



Standard Practice for Use of Mattsson's Solution of pH 7.2 to Evaluate the Stress-Corrosion Cracking Susceptibility of Copper-Zinc Alloys¹

This standard is issued under the fixed designation G 37; 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 This practice covers the preparation and use of Mattsson's solution of pH 7.2 as an accelerated stress-corrosion cracking test environment for brasses (copper-zinc base alloys). The variables (to the extent that these are known at present) that require control are described together with possible means for controlling and standardizing these variables.

1.2 This practice is recommended only for brasses (copper-zinc base alloys). The use of this test environment is not recommended for other copper alloys since the results may be erroneous, providing completely misleading rankings. This is particularly true of alloys containing aluminum or nickel as deliberate alloying additions.

1.3 This practice is intended primarily where the test objective is to determine the relative stress-corrosion cracking susceptibility of different brasses under the same or different stress conditions or to determine the *absolute* degree of stress corrosion cracking susceptibility, if any, of a particular brass or brass component under one or more specific stress conditions. Other legitimate test objectives for which this test solution may be used do, of course, exist. The tensile stresses present may be known or unknown, applied or residual. The practice may be applied to wrought brass products or components, brass castings, brass weldments, and so forth, and to all brasses. Strict environmental test conditions are stipulated for maximum assurance that apparent variations in stress-corrosion susceptibility are attributable to real variations in the material being tested or in the tensile stress level and not to environmental variations.

1.4 This practice relates solely to the preparation and control of the test environment. No attempt is made to recommend surface preparation or finish, or both, as this may vary with the test objectives. Similarly, no attempt is made to recommend particular stress-corrosion test specimen configurations or methods of applying the stress. Test specimen configurations that may be used are referenced in Practice G 30 and STP 425.²

1.5 *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 more specific safety hazard statements see Section 8.)

2. Referenced Documents

2.1 ASTM Standards:³

D 1193 Specification for Reagent Water

G 30 Practice for Making and Using the U-Bend Stress-Corrosion Test Specimens

3. Summary of Practice

3.1 The practice consists of completely and continuously immersing a stressed test specimen in an aqueous solution containing 0.05 g-atom/L of Cu^{++} and 1 g-mol/L of NH_4^+ and of pH 7.2. The copper is added as $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and the NH_4^+ as a mixture of NH_4OH and $(\text{NH}_4)_2\text{SO}_4$. The ratio of these latter two compounds is adjusted to give the desired pH. Exposure time, criterion of failure, and so forth, are variable and not specifically recommended.

4. Significance and Use

4.1 This test environment is believed to give an accelerated ranking of the relative or *absolute* degree of stress-corrosion cracking susceptibility for different brasses. It has been found to correlate well with the corresponding service ranking in environments that cause stress-corrosion cracking which is thought to be due to the combined presence of traces of

¹ This practice is under the jurisdiction of ASTM Committee G01 on Corrosion of Metals, and is the direct responsibility of Subcommittee G01.06 on Environmentally Assisted Cracking.

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² *Stress Corrosion Testing*, ASTM STP 425, ASTM (Although currently out of print, copies may be obtained from University Microfilms, Inc., 300 North Zeeb Rd., Ann Arbor, MI 48106).

³ 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.