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PEOPLE'S REPUBLIC OF CHINA**

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**Corrosion of metals and alloys - Measurement of the electrochemical
critical localized corrosion temperature (E-CLCT) for Ti alloys
fabricated via the additive manufacturing method**

**金属和合金的腐蚀 增材制造钛合金电化学临界局部腐蚀温度（E-CLCT）的测量
(English Translation)**

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is equivalent to ISO 22910:2020 "Corrosion of metals and alloys - Electrochemical critical localized corrosion temperature of titanium alloys used in additive manufacturing".

(E-CLCT) measurement.

The following minimal editorial changes have been made to this document.

---Correct "ISO 18098" in Chapter 5 to "ISO 18089".

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the China Iron and Steel Association.

This document is under the jurisdiction of the National Steel Standardization Technical Committee (SAC/TC183).

Introduction

Titanium alloys (such as Ti-6Al-4V) are considered to be among the most promising engineering materials. They uniquely combine a high strength-to-density ratio with excellent...

Its excellent mechanical and corrosion resistance properties have led to its increasingly widespread application in industrial fields such as aerospace, automotive, marine, and biomedicine.

Titanium alloys are typically produced through forging or casting processes, both of which are subtractive manufacturing (SM) methods. Recently, a new...

Additive manufacturing (AM), also known as "3D printing," has gained popularity as a cost-effective and efficient method for small-batch production.

The world's attention.

Additive manufacturing of titanium alloys has been extensively studied in aerospace and medical applications. The raw material utilization rate of additive manufacturing is approximately [percentage missing] that of conventional manufacturing.

15 times that of [other materials]. From a mechanical perspective, additive manufacturing, based on laser or electronic technology, possesses a unique microstructure, and the

prepared Ti-6Al-4V, etc.

Titanium alloys possess strength and ductility comparable to or superior to alloys prepared using conventional manufacturing methods. However, additively manufactured alloys exhibit higher properties.

The degree of layer formation depends on geometry and process conditions (more than 130 parameters), such as the layer formation method (powder bed melting or spray molding), and whether it is powder or filament.

Size and mass, component dimensions, input energy, layer orientation and surface conditions, and the CAD process of converting data into added layers to construct the component.

Process compatibility. Differences in porosity arising from layer orientation and melt pool intersections during layer-by-layer fabrication can lead to problems in additive manufacturing.

Differences in the mechanical and electrochemical properties of materials. Heat treatment can control the porosity or microstructure resulting from rapid melting and quenching, but not...

The ability to eliminate the intermediate layer leads to differences in the localized corrosion mechanism of additively manufactured materials. Even additively manufactured titanium alloys differ from conventionally manufactured titanium alloys.

The alloys exhibit similar corrosion resistance, but their corrosion mechanisms differ. Due to limitations in traditional testing methods for evaluating these properties, therefore...

A novel testing method was developed to measure the electrochemical critical localized corrosion temperature (E-CLCT) to evaluate pitting and crevice corrosion in additively manufactured alloys.

E-CLCT is defined as the lowest temperature at which pitting and crevice corrosion initiate on the surface of an additively manufactured specimen under given test conditions.

This document specifies a method for evaluating the localized corrosion resistance of additively manufactured alloys by testing their E-CLCT (Extracorporeal Corrosion Coefficient of Conductivity), and provides a method for...

An effective method is needed to qualitatively evaluate or compare the corrosion performance of additively manufactured materials with different process parameters. This test method verifies the additive manufacturing process.

The quality of heat treatment of materials, the integrity of interlayer bonding, and the effective control of parameters provide a qualitative tool for long-term application.

Furthermore, this document can be extended from additive manufacturing of titanium alloys

to other additive manufacturing alloys, for example, by modifying the concentration of the test solution or by adding external additives.

Potential is applied to Ni alloys. This document also provides important information for evaluating other types of localized corrosion, such as corrosion cracking and erosion.

Based on the results of this experiment, relevant documents can be developed and further improved.

Corrosion Additive Manufacturing of Metals and Alloys Electrochemical Critical Localized Corrosion Temperature of Titanium Alloy (E-CLCT) measurement

1 Scope

This document describes a method for testing the resistance to localized corrosion of titanium alloys prepared by additive manufacturing (AM) methods.

This document applies to the measurement of the electrochemical critical localized corrosion temperature (E-CLCT) of additively manufactured titanium alloy materials, used for localized corrosion resistance.

Relative evaluation of force.

2 Normative references

This document has no normative references.

3 Terms and Definitions

The following terms and definitions apply to this document.

Under specified test conditions, the most stable localized corrosion (including pitting and crevice corrosion) on the surface of additively manufactured titanium alloy samples is...

Low temperature.

temperatureramp rate

The rate at which the surface temperature of the sample rises during the test.

4.1 Scope of ISO 17864

The ISO 17864 test method determines the critical pitting temperature (CPT) by performing a temperature scan under constant potential control. During the temperature scan...

During the process, the current is monitored, and CPT is defined as the temperature at which the current increases rapidly. Considering practical operational factors, CPT is further defined as...