VOCAM™ Application Note: Cannabis Nuisance Odors

Introduction

As cannabis, both for medicinal and adult use, becomes legal in more and more jurisdictions, the cultivation and processing of the cannabis product is occurring in more locations as well. For communities where cultivation and processing facilities exist, there can be challenges with containing the odors that are associated with these facilities. The odors most commonly associated with cannabis are primarily caused by terpenes like alpha-pinene which are produced by the cannabis plant and become airborne at various points during plant growth and eventual processing of the cannabis product. As a result, monitoring for these compounds is essential for identifying potential sources in order to begin mitigating a nuisance odor problem.

The Defiant VOCAM™ for VOC Analysis

The Defiant Technologies VOCAM™ system is a portable gas chromatograph (GC) intended for continuous volatile and semi-volatile organic compound (VOC/SVOC) monitoring. It combines a series of MEMS components like a micro-GC column and miniaturized sample preconcentrator alongside a photoionization detector (PID) operating at 10.6eV to give the operator a powerful yet portable solution for continuous analysis. Additionally, the VOCAM™ integrates a heated detector to make the system more analogous to its benchtop counterparts, drastically reducing system downtime and dramatically increasing the length of time between calibrations and maintenance cycles.

System Configuration for Terpenes Analysis

As most terpenes would be considered semi-volatile in nature, a VOCAM™ system was configured with this fact in mind prior to testing. The following settings were used in this particular configuration:

Sample Collection Flow Rate: 240mL/min

Sample Collection Time: 120 seconds (2 minutes)

GC Column Start Temperature: 60°C

GC Column Ending Temperature: 120°C

Method Profile: 60°C, hold for 200 seconds
Ramp to 120°C for 340 seconds (10.6°C/min)
Hold at 120°C for 150 seconds

Carrier Gas: Scrubbed Ambient Air, 1.2mL/min

Procedure

Neat alpha-pinene and d-limonene were each loaded into VICI Metronics Type “A” diffusion vials and introduced to a precisely temperature-controlled oven for a period of several weeks with gravimetric measurements taken periodically to establish the flux rate of each compound. Sweep gas flowing over the diffusion vials was then mixed with diluent gas to generate a series of concentrations which were then delivered to a VOCAM™ portable GC for

analysis. A four-point calibration was then performed for both alpha-pinene and d-limonene to establish instrument sensitivity and linear response.

Results

Alpha-pinene was introduced to the VOCAM™ at concentrations of 1.1, 2.2, 4.4 and 8.7ppbv. The amplitude of the peak at the lowest concentration (of 1.1ppbv) suggests a limit of detection below 0.25ppbv. A method detection limit (MDL) study will be conducted to establish the MDL and PQL for alpha-pinene and will be discussed in a later application note. The linear R^2 correlation for the curve fit for these four calibration points was 0.99968, suggesting an excellent linear least-squares fit for this compound (see Figure 1).

D-Limonene was introduced to the VOCAM™ at concentrations of 1.4, 2.8, 5.6 and 11.2ppbv. As in the case with alpha-pinene, the response at the lowest concentration also suggests a limit of detection below 0.25ppbv, and a further application note will discuss the MDL and PQL for this compound. The linear R^2 correlation for these calibration points was 0.99416, also demonstrating an excellent curve fit for this compound (see Figure 2).

Both of these compounds were well-separated, indicating that speciation and positive identification is very possible, even in the presence of other terpenes which may be present in cannabis cultivation and processing facilities (see Figure 3). These two compounds were chosen due to the fact that they are almost universally present in all cannabis cultivars and can be used as markers for the presence of nuisance odors more generally.

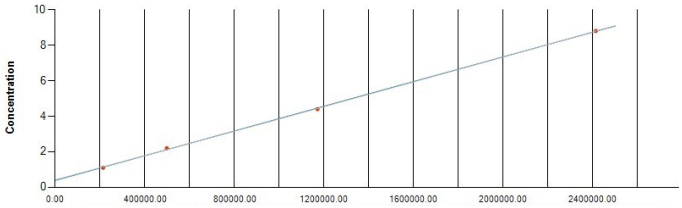

Figure 1: Calibration curve generated for α-pinene

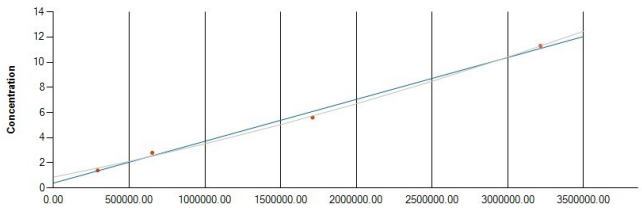

Figure 2: Calibration curve generated for d-limonene

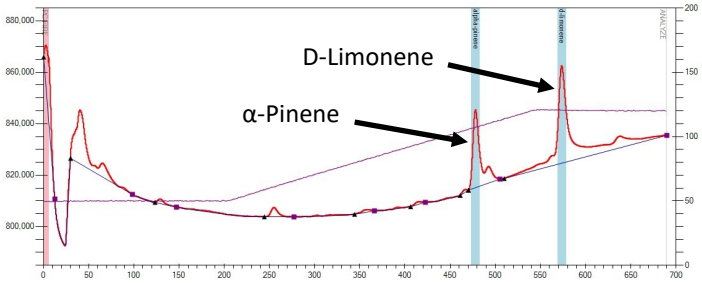

Figure 3: Alpha-pinene (1.1ppbv) and d-limonene (1.4ppbv) well-separated on the VOCAM™ GC column.

Conclusion

Gas chromatography is a powerful tool for terpenes analysis, and until recently was reserved for fixed laboratories. This required samples to be gathered and sent away for analysis, which could take days or even weeks to be analyzed. New portable GCs like the VOCAM™ now allow for near-real-time analysis of volatile organics, including terpenes, which gives users powerful data that can be used to make assessments and decisions on-the-spot. This is especially important for transient and fleeting issues like cannabis nuisance odors, as they can appear, disappear and migrate based on the prevailing winds and the volume of processing activity.