

New Folder Name Atomizer Test

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ASTM Atomizer and Water Break tests, for your information. We are not expressing a desire to incorporate these particular procedures in your effort at this time.



Standard Test Method for HYDROPHOBIC SURFACE FILMS BY THE ATOMIZER TEST¹

This standard is issued under the fixed designation F 21; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last approval.

1. Scope

1.1 This method covers the detection of the presence of hydrophobic (nonwetting) films on surfaces and the presence of hydrophobic organic materials in processing ambients. When properly conducted, the test will enable detection of fractional molecular layers of hydrophobic organic contaminants. On very rough or porous surfaces the sensitivity of the test may be significantly decreased.

2. Summary of Method

2.1 The atomizer test² is performed by subjecting the dry surface to be tested to a fine water spray. The interpretation of the test is based upon the pattern of wetting. In the absence of hydrophobic films, the impinging water droplets will wet the surface and spread immediately to form a continuous water film. In areas where hydrophobic materials are present on the surface, the sprayed droplets will not wet the surface and spread but will tend to remain as fine droplets.

3. Significance

3.1 The atomizer test as described in this method is nondestructive and may be used for control and evaluation of processes for the removal of hydrophobic contaminants. The test may also be used for the detection and control of hydrophobic contaminants in processing ambients. For this application, a surface free of hydrophobic films is exposed to the ambient and subsequent tested.³

4. Definitions

4.1 *hydrophilic*—having a strong affinity for water; wettable.

4.2 *hydrophobic*—having little affinity for water; nonwetable.

5. Interferences

5.1 Loss of sensitivity may result from either of the following factors:

5.1.1 The presence of hydrophilic substances on the surface to be tested, test equipment, or test materials, or

5.1.2 An unusually rough or porous surface condition.

6. Apparatus

6.1 *Spray Gun Atomizer*.⁴

6.2 *Low Power Microscope* (5× to 50×), and light source for observation of small piece parts.

7. Reagents and Materials

7.1 *Acetone*, reagent grade.

7.2 *Mica Blanks*, preferably 1 in. (25 mm) by 2 in. (50 mm) by 0.015 in. (0.38 mm) or larger, having a minimum ASTM quality V6 as described in ASTM Specification D 351, for Natural Moscovite Block Mica and Thins Based on Visual Quality.⁵

7.3 *Oleic or Stearic Acid*—A 0.005 to 0.05 percent solution in acetone.

¹This method is under the jurisdiction of ASTM Committee F-1 on Electronics, and is the direct responsibility of Subcommittee F01.05 on Semiconductor Process Materials.

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²Linford, H. B., and Saubestre, E. B., "A New Degraining Evaluation Test: The Atomizer Test," *ASTM Bulletin*, ASTBA, May 1953, p. 47.

³Feder, D. O., and Koontz, D. E., "Detection, Removal and Control of Organic Contaminants in the Production of Electron Devices," *ASTM STP 246*, ASTA, Am. Soc. Testing Mats., p. 40 (1959).

⁴Paasche Air Brush Model VL-1 or its equivalent has been found satisfactory for this purpose.

⁵*Annual Book of ASTM Standards*, Part 40



7.4 *Oxygen*—Filtered low-pressure (15 psi min) oxygen or other suitable gas that is free of hydrophobic and hydrophilic substances.

NOTE 1—The freedom of the water and the gas from hydrophobic and hydrophilic contamination may be determined in accordance with Section 8.

7.5 *Water*—Deionized or distilled water is preferred. Water of higher ionic content may render the test destructive. The water used must be free of hydrophobic and hydrophilic substances (see Note 1).

8. Calibration and Standardization

8.1 The degree of freedom of the test equipment and materials from hydrophobic contamination is proportional to the number of alternate spraying and drying cycles required to produce detectable hydrophobic contamination on a freshly cleaved mica surface. This test may be performed with greater sensitivity by masking a portion of the freshly cleaved surface under test with a mica sheet (having both surfaces freshly cleaved) during the sequential test cycle. After the desired number of sprays, the mask shall be removed and the entire surface retested for a detectable difference in wetting behavior between the two areas.

8.2 To assure that test results are not obscured by flooding or by hydrophilic contaminants, a freshly cleaved mica surface from

which the solvent from one drop (0.05 to 0.1 ml) of a 0.005 to 0.05 percent solution of oleic or stearic acid in acetone has been allowed to evaporate shall, when tested, clearly show the demarkation between the clean and contaminated areas.

9. Procedure

9.1 *Testing of Surfaces*—Hold the test surface 10 in. (250 mm) to 20 in. (500 mm) from the atomizer and spray with a fine mist of water for a period of 1 to 10 s.

9.2 *Testing of Ambients*—Expose a freshly cleaved mica surface to the ambient and subsequently perform the test as described in 9.1.

NOTE 2—Exposure may be by immersion of mica surface in the ambient or by deposition of sample of the ambient on the mica surface. The procedure described in 8.1 may be used to increase the sensitivity of this test.

10. Interpretation of Results

10.1 Surfaces tested as described in 9.1 shall be considered free of hydrophobic contaminants by this test if the impinging water droplets spread immediately to form a thin continuous uniform water film as shown in Fig. 1. If hydrophobic contaminants are present, as evidenced by discontinuous or nonuniform water films, the degree of contamination may be estimated by comparison of the pattern of wetting with Figs. 2 to 5.

ml) of a 0.005 to 0.05 percent solution of oleic or stearic acid in acetone has been allowed to evaporate shall, when tested, clearly show the demarkation between the clean and contaminated areas.

9. Procedure

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NOTE 2—Exposure may be by immersion of the mica surface in the ambient or by deposition of a sample of the ambient on the mica surface. The procedure described in 8.1 may be used to increase the sensitivity of this test.

10. Interpretation of Results

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FIG. 1 Atomizer Test of Nickel Specimen with No Detectable Hydrophobic Contaminant ($\times 2$ Reduced One-Half in Reproduction).

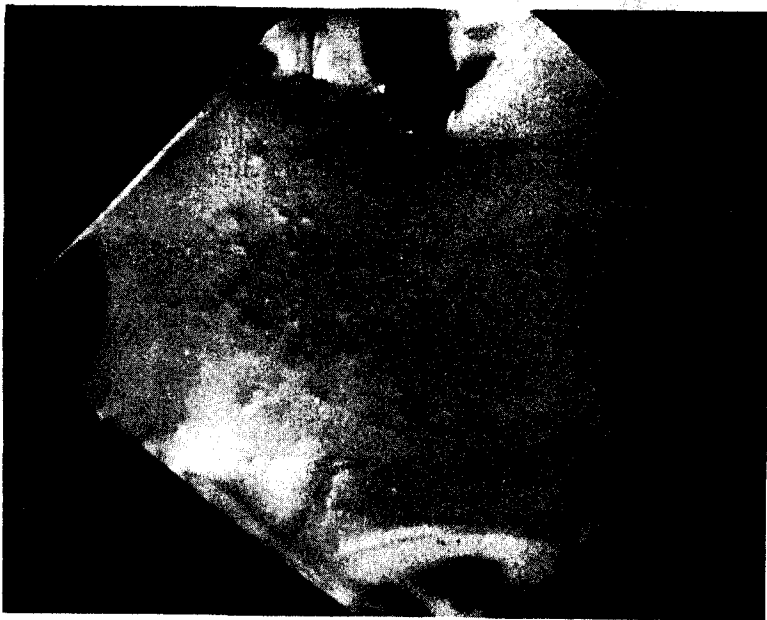


FIG. 2 Atomizer Test of Nickel Specimen Showing Trace of Hydrophobic Contaminant ($\times 2$, Reduced One-Half in Reproduction). Note Slight Discontinuities in Otherwise Uniform Water Film.

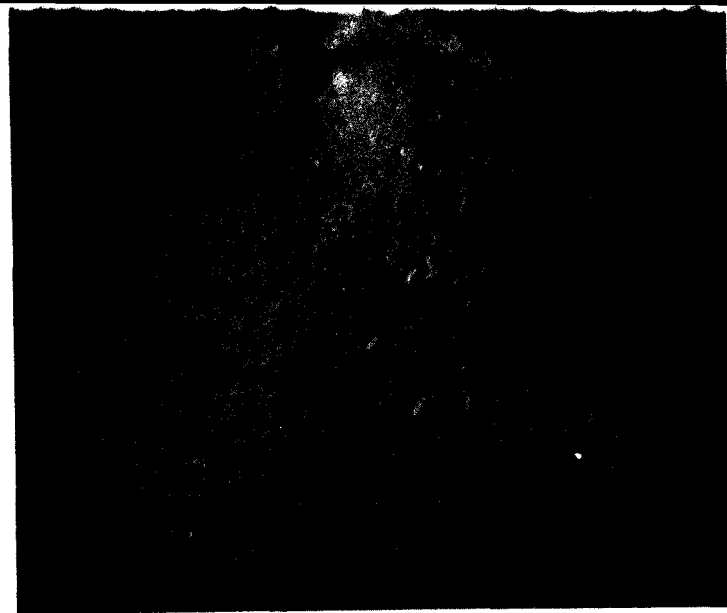


FIG. 3 Atomizer Test of Nickel Specimen Showing Traces of Hydrophobic Contaminant ($\times 2$, Reduced One-Half in Reproduction).



FIG. 4 Atomizer Test of Partially Contaminated Nickel Specimen ($\times 2$, Reduced One-Half in Reproduction).

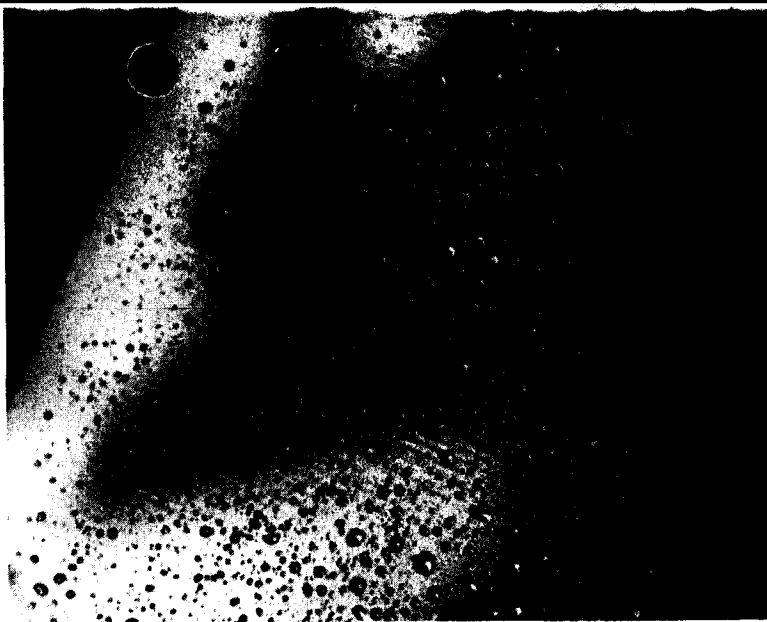


FIG. 5 Atomizer Test of Nickel Specimen with Hydrophobic Film Covering Surface ($\times 2$, Reduced One-Half in Reproduction).

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103, which will schedule a further hearing regarding your comments. Failing satisfaction there, you may appeal to the ASTM Board of Directors.

Standard Test Method for HYDROPHOBIC SURFACE FILMS BY THE WATER- BREAK TEST¹

This standard is issued under the fixed designation F 22; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

1. Scope

1.1 This method covers the detection of the presence of hydrophobic (nonwetting) films on surfaces and the presence of hydrophobic organic materials in processing ambients. When properly conducted, the test will enable detection of molecular layers of hydrophobic organic contaminants. On very rough or porous surfaces the sensitivity of the test may be significantly decreased.

2. Summary of Method

2.1 The water-break test is performed by withdrawing the surface to be tested, in a vertical position, from a container overflowing with water. The interpretation of the test is based upon the pattern of wetting. In the absence of hydrophobic films, the draining water layer will remain as a film over the surface. In areas where hydrophobic materials are present on the surface, the draining water layer will break up into a discontinuous film within 1 min.

3. Significance

3.1 The water-break test as described in this method is nondestructive and may be used for control and evaluation of processes for the removal of hydrophobic contaminants. The test may also be used for the detection and control of hydrophobic contaminants in processing ambients. For this application, a surface free of hydrophobic films is exposed to the ambient and subsequently tested.

4. Definitions

4.1 *hydrophilic*—having a strong affinity for water, wettable.

4.2 *hydrophobic*—having little affinity for water, nonwetable.

5. Interferences

5.1 Loss of sensitivity may result from either of the following factors:

5.1.1 The presence of hydrophilic substances on the surface to be tested, in the test equipment, or in the test materials, or

5.1.2 An unusually rough or porous surface condition.

6. Apparatus

6.1 *Overflow Container* such as a glass beaker.

6.2 *Low Power Microscope* ($5\times$ to $50\times$) and light source for observation of small piece parts.

7. Reagents and Materials

7.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society,² where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

¹ This method is under the jurisdiction of ASTM Committee F-1 on Electronics.

Current edition effective Aug. 31, 1965. Originally issued 1962. Replaces F 22 - 62 T.

² "Reagent Chemicals, American Chemical Society Specifications," Am. Chemical Soc., Washington, D.C.



7.2 *Purity of Water*—Deionized or distilled water is preferred. Water of higher ionic content may render the test destructive. The water used must be free of hydrophobic and hydrophilic substances.

NOTE 1—The freedom of the water from hydrophobic and hydrophilic contamination may be determined in accordance with Section 8.

7.3 Acetone.

7.4 *Mica Blanks*, preferably 1 in. (25 mm) by 2 in. (50 mm) by 0.015 in. (0.38 mm) or larger, having minimum ASTM Quality V6 as described in ASTM Specifications D 351, for Natural Muscovite Block Mica and Thins Based on Visual Quality.³

7.5 *Oleic or Stearic Acid*—A 0.05 percent solution in acetone.

8. Calibration and Standardization

8.1 Freedom of the test equipment and materials from hydrophobic contamination shall be determined as described in 9.1 on a mica sheet having both surfaces freshly cleaved. If water-break does not occur within 1 min after withdrawal of the freshly cleaved mica surface from the overflow container, the test equipment and materials shall be considered free of hydrophobic contamination for this test.

8.2 To ensure the freedom of the test equipment and materials from hydrophilic contamination, a mica sheet having both surfaces freshly cleaved, from which the solvent

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from 1 drop (0.05 to 0.10 ml) of a 0.05 percent solution of oleic or stearic acid in acetone has been allowed to evaporate shall, when tested, clearly show within 1 min the demarcation between the clean and contaminated areas.

9. Procedure

9.1 *Testing of Surfaces*—Withdraw the test surface, in a vertical position, from the container overflowing with water.

9.2 *Testing of Ambients*—Expose a freshly cleaved mica surface to the ambient and subsequently continue as described in 9.1.

NOTE 2—Exposure may be by immersion of the mica surface in the ambient or by deposition of a sample of the ambient on the mica surface.

10. Interpretation of Results

10.1 Surfaces tested as described in 9.1 shall be considered free of hydrophobic contaminants by this test if the draining water layer remains as a thin continuous film over the surface for 1 min after withdrawal of the surface from the overflow container. If hydrophobic contaminants are present, as evidenced by formation of a discontinuous water film within 1 min after withdrawal of the surface from the overflow container, the length of time necessary for the water-break to occur is a rough indication of the degree of contamination.

³ *Annual Book of ASTM Standards*, Part 40.



Standard Recommended Practice for TEMPERATURE MEASUREMENT OF THERMIONIC EMITTERS¹

This standard is issued under the fixed designation F 23; the number immediately following the designation indicates that of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of approval.

INTRODUCTION

The temperature of a thermionic emitter is very important to the life and performance of an electron tube. Of all the measurable tube parameters, cathode temperature is often determined with the least accuracy. This is unfortunate since emission, face resistance, coating resistance, and coating evaporation are dependent upon temperature of the emitter. Even in the determination of the thermionic constant wherein it is necessary to make a simultaneous measurement of cathode emission density and cathode temperature, the accuracy of the cathode temperature measurement should be known within a few percent in order that the work function can be determined with comparable accuracy. The accuracy of measurement depends on several factors: (1) the physical shape of the emitter, (2) the operating temperature range, (3) the desired accuracy of the determination, and (4) the relative convenience.

1. Scope

1.1 This recommended practice provides methods for temperature measurement of thermionic emitters.

NOTE 1—There are several comprehensive works (1,2,3)² on general temperature measurements.

1.2 The methods of temperature measurement appear in the following order:

| Method | Sections |
|---------------------------------|----------|
| Optical and Infrared Techniques | |
| Optical Pyrometry | 2 |
| Spectral Emittance | 3 |
| Infrared Photography | 4 |
| Thermocouple Techniques | 5 to 8 |
| Direct Current Methods | 9 to 12 |

TEMPERATURE MEASUREMENT BY OPTICAL AND INFRARED TECHNIQUES

2. Optical Pyrometry

2.1 A widely used method of measuring the temperature of an emitting cathode is the de-

vantages, as follows:

2.1.1 No need for physical contact instrument with the element being measured.

2.1.2 Wide effective range of the instrument (900 to 3500 K),

2.1.3 Applicable to any shape structure provided it is visible, and

2.1.4 Adaptable to small emitters without appreciably upsetting the thermal equilibrium.

2.2 The radiation emerging from a hole in a uniformly heated enclosure is considered to be black-body radiation. By multiple reflections from the walls of the enclosure, equilibrium is established between the radiation; this black-body radiation is characterized by a particular distribution

¹ This recommended practice is under the jurisdiction of the ASTM Committee F-1 on Electronics, and is the responsibility of Subcommittee F01.03 on Metallurgical.