

The information and data contained in this document were prepared by a technical working group of the Association. The working group and the Association assume no liability or responsibility in connection with the use of such information or data, including but not limited to any liability under patent, copyright, or trade secret laws. The user is responsible for determining that this document is the most recent edition published.

PLEASE NOTE: A TAPPI Useful Method (UM) is a document written to describe a test, procedure, or practice which may be proposed by a Working Group of no fewer than three TAPPI members not employed by the same organization and written in the same general style as a TAPPI Standard Test Method, but with the inclusion or exclusion of certain sections as deemed appropriate by the Working Group, and with minimum precision requirements that may be expanded at the discretion of the Working Group. A UM is written with no less attention to proper use of the language to describe the procedure using essentially the same elements of a TAPPI Standard Test Method, but in a less rigorous manner. TAPPI Useful Methods do not receive the same review through a rigorous process of openness, voluntary review, and consensus as do the TAPPI Standard Test Methods, and as such, are not intended to be used as referee methods as the TAPPI Standard Test Methods are.

CAUTION:

This 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.

Polystyrene in paper products

Scope

These procedures are applicable to paper modified with polystyrene. Two alternative methods can be used: ultraviolet and gravimetric.

These can be used for products covering a wide range of polystyrene content. The UV method is more sensitive than the gravimetric method and can be used for determining very low polystyrene loadings as low as 0.1%. The practical lower limit of the gravimetric method is approximately 1% polystyrene content.

Safety precautions

Run all procedures using chloroform under a fume hood approved for the use of this chemical and note the chemical caution statement above.

Significance

The purpose of the addition of polystyrene is for improved optical properties such as whiteness and opacity, and also improved printing characteristics and bulking.

Apparatus

For the UV method:

1. *Ultraviolet spectrophotometer*, any commercially available spectrophotometer covering the UV region from 200 to 390 nm is satisfactory.

Approved by a Working Group of TAPPI in accordance with the Useful Method Guidelines

2. *UV cells*, two matched 1-cm path length cells, UV transmitting.
3. *Erlenmeyer flasks*, 250 mL, 24/40 standard taper flasks with water-cooled condensers to fit.
4. *Blender*.
5. *Hot plate*.
6. *Pipet*, 100 mL volumetric.

For the gravimetric method:

Soxhlet extraction apparatus, with 33 × 80 mm cellulose thimbles

Reagent

Chloroform, reagent grade.

Sampling

Ultraviolet method. From each test unit of the sample obtained in accordance with TAPPI T 400 “Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product,” cut an approximately 4 × 4 in. (100 × 100 mm) piece of paper (about 0.4 g) from the sheet and weigh to the nearest milligram. Then cut into 0.5 in. (12.7 mm) strips and then into 0.5 in. (12.7 mm) squares and transfer to the Erlenmeyer flask through a wide neck polyethylene funnel.

Gravimetric method. Cut a piece of paper sheet weighing about 5 g into approximately 1-in. (2.5-mm) square and grind dry in a blender at high speed until completely macerated (usually about 30 s).

Procedure

Ultraviolet method

Run all procedures using chloroform under a fume hood approved for the use of this chemical. Add exactly 100 mL of chloroform to the sample in the Erlenmeyer flask and reflux on a hot plate for 1 h under a water-cooled condenser, then stopper and cool to room temperature under running water, with intermittent loosening of the stopper to release the vacuum.

Run a “paper blank” of approximately equal weight, formulated with all the ingredients except the polystyrene. Measure the absorbencies at 250 and 260 nm of both sample and paper blank in a 1-cm cell versus pure chloroform in a matched cell on the spectrophotometer.

Depending on the polystyrene concentration and absorbance range of the spectrophotometer, more or less sample may be used to give a practical absorbance reading. It is not necessary to run a different weight of paper blank for each weight of sample. A simple correction is made for the absorbance of the blank equivalent to the weight of sample taken for analysis; however, run a new paper blank for each different paper formulation.

The corrected absorbance at the two wavelengths is calculated by subtracting the absorbance of the paper blank from that of the sample.

The absorptivity of the sample at 250 and 260 nm is calculated as follows:

$$a = A / LC \quad (1)$$

where

a	=	absorptivity
A	=	measured absorbance relative to the “paper blank,” % or fraction
L	=	cell length, cm
C	=	sample concentration, g/1000 mL extract

NOTE 1: Following the procedure outlined in this UM, the cell path length (L) is equal to 1 cm and the concentration (C) is equal to the weight (grams) of sample used times 10.