
IMPROVED PESTICIDE ANALYSIS WITH THE SUPERSONIC GC-MS AND ITS RECENTLY DEVELOPED ADVANCED TOOLS

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Supersonic GC-MS (GC-MS with Supersonic Molecular Beams (SMB)) is based on GC and MS interface with SMB and on electron ionization of sample compounds while they are cold in a fly-through ion source. The GC eluting sample compounds are mixed with helium make up gas, expand from the supersonic nozzle into a vacuum chamber, vibrationally cooled, skimmed and collimated into a SMB. Sample compounds seeded in the SMB pass a contact-free dual cage electron ionization ion source where they are ionized by 70 eV electrons and mass analyzed by a single or triple quadrupole MS system. The combination of the Supersonic GC-MS and a few of its recently developed tools provide the following features and benefits that serve to improve pesticide analysis:

- A) Enhanced and trustworthy molecular ions are exhibited which improve the detection selectivity, sensitivity and confidence level in the pesticide identity.
 - B) Extended range of thermally labile pesticides including carbamates is amenable for analysis thereby bridging the gap between GC-MS and LC-MS analyses.
 - C) A novel Isotope Abundance Analysis (IAA) method and software was developed. It helps to improved pesticide identification in all the MS modes of full scan, 3-4 ions SIM and MS-MS, even at trace level in complex agricultural matrices.
 - D) Pulsed Flow Modulation (PFM) GCxGC was developed, combined with the Supersonic GC-MS and applied for achieving more sensitive and selective universal pesticide analysis with only two ions SIM instead of 3 or 4.
 - E) Sample preparation effort could be reduced through the use of the ChromatoProbe sample introduction device with which dirty extracts can be introduced in a removable disposable vial. The ChromatoProbe further allows for large volume injections of complex agricultural matrices extracts for improved sensitivity.
 - F) A novel Open Probe was recently developed for enabling fast qualitative screening of a few target pesticides with fast Open Probe-MS-MS analysis instead of lengthy GC-MS.
 - G) A new type of low thermal mass fast GC with 1.5 m 0.32 mm ID columns and high column flow rate (16-50 ml/min) was developed and combined with the Supersonic GC-MS for achieving sub one minute repetitive GC-MS analysis cycle time of pesticides in complex matrices.
- As a result, the combination of Supersonic GC-MS and its advanced tools improve the detection sensitivity, selectivity, speed of analysis and confidence level in pesticide identification.
- A new Supersonic GC-MS system which is based on the combination of the SMB technology with the Agilent 5975 GC-MS will be described, and several examples will be demonstrated with emphasis on speeding up pesticide analysis in agricultural matrices. The subject of what is actually required for fast yet effective GC-MS analysis will be discussed.