

ICS 25.220.20

CCS A 29



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 4955-2005

**Metallic coatings -- Measurement of coating thickness --
Coulometric method by anodic dissolution
(English Translation)**

Issued on: October 12, 2005

Implemented on: April 1, 2006

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine of the People's Republic of China**

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Foreword

This Standard identically adopts ISO 2177.2003 "Metallic coatings - Measurement of coating thickness - Coulometric method by anodic dissolution" (English version).

This Standard was redrafted based on ISO 2177.2003. This Standard has been modified in accordance with ISO 2177 as follows.

- Delete the foreword of ISO 2177;
- For ease of use, it adopts Chinese standards that corresponds to the international standards;
- Add the introduction to the normative references;
- Use "this Standard" to replace "this International Standard".

This Standard replaces GB/T 4955-1997 "Metallic coatings -- Measurement of coating thickness -- Coulometric method by anodic dissolution".

Compared with GB/T 4955-1997, the main changes in this Standard are as follows.

- Modify the measurable combinations in Table 1. Add the thickness measurement of the gold plating layer;
- Add the normative references;
- Modify Clause 8 Procedure. Add the requirements for note in 8.7;
- Modify Clause 9 Thickness calculation formula;
- Modify the appendix regarding typical electrolytes. Add electrolyte for gold;
- Modify the size requirements for electrolytic cells in the appendix. Add the requirement for small size. Add requirements for hot-dip coating and multi coating thickness measurement.

Annex A and Annex B of this Standard are informative.

This Standard was proposed by China Machinery Industry Federation.

This Standard shall be under the jurisdiction of National Technical Committee on Metallic and non-metallic coatings of Standardization Administration of China.

The drafting organizations of this Standard. Wuhan Institute of Material Protection and Guangzhou Entry-Exit Inspection and Quarantine Bureau Chemical Mineral Gold Center.

Metallic coatings - Measurement of coating thickness -
Coulometric method by anodic dissolution

1 Scope

This document describes a coulometric method, by anodic dissolution, for measuring the thickness of metallic coatings. It is only applicable to conductive coatings.

Typical combinations of coatings and substrates that can be tested by this method are given in Table 1. Other combinations may be tested with electrolytes in current use (see Annex A), or new electrolytes may be developed for them but, in both cases, it is necessary to verify the suitability of the complete system.

This Standard is also applicable to multi-layer systems, e.g. Cu-Ni-Cr (see also 8.5).

It may be used to measure the thickness of coatings applied by various means, if due account is taken of special features such as the presence of an alloy layer. In some cases,

the presence and thickness of diffusion layers can also be measured. It can also be used to measure the thickness of coatings on cylindrical specimens and wires (see 8.7).

8.1 General

If commercial equipment is used, follow the manufacturer's instructions with respect to the operating procedure for measurement, the electrolytes and, if necessary, calibration (see 5.3). Appropriate attention shall be given to the factors listed in Clause 7.

NOTE: If using instruments that require a pre-set voltage, it should be noted that the actual value is dependent on the particular metallic coating, current density, electrolyte concentration and

temperature and circuit resistance, e.g. lead-out connections. For these reasons, it is considered

advisable to first perform an evaluation test.

8.2 Preparation of test surface

The test surface (see 7.7) shall be cleaned immediately prior to beginning the test. It may be necessary to activate the test surface by mechanical or chemical means, but care should then be taken to avoid removal of metal.

8.3 Cell application

Press the electrolytic cell, fitted with its flexible sealing ring, on to the coating so that a known area is exposed to the test electrolyte. If the cell body is metallic, e.g. stainless steel, it normally forms the cell cathode; if not, insert a suitable cathode (incorporated in some instruments as part of the electrolyte agitation mechanism).

8.4 Electrolysis

Add appropriate electrolyte, making sure there are no bubbles on the measuring surface. If necessary, place a stirrer in the electrolytic cell. Connect the circuit. Allow the stirrer to work normally. Continue electrolysis until the anode potential or the cell voltage changes sharply or the stripping test is automatically cut off, indicating that the coating has been dissolved.

8.5 Undercoats

When one or more undercoats are to be measured, after measuring the top coating ensure that the top coat has first been completely removed from the whole of the measuring area. Remove the electrolyte from the cell using a suitable suction device, and thoroughly rinse out the cell with distilled or de-mineralized water.

Do not disturb the cell at any time during these operations. Abandon the test if the slightest displacement has occurred.

Reset the instrument controls for the next coating, introduce the appropriate electrolyte and continue the test as before.

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