

Carbotrap[®] T420 Thermal Desorption Tube— Simplify Your Terpene Analysis

The Optimal Solution for Sampling and Analysis of Terpenes in Air with TD-GC/MS

Terpenes are highly aromatic natural compounds found in many living plants, fruits and herbs that provide the characteristic scent or fragrance often recognized by the sense of smell. In nature, terpenes function to protect the plants from insects, animal grazing and plant diseases. As these plants are dried and cured, the terpenes oxidize and become terpenoids. Many consumer products are derived from the vibrant aromas of terpenes such as from the cannabis sativa plant for medicinal and recreational use; and also, from plants such as hemp, hops, juniper berries and for essential oils used in aromatherapy and characteristic flavorings in food and beverages. Terpene and terpenoid compounds are highly studied in research to evaluate their potential medicinal and therapeutic benefits in both animals and humans. In order to analytically profile the levels of terpenes in these plants, a flowering portion of the plant must be removed and then dried for qualitative analysis at a cost to the grower in reduced plant yield. The Carbotrap[®] T420 Thermal Desorption (TD) tube can provide the grower with a non-destructive **profiling** tool of their growing and flowering plants and plant materials with a simple grab sample of air.

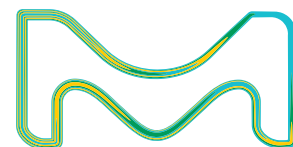
People who work in the agriculture side of the growing and cultivation of cannabis and hemp in indoor greenhouse environments are exposed to high levels of terpenes and other volatile organic compounds (VOCs) during their work shift and may experience unpleasant respiratory health effects. However, there are currently no federal or state government mandated workplace exposure limits associated with terpenes emissions in these environments and no reliable air sampling method optimized for measuring these terpenes. The Carbotrap[®] T420 TD tube was designed to solve the problem for sampling terpenes in air in high humidity environments for industrial hygiene, indoor air quality and ambient air emissions.

Communities that neighbor the cannabis and hemp agricultural growing operations often complain of the persistent unpleasant odors, but there are few government mandates related to odor emissions and mitigation strategies. The Carbotrap[®] T420 TD tube can provide regulators with a tool to actively measure the fence line around these growing operations and neighborhoods to study and monitor environmental emissions, assess terpene drift, and associated odors to develop their mitigation strategies and set future terpene odor limit thresholds.



Features & Benefits of the Carbotrap[®] T420 TD Tube for Sampling Terpenes in Air

- Efficiently retains and releases terpenes associated with cannabis, hemp, hops and other terpene fragrant plants
- Optimized for sampling a wide-range of applications such as: industrial hygiene, environmental emissions and terpene drift; terpene odor concentration; non-destructive live plant profiling and headspace air of plant materials
- Designed for sampling in high humidity environments such as indoor greenhouse environments
- Available in both glass-fritted and stainless steel TD tubes—¼ in. O.D. x 3.5 in. L (6.35 mm O.D. x 89 mm long).
- Preconditioned & QC tested to ensure low background levels
- Easy sample identification and tracking—a unique number with corresponding durable barcode on each tube



Guidelines for Air Sample Volume Collection by Application

To quantitate the terpene concentration from air depending on your application, it is important to know the total volume of air pulled through the tube with an air sampling pump during the sampling event. The sample volume is calculated by multiplying the flow rate (L/min) by the sampling time (minutes). The recommended sample collection volume is between 0.10 to 10 liters to prevent breakthrough and/or overloading the analytical system.

The optimal sample volume is dependent on the terpene concentration levels that are present during sampling and the analytical instrument parameters of the thermal desorption and gas chromatograph parameters (TD-GC/MS). **Table 1** provides the recommended sample volumes based on various sampling conditions. Additional experimentation may need to be performed for your specific conditions.

Table 1: Recommended Sample Collection Volumes by Application

Application	Observed Terpene Odor	Recommended Sampling Volume
Testing of live plants and headspace of the actual plant material	Very Strong	0.1 to 0.2 Liters
Indoor sampling of greenhouse	Strong	1 to 2 Liters
Outdoor sampling near growing location	Detectable	2 to 5 Liters
Outdoor sampling	Undetectable	5 to 10 Liters

Note: Terpene odor thresholds will be different among users so keep this in mind when choosing a sample volume for your application.

Products for Sample Collection

Description	Pkg size	Cat. No.
Carbotrap® T420, Glass-Fritted TD Tube, Preconditioned	10	28689-U
Carbotrap® T420, Stainless Steel TD Tube, Preconditioned	10	28687-U
Air Sampling Pumps and Flow Calibration Equipment		
Spectrex PAS-500 Battery-Operated Personal Sampling Pump	1	24865
Zefon Escort ELF® Personal Air Sampling Pump	1	28160-U
Battery Charger for Zefon Escort ELF®, 110 VAC	1	28157-U
Battery Charger for Zefon Escort ELF®, 240 VAC	1	28158-U
Zefon Gemini® Twin-Port Sampler	1	28118-U
A.P. mini-Buck™ M-5 Flow Calibrator	1	24843
Battery Charger for M-5 Flow Calibrator, 110 VAC	1	24844
Battery Charger for M-5 Flow Calibrator, 220 VAC	1	24846
Ellutia 7000 GC Flowmeter, includes universal charger	1	29597-U
TDS³ Storage Container & Sampling Apparatus		
TDS ³ Sampling Caps Set	1	25069
Male Luer Fitting for 1/8 in. Tubing (for use with Ellutia 7000 GC Flowmeter)	1	21016
Male Luer Fitting for 1/4 in. Tubing (for use with A.P. mini-Buck™ M-5 Flow Calibrator)	1	24586
Replacement TDS ³ Storage Container for 3.5 in. L, 89 mm TD Tubes	1	25097-U
Replacement TDS ³ Septa	50	25073



Outdoor measurement of terpenes from hemp growing operations using our glass and stainless steel Carbotrap® T420 TD tubes and Spectrex PAS-500 Personal Air Sampling pumps



Indoor profile measurement of cannabis terpenes (flowering plant) from cannabis greenhouse growing operations using our glass Carbotrap® T420 TD tubes and detector tube pump



Indoor profile measurement of cannabis terpenes using headspace on dried plant materials from cannabis greenhouse growing operations using our stainless Carbotrap® T420 TD tubes and large syringe to pull the sample into our Carbotrap T420 TD tube.

To place an order or receive technical assistance

Order/Customer Service: [SigmaAldrich.com/order](https://www.sigmaaldrich.com/order)
 Technical Service: [SigmaAldrich.com/techservice](https://www.sigmaaldrich.com/techservice)
 Safety-related Information: [SigmaAldrich.com/safetycenter](https://www.sigmaaldrich.com/safetycenter)

[SigmaAldrich.com](https://www.sigmaaldrich.com)

MilliporeSigma
 400 Summit Drive
 Burlington, MA 01803

© 2022 Merck KGaA, Darmstadt, Germany and/or its affiliates. All Rights Reserved. MilliporeSigma, the vibrant M, Supelco and Carbotrap are trademarks of Merck KGaA, Darmstadt, Germany or its affiliates. All other trademarks are the property of their respective owners. Detailed information on trademarks is available via publicly accessible resources.

