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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Mercurous Nitrate Test for Copper and Copper Alloys[1]

This standard is issued under the fixed designation B 154; 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. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method describes the technique for conducting the mercurous nitrate test for residual stress in wrought copper and cast or wrought copper-base alloy products. This test method is intended to cover the mercurous nitrate test of certain copper-alloy products supplied in accordance with ASTM specifications prepared by Committee B-5. This test method is not intended to be used on assembled parts.

NOTE 1—For any particular copper alloy, reference should be made to the material specification.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For specific precautionary and hazard statements see Note 2, Note 3, Note 4, Note 5, and Note 6 and Sections 1, 4, 5, and 7.

NOTE 2—**Warning:** Mercury is a definite health hazard in use and disposal.

2. Terminology

2.1 *Definitions:*

2.1.1 *stress corrosion crack*—spontaneous failure of metals by cracking under combined action of corrosion and stress, residual or applied.

2.1.2 *residual stress*—stresses that remain within a body as the result of plastic deformation or casting.

3. Significance and Use

3.1 This test method is an accelerated test for detecting the presence of residual (internal) stresses which might result in failure of individual parts in storage or in service due to stress corrosion cracking. This test method is not intended for assemblies under applied stress. If used for that purpose it shall be for information only and not a cause for rejection of the assembly, its component parts, or the original mill product.

4. Mercurous Nitrate Solution

4.1 *Concentration*—The solution shall be an aqueous mercurous nitrate solution containing 10 g of $HgNO_3$ and 10 mL of HNO_3 (sp gr 1.42) per litre of solution.

4.2 *Preparation*—The aqueous mercurous nitrate solution shall be prepared by either of the following procedures, A or B. Used solutions may be replenished as described in 4.3.

4.2.1 *Procedure A*—Dissolve 11.4 g of $HgNO_3 \cdot 2H_2O$ or 10.7 g of $HgNO_3 \cdot H_2O$ in approximately 40 mL of distilled water acidified with 10 mL of HNO_3 (sp gr 1.42). After the crystals are completely dissolved, dilute the solution with distilled water to 1000 mL.

NOTE 3—**Warning:** The mercurous nitrate crystals are obtainable in both the monohydrate and dihydrate form and should be handled with caution because of their highly toxic effects.

NOTE 4—**Caution:** When weighing crystals, the weight of the water of crystallization should be taken into consideration. The mercurous nitrate crystals are photosensitive and when they have turned yellow are difficult to dissolve.

NOTE 5—**Precaution:** Care should be exercised when mixing chemicals. Mixing should only be done by qualified personnel using appropriate chemical laboratory techniques.

4.2.2 *Procedure B*—Dissolve 76 g of mercury in 114 mL of diluted HNO_3 (1 part water to 1 part HNO_3) (sp gr 1.42). Carefully dilute with distilled water to 1000 mL. This provides a concentration of 100 g of $HgNO_3$ after a slight loss due to heating. Add the water in small portions while stirring to prevent local overdilution. This gradual dilution, together with the excess acid, will prevent precipitation of basic salts of mercury. Dilute 100 mL of this solution (10 %) with 7 mL of HNO_3 (sp gr 1.42) and 893 mL of water.

NOTE 6—**Warning:** Mercury is a definite health hazard and therefore equipment for the detection and removal of mercury vapor produced in volatilization is recommended. The use of rubber gloves in testing is advisable.

4.3 *Replenishment of Solution*—The spent solution may be reclaimed by replenishing the mercurous nitrate solution, to a 1 % concentration, as follows:

4.3.1 Measure as accurately as possible in a small graduated cylinder 50 mL of the spent $HgNO_3$ solution.

4.3.2 Transfer to an Erlenmeyer flask, and add 10 mL of HNO_3 (1 + 1).

[1] This test method is under the jurisdiction of ASTM Committee B-5 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.06 on Methods of Test.

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