
**Anodizing of aluminium and its
alloys — Determination of mass
per unit area (surface density)
of anodic oxidation coatings —
Gravimetric method**

*Anodisation de l'aluminium et de ses alliages — Détermination
de la masse par unité de surface (masse surfacique) des couches
d'oxydation anodique — Méthode gravimétrique*

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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 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be 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 79, *Light metals and their alloys*, Subcommittee SC 2, *Organic and anodic oxidation coatings on aluminium*.

This fourth edition cancels and replaces the third edition (ISO 2106:2011), which has been technically revised. The main changes compared with the previous edition are as follows:

- phosphoric acid/sodium molybdate solution has been added as a test solution;
- the information of the test specimen has been added;
- [Formula \(2\)](#) has been corrected.

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

Anodizing of aluminium and its alloys — Determination of mass per unit area (surface density) of anodic oxidation coatings — Gravimetric method

1 Scope

This document specifies a gravimetric method for determining the mass per unit area (surface density) of anodic oxidation coatings on aluminium and its alloys.

The method is applicable to all oxidation coatings formed by anodizing aluminium and its alloys, either cast or wrought, and is suitable for most aluminium alloys, except those in which the mass fraction of copper is greater than 6 %.

NOTE 1 A high content of copper in the alloy can lead to increased dissolution of the substrate aluminium.

NOTE 2 If the thickness is known with sufficient precision (for example, using the method specified in ISO 2128), the determination of the mass per unit area (surface density) of the coatings will enable its apparent density to be calculated. Conversely, if the conditions of application of the coating and its density are known, the determination of its mass per unit area (surface density) can permit the calculation of the average mass and an approximate evaluation of the thickness (see [Clause 9](#)).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7583, *Anodizing of aluminium and its alloys — Terms and definitions*

<https://standards.iteh.ai/catalog/standards/iso/05ab0b58-bbc8-45b2-81d3-7cf3676d2391/iso-2106-2019>

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7583 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 <http://www.electropedia.org/>

4 Principle

The anodic oxidation coating on a weighed test specimen of known surface area is dissolved without significantly attacking the substrate aluminium, using a solution of phosphoric acid and chromium(VI) oxide or phosphoric acid and sodium molybdate of specified concentration.

After dissolution of the coating, the test specimen is reweighed in order to calculate the loss in mass. The mass loss is related to the unit area covered by the coating, and is expressed in milligrams of coating per square decimetre of surface.

NOTE This is a destructive test.

5 Reagents

Use only reagents of recognized analytical grade and only distilled water or deionized water.

Test solution A does not attack the substrate aluminium and it is not necessary to take uncoated surfaces into account.

Test solution B attacks the substrate aluminium to a limited extent. Therefore, it is necessary to prevent to dissolve.

5.1 Test solution A.

Phosphoric acid/chromic solution, prepared as follows:

- phosphoric acid, ($\rho_{20} = 1,7$ g/ml): 35 ml;
- chromium(VI) oxide: 20 g;
- water: make up to 1 000 ml.

WARNING — Chromium(VI) is toxic and shall be handled properly. Chromium (VI) solutions are hazardous to the environment and severely hazardous to waters.

5.2 Test solution B.

Phosphoric acid/sodium molybdate solution, prepared as follows:

- phosphoric acid, ($\rho_{20} = 1,7$ g/ml): 35 ml;
- disodium molybdate(VI) dihydrate: 10 g;
- water: make up to 1 000 ml.

WARNING — Molybdate(VI) is toxic and shall be handled properly. In the enforcement of this test, it is necessary to have sufficient indoor ventilation.

6 Apparatus

Usual laboratory apparatus and glassware and, in particular, the following.

6.1 Laboratory balance, with a resolution of 0,1 mg.

7 Preparation of test specimen

7.1 Sampling

The test specimen shall be taken from a significant surface of the product, where the anodic oxidation coating formed thereon satisfies the quality requirements for the application of the product. The test specimen shall not be taken from an edge of the part because of possible distortion and/or non-uniformity.

Where it is impossible to test the product itself, a test specimen that is representative of the product may be used. In this case, the test specimen used shall be made from the same material and prepared under the same conditions of finishing as those used for the preparation of the product. The aluminium alloy, the manufacturing conditions (kind and temper of the material), and the surface condition before treatment should be the same as those of the product. Pretreatment and anodizing should be performed in the same bath and under the same conditions as the treatment of the product.