ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Technology Advantage: Agilent Intuvo 9000 GC with Agilent 5977 MSD

Introduction

Semivolatile organic compounds (SVOCs) are molecules with intermediate volatility, making them abundant in both the vapor and condensed phase at ambient temperatures and pressures[1]. Certain compounds within the class of SVOCs are known to be environmental pollutants.

Many government regulatory agencies have established methods and set performance criteria for the measurement SVOCs in a variety of environmental and industrial matrices. For example, United States Environmental Protection Agency (USEPA) method 8270D contains a list of 243 compounds that are suitable for analysis by gas chromatography coupled to mass spectrometry (GC/MS). Method 8270D contains detailed performance specifications necessary for the quantitative analysis of SVOCs.

This Application Note demonstrates that the Agilent Intuvo 9000 GC can easily achieve the rigorous calibration specifications established in USEPA 8270D for the quantitative analysis of SVOCs in environmental matrices.

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Experimental

Instrumentation

- Agilent Intuvo 9000 GC
- Agilent 5977 MSD with inert ion source with 6 mm and drawout plate
- Agilent DB-5ms UI, 30 m × 0.25 mm, 0.5 µm column

Sample preparation

A mixture of 77 target compounds comprised of acids, bases, neutrals, and six internal standards were selected.

Standards were prepared in dichloromethane ranging in concentration from 0.1 to 100 µg/mL, and internal standards at a concentration of 40 µg/mL.

Results and Discussion

Method 8270D allows the use of several different calibration techniques. The simplest is the calculation of average response factors (RF). The method specifies that the relative standard deviation (RSD) in RF must fall within 20 % for a minimum of five calibration levels.

Figure 1 shows the percent RSDs in RF for 71 out of 77 of the target analytes. For compounds shown in blue, the concentrations ranged from 0.1 to 100 µg/mL with the exception of benzoic acid, starting at 4 µg/mL.

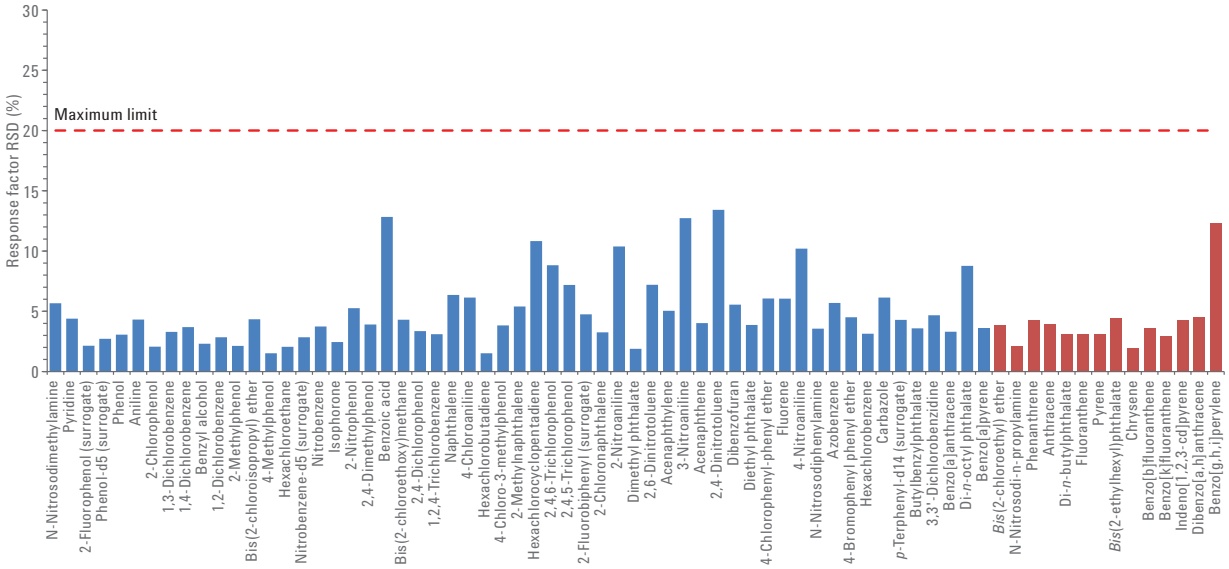

Figure 1. RF percent RSDs below the 8270D 20 % RSD limit for calibration.

Certain compounds such as polyaromatic hydrocarbons tend to saturate the detector at higher concentrations. In this case, it is common practice to adjust the linear range to avoid saturation. For the compounds in Figure 1 shown in red, the concentrations ranged from 0.1 to 50 µg/mL with the exception of benz[a]anthracene, starting at a concentration of 0.8 µg/mL. The average percent RSD for all the compounds in Figure 1 was 4.81%.

For the small number of SVOCs that are reactive or labile, calibration using curve fitting is preferred. In this case, 8270D specifies that the correlation coefficient must be greater than 0.99. Figure 2 shows the correlation coefficients using weighted linear regression for the remaining six compounds.

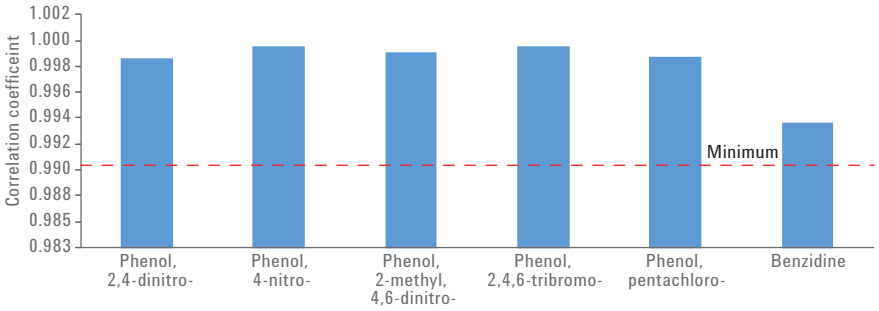

Figure 2. Correlation coefficients.

Conclusion

For all of the target analytes comprising a representative mixture of acid, base and neutral SVOCs, calibration requirements as specified by method 8270D were easily achieved using the Agilent Intuvo 9000 GC and an Agilent 5977 Series Mass Selective Detector.

For more detailed information and methodology, refer to Application Note 5991-7256EN[2].

References

1. Weschler, C. J.; Nazaroff, W. W., Semivolatile Organic Compounds in Indoor Environments, Atmos. Environ. **2008**, *42*, 9018-9040.
2. The analysis of semivolatile organic compounds using the Agilent 9000 Intuvo Gas Chromatograph, *Agilent Technologies Application Note*, publication number 5991-7256EN.

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