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Technical Bulletin

June, 2021

ANALYSIS OF 3M™ ORGANIC VAPOR MONITOR 3500+/3510+ by GC/FID

STANDARD PREPARATION

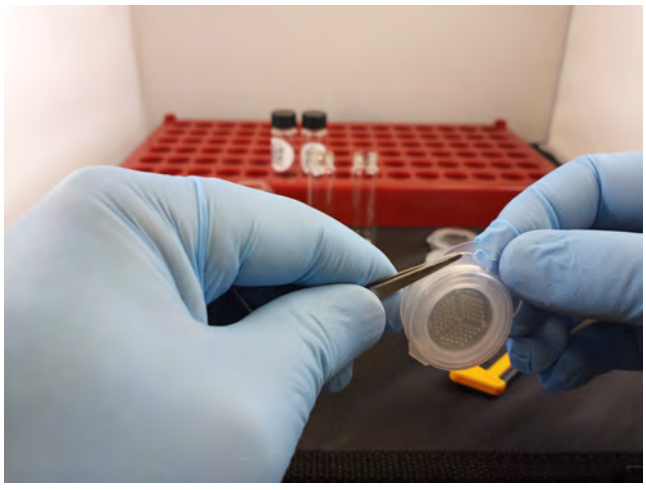
Accurately weigh a Reference Std for each analyte into a measured volume of chromatography-grade desorption solvent (typically benzene-free carbon disulfide which may have up to 5% benzyl alcohol or butyl alcohol) to make a Stock Standard Solution equivalent to of 1.0 mg of analyte per ml of desorption solvent. A Stock Standard may contain multiple Standard Analytes provided they do not co-elute in the chromatography system used. Date Stock Standards, store under refrigeration, and make fresh monthly. Dilute the Stock Standard Solution at least weekly using Internal Standard Solution to make 3-5 Working Standards in the range 0.01-10 µg per ml of Desorption Solvent. Date Working Standards, store under refrigeration, and make fresh weekly.

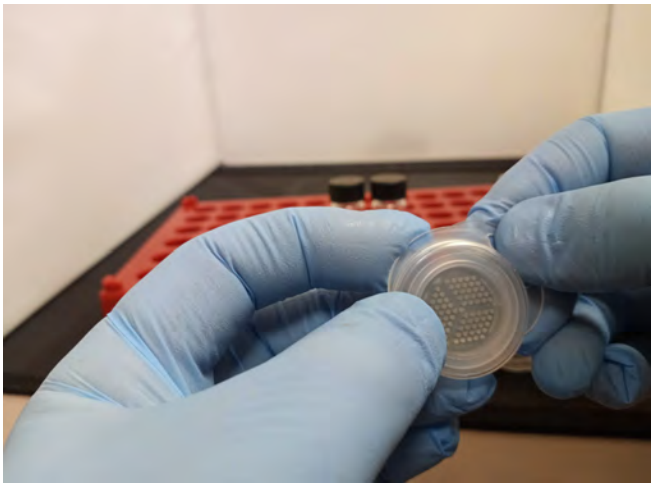
INTERNAL STANDARD SOLUTION

Accurately weigh pure (99+%) cyclohexane and n-decane to make a solution of 1-10 µg of each internal standard substance (accurately measured) per ml of Desorption Solvent.

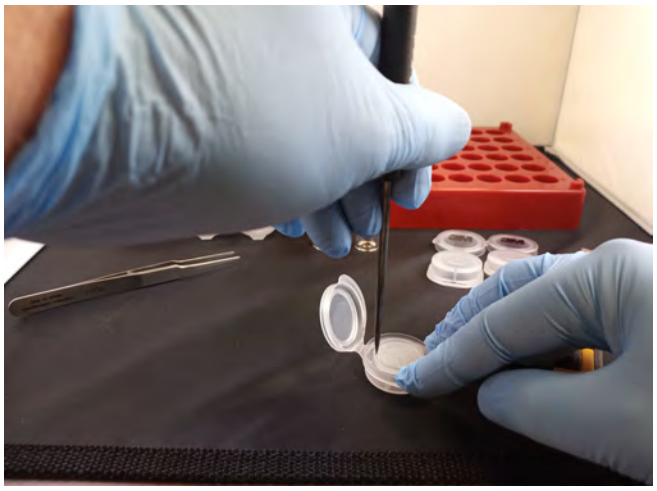
SAMPLE PREPARATION

Remove each Monitor to be tested from the Return Pouch. To open the face of the Monitor either use something flat as a wedge to open it, or just open with your fingers.





Place Monitor on a hard solid surface. Do Not hold the badge in the palm of your hand.



YES

NO

Using a lab pick (typ. McMaster-Carr 3842A42) as a tool, remove the plastic Sampling Grid from the clear plastic Sampler Body exposing the carbon wafer beneath. Place the tip of the pick either at the side or the middle. Push down hard and pry out the sampling grid.

If you do not have a pick, use a small sharp blade to make 2 incisions within 25 degrees for each other. Then pry the sampling grid out.

Using forceps, transfer the carbon wafer to into a 7 ml glass vial (or similar) with inert gas tight closure cap.

Immediately pipet 2.0 ml of Internal Standard Solution and cap the vial with inert, gas-tight closure. Agitate the vial continuously for one hour using an orbital shaker or equivalent. Reserve for gas chromatographic analysis.

BLANK PREPARATION

At least weekly, remove a similar Monitor which has not been exposed. Process the unexposed "BLANK" Monitor exactly as the Sample Preparations (above) and subtract any Peak Area response at the retention time of interest from the value obtained from the Sample Preparation. Report any significant BLANK values to Quality Assurance group along with the Lot number of the Monitor analyzed.

QUALITY CONTROL SAMPLES

During each run, analyze check standards and determine whether Analyte Standard responses fall within the Calibration Parameters specified for that Analyte and stored in the Computer. Investigate and resolve any deviation or discrepancy of Standards from the known Calibration Parameters before reporting results.

CAPILLARY GAS CHROMATOGRAPHY(GC) ANALYSIS

Inject an aliquot of the Sample Preparation from each Monitor to be analyzed into a Gas Chromatography System using the following conditions:

GC Columns (dual)	RT-1 (Column A); RTX-Volatiles (Column B)
Column Size	0.32 mm capillary x 60 m, 1.5 µm film thickness
Injection Mode	Split (typical 10:1)
Injector/Detector Temp	280°C
Detector	Flame Ionization Detector (FID)
Column Temp	Hold 3 min 40°C; 15-25°C per min to 250°C; Hold 5 min
Injection Volume	1.0 microliter (nominal)

(*) Restek Corp, Bellefonte, Pennsylvania

Concomitantly, inject measured aliquots of a BLANK Preparation and 3-5 Standard Preparations in the range of interest (i.e. which bracket the concentrations of the Sample Preparations).

CALCULATION

Acquire the analytical data into a computer system in which chromatography data handling software has been installed. Using the software, compare the peak area ratio for analyte vs internal standard normalized for concentration from each Sample Preparation to the best-fit Calibration Curve obtained from BLANK and Standard Preparations and compute the Analyte Concentration in the Sample Preparation.

Calculate Exposure Level from Analyte Concentration as follows:

$$\text{EXPOSURE LEVEL (ppm)} = \frac{1000(C)(V)(R)}{(DE)(M)(SR)(T)}$$

Where

- **C** = **Analyte Concentration** (µg/ml)
- **V** = **Volume of desorption solvent** (ml)
- **R** = **Molar Volume @ 25°C** (24.45 l/mole)
- **DE** = **De-Sorption Efficiency** (fraction of extraction) **for 2.0 ml CS_2**
- **M** = **Analyte Molecular Wt** (g/mole)
- **SR** = **Monitor Sampling Rate** (ml/min)
- **T** = **Sampling Time** (min)

Personal Safety Division
3M Center, Building 235-2W-70
St. Paul, MN 55144-1000

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