

Analysis of Stack Emissions Using VOST Air Sampling Tubes and Capillary GC

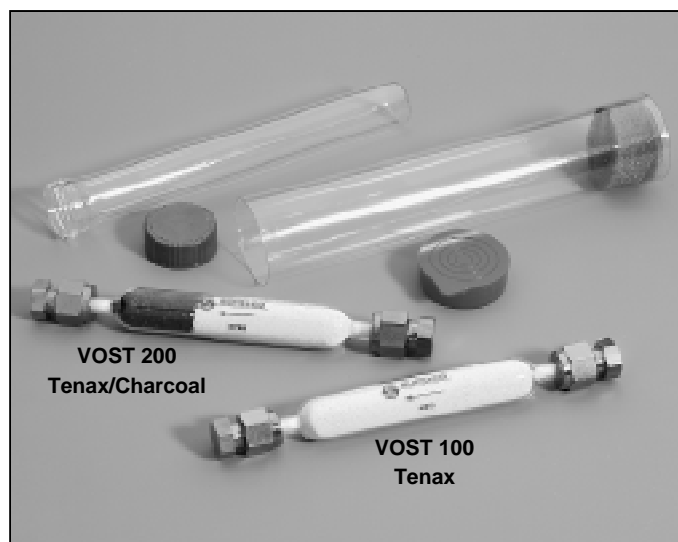
United States EPA SW-846, Method 0030, Volatile Organic Sampling Train (VOST), describes the sampling of emissions for volatile compounds from hazardous waste incinerator stacks. Supelco's VOST air sampling tubes are designed to fulfill the method requirements and provide low background levels.

Key Words:

▣ desorption ▣ sampling train ▣ stack gas

VOST air sampling tubes meet the specifications for US EPA SW-846, Method 0030, Volatile Organic Sampling Train, which explains how to sample emissions for volatile compounds (boiling point range 30-100°C) from hazardous waste incinerator stacks. The VOST tubes — VOST 100 and VOST 200 — trap these emissions for thermal desorption and gas chromatography/mass spectrometry (GC/MS) analysis (see Figure A).

Figure A. VOST Tubes With Storage and Shipping Containers



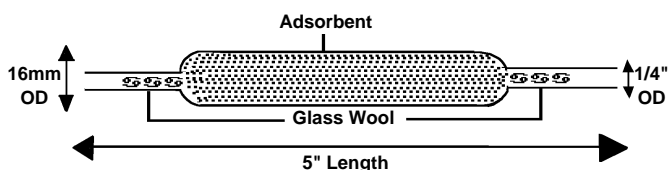
996-0072

The high-purity adsorbents used in the VOST tubes provide consistently low background levels. VOST 100 tubes are packed with Tenax® TA 35/60, a porous material based on 2,6-diphenylene oxide polymer that traps volatile and semivolatile compounds and has a low affinity for water and methanol. VOST 200 tubes are packed with Tenax TA 35/60 and petroleum charcoal 20/40 (2:1 by volume). Petroleum charcoal is a naturally occurring adsorbent that traps the more volatile compounds. (See Figure B for a diagram of a VOST tube.)

The two tubes are assembled in a sampling train in series, with the VOST 100 followed by the VOST 200 as a back-up to trap the more volatile compounds. At flow rates between 250-1000mL/min, a total volume of 5-20L of air is collected on each VOST pair. Up to six VOST pairs may be collected from the same source, replacing each pair after a maximum of 20L has been collected.

Following collection, the VOST tubes are thermally desorbed by heating and purging with an inert gas. The effluent is transferred and bubbled into organic-free water in a purge-and-trap system. Analysis is by GC/MS as described in Method 5041, Protocol for Analysis of Sorbent Cartridges from VOST. This analysis technique is used because the sampled tubes may contain high quantities of moisture, which might otherwise present problems in a thermal desorption system. More than the 35 compounds listed in Method 5041 can readily be collected with the VOST tubes. However, low recoveries of polar compounds may result because of poor purging efficiency from water.

Figure B. Structure of a VOST Tube



796-0329

Figure C. Comparison of Calibration Standard with Spiked VOST Tubes

Sampling Tubes: VOST 100 (Cat. No. 2-0074)
 VOST 200 (Cat. No. 2-0075)
 Purge Trap: VOCARB™-4000
 Cat. No.: 20308
 Column: SPB™-624, 75m x 0.53mm ID x 3.0µm film
 Cat. No.: 2-5432
 Oven: 35°C (5min) to 200°C at 10°C/min, hold 2min
 Carrier: helium, 8mL/min
 Det.: FID, 300°C

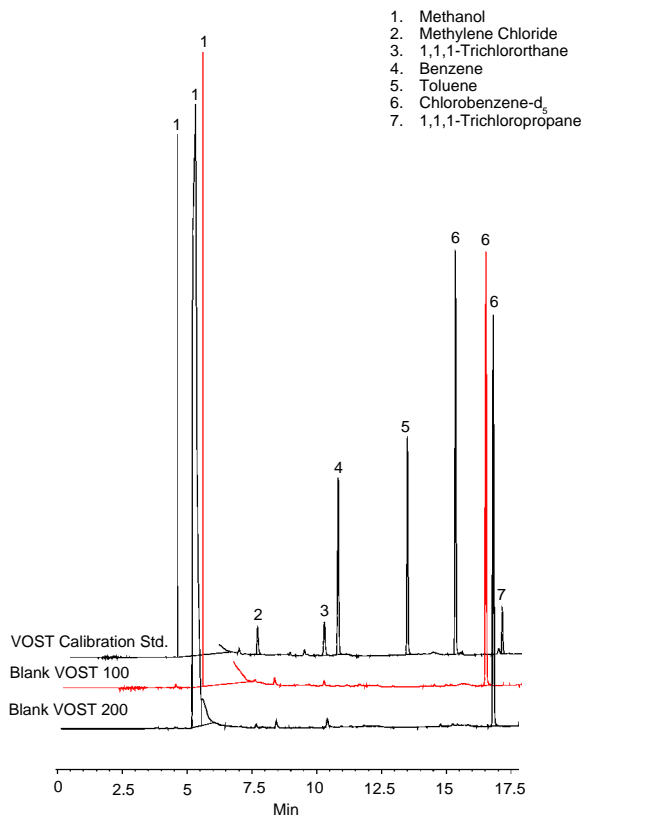


Table 1. Quality Assurance Specifications

Background:	<20ng single component by GC/FID
Surrogate Recovery:	50-150%
Pressure Drop:	<5 inches water at 50cc/min

Figure C compares a calibration standard at 20ng with blank VOST tubes that have been spiked with 50ng chloro-benzene-d₅ as a surrogate to monitor extraction efficiency. The chromatograms illustrate the high purity of the adsorbent, preconditioned and ready to use. The GC conditions encompass the elution range of the target compounds from the EPA method. Peaks comprising the calibration standard represent the most commonly found adsorbent contaminants.

The VOST tubes are sealed with stainless steel Swagelok® end fittings and enclosed in a screw-capped glass storage container that holds a charcoal packet to maintain sample integrity. The storage container is then packed in a protective flex tube to minimize breakage in shipping. Each batch of VOST tubes is tested for both recovery and background as described in Table 1. In addition, each tube has a certificate of analysis and a unique serial number, which ensures accurate sample identification. Tubes may be reused following conditioning with inert gas flow at temperatures 10-15°C above the desorption temperature.

Supelco has the capability of making VOST tubes to the specification of the customer. Choose your own type of tube material, dimensions or adsorbent. Quotations and prototypes are available upon request. Contact Supelco Technical Service for more information: 800-359-3041 or 814-359-3041.

Ordering Information:

Description	Cat. No.
VOST 100, Tenax TA	20074-U
VOST 200, Tenax TA and petroleum charcoal	20075-U
Empty Glass Tube, 11.5cm x 16mm ID	21993
Glass Storage Container	21998
SPB-624 Fused Silica Capillary Column, 75m x 0.53mm ID, 3.0µm film	25432
VOCARB-4000	20308
Stack Gas Effluents VOC Mix, 200µg/mL, 37 components in methanol:water (80:20)	47636-U

Trademarks

SPB, VOCARB — Sigma-Aldrich Co.

Swagelok — Crawford Fitting Co.

Tenax — Enka Research Institute Arnhem

Fused silica columns manufactured under HP US Pat. No. 4,293,415.

Contact our Technical Service Department
 (phone 800-359-3041 or 814-359-3041, FAX 800-359-3044 or
 814-359-5468) for expert answers to your questions.

Note 104

For more information, or current prices, contact your nearest Supelco subsidiary listed below. To obtain further contact information, visit our website (www.sigma-aldrich.com), see the Supelco catalog, or contact Supelco, Bellefonte, PA 16823-0048 USA.

ARGENTINA · Sigma-Aldrich de Argentina, S.A. · Buenos Aires 1119 AUSTRALIA · Sigma-Aldrich Pty. Ltd. · Castle Hill NSW 2154 AUSTRIA · Sigma-Aldrich Handels GmbH · A-1110 Wien
 BELGIUM · Sigma-Aldrich N.V./S.A. · B-2880 Bornem BRAZIL · Sigma-Aldrich Quimica Brasil Ltda. · 01239-010 São Paulo, SP CANADA · Sigma-Aldrich Canada, Ltd. · 2149 Winston Park Dr., Oakville, ON L6H 6J8
 CZECH REPUBLIC · Sigma-Aldrich s.r.o. · 186 00 Praha 8 DENMARK · Sigma-Aldrich Denmark A/S · DK-2665 Vallensbaek Strand FINLAND · Sigma-Aldrich Finland/YA-Kemia Oy · FIN-00700 Helsinki
 FRANCE · Sigma-Aldrich Chimie · 38297 Saint-Quentin-Fallavier Cedex GERMANY · Sigma-Aldrich Chemie GmbH · D-82041 Deisenhofen GREECE · Sigma-Aldrich (o.m.) Ltd. · Ilioupoli 16346, Athens
 HUNGARY · Sigma-Aldrich Kft. · H-1067 Budapest INDIA · Sigma-Aldrich Co. · Bangalore 560 048 IRELAND · Sigma-Aldrich Ireland Ltd. · Dublin 24 ISRAEL · Sigma Israel Chemicals Ltd. · Rehovot 76100
 ITALY · Sigma-Aldrich s.r.l. · 20151 Milano JAPAN · Sigma-Aldrich Japan K.K. · Chuo-ku, Tokyo 103 KOREA · Sigma-Aldrich Korea · Seoul MALAYSIA · Sigma-Aldrich (M) Sdn. Bhd. · Selangor
 MEXICO · Sigma-Aldrich Quimica S.A. de C.V. · 50200 Toluca NETHERLANDS · Sigma-Aldrich Chemie BV · 3330 AA Zwijndrecht NORWAY · Sigma-Aldrich Norway · Torshov · N-0401 Oslo
 POLAND · Sigma-Aldrich Sp. z o.o. · 61-663 Poznań PORTUGAL · Sigma-Aldrich Quimica, S.A. · Sintra 2710 RUSSIA · Sigma-Aldrich Russia · Moscow 103062 SINGAPORE · Sigma-Aldrich Pte. Ltd.
 SOUTH AFRICA · Sigma-Aldrich (pty) Ltd. · Jet Park 1459 SPAIN · Sigma-Aldrich Quimica, S.A. · 28100 Alcobendas, Madrid SWEDEN · Sigma-Aldrich Sweden AB · 135 70 Stockholm
 SWITZERLAND · Supelco · CH-9471 Buchs UNITED KINGDOM · Sigma-Aldrich Company Ltd. · Poole, Dorset BH12 4QH
 UNITED STATES · Supelco · Supelco Park · Bellefonte, PA 16823-0048 · Phone 800-247-6628 or 814-359-3441 · Fax 800-447-3044 or 814-359-3044 · email: supelco@sial.com

H

Supelco is a member of the Sigma-Aldrich family. Supelco products are sold through Sigma-Aldrich, Inc. Sigma-Aldrich warrants that its products conform to the information contained in this and other Sigma-Aldrich publications. Purchaser must determine the suitability of the product for a particular use. Additional terms and conditions may apply. Please see the reverse side of the invoice or packing slip.

ASK