Designation: B895 – 15

StandardTest Methods for Evaluating the Corrosion Resistance of Stainless Steel Powder Metallurgy (PM) Parts/Specimens by Immersion in a Sodium Chloride Solution[1]

This standard is issued under the fixed designation B895; 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.

1. Scope*

1.1 These test methods cover a procedure for evaluating the ability of sintered PM stainless steel parts/specimens to resist corrosion when immersed in a sodium chloride (NaCl) solution.

1.2 Corrosion resistance is evaluated by one of two methods. In Method 1, the stainless steel parts/specimens are examined periodically and the time to the first appearance of staining or rust is used to indicate the end point. In Method 2, continued exposure to the sodium chloride solution is used to monitor the extent of corrosion as a function of time.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *This standard does not purport to address 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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A380 Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems

B243 Terminology of Powder Metallurgy

B528 Test Method for Transverse Rupture Strength of Powder Metallurgy (PM) Specimens

D610 Practice for Evaluating Degree of Rusting on Painted Steel Surfaces

D1193 Specification for Reagent Water

G1 Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens

G48 Test Methods for Pitting and Crevice Corrosion Resistance of Stainless Steels and Related Alloys by Use of Ferric Chloride Solution

3. Terminology

3.1 *Definitions*—Useful definitions of terms for metal powders and powder metallurgy are found in Terminology B243.

4. Summary of Test Method

4.1 Method 1 is recommended for evaluating the corrosion resistance of stainless steel powder metallurgy parts/specimens and to verify that proper materials and processing conditions were used.

4.1.1 In this method, parts/specimens are immersed in 5 % (by mass) NaCl solution and examined periodically until the first appearance of staining or rust. A part or specimen is considered to have reached the end point when the first sign of corrosion occurs.

4.2 Method 2 is recommended for evaluating the processing variables used in producing parts/specimens.

4.2.1 In this method, parts/specimens are exposed further to the NaCL solution and periodically rated as either A, B, C, or D (A-no corrosion; D-high or extreme corrosion) by comparison with Fig. 1, a photograph of corroded specimens which serves as a standard. Additional examples of quantitative ratings may be found in Test Method D610. Method 2 has been found useful in alloy screening and process optimization studies.

5. Significance and Use

5.1 The ability of sintered powder metallurgy stainless steel parts/specimens to resist corrosion when immersed in sodium chloride solution is important to their end use. Causes of unacceptable corrosion may be incorrect alloy, contamination of the parts by iron or some other corrosion-promoting material or improper sintering of the parts (for example, undesirable carbide and nitride formations caused by poor lubricant burnoff or improper sintering atmosphere).

[1] These test methods are under the jurisdiction of Committee B09 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.05 on Structural Parts.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

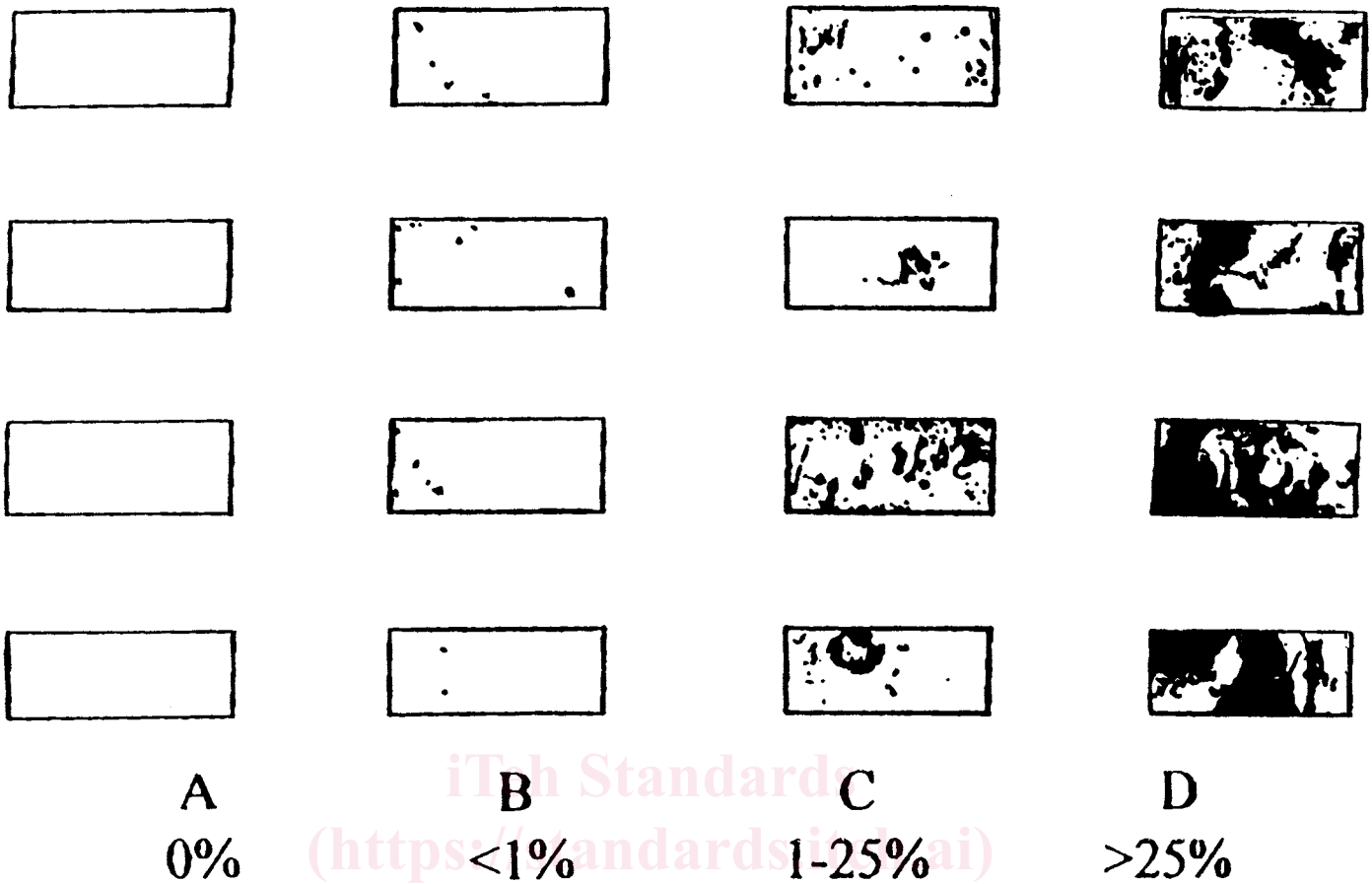

FIG. 1 Examples of Ratings for Various Amounts of Rust or Stain (Immersion in Aqueous Solution of 5 % NaCl)

5.2 This standard may be part of a purchase agreement between the PM parts producer (seller) and the user of the parts (purchaser) (Method 1). It may also be used to optimize part or specimen production parameters (Method 2).

6. Apparatus

6.1 *Sealable Glass or Plastic Jars,* of suitable capacity for specimens to be completely covered by the NaCl solution.

6.2 *Glass Beads* (4 mm is recommended).

6.3 *Glass Stirring Rods.*

6.4 *Tongs* (Stainless steel or plastic, nonmetallic plated).

7. Reagents

7.1 A sodium chloride solution consisting of 5 ± 0.1 % (by mass) NaCl shall be prepared using distilled or deionized water conforming to Specification D1193 (Type 4) and ACS reagent grade NaCl solution. The 5 % NaCl solution shall be prepared no less than 16 h before beginning the corrosion testing.

7.2 Concentrated HCl.

7.3 Distilled or deionized water.

8. Test Specimen

8.1 Usually test parts are sintered parts, but they may also be standard transverse rupture bars as defined in Test Method B528. A minimum of ten parts/specimens shall be used for each test except for routine testing of production parts, where the use of five parts is acceptable. The use of ten parts/specimens is, however, recommended for evaluating new materials/processes.

8.1.1 The density of the parts or specimens as well as any post sintering treatments, (that is, coining, repressing, machining, etc.) shall be stated. Parts or specimens shall be free of oil, dirt, grease and fingerprints. If they have been cleaned, the cleaning method shall be stated. Refer to Practices A380 and G1 for recommended cleaning practices.

8.1.2 The use of tongs or gloves, or both, to prevent contamination in handling is suggested.

NOTE 1—Iron or low-alloy steel particles present on the surface of the sintered stainless steel parts/speciments can be revealed by placing the parts/specimens in a concentrated solution of copper sulfate, $CuSO_4$. The dissolved copper plates out on the iron/low-alloy particles within minutes and can be seen by using a low-magnification microscope.

9. Preparation of Apparatus

9.1 Soak previously used jars and glass beads in concentrated HCl for at least 12 h to remove rust stains; rinse with distilled or deionized water, then rinse again and allow to dry.

9.1.1 Place the glass beads in the bottom of the beaker. Use a sufficient number of beads to keep the test specimen off the bottom of the jar.