T 519 om-02

SUGGESTED METHOD – 1970
OFFICIAL STANDARD – 1978
OFFICIAL TEST METHOD – 1980
REVISED – 1986
REVISED – 1991
REVISED – 1996
REVISED – 2002

CAUTION:
This Test Method may include safety precautions which are believed to be appropriate at the time of publication of the method. The intent of these is to alert the user of the method to safety issues related to such use. The user is responsible for determining that the safety precautions are complete and are appropriate to their use of the method, and for ensuring that suitable safety practices have not changed since publication of the method. This method may require the use, disposal, or both, of chemicals which may present serious health hazards to humans. Procedures for the handling of such substances are set forth on Material Safety Data Sheets which must be developed by all manufacturers and importers of potentially hazardous chemicals and maintained by all distributors of potentially hazardous chemicals. Prior to the use of this method, the user must determine whether any of the chemicals to be used or disposed of are potentially hazardous and, if so, must follow strictly the procedures specified by both the manufacturer, as well as local, state, and federal authorities for safe use and disposal of these chemicals.

Diffuse opacity of paper (*d*/0 paper backing)

1. Scope

1.1 This method provides a measure of diffuse opacity (paper backing) of white and near-white papers, previously known as "printing opacity."

1.2 The method may be employed for colored papers on condition that their reflectance (paper backing) is greater than 20% and their diffuse opacity (paper backing) is greater than 45% (*1*).

1.3 The method is not suitable for highly transparent papers such as glassine.

1.4 This method employs *d*/0 geometry, illuminant C, and paper backing whereas TAPPI T 425 "Opacity of Paper" employs 15/*d* geometry, illuminant A, both 89% reflectance backing and paper backing.

1.5 This method is similar to ISO 2471.

2. Summary

Diffuse opacity, expressed as a percentage, is given by the ratio of the diffuse luminous reflectance factor of a single sheet with black backing (Y_0) to that with a backing consisting of a pad of the same paper (Y_∞), multiplied by 100, i.e., ($100 \times Y_0 / Y_\infty$).

NOTE 1: Light absorption coefficients *K* and light scattering coefficients *S* may also be determined from these reflectances if either the grammage of a sheet or its thickness is known (*2,3*).

3. Significance

3.1 This method indicates the extent to which a single sheet of paper hides (obscures) printed matter on underlying sheets of similar paper.

3.2 This method should not be confused with the opacity, white backing (TAPPI T 425) method, which assesses different optical properties (see section 15.3).

Approved by the Standard Specific Interest Group for this Test Method
TAPPI

12. Report

12.1 Report the average high and low opacity to the nearest 0.1%, stating the method used.
12.2 If the measured opacity from each side differs by 0.5% or more, report the opacity for each side separately.

13. Precision

13.1 The following estimates of repeatability and reproducibility are based on data from the CTS-TAPPI Interlaboratory Program from 1997 through 2000. Samples on which this data is based were uncoated printing and xerographic grades and standard 30# newsprint. Participants were asked to follow TAPPI Official Test Method T 419 om-96 to conduct this testing. Testing is based on 10 determinations per test result and 1 test result per lab, per material.

Repeatability = 0.4%

Reproducibility = 0.6%

The following chart shows representative data on which the figures above are based.

		Opacity Measurements						
Material description	**Grand Mean**	**Stnd Dev Btwn Lab Results**	**Repeatability r and %r**		**Reproducibility R and %R**		**Labs Included**
30# Newsprint	96.27	0.25	0.28	0.3%	0.68	0.7%	37
70# Offset	94.34	0.11	0.17	0.2%	0.30	0.3%	34
60# Offset	92.61	0.20	0.37	0.4%	0.55	0.6%	41
20# Xerographic	89.65	0.20	0.49	0.5%	0.55	0.6%	36

13.2 Repeatability and reproducibility are estimates of the maximum difference (at 95%) which should be expected when comparing test results for materials similar to those described above under similar test conditions. These estimates may not be valid for different materials or testing conditions.
13.3 The user of these precision data is advised that it is based on actual mill testing, laboratory testing, or both. There is no knowledge of the exact degree to which personnel skills or equipment were optimized during its generation. The precision quoted provides an estimate of typical variation in test results which may be encountered when this method is routinely used by two or more parties.

14. Keywords

Opacity, Paper, Reflectance, Diffuse reflection.

15. Additional information

15.1 Effective date of issue: March 5, 2002.
15.2 To reduce the opacities of different kinds of paper to relate to a common grammage, application of the Kubelka-Munk theory (*4*) provides the following formula: