Designation: D4095 – 97 (Reapproved 2020)

Standard Practice for Use of the Refractometer for Determining Nonvolatile Matter (Total Solids) in Floor Polishes[1]

This standard is issued under the fixed designation D4095; 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 practice covers the use of a refractometer for determining the nonvolatile matter (total solids) in floor polishes. This practice is also applicable to resin solutions and wax emulsions used in floor polishes.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1218 Test Method for Refractive Index and Refractive Dispersion of Hydrocarbon Liquids

D2834 Test Method for Nonvolatile Matter (Total Solids) in Water-Emulsion Floor Polishes, Solvent-Based Floor Polishes, and Polymer-Emulsion Floor Polishes

3. Summary of Practice

3.1 Solids (nonvolatile matter) and refractive index are used as the basis for preparing curves that allow the use of refractive index as a fast, accurate means for determining solids in floor polishes, resin solutions, and wax emulsions.

4. Significance and Use

4.1 Solids (nonvolatile matter) determinations of polishes, resin solutions, and wax emulsions take 2 to 4 h in accordance with Test Method D2834, not counting preparation time.

4.2 Curves of solids/refractive index provide a means for determining solids in a matter of minutes.

4.3 This practice is particularly useful for quality control and in process control for the production of polishes and polish components.

5. Apparatus

5.1 *Refractometer*—An instrument capable of reading to four decimal places.

5.2 *Water Bath,* or other means of controlling the temperature of the refractometer prisms.

6. Procedure

6.1 Determine the nonvolatile matter in the polish, resin, or wax emulsion in accordance with Test Method D2834 using a minimum of three and preferably four replicates. Record the arithmetic average.

6.2 Adjust prism temperature of the refractometer to 25°C through the use of a water bath. Temperatures of 20°C and 30°C are also commonly used for refractive index work. Any convenient temperature may be used as long as that temperature is used consistently.

6.3 Standardize the refractometer using the procedure in Test Method D1218 or according to the refractometer manufacturer's instructions. In either case, standard reference liquids should be used.

6.4 Determine the refractive index of the process water used for preparation of the polish, resin, or wax emulsion according to the procedure in Test Method D1218.

6.5 Determine the refractive index of the same sample of polish, resin solution, or wax emulsion from 6.1 according to the procedure in Test Method D1218. (Take multiple readings and record the arithmetic average.)

6.6 Plot a curve of refractive index versus solids on standard (20 by 20/in.) graph paper.

[1] This practice is under the jurisdiction of ASTM Committee D21 on Polishes and is the direct responsibility of Subcommittee D21.03 on Chemical and Physical Testing.

Current edition approved Oct. 1, 2020. Published October 2020. Originally approved in 1982. Last previous edition approved in 2014 as D4095 – 97 (2014). DOI: 10.1520/D4095-97R20.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

6.6.1 Use zero (0 %) solids and the refractive index of the process water as the origin.

6.6.2 Plot the solids from 6.1 and the refractive index from 6.5 as the second point. Draw a line connecting the origin to the second point. Curves, thus produced for polishes, resin solutions, and wax emulsions are usually straight lines. Verification must be made by careful dilution (by weight) of the sample with the process water; determine the refractive index of the diluted sample that should fall on the curve at the calculated solids.

6.6.3 Curves should be checked periodically by determining solids in accordance with Test Method D2834 to make sure the curve has not shifted. Generally, once a year is sufficient.

6.6.4 Each formulation has its own individual curve. Changing ingredients or ratios of ingredients in a particular formulation will change the slope of the curve and require development of a new curve for the revised composition.

7. Some Practical Uses of the Data

7.1 The curve plotted in 6.6.2 can be adapted in several ways to provide useful information and data for production control.

7.1.1 The curve itself can be used to determine solids of polish or polish components while in process.

NOTE 1—The useful area of the curve can be enlarged to provide easier reading with increased accuracy.

7.1.2 The data from the curve can be used to prepare a table of refractive index readings over a useful range of solids. This avoids the necessity of constant reference to the actual plot of the curve.

7.1.3 The data from the curve can be used to prepare a table of "water to add" to achieve a specific solids. For each refractive index reading covering the range of interest there is a volume (gallons or litres) of water to add. Each batch of material produced must be brought to some specific, known base volume to use a "water to add" table.

8. Cautions and Comments

8.1 Refractive index is very sensitive to temperature. A good rule of thumb is for every 1°C temperature change the refractive index changes about 0.0002; as the temperature increases the refractive index decreases.

8.2 Refractive index varies with different wave lengths of light. Yellow light (sodium, D) is most commonly used. It is important to use a constant light source.

8.3 Each laboratory must develop its own curves, based on solids (nonvolatile matter) results, in its oven (and other equipment), its own refractometer and its own trained operators.

8.4 It is not important that absolute or even the same refractive index readings be obtained from each laboratory in interlaboratory tests on the same sample. Refractometers, operators, and conditions can vary significantly from laboratory to laboratory.

8.5 Extrapolation of curves to significantly higher solids is not recommended. Solids more than 3 % higher than the solids level used to develop the curve should not be attempted without verification. For example, a curve developed for a 20 % polish should not be extrapolated for use at 25 % solids; above 23 % a new curve should be considered.

8.6 "Hand-held" refractometers can be used but at a considerable sacrifice in accuracy. These instruments may be sufficiently accurate for in process monitoring.

8.7 Opaque materials give less distinct light and dark areas that make it somewhat more difficult to adjust the critical edge on the crosshairs.

9. Precision and Bias

9.1 The precision and bias of this practice is limited to that attainable by solids determinations when using Test Method D2834.

10. Keywords

10.1 nonvolatile matter; polishes; refractometer solids content