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Specular gloss of paper and paperboard at 20 degrees

1. Scope

1.1 This method is for the measurement of the specular gloss of high-gloss papers at 20° (70° from the plane of the paper).

1.2 This method is suitable for high-gloss coated, cast-coated, lacquered, highly varnished or waxed papers, and high-gloss ink films. For the measurement of low- to moderate-gloss coated and uncoated papers and low- to moderate-gloss ink films, TAPPI T 480 “Specular Gloss of Paper and Paperboard at 75 Degrees” is preferred. Neither method is a measure of image reflecting quality.

1.3 This method will provide different values for 20° gloss than ASTM Standard D523 due to differences in optical geometry.

2. Summary

This method involves the measurement of reflectance using a scale on which a polished black glass with a refractive index of 1.540 measures 100 units. The angles of incidence and reflectance are each 20°, the receptor or viewing window is round and its diameter subtends an angle of 5° with respect to an apex at the center of the illuminated area in the plane of a specimen opening. These geometric conditions establish a gloss scale which provides optimum discrimination for high gloss papers. (1)

3. Significance

This method gives good correlation with visual gloss or shininess provided the sample is flat. The degree of correlation decreases as the sample deviates from being flat.

4. Definition

Specular gloss - ratio of flux reflected in specular direction to incident flux for specified source and receptor apertures (usually measured relative to a standard of specified index of refraction).

Approved by the Standard Specific Interest Group for this Test Method



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5. Apparatus¹

5.1 *Gloss meter*, which has the general arrangement and significant dimensions of the optical system shown in Figure 1. The instrument consists of a source of light, a lens giving a converging beam of rays incident on the test specimen, a suction plate to hold the specimen flat, a receptor window, a receiving lens, a filter to modify the spectral distribution of the light, and a photodetector to receive and measure the rays reflected by the test specimen. These components are combined in a light-tight housing that is matte black inside and is structurally and optically stable throughout a normal range of operating temperatures $23.0 \pm 5^\circ\text{C}$ ($73.4 \pm 9^\circ\text{F}$). The instrument must also meet the geometric, photometric and spectral conditions described as follows:

5.1.1 *Geometric conditions* - The axis of the incident beam is $20 \pm 0.15^\circ$ from a line perpendicular to the plane of the test surface. The receptor window, the lens adjacent to this window, and the photodetector are centered about an axis which is the mirror image of the axis of the incident beam. Thus, an image of the source field stop shall be formed in the center of the receptor window when a front-surface mirror is placed in the specimen position. The diameter of this image shall subtend angles at the center of the illuminated area in the specimen plane of no more than 2.5° nor less than 1.0° . The receptor window is round in shape and is of such a diameter that it collects a solid angle of light rays of $5 \pm 0.5^\circ$ with respect to the center of the illuminated area in the plane of the specimen opening (Figure 1).

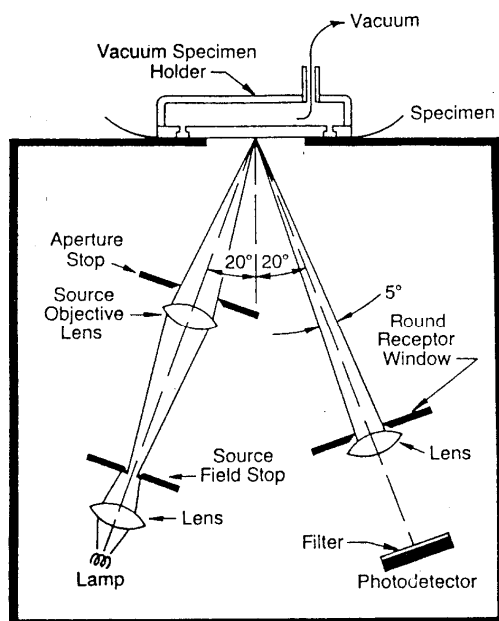


Fig. 1. 20° Glossmeter optical system.

Diaphragms and light shields are provided to keep all light from reaching the photodetector except that light present in the beams described above without any vignetting or interception by stops or diaphragms of rays projected in the directions specified. The interior of the instrument is finished in matte black, and the lamp, lenses, photodetector and interior surfaces are to be kept clean and free of dust to minimize stray light.

5.1.2 *Photometric conditions* - Any combination of photodetector and indicating device may be used provided it gives a numerical indication in direct proportion to light flux passing through the receptor window over the entire scale to within $\pm 0.2\%$ of full scale: i.e., ± 0.2 scale division for a scale comprised of 100 divisions. The photometric linearity

¹ Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list, available as part of the CD or printed set of Standards, or on the TAPPI website general Standards page.