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Corrosion of metals and alloys — Method for determination of the uniform corrosion rate of stainless steels and nickel based alloys in liquids

Corrosion des métaux et alliages — Méthode pour la détermination du taux de corrosion uniforme des aciers inoxydables et des alliages à base de nickel dans les liquides

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 156, *Corrosion of metals and alloys*.

Introduction

Stainless steel and nickel based alloys generally show good corrosion resistance but uniform corrosion can occur in acidic and alkaline solutions. The uniform corrosion rate in aqueous solutions is usually considered to be a fairly stable process as long as the corrosive environment is constant with respect to chemical composition, temperature, and flow conditions. The uniform corrosion resistance of stainless steels and nickel based alloys is thus often determined by short-term laboratory coupons immersion tests carried out under controlled conditions. However, in real applications, some variation in service conditions can occur which might cause a temporary activation of the stainless steel or nickel based alloy surface. Temperature variations, fluctuation in the access of air or other oxidants, contact to less noble materials, e.g. mild steel, or to certain cleaning agents are all factors which under certain circumstances could cause activation.

One important property to investigate is therefore the ability for the material to passivate after activation and accordingly, this method includes activation of the specimens. The corrosion rate determined by this test can be used as a basis for material selection and to estimate the lifetime of the material.

Corrosion of metals and alloys — Method for determination of the uniform corrosion rate of stainless steels and nickel based alloys in liquids

1 Scope

This International Standard specifies the measurements of the corrosion rate of uniform corrosion for stainless steels and nickel based alloys in the intended liquids and the ability for the material to passivate after activation.

This method is intended to be used for estimation of the uniform corrosion rate in liquids, under atmospheric conditions, for the chemical industry under specific environmental conditions and not as a qualification test. It can also be used to determine iso-corrosion diagrams and at which temperature the corrosion rate exceeds 0,1 mm/a.

This International Standard is not intended for excessive corrosion rates above 1 mm/a since an even higher corrosion rate indicates that the stainless steel is not suitable in the application.

This International Standard is not intended to be used for solutions containing halides, especially chlorides, since these might cause localized corrosion.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applied. For undated references, the latest edition of the referenced document applies.

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 8044, *Corrosion of metals and alloys — Basic terms and definitions*

ISO 17864, *Corrosion of metals and alloys — Determination of the critical pitting temperature under potientiostatic control*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8044 apply.

4 Principle

4.1 This method involves immersion of the material in the intended liquid after the required temperature has been reached. Mass measurements are carried out before and after each of three sequential periods, 24 h, 72 h, and 72 h of immersion.

Period 1: 24 h of immersion in the liquid. When exposed to acid, the passive layer will change composition during this period. In addition, contaminations on the specimens will be removed during this period. For this reason, the first period is normally not accounted for when evaluating the corrosion rate.

Period 2: 72 h of immersion in the liquid. This period determines the corrosion rate.

Period 3: 72 h of immersion in the liquid with activation of the specimens. This period determines the corrosion rate of a specimen with an active surface and the ability to repassivate in the specific liquid.