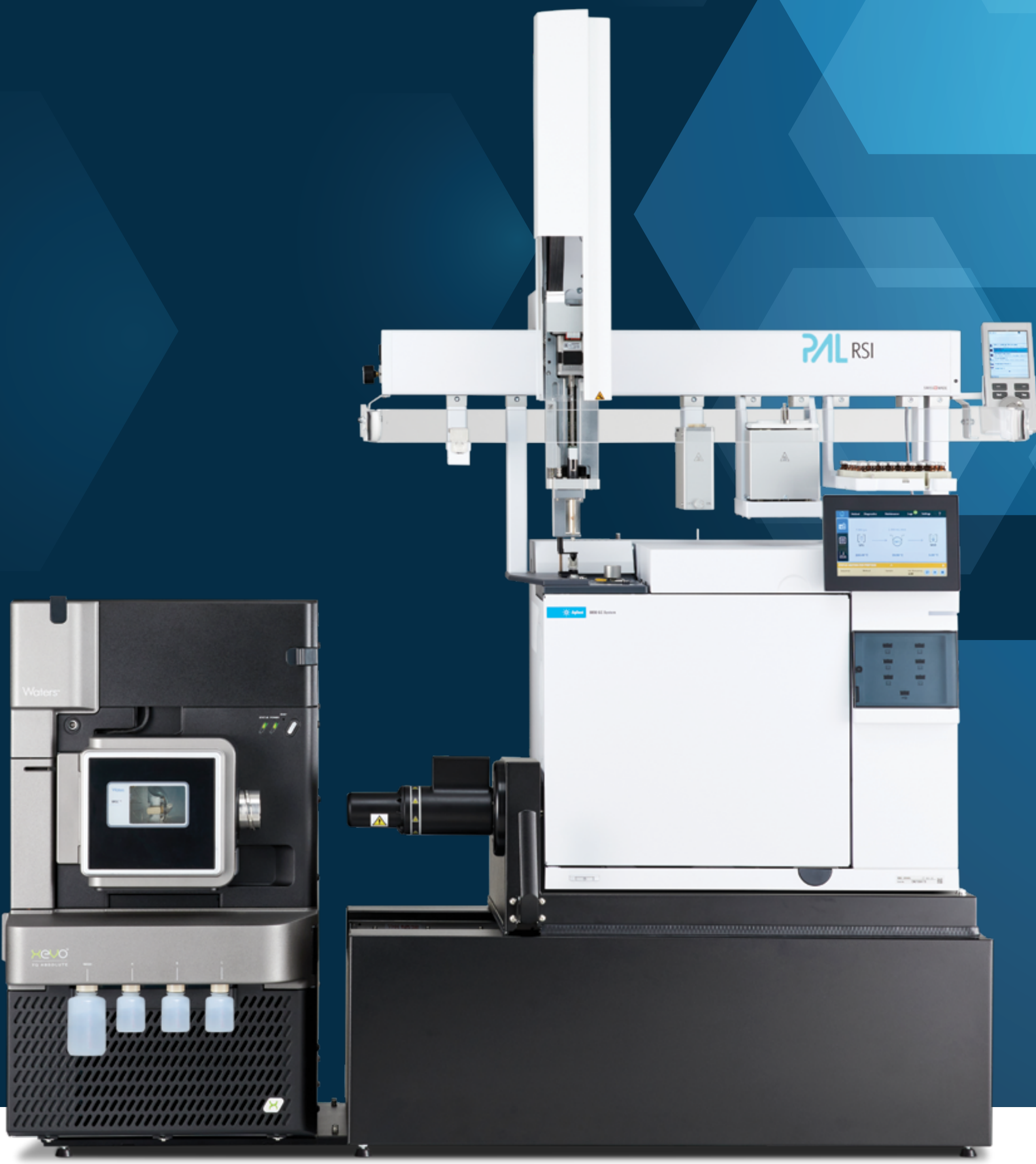
APGC

No Compromise Atmospheric Pressure Ionization GC/MS



Waters™

Next Generation GC-MS is Already Here

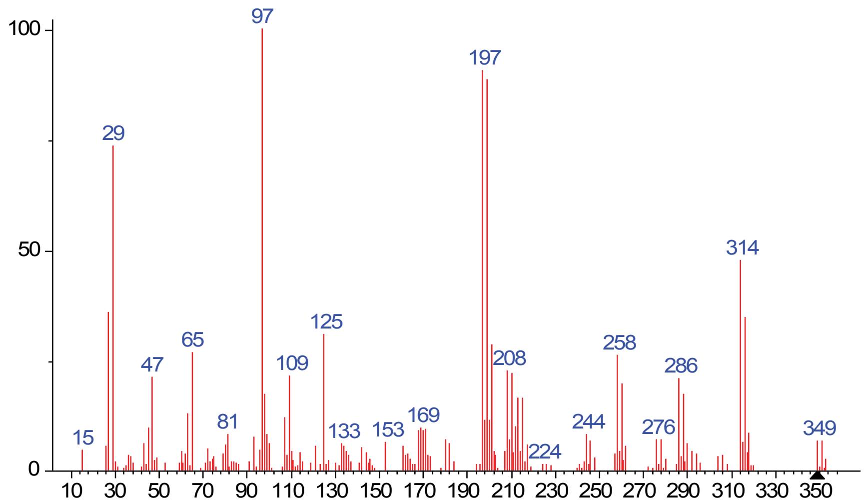
Discover what benefits the next generation of GC-MS/MS can offer your laboratory in terms of operational efficiency, cost savings and analytical quality. Atmospheric Pressure Gas Chromatography (APGC™) technology offers a powerful alternative to electron ionization (EI) for gas chromatography coupled with mass spectrometry (GC-MS). With APGC ionization occurring at atmospheric pressure, many limitations experienced in vacuum-based systems can be overcome, achieving:

- Increased selectivity and confidence in analyte identification and confirmation
- Increased sensitivity, enabling low limits of detection, streamlined sample preparation and/or injection modes for less matrix on column, thus reducing system maintenance
- Higher operating pressures which allow flexibility in terms of carrier gas flows and sustainable options

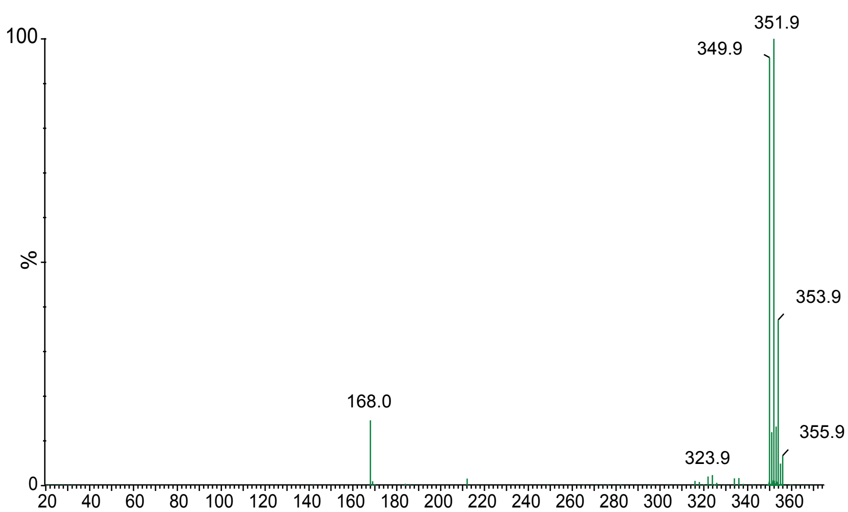
Selectivity And Sensitivity For Improved Confidence

APGC technology takes advantage of soft, atmospheric pressure chemical ionization (APCI) to create high abundance molecular ions for most analytes in contrast to the highly fragmented spectra commonly observed using electron ionization. This provides increased selectivity, sensitivity and confidence in analyte identification, especially in complex matrices where analytes and/or co-extractives may have similar fragment ions.

(a) GC-EI-MS/MS spectrum



(b) GC-APCI-MS/MS spectrum



Example spectra for chlorpyrifos (molecular formula $C_9H_{11}C_{l3}NO_3PS$, monoisotopic mass 348.9 Da).

(a) EI spectrum (taken from NIST) is highly fragmented

(b) The spectrum acquired by APGC shows less fragmentation at sample introduction, with $[M+H]^+$ as the most intense choice for a precursor ion.

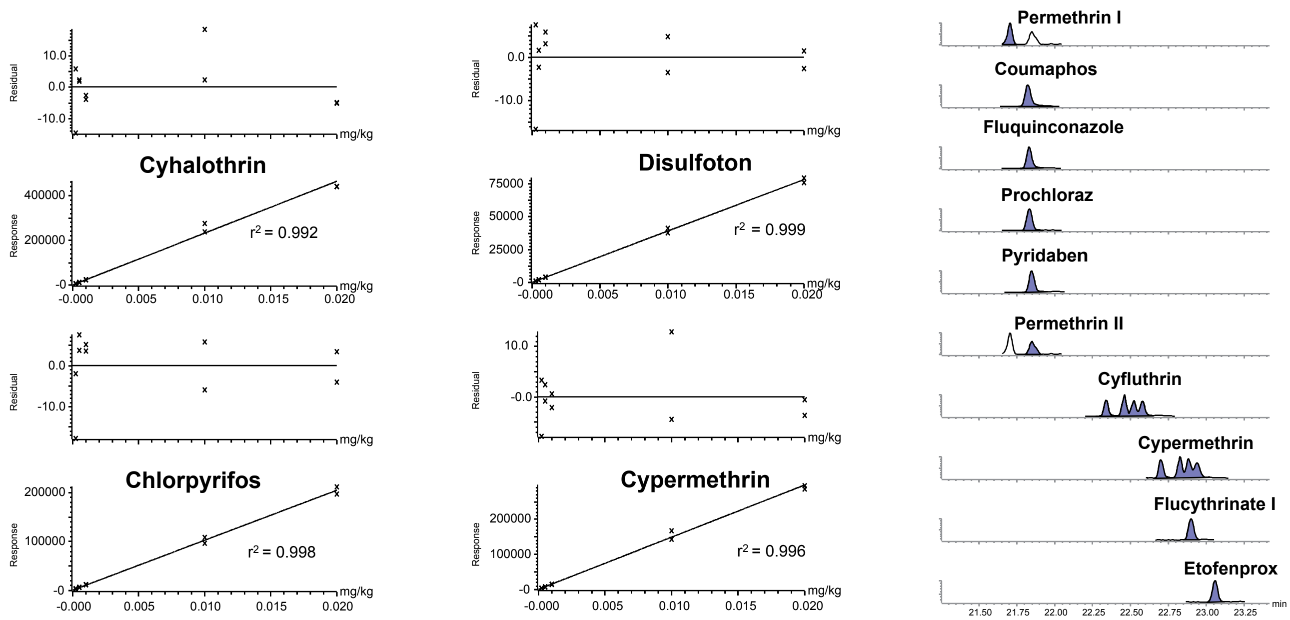
"APGC is a more sensitive and selective technique, because if we have the whole molecule we can detect with greater confidence if there are contaminants in the sample and in what proportion."

Research science leader at water testing lab, Europe

Enabling Robust Injection Techniques for Increased Productivity

The sensitivity gain achieved by APGC often allows for more flexible and preferred injection techniques providing more robust operation, such as:

- Lower injection volumes to reduce the absolute matrix load, reducing the time and cost of consumables and instrument maintenance
- Split injection mode to improve method performance and analyte stability
- Streamlined sample preparation, for example avoiding time consuming and manual concentration, evaporation and/or solvent exchange steps, while still achieving your required reporting limits.



Examples of linearity, repeatability and chromatography achieved in cottage pie (cooked meat and potatoes) baby food extract, with 1 µL injected in acetonitrile.

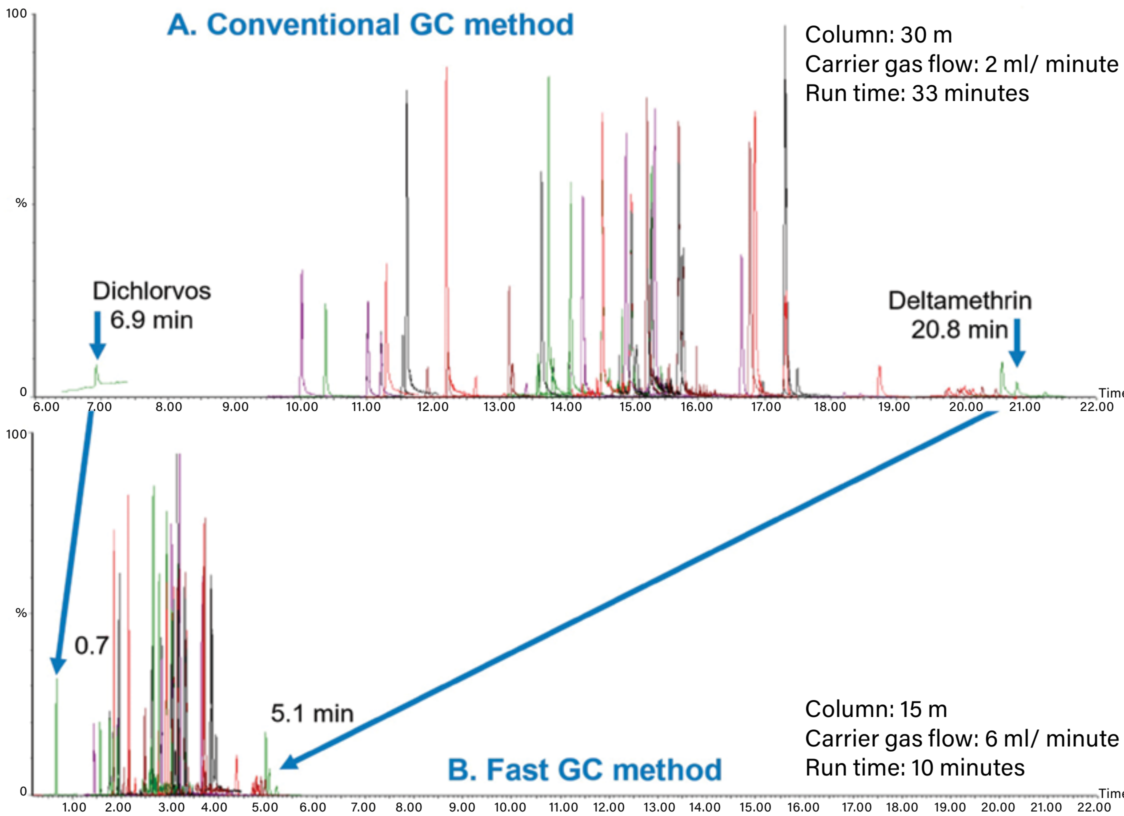
> "The instrument is very sensitive so you have the opportunity to inject less sample. That makes the GC stay clean longer and helps reduce the cost of materials."
>
> *Technical leader at food testing lab, Europe*

Increased Flexibility Offering Alternative Analytical Approaches

Laboratory productivity can be increased by coupling APGC's capabilities in terms of carrier gas flow rates and improved injection techniques. Running split injections at higher carrier gas flows allows for reduced runtimes, injection to injection, while conserving carrier gas over the analytical batch. In addition, the method's performance is not compromised.

"Companies that work with us are interested in knowing the capabilities of APGC in their project."

Research science leader at water testing lab, Europe



Fast GC method achieved by running at higher carrier gas flow rates, allowing for a 200% increase in throughput, or up to 23 minutes saved and reduced carrier gas consumption per injection.

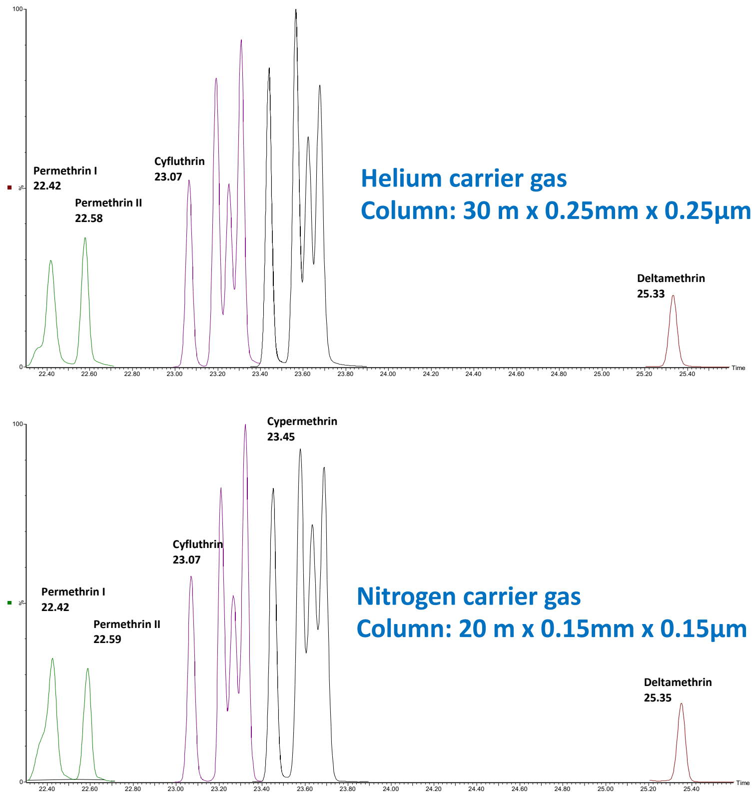
Unrestricted Use of Nitrogen as a Sustainable Carrier Gas Supply

With supplies of helium impacting ready access and cost, laboratories continue to explore alternatives to future proof their operation and continuity of service. Operating the GC source at atmospheric pressure enables the use of nitrogen as a carrier gas, without certain limitations experienced in vacuum-based GC systems. The unrestricted use of nitrogen in APGC-MS/MS enables laboratories to:

- Maintain method performance
- Ensure continuity of service
- Better manage costs with ready access to a more sustainable gas supply

"For the dioxins, we are analyzing completely with nitrogen. For the pesticides, we started it and it looks promising, but...it works, so if we have problems we can switch to nitrogen."

Technical leader at food testing lab, Europe



Comparison of a pesticide sample analysed using helium carrier gas (upper trace) and nitrogen carrier gas (lower trace). This illustrates that with APGC and the appropriate column choice, it is possible to maintain method performance and use nitrogen as an alternative to helium carrier gas.

All on Your MS Platform of Choice

Part of the universal source architecture of Waters' portfolio of MS/MS systems, APGC performance and benefits can be realized on your preferred mass spectrometry platform to meet your analytical needs.

- Xevo™ tandem quadrupole (TQ) MS for targeted screening, identification, quantitation and confirmation
- Xevo Quadrupole Time of Flight (Q-Tof) MS providing high resolution with accurate mass for non-targeted analysis
- SYNAPT™ and SELECT SERIES™ Cyclic ion mobility enabled Tof MS for an added dimension of selectivity with unparalleled resolution in non-targeted analysis

"This is one of my favourite instruments, it's highly sensitive and selective due to the soft ionisation with APGC. It is easy to operate, and low-maintenance compared to the magnet sector, which is a big benefit to routine analysis. Also, I'm able to switch between methods without any difficulty."

Senior instrument chemist at environment testing lab, North America

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Waters™

Waters Corporation
34 Maple Street
Milford, MA 01757 U.S.A.
T: 1 508 478 2000
F: 1 508 872 1990
waters.com