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If you have questions about applying methodology described in this article to a current application, please contact our technical service chemists.

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New ASTM Method for Monitoring Ethylene Oxide in the Workplace

I. DeGraff

The ORBO-78 adsorbent tube is cited in the new ASTM Method D5578 for monitoring ethylene oxide in air. The tube contains Carboxen-564 carbon molecular sieve coated with hydrogen bromide, an adsorbent that meets all criteria of the method.

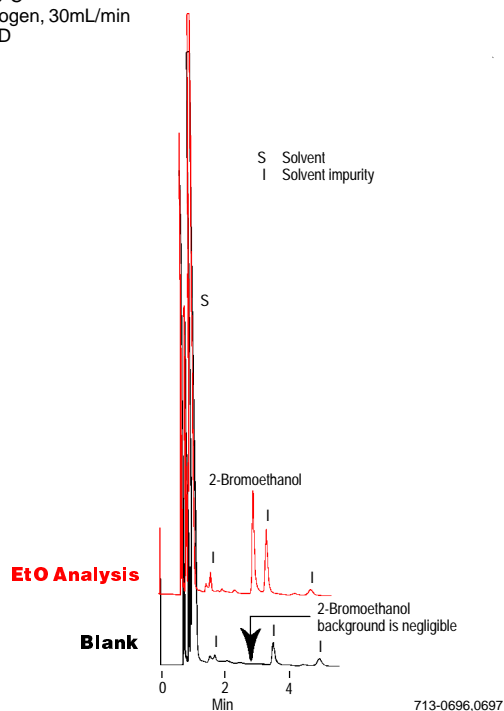
A new ASTM method has been developed for monitoring ethylene oxide in air. ASTM D5578, *Standard Test Method for Determination of Ethylene Oxide in Workplace Atmospheres (HBr Derivatization Method)*, cites the ORBO™-78 adsorbent tube as the sampling device (1,2).

Figure A. Ethylene Oxide by ASTM D5578

Sample: HBr-coated Carboxen-564 spiked with 2-bromoethanol (1.2ng) and desorbed with toluene:acetonitrile (50:50)

Sampling Tube: **ORBO-78**
Cat. No.: **20355**

Packing: **10% DEGS on 80/100 SUPELCOPORT**
Cat. No.: **11999** (20g)
Column: 12' x 1/8", stainless steel
Oven: 155°C
Carrier: nitrogen, 30mL/min
Det.: ECD



The sampling device in this method must contain a carbon molecular sieve adsorbent coated with hydrogen bromide (HBr) contained in 400/200mg beds. The HBr reacts with the ethylene oxide to form 2-bromoethanol, which is then extracted and analyzed by gas chromatography with an electron capture detector.

Comparisons revealed good correlation of airborne ethylene oxide between Method D5578 and the established Qazi-Ketcham charcoal tube method (3). Research was conducted to validate the carbon molecular sieve chosen for this application by evaluating desorption efficiency and breakthrough volume. Carboxen™ - 564 adsorbent* was selected because of its favorable performance characteristics. Data indicated that no significant breakthrough of 2-bromoethanol occurs at sample volumes of 55.2 liters in either dry or humid conditions. Desorption efficiency over airborne concentrations of 0.06-1.02ppm (based on 32L air volume) was 100%.

Figure A shows the chromatogram for a spiked tube representing the concentration at the action level (one-half the threshold limit value) of 0.5ppm, based on a 10-liter sample volume. A comparison with the background levels for a blank tube indicates that the adsorbent in ORBO-78 tubes is a high purity material that does not interfere with 2-bromoethanol analysis.

Ordering Information:

ORBO-78 Adsorbent Tubes

Pk. of 25 **20355**

GP 10% DEGS-PS on 80/100 SUPELCOPORT™

20g **11999**

SUPELCOWAX™ 10 Fused Silica Capillary Columns

30m x 0.53mm ID, 1.0µm film **25301-U**

30m x 0.53mm ID, 0.5µm film **25325**

2-Bromoethanol

2000µg/mL in toluene

1mL **48874**

References

- Annual Book of ASTM Standards, Vol. 11.03, 1994.
- Esposito, G.G., K. Williams, and R. Bongiovanni, "Determination of Ethylene Oxide in Air by Gas Chromatography", *Analytical Chemistry*, Vol. 56, No. 11, September 1984, pp. 1950-53.
- Qazi, A.H. and N.H. Ketcham, *American Industrial Hygiene Association Journal*, 39 (1977), pp. 635-647.

References not available from Supelco.

*US Pat. No. 4,839,331.

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

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