



Standard Classification of Resistance to Stress-Corrosion Cracking of Heat-Treatable Aluminum Alloys¹

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INTRODUCTION

Stress corrosion behavior is an important characteristic to be considered when optimizing the choice of material for an engineering structure. Unfortunately, there is no generally accepted scale for measuring it, and stress corrosion tendencies are difficult to define because of the complex interdependence of the material, tensile stress, environment, and time. Conventional test-dependent types of laboratory stress corrosion data have only very limited applicability in mathematical models used for materials selection.

This standard is intended to provide a qualitative classification of the relative resistance to stresscorrosion cracking (SCC) of high-strength aluminum alloys to assist in the selection of materials. The classification is based on a combination of service experience and a widely accepted laboratory corrosion test.

It is cautioned, however, that any such generalized classification of alloys can involve an oversimplification in regard to their behavior in unusual environments. Moreover, the quantitative prediction of the service performance of a material in a specific situation is outside the scope of this standard.

1. Scope

1.1 This standard contains alphabetical ratings of the relative resistance to SCC of various mill product forms of the wrought 2XXX, 6XXX, and 7XXX series heat-treated aluminum alloys and the procedure for determining the ratings.

1.2 The ratings do not apply to metal in which the metallurgical structure has been altered by welding, forming, or other fabrication processes.

2. Referenced Documents

2.1 ASTM Standards:

G 44 Practice for Evaluating Stress Corrosion Cracking Resistance of Metals and Alloys by Alternate Immersion in 3.5 % Sodium Chloride Solution²

G 47 Test Method for Determining Susceptibility to Stress-Corrosion Cracking of High-Strength Aluminum Alloy Products²

3. Terminology

3.1 Definitions:

3.1.1 *lot*—an identifiable quantity of material of the same

mill form, alloy, temper, section and size (or thickness, in the case of sheet and plate) traceable to a heat treat lot or lots, and subjected to inspection at one time.

3.1.2 *stress-corrosion cracking (SCC)*—a cracking process that requires the simultaneous action of a corrodent and sustained tensile stress. SCC in aluminum alloy products historically has been observed to follow an intergranular path leading to the ultimate fracture. Thus, for the purpose of this standard, a fractured test specimen that reveals only pitting corrosion or pitting plus transgranular cracking shall not be considered as an SCC failure (Test Method G 47).

4. Significance and Use

4.1 This classification involves alphabetical ratings intended only to provide a qualitative guide for materials selection. The ratings are based primarily on the results of standard corrosion tests.

4.2 Interpretations of the SCC ratings in terms of typical problem areas including service experience are given in Table 1. Practical experience has shown that SCC problems with aluminum alloys generally have involved situations where the direction and magnitude of the tensile stresses resulting from manufacturing or use, or both, of the material were not recognized.

4.3 A list of the SCC ratings for the heat-treatable aluminum alloy products is given in Table 2. Revisions to the table will be required as new materials become available and additional test

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² *Annual Book of ASTM Standards*, Vol 03.02.