INTERNATIONAL STANDARD

ISO 10270

Second edition
2022-02

Corrosion of metals and alloys — Aqueous corrosion testing of zirconium alloys for use in nuclear power reactors

Corrosion des métaux et alliages — Essais de corrosion aqueuse des alliages de zirconium utilisés dans les réacteurs nucléaires

Reference number
ISO 10270:2022(E)

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Published in Switzerland

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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 are noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO is not held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 156, *Corrosion of metals and alloys*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 262, *Metallic and other inorganic coatings, including for corrosion protection and corrosion testing of metals and alloys*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 10270:1995), which has been technically revised. It also incorporates the Technical Corrigendum ISO 10270:1995/Cor 1:1997. The main changes compared with the previous edition are as follows:

— the references have been updated;

— in Clause 4, two sentences have been added: “The tests in water is performed at 18,6 MPa. The pressure is also determined by the contractor's requirements.”;

— in 5.2, “the test” has been replaced by “the measurement to avoid erroneous results from differing corrosion behaviour of the materials”;

— in 7.1, “welding grade” has been replaced by “of purity 999,9 ml/l or higher”,

— in 11.1, d), “1 day” has been replaced by “24 h”; and “at 18,6 MPa” has been added after “at 360 °C in water”.

— in 12.1, a sentence has been added: “Post-heat treatment, the coupons are inspected for any residual oxide and prepared (e.g. etched) in line with standard coupons”;

— in 12.3.4, a sentence has been added: “However, for the product acceptance test, it is better to keep the control coupons as evidence of test effectiveness.”;

— in 13.3.1, “±3 °C for steam tests, and ±6 °C for water tests” has been replaced by “±3 °C for steam tests and water tests”;

— in 13.3.3, “3 days or 14 days” has been replaced by “72 h or 336 h”;

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— in 14.2, a sentence has been added: “Mass gain measurements are taken in triplicate for each specimen and a mean value calculated”;

— in 14.3.1, a sentence has been added: “The separators are such as not to induce Galvanic interaction between the samples and the separators”; “zirconium or zirconium alloy” has been added before “stainless steel”;

— in Clause 16, “including its number and year of publication” has been added before “this document”;

— in A.3.1, “3 % (m/m) of hydrofluoric acid (7.7), 39 % (m/m) of nitric acid (7.8)” has been replaced by “40 g/kg ± 20 g/kg of hydrofluoric acid (7.7), 450 g/kg ± 50 g/kg of nitric acid (7.8)”, and a sentence has been added: “A different acid ratio may be chosen to satisfy the requirement of a smooth and shining surface given in 13.4.1;

— in A.3.2, “9 % (m/m) ± 1 % (m/m)” has been replaced by “90 g/kg ± 10 g/kg” and “30 % (m/m) ± 5 % (m/m)” has been replaced by “300 g/kg ± 50 g/kg”;

— in A.4.2,“25 % (V/V)” has been replaced by “250 ml/l” and “50 % (V/V)” has been replaced by “500 ml/l”;

— in Clause A.6, the following text has been added: “or placed into the oven at a recommended temperature of 60 °C to 70 °C for 1 h" and “The specimens need to be cooled to room temperature after removing from the oven”.

Any feedback or questions on this document are directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Corrosion of metals and alloys — Aqueous corrosion testing of zirconium alloys for use in nuclear power reactors

WARNING — This document can involve the use of hazardous materials, operations and equipment (see Clause 9). It is the responsibility of the user of this document to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This document specifies:

a) the determination of mass gain;

b) the surface inspection of products of zirconium and its alloys when corrosion is tested in water at 360 °C or in steam at or above 400 °C;

c) the performance of tests in steam at 10,3 MPa.

This document is applicable to wrought products, castings, powder metallurgy products and weld metals.

This method has been widely used in the development of new alloys, heat-treating practices and for the evaluation of welding techniques. It is applicable for use in its entirety to the extent specified for a product acceptance test, rather than merely a means of assessing performance in service.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
etching
process for the removal of surface metal by action of acids in water

3.2
control coupon
zirconium alloy specimen of known performance used to monitor the validity of the test

3.3
high mass gain coupon
zirconium alloy specimen that has been specially heat-treated to produce a mass gain higher than the maximum given in materials acceptance specifications and which is used for verifying the severity of the test procedure

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