

A FULLY AUTOMATED SYSTEM FOR SIMULTANEOUS HIGH SENSITIVITY DETECTION OF PAHS, PCBS AND MULTI-RESIDUE PESTICIDES IN WATER USING SPME ARROW AND APGC-MS/MS

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INTRODUCTION

With hundreds of compounds being used for crop protection around the world, pesticide residues are entering water bodies via runoff or leaching from treated agricultural fields and wastewater treatment plant effluents. There is a resulting need for rapid multi-residue screening to efficiently determine residue violations. A fully automated system is described which readily detects hundreds of compounds present at 20 parts per trillion concentration levels in water.



Figure 1: Waters Xevo TQ-XS with APGC and CTC PAL DHR (RTC/RTC) equipped for SPME Arrow as well as SPE using Waters Oasis Cartridges.

AUTOMATION WORKFLOW

The SPME Arrow technique involves the following steps:

1. Incubation of the sample in the (heated) agitator module
2. SPME Arrow Heatex Extraction in the heatex stirrer module
3. Desorption in the GC Injector and triggering of the GC-MS/MS analysis
4. Conditioning of the Arrow in the SPME Arrow conditioning module

A video of the fully automated SPME Arrow technique can be found here:



<https://youtu.be/pEB7qT1TUww>

SAMPLES

A test mix was prepared using a GC Multiresidue Standards Kit, PAH mix and PCB mix (Restek) containing over 200 compounds. This was used to spike a water sample, such that individual compounds were present at a concentration of **20 parts per trillion**. 5ml samples of spiked water in a 20ml vial were placed on the PAL tray.

RESULTS AND DISCUSSION

Some example results are shown in figure 2 below:

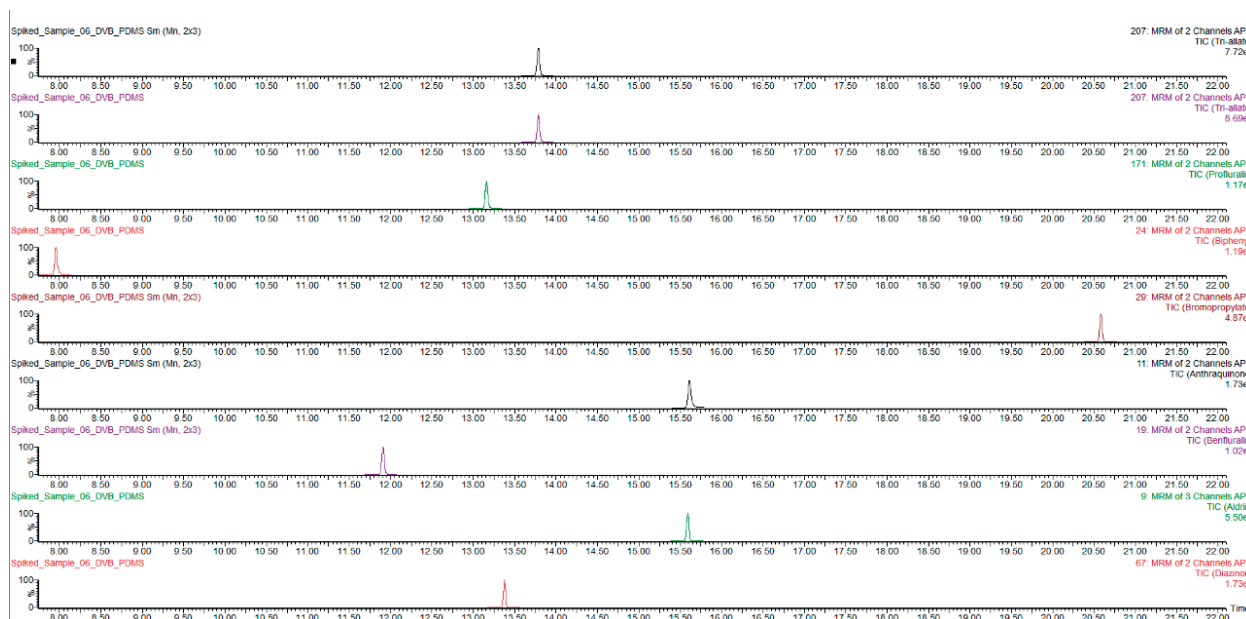


Figure 2: Example chromatograms at 20ppt concentration.

The spiked sample contained a mixture of over 200 compounds including PAHs, PCBs, organochlorine pesticides, organo-nitrogen pesticides, organophosphorus pesticides, synthetic pyrethroids and herbicide methyl esters. The results were generated using a combined DVB/PDMS phase arrow, sampling in the headspace above the sample in the 20ml vial. Using this approach, the system easily detected hundreds of compounds present at a concentration of 20ppt in the spiked sample.

CONCLUSIONS

- The SPME Arrow technique offers highly sensitive, fully automated, targeted extraction of a wide range of compounds.
- The fast scanning speed of the Waters Xevo-TQ-XS provides enough data points across a peak for accurate quantification within high volume multi-residue analysis.
- Headspace-SPME Arrow-APGC-MS/MS is a powerful, user-friendly technique offering extremely high sensitivity over a wide range of compounds.