SCAQMD METHOD 304-91

DETERMINATION OF VOLATILE ORGANIC COMPOUNDS (VOC) IN VARIOUS MATERIALS

1. Principle

1.1 Aliquots of the sample are analyzed for percent weight of volatiles, water, and exempt compounds. In addition, the density of the sample is determined. The VOC content of the sample is calculated and expressed in units specified by the requirement of the relevant SCAQMD Rule.

2. Equipment

2.1 Laboratory exhaust hood

2.2 Other equipment: Refer to relevant individual method for other equipment required.

3. Reagents

3.1 Refer to relevant individual methods for required reagents.

4. Analytical Procedure

4.1 Preparation of Sample

4.1.1. Mix the sample thoroughly by shaking or rolling the sample in its container. Take proper precautions to minimize the inclusion of air into the sample.

4.1.2 For multi-package coatings wherein, at ambient conditions, one or more parts may contain coreactants that are volatile until a chemical reaction with another component of the multi-package coating has occurred:

4.1.2.1 Mix the individual components in the proper mixing weight ratios specified by the manufacturer.

4.1.2.2 Mix enough sample for all the required analyses.

4.1.2.3 Immediately weigh out the proper aliquots for the various analyses required.

4.2 Determination of Density

4.2.1 Refer to the most recent version of ASTM D 1475 (Standard Test Method for Density of Paint, Varnish, Lacquer, and Related Products) to determine the density of the sample.

4.2.2 Calculate and record the density, (Dm), of the sample in g/mL.

4.3 Determination of Total Volatile Content

4.3.1 Analyze an appropriate aliquot of the sample for total volatile content by following the procedure specified in the most recent version of ASTM D 2369 (Standard Test Method for Volatile Content of Coatings). Use heating temperature of 110^{o}C for 60 minutes.

4.3.1.1 For multi-package materials:

4.3.1.1.1 Immediately weigh out and disperse the proper aliquot from 4.1.2.2 into a tared aluminum dish.

4.3.1.1.2 Allow the dish and contents to stand for one hour at ambient conditions before heating at 110^{o}C for 60 minutes.

4.3.1.1.3 For air-dried materials that may require more than one hour for the components to react, allow the sample from 4.3.1.1.1 to stand for 24 hours at ambient conditions before heating at 110^{o}C for 60 minutes.

4.3.1.2 Rotogravure inks will be analyzed in accordance with the most recent version of EPA Method 24A. The sample aliquot is heated at 120 $\pm$2^{o}C for 24 hours.

4.3.1.3 Pipe cements will be analyzed in accordance with the most recent version of SCAQMD Method 316A-92.

4.3.1.4 Ultraviolet curable coatings will be analyzed in accordance with the most recent version of ASTM D 5403.

4.3.2 Calculate and record the total nonvolatile content, (N), of the sample in weight percent.

4.4 Determination of Water Content

4.4.1 An appropriate aliquot of the sample is analyzed for water in accordance with the most recent version of ASTM D 4017 (Standard Test Method for Water in Paints and Paint Materials by Karl Fischer Method).

4.4.2 Alternatively, the water content of the sample may be determined by following the procedure specified in the latest version of ASTM D 3792 (Standard Test Method for Water Content of Water-Reducible Paints by Direct Injection Into a Gas Chromatograph).

4.4.3 Record the water content (W) in weight percent.

4.5 Determination of Exempt Compounds Content

4.5.1 The exempt compounds content of the sample is determined by following the procedure detailed in the most recent version of SCAQMD Method 303 (Determination of Exempt Compounds in Various Materials)

4.5.2 Record the exempt compounds content, (Ex), of the sample in weight percent.

5. Calculations

5.1 The VOC content of the sample expressed in grams VOC per liter of coating is calculated by using the equation:

$$\text{VOC, g/L (of coating)} = \frac{(100\text{-N-W-Ex})(\text{Dm})(1000)}{100 - \frac{(\text{W})(\text{Dm})}{\text{Dw}} - \frac{(\text{Ex})(\text{Dm})}{\text{De}}}$$

5.2 The VOC content of the sample expressed in grams per liter of material is calculated by using the formula:

$$\text{VOC, g/L (of material)} = (100\text{-N-W-Ex})(\text{Dm})(10)$$

5.3 The VOC content of the sample expressed in weight percent is calculated by using the formula:

$$\text{VOC, \% (w/w)} = 100\text{-N-W-Ex}$$

5.4 Definition of terms used in the calculations:

N = Weight percent nonvolatiles (Sec. 4.3.2)
W = Weight percent water (Sec. 4.4.3)
Ex = Weight percent exempt compound (Sec. 4.5.2)
Dm = Density of the sample, g/mL (Sec. 4.2.2)
De = Density of the exempt compound, g/mL
Dw = Density of water, g/mL

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

APPLIED SCIENCE & TECHNOLOGY DIVISION

LABORATORY SERVICES BRANCH

SCAQMD METHOD 304-91

DETERMINATION OF VOLATILE ORGANIC COMPOUNDS (VOC) IN VARIOUS MATERIALS

Approved June 1, 1991
Revised February 1993
Revised February 1996

SCAQMD METHOD 304-91

DETERMINATION OF VOLATILE ORGANIC COMPOUNDS (VOC) IN VARIOUS MATERIALS

This method is applicable for the determination of the VOC content of various materials for compliance with the VOC requirement specified in the various Rules of SCAQMD Regulation XI.

CONTENTS