

METHOD 26

REF: Reg 8-50

DETERMINATION OF VOLATILE WEIGHT LOSS OF GEL COATS

1) PRINCIPLE

- 1.1 A pour pan method is used, where a weighed amount of gel coat is reacted with methyl ethyl ketone peroxide (**MEKP**) catalyst to form a 100 mm diameter x 1/8" thick casting at room temperature (**75 ± 3°F**).
- 1.2 The weight losses attributed to volatile emissions are to be reported in grams per liter of coating applied.
- 1.3 This method is applicable only to gel coats.

2) APPARATUS

- 2.1 **Analytical Balance.** Top Loading, capable of weighing to ± 0.01 g.
- 2.2 **Can Lid** - 100 mm diameter x 1/2" deep can lid. (**Item #04116000**). These are available from:

California Glass Company
155 - 98th Avenue
Oakland, CA 94603
- 2.3 **Stirring Rod, Glass or Metal.**
- 2.4 **Clock or Timer.**
- 2.5 **8 oz Wide Mouth Bottles.**
- 2.6 **Paper Clip.** Bent to approximately 90° angle.
- 2.7 **Thermometer.** 20° to 120°F in 1° division.
- 2.8 **Pipettes.** Various sizes as needed.
- 2.9 **Syringe.** Disposable, 3 ml capacity.

2.10 Disposable Beral Pipette. These are available from Curtin Matheson Company. (Catalog #376-970).

2.11 Spatula.

2.12 Gardner Weight Per Gallon Cup.

2.13 Eberbach Shaker.

2.14 Constant Temperature Water Bath.

3) ANALYTICAL PROCEDURE

3.1 Determination of Density.

3.1.1 Calibrate the volume of the Gardner weight per gallon cup as described in ASTM D1475-85.

3.1.2 Mix the gel coat thoroughly for about 30 min using an Eberbach shaker. It is essential that the sample be well mixed to obtain a valid result. Stirring with a spatula may also be required.

3.1.3 Using a top loading analytical balance, accurately weigh the cup (3.1.1) to $\pm 0.01\text{g}$.

3.1.4 Transfer an aliquot of the thoroughly mixed gel coat (3.1.2) to the cup. Cap the container, leaving the overflow orifice open. Immediately remove excess overflow sample material by wiping dry with absorbent material.

3.1.5 Avoid occluding air bubbles in the container.

3.1.6 Accurately weigh the filled cup to $\pm 0.01\text{ g}$.

3.1.7 Calculate the density in grams per milliliter of the Gel Coat as follows:

$$\frac{D_{\text{gel coat}} (\text{g/ml})}{(3.1.1)} = \frac{(3.1.6) - (3.1.3)}{(3.1.1)}$$

Where: $D_{\text{gel coat, g/m}}$ = Density of the gel coat

3.1.8 Run samples in duplicate. Results should not vary by more than $\pm 1\%$ of the mean.

3.1.9 Assume average density of MEK peroxide to be 1.08 g/ml.

3.1.10 Calculation of Density of Catalyzed Gel Coat:

$$D \text{ g/ml} = (3.1.7 \times A \times 10^{-2}) + (1.08 \text{ g/ml} \times B \times 10^{-2})$$

Where: **A** = The percentage by volume of the gel coat in the catalyzed gel coat mixture.

B = The percentage by volume of the MEKP in the catalyzed gel coat mixture

1.08 g/ml = Average density of MEKP (3.1.9)

D g/ml = Density of catalyzed gel coat

3.2 Determination of Volatile Organics

3.2.1 Clean the 100 mm x 1/2" metal lid with acetone and wipe dry before using.

3.2.2 Place the balance in a constant temperature room free from drafts. If a constant temperature room is not available, place the balance on the lab bench in an area free of draft. Determine the temperature of the room before starting the test.

3.2.3 Place the bent paper clip (**2.6**) on the metal lid and weigh to ± 0.01 g. Record the weight.

3.2.4 Weigh accurately approximately 100 ± 0.05 g of the gel coat into a dry and clean 8 oz wide mouth bottle with a screw cap.

3.2.5 Cap the bottle containing the gel coat and place in a constant temperature water bath. Adjust the bath temperature to $77 \pm 3^\circ\text{F}$.

3.2.6 Place the tared metal lid with the bent paper clip on the balance.

3.2.7 Check the gel coat temperature in the bottle using a thermometer. Be sure it is $77^\circ \pm 3^\circ\text{F}$. Take the glass bottle containing the gel coat out of the water bath and, using a pipette or syringe, add the appropriate amount and type of catalyst.

3.2.8 Mix the catalyst and the gel coat for one minute, using a spatula. Start the timer.

- 3.2.9 Pour approximately 25 g (± 0.5 g) of the catalyzed gel coat into the tared metal lid. Record the weight. The sample weight must be 25 ± 0.5 g net.
- 3.2.10 Put the metal lid containing the get coat in a fume hood. Turn off the hood.
- 3.2.11 Use the paper clip to determine if the resin has hardened sufficiently to allow the resin, or resin and lid, to be lifted. Stop the timer. Record this as the gel time.
- 3.2.12 Allow the gel coat to cure completely in the metal lid and continue weighing every 15 minutes until concurrent weighings agree to within ± 0.05 g. Record the weights. The last weight is the final weight.
- 3.2.13 For duplicate analysis, repeat Section 3.2.1 through Section 3.2.12.
- 3.2.14 Duplicate sample analysis must agree to within $\pm 5\%$ of the mean.

4) CALCULATIONS FOR COMPLIANCE

4.1 Weight of Sample (g) = (3.2.9) - (3.2.3)

4.2 Volatile Organic Compounds (g VOC) = (3.2.9) - (3.2.12)

4.3 Volume (l) of Catalyzed gel coat used in the Analysis.

$$= \frac{(4.1) \times 10^{-3}}{(3.1.10)}$$

4.4 Gram VOC/l of Catalyzed Gel Coat.

$$= \frac{(4.2)}{(4.3)}$$

4.5 Lb VOC/Gal of Catalyzed Gel

$$\text{Coat} = (4.4) \times 8.34 \times 10^{-3}$$

Where: $8.34 \times 10^{-3} = \frac{3.785 \text{ (l/gal)}}{454 \text{ (g/lb)}}$

5) REFERENCES:

- 5.1 "Static Method for Determination of Volatile Emissions from Polyester and Vinyl Ester Resins".** Society of Plastic Industry Composites Institute Method.
- 5.2 "Standard Method for Static Volatile Emissions".** South Coast Air Quality Management District.
- 5.3 "Density of Paint, Varnish, Lacquer and Related Products",** ASTM Designation D 1475 - 85, Book of ASTM Standards, Vol 06.01, 1986.