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Forming handsheets for reflectance testing of pulp (sheet machine procedure)

1. Scope

1.1 This practice describes the procedure using the TAPPI sheet machine for preparing reflectance-testing specimen sheets of bleached or unbleached pulp whose fibers are readily dispersed in water. This practice permits the preparation of sheets having a smooth and reproducible surface for reflectance measurements with a minimum of washing or contamination of the sample.

1.2 The pulp sample slurry is adjusted to a pH of 6.5 ± 0.5 .

1.3 TAPPI Standard Practice T 218 describes a procedure for using the Büchner funnel for making handsheets for the same application. The purpose for having two practices is discussed in sections 4.3 and 4.4.

1.4 See Appendix for consideration of recycled pulps.

2. Applicable documents

2.1 TAPPI Official Test Methods referred to for parts of this procedure include: TAPPI T 400 “Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product;” TAPPI T 205 “Forming Handsheets for Physical Tests of Pulp;” and TAPPI T 402 “Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products.”

2.2 Reflectance testing on handsheets prepared by this practice may be performed using TAPPI Official Test Methods TAPPI T 452 “Brightness of Pulp, Paper, and Paperboard (Directional Reflectance at 457 nm),” or TAPPI T 525 “Diffuse Blue Reflectance Factor of Pulp (Diffuse Brightness).”

2.3 TAPPI Standard Practice TAPPI T 218 “Forming Handsheets for Reflectance Testing of Pulp (Büchner Funnel Procedure)” differs from this practice in the manner in which the sheets are made.

3. Summary

3.1 A properly selected specimen of the pulp to be evaluated is dispersed in a small volume of water, the pH of the slurry and the water in the sheet machine is adjusted to a pH of 6.5 ± 0.5 and formed into a sheet on a sheet machine. The sheet is pressed and dried under controlled conditions to produce a reproducible surface for reflectance testing.

Approved by the Standard Specific Interest Group for this Standard Practice

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4. Significance

4.1 The reflectance of a sheet composed of fibers is dependent on the structure of the surface and orientation of the fibers. Industrially made pulp sheets have a variety of structures and surface textures and may contain impurities removable in water. The dispersion of the pulp and the forming of a uniform sheet in a repeatable manner are therefore necessary for accurate testing (1).

4.2 It is well established that the reflectance of pulps, particularly unbleached, is affected by pH (2). Accordingly, this practice establishes a pH which is an optimum for most pulps. If however, reflectance must be measured at a specific pH, all water used in preparation of the sheets shall be appropriately adjusted and the actual pH reported.

4.3 The procedure described in this practice for forming the sheets and the Büchner funnel procedure described in Practice T 218 may not produce equivalent results. The 150 mesh stainless steel wire screen of the sheet machine may result in the loss of fines which are frequently defined as being able to pass a 200 mesh screen. Stone groundwood, which contains a large percentage of fines, would be particularly affected by the sheet machine. Dilution factors between the two procedures are different, and opposite sides of the sheets are tested (2).

4.4 In selecting which of the practices to use (T 218 or T 272), consideration should be given to the drainage characteristics of the pulp. For example, recycled or low freeness pulps may require an unreasonable time to remove the excess water from the funnel (T 218) and the fibers may not be distributed evenly. In that case the sheet machine practice (T 272) would be preferred.

4.4.1 Two of the advantages of the Büchner funnel practice (T 218) are that less water is involved so pH control is more convenient and the equipment is less expensive.

4.5 This practice includes precautions to prevent contamination of the pulp with color-causing materials during preparation of the sheets.

4.6 The reflectance of a sheet prepared according to this procedure may not be the same as that of a sheet made from the same pulp under industrial papermaking conditions since pulp fines retention will probably be different and no heat is used to dry the sheet.

5. Apparatus and reagents

5.1 *Disintegrator*¹, as described in TAPPI T 205, or a *high-speed mixer*¹ with two fixed ripple-edge stainless steel mixing blades on a stainless steel shaft and fitted with a square-shaped 1000-mL stainless steel canister¹.

NOTE 1: A disintegrator with a stainless steel paddle and shaft and canister made of stainless steel or plastic is preferred. It is essential, if an old model bronze disintegrator is used, that the interior of the canister, the paddle, and the shaft be chromium-plated or plastic-coated to prevent discoloration of the pulp.

NOTE 2: The high-speed mixer recommended is of the “malted-milk” type, not the “blender” type. For ease of cleaning, it should have fixed, ripple-edged blades rather than hinged blades. The canister is specially made to fit the mixer but is square because this shape is more efficient than the common round “malted-milk” can (Fig. 1).

5.2 *Balance*, capable of weighing to the nearest 0.2 g.

5.3 *Graduated vessels*, two calibrated 2000-mL glass cylinders or stainless steel cups.

5.4 *Filter paper*, sheets of smooth, 185-mm white filter paper, free from water soluble impurities.

5.5 *Sheet machine*, the TAPPI 159-mm (6.25-in.) sheet machine (see T 205) provided that the sheet mold must meet the following conditions.

5.5.1 For bleached pulp the entire inner surface of the mold, grid plate, and water leg must be chromium- or nickel-plated. The forming surface should be of 150-mesh stainless steel wire backed by a 20-mesh stainless steel screen. Purified water must be piped in, using plastic or aluminum pipes, and special care must be taken so that it does not become contaminated.

¹ Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list in the bound set of TAPPI Test Methods, or may be available from the TAPPI Quality and Standards Department.