

PCB Measurement with High Mass Resolution and Sensitivity



InfiTOF-ei

[Introduction]

High-resolution selected ion monitoring (HRSIM) provides sensitive and selective detection for compounds of environmental interest such as polychlorinated biphenyls (PCB's). The analysis as traditionally carried out by using magnetic sector mass spectrometers is highly effective. However, setup and method development can be complicated, requiring careful programming of SIM target masses, lock masses, and retention time groups. Magnetic sector mass spectrometers with a resolving power of 10,000 or greater tend to be large and expensive.

Time-of-flight mass spectrometry (TOFMS) is an attractive alternative because there is little or no tradeoff between high resolution and high sensitivity. However, previous commercially available GC/TOFMS systems are not offered with a resolving power of 10,000 or greater.

The InfiTOF is well suited for PCB analysis. The system is compact, portable, and capable of achieving a resolving power of >30,000. By acquiring high-resolution mass spectra in segments, method development is made easier.

Here, we demonstrate the feasibility of using the InfiTOF for PCB analysis by determining the optimal conditions for analysis and demonstrating the resolving power, detection limits, and linearity for PCB standards.

[Material]

C-180S-TP (2,2',3, 4, 4',5,5' -Heptachlorobiphenyl) (Fig. 1)

Analytes were diluted with isoctane (1 ppm, 0.1 ppm, 0.01 ppm, 0.001 ppm)

[Methods]

Measurement mode of MS: Multi segment

GC: Agilent 6890N

Oven: 100degC(1min)->40degC/min->300degC

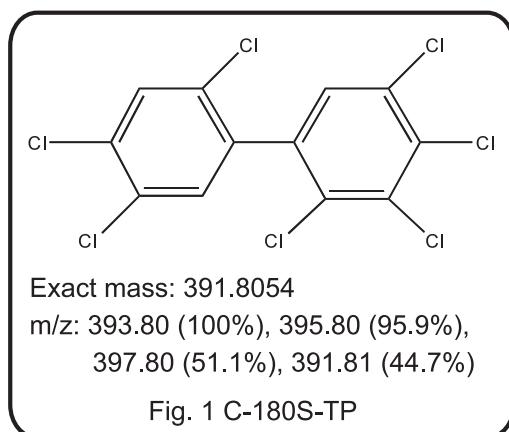
Injection: 300degC (Splitless, purge 1min)

Amount of injected sample: 1 uL

Carrier gas: He

Column: SGE forte BP1 30 m x 0.22 mm (I.D.) x 0.25 um

Acceleration voltage: 2000 V (push), 3212 V (float)



[Dependence of ionization voltage]

To optimize ionization voltage, variations of peak intensity were obtained.

Investigated voltages were 10, 15, 16, 18, 38 and 70 V.

The results indicated that the **optimal ionization voltage was around 18 V**.

Signal-to-noise ratio was larger than 20 around 18 V.

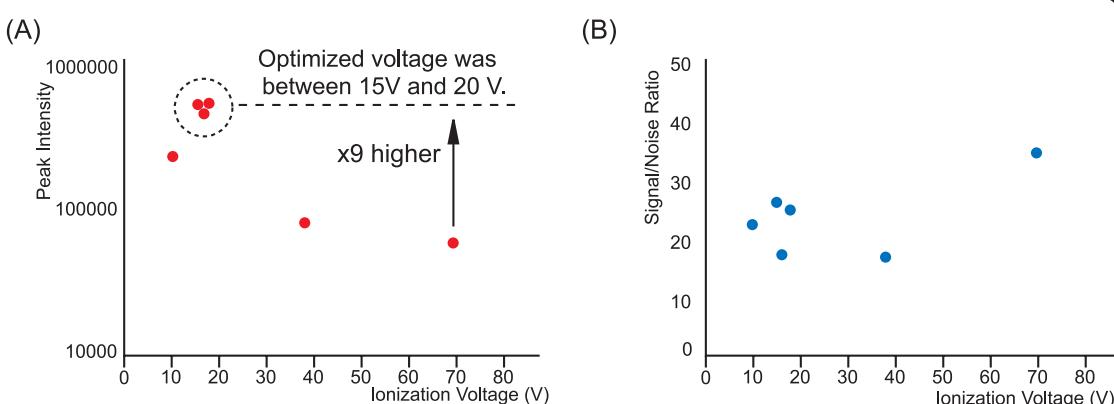


Fig. 2 (A) Variation of peak intensity by changing ionization voltage.

(B) signal-to-noise ratio

[Comparison of mass spectra in 2 cycles and 20 cycles]

infiTOF can vary mass resolution by changing the number of cycles.

After 20 cycles, the mass resolution of 8,000 (m/z 393.80) was obtained.

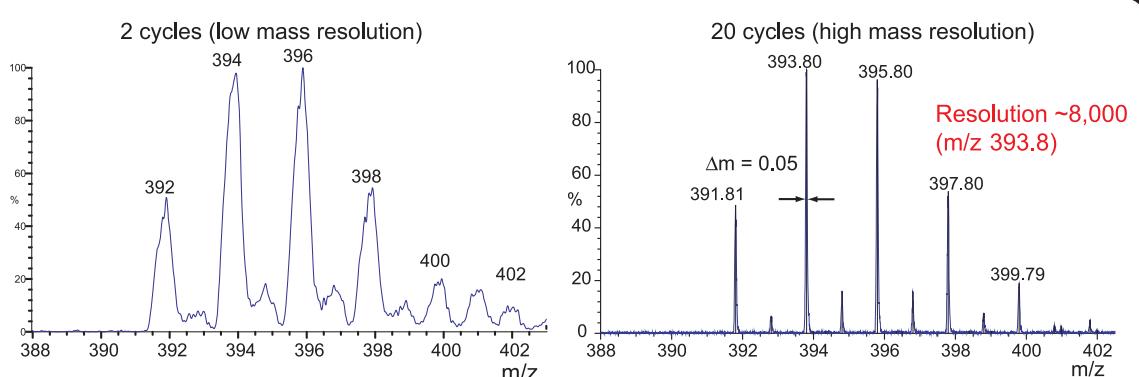


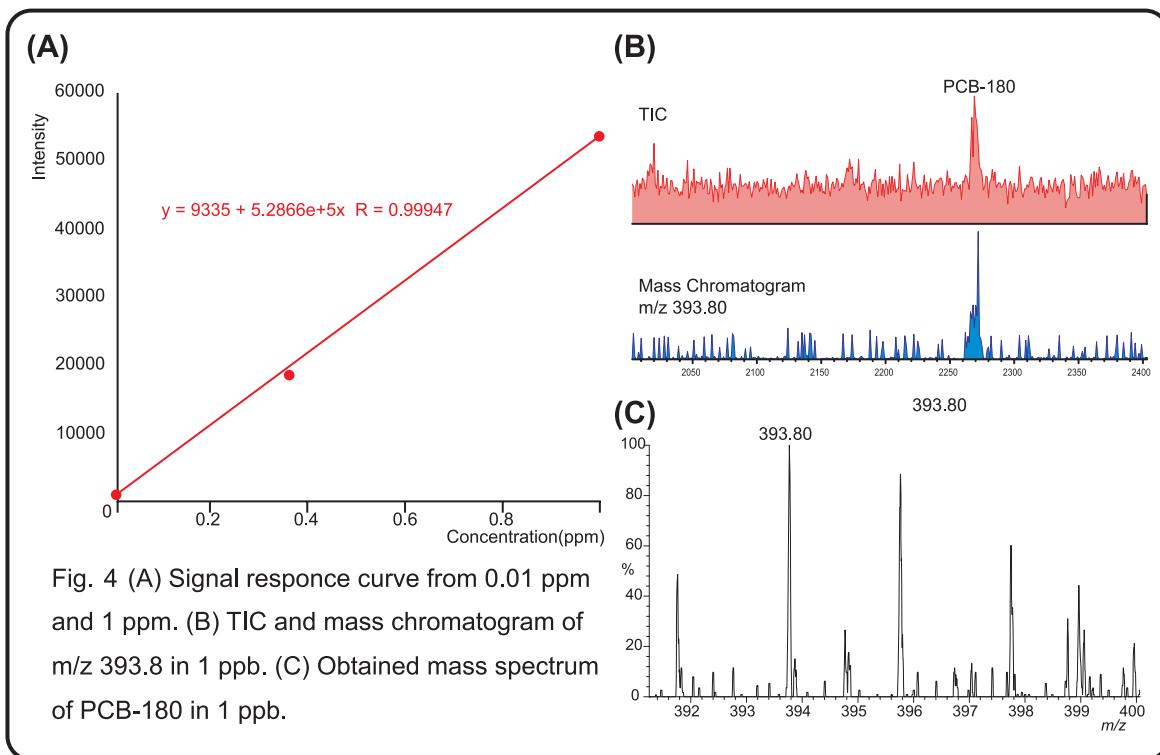
Fig. 3 Comparison of mass spectra of PCB-180-T P (2 cycles and 20 cycles)

[Linearity and Limit of Detection in High-Mass Resolution]

In the high-mass resolution mode, the signal response curve and LOD was estimated.

In this experiment (20 cycles), the linearity was 2.5 orders of magnitude and LOD was.

1 ppb (S/N ~ 2).



[Summary]

Miniaturized time-of-flight mass spectrometer, infiTOF, can obtain high-mass resolution spectra (> 10000) with high sensitivity.

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