Designation: D 3790 – 79 (Reapproved 2001)

Standard Test Method for Volatile Matter (Moisture) of Leather by Oven Drying[1]

This standard is issued under the fixed designation D 3790; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of volatile matter (moisture) in all types of leather.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 2813 Practice for Sampling Leather for Physical and Chemical Tests[2]

E 180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial Chemicals[3]

3. Summary of Test Method

3.1 The ground leather specimen is heated in a mechanical-convection oven for 16 h at 100°C, placed in a desiccator, cooled, and reweighed. The loss in weight represents the volatile matter.

4. Significance and Use

4.1 The result obtained by this test is normally considered to be the moisture content of the leather sample. This result is used to correct all other chemical tests to a moisture-free basis.

4.2 Materials that are volatile under these conditions, other than water, may be present in the leather, although their amount in any normal leather would be expected to be a very small percentage of the total volatile matter.

4.3 Under the conditions of this test, certain materials in leather, such as protein fiber and chromium tanning salts, may retain moisture. Other materials, such as tannins and oils, may be oxidized. Both of these effects produce negative errors in the moisture determination.

4.4 The amount of volatile matter (moisture) released by a given leather varies with (*a*) degree of grinding of the sample, (*b*) weight of sample taken, (*c*) temperature and time of the oven drying, (*d*) shape of the weighing container, and (*e*) type of oven (gravity versus mechanical convection) used.

4.5 Because of the above unknown errors, the result of this test is a purely arbitrary value for the moisture content of the sample. It is, therefore, essential that the method be followed exactly in order to obtain reproducible results among laboratories. This is particularly true if other chemical analytical tests being performed on the same sample are reported on the moisture-free basis.

5. Apparatus

5.1 *Weighing Bottle*[4], glass, low-form, cylindrical with a ground-glass stopper of standard taper. The bottle shall have 70 ± 5 mm inside diameter, and 33 ± 3 mm overall height.

5.2 *Oven*, mechanical-convection draft capable of setting at 100°C, with a thermoregulator system capable of holding oven temperature within ± 2°C of set point. A thermometer accurate to ±0.2°C should be used to check and monitor the oven set point.

5.3 *Balance*, capable of weighing up to 100 g with an accuracy of ±0.001 g.

5.4 *Desiccator*, any convenient form or size, using any normal desiccating agent such as calcium sulfate, calcium chloride, or silica gel.

6. Sampling

6.1 The leather shall be sampled in accordance with Practice D 2813.

7. Procedure

7.1 Insert the empty weighing bottle inside the inverted stoppered cap and place on a shelf in the oven at 100 ± 2°C for 1 h or more. If the stopper has a handle then the stopper may be placed on the shelf in the oven near the empty weighing bottle.

7.2 Remove and place in a desiccator for at least 2 h to cool.

7.3 Weigh and record to the nearest ±0.001 g.

7.4 Use the ground leather sample as specified in Practice D 2813 and transfer 5 ± 1 g of ground leather into the previously weighed weighing bottle and stopper the bottle.

7.5 Weigh the stoppered bottle to the nearest ±0.001 g and record.

NOTE 1—Since leather varies greatly in moisture content depending

[1] This test method is under the jurisdiction of ASTM Committee D31 on Leather and is the direct responsibility of Subcommittee D31.06 on Chemical Analysis—General.

Current edition approved April 27, 1979. Published June 1979.

[2] *Annual Book of ASTM Standards*, Vol 15.04.

[3] *Annual Book of ASTM Standards*, Vol 15.05.

[4] Weighing bottles that have been found to be satisfactory are the Kimble Glass Co. No. 15166 and 15165 with 71/15 standard-taper caps and are available from most laboratory supply houses.

upon the humidity of the surrounding atmosphere, it is essential that weighings be made rapidly from the sample. It is further recommended that no weighings of samples be carried out if the humidity of the atmosphere at the balance varies by more than ±20 % from the humidity conditions under which the sample was equilibrated.

NOTE 2—The specimens for all chemical tests to be reported on a moisture-free basis should be weighed out at the same time as the moisture specimens.

7.6 *Oven Drying*—Insert the weighing bottle containing the sample inside the inverted stoppered cap and place on a shelf in the mechanical-convection oven at 100 ± 2°C for 16 ± ½ h.

7.7 Recap the bottle, place in the desiccator, and cool for at least 2 h.

7.8 Weigh and record to the nearest ±0.001 g.

8. Calculations

8.1 Calculate the percent volatile matter (moisture) as follows:

$$\text{Volatile matter (moisture), \%} = \frac{S - D}{S - B} \times 100 \quad (1)$$

where:

S = weight, of original specimen plus bottle plus cap, g,
B = weight, of empty bottle plus cap, g, and
D = weight, grams, of oven-dried sample plus bottle plus cap, g.

9. Report

9.1 Report the percent volatile matter on the as-received basis for each of the two specimens and the average of the two specimens to the nearest 0.01 %.

10. Precision and Bias [5]

10.1 *Repeatability*—The average difference between two results obtained by the same analyst on different days will approximate 0.2 % absolute. Two such values should be considered suspect (95 % confidence level) if they differ by more than 0.5 % absolute.

10.2 *Reproducibility*—The average difference between two results (each the average of duplicate determinations) obtained by analysts in different laboratories will approximate 0.3 % absolute. Two such values should be considered suspect (95 % confidence level) if they differ by more than 0.9 % absolute.

10.3 This method is purely arbitrary and the bias cannot be related to the true moisture content of the sample.

11. Keywords

11.1 moisture; volatile matter

[5] The precision estimates are based on an interlaboratory study of six different types of leather. One analyst in each of five laboratories performed two analyses on each sample on successive days for a total of 60 analyses. Practice E 180 was used in developing these precision estimates.