



T 444 om-12

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OFFICIAL STANDARD – 1941
REVISED – 1947
OFFICIAL METHOD – 1968
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Silver tarnishing by paper and paperboard

1. Scope

1.1 This method is for identifying papers and boards that will tarnish or stain silver. The appearance of the tarnish or stain of silver by a test specimen of the sample is reported, together with the distribution of the tarnishing or staining. Reducible sulfur activity is a common cause of tarnishing.

1.2 Certain sample types, such as water repellent or metal-coated papers, or board may require a modification of the test procedure. In most cases, water repellent or metal-coated samples may be tested without wetting the test specimen and by prolonging the time in contact with the silver to at least 24 h. When such sample types are tested, state any modification of the procedure which is used in the report.

1.3 The principles involved in this test method might be used to test samples for their staining or corrosion properties with respect to other metals, such as steel, copper, nickel, brass, etc. In such cases, it is necessary to use plates or forms of the particular metal or alloy in question and to make such modifications as may be required for the particular purpose. For example, in the case of metal that would rust, the paper might not be wetted; it could instead be heated in an atmosphere of high humidity.

1.4 Specific details of testing for tarnishing or staining papers are beyond the scope of this test method. The information in 10.2 and 10.3 is given only as examples of extensions of the test method which may be possible.

2. Significance

This test method provides a semi-quantitative method to determine if paper or paperboard will cause tarnishing of the surface of silver.

Approved by the Standard Specific Interest Group for this Test Method



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3. Apparatus

3.1 *Metal plates*, solid silver or silver plated brass flat plates, approximately 15 × 15 cm (6 × 6 in.). Two plates are needed for each test and are probably sufficient for occasional tests of paper. Several sets are necessary where frequent testing is desired.

3.1.1 *Silver plated brass plates*, produced as follows: commercial rolled-sheet brass 6.35 mm (0.25 in.) thick is buffed smooth and as free from tool marks as practical, then plated with pure silver to a thickness of about 0.125 mm (0.005 in.), buffed again, and replated with another 0.125 mm of pure silver. A smooth, continuous layer of pure silver about 0.25 mm (0.010 in.) thick, which can be repeatedly cleaned and polished, should be obtained. To determine the amount of plated silver, weigh the brass plate before and after plating. A layer of silver 0.25 mm thick weighs about 2.5 kg/m². The brass plates may be plated on one or both sides.

3.1.2 *Solid silver plates*, approximately 15 × 15 cm (6 × 6 in.).

3.2 *Oven*, forced draft, capable of maintaining a temperature of 38 ± 2°C about (100°F) or 70 ± 5°C (about 150°F) protected by isolation from laboratory fumes.

3.3 *Desiccator*, glass, or other container with a tightly fitting cover, and ceramic or glass stand.

3.4 *Forceps*, wooden or plastic.

3.5 *Weight*, approximately 2.5 kg (5 lb).

4. Reagents and materials

4.1 *Silver polish*, a silver-polishing powder or paste, which will not scratch pure silver and does not contain cyanides or protective coatings such as silicone. A paste made up of the finest grade of Tripoli powder, such as that used for polishing metals for metallographic work, and distilled water containing a small amount of NH₄OH is recommended.

4.1.1 Tripoli powder is the common name for particulate SiO₂ used in polishes for a wide range of materials including wood, “rocks,” and metal surfaces. Tripoli powder comes in a wide range of particle sizes and purities between about 90% and 99%, major impurities being other oxides such as aluminum, calcium, and iron. The use of Tripoli powder in this test dates from the origination of the procedure in 1939, and there is no added information on the use of Tripoli powder for polishing the plates used than that in section 4.1. While a Tripoli powder paste can be prepared, commercial metal (silver) polishes are quite suitable, but the requirement that they not leave any cyanides or protective coating on the silver is critical. Any material deposited on the silver by the polish that would coat it in any way would eliminate its use in a test for tarnishing.

4.2 *Water*, distilled or deionized.

4.3 *Silver foil*

4.4 *Aluminum foil*, area to contact test specimen must be cleaned free of oil by wiping with clean cotton or lens paper soaked in a suitable solvent.

4.5 *Solvent*, the solvent historically specified in this method was is 1, 1, 1-trichloroethane. **SAFETY CAUTION:** 1, 1, 1-trichloroethane represents a significant health and environmental hazardous material. The use of solvent has been retained for historical reasons. Toluene and hexane have been suggested as replacements. Toluene, however, also has been implicated as a potential health and environmental hazard because of the potential for contamination with benzene. If an alternative cleaner has been used, the name/type of this alternative should be noted in the report.

5. Test specimen

5.1 Obtain the sample in accordance with TAPPI T 400 “Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, or Related Product.” Do not touch the areas to be tested with the fingers; instead, use clean forceps and protect the sample from contamination which may be in the atmosphere.

5.1.1 Whenever there is any doubt regarding the presence of sulfur compounds in the air, it is advisable to hang one or more small strips of clean, highly polished silver foil in the laboratory in which the test pieces are prepared, and in the oven with the test specimens. If tarnishing or staining of these strips occurs, the air entering the oven should be purified, or the oven should be placed where the air causes no tarnishing of the silver.

5.2 From the sample, select at least five representative test specimens, each about 160 mm (6.5 in.) square.