International Standard **ISO** 2177

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

Revêtements métalliques — Mesurage de l'épaisseur — Méthode coulométrique par dissolution anodique

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 2177 was prepared by Technical Committee ISO/TC 107, *Metallic and other non-organic coatings*.

This second edition cancels and replaces the first edition (ISO 2177-1972), of which it constitutes a technical revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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

1 Scope and field of application

This International Standard specifies a coulometric method by anodic dissolution for measuring the thickness of metallic 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 B), or new electrolytes may be developed for them, but, in both cases, it is necessary to verify the suitability of the complete system.

The method is also applicable to multi-layer systems, for example Cu/Ni/Cr (see also 8.6).

This method 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 8.8).

2 Reference

ISO 2064, *Metallic and other non-organic coatings — Definitions and conventions concerning the measurement of thickness.*

3 Definitions

For the purpose of this International Standard, the definitions of ISO 2064, and the following, apply.

measuring area: The area of the significant surface over which a single measurement is made.

The measuring area for this method is the area enclosed by the sealing ring of the cell.

4 Principle

Anodic dissolution of a well-defined area of the coating using a suitable electrolyte. Detection of the virtually complete dissolution of the coating by a rapid change in cell voltage. Calculation of the coating thickness from the quantity of electricity (in coulombs) used, which may in turn be calculated from

a) the time interval between the start and the end of the test, if it is conducted at constant current density;

b) the integrated quantity of electricity used in dissolving the coatings.

5 Instrumentation

5.1 Suitable instruments may be constructed from readily available components but proprietary instruments are usually used (see annex A).

5.2 Proprietary direct reading instruments are available for use with electrolytes recommended by the manufacturer. Other instruments record the quantity of electricity, in coulombs, used in dissolving the coating from the measuring area (see clause 3), usually in arbitrary units, from which the thickness is calculated using factors or tables.

With direct reading instruments, the calculation of thickness from current density is made electronically.

5.3 The performance of the instrument shall be checked using specimens of known coating thickness. If the instrument readings agree to ±5 % of the known thicknesses of the specimens, the instrument may be used without further adjustment. Otherwise, the cause of the discrepancy shall be removed. Proprietary instruments shall always, however, be calibrated in accordance with the manufacturer's instructions.

Suitable specimens of known coating thickness shall consist of the same type of coating and substrate as the specimen to be measured, and they shall have an accuracy of 5 % or better. If measuring alloy coatings, the use of correct specimens is of particular importance.

6 Electrolyte

The electrolyte shall have a known, adequate shelf-life and shall be such that:

a) there is no reaction with the coating metal in the absence of an impressed flow of current;

b) the coating dissolves anodically at an efficiency as close to 100 % as possible;